RK05

digital INTEROFFICE MEMORANDUM

TO: LIST

DATE: SEPTEMBER 18, 1973

FROM: ANDY VEROSTIC

DEPT: FIELD SERVICE

EXT :

SUBJ: RK05 DISK PACK SEMINAR

Enclosed is the summary of information discussed at the recent seminar. It's accuracy has not been verified by Disk Engineering but as soon as it is, an addendum will be generated, if necessary.

I want to apologize for any lack of descriptions on certain topics but I felt it was far better to just touch on all the topics discussed in as quick a fashion as possible to expedite the release of this document (I also didn't want to put some of you guys to sleep).

If any errors are discovered please inform me at X4180 so I can pass it along to the others involved.

Thank you for your attendance and understanding, I hope the seminar was informative to all.

Regards,

Andy

AV/sg
Attachments

P. S. Distribution of this summary should be handled discreetly due to its lack of description. This document is intended only as a guide for those present at the seminar to use in their updating of field personnel.

LIST

TRAVIS BRANDON - CENTRAL REGION
JOHN TOTHLINE - MID-ATLANTIC
NICK MEYER - GENEVA
KARL-GUSTAV-RUDELS - SWEDEN
JIM R. MCKENZIE - WESTERN REGION
MAX BUCHER - SOUTH GERMANY
CHUCK DOUGLAS - KANATA
REG BURGESS - GENEVA
DENNIS SULLIVAN - N. E. REGION
TOM SPEAKE - TRAINING (MAYNARD)
JIM WALSH - F. S. MAYNARD
DICK CARUSO - DISK ENGINEERING
MAC SLOAN - DISK ENGINEERING
ROGER LAWSON - DISK ENGINEERING
BRIAN FTIZGERALD - CENTRAL 11 ENGINEERING
ART ZINS - FIELD SERVICE MAYNARD
BILL DIMBAT - FIELD SERVICE MAYNARD
VENUGOPAL - DISK ENGINEERING
BILL LINTON - FIELD SERVICE PRINCETON
KEN QUINN - FIELD SERVICE MAYNARD
JIM BARCLAY - FIELD SERVICE MAYNARD
GUENTER SCHNEIDER - DISK ENGINEERING
GRANT SAVIERS - DISK ENGINEERING

DISK PACKS

AVAILABILITY

$14K was spent on Priority 1 orders during Q4 of the last year. All offices should have on hand a DEC CE pack, 16 sector scratch pack and a 12 sector scratch pack.

TYPES OF PACKS

Packs can be recognized as follows:

*BASF - Serial number is prefixed by "B"

CFI - Silver label for serial number

*3M - Serial number is prefixed by "L"

Nashua- Name present on serial tag.

* DEC approved packs - non approved packs will not be replaced by DEC if damaged by drive. Some are non approved simply because we have not yet evaluated them. A list of legal packs will be generated in the near future.

PACK HANDLING

1. The cartridge itself is very vulnerable since it is not a sealed cartridge. Care must be taken to keep it clean. It should at no time be carried in the trunk of one's car. The trunk is too dirty and the shock from the ride can cause the disk to move around inside the shell and chew up the retainer button. Always carry it on the front seat of the car.

2. Customers must be educated at installation time about the damage a dirty cartridge can cause to his system. Packs should always be stored in a plastic bag when not in use to avoid contamination. Some packs, after long usage will not close completely and become even more succeptable to dirt.

3. Pack should be handled only by the front to rear axis, never on the side. If it is grabbed by the side, which has the air vent it is:

   A. Possible to break vent loose if plastic rivets are used.

   B. Since vent is flexible steel, it may come in contact with disk surface.

PACK HANDLING (continued)

Underside metal of cartridges can become uncomfortably hot in some environments. Hold the pack by the handle only! Dirt build up on spindle surface and pack bottom can result from handling bottom of cartridge.

PROBLEMS

Plastic rivets on air vent - Plastic rivets used to hold on the air vent on the cartridge are acceptable only if cartridge is made by Dynamit Nobel (Identified by two tone pack). Centron plastic rivets are no good. (Identified by all white pack).

Round head screws inside the pack connecting the disk to the hub can cause a problem of the screw rubbing on the cover. The screws should be a philister head type screw but round head screws can be considered good as long as there is no contact between the screws and cover.

Cartridges which have been in use for some time may have a problem where the access door takes a set and will not close completely when removed from drive. Caution must be taken to insure this pack is kept in a plastic bag to insure no contamination takes place. Also, these cartridges should be checked to insure that when the door is opened the plastic retainer button is lifted up out of the way to avoid contact between it and the disk when it is spinning.

CUSTOMER HANDLING AND PACK CLEANING

At installation all customers must be made aware of the disasters which can result if their pack are not kept clean. It must be stressed such that if they don't they will be liable to experience head crashes, ruined packs and costly down time. This must be done discreetly and insure to the customers this is not a DEC problem, but rather an industry wide problem. Recommend to him periodic inspection and cleaning (if necessary) of his library at periods not exceeding 6 months. DEC does not clean disk pack libraries. A list of cleaning services is attached to the recommended cleaning procedure.

CUSTOMER HANDLING AND PACK CLEANING (continued)

Pack cleaning services usually run between $8 and $9 per pack and is a cheap price to pay to insure continued error free running. This price does not include pack refurbishing if it is necessary.

