

KT11-C

EXERCISER

MD-11-DCKTG-E

EP DCKTG E DL A

OCT 1976

COPYRIGHT © 1976

digital

FICHE 1 OF 1

Made in U.S.A.

This microfiche card contains a grid of frames. The first column on the left contains 12 frames, each with a small header and a list of data. The subsequent columns contain larger frames with more detailed data, including tables and lists. The data appears to be organized into several sections, with some frames containing headers like 'EXERCISER' and 'MD-11-DCKTG-E'. The frames are arranged in a grid that is approximately 12 frames wide and 12 frames high, though some frames are missing or blank.

.REM *

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DCKTG-E-D
PRODUCT NAME: KT11-C EXERCISER
DATE: JANUARY 1976
MAINTAINER: DIAGNOSTIC PROGRAMMING
AUTHOR: RICK FADDEN

THE INFORMATION IN THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE AND SHOULD NOT BE CONSTRUED AS A COMMITMENT BY DIGITAL EQUIPMENT CORPORATION. DIGITAL EQUIPMENT CORPORATION ASSUMES NO RESPONSIBILITY FOR ANY ERRORS THAT MAY APPEAR IN THIS DOCUMENT.

THE SOFTWARE DESCRIBED IN THIS DOCUMENT IS FURNISHED UNDER A LICENSE AND MAY ONLY BE USED OR COPIED IN ACCORDANCE WITH THE TERMS OF SUCH LICENSE.

DIGITAL EQUIPMENT CORPORATION ASSUMES NO RESPONSIBILITY FOR THE USE OR RELIABILITY OF ITS SOFTWARE ON EQUIPMENT THAT IS NOT SUPPLIED BY DIGITAL

COPYRIGHT (C) 1972, 1973, 1975

1.0 ABSTRACT

THIS PROGRAM IS AN INTERACTIVE EXERCISER FOR A PDP-11/45 EQUIPPED WITH THE KT11-C OPTION. IT PERFORMS A TEST OF INSTRUCTIONS AND CONCURRENT OPERATIONS OF I/O EQUIPMENT WHILE RELOCATING THRU MEMORY. IT PROVIDES NUMEROUS MODES OF TESTING, FROM 4K EXECUTION WITH THE KT11-C TURNED OFF AND ONLY KERNEL MODE IN USE, TO 128K EXECUTION WITH EACH USER PAGE MAPPED SEQUENTIALLY TO EVERY 4K BANK OF MEMORY, TC11 AND RF11 BUFFER AND CODE RELOCATION THRU ALL MEMORY, AND SUPERVISOR MAPPING OF OTHER I/O DEVICES. THIS PROGRAM IS NOT TO BE CONSIDERED A TOTAL CHECK OF THE SYSTEM. IF AN ERROR IS DETECTED IN AN I/O DEVICE, IT WILL PROBABLY BE NECESSARY TO CORRECT THE MALFUNCTION WITH THE RESPECTIVE DIAGNOSTIC FOR THAT DEVICE.

2.0 REQUIREMENTS

2.1 EQUIPMENT

PDP-11/45 STANDARD COMPUTER
KT11-C MEMORY MANAGEMENT OPTION

2.1.1 OPTIONAL HARDWARE THAT THE PROGRAM WILL EXERCISE

MEMORY UP TO 128KW OF MEMORY-DOES NOT HAVE TO BE CONTIGUOUS,
BUT BLOCKS OF LESS THAN 4KW WILL NOT BE USED
RF11 DISK
TC11 DECTAPE-TRANSPORT ZERO
KW11-L LINE CLOCK
KL11 ASR33 OR ASR35 TELEPRINTER
LP11 LINE PRINTER

2.2 STORAGE

THIS PROGRAM USES MEMORY FROM 00000 TO 17760.

3.0 LOADING PROCEDURE

PROCEDURE FOR NORMAL ABSOLUTE TAPES SHOULD BE FOLLOWED.

4.0 STARTING PROCEDURE AND SWITCH SETTINGS

4.1 NORMAL STARTING PROCEDURE

LOAD STARTING ADDRESS 200. (300 IF LP11 IS USED).
SET DESIRED MEMORY MANAGEMENT SELECTION SWITCHES (SEE 4.2)- ALL
DOWN FOR WORST CASE TESTING.
PRESS START.

(CONTINUED ON THE NEXT PAGE)

4.1 NORMAL STARTING PROCEDURE (CONTINUED)

THE PROGRAM WILL IMMEDIATELY HALT. AT THE HALT, SET THE DESIRED DEVICE SELECTION SWITCHES (SEE 4.3) AND THE DESIRED DYNAMIC SWITCHES (SEE 5.1.2).

PRESS CONTINUE.

THE PROGRAM WILL PRINT A \$ (UNLESS THE TTY OUTPUT IS SELECTED) AT THE END OF EACH BANK. IF SWITCHES 0, 1 AND 2 WERE ALL DOWN WHEN START WAS PRESSED (SELECTING THE USE OF 4K PHYSICAL ADDRESS SPACE AS 32K VIRTUAL ADDRESS SPACE-SEE 5.3.1) AN ASTERISK WILL BE TYPED AT THE END OF A FULL PASS THRU ALL MEMORY (UNLESS THE TTY OUTPUT IS SELECTED).

NOTE THAT IF TTY OUTPUT IS SELECTED, THE DOLLAR SIGN AND ASTERISK ARE NOT PRINTED.

4.2 MEMORY MANAGEMENT SELECTION SWITCHES (INITIAL SWITCH REGISTER SETTINGS).

THE SWITCHES SET AT STARTUP DETERMINE THE WAY IN WHICH MEMORY IS MAPPED AND EXERCISED:

SW0=1 OR UP---INHIBIT THE K11-C (SR0<0) WILL NOT BE SET AT ALL)

SW1=1 OR UP---INHIBIT USE OF SUPERVISOR AND USER MODES

(ALSO INHIBITS 4K AS 32K)

SW2=1 OR UP---INHIBIT 4K AS 32 K (ALSO INHIBITED IF EITHER SW0 OR SW1 IS SET)-SEE SECTION 5.3.1 FOR EXPLANATION

SW3=1 OR UP---INHIBIT RELOCATION OF RF11 AND TC11 CODE AND

BUFFERS-SEE SECTIONS 5.3.4 AND 5.3.5 FOR AN EXPLANATION

SW4=1 OR UP---INHIBIT CYCLING ACCESS KEY OF SUPERVISOR PAGE 7

-SEE SECTION 5.3.7 FOR AN EXPLANATION

SW5=1 OR UP---INHIBIT VARIABLE CORE EXPANSION

=0 OR DOWN-CORE EXPAND UNLESS SW0, 1 AND 2 ARE ALL DOWN

(IN WHICH CASE 4K AS 32K IS RUN INSTEAD)

4.3 DEVICE SELECTION SWITCHES

THE DEVICE SELECTION SWITCHES ARE SET AT THE FIRST (AND ONLY) HALT. EACH SWITCH, IF SET, INHIBITS A SINGLE I/O DEVICE FROM BEING EXERCISED. IF A DEVICE DOES NOT EXIST, THE CORRESPONDING INHIBIT SWITCH DOES NOT HAVE TO BE SET.

SW0=1 OR UP---INHIBIT TTY OUTPUT

SW4=1 OR UP---INHIBIT LINE CLOCK

SW5=1 OR UP---INHIBIT LINE PRINTER

SW6=1 OR UP---INHIBIT RF11 DISK

SW7=1 OR UP---INHIBIT TC11 DECTAPE

4.4 RESTART PROCEDURE

USING RESTART ADDRESS 310 THE SWITCH REGISTER SETTINGS GIVEN PREVIOUSLY ARE USED (FOR BOTH MEMORY MANAGEMENT SELECTION AND DEVICE SELECTION). NO HALT OCCURS AFTER START IS PRESSED.

5. OPERATING PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

5.1.1 BASIC SWITCH SETTINGS-STARTUP

SEE SECTIONS 4.2 AND 4.3 FOR THE BASIC SWITCH SETTINGS USED AT STARTUP. THOSE SWITCHES ARE NOT RECHECKED AFTER THEY ARE INITIALLY STORED.

5.1.2 DYNAMIC SWITCH SETTINGS

THE FOLLOWING SWITCHES ARE RECHECKED PERIODICALLY DURING PROGRAM EXECUTION:

SW15=1 OR UP---HALT ON ERROR
 SW14=1 OR UP---SCOPE LOOP
 SW13=1 OR UP---INHIBIT ERROR PRINT OUT
 SW12=1 OR UP---INHIBIT TRACE TRAPPING
 SW11=1 OR UP---INHIBIT SUBTEST ITERATION AND INHIBIT TESTS WHICH USE ALL COMBINATIONS OF NUMBERS (SEE 5.2.1)
 SW10=1 OR UP---INHIBIT PROCESSOR TEST (ONCE SET, PROCESSOR TEST IS PERMANENTLY INHIBITED)
 SW09=1 OR UP---INHIBIT CYCLING SUPERVISOR MAPPING (SUPERVISOR PAGE CURRENTLY MAPPED WILL BE USED UNTIL THE SWITCH IS SET =0)
 SW08=1 OR UP---INHIBIT CYCLING SUPERVISOR PAGE 7 ACCESS KEY (THE KEY CURRENTLY IN USE WILL REMAIN IN USE UNTIL THE SWITCH IS SET =0)

5.2 SUBROUTINE ABSTRACTS

5.2.1 SCOPE

THIS SUBROUTINE CALL IS PLACED BETWEEN EACH SUBTEST. IT RECORDS THE STARTING ADDRESS OF EACH SUBTEST AS IT IS BEING ENTERED. IF A SCOPE LOOP IS REQUESTED, IT WILL JUMP TO THE START OF THE SUBTEST THAT THE SCOPE LOOP IS REQUESTED FOR. IF A SCOPE LOOP IS NOT REQUESTED, THERE WILL BE 256 ITERATIONS ON THAT SUBTEST BEFORE THE NEXT SUBTEST IS ENTERED. SWITCH 11 ON A 1 INHIBITS ITERATION OF SUBTESTS.

5.2.2 HLT

THIS ENT CALLS THE SUBROUTINE PRINT, WHICH PRINTS OUT THE LOCATION COUNTER AT THE TIME OF FAILURE, THE CONTENTS OF THE PROCESSOR STATUS REGISTER, THE CONTENTS OF THE CURRENT BANK COUNTER, AND THE STARTING ADDRESS (VIRTUAL) OF THE BACKGROUND PROCESSOR SUBTEST BEING EXECUTED AT THE TIME OF FAILURE. NOTE THAT THE LOCATION COUNTER WILL BE THE VIRTUAL ADDRESS OF THE HLT PLUS TWO.

5.2.3 TRAPCATCHER

THIS IS A SERIES OF INSTRUCTIONS STARTING AT LOCATION 0 DESIGNED TO DETECT AND ISOLATE UNEXPECTED TRAPS AND INTERRUPTS TO THE TRAP AND INTERRUPT VECTOR AREA OF MEMORY.

EACH VECTOR ENTRANCE ADDRESS IS LOADED WITH THE ADDRESS OF THE NEXT LOCATION. THE NEXT LOCATION IS LOADED WITH A HALT (000000). THUS AN ILLEGAL TRAP OR INTERRUPT WILL CAUSE A HALT AT THE TRAP LOCATION PLUS TWO.

IF A HALT OCCURS IN THE TRAP OR INTERRUPT AREA EXAMINE KERNEL REGISTER SIX. IT WILL CONTAIN THE CURRENT KERNEL STACK ADDRESS. THE CONTENTS OF THE CURRENT KERNEL STACK ADDRESS IS THE VIRTUAL PC AT THE TIME THE TRAP OR INTERRUPT OCCURRED.

5.2.4 ENTSRV (ENT HANDLER)

THIS ROUTINE DECODES THE ENT CALLS AND PASSES CONTROL TO THE CORRECT SERVICE ROUTINE. THE ROUTINES HANDLED BY ENT CALLS ARE PRINT (HLT CALL), EOBSRV (EOB CALL), AND RTIKEX (RTIK CALL).

5.2.5 RTIKEX (RTI VIA KERNEL)

SINCE I/O EXECUTION IN SUPERVISOR IS DONE BY MANY OF THE ROUTINES IN THIS EXERCISER, A MEANS IS REQUIRED TO RETURN FROM THE INTERRUPTS TO THE MODE THAT WAS IN EFFECT WHEN THE INTERRUPT OCCURRED. THE CALL RTIK IS USED TO DO THIS.

5.2.6 EOBSRV (END OF BANK SERVICE)

THE VARIOUS EXECUTION OPTIONS FOR THIS EXERCISER REQUIRE SPECIAL HANDLING WHEN THE END OF THE PROCESSOR TESTS IS REACHED IN A BANK. THIS SERVICE ROUTINE PERFORMS THE VARIOUS MAPPING FUNCTIONS, DEPENDING UPON THE INITIAL SWITCH REGISTER SETTINGS.

5.2.7 BEGINX (CORE EXPANSION SPECIAL HANDLER)

WHEN CORE EXPANSION IS UTILIZED, A NUMBER OF SPECIAL ACTIONS MUST BE TAKEN AT THE BEGINNING OF EACH BANK. THE SCOPE ROUTINE VECTOR IS LOADED TO POINT TO THE NEW BANK, AND IF TC11 AND RF11 CODE AND BUFFER RELOCATION IS ALLOWED, THEIR POINTERS AND BUFFER ADDRESSES MUST BE CHANGED. THIS ROUTINE PERFORMS THESE OPERATIONS.

5.2.8 ABSRV (KT11-C ABORT AND TRAP HANDLER)

IF CYCLING OF THE ACCESS KEY FOR SUPERVISOR PAGE 7 IS ALLOWED, I/O REFERENCES TO THE EXTERNAL BANK WILL SOMETIMES ABORT OR TRAP. THIS ROUTINE HANDLES THESE ABORTS AND TRAPS.

5.2.9 PFAIL (POWER FAIL)

THE POWER FAIL ROUTINE JUMPS TO THE RESTART ROUTINE ON POWER UP, AFTER PRINTING AN ERROR PRINTOUT.

5.2.10 TYOUT (TTY OUTPUT)

THIS ROUTINE OUTPUTS A COUNT PATTERN IN THE INTERRUPT MODE TO THE TELEPRINTER.

5.2.11 RFSTART (RF11 DISK)

THIS ROUTINE PERFORMS A WRITE AND A WRITE CHECK OF THE DISK. THE DATA THAT IS WRITTEN ON THE DISK IS A PART OF THE TEST PROGRAM CODE THAT IS NEVER MODIFIED. THIS SEGMENT OF CORE IS WRITTEN IN CONTIGUOUS BLOCKS ON THE DISK. AFTER THE TOTAL DISK HAS BEEN WRITTEN, A WRITE CHECK IS USED TO VERIFY THAT THE DATA HAS BEEN WRITTEN CORRECTLY ON THE DISK. NOTE THAT NO "DATA" ARE USED IN EXERCISING THE DISK (DATA IS NOT TRANSFERRED INTO MEMORY). THERE IS A LOCATION IN THE PROGRAM THAT IF MODIFIED WILL ALLOW EXERCISING UP TO EIGHT DISKS.

5.2.12 ENDZ (TC11 END ZONE HANDLER)

THIS ROUTINE IS PART OF THE TC11 SERVICE CODE. IT DRIVES THE DECTAPE INTO THE FORWARD OR REVERSE END ZONE, THEN REVERSES IT. IT ALSO DOES THE NECESSARY SETUP TO BEGIN READING OR WRITING THE TAPE.

5.2.13 REGEN (TC11 WRITE BUFFER REGENERATE ROUTINE)

THE TC11 CODE WRITES THE ENTIRE DECTAPE GOING FORWARD, THEN READS IT IN REVERSE. THE BUFFER IS REGENERATED BEFORE WRITING THE TAPE, AND IS CLEARED OUT ONCE THE ENTIRE TAPE HAS BEEN WRITTEN. THIS ROUTINE REGENERATES THE WRITE BUFFER. IT IS CALLED BY A PRIORITY INTERRUPT REQUEST ON LEVEL 2.

5.2.14 RBN (TC11 READ BLOCK NUMBER SERVICE ROUTINE)

AT THE END OF EACH "BLOCK NUMBER FOUND" INTERRUPT, THIS ROUTINE IS ENTERED (UNLESS END ZONE IS BEING SEARCHED FOR). IT CHECKS FOR THE CORRECT SEQUENCE OF BLOCK NUMBERS, THEN SETS UP THE TC11 TO WRITE A BLOCK IF THE TAPE IS TRAVELLING FORWARD. IF IT IS GOING IN REVERSE, THE ROUTINE CHECKS TO SEE IF DATA IS STILL BEING CHECKED FROM A PREVIOUS READ. IF IT'S NOT, THE ROUTINE SETS UP TO READ A BLOCK. IF DATA IS STILL BEING CHECKED FROM BEFORE, IT SIMPLY DOES ANOTHER READ BLOCK NUMBER.

5.2.15 NXTBLK (TC11 READ BLOCK AND WRITE BLOCK SERVICE ROUTINE)

WHEN A READ BLOCK OR A WRITE BLOCK OPERATION IS COMPLETED, THIS ROUTINE IS ENTERED. IT CHECKS THE ERROR BIT, THEN SETS UP A CALL TO CHECK DATA IF DATA WAS JUST READ IN. THE ROUTINE ALSO SETS UP A READ BLOCK NUMBER OPERATION.

5.2.16 TCK (TC11 CHECK DATA ROUTINE)

WHEN A READ BLOCK OPERATION HAS BEEN COMPLETED, THIS ROUTINE IS CALLED VIA A PRIORITY INTERRUPT REQUEST AT LEVEL 3. THE ENTIRE BUFFER IS CHECKED, AND THE CONTENTS OF THE BUFFER IS ALTERED AS THE CHECK PROGRESSES. THUS, IF A READ BLOCK OPERATION DOES NOT ACTUALLY READ IN ANY DATA, THE DATA CHECK ROUTINE WILL FIND BAD DATA INSTEAD OF SEEING GOOD DATA FROM AN EARLIER READ.

5.2.17 LCLK (LINE CLOCK)

THIS TEST OF THE LINE CLOCK IS IN THE INTERRUPT MODE. IF OPERATING CORRECTLY THE ROUTINE WILL OUTPUT A MINUTES ELAPSED COUNT TO THE HIGH BYTE OF THE DISPLAY REGISTER. THE MINUTE COUNT IS BASED ON A 60 CYCLE LINE FREQUENCY.

5.2.18 LPI (LINE PRINTER)

THIS ROUTINE OUTPUTS TO THE LINE PRINTER IN THE FLAG MODE WHILE FILLING THE BUFFER, AND IN THE INTERRUPT MODE WHILE THE BUFFER IS BEING PRINTED.

5.2.19 CORE EXPANSION (DET1)

THIS ROUTINE IS CONTROLLED BY SWITCH 5 AT STARTUP. IF CALLED, THE PROCESSOR BACKGROUND CODE WILL BE EXPANDED THRU AVAILABLE MEMORY (UP TO 28K). THE ROUTINE DETERMINES THE MAXIMUM MEMORY SIZE BY DOING A "DATA" TO A LOCATION IN EACH BANK (IF THE BANK DOES NOT EXIST, A TIMEOUT WILL OCCUR). AN IMAGE OF BANK 0 IS THEN TRANSFERRED TO EACH EXISTING BANK. THE CODE IN EACH BANK EXCEPT THE LAST IS MODIFIED TO CHANGE THE END OF BANK CALL TO A JUMP TO BEGINX (CORE EXPANSION SPECIAL HANDLER) IN THE NEXT BANK.

THE LISTING SHOWS ONLY THE CODE FOR BANK ZERO. WHEN AN ERROR OCCURS THAT IS NOT IN BANK ZERO, IGNORE THE BANK BITS OF THE PRINT OUT AND USE THE LISTING FOR BANK ZERO.

SEE 5.3.2 FOR A FURTHER EXPLANATION OF MODES OF EXECUTION USING CORE EXPANSION.

5.2.20 PIRSRV (PRIORITY INTERRUPT REQUEST SERVICE ROUTINE)

TC11 DATA BUFFER GENERATION AND CHECKING LENDS ITSELF TO HANDLING AT A LEVEL LOWER THAN THAT OF THE TC11 INTERRUPT. THE PRIORITY INTERRUPT REQUEST PROVIDES THE ABILITY TO DO THIS. THUS, SOFTWARE REQUESTS ARE USED IN THE DECTAPE CODE TO CALL THESE ROUTINES. THE DATA CHECK IS CALLED BY A LEVEL 3 REQUEST, AND THE BUFFER GENERATION ROUTINE IS CALLED BY A LEVEL 2 REQUEST. THE PIRSRV ROUTINE HANDLES THESE TWO PIRQ INTERRUPTS.

5.2.21 TRTRP

THE TRACE BIT IS NORMALLY SET ON ALTERNATE PASSES THRU THE BACKGROUND PROCESSOR TESTS (IT IS SET DURING THE EVEN NUMBERED PASSES). IF THE TRACE BIT IS SET, THIS ROUTINE'S ADDRESS IS LOADED IN THE TRACE TRAP VECTOR. IT SIMPLY DOES AN RTT BACK TO THE PROCESSOR TESTS. SWITCH 12 SET TO A ONE WILL INHIBIT THE USE OF THE TRACE BIT WITH THE BACKGROUND PROCESSOR TESTS.

5.3 PROGRAM AND/OR OPERATOR ACTION

5.3.1 PROCESSOR TEST EXECUTION - 4K AS 32K

IF SWITCHES 0, 1, AND 2 ARE ALL DOWN (=0) AT STARTUP, THE PROCESSOR TEST WILL BE EXECUTED TREATING EACH 4K BANK AS 32K OF VIRTUAL ADDRESS SPACE. THE FOLLOWING DETAILS THIS MODE OF OPERATION.

USER PAGE 0 IS FIRST MAPPED RW, BANK 0, AND ALL OTHER USER PAGES ARE MAPPED NON-RESIDENT. THE PROCESSOR TESTS ARE EXECUTED IN USER THRU USER PAGE 0. WHEN DONE, USER PAGE 0 IS CHANGED TO NON-RESIDENT, AND USER PAGE 1 IS MAPPED RW, BANK 0. THE PC IS CHANGED TO ADDRESS THE START OF THE PROCESSOR TESTS THRU PAGE 1, AND ANOTHER PASS THRU THE PROCESSOR TESTS IS EXECUTED. AT THE END OF THIS PASS, USER PAGE 2 IS MAPPED RW, BANK 0, AND USER PAGE 1 IS MADE NON-RESIDENT. THE PC IS AGAIN CHANGED. THIS TIME TO ACCESS USER PAGE 2, AND THE PROCESSOR TESTS ARE EXECUTED THRU USER PAGE 2. THIS CYCLE IS REPEATED FOR THE REMAINING USER PAGES, MAPPING EACH IN TURN TO BANK 0 AND CHANGING THE PC TO EXECUTE THRU THE ONE CURRENTLY MAPPED. WHEN THE PASS USING USER PAGE 7 IS COMPLETED, A SEARCH IS MADE FOR THE NEXT 4K BANK OF MEMORY. WHEN A BANK IS FOUND, THE PROGRAM IS COPIED INTO THAT BANK FROM BANK 0. USER PAGE 0 IS MAPPED TO THE NEW BANK, AND THE PC IS CHANGED TO EXECUTE THRU USER PAGE 0. THE PREVIOUS CYCLE IS REPEATED, BUT THIS TIME EACH USER PAGE IS MAPPED IN TURN TO THE NEW BANK. ONCE EXECUTION THRU USER PAGE 7 IS COMPLETED, A SEARCH IS MADE FOR THE NEXT BANK. THE PREVIOUS BANK IS CLEARED (EXCEPT FOR THE LOADER), AND THE PROGRAM IS COPIED FROM BANK 0 INTO THE CURRENT BANK. THE CYCLE REPEATS UNTIL THE EXTERNAL BANK IS REACHED, AT WHICH POINT USER 0 IS MAPPED BACK TO BANK 0 AND THE PROCESS STARTS AGAIN.

5.3.2 PROCESSOR TEST EXECUTION - CORE EXPANSION

IF SWITCH 0, 1, OR 2 IS UP AND SWS IS DOWN AT STARTUP, THE PROCESSOR TESTS WILL BE CORE EXPANDED THRU AVAILABLE MEMORY UP TO 28K. THE ROUTINE DET1 DOES THIS CORE EXPANSION, COPYING BANK 0 INTO EACH OF THE OTHER BANKS. THE EMT CALL AT THE END OF EACH BANK (EOB) WHICH CALLS THE END OF BANK SERVICE ROUTINE IS CHANGED TO A JUMP TO BEGINX IN THE NEXT BANK. THE EOB CALL IN THE LAST BANK IS LEFT ALONE. IF SWITCHES 0 AND 1 WERE BOTH DOWN AT STARTUP, USER PAGES 0 THRU 6 ARE MAPPED SO THAT THE PHYSICAL AND VIRTUAL ADDRESSES CORRESPOND, AND THE PROCESSOR TESTS ARE THEN RUN IN U.S.R. IF SWS WAS DOWN BUT SW1 WAS SET, KERNEL PAGES 0-6 ARE MAPPED SO THAT THE PHYSICAL AND VIRTUAL ADDRESSES ARE THE SAME, AND THE PROCESSOR TESTS ARE THEN RUN IN KERNEL MODE. IF SWS WAS SET, ORDINARY CORE EXPANSION IS RUN WITH NO SPECIAL MAPPING REQUIRED (KT11-C IS TURNED OFF).

5.3.3 PROCESSOR TEST EXECUTION - BANK 0 ONLY

IF SWS, 1 OR 2 IS UP AND SWS IS UP AT STARTUP, ONLY BANK 0 IS UTILIZED. IN THIS CASE, IF SWS AND SW1 WERE DOWN THE PROCESSOR TESTS ARE EXECUTED IN USER, WITH USER PAGE 0 MAPPED TO BANK 0. IF SWS WAS DOWN AND SW1 WAS UP, THE PROCESSOR TESTS ARE EXECUTED IN KERNEL, WITH KERNEL PAGE 0 MAPPED TO BANK 0. IF SWS WAS UP, THE KT11-C IS TURNED OFF AND THE PROCESSOR TESTS ARE EXECUTED IN KERNEL MODE OR USER MODE (DEPENDING ON SW1) IN BANK 0 ONLY.

