THE MINI-TASKER

RT-11 SIG NEWSLETTER

MAY VOL. 1 - - NO. 2 1975

Newsletter contributions should be sent to:

John T. Rasted
CAM Systems, Inc.
17 Brown Street
Waterbury, Conn Ø67Ø2

All other correspondence should be sent to:

Thomas J. Provost
Bates Linear Accelerator
P.O. Box 95
Middleton, MA Ø1949
- or -
Thomas J. Provost
RT-11 Special Interest Group
c/o DECUS
146 Main Street
Maynard, MA Ø1754
Phone (617) 774-237Ø
(617) 245-66ØØ (Boston Tie Line)

SPRS

Xerox copies of SPR's can be submitted to the Mini-tasker. These will be published so that (1) each user can determine if the problem is applicable to his installation, and (2) the SIG can help DEC decide if the problem is system-wide.
No SPR's have been submitted to us this month.

LUGS

This section is reserved for news from and for the local user groups within the SIG.

One local SIG is already active on the west coast. It is called SCURT, for Southern California Users of RT-11. Others are now forming in other areas. If you wish to see an active local users group in your area, write to me, Tom Provost, and I will attempt to get other interested users in your area in touch with you. I list below the contacts for the LUGs now in action or now forming. I strongly recommend active participation in these groups. It has proven very valuable to our installation.

LUG CONTACTS

CONTACT	AREA	LUG NAME
Bob Roessler UCI-CCM 144 MSR1 Irvine, CA 92664	SOUTHERN CALIFORNIA	SCURT

Patrick E. Perrott
PELCOR
16Ø7 Forsyth Rd.
Orlando, FL 328Ø7
(3Ø5) 275-1132

FLORIDA

FLURT?

Eric Morton
PRELCO Corp.
17Ø Lincoln
Lowell, MA Ø1851
(617) 458-8763

NEW ENGLAND

NEURT?

INSTALLATIONS

Other users are interested in your installation: the configuration you have, the peripherals, and your applications. This space is reserved for those descriptions. Send a summary of your installation (including any special features or problems you may have) to the newsletter. Include your mailing address and phone number if you wish other users to be able to contact you.

MIT-LNS BATES LINEAR ACCELERATOR

PDP 11/45 no. 1

MEMORY MANAGEMENT
FLOATING POINT PROCESSOR
LINE FREQUENCY CLOCK
PROGRAMMABLE CLOCK
8 K MOS
58 MEGABYTE DISK SYSTEM (DIVA)
8 K CORE (DEC)
48 K CORE (CAMBRIDGE MEMORIES)
KSR-35 TELETYPE
CAMAC BRANCH DRIVER (BI-RA)
IBM 729 MAGNETIC TAPE DRIVE

SHARED BUS

LINE PRINTER (DATA PRINTER)
PAPER TAPE READER (REMEX)
CARD READER (DEC)
MR11-DB BOOTSTRAP LOADER
RK-Ø5 DISK
STORAGE GRAPHICS TERMINAL (TEKTRONIX)

PDP 11/45 no. 2

MEMORY MANAGEMENT
FLOATING POINT PROCESSOR
LINE FREQUENCY CLOCK
PROGRAMMABLE CLOCK
8 K MOS
58 MEGABYTE DISK SYSTEM (DIVA)
8 K CORE (DEC)
8Ø K CORE (CAMBRIDGE MEMORIES)
VT-Ø5 CRT TERMINAL
CAMAC BRANCH DRIVER (BI-RA)
IBM 729 MAGNETIC TAPE DRIVE
IBM 729 MAGNETIC TAPE DRIVE
DMA AND DIGITAL INTERFACES
GT-4Ø INTERACTIVE GRAPHICS TERMINAL
PRINTER-PLOTTER (GOULD)
SYNCHRONOUS LINE INTERFACE
MR11-DB BOOTSTRAP LOADER
DUAL DECTAPE DRIVE
EDIT CRT TERMINAL (BEEHIVE)

RT-11 is used on CPU no. 1 for data acquisition.
RSX-11D is used on CPU no. 2 for all other computing.
We have plot software for the Gould 5ØØØ printer/plotter under RSX-11D.
We have plot software for the Tektronix 4Ø1Ø under RT-11.

We use this system for data acquisition and analysis for experiments conducted at Bates.

HARVARD MEDICAL SCHOOL LAB. OF NEUROPHYSIOLOGY. We use the following system for data collection in neurophysiological experiments (intervals between neuronal discharges and also EEG-type analog data) and for statistical processing of that data:

Hardware: DECLAB 11/4Ø with 16K core Extended instruction set
Calcomp 565 drum plotter

Software: Fortran, Basic (RT-11)

I would like to hear if anyone has a software driver for RT-11 and the Calcomp plotter.

Robert W. McCarley, M.D.
Harvard Medical School
Lab. of Neurophysiology
74 Fenwood Road
Boston, MA Ø2115
tele. (617) 734-13ØØ

CENTER FOR MUSIC EXPERIMENT, UCSD
DEPARTMENT OF NEUROLOGY, USCD

The Neurology system consists of a PDP-11, 24K core, EIS, RK-Ø5, paper tape, DECWRITER, 611 storage scope and hardcopy unit, 16 channel LPS unit and some homemade interfaces to FM tape recorders and the like. An extensive hardware development effort is currently underway which includes a DMA interface for the LPS unit which will auto-mix A/D channel inputs. CME's system consists of a PDP-11/2Ø, 24K core, EAE, RK-Ø3, paper tape, DECWRITER and some homemade goodies including semi-programmable clocks, control speed DACs, and audio rate DAC and ADC with appropriate interfaces.

Both installations are converting from DOS to RT.

Bruce Leibig
CME
UCSD
La Jolla, CA 92Ø37
(714) 452-4384
(714) 452-4383

OPEN DR. MEMORY (this column formerly called "HELP")

This monthly column is intended to provide helpful hints on the use of the RT-11 system, especially advanced use of F/B, to clear up some misconceptions about the system, and to answer users' questions. If you have a problem with RT which you would like published and (hopefully) answered, write to me at the following address:

Anton Chernoff
Lawrence University
Appleton, WI 54911
(414) 739-3681

This month's topic is on RT-11 device names.