If it becomes necessary to clean a customer pack, we do this only when in an unavoidable situation, follow the enclosed procedure. The surface of the disk is an epoxy saturated with rust particles and is very sensitive to water. The epoxy will absorb water and become damaged. Under no circumstances should the disk ever be cleaned with water.

Discolored surfaces may not mean a disk pack is bad, as long as it does not deposit oxide on the heads it is okay.

Disk packs should not be handled in such a way that your fingers can come in contact with the disk surface. The enclosed memo entitled Disk Destruction Made Simple may shine some light on this subject to all non believers. Always insure sector/index slots, and spindle mating surfaces of pack are clean. A very small amount of dirt can cause large runout errors.

CPL

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

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

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.

...RUCTION MADE SIMPLE

Tech Tip
Number RK05-TT-11

Processor Applicability							Author ANDY VEROSTIC	Rev 0	Cross Reference
All	8	11	15				Approval JIM BARCLAY	Date 8/2/73	RK05-TT-10

RECOGNITION OF BAD PACKS

This is a judgement situation but there are a few obvious things that can definitely define a pack as bad.

1. Pack that causes continuous oxide buildup on the heads is bad.

2. Pack which has metal surface showing (Oxide coating worn away) is bad.

3. Packs with broken or loose rivets on air access door are bad along with aforementioned plastic rivit packs.

4. Packs with marks such as comet tails (a mark with a trailing scratch usually caused by particles being thrown from surface) may or may not be bad, again a judgement situation dependent upon whether oxide buildup occurs or if it works or not.

5. Packs with retainer button chewed up may or may not be re-usable depending upon the ability to remove shavenings and cause for button to be chewed up to begin with. If both are resolvable and the pack appears useable, the only judgement left is whether it works or not.

CE PACK

DEC CE packs and IBM CE packs are the only two acceptable alignment cartridges. However we are presently phasing over to DEC only, for the following reasons:

IBM is a low density pack and requires use of shim for alignment.

DEC CE packs is designed to be used with our heads and thus is more accurate. It is also easier to use and allows checking for run-out.

Some points regarding alignment which are worth mentioning:

1. Temperature stabilization of unit and pack (30 min) must be done prior to alignment. It is felt it is not being done and therefore a number of recalls on alignment problems.

2. Index/Sector timing should be checked prior to head alignment when incompatability is discovered.

3. Dirt on spindle/disk mating surfaces can cause excessive runout problems and should be cleaned and rechecked prior to starting alignment when a pack cannot be read.

CE PACK (continued)

4. Alignment should only be done in temperature ranges of 60-80° F.

5. Alignment should not be needed unless a greater than 15% error is seen using DEC CE pack (35 u "/%) or 50% if IBM CE pack is used (10 u "/%).

6. Index timing pulse can be either polarity due to winding in head may be either way.

7. Index/sector adjustment is to be done so the average of both is 70 usec. Not so that either one falls within the 60 to 80 usec range. 60 and 65 is not acceptable and 70 and 75 is not acceptable. 72.5 and 68.5 are acceptable.

8. Care must be taken when doing head alignment not to exert excessive force on the positioner assembly when tightening or adjusting head screws because it is possible to damage the bearings with too much force.

9. Triggering for IBM pack is on INDEX. For the DEC pack it is on SECTOR. Use of sector with DEC CE pack allows for average alignment of all sectors. Trigger on INDEX for DEC CE pack when checking runout only.

10. Handle CE Packs with care.

11. Early version drives had the sector/index timing set to 30 not 70 usec. This can cause a compatability problem if a newer drive is added to an older one which had the time set at 30.

12. Bending of heads is not allowed for any reason what so ever.

If a head adjustment or related adjustment cannot be made because the heads are too far out, replace the heads, do not bend them. Other things which can cause incompatability between two drives are:

A. Lightly loaded heads (RK03's with serial numbers up to 5000 are suspected of having lightly loaded heads).

B. Improper write current.

C. Low P. S. voltages.

D. Woobly disk spindle.

E. Dirty Packs.

F. Head cables reversed in one drive.

HEAD ALIGNMENTS

Due to the number of tolerances in the mechanical circle between the pack which rides on a spindle, which is mounted on the base casting, which in turn holds the linear tranducer, which relates to the voice coil assembly, which in turn holds the heads, which determines the area of the cartridge being read, the head alignment becomes a major adjustment in determining the final position of the head relative to the disk surface.

A few points on head alignments should be noted:

1. Heads should always be clean before alignment is started.

   A. This can be done with cleaning kit supplied, but only wrap the Texwipe around the wand one time - more than once may cause damage to head because it will be too thick.

   B. Support the little box on the head very gently with finger to avoid damage to gimbal when cleaning.

   C. If scrubbing action is required to remove a dirty spot leave the Texwipe protrude beyond the tip of the wand so that a corner of the wand can be used for scrubbing.

   D. It is a good idea to go over the head with a clean kimwipe as soon as it is cleaned to remove liquid before it does and forms a film on the head.

2. When doing head alignments or adjustments, it is a good idea to hold the head assembly while releasing the servo switch. It was found that the switch may cause a noise spike to be injected into the servo system causing the head to fly forward at full speed. Light pressure on the assembly when releasing the switch will prevent this.

