

# ADJUSTMENT PROCEDURES

## 7970B/C



### 7970B/C ADJUSTMENT FOR READ/WRITE UNITS

#### TOOLS REQUIRED:

13191A	Control & status test PCA
13192A	Write test PCA
HP 180A	Oscilloscope or equivalent
HP 3476A	Digital voltmeter or equivalent
HP 5245L	Counter or equivalent
Test Tapes	Transport test tape HP P/N 5080-4525 or 5081-9401 IBM master skew tape, HP P/N 9162-0027 Scratch tape equipped with write ring

#### POWER SUPPLY ADJUSTMENTS

Adjust the variable resistor on the power regulator PCA to provide an output on the +5V test point of  $+5 \pm 0.01$  Vdc. Verify that the +12Vdc and -12Vdc test points provide outputs of  $+12 \pm 0.36$  Vdc and  $-12 \pm 0.36$  Vdc, respectively.

#### PREALIGNMENT CLEANING

Clean the tape heads and path.

#### CAPSTAN MOTOR OFFSET CURRENT ADJUSTMENT

##### NOTE

Final reel servo adjustments must be made after the capstan servo adjustments. The capstan speed must be within tolerance in order to properly adjust the reel servo. However, tension must be maintained in order to make the capstan servo adjustments. If the tape unit does not maintain tension, perform the reel servo adjustments initially, complete the capstan servo adjustments, and repeat the reel servo adjustments.

Prior to making the capstan motor offset current adjustment, verify that the power supply voltages have been adjusted. See Figure 1 for the location of the switches and adjustments.

Connect a suitable dc voltmeter (capable of resolution to  $\pm 5$  mV dc) across the 3-ohm resistor (R21 or R22) connected in series with the capstan motor. The common side of the resistance is associated with pin 2 of CJ1 and the high or motor side is associated with pin 2 of CJ2.

Load the transport with a scratch tape and be sure the tape is stopped. Adjust the OFFSET control until the voltmeter reading is minimum. An acceptable minimum is any value which is between +0.100 Vdc and -0.100 Vdc. Typical adjustment at room ambient temperature (25°C) will be in the order of  $\pm 0.080$  Vdc.

## CAPSTAN SERVO FORWARD AND REVERSE DRIVE SPEED ADJUSTMENTS

Load the tape transport with the speed test tape, HP P/N 5080-4525 or 5081-9401. Connect the counter to the preamp test point of channel three for nine track units or channel six for seven track units on the preamp PCA. Place the unit in forward mode using the FWD switch (S2) on the capstan servo PCA. Refer to Figure 1 for locations of switches and adjustments on the capstan servo PCA.

Adjust the FWD syn adjustment (R34) until the counter reads within the tolerances in Table 1.

**TABLE 1. SPEED VERSUS FREQUENCY**

Tape Speed (IPS)	Frequency (KHz)
45	15,000±150Hz
37.5	12,000±125Hz
25	8,000±80Hz

Place the unit in reverse mode using the REV switch (S1) on the capstan servo PCA. Adjust the REV SYN adjustment (R28) until the counter reads within the tolerances in Table 1.

### CAPSTAN SERVO HIGH SPEED FORWARD ADJUSTMENT

Place the unit in high speed forward mode (+160) using the HS FWD switch (S3) on the capstan servo PCA. Use the high speed forward adjustment (R53) to adjust speed until the counter reads 53,333±1000Hz.

### CAPSTAN SERVO HIGH-SPEED REVERSE ADJUSTMENT

The high speed reverse adjustment is identical to the high speed forward adjustment except that the REWIND pushbutton (on the front of the transport) is used to place the unit in high speed reverse motion. Use the high speed reverse adjustment (R60) to adjust speed until the counter reads 53,333±1000Hz.

### CAPSTAN SERVO RAMP SLOPE ADJUSTMENT

Load a scratch tape on the transport. Begin FWD start/stop motion by setting the PROG/MAN switch to PROG and the CF switch to the upper position on the 13191A test PCA.

Connect a scope to the TACH TP on the capstan servo PCA. Sync the scope externally with the positive transition of the forward command (TP9 of the control and status PCA). Adjust the capstan servo PCA RAMP control (Figure 1) so that the 90% point of the waveform occurs at the time listed in Table 2. Use the vertical gain vernier control of the scope to expand the waveform so that the waveform fills the vertical calibrated part of the scope display. Refer to Figure 2.

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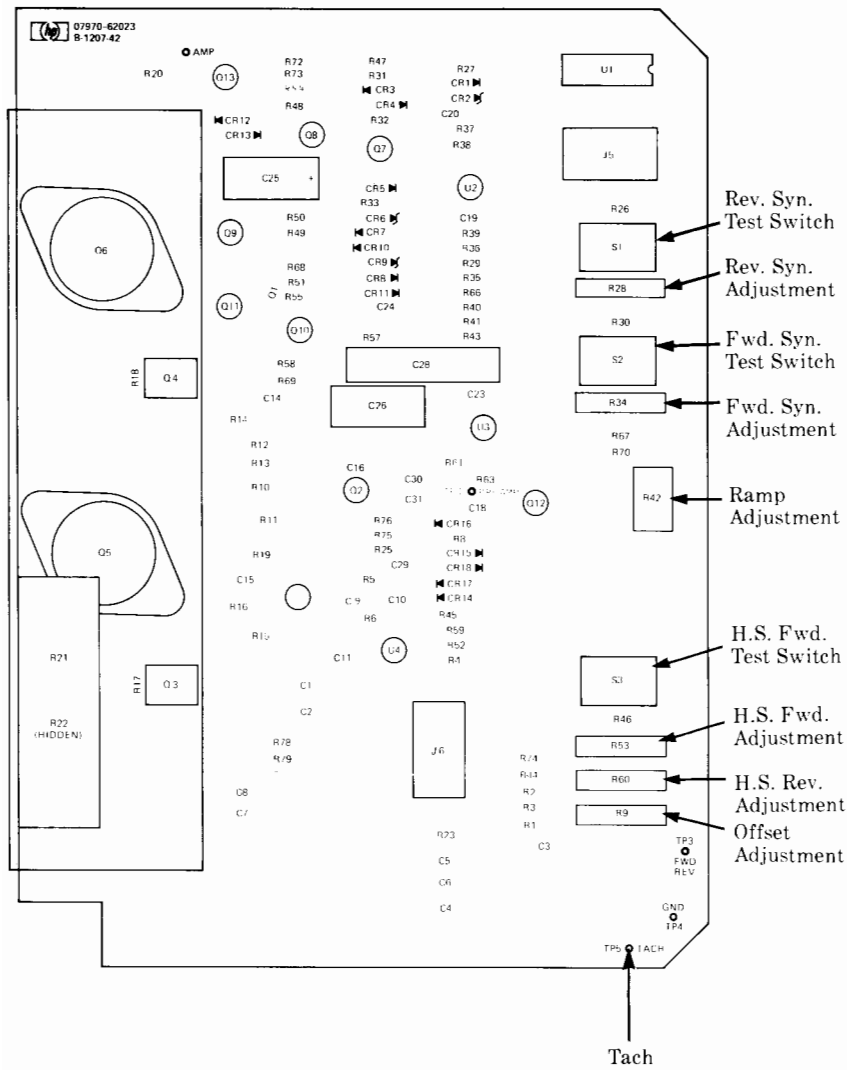


