Section 4

Tape Transport Mechanism

GENERAL

The tape transport mechanism provides the 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 -- insure smooth, positive movement of the tape across the head assembly and proper tape tensioning when the equipment is in the record or play 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 takeup tension arm, and reel idler guide arm. See Fig. 3-2 and 3-3 (Tape Threading Path).

The reel idler assembly on the supply side of the tape transport is composed of a pulley and flywheel used to smooth out transient speed variations in the tape system. A spring-pivot mounted arm is affixed to the base of the assembly and assures relief of starting tensions. This pivot arm has been damped with Dow Corning type 200 silicon fluid (15000 centistokes).

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 spring bracket with two leaf springs actuates the safety switch (S501) stopping tape motion if the tape tension is lost. Another function of the leaf springs is to provide a cushioning of the arm before it strikes the stop due to high tape tension.

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 interchangeable. 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 play 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 proper motor responds to the commands from either pushbutton by operating at maximum torque to provide the selected function.

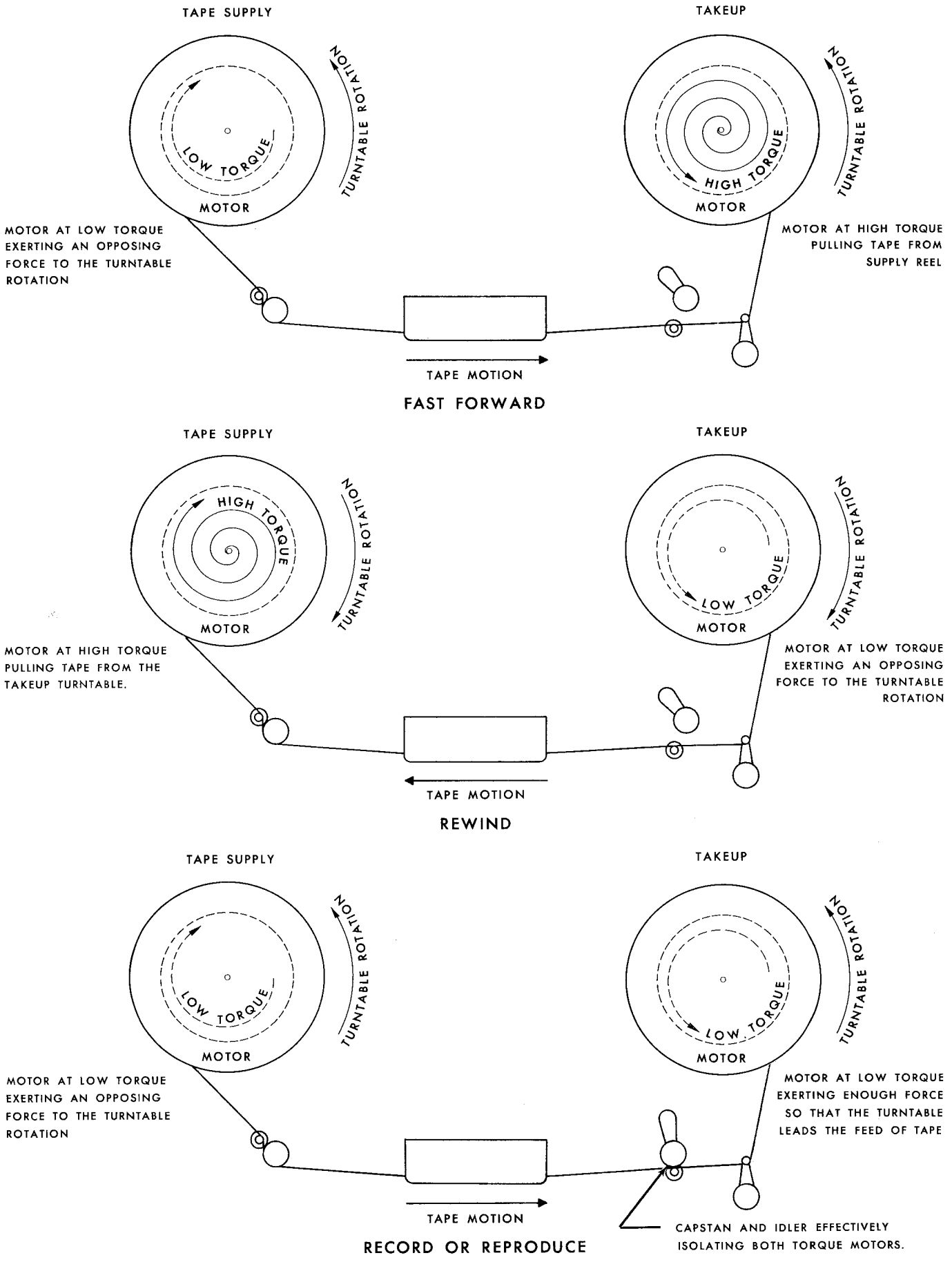


Figure 4-1 **TAPE TENSIONING**

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

Motor torque in the play/record mode is adjusted by the position of sliders on tensioning resistors R801, R802, and R803. Since the torque required for NAB hub (10-1/2 or 14) inch reels is different than that required for EIA hub (7 inch) reels individual sliders are selected by switches S807 and S808.

The following table shows approximate torque obtained when using NAB hubs in various modes of operation.

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 illustration.

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 play 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 and 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. Its function provides tape storage loop 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 play 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 monentary 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 playback. 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.

The purpose of the tape drive system is to transport the tape across the heads at a uniform speed during the record and playback 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 electronics 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 at this time but in FAST start the capstan drive motor solenoid energizes and the 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

