

**DataGeneral**

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**TECHNICAL  
STATEMENT**

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TEXT LISTING

068-000488-02

PROGRAM

6063,6064 FIXED HEAD DISK  
DIAGNOSTIC

TEXT TAPE

097-000488-01

ABSTRACT

THIS PROGRAM IS A HARDWARE DIAGNOSTIC FOR THE 6063,6064 FIXED  
HEAD DISK CONTROL AND DRIVES.

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0001 .MAIN          MACRO REV 06.30      08:44:04 05/16/79
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PROGRAM NAME - PDD.SR - 6063,6064
FIXED HEAD DISK SYSTEM DIAGNOSTIC

REVISION HISTORY
01 TO UPDATE PDD TO HANDLE TIMING AND
HARDWARE CHANGES -
02 TO UPDATE PDD TO HANDLE HIGH SPEED CHANNEL
(CHSC) HARDWARE CHANGES -
TO IMPLEMENT DIAGNOSTIC ERROR PACKAGE
TO IMPLEMENT I70 MOD USE (DTOS)
ADD RANDOM HEAD/SECTOR WRITE/READ TEST
ADD UNIT SELECT TEST

MACHINE REQUIREMENTS
:3.0
1. NOVA OR ECLIPSE FAMILY CENTRAL PROCESSOR
2. MINIMUM OF 8K READ/WRITE MEMORY
3. DGC 6063,6064 FIXED HEAD DISK SYSTEM
4. 0-3 DGC 6063,6064-A ADD ON DISK DRIVES
5. TELETYPE OR CRT AND 4010 CONTROL

TEST REQUIREMENTS - N.A.

SUMMARY
:5.0
THIS PROGRAM IS A HARDWARE DIAGNOSTIC FOR THE
6063, 6064 FIXED HEAD DISK CONTROL AND DRIVES.
THE DEVICE CODE MAY BE 20-76 OCTAL WITH THE DEFAULT
BEING 26 (OCTAL)

RESTRICTIONS - N.A.

PROGRAM DESCRIPTION - BY MEANS OF MULTIPLE SUBROUTINES
THE OPERATION OF THE FIXED HEAD DISK CAN BE BROKEN
DOWN INTO SEVERAL CATEGORIES:

1 NORMAL SETUP OF ROUTINES AND LOOPING IS
CONTROLLED BY ADSET,SETP,SETPI, .SETUP, & .LOOP
2 ERROR FUNCTIONS CAN BE CALLED BY EHALL OR EHECC
3 READ,WRITE, IDLE, VERIFY, AND OTHER SIMILAR DISK
OPERATIONS ARE CALLED BY THIS SET OF ROUTINES
4 STRIP HANDLES THE ACTUAL ROUTINE TO ACTIVATE
FULL OPERATIONS OF THE DISK
5 CHECK, CHECKS, ESTAT, ISTAT, MSTAT, & XSTAT
HANDLE THE CHECKING AND FAULT ISOLATION
ROUTINES THAT INTERACT WITH THE DISK
OPERATING SYSTEMS

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10003 .MAIN

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01 SWITCH SETTINGS
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18.0

LOCATION "SWREG" IS USED TO SELECT THE PROGRAM OPTIONS (NOT SYSTEM CONFIGURATION), WHILE RUNNING UNDER DTOS, THIS LOCATION WILL BE LOADED BY THE MONITOR. HOWEVER UNDER STAND ALONE AND PROGRAM LOAD MODES THIS LOCATION WILL BE SET ACCORDING TO THE ANSWERS SUPPLIED BY THE OPERATOR. IN ANY CASE THE OPTIONS CAN BE CHANGED OR VERIFIED BY USING ONE OF THE COMMANDS GIVEN IN SEC. 8.2

18.1 SWITCH OPTIONS DIFFERENT BITS AND THEIR INTERPRETATION AT LOCATION "SWREG" IS AS FOLLOWS:

BIT	OCTAL VALUE	BINARY INTERPRETATION
1	40000	0 LOOP ON ERROR 1 SKIP LOOPING ON ERROR
2	20000	0 PRINT TO CONSOLE 1 ABORT PRINT OUT TO CONSOLE
3	10000	0 DO NOT PRINT % FAILURE 1 PRINT % FAILURE
5	02000	0 DO NOT PRINT ON THE LINE PRINTER 1 PRINT ON THE LINE PRINTER
6	01000	0 DO NOT HALT ON ERROR 1 HALT ON ERROR
12(C)	00010	N/A 20(16.) WORD DCH BUFFER (ECLIPSE HSC ONLY)
13(D)	00004	N/A ECLIPSE HIGH SPEED CHANNEL

