"DATASPEED®" MAGNETIC TAPE SET

TAPE TRANSPORT

ADJUSTMENTS AND LUBRICATION

CONTENTS

		PAGE
1.	GENERAL	2
	A. Cleaning of Recording Head	2
	B. Tape Drive Clutches and Brake Assembly	2
	C. Photosensor Assembly	5 ←
2.	ADJUSTMENTS	6
	Gear Shift Mechanism	
	Clutch trip lever	14
	Clutch trip lever spring	14
	Gear shift position	18
	Input gear overload clutch	19
	Magnet coil position	14
	Motor pinion gear backlash	19
	Reel drive idler arm spring	18
	Spring clutch gear assembly endplay	13
	Reel Drive Mechanism	
	Supply and take-up reel drive gear backlash	6
	Supply reel hub height and clearance (final)	20 ←
	Supply reel hub height and clearance (preliminary)	15 ←
	Take-up reel hub height and clearance	15
	Tape reel clutch torque	6
	Tape Drive Mechanism	
	Capstan interlock switch	11
	Capstan tape guide (final)	22
	Capstan tape guide (preliminary)	12
	Capstan tape guide spring	22
	Forward clutch armature assembly	8
	Head tape guide spring	22
	Photosensor lamp beam (final)	24
	Photosensor lamp beam (preliminary)	23
	Pinch roller engagement	9
	Pinch roller parallelism (final)	21
	Pinch roller parallelism (preliminary)	9
	Pinch roller torsion springs	21
	Reverse clutch armature assembly	9
	Reverse clutch rotor clearance	8
	Supply and take-up tension arms torsion springs (preliminary)	10
	Supply tape guide roller (early design)	12 ←
	Supply tension arm torsion spring (final)	28
	Take-up tension arm torsion spring (final)	29
	Tension arm cam plate	10
	Tape Transport Assembly	
	Cartridge holder centering	31
	Counter drive belt tension	17
	Counter drive pulley position	17
	Counter position (early design)	16
	Counter position (late design)	16
	Dust cup — counter drive belt clearance	30
	Dust cup height	30
	Record interlock switch (early design)	7 ←
	Record interlock switch (late design)	7
	Record interlock switch push rod spring (late design)	7 ←
	Top panel gap	7
3.	LUBRICATION	31
	GENERAL	31
	TAPE TRANSPORT	
	Gear shift mechanism	32,33
	Motor unit	33
	Right-hand head cover (late design)	36 ←

Prepared for American Telephone and Telegraph Company by Teletype Corporation

CONTENTS PAGE

Reel drive mechanism 34
Tape drive mechanism 34,35
Tape position counter 35

1. GENERAL

1.01 This section provides adjustment and lubrication procedures for the tape transport used in DATASPEED Magnetic Tape Sets (Figure 1). It is reissued to include information presented in TCN's 1568, 1604, 1723, 1733, and 1748, to include engineering changes, and to permit standard distribution. Changes and additions are indicated by marginal arrows. Issues 1 and 2 of this section were limited printings and did not receive standard distribution.

1.02 The adjustments are arranged in a sequence that would be followed if a complete readjustment of the unit were undertaken. In some cases where an illustration shows interrelated parts, the sequence that should be followed in checking the requirements and making the adjustments shown is indicated by the letters (A), (B), (C), etc. In following such a procedure, parts or assemblies that are removed to facilitate adjustments should not be replaced until all other adjustments, which would be facilitated by removal of these parts, are made. If any adjustment is changed, related adjustments should be checked. Before making any adjustment, read the adjustment procedure thoroughly.

CAUTION: REMOVE POWER FROM UNIT BEFORE MAKING ANY ADJUSTMENT UNLESS OTHERWISE STATED.

1.03 Unless stated otherwise, make screws or nuts friction tight to make an adjustment and tighten them to just compress the lockwasher once the adjustment has been made.

1.04 References made to left, right, front, rear, top or bottom, etc, apply to the transport in its normal operating position in the cabinet as viewed by the operator.

1.05 The spring tension values indicated are scale readings which would be obtained when proper scales are used as specified. Springs which do not meet the requirements, and for which no adjusting procedure is given, should be replaced by new ones.

1.06 Check all moving parts to make sure they are free from binds before operating the unit under power.

1.07 Parts ordering information can be obtained from Section 578-300-800. For tools necessary in making the adjustments, refer to Section 570-005-800.

A. Cleaning of Recording Head

1.08 In order to insure efficient performance of the magnetic tape set, the operator should clean the tape head and associated guiding apparatus once a week. If dirt and oxide are detected on the guides and rollers, the interval should be shortened. Figure 2 shows areas to be cleaned. When cleaning the head and guides, use TP337401 recording head cleaner and a cotton swab.

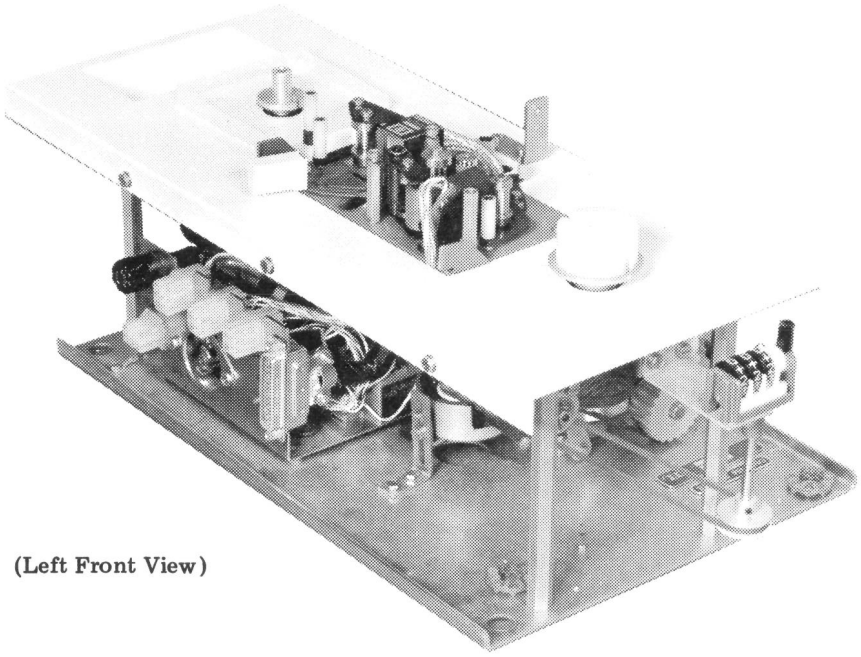
CAUTION: EXERCISE EXTREME CARE WHEN WORKING IN THE AREA OF THE RECORDING HEAD. USE NO SHARP OBJECTS TO REMOVE DIRT FROM HEAD. DO NOT ATTEMPT TO MAKE ANY ELECTRICAL CHECKS ON THE TAPE HEAD.

1.09 Late design units include a tape cleaner in the right-hand head cover to minimize accumulation of dirt and oxide particles in the head area. In units so equipped, rotate the active cleaner one detent position clockwise once monthly for normal usage and twice monthly for heavy usage. The tape cleaner has six detent positions and should be discarded and replaced by one of the spare cleaners when all six detent positions have been used.

B. Tape Drive Clutches and Brake Assembly

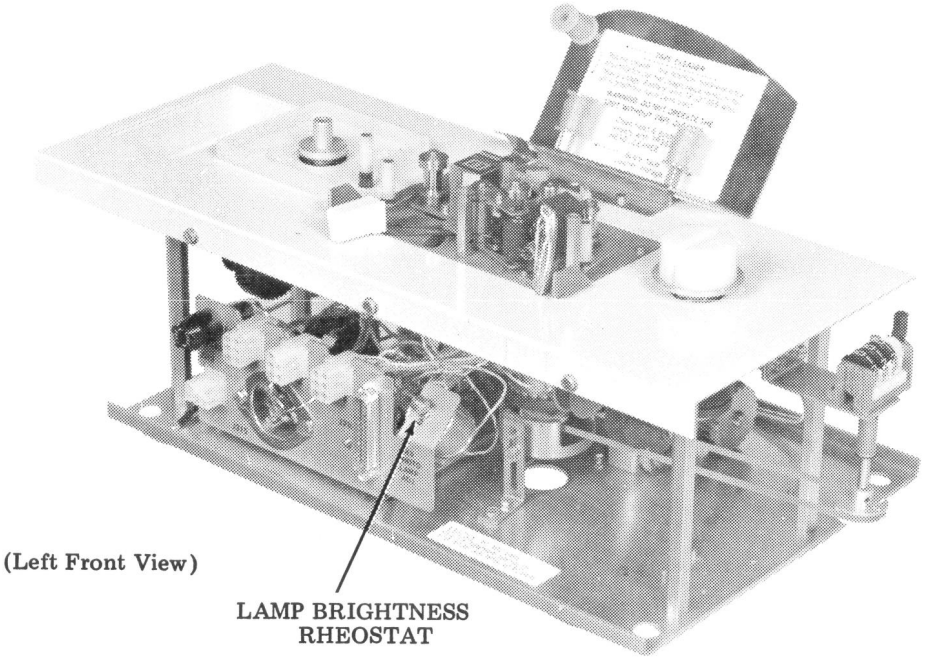
1.10 The performance of the tape drive clutches and brake depend upon the precise and intimate contact of the clutch and brake armatures with their respective mating surfaces. This contact is acheived initially by manufacturing processes and finally by the friction surfaces wearing in during normal operation. They then become mated friction surfaces.

CAUTION: DO NOT LOOSEN, MOVE, OR REMOVE THE TAPE DRIVE BRAKE ASSEMBLY. THIS WOULD ALTER THE ALIGNMENT OF THE BRAKE FRICTION SURFACES AND DEGRADE THE TAPE DRIVE PERFORMANCE.



(Left Front View)

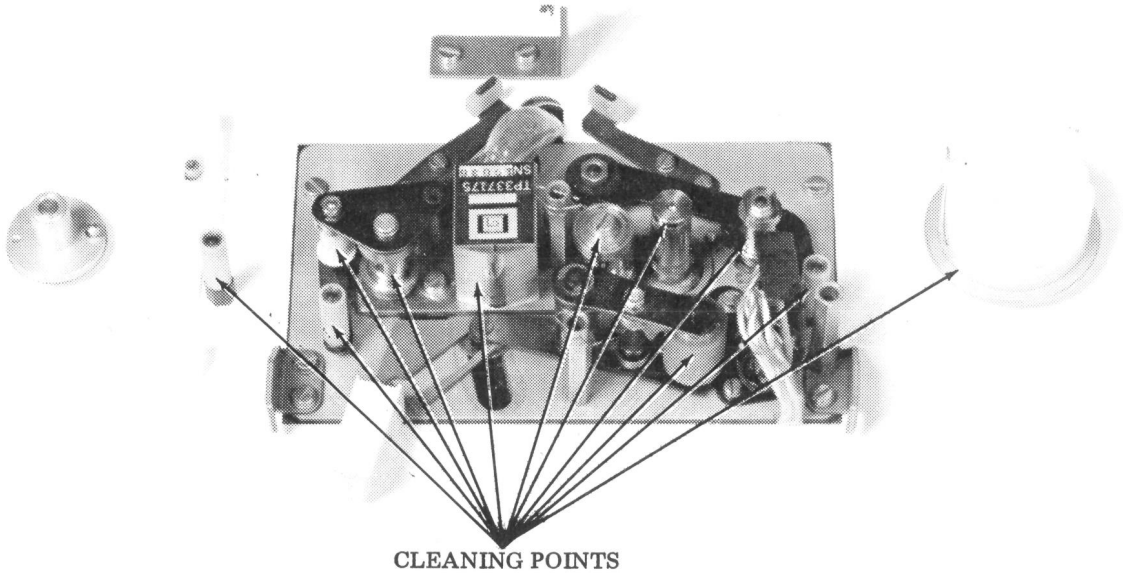
Early Design



(Left Front View)

Late Design

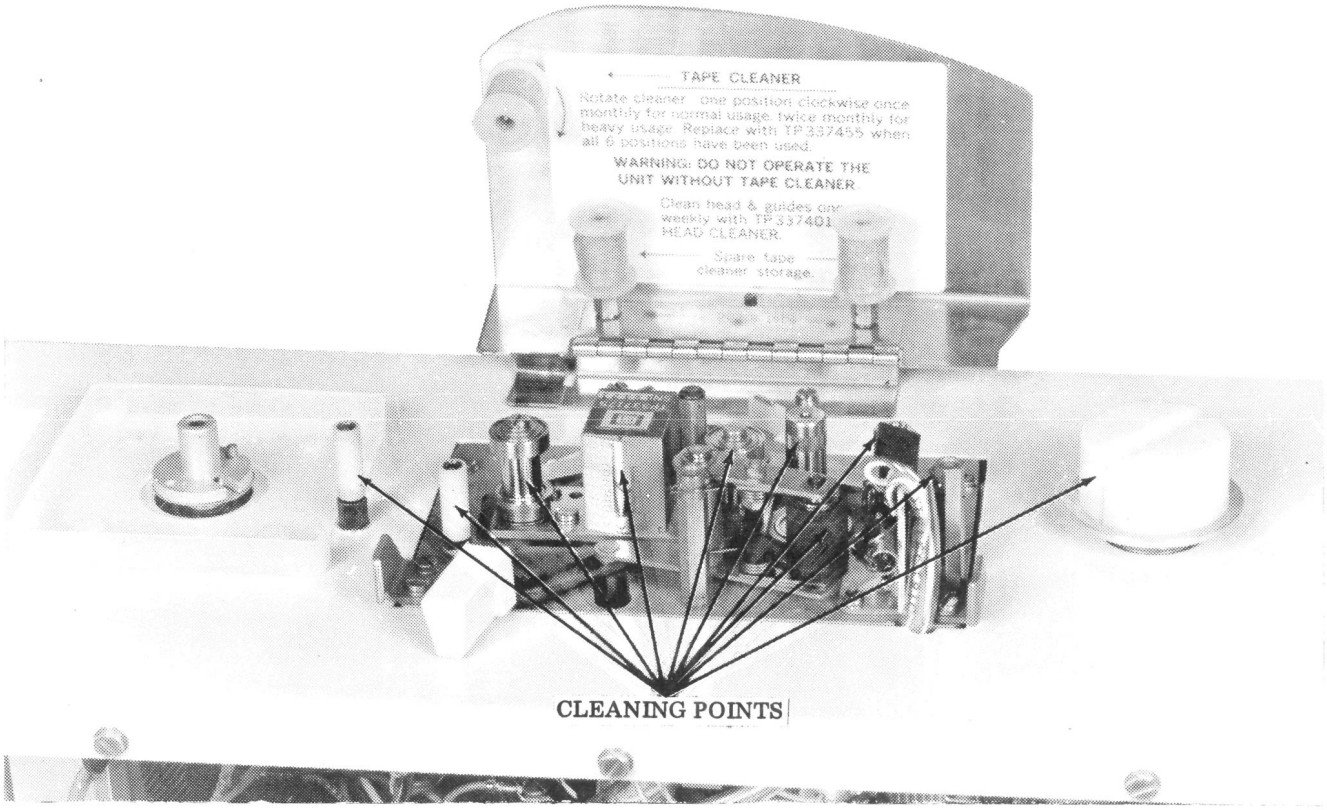
Figure 1 - Magnetic Tape Transport



CLEANING POINTS

(Top Left View)

Early Design



CLEANING POINTS

(Top Left View)

Late Design

Figure 2 - Tape Path Cleaning

If for any reason the brake, brake and forward clutch armature assembly, or forward clutch rotor have to be replaced, they must all be replaced with new assemblies as they are mated parts. If for any reason the reverse clutch or reverse clutch armature are replaced, they must both be replaced with new assemblies as they are mated parts.

