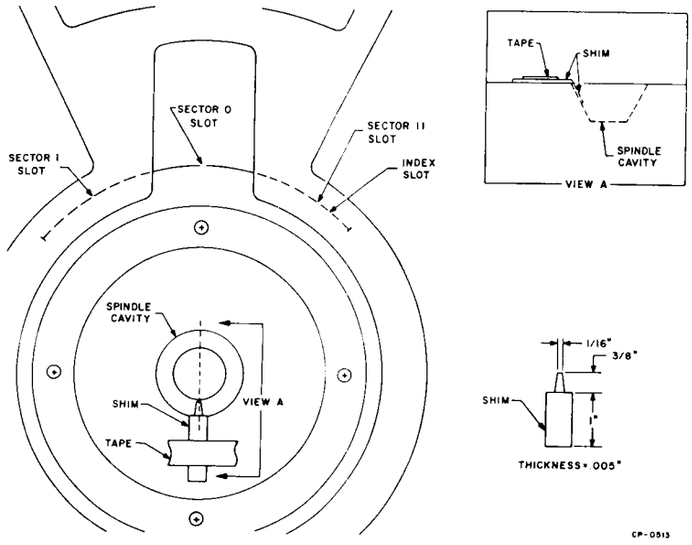


Figure 5-14 CE Test Cartridge Shim Installation

Table 5-3
Servo System Checks

Checks	Drive Configuration	Test Point	Tolerance	Reference
Sine Amplitude/ Offset	4 cyl osc seek	A05M1	10 ± 1 V p-p, ground symmetrical within ±10%	Fig. 5-15
Velocity Offset	4 cyl osc seek	A05M1	ground symmetrical within ±10%	Fig. 5-15
Cosine Amplitude	4 cyl osc seek	A05S1	10 ± 1 V p-p, ground symmetrical within ±10%	Fig. 5-16
Velocity Amplitude	2 cyl osc seek	A05M1	center pulse duration = 3.2 ± .05 ms	Fig. 5-17
Acceleration	64 cyl osc seek	A05H1	14 ms ± 1 ms rise time	Fig. 5-18
Full Stroke Profile	202 cyl osc seek	A05H1	< 90 ms waveform duration with plateau at trailing edge	Fig. 5-19
Full Stroke Position	202 cyl osc seek	A05M1	equal beginning & end amplitudes within 5%. < 1 V overshoot	Fig. 5-20
Outer Limit	rep RTZ	A05J1	3 to 3.5 V amplitude. < 0.3 V plateau	Fig. 5-21

For most malfunction cases, the positioner system will operate enough to allow dynamic measurements. However, if the positioner either does not operate or operates very erratically, the static checks and adjustments described in Paragraph 5.4.2.2 should be performed.

If servo system parts are field-installed, settings must be readjusted, according to Table 5-3.

5.4.2.1 Dynamic Off-Line Checks and Adjustments – If on-line diagnostics or an RK05 Exerciser are not available to exercise the positioner, the RK05 should be disconnected from the interface bus and operated off-line.

In this mode, SECTOR pulses are jumpered to simulate STROBE pulses, and a SECTOR ADDRESS line is jumpered to provide changing inputs to selected CYLINDER ADDRESS lines. These jumper installations permit oscillating seeks between cylinder 00 and any selected cylinder to be performed (Appendix B and Appendix C).

The procedure for operating the drive off-line is as follows:

1. Unplug the drive ac line cord to remove power.

2. Install an M930 terminator card in position 7 or 8 of the electronic module.

3. Set the address select switch on the M7700 card (card position 2) to the first switch position.

4. Select the drive by connecting a jumper from A08T1 (ground) to A08J2 (switch position 1).

5. Reconnect the ac line cord to apply power to the drive and cycle the drive up to operating status.

6. Perform an off-line oscillating seek with the jumpers as follows:

   It is also possible to perform the following adjustments using the RK05-TA Exerciser or simple test programs (Appendix D). For additional information, refer to the *RK05 Exerciser Maintenance Manual*, (DEC-00-HZRKA-A-D).

   a. Connect a jumper from B08H1 (STROBE) to B08N2 (BUS SECTOR PULSE).

   b. Determine the seek length by connecting A08P2 (SECTOR ADDRESS) to the desired points indicated in the following table.

Seek Length	Jumper Connections
2	A08D1
4	A08L1
64	A08E1
100	A08E1, A08J1, A08L1
105	A08E1, A08J1, A08C1, A08K1
202	A08H1, A08E1, A08C1, A08D1
Restore (RTZ)*	A08M1 (RESTORE) to A07T1 (or any available ground) B08H1 (STROBE) to B08M1 (INDEX)

*Connect only the points listed in the table.

7. Unless otherwise indicated, set the oscilloscope controls (Tektronix 453 or equivalent) as follows:

vertical
- mode = channel 1
- sensitivity = 2 V/div
- trigger = channel 1
- coupling = dc

sweep
- A sweep time = 10ms/div
- trigger = normal

trigger
- source = externals*
- coupling = ac
- slope = +

*Connect the scope external trigger input to B05J2 (FWD H).

8. To avoid excessive scope control changes and to keep the probe test point changes to a minimum, perform the following checks and adjustments in the listed sequence.

Sine Amplitude (SA) and Offset (SO)

a. Perform a 4-cylinder oscillating seek (Step 6).

b. Observe A05M1 (SIN POSITION) for a scope display similar to that shown in Figure 5-15a. The waveform amplitude must be 10 ± 1 V peak-to-peak and symmetrical about ground.

c. If necessary, adjust SA (Table 5-4) for the correct amplitude and SO for the ground symmetry.

Velocity Offset (VO)

a. Perform a 4-cylinder oscillating seek (Step 6).

b. Observe that the voltage minimums at A05M1 (SIN POSITION) are symmetrical about ground (Figures 5-15a and 5-15b). A small amount of ripple at the minimum voltage levels is normal. To estimate the degree of symmetry, use the average value of the ripple as the voltage minimum.

c. If necessary, adjust VO (Table 5-4) for the required symmetry.

Cosine Amplitude (CA) and Offset (CO)

a. Perform a 4-cylinder oscillating seek (Step 6).

b. Observe A05S1 (COS POSITION) for a scope display as shown in Figure 5-16. The waveform amplitude must be 10 ± 1 V peak-to-peak, and symmetrical about ground.

c. If necessary, adjust CA (Table 5-4) for the correct amplitude and CO for the ground symmetry.

Velocity Amplitude (VA)

a. Perform a 2-cylinder oscillating seek (Step 6).

b. Set the scope sweep time to 1 ms/div.

c. Observe A05M1 for a scope display as illustrated in Figure 5-17. The duration of the center cycle must equal 3.2 ± .05 ms.

d. If necessary, adjust VA (Table 5-4) for the correct time.

Acceleration (Positioner Current)

a. Perform a 64-cylinder oscillating seek (Step 6).

b. Set the scope sweep time to 5 ms/div and the vertical sensitivity to 0.5 V/div.

c. Observe A05H1 (VELOCITY) for a velocity profile as shown in Figure 5-18.

d. If necessary, adjust R15 (on H604) for a rise time of 14 ms ± 1 ms.

Full Stroke Profile

a. Perform a 202-cylinder oscillating seek (Step 6).

b. Set the scope sweep time to 10 ms/div and the vertical sensitivity to 0.5 V/div.

c. Observe A05H1 (VELOCITY) for a scope display as illustrated in Figure 5-19. The 0 V level of the profile must be reached in less than 90 ms from the start of the seek. In addition, there must be a definite plateau (constant voltage level) at the end of the seek. If this is not the case, recheck the Velocity Amplitude (VA) and the Acceleration (Positioner Current). Adjust the appropriate potentiometer (Table 5-4) as required to obtain the correct waveform.

