

KT11-D

EXERCISER
MD-11-DBKTG-C

EP-DBKTG-C-DL-A
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1.0 ABSTRACT

THIS PROGRAM IS AN INTERACTIVE EXERCISER FOR A PDP-11/40 EQUIPPED WITH THE KT11-D 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-D TURNED OFF AND ONLY KERNEL MODE IN USE, TO 128K EXECUTION WITH EACH USER PAGE MAPPED SEQUENTIALLY TO EVERY 4K BANK OF MEMORY, 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-11/40 STANDARD COMPUTER
KT11-D MEMORY MANAGEMENT OPTION

2.1.1 OPTIONAL HARDWARE THAT THE PROGRAM WILL EXERCISE

MEMORY UP TO 124 KW OF MEMORY-DOES NOT HAVE TO BE CONTIGUOUS,
BUT BLOCKS OF LESS THAN 4KW WILL NOT BE USED
RF11 DISK
RK11 DISK
TC11 DECTAPE-TRANSPORT ONE(1)
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.
SET DESIRED MEMORY MANAGEMENT SELECTION SWITCHES (SEE 4.2)-ALL
DOWN FOR WORST CASE TESTING.
PRESS START.

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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 RING THE BELL (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).

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 KT11-D (SR0(D) WILL NOT BE SET AT ALL)
SW1=1 OR UP---INHIBIT USE OF USER MODE.

(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

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
SW3=1 OR UP---INHIBIT RK11 DISK
SW4=1 OR UP---INHIBIT LINE CLOCK
SW5=1 OR UP---INHIBIT RF11 DISK
SW6=1 OR UP---INHIBIT TC11 DECTAPE
SW7=1 OR UP---INHIBIT LINE PRINTER (USE SA310 IF LP11 IS SELECTED)

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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 PRINT OUT
 SW12=1 OR UP---INHIBIT TRACE TRAPPING
 SW11=1 OR UP---INHIBIT SUB-PROGRAM ITERATION AND INHIBIT TESTS WHICH USE ALL COMBINATIONS OF NUMBERS

SW10=1 OR UP---INHIBIT PROCESSOR TEST (ONCE SET, PROCESSOR TEST IS PERMANENTLY INHIBITED)

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.

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5.2.2 HLT

THIS EMT CALLS THE SUBROUTINE PRINT, WHICH PRINTS OUT THE LOCATION COUNTER AT THE TIME OF FAILURE, THE CONTENTS OF THE PROCESSOR STATUS REGISTER, AND THE CONTENTS OF THE CURRENT BANK COUNTER. 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 (00000). 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 STACK ADDRESS. THE CONTENTS OF THE CURRENT STACK ADDRESS IS THE VIRTUAL PC AT THE TIME THE TRAP OR INTERRUPT OCCURRED.

5.2.4 EMTSRV (EMT HANDLER)

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

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.

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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.

5.2.9 PFAIL (POWER FAIL)

IN THIS VERSION THE POWER FAIL ROUTINE IS NOT OPERABLE.

5.2.11 TYOUT (TTY OUTPUT)

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

5.2.12 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 THRU THE DISK MEMORY. AFTER THE TOTAL DISK(S) 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.

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5.2.13 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.

5.2.14 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.

5.2.15 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.

5.2.16 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.

5.2.17 TCCK (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.

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5.2.18 LCLK (LINE CLOCK)

THIS TEST OF THE LINE CLOCK IS IN THE INTERRUPT MODE. IF OPERATING CORRECTLY THE SYSTEM I/O WILL RUN AT FULL SPEED FOR 55 SECONDS. AND THEN ALL I/O AT LEVEL FOUR OR LESS (AND THE PROCESSOR TESTS) WILL STALL FOR 5 SECONDS. TIMES GIVEN ARE BASED ON 60 CYCLES AS THE LINE FREQUENCY.

5.2.19 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.

5.2.20 RKSTART (RK-11 DISK)

THIS ROUTINE PERFORMS A WRITE AND WRITE CHECK OF THE DISK. THE DATA THAT IS WRITTEN ON THE DISK IS PART OF THE TEST PROGRAM CODE THAT IS NEVER MODIFIED. THIS SEGMENT OF CORE IS WRITTEN IN CONTIGUOUS BLOCKS THRU THE DISK MEMORY. AFTER THE TOTAL DISK HAS BEEN WRITTEN, A WRITE CHECK IS USED TO VERIFY THAT DATA HAS BEEN WRITTEN CORRECTLY ON THE DISK.

5.2.22 CORE EXPANSION (DET1)

THIS ROUTINE IS CONTROLLED BY SWITCH 5. IF CALLED, THE PROCESSOR MAINLINE CODE WILL EXPAND TO THE MAXIMUM MEMORY THAT IS AVAILABLE (UP TO 28K). THE ROUTINE DETERMINES THE MAXIMUM MEMORY SIZE BY DOING A "DATO" 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.

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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.

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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 ALL AVAILABLE MEMORY UP TP 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 USER. IF SW0 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 SW0 WAS SET, ORDINARY CORE EXPANSION IS RUN WITH NO SPECIAL MAPPING REQUIRED (KT11-D IS TURNED OFF).

5.3.3 PROCESSOR TEST EXECUTION - BANK 0 ONLY

IF SW0, 1 OR 2 IS UP AND SWS IS UP AT STARTUP, ONLY BANK 0 IS UTILIZED. IN THIS CASE, IF SW0 AND SW1 WERE DOWN THE PROCESSOR TESTS ARE EXECUTED IN USER, WITH USER PAGE 0 MAPPED TO BANK 0. IF SW0 WAS DOWN AND SW1 WAS UP, THE PROCESSOR TESTS ARE EXECUTED IN KERNEL, WITH KERNEL PAGE 0 MAPPED TO BANK 0. IF SW0 WAS UP, THE KT11-D IS TURNED OFF AND THE PROCESSOR TESTS ARE EXECUTED IN KERNEL MODE OR USER MODE (DEPENDING ON SW1) IN BANK 0 ONLY.

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6.0 ERRORS

6.1 ERROR PRINTOUT

PRINTOUTS ARE IN AN EXTENDED VERSION OF THE STANDARD FORMAT, USING THREE 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 TEST. THE FOURTH IS RETURN WHICH IS THE RETURN ADDRESS IN THE CURRENT BANK OF MEMORY. 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).

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. FOR TTY READER AND HSR, TAPE MUST BE REPOSITIONED TO LEADER BEFORE RESTARTING THE TEST.

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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. THUS, TO DETERMINE WHICH PROCESSOR TEST WAS BEING EXECUTED WHEN A FAILURE OCCURRED, FIRST CHECK THE CONTENTS OF CURBNK IN BANK 0. THIS LOCATION CONTAINS THE ADDRESS OF THE CURRENT PHYSICAL BANK, SHIFTED RIGHT 6 PLACES. BY APPENDING 2 ZEROES TO IT, YOU HAVE THE 18-BIT ADDRESS OF THE CURRENT BANK OF MEMORY. ADD TO THIS THE ADDRESS OF RETURN IN BANK 0 AND YOU HAVE THE ADDRESS OF RETURN IN THE CURRENT BANK OF MEMORY. THE CONTENTS OF RETURN IN THE CURRENT BANK OF MEMORY IS THE VIRTUAL ADDRESS OF THE START OF THE CURRENT PROCESSOR TEST.

7.0 RESTRICTIONS

PROGRAM MUST BE LOADED INTO LOWER 4K OF MEMORY.

THE INHIBIT SWITCHES MUST ONLY BE SET FOR ALL DEVICES THAT ARE PART OF THE SYSTEM BUT WHICH YOU DO NOT WISH TO RUN.

IF THE LINE PRINTER IS USED, STARTING ADDRESS 310 MUST BE USED.

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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, IN CORE MEMORY WITH NO I/O, TAKES ABOUT 15 SECONDS PER 4K BANK. (AN ASTERISK IS PRINTED AT THE END OF A FULL PASS, AND THE BELL IS RUNG AT THE END OF EACH 4K BANK).

A PASS RUN WITH 4K AS 32 WITH TAKES ABOUT 1 MINUTE PER 4K BANK.

8.2 STACK POINTERS

THE KERNEL STACK POINTER IS INITIALIZED TO 17760.

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 PROGRAM PHYSICAL AND THE DATA SELECTOR TO DATA PATHS. 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).

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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. MEMORY MANAGEMENT CAN BE LEFT TURNED OFF AND THE PROCESSOR TESTS CAN STILL BE RUN IN 4K ONLY OR CORE EXPANDED UP TO 28K. WITH MEMORY MANAGEMENT ON, THE PROGRAM CAN BE RUN USING ONLY 4K, WITH EVERYTHING MAPPED IN KERNEL SPACE OR WITH USER AND KERNEL BOTH USED. AT THE NEXT LEVEL OF COMPLEXITY, CORE EXPANSION CAN BE RUN WITH MEMORY MANAGEMENT ON, USING KERNEL ONLY OR USING BOTH MODES AS DESIRED. FINALLY, ALL AVAILABLE MEMORY (IN 4K PIECES) CAN BE UTILIZED BY RUNNING 4K AS 32K. 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 AREA 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 KT11-D SETUP CODE. THE RF11 AND TC11 PRIMER CODE IS IN WITH THE KT11-D SETUP CODE SINCE THEY REQUIRE CERTAIN PARTS OF THE KT11-D 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.

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;PDP11/40 SYSTEM EXERCISER, WITH KT11-D --- TTY,PC11,KW11-L
;LP11,RF11,TC11
;TEST SIMULTANEOUS RUNNING OF I/O, WITH PROCESSOR INSTRUCTION TEST AND
;WITH TRACE BIT ENABLED TO BE CONSIDERED MAINLINE CODE

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;I/O RUNS IN KERNEL MODE
;CPU TESTS RUN IN USER MODE UNLESS INHIBITED BY SR SETTINGS
;KT11-D IS UTILIZED

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;(R6) IS THE STACK POINTER
;((R6)) IS THE PC+2 OF LOCATION WHERE THE TRAP ORIGINATED
;FOR NORMAL OPERATION RUN WITH ALL SWITCHES DOWN
;SA - 200
;RESTART - 310 (SR SETTINGS PREVIOUSLY MADE ARE USED)

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;AT STARTUP, SR SETTINGS ARE:
;SR 0=1 OR UP --- RUN WITHOUT KT11-D
;SR 1=1 OR UP --- RUN ALL IN KERNEL MODE (INHIBITS RUNNING 4K AS 32K)
;SR 2=1 OR UP --- INHIBIT RUNNING 28K USER KT11-D FROM EVERY 4K
;BANK (ALLOW NORMAL CORE EXPANSION)
;SR 5=1 OR UP---INHIBIT VARIABLE CORE EXPANSION

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;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

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;SPECIAL DELETE SWITCHES-SET RESPECTIVE SWITCH TO A 1 TO INHIBIT
;INITIATION OF DEVICE

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;SW 0=1 INHIBIT TTY OUTPUT
;SW 3=1 INHIBIT RK11 DISK
;SW 4=1 INHIBIT LINE CLOCK
;SW 5=1 INHIBIT RF11 DISK
;SW 6=1 INHIBIT TC11 DECTAPE
;SW 7=1 INHIBIT LINE PRINTER

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;DEFINITIONS

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000240
104400
000410
000412
177570
177776
104006
104010
000000
000001
000002
000003

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NOP=240
SCOPE=TRAP
TCSR=TTCSR
TDBR=TTDBR
SR=177570
PSR=177776
HLT=104006
EOB=104010
R0=%0
R1=%1
R2=%2
R3=%3

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;SYSTEM NULL OPERATION
;TRAP USED SCOPE LOOP AND ITERATION

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;ERROR PRINTOUT CALL
;END OF BANK CALL

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 DBKTG.P11 MAIN

654	000136	000000	HALT	: TRAPPED TO PREVIOUS LOCATION:
655	000140	000142	.+2	: TRAP ENTRANCE
656	000142	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
657	000144	000146	.+2	: TRAP ENTRANCE
658	000146	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
659	000150	000152	.+2	: TRAP ENTRANCE
660	000152	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
661	000154	000156	.+2	: TRAP ENTRANCE
662	000156	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
663	000160	000162	.+2	: TRAP ENTRANCE
664	000162	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
665	000164	000166	.+2	: TRAP ENTRANCE
666	000166	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
667	000170	000172	.+2	: TRAP ENTRANCE
668	000172	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
669	000174	000176	.+2	: TRAP ENTRANCE
670	000176	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
671	000200	000202	.+2	: TRAP ENTRANCE
672	000202	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
673	000204	000206	.+2	: TRAP ENTRANCE
674	000206	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
675	000210	000212	.+2	: TRAP ENTRANCE
676	000212	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
677	000214	000216	.+2	: TRAP ENTRANCE
678	000216	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
679	000220	000222	.+2	: TRAP ENTRANCE
680	000222	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
681	000224	000226	.+2	: TRAP ENTRANCE
682	000226	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
683	000230	000232	.+2	: TRAP ENTRANCE
684	000232	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
685	000234	000236	.+2	: TRAP ENTRANCE
686	000236	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
687	000240	000242	.+2	: TRAP ENTRANCE
688	000242	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
689	000244	000246	.+2	: TRAP ENTRANCE
690	000246	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
691	000250	000252	.+2	: TRAP ENTRANCE
692	000252	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
693	000254	000256	.+2	: TRAP ENTRANCE
694	000256	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
695	000260	000262	.+2	: TRAP ENTRANCE
696	000262	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
697	000264	000266	.+2	: TRAP ENTRANCE
698	000266	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
699	000270	000272	.+2	: TRAP ENTRANCE
700	000272	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
701	000274	000276	.+2	: TRAP ENTRANCE
702	000276	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
703	000300	000302	.+2	: TRAP ENTRANCE
704	000302	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
705	000304	000306	.+2	: TRAP ENTRANCE
706	000306	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
707	000310	000312	.+2	: TRAP ENTRANCE
708	000312	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
709	000314	000316	.+2	: TRAP ENTRANCE

710	000316	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
711	000320	000322	.+2	: TRAP ENTRANCE
712	000322	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
713	000324	000326	.+2	: TRAP ENTRANCE
714	000326	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
715	000330	000332	.+2	: TRAP ENTRANCE
716	000332	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
717	000334	000336	.+2	: TRAP ENTRANCE
718	000336	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
719	000340	000342	.+2	: TRAP ENTRANCE
720	000342	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
721	000344	000346	.+2	: TRAP ENTRANCE
722	000346	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
723	000350	000352	.+2	: TRAP ENTRANCE
724	000352	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
725	000354	000356	.+2	: TRAP ENTRANCE
726	000356	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
727	000360	000362	.+2	: TRAP ENTRANCE
728	000362	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
729	000364	000366	.+2	: TRAP ENTRANCE
730	000366	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
731	000370	000372	.+2	: TRAP ENTRANCE
732	000372	000000	HALT	: TRAPPED TO PREVIOUS LOCATION
733	000374	000376	.+2	: TRAP ENTRANCE
734	000376	000000	HALT	: TRAPPED TO PREVIOUS LOCATION

735				
736			:LOAD VECTOR AREA	
737		000024	.=24	
738	000024	016634	PFAIL	:POWER FAIL TRAP
739	000026	000340	340	
740		000030	.=30	
741	000030	015050	EMTSRV	:EMT CALLS
742	000032	000340	340	:HIGHEST PRIORITY
743		000034	.=34	
744	000034	014642	SCOPEC	:USER TRAP
745	000036	000000	0	
746				
747				

748			:LOAD STACKING AREA	
749		000200	.=200	
750	000200	000137	JMP	2#START
751		000300	.=300	
752	000300	000137	JMP	2#START
753		000310	.=310	
754	000310	000137	JMP	2#RSTRT
755				

756			:DATA AREA	
757		000400	.=400	
758	000400	000000	UBUFF: 0	:BUFFER FOR USER SP
759		000406	.+.4	:FOR STACK OVERRUN
760	000406	177560	TRCSR: 177560	:TTY READER STATUS REGISTER
761	000410	177564	TTCSR: 177564	:TTY PUNCH STATUS REGISTER
762	000412	177566	TTDBR: 177566	
763	000414	000064	TTPVC: 64	
764	000416	000066	TTPST: 66	
765	000420	000000	TTSBV: 0	

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 DSKTG.P11 MAIN

766	000422	000100	KWLC:	100
767	000424	000102	KWLST:	102
768	000426	177546	LKCSR:	177546
769	000430	177514	LPCSR:	177514
770	000432	177516	LPDBR:	177516
771	000434	000200	LPVC:	200
772	000436	000202	LPST:	202
773	000440	177470	RFDAR:	177470
774	000442	177466	RFDAR:	177466
775	000444	177462	RFC:	177462
776	000446	177464	RFCAR:	177464
777	000450	177460	RFCSR:	177460
778	000452	177461	RFCSRH:	177461
779	000454	000204	RFVC:	204
780	000456	000206	RFST:	206
781	000460	177413	RKDAH:	177413
782	000462	177412	RKDAE:	177412
783	000464	177406	RKWC:	177406
784	000466	177410	RKBAR:	177410
785	000470	177404	RKCSR:	177404
786	000472	177405	RKCSRH:	177405
787	000474	000220	RKVC:	220
788	000476	000222	RKST:	222
789	000500	177572	SRO:	177572
790	000502	177600	UPDR0:	177600
791	000504	177602	UPDR1:	177602
792	000506	177616	UPDR7:	177616
793	000510	177640	UPAR0:	177640
794	000512	177642	UPAR1:	177642
795	000514	177656	UPAR7:	177656
796	000516	172300	KPDR0:	172300
797	000520	172302	KPDR1:	172302
798	000522	172304	KPDR2:	172304
799	000524	172316	KPDR7:	172316
800	000526	172340	KPAR0:	172340
801	000530	172342	KPAR1:	172342
802	000532	172344	KPAR2:	172344
803	000534	172356	KPAR7:	172356
804				
805	000536	177600	IPDRTAB:	177600
806	000540	177640		177640
807	000542	172300		172300
808	000544	172340	IPDREND:	172340
809	000546	000000	SREG1:	0
810	000550	000000	SREG2:	0
811	000552	177342	TCCM:	177342
812	000554	177340	TCST:	177340
813	000556	177350	TCDT:	177350
814	000560	177344	TCWC:	177344
815	000562	177346	TCBA:	177346
816	000564	000214	TCIV:	214
817	000566	000216	TCSTA:	216
818	000570	000000	CURBNK:	0
819	000572	000000	OLDBNK:	0
820	000574	000000	CURPAR:	0
821	000576	000000	CURPDR:	0

;DISK ADDRESS AND REGISTER
 ;DISK ADDRESS REGISTER
 ;WORD COUNT REGISTER
 ;CURRENT ADDRESS REGISTER
 ;STATUS REGISTER
 ;HIGH BYTE ADDRESS OR CSR

;HIGH BYTE DISK ADDRESS
 ;DISK ADDRESS REGISTER
 ;WORD COUNT REGISTER
 ;CURRENT ADDRESS REGISTER
 ;STATUS REGISTER
 ;HIGH BYTE OF CSR
 ;TRAP VECTOR

;KT11-D REGISTERS

;STORES KT11-D SWITCH REGISTER SETTINGS
 ;STORES SR SETTINGS
 ;CONTROL AND FUNCTION
 ;GENERAL STATUS
 ;DATA
 ;WORD COUNT
 ;BUS ADDRESS
 ;DECTAPE INTERRUPT VECTOR
 ;SAF TO POINT TO CURRENT BANK
 ;ADDRESS OF CURRENT ISAR

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 DBKTG.P11 MAIN

878	001074	052777	000001	177376		BIS	#1, JSRO	
879	001102	016777	177506	177422	MAP1:	MOV	TBANK, JKPARG	; MAP KERNEL PAGE 2 TO BANK
880	001110	005737	041000			TST	J#41000	; 1ST K PRESENT
881	001114	005737	045000			TST	J#45000	; 2ND K PRESENT
882	001120	005737	051000			TST	J#51000	; 3RD K PRESENT
883	001124	005737	055000			TST	J#55000	; 4TH K PRESENT
884	001130	000404				BR	MOVEPT	; OK, FULL 4K BLOCK PRESENT
885	001132	046777	177452	177452	TMEMEX:	BIC	COREPT, JMEMUT	; NO, BLOCK NOT PRESENT
886	001140	022626				CMP	(SP)+, (SP)+	; ADJUST STACK POINTER
887	001142	062767	000200	177444	MOVEPT:	ADD	#200, TBANK	; UPDATE BANK POINTER
888	001150	006367	177434			ASL	COREPT	
889	001154	103006				BCC	MAP2	; THIS 1ST MEM WORD DONE
890	001156	012767	000001	177424		MOV	#1, COREPT	
891	001164	012767	000606	177420		MOV	#MEM1, MEMUT	
892	001172	022767	007600	177414	MAP2:	CMP	#7600, TBANK	; EXTERNAL BANK YET
893	001200	001340				BNE	MAP1	; NO, NOT YET?
894	001202	012767	000001	177400		MOV	#1, COREPT	; RE-INIT
895	001210	012767	000604	177374		MOV	#MEM0, MEMUT	
896	001216	042777	000001	177254		BIC	#1, JSRO	
897	001224	012767	000001	013502		MOV	#1, ICOUNT	
898	001232	004767	015344			JSR	%7, CRLF	
899	001236	012737	014642	000034		MOV	#SCOPEC, J#34	
900	001244	005037	000036			CLR	J#36	; INITIALIZE SCOPE CALL TO KERNEL STATUS
901	001250	012737	015050	000030		MOV	#EMTSRV, J#30	
902	001256	012737	000340	000032		MOV	#340, J#32	
903	001264	012737	005452	014740		MOV	#BEGIN, J#RETURN	
904	001272	005037	014736			CLR	J#SCOPEF	
905	001276	012737	000340	177776		MOV	#340, J#PSR	; LOCK OUT INTERRUPTS
906	001304	005037	016352			CLR	J#PRTON	; PRINT ROUTINE BUSY FLAG
907	001310	000005				RESET		
908	001312	012737	002314	000004		MOV	#NODEV, J#4	; RETURN FOR NO DEVICE
909	001320	005037	000006			CLR	J#6	
910	001324	005067	001436			CLR	DATA2	; BASE DATA FOR TTY TELEPRINTER
911	001330	005737	000042			TST	J#42	; ACT 11?
912	001334	001012				BNE	ST3	; YES
913	001336	033727	000550	000001		BIT	J#SREG2, #1	; INHIBIT TTY OUTPUT?
914	001344	001006				BNE	ST3	; YES, GO CHECK NEXT.
915	001346	012777	003000	177040		MOV	#TYOUTR, J#TPVC	; NO, SETUP INTERRUPT VECTOR
916	001354	052777	000100	177026		BIS	#100, J#TCSR	; START TTY OUTPUT
917	001362	012700	000010		ST3:	MOV	#10, R0	
918	001366	032737	000010	000550		BIT	#10, J#SREG2	; INHIBIT RK DISK
919	001374	001026				BNE	ST4	; YES, SKIP OVER
920	001376	005777	177066			TST	J#RKCSR	; PRESENT
921	001402	012777	003376	177064		MOV	#IRK, J#KVC	; SETUP VECTOR RETURNS
922	001410	012777	000240	177060		MOV	#240, J#KST	
923	001416	012767	043503	002014		MOV	#43503, J#KFUNCT	
924	001424	005077	177032			CLR	J#KDAE	; INIT
925	001430	016777	002144	177030		MOV	LLIMIT, J#KBAR	; CORE BASE
926	001436	016777	002140	177020		MOV	WORDCT, J#KWC	; TRANSFER LENGTH
927	001444	116777	001770	177016		MOV#	J#KFUNCT, J#KCSR	
928	001452	006300			ST4:	ASL	R0	
929	001454	033727	000550	000020		BIT	J#SREG2, #20	; INHIBIT LINE CLOCK?
930	001462	001015				BNE	ST5	; YES, GO CK NEXT
931	001464	005777	176736			TST	J#LKCSR	; PRESENT
932	001470	012777	003056	176724		MOV	#LK3, J#KWLVC	
933	001476	012777	000300	176720		MOV	#300, J#KWLST	