C. Photosensor Assembly

1.11 The photosensor assembly includes a lamp and a pair of phototransistors which sense the light reflected by the foil strips on the tape to activate the beginning of tape, low tape, and end of tape alarm circuits. Two types of photosensor assembly are shown in Figure 3. In the early design unit (TP337220), the lamp and phototransistors are exposed, and the position of the lamp is adjustable. The late design photosensor (TP337472) has a plastic block shielding the lamp and phototransistors from extraneous light. The lamp is not adjustable on this unit.

1.12 In late design sets, electrical adjustments are added for more precise control of the sensors. Either or both of the following electrical adjustments may be present in a late design unit:

(a) Two potentiometers on the TP322468 card (connector XZ8 of the electronics module) permit adjustment of the photoamplifier current. These potentiometers are present on cards with issue number 7 or higher.

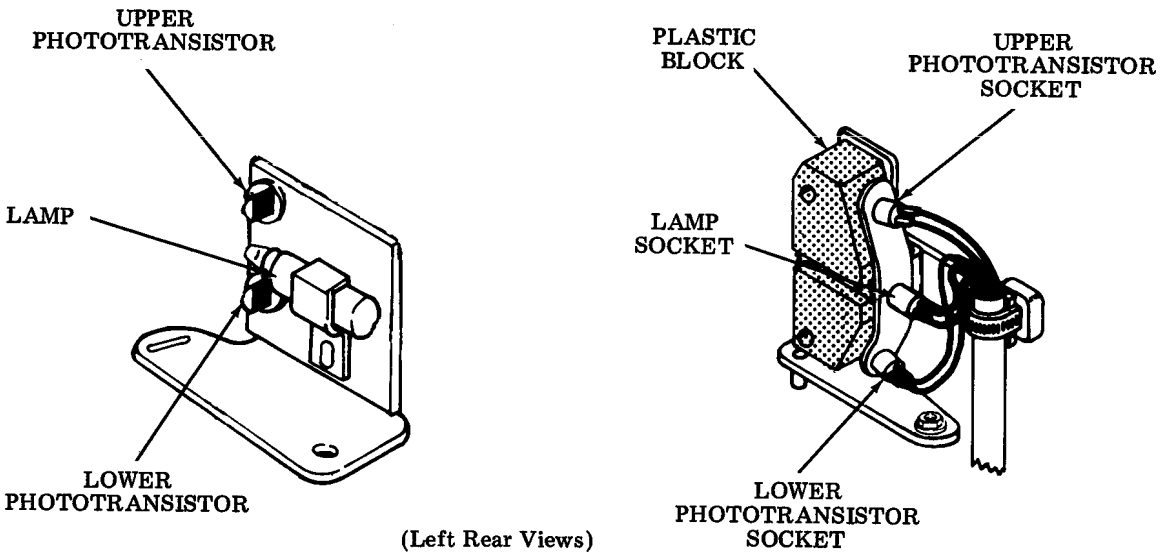
(b) A rheostat (Figure 1) mounted adjacent to connector J210 on the tape transport permits adjustment of lamp brightness.

1.13 If the TP322468 card includes the potentiometers, card TP322467 (connector XZ7 of the electronics module) must have R24 equal to 10 ohms and R25 equal to 2.2 ohms. These resistors are factory installed on TP322467 cards with issue number 7 or higher. On TP322467 cards with issue number 5 or less, R24 and R25 must be changed as follows:

(1) Remove the 4.3 ohm resistor (R24) and replace it with a 10 ohm, 3 watt resistor.

(2) Remove the 3.9 ohm resistor (R25) and replace it with a 2.2 ohm, 1 watt resistor.

1.14 A wire strap may or may not be required across R25 of card TP322467. This strap (7A1) is required if the TP322468 card is issue 5 or less and the transport has a TP337220 photosensor, or if the TP322468 card is issue 7 or higher and the transport has a TP337472 photosensor. This strap must be omitted if the TP322468 card is issue 7 or greater and the transport has a TP337220 photosensor.

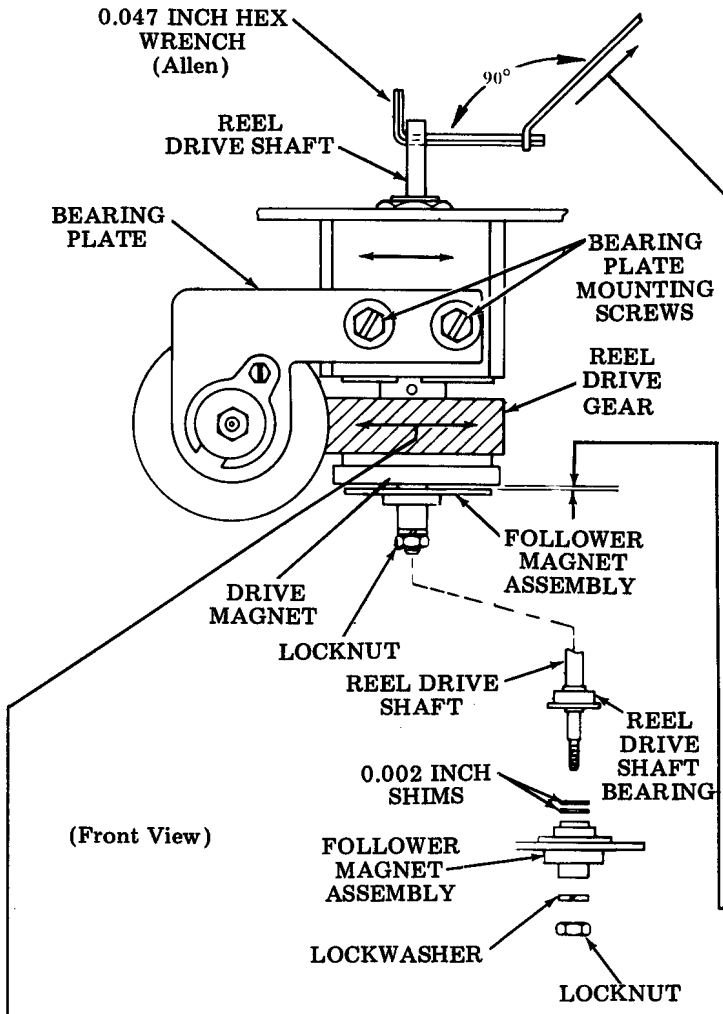


(Left Rear Views)

Figure 3 - TP337220 (left) and TP337472 (right) Photosensor Assemblies

2. ADJUSTMENTS

2.01 Reel Drive Mechanism



(A) SUPPLY AND TAKE-UP REEL DRIVE GEAR BACKLASH

Requirement

Backlash between drive mating gears should be

—Min 0.003 inch --- Max 0.005 inch at point of apparent minimum clearance.

To Adjust

With two bearing plate mounting screws friction tight, position bearing plate left or right in its slotted holes. Check requirement in four places, 90 degrees apart, around gear, using a flat feeler gauge between mating gear teeth. Tighten screws.

(B) TAPE REEL CLUTCH TORQUE

Note 1: This adjustment performed at factory. Do not disturb unless parts affecting adjustment have been replaced or there is reason to believe that requirement is not met.

To Measure

Remove take-up reel assembly and cartridge drive hub from reel drive shafts (refer to Section 578-300-703 for disassembly instructions). Place 0.047 inch hex wrench (Allen) in cross hole of reel drive shafts. Position 8 ounce spring scale on wrench 1 inch from center of reel drive shaft. Pull with spring scale maintaining angle of 90 degrees.

Requirement

Each tape reel clutch should generate a torque of

—Min 4 oz in. --- Max 4-1/2 oz in.

To Adjust

With wrench preventing shaft from turning, remove follower magnet assembly locknut and lockwasher. Push down on reel drive shaft to separate follower magnet assembly from drive magnet. (To avoid loss of drive torque, make sure magnets do not touch each other.)

—Remove follower magnet assembly. Add or remove 0.002 inch shims between follower magnet assembly, lockwasher, and locknut. Each shim increases or decreases clutch torque by about 1/2 ounce-inch.

Note 2: If minimum torque requirement cannot be met with all shims removed, magnet drive assembly must be replaced.

Recheck clutch torque and refine adjustments, if necessary.

Related Adjustments:

Affects

SUPPLY TENSION ARM TORSION SPRING (Final) (2.20)
TAKE-UP TENSION ARM TORSION SPRING (Final) (2.21)

2.02 Tape Transport Assembly

TOP PANEL GAP

Requirement

Gap between top panel and transport mounting plate at left side of unit should be equal to gap on right side within 1/64 inch.

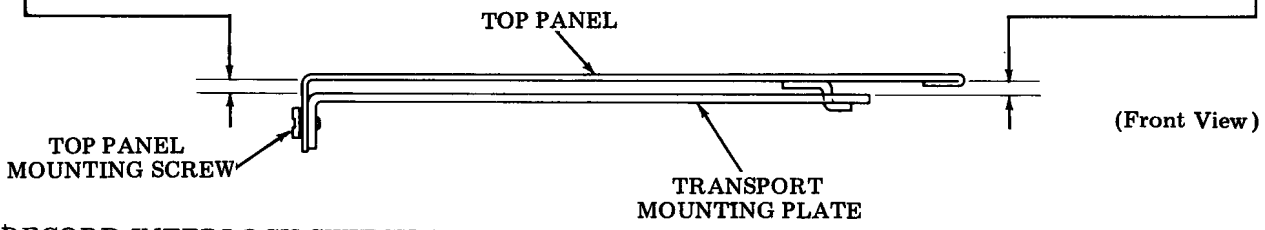
To Adjust

Loosen three top panel mounting screws. Measure gap on right side of unit and adjust left side of top panel, front and rear, up or down to meet requirement. Tighten mounting screws.

Related Adjustments:

Affects

SUPPLY REEL HUB HEIGHT AND CLEARANCE PRELIMINARY (2.10)
TAKE-UP REEL HUB HEIGHT AND CLEARANCE (2.10)



RECORD INTERLOCK SWITCH (EARLY DESIGN)

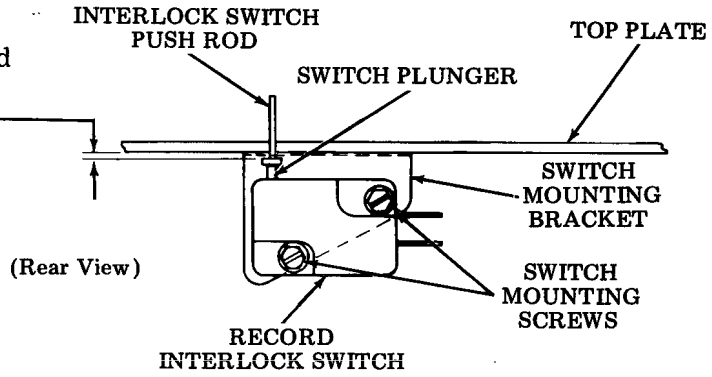
Requirement

Clearance between bottom surface of top plate and flange of interlock switch push rod should be

Min 0.025 inch --- Max 0.035 inch

To Adjust

Loosen switch mounting screws and rotate switch about screw farthest from switch plunger to meet requirement. Tighten screws.



RECORD INTERLOCK SWITCH PUSH ROD SPRING (LATE DESIGN)

Requirement

Min 10 grams --- Max 28 grams to start push rod moving.

RECORD INTERLOCK SWITCH (LATE DESIGN)

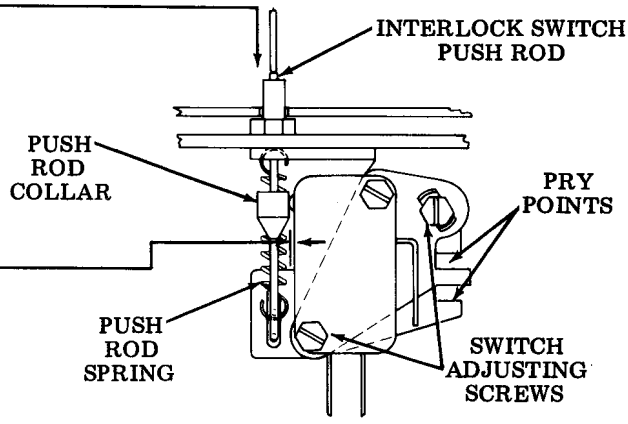
Requirement

Clearance between switch housing and push rod collar should be

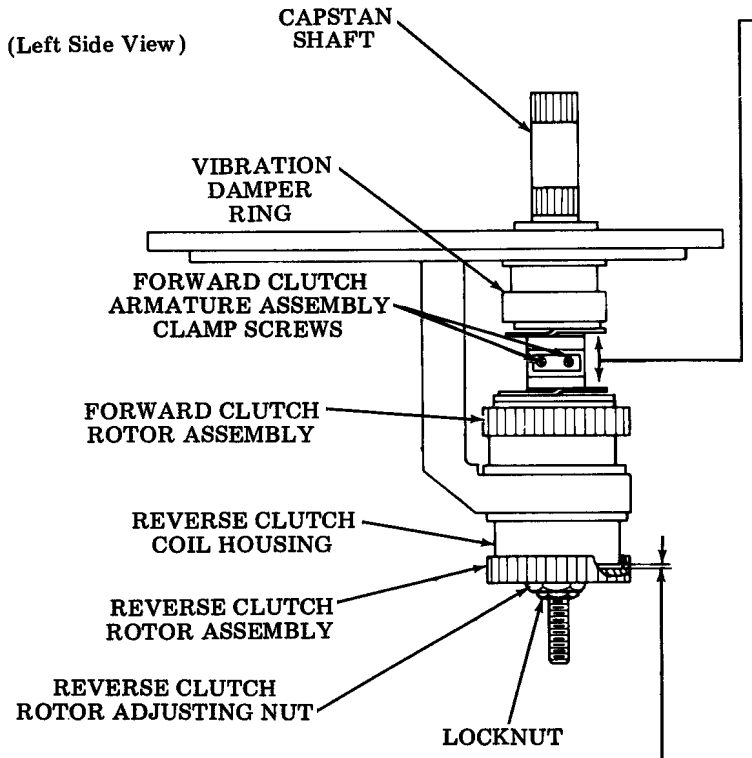
Min 0.025 inch --- Max 0.035 inch

To Adjust

Loosen switch adjusting screws and, using screwdriver at pry points, position switch to meet requirement. Tighten switch adjusting screws.



2.03 Tape Drive Mechanism



(A) REVERSE CLUTCH ROTOR CLEARANCE

Requirement

Clearance between reverse clutch rotor and reverse clutch coil housing should be

Min 0.010 inch --- Max 0.016 inch

To Adjust

Remove reverse clutch armature assembly then loosen locknut while holding adjusting nut. Tighten reverse clutch rotor adjusting nut until rotor just rubs against coil housing. Back off adjusting nut 1/3 to 1/2 turn (which corresponds to 0.010 inch to 0.016 inch). Tighten locknut securely while holding adjusting nut to prevent it from turning. Replace reverse clutch armature assembly.

