Price: $6.00

AMPEX TM 4
MAGNETIC TAPE TRANSPORT

SDS 90 05 63B (OEM)

FOR USE WITH SDS MODELS: 9146A/9148, 9246A/9248, 92461A/92481, 92462A/92482

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TECHNICAL MANUAL FOR

SDSTM-4 TAPE TRANSPORT

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SECTION I
GENERAL DESCRIPTION

1-1. GENERAL DESCRIPTION.

1-2. The Ampex TM-4 Tape Transport is a high speed data storage unit intended for use in digital systems. A typical TM-4 unit (Figure 1-1) includes the transport, a transport electronics assembly, and an optional manual control panel for mounting in a standard 19-inch rack cabinet.

1-3. SELECTIVE AND OPTIONAL FEATURES.

1-4. A choice of tape speeds is available and the tape can be stored on Ampex or IBM compatible reels. Electronic interlocks, preventing acceptance by the transport of simultaneous forward and reverse commands can be included in the transport electronics assembly. A transport access door, cabinet assembly, manual control panel, write enable switch (operated by a ring on the supply reel) and photosense unit for detecting reflective tabs on the tape are also available.

1-5. TAPE TRANSPORT.

1-6. The function of the tape transport is to move 1/2-inch wide magnetic tape across a read/write head in response to commands from a manual control panel or from remote equipment. Rotating capstans pull the tape across the head when engaged by capstan rollers. The tape drive capstans are belt driven by a two speed synchronous motor; the higher motor speed providing the FAST FORWARD and FAST REVERSE tape speed.

1-7. Vacuum chambers and tape tension arms above and below the tape drive area store loops of tape and effectively isolate the driven tape from the storage reels. The storage reels are motor driven and servo controlled to maintain useful tape loops on the tension arms.

1-8. Tape guides on the head assembly and in the tape supply system ensure accurate tape tracking and a motor driven blower provides the vacuum needed for proper tape tension and smooth loop configuration in the vacuum chambers.

1-9. Other features of the transport include safety interlocks, facilities to sense metallic leaders, and a switch to prevent operation during tape threading. Rapid tape supply changes are made possible by operating a threading lever that correctly positions the tension arms for tape threading.

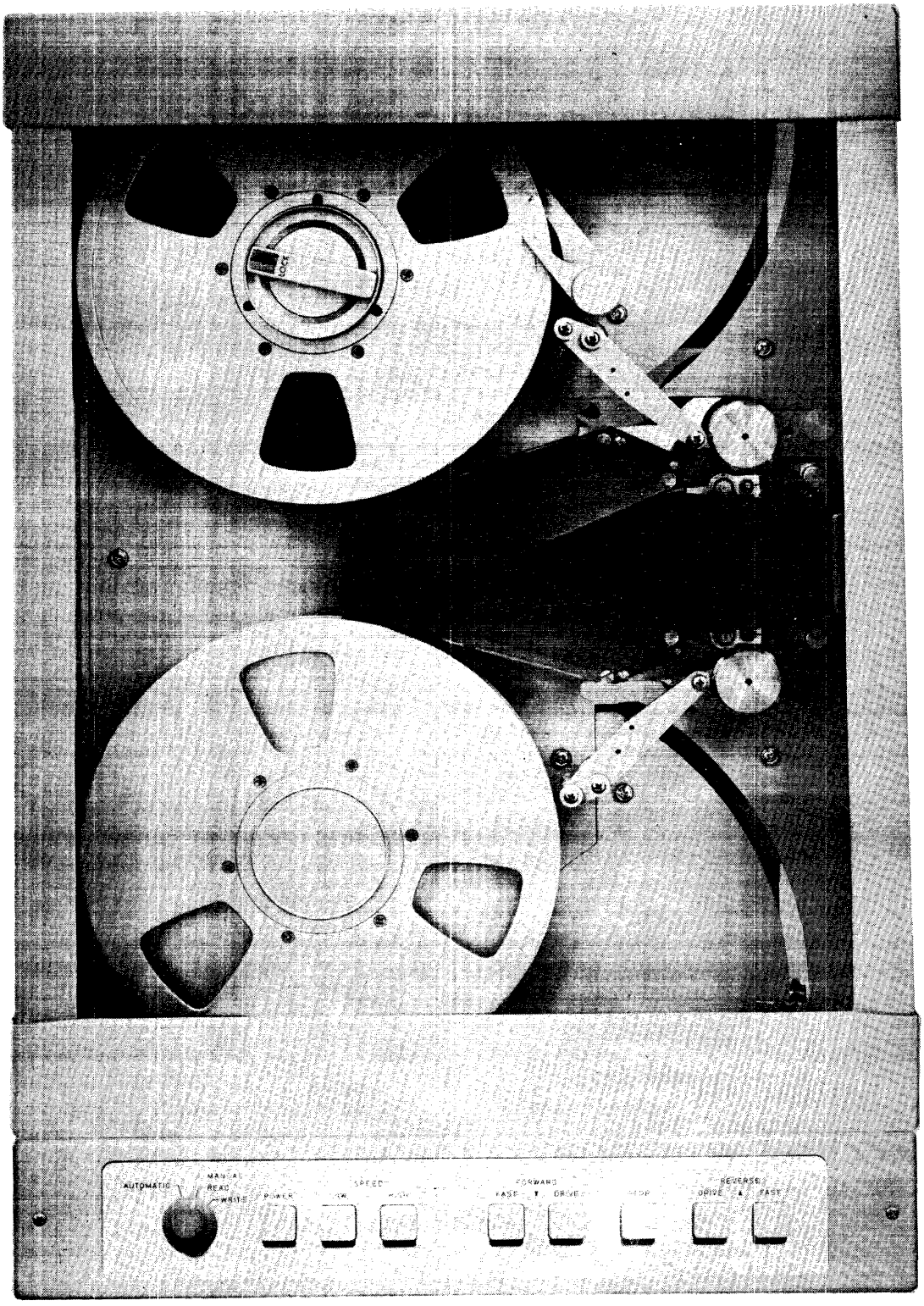


Figure 1-1.
Tape Transport

1-10. READ/WRITE HEAD ASSEMBLY.

1-11. The read/write head assembly reads information from the tape (to external equipment) and writes information (supplied by external equipment) on the tape. This information may be written in either seven or eight tape tracks on 1/2" tape, depending upon the type of head selected by the customer.

1-12. PHOTOSENSE.

1-13. A two channel photosense head detects reflective markers fixed to the mylar side of the tape. Outputs from this device are amplified to provide control signals to external equipment. These control signals can be in the form of either a voltage level or a contact transfer depending upon the type of photosense unit selected by the customer.

1-14. SAFETY INTERLOCKS.

1-15. Electro-mechanical interlocks are used to protect the operator and to prevent tape or equipment damage in the event of failure. One interlock circuit, an initial time delay, prevents programming while the tubes are heating and before the capstans have had time to reach operating speed and the vacuum pressure has had time to build up.

1-16. MANUAL CONTROL PANEL.

1-17. The manual control panel is used for local control of the transport and provides pushbutton commands for tape motion control. While this panel is optional, some form of equivalent circuitry should be provided when the Ampex panel is not included so that local control can be used during tape changes and maintenance.

1-18. PUSHBUTTON CONTROLS. The following pushbuttons are mounted on the manual control panel:

POWER	Controls the AC supply to the transport
FORWARD DRIVE	Starts the tape moving forward across the read/write head
REVERSE DRIVE	Starts the tape moving in reverse across the read/write head
SPEED SELECT	Changes capstan motor speed from data speed to rewind speed

FAST FORWARD	Starts the tape moving forward at twice the nominal speed
FAST REVERSE	Starts the tape moving in reverse at twice the nominal speed
STOP	Stops tape movement. Resets a forward/reverse interlock in the control panel

A forward reverse interlock in the control panel assembly makes it impossible to manually switch from forward to reverse without first pressing the STOP pushbutton.

1-19. MANUAL/AUTO CONTROL. This is a three-position rotary switch mounted on the control panel used to place the transport under local (MANUAL) or remote (AUTO) control. Two manual positions are provided for use with external write amplifier circuits to give manual write enable and write disable conditions.

1-20. INDICATORS. High and Low speed indicators show that the power is ON and indicate the operating speed.

1-21. TRANSPORT ELECTRONICS ASSEMBLY.

1-22. The transport electronics assembly contains all control circuits and power supplies needed for the tape transport. The control circuits exercise complete control over the transport in accordance with signals originating in a command source. Power supplies are included to operate the reel motors, control circuits, and capstan roller actuators.

1-23. BUFFER INTERLOCK UNIT. This optional unit in the transport electronics assembly prevents simultaneous remote forward and reverse commands from programming the transport. Two versions are available and their selection is determined by the remote command voltages to be used.

1-24. CABINET ASSEMBLY.

1-25. A standard Ampex rack cabinet is optional. Filler panels and a cooling fan are included in this assembly and rack space is available for housing associated electronic equipment.

1-26. SPECIFICATIONS.

1-27. TAPE SUPPLY.

Tape Type	Computer grade 1/2 inch mylar base, (0.001 or 0.0015 inch) hard binder, oxide coated tape.
Tape Reel Hubs	IBM compatible, NAB compatible, or fixed lower reel
Tape Speed	30, 37.5, 60, or 75 ips

NOTE

Special tape speeds are available on request. Data handling performance of the TM-4 transport above 75 ips is not specified.

1-28. INPUT POWER REQUIREMENTS.

Voltage	Frequency	Approx. Standby Current	Max. Operating Current
117 ±10%	48 to 62 cps	5.2 amps	8.0 amps

1-29. HEAD ASSEMBLY.

8 track 2 stacks (read and write) or 7 track 2 stacks (read and write).

1-30. WRITE LOCKOUT SWITCH.

IBM or NAB compatible, retractable.

1-31. PHYSICAL DIMENSIONS

TABLE 1-1.
PHYSICAL DIMENSIONS

UNIT	HEIGHT	WIDTH	DEPTH	WEIGHT
Tape Transport	24-1/4"	19"	14-1/2"	163 lbs. max.
Transport Electronics	5-3/4"	19"	10"	22 lbs.
Photosensor Chassis	3-1/2"	19"	4"	6 lbs.
Manual Control Panel	3-1/2"	19"	8-1/2"	10 lbs.
Transport Access Door	24-1/2"	19"	3-7/8"	25 lbs. max.
Cabinet Assembly	66-1/2"	23"	24"	170 lbs. ma
	73-1/2"	23"	24"	190 lbs.
	77-1/2"	23"	24"	200 lbs.
	80-1/2"	23"	24"	210 lbs.
	84-1/2"	23"	24"	220 lbs.

1-32. ENVIRONMENT.

Operating Environment

Ambient air temperature . . . . . 50 to 90°F

Relative humidity . . . . . 40 to 70%

Altitude. . . . . 0 to 7,000 ft.

Storage Environment (excluding sudden temperature changes)

Ambient air temperature . . . . . -20 to 150°F

Relative humidity . . . . . 95% maximum

Altitude. . . . . 0 to 40,000 ft.

1-33. COOLING.

1-34. When the transport is enclosed, sufficient air must be blown over the major components in the rear of the tape transport to maintain maximum exhaust temperature at less than 140°F. The air flow requirements depend upon the additional electronics located in the rack by the customer. However, for the transport, only a flow of 250 cfm is needed at a maximum inlet temperature of 90°F.

1-35. START/STOP CHARACTERISTICS.

Start Time: The start time is defined as the time from the application of a "Start Command" until the tape passing over the magnetic head has obtained an instantaneous speed variation of 10% or less from nominal speed. The start time shall be 3.3 ms.

Start Distance:

TAPE SPEED IN IPS	START DISTANCE IN INCHES MIN.	MAX.
30	0.064	0.092
37.5	0.080	0.114
60	0.120	0.182
75	0.162	0.203

Stop Time: The stop time shall be defined as the time from the application of a "Stop Command" until all tape motion over the magnetic head has ceased. The stop time shall be 1.8 ms maximum.

TAPE SPEED IN IPS	STOP DISTANCE IN INCHES MIN.	MAX.
30	0.006	0.030
37.5	0.009	0.037
60	0.018	0.068
75	0.030	0.100

1-36. TAPE SPEED CHARACTERISTICS.

Instantaneous Speed Variations:	ISV is defined as the speed variation from the specified nominal speed at any instant of time. The ISV at any instant of time following the start time of 3.3 ms, is ±10%; 6.3 ms or more after receipt of a start command, the ISV is ±5%. This does not include effects caused by variation in line frequency.
Short Term Average Speed Variation:	The short term average speed variation is defined as the variation from the specified nominal speed averaged over any interval of 15 ms occurring 3.3 ms or more after a start command. The variation shall be 3% maximum.
Long Term Average Speed	The long term average speed variation is defined as the variation from the specified nominal speed averaged over any interval of 30 ms occurring 3.3 ms or more after a start command. This variation shall be 2% maximum.
Speed Change Times:	Acceleration from low to high speed in forward or reverse directions shall be 10 seconds or less. Deceleration from high to low speed in forward or reverse direction shall be one (1) second or less.

1-37. INTERCHANNEL TIME DISPLACEMENT.

1-38. ITD is the time band within which all bits of a character-frame arrive at the head output when reading a tape written on the same or another TM-4 tape transport. ITD is the sum of the static skew contributed by the mechanical tolerances of the magnetic head assembly, plus one-half the dynamic skew contributed by the tape drive. ITD = Static Skew + Dynamic Skew/2.

1-39. DYNAMIC SKEW.

1-40. Dynamic skew is defined as the varying time displacement between the recorded signals of any two heads in the same stack with the tape traveling over the heads at the specified nominal speed in either direction. This time displacement is caused by random displacement of the tape as it is moved and guided across the head. Dynamic skew is measured as the jitter band produced by the pulse output of one outside track referenced to the output of the other outside track in the same character frame. Jitter introduced by read/write electronics must be discounted.

TABLE 1-2.
INTERCHANNEL TIME DISPLACEMENT

SPEED INCHES/SEC	DYNAMIC SKEW MICRO SEC	STATIC SKEW MICRO SEC	ITD MICRO SEC
30	15.0	17.0	24.5
37.5	12.0	13.6	19.6
60	7.5	8.5	12.3
75	6.0	6.8	9.8

1-41. TAPE DRIVE PROGRAMMING.

1-42. The transport shall be free of program restrictions within the limits specified below.

DUTY	MODE	MINIMUM TIME BETWEEN COMMANDS
Continuous	Unidirectional	8.5 ms
Continuous	Bidirectional	4.3 ms
Intermittent	Either Mode	2.5 ms

SECTION II
INSTALLATION

2-1. GENERAL.

2-2. CUSTOM INSTALLATION.

2-3. The tape transport, transport electronics assembly, photosense chassis assembly, and manual control panel are designed for mounting in a standard 19-inch rack or cabinet. Read and write amplifiers to be used with the transport must be located within the limits of the head cables as any increase in cable length will tend to reduce the high-frequency response of the heads.

2-4. LOCATION.

CAUTION

The transport must not be located near strong magnetic fields, or in areas of high air temperature.

2-5. The location selected should meet the following environmental conditions:

Ambient Temperature	50 to 90°F
Relative Humidity	40 to 70%
Altitude.	0 to 7,000 feet

When closed, sufficient air must be circulated around the major components to maintain the maximum exhaust air temperature at less than 140°F.

2-6. UNCRATING.

2-7. When no cabinet rack is furnished, the tape transport is packed and shipped in a custom-built case. This case, designed for flat shipment, will provide maximum protection during shipment. The case should not be handled in an upright position.

CAUTION

To prevent damage to the tape transport when removing it from the packing case, grasp or lift the transport only by the tape transport plate.

2-8. The transport electronics assembly, photosensor chassis assembly, and manual control assembly are shipped in the same packing case as the tape transport. When removing these assemblies from the packing case, exercise caution to avoid damage.

2-9. When the tape transport is furnished with an Ampex cabinet rack, the components are shipped mounted in the cabinet rack. Carefully open and unpack the packing case. Check the contents accurately a against the packing slip. Visually check the equipment for damage incurred during shipment.

2-10. MOUNTING THE TAPE TRANSPORT. (See Figure 2-1.)

CAUTION

To prevent damage to the tape transport during custom installation, do not lift by any mechanism other than an eye bolt installed in the casting.

Step 1: Install a 1/4-20 eye bolt in the casting just above the upper reel motor.

Step 2: Using an eye bolt, lift the tape transport up and move it to the cabinet rack.

Step 3: Install tape transport mounting hinge on cabinet rack.

WARNING

The cabinet rack must be securely fastened to the floor before the tape transport can be swung out on its mounting hinge. Otherwise, the cabinet rack and tape transport may tip forward, injuring personnel and damaging the equipment.

Step 4: Slowly swing the tape transport out and in on its mounting hinge. Observe the cables to ensure they are not stretched as the tape transport is swung out, or pinched between the plate and cabinet rack as the tape transport is swung in.

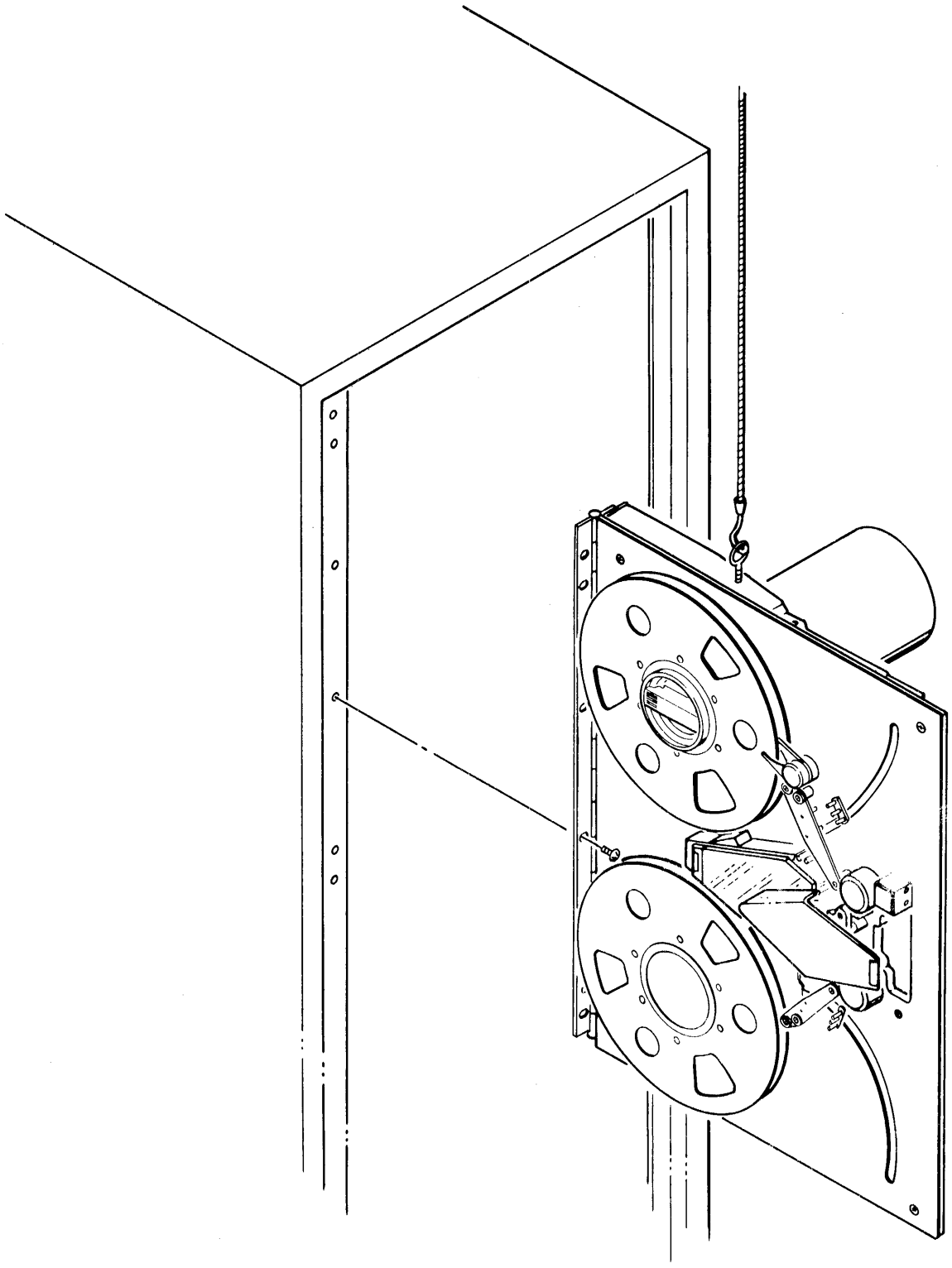


Figure 2-1.
Mounting the Tape Transport

2-11. MOUNTING THE TRANSPORT ELECTRONICS ASSEMBLY. The transport electronics assembly may be mounted in any convenient position. The cables will govern the distance at which the transport electronics assembly may be mounted from the tape transport.

2-12. MOUNTING THE PHOTOSENSOR CHASSIS ASSEMBLY. The photosensor chassis assembly may be mounted in the horizontal or vertical position. The photosensor chassis head cable will govern the distance at which the assembly may be mounted from the tape transport.

2-13. MOUNTING THE MANUAL CONTROL ASSEMBLY. The manual control assembly should be mounted directly above or below the tape transport in a horizontal position. Spacers are supplied as needed to bring the panel flush with the access door.

2-14. TAPE TRANSPORT ASSEMBLY CABLE CONNECTIONS. (See Figure 2-2.)

Step 1: Connect tape transport plug P1 to receptacle J1 on the transport electronics assembly.

Step 2: Connect manual control assembly plug P2 to receptacle on J2 on the transport electronics assembly.

Step 3: Connect P4 on the transport electronics assembly to a 117-vac power source.

2-15. REMOTE CONTROL PLUG CONNECTIONS. Table 2-1 identifies the connections of J3 on the transport electronics assembly. This is the connection that ties the transport to the customer tape-drive command source.

TABLE 2-1.
REMOTE CONTROL PLUG CONNECTIONS

J3 PIN NO.	FUNCTION
A	Failure signal to remote control (see Figures 6-1 and 6-2)
B	Failure signal to remote control (see Figures 6-1 and 6-2)
C	Failure signal to remote control (see Figures 6-1 and 6-2)
D	Write-enable signal to remote control (used in conjunction with pin J)

TABLE 2-1.
REMOTE CONTROL PLUG CONNECTIONS (Continued)

J3 PIN NO.	FUNCTION
E	End-of-takeup-reel sensing signal (B.O.R.)
F	Speed select remote control (Not used on SDS)
G	Failure signal to remote control (see Figures 6-1 and 6-2)
H	End-of-supply-reel sensing signal (E.O.R.)
J	Write-enable signal to remote control (used in conjunction with pin D)
L	Manual input for reverse drive OFF
M	Automatic input for reverse drive ON and OFF
N	Safety relay ground (remote control only)
P	Manual input for reverse drive ON
Q	Manual input for forward drive OFF
R	Automatic input for forward drive ON and OFF
S	Failure signal to remote signal (see Figures 6-1 and 6-2)
T	Remote ground return (must be remotely grounded)
U	Manual input for forward drive ON
V	Ground signal input for automatic fast forward (remote)
W	Ground signal input for automatic fast reverse (remote)
X	Failure signal link from control panel
Y	Lower (forward) servo ground for remote control
Z	Upper (reverse) servo ground for remote control

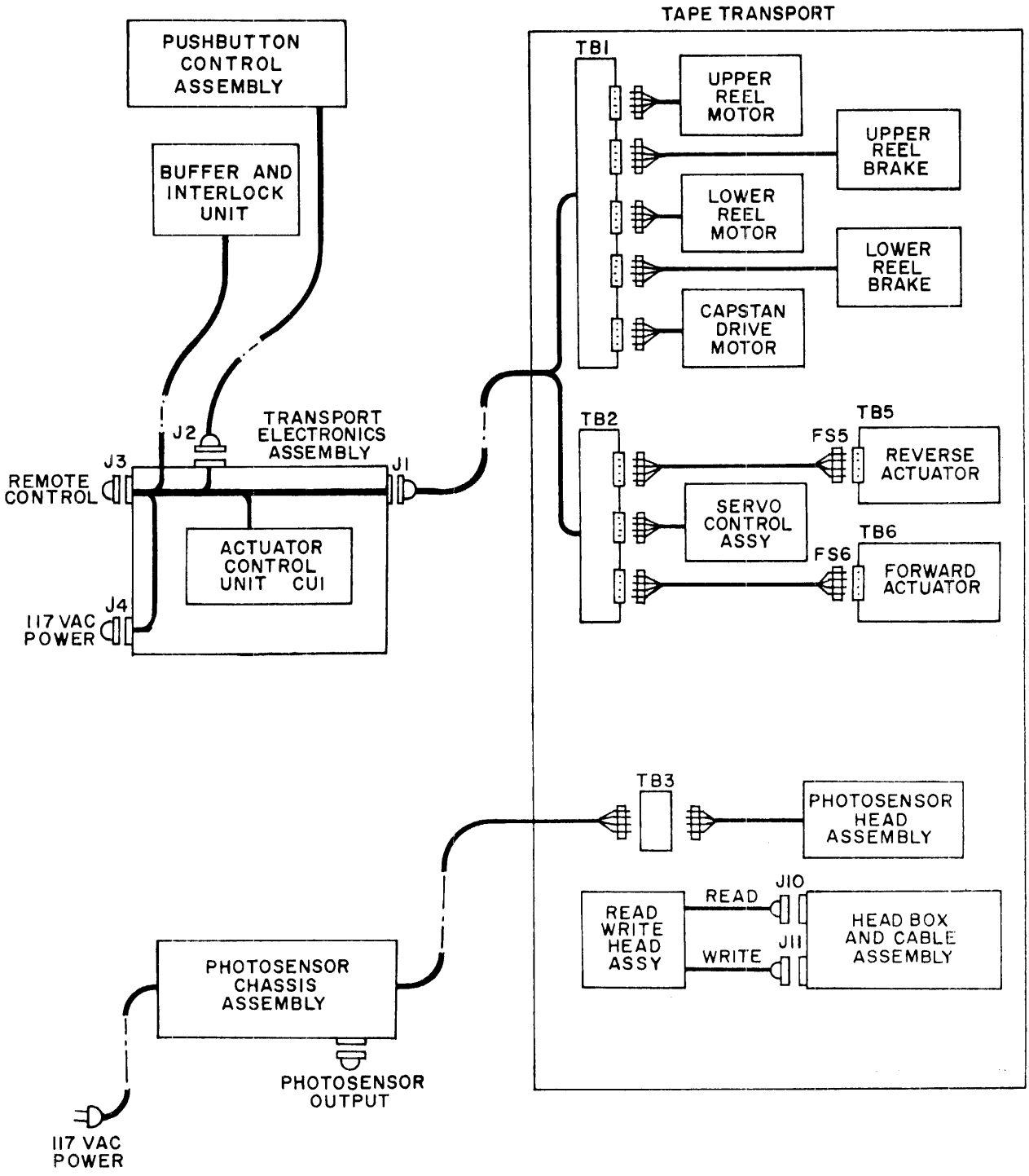


Figure 2-2.
Tape Transport and Transport Electronics Cable Connections

2-16. HEAD CABLE AND BOX ASSEMBLY CONNECTIONS.

NOTE

Channel one is the channel nearest the operator. The head cable and box assembly is mounted on the rear of the tape transport, just below the lower capstan.

Step 1: When a read-head is used, connect the read-head cable plug to the READ receptacle on the head cable and box assembly. (See Figure 2-2.) Head box read cable connections are shown in Table 2-2.

TABLE 2-2.
READ AND WRITE CABLE OUTPUT CONNECTIONS

CHANNEL REFERENCE	FROM CABLE BOX RECEPTACLE CONNECTOR	TO REMOTE SOURCE PLUG CONNECTOR
1	A E	1 4
2	H M	8 13
3	P U	2 5
4	W AA	9 14
5	BB X	3 5
6	V R	10 15
7	N J	7 12
8	F B	11 16

TABLE 2-2.
READ AND WRITE CABLE OUTPUT CONNECTIONS (Continued)

CHANNEL REFERENCE	FROM CABLE BOX RECEPTACLE CONNECTOR	TO REMOTE SOURCE PLUG CONNECTOR
Grd, shields (write cable only)	CC	19
Shields (read cable only)	No connection	19

NOTE: For 7 channel assembly, omit channel 8.

Step 2: When a write head is used, connect the write-head cable plug to the WRITE receptacle on the head cable and box assembly. Head box write cable connections are identical to read-head connections.

2-17. PHOTOSENSOR KIT CABLE CONNECTIONS.

CAUTION

The numbers on the fanning strip must match the numbers on the photosensor head terminal board. Damage to the photocells may result with incorrect fanning strip connection.

Step 1: Connect the photosensor chassis assembly cable with fanning strip to the photosensor head terminal board.

NOTE

The photosensor head terminal board is located near the upper capstan.

Step 2: Connect the three-wire ground-pin type input power plug to a 117-vac, 48- to 62-cps power source.

2-18. Output to the command source is terminated at receptacle J6 on the photosensor chassis assembly. An unwired mating plug is provided for customer use, and may be wired as shown in Table 2-3. Table 2-4 identifies the wire connections from the photosensing head.

TABLE 2-3.
PHOTOSENSOR OUTPUT CONNECTOR

RECEPTACLE J6 PIN NO.	CIRCUIT (Use where applicable)
10	Channel A Relay (N.C.)
9	Channel A Relay (Common)
8	Channel A Relay (N.O.)
7	Channel A Level
6	Channel A Ground
5	Channel B Relay (N.C.)
4	Channel B Relay (Common)
3	Channel B Relay (N.O.)
2	Channel B Level
1	Channel B Ground

TABLE 2-4.
PHOTOSENSING HEAD ASSEMBLY CONNECTIONS

COMPONENT	COLOR CODE	TERMINAL
Photocell	Red	2
Channel "A"	Blue	1
Photocell	White	4
Channel "B"	Green	3
Lamp	Black	5
Lamp	Black	6

2-19. INITIAL CHECKOUT.

2-20. When the installation procedures described above have been completed and a visual check made of the transport, the initial checkout may be undertaken.

2-21. Thread a reel of tape on the transport as described in Paragraph 3-3, Tape Threading Procedure. Apply power to the equipment and see that the vacuum unit motor is operating, forming a tape loop in the two pockets of the vacuum chamber, and that the capstans are turning and driving the rubber capstan rollers. Check that the tape tension arms are near the mid-point of their arcs, approximating a proper servo null point.

2-22. Grasp the upper reel and rotate it slowly clockwise. The reel motor should oppose this action after the reel has rotated slightly. Check the upper reel in the counterclockwise direction and the lower reel in both clockwise and counterclockwise directions.

2-23. Open the thread lever handle. As the handle moves, the vacuum unit motor should stop, the capstan drive motor (and thus the capstans) should stop, the reel motors should be rendered inoperative, and the reel brakes applied. When the thread lever handle has been moved to the open position, a latch engages to hold it open. At this point, the reel brakes should release to permit free rotation of the upper and lower reels. Release the thread lever handle by pulling toward the left until the latch operates, then close the thread lever handle. When the thread lever handle is closed, the vacuum unit motor and capstan drive motors should operate and the tension arms should return to their respective null positions.

2-24. Disconnect power from the equipment and remove the tape from the capstans; insert a 0.009-inch feeler gage between the upper capstan and upper capstan roller. Slight resistance to the feeler gage should be encountered. If the capstan roller gap is badly out of adjustment, refer to the Maintenance Section of this technical manual for the adjustment procedure, Paragraph 5-24. Repeat the process for the lower capstan roller gap.

2-25. Operate the tape transport from the control source. Observe the tape as it emerges from the capstan and capstan rollers to the head guides for any signs of rippling or curling of the edges of the tape. Similarly, examine the tape as it passes between the capstans and the vacuum chambers. If rippling or curling of the tape occurs, repeat the procedures in Paragraph 5-23. If the capstan roller gap adjustment does not correct rippling or curling of the tape, refer to the Maintenance Section of this manual, Paragraph 5-44.

SECTION III
OPERATION

3-1. GENERAL.

3-2. This section lists controls, indicators, and fuses. Controls and interlocks are explained and tape threading instructions given for the tape transport.

3-3. CONTROLS AND INDICATORS.

3-4. MANUAL CONTROL PANEL.

3-5. All operator controls and indicators are on the manual control panel shown in Figure 3-1. If the Ampex control panel is not supplied, equivalent controls should be provided for local control during tape changes and maintenance.

3-6. POWER SWITCH. A push on, push off type switch controlling power to the transport. When switched ON a SPEED indicator glows.

3-7. MODE SWITCH. A three-position (AUTO, MANUAL READ, MANUAL WRITE) rotary switch controlling the operating mode of the transport. In the AUTO position, only remote commands to the transport are accepted. In the MANUAL positions tape movement can be controlled only by the control pushbuttons on the panel. Internal connections can be wired to give control voltages to external write amplifier circuits when this switch is in the MANUAL WRITE position.

3-8. FORWARD DRIVE SWITCH. A momentary ON pushbutton switch that starts the tape moving in the forward direction over the read/write head at nominal speed. This switch is disabled by the time delay and safety interlocks.

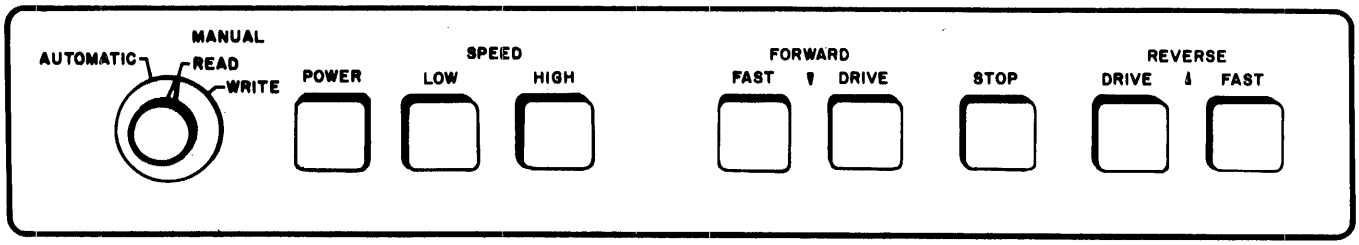


Figure 3-1.
Manual Control Panel

3-9. **REVERSE DRIVE SWITCH.** A momentary ON pushbutton switch that starts the tape moving in the reverse direction over the read/write head at nominal speed. This switch is disabled by the time delay and safety interlocks.

3-10. **FAST FORWARD SWITCH.** A momentary ON pushbutton switch that starts the tape moving in the forward direction at twice the nominal speed. This switch is disabled by the time delay and safety interlocks.

3-11. **FAST REVERSE SWITCH.** A momentary ON pushbutton switch that starts the tape moving in the reverse direction over the read/write head at twice the nominal speed. This switch is disabled by the time delay and safety interlocks.

3-12. **STOP SWITCH.** A momentary OFF pushbutton switch that stops the tape. This switch must be pressed before a change in tape direction can be made.

3-13. **LOW SPEED SWITCH AND INDICATOR.** A momentary ON pushbutton switch places the transport in the low speed condition. A lamp indicates this selection.

3-14. **HIGH SPEED SWITCH AND INDICATOR.** A momentary ON pushbutton switch places the transport in the high speed condition. A lamp indicates this selection.

3-15. **FUSES.**

3-16. With the exception of the photosense fuse on the photosense chassis, all fuses are located on the transport electronic chassis. The circuits protected by the fuses are as follows:

CIRCUIT	RATING	FUSE
AC power input	10 amp	F1, F2
Power supply input	5 amp	F3
Actuator power supply	1/2 amp	F4
Photosense AC power	1/4 amp (SB)	F1

3-17. **INTERLOCKS.**

3-18. **TIME DELAY.** A time delay interlock in the power supply circuit prevents acceptance of tape motion commands for approximately one minute after the power to the transport is first switched on. During this time, the capstan motor is able to reach operating speed, the vacuum system is able to reach operating pressure, and thyratron filaments are able to reach operating temperature.

3-19. **AUTO-MANUAL INTERLOCK.** An interlock circuit in the manual control panel prevents acceptance of remote commands when the mode switch is in the **MANUAL** position and manual commands when it is in the **AUTO** position.

3-20. **TAPE THREADING LEVER.** When the tape threading lever cover is opened to allow access to the tape drive area, the transport is disabled but the reel brakes are released.

3-21. **TENSION ARM LIMITS.** If a tape tension arm reaches the maximum outside limit due to a failure in the tape supply system or other reason, the transport will be disabled and the reel brakes applied. When the condition is corrected, the transport will not restart but will require a start command to resume operation.

3-22. **BEGIN AND END OF TAPE SENSING.** When metal faced leaders are used on a machine equipped with a manual control panel, contact of the leader with a sensing post while in manual operation will stop the tape. A start command is then needed to resume operation. In automatic mode, or if a manual control panel is not used, sensing post signals are available at the remote connector for external use.

3-23. THREADING THE TAPE. (See Figure 3-2.)

3-24. Use Ampex Part No. 087-007 head cleaner and a cotton swab to clean the head and the tape guides before starting to thread the tape. As the tape reel brakes must be released while the tape is being threaded, power to the transport must be switched ON during the following steps.

Step 1: Pull open the thread lever handle to its latched position. This will automatically position the tension arms for tape threading.

Step 2: (NAB Compatible Reel Retainer) Slip the supply reel over the reel retainer. Hold the reel firmly against the turntable surface and rotate the reel retainer handle approximately 120° clockwise, at which point the reel retainer handle will lock into position. Check to see that the reel is snugly mounted on the retainer.

(IBM Compatible Reel Retainer) Slip the supply reel over the reel retainer. Hold the reel firmly against the turntable surface and turn the retainer knob clockwise to the mechanical stop.

Step 3: Unwind 6 to 8 feet of tape leader from the supply reel. (The supply reel should have approximately 15 feet of metallized leader spliced to each end of the tape.)

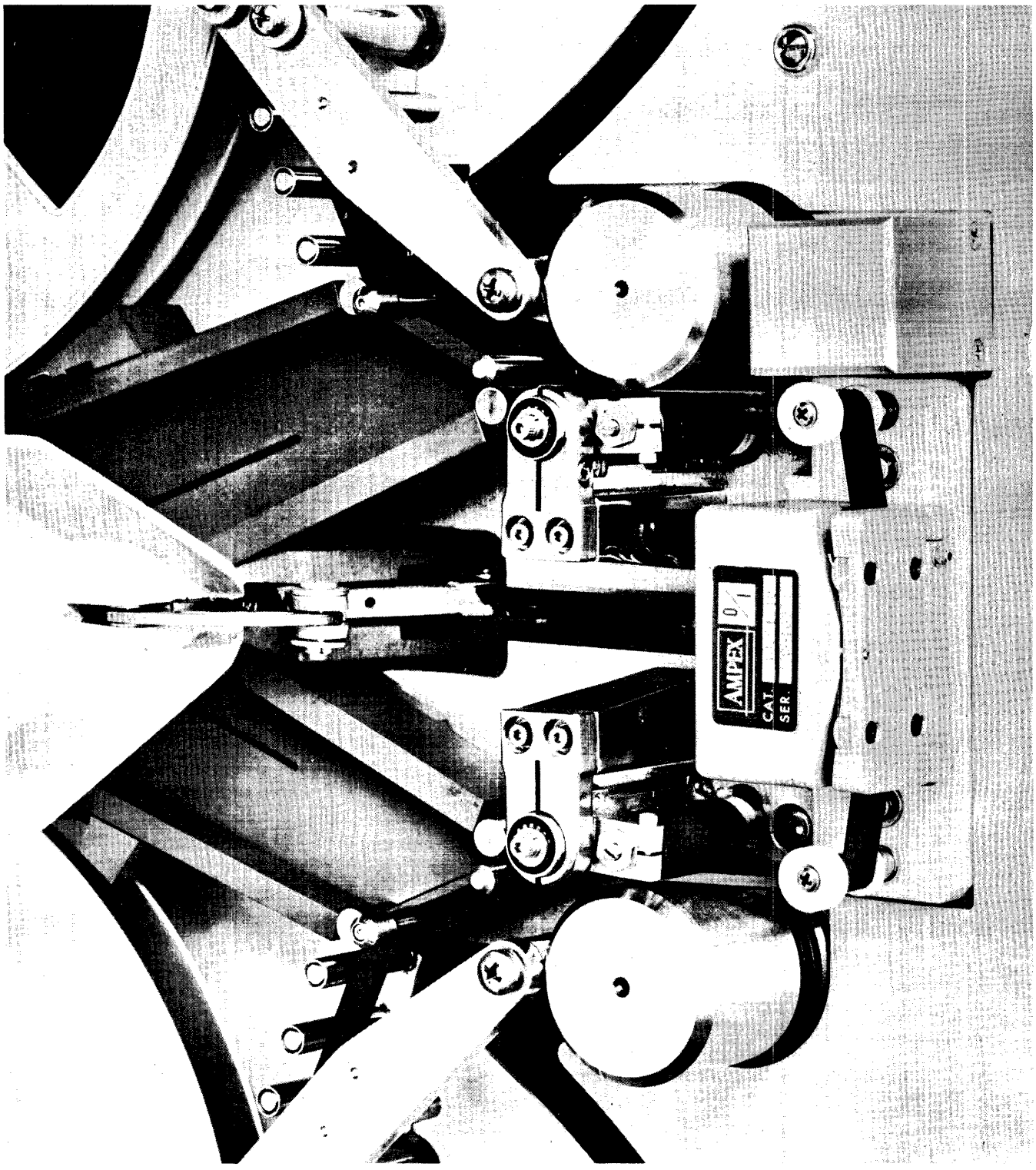


Figure 3-2.
Tape Path

Step 4: Starting where the tape leaves the supply reel, place the tape under the sense post guide assembly.

Step 5: Place the tape across the tension arm rollers.

Step 6: Thread the tape between the pin guides and the glass cover door on the upper half of the vacuum chamber. Push the tape back against the chamber base.

Step 7: Insert the tape between the upper capstan and capstan roller.

Step 8: Holding the head assembly gate open, place the tape across the head assembly tape guides and head.

Step 9: Insert the tape between the lower capstan and capstan roller.

Step 10: Thread the tape in the lower vacuum chamber and across the lower tension arm rollers similar to the path through the upper chamber.

Step 11: Place the tape over the lower sense post guide and attach to the lower reel by holding the tape to the hub of the reel and rotating the reel clockwise about eight turns.

CAUTION

In the next step, the tension arms will automatically move to an operating position.

Step 12: Open the thread lever cover past its latched position to release the latch and allow the cover to close. The transport is now ready for operation in the forward direction.

3-25. PHOTOSENSE TABS.

3-26. The two-channel photosense unit gives an output to remote equipment when reflective tabs on the tape are sensed. Placement of reflective tabs in two channels on the tape is shown in Figure 3-3.

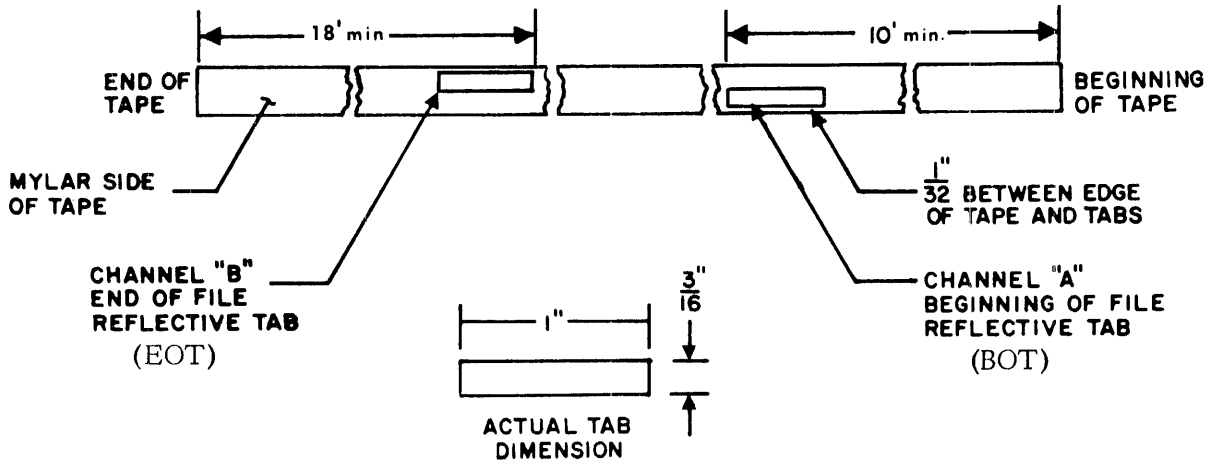


Figure 3-3.
Placement of Photosense Tabs on the Tape

SECTION IV
THEORY OF OPERATION

4-1. INTRODUCTION.

4-2. DESCRIPTION.

4-3. The tape transport in its minimum form consists of two assemblies, a tape transport assembly and a transport electronics assembly. The transport provides the means of moving tape over the head assembly, for reading and writing while the electronics contains the circuitry needed to control the transport.

4-4. Provision is made in the transport electronics assembly for connection to external control circuitry. Lines for tape movement command inputs and status indication outputs are available.

4-5. Once the tape has been threaded on the machine and the electronics properly connected to the command source, the tape transport is ready for use.

4-6. A simplified block diagram of the tape transport is shown in Figure 4-1. Program signals from a command source to the forward or reverse control circuits in the transport electronics assembly, pulse one of two actuators associated with two contrarotating capstans. After receiving the pulse signal, the actuator moves to the ON position, clamping the tape between capstan and capstan pinch roller. The tape is then driven, its direction determined by the driving capstan, until the actuator is pulsed off, disengaging the tape and allowing it to stop.

4-7. The tape supply to the capstans is taken from a small vacuum chamber which is in turn fed from loops of tape supported by spring loaded tension arms. These vacuum chambers maintain correct tape tension across the read/write head and damp rapid changes in tape command that would otherwise cause tension arm oscillation. A useful amount of tape is maintained in the tension arm loops by the servo systems driving the supply and take-up reels.

4-8. TAPE DRIVE SYSTEM.

4-9. The tape drive system consists of a capstan drive motor, capstans, capstan pinch rollers, pinch roller actuators, and the circuitry required to select the motor speed and control the actuators.

4-10. CAPSTANS.

4-11 Two contrarotating capstans are belt driven from a two-speed hysteresis synchronous motor. With power applied to the motor, each capstan continuously drives its associated capstan roller through a rubber quad ring; thus, the capstans and the capstan pinch rollers are turning together but in opposite directions. Switching the motor supply from the low to the high speed windings increases the capstan speed.

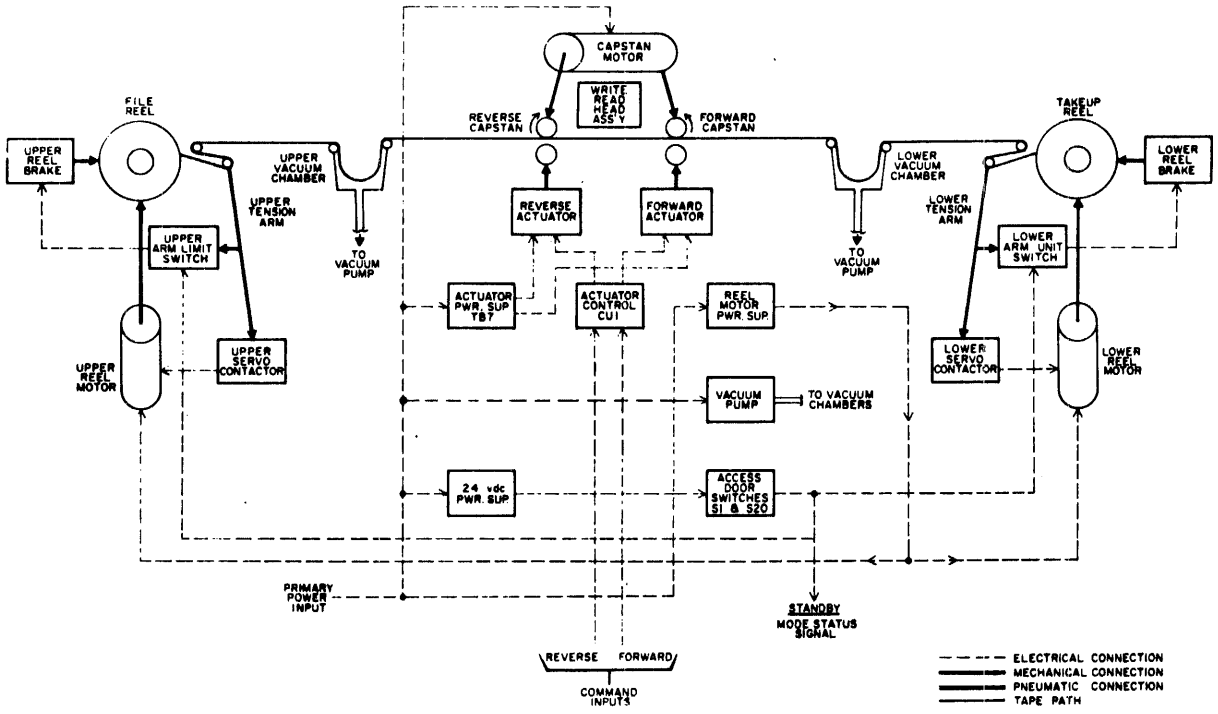


Figure 4-1.
Tape Transport and Transport Electronics, Block Diagram

4-12. CAPSTAN MOTOR CIRCUIT. (See Figure 4-2.)

