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FIELD CHANGE ORDER	NUMBER: RA90X-F003
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Applicability: This FCO must be installed on all RA90 disk drives with HDA's installed that are below the revision level of "N12".
HDA'S at or below these build dates CX926XXXXX and KB928XXXXX are affected.

Problem/Symptom: RA90 long arm HDA's that were produced before July 1989, HDA date code CX926XXXXX and KB928XXXXX may exhibit a hazing condition caused by a hazing contaminate inside the HDA. This micro contaminate may induce the following error codes upon an extended power down situation. The resultant error codes are: 13, 15, 59, 5A, 60, 62, 63, CD, E6.

SOLUTION: Install this FCO on all below N12 HDAs to protect against early failure. Revision V26 and above microcode will enable special code to perform a "spin-up retrack" during a drive spin up.

Quick Check: Drive hardware revision is 25 and the drive microcode is revision V26 or higher. (or)
The drive takes about 1 minute 15 seconds to come ready on spin-up.

PRE/CO-REQUISITE FCO: None	MTTI HRS 0.5 HOURS
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TOOL/TEST EQUIPMENT: See page three of this FCO

FCO PARTS INFORMATION

FCO KIT NO.	DESCRIPTION OF CONTENTS	EQ KIT VARIATION APPLICABILITY
EQ-01593-01	1 - 70-27950-02 RA90 Microcode Cartridge 1 - FA-04923-01 FCO Document	N/A

FCO CHARGING INFORMATION

WARRANTY/CONTRACT

NONWARRANTY/NONCONTRACT

ON-SITE

OFF-SITE

ON-SITE

OFF-SITE

MATERIAL ONLY

TRAVEL/ INSTALL	EQ KIT	INSTALL	EQ KIT	TRAVEL/ INSTALL	EQ KIT	INSTALL	EQ KIT	ORDER-ADMIN, HANDLING PKG, SHIPPING & EQ KIT
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DEC	DEC	DEC	DEC	CUS	CUS	CUS	CUS	CUS
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APPROVALS

CSSE John Kowall	FSHQ LOGISTICS Dennis Leblanc	FS PRODUCT SAFETY Robert Brister
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CSSE MANAGER Larry Palm	FS. MICROFICHE LIBRARIES	FCO RELEASE DATE 8 Oct 1990
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MICROMEDIA Diane MacDonald	VAXDOC VAX/PDP	EP-CSVDC-LB EP-CSTMST-LB	FCO REVISION B
POPULATION 2,000	STARS VAX Notes		PARTS AVAILABILITY October, 1990

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*****
*           Instruction for determining FCO applicability           *
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There are three ways to determine If an RA90 disk drive requires this FCO.

1. Remove the HDA and check the 70 class label 70-22951-01 for revision M12 and below.
2. From an HSC controller, run program DKUTIL. The drive must be dismounted from the system but the ports must be enabled. Type "GET DXXX" command for all RA90 drives for which you do not know the revision or serial number. This "GET" command will display the HDA serial number.

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EXAMPLES:  CX91203434  Manufactured in Colorado Springs plant in
              1989, calendar week 12, serial number 03434.
           KB92105252  Manufactured in Kaufbeuren, Germany plant in
              1989, calendar week 21, serial number 05252.

```

3. The following program can be typed into any system and run, without privileges, to read the stored HDA serial number from the VCB control block of a mounted disk. If you get an invalid number you must use Step 1 to verify the revision/serial number.