   It was also noted that if you have fat fingers you can touch the I.C. adjacent to the switch and cause the same action - BE CAREFUL.

3. If it becomes necessary to load the heads on one another, it is advisable to place a piece of paper between the heads to prevent the R/W elements from grinding against each other.

HEAD ALIGNMENTS (continued)

4. Head locking screws now have a nylock insert which prevents their moving once tightened. They are reusable up to about a dozen times. When initially inserting the screws it is good to run the nylocks screw thru the head clamping hole completely (without a head in) to cut the nylock and prevent additional torquing when clamping the screw to the head. This becomes even more necessary once the head clamping torque wrenches are available.

5. Head adjustment screws should be backed off after locking so not to apply forward pressures to head assembly.

6. Insure track indicator scale is aligned prior to using it in head alignment (If you use it).

7. Some old positions are present in the field and contain 6/32 screws for clamping screws. Do not lose these screws as they are no longer being stocked. New screws with nylock inserts are 8/32. The way to identify old positioners are that the front and rear screws are the same size (6/32). The new positioners have 8/32 clamping and 6/32 adjusting screws. The adjusting screws have a different taper on the tip than the clamping, therefore the adjustment ones (6/32) cannot be used as old clamping screws.

8. At one point in time the head tailpiece was ECOed. New heads have machining marks on the shoulder. The new heads will fit in the aforementioned old positioner however, the old heads will not fit into the new positioners.

9. It has been found that occasionally it is necessary to file the upper head tailpiece in order to pass the head clamping screw thru to the bottom head. This phenomenum may be due to the linear tranducer positioned too far forward. However, since it is easier to file the tailpiece than move the Xducer, make sure that if it is filed, it is completely deburred or else replacement and subsequent removal will be very difficult.

10. When heads are realigned or removed and replaced, note if there are any "pits" or "Dings" in the clamping area, it may be necessary to file these down before insertion of the head because the clamping screw will slide back into these pits, making realignment very difficult. It may even tend to drift into these "pits" after a period of time. The same holds true for the adjusting ramp.

11. Very early machines did not have the Blue Cylinderical capacitor mounted on the power supply because there was a higher amount of friction between the heads and older duckbills. Should you change one of these duckbills it may be necessary to add the capacitor ECO (H743-0001). The problem will show up as the heads oscillating in the home position. (Misadjusted home switch can also show this problem on any machine).

12. A large number of head alignments in the field may have been due to the positioner housing moving in shipment, due to insufficient torquing of the holding screws. As of serial number 7650 torque wrenches have been incorporated into production. These will also be put in the field in the near future, probably on the regional level.

13. Some machines experience the problem of the low amplitude from the heads getting hung up on the duckbill ramp. The REV C Duckbill has the ramps shaved to alleviate this problem.

HDI

This is a very questionable area and not all the facts about it are known, but some discussion is necessary; some information must be passed onto customers.

Customers must be made aware of the danger of a dirty disk pack that if a head does crash, don't use that pack in another drive nor any more packs in that drive. This education must happen at installation and be spread by customers to fellow workers. Some new packs "ting" the first time a head is passed across its surface. This "tinging" will cease after the first pass or so. If not, the pack is bad.

Heads with oxide buildup are not always bad. Even burned on oxide is not always bad. The dangerous areas are the R/W element and the epoxy around the R/W element which holds it in. This is not to say that heads with oxide on spots other than those mentioned are good but that the R/W element and surrounding epoxy are the most critical areas. This is a judgement effort on the part of the servicemen and since we have no method of measuring this profile of the head in the field, it will remain a judgement situation. Oxide buildup should not be ignored but rather the cause should be traced... usually to a bad or dirty disk pack sometimes to a bad head, improperly seated cartridge or other. Small amounts of build up over a long period of time may not be dangerous...in this case, heads should be cleaned and pack reinserted to insure there is no continued build up. If a number of packs are involved it should be suggested to customer that he have his library checked by an appropriate disk cleaning service. Head warranty for use of non DEC recommended packs is under discussion and being worked on by the legal department.

HDI (continued)

There are no hard and fast rules on HDI to date and the best way to lower the number of head crashes is by making everyone aware including customers, to what can happen if packs are not kept clean and what to do if a crash occurs, that is, not to spread it around but rather stop usage of both the pack and the drive on which the crash occurred.

CARTRIDGE SEATING

There have been numerous cases of cartridge not seating correctly on the two posts when inserted in drive, the pack being hard to insert in the drive, access door falling off opener and disk pack getting stuck inside the drive due to opener bail catching underneath the access flap.

A number of the above problems have been cured by a group of ECO's to the RK05. The others are curable by the proper alignment of the cartridge receiver.

First the ECO's...Some two tone cartridges, those with a white access door and grey shell made by Dynamit-Nobel (the shell, that is) have a stiffer plastic substance. This is due to no national standard on the disk pack and thus the molds can be of various thicknesses.

On some two tone cartridges, it was found that they will not seat properly or are hard to insert. ECO # 37 adds a new duckbill (Rev C) to guide cartridges more gently and into slightly different positions.

Some packs have access doors that do not shut completely and when they are inserted, the door opener slips underneath the access door flap trapping the cartridge inside the drive. ECO 36 and 41 add rubber sleeves to raise the bail which opens the cartridge door so it no longer can slip under the door.