5.3.4 RF11 CODE AND BUFFER RELOCATION

IF SW3 IS DOWN AT STARTUP AND THE RF11 IS NOT INHIBITED, THE RF11 CODE WILL BE EXECUTED FROM THE SAME BANK THAT THE PROCESSOR TESTS ARE RUNNING IN. THE PHYSICAL MEMORY ADDRESS USED BY THE RF11 FOR WRITE AND WRITE CHECK OPERATIONS WILL ALSO BE IN THE SAME BANK AS THE PROCESSOR TESTS ARE RUNNING IN. THUS THE EXTENDED MEMORY ADDRESS BITS WILL GET SET IF THE PROCESSOR TESTS ARE RUNNING ABOVE 32K. THIS RELOCATION OCCURS IF CORE EXPANSION IS SELECTED (EVEN IF THE KT11-C IS INHIBITED) OR IF THE PROCESSOR TESTS ARE BEING RUN IN THE 4K AS 32K MODE.

NOTE THAT IF THE 4K AS 32K MODE IS USED, THE RF11 WILL BE MAPPED TO KERNEL PAGE 1, AND KERNEL PAGE 1 IS MAPPED TO THE CURRENT BANK. OTHERWISE, RELOCATION IS DONE BY MAPPING THE RF11 TO THE CURRENT BANK DIRECTLY (IN WHICH CASE VIRTUAL AND PHYSICAL ADDRESSES ARE MAPPED EQUAL IF KT11-C IS ON).

5.3.5 TC11 CODE AND BUFFER RELOCATION

IF SW3 IS DOWN AT STARTUP AND IF THE TC11 IS NOT INHIBITED, THE TC11 CODE WILL BE EXECUTED FROM THE SAME BANK THAT THE PROCESSOR TESTS ARE RUNNING IN. THE READ AND WRITE BUFFERS FOR THE TC11 WILL ALSO BE LOCATED IN THE BANK IN WHICH THE PROCESSOR TESTS ARE RUNNING. DUE TO THE COMPLEXITY OF RELOCATING THE TC11 CODE AND BUFFERS, RELOCATION IS DONE ONLY WHEN THE DECTAPE IS AT THE FORWARD END ZONE. THUS, BEFORE THE BANK IN WHICH THE PROCESSOR TESTS ARE RUNNING IS CHANGED, THE CODE WAITS FOR THE DECTAPE TO FINISH A PASS OF WRITING AND READING THE TAPE. A PASS THRU ALL OF MEMORY RUNNING TC11 RELOCATION WILL REQUIRE THE DECTAPE TO MAKE AS MANY PASSES AS THERE ARE BANKS OF MEMORY.

NOTE THAT IF THE 4K AS 32K MODE IS USED, THE TC11 WILL BE MAPPED TO KERNEL PAGE 1, AND KERNEL PAGE 1 IS MAPPED TO THE CURRENT BANK. OTHERWISE, RELOCATION IS DONE BY MAPPING THE TC11 TO THE CURRENT BANK DIRECTLY (IF KT11-C IS ON, VIRTUAL ADDRESSES ARE MAPPED TO EQUAL THE PHYSICAL ADDRESSES).

5.3.6 EXECUTION OF I/O CODE IN SUPERVISOR

IF SW1 IS DOWN AT STARTUP, THE FOLLOWING DEVICES ARE SERVICED IN SUPERVISOR MODE: TELETYPE OUTPUT, LINE CLOCK, AND LINE PRINTER. IF MEMORY MANAGEMENT IS NOT INHIBITED, THESE DEVICES' SERVICE ROUTINES EXECUTE THRU SUPERVISOR PAGE 0, THEN PAGE 1, AND SO ON, SEQUENTIALLY UP TO SUPERVISOR PAGE 6. THE PAGE BEING ACCESSED IS CHANGED EACH TIME THE END OF BANK CODE (EOBSRV ROUTINE) IS EXECUTED, BY CHANGING THE ADDRESSES STORED IN THE DEVICES' INTERRUPT VECTORS. WHEN SUPERVISOR PAGE 6 WAS THE ONE JUST USED, THE CYCLE STARTS OVER WITH PAGE 0. PAGE 7 IS USED FOR ACCESSING THE EXTERNAL BANK. A DYNAMIC SWITCH (SWC9) IS PROVIDED TO INHIBIT CYCLING THE SUPERVISOR MAPPING. IF THIS SWITCH IS SET, THE SUPERVISOR CODE WILL REMAIN MAPPED TO THE PAGE IT WAS MAPPED TO WHEN THE SWITCH WAS SET.

5.3.7 EXECUTION OF I/O CODE IN SUPERVISOR - USE OF SUPERVISOR PAGE 7

IF SW1 IS DOWN AT STARTUP, THE DEVICES LISTED IN 5.3.6 WILL BE SERVICED IN SUPERVISOR MODE, AS EXPLAINED PREVIOUSLY. IF SW1 IS ALSO DOWN AT STARTUP, SUPERVISOR PAGE 7 (MAPPED TO THE EXTERNAL BANK) WILL HAVE ITS ACCESS KEY CHANGED EACH TIME THE END OF BANK CODE (ECSRV) IS EXECUTED. THE ACCESS KEY WILL BE SET FIRST TO 0, THEN 1, AND SO ON UP THRU 7. AFTER BEING SET TO 7, IT WILL BE RECYCLED TO 0 AND THE CYCLE WILL BE REPEATED. DEPENDING ON THE KEY IN EFFECT AT THE TIME, THE SUPERVISOR I/O MAY TRAP, ABORT, OR EXECUTE WHEN REFERENCING THE EXTERNAL PAGE. IF A TRAP OR ABORT OCCURS THE KERNEL ROUTINE ASRV IS ENTERED. THIS ROUTINE PERFORMS CERTAIN CHECKS ON THE TRAP OR ABORT, AND IF IT WAS AN ABORT, IT REEXECUTES THE INSTRUCTION IN KERNEL MODE (MAPPED R/W). TO REGAIN CONTROL AFTER THE INSTRUCTION IS COMPLETED, THE ROUTINE SETS THE T-BIT AND CHANGES THE TRACE TRAP RETURN TO POINT TO A SECTION OF THE ABORT SERVICE CODE. AFTER THE INSTRUCTION IS COMPLETED, A TRACE TRAP TO THE KERNEL ABORT SERVICE CODE OCCURS. THE CODE RESTORES THE PREVIOUS TRACE-TRAP VECTOR, RESTORES THE T-BIT TO ITS PREVIOUS STATE, AND RETURNS TO THE SUPERVISOR DEVICE SERVICE CODE AT THE INSTRUCTION AFTER THE ONE WHICH ABORTED.

NOTE THAT SWITCH 8 UP WILL INHIBIT THE CYCLING OF THE ACCESS KEY DYNAMICALLY, LEAVING IT SET TO THE CURRENT VALUE.

6.0 ERRORS

6.1 ERROR PRINTOUT

PRINTOUTS ARE IN AN EXTENDED VERSION OF THE STANDARD FORMAT, USING FOUR WORDS. THE FIRST WORD IS THE OCTAL VALUE OF THE VIRTUAL PC+2 OF THE DETECTED ERROR. THE SECOND WORD IS THE CONTENTS OF THE PROCESSOR STATUS REGISTER WHEN THE ERROR WAS DETECTED. THE THIRD IS THE TOP 12 BITS OF THE 18 BIT ADDRESS OF THE BANK BEING CURRENTLY USED FOR EXECUTION OF THE PROCESSOR TESTS (AND R11 AND T11 CODE IF IT IS BEING RELOCATED). TO GET THE STARTING ADDRESS OF THE CURRENT BANK SIMPLY APPEND TWO ZEROS TO THE END OF THE OCTAL VALUE PRINTED OUT (I.E. 007400 INDICATES THE BANK BEGINNING AT PHYSICAL ADDRESS 740000). THE FOURTH WORD IS THE PC (VIRTUAL) OF THE CURRENT PROCESSOR SUBTEST BEING EXECUTED IN BACKGROUND.

6.2 ERROR RECOVERY

IN GENERAL, TEST FAILURES WILL PRINTOUT AN ERROR MESSAGE AND CONTINUE. IF THE "HALT ON ERROR" SWITCH IS SET, HITTING CONTINUE WILL RECOVER. IF THE PROGRAM HANGS UP IN A LOOP, THE ERROR IS LIKELY TO BE A SIGNAL WHICH WAS NEVER RECEIVED. IF A HALT OCCURS IN THE TRAP AND VECTOR AREA THE PROGRAM MUST BE RESTARTED. IF THE PROGRAM HALTS IN THE MAIN FLOW, CONSULT THE LISTING IF NO MESSAGE IS TYPED OUT.

6.3 FINDING WHICH PROCESSOR TEST WAS BEING EXECUTED WHEN AN ERROR OCCURRED

SOME ERRORS ARE DEPENDENT ON THE PROCESSOR TEST BEING RUN (SUCH AS LATENCY ERRORS WHICH ONLY SHOW UP IN WORST-CASE PROCESSOR TIMING). THE SCOPE ROUTINE CONTAINS A LOCATION CALLED "RETURN" WHICH STORES THE STARTING ADDRESS OF THE PROCESSOR TEST CURRENTLY BEING EXECUTED. NOTE THAT THE SCOPE ROUTINE IS EXECUTED IN USER MODE IF SW1 IS DOWN AT STARTUP, AND IS THEREFORE RELOCATED WITH THE PROCESSOR TESTS. THE CONTENTS OF RETURN IN THE CURRENT BANK IS THE FOURTH WORD OF THE ERROR PRINTOUT.

7.0 RESTRICTIONS

PROGRAM MUST BE LOADED INTO THE LOWER 4K OF MEMORY.

IF THE LINE PRINTER IS USED, STARTING ADDRESS 300 MUST BE USED INSTEAD OF SA 200.

8.0 MISCELLANEOUS

8.1 EXECUTION TIME

EXECUTION TIME VARIES WITH THE AMOUNT OF MEMORY, THE TYPES OF MEMORY, THE DEVICES RUN, AND THE OPTIONAL MODES OF EXECUTION USED.

A PASS RUN WITH CORE EXPANSION AND 4K AS 32K RELOCATION BOTH INHIBITED TAKES LESS THAN 10 SECONDS (RUNNING NO I/O).

A PASS RUN WITH 4K AS 32K, THRU 128K OF CORE MEMORY, WITH NO I/O TAKES ABOUT 15 MINUTES. (AN ASTERISK IS PRINTED AT THE END OF A FULL PASS, AND A DOLLAR SIGN IS PRINTED AT THE END OF EACH 4K BANK).

A PASS RUN WITH 4K AS 32K, WITH DECTAPE RELOCATION, TAKES ABOUT 1 MINUTE PER 4K BANK, IF ITERATIONS ARE INHIBITED (SW11 IS UP).

8.2 STACK POINTERS

THE KERNEL STACK POINTER IS INITIALIZED TO 17760.

THE SUPERVISOR STACK POINTER IS INITIALIZED TO 600. IT IS RELOCATED TO THE CURRENT SUPERVISOR PAGE.

THE USER STACK POINTER IS INITIALIZED TO 400. IT IS RELOCATED THRU ALL USER PAGES AND TO EVERY 4K BANK IF THE 4K AS 32K MODE OF EXECUTION IS RUN.

8.3 MONITORING PHYSICAL AND VIRTUAL ADDRESSES

DURING EXECUTION OF 4K AS 32K, IT IS HELPFUL TO SET THE ADDRESS SELECTOR TO PHYSICAL AND THE DISPLAY SELECTOR TO DATA REGISTER. IF THIS IS DONE, THE ADDRESS LIGHTS WILL INDICATE THE CURRENT PHYSICAL ADDRESSES WHILE THE DATA LIGHTS WILL SHOW THE CURRENT VIRTUAL ADDRESSES (SINCE THEY ARE USED AS DATA A GREAT DEAL OF THE TIME).

8.4 DISPLAY REGISTER

THE LOWER BYTE OF THE DISPLAY REGISTER SHOWS THE PASS COUNT. THE UPPER BYTE IS USED WHEN THE KW11-L LINE CLOCK IS RUN TO INDICATE MINUTES ELAPSED SINCE THE PROGRAM WAS STARTED (BASED ON A LINE FREQUENCY OF 60 CYCLES PER SECOND).

9.0 PROGRAM DESCRIPTION

THIS MEMORY MANAGEMENT EXERCISER IS DESIGNED TO RUN BACKGROUND PROCESSOR TESTS AND FOREGROUND CONCURRENT I/O WITH MEMORY MANAGEMENT UTILIZED IN ANY OF SEVERAL DIFFERENT MODES. THE VARIOUS MODES AVAILABLE FOR UTILIZING MEMORY MANAGEMENT ARE INCLUDED TO AID IN FAULT ISOLATION BY PROVIDING A SERIES OF STEPS FROM SIMPLE TO COMPLEX. THESE LEVELS ARE AS FOLLOWS:

	KT11-C ON	CORE EXPAN (SEE 5.3.2)	4K AS 32 (TO 128K) (SEE 5.3.1)	USER/SUPER KERNEL	RF/TC RELOC (SEE 5.3.4 AND 5.3.5)	VARIABLE USE OF SUPER (SEE 5.3.6 AND 5.3.7)
1				X		
2		X		X		
3		X		X		
4		X		X		
5		X		X	X	
6		X		X	X	
7	X			X		
8	X			X		X
9	X	X		X		
10	X	X		X		X
11	X	X		X	X	
12	X	X		X	X	X
13	X		X	X		X
14	X		X	X	X	X

NOTE THAT WHERE VARIABLE USE OF THE SUPERVISOR SPACE IS ALLOWED, THERE ARE FOUR POSSIBLE LEVELS FOR ITS USE:

1. ALL EXECUTION OCCURS THRU SUPERVISOR PAGE 0, WITH PAGE 7 MAPPED RW FOR I/O REFERENCES.
2. EXECUTION OCCURS THRU SUPERVISOR PAGES 1 THRU 6, ONE AT A TIME, WITH PAGE 7 MAPPED RW FOR I/O REFERENCES.
3. ALL EXECUTION OCCURS THRU SUPERVISOR PAGE 0 WITH PAGE 7 CYCLED THRU ALL VALUES OF THE ACCESS KEY.
4. EXECUTION OCCURS THRU SUPERVISOR PAGES 1 THRU 6, ONE AT A TIME, WITH THE ACCESS KEY FOR PAGE 7 CYCLED THRU ALL VALUES.

THERE IS NO MONITOR IN THE CONVENTIONAL SENSE. EACH DEVICE THAT IS TO BE EXERCISED HAS ITS OWN STAND ALONE ROUTINE THAT OPERATES IN THE INTERRUPT MODE. THESE ROUTINES NEED NO SUPERVISION OR MONITORING AFTER THEY ARE INITIATED. THERE IS A PRIMER A TA THAT CHECKS THE SWITCH REGISTER TO SEE WHAT DEVICES ARE TO BE INITIATED. IT SETS THE INTERRUPT ENABLE BIT IN THE DEVICE STATUS REGISTER, INITIALIZES THE DATA PATTERN, AND INITIATES AN OPERATION TO RAISE DATA FLAGS ON DEVICES THAT CAN NOT INITIATE THEM THEMSELVES. THE PRIMER CODE THEN ENTERS THE K11-C SETUP CODE. THE R11 AND T11 PRIMER CODE IS IN WITH THE K11-C SETUP CODE SINCE THESE DEVICES, AS CODED REQUIRE CERTAIN PARTS OF THE K11-C CODE TO BE RUN FIRST. AFTER MEMORY MANAGEMENT IS TURNED ON, EXECUTION OF THE BACKGROUND PROCESSOR TESTS BEGINS, AND THE I/O DEVICES ARE SERVICED WHEN THEY INTERRUPT. ALL CYCLING FEATURES OCCUR AT THE END OF THE PROCESSOR TESTS IN EACH BANK.

•

;COPYRIGHT 1972,1973, DIGITAL EQUIPMENT CORPORATION, MAYNARD, MASS. 01754
;POP-11/45 SYSTEM EXERCISER WITH KT11-C --- TTY, KW11-L
;LP11,RF11,AND TC11

;RF11 AND TC11 CODE RUN IN KERNEL MODE IN SAME
;PHYSICAL BANK AS BACKGROUND TESTS (IF ALL SWITCHES DOWN)
;ALL OTHER I/O IS RUN IN SUPERVISOR MODE WITH EXTERNAL
;BANK ACCESS KEY CYCLED THRU ALL VALUES (SUPERVISOR ONLY)
;CPU TESTS RUN IN USER MODE UNLESS INHIBITED BY SR SETTINGS

;SA - 200 (300 IF LP11 IS USED)
;RESTART - 310 (SR SETTINGS PREVIOUSLY MADE ARE USED)

;AT STARTUP, SR SETTINGS ARE:
;SR 0=1 OR UP --- RUN WITHOUT KT11-C
;SR 1=1 OR UP --- RUN ALL IN KERNEL MODE (INHIBITS RUNNING 4K AS 32K
;AND INHIBITS RUNNING I/O IN SUPERVISOR)
;SR 2=1 OR UP --- INHIBIT RUNNING 32K USER RELOCATION FROM EVERY 4K
;BANK (ALLOW NORMAL CORE EXPANSION)
;SR 3=1 OR UP --- INHIBIT RF AND TC RELOCATION OF CODE AND BUFFERS
;SR 4=1 OR UP --- INHIBIT CYCLING ACCESS KEYS IN S7
;SR 5=1 OR UP --- INHIBIT VARIABLE CORE EXPANSION

;AT HALT, SR SETTINGS ARE:
;SR 15=1 OR UP---HALT ON ERROR
;SR 14=1 OR UP---SCOPE LOOP
;SR 13=1 OR UP---INHIBIT PRINT OUT
;SR 12=1 OR UP---INHIBIT TRACE TRAPPING
;SR 11=1 OR UP---INHIBIT SUB-PROGRAM ITERATION AND INHIBIT TESTS WHICH
;USE ALL COMBINATIONS OF NUMBERS
;SR 10=1 OR UP---INHIBIT PROCESSOR TEST (ONCE SET, CLEARING IT WILL NOT
;CAUSE PROCESSOR TEST TO CONTINUE)
;SR 09=1 OR UP---STOP CYCLING SUPERVISOR PAGES
;SR 08=1 OR UP---STOP CYCLING SUPERVISOR PAGE 7 ACCESS KEY
;THESE SWITCHES ARE ALSO CHECKED AT THE END OF EACH PASS

;SPECIAL DELETE SWITCHES-SET RESPECTIVE SWITCH TO A 1 TO INHIBIT
;INITIATION OF DEVICE - IF SWITCH IS DOWN, DEVICE WILL BE STARTED
;IF PRESENT

;SW 0=1 INHIBIT TTY OUTPUT
;SW 4=1 INHIBIT LINE CLOCK
;SW 5=1 INHIBIT LINE PRINTER
;SW 6=1 INHIBIT RF11 DISK
;SW 7=1 INHIBIT TC11 DECTAPE

.SBTTL DATA

;DEFINITIONS

000240
104400
177776
177776
000616
000620
177570
104006

NOP=240
SCOPE=TRAP
CC=177776
PSR=CC
TCSR=TTCSR
TDBR=TTDBR
SR=177570
HLT=104006

;SYSTEM NULL OPERATION
;TRAP USED SCOPE LOOP AND ITERATION

;ERROR PRINTOUT CALL

```
RTIK=104010
E08=104012
R0=%0
R1=%1
R2=%2
R3=%3
R4=%4
R5=%5
SP=%6
R6=SP
PC=%7
STATUS=PSR
SEGREG=SREG1
REG1=SREG2
```

```
;RTI VIA KERNEL CALL
;END OF BANK CALL
```

```

;LOAD TRAP CATCHER IN LOCATIONS 0 THRU 577

```

```

;LOAD VECTOR AREA

```

```

.=30
ENTSRV
340
.=34
SCOPEC
0
.=46
LOGICAL
.=52
40000
.=240
PIRSRV
340

```

```

;EMT CALLS
;HIGHEST PRIORITY

;USER TRAP

```

```

;LOAD STARTING AREA

```

```

      =200      JMB      @START
      =300      JMB      @START
      =310      JMB      @RSTRT

```

```

; DATA AREA

```

```

, DATA AREA
UBUFF: 0 =400
SBUFF: 0 =600
TRCSR: 177560
TRDR: 177562
TTRVC: 60
TTRST: 62
TTCSR: 177564
TTDBR: 177566
TTPVC: 64
TTPST: 66
TTSAV: 0
LKCSR: 177546

```

;BUFFER FOR USER SP

```

;BUFFER FOR SUPERVISOR STACK
;FOR STACK OVERRUN
;TTY READER STATUS REGISTER

```

;TTY PUNCH STATUS REGISTER

```

;STORE CONTENTS OF TTY PRINTER CSR HERE

```

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 18
 DCKTGE.P11 DATA

000632	000100	KMLVC:	100
000634	000102	KMLST:	102
000636	177514	LPCSR:	177514
000640	177516	LPDBR:	177516
000642	000200	LPVC:	200
000644	000202	LPST:	202
000646	177470	RFDAR:	177470
000650	177472	RFDAR:	177472
000652	177466	RFDAR:	177466
000654	177462	RFWC:	177462
000656	177464	RFCAR:	177464
000660	177460	RFCSR:	177460
000662	177461	RFCSRH:	177461
000664	000204	RFVC:	204
000666	000206	RFST:	206
000670	177572	SRO:	177572
000672	177574	SRI:	177574
000674	177576	SR2:	177576
000676	172516	SR3:	172516
000700	177600	UIPCRO:	177600
000702	177602	UIPCRI:	177602
000704	177616	UIPCAR:	177616
000706	177620	UOPRO:	177620
000710	177622	UOPRI:	177622
000712	177636	UOPAR:	177636
000714	177640	UIPRO:	177640
000716	177642	UIPRI:	177642
000720	177656	UIPAR:	177656
000722	177660	UOPRO:	177660
000724	177662	UOPRI:	177662
000726	177676	UOPAR:	177676
000730	172200	STPRO:	172200
000732	172220	SUPRO:	172220
000734	172214	SIPRO:	172214
000736	172256	SIPAR:	172256
000740	172276	SDPAR:	172276
000742	172216	SIPOR:	172216
000744	172236	SDPOR:	172236
000746	172300	KIPRO:	172300
000750	172302	KIPRI:	172302
000752	172304	KIPOR:	172304
000754	172306	KIPOR:	172306
000756	172316	KIPOR:	172316
000760	172320	KIPOR:	172320
000762	172322	KIPOR:	172322
000764	172324	KIPOR:	172324
000766	172326	KIPOR:	172326
000770	172336	KIPOR:	172336
000772	172340	KIPAR:	172340
000774	172342	KIPAR:	172342
000776	172344	KIPAR:	172344
001000	172346	KIPAR:	172346
001002	172356	KIPAR:	172356
001004	172360	KIPAR:	172360
001006	172362	KIPAR:	172362
001010	172364	KIPAR:	172364

:DISK ADDRESS AND ERROR
 :DATA BUFFER REGISTER
 :DISK ADDRESS REGISTER
 :WORD COUNT REGISTER
 :CURRENT ADDRESS REGISTER
 :STATUS REGISTER
 :HIGH BYTE ADDRESS OR CSR

;KT11-C STATUS REGISTERS

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 19
DCKTGE.P11 DATA

001012	172366	KDPA3: 172366
001014	172376	KDPA7: 172376
001016	177600	IPORTAB: 177600
001020	172200	
001022	172300	IPOREND: 172300
001024	000000	SREG1: 0
001026	000000	SREG2: 0
001030	000000	SEGCNT: 0
001032	177342	TCCM: 177342
001034	177340	TCST: 177340
001036	177350	TCOT: 177350
001040	177344	TCMC: 177344
001042	177346	TCBA: 177346
001044	000214	TCIV: 214
001046	000216	TCSTA: 216
001050	000000	CURBNK: 0
001052	000000	OLDBNK: 0
001054	000000	CURIPAR: 0
001056	000000	CUROPAR: 0
001060	000000	CURIPDR: 0
001062	000000	CUROPDR: 0
001064	000000	CSIPDR: 0
001066	000000	BKSTR: 0
001070	000000	TRPB: 0
001072	000000	PSSAV: 0
001074	177770	UBRK: 177770
001076	177772	PIR: 177772
001100	000240	PIRQIV: 240
001102	000242	PIRQST: 242
001104	000000	DISPLY: 0

;STORES K11-C SWITCH REGISTER SETTINGS
;STORES SR SETTINGS
;USED TO LOAD K11-C REGISTERS
;CONTROL AND FUNCTION
;GENERAL STATUS
;DATA
;WORD COUNT
;BUS ADDRESS
;DECTAPE INTERRUPT VECTOR

;SAF TO POINT TO CURRENT BANK
;SAVES ADDRESS OF PREVIOUS BANK
;ADDRESS OF CURRENT IPAR

;PC TO POINT TO BEGIN THRU CURRENT PAGE

;MICROBREAK REGISTER ADDRESS

;VALUE LOADED INTO DISPLAY REGISTER
;LOW BYTE SHOWS PASS COUNT
;HIGH BYTE SHOWS MINUTES ELAPSED IF RUNNING KW11

001106	005077	177666							
001112	005077	177674							
001116	012777	077406	177630						
001124	012777	077406	177634						
001132	012737	001234	000114						
001140	012737	001230	000004						
001146	005037	000006							
001152	012700	060000							
001156	012702	010000							
001162	011001								
001164	005720								
001166	077203								
001170	062777	000200	177602						
001176	062777	000200	177606						
001204	022777	007600	177566						
001212	003357								
001214	011600								
001216	104006								

;PARITY TRAP SERVICE ROUTINE
PARSRV: CLR @KIPAR3
CLR @KDPA3
MOV @77406, @KIPDR3
MOV @77406, @KDPA3
MOV @PAF-D, @114
MOV @PARTO, @4
CLR @6
PAR1: MOV @60000, R0
MOV @10000, R2
PAR2: MOV @R0, R1
TST (R0)+
SOB R2, PAR2
PAR3: ADD @200, @KIPAR3
ADD @200, @KDPA3
CMP @7600, @KIPAR3
BGT PAR1
MOV @SP, R0
HLT

;CHANGE PARITY TRAP RETURN
;SETUP TIMEOUT RETURN

;INITIALIZE R0 TO TEST BANK THRU KERNEL 3
;R2 IS USED AS A COUNTER
;READ LOCATION AND SAVE CONTENTS
;MOVE POINTER
;LOOP UNTIL 4K HAS BEEN CHECKED