```

>EDIT Serial.COM
! THIS PROGRAM WILL ACCESS THE VCB OF A "MOUNTED" DISK DRIVE AND IF THE
! SERIAL NUMBER IS VALID IT WILL REPORT THE YEAR AND WEEK OF MANUFACTURE.
$Say := Write sys$output
$Inquire DEV "RA drive to analyze."
$Serial = F$fao("!9ZL", 'F$getdvi(DEV, "SERIALNUM")')
$Say "Full Drive serial number ''serial'"
$Say "Year of MFG is 19x''F$extract(0,1,SERIAL)'"
$Say "Week of MFG is ''F$extract(1,2,serial)'"
$INT = F$integer('F$extract(3,2,serial)')
$If INT .GT. 09
$ Then
$   SEQ[0,8] = INT+55
$   String = F$Fao("!AS", SEQ)
$ Else
$   String = F$Fao("!OB", int)

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$ String = F$extract(2,1,string)
$Endif
$Say "HDA serial number is ''string''F$extract(5,4,serial)''"
```

```
CONTROL Z
* EXIT
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```
> show DEV D      ! This will show all the disk drives on the system.
> @serial         ! Type in the drive name of individual units not Shadow units.
```

Any drive HDA serial number at or below the dates CX926XXXXX and KB928XXXXX
should be considered for this FCO.

The above .com file and a more comprehensive file to read all the drive serial
numbers is in the RA90 notes file NOTE 145.* GENRAL::RA90

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* TOOLS AND SPARE PARTS NEEDED FOR THIS FCO *

Engineer supplied	FCO Supplied (EQ Kit Contents)
• 25/30 watt soldering iron	1 Microcode Cartridge W/V26 70-27950-02
• solder	
• XACTO knife 29-26124	Recommended parts to be ordered
• 30 gauge green wire	
• needle nose pliers	
• wire strippers	10 Spare screws 4-40 X 3/4 in 90-00049-61
• pocket screwdriver	25 Spare E clips 90-09273-01
• de-soldering tool	
• RA90/RA92 Service Manual	EK-ORA90-SV-003
• 7/64 Ball-End hex drive	

NOTE: We recommend having a spare ECM module, HDA and a power supply available while doing this FCO.

To assure the success of this FCO and while there is complete access to the drive, a few PM checks will be necessary. The only PM check list for the RA90 at this time in the new RA90/92 service manual - 003. Recommend PM's are at one, two, and five year intervals.

At this time it covers checking the drive error logs, cleaning filters, updating drive microcode and verifying that all the SDI cables are tight. This FCO will cover a few additional connectors that we know have caused problems in the past.

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Reference the RA90/RA92 service manual if necessary.

NOTE: It is recommended that the data on HDAs that are at revision "M12" and below are backed up before updating the microcode to version V26. See page 9 for additional details.

1. Have the drives to be FCO'd dismounted from the system.
2. Disable the A and B ports.
3. Spin down the drive.
4. Remove the front and rear covers from the cabinet.
5. Load microcode V26 into the drive. This code should remain in the drive even if further investigation shows that the HDA to be revision N12 or greater.
 - A. Install MUC into the OCP.
 - B. Select and run test 40.
6. From the rear of the cabinet turn off the power switch to the individual drive/drives to be FCO'd.
7. Grip the OCP in the middle and gently pull towards you.

8. Remove the blower/bezel assembly by rotating the 4 wing nuts counterclockwise. Pull the assembly toward you. Note the orientation as the left and right units are reversed.
9. Remove the ribbon cable from the HDA.
10. Unlatch the HDA from the chassis by holding onto the base plate handle and pulling up and turning the latch pin.
11. Grasp the carrier handle with one hand and position your other hand for support under the HDA while slowly removing it.
12. Place the HDA on an anti-static work surface carrier side up.

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*****
* Perform the following checks as a preventative maintenance measure. *
* They are to be considered necessary for this FCO and vital to the *
* overall reliability of the drive. *
*****

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13. Now that the HDA is removed, inspect the green male connector in the rear of the chassis. This connector is part of the rear flex backplane and is held in place by two 4-40 x 3/4 inch screws. Assure that the screws are "present."
14. You must now inspect the green connector at the rear of the HDA. It is necessary to confirm that all 14 electrical contacts are locked into the green connector. With the flat end of a tool, like a soldering aid, verify that when you gently push on the gold contact pins they do not move back into the connector. If they do, the contact pin must be reworked. (See Figure 4)