Some cartridges, noteably 3M, have thinner lips where the bail on the opener grabs the lip and thus they tend to slip off, closing onto the duckbill and possibly moving the retainer button inside the pack to a point where it comes in contact with the rotating surface. ECO # 39 adds two stronger springs to provide the door opener with greater tension against the access door.

New cartridge posts (Rev B) are added by ECO 37 to conform to industry specifications. ECO's 36, 37, 39 and 41 should be installed together as they are all inter-related to pack seating problems.

CARTRIDGE SEATING (continued)

The aforementioned two tone cartridge was not shipped by DEC while these problems were being resolved, however, it is now being shipped and all drives must receive these ECO's. The final result in a pack seating and door closing problem can be a head crash and maintenance cost can be quite high. Don't forget...that also may mean warranty and contract costs to us.

Cartridge receiver alignments may well be necessary for a period of time since a lot of receivers were apparently incorrectly aligned before shipment. This is now being corrected by use of a device which simulates the cartridge in this alignment in Production.

Basically the receiver alignment consists of 7 points of contact and three clearance points. The first thing to be remembered is that the receiver is not a holder of the cartridge but rather a guide for it. If it is too tight the cartridge will not seat properly. The pack is positioned inside the drive on the two cartridge posts and the lower lip of the duckbill it should not be resting on, nor be squeezed by, the cartridge receiver.

The 7 points of contact are:

Two thin rails should touch evenly all along the length of the top of cartridge.

Two cartridge posts in front of drive.

Door opener bail

Spring at rear top of cartridge

Duckbill (lower lip)

The four points of clearance are:

(2) Fat rails on top of cartridge.

The four crosspoints on underside of cartridge.

Pivit posts and receiver hinge bail.

The position of the pivot posts determines how the top rails ride on the cartridge and the bottom clearances of the 4 crosspoints and underside of cartridge. When tightening these posts it will be necessary to hold their position with an open face wrench while securing the bottom nut with a 1/2" socket wrench to prevent it from shifting.

CARTRIDGE SEATING (continued)

Some older machines have the cartridge receiver tension springs tied to a bracket on the top side of the baseplate. This has been changed to tie to a bracket on the underside of the baseplate to provide more tension on the cartridge receiver.

One check of correct alignment is to see that if the pack is inserted slightly cocked that it is repositioned and free to slide correctly onto the posts when the door is closing.

If a pack will not seat on the left post insure the receiver is not pushing it to the other side along the top rails. Clearance is allowable on the top of cartridge and is sometimes necessary for proper seating of both thin and fat packs. The main thing is to remember in these alignments is for the pack to be able to slide easily.

POSITIONER

A few points worth mentioning on the positioners are:

There are precision surfaces on the positioner and spindle - when replacement is necessary be very careful not to bang it around or drop it.

When one is replaced, insure it is returned in the same box the new one arrived in, otherwise it will be damaged and not reworkable.

The glass slide attached to the linear transducer is not field replaceable. It must be aligned parallel to the motion of the carriage, i.e., matched to the carriage, bearings and ways and requires a special fixture. If the slide is damaged, the complete positioner must be replaced. The photo cell tranducer can however, be replaced.

Positioners do make audible noises while in operation due to the fact that they operate in an audible range.

There are plastic tires which are used in the positioner which the voice coil assembly rides on. These tires tend to develop a flat spot when remaining in one position for a period of time. It is most noticable in the track 180 area since this is one complete revolution of the tire from the home position. This is not a problem but should be noted when checking for positioner binding or rubbing. The flat spot will go away after the carriage assembly has been moved back and forth a number of times. Bad bearings in the wheels have been mistaken for the flat spot in failures occuring around track 180. All cases to date have proved to be bad bearings.

POSITIONER (continued)

The coils in the positioner assembly should at no time rub against the magnet hold pieces.

BELTS

There are some older belts which stretch excessively.

There are two approved vendors for new belts:

1. Walters Belting Industries

   These belts are marked W12 10812

2. Arthur S. Brown

   These belts are marked 3/8 x 16 1/8 medium super speed 9-39A

The belts marked - 3/8 x 16 1/8 J SPEC 607 5-1A have been obsoleted and should not be used for field replacement.

Do not stretch the belt when replacing it. Do not push motor mounting plate with your thunb, it stretches the belt.

MOTORS

There are four types of spindle motors in use today:

1. GE KH19FG-150 which has no thermal protect.

2. GE KH19FG-150T which has thermal protect but is set too low. Can be used in 60 cycle machines only.

3. GE KH19FG-150AT which has thermal protect which is set correctly and can be used in 50 and 60 cycle.

4. Robbins and Meyers KSG330 BOL which has thermal protect set correctly and can be used in 50 and 60 cycle.

Motors 1 and 2 must be replaced if drive is converted to 50 cycle.

However, in retraction to the above mentioned statement, a problem was discovered in incoming inspection very recently and it is too soon to be sure it exists everywhere. The problem is that the GE motors were found to have the thermal cutout below spec. Thus, in very hot environments, they may not start due to the low thermal cutout. It is not likely to show up unless the room temperature is approximately 110° F. All GE motors are suspect at this time and if you have a customer whose environment is quite warm and is exhibiting this problem, replace the motor with a Robins and Meyers motor.