CAUTION: DO NOT TIGHTEN ADJUSTING NUT AGAINST CLUTCH ROTOR WITH MORE THAN LIGHT PRESSURE AS DAMAGE TO ROTOR BEARINGS WILL RESULT.

(B) FORWARD CLUTCH ARMATURE ASSEMBLY

Requirement

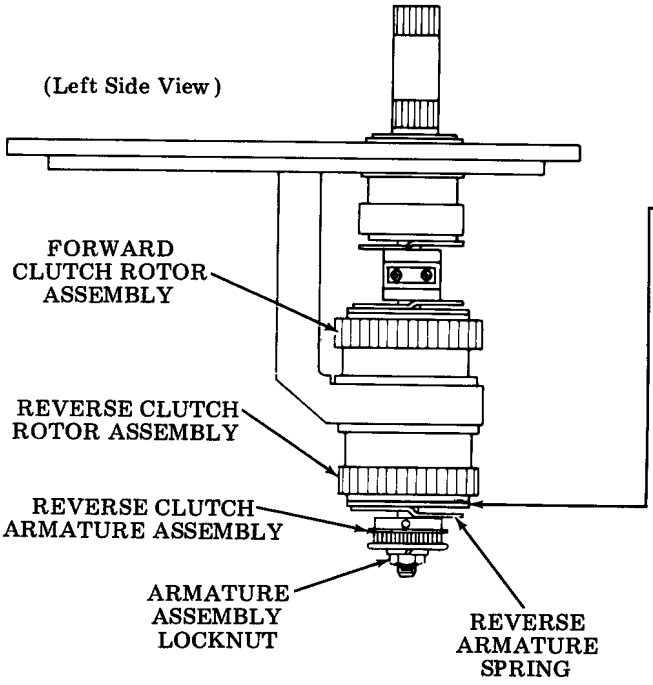
Clutch armature assembly should be positioned in center of its travel, as gauged by eye.

To Adjust

Loosen clutch armature assembly clamp screws, move armature hub to its maximum up position, then maximum down position. Locate hub approximately in center of travel and tighten clamp screws.

Note: Remove one screw and open flexible dust trap to perform adjustment.

2.04 Tape Drive Mechanism (continued)



REVERSE CLUTCH ARMATURE ASSEMBLY

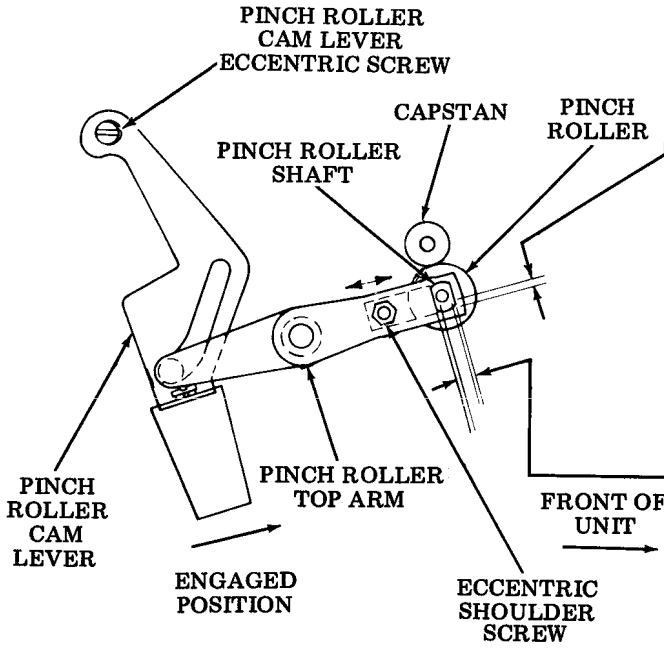
Requirement

Reverse armature spring should be compressed by 1/2 to 3/4 of a turn of armature assembly hub.

To Adjust

Rotate reverse clutch armature assembly until armature plate just contacts and lies flat against reverse clutch rotor. Rotate additional 1/2 to 3/4 turn clockwise. Tighten locknut securely, taking care not to disturb adjustment.

Note: A 0.078 hex wrench placed in hole can be used to keep assembly from turning while locknut is tightened.



PINCH ROLLER ENGAGEMENT

Requirement

Clearance between pinch roller shaft and left-hand side of slot in pinch roller arm should be

Min 0.050 inch --- Max 0.070 inch when pinch roller cam lever is in engaged position.

To Adjust

Loosen pinch roller cam lever eccentric screw locknut on underside of casting. Rotate eccentric screw until requirement is met. Tighten locknut.

Note: High side of eccentric (chamfer on screw head) must be toward front of unit.

PINCH ROLLER PARALLELISM (PRELIMINARY)

Requirement

Pinch roller shaft should be centered in top pinch roller arm slot in front to rear direction.

To Adjust

Loosen eccentric shoulder screw locknut in top arm and adjust eccentric shoulder screw until requirement is met, as gauged by eye. Tighten nut.

Note: High side of eccentric should be to left.

2.05 Tape Drive Mechanism (continued)

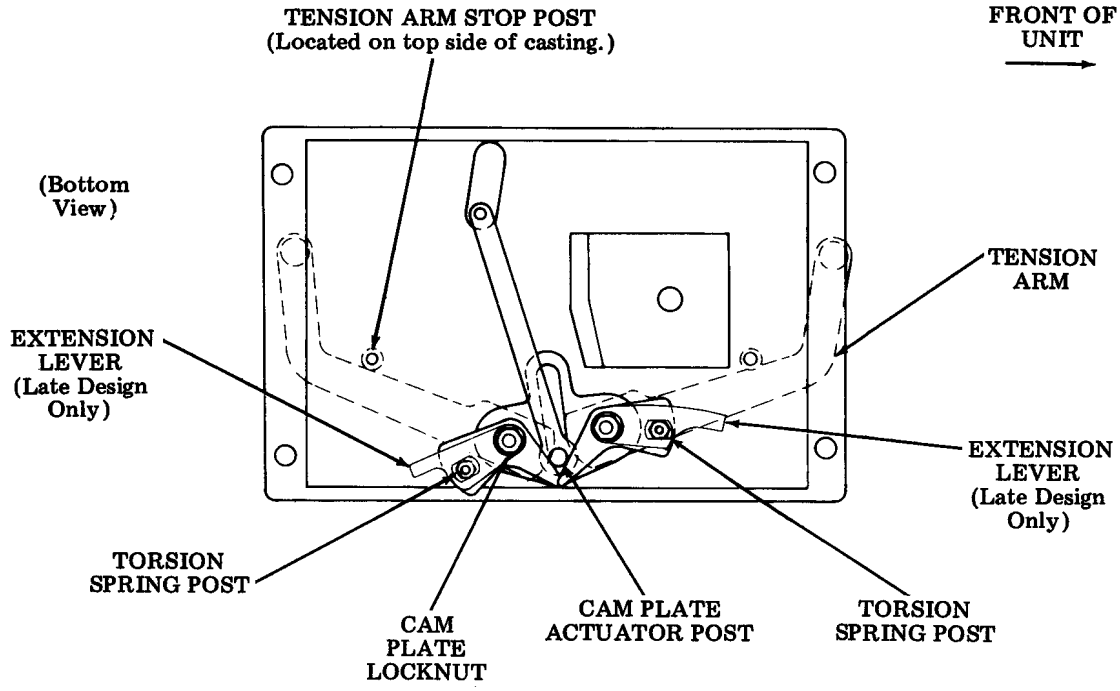
TENSION ARM CAM PLATE

Requirement

With pinch roller in released position and tension arms against arm stop posts, tension arm cam plates should just contact cam plate actuator post.

To Adjust

Disengage pinch roller. Loosen cam plate locknuts and position tension arms against their stop posts and cam plates against cam plate actuator post. Tighten cam plate locknuts.



SUPPLY AND TAKE-UP TENSION ARMS TORSION SPRINGS (PRELIMINARY)

Requirement

Torsion spring posts should be in center of adjustment range in slots of tension arm cam plates.

To Adjust (Early Design)

Loosen spring posts and position to meet requirement, as gauged by eye. Tighten spring posts.

To Adjust (Late Design)

Loosen spring posts and position extension levers to center of adjustment range (estimate halfway point between extremes of adjustment range). Tighten spring posts.

2.06 Tape Drive Mechanism (continued)

CAPSTAN INTERLOCK SWITCH

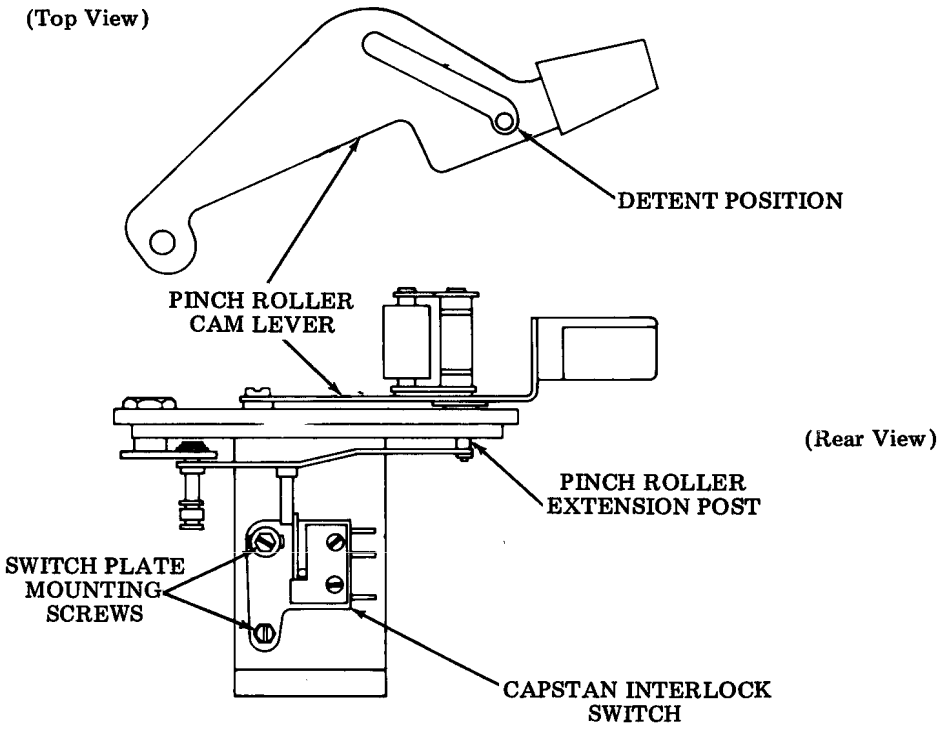
Requirement

Switch should trip just as pinch roller extension post begins to pass over detent in pinch roller cam lever. The switch should remain tripped in detented position.

To Adjust

Loosen pinch roller switch plate mounting screws. Place pinch roller cam lever in engaged position. Then move lever just off its detent position. Adjust switch bracket so that switch is not made in off detent position but makes as the lever just starts to move toward detented position. Tighten switch plate mounting screws.

Note: Adjustment can be made with the aid of a VOM (KS14510). Pull connectors from bottom two pins of capstan interlock switch, and check for switch closure using ohmmeter section of VOM.



2.07 Tape Drive Mechanism (continued)

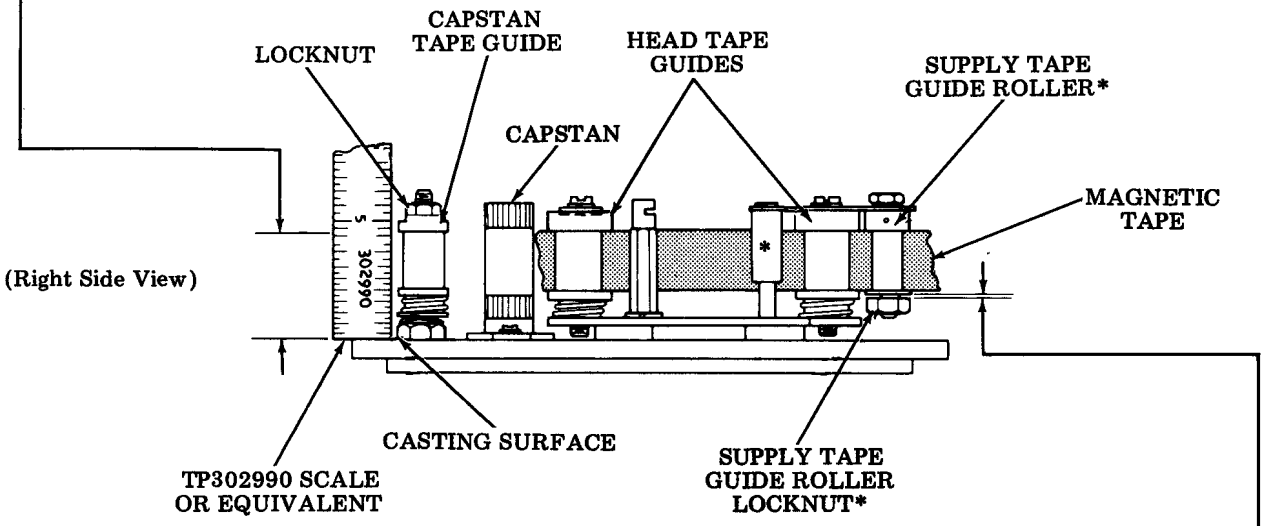
CAPSTAN TAPE GUIDE (PRELIMINARY)

Requirement

Clearance between top guide edge of capstan tape guide and casting surface should be Min 29/32 inch --- Max 29/32 inch plus 1/64 inch

To Adjust

Measure height of top guide edge of capstan tape guide using TP302990 scale or equivalent. Loosen capstan tape guide locknut and adjust tape guide up or down until requirement is met, as gauged by eye. Tighten locknut.



SUPPLY TAPE GUIDE ROLLER (EARLY DESIGN)

Note: This adjustment for early design units only. Supply tape guide roller and related parts indicated by (*) in diagram not present in late design units equipped with tape cleaner.

Requirement

Clearance between supply tape guide roller and supply tape guide locknut should be Min some --- Max 0.005 inch

To Adjust

Place a piece of magnetic tape in guide roller, bias roller and tape against top guide flange and adjust locknut to meet requirement.

2.08 Gear Shift Mechanism

SPRING CLUTCH GEAR ASSEMBLY ENDPLAY

Note 1: This adjustment is performed at the factory and should not be disturbed unless associated parts affecting it have been replaced, or there is reason to believe the requirement is not met.

Note 2: Removal of the gear shift mechanism from the tape transport is necessary to make this adjustment (refer to Section 578-300-703 for disassembly). Note the sequence of disassembly so the identical pile-up can be made when parts are reassembled.

To Measure

Bias each spring clutch gear assembly in direction shown and measure clearance. Record measurement.

