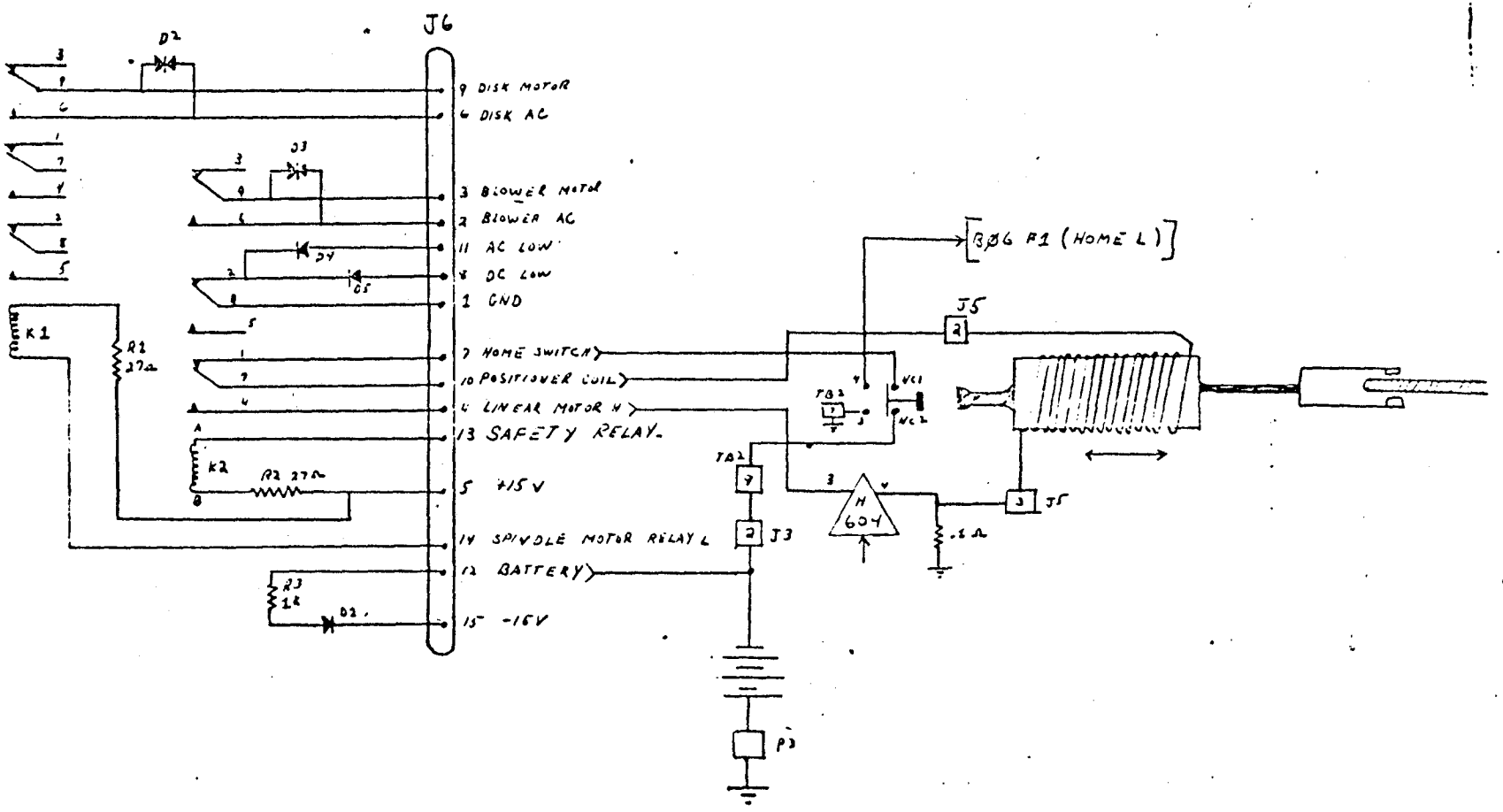
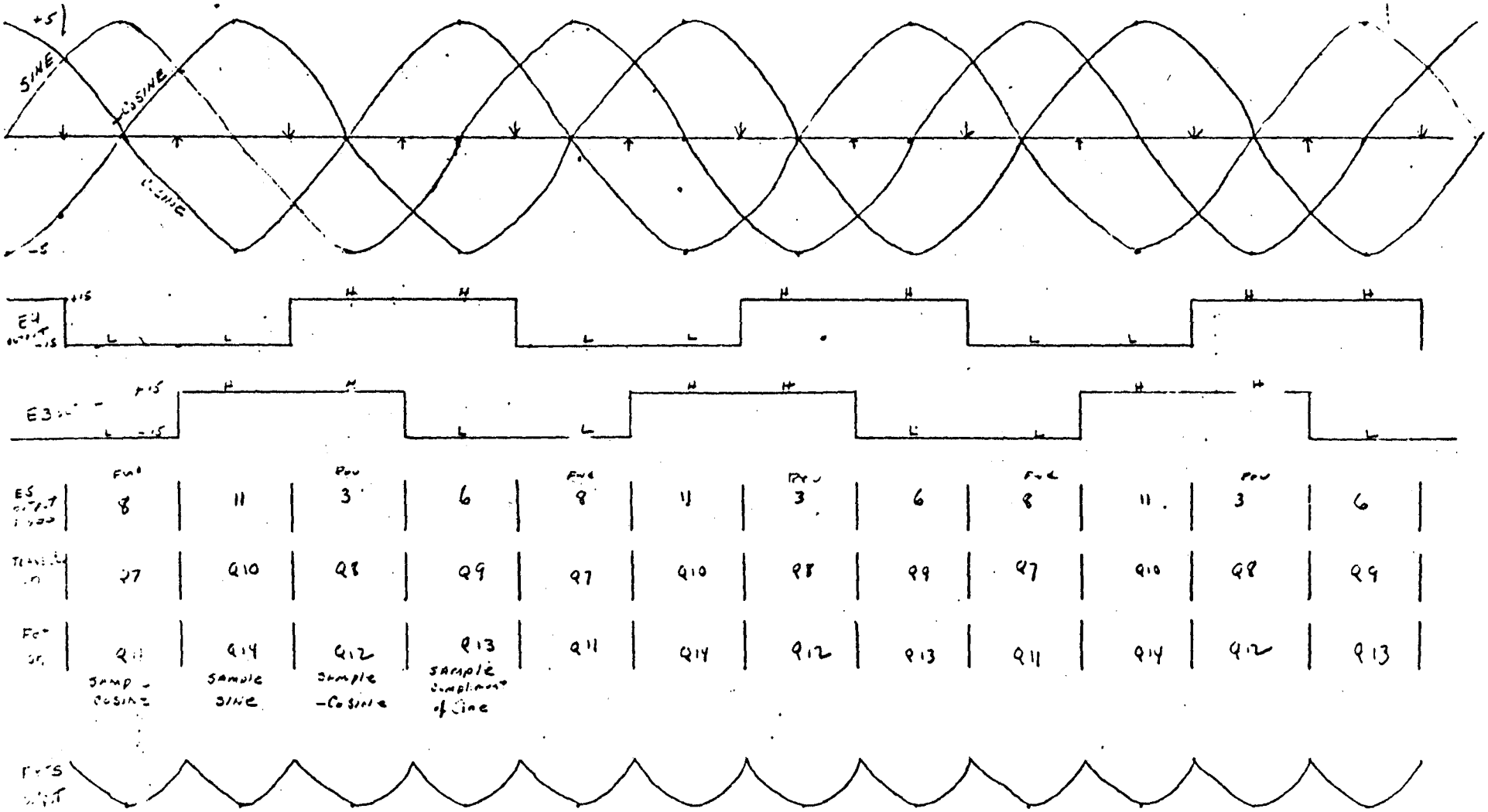
RK8-E Handouts