MOTORS (continued)

Blower motor removal requires a longer Hex wrench then available in tool kits. 3/16" hex with a 6" shaft will be added to the RK05 kits.

50 cycle blower motors will heat up more than 60 cycle so be careful.

RK03 note not RK05, spindle motor shafts are isolated from the spindle and dirt accumulation on the top of the spindle cone between these two surfaces can cause random errors. Worth checking on a PM.

TOOLS

Branch RK05 kits aren't sufficient with the volume of drives being shipped. All branches should have modules, heads, CE packs, 16 sector scratch pack and 12 sector scratch pack.

The following tools are being added to the District RK05 kits:

1. Torque wrench for head clamping 55 in ounces (DEC 96-05893)
2. Head holder (DEC 93-05667)
3. 3/16" hex with 6" shaft for blower control removal
4. Positioner Housing Torque wrench 65 in pounds will be stocked at a regional level.

These wrenches must be set to required torque. When the set torque is reached, the wrench clicks and moves freely through a few degrees of arc. It is then possible to continue applying torque in excess of the set torque. Don't do it! Release the torque wrench and it will automatically reset itself to click again at the set torque. Don't over torque. Instruct your people.

ECO's

In addition to the aforementioned mechanical ECO's, new ECO's of note are:

ECO # 6 to the M7700 making it Rev L or later versions of M7700, require ECO #6 to the G180. That is if you swap a old M7700 with one at Rev L or greater you must install ECO G180 #6.

ECO'S (continued)

ECO G938 #0006 stabilizes the servo adjustments and minimizes drift to within spec.

ECO G180 #0007 cuts selectable resistors in module test for data separator thus removing two pots.

ECO M7700 #5 requires Sector Timing to be adjusted.

A guard is being added to the red ramp to insure it does not light up when adjacent lights are lit.

Attached is an ECO summary of all presently released ECO's to date.

DIAGNOSTICS

RK11 diagnostics are being rewritten. If anyone has a list of deficiencies of old version or ideas for the new ones, send them to me.

These will be released sometime around December and will include a Static (or logic) Test Dynamic (Data-Address) Test Performance (Random Exer) and a Utility Package to include such features as a standalone format routine, compatability test, etc.

The new revisions of the older diagnostics required MCN's. Make sure the guys are aware that DZRKB has its deficiencies.

Attached is a acceptable error rate chart for field use for PDP-11 GTP and RK11 Disk Data.

RK05 ECO COMPILATION

E.C.O. NUMBER	DESCRIPTION	AFFECTIVITY
RK05-00001	Various dimensional changes	Non Field Service
RK05-00002	Bus terminator not listed on the module utilization drawing.	Non Field Service
RK05-00003	Dimensional changes carriage machining, front logo	Non Field Service
RK05-00004	Improper wire lengths exist to connect to proper termination points on ground and AC low L wires	Non Field Service
RK05-00005	Incorrect wiring from P1-7 and P1-8 on print E-1A-7008705 Shrink tubing missing on points 37-51 on print E-1A-7008705	Non Field Service
RK05-00006	Terminator module and unibus cable connector may not be interchanged in module position since +15V is not parrallel wired between the two module positions connect +5 from A7-A2 to A8-A2 and B7-A2 to B8-A2	Non Field Service
RK05-00006A	+15VDC and -15VDC bus connection on (A) half of connector position 5 is missing add strip from A4-B2 to A5-B2 and continue strip at A4-D2 to A5-D2.	Non Field Service
RK05-00007	Noise from power supply affecting adjacent wires in cable harness twist HI and LO input pairs of regulator wires and add direct wires from regulator outputs to chassis ground	Non Field Service
RK05-00008	Update documentation	Non Field Service
RK05-00009	Painting instruction change changes to post height and wire bend radius	Non Field Service
RK05-00010	Documentation changes	Non Field Service

E.C.O. NUMBER	DESCRIPTION	Rev	AFFECTIVITY
RK05-00011	Change documentation		non field service
RK05-00011A	ECO 11 did not define rework correctly		" "
RK05-00012	Change to final prints mechanical		" "
RK05-00013	Incoming inspection procedure change because of previous ECO.		" "
RK05-00014	Add two wires to RK05 backplane to make it compatible with RK11D (select lines)	A	Field Service not required for RK11C
RK05-00015	Procedure for G180 adjust plus signal check wave forms added to prints		Non field service
RK05-00016	Add accessory list to prints		" "
RK05-00017	Silk screen changes		" "
RK05-00018	Made 05 compatible with 8 controller dimensional change.		" "
RK05-00019	Removal of AC wires which went to on-off switch	—	Field Service jumper AC remove wires.
RK05-00020	New front panel without on-off switch	—	Field Service remove old install new one.
RK05-00021	Change to base plate for shipping, and air seal on blower.		Non field service
RK05-00022	Documentation error sharp corner on door lock not sharp enough.		" "
RK05-00023	Accumulation of documentation changes from previous ECO's 18 & 21		" "
RK05-00024	UL approval required decal change		" "
RK05-00025	Shipping brackets changed (made heavier)		" "
RK05-00026	Heads unload on multiple drive systems when the load/run switch on any of the drives is pushed from load to run - capacitor added to D.L. low line. (1000 MMF) DC low to grnd.	—	Field Service install CAP
RK05-00027	Door plexiglass for door too thick		Non field service
RK05-00028	Incorrect mounting holes mounting hardware not called out.		" "

