SECTION 5

TAPE TRANSPORT MECHANISM

GENERAL

The tape transport mechanism provides tape motion for all modes of operation. Basic functions of the various assemblies are described in full and specifications of each are given throughout this manual. The assemblies and their associated components—the tape supply system, the tape takeup system, the tape drive system and 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 Low-High tape speed switch, a takeup tension arm (safety microswitch) and the head assembly are located on the tape transport.

> **CAUTION**
>
> *When loading the tape from the left hand reel holder be sure the tape has the oxide-coated side toward the head faces.*

TAPE SUPPLY AND TAKEUP 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 mode is selected, tape is rewound onto this supply reel when the REWIND button is selected. Proper tape tensioning is maintained during the record and reproduce modes by means of two reel induction torque motors, the supply reel idler, and reel idler guide arm (used only with ¼-inch tape).

The reel idler assembly on the supply side of the tape transport is composed of a pulley, a spring-pivot-mounted arm (only for ¼-inch machines) and a flywheel for the purpose of smoothing out transient speed variations in the tape system.

On the takeup 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 takeup assemblies are composed of induction torque motors (B601 Supply [Rewind], B701 Takeup), 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 interchangable. The brakes are solenoid operated, remaining in the braking

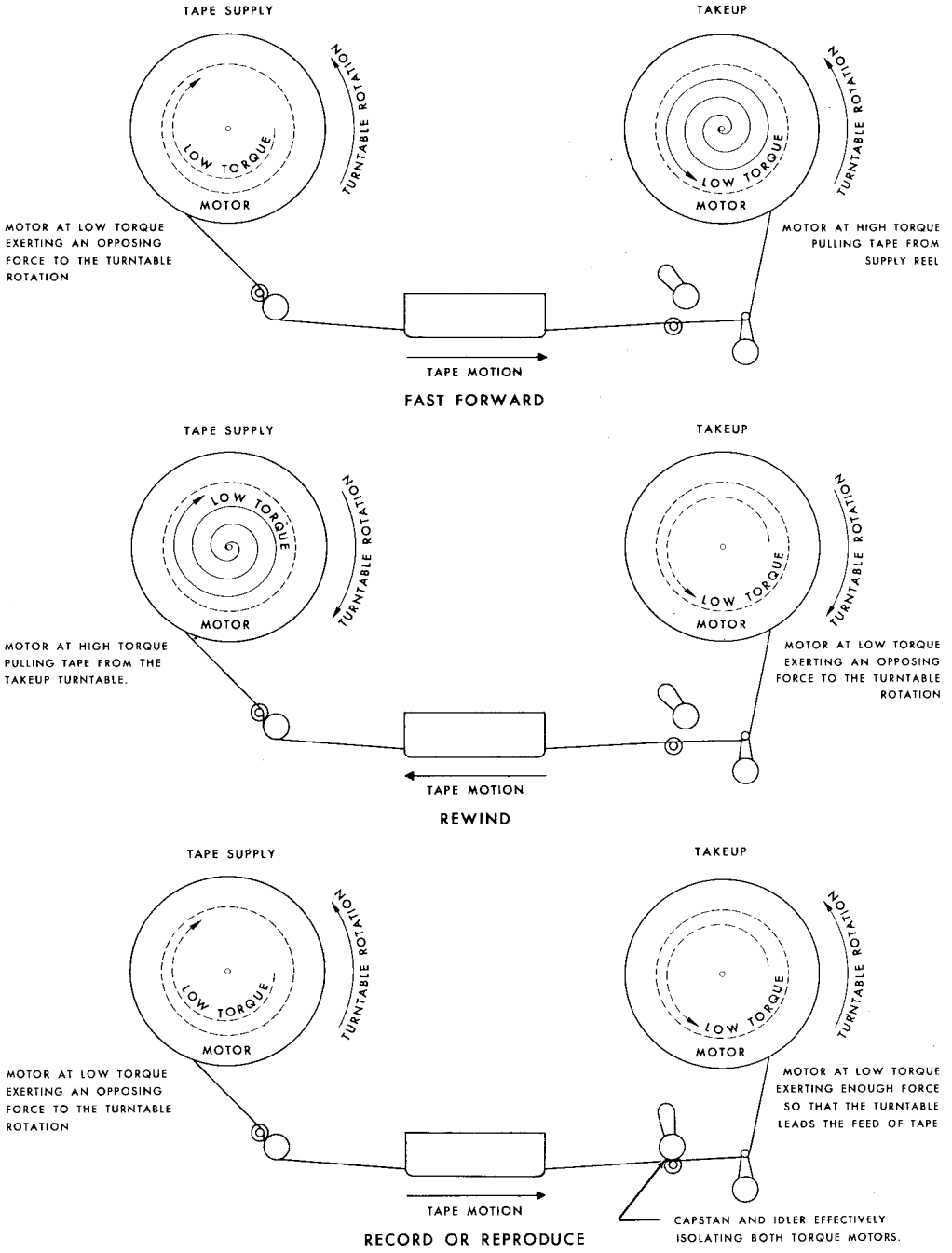
position until the brake solenoids K601 and K701 are energized at which time the brakes are released.

During the reproduce or record modes, the two induction torque motors B601 and B701 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 push-button 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 takeup 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



TAPE TENSIONING

will rotate clockwise, the tape takeup turntable will rotate counterclockwise.

Motor torque in the reproduce and record mode is adjusted to equality by the tensioning adjustment resistors (R801 HOLDBACK and R803 TAKEUP) in series.

In the fast forward mode, the torque of the supply (rewind) motor is reduced considerably by introduction of a series resistance (R802). In the rewind mode, R802 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 thus 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).

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.