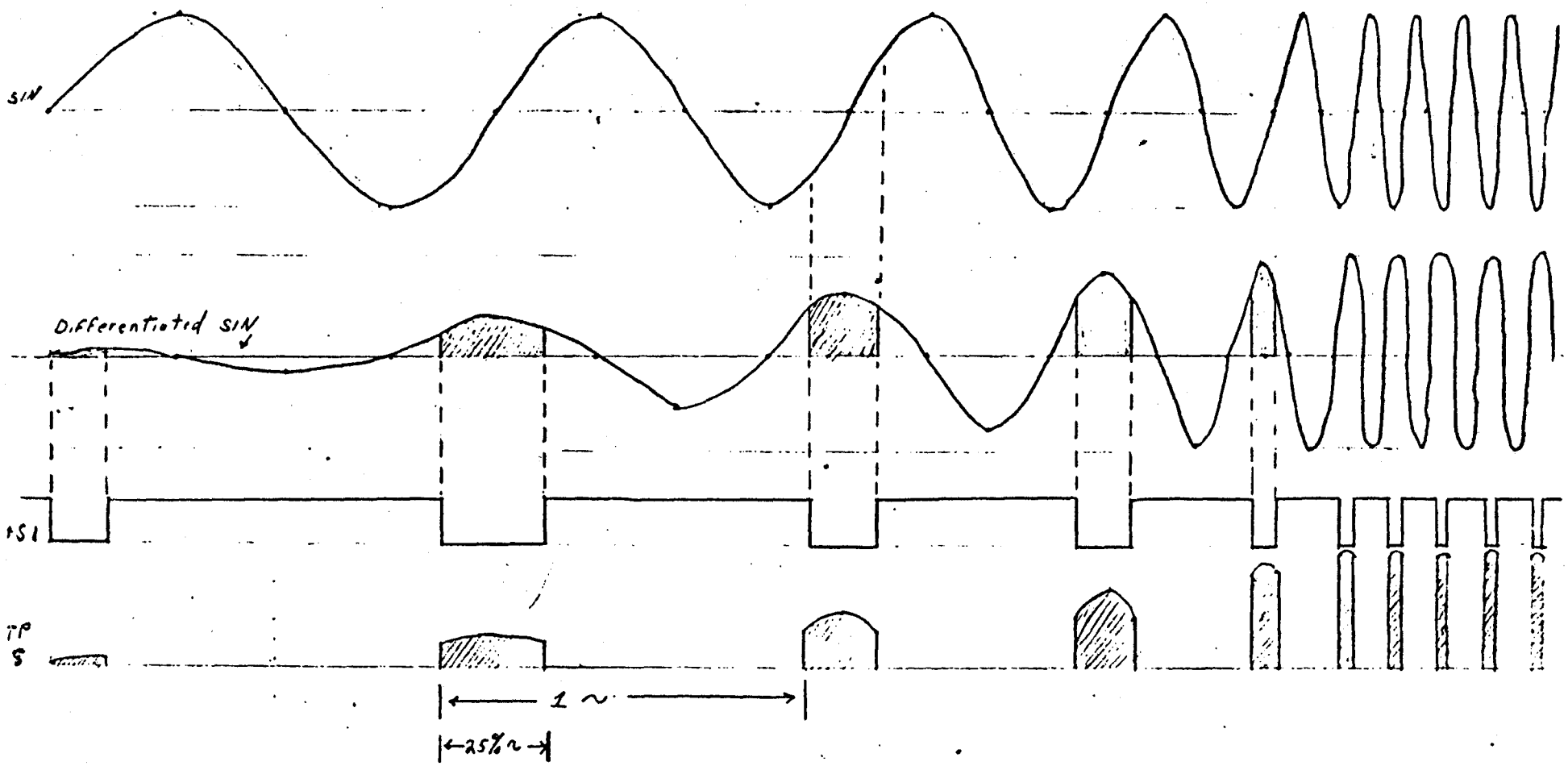


RKØ5 Home Switch (11)
Ø5/Ø3/72 REV A
R. Coutin

RK05 Reference G938



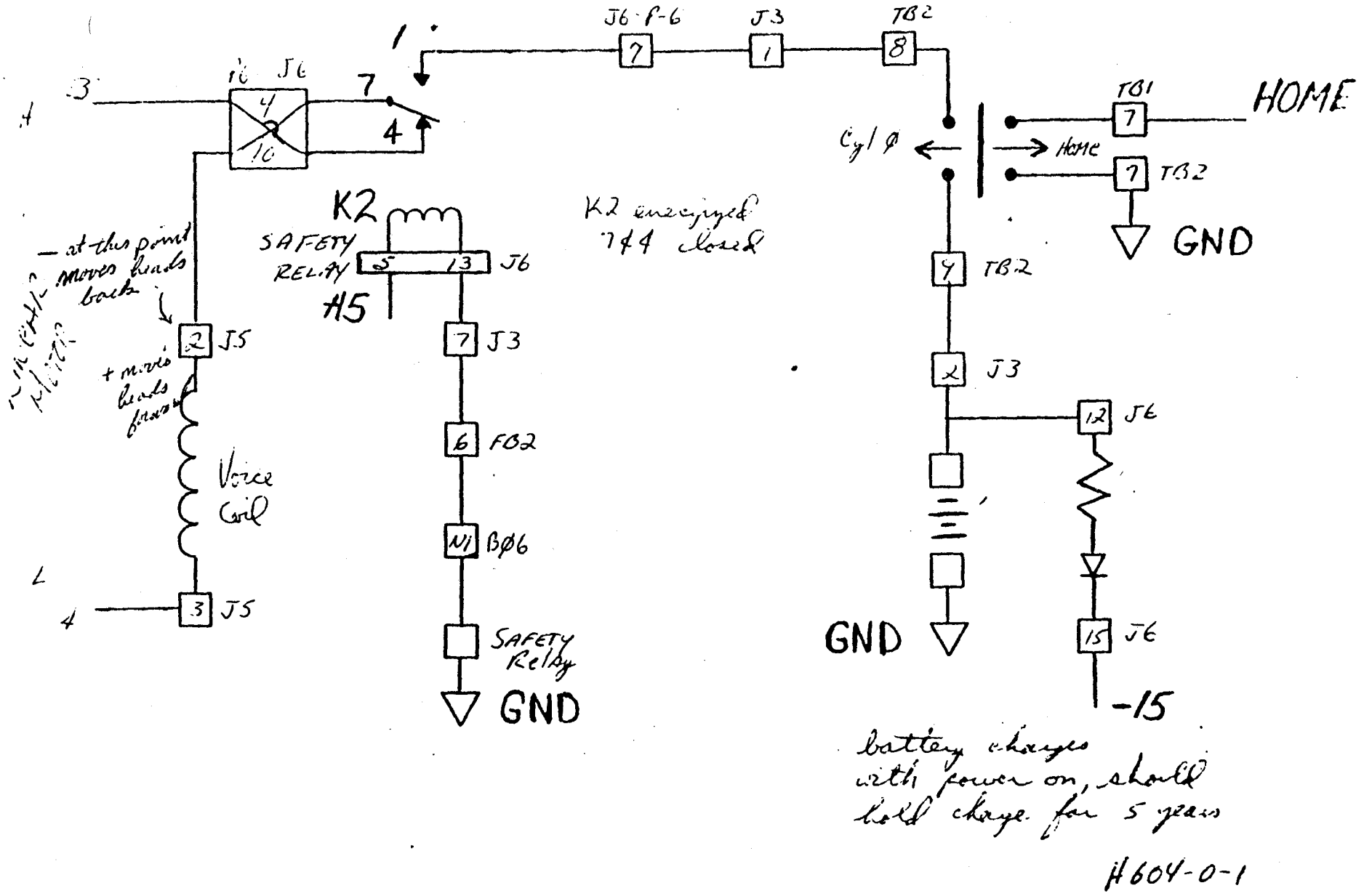
RK05 (12)
Velocity Synthesizer

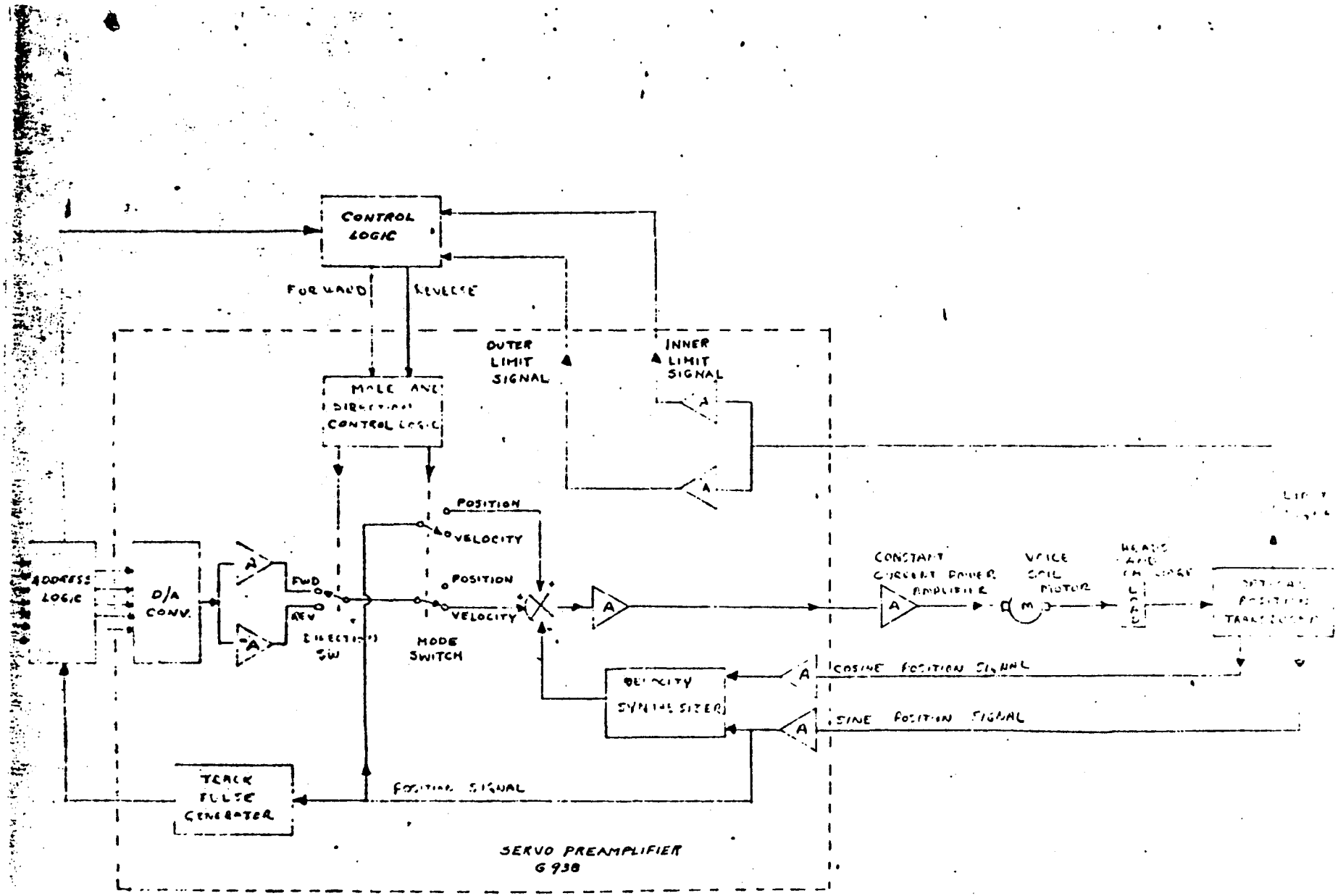


RK Ø5 (10)

Accelerating "SIN POSITION

R. Goudin


J6 P-6
J3
TB2
HOME
TB1
Cyl Ø
Home
TB2
GND
K2
SAFETY RELAY
J6
K2 energized 7 & 4 closed
— at this point moves heads back
+ moves heads forward
J5
Voice Coil
J3
FØ2
BØ6
SAFETY Relay
GND
GND
J6
-15
battery charges with power on, should hold charge for 5 years
H604-0-1



