PROGRAMMING SPECIFICATION

KS-10 DISK FORMATTER

Name: KSFORM.RNO

Edition: 1

Date: 15-Jan-1979

CONTENTS

1.0 INTRODUCTION

KSFORM was designed to run stand-alone on any DECSYSTEM-2020 KS10/RH11 RP06/RM03 system. It was designed to provide a flexible yet easy to use RP06/RM03 formatter program. The program will format up to 11 drives: the maximum number that can be connected to an RH11 controller. The program is organized such that the formatting of all selected drives begins at the same time. The disks are formatted in 18-bit mode (-10 format).

2.0 LOADING PROCEDURE

1. After bringing the tape on-line, type CTRL\ to get the KS10 prompt from the console <KS10>.

2. Type "MT"<CR>. The program will start automatically.

3.0 PROGRAM-OPERATOR INTERACTION

KSFORM has been designed to require a minimal amount of user interaction. Following is a description of all user dialog under a variety of conditions.

1. "MODIFY ANY CONTROLLER ADDRESS PARAMETERS? Y,N OR ? - "

    Typing "N" to this question will cause the program to access the standard addresses, which are:

        UBA # 1
        RH ADDR 776700
        INTERRUPT VECTOR 254

    Typing "Y" is required if you wish to format drives accessed at some other address. The program will question you as to the desired addresses.

    This is a one-time question and any further changes will require program reload.

2. "DO YOU WANT TO FORMAT PACKS? Y,N OR ? - "

    The program has polled all drives in the system configuration and listed their current status. If you would like to format any of the on-line drives listed you should type "Y".

    Typing "N" will cause the program to jump to the program starting address and halt. The program may be continued by typing "CO"<CR>.

    This question is asked after each batch of disks is formatted.

3. "WHAT DRIVE(S) TO BE FORMATTED? (TYPE 00 TO 77 OR "H" FOR THE COMPLETE LIST OF POSSIBLE COMMANDS.)"
    *

                                    OR

    "WHAT DRIVE #'S -"

1

If you type "H"<CR> a HELP message, containing an explanation of all possible responses to this question, is printed. The options are:

AXX	Add drive XX to the test list.
DXX	Delete drive XX from the test list.
PXX	Program write-lock drive XX.
PALL	Program write-lock all drives.
WEALL	Program write-enable all drives.
EXX	Program write-enable drive XX.
XX	Select only drive XX.
XX,YY,ZZ	Select drives XX,YY,ZZ.
SELECT	Print summary operator-selected drives.
LOCKED	Print summary write-locked drives.
SAME	Select same drives reported by select.
DDT	Enter DDT.
H	Print this help message.

You are notified that if a drive is software (program) write-locked you must write-enable it before it can be formatted and that the program does not support formatting of both RM03s and RP06s in the same operation.

4. "DO YOU WANT TO MAPOUT SOFT (RECOVERABLE) ERROR SPOTS? Y,N OR ? - "

Typing "Y" will cause the locations of all areas of the pack that have caused read errors (recoverable and non-recoverable) to be written into the BAT block (bad block) area of the pack.

Typing "N" will cause only the locations on the pack that have caused hard (unrecoverable) read errors to be written onto the BAT block area.

5. "PRINT SYSTEM TOTALS? Y,N OR ? - "

Typing "Y" will cause the system totals to be printed.

The system totals are an itemized list of statistics:

    a. Number of bits XFERFD, read and written.

    b. Number of transfer and positioning errors.

    c. Number of MBC errors detected.

Typing "N" will accumulate the totals but not print them.

4.0 CONFIGURING THE DRIVES

After program initialization, the configuration routine is called. This routine performs an initial diagnostic check on the UBA and RH11. It ensures that the enable transfer bit in the UBA can be set and cleared with a UBA INIT and that all PI channels can be cleared. The drive select register, RHCS2, is tested to ensure that none of the select bits are stuck either on or off. If any of these checks fail, the program halts.

The program then proceeds to poll the drives and reports to the
operator all drives in the system configuration with their present
status. The status report includes the following:

1. Drive type

2. Serial number

3. If the drive is on-line

4. If the drive is presently write-locked

5. If the pack is software write-protected

6. If the drive is single- or dual-ported

7. If the drive is -10 formatted or in unknown format

8. If available, the serial number where formatted

The program will recognize only 10-formatted packs as already
formatted (that is, -11 (16-bit mode) formatted packs are reported as
unknown). Pack recognition is done with zero drive offset.