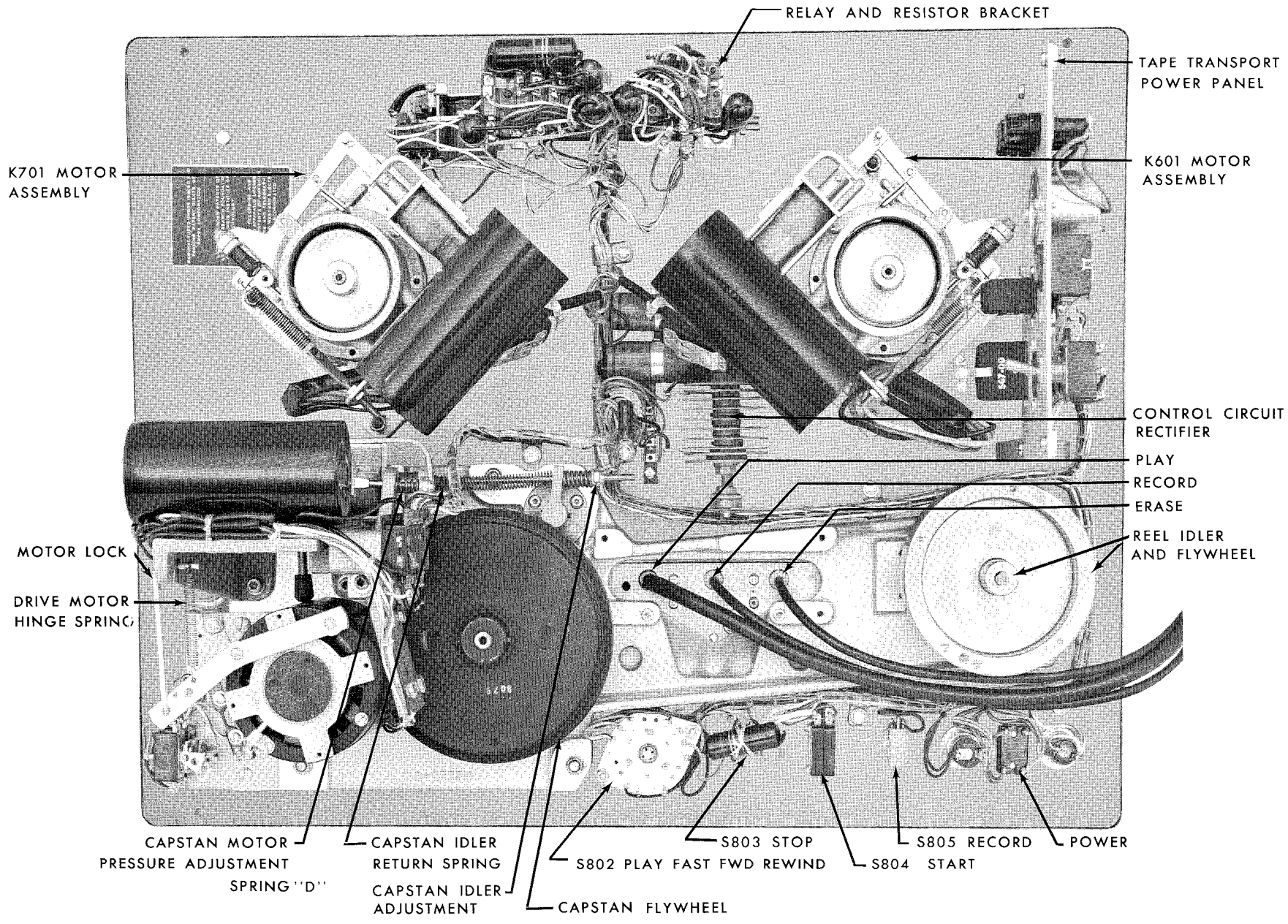
The reel idler assembly smooths out transients in the tension system. For example, when starting the tape in the reproduce mode, the momentary strain transmitted through the tape to the tape supply turntable, when the capstan idler forces the tape against the capstan, is considerable. Under some circumstances, 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 capstan assembly, 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 tape drive capstan assembly 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 pressed. (The drive motor has two windings to provide two tape speeds either of which can be selected at the TAPE SPEED toggle switch (S502 and S503).

After the POWER switch (S801) at the electronic assembly and tape transport has been placed in the ON position the FAST or SLOW start switch (S806) is at this time operated. In the SLOW start position the capstan drive motor is out of the circuit but in FAST start the capstan drive motor solenoid energizes and the



BOTTOM VIEW, TAPE TRANSPORT

motor pulley engages the capstan flywheel. When the PLAY position is selected, followed by pressing the START button, (provided the tape is properly threaded), the capstan solenoid (K501) and the brake solenoids K601 and K701 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.

The capstan drive motor assembly is mounted on a sturdy motor bracket held to the underneath side of the tape transport with three ¼-20x⅝ socket head cap screws. Mounted on top of the motor is the spring arm with variable holes for the drive motor return spring whether it be rack, portable or console (horizontal or vertical mounted). Two holes for the shipping lock also share this spring arm. The purpose of the spring is to provide a means to keep your motor pulled away from the capstan in the de-energized position. A stronger return spring is required for rack mounted machines than for console or portable units.

Rack—A-19995-01 (Heavier)

Console—A-19994-01

The capstan drive motor is mounted on a hinge which is moved by a solenoid to engage the motor and capstan flywheel. Extending from the solenoid draw bar is an adjustment point listed on the illustration.

The capstan speed should be checked with the stick-on strobosticker provided. Before checking, let drive unit run for at least five minutes to warm up lubricant in the capstan assembly. If the lubricant is stiff, the additional drag will cause greater compression of the rubber tire and the capstan will therefore run slightly slow until warmed up. Place strobosticker on capstan shaft with the sticky side down and view rotating shaft under 60 cps light. If the speed is not correct the spokes will appear to rotate. Slight speed changes can be realized by change in capstan drive motor pressure. If the adjustment is in the proper range, increasing pressure will slow the capstan, decreasing pressure will speed the capstan. Adjust for no rotation of the strobosticker spokes. (If drive motor pressure is too light, increasing pressure will speed the capstan. In this range the tire pressure is inadequate for stable operation, and the pressure should be increased until increase in pressure reduces capstan speed.)

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 the throwing of tape loops.

One end of the brake band is fixed to the cross head by a roll pin (⅛ inch x ¾ inch) and two 4-40 x ¼ inch 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 ⅛ inch x ½ inch 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.

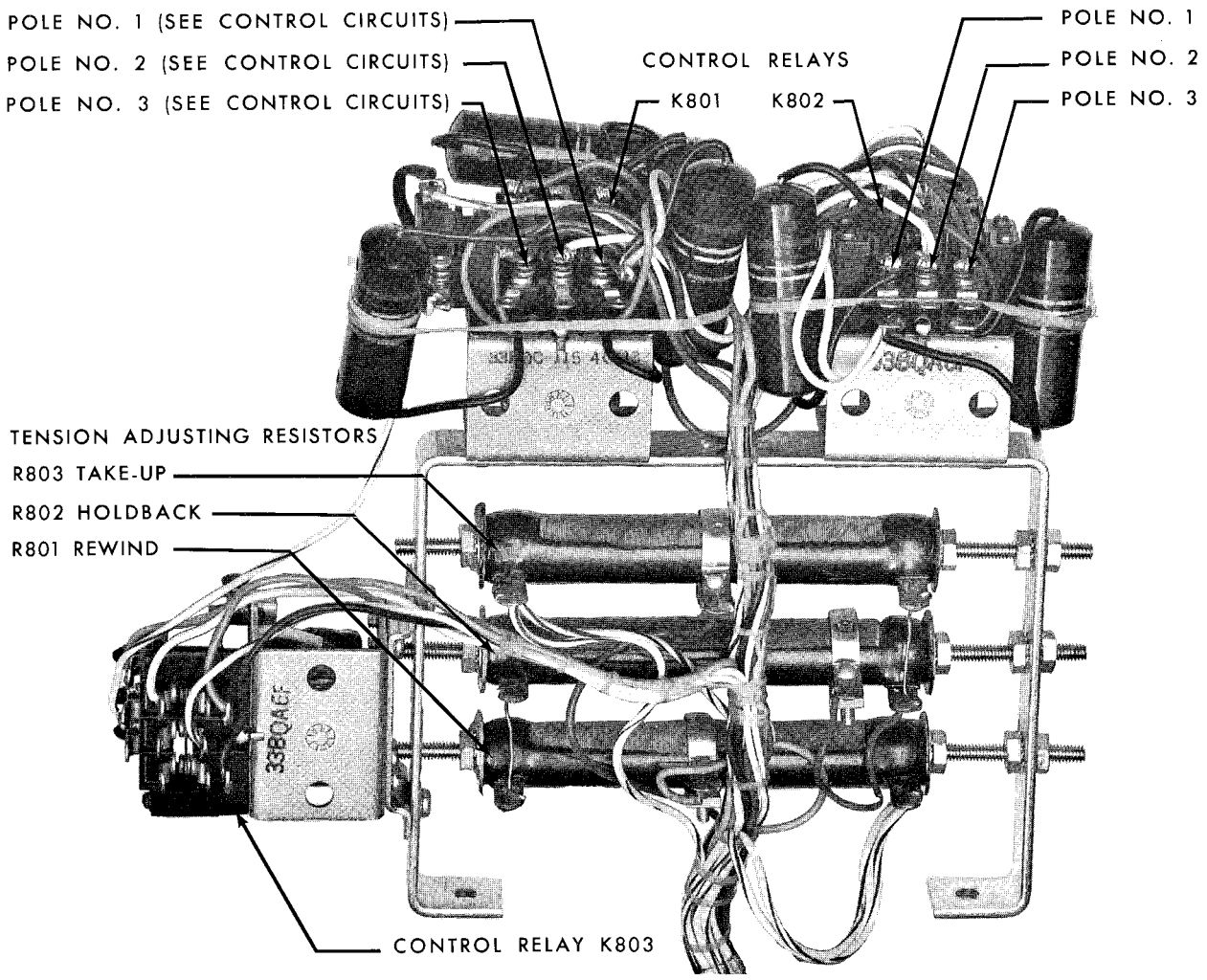
For example if the brake drum of the supply motor, as viewed from the brake housing end, is rotating clockwise when the brake band is applied, the frictional force will cause the band to wrap itself tightly around the brake drum, the brake lever end of the band moving to the right thus increasing braking 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

