		CATEGORY	PAGE 1
Digital Equipment Corp. FCO		[F]	OF 10

FIELD CHANGE ORDER   NUMBER: RA9X-F005

Applicability: This FCO must be installed on all RA90 and RA92 disk drives.

Problem/Symptom: All prior releases of microcode do not handle invalid and illegal commands properly. The drive can hang until power cycled. The drive Head offset table is not being utilized properly. Soft positioner errors may result.

SOLUTION: Install this FCO in all RA9X drives. Revision V27 microcode supports RA90X-F-003 FCO performing a "spin-up Retract" during a drive spin up.

Quick Check: The drive microcode is revision V27 or higher.

PRE/CO-REQUISITE FCO: N/A	MTTI HRS
	.8 hr/4
TOOL/TEST EQUIPMENT: N/A	

FCO PARTS INFORMATION

FCO KIT NO.	DESCRIPTION OF CONTENTS	EQ KIT VARIATION APPLICABILITY
EQ-01643-01	1 70-27950-03 RA90/92 M.U.C. 1 FA-04979-01 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
DEC	DEC	DEC	DEC	CUST	CUST	CUST	CUST	CUST

APPROVALS

PSPE John Kowall	DSHQ LOGISTICS Willie Ewing	DS PRODUCT SAFETY Robert Brister
PSPE MANAGER Fred Harding	This document is published on multiple media including Customer Services and MDS	FCO RELEASE DATE 06 May 1992
MICROMEDIA	Microfiche Libraries. It is	FCO REVISION

| Anne James Smith | also available electronical- | A |
| ly via TIMA and the SSD |
| POPULATION | CD-ROM. | PARTS AVAILABILITY |
| 19,081 | | May 1992 |

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```
*****************************************************************
*         Instruction for determining FCO applicability        *
*****************************************************************
```

The FCO is applicable if the drive microcode is below V27.

There are several methods for determinating if microcode updating
is necessary:

SYSTEM LEVEL - Run the latest copy of LIFE. It will report the
        microcode level of all RAXX drives that are on line.
 NOTE: The current version of LIFE will properly report the
        current microcode revision, it will not report the
        proper FCO/EQ number. LIFE is being revised, and
        will require LIFE version 4.0, and Rules Database
        number 1.0 to report the proper FCO and EQ numbers.

    CONTROLLER LEVEL - From the HSC controller prompt type: SHOW DISK.
        All drives that are either on line or available
        will display the drive microcode level.

 DRIVE LEVEL - Select and execute the drive utility Test 45
            (drive revision display utility).
        Note the scrolling display for DCD=xxx, where
        xxx is the current drive microcode version.
        Pressing the run switch will start and stop the
        display for easy reading.