;LOAD PC AT TIME OF ABORT INTO R0
;PARITY TRAP OCCURRED BUT MEMORY
;SCAN DID NOT DETECT A PARITY ERROR-
;R0 CONTAINS PC AT TIME OF ABORT

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 20
 DCKTGE.P11 DATA

001220	000000			HALT					
001222	000005			RESET					
001224	000167	000020		JMP	RSTRT				
001230	022626			PARTO: CMP	(SP)+, (SP)+				
001232	000756			BR	PAR3				
001234	022626			PARFD: CMP	(SP)+, (SP)+				
001236	104006			HLT					

:HALT AFTER PARITY ERROR
 :CLEAR PARITY REGISTERS AND DEVICES
 :RESTART TEST
 :TIMEOUT OCCURRED- BANK NOT PRESENT
 :GO CHECK FOR ANOTHER BANK
 :BAD PARITY FOUND
 :PARITY ERROR OCCURRED AND MEMORY
 :SCAN FOUND A MEMORY LOCATION
 :CONTAINING BAD PARITY. RD CONTAINS
 :THE ADDRESS OF THE LOCATION
 :HAVING BAD PARITY
 : (VIRTUAL MAPPED THRU KERNEL PAGE 3)
 :HALT AFTER PARITY ERROR
 :IF CONTINUED, CLEAR PARITY AND DEVICES
 :RESTART PROGRAM

001240	000000			HALT					
001242	000005			RESET					
001244	000167	000000		JMP	RSTRT				

:RESTART ADDRESS USING INITIAL SR SETTINGS
 RSTRT: MOV #KSTACK, R6
 MOVB @SR+1, @SREG2+1
 BR START1

;SBTTL I/O CODE
 ;START UP FOR MINI MONITOR

001264	012706	017760		START: MOV	#KSTACK, R6				
001270	005737	000042		TST	@#42				
001274	001417			BEQ	STARTX				
001276	012737	014774	000004	MOV	#LOGIC, @#4				
001304	005037	000006		CLR	@#6				
001310	005777	177562		TST	@PIR				
001314	012737	000006	000004	MOV	@#6, @#4				
001322	005037	001024		CLR	@SREG1				
001326	005037	001026		CLR	@SREG2				
001332	000410			BR	START0				
001334	013737	177570	001024	STARTX: MOV	@SR, @SREG1				
001342	000000			HALT					
001344	013737	177570	001026	MOV	@SR, @SREG2				

;SET UP KERNEL STACK
 ;RUNNING UNDER A MONITOR?
 ;NO- BRANCH
 ;YES- CHECK TO SEE IF THIS IS AN 11/45
 ;IF NO TRAP THIS IS AN 11/45
 ;RUN WITH ALL SWITCHES DOWN IF UNDER A MONITOR

001352	000403			BR	START1				
001354	012737	000361	001026	START0: MOV	@#361, @SREG2				
001362	012737	000001	013354	START1: MOV	@1, @ICOUNT				
001370	005037	001104		CLR	@DISPLY				
001374	004767	015400		JSR	%7, CRLF				
001400	012737	013262	000034	MOV	@SCOPEC, @#34				
001406	005037	000036		CLR	@#36				
001412	012737	006700	013360	MOV	@BEGIN, @RETURN				
001420	005037	013356		CLR	@SCOPEF				
001424	012737	013536	000030	MOV	@EMTSRV, @#30				
001432	012737	000340	000032	MOV	@#340, @#32				
001440	012737	006172	004276	MOV	@NXTBLK, @LLIMIT				

;INITIALIZE ITERATION COUNT
 ;INITIALIZE PASS COUNT
 ;OUTPUT CARRIAGE RETURN, LINE FEED
 ;INITIALIZE SCOPE TO KERNEL PAGE 0

;IN-LINE ROUTINE TO SET ACTION ENABLE IN ALL MAIL OR MF11 PARITY
 :REGISTERS FOUND
 PARSET: MOV @PARSRV, @#114
 MOV @#340, @#116
 MOV @172000, R1

;SET UP PARITY TRAP VECTOR
 ;CAUSE LOCK UP AFTER PARITY TRAP
 ;INITIALIZE R1 TO THE FIRST POSSIBLE
 ;PARITY REGISTER ADDRESS

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 21
DCKTGE.P11 I/O CODE

001466	012737	000006	000004		MOV	R6, R4	
001474	012737	000002	000006		MOV	R11, R6	
001502	012721	000001		15:	MOV	R1, (R1)+	
001506	020127	172140			CMP	R1, R172140	
001512	103773				BLO	15	
001514	005037	000006		PARDN:	CLR	R6	
001520	012737	000340	177776		MOV	R340, RPSR	
001526	005037	016546			CLR	RPRION	
001532	012737	000000	001050		MOV	R0, RCURBNK	
001540	032737	000002	001024		BIT	R2, RSREG1	
001546	001017				BNE	ST0	
001550	052737	140000	000036		BIS	R140000, R36	
001556	012746	000600			MOV	RSBUFF, -(R6)	
001562	052737	010000	177776		BIS	R10000, RPSR	
001570	106606				MTPD	SP	
001572	012746	000400			MOV	RSBUFF, -(R6)	
001576	052737	030000	177776		BIS	R30000, RPSR	
001604	106606				MTPD	SP	
001606	012737	003220	000004	ST0:	MOV	RNODEV, R4	
001614	005037	000006			CLR	R6	
001620	012700	000001			MOV	R1, R0	
001624	005037	177776			CLR	RPSR	
001630	033700	001026			BIT	RSREG2, R0	
001634	001024				BNE	ST1	
001636	005777	176754			TST	RTTCSR	
001642	012777	000200	176754		MOV	R200, RTTPST	
001650	005037	003656			CLR	RDATA2	
001654	012777	003670	176740		MOV	RTYOUTR, RTTPVC	
001662	032737	000002	001024		BIT	R2, RSREG1	
001670	001003				BNE	+.10	
001672	052777	040000	176724		BIS	R40000, RTTPST	
001700	052777	000100	176710		BIS	R100, RTTCSR	
001706	006300			ST1:	ASL	R0	
001710	006300			ST2:	ASL	R0	
001712	006300			ST3:	ASL	R0	
001714	006300			ST4:	ASL	R0	
001716	033700	001026			BIT	RSREG2, R0	
001722	001026				BNE	ST5	
001724	005777	176700			TST	RLKCSR	
001730	105037	001105			CLRB	RDISPLY+1	
001734	012777	003726	176670		MOV	RLK3, RKLVC	
001742	012777	000240	176664		MOV	R240, RKLST	
001750	032737	000002	001024		BIT	R2, RSREG1	
001756	001003				BNE	+.10	
001760	052777	040000	176646		BIS	R40000, RKLST	
001766	005067	001770			CLR	TIME	
001772	052777	000100	176630		BIS	R100, RLKCSR	
002000	006300			ST5:	ASL	R0	
002002	033700	001026			BIT	RSREG2, R0	
002006	001036				BNE	ST6	
002010	005777	176622			TST	RLPCSR	

; IF NO TIMEOUT, PARITY PRESENT-
; SET PARITY ACTION ENABLE TO CAUSE
; TRAP TO 114 ON PARITY ERROR.
; TO INHIBIT SETUP OF PARITY MEMORY
; CHANGE THE R1 TO A ZERO
; DONE WITH PARITY ADDRESSES?
; NO- BRANCH
; YES- RESTORE TRAPCATCHER
; LOCK OUT INTERRUPTS
; INITIALIZE PRINT ROUTINE BUSY FLAG
; INITIALIZE BANK POINTER
; INHIBIT USER/SUPERVISOR/KERNEL?
; YES - SKIP OVER
; SET USER BIT IN SCOPE STATUS
; SETUP SUPERVISOR STACK

; SETUP USER STACK

; INHIBIT TTY OUTPUT?
; YES, GO CHECK NEXT
; CHECK FOR TTY PRESENT

; INITIALIZE BASE DATA
; NO, SETUP INTERRUPT VECTOR
; RUN KERNEL ONLY?
; YES - SKIP NEXT
; NO - RUN DEVICE IN SUPERVISOR
; START TTY OUTPUT

; INHIBIT LINE CLOCK?
; YES, GO CK NEXT

; INITIALIZE MINUTE COUNTER

; SERVICE KHI1-L AT LEVEL
; 5 TO ALLOW TC11 IN
; RUN KERNEL ONLY?
; YES- BRANCH
; NO- RUN DEVICE IN SUPERVISOR
; INITIALIZE COUNT
; START LINE CLOCK

; INHIBIT LINE PRINTER?
; YES, GO CK NEXT

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 22
DCKTGE.P11 I/O CODE

002014	012767	000137	002076	MOV	#137, SOLPAT	; RESET FOR START OF LINE PATTERN
002022	012767	000117	001772	MOV	#79, CLINCT	; LINE COUNT
002030	012767	000137	002064	MOV	#137, CUPPAT	
002036	012777	000014	176574	MOV	#14, ALPUBR	; LINE FEED TO POSITION BUFFER
002044	012777	004000	176570	MOV	ALPINTR, ALPVC	; INTERRUPT ENABLE
002052	012777	000200	176564	MOV	#200, ALPST	; PROCESSOR LEVEL 4
002060	032737	000002	001024	BIT	#2, SREG1	; RUN KERNEL ONLY?
002066	001003			BNE	.+10	; YES - BRANCH
002070	052777	040000	176546	BIS	#40000, ALPST	
002076	012777	000100	176532	MOV	#100, ALPCSR	; INTERRUPT ENABLE
002104	005037	001070		CLR	#TRPB	; NO "T" BIT FIRST PASS
002110	012737	000006	000004	MOV	#6, #4	; RESTORE TRAP CATCHER
002116	004737	017074		JSR	X7, #USER	; FOR I/O PROGRAM INSERTION
002122	004767	001112		JSR	X7, DET1	; CHECK FOR CORE EXPANSION
002126	032767	000001	176670	BIT	#1, SREG1	; INHIBIT KT11-C?
002134	001402			BEQ	.+6	
002136	000167	000522		JMP	STRF	; YES - GO CHECK FOR RUNNING RFI1
002142	004767	011260		JSR	X7, NRALL	; NO - MAKE ALL PAGES INITIALLY NON-RESIDENT
002146	012777	077406	176602	MOV	#77406, #KIPDR7	; MAP KERNEL 7 TO THE EXTERNAL BANK, RW
002154	012777	077406	176606	MOV	#77406, #KDPDR7	
002162	012777	007600	176612	MOV	#7600, #KIPAR7	
002170	012777	007600	176616	MOV	#7600, #KDPAR7	
002176	032737	000002	001024	BIT	#2, SREG1	; INHIBIT USER/SUPERVISOR/KERNEL?
002204	001423			BEQ	SEGM1	; NO - BRANCH
002206	012701	000007		MOV	#7, R1	; YES - MAP KERNEL PAGES 0-6 TO PA
002212	016702	176554		MOV	KIPAR0, R2	
002216	005003			CLR	R3	
002220	010312			MOV	R3, #R2	
002222	010362	000020		MOV	R3, 20(R2)	
002226	012762	077406	177740	MOV	#77406, -40(R2)	
002234	012762	077406	177760	MOV	#77406, -20(R2)	
002242	005722			TST	(R2)+	
002244	012703	000200		ADD	#200, R3	
002250	077115			SQB	R1, SETEX	
002252	000576			BR	SETSEG	
002254	012777	077406	176464	MOV	#77406, #KIPDR0	; MAP KERNEL 0 TO BANK 0, RW
002262	012777	077406	176470	MOV	#77406, #KDPDR0	
002270	012777	077406	176432	MOV	#77406, #SIPDR0	; MAP SUPERVISOR 0
002276	012777	077406	176426	MOV	#77406, #SDPDR0	; TO BANK 0, RW
002304	016767	176420	176552	MOV	SIPDR0, CSIPDR	; SET UP POINTER TO TRACK CURRENT SUPERVISOR PAGE
002312	032767	000004	176504	BIT	#4, SREG1	; INHIBIT RUNNING 4K AS 32K?
002320	001453			BEQ	USEALL	; NO, SETUP FOR RUNNING 4K AS 32K
002322	012701	000007		MOV	#7, R1	; YES, MAP USER 0-6 TO PA
002326	016702	176362		MOV	UIPAR0, R2	
002332	005003			CLR	R3	
002334	010312			MOV	R3, (R2)	
002336	010362	000020		MOV	R3, 20(R2)	
002342	062703	000200		ADD	#200, R3	
002346	012762	077406	177740	MOV	#77406, -40(R2)	
002354	012762	077406	177760	MOV	#77406, -20(R2)	
002362	005722			TST	(R2)+	
002364	077115			SQB	R1, SETUSE	
002366	012701	000007		MOV	#7, R1	; MAP KERNEL 0 THRU 6 TO PHYSICAL ADDRESS
002372	016702	176374		MOV	KIPAR0, R2	; FOR I/O RELOCATION
002376	005003			CLR	R3	
002400	010312			SETKER: MOV	R3, (R2)	

002402	010362	000020		MOV	R3,20(R2)	
002406	062703	000200		ADD	#200,R3	
002412	012762	077406	177740	MOV	#77406,-40(R2)	
002420	012762	077406	177760	MOV	#77406,-20(R2)	
002425	063722			IST	(R2)+	
002430	077115			SUB	R1,SETKER	
002432	012777	007600	176266	MOV	#7600,2UDPAR7	;MAP USER 7 D-SPACE TO THE EXTERNAL
002440	012777	077406	176244	MOV	#77406,2UDPAR7	;BANK TO ALLOW ACCESSING PROCESSOR STATUS
002446	000436			BR	SETSUP	
002450	012777	077406	176222	USEALL: MOV	#77406,2UDPAR0	;MAP USER 0 TO BANK 0, RW
002456	012777	077406	176222	MOV	#77406,2UDPAR0	
002464	012777	077406	176256	MOV	#77406,2SKIPDR1	;MAP KERNEL 1 TO BANK 0, RW
002472	012777	077406	176262	MOV	#77406,2SKIPDR1	
002480	012767	000000	176342	MOV	#0,CURBANK	;CURRENT PAR CONTENTS
002486	016767	176202	176340	MOV	UDPAR0,CURIPAR	;CURRENT PAGE ADDRESS REGISTER ADDRESSES
002514	016767	176202	176334	MOV	UDPAR0,CURIPAR	
002522	016767	176152	176330	MOV	UDPAR0,CURIPAR	;CURRENT PAGE DESCRIPTOR REGISTER ADDRESSES
002530	016767	176152	176324	MOV	UDPAR0,CURIPAR	
002536	012767	006700	176322	MOV	#BEGIN,BNKSTR	;CURRENT STARTING PC
002544	012777	007600	176164	SETSUP: MOV	#7600,2SIPAR7	;MAP SUPERVISOR 7 TO THE
002552	012777	007600	176160	MOV	#7600,2SDPAR7	;EXTERNAL BANK
002560	032767	000020	176236	BIT	#20,SREG1	;CHECK SWITCH 4 - INHIBIT CYCLING ACCESS KEY?
002566	001015			BNE	SETSP1	;YES - BRANCH
002570	012777	077400	176144	MOV	#77400,2SIPDR7	;MAP SUPERVISOR PAGE 7 4K, NR
002576	012777	077400	176140	MOV	#77400,2SDPDR7	
002604	012737	015654	000250	MOV	#ABSRY,2#250	
002612	012737	000340	000252	MOV	#340,2#252	
002620	000413			BR	SETSEG	
002622	012777	077406	176112	SETSP1: MOV	#77406,2SIPDR7	;MAP SUPERVISOR PAGE 7 4K, RW
002630	012777	077406	176106	MOV	#77406,2SDPDR7	
002636	012737	000252	000250	MOV	#252,2#250	
002644	005037	000252		CLR	2#252	
002650	012777	000007	176020	SETSEG: MOV	#7,2SR3	;ENABLE ALL D-SPACES
002656	012777	001001	176004	MOV	#1001,2SR0	;TURN ON MEMORY MANAGEMENT AND ENABLE TRAPPING (
002664	012737	003220	000004	STRF: MOV	#MODEV,2#4	
002672	012700	000100		MOV	#100,R0	
002676	036700	176124		BIT	SREG2,R0	;TEST FOR INHIBITING RF11 DISK
002702	001040			BNE	STTC	;SKIP IF SET
002704	005737	000660		TST	2#RFCSR	
002710	016701	176110		MOV	SREG1,R1	
002714	042701	177770		BIC	#177770,R1	
002720	005701			TST	R1	
002722	001004			BNE	STRF1	
002724	012777	024142	175732	MOV	#IRF+20000,2RFVC	;IF SW0, 1, 2 ALL ZERO, MAP RF11 TO
002732	000403			BR	.+10	;KERNEL 1
002734	012777	004142	175722	STRF1: MOV	#IRF,2RFVC	;IF SW0, 1, 2 NOT ALL ZERO, MAP RF11 TO
002742	012777	000240	175716	MOV	#240,2RFST	;KERNEL 0
002750	012767	043503	001316	MOV	#43503,FUNCTION	;WRITE CHECK/WRITE
002756	105277	175700		INCB	2#RFCSR	;INITIALIZE DISK-DAR,DAE
002762	016777	001312	175664	MOV	WORDCT,2#RFC	;LENGTH OF TRANSFER
002770	016777	001302	175660	MOV	LLIMIT,2#FCAR	;CORE ADDRESS OF START OF TRANSFER
002776	116777	001272	175654	MOV	FUNCTION,2#FCAR	;START RF11 READ OR WRITE
003004	012737	004336	004302	STTC: MOV	#TCBUF,2#TCBUF	;INITIALIZE PA AND VA OF TC11 BUFFER
003012	012737	004336	004304	MOV	#TCBUF,2#TCBUFV	;TO BANK 0
003020	012737	000001	004330	MOV	#1,2#TCMA	;INITIALIZE TC11 BUFFER EXTENDED
						;MEMORY ADDRESS BITS TO 0

```

003026 005037 004332 CLR      2#TCEOP      ;CLEAR TC11 END OF PASS FLAG
003032 005037 004334 CLR      2#TCREL      ;CLEAR TC11 RELOCATION FLAG
003036 006300      RO      ;
003040 036700 175762 BIT      SREG2,R0      ;CHECK FOR INHIBITING TC11 DECTAPE
003044 001041      BNE     MODE1      ;SKIP IF SET
003046 005777 175762 TST      2#TCST      ;
003052 005067 001250 CLR      DATAK      ;INITIALIZE FLAG
003056 013701 001024 MOV      2#SREG1,R1
003062 032701 000050 BIT      2#S0,R1
003066 001403      BEQ     SETREL
003070 032701 000017 BIT      2#17,R1
003074 001002      BNE     .+6
003076 005237 004334 SETREL: INC     2#TCREL      ;SET FLAG INDICATING RELOCATION IS ALLOWED
003102 032701 000007 BIT      2#7,R1
003106 001007      BNE     .+20
003110 012777 025336 175726 MOV      2#ENDZ+20000,2#TCIV      ;IF SMD, 1, 2 ALL ZERO, MAP TC11
003116 012737 024336 004304 MOV      2#TCBUF+20000,2#TCBUFV      ;POINT VIRTUAL ADDRESS OF TC11 DATA
003124 000403      BR      .+10      ;BUFFER TO KERNEL PAGE 1
003126 012777 005336 175710 MOV      2#ENDZ,2#TCIV      ;TO KERNEL PAGE 1
003134 012777 000300 175704 MOV      2#300,2#TCSTA      ;IF SMD, 1, 2 NOT ALL ZERO, MAP TC11
003142 012777 004503 175662 MOV      2#R+IE+RB+DO+UN1,2#TCCH      ;TO KERNEL PAGE 0
003150 005037 177776      CLR      2#PSR      ;START REVERSE READ BLOCK NUMBER
003154 012737 000006 000004 MODE1: MOV      2#6,2#4      ;PRIORITY LEVEL 0
003162 032767 000002 175634 BIT      2#2,SREG1      ;RESTORE TRAP CATCHER TO ADDRESS ERROR VECTOR
003170 001005      BNE     MAIN+2
003172 012737 140000 177776 MOV      2#140000,2#PSR      ;CHANGE TO USER
003200 000401      BR      .+4
003202 000001      MAIN: WAIT
003204 036727 175616 002000 BIT      SREG2,2#2000      ;INHIBIT PROCESSOR TEST
003212 001373      BNE     MAIN
003214 000167 003460      JMP     BEGIN

;ROUTINE EXECUTED IF A DEVICE IS NOT INHIBITED BUT IS FOUND
;TO NOT BE PRESENT. IT SETS THE CORRESPONDING INHIBIT IN SREG2
;AND ALTERS THE PC TO SKIP THE STARTUP FOR THE DEVICE
003220 050037 001026 NODEV: BIS      R0,2#SREG2      ;SET INHIBIT BIT
003224 162716 000006      SUB      2#6,(SP)      ;ALTER RETURN PC TO
003230 042766 000017 000002      BIC      2#17,2(SP)      ;SKIP DEVICE STARTUP
003236 000002      RTI      ;CLEAR Z BIT ON STACK

;PDP-11 MEMORY DETERMINATION AND SETUP
;USE WITH VARIABLE CORE QUANTITY SYSTEMS
003240 012767 104012 007752 DET1: MOV      2#E08,DONE      ;RESTORE INITIAL CODE
003246 032767 000007 175550 BIT      2#7,SREG1      ;INHIBIT RUNNING 4K AS 32K USER?
003254 001001      BNE     .+4      ;OR INHIBIT KT11-C?
003256 000207      RTS      2#7      ;OR INHIBIT USER & SUPERVISOR MODES?
003260 032737 000040 001024 BIT      2#40,2#SREG1      ;YES - ALLOW CORE EXPANSION
003266 001401      BEQ     DET4      ;NO - INHIBIT CORE EXPANSION
003270 000207      RTS      2#7      ;CHECK VARIABLE CORE SWITCH
003272 012737 003342 000004 DET4: MOV      2#DET2,2#4      ;USE VARIABLE CORE ROUTINE
003300 012737 000340 000006      MOV      2#340,2#6      ;4K ONLY (SWITCH SET)
003306 000241      CLC      ;TRAP VECTOR SETUP
;TRAP STATUS SETUP

```

M02

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 25
DCKTGE.P11 I/O CODE

003310	005537	037770	EIGHT:	ADC	2037770	;CHECK FOR 8K
003314	005537	057770	TWELVE:	ADC	2057770	;CHECK FOR 12K
003320	005537	077770	SXTEEN:	ADC	2077770	;CHECK FOR 16K
003324	005537	117770	TWENTY:	ADC	20117770	;CHECK FOR 20K
003330	005537	137770	TWOFOR:	ADC	20137770	;CHECK FOR 24K
003334	005537	157770	TWOEIG:	ADC	20157770	;CHECK FOR 28K
003340	000437			BR	STR28	
003342	012602		DET2:	MOV	(6)+,X2	;RETRIEVE TRAP PC
003344	005726			TST	(6)+	;DISCARD TRAP STATUS WORD
003346	062702	000060		ADD	STR4-EIGHT-4,R2	
003352	000112			JMP	2R2	
003354	005000		MOVE:	CLR	X0	;SET UP MAIN CORE POINTER
003356	010102			MOV	X1,X2	
003360	062702	013426		ADD	20+2,X2	;SET UP MAX CORE MOVE
003364	012021			MOV	(0)+(1)+	;MOVE WORD
003366	020201			CMP	X2,X1	;MOVE COMPLETE?
003370	001375			BNE	-4	;MOVE ANOTHER WORD
003372	000207			RTS	X7	;MOVE COMPLETE
003374	000521		STR4:	BR	DET3	
003376	000240			NOP		
003400	000240			NOP		
003402	004767	000110	STR8:	JSR	X7,XFER8	;START 8K TRANSFER
003406	000506			BR	MOD4	;START 4K MODIFY
003410	004767	001072	STR12:	JSR	X7,XFER12	;START 12K TRANSFER
003414	000475			BR	MOD8	;START 8K MODIFY
003416	004767	000054	STR16:	JSR	X7,XFER16	;START 16K TRANSFER
003422	000464			BR	MOD12	;START 12K MODIFY
003424	004767	000036	STR20:	JSR	X7,XFER20	;START 20K TRANSFER
003430	000453			BR	MOD16	;START 16K MODIFY
003432	004767	000020	STR24:	JSR	X7,XFER24	;START 24K TRANSFER
003436	000442			BR	MOD20	;START 20K MODIFY
003440	004767	000002	STR28:	JSR	X7,XFER28	;START 28K TRANSFER
003444	000431			BR	MOD24	;START 24K MODIFY
003446	012701	140000	XFER28:	MOV	140000,X1	;SET UP MOVE START LOCATION
003452	004767	177676		JSR	X7,MOVE	;GO TO MOVE SUBROUTINE
003456	012701	120000	XFER24:	MOV	120000,X1	
003462	004767	177666		JSR	X7,MOVE	
003466	012701	100000	XFER20:	MOV	100000,X1	
003472	004767	177656		JSR	X7,MOVE	
003476	012701	060000	XFER16:	MOV	60000,X1	
003502	004767	177646		JSR	X7,MOVE	
003506	012701	040000	XFER12:	MOV	40000,X1	
003512	004767	177636		JSR	X7,MOVE	
003516	012701	020000	XFER8:	MOV	20000,X1	
003522	004767	177626		JSR	X7,MOVE	
003526	000207			RTS	X7	;RETURN FROM TRANSFERS
003530	012767	000137	MOD24:	MOV	137,DONE+120000	
003536	012767	146466		MOV	8EG1NX+140000,DONE+120002	
003544	012767	000137	MOD20:	MOV	137,DONE+100000	
003552	012767	126466		MOV	8EG1NX+120000,DONE+100002	
003560	012767	000137	MOD16:	MOV	137,DONE+60000	
003566	012767	106466		MOV	8EG1NX+100000,DONE+60002	
003574	012767	000137	MOD12:	MOV	137,DONE+40000	
003602	012767	066466		MOV	8EG1NX+60000,DONE+40002	
003610	012767	000137	MOD8:	MOV	137,DONE+20000	