15. If rework is necessary you only need to remove the green connector from the carrier by removing the E clips and pulling it forward to reveal the wires. You do not have to remove the carrier. With a small screwdriver remove the two small "E" clips that retain the green connector. With needle nose pliers gently pull on each wire to insure that it is locked in place. If loose, try pushing in on the wire first to see if it will lock. If the wire doesn't lock-in place pull that wire out and push on the locking tab from the rear so that the pin locks in place when reinserted. (See Figure 4)

16. With a 7/64 ball hex drive, extended down through the carrier, tighten the two screws that hold the damper bracket.
(See Figure 4).
The ball drive is necessary as one screw will be at an angle. You can see the screws better by looking from the side.
A loose plate could add to 9X and other servo errors.

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..... Continue with FCO

17. Set switch 2 to the open position on the PCM module.
(See Figure 3).
18. Reinstall the HDA.
19. Remove the ECM module from the drive and place it on an anti static mat SERVO side up. (See Figure 2) The SERVO side has the two large heat sinks.
20. Cut and remove jumper W4. This will cause the ECM servo module -01 to be reported as revision "8" for an E etch module and revision "9" for an F etch module when running test from the OCP. The newer -02 module, which will soon be the standard field replacement, will report revision "11" when W4 is cut.
(See Figure 2).
21. Cut the ETCH as indicated in Figure 1. With the proper knife TRY to fold the etch back rather than cut a piece out. This may aid in preventing the piece that was cut out from being lost somewhere on the module. Some modules have a heavy coating over the etch making the fold attempt too difficult. The Etch run is from E4 pin 7, past C15 and C17, thru to side 2, to E10 pin 2. Cut the Etch between C15 and C17. Look for the plus "+" sign on the module between C15 and C17 as a guide.
22. Add the wire from E4 pin 7 to E10 pin 2. (See Figure 2). Before attaching the wire to the lead on the ICs, tin the IC leads and the wire ends first to keep the IC lead heat exposure time to a minimum to avoid IC damage. The wire can be cut to 2 3/8 inches or 6 CM in length. Trim a 1/32 of an inch or about 2 MM from both ends of the wire.
22. Replace the ECM. If you have problems inserting the module the last inch of travel, follow the instructions in figure 5. Do not try to force the module in. Moving the connector block

from the rear of the drive will always work. You might have to move it more than once.

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23. Replace the BEZEL and the OCP.
24. Power up the drive. If you cannot restore power to the drive (OCP LEDs are not lit) remove and reinsert the OCP first. You should suspect the power supply if the reinsertion does not work and not the ECM or HDA. From the rear of the power supply see if the LED is dimly lit. If so, replace the power supply. There is a possible failure mode on a select range of supplies which MAY exhibit failures on power up.
25. After powering up the drive if you receive an error code "C5," there has been a problem doing the FCO. Check to make sure that you have removed the jumper "W4" in step 20. You can do this by running test 45 from the OCP. Check that the servo module is at hardware revision 8, 9 or 11.
26. Run TEST 45 from the OCP. Verify the drive REVISIONS.

DRV = 25 :25= long arm HDA below N12 :17= long arm HDA above M12.
DCD = 26 :26= microcode revision V26.
IOP = 0/1/3 :0= E etch module :1= F etch PN -01 :3= F etch PN -02*
SER = 8/9/11:8= E etch module :9= F etch PN -01 :11 F etch PN -02*
PCM = 0 :0= long arm PCM :SW 2 on PCM will not change PCM rev.
ORV = 1 :1= PCM hardware revision
OCD = 4.6 :4.6 OCP microcode revision.

Note * ECM part numbers 70-22942-01 RA90 only runs with all microcode
70-22942-02 RA90/RA92 runs with V20 and higher

27. Press the RUN switch and bring the drive READY. Verify that the drive takes about 1 minute 15 seconds to come READY. If the drive comes READY in about 45/50 seconds you should verify that the etch cut on the ECM was made. Do not continue until you resolve the time difference.

RUN TEST 00 for a few minutes before returning the drive to service.

28. Complete your LARS form using the information on page 8 as a guide.

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LARS	USA	GIA	EUROPE
Activity -			
(a)Contract and Warranty	W	U	Y
(b)IN-DEC Contract	K		