Device names in RT-11 specify physical device on which a file resides. There are three types of device names in the system. First are the physical device names. These consist of a 2-letter device type code (e.g., DT, RK, PR) and may be followed by a digit from Ø to 7 to indicate the unit number: If the unit number after a physical device name is missing, unit Ø is assumed. Thus, RK: and RKØ: specify the same physical device. For inherently non-file-structured RT-11 devices (i.e. LP, PP, PR, TT), the unit number is ignored by the handler.

Second are the system device names SY and DK. When RT-11 is bootstrapped, the special device names SY: and DK: (without an explicit unit number) are set up to refer to the device from which the system was booted (called the system device.) For example, if RK2 is the system device, both SY: and DK: mean RK2 (see below on booting a disk other than unit Ø). When SY and DK are used with an explicit unit number, they refer to the specified unit of the device type which is the system device. In the above example, DKØ: and SYØ: mean RKØ: and the system device may be referred to as SY:, DK:, DK2:, or RK2:.

These first two classes of device names are called permanent names, since they are always defined in the system. The third type of device name is the user-assigned device name. This is a 3-character name chosen by the user, and associated with a permanent name via the ASSIGN keyboard command. The pairings set up by ASSIGN commands are used as a "pre-mapping" for device names in all programmed operators. Whenever the system looks for a device by name, it first scans the table of user name assignments. If the 3-character (i.e., one RAD5Ø word) name specified is found to be a user logical name, it is replaced by the corresponding permanent name. Thus, ASSIGN RK3 RK2 causes all references to RK2: to be redirected to RK3. ASSIGN DK RKØ maps the name RKØ: into the system device and unit. ASSIGN DT DK maps the name DK into DECtape unit Ø.

The last example is especially important. The Command String Interpreter, CSI, supplies the default, device name DK: when it scans a filename string which has no explicit device name. Since all CUSPS (and most user-written programs) use the CSI to translate device and filename strings, DK: is the system-wide default device name. If all data files for an application are on a device (other than the system device) - say DP1 - assigning DK as a user name which corresponds to DP1 (thus superceding the original meaning of DK: as a permanent name) eliminates the need to type the specifier DP1: on all command strings. Notice that if the system device here is RK1, the command ASSIGN DP1 DK will not affect the meaning of DKØ: (which still means RKØ) or of DK1: (which still meand RK1), etc.

Caution: it is unhealthy to assign SY: as a user name!

Booting an RK disk other than Ø

The easiest way to boot RK1 is to boot RKØ with a valid system (or DTØ, or any other system device) and use PIP to boot RK1: unfortunately, if you have no DECtape and if RKØ is down, this doesn't work. Toggling in the alternate device bootstrap given in the RT-11 manual is a nuisance. The easiest way is to ensure that RKØ is not ready, and then initiate the hardware RK bootstrap. This will, of course, hang waiting for RKØ to become ready. Halt the processor, and examine 177412 (RK address register). This should be Ø.

Deposit in this location the RK unit number in the top three bits, and Ø's in all the others (e.g. deposit 12ØØØØ to boot RK5). Press continue, and the specified unit will boot. (Note: in some RK controllers, you must then examine (without change) the location 1774Ø6 to reset some flags in the controller. Try it without this first.)

Comments from DEC

We received some "clarifications" from Bob Bean of Digital. I print them here, rather than in the help column because of the new nature of that column and the sparcity of other news from DEC.

Loaded CT and MT Handlers

If the casette or magtape handlers are made resident with the LOAD command, and a job using either device is aborted while a tape file is open, the handler must be UNLOADed and reLOADed before it will allow processing of any new files. This is caused by flags internal to the handler, which cannot be reset unless a file is closed.
Normal procedure is not to keep CT or MT handlers resident. Users should also avoid .PURGE for files open on MT or CT.

Directory Overflow

The "?M-DIR OVRFLO XX" error message occurs if there is no room in the directory to create the desired new file entry. When this occurs, there are two courses of action:

1) Compress the device. The volume should be thoroughly backed-up (i.e., all files stored on another device also) before the compress is performed. Once compressed, the directory usually contains more space for new files.

2) If compress does not yield enough space to remove the error condition, the device should be copied to another device after first initializing the new volume to have a larger directory than the old volume. Do not use /S to transfer the files.
For example:

```
.R PIP
*RK1:/Z/N:2Ø                  (OLD DIRECTORY HAD 1Ø SEGMENTS)
RK1:/Z ARE YOU SURE?Y
*RK1:*.*=RK:*.*/X/Y           (COPY THE FILES)
```

The new device now has room for additional file entries.

3) If the compress fails and the above option is not available, the DIREXT program documented below may be used as a last resort to extend the directory.

Directory Extension

When a device is zeroed, additional directory segments can be specified by use of the PIP /N switch. Once files are written on the device, however, the directory size cannot be changed without using the /Z option in PIP, which destroys existing directory information.

Although it is recommended that, whenever possible, the PIP /Z/N combination be used to determine directory size, the following program may be used to change the size of a directory "on-line" without reinitializing the disk.

It can be used if there is no other alternative, and will be of special interest to paper tape users who cannot specify the size of their disk directory at system build time.

The program should be used only as a last resort, and only on a disk which has been thoroughly backed-up. It should be entered as instructed in the comments. Instructions for its use are also in the comments.
(program may be found in the back of the newsletter)

System HALT Clarification

As documented in section 2.8.1 in the RT-11 System Reference Manual, there are two HALTs in the RT-11 monitors. Users should carefully read this section, since knowledge of these HALTs and their meaning will help diagnose problems.

The Single-Job Monitor HALTs when monitor I/O to the system device fails. The most common reason is a write-locked system device.

The F/B Monitor HALTs when a trap through 4 or 1Ø occurs from monitor level code (RMON or handlers). The most common causes of this are:
1. Coding errors in user-written device drivers.
2. Calling a device which is not supported on the configuration. The handler traps when the device registers are referenced. One way to avoid this is to delete the handlers for those devices which are not on the configuration from the system disk. If the handler is not on the disk, the monitor will report an error for attempted references.
3. Hardware problems causing bus timeout traps through location 4. This is very rare and should be investigated only as a last resort.

The system HALTs are easily recognized by the fact that they occur in high memory, above the contents of location 54.