934	001504	005067	001442		CLR	TIME	;NO, INITIALIZE COUNT
935	001510	052777	000100	176710	BIS	#100, @LKCSR	;START LINE CLOCK
936	001516	006300			ST5: ASL	RO	
937	001520	033727	000550	000040	BIT	@SREG2, #40	;TEST FOR INHIBITING RF11 DISK
938	001526	001026			BNE	ST6	;SKIP IF SET
939	001530	005777	176714		TST	@RFCSR	;PRESENT?
940	001534	012777	003472	176712	MOV	#IRF, @RFVC	;SET UP TRAP RETURN
941	001542	012777	000240	176706	MOV	#240, @RFST	
942	001550	012767	043503	002020	MOV	#43503, RFFUNCT	;WRITE CHECK/WRITE
943	001556	105277	176670		INCB	@RFCSR	;INITIALIZE DISK-DAR, DAE
944	001562	016777	002014	176654	MOV	WORDCT, @RFWC	;LENGTH OF TRANSFER
945	001570	016777	002004	176650	MOV	LLIMIT, @RFCAR	;CORE ADDRESS OF START OF TRANSFER
946	001576	116777	001774	176644	MOV8	RFFUNCT, @RFCSR	;START RF11 READ OR WRITE
947	001604	006300			ST6: ASL	RO	
948	001606	033727	000550	000100	BIT	@SREG2, #100	;CHECK FOR INHIBITING TC11 DECTAPE
949	001614	001013			BNE	ST7	;SKIP IF SET
950	001616	005777	176732		TST	@TCST	;PRESENT?
951	001622	012777	003612	176734	MOV	#FENDZ, @TCIV	;GO TO END ZONE ON INTERRUPT
952	001630	012777	000300	176730	MOV	#300, @TCSTA	
953	001636	012777	004503	176706	MOV	#R+IE+RB+DO, @TCCM	;START REVERSE READ BLOCK NUMBER
954	001644	006300			ST7: ASL	RO	
955	001646	005737	000042		TST	@#42	;ACT 11?
956	001652	001402			BEQ	15	;YES
957	001654	050037	000550		BIS	RO, @SREG2	
958	001660	033727	000550	000200	15: BIT	@SREG2, #200	;INHIBIT LINE PRINTER?
959	001666	001032			BNE	ST8	;YES, GO CK NEXT
960	001670	005777	176534		TST	@LPCSR	;PRESENT?
961	001674	012737	001754	000004	MOV	#ST8, @#4	;DON'T CHANGE 200 IF NO SUCH DEVICE
962	001702	012767	000137	001246	MOV	#137, SOLPAT	;RESET FOR START OF LINE PATTERN
963	001710	012767	000117	001332	MOV	#79, CLINCT	;LINE COUNT
964	001716	012767	000137	001234	MOV	#137, CURPAT	
965	001724	012777	000014	176500	MOV	#14, @LPDBR	;LINE FEED TO POSITION BUFFER
966	001732	012777	003200	176474	MOV	@LPINTR, @LPVC	;INTERRUPT ENABLE
967	001740	012777	000200	176470	MOV	#200, @LPST	;PROCESSOR LEVEL 4
968	001746	012777	000100	176454	MOV	#100, @LPCSR	;INTERRUPT ENABLE
969	001754	005037	000602		ST8: CLR	@TRPB	;NO "T" BIT FIRST PASS
970	001760	005037	000006		CLR	@#6	;CHANGE ADDRESS ERROR VECTOR TO CAUSE
971	001764	012737	000006	000004	MOV	#6, @#4	;HALT ON A TRAP TO 4
972	001772	004737	016676		JSR	%7, @USER	;FOR USER I/O PROGRAM INSERTION
973	001776	004767	000332		JSR	%7, DET1	;CHECK FOR CORE EXPANSION
974	002002	032737	000001	000546	BIT	#1, @SREG1	;INHIBIT KT11-0?
975	002010	001106			BNE	MODE	;YES - GO SETUP USER
976	002012	004767	012770		JSR	%7, NRALL	;NO - MAKE ALL SEGMENTS INITIALLY NON-RESIDENT
977	002016	012777	077406	176500	MOV	#77406, @KPDR7	
978	002024	012777	007600	176502	MOV	#7600, @KPAR7	
979	002032	032737	000006	000546	BIT	#6, @SREG1	;INHIBIT USER/KERNEL OR 4K AS 32K?
980	002040	001415			BEQ	SEGM1	;NO - BRANCH
981	002042	012701	000007		MOV	#7 R1	;YES - MAP KERNEL ASR'S 0-6 TO PA
982	002046	016702	176454		MOV	KPAR0, R2	
983	002052	005003			CLR	R3	
984	002054	010312			SETEX: MOV	R3, @R2	
985	002056	012762	077406	177740	MOV	#77406, -40(R2)	
986	002064	005722			TST	(R2)+	
987	002066	062703	000200		ADD	#200, R3	
988	002072	077110			SOB	R1, SETEX	
989	002074	012777	077406	176414	SEGM1: MOV	#77406, @KPDRO	;MAP KERNEL 0 TO BANK 0, RW

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990 002102 032737 000004 000546 BIT #4,2#SREG1 ;INHIBIT RUNNING 4K AS 32K?
991 002110 001416 BEQ USEALL ;NO, SETUP FOR RUNNING 4K AS 32K
992 002112 012701 000010 MOV #10,R1 ;YES, MAP ALL USER ASR'S TO PA
993 002116 016702 176366 MOV UPARO,R2
994 002122 005003 CLR R3
995 002124 010312 SETUSE: MOV R3,(R2)
996 002126 062703 000200 ADD #200,R3
997 002132 012762 077406 177740 MOV #77406,-40(R2)
998 002140 005722 TST (R2)+
999 002142 077110 SOB R1,SETUSE
1000 002144 000425 BR SETSEG
1001 002146 012777 077406 176326 USEALL: MOV #77406,2UPDRO ;MAP USER ASRO TO BANK 0, RW
1002 002154 012737 000000 000570 MOV #0,2#CURBNK ;CURRENT SAR CONTENTS
1003 002162 012767 000001 176420 MOV #1,COREPT ;INIT MAP POINTERS
1004 002170 012767 000604 176414 MOV #MEMO,MEMUT
1005 002176 016767 176306 176370 MOV UPARO,CURPAR ;CURRENT SEGMENT REGISTER ADDRESSES
1006 002204 016767 176272 176364 MOV UPDRO,CURPDR
1007 002212 012767 005452 176360 MOV #BEGIN,BNKSTR ;CURRENT STARTING PC
1008 002220 052777 000001 176252 SETSEG: BIS #1,2SR0 ;SET KT11-D BIT
1009 002226 042737 000340 177776 MODE: BIC #340,2#PSR ;PRIORITY LEVEL 0
1010 002234 032737 000002 000546 BIT #2,2#SREG1 ;INHIBIT USER/KERNEL?
1011 002242 001016 BNE MAIN+2 ;YES - SKIP OVER
1012 002244 052737 140000 000036 BIS #140000,2#36 ;SET USER BIT IN SCOPE STATUS
1013 002252 012746 000400 MOV #UBUFF,-(R6)
1014 002256 052737 030000 177776 BIS #30000,2#PSR
1015 002264 006606 MTP1 SP ;SET UP USER STACK
1016 002266 012737 140000 177776 MOV #140000,2#PSR ;CHANGE TO USER
1017 002274 000401 BR .+4
1018 002276 000001 MAIN: WAIT
1019 002300 033727 000550 002000 BIT 2#SREG2,#2000 ;INHIBIT PROCESSOR TEST
1020 002306 001373 BNE MAIN
1021 002310 000167 003136 JMP BEGIN
1022
1023 ;NON-EXISTING DEVICE SERVICE
1024 002314 050337 000550 NODEV: BIS R0,2#SREG2 ;SET INHIBIT BIT
1025 002320 162716 000006 SUB #6,(SP) ;ALTER PC RETURN
1026 002324 042766 000017 000002 BIC #17,2(SP) ;CLEAR Z BIT ON STACK
1027 002332 000002 RTI
1028
1029 ;PDP-11 MEMORY DETERMINATION AND SETUP/
1030 ;USE WITH VARIABLE CORE QUANTITY SYSTEMS/
1031 002334 012767 104010 012236 DET1: MOV #EOB,DONE ;RESTORE INITIAL CODE
1032 002342 032767 000007 176176 BIT #7,SREG1 ;INHIBIT RUNNING 4K AS 32K USER?
1033 ;OR INHIBIT SEGMENTATION?
1034 002350 001001 BNE .+4 ;YES - ALLOW CORE EXPANSION
1035 002352 000207 RTS %7 ;NO - INHIBIT CORE EXPANSION
1036 002354 032737 000040 000546 BIT #40,2#SREG1 ;CHECK VARIABLE CORE SWITCH
1037 002362 001401 BEQ DET4 ;USE VARIABLE CORE ROUTINE
1038 002364 000207 RTS %7 ;4K ONLY (SWITCH SET)
1039 002366 012737 002452 000004 DET4: MOV #DET2,2#4 ;TRAP VECTOR SETUP
1040 002374 012737 000340 000006 MOV #340,2#6 ;TRAP STATUS SETUP
1041 002402 000241 CLC
1042 002404 005537 037770 EIGHT: ADC 2#37770 ;CHECK FOR 8K
1043 002410 000240 NOP
1044 002412 005537 057770 ADC 2#57770 ;CHECK FOR 12K
1045 002416 000240 NOP

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1046	002420	005537	077770		RUC	Q#077770	;CHECK FOR 16K
1047	002424	000240			NOP		
1048	002426	005537	117770		ADC	Q#117770	;CHECK FOR 20K
1049	002432	000240			NOP		
1050	002434	005537	137770		ADC	Q#137770	;CHECK FOR 24K
1051	002440	000240			NOP		
1052	002442	005537	157770		ADC	Q#157770	;CHECK FOR 28K
1053	002446	000240			NOP		
1054	002450	000437			BR	STRT28	
1055	002452	012602		DET2:	MOV	(6)+,%2	;RETRIEVE TRAP PC
1056	002454	005726			TST	(6)+	;DISCARD TRAP STATUS WORD
1057	002456	062702	000074		ADD	#STRT4-EIGHT-4,R2	
1058	002462	000112			JMP	QR2	
1059							
1060	002464	005000		MOVE:	CLR	%0	;SET UP MAIN CORE POINTER
1061	002466	010102			MOV	%1,%2	
1062	002470	062702	015006		ADD	#0+2,%2	;SET UP MAX CORE MOVE
1063	002474	012021			MOV	(0)+,(1)+	;MOVE WORD
1064	002476	020201			CMP	%2,%1	;MOVE COMPLETE?
1065	002500	001375			BNE	-4	;MOVE ANOTHER WORD
1066	002502	000207			RTS	%7	;MOVE COMPLETE
1067	002504	000521		STRT4:	BR	DET3	
1068	002506	000240			NOP		
1069	002510	000240			NOP		
1070	002512	004767	000110		JSR	%7,XFER8	;START 8K TRANSFER
1071	002516	000506			BR	MOD4	;START 4K MODIFY
1072	002520	004767	000072		JSR	%7,XFER12	;START 12K TRANSFER
1073	002524	000475			BR	MOD8	;START 8K MODIFY
1074	002526	004767	000054		JSR	%7,XFER16	;START 16K TRANSFER
1075	002532	000464			BR	MOD12	;START 12K MODIFY
1076	002534	004767	000036		JSR	%7,XFER20	;START 20K TRANSFER
1077	002540	000453			BR	MOD16	;START 16K MODIFY
1078	002542	004767	000020		JSR	%7,XFER24	;START 24K TRANSFER
1079	002546	000442			BR	MOD20	;START 20K MODIFY
1080	002550	004767	000002	STRT28:	JSR	%7,XFER28	;START 28K TRANSFER
1081	002554	000431			BR	MOD24	;START 24K MODIFY
1082	002556	012701	140000	XFER28:	MOV	#140000,%1	;SET UP MOVE START LOCATION
1083	002562	004767	177676		JSR	%7,MOVE	;GO TO MOVE SUBROUTINE
1084	002566	012701	120000	XFER24:	MOV	#120000,%1	
1085	002572	004767	177666		JSR	%7,MOVE	
1086	002576	012701	100000	XFER20:	MOV	#100000,%1	
1087	002602	004767	177656		JSR	%7,MOVE	
1088	002606	012701	060000	XFER16:	MOV	#60000,%1	
1089	002612	004767	177646		JSR	%7,MOVE	
1090	002616	012701	040000	XFER12:	MOV	#40000,%1	
1091	002622	004767	177636		JSR	%7,MOVE	
1092	002626	012701	020000	XFER8:	MOV	#20000,%1	
1093	002632	004767	177626		JSR	%7,MOVE	
1094	002636	000207			RTS	%7	;RETURN FROM TRANSFERS
1095	002640	012767	000137	131732	MOD24:	MOV	#137,DONE+120000
1096	002646	012767	145420	131726	MOV	#BEGINX+140000,DONE+120002	
1097	002654	012767	000137	111716	MOD20:	MOV	#137,DONE+100000
1098	002662	012767	125420	111712	MOV	#BEGINX+120000,DONE+100002	
1099	002670	012767	000137	071702	MOD16:	MOV	#137,DONE+60000
1100	002676	012767	105420	071676	MOV	#BEGINX+100000,DONE+60002	
1101	002704	012767	000137	051666	MOD12:	MOV	#137,DONE+40000

M02

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1102 002712 012767 065420 051662      MOV      #BEGINX+60000,DONE+40002
1103 002720 012767 000137 031652  MOD8:   MOV      #137,DONE+20000
1104 002726 012767 045420 031646      MOV      #BEGINX+40000,DONE+20002
1105 002734 012767 000137 011636  MOD4:   MOV      #137,DONE
1106 002742 012767 025420 011632      MOV      #BEGINX+20000,DONE+2
1107 002750 005037 000006      DET3:   CLR      @#6
1108 002754 012737 000006 000004      MOV      #6,@#4
1109 002762 000207      RTS      %7
1110
1111      ;TTY TRANSMITTER PRINT VALUES 0 TO 377/
1112 002764 005027 000000      TYOUT:  CLR      #0      ;INITAL DATA
1113      002766      DATA2=-2
1114 002770 016777 177772 175414  TYOUT1: MOV      DATA2,@TTDBR      ;OUTPUT TO DEVICE
1115 002776 000002      RTI      ;RETURN TO MAINLINE**
1116 003000 017767 175404 175412  TYOUTR: MOV      @TTCSR,TTSV
1117 003006 105767 175406      TSTB    TTSAV      ;TEST FOR DONE
1118 003012 100401      BMI     .+4      ;BRANCH IF FLAG FOUND
1119 003014 104006      HLT
1120 003016 005267 177744      INC     DATA2      ;FALSE INTERRUPT RETURN
1121 003022 022767 000400 177736      CMP     #400,DATA2  ;INCREMENT DATA
1122 003030 001755      BEQ     TYOUT      ;TEST DATA FOR UPPER LIMIT
1123 003032 000756      BR     TYOUT1      ;AT UPPER LIMIT START OVER
1124      ;FINISH REST OF DATA
1125      ;TEST OF LINE CLOCK, INTERRUPT FOR 55 SECONDS THEN STALL FOR 5 SECONDS.
1126 003034 005037 003152      LK1:   CLR      @#TIME      ;CLEAR LINE CLOCK TIMER
1127 003040 052777 000100 175360      BIS     #100,@LKCSR
1128 003046 052737 000100 177776      BIS     #100,@#PSR
1129 003054 000002      LK2:   RTI
1130 003056 105777 175344      LK3:   TSTB    @LKCSR
1131 003062 100401      BMI     .+4
1132 003064 104006      HLT      ;FALSE INTERRUPT
1133 003066 042777 000200 175332      BIC     #200,@LKCSR
1134 003074 005237 003152      LK4:   INC     @#TIME      ;HERE ON INTERRUPTS
1135 003100 022737 006344 003152      CMP     #3300.,@#TIME  ;55 SEC YET?
1136 003106 103362      BHIS   LK2      ;BR IF NOT
1137 003110 042777 000100 175310      BIC     #100,@LKCSR
1138 003116 042737 000100 177776      BIC     #100,@#PSR      ;LOWER PRIORITY
1139 003124 022737 007020 003152      CMP     #3600.,@#TIME  ;ONE MINUTE YET
1140 003132 001740      BEQ     LK1      ;YES RESET TIMER
1141 003134 105777 175266      TSTB    @LKCSR      ;NO, SKIP TILL MINUTE UP
1142 003140 100375      BPL     .-4
1143 003142 042777 000200 175256      BIC     #200,@LKCSR      ;CLEAR FLAG
1144 003150 000751      BR     LK4
1145 003152 000000      TIME:  0
1146
1147      ;LINE PRINTER SHOULD RAISE PROCESSOR PRIORITY TO LEVEL OF LINE PRINTER/
1148      ;INTERRUPT VECTOR IS 200/
1149 003154 012727 000000 000000  LP1:   MOV      #0,#0      ;START OF LINE TO CURRENT
1150      003160      CURPAT=-2      ;CHARACTER BEING PRINTED
1151      003156      SOLPAT=-4      ;START OF LINE CHARACTER
1152 003162 016777 177772 175242  LP2:   MOV      CURPAT,@LPDBR  ;CURRENT PATTERN TO LINE PRINTER
1153 003170 105777 175234      TSTB    @LPCSR
1154 003174 100420      BMI     LP6
1155 003176 000002      RTI
1156 003200 105777 175224      LPINTR: TSTB    @LPCSR      ;RETURN TO MAIN LINE
1157 003204 100414      BMI     LP6      ;TEST FOR FLAG
  
```

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1158 003206 005737 000042          TST      @#42          ; MONITOR LOAD
1159 003212 001410          BEQ      LP7          ; NO, ERROR
1160 003214 032777 100000 175206        BIT      @#100000,@LPCSR ; YES, IS ERROR SET
1161 003222 001404          BEQ      LP7          ; NO, ERROR
1162 003224 042777 000100 175176        BIC      @#100,@LPCSR ; DIS ABLE INTERRUPT
1163 003232 000002          RTI
1164 003234 104006          HLT
1165 003236 026727 000006 000117 LP7:    CMP      CLINCT, #79. ; FALSE RETURN FROM MAIN LINE
LP6:    BEQ      LP4          ; TEST FOR END OF LINE
1166 003244 001415          BEQ      LP4          ; GO GENERATE CR/LF
1167 003246 005227 000000          INC      #0          ; INCREMENT LINE POSITION COUNT
1168 003250 003250          CLINCT=-2          ; POSITION OF LINE
1169 003252 026727 177702 000137        CMP      CURPAT, #137 ; TEST FOR MAXIMUM PATTERN
1170 003260 001403          BEQ      LP3          ; YES - GO TO LP3 AND RESET
1171 003262 005267 177672          INC      CURPAT      ; NO - INCREMENT TO NEXT PATTERN
1172 003266 000735          BR       LP2          ; GO SEND IT TO LINE PRINTER
1173 003270 012767 000040 177662 LP3:    MOV      #40,CURPAT ; RESET PATTERN AND SEND TO PRINTER
1174 003276 000731          BR       LP2          ; SENT TO LINE PRINTER
1175 003300 005067 177744          LP4:    CLR      CLINCT      ; RESET LINE COUNT
1176 003304 012777 000012 175120        MOV      #12,@LPDDBR ; LINE FEED
1177 003312 105777 175112          TSTB    @LPCSR
1178 003316 100375          BPL      -4
1179 003320 026727 177632 000137        CMP      SOLPAT, #137 ; START OF LINE PATTERN
1180 003326 001403          BEQ      LP5          ; INCREMENT START OF LINE
1181 003330 005267 177622          INC      SOLPAT
1182 003334 000707          BR       LP1
1183 003336 012767 000040 177612 LP5:    MOV      #40,SOLPAT ; RESET START OF LINE
1184 003344 000703          BR       LP1          ; PRINT
1185
1186          ;RK11 DISK TEST INTERRUPT LEVEL 5, 2000 WORD TRANSFERS
1187 003346 005077 175110          RKSTART: CLR      @RKDAE ; INIT
1188 003352 013777 003607 175106        RK1:    MOV      @#LLIMIT,@RKBAR ; CORE BASE
1189 003360 013777 003602 175076        MOV      @#WORDCT,@PKWC ; TRANSFER LENGTH
1190 003366 113777 003440 175074        MOV      @#RKFUNCT,@RKCSR ; WRITE OR WRITE CK TO DSK
1191 003374 000002          RTI      ; RETURN TO MAINLINE
1192 003376 032777 100200 175064        IRK:    BIT      @#100200,@RKCSR ; INTERRUPT RETURN
1193 003404 003002          BGT      +6
1194 003406 104006          HLT
1195 003410 000756          BR       RKSTART
1196 003412 032777 000037 175042        BIT      #37,@RKDAE ; DISK AT UPPER LIMIT?
1197 003420 001354          BNE      RK1
1198 003422 122777 000031 175030        CMP      #31,@RKDAH
1199 003430 001350          BNE      RK1
1200 003432 000337 003440          SWAB    @#RKFUNCT ; CHANGE COMMAND
1201 003436 000743          BR       RKSTART ; RESTART NEW TRANSFER OF DISK
1202 003440 000000          RKFUNCT: 0
1203
1204          ;RF11 DISK
1205 003442 105277 175004          RFSTART: INCB    @RFCSRH ; INITIALIZE DISK - DAR-DAE
1206 003446 013777 003600 174772        RF1:    MOV      @#LLIMIT,@RFCAR ; CORE BASE
1207 003454 013777 003602 174762        MOV      @#WORDCT,@RFWC ; LENGTH OF TRANSFER
1208 003462 113777 003576 174760        MOV      @#RFFUNCT,@RFCR ; WRITE OR WRITE CHECK TO DISK
1209 003470 000002          RTI      ; RETURN TO MAINLINE CODE
1210 003472 105777 174752          IRF:    TSTB    @RFCR ; INTERRUPT VECTOR POINTS HERE
1211 003476 100402          BMI      +6
1212 003500 104006          HLT
1213 003502 000757          BR       RFSTART

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1214	003504	005777	174740	TST	DRFCSR		; ERROR SET?
1215	003510	100012		BPL	ERROK		; BRANCH IF NOT
1216	003512	032777	020000	BIT	#20000, DRFCSR		; YES-WRITE CHECK ERROR?
1217	003520	001404		BEQ	ERRSET		; NO-BRANCH
1218	003522	104006		HLT			; YES-RF11 WRITE CHECK ERROR
1219	003524	000337	003576	SWAB	DRFFUNCT		; CHANGE COMMAND TO DO WRITE
1220	003530	000744		SR	RFSTART		
1221	003532	104006		ERRSET: HLT			; RF11 ERROR SET-NOT WRITE CHECK
1222	003534	000742		BR	RFSTART		
1223	003536	005777	174702	ERROK: TST	DRFWC		
1224	003542	100002		BPL	.+6		
1225	003544	104006		HLT			; RF-11 WORD COUNT NOT ZERO
1226	003546	000735		BR	RFSTART		
1227	003550	122777	000003	CMPB	#3, DRFDAE		; DISK AT UPPER LIMIT? 7=2, 17=4, 37=8
1228	003556	001333		BNE	RF1		; NO
1229	003560	027727	174656	CMP	DRFDAR, #174000		; AS FAR ON DISK AS WE CAN GO
1230	003566	101727		BLOS	RF1		; NO
1231	003570	000337	003576	SWAB	DRFFUNCT		; CHANGE COMMAND
1232	003574	000722		BR	RFSTART		; RESTART NEW TRANSFER OF DISK
1233	003576	000000		RFFUNCT:	0		; DISK COMMAND
1234	003600	005452		LLIMIT: BEGIN			; FIRST CORE ADDRESS OF TRANSFER
1235	003602	176000		WORDCT: -2000			; LENGTH OF TRANSFER
1236							
1237							
1238							
1239							
1240							
1241							
1242							
1243							
1244							
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1256							
1257							
1258							
1259							
1260							
1261							
1262							
1263							
1264	003604	000000		TCFIRST:	0		; FIRST BLOCK TO BE SEARCHED FOR
1265	003606	001101		TCLAST:	577.		; LAST BLOCK TO BE SEARCHED FOR
1266	003610	000000		TCEXPE:	0		; THE BLOCK THAT IS EXPECTED
1267							
1268							
1269	003612	012777	003612	174744	FENDZ: MOV	#FENDZ, DTCIV	; END ZONE VECTOR SETUP

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:DECTAPE DIAGNOSTIC ROUTINE. THE TAPE 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
:DT11 DEC TAPE
RD=4 ; READ DATA
WD=14 ; WRITE DATA
RB=2
IE=500 ; INTERRUPT ENABLE+UNIT 1
DO=1 ; DO - THE FUNCTION
R=4000 ; REVERSE