Figure 1. Capstan Servo PCA, Switches and Adjustments

**TABLE 2. CAPSTAN SERVO START/STOP TIME**

Speed (IPS)	Time (90%) ms
25	13.0±0.2
37.5	8.1±0.1
45	6.6±0.1

Change the polarity of the scope sync to obtain the stop tach waveform on the scope. The stop tach waveform should be within  $\pm 0.5$  ms of the start tach waveform. The stop tach waveform will be displayed as the inverse of the start tach waveform.

**NOTE**

On HP 180 scopes, there is a dotted line across the screen at the 90% level (see Figure 2). The tolerance for 90% time using the forward command is  $\pm 0.02$ ms.

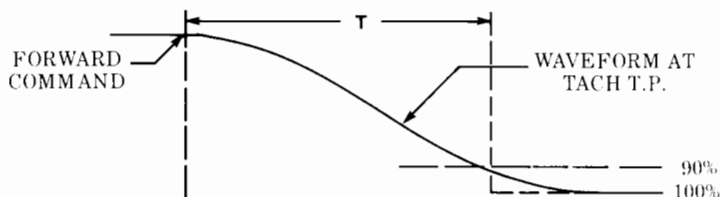


Figure 2. Tach Waveform

**REEL SERVO ADJUSTMENTS**

The following adjustments determine the peak deflections of the tension arms. The amount of deflection desired is a function of the synchronous speed. At the highest speed (45 ips) the deflection is set so the tension arms deflect to the outer marks located on the back side of the casting, both in forward and reverse drive modes. At lower speeds the amount of deflection is smaller (i.e., at 25 ips the deflection is about half, 25/45, the amount at 45 ips). Due to nonlinearity of the tension arm transducer the swing of the tension arm may be unsymmetrical in the forward and reverse drive modes. (This will mean the tension arm will not be centered when there is no tape motion. This is normal).

Mount a supply reel loaded with approximately 200 feet of tape. Use the 13191A test PCA to place the transport in forward synchronous motion (PROG/MAN switch to MAN). Place the CRW switch in the middle position so the tape will stop at EOT. Adjust the supply reel variable resistor (R106 upper) on the reel servo PCA for proper deflection.

Stop tape motion and put the transport in reverse synchronous motion using the 13191A test PCA. Check to be certain the amount of deflection is the same as in forward motion.

Repeat this procedure for the take-up reel with approximately 200 feet of tape on the take-up reel. Use the upper variable resistor (R104) for the take-up reel adjustment.

## PREAMPLIFIER GAIN ADJUSTMENT

Load the transport with a scratch tape equipped with a write ring. Using the 13191A and 13192A test PCAs with the BLOCK/ XTALK switch in the XTALK position and the WSW switch in the upper position, place the CF switch in the upper position, then the lower position. The tape unit should stop and the LED on the 13192A test PCA should be illuminated.

Connect a scope to the WC TP on the write control PCA. Adjust the variable resistor on the 13192A test PCA for the pulse-to-pulse spacing according to the speed of the drive as given in Table 3.



TABLE 3. PULSE SPACING

Speed (ips)	Time ( $\mu$ sec)
45	111
37.5	132
25	200

Place the CF switch in the upper position to start forward tape motion. Use a scope to monitor the voltage across several of the large 2 watt resistors on the write interconnect PCA to ensure the tape drive is writing data, and measure the preamp output for each track at the preamp TP. Adjust the preamp gains to provide an average peak-to-peak output of 6.4V-0.4, +0.2.

## FORWARD STATIC SKEW COMPENSATION ADJUSTMENTS

The techniques for rapid adjustment and for evaluating the need for adjustment differ. Figure 3 shows poor skew alignment and proper skew alignment. To adjust static skew compensation, proceed as follows:

Load the master alignment tape, HP P/N 9162-0027, and place the tape unit in synchronous forward mode. Using the 13191A test PCA, place the CRW switch in the middle position so the tape will stop at EOT (see note below).

On the read data PCA adjust the FWD skew delay control for channel 2, approximately  $\frac{1}{4}$  turn from the fully counter clockwise position. Channel 2 will be the reference channel for the remaining adjustments.

Connect the oscilloscope "A" probe to the SKEW test point of the reference channel (2). Connect the oscilloscope "B" probe to each SKEW test point in succession and algebraically add oscilloscope inputs A and B.

Adjust each channel skew delay variable resistor for a maximum displayed amplitude; refer to Figure 3.

### NOTE

The master alignment tape must only be run forward and reverse at normal (45 ips) speed the full length of the tape. Full reel passes or high speeds may cause degradation of the tape.