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 26
DCKTGE.P11 I/O CODE

```

003616 012767 046466 027376      MOV      #BEGINX+40000,DONE+20002
003624 012767 000137 007366      MOD4:    MOV      #137,DONE
003632 012767 026466 007362      MOV      #BEGINX+20000,DONE+2
003640 005037 000006 000004      DET3:    CLR      #0
003644 012737 000006 000004      MOV      #6,#04
003652 000207 000006 000004      RTS      X7

;TTY TRANSMITTER PRINT VALUES 0 TO 377
003654 005027 000000 000000      TYOUT:   CLR      #0      ;INITIALIZE DATA
003656 003656 000000 000000      DATA2=-2
003660 016777 177772 174732      TYOUT1:  MOV      DATA2,ATTDBR      ;OUTPUT TO DEVICE
003666 104010 000000 000000      RTIK      ;RETURN TO MAINLINE
003670 017767 174722 174730      TYOUTR:  MOV      ATTCSR,TTSABV      ;SAVE CONTENTS OF TTY CSR
003676 105767 174724 000000      TSTB     TTSABV      ;CHECK TO SEE IF READY WAS SET
003702 100401 000000 000000      BMI      .+4      ;BRANCH IF FLAG FOUND
003704 104006 000000 000000      HLT      ;FALSE INTERRUPT RETURN
003706 000240 000000 000000      NOP
003710 005267 177742 000000      INC      DATA2      ;INCREMENT DATA
003714 022767 000400 177734      CMP      #400,DATA2      ;TEST DATA FOR UPPER LIMIT
003722 001754 000000 000000      BEQ      TYOUT      ;AT UPPER LIMIT START OVER
003724 000755 000000 000000      BR       TYOUT1      ;FINISH REST OF DATA

;TEST OF LINE CLOCK -OUTPUT MINUTE COUNT TO UPPER BYTE OF DISPLAY REGISTER.
003726 105777 174676 000000      LK3:    TSTB     #LKCSR      ;ON INTERRUPTS ENTER HERE
003732 100401 000000 000000      BMI      .+4      ;TEST FOR DONE
003734 104006 000000 000000      HLT      ;FALSE INTERRUPT
003736 042777 000200 174664      BIC      #200,#LKCSR
003744 005267 000012 000004      LK4:    INC      TIME      ;ONE MINUTE UP?
003750 022767 007020 000004      CMP      #3600.,TIME      ;NO- EXIT
003756 003007 000000 000000      BGT      LK2      ;YES- CLEAR LINE CLOCK TIMER
003760 005027 000000 000000      LK1:    CLR      #0
003762 003762 000000 000000      TIME=-2
003764 105267 175115 000000      INCB     DISPLY+1      ;LOAD DISPLAY REGISTER
003770 016737 175110 177570      MOV      DISPLY,#SR      ;WITH MINUTE COUNT
003776 104010 000000 000000      LK2:    RTIK      ;RETURN TO MAINLINE

;LINE PRINTER INTERRUPT SERVICE ROUTINE
004000 105777 174632 000000      LPINTR: TSTB     #LPCSR      ;TEST FOR FLAG
004004 100401 000000 000000      BMI      .+4      ;FALSE RETURN FROM MAIN LINE
004006 104006 000000 000000      HLT      ;TEST FOR END OF LINE
004010 026727 000006 000117      LP6:    CMP      CLINCT,#79.      ;GO GENERATE CR/LF
004016 001415 000000 000000      BEQ      LP4      ;INCREMENT LINE POSITION COUNT
004020 005227 000000 000000      INC      #0      ;POSITION OF LINE
004022 004022 000000 000000      CLINCT=-2
004024 026727 000072 000137      CMP      CURPAT,#137      ;TEST FOR MAXIMUM PATTERN
004032 001403 000000 000000      BEQ      LP3      ;YES - GO TO LP3 AND RESET
004034 005267 000062 000000      INC      CURPAT      ;NO - INCREMENT TO NEXT PATTERN
004040 000431 000000 000000      BR       LP2      ;GO SEND IT TO LINE PRINTER
004042 012767 000040 000052      LP3:    MOV      #40,CURPAT      ;RESET PATTERN AND SEND TO PRINTER
004050 000425 000000 000000      BR       LP2      ;SENT TO LINE PRINTER
004052 005067 177744 000000      LP4:    CLR      CLINCT      ;RESET LINE COUNT
004056 012777 000012 174554      MOV      #12,ALPDBR      ;LINE FEED
004064 105777 174546 000000      TSTB     #LPCSR
004070 100375 000000 000000      BPL      .-4

```

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 27
DCKTGE.P11 I/O CODE

004072	026727	000022	000137	CMP	SOLPAT, #137	; START OF LINE PATTERN
004100	001403			BEQ	LP5	
004102	005267	000012		INC	SOLPAT	; INCREMENT START OF LINE
004106	000403			BR	LP1	
004110	012767	000040	000002	LP5:	MOV #40, SOLPAT	; RESET START OF LINE
004116	012727	000000	000000	LP1:	MOV #0, #0	; START OF LINE TO CURRENT
	004122				CURPAT = -2	; CHARACTER BEING PRINTED
	004120				SOLPAT = -4	; START OF LINE CHARACTER
004124	016777	177772	174506	LP2:	MOV CURPAT, 2LPDBR	; CURRENT PATTERN TO LINE PRINTER
004132	105777	174500		TSTB	2LPDBR	
004136	100724			BMI	LP6	
004140	104010			RTIK		; RETURN TO MAIN LINE
				RF11 DISK		
004142	105777	174512		IRF:	TSTB 2RFCSR	; INTERRUPT VECTOR POINTS HERE
004146	100402			BMI	.+6	
004150	104006			HLT		; RF11 READY NOT UP
004152	000434			BR	RFSTART	
004154	005777	174500		TST	2RFCSR	; ERROR SET?
004160	100012			BPL	ERROK	; BRANCH IF NOT
004162	032777	020000	174470	BIT	#20000, 2RFCSR	; YES-WRITE CHECK ERROR?
004170	001404			BEQ	ERRSET	; NO-BRANCH
004172	104006			HLT		; YES-RF11 WRITE CHECK ERROR
004174	000337	004274		SWAB	2#FUNCTION	; CHANGE COMMAND TO DO A WRITE
004200	000421			BR	RFSTART	
004202	104006			ERRSET:	HLT	; RF11 ERROR SET-NOT WRITE CHECK ERROR
004204	000417			BR	RFSTART	
004206	005777	174442		ERROK:	TST 2RFWC	
004212	100002			BPL	.+6	
004214	104006			HLT		; RF-11 WORD COUNT NOT ZERO
004216	000412			BR	RFSTART	
004220	122777	000003	174420	CMPB	#3, 2RFDAE	; DISK AT UPPER LIMIT? 7=2, 17=4, 37=8
004226	001010			BNE	RF1	; NO
004230	027727	174416	174000	CMP	2RFDAE, #174000	; AS FAR ON DISK AS WE CAN GO?
004236	101404			BLOS	RF1	; NO
004240	000337	004274		SWAB	2#FUNCTION	; CHANGE COMMAND
004244	105277	174412		RFSTART:	INCB 2RFCSR	; INITIALIZE DISK - DAR-DAE
01250	013777	004276	174400	RF1:	MOV 2#LLIMIT, 2RFCAR	; CORE BASE
01256	013777	004300	174370		MOV 2#WORDCT, 2RFWC	; LENGTH OF TRANSFER
004264	113777	004274	174366		MOVB 2#FUNCTION, 2RFCSR	; WRITE OR WRITE CHECK TO DISK
004272	104010			RTIK		; RETURN TO MAINLINE CODE
004274	000000			FUNCTION:	0	; DISK COMMAND
004276	006172			LLIMIT:	NXTBLK	; FIRST CORE ADDRESS OF TRANSFER
004300	176000			WORDCT:	-2000	; LENGTH OF TRANSFER

; DECTAPE DIAGNOSTIC ROUTINE. THE TAPE ON DRIVE 1 IS FIRST DRIVEN TO THE FORWARD END ZONE. THE DESIRED DATA IS THEN GENERATED IN THE DECTAPE BUFFER AREA AND DATA IS WRITTEN ONTO ALL BLOCKS FROM THE BLOCK NUMBER IN TCFRST THRU THE BLOCK NUMBER IN TCLAST. BLOCK NUMBERS ARE ALSO CHECKED FOR BEING IN ORDER. AFTER THE BLOCK NUMBER IN TCLAST IS WRITTEN, TAPE IS DRIVEN INTO THE REVERSE END ZONE. THE TAPE IS THEN STARTED IN REVERSE, AND WHEN THE CLOSEST BLOCK THAT WAS WRITTEN (TCLAST) IS FOUND, IT IS READ INTO THE DECTAPE BUFFER AREA. THE PROGRAM INTERRUPT REQUEST FACILITY IS THEN USED TO BOOK A REQUEST FOR CHECKING THE DATA AT LEVEL 3, AND NO FURTHER DATA IS READ IN UNTIL THAT DATA HAS BEEN CHECKED. AFTER IT IS CHECKED, THE DATA IS

```

;SCRAMBLED TO GUARANTEE THAT NEW DATA IS REALLY READ IN NEXT TIME. WHILE
;THIS IS GOING ON, BLOCK NUMBERS ARE CHECKED FOR BEING IN ORDER AS THE
;TAPE TRAVELS TOWARD THE FORWARD END ZONE. ONCE THE DATA IS FULLY CHECKED
;THE NEXT BLOCK THAT COMES UP IS READ IN AND THE PROCESS REPEATED. ONCE
;THE BLOCK WHOSE NUMBER IS IN TCFRST HAS BEEN READ, THE TAPE IS DRIVEN
;INTO THE FORWARD END ZONE AND THE WHOLE SEQUENCE IS REPEATED.

```

:FUNCTION VALUES IN CSR

```

000004
000014
000002
000100
000001
004000
000400

```

```

RD=4
MD=14
RB=2
IE=100
DO=1
R=4000
UN1=400

```

```

;READ DATA
;WRITE DATA
;READ BLOCK NUMBER
;INTERRUPT ENABLE
;DO - THE FUNCTION
;REVERSE
;UNIT 1

```

```

004302 004336
004304 004336
004306 000000
004310 001101
004312 000000
004314 000000
004316 000000

```

:DECTAPE DATA

```

TCBUF: TCBUF
TCBUFV: TCBUF
TCFRST: 0
TCLAST: 577.
TCBLK: 0
TCEXP: 0
TCSTOR: 0

```

```

;PHYSICAL ADDRESS OF BUFFER
;VIRTUAL ADDRESS OF BUFFER
;FIRST BLOCK TO BE SEARCHED FOR
;LAST BLOCK TO BE SEARCHED FOR
;CURRENT BLOCK FOUND
;THE BLOCK THAT IS EXPECTED
;SAVES CONTENTS OF TC STATUS
;REGISTER AT TIME OF INTERRUPT

```

```

004320 000000
004322 000000
004324 000000
004326 000000
004330 000001
004332 000000
004334 000000

```

```

FBLK: 0
STOR1: 0
STOR2: 0
DATAK: 0
TCMA: 1
TCEOP: 0
TCREL: 0

```

```

;EXTENDED MEMORY ADDRESS BITS AND DO BIT
;END OF PASS FLAG
;SET IF TC CODE IS TO BE
;RELOCATED TO THE SAME BANK AS USER

```

```

004336 000000
005336

```

:DECTAPE BUFFER USED FOR BOTH WRITE AND READ FUNCTIONS

```

TCBUF: 0
.=.+776

```

```

;DECTAPE ROUTINE TO DRIVE TAPE INTO ENDOZONE
;REGENERATES DECTAPE WRITE BUFFER BEFORE WRITING TAPE
;MUST BE ENTERED WITH FUNCTION SET TO READ BLOCK #

```

```

005336 042777 017777 173500
005344 052777 005336 173472
005352 005777 173456
005356 100403
005360 105277 173446
005364 000002
005366 042777 017777 173450
005374 052777 005570 173442
005402 005037 004320
005406 032777 004000 173416
005414 001007
005416 052777 004001 173406
005424 013737 004310 004314
005432 000002
005434 005737 004334

```

```

ENDZ: BIC #17777, @TCIV
      BIS #ENDZ, @TCIV
      TST @TCST
      BMI ENDZ1
      INCB @TCCM
      RTI
ENDZ1: BIC #17777, @TCIV
      BIS #RBN, @TCIV
      CLR @FBLK
      BIT #4000, @TCCM
      BNE ENDZ2
      BIS #4001, @TCCM
      MOV @TCLAST, @TCEXP
      RTI
ENDZ2: TST @TCREL

```

```

;END ZONE SET?
;YES-BRANCH
;NO-GO AGAIN

```

```

;LOOKING FOR FIRST DESIRED BLOCK
;REVERSE SET?
;YES, NOW AT FORWARD END ZONE, BRANCH
;NO, SET IT AND DO

```

```

;TC RELOCATION ALLOWED?

```

```

005440 001403      BEQ      BKREQ      ;NO BRANCH TO BOOK PIRQ
005442 005737 004332 TST      @TCEOP    ;YES-DON'T STOP TC IF THIS IS
                                      ;THE INITIAL SEARCH FOR THE
                                      ;FORWARD END ZONE

005446 001003      BNE      STOPTC     ;YES, BOOK LEVEL 2 PIRQ TO RESTART
005450 052777 002000 173420 BKREQ: BIS      @2000,@PIR ;TC11 AND REGENERATE WRITE BUFFER

005456 104010      STOPTC: RTIK

```

```

;ROUTINE TO REGENERATE WRITE BUFFER AND START UP DECTAPE WRITING BLOCKS
;FORWARD. MUST RUN AT LOWER LEVEL THAN READ BUFFER DATA CHECK ROUTINE
;BOTH ARE RUN UNDER PIRQ

```

```

005460 010137 004322 REGEN: MOV      R1,@STOR1    ;SAVE REGISTERS
005464 010237 004324      MOV      R2,@STOR2
005470 005037 004320      CLR      @FBLK    ;INITIALIZE FIRST BLOCK FOUND FLAG
005474 012701 000001      MOV      @1,R1    ;REGENERATE WRITE BUFFER
005500 013702 004304      MOV      @TCBUFV,R2
005504 010122      REGENL: MOV      R1,(R2)+
005506 010112      MOV      R1,R2
005510 005122      COM      (R2)+
005512 005201      INC      ?1
005514 022701 000201      CMP      @20,R1
005522 013701 004322      BNE      REGENL
005526 013702 004324      MOV      @STOR1,R1    ;RESTORE REGISTERS
005532 042777 017777 173304      MOV      @STOR2,R2
005540 052777 005570 173276      BIC      @17777,@TCIV    ;CHANGE INTERRUPT RETURN
005546 012777 000503 173256      BIS      @RPN,@TCIV    ;TO READ BLOCK NUMBER ROUTINE
005554 013737 004306 004314      MOV      @R8+IE+@0+@1,@TCM    ;FORWARD READ BLOCK #
005562 005037 004332      MOV      @TCFRST,@1EXP
005566 000207      CLR      @TCEOP
                        RTS      x7

```

```

;DECTAPE ROUTINE TO PROCESS INTERRUPT FROM READING A BLOCK NUMBER
;SETS UP FOR WRITING A BLOCK IF TAPE IS GOING FORWARD
;SETS UP FOR READING A BLOCK IF TAPE IS GOING IN REVERSE
;DATAK IS NON ZERO WHENEVER A PREVIOUS READ HAS NOT
;BEEN FULLY CHECKED-IF NONZERO, NO DATA IS READ IN

```

```

005570 017727 173240 004316 RBN:  MOV      @TCST,@TCSTOR    ;SAVE STATUS IN CASE OF ERROR
005576 032777 100200 173226      BIT      @100200,@TCM    ;CHECK ERROR AND READY
005604 100006      BPL      RBN2      ;BRANCH IF ERROR NOT SET
005606 104006      HLT      ;ERROR SET-CHECK CONTENTS OF TCSTOR
005610 012777 004502 173214 RBN1: MOV      @R8+IE+R+@1,@TCM    ;REVERSE READ BLOCK NUMBER
005616 000167 177514      JMP      ENDZ      ;RESTART ON ERROR
005622 001002      RBN2:  BNE      RBN3      ;BRANCH IF READY SET
005624 104006      HLT      ;READY NOT SET
005626 000770      BR      RBN1      ;RESTART
005630 005737 004320      RBN3:  TST      @FBLK    ;FIRST EXPECTED BLOCK FOUND YET?
005634 100526      BMI      RBN10     ;YES-BRANCH
005636 027737 173174 004314      CMP      @TCOT,@TCEXP    ;BLOCK NUMBER EQUAL TO FIRST ONE DESIRED?
005644 001067      BNE      RBN7      ;NO, BRANCH
005646 005137 004320      COM      @FBLK    ;YES, SET FIRST BLOCK FOUND FLAG (NEGATIVE INDIC
005652 042777 017777 173164 RBN4: BIC      @17777,@TCIV
005660 052777 006172 173156      BIS      @NXTBLK,@TCIV
005666 012777 177400 173144      MOV      @-400,@TCMC
005674 013777 004302 173140      MOV      @TCBUFV,@TCBA
005702 032777 004000 173122      BIT      @4000,@TCM    ;REVERSE SET?

```

E03

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 30
 DCKTGE.P11 I/O CODE

005710	001007			BNE	RBN5	;YES-BRANCH TO READ BLOCK
005712	012777	000514	173112	MOV	#RD+IE+UN1,@TCCH	;NO-WRITE BLOCK
005720	053777	004330	173104	BIS	@TCMA,@TCCH	
005726	104010			RTIK		
005730	005737	004326		RBN5: TST	@DATAACK	;IF NOT ZERO INDICATES READ BUFFER
						;NOT YET FULLY CHECKED
						;SO DON'T READ BLOCK
005734	001011			BNE	RBN6	;WAS ZERO-SO SET IT NOW
005736	005137	004326		COM	@DATAACK	;AND READ A BLOCK
005742	012777	004504	173062	MOV	#RD+R+IE+UN1,@TCCH	
005750	053777	004330	173054	BIS	@TCMA,@TCCH	
005756	104010			RTIK		
005760	027737	173052	004306	RBN6: CMP	@TCOT,@TCFRST	
005766	003004			BGT	+12	
005770	005237	004332		INC	@TCEXP	
005774	000167	177336		JMP	ENDZ	
006000	042777	017777	173036	BIC	#17777,@TCIV	;READ BLOCK NUMBER
006006	052777	005570	173030	BIS	#RBN,@TCIV	
006014	012777	004503	173010	MOV	#RB+A+DO+IE+UN1,@TCCH	
006022	104010			RTIK		
006024	032777	004000	173000	RBN7: BIT	#4000,@TCCH	;CHECK REVERSE BIT
006032	001415			BEQ	RBN9	;BRANCH IF FORWARD
006034	027737	172776	004314	CMP	@TCOT,@TCEXP	
006042	003006			BGT	RBN8	;CONTINUE IF NOT THERE YET
006044	104006			HLT		;PAST DESIRED POINT
006046	012777	000502	172756	MOV	#RB+IE+UN1,@TCCH	;READ BLOCK NUMBER, CHANGE DIRECTION
006054	000167	177256		JMP	ENDZ	
006060	105277	172746		RBN8: INCB	@TCCH	
006064	104010			RTIK		
006066	023777	004314	172742	RBN9: CMP	@TCEXP,@TCOT	
006074	003371			BGT	RBN8	;BRANCH IF NOT THERE YET
006076	104006			HLT		;PAST DESIRED POINT
006100	012777	004502	172724	MOV	#RB+R+IE+UN1,@TCCH	;READ BLOCK NUMBER, CHANGE DIRECTION
006106	000167	177224		JMP	ENDZ	
006112	032777	004000	172712	RBN10: BIT	#4000,@TCCH	;REVERSE SET?
006120	001011			BNE	RBN11	;YES-BRANCH
006122	023777	004310	172706	CMP	@TCLAST,@TCOT	;NO, CHECK FOR PAST LAST DESIRED BLOCK
006130	002002			BGE	+6	
006132	000167	177200		JMP	ENDZ	;IF PAST GO TO ENDZ ROUTINE
006136	005237	004314		INC	@TCEXP	;UP BLOCK NUMBER EXPECTED
006142	000402			BR	+6	
006144	005337	004314		RBN11: DEC	@TCEXP	
006150	023777	004314	172660	CMP	@TCEXP,@TCOT	;SEQUENTIAL BLOCK?
006156	001002			BNE	+6	;NO
006160	000167	177466		JMP	RBN4	;YES, READ OR WRITE IT
006164	104006			HLT		;BLOCK NUMBER NOT SEQUENTIAL
006166	000167	177416		JMP	RBN1	;RESTART
006172	017737	172636	004316	:DECTAPE ROUTINE INTERRUPTED TO AFTER READING OR WRITING A BLOCK		
006200	032777	100200	172624	NXTBLK: MOV	@TCST,@TCSTOR	;SAVE DTA STATUS IN CASE OF ERROR
006206	100003			BIT	#100200,@TCCH	;CHECK ERROR AND READY
006210	104006			BPL	NXTB1	;BRANCH IF ERROR NOT SET
006212	000167	177372		HLT		;ERROR SET-CK CONTENTS OF TCSTOR
006216	001003			JMP	RBN1	;RESTART
006220	104006			BNE	NXTB2	;BRANCH IF READY SET
006222	000167	177362		HLT		;READY NOT SET
				JMP	RBN1	

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 31
DCKTGE.P11 I/O CODE

006226	105737	004326	NXTB2:	TSTB	2#DATAACK	:Cleared INDICATES REQUEST ALREADY MADE ;OR NO DATA WAS READ
006232	001405			BEQ	NXTB3	
006234	105037	004326		CLRB	2#DATAACK	:CLEAR AND BOOK
006240	052777	004000	172630	BIS	2#4000,2#PIR	:BOOK A PIR AT LEVEL 3
006246	032777	004000	172556	NXTB3:	2#R,2#TCCM	:REVERSE SET?
006254	001022			BNE	NXTB4	:YES,SKIP NEXT
006256	042777	017777	172560	BIC	2#17777,2#TCIV	
006264	112777	000103	172540	MOVB	2#R2+IE+00,2#TCCM	
006272	023737	004310	004314	CHP	2#TCLAST,2#TCEXP	
006280	003004			BGT	2#+12	
006286	052777	005336	172534	BIS	2#ENDZ,2#TCIV	
006290	104010			RTIK		
006296	052777	005570	172524	BIS	2#RBN,2#TCIV	
006300	104010			RTIK		
006306	042777	017777	172514	NXTB4:	2#17777,2#TCIV	
006310	112777	000103	172474	MOVB	2#R2+IE+00,2#TCCM	
006316	023737	004306	004314	CHP	2#TCFRST,2#TCEXP	
006324	002407			BLT	2#+20	
006346	052777	005336	172470	BIS	2#ENDZ,2#TCIV	
006354	012737	000001	004332	MOV	2#1,2#TCEOP	
006362	104010			RTIK		
006364	052777	005570	172452	BIS	2#RBN,2#TCIV	
006372	104010			RTIK		

:DECTAPE ROUTINE TO CHECK DATA READ IN DURING READ BLOCK
TCCK: NOP ;FOR DEBUGGING IF NEEDED

006374	000240			NOP		
006376	000240			NOP		
006400	000240			NOP		
006402	010137	004322		MOV	2#R1,2#STOR1	
006406	010237	004324		MOV	2#R2,2#STOR2	
006412	012701	000230		MOV	2#200,R1	
006416	013702	004304		MOV	2#TCCBUFV,R2	
006422	005112		TCCK1:	COM	2#R2	
006424	020122			CHP	2#R1,(R2)+	
006426	001402			BEQ	2#+6	
006430	104006			HLT		:TC11 DATA ERROR
006432	000406			BR	TCCK2	
006434	020112			CHP	2#R1,2#R2	
006436	001402			BEQ	2#+6	
006440	104006			HLT		:TC11 DATA ERROR
006442	000402			BR	TCCK2	
006444	005422			NEG	2#(R2)+	:SCRAMBLE
006446	077113			SOS	2#R1,TCCK1	
006450	013701	004322	TCCK2:	MOV	2#STOR1,R1	
006454	013702	004324		MOV	2#STOR2,R2	
006460	005037	004326		CLR	2#DATAACK	
006464	000207			RTS	2#X7	

006466	010701		BEGINX:	MOV	2#PC,R1	:SETUP R1 TO CONTAIN TOP BITS OF
006470	042701	017777		BIC	2#17777,R1	:ADDRESS (SELECTS BANK)
006474	072127	177772		ASH	2#-6,R1	:RIGHT SHIFT SIX
006500	010137	001050		MOV	2#R1,2#CURBNK	
006504	072127	000006		ASH	2#6,R1	:LEFT SHIFT SIX
006510	042737	160000	000034	BIC	2#160000,2#34	:SETUP SCOPE VECTOR RETURN TO
006516	050137	000034		BIS	2#R1,2#34	:REFERENCE CURRENT BANK

006522	032737	000010	001024	BIT	#10, @SREG1	;INHIBIT I/O RELOCATION?
006530	001063			BNE	BEGIN	;YES - SKIP REST
006532	052737	000340	177776	BIS	#340, @PSR	;RAISE PRIORITY TO LEVEL 7
006540	042777	160000	172116	BIC	#160000, @RVC	;CHANGE RF VECTOR RETURN TO ADDRESS
006546	050177	172112		BIS	R1, @RVC	;NEW FINK
006552	042737	160000	004276	BIC	#160000, @LLIMIT	;CHANGE RF BUFFER ADDRESS TO
006560	050137	004276		BIS	R1, @LLIMIT	;REFERENCE NEW BANK
006564	042737	000340	177776	BIC	#340, @PSR	;DROP PRIORITY TO LEVEL 0
006572	005737	004334		TST	@TCREL	;TC11 RELOCATING?
006576	001440			BEG	BEGIN	;NO-SKIP
006600	005737	004332		TST	@TCEOP	;WAIT FOR TC11 TO FINISH A FULL
006604	001775			BEG	-4	;PASS
006606	042777	000100	172216	BIC	#100, @TCCH	;CLEAR TC11 IE
006614	005777	172212		TST	@TCCH	;WAIT FOR ENDZONE
006620	100375			BPL	-4	
006622	005737	004326		TST	@DATAACK	;WAIT FOR DATA TO BE CHECKED
006624	100775			BMI	-4	
006626	012737	004336	004302	MOV	@TCBUF, @TCBUF	;SETUP TC11 PHYSICAL BUFFER ADDRESS
006636	050137	004302		BIS	R1, @TCBUF	;TO REFERENCE NEW BANK
006642	012737	004336	004304	MOV	@TCBUF, @TCBUFV	;SETUP TC11 VIRTUAL BUFFER ADDRESS
006650	050137	004304		BIS	R1, @TCBUFV	;TO REFERENCE NEW BANK
006654	012777	005336	172162	MOV	@ENDZ, @TCIV	;SETUP TC11 VECTOR RETURN ADDRESS
006662	050177	172156		BIS	R1, @TCIV	;TO REFERENCE NEW FINK
006666	005037	004332		CLR	@TCEOP	;REINITIALIZE TC END OF PASS FLAG
006672	052777	002000	172176	BIS	#2000, @PIR	;BOOK LEVEL 2 REQUEST TO REGENERATE
						;WRITE BUFFER AND RUN ANOTHER PASS
						;OF DECTAPE CODE