E.C.O. NUMBER	DESCRIPTION	AFFECTIVITY
RK05-00029	Unsatisfactory locating diameter for magnet alignment fixture.	Non Field Service
RK05-00030	Procedure change in Engineering spec.	Non Field Service
RK05-00031	Unused unibus pins not grounded die cast bezel instead of sand cast. Assembly drawing and parts list updated.	B Field Service install wires to gnd pins.
RK05-00032	Additional information for reference chassis wiring.	Non Field Service
RK05-00033	Seek errors caused from noise being induced into sector pulse wires from low level servo signals in same cable.	— Field Service remove and twist with gnd.
RK05-00035	Motor relay diode D2 connected wrong.	— Field Service connect diode correctly TB4-5 to TB4-6
RK05-00036	Cartridge access door fatigues and access bale slips under door causing cartridges to hang in drive.	— Field Service adjust height of bale with rubber sleeve.
RK05-00037	Duckbill, cartridge support post, airduct, dimensional changes.	— Retrofit all in Field when problem is detected with Dynamit Nobel cartridge (greenish gray with white door
RK05-00038	Solenoid & arm solenoid combined into one part	Non Field Service
RK05-00039	Adds Z heavier springs to cartridge access door opener bale inside drive.	Retrofit all drives.
RK05-00040	New item drive identification number added to accessory list.	Non Field Service
RK05-00041	Changes a temporary fix in ECO 00036 to a permanent fix by the addition of 2 rubber sleeves on the cartridge receiver to add height to the access door opener bale and cancel rev change to cartridge receiver.	— Retrofit all drives

E.C.O. NUMBER	DESCRIPTION	ETCH	CS
M7700-00001	Add cap and revised Q1 circuitry to make more noise immune		E
M7700-00002	Additional reference material		F
M7700-00003	Seek done and write indicators light only during ready mode and index separator made more reliable.		H
M7700-00004	Removed D1 and D2 replace with jumpers		J
M7700-00005	Resister change		K
M7700-00006	Drive selection (RK11D)		L
M7700-8	On power up race condition can occur		N

E.C.O. NUMBER	DESCRIPTION	ETCH	CS
M7701-00001	Fault light made noise immune	D	D
M7701-00001A	Additional pins needed on AC & DC low	D	D
M7701-00002	Low speed falsely triggered and not enought R8 pot adjustment for sector xducer	E	E
M7701-00003	Remove D2 and D3	F	F
M7701-00004	Change E1 from 741 to 301 faster OP amp	F	H
M7701-00005	Guarantee state of ready flop clear E15 with load heads H line.	H	J
M7701-00006	Change R8 to 10K (OHM)	H	K
M7701-00007	Change R5 and R4 and D12 to reduce E21 to 45 ms and put DC low into E12 change C24.	J	L
M7701-00008	Add CLK kill test point	K	M
M7701-00009	Unsafe L cut from fault latch and put to bus write check. +15V H1 OK put E18-7 R21 put to D6 cathode.	L	N
M7701-00009A	Cancel relay out do not (change B.E. rev)	K	N
M7701-00010	Noise effect on DC LO		P

E.C.O. NUMBER	DESCRIPTION	ETCH	CS
M7702-	None		

E.C.O. NUMBER	DESCRIPTION	ETCH	CS
G180-00001	Add missing etch and change Z components	E	D
G180-00002	Add "Force Unsafe" test point	F	E
G180-00003	Diode clamp data window output	H	F
G180-00004	Change C27 to 120pf	J	H
G180-00005	Change input to E12 1414, add dual one shot and gate to output change R14 to 470 ohms.	K	J
G180-00006	Voltage differences between A & B gnds cause seek errors and data errors. Change C20, C21 to one capacitor 27 pf loop gain too low data separator locks up slow change R58 to 3.3K.	K	K Add wires and components no new etch.

E.C.O. NUMBER	DESCRIPTION	ETCH	CS
G938-00001	Increase servo gain, derive count pulse differently level shift the limit signals.	F	E
G938-00001A	Add A resistor	F	E
G938-00002	Corrected document errors deleted four unnecessary resistors.	H	F
G938-00003	Add R97 and thermister R98, changed R74 value.	J	H
G938-00004	Change R75 value	J	J
G938-00005	Redesigned tach, reference and output	K	K
G938 -00005A	Change date.	K	K
G938-0006	Temp. range not good.		L

E.C.O. NUMBER	DESCRIPTION	ETCH	CS
H604-00001	Increase lead spacing for C5	H	F
H604-00002	Add thermistor R15, changed values of R1 & R2	J	Z
H604-00003	Remove thermistor change R1 value this rev used. in conjunction with ECO G938-00005.	J	J
H604-00003A	Changed break-in point	J	J