10004 .MAIN

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18.2 SWITCH COMMANDS

ONCE THE PROGRAM STARTS EXECUTING THE STATE OF ANY OF THE BITS CAN BE CHANGED BY HITTING KEYS 1-9, A-F. THE PROGRAM WILL CONTINUE RUNNING AFTER UPDATING THE OPTIONS. EACH KEY WILL COMPLEMENT THE STATE OF THE BIT. AFFILIATED WITH IT, THUS BIT 4 CAN BE ALTERED BY HITTING KEY 4. (DEFAULT MODE IS DEFINED AS ALL BITS OF SWREG SET TO 0)

18.3 OTHER COMMANDS (\* = CONTROL KEY)

"CR" A "RETURN" CAN BE TYPED TO CONTINUE THE PROGRAM AFTER ITS LOCKED IN A SWITCH MODIFICATION MODE

"D" THIS COMMAND GIVEN AT ANY TIME WILL RESET "SWREG" TO DEFAULT MODE AND RESTART THE PROGRAM.

"R" THIS COMMAND GIVEN AT ANY TIME WILL RESTART THE PROGRAM. SWITCHES ARE LEFT WITH THE VALUES THEY HAD BEFORE THE COMMAND WAS ISSUED.

"O" THIS COMMAND GIVEN AT ANY TIME WILL CAUSE THE PROGRAM CONTROL TO GO TO ODT (NOTE: THIS IS AN OPTIONAL COMMAND AND IS AVAILBLE ONLY IF ODTPK IS PRESENT)

"M" THIS COMMAND GIVEN AT ANY TIME WILL PRINT THE CURRENT OPERATING MODES.

"0" THIS COMMAND GIVEN AT ANY TIME WILL LOCK THE PROGRAM INTO SWITCH MODIFICATION MODE WHERE MORE THAN 1 BIT CAN BE CHANGED.

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10005 *MAIN
01 OPERATING PROCEDURE
02
03 1. LOAD USING THE BINARY LOADER (OR DTOS)
04 2. STARTING ADDRESSES
05 2 - TO RE-INITIALIZE PROGRAM
06 PROGRAM THEN PROCEEDS TO 400.
07 4 - SET DISK CONTROL ADDRESS TO OTHER THAN 26
08 70 - UOT - DIRECT ENTRY ONLY
09 200- START DIAGNOSTIC (DTOS DEFAULT START)
10 THE PROGRAM PRINTS "PASS" FOLLOWING EACH
11 COMPLETE PASS THROUGH THE TESTS.
12 5. OPERATOR INPUTS
13
14 UNIT NUMBERS ARE REQUESTED TO WHICH THE OPERATOR
15 ENTERS THE UNIT NUMBERS TO BE TESTED, SEPARATING
16 THE INDIVIDUAL #'S BY A <,> OR <SPACE>.
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18 THE FOLLOWING IS THEN ASKED FOR EACH DRIVE:
19
20 LOWER UPPER TRACKS ARE REQUESTED TO WHICH THE
21 OPERATOR ENTERS 2 OCTAL NUMBERS CORRESPONDING
22 TO THE LOWER AND UPPER LIMITS OF THE TRACKS TO
23 BE TESTED. THE PROGRAM WILL WRITE ONLY BETWEEN
24 (AND INCLUDING) THESE TRACKS.
25
26 DISK SIZE, MEGABYTES(1 OR 2) ?
27 TO WHICH THE OPERATOR ENTERS 1 OR 2 FOR 1
28 OR 2 MEGABYTE DRIVES.
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10006 *MAIN
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? 10. PROGRAM OUTPUT/ERROR DESCRIPTION:
? WHEN AN ERROR IS DETECTED THE PROGRAM PRINTS THE ERROR
? PC, AC'S 0,1,AND 2 AT THE POINT OF ERROR,
? PLUS AN OPTION PRINTOUT. THE PROGRAM THEN
? GOES INTO A SCOPE LOOP BETWEEN THE ENTRIES TO
? SETUP AND LOOP ALLOWING THE OPERATOR TO SET SWPAK.
? IN GENERAL THE ERROR PC WILL POINT TO A CALL ERROR.
?
? THE OPTION PRINTOUT WILL BE OF ONE OF THE FOLLOWING FORMATS:
?
? A. STANDALONE CONTROLLER TEST FAILURES-
?
? FAILING MODULE - DISK CONTROLLER
?
? B. STATUS ERRORS
?
? MODE UNIT # HEAD # SECTOR #
? ACI(STATUS) SHOULD =AC0
? DESCRIPTIONS OF FAILING STATUS BITS
? PROBABLE FAILURE -(AS PER FAILING BIT)
?
? C. MEMORY ADDRESS ERROR
?
? MODE UNIT # HEAD # SECTOR #
? ENDING MEMORY ADDRESS ERROR
? ACI(MA) SHOULD =AC0
?
? C. INTERRUPT TIMEOUT
?
? MODE UNIT # HEAD # SECTOR #
? INTERRUPT TIMEOUT
?
? ADDITIONAL TEST SIGNIFICANCE CAN BE FOUND IN THE PROGRAM
? LISTING, ALTHOUGH IT IS HOPED THAT A NEED FOR THE
? LISTING WILL BE MINIMAL. SWPACK(SWREG) WILL PROVIDE
? ALL CONTROL OVER TEST LOOP OPTIONS AND PRINTOUTS.
?
? DATA ERRORS WILL RESULT IN THE 1ST 3 GOOD/BAD
? PAIRS AND THEIR ADDRESSES BEING PRINTED ALONG WITH THE
? TOTAL COUNT. IF AN CRC ERROR IS DETECTED, THE CALL
? EHECC WILL ACKNOWLEDGE THE FACT AND RETURN TO THE
? MAIN TEST FOR THE DATA COMPARE. PRINTOUTS RESULT
? ON THE 1ST ERROR PASS ONLY.
?
? IN GENERAL EACH SUCCESSIVE TEST ASSUMES ALL
? PREVIOUS TESTS WORK. BYPASSING ERRORS
? CAN RESULT IN CONFUSING SITUATIONS
? IN THE SETUP OF MORE COMPLEX TESTS.