SEE M7702 FOR ADDRESS AND CONTROL LOGIC

RKØ5 HEAD POSITIONER SYSTEM

CPL

digital	FIELD SERVICE TECHNICAL MANUAL				Option or Designator
	12 Bit [X]	16 Bit [X]	18 Bit [ ]	36 Bit [ ]	RKØ5

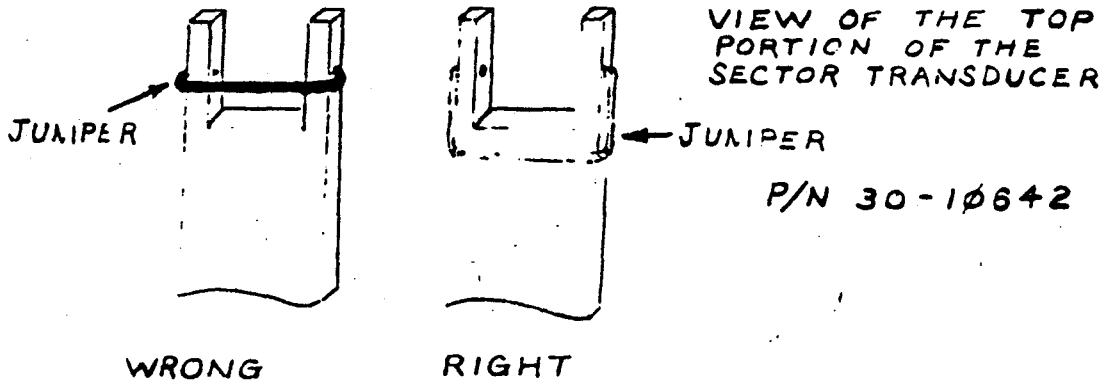
Title	+5 VOLT REGULATOR 5409503		Tech Tip Number RKØ5-TT-1
Processor Applicability: All (8, 11)	Author J. WALSH/A. MUIR	Rev 0	Cross Reference
	Approval HAROLD LONG	Date 9/12/72	

The +5 volt regulator 5409503 which is used in both the RKØ5 and RC11/RS64 has a partially installed ECO. For some reason, in a few units, some difficulty has been experienced which results in the triggering of the crowbar. If the crowbar triggers and system power is not removed the heat dissipated by the S.C.R. is sufficient to damage the regulator board. ECO 5409503-04 was written to correct this problem. However, due to material non-availability the ECO was never implemented fully. ECO 5409503-05 is a field retrofit to correct this deficiency. This ECO will be distributed immediately at the regional level and as soon as possible to all field offices.

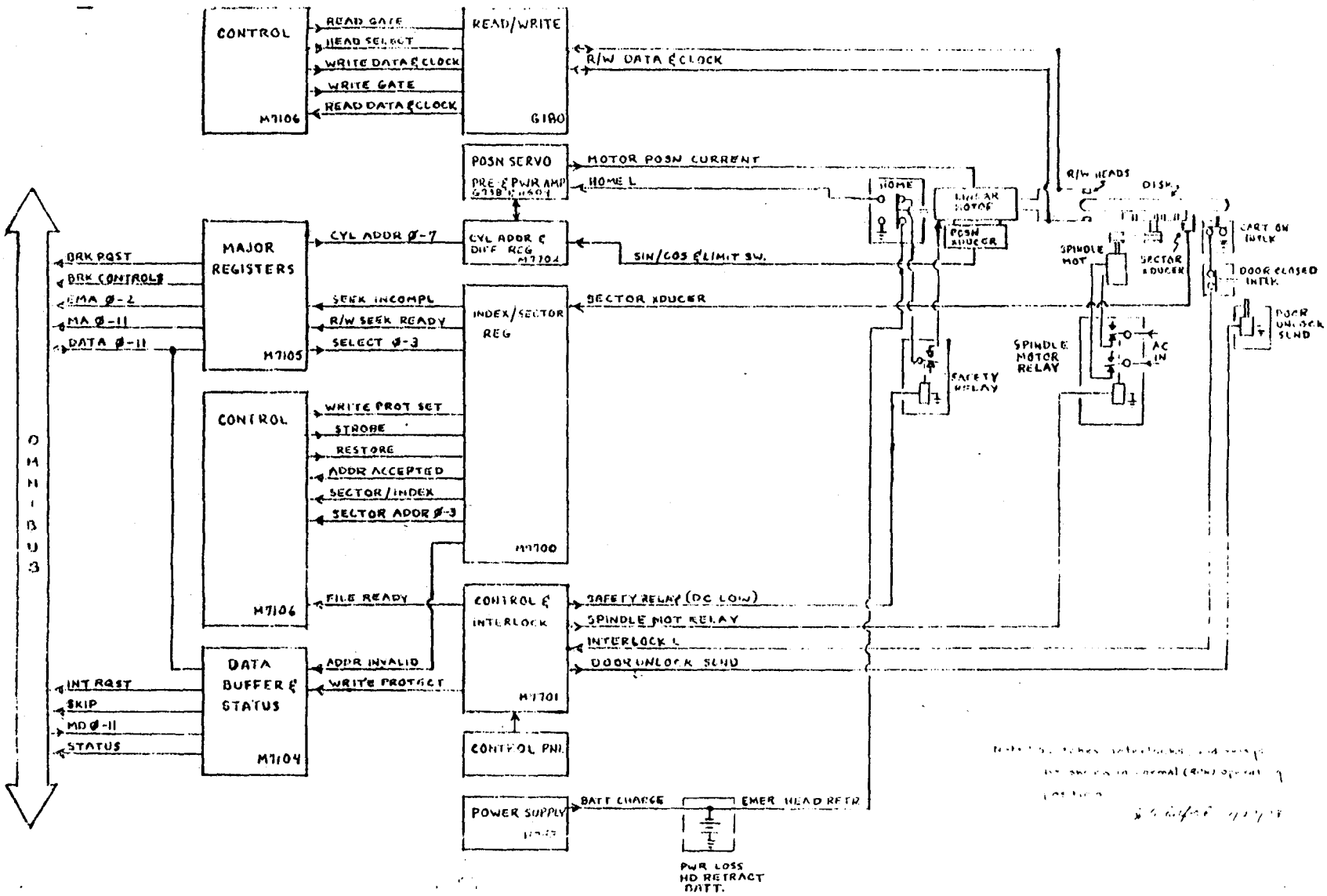
CPL

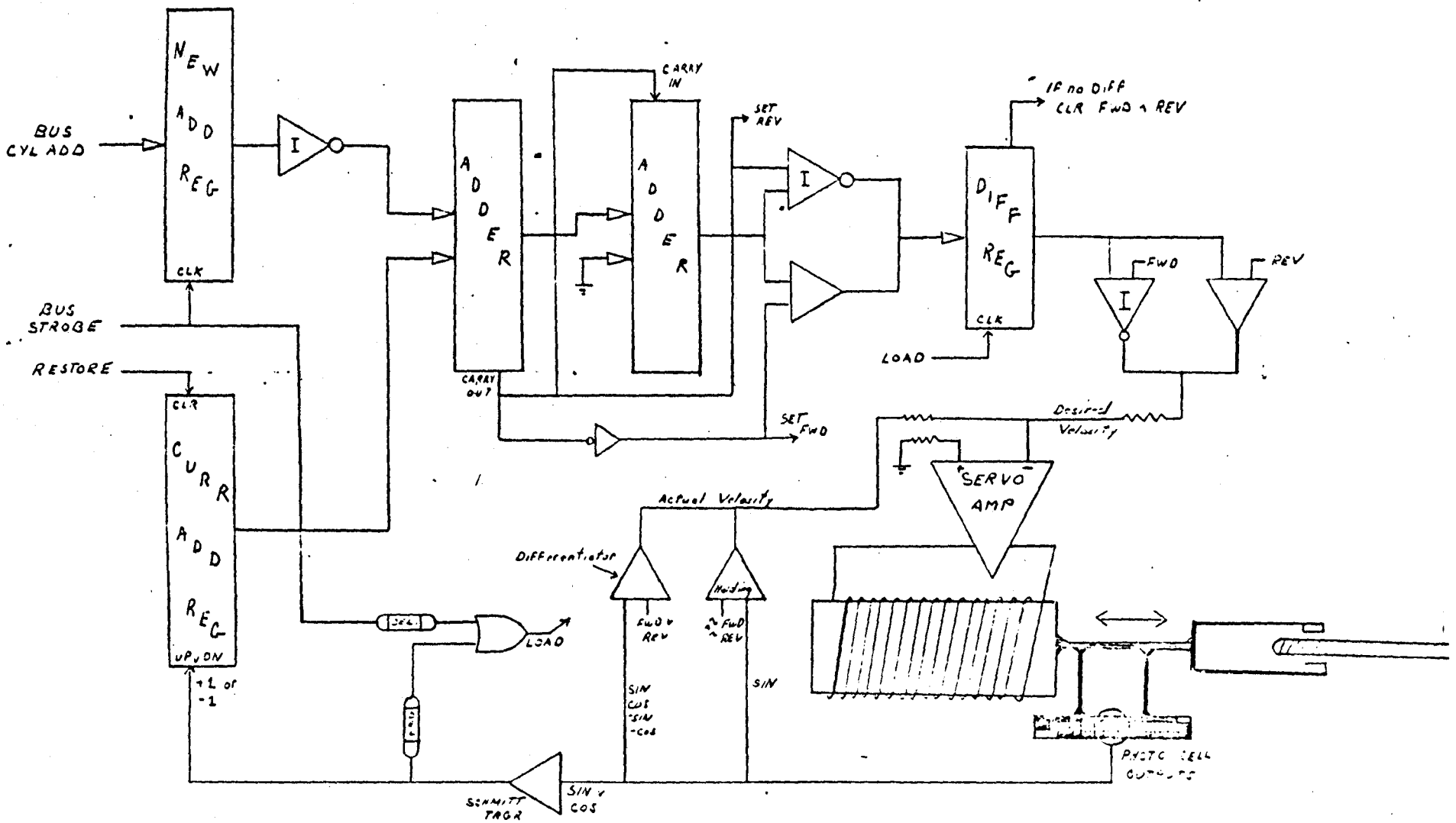
Title	IMPROPERLY WIRED SECTOR TRANSDUCERS		Tech Tip Number RKØ5-TT-2
Processor Applicability: All (8, 11)	Author J. WALSH/A. MUIR	Rev 0	Cross Reference
	Approval HAROLD LONG	Date 9/12/72	

A number of improperly wired sector transducers were produced some time ago. We feel that our logistics system has been purged of these defective parts, however, as a precautionary measure, this tech tip is being issued. Below, both types of transducers are illustrated. Should replacement become necessary, it is suggested that a visual inspection be made. Improperly wired transducers should be disposed of and replacement ordered from Maynard or respective regional stockrooms.