4-13. In this simplified schematic, the AC supply to the motor is shown disconnected by safety relay K1. When the power is switched on to the transport, relay K1 (Figure 6-2A) closes and supplies power to the capstan motor. In the event of a system failure, K1 deenergizes, removing power from the motor. The speed control relay K2 (Figure 6-3) located in the pushbutton control panel, is used to switch the motor power from the low to the high speed winding. When no pushbutton control panel is supplied, the speed control relay is located on the capstan motor assembly.

4-14. Motor speed is determined by the input power frequency, the high speed is always twice the rate of the low speed. The capstan speed is reduced from the motor speed by the belt drive, and the several speed options available are provided by selection of pulley ratios.

4-15. ACTUATORS.

4-16. While the tape speed is determined solely by the capstan speed, tape movement is controlled by the actuator assemblies which move the capstan pinch rollers to engage the tape. There are two actuator assemblies, one for each capstan roller, mounted on the back of the transport plate, each with a shaft extending through the plate to the front of the transport. A yoke assembly carrying the capstan pinch roller is mounted to the actuator shaft.

4-17. Each actuator is a bi-stable electro mechanical device, the two states (ON and OFF) being different positions of rotation of the actuator shaft. There are two coils in each actuator, which, when pulsed by the control circuit thyratrons, change the actuator state. Current in one coil switches the actuator to the ON state and current in the other coil switches the actuator to the OFF state.

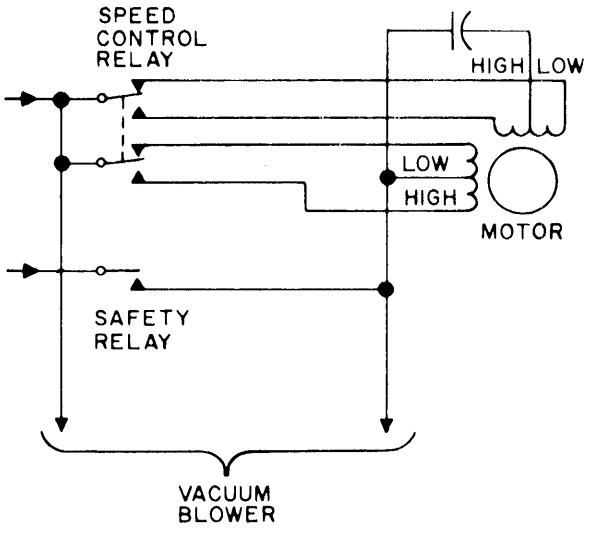


Figure 4-2.
Capstan Motor Circuit

4-18. ACTUATOR CONTROL.

4-19. The actuator control unit (block diagram, Figure 4-3 and schematic, Figure 6-2) contains four thyratrons, V12 to V15, two pulse transformers, T8 and T9, and associated circuitry mounted on a printed circuit board (CU1). Each actuator has one end of its pair of transformers connected to a common supply point and the other end of each transformer connected to the anode of the control thyratron through a noise suppressing inductor. As forward and reverse actuator circuits are alike, only the forward actuator is described.

4-20. Input power of approximately 500 VDC, unloaded, is supplied through the actuator transformers from capacitor C4 in the power supply section of the transport electronics to the anodes of thyratrons of V12 and V13. The thyratrons are biased off by a negative voltage applied to their grids via center tap of the grid input transformer. This negative supply is obtained by rectifying 26 VAC from the power supply transformer T1 by diode CR9 and filtering in R42, C16 and C29. Zener diode CR28 provides shunt regulation.

4-21. To shift the forward actuator from OFF to ON, a positive-going voltage level change of sufficient amplitude to drive the grid of V12 more positive than -2 volts must be provided from the command source. The voltage may be applied to the grid of V12 from a remote command via the grid transformer through R33. The command source may be either a manual input applied to R33, C17, and R29 in combination with R34 and R29. (See Figure 6-2.)

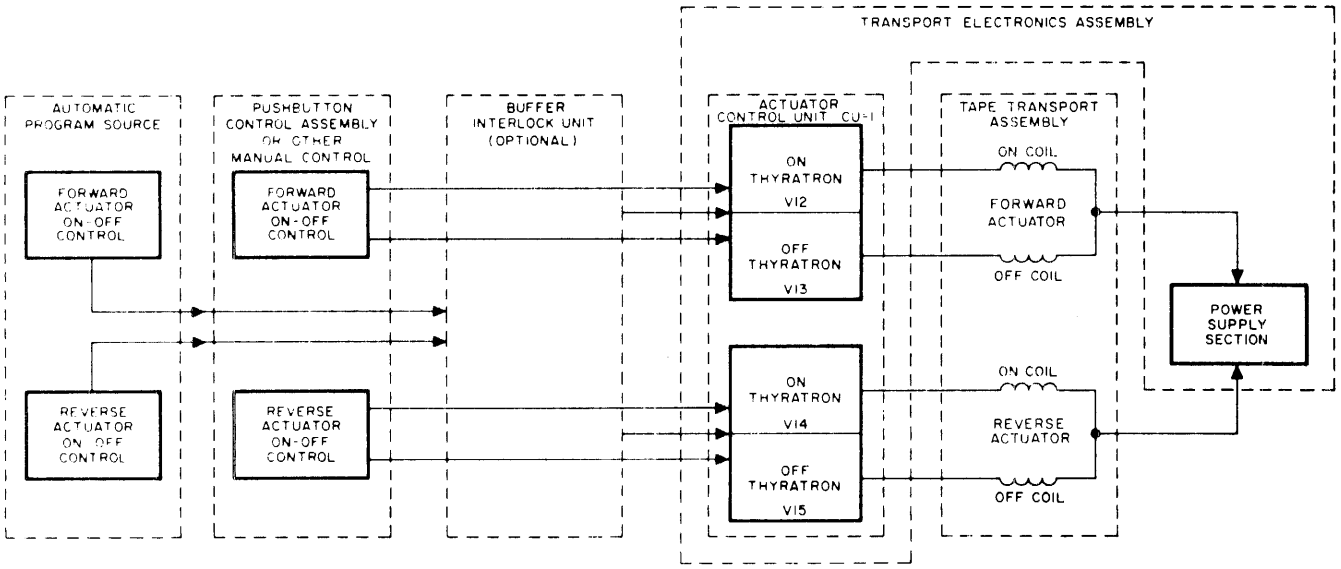


Figure 4-3.
Actuator Control System, Block Diagram

4-22. When the grid voltage of V12 is brought from its negative bias level to a less negative voltage (approximately -3 volts nominal), V12 fires discharging C14 through the ON winding of the actuator. This current through the actuator coil is sufficient to magnetize the actuator vane with a polarity such that it seeks the ON position as a stable state.

4-23. One characteristic of a thyratron is that once ionized, conduction will continue until the thyratron anode voltage shifts negative with respect to the cathode. The actuator thyratrons are deionized by the negative voltage generated by the collapsing magnetic field within the actuator coil after C4 is discharged.

4-24. Figure 4-4 shows the voltage waveform as a function of time for the anode of V12 when an ON command is given at T_o. The voltage on the anode is initially the same as the voltage on C4. When ionization takes place, the voltage on the anode drops to near 0 potential. Its slight positive potential is due to the voltage drop across V12 which, when ionized, is approximately 8 volts. At approximately 750 microseconds, V12 deionizes and the potential of V12 shifts to approximately -150 volts. This is the same as the potential of C4 since there is 0 current flowing in the circuit and there is 0 voltage drop across the actuator coil.

4-25. Figure 4-5 shows the potential on C4 as a function of time when an ON command is given at T_o. Note that the capacitor discharges from its initial voltage of approximately +500 volts and charges to approximately -150 volts.

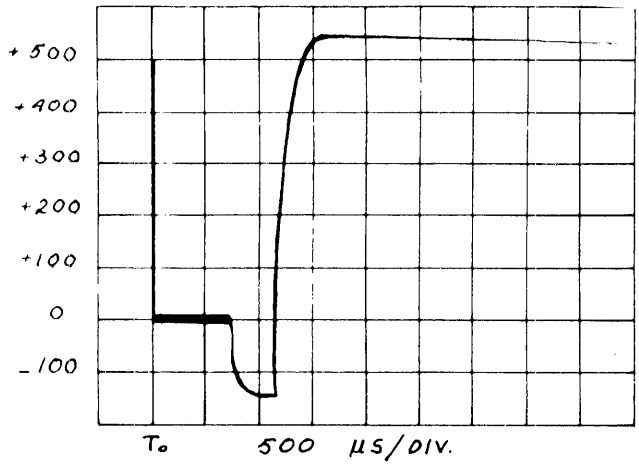


Figure 4-4.
Voltage Waveform,
Anode of V12

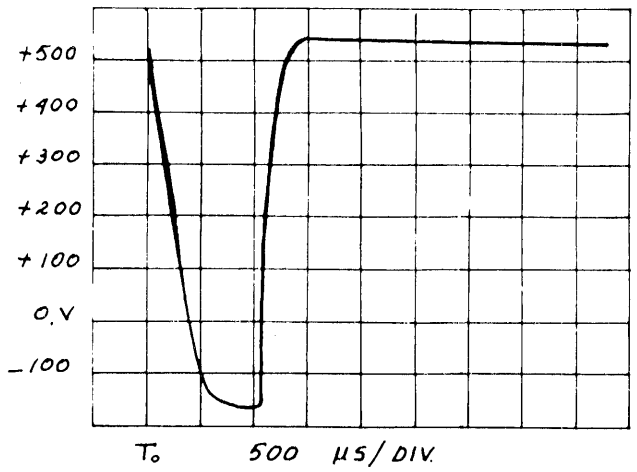


Figure 4-5.
Voltage Waveform,
Discharge and Charge of C4

4-26. When V12 ionizes, current starts to flow in the circuit, causing C4 to discharge. As C4 discharges, the current in the actuator coil increases to its peak value of approximately 3 amps (Figure 4-6) and then starts to decrease. At approximately 400 microseconds C4 has discharged to 0 volts; however, there is a current of approximately 3 amps flowing through the actuator coil storing energy in its magnetic field. The collapsing magnetic field keeps current flowing in the circuit, charging C4 to its final negative potential.

4-27. When the actuator coil magnetic field has collapsed, the current in the circuit will be 0 and will try to reverse its direction to discharge the now negatively charged C4; however, V12 will be cut off when the current goes to 0 and C4 will remain charged with the -150 volts. At approximately 1.2 milliseconds V1 fires, recharging C4 to its initial value of approximately +500 volts.

4-28. ACTUATOR POWER SUPPLY. (See Figure 6-2, Transport Electronics Schematic.)

4-29. Upon completion of time delay K11, 400V rms is supplied to the high voltage bridge rectifier circuit (CR1 through CR8) by the closing of K14C. The bridge rectified output is then fed to the input filter circuit (C8, C9) through K9 coil and parallel resistor R1 and through normally closed contacts of K9. Initially, C4 and C5 (actuator supply capacitors) are charged through L3, R5, R8 and R9 respectively. The time constant of this initial charging to usable level is less than one second. After this initial delay, manual or remote commands will be accepted.

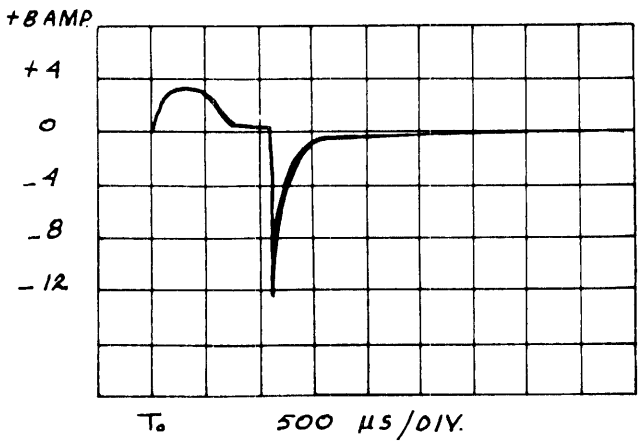


Figure 4-6.
Current Waveform,
Discharge and Charge of C4

4-30. Thyratron V1 functions as a time-delay electronic switch isolating the power supply section from C4 until V12 has deionized. It then connects the power supply section to charge C4 or C5 depending on whether the forward actuator or the reverse actuator has been pulsed.

4-31. Figure 4-7 illustrates the cathode and grid voltage waveforms of V1 during one cycle of operation. At T_o, V12 fires to shift the forward actuator ON. The cathode voltage of V1 follows the exponential curve of C4. The grid of V1 follows the cathode due to capacitor C3. However, C3 discharges through R4 allowing the grid of V1 to rise toward the cathode potential. At approximately 1.2 milliseconds after T_o, the grid-to-cathode potential is so low that it can no longer hold V1 cut off and V1 fires.

4-32. V1 acts as a short circuit allowing C8 and C9 to charge C4 and C5 in approximately 300 microseconds through choke L4 and through limiting resistors R7 and R8. Due to the grid current and the effect of C3, the grid assumes a potential somewhere between that of the cathode and anode during conduction. The magnetic field around L4, produced by the current when C4 and C5 are charging, collapses and provides sufficient energy to C4 so that when the current in the circuit goes to 0, the voltage on C4 is sufficient to back bias V1 and cut it off. Since the grid was above the cathode potential at the time of cutoff, this positive grid potential will leak off to ground through R4. Reference to Figure 4-7 shows that the grid is at nearly ground potential after a total elapsed time of 4.0 milliseconds from T_o.

4-33. The reverse actuator is controlled in the same manner as the forward actuator except that capacitor C5 supplies the direct actuator power instead of C4.

4-34. ACTUATOR COMMAND. (See Figures 6-1 and 6-2.)

4-35. REMOTE COMMANDS. Remote commands are applied either to the buffer/interlock unit or to the jumper card. The optional buffer/interlock unit stabilizes the voltage level, rise and fall times of the command signals to the actuator control unit and prevents acceptance of an ON command to an actuator if the other actuator is on. The output signal from the buffer/interlock unit or the signal coming through the jumper card is applied to the actuator control unit through current

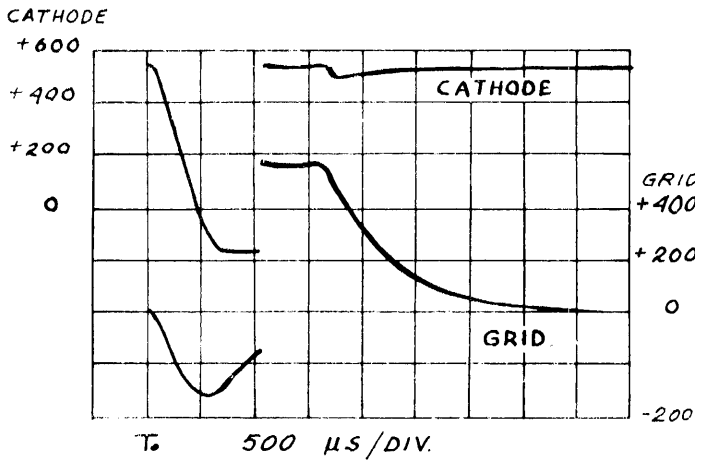


Figure 4-7.
Voltage Waveforms,
Cathode and Grid of V1

limiting resistor R45 and parallel network C30 and R43 to the primary of pulse transformer T8. The combination RC series-parallel network and the pulse transformer shapes the input signal at terminal 1 of T8 to a narrow pulse. The signal voltage pulse is stepped up in T8 by a ratio of 1 to 2 and applied to the grids of V12 and V13. An ON signal causes a positive pulse to the grid of V12, causing V12 to conduct and shift the actuator to the ON position. At the same time, a negative pulse is applied to the grid of V13 adding to the fixed DC bias and driving the grid more negative. If the input is an OFF command, the input level will shift negative, applying a positive pulse to the grid of V13 and causing it to conduct, and a negative pulse to the grid of V12 driving it more negative.

4-36. MANUAL COMMANDS. Manual commands from the Ampex pushbutton control panel (Figure 6-3) or through the remote connector are positive-going step levels applied to the thyratron grids through a differentiating network. The thyratron grid input transformers are not used, and both ON and OFF commands are positive-going levels of approximately 14 volts.

4-37. Using a forward ON command as an example, a positive-going 14 volt level change is applied to the junction of C14A and C17. The resulting positive-going pulse developed across R34 drives the grid of V12 more positive than the tube cutoff point and the tube fires switching the forward actuator to its ON state. Capacitor C14A provides a time delay and prevents short noise pulses from being accepted as commands. R33 across C17 provides a discharge path for the capacitors after the command pulse is completed. The actuator power supply operates in the manner described for remote commands.

4-38. BUFFER/INTERLOCK UNITS (OPTIONAL).

4-39. LOCATION. The buffer/interlock circuit is mounted on a printed circuit board plugged into printed circuit connector J10 on the transport electronics chassis. On transports shipped without the buffer/interlock circuit card, a jumper card must be inserted into connector J10 to provide continuity for the control commands.

4-40. OPERATION. The block diagram (Figure 4-8) shows the logic elements used in the buffer/interlock. Forward and reverse command inputs are shown applied to a pair of AND gates which provide interlocking to prevent simultaneous forward and reverse commands. The output from each AND gate operates a trigger circuit which in turn,

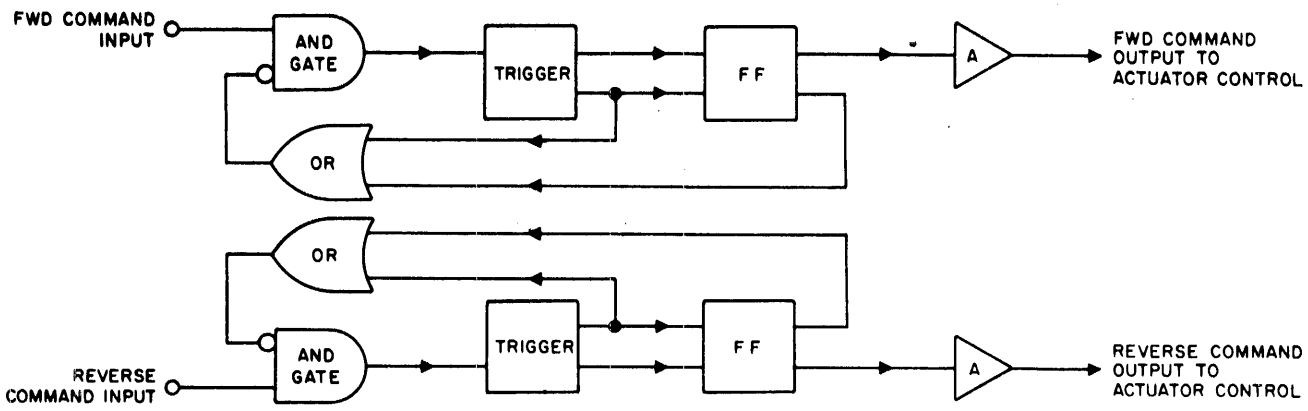


Figure 4-8.
Buffer/Interlock, Block Diagram

drives a flip-flop to give a fast rising output when a command of a change signal is received. Each flip-flop has two outputs. One is used with an input AND gate for interlocking and the other, after amplification, is applied to the actuator control unit.

4-41. CIRCUIT. The buffer/interlock circuit shown in Figure 6-4 is simplified in Figure 4-9 where only the forward command circuit is shown and all components are referenced to the block diagram elements. In the normal (no command) state, the circuit input terminal is at 0 volts and the output amplifier transistor (Q3) is conducting and holding the output terminal close to 0 volts. In the trigger circuit, Q1 is cut off and Q2 is conducting. In the four transistor flip-flop circuits, Q4 and Q6 are cut off and Q5 and Q7 are conducting. The input AND gate transistor (Q8) is cut off. When a positive-going forward command is applied to the input terminal, the trigger circuit changes its state and this in turn changes the state of the flip-flop. Q3 is now cut off and the output terminal is held close to the +20 volts supply. The output of the reverse commands interlock AND gate, normally held close to 0 volts, goes positive when the forward command changes the state of the circuit. A similar positive voltage from the reverse circuit when a reverse command changes its state will saturate Q8 and inhibit any forward commands during the reverse operation.

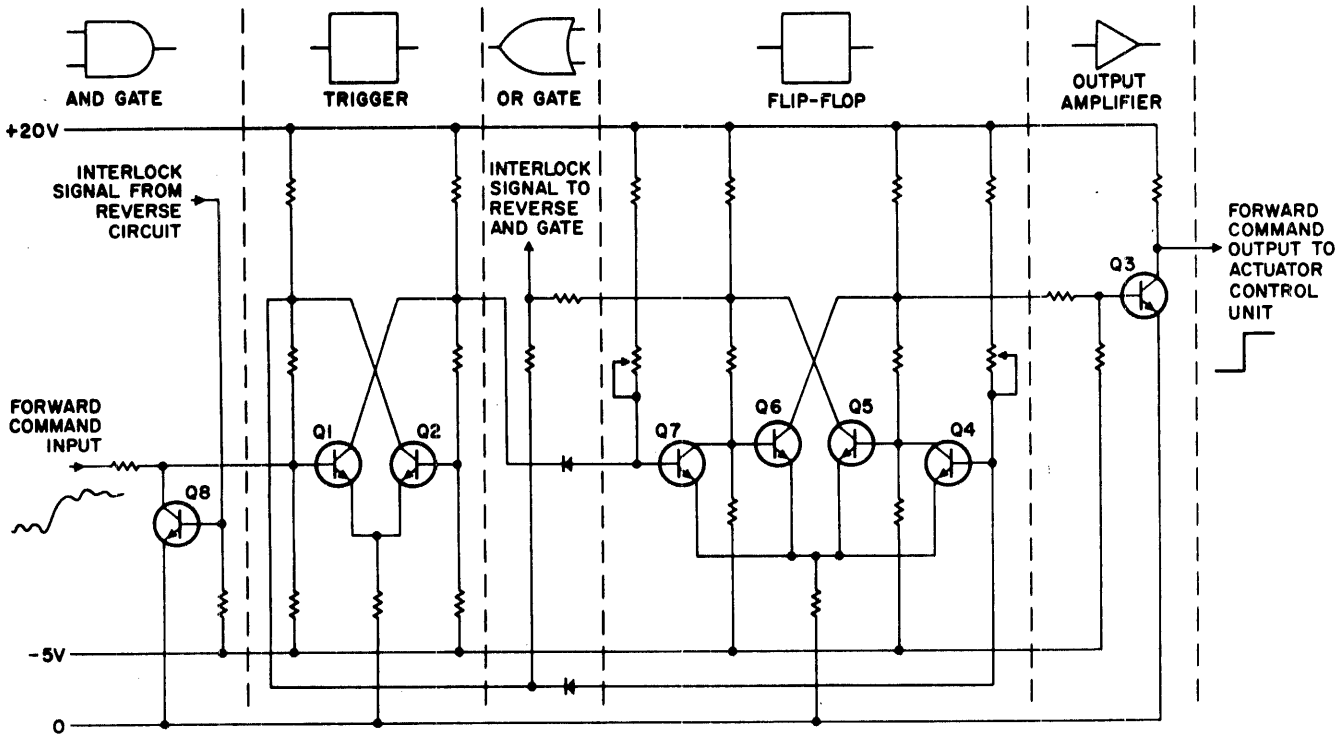


Figure 4-9.
Forward Command Buffer/Interlock Circuit

4-42. Forward and reverse buffer/interlock outputs assume a normal (0 volt) output condition when the command input lines are disconnected or in the event of a power supply failure. Power supply circuit (TB12) mounted in the transport electronics chassis provides the +20 volt DC and the -5 volt DC required by the buffer/interlock circuit.

4-43. MANUAL CONTROL PANEL. (See Figure 6-3.)

4-44. The manual control panel provides local power control, command source selection (manual or automatic), and tape motion control. The control circuitry is interlocked to prevent acceptance of manual commands when automatic control is selected and of remote commands when manual control is selected. Further interlocking makes it impossible to give a second manual tape motion command without first stopping the tape.

4-45. The manual control panel is interlocked to prevent commands being given that do not conform with the program limitations. For example: it is not possible to give forward and reverse drive commands simultaneously or in sequence without going through a stop command.

4-46. POWER CONTROL. Input power to the transport is controlled by a pushbutton switch (S6) on the manual control panel.

4-47. AUTOMATIC CONTROL. When the mode switch (S13) is set to the AUTOMATIC position, relay K8 is energized by -24 volts from the power supply section of the tape transport electronics. Relay contact K8C opens the ground circuit to the switches used for manual tape motion control. Contacts K8B and K8D disconnect the disabling ground from the primaries of transformers T8 and T9 in the actuator control unit (CU1) and allow remote commands to be accepted. Contact K8A disconnects the voltage source used for manual commands to the actuator control unit. Contact K8E connects pin X to pin C of connector J3 for use by the customer in his external circuitry.

4-48. MANUAL CONTROL. When mode switch S13 is set to one of the manual positions, relay K8 is deenergized. Contact K8C now completes the -24 volt circuit to the pushbutton switches that are used to manually control tape motion. The -24 volt supply is routed via a normally closed stop pushbutton switch (S11) to the windings of relays K6, K3, K4, and K5. The circuit is completed through a normally open pushbutton switch in series with each relay winding and relay contacts K8C and K7A to ground.

4-49. When the FORWARD DRIVE pushbutton (S10) is pressed, the -24 volt circuit to relay K4 is completed. The relay contacts operate and contact K4B provides a hold circuit to hold the relay operated after the pushbutton is released. K4C opens the circuit to relay K5 to interlock against a possible reverse command while the transport is driving tape in the forward direction. Contact K4A connects +14 volts divided from the 500 volt supply by resistors R2, R6, and R13 to the forward ON actuator control unit input via connector J2.

4-50. When the STOP pushbutton (S11) is pressed, the -24 volt circuit to relay K4 winding is opened and the relay contacts reset. Contact K4A now applies +14 volts to the forward OFF input of the actuator control unit. K4C closes to enable the circuit to relay K5 winding and allows a reverse command to be made if needed.

4-51. Operation of the REVERSE DRIVE pushbutton (S12) is similar to the operation described for the FORWARD DRIVE pushbutton. In this case, relay K5 closes and the +14 volts is supplied to the reverse ON input of the actuator control unit and relay K4 is disabled to prevent a possible forward command being made while the transport is driving tape in the reverse direction.

4-52. When the FAST FORWARD pushbutton (S8) is pressed, the -24 volt circuit to relay K6 winding is completed and the relay contacts close. Contact K6A closes a holding circuit to keep the relay energized after the pushbutton is released. Contact K6C closes the relay K4 winding circuit and K4 then operates in the same manner as described in paragraph 4-49. Contact K6B closes the -24 volt circuit to relay K2 coil, operating the relay and transferring the capstan motor supply from the low speed windings to the high speed windings via contacts K2B and K2C. The transport now drives the tape at high speed in the forward direction.

4-53. When the FAST REVERSE pushbutton (S9) is pressed, relay K3 is energized operating K5 relay via contact K3C and K2 relay via contact K3B. K2 switches the capstan motor to high speed and K5 operates as described in paragraph 4-51. The transport now drives the tape in the reverse direction at high speed.

4-54. TAPE SUPPLY SYSTEM. (See Figure 4-10.)

4-55. The upper reel tape supply system consists of a supply reel motor assembly, a tension arm assembly, a vacuum chamber and a servo control assembly. The lower reel take-up system is identical and the following description applies to both systems.

4-56. SYSTEM OPERATION.

4-57. The reel brake assembly has a loading spring which applies the reel brakes whenever the brake solenoid is not energized. When the solenoid is energized, the brake shoe is pulled away from the turntable allowing the reel to turn freely. The solenoids are energized when the tape transport is in the operating mode, or when the thread lever handle is opened, actuating the brake release switch (S20). (See Figure 4-11.) This switch permits rotation of the supply and take-up reels for tape threading. The reel brakes are automatically applied by the loading spring whenever power failure or tape breakage occurs.

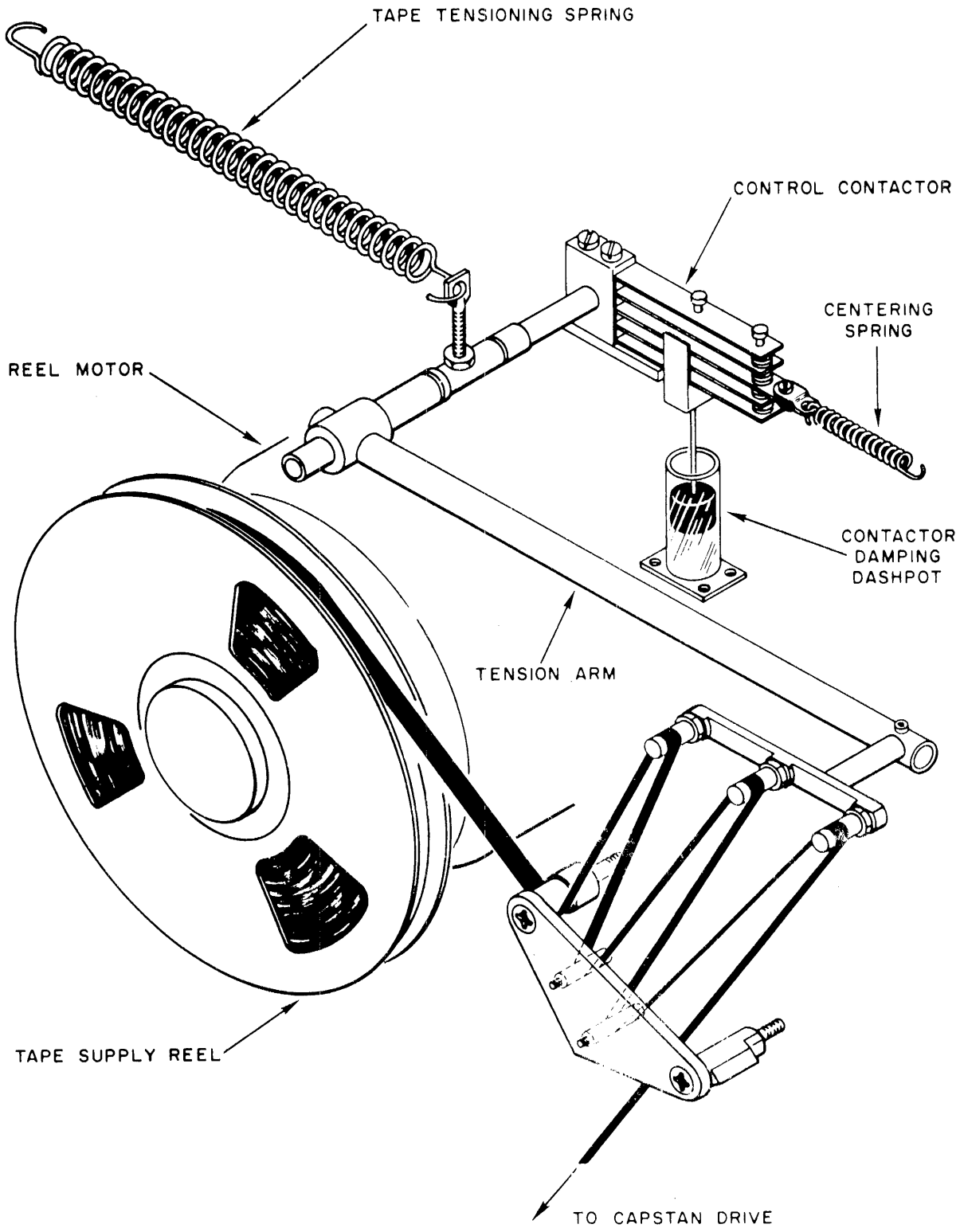


Figure 4-10.
Tape Supply System

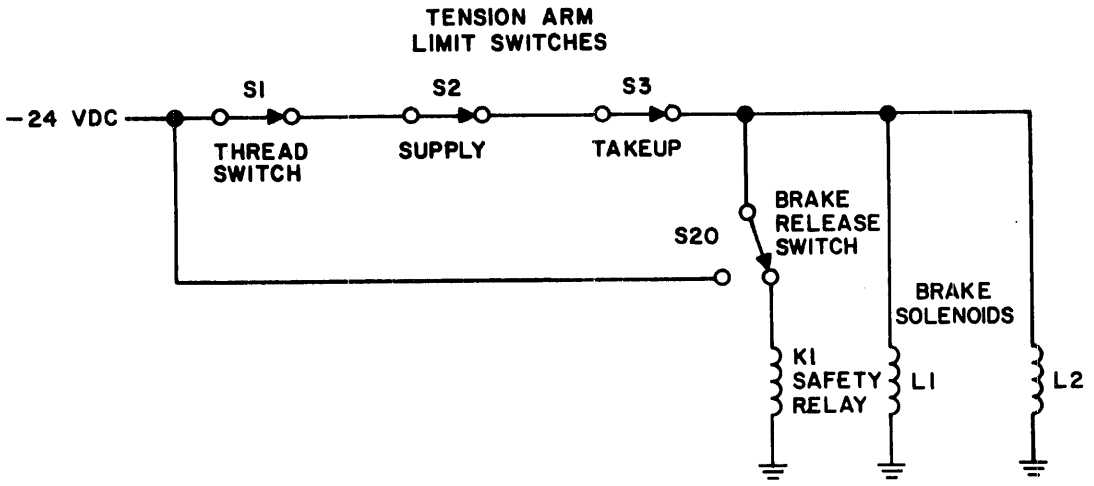


Figure 4-11.
Interlock Circuit.

4-58. All other components in the tape supply system operate in conjunction with the tape tension arm assembly. The arm is free to move between the limits and the tape tension spring connected to the arm tends to pull the arm outward to maintain the tape loops. A control contactor is attached to the tension arm shaft and moves with the tension arm. Motion of the tension arm away from the NULL position midway between its two limits, combined with the action of a centering spring and a contactor damping dashpot and the control contactor, drives the reel motor into the direction that will return the tension arm to the NULL position.

4-59. Should the tension arm move to its outer limit, a microswitch (tension arm limit switch S2) opens to disable the tape drive system, disconnect power to the reel motors, apply the reel brakes and give a failure signal to the command source. When the condition has been corrected, the reel motor will rotate to take up slack tape and the equipment will resume operation. However, the program sequence will have been interrupted. When the Ampex control panel is used, switch S2 gives a stop command and (in MANUAL mode) the transport must be restarted after the fault is cleared.

4-60. The vacuum produced by the vacuum blower creates the tape loops in the vacuum chamber. The tape stored in this chamber is used during start and stop transients and aids in damping out tension arm oscillation and variations in tape tension.

4-61. SERVO CONTROL SYSTEM. (See Figure 4-12.)

4-62. When both actuators are in the OFF position, neither capstan roller is engaged. The tape is not in motion and the tape tension arms are positioned between the inner and outer limits of travel at the NULL position. The NULL position of the tension arm, midway between its two limits, is established by the servo control contactor. At the NULL position, the servo control contactor does not make contact in either direction. Neither of the reel motors have power applied to them and the pull of the tape tensioning springs is balanced by general system friction.

4-63. When the tape is started in the forward direction by the capstan, the upper tension arm is pulled down by the tape. Contacts D and E of the servo control contactor make contact and energize K12 relay. K12 relay applies power to the clockwise windings of the reel motor, rotating the supply reel to supply tape to the tension arm (Figure 4-13). As the reel motor approaches full speed, tape is supplied to the tension arm at a slightly faster rate of speed than the tape drive assembly is pulling it off. The tension arm thus moves toward its NULL position as the slack increases, opening the contacts of the control contactor to deenergize relay K12 and cut the power applied to the reel motor. As the tape supply speed decreases, the tension arm again moves inward until the contacts of the control connector again connect power to the reel motor. Should the reel motor supply too much tape to the tape drive area and the tension arm passes the NULL position, contacts B and A of the control contactor would make contact and apply power to the counterclockwise windings of the reel motor via K22. This power retards rotation of the reel motor in the clockwise direction. If this power is applied long enough, the reel motor stops and starts to rotate in the counterclockwise direction rewinding the excessive tape onto the reel.

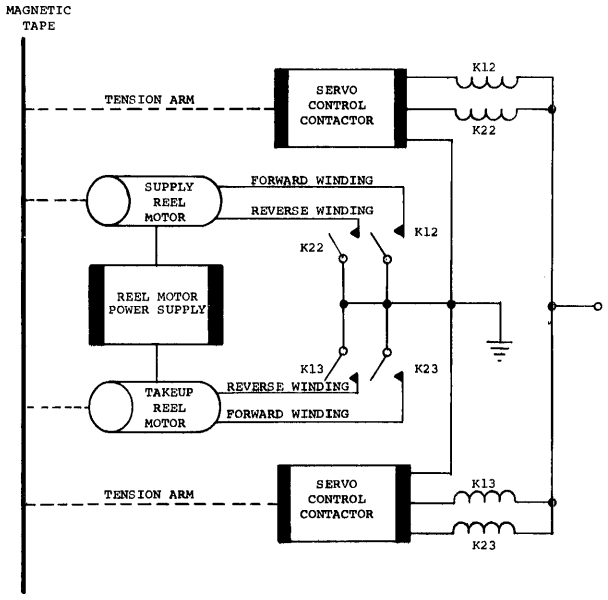


Figure 4-12.
Servo Control, Block Diagram

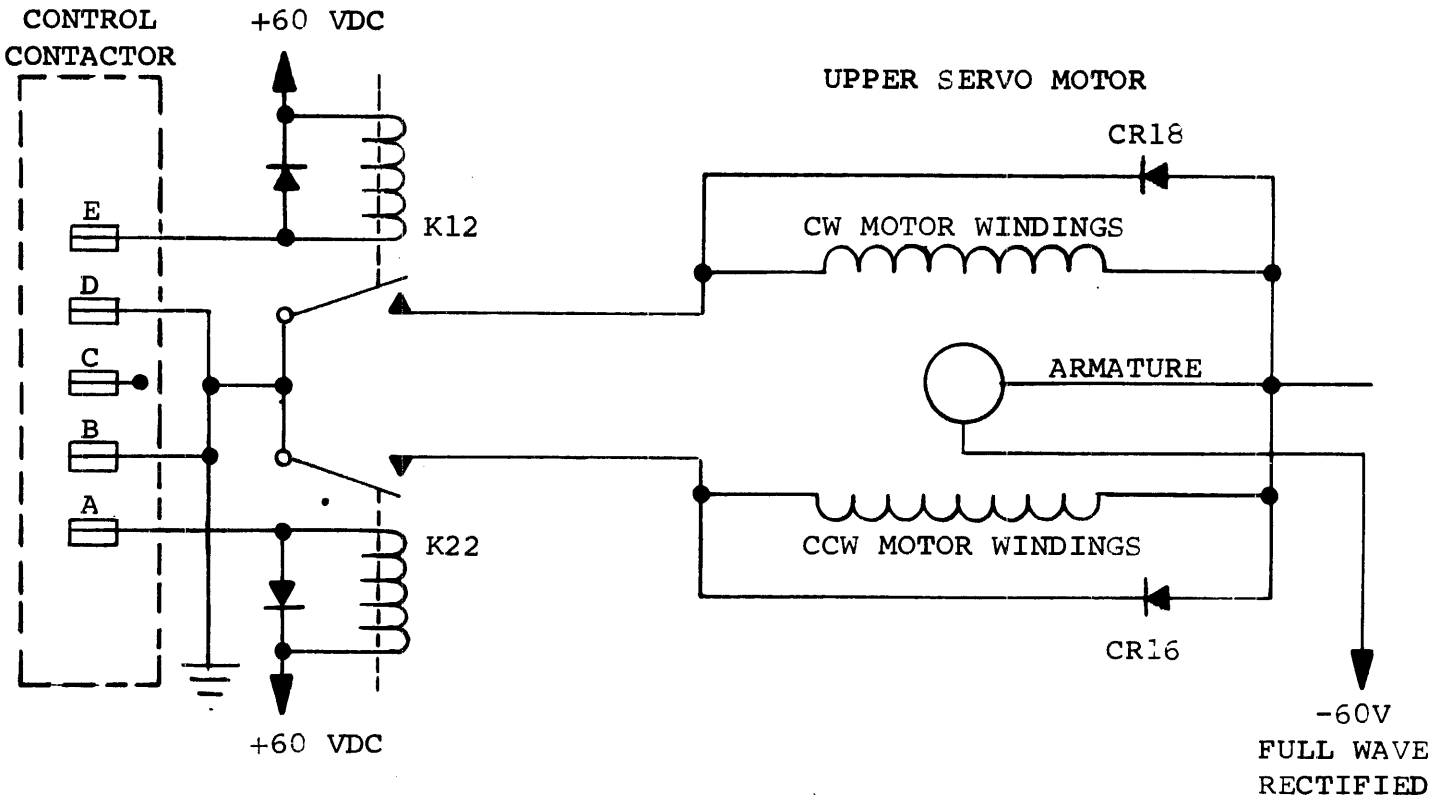


Figure 4-13.
Upper Servo System, Schematic

4-64. To prevent the servo control systems from going into oscillation (resulting from full power being applied to the reel motors for minor tension arm position variations) a damping dashpot is attached to each control contactor by a mechanical linkage. The effect of the dashpot is to damp out rapid oscillations of the control contactor and associated tension arm. (See Figure 4-10.)

4-65. When a stop command is given, the tape in the drive area stops and the tension arms return to their NULL position. (Refer to paragraph 4-63.)

4-66. The operation of the tape take-up and tape supply system is similar except that forward tape motion tends to permit the take-up tension arm to move toward its outer limit. This causes the take-up reel motor to operate in the clockwise direction to take up tape returning the tension arm toward the NULL position.

4-67. When the tape is started in the reverse direction, the reel m. motor control system operates in the same manner as the forward drive except the tape is now being supplied by the take-up reel and rewound onto the supply reel.

SECTION V
MAINTENANCE

5-1. GENERAL.

5-2. The TM-4 Tape Transport is designed to require minimum maintenance and service. Such maintenance as is required will be facilitated by a well-planned program of preventive maintenance and a systematically kept maintenance log.

5-3. A listing of the tools and equipment used in maintenance of the tape transport will be found at the end of this section.

5-4. PREVENTIVE MAINTENANCE.

5-5. A program of planned preventive maintenance is the most effective way of keeping the tape transport operating at its designed potential. A recommended schedule is shown in the table below. Maintenance procedures are scheduled by the number of eight-hour shifts, or by hours of running time.

TABLE 5-1.
SCHEDULE OF PREVENTIVE MAINTENANCE

Maintenance Operation	Frequency		Approx. Min. Ea.	Qty.	Total Time	Text Ref.
	Shifts	Hours				
Clean transport	1	8	3	1	3	5-6
Check capstan roller adjustment	2	16	1	2	2	5-33
Check tape tracking	2	16			5	5-36
Check packer arm tension and adjustment	12	96	3	1	3	5-47
Check servo contactor	12	96	5	2	10	5-38
Check dashpot adjustment	12	96	3	2	6	5-39
Empty tape cleaner cartridge	12	96	3	1	3	5-7

TABLE 5-1.
SCHEDULE OF PREVENTIVE MAINTENANCE (Continued)

Maintenance Operation	Frequency		Approx. Min. Ea.	Qty.	Total Time	Text Ref.
	Shifts	Hours				
Clean rack	24	192	10	1	10	5-8
Clean vacuum unit motor filter	24	192	2	1	4	5-6
Check tape guides	24	192	1	10	10	5-40
Check actuator firing circuitry	24	192	5	1	5	5-42
Replace tape cleaner blade	48	384	5	1		5-74
Replace vacuum unit motor brushes	100	800	15	1	20	5-60
Replace capstan and quad ring	250	2000	20	2	40	5-53
Remove and replace capstan rollers	250	2000	20	2	40	5-52
Replace capstan drive belt	250	2000	10	1	10	5-54
Replace vacuum unit motor	200	1600	15	1	15	5-60
Check reel motor	625	5000	15	2	30	5-43
Check brushes in reel motor	625	5000	15	2	30	5-58 (1 thru n)
Replace capstan drive motor	625	5000	2	1	25	5-64

5-6. CLEANING THE TAPE TRANSPORT. Clean the tape transport as follows:

CAUTION

Solvents such as carbon tetrachloride may dissolve the head lamination adhesive and should not be used. The recommended cleaning fluids are: Ampex Head Cleaner (Catalog No. 087-007) for the head and metal guides only. Denatured alcohol for the capstans, capstan rollers, packer arm shoes, vacuum chambers and all rubber components.

Cleaning agents must not be allowed to penetrate bearings where lubricatnts may be broken down.

Step 1: Use a clean, lint-free, cloth or cotton swab, moistened with Ampex head cleaner, to carefully wipe off all oxide and dirt that may have gathered on and around head stacks, head cover, head guides, and tape cleaner.

Step 2: Clean capstans by carefully placing a clean, lint-free, cloth or cotton swab, moistened with denatured alcohol, against each capstan in turn while turning capstan drive pulley by hand. All oxide and dirt should be removed.

Step 3: Clean capstan rollers by carefully placing a clean, lint-free, cloth or cotton swab moistened with denatured alcohol, against each capstan roller in turn while turning capstan drive pulley by hand. All oxide and dirt should be removed.

Step 4: Use a clean, lint-free, cloth or cotton swab, moistened with denatured alcohol, to thoroughly clean vacuum chamber interior, tape guides, and vacuum chamber door. All oxide and dirt should be removed.

Step 5: Clean vacuum motor filter, first with a vacuum cleaner, then by washing it in clean water. Thoroughly dry filter before re-installing. (Refer to paragraph 5-60 for filter remove and replace instructions.)

5-7. EMPTYING THE TAPE CLEANER CARTRIDGE. Use an Allen wrench to remove the head cleaner cartridge retaining screw. The head assembly and tape cleaner bracket retaining screw should not be disturbed. Remove the tape cleaner cartridge and gently tap the cartridge to remove accumulated oxide. Re-install cartridge and retaining screw.

5-8. CLEANING THE RACK. The entire rack or cabinet housing the tape transport, and the tape transport itself, should be thoroughly cleaned to a regular schedule. The front of the tape transport should be wiped clean with a cloth moistened in denatured alcohol.

5-9. LUBRICATION. No periodic lubrication of the tape transport is necessary.

5-10. CHECKING OPERATION PARAMETERS.

5-11. START TIME CHECKOUT.

5-12. Start time is defined as the time from the application of a Start Command until the tape passing over the head has obtained an instantaneous speed variation of 10% or less from nominal speed. The start time should be 3.3 ms or less.

5-13. The following equipment is used when checking the start time:

1) Test tape with a 25KC (±0.1%) NRZ signal recorded at 333.33 bpi (master tape)
2) Read amplifier
3) Calibrated oscilloscope
4) FM discriminator

5-14. Check out the start time as follows:

Step 1: Connect equipment according to Figure 5-1.

Step 2: Thread master tape on transport.

Step 3: Adjust FM discriminator to produce zero volts output at 25KC.

Step 4: Cycle transport to operate in Forward and Reverse Drive modes at a convenient rate. Instantaneous speed variation must fall to 10% or less within 3.3 msec from start command. A typical waveshape is shown in Figure 5-1.

5-15. STOP TIME CHECKOUT.

5-16. Stop time is defined as the time from the application of a Stop Command until all tape motion over the magnetic head has ceased. The stop time should be 1.8 ms or less.

5-17. The following equipment is used when checking the stop time:

1) Test tape with a 25KC (±0.1%) NRZ signal recorded at 333.33 bpi (master tape)
2) Read amplifier
3) Calibrated oscilloscope

5-18. Check out the stop time as follows:

Step 1: Connect test equipment as shown in Figure 5-2.

Step 2: Thread master tape on transport.

Step 3: Cycle transport at a convenient rate in Forward and Reverse Drive modes.