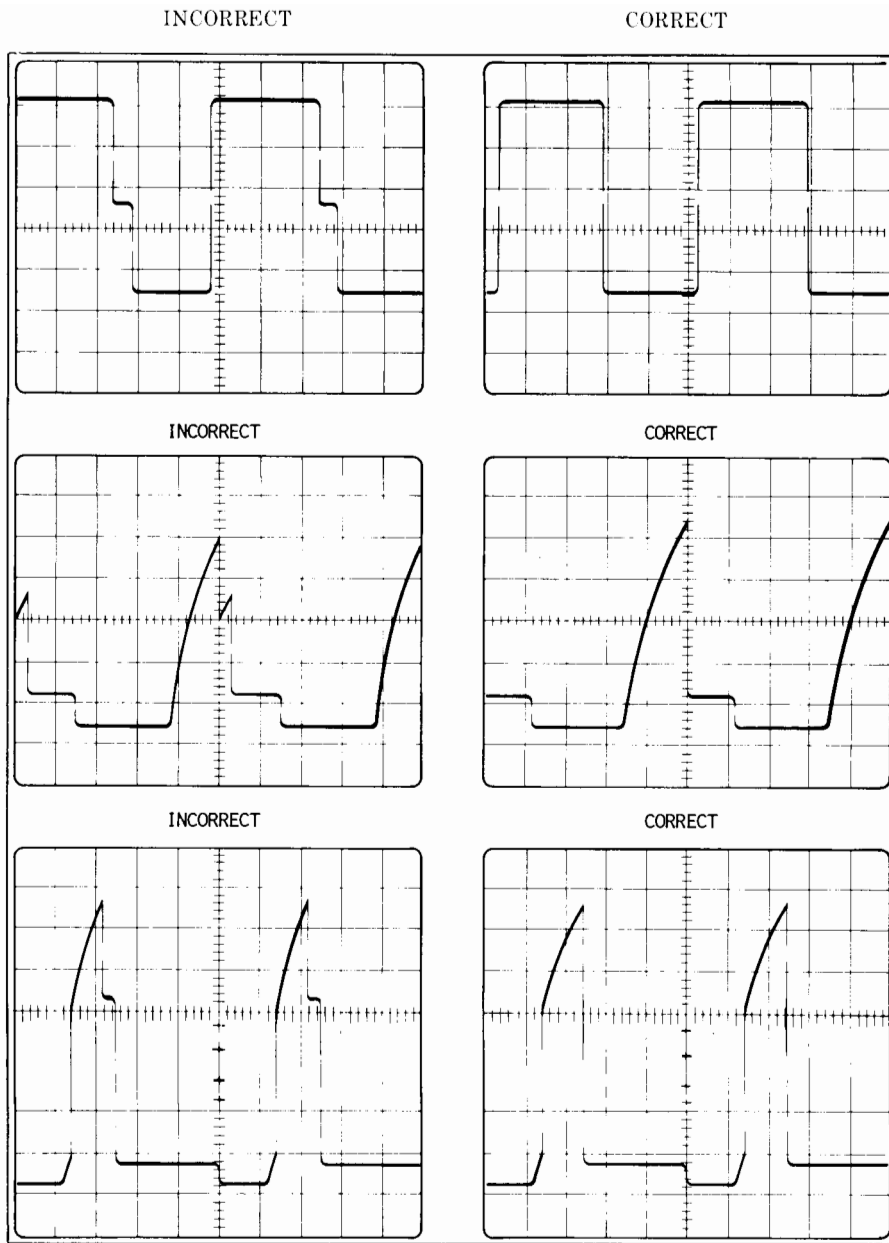


Figure 3. Skew Alignment

## REVERSE STATIC SKEW COMPENSATION ADJUSTMENTS

Reverse static skew compensation is accomplished in exactly the same manner as that used for forward skew except for the reverse drive mode and adjustment of reverse skew controls. The same SKEW test points are used for both adjustments.

## READ CHARACTER GATE ADJUSTMENTS

Load the tape unit with the master alignment tape, HP P/N 9162-0027, place the unit in synchronous forward operation, and select 800 bpi operation (seven-track units only, other drives are always selected for 800 bpi).

Synchronize the oscilloscope (negative slope) to the NOR test point on the read control PCA. (The first data bit of a character will start the gate time when this line goes to ground).

Observe the bit-to-bit time (negative-going edge to negative-going edge). The low (or ground) portion of this signal represents the character gate time.

Adjust R29 on the read control PCA so that the negative portion of the square wave represents 46% of the bit-to-bit time. In actual time, it can be adjusted for the times in Table 4.

TABLE 4.

Speed (ips)	Time (msec)
45	13
37.5	16
25	23

## WRITE ADJUSTMENT PROCEDURES

Load the tape transport with a reel of scratch tape equipped with a write enable ring. Place the unit in synchronous forward write mode and write a data pattern consisting of all "ones" at 800 bpi. Verify write mode by monitoring the voltage at the 2 watt resistors on the write interconnect PCA.

### NOTE

To obtain 800 bpi consisting of all "ones", use the procedure outline in PREAMP ADJUSTMENTS. However, this time set the bit-to-bit spacing as shown in Table 5.

TABLE 5. BIT-TO-BIT TIME

Speed (ips)	Time (us)
45	27.9
37.5	33
25	50



Adjust the write skew delays as follows:

Adjust the channel 2 write skew delay until channel 2 resistor is approximately 1/4 turn from CCW position. Channel 2 will be used as a reference channel.

Connect the oscilloscope channel A probe to tape unit channel 2 read FWD/REV skew test point, and connect the oscilloscope channel B probe to the SKEW test point corresponding to the write data channel being adjusted. Set the oscilloscope controls to algebraically sum channels A and B. Adjust the oscilloscope sweep to display at least one full bit time (leading edge of one bit to the leading edge of the next).

Adjust the skew delay variable resistor of the channel under adjustment to obtain a maximum amplitude on the oscilloscope display.

Repeat step "c" for all remaining channels except the reference channel (channel 2).

#### NOTE

Under no circumstances are any of the read skew adjustments to be changed during the write skew compensation process.

#### **BOT/EOT ADJUST**

The BOT/EOT test points are located on the bottom of the control switch assembly. Put the drive on a BOT tab and measure the BOT test point. If the voltage is less than 1.1 volts, make sure the filament in the lamp is perpendicular to the transport. If the voltage is still less than 1.1 volt, change the photosense lamp. Manually rotate the capstan pulley until the load point tab is no longer under the photosense assembly. The voltage should now measure -0.4V. Perform the same measurement for the EOT tab.

# ADJUSTMENT PROCEDURES

## 7970E



### 7970E ADJUSTMENT FOR READ/WRITE UNITS

#### TOOL REQUIREMENTS:

13191A	Control and status test PCA
13195A	Write formatter PCA
13196A, Opt 001	PE write test PCA
HP 180A	Oscilloscope or equivalent
HP 3476A	Digital voltmeter or equivalent
HP 5246L	Counter or equivalent
Test tapes	HP P/N 5081-9401 (1200 feet) or HP P/N 5080-4525 (2400 feet) HP P/N 9162-0027 Scratch tape equipped with a write ring

#### PREALIGNMENT/SETUP

Clean the tape heads and path.

Install the 13191A test PCA and set all switches to their lower positions (including the PROG/MAN slide switch). Install the 13195A test PCA and see that jumper U23 is correctly installed to match the machine speed, and that the parity jumper is connected to Pin 3. Install the 13196A Opt 1 test PCA vertically into the 13195A test PCA and set all toggle switches to their left position. Refer to the test accessory PCA descriptions or operator and service manuals for the test PCAs.

#### POWER SUPPLY ADJUSTMENT

Adjust the variable resistor (R4) on the power regulator PCA to provide an output on the +5V test point of  $+5 \pm 0.05$  Vdc. Verify that the +12 Vdc and -12 Vdc test points provide outputs of  $+12 \pm 0.36$  Vdc and  $-12 \pm 0.36$  Vdc, respectively.

#### CAPSTAN MOTOR OFFSET CURRENT ADJUSTMENT

##### NOTE

Final reel servo adjustments must be made after the capstan servo adjustments. The capstan speed must be within tolerance in order to properly adjust the reel servo. However, tension must be maintained in order to make the capstan servo adjustments. If the tape unit does not maintain tension, perform the reel servo adjustments initially, complete the capstan servo adjustments, and repeat the reel servo adjustments.