```
*****************************************************************
*             FCO REWORK INSTRUCTIONS    *
*****************************************************************
```

Reference the RA90/RA92 service manual if necessary.

1. Have the drives to be FCO'd dismounted from the system.

2. Disable the A and B ports. Record which port if only one.

3. Spin down the drive(s).

4. Remove the front cover from the drive(s).

5. Load microcode V27 into the drive.
 A - Install MUC into the OCP.
 B - Select and run test 40.
 C - Remove MUC at completion of test.

6. Press the RUN switch to bring the drive READY.

7. Check that the air filter in either the door or front bezel
   is clean.

8. Replace the BEZEL or front door if this is the last drive to be
   updated in this cabinet.

9. Enable the proper port(s).

        10. Return the drive(s) to the system.

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        LARS

    CATEGORY F   USA   GIA   EUROPE

    Activity -
    (a)Contract and Warranty   W   U   Y
    (b)IN-DEC Contract   K   U
       Hardware Segment Code   111   111
       Non Contract/Non Warranty F   F   F
    (c)RTD/Off-site Agreement   F   U
       Product Line   031

    DEC Option   RA90/92   RA90/92   RA90/92
    Type of Call   M   M   M
    Action Taken   D   D   I
    Fail Area-Module-FCO-Comments RA9X-F005   RA9X-F005   RA9X-F005
    Material Used   EQ-01643-01   EQ-01643-01   EQ-01643-01
    FCO with no material used   EQ-RA90X-05   EQ-RA90X-05   EQ-RA90X-05

NOTE: EACH EQ REPORTED REPRESENTS 4 (four) DRIVES

    (a) Warranty Optimum, Warranty Standard and Warranty Basic (on-site)

Agreements; * Note material (only) free of charge for all customers.

(b) Applies to IN-DEC Area Only - Warranty Optimum, Warranty Standard
    and Warranty Basic (on-site) Agreements.

(c) RTD=Return to Digital or Off-site Agreements; If Field Engineer
    On-site, use Activity Code "F".

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DIGITAL CUSTOMERS

RA90/RA92 RELEASE NOTES

FOR MICROCODE VERSION V27

These release notes describe RA90/RA92 disk drive microcode
version V27 changes and recommendations. They contain a brief
description of the enhancements contained within this code
release.

V27 Microcode Cartridge Part number (70-27950-03 REV. A1)

Digital Equipment Corporation

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March, 1992

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DECsystem-10        PDP                  VT
DECSYSTEM-20        PDT
DECUS               RSTS
DECwriter           RSX                  DIGITAL
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1 OVERVIEW

This RA90/RA92 microcode release notes document is to inform our
customers, with RA90 and RA92 disk drives, of the changes in the
new version V27 drive microcode update cartridge. This document
contains a brief description of the benefits with implementation
of this new RA90/92 revision of microcode.

2 MICROCODE AVAILABILITY

RA90/RA92 drive microcode is provided to Digital Services Cus-
tomer Engineers via an RA9X Microcode Update Cartridge.

Version V27 microcode is installed in all RA92s now being
shipped and in all new spare ECM's (Electronics Control Module)
coming from our major stockrooms.

3 PRE-INSTALLATION CONSIDERATIONS

The customer is not required to back up the data from each
drive before allowing Digital Service the opportunity to do
the upgrade. The microcode reload involves spinning down the
drive for about 2 minutes while the microcode updating process
is completed.

This microcode is compatible with all revisions of the RA90 and

RA92 drives.

During the microcode update process the resident drive microcode
is not overwritten until the code in the update cartridge is
read and verified to be good. This eliminates the possibility of
a drive becoming inoperable after a microcode update or reload.

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4   DRIVE IMPROVEMENTS WITH VERSION V27

4.1 OPERATIONAL IMPROVEMENTS

o A drive would hang if sent an illegal operation code (Error
   code "0B"). To clear this error a drive had to be powered
   down. The situation would present itself if a drives SDI
   cable was plugged into a tape port on an HSC controller
   during some reconfiguration work.
   This error will still be reported, which is correct, but will
   no longer hang the drive.

o A drive would hang if sent an invalid command procedure
   (drive error code "47") from a crashed/hung HSC. This can
   occur during a host DAP command when an HSC is crashing.
   An HSC with software V5XX or V41X and below may do this
   causing some drives or a system to hang until the drives
   (system disk) are power cycled. With V27 installed, this
   error will still be reported but it will no longer hang the
   drives or the system.

   HSC software at V600 and above has fixed the invalid command,
   but the HSC software V41X and below is not fixed at this
   time. This makes version V27 drive code necessary if you are
   using HSC50 controllers.

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4.2 PERFORMANCE

o Engineering has made improvements in the microcode that
   utilizes the drive head offset table during a seek to a
   new cylinder. This table puts the new head in the center
   of the track before the read head is turned on. Not using
   this table properly in the past has caused intermittent soft
   positioner errors. Initial testing has shown the reduction
   or elimination of the following errors as related to changes
   in the use of this table. These errors can also be caused
   by actual hardware and environment problems. Also, this
   microcode does not attempt to eliminate normally expected
   soft errors as is common to all moving head media.

   o Controller reported error codes: 2B, 48, 6B, CB, 8B/34,
      8B/14, E8/34.

   o Drive reported error codes: 7C, 7F, 8B, 9A, 9B, 9C.

While the overall RA90/RA92 performance of our customer in-
stalled base has been excellent, we want to take this oppor-
tunity to install V27 for additional drive improvement and
customer satisfaction.

o Provides improved drive performance.

o Provides improvements in reliability.

o   Provides improvements in error reporting.

o   Reduce the possibility of a drive causing system hangs and
    customer down time.

o   V27 supports "all" RA9X drives and FRUs' (Field Replaceable
    Units).

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4.3 MAINTENANCE CHANGES

o   The drive cylinder position information was not being logged
    into the drive internal error silo properly. The drive stores
    64 of the last events and or errors that were detected at the
    drive level. This information is useful for diagnosing drive
    problems on site and FRU problem diagnosing at our Digital
    repair facilities.

o   The drive microcode reports correctly a "3E" error code to
    the drive internal error silo but a "3F" error code to it's
    controller when the OCP is removed while power is applied to
    the drive. The "3F" error is not documented in any Digital
    Services literature because it was never to be implemented.

\\FCO_DOCS
\\RA9X
\^ RA9X
\\RA9X-F005
\\MAY
\\1992
\\KOWALL
\\FA-04979-01
\\RA90
\\RA92
\\DRIVES