Full Stroke Position Waveform

a. Maintain the same configuration as for the Full Stroke Profile.

b. Set the scope vertical sensitivity to 2 V/div and observe A05M1 (SIN POSITION) for a scope display as illustrated in Figure 5-20. The waveform amplitudes at the start and end of the seek must be equal within 5%, and the overshoot at the end of the seek must not exceed 1 V. If overshoot is excessive, recheck the Velocity Adjustment (VA) and the Acceleration (Positioner Current).

Outer Limit (dynamic test)

a. Perform a repetitive restore operation (Step 6).

b. Trigger the scope from B05K2 (REV H).

c. Set the scope vertical sensitivity to 1 V/div and observe A05J1 (LIMIT) for a scope display as illustrated in Figure 5-21. The waveform peak amplitude must be 3 to 3.5 V with a minimum level of 0 V. In addition, the voltage plateau immediately following the trailing edge must not exceed 0.3 V. If not, perform the Static Limit Adjustment procedure (Paragraph 5.4.2.2).

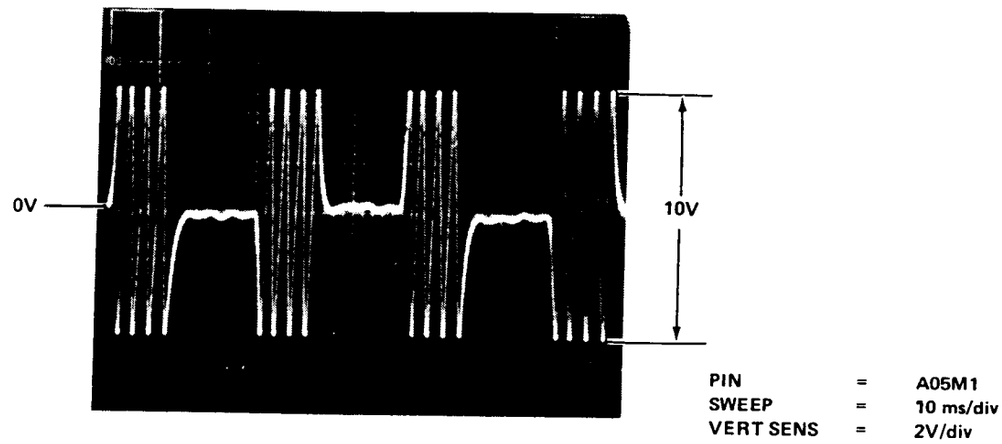
d. Disconnect the B08H1 (STROBE) jumper to halt the repetitive restore.

e. Check the INNER LIMIT signal by physically moving the positioner to the inner limit (toward the spindle). If the INNER LIMIT signal is operative, a restore operation will be initiated. If this is not the case, perform the Static Limit Adjustment procedure (Paragraph 5.4.2.2).

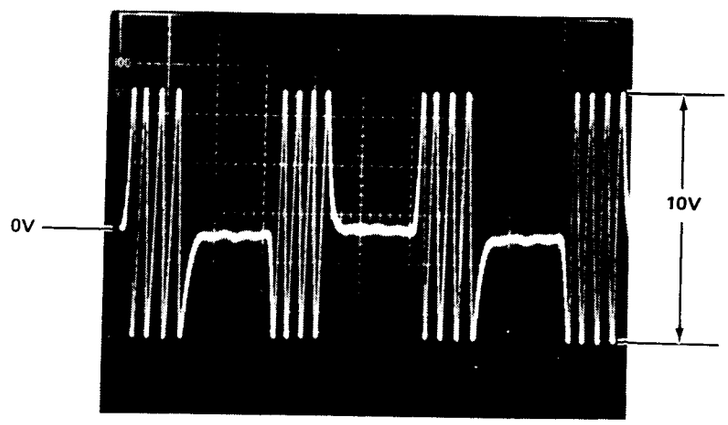
Table 5-4
Servo System Adjustments

Potentiometer*	Function
CA (Cosine Amplitude)	Sets amplitude of COS POSITION signal.
CO (Cosine Offset)	Adjusts COS POSITION symmetry about ground.
SA (Sine Amplitude)	Sets amplitude of SIN POSITION signal.
SO (Sine Offset)	Adjusts SIN POSITION symmetry about ground.
LSA (Limit Signal Amplitude)	Simultaneously adjusts amplitude of both Limit signals before digitizing.
LSO (Limit Signal Offset)	Sets zero level of Limit signal with positioner in normal recording area of disk.
VA (Velocity Adjustment)	Calibrates velocity generator.
VO (Velocity Offset)	Adjusts velocity generator output at zero velocity. (Provides offset control to position loop.)
CURRENT (on H604)	Sets maximum positioner current (determines acceleration).

*Potentiometers are located on the G938 card (card position 5) of the logic assembly; access is obtained by removing the prefilter. They are listed in the table according to their physical orientation; CA is the topmost potentiometer as viewed from the rear of the drive with the prefilter removed.



a. Correct Waveform (Symmetrical Signal)



b. Incorrect Waveform (Signal not Symmetrical about Ground)