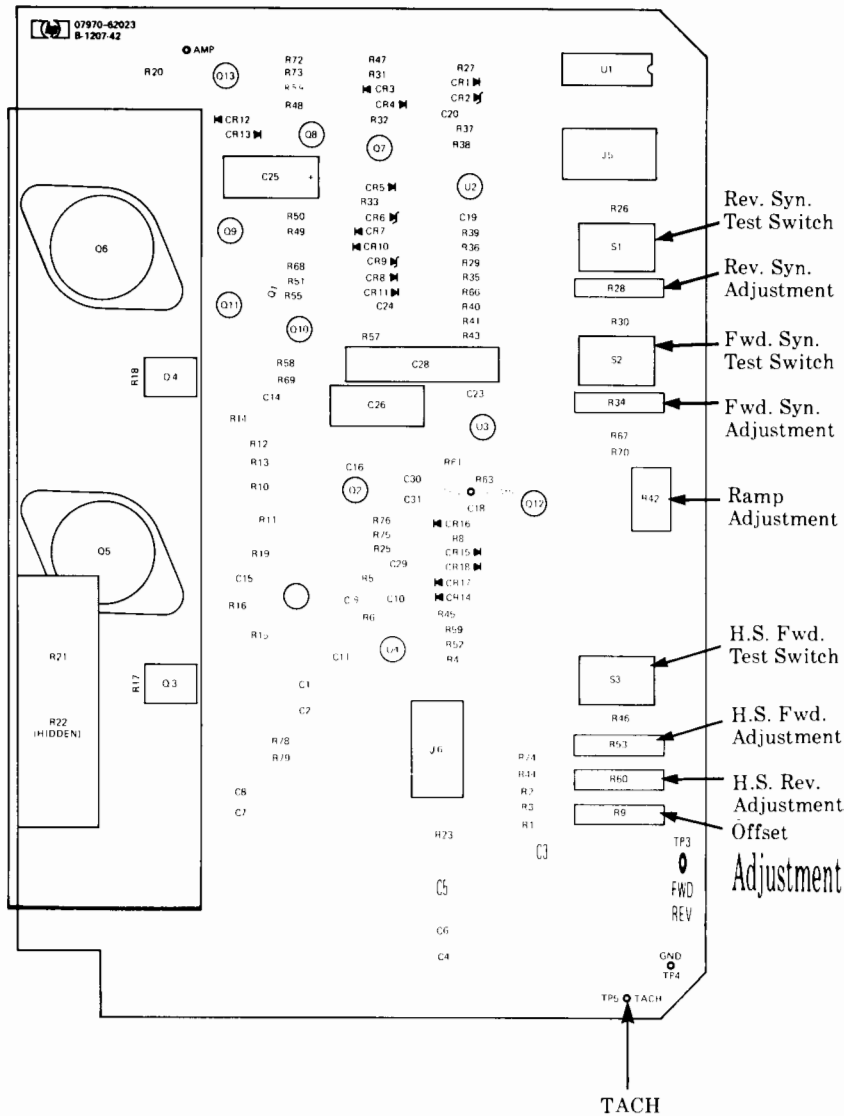


Figure 1. Capstan Servo PCA, Switches and Adjustments

Prior to making the capstan motor offset current adjustment, verify that the power supply voltages have been adjusted. See Figure 1 for the location of the switches and adjustments.

Connect a suitable dc voltmeter (capable of resolution to  $\pm 5\text{mVdc}$ ) across one of the 3-ohm resistors (R21 or R22) connected in series with the capstan motor. The common side of the resistance is associated with pin 2 of CJ1 and the high or motor side is associated with pin 2 of CJ2.

Load the transport with a scratch tape and be sure the tape is stopped. Adjust the OFFSET control until the voltmeter reading is minimum. An acceptable minimum is any value which is between  $+0.100\text{ Vdc}$  and  $-0.100\text{ Vdc}$ . Typical adjustments at room ambient temperature ( $25^\circ\text{C}$ ) will be in the order of  $\pm 0.080\text{ Vdc}$ .

### **CAPSTAN SERVO FORWARD AND REVERSE DRIVE SPEED ADJUSTMENTS**

Load the tape transport with the speed test tape, HP P/N 5080-4525 or 5081-9401. Connect the counter to the DIFF test point of channel three (for nine track units) on the preamp PCA. Place the unit in forward mode using the FWD switch (S2) on the capstan servo PCA. Refer to Figure 1 for locations of switches and adjustments on the capstan servo PCA.

Adjust the FWD SYN adjustment (R34) until the counter reads within the tolerances in Table 1.

**TABLE 1. SPEED VERSUS FREQUENCY**

Tape Speed (IPS)	Frequency (KHz)
45	$15,000 \pm 150\text{Hz}$
37.5	$12,500 \pm 125\text{Hz}$
25	$8,333 \pm 83\text{Hz}$

Place the unit in reverse mode using the REV switch (S1) on the capstan servo PCA. Adjust the REV SYN adjustment (R28) until the counter reads within the tolerances in Table 1.

### **CAPSTAN SERVO HIGH-SPEED FORWARD ADJUSTMENT**

Place the unit in high speed forward mode (+160) using the HS FWD switch (S3) on the capstan servo PCA. Use the high-speed forward adjustment (R53) to adjust speed until the counter reads  $53,333 \pm 100\text{Hz}$ .

### **CAPSTAN SERVO HIGH-SPEED REVERSE ADJUSTMENT**

The high-speed reverse adjustment is identical to the high-speed forward adjustment except that the REWIND pushbutton (on the front on the transport) is used to place the unit in high-speed reverse motion. The high-speed reverse adjustment is R60.

## CAPSTAN SERVO RAMP SLOPE ADJUSTMENT

Load a scratch tape on the transport. Begin FWD start/stop motion by setting the PROG/MAN switch to PROG and the CF switch to the upper position on the 13191A test PCA.

Connect a scope to the TACH TP on the capstan servo PCA. Sync the scope externally with the positive transition of the forward command (TP9 of the control and status PCA). Adjust the capstan servo PCA RAMP control (Figure 1) so that the 90% point of the waveform occurs at the time listed in Table 2. Use the vertical gain vernier control of the scope to expand the waveform so that the waveform fills the vertical calibrated part of the scope display. Refer to Figure 2.

**TABLE 2. CAPSTAN SERVO START/STOP TIME**

Speed (IPS)	Time (90%) ms
25	13.0±0.2
37.5	8.1±0.1
45	6.6±0.1

Change the polarity of the scope sync to obtain the stop tach waveform on the scope. The stop tach waveform should be within ±0.5 ms of the start tach waveform. The stop tach waveform will be displayed as the inverse of the start tach waveform.