The control circuit contains all switches and relays which control the operation of the tape



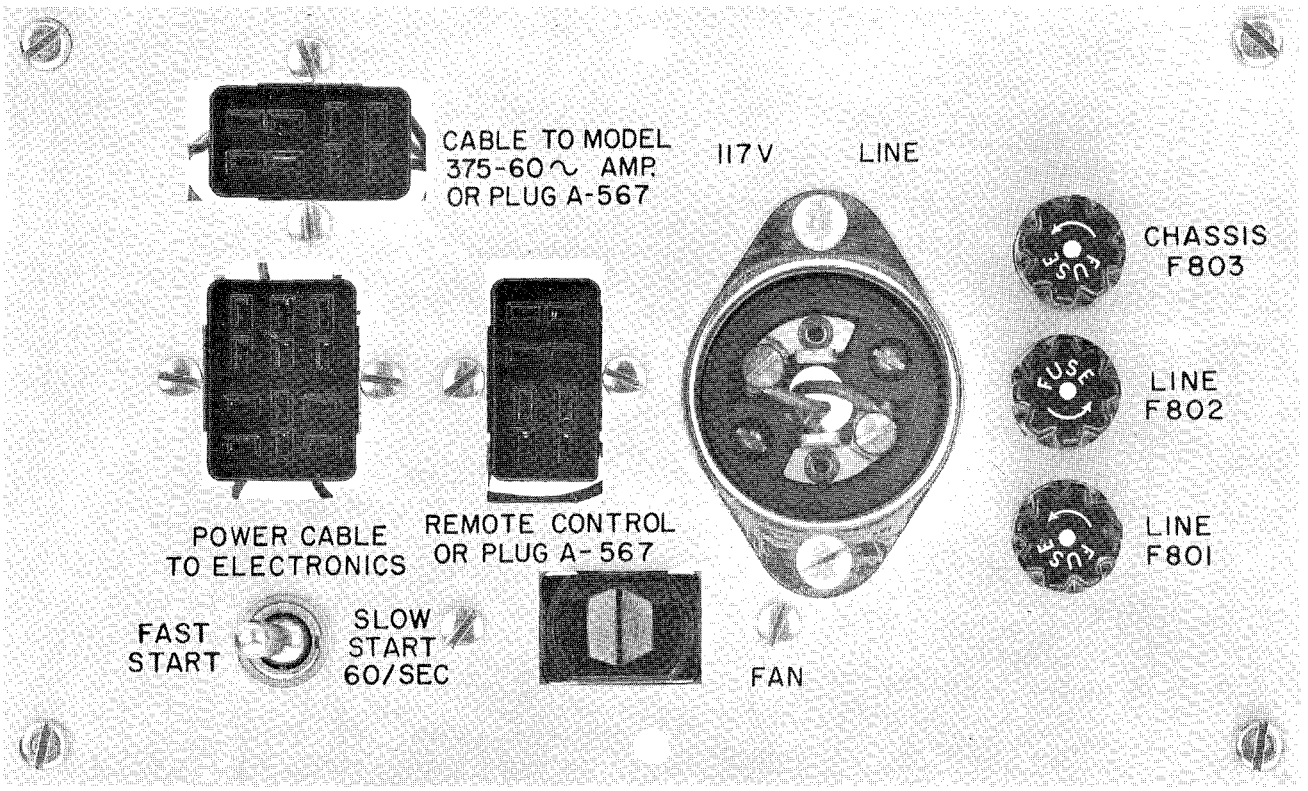
RESISTOR AND RELAY BRACKET

transport in all modes. Located underneath the transport, between the supply and takeup motor assemblies, is the bracket supporting rewind resistor (R801), takeup resistor (R803) and series resistor (R802). Also mounted on this bracket are three relays—PLAY RELAY (K801), MODE RELAY (K802) and FAST START RELAY (K803). All electronic components such as capacitors and resistors are shown in the foldout illustration, Tape Transport Control Circuits. There are three motor starting capacitors, the capstan solenoid, the brake solenoids, and the safety microswitch mounted adjacent to the assemblies they serve.

Located underneath the tape transport is the control panel which is the source of power for the tape transport and electronic assemblies. When a Model 375 or remote control are not used two dummy plugs must be inserted into the appropriate sockets. These plugs are catalog No. 567 (60 cycle amplifier), 8-pin Jones plug, with pins 1 and 2 jumpered and pins 7 and 8 jumpered.

1. One No. 567 must be plugged into receptacle J804S, labeled. "Remote Control or Plug A367" located on the connector panel. It is removed only when remote control is desired and the remote control cable must then be plugged into the receptacle.

2. The other No. 567 must be plugged into receptacle J805S labeled "Cable to Model 375 —60 Cycle Amplifier". When the Model 375 is used with the recorder, the input-output



POWER PANEL, TAPE TRANSPORT

cable from the 375 is plugged into the receptacle.

Fuse Requirements
For Multichannel
Tape Transport Power Panel

Fuse	F803—3 amp.	
Fuse	F802—5 amp.	2 and 3 channel
Fuse	F801—5 amp.	
Fuse	F803—3 amp.	
Fuse	F802—6 amp.	4 channel
Fuse	F801—6 amp.	

All function control of the tape transport, with one exception, takes place at the control circuit switch assembly comprising three push-buttons START, STOP and RECORD, and three position selector switch choosing one of three modes at a time: PLAY, REWIND and FAST FORWARD. Two toggle switches POWER and TAPE SPEED (selector type knob) are mounted at either end of the control cluster. The safety switch (not an operating control) is mounted under the tape transport.

Rewind

Power has been applied by Power Switch (S801) and Indicator Light (I801) is lighted. When REWIND mode S802-B is selected and the START button pressed MODE relay K802 is energized and held in this condition by relay contact sets K802-B and the normally closed STOP button S803. Contact set K802A connects bull a-c power directly to the rewind (supply) motor. The rewind motors operates at full torque and the takeup motor at reduced torque, thus tape is pulled at a maximum speed from the takeup to the rewind reel assembly, thus releasing the brakes.

Fast Forward

Power has been applied by Power Switch (S801) and Indicator Light (I801) is lighted. When FAST FORWARD mode S802C is selected and the START button pressed, (S805), MODE relay K802 is energized and held in this condition by relay contact sets K802-B and the normally closed STOP button S803, Contact K802A connects full a-c power directly to the

takeup motor. The takeup 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 takeup reel. Contact set K802-C completes the d-c circuit to the brake solenoids at each reel assembly, thus releasing the brakes.