```

```

1270 003620 005777 174730          TST      @TCST      ;TEST FOR END ZONE
1271 003624 100403          BMI      FEND1     ;AT END ZONE?
1272 003626 105277 174720          INCB    @TCCM     ;SET DO - NO DELAY
1273 003632 000002          RTI      ;NO - WAIT SOME MORE
1274 003634 012777 003664 174722 FEND1:  MOV     @TCF1,@TCIV ;YES - NEW VECTOR
1275 003642 042777 104000 174702          BIC     @104000,@TCCM ;SEARCH BLOCK FOWARD
1276 003650 016767 177730 177732          MOV     TCFIRST,TCEXPE ;COUNT WHEN THIS BLOCK IS FOUND
1277 003656 105277 174670          TCF1A:  INCB    @TCCM     ;SET DO
1278 003662 000002          RTI      ;RETURN ON NEXT BLOCK
1279 003664 032777 100200 174660 TCF1:   BIT      @100200,@TCCM ;ANY ERROR ON READ?
1280 003672 100001          BPL     .+4
1281 003674 104006          HLT     ;TC ERROR SET - FORWARD READ BLOCK
1282 003676 001001          BNE     .+4      ;DONE FLAG UP?
1283 003700 104006          HLT     ;FALSE INTERRUPT
1284 003702 027767 174650 177700          CMP     @TCDT,TCEXPE ;IS THIS OUR BLOCK FOR SYNC
1285 003710 002762          BLT     TCF1A    ;NO-READ SOME MORE BLOCKS
1286 003712 001401          BEQ     TCF2     ;YES
1287 003714 104006          HLT     ;WE PASSED THE BLOCK
1288
1289 003716 012777 003732 174640 TCF2:   MOV     @TCF3,@TCIV ;VECTOR FOR SEQUENTIAL READS
1290 003724 105277 174622          INCB    @TCCM     ;SET DO
1291 003730 000002          RTI      ;RETURN AND TEST SEQUENTIAL BLOCKS
1292
1293          ;FIND SEQUENTIAL BLOCK AT FOWARD DIRECTION
1294 003732 032777 100200 174612 TCF3:   BIT      @100200,@TCCM ;TEST ERROR AND READY
1295 003740 100001          BPL     .+4
1296 003742 104006          HLT     ;FOWARD READ ERROR TC-11
1297 003744 001001          BNE     .+4
1298 003746 104006          HLT     ;FALSE INTERRUPT ON TC-11
1299 003750 027767 174602 177630          CMP     @TCDT,TCLAST ;HAVE WE TESTED ALL BLOCKS
1300 003756 001414          BEQ     REN0Z    ;YES DRIVE UNIT IN END ZONE TO START OVER
1301 003760 005267 177624          INC     TCXPE    ;NO-INCREMENT EXPECTED COUNT
1302 003764 027767 174566 177616          CMP     @TCDT,TCXPE ;IS CURRENT BLOCK CORRECT
1303 003772 001401          BEQ     .+4
1304 003774 104006          HLT     ;FAILED IN FOWARD READ TO FIND NEXT BLOCK
1305 003776 000427          BR     TCWBK    ;THIS ROUTINE WRITES A BLOCK
1306 004000 105277 174546          TCF4:   INCB    @TCCM     ;SET DO
1307 004004 000002          RTI
1308 004006 000701          XFENDZ: BR     FENDZ    ;INDIRECT LINK
1309
1310          ;MOVE TAPE TO REVERSE END ZONE
1311 004010 012777 004010 174546 REN0Z:  MOV     @REN0Z,@TCIV ;END ZONE VECTOR SETUP
1312 004016 016767 177564 177564          MOV     TCLAST,TCXPE ;SET UP FOR REVERSE SEARCH
1313 004024 005777 174524          TST     @TCST    ;IN END ZONE
1314 004030 100403          BMI     REN01    ;YES - START TO TURN UNIT AROUND
1315 004032 105277 174514          INCB    @TCCM     ;SET DO
1316 004036 000002          RTI      ;NO - WAIT TILL WE ARE
1317 004040 012777 004503 174504 REN01:  MOV     @R+IE+RB+DO,@TCCM ;FUNCTION = READ BLOCK, REVERSE AND GO
1318 004046 012777 004136 174510          MOV     @TCR1,@TCIV ;SET UP NEW INTERRUPT VECTOR
1319 004054 000002          RTI
1320          ;WRITE FORWARD ALL BLOCKS EXCEPT 0
1321
1322 004056 012777 004110 174500 TCWBK:  MOV     @TCWB1,@TCIV ;INTERRUPT VECTOR FOR WRITE
1323 004064 012777 177400 174466          MOV     @-400,@TCWC ;ONE BLOCK
1324 004072 012777 004420 174462          MOV     @TCWBUF,@TCBA ;THE WRITE BUFFER ADDRESS
1325 004100 012777 000515 174444          MOV     @IE+WD+DO,@TCCM ;WRITE THE BLOCK

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1326 004106 000002          RTI          ;RETURN WHEN BLOCK IS WRITTEN
1327 004110 005777 174436    TCWB1:  TST      @TCCM      ;ANY ERRORS
1328 004114 100001          BPL      .+4
1329 004116 104006          HLT
1330 004120 012777 003732 174436    MOV      @TCF3,@TCIV      ;SEARCH BLOCK VECTOR
1331 004126 112777 000502 174416    MOV      @IE+RB,@TCCM     ;READ BLOCK
1332 004134 000721          BR       TCF4             ;FIND THE NEXT BLOCK
1333
1334 004136 032777 100200 174406    TCR1:  BIT      @100200,@TCCM ;TEST FOR ERROR AND READY
1335 004144 100001          BPL      .+4
1336 004146 104006          HLT
1337 004150 001001          BNE      .+4             ;DECTAPE ERROR ON READ BLOCK REVERSE
1338 004152 104006          HLT
1339 004154 027767 174376 177426    CMP      @TCDT,TCEXPE     ;FALSE INTERRUPT FROM DECTAPE
1340 004162 001406          BEQ      TCR2             ;IS IT OUR FIRST BLOCK
1341 004164 002002          BGE      TCR1A           ;YES - GO TEST THE REST
1342 004166 104006          HLT
1343 004170 000707          BR       RENDZ           ;NO - HAVE WE PASSED THE BLOCK
1344 004172 105277 174354    TCR1A: INCB     @TCCM      ;WE PASS OUR BLOCK
1345 004176 000002          RTI          ;GO TO END ZONE AND TRY AGAIN
1346 004200 012777 004214 174356    TCR2:  MOV      @TCR3,@TCIV ;SET DO
1347 004206 105277 174340    INCB     @TCCM          ;WE FOUND OUR FIRST BLOCK
1348 004212 000002          RTI          ;SET UP INTERRUPT TO TEST ALL BLOCKS
1349
1350          ;FIND SEQUENTIAL BLOCK IN REVERSE DIRECTION
1351 004214 032777 100200 174330    TCR3:  BIT      @100200,@TCCM ;TEST FOR READ AND ERROR
1352 004222 100001          BPL      .+4
1353 004224 104006          HLT
1354 004226 001001          BNE      .+4             ;ERROR READING SEQUENTIAL BLOCK IN REVERSE
1355 004230 104006          HLT
1356 004232 026777 177346 174316    CMP      TCFIRST,@TCDT   ;FALSE DECTAPE INTERRUPT
1357 004240 001662          BEQ      XFENDZ          ;DID WE DO ALL THE BLOCKS
1358 004242 005367 177342          DEC      TCXPE           ;YES - GO TO END ZONE TO RESTART
1359 004246 027767 174304 177334    CMP      @TCDT,TCXPE     ;NO - DECREMENT BLOCK NUMBER
1360 004254 001401          BEQ      .+4             ;TEST SEQUENTIAL BLOCK IN REVERSE
1361 004256 104006          HLT
1362 004260 000403          BR       TCRBK          ;TEST SEQUENTIAL READ BLOCK IN REVERSE FAILED
1363 004262 105277 174264    TCR4:  INCB     @TCCM      ;THIS ROUTINE READ A BLOCK
1364 004266 000002          RTI          ;SET DO
1365
1366          ;READ REVERSE ALL BLOCK EXCEPT BLOCK 1101
1367 004270 012777 004326 174266    TCRBK: MOV      @TCRB1,@TCIV ;SET UP INTERRUPT VECTOR
1368 004276 012777 177400 174254    MOV      @-400,@TCWC     ;READ ONE BLOCK
1369 004304 012777 004420 174250    MOV      @TCRBUF,@TCBA  ;WHERE BUFFER IS
1370 004312 112777 000505 174232    MOV      @IE+RD+DO,@TCCM ;READ THE BLOCK
1371 004320 004767 000030          JSR      %7,TC1         ;CHECK DATA BUFFER
1372 004324 000002          RTI          ;EXIT - RETURN WHEN BLOCK IS READ
1373 004326 005777 174220    TCRB1: TST      @TCCM      ;AND ERRORS
1374 004332 100001          BPL      .+4
1375 004334 104006          HLT
1376 004336 012777 004214 174220    MOV      @TCR3,@TCIV     ;DECTAPE ERROR
1377 004344 112777 000502 174200    MOV      @IE+RB,@TCCM   ;NEW VECTOR FOR BLOCK SEARCH
1378 004352 000743          BR       TCR4           ;READ BLOCK FUNCTION
1379
1380          ;THIS ROUTINE CHECKS THE READ DATA BUFFER TC11
1381          ;BY DOING A CHECK SUM ON THE DATA

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1382 004354 010146          TC1:  MOV    %1,-(6)      ;SAVE THESE ON THE STACK
1383 004356 010246          MOV    %2,-(6)
1384 004360 010346          MOV    %3,-(6)
1385 004362 005003          CLR    %3              ;SUM OF DATA
1386 004364 012701 004420     MOV    #TCRBUF,%1      ;ADDRESS OF READ BUFFER
1387 004370 012702 005420     MOV    #TCRBUF+1000,%2 ;END OF READ BUFFER
1388 004374 062103          TC2:  ADD    (1)+,%3      ;EVEN ADD
1389 004376 062103          ADD    (1)+,%3        ;ODD ADD -2'S COMPLIMENT
1390 004400 001401          BEQ    .+4
1391 004402 104006          HLT
1392 004404 020102          CMP    %1,%2          ;DATA ERROR TC-11
1393 004406 001372          BNE    TC2            ;AT END OF BUFFER?
1394 004410 012603          MOV    (6)+,%3        ;NO - SUM THE REST
1395 004412 012602          MOV    (6)+,%2        ;RESTORE THE REGISTERS
1396 004414 012601          MOV    (6)+,%1
1397 004416 000207          RTS    %7             ;EXIT
  