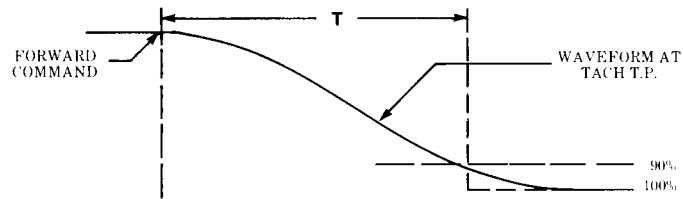


Figure 2. Tach Waveform

### NOTE

*On HP 180 scopes, there is a dotted line across the screen at the*

90% level (see Figure 2). The tolerance for 90% time using the forward command is ±0.2ms.

## REEL SERVO ADJUSTMENTS

The following adjustments determine the peak deflections of the tension arms. The amount of deflection desired is a function of the synchronous speed. At the highest speed (45 ips) the deflection is set so the tension arms deflect to the outer marks located on the back side of the casting, both in forward and reverse drive modes. At lower speeds the amount of deflection is smaller (i.e., at 25 ips the deflection is about half the amount at 45 ips). Due to nonlinearity of the tension arm transducer the swing of the tension arm may be unsymmetrical in the forward and reverse drive modes. (This will mean the tension arm will not be centered when there is not tape motion. This is normal.)

Mount a supply reel loaded with approximately 200 feet of tape. Use the 13191A test PCA to place the transport in forward synchronous motion (PROG/MAN switch to MAN). Place the CRW switch in the middle position so the tape will stop at EOT. Adjust the supply reel variable resistor (R106 upper) on the reel servo PCA for proper deflection.

Stop tape motion and put the transport in reverse synchronous motion using the 13191A test PCA. Check to be certain the amount of deflection is the same as in forward motion.

Repeat this procedure for the take-up reel with approximately 200 feet of tape on the take-up reel. Use the lower variable resistor (R104) for the take-up reel adjustment.

## **PREAMPLIFIER GAIN ADJUSTMENT**

Load the transport with a scratch tape equipped with a write ring. Place the WSW switch on the 13191A test PCA in the upper position. Place the DATA SELECT and DATA BLOCKS switches on the 13196 test PCA to the right positions. Place the transport in synchronous forward motion using the 13191A test PCA. Connect a scope to the DIFF TP on the preamp PCA and adjust the variable resistor for each channel to provide  $4.5 \pm 0.2V$  PP. Switches must be selected in the order given or the write operation will not occur. Monitor the voltage across several of the large 2 watt resistors on the write interconnect PCA to ensure the tape drive is writing data.

## **WRITE SKEW DELAY**

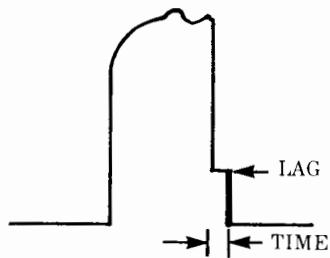
Load the master alignment tape. HP P/N 9162-0027, and place the tape unit in synchronous forward motion using the 13191A test PCA. Place the WSW switch in the down position. Place the CRW switch in the middle position so the tape will stop at EOT (see note below). Determine the amount of skew at the DAT TP for each decoder PCA.

Connect scope probe "A" to the DAT TP of channel two decoder PCA (fourth card from the left in the read card cage). Connect probe "B" sequentially to the DAT TP of each of the other decoder cards. Adjust the vertical gain verniers such that scope channel A is approximately twice that of "B". Set the scope to algebraically sum channels "A" and "B" with "A" used for sync. The scope display should indicate one of the three possible waveforms shown in Figure 3.

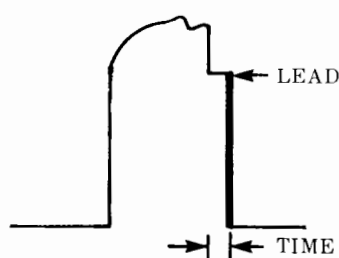
Note the amplitude and width of the discontinuity in the trailing edges of the summed waveforms (see arrows in Figure 3). With channel two as reference, the discontinuity will either be at a higher or lower amplitude point depending on whether the non-referenced channel (B) leads or lags, respectively, channel two in time. The width of the discontinuity is the amount of time the channel being measured leads or lags channel two (as measured on the scope horizontal scale). If there is a single discontinuity in both the upper and lower amplitude points there is no skew difference (see Figure 3C). Determine this time difference for each channel with respect to channel two and write these values on a separate piece of paper.

Rewind the master alignment tape in synchronous reverse mode using the 13191A test PCA (see note below). Load a scratch tape equipped with a write ring. Use the 13191A test PCA to enable the write circuitry by placing the WSW on the 13191A in the up position. Then place CF switch on the 13191A in the up position to enable synchronous forward motion. Place the DATA SELECT and DATA BLOCK switches on the 13196A test PCA to the right positions to enable the write mode. Verify write mode by monitoring the voltage at the 2 watt resistors on the write interconnect PCA.

A. CHANNEL B LAGS CHANNEL A



B. CHANNEL B LEADS CHANNEL A



C. NO SKEW DELAY

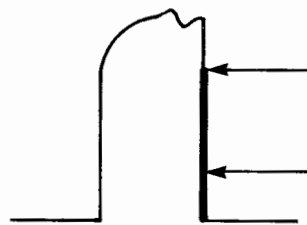


Figure 3. Skew Delay Waveforms

Connect scope channel "A" probe to the DAT TP of the decoder card for channel two. Turn the variable resistor for channel two on the write data PCA CCW until it is fully CCW at which time a click can be heard, then rotate it CW two or three turns. Sequentially connect probe "B" to each of the DAT TPs of the other decoder cards. Set the scope to algebraically sum the scope channels as before. Adjust the variable resistor on each of the other eight decoder cards to achieve the same lead or lag measured with the master alignment tape in the previous step (recorded on separate paper).

### NOTE

The master alignment tape must only be run forward and reverse at normal (45 ips) speed, the full length of the tape. Partial reel passes or high speeds may cause degradation of the tape.

### EOT/BOT ADJUST

The EOT/BOT test points are located on the bottom of the control switch assembly. Put the drive on a BOT tab and measure the BOT test point. If the voltage is less than 1.1 volt, make sure the filament in the lamp is perpendicular to the transport. If the voltage is still less than 1.1 volts, change the photosense lamp. Manually rotate the capstan pulley until the load point tab is no longer under the photosense assembly. The voltage should now measure -0.4 minimum V. Perform the same measurements for EOT TAB.