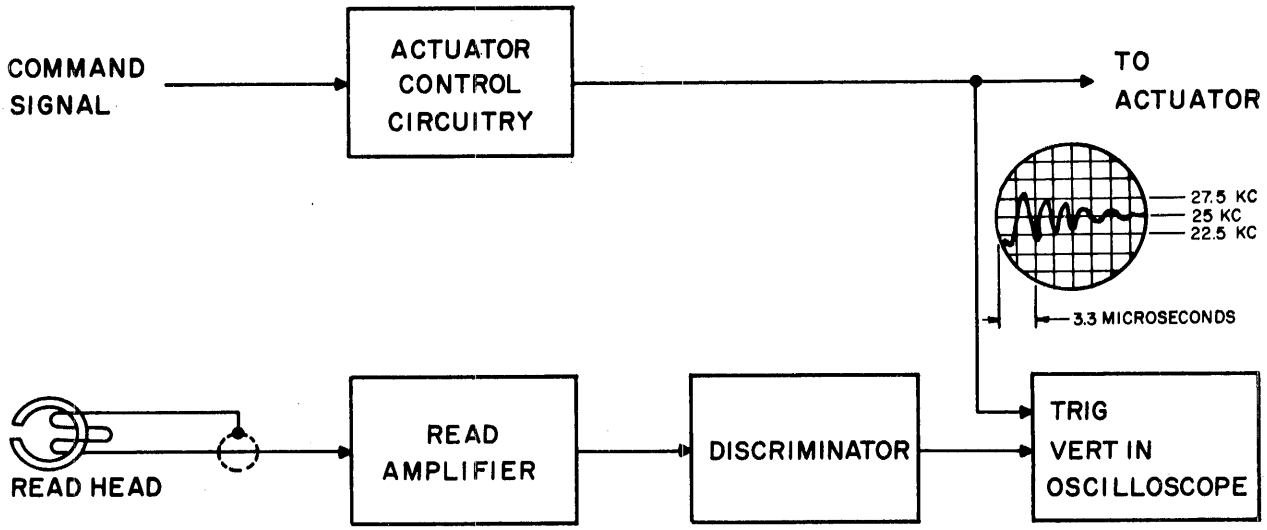


Figure 5-1.
Start Time Measurement, Test Setup

Step 4: Observe decay time of signal displayed on oscilloscope. Decay time should be 1.8 msec or less. A typical waveshape is shown in Figure 5-2.

5-19. START AND STOP DISTANCE CHECKOUT.

5-20. Start distance is the distance that the tape moves during start time. Stop distance is the distance that the tape moves during stop time. The start and stop distances should be:

TAPE SPEED IPS	START DISTANCE INCHES	STOP DISTANCE INCHES
75	.162 to .203	.030 to .100
60	.120 .182	.018 .068
37.5	.080 .114	.009 .037
30	.064 .092	.006 .030

5-21. The following equipment is used when checking the start and stop distances:

1) Test tape with a 25KC (±0.1%) NRZ signal at 333.33 bpi (master tape)

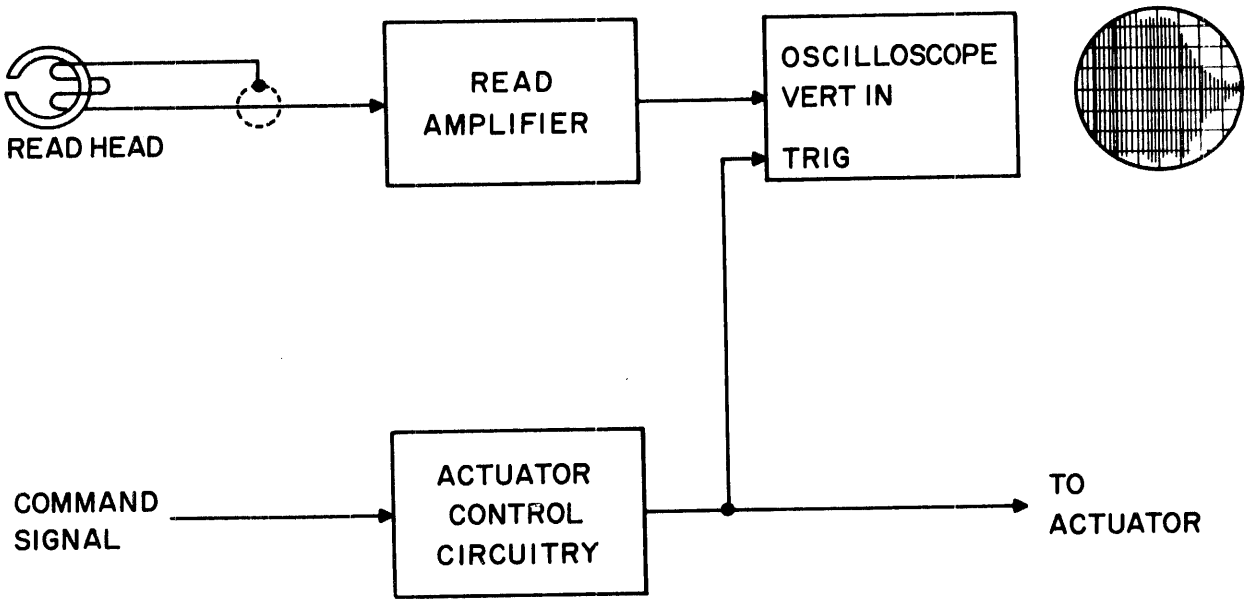


Figure 5-2.
Stop Time Measurement, Test Setup

2) Four waveform generators (Tektronix 162 or equivalent)

3) Read amplifier capable of developing 2.0 volts peak-to-peak output across a 600 ohm impedance, rise time 7 to 9 μs

4) Oscilloscope

5) Electronic counter (Hewlett Packard 523B or equivalent)

6) Pulse generator (Tektronix 161 or equivalent)

7) Power supplies as needed for the above equipment

8) Level converter

5-22. Check out the start and stop distance as follows:

Step 1: Connect test equipment as shown in Figure 5-3.

Step 2: Switch equipment on for a warm-up period.

Step 3: Thread test tape on transport.

Step 4: Put all four operating MODE switches on waveform generators in triggered position.

Step 5: Put all four VERNIER controls on waveform generator in calibrated position.

Step 6: Select program at waveform generator DURATION and MULTIPLIER controls (example: fwd on 40ms, fwd off 20ms, rvs on 40ms, rvs off 20ms). This program (40-20-40-20) states that the forward actuator is ON for 40 msec and OFF for 20 msec. The same is true for the reverse actuator.

Step 7: Set the GATE OUT/PULSE OUT switch to GATEOUT position.

Step 8: Start transport in automatic mode. Machine should now be programming at a 40-20-40-20 rate.

Step 9: Pulse generator controls are set as follows:

(a) Pulse TRIGGER SELECT in POSITIVE position.

(b) PULSE WIDTH to 1 MSEC.

(c) PULSE WIDTH MULTIPLIER to THREE.

(d) PULSE DELAY center scale.

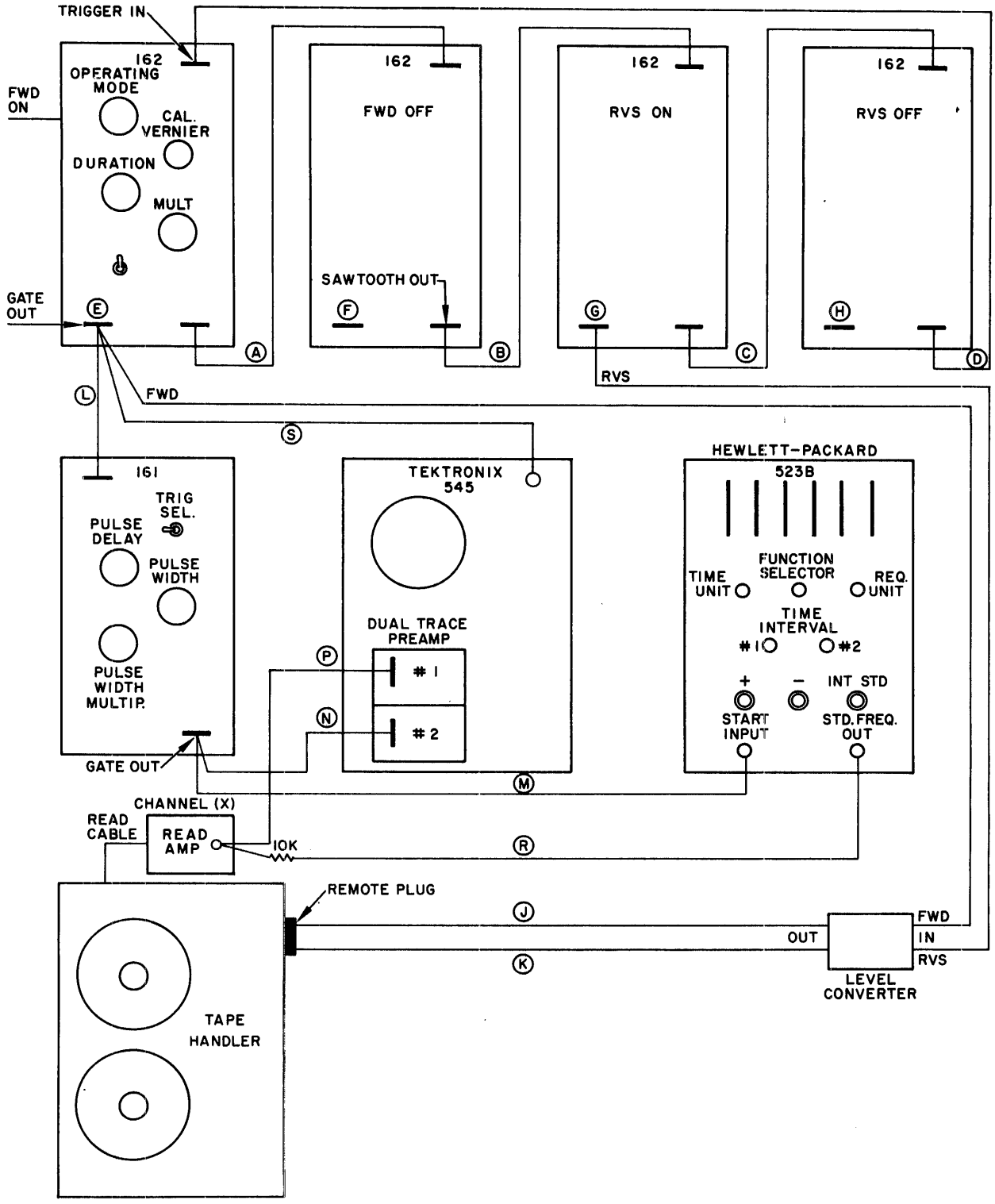


Figure 5-3.
Start/Stop Distance Measurement, Test Setup

Step 10: Electronic counter 523B controls are set as follows:

(a) FUNCTION SELECTOR to TIME INTERVAL.

(b) TIME UNIT to μSEC (Check position).

(c) FREQUENCY UNIT to 1 second.

(d) 100 KC STD to INT STD.

(e) GATE to OPEN.

(f) TIME INTERVAL No. 1 to X1; rotate TRIGGER LEVEL until a count of near 3000 μsec appears.

Step 11: Rotate PULSE WIDTH knob on 161 pulse generator until 3300 μsec ±5 (3.3 msec) appears on counter.

Step 12: Switch to pre-amp #2 on oscilloscope (probe N) using DC INPUT at 5 VOLTS/CM sensitivity and INTERNAL SYNC.

Step 13: Set TIME/CM to 100 μsec, and put MULTIPLIER in the 2-5-1 position; then adjust for 3.3 msec gate to cover the full 10 cm oscilloscope face. Place waveform in lower half of oscilloscope face.

Step 14: Place TIME SELECTOR switch on the 523B counter to EXT. position (count position), and run tape handler in AUTOMATIC MODE.

Step 15: Place cable L in the following positions, and move cables (oscilloscope sync.) with each movement.

(a) To measure forward start distance: attach cable L to E; multiply counter reading by .003 inch.

(b) To measure forward stop distance: attach cable L to F; multiply counter reading by .003 inch.

(c) To measure reverse start distance: attach cable L to G; multiply counter reading by .003 inch.

(d) To measure reverse stop distance: attach cable L to H; multiply counter reading by .003 inch.

(e) During test 1 through 4, the proper start and stop waveforms may be viewed by switching to pre-amp #1 (probe P), using DC INPUT at 0.2 VOLT/CM sensitiviey and EXTERNAL SYNC.

NOTE

Photograph the waveforms and make an actual count of the pulses for an additional check.

5-23. LONG TERM AVERAGE SPEED VARIATION CHECKOUT.

5-24. Long term average speed variation is variation from specified nominal speed, averaged over any interval of 30 ms occurring 3.3 ms or more after a run command. Maximum variation should be 2%.

5-25. The following test equipment is used to measure long term speed variation:

1) Master tape with a known data frequency NRZ signal

2) Read amplifier

3) Counter

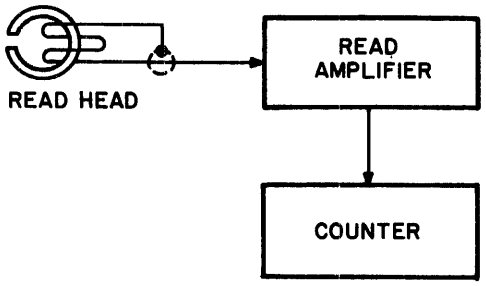


Figure 5-4.
Long Term
Speed Variation, Test Setup

5-26. Checkout long term speed variation as follows:

Step 1: Connect equipment as shown in Figure 5-4 (set counter for a repetitive 100 ms count time) and thread test tape on transport.

Step 2: Run at least a half reel of tape through transport while observing count. Reading should not deviate more than ±2% from nominal rate.

5-27. INTERCHANNEL TIME DISPLACEMENT ERROR CHECKOUT. The following procedure permits measurement of interchannel time displacement error of any data

track from any other data track or reference track. The procedure does not permit separation of errors introduced by write and read electronics.

5-28. The following equipment is required to measure ITDE:

1) Test tape with a 25KC (±0.1%) NRZ signal recorded at 75 ips (333.33 bpi)
2) Dual trace oscilloscope
3) Read amplifiers (customer supplied)
4) Connect the test equipment as shown in Figure 5-5

5-29. Check out the interchannel time displacement error as follows:

Step 1: Program tape transport to operate in Forward Drive mode. A presentation such as is shown in Figure 5-6 should appear on oscilloscope.

Step 2: Switch non-reference input of oscilloscope to other tracks in turn to measure ITDE of each track with respect to reference track.

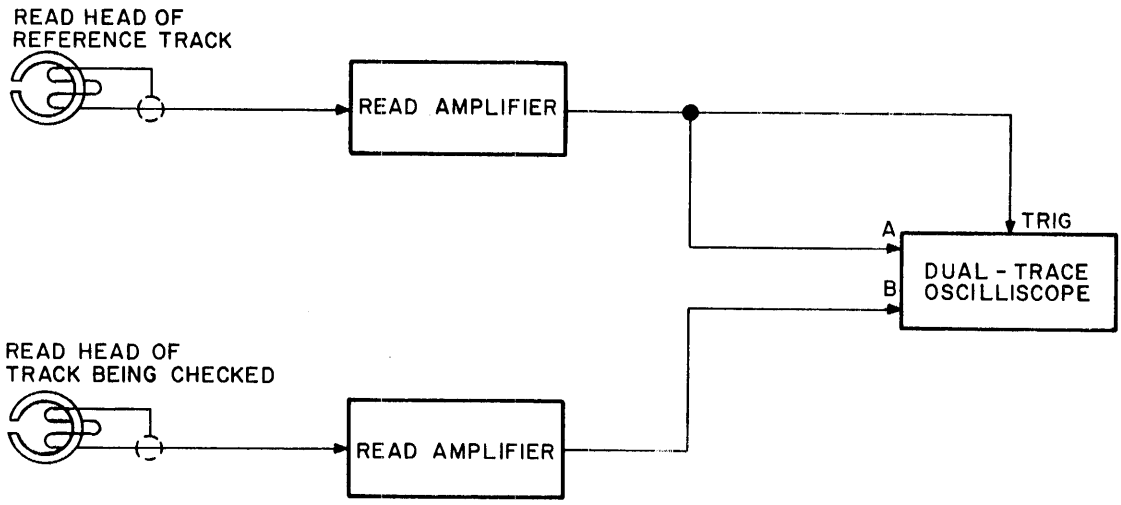


Figure 5-5.
Interchannel Time Displacement Error, Test Setup

5-30. PHOTOSENSOR CHECKOUT. (See Figure 5-7 for waveforms.) The following test equipment is required:

1) Test tape with reflective markers attached

2) Vacuum tube voltmeter

3) Oscilloscope

5-31. Check out the photosensor kit as follows:

Step 1: Thread tape on tape transport.

Step 2: Turn supply and takeup reels by hand until magnetic tape (without reflective marker) is under photosensor head assembly.

Step 3: Remove cover of photosensor chassis assembly and locate composite base card assemblies for channels A and B. (See photosensor kit schematic.)

Step 4: Starting with base card assembly for channel A, locate TP1, TP2, and R4 in DC amplifier circuit. (See schematic.)

Step 5: Connect voltmeter leads TP1 and TP2. Adjust R4 for a level as close as possible to, but not more positive than -7.8 VDC.

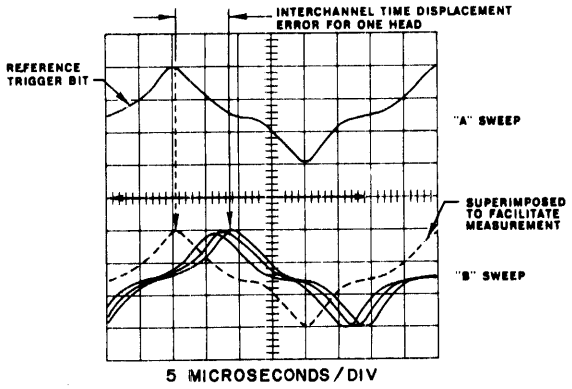


Figure 5-6.
Interchannel Time
Displacement Error, Waveshape

Step 6: Repeat Steps 4 and 5 for channel B.

Step 7: To check phantastron hold and driver circuits used in channel A, connect oscilloscope ground lead to pin 1 of connector P1, and input lead to pin 11.

Step 8: Set oscilloscope to trigger on level change when reflective marker passes under photosensor head assembly.

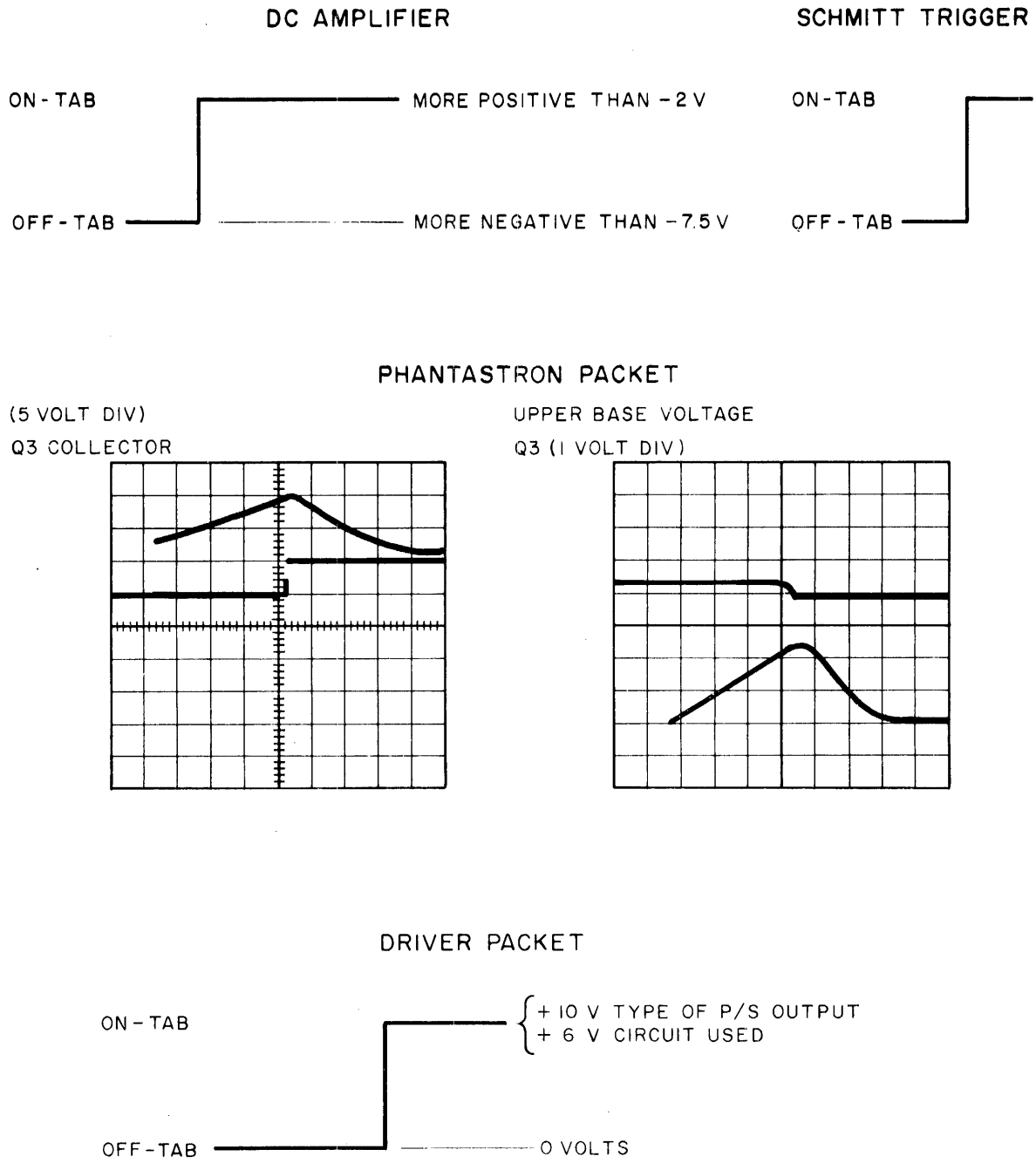


Figure 5-7.
Photosensor, Waveform

Step 9: Observe output on oscilloscope. 100 msec (±20%) pulse duration must be seen when phantastron hold circuit is used even though reflective marker is actually sensed for a much shorter time. A minimum pulse amplitude of +10 VDC should be seen from driver circuit.

Step 10: Move reflective marker from beneath photosensor head assembly. The +10 VDC level should drop to a level of -0 to -0.5 VDC.

Step 11: To check the phantastron hold and driver circuits used in channel B, disconnect oscilloscope input lead from pin 11 of P1 and connect it to pin 11 of P2. Disconnect oscilloscope ground lead from pin 1 of P1 and connect it to pin 1 of P2.

Step 12: Repeat Steps 8 and 9 for channel B. Malfunction symptoms, possible causes, and remedies are listed in Table 5-2.

5-32. CORRECTIVE MAINTENANCE.

5-33. CAPSTAN ROLLER GAP CHECKOUT AND ADJUSTMENT.

5-34. Correct gap spacing between capstan and capstan roller is .008 to .010-inch with a maximum variation over the length of the gap of .001-inch. Two adjustments are provided (Figure 5-8); one to obtain parallelism between the capstan and capstan roller, by rotating hexagon eccentric bushing supporting the capstan roller shaft, the second, used to obtain gap adjustment, by turning the capstan roller yoke on the actuator shaft.

5-35. The following procedure is recommended for optimum performance within the specification range for the transport. However, this may be varied to suit system requirements.

CAUTION

Transport power should be OFF, actuators should be in OFF position and tape removed from gap.

Step 1: Before commencing any adjustment, check that the capstan roller shaft has the slot aligned in a horizontal plane with the beveled side furthest from the actuator shaft. The punch mark on the hexagonal eccentric should be positioned likewise as shown in Figure 5-8.

NOTE

Earlier transport models do not have the locating bevel on the shaft which shows the position of minimum eccentric displacement at the rear of the pinch roller shaft. This position can be found by loosening the rear shaft clamping screw and turning the shaft with a screwdriver; the shaft should then be permanently marked at the point of minimum eccentricity and this mark positioned furthest from the actuator shaft before tightening the clamping screw. The rear clamping screw should then be tightened and no further adjustment made to the rear eccentric.

Step 2: Loosen the two yoke clamping screws (Figure 5-8) until yoke can be rotated on actuator shaft with a slight drag.

CAUTION

With the yoke clamping screws loose, some movement of the yoke along the actuator shaft is possible. When the adjustment is completed the metal surface of the capstan roller must be in contact with the capstan quad ring and must not touch the capstan.

Step 3: Insert a 0.009-inch feeler gauge between the length of capstan roller and capstan. Hold capstan roller firmly against the feeler gauge and tighten yoke clamping screws alternately until both screws are locked home.

Step 4: Check gap spcaing with feeler gauge (Figure 5-9) (0.008 min. to 0.010 max.) for any displacement that may have occurred when yoke clamping screws are tightened. If necessary, return to Step 2 increasing or decreasing the feeler guage thickness used in the original setting to compensate for any displacement that may occur when yoke clamping screws are tightened.

Step 5: Measure the front end of the gap with the feeler gauges and, if needed, adjust the front eccentric (hexagonal bushing) to give a parallel gap. The front eccentric clamping screw (Figure 5-8) should be loosened during this step and then tightened. Clockwise rotation will raise and counterclockwise will lower the front (nearest operator) of the capstan roller. Maximum adjustment of the eccentric should not exceed 45° from the horizontal starting point, equal to .005 inch vertical displacement at the roller.

Step 6: Recheck the gap over its entire length with feeler gauges and repeat the above procedure until a correct gap setting of .008 to .010 inch, parallel within .001 inch, is obtained.

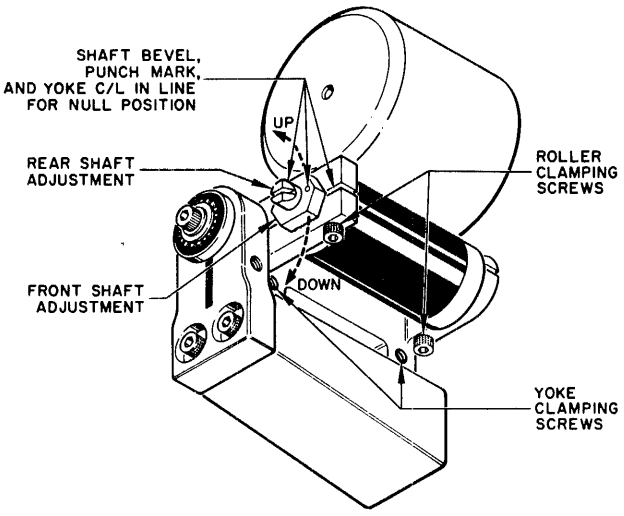


Figure 5-8.
Capstan Roller Adjustments

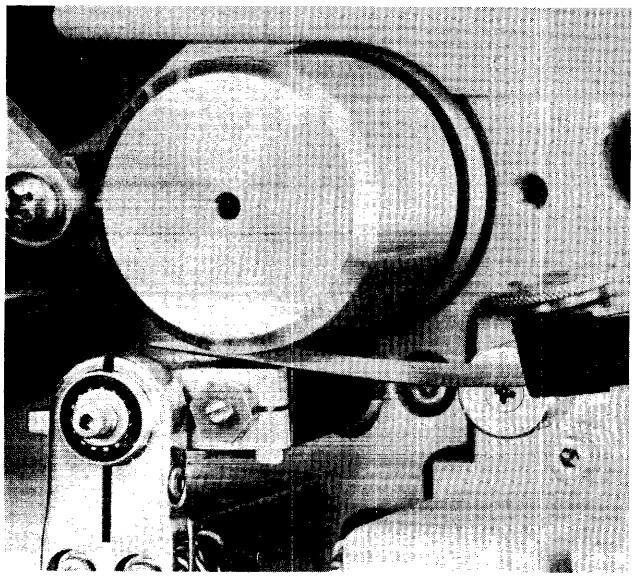


Figure 5-9.
Capstan Roller Gap Measurement

5-36. TAPE TRACKING CHECKOUT AND ADJUSTMENT.

CAUTION

Capstan roller gap must be correct before checking or adjusting tape tracking.

5-37. The following procedure should be used to check and adjust tape tracking:

Step 1: Clamp tape against wall of vacuum chamber and hold other end of tape between head guide and head stack as shown in Figure 5-10.

Step 2: Pull tape gently in both directions while holding it against guide surfaces. Tape held in a horizontal plane should not touch the capstan roller but may make light contact with the capstan. If tape makes contact with roller, or makes heavy contact with capstan, vacuum chamber and/or head assembly must be adjusted.

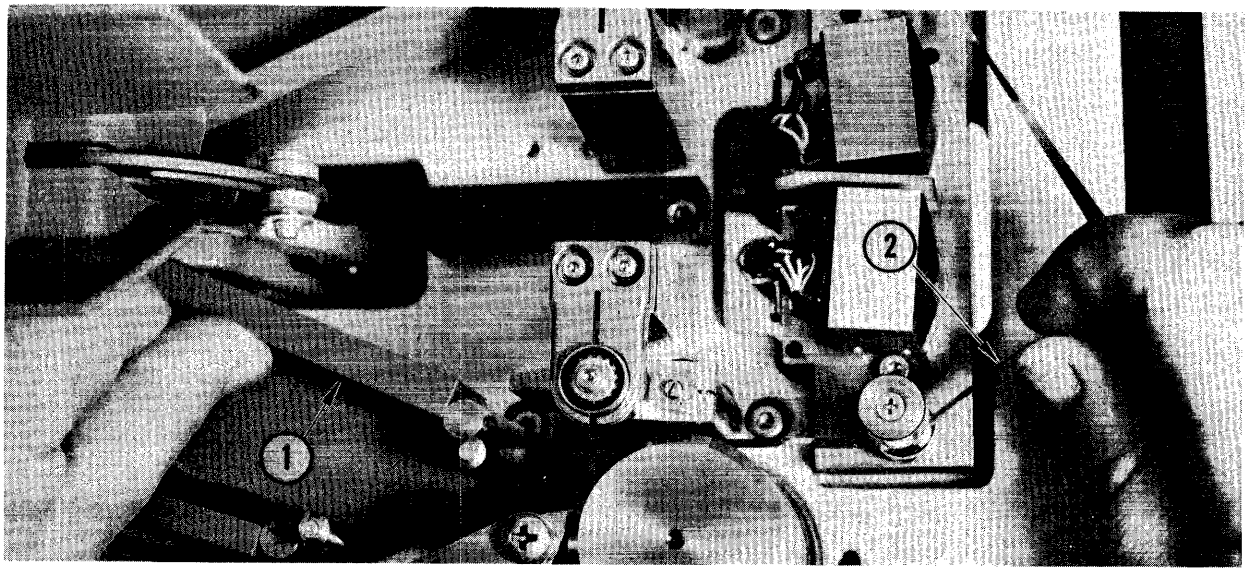


Figure 5-10.
Vacuum Chamber Alignment Checkout

NOTE

Following steps need only be taken if tracking is incorrect.

Step 3: Loosen head assembly mounting screws and position head mounting base so that mounting screws are in center of base holes. Tighten screws.

Step 4: Loosen screws holding vacuum chamber to casting (access from rear of transport).

Step 5: See Figure 5-11. Position vacuum chamber in horizontal plane. Be sure that vacuum chamber does not interfere with reel rotation or with capstan roller yokes. At the same time, position vacuum chamber in the vertical plane so that tape passes between capstan roller and capstan without touching the capstan roller. (Refer to Step 2 above.)

Step 6: Snug up mounting screws on vacuum chamber, and repeat Steps 1 through 4 above.

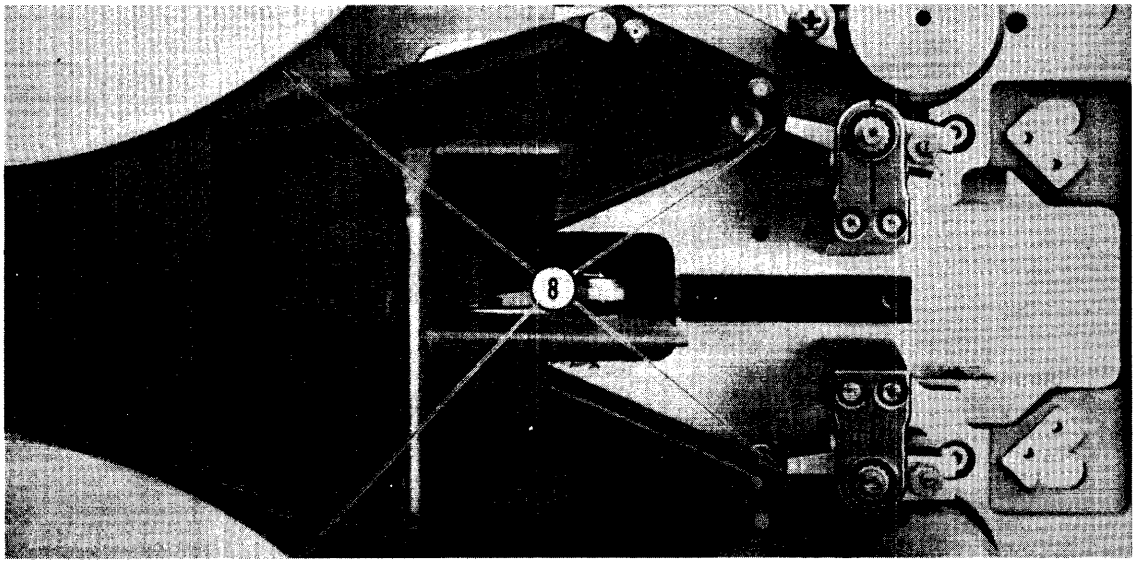


Figure 5-11.
Vacuum Chamber Alignment

Step 7: If any fine adjustment is still needed, it may be advantageous to move head assembly. Refer to Step 1 of adjustment procedure. If the head assembly is moved, it will affect tape travel at the upper and lower vacuum chambers; thus, repositioning of chambers may be required.

Step 8: When adjustment has been established, tighten mounting hardware for vacuum chamber to 40-45 inch-ounces torque. Tighten mounting hardware for head assembly.

5-38. SERVO CONTACTOR CHECKOUT AND ADJUSTMENT. (See Figure 5-12.)

WARNING

Initial servo contactor adjustment should be made with power OFF. Otherwise, injury to personnel may result.

Step 1: Remove cover from servo control assembly.

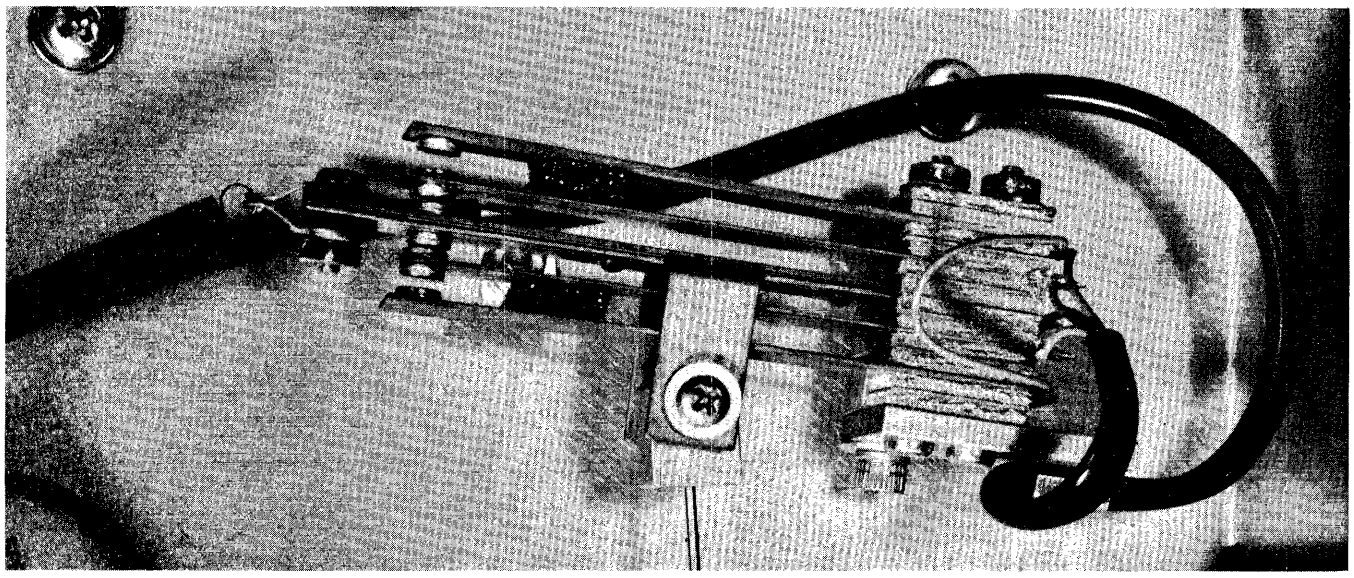


Figure 5-12.
Servo Contactor

Step 2: Set tension arm roller guide support at center-of-travel position by manually rotating upper or lower reel.

Step 3: Check alignment of center contact of contact assembly and centering spring. These components should be in a straight line.

Step 4: Insert a 0.010-inch feeler gauge between contacts on center contact leaf and inner leaf (one at a time). The gap should be 0.010 ±0.005-inch for each set of contacts.

NOTE

If Steps 1 through 4 check out, proceed to Step 10. If Steps 1 through 4 do not check out, use adjustment procedure Steps 5 through 10.

Step 5: Set tension arm at center-of-travel position.

Step 6: Use a 3/32-inch Allen wrench to loosen cap screw holding contact clamp to tension arm shaft.

Step 7: Rotate contactor assembly on shaft until spring and contactor form a straight line.

Step 8: Tighten cap screw holding contact clamp to tension arm shaft.

Step 9: Position contactor assembly on the tension-arm shaft so that contactor assembly and dashpot rod form a 90° ±5° angle.

CAUTION

Do not twist contact leaves during adjustment.

Step 10: Use an Allen wrench to adjust cap screws until a slight drag is felt on a 0.010-inch feeler gauge between contacts.

Step 11: Gently move tension arm up and down from center-of-travel position. Observe outer contact leaves. The outer contact should provide an arm travel of 3/4 inch ±1/4 inch on each side of center before closing. Adjust as needed with adjustment cap screws and Allen wrench.

CAUTION

When power is on, do not touch any equipment or parts in the servo control box. With reel motors active, any movement of tension arm must be made very slowly to prevent the dashpot closing the servo contact and initiating a lead signal to the reel motors.

Step 12: With power ON, slowly move tension arm up from center-of-travel position until full power is applied to reel motor. Null setting before outer contacts give full power to reel motor is 3/4-inch ±1/4-inch. If full power is first given to reel motor before or after the movement of 3/4-inch ±1/4-inch, turn off the electrical power and re-adjust cap screws.

5-39. DASHPOT CHECKOUT AND ADJUSTMENT.

Step 1: Thread tape on transport.

Step 2: Turn electrical power on.

Step 3: Grasp upper reel and quickly rotate in clockwise direction, then immediately release. Check that tension arm does not oscillate, but reacts swiftly. Should there be oscillation for more than two cycles, or sluggishness, refer to Steps 6 through 8 below.

Step 4: Repeat for counterclockwise rotation.

Step 5: Repeat Steps 3 and 4 for lower reel.

NOTE

Supply reel and upper tension arm are connected to upper dashpot, take-up reel, and lower tension arm are connected to lower dashpot.

Step 6: See Figure 5-13. Screw in dashpot adjusting screw clockwise to bottom.

Step 7: Grasp reel and turn in either direction until associated outer contact of servo contactor assembly closes. Release reel and permit reel to oscillate.

Step 8: Turn adjusting screw counterclockwise until oscillation stops plus 1/16 of a turn.

5-40. ROTARY TAPE GUIDE CHECKOUT.

5-41. The guides on the tension arms and on the fixed support are checked by spinning each guide separately to ensure that it rotates smoothly and quietly. Stiff or noisy guides should be replaced. Refer to paragraph 5-57.

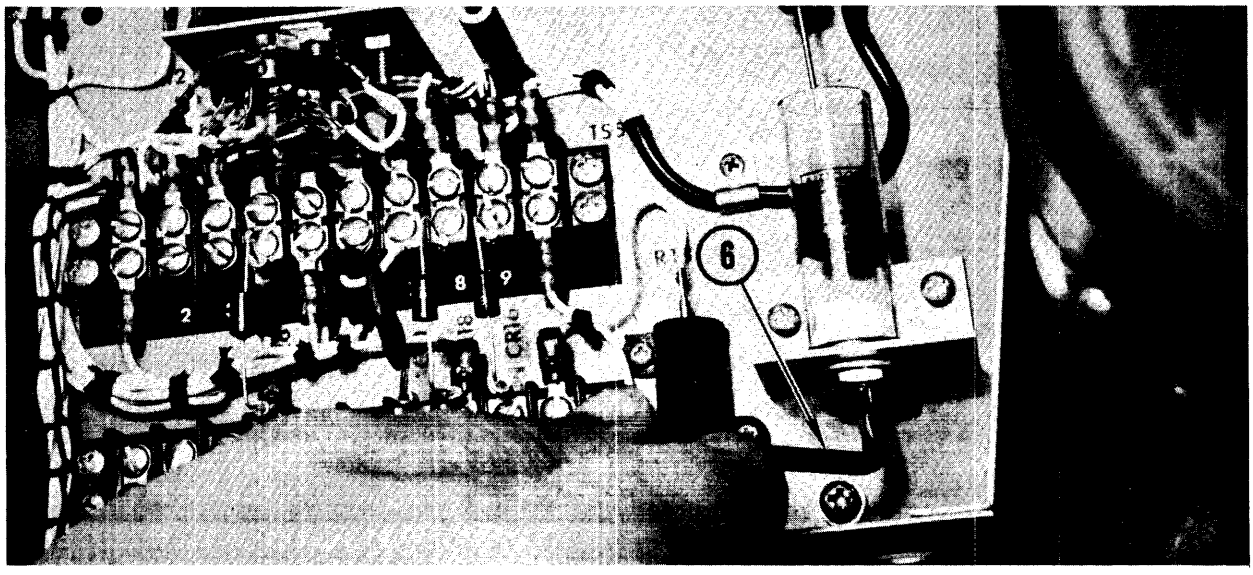


Figure 5-13.
Servo Dashpot Adjustment

5-42. ACTUATOR FIRING CIRCUITRY CHECKOUT. Operation of the actuator firing circuitry may be checked by programming the transport at the maximum permissible rate. No actuator functions should be missed during this test. Failures should be pinpointed as to the responsible thyratron, e.g., forward on, and the component replaced.

5-43. REEL MOTOR CHECKOUT.

Step 1: Remove supply reel.

Step 2: Grasp hold-down knob firmly; push it in and pull out, checking for shaft end play.

Step 3: If any end play is felt, remove and replace reel motor. (Refer to paragraph 5-58.)

NOTE

If evidence of end play cannot be determined by hand, measure it with a dial indicator. End play should be a maximum of 0.005-inch.

Step 4: Grasp fixed takeup-reel (or remove any other type of takeup-reel) at the hub and repeat Steps 2 and 3.

5-44. REEL BRAKES CHECKOUT AND ADJUSTMENT. (See Figure 5-14.)

Step 1: Turn on electrical power and install an empty reel.

Step 2: Open thread lever handle to thread position and rotate reel in clockwise and counterclockwise directions.

Step 3: The reel should spin freely. If any drag is felt, adjust the brake spring and solenoid.

Step 4: Remove attaching hardware and lay aside terminal mounting strip bracket.

Step 5: Plug tape transport electrical cord into variable transformer.

Step 6: Turn on variable transformer and set line voltage at 100 VAC.

Step 7: Turn on electrical power to tape transport.

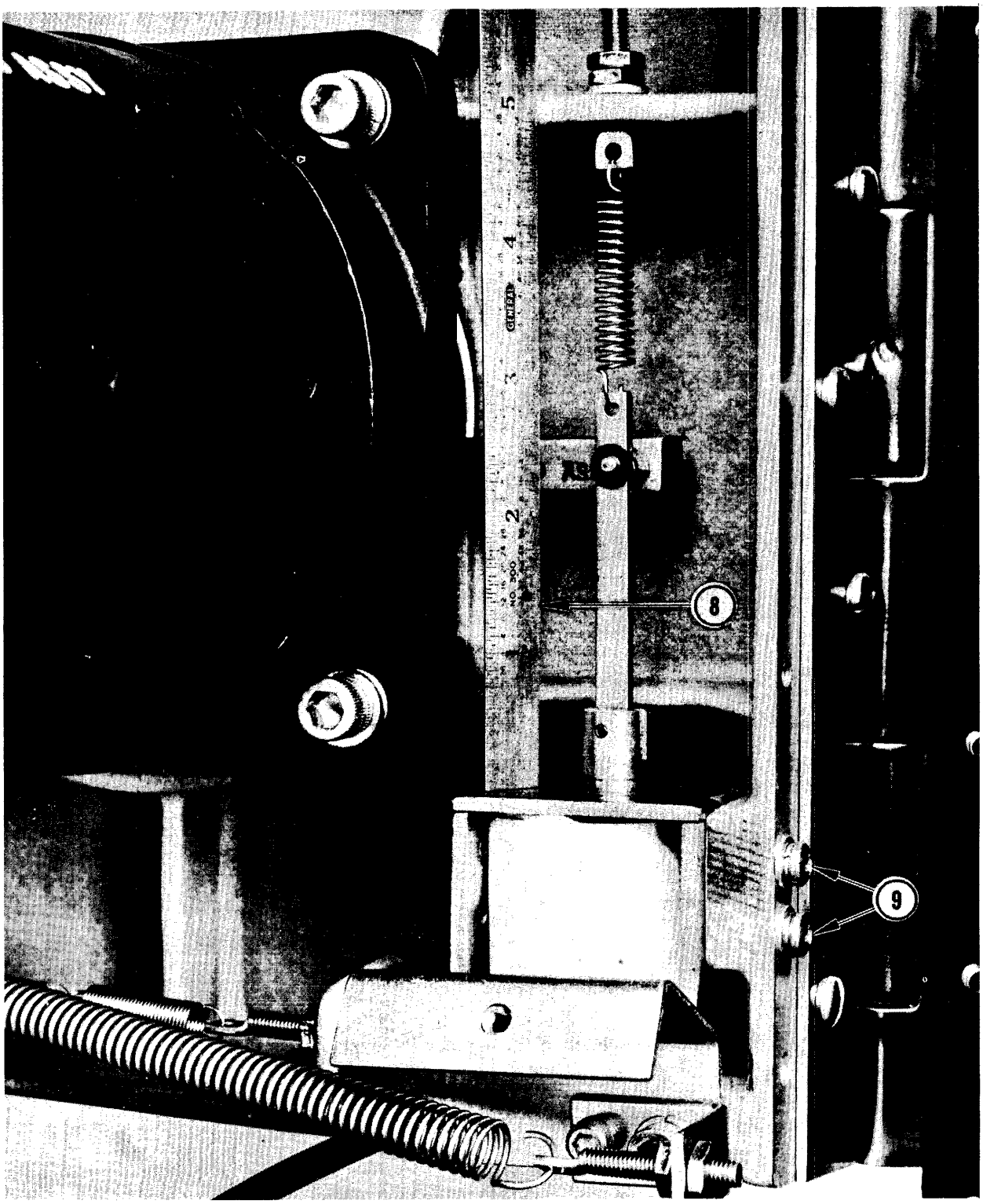


Figure 5-14.
Reel Brake Adjustment

Step 8: Place 6-inch scale on brake solenoid parallel to plunger (#8, Figure 5-14). Turn electrical power on and off at the variable transformer, observing travel of the plunger. Plunger travel should be 1/16-inch.

Step 9: If plunger travel needs to be adjusted, loosen but do not remove, solenoid mounting screws (#9, Figure 5-14). Slide solenoid up or down in slotted holes in plate until proper plunger travel is obtained. Tighten mounting screws.

Step 10: Energize solenoid; plunger should overcome spring tension and pick up at 100 volts. If more than 100 volts is required to move plunger, adjust spade bolt to decrease spring tension.

Step 11: Decrease line voltage to 95 volts and again energize solenoid. Plunger should not pick up. If plunger picks up when power is turned on at 95 volts, re-adjust spade volt to increase brake spring tension.

5-45. WRITE-ENABLE SWITCH ASSEMBLY CHECKOUT AND ADJUSTMENT. See Figures 5-15a, 5-15b, and 5-15c where the following step numbers are shown.

NOTE

Do not unsolder any connections.

Step 1: Remove write enable switch assembly from tape transport. Refer to paragraph 5-69.

Step 2: Remove attaching hardware and rotary solenoid from actuator bracket.

Step 3: Decrease tension on rotary actuator spring until spring will just return the rotary actuator to a de-energized position when power is turned off. Spring tension is adjusted by moving outer end of coiled spring to desired position. Clockwise movement of outer spring end will decrease tension; counterclockwise movement will increase tension.

Step 4: Install rotary solenoid on actuator bracket.