```

: THIS WRITE BUFFER LOOK THE SAME FORWARD OR REVERSE

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1400 004420          †CWBUF:
1401 004420          TCRBUF:
1402          000001      N=1
1403 004420 000001      N              ;DECTAPE WRITE BUFFER
1404 004422 177777      -N
1405          000002      N=N+1
1406 004424 000002      N              ;DECTAPE WRITE BUFFER
1407 004426 177776      -N
1408          000003      N=N+1
1409 004430 000003      N              ;DECTAPE WRITE BUFFER
1410 004432 177775      -N
1411          000004      N=N+1
1412 004434 000004      N              ;DECTAPE WRITE BUFFER
1413 004436 177774      -N
1414          000005      N=N+1
1415 004440 000005      N              ;DECTAPE WRITE BUFFER
1416 004442 177773      -N
1417          000006      N=N+1
1418 004444 000006      N              ;DECTAPE WRITE BUFFER
1419 004446 177772      -N
1420          000007      N=N+1
1421 004450 000007      N              ;DECTAPE WRITE BUFFER
1422 004452 177771      -N
1423          000010      N=N+1
1424 004454 000010      N              ;DECTAPE WRITE BUFFER
1425 004456 177770      -N
1426          000011      N=N+1
1427 004458 000011      N              ;DECTAPE WRITE BUFFER
1428 004462 177767      -N
1429          000012      N=N+1
1430 004464 000012      N              ;DECTAPE WRITE BUFFER
1431 004466 177766      -N
1432          000013      N=N+1
1433 004470 000013      N              ;DECTAPE WRITE BUFFER
1434 004472 177765      -N
1435          000014      N=N+1
1436 004474 000014      N              ;DECTAPE WRITE BUFFER
1437 004476 177764      -N
  
```

1438		000015	N=N+1	
1439	004500	000015	N	;DECTAPE WRITE BUFFER
1440	004502	177762	-N	
1441		000016	N=N+1	
1442	004504	000016	N	;DECTAPE WRITE BUFFER
1443	004506	177762	-N	
1444		000017	N=N+1	
1445	004510	000017	N	;DECTAPE WRITE BUFFER
1446	004512	177761	-N	
1447		000020	N=N+1	
1448	004514	000020	N	;DECTAPE WRITE BUFFER
1449	004516	177760	-N	
1450		000021	N=N+1	
1451	004520	000021	N	;DECTAPE WRITE BUFFER
1452	004522	177757	-N	
1453		000022	N=N+1	
1454	004524	000022	N	;DECTAPE WRITE BUFFER
1455	004526	177756	-N	
1456		000023	N=N+1	
1457	004530	000023	N	;DECTAPE WRITE BUFFER
1458	004532	177755	-N	
1459		000024	N=N+1	
1460	004534	000024	N	;DECTAPE WRITE BUFFER
1461	004536	177754	-N	
1462		000025	N=N+1	
1463	004540	000025	N	;DECTAPE WRITE BUFFER
1464	004542	177753	-N	
1465		000026	N=N+1	
1466	004544	000026	N	;DECTAPE WRITE BUFFER
1467	004546	177752	-N	
1468		000027	N=N+1	
1469	004550	000027	N	;DECTAPE WRITE BUFFER
1470	004552	177751	-N	
1471		000030	N=N+1	
1472	004554	000030	N	;DECTAPE WRITE BUFFER
1473	004556	177750	-N	
1474		000031	N=N+1	
1475	004560	000031	N	;DECTAPE WRITE BUFFER
1476	004562	177747	-N	
1477		000032	N=N+1	
1478	004564	000032	N	;DECTAPE WRITE BUFFER
1479	004566	177746	-N	
1480		000033	N=N+1	
1481	004570	000033	N	;DECTAPE WRITE BUFFER
1482	004572	177745	-N	
1483		000034	N=N+1	
1484	004574	000034	N	;DECTAPE WRITE BUFFER
1485	004576	177744	-N	
1486		000035	N=N+1	
1487	004600	000035	N	;DECTAPE WRITE BUFFER
1488	004602	177743	-N	
1489		000036	N=N+1	
1490	004604	000036	N	;DECTAPE WRITE BUFFER
1491	004606	177742	-N	
1492		000037	N=N+1	
1493	004610	000037	N	;DECTAPE WRITE BUFFER

1494	004612	177741	-N	
1495		000040	N=N+1	
1496	004614	000040	N	;DECTAPE WRITE BUFFER
1497	004616	177740	-N	
1498		000041	N=N+1	
1499	004620	000041	N	;DECTAPE WRITE BUFFER
1500	004622	177737	-N	
1501		000042	N=N+1	
1502	004624	000042	N	;DECTAPE WRITE BUFFER
1503	004626	177736	-N	
1504		000043	N=N+1	
1505	004630	000043	N	;DECTAPE WRITE BUFFER
1506	004632	177735	-N	
1507		000044	N=N+1	
1508	004634	000044	N	;DECTAPE WRITE BUFFER
1509	004636	177734	-N	
1510		000045	N=N+1	
1511	004640	000045	N	;DECTAPE WRITE BUFFER
1512	004642	177733	-N	
1513		000046	N=N+1	
1514	004644	000046	N	;DECTAPE WRITE BUFFER
1515	004646	177732	-N	
1516		000047	N=N+1	
1517	004650	000047	N	;DECTAPE WRITE BUFFER
1518	004652	177731	-N	
1519		000050	N=N+1	
1520	004654	000050	N	;DECTAPE WRITE BUFFER
1521	004656	177730	-N	
1522		000051	N=N+1	
1523	004660	000051	N	;DECTAPE WRITE BUFFER
1524	004662	177727	-N	
1525		000052	N=N+1	
1526	004664	000052	N	;DECTAPE WRITE BUFFER
1527	004666	177726	-N	
1528		000053	N=N+1	
1529	004670	000053	N	;DECTAPE WRITE BUFFER
1530	004672	177725	-N	
1531		000054	N=N+1	
1532	004674	000054	N	;DECTAPE WRITE BUFFER
1533	004676	177724	-N	
1534		000055	N=N+1	
1535	004700	000055	N	;DECTAPE WRITE BUFFER
1536	004702	177723	-N	
1537		000056	N=N+1	
1538	004704	000056	N	;DECTAPE WRITE BUFFER
1539	004706	177722	-N	
1540		000057	N=N+1	
1541	004710	000057	N	;DECTAPE WRITE BUFFER
1542	004712	177721	-N	
1543		000060	N=N+1	
1544	004714	000060	N	;DECTAPE WRITE BUFFER
1545	004716	177720	-N	
1546		000061	N=N+1	
1547	004720	000061	N	;DECTAPE WRITE BUFFER
1548	004722	177717	-N	
1549		000062	N=N+1	

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1550	004724	000062	N	;DECTAPE WRITE BUFFER
1551	004726	177716	-N	
1552		000063	N=N+1	
1553	004730	000063	N	;DECTAPE WRITE BUFFER
1554	004732	177715	-N	
1555		000064	N=N+1	
1556	004734	000064	N	;DECTAPE WRITE BUFFER
1557	004736	177714	-N	
1558		000065	N=N+1	
1559	004740	000065	N	;DECTAPE WRITE BUFFER
1560	004742	177713	-N	
1561		000066	N=N+1	
1562	004744	000066	N	;DECTAPE WRITE BUFFER
1563	004746	177712	-N	
1564		000067	N=N+1	
1565	004750	000067	N	;DECTAPE WRITE BUFFER
1566	004752	177711	-N	
1567		000070	N=N+1	
1568	004754	000070	N	;DECTAPE WRITE BUFFER
1569	004756	177710	-N	
1570		000071	N=N+1	
1571	004760	000071	N	;DECTAPE WRITE BUFFER
1572	004762	177707	-N	
1573		000072	N=N+1	
1574	004764	000072	N	;DECTAPE WRITE BUFFER
1575	004766	177706	-N	
1576		000073	N=N+1	
1577	004770	000073	N	;DECTAPE WRITE BUFFER
1578	004772	177705	-N	
1579		000074	N=N+1	
1580	004774	000074	N	;DECTAPE WRITE BUFFER
1581	004776	177704	-N	
1582		000075	N=N+1	
1583	005000	000075	N	;DECTAPE WRITE BUFFER
1584	005002	177703	-N	
1585		000076	N=N+1	
1586	005004	000076	N	;DECTAPE WRITE BUFFER
1587	005006	177702	-N	
1588		000077	N=N+1	
1589	005010	000077	N	;DECTAPE WRITE BUFFER
1590	005012	177701	-N	
1591		000100	N=N+1	
1592	005014	000100	N	;DECTAPE WRITE BUFFER
1593	005016	177700	-N	
1594		000101	N=N+1	
1595		000100	N=N-1	
1596	005020	177700	-N	
1597	005022	000100	N	;DEC TAPE WRITE BUFFER
1598		000077	N=N-1	
1599	005024	177701	-N	
1600	005026	000077	N	;DEC TAPE WRITE BUFFER
1601		000076	N=N-1	
1602	005030	177702	-N	
1603	005032	000076	N	;DEC TAPE WRITE BUFFER
1604		000075	N=N-1	
1605	005034	177703	-N	

1606	005036	000075	N	;DEC TAPE WRITE BUFFER
1607		000074	N=N-1	
1608	005040	177704	-N	
1609	005042	000074	N	;DEC TAPE WRITE BUFFER
1610		000073	N=N-1	
1611	005044	177705	-N	
1612	005046	000073	N	;DEC TAPE WRITE BUFFER
1613		000072	N=N-1	
1614	005050	177706	-N	
1615	005052	000072	N	;DEC TAPE WRITE BUFFER
1616		000071	N=N-1	
1617	005054	177707	-N	
1618	005056	000071	N	;DEC TAPE WRITE BUFFER
1619		000070	N=N-1	
1620	005060	177710	-N	
1621	005062	000070	N	;DEC TAPE WRITE BUFFER
1622		000067	N=N-1	
1623	005064	177711	-N	
1624	005066	000067	N	;DEC TAPE WRITE BUFFER
1625		000066	N=N-1	
1626	005070	177712	-N	
1627	005072	000066	N	;DEC TAPE WRITE BUFFER
1628		000065	N=N-1	
1629	005074	177713	-N	
1630	005076	000065	N	;DEC TAPE WRITE BUFFER
1631		000064	N=N-1	
1632	005100	177714	-N	
1633	005102	000064	N	;DEC TAPE WRITE BUFFER
1634		000063	N=N-1	
1635	005104	177715	-N	
1636	005106	000063	N	;DEC TAPE WRITE BUFFER
1637		000062	N=N-1	
1638	005110	177716	-N	
1639	005112	000062	N	;DEC TAPE WRITE BUFFER
1640		000061	N=N-1	
1641	005114	177717	-N	
1642	005116	000061	N	;DEC TAPE WRITE BUFFER
1643		000060	N=N-1	
1644	005120	177720	-N	
1645	005122	000060	N	;DEC TAPE WRITE BUFFER
1646		000057	N=N-1	
1647	005124	177721	-N	
1648	005126	000057	N	;DEC TAPE WRITE BUFFER
1649		000056	N=N-1	
1650	005130	177722	-N	
1651	005132	000056	N	;DEC TAPE WRITE BUFFER
1652		000055	N=N-1	
1653	005134	177723	-N	
1654	005136	000055	N	;DEC TAPE WRITE BUFFER
1655		000054	N=N-1	
1656	005140	177724	-N	
1657	005142	000054	N	;DEC TAPE WRITE BUFFER
1658		000053	N=N-1	
1659	005144	177725	-N	
1660	005146	000053	N	;DEC TAPE WRITE BUFFER
1661		000052	N=N-1	

1662	005150	177726	-N	
1663	005152	000052	N	;DEC TAPE WRITE BUFFER
1664		000051	N=N-1	
1665	005154	177727	-N	
1666	005156	000051	N	;DEC TAPE WRITE BUFFER
1667		000050	N=N-1	
1668	005160	177730	-N	
1669	005162	000050	N	;DEC TAPE WRITE BUFFER
1670		000047	N=N-1	
1671	005164	177731	-N	
1672	005166	000047	N	;DEC TAPE WRITE BUFFER
1673		000046	N=N-1	
1674	005170	177732	-N	
1675	005172	000046	N	;DEC TAPE WRITE BUFFER
1676		000045	N=N-1	
1677	005174	177733	-N	
1678	005176	000045	N	;DEC TAPE WRITE BUFFER
1679		000044	N=N-1	
1680	005200	177734	-N	
1681	005202	000044	N	;DEC TAPE WRITE BUFFER
1682		000043	N=N-1	
1683	005204	177735	-N	
1684	005206	000043	N	;DEC TAPE WRITE BUFFER
1685		000042	N=N-1	
1686	005210	177736	-N	
1687	005212	000042	N	;DEC TAPE WRITE BUFFER
1688		000041	N=N-1	
1689	005214	177737	-N	
1690	005216	000041	N	;DEC TAPE WRITE BUFFER
1691		000040	N=N-1	
1692	005220	177740	-N	
1693	005222	000040	N	;DEC TAPE WRITE BUFFER
1694		000037	N=N-1	
1695	005224	177741	-N	
1696	005226	000037	N	;DEC TAPE WRITE BUFFER
1697		000036	N=N-1	
1698	005230	177742	-N	
1699	005232	000036	N	;DEC TAPE WRITE BUFFER
1700		000035	N=N-1	
1701	005234	177743	-N	
1702	005236	000035	N	;DEC TAPE WRITE BUFFER
1703		000034	N=N-1	
1704	005240	177744	-N	
1705	005242	000034	N	;DEC TAPE WRITE BUFFER
1706		000033	N=N-1	
1707	005244	177745	-N	
1708	005246	000033	N	;DEC TAPE WRITE BUFFER
1709		000032	N=N-1	
1710	005250	177746	-N	
1711	005252	000032	N	;DEC TAPE WRITE BUFFER
1712		000031	N=N-1	
1713	005254	177747	-N	
1714	005256	000031	N	;DEC TAPE WRITE BUFFER
1715		000030	N=N-1	
1716	005260	177750	-N	
1717	005262	000030	N	;DEC TAPE WRITE BUFFER

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1718		000027	N=N-1	
1719	005264	177751	-N	
1720	005266	000027	N	;DEC TAPE WRITE BUFFER
1721		000026	N=N-1	
1722	005270	177752	-N	
1723	005272	000026	N	;DEC TAPE WRITE BUFFER
1724		000025	N=N-1	
1725	005274	177753	-N	
1726	005276	000025	N	;DEC TAPE WRITE BUFFER
1727		000024	N=N-1	
1728	005300	177754	-N	
1729	005302	000024	N	;DEC TAPE WRITE BUFFER
1730		000023	N=N-1	
1731	005304	177755	-N	
1732	005306	000023	N	;DEC TAPE WRITE BUFFER
1733		000022	N=N-1	
1734	005310	177756	-N	
1735	005312	000022	N	;DEC TAPE WRITE BUFFER
1736		000021	N=N-1	
1737	005314	177757	-N	
1738	005316	000021	N	;DEC TAPE WRITE BUFFER
1739		000020	N=N-1	
1740	005320	177760	-N	
1741	005322	000020	N	;DEC TAPE WRITE BUFFER
1742		000017	N=N-1	
1743	005324	177761	-N	
1744	005326	000017	N	;DEC TAPE WRITE BUFFER
1745		000016	N=N-1	
1746	005330	177762	-N	
1747	005332	000016	N	;DEC TAPE WRITE BUFFER
1748		000015	N=N-1	
1749	005334	177763	-N	
1750	005336	000015	N	;DEC TAPE WRITE BUFFER
1751		000014	N=N-1	
1752	005340	177764	-N	
1753	005342	000014	N	;DEC TAPE WRITE BUFFER
1754		000013	N=N-1	
1755	005344	177765	-N	
1756	005346	000013	N	;DEC TAPE WRITE BUFFER
1757		000012	N=N-1	
1758	005350	177766	-N	
1759	005352	000012	N	;DEC TAPE WRITE BUFFER
1760		000011	N=N-1	
1761	005354	177767	-N	
1762	005356	000011	N	;DEC TAPE WRITE BUFFER
1763		000010	N=N-1	
1764	005360	177770	-N	
1765	005362	000010	N	;DEC TAPE WRITE BUFFER
1766		000007	N=N-1	
1767	005364	177771	-N	
1768	005366	000007	N	;DEC TAPE WRITE BUFFER
1769		000006	N=N-1	
1770	005370	177772	-N	
1771	005372	000006	N	;DEC TAPE WRITE BUFFER
1772		000005	N=N-1	
1773	005374	177773	-N	

1774	005376	000005			N		;DEC TAPE WRITE BUFFER
1775		000004			N=N-1		
1776	005400	177774			-N		
1777	005402	030004			N		;DEC TAPE WRITE BUFFER
1778		000003			N=N-1		
1779	005404	177775			-N		
1780	005406	000003			N		;DEC TAPE WRITE BUFFER
1781		000002			N=N-1		
1782	005410	177776			-N		
1783	005412	000002			N		;DEC TAPE WRITE BUFFER
1784		000001			N=N-1		
1785	005414	177777			-N		
1786	005416	000001			N		;DEC TAPE WRITE BUFFER
1787							
1788	005420	010701			BEGINX: MOV	PC,R1	;SET UP R1 TO SELECT CURBNK
1789	005422	042701	017777		BIC	#17777,R1	
1790	005426	042737	160000	000034	BIC	#160000,@#34	;SET SCOPE RET TO CURRENT BANK
1791	005434	050137	000034		BIS	R1,@#34	
1792	005440	000301			SWAB	R1	
1793	005442	006201			ASR	R1	
1794	005444	006201			ASR	R1	
1795	005446	C10137	000570		MOV	R1,@#CURBNK	
1796							
1797							
1798							
1799							
1800	005452	010767	007262				
1801	005456	062767	000014	007254	BEGIN: MOV	PC,RETURN	;FOR SCOPING - SETUP ADDRESS OF BEGIN1 IN
1802	005464	012767	000400	007242	ADD	#14,RETURN	;THIS BANK THRU CURRENT ASR
1803					MOV	#400,ICOUNT	;ITERATION COUNT
1804	005472	012700	177770		;TEST COMPARE INSTRUCTION INDEXED		
1805	005476	026027	014752	125252	MOV	#-10,%0	;MINUS 10 TO REG 0
1806	005504	001401			CMP	A(0),#125252	; (A INDEX BY MINUS 10) TO #125252
1807	005506	104006			BEQ	+.4	
1808	005510	104400			HLT		;COMPARE WITH INDEX FAILED
1809					SCOPE		
1810	005512	012700	000010		MOV	#10,%0	
1811	005516	022760	052525	014752	CMP	#052525,A(0)	
1812	005524	001401			BEQ	+.4	
1813	005526	104006			HLT		
1814	005530	104400			SCOPE		
1815							
1816	005532	012700	177770		MOV	#-10,%0	
1817	005536	026060	014752	014752	CMP	A(0),A(0)	
1818	005544	001401			BEQ	+.4	
1819	005546	104006			HLT		
1820	005550	104400			SCOPE		
1821							
1822	005552	012700	000010		MOV	#+10,%0	
1823	005556	026060	014752	014752	CMP	A(0),A(0)	
1824	005564	001401			BEQ	+.4	
1825	005566	104006			HLT		
1826	005570	104400			SCOPE		
1827							
1828	005572	012700	177774		MOV	#-4,%0	
1829	005576	012701	000010		MOV	#+10,%1	

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1830	005602	026061	014752	014752	CMP	A(0),A(1)
1831	005610	001401			BEQ	+.4
1832	005612	104006			HLT	
1833	005614	104400			SCOPE	
1834						
1835	005616	012700	177774		MOV	#-4,%0
1836	005622	012701	000010		MOV	#10,%1
1837	005626	026160	014752	014752	CMP	A(1),A(0)
1838	005634	001401			BEQ	+.4
1839	005636	104006			HLT	
1840	005640	104400			SCOPE	
1841						
1842						
1843						
1844	005642	012700	177770		MOV	#-10,%0
1845	005646	016067	014752	007120	MOV	A(0),TEMP
1846	005654	026727	007114	125252	CMP	TEMP,#125252
1847	005662	001401			BEQ	+.4
1848	005664	104006			HLT	
1849	005666	104400			SCOPE	
1850						
1851	005670	012700	177770		MOV	#-10,%0
1852	005674	012760	125252	014774	MOV	#125252,TEMP(0)
1853	005702	023727	014764	125252	CMP	@#C,#125252
1854	005710	001401			BEQ	+.4
1855	005712	104006			HLT	
1856	005714	104400			SCOPE	
1857						
1858						
1859	005716	012767	177777	007050	MOV	#-1,TEMP
1860	005724	012700	177770		MOV	#-10,%0
1861	005730	046067	014752	007036	BIC	A(0),TEMP
1862	005736	026727	007032	052525	CMP	TEMP,#052525
1863	005744	001401			BEQ	+.4
1864	005746	104006			HLT	
1865	005750	104400			SCOPE	
1866						
1867	005752	012700	177770		MOV	#-10,%0
1868	005756	012767	177777	007000	MOV	#-1,TEMP-10
1869	005764	042767	052525	006772	BIC	#052525,TEMP-10
1870	005772	026727	006766	125252	CMP	TEMP-10,#125252
1871	006000	001401			BEQ	+.4
1872	006002	104006			HLT	
1873	006004	104400			SCOPE	
1874						
1875	006006	012737	125252	014774	MOV	#125252,@#TEMP
1876	006014	012700	177770		MOV	#-10,%0
1877	006020	166760	006716	015004	SUB	B,TEMP+10(0)
1878	006026	001401			BEQ	+.4
1879	006030	104006			HLT	
1880	006032	104400			SCOPE	
1881						
1882	006034	012737	052525	014774	MOV	#052525,@#TEMP
1883	006042	012700	000010		MOV	#10,%0
1884	006046	166760	006710	014764	SUB	A+10,C(0)
1885	006054	001401			BEQ	+.4

;TEST MOVE INSTRUCTION FOR INJEX

;TEST BIC INSTRUCTION FOR INDEXING

1886	006056	104006			HLT	
1887	006060	104400			SCOPE	
1888						
1889						
1890						;TEST UNARYS INDEXED
1891	006062	012737	177777	014774	MOV	#-1,@#TEMP
1892	006070	012700	000010		MOV	#+10,%0
1893	006074	005060	014764		CLR	C(0)
1894	006100	005737	014774		TST	@#TEMP
1895	006104	001401			BEQ	+.4
1896	006106	104006			HLT	
1897	006110	104400			SCOPE	
1898						
1899	006112	012737	177777	014774	MOV	#-1,@#TEMP
1900	006120	012700	000010		MOV	#10,%0
1901	006124	005160	014764		COM	C(0)
1902	006130	005737	014774		TST	@#TEMP
1903	006134	001401			BEQ	+.4
1904	006136	104006			HLT	
1905	006140	104400			SCOPE	
1906						
1907	006142	012737	177777	014774	MOV	#-1,@#TEMP
1908	006150	012700	177770		MOV	#-10,%0
1909	006154	0052E0	015004		INC	D(0)
1910	006160	005737	014774		TST	@#TEMP
1911	006164	001401			BEQ	+.4
1912	006166	104006			HLT	
1913	006170	104400			SCOPE	
1914						
1915	006172	012737	000001	014774	MOV	#1,@#TEMP
1916	006200	012700	177770		MOV	#-10,%0
1917	006204	005360	015004		DEC	D(0)
1918	006210	005737	014774		TST	@#TEMP
1919	006214	001401			BEQ	+.4
1920	006216	104006			HLT	
1921	006220	104400			SCOPE	
1922						
1923	006222	012737	000001	014774	MOV	#1,@#TEMP
1924	006230	012700	000010		MOV	#10,%0
1925	006234	005360	014764		DEC	C(0)
1926	006240	005737	014774		TST	@#TEMP
1927	006244	001401			BEQ	+.4
1928	006246	104006			HLT	
1929	006250	104400			SCOPE	
1930						
1931	006252	012737	000001	014774	MOV	#1,@#TEMP
1932	006260	012700	177770		MOV	#-10,%0
1933	006264	005460	015004		NEG	D(0)
1934	006270	022737	177777	014774	CMP	#-1,@#TEMP
1935	006276	001401			BEQ	+.4
1936	006300	104006			HLT	
1937	006302	104400			SCOPE	
1938						
1939	006304	012737	000001	014774	MOV	#1,@#TEMP
1940	006312	012700	000010		MOV	#+10,%0
1941	006316	005460	014764		NEG	C(0)

1942	006322	022737	177777	014774	CMP	#-1, @TEMP
1943	006330	001401			BEQ	.+4
1944	006332	104006			HLT	
1945	006334	104400			SCOPE	
1946						
1947	006336	012737	177777	014774	MOV	#-1, @TEMP
1948	006344	012700	177770		MOV	#-10, %0
1949	006350	000261			SEC	
1950	006352	005560	015004		ADC	D(0)
1951	006356	005737	014774		TST	@TEMP
1952	006362	001401			BEQ	.+4
1953	006364	104006			HLT	
1954	006366	104400			SCOPE	
1955						
1956	006370	012737	177777	014774	MOV	#-1, @TEMP
1957	006376	012700	000010		MOV	#+10, %0
1958	006402	000261			SEC	
1959	006404	005560	014764		ADC	C(0)
1960	006410	005737	014774		TST	@TEMP
1961	006414	001401			BEQ	.+4
1962	006416	104006			HLT	
1963	006420	104400			SCOPE	
1964						
1965	006422	012737	000001	014774	MOV	#1, @TEMP
1966	006430	012700	177770		MOV	#-10, %0
1967	006434	000261			SEC	
1968	006436	005660	015004		SBC	D(0)
1969	006442	005737	014774		TST	@TEMP
1970	006446	001401			BEQ	.+4
1971	006450	104006			HLT	
1972	006452	104400			SCOPE	
1973						
1974	006454	012737	000001	014774	MOV	#1, @TEMP
1975	006462	012700	000010		MOV	#+10, %0
1976	006466	000261			SEC	
1977	006470	005660	014764		SBC	C(0)
1978	006474	005737	014774		TST	@TEMP
1979	006500	001401			BEQ	.+4
1980	006502	104006			HLT	
1981	006504	104400			SCOPE	
1982						
1983						
1984	006506	010700				
1985	006510	062700	000010		MOV	%7, %0
1986	006514	000110			ADD	#10, %0
1987	006516	104006			JMP	@%0
1988	006520	000240			HLT	
1989	006522	104400			NOP	
1990					SCOPE	
1991	006524	010700				
1992	006526	062700	000010		MOV	%7, %0
1993	006532	000110			ADD	#10, %0
1994	006534	104006			JMP	@%0
1995	006536	000240			HLT	
1996	006540	104400			NOP	
1997					SCOPE	

;TEST JMP INDIRECT

1998					:TEST INDIRECT ADDRESSING
1999					:TEST COMPARE INSTRUCTION