Setting the Stack with .ASECT in a Foreground Job

A relocatable symbol must not be used as the contents of location 42 when resetting the initial stack pointer via an .ASECT in a foreground job. To set the stack to relative location 1ØØØ in a foreground job, use:

```
.ASECT
.=42
.WORD 1ØØØ
```

Accessing Nonsystem Disks on Single-Disk Systems

Source disks and other nonsystem disks can be accessed on single-disk systems under RT-11 as follows:

1. Boot the system disk.
2. Load the handler for the device to which the desired files will be transferred.
3. Run PIP. When the prompting "*" appears, dismount the system disk.
4. Mount the source disk, WRITE LOCKed, in place of the system disk.
5. Transfer the desired files to the backup device (such as magtape or cassette).
6. Remount the system disk.

7. CTRL C out of PIP.

PIP always keeps the USR resident, and with the handler loaded, the system disk is not required (as long as no other devices are referenced).

For example, to transfer RT-11 sources from the source disk to magtape on a single-disk system:

1. Boot system.
2. Type:

```
.LOAD MT
.R PIP
*
```

3. Dismount system disk, mount source disk.
4. Type: MTØ:*.*=*.*/X/M:1
5. When done, remount system disk.

The sources can now be manipulated from magtape.

Device Names for RK11 and RF11

Users of other DIGITAL operating systems will notice that RT-11 uses the controller names (RK and RF) rather than the more common user-level names (DK and DF) for these devices. This is due to the fact that RT-11 uses the name DK to refer to the "Default Storage Device", which may not necessarily be the RK11.
If the user finds this situation annoying, the device names can be reassigned with the monitor ASSIGN command, as follows:

```
.ASS RK:DK
.ASS RF:DF
```

Note, however, that when DK is reassigned in this manner all default storage goes to device name DK, and the user may not wish to use the physical device RK as the default storage device.

Attached to the end of the Mini-tasker, you will find a listing of VM.SYS, the latest extended memory handler for RT-11 Version 2 (and Version 2B) systems. It comes compliments of Rich Billig of DIGITAL.

FOCAL/RT-11

Users interested in FOCAL under RT-11 should contact:

Steve Mullen
LDP LIFE SCIENCE MARKETING
DIGITAL
Marlboro, MA Ø1752
(617) 481-9511 ext: 6943

Questionnaire Results

On March 5, 1975 a questionnaire was sent to 42 RT-11 users who attended the RT-11 SIG Organization meeting at the Fall '74 DECUS Symposium. The questionnaire sought suggestions for the Miami meeting and volunteers to work for the SIG. It also requested user comments on the following topics:

1) Need for documentation on the system.
2) Preference as to enhancements versus keeping RT-11 small, fast, simple and inexpensive.
3) Need for closer compatibility with other DEC systems (cross assemblers, compilers, linkers).

5) Need for access to more than 28K of memory, remembering the impact on size, speed, cost, and simplicity.
Several letters were received, as well as numerous telephone calls, I will attempt to summarize the results.
Users felt that user-level documentation was excellent, but that there was need for more documentation at the systems level. This need may have been filled by the software support manual about to be published. (see report of the SIG meeting in Miami) Documentation need in the areas of FORTRAN-MACRO interaction was expressed, and will not be fulfilled by the software support manual. There were complaints of GT44 graphics package documentation.
Users were unanimous in their desire to keep the system small, fast, simple, and inexpensive.
The compatibility question brought varied response. Users requested compatability between RT-11 and RSX-11 to be implemented under RSX. This would include direct support of RT-11 file structure as well as FILEX direct to RT-11, support of the same editor under both systems, RT-11 linker and librarian under RSX-11, and MACRO and FORTRAN to generate RT-11 object code. Requests ranged from a full RT-11 emulator to simple compatible utility commands and batch stream.
Access to more than 28K core, although desireable to some users, was not considered essential. A limited capability to use the extra memory for data arrays or core to core overlays would be desireable, if it did not impact the more important features of system cost, reliability, size, and simplicity.
In addition to these comments, there was a strong push for some kind of file protection, and provision for memory common to both foreground and background (accessible with FORTRAN COMMON).

Spring '75 Symposium

At the 1975 Spring DECUS Symposium, presentations were made by DIGITAL, of hardware and software of interest to RT-11 users. There was an RT-11 SIG meeting, and several papers were presented by users describing their applications. For the Fall DECUS Symposium in Los Angeles, we hope to have, in addition to these presentations, panel discussions by experienced users focusing upon ideas and techniques in applying RT-11. Typical topics might be "Writing Device Handlers", "Intertask Communication and Scheduling", or "Using Memory Management". If you have an idea for a panel, or would like to participate in one, write to me and I will put you in touch with other users of similar interest. A more thorough report on the Miami meeting will be in the next edition of the Mini-tasker.

RT-11 SIG Meeting

Most of the meeting consisted of a review of the questionnaire described above, and an interactive discussion with George Thissell and others from DEC on RT-11. Description of this will be left to the next issue of the Mini-tasker.
Tom Provost was unanimously elected chairman, and it was decided to form working committees to carry out the work of the SIG until the fall symposium meeting.
A steering committee was formed of those members interested in becoming involved in SIG activities. This committee met and chairmen were chosen for each of the working committees.

I list below the committee chairmen and members so far. I strongly urge users to work on and through these committees to make this an effective organization for the users.

NEWSLETTER COMMITTEE: The newsletter committee is concerned with preparing the newsletter. Complete items should be sent to the chairman. News to be compiled into articles should be sent to Seldon Ball, who will pass the completed articles on to the chairman for inclusion. The newsletter is the lifeline of the SIG, and requires more attention than any other area. We will try to publish monthly. Suggestions and volunteers are welcomed.

John T. Rasted — Chairman
CAM Systems, Inc.
17 Brown Street
Waterbury, CT Ø67Ø2
(2Ø3) 757-8Ø1Ø

H. G. Hodkins
Algonquin College
2ØØ Lees Ave.
Ottawa KISØC5
CANADA

Seldon E. Ball, Jr.
Wilson Lab. of Nuclear Studies
Cornell University
Ithaca, NY 14853
(6Ø7) 256-4882

STANDARDS COMMITTEE: The standards committee serves two functions. First, they supply input to DEC on internal standards. To this end, they work with the DECUS standards committee to review proposed standards. They are also concerned with compatibility. Compatibility is needed in files, utility command syntax, Fortran, batch streams, etc. Progress here could ease conversion problems as well as improve intersystem communications.