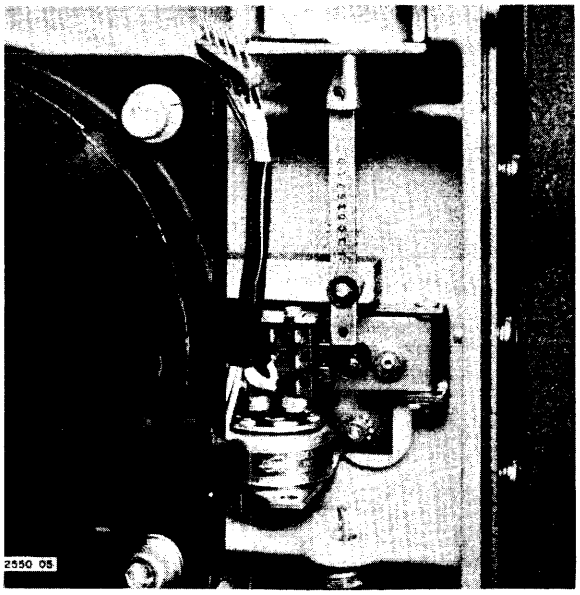
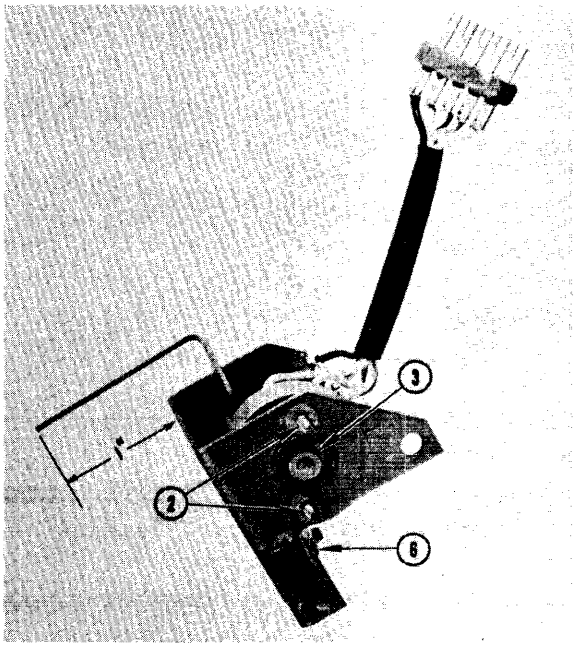


Figure 5-15a.



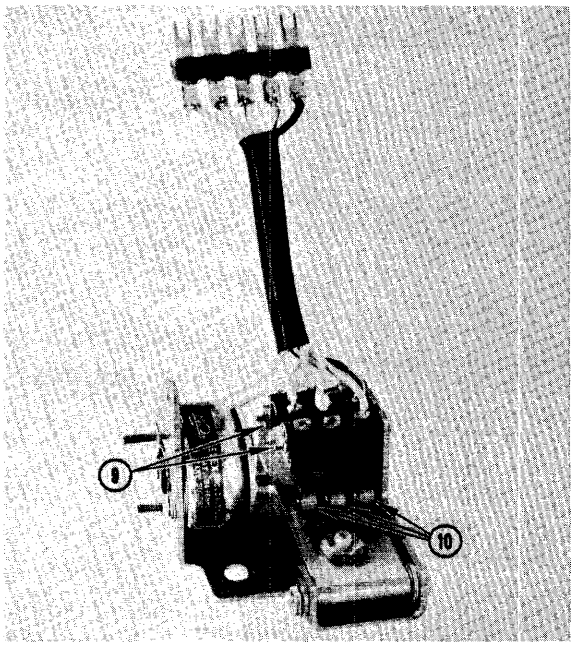


Figure 5-15b. Figure 5-15c.
Write-Enable Switch Adjustment

Step 5: Measure distance from tip of actuator arm to mounting face of actuator bracket. This distance must be 1-inch. If actuator needs adjustment, see Steps 6 through 8.

Step 6: Loosen lock nut holding set screw on actuator arm.

Step 7: Repeat Step 5 setting proper distance with set screw.

Step 8: Tighten lock nut.

Step 9: Loosen attaching hardware holding switches to actuator bracket so that all switches will slide in slots cut in actuator bracket.

Step 10: Slide switches to a position on actuator bracket so that rollers of switch arms rest on actuator arm without bending switch arms.

Step 11: Tighten attaching hardware.

Step 12: Replace write-enable switch on tape transport. Refer to paragraph 5-70.

5-46. MAGNETIC HEAD ASSEMBLY CHECKOUT.

Step 1: Clean head stacks and head tape guides. Refer to paragraph 5-6.

Step 2: Thread a blank tape known to be in good condition on tape transport.

Step 3: Program tape transport in forward mode.

Step 4: Operate all write amplifiers at a 15KC bit rate (200 bits per inch). All write amplifier inputs should be connected in parallel and in phase.

NOTE

Track No. 1 is the track nearest the operator.

Step 5: With tape moving across read/write head stacks, monitor read head output tracks.

Step 6: When read pulse width on all tracks at the 25% level exceeds 26 μsec with a simultaneous decrease in read output voltage below 25 millivolts (7 track head), or 15 millivolts (8 track head), (peak-to-peak) this head assembly should be replaced. Refer to paragraph 5-68, Removal and Replacement of the Head Assembly.

5-47. TAPE PACKER ARM CHECKOUT AND ADJUSTMENT.

5-48. Attach a scale to the end of the packer arm, midway between the reel hub and the outer edge of the reel, and perpendicular to the packer arm. The tension should be 2.5 oz. ±10%. To adjust the spring tension, turn the hex nuts on the spade bolt in the bracket. Move the tension arm to its fully open position. The connecting rod should operate the tension arm limit switch. To minimize play in the connecting rod, adjust the anchor eyelet.

5-49. TROUBLESHOOTING.

5-50. Table 5-2 lists various transport malfunctions, including possible causes and remedies. Table 5-3 lists relay designation, contact number, and function for each relay in the transport.

TABLE 5-2.
TROUBLESHOOTING CHART

SYMPTOM	POSSIBLE CAUSE	REMEDY
1. Edge damage to tape (noted by raised edge on reel).	Capstan roller out of adjustment.	Adjust capstan roller (refer to paragraph 5-33).
	Tape rubbing reel flange.	Reseat reel and/or reshim reel hub (refer to paragraph 5-58).
	Severe oxide deposit on tape guides.	Clean tape guides (refer to paragraph 5-6).
2. Poor tape pack.	Edge damage. Note: tape may have been damaged on another tape transport.	See Symptom No. 1
	Packer arm out of adjustment.	Refer to paragraph 5-47.

TABLE 5-2.
TROUBLESHOOTING CHART (Continued)

SYMPTOM	POSSIBLE CAUSE	REMEDY
2. Poor tape pack. (Cont)	Reel not installed properly.	Re-install reel (refer to Section III).
	Turntable out of line.	Check alignment of hold-down assembly and turntable (refer to paragraph 5-58).
3. Oxide accumulation.	Rough surface on component.	Replace component.
	Dirty tape guides.	Clean guides (refer to paragraph 5-6).
	Worn head.	Replace head (refer to paragraph 5-68).
4. Parity and bit error.	Damaged or worn tape.	See Symptom Nos. 1, 2, and 3 and/or replace tape.
	Defective or loose head cable connection.	Tighten connector or replace defective connector.
	Dirty or worn out head assembly.	Clean or replace (refer to paragraph 5-6 and 5-68).
	Capstan roller out of adjustment.	Adjust capstan roller (refer to paragraph 5-33).
5. Inoperative actuator.	Defective thyratron V1.	Replace thyratron (see schematic).
	Defective rectifier in high voltage bridge.	Replace diode (see schematic).
	Defective capacitor C2.	Replace capacitor C2 (see schematic).

TABLE 5-2.
TROUBLESHOOTING CHART (Continued)

SYMPTOM	POSSIBLE CAUSE	REMEDY
5. Inoperative actuator (cont).	Defective overload relay.	Clean contact or replace relay or replace fuse F4 (see schematic).
6. Actuator flips but tape does not move.	Capstan roller gap too large.	Adjust capstan roller (refer to paragraph 5-33).
7. Actuator flips but capstan roller bounces off.	Capstan roller gap too tight.	Adjust capstan roller (refer to paragraph 5-33).
8. Only one actuator fails to go either ON or OFF.	Defective actuator.	Replace actuator (refer to paragraph 5-62).
	Defective capacitor C4 or C5.	Replace capacitor (see schematic).
9. Actuator goes ON but fails to go OFF.	Defective thyratron V13 or V15.	Replace thyratron V13 (forward) or V15 (reverse).
10. Actuator goes OFF but fails to go ON.	Defective thyratron V12 or V14.	Replace thyratron V12 (forward) or V14 (reverse).
11. Tension arm oscillates.	Dashpot out of adjustment.	Adjust dashpot (refer to paragraph 5-39).
12. Servo contacts arcing.	Gap null band too narrow.	Adjust servo contacts (refer to paragraph 5-38).
	Mercury relay K12 or K13 contacts shorted.	Replace relay K12 (take-up) or K13 (supply).
	Defective reel motor.	Replace reel motor (refer to paragraph 5-58).

TABLE 5-2.
TROUBLESHOOTING CHART (Continued)

SYMPTOM	POSSIBLE CAUSE	REMEDY
12. Servo contacts arcing (cont).	Defective suppression diode CR26 or CR27.	Replace diode CR26 or CR27 (see schematic).
	Defective rectifier diodes CR19 or CR20.	Replace diode CR19 or CR20 (see schematic).
	Gap setting incorrect.	Reset gap (refer to paragraph 5-38).
13. Tension arm travel not enough for tape threading position.	Tension arm cable out of adjustment.	Adjust cable (refer to paragraph 5-57).
	Tension arm return spring deformed.	Replace spring (refer to paragraph 5-57).
14. Reel motor and vacuum unit motor do not shut off when tension arms are all the way out.	Switches S2 and S3 are out of adjustment.	Adjust switches S2 or S3 (refer to paragraph 5-57).
15. Reel motor and vacuum unit motor do not shut off when thread lever handle is opened.	Switch S1 is out of adjustment.	Adjust switch S1 (refer to paragraph 5-57).
16. Reel brakes do not release when thread lever handle is in thread position.	Switch S20 is out of adjustment.	Adjust switch (refer to paragraph 5-57).
	Reel brake is out of adjustment.	Adjust reel brake (refer to paragraph 5-44).
	Reel brake solenoid not receiving power.	Check power supply (see schematic).

TABLE 5-2.
TROUBLESHOOTING CHART (Continued)

SYMPTOM	POSSIBLE CAUSE	REMEDY
17. Power failure.	No power input.	Check power connections (refer to Section III).
	F1 or F2 10 amp fuse blown.	Replace fuse and check current (see schematic and refer to Section III).
18. No -24V, -60V and +60V power.	Blown fuse.	Replace fuse (refer to Section III).
		Check applicable diodes (see schematic).
19. No vacuum unit or capstan drive motor power; reel brakes stay on; fuses OK.	Defective safety relay K1.	Replace safety relay K1 (see schematic).
	24V power supply inoperative.	Check 24V power supply (see schematic).
20. Vacuum unit motor operates; fuses OK; no reel motor power present.	Defective diode CR10 or CR13 in reel motor supply.	Replace diode CR10 or CR13 and check circuit (see schematic).
	-60V power supply inoperative.	Check -60V power supply (see schematic).
	Relay contacts dirty.	Clean relay contacts.
21. Reel motor does not have full torque.	Defective relay K12 or K13.	Replace relay K12 or K13 (see schematic).
22. Power on, thread lever handle closed, relays do not energize, brakes do not release.	-24V power supply.	Check -24V power supply (see schematic).
	Switches S1, S2, or S3.	Replace switch or adjust switch actuator lever.

TABLE 5-2.
TROUBLESHOOTING CHART (Continued)

SYMPTOM	POSSIBLE CAUSE	REMEDY
23. Power on, thread lever handle closed, relays do not energize, brake release.	Switch S20.	Replace switch or adjust switch lever.
24. In fast rewind mode, tape loop in upper vacuum chamber increases and decreases in size.	Vacuum leak.	Check vacuum chamber door.
		Check tension arm.
25. In fast forward mode, tape loop in lower vacuum chamber increases in size.	Vacuum leak.	Check vacuum chamber door.
		Check tension arm.
26. One actuator is on and other actuator is fired on.	Buffer/interlock unit.	Replace buffer/interlock card (refer to Section VII).
27. One or both actuators are in ON position after power to tape transport has been disconnected.	Buffer/interlock unit.	Replace buffer/interlock card (refer to Section VII).
28. Slow tape speed.	Glazed capstan drive belt.	Replace belt.
	Line frequency.	Check source.
29. No light in photosensor head.	F1 0.25-amp, slo-blo fuse blown.	Replace fuse.
	+6VDC supply card.	Replace +6VDC supply card assembly.
	Lamp.	Replace head.
30. Photosensor hold circuit time is less than 100 milliseconds. (Hold circuit unit units only)	Phantastron packet.	Replace phantastron packet.
	Relay K1 in photosense.	Replace relay K1.

TABLE 5-3.
RELAY FUNCTION LIST

	RELAY	CONTACT	FUNCTION
K1	Safety Relay (Transport Electronics)	K1A	Applies 117 VAC to vacuum unit motor and capstan drive motor.
		K1B	Applies -24 VDC to pushbutton control assembly for operation of control relays.
		K1C	Optional circuit for use with remote equipment.
		K1D	Optional circuit for use with remote equipment.
		K1E	Applies -60 VDC to one side of reel motors.
K2	Capstan Drive Motor Speed Select (Manual Control Panel)	K2A	Applies 6.3 VAC to LOW or HIGH speed indicator.
		K2B & K2C	Applies 117 VAC to LOW or HIGH speed windings of capstan drive motor.
K3	Manual Fast Reverse (Manual Control Panel)	K3A	Holding contacts for relay K3.
		K3B	Operates K2.
		K3C	Operates K5.
K4	Manual Drive Forward (Manual Control Panel)	K4A	Applies control signal for forward actuator ON/OFF operation.
		K4B	Holding contacts for relay K4.
		K4C	Opens K5 coil circuit.
K5	Manual Drive Reverse (Manual Control Panel)	K5A	Applies control signal for reverse actuator ON/OFF operation.
		K5B	Holding contacts for relay K5.
		K5C	Opens K4 coil circuit.

TABLE 5-3.
RELAY FUNCTION LIST (Continued)

	RELAY	CONTACT	FUNCTION
K6	Manual Fast Forward (Manual Control Panel)	K6A	Holding contacts for relay K6.
		K6B	Operates K2.
		K6C	Operates K4.
K7	End Reel Sensing (Manual Control Panel)	K7A	Opens ground circuit of relay K1, placing transport in stand-by mode.
K8	Automatic/Manual (Manual Control Panel)	K8A	Opens manual command line.
		K8B	Removes ground from one side of T9.
		K8C	Opens K3, K4, K5, K6 relay circuits.
		K8D	Removes ground from one side of T8.
		K8E	Optional circuit.
K9	Overload (Transport Electronics)	K9A & K9B	Removes high voltage applied to V1, V12, V13, V14, V15.
		K9C	Optional circuit, used in conjunction with K1D.
K11	"Ready" Delay (Transport Electronics)	K11	Time delay before power is applied to transport power supply.
K12	Reel Speed Control (Transport)	K12	Applies power to upper Reel Motor clockwise winding.
K13	Reel Speed Control (Transport)	K13	Applies power to lower Reel Motor counterclockwise winding.

TABLE 5-3.
RELAY FUNCTION LIST (Continued)

	RELAY	CONTACT	FUNCTION
K14	Ready (Transport Electronics)	K14A	Applies -24 VDC to pushbutton assembly after a delay determined by K11.
		K14B	Holding contact for K14 coil.
		K14C	Activates +600 VDC supply after delay of K11.
		K14D	Ready indication of the (operation indication) circuit.
		K14E	Opens circuit of K11 heater for recycle.
K22	Reel Speed Control (Transport)	K22	Applies power to upper Reel Motor counterclockwise winding.
K23	Reel Speed Control (Transport)	K23	Applies power to lower Reel Motor clockwise winding.

5-51. REMOVAL AND REPLACEMENT PROCEDURES.

5-52. CAPSTAN ROLLER ASSEMBLY REMOVAL AND REPLACEMENT. See Figure 5-16 where the following steps are referenced:

Step 1: Loosen cap screw on actuator shaft support arm holding outboard bearing.

Step 2: Remove attaching hardware for outboard bearing.

Step 3: Remove attaching hardware and actuator shaft support arm with the outboard bearing intact.

Step 4: Loosen attaching hardware clamping capstan roller assembly to actuator shaft.

Step 5: Remove capstan roller assembly.

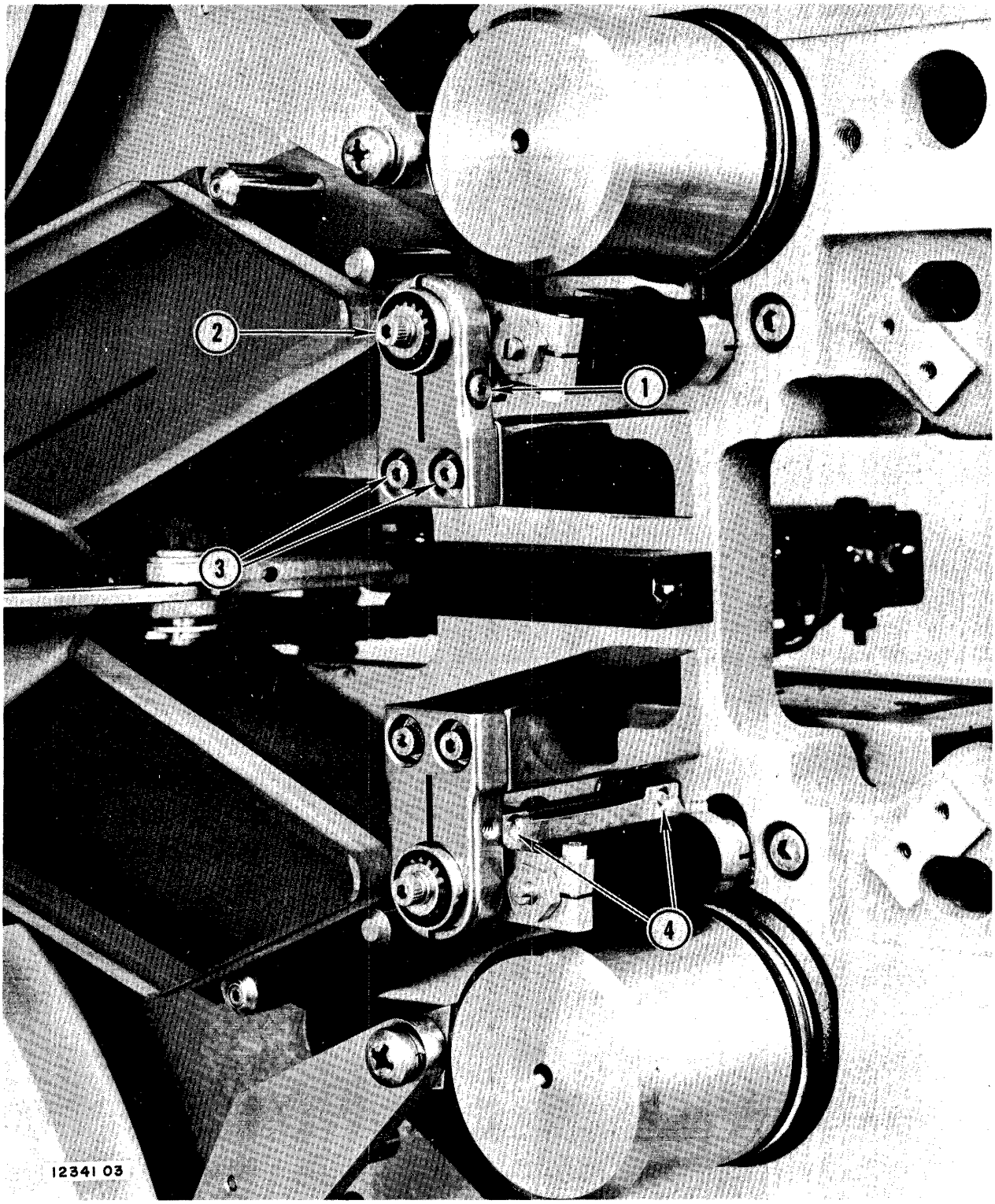


Figure 5-16.
Capstan Roller Assembly Removal

Step 6: Loosen attaching hardware clamping capstan roller shaft to yoke.

Step 7: Remove flanged sleeve.

NOTE

Record amount and location of shim washers at each end of capstan roller.

Step 8: Remove capstan roller shaft from capstan roller and yoke.

Step 9: Remove ball bearings from each end of capstan roller.

Step 10: Reassemble capstan roller and yoke by reversing the procedure of Steps 1 through 9.

Step 11: Adjust capstan roller parallelism and gap prior to placing the tape transport in service. (Refer to paragraph 5-33.)

5-53. CAPSTAN REMOVAL AND REPLACEMENT.

WARNING

Disconnect electrical power to prevent injury to personnel or damage to equipment.

Step 1: Perform Steps 1 through 4 of paragraph 5-52, Capstan Roller Assembly Removal and Replacement.

Step 2: Remove capstan drive belt. (Refer to paragraph 5-54.)

Step 3: Remove transport cable assembly fanning strip from actuator terminal board.

Step 4: Remove attaching hardware from actuator.

Step 5: Remove attaching hardware from capstan.

Step 6: Remove capstan and actuator together.

Step 7: Reassemble capstan by reversing the procedure of Steps 1 through 6.

Step 8: Adjust capstan and capstan roller parallelism and gap prior to placing tape transport in service. (Refer to paragraph 5-33.)

5-54. CAPSTAN DRIVE BELT REPLACEMENT AND ALIGNMENT. See Figures 5-17a & b where the following steps are referenced.

Step 1: Remove capstan drive belt by moving belt idler pulley to obtain slack in drive belt.

Step 2: Replace drive belt by installing it on pulleys and taking up slack with belt idler pulley.

Step 3: Visually check alignment of belt and pulleys. Belt should track in a straight line, with tape transport running.

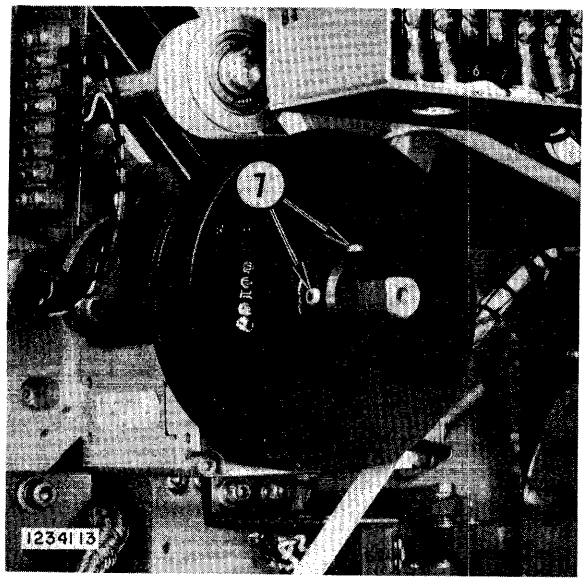


Figure 5-17a.

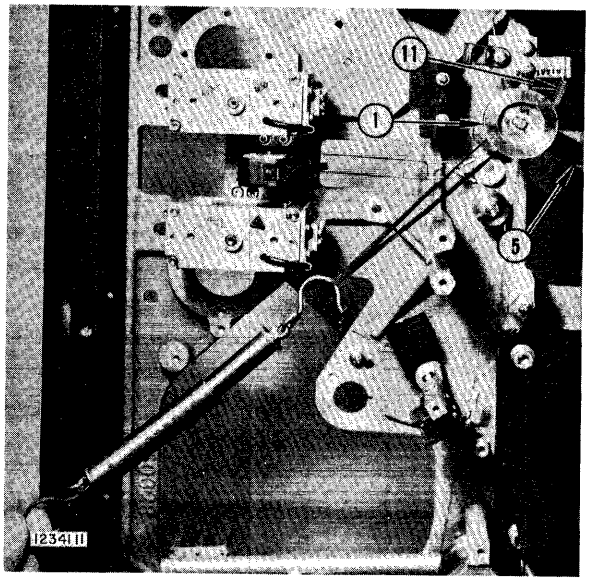


Figure 5-17b.

Capstan Drive Belt Removal

NOTE

If any alignment is needed, use the following procedure.

Step 4: Remove belt.

Step 5: Turn idler arm so that pulleys of idler arm and capstan drive motor are together and matched.

Step 6: Use an Allen wrench to loosen set screws in capstan drive motor pulley and adjust to line up with idler arm pulley.

Step 7: Use an Allen wrench to loosen set screws on either or both capstan drive pulleys and align with belt roller assembly pulley (#7, Figure 5-17a).

Step 8: Make a loop of nylon twine approximately 18 inches from center to center.

Step 9: Place one end of loop around belt idler arm and hook other end of the loop to scale.

Step 10: Pull scale at a 90° angle to belt idler arm until there is an indication of slack in belt. The scale should read 25 oz. ±2 oz.

Step 11: When any other reading is obtained, loosen screw on bracket holding tension spring and raise bracket to increase or lower bracket to decrease the tension. Repeat until proper scale reading is obtained.

Step 12: Reinstall belt and repeat Step 3.

5-55. SERVO CONTACTOR REMOVAL AND REPLACEMENT. See Figure 5-18 where the following steps are referenced:

WARNING

Disconnect electrical power to prevent injury to personnel or damage to equipment.

Step 1: Remove cover from servo assembly.

Step 2: Remove centering spring from center leaf of contactor assembly.

Step 3: Disconnect cable leads from terminal board in servo control box assembly.

Step 4: Remove attaching hardware holding cable clamp and cable to servo control box assembly.

NOTE

Do not let lower dashpot piston drop out of cylinder when lower servo contactor is removed.

Step 5: Loosen set screw holding dashpot connecting rod stiffener to contactor assembly.

Step 6: Loosen cap screw clamping contactor assembly on tension arm mounting shaft, and remove contactor assembly.

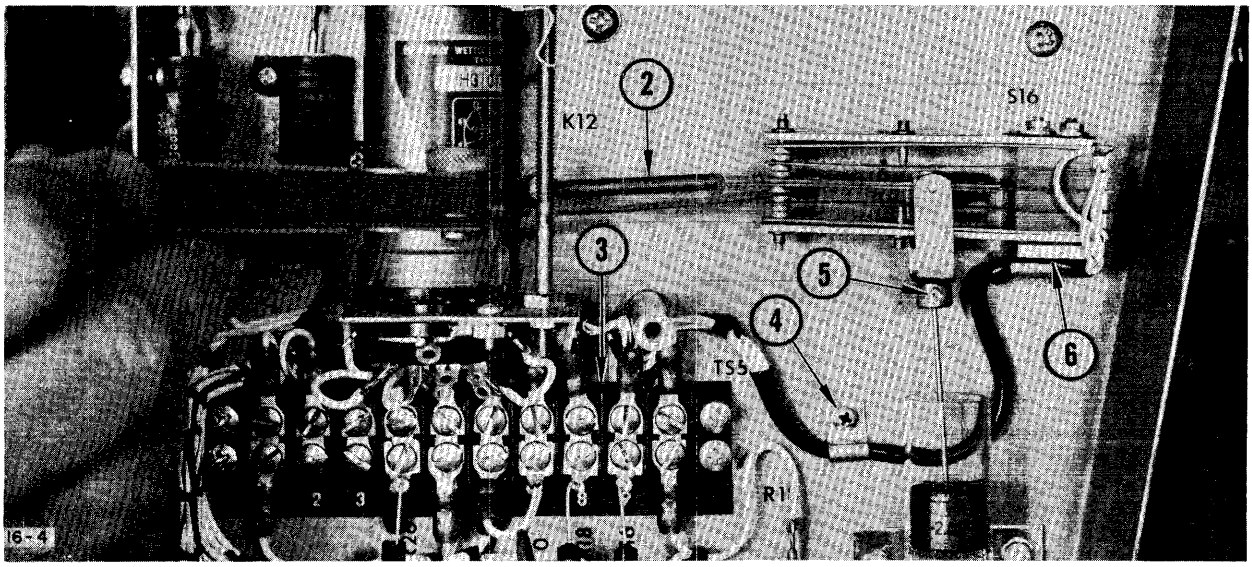


Figure 5-18.
Servo Contactor Removal

Step 7: Reassemble the servo contactor assembly by reversing Steps 1 through 5.

Step 8: Adjust servo contactor. Refer to paragraph 5-38.

5-56. DASHPOT REMOVAL AND REPLACEMENT.

Step 1: Loosen set screw holding dashpot connecting rod stiffener to contactor assembly.

Step 2: Remove attaching hardware holding dashpot to mounting bracket.

Step 3: Reassemble dashpot by reversing Steps 1 and 2.

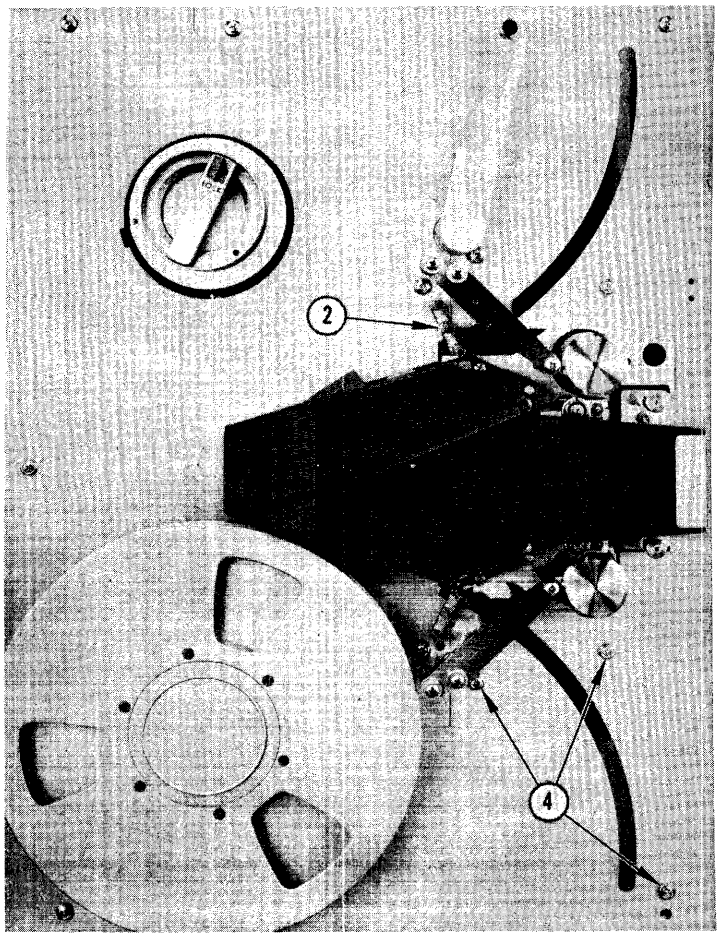


Figure 5-19a.
Tension Arm Assembly Removal and Replacement

Step 4: Adjust dashpot. Refer to paragraph 5-39.

5-57. TENSION ARM MOUNTING ASSEMBLY AND TAPE GUIDES REMOVAL AND REPLACEMENT. See Figures 5-19a through 5-19e where the following steps are referenced.

WARNING

Disconnect electrical power to prevent injury to personnel or damage to equipment.

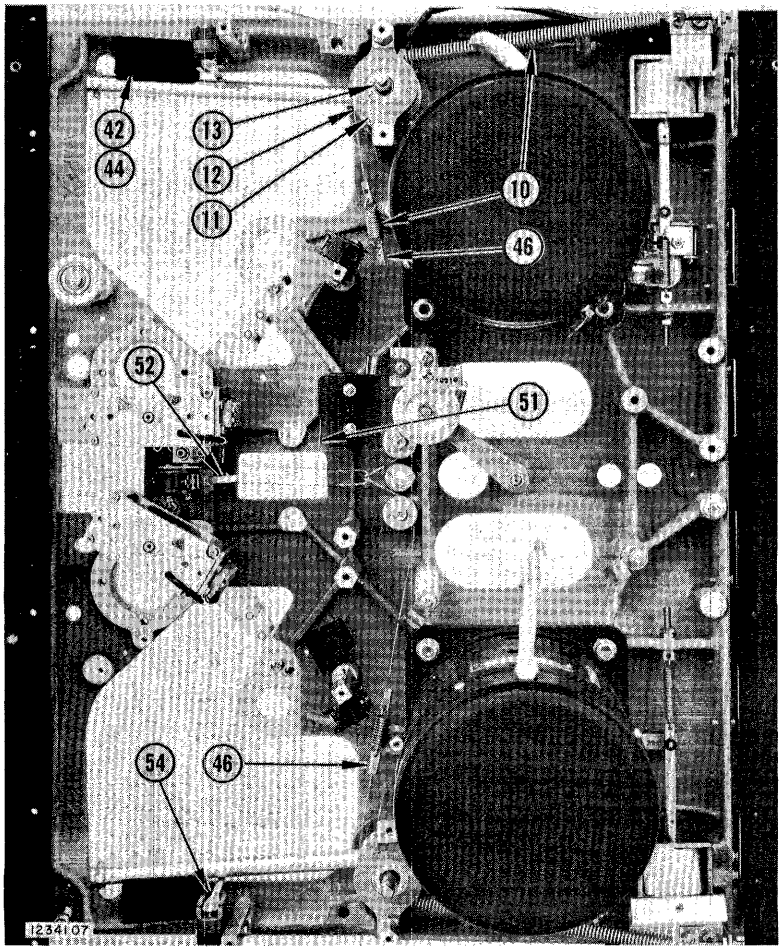


Figure 5-19b.
Tension Arm Assembly Removal and Replacement

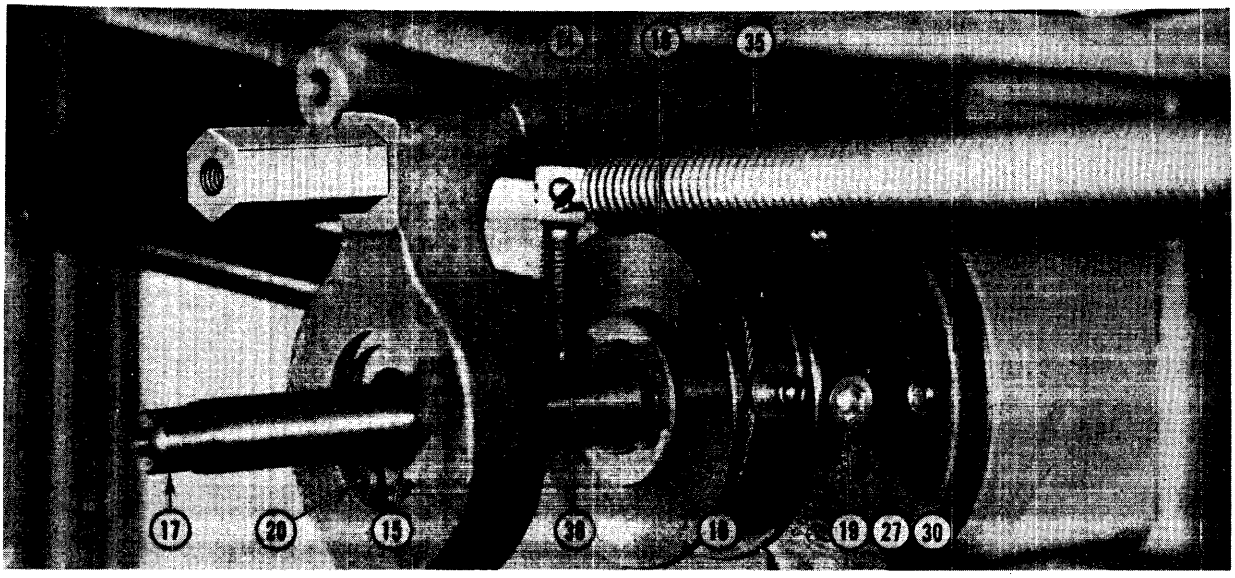


Figure 5-19c.
Tension Arm Assembly Removal and Replacement

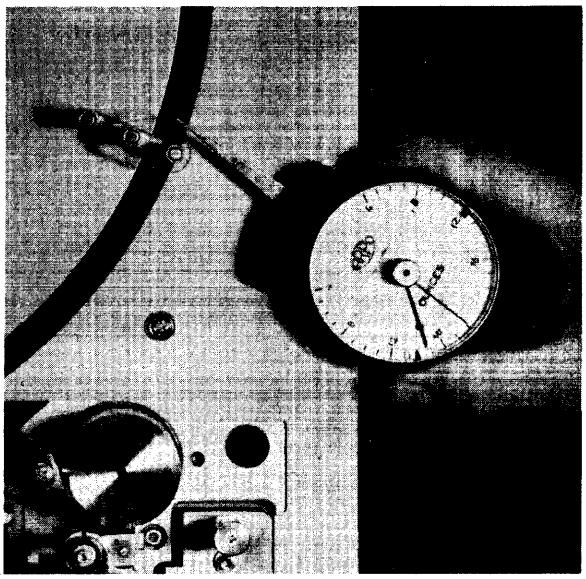


Figure 5-19d.
Tension Arm Assembly
Removal and Replacement

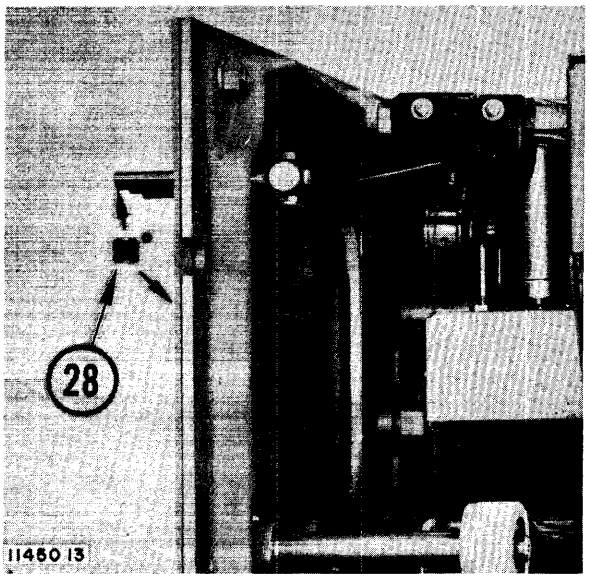


Figure 5-19e.
Tension Arm Assembly
Removal and Replacement

Step 1: Remove supply reel.

Step 2: Remove attaching hardware and tension arm tape guide assembly from tension arm.

Step 3: Pull thread lever handle to open to thread position.

Step 4: Remove attaching hardware and right hand half of overlay plate.

Step 5: Pull back to unlock and place thread lever handle in closed position.

Step 6: Remove cover from servo assembly.

CAUTION

Cover cylinder of dashpot to prevent piston from dropping out or dirt from entering cylinder.

Step 7: Complete Step 1, Removal and Replacement of Dashpot.

Step 8: Complete Steps 1 and 5 only, Removal and Replacement of Servo Contactor.

Step 9: Remove attaching hardware and servo assembly (lay it aside).

Step 10: Disconnect long cable assembly from buffer arm cable spring and helical extension spring.

Step 11: Remove attaching hardware and tension arm mounting assembly from transport frame.

NOTE

The following Steps 12 through 20 will be used when removing and replacing parts in tension arm mounting assembly.

Step 12: Remove long cable assembly from cable pulley.

Step 13: Remove internal retaining ring, flat retaining washer, and ball bearing washer from servo contactor end of tension arm shaft.

Step 14: Remove spade bolt from tension arm shaft.

Step 15: Remove ball bearing from servo contactor end of tension arm shaft.

Step 16: Remove external retaining ring and flat washer mounting cable pulley on tension arm shaft.

Step 17: Remove tension arm shaft from tension arm bracket.

Step 18: Remove cable pulley from tension arm shaft.

Step 19: Remove ball bearing from transport end of tension arm shaft.

Step 20: Remove internal retaining ring from tension arm bracket.

Step 21: Reassemble tension arm mounting assembly by reversing the procedure of Steps 12 through 16.

Step 22: Reassemble the tension arm mounting assembly by reversing the procedure of Steps 1 through 8.

Step 23: Adjust servo contactor. Refer to paragraph 5-38.

Step 24: Adjust dashpot. Refer to paragraph 5-39.

Step 25: Loosen tension arm at end of tension arm shaft, using a 5/32-inch Allen wrench.

Step 26: With tension arm in line with tape guide rollers on stationary tape guide, adjust tension arm length manually until a clearance of 1/16 ±1/16-inch is obtained between each roller.

Step 27: Using 5/32-inch Allen wrench, tighten locking screw enough to hold tension arm in place.

Step 28: Move tension arm to top of its travel. Place a 90° angle base on cover plate. Check tension arm tape guide rollers to assure an angle of 90° to cover plate. Tighten tension lock screw.

Step 29: If needed, gently turn tension arm until rollers are at 90° to cover plate.

Step 30: Recheck clearance setting made in Step 26. If this clearance has not changed, tighten tension arm locking screw to 45 to 50 inch-ounces torque.

Step 31: Place dynamometer adaptor on tension arm rollers (Ampex Part No. T1154MR-1).

Step 32: Holding dynamometer in right hand, place tension arm in center of travel in its arc (marked on cover plate by a small indention) and dynamometer lever point in adaptor groove. (See Figure 5-19d.)

Step 33: Hold tension arm, keeping dynamometer at a 90° angle to tension arm. The scale should read 13 to 15 ounces. If any other reading is obtained, use the following procedure for adjustment.

Step 34: Disconnect tension spring from spade bolt screwed into tension arm shaft.

Step 35: Loosen lock nut on spade bolt. Hold spade bolt in position.

Step 36: If tension is below 13 ounces, screw spade bolt out of shaft. If tension is above 15 ounces, screw spade bolt into shaft.

Step 37: Hold spade bolt in new position and tighten lock nut.

Step 38: Connect tension spring to spade bolt.

Step 39: Repeat Steps 30 through 32.

Step 40: With tension arms against bumper, check that rollpin in large cable pulley of tension arm mounting assembly is resting against tension arm. If rollpin is not resting against tension arm, adjust as detailed below.

Step 41: With tension arms placed against bumper, pull thread lever handle open. Tension arms should start to move to tape threading position when thread lever handle has been moved approximately 1/2-inch. If one or both tension arms fail to respond in the above described manner, adjust as detailed below.

Step 42: Open thread lever handle. Tension arms should move to tape threading position on a direct line with vacuum chamber guides. A minimum distance of 1/2-inch is required between tension arm and stationary tape guides.

NOTE

If tension arms do not line up with the vacuum chamber guides, adjust as detailed in Steps 43 through 54.

Step 43: With thread lever resting against stop (operating position), place tension arm against tension arm bumper.

Step 44: Check rollpin in large cable pulley of tension arm mounting assembly to be sure that it is resting against tension arm. If not, loosen cable clamping screws on large cable pulley.

Step 45: Starting at point where cable connects to thread lever and working towards large cable pulley, slip cable back and forth until all slack between tension arm shaft of the tension arm mounting assembly and cable equalizing spring is removed.

Step 46: Slowly open thread lever handle to tape thread position.

Step 47: Measure travel distance of thread lever handle as it leaves stop in closed position. At a distance of between 1/2-inch and 1-inch of travel, thread lever handle switch should de-energize brake solenoids and safety relay K1.

Step 48: Bend, but do not twist, actuating arm of thread lever handle switch until proper thread lever handle travel is obtained.

Step 49: Open thread lever handle. The switch must energize brake solenoids after thread lever handle has traveled one-half of distance between closed position and just prior to full locked open position.

Step 50: Observe actuating arm of switch to ensure arm clears pawl and will not cause a malfunction of thread lever handle operations.

Step 51: Bend, but do not twist, actuating arm of tape brake switch until proper thread lever handle travel is obtained.

Step 52: Move tension arm gently in its arc, toward tension arm bumper from back of casting. The tension arm should actuate limit switch 1/8-inch ±1/16-inch and turn off electrical power before tension arm rests against tension arm bumper.

Step 53: Bend, but do not twist, actuating arm of limit switch up or down to increase or decrease distance.

Step 54: Repeat Step 42.

5-58. REEL MOTOR ASSEMBLY AND BRUSHES REMOVAL AND REPLACEMENT.

NOTE

Steps 12 through 14 are used for removal and replacement of reel motor brushes. Brushes may be replaced with reel motor mounted to tape transport.

Step 1: Remove reel (supply or takeup) of reel motor to be replaced.

WARNING

Disconnect electrical power to prevent injury to personnel or damage to equipment.

Step 2: Remove reel motor fanning strip from tape transport terminal.

Step 3: Remove attaching hardware and reel motor from tape transport plate.

CAUTION

Do not re-use any shims found under reel hub and mounting flange of reel motor.

Step 4: Remove reel hold-down knob assembly and shims.

Step 5: Install reel hold-down knob assembly without shims.

Step 6: Install reel motor without shims.

Step 7: Thread tape on tape transport.

CAUTION

Careful observation is needed to prevent damage to tape or tape transport.

Step 8: Program tape transport forward and reverse, observing tape tracking at reel of newly installed reel motor.

NOTE

Use Step 9 or 10 as required by Step 8.

Step 9: If tape rubs rear flange of reel, shims are needed between reel motor mounting flange and tape transport plate. Put the same size and number of shims under each mounting flange hole to keep reel motor and turntable in a parallel plane to overlay plate. Shims are necessary until proper tape tracking is achieved.

Step 10: If tape rubs front flange of reel, shims are needed between reel hold-down assembly and turntable. Shims are necessary until proper tape tracking is achieved.

Step 11: Repeat Steps 8, 9, or 10 until tape tracking is correct.

Step 12: Remove attaching hardware and dust cover from reel motor.

Step 13: Remove attaching hardware, lift spring up, and remove reel motor brush.

Step 14: Reassemble reel motor brushes by reversing Steps 12 and 13.

5-59. REEL BRAKE SHOE REMOVAL AND REPLACEMENT. (See Figure 5-14.)

WARNING

Disconnect electrical power to prevent injury to personnel or damage to equipment.

Step 1: Remove reel motor (refer to paragraph 5-58), upper reel motor, upper brake shoe, lower reel motor, lower brake shoe.

Step 2: Loosen reel brake lock nut and adjusting nut.

Step 3: Remove tension spring.

Step 4: Remove cap screw and bushing from pivot end of brake shoe.

Step 5: Remove cotter pin, washer, and disconnect brake from link.

Step 6: Reassemble reel brake shoe assembly by reversing Steps 1 through 5.

Step 7: Adjust reel brake assembly (refer to paragraph 5-44).

5-60. VACUUM UNIT MOTOR, FILTER AND BRUSHES REMOVAL AND REPLACEMENT. See Figure 5-20 where the following steps are referenced:

CAUTION

Filter must be thoroughly dry before installation or damage to equipment may result.

Step 1: Unlatch lever arm which holds filter in motor housing assembly.

Step 2: Remove filter using the two loops attached.

Step 3: Reassemble filter by reversing Steps 1 and 2.

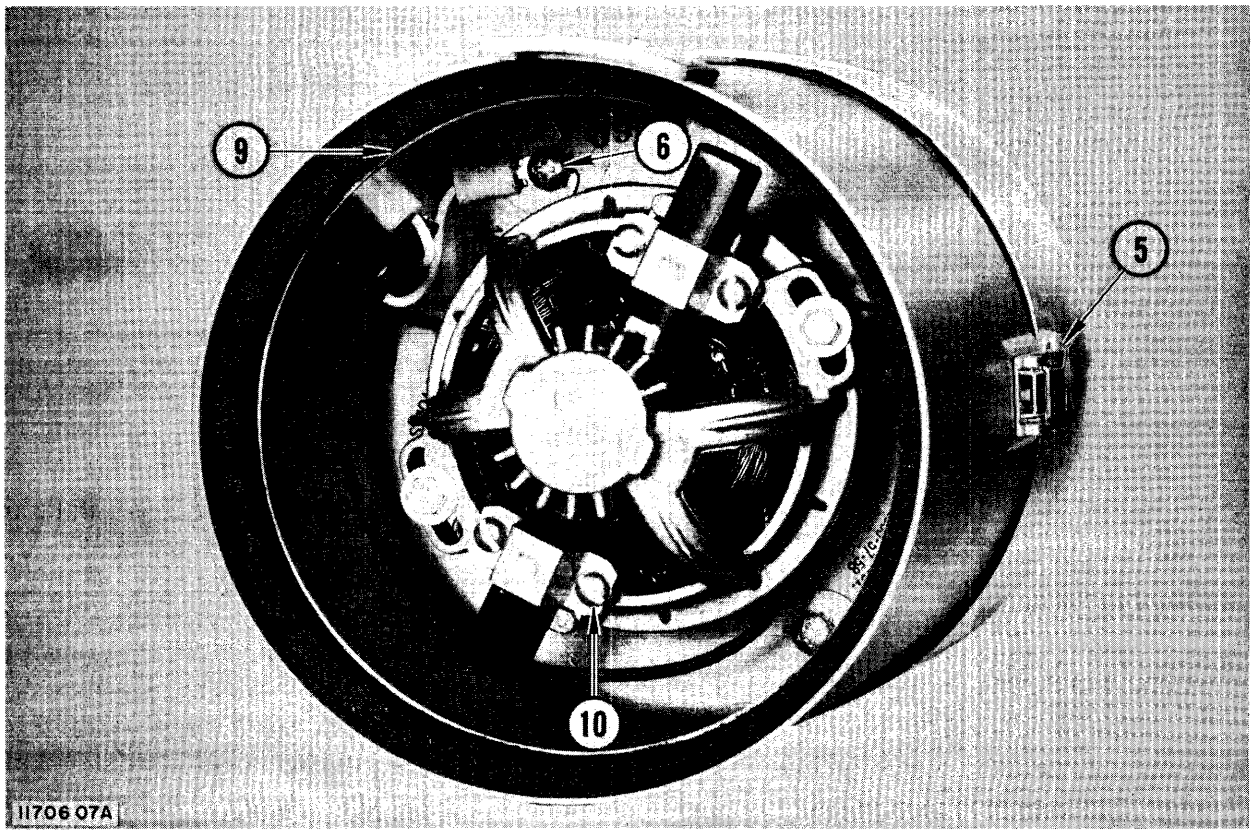


Figure 5-20.
Vacuum Unit Motor and Brushes Removal and Replacement

NOTE

Steps 4 through 9 shall be used for the removal and replacement of the vacuum unit motor.