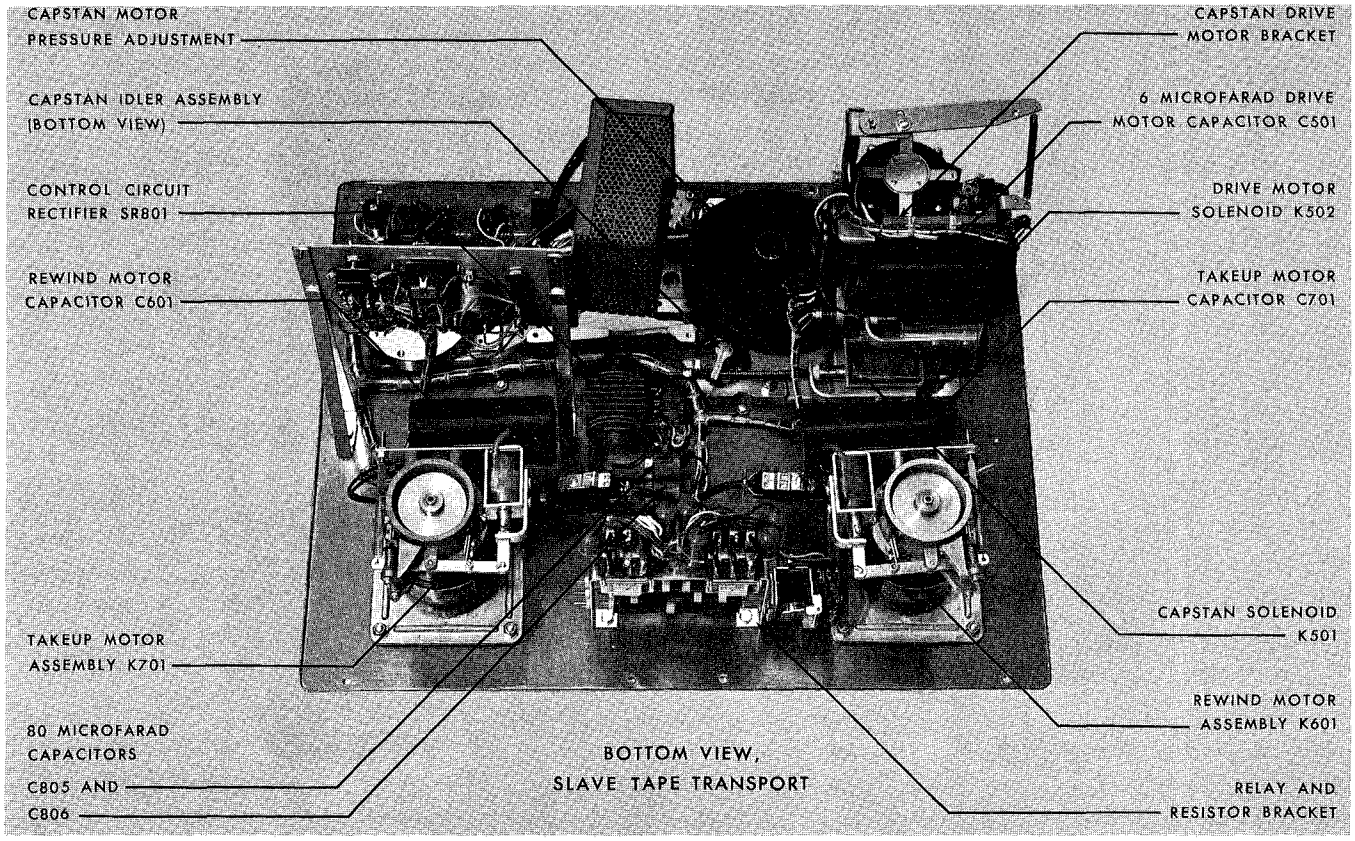


Figure 4-2 **TAPE TRANSPORT PART CALLOUTS**

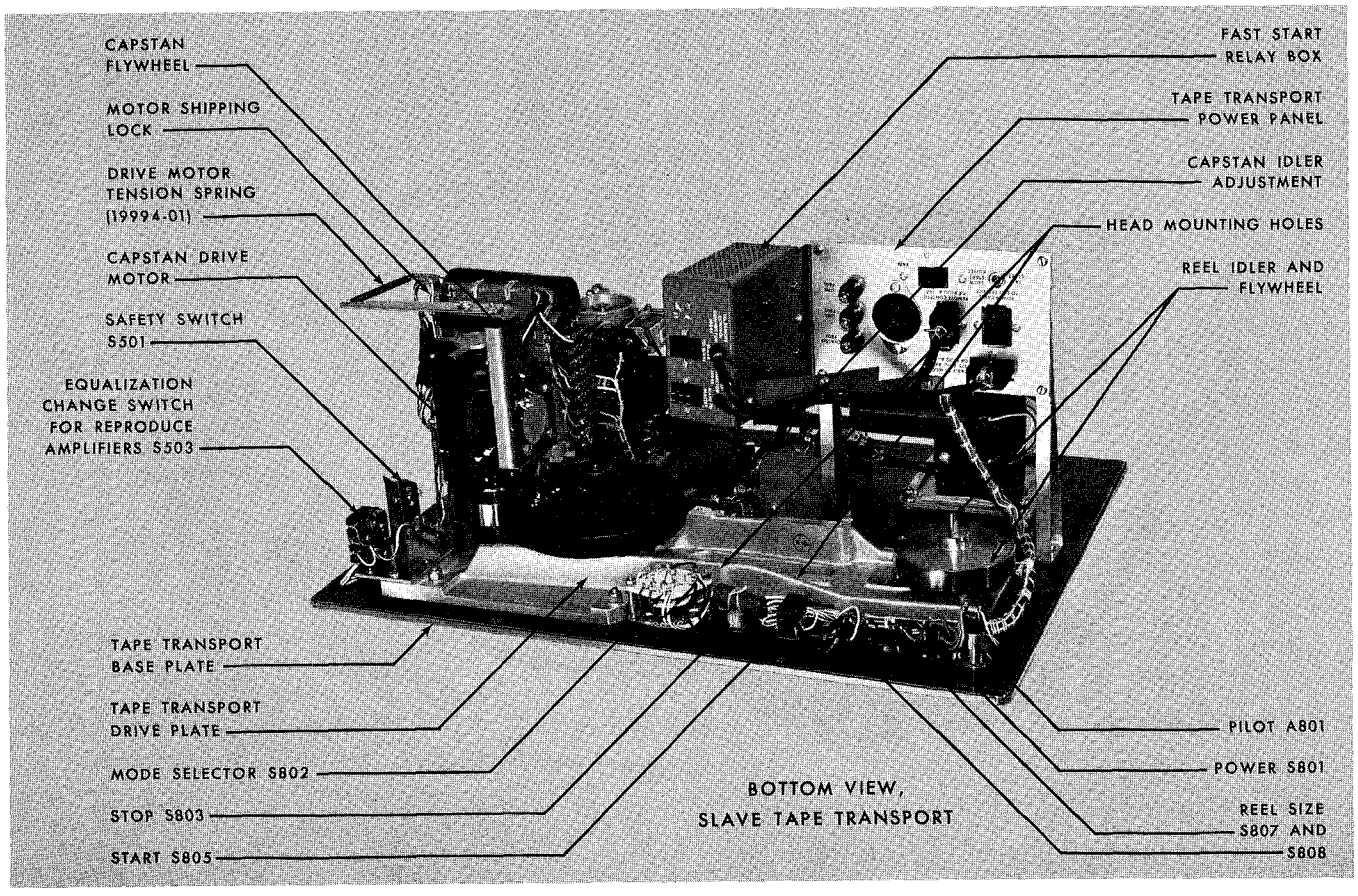


Figure 4-3 TAPE TRANSPORT PART CALLOUTS

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 moved 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 1/4-20 x 5/8 socket head cap screws. Mounted on top of the motor is the spring arm with a hole for the drive motor return spring and variable holes for the shipping lock. The purpose of the spring is to provide a means to keep the motor pulled away from the capstan in the de-energized position.

SPRING-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 Figure 4-2.

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. (See Adjustment Point in Figure 4-3.) 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 (1/8 inch x 3/4 inch) and two 4-40 x 1/4 inch socket head cap screws which is attached to the anchor mounted of the brake housing. The other end is linked to the brake lever by a 1/8 inch x 1/2 inch drive lock 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 transport in all modes. Located underneath the transport, between the supply and takeup motor assemblies, is the bracket supporting rewind resistor (R803) and series resistor (R802). Also mounted on this bracket are three relays -- PLAY relay (K801), TAPE MOTION relay (K802), and DRIVE MOTOR relay (K803). All electronic components such as capacitors and resistors are shown in the foldout illustration, Tape Transport Control Circuits. There are three motor 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 panel which provides a connector for AC line voltage, in, fuses, receptacles for electronic assemblies, and AC line voltage outlet, and "fast start-slow start" switch.

NOTE

Fast start relay box cables plug into receptacles J804S and J805S.

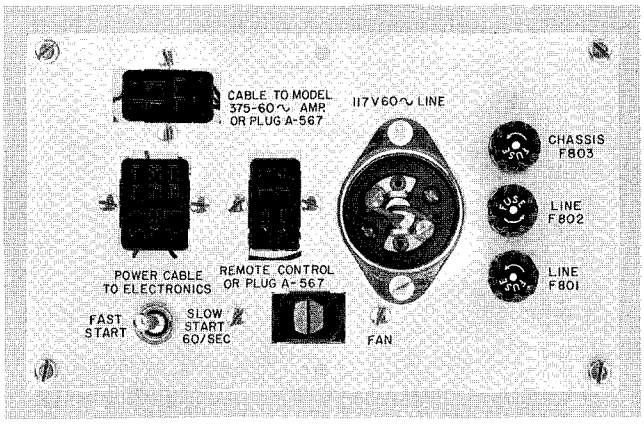


Figure 4-4 POWER PANEL

FUSE REQUIREMENTS
TAPE TRANSPORT
POWER PANEL

Fuse F803	--	-3.2 amp. slowblow
Fuse F802	--	-5 amp
Fuse F801	--	5 amp

FAST START RELAY BOX

The FAST START relay box provides a high initial torque to the takeup motor to quickly take up the loop thrown by the capstan in fast start. This is accomplished by relay K103 which is actuated by the current drawn by capacitor C101 at the moment the start button is pressed. As soon as capacitor C101 becomes charged, no further current is drawn, K103 drops out and normal voltage is applied to the take-up motor. K101 provides remote starting from the Master Control Panel and K102 serves the same purpose for stopping the machine (See Figure 4-13, Schematic Diagram, Master Control Panel for a suggested wiring schematic for Remote Control.

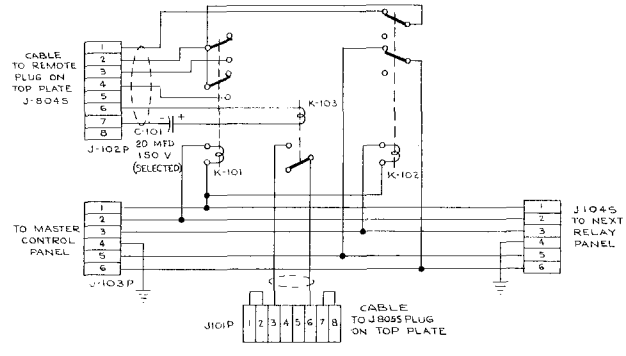


Figure 4-5 SCHEMATIC DIAGRAM, FAST START RELAY BOX

All function control of the tape transport, with one exception, takes place at the control switch assembly comprising two push buttons, START and STOP; three position selector switch choosing one of three modes at a time: PLAY, REWIND and FAST FORWARD. Four toggle switches, POWER, TAPE SPEED (selector type knob), and for REEL SIZE (Rewind and Takeup). 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 full ac 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, contact set K802C completes the DC circuit to the brake solenoids at each 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 ac power directly to the takeup motor. The takeup motor now operates at full torque, causing the tape to be pulled at a maximum speed from the rewind to the takeup reel. Contact set K802-C completes the dc 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 sleected by the TAPE SPEED SWITCH (S503).

FAST START

When power has been applied to the tape transport by turning POWER SWITCH (S801) to the ON position and safety switch (S501) energized, the TAPE SPEED switch (S502) in the FAST START position (S806), the capstan solenoid (501) has been energized and effectively engages the capstan motor pulley with the capstan flywheel. By this engagement, the capstan will rotate continuously in all modes of operation until the safety switch (S501) is de-energized.

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 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 provides ac power 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 and the capstan idler to the capstan. Applications using a tape speed of 60 inches per second and delicate tape may require SLOW START.

REEL SIZE SWITCH

For operation procedures see Figure 4-6.

This switching arrangement selects taps on resistors R801, R802, and R803 and provides proper torque for the takeup and rewind motors in the PLAY mode of operation.

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 stopping the tape transport. This may be accomplished in two ways; the function switch may be returned

to the PLAY position or the STOP button pressed. 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.