				;SBTTL BACKGROUND CPU TESTS	
				;BINARY INSTRUCTIONS	
				;INDEX, AND INDIRECT TEST OF PDP-11	
006700	010767	004454		MOV	PC, RETURN
006704	062767	000142	004446	ADD	@BEGIN2-BEGIN-2, RETURN
006712	010705			MOV	PC, RS
006714	042705	017777		BIC	#17777, RS
006720	012767	013362	004436	MOV	#8, B+2
006726	060567	004432		ADD	RS, B+2
006732	012767	013376	004434	MOV	#A+4, A+2
006740	060567	004430		ADD	RS, A+2
006744	012767	013402	004426	MOV	#A+10, A+6
006752	060567	004422		ADD	RS, A+6
006756	012767	013404	004422	MOV	#C, C+2
006764	060567	004416		ADD	RS, C+2
006770	012767	013414	004420	MOV	@TEMP, TEMP+2
006776	060567	004414		ADD	RS, TEMP+2
007002	012767	013424	004412	MOV	@TEMP+10, TEMP+6
007010	060567	004406		ADD	RS, TEMP+6
007014	012767	000400	004332	MOV	#400, ICOUNT
				;TEST COMPARE INSTRUCTION INDEXED	
007022	012700	177770		MOV	J-10, R0
007026	060500			ADD	RS, R0
007030	012701	177774		MOV	#-4, R1
007034	060501			ADD	RS, R1
007036	012702	000010		MOV	#+10, R2
007042	060502			ADD	RS, R2

;FOR SCOPING - SETUP ADDRESS OF BEGIN2 IN
THIS BANK THRU CURRENT ASR IN RETURN
;SETUP RS WITH VIRTUAL ADDRESS
;OFFSET
;SETUP DATA FOR BACKGROUND CPU TESTS

;ITERATION COUNT

;R0, R1, AND R2 ARE RESERVED FOR SPECIFIC VALUES

```

007044 026027 013372 125252 BEGIN2: CMP      A(0),#125252      ;(A INDEX BY MINUS 10) TO #125252
007052 001401                      BEQ      .+4
007054 104006                      HLT
007056 104400                      SCOPE      ;COMPARE WITH INDEX FAILED

```

```

007060 012703 000004                      MOV      #4,R3
007064 060503                      ADD      R5,R3
007066 026063 013372 013372          CMP      A(0),A(3)
007074 001401                      BEQ      .+4
007076 104006                      HLT
007100 026360 013372 013372          CMP      A(3),A(0)
007106 001401                      BEQ      .+4
007110 104006                      HLT
007112 104400                      SCOPE

```

```

007114 026162 013372 013372          CMP      A(1),A(2)
007122 001401                      BEQ      .+4
007124 104006                      HLT
007126 026261 013372 013372          CMP      A(2),A(1)
007134 001401                      BEQ      .+4
007136 104006                      HLT
007140 104400                      SCOPE

```

;TEST MOVE INSTRUCTION FOR INDEXING

```

007142 016067 013372 004244          MOV      A(0),TEMP
007150 026727 004240 125252          CMP      TEMP,#125252
007156 001401                      BEQ      .+4
007160 104006                      HLT
007162 104400                      SCOPE

```

```

007164 012762 052525 013414          MOV      #052525,TEMP(2)
007172 026727 004226 052525          CMP      TEMP+10,#052525
007200 001401                      BEQ      .+4
007202 104006                      HLT
007204 104400                      SCOPE

```

;TEST BIC INSTRUCTION FOR INDEXING

```

007206 012767 177777 004200          MOV      #-1,TEMP
007214 046267 013372 004172          BIC      A(2),TEMP
007222 026727 004166 125252          CMP      TEMP,#125252
007230 001401                      BEQ      .+4
007232 104006                      HLT
007234 104400                      SCOPE

```

```

007236 012767 177777 004140          MOV      #-1,TEMP-10
007244 042767 052525 004132          BIC      #052525,TEMP-10
007252 026727 004126 125252          CMP      TEMP-10,#125252
007260 001401                      BEQ      .+4
007262 104006                      HLT
007264 104400                      SCOPE

```

;TEST SUBTRACT INSTRUCTION FOR INDEXING

```

007266 012767 125252 004120          MOV      #125252,TEMP

```

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 34
 DCKTGE.P11 BACKGROUND CPU TESTS

007274	166760	004062	013424	SUB	B, TEMP+10(0)
007302	001401			BEQ	.+4
007304	104006			HLT	
007306	104400			SCOPE	
007310	012767	052525	004076	MOV	#052525, TEMP
007316	166267	013372	004070	SUB	A(2), TEMP
007324	001401			BEQ	.+4
007326	104006			HLT	
007330	104400			SCOPE	
; TEST UNARYS INDEXED					
007332	012767	177777	004054	MOV	#-1, TEMP
007340	005060	013424		CLR	D(0)
007344	005767	004044		TST	TEMP
007350	001401			BEQ	.+4
007352	104006			HLT	
007354	104400			SCOPE	
007356	012767	177777	004030	MOV	#-1, TEMP
007364	005162	013404		COM	C(2)
007370	005767	004020		TST	TEMP
007374	001401			BEQ	.+4
007376	104006			HLT	
007400	104400			SCOPE	
007402	012767	177777	004004	MOV	#-1, TEMP
007410	005162	013404		INC	C(2)
007414	005767	003774		TST	TEMP
007420	001401			BEQ	.+4
007422	104006			HLT	
007424	104400			SCOPE	
007426	012767	000001	003760	MOV	#1, TEMP
007434	005360	013424		DEC	D(0)
007440	005767	003750		TST	TEMP
007444	001401			BEQ	.+4
007446	104006			HLT	
007450	104400			SCOPE	
007452	012767	000001	003734	MOV	#1, TEMP
007460	005460	013424		NEG	D(0)
007464	022767	177777	003722	CMP	#-1, TEMP
007472	001401			BEQ	.+4
007474	104006			HLT	
007476	104400			SCOPE	
007500	012767	177777	003706	MOV	#-1, TEMP
007506	000261			SEC	
007510	005562	013404		ADC	C(2)
007514	005767	003674		TST	TEMP
007520	001401			BEQ	.+4
007522	104006			HLT	
007524	104400			SCOPE	
007526	012767	000001	003660	MOV	#1, TEMP

007534	000261		SEC	
007536	005660	013424	SBC	D(0)
007542	005767	003646	TST	TEMP
007546	001401		BEQ	.+4
007550	104006		HLT	
007552	104400		SCOPE	

;TEST JMP INDIRECT

007554	010704		MOV	%7,%4
007556	062704	000010	ADD	#10,%4
007562	000114		JMP	@%4
007564	104006		HLT	
007566	000240		NOP	
007570	104400		SCOPE	

;TEST INDIRECT ADDRESSING WITH INDEXING
;TEST COMPARE INSTRUCTION

007572	027727	003566	125252	CMP	@B+2,@125252
007600	001401			BEQ	.+4
007602	104006			HLT	
007604	104400			SCOPE	

;TEST MOVE INSTRUCTIONS

007606	012777	125252	003602	MOV	@125252,@TEMP+2
007614	026767	003542	003572	CMP	B,TEMP
007622	001401			BEQ	.+4
007624	104006			HLT	
007626	104400			SCOPE	

;TEST BIC INSTRUCTION INDIRECT WITH INDEXING

007630	012767	177777	003556	MOV	#-1,TEMP
007636	042777	125252	003552	BIC	@125252,@TEMP+2
007644	022767	052525	003542	CMP	@52525,TEMP
007652	001401			BEQ	.+4
007654	104006			HLT	
007656	104400			SCOPE	

;TEST SUBTRACT INSTRUCTION INDIRECT WITH INDEXING

007660	012767	125252	003526	MOV	@125252,TEMP
007666	167777	003472	003522	SUB	@B+2,@TEMP+2
007674	005767	003514		TST	TEMP
007700	001401			BEQ	.+4
007702	104006			HLT	
007704	104400			SCOPE	

;TEST ADD INDIRECT WITH INDEXING

007706	012767	125252	003500	MOV	@125252,TEMP
007714	067777	003460	003474	ADD	@A+6,@TEMP+2
007722	026727	003466	177777	CMP	TEMP,#-1
007730	001401			BEQ	.+4
007732	104006			HLT	
007734	104400			SCOPE	

;TEST UNARYS INDIRECT WITH INDEXING

K03

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 36
 DCKTGE.P11 BACKGROUND CPU TESTS

007736	012767	177777	003450	MOV	#-1, TEMP
007744	005077	003446		CLR	@TEMP+2
007750	005767	003440		TST	TEMP
007754	001401			BEQ	.+4
007756	104006			HLT	
007760	104400			SCOPE	
007762	012767	125252	003424	MOV	#125252, TEMP
007770	005177	003422		COM	@TEMP+2
007774	022767	052525	003412	CMP	#52525, TEMP
010002	001401			BEQ	.+4
010004	104006			HLT	
010006	104400			SCOPE	
010010	005067	003400		CLR	TEMP
010014	005377	003376		DEC	@TEMP+2
010020	026727	003370	177777	CMP	TEMP, #-1
010026	001401			BEQ	.+4
010030	104006			HLT	
010032	104400			SCOPE	
010034	012767	000001	003352	MOV	#1, TEMP
010042	005477	003350		NEG	@TEMP+2
010046	022767	177777	003340	CMP	#-1, TEMP
010054	001401			BEQ	.+4
010056	104006			HLT	
010060	104400			SCOPE	
010062	012767	177777	003324	MOV	#-1, TEMP
010070	000261			SEC	
010072	005577	003320		ADC	@TEMP+2
010076	005767	003312		TST	TEMP
010102	001401			BEQ	.+4
010104	104006			HLT	
010106	104400			SCOPE	
010110	012767	000001	003276	MOV	#1, TEMP
010116	000261			SEC	
010120	005677	003272		SBC	@TEMP+2
010124	005767	003264		TST	TEMP
010130	001401			BEQ	.+4
010132	104006			HLT	
010134	104400			SCOPE	
010136	012767	177777	003240	;TEST BIC INSTRUCTION	
010144	012703	177772		MOV	#-1, C
010150	060503			MOV	#-6, %3
010152	010304			ADD	RS, R3
010154	047374	013372	013414	MOV	%3, %4
010162	022767	052525	003214	BIC	@A(3), @TEMP(4)
010170	001401			CMP	#52525, C
010172	104006			BEQ	.+4
010174	104400			HLT	
				SCOPE	

;TEST COMPARE INSTRUCTION INDEXED

010176	126162	013372	013372	CMPB	A(1),A(2)
010204	001401			BEQ	.+4
010206	104006			HLT	
010210	126261	013372	013372	CMPB	A(2),A(1)
010216	001401			BEQ	.+4
010220	104006			HLT	
010222	104400			SCOPE	
;TEST MOVE BYTE INSTRUCTION INDEXED					
010224	116267	013372	003162	MOVB	A(2),TEMP
010232	126727	003156	000125	CMPB	TEMP,#000125
010240	001401			BEQ	.+4
010242	104006			HLT	
010244	104400			SCOPE	
;TEST BICB INSTRUCTION FOR INDEXING					
010246	012767	177777	003150	MOV	#-1,TEMP+10
010254	142762	125252	013414	BICB	#125252,TEMP(2)
010262	126727	003136	002525	CMPB	TEMP+10,#2525
010270	001401			BEQ	.+4
010272	104006			HLT	
010274	104400			SCOPE	
;TEST UNARYS INDEXED (BYTE INSTRUCTIONS)					
010276	012767	177777	003110	MOV	#-1,TEMP
010304	012703	177771		MOV	#-7,%3
010310	060503			ADD	RS,R3
010312	105063	013424		CLRB	D(3)
010316	026727	003072	000377	CMP	TEMP,#000377
010324	001401			BEQ	.+4
010326	104006			HLT	
010330	104400			SCOPE	
010332	012767	177777	003054	MOV	#-1,TEMP
010340	105160	013424		COMB	D(0)
010344	105767	003044		TSTB	TEMP
010350	001401			BEQ	.+4
010352	104006			HLT	
010354	104400			SCOPE	
010356	012767	177777	003030	MOV	#-1,TEMP
010364	105260	013424		INCB	D(0)
010370	026727	003020	177400	CMP	TEMP,#177400
010376	001401			BEQ	.+4
010400	104006			HLT	
010402	104400			SCOPE	
010404	012767	000001	003002	MOV	#1,TEMP
010412	105362	013404		DECB	C(2)
010416	105767	002772		TSTB	TEMP
010422	001401			BEQ	.+4
010424	104006			HLT	
010426	104400			SCOPE	

010430	012767	000001	002756	MOV	#1, TEMP
010436	105460	013424		NEGB	D(0)
010442	026727	002746	000377	CMP	TEMP, #377
010450	001401			BEQ	.+4
010452	104006			HLT	
010454	104400			SCOPE	
010456	012767	177777	002730	MOV	#-1, TEMP
010464	000261			SEC	
010466	105562	013404		ADCB	C(2)
010472	026727	002716	177400	CMP	TEMP, #177400
010500	001401			BEQ	.+4
010502	104006			HLT	
010504	104400			SCOPE	
010506	012767	000401	002700	MOV	#401, TEMP
010514	012704	177771		MOV	#-7, %4
010520	060504			ADD	R5, R4
010522	000261			SEC	
010524	105664	013424		SBCB	D(4)
010530	022767	000001	002656	CMP	#1, TEMP
010536	001401			BEQ	.+4
010540	104006			HLT	
010542	104400			SCOPE	

;TEST INDIRECT ADDRESSING WITH INDEXING
;TEST COMPARE INSTRUCTION

010544	127727	002614	125252	CMPB	28+2, #125252
010552	001401			BEQ	.+4
010554	104006			HLT	
010556	104400			SCOPE	

010560	122777	125252	002576	CMPB	#125252, 28+2
010566	001401			BEQ	.+4
010570	104006			HLT	
010572	104400			SCOPE	

;TEST MOVE INSTRUCTIONS

010574	117703	002564		MOVB	28+2, %3
010600	122703	125252		CMPB	#125252, %3
010604	001401			BEQ	.+4
010606	104006			HLT	
010610	104400			SCOPE	

010612	112777	125252	002576	MOVB	#125252, 2TEMP+2
010620	126767	002536	002566	CMPB	B, TEMP
010626	001401			BEQ	.+4
010630	104006			HLT	
010632	104400			SCOPE	

;TEST BIC INSTRUCTION INDIRECT WITH INDEXING

010634	012704	177777		MOV	#-1, %4
010640	147704	002520		BICB	28+2, %4
010644	120427	052525		CMPB	%4, #52525
010650	001401			BEQ	.+4
010652	104006			HLT	

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 39
 DCKTGE.P11 BACKGROUND CPU TESTS

010654	104400			SCOPE	
010656	012767	177777	002530	MOV	#-1, TEMP
010664	142777	125252	002524	BICB	#125252, @TEMP+2
010672	122767	052525	002514	CMPB	#52525, TEMP
010700	001401			BEQ	.+4
010702	104006			HLT	
010704	104400			SCOPE	
;TEST UNARYS INDIRECT WITH INDEXING					
010706	012767	177777	002500	MOV	#-1, TEMP
010714	105077	002476		CLRB	@TEMP+2
010720	105767	002470		TSTB	TEMP
010724	001401			BEQ	.+4
010726	104006			HLT	
010730	104400			SCOPE	
010732	012767	125252	002454	MOV	#125252, TEMP
010740	105177	002452		COMB	@TEMP+2
010744	122767	052525	002442	CMPB	#052525, TEMP
010752	001401			BEQ	.+4
010754	104006			HLT	
010756	104400			SCOPE	
010760	005067	002430		CLR	TEMP
010764	105277	002426		INCB	@TEMP+2
010770	122767	000001	002416	CMPB	#1, TEMP
010776	001401			BEQ	.+4
011000	104006			HLT	
011002	104400			SCOPE	
011004	005067	002404		CLR	TEMP
011010	105377	002402		DECB	@TEMP+2
011014	126727	002374	177777	CMPB	TEMP, #-1
011022	001401			BEQ	.+4
011024	104006			HLT	
011026	104400			SCOPE	
011030	012767	000001	002356	MOV	#1, TEMP
011036	105477	002354		NEGB	@TEMP+2
011042	122767	177777	002344	CMPB	#-1, TEMP
011050	001401			BEQ	.+4
011052	104006			HLT	
011054	104400			SCOPE	
011056	012767	177777	002330	MOV	#-1, TEMP
011064	001401			SEC	
011066	105577	002324		ADCB	@TEMP+2
011072	022767	177400	002314	CMP	#177400, TEMP
011100	001401			BEQ	.+4
011102	104006			HLT	
011104	105767	002304		TSTB	TEMP
011110	001401			BEQ	.+4
011112	104006			HLT	
011114	104400			SCOPE	

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 40
 DCKTGE.P11 BACKGROUND CPU TESTS

011116	012767	000001	002270	MOV	B1,TEMP
011124	000261			SEC	
011126	105377	002264		DECB	TEMP+2
011132	005767	002256		TST	TEMP
011136	001401			BEQ	.+4
011140	104006			HLT	
011142	104400			SCOPE	

;TEST OF COMBINED INDEXING AND INDIRECT

011144	012703	177772		MOV	B-6,X3
011150	012704	000002		MOV	B+2,X4
011154	060503			ADD	RS,R3
011156	060504			ADD	RS,R4
011160	127374	013372	013372	CMPS	2A(3),2A(4)
011166	001401			BEQ	.+4
011170	104006			HLT	
011172	104400			SCOPE	

;TEST BIC INSTRUCTION

011174	012703	000006		MOV	B+6,X3
011200	012767	177777	002206	MOV	B-1,TEMP
011206	060503			ADD	RS,R3
011210	147367	013372	002176	BICB	2A(3),TEMP
011216	122767	125252	002170	CMPS	B125252,TEMP
011224	001401			BEQ	.+4
011226	104006			HLT	
011230	104400			SCOPE	

011232	012704	177772		MOV	B-6,X4
011236	012767	177777	002140	MOV	B-1,C
011244	060504			ADD	RS,R4
011246	142774	125252	013414	BICB	B125252,TEMP(4)
011254	126727	002124	000125	CMPS	C,B000125
011262	001401			BEQ	.+4
011264	104006			HLT	
011266	104400			SCOPE	

011270	012703	013364		MOV	B+2,X3
011274	060503			ADD	RS,R3
011276	023367	002060		CMPS	2(3)+,B
011302	001401			BEQ	.+4
011304	104006			HLT	
011306	104400			SCOPE	

;ADDRESS OF ADDRESS OF B

011310	012704	013366		MOV	B+4,X4
011314	060504			ADD	RS,R4
011316	025467	002040		CMPS	2-(4),B
011322	001401			BEQ	.+4
011324	104006			HLT	
011326	104400			SCOPE	

011330	012703	013410		MOV	B+4,X3
011334	060503			ADD	RS,R3
011336	012767	177777	002040	MOV	B-1,C
011344	105053			CLRB	2-(3)

```

011346 026727 002032 177400      CMP      C, #177400
011354 001401                    BEQ      .+4
011356 104006                    HLT
011360 104400                    SCOPE

011362 012767 177777 002014      MOV      #1,C
011370 012703 177772              MOV      #6,%3
011374 060503                    ADD      R5,R3
011376 010304                    MOV      R3,R4
011400 147374 013372 013414      BICB     2A(3), 2TEMP(4)
011406 022767 177525 001770      CMP      #177525,C
011414 001401                    BEQ      .+4
011416 104006                    HLT
011420 104400                    SCOPE

```

```

;TEST JSR INSTRUCTION
011422 012703 011434              MOV      #TJSR1,R3
011426 060503                    ADD      R5,R3
011430 004767 000002              JSR      %7, TJSR2
011434 000404                    BR       TJSR3
TJSR1: 011436 021603              CMP      2%6,R3
TJSR2: 011440 001401              BEQ      .+4
011442 104006                    HLT
011444 000207                    RTS      %7
011446 104400                    TJSR3:  SCOPE

;PLACE PC ON STACK
;RETURN HERE ON RTS %7
;CHECK FOR CORRECT PC ON STACK

;INCORRECT PC ON STACK
;RETURN TO INST AFTER JSR

```

```

011450 000257 011462              CCC
011452 012704                    MOV      #TJSR4,R4
011456 060504                    ADD      R5,R4
011460 004717                    JSR      %7, 2%7
011462 021604                    CMP      2%6,R4
TJSR4: 011464 001401              BEQ      .+4
011466 104006                    HLT
011470 005726                    TST      (6)+
011472 104400                    SCOPE

;INSTRUCTION UNDER TEST
;TEST THE STACK

;PC OF JSR DID NOT GO TO STACK
;REPOSITION THE STACK

```

```

;TEST NESTED SUBROUTINES
011474 000257 001552              CCC
011476 004767                    JSR      %7, SUBR6
011502 100401                    BMI      .+4
011504 104006                    HLT
011506 001401                    BEQ      .+4
011510 104006                    HLT
011512 102401                    BVS      .+4
011514 104006                    HLT
011516 103401                    BCS      .+4
011520 104006                    HLT
011522 104400                    SCOPE

;CLEAR CONDITION CODES

;JSR OR RTS FAILED

;JSR OR RTS FAILED

;JSR OR RTS FAILED

;JSR OR RTS FAILED

```

```

;TEST ROTATE 000 BYTE
011524 104400                    SCOPE
011526 000257                    CCC
011530 012767 123456 001656      MOV      #123456,TEMP
011536 106067 001653              RORB     TEMP+1
011542 103401                    BCS      .+4
011544 104006                    HLT

;CLEAR "C"
;ROTATE 000 BYTE
;C NOT SET

```

011546	102401			BVS	.+4	
011550	104006			HLT		;V NOT SET
011552	022767	051456	001634	CMP	#051456,TEMP	
011560	001401			BEQ	.+4	
011562	104006			HLT		;ROTATE FAILED
011564	104400			SCOPE		
011566	000277			SCC		;SET C
011570	012767	123456	001616	MOV	#123456,TEMP	
011576	106067	001613		RORB	TEMP+1	
011602	103401			BCS	.+4	
011604	104006			HLT		;C NOT SET
011606	102001			BVC	.+4	
011610	104006			HLT		;V NOT CLEARED
011612	022767	151456	001574	CMP	#151456,TEMP	
011620	001401			BEQ	.+4	
011622	104006			HLT		;ROTATE FAILED
011624	104400			SCOPE		
011626	000257			CCC		
011630	012767	123456	001556	MOV	#123456,TEMP	
011636	106167	001553		ROLB	TEMP+1	
011642	103401			BCS	.+4	
011644	104006			HLT		;C NOT SET
011646	102401			BVS	.+4	
011650	104006			HLT		;V NOT SET
011652	022767	047056	001534	CMP	#047056,TEMP	
011660	001401			BEQ	.+4	
011662	104006			HLT		;ROTATE BYTE FAILED
011664	104400			SCOPE		
011666	000277			SCC		;SET C
011670	012767	123456	001516	MOV	#123456,TEMP	
011676	106167	001513		ROLB	TEMP+1	
011702	103401			BCS	.+4	
011704	104006			HLT		;C NOT SET
011706	102401			BVS	.+4	
011710	104006			HLT		;V NOT SET
011712	022767	047456	001474	CMP	#047456,TEMP	
011720	001401			BEQ	.+4	
011722	104006			HLT		;ROTATE 000 BYTE FAILED
011724	104400			SCOPE		
011726	000257			CCC		;CLEAR C
011730	012767	177777	001456	MOV	#-1,TEMP	
011736	106267	001453		ASRB	TEMP+1	
011742	103401			BCS	.+4	
011744	104006			HLT		;C NOT SET
011746	102001			BVC	.+4	
011750	104006			HLT		;V NOT CLEARED
011752	026727	001436	177777	CMP	TEMP, #-1	
011760	001401			BEQ	.+4	
011762	104006			HLT		;SHIFT FAILED
011764	104400			SCOPE		
011766	000277			SCC		

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 43
DCKTGE.P11 BACKGROUND CPU TESTS

011770	012767	177777	001416	MOV	#-1, TEMP	
011776	106367	001413		ASLB	TEMP+1	
012002	103401			BCS	.+4	
012004	104006			HLT		;C NOT SET
012006	104006			BVC	.+4	
012010	104006			HLT		;V NOT CLEARED
012012	026727	001376	177377	CMP	TEMP, #177377	
012020	001401			BEQ	.+4	
012022	104006			HLT		;SHIFT BYTE FAILED
012024	104400			SCOPE		
;END OF RESTRICTION ON R0-R2						
012026	005067	001322		CLR	ICOUNT	;NO ITERATION
012032	032767	004000	166766	BIT	#4000, SREG2	
012040	001076			BNE	TSRT2A	
;TEST ALL COMBINATIONS OF NUMBERS WITH COMPARE INSTRUCTION						
012042	005000			COMPAR: CLR	%0	;INIT %0
012044	005001			CLR	%1	;INIT %1
012046	020001			CMP1: CMP	%0, %1	;ARE THEY EQUAL?
012050	001401			BEQ	.+4	
012052	104006			HLT		;R0 AND R1 DID NOT COMPARE
012054	020027	177777		CMP	%0, #-1	;AT UPPER LIMIT
012060	001403			BEQ	CMP2	;YES EXIT
012062	005200			INC	%0	;INCREMENT TO NEXT NUMBER
012064	005201			INC	%1	
012066	000767			BR	CMP1	
012070	104400			CMP2: SCOPE		
;TEST ROTATING ALL NUMBERS						
012072	012767	177777	000132	MOV	#-1, REFF	;INITIALIZE BASE NUMBER
012100	005267	000126		TSROT: INC	REFF	;INCREMENT NUMBER
012104	004767	000014		JSR	%7, ROTALL	;GO TO COMPARE ROUTINE
012110	026727	000116	177777	CMP	REFF, #-1	;TEST ALL VALUES
012116	001370			BNE	TSROT	;NO TEST THEM ALL
012120	104400			SCOPE		
012122	000445			BR	TSRT2A	;WE ARE DONE
012124	016767	000102	000102	ROTALL: MOV	REFF, TEST	
012132	006067	000076		ROR	TEST	
012136	006067	000072		ROR	TEST	
012142	006067	000066		ROR	TEST	
012146	006167	000062		ROL	TEST	
012152	006167	000056		ROL	TEST	
012156	006167	000052		ROL	TEST	
;TEST COMBINATION OF N, C AND V						
012162	100004			BPL	.+12	;Z=1
012164	103007			BCC	.+20	;Z=1, C=1
012166	102013			BVC	.+30	;Z=C, BUT V=1
012170	104006			HLT		
012172	000411			BR	.+24	
012174	103006			BCC	.+16	;Z=0
012176	102407			BVS	.+20	;Z=0, C=1
012200	104006			HLT		;Z NOT EQUAL C, V=1
012202	000405			BR	.+14	