2000	006542	023727	014742	125252	CMP @B, #125252
2001	006550	001401			BEQ .+4
2002	006552	104006			HLT
2003	006554	104400			SCOPE
2004					
2005	006556	022737	125252	014742	CMP #125252, @B
2006	006564	001401			BEQ .+4
2007	006566	104006			HLT
2008	006570	104400			SCOPE
2009					
2010	006572	023737	014742	014742	CMP @B, @B
2011	006600	001401			BEQ .+4
2012	006602	104006			HLT
2013	006604	104400			SCOPE
2014					
2015					:TEST MOVE INSTRUCTIONS
2016	006606	013700	014742		MOV @B, %0
2017	006612	022700	125252		CMP #125252, %0
2018	006616	001401			BEQ .+4
2019	006620	104006			HLT
2020	006622	104400			SCOPE
2021					
2022	006624	012737	125252	014774	MOV #125252, @TEMP
2023	006632	023737	014742	014774	CMP @B, @TEMP
2024	006640	001401			BEQ .+4
2025	006642	104006			HLT
2026	006644	104400			SCOPE
2027					
2028	006646	013737	014742	014764	MOV @B, @C
2029	006654	023737	014742	014764	CMP @B, @C
2030	006662	001401			BEQ .+4

004

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2031 006664 104006

HLT

E04

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2032 006666 104400
2033
2034
2035 006670 012700 177777

SCOPE
;TEST BIC INSTRUCTION INDIRECT
MOV # -1,%0

2036	006674	043700	014742	BIC	2#8,%0
2037	006700	020027	052525	CMP	%0,#052525
2038	006704	001401		BEQ	.+4
2039	006706	104006		HLT	
2040	006710	104400		SCOPE	
2041					
2042	006712	012737	177777	MOV	#-1,2#TEMP
2043	006720	042737	125252	BIC	#125252,2#TEMP
2044	006726	022737	052525	CMP	#052525,2#TEMP
2045	006734	001401		BEQ	.+4
2046	006736	104006		HLT	
2047	006740	104400		SCOPE	

2048					
2049	006742	012737	177777	014764	MOV # -1, @#C
2050	006750	043737	014742	014764	BIC @#B, @#C
2051	006756	023727	014764	052525	CMP @#C, #52525
2052	006764	001401			BEQ .+4
2053	006766	104006			HLT
2054	006770	104400			SCOPE
2055					
2056					;TEST SUBTRACT INSTRUCTION
2057	006772	012700	125252		MOV #125252, %0
2058	006776	163700	014742		SUB @#B, %0
2059	007002	020027	000000		CMP %0, #0
2060	007006	001401			BEQ .+4
2061	007010	104006			HLT
2062	007012	104400			SCOPE
2063					
2064	007014	012737	125252	014774	MOV #125252, @#TEMP
2065	007022	166737	005714	014774	SUB @#B, @#TEMP
2066	007030	001401			BEQ .+4
2067	007032	104006			HLT
2068	007034	104400			SCOPE
2069					
2070	007036	012767	125252	005730	MOV #125252, TEMP
2071	007044	163767	014742	005722	SUB @#B, TEMP
2072	007052	005767	005716		TST TEMP
2073	007056	001401			BEQ .+4
2074	007060	104006			HLT
2075	007062	104400			SCOPE
2076					
2077					;TEST ADD INDIRECT
2078	007064	005000			CLR %0
2079	007066	063700	014742		ADD @#B, %0
2080	007072	022700	125252		CMP #125252, %0
2081	007076	001401			BEQ .+4
2082	007100	104006			HLT
2083	007102	104400			SCOPE
2084					
2085	007104	005037	014774		CLR @#TEMP
2086	007110	062737	125252	014774	ADD #125252, @#TEMP
2087	007116	022737	125252	014774	CMP #125252, @#TEMP
2088	007124	001401			BEQ .+4
2089	007126	104006			HLT
2090	007130	104400			SCOPE
2091					
2092	007132	012737	125252	014774	MOV #125252, @#TEMP
2093	007140	067737	005614	014774	ADD @A+6, @#TEMP
2094	007146	023727	014774	177777	CMP @#TEMP, # -1
2095	007154	001401			BEQ .+4
2096	007156	104006			HLT
2097	007160	104400			SCOPE
2098					
2099					;TEST UNARYS INDIRECT
2100	007162	012737	177777	014774	MOV # -1, @#TEMP
2101	007170	005037	014774		CLR @#TEMP
2102	007174	005737	014774		TST @#TEMP
2103	007200	001401			BEQ .+4

2104	007202	104006			HLT	
2105	007204	104400			SCOPE	
2106						
2107	007206	012737	125252	014774	MOV	#125252,@TEMP
2108	007214	005137	014774		COM	@TEMP
2109	007220	022737	052525	014774	CMP	#052525,@TEMP
2110	007226	001401			BEQ	+.4
2111	007230	104006			HLT	
2112	007232	104400			SCOPE	
2113						
2114	007234	005037	014774		CLR	@TEMP
2115	007240	005237	014774		INC	@TEMP
2116	007244	022737	000001	014774	CMP	#1,@TEMP
2117	007252	001401			BEQ	+.4
2118	007254	104006			HLT	
2119	007256	104400			SCOPE	
2120						
2121	007260	005037	014774		CLR	@TEMP
2122	007264	005377	005506		DEC	@TEMP+2
2123	007270	023727	014774	177777	CMP	@TEMP,#-1
2124	007276	001401			BEQ	+.4
2125	007300	104006			HLT	
2126	007302	104400			SCOPE	
2127						
2128	007304	012737	000001	014774	MOV	#1,@TEMP
2129	007312	005437	014774		NEG	@TEMP
2130	007316	022737	177777	014774	CMP	#-1,@TEMP
2131	007324	001401			BEQ	+.4
2132	007326	104006			HLT	
2133	007330	104400			SCOPE	
2134						
2135						
2136						
2137	007332	027727	005406	125252	CMP	@B+2,#125252
2138	007340	001401			BEQ	+.4
2139	007342	104006			HLT	
2140	007344	104400			SCOPE	
2141						
2142	007346	022777	125252	005370	CMP	#125252,@B+2
2143	007354	001401			BEQ	+.4
2144	007356	104006			HLT	
2145	007360	104400			SCOPE	
2146						
2147	007362	027777	005356	005354	CMP	@B+2,@B+2
2148	007370	001401			BEQ	+.4
2149	007372	104006			HLT	
2150	007374	104400			SCOPE	
2151						
2152						
2153	007376	017700	005342		MOV	@B+2,%0
2154	007402	022700	125252		CMP	#125252,%0
2155	007406	001401			BEQ	+.4
2156	007410	104006			HLT	
2157	007412	104400			SCOPE	
2158						
2159	007414	012777	125252	005354	MOV	#125252,@TEMP+2

;TEST INDIRECT ADDRESSING WITH INDEXING
;TEST COMPARE INSTRUCTION

;TEST MOVE INSTRUCTIONS

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2160	007422	023737	014742	014774	CMP	@B,@TEMP
2161	007430	001401			BEQ	.+4
2162	007432	104006			HLT	
2163	007434	104400			SCOPE	
2164						
2165	007436	017777	005302	005322	MOV	@B+2,@C+2
2166	007444	023737	014742	014764	CMP	@B,@C
2167	007452	001401			BEQ	.+4
2168	007454	104006			HLT	
2169	007456	104400			SCOPE	
2170						
2171						
2172	007460	012700	177777		MOV	#-1,%0
2173	007464	047700	005254		BIC	@B+2,%0
2174	007470	020027	052525		CMP	%0,#52525
2175	007474	001401			BEQ	.+4
2176	007476	104006			HLT	
2177	007500	104400			SCOPE	
2178						
2179	007502	012737	177777	014774	MOV	#-1,@TEMP
2180	007510	042777	125252	005260	BIC	#125252,@TEMP+2
2181	007516	022737	052525	014774	CMP	#52525,@TEMP
2182	007524	001401			BEQ	.+4
2183	007526	104006			HLT	
2184	007530	104400			SCOPE	
2185						
2186	007532	012737	177777	014764	MOV	#-1,@C
2187	007540	047777	005200	005220	BIC	@B+2,@C+2
2188	007546	026737	005210	014764	CMP	A+10,@C
2189	007554	001401			BEQ	.+4
2190	007556	104006			HLT	
2191	007560	104400			SCOPE	
2192						
2193	007562	012700	125252		MOV	#125252,%0
2194	007566	167700	005152		SUB	@B+2,%0
2195	007572	020027	000000		CMP	%0,#0
2196	007576	001401			BEQ	.+4
2197	007600	104006			HLT	
2198	007602	104400			SCOPE	
2199						
2200	007604	012737	125252	014774	MOV	#125252,@TEMP
2201	007612	166777	005124	005156	SUB	B,@TEMP+2
2202	007620	001401			BEQ	.+4
2203	007622	104006			HLT	
2204	007624	104400			SCOPE	
2205						
2206	007626	012737	125252	014774	MOV	#125252,@TEMP
2207	007634	167777	005104	005134	SUB	@B+2,@TEMP+2
2208	007642	005737	014774		TST	@TEMP
2209	007646	001401			BEQ	.+4
2210	007650	104006			HLT	
2211	007652	104400			SCOPE	
2212						
2213						
2214	007654	005000			CLR	%0
2215	007656	067700	005062		ADD	@B+2,%0

;TEST BIC INSTRUCTION INDIRECT WITH INDEXING

;TEST ADD INDIRECT WITH INDEXING

2216	007662	022700	125252		CMP	#125252,%0
2217	007666	001401			BEQ	.+4
2218	007670	104006			HLT	
2219	007672	104400			SCOPE	
2220						
2221	007674	005037	014774		CLR	@#TEMP
2222	007700	062777	125252	005070	ADD	#125252,@TEMP+2
2223	007706	022737	125252	014774	CMP	#125252,@#TEMP
2224	007714	001401			BEQ	.+4
2225	007716	104006			HLT	
2226	007720	104400			SCOPE	
2227						
2228	007722	012737	125252	014774	MOV	#125252,@#TEMP
2229	007730	067777	005024	005040	ADD	@A+6,@TEMP+2
2230	007736	023727	014774	177777	CMP	@#TEMP,#-1
2231	007744	001401			BEQ	.+4
2232	007746	104006			HLT	
2233	007750	104400			SCOPE	
2234						
2235						
2236	007752	012737	177777	014774	MOV	#-1,@#TEMP
2237	007760	005077	005012		CLR	@TEMP+2
2238	007764	005737	014774		TST	@#TEMP
2239	007770	001401			BEQ	.+4
2240	007772	104006			HLT	
2241	007774	104400			SCOPE	
2242						
2243	007776	012737	125252	014774	MOV	#125252,@#TEMP
2244	010004	005177	004766		COM	@TEMP+2
2245	010010	022737	052525	014774	CMP	#052525,@#TEMP
2246	010016	001401			BEQ	.+4
2247	010020	104006			HLT	
2248	010022	104400			SCOPE	
2249						
2250	010024	005037	014774		CLR	@#TEMP
2251	010030	005277	004742		INC	@TEMP+2
2252	010034	022737	000001	014774	CMP	#1,@#TEMP
2253	010042	001401			BEQ	.+4
2254	010044	104006			HLT	
2255	010046	104400			SCOPE	
2256						
2257	010050	005037	014774		CLR	@#TEMP
2258	010054	005377	004716		DEC	@TEMP+2
2259	010060	023727	014774	177777	CMP	@#TEMP,#-1
2260	010066	001401			BEQ	.+4
2261	010070	104006			HLT	
2262	010072	104400			SCOPE	
2263						
2264	010074	012737	000001	014774	MOV	#1,@#TEMP
2265	010102	005477	004670		NEG	@TEMP+2
2266	010106	022737	177777	014774	CMP	#-1,@#TEMP
2267	010114	001401			BEQ	.+4
2268	010116	104006			HLT	
2269	010120	104400			SCOPE	
2270						
2271	010122	012737	177777	014774	MOV	#-1,@#TEMP

;TEST UNARYS INDIRECT WITH INDEXING

2272	010130	000261			SEC	
2273	010132	005577	004640		ADC	@TEMP+2
2274	010136	005737	014774		TST	@TEMP
2275	010142	001401			BEQ	.+4
2276	010144	104006			HLT	
2277	010146	104400			SCOPE	
2278						
2279	010150	012737	000001	014774	MOV	#1,@TEMP
2280	010156	000261			SEC	
2281	010160	005677	004612		SBC	@TEMP+2
2282	010164	005737	014774		TST	@TEMP
2283	010170	001401			BEQ	.+4
2284	010172	104006			HLT	
2285	010174	104400			SCOPE	
2286						
2287						
2288	010176	012700	177772			
2289	010202	027027	014752	125252	MOV	#-6,%0
2290	010210	001401			CMP	@A(0),#125252
2291	010212	104006			BEQ	.+4
2292	010214	104400			HLT	
2293					SCOPE	
2294	010216	012700	177772			
2295	010222	022770	125252	014752	MOV	#-6,%0
2296	010230	001401			CMP	#125252,@A(0)
2297	010232	104006			BEQ	.+4
2298	010234	104400			HLT	
2299					SCOPE	
2300	010236	012700	177772			
2301	010242	012701	000002		MOV	#-6,%0
2302	010246	027071	014752	014752	MOV	#+2,%1
2303	010254	001401			CMP	@A(0),@A(1)
2304	010256	104006			BEQ	.+4
2305	010260	104400			HLT	
2306					SCOPE	
2307						
2308	010262	012700	000006			
2309	010266	012767	177777	004500	MOV	#+6,%0
2310	010274	047067	014752	004472	MOV	#-1,TEMP
2311	010302	022767	125252	004464	BIC	@A(0),TEMP
2312	010310	001401			CMP	#125252,TEMP
2313	010312	104006			BEQ	.+4
2314	010314	104400			HLT	
2315					SCOPE	
2316	010316	012700	177772			
2317	010322	012737	177777	014764	MOV	#-6,%0
2318	010330	042770	125252	014774	MOV	#-1,@#C
2319	010336	023727	014764	052525	BIC	#125252,@TEMP(0)
2320	010344	001401			CMP	@#C,#052525
2321	010346	104006			BEQ	.+4
2322	010350	104400			HLT	
2323					SCOPE	
2324	010352	012737	177777	014764		
2325	010360	012700	177772		MOV	#-1,@#C
2326	010364	012701	177772		MOV	#-6,%0
2327	010370	047071	014752	014774	MOV	#-6,%1
					BIC	@A(0),@TEMP(1)

;TEST OF COMBINED INDEXING AND INDIRECT

;TEST BIC INSTRUCTION

2328	010376	022737	052525	014764	CMP	#052525,2#C	
2329	010404	001401			BEQ	.+4	
2330	010406	104006			HLT		
2331	010410	104400			SCOPE		
2332							
2333							
2334							
2335							
2336	010412	012700	177770		MOV	#-10,%0	;MINUS 10 TO REG 0
2337	010416	126027	014752	000252	CMPB	A(0),#000252	; (A INDEX BY MINUS 10) TO #125252
2339	010424	001401			BEQ	.+4	
2339	010426	104006			HLT		;COMPARE WITH INDEX FAILED
2340	010430	104400			SCOPE		
2341							
2342	010432	012700	177770		MOV	#-10,%0	;FOR INDEX
2343	010436	122760	000252	014752	CMPB	#000252,A(0)	;A INDEXED
2344	010444	001401			BEQ	.+4	
2345	010446	104006			HLT		
2346	010450	104400			SCOPE		
2347							
2348	010452	012700	000010		MOV	#10,%0	;INDEX
2349	010456	126027	014752	000125	CMPB	A(0),#000125	
2350	010464	001401			BEQ	.+4	
2351	010466	104006			HLT		
2352	010470	104400			SCOPE		
2353							
2354	010472	012700	000010		MOV	#10,%0	
2355	010476	122760	000125	014752	CMPB	#000125,A(0)	
2355	010504	001401			BEQ	.+4	
2357	010506	104006			HLT		
2358	010510	104400			SCOPE		
2359							
2360	010512	012700	177770		MOV	#-10,%0	
2361	010516	126060	014752	014752	CMPB	A(0),A(0)	
2362	010524	001401			BEQ	.+4	
2363	010526	104006			HLT		
2364	010530	104400			SCOPE		
2365							
2366	010532	012700	000010		MOV	#+10,%0	
2367	010536	126060	014752	014752	CMPB	A(0),A(0)	
2368	010544	001401			BEQ	.+4	
2369	010546	104006			HLT		
2370	010550	104400			SCOPE		
2371							
2372	010552	012700	177770		MOV	#-10,%0	
2373	010556	012701	000004		MOV	#+4,%1	
2374	010562	126061	014752	014752	CMPB	A(0),A(1)	
2375	010570	001401			BEQ	.+4	
2376	010572	104006			HLT		
2377	010574	104400			SCOPE		
2378							
2379	010576	126160	014752	014752	CMPB	A(1),A(0)	
2380	010604	001401			BEQ	.+4	
2381	010606	104006			HLT		
2382	010610	104400			SCOPE		
2383							

2384	010612	012700	177774		MOV	#-4,%0
2385	010616	012701	000010		MOV	#+10,%1
2386	010622	126061	014752	014752	CMPB	A(0),A(1)
2387	010630	001401			BEQ	.+4
2388	010632	104006			HLT	
2389	010634	104400			SCOPE	
2390						
2391	010636	012700	177774		MOV	#-4,%0
2392	010642	012701	000010		MOV	#10,%1
2393	010646	126160	014752	014752	CMPB	A(1),A(0)
2394	010654	001401			BEQ	.+4
2395	010656	104006			HLT	
2396	010660	104400			SCOPE	
2397						
2398						
2399	010662	012700	177770			;TEST MOVE INSTRUCTION FOR INDEX
2400	010666	116067	014752	004100	MOV	#-10,%0
2401	010674	126727	004074	000252	MOVB	A(0),TEMP
2402	010702	001401			CMPB	TEMP,#000252
2403	010704	104006			BEQ	.+4
2404	010706	104400			HLT	
2405					SCOPE	
2406	010710	012700	000010		MOV	#+10,%0
2407	010714	116067	014752	004052	MOVB	A(0),TEMP
2408	010722	126727	004046	000125	CMPB	TEMP,#000125
2409	010730	001401			BEQ	.+4
2410	010732	104006			HLT	
2411	010734	104400			SCOPE	
2412						
2413	010736	012700	177770		MOV	#-10,%0
2414	010742	112760	125252	014774	MOVB	#125252,TEMP(0)
2415	010750	123727	014764	125252	CMPB	TEMP,#125252
2416	010756	001401			BEQ	.+4
2417	010760	104006			HLT	
2418	010762	104400			SCOPE	
2419						
2420	010764	012700	000010		MOV	#+10,%0
2421	010770	112760	052525	014774	MOVB	#052525,TEMP(0)
2422	010776	123727	015004	052525	CMPB	TEMP+10,#052525
2423	011004	001401			BEQ	.+4
2424	011006	104006			HLT	
2425	011010	104400			SCOPE	
2426						
2427						
2428	011012	012767	177777	003754		;TEST BIC INSTRUCTION FOR INDEXING
2429	011020	012700	177770		MOV	#-1,TEMP
2430	011024	146067	014752	003742	MOV	#-10,%0
2431	011032	126727	003736	177525	BICB	A(0),TEMP
2432	011040	001401			CMPB	TEMP,#177525
2433	011042	104006			BEQ	.+4
2434	011044	104400			HLT	
2435					SCOPE	
2436	011046	012767	177777	003720	MOV	#-1,TEMP
2437	011054	012700	000010		MOV	#10,%0
2438	011060	146067	014752	003706	BICB	A(0),TEMP
2439	011066	126727	003702	007652	CMPB	TEMP,#007652

2440	011074	001401			BEQ	.+4
2441	011076	104006			HLT	
2442	011100	104400			SCOPE	
2443						
2444	011102	012737	177777	015004	MOV	#-1,@#TEMP+10
2445	011110	012700	000010		MOV	#10,%0
2446	011114	142760	125252	014774	BICB	#125252,TEMP(0)
2447	011122	123727	015004	002525	CMPB	@#TEMP+10,#2525
2448	011130	001401			BEQ	.+4
2449	011132	104006			HLT	
2450	011134	104400			SCOPE	
2451						
2452	011136	012700	177770		MOV	#-10,%0
2453	011142	012767	177777	003614	MOV	#-1,TEMP-10
2454	011150	142767	052525	003606	BICB	#052525,TEMP-10
2455	011156	126727	003602	125252	CMPB	TEMP-10,#125252
2456	011164	001401			BEQ	.+4
2457	011166	104006			HLT	
2458	011170	104400			SCOPE	
2459						
2460						
2461	011172	012737	177777	014774	MOV	#-1,@#TEMP
2462	011200	012700	177770		MOV	#-10,%0
2463	011204	105060	015004		CLRB	D(0)
2464	011210	105737	014774		TSTB	@#TEMP
2465	011214	001401			BEQ	.+4
2466	011216	104006			HLT	
2467	011220	104400			SCOPE	
2468						
2469	011222	012737	177777	014774	MOV	#-1,@#TEMP
2470	011230	012700	177770		MOV	#-10,%0
2471	011234	105060	015004		CLRB	D(0)
2472	011240	023727	014774	177400	CMP	@#TEMP,#177400
2473	011246	001401			BEQ	.+4
2474	011250	104006			HLT	
2475	011252	104400			SCOPE	
2476						
2477	011254	012737	177777	014774	MOV	#-1,@#TEMP
2478	011262	012700	177771		MOV	#-7,%0
2479	011266	105060	015004		CLRB	D(0)
2480	011272	023727	014774	000377	CMP	@#TEMP,#000377
2481	011300	001401			BEQ	.+4
2482	011302	104006			HLT	
2483	011304	104400			SCOPE	
2484						
2485	011306	012737	177777	014774	MOV	#-1,@#TEMP
2486	011314	012700	000010		MOV	#+10,%0
2487	011320	105060	014764		CLRB	C(0)
2488	011324	105737	014774		TSTB	@#TEMP
2489	011330	001401			BEQ	.+4
2490	011332	104006			HLT	
2491	011334	104400			SCOPE	
2492						
2493	011336	012737	177777	014774	MOV	#-1,@#TEMP
2494	011344	012700	177770		MOV	#-10,%0
2495	011350	105160	015004		COMB	D(0)

;TEST UNARYS INDEXED

2548	011354	105737	014774	TSTB	2#TEMP
2549	011360	001401		BEQ	.+4
2550	011362	104006		HLT	
2551	011364	104400		SCOPE	
2552	011366	012737	177777 014774	MOV	#-1,2#TEMP
2553	011374	012700	000010	MOV	#+10,%0
2554	011400	105260	014764	INCB	C(0)
2555	011404	105737	014774	TSTB	2#TEMP
2556	011410	001401		BEQ	.+4
2557	011412	104006		HLT	
2558	011414	104400		SCOPE	
2559	011416	012737	000001 014774	MOV	#1,2#TEMP
2560	011424	012700	177770	MOV	#-10,%0
2561	011430	105360	015004	DECB	D(0)
2562	011434	105737	014774	TSTB	2#TEMP
2563	011440	001401		BEQ	.+4
2564	011442	104006		HLT	
2565	011444	104400		SCOPE	
2566	011446	012737	000001 014774	MOV	#1,2#TEMP
2567	011454	012700	000010	MOV	#+10,%0
2568	011460	105460	014764	NEGB	C(0)
2569	011464	023727	014774 000377	CMP	2#TEMP,#377
2570	011472	001401		BEQ	.+4
2571	011474	104006		HLT	
2572	011476	104400		SCOPE	
2573	011500	012737	177777 014774	MOV	#-1,2#TEMP
2574	011506	012700	177770	MOV	#-10,%0
2575	011512	000261		SEC	
2576	011514	105560	015004	ADCB	D(0)
2577	011520	023727	014774 177400	CMP	2#TEMP,#177400
2578	011526	001401		BEQ	.+4
2579	011530	104006		HLT	
2580	011532	104400		SCOPE	
2581	011534	012737	000001 014774	MOV	#1,2#TEMP
2582	011542	012700	000010	MOV	#+10,%0
2583	011546	000261		SEC	
2584	011550	105660	014764	SBCB	C(0)
2585	011554	005737	014774	TST	2#TEMP
2586	011560	001401		BEQ	.+4
2587	011562	104006		HLT	
2588	011564	104400		SCOPE	
2589				;TEST INDIRECT ADDRESSING	
2590				;TEST COMPARE INSTRUCTION	
2591	011566	123727	014742 000252	CMPB	2#B,#000252
2592	011574	001401		BEQ	.+4
2593	011576	104006		HLT	
2594	011600	104400		SCOPE	
2595	011602	122737	125252 014742	CMPB	#125252,2#B
2596	011610	001401		BEQ	.+4

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2552 011612 104006          HLT
2553 011614 104400          SCOPE
2554
2555          ;TEST MOVE INSTRUCTIONS
2556 011616 113700 014742     MOVB  @#B,%0
2557 011622 122700 000252     CMPB  #000252,%0
2558 011626 001401          BEQ   .+4
2559 011630 104006          HLT
2560 011632 104400          SCOPE
2561
2562 011634 112737 125252 014774     MOVB  #125252,@#TEMP
2563 011642 126737 003074 014774     CMPB  B,@#TEMP
2564 011650 001401          BEQ   .+4
2565 011652 104006          HLT
2566 011654 104400          SCOPE
2567
2568          ;TEST UNARYS INDIRECT
2569 011656 012737 177777 014774     MOV   #-1,@#TEMP
2570 011664 105037 014774          CLRB  @#TEMP
2571 011670 023727 014774 177400     CMP   @#TEMP,#177400
2572 011676 001401          BEQ   .+4
2573 011700 104006          HLT
2574 011702 104400          SCOPE
2575
2576 011704 012737 125252 014774     MOV   #125252,@#TEMP
2577 011712 105137 014775          COMB  @#TEMP+1
