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Rev 4	UNIT 0	<i>RK05 ANNUAL PROCEDURES</i>

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1.0 PURPOSE/SCOPE

1.1 Purpose

1.1.1 To clean and verify proper alignment of RKO5 disk drives.

1.2 Scope

1.2.1 To verify that the RKO5 disk drive is operating correctly and that the power supply's are within specifications.

2.0 REFERENCES

2.1 Manuals

2.1.1 DEC. RKO5 disk drive Maintenance Manuals.

2.1.2 DEC. Print set.

2.2 Flowsheets

2.2.1 NK-21-OP-0-63590-FS1, FS2 Fuel Handling Control System Block Diagram.

3.0 PREREQUISITES

3.1 Preliminary Considerations

3.1.1 This procedure will require one man. The time required is about three hours plus two hours for each additional drive.

3.1.2 The RKO5 disk drives are located in the F/H control equipment rooms, MATF control room and in the F/H maintenance shop.

3.2 Precautions

3.2.1 The pins of the backplane can be easily shorted with catastrophic results. Use an insulated probe tip when measuring voltages.

3.2.2 The SERVO motor is powerful. Watch your fingers.

3.2.3 The cartridge is not a sealed unit and is extremely vulnerable to dirt, care must be taken to keep the cartridge and the interior of the drive clean.

3.2.4 Smoke particles, finger print smudges, or dust specks can cause head crashes.

3.3 Isolation

3.3.1 No required.

3.4 Tools and Equipment

3.4.1 Dual Channel Oscilloscope,

3.4.2 Fluke multimeter,

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- 3.4.3 Vacuum cleaner,
- 3.4.4 Inspection Mirror,
- 3.4.5 Isopropyl Alcohol,
- 3.4.6 Alignment, Diagnostic & Scratch Cartridges,
- 3.4.7 Screwdrivers, slotted & phillips,
- 3.4.8 Ball Handled Allen Wrenches, 1/16, 5/64, 3/32, 3/16 & 1/8,
- 3.4.9 Head cleaning kit SCN 817C3363
- 3.4.10 Replacement LED's SCN 812B7343, 810A7080.
- 3.5 Quality Assurance**
- 3.5.1 Include completed CALL-UP sheet with your Work Report.
- 3.5.2 Note any abnormal conditions, observations or repairs on a Work Report.

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4.0 PROCEDURE

NOTE: this procedure is to be done in conjunction with the RKO5 QUARTERLY PROCEDURE CMP-63591-016.

4.1 Cleaning & Inspection

- 4.1.1 Loosen the hose clamp and remove the absolute filter.
- 4.1.2 Clean any dusty areas with Texpads. Also inspect airduct for signs of aging, if necessary replace airduct at this time.
- 4.1.3 Install a new filter SCN 817C3335. Ensure that the filter is snapped into the blower port and that the velcro strip is in place on the bottom of the filter.
- 4.1.4 Tighten the hose clamp.
- 4.1.5 Push the spindle motor mounting plate towards the spindle to relieve belt tension, and slip the belt off the pulleys. Ensure that the pulleys are not loose or have moved on their shaft.
- 4.1.6 With the belt removed, check for horizontal or vertical wobble of the spindle; if wobble is noticeable and excessive, replace the spindle.
- 4.1.7 Using a Texpad clean the spindle and drive motor pulleys.
- 4.1.8 Spin disk drive spindle and listen for brush squeaking noise. If brushes are squeaking, loosen the mounting screws and repetition brushes, then retighten screws. Ensure that the curved brushes are centered on the spindle hub and that the brush assembly is not tilted or twisted. Full contact of the brushes to the shaft is necessary to prevent brushes from squealing.
If brushes are worn out, install a new brush assembly SCN 817D6044.
- 4.1.9 Inspect the spindle drive belt. IF it is frayed or cracked, install a new belt. SCN 817C6793. Otherwise reinstall the same belt by pushing the spindle motor mounting plate towards the spindle and slipping the belt around the pulleys.
- 4.1.10 Check Linear Positioner bearings for wear.
- 4.1.11 Disable the positioner by disconnecting P5 connector on power supply.
- 4.1.12 Place a clean Texpad between the heads to prevent them from contacting each other.
- 4.1.13 Using a texpad clean the linear positioner guides.
- 4.1.14 Without applying undue pressure, move carriage and coil assembly in and out while observing the four bearings on the linear positioner. Each should turn equally; if a bearing stops while moving the carriage, the carriage assembly is not properly aligned. If a bump is felt the bearing may be worn or have a flat spot on it. With either symptom, replacement of the linear positioner is recommended. Reconnect P5 connector, and heads will retract.
- 4.1.15 Remove the mounting screws from the blower shroud using an Allen head driver and lift the blower assembly out of RKO5, being careful not to damage the foam seal.
- 4.1.16 If necessary, remove the blower motor wires from TB-4.
- Green wire = TB-4, pin 1.
Blue wire = TB-4, pin 2.
Black wire = TB-4, pin 4.