012204	102404		BVS	+.12	;Z=1, C=0
012206	104006		HLT		;Z NOT EQUAL C, V=1
012210	000402		BR	+.6	
012212	102001		BVC	+.4	;Z=0, C=0
012214	104006		HLT		;Z=C, BUT V=1
012216	026767	000012 000006	CHP	TEST, REFF	
012224	001401		BEQ	+.4	
012226	104006		HLT		;INITIAL NOT EQUAL TO FINAL
012230	000207		RTS	%7	
012232	000000	REF: 0			
012234	000000	TEST: 0			
	012232		REF=REF		

:TEST ROTATING BYTE EVEN/ODD, ALL NUMBERS			
012236	012767	177777	177766
012244	005267	177762	
012250	004767	000016	
012254	004767	000120	
012258	022767	177777	177744
012266	01366		
012270	000503		
012272	016767	177734	177734
012300	10067	177730	
012304	10067	177724	
012310	106067	177720	
012314	106167	177714	
012320	106167	177710	
012324	106167	177704	

;TEST COMBINATION OF N, C AND V

012330	100004		BPL	+.12	;Z=1
012332	103007		BCC	+.20	;Z=1, C=1
012334	102013		BVC	+.30	;Z=C, BUT V=1
012336	104006		HLT		
012340	000411		BR	+.24	
012342	103006		BCC	+.16	;Z=0
012344	102407		BVS	+.20	;Z=0, C=1
012346	104006		HLT		;Z NOT EQUAL C, V=1
012350	000405		BR	+.14	
012352	102404		BVS	+.12	;Z=1, C=0
012354	104006		HLT		;Z NOT EQUAL C, V=1
012356	000402		BR	+.6	
012360	102001		BVC	+.4	;Z=0, C=0
012362	104006		HLT		;Z=C, BUT V=1
012364	026767	177644 177640	CHP	TEST, REFF	
012372	001401		BEQ	+.4	
012374	104006		HLT		
012376	000207		RTS	%7	
012400	106067	177631	ROTBO: ROR8	TEST+1	;ROTATE BYTE ODD
012404	106067	177625	ROR8	TEST+1	
012410	106067	177621	ROR8	TEST+1	
012414	106167	177615	ROLB	TEST+1	
012420	106167	177611	ROLB	TEST+1	
012424	106167	177605	ROLB	TEST+1	
:TEST COMBINATION OF N, C AND V					
012430	100004		BPL	+.12	;Z=1
012432	103007		BCC	+.20	

012434	102013			BVC	+.30		:Z=1, C=1
012436	104006			HLT			:Z=C, BUT V=1
012440	000411			BR	+.24		
012442	103006			BCC	+.16		:Z=0
012444	102407			BVS	+.20		:Z=0, C=1
012446	104006			HLT			:Z NOT EQUAL C, V=1
012450	000405			BR	+.14		
012452	102404			BVS	+.12		:Z=1, C=0
012454	104006			HLT			:Z NOT EQUAL C, V=1
012456	000402			BR	+.6		
012460	102001			BVC	+.4		:Z=0, C=0
012462	104006			HLT			:Z=C, BUT V=1
012464	026767	177544	177540	CMP	TEST, REFF		
012472	001401			BEQ	+.4		
012474	104006			HLT			
012476	000207			RTS	X7		
012500	104400						

ROTE1: SCOPE

;INHIBIT SOME TESTS WHEN SW11 IS SET

012502	032767	004000	166316	BIT	#4000, SREG2		
012510	001402			BEQ	TSTAR1		
012512	000167	000502		JMP	DONE		

;ADD AND SUBTRACT ALL NUMBERS AGAINST FIXED NUMBERS
;A+B=C, C-A=B, BF SHOULD EQUAL BI

012516	011667	000066		TSTAR1: MOV	NUMA		
012522	012767	003001	177502	MOV	REF		
012530	005267	177476		ARITST: INC	REF		
012534	004767	000012		JSR	X7, ADSUB		
012540	022767	177777	177464	CMP	REF, REFF		
012546	001370			BNE	ARITST		
012550	000420			BR	ARIEND		
012552	016767	177454	177454	ADSUB: MOV	REF, TEST		
012560	066767	000024	177446	ADD	NUMA, TEST		
012566	166767	000016	177440	SUB	NUMA, TEST		
012574	026767	177432	177432	CMP	REF, TEST		
012602	001401			BEQ	+.4		
012604	104006			HLT			
012606	000207			RTS	X7		
012610	000000						
012612	104400						

NUMA: 0
ARIEND: SCOPE

;TEST COMPLEMENTING ALL NUMBERS

012614	005067	000574		CLR	TEMP		:BASE DATA
012620	005067	000574		CLR	TEMP+4		:BASE REFERENCE
012624	005167	000564		COM	TEMP		:COMPLIMENT DATA
012630	005367	000564		DEC	TEMP+4		:DECREMENT REFERENCE
012634	026767	000554	000556	CMP	TEMP, TEMP+4		:COMPARE
012642	001401			BEQ	+.4		:TEST
012644	104006			HLT			:COMPLIMENT OR DECREMENT FAILED
012646	005167	000542		COM	TEMP		
012652	005267	000536		INC	TEMP		:INCREMENT AND TEST FOR DONE
012656	001362			BNE	TCOM		:NOT FINISHED GO LOOP
012660	104400			SCOPE			

;TEST COMB (EVEN BYTE)

H04

DOCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 46
DOCKTGE.P11 BACKGROUND CPU TESTS

```

012662 005067 000526          CLR      TEMP      ;BASE DATA
012666 005067 000526          CLR      TEMP+4    ;REFERENCE DATA
012672 105167 000516          TCOM2: COMB      TEMP
012676 005367 000516          DEC      TEMP+4
012702 126767 000506 000510  CMPB      TEMP,TEMP+4    ;COMPARE
012710 001401          BEQ      .+4
012712 104006          HLT
012714 105167 000474          COMB      TEMP      ;COMPLIMENT OR INCREMENT BYTE FAILED
012720 105267 000470          INCB      TEMP
012724 001362          BNE      TCOM2
012726 104400          SCOPE

;TEST COMB (000 BYTE)
012730 005067 000460          CLR      TEMP      ;BASE DATA
012734 005067 000460          CLR      TEMP+4    ;REFERENCE DATA
012740 105167 000451          TCOM3: COMB      TEMP+1  ;000 BYTE
012744 005367 000450          DEC      TEMP+4
012750 126767 000441 000442  CMPB      TEMP+1,TEMP+4
012756 001401          BEQ      .+4
012760 104006          HLT
012762 105167 000427          COMB      TEMP+1
012766 105267 000423          INCB      TEMP+1
012772 001362          BNE      TCOM3
012774 104400          SCOPE

;TEST COMPARE ALL VALUE EVEN BYTE WITH 000
012776 005067 000412          CLR      TEMP      ;BASE VALUE
013002 126767 000406 000405  TSOMB: CMPB      TEMP,TEMP+1  ;COMPARE
013010 001401          BEQ      .+4
013012 104006          HLT
013014 002001          BGE      .+4
013016 104006          HLT
013020 003401          BLE      .+4
013022 104006          HLT
013024 062767 000401 000362  ADD      #401,TEMP
013032 022767 177777 000354  CMP      #1,TEMP
013040 001362          BNE      TSOMB
013042 104400          SCOPE

;TEST TO SEE IF I/O DEVICES WERE SELECTED
013044 016767 165756 000026  MOV      SREG2,CKWAIT ;GET DEVICE INHIBIT FLAGS
013052 005167 000022          COM      CKWAIT      ;COMPLEMENT SO DEVICES SELECTED
013056 032767 000161 000014  BIT      #161,CKWAIT ;CORRESPOND TO ONES
013064 001406          BEQ      WAIT4          ;ANY DEVICES BESIDES TC11 SELECTED?
013066 000001          WAIT
013070 000001          WAIT
013072 000001          WAIT
013074 000001          WAIT
013076 000401          BR      .+4
013100 000000          CKWAIT: 0
013102 104400          WAIT4:  SCOPE

;TEST SWAB
013104 012767 000200 177122  MOV      #0200,TEST
013112 000367 177116          SWAB      TEST

```

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 47
DCKTGE.P11 BACKGROUND CPU TESTS

```
013116 100001      BPL      .+4
013120 104006      HLT
013122 001401      BEQ      .+4
013124 104006      HLT
013126 000367 177102 SWAB      TEST
013132 100401      BMT      .+4
013134 104006      HLT
013136 001001      BNE      .+4
013140 104006      HLT
013142 104400      SCOPE
```

```
013144 005067 177064      CLR      TEST
013150 005067 177056      CLR      REF
013154 000367 177054 SWABA: SWAB      TEST
013160 026767 177050 177044 CMP      TEST,REF
013166 001401      BEQ      .+4
013170 104006      HLT
013172 000367 177036 SWAB      TEST
013176 005267 177030 INC      REF
013202 105267 177027 INCB      TEST+1
013206 001362      BNE      SWABA
013210 104400      SCOPE
013212 012767 000400 000134 MOV      #400,ICOUNT
```

;TEST ALL COMBINATIONS OF SWAB

;NUMBER UNDER TEST
;REFERENCE NUMBER
;OPERATION UNDER TEST
;TEST SWAB INSTRUCTION

;SWAB FAILED

;INCREMENT REFERENCE NUMBER
;INC TEST NUMBER
;LOOP TILL DONE

```
*****
;END OF USER CODE IN BANK
;CALL KERNEL
;ALTERED IN CORE EXPANSION
DONE:  EOB
      NOP
```

```
013220 104012
013222 000240
```

;TO ALLOW CORE EXPANSION TO PATCH IN JMP

```
013224 000207      .GROUP OF NESTED SUBROUTINES
013226 000277 SUBR1: RTS      %7      ;ONE INSTRUCTION
013230 000207 SUBR2: SCC      ;ONE DEEP
013232 004767 177770 SUBR3: JSR      %7,SUBR2  ;TWO DEEP
013236 000207      RTS      %7
013240 004767 177766 SUBR4: JSR      %7,SUBR3  ;THREE DEEP
013244 000207      RTS      %7
013246 004767 177766 SUBR5: JSR      %7,SUBR4  ;FOUR DEEP
013252 000207      RTS      %7
013254 004767 177766 SUBR6: JSR      %7,SUBR5  ;FIVE DEEP
013260 000207      RTS      %7
```

.SBTTL UTILITY ROUTINES

```
013262 032767 002000 165536 ;SCOPE AND/OR ITERATION LOOP FOR EACH TEST
013270 001403 SCOPEC: BIT      #2000,SREG2      ;INHIBIT PROCESSOR TESTS?
013272 022626      BEQ      .+10      ;NO
013274 000167 167702      CMP      (SP)+,(SP)+
013300 032767 040000 165520 JMP      MAIN      ;YES
013306 001012      BIT      #40000,SREG2      ;TEST SR FOR SCOPE
013310 032767 004000 165510 BNE      SCOPEB      ;YES, SCOPE
      BIT      #4000,SREG2      ;NO-TEST FOR ITERATION
```

```

013316 001011          BNE      SCOPEG          ;INHIBIT ITERATION
013320 026767 000032 000026      CMP      SCOPEF,ICOUNT ;COMPARE CURRENT COUNT TO MAX NUMBER
013326 100005          BPL      SCOPEG          ;EXIT-DONE
013330 005267 000022          INC      SCOPEF          ;INCREMENT COUNT
013334 016716 000020          SCOPEB: MOV      RETURN,2SP
013340 000002          RTI
013342 005067 000010          SCOPEG: CLR      SCOPEF          ;CLEAR COUNT
013346 011667 000006          MOV      2%6,RETURN ;SAVE SCOPE RETURN POINTER
013352 000002          RTI ;RETURN INLINE-NEXT TEST
013354 000400          ICOUNT: 400 ;ITERATION COUNT
013356 000000          SCOPEF: 0 ;COUNT LOCATION FOR ITERATION LOOP
013360 000000          RETURN: 0 ;ADDRESS OF LAST TEST

;FIXED VALUES FOR USE IN TEST
013362 125252          B: 125252
013364 013362          B ;ADDRESS OF B
013366 052525          . =B+10
013372 013372          A: -1
013374 013376          A+4
013376 013376          . =A+4
013376 125252          125252
013400 013402          A+10 ;ADDRESS OF A+10
013402 052525          052525

;FOR STORAGE
013404 000000          C: 0
013406 013404          C ;ADDRESS OF C
013414 013414          . =C+10
013414 000000          TEMP: 0
013416 013414          TEMP ;ADDRESS OF TEMP
013422 013422          . =TEMP+6
013424 013424          TEMP+10 ;ADDRESS OF TEMP+10 OR "D"
013424 000000          D: 0

;SUBROUTINE TO INITIALIZE ALL PAGES TO NR, BANK 0, 1 PAGE, UP
013426 010146          NRALL: MOV      R1,-(R6) ;SAVE REGISTERS
013430 010246          MOV      R2,-(R6)
013432 010346          MOV      R3,-(R6)
013434 012701 001016          MOV      #IPDRAB,R1 ;R1 HOLDS ADDRESS OF CURRENT POSITION
;IN TABLE OF ADDRESSES
013440 012703 000040          NRLOOP: MOV      #32,R3 ;R3 USED AS COUNTER
013444 012102          MOV      (R1)+,R2 ;R2 CONTAINS ADDRESS OF PDR OR
;PAR TO BE CLEARED
013446 005022          CLR      (R2)+ ;CLEAR ALL ASR'S FOR THIS MODE
013450 077302          SOB      R3,-2
013452 020127 001022          CMP      R1,#IPDREND ;CHECK FOR DONE
013456 003770          BLE      NRLOOP ;CLEAR ALL IN NEXT MODE IF NOT DONE
013460 012603          MOV      (R6)+,R3
013462 012602          MOV      (R6)+,R2
013464 012601          MOV      (R6)+,R1
013466 000207          RTS      %7

;PROGRAMMED INTERRUPT REQUEST SERVICE ROUTINE
013470 117737 165402 177776      PIRSRV: MOVB      2PIR,2PSR ;SET PRIORITY
013476 032777 000002 165372      BIT      #2,2PIR ;CHECK FOR LEVEL 2 VS LEVEL 3

```

K04

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 49
DCKTGE.P11 UTILITY ROUTINES

```

013504 001006      BNE      PIR3      ;IF SET, IS LEVEL 3
013506 042777 002000 165362      BIC      #2000,2PIR
013514 004767 171740      JSR      %7,REGEN      ;LEVEL 2-REGENERATE WRITE BUFFER
013520 000002      RTI
013522 042777 004000 165346 PIR3: BIC      #4000,2PIR
013530 004767 172640      JSR      %7,TCK      ;LEVEL 3-CHECK DATA READ FROM DTA
013534 000002      RTI

;ENT HANDLER
;FIRST 3 CALLS LEFT OPEN IN TABLE FOR EASY PATCHES
013536 162716 000002      ENTSRV: SUB      #2,2SP      ;GET CALL
013542 006576 000000      MFPI      2(SP)
013546 012667 000022      MOV      (SP)+,EPC
013552 062716 000002      ADD      #2,2SP
013556 105067 000013      CLRB      EPC+1      ;SAVE OFFSET ONLY
013562 062767 013576 000004      ADD      #ENTAB,EPC      ;POINT TO TABLE OF ADDRESSES
013570 017707 000000      MOV      2EPC,PC      ;JUMP TO DESIRED ROUTINE
013574 000000      EPC: 0
000000      PATCH1=0
000000      PATCH2=0
000000      PATCH3=0
013576 000000      ENTAB: PATCH1      ;PATCH IN ADDRESS OF ROUTINE
013600 000000      PATCH2
013602 000000      PATCH3
013604 016262      PRINT      ;ERROR PRINTOUT
013606 013612      RTIKEX      ;RTI VIA KERNEL
013610 013700      EOBSRV      ;END OF BANK

013612 022626      RTIKEX: CMP      (SP)+,(SP)+      ;FIX KERNEL STACK POINTER
013614 032737 030000 177776      BIT      #30000,2#PSR      ;PREVIOUS KERNEL?
013622 001001      BNE      .+4      ;BRANCH IF NOT
013624 000002      RTI      ;RETURN IF FROM KERNEL
013626 106506      MFPI      SP      ;GET PREVIOUS STACK POINTER
013630 012667 000042      MOV      (SP)+,SPSAV      ;RESTORE KERNEL STACK
013634 062767 000002 000034      ADD      #2,SPSAV
013642 106577 000030      MFPI      2SPSAV      ;PUSH PS ON KERNEL STACK
013646 162767 000002 000022      SUB      #2,SPSAV
013654 106577 000016      MFPI      2SPSAV      ;PUSH PC ON KERNEL STACK
013660 062767 000004 000010      ADD      #4,SPSAV
013666 016746 000004      MOV      SPSAV,-(SP)
013672 106606      MTPD      SP      ;RESTORE CORRECTED PREVIOUS STACK
013674 000002      RTI      ;POINTER
013676 000000      SPSAV: 0      ;RETURN

;END OF BANK SERVICE- DOES ALL MAPPING FUNCTIONS AFTER STARTUP
;CALLED AT THE END OF EACH BACKGROUND CPU PASS THRU 4K (VIRTUAL) UNLESS
;CORE EXPANDED (IN WHICH CASE IT IS CALLED AFTER EACH PASS THRU ALL MEMORY
;TO 28K)
013700 113737 177571 001027      EOBSRV: MOVB      2#SR+1,2#SREG2+1      ;READ SWITCHES AGAIN
013706 032737 000001 001024      BIT      #1,2#SREG1      ;KT11-C INHIBITED?
013714 001503      BEQ      E0B2      ;NO - CONTINUE
013716 004767 003026      E0B1: JSR      %7,BELL      ;YES-SIGNAL END OF PASS
013722 042766 000020 000002      BIC      #20,2(SP)      ;CLEAR TRACE BIT OF STATUS ON STACK
013730 012737 000016 000014      MOV      #16,2#14      ;SETUP TRACE RETURN TO CAUSE HALT
013736 005037 000016      CLR      2#16      ;IF A TRACE TRAP OCCURS

```

013742	032737	010000	001026	BIT	#10000,2#SREG2	;INHIBIT TRACE TRAPPING?
013750	001011			BNE	E081A	;YES - BRANCH
013752	005167	165112		COM	TRPB	;SWITCH TRACE FLAG
013756	100006			BPL	E081A	;IF NOT SET, LEAVE TRACE OFF
013760	052766	000020	000002	BIS	#20,2(SP)	;IF SET, SET TRACE BIT OF STATUS ON STACK
013766	012737	016700	000014	MOV	#TRTRP,2#14	
013774	105267	165104		E081A: INCB	DISPLY	
014000	016737	165100	177570	MOV	DISPLY,2#SR	
014006	032737	000040	001024	BIT	#40,2#SREG1	;CORE EXPANSION INHIBITED?
014014	001040			BNE	E081C	;YES, BRANCH OVER
014016	013746	000006		MOV	2#6,-(SP)	;NO, COPY NEW DYNAMIC SWITCHES TO
014022	013746	000004		MOV	2#4,-(SP)	;ALL BANKS UP TO 28K
014026	012737	014076	000004	MOV	#E081B,2#4	
014034	005037	000006		CLR	2#6	
014040	013701	001026		MOV	2#SREG2,R1	
014044	010137	021026		MOV	R1,2#SREG2+20000	
014050	010137	041026		MOV	R1,2#SREG2+40000	
014054	010137	061026		MOV	R1,2#SREG2+60000	
014060	010137	101026		MOV	R1,2#SREG2+100000	
014064	010137	121026		MOV	R1,2#SREG2+120000	
014070	010137	141026		MOV	R1,2#SREG2+140000	
014074	000401			BR	+4	
014076	022626			E081B: CMP	(SP)+,(SP)+	
014100	012637	000004		MOV	(SP)+,2#4	
014104	012637	000006		MOV	(SP)+,2#6	
014110	012716	006466		MOV	#BEGINX,(SP)	;SETUP PC TO RETURN TO BEGINX
014114	000002			RTI		
014116	012716	006700		E081C: MOV	#BEGIN,(SP)	;IF NO CORE EXPANSION, RETURN TO
014122	000002			RTI		;BEGIN
014124	032737	000002	001024	E082: BIT	2,2#SREG1	;USER/SUPERVISOR/KERNEL INHIBITED?
014132	001271			BNE	E081	;YES - SET PC AND RETURN
014134	032737	001000	001026	BIT	#1000,2#SREG2	;STOP CYCLING SUPERVISOR PAGES?
014142	001132			BNE	SUPD1	;YES- BRANCH
014144	023737	001064	000734	CMP	2#CSIPDR,2#SIPDR6	;NO-LAST SUPERVISOR PAGE DONE (PAGE 6)?
014152	001455			BEQ	SUPCYC	;YES, BRANCH TO RECYCLE
014154	016701	164704		MOV	CSIPDR,R1	
014160	005721			TST	(R1)+	;ADDRESS NEXT PDR
014162	012711	077406		MOV	#77406,2R1	
014166	012761	077406	000020	MOV	#77406,20(R1)	
014174	062777	020000	164420	ADD	#20000,2TTPVC	;UPDATE SUPERVISOR I/O VECTORS
						;TO REFERENCE NEXT PAGE
014202	062777	020000	164402	ADD	#20000,2TTRVC	
014210	062777	020000	164414	ADD	#20000,2KWLVC	
014216	032737	000040	001026	BIT	#40,2#SREG2	;UPDATE LP11 VECTOR ONLY IF USED
014224	001003			BNE	+10	
014226	062777	020000	164406	ADD	#20000,2LPVC	
014234	013737	177776	001072	MOV	2#PSR,2#PSSAV	;UPDATE SUPERVISOR STACK POINTER
014242	042737	030000	177776	BIC	#30000,2#PSR	
014250	052737	010000	177776	BIS	#10000,2#PSR	
014256	106506			MFPD	SP	
014260	062716	020000		ADD	#20000,(SP)	
014264	106506			MTPD	SP	
014266	013737	001072	177776	MOV	2#PSSAV,2#PSR	
014274	005061	177776		CLR	-2(R1)	;MAKE PREVIOUS PAGE NON-RESIDENT
014300	005061	000016		CLR	16(R1)	
014304	000447			BR	SUPDON	

014306	016701	164416		SUPCYC:	MOV	SIPDR0,R1	;MAP TO FIRST SUPERVISOR PAGE
014312	012711	077406			MOV	#77406,2R1	
014316	012761	077406	000020		MOV	#77406,20(R1)	
014324	042777	160000	164270		BIC	#160000,2TTPVC	
014332	042777	160000	164252		BIC	#160000,2TTRVC	
014340	042777	160000	164264		BIC	#160000,2KMLVC	
014346	042777	160000	164266		BIC	#160000,2LPVC	
014354	013737	177776	001072		MOV	2#PSR,2#PSSAV	;MAP SUPERVISOR STACK TO PAGE 0
014362	042737	030000	177776		BIC	#30000,2#PSR	
014370	052737	010000	177776		BIS	#10000,2#PSR	
014376	106506				MFPD	SP	
014400	042716	160000			BIC	#160000,(SP)	
014404	106606				MTPD	SP	
014406	013737	001072	177776		MOV	2#PSSAV,2#PSR	
014414	005061	000014			CLR	14(R1)	;MAP SUPERVISOR PAGE 6 NON-RESIDENT
014420	005061	000034			CLR	34(R1)	
014424	010137	001064		SUPDON:	MOV	R1,2#CSIPDR	
014430	042737	000340	177776	SUPD1:	BIC	#340,2#PSR	
014436	032737	000420	001024		BIT	#420,2#SREG1	;INHIBIT CYCLING ACCESS KEY OF S7?
014444	001010				BNE	SUPD2	;YES, SKIP
014446	005277	164272			INC	2SDPDR7	;NO, SETUP NEXT KEY IN SUPERVISOR
014452	042777	000010	164264		BIC	#10,2SDPJR7	;PAGE 7
014460	017777	164260	164254		MOV	2SDPDR7,2SIPDR7	
014466	032737	000004	001024	SUPD2:	BIT	#4,2#SREG1	;INHIBIT 4K AS 32K?
014474	001402				BEQ	+6	
014476	000167	177214			JMP	E081	;YES - SET PC AND RETURN
014502	023737	001054	000720		CMP	2#CURIPAR,2#UIPAR7	;LAST USER ASR DONE?
014510	001460				BEQ	NXTBNK	;YES - GO FIND NEXT BANK
014512	062737	020000	000034		ADD	#20000,2#34	;UPDATE SCOPE VECTOR ADDRESS IN BANK 0
014520	062737	020000	001066		ADD	#20000,2#BNKSTR	;UPDATE BANK START TO REFERENCE CURRENT ASR
014526	013716	001066			MOV	2#BNKSTR,(SP)	
014532	01077	164316			CLR	2CURIPAR	;SET PREVIOUS PAGE NR, BANK 0
014536	01077	164314			CLR	2CURDPAR	
014542	01077	164312			CLR	2CURIPDR	
014546	01077	164310			CLR	2CURDPR	
014552	062767	000002	164274	NXTSEG:	ADD	#2,CURIPAR	;UPDATE POINTERS TO NEXT PAGE
014560	062767	000002	164270		ADD	#2,CURDPAR	
014566	062767	000002	164264		ADD	#2,CL IPDR	
014574	062767	000002	164260		ADD	#2,CL DPAR	
014602	012777	077406	164250		MOV	#77406,2CURIPDR	;SET NEXT PAGE RW, 4K
014610	012777	077406	164244		MOV	#77406,2CURDPR	
014616	016777	164226	164230		MOV	CURBNK,2CURIPAR	;MAP NEXT PAGE TO CURRENT BANK
014624	016777	164220	164224		MOV	CURBNK,2CURDPAR	
014632	052737	030000	177776		BIS	#30000,2#PSR	;SET PREVIOUS MODE TO USER
014640	106506				MFPD	R6	;PICK UP USER STACK POINTER
014642	062716	020000			ADD	#20000,2R6	;MAP IT TO NEXT ASR
014646	106606				MTPD	R6	;PUT IT BACK
014650	000002				RTI		;GO BACK TO MAINLINE
014652	005327	000000		NXTBNK:	DEC	#0	;STALL SO DOUBLE BELL WILL BE
014656	001375				BNE	-4	;NOTED
014660	004767	002064			JSR	%7,BELL	
014664	012746	000400		NXBNK1:	MOV	#UBUFF,-(SP)	;MAP USER STACK TO PAGE 0
014670	052737	030000	177776		BIS	#30000,2#PSR	
014676	106606				MTPD	R6	
014700	042737	160000	000034		BIC	#160000,2#34	;INITIALIZE SCOPE VECTOR ADDRESS
014706	013746	000004			MOV	2#4,-(SP)	;STORE ADDRESS ERROR RETURN