Stop

When the tape is moving in any mode and the STOP button (S803) is pressed, 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

Power has been applied by Power Switch (S801) and Indicator Light (I801) is lighted. When PLAY mode (S802-A) is selected and start button (S805) is pressed PLAY relay (K801), MODE relay (K802) and FAST START relay K803 (only in Fast Start Position) are energized. Contact sets K802B, K801B and normally closed STOP button (S803) form a holding circuit. Power is connected to the turntable reel motors through contact K802A through contact K802C power reaches the brake solenoids K701 and K601. 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 the TAPE SPEED SWITCH (S503).

Record

Power has been applied by Power Switch (S801) and Indicator Light (S801) is lighted. The RECORD button (S804 is pressed only after the PLAY mode (S802A) has been selected and the START button (S805) pressed. Record Lamp (I802) will then light.

Fast Start

When power has been applied to the tape transport by turning POWER SWITCH (S801) to the ON position, and the TAPE SPEED SWITCH (S502) in the FAST START POSITION (S806), the capstan solenoid K501 and drive solenoid K502 have been energized and effectively engages the capstan motor pulley with the capstan flywheel. Now, by this engagement, the capstan will rotate continuously in all modes of operation until the POWER SWITCH (S801) is switched to the OFF position.

Slow Start

When power has been applied to the tape transport by turning POWER SWITCH (S801) to the ON position, and switch S806 to the SLOW START position, the capstan solenoid K501 and drive solenoid K502 are de-energized which leaves the capstan motionless. The PLAY position is then selected and the START button pressed which puts a-c to the capstan motor. The capstan solenoid K501 and drive solenoid K502 are then energized and engages the capstan motor pulley with the capstan flywheel. (Special applications sometimes require a tape speed of 60 inches per second. SLOW START must be used at this speed.)

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 pressing the STOP button. If this is done the circuit is broken at the selector switch S802 and the tape transport stops all tape motion. The START button S805 must then be pressed to start tape motion again.

CAUTION

If the STOP and PLAY buttons are pressed 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.

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 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 N. 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 to remove all dirt and accumulated oxide deposited from tape.

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 consistant 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, signal drop-outs or poor high frequency response.

Lubrication

The following parts of the tape transport mechanism require lubrication every three months, or 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 Catalog Number 087-005) Standard Oil Company, 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

To lubricate the drive motor locate the two oil cups extended from each motor end bell. Place into each oil cup not more than 4 drops of the recommended lubricant (OC-11).

CAUTION

Do not over lubricate. Wipe off excess oil.

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 oil, 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 overlubricate or the wheel will throw oil in operation. If oil spills on rubber tire, clean it immediately with ethyl alcohol.

NOTE

The reel idler assembly, the takeup tension arm assembly and the takeup and rewind motors contain permanently lubricated bearings, and require no further lubrication.

Capstan Assembly Lubrication

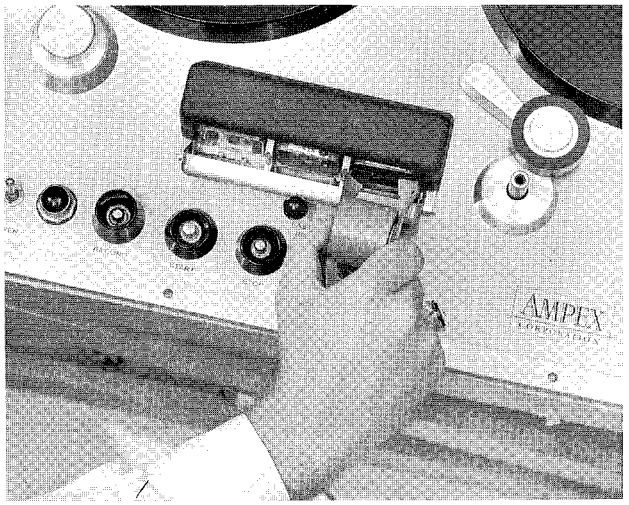
When lubricating your Capstan Assembly a note of caution should be made in regard to an overload of lubricant. The capstan is one

of the most important functioning assemblies on your tape transport, and its smooth operation will ensure long life of your machine.

To lubricate remove the capstan idler by loosening the set screw in the capstan arm. Loosen the set screw in dust cap and remove the cap. Remove the felt washer and fill the small hole in the capstan upper bearing with the prescribed oil (OC-11). Reinstall the felt washer, dust cap and capstan idler by retightening the set screws in both the dust cap and capstan idler arm.

NOTE

This lubricating process is imperative at least once every three months using the oil prescribed above. If an excess of oil has been added wipe off to prevent the throwing of oil in operation.



DEMAGNETIZING THE HEADS

Head Demagnization

Occasionally, the heads may become permanently magnetized through electrical faults in the amplifiers, improper use of the equipment, or by contact with magnetized objects. Magnitized 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.

If it becomes necessary to check the continuity of the playback or record heads with an ohmmeter they must be demagnetized after checking. The erase heads are self demagnetizing.

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 heads will then be prevented.

Step 3: Bring the tips of the demagnetizer to within approximately ⅛-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 demagnitization is effected in each case.

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

Takeup and Supply (Rewind) Tension

Takeup and Supply tensions are determined by the positioning of the sliders on resistors R801 and R802 located on the relay and resistor bracket on the underneath side of the tape transport. Resistor R802, on the same bracket, is set for maximum resistance to obtain ½ ounce to 1 ounce holdback tension in the fast modes of ¼-inch and ½-inch machines. With 1 inch machines the slider is set for minimum resistance to obtain 1 ounce to 2 ounce holdback tension in the fast modes.

The torque of both the rewind and takeup motors must be adjusted to the following set adjustments; with a 16 ounce spring scale at NAB reel hub diameter.

For ¼-inch versions set for 6 to 7 ounces.
For ½-inch versions set for 8 to 10 ounces.
For 1 inch versions set for 12 to 15 ounces.

With the following step by step methods of measuring the torque of the takeup and supply motors no problems should arise in having perfect functioning of your tape motion. Included with these methods are illustrations and step by step procedures of adjusting the brakes of the takeup and rewind assemblies. Both of these are important in obtaining smooth performance from your tape transport at all times.

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: Hold the takeup tension arm so that the safety switch is activated (a rubber band or piece of masking tape will hold the arm as though the tape were threaded on the equipment.)

Step 4: Make small loops at both ends of a thirty inch piece of nylon lacing twine.

Step 5: Attach one loop to the tape anchor on the reel hub and the other to a 0 to 16 ounce spring scale or equivalent.

Step 6: 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 7: 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 8: Now let the torque motor pull the twine slowly onto the hub by following the torque motor force with the scale.

Step 9: Using this "following" technique, observe the readings on the scale until a constant reading is obtained.

Step 10: If necessary adjust the slide on resistor R801 on the resistor and relay bracket until the desired reading is obtained.

Step 11: Use the procedures in the preceding steps to check and adjust the takeup tension which is set at R803 (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 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 for ¼ inch machines and 0-32 oz. spring scale for ½ and 1 inch machines.