Figure 5-15 Sine Amplitude/Offset and Velocity Offset Waveform

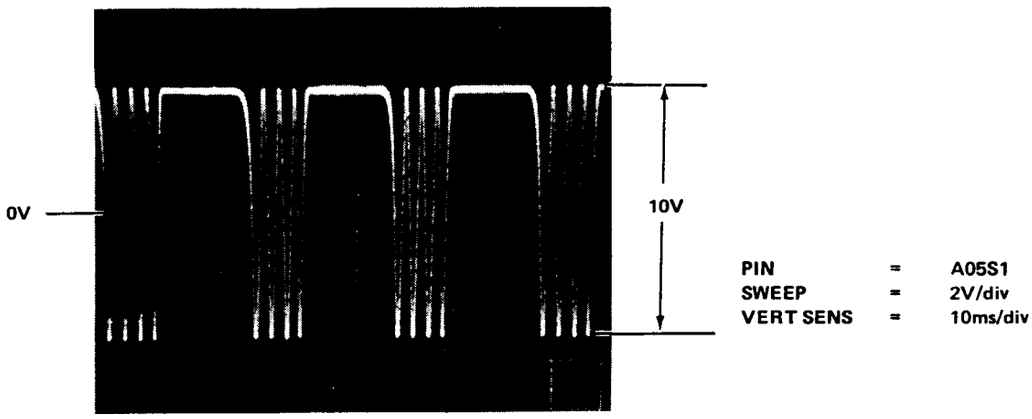


Figure 5-16 Cosine Amplitude/Offset Waveform

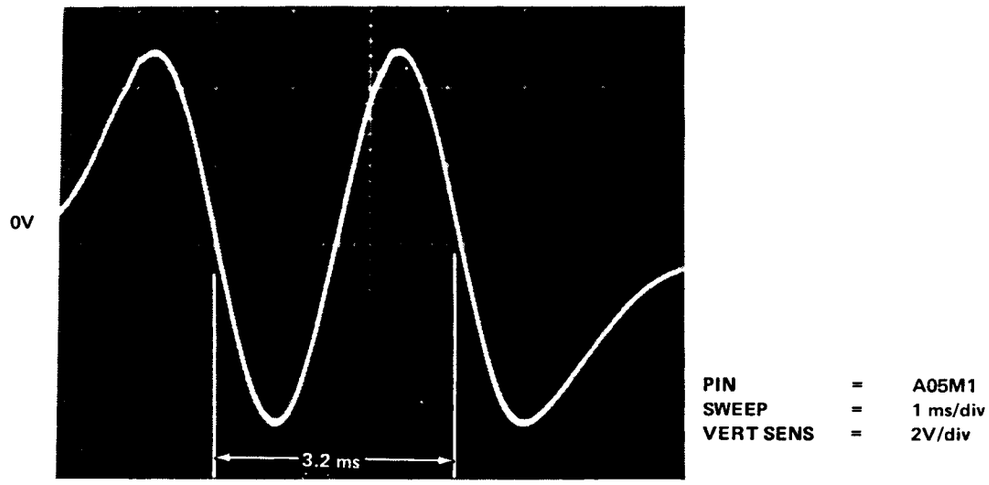


Figure 5-17 Velocity Amplitude Waveform

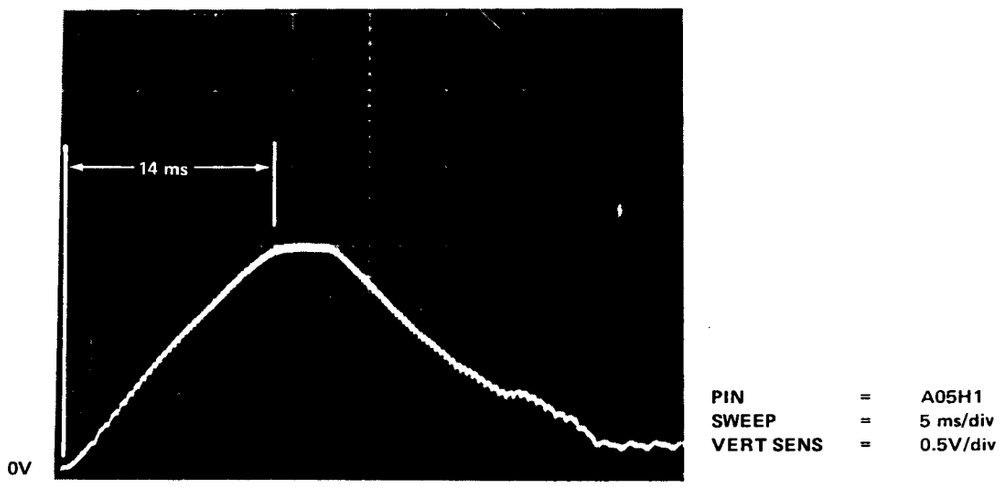


Figure 5-18 Acceleration Waveform

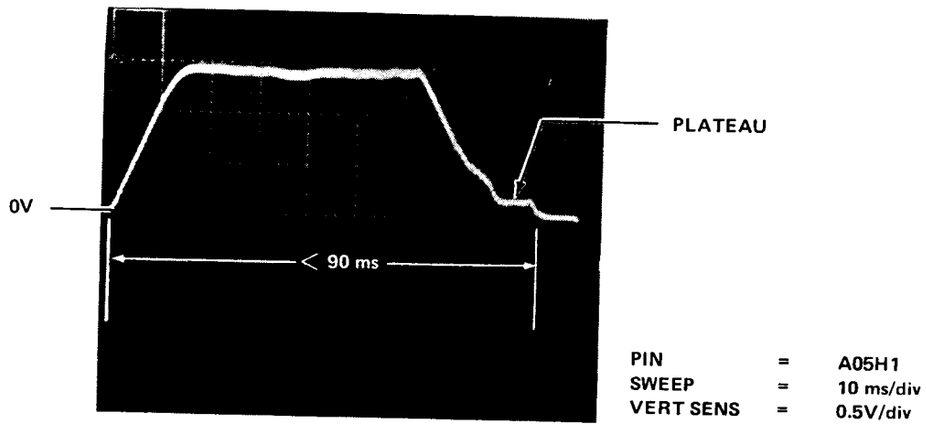


Figure 5-19 Full Stroke Waveform

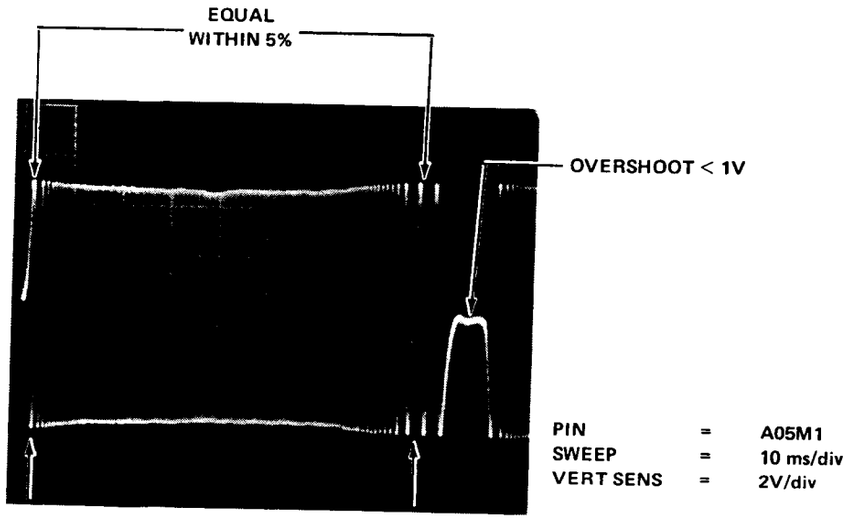


Figure 5-20 Full Stroke Position Waveform

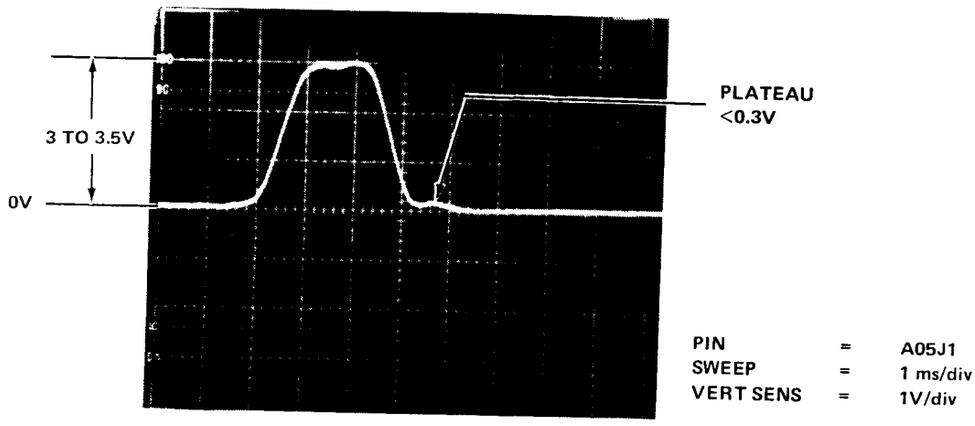


Figure 5-21 Outer Limit Waveform

5.4.2.2 Static Tests and Adjustments – The following procedure should be performed when the positioner or a major servo system component has been replaced. This procedure should also be followed as a diagnostic aid when the positioner system is inoperative or unstable in operation.

To make the required adjustments, remove the disk cartridge from the drive and physically move the positioner carriage back and forth while observing the selected signal. Use the automatic scope sweep and do not attempt to sync the sweep to the observed signal. With a little practice, the most convenient sweep speed setting and the type of positioner motion required will quickly be discovered.

To make static adjustments, the following procedure should be followed:

1. Do not install a disk cartridge in the drive.

2. Place a finger on the positioner carriage assembly and then place switch S1 (Figure 5-3) in the down or OFF position. (This precaution prevents any possible carriage motion caused by transient switch noise.)

3. Make the following checks and adjustments.

   Sine Amplitude (SA) and Offset (SO)

   a. Set the scope vertical sensitivity to 2 V/div and adjust the ground reference to the center of the scope screen.

   b. Observe A05M1 (SIN POSITION) while manually moving the positioner back and forth. Adjust SA (Table 5-4) for a 10 V peak-to-peak signal amplitude.

   c. Adjust SO until the signal is symmetrical about ground.

   Cosine Amplitude (CA) and Offset (CO)

   Observe A05S1 and adjust CA and CO (Table 5-4) in the same manner as that used in the Sine Amplitude and Offset procedure, above.