CONDITIONS OF OPERATIONAL CIRCUITRY

A. Power switch (S801) in the ON position.

1. Tape not threaded: The Playback Amplifiers receive power.

2. Tape threaded: Fast Start -- Slow Start switch S806 in Fast Start position.

   a. Safety switch (S501) activated.

   b. DC supply activated.

   c. Drive motor relay (K803) activated. Voltage applied to capstan drive motor through contact set K803A.

   d. DC voltage applied to drive solenoid (K502) energizes which allows motor pulley and capstan flywheel to come into contact.

3. Tape threaded: Fast Start -- Slow Start switch (S806) in Slow Start position.

   a. Safety switch (S501) activated.

   b. DC supply activated.

B. Press Start Button (S805)

1. Function switch (S802) in Play (A) position.

   a. Play mode relay (K801) energized through contact set S802-A; held through contact set K802-B.

   b. Tape motion relay (K802) energized through contact set K801-A; held through contact set K802-B.

   c. Contacts K802-C and K801-C energizes capstan solenoid K501 which allows motor pulley and capstan flywheel to come into contact.

NOTE

With Fast Start -- Slow Start switch (S806) in Slow Start position, the drive solenoid (K502) and Drive Motor Relay (K803) are actuated at this time.

   d. Brake solenoids (K601 and K701) energizes through contact set K802-C and releases the brake bands on the rewind and takeup motors.

   e. Reduced AC voltage is applied to rewind motor (B601) through contact set. S802-B and RESISTOR R801.

f. Reduced AC voltage is applied to takeup motor (B701) through contact set S802-C and resistor R803.

2. Function switch (S802) in REWIND (B) position.

a. Tape motion relay (K802) energizes through contact sets S802A and S802C; held through contact set K802-B.

b. Brake solenoids (K601 and K701) energizes through contact set K802-C and releases the brake bands on the rewind and takeup motors.

c. Full AC voltage is applied to rewind motor B601 through contact sets S802B and K802A. This voltage is reduced through resistors R801, R802, R803, and then applied to takeup motor (B701).

3. Function switch (S802) in Fast Forward (C) position.

a. Same as 2a.

b. Same as 2b.

c. Full AC voltage is applied to takeup motor (B701) through contact sets S802-C and K802-A. This voltage is reduced through resistors R803, R802, R803 and then applied to rewind motor (B601).

C. Condition B1 existing.

1. Function switch (S802) changed to REWIND (B) position.

a. PLAY mode relay de-energized. Opening of contact set K801-C deactivates capstan solenoid (K501).

D. Condition B2 existing.

1. Function switch (S802) changed to FAST FORWARD (C) position.

a. B2C condition only changed to B3C.

E. Condition B3 existing.

1. Function switch (S802) changed to REWIND (B) position.

a. B3C condition only changed to B2C.

F. Condition B2 existing.

1. Function switch (S802) changed to PLAY (A) position.

a. Tape motion relay de-energized. AC voltage removed from both torque motors (B601 and B701) and brake solenoids are de-energized, applying brakes to both motors. Tape transport returns to condition A2, or A3.

G. Press STOP button (Function switch in any mode of operation).

1. All relays deactivated and tape transport returns to condition A2.

H. Safety switch (S501) opens (if by tape breakage, take loop thrown or empty reel).

1. Drive motor de-energized with all dc power removed. Tape transport returns to conditions A-1.

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 and capstan flywheel weekly. Great care must be taken to see that oil does not reach the rubber tire of either assembly. 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 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 to remove all dirt and accumulated oxide deposited from tape.

CAUTION

Do not use any other solvents as there are some which may leave a deposit on 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, 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

Tape transports utilizing ball bearing type motors require no lubrication of these motors as they employ permanently lubricated sealed bearings.

NOTE

This type motor has no oil cups or oil holes.

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 oxidation 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° (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 (Ampex No. 087-005).

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 Ampex No. 087-005 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 the 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 the tape transport, and its smooth operation will ensure long life of the machine.

To lubricate, remove the capstan idler by loosening the set screw in the capstan idler arm. Loosen the set screw and remove the dust cap, bowed holddown washer, and the felt washer. The allen head set screw, located in the bronze bearing, must be removed to lubricate. Fill this hole with the prescribed oil, OC-11 (Ampex Catalog Number 087-005), until the oil overflows through the small vent hole on the opposite side of the bronze bearing. Replace the allen head set screw from the bearing and wipe off all excess oil. Reinstall the felt washer, bowed holddown washer, dust cap, and capstan idler. Retighten the set screws in both the dust cap and capstan idler.

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.

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 the following 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.

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 ac 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 1/8 inch (if the demagnetizer tips are taped or covered, contact with the heads can be made) by straddling the record 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 1 or 2 feet, thus allowing its ac 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 head.

Step 6: If necessary, repeat the process till complete demagnetization is effected in each case.

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

ADJUSTMENTS

The mechanical assembly is shipped from the factory with all adjustment before putting the equipment into service, unless shipping damage has occured. In the course of wear in normal service, or in the event of components failure, and replacement of parts, some readjustments may be necessary.

Equipment Required:

Spring Scale 0-16 oz.
Spring Scale 0-32 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

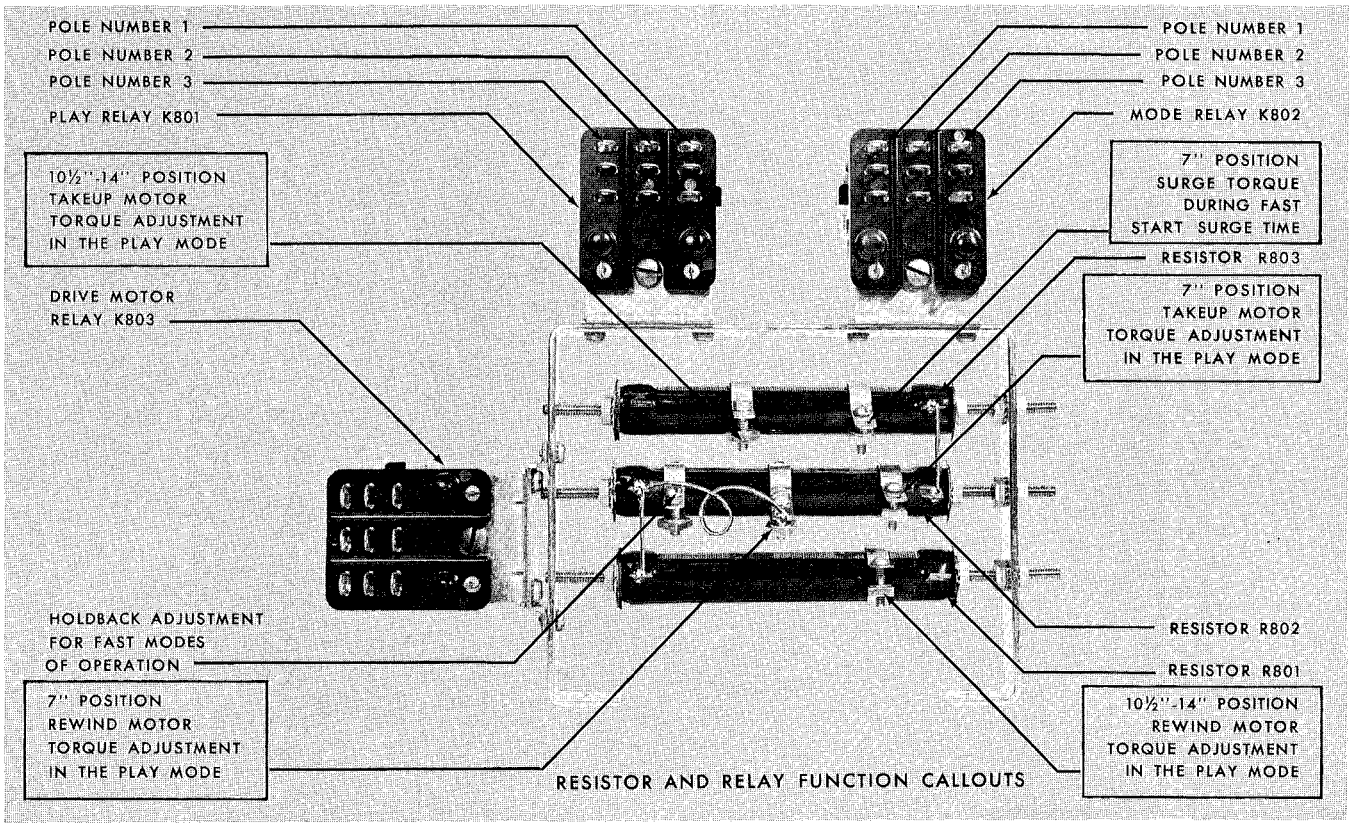


Figure 4-6 **RELAY RESISTOR BRACKET**

TAKEUP AND SUPPLY (REWIND) TENSION

Takeup and Supply tensions are determined by the position of the sliders on resistors R801, R802, and R803 located on the relay and resistor bracket on the underneath side of the tape transport mechanism. All resistance settings and torque adjustments can be found in illustration labeled Figure 4-6.

Torque adjustments are made with a 16 ounce spring scale at NAB reel hub diameter.

With the following step by step methods of measuring the torque of the takeup and rewind motors no problems should arise in obtaining perfect functioning of 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 the tape transport at all times.