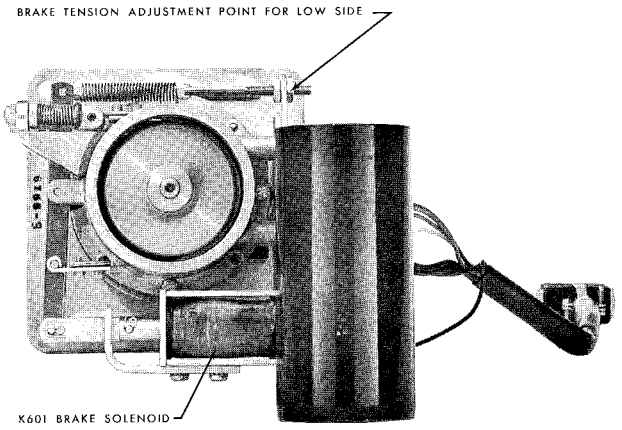
Step 4: Manually rotate the reel clockwise to wind several turns of twine onto the hub.

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.

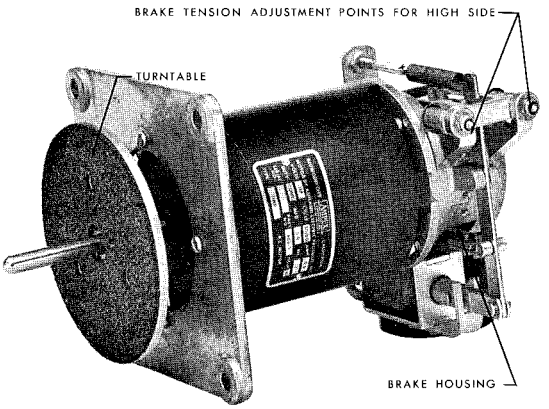
Step 6: Adjust the supply and takeup motors brakes for scale readings listed below. Points of adjustment are shown by illustration.

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 takeup turntable.



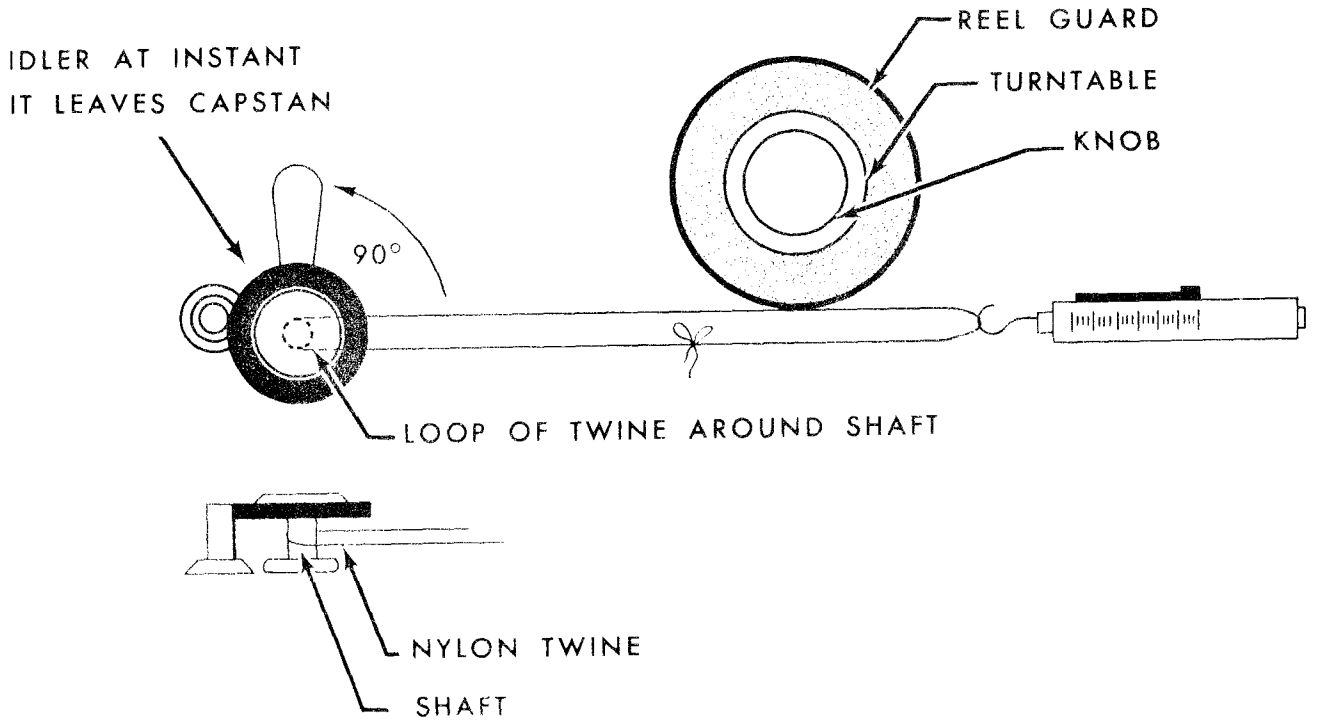
BRAKE ADJUSTMENT, LOW SIDE



BRAKE ADJUSTMENT, HIGH SIDE

SPRING SCALE READING

Tape Width	*Direction of Most Resistance Supply Counterclockwise Takeup Clockwise*	*Direction of Least Resistance Supply Clockwise Takeup Counterclockwise*
¼ inch	15 to 16 ounces	2:1 ratio ±1 ounce in accordance with the High Side
½ inch	19 to 20 ounces	2.5:1 ratio ±1 ounce, etc.
1 inch	22 to 24 ounces	3:1 ratio ±1 ounce, etc.



CAPSTAN IDLER PRESSURE MEASUREMENT

Capstan Idler Pressure

The capstan idler is forced against the capstan by the action of 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 and causes a considerable lax in that speed being operated. The recommended procedure for adjusting idler pressure is as follows:

Step 1: Hold the takeup tension 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 5 ±½ pound.

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 10 pound 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. ±½lb. If necessary, adjust the capstan dig at the point shown in the illustration.

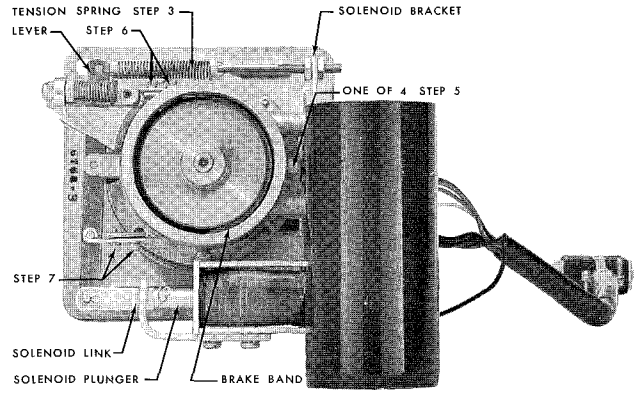
Replacement of Parts

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

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 screws 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 knife disconnects and free the capacitor from the bracket.

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 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.

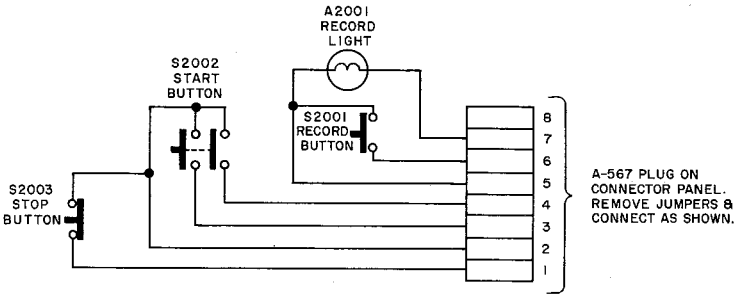
NOTE

Whenever the remote control unit is not connected, the dummy plug (A-567), supplied with the equipment, must be plugged into J802S.

REMOTE CONTROL

The operation of the tape transport mechanism can be controlled at a location removed from the equipment through the use of a remote control unit. To install the unit, wire it as shown, and plug it into the remote control connector on the tape transport.