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- 4.1.17 Inspect impeller. If dirty, loosen locking screw holding the impeller to the motor shaft, remove and clean impeller blades.
- 4.1.18 ~~Wire~~ ^{Wipe} the inside of the blower housing clean.
- 4.1.19 Reinstall the impeller and end plate. Ensure that the screws are tight and that the impeller is located on the shaft, so that it does not make contact with the motor or the inlet ring.
- 4.1.20 Reinstall the assembly in RKO5 and reconnect the wires to TB-4, if they were previously disconnected.
- 4.2 RKO5 Servo System Adjustments**
- 4.2.1 Load ALIGNX diagnostics program into computer, then remove the diagnostic cartridge and install SCRATCH cartridge in drive, and allow 30 minutes warm up time for the cartridge and the drive to achieve thermal stabilization. (Refer to Appendix A, Attachment 6.2).
- 4.2.2 Connect scope channel #1 probe to various points on RKO5 backplane noted in the procedure below.
- 4.2.3 Connect scope external trigger input to the RKO5 back plane B05J2.
- 4.2.4 Set the Oscilloscope controls as follows:
- Vertical Mode = Ch #1
 - Sensitivity = 2.0 V/div. (X10 probe)
 - Coupling = dc.
 - Trigger = A
 - Sweep time = 10 ms/div.
 - Trigger mode = normal
 - Coupling = ac.
 - Source = external
 - Slope = (-)
- 4.2.5 Sine Amplitude (SA) and Offset (SO) Figure 4.1 & 4.2.
1. Perform a four cylinder oscillating seek. X402
 2. Observe A05M1 (SINE POSITION) for a scope display similar to that shown in Figure 4.1. The waveform amplitude must be 10 Vdc \pm 1 volt peak to peak and symmetrical about ground.
 3. If necessary, adjust SA (see Table #1, Attachment 6.1) for the correct amplitude and SO for the ground symmetry.
- 4.2.6 Velocity Offset (VO) Figure 4.1 & 4.2
1. Observe that the voltage minimums at A05M1 (SINE POSITION) are symmetrical about ground Figure 4.1 & 4.2. A small amount of ripple at the minimum voltage levels is normal.