014712	013746	000006		MOV	2#6, -(SP)	
014716	012737	015646	000004	MOV	8CORCK, 2#4	; SETUP TRAP RETURN
014724	005037	000006		CLR	2#6	
014730	013737	001050	001052	MOV	2#CURBNK, 2#OLDBNK	; SAVE ADDRESS OF PREVIOUS BANK
014736	062737	000200	001050	BNKTST: ADD	200, 2#CURBNK	
014744	022737	007600	001050	CMP	27600, 2#CURBNK	; CHECK FOR EXTERNAL BANK
014752	001067			BNE	E0B3	; IF NOT, TEST FOR ITS PRESENCE
014754	012737	000000	001050	MOV	20, 2#CURBNK	; START OVER, TESTING BANK 0
014762	105237	001104		INCB	2#DISPLY	
014766	013737	001104	177570	MOV	2#DISPLY, 2#SR	
014774	013701	000042		LOGIC: MOV	2#42, R1	
015000	001413			BEQ	BNKT	
015002	000005			RESET		
015004	005046			CLR	-(SP)	; CLEAR T-BIT VIA RTI
015006	012746	015014		MOV	2#LOGICAL, -(SP)	
015012	000002			RTI		
015014	004711			LOGICAL: JSR	27, 2R1	
015016	000240			NOP		
015020	000240			NOP		
015022	000240			NOP		
015024	000137	001250		JMP	2#RSTR	
015030	032737	000001	001026	BNKT: BIT	21, 2#SREG2	; TTY OUTPUT SELECTED?
015036	001410			BEQ	BNKT1	; YES, SKIP OUTPUTTING ASTERISK
015040	004767	001734		JSR	27, CRLF	
015044	105777	163546		TSTB	27CSR	; WAIT FOR TELETYPE
015050	100375			BPL	24	
015052	012777	000252	163540	MOV	252, 27D8R	; OUTPUT ASTERISK TO SIGNAL END OF PASS
015060	042766	000020	000006	BNKT1: BIC	20, 6(SP)	; CLEAR TRACE BIT OF STATUS ON STACK
015066	012737	000016	000014	MOV	216, 2#14	
015074	005037	000016		CLR	2#16	
015100	032737	010000	177570	BIT	210000, 2#SR	
015106	001011			BNE	E0B3	
015110	005167	163754		COM	TRP8	
015114	100006			BPL	E0B3	
015116	052766	000020	000006	BIS	20, 6(SP)	
015124	012737	016260	000014	MOV	2TRTP, 2#14	
015132	016777	163712	163636	E0B3: MOV	CURBNK, 2#KIPAR2	; MAP KERNEL PAGE 2 TO BANK BEING LOOKED FOR
015140	016777	163704	163642	MOV	CURBNK, 2#KDPAR2	
015146	012777	077406	163576	MOV	277406, 2#KIPDR2	
015154	012777	077406	163602	MOV	277406, 2#KDPDR2	
015162	013737	041000	041000	MOV	2#41000, 2#41000	
015170	013737	045000	045000	MOV	2#45000, 2#45000	
015176	013737	051000	051000	MOV	2#51000, 2#51000	
015204	013737	055000	055000	MOV	2#55000, 2#55000	
015212	012637	000006		MOV	(SP)+, 2#6	; RESTORE ADDRESS ERROR RETURN
015216	012637	000004		MOV	(SP)+, 2#4	
015222	005001			CLR	R1	; R1 ADDRESSES BANK 0 THRU KERNEL ASR0
015224	012702	040000		MOV	240000, R2	; R2 ADDRESSES NEW BANK THRU KERNEL ASR2
015230	012703	013424		MOV	20, R3	; R3 IS USED TO CHECK FOR END OF TRANSFER
015234	006203			ASR	R3	
015236	012122			CORMOV: MOV	(R1)+, (R2)+	; LOAD NEW BANK
015240	077302			SOB	R3, CORMOV	
015242	016767	163446	163604	E0B4: MOV	UIPAR0, CURIPAR	; FIRST ASR CHECKED IS USER ASR0
015250	016767	163446	163600	MOV	UDPAR0, CURDPAR	
015256	016767	163416	163574	MOV	UIPDR0, CURIPDR	
015264	016767	163416	163570	MOV	UDPDR0, CURDPDR	

015272	016777	163552	163554	MOV	CURENK, 2CURIPAR	
015300	016777	163544	163550	MOV	CURENK, 2CURIPAR	
015306	012777	077406	163544	MOV	877406, 2CURIPAR	
015314	012777	077406	163540	MOV	877406, 2CURIPAR	
015322	005077	163372		CLR	2UIPAR7	
015326	005077	163374		CLR	2UOPAR7	
015332	005077	163346		CLR	2UIPAR7	
015336	005077	163350		CLR	2UOPAR7	
015342	032737	000010	001024	BIT	810, 2SREG1	:CHECK FOR INHIBITING I/O RELOCATION
015350	001111			BNE	E085	:SKIP IF SET
015352	005737	004334		TST	2ATCREL	:TC11 RELOCATION ALLOWED?
015356	001414			BEQ	E084A	:NO- BRANCH
015360	005737	004332		TST	2ATCEOP	:YES- WAIT FOR TC11 TO SET
015364	001775			BEQ	.-4	:END OF PASS FLAG
015366	042777	000100	163436	BIC	8100, 2TCCM	:CLEAR TC11 IE
015374	005777	163432		TST	2TCCM	:WAIT FOR END ZONE
015400	100375			BPL	.-4	
015402	005737	004326		TST	2DATAACK	:WAIT FOR DATA CHECK TO FINISH
015406	100775			BMI	.-4	
015410	052737	000340	177776	BIS	8340, 2APSR	:SET PRIORITY TO LEVEL 7
015416	016777	163426	163350	MOV	CUF *K, 2KIPAR1	:MAP KERNEL PAGE 1 TO NEW BANK
015424	016777	163420	163354	MOV	CUF *K, 2KDPAR1	
015432	016700	163412		MOV	CUF *K, R0	:CALCULATE NEW PHYSICAL ADDRESS
015436	010001			MOV	R0, R1	
015440	072027	000006		ASH	86, R0	:LEFT SHIFT 6 PLACES - LEAVES LOWER
015444	042700	017777		BIC	817777, R0	:16 BITS OF THE BANK ADDRESS
015450	072127	177772		ASH	8-6, R1	:RIGHT SHIFT 6 PLACES - SETS UP TOP 2
015454	042701	177717		BIC	8177717, R1	:BITS OF ADDRESS IN BITS 4 AND 5
015460	042737	160000	004276	BIC	8160000, 2ALLIMIT	:CLEAR BITS 13-15 OF RF11 BUFFER ADDRESS
015466	050037	004276		BIS	R0, 2ALLIMIT	:MAP RF11 BUFFER ADDRESS TO
						:CURRENT BANK
015472	042737	030060	004274	BIC	830060, 2FUNCTION	:SET UP EXTENDED ADDRESS BITS
015500	150137	004274		BISB	R1, 2FUNCTION	
015504	150137	004275		BISB	R1, 2FUNCTION+1	
015510	032737	000100	001026	BIT	8100, 2SREG2	:RF11 INHIBITED?
015516	001003			BNE	.-10	:YES SKIP NEXT
015520	105777	163134		TSTB	2AFCSR	:WAIT FOR RF11 READY
015524	100375			BPL	.-4	
015526	042737	000340	177776	BIC	8340, 2APSR	:DROP PRIORITY TO LEVEL 0
015534	005737	004334		TST	2ATCREL	:TC11 RELOCATION ALLOWED?
015540	001415			BEQ	E085	:NO- SKIP TC RELOCATION
015542	042737	160000	004302	BIC	8160000, 2ATCBUFF	:YES - RELOCATE TC BUFFER PHYSICAL
015550	050037	004302		BIS	R0, 2ATCEFP	:ADDRESS
015554	042737	000060	004330	BIC	860, 2ATCEMA	:SET UP EXTENDED MEMORY BITS
015562	050137	004330		BIS	R1, 2ATCEMA	
015566	052777	002000	163302	BIS	82000, 2PIR	:BOOK PIRQ LEVEL 2 TO REGENERATE
						:WRITE BUFFER AND STARTUP TC11
015574	026727	163252	000000	E085: CMP	OLDBNK, 80	:WAS PREVIOUS BANK 0?
015602	001414			BEQ	E086	:YES - DON'T CLEAR IT
015604	016777	163242	163176	MOV	OLDBNK, 2KDPAR2	:NO - CLEAR IT TO CATCH RELOCATION
015612	012777	077406	163144	MOV	877406, 2KDPAR2	:ERRORS
015620	012701	040000		MOV	840000, R1	
015624	012703	007630		MOV	87630, R3	
015630	005021			CLR	(R1)+	
015632	077302			SQB	R3, BNKLP	
015634	012716	006700		MOV	8BEGIN, (SP)	:SETUP USER PC ON THIS STACK
				E086:		

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 54
DCKTGE.P11 UTILITY ROUTINES

015640	011667	163222		MOV	(SP),BNKSTR	;STORE IT ALSO
015644	000002			RTI		;RETURN TO USER
015646	022626			CORCK: CMP	(SP)+(SP)+	;RESTORE STACK POINTER
015650	000167	177062		JMP	BNK1ST	;TRY AGAIN
;KT11-C TRAP AND ABORT SERVICE ROUTINE						
015654	000240			ABSRV: NOP		
015656	032777	010000	163004	BIT	#10000,2SR0	;MEMORY MANAGEMENT TRAP?
015664	001404			BEQ	+12	;NO, CONTINUE
015666	042777	010000	162774	BIC	#10000,2SR0	;YES, CLEAR TRAP FLAG AND RETURN
015674	000002			RTI		
015676	122777	000077	162764	CMPB	#77,2SR0	;ONLY AN ABORT FROM A SUPERVISOR D-SPACE
015704	001404			BEQ	+12	;PAGE 7 REFERENCE IS ALLOWED
015706	000000			HALT		;ABORT FROM A PAGE OTHER THAN
015710	000005			RESET		;SUPERVISOR D-SPACE 7 - FATAL ERROR
015712	000167	163332		JMP	RSTRT	;RESTART AFTER FATAL ERROR
015716	017716	162750		MOV	2SR1,(SP)	;GET SR1
015722	001454			BEQ	REEX	;GO FIX PC IF NO REGISTERS WERE AFFECTED
015724	012767	000002	000262	MOV	#2,ALLREG	
015732	042716	177770		LSTSET: BIC	#177770,(SP)	;WAS PC AFFECTED?
015736	022716	000007		CMP	#7,(SP)	
015742	001436			BEQ	NXTSET	;YES - BRANCH
015744	022716	000006		CMP	#6,(SP)	;NO - WAS IT THE STACK POINTER?
015750	001016			BNE	GENR	;NO - GO CHANGE REGISTERS
015752	032737	030000	177776	BIT	#30000,2#PSR	;YES - WAS IT THE KERNEL STACK?
015760	001002			BNE	+6	
015762	104006			HLT		;CANNOT RESTORE KERNEL STACK POINTER
015764	000433			BR	REEX	;EXIT
015766	000240			NOP		
015770	106506			MFPD	SP	;GET STACK POINTER
015772	004767	000220		JSR	X7,SHIFT	
015776	166616	177774		SUB	-4(SP),(SP)	;RESTORE SP TO ORIGINAL VALUE
016002	106606			MTPD	SP	
016004	000415			BR	NXTSET	;GO CHECK NEXT SET
016006	000240			GENR: NOP		
016010	142767	000007	000016	BICB	#7,RSREG	
016016	051667	000012		BIS	(SP),RSREG	
016022	004767	000170		JSR	X7,SHIFT	
016036	016667	177774	000002	MOV	-4(SP),RSREG+2	
016034	162700			RSREG: SUB	(7)+,X0	;THIS INSTRUCTION RESTORES THE REGISTER
016036	000000			.WORD	0	
016040	017716	162626		NXTSET: MOV	2SR1,(SP)	
016044	000316			SWAB	(SP)	
016046	000357	000142		DEC	ALLREG	
016052	001327			BNE	LSTSET	
016054	017716	162614		REEX: MOV	2SR2,(SP)	;SET PC ON STACK TO VA OF INSTRUCTION
016060	013746	000014		MOV	2#14,-(SP)	;PUSH CONTENTS OF TBIT VECTOR
016064	013746	000016		MOV	2#16,-(SP)	
016070	016646	000006		MOV	6(SP),-(SP)	;PUSH COPY OF ABORT STATUS
016074	016646	000006		MOV	6(SP),-(SP)	;PUSH COPY OF VA
016100	042716	160000		BIC	#160000,(SP)	;CHANGE TO BANK 0 PC ON STACK
016104	042766	140000	000002	BIC	#140000,2(SP)	;KERNEL
016112	052766	000020	000002	BIS	#20,2(SP)	;SET T BIT
016120	012737	016144	000014	MOV	#1SEG,2#14	;CHANGE T-BIT VECTOR ADDRESS
016126	012737	000340	000016	MOV	#340,2#16	
016134	042777	176000	162526	BIC	#176000,2SR0	;CLEAR ERROR BITS IN SR0

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 55
 DCKTGE.P11 UTILITY ROUTINES

016142	000006			RTT		
016144	042766	007737	000012	TSEG: BIC	#7737, 12(SP)	;RESTORE STATUS
016152	042766	170020	000002	BIC	#170020, 2(SP)	
016160	056666	000002	000012	BIS	2(SP), 12(SP)	
016166	042766	017777	000010	BIC	#17777, 10(SP)	;FIX RETURN PC
016174	051666	000010		BIS	(SP), 10(SP)	
016200	022626			CMP	(SP)+, (SP)+	
016202	012637	000016		MOV	(SP)+, #16	
016206	012637	000014		MOV	(SP)+, #14	
016212	000002			RTI		;RETURN
016214	000000			ALLREG: 0		
016216	000240			SHIFT: NOP		
016220	017746	162446		MOV	@SR1, -(SP)	
016224	022767	000001	177762	CMP	#1, ALLREG	
016232	001001			BNE	.+4	
016234	000316			SWAB	(SP)	
016236	105066	000001		CLRB	1(SP)	
016242	006716			SXT	(SP)	
016244	042716	000007		BIC	#7, (SP)	
016250	076216			ASR	(SP)	
016252	C 6216			ASR	(SP)	
016254	006226			ASR	(SP)+	
016256	000207			RTS	%7	

016260 000006 ;RTT EXECUTED WHEN TRACE IS ON
 TRTRP: RTT

;ENTERED WITH SYSTEM TRAP CALL (HLT)
 ;PRINT OUT THE ERROR PC+2, STATUS REGISTER,
 ;LOCATION IN BACKGROUND (TOP 12 BITS OF 18 BIT ADDRESS), AND
 ;CONTENTS OF RETURN IN CURRENT BANK

016262	005767	000260		PRINT: TST	PRTON	;CHECK PRINT ON FLAG
016266	001401			BEQ	.+4	
016270	000002			RTI		;IF ANOTHER HALT IS BEING PRINTED, SKIP THIS ONE
016272	005267	000250		INC	PRTON	
016276	012767	000340	161472	MOV	#340, PSR	;SET PRIORITY TO 7
016304	036727	161260	020000	BIT	SR, #20000	;TEST FOR INHIBIT PRINT OUT
016312	001401			BEQ	.+4	;BRANCH TO PRINT
016314	060500			BR	CK	;INHIBIT, CHECK FOR HALT
016316	012667	000220		MOV	(6)+, SAVPC	;PC OF FAILING ROUTINE
016322	012667	000216		MOV	(6)+, SAVPSR	;PSR OF ERROR CONDITION
016326	024646			CMP	-(6), -(6)	;RESTORE STACK
016330	012767	000200	161440	MOV	#200, PSR	
016336	004767	000436		JSR	%7, CALF	;OUTPUT CARRIAGE RETURN AND LINE FEED
016342	016767	000174	000356	MOV	SAVPC, PTEMP1	;LOAD WITH FAILING PC+2
016350	004767	000174		JSR	%7, PROCT	;PRINT FAILING PC+2
016354	004767	000352		JSR	%7, SPACE	
016360	016767	000160	000340	MOV	SAVPSR, PTEMP1	;LOAD PROCESSOR STATUS
016366	004767	000156		JSR	%7, PROCT	;PRINT PROCESSOR STATUS
016372	004767	000334		JSR	%7, SPACE	
016376	016767	162446	000322	MOV	CURBNK, PTEMP1	
016404	004767	000140		JSR	%7, PROCT	
016410	004767	000316		JSR	%7, SPACE	
016414	012737	000340	177776	MOV	#340, #PSR	
016422	017746	162360		MOV	@KDPAR1, -(SP)	
016426	017746	162330		MOV	@KDPDR1, -(SP)	

016432	016777	162412	162346	MOV	CURBNK, 2KOPAR1		
016440	012777	077406	162314	MOV	877406, 2KOPDR1		
016446	013767	033360	000252	MOV	200, 20000, PTEMP1	; GET CONTENTS OF CURRENT RETURN	
016454	012677	162302		MOV	(SP)+, 2KOPDR1		
016460	012677	162322		MOV	(SP)+, 2KOPDR1		
016464	012737	000200	177776	MOV	200, 200PSR		
016472	004767	000052		JSR	X7, PROCT		
016476	004767	000230		JSR	X7, SPACE		
016502	032737	000001	001026	BIT	01, 200SREG2	; TTY OUTPUT ALLOWED?	
016510	001002			BNE	.+6	; NO SKIP	
016512	004767	000262		JSR	X7, CR LF	; YES- OUTPUT CR, LF	
016516	005767	161046		TST	SR	; CHECK SR FOR HALT SWITCH	
016522	100001			BPL	.+4	; BRANCH IF NOT SET	
016524	000000			HALT		; HALT ON ERROR UP	
016526	005067	000014		CLR	PRTON	; ROUTINE DONE - CLEAR FLAG	
016532	000002			RTI		; RETURN TO MAIN LINE	
016534	000000			SAVR2:	0		
016536	000000			SAVR3:	0		
016540	000000			SAVR4:	0		
016542	000000			SAVPC:	0		
016544	000000			SAVPSR:	0		
016546	000000			PRTON:	0		
016550	012727	000006	016554	PROCT:	MOV	06, 20TEMP3	; CLEAR R4 FOR COUNTING CHARACTERS OUTPUT
	016554				PTEMP3=	-2	
016556	005067	000142		CLR	PRFLG		; INITIALIZE CARRY FLAG FOR ROTATES
016562	012767	000260	000140	MOV	260, PTEMP2		; SETUP R3
016570	005767	000132		TST	PTEMP1		; CHECK BIT 15 OF NUMBER
016574	100002			BPL	.+6		; BRANCH IF ZERO
016576	005267	000126		INC	PTEMP2		; INCREMENT R3 IF ONE
016602	006167	000120		ROL	PTEMP1		; ROTATE LEFT MOST OCTAL TO RIGHT END
016606	006167	000114		ROL	PTEMP1		
016612	005567	000106		ADC	PRFLG		; STORE CARRY
016616	105777	161774		P.WAIT:	TSTB	2TCSR	; WAIT FOR TTY READY
016622	100375			BPL	P.WAIT		
016624	016777	000100	161766	MOV	PTEMP2, 2TDBR		; OUTPUT NEXT CHARACTER
016632	005367	177716		P.CONT:	DEC	PTEMP3	; COUNT
016636	001001			BNE	P.CNT1		; BRANCH IF NOT DONE
016640	000207			RTS	X7		; BRANCH IF NOT DONE
016642	000241			P.CNT1:	CLC		; CLEAR CARRY
016644	005767	000054		TST	PRFLG		; CHECK FOR PREVIOUS CARRY
016650	001403			BEQ	.+10		; BRANCH IF PREVIOUSLY ZERO
016652	005067	000046		CLR	PRFLG		; INITIALIZE FLAG
016656	000261			SEC			; SET CARRY
016660	006167	000042		ROL	PTEMP1		; ROTATE NEXT CHARACTER INTO RIGHT END OF REGISTE
016664	006167	000036		ROL	PTEMP1		
016670	006167	000032		ROL	PTEMP1		
016674	005567	000024		ADC	PRFLG		; STORE CARRY
016700	016767	000022	000022	MOV	PTEMP1, PTEMP2		; LOAD DATA INTO R3
016706	042767	177770	000014	BIC	2177770, PTEMP2		; CLEAR ALL BUT LOWEST OCTAL DIGIT
016714	052767	000260	000006	BIS	260, PTEMP2		; SET TO ASCII EQUIVALENT
016722	000735			BR	P.WAIT		; LOOP
016724	000000			PRFLG:	0		
016726	000000			PTEMP1:	0		; CONTAINS VALUE TO BE OUTPUT
016730	000000			PTEMP2:	0		; SCRATCH

```

016732 105777 161660      :ISSUE SPACE
016736 100375      SPACE: TSTB      @TCSR      ;WAIT FOR TTY READY
016740 012777 000240 161652      BPL      .-4
016746 000207      MOV      @240,@TDBR      ;OUTPUT A SPACE
                                RTS      %7

016750 032737 000001 001026      :BELL ON PASS COMPLETE
016756 001001      BELL: BIT      @1,@SREG2      ;TTY OUTPUT SELECTED?
016760 000207      BNE      .+4      ;NO, RING BELL
016762 105777 161630      RTS      %7      ;YES, SKIP
016766 100375      TSTB      @TCSR
016770 012777 000244 161622      BPL      .-4
016776 000207      MOV      @244,@TDBR
                                RTS      %7

017000 105777 161612      :SUBROUTINE TO OUTPUT CARRIAGE RETURN AND LINEFEED
017004 100375      CALF: TSTB      @TCSR      ;WAIT FOR TTY READY
017006 012777 000215 161604      BPL      .-4
017014 105777 161576      MOV      @215,@TDBR      ;OUTPUT CARRIAGE RETURN
017020 100375      TSTB      @TCSR      ;WAIT FOR TTY READY
017022 012777 000212 161570      BPL      .-4
017030 000207      MOV      @212,@TDBR      ;OUTPUT LINEFEED
                                RTS      %7      ;RETURN

017032 013746 000024      :ENTER HERE ON POWER FAIL
017036 010667 000030      PFAIL: MOV      @224,-(6)      ;SAVE CONTENTS OF POWER FAIL VECTOR
017042 012737 017052 000024      MOV      %6,SAVR6      ;STORE STACK POSITION
017050 000000      MOV      @RESTRT,@224      ;LOAD VECTOR WITH POWER UP RETURN ADDRESS
017052 016706 000014      HALT
017056 012637 000024      RESTRT: MOV      SAVR6,%6      ;HALT ON POWER DOWN
017062 022626      MOV      (6)+,@224      ;RESTORE STACK WHEN POWERING UP
017064 104006      CMP      (SP)+,(SP)+      ;RESTORE ORIGINAL CONTENTS OF POWER FAIL VECTOR
017066 000167 162156      HLT
017072 000000      JMP      RSTRT      ;RESTORE THE STACK
                                ;POWER FAIL OCCURRED

017074 000207      USER: RTS      %7
017760 017760      .=17760
017760 000000      KSTACK: 0
000001      .END
;OVERLAY USER ROUTINE HERE

```

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 59
DCKTGE.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

A	013372	1630*	1631*	1632*	1633*	1649	1656	1659	1664	1667	1674	1689	1711	1810
ABSRV	015654	1866	1873	1876	1882	2055	2064	2106	2507*	2508	2509	2511		
ADSUB	012552	1114	2331*											
ALLREG	016214	2349	2333*											
ARIEND	012612	2843*	2338*	2891*	2894									
ARITST	012530	2352	2361*											
B	013362	2348*	2351											
BEGIN	006700	1628*	1629*	1705	1780	1787	1802	1956	1961	1967	1974	1981	2079	2081
BEGINX	006466	2086	2038	2503*	2504	2506								
BEGIN1	007022	966	1107	1176	1594	1602	1624*	1625	2628	2824				
BEGIN2	007044	1249	1251	1253	1255	1257	1259	1586*	2626					
BELL	016750	1642*												
BKREQ	005450	1625	1649*											
BKLP	015630	2597	2707	3000*										
BKSTR	001066	1425	1430*											
BKNT	015030	2822*	2823											
BKNTST	014736	839*	1107*	2686*	2687	2825*								
BKNT1	015060	2724	2734*											
C	013404	2717*	2739											
CC	= 177776	2735	2740*											
CK	016516	1634*	1635*	1725*	1732*	1754*	1862*	1867	1923*	1938*	2071*	2074	2093	2095*
CKWAIT	013100	2097	2102*	2107	2515*	2516	2517							
CLINCT=	004022	747*	749											
CHP1	012046	2919	2948*											
CHP2	012070	2417*	2418*	2420	2427*									
COMPAR	012042	1034*	1299	1302*	1309*									
CORCK	015646	2229*	2236											
CORMOV	015236	2233	2237*											
CRLF	017000	2227*												
CSIPDR	001064	2714	2827*											
CURBNK	001050	2763*	2764											
CURCPA	001056	963	2736	2924	2947	3009*								
CURCPD	001062	887*	1072*	2634	2636	2673*								
CURIPA	001054	881*	989*	1102*	1589*	2698	2699	2716	2717*	2718	2720*	2749	2750	2769
CURIPD	001060	2770	2789	2790	2791	2931	2937							
CURPAT=	004122	884*	1104*	2689*	2693*	2699*	2766*							
D	013424	886*	1106*	2691*	2695*	2697*	2768*	2770*						
DATAK	004326	883*	1103*	2683	2688*	2692*	2768*	2772*						
DATA2 =	003776	835*	1105*	2690*	2694*	2696*	2767*	2769*						
DET1	003340	1035*	1303	1305*	1307*	1319*	1321							
DET2	003342	1215	1718*	1739*	1746*	1762*	1902*	1909*						
DET3	003640	1151*	1397*	1485	1488*	1537	1540*	1583*	1608	1916*	1930*	1948*	2522*	2761
DET4	003272	1007*	1266*	1267	1274*	1275								
DISPLY	001104	1046	1189*											
DO	= 000001	1198	1208*											
DONE	013220	1220	1260*											
EIGHT	003310	1196	1198*											
EMTAB	013576	895*	962*	1020*	1290*	1291	2607*	2608	2721*	2722				
EMTSRV	013536	1166	1381*	1452	1498	1545	1553							
ENOZ	005336	1189*	1248*	1249*	1250*	1251*	1252*	1253*	1254*	1255*	1256*	1257*	1258*	1259*
ENOZ1	005366	2342	2463*											
		1201*	1210											
		2560	2566*											
		772	968	2555*										
		1160	1164	1410*	1411	1467	1495	1506	1513	1518	1548	1556	1614	
		1413	1416*											