Step 4: Disconnect power cable at vacuum unit motor assembly.

Step 5: Unsnap latches on motor housing assembly and remove this assembly from mounting bracket.

NOTE

If spare vacuum is available, replace old unit with spare at this point and continue maintenance procedure without affecting transport downtime.

Step 6: Loosen screws attaching vacuum unit motor to motor housing.

Step 7: Rotate vacuum unit motor until attaching hardware is clear of slotted bracket.

Step 8: Remove vacuum unit motor from motor housing assembly just far enough to take up slack in wires of chassis connector plug.

Step 9: Squeeze nylon clips together and remove chassis connector plug from motor housing assembly.

NOTE

Steps 10 through 13 shall be used for removal and replacement of vacuum unit motor brushes.

Step 10: Remove attaching hardware holding brush holder to motor frame.

Step 11: Remove wire connected tab from brush housing, taking care not to break the connection.

Step 12: Reassemble brush holder to motor frame.

Step 13: Repeat Steps 10 through 12 for second brush.

Step 14: Reassemble vacuum unit by reversing Steps 1 through 14.

5-61. VACUUM CHAMBER AND THREAD LEVER ASSEMBLY REMOVAL AND REPLACEMENT.

WARNING

Disconnect electrical power to the tape transport to prevent injury to personnel or damage to equipment.

Step 1: Remove vacuum unit motor (refer to paragraph 5-60).

Step 2: Remove attaching hardware and blower bracket.

Step 3: Remove blower tube.

Step 4: Place thread lever handle in operation position.

Step 5: Disconnect short cable assembly from cable spring.

CAUTION

Be sure not to let the vacuum chamber and thread lever handle assembly, which come off together, fall from the tape transport.

Step 6: Remove attaching hardware from vacuum chamber. When removing vacuum chamber and thread lever handle assembly from tape transport plate, the assembly must be tilted to permit attaching linkage to be lifted through opening in tape transport plate.

Step 7: Reassemble vacuum chamber and thread lever handle assembly by reversing Steps 1 through 6.

Step 8: Adjust vacuum chamber. Refer to paragraph 5-36.

5-62. **ACTUATOR REMOVAL AND REPLACEMENT.** Removal and replacement of the actuator is identical to paragraph 5-53, Capstan Removal and Replacement.

5-63. **HEAD CABLE AND BOX ASSEMBLY REMOVAL AND REPLACEMENT.**

WARNING

Disconnect electrical power to prevent injury to personnel or damage to equipment.

Step 1: Disconnect head cables from head box.

Step 2: Remove cover from servo control assembly.

Step 3: Remove attaching hardware and box assembly from servo control assembly.

Step 4: Remove attaching hardware and cable retainer from box assembly.

Step 5: Remove attaching hardware from female receptacle connector.

Step 6: Push cable assembly into box approximately 2 inches; lift female receptacle connector off box assembly.

Step 7: Tilt female receptacle connector downward so that it is parallel to cable assembly. Gently push female receptacle connector through slot opening in box assembly, at the same time gently pull cable assembly out of box assembly.

Step 8: Reassemble head cable and box assembly by reversing Steps 1 through 7.

Step 9: Make a continuity check of cable assembly prior to placing in operation.

5-64. CAPSTAN DRIVE MOTOR AND MOTOR CAPACITOR REMOVAL AND REPLACEMENT. (See Figure 5-21.)

WARNING

Disconnect electrical power to prevent injury to personnel or damage to equipment.

Step 1: Remove capstan drive motor fanning strip from terminal strip.

Step 2: Remove capstan drive belt (refer to paragraph 5-54).

Step 3: Remove attaching hardware and lay aside terminal mounting strip bracket.

Step 4: Remove attaching hardware and capstan motor bracket from tape transport plate.

Step 5: Unsolder leads from capacitor to motor.

Step 6: Loosen set screws and remove pulley.

Step 7: Remove attaching hardware and capstan drive motor from capstan motor bracket.

Step 8: Remove attaching hardware and motor capacitor from capstan motor bracket.

Step 9: Reassemble capstan drive motor assembly by reversing Steps 1 through 8.

Step 10: Adjust capstan drive belt. Refer to paragraph 5-54.

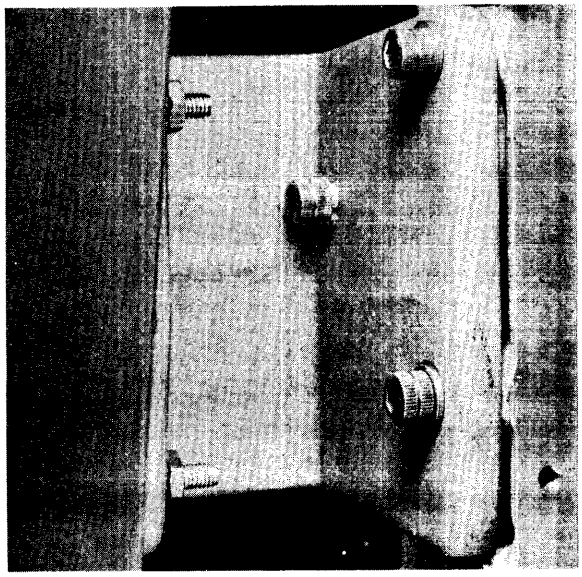


Figure 5-21.
Capstan Drive Motor Bracket

5-65. VACUUM CHAMBER DOOR REMOVAL, REPLACEMENT AND ALIGNMENT. See Figure 5-22 where the following steps are referenced:

NOTE

Do not move the hinge block. If hinge block is moved, vacuum chamber door will have to be aligned.

Step 1: Open vacuum chamber door.

Step 2: Remove set screw in hinge block.

Step 3: Remove hinge pin, being very careful not to move hinge block and vacuum chamber door.

NOTE

Steps 4 through 6 shall be used to align vacuum chamber door.

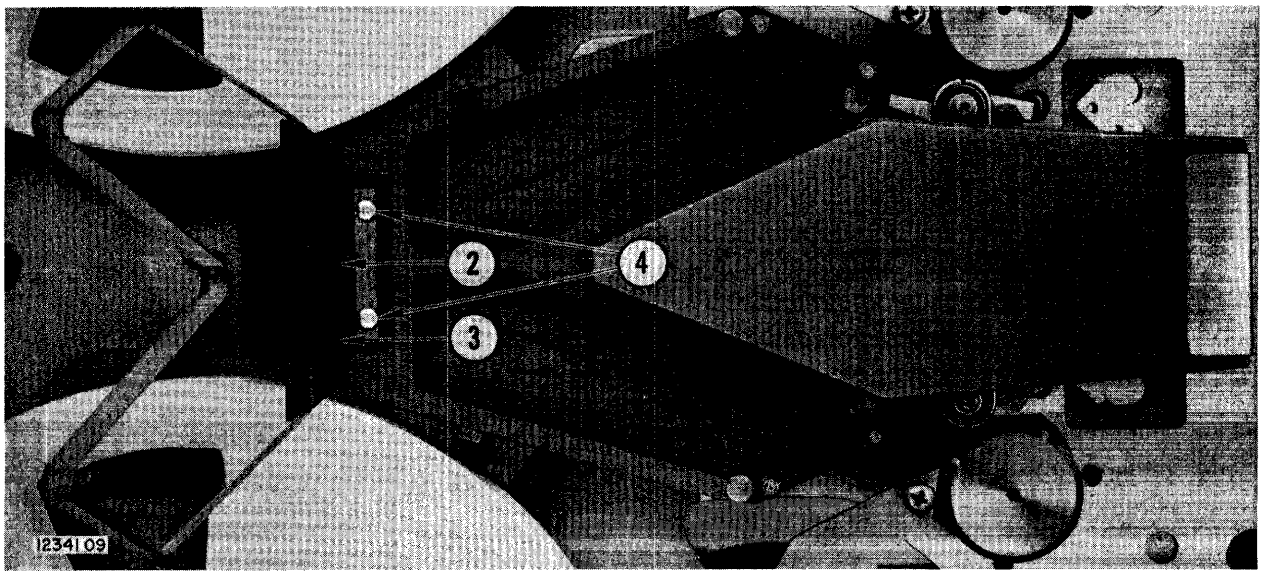


Figure 5-22.
Vacuum Chamber Door Removal

Step 4: Loosen attaching hardware holding hinge block to vacuum chamber.

NOTE

Steps 5 and 6 must be done together.

CAUTION

Care must be taken when moving the vacuum chamber door to avoid scratching in the thread lever assembly.

Step 5: Slide vacuum chamber door as close as possible in a vertical plane to thread lever handle without interfering with the operation of thread lever handle.

Step 6: Slide vacuum chamber door up and down in a vertical plane until the opening between vacuum chamber door and tape guide pins is an equal distance for the upper half and the lower half of the vacuum chamber door.

Step 7: Reassemble vacuum chamber assembly by reversing Steps 1 through 6.

Step 8: Prior to placing tape transport in service, check and adjust tape tracking (refer to paragraph 5-36).

5-66. ACTUATOR BOARD ASSEMBLY REMOVAL AND REPLACEMENT.

WARNING

Disconnect electrical power to prevent injury to personnel or damage to equipment.

Step 1: Disconnect all connectors at transport electronics chassis assembly.

Step 2: Remove attaching hardware and chassis cover from tape transport.

Step 3: Remove attaching hardware and etched board cover from electronics chassis assembly.

Step 4: Remove tube shield and thyratron tube from etched board assembly.

Step 5: Remove attaching hardware and etched board assembly from electronics chassis assembly.

Step 6: Reassemble actuator board assembly by reversing Steps 1 through 5.

5-67. PHOTOSENSOR HEAD ASSEMBLY REMOVAL AND REPLACEMENT. See Figure 5-23 where the following Steps 1 and 2 are referenced.

WARNING

Disconnect electrical power to prevent injury to personnel or damage to equipment.

Step 1: Disconnect photosensor head cable from terminal strip.

Step 2: Remove hollow stud from photosensor head assembly.

Step 3: Gently draw the photosensor head cable through hollow stud.

NOTE

Photosensor head must be mounted with bottom surface parallel to edge of mounting base of head assembly and 5/32 ± 1/32-inch from tape.

Step 4: Reassemble photosensor head assembly by reversing Steps 1 through 3.

5-68. HEAD ASSEMBLY REMOVAL AND REPLACEMENT.

Step 1: Remove tape from head assembly.

Step 2: Disconnect read and/or write cable connectors.

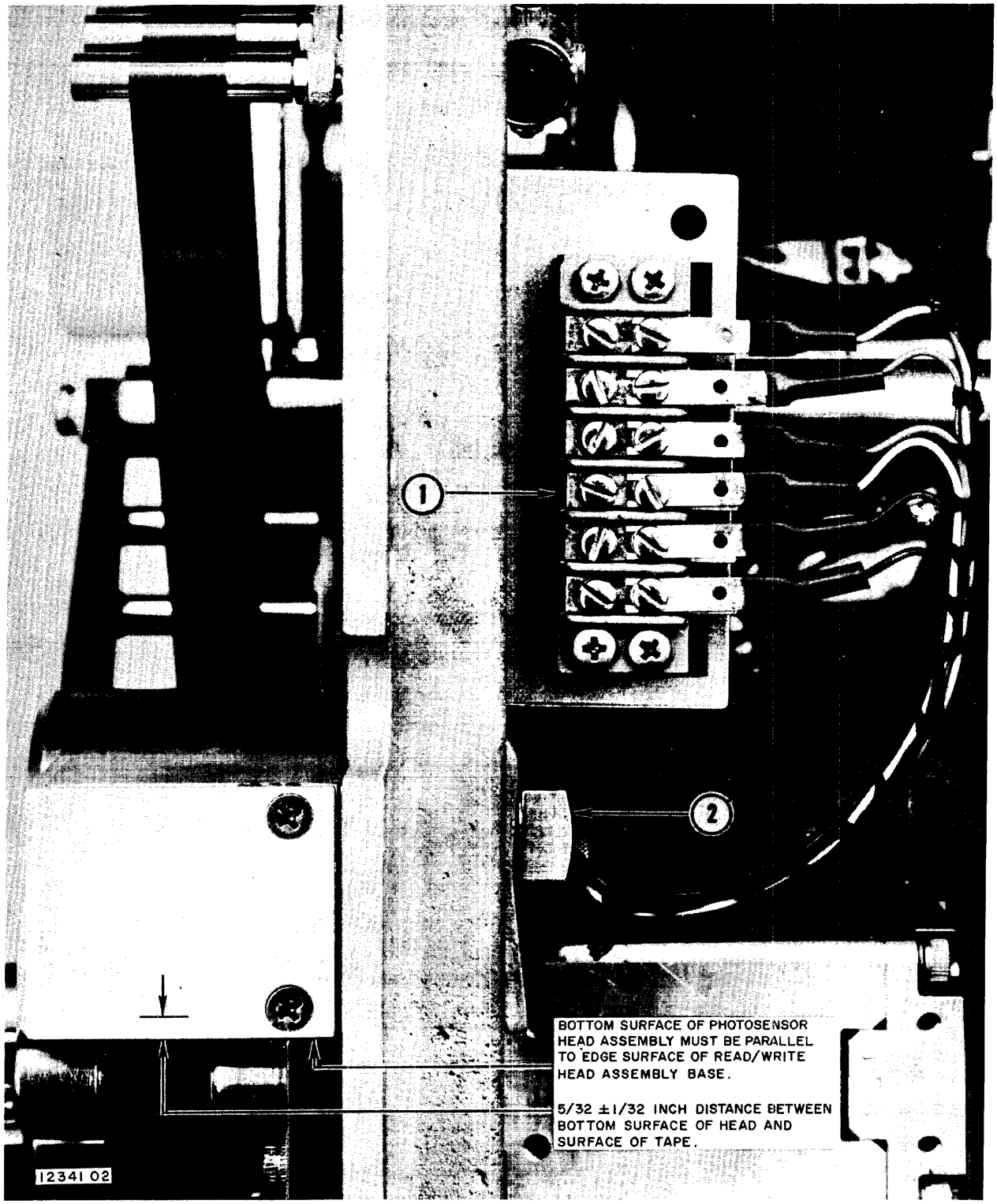


Figure 5-23.
Photosensor Head Assembly Removal and Replacement

Step 3: Remove attaching hardware and cable clamp from tape transport.

Step 4: Remove attaching hardware and head assembly from tape transport plate.

Step 5: Reassemble head assembly by reversing Steps 1 through 4.

Step 6: Prior to placing the tape transport in operation, the procedures in paragraph 5-36 (checkout for tape tracking) must be performed.

5-69. WRITE ENABLE SWITCH ASSEMBLY REMOVAL AND REPLACEMENT.

WARNING

Disconnect electrical power to prevent injury to personnel or damage to equipment.

Step 1: Unlock, swing open and lock open tape transport.

Step 2: Remove write-enable-switch fanning strip from terminal strip.

Step 3: Remove attaching hardware and lay aside terminal strip mounting bracket, for TS-1 and TS-2, from transport frame (vertically-mounted, long terminal strips directly behind brake solenoid).

Step 4: Disconnect brake solenoid spring.

NOTE

Perform Steps 5 and 6 for removal and replacement of rotary solenoid.

Step 5: Unsolder solenoid leads.

Step 6: Remove attaching hardware and rotary solenoid from mounting bracket.

NOTE

Use Steps 7 through 9 for removal and replacement of actuator switch.

Step 7: Unsolder solenoid leads.

Step 8: Loosen attaching hardware and remove actuator switch from mounting bracket.

Step 9: Unsolder switch leads from fanning strip.

Step 10: Reassemble write enable switch assembly by reversing Steps 1 through 9.

Step 11: Prior to placing transport in operation, complete procedures in paragraph 5-45.

5-70. TAPE PACKER ARM REMOVAL AND REPLACEMENT.

5-71. REMOVAL.

Step 1: Remove the extension spring and connecting rod from the bracket on the rear of the transport.

Step 2: Loosen the set screw in the packer arm handle and remove the crank from the rear of the transport and the packer arm.

Step 3: Remove the three screws from the body assembly. Remove the body assembly from the front of the transport and the clamp and bracket from the rear of the transport.

5-72. INSTALLATION.

Step 1: Attach the spade bolt to the bracket, placing one hex nut on each side of the bracket flange.

NOTE

In the following step, the screws should be loose enough to allow the body assembly to be rotated slightly in the transport frame. The screws will be tightened after the adjustment procedure is complete.

Step 2: Mount the clamp and bracket on the rear of the transport and the body assembly on the front of the transport, using the three screws and washers provided. Orient the bracket to the 25° reference angle shown in Figure 5-24.

Step 3: From the rear of the transport, insert the crank shaft into the body assembly.

Step 4: Insert the connecting rod through the hole in the bracket flange and connect to the pivot on the crank (Figure 5-24).

Step 5: Connect the short end of the extension spring to the spade bolt and the long end to the pivot on the crank as shown in Figure 5-24.

Step 6: Place the packer arm on the shaft (Figure 5-24) with the set screw in line with the indentation in the shaft. Compress the packer arm and crank assembly to remove lateral play and tighten the set screw on the packer arm handle.

Step 7: Check the clearance between the packer arm shoe and the reel hub. The shoe shall clear the reel hub by 1/16 ±1/64-inch. If the clearance is correct, proceed to Step 10. If the clearance is insufficient, proceed to Step 8.

Step 8: Rotate the bracket on the rear of the transport counterclockwise as far as possible to obtain maximum clearance between the packer arm shoe and the reel hub.

Step 9: Place a feeler gauge between the packer arm shoe and the reel hub and rotate the bracket clockwise until the clearance is 1/16 ±1/64-inch.

Step 10: Loosen the set screw and remove the packer arm from the shaft.

Step 11: Tighten the three screws in the body assembly until the assembly is secure in the transport frame.

Step 12: Install the packer arm on the shaft. Recheck the shoe clearance and see that the connecting rod in the bracket trips the switch when the packer arm is in the fully open position.

5-73. TAPE CLEANER, TAPE CLEANER BLADE REMOVAL AND REPLACEMENT.

NOTE

If only blade replacement is needed do not remove cleaner but follow Steps 3, 4 and 5 only.

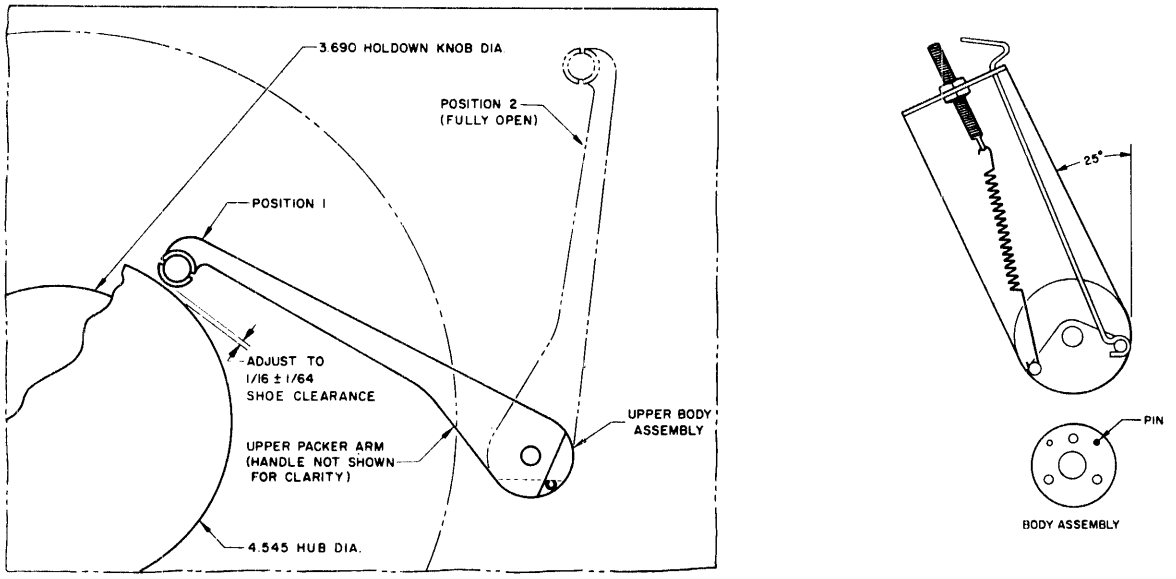


Figure 5-24.
Packer Arm Removal and Replacement

Step 1: With power OFF and tape removed from the tape cleaner guide, remove the screw that holds the tape cleaner and magnetic head to the base plate.

Step 2: Remove the tape cleaner.

Step 3: Use an Allen wrench to remove cartridge retaining screw and remove cartridge from base.

Step 4: Loosen the two small screws holding the blade to the cartridge. Discard old blade and slide new blade into position under the screw heads. Tighten screws.

Step 5: Replace cartridge (locating pin fits hole in base plate) and retaining screw.

Step 6: Locate the tape cleaner as shown in Figure 5-25 and install the magnetic head hold-down screw complete with flat washer and lockwasher. Half-tighten the screw.

Step 7: Thread the tape as shown in Figure 5-25 and check the tape path between upper capstan and capstan roller; pivot the cleaner on the hold-down screw so that the tape does not touch the capstan roller but may make light contact with the capstan. Tighten the hold-down screw.

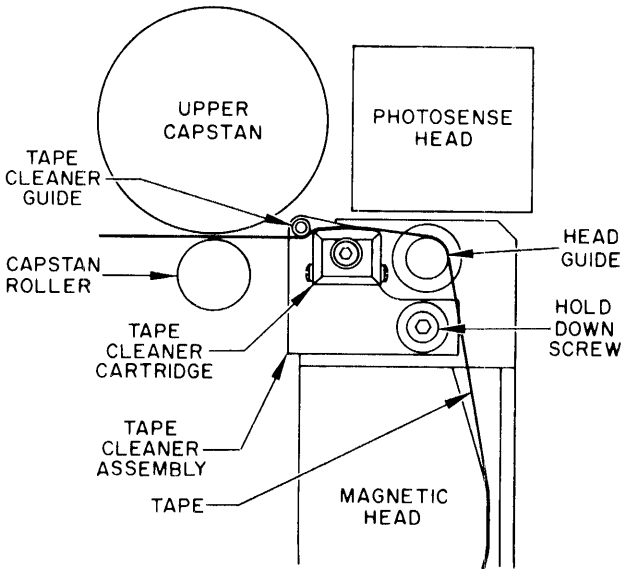


Figure 5-25.
Tape Cleaner Installation

Step 8: Check photosense (if used).

5-74. TOOLS AND TEST EQUIPMENT.

5-75. Table 5-4 lists the general nature of tools and test equipment required to maintain the TM-4. Manufacturer's names and numbers are given only as a guide; any equivalent tools or test equipment may be used.

TABLE 5-4.
SUGGESTED TOOLS AND TEST EQUIPMENT

Tool	Recommended Equipment
Allen wrench set, handled, 0.35" through 1/8"	Allen #6075
Center punch, 5/16" x 4"	Hargrove #284-5/16
Plastic hammer	Stanley #593
Ball-peen hammer	Stanley #306B
Socket, 12pt, 3/8-inch drive	Williams #B-1218
1/4" to 3/8" drive adaptor	Proto #5256
1/4" extension drive 14" long	Proto #4763
"T" handle, 1/4" drive	Proto #4785
Scale, 6" steel	Starrett #384
Soldering aid	Walsco #2530
Scribe	Starrett #70A
Screw starter screwdriver	Pearson #3
Scissors, 2-1/2" blade	Wiss #173E
Open end wrench set, 15° and 75° 3/16" through 5/8"	Williams #1142PR
Tube puller	G.C. #9130
Pen light	
Standard screwdriver set	Snap-On #SD-130-K
Stub screwdriver, small	Xcelite #R-184
Soldering iron	

TABLE 5-4.
SUGGESTED TOOLS AND TEST EQUIPMENT (Continued)

Tool	Recommended Equipment
Stub screwdriver, medium	Xcelite #R-3164
Stub screwdriver, large	Xcelite #R-5166
Phillips screwdriver set	Proto #9600A
Torque wrench, 0-50 in-lb	Apco Mossberg #B50
Offset ratchet driver, Allen and Phillips	Yankee #3600-9
Offset ratchet, slot	
Pliers, extractor, external, black	Truarc #2
Pliers, extractor, internal, black	Truarc #3
Pliers, extractor, external, black, large	Truarc #4
Pliers, extractor, external, black	Truarc #015
Wrench, adjustable, 6"	Crescent #AT16
Thickness gauge	Starrett #66
Drift punch, 1/8"	Hargrove #2868
Drift punch, 3/32"	Hargrove #2866
Drift punch, 1/16"	Hargrove #2864
Pliers, diagonal cutter	Klein #202-5
Pliers, long nose	Klein #303-6
Pliers, needle nose	Utica #777-6
Nutdriver, roll set	Xcelite #99SM
Nutdriver, #18	Xcelite #HS-18

TABLE 5-4.
SUGGESTED TOOLS AND TEST EQUIPMENT (Continued)

Tool	Recommended Equipment
File, 6" smooth cut	
File, 4" round, second cut	
Tape, steel, 8'	Lufkin #688
Inspection mirror	G.C. #5090
Wire stripper	Miller #100
Burnishing tool	
Pliers, 7-1/2"	Proto #242
Read/write electronics	Customer supplied
Oscilloscope	Tektronix 535 or equivalent
FM discriminator	Ampex #15730 with Ampex #15600 power supply, or equivalent
Waveform generators (four)	Tektronix 162 or equivalent
Frequency counter	Hewlett-Packard 523C or equivalent
Pulse generator	Tektronix 161 or equivalent
Power supply	Tektronix 160A or equivalent
Variable transformer	General Radio Variac 150 VAC, 10 amp, or equivalent

TABLE 5-4.
SUGGESTED TOOLS AND TEST EQUIPMENT (Continued)

Tool	Recommended Equipment
Voltage-level converter (to convert output of waveform generators to 10 VDC level change required by transport actuators)	Homemade
Dynamometer	George Scherr Co. #6391
Dynamometer adaptor	Ampex Part No. T1154 MR-1

SECTION VI
DRAWINGS

6-1. INTRODUCTION.

6-2. This section contains schematic drawings pertinent to the SDSTM-4 Tape Transport and its components. A complete listing of all drawings in Section VI is given in the List of Illustrations at the front of this manual.

1. UNLESS OTHERWISE SPECIFIED:

   ALL RESISTORS NOHMS
   ALL CAPACITORS IN MICROFARADS
   ALL RELAYS SHOWN IN DEENERGIZED POSITION

2. SI IS SHOWN IN A POSITION WHEN THE MACHINE IS IN AN OPERATING CONDITION.
3. RED WIRES CARRY -60V.D.C.
   YEL. WIRES CARRY -24V.D.C.
   BRN. WIRES CARRY 117V.A.C.
   BRN.&WHT. TWISTED WIRES CARRY LINE VOLTAGE
   BLACK WIRES ARE GRD RETURNS.
4. DOT "•" DENOTES LOWER CASE LETTERS
5. ALL GROUND CONNECTIONS (⏚) ARE CONNECTED TO A POINT NEAR TS15-1

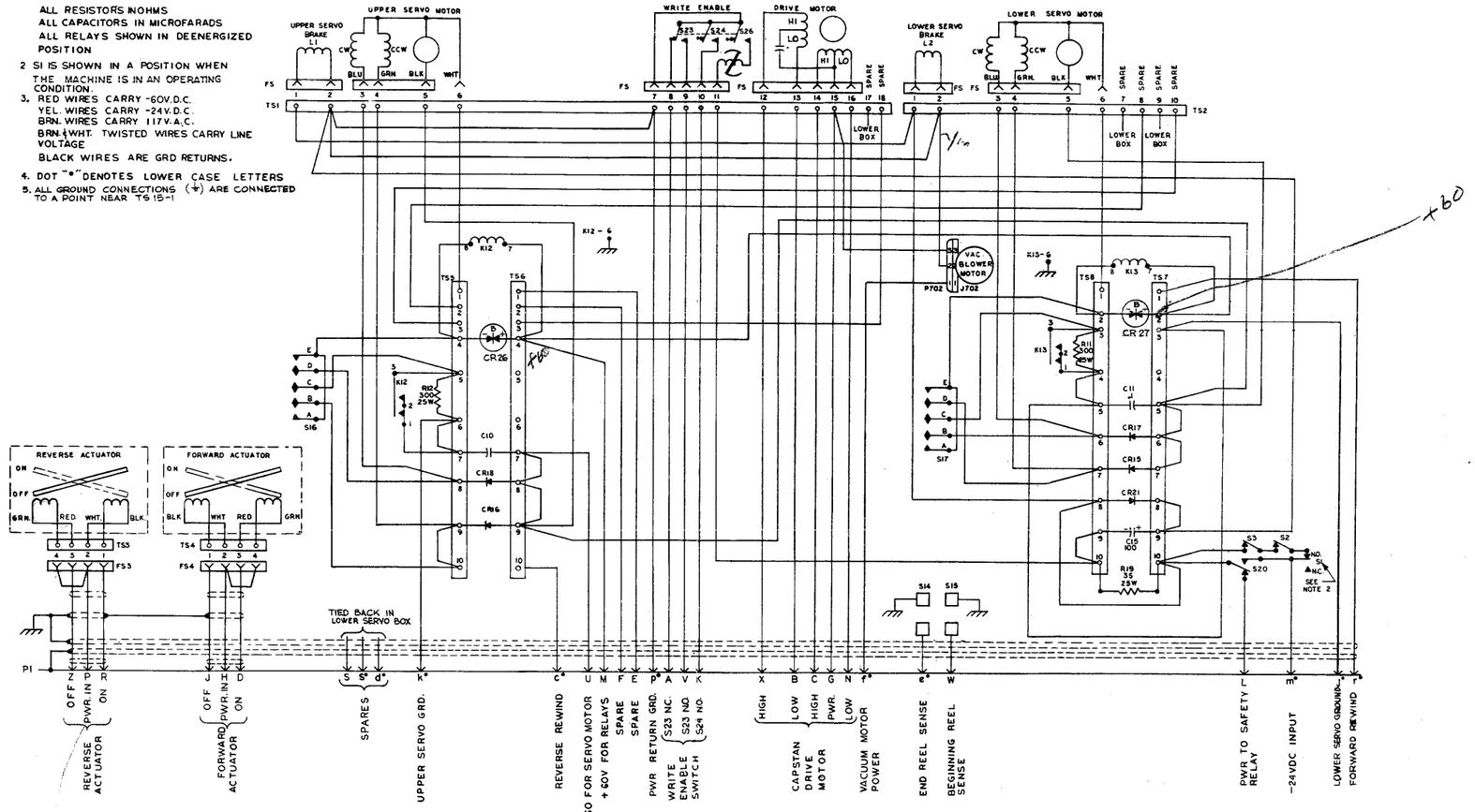


Figure 6-1.
Tape Transport Assembly, Schematic Diagram
(31 04438E)

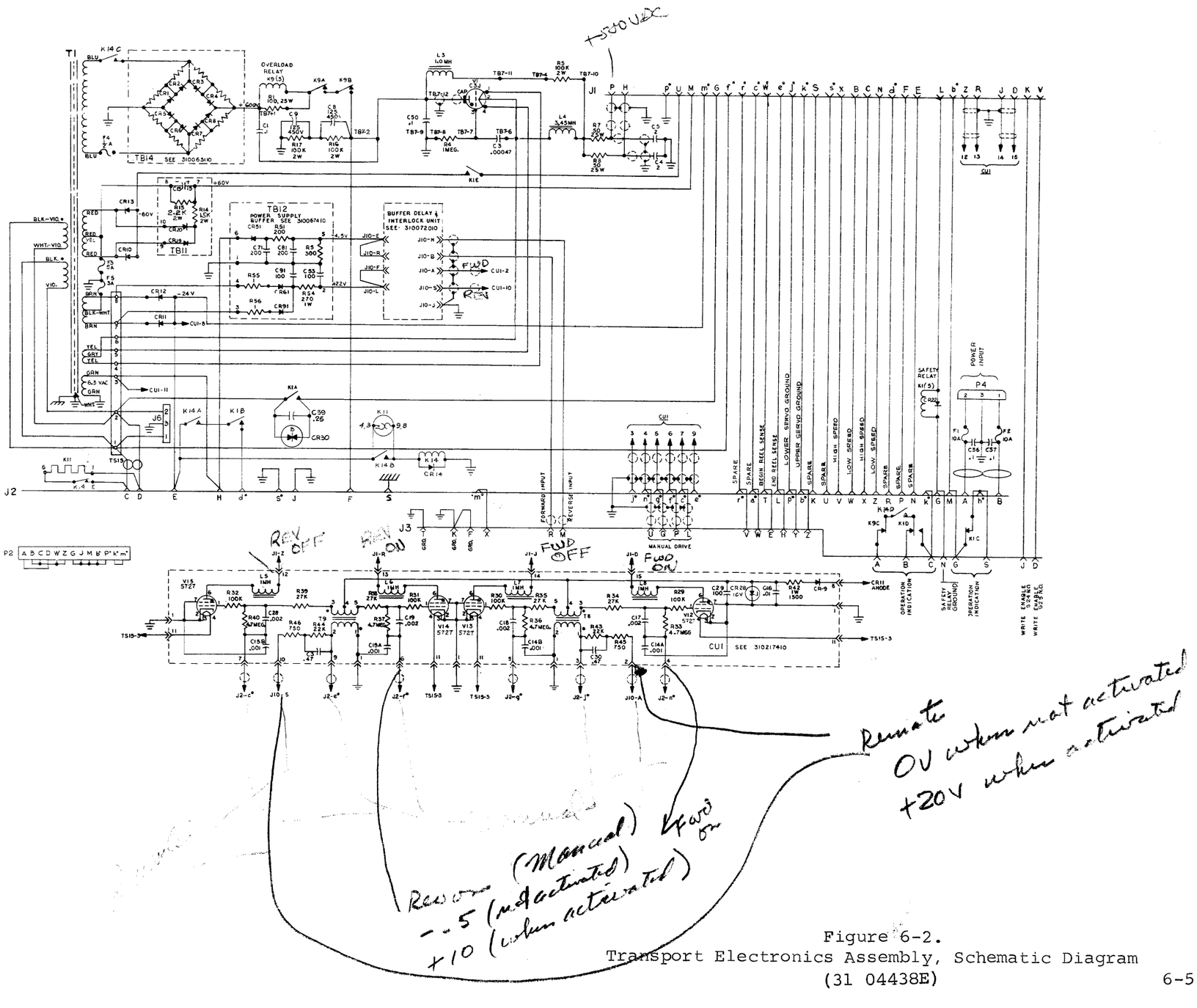
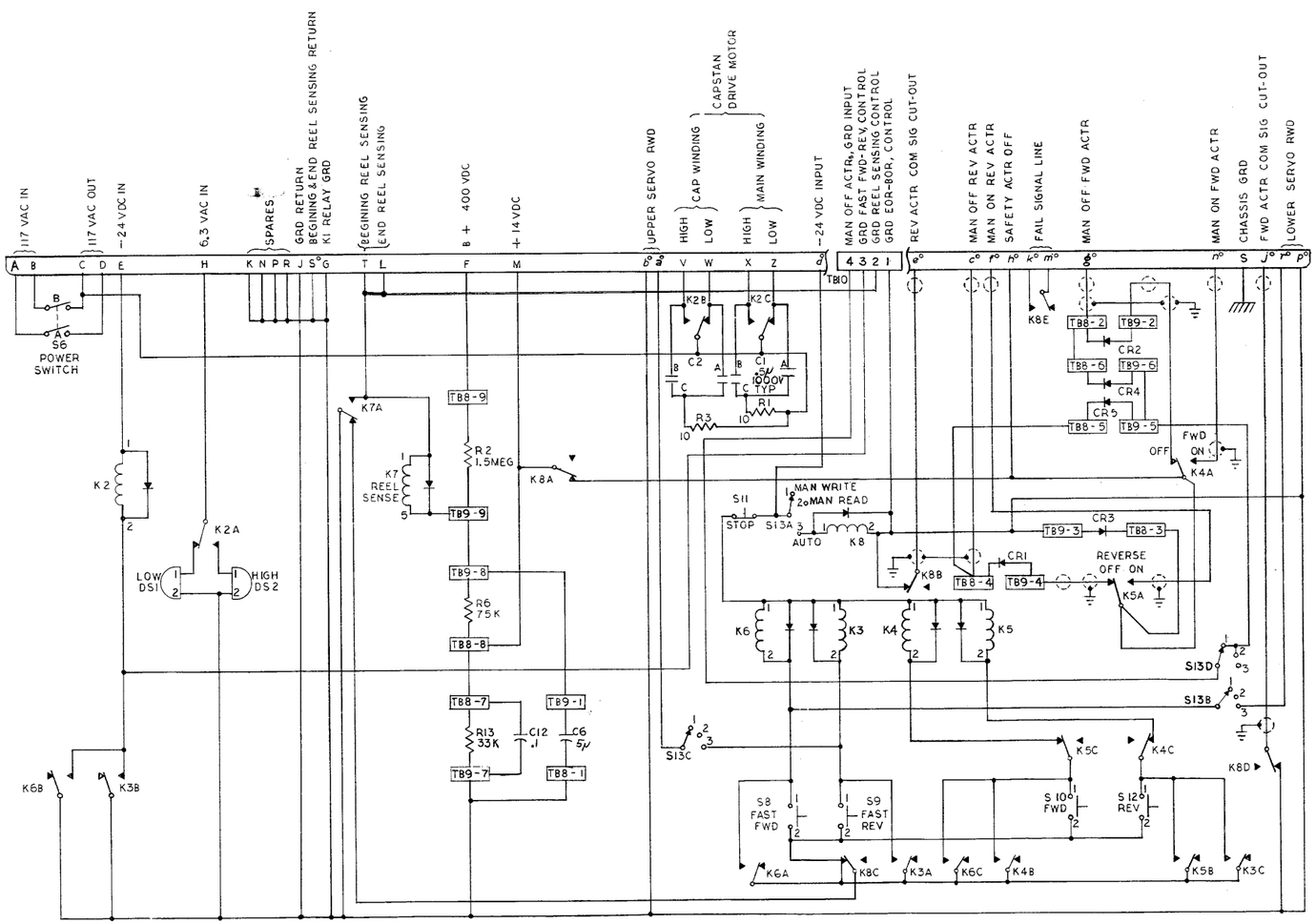


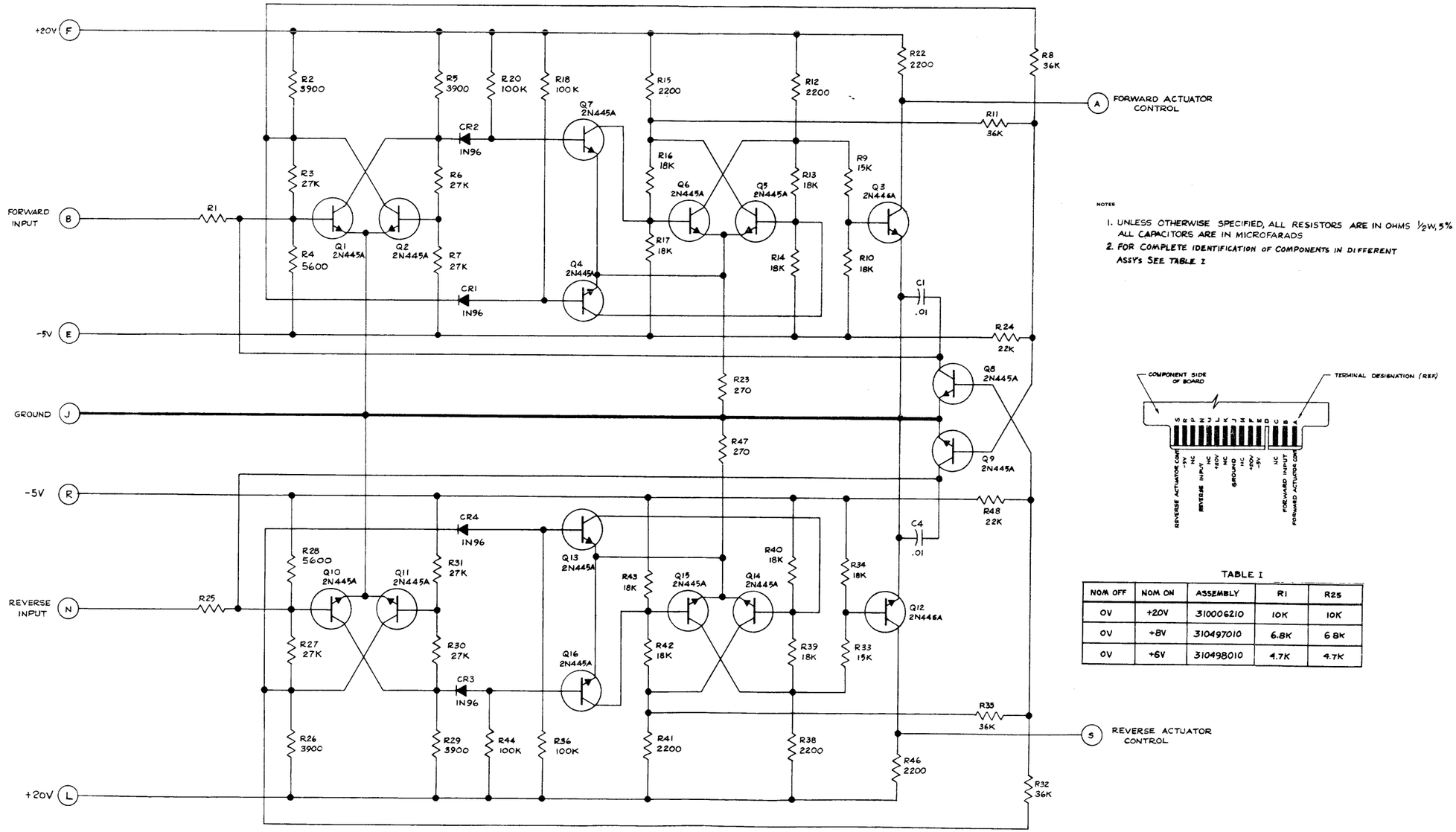
Figure 6-2.
Transport Electronics Assembly, Schematic Diagram
(31 04438E)



4. ALL RELAYS SHOWN IN DEENERGIZED POSITION.
3. ALL RESISTORS VALUES ARE IN OHMS.
2. ALL CAPACITORS ARE IN MICROFARADS.
1. FOR ASSY. SEE 3105437

NOTES UNLESS OTHERWISE SPEC.

Figure 6-3.
Pushbutton Control Assembly, Schematic Diagram
(31 05438C)



NOTES

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE IN OHMS ½W, 5% ALL CAPACITORS ARE IN MICROFARADS
2. FOR COMPLETE IDENTIFICATION OF COMPONENTS IN DIFFERENT ASSY's SEE TABLE I

TABLE I

NOM OFF	NOM ON	ASSEMBLY	R1	R25
0V	+20V	310006210	10K	10K
0V	+8V	310497010	6.8K	6.8K
0V	+6V	310498010	4.7K	4.7K

Figure 6-4.
Buffer Interlock Unit, Schematic Diagram
(310072010B)

SECTION VII
ILLUSTRATED PARTS BREAKDOWN

7-1. INTRODUCTION.

7-2. The following pages constitute an Illustrated Parts Breakdown for the SDSTM-407 Tape Transport.

7-3. Parts are listed in order of disassembly sequence, except that this may be modified where sequence of disassembly cannot be maintained. In general, the Illustrated Parts Breakdown indicates the maximum permissible disassembly of parts in the field. Further disassembly may require special tools and fixtures on reassembly, and should not be undertaken.

7-4. An indention system is used in the DESCRIPTION column of the Illustrated Parts Breakdown to indicate parts relationship. An assembly beginning in column 1 will have its detail parts listed in column 2; a subassembly beginning in column 2 will have its detail parts listed in column 3; etc.

7-5. To locate a part, determine the function and application of the part required. Turn to the List of Illustrations and locate the title of the figure where the part is most likely to be found. From the illustration, obtain the index number assigned to the part. Refer to the accompanying description for specific information regarding the part.

7-6. In correspondence with Ampex or when ordering parts for the equipment, order by Ampex Part Number. Handling of the order may also be expedited by noting the serial number of the machine for which the part is ordered.