2. If necessary adjust VO (see Table #1) for the required symmetry.

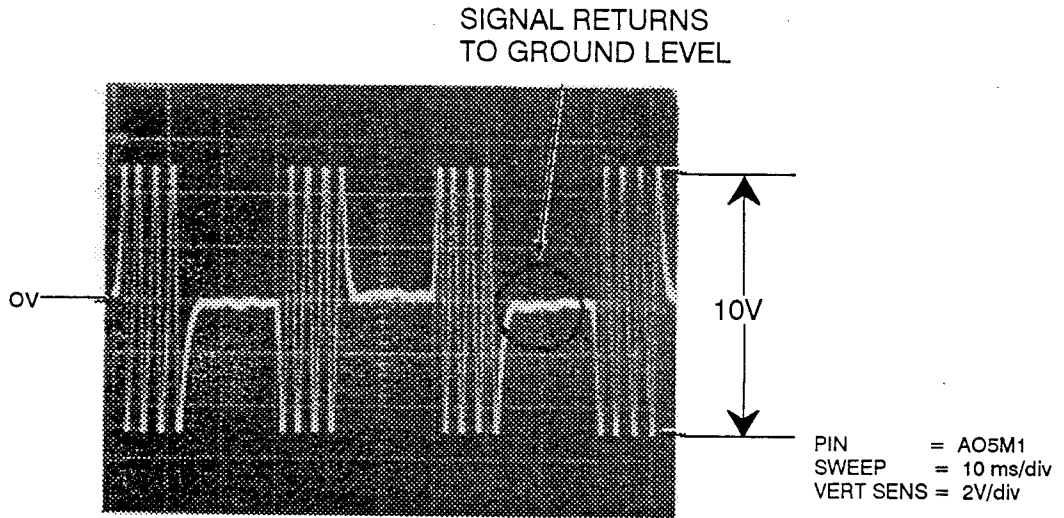


FIGURE 4.1

Sine Amplitude/Offset and Velocity Offset Waveform

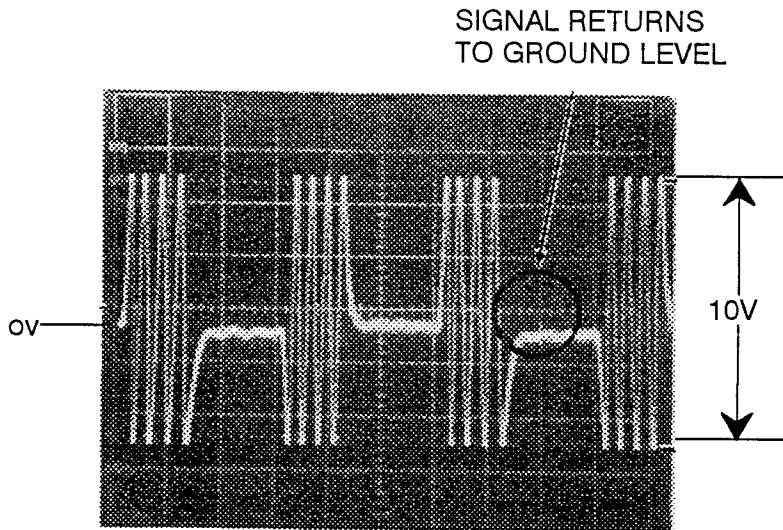


FIGURE 4.2

Incorrect Waveform (Signal not symmetrical about ground)

4.2.7 Cosine Amplitude (CA) and Offset (CO) Figure 4.3.

1. Perform a four cylinder oscillating seek.

X402

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2. Observe A05S1 (COS POSITION) for a scope display similar to that shown in Figure 4.3. The waveform amplitude must be $10 \text{ Vdc} \pm 1 \text{ volt}$ peak to peak and symmetrical about ground.
3. If necessary, adjust CA (see Table #1) for the correct amplitude and CO for the ground symmetry.

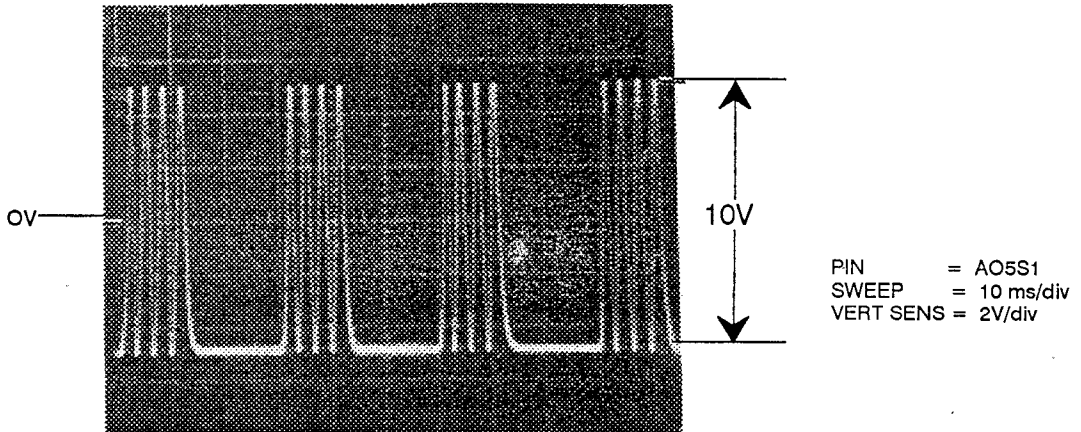


FIGURE 4.3

 4.2.8 Velocity Amplitude (VA).

Figure 4.4.

1. Perform a two cylinder oscillating seek. $\times 401$
2. Set the scope sweep time to 1 ms/div .
3. Observe A05M1 for a scope display similar to that shown in Figure 4.4. The duration of the center cycle must equal $3.2 \text{ ms} \pm 0.05 \text{ ms}$.
4. If necessary, adjust VA (see Table #1) for the correct time.