   Limit Signal Amplitude (LSA) and Offset (LSO)

   a. Set the scope vertical sensitivity to 1 V/div and adjust the ground reference to the center of the scope screen.

   b. Observe A05J1 with the positioner stationary at approximately the center of travel. Adjust LSO (Table 5-4) for a ground signal at the center of the scope screen.

   c. Move the positioner to the inner limit and observe the voltage change on the scope. Similarly, move the positioner to the outer limit and observe the voltage change.

   d. Adjust LSA until the smaller voltage level obtained in Step c, above, is 3.0 V.

   e. Return the positioner to the center of travel and readjust LSO for 0 V.

   f. Repeat Step c, above, and, if necessary, readjust the smaller voltage level to 3.0 V.

5.4.3 Read/Write Data Separator (G180 Card) Adjustment Adjustment of the data separator is not part of normal maintenance and is therefore not recommended unless a G180 component that affects the data separator section has been replaced. If this occurs, the width of the data window should be set as follows:

CAUTION

R13 is the write current adjustment potentiometer and cannot be adjusted in the field.

1. Install a prerecorded cartridge in the drive.

2. Place the drive in the run mode and manually position the heads at any recorded cylinder past track zero. An all-zero recording is preferable; however, any recorded pattern is sufficient.

NOTE

To position the heads manually, allow them to load under servo control; then place a finger on the carriage while opening the switch (S1) to preclude the possibility of carriage motion caused by the transient switch noise.

3. Set the oscilloscope controls as follows:

vertical

mode = channel 1

sensitivity = 1 V/div

trigger = channel 1

coupling = dc

sweep

A sweep time = 100 ns/div

trigger = normal

trigger

source = internal

coupling = ac

slope = +

4. Connect the channel 1 scope probe to TP1 of the G180 card (card position 1). It should be possible to obtain solid scope synchronization at the sweep start. (Disregard the unsynchronized pulses that follow.)

5. Adjust R55 fully counterclockwise and R54 fully clockwise.

6. Adjust R54 counterclockwise to obtain a 500 ± 40 ns pulse width as measured from the start of the rise to the start of the fall.

7. Readjust R55 clockwise until the pulse width decreases to 440 ± 10 ns as measured from the start of the rise to the start of the fall.

5.4.4 Read/Write Head Check and Alignment

The following procedure describes the complete read/write head alignment. Before attempting this alignment procedure, ensure that the drive operates correctly and that the heads have not been contaminated by exposure to a defective cartridge. If new heads have been installed, it is recommended that this alignment procedure be performed off-line using backboard jumpers to move the positioner to the alignment cylinder. Off-line alignment is strongly recommended because of the ease of returning to the alignment cylinder whenever the positioner has been physically moved. However, simple maintenance routines or an RK05 Exerciser may also be used to move the positioner.

5.4.4.1 RK05K-AC Alignment Cartridge – The appropriate on-line diagnostics may be used for head alignment; however, *do not adjust a head that has less than a 15% error* (Figure 5-22).

To align or check the heads, proceed as follows:

1. Unplug the drive ac line cord to remove power.

2. Disconnect the drive interface cable card from the logic assembly and install in its place an M930 terminator card.

3. Reconnect the ac line cord to bring the drive up to operating status.

4. Install an alignment cartridge on the spindle and operate the drive in the run mode for *at least 30 minutes.* This must be done to allow the alignment cartridge and the drive components to achieve thermal stabilization.

5. Using the WT PROT switch, place the drive in the write protect condition.

6. Set the oscilloscope controls as follows:

vertical

mode = ADD (invert CHAN 2)

sensitivity = 20 mV/div

coupling = dc

sweep

A sweep time = 500 μs/div

trigger = normal

trigger

source = external*

coupling = ac

***Important: Use a 1:1 probe to connect the scope external trigger input to A02S2 (SECTOR).**

7. Connect the channel 1 probe to TP3 and the channel 2 probe to TP4 of the G180 card. (Use 10:1 probes.)

f. After turning off positioner power, move the positioner fully forward. Turn on positioner power (S1 up) to initiate a restore (RTZ) operation. The positioner will automatically return to cylinder 105 following the RTZ.

11. If one of the illustrated waveforms is present, note in which direction the head must be moved to obtain the correct indication (Figure 5-22d). If it must be moved backward, loosen the head clamp and adjustment screws and gently push the head all the way back into the carriage; if it must be moved forward, loosen only the clamp screw, and then turn the adjustment screw until the correct waveform is obtained.

The adjustment screw is a vernier that only moves the head forward; it should not be left torqued down after this adjustment.

NOTE

If the positioner is moved from cylinder 105 during the adjustment procedure, turn off positioner power (S1 down) and manually move the positioner fully forward. Then turn on positioner power (S1 up) to initiate a restore (RTZ) operation. The positioner will automatically return to cylinder 105 following the RTZ.

12. Ground B08M2 to select the upper head and repeat the preceding steps.

13. Using a torque wrench (9605893-0-0), if available, tighten the head clamp screw until the wrench begins to ratchet (55 ounce-inches). If a torque wrench is not available, use the appropriate Allen wrench to tighten the head clamp screw snugly; however, do not overtighten.

14. Recheck to ensure that the clamping action did not disturb the head adjustment.

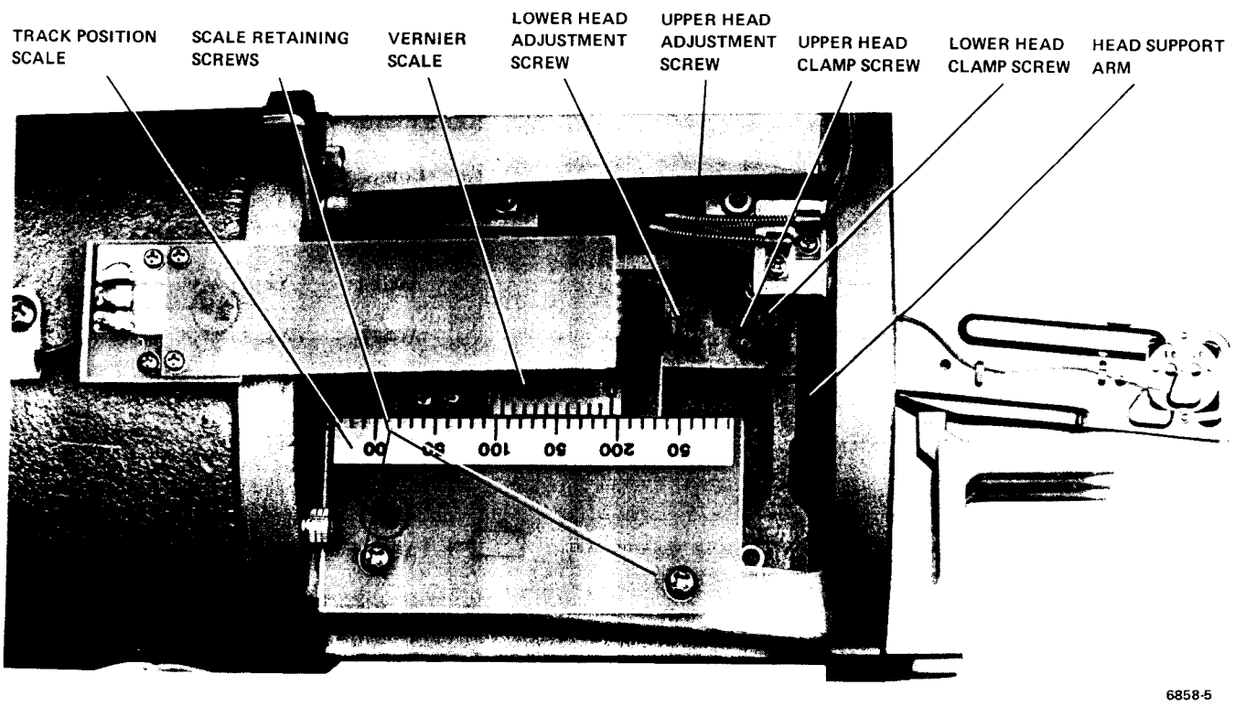


Figure 5-23 Read/Write Head Adjustments

5.4.4.2 2315 CE Pack – The appropriate on-line diagnostics may be used for head alignment; however, *do not adjust a head that has less than a 50% error* (Figure 5-24).