E.C.O. NUMBER	DESCRIPTION	AFFECTIVITY
5409503-00001		

TITLE DATA RELIABILITY PERFORMANCE

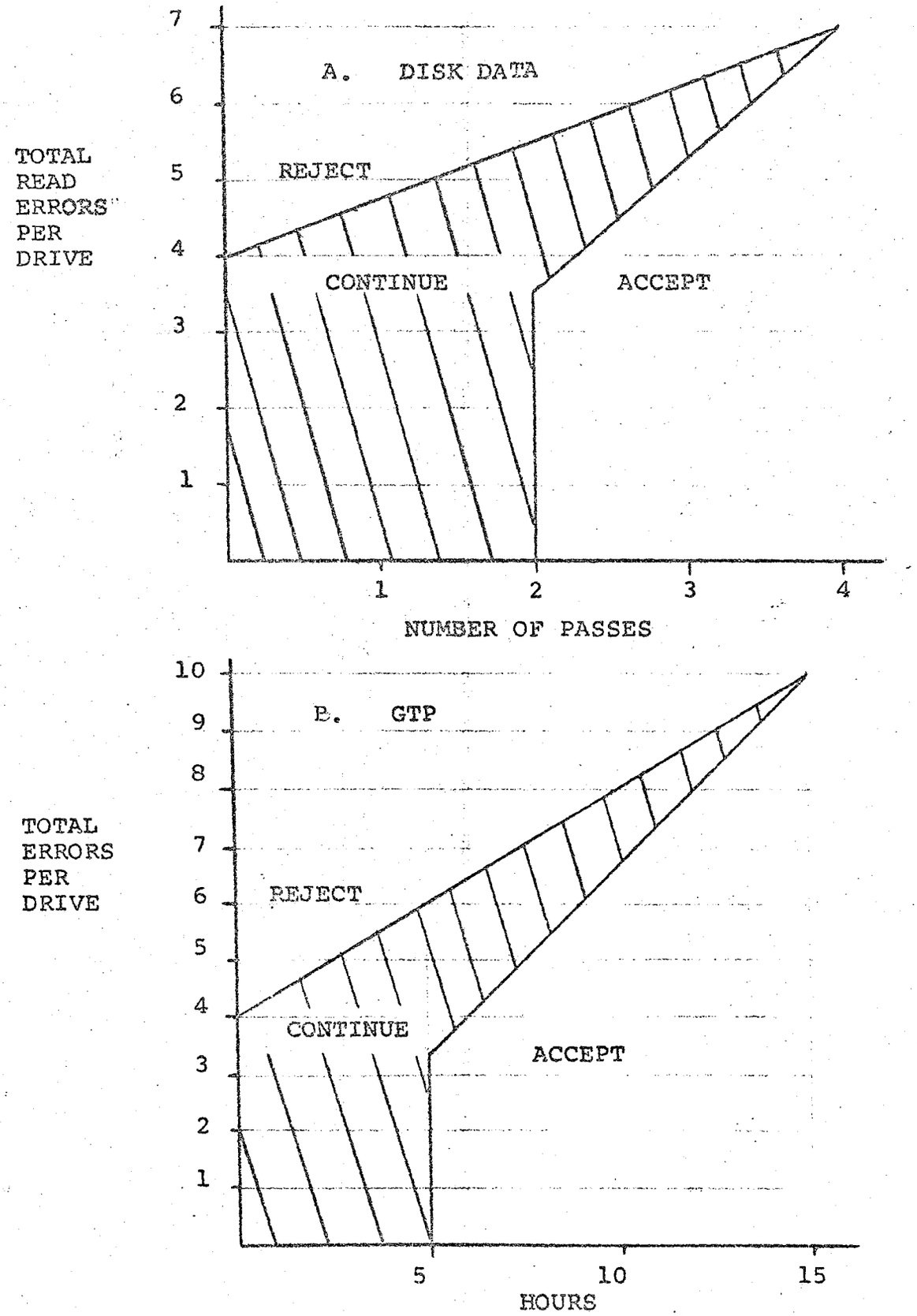

FIGURE 4. CUSTOMER ACCEPTANCE ERROR RATE CHART

SIZE	CODE	NUMBER	REV
A	SP	RK11-0-1	

TECH MANUAL

Some notes on the manual ...Referring to DEC-00-RK05-DB.

Figure on 5-11 is upside down.

Data window adjustment should be done on track Ø with an all Ø's pattern.

The inner and outer limit adjustment should point out that the + and - values may be greater than 2.5 and that it is the 0V across the surface that matters. All the ± voltages are used for are triggering levels at the limits and being higher doesn't matter.

Overshoot check on Figure 5-16 lacks the note that if it exceeds 1V the linear tranducer should be checked.

Cleaning of pack bottom (mating surface) and spindle assembly should be part of the PM procedure.

Up and down head nomeclature can be confusing to some people. IBM defines UP head as a head which forces UP (Manual references it as lower head occasionally).

Manual is incorrect in Data Window adjustment. Initially should be set to 480, not 500, then back to 420.

ITEMS TO BE RESOLVED

The wirelist does not always correspond to the print set and is being removed. It was felt it should be corrected and not removed.

Track locations in the manual should be stated in both decimal and octal.

Why not incorporate a Drive Function Timer Test into the new RK11 diagnostics?

A scheme must be developed between Brian Fitzgerald and myself for possible field evaluation, on a regional level, of the new diagnostics prior to their release.

Is it possible for Field Service to buy a Universal Torque Wrench rather than individual ones for each device?

Can a small tripod be added to the RK05 kits to hold disk while cleaning is being done?

Should special tools for individual devices be handed out and explained during Training on that device? That way the guy who will be needing them is assured of having them.

ITEMS TO BE RESOLVED (continued)

Does manual need troubleshooting procedure?

Static test for Servo should be placed before Dynamic Test in Manual.