Ampex Corporation does not include remote control as an accessory unit but this manual contains a suggested wiring schematic for customers convenience.



A2001 120 VOLT, 6 WATT LAMP
S2001 SNAP ACTION PUSH BUTTON SWITCH, NORMALLY OPEN. 1 AMP 115V.
S2002 DOUBLE MAKE SNAP ACTION PUSH BUTTON SWITCH, NORMALLY OPEN. 1 AMP 115 V.
S2003 SNAP ACTION PUSH BUTTON SWITCH, NORMALLY CLOSED. 1 AMP 115V.

IDENTIFICATIONS AND CATALOG NUMBERS OF VARIOUS TAPE TRANSPORT MECHANISMS

Tape Transport Ass'y.	*Inches per Sec. (ips)*	*Cycle*	*Tape Width*	*Pilot Light*
D-7784-01	3¾-7½	60	¼ inch	110 VAC
D-7784-02	7½-15	60	¼ inch	6.3 VAC
D-7784-03	7½-15	50	¼ inch	6.3 VAC
D-7784-04	15-30-60	60	¼ inch	6.3 VAC
D-7784-05	15-30-60	50	¼ inch	6.3 VAC
D-7784-06	15-30-60	60	½ inch	6.3 VAC
D-7784-07	15-30-60	50	½ inch	6.3 VAC
D-7784-08	15-30-60	60	1 inch	6.3 VAC
D-7784-09	15-30-60	50	1 inch	6.3 VAC
D-7784-10	7½-15-30	60	¼ inch	6.3 VAC
D-7784-11	7½-15-30	50	¼ inch	6.3 VAC
D-7784-12	7½-15	60	¼ inch	110 VAC
D-7784-13	7½-15	50	¼ inch	110 VAC
D-7784-14	7½-15	60	½ inch	110 VAC
D-7784-15	7½-15	50	½ inch	110 VAC
D-7784-16	7½-15	60	1 inch	110 VAC
D-7784-17	7½-15	50	1 inch	110 VAC

PARTS LIST TAPE TRANSPORT

PART DESCRIPTION MECHANICAL PARTS AND ASSEMBLIES	AMPEX PART NUMBER		
	1/4-inch	1/2-inch	1-inch
CAPSTAN ASSEMBLY: 15-30-60 ips	7518-01	7518-01	7518-02
CAPSTAN ASSEMBLY: 7-1/2--15 ips	7518-03	7518-03	7518-03
CAPSTAN ASSEMBLY: 3-3/4--7-1/2 ips	7518-04	7518-04	7518-04
Capstan Dust Cap, 7-1/2--15--30 ips	2326-00	2326-00	2326-00
and 15--30--60 ips	2326-00	2326-00	2326-00
Capstan Dust Cap, 3-3/4--7-1/2 ips	2326-03	2326-03	2326-03
and 7-1/2--15 ips	2326-03	2326-03	2326-03
Capstan Felt Washer -- Dust Seal	494-00	494-00	494-00
Capstan Tru-Arc Retainer	430-050	430-050	430-050
CAPSTAN IDLER ASSEMBLY: (All except 3-3/4--7-1/2 ips)	30945-01	30945-03	30945-04
CAPSTAN IDLER ASSEMBLY: 3-3/4--7-1/2 ips	2384-00	--------	--------
Capstan Idler Arm	372-01	372-01	372-01
Capstan Idler Arm Bearing	374-00	374-00	374-00
Capstan Solenoid	670-00	670-00	670-00
Capstan Idler Return Spring	400-00	400-00	400-00
Capstan Idler Adjusting Spring	676-00	676-00	676-00

PARTS LIST TAPE TRANSPORT

DRIVE MOTOR ASSEMBLY: (60 cycles--Complete with motor and pulley, 3-3/4--7-1/2 ips, 7-1/2--15--30 ips, 7-1/2--15 ips	1030-01	1030-01	1030-01
For 60 cycles, 15--30--60 ips	1030-02	1030-02	1030-02
For 50 cycles, 7-1/2--15 ips or 7-1/2--15--30 ips	1030-03	1030-03	1030-03
For 50 cycles, 15--30--60 ips	1030-04	1030-04	1030-04
Drive Motor Return Spring (Console and portable)	19994-01	19994-01	19994-01
Drive Motor Return Spring (Rack)	19995-01	19995-01	19995-01
Drive Motor Mounting Hinge	7815-00	7815-00	7815-00
Drive Motor Shield (Bodine Motors only)	1905-00	1905-00	1905-00
Drive Motor Solenoid	670-00	670-00	670-00
Felt Washer (Solenoid Assembly)	503-015	503-015	503-015
Drive Motor Pressure Adjusting Spring	389-00	389-00	389-00
TAPE SPEED SWITCH ASSEMBLY (Includes S501, S502 and S503)	364-00	364-00	364-00
TAKEUP ASSEMBLY: Complete	5704-04	5704-02	5704-03
BRAKE ASSEMBLY	17327-01	17327-03	17327-05
REWIND ASSEMBLY: Complete	5705-04	5705-02	5705-03
BRAKE ASSEMBLY	17327-02	17327-04	17327-06

PARTS COMMON TO TAKEUP AND REWIND ASSEMBLIES

MOTOR ASSEMBLY (Motor, Flange, Brakedrum and Turntable)	6768-00	6768-00	6768-00
BRAKE BAND ASSEMBLY	17612-01	17612-01	17612-01
Brake Band Leaf	61460-01	61460-01	61460-01
Brake Solenoid	337-00	337-00	337-00
Brake Adjusting Spring	322-00	322-00	322-00
Compression Spring	17323-00	17323-00	17323-00
Turntable	61462-01	61462-01	61462-01
	1/4-inch	1/2-inch	1-inch
Housing, Brake	17614-01	17614-01	17614-01
Eye Bolt	396-06	396-06	396-06
Crosshead	17324-01	17324-01	17324-01
Anchor	17325-01	17325-01	17325-01
Spacer	17322-01	17322-01	17322-01
Roll Pin - 1/8 inch x 3/4 inch	406-031	406-031	406-031
Screw, Socket head cap stl. cad. pl.	470-008	470-008	470-008
Brake Band Link	330-00	330-00	330-00
Brake Band Clamp	331-00	331-00	331-00
Brake Lever	332-00	332-00	332-00
Drivelock Pin - 1/8 inch x 1/2 inch	403-008	403-008	403-008
Cotter Pin - 1/16 inch x 1/2 inch	401-005	401-005	401-005
Clevis Pin - 1/8 inch x 9/32 inch	400-002	400-002	400-002
CONNECTOR: J601P, 8 contact, Jones	145-013	145-013	145-013
ROTARY TAPE GUIDE	----	6050-00	6050-01
REEL GUARD (10 1/2 inches)	342-00	342-00	342-00
REEL GUARD (14 inches)	5708-00	5708-00	5708-00