To align or check the heads proceed as follows:

1. Unplug the drive ac line cord to remove power.
2. Disconnect the drive interface cable card from the logic assembly and install an M930 terminator card in its place.
3. Reconnect the ac line cord to apply power to the drive and cycle the drive up to operating status.
4. Install a 2315 CE test cartridge on the spindle and operate the drive in the run mode for *at least 30 minutes.* This must be done to allow the CE cartridge and the drive components to achieve thermal stabilization.
5. Using the WT PROT switch, place the drive in the write protect condition.
6. Set the oscilloscope controls as follows:

   vertical

   mode = ADD (invert CHAN 2)

   sensitivity = 20 mV/div

   coupling = dc

   sweep

   A sweep time = 10 ms/div

   trigger = normal

   trigger

   source = external*

   coupling = ac

   ***Important: Use a 1:1 probe to connect the scope external trigger input to A02R2 (INDEX).**

7. Connect the channel 1 probe to TP3 and the channel 2 probe to TP4 of the G180 card. (Use 10:1 probe.)
8. Ensure that the positioner track scale indicates cylinder 00. If it does not, loosen and readjust the scale to read 00, ensuring proper scale readout over the entire length of the head. This is done as follows:

   a. Load the heads.

   b. Check whether the scale is set at zero; if not, loosen the scale retaining screws (Figure 5-23).

   c. Adjust the fixed scale horizontally to read zero. Ensure that the calibrated edges of the fixed scale and the vernier scale are parallel and close together without touching. Tighten the scale retaining screws.

   d. Push S1 (Figure 5-3) down, and move the vernier scale horizontally through its entire range to ensure that the calibrated edges of the two scales do not touch at any point.

9. Select cylinder 105 as follows:

   NOTE

   It is also possible to perform the following adjustments using the RK05 Exerciser or simple maintenance routines. For additional information, refer to the RK05 Exerciser Maintenance Manual.

   a. Connect backboard jumpers from A07T1, A07C2, B07T1, or any available ground pins to the following points:

A08E1	CYL ADD 6(64)	
A08J1	CYL ADD 5(32)	
A08C1	CYL ADD 3(8)	
A08K1	CYL ADD 1(1)	
		105
A04V1	SEL RDY L	

   b. Connect a jumper from B08H1 (STROBE) to B08N2 (SECTOR PULSE). The positioner should move to cylinder 105. Confirm this by observing the track scale indicator.

5.4.5 Index/Sector Timing Adjustment

5.4.5.1 RK05K-AC Alignment Cartridge – The procedure for adjusting index/sector timing using the RK05K-AC Alignment Cartridge is as follows:

1. Unplug the drive ac line cord to remove power.
2. Disconnect the drive interface cable card from the electronic module and install an M930 terminator card in its place.
3. Reconnect the ac line cord to bring the drive up to operating status.
4. Install an RK05K-AC Alignment Cartridge on the spindle, ensuring that the mating surfaces are clean; operate the drive in the run mode for *at least 30 minutes.* This must be done to allow the alignment cartridge and the drive components to achieve thermal stabilization.
5. Using the WR PROT switch, place the drive in the write protect condition.
6. Set the oscilloscope controls as follows:

   vertical

   mode = ADD (invert CHAN 2)

   sensitivity = 0.2 V/div

   coupling = dc

   sweep

   A sweep time = 5 ms/div

   trigger = normal

   trigger

   source = external*

   coupling = ac

   slope = –

   ***Important: Use a 1:1 probe to connect the scope external trigger input to A02R2 (INDEX).**

7. Connect the channel 1 probe to TP3 and the channel 2 probe to TP4 of the G180 card. (Use 10:1 probes.)
8. Ensure that the positioner track scale indicates cylinder 00 (Paragraph 5.4.4.1, Step 8).
9. Select cylinder 105 with jumpers as follows:

   NOTE

   It is also possible to perform the following adjustments using the RK05 Exerciser or simple test programs.

   a. Connect backboard jumpers from A07T1, A07C2, or any available ground pins to the following points:

A08E1	CYL ADD 6(	64)
A08J1	CYL ADD 5(	32)
A08C1	CYL ADD 3(	8)
A08K1	CYL ADD 0(	1)
		105
A04V1	SEL/RDY L	

   b. Connect a jumper from B08H1 (STROBE) to B08N2 (BUS SECTOR PULSE). The positioner should move to cylinder 105. Confirm this by observing the track scale indicator.

10. Monitor the scope for a single pulse followed by data beginning 10 μs following the pulse. This timing pulse may be either positive or negative going. Cylinders 85 and 125 also contain this pulse, and can be used if 105 is unusable.
11. Expand the sweep time to 10 μs/div and check that the single pulse occurs 70 ± 10 μs from the start of the sweep (Figure 5-25).
12. Ground B08M2 to select the upper head and check for the same pulse tolerances as in Step 11, above. If necessary, adjust R6 on the M7700 card (card position 2) until the average time for the two pulses is 70 μs and the 70 ± 10 μs individual pulse requirement is maintained. If these requirements cannot be achieved, perform either of the following corrective actions:

    a. If the time difference of the two timing pulses exceeds 20 μs, replace one of the heads to reduce the difference. Once the difference is within tolerable limits, readjust R6 to achieve an average 70 μs between the peaks.

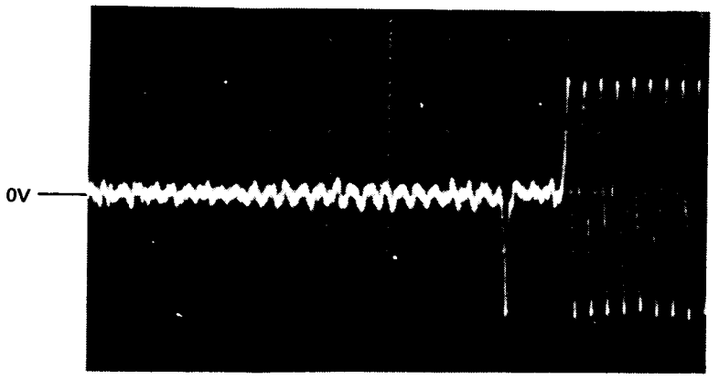


Figure 5-25 Index/Sector Waveform

b. If the average of the peaks cannot be adjusted to 70 μs, relocate the sector transducer to the right (if the average is too high) or to the left (if the average is too low). Readjust R6 to achieve an average 70 μs between peaks.

5.4.5.2 2315 CE Pack – The procedure for adjusting index/sector timing using the 2315 CE Pack is as follows:

1. Unplug the drive ac line cord to remove power.
2. Disconnect the drive interface cable card from the electronic module and install an M930 terminator card in its place.
3. Reconnect tha ac line cord to bring the drive up to operating status.
4. Install a 2315 CE test cartridge on the spindle, ensuring that the mating surfaces are clean, and operate the drive in the run mode for *at least 30 minutes.* This must be done to allow the CE cartridge and the drive components to achieve thermal stabilization.
5. Using the WR PROT switch, place the drive in the write protect condition.
6. Set the oscilloscope controls as follows:

vertical

mode = ADD (invert CHAN 2)

sensitivity = 0.2 V/div

coupling = dc

sweep

A sweep time = 10 ms/div

trigger = normal

trigger

source = external*

coupling = ac

slope = -

***Important: Use a 1:1 probe to connect the scope external trigger input to A02R2 (INDEX).**

7. Connect the channel 1 probe to TP3 and the channel 2 probe to TP4 of the G180 card. (Use 10:1 probes.)

8. Ensure that the positioner track scale indicates cylinder 00 (Paragraph 5.4.4.2, Step 8).

9. Select cylinder 100 with jumpers as follows:

NOTE

It is also possible to perform the following adjustments using the RK05 Exerciser or simple test programs.

a. Connect backboard jumpers from A07T1, A07C2, or any available ground pins to the following points:

A08E1 CYL ADD 6(64)

A08J1 CYL ADD 5(32)

A08L1 CYL ADD 2(4)

100

A04V1 SEL/RDY L

b. Connect a jumper from B08H1 (STROBE) to B08N2 (BUS SECTOR PULSE). The positioner should move to cylinder 100. Confirm this by observing the track scale indicator.