Requirement

Endplay of each of two spring clutch gear assemblies on their respective shafts should be

Min 0.012 inch --- Max 0.018 inch

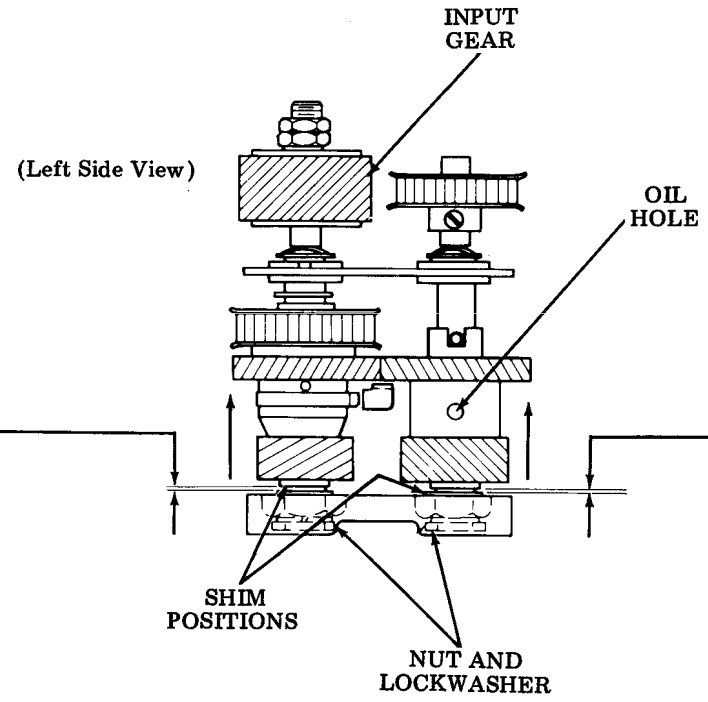
To Adjust

Early Design Units

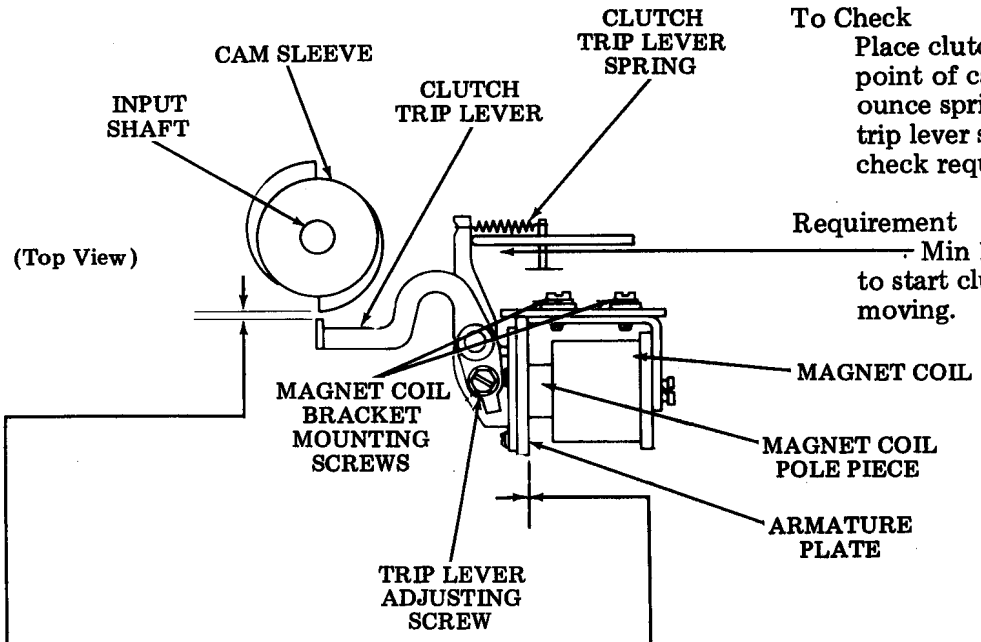
Remove nut, lockwasher, bearing, and spacer from shaft end. Add or remove 0.005 inch shims to meet requirement. Replace spacer, bearing, lockwasher, and nut. Recheck requirement.

Late Design Units

Remove nut, lockwasher, bearing, and shim retaining spacer from shaft end. Add or remove 0.003 inch shims to meet requirement. Replace shim retaining spacer, bearing, lockwasher, and nut. Recheck requirement.



2.09 Gear Shift Mechanism (continued)



(C) CLUTCH TRIP LEVER SPRING

To Check

Place clutch trip lever on high point of cam sleeve. Place an 8 ounce spring scale parallel to trip lever spring and push to check requirement.

Requirement

Min 1-1/2 oz --- Max 3 oz to start clutch trip lever moving.

(A) MAGNET COIL POSITION

Requirement

Armature plate should lie flat on magnet coil pole piece when in attracted position.

To Adjust

Loosen two magnet coil bracket mounting screws and position magnet coil to meet requirement, while manually holding armature plate attracted. Tighten magnet coil bracket mounting screws.

(B) CLUTCH TRIP LEVER

Note: To facilitate making this adjustment, refer to Section 578-300-703 for removal of gear shift mechanism.

To Measure

Manually hold armature plate against magnet coil pole piece. Rotate input shaft until high point of cam surface is under trip lever. Bias cam sleeve towards trip lever and measure clearance.

Requirement

Clearance between clutch trip lever and high point of cam sleeve when clutch trip lever is held attracted by magnet coil should be

Min 0.010 inch --- Max 0.020 inch

To Adjust

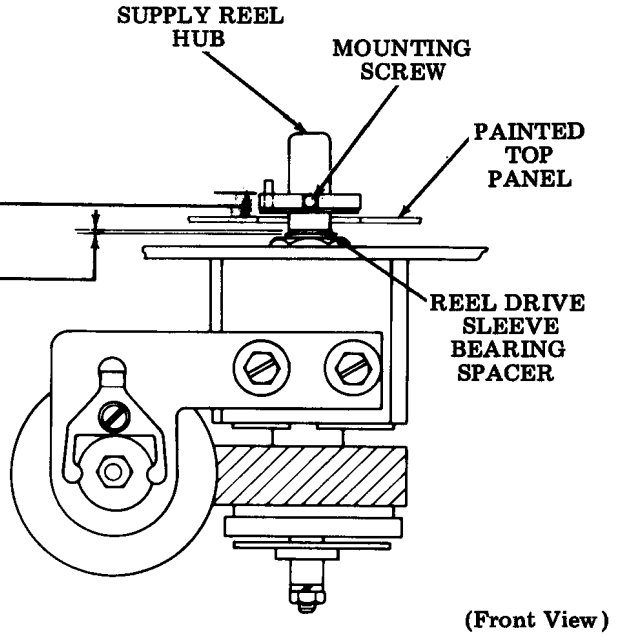
Loosen clutch trip lever adjusting screw and position clutch trip lever to meet requirement. Tighten screw.

2.10 Reel Drive Mechanism (continued)

SUPPLY REEL HUB HEIGHT AND CLEARANCE (PRELIMINARY)

(1) Requirement
Top surface of flange on supply reel hub should be
Min 17/64 inch --- Max 19/64 inch above top surface of painted top plate.

(2) Requirement
Clearance between bottom of supply reel hub and reel drive sleeve bearing spacer should be
Min some --- Max 0.010 inch



(Front View)

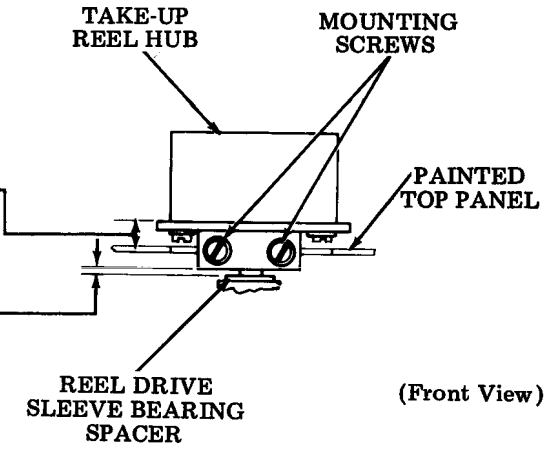
To Adjust
Loosen supply reel hub mounting screw and position hub up or down to meet requirement (1). If requirement (2) cannot be met with hub at required height, remove hub and add or remove 0.010 inch spacers.

Related Adjustment:
Affected By
TOP PANEL GAP (2.02)

TAKE-UP REEL HUB HEIGHT AND CLEARANCE

(1) Requirement
Top surface of flange on take-up reel should be
Min 5/16 inch --- Max 11/32 inch above top surface of painted top plate.

(2) Requirement
Clearance between bottom of take-up reel hub and reel drive sleeve bearing spacer should be
Min some --- Max 0.010 inch



(Front View)

To Adjust
Loosen take-up reel hub mounting screws and position hub up or down to meet requirement (1). If requirement (2) cannot be met with hub at required height, remove hub and add or remove 0.010 inch spacers.

Related Adjustment:
Affected By
TOP PANEL GAP (2.02)

2.11 Tape Transport Assembly (continued)

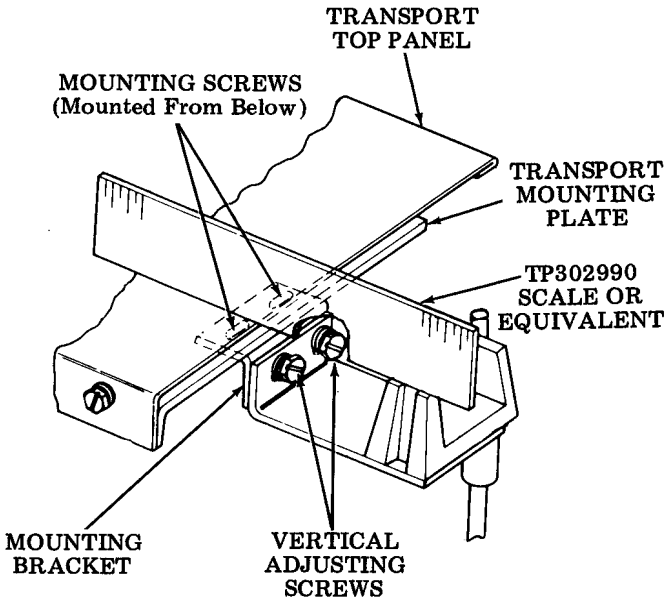
Note: The following counter adjustments are preliminary adjustments to gain operation of the unit. Final adjustments should be made with transport installed in cabinet.

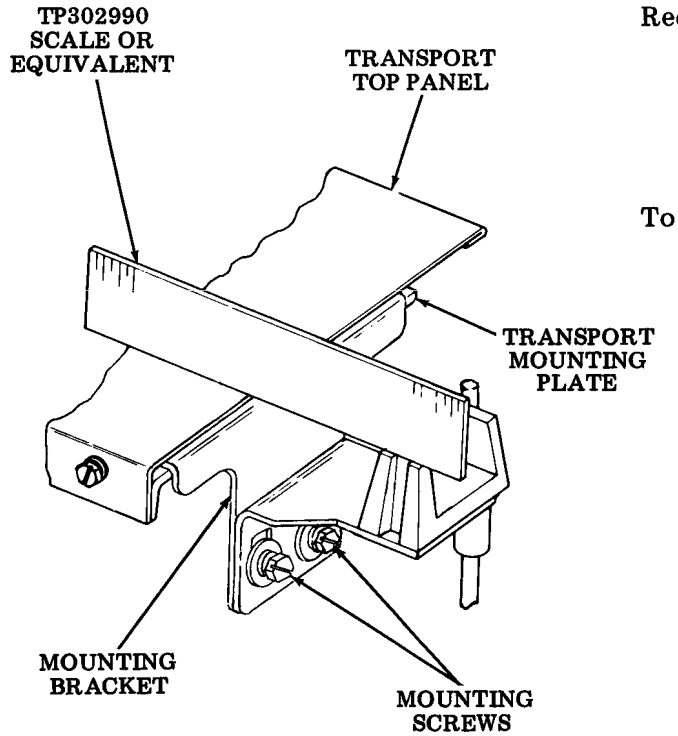
COUNTER POSITION (EARLY DESIGN)

(1) Requirement
Counter mounting bracket should be positioned left to right so that mounting screws are in center of adjusting slots.

(2) Requirement
Counter casting top surfaces should be flush with top panel of transport.

To Adjust
Loosen two mounting screws and position bracket to meet requirement (1). Tighten screws. Loosen two vertical adjusting screws. Place a TP302990 scale or equivalent straight edge on top panel. Position counter up or down to meet requirement (2). Tighten screws.





COUNTER POSITION (LATE DESIGN)

Requirement
Counter casting should be positioned horizontally so that mounting screws are in center of adjusting slots and vertically so counter casting top surfaces are flush with top panel of transport.

To Adjust
Loosen two mounting screws and position casting on mounting bracket. A TP302990 scale or equivalent straight edge can be placed on the top panel to check flushness with top panel. Tighten mounting screws when requirements are met.

2.12 Tape Transport Assembly (continued)

COUNTER DRIVE PULLEY POSITION

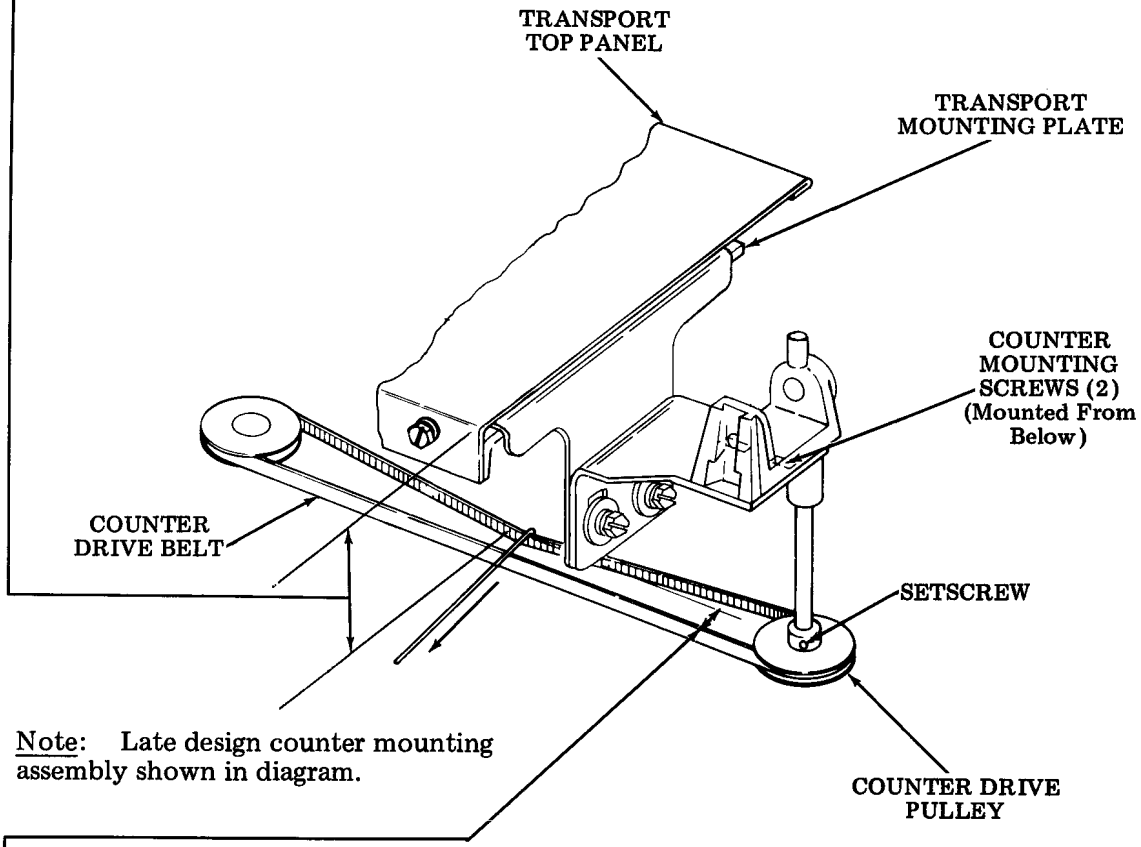
Requirement

Clearance between top edge of counter drive belt and underside of transport mounting plate should be

Min 3-5/16 inch --- Max 3-7/16 inch

To Adjust

Loosen setscrew of counter drive pulley and position up or down to meet requirement. Tighten pulley setscrew.