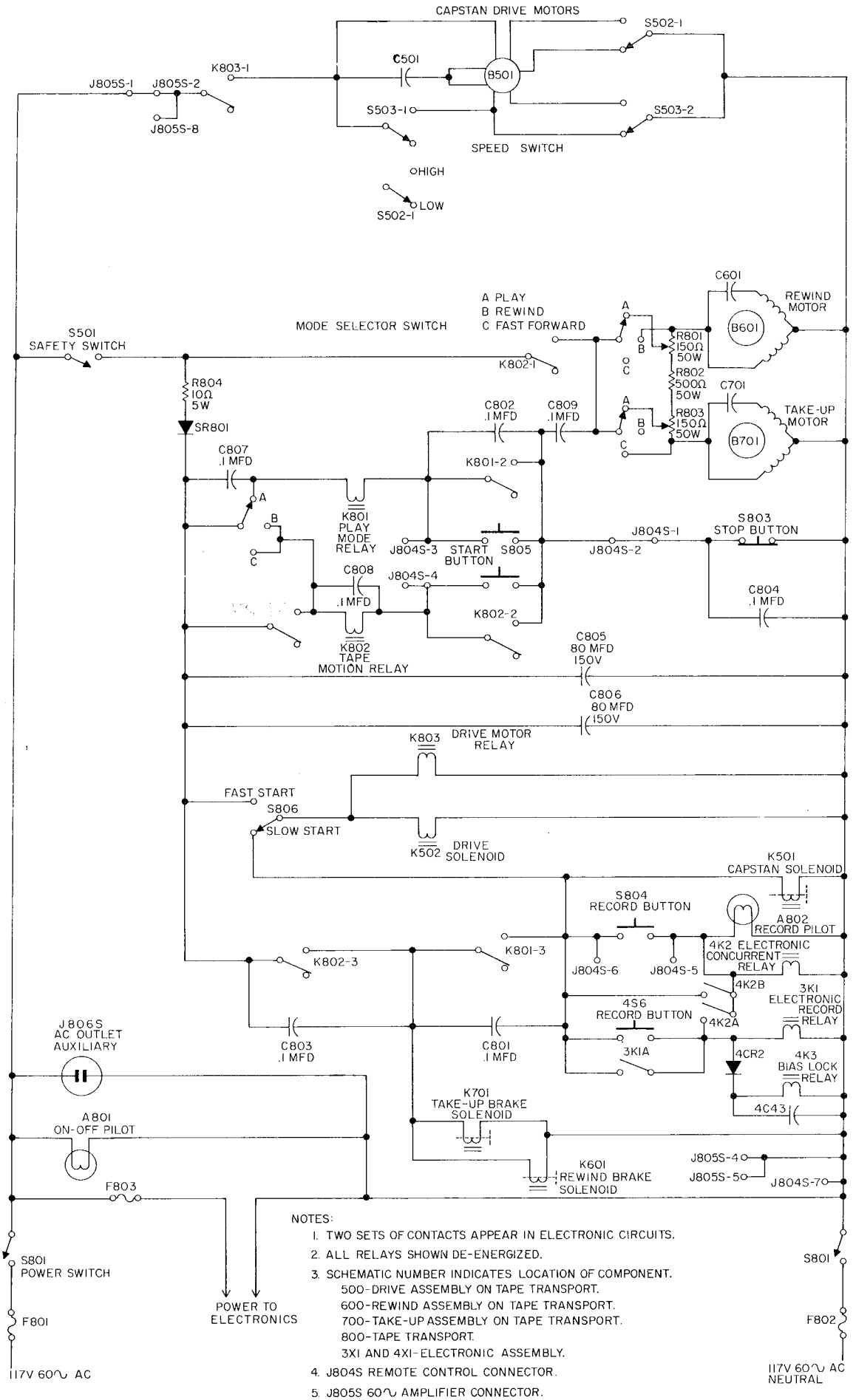
TAKEUP TENSION ARM ASSEMBLY	425-00	425-00	425-00
Tape Guide	675-00	675-00	675-00
Tape Guide Hook	355-00	355-00	355-00
Takeup Tension Spring	30946-01	30946-01	30946-02
REEL IDLER ASSEMBLY: (All except $3\frac{3}{4}$-$7\frac{1}{2}$ ips)	4459-00	4459-08	4459-06
REEL IDLER ASSEMBLY: ($3\frac{3}{4}$-$7\frac{1}{2}$ ips)	4459-03	----	----
REEL IDLER BASE ASSEMBLY	30840-01	30840-02	30840-02
REEL IDLER PULLEY (All except $3\frac{3}{4}$-$7\frac{1}{2}$ ips)	5893-00	5893-00	5893-02
REEL IDLER PULLEY ($3\frac{3}{4}$-$7\frac{1}{2}$ ips)	5893-01	----	----
Tape Guide	257-00	257-01	1747-00
GUARD, Record Pushbutton	463-00	463-00	463-00
GUARDS, Start and Stop Pushbutton	361-00	361-00	361-00
KNOB, Speed Change	230-010	230-010	230-010
KNOB, Mode Selector	230-002	230-002	230-002
FUSE HOLDER	085-001	085-001	085-001
PILOT LAMP BASE, amber (Single track Model 300)	132-005	132-005	132-005
PILOT LAMP BASE, red	132-006	132-006	132-006
PILOT LAMP BASE, amber (Multi-channel Model 300)	132-011	132-011	132-011

Electronic Parts Common to All Tape Transports Except as Noted.

A801	LAMP, incandescent: 6.3 volts, .15 ampere, miniature base; General Electric Part Number 47	060-001
	Used with Single Channel Electronics	
A801	LAMP: 120 volts, 6 watts, candelabra screw base; General Electric Part No. 6T4 1/2/1	060-006
	Used with Multichannel Electronics	
A802	Same as A801 (060-006)	
C501	CAPACITOR, Drive Motor 5 mfd. 330 V ac	7464-00
	CAPACITOR, Drive Motor: 6 mfd; 330 vacw; 10%: Cornell Dubilier Part No.: MKK3060C	035-245
C601	CAPACITOR, Rewind Motor (60 cps) 3.75 mfd; 330 vacw 10%: General Electric Part No: 21F525	
	CAPACITOR, Rewind Motor (50 cps only) 4.00 mfd; 330 vacw 10%: General Electric Part No: 21F526	035-116
C701	CAPACITOR, Takeup Motor (60 cps) 3.75 mfd; 330 vacw; 10%: General Electric Part No. 21F525	035-111
C801	CAPACITOR, fixed: paper tubular; .01 uf -10 +20%, 600 vdcw; Sangamo Part No. 330601	035-074
C802	Same as C801	
C803	Same as C801	
C804	Same as C801	
C805	CAPACITOR, Fixed: electrolytic, 80 uf, 150 vdcw; Cornell Dubilier Part No. BRM-8015	031-016
C806	Same as C805	
C807	Same as C801	
C808	Same as C801	
C809	Same as C801	
F801	See Fuse Chart Section Page 5-7	
F802	See Fuse Chart Section Page 5-7	
F803	See Fuse Chart Section Page 5-7	