8


CONTROL
M7106
READ GATE
HEAD SELECT
WRITE DATA & CLOCK
WRITE GATE
READ DATA & CLOCK
READ/WRITE
G180
R/W DATA & CLOCK
POSN SERVO
PRE & PWR AMP
MOTOR POSN CURRENT
HOME L
HOME
LINEAR MOTOR
POSN XDUCER
R/W HEADS
DISK
SPINDLE MOT
SECTOR XDUCER
CART ON INTLK
DOOR CLOSED INTLK
DOOR UNLOCK SEND
MAJOR REGISTERS
M7105
CYL ADDR Ø-7
CYL ADDR & DIFF REG
M7704
SIN/COS & LIMIT SW.
BRK RQST
BRK CONTROLS
EMA Ø-2
MA Ø-11
DATA Ø-11
SEEK INCOMPL
R/W SEEK READY
SELECT Ø-3
INDEX/SECTOR REG
M7700
SECTOR XDUCER
SAFETY RELAY
SPINDLE MOTOR RELAY
AC IN
CONTROL
M7106
WRITE PROT SET
STROBE
RESTORE
ADDR ACCEPTED
SECTOR/INDEX
SECTOR ADDR Ø-3
FILE READY
CONTROL & INTERLOCK
M7701
SAFETY RELAY (DC LOW)
SPINDLE MOT RELAY
INTERLOCK L
DOOR UNLOCK SEND
DATA BUFFER & STATUS
M7104
ADDR INVALID
WRITE PROTECT
INT RQST
SKIP
MD Ø-11
STATUS
CONTROL PNL
POWER SUPPLY
BATT CHARGE
EMER HEAD RETR
PWR LOSS HD RETRACT BATT.
OMNIBUS



RK05
Positioner Block Diagram

CPL

Title	RKØ5 MAINTENANCE MANUAL CORRECTIONS	Tech Tip Number	RKØ5-TT-3
Processor Applicability: All / 8 / 11	Author J. WALSH/A. MUIR Rev 0		Cross Reference
	Approval HAROLD LONG Date		

RKØ5 MAINTENANCE MANUAL CORRECTIONS

Ch. 2 Sec. 2.1: Step 6 makes reference to 3 rubber shock-mount cushions. These shock mounts are presently not being employed. A restraint bracket is being developed and will be used when it is available. Presently there is nothing in this area to be removed.

Step 7 should state that the shipping bracket will be turned 180° rather than being completely removed.

Sec. 2.2 Step 4 - see correction to Sec 2.1 step 6.

Chapter 5, section 5:3.2.6 in Step 21 should be looking A7 A5M1.

section 5.3.3.3 in Step 4, pins A8M2 and A7M2 are called out for head selection. The should be B8M2 and B7M2 respectively.

Step 10 calls for a ± 10% margin. This spec has been widened to ± 25%.

Section 5.3.4.3 Step 7 calls for 30 usec average. This spec has been changed to 70 uses ± 10 usec average. Just as in the RK05, attempt to split the difference between upper and lower head when performing this adjustment.

Section 5.3.2.6 Step 22. The sweep speed should be 10 MS/DIV. Page 5- 14 figure 5-10 the sweep speed should be 10 MS/DIV.

CPL

Title	HEAD OSCILLATION PROBLEM	Tech Tip Number	RKØ5-TT-4
Processor Applicability: All / 8 / 11	Author J. WALSH/A. MUIR Rev 0		Cross Reference
	Approval HAROLD LONG Date 9/13/72		

The composition of the duck bill used on the RK05 was changed. Should this new duck bill be installed on an early model RK05, a head oscillation problem may be encountered to correct this problem. See ECO H743-0001.

digital	FIELD SERVICE TECHNICAL MANUAL				Option or Designator
	12 Bit ☐	16 Bit ☒	18 Bit ☐	36 Bit ☐	RK05

Title	RK05 POWER SUPPLY REMOVAL		Tech Tip Number	RK05-TT-5
Processor Applicability: All (8, 11)	Author J. Walsh/A. Muir	Rev 0	Cross Reference	
	Approval H. Long	Date 09/13/72		

When removing the RK05 power supply and assembly some difficulty may be encountered. The reasons for this is the close tolerances between the power supply package, base plate assembly and chassis. To facilitate removal loosen the two (2) captive screws which hold the front most (+15 volt) regulator in place and remove it. There should now be enough room to maneuver the H742 supply free.

Title	POSSIBLE MISCONNECTION OF NOISE CLIPPER		Tech Tip Number	RK05-TT-6
Processor Applicability: All (8, 11)	Author J. Walsh	Rev 0	Cross Reference	
	Approval H. Long	Date 1/4/73		

An error in the DEC Pack Print RK05-0-1, chassis wiring, has resulted in a number of units being shipped to the field with the GE 130V MOV incorrectly connected.

The schematic has been corrected via ECO. To insure that drives which you are supporting have this MOV in correctly, make the following check:

(1) Extend drive fully on sides
(2) Remove the bottom panels
(3) Look behind the spindle motor
(4) If the red body of the GE MOV is parallel to the front panel, it is incorrectly connected
(5) If the red body is parallel to the side panel, it is connected correctly.

The incorrect connection across the RK05 spindle motor starting relay is from terminal 3 to terminal 4. The connection should be from terminal 2 to terminal 4.

10

Title	RK11-C AC LOW DC LOW	Tech Tip Number	RK05-TT-7
Processor Applicability: All / 8 / 11	Author: Al Muir	Rev: 0	Cross Reference
	Approval: Jim Walsh	Date: 01/04/73	

Unibus AC LO and DC LO are separate signals peculiar to PDP-11 operation and are not to be confused with RK11C DR BUS AC LO and DC LO. These signals cannot be tied together, the result if this occurs, is PDP-11 power fail will not work.

A popular production wiring error is to connect these signals together at the power end panels. The correct wiring sequence is:

Unibus AC LO: From H720E at the bottom of the cabinet to AC LO connector on bottom power end plate.

Unibus DC LO: From H720E at the bottom of the cabinet to DC LO connector on bottom power end plate.

Disk Bus AC LO: From nearest H734 to AC LO connector top power end plate.

Disk Bus DC LO: From nearest H734 to DC LO connector top power end plate.

If the system has only RK05 disk drives there are no H734 supplies and therefore, no connections to the top end plate. These signals are then provided through the disk bus cable and RK11-C ECO #.00008 must be installed in the RK11-C logic.

Title	HEAD IDENTIFICATION	Tech Tip Number	RK05-TT-8
Processor Applicability: All / 8 / 11	Author: J. Walsh	Rev: 0	Cross Reference
	Approval: H. Long	Date: 01/04/73	

The RK05 head designations "up" and "down" are derived from IBM designations used in their moving head disk memories. When the air bearing is oriented upward, the term "up" is employed and when the air bearing is oriented downward, the term "down" is used. These designations are used throughout the moving-head disk industry.

Care should be exercised when encountering these terms, for the "up" head is the head which reads from the lower surface of the disk, i.e., the head which occupies the lower position in the carriage assembly. The "down" head is the head which reads from the upper surface of the disk, i.e., the head which occupies the upper position in the carriage assembly.

When ordering RK05 heads, use the following part numbers:

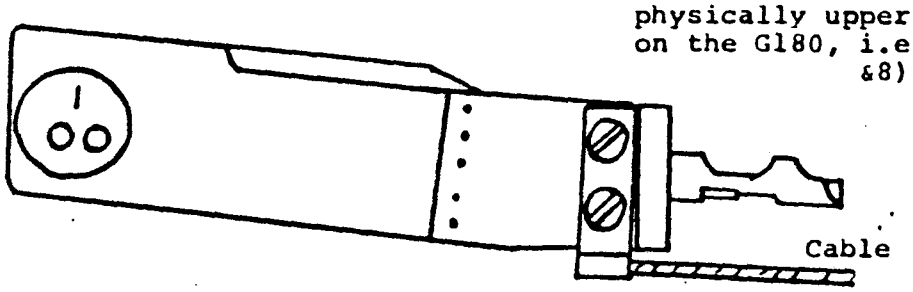
Upper head ("down" head)	30-10863-2
Lower Head ("up" head)	30-10863-1

digital	FIELD SERVICE TECHNICAL MANUAL				Option or Designator RK05
	12 Bit [X]	16 Bit [X]	18 Bit [ ]	36 Bit [ ]	

Title HEAD IDENTIFICATION (Continued)			Tech Tip Number RK05-TT-8
Processor Applicability: All (8, 11)	Author Jim Walsh	Rev A	Cross Reference
	Approval Harold Long	Date 06/04/73	

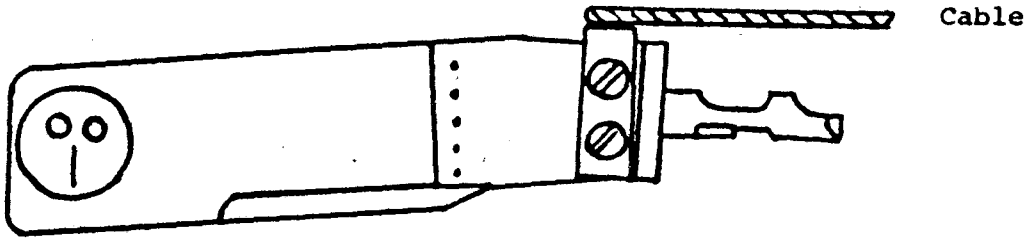
LOWER HEAD
30-10863-01

(Cable will plug into the physically upper set of pins on the G180, i.e.pins 5,6,7 &8)



(Cable plugs to pins 1,2,3 &4 on the G180)

UPPER HEAD
30-10863-02



Note: No disk malfunction will occur if the head cables are reversed. (Indeed reversing them can be a useful troubleshooting aid) but any unit with reversed cables will produce discs that are not program compatible with other RK05 disk units, since the data is on the opposite side of the disk from where it is expected. Check for correct head wiring at installation time!