10. Monitor the scope for a single pulse followed by a 1-ms burst of data. This pulse may be of *either* polarity.

11. Expand the sweep time to 10 μs/div and check that the single pulse occurs 70 μs ±10 μs from the start of the sweep (Figure 5-24). This pulse may be of *either* polarity.

12. Ground B08M2 to select the upper head and check for the same pulse tolerances as Step 11, above. If necessary, adjust R6 on the M7700 card (card position 2) until the average time for the two pulses is 70 μs and the 70 ± 10 μs individual pulse requirement is maintained. If these requirements cannot be achieved, perform either of the following corrective actions:

a. If the time difference of the two timing pulses exceeds 20 μs, replace one of the heads to reduce the difference. Once the difference is within tolerable limits, readjust R6 to achieve an average 70 μs between the peaks.

b. If the average of the peaks cannot be adjusted to 70 μs, relocate the sector transducer to the right (if the average is too high) or to the left (if the average is too low). Readjust R6 to achieve an average 70 μs between peaks.

5.4.6 Cartridge Receiver Alignment

Prior to shipment of the RK05 Disk Drive, the cartridge receiver is precisely aligned at the factory. Since it is not necessary to disturb the receiver alignment when performing any of the field maintenance procedures, cartridge receiver alignment is not normally required in the field. However, if the duckbill, airduct, or cartridge support posts are replaced, the cartridge receiver alignment must be checked. In addition, the Cartridge-On switch should also be checked for proper operation.

NOTE

The duckbill on later model drives differs slightly from that on earlier models. If an earlier version duckbill should be replaced by a later version, the airduct and cartridge support posts must also be replaced. Refer to the RK05 Illustrated Parts Breakdown (DEC-RK05-IPB-1) to identify which duckbill version is being replaced.

1. Slide the drive out of the rack and remove the top and bottom covers.

2. Insert a cartridge into the receiver and close the drive front door.

3. Check for a .020 to .040-in. clearance (A in Figure 5-26) between the plastic cartridge case and the receiver rails. Perform this measurement toward the rear of the receiver at a point where the plastic cartridge case passes over the intersecting receiver rails.

4. If the (A) clearance is incorrect, loosen the pivot post lock nuts and adjust the height of both posts to obtain the proper clearance. Hold the pivot post at (X) with an adjustable wrench while loosening and tightening the lock nuts (Y).

5. Lightly tighten the pivot post lock nuts and check the following (Figure 5-27):

a. Remove the cartridge and ensure that the clearances (B) between the upper receiver rails and the cartridge channel are equal, and that the receiver rails are as parallel as possible to the channel.

b. Push the receiver all the way to one side and ensure that there is a slight clearance (C) of .010 to .040-in. between the pivot post and the receiver hinge rail. When making this check, do not push the receiver so hard that the pivot posts twist.

c. Push the receiver to the left and right, ensuring that the front receiver rail does not touch either side of the chassis.

6. Tighten the pivot post lock nuts and recheck all clearances. There must be clearances at points (A), (B), and (C); however, it is particularly important that clearances (A) and (C) do not exceed the limits indicated in Figures 5-26 and 5-27.

7. Check for the following points of contact between the cartridge and the cartridge receiver, which indicate that the cartridge is properly seated:

   a. Two thin rails (These should either touch evenly or be parallel along the full length of the cartridge.)

   b. Two cartridge posts

   c. Access door opener bail

   d. Spring at top center of cartridge

   e. Duckbill (lower slot)

   f. Airduct bridge

   g. Airduct foam seal.

8. Check for the following points of clearance between the cartridge and the cartridge receiver, which indicate that the cartridge is properly seated:

   a. Two fat rails on top of the cartridge

   b. Four crosspoints on the underside of the cartridge

   c. The pivot posts and receiver hinge bail.

   The position of the pivot posts determines how the top rails ride on the cartridge and also determines the bottom clearances of the four crosspoints and the underside of the carriage.

   One way to check alignment is to insert a cartridge pack at a slightly cocked angle. The receiver should guide the pack onto the posts as the door is closing. If a pack will not seat on the left post, make sure that the top rails of the receiver are not pushing the pack away.

NOTE

Remember that the receiver does not hold, but merely guides the cartridge. The pack is actually positioned by the two cartridge posts and the lower lip of the duckbill. The pack should not rest on, or be tightly squeezed by, the cartridge receiver, but should be able to slide easily.

5.5 SPARE PARTS

Refer to the RK05 Illustrated Parts Breakdown (DEC-RK05-IPB-1) and the H743 Power Supply Illustrated Parts Breakdown (DEC-H743-IPB-1) for parts identification.

5.6 TROUBLESHOOTING

The information in this paragraph will assist the service technician in isolating a failing drive component. This information is intended only as a guide during trouble analysis, and does not cover all possible malfunctions of any designated area. To eliminate correctly functioning areas of the drive and arrive at an area of failure, perform the checks described in Paragraphs 5.6.1 through 5.6.4. A basic knowledge of electronics, primary understanding of DEC logic, and logical deductive reasoning should then be employed to locate faulty components within the area of failure. Figure 5-28 consists of a quick-reference flow chart illustrating the checks described in detail in the following paragraphs.

Once the malfunction is diagnosed, corrective maintenance should be performed largely through module swapping. The term module includes those modules listed in the UML (Dwg. No. RK05-0-2), in addition to the linear positioner, the +5 Vdc regulator, the ±15 Vdc regulators, and the H604 Servo Power Amplifier. Failures not attributable to these modules must be repaired at the faulty component level. If module replacement cannot be accomplished within a practical time period, repair of the defective modules should be undertaken, with the exception of a defective linear positioner. In all cases, defective linear positioners should be returned to Digital Equipment Corporation, Maynard, Mass.

NOTE

The G180 module should not be used on an extender module. Faulty G180s should be replaced in the field, rather than repaired at the faulty component level, if the nature of the fault is such that an extender module would normally be required.