Note: Late design counter mounting assembly shown in diagram.

COUNTER DRIVE BELT TENSION

Requirement

Separation between belt members, with a force of one ounce applied to center of belt, should be

Min 1/2 inch --- Max 5/8 inch

To Adjust

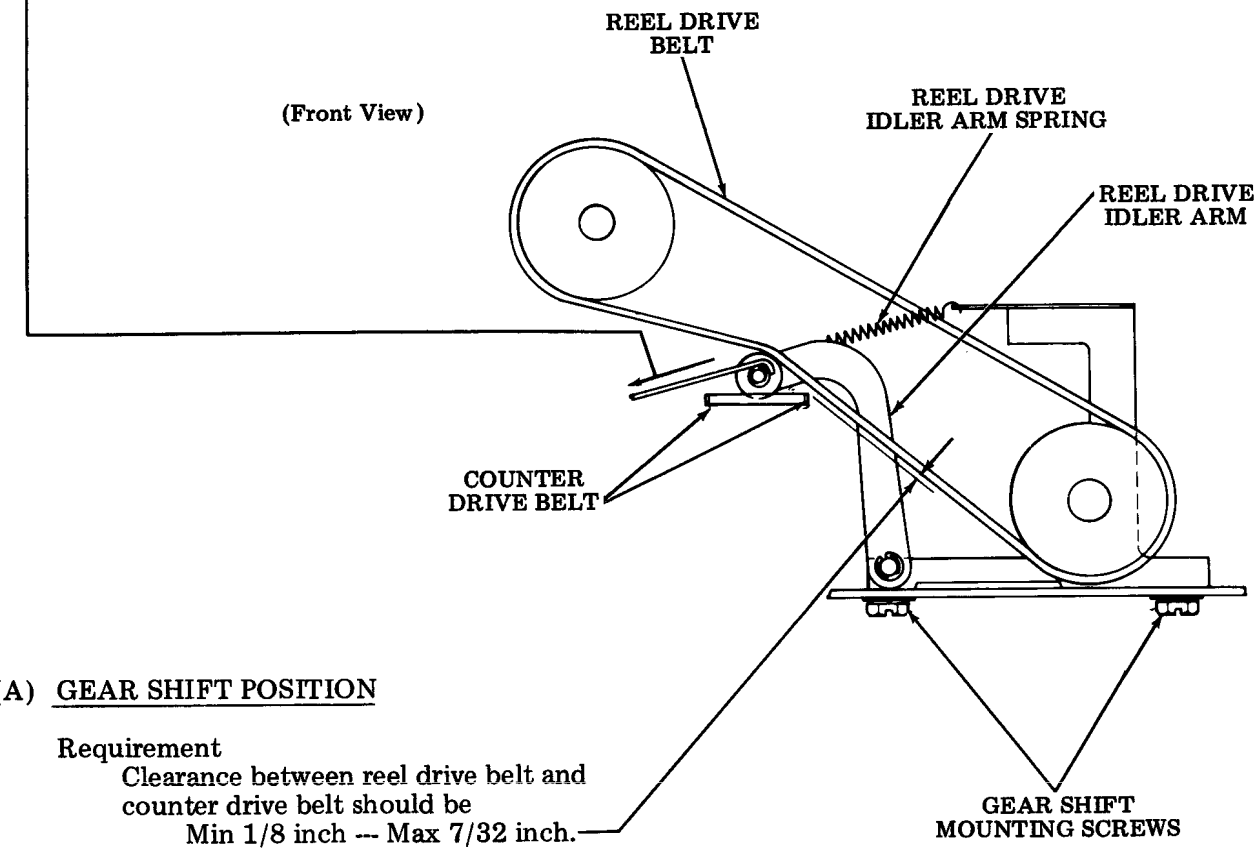
Loosen two counter mounting screws and move counter forward or backward until requirement is met. Tighten counter mounting screws.

2.13 Gear Shift Mechanism (continued)

(B) REEL DRIVE IDLER ARM SPRING

To Check
Hold reel drive belt in position, hook an 8 ounce spring scale over reel drive idler arm roller post and pull to check requirement.

Requirement
Min 3 oz --- Max 8 oz
to start idler arm moving.



(A) GEAR SHIFT POSITION

Requirement
Clearance between reel drive belt and counter drive belt should be
Min 1/8 inch --- Max 7/32 inch.

To Adjust
Loosen three gear shift mounting screws and position gear shift in slotted holes in base plate left or right to meet requirement. Tighten mounting screws.

2.14 Gear Shift Mechanism (continued)

MOTOR PINION GEAR BACKLASH

Requirement

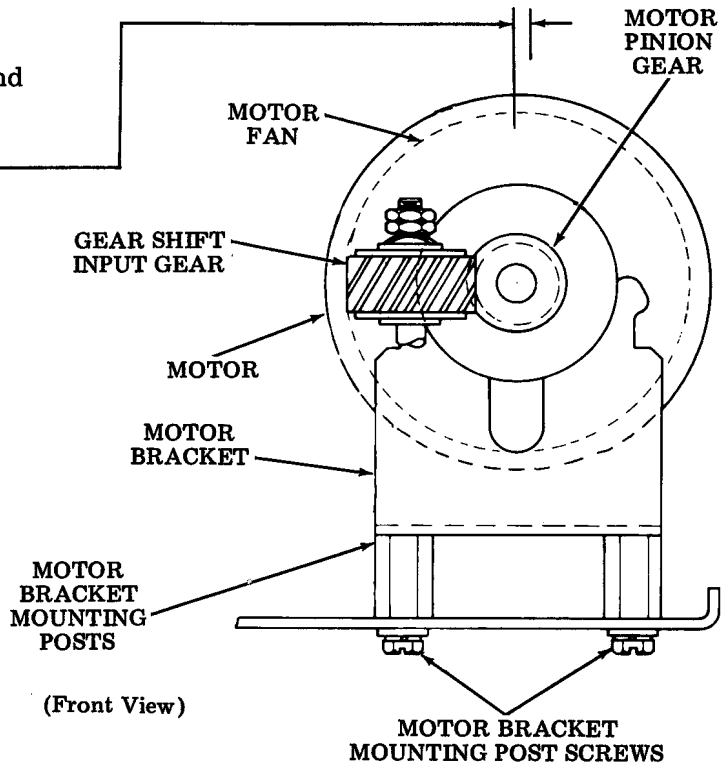
Backlash between motor pinion gear and input gear of gear shift measured at motor fan rim, should be

Min 1/64 inch --- Max 1/16 inch

Note: Check backlash requirement four places, 90 degrees apart about circumference of gear shift input gear, and make sure requirement is met at point of apparent minimum clearance.

To Adjust

Loosen motor bracket mounting post screws and move motor left or right to meet requirement. Tighten mounting screws and recheck requirement.



INPUT GEAR OVERLOAD CLUTCH

To Measure

Place a 3/8 inch open end wrench on cross shaft end nut. Rotate motor in its normal direction until input shaft of gear shift locks. Using a 64 ounce spring scale placed on a vane of fan, pull until overload clutch slips. Record scale reading.

Requirement

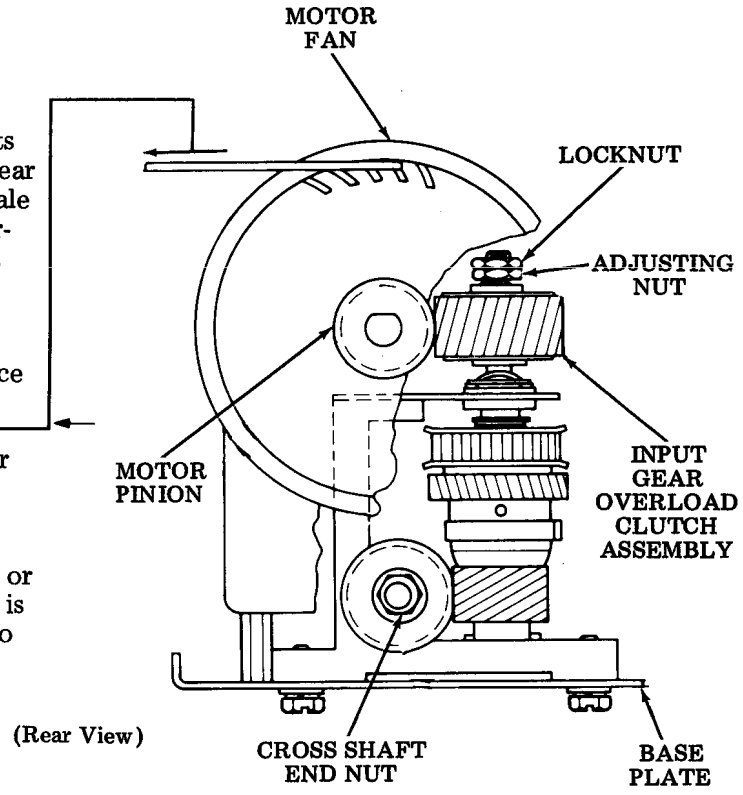
With input shaft of gear shift locked, overload clutch should slip when a force of

Min 26 oz --- Max 42 oz

is applied to outside diameter of motor fan.

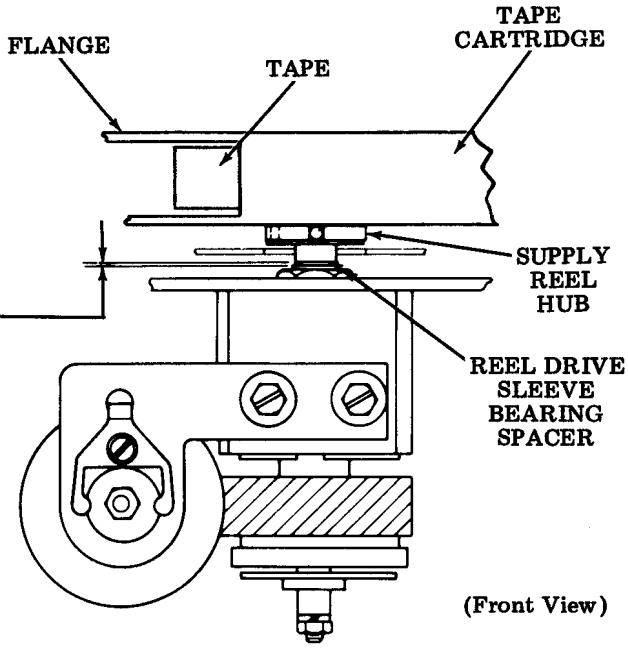
To Adjust

Loosen input gear locknut and tighten or loosen adjusting nut until requirement is met. Tighten locknut taking care not to change adjustment.



2.15 Reel Drive Mechanism (continued)

Note: For the following adjustments, the transport must be assembled and connected to an appropriate control panel and electronics module to permit operation under power. Unless otherwise indicated, a tape must be loaded in the transport.



SUPPLY REEL HUB HEIGHT AND CLEARANCE (FINAL)

(1) Requirement

Tape should not touch either flange (upper or lower) of cartridge when the unit is operated.

To Adjust

Loosen supply reel hub mounting screw and raise or lower supply reel hub to meet requirement.

(2) Requirement

Clearance between bottom of supply reel hub and reel drive sleeve bearing spacer should be

Min some --- Max 0.010 inch

To Adjust

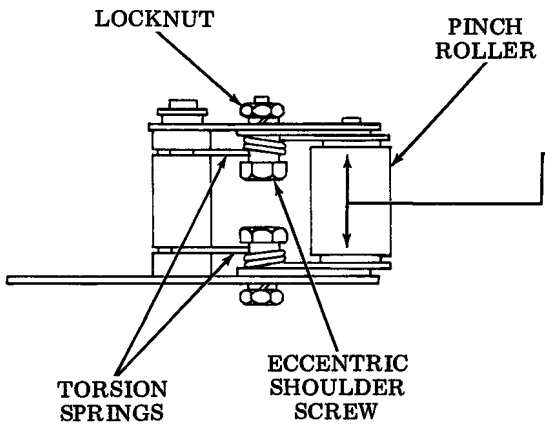
Remove supply reel hub and add or remove 0.010 inch spacers until requirement is met. Replace supply reel hub and recheck both requirements.

2.16 Tape Drive Mechanism (continued)

Note: The PINCH ROLLER PARALLELISM (FINAL) and CAPSTAN TAPE GUIDE (FINAL) (2.17) adjustments are performed at the factory and should not normally be disturbed. If the unit does not appear to meet requirement, check to see that the pinch roller arm mounting posts, head tape guide assemblies, tape head pads, and the capstan tape guide mounting screws and/or nuts are tight. If loose, tighten them. Also, make sure the tension arms are flat and the rollers are square with the tension arms. The tape should not ride up or down the tension arm rollers more than 1/16 inch when the tape direction is reversed. If the unit still does not meet requirement, try another tape cartridge. If the tape is not at fault and the guide assemblies are tight, the following adjustments can be made. All tape guiding adjustments must be accurately made to assure minimum error rates and maximum tape life. The tape must move freely from reel to reel in both forward and reverse directions with a minimum of buckling or bending as the tape enters or leaves the guide posts and rollers.

PINCH ROLLER PARALLELISM (FINAL)

(Left Side View)



To Check

With no tape threaded through capstan, operate unit in forward and reverse fast access modes and watch for up or down motion of pinch roller upon reversals.

Requirement

Pinch roller should not move up or down more than 0.002 inch when drive direction is reversed. (Motion of 0.002 inch is just visible through a 4X magnifying glass, but should not be apparent to the unaided eye.)

To Adjust

Loosen eccentric (plated) shoulder screw locknut friction tight. Operate unit in forward and reverse fast access mode while adjusting eccentric screw to null out pinch roller shift. Carefully tighten locknut and recheck requirement.

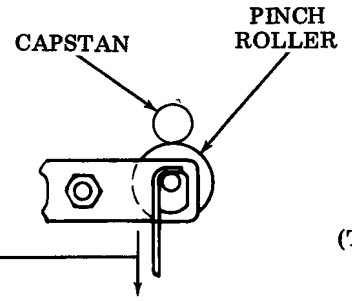
PINCH ROLLER TORSION SPRINGS

To Check

Disengage pinch roller from capstan. Hook a 32 ounce spring scale on upper portion of pinch roller shaft and pull to check requirement. Check lower spring in same manner.

Requirement

Min 22 oz --- Max 24 oz to start each end of pinch roller shaft moving.