Power Supply Regulators need a sticker for identification of Revision.

Should ECO's state "For Field Service to scratch off the appropriate Rev letter from module?"

RK05 Dec-O-Log must be checked to insure proper distribution to 8-11-15. It is believed it only states 11 at present.

Field Service needs decimal rulers included in tool bags, not fractional rulers.

Specific holes should be noted for 50 and 60 cycle operation for spindle motors in manual.

Customer Software Courses should stress care and feeding of disk packs and drives to allow us to get to the users from day one.

Table of Pot Adjustments for servo system are not in same sequence as pots on modules and H604 adjustment should be separated from G938 adjustments. Manual should reference IPB.

A list of legal (DEC approved) packs must be generated and DEC warranty policies for the heads developed.

Customer education must happen at installation to ensure their awareness of the vulnerability of disk packs to dirt.

Break in number for use of cartridge receiver alignment pack and feedback from field as to if it worked. Number is 8404.

A pack policy must be developed as to what we do with bad packs from the field.

Tech Tip needs to be written about glass slide and the fact it can not be field replaced.

Field Service needs to stock brackets for cartridge receiver tension springs which allow attachment to lower side of base casting.

The rubber gasket on some absolute filters is too thick making the bottom cover difficult to put on. Needs further investigation.

ITEMS TO BE RESOLVED (continued)

Spindle assemblies are rusting. New spindles are being plated. Old one can be cleaned, and an acceptable commercial cleaner is to be specified in the near future.

MISCELLANEOUS

One easy way to remove the magnet from the spindle for cleaning is with a bent hex key thru the holes in the underside of the spindle.

Occasionally it has been noted that the spindle motor pulley projected 1/8" below the bottom of the drive gouging the bottom cover at installation. This is now being checked for in Production by testing with all covers on.

Spindle brush noise may be due to the brushes being bent up and hitting the spindle assembly. However, there is a problem which is being looked into and that is one of squealing brushes. It has been found that if the surfaces of the brushes and spindle are not clean and matched so that as much as possible of the brush is making contact with the spindle, it will emit an awful squealing noise. Present method of eliminating the noise is to bend the brushes to make better surface contact and cleaning of the shaft. Do not remove these brushes as they are in there to remove any static charge from the spindle and random errors can occur if they are misaligned or dirty.

Smoking around a disk drive is not recommended. Never blow smoke directly into the drive.

Sector pulses have been getting coupled into the servo system causing random seek errors. ECO # RK05-00033 removes sector pulse wires from cable and twists them together with ground.

SUMMARY

Each Regional Support man was shipped an RK05 disk drive on Thursday (9/13/73). It will be his responsibility to update all previously trained RK05 branch and district men with the compiled information from the seminar.

They should also come up with a schedule to allow people in Maynard to have a feel for when the field will be completely updated.

During his visit to each branch or when each branch visits him, he should do the following:

SUMMARY (continued)

1. Develop contact (one) for each office as a channel of information of new problems or new solutions.

2. Discuss with BSM and DSM the need to update spares for RK05's due to the high volume of drives being shipped and the amount of money spent processing Priority 1 orders.

3. Allow each man as much time as needed to insure he can disassemble and assemble the drive completely and that he is confident it can be maintained and is not scared of such things as dirty heads or cartridge receiver alignments.

4. Discuss the fact that Maynard is working very hard to resolve production problems but until then it must be realized by him that maybe a drive will arrive with dirty heads & bent cartridge receivers, until all new procedures are implemented in production.

5. Discuss the need for correct filling out of Field Service Reports and use of the Problem Report System in order for us to recognize any future problems.

6. Give them my extension X 4180 and let them know I am more than willing to help them if you guys can't be reached.

Good luck with your Training courses and lets hope it will remove the number of critical situations that develop purely due to lack of knowledge. Please stress to them the need for customer education at installation time.

In addition to the field training program, it will be Training's responsibility to take the information discussed at this seminar and incorporate it into the RK05 course and insure all classes receive adequate hands on time.

RK05 EXERCISER

The following is a list where and to whom RK05 exercisers were sent. Please insure one is present when you update the individual branches. All were shipped 6/18/73.

REGION	COST CENTER	SBA #	ASSIGNED TO
Western	703	42876	Bill Townsend
	710	42882	Dave Neff
	724	42877	George Newton
	748	42888	Haskel Wade
	749	42880	Clarence Cichon
CENTRAL	706	42877	Gary Jennings
	733	42875	Dave Hawk
	734	42881	Joe McDermott
	761	42886	Jim McPherson
Mid-Atlantic	709	42878	Chuck Tharp
	714	42884	Norm Howe
	775	42883	Tom Schorn
	781	42879	Bill Keil
N. E.	713	42887	Cliff Pitz
No. Europe	716	716671	Dave Lawrence
	716	716670	Dave Lawrence
	720	720244	Sven Martin
	791	791076	Jerry Fraiser
Remote	719	719139	Ed Reilly
	721	721545	John Kilkenny
	74A	74A011	Bob Aldea
Central Europe	70F	791192	Walt Huwyler
	718	718547	Karl Hofmann
South Europe	722	722193	Tony Adcock
	722	722194	Tony Adcock
	785	785113	Peter Picthall
	792	792050	Carlo Falotti
	792	792067	Carlo Falotti