# PARTS CROSS REFERENCE



HP PART NUMBER	ASSEMBLY DESCRIPTION	7970B SPEED			7970C SPEED			7970E SPEED			EX. PART NUMBER	REPLACEMENT PART NO.	COMMENTS
		10-20.9	21-45	ALL	10-20.9	21-45	ALL	10-20.9	21-45	ALL			
07970-										07970-			
60090	Density Select Assy.		X							N/A			
60140	Capstan Motor					X				N/A			
60141	Capstan Motor							X		N/A			
60240	Write Control								X	N/A			
60300	Write Interconnect		X							N/A			
60390	Read Mother Bd.							X		N/A			
60481	Tension Arm Assy.								X	N/A			
60520	Dual Chan. Read	X								N/A	62166	Note 1.	
60530	Dual Chan. Read		X							N/A	62168		
60560	Single Chan. Read	X								N/A	62167	Note 1.	
60570	Single Chan. Read		X							N/A	62169		
60580	Head Assy. R/W 9tr 21-45 IPS		X							N/A	62206		
60581	Head Assy. R/W 7tr 21-45 IPS		X							N/A	62204		
60582	Head Assy. RO 9tr 21-45 IPS		X							N/A	62202		
60583	Head Assy. RO 7tr 21-45 IPS		X							N/A	62200		
60584	Head Assy. R/W 7tr 10-20.9 IPS	X								N/A	62203		
60585	Head Assy. R/W 9tr 10-20.9 IPS	X								N/A	62211		
60586	Head Assy. R/O 7tr 10-20.9 IPS	X								N/A	62199		
60587	Head Assy R/O 9tr 10-20.9 IPS	X								N/A	62201		
60588	Head Assy. R/R 7/9tr 10-20.9 IPS	X								N/A	62207		



HP PART NUMBER	ASSEMBLY DESCRIPTION	7970B SPEED			7970C SPEED			7970E SPEED			EX. PART NUMBER	REPLACEMENT PART NO.	COMMENTS
		10-20.9	21-45	ALL	10-20.9	21-45	ALL	10-20.9	21-45	ALL			
07970-										07970-	07970-		
60589	Head Assy. R/R 7/9tr 21-45 IPS	X								N/A	62208		
60800	Dual Chan. Write	X								N/A			
60810	Dual Chan. Write		X							N/A			
60820	Single Chan. Write	X								N/A			
60830	Single Chan. Write		X							N/A			
60950	Read Parity 9tr			X						N/A	60954		
60951	Write Parity 9tr			X						N/A			
60952	Write Parity 7tr			X						N/A			
60953	Read Parity 7tr			X						N/A			
60954	Prog. Read Parity 7/9tr			X				X		69333		Note 5.	
61010	Power Regulator			X				X		N/A		Note 4.	
61020	Power Distribution			X				X		N/A		Note 4.	
61030	Door Interlock			X				X		N/A			
61080	Control & Status			X				X		61081	62336		
61150	Photo Sense Assy.			X				X		N/A	62131		
62000	Read Pre Amp		X							62119			
62001	Read-Read Pre Amp		X							N/A			
62002	Read-Read Pre Amp		X							N/A	62001		
62003	Read-Read Mother Bd.			X						N/A			
62004	Read-Read Control		X							N/A			
62005	Read-Read Control			X						N/A			
62006	Density Select Assy. R/R			X						N/A	62088		



HP PART NUMBER	ASSEMBLY DESCRIPTION	7970B SPEED			7970C SPEED			7970E SPEED			EX. PART NUMBER	REPLACEMENT PART NO.	COMMENTS
		ALL	21-45	10-20.9	ALL	21-45	10-20.9	ALL	21-45	10-20.9			
07970-										07970-	07970-		
62060	Read Only Mother Bd NRZI							X		N/A		Note 5.	
62061	Read Control NRZI 21-45 IPS							X		N/A		Note 5.	
62062	Control & Status									62128			
62071	P. C. Power Distribution									N/A			
62072	Power Regulator									N/A			
62074	R/R/R Pre Amp 10-20.9 IPS									N/A		Note 5.	
62086	Unit Select Assy.									N/A			
62087	Triple Density Select									N/A			
62088	R/R Density Select									N/A			
62089	Control Switch Assy.									N/A			
62092	Read Control NRZI 10-20.9			X						N/A		Note 5.	
62099	Density Select MultiFormat									N/A		Note 5.	
62100	Dual Density Select									N/A		Note 5.	
62101	Parity Select									N/A		Note 5.	
62102	Control Switch Assy.									N/A	62089		
62108	Tension Arm Assy.									N/A			
62121	Head Assy. Dual Speed 7/9tr								X				
62122	Write Enable Assy.									N/A			
62130	Aux. Control									69326			
62131	Photosense Assy.									N/A	62345		
62132	Power Supply									N/A			
62133	Control & Status									69327			



HP PART NUMBER	ASSEMBLY DESCRIPTION	7970B SPEED			7970C SPEED			7970E SPEED			EX. PART NUMBER	REPLACEMENT PART NO.	COMMENTS
		ALL	21-45	10-20.9	ALL	21-45	10-20.9	ALL	21-45	10-20.9			
07970-										07970-			
62203	Head Assy. R/W 7tr	X								N/A			
62204	Head Assy. R/W 7tr		X							N/A			
62205	Head Assy. R/W 9tr	X								N/A			
62206	Head Assy. R/W 9tr		X							N/A			
62207	Head Assy. R/R 7/9tr	X								N/A			
62208	Head Assy. R/R 7/9tr		X							N/A			
62209	Head Assy. R/O			X						N/A			
62210	Head Assy. R/O				X					N/A			
62211	Head Assy. R/W 9tr	X								N/A			
62212	Head Assy. R/W 9tr			X						N/A			
62213	Head Assy. R/R 7/9tr			X						N/A			
62214	Head Assy. R/R 7/9tr				X					N/A			
62246	Head Assy. R/O 9tr	X								N/A	62210		
62248	Head Assy. R/W 9tr	X								N/A			
62278	P. E. Read Control							X		62279			
62291	Head Assy. R/R 9tr						X			N/A			
62294	Decoder						X			N/A	62353		
62297	Read Pre Amp	X								62298		Note 2.	
62299	R/R Density Select		X							N/A			
62316	Single Chan. Read			X						N/A			
62317	Dual Chan. Read			X						N/A			
62324	48 VDC Supply		X				X			69324			



# **PARTS NOTES**

NOTE 1. Serial prefix 1208 and below.

NOTE 2. Used only with 07970-62031 head.

NOTE 3. Used only with the following heads:

07970-60584

\*07970-60585

07970-60586

07970-60587

NOTE 4. Used in P. E. Slave.

NOTE 5. Multiformat 7970E only.

NOTE 6. Use only on 7970's with either 48 or 60 VDC supply.

NOTE 7. This is required for HP-IB.

\* Now obsolete. Returned head will be automatically replaced by 07970-62205 head.