(Top View)

2.17 Tape Drive Mechanism (continued)

CAPSTAN TAPE GUIDE (FINAL)

To Check

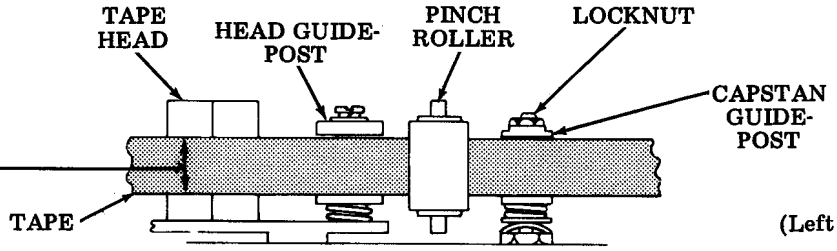
Load tape in unit. Using fast access control, run tape in forward and reverse direction and note position of one edge of tape at tape head each direction.

Requirement

Up or down tape shift at head should not exceed 0.003 inch after reversing direction of tape. (A 0.003 inch shift is just noticeable using a 4X magnifying glass but is not apparent to the unaided eye.) Tape shift of more than 0.003 inch at the instant reversal occurs is normal and may be disregarded.

To Adjust

Loosen capstan guidepost locknut. Adjust capstan guidepost in direction opposite observed tape shift. To raise, rotate counterclockwise. To lower, rotate clockwise. Run tape back and forth several times for a distance of at least 100 counts and refine adjustment for minimum tape shift. Carefully tighten locknut while holding guidepost to prevent it from moving.



(Left Side View)

HEAD TAPE GUIDE SPRING

Requirement

Using a TP98631 gram scale, it should require

Min 1 gram --- Max 10 grams

to start head tape guide flange moving down with no tape in guide.

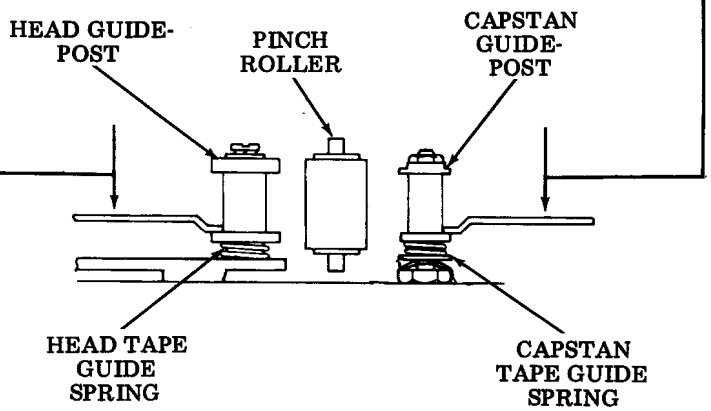
CAPSTAN TAPE GUIDE SPRING

Requirement

Using a TP98631 gram scale, it should require

Min 2 grams --- Max 15 grams

to start capstan tape guide flange moving down with no tape in guide.



(Left Side View)

2.18 Tape Drive Mechanism (continued)

PHOTOSENSOR LAMP BEAM (PRELIMINARY)

Note 1: This adjustment applies only to early design photosensor assemblies (TP337220) as illustrated in diagram. See 1.11 for identification.

Note 2: Rear (flat) surface of each phototransistor must be blackened for stable operation. If not, roughen surface with emery cloth and apply black lacquer or enamel.

To Check

Loosen photosensor mounting screws and position assembly in the center of its range by rotating photosensor bracket about left-hand mounting screw. Tighten mounting screws.

(1) Requirement

Lamp beam should be perpendicular to tape edges.

To Adjust

Loosen lamp mounting screw and rotate lamp until beam on magnetic tape is perpendicular to tape edges.

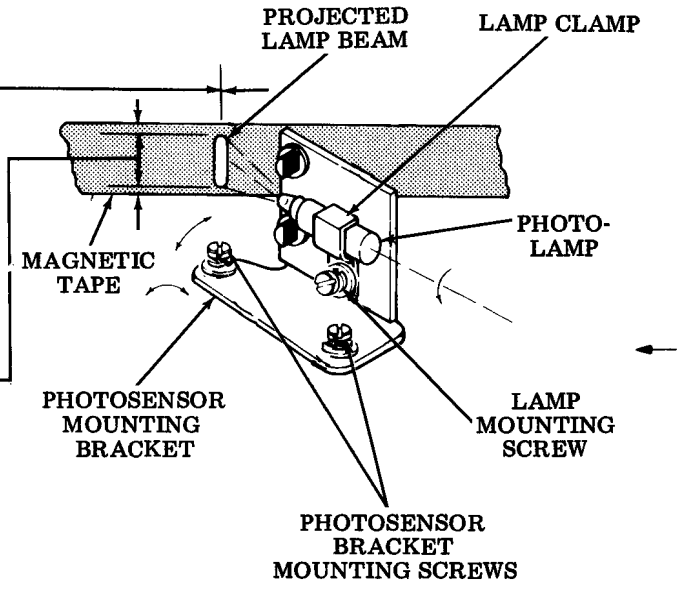
(2) Requirement

Lamp beam should be centered and within 3/32 inch of tape edges, top and bottom.

To Adjust

Center lamp beam by moving lamp and its clamp up and down and tilting lamp left or right. Adjust lamp beam size by moving lamp closer to or farther from tape until requirement is met.

(Left Rear View)



Note 3: Front of lamp must not extend beyond rear (flat) surface of phototransistors. If lamp is moved away from tape, rear of lamp must not overhang card by more than 3/32 inch.

Note 4: Lamp must never be positioned so that beam strikes polished metal post.

(3) Requirement

Intensity of projected lamp beam should be approximately equal from top to bottom.

To Adjust

Refine lamp beam centering (requirement (2)) to give a beam of approximately equal intensity from top to bottom. Tighten lamp mounting screw.

2.19 Tape Drive Mechanism (continued)

PHOTOSENSOR LAMP BEAM (FINAL)

Final adjustment of the photosensor indicator and control system requires an electrical check, and in late design units an adjustment, of the photosensor circuitry. Different methods are required for early and late design sets. Check the following points before starting the adjustment:

(a) Tape set must be at operating site, at normal operating temperature.
(b) Head cover must be in place over head assembly when measurements and electrical adjustments are made.
(c) Voltmeter must have sensitivity of at least 20,000 ohms per volt. Use highest range that permits readable pointer deflection.
(d) Milliammeter must be capable of accurate current readings between 0.1 ma and 10 ma. A 100 to 150 ohm resistor must be placed in series with the milliammeter for all current measurements.
(e) Type of photosensor and related components must be properly identified. See paragraphs 1.11 through 1.14.

When all preliminary check points are satisfactory, select one of the following procedures (A, B, or C) and proceed with adjustment.

A. TP322468 CARD DOES NOT HAVE POTENTIOMETERS
TAPE TRANSPORT DOES NOT HAVE LAMP BRIGHTNESS RHEOSTAT

1. Position End of Tape markers in front of photosensor assembly by operating fast access switch.
2. Measure "on-marker" voltages by attaching negative lead of voltmeter to XZ8-B34 and positive lead to XZ8-A17 (upper phototransistor) and then to XZ8-B22 (lower phototransistor). Both voltages should be ±1.0 volt or less.
3. Position tape so there is no marker in front of photosensor assembly. Measure voltages as in Step 2. Both "off-marker" voltages should be ±4.0 volts or greater.
4. If voltages are not satisfactory, refine CAPSTAN TAPE GUIDE (FINAL) (2.17) and PHOTOSENSOR LAMP BEAM (PRELIMINARY) (2.18) and recheck.
5. Check operation of photosensor circuitry by fast accessing to Beginning of Tape, Low Tape, and End of Tape positions and observing action.

B. TP322468 CARD HAS POTENTIOMETERS
TAPE TRANSPORT DOES NOT HAVE LAMP BRIGHTNESS RHEOSTAT

1. Position End of Tape markers in front of photosensor assembly by operating fast access switch.
2. Remove TP322468 card from connector XZ8 of electronics module.
3. Measure "on-marker" currents of both phototransistors by attaching positive lead of milliammeter to XZ8-A1 and negative lead to XZ8-A17 and then XZ8-B22. The "on-marker" currents should be between 0.3 ma and 2.5 ma.

B. TP322468 CARD HAS POTENTIOMETERS
TAPE TRANSPORT DOES NOT HAVE LAMP BRIGHTNESS RHEOSTAT (Continued)

4. Position tape so there is no marker in front of photosensor assembly.

5. Measure phototransistor currents as in Step 3. The "off-marker" current of each phototransistor should be 1/10 or less of "on-marker" current.

6. If currents are satisfactory in Steps 3 and 5, restore TP322468 card to electronics module and proceed to next step. If not, refine CAPSTAN TAPE GUIDE (FINAL) (2.17) and PHOTOSENSOR LAMP BEAM (PRELIMINARY) (2.18) and recheck. If still not satisfactory, lamp or complete photosensor assembly may require replacement.

Note: If TP322468 card is issue 9 or less, proceed with Steps 7 through 15 and disregard Steps 16 through 23. If TP322468 card is issue number 10 or greater, disregard Steps 7 through 15 and proceed with Steps 16 through 23.

7. Remove milliammeter from circuit and position tape with End of Tape markers in front of photosensor assembly.

8. Adjust lower potentiometer of TP322468 card counterclockwise until BEGIN OF TAPE or END OF TAPE lamp on control panel JUST lights. (If lamp is already lit, adjust potentiometer clockwise until it goes out, then counterclockwise until it JUST lights.)

9. Adjust upper potentiometer counterclockwise until LOW TAPE lamp JUST lights. (If already lit, adjust potentiometer clockwise until it goes out, then counterclockwise until it JUST lights.)

10. Move tape so there is no marker in front of photosensor.

11. Attach negative lead of milliammeter to XZ8-B34 and positive lead to XZ8-A17, and note current. Adjust upper potentiometer of TP322468 card until current is 40 percent of noted value.

12. Move positive lead of milliammeter to XZ8-B22, note current, and adjust lower potentiometer until current is 40 percent of noted value.

13. With tape positioned so there is no marker in front of photosensor, measure "off-marker" voltages by attaching positive lead of voltmeter to XZ8-A1 and negative lead to XZ8-A17 and then XZ8-B22. Both voltages should be less than ±0.75 volt.

14. Position End of Tape markers in front of photosensor assembly. Measure "on-marker" voltages by attaching negative lead of voltmeter to XZ8-B34 and positive lead to XZ8-A17 and then XZ8-B22. Both voltages should be less than +1.0 volt.

15. Check operation of photosensor circuitry by fast accessing to Beginning of Tape, Low Tape, and End of Tape positions and observing action.

Note: Steps 16 through 23 apply only to TP322468 cards with issue number 10 or above. If TP322468 card is issue number 9 or less, disregard Steps 16 through 23 and follow Steps 7 through 15 instead.

16. Remove milliammeter from circuit and position tape with End of Tape markers in front of photosensor assembly.

17. Strap two terminals marked STRAP TO ADJ on TP322468 card together.

18. Adjust BOT potentiometer of TP322468 card counterclockwise until BEGIN OF TAPE or END OF TAPE lamp on control panel JUST lights. (If lamp is already lit, adjust potentiometer clockwise until lamp goes out, then counterclockwise until it JUST lights.)

19. Adjust LT potentiometer on TP322468 card counterclockwise until LOW TAPE lamp on control panel JUST

B. TP322468 CARD HAS POTENTIOMETERS
TAPE TRANSPORT DOES NOT HAVE LAMP BRIGHTNESS RHEOSTAT (Continued)

lights. (If lamp is already lit, adjust potentiometer clockwise until lamp goes out, then counterclockwise until it JUST lights.

20. Remove adjustment strap from terminals.

21. With tape positioned so End of Tape markers are in front of photosensor assembly, connect positive lead of voltmeter to frame ground and negative lead to either TP1 or TP2 of TP322468 card. The "on-marker" voltage from ground to TP1 or TP2 should be greater than -5 volts.

22. Disconnect voltmeter and position tape so there is no marker in front of photosensor. Connect negative lead of voltmeter to frame ground and positive lead to TP1 or TP2 of TP322468 card. The "off-marker" voltage should be greater than +2.5 volts. Disconnect voltmeter.

23. Check operation of photosensor circuitry by fast accessing to Beginning of Tape, Low Tape, and End of Tape positions and observing action.

C. TP322468 CARD HAS POTENTIOMETERS
TAPE TRANSPORT HAS LAMP BRIGHTNESS RHEOSTAT

1. Position End of Tape markers in front of photosensor assembly by operating fast access switch.

2. Remove TP322468 card from connector XZ8 of electronics module.

3. Measure "on-marker" currents of both phototransistors by attaching positive lead of milliammeter to XZ8-A1 and negative lead to XZ8-A17 and then XZ8-B22. The "on-marker" currents should be between 0.3 ma and 2.5 ma. If not, loosen shaft locking nut on lamp brightness rheostat and adjust as follows:

   a. If transport has TP337220 photosensor assembly, adjust rheostat for maximum lamp brightness without exceeding 2.5 ma output from phototransistor with highest reading.

   b. If transport has TP337472 photosensor assembly, adjust rheostat for minimum lamp brightness with a minimum output of 0.3 ma from both phototransistors.

4. Position tape so there is no marker in front of photosensor assembly.

5. Measure phototransistor currents as in Step 3. The "off-marker" current of each phototransistor should be:

   a. 1/10 or less of "on-marker" current if transport has TP337220 phototransistor assembly.

   b. 1/8 or less of "on-marker" current if transport has TP337472 photosensor assembly.

6. If currents are satisfactory in Steps 3 and 5, restore TP322468 card to electronics module and proceed to next step. If not, proceed as follows:

   a. If transport has TP337220 photosensor assembly, refine CAPSTAN TAPE GUIDE (FINAL) (2.17) and PHOTOSENSOR LAMP BEAM (PRELIMINARY) (2.18) and recheck. If still not satisfactory, lamp or complete photosensor assembly may require replacement.

   b. If transport has TP337472 photosensor assembly, lamp and/or phototransistors may have to be replaced.

C. TP322468 CARD HAS POTENTIOMETERS
TAPE TRANSPORT HAS LAMP BRIGHTNESS RHEOSTAT (Continued)

Note: If TP322468 card is issue number 9 or less, proceed with Steps 7 through 12 and disregard Steps 13 through 19. If TP322468 card is issue number 10 or greater, disregard Steps 7 through 12 and proceed with Steps 13 through 19.

7. Position tape with End of Tape markers in front of photosensor assembly.

8. Measure "on-marker" current of either phototransistor as in Step 3. Adjust lamp brightness rheostat so current is 33 to 40 percent of noted value.

9. Remove milliammeter from circuit.

10. Adjust lower potentiometer on TP322468 card counterclockwise until BEGIN OF TAPE or END OF TAPE lamp on control panel JUST lights. (If lamp is already lit, adjust potentiometer clockwise until lamp goes out, then counterclockwise until it JUST lights.)

11. Adjust upper potentiometer counterclockwise until LOW TAPE lamp JUST lights. (If already lit, adjust potentiometer until lamp goes out, then counterclockwise until it JUST lights.)