[illegible]

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 61
 DCKTGE.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

KMLST	000634	810#	1022#	1026#					
KMLVC	000632	809#	1021#	2643#	2662#				
LKCSR	000630	878#	1019	1028#	1281	1284#			
LK1	003760	128#							
LK2	003776	1287	1293#						
LK3	003726	1021	1281#						
LP4	003744	125#							
LLIMIT	004276	970#	1139	1350	1355#	1598#	1599#	2797#	2798#
LOGIC	014774	948	2723#						
LOGICA	015014	778	2727	2729#					
LPCSR	000636	811#	1032	1042#	1296	1311	1322		
LPDBR	000640	812#	1036#	1310#	1321#				
LPINTR	004000	1037	1296#						
LPST	000644	814#	1038#	1041#					
LPVC	000642	813#	1037#	2646#	2663#				
LP1	004116	1316	1318#						
LP2	004124	1306	1308	1321#					
LP3	004042	1304	1307#						
LP4	004052	1300	1309#						
LP5	004110	1314	1317#						
LP6	004010	1299#	1323						
LSTSET	015732	2844#	2869						
MAIN	003202	1170	1173#	1175	2485				
MODE1	003150	1149	1167#						
MODE2	003574	1228	1254#						
MODE6	003560	1230	1252#						
MODE20	003544	1232	1250#						
MODE4	003530	1234	1248#						
MODE4	003624	1224	1258#						
MODE8	003610	1226	1256#						
MOVE	003354	1213#	1236	1238	1240	1242	1244	1246	
MODEV	003220	999	1123	1181#					
NOP =	000240	745#							
NRALL	013426	1050	2525#						
NRLOOP	013440	2530#	2536						
NUMA	012610	2346#	2354	2355	2360#				
NXENK1	014664	2708#							
NXTBLK	006172	970	1355	1477	1529#				
NXTBNK	014652	2684	2705#						
NXTB1	006216	1531	1534#						
NXTB2	006226	1534	1537#						
NXTB3	006246	1539	1542#						
NXTB4	006322	1543	1552#						
NXTSEG	014552	2692#							
NXTSET	016040	2846	2858	2866#					
OLDBNK	001052	882#	2716#	2816	2818				
PAGE	002126	1047#							
PARON	001514	986#							
PARFD	001234	905	926#						
PARSET	001446	973#							
PARSRV	001106	901#	973						
PARO	001230	906	924#						
PAR1	001152	908#	916						
PAR2	001162	910#	912						
PAR3	001170	913#	925						
PATCH1=	000000	2563#	2566						

[illegible]

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 63
DCKTGE.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

[illegible]

[illegible]

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 65
DCKTGE.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

[illegible]

TEST	012234	2248*	2249*	2250*	2251*	2252*	2253*	2254*	2270	2275*	2286*	2287*	2288*	2289*
		2290*	2291*	2292*	2308	2312*	2313*	2314*	2315*	2316*	2317*	2333	2353*	2354*
		2355*	2356	2431*	2432*	2437*	2445*	2447*	2448	2451*	2453*			
TIME	= 003762	1027*	1225*	1286	1289*									
TJSR1	011434	2113	2116*											
TJSR2	011436	2115	2117*											
TJSR3	011446	2116	2121*											
TJSR4	011462	2124	2127*											
TRCSR	000606	799*												
TROR	000610	800*												
TRPB	001070	889*	1043*	2603*	2745*									
TRTP	016260	2606	2748	2906*										
TSCOMB	013002	2404*	2413											
TSEG	016144	2878	2882*											
TSROT	012100	2241*	2244											
TSROT2	012244	2280*	2284											
TSRT2A	012236	2224	2246	2279*										
TSTAR1	012516	2341	2346*											
TTCSR	000616	749	803*	1005	1012*	1269								
TTDBR	000620	750	804*	1267*										
TTPST	000624	806*	1006*	1011*										
TTPVC	000622	805*	1008*	2640*	2660*									
TTRST	000614	802*												
TTRVC	000612	801*	2642*	2661*										
TTSAY	000626	807*	1269*	1270										
TWELVE	003314	1202*												
TWENTY	003324	1204*												
TWOEIG	003334	1206*												
TWOFOR	003330	1205*												
TYOUT	003654	1265*	1276											
TYOUTR	003670	1008	1269*											
TYOUT1	003660	1267*	1277											
UBRK	001074	891*												
UBUFF	000400	795*	996	2708										
UDPAR0	000722	837*	1104	2766										
UDPAR1	000724	838*												
UDPAR7	000726	839*	1095*	2774*										
UDPDR0	000706	831*	1099*	1106	2768									
UDPDR1	000710	832*												
UDPDR7	000712	833*	1096*	2776*										
UIPAR0	000714	834*	1076	1103	2765									
UIPAR1	000716	835*												
UIPAR7	000720	836*	2683	2773*										
UIPDR0	000700	828*	1098*	1105	2767									
UIPDR1	000702	829*												
UIPDR7	00J704	830*	2775*											
LN1	= 000400	1166	1383*	1452	1466	1482	1489	1498	1505	1512				
USEALL	002450	1074	1098*											
USER	017074	1045	3029*											
WAIT4	013102	2421	2428*											
WD	= 000014	1378*	1482											
WORDCT	004300	1138	1351	1356*										
XFER12	003506	1225	1243*											
XFER16	003476	1227	1241*											
XFER20	003466	1229	1239*											
XFER24	003456	1231	1237*											

XFER28 003446
XFER8 003516
. = 017762

1233	1235											
1223	1245											
769	771											
1025	1040	774	777	779	781	786	788	790	794	796	798	1010
1289	1297	1048	1133	1156	1159	1163	1172	1193	1218	1266	1271	1282
1547	1555	1302	1312	1319	1320	1328	1341	1405	1493	1517	1520	1523
1682	1691	1572	1576	1604	1607	1509	1650	1657	1660	1665	1668	1676
1788	1796	1698	1706	1712	1720	1727	1734	1741	1748	1756	1764	1781
1884	1893	1804	1812	1820	1827	1834	1841	1849	1857	1868	1874	1877
1983	1990	1904	1911	1918	1925	1932	1940	1950	1957	1962	1969	1975
2082	2089	1998	2005	2012	2019	2026	2034	2037	2045	2051	2066	2075
2153	2165	2098	2108	2118	2128	2136	2148	2140	2142	2151	2153	2156
2251	2261	2166	2175	2177	2180	2187	2189	2192	2199	2201	2204	2211
2350	2361	2266	2275	2283	2286	2299	2261	2262	2264	2265	2267	2268
2450	2461	2366	2375	2383	2386	2399	2302	2303	2305	2306	2309	2319
2550	2561	2466	2475	2483	2486	2499	2330	2331	2334	2357	2369	2382
2650	2661	2566	2575	2583	2586	2599	2433	2440	2449	2463	2506	2503
2750	2761	2666	2675	2683	2686	2699	2645	2706	2782	2785	2797	2804
2850	2861	2766	2775	2783	2786	2799	2913	2946	2938	2965	2978	2995

C06

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 69
DCKTGE.P11 CROSS REFERENCE TABLE -- MACRO NAMES

TNCV 2220 2255 2293 2318

DOCTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 71
DOCTGE.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

ROC	1201	1202	1203	1204	1205	1206	1754	1847	2969	2984					
ROCB	1938	2032													
ROO	913	914	1065	1080	1090	1210	1215	1625	1629	1631	1633	1635	1637	1639	1643
	1645	1647	1655	1771	1810	1864	1901	1946	2053	2054	2063	2072	2080	2087	2094
	2104	2114	2125	2354	2411	2558	2560	2579	2583	2640	2642	2643	2646	2651	2685
	2686	2692	2693	2694	2695	2702	2717								
ASH	1588	1590	2793	2795											
ASL	1013	1014	1015	1016	1029	1147									
ASLB	2210														
ASR	2762	2900	2901	2902											
ASRB	2198														
BCC	2257	2261	2295	2299	2320	2324									
BCS	2142	2151	2163	2175	2187	2199	2211								
BEQ	947	1048	1056	1074	1154	1196	1276	1300	1304	1314	1334	1425	1501	1539	1572
	1576	1602	1604	1650	1657	1660	1665	1668	1676	1682	1691	1698	1706	1712	1720
	1727	1734	1741	1748	1756	1764	1781	1788	1796	1804	1812	1820	1827	1834	1841
	1849	1857	1868	1874	1877	1884	1893	1904	1911	1918	1925	1932	1940	1950	1957
	1962	1969	1975	1983	1990	1998	2005	2012	2019	2026	2034	2037	2045	2056	2066
	2075	2082	2089	2098	2108	2118	2128	2138	2156	2168	2180	2192	2204	2216	2230
	2233	2271	2309	2334	2341	2357	2369	2382	2395	2405	2421	2435	2449	2483	2596
	2635	2681	2684	2724	2735	2780	2782	2809	2817	2833	2837	2842	2846	2913	2918
	2978														
BGE	1517	2407													
BGT	916	1287	1493	1503	1510	1547									
BIC	1129	1184	1284	1410	1416	1450	1476	1496	1544	1552	1587	1591	1596	1598	1600
	1605	1627	1689	1696	1794	1866	2546	2549	2598	2648	2660	2661	2662	2663	2665
	2668	2674	2678	2711	2740	2783	2794	2796	2797	2800	2807	2810	2812	2834	2844
	2875	2876	2880	2882	2883	2885	2899	2986							
BICB	1891	1981	1988	2064	2073	2106	2860								
BIS	992	994	997	1011	1012	1026	1028	1041	1181	1411	1417	1421	1430	1451	1477
	1483	1490	1497	1541	1548	1550	1556	1559	1592	1595	1597	1599	1611	1613	1615
	1617	2605	2649	2666	2700	2709	2747	2788	2798	2811	2813	2814	2861	2877	2884
	2886	2987													
BISB	2801	2802													
BIT	990	1003	1009	1017	1024	1030	1039	1047	1055	1073	1110	1125	1148	1153	1155
	1158	1169	1174	1190	1195	1333	1419	1463	1480	1500	1514	1530	1542	1593	2223
	2340	2420	2482	2486	2488	2544	2574	2595	2601	2609	2630	2632	2644	2675	2680
	2734	2743	2777	2803	2832	2849	2917	2945	3000						
BLE	2409	2536													
BLO	985														
BLOS	1347														
BLT	1555														
BPI	1271	1282	1297	1323	1328	1413	1472	1609	2136	2438	2787				
BNE	991	1004	1010	1018	1025	1031	1040	1111	1126	1131	1149	1156	1159	1170	1175
	1193	1218	1345	1420	1429	1447	1468	1474	1481	1487	1515	1523	1534	1543	1594
	2224	2244	2284	2351	2373	2386	2399	2413	2440	2454	2487	2489	2545	2575	2602
	2610	2631	2633	2645	2676	2706	2719	2744	2778	2804	2848	2850	2869	2895	2946
	2974	3001													
BPL	1312	1332	1341	1464	1531	1607	2256	2294	2319	2433	2491	2604	2738	2746	2785
	2806	2949	2965	2971	2995	3004	3010	3013							
BR	925	940	954	959	1067	1097	1116	1133	1163	1172	1207	1220	1224	1226	1228
	1230	1232	1234	1277	1306	1308	1316	1330	1337	1339	1343	1470	1520	1574	1578
	2116	2236	2246	2260	2264	2267	2285	2298	2302	2305	2323	2327	2330	2352	2426
	2622	2656	2852	2858	2919	2988									
BVC	2165	2201	2213	2258	2268	2296	2306	2321	2331						
BVS	2140	2153	2177	2189	2262	2265	2300	2303	2325	2328					

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 72
 DCKTGE.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

CCC	2123	2134	2148	2172	2196										
CLC	1200	2976													
CLR	901	902	907	949	952	953	962	965	967	986	988	1000	1002	1007	1027
	1043	1059	1077	1087	1120	1145	1146	1151	1167	1213	1260	1265	1288	1309	1418
	1439	1454	1583	1616	1718	1818	1831	2009	2016	2222	2227	2228	2364	2365	2377
	2378	2390	2391	2403	2445	2446	2495	2533	2600	2614	2654	2655	2671	2672	2688
	2689	2690	2691	2715	2726	2742	2759	2773	2774	2775	2776	2822	2951	2962	2979
CLRB	1020	1540	1902	1996	2096	2559	2897								
CMP	915	924	926	984	1217	1275	1286	1299	1303	1313	1346	1446	1473	1492	1502
	1509	1516	1522	1546	1554	1571	1575	1649	1656	1659	1664	1667	1675	1681	1690
	1697	1747	1780	1787	1795	1811	1826	1833	1840	1867	1903	1917	1931	1939	1949
	2033	2081	2088	2097	2107	2117	2127	2155	2167	2179	2191	2203	2215	2229	2232
	2243	2270	2283	2308	2333	2350	2356	2368	2412	2448	2484	2490	2535	2573	2623
	2634	2683	2718	2816	2827	2845	2847	2837	2894	2922	3024				
CMPB	1344	1873	1876	1813	1892	1956	1961	1968	1974	1982	1989	2004	2011	2018	2025
	2055	2065	2074	2381	2394	2404	2836								
COM	1444	1475	1488	1570	1725	1825	2366	2371	2418	2603	2745				
COMB	1909	2003	2379	2384	2392	2397									
DEC	1521	1739	1832	2367	2380	2393	2705	2868	2973						
DECB	1923	2017	2043												
HALT	769	921	933	956	2838	2950	3021								
INC	1157	1274	1285	1301	1305	1315	1445	1494	1519	1732	2234	2235	2241	2280	2348
	2372	2452	2492	2677	2915	2966									
INCB	1137	1290	1349	1414	1507	1916	2010	2385	2398	2453	2607	2721			
JMP	787	789	791	923	935	1049	1176	1211	1467	1495	1506	1513	1518	1524	1526
	1533	1536	1772	2342	2475	2682	2733	2828	2940	3026					
JSR	963	1045	1046	1050	1223	1225	1227	1229	1231	1233	1236	1238	1240	1242	1244
	1246	2115	2126	2135	2242	2281	2282	2349	2470	2472	2474	2476	2547	2550	2597
	2707	2729	2736	2855	2862	2924	2926	2927	2929	2930	2932	2933	2943	2944	2947
MFPD	2577	2580	2582	2650	2667	2701	2854								
MFP1	2556														
MOV	903	904	905	906	908	909	910	917	938	945	948	951	955	957	960
	961	964	966	968	969	970	973	974	975	977	978	979	987	989	993
	996	999	1001	1006	1008	1021	1022	1033	1034	1035	1036	1037	1038	1042	1044
	1051	1052	1053	1054	1057	1058	1060	1061	1062	1063	1068	1069	1070	1071	1072
	1075	1076	1078	1079	1081	1082	1085	1086	1088	1089	1091	1092	1095	1096	1098
	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1112	1113	1114	1115
	1117	1118	1119	1121	1122	1123	1124	1128	1132	1134	1135	1136	1138	1139	1141
	1142	1143	1152	1160	1161	1164	1165	1166	1168	1171	1189	1198	1199	1208	1214
	1216	1235	1237	1239	1241	1243	1245	1248	1249	1250	1251	1252	1253	1254	1255
	1256	1257	1258	1259	1261	1267	1269	1291	1307	1310	1317	1318	1321	1350	1351
	1422	1437	1438	1440	1441	1442	1443	1448	1449	1452	1453	1462	1466	1478	1479
	1482	1489	1498	1505	1512	1529	1557	1566	1567	1568	1569	1581	1582	1586	1589
	1610	1612	1614	1624	1626	1628	1630	1632	1634	1636	1638	1640	1642	1644	1646
	1654	1674	1680	1688	1695	1704	1710	1717	1724	1731	1738	1745	1752	1760	1770
	1786	1793	1801	1809	1817	1824	1838	1845	1853	1862	1863	1865	1890	1899	1900
	1908	1915	1922	1929	1936	1944	1945	1980	1987	1995	2002	2023	2030	2041	2051
	2052	2061	2062	2070	2071	2079	2086	2093	2095	2102	2103	2105	2113	2124	2149
	2161	2173	2185	2197	2209	2240	2248	2279	2296	2346	2347	2353	2417	2431	2456
	2493	2496	2525	2526	2527	2528	2530	2531	2537	2538	2539	2557	2561	2578	2584
	2599	2606	2608	2611	2612	2613	2615	2616	2617	2618	2619	2620	2621	2624	2625
	2626	2628	2636	2638	2639	2647	2653	2657	2658	2659	2664	2670	2673	2679	2687
	2696	2697	2698	2699	2708	2712	2713	2714	2716	2720	2722	2723	2727	2739	2741
	2748	2749	2750	2751	2752	2753	2754	2755	2756	2757	2758	2760	2761	2763	2765
	2766	2767	2768	2769	2770	2771	2772	2789	2790	2791	2792	2818	2819	2820	2821
	2824	2825	2841	2843	2863	2866	2870	2871	2872	2873	2874	2878	2879	2888	2889

DCKTG-E MACY11 27(732) 10-SEP-76 10:39 PAGE 73
 DCKTGE.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

	2893	2916	2920	2921	2923	2925	2928	2931	2934	2935	2936	2937	2938	2939	2940
	2941	2942	2960	2963	2972	2985	2996	3005	3011	3014	3018	3019	3020	3022	3023
MOV8	939	1140	1372	1545	1553	1622	1967	1973	2543	2594					
MTPO	955	998	2555	2652	2669	2703	2710	2857							
NEG	1579	1746	1839												
NEGB	1930	2024													
NOP	1221	1222	1273	1563	1564	1565	1774	2464	2730	2731	2732	2831	2853	2859	2892
RESET	922	934	2729	2839											
ROL	2252	2253	2254	2967	2968	2981	2982	2983							
ROLB	2174	2186	2290	2291	2292	2315	2316	2317							
ROR	2249	2250	2251												
RORB	2150	2162	2287	2288	2289	2312	2313	2314							
RTI	978	1185	1415	1423	2494	2497	2548	2551	2576	2587	2627	2629	2704	2728	2826
RTS	2835	2890	2914	2952											
	1194	1197	1219	1247	1262	1455	1584	2120	2273	2311	2336	2359	2467	2469	2471
	2473	2475	2477	2540	2903	2975	2997	3002	3006	3015	3029				
RTT	2881	2906													
SBC	1762	1855													
SBCB	1948														
SCC	2160	2184	2208	2468											
SEC	1753	1761	1846	1854	1937	1947	2031	2042	2980						
S08	912	1066	1084	1094	1580	2534	2764	2823							
SUB	1182	1705	1711	1802	2355	2555	2581	2856	2864						
SWAB	1336	1348	2432	2437	2447	2451	2867	2896							
SXT	2898														
TRAP	746														
TST	911	946	950	1005	1019	1032	1064	1083	1093	1127	1130	1150	1209	1331	1340
	1412	1424	1426	1471	1485	1601	1603	1606	1608	1719	1726	1733	1740	1755	1763
	1803	1819	1848	1856	2044	2130	2637	2779	2781	2784	2786	2808	2912	2948	2964
	2977														
TSTB	1270	1281	1296	1311	1322	1327	1537	1910	1924	1997	2036	2737	2805	2970	2994
	3003	3009	3012												
WAIT	1173	2422	2423	2424	2425										
.ABS	697														
.DSABL	697														
.END	3032														
.LIST	1	697	769												
.MACR	2220														
.MLIST	1	697	769												
.REM	1														
.REPT	769														
.SBTTL	1	697	742	942	1621	2479									
.TITLE	697														
.WORD	2865														

ERRORS DETECTED: 0
 DEFAULT GLOBALS GENERATED: 0

*DCKTGE, DCKTGE.SEQ/SOL/CRF/DS:ERFZ/EN:ABS=DSKM:DCKTGE.P11
 RUN-TIME: 9 19 4 SECONDS
 RUN-TIME RATIO: 72/34=2.0
 CORE USED: 10K (20 PAGES)

Special mailing 10 pounds 52 503 573 613 663 713 763 813 863 913 963 1013 1063 1113 1163 1213 1263 1313 1363 1413 1463 1513 1563 1613 1663 1713 1763 1813 1863 1913 1963 2013 2063 2113 2163 2213 2263 2313 2363 2413 2463 2513 2563 2613 2663 2713 2763 2813 2863 2913 2963 3013 3063 3113 3163 3213 3263 3313 3363 3413 3463 3513 3563 3613 3663 3713 3763 3813 3863 3913 3963 4013 4063 4113 4163 4213 4263 4313 4363 4413 4463 4513 4563 4613 4663 4713 4763 4813 4863 4913 4963 5013 5063 5113 5163 5213 5263 5313 5363 5413 5463 5513 5563 5613 5663 5713 5763 5813 5863 5913 5963 6013 6063 6113 6163 6213 6263 6313 6363 6413 6463 6513 6563 6613 6663 6713 6763 6813 6863 6913 6963 7013 7063 7113 7163 7213 7263 7313 7363 7413 7463 7513 7563 7613 7663 7713 7763 7813 7863 7913 7963 8013 8063 8113 8163 8213 8263 8313 8363 8413 8463 8513 8563 8613 8663 8713 8763 8813 8863 8913 8963 9013 9063 9113 9163 9213 9263 9313 9363 9413 9463 9513 9563 9613 9663 9713 9763 9813 9863 9913 9963 10013 10063 10113 10163 10213 10263 10313 10363 10413 10463 10513 10563 10613 10663 10713 10763 10813 10863 10913 10963 11013 11063 11113 11163 11213 11263 11313 11363 11413 11463 11513 11563 11613 11663 11713 11763 11813 11863 11913 11963 12013 12063 12113 12163 12213 12263 12313 12363 12413 12463 12513 12563 12613 12663 12713 12763 12813 12863 12913 12963 13013 13063 13113 13163 13213 13263 13313 13363 13413 13463 13513 13563 13613 13663 13713 13763 13813 13863 13913 13963 14013 14063 14113 14163 14213 14263 14313 14363 14413 14463 14513 14563 14613 14663 14713 14763 14813 14863 14913 14963 15013 15063 15113 15163 15213 15263 15313 15363 15413 15463 15513 15563 15613 15663 15713 15763 15813 15863 15913 15963 16013 16063 16113 16163 16213 16263 16313 16363 16413 16463 16513 16563 16613 16663 16713 16763 16813 16863 16913 16963 17013 17063 17113 17163 17213 17263 17313 17363 17413 17463 17513 17563 17613 17663 17713 17763 17813 17863 17913 17963 18013 18063 18113 18163 18213 18263 18313 18363 18413 18463 18513 18563 18613 18663 18713 18763 18813 18863 18913 18963 19013 19063 19113 19163 19213 19263 19313 19363 19413 19463 19513 19563 19613 19663 19713 19763 19813 19863 19913 19963 20013 20063 20113 20163 20213 20263 20313 20363 20413 20463 20513 20563 20613 20663 20713 20763 20813 20863 20913 20963 21013 21063 21113 21163 21213 21263 21313 21363 21413 21463 21513 21563 21613 21663 21713 21763 21813 21863 21913 21963 22013 22063 22113 22163 22213 22263 22313 22363 22413 22463 22513 22563 22613 22663 22713 22763 22813 22863 22913 22963 23013 23063 23113 23163 23213 23263 23313 23363 23413 23463 23513 23563 23613 23663 23713 23763 23813 23863 23913 23963 24013 24063 24113 24163 24213 24263 24313 24363 24413 24463 24513 24563 24613 24663 24713 24763 24813 24863 24913 24963 25013 25063 25113 25163 25213 25263 25313 25363 25413 25463 25513 25563 25613 25663 25713 25763 25813 25863 25913 25963 26013 26063 26113 26163 26213 26263 26313 26363 26413 26463 26513 26563 26613 26663 26713 26763 26813 26863 26913 26963 27013 27063 27113 27163 27213 27263 27313 27363 27413 27463 27513 27563 27613 27663 27713 27763 27813 27863 27913 27963 28013 28063 28113 28163 28213 28263 28313 28363 28413 28463 28513 28563 28613 28663 28713 28763 28813 28863 28913 28963 29013 29063 29113 29163 29213 29263 29313 29363 29413 29463 29513 29563 29613 29663 29713 29763 29813 29863 29913 29963 30013 30063 30113 30163 30213 30263 30313 30363 30413 30463 30513 30563 30613 30663 30713 30763 30813 30863 30913 30963 31013 31063 31113 31163 31213 31263 31313 31363 31413 31463 31513 31563 31613 31663 31713 31763 31813 31863 31913 31963 32013 32063 32113 32163 32213 32263 32313 32363 32413 32463 32513 32563 32613 32663 32713 32763 32813 32863 32913 32963 33013 33063 33113 33163 33213 33263 33313 33363 33413 33463 33513 33563 33613 33663 33713 33763 33813 33863 33913 33963 34013 34063 34113 34163 34213 34263 34313 34363 34413 34463 34513 34563 34613 34663 34713 34763 34813 34863 34913 34963 35013 35063 35113 35163 35213 35263 35313 35363 35413 35463 35513 35563 35613 35663 35713 35763 35813 35863 35913 35963 36013 36063 36113 36163