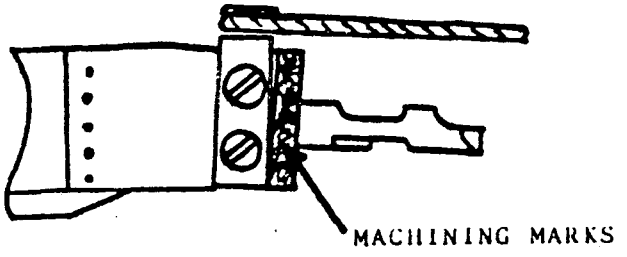
12

Title	RK05 HEADS	Tech Tip Number	RK05-TT-9
Processor Applicability: All / 8 / 11	Author Jim Walsh Rev 0	Cross Reference	
	Approval Harold Long Date 01/04/73		

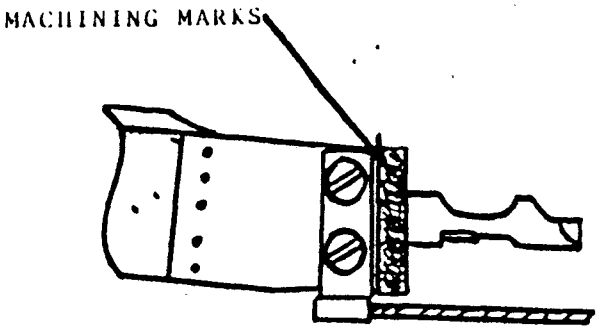
An ECO tc the carriage assembly and one to the tailpiece of the R/W heads involved the machining of the flat surface where the head rests on the tang of the carriage. The new REV head will fit in the old REV carriage assemblies. Caution should be exercised however to insure that the pad of the head is on a plane which is parallel to that of the disk surface.

Heads on old REV tailpieces will not fit into new REV carriage assemblies.

New REV tailpieces can be identified by the machining marks on the shoulder. See Figure 1.



UPPER HEAD



LOWER HEAD

13

digital	FIELD SERVICE TECHNICAL MANUAL	Option or Designator
	12 Bit [X] 16 Bit [X] 18 Bit [X] 36 Bit [ ]	RK05

Title: Head/Disk Interference	Tech Tip Number: RK05-TT-10
Processor Applicability: All (8, 11, 15)	Author: W. Linton Rev:
	Approval: Date: 7/12/73
	Cross Reference:

INTRODUCTION:

Head/Disc Interference, or HDI (frequently referred to as a head crash) is a result of head contact with a disc surface. Most commonly it is caused by a build up of dirt on the read/write head or a foreign particle in the air stream used as a "LUBRICANT" between the head and disc surface. If the problem is not TOTALLY CORRECTED, it has a propagation effect from drive to drive through pack after pack.

RECOGNITION:

Head /Disc Interferance can be recognized by one or more of the following:

A. Repetitive hard read errors. Because of adverse propagation effect, do not move any pack with this kind of error to more than one other drive. If errors persist, stop both drives and remove packs that are on them (DO NOT ALLOW USE OF THESE PACKS OR DRIVES UNTIL THE PROBLEM IS FULLY RESOLVED) investigate further for head/disc interference.

B. Uncommon noise from the disc as characterized by audible tinkling sound. The noise will progress to a screech.

C. Disc surface damage. A pack with any of the following conditions must be replaced:

   1. Deposits or smears that cannot be totally removed with alcohol and Kimwipes.

   2. A concentric scratch or any scratch where the aluminum substrate is visible. NOTE: The disc edge may have aluminum visible and cause no problem.

Title	Head/Disk Interference		Tech Tip Number	RK05-TT-10
Processor Applicability: All / 8 / 11 / 15	Author W. Linton	Rev		Cross Reference
	Approval	Date 7/12/73		

RECOGNITION (continued)

3. Multiple adjacent concentric scratches regardless of length.

4. Imbedded particle with trailing scratch (also called comet tail).

5. Radial/diagonal scratches where aluminum substrate is exposed.

D. Read/Write Head Damage

1. Dark brown or black streaks (burned oxide and/or aluminum) anywhere on the white ceramic head. clean the head. If the head again crashes on a known good, clean disk, replace the head.

2. Discolored epoxy (normally white) at the R/W element which cannot be cleaned off with alcohol.

3. Other. Bent or broken flexures can result from a prolonged HDI or mishandling. Replace any head with this type of damage. DO NOT ATTEMPT REPAIR. The ceramic head gimbal spring is adjusted to ± 1 degree landing attitude. If this attitude is disturbed in any way, the head will consistantly crash when loaded on the disk.

RECOVERY:

A. Inspect head and disc packs. Determine which heads and surfaces were involved in the crash. Check all heads and TOTAL pack library for possible spreading of a general crash problem.

B. Replace all damaged heads and disc packs.

C. Clean remaining heads.

1. If contamination cannot be removed, the head must be replaced.

2. Check head loading manually for correct operation.

15

RECOVERY: (continued)

D. Check absolute filter and disc pack filter for contamination. Replace it if necessary.

E. Clean disc pack area watching particularly for filings, shaved metal, plastic particles, etc.

F. In Steps F and G, the off line tester may be used. Mount a maintenance pack (not a CE pack) on the drive, turn power on and permit to come READY. Turn power off and check for oxide buildup on heads or other signs of head/disk interference. If satisfactory, turn power back on and run using the off line tester for at least 15 minutes. NOTE: heads being out of correct alignment will cause ERRORS. Try several different operations and correct any failure noted which cannot be ascertained to be due to incorrect head alignment.

G. Mount a CE pack and check and align all heads.

H. If original pack on which the crash occured does not appear damaged, mount it. Turn on power and permit to come READY. Turn power off and check for signs of head/disc interference. If satisfactory, turn power back on and ensure that the pack is dumped before proceeding to the next operation.

I. Check the pack and drive thoroughly using the disc pack diagnostics. It may be necessary to reformat the pack. Be sure to run Disk Data for at least 15 minutes.

J. Inspect heads for oxide after 12 hours of run time. If oxide appears, determine cause and correct. If no oxide is visible recheck in a week.

K. After one week, revert to PM schedule.

L. Unless all damaged packs and all damaged heads have been removed from the machines involved and the actual cause of the HDI is determined (when possible) and corrected, the problem WILL reoccur in a short period of time. Usually within a month.

16

Title	Head/Disk Interference	Tech Tip Number	CPL RK05-TT-10
Processor Applicability: All (8, 11, 15)	Author W. Linton	Rev 0	Cross Reference
	Approval	Date	

PREVENTION

A. Proper cleaning of R/W heads.

B. Insure air filtering system has no leaks and filters are clean, a dirty filter (drive filter) will cause contamination build up and excessive heating of the drive unit.

C. Insure no foreign particles are being generated within a drive due to wear caused by interference between disk and cartridge or between sector slots and index/sector transducer.

D. Careful handling of disc packs. Bumping of disc packs against cabinets or file drive front covers can bend the sector discs.

E. Careful examination of head loading during PM periods.

F. Disk packs should be stored in the computer room or similar environment. Cabinets that are clean and free of dust and made of metal or other fire resistant material are a good storage medium. Metal doors on such a cabinet will provide better protection.

REPORTING

A. Fill out a Field Service Report and appropriate site equipmeat log, giving the following information:

1. RK05 serial number.
2. System type and customer name.
3. Cause of damage (dropped pack, bent sector disc, HDI etc.)
4. Was permanently stored customer information destroyed?
5. Disc pack serial number and manufacturer.
6. Cylinder and disc surface damaged.
7. Location of R/W heads replaced (if any).
8. Date of damage.

"Data Errors" could indicate abnormal conditions and should be investigated accordingly. To determine whether the data error can be circumvented, move the pack to another drive and try again. If the operation on the second drive is successful and data erros are not experienced, continue with normal operation. If data errors continue, follow this procedure:

17

Title: Head/Disk Interference | Tech Tip Number: RK05-TT-10

Processor Applicability: All (8, 11, 15) | Author: W. Linton | Rev: | Approval: | Date: 7/12/73 | Cross Reference:

REPORTING: (continued)

NOTE: Successful recovery after trying on two drives is highly unlikely. Moving this suspect pack again and/or placing other packs on these suspect drives could cause a cascade of damage to other packs and drives since this type of repeating Data Error failure may be indicative of physical damage to the pack surface and/or drives.