Vincent E. Perriello — Chairman
CAM Systems, Inc.
17 Brown Street
Waterbury, CT Ø67Ø2
(2Ø3) 757-8Ø1Ø

Herbert G. Bown
Communication Research Centre
Dept. of Communications
Box 49Ø, Terminal 'A'
Shirley Bay, OTTAWA
CANADA K1N8T5
(613) 996-7Ø51 local 351

J. Frederick Bartlett
California Institute of Technology
248-48 Pasadena, CA 91125

DOCUMENTATION COMMITTEE: Documentation committee is charged with presenting DEC with a clear picture of the needs of the users for documentation. Although the new software support manual fills many of the past gaps in documentation, there are still areas in need of attention. Fortran OTS documentation is almost non-existant. A manual should be prepared to introduce the experienced DOS user, or OS 8 user to RT-11 surprises in terms of what he is already familiar with. A manual is needed to introduce the newcommer to DEC systems to the concepts of on-line programming with PIP, ODT, and a monitor.

Fred I. Magee — Chairman
Sandia Laboratories
Div 2643
P.O. Box 58ØØ
Albuquerque, NM 87115
(5Ø5) 264-2115
(5Ø5) 264-4896

HELP COMMITTEE: The HELP committee is concerned with helping the new users of RT-11 to understand and utilize fully the new or diffuse features of RT-11. To this end, they prepare the OPEN DR. MEMORY column for the Minitasker. Other aids will be developed.

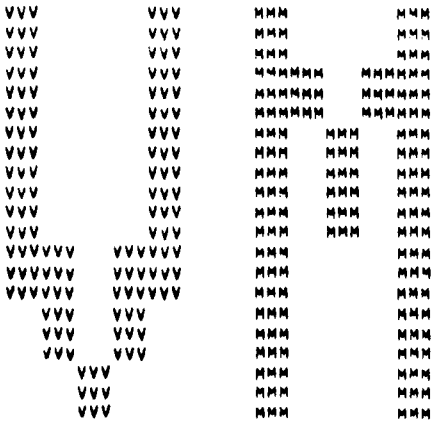
Anton Chernoff — Chairman
Lawrence University
Appleton, WI 54911
(414) 739-3681 ext: 567 or 564

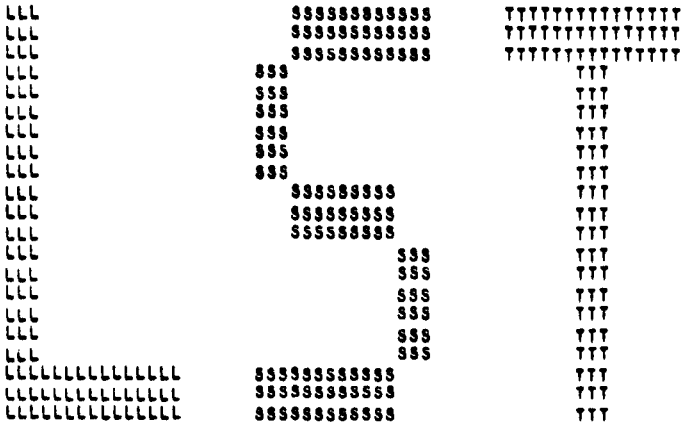
LIBRARY COMMITTEE: Library committee is concerned with testing of submissions to the DECUS Library. Users willing to test such programs are asked to make themselves known to the chairman, who will distribute each new contribution to a few test sites to verify whether it does as the author documents and whether some critical documentation needs to be added.

David Sykes — Chairman
Mead Technology Laboratories
3481 Dayton-Xenia Road.
Dayton, OH 45423
(513) 426-3111

STEERING COMMITTEE: The steering committee oversees the work of the other committees and attempts to solve all problems not handled by the committee structure. The SIG chairman, the local SIG chairmen, and the other committee chairman are defacto members of the steering committee.