2578 011716 022737 052652 014774     CMP   #052652,@#TEMP
2579 011724 001401          BEQ   .+4
2580 011726 104006          HLT
2581 011730 104400          SCOPE
2582
2583 011732 005037 014774          CLR   @#TEMP
2584 011736 105237 014775          INCB  @#TEMP+1
2585 011742 022737 000400 014774     CMP   #400,@#TEMP
2586 011750 001401          BEQ   .+4
2587 011752 104006          HLT
2588 011754 104400          SCOPE
2589
2590 011756 005037 014774          CLR   @#TEMP
2591 011762 105377 003010          DECB  @#TEMP+2
2592 011766 023727 014774 000377     CMP   @#TEMP,#377
2593 011774 001401          BEQ   .+4
2594 011776 104006          HLT
2595 012000 104400          SCOPE
2596
2597 012002 005037 014774          CLR   @#TEMP
2598 012006 112737 000001 014775     MOVB  #1,@#TEMP+1
2599 012014 105437 014775          NEGB  @#TEMP+1
2600 012020 022737 177400 014774     CMP   #177400,@#TEMP
2601 012026 001401          BEQ   .+4
2602 012030 104006          HLT
2603 012032 104400          SCOPE
2604
2605          ;TEST INDIRECT ADDRESSING WITH INDEXING
2606          ;TEST COMPARE INSTRUCTION
2607

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2608	012034	122777	125252	002702	CMPB	#125252,@B+2
2609	012042	001401			BEQ	+.4
2610	012044	104006			HLT	
2611	012046	104400			SCOPE	
2612						
2613	012050	127777	002670	002666	CMPB	@B+2,@B+2
2614	012056	001401			BEQ	+.4
2615	012060	104006			HLT	
2616	012062	104400			SCOPE	
2617						
2618						
2619	012064	117700	002654		;TEST MOVE INSTRUCTIONS	
2620	012070	122700	125252		MOVB	@B+2,%0
2621	012074	001401			CMPB	#125252,%0
2622	012076	104006			BEQ	+.4
2623	012100	104400			HLT	
2624					SCOPE	
2625	012102	112777	125252	002666	MOVB	#125252,@TEMP+2
2626	012110	126737	002626	014774	CMPB	B,@TEMP
2627	012116	001401			BEQ	+.4
2628	012120	104006			HLT	
2629	012122	104400			SCOPE	
2630						
2631	012124	117777	002614	002634	MOVB	@B+2,@C+2
2632	012132	126737	002604	014764	CMPB	B,@C
2633	012140	001401			BEQ	+.4
2634	012142	104006			HLT	
2635	012144	104400			SCOPE	
2636						
2637						
2638	012146	012700	177777		;TEST BIC INSTRUCTION INDIRECT WITH INDEXING	
2639	012152	147700	002566		MOV	#-1,%0
2640	012156	120027	052525		BICB	@B+2,%0
2641	012162	001401			CMPB	%0,#52525
2642	012164	104006			BEQ	+.4
2643	012166	104400			HLT	
2644					SCOPE	
2645	012170	012737	177777	014774	MOV	#-1,@TEMP
2646	012176	142777	125252	002572	BICB	#125252,@TEMP+2
2647	012204	122737	052525	014774	CMPB	#52525,@TEMP
2648	012212	001401			BEQ	+.4
2649	012214	104006			HLT	
2650	012216	104400			SCOPE	
2651						
2652	012220	012737	177777	014764	MOV	#-1,@C
2653	012226	147777	002512	002532	BICB	@B+2,@C+2
2654	012234	126737	002522	014764	CMPB	A+10,@C
2655	012242	001401			BEQ	+.4
2656	012244	104006			HLT	
2657	012246	104400			SCOPE	
2658						
2659						
2660	012250	012737	177777	014774	;TEST UNARYS INDIRECT WITH INDEXING	
2661	012256	105077	002514		MOV	#-1,@TEMP
2662	012262	105737	014774		CLRB	@TEMP+2
2663	012266	001401			TSTB	@TEMP
					BEQ	+.4

2664	012270	104006			HLT	
2665	012272	104400			SCOPE	
2666						
2667	012274	005037	014774		CLR	2*TEMP
2668	012300	105277	002472		INCB	2*TEMP+2
2669	012304	122737	000001	014774	CMPB	#1,2*TEMP
2670	012312	001401			BEQ	.+4
2671	012314	104006			HLT	
2672	012316	104400			SCOPE	
2673						
2674	012320	005037	014774		CLR	2*TEMP
2675	012324	105377	002446		DECB	2*TEMP+2
2676	012330	123727	014774	177777	CMPB	2*TEMP, #-1
2677	012336	001401			BEQ	.+4
2678	012340	104006			HLT	
2679	012342	104400			SCOPE	
2680						
2681	012344	012737	000001	014774	MOV	#1,2*TEMP
2682	012352	105477	002420		NEGB	2*TEMP+2
2683	012356	122737	177777	014774	CMPB	#-1,2*TEMP
2684	012364	001401			BEQ	.+4
2685	012366	104006			HLT	
2686	012370	104400			SCOPE	
2687						
2688	012372	012737	177777	014774	MOV	#-1,2*TEMP
2689	012400	000261			SEC	
2690	012402	105577	002370		ADCB	2*TEMP+2
2691	012406	022737	177400	014774	CMP	#177400,2*TEMP
2692	012414	001401			BEQ	.+4
2693	012416	104006			HLT	
2694	012420	105737	014774		TSTB	2*TEMP
2695	012424	001401			BEQ	.+4
2696	012426	104006			HLT	
2697	012430	104400			SCOPE	
2698						
2699	012432	012737	000001	014774	MOV	#1,2*TEMP
2700	012440	000261			SEC	
2701	012442	105377	002330		DECB	2*TEMP+2
2702	012446	005737	014774		TST	2*TEMP
2703	012452	001401			BEQ	.+4
2704	012454	104006			HLT	
2705	012456	104400			SCOPE	
2706						
2707						
2708	012460	012700	177772		MOV	#-6,%0
2709	012464	127027	014752	125252	CMPB	2A(0),#125252
2710	012472	001401			BEQ	.+4
2711	012474	104006			HLT	
2712	012476	104400			SCOPE	
2713						
2714	012500	012700	177772		MOV	#-6,%0
2715	012504	012701	000002		MOV	#+2,%1
2716	012510	127071	014752	014752	CMPB	2A(0),2A(1)
2717	012516	001401			BEQ	.+4
2718	012520	104006			HLT	
2719	012522	104400			SCOPE	

;TEST OF COMBINED INDEXING AND INDIRECT

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2720
2721 ;TEST BIC INSTRUCTION
2722 012524 012700 000006 MOV #+6,%0
2723 012530 012767 177777 MOV #-1,TEMP
2724 012536 147067 014752 002230 BICB @A(0),TEMP
2725 012544 122767 125252 002222 CMPB #125252,TEMP
2726 012552 001401 BEQ .+4
2727 012554 104006 HLT
2728 012556 104400 SCOPE
2729
2730 012560 012700 177772 MOV #-6,%0
2731 012564 012737 177777 014764 MOV #-1,@#C
2732 012572 142770 125252 014774 BICB #125252,@TEMP(0)
2733 012600 123727 014764 000125 CMPB @#C,#000125
2734 012606 001401 BEQ .+4
2735 012610 104006 HLT
2736 012612 104400 SCOPE
2737
2738 012614 012700 014744 MOV #B+2,%0 ;ADDRESS OF ADDRESS OF B
2739 012620 023067 002116 CMP @-(0),B
2740 012624 001401 BEQ .+4
2741 012626 104006 HLT
2742 012630 104400 SCOPE
2743
2744 012632 012700 014746 MOV #B+4,%0
2745 012636 025067 002100 CMP @-(0),B
2746 012642 001401 BEQ .+4
2747 012644 104006 HLT
2748 012646 104400 SCOPE
2749
2750 012650 012700 014746 MOV #B+4,%0
2751 012654 125067 002062 CMPB @-(0),B
2752 012660 001401 BEQ .+4
2753 012662 104006 HLT
2754 012664 104400 SCOPE
2755
2756 012666 012700 014770 MOV #C+4,%0
2757 012672 012737 177777 014764 MOV #-1,@#C
2758 012700 105050 CLRB @-(0)
2759 012702 023727 014764 177400 CMP @#C,#177400
2760 012710 001401 BEQ .+4
2761 012712 104006 HLT
2762 012714 104400 SCOPE
2763
2764 012716 012737 177777 014764 MOV #-1,@#C
2765 012724 012700 177772 MOV #-6,%0
2766 012730 012701 177772 MOV #-6,%1
2767 012734 147071 014752 014774 BICB @A(0),@TEMP(1)
2768 012742 022737 177525 014764 CMP #177525,@#C
2769 012750 001401 BEQ .+4
2770 012752 104006 HLT
2771 012754 104400 SCOPE
2772
2773 ;SET UP TO TEST THAT R0 IS NOT DESTROYED BY FALSE SELECTION
2774 012756 012700 052525 MOV #52525,%0 ;THIS IS CHECKED LATER IN PROGRAM
2775
    
```

```

2776 ;TEST JSR INSTRUCTION
2777 012762 004767 000002 JSR %7, TJSR2 ;PLACE PC ON STACK
2778 012766 000405 TJSR1: BR TJSR3 ;RETURN HERE ON RTS %19
2779 012770 121627 012766 TJSR2: CMPB %6, #TJSR1 ;CHECK FOR CORRECT PC ON STACK
2780 012774 001401 BEQ .+4
2781 012776 104006 HLT ;INCORRECT PC ON STACK
2782 013000 000207 RTS %7 ;RETURN TO IMST AFTER JSR
2783 013002 104400 TJSR3: SCOPE
2784
2785 013004 000257 CCC
2786 013006 004717 JSR %7, %7 ;INSTRUCTION UNDER TEST
2787 013010 121627 013010 CMPB %6, #TJSR3+6 ;TEST THE STACK
2788 013014 001401 BEQ .+4
2789 013016 104006 HLT ;PC OF JSR DID NOT GO TO STACK
2790 013020 005726 TST (6)+ ;REPOSITION THE STACK
2791 013022 104400 SCOPE
2792
2793 ;TEST NESTED SUBROUTINES
2794 013024 000257 CCC ;CLEAR CONDITION CODES
2795 013026 004767 001602 JSR %7, SUBR6
2796 013032 100401 BMI .+4
2797 013034 104006 HLT ;JSR OR RTS FAILED
2798 013036 001401 BEQ .+4 ;JSR OR RTS FAILED
2799 013040 104006 HLT ;JSR OR RTS FAILED
2800 013042 102401 BVS .+4 ;JSR OR RTS FAILED
2801 013044 104006 HLT ;JSR OR RTS FAILED
2802 013046 103401 BCS .+4 ;JSR OR RTS FAILED
2803 013050 104006 HLT
2804 013052 104400 SCOPE
2805
2806 ;TEST ROTATE ODD BYTE
2807 013054 104400 SCOPE
2808 013056 000257 CCC ;CLEAR "C"
2809 013060 012767 123456 001706 MOV #123456, TEMP ;ROTATE ODD BYTE
2810 013066 106067 001703 RORB TEMP+1
2811 013072 103401 BCS .+4 ;C NOT SET
2812 013074 104006 HLT ;V NOT SET
2813 013076 102401 BVS .+4
2814 013100 104006 HLT
2815 013102 022767 051456 001664 CMP #051456, TEMP ;ROTATE FAILED
2816 013110 001401 BEQ .+4
2817 013112 104006 HLT
2818 013114 104400 SCOPE
2819
2820 013116 000277 SCC ;SET C
2821 013120 012767 123456 001646 MOV #123456, TEMP
2822 013126 106067 001643 RORB TEMP+1
2823 013132 103401 BCS .+4
2824 013134 104006 HLT ;C NOT SET
2825 013136 102001 BVC .+4 ;V NOT CLEARED
2826 013140 104006 HLT
2827 013142 022767 151456 001624 CMP #151456, TEMP ;ROTATE FAILED
2828 013150 001401 BEQ .+4
2829 013152 104006 HLT
2830 013154 104400 SCOPE
2831

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2832	013156	000257			CCC		
2833	013160	012767	123456	001606	MOV	#123456,TEMP	
2834	013166	106167	001603		ROLB	TEMP+1	
2835	013172	103401			BCS	.+4	
2836	013174	104006			HLT		;C NOT SET
2837	013176	102401			BVS	.+4	
2838	013200	104006			HLT		;V NOT SET
2839	013202	022767	047056	001564	CMP	#047056,TEMP	
2840	013210	001401			BEQ	.+4	
2841	013212	104006			HLT		;ROTATE BYTE FAILED
2842	013214	104400			SCOPE		
2843							
2844	013216	000277			SCC		;SET C
2845	013220	012767	123456	001546	MOV	#123456,TEMP	
2846	013226	106167	001543		ROLB	TEMP+1	
2847	013232	103401			BCS	.+4	
2848	013234	104006			HLT		;C NOT SET
2849	013236	102401			BVS	.+4	
2850	013240	104006			HLT		;V NOT SET
2851	013242	022767	047456	001524	CMP	#047456,TEMP	
2852	013250	001401			BEQ	.+4	
2853	013252	104006			HLT		;ROTATE ODD BYTE FAILED
2854	013254	104400			SCOPE		
2855							
2856	013256	000257			CCC		;CLEAR C
2857	013260	012767	177777	001506	MOV	#-1,TEMP	
2858	013266	106267	001503		ASRB	TEMP+1	
2859	013272	103401			BCS	.+4	
2860	013274	104006			HLT		;C NOT SET
2861	013276	102001			BVC	.+4	
2862	013300	104006			HLT		;V NOT CLEARED
2863	013302	026727	001466	177777	CMP	TEMP,#-1	
2864	013310	001401			BEQ	.+4	
2865	013312	104006			HLT		;SHIFT FAILED
2866	013314	104400			SCOPE		
2867							
2868	013316	000277			SCC		
2869	013320	012767	177777	001446	MOV	#-1,TEMP	
2870	013326	106367	001443		ASLB	TEMP+1	
2871	013332	103401			BCS	.+4	
2872	013334	104006			HLT		;C NOT SET
2873	013336	102001			BVC	.+4	
2874	013340	104006			HLT		;V NOT CLEARED
2875	013342	026727	001426	177377	CMP	TEMP,#177377	
2876	013350	001401			BEQ	.+4	
2877	013352	104006			HLT		;SHIFT BYTE FAILED
2878	013354	104400			SCOPE		
2879							
2880							
2881							;TEST THAT RO WASN'T CLEARED BY FALSE SELECTION
2882	013356	022700	052525		CMP	#52525,RO	
2883	013362	001401			BEQ	.+4	
2884	013364	104006			HLT		
2885	013366	104400			SCOPE		
2886							
2887							;TEST COMBINATION OF N, C AND V

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2888 013370 005067 001340          CLR      ICOUNT          ;NO ITERATION
2889
2890          ;INHIBIT TESTS WHICH USE ALL NUMBERS WHEN SW11 IS SET
2891 013374 032737 004000 000550      BIT      #4000, #SREG2
2892 013402 001402          BEQ      COMPAR
2893 013404 000167 001170          JMP      DONE
2894
2895          ;TEST ALL COMBINATIONS OF NUMBERS WITH COMPARE INSTRUCTION
2896 013410 005000      COMPAR: CLR      %0          ;INIT %0
2897 013412 005001      CLR      %1          ;INIT %1
2898 013414 020001      CMP1:  CMP      %0,%1      ;ARE THE EQUAL
2899 013416 001401      BEQ      .+4
2900 013420 104006      HLT
2901 013422 020027 177777      CMP      %0,%-1      ;R0 AND R1 DID NOT COMPARE
2902 013426 001403      BEQ      CMP2        ;AT UPPER LIMIT
2903 013430 005200      INC      %0          ;YES EXIT
2904 013432 005201      INC      %1          ;INCREMENT TO NEXT NUMBER
2905 013434 000767      BR       CMP1
2906 013436 104400      CMP2:  SCOPE
2907
2908          ;TEST ROTATING ALL NUMBERS
2909 013440 104400      SCOPE
2910 013442 012767 177777 000132      TSROT:  MOV      #-1, REFF      ;INITIALIZE BASE NUMBER
2911 013450 005267 000126          INC      REFF          ;INCREMENT NUMBER
2912 013454 004767 000012          JSR      %7, ROTALL      ;GO TO COMPARE ROUTINE
2913 013460 026727 000116 177777      CMP      REFF, #-1      ;TEST ALL VALUES
2914 013466 001370      BNE      TSROT        ;NO TEST THEM ALL
2915 013470 000446      BR       TSRT2A       ;WE ARE DONE
2916
2917 013472 016767 000104 000104      ROTALL: MOV      REFF, TEST
2918 013500 006067 000100          ROR      TEST
2919 013504 006067 000074          ROR      TEST
2920 013510 006067 000070          ROR      TEST
2921 013514 006167 000064          ROL      TEST
2922 013520 006167 000060          ROL      TEST
2923 013524 006167 000054          ROL      TEST
2924 013530 100004          BPL      .+12
2925 013532 103007          BCC      .+20          ;Z=1
2926 013534 102013          BVC      .+30          ;Z=1, C=1
2927 013536 104006          HLT      ;Z=C, BUT V=1
2928 013540 000411          BR       .+24
2929 013542 103006          BCC      .+16          ;Z=0
2930 013544 102407          BVS      .+20          ;Z=0, C=1
2931 013546 104006          HLT      ;Z NOT EQUAL C, V=1
2932 013550 000405          BR       .+14
2933 013552 102404          BVS      .+12          ;Z=1, C=0
2934 013554 104006          HLT      ;Z NOT EQUAL C, V=1
2935 013556 000402          BR       .+6
2936 013560 102001          BVC      .+4          ;Z=0, C=0
2937 013562 104006          HLT      ;Z=C, BUT V=1
2938 013564 104400      SCOPE
2939 013566 026767 000012 000006      CMP      TEST, REFF
2940 013574 001401      BEQ      .+4
2941 013576 104006          HLT
2942 013600 000207      RTS      %7
2943 013602 000000      REFF:  0
    
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2944 013604 000000          TEST:  0
2945          013602          REF=REFF
2946
2947          :TEST ROTATING BYTE EVEN/ODD, ALL NUMBERS
2948 013606 012767 177777 177766 TSRT2A: MOV    #-1, REFF
2949 013614 005267 177762          TSROT2: INC    REFF
2950 013620 004767 000016          JSR    %7, ROTBE
2951 013624 004767 000122          JSR    %7, ROTBO
2952 013630 022767 177777 177744          CMP    #-1, REFF
2953 013636 001366          BNE    TSROT2
2954 013640 000505          BR     ROTEN1
2955 013642 016767 177734 177734 ROTBE:  MOV    REFF, TEST
2956 013650 106067 177730          RORB   TEST          ;ROTATE BYTE EVEN
2957 013654 106067 177724          RORB   TEST
2958 013660 106067 177720          RORB   TEST
2959 013664 106167 177714          ROLB   TEST
2960 013670 106167 177710          ROLB   TEST
2961 013674 106167 177704          ROLB   TEST
2962 013700 100004          BPL    .+12
2963 013702 103007          BCC    .+20          ;Z=1
2964 013704 102013          BVC    .+30          ;Z=1, C=1
2965 013706 104006          HLT    ;Z=C, BUT V=1
2966 013710 000411          BR     .+24
2967 013712 103006          BCC    .+16          ;Z=0
2968 013714 102407          BVS    .+20          ;Z=0, C=1
2969 013716 104006          HLT    ;Z NOT EQUAL C, V=1
2970 013720 000405          BR     .+14
2971 013722 102404          BVS    .+12          ;Z=1, C=0
2972 013724 104006          HLT    ;Z NOT EQUAL C, V=1
2973 013726 000402          BR     .+6
2974 013730 102001          BVC    .+4          ;Z=0, C=0
2975 013732 104006          HLT    ;Z=C, BUT V=1
2976 013734 104400          SCOPE
2977 013736 026767 177642 177636          CMP    TEST, REFF
2978 013744 001401          BEQ    .+4
2979 013746 104006          HLT
2980 013750 000207          RTS    %7
2981 013752 106067 177627          ROTBO: RORB   TEST+1          ;ROTATE BYTE ODD
2982 013756 106067 177623          RORB   TEST+1
2983 013762 106067 177617          RORB   TEST+1
2984 013766 106167 177613          ROLB   TEST+1
2985 013772 106167 177607          ROLB   TEST+1
2986 013776 106167 177603          ROLB   TEST+1
2987 014002 100004          BPL    .+12
2988 014004 103007          BCC    .+20          ;Z=1
2989 014006 102013          BVC    .+30          ;Z=1, C=1
2990 014010 104006          HLT    ;Z=C, BUT V=1
2991 014012 000411          BR     .+24
2992 014014 103006          BCC    .+16          ;Z=0
2993 014016 102407          BVS    .+20          ;Z=0, C=1
2994 014020 104006          HLT    ;Z NOT EQUAL C, V=1
2995 014022 000405          BR     .+14
2996 014024 102404          BVS    .+12          ;Z=1, C=0
2997 014026 104006          HLT    ;Z NOT EQUAL C, V=1
2998 014030 000402          BR     .+6
2999 014032 102001          BVC    .+4          ;Z=0, C=0

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K05

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 DBKTG.P11 BACKGROUND CPU TESTS

;Z=C, BUT V=1

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3000 014034 104006          HLT
3001 014036 104400          SCOPE
3002 014040 026767 177540 177534  CMP TEST,REFF
3003 014046 001401          BEQ .+4
3004 014050 104006          HLT
3005 014052 000207          RTS %7
3006 014054 104400          ROTEN1: SCOPE
3007
3008 ;ADD AND SUBTRACT ALL NUMBERS AGAINST FIXED NUMBERS
3009 ;A+B=C, C-A=B, BF SHOULD EQUAL BI
3010 014056 011667 000072          MOV %6,NUMA
3011 014062 012767 000001 177512  MOV #1,REF
3012 014070 005267 177506  ARITST: INC REF
3013 014074 004767 000014          JSR %7,ADSUB
3014 014100 022767 177777 177474  CMP #-1,REFF
3015 014106 001370          BNE ARITST
3016 014110 000422          BR ARIEND
3017 014112 104400          SCOPE
3018 014114 016767 177462 177462  ADSUB: MOV REF,TEST
3019 014122 066767 000026 177454  ADD NUMA,TEST
3020 014130 166767 000020 177446  SUB NUMA,TFST
3021 014136 026767 177440 177440  CMP REF,TEST
3022 014144 001401          BEQ .+4
3023 014146 104006          HLT
3024 014150 104400          SCOPE
3025 014152 000207          RTS %7
3026 014154 000000          NUMA: 0
3027 014156 104400          ARIEND: SCOPE
3028
3029 ;TEST COMPLIMENTING ALL NUMBERS
3030 014160 005067 000610          CLR TEMP ;BASE DATA
3031 014164 005067 000610          CLR TEMP+4 ;BASE REFERENCE
3032 014170 005167 000600          TCOM: COM TEMP ;COMPLIMENT DATA
3033 014174 005367 000600          DEC TEMP+4 ;DECREMENT REFERENCE
3034 014200 026767 000570 000572  CMP TEMP,TEMP+4 ;COMPARE
3035 014206 001401          BEQ .+4 ;TEST
3036 014210 104006          HLT ;COMPLIMENT OR DECREMENT FAILED
3037 014212 005167 000556          COM TEMP
3038 014216 005267 000552          INC TEMP ;INCREMENT AND TEST FOR DONE
3039 014222 001362          BNE TCOM ;NOT FINISHED GO LOOP
3040 014224 104400          SCOPE
3041
3042 ;TEST COMB (EVEN BYTE)
3043 014226 005067 000542          CLR TEMP ;BASE DATA
3044 014232 005067 000542          CLR TEMP+4 ;REFERENCE DATA
3045 014236 105167 000532          TCOM2: COMB TEMP
3046 014242 005367 000532          DEC TEMP+4
3047 014246 126767 000522 000524  CMPB TEMP,TEMP+4 ;COMPARE
3048 014254 001401          BEQ .+4
3049 014256 104006          HLT ;COMPLIMENT OR INCREMENT BYTE FAILED
3050 014260 105167 000510          COMB TEMP
3051 014264 105267 000504          INCB TEMP
3052 014270 001362          BNE TCOM2
3053 014272 104400          SCOPE
3054
3055 ;TEST COMB (ODD BYTE)