Title: DISK DESTRUCTION MADE SIMPLE | Tech Tip Number: RK05-TT-11

Processor Applicability: All (8, 11, 15) | Author: Mac Sloan/Bill Linton | Rev: 0 | Approval: Jim Barclay | Date: 8/2/73 | Cross Reference: RK05-TT-10

See attached picture. Yes, the head in an RK05 (or similar) disk drive actually "flies" closer than a finger print smudge or large smoke particle -- let alone a spec of dust, flake of dandruff or a hair. This may give you some idea why, when you can write your name in the dust on the outside of the disk cartridge, you may get disk oxide building up on the white ceramic head. Oxide build-up on the heads causes improper head flight and ERRORS if your're lucky--CATASTROPHIC DESTRUCTION OF HEADS AND DISK if you're not. Keep the disk cartridge door shut and the disk in a clean bag or clean environment when not in the drive. And that's only dirt. There are other ways you can wreck a cartridge and/or drive; such as:

Title	DISK DESTRUCTION MADE SIMPLE		Tech Tip Number RK05-TT-11
Processor Applicability: All / 8 / 11 / 15	Author Mac Sloan/Bill Linton	Rev 0	Cross Reference
	Approval Jim Barclay	Date 8/2/73	RK05-TT-10

The small foil gimble spring which holds the white ceramic head to its support bracket is "tweeked" by the head manufacturer to ±1 degree so that the head will "land" properly on the boundary layer of air which spins along with the disk. Now, if you BEND the head in any way, you mess up this landing angle. When the head does not land right, usually one edge of the head "bites" through the air boundary layer and dings the oxide. Usually, the head will bounce and fly. Occasionally, however, known to us all, the head doesn't get up and fly -- it digs and burrows into the oxide, which happens to be moving at about 58 miles per hour.

The disk cartridge has other paths to glory. To my knowledge, no drive in the industry will accept a cartridge upside down. While this is a rather extreme case of an improperly seated cartridge, less obviously mis-seated cartridges will cause equally spectacular disk operation. *DO NOT FORCE the cartridge into (or out of) the drive and, unless you are Westfield assembly or Field Service, do not "realign" the cartridge receiver.

Finally, dinged disks and oxide build up on heads are rather like a social disease which may be transmitted by either disk or heads to other heads or disks. Fix the problem before mixing bad cartridges or drives.

SO: Disks, like jokes in the presence of ladies, should be kept clean.
Do not bend heads!
Do not rape the drive with the cartridge.
Do not mix bad disks.

digital

FIELD SERVICE TECHNICAL MANUAL

Option or Designator: CPL

12 Bit	16 Bit	18 Bit	36 Bit
[x]	[x]	[x]	[ ]

Title: DISK DESTRUCTION MADE SIMPLE

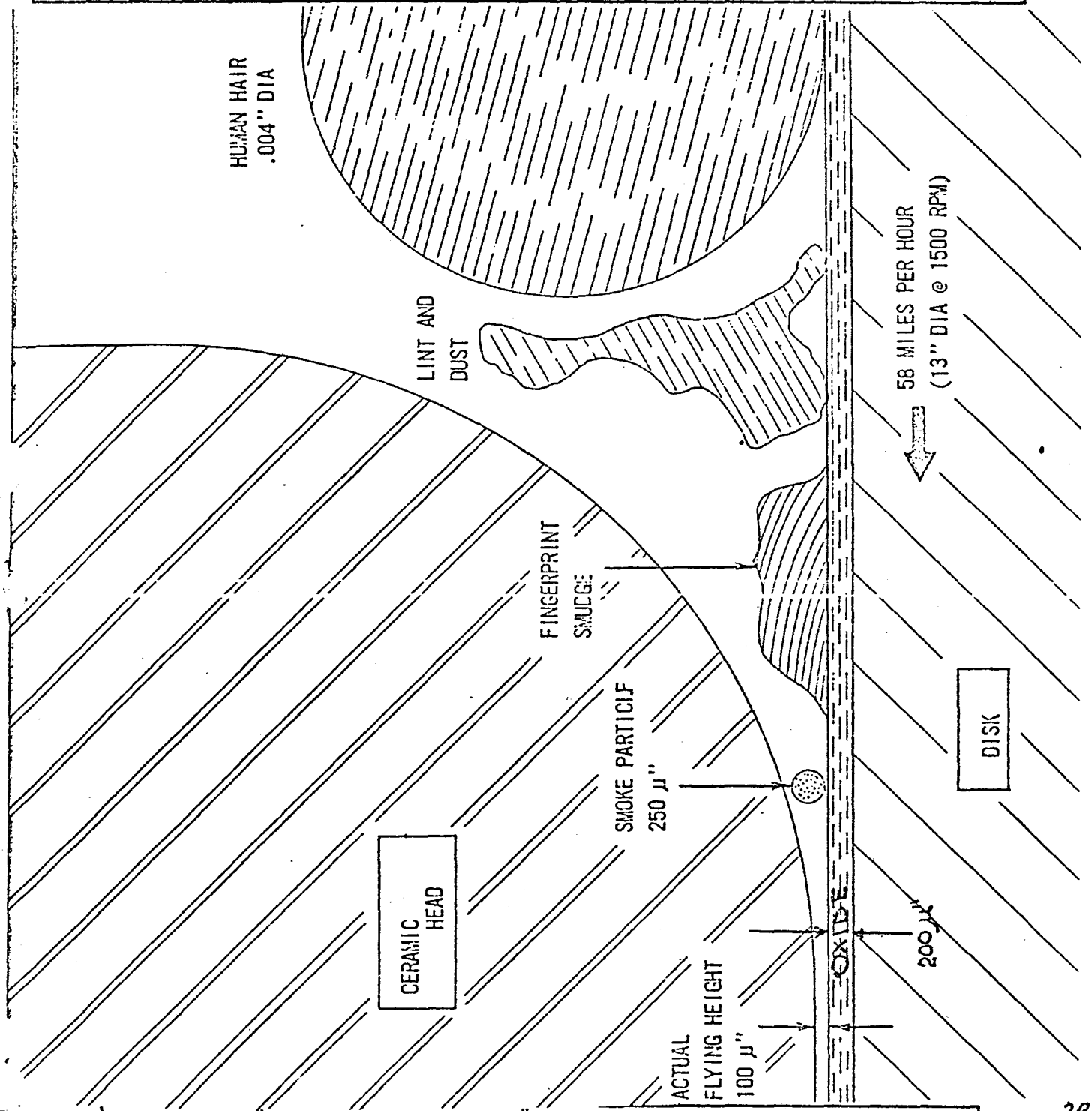
Tech Tip Number: RK05-TT-11

Processor Applicability: All (8, 11, 15)

Author: ANDY VEROSTIC Rev 0

Approval: JIM BARCLAY Date: 8/2/73

Cross Reference: RK05-TT-10



CPL

Title	INSTRUCTIONS FOR USING THE RK05K-AC ALIGNMENT CARTRIDGE		Tech Tip Number RK05-TT-12
Processor Applicability: All (8, 11, 15)	Author BILL LINTON	Rev 0	Cross Reference
	Approval ART ZINS	Date 8/2/73	

The following information describes how to do an RK05 head alignment and Index/Sector timing adjustment using the DEC made alignment cartridge (RK05-AC). These instructions will be included in the next update of the RK05 Manual, which will be about three months from now.

1. ALIGNMENT CARTRIDGE

Function

The RK05K-AC Alignment Cartridge provides three tracks (track 105 plus spare tracks 85 and 125) of constant frequency data with alternating sectors recorded at displacements of +2.5 milliinches and -2.5 milliinches from the ideal track locations respectively.

When a head is aligned to specification, the readback signal shows equal amplitudes for all sectors (as shown when the oscilloscope displays only two sectors and triggered by the SECTOR SIGNAL). The degree of amplitude inequality in alternating sectors is indicative of the departure from exact alignment. See figures 3 thru 9.

Sector timing data is included on these three tracks to indicate the head gap location relative to sector pulse detection. This data is represented by a single pulse 70 u sec nominal following the INDEX pulse and 10 u sec prior to the onset of head alignment data.

An additional feature of the alignment cartridge is its ability to indicate the degree of runout of the spindle. By triggering the oscilloscope on INDEX and displaying a complete revolution of the disk on the display, the head may appear to be aligned at a few sector locations while misaligned at others. Such a condition is indicative of the degree of wobble of the spindle. Figure 1 shows a display with negligible runout while Figure 2 shows a spindle with considerable runout. The amount of wobble can be determined by the amplitude differences occurring in any adjacent pair of sector boundaries by the same equations as used for head alignment. The acceptance criteria for spindle runout is to be determined.

21

ALIGNMENT CARTRIDGE (continued)

Alignment Cartridge Specifications

Alignment and Sector Timing Tracks:

Primary Track - 105
Backup Tracks - 85, 125

Recorded Frequency: Nominal 720 KHz

No. of Sectors: 12

Alignment Accuracy, track 105: ± 200 u in.

Alignment Accuracy, tracks 85, 125: ± 300 u in.

Sector Timing: Single pulse 70usec ± 1 usec following INDEX pulse.

Figure 1
Negligible runout

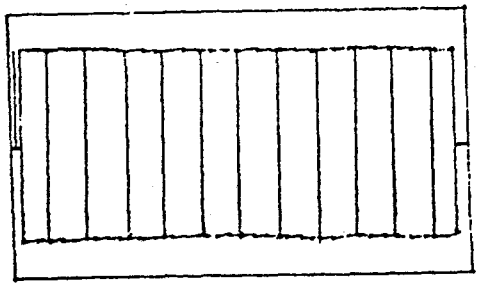
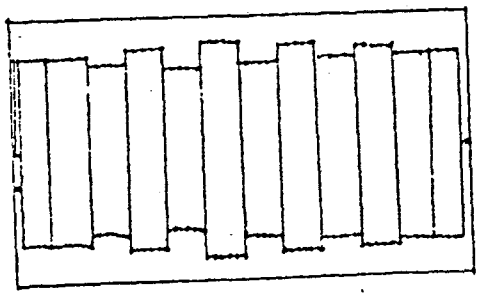


Figure 2
Considerable runout. NOTE: If this condition exists ensure that mating of spindle and disk are clean. Improper mating can cause such runout.



Title	INSTRUCTIONS FOR USING THE RK05K-AC ALIGNMENT CARTRIDGE	Tech Tip Number	RK05-TT-12
Processor Applicability: All / 8 / 11 / 15	Author BILL LINTON Rev 0 Approval ART ZINS Date 8/2/73	Cross Reference	

2. 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. See Step 9.