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: 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

I-PLAY/RECORD MODE

	REWIND MOTOR		TAKEUP MOTOR	
	LARGE REEL	SMALL REEL	LARGE REEL	SMALL REEL
REEL SIZE SWITCH	NAB (10½ OR 14 INCH)	EIA (7 INCH)	NAB (10½ OR 14 INCH)	EIA (7 INCH)
RESISTOR REF. NO.	ADJUST R801	ADJUST R802	ADJUST R803	ADJUST R802
TORQUE MEASUREMENT	6½ TO 8 OUNCES HOLDBACK	2½-4 OUNCES HOLDBACK	6½ TO 8 OUNCES TAKEUP	2½-4 OUNCES TAKEUP

II-REWIND MODE

	LARGE REEL	SMALL REEL	LARGE REEL	SMALL REEL
REEL SIZE SWITCH	NAB (10½ OR 14 INCH)	EIA (7 INCH)	NAB (10½ OR 14 INCH)	EIA (7 INCH)
RESISTOR REF. NO.	117 VOLTS LINE (FULL TORQUE)	117 VOLTS LINE (FULL TORQUE)	ADJUST R802	ADJUST R802
TORQUE MEASUREMENT	APPROXIMATELY 11-13 OUNCES TAKEUP	APPROXIMATELY 11-13 OUNCES TAKEUP	½ TO 1 OUNCE HOLDBACK	½ TO 1 OUNCE HOLDBACK

III-FAST FORWARD MODE

	LARGE REEL	SMALL REEL	LARGE REEL	SMALL REEL
REEL SIZE SWITCH	NAB (10½ OR 14 INCH)	EIA (7 INCH)	NAB (10½ OR 14 INCH)	EIA (7 INCH)
RESISTOR REF. NO.	ADJUST R802	ADJUST R802	117 VOLTS LINE (FULL TORQUE)	117 VOLTS LINE (FULL TORQUE)
TORQUE MEASUREMENT	½ TO 1 OUNCE HOLDBACK	½ TO 1 OUNCE HOLDBACK	APPROXIMATELY 11-13 OUNCES TAKEUP	APPROXIMATELY 11-13 OUNCES TAKEUP

NOTE:
ALL TORQUE MEASUREMENTS ARE MADE USING NAB HUB.

TAKEUP AND HOLDBACK MEASUREMENTS FOR DUPLICATOR (3200 D) USING ¼-INCH MAGNETIC TAPE.

Figure 4-7 TAKEUP AND HOLDBACK MEASUREMENTS

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 slides 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 points shown in Figure 4-8.

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

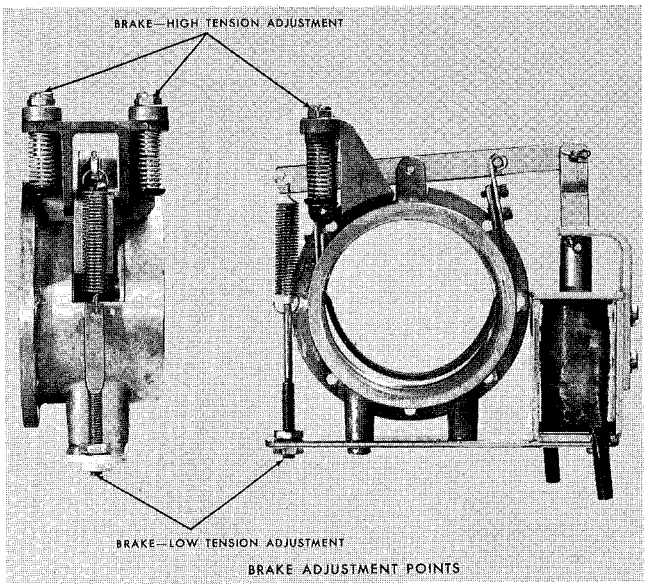


Figure 4-8 BRAKE ADJUSTMENT

0-16 oz. spring scale for 1/4 inch machines and 0-32 oz. spring scale for 1/2 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 in Figure 4-8.

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.

SPRING SCALE READING

Tape Width	Direction of Most Resistance Supply Counterclockwise, Takeup Clockwise	Direction of Lease Resistance Supply Clockwise, Takeup Counterclockwise
1/4 Inch	12 to 16 ounces	2:1 ratio ±1 ounce in accordance with the High Side
1/2 Inch	16 to 20 ounces	2:5:1 ratio ±1 ounce, etc.

CAPSTAN IDLER PRESSURE

The capstan idler is forced against the capstan by the action of the capstan solenoid spade bolt. See the illustration (Pressure Measurement, Capstan Idler). 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

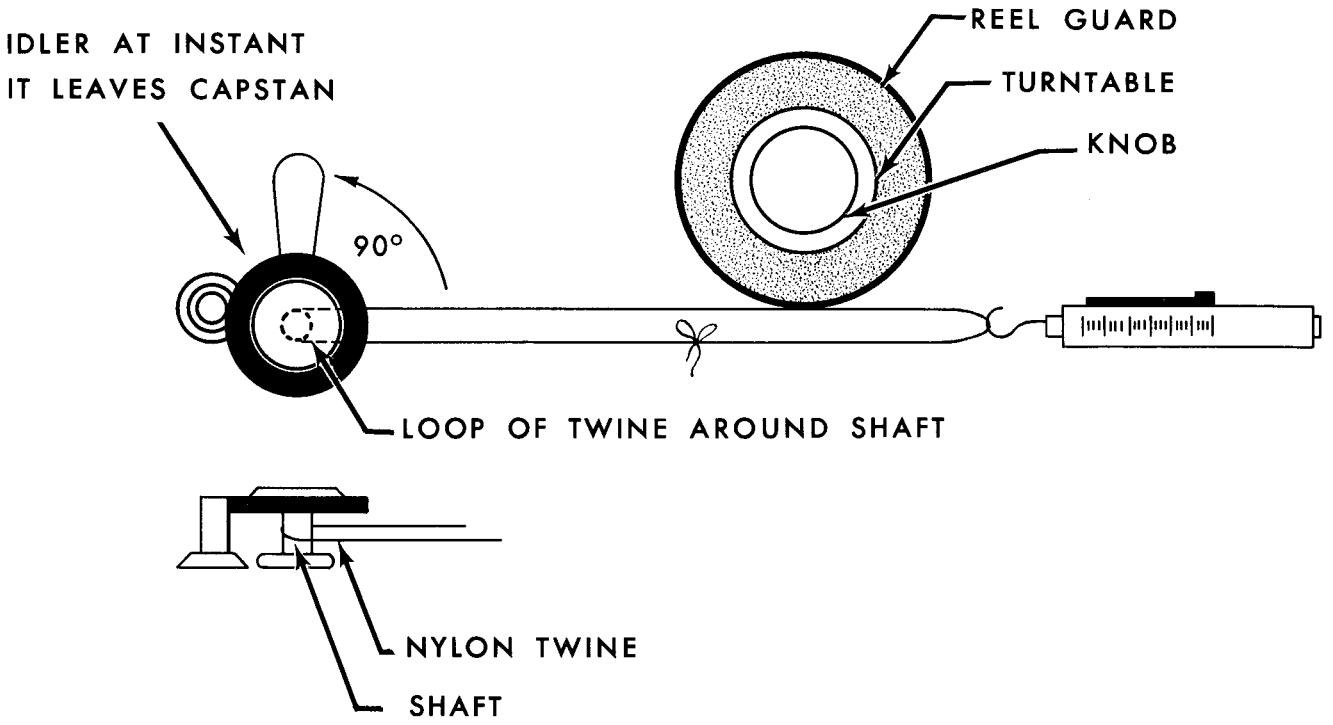


Figure 4-9 PRESSURE MEASUREMENT, CAPSTAN IDLER

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 ac when cold, or 105 volts when warm (after 1/2 hour running). The pressure ("dig") against the capstan shaft should be 5 ± 1/2 pounds.

NOTE

In the course of normal operation in the reproduce or record modes, the temperature of the capstan solenoid will rise, and its dc 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 110 volts), 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 equipments 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 twin 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 pounds ± 1/2 pound. 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 screw driver 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 Franchised Dealer for repair or replacement. Contact 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. Removal of the complete torque motor assembly from the tape transport is sometimes necessary or desired depending on the accessibility to the brake housing assembly.

BRAKE BAND REPLACEMENT

NOTE

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

Step 1: With a 7/16 socket wrench remove the four mounting screws and washers at the motor mounting plate. If shims have been used, be sure not to lose them and replace in the exact place of removal. Carefully hold the motor with one hand to prevent it from falling.

Step 2: Take motor to a convenient work area.

Step 3: Unhook the brake tension spring from the brake lever.