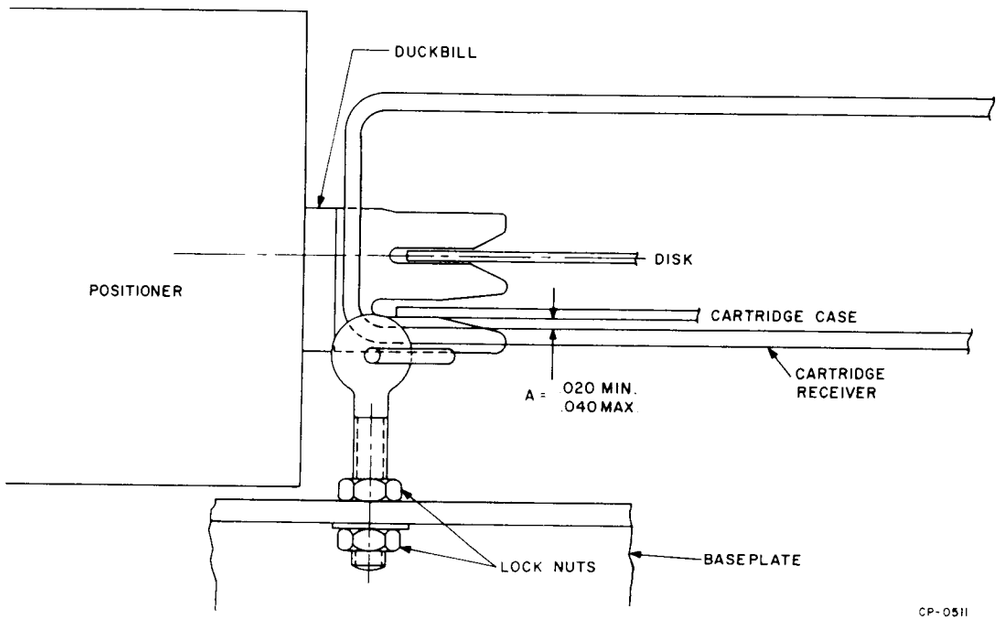


Figure 5-26 Cartridge-to-Receiver Clearance

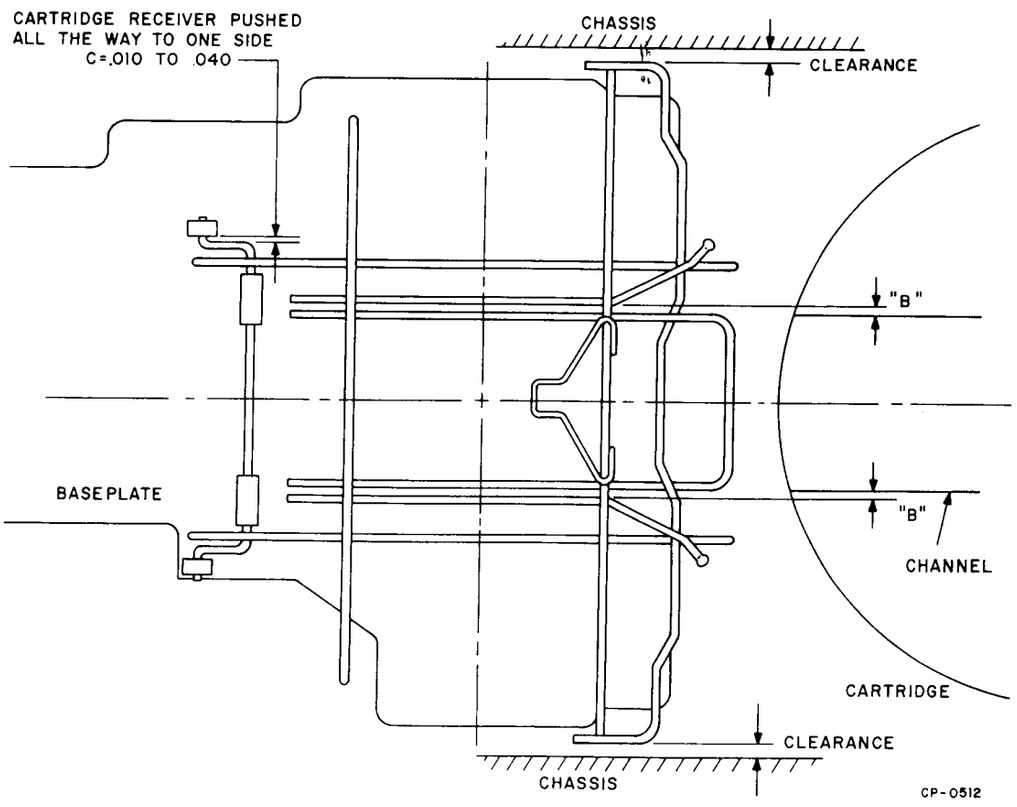


Figure 5-27 Cartridge Receiver Clearances

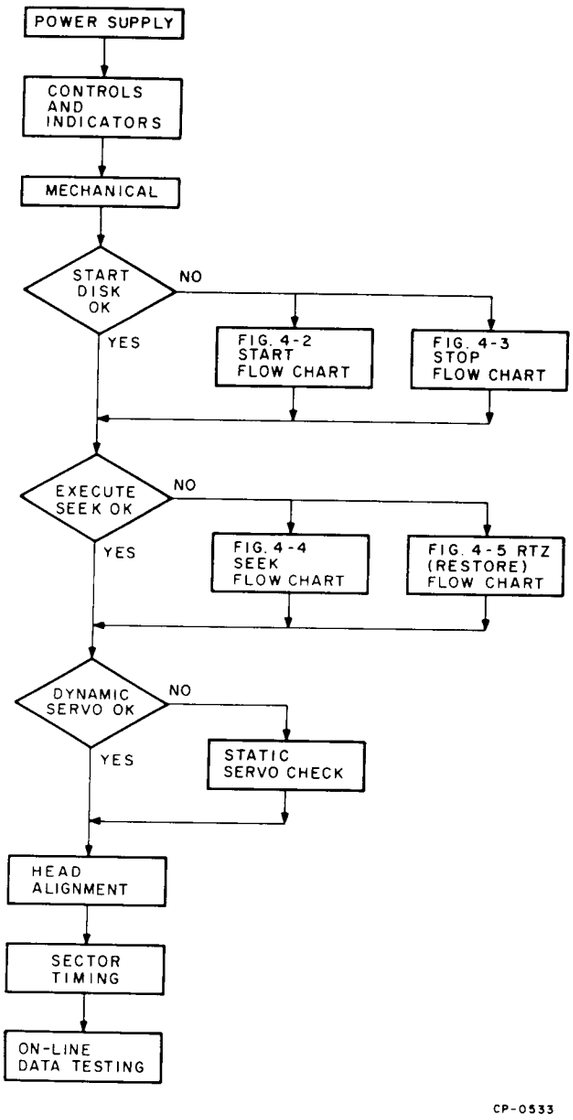


Figure 5-28 Troubleshooting Flow Chart

5.6.1 Power Supply

The troubleshooting procedure for the power supply is as follows:

1. Open the rear door of the rack and unplug the drive ac line cord.

2. Extend the drive fully on the slides and remove the top cover.

3. Disconnect P1 (Figure 5-3) from the power supply chassis.

4. Apply power to the drive and check J1 for the following voltages (measured from ground to the center value of the peak-to-peak ripple):

a.	pin 1 = +15 ±0.75 Vdc	200 mV p-p max. ripple of either regulator.
b.	pin 2 = -15 ±0.75 Vdc	
c.	pin 3 = +5 ±0.15 Vdc	

5. Remove power from the drive and check for shorts between buses.

a.	AT1, BT1 = GND	Max. allowable ripple voltage seen at these pins on the logic assembly is 250 mV p-p.
b.	AA2, BA2 = +5 Vdc	
c.	AD2, BD2 = +15 Vdc	
d.	AB2, BB2 = -15 Vdc	

6. Reconnect P1 and apply power to the drive.

7. Measure the +5, +15, and -15 Vdc at the buses as indicated in Step 5, above. The tolerances should be the same as those in Step 4, above.

8. Check for approximately 30 Vac at A04E1.

9. Remove power from the drive.

5.6.2 Controls and Indicators

The troubleshooting procedure for the controls and indicators is as follows:

1. Check that all modules are present and in their correct locations (Dwg. No. RK05-0-2).

2. Apply power to the drive and check that:

   a. the PWR and LOAD indicators are lit and that the WT and RD indicators are OFF. (WT and RD can be checked while formatting a cartridge during the diagnostic exercise.)

   b. the door unlocking solenoid is energized.

   c. the blower is operating.