Robert F. Ampula
Giant Food, Inc.
P.O. Box 18Ø4
Washington, DC 2ØØ13





```
*START*   RT-11 LPTSPL VERSION X01-01  RUNNING ON LP0   *START*

DATE:     2-MAY-75
REQUEST:  VM:VM/C:2
SIZE:     38 BLOCKS
COPY:     NUMBER 2 OF 2
FILE WILL BE DELETED AFTER PRINTING
```

```
                                .TITLE  VM.SYS
                        ; VIRTUAL MEMORY HANDLER FOR RT-11 V2 (V28)
                        ;
                        ; SIMULATES A DISK IN EXTENDED MEMORY ON 11/40, 11/45, AND 11/70
                        ; PROCESSORS WITH KT11.
                        ;
                        ; "FASTER THAN A SPEEDING BULLET ..."
                        ;                       -CLARK KENT
                        ;
                        ; RICH BILLIG/MAY 1975
                        ; WITH RANDOM ASSISTANCE FROM A(C AND MJ

                        ; REGISTER DEFINITIONS

000000                          R0=     %0
000001                          R1=     %1
000002                          R2=     %2
000003                          R3=     %3
000004                          R4=     %4
000005                          R5=     %5
000006                          SP=     %6
000007                          PC=     %7

                        ; MEMORY MANAGEMENT REGISTERS

177572          MMSR0=  177572          ;STATUS REG 0
177574          MMSR1=  177574          ;STATUS REG 1
177576          MMSR2=  177576          ;STATUS REG 2
172516          MMSR3=  172516          ;STATUS REG 3
177600          UISDR0= 177600          ;USER I DESC REG 0
177616          UISDR7= 177616          ;USER I DESC REG 7
177640          UISAR0= 177640          ;USER I ADDR REG 0
177656          UISAR7= 177656          ;USER I ADDR REG 7
172300          KISDR0= 172300          ;KERNEL I DESC REG 0
172316          KISDR7= 172316          ;KERNEL I DESC REG 7
172340          KISAR0= 172340          ;KERNEL I ADDR REG 0
172356          KISAR7= 172356          ;KERNEL I ADDR REG 7

                        ; MISCELLANEOUS DEFINITIONS

177776          PS=     177776          ;PROCESSOR STATUS WORD
140000          UMODE=  140000          ;CURRENT MODE = USER (IN PS)
002220          ADR22=  000020          ;22-BIT ADDRESSING MODE FOR 11/70
030000          PUMODE= 030000          ;PREVIOUS MODE = USER MODE (IN PS)
```

```
000000                  .REPT   0               ;FOR CLEANLINESS AND BEAUTY

                THE VM HANDLER IS USED TO ALLOW RT-11 ACCESS TO EXTENDED MEMORY ON
                PDP-11 MODELS WITH THE KT-11 MEMORY MANAGEMENT UNIT.  WHEN INSTALLED
                IN A SYSTEM, IT ALLOWS ACCESS TO EXTENDED MEMORY AS AN RT-11 FILE-
                STRUCTURED DEVICE.  SIGNIFICANT PERFORMANCE IMPROVEMENTS CAN BE
                REALIZED BY PLACING OFTEN-REFERENCED FILES IN EXTENDED MEMORY.
                FOR EXAMPLE, FORTRAN LINK TIMES CAN BE REDUCED BY PLACING THE FORTRAN
                LIBRARY IN VM.

                THERE ARE SEVERAL RESTRICTIONS ON THE USE OF THE VM DEVICE. THEY ARE:

                1.      VM: MUST BE ZEROED USING THE SET COMMAND:

                        SET VM SIZE = N

                        WHERE N REPRESENTS THE NUMBER OF DIRECTORY SEGMENTS DESIRED.
                        UNLESS THE VM: HANDLER IS TO BE USED ON ONLY ONE CONFIGURATION,
                        THE SIZE OF THE DEVICE CANNOT BE PREDICTED, AND THEREFORE THE
                        MONITOR TABLE WHICH IS REFERENCED BY PIP WHEN ZEROING THE
                        DEVICE WILL NOT CONTAIN THE VALID DEVICE SIZE.  USERS WHO
                        DO NOT REQUIRE THAT THE HANDLER BE MOVED FROM SYSTEM TO SYSTEM
                        MAY INSTALL IT IN SUCH A WAY AS TO ALLOW NORMAL PIP ZERO (/Z)
                        OPERATIONS (SEE BELOW).

                2.      THE VM: DEVICE SHOULD NOT BE COMPRESSED USING THE PIP /S
                        COMMAND UNLESS THE HANDLER IS INSTALLED WITH THE NUMBER OF
                        BLOCKS SPECIFIED (SEE BELOW), OR UNPREDICTABLE RESULTS WILL
                        OCCUR.

                INSTALLATION INSTRUCTIONS:

                THE VM HANDLER IS INSTALLED IN THE SAME MANNER AS ANY OTHER RT-11
                HANDLER, NAMELY, IT IS ASSEMBLED, LINKED, AND THE APPROPRIATE MONITOR
                LOCATIONS ARE PATCHED.  TO ASSEMBLE AND LINK:

                        .R MACRO
                        *VM=VM
                        ERRORS DETECTED: 0
                        FREE CORE: XXXXX. WORDS

                        *^C
                        .R LINK
                        *VM,SYS=VM

                        *^C
                        .

                ENTRIES MUST BE MADE IN THE MONITOR TABLES SPNAME, SDVSIZ, SMSIZE,
                AND SSTAT.  TWO DIFFERENT PATCHES ARE PROVIDED, ONE WHICH ALLOWS THE
                HANDLER TO BE USED ON SEVERAL DIFFERENT SYSTEMS (WITH THE RESTRICTIONS
                LISTED ABOVE), AND ANOTHER WHICH REMOVES THE RESTRICTIONS BUT DOES
                NOT ALLOW THE HANDLER TO BE TRANSPORTED WITHOUT REPATCHING THE
                MONITOR.
```

```
                        TO MAKE THE APPROPRIATE PATCH TO THE MONITOR, FIND THE LOCATIONS OF
                        THE VARIOUS DEVICE TABLES FOR YOUR PARTICULAR VERSION.  FOR INSTANCE,
                        THE LOCATIONS FOR STANDARD RT-11 VERSION 2 MONITORS ARE:

                        TABLE           S/J MONITOR     F/B MONITOR
                        $MSIZE          012642          013542
                        $DVSIZ          012676          013576
                        $PNAME          015470          016612
                        $STAT           015524          016646

                        THE FOLLOWING PROCEDURE PATCHES THE MONITOR APPROPRIATELY:

                        1.      FIND THE FIRST FREE DEVICE SLOT IN $PNAME.
                                MODIFY THIS WORD TO CONTAIN THE VALUE 105610 OCTAL (RAD50 FOR VM).

                        2.      MODIFY THE CORRESPONDING $STAT TABLE ENTRY TO CONTAIN 100020 (OCTAL).

                        3.      MODIFY THE CORRESPONDING $MSIZE TABLE ENTRY TO CONTAIN 000322 (OCTAL).

                        4.      IF YOU WISH TO ALLOW THE HANDLER TO BE USED ON SEVERAL DIFFERENT
                                SYSTEMS, MODIFY THE CORRESPONDING $DVSIZ ENTRY TO CONTAIN 0.
                                IF THIS IS DONE, THE SET VM SIZE COMMAND IS USED TO ZERO THE
                                DEVIC, AND THE INSTALLATION PROCEDURE IS COMPLETE.

                                OTHERWISE, TO TAILOR THE HANDLER TO A PARTICULAR CONFIGURATION,
                                DETERMINE THE NUMBER OF AVAILABLE BLOCKS USING THE FORMULA:

                                SIZE = ( (MEMORY IN K WORDS) - 28 ) * 4

                                CONVERT THIS NUMBER TO OCTAL AND STORE IT IN THE APPROPRIATE
                                ENTRY IN THE $DVSIZ TABLE.  THIS WILL ALLOW THE DEVICE TO BE
                                USED WITH COMPLETE GENERALITY IN PIP, PERMITTING THE /Z AND /S