```

3056	014274	005067	000474		CLR	TEMP	;BASE DATA
3057	014300	005067	000474		CLR	TEMP+4	;REFERENCE DATA
3058	014304	105167	000465		COMB	TEMP+1	;ODD BYTE
3059	014310	005367	000464		DEC	TEMP+4	
3060	014314	126767	000455	000456	CMPB	TEMP+1,TEMP+4	
3061	014322	001401			BEQ	.+4	
3062	014324	104006			HLT		;COMPLIMENT BYTE FAILED
3063	014326	105167	000443		COMB	TEMP+1	
3064	014332	105267	000437		INCB	TEMP+1	
3065	014336	001362			BNE	TCOM3	
3066	014340	104400			SCOPE		
3067							
3068							
3069	014342	005067	000426				;TEST COMPARE ALL VALUE EVEN BYTE WITH ODD
3070	014346	126767	000422	000421	CLR	TEMP	;BASE VALUE
3071	014354	001401			TSCOMB: CMPB	TEMP,TEMP+1	;COMPARE
					BEQ	.+4	

M05

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3072 014356 104006          HLT          ;COMPARE FAILED
3073 014360 002001          BGE         .+4
3074 014362 104006          HLT          ;V IS NOT = TO N
3075 014364 003401          BLE         .+4
3076 014366 104006          HLT          ;V IS SET
3077 014370 062767 0004C1 000376  ADD        #401,TEMP
3078 014376 022767 177777 000370  CMP        #-1,TEMP
3079 014404 001360          BNE        TSCOMB
3080 014406 104400          SCOPE
3081
3082 014410 012767 000010 000316  MOV        #10,ICOUNT
3083
3084          ;TEST TO SEE IF I/O DEVICES WERE SELECTED
3085 014416 016767 164126 000026  MOV        SREG2,CKWAIT
3086 014424 005167 000022          COM        CKWAIT
3087 014430 032767 000371 000014  BIT        #371,CKWAIT
3088 014436 001406          BEQ        WAIT4          ;BRANCH IF NO DEVICES SELECTED
3089 014440 000001          WAIT       ;INTERRUPTS WILL OCCUR
3090 014442 000001          WAIT       ;IF DEVICES ARE SELECTED
3091 014444 000001          WAIT
3092 014446 000001          WAIT
3093 014450 000401          BR         .+4
3094 014452 000000          CKWAIT: 0
3095 014454 104400          WAIT4:    SCOPE
3096 014456 012767 000400 000250  MOV        #400,ICOUNT
3097
3098          ;TEST SWAB
3099 014464 012767 000200 177112  MOV        #0200,TEST
3100 014472 000367 177106          SWAB      TEST
3101 014476 100001          BPL        .+4
3102 014500 104006          HLT
3103 014502 001401          BEQ        .+4
3104 014504 104006          HLT
3105 014506 000367 177072          SWAB      TEST
3106 014512 100401          BMI        .+4
3107 014514 104006          HLT
3108 014516 001001          BNE        .+4
3109 014520 104006          HLT
3110 014522 104400          SCOPE
3111
3112          ;TEST ALL COMBINATIONS OF SWAB
3113 014524 005067 177054          CLR        TEST          ;NUMBER UNDER TEST
3114 014530 005067 177046          CLR        REF          ;REFERENCE NUMBER
3115 014534 000367 177044          SWAB      TEST          ;OPERATION UNDER TEST
3116 014540 026767 177040 177034  CMP        TEST,REF      ;TEST SWAB INSTRUCTION
3117 014546 001401          BEQ        .+4
3118 014550 104006          HLT          ;SWAB FAILED
3119 014552 000367 177026          SWAB      TEST
3120 014556 005267 177020          INC        REF          ;INCREMENT REFERENCE NUMBER
3121 014562 105267 177017          INCB      TEST+1        ;INC TEST NUMBER
3122 014566 001362          BNE        SWABA        ;LOOP TILL DONE
3123 014570 104400          SCOPE
3124 014572 012767 004000 000134  MOV        #4000,ICOUNT
3125
3126
3127
;*****

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3128 ;END OF USER CODE IN BANK/
3129 ;CALL KERNEL/
3130 ;ALTERED IN CORE EXPANSION/
3131 014600 104010 DONE: EOB
3132 014602 000240 NOP ;TO ALLOW CORE EXPANSION TO PATCH IN JMP
3133
3134 ;GROUP OF NESTED SUBROUTINES/
3135 014604 000207 SUBR1: RTS %7 ;ONE INSTRUCTION
3136 014606 000277 SUBR2: SCC ;ONE DEEP
3137 014610 000207 RTS %7
3138 014612 004767 177770 SUBR3: JSR %7, SUBR2 ;TWO DEEP
3139 014616 000207 RTS %7
3140 014620 004767 177766 SUBR4: JSR %7, SUBR3 ;THREE DEEP
3141 014624 000207 RTS %7
3142 014626 004767 177766 SUBR5: JSR %7, SUBR4 ;FOUR DEEP
3143 014632 000207 RTS %7
3144 014634 004767 177766 SUBR6: JSR %7, SUBR5 ;FIVE DEEP
3145 014640 000207 RTS %7
3146
3147 ;SCOPE AND/OR ITERATION LOOP FOR EACH TEST TIMES/
3148 014642 032767 002000 1637C0 SCOPEC: BIT #2000, SREG2 ;INHIBIT PROCESSOR TESTS?
3149 014650 001403 BEQ .+10 ;NO
3150 014652 022626 CMP (SP)+, (SP)+
3151 014654 000167 165416 JMP MAIN ;YES
3152 014660 032767 040000 163662 BIT #40000, SREG2 ;TEST SR FOR SCOPE
3153 014666 001012 BNE SCOPEB ;YES, SCOPE
3154 014670 032767 004000 163652 BIT #4000, SREG2 ;NO-TEST FOR ITERATION
3155 014676 001011 BNE SCOPEG ;INHIBIT ITERATION
3156 014700 026767 000032 000026 CMP SCOPEF, ICOUNT ;COMPARE CURRENT COUNT TO MAX NUMBER
3157 014706 100005 BPL SCOPEG ;EXIT-DONE
3158 014710 005267 000022 INC SCOPEF ;INCREMENT COUNT
3159 014714 016716 000020 SCOPEB: MOV RETURN, @SP
3160 014720 000002 RTI
3161 014722 005067 000010 SCOPEG: CLR SCOPEF ;CLEAR COUNT
3162 014726 011667 000006 MOV @%6, RETURN ;SAVE SCOPE RETURN POINTER
3163 014732 000002 RTI ;RETURN INLINE-NEXT TEST
3164 014734 000400 ICOUNT: 400 ;ITERATION COUNT
3165 014736 000000 SCOPEF: 0 ;COUNT LOCATION FOR ITERATION LOOP
3166 014740 000000 RETURN: 0 ;ADDRESS OF LAST TEST
3167
3168 ;FIXED VALUES FOR USE IN TEST/
3169 014742 125252 B: 125252 ;ADDRESS OF B
3170 014744 014742 B
3171 014746 052525 052525
3172 014752 014752 . =B+10
3173 014752 177777 A: -1
3174 014754 014756 A+4
3175 014756 014756 . =A+4
3176 014756 125252 125252 ;ADDRESS OF A+10
3177 014760 014762 A+10
3178 014762 052525 052525
3179
3180 ;FOR STORAGE
3181 014764 000000 C: U
3182 014766 014764 C ;ADDRESS OF C
3183 014774 014774 . =C+10
    
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3184 014774 000000      TEMP: 0
3185 014776 014774      TFMP ;ADDRESS OF TEMP
3186 015002 015002      =TEMP+6
3187 015002 015004      TEMP+10 ;ADDRESS OF TEMP+10 OR "D"
3188 015004 000000      D: 0
3189
3190 ;SUBROUTINE TO INITIALIZE ALL PAGES TO NR, BANK 0, 1 PAGE, UP/
3191 015006 010146      NRALL: MOV R1,-(R6) ;SAVE REGISTERS
3192 015010 010246      MOV R2,-(R6)
3193 015012 010346      MOV R3,-(R6)
3194 015014 012701 000536      MOV #IPDRTAB,R1 ;R1 HOLDS ADDRESS OF CURRENT POSITION
3195 ;IN TABLE OF ADDRESSES
3196 015020 012703 000010      NRLOOP: MOV #8,R3 ;R3 USED AS COUNTER
3197 015024 012102      MOV (R1)+,R2 ;R2 CONTAINS ADDRESS OF PDR OR
3198 ;PAR TO BE CLEARED
3199 ;CLEAR ALL ASR'S FOR THIS MODE
3200 015030 077302      CLR (R2)+
3201 015032 020127 000544      SOB R3,-2
3202 015036 003770      CMP R1,#IPDREND ;CHECK FOR DONE
3203 015040 012603      BLE NRLOOP ;CLEAR ALL IN NEXT MODE IF NOT DONE
3204 015042 012602      MOV (R6)+,R3
3205 015044 012601      MOV (R6)+,R2
3206 015046 000207      MOV (R6)+,R1
3207      RTS %7
3208 ;EMT HANDLER/
3209 ;FIRST 3 CALLS LEFT OPEN IN TABLE FOR EASY PATCHES/
3210 015050 162716 000002      EMTSRV: SUB #2,SP ;GET CALL
3211 015054 006576 000000      MFPI 2(SP)
3212 015060 012667 000022      MOV (SP)+,EPC
3213 015064 062716 000002      ADD #2,SP
3214 015070 105067 000013      CLRB EPC+1 ;SAVE OFFSET ONLY
3215 015074 062767 015110 000004      ADD #EMTAB,EPC ;POINT TO TABLE OF ADDRESSES
3216 015102 017707 000000      MOV #EPC,PC ;JUMP TO DESIRED ROUTINE
3217 015106 000000      EPC: 0
3218 000000      PATCH1=0
3219 000000      PATCH2=0
3220 000000      PATCH3=0
3221 015110 000000      EMTAB: PATCH1 ;PATCH IN ADDRESS OF ROUTINE
3222 015112 000000      PATCH2
3223 015114 000000      PATCH3
3224 015116 016164      PRINT ;ERROR PRINTOUT
3225 015120 015122      EOBSRV ;END OF BANK
3226
3227 ;END OF BANK SERVICE
3228 015122 113737 177571 000551      EOBSRV: MOVB #SR+1,#SREG2+1 ;READ SWITCHES AGAIN
3229 015130 032767 000001 163410      BIT #1,SREG1 ;KT11-D INHIBITED?
3230 015136 001507      BEQ EOB2 ;NO - CONTINUE
3231 015140 004767 001410      JSR %7,BELL ;SIGNAL END OF PASS
3232 015144 042766 000020 000002      BIC #20,2(SP) ;CLEAR TRACE BIT OF STATUS ON STACK
3233 015152 012737 000016 000014      MOV #16,2#14 ;SETUP TRACE RETURN TO CAUSE HALT
3234 015160 005037 000016      CLR 2#16 ;IF A TRACE TRAP OCCURS
3235 015164 032737 010000 000550      BIT #10000,2#SREG2 ;INHIBIT TRACE TRAPPING?
3236 015172 001011      BNE EOB1A ;YES - BRANCH
3237 015174 005167 163402      COM TRPB ;SWITCH TRACE FLAG
3238 015200 100006      BPL EOB1A ;IF NOT SET, LEAVE TRACE OFF
3239 015202 052766 000020 000002      BIS #20,2(SP) ;IF SET, SET TRACE BIT OF STATUS ON STACK
    
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3240	015210	012737	016162	000014		MOV	#TRTRP, @#14	
3241	015216	032737	000040	000546	ECB1A:	BIT	#40, @#SREG1	; CORE EXPANSION INHIBITED?
3242	015224	001051				BNE	E0B1C	; YES, SKIP
3243	015226	013701	000550			MOV	@#SREG2, R1	
3244	015232	032767	000002	163344		BIT	#2, MEMO	
3245	015240	001402				BEQ	DSW1	
3246	015242	010137	020550			MOV	R1, @#SREG2+20000	
3247	015246	032767	000004	163330	DSW1:	BIT	#4, MEMO	
3248	015254	001402				BEQ	DSW2	
3249	015256	010137	040550			MOV	R1, @#SREG2+40000	
3250	015262	032767	000010	163314	DSW2:	BIT	#10, MEMO	
3251	015270	001402				BEQ	DSW3	
3252	015272	010137	060550			MOV	R1, @#SREG2+60000	
3253	015276	032767	000020	163300	DSW3:	BIT	#20, MEMO	
3254	015304	001402				BEQ	DSW4	
3255	015306	010137	100550			MOV	R1, @#SREG2+100000	
3256	015312	032767	000040	163264	DSW4:	BIT	#40, MEMO	
3257	015320	001402				BEQ	DSW5	
3258	015322	010137	120550			MOV	R1, @#SREG2+120000	
3259	015326	032767	000100	163250	DSW5:	BIT	#100, MEMO	
3260	015334	001402				BEQ	E0B1B	
3261	015336	010137	140550			MOV	R1, @#SREG2+140000	
3262	015342	012716	005420		E0B1B:	MOV	#BEGINX, (SP)	
3263	015346	000002				RTI		
3264	015350	012716	005452		E0B1C:	MOV	#BEGIN, (SP)	
3265	015354	000002				RTI		
3266	015356	042737	000340	177776	E0B2:	BIC	#340, @#PSR	
3267	015364	032767	000002	163154		BIT	#2, SREG1	; USER/KERNEL INHIBITED?
3268	015372	001262				BNE	E0B1	; YES - SET PC AND RETURN
3269	015374	032767	000004	163144		BIT	#4, SREG1	; NO--INHIBIT 4K AS 32K?
3270	015402	001256				BNE	E0B1	; YES - SET PC AND RETURN
3271	015404	026767	163164	163102		CMP	CURPAR, UPAR7	; LAST USER ASR DONE?
3272	015412	001444				BEQ	NXTBNK	; YES - GO FIND NEXT BANK
3273	015414	062737	020000	000034		ADD	#20000, @#34	; UPDATE SCOPE VECTOR ADDRESS IN BANK 0
3274	015422	062767	020000	163150		ADD	#20000, BNKSTR	; UPDATE BANK START TO REFERENCE CURRENT ASR
3275	015430	016716	163144			MOV	BNKSTR, (SP)	
3276	015434	026767	163050	163132		CMP	UPAR0, CURPAR	
3277	015442	001404				BEQ	NXTSEG	
3278	015444	005077	163124			CLR	@CURPAR	; SET PREVIOUS ASR TO NR, BANK 0
3279	015450	005077	163122			CLR	@CURPDR	
3280	015454	062767	000002	163112	NXTSEG:	ADD	#2, CURPAR	; UPDATE POINTERS TO NEXT SEGMENT
3281	015462	062767	000002	163106		ADD	#2, CURPDR	
3282	015470	012777	077406	163100		MOV	#77406, @CURPDR	; SET NEXT SEGMENT RW, 4K
3283	015476	016777	163066	163070		MOV	CURBNK, @CURPAR	; MAP NEXT SEGMENT TO CURRENT BANK
3284	015504	052737	030000	177776		BIS	#30000, @#PSR	; SET PREVIOUS MODE TO USER
3285	015512	006506				MFP1	R6	; PICK UP USER STACK POINTER
3286	015514	062716	020000			ADD	#20000, @R6	; MAP IT TO NEXT ASR
3287	015520	006506				MTP1	R6	; PUT IT BACK
3288	015522	000002				RTI		; GO BACK TO MAINLINE
3289	015524	005327	000000		NXTBNK:	DEC	#0	; STALL SO DOUBLE BELL NOTED
3290	015530	001375				BNE	.-4	
3291	015532	004767	001016			JSR	%7, BELL	
3292	015536	012746	000400			MOV	#UBUFF, -(SP)	
3293	015542	052737	030000	177776		BIS	#30000, @#PSR	
3294	015550	006506				MTP1	R6	
3295	015552	013737	000570	000572		MOV	@#CURBNK, @#OLDBNK	; SAVE PREV BANK ADDRESS

3296	015560	062767	000200	163002	BNKTST:	AUD	#200,CURBNK	
3297	015566	006367	163016			ASL	COREPT	
3298	015572	103006				BCC	IS	
3299	015574	012767	000001	163006		MOV	#1,COREPT	
3300	015602	012767	000606	163002		MOV	#MEM1, MEMUT	
3301	015610	022767	007600	162752	IS:	CMP	#7600,CURBNK	;CHECK FOR EXTERNAL BANK
3302	015616	001067				BNE	E0B3	;IF NOT, TEST FOR ITS PRESENCE
3303	015620	012767	000000	162742		MOV	#0,CURBNK	;START OVER, TESTING BANK 0
3304	015626	012767	000001	162754		MOV	#1,COREPT	
3305	015634	012767	000604	162750		MOV	#MEM0, MEMUT	
3306	015642	013701	000042		LOGIC:	MOV	#42,R1	
3307	015646	001412				BEQ	BNKT	
3308	015650	000005				RESET		
3309	015652	005046				CLR	-(SP)	;CLEAR TBTT VIA RTI
3310	015654	012746	015662			MOV	#LOGICAL,-(SP)	
3311	015660	000002				RTI		
3312	015662	004711			LOGICAL:	JSR	%7,@R1	
3313	015664	000240				NOP		
3314	015666	000240				NOP		
3315	015670	000240				NOP		
3316	015672	000000				HALT		
3317	015674	032737	000001	000550	BNKT:	BIT	#1,@SREG2	;TTY OUT SELECTED
3318	015702	001410				BEQ	BNKT1	;YES, NO ASTERISK
3319	015704	004767	000672			JSR	%7,CRLF	
3320	015710	105777	162474			TSTB	@TCR	;WAIT FOR TELETYPE
3321	015714	100375				BPL	.-4	
3322	015716	012777	000252	162466		MOV	#252,@TDBR	;OUTPUT ASTERISK TO SIGNAL END OF PASS
3323	015724	042766	000020	000006	BNKT1:	BIC	#20,6(SP)	;CLEAR TRACE BIT OF STATUS ON STACK
3324	015732	012737	000016	000014		MOV	#16,@#14	
3325	015740	005037	000016			CLR	@#16	
3326	015744	032737	010000	177570		BIT	#10000,@#SR	
3327	015752	001011				BNE	E0B3	
3328	015754	005167	162622			COM	TRPB	
3329	015760	100006				BPL	E0B3	
3330	015762	052766	000020	000006		BIS	#20,6(SP)	
3331	015770	012737	016162	000014		MOV	#TRTRP,@#14	
3332	015776	016777	162566	162526	E0B3:	MOV	CURBNK,@KPAR2	;MAP KERNEL SEGMENT 2 TO BANK BEING LOOKED FOR
3333	016004	012777	077406	162510		MOV	#77406,@KPAR2	
3334	016012	036777	162572	162572		BIT	COREPT,@MEMUT	
3335	016020	001657				BEQ	BNKTST	
3336	016022	042737	160000	000034		BIC	#160000,@#34	;INITIALIZE SCOPE VECTOR ADDRESS
3337	016030	005001				CLR	R1	;R1 ADDRESSES BANK 0 THRU KERNEL ASR0
3338	016032	012702	040000			MOV	#40000,R2	;R2 ADDRESSES NEW BANK THRU KERNEL ASR2
3339	016036	012703	015004			MOV	#0,R3	
3340	016042	006203				ASR	R3	
3341	016044	012122			CORMOV:	MOV	(R1)+,(R2)+	
3342	016046	077302				SOB	R3,CORMOV	
3343	016050	016767	162434	162516		MOV	UPARD,CURPAR	;FIRST ASR CHECKED IS USER ASR0
3344	016056	016767	162420	162512		MOV	UPDR0,CURPDR	
3345	016064	016777	162500	162502		MOV	CURBNK,@CURPAR	
3346	016072	012777	077406	162476		MOV	#77406,@CURPDR	
3347	016100	005077	162410			CLR	@UPAR7	
3348	016104	005077	162376			CLR	@UPDR7	
3349	016110	026727	162456	000000		CMP	OLDBNK,#0	;PREV BANK = 0
3350	016116	001414				BEQ	E0B6	;YES, DO NOT CLEAR
3351	016120	016777	162446	162404		MOV	OLDBNK,@KPAR2	

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3352 016126 012777 077406 162366      MOV      #77406, @KPDR2
3353 016134 012701 040000      MOV      #40000, R1
3354 016140 012703 007630      MOV      #7630, R3
3355 016144 005021      BNKLP:   CLR      (R1)+
3356 016146 077302      SOB      R3, BNKLP
3357 016150 012716 005452      E0B6:   MOV      #BEGIN, (SP)
3358 016154 011667 162420      MOV      (SP), BNKSTR
3359 016160 000002      RTI

3360
3361                                     ;RTT EXECUTED WHEN TRACE IS ON/
3362 016162 000006      TRTRP:  RTT

3363
3364                                     ;ENTERED WITH SYSTEM TRAP CALL (HLT)
3365                                     ;PRINT OUT THE ERROR PC+2, STATUS REGISTER, AND LOCATION IN BACKGROUND
3366 016164 005767 000162      PRINT:  TST      PRTON      ;CHECK PRINT ON FLAG
3367 016170 001401      BEQ      .+4
3368 016172 000002      RTI                                     ;IF ANOTHER HALT IS BEING PRINTED, SKIP THIS ONE
3369 016174 005267 000152      INC      PRTON
3370 016200 012767 000340 161570      MOV      #340, PSR      ;SET PRIORITY TO 7
3371 016206 036727 161356 020000      BIT      SR, #20000     ;TEST FOR INHIBIT PRINT OUT
3372 016214 001401      BEQ      .+4             ;BRANCH TO PRINT
3373 016216 000444      BR      CK              ;INHIBIT CHECK FOR HALT
3374 016220 012667 000122      MOV      (6)+, SAVPC    ;PC OF FAILING ROUTINE
3375 016224 012667 000120      MOV      (6)+, SAVPSR   ;PSR OF ERROR CONDITION
3376 016230 024646      CMP      -(6), -(6)     ;RESTORE STACK
3377 016232 012767 000200 161536      MOV      #200, PSR
3378 016240 004767 000336      JSR      %7, CRLF       ;OUTPUT CARRIAGE RETURN AND LINE FEED
3379 016244 016767 000076 000260      MOV      SAVPC, PTEMP1  ;LOAD WITH FAILING PC+2
3380 016252 004767 000076      JSR      %7, PROCT      ;PRINT FAILING PC+2
3381 016256 004767 000254      JSR      %7, SPACE
3382 016262 016767 000062 000242      MOV      SAVPSR, PTEMP1 ;LOAD PROCESSOR STATUS
3383 016270 004767 000060      JSR      %7, PROCT      ;PRINT PROCESSOR STATUS
3384 016274 004767 000236      JSR      %7, SPACE
3385 016300 016767 162264 000224      MOV      CURBNK, PTEMP1
3386 016306 004767 000042      JSR      %7, PROCT
3387 016312 004767 000220      JSR      %7, SPACE
3388 016316 016767 176416 000206      MOV      RETURN, PTEMP1
3389 016324 004767 000024      JSR      %7, PROCT
3390 016330 005767 161234      CK:     TST      SR      ;CHECK SR FOR HALT SWITCH
3391 016334 100001      BPL      .+4            ;BRANCH IF NOT SET
3392 016336 000000      HALT     ;HALT ON ERROR UP
3393 016340 005067 000006      CLR      PRTON         ;ROUTINE DONE - CLEAR FLAG
3394 016344 000002      RTI      ;RETURN TO MAIN LINE
3395 016346 000000      SAVPC:  0
3396 016350 000000      SAVPSR: 0
3397 016352 000000      PRTON:  0

3398
3399                                     ;SUBROUTINE TO PRINT OUT OCTAL NUMBER/
3400 016354 012727 000006 016360      PROCT:  MOV      #6, #PTEMP3   ;CLEAR R4 FOR COUNTING CHARACTERS OUTPUT
3401 016360 005067 000142      PTEMP3=-2
3402 016362 005067 000142      CLR      PFLG          ;INITIALIZE CARRY FLAG FOR ROTATES
3403 016366 012767 000260 000140      MOV      #260, PTEMP2  ;SETUP R3
3404 016374 005767 000132      TST      PTEMP1        ;CHECK BIT 15 OF NUMBER
3405 016400 100002      BPL      +6            ;BRANCH IF ZERO
3406 016402 005267 000126      INC      PTEMP2        ;INCREMENT R3 IF ONE
3407 016406 006167 000120      ROL      PTEMP1        ;ROTATE LEFT MOST OCTAL TO RIGHT END