For a simple check of the head alignment, the appropriate on-line diagnostics may be used; however:

DO NOT ADJUST A HEAD THAT HAS LESS THAN 15% ERROR

REF STEP 11, THE FINAL ADJUSTMENT ERROR MUST NOT EXCEED 6%

To align or check the heads proceed as follows:

1. Unplug the drive AC line cord to remove power.
2. Disconnect the drive interface card from the electronic module 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 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 WTPROT switch, place the drive in the write protect condition.
6. Set the oscilloscope controls as follows:

2. READ/WRITE HEAD CHECK AND ALIGNMENT (continued)

```
vertical
    mode        =     ADD (invert CHAN 2)
    sensitivity =     20mV/div
    coupling    =     dc


sweep
    Asweep      =
    time        =     500 us/div
    trigger     =     normal


trigger
    source      =     external*
    coupling    =     ac
    slope       =     (-) negative
```

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

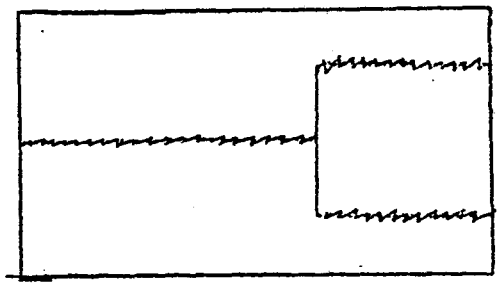
7. Connect the channel 1 probe to TP3 and the channel 2 probe to TP4 of the G180 card. (Use 10:1 probes).

8. Ensure that the positioner track scale indicates cylinder 00.

Figure 3

a. Error = -100%

Large misalignment. Head close to CYL 104. (Further misalignment only reduces signal on right of screen).



Title	INSTRUCTIONS FOR USING THE RK05K-AC ALIGNMENT CARTRIDGE		Tech Tip Number RK05-TT-12
Processor Applicability: All / 8 / 11 / 15	Author BILL LINTON	Rev 0	Cross Reference
	Approval ART ZINS	Date 8/2/73	

2. READ/WRITE HEAD CHECK AND ALIGNMENT (continued)

Figure 4

b. Error =-72%

Head considerably misaligned, Smaller left amplitude indicates head position less than CYL 105.

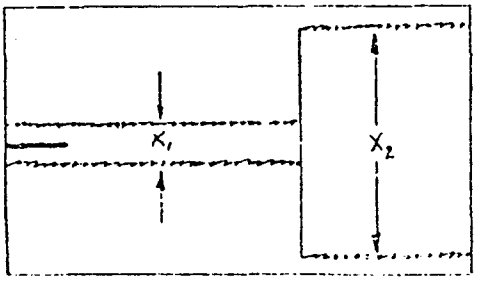


Figure 5

c. Error = -15%

Head slightly misaligned. Smaller left amplitude indicates head position less than CYL 105.

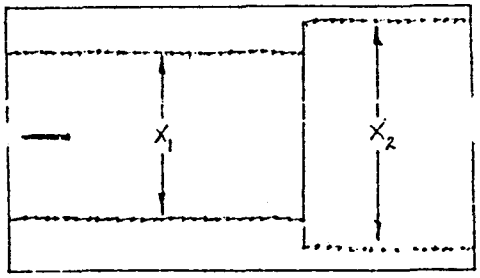
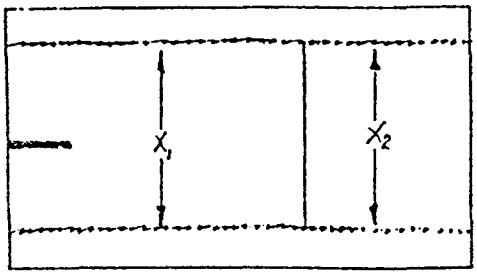


Figure 6

d. Right On

Head correctly aligned at CYL 105. Amplitudes are equal.



2. READ/WRITE HEAD CHECK AND ALIGNMENT (continued)

Figure 7

e. Error = +15%

Head slightly misaligned. Larger left amplitude indicates head position more than CYL 105.

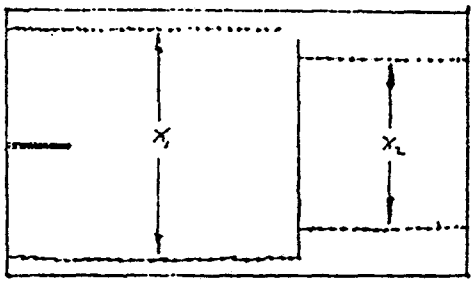


Figure 8

f. Error = +72%

Head considerably misaligned. Larger left amplitude indicates head position more than CYL 105.

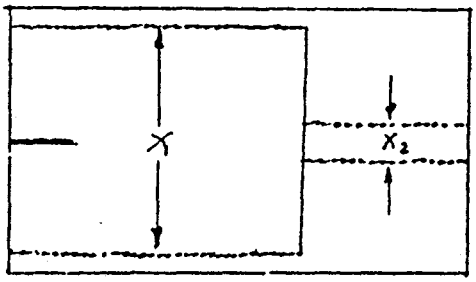
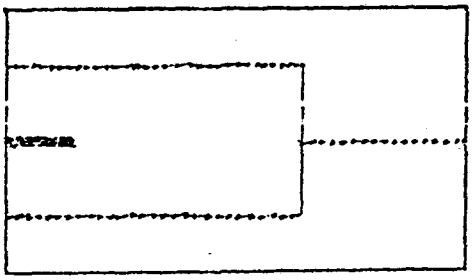


Figure 9

g. Error = +100%

Large misalignment. Head close to CYL 106. (Further misalignment only reduces amplitude of signal on left side of screen).



*To calculate % of error, use the following formula:

$$\% \text{ error} = \frac{X_1 - X_2}{X_1 + X_2} \times 100$$

Title	INSTRUCTIONS FOR USING THE RK05K-AC ALIGNMENT CARTRIDGE	Tech Tip Number RK05-TT-12
All Processor Applicability: 8 | 11 | 15	Author BILL LINTON Rev 0 Approval ART ZINS Date 8/2/73	Cross Reference

2. READ/WRITE HEAD CHECK AND ALIGNMENT (continued)

X_1, X_2 = amplitude and the resultant sign denotes the direction of error. A negative (-) sign indicates that the head is back too far.

9. Select cylinder 105 as follows:

NOTE: It is also possible to perform the following adjustments using the RK05 Exerciser or simple maintenance routines.

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)
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.

c. If the RK11/RK05 is still cabled to the processor cylinder 105 may be selected by: (1) Load address 177412 (the RKDA) and deposit 006440_8 (CYL 105) then (2) Load address 177404 (RCC5) and deposit 000011 (Seek and Go).

d. For RK8E/RK05, the following program may be used:

```
7000    BGN,    7201    /   CLA CLL
                6742    /   DCLR
                1212    /   TAD SEEK
                6746    /   DLDC
                7604    /   LAS (0-6 = cyl, 7 = surface)
                6743    /   DLAG
                6741    /   DSKP
                5206    /   JMP-1
                7402    /   HLT
                5200    /   JMP BGN
            SEEK,   3000    /   (Change bit 9 and 10 for drive other
                                    than 0)
Load Address        7000
Set S.R. to 6440 (for cyl addr. 105(10) physically lower head)
                (or S.R. 6460 for physically upper head)
Press CLEAR, then CONTINUE
```

10. Monitor the scope display for one of the waveforms illustrated in Figure 3 thru 9. Adjust the trigger level control so that the bright horizontal line appears at beginning of sectors displayed at left of screen. This indicates that these are odd sectors, while sectors displayed on right side of screen are even numbered sectors. The odd numbered sector amplitudes correspond to X_1, and even numbered, X_2 in equation for % error.

If none of the illustrated waveforms appear, the head is misaligned so badly that manual manipulation of the positioner is required. If manual manipulation is required, perform the following steps; if not, proceed to Step 11.

a. Place Switch S1 (on H604) in the down or off position.

b. Slowly move the positioner by hand until the alignment pattern occurs. CAUTION: Do not use any undue force on positioner when manually changing track positions.

c. Since cylinder 85 and 125 have identical patterns, be sure that the displayed pattern is for cylinder 105.

d. Observe the track scale and note the cylinder indication when the "right on" waveform (Figure 6) is obtained. If the scale indicates less than 105, the head is too far forward in the carriage. Conversely, if the scale indicates more than 105, the head is back too far in the carriage.

e. Loosen the clamp and adjustment screws (Figure 10) and move the head in the appropriate direction until the "right on" waveform is obtained and the scale indication is slightly greater than 105.

f. Lightly tighten the clamp screw and turn on the positioner power (S1 up).

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

28

Title	INSTRUCTIONS FOR USING THE RK05K-AC ALIGNMENT CARTRIDGE		Tech Tip Number RK05-TT-12
Processor Applicability: All / 8 / 11 / 15	Author BILL LINTON	Rev 0	Cross Reference
	Approval ART ZINS	Date 8/2/73	

11. If one of the illustrated waveforms is present, note the direction in which the head must be moved to obtain the "right on" indication. If the head must be moved backward, loosen the head clamp and adjustment screws and gently push the head all the way back into the carriage. If the head must be moved forward, loosen only the clamp screw, then turn the adjustment screw until the correct waveform is obtained. (The adjustment screw is a vernier which only moves the head forward and 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. If available, use a torque wrench (C-IA9605893-0-0) and tighten the head clamp screw until the wrench begins to ratchet (55 oz/in.). If a torque wrench is not available, use the appropriate Allen wrench to tighten the head clamp screw snugly, however, do not over tighten.