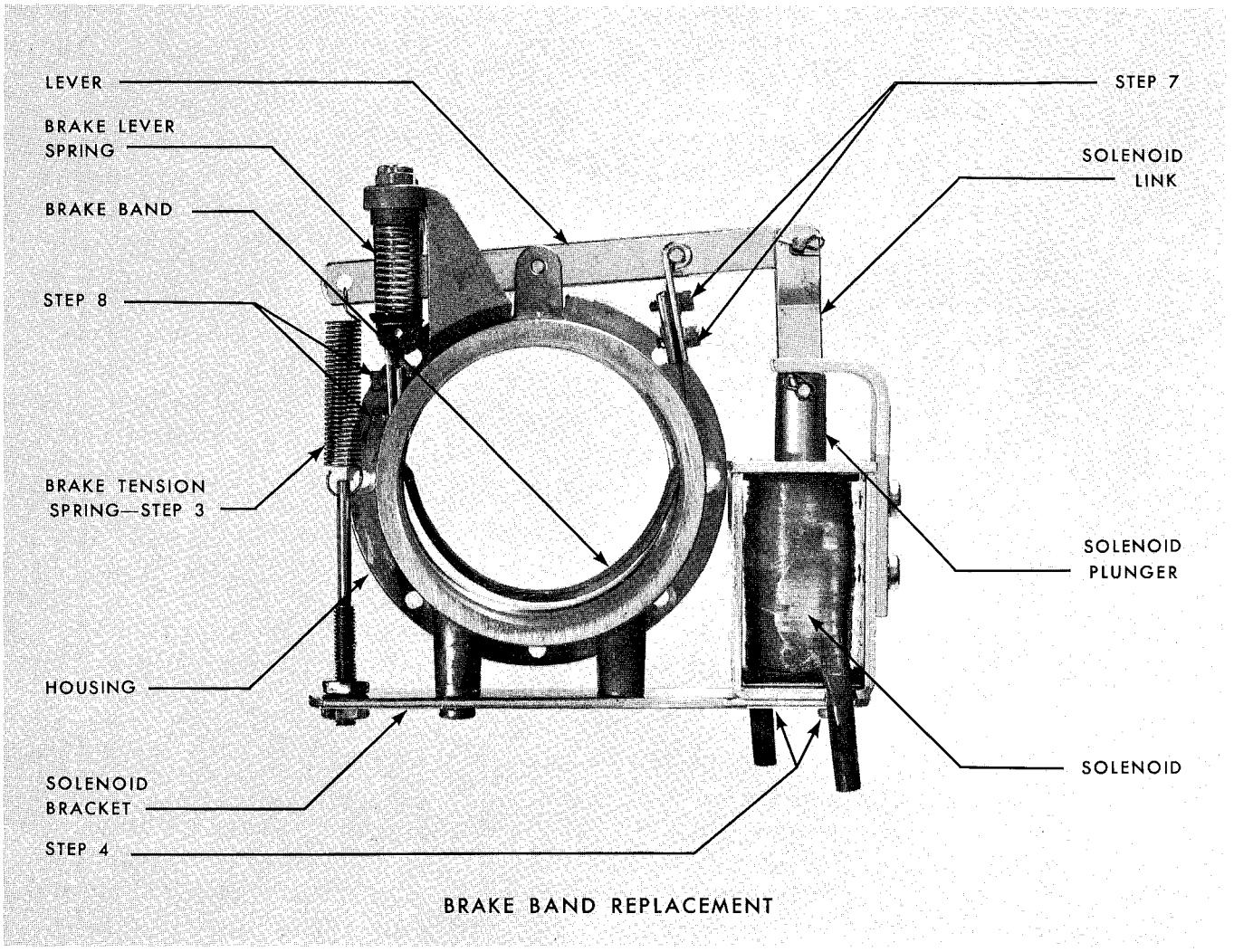


Figure 4-10

BRAKE BAND REPLACEMENT

Step 4: Remove the two screws holding the capacitor to the solenoid bracket. (On some models the capacitor is mounted on the side of the motor which makes this step unnecessary). Let capacitor hang free of brake housing. Replace one of the screws temporarily to keep the solenoid bracket tight on the housing.

Step 5: Disconnect the solenoid wires at knife disconnects.

Step 6: Remove the screws that hold the brake housing to the motor, noting the position of the washers and spacers and remove the entire housing.

Step 7: Loosen (do not remove) the two cap screws at the end of the brake band next to the solenoid.

Step 8: Remove the two cap screws holding one end of the brake band between the brake lever spring and the housing using a 5/16 inch Allen wrench.

Step 9: 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. Before installing the new brake band, clean the inside of the brake housing and the brake drum surface with a non-oil base solvent.

Step 10: Position the new brake band through the hole in the housing. Follow the curvature of the housing and place between the clamp and the link. Replace the two cap screws and tighten.

Step 11: Insert the other end of the band between the band link and clamp, making certain that small band leaf is also positioned at this point on inside of band next to the clamp. Do not tighten the two cap screws at this time.

Step 12: Replace the brake housing assembly on the motor, making certain that the spacers, housing, lock washers and the screws are replaced in that order, and tighten the screws.

Step 13: Push the solenoid plunger in by hand until it bottoms. Adjust the depth of insertion of the brake band between the link and the clamp so that there is no buckling of the band and so that the brake drum rotates freely with no drag. Then tighten the two cap screws.

CAUTION

If the band is set too far forward in the link it will buckle when the solenoid plunger is bottomed by hand. If this condition continued to exist the band would eventually break at the point of buckling.

Step 14: Interconnect the wires at the knife disconnects and replace the capacitor to the bracket with the two screws removed in Step 4.

Step 15: Hook the brake spring to the brake lever. Step 3.

Step 16: Replace the motor assembly, if removed in Step 1, tightening the four screws securely.

Step 17: Run the torque motors for approximately ten minutes. Energize and de-energize the brake solenoid several times to seat the brake bands against the drums.

Step 18: Adjust the brake tensions to the correct settings as called for in "Brake tension adjustments".

PACKING PRECAUTIONS FOR MOTORS

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

MODEL 3200-D DUPLICATOR SYSTEM
COMPLETE EQUIPMENT
CATALOG NUMBER 7870

Handles up to 14-inch reels.

Ampex Part No.	Cycles Per Second	Inches Per Second	Tape Width
7870-01	60 cps	30/60 ips	1/4 inch
7870-02	50 cps	30/60 ips	1/4 inch
7870-07	60 cps	15/30 ips	1/4 inch
7870-08	50 cps	15/30 ips	1/4 inch

3200-D
TAPE TRANSPORT PARTS LIST
CATALOG NUMBER 7870

PART DESCRIPTION	1/4-Inch
CAPSTAN ASSEMBLY: 15-30-60 IPS	7518-01
Capstan Dust Cap	2326-00
Capstan Felt Washer - Dust Seal	494-00
CAPSTAN IDLER ASSEMBLY:	30945-01
Capstan Idler Arm	372-01
Capstan Idler Arm Bearing	374-00
Capstan Solenoid	670-00
Capstan Idler Adjusting Spring	676-00
Capstan Idler Return Spring	400-00
DRIVE MOTOR ASSEMBLY:	
For 60 Cycles	1030-07
For 50 Cycles	1030-11
Drive Motor Return Spring (Console and Portable)	19994-01

When ordering replacement parts always include the following information: Equipment Type; Equipment Serial Number; Ampex Part or Catalog Number; and Description of Part. DO NOT simply use the schematic reference number.

PART DESCRIPTION	1/4-Inch
Drive Motor Return Spring (Rack)	19995-01
Drive Motor Mounting Hinge	7815-00
Drive Motor Shield (Bodine Motors Only)	1905-00
Drive Motor Solenoid	670-00
Felt Washer (Solenoid Assembly)	503-015
Drive Motor Pressure Adjusting Spring	389-00
TAPE SPEED SWITCH ASSEMBLY: (Includes S501, S502 and S503)	364-02
TAKEUP ASSEMBLY: Complete	5704-04
TAKEUP BRAKE ASSEMBLY	17327-01
REWIND ASSEMBLY: Complete	5705-04
REWIND BRAKE ASSEMBLY	17327-02

PARTS COMMON TO TAKEUP AND REWIND ASSEMBLIES

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

When ordering replacement parts always include the following information: Equipment Type; Equipment Serial Number; Ampex Part or Catalog Number; and Description of Part. DO NOT simply use the schematic reference number.

PART DESCRIPTION	1/4-Inch
Connector: J601P, 8 contact Jones Part No. P-308-CCT-L	145-013
REEL GUARD (14 Inch)	5708-00
TAKEUP TENSION ARM ASSEMBLY	425-06
Tape Guide	675-00
Tape Guide Hook	355-00
Takeup Tension Spring	30946-01
BASE, Rotary Tape Guide (Takeup)	17720-01
DISC, Rotary Tape Guide (Takeup)	17719-01
CAP, Rotary Tape Guide (Takeup)	17718-00
BEARING, Rotary Tape Guide (Takeup)	421-029.
REEL IDLER ASSEMBLY:	4459-12
BASE ASSEMBLY, Reel Idler	30840-01
PULLEY, Reel Idler	5893-00
FLYWHEEL, Reel Idler	30941-01
TAPE GUIDE	257-00
SPEED CHANGE KNOB	230-010
MODE SELECTOR KNOB	230-002
FUSE HOLDER	085-001
PILOT BASE LAMP	132-011

TAPE TRANSPORT
CATALOG NUMBER 7870

Electronic Parts Common to all Tape Transports Except as Noted

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
A801	LAMP: 120 volts, 6 watts, candelabra screw base; G.E. Part No. 6T4 1/2/1	060-006
A802	Same as A801	
C501	CAPACITOR, Drive Motor: 5 mfd; 330 vacw	7464-00
	CAPACITOR, Drive Motor: 6 mfd; 330 vacw; 10%; Cornell Dubilier Part No. MKK3060C	035-245

When ordering replacement parts always include the following information: Equipment Type; Equipment Serial Number; Ampex Part or Catalog Number; and Description of Part. DO NOT simply use the schematic reference number.