                                OPERATIONS TO TAKE PLACE IN THEIR NORMAL WAY.

                                .ENDR
```

```
                                ; SET COMMAND OPTIONS
                                ;
                000000                  .ASECT
                                ;
                000400                  .=400
                                ;
000400  172340                  .WORD   KISAR0          ;WORD TO PRELOAD INTO R3
000402  074122  017500          .RAD50  /SIZE/          ;NAME OF OPTION
000406  040035                  .WORD   <SIZE-400>/2+40000 ;OFFSET AND LEGAL OPTIONS FLAG
                                ;
000410  000000                  .WORD   0               ;END OF TABLE
                                ;
                                ; THE SET COMMAND:
                                ;
                                ;       SET VM SIZE = N
                                ;
                                ;       ZEROES THE VM DEVICE FOR THE MAXIMUM AMOUNT OF MEMORY
                                ;       AVAILABLE ON THE PRESENT CONFIGURATION.  THE COMMAND
                                ;       ARGUMENT N SPECIFIES THE NUMBER OF DIRECTORY SEGMENTS
                                ;       TO BE ALLOCATED ON THE ZEROED DEVICE (THIS IS THE
                                ;       EQUIVALENT OF THE /NIX SWITCH TO PIP). THIS COMMAND
                                ;       MUST BE ISSUED BEFORE THE VM IS USED TO ASSURE A VALID
                                ;       RT-11 DIRECTORY IS PRESENT.
                                ;
                                ;       NOTE:
                                ;
                                ;       VM: CANNOT BE ZEROED USING PIP, BECAUSE THE MONITOR DOES
                                ;       NOT KNOW HOW LARGE THIS "DEVICE" IS.
                                ;
                                        .ENABL  LSB
000412  022700  000037          SIZE:   CMP     #37,R0          ;CHECK FOR VALID # OF DIR SEGMENTS
000416  103522                          BLO     6$              ;BOGUS -- GIVE ?ILL CMD?
000420  010067  000314                  MOV     R0,DIRSEG       ;ELSE REMEMBER IT FOR LATER
000424  001002                          BNE     1$              ;BRANCH IF IT WAS SPECIFIED
000426  005267  000306                  INC     DIRSEG          ;ELSE DEFAULT TO 1 SEGMENT
000432  010700                  1$:     MOV     PC,R0           ;DO A PIC .TRPSET CALL
000434  062720  000300                  ADD     #TBLK-.,R0      ;  TO ALLOW US TO INTERCEPT
000440  060062  000002                  ADD     R0,2(R0)        ;  TRAPS FROM ILLEGAL MEMORY REFS
000444  104375                          EMT     375
000446  005000                          CLR     R0              ;SET LOWEST MEM BLOCK & FLAG FOR TRAP4
000450  012701  000010                  MOV     #8.,R1          ;NUMBER OF MEM MGMT REGS TO SET UP
000454  012763  077406  177740  2$:     MOV     #77406,KISDR0-KISAR0(R3) ;SET DESCRIPTOR
000462  010023                          MOV     R0,(R3)+        ;AND BASE ADDRESS
000464  062700  000200                  ADD     #200,R0         ;BUMP BASE BY 4K WORDS
000470  077107                          SOB     R1,2$           ;SET ALL 8 REGS
000472  012743  177600                  MOV     #177600,-(R3)   ;KERNAL APR7 MAPS IO PAGE
000476  012737  077406  177600          MOV     #77406,@#UISDR0 ;SET USER 0-4K MAP
000504  052737  030000  177776          BIS     #PUMODE,@#PS    ;SET PREVIOUS MODE = USER
000512  052737  000001  177572          BIS     #1,@#MMSR0      ;ENABLE MANAGEMENT
000520  012703  177640                  MOV     #UISAR0,R3      ;R3 => USER 0-4K APR
000524  012713  001600                  MOV     #1600,@R3       ;MAP OVER 28K-32K
000530  012700  007740                  MOV     #7740,R0        ;SET R0 = MAX APR VALUE
000534  052737  000020  172516          BIS     #ADRS22,@#MMSR3 ;SET 22-BIT MODE FOR 11/70
000542  005737  172516                  TST     @#MMSR3         ;IS 11/70 PRESENT?
000546  001401                          BEQ     3$              ;NOPE = LIMIT IS OKAY
000550  110038                          MOVB    R0,R0           ;ELSE SET R0 = 177740
```

```
 1 000552  006537  000000          3$:     MFPI    #0              ;TEST ADDRESSES
 2 000556  005726                          TST     (SP)+           ;UNTIL WE TRAP OUT
 3 000560  020013                          CMP     R0,@R3          ;OR MAX IS REACHED
 4 000562  001403                          BEQ     4$              ;BRANCH IF AT MAX
 5 000564  062713  000040                  ADD     #40,@R3         ;ELSE BUMP BY 1K WORDS AND TRY AGAIN
 6 000570  000770                          BR      3$              ;UNTIL SOMETHING TAKES
 7 000572  011300                  4$:     MOV     @R3,R0          ;HERE WHEN MEMORY LIMIT FOUND
 8 000574  006200                          ASR     R0              ;GET MEM SIZE IN 256 WORD BLOCKS
 9 000576  006200                          ASR     R0
10 000600  006200                          ASR     R0
11 000602  042700  160003                  BIC     #160003,R0
12 000606  062700  177624                  ADD     #4-<2$.-4>,R0   ;R0 = # OF BLOCKS
13 000612  010701                          MOV     PC,R1           ;GET PIC ADRS OF SAMPLE DIRECTORY
14 000614  062701  000124                  ADD     #DIRSEG-.,R1
15 000620  161100                          SUB     @R1,R0          ;R0 = # OF BLOCKS - DIRECTORY SIZE
16 000622  161100                          SUB     @R1,R0
17 000624  060061  000022                  ADD     R0,22(R1)       ;SET SIZE OF EMPTY ENTRY
18 000630  061161  000010                  ADD     @R1,10(R1)      ;AND STARTING FILE BLOCK #
19 000634  061161  000010                  ADD     @R1,10(R1)
20 000640  012713  001660                  MOV     #1660,@R3       ;SET APR TO MAP BLOCK 6 OF VM:
21 000644  005003                          CLR     R3              ;START AT LOC 0 OF BLOCK 6
22 000646  012700  000015                  MOV     #13.,R0         ;AND MOVE 13 WORDS OF DIRECTORY
23 000652  012146                  5$:     MOV     (R1)+,-(SP)     ;PUSH THE DIRECTORY WORD
24 000654  006623                          MTPI    (R3)+           ;AND STORE IN DEVICE
25 000656  077003                          SOB     R0,5$
26 000660  005037  177572                  CLR     @#MMSR0         ;TURN OFF MANAGEMENT
27 000664  012767  000006  000356    6$:   MOV     #6,DIRSEG+10    ;RESET FOR NEXT TIME
28 000672  012767  177772  000352          MOV     #-6,DIRSEG+22
29 000700  012767  177754  000030          MOV     #TRAP4-TBLK,TBLK+2
30 000706  000207                          RTS     PC              ;AND RETURN TO KMON
31
32 000712  022626                  TRAP4:  CMP     (SP)+,(SP)+     ;DUMP PS AND PC
33 000712  005700                          TST     R0              ;CHECK FLAG
34 000714  000261                          SEC                     ;CARRY SET IN CASE OF ERROR