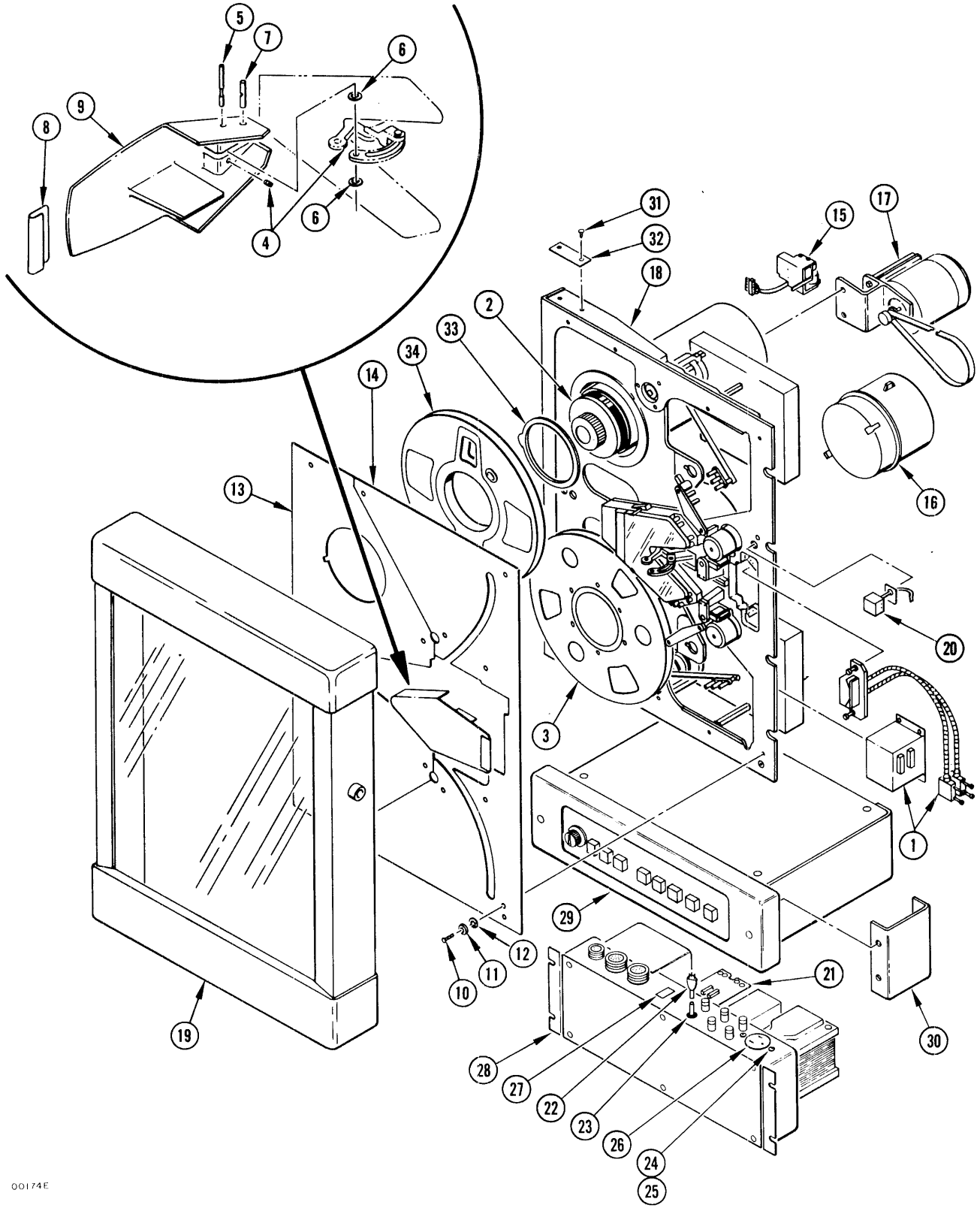


Figure 7-1.
SDSTM-407 Tape Transport

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-1-		SDSTM-407 TAPE TRANSPORT				
	310263010	Tape Transport, SDSTM-407, IBM Compatible, 1/2 in., 75/150 ips, 117 vac, 60 cps	1			
1	310566510	. Head and Cable Box Assembly (See Figure 7-2)	1			
2	310261010	. Knob Assembly, reel hold down, IBM Compatible (See Figure 7-3)	1			
3	310078710	. Fixed Reel Assembly (See Figure 7-3)	1			
	310263110	. Cover Installation, thread lever	1			
4	477-027	. . Setscrew, headless, 2-56 NC-3A by 3/16 in., hex soc, cup point, stl cad plt (MS51017-2)	2			
5	310091110	. . Pin, radius rod	1			
6	501-003	. . Washer, #6 flat, brass cad plt (Type AN960B)	2			
7	310091010	. . Pin, head cover	1			
8	310075510	. . Handle, head cover	1			
9	310264010	. . Cover, thread lever	1			
	310263210	. Overlay Plate Installation	1			
10	472-067	. . Screw, machine, 6-32 NC-2A by 3/8 in., oval hd Phillips, brass nickel plt	13			
11	506-023	. . Washer, #6 finishing, countersunk, brass nickel plt (H.H. Smith #1115)	13			
12	503-053	. . Ring, backup, #6 nylon (Wesco Electronic #MW-15-6)	13			
13	310264110	. . Overlay Plate, reel side	1			
14	310264210	. . Overlay Plate, head side	1			
15	310085610	. Switch Assembly, write enable (See Figure 7-4)	1			
16	310229710	. Motor Installation, vacuum unit (See Figure 7-5)	1			
17	310084410	. Drive Motor, Pulley and Belt Installation (See Figure 7-6)	1			
18	310052510	. Tape Transport Assembly (See Figures 7-7 thru 7-15)	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-1-						
19	310263310	. Access Door Assembly (See Figure 7-16)	1			
20	310795010	. Photosense Head and Cable Assembly (See Figure 7-17)	1			
	310441010	. Transport Electronics Assembly, 117 vac	1			
21	310497010	. . Buffer Delay Interlock Unit Assembly (See Figure 7-18)	1			
22	084-008	. . Cord Set, 3 conductor, male plug (Cornish #3532)	1			
23	264-004	. . Bushing, strain relief (Heyco #SR-6P-1)	1			
24	471-076	. . Screw, machine, 8-32 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-38)	2			
25	502-004	. . Washer, #8 spring lock, stl cad plt (MS35338-43)	2			
26	146-175	. . Connector, receptacle, female, 2 contact (J6) (Hubbell #5258)	1			
27	310024910	. . Identification Plate	1			
28	310443610	. . Transport Electronics Chassis Assembly (See Figure 7-19)	1			
29	310263410	. Pushbutton Control Assembly (See Figure 7-20)	1			
30	310263510	. Spacer, control panel	1			
	310893910	. Transport Stop Arm Kit (See Figure 7-9)	1			
	310229510	. Identification Plate Installation	1			
31	474-008	. . Screw, drive, #0 by 1/8 in., round hd, stl cad plt (AN535-0-2)	2			
32	310019310	. . Identification Plate	1			
	310230610	. Reel Assembly, empty, IBM Compatible, 10-1/2 in. dia, grey	1			
33	310827210	. . Lockout Ring, IBM Compatible	1			
34	310827320	. . Reel, IBM Compatible, 10-1/2 in. dia, grey	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-1-						
	310690810	. Maintenance Kit	1			
	310894110	. Cabinet Hardware Kit	1			
	141-004	. Connector, plug, male, 24 contact (P3) (MS3106B24-28P)	1			
	302-002	. Clamp, cable (MS3057A)	1			
	262-006	. Bushing, telescoping (AN3420-12)	1			
	759-005	. Photosense Marker	2			
	764-009	. Tape, magnetic, 1.5 mil, mylar (Ampex #832-278652)	1			

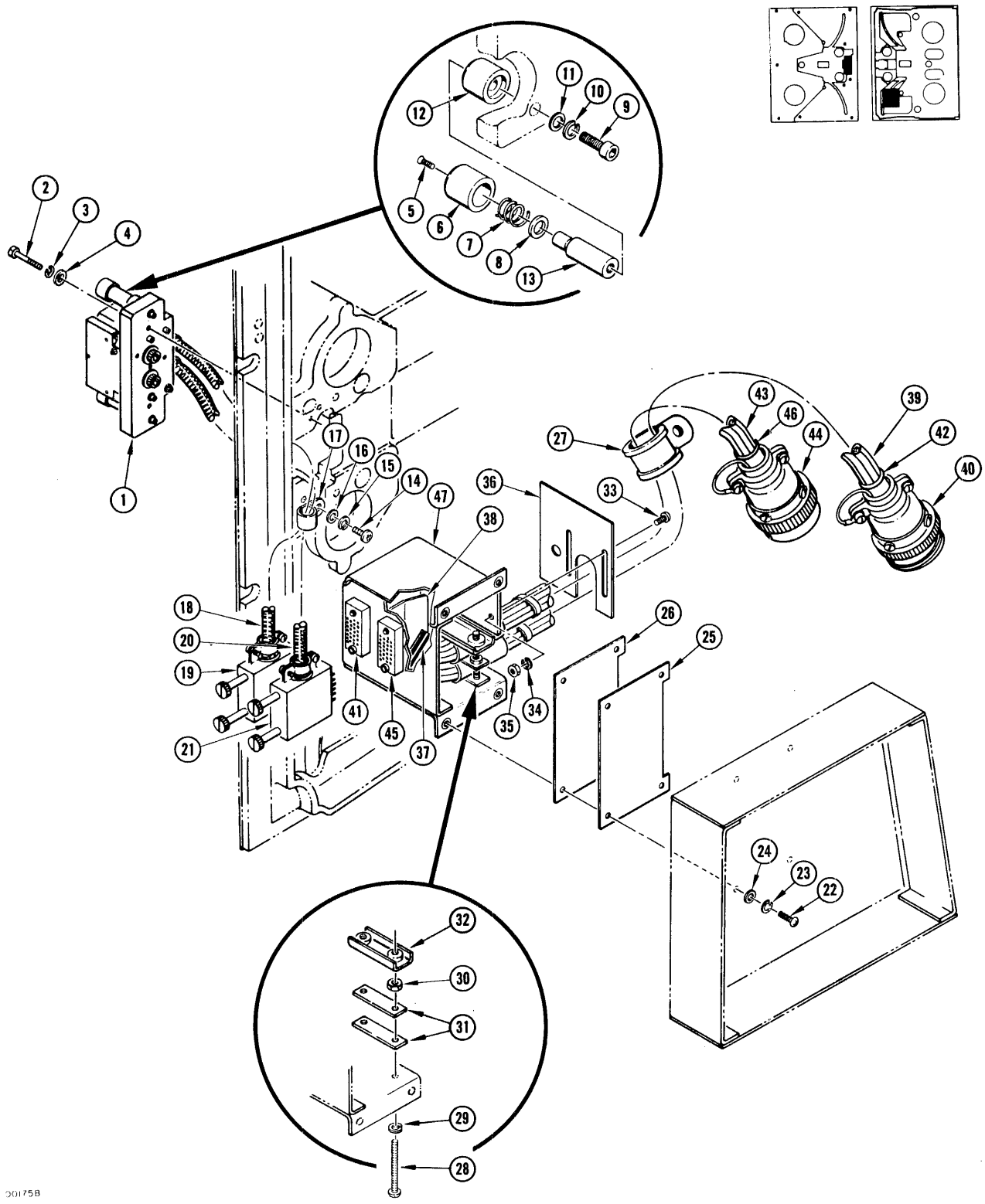


Figure 7-2.
Read/Write Head and Cable Box

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-2-		READ/WRITE HEAD AND CABLE BOX				
	310566510	Head and Cable Box Assembly (See Figure 7-1)	Ref			
1	310351010	. Head Assembly, read/write, 7 channel	1			
2	470-023	. . Screw, cap, 6-32 NC-3A by 7/8 in., hex soc, stl cad plt (MS35457-11)	2			
3	502-009	. . Washer, #6 spring lock, sst, passivated (MS35338-79)	2			
4	501-015	. . Washer, #6 flat, sst, passivated (MS15795-306)	2			
	310365910	. . Guide Assembly, ceramic, inner edge	2			
5	471-379	. . . Screw, machine, 4-40 NC-2A by 1/4 in., flat hd Phillips, sst, passivated (MS35200-12)	1			
6	310300810	. . . Cap, guide	1			
7	310202810	. . . Spring, compression	1			
8	310348810	. . . Ring, guide	1			
9	470-137	. . . Screw, cap, 6-32 NC-2A by 1-1/8 in., hex soc, stl cad plt	1			
10	502-009	. . . Washer, #6 spring lock, sst, passivated (MS35338-78)	1			
11	501-020	. . . Washer, flat, special, 0.015 in. thk, brass cad plt	1			
12	310348910	. . . Base, guide	1			
13	310301710	. . . Guide, post	1			
14	471-069	. . Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	1			
15	502-009	. . Washer, #6 spring lock, sst, passivated (MS35338-79)	1			
16	501-015	. . Washer, #6 flat, sst, passivated (MS15795-306)	1			
17	302-049	. . Clamp, cable, 1/2 in. (Commercial Plastics #742-8)	1			
18	310369610	. . Cable Assembly, read	1			
19	145-181	. . . Connector, plug, male, 26 contact (Winchester #MRE26P-JTC6-H1)	1			
20	310369710	. . Cable Assembly, write	1			
21	145-181	. . . Connector, plug, male, 26 contact (Winchester #MRE-26P-JTC6-H1)	1			
	310566310	. Cable and Box Assembly, write/read transmission	1			
22	474-302	. . Screw, nylon, 6-32 by 1/2 in., slotted fillister hd (Weckesser #N-632 Natural)	4			
23	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	4			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-2-						
24	501-907	. . Washer, #6 flat, stl cad plt (AN960-6)	4			
25	310519210	. . Spacer, isolating, phenolic	1			
26	310612510	. . Spacer, metallic	1			
27	302-054	. . Clamp, cable (Adel #760-14-2-10)	1			
28	471-456	. . Screw, machine, 6-32 NC-2A by 1-3/4 in., pan hd Phillips, brass cad plt (MS35212-34)	2			
29	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
30	492-009	. . Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	2			
31	310023110	. . Strap, head cable clamp	2			
32	310023010	. . Clamp, head cable	1			
33	471-072	. . Screw, machine, 6-32 NC-2A by 5/8 in., pan hd Phillips, stl cad plt (MS35208-28)	2			
34	502-003	. . Washer, #6 lock, stl cad plt (MS35338-41)	2			
35	492-009	. . Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	2			
36	310566410	. . Shield	1			
37	269-008	. . Seal, rubber (Rubbercraft #73)	1			
38	310746710	. . Shield, inner, transmission cable	1			
39	310566710	. . Cable Assembly, transmission, read	1			
40	145-207	. . . Connector, plug, male, 19 contact (Cannon #RSK-19-22C-3/4)	1			
41	146-173	. . . Connector, receptacle, female, 26 contact (Winchester #MRE-26S-J-30)	1			
42	262-006	. . . Bushing, telescoping (AN3420-12)	2			
43	310566610	. . Cable Assembly, transmission, write	1			
44	144-050	. . . Connector, plug, female, 19 contact (Cannon #SK-19-21C-3/4)	1			
45	146-173	. . . Connector, receptacle, female, 26 contact (Winchester #MRE-26S-J-30)	1			
46	262-006	. . . Bushing, telescoping (AN3420-12)	2			
47	310612810	. . Box, head, transmission cable	1			

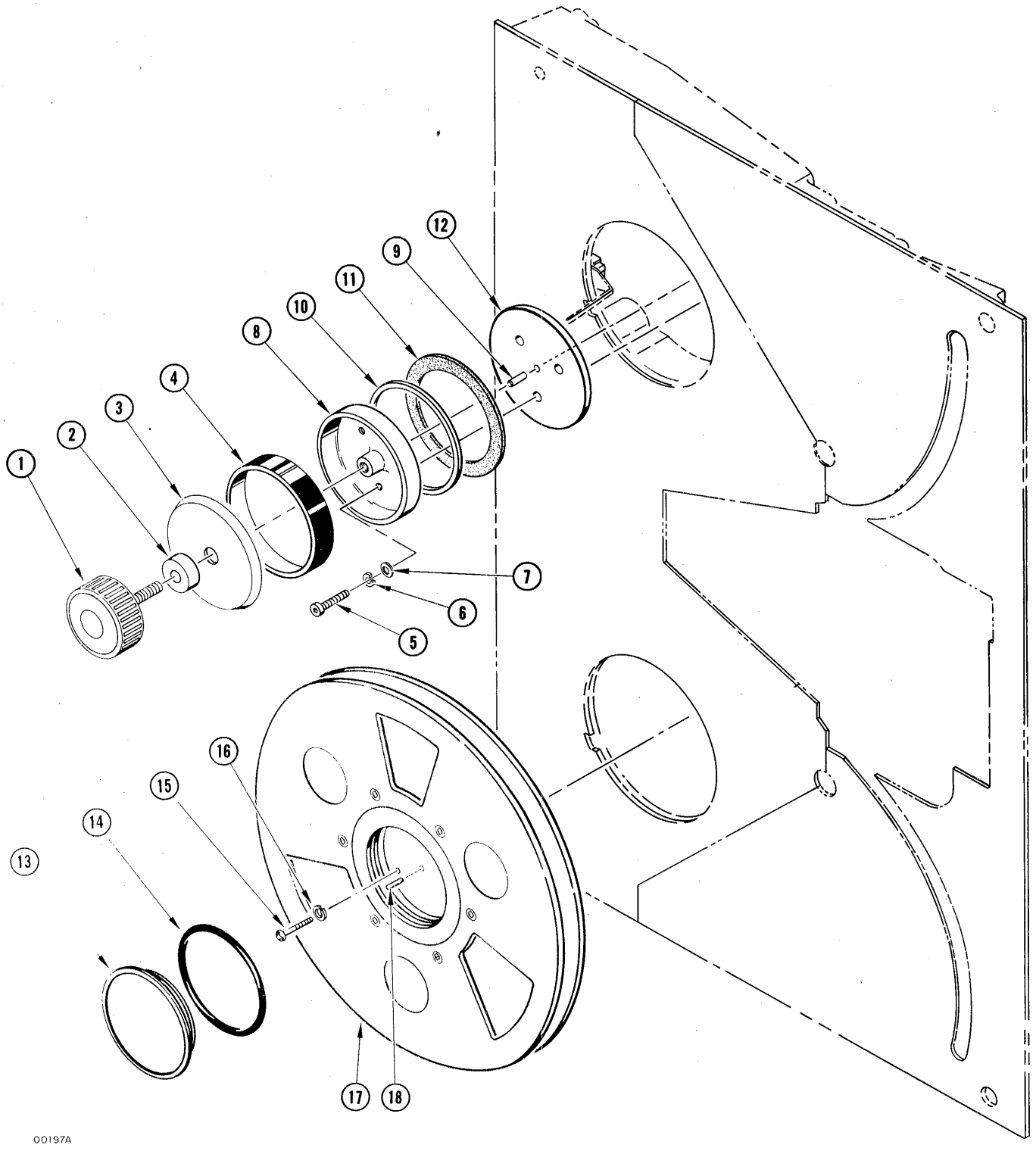


Figure 7-3.
Reel Hold Down Knob and Fixed Reel

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-3-		REEL HOLD DOWN KNOB AND FIXED REEL				
	310261010	Knob Assembly, reel hold down, IBM Compatible (See Figure 7-1)	Ref			
1	310920930	. Knob, hold down, white	1			
2	423-045	. Bearing, thrust (Boston Bronze #602)	1			
3	310034510	. Cover, latch, hold down knob	1			
4	310090010	. Ring, hold down knob	1			
5	470-093	. Screw, cap, 10-32 NF-3A by 1 in., hex soc, sst, passivated	3			
6	502-011	. Washer, #10 spring lock, sst (MS35338-81)	3			
7	501-017	. Washer, #10 flat, sst, passivated (MS15795-308)	3			
8	310034110	. Hub Assembly, hold down knob	1			
9	402-005	. . Pin, dowel, stl (Unbrako)	1			
10	310034610	. Spacer	1			
11	310034010	. Pad, turntable	1			
12	310034410	. Spacer	1			
	310078710	Fixed Reel Assembly (See Figure 7-1)	Ref			
13	310079210	. Cap, hub, fixed reel	1			
14	432-043	. O-Ring, neoprene (MS29513-139)	1			
15	471-093	. Screw, machine, 10-32 NF-2A by 1 in., pan hd Phillips, stl cad plt (MS24584-59)	3			
16	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	3			
17	310702910	. Hub and Flange Assembly	1			
18	402-011	. . Pin, dowel, sst, 1/2 in. lg (Anti-Corrosive Metal Products Co.)	1			

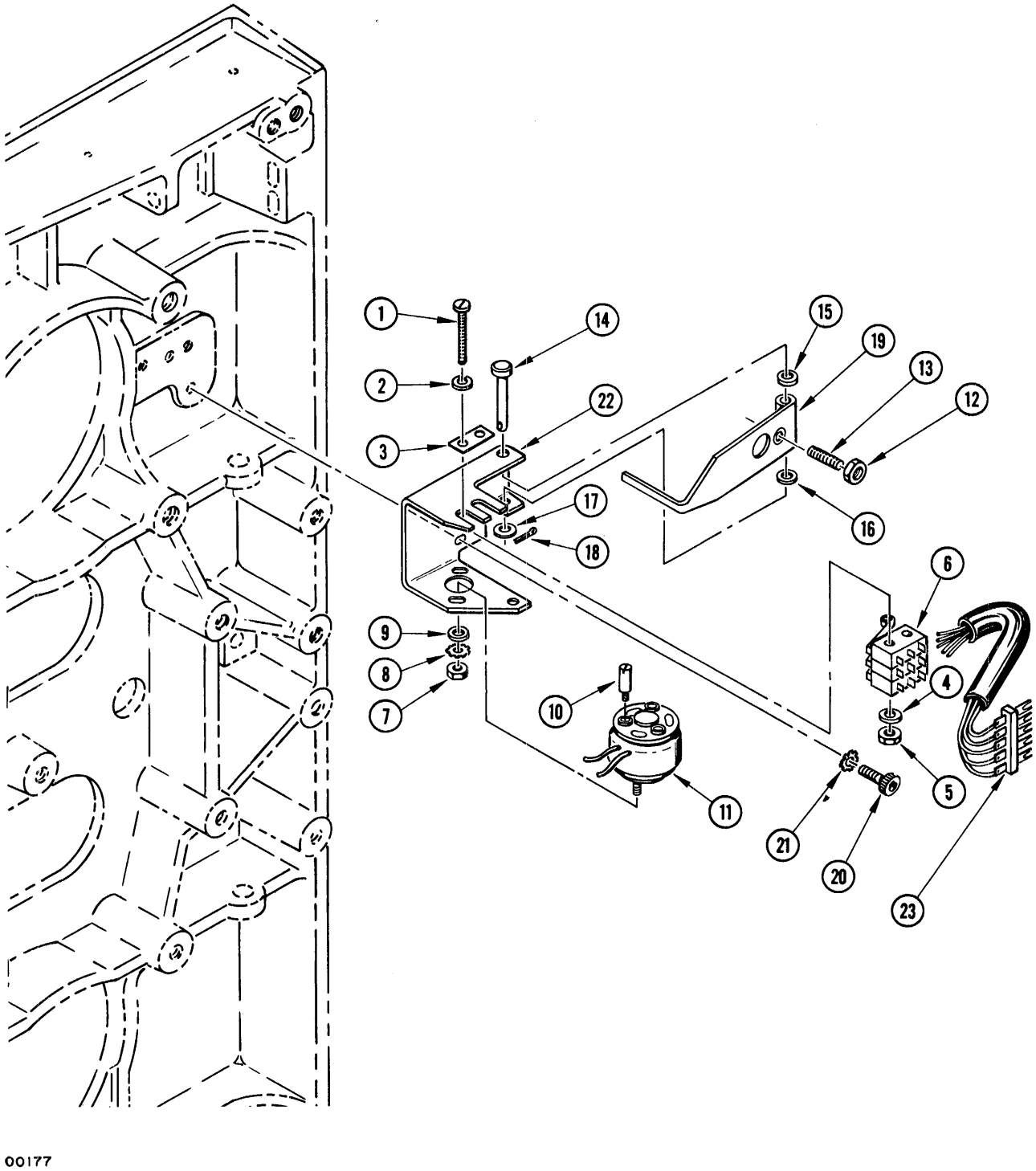


Figure 7-4.
Write Enable Switch

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-4-		WRITE ENABLE SWITCH				
	310085610	Switch Assembly, write enable (See Figure 7-1)	Ref			
1	471-803	. Screw, machine, 2-56 by 1 in., slotted binder hd, stl cad plt	2			
2	502-001	. Washer, #2 spring lock, stl cad plt (MS35338-39)	2			
3	310262610	. Strip, locking	1			
4	501-007	. Washer, #2 flat, stl cad plt (MS15795-202)	2			
5	493-013	. Nut, self-locking hex, 2-56 NC-3B, stl cad plt w/nylon insert (Esna Type NM-26)	2			
6	120-083	. Switch, w/roller actuator, spdt (Unimax #USMW)	3			
7	492-059	. Nut, plain hex, 3-48 NC-2B, stl cad plt	2			
8	502-093	. Washer, #3 lock, external tooth, stl cad plt (Shakeproof #1103)	2			
9	501-007	. Washer, #2 flat, stl cad plt (MS15795-202)	2			
10	310046010	. Pin, solenoid	1			
11	310046110	. Solenoid, rotary	1			
12	492-009	. Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	1			
13	477-065	. Setscrew, headless, 6-32 NC-3A by ½ in., hex soc, flat point, stl cad plt (AN565A6H8)	1			
14	400-012	. Pin, clevis, pan hd, stl cad plt (MS20392-1-31)	1			
15	501-026	. Washer, #4 flat, 0.003 in. thk, brass, unplated	A/R			
16	501-061	. Washer, #4 flat, 0.017 in. thk, brass, white nickel plt	A/R			
17	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	1			
18	401-005	. Pin, cotter, 1/16 in. dia by ½ in. lg, stl cad plt	1			
19	310045910	. Arm, actuator	1			
20	470-018	. Screw, cap, 6-32 NC-3A by 3/8 in., hex soc, stl cad plt (MS35457-7)	2			
21	502-014	. Washer, #6 lock, external tooth, stl cad plt (MS35335-30)	2			
22	310045810	. Bracket, actuator	1			
23	310036010	. Fanning Strip	1			

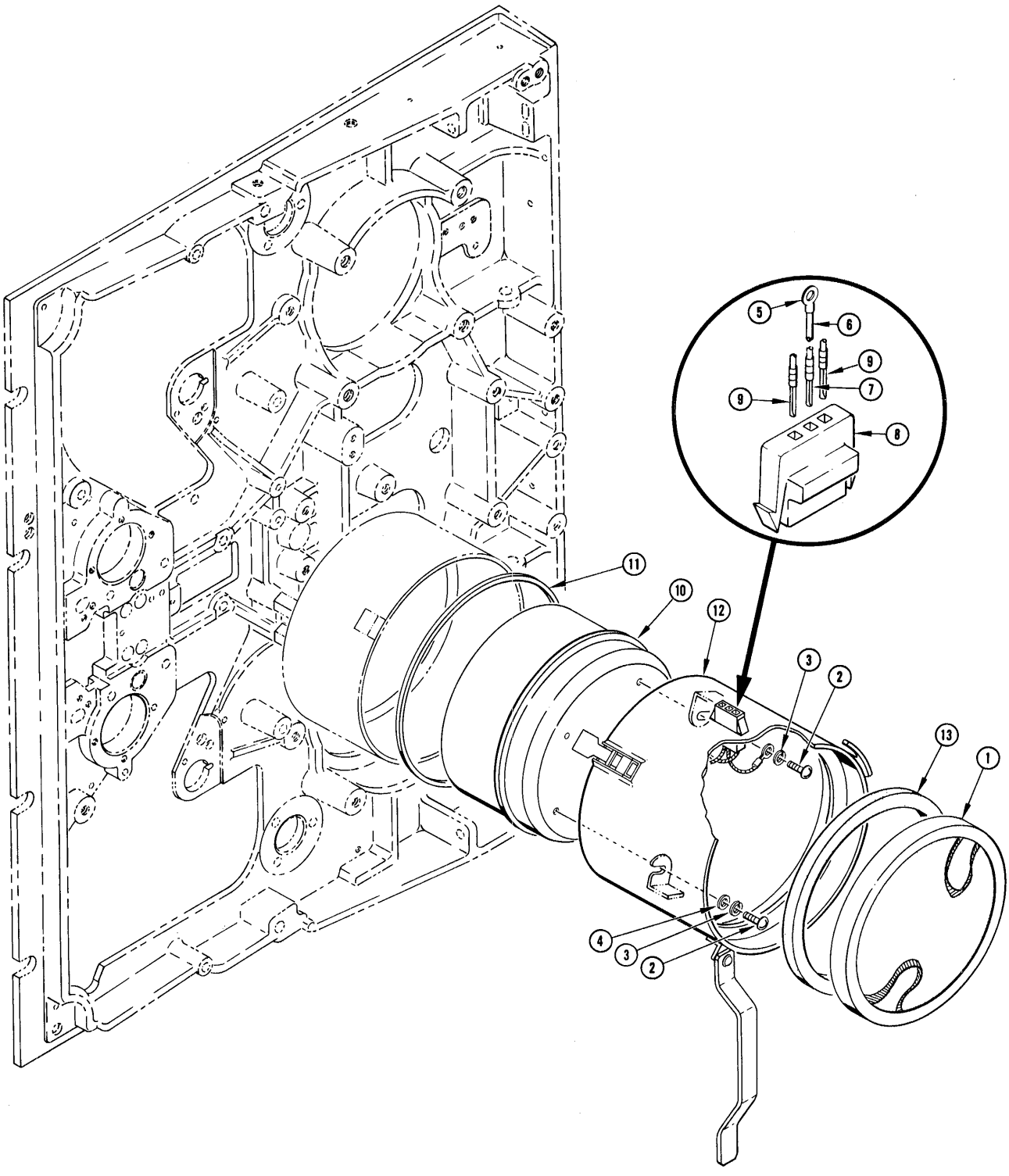


Figure 7-5.
Vacuum Unit Motor

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-5-		VACUUM UNIT MOTOR				
	310229710	Motor Installation, vacuum unit, 117 vac (See Figure 7-1)	Ref			
1	310153310	. Filter, vacuum blower	1			
2	471-087	. Screw, machine, 10-32 NF-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35209-53)	2			
3	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	2			
4	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	1			
5	171-016	. Connector, solderless, ring tongue, #10 stud (AMP #34170)	1			
6	611-595	. Wire, stranded, insulated, #16 (MIL-W-16878)	A/R			
7	169-019	. Connector, contact pin, brass (AMP #42641-1)	1			
8	169-987	. Connector, chassis plug, 3 way (AMP #480177-1)	1			
	310076710	. Motor Assembly, vacuum unit, 117 vac	1			
9	169-019	. . Connector, contact pin, brass (AMP #42641-1)	2			
10	592-030	. . Motor, vacuum unit (Lamb Electric #IS-14894)	1			
	650-154	. . . Brush, contact (Lamb Electric #33185)	2			
11	310236610	. Ring, seal	1			
12	310074710	. Housing Assembly, vacuum motor	1			
13	269-116	. . Gasket, foam rubber, 1/2 in. by 3/4 in. by 19 in. (Bracamonte)	1			

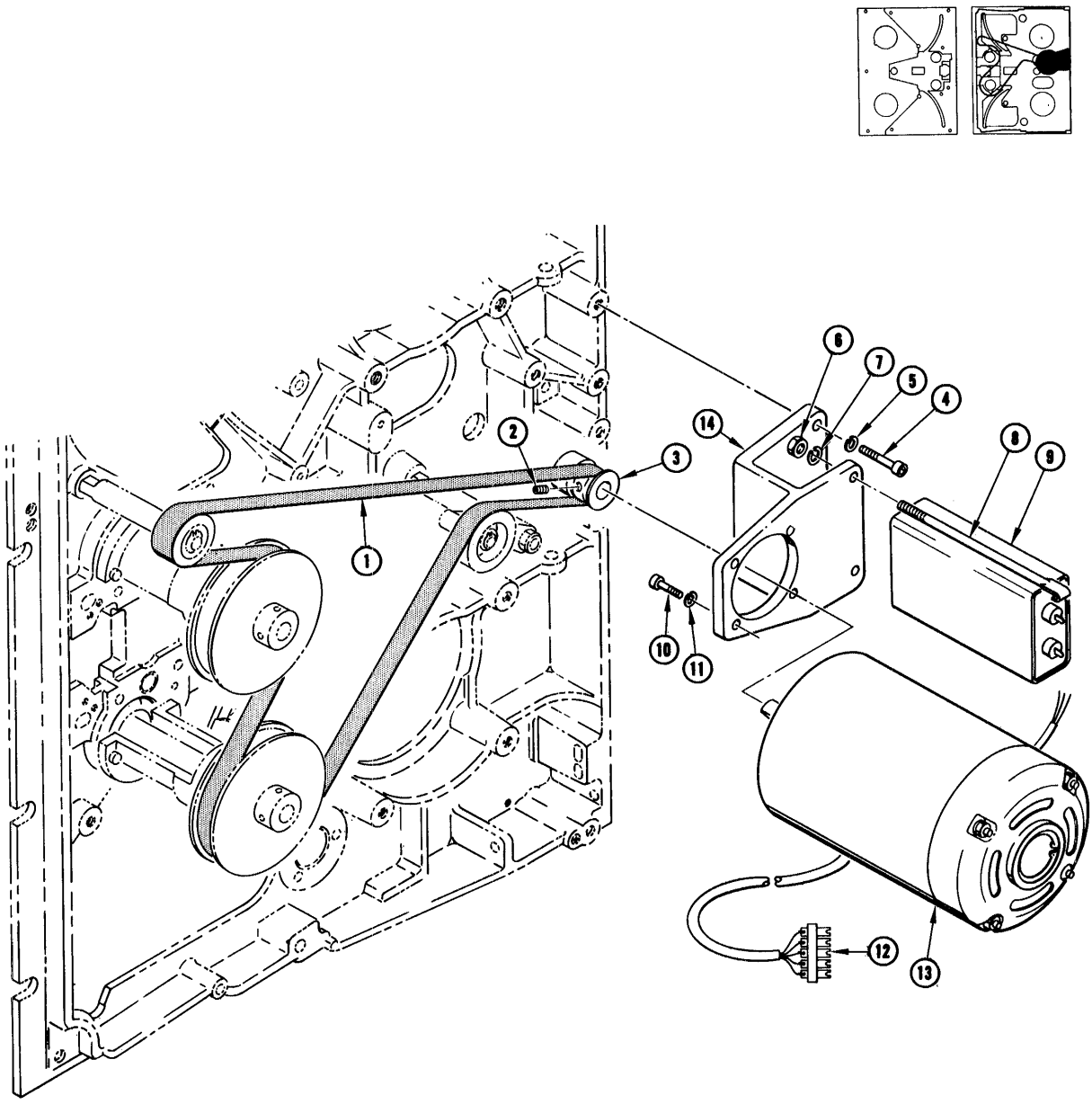


Figure 7-6.
Capstan Drive Motor, Pulley and Belt

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-6-		CAPSTAN DRIVE MOTOR, PULLEY AND BELT				
	310084410	Drive Motor, Pulley and Belt Installation, 117 vac, 60 cps, 75/150 ips (See Figure 7-1)	Ref			
1	081-006	. Belt, endless, nylon, 1/2 in. w by 43-3/8 in. lg (Tilton #S5-TW Light)	1			
2	477-048	. Setscrew, headless, 10-32 NF-3A by 5/16 in., hex soc, cup point, stl cad plt (MS51018-50)	2			
3	310024110	. Pulley, capstan motor	1			
4	470-048	. Screw, cap, 1/4-20 UNC-3A by 7/8 in., hex soc, stl cad plt (MS35457-36)	3			
5	502-006	. Washer, 1/4 spring lock, stl cad plt (MS35338-44)	3			
	310012410	. Drive Motor Assembly, capstan, 117 vac, 60 cps	1			
6	492-017	. . Nut, plain hex, 10-32 NF-2B, sst, passivated (MS35650-104)	2			
7	502-005	. . Washer, #10 spring lock, stl cad plt (MS35338-43)	2			
8	290-019	. . Bracket, capacitor, spade lug type (MIL-C-25:CP07SB5)	2			
9	036-007	. . Capacitor, paper, rectangular, 6 uf, 600 volt (General Electric #23F352)	1			
10	470-103	. . Screw, cap, 10-24 NC-3A by 5/8 in., hex soc, stl cad plt (MS35457-24)	4			
11	502-005	. . Washer, #10 spring lock, stl cad plt (MS35338-43)	4			
	310043410	. . Drive Motor, capstan	1			
12	310036010	. . . Fanning Strip, 5 terminal	1			
13	310063610	. . . Drive Motor, 117 vac	1			
14	310043510	. . Bracket, capstan motor	1			

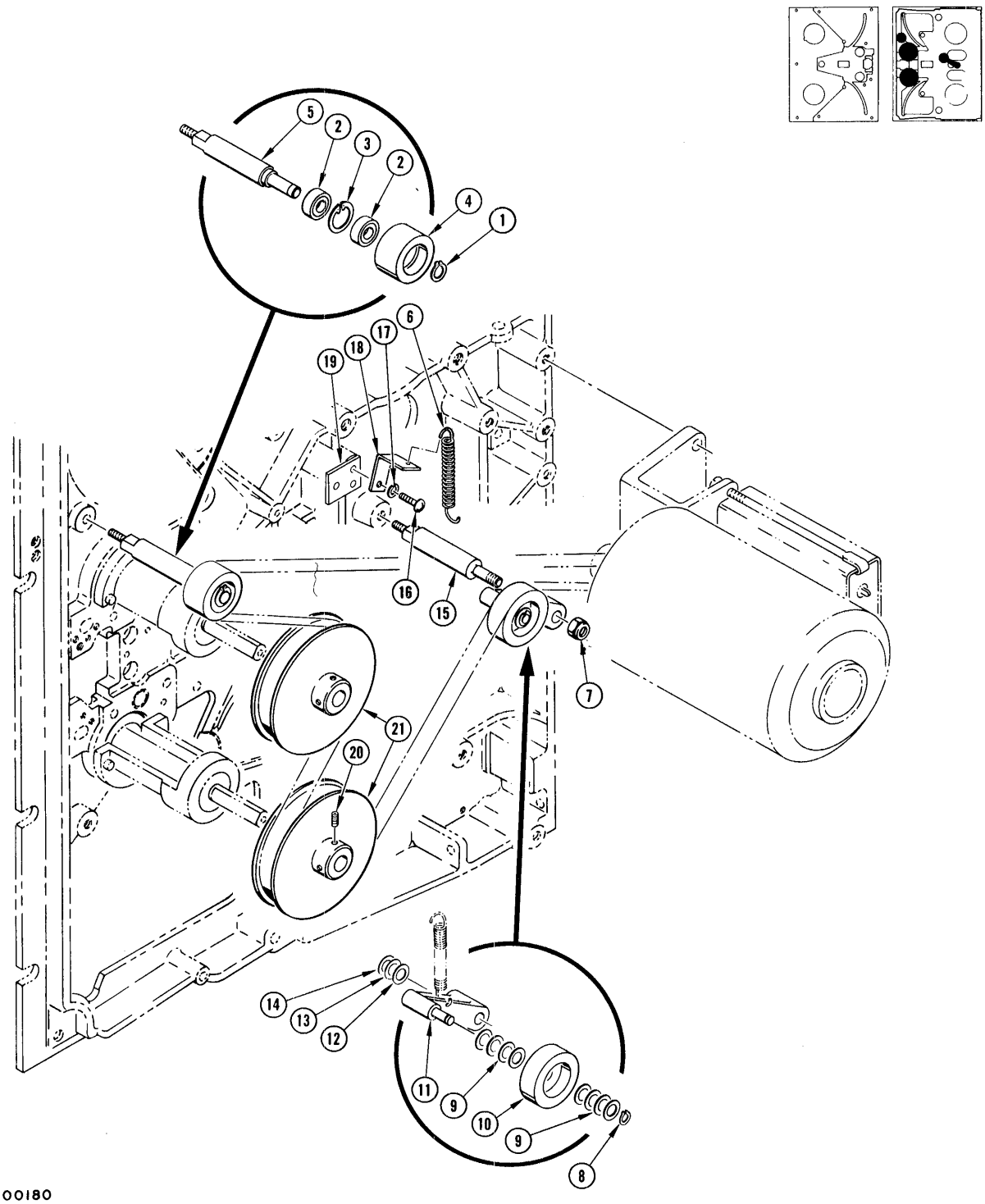


Figure 7-7.
Capstan Drive Pulleys and Idler Arm

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-7-		CAPSTAN DRIVE PULLEYS AND IDLER ARM				
	310052510	Tape Transport Assembly (See Figure 7-1)	Ref			
	310008510	. Roller Assembly, drive belt	1			
1	430-086	. . Ring, retaining, external, stl cad plt (Truarc #5100-37-S-MD)	1			
2	421-001	. . Bearing, ball, double shield (Fafnir #S3KDD)	2			
3	430-085	. . Ring, retaining, internal, stl cad plt (Truarc #N5000-87-S-MD)	1			
4	310034710	. . Roller, drive belt	1			
5	310034810	. . Shaft, drive belt	1			
6	310021810	. Spring, belt idler	1			
7	493-012	. Nut, self-locking, hex, ¼-20 NC-3B, stl cad plt w/nylon insert (Esna Type NM)	1			
	310008210	. Arm Assembly, belt idler	1			
8	431-006	. . Retainer, hairpin, external (Connor #7802)	1			
9	310033910	. . Washer, thrust	A/R			
10	310033810	. . Pulley, belt idler	1			
11	310033710	. . Arm, belt idler	1			
12	501-045	. Washer, shim, flat, brass, 0.005 in. thk	A/R			
13	501-052	. Washer, shim, flat, brass, 0.003 in. thk	A/R			
14	501-059	. Washer, shim, flat, brass, 0.010 in. thk	A/R			
15	310017410	. Stud, shouldered	1			
16	471-088	. Screw, machine, 10-32 NF-3A by 7/16 in., pan hd Phillips, stl cad plt (MS35209-54)	2			
17	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	2			
18	310019710	. Bracket, angle, belt tension	1			
19	310088310	. Bracket, harness	1			
20	477-049	. Setscrew, headless, 10-32 NF-3A by 3/8 in., hex soc, cup point, stl cad plt (MS51018-51)	4			
21	310016710	. Pulley, capstan drive	2			

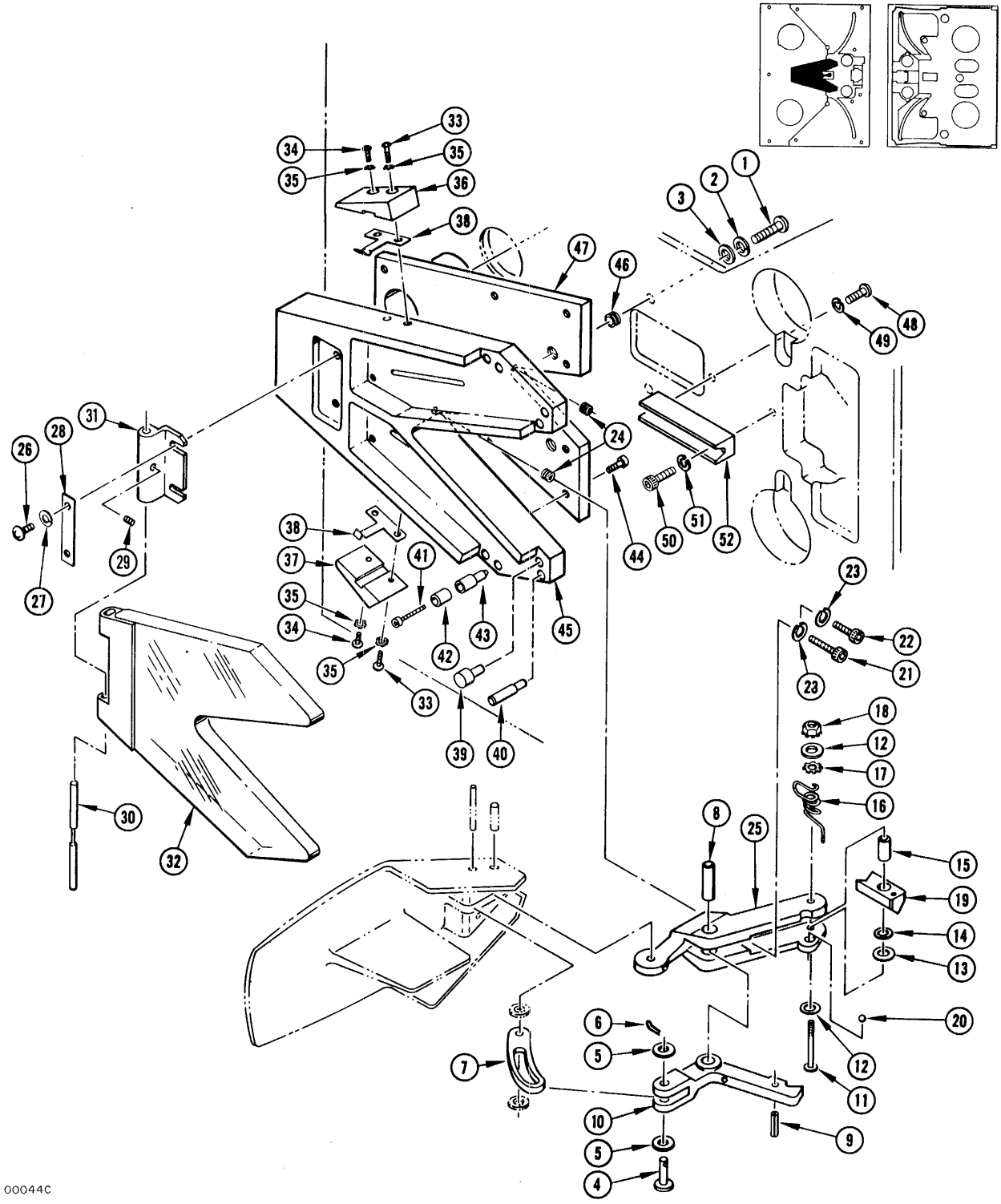


Figure 7-8.
Vacuum Chamber

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-8-		VACUUM CHAMBER				
	310052510	Tape Transport Assembly (See Figure 7-1)	Ref			
1	471-092	. Screw, machine, 10-32 NF-2A by 7/8 in., pan hd Phillips, stl cad plt (MS35209-58)	3			
2	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	3			
3	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	3			
	310216710	. Vacuum Chamber Assembly	1			
4	400-017	. . Pin, clevis, pan hd, stl cad plt (MS20392-2-15)	1			
5	501-019	. . Washer, #10 flat, stl cad plt (AN960-10L)	2			
6	401-004	. . Pin, cotter, extended prong, mitre end, 1/16 in. dia by 3/8 in. lg	1			
7	310075310	. . Link, thread lever	1			
8	304020340	. . Pin, dowel	1			
	310215110	. . Thread Lever Assembly	1			
9	406-029	. . . Rollpin, sst (Esna #79-028-125-0500)	1			
10	310208510	. . . Support, thread lever	1			
11	471-469	. . Screw, machine, 4-40 NC-2A by 1-¼ in., pan hd Phillips, stl cad plt	1			
12	501-008	. . Washer, #4 flat, stl cad plt (MS15795-204)	2			
13	501-057	. . Washer, flat, shim, 0.010 in. thk, brass (Tilley)	A/R			
14	501-019	. . Washer, #10 flat, stl cad plt (AN960-10L)	1			
15	310036610	. . Bushing, support	1			
16	310036710	. . Spring, latch, thread lever	1			
17	502-013	. . Washer, #4 lock, external tooth, stl cad plt (MS35335-20)	1			
18	496-004	. . Nut, keps, 4-40 NC-2B, external washer, stl cad plt (Shakeproof)	1			
19	310037910	. . Latch, thread lever	1			
20	420-002	. . Bearing, ball, sst, 0.187 in. dia	1			
21	470-013	. . Screw, cap, 4-40 NC-3A by 5/8 in., hex soc, stl cad plt (MS35457-4)	1			
22	470-011	. . Screw, cap, 4-40 NC-3A by 7/16 in., hex soc, stl cad plt	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-8-						
23	502-002	. . Washer, #4 spring lock, stl cad plt (MS35338-40)	2			
24	495-017	. . Insert, sst (Heli-Coil #1185-04CNX.224)	2			
25	310075210	. . Hinge, thread lever	1			
26	471-060	. . Screw, machine, 4-40 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-12)	2			
27	502-008	. . Washer, #4 spring lock, sst (MS35338-78)	2			
28	310076110	. . Strip, locking	1			
29	477-131	. . Setscrew, headless, 2-56 NC-3A by 1/8 in., hex soc, cup point, stl cad plt (MS51017-1)	1			
30	310075910	. . Pin, hinge	1			
31	310075810	. . Block, hinge	1			
32	310074010	. . Door Assembly, vacuum chamber	1			
33	471-063	. . Screw, machine, 4-40 NC-2A by 7/16 in., pan hd Phillips, stl cad plt (MS35208-15)	2			
34	471-060	. . Screw, machine, 4-40 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-12)	2			
35	502-013	. . Washer, #4 lock, external tooth, stl cad plt (MS35335-20)	4			
36	310074410	. . Guard, upper, vacuum chamber	1			
37	310074510	. . Guard, lower, vacuum chamber	1			
38	310192110	. . Spring, door retainer	2			
39	310934610	. . Pin, tape guide	4			
40	310217110	. . Pin, guide	2			
41	470-189	. . Screw, cap, 2-56 NC-3A by 7/16 in., hex soc, sst	2			
42	310262710	. . Cap, tape guide	2			
43	310262810	. . Tape Guide	2			
44	470-002	. . Screw, cap, 2-56 NC-3A by 3/16 in., hex soc, stl cad plt	9			
45	310074110	. . Vacuum Chamber	1			
46	495-010	. . Insert, sst (Heli-Coil #1191-3CNX.285)	3			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-8-						
47	310216910	. . Base, vacuum chamber	1			
48	471-065	. Screw, machine, 4-40 NC-2A by 5/8 in., pan hd Phillips, stl cad plt (MS35208-17)	1			
49	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	1			
50	470-027	. Screw, cap, 8-32 NC-3A by 3/8 in., hex soc, stl cad plt (MS35457-14)	1			
51	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	1			
52	310073710	. Stop, head cover	1			

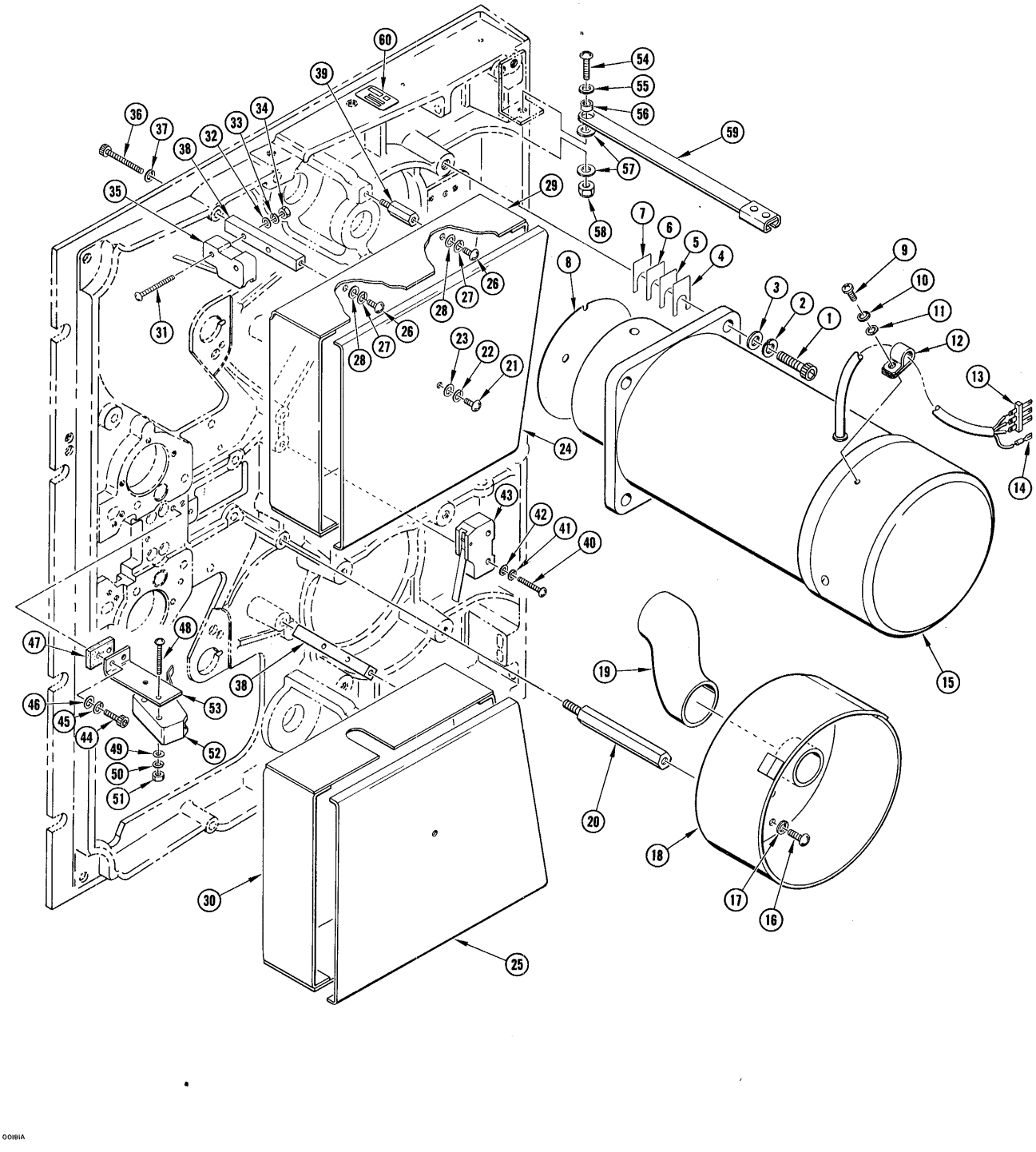


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Figure 7-9.
Reel Motors and Switches