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
C601	CAPACITOR, Rewind Motor (60 cps): 3.75 mfd; 330 vacw; 10%: General Electric Part No. 21F525	035-111
	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	035-074
C803	Same as C801	035-074
C804	Same as C801	035-074
C805	CAPACITOR, Fixed: electrolytic; 80 uf; 150 vdcw: C.D. Part No. BRM-8015	031-016
C806	Same as C805	031-016
C807	Same as C801	035-074
C808	Same as C801	035-074
C809	Same as C801	035-074
C810	Same as C801	035-074
F801	FUSE, cartridge: 5 amperes; 250 volt; Fast blow: Littelfuse Part No. 312005	070-007
F802	Same as F801	070-007
F803	FUSE, cartridge: 3.2 amperes; 120 volt; Slow blow: Littelfuse Part No. 31303.2	070-014
	FUSE POST: Finger operated, short body: Littelfuse Part No. 342003	085-001

When ordering replacement parts always include the following information: Equipment Type; Equipment Serial Number; Ampex Part or Catalog Number; and Description of Part. DO NOT simply use the schematic reference number.

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
J601P	CONNECTOR, Plug: male; 8 contact, 730 volts rms; 10 amp contacts: Jones Part No. P-308-CCT-L	147-013
J701P	Same as J601P	147-013
J801P	CONNECTOR, receptacle: male; 2 contact, 250 volts, 10 amp contacts: Hubbel Part No. 4897	147-010
J802S	CONNECTOR, receptacle: female; 12 contacts; 730 volts rms, 10 amp contacts: Jones Part No. S-312-AB	146-009
J804S	CONNECTOR, receptacle: female, 8 contacts; 730 volts rms, 10 amp contacts: Jones Part No. S-308-AB	146-003
J805S	Same as J804S	146-003
J806S	CONNECTOR, receptacle: female; 2 contacts; 250 volts, 10 amp contacts: P and S Des Pard Part No. 1320 and 1354	146-014
J807S	CONNECTOR, receptacle: female; 8 contacts; 730 volts rms, 10 amp contacts: Jones Part No. S308 CCT-K	144-019
J808S	Same as J807S	144-019
K801	RELAY, PLAY: 3PDT; 115 volt dc coil std; 10 ampere contact: Philtrol Part No. 33QA	020-006
K802	Same as K801	020-006
K803	Same as K801	020-006
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

When ordering replacement parts always include the following information: Equipment Type; Equipment Serial Number; Ampex Part or Catalog Number; and Description of Part. DO NOT simply use the schematic reference number.

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
R803	Same as R801	040-011
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)	122-014
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. 3391BSA	120-014
S804	PUSHBUTTON: Record; SPST, normally open, 1 pole: Arrow H and H Part No. 3391EPA	120-013
S805	PUSHBUTTON: Play; normally open, 2 pole: Arrow H and H Part No. 80913-0	120-006
S806	SWITCH, toggle, SPDT, normally open, 1 pole: Arrow H and H Part No. 81021-81021AV	120-011
S807	SWITCH, toggle, DPDT, 2 pole: Jan Part No. ST52N	120-016
S808	Same as S807	120-016
SR801	RECTIFIER; Selenium: single phase, half wave: General Electric Part No. 6RS5CHB21	582-001
TS501	TERMINAL STRIP: 9 one-sided solder terminals: Cinch Part No. 9-141-3/4W	180-045

When ordering replacement parts always include the following information: Equipment Type; Equipment Serial Number; Ampex Part or Catalog Number; and Description of Part. DO NOT simply use the schematic reference number.

CABLE ASSEMBLIES FOR THE 3200-D DUPLICATOR SYSTEM

CONNECTOR PART NO.	PART DESCRIPTION	AMPEX PART NO.
	CORD SET, power; ac	084-005
PL-105S	CABLE, power cable - master record panel	2413-00
	CABLE, Interconnecting - long (48"x48"on each leg)	3584-00
	short (20"x26"on each leg)	3584-01
140-007	CABLE, bias buss	3730-04
144-003 and 140-008	CABLE, Audio to record (audio #1 and #2) (10' long)	6006-00
144-011 and	CABLE, Control, Interconnecting (10' long)	30885-01
145-004	CABLE, Control, Interconnecting (5' long)	30885-02
PL-43-S	CABLE, Audio to Record lower track	6012-00
PL-44-S	CABLE, Audio to Record upper track	6014-00
PL-105-S	CABLE, Power line	2413-01
145-004	CABLE ASSEMBLY, Control interconnecting (15' long)	6005-02
140-008 and 144-003	CABLE ASSEMBLY, Audio duplicator (15' long)	6006-01
144-003 and	CABLE, Input, Audio to Record full track (10' long)	6013-00
145-009	CABLE, Input, Audio to Record full track (5' long)	6013-01
140-009 and 144-003	CABLE ASSEMBLY, Audio to Record upper track (10' long)	6008-00
144-011 and 145-004	CABLE, Control interconnecting	30885-02
144-018 and 145-018	CABLE, Relay buss	30886-01

When ordering replacement parts, always include the following information: Ampex type; equipment serial number; Ampex part or catalog number; and description of part. DO NOT SIMPLY USE THE SCHEMATIC REFERENCE NUMBER.

FAST START RELAY BOX ASSEMBLY
FOR
3200-D
CATALOG NUMBER 5995

REF NO.	PART DESCRIPTION	AMPEX PART NO.
C101	CAPACITOR, electrolytic: tubular; 16 mfd; -10 +150%; 85° C: Cornell Dubilier: BRM-1615	031-018
J101P	CONNECTOR, Plug; male; 8 contacts; 730 volts rms; 10 amp contacts: Jones Part No. P-308-CCT	145-008
J102P	Same as J101P	145-008
J103P	CONNECTOR, receptacle: male; 6 contacts; 730 volts rms; 10 amp contacts: Jones Part No. P-306-AB	147-011
J104S	CONNECTOR, receptacle: female; 6 contacts; 730 volts rms; 10 amp contacts: Jones Part No. S-306-AB	146-004
K101	RELAY: DPDT; 115 volt dc coil; 4000 ohm; 10 amp contacts: Advance Part No. PC2115VD	202-014
K102	Same as K101	202-014
K103	RELAY: 3 PDT; 115 volt dc coil; 10K ohm	5760-00
	COVER, Relay Box	5983-01

When ordering replacement parts always include the following information: Equipment Type; Equipment Serial Number; Ampex Part or Catalog Number; and Description of Part. DO NOT simply use the schematic reference number.

ACCESSORIES FOR 3200-D

AMPEX alignment tape: 30 inches per second for 1/4-inch application	6878-00
AMPEX head demagnetizer	704-00
Head Cleaner	087-007
Lubricating Oil (Caloil - OC - 11)	087-005
Reel hold-down knob (rack mount)	9093-00
Reel Knob, editing (console)	1917-00
Reel, Centering adaptor	976-00
Bushing extractor	1514-00
Strobosticker, 24 bar (60 cycles per second)	575-00
Strobosticker, 20 bar (50 cycles per second)	1453-00
Panel, blank: 7 inches x 19 inches; gray	6889-04
Panel, blank: 8-3/4 inches x 19 inches; gray	6889-05

When ordering replacement parts, always include the following information: Ampex type; equipment serial number; Ampex part or catalog number; and description of part. DO NOT SIMPLY USE THE SCHEMATIC REFERENCE NUMBER.

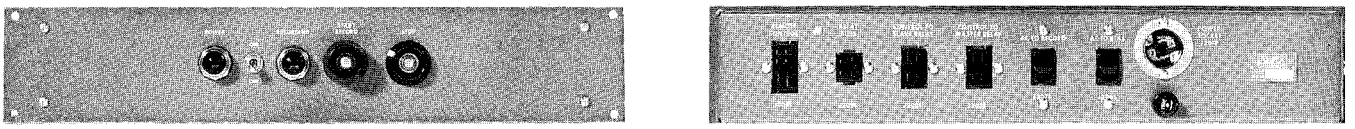


Figure 4-11 MASTER CONTROL PANEL PARTS LOCATION (EXTERIOR VIEW)

MASTER CONTROL PANEL

Theory of operation

Power is supplied to the panel through (Power Socket) J201P. Refer to Figure 2-3, interconnecting diagram. Placing Switch S203 in the "ON" position supplies power to J206S (AC to Bias) and J207S (AC to Record) thence through interconnecting cables to the Bias Oscillator (and Bias Amplifier if used) and the record amplifiers.

Voltage is supplied to POWER indicator lamp I202 and through current limiting resistor R201 to half wave rectifier SR201. Pulsating DC voltage from the rectifier is smoothed by capacitor C201. Bleeder resistor R202 provides a load for the rectifier system to prevent excessive peak voltage during standby periods. Figure 4-11

When "START-RECORD" button is pressed one section of Switch S201 supplies DC voltage to J202S, J203S and remote control connector J208S. The DC voltage from J202S and J203S is carried by interconnecting cables to the fast start boxes of all transports including the master transport and momentarily energizes all start relays K101, the contacts of which are paralleled with the "START" switch in each transport. Holding contacts are not required on start relay K101 as the play relay in each transport carries its own holding contact.