35 000716  001762                          BEQ     6$              ;BRANCH IF NO VM PRESENT
36 000720  162713  000040                  SUB     #40,@R3         ;ELSE CORRECT SIZE
37 000724  052737  030000  177776          BIS     #PUMODE,@#PS    ;SET USER PREVIOUS AGAIN
38 000732  000717                          BR      4$              ;AND GO MAKE DIRECTORY
39
40                                        .DSABL  LSB
41
42 000734  001400                  TBLK:   .WORD   3*400           ;.TRPSET CODE
43 000736  177754                          .WORD   TRAP4-TBLK      ;AND ADDRESS OF TRAP ROUTINE
44
45 000740  000000  000000  000001  DIRSEG:.WORD   0,0,1,0,6,1000,0,0,0,-6,0,0,4000 ;SAMPLE DIRECTORY
```

```
                                ; LOAD POINT
                                
                000000'                 .CSECT  VM
                                
000000  000250                  .WORD   250             ;VECTOR
000002  000242                  .WORD   VMINT-.         ;OFFSET TO INTERRUPT SERVICE
000004  000340                  .WORD   340             ;PR7
000006  000000          VMLQE:  .WORD   0               ;POINTER TO LAST Q ENTRY
000010  000000          VMCQE:  .WORD   0               ;POINTER TO CURRENT Q ENTRY

                                ; ENTRY POINT

000012  016703  177772          MOV     VMCQE,R3        ;R3 => QUEUE ELEMENT
000016  012302                  MOV     (R3)+,R2        ;R2 = BLOCK NUMBER
000020  006302                  ASL     R2
000022  006302                  ASL     R2
000024  006302                  ASL     R2              ;R2 = VM MEMORY BLOCK #
000026  062702  001600          ADD     #1600,R2        ;   + 28K WORDS
000032  005004                  CLR     R4              ;R4 = MEMORY BLK #
000034  012701  177640          MOV     #UISAR0,R1      ;R1 => USER I ADDRESS REGS
000040  012700  000010          MOV     #8.,R0          ;8 REGS TO LOAD
000044  012761  077406  177742  VMSET:  MOV     #77406,UISDR0-UISAR0(R1) ;LOAD USER DESC REG
000052  012761  077406  172442          MOV     #77406,KISDR0-UISAR0(R1) ;LOAD KERNEL DESC REG
000060  010461  172502          MOV     R4,KISAR0-UISAR0(R1) ;LOAD KERNEL I ADDR REG
000064  010421                  MOV     R4,(R1)+        ;AND USER I ADDR REG
000066  062704  000200          ADD     #200,R4         ;BUMP ADDR BY 4K
000072  077014                  SOB     R0,VMSET        ;AND LOOP TO SET UP ALL 8
000074  010241                  MOV     R2,-(R1)        ;MAP VM BLK OVER USER I/O PAGE
000076  012737  037406  177616  MOV     #37406,@#UISDR7 ;WITH A LENGTH OF 2K WORDS
000104  012737  177600  172356  MOV     #177600,@#KISAR7 ;MAP I/O PAGE TO KERNEL
000112  012705  160000          MOV     #160000,R5      ;R5 => BASE OF I/O PAGE
000116  052737  000020  172516  BIS     #ADRS22,@#MMSR3 ;SET 22-BIT MODE FOR 11/70 (ELSE NOP)
000124  052737  140000  177776  BIS     #UMODE,@#PS     ;GO INTO USER MODE
000132  052737  000001  177572  BIS     #1,@#MMSR0      ;ENABLE MANAGEMENT
000140  005723                  TST     (R3)+           ;SKIP UNIT NUMBER IN Q ELEMENT
000142  012300                  MOV     (R3)+,R0        ;R3 = BUFFER ADDRESS
000144  011304                  MOV     @R3,R4          ;R4 = WORD COUNT
000146  100410                  BMI     VMWRT           ;IF NEGATIVE, WRITE REQUEST
000150  001423                  BEQ     VMTRAP          ;IF SEEK THEN DONE IMMEDIATELY

000152  005204                  INC     R4              ;FOLD WORD COUNT TO SPEED TRANSFER
000154  006204                  ASR     R4
000156  103001                  BCC     VMR2
000160  012520          VMREAD: MOV     (R5)+,(R0)+     ;COPY TO USER BUFFER
000162  012520          VMR2:   MOV     (R5)+,(R0)+
000164  077403                  SOB     R4,VMREAD       ;LOOP UNTIL TRANSFER COMPLETE
000166  000414                  BR      VMTRAP          ;THEN GO TO COMMON EXIT
```

```
 1 000170  005404                  VMWRT:  NEG     R4              ;MAKE WORD COUNT POSITIVE
 2 000172  005204                          INC     R4              ;FOLD WORD COUNT TO SPEED TRANSFER
 3 000174  006204                          ASR     R4
 4 000176  103001                          BCC     VMW2
 5 000200  012025                  VMWRIT: MOV     (R0)+,(R5)+     ;MOVE A WORD FROM USER BUFFER
 6 000202  012025                  VMW2:   MOV     (R0)+,(R5)+
 7 000204  077403                          SOB     R4,VMWRIT       ;LOOP UNTIL TRANSFER COMPLETE
 8 000206  111304                          MOVB    @R3,R4          ;CHECK IF ZERO-FILL REQ'D
 9 000210  001403                          BEQ     VMTRAP          ;NOPE - MULTIPLE OF A BLOCK
10 000212  005025                  VMCLR:  CLR     (R5)+           ;ELSE CLEAR A WORD
11 000214  105304                          DECB    R4              ;UNTIL REACH A BLOCK BOUNDARY
12 000216  001375                          BNE     VMCLR
13
14 000220  005037  177572          VMTRAP: CLR     @#MMSR0         ;TRY TO TURN OFF MANAGEMENT
15 000224  010704                          MOV     PC,R4           ;POINT TO G ELEMENT AGAIN
16 000226  062704  177562                  ADD     #VMCQE-.,R4
17 000232  013700  000054                  MOV     @#54,R0         ;GET BASE OF RMON
18 000236  000170  000270                  JMP     @270(R0)        ;AND DISPATCH ELEMENT
19
20                                    ; ABORT ENTRY
21
22 000242  000766                          BR      VMTRAP          ;ABORT BY DISABLING MANAGEMENT
23
24                                    ; INTERRUPT SERVICE
25
26 000244  012705  160000          VMINT:  MOV     #160000,R5      ;RESET TO POINT TO BASE OF I/O PAGE
27 000250  062737  000100  177656          ADD     #100,@#UISAR7    ;AND REMAP TO NEXT 2K CHUNK
28 000256  013701  177576                  MOV     @#MMSR2,R1      ;R1 = VIRTUAL PC OF ERROR
29 000262  021127                          CMP     @R1,(PC)+       ;CHECK FOR R0 MODIFICATION
30 000264  012025                           MOV    (R0)+,(R5)+     ;  ON THIS INSTRUCTION ONLY!
31 000266  001001                          BNE     1$              ;NOT THIS ONE, SO SKIP CORRECTION
32 000270  005740                          TST     -(R0)           ;ELSE UPDATE
33 000272  040537  177572          1$:     BIC     R5,@#MMSR0      ;CLEAR SEGMENT LENGTH FAULT
34 000276  010702                          MOV     PC,R2           ;GET ADDR OF EXIT CODE
35 000300  062702  177720                  ADD     #VMTRAP-.,R2    ;  IN R2
36 000304  020102                          CMP     R1,R2           ;TRYING TO EXIT?
37 000306  001002                          BNE     VMRTI           ;NOPE
38 000310  040566  000002                  BIC     R5,2(SP)        ;ELSE RETURN TO KERNEL MODE
39 000314  010116                  VMRTI:  MOV     R1,@SP          ;RESTART INSTRUCTION
40 000316  000002                          RTI                     ;AND EXIT
41
42 000320  000000                  SINPTR: .WORD   0               ;FOR COMPATIBILITY
43
44         000001'                          .END
```