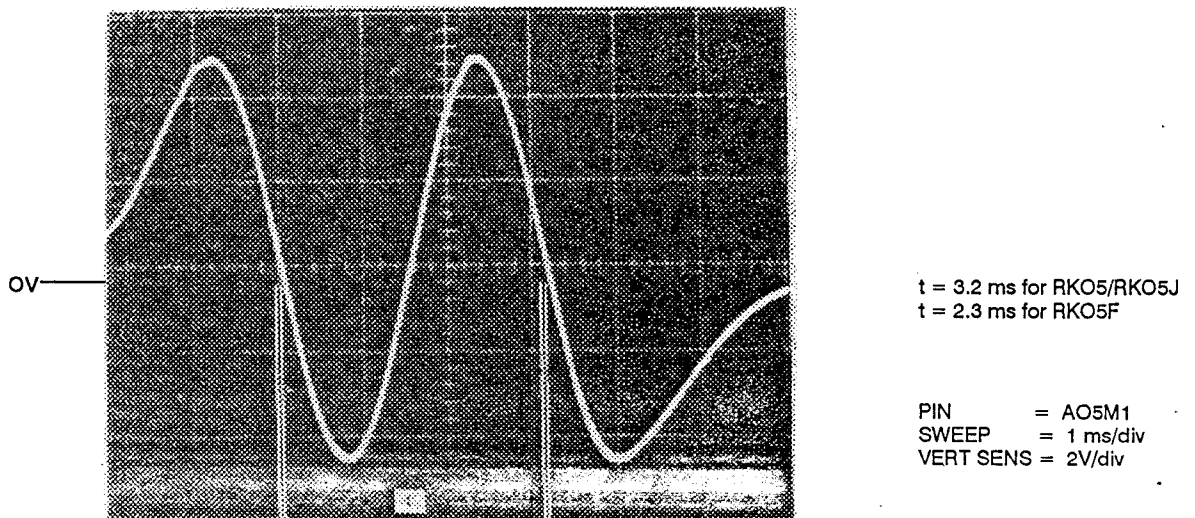


FIGURE 4.4

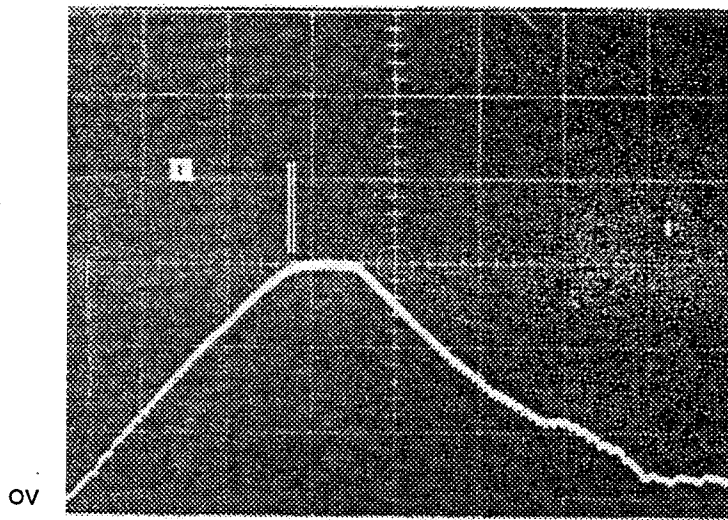
 4.2.9 Acceleration (Positioner Current)

Figure 4.5.

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1. Perform a 64 cylinder oscillating seek. $\times 404$
2. Set the scope sweep time to 5 ms/div. and the vertical sensitivity to 0.5 V/div.
3. Observe A05H1 (VELOCITY) for a velocity profile as shown in Figure 4.5.
4. If necessary, adjust R15 (on H604) for a rise time of 14 ms \pm 1 ms.



t = 14 ms for RKO5/RKO5J
t = 13 ms for RKO5F

PIN = A05H1
SWEEP = 5 ms/div
VERT SENS = 0.5V/div

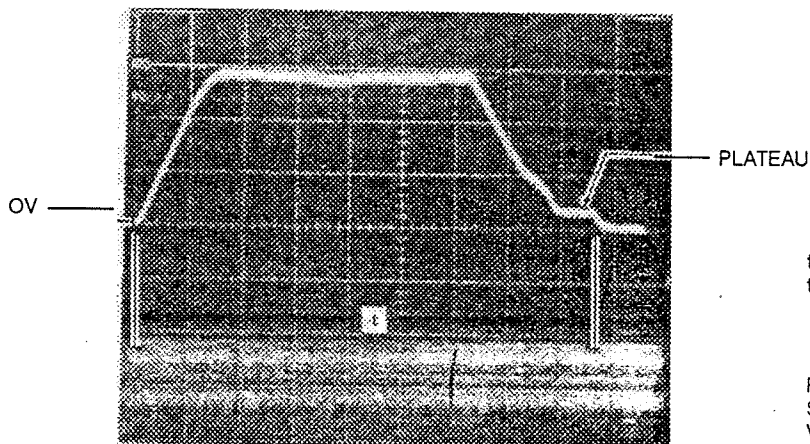
FIGURE 4.5



4.2.10 Full Stroke Profile

Figure 4.6.