# SERVICE NOTES



## 7970B/C

Seq. No.	Pub. Date	Title
1	5/70	Operator Maintenance Instruction
2	5/70	PM Procedures
3	5/70	Installation Procedures
4	5/70	Spares List
5	6/70	Capstan PCB Installation Note (J6 Replacement)
6	4/72	Using Silicone Grease In Place Of Wakefield
7	1/73	Reel Servo PCA Design Change
8	6/73	230 VAC Line Fuse (F2 Change)
9	6/73	7-Track Parity Select Problem
10	10/73	Capstan Servo Design Change
11	4/74	Tape Unit EOT Status Negation Problem
12	5/74	Line Power Toggle Switch P/N Switch
13	6/74	No "Ready" Status
14	8/74	Photosense Assembly Over Sensitive Photosense Amplifier
15	1/75	Control And Status PCA Obsolete & Replacement
16	4/75	Negate Write Control PCA Status
17	6/75	Improved Version Read Channel
18	8/75	Transposed Or Wrong Diode Bridge Rectifiers
19	8/75	New Magnetic Tape Heads
20	8/75	Reel Motor Brush Replacement Part Number
21	8/75	Defective Tension Arm Limit Switches
22	9/75	Crosstalk Shield Replacement
23	1/76	Noise Spike On Write Clock Line
24	2/76	Gain Adjustment On Read Preamplifier
25	11/76	HP 7970B Option 136 (7 Track)
26	1/77	Magnetic Tape Drive Test Tapes
27	6/77	Write Control Assembly 07970-60240 Artwork Rev. K.
28	1/78	All 48VDC and 60VDC Power Supplies
29	7/78	7970B/C/E Magnetic Tape Drive
30	9/79	7970B/C/E Power Switch

### PRODUCTION MEMOS

No.	Date	Subject
1	4/71	Read Head Glitch
2	11/75	48VDC Power Supply Support Plan
3	2/76	Read Gate Assembly
4	11/76	7970 Reel Motors Generate Noise
5	12/76	Noise In The Inter Record Gap
6	4/77	7970C Serial Prefix 1631 & Below. Field Upgrade Instructions
7	5/79	High Speed Capstan Servo Motor (07970-60141)



## INTEROFFICE SERVICE MEMOS

Date	Subject
4/71	7970B/C Service Kit
7/71	New Part-Exchange Part Cross Reference
9/71	Recall of HP Write Control
1/72	Simplified Service Procedures
4/72	PCA New Part # And Exchange Part # List
9/72	Digital Tape Unit Parts Change Information
1/73	Reel Servo Replacement PCA
9/73	Capstan Servo Replacement PCA
3/74	PCA New Part # And Exchange Part # List (Rev. 7/74)
5/74	Nine Track Write Parity
4/75	Assembly Part Numbers And Exchange Part Numbers
4/75	Head Refurbishment
5/75	Degaussing 7970 Magnetic Tape Heads
8/77	HP 7970A/B/C/E Servo Motors — Information Only
5/78	7970B/E. Option 088. Lo-Boy Cabinet Support Plan
8/78	7970A/B/C/E/ Assy. Part Numbers and Exchange Part Numbers

# SERVICE NOTES

## 7970E

Seq. No.	Pub. Date	Title
1	6/71	Capstan Servo PCB Installation Note
2	10/71	Spares Provisioning
3	11/71	Operator Maintenance Instructions
4	11/71	PM Procedures
5	11/71	Installation Procedures
6	11/71	Tools, Test Equipment
7	11/71	Off-Line Testing
8	4/72	Using Silicone Grease Instead Of Wakefield
9	1/73	Reel Servo PCA Design Change
10	6/73	230 VAC Line Fuse (F2) Change
11	6/73	Density Select Assembly Multiformat
12	10/73	Capstan Servo PCA Design Change
13	4/74	Tape Unit EOT Status Negation Problem
14	5/74	Line Power Toggle Switch P/N Switch
15	6/74	No "Ready" Status
16	6/74	7970E Read Control PCA Redesign And Replacement
17	7/74	Decoder PCA Design Change
48	8/74	Oversensitive Photosense Amplifier
19	9/74	Possible STE Errors On High-Speed Tape Drives Due To Head OV
20	4/75	Negate Write Control PCA Status
21	5/75	Reel Servo PCA Tape Stretching During Rewind
22	8/75	New Magnetic Tape Heads
23	8/75	Reel Motor Brush Replacement Part Number
24	8/75	Defective Tension Arm Limit Switches
25	9/75	Crosstalk Shield Replacement
26	11/75	Increasing Read Clock Pulse Width
27	1/76	Noise On The Write Clock Line
28	2/76	Phase Encoded Read Circuits Performance Test
29	5/76	Suspect National Chip On The Write Formatter PCA
30	1/77	Magnetic Tape Drive Test Tape
31	6/77	Write Control Assembly 07970-60240 Artwork Rev. K.
32	12/77	All 48Vdc and 60Vdc Power Supplies
33	7/78	7970B/C/E Magnetic Tape Drive
34	9/79	7970B/C/E Power Switch

### PRODUCTION MEMOS

No.	Date	Subject
1	5/72	Off-Line Test Kit PCB Mod
1	4/74	Read Head Glitch
3	11/75	48Vdc Power Supply Support Plan
4	2/76	Read Gate Assembly

5	4/77	7970E Mag Tape — Read Window
6	12/77	7970E Magnetic Tape Drive 07970-62353 Decoder PCA
7	12/78	07970-62034 Preamplifier PCA Series 1709 and Below
8	12/78	Parity Errors at 22.5 IPS & Below PE Read Data & Status PCA. (etc.)
9	5/79	High Speed Capstan Servo Motor (07970-60141)

### INTEROFFICE SERVICE MEMOS

Date	Subject
1/73	Reel Servo Replacement PCA (Rev. 6/73)
9/73	Capstan Servo Replacement PCA
4/74	Preamp PCB Correction
5/74	Read Control Replacement PCA
4/75	Assembly Part Numbers and Exchange Part Numbers
4/75	Head Refurbishment
8/77	HP 7970A/B/C/E Servo Motors Information Only
5/75	Degaussing 7970 Magnetic Tape Heads
5/78	7970B/E, Option 088, Lo-Boy Cabinet Support Plan
8/78	7970E HP-IB Interface Support Plan
8/78	7970A/B/C/E Assy. Part Numbers and Exchange Part Numbers
9/78	7970B/E HP-IB Interface Support Plan
12/79	HP-IB On 7970E Option 426

**SERVICE NOTE**

Supersedes:

7970B/C/E WRITE ENABLE ADJUSTMENT  
 PROCEDURE FOR PART NUMBERS  
 07970-62423 and 07970-62426 (48/60V)