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

29

digital	FIELD SERVICE TECHNICAL MANUAL				Option or Designator
	12 Bit [x]	16 Bit [x]	18 Bit [x]	36 Bit [ ]	RK05

Title	INSTRUCTIONS FOR USING THE RK05K-AC ALIGNMENT CARTRIDGE			Tech Tip Number RK05-TT-12
Processor Applicability: All / 8 / 11 / 15	Author BILL LINTON	Rev 0		Cross Reference
	Approval ART ZINS	Date 8/2/73		

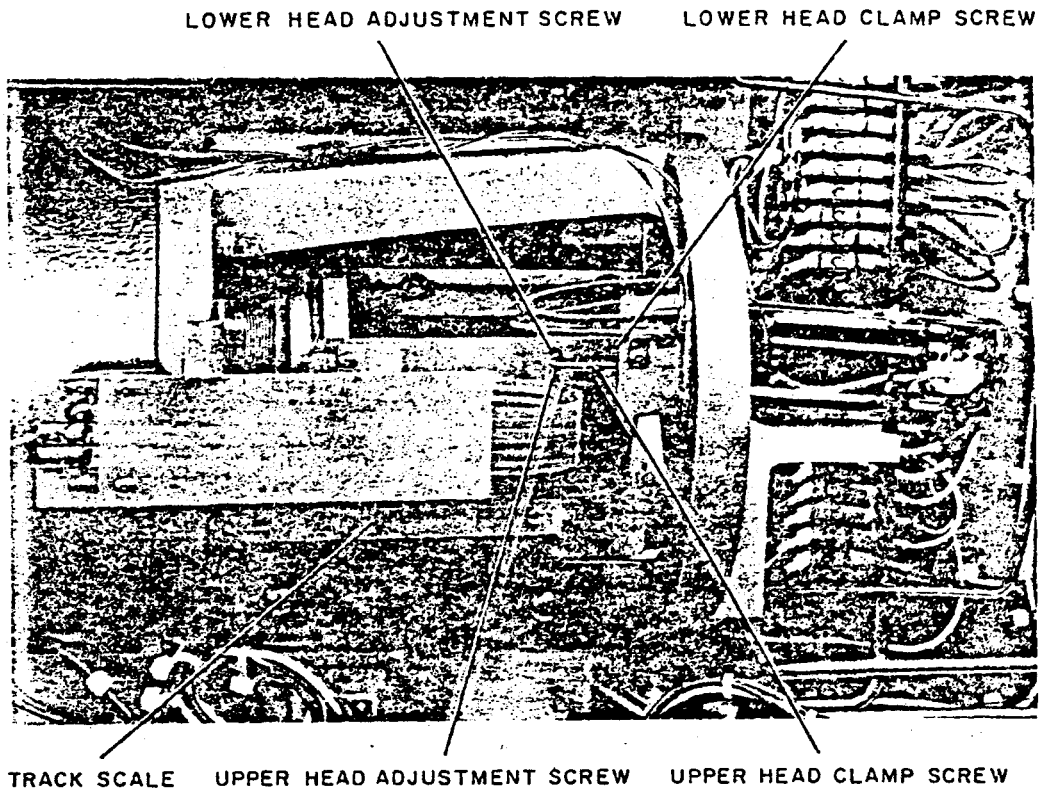


Figure 10
Read/Write Head Adjustments

Title	INSTRUCTIONS FOR USING THE RK05K-AC ALIGNMENT CARTRIDGE		Tech Tip Number RK05-TT-12
Processor Applicability: All (8, 11, 15)	Author BILL LINTON	Rev 0	Cross Reference
	Approval ART ZINS	Date 8/2/73	

3. INDEX/SECTOR TIMING ADJUSTMENT

NOTE

Heads must be aligned to track before checking sector/index timing.

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 apply power to the drive and cycle 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 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	=	0.2V/div
coupling	=	dc

sweep

A sweep		
time	=	5 MS/dv
trigger	=	normal

trigger

source	=	external*
coupling	=	ac
slope	=	-

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

31

3. INDEX/SECTOR TIMING ADJUSTMENT (continued)

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.

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)
A04V1	SEL/RDY L^{105}

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.

10. Monitor the scope for a single pulse followed by data beginning 10 us following the pulse.

11. Expand the sweep time to 10 us/div and check that the single pulse occurs 70 $\pm$ 10 us from the start of the sweep (figure 11).

12. Ground B08M2 to select the upper head and check for the same pulse tolerances as step 11. If necessary, adjust R6 on the M7700 card (card position 2) until the average time for the two pulses is 70 us and the 70 $\pm$ 10 us individual pulse requirement is maintained. If these requirements cannot be met, go to step 13 or 14.
DO NOT BEND THE HEADS!

32

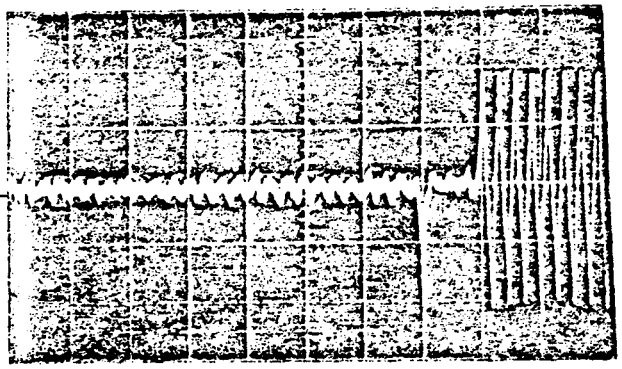
13. If R6 does not adjust the average of the two pulses to 70 usec, perform the following:

    A. Loosen the sector transducer screws.

    B. If the average of the pulses is greater than 70 usec, move the transducer towards the airduct, if less than 70 usec move transducer away from the airduct.

    C. Tighten the screws and perform steps 11 and 12.

14. If the time between the two pulses is greater than 20 usec, one or possibly both of the heads must be replaced. DO NOT BEND THE HEADS. The head to be replaced can only be found by trial and error.



PIN =TP3&TP4
SWEEP =10 us/div
VERT SENS =0.2V/div

Figure 4 Index/Sector Waveform

33

digital	FIELD SERVICE TECHNICAL MANUAL				Option or Designator
	12 Bit [X]	16 Bit [X]	18 Bit [X]	36 Bit [ ]	RK05

Title	ECO'S 36, 37, 39 and 41 GENERAL INFORMATION							Tech Tip Number RK05-TT-13
Processor Applicability								Author BILL LINTON / A. VEROSTIC	Cross Reference
All	8	11	15					Approval ART ZINS Date 8/15/73	

The purpose of this Tech Tip is to describe the Inter-relationship between RK05 ECO's 36, 37, 39 and 41.

These four ECO's will solve some of the cartridge seating problems that are being experienced with RK05's. Specifically they are:

1. Two tone cartridges that do not seat properly (difficult to insert or platter rubs on cartridge case).

   ECO # 37 adds a new Duck Bill to fix this.

2. Cartridge door opener slips underneath the access door flap thus trapping the cartridge in the drive.

   ECO # 36, by adding a rubber sleeve, raises the door opener so that now it should not slip under the flap.

3. Cartridge door opener slips off the access door so that the door tries to close when the cartridge is seated.

   ECO # 39 causes the door opener to have greater tension against the door by adding two new springs to the door opener. Because of the new springs, ECO 41 adds a second rubber sleeve under the door opener to keep it from twisting.

Additional comments on the ECO's follow:

ECO # 36

1. No additional comments.

Additional comments on the ECO's follow: (continued)

ECO # 37

1. The new duck bill installed by ECO # 37 can be recognized by the fact that the DEC part number and rev (12-10744 Rev C) is molded on the part. Therefore, you can easily recognize a drive that needs ECO # 37.

2. The addition of the new cartridge posts is for industry specification conformance. The new posts can be recognized by the fact that Rev "B" is stamped on them.

3. A new airduct and gasket are not to be installed and therefore, will not be shipped with the kit.

4. The following is the procedure for installing ECO # 37. It is included in this Tech Tip for your convenience, a copy will be sent with the ECO kit.

   4.1 Power down the RK05.

   4.2 Remove top and bottom covers.

   4.3 Install revision "B" cartridge support posts.

   4.4 Install Rev C duck bill.

   4.5 The cartridge receiver alignment procedure as printed in the Maintenance Manual stays in effect. The two types of cartridges presently in use (all white and two tone are also slightly different in height, i.e., the two tone one is generally lower than the all white ones. In some cases the cartridge receiver might be too tight to insert the all white cartridge. This of course has the effect that the cartridge gets compressed somewhat which reduces the internal clearance.

4.5 (continued)

If cartridge receiver is too tight, i.e., considerable force is needed to insert the cartridge bend it open so a white cartridge slides in easily (this is only to be used as an emergency procedure). Do not get disturbed by the fact that two tone cartridges have a lot of vertical play inside the cartridge receiver. After alignment of cartridge receiver, make absolutely sure there is about .010 to .040 inch clearance between the bottom of the cartridge and the two longitudinal rails of the cartridge receiver at a point close to the linear positioner (dimension "A" on page 5-36 of Maintenance Manual). Note the manual defines .020 to .040 inch. The cartridge, when resting inside the drive is suspended by three points: two support posts and the lower slot of the duckbill. The only purpose of the cartridge receiver is to guide the cartridge into position and to apply vertical pressure to the cartridge when it is seated. The cartridge receiver is not supposed to restrain the cartridge in any way. It has to give the cartridge freedom to assume the three point location, hence, clearance "A" is needed underneath the cartridge.

ECO # 39

1. When 39 is installed, ECO 41 must also be installed.

ECO # 41

1. If ECO 39 and 41 are installed there is no need to order ECO 36 since ECO 41 will be sent with two rubber sleeves DEC P/N 7411271, thus 41 incorporates ECO 36.

It is anticipated that the parts for these ECO's will be available by the first week in August.

36

CPL

Title	ECO'S 36, 37, 39 and 41 GENERAL INFORMATION	Tech Tip Number	RK05-TT-13
Processor Applicability: All (8 11 15)	Author BILL LINTON Rev 0		Cross Reference
	Approval ART ZINS Date 8/15/73		

Please note that all four of these ECO's could be installed at the same time. Since there is no major disassembly or extensive parts installation required in any of these four ECO's, it is recommended that all four be installed at the same time. Alternatively ECO 36 or ECO 37 or ECO's 39 and 41 may be installed at separate times. Your choice is naturally going to depend on your particular situation.

If you have any further questions about this Tech Tip or the four ECO's, please call Bill Linton or Andy Verostic in Maynard at extensions 3242 or 2916.

37