1. Perform a 202 cylinder oscillating seek. $\times 406$
2. Set the scope sweep time to 10 ms/div. and the vertical sensitivity to 0.5 V/div.
3. Observe A05H1 (VELOCITY) for a scope display as shown in Figure 4.6. The 0 volt level of the profile must be reached in less than 90 ms from the start of the seek. This figure may not be attainable: 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 VA and the Acceleration (Positioner Current). Adjust the appropriate potentiometer (see Table #1) as required to obtain the correct waveform.



t = 90 ms for RKO5/RKO5J
t = 70 ms for RKO5F

PIN = A05H1
SWEEP = 10 ms/div
VERT SENS = 0.5V/div

FIGURE 4.6

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4.2.11 Full Stroke Position Waveform Figure 4.7.

1. Maintain the same configuration as for the Full Stroke Profile.
2. Set the scope vertical sensitivity to 2 V/div. and observe A05M1 (SINE POSITION) for a scope display similar to that shown in Figure 4.7. 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 volt. If overshoot is excessive, recheck the VA and the Acceleration (Positioner Current).

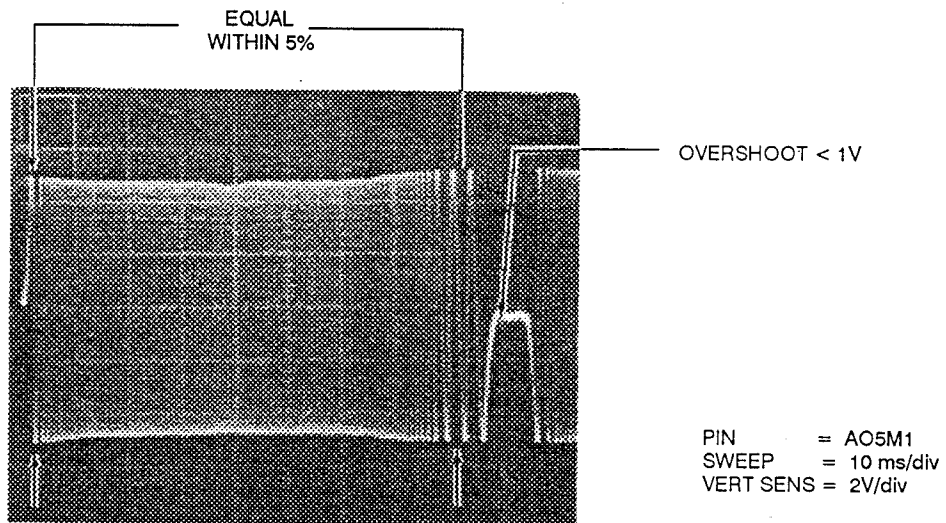


FIGURE 4.7

4.2.12 Out Limit (Dynamic Test)

1. At communication printer type CTRL "D".
2. Perform a repetitive restore operation by installing the following jumpers.
B08H1 to B08M1
A08M1 to A08T1
3. Trigger the scope from B05K2.
4. Set the scope vertical sensitivity to 1 V/div and observe A05J1 (LIMIT) for a scope display as shown in Figure 4.8. The waveform peak amplitude must be 3 to 3.5 volts with a minimum level of 0.0 volts. In addition, the plateau immediately following the trailing edge must not exceed 0.3 volts. IF NOT, remove jumpers and perform Step 4.2.14. STATIC LIMIT Adjustment.
5. Disconnect both jumpers to halt the repetitive restore.
6. Check the INNER LIMIT signal by disabling the positioner using the red maintenance switch (S1) on Servo Amp H640. Select switch (S1) to the down position and physically move the positioner to the inner limit. Now select switch (S1) to the up position, enabling the positioner and if the inner limit signal is operative a restore operation will be initiated and heads will retract.