12. Measure current of either phototransistor as in Step 3 and adjust lamp brightness rheostat until current is 2-1/2 to 3 times noted value. Tighten shaft locking nut. Remove milliammeter.

Note: Steps 13 through 19 apply only to TP322468 cards with issue number 10 or above. If TP322468 card is issue number 9 or less, disregard Steps 13 through 19 and follow Steps 7 through 12 instead.

13. Remove milliammeter from circuit and position tape with End of Tape markers in front of photosensor assembly.

14. Strap two terminals marked STRAP TO ADJ on TP322468 card together.

15. Adjust BOT potentiometer of TP322468 card counterclockwise until BEGIN OF TAPE or END OF TAPE lamp on control panel JUST lights. (If lamp is already lit, adjust potentiometer clockwise until lamp goes out, then counterclockwise until it JUST lights.)

16. Adjust LT potentiometer on TP322468 card counterclockwise until LOW TAPE lamp on control panel JUST lights. (If lamp is already lit, adjust potentiometer clockwise until lamp goes out, then counterclockwise until it JUST lights.)

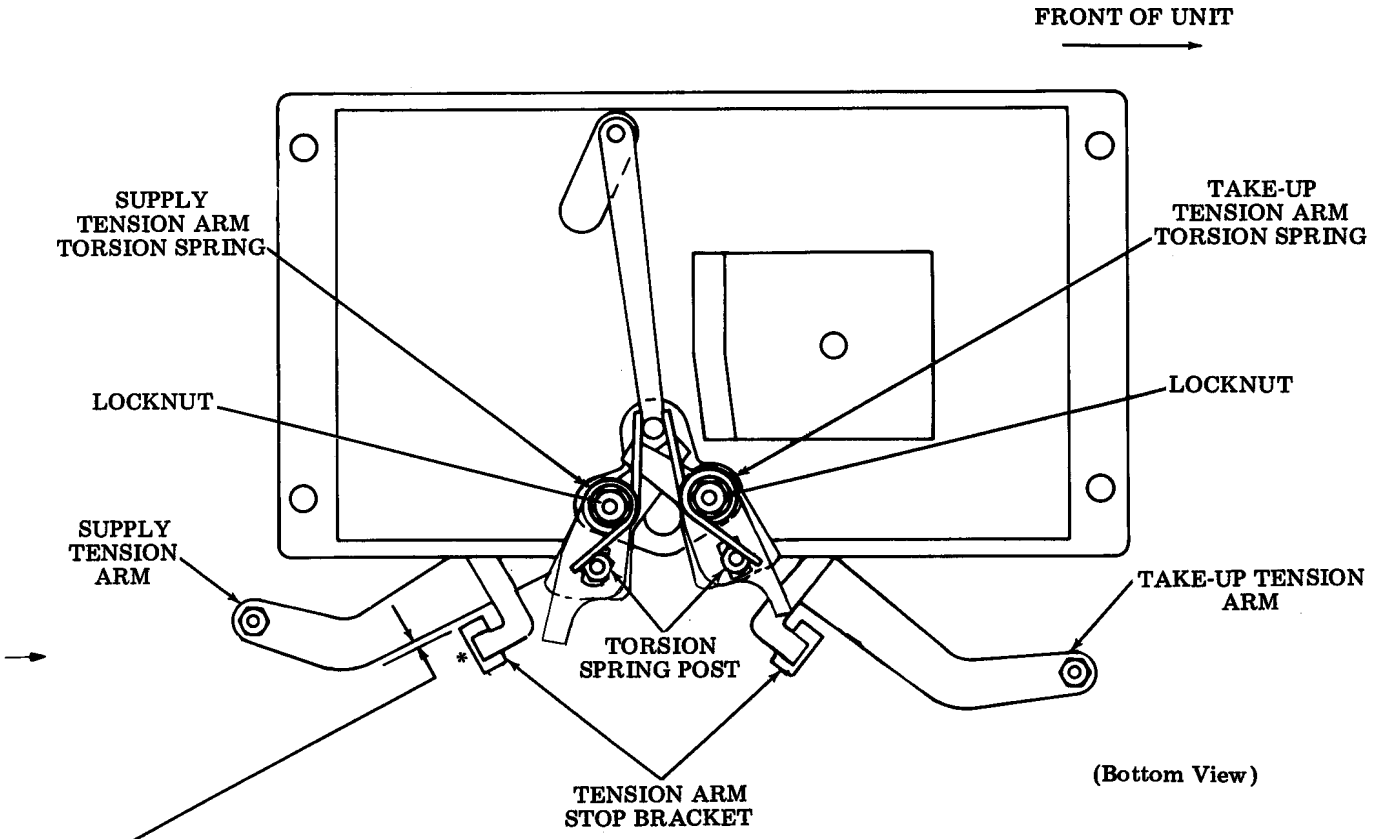
17. Remove adjustment strap from terminals.

18. With tape positioned so End of Tape markers are in front of photosensor assembly, connect positive lead of voltmeter to frame ground and negative lead to either TP1 or TP2 of TP322468 card. The "on-marker" voltage from ground to TP1 or TP2 should be greater than -5 volts.

19. Disconnect voltmeter and position tape so there is no marker in front of photosensor. Connect negative lead of voltmeter to frame ground and positive lead to TP1 or TP2. The "off-marker" voltage should be greater than +2.5 volts. Disconnect voltmeter.

20. Check operation of photosensor circuit by fast accessing to Beginning of Tape, Low Tape, and End of Tape positions and observing action.

2.20 Tape Drive Mechanism (continued)



SUPPLY TENSION ARM TORSION SPRING (FINAL)

(1) Requirement
Clearance between supply tension arm and bumper of tension arm stop bracket should be Min 3/32 inch --- Max 1/4 inch with a full tape cartridge loaded and with tape running in reverse fast access mode while within 100 counts of beginning of tape marker.

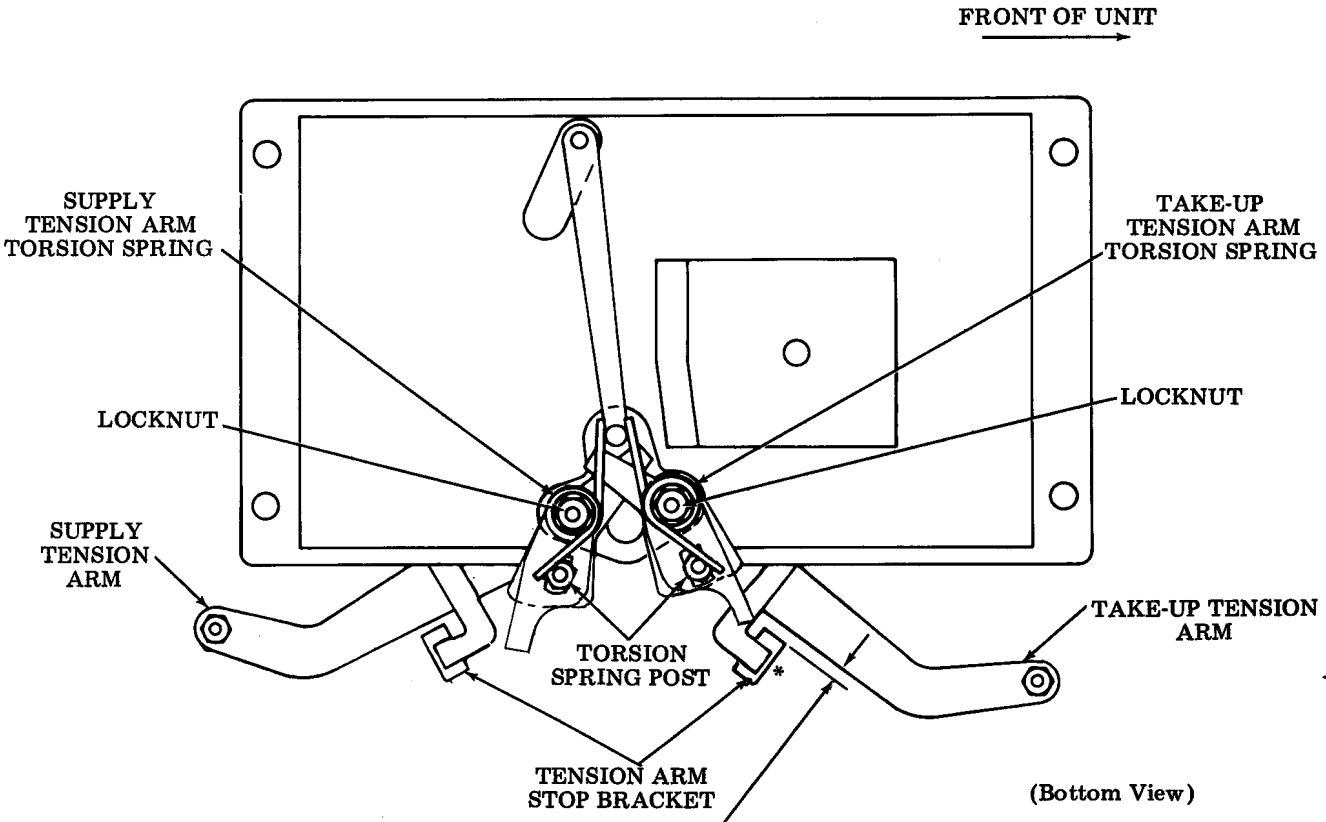
(2) Requirement
When tape has stopped after forward or reverse fast access operation, there should be a minimum clearance of 1/32 inch between supply tension arm and bumper of tension arm stop bracket, as measured at rear surface of bumper.

To Check
Position tape at beginning of tape marker, zero pointer, and forward fast access to count of 100. Reverse fast access and measure clearance between tension arm and bumper in line with bumper rear surface.

To Adjust
Loosen nut of supply tension arm torsion spring post and increase or decrease torsion spring force to meet requirement. (On late design units, adjust by positioning extension levers.) Tighten spring post.

Related Adjustment:
Affected By
TAPE REEL CLUTCH TORQUE (2.01)

2.21 Tape Drive Mechanism (continued)



*Measure in line with this surface.

TAKE-UP TENSION ARM TORSION SPRING (FINAL)

(1) Requirement

Clearance between take-up tension arm and bumper of tension arm stop bracket should be

Min 3/32 inch --- Max 1/4 inch

with full tape cartridge loaded and tape running in forward fast access mode while within 100 counts of end of tape marker.

(2) Requirement

When tape has stopped after forward or reverse fast access operation, there should be a minimum clearance of 1/32 inch between take-up tension arm and bumper of tension arm stop bracket, as measured at front surface of bumper.

To Check

Forward fast access to end of tape marker. Zero counter and reverse fast access to counter number 900. Forward fast access and measure clearance between tension arm and bumper in line with bumper front surface.

To Adjust

Loosen nut of take-up tension arm torsion spring post and increase or decrease torsion spring force to meet requirement. (On late design units, adjust by positioning extension levers.) Tighten spring post.

Related Adjustment:

Affected By

TAPE REEL CLUTCH TORQUE (2.01)

2.22 Tape Transport Assembly (continued)

(B) DUST CUP — COUNTER DRIVE BELT CLEARANCE

Requirement

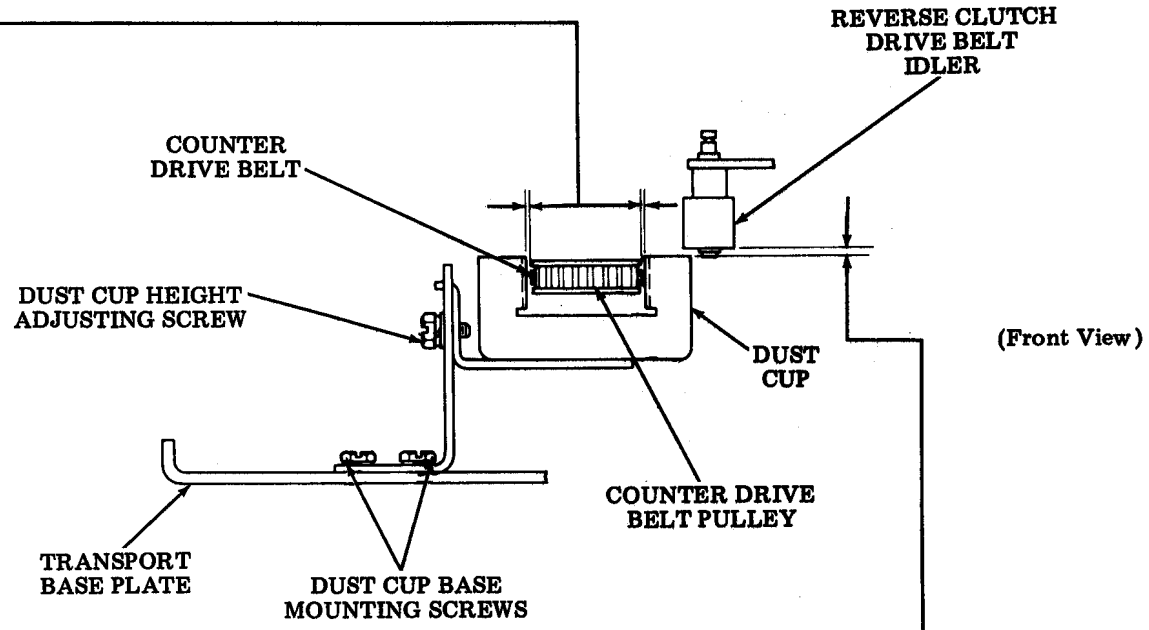
There should be

Min some

clearance between counter drive belt members and dust cup.

To Adjust

Loosen dust cup base mounting screws and adjust cup to meet requirement.



(A) DUST CUP HEIGHT

Requirement

Clearance between dust cup and reverse clutch idler roller should be

Min 0.030 inch --- Max 0.065 inch

To Adjust

Loosen dust cup height adjusting screw and move dust cup up or down to meet requirement. Tighten adjusting screw.

2.23 Tape Transport Assembly (continued)

CARTRIDGE HOLDER CENTERING

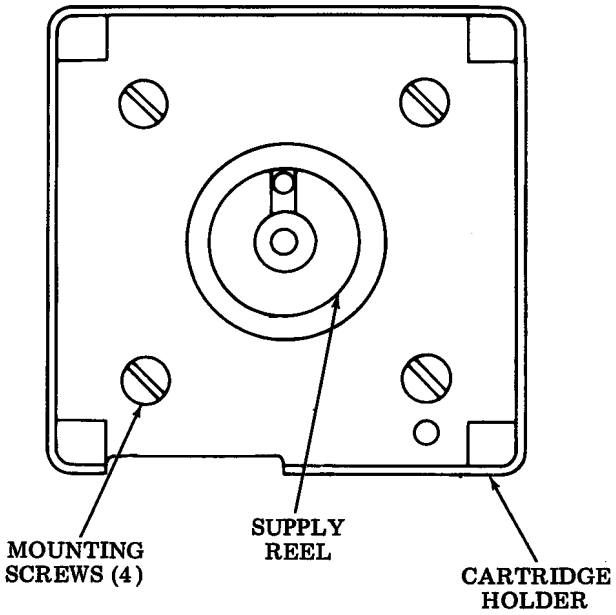
Requirement

Cartridge holder should be centered about supply reel hub.