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3408 016412 006167 000114          ROL      PTEMP1
3409 016416 005567 000106          ADC      PRFLG      ;STORE CARRY
3410 016422 105777 161762          TSTB    @TCSR    ;WAIT FOR TTY READY
3411 016426 100375          BPL      P.WAIT
3412 016430 016777 000100 161754      MOV      PTEMP2,@TDBR ;OUTPUT NEXT CHARACTER
3413 016436 005367 177716          DEC      PTEMP3    ;COUNT
3414 016442 001001          BNE      P.CNT1    ;BRANCH IF NOT DONE
3415 016444 000207          RTS      ;BRANCH IF NOT DONE
3416 016446 000241          CLC      ;CLEAR CARRY
3417 016450 005767 000054          TST      PRFLG     ;CHECK FOR PREVIOUS CARRY
3418 016454 001403          BEQ      .+10     ;BRANCH IF PREVIOUSLY ZERO
3419 016456 005067 000046          CLR      PRFLG     ;INITIALIZE FLAG
3420 016462 000261          SEC      ;SET CARRY
3421 016464 006167 000042          ROL      PTEMP1    ;ROTATE NEXT CHARACTER INTO RIGHT END OF REGISTER
3422 016470 006167 000036          ROL      PTEMP1
3423 016474 006167 000032          ROL      PTEMP1
3424 016500 005567 000024          ADC      PRFLG     ;STORE CARRY
3425 016504 016767 000022 000022      MOV      PTEMP1,PTEMP2 ;LOAD DATA INTO R3
3426 016512 042767 177770 000014      BIC      #177770,PTEMP2 ;CLEAR ALL BUT LOWEST OCTAL DIGIT
3427 016520 052767 000260 000006      BIS      #260,PTEMP2  ;SET TO ASCII EQUIVALENT
3428 016526 000735          BR       P.WAIT    ;LOOP
3429 016530 000000          PRFLG: 0
3430 016532 000000          PTEMP1: 0          ;CONTAINS VALUE TO BE OUTPUT
3431 016534 000000          PTEMP2: 0          ;SCRATCH
3432
3433          ;SUBROUTINE TO ISSUE SPACE/
3434 016536 105777 161646          SPACE: TSTB    @TCSR    ;WAIT FOR TTY READY
3435 016542 100375          BPL      .-4
3436 016544 012777 000240 161640      MOV      #240,@TDBR ;OUTPUT A SPACE
3437 016552 000207          RTS      ;RETURN
3438
3439          ;BELL ON PASS COMPLETE
3440 016554 032737 000001 000550      BELL:  BIT     #1,@#SREG2
3441 016562 001406          BEQ      1$
3442 016564 105777 161620          TSTB    @TCSR
3443 016570 100375          BPL      .-4
3444 016572 012777 000207 161612      MOV      #207,@TDBR
3445 016600 000207          1$:    RTS      ;?
3446
3447          ;SUBROUTINE TO OUTPUT CARRIAGE RETURN AND LINEFEED/
3448 016602 105777 161602          CRLF:  TSTB    @TCSR    ;WAIT FOR TTY READY
3449 016606 100375          BPL      .-4
3450 016610 012777 000215 161574      MOV      #215,@TDBR ;OUTPUT CARRIAGE RETURN
3451 016616 105777 161566          TSTB    @TCSR    ;WAIT FOR TTY READY
3452 016622 100375          BPL      .-4
3453 016624 012777 000212 161560      MOV      #212,@TDBR ;OUTPUT LINEFEED
3454 016632 000207          RTS      ;RETURN
3455
3456          ;ENTER HERE ON POWER FAIL/
3457 016634 013746 000024          PFAIL: MOV     @#24,-(6)
3458 016640 010667 000010          MOV     %6,SAVR6    ;STORE STACK POSITION
3459 016644 012737 016656 000024      MOV     #RESTRT,@#24
3460 016652 000000          HALT    ;HALT ON POWER DOWN NORMAL
3461 016654 000000          SAVR6: 0          ;STACK IS SAVED HERE
3462 016656 0167J6 177772          RESTRT: MOV     SAVR6,%6 ;RESTORE STACK WHEN POWERING UP
3463 016662 012637 000024          MOV     (6)+,@#24
    
```

3464	016666	022626		CMP	(SP)+,(SP)+		;RESTORE STACK
3465	016670	104006		HLT			;POWER FAIL OCCURRED
3466	016672	000167	161720	JMP	RSTRT		;RETURN TO MAIN LINE
3467							
3468							
3469	016676	000207		USER:	RTS	%7	;OVERLAY USER ROUTINE HERE IF 4KW
3470							;USE BANK1 IF 8KW
3471		017760					
3472	017760	000000		KSTACK:	0	=17760	
3473		000001				.END	

ST5	001516	930	936*											
ST6	001604	938	947*											
ST7	001644	949	954*											
ST8	001754	959	961	969*										
SUBR1	014604	3135*												
SUBR2	014606	3136*	3138											
SUBR3	014612	3138*	3140											
SUBR4	014620	3140*	3142											
SUBR5	014626	3142*	3144											
SUBR6	014634	2795	3144*											
SWABA	014534	3115*	3122											
TBANK	000614	832*	870*	879	887*	892								
TCBA	000562	815*	1324*	1369*										
TCCM	000552	811*	953*	1272*	1275*	1277*	1279	1290*	1294	1306*	1315*	1317*	1325*	1327
		1331*	1334	1344*	1347*	1351	1363*	1370*	1373	1377*				
TCDT	000556	813*	1284	1299	1302	1339	1356	1359						
TCEXPE	003610	1266*	1276*	1284	1301*	1302	1312*	1339	1358*	1359				
TCFIRS	003604	1264*	1276	1356										
TCF1	003664	1274	1279*											
TCF1A	003656	1277*	1285											
TCF2	003716	1286	1289*											
TCF3	003732	1289	1294*	1330										
TCF4	004000	1306*	1332											
TCIV	000564	816*	951*	1269*	1274*	1289*	1311*	1318*	1322*	1330*	1346*	1367*	1376*	
TCLAST	003606	1265*	1299	1312										
TCOM	014170	3032*	3039											
TCOM2	014236	3045*	3052											
TCOM3	014304	3058*	3065											
TCRBK	004270	1362	1367*											
TCRBUF	004420	1369	1386	1387	1401*									
TCRB1	004326	1367	1373*											
TCR1	004136	1318	1334*											
TCR1A	004172	1341	1344*											
TCR2	004200	1340	1346*											
TCR3	004214	1346	1351*	1376										
TCR4	004262	1363*	1378											
TCSR =	000410	588*	3320	3410	3434	3442	3448	3451						
TCST	000554	812*	950	1270	1313									
TCSTA	000566	817*	952*											
TCWBK	004056	1305	1322*											
TCWBUF	004420	1324	1400*											
TCWB1	004110	1322	1327*											
TCWC	000560	814*	1323*	1368*										
TC1	004354	1371	1382*											
TC2	004374	1388*	1393											
TDBR =	000412	589*	3322*	3412*	3436*	3444*	3450*	3453*						
TEMP	014774	1845*	1846	1852*	1859*	1861*	1862	1868*	1869*	1870	1875*	1877*	1882*	1891*
		1894	1899*	1902	1907*	1910	1915*	1918	1923*	1926	1931*	1934	1939*	1942
		1947*	1951	1956*	1960	1965*	1969	1974*	1978	2022*	2023	2042*	2043*	2044
		2064*	2065*	2070*	2071*	2072	2085*	2086*	2087	2092*	2093*	2094	2100*	2101*
		2102	2107*	2108*	2109	2114*	2115*	2116	2121*	2122*	2123	2128*	2129*	2130
		2159*	2160	2179*	2180*	2181	2200*	2201*	2206*	2207*	2208	2221*	2222*	2223
		2228*	2229*	2230	2236*	2237*	2238	2243*	2244*	2245	2250*	2251*	2252	2257*
		2258*	2259	2264*	2265*	2266	2271*	2273*	2274	2279*	2281*	2282	2309*	2310*
		2311	2318*	2327*	2400*	2401	2407*	2408	2414*	2421*	2422	2428*	2430*	2431
		2436*	2438*	2439	2444*	2446*	2447	2453*	2454*	2455	2461*	2464	2469*	2472

		2477*	2480	2485*	2488	2493*	2496	2501*	2504	2509*	2512	2517*	2520	2525*
		2529	2534*	2538	2562*	2563	2569*	2570*	2571	2576*	2577*	2578	2583*	2584*
		2585	2590*	2591*	2592	2597*	2598*	2599*	2600	2625*	2626	2645*	2646*	2647
		2660*	2661*	2662	2667*	2668*	2669	2674*	2675*	2676	2681*	2682*	2683	2688*
		2690*	2691	2694	2699*	2701*	2702	2723*	2724*	2725	2732*	2767*	2809*	2810*
		2815	2821*	2822*	2827	2833*	2834*	2839	2845*	2846*	2651	2857*	2858*	2863
		2869*	2870*	2875	3030*	3031*	3032*	3033*	3034	3037*	3038*	3043*	3044*	3045*
		3046*	3047	3050*	3051*	3056*	3057*	3058*	3059*	3060	3063*	3064*	3069*	3070
		3077*	3078	3184*	3185	3186	3187							
TEST	013604	2917*	2918*	2919*	2920*	2921*	2922*	2923*	2939	2944*	2955*	2956*	2957*	2958*
		2959*	2960*	2961*	2977	2981*	2982*	2983*	2984*	2985*	2986*	3002	3018*	3019*
		3020*	3021	3039*	3100*	3105*	3113*	3115*	3116	3119*	3121*			
		934*	1126*	1134*	1135	1139	1145*							
TIME	003152													
TJSR1	012766	2778*	2779											
TJSR2	012770	2777	2779*											
TJSR3	013002	2778	2783*	2787										
THEMEX	001132	876	885*											
TRCSR	000406	760*												
TRPB	000602	823*	969*	3237*	3328*									
TRTRP	016162	3240	3331	3362*										
TSCOMB	014346	3070*	3079											
TSROT	013450	2911*	2914											
TSROT2	013614	2949*	2953											
TSRT2A	013606	2915	2948*											
TTCSR	000410	588	761*	916*	1116									
TTDBR	000412	589	762*	1114*										
TTPST	000416	764*												
TTPVC	000414	763*	915*											
TTSAY	000420	765*	1116*	1117										
TYOUT	002764	1112*	1122											
TYOUTR	003000	915	1116*											
TYOUT1	002770	1114*	1123											
UEUFF	000400	758*	1013	3292										
UPARO	000510	793*	993	1005	3276	3343								
UPAR1	000512	794*												
UPAR7	000514	795*	3271	3347*										
UPDRO	000502	790*	1001*	1006	3344									
UPDR1	000504	791*												
UPDR7	000506	792*	3348*											
USEALL	002146	991	1001*											
USER	016676	972	3469*											
WAIT4	014454	3088	3095*											
WD =	000014	1258*	1325											
WORDCT	003602	926	944	1189	1207	1235*								
XFENDZ	004006	1308*	1357											
XFER12	002616	1072	1090*											
XFER16	002606	1074	1088*											
XFER20	002576	1076	1086*											
XFER24	002566	1078	1084*											
XFER28	002556	1080	1082*											
XFER8	002626	1070	1092*											
.	= 017762	606*	607	609	611	613	615	617	619	621	623	625	627	629
		631	633	635	637	639	641	643	645	647	649	651	653	655
		657	659	661	663	665	667	669	671	673	675	677	679	681
		683	685	687	689	691	693	695	697	699	701	703	705	707
		709	711	713	715	717	719	721	723	725	727	729	731	733

737*	740*	743*	749*	751*	753*	757*	759*	858	1017	1034	1065	1113
1119	1131	1142	1150	1151	1158	1178	1193	1211	1224	1290	1282	1295
1297	1303	1328	1335	1337	1352	1354	1360	1374	1390	1806	1812	1818
1924	1831	1838	1847	1854	1863	1871	1878	1885	1895	1903	1911	1919
1927	1935	1943	1952	1961	1970	1979	2001	2006	2011	2018	2024	2030
2038	2045	2052	2060	2066	2073	2081	2088	2095	2103	2110	2117	2124
2131	2138	2143	2148	2155	2161	2167	2175	2182	2189	2196	2202	2209
2217	2224	2231	2237	2246	2253	2260	2267	2275	2283	2290	2296	2303
2312	2320	2329	2338	2344	2350	2356	2362	2368	2375	2380	2387	2394
2402	2409	2416	2423	2432	2440	2443	2456	2465	2473	2481	2489	2497
2505	2513	2521	2530	2539	2546	2551	2558	2564	2572	2579	2586	2593
2601	2609	2614	2621	2627	2633	2641	2648	2655	2663	2670	2677	2684
2692	2695	2703	2710	2717	2726	2734	2740	2746	2752	2760	2769	2780
2788	2796	2798	2800	2802	2811	2813	2816	2823	2825	2828	2835	2837
2840	2847	2849	2852	2859	2861	2864	2871	2873	2876	2883	2899	2924
2925	2926	2928	2929	2930	2932	2933	2935	2936	2940	2962	2963	2964
2966	2967	2968	2970	2971	2973	2974	2978	2987	2988	2989	2991	2992
2993	2995	2996	2998	2999	3003	3022	3035	3048	3061	3071	3073	3075
3093	3101	3103	3106	3108	3117	3149	3172*	3175*	3183*	3186*	3200	3290
3321	3367	3372	3391	3401	3405	3418	3435	3443	3449	3452	3471*	

COMMEN	10			
ENDCOM	10			
ESCAPE	10			
GETPRI	10			
GETSWR	10			
MULT	10			
NEWTST	10			
POP	10			
PUSH	10			
REPORT	10			
SETPRI	10			
SETUP	10			
SKIP	10			
SLASH	10			
STARS	10			
SWRSU	10			
TNCV	2888	2924	2962	2987
TYPBIN	10			
TYPDEC	10			
TYPNAM	10			
TYPNUM	10			
TYPJCS	10			
TYPJCT	10			
TYPTXT	10			
SSESCA	10			
SSNEWT	10			
SSSKIP	10			
.EQUAT	10			
.HEADE	10			
.KILL	10			
.SETUP	10			
.SWRHI	10			
.SACT1	10			
.SAPT8	10			
.SAPTH	10			
.SAPTY	10			
.SASTA	10			
.SCATC	10			
.SCHTA	10			
.SDB2D	10			
.SDB2O	10			
.SDIV	10			
.SEOP	10			
.SERRO	10			
.SERRT	10			
.SHLLT	10			
.SPOWE	10			
.SRAND	10			
.SRDOE	10			
.SRDOC	10			
.SREAD	10			
.SR2AZ	10			
.SSAVE	10			
.SSB2D	10			
.SSB2O	10			
.SSCOP	10			

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DBKTG.P11 CROSS REFERENCE TABLE -- MACRO NAMES

.SSIZE	18
.SSUPR	18
.STRAP	18
.STYPB	18
.STYPD	18
.STYPE	18
.STYPO	18
.S4OCA	18
.1170	18

...

CLRB	2463	2471	2479	2487	2570	2661	2758	3214									
CMP	857	886	892	1064	1121	1135	1139	1165	1163	1179	1229	1284	1299	1302	1339		
	1356	1359	1392	1805	1811	1817	1823	1830	1837	1846	1853	1862	1870	1934	1942		
	2000	2005	2010	2017	2023	2029	2037	2044	2051	2059	2080	2087	2094	2109	2116		
	2123	2130	2137	2142	2147	2154	2160	2166	2174	2181	2188	2195	2216	2223	2230		
	2245	2252	2259	2266	2289	2295	2302	2311	2319	2328	2472	2490	2520	2529	2571		
	2578	2585	2592	2600	2691	2739	2745	2759	2768	2815	2827	2839	2851	2863	2875		
	2882	2898	2901	2913	2939	2952	2977	3002	3014	3021	3034	3078	3116	3150	3156		
	3201	3271	3276	3301	3349	3376	3464										
CMPB	1198	1227	2337	2343	2349	2355	2361	2367	2374	2379	2386	2393	2401	2408	2415		
	2422	2431	2439	2447	2455	2545	2550	2557	2563	2608	2613	2620	2626	2632	2640		
	2647	2654	2669	2676	2683	2709	2716	2725	2733	2751	2779	2787	3047	3060	3070		
COM	1901	2108	2244	3032	3037	3086	3237	3328									
COMB	2495	2577	3045	3050	3058	3063											
DEC	1358	1917	1925	2122	2258	3033	3046	3059	3289	3413							
DECB	2511	2591	2675	2701													
HALT	608	610	612	614	616	618	620	622	624	626	628	630	632	634	636		
	638	640	642	644	646	648	650	652	654	656	658	660	662	664	666		
	668	670	672	674	676	678	680	682	684	686	688	690	692	694	696		
	698	700	702	704	706	708	710	712	714	716	718	720	722	724	726		
	728	730	732	734	864	3316	3392	3460									
INC	1120	1134	1167	1171	1181	1301	1909	2115	2251	2903	2904	2911	2949	3012	3038		
	3120	3158	3369	3406													
INCB	943	1205	1272	1277	1290	1306	1315	1344	1347	1363	2503	2584	2668	3051	3064		
	3121																
JMP	750	752	754	859	1021	1058	1986	1993	2893	3151	3466						
JSR	866	898	972	973	976	1070	1072	1074	1076	1078	1080	1083	1085	1087	1089		
	1091	1093	1371	2777	2786	2795	2912	2950	2951	3013	3138	3140	3142	3144	3231		
	3291	3312	3319	3378	3380	3381	3383	3384	3386	3387	3389						
MFPI	3211	3285															
MOV	835	836	842	843	844	847	848	863	865	867	868	869	871	872	873		
	874	875	875	879	890	891	894	895	897	899	901	902	903	905	908		
	915	917	921	922	923	925	926	932	933	940	941	942	944	945	951		
	952	953	961	962	963	964	965	966	967	968	971	977	978	981	982		
	984	985	989	992	993	995	997	1001	1002	1003	1004	1005	1006	1007	1013		
	1016	1031	1039	1040	1055	1061	1063	1082	1084	1086	1088	1090	1092	1095	1096		
	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1108	1114	1116	1149	1152		
	1173	1176	1183	1188	1189	1206	1207	1269	1274	1276	1289	1311	1312	1317	1318		
	1322	1323	1324	1330	1346	1367	1368	1369	1376	1382	1383	1384	1386	1387	1394		
	1395	1396	1788	1795	1800	1802	1804	1810	1816	1822	1828	1829	1835	1836	1844		
	1845	1851	1852	1859	1860	1867	1868	1875	1876	1882	1883	1891	1892	1899	1900		
	1907	1908	1915	1916	1923	1924	1931	1932	1939	1940	1947	1948	1956	1957	1965		
	1966	1974	1975	1984	1991	2016	2022	2028	2035	2042	2049	2057	2064	2070	2092		
	2100	2107	2128	2153	2159	2165	2172	2179	2186	2193	2200	2206	2228	2236	2243		
	2264	2271	2279	2288	2294	2300	2301	2308	2309	2316	2317	2324	2325	2326	2336		
	2342	2348	2354	2360	2366	2372	2373	2384	2385	2391	2392	2399	2406	2413	2420		
	2428	2429	2436	2437	2444	2445	2452	2453	2461	2462	2469	2470	2477	2478	2485		
	2486	2493	2494	2501	2502	2509	2510	2517	2518	2525	2526	2534	2535	2569	2576		
	2638	2645	2652	2660	2681	2688	2699	2708	2714	2715	2722	2723	2730	2731	2738		
	2744	2750	2756	2757	2764	2765	2766	2774	2809	2821	2833	2845	2857	2869	2910		
	2917	2948	2955	3010	3011	3018	3082	3085	3096	3099	3124	3159	3162	3191	3192		
	3193	3194	3196	3197	3203	3204	3205	3212	3216	3233	3240	3243	3246	3249	3252		
	3255	3258	3261	3262	3264	3275	3282	3283	3292	3295	3299	3300	3303	3304	3305		
	3306	3310	3322	3324	3331	3332	3333	3338	3339	3341	3343	3344	3345	3346	3351		
	3352	3353	3354	3357	3358	3370	3374	3375	3377	3379	3382	3385	3388	3400	3403		
	3412	3425	3436	3444	3450	3453	3457	3458	3459	3462	3463						

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 DBKTG.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

MOV8	837	927	946	1190	1208	1325	1331	1370	1377	2400	2407	2414	2421	2556	2562
	2598	2519	2625	2631	3228										
MTPI	1015	3287	3294												
NEG	1933	1941	2129	2265											
NEGB	2519	2599	2682												
NOP	1043	1045	1047	1049	1051	1053	1068	1069	1988	1995	3132	3313	3314	3315	
RESET	907	3308													
ROL	2921	2922	2923	3407	3408	3421	3422	3423							
ROLB	2834	2846	2959	2960	2961	2984	2985	2986							
ROR	2918	2919	2920												
RORB	2810	2822	2956	2957	2958	2981	2982	2983							
RTI	847	1027	1115	1129	1155	1163	1191	1209	1273	1278	1291	1307	1316	1319	1326
	1345	1348	1364	1372	3160	3163	3263	3265	3288	3311	3359	3368	3394		
RTS	1035	1038	1066	1094	1109	1397	2782	2942	2980	3005	3025	3135	3137	3139	3141
	3143	3145	3206	3415	3437	3445	3454	3469							
RTT	3362														
SBC	851	854	1968	1977	2281										
SBCB	2537														
SCC	2820	2844	2868	3136											
SEC	849	852	1949	1958	1967	1976	2272	2280	2527	2536	2689	2700	3420		
SOB	988	999	3200	3342	3356										
SUB	1025	1877	1884	2058	2065	2071	2194	2201	2207	3020	3210				
SWAB	1200	1219	1231	1792	3100	3105	3115	3119							
TRAP	587														
TST	845	850	880	881	882	883	911	920	931	939	950	955	960	986	998
	1056	1158	1214	1223	1270	1313	1327	1373	1894	1902	1910	1918	1926	1951	1960
	1969	1978	2072	2102	2208	2238	2274	2282	2538	2702	2790	3366	3390	3404	3417
TSTB	853	1117	1130	1141	1153	1156	1177	1210	2464	2488	2496	2504	2512	2662	2694
	3320	3410	3434	3442	3448	3451									
WAIT	1018	3089	3090	3091	3092										
.ABS	544														
.DSABL	544														
.ENABL	1														
.END	3473														
.LIST	1	544													
.MACR	2888														
.MACRO	1														
.MLIST	1	544													
.REM	1														
.REPT	607	1403	1595												
.SBTTL	544	604	1797												
.TITLE	544														

ERRORS DETECTED: 0
 DEFAULT GLOBALS GENERATED: 0

* DBKTGC.SEQ/SOL/CRF/PAGNUM/NL:TOC/DS:ERFZ=SYSMAC.CO,DBKTG.P11
 RUN-TIME: 27 38 4 SECONDS
 RUN-TIME RATIO: 223/71=3.1
 CORE USED: 33K (65 PAGES)