5.0 PROGRAM DESCRIPTION

If you have entered valid drive numbers to be formatted, program
control passes to the routine that directs the formatting of the disk
packs.

   PAKINT   Routine to format, map, and create the BAT blocks for
               the selected drives.

The PAKINT routine will automatically format, map, and create the BAT
blocks for the selected RP06/RM03 disk drives. The script is designed
to minimize the dialog necessary to complete the formatting operation
and hopefully avoid user errors.

The PAKINT routine directs the formatting operation by calling three
major task routines - FORMAT, RONLY, and MAPOUT.

   FORMAT   Routine to format RP06/RM03 disk packs in PDP-10 mode.

The first of these routines to be called is FORMAT, which provides the
facilities for formatting in 18 bit (PDP-10 mode). The operator is
notified as to when the formatting begins with the message "FORMAT"
and the current runtime.

Formatting is done on a track-by-track basis (that is, an individual
sector cannot be processed, the entire track is processed). The
routine is organized such that the formatting of all selected packs is
done at the same time.

Twenty errors are allowed to occur on each pack, only five of which
can be hard errors. Cylinder 000, surface 00 of each pack may not
have any hard errors.

Each area on the pack is formatted with header and worst-case data
information. This data is written to the pack with 0 offset.

3

When all selected packs have been formatted the user is notified with the message "OPERATION COMPLETED" and the current runtime.

    RONLY   Routine to perform a read-only verify on a formatted pack.

The PAKINT routine then transfers control to the RONLY subroutine, which is designed to read all areas of each pack. The routine acknowledges only errors detected by the ECC logic (that is, no write transfer or data compare code is executed). Any error corrected by the ECC logic is reported as well as those ECC correction attempts that fail.

Again, the operator is notified as to when the operation begins and when it ends.

    MAPOUT   Routine to report the BAT block contents to the user and to write them onto the pack.

After the pack is verified by the RONLY routine, control passes to MAPOUT, the hard data error spot identifier. This routine will report the pack BAT block contents and update the pack BAT block area. MAPOUT works in conjunction with several other routines that are responsible for generating the BAT block entry word and putting this entry into the drive's BAT block area, writing the drive's BAT block area onto the pack, and generating the BAT block area for the drive in memory.

6.0 PROGRAM ERROR MESSAGES

All program messages are intended to notify you as to current program activity. It is very important to note that there is no operator interaction required for the program other than the questions discussed in Section 3 (Program-Operator Interaction) even in the case of program error.

There are two basic types of errors that may occur in the program. These are:

1. Fatal errors, which the program considers so severe that it terminates program operation. In the case of a fatal error the program will print a short message describing the possible cause of the error. Program control passes to the program starting address and a halt is executed. A halt message will be printed. You may restart the program at this time by typing "CO"<CR>.

    Errors of this type may indicate a problem in the system or with the disk packs. Several occurrences of such errors should result in the notification of field service.

2. Errors that the program will attempt to recover from and continue.

    There are several types of errors from which the program may recover. For example, up to 20 recoverable and 5 non-recoverable transfer errors per disk pack are considered acceptable (although cylinder 00 surface 00 may not have any hard errors).

Of course, you are notified when the error occurs and may be given additional information concerning the error. In general, you are also notified as to the resolution of the problem.

Another example concerns the case in which one of the selected disk drives goes off-line for some reason (a fatal drive error). In this instance, the drive in question is deselected but the program will continue to format all other selected drives. If there are no other selected drives the program will restart itself and ask the user to reselect them.

Some errors, especially soft, easily recoverable errors, are to be expected.

Since all information on the pack has been written with the same drive (with the exception of the initial reading of the HOME and BAT blocks on the pack) retry is always done with zero offset.

The retry procedure is as follows:

All non-fatal drive errors processed in channel 5 interrupt routines request error recovery. Once the recovery procedure is initiated, all other data transfers and positioning operations are inhibited until its completion. The error recovery is initiated at interrupt level and is automatic.

All positioning operations are limited to three retries. The drive is recalibrated before each retry.

Write header and data commands are also limited to three retries. The command is reissued at zero drive offset and examined for errors.

READ/WRITE commands are retried seven times at zero offset.