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-9-		REEL MOTORS AND SWITCHES				
	310052510	Tape Transport Assembly (See Figure 7-1)	Ref			
1	470-134	. Screw, cap, 5/16-24 NF-2A by 1 in., hex soc, stl cad plt (MS35458-35)	8			
2	502-066	. Washer, 5/16 spring lock, sst, passivated (MS35338-83)	8			
3	501-022	. Washer, 5/16 flat, stl cad plt (AN960-516L)	8			
4	310021210	. Shim, brass, 0.0015 in. thk	A/R			
5	310021310	. Shim, brass, 0.003 in. thk	A/R			
6	310021410	. Shim, brass, 0.005 in. thk	A/R			
7	310021510	. Shim, brass, 0.010 in. thk	A/R			
8	310019610	. Shim, turntable	2			
9	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	2			
10	502-009	. Washer, #6 spring lock, sst (MS35338-79)	2			
11	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	2			
12	302-037	. Clamp, cable, plastic, 5/16 in. ID (Commercial Plastics #742-5)	2			
	310009110	. Reel Motor Assembly	2			
13	310035810	. . Fanning Strip	1			
14	171-063	. . Connector, solderless (Burndy #YAE18-Z1)	1			
15	310035710	. . Reel Motor	1			
16	471-090	. Screw, machine, 10-32 NF-2A by 5/8 in., pan hd Phillips, stl cad plt (MS35209-56)	2			
17	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	2			
18	310081610	. Bracket, blower	1			
19	310081710	. Tube, blower	1			
20	310081810	. Standoff, blower	2			
21	471-078	. Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	2			
22	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	2			
23	501-010	. Washer, #8 flat, stl cad plt (MS15795-207)	2			
24	310086810	. Cover, servo box, upper	1			
25	310086710	. Cover, servo box, lower	1			
26	471-078	. Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	6			
27	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	6			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-9-						
28	501-010	. Washer, #8 flat, stl cad plt (MS15795-207)	6			
29	310076310	. Servo Control Assembly, upper (See Figure 7-10)	1			
30	310076210	. Servo Control Assembly, lower (See Figure 7-11)	1			
31	471-448	. Screw, machine, 6-32 NC-2A by 1-¼ in., pan hd Phillips, stl cad plt (MS35208-32)	4			
32	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	4			
33	502-014	. Washer, #6 lock, external tooth, stl cad plt (MS35335-30)	4			
34	492-009	. Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	4			
35	120-062	. Switch, sensitive, spdt (S2,S3) (Unimax #2HBT215-1)	2			
36	470-104	. Screw, cap, 8-32 NC-3A by 1-¼ in., hex soc, stl cad plt (MS35457-20)	2			
37	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	4			
38	310016510	. Standoff, servo control	4			
39	310017510	. Stud, extension	2			
40	471-468	. Screw, machine, 4-40 NC-2A by 7/8 in., pan hd Phillips, stl cad plt (MS35208-19)	2			
41	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	2			
42	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	2			
43	120-062	. Switch, sensitive, spdt (S1) (Unimax #2HBT215-1)	1			
44	470-030	. Screw, cap, 8-32 NC-3A by 5/8 in., hex soc, stl cad plt (MS35457-16)	2			
45	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	2			
46	501-010	. Washer, #8 flat, stl cad plt (MS15795-207)	2			
47	310021110	. Pad, spacer	1			
	310011010	. Bracket Assembly, thread lever switch	1			
48	471-591	. . Screw, machine, 4-40 NC-2A by 1 in., binder hd slotted, brass, white nickel plt	2			
49	501-008	. . Washer, #4 flat, stl cad plt (MS15795-204)	2			
50	502-002	. . Washer, #4 spring lock, stl cad plt (MS35338-40)	2			
51	492-008	. . Nut, plain hex, 4-40 NC-2B, stl cad plt (MS35649-42)	2			
52	120-062	. . Switch, sensitive, spdt (S20) (Unimax #2HBT215-1)	1			
53	310040210	. . Bracket, angle	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-9-						
	310893910	Transport Stop Arm Kit (See Figure 7-1)	Ref			
54	471-082	. Screw, machine, 8-32 NC-2A by 3/4 in., pan hd Phillips, stl cad plt (MS35208-44)	2			
55	310021710	. Washer, hinge stop cap	2			
56	310021610	. Washer, hinge stop	2			
57	501-010	. Washer, #8 flat, stl cad plt (MS15795-207)	4			
58	493-007	. Nut, self-locking, hex, 8-32 NC-3B, stl cad plt w/nylon insert (Esna Type NM)	2			
59	310009510	. Arm Assembly, stop	2			
60	310024910	. Identification Plate	1			

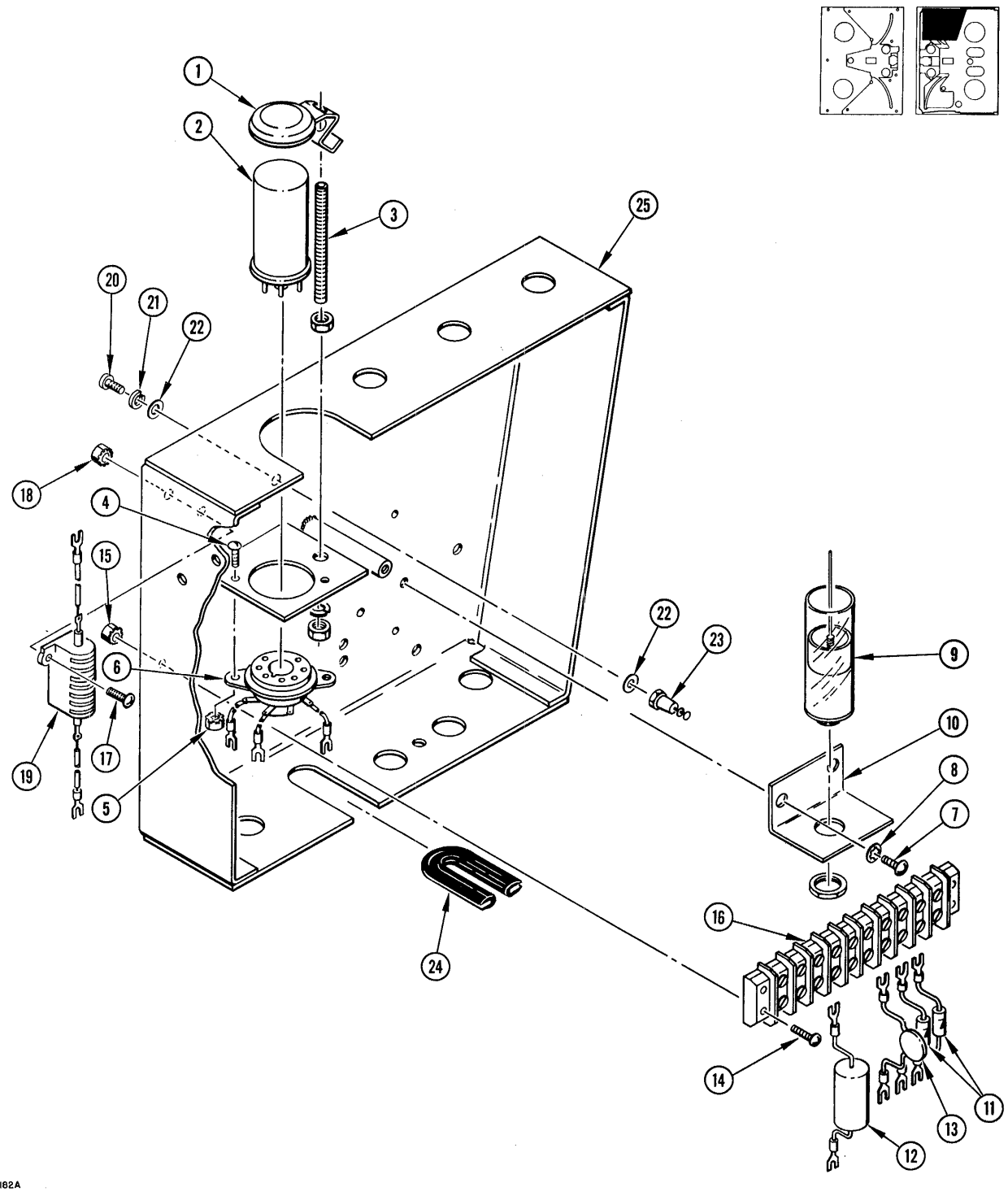

Figure 7-10.
Upper Servo Control

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-10-		UPPER SERVO CONTROL				
	310076310	Servo Control Assembly, upper (See Figure 7-9)	Ref			
1	300-021	. Clamp, tube, sst (Top Hat #2T)	1			
2	020-072	. Relay, mercury wetted contact, spdt (K12) (C.P. Clare #HG-1013)	1			
3	300-020	. Post, tube clamp, sst, w/mounting hardware (Top Hat #32)	1			
4	471-061	. Screw, machine, 4-40 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-13)	2			
5	496-004	. Nut, keps, 4-40 NC-2B, external washer, stl cad plt (Shakeproof)	2			
6	310081910	. Socket Assembly, relay, upper box	1			
7	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	2			
8	502-025	. Washer, #6 lock, internal tooth, stl cad plt (MS35333-37)	2			
9	310262910	. Dashpot Assembly, stud mounted	1			
10	310250410	. Bracket, dashpot, upper	1			
11	310082210	. Diode Assembly, 1N2069 (CR16, CR18)	2			
12	310258910	. Diode Assembly, transient suppressor (CR26)	1			
13	310082310	. Capacitor Assembly, 0.1 uf, 500 volt (C10)	1			
14	471-071	. Screw, machine, 6-32 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-27)	8			
15	496-005	. Nut, keps, 6-32 NC-2B, external washer, stl cad plt (Shakeproof)	8			
16	180-031	. Terminal Strip, barrier, phenolic (TS5, TS6) (Jones #10-140 w/marker strip)	2			
17	471-061	. Screw, machine, 4-40 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-13)	2			
18	496-004	. Nut, keps, 4-40 NC-2B, external washer, stl cad plt (Shakeproof)	2			
19	310082610	. Resistor Assembly, 300 ohm, 25w, 3% (R12)	1			
20	471-061	. Screw, machine, 4-40 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-13)	1			
21	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	1			
22	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	2			
23	173-068	. Terminal Lug, insulated (Lerco #6122)	1			
24	269-008	. Seal, neoprene (Rubbercraft #73)	1			
25	310086310	. Box Assembly, servo control upper	1			

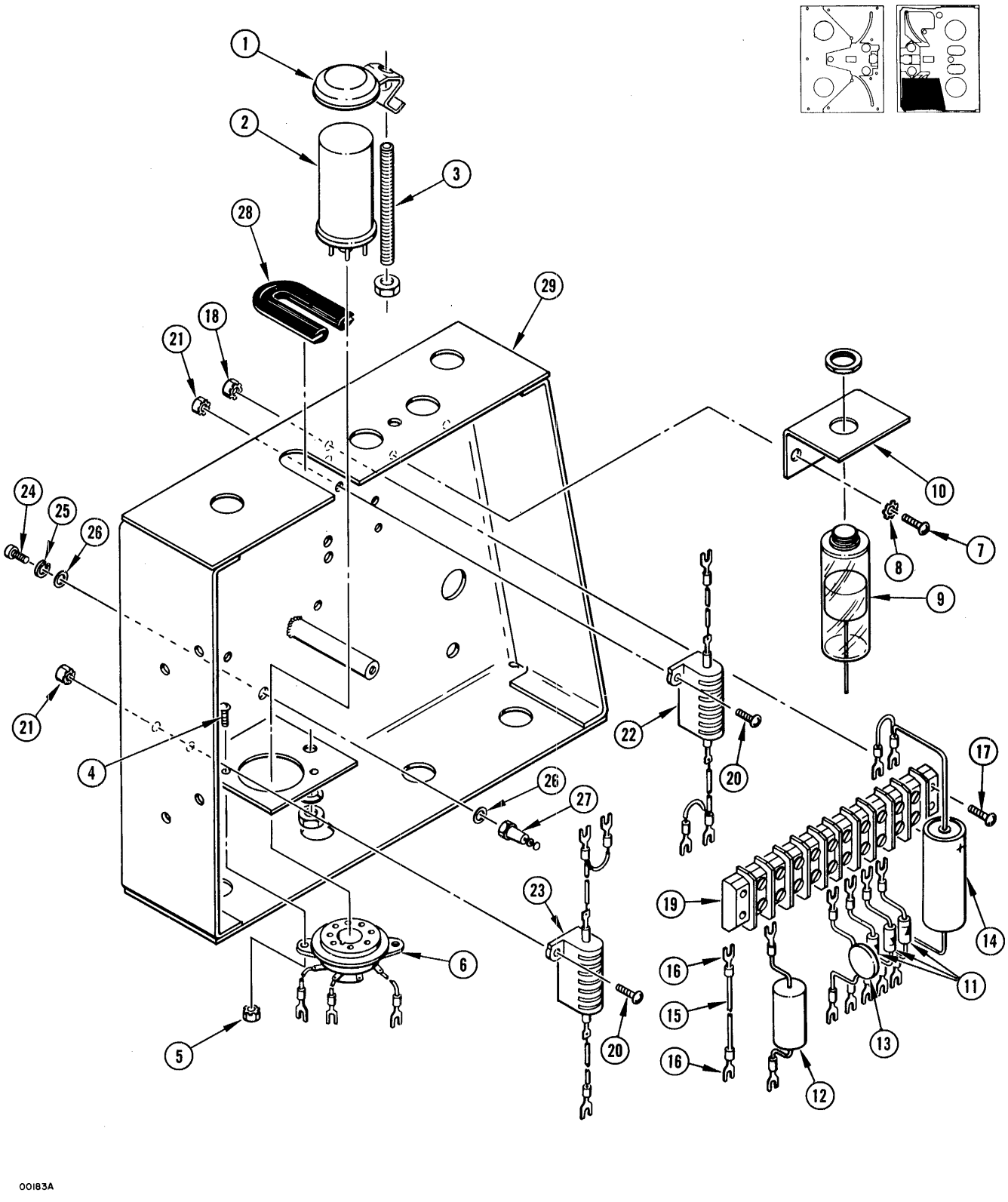

Figure 7-11.
Lower Servo Control

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-11-		LOWER SERVO CONTROL				
	310076210	Servo Control Assembly, lower (See Figure 7-9)	Ref			
1	300-021	. Clamp, tube, sst (Top Hat #2T)	1			
2	020-072	. Relay, mercury wetted contact, spdt (K13) (C.P. Clare #HG-1013)	1			
3	300-020	. Post, tube clamp, sst, w/mounting hardware (Top Hat #32)	1			
4	471-061	. Screw, machine, 4-40 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-13)	2			
5	496-004	. Nut, keps, 4-40 NC-2B, external washer, stl cad plt (Shakeproof)	2			
6	310082010	. Socket Assembly, relay, lower box	1			
7	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	2			
8	502-025	. Washer, #6 lock, internal tooth, stl cad plt (MS35333-37)	2			
9	310262910	. Dashpot Assembly, stud mounted	1			
10	310262510	. Bracket, dashpot, lower	1			
11	310082210	. Diode Assembly, 1N2069 (CR15,CR17,CR21)	3			
12	310258910	. Diode Assembly, transient suppressor (CR27)	1			
13	310082310	. Capacitor Assembly, 0.1 uf, 500 volt (C11)	1			
14	310084310	. Capacitor Assembly, 100 uf, 50 volt (C15)	1			
15	611-057	. Wire, stranded, insulated, MIL-W-16878 Type C, 22GA, 12 in. lg	1			
16	171-166	. Connector, solderless (AMP #41470)	2			
17	471-071	. Screw, machine, 6-32 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-27)	8			
18	496-005	. Nut, keps, 6-32 NC-2B, external washer, stl cad plt (Shakeproof)	8			
19	180-031	. Terminal Strip, barrier, phenolic (TS7, TS8) (Jones #10-140 w/marker strip)	2			
20	471-061	. Screw, machine, 4-40 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-13)	4			
21	496-004	. Nut, keps, 4-40 NC-2B, external washer, stl cad plt (Shakeproof)	4			
22	310082410	. Resistor Assembly, 35 ohm, 25w, 3% (R19)	1			
23	310082710	. Resistor Assembly, 300 ohm, 25w, 3% (R11)	1			
24	471-061	. Screw, machine, 4-40 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-13)	1			
25	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-11-						
26	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	2			
27	173-068	. Terminal Lug, insulated (Lerco #6122)	1			
28	269-008	. Seal, neoprene (Rubbercraft #73)	1			
29	310086210	. Box Assembly, servo control lower	1			

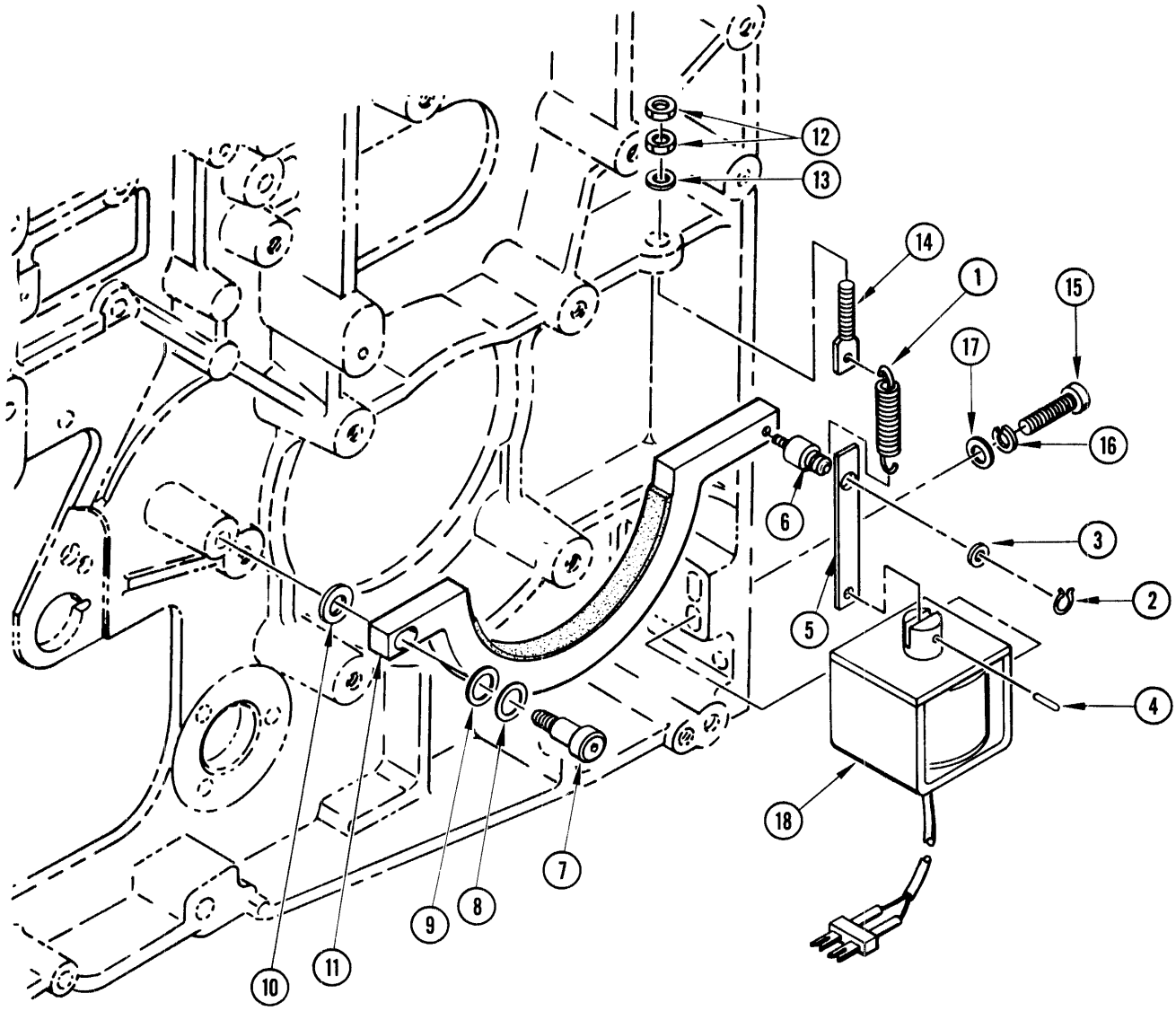

Figure 7-12.
Reel Brakes and Solenoid

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-12-		REEL BRAKES AND SOLENOID				
	310052510	Tape Transport Assembly (See Figure 7-1)	Ref			
1	310021810	. Spring, reel brake	2			
2	430-076	. Ring, retaining, external, flat, 1/8 in., beryllium copper (Truarc #5100-12-C)	2			
3	501-124	. Washer, flat, 0.126 in. ID, 0.315 in. OD, 0.016 in. thk (Bearing Engineering, Bellville #BS-8-3.2-0.4)	2			
4	406-026	. Pin, roll, sst (Esna #79-022-094-500)	2			
5	310018710	. Link, solenoid	2			
6	310089410	. Standoff, reel brake	2			
7	304714260	. Screw, shoulder, socket head cap	2			
8	501-055	. Washer, shim, flat, 0.005 in. thk, brass unplated	A/R			
9	501-058	. Washer, shim, flat, 0.010 in. thk, brass (Tilley)	A/R			
10	310016610	. Washer, flat	2			
11	310089210	. Shoe Assembly, reel brake	2			
12	492-011	. Nut, plain hex, 10-32 NF-2B, stl cad plt (MS35650-102)	4			
13	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	A/R			
14	310016010	. Bolt, spade	2			
15	471-082	. Screw, machine, 8-32 NC-2A by 3/4 in., pan hd Phillips, stl cad plt (MS35208-44)	4			
16	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	4			
17	501-010	. Washer, #8 flat, stl cad plt (MS15795-207)	4			
18	310085210	. Solenoid and Cable Assembly, DC	2			

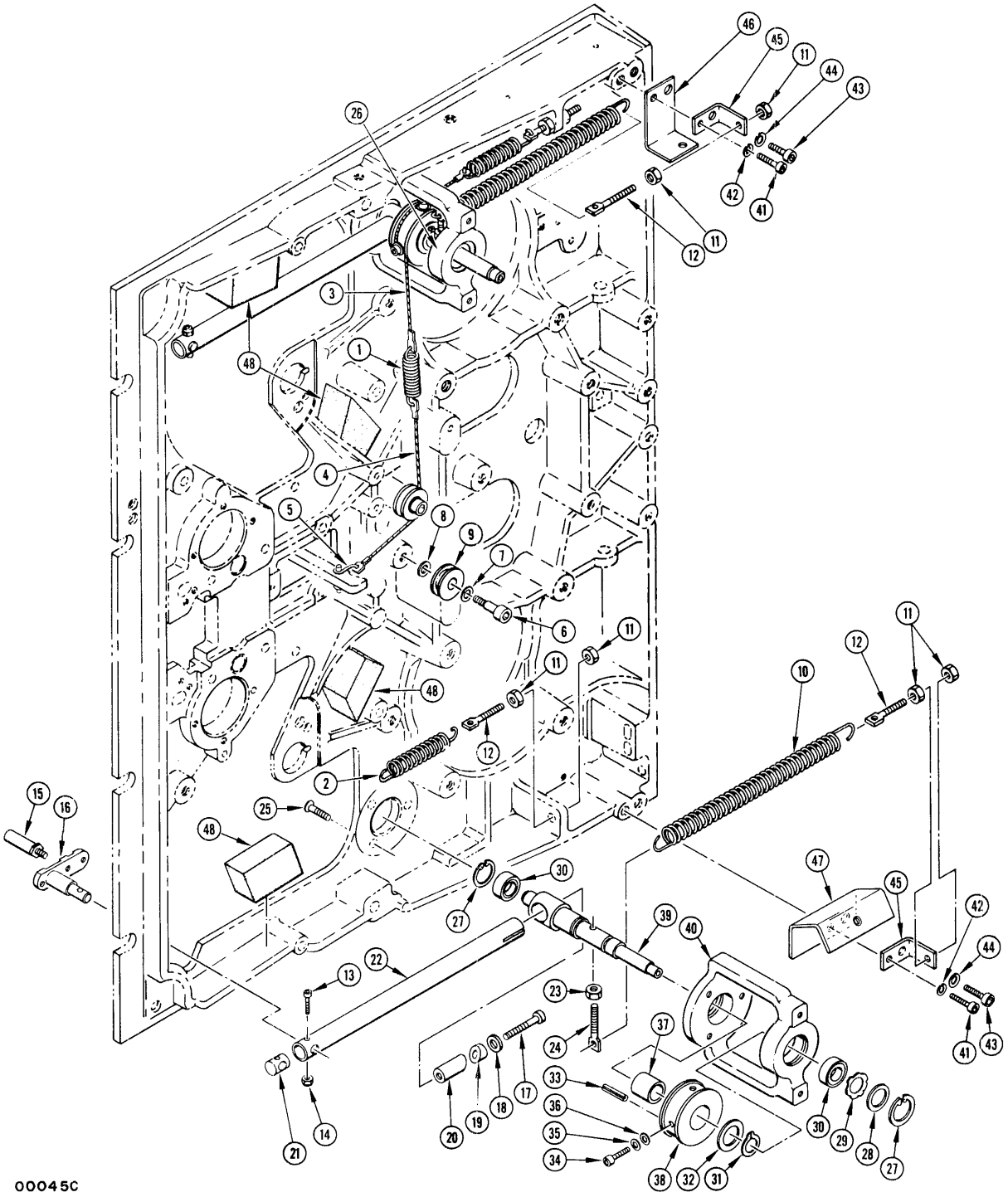

Figure 7-13.
Tension Arms

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-13-		TENSION ARMS				
	310052510	Tape Transport Assembly (See Figure 7-1)	Ref			
1	310209010	. Spring, buffer arm cable	2			
2	310020110	. Spring, extension, helical	2			
3	310208710	. Cable Assembly, long	2			
4	310208810	. Cable Assembly, short	2			
5	310209110	. Shackle, thread latch	1			
6	304717310	. Screw, shoulder, socket head cap	2			
7	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	2			
8	501-058	. Washer, shim, flat, 0.010 in. thk, brass (Tilley)	2			
9	310016810	. Roller, cable	2			
10	310018010	. Spring, tape tensioning	2			
11	492-011	. Nut, plain hex, 10-32 NF-2B, stl cad plt (MS35650-102)	8			
12	310016010	. Bolt, spade	4			
13	470-072	. Screw, cap, 6-32 NC-3A by 5/8 in., hex soc, sst, passivated	2			
14	493-017	. Nut, self-locking, hex, 6-32 NC-2B, stl cad plt (Esna #22NM107-62)	2			
	310080410	. Tape Guide Assembly	2			
15	310019910	. . Roller, tape guide	3			
16	310074910	. . Support, tape guide	1			
17	470-042	. Screw, cap, 10-32 NF-3A by 1 in., hex soc, stl cad plt (MS35458-15)	2			
18	310018510	. Washer, flat	2			
19	310016210	. Wedge, expansion	2			
20	310016110	. Wedge, expansion	2			
	310009410	. Tension Arm Assembly	2			
21	310036210	. . Plug, tension arm	1			
22	310036310	. . Tension Arm	1			
23	492-011	. Nut, plain hex, 10-32 NF-2B, stl cad plt (MS35650-102)	2			
24	310016010	. Bolt, spade	2			
25	471-347	. Screw, machine, 8-32 NC-2A by ½ in., 82° flat hd Phillips, stl cad plt (MS35192-42)	6			
26	310008610	. Mounting Assembly, tension arm	2			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-13-						
27	430-085	. . Ring, retaining, internal (Truarc #N5000-87-S-MD)	2			
28	310034910	. . Washer, flat, retaining	1			
29	352-007	. . Washer, spring, ball bearing (Wallace Barnes #R6)	1			
30	421-001	. . Bearing, ball, double shield (Fafnir #S3KDD)	2			
31	430-014	. . Ring, retaining, external (Truarc #5100-50-S-ZD)	1			
32	501-032	. . Washer, flat, ½ in., stl cad plt (AN960-816L)	1			
33	406-031	. . Pin, roll, sst (Esna #79-028-125-0750)	1			
34	470-008	. . Screw, cap, 4-40 NC-3A by ¼ in., hex soc, stl cad plt (MS35457-1)	2			
35	501-008	. . Washer, #4 flat, stl cad plt (MS15795-204)	2			
36	503-035	. . Washer, flat, fiber (Walsco #7836)	2			
	310035010	. . Pulley Assembly	1			
37	423-024	. . . Bearing, plain sleeve, bronze (Boston Bronze #B-810-5)	1			
38	310061510	. . . Pulley, uncrowned	1			
39	310035110	. . Shaft, tension arm	1			
40	310035210	. . Bracket, tension arm	1			
41	470-039	. Screw, cap, 10-32 NF-3A by 5/8 in., hex soc, stl cad plt (MS35458-12)	2			
42	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	2			
43	470-045	. Screw, cap, ¼-20 UNC-3A by ½ in., hex soc, stl cad plt (MS35457-33)	2			
44	502-006	. Washer, ¼ spring lock, stl cad plt (MS35338-44)	2			
45	310020810	. Bracket, angle	2			
46	310019810	. Bracket, angle	1			
47	310088210	. Bracket, cable clamp	1			
48	310017110	. Pad, rubber	4			

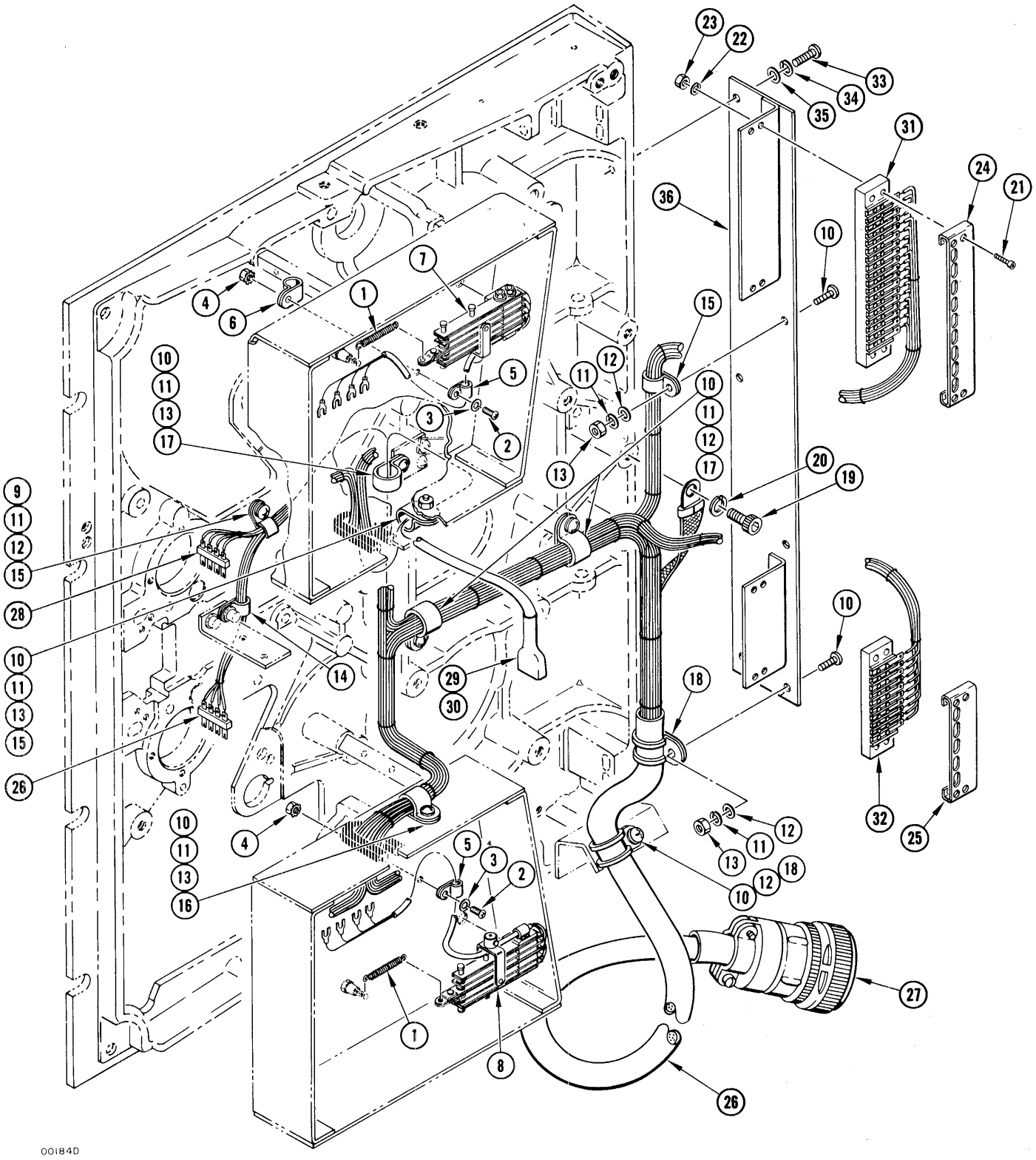

Figure 7-14.
Servo Contact and Transport Cables

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-14-		SERVO CONTACT AND TRANSPORT CABLES				
	310052510	Tape Transport Assembly (See Figure 7-1)	Ref			
1	310044110	. Spring, contact centering	2			
2	471-062	. Screw, machine, 4-40 NC-2A by 3/8 in. pan hd Phillips, stl cad plt (MS35208-14)	2			
3	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	2			
4	496-004	. Nut, keps, 4-40 NC-2B, stl cad plt (Shakeproof)	2			
5	302-058	. Clamp, cable, plastic, 1/8 in. ID (Commercial Plastics #742-2)	2			
6	302-041	. Clamp, cable, stl cad plt (Cinch-Jones #85A)	2			
7	310259310	. Servo Contact and Cable Assembly, upper	1			
8	310259210	. Servo Contact and Cable Assembly, lower	1			
9	471-078	. Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	1			
10	471-080	. Screw, machine, 8-32 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-42)	8			
11	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	8			
12	501-010	. Washer, #8 flat, stl cad plt (MS15795-207)	6			
13	492-010	. Nut, plain hex, 8-32 NC-2B, stl cad plt (MS35649-82)	5			
14	302-007	. Clamp, cable, plastic, 1/4 in. ID (Commercial Plastics #742-4)	1			
15	302-037	. Clamp, cable, plastic, 5/16 in. ID (Commercial Plastics #742-5)	3			
16	302-036	. Clamp, cable, plastic, 3/8 in. ID (Commercial Plastics #742-6)	1			
17	302-049	. Clamp, cable, plastic, 1/2 in. ID (Commercial Plastics #742-8)	3			
18	302-029	. Clamp, cable, loop (AN742D14C)	2			
19	470-045	. Screw, cap, 1/4-20 UNC-3A by 1/2 in., hex soc, stl cad plt (MS35457-33)	1			
20	502-006	. Washer, 1/4 spring lock, stl cad plt (MS35338-44)	1			
21	470-012	. Screw, cap, 4-40 NC-3A by 1/2 in., hex soc, stl cad plt (MS35457-3)	8			
22	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	8			
23	492-008	. Nut, plain hex, 4-40 NC-2B, stl cad plt (MS35649-42)	8			
24	310905210	. Cover, terminal block	1			
25	310905110	. Cover, terminal block	1			
26	310087810	. Cable Assembly, transport	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-14-						
27	301451870	. . Connector, plug, 37 pin (P1)	1			
28	310064010	. . Fanning Strip (FS3, FS4)	2			
29	169-988	. . Connector, three way, nylon housing (P702) (AMP #480177-1)	1			
30	169-019	. . Connector, contact pin, brass (AMP #42641-1)	3			
31	301801340	. . Terminal Strip, 18 terminals (TS1)	1			
32	301801350	. . Terminal Strip, 10 terminals (TS2)	1			
33	471-088	. Screw, machine, 10-32 NF-3A by 7/16 in., pan hd Phillips, stl cad plt (MS35209-54)	3			
34	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	3			
35	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	3			
36	310087010	. Support Assembly	1			

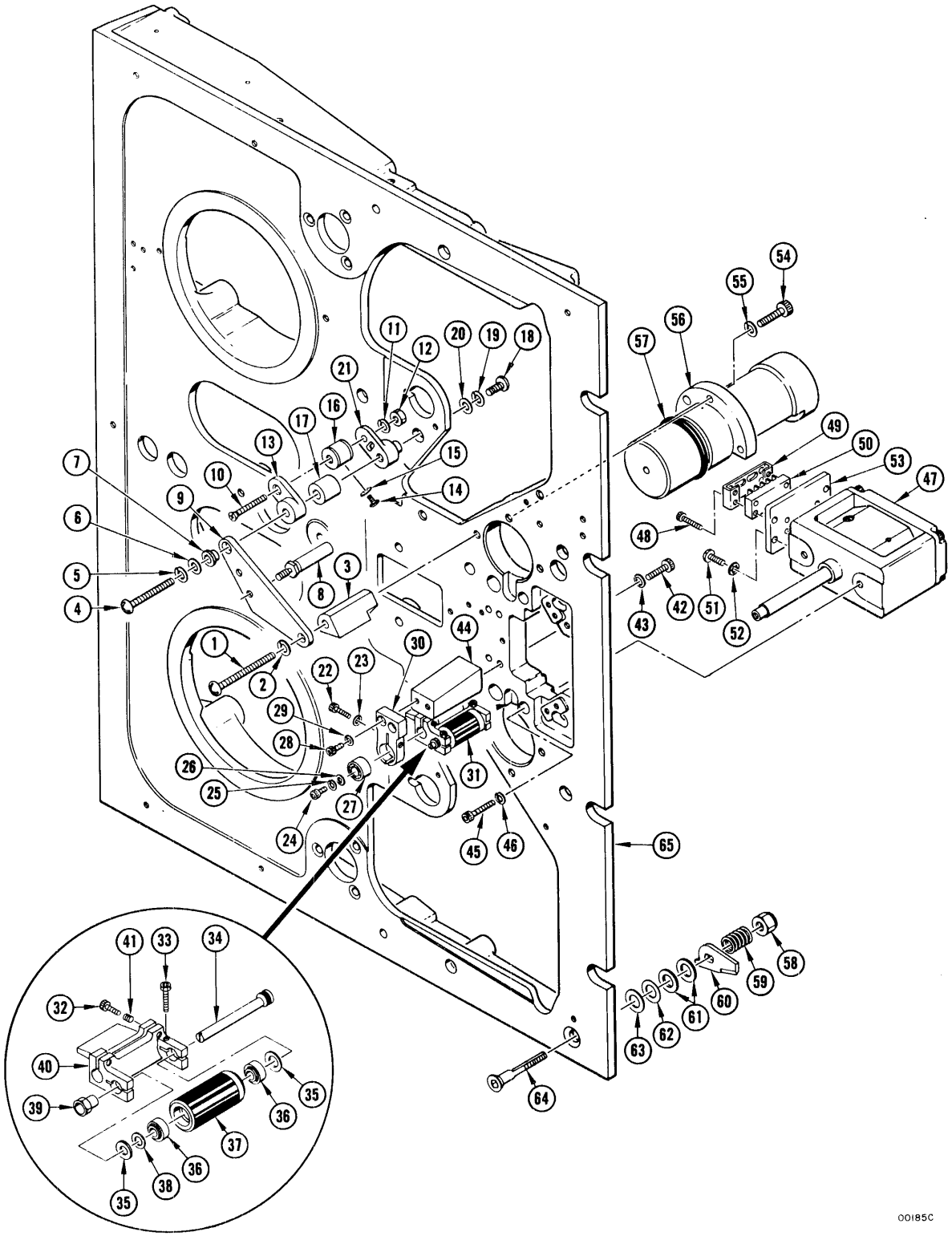

Figure 7-15.
Tape Guides, Actuators, Capstans and Capstan Rollers

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-15-		TAPE GUIDES, ACTUATORS, CAPSTANS AND CAPSTAN ROLLERS				
	310052510	Tape Transport Assembly (See Figure 7-1)	Ref			
1	471-732	. Screw, machine, 10-32 NC-2A by 2 in., pan hd Phillips, sst, passivated (MS35217-63)	2			
2	502-011	. Washer, #10 spring lock, sst (MS35338-81)	2			
3	310017210	. Spacer, sleeve	2			
4	304720100	. Screw, machine, 10-32 by 1-½ in., pan hd Phillips, sst	2			
5	502-011	. Washer, #10 spring lock, sst (MS35338-81)	2			
6	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	2			
7	503-038	. Washer, shoulder, fiber (General Cement #6527)	2			
8	310019910	. Roller, tape guide	4			
9	310075010	. Tie, stationary tape guide	2			
10	471-402	. Screw, machine, 8-32 NC-2A by 1 in., flat hd Phillips, sst, passivated (MS35200-46)	2			
11	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	2			
12	492-010	. Nut, plain hex, 8-32 NC-2B, stl cad plt (MS35649-82)	2			
13	310088810	. Support, tape guide, upper	2			
14	471-838	. Screw, machine, 2-56 NC-2A by 3/16 in., pan hd slotted, stl cad plt (MS35225-2)	2			
15	502-023	. Washer, #2 lock, internal tooth, stl cad plt (MS35333-35)	2			
16	310089010	. Tape Guide Assembly	2			
17	310089110	. Tape Guide, back	2			
18	471-087	. Screw, machine, 10-32 NF-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35209-53)	2			
19	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	2			
20	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	2			
21	310088710	. Support, tape guide, lower	2			
22	470-063	. Screw, cap, 4-40 NC-3A by ½ in., hex soc, sst, passivated	2			
23	502-008	. Washer, #4 spring lock, sst (MS35338-78)	2			
24	470-059	. Screw, cap, 4-40 NC-3A by ¼ in., hex soc, sst, passivated	2			
25	502-008	. Washer, #4 spring lock, sst (MS35338-78)	2			
26	501-014	. Washer, #4 flat, sst, passivated (MS15795-304)	2			
27	310084010	. Bearing, outboard	2			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-15-						
28	470-061	. Screw, cap, 4-40 NC-3A by 3/8 in., hex soc, sst, passivated	4			
29	502-008	. Washer, #4 spring lock, sst (MS35338-78)	4			
30	310157010	. Arm, actuator shaft support	2			
31	310084110	. Capstan Roller Assembly, lower	1			
	310084210	. Capstan Roller Assembly, upper	1			
32	470-236	. . Screw, cap, self-locking, hex soc, 4-40 by 7/16 in., sst (Allen 1960 Series)	2			
33	470-235	. . Screw, cap, self-locking, hex soc, 2-56 by 3/8 in., sst (Allen 1960 Series)	2			
34	310176410	. . Shaft Assembly, capstan roller	1			
35	310183310	. . Spacer, bearing	2			
	310929510	. . Capstan Roller Assembly	1			
36	310178210	. . . Bearing, ball	2			
37	310176510	. . . Roller, capstan	1			
38	501-119	. . Washer, spring, #5, beryllium copper (Shakeproof #3502-05-23-2114)	1			
39	310183810	. . Sleeve, flanged	1			
40	310084510	. . Yoke, capstan roller, lower	1			
	310084610	. . Yoke, capstan roller, upper	1			
41	495-004	. . . Insert, sst, 4-40 (Heli-Coil #1185-04CNX.168)	2			
42	470-030	. Screw, cap, 8-32 NC-3A by 5/8 in., hex soc, stl cad plt (MS35457-16)	4			
43	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	4			
44	310085010	. Post, actuator shaft support	2			
45	470-031	. Screw, cap, 8-32 NC-3A by 3/4 in., hex soc, stl cad plt (MS35457-17)	4			
46	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	4			
47	310083710	. Actuator Assembly, capstan roller	2			
48	470-012	. . Screw, cap, 4-40 NC-3A by 1/2 in., hex soc, stl cad plt (MS35457-3)	4			
49	310905010	. . Cover, terminal block	1			
50	180-080	. . Terminal Strip, barrier, phenolic (Kulka #410-3/4ST-4M)	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-15-						
51	471-019	. . Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, brass cad plt (Type MS35212)	4			
52	502-025	. . Washer, #6 lock, internal tooth, stl cad plt (MS35333-37)	4			
53	310041610	. . Plate, terminal board mounting	1			
54	470-039	. Screw, cap, 10-32 NF-3A by 5/8 in., hex soc, stl cad plt (MS35458-12)	6			
55	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	6			
56	310280410	. Capstan Assembly	2			
57	432-032	. . Quad Ring (Minnesota Rubber and Gasket #MRQ1-Q24)	1			
58	493-012	. Nut, self-locking, hex, 1/4-20 NC-3B, stl cad plt w/nylon insert (Esna Type NM)	1			
59	310018110	. Spring, transport lock	1			
60	310018310	. Latch, thumb	1			
61	310016610	. Washer, flat	2			
62	501-055	. Washer, shim, flat, brass, unplated, 0.005 in. thk	A/R			
63	501-058	. Washer, shim, flat, brass, 0.010 in. thk (Tilley)	A/R			
64	310018610	. Screw, machine, latch	1			
65	310091310	. Frame, transport	1			