CROSS REFERENCE TABLE (CREF V01-02)

```
SINPTR  7-42#
.       4-5#    4-37    5-14    6-6     7-15    7-35
ADRS22  1-44#   4-53    6-32
DIRSEG  4-33*   4-35*   5-14    5-27*   5-28*   5-45#
KISAR0  1-37#   4-7     4-42*   6-24*
KISAR7  1-38#   6-30*
KISDR0  1-35#   4-42*   6-23*
KISDR7  1-36#
MMSR0   1-27#   4-49*   5-26*   6-34*   7-14*   7-33*
MMSR1   1-28#
MMSR2   1-29#   7-28
MMSR3   1-30#   4-53*   4-54    6-32*
PS      1-42#   4-48*   5-37*   6-33*
PUMODE  1-45#   4-48    5-37
SIZE    4-9     4-31#
TBLK    4-37    5-29    5-29*   5-42#   5-43
TRAP4   5-29    5-32#   5-43
UISAR0  1-33#   4-50    6-20    6-22*   6-23*   6-24*
UISAR7  1-34#   7-27*
UISDR0  1-31#   4-47*   6-22*
UISDR7  1-32#   6-29*
UMODE   1-43#   6-33
VMCLR   7-10#   7-12
VMCQE   6-9#    6-13    7-16
VMINT   6-6     7-26#
VMLQE   6-8#
VMR2    6-43    6-45#
VMREAD  6-44#   6-46
VMRTI   7-37    7-39#
VMSET   6-22#   6-27
VMTRAP  6-39    6-47    7-9     7-14#   7-22    7-35
VMW2    7-4     7-6#
VMWRIT  7-5#    7-7
VMWRT   6-38    7-1#
```

```
VM.SYS  RT-11 MACRO VM02-09   2-MAY-75 02:20:23 PAGE 7+
SYMBOL TABLE

ADRS22= 022220          DIRSEG  000748          KISAR0= 172340          KISAR7= 172356          KISDR0= 172300
KISDR7= 172316          MMSR0 = 177572          MMSR1 = 177574          MMSR2 = 177576          MMSR3 = 172516
PC     =%000027          PS     = 177776          PUMODE= 030000          R0     =%000000          R1     =%000001
R2     =%000002          R3     =%000003          R4     =%000004          R5     =%000005          SIZE    000412
SP     =%000026          TBLK    000734          TRAP4   000710          UISAR0= 177640          UISAR7= 177656
UISDP0= 177600          UISDR7= 177616          UMODE = 140000          VMCLR   000212R     002 VMCOE   000010R     002
VMINT   022244R     002 VMLOE   000006R     002 VMREAD  000100R     002 VMRTI   000314R     002 VMR2    000162R     002
VMSET   022244R     002 VMTRAP  000226R     002 VMWRIT  000200R     002 VMWRT   000170R     002 VMW2    000202R     002
SINPTR  000320R     002
. ABS.  000772      000
        000000      001
VM      000322      002
ERRORS DETECTED: 0
FREE CORE: 12297. WORDS

,VM:VM/N:TTM:BEX/C=VM:VM
```

DECUS

DIGITAL EQUIPMENT COMPUTER USERS SOCIETY
MAYNARD, MASSACHUSETTS 01754

ADDRESS CORRECTION REQUESTED

BULK RATE
U.S. POSTAGE
PAID
DIGITAL EQUIPMENT
CORPORATION