<b>APPLIES TO:</b>	All Units <input checked="" type="checkbox"/>	Only Units on Agreement <input type="checkbox"/>	
<b>PERFORM:</b>	Immediately <input type="checkbox"/>	At PM Normal Call <input type="checkbox"/>	
	On Failure <input type="checkbox"/>	Information Only <input checked="" type="checkbox"/>	
<b>WARRANTY:</b>	<b>EXTENDED</b>	<b>NORMAL</b>	<b>NONE</b>
<b>LABOR:</b>			<input checked="" type="checkbox"/>
<b>PARTS:</b>			<input checked="" type="checkbox"/>
<b>TRAVEL:</b>			<input checked="" type="checkbox"/>
<b>SERVICE</b>	Return for update <input type="checkbox"/>	Use as is <input type="checkbox"/>	
<b>INVENTORY</b>	Return for salvage <input type="checkbox"/>	See text <input type="checkbox"/>	
<b>WARRANTY EXTENDED UNTIL:</b>			

The new write enable assembly (series #2114) may require some field adjustment when installed. The following is an outline of this procedure:

1. Mount tape with write enable ring in unit.
2. Loosen locking nut on adjustment screw.
3. Turn adjustment screw fully clockwise.
4. Slowly reverse screw until the audible click of the black microswitch (HP P/N 3101-0406) is heard.
5. Turn the screw counterclockwise one complete turn.
6. Tighten the lock nut.
7. Check to see if the assembly is properly adjusted by removing and replacing the tape several times.
8. Turn the unit on and engage the solenoid.
9. Check to see if the solenoid microswitch is being engaged. If the switch is not engaging, loosen the bolts on the reel motor and drop the reel motor down until the reel motor ridge no longer interferes with the actuator arm.

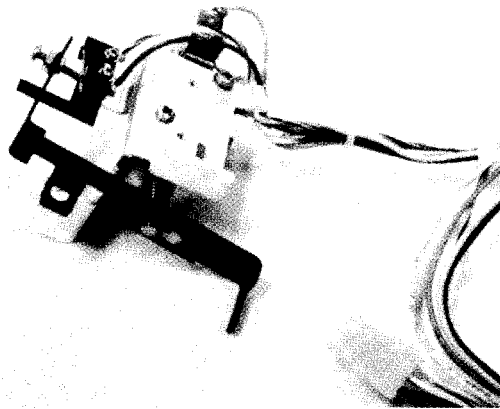
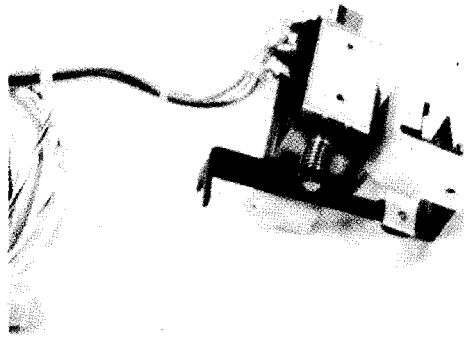
Boise Division is presently working on this problem so no field adjustments will be necessary.



EMH/was

8/81-46





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**S E R V I C E   N O T E**

Supersedes:

7970B/C/E WRITE ENABLE ADJUSTMENT  
 PROCEDURE FOR PART NUMBERS  
 07970-62423 and 07970-62426 (48/60V)

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<b>WARRANTY:</b>	<b>EXTENDED</b>	<b>NORMAL</b>	<b>NONE</b>
<b>LABOR:</b>			<input checked="" type="checkbox"/>
<b>PARTS:</b>			<input checked="" type="checkbox"/>
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<b>SERVICE</b>	Return for update <input type="checkbox"/>	Use as is <input type="checkbox"/>	
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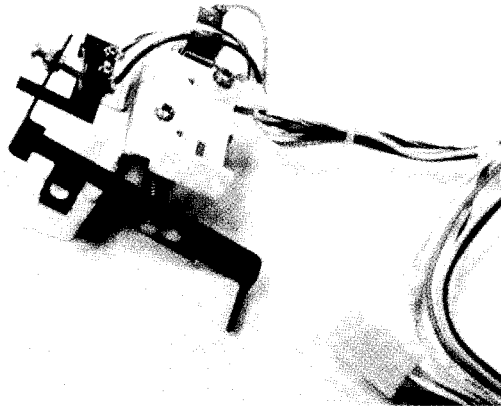
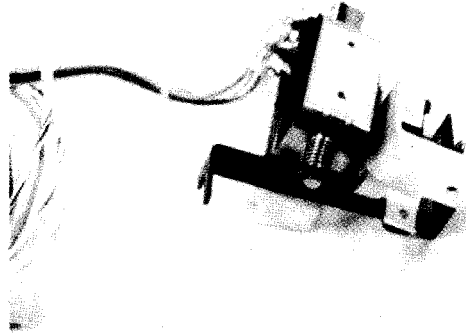
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6. Tighten the lock nut.
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8. Turn the unit on and engage the solenoid.
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Boise Division is presently working on this problem so no field adjustments will be necessary.

EMH/was

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# SERVICE NOTE

Supersedes:

7970B/C/E WRITE ENABLE ADJUSTMENT  
 PROCEDURE FOR PART NUMBERS  
 07970-62423 and 07970-62426 (48/60V)

<b>APPLIES TO:</b>	All Units <input checked="" type="checkbox"/>	Only Units on Agreement <input type="checkbox"/>
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	On Failure <input type="checkbox"/>	Information Only <input checked="" type="checkbox"/>
<b>WARRANTY:</b>	<b>EXTENDED</b>	<b>NORMAL</b>
<b>LABOR:</b>		<input checked="" type="checkbox"/>
<b>PARTS:</b>		<input checked="" type="checkbox"/>
<b>TRAVEL:</b>		<input checked="" type="checkbox"/>
<b>SERVICE INVENTORY</b>	Return for update <input type="checkbox"/>	Use as is <input type="checkbox"/>
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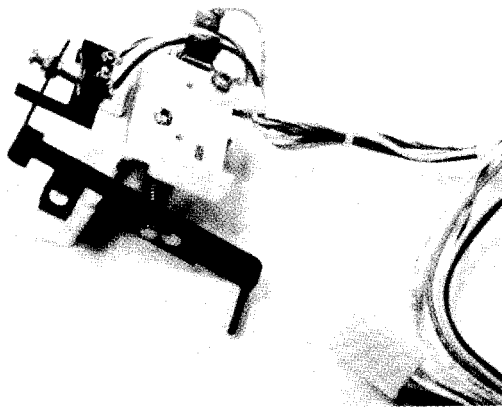
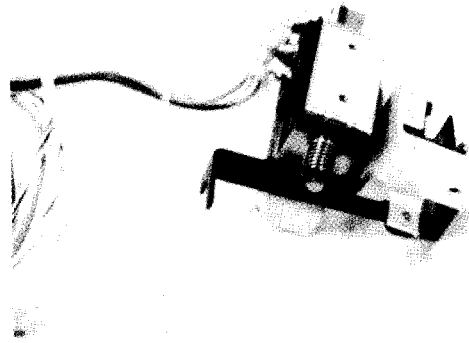
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