The second section of "START-RECORD" switch S201 supplies DC voltage to "RECORDING" lamp I201, remote control connector J208S and relay K201. When Relay K201 energizes one set of its contacts removes bleeder resistor R202 from the DC supply and supplies DC voltage to "BIAS RELAY BUSS" connector J209S. Voltage from this connector is taken to the BIAS OSCILLATOR (and bias amplifier if used) through interconnecting cables and energizes relay K501 in that assembly. The second set of contacts on K201 provides a holding circuit through J203S, an interconnecting cable, and de-energized contacts of K102 in the master transport fast start box.

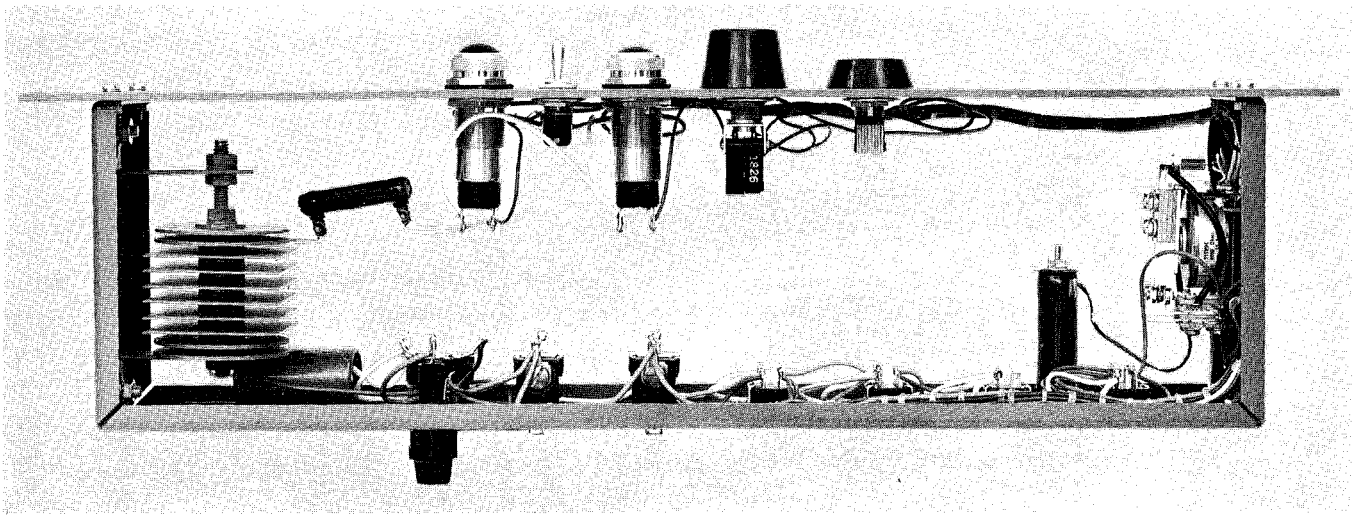


Figure 4-12 MASTER CONTROL PANEL PARTS LOCATION (INTERIOR VIEW)

Depressing the "STOP" button of Switch S202 supplies DC voltage to J202S, J203S and "Remote Control" connector J208S. Interconnecting cables to the "FAST START" boxes on each transport carry the DC voltage to relay K102 in each box and momentarily energizes this relay. One set of K102 contacts opens the circuit of "Tape Motion Relay" holding contact in its associated transport causing the transport to stop. A second set of contacts on K102 opens the circuit holding relay K201 in the energizes and the system returns to standby condition.

The remote control connector J208S may be used when remote or multiple controls for the system may be desirable. A suggested circuit for the remote control is shown on schematic diagram 30923 Figure 4-13. The remote "START" and "RECORD" switches may be combined into a double pole switch if convenient.

Maintenance

Inspect and clean relay contacts with a burnishing tool at regular intervals. Visually inspect interconnecting cable plugs periodically to assure that all latches are secure and the plugs firmly seated.

DC voltage from pins 5 (positive) and pin 7 (negative) of the remote control connector (J2085) should be measured occasionally to check condition of rectifier SR201 and capacitor C201. The voltage should read at least 115 volts DC.

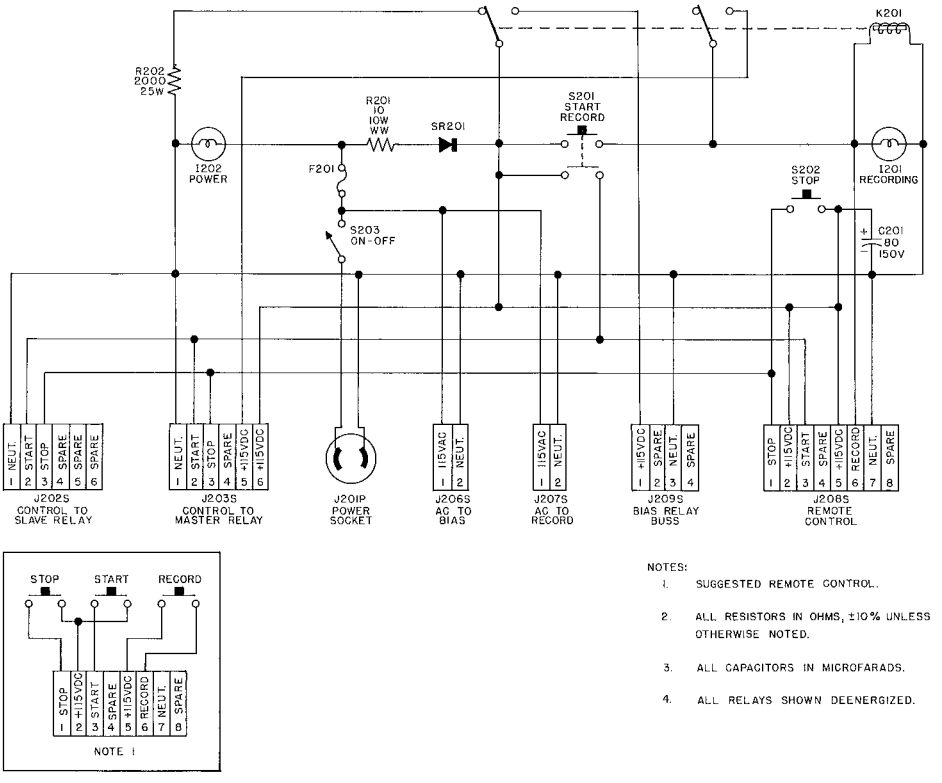


Figure 4-13 SCHEMATIC DIAGRAM, MASTER CONTROL PANEL

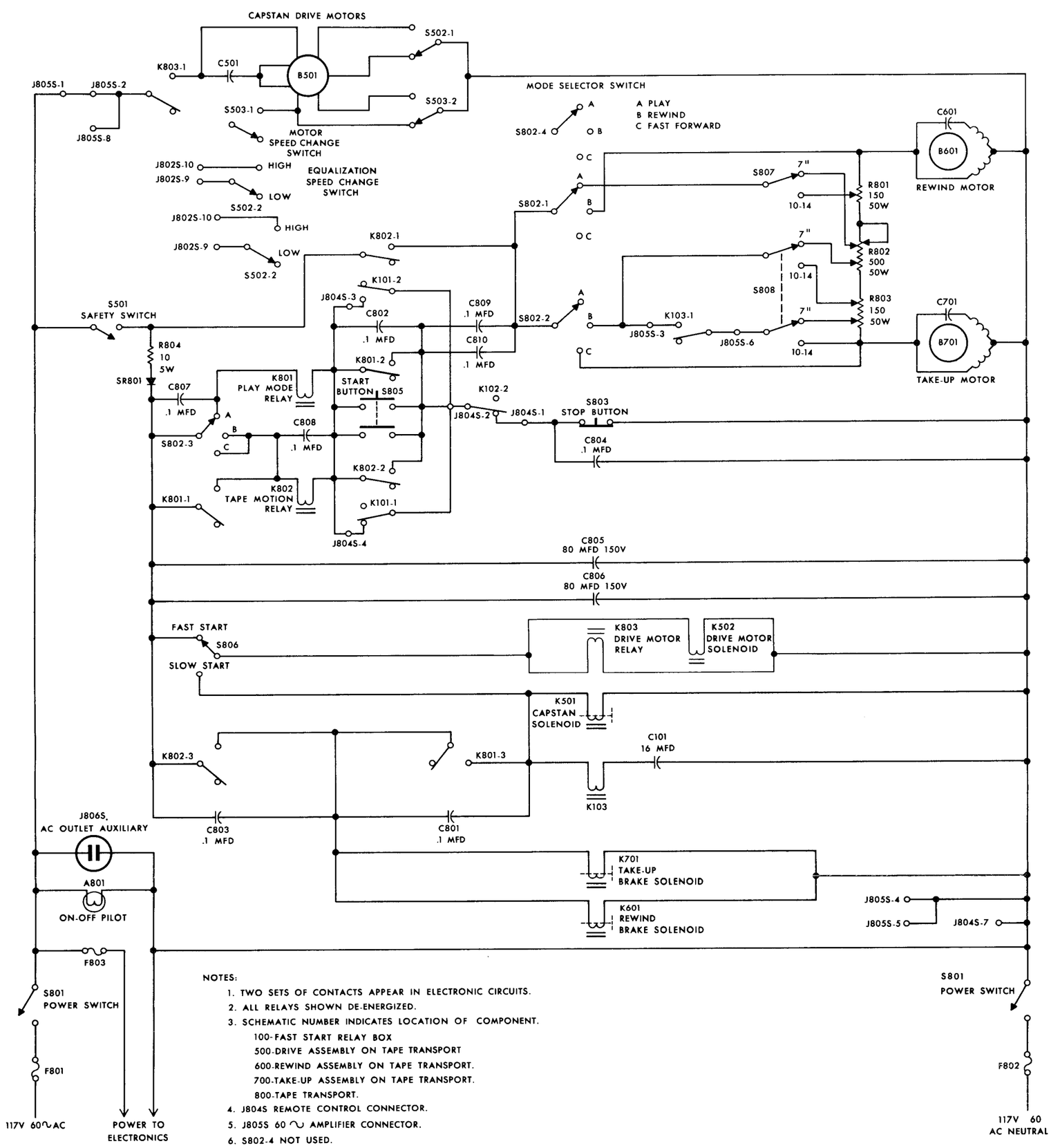
MASTER CONTROL PANEL
FOR
3200-D
CATALOG NUMBER 5993