3. Press the WT PROT switch and check that the WT PROT indicator lights. (The drive should power-up with WT PROT off.)

5.6.3 Mechanical Checks

The troubleshooting procedure for mechanical checks is as follows:

1. Open the rear door of the rack and unplug the drive ac line cord.

2. Extend the drive fully on the slides, and remove the bottom covers.

3. Tape the door-locking bar (located behind the front bezel) in the down position (Figure 5-29). This permits the drive front door to be opened and shut without power being applied.

4. Install a test cartridge in the drive.

CAUTION

Do not attempt to cycle up the drive with the locking bar disabled.

5. Check the following to ensure that the cartridge is seated properly:

   a. Ensure that there is a clearance between the lip on the metal disk hub and the sector transducer slot (Figure 5-30).

   b. The airduct foam seal fits snugly to the bottom of the cartridge case.

   c. The cartridge case rests securely on the front cartridge support posts. (No gaps between the cartridge case and the support posts shoulders.)

6. Rotate the spindle pulley by hand and check that:

   a. the disk surface does not touch the duckbill.

   b. there is no scraping or rubbing sound within the drive.

   c. the drive belt is not stretched or worn.

7. Remove the tape from the door-locking bar, apply power to the drive, place the RUN/LOAD switch in the RUN position, and check that:

   a. the PWR indicator is lit.

   b. the disk is rotating and there is still no rubbing sound from within the drive.

   c. after approximately 8 seconds, the heads load.

   d. the RDY and ON CYL indicators are lit.

   e. the door is now locked.

8. Place the RUN/LOAD switch in the LOAD position and check that the door unlocks when the LOAD light comes on.

9. Remove power from the drive.

5.6.4 Electronic Checks

The troubleshooting procedure for electronic checks is as follows:

1. If possible, perform the Dynamic Off-Line Servo System Timing Checks (Paragraph 5.4.2.1). If there is any question about the drive operating well enough to accomplish the dynamic servo timing checks, perform the Static Tests and Adjustments (Paragraph 5.4.2.2).

NOTE

When attempting the preceding checks, if the drive does not start or stop correctly, refer to the Start Flow Chart (Figure 4-2) or the Stop Flow Chart (Figure 4-3) for areas of possible malfunction. If the drive starts properly but does not execute a Seek or Restore command correctly, refer to the Seek Flow Chart (Figure 4-4) or the Restore Flow Chart (Figure 4-5).

2. Verify that the heads are correctly aligned (Paragraph 5.4.4).

3. Check the Index/Sector Timing (Paragraph 5.4.5).

4. Remove all jumpers and configure the drive for normal operation.

5. Ensure that spindle brushes are mating properly and that the ground strap between the chassis and the baseplate is secure; otherwise, random data errors may result.

6. Inspect the logic assembly for bent or shorting pins.

7. Check the power supply voltages.

8. Run the appropriate diagnostic tests to exercise the remaining portions of the drive.

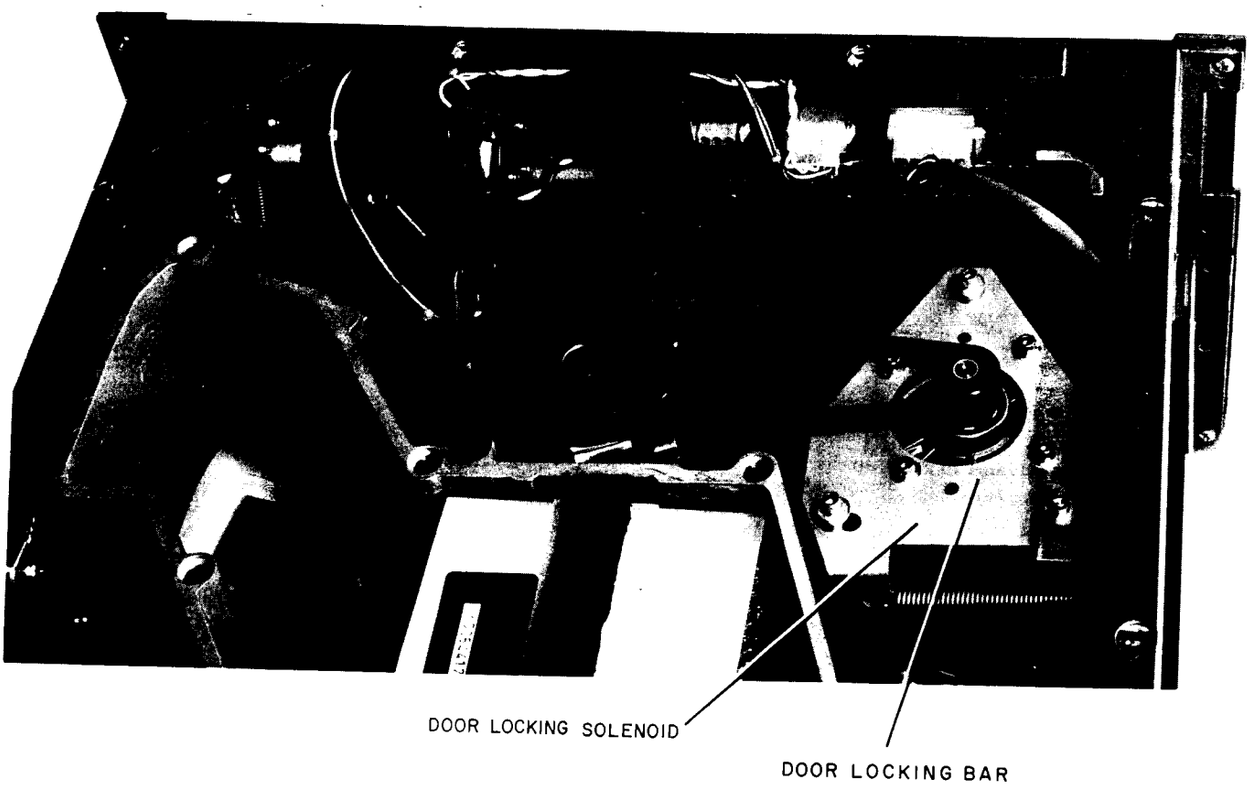


Figure 5-29 Door Locking Bar Location

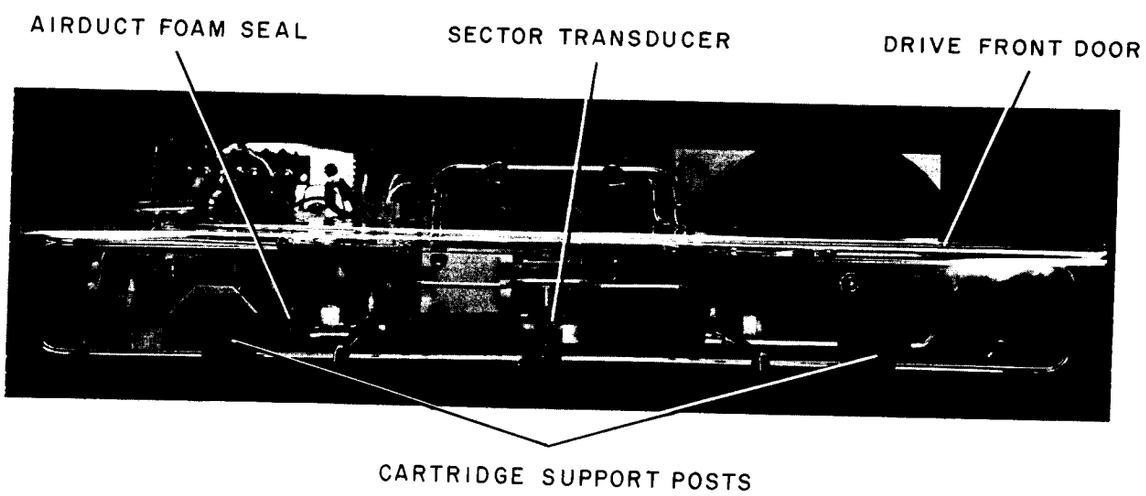


Figure 5-30 Cartridge Seating Elements