Hardware Segment Code	111		
Non Contract/Non Warranty	F	F	F
(c)RTD/Off-site Agreement	F		
Product Line	031		
DEC Option	RA90X	RA90X	RA90X
Type of Call	M	M	M
Action Taken	D	D	I
Fail Area-Module-FCO-Comments	RA90X-F003	RA90X-F003	RA90X-F003
Material Used	EQ-01593-01	EQ-01593-01	EQ-01593-01

- (a) Warranty Optimum, Warranty Standard and Warranty Basic (on-site) Agreements.
- (b) Applies to INDEC AREA ONLY
- (c) RTD=Return to Digital or Off-site Agreements; If Field Engineer On-site, use Activity Code "F".

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* The following recommendation should be considered on the *
* RARE occurrence of a 7C error occurring during spin up. *

7C errors during spin-up: This error became apparent with the implementation of code V25. This new servo code (better but different) did not take into consideration that an HDA crash stop might be mis-adjusted enough to cause problems or that the sync track was not rewritten properly during rework.

Version V26 code changes were made to address all but the worse cases. There is a possibility that an adjustment can be made to

the crash stop in the field that will fix the problem. More testing must be done to verify this. If so, a change or addendum will follow this FCO.

IF 7C errors occur after FCO installation or code update, the following are recommendations that should be considered as a guide.

M12 and below

1. If the 7C error on spin up is solid replace the HDA.
If the 7C error on spin up is intermittent inform the customer about the error and ask him to accept the soft error until a rework procedure is received.
2. Reinstall version V13 microcode. Inform the customer that the data on this HDA should be part of a shadow copy or the HDA should be backed up before powering down the drive.

N12 and above

1. If the 7C error is solid, reinstall V13 code.
2. If the 7C error is soft and the drive is running error free reinstall V13 code and wait for future rework instructions.
3. If the 7C error is soft and the drive is not running error free, keep V26 installed. Inform the customer of the soft spin up error, that they are now running the latest and best microcode and to wait for future rework instructions on the soft error.

CSSE supports using this latest microcode during a service call or upgrading the microcode during the annual PM into the installed base.

CSL ECM spares will soon have the FCO rework installed. This will include V26 microcode. V26 code should be used over all previous code.

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 * Problems that are addressed in revision V26 microcode *

1. When drive detects an off-track while writing, drive will log in its internal log a "09" error when it should be a "9B".

2. Internal Temp. set to high.
3. During a shutdown on ULTRIX the drive may appear to hang.
4. Drive will allow to be put on-line if an error occurs on spin-up.
5. Servo code does not allow enough time for the lock-pin on the HDA, causing wearing on the shaft hole.
6. Below N12 HDA may not spin up.
7. Drive will spin up after a "C0" or "C5" error.
8. Drive error code "9B" is logged to the system but not to the internal log.
9. Mfg. head offset information did not work properly.
10. Simultaneous drive errors are not logged in the drives internal error log.
11. Drive may exhibit "7C" errors during spin up and head load (RTZ) testing.
12. Version V13 microcode may fail Test 29 with a CD error.

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*****
*      Corrections and Enhancements in revision V26 microcode      *
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1. Replace E1 with 23-588E6-00. Code change to wait for controller to finish data transfer.
2. Temp. change to 125F.
3. Logic added on a controller disconnect to check and change status of OCP.
4. Drive spin-up logic changed to not allow drive to go ready if an error occurs on spin-up.

5. Servo code changed from 0.8 seconds to 2.0 seconds delay for the lock-pin.
6. Load new code. Code has new spin up algorithm for pre N12 HDA.
7. Drive code will check for illegal condition and not allow a spin up.
8. Code will check for the condition of the "9B" and wait for controller to complete.
9. Additional code added to fetch offset information from the servo. New read memory region location provided for this information.
10. Code changed to only log and report the first error.
11. The algorithm for the RTZ command was modified. This is also the command used during a head load.
12. Turn off embedded code during seeking.

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