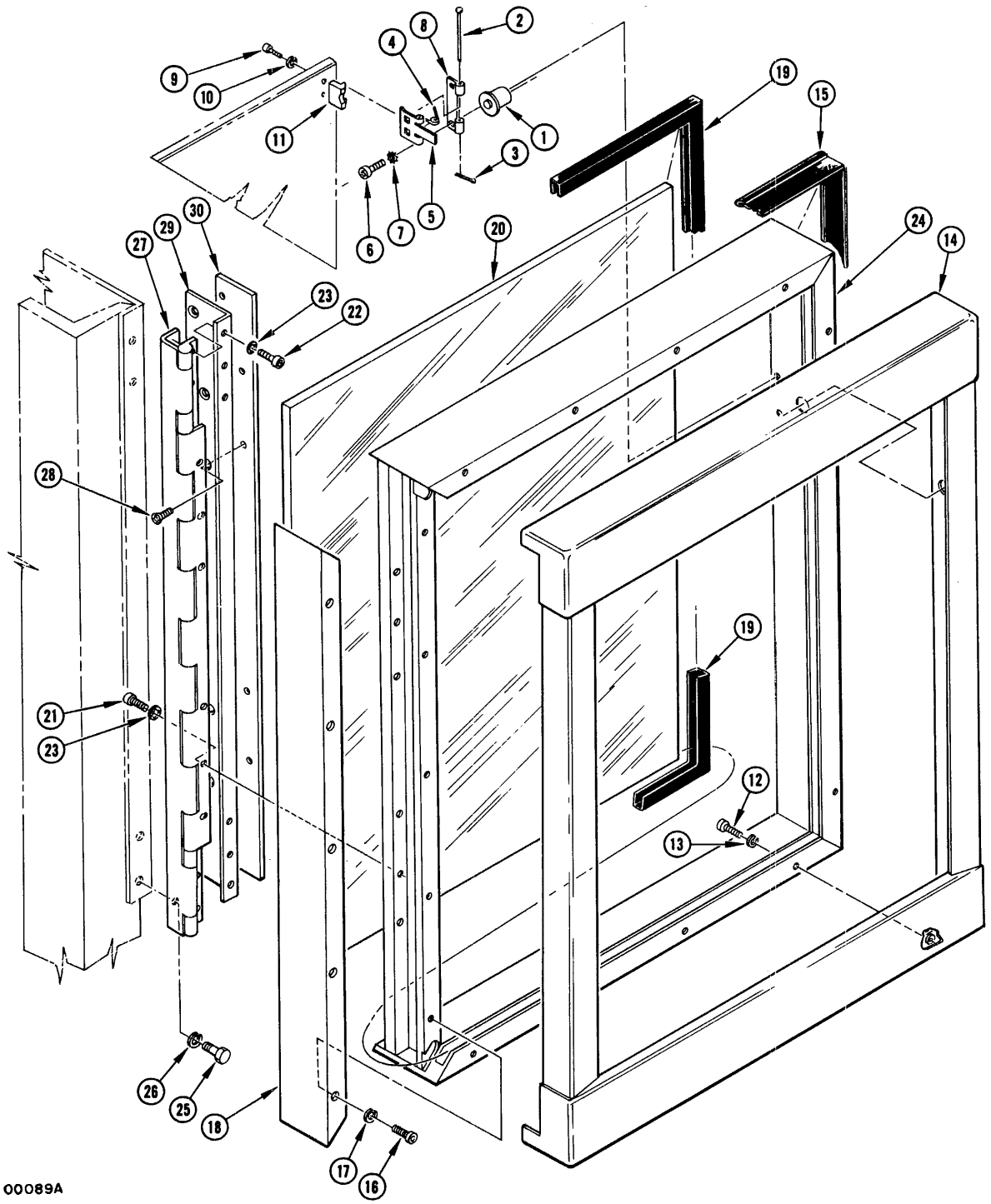

Figure 7-16.
Access Door

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-16-		ACCESS DOOR				
	310263310	Access Door Assembly (See Figure 7-1)	Ref			
1	310025810	. Button, latch finger	1			
2	400-021	. Pin, clevis, 1/8 in. dia by 1-31/32 in. lg, pan hd, stl cad plt (MS20392-1-63)	1			
3	401-004	. Pin, cotter, 1/16 in. dia by 3/8 in. lg, sst	1			
4	310025510	. Spring, helical torsion	1			
5	310025410	. Strike, latch	1			
6	471-059	. Screw, machine, 4-40 NC-2A by 3/16 in., pan hd Phillips, stl cad plt (MS35208-11)	2			
7	502-013	. Washer, #4 lock, external tooth, stl cad plt (MS35335-20)	2			
8	310025310	. Hinge, strike latch	1			
9	470-009	. Screw, cap, 4-40 NC-3A by 5/16 in., hex soc, stl cad plt	2			
10	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	2			
11	310022710	. Bolt, latch	1			
12	470-031	. Screw, cap, 8-32 NC-3A by 3/4 in., hex soc, stl cad plt (MS35457-17)	8			
13	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	8			
14	310264310	. Door Frame, transport access	1			
15	269-124	. Seal, extrusion, black (Rubbercraft #1133 non-staining)	A/R			
16	470-030	. Screw, cap, 8-32 NC-3A by 5/8 in., hex soc, stl cad plt (MS35457-16)	5			
17	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	5			
18	310025110	. Channel, window	1			
19	PACKING	. Packing (Everseal #616, 632 or 664)	A/R			
20	310025010	. Pane, glass, dust cover	1			
21	470-030	. Screw, cap, 8-32 NC-3A by 5/8 in., hex soc, stl cad plt (MS35457-16)	6			
22	470-027	. Screw, cap, 8-32 NC-3A by 3/8 in., hex soc, stl cad plt (MS35457-14)	6			
23	502-026	. Washer, #8 lock, internal tooth, stl cad plt (MS35333-38)	12			
24	310025210	. Window, access door	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-16-						
25	471-465	. Screw, machine, 12-24 NC-2A by 1/2 in., hex hd, stl cad plt	6			
26	502-049	. Washer, #12 spring lock, stl cad plt	6			
27	310017810	. Hinge, butt	1			
28	471-734	. Screw, machine, 10-24 NC-2A by 1/2 in., flat hd Phillips, stl cad plt	10			
29	310017710	. Bracket, hinge	1			
30	310017610	. Spacer, hinge	1			

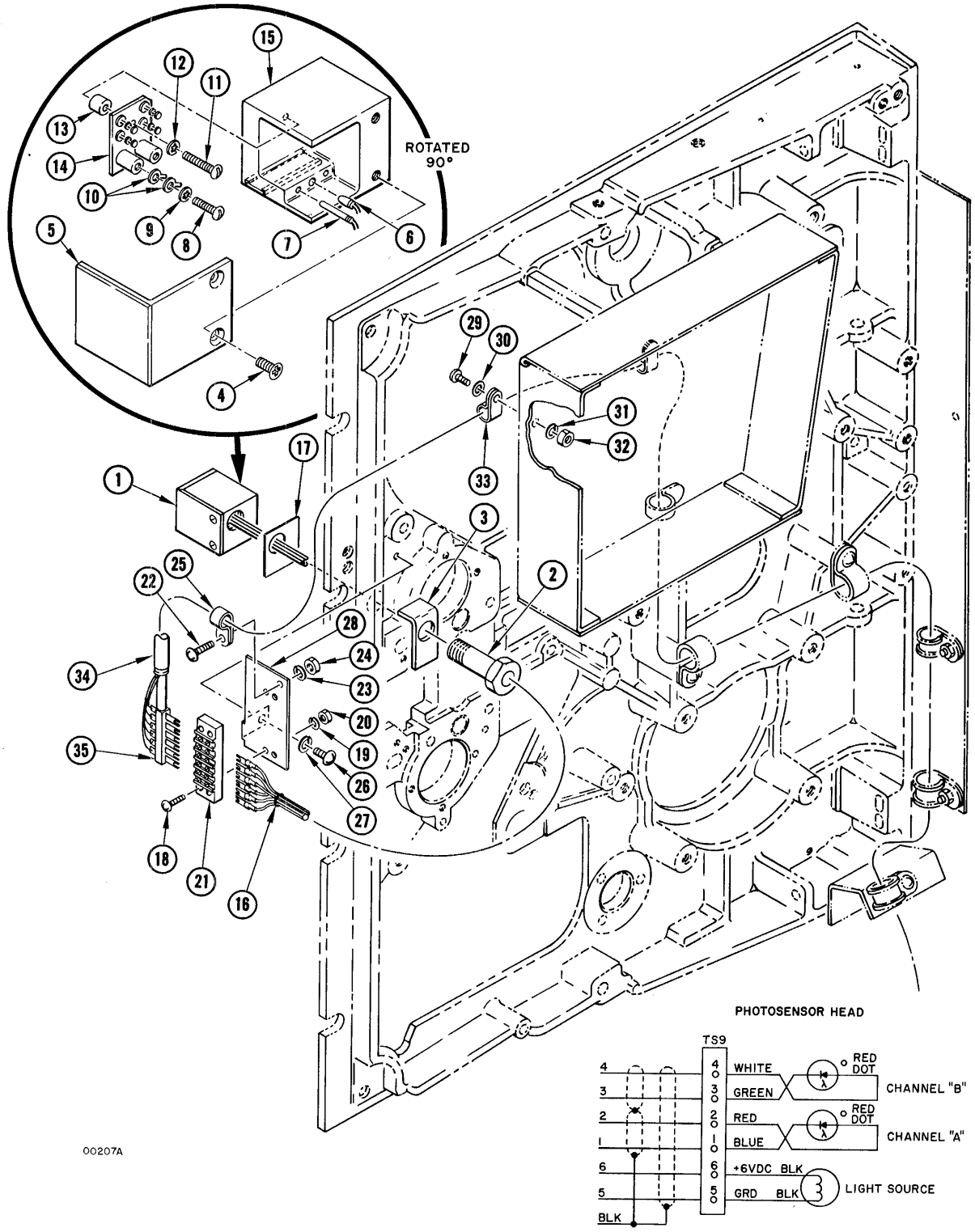

Figure 7-17.
Photosense Head and Cable

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-17-		PHOTOSENSE HEAD AND CABLE				
	310795010	Photosense Head and Cable Assembly (See Figure 7-1)	Ref			
1	310030910	. Head Assembly, photosense	1			
2	310059210	. . Stud, hollow	1			
3	310079410	. . Bracket, mounting	1			
4	471-379	. . Screw, machine, 4-40 NC-2A by 1/4 in., flat hd Phillips, sst (MS35200-12)	2			
5	310059110	. . Cover	1			
6	060-059	. . Lamp, miniature, 5 volt, 0.060 amp (Chicago Miniature #CM8-683)	1			
7	310059410	. . Cell, photoelectric	2			
8	471-002	. . Screw, machine, 2-56 NC-2A by 3/16 in., pan hd slotted, brass cad plt (MS35229-2)	2			
9	502-023	. . Washer, #2 lock, internal tooth, stl cad plt (MS35333-35)	2			
10	172-027	. . Lug, soldering, #2 plain, copper tinned (Zierick #341)	4			
11	471-056	. . Screw, machine, 2-56 NC-2A by 3/8 in., pan hd slotted, stl cad plt (MS35225-5)	1			
12	502-023	. . Washer, #2 lock, internal tooth, stl cad plt (MS35333-35)	1			
13	267-006	. . Spacer (Centralab #P-325)	1			
14	310059310	. . Terminal Board Assembly	1			
15	310771310	. . Housing, photosense	1			
16	310062110	. . Lug, fanning strip	6			
17	310091210	. Spacer, photosense	1			
18	471-064	. Screw, machine, 4-40 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS24584-16)	4			
19	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	4			
20	492-008	. Nut, plain hex, 4-40 NC-2B, stl cad plt (MS35649-42)	4			
21	180-077	. Terminal Strip, barrier, 6 terminals, w/marker strip (TS9) (Kulka #410-3/4ST-6M)	1			
22	471-080	. Screw, machine, 8-32 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-42)	1			
23	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	1			
24	492-010	. Nut, plain hex, 8-32 NC-2B, stl cad plt (MS35649-82)	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-17-						
25	302-007	. Clamp, cable, plastic, 1/4 in. ID (Commercial Plastics #742-4)	1			
26	471-085	. Screw, machine, 10-32 NF-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35209-51)	1			
27	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	1			
28	310087410	. Bracket, photosense	1			
29	471-070	. Screw, machine, 6-32 NC-2A by 7/16 in., pan hd Phillips, stl cad plt (MS24584-26)	2			
30	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	2			
31	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
32	492-009	. Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	2			
33	302-007	. Clamp, cable, plastic, 1/4 in. ID (Commercial Plastics #742-4)	2			
34	310794910	. Cable Assembly, photosense head	1			
35	310190910	. . Fanning Strip	1			

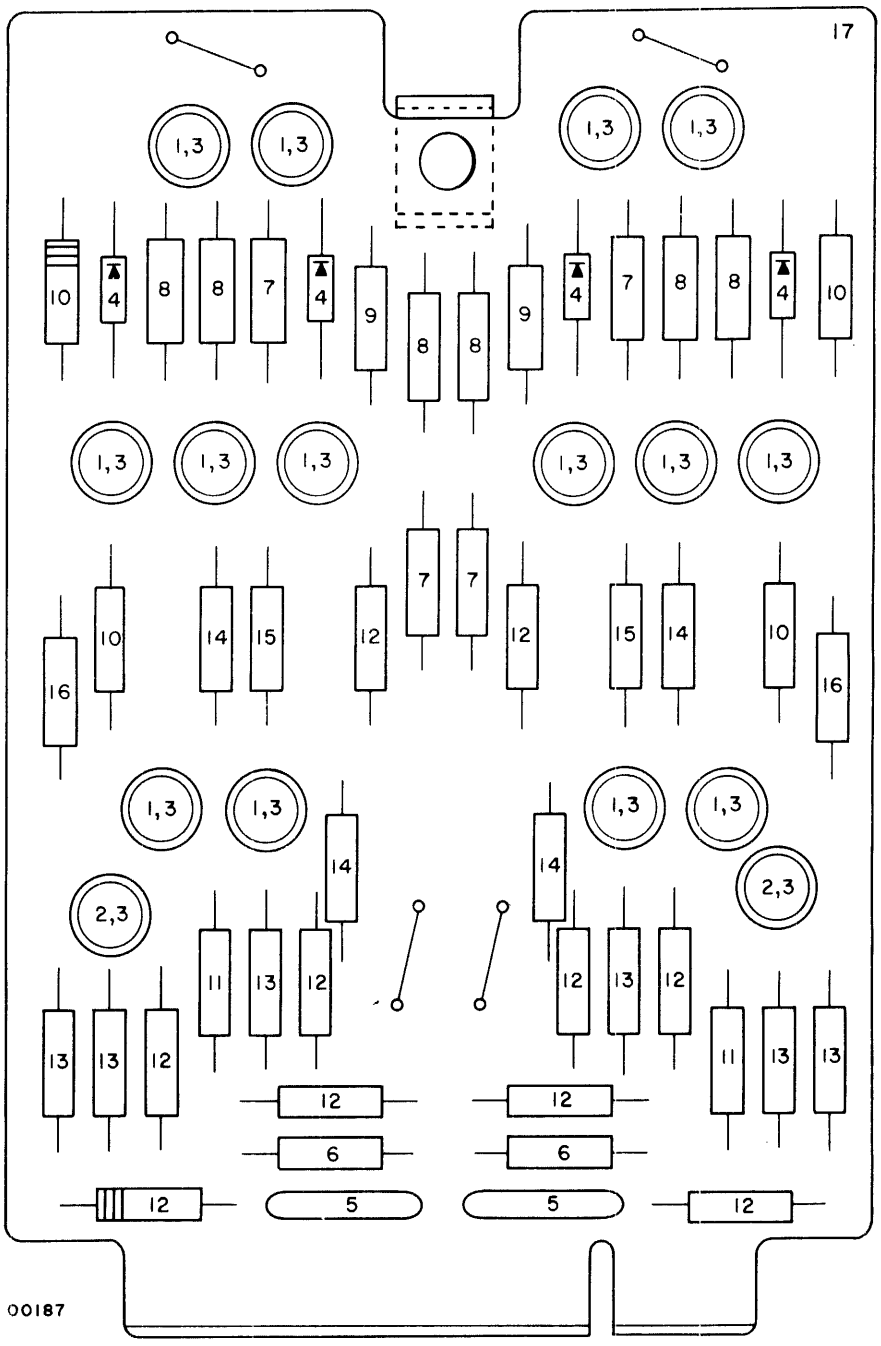

Figure 7-18.
Buffer Delay and Interlock Unit

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-18-		BUFFER DELAY AND INTERLOCK UNIT				
	310497010	Buffer Delay and Interlock Unit Assembly (See Figure 7-1)	Ref			
1	014-078	. Transistor, NPN, switching type (Q1, Q2, Q4 thru Q11, Q13 thru Q16) (General Transistor #2N445A)	14			
2	014-030	. Transistor (Q3, Q12) (General Transistor #2N446A)	2			
3	280-030	. Spacer, transistor mounting pad (Milton Ross Metals #10012)	16			
4	320132310	. Diode, silicon (CR1 thru CR4)	4			
5	030-129	. Capacitor, ceramic disc, 0.01uf, 1000 volt (C1, C4) (Cornell-Dubilier #BYA10S1M)	2			
6	041-330	. Resistor, fixed, composition, 6800 ohm, 1/2w, 5% (R1, R25) (MIL-R-11:RC20GF682J)	2			
7	041-303	. Resistor, fixed, composition, 3900 ohm, ½w, 5% (R2, R5, R26, R29) (MIL-R-11:RC20GF392J)	4			
8	041-015	. Resistor, fixed, composition, 27K, ½w, 5% (R3, R6, R7, R27, R30, R31) (MIL-R-11: RC20GF273J)	6			
9	041-357	. Resistor, fixed, composition, 5600 ohm, ½w, 5% (R4, R28) (MIL-R-11:RC20GF562J)	2			
10	041-456	. Resistor, fixed, composition, 36K, ½w, 5% (R8, R11, R32, R35) (MIL-R-11:RC20GF363J)	4			
11	041-254	. Resistor, fixed, composition, 15K, ½w, 5% (R9, R33) (MIL-R-11:RC20GF153J)	2			
12	041-322	. Resistor, fixed, composition, 18K, ½w, 5% (R10, R13, R14, R16, R17, R34, R39, R40, R42, R43) (MIL-R-11:RC20GF183J)	10			
13	041-239	. Resistor, fixed, composition, 2200 ohm, ½w, 5% (R12, R15, R22, R38, R41, R46) (MIL-R-11:RC20GF222J)	6			
14	041-023	. Resistor, fixed, composition, 100K, ½w, 5% (R18, R20, R36, R44) (MIL-R-11:RC20GF104J)	4			
15	041-273	. Resistor, fixed, composition, 270 ohm, ½w, 5% (R23, R47) (MIL-R-11:RC20GF271J)	2			
16	041-016	. Resistor, fixed, composition, 22K, ½w, 5% (R24, R48) (MIL-R-11:RC20GF223J)	2			
17	310059710	. Printed Circuit Board	1			

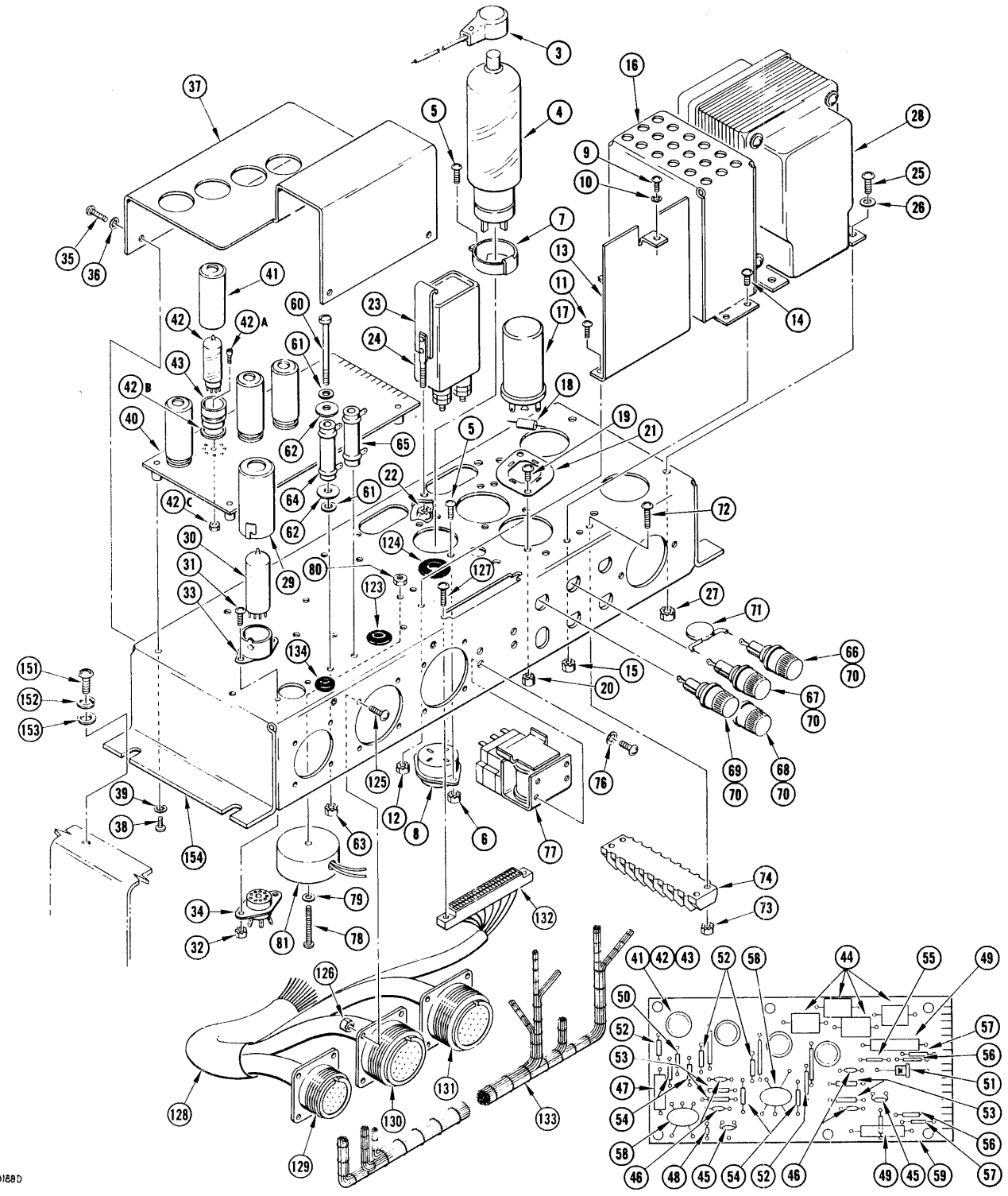

Figure 7-19.
Transport Electronics (Sheet 1 of 2)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-19-		TRANSPORT ELECTRONICS CHASSIS				
	310443610	Transport Electronics Assembly, basic unit (See Figure 7-1)	Ref			
1	476-002	. Screw, self-tapping, 6-32 by ¼ in., pan hd Phillips, stl cad plt (Parker-Kalon)	6			
2	310076910	. Cover, chassis	1			
3	162-017	. Cap, vacuum tube (Millen #36001)	1			
4	015-013	. Tube, thyratron, 4 pin base (V1) (Taylor #C3J)	1			
5	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	2			
6	496-005	. Nut, keps, 6-32 NC-2B, external washer, stl cad plt (Shakeproof)	2			
7	300-001	. Clamp, tube hold down (Birtcher #926C-2)	1			
8	150-058	. Socket, tube, 4 contact (Millen #33004)	1			
9	471-062	. Screw, machine, 4-40 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-14)	1			
10	502-024	. Washer, #4 lock, internal tooth, stl cad plt (MS35333-36)	1			
11	471-062	. Screw, machine, 4-40 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-14)	2			
12	496-004	. Nut, keps, 4-40 NC-2B, external washer, stl cad plt (Shakeproof)	2			
13	310076510	. Shield, buffer board	1			
14	471-067	. Screw, machine, 6-32 NC-2A by ¼ in., pan hd Phillips, stl cad plt (MS35208-23)	3			
15	496-005	. Nut, keps, 6-32 NC-2B, external washer, stl cad plt (Shakeproof)	3			
16	310091610	. Shield, capacitor	1			
17	031-039	. Capacitor, electrolytic, 125 uf, 450 volt (C8, C9) (Sprague #TVL-1760)	2			
18	041-224	. Resistor, fixed, composition, 100K, 2w, 10% (R16, R17) (MIL-R-11:RC42GF104K)	2			
19	471-067	. Screw, machine, 6-32 NC-2A by ¼ in., pan hd Phillips, stl cad plt (MS35208-23)	4			
20	496-005	. Nut, keps, 6-32 NC-2B, external washer, stl cad plt (Shakeproof)	4			
21	290-004	. Bracket, capacitor mounting (Mallory #BP-6)	2			
22	496-007	. Nut, keps, 10-32 NF-2B, external washer, stl cad plt (Shakeproof)	4			
23	290-015	. Bracket, capacitor mounting, stl (MIL-C-25: CP07SA3)	4			

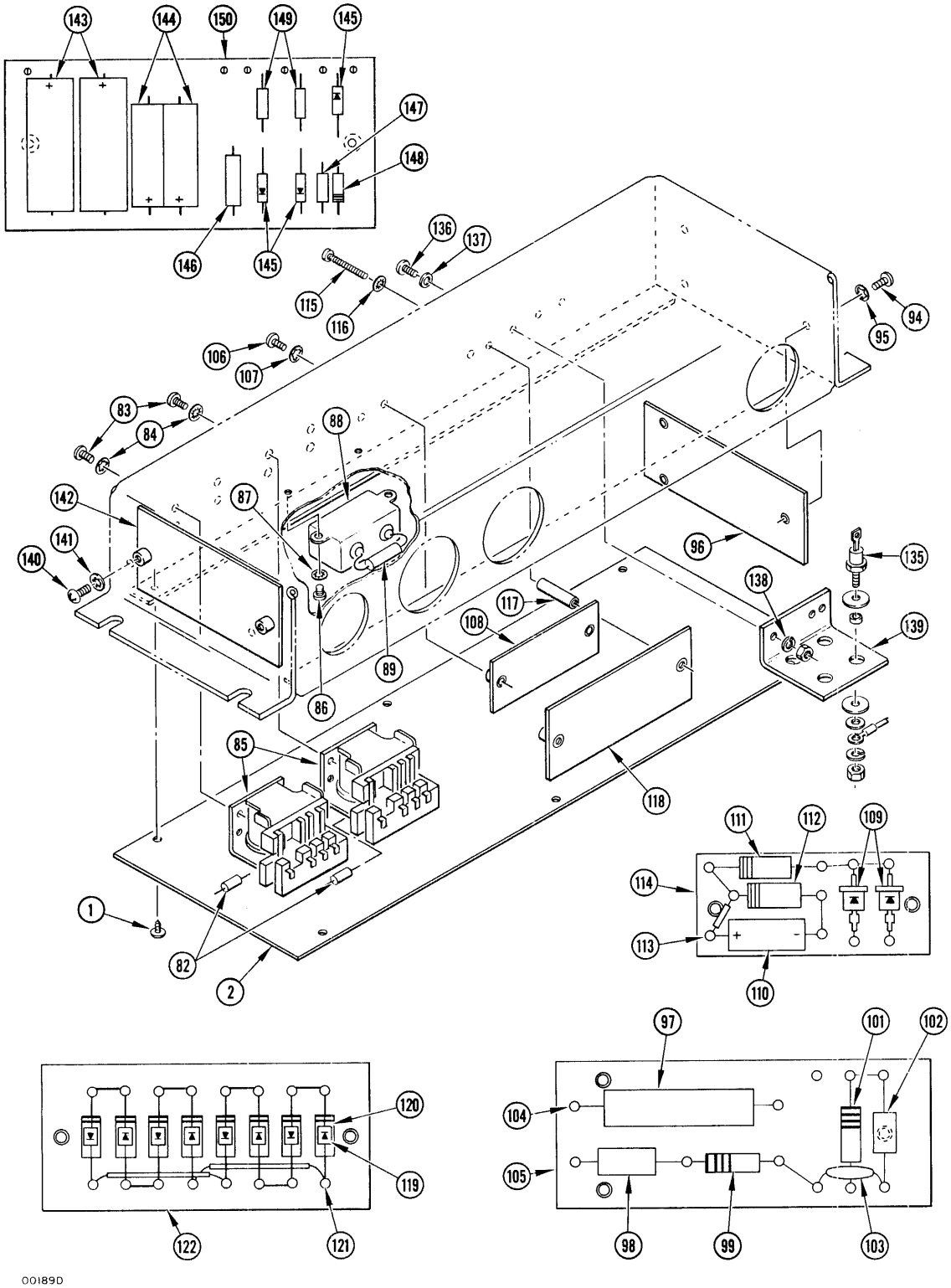

Figure 7-19.
Transport Electronics (Sheet 2 of 2)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-19-						
24	036-059	. Capacitor, paper, rectangular, 2 uf, 600 volt (C4, C5) (Sprague #CP70B1EF205K)	2			
25	471-087	. Screw, machine, 10-32 NF-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35209-53)	4			
26	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	5			
27	496-007	. Nut, keps, 10-32 NF-2B, external washer, stl cad plt (Shakeproof)	4			
28	310076410	. Transformer (T1)	1			
29	160-020	. Shield, tube (JAN-S-28A:TS103U03)	1			
30	020-164	. Relay, thermal delay, 60 second (K11) (Electronics Fitting Corp #117-60-SG0)	1			
31	471-062	. Screw, machine, 4-40 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-14)	2			
32	496-004	. Nut, keps, 4-40 NC-2B, external washer, stl cad plt (Shakeproof)	2			
33	160-076	. Base, tube shield (Vector #S-9)	1			
34	150-037	. Socket, bottom mounting (Cinch #13398)	1			
35	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	4			
36	502-025	. Washer, #6 lock, internal tooth, stl cad plt (MS35333-37)	4			
37	310073510	. Cover, circuit board	1			
38	471-067	. Screw, machine, 6-32 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-23)	6			
39	502-025	. Washer, #6 lock, internal tooth, stl cad plt (MS35333-37)	6			
40	310217410	. Actuator Control Assembly (CU1)	1			
41	160-082	. . Shield, tube, miniature (IERC #TRT5-5020B)	4			
42	012-136	. . Tube, thyratron (V12 thru V15) (RCA, GE, CBS #5727)	4			
42A	470-061	. . Screw, cap, 4-40 NC-3A by 3/8 in., hex soc, sst, passivated	4			
42B	503-068	. . Washer, non-metallic, phenolic (Vector #0360-61-12)	4			
42C	496-004	. . Nut, keps, 4-40 NC-2B, stl cad plt (Shakeproof)	4			
43	150-144	. . Socket, tube (Cinch #111-54-11-102)	4			
44	305410520	. . Inductor, 1 MH, ±20%, 3.4 ohms max (L5 thru L8)	4			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-19-						
45	030-004	. . Capacitor, ceramic disc, 2 x 0.001 uf, 500 volt (C14A, C14B, C15A, C15B) (Centralab #DD2-102)	2			
46	030-043	. . Capacitor, ceramic disc, 0.0022 uf, 500 volt (C17, C18, C19, C28)	4			
47	031-271	. . Capacitor, electrolytic, 100 uf, 15 volt (C29) (Sprague #30D172A1)	1			
48	030-002	. . Capacitor, ceramic disc, 0.01 uf, 500 volt (C16) (Erie #811-000-GP-103P)	1			
49	035-180	. . Capacitor, tubular, 0.47 uf, 100 volt (C30, C31) (Sprague #96P47491S4)	2			
50	013-992	. . Diode, silicon, 10 volt, 10% (CR28) (Transitron #1N714)	1			
51	582-028	. . Rectifier, silicon, single phase, half wave (CR9) (General Instrument #PT-5)	1			
52	041-072	. . Resitor, fixed, composition, 100K, 1/2w, 10% (R29 thru R32) (MIL-R-11:RC20GF104K)	4			
53	041-089	. . Resistor, fixed, composition, 4.7 megohm, 1/2w, 10% (R33, R36, R37, R40) (MIL-R-11:RC20GF475K)	4			
54	041-065	. . Resistor, fixed, composition, 27K, 1/2w, 10% (R34, R35, R38, R39) (MIL-R-11:RC20GF273K)	4			
55	041-148	. . Resistor, fixed, composition, 1500 ohm, 1w, 10% (R42) (MIL-R-11:RC32GF152K)	1			
56	041-064	. . Resistor, fixed, composition, 22K, 1/2w, 10% (R43, R44) (MIL-R-11:RC20GF223K)	2			
57	041-007	. . Resistor, fixed, composition, 750 ohm, 1/2w, 5% (R45, R46) (MIL-R-11:RC20GF751J)	2			
58	310060010	. . Transformer, pulse (T8, T9)	2			
59	310217310	. . Etched Board, actuator control	1			
60	471-524	. Screw, machine, 6-32 NC-2A by 2-1/2 in., round hd slotted, brass cad plt	3			
61	506-003	. Washer, centering (Ohmite #6000)	6			
62	310031510	. Washer, fiber	6			
63	496-005	. Nut, keps, 6-32 NC-2B, external washer, stl cad plt (Shakeproof)	3			
64	043-055	. Resistor, fixed, wirewound, 100 ohm, 25w, 5% (R1) (Tru-Ohm Type FR-25)	1			
65	043-053	. Resistor, fixed, wirewound, 50 ohm, 25w, 5% (R7, R8) (Tru-Ohm Type FR-25)	2			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-19-						
66	070-041	. Fuse, cartridge, 10 amp, 250 volt, normal blow (F1, F2) (MS90079-5)	2			
67	070-020	. Fuse, cartridge, 5 amp, 125 volt, slow blow (F3) (Littelfuse #313005)	1			
68	070-026	. Fuse, cartridge, 1/2 amp, 125 volt, slow blow (F4) (Littelfuse #313.500)	1			
69	070-002	. Fuse, cartridge, 3 amp, 125 volt, slow blow (F5) (Littelfuse #313003)	1			
70	085-001	. Fuse Post, finger operated (Littelfuse #342012)	5			
71	030-032	. Capacitor, ceramic, 0.1 uf, 500 volt (C36, C37) (Erie #3877-000-Z5V0-104Z)	2			
72	471-071	. Screw, machine, 6-32 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-27)	4			
73	496-005	. Nut, keps, 6-32 NC-2B, external washer, stl cad plt (Shakeproof)	4			
74	180-133	. Terminal Strip, barrier, 8 terminals	1			
75	471-067	. Screw, machine, 6-32 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-23)	4			
76	502-025	. Washer, #6 lock, internal tooth, stl cad plt (MS35333-37)	4			
77	020-006	. Relay, 3 pdt, 10 amp contacts (K9) (Philtrol #33QA)	1			
78	471-448	. Screw, machine, 6-32 NC-2A by 1-1/4 in., pan hd Phillips, stl cad plt (MS35208-32)	1			
79	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	1			
80	496-005	. Nut, keps, 6-32 NC-2B, external washer, stl cad plt (Shakeproof)	1			
81	310033010	. Choke, encapsulated (L4)	1			
82	013-139	. Diode, silicon (Texas Instrument #1N2069)	2			
	320132310	. Diode, silicon (replaces 013-139)	2			
83	471-067	. Screw, machine, 6-32 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-23)	8			
84	502-025	. Washer, #6 lock, internal tooth, stl cad plt (MS35333-37)	8			
85	020-036	. Relay, 5 pdt, 10 amp contacts (K1, K14) (Philtrol #33BDC-24-5C-13)	2			
86	471-076	. Screw, machine, 8-32 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-38)	2			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-19-						
87	502-026	. Washer, #8 lock, internal tooth, stl cad plt (MS35333-38)	2			
88	036-048	. Capacitor, paper, rectangular, 0.25 uf, 600 volt (C39) (Cornell-Dubilier #DYR6025)	1			
89	013-271	. Diode, selenium (CR30) (General Electric #6RS5SP4B4)	1			
90	thru 93	. Deleted				
94	471-067	. Screw, machine, 6-32 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-23)	3			
95	502-025	. Washer, #6 lock, internal tooth, stl cad plt (MS35333-37)	3			
96	310443110	. Terminal Board Assembly (TB7)	1			
97	035-073	. . Capacitor, tubular, 0.1 uf, 600 volt, 5% (C1) (Sangamo #330601)	1			
98	034-105	. . Capacitor, mica, 0.00047 uf, 1000 volt, 5% (C3) (Elmenco #VCM20D471J)	1			
99	041-127	. . Resistor, fixed, composition, 1 megohm, 1w, 5% (R4) (MIL-R-11:RC32GF105J)	1			
100		. . Deleted				
101	041-224	. . Resistor, fixed, composition, 100K, 2w, 10% (R5) (MIL-R-11:RC42GF104K)	1			
102	305410520	. . Inductor, 1 MH, ±20%, 3.4 ohms max (L3)	1			
103	030-129	. . Capacitor, ceramic disc, 0.01 uf, 1000 volt (C50) (Cornell-Dubilier #BYA10S1M)	1			
104	173-015	. . Turret Lug, single end (Useco #1300B-8)	11			
105	310069010	. . Terminal Board	1			
106	471-067	. Screw, machine, 6-32 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-23)	2			
107	502-025	. Washer, #6 lock, internal tooth, stl cad plt (MS35333-37)	2			
108	310227110	. Terminal Board Assembly (TB11)	1			
109	582-028	. . Rectifier, half wave, single phase (CR19, CR20) (General Instrument #PT-5)	2			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-19-						
110	037-009	. . Capacitor, tantalum, 15 uf, 75 volt (C13) (Fansteel #PP15B75A2)	1			
111	041-994	. . Resistor, fixed, composition, 1500 ohm, 2w, 5% (R14) (MIL-R-11:RC42GF152J)	1			
112	041-229	. . Resistor, fixed, composition, 2200 ohm, 2w, 5% (R15) (MIL-R-11:RC42GF222J)	1			
113	173-015	. . Turret Lug, single end (Useco #1300B-8)	10			
114	310070810	. . Terminal Board	1			
115	471-448	. Screw, machine, 6-32 NC-2A by 1-1/4 in., pan hd Phillips, stl cad plt (MS35208-32)	2			
116	502-025	. Washer, #6 lock, internal tooth, stl cad plt (MS35333-37)	2			
117	310443910	. Spacer	2			
118	310063110	. Terminal Board Assembly, diode (TB14)	1			
119	013-198	. . Diode, silicon (CR1 thru CR8) (Texas Instrument #1N2071)	8			
	320132310	. . Diode, silicon (replaces 013-198)	8			
120	041-476	. . Resistor, fixed, composition, 1.2 megohm, 1/2w, 5% (MIL-R-11:RC20GF125J)	8			
121	173-015	. . Turret Lug, single end (Useco #1300B-8)	16			
122	310063510	. . Terminal Board	1			
123	260-005	. Grommet, neoprene (Rubbercraft #6)	1			
124	260-012	. Grommet, neoprene (MS35489-16)	1			
125	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	12			
126	496-005	. Nut, keps, 6-32 NC-2B, external washer, stl cad plt (Shakeproof)	12			
127	471-064	. Screw, machine, 4-40 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-16)	2			
128	310948910	. Cable Assembly, transport electronics, #1	1			
129	301462110	. . Connector, receptacle, female, 24 pin (J3)	1			
130	301461990	. . Connector, receptacle, female, 37 pin (J2)	1			
131	301462000	. . Connector, receptacle, female, 37 pin (J1)	1			
132	168-032	. . Connector, printed circuit, 15 pin (J10) (Continental Connector #600-120-3XBD)	1			
133	310949010	. Cable Assembly, transport electronics, #2	1			
134	260-006	. Grommet, neoprene (Rubbercraft #85)	1			
135	013-206	. Diode, silicon, 6 amp, 200 volt, w/mounting hardware (CR10 thru CR13) (GE #1N1344A)	4			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-19-						
136	471-062	. Screw, machine, 4-40 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-14)	2			
137	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	2			
138	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	2			
139	310612910	. Bracket, heat sink	1			
140	471-067	. Screw, machine, 6-32 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-23)	2			
141	502-025	. Washer, #6 lock, internal tooth, stl cad plt (MS35333-37)	2			
142	310067410	. Power Supply Board Assembly (TB12)	1			
143	031-263	. . Capacitor, electrolytic, 100 uf, 50 volt (C53, C91) (Cornell-Dubilier #BR1005)	2			
144	031-219	. . Capacitor, electrolytic, 200 uf, 12 volt (C71, C81) (Sprague #30D156A1)	2			
145	320132310	. . Diode, silicon (CR51, CR61, CR71)	3			
146	041-099	. . Resistor, fixed, composition, 270 ohm, 1w, 5% (R54) (MIL-R-11:RC32GF271J)	1			
147	041-528	. . Resistor, fixed, composition, 300 ohm, 1/2w, 5% (R52) (MIL-R-11:RC20GF301J)	1			
148	041-334	. . Resistor, fixed, composition, 200 ohm, 1/2w, 5% (R51) (MIL-R-11:RC20GF201J)	1			
149	043-391	. . Resistor, fixed, wirewound, 1 ohm, 1/2w, 5% (R55, R56) (Continental Carbon #NA15)	2			
150	310073310	. . Printed Circuit Board	1			
151	471-464	. Screw, machine, 12-24 NC-2A by 5/8 in., pan hd Phillips, stl cad plt	4			
152	502-049	. Washer, #12 spring lock, stl cad plt	4			
153	501-029	. Washer, #12 flat, stl cad plt	4			
154	310443710	. Chassis Assembly, transport electronics	1			

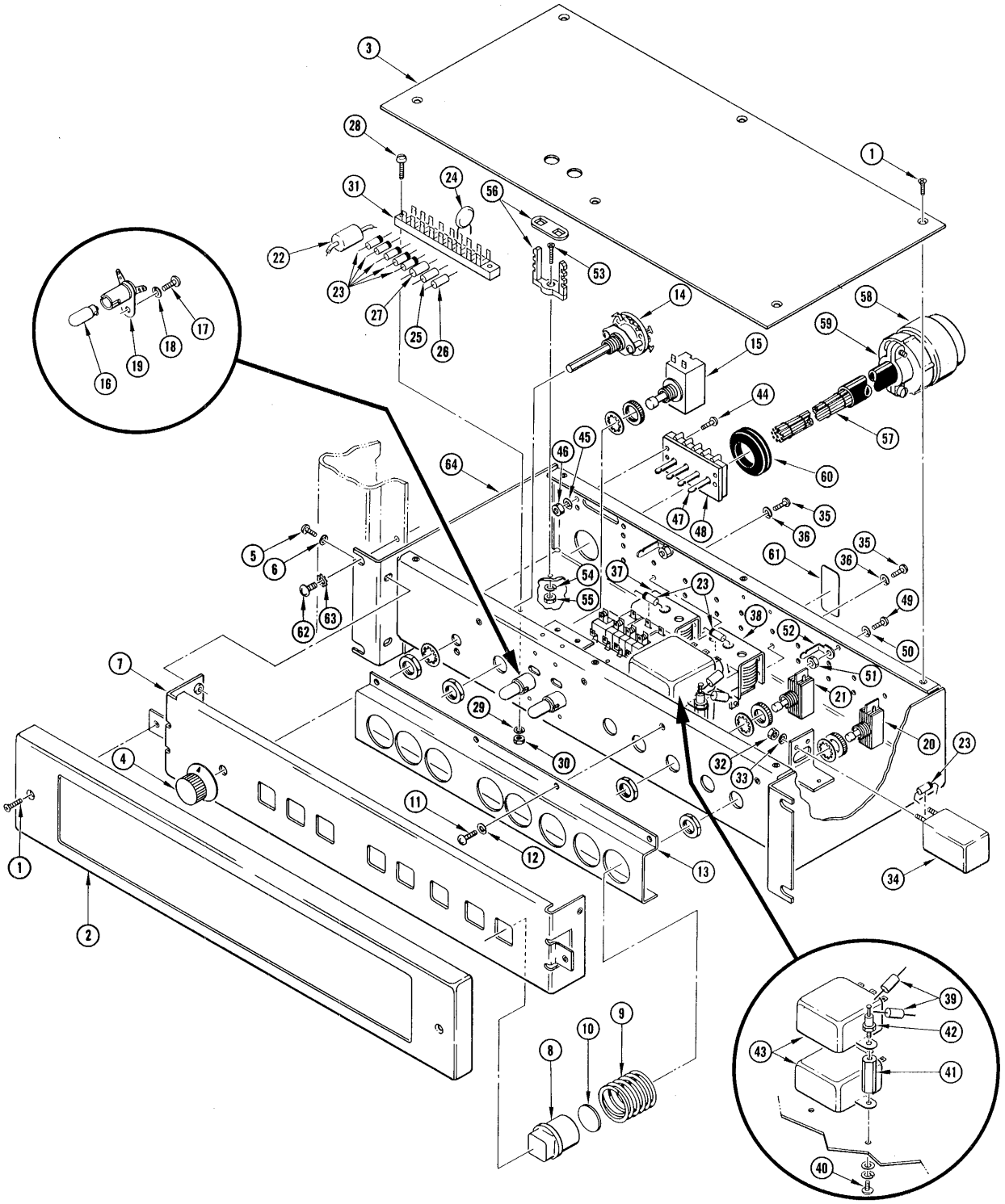

Figure 7-20.
Pushbutton Control Assembly

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-20-		PUSHBUTTON CONTROL ASSEMBLY				
	310263410	Pushbutton Control Assembly (See Figure 7-1)	Ref			
1	471-387	. Screw, machine, 6-32 NC-2A by 3/8 in., 82° flat hd Phillips, sst, passivated (MS35200-25)	8			
2	310281810	. Cover, panel	1			
3	310281710	. Cover, top	1			
	310543710	. Pushbutton Control Box Assembly	1			
4	230-018	. . Knob, w/2 hex socket setscrews (Raytheon #70-3-2G)	1			
5	471-071	. . Screw, machine, 6-32 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-27)	4			
6	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	4			
7	310026510	. . Panel, front control	1			
8	310026310	. . Button, control	8			
9	310026210	. . Spring, control button	8			
10	310026110	. . Platform, control button	6			
11	471-069	. . Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	4			
12	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	4			
13	310026610	. . Bracket, pushbutton	1			
14	122-030	. . Switch, rotary, 5 pole, 2-3 position, w/mounting hardware (S13) (Centralab #PA2015)	1			
15	120-037	. . Switch, pushbutton, dpdt, w/mounting hardware (S6) (Arrow Hart & Hegeman #81117)	1			
16	060-001	. . Lamp, incandescent, 6.3 volt, 0.15 amp (General Electric #47)	2			
17	471-069	. . Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	2			
18	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
19	132-027	. . Holder, lamp, bayonet socket (DS1, DS2) (Dialco #7-12)	2			
20	120-013	. . Switch, pushbutton, single pole, w/mounting hardware (S8, S9, S10, S12) (Arrow Hart & Hegeman #3391EPA)	4			
21	120-014	. . Switch, pushbutton, single pole, w/mounting hardware (S11) (Arrow Hart & Hegeman #3391BSA)	1			
22	031-145	. . Capacitor, electrolytic, 5 uf, 25 volt (C6) (Sprague #30D179A1)	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-20-						
23	320132310	. . Diode, silicon	12			
24	030-032	. . Capacitor, ceramic, 0.1 uf, 500 volt (C12) (Erie #3877-00-ZSVO-104Z)	1			
25	041-253	. . Resistor, fixed, composition, 75K, 1/2w, 5% (R6) (MIL-R-11:RC20GF753J)	1			
26	041-129	. . Resistor, fixed, composition, 1.5 meg, 1w, 5% (R2) (MIL-R-11:RC32GF155J)	1			
27	041-017	. . Resistor, fixed, composition, 33K, 1/2w, 5% (R13) (MIL-R-11:RC20GF333J)	1			
28	471-435	. . Screw, machine, 4-40 NC-2A by 1/2 in., fillister hd Phillips, brass cad plt	4			
29	502-002	. . Washer, #4 spring lock, stl cad plt (MS35338-40)	4			
30	492-008	. . Nut, plain hex, 4-40 NC-2B, stl cad plt (MS35649-42)	4			
31	180-017	. . Terminal Strip, 9 terminal (TB8, TB9) (Cinch Jones #9-170)	2			
32	492-008	. . Nut, plain hex, 4-40 NC-2B, stl cad plt (MS35649-42)	2			
33	502-002	. . Washer, #4 spring lock, stl cad plt (MS35338-40)	2			
34	020-029	. . Relay, sensitive, spdt (K7) (Sigma #26-RJ-12,000W)	1			
35	471-067	. . Screw, machine, 6-32 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-23)	24			
36	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	24			
37	020-036	. . Relay, 5pdt (K8) (Philtrol #33BDC-24-5C-13)	1			
38	020-034	. . Relay, 3 pole (K2 thru K6) (Philtrol #33BDC-24-3C-13)	5			
39	041-131	. Resistor, fixed, composition, 10 ohm, 1w, 10% (R1, R3) (MIL-R-11:RC32GF100K)	2			
40	SCREW	. Screw, machine, 6-32	3			
41	280-110	. Spacer, hex, 1-1/8 in. lg (Angler Industries #AP465C-M03-F02)	2			
42	173-041	. Standoff, ceramic (Cambridge Thermionic #X1995-A)	1			
43	035-592	. Capacitor, paper, rectangular, 0.5 uf, 1000 volt (C1, C2) (Cornell-Dubilier #DYR10055)	2			
44	471-071	. . Screw, machine, 6-32 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-27)	4			
45	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	4			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
7-20						
46	492-034	. . Nut, plain hex, special 6-32 NC-2B, stl cad plt	4			
47	172-030	. . Lug, solder (Cinch-Jones #Y140)	4			
48	180-387	. . Terminal Strip, 4 terminal, w/marker strip (TB10) (Cinch-Jones #4-140-Y)	1			
49	471-067	. . Screw, machine, 6-32 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-23)	2			
50	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
51	492-009	. . Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	2			
52	172-019	. . Lug, solder, brass (Cinch-Jones #Y-142)	2			
53	471-338	. . Screw, machine, 6-32 NC-2A by 1/2 in., 82° flat hd Phillips, stl cad plt (MS35192-27)	1			
54	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	1			
55	492-009	. . Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	1			
56	302-042	. . Clamp, cable, white nylon (Dakota #2C1-50/2C1-50A)	1			
57	310612310-	. . Cable Assembly, pushbutton control chassis	1			
58	141-001	. . . Connector, plug, male, 37 contact (MS3106B28-21P)	1			
59	302-002	. . . Clamp, cable, w/bushing (AN3057-16A)	1			
60	260-011	. . . Grommet, neoprene (MS35489-19)	1			
61	310024910	. . Identification Plate	1			
62	471-463	. . Screw, machine, 12-24 NC-2A by 3/8 in., pan hd Phillips, stl cad plt	4			
	471-087	. . Screw, machine, 10-32 NF-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-53)	4			
63	502-052	. . Washer, #12 lock, external tooth, stl cad plt	4			
	502-016	. . Washer, #10 lock, external tooth, stl cad plt (MS35335-32)	4			
64	310026410	. . Chassis Assembly, pushbutton control welded	1			