To Adjust

Loosen cartridge holder mounting screws friction tight. Place a cartridge in cartridge holder and position cartridge holder left to right and front to rear to center cartridge with respect to supply reel. Remove cartridge and tighten mounting screws.

(Top View)



3. LUBRICATION

GENERAL

3.01 The tape transport should be lubricated just prior to placing it in service. After 200 hours of service, it should be relubricated to make certain that all points receive lubrication. Thereafter the unit should be lubricated every 1500 hours or 6 months, whichever occurs first.

3.02 Specific points to receive lubricant are indicated by line drawings and descriptive text. The symbols in the text indicate the following:

SYMBOL	MEANING
O	Light film of oil.
O1	Apply 1 drop of oil.
O6	Apply 6 drops of oil.
G	Apply thin coat of grease.
SAT	Saturate with oil (washers, oilers, wicks).

KS7470 oil should be used for all points where oil is specified. KS7471 grease should be used where grease is specified, except ball bearings. All ball bearings are packed with grease and normally need no lubrication. However, ball bearings should be lubricated with Beacon 325 grease whenever the unit is disassembled, particularly the tape drive capstan bearings.

3.03 Lubricants cannot be tolerated at points or on surfaces other than those specified, particularly on those surfaces which contact the magnetic tape and the friction surfaces of the magnetic clutches and brakes.

Note: It is normal for magnetic clutches and brake of the tape drive to produce a rust-colored wear product. Do not lubricate these friction surfaces or else improper operation will result.

3.04 The equipment should be thoroughly lubricated, but overlubrication which might allow oil or grease to be thrown on other parts should be avoided.

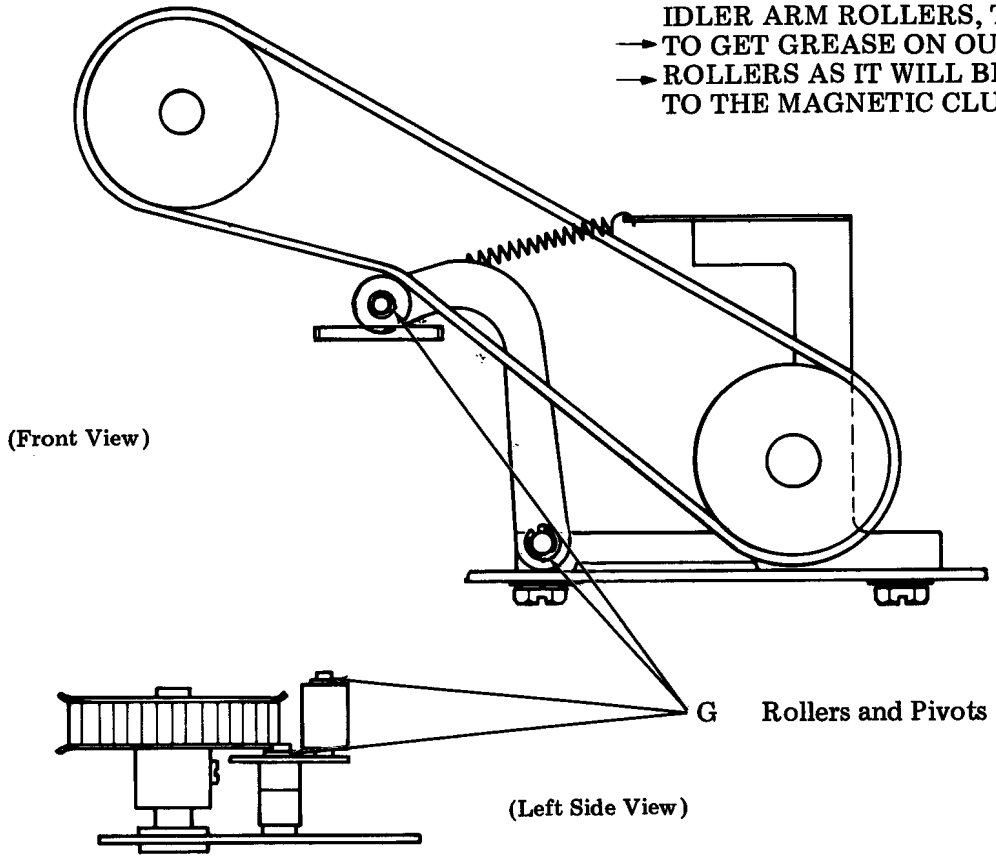
3.05 Refer to Section 570-005-800 for the tools used in lubrication procedures.

3.06 Magnetic Dust Traps — The magnetic dust traps should be cleaned of wear particles every 1500 hours or 6 months, whichever occurs first. Refer to Section 578-300-703 for upper and lower dust trap removal.

TAPE TRANSPORT

3.07 Gear Shift Mechanism

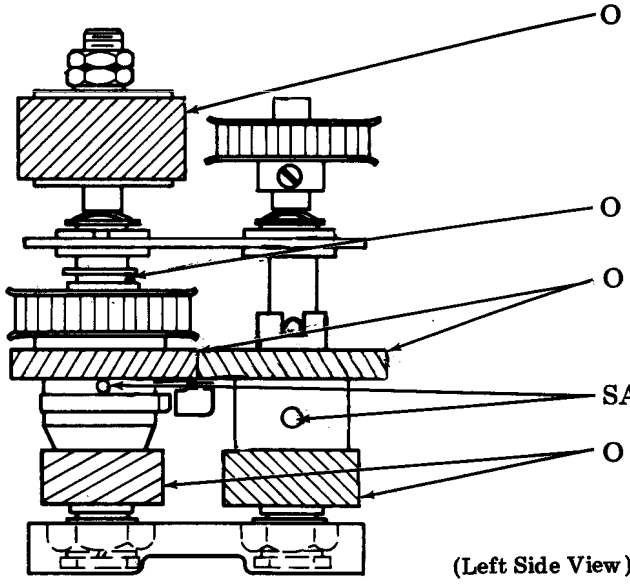
CAUTION: WHEN LUBRICATING THE FORWARD AND REVERSE ROTOR BELT IDLER ARM ROLLERS, TAKE CARE NOT TO GET GREASE ON OUTER SURFACE OF ROLLERS AS IT WILL BE TRANSMITTED TO THE MAGNETIC CLUTCHES.



(Front View)

(Left Side View)

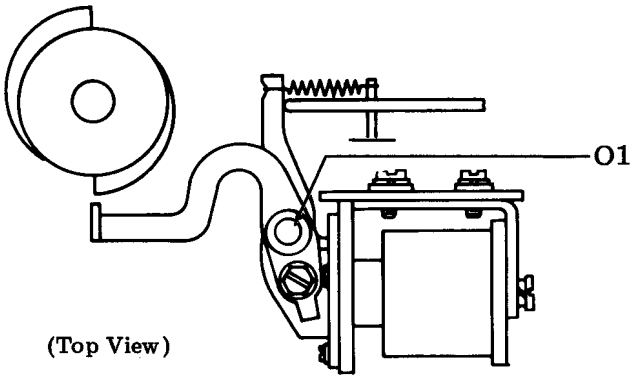
G	Rollers and Pivots	Belt Idler Arms (4)



(Left Side View)

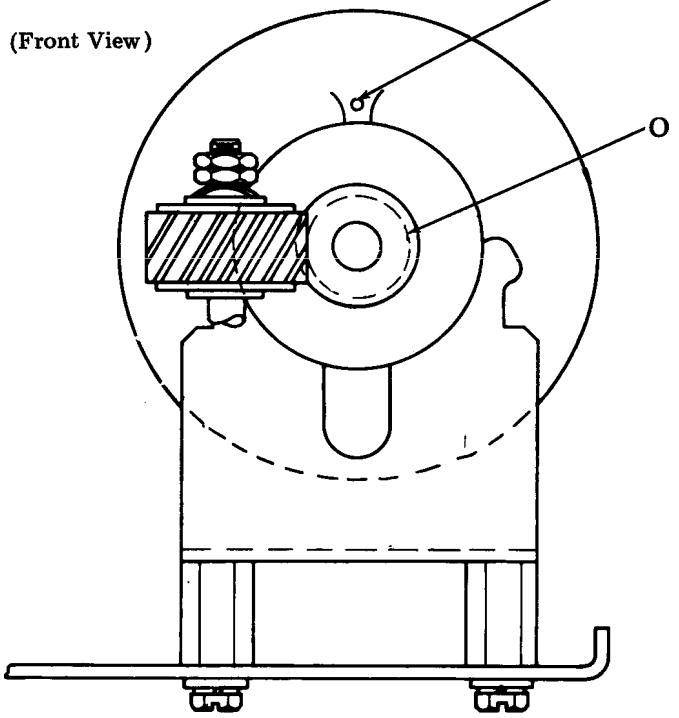
O	Teeth Surfaces	All Gears
O	Gear Bearing Bore	Reverse Gear
O	Teeth Surfaces	All Gears
SAT	Internal Felt Wick	Spring Clutches (2)
O	Teeth Surfaces	All Gears

3.08 Gear Shift Mechanism (continued)



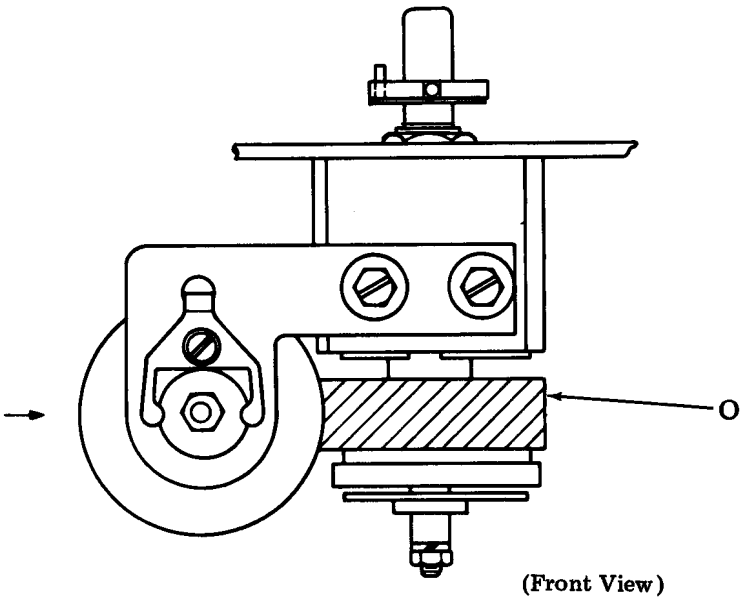
O1	Pivot	Clutch Trip Lever

3.09 Motor Unit



O6	Bearing Oil Hole	Motor Unit
O	Teeth Surfaces	Pinion Gear

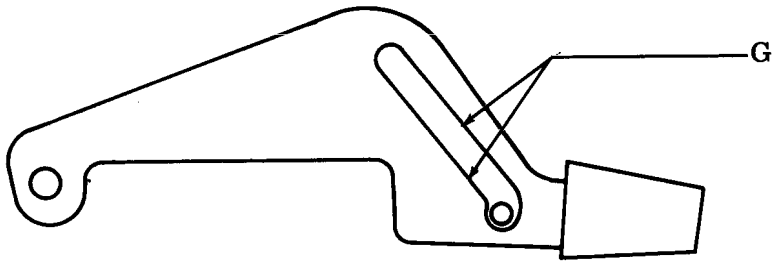
3.10 Reel Drive Mechanism



O Teeth Surfaces — Supply and Take-Up Gears

(Front View)

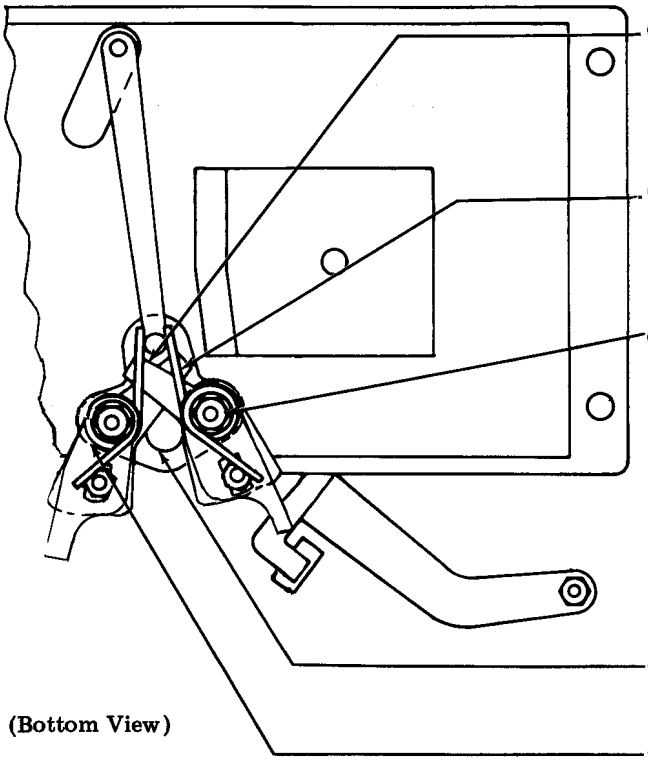
3.11 Tape Drive Mechanism



G Cam Surface — Pinch Roller Cam Lever

(Top View)

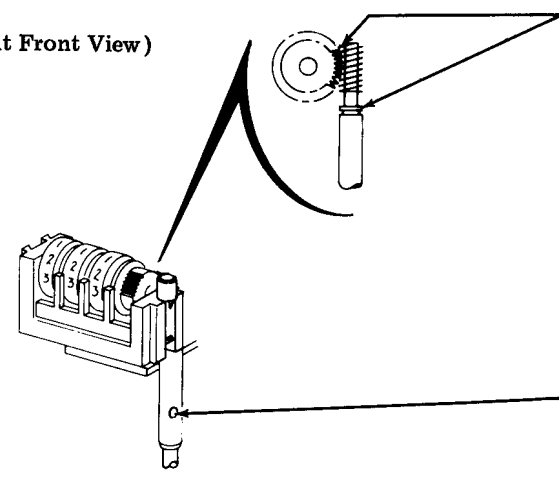
3.12 Tape Drive Mechanism (continued)



(Bottom View)

G	Cam Surfaces	Tension Arm Cam Plates
G	Spring Ends (4 Places)	Tension Arm Cam Plates
O1	Shaft Surface in Bushing (2 Places)	Tension Arm Shafts and Bushings
G	Top and Bottom Surfaces and Slot	Link Guideplate
G	Hubs (Under Spring Coils) (2 Places)	Tension Arm Cam Plates

3.13 Tape Position Counter

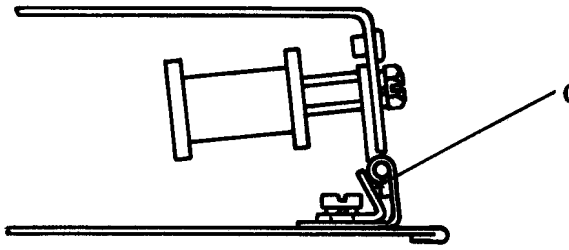


(Right Front View)

O1	Shaft Bearings and Gears	Tape Position Counter
O1	Oil Hole (Late Design Units Only)	Tape Position Counter

3.14 Right-Hand Head Cover (Late Design)

Note: This lubrication routine applies only to transports with hinged right-hand head covers.



G Surface Contacting Head Cover

Hinge Spring

(Front View)