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
C201	CAPACITOR, electrolytic: tubular; 80 mfd; -10 +150%; 85° C: Cornell Dubilier BRM-8015	031-016
F201	FUSE, cartridge: fast blow; 250 volt; 3 amp: Littelfuse Part No. 312003	070-001
I201	PILOT LIGHT ASSEMBLY: red Dialco Part No. 721515-111	132-006
I202	PILOT LIGHT ASSEMBLY: amber Dialco Part No. 721515-113	132-011
J201P	CONNECTOR, Plug: male; 8 contacts; 730 volts rms; 10 amp contacts: Jones Part No. P-308-CCT-L	147-013
J202S	CONNECTOR, receptacle: female; 6 contacts; 730 volts rms; 10 amp contacts; Jones Part No. S-306-AB	146-004
J203S	Same as J202S	146-004
J206S	CONNECTOR, receptacle: female; 2 contacts; 250 volts; 10 amp contacts; P and S DesPart Part No. 1320 and 1354	146-014
J207S	Same as J206S	146-014
J208S	CONNECTOR, receptacle: female; 8 contacts; 730 volts rms; 10 amp contacts: Jones Part No. S-308-AB	146-003
J209S	CONNECTOR, receptacle: female; 730 volts rms; 10 amp contacts: Jones Part No. S-304-AB	146-005

When ordering replacement parts always include the following information: Equipment Type; Equipment Serial Number; Ampex Part or Catalog Number; and Description of Part. DO NOT simply use the schematic reference number.

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
K201	RELAY: DPDT; 115 volt dc coil; 4000 ohm; 10 amp contacts: Advance Part No. PC2115VD	020-014
R201	RESISTOR, Fixed: wirewound; 10 ohm; 5%; 10 watt: Tru-Ohm Part No. Type FRL-10	043-089
R202	RESISTOR, Fixed: wirewound; 2000 ohm; 5%; 25 watt: Tru-Ohm Part No. Type FR-25	043-064
S201	SWITCH, toggle: Pushbutton; DPDT; 12-20 oz. operating pressure, 10 amp rating: Arco Electric Co., Part No. 2 ea. 2MD3-1A and 1 ea. A-14 mtg. brkt.	120-025
S202	PUSHBUTTON: record; SPST; normally open, 1 pole: Arrow H and H Part No. 3391EPA	120-013
S203	SWITCH, toggle: SPST; 3 and 6 amp rating: Arrow H and H Part No. 86994-N	120-005
SR201	RECTIFIER, selenium: single phase; half wave; 270 volts ac rms: General Electric Part No. 6RS25PH6BBD1 or 6RS5CHB21	582-001
	FUSE EXTRACTOR POST: Littelfuse Part No. 442001	085-002
	ESCUTCHEON: Pushbutton	361-00
	ESCUTCHEON: Pushbutton; record	463-00
	LAMP: 6 watt; 120 volt; candelabra screw base T-4-1/2: General Electric Part No. 6T4-1/2/1	060-006
	WASHER: Mica, insulating: Ohmite Part No. 6011	503-007
	WASHER: centering: Ohmite Part No. 6000	506-003

When ordering replacement parts always include the following information: Equipment Type; Equipment Serial Number; Ampex Part or Catalog Number; and Description of Part. DO NOT simply use the schematic reference number.

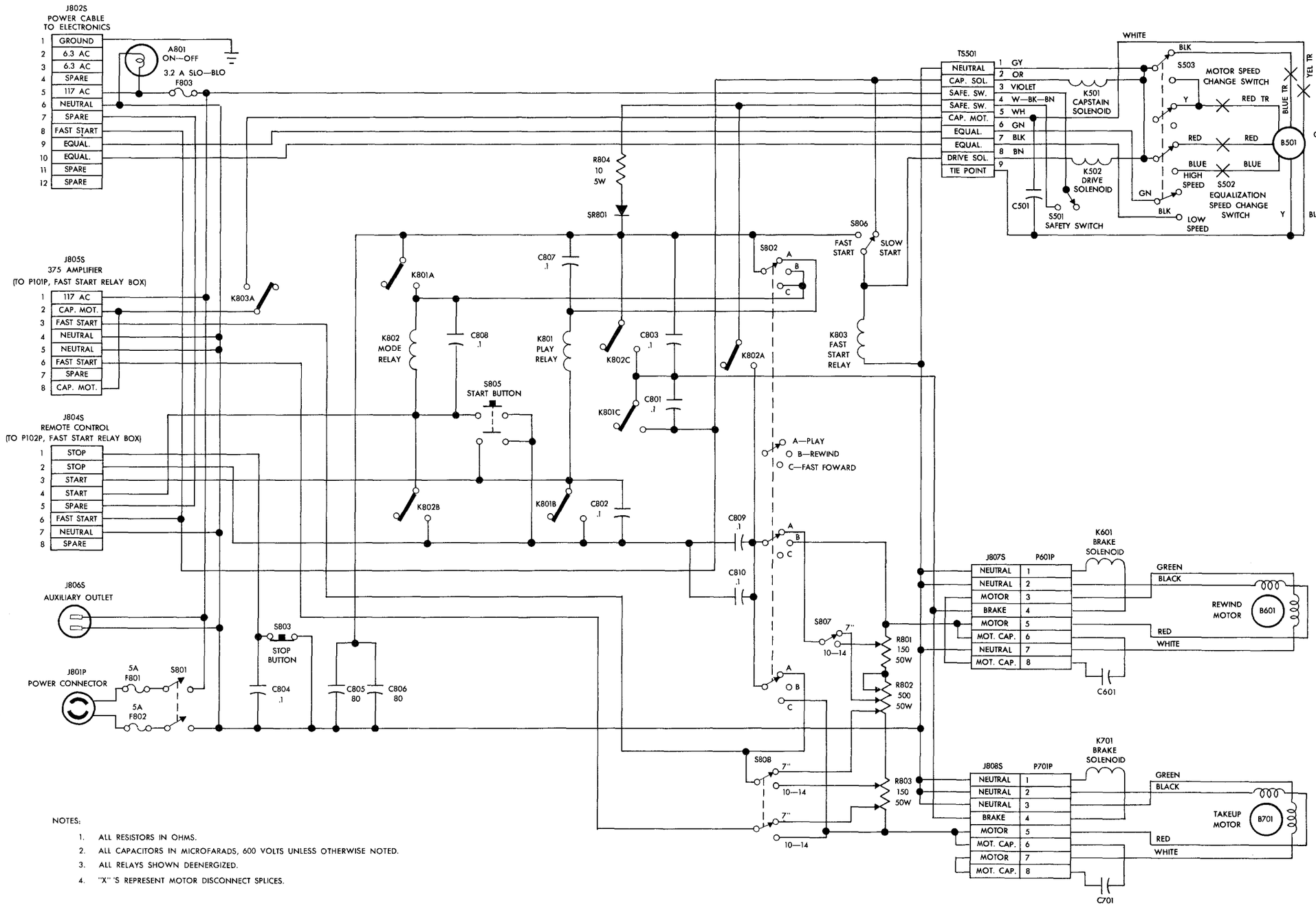


NOTES:

1. TWO SETS OF CONTACTS APPEAR IN ELECTRONIC CIRCUITS.
2. ALL RELAYS SHOWN DE-ENERGIZED.
3. SCHEMATIC NUMBER INDICATES LOCATION OF COMPONENT.
   - 100-FAST START RELAY BOX
   - 500-DRIVE ASSEMBLY ON TAPE TRANSPORT
   - 600-REWIND ASSEMBLY ON TAPE TRANSPORT.
   - 700-TAKE-UP ASSEMBLY ON TAPE TRANSPORT.
   - 800-TAPE TRANSPORT.
4. J804S REMOTE CONTROL CONNECTOR.
5. J805S 60 ~ AMPLIFIER CONNECTOR.
6. S802-4 NOT USED.

SIMPLIFIED TAPE TRANSPORT
CONTROL CIRCUITS
MODEL 3200-D

SCHEMATIC DIAGRAM
TAPE TRANSPORT
MODEL 3200-D TAPE DUPLICATOR SYSTEM
CATALOG NUMBER 7870-01
ED 5996



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.