4.2.13 After completion of Step 4.2.12.6 go to the QUARTER PROCEDURE CMP-63591-016, Section 4.4 and complete all remaining steps.

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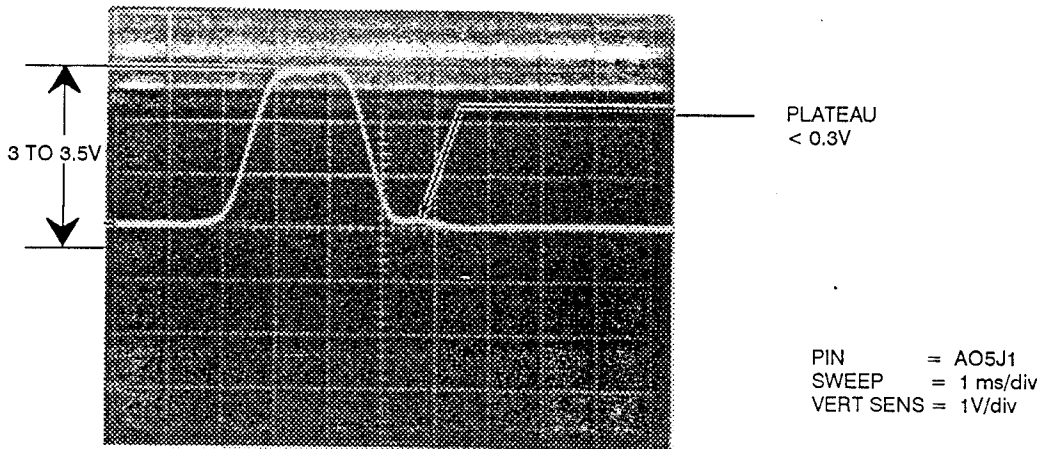


FIGURE 4.8

4.2.14 Static Limit Adjustment. Limit Signal Amplitude (LSA) and Offset (LSO)

1. Observe AO5J1 with the positioner stationary at center of travel. Adjust LSO for a ground signal at the center of the scope screen.
2. 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.
3. Adjust LSA until the smaller voltage level obtained in step above is 3.0 volts.
4. Return the positioner to the center of its travel and readjust LSO for 0.0 volts.
5. Repeat the above steps if necessary.
6. Go back to Step 4.2.12.6

5.0 POSTREQUISITES

- 5.1 Ensure work authorization is surrendered.
- 5.2 File DR for any outstanding problems.
- 5.3 Mark up this procedure noting any errors or omissions. Forward to the Control Maintenance Supervisor if revisions are required.

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6.0 ATTACHMENT

6.1 Table 1 – 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)	Adjust 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 Adjustments)	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).

NOTE: Potentiometers are located on the G938/G938YA PCB (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 top most potentiometer as viewed from the rear of the drive with the prefilter removed.

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6.2 RKO5 Alignment Program

ALIGNX

REV 3.1

RKO5 ALIGNMENT PROGRAM

SET UP SWITCH REGISTER AS FOLLOWS:

BINARY VALUE

BITS 0-2	=	DRIVE # (0-7)
BIT 3	=	0 - ALIGN TO TRACK 1 - OSCILLATING SEEK BETWEEN ZERO AND TRACK
BIT 4	=	0 - SELECT LOWER HEAD FOR ALIGNMENT 1 - SELECT UPPER HEAD FOR ALIGNMENT
BITS 9-11	=	TRACK TO SEEK / ALIGN TO
		0 - CYL 0
		1 - 2
		2 - 4
		3 - 16
		4 - 64
		5 - 105
		6 - 202
		7 - ANY CYLINDER YOU DEPOSIT INTO LOC. 37

REFERENCE DIAGNOSTIC SYSTEM HELP FILES FOR ADDITIONAL INFORMATION

CONSOLE CONTROLS

CTRL C - Return to OS8 monitor.
CTRL D - Modify Pseudo-switch register.
CTRL R - Restarts the program.
CTRL U - Erases that line just input.
RETURN - Terminates a line of input.

NOTE: Computer responds with SR=0000.

OCTAL VALUE

Type X401 - X406 for a particular cylinder seek, where X is the drive # being tested.

2	- CYLINDER SEEK	= X401
4	- CYLINDER SEEK	= X402
64	- CYLINDER SEEK	= X404
202	- CYLINDER SEEK	= X406
	CHECK UPPER HEAD	= X205
	CHECK LOWER HEAD	= X005