PARTS LIST TAPE TRANSPORT

J601P	See Rewind Assembly 5705	
J701P	See Takeup Assembly 5704	
J801P	CONNECTOR, receptacle: male, 2 contacts, 250 volts, 10 amperes; Hubbel Part No. 4897 Used with 1/4-inch Tape Transports	147-010
J801P	CONNECTOR, receptacle: male, 2 contacts, polarized, 250 volts, 20 amperes; Hubbel Part No. 9105	147-017
J802S	CONNECTOR, receptacle: female, 12 contacts, 730 volts rms, 10 amperes; Jones Part No. S-312-AB	146 009
J804S	CONNECTOR, receptacle: female, 8 contacts, 730 volts rms, 10 amperes; Jones Part No. S-308-AB	146-003
J805S	Same as J804S	
J806S	CONNECTOR, receptacle: female, 2 contacts, 250 volts, 10 amperes; P and S Despard Part No. 1320 and 1354	146-014
J807S	CONNECTOR, receptacle: female, 30 contacts, 730 volts rms, 10 amperes; Jones Part No. S-330-DB	144-019
J808S	Same as J807S	
K801	RELAY, PLAY: 3PDT, 115 volt dc coil std. 10 ampere contact; Philtrol Part No. 33QA	020-006
K802	Same as K801	
K803	Same as K801	
R801	RESISTOR, adjustable: wirewound, 150 ohm ± 5%, 50 watts; Tru-Ohm Part No. AR-50 type 0566	040-011
R802	RESISTOR, adjustable: wirewound, 500 ohm ± 5%, 50 watts; Tru-Ohm Part No. AR-50 type 0569	040-014
R803	Same as R801	
R804	RESISTOR, fixed: wirewound, 10 ohm ± 10%, 5 watts; Tru-Ohm Part No. FRL-5	043-156
S501	SWITCH, safety: SPST, normally closed: Unimax Part No. 2HBT-215-1W	120-001
S502	SWITCH, speed, rotary: Dual DPDT: Arrow H and H Part No. 21490-CA	122-014
S503	Same as S502: (SPEED)	
S801	SWITCH, toggle, ON-OFF: DPST Carling Part No. 2BK62-73	120-003
S802	SWITCH, rotary: 3 pole, 3 position; Centralab Part No. CRL-PA-230-028	122-010
S803	PUSHBUTTON: stop: SPST, normally closed, 1 pole: Arrow H and H Part No: 3391 BSA	120-014
S804	PUSHBUTTON: record: SPST, normally open, 1 pole: Arrow H and H Part No: 3391 EPA	120-013
S805	PUSHBUTTON, PLAY 2 pole, normally open; Arrow H and H Part No. 80913-0	120-025
S806	SWITCH, toggle, FAST START (15-30-60 ips models only); 2 pole, normally open, 1 pole, 2 throw: Arrow H and H Part No. 81021-81021AV or Carling: 2BB62-73	120-011
SR801	RECTIFIER, selenium: single phase, half wave; General Electric Part No. 6RS5CHB21	582-001

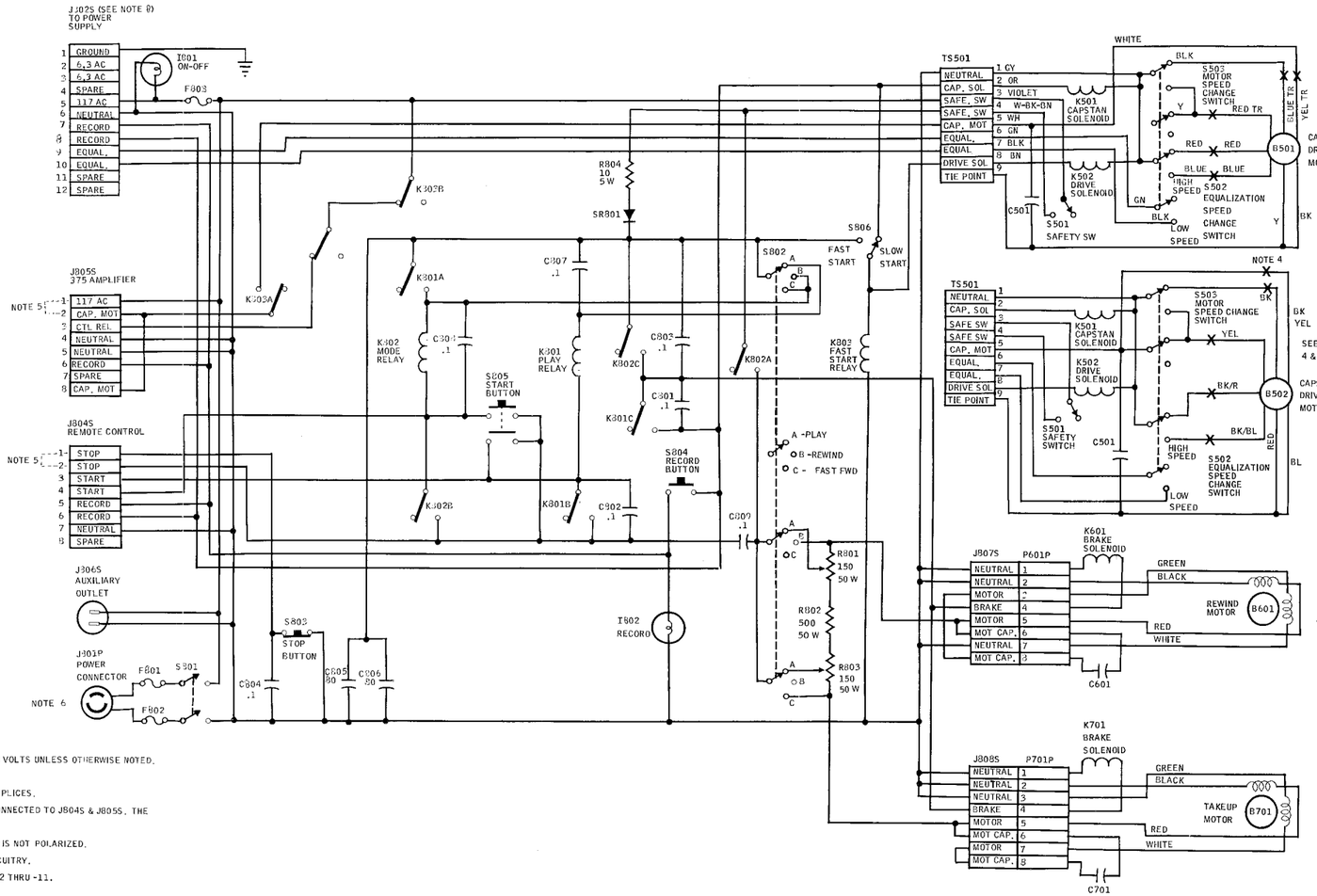


NOTES:

1. TWO SETS OF CONTACTS APPEAR IN ELECTRONIC CIRCUITS.
2. ALL RELAYS SHOWN DE-ENERGIZED.
3. SCHEMATIC NUMBER INDICATES LOCATION OF COMPONENT.
   - 500-DRIVE ASSEMBLY ON TAPE TRANSPORT.
   - 600-REWIND ASSEMBLY ON TAPE TRANSPORT.
   - 700-TAKE-UP ASSEMBLY ON TAPE TRANSPORT.
   - 800-TAPE TRANSPORT.
   - 3XI AND 4XI-ELECTRONIC ASSEMBLY.
4. J804S REMOTE CONTROL CONNECTOR.
5. J805S 60~ AMPLIFIER CONNECTOR.

SIMPLIFIED CONTROL CIRCUIT SCHEMATIC
MODEL 300 TAPE TRANSPORT

SCHEMATIC DIAGRAM
SERIES 300 TAPE TRANSPORT
CONTROL CIRCUITS
1882T



NOTES:

1. ALL RESISTORS IN OHMS.
2. ALL CAPACITORS IN MICROFARADS, 600 VOLTS UNLESS OTHERWISE NOTED.
3. ALL RELAYS SHOWN DEENERGIZED.
4. "X"S REPRESENT MOTOR DISCONNECT SPLICES.
5. UNIT IS SUPPLIED WITH A-567 PLUGS CONNECTED TO J804S & J805S. THE A-567 PLUG IS STRAPPED AS SHOWN.
6. ON 1/4 INCH TAPE TRANSPORTS, J801P IS NOT POLARIZED.
7. ALTERNATE CAPSTAN DRIVE MOTOR CIRCUITRY.
8. I801 IS CONNECTED TO 2 & 3 ON 7784-02 THRU -11.