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:0009 .MAIN
01 DELAY(.DLY) DELAY GENERATOR
02 # MILLISECONDS
03 NORMAL RETURN
04 EHALLT(.EMHALT) ERROR SUBROUTINE
05 EHCCC(.EHCCC) ERROR ON ECC
06 ESTAT(.ESTT) FORCED ERROR STATUS
07 ADDRESS IN QUEUE
08 ERROR WORD EXPECTED
09 FAULT RETURN
10 NORMAL RETURN
11 GENDAT(.GEN) GENERATE "N" SECTORS OF DATA
12 ADDRESS OF GENERATOR ROUTINE (WHERE CODE LIES)
13 DATA BUFFER ADDRESS
14 # SECTORS
15 RETURN
16 IDLE(.ID) SETUP IDLE BLOCK(S)
17 # SECTOR "DISK ADDRESS"
18 # SECTORS
19 INIT(.INI) PROGRAM INITIALIZATION
20 INTWT(.WAIT) WAIT 0.300 SECONDS OR INTERRUPT
21 FAULT RETURN (NO INTERRUPT)
22 NORMAL RETURN
23 ISTAT(.ISTT) IDLE STATUS FOR MULTIPLE BLOCKS
24 ADDRESS
25 # SECTORS
26 FAULT RETURN
27 NORMAL RETURN
28 IWAIT(.WAIT) WAIT 0.300 SECONDS OR INTERRUPT
29 FAULT RETURN (NO INTERRUPT)
30 NORMAL RETURN
31 .LOOP(.LOOP) END OF TEST ITERATION
32 MSTAT(.MSTT) CHECK W/R STATUS FOR MULTIPLE BLOCKS
33 ADDRESS OF 1ST STATUS
34 # SECTORS
35 FAULT RETURN
36 NORMAL RETURN
37 RAND(RAN) RANDOM # GENERATOR A FOR R/W DATA
38 RCKCA(.RCKCA) ENDING CHECK READ MA
39 ADDRESS
40 FAULT RETURN
41 NORMAL RETURN
42 ROFILE(.ROF) READ REGISTER FILES
43 DISK ADDRESS
44 MEMORY ADDRESS
45 # SECTORS
46 * READ(.READ) SETUP A READ BLOCK (S)
47 DISK ADDRESS
48 MEMORY ADDRESS
49 # SECTORS (BLOCKS)
50 RNOER(.RNE) READ, NO ERROR HALT
51 DISK ADDRESS
52 MEMORY ADDRESS
53 # SECTORS

:0010 .MAIN
01 SWELL(.L0UP)
02 ITERATE ONCE
03 ITERATE 5 TIMES
04 .SETUP(.SET) INITIALIZATION - ADDRESS OF TOP OF LOOP
05 SJMP(.SJMP) SETUP JUMP BLOCK
06 ADDRESS
07 STALL(.STAL) DRIVE PARAMETERS - DELAY 20-30 MICRO-SEC.
08 STPAR(.SP) DRIVE PARAMETERS - STARTING
09 STRTP(.STRT) START PAGING
10 VERIFY(.VERFY) SETUP A VERIFY BLOCK
11 DISK ADDRESS
12 MEMORY ADDRESS
13 # SECTORS
14 WCKCA(.WCKCA) CHECK ENDING WRITE MA
15 ADDRESS
16 FAULT RETURN
17 NORMAL RETURN
18 WRECC(.WECC) WRITE A FORCED ECC ERROR
19 DISK ADDRESS
20 MEMORY ADDRESS
21 #SECTORS
22 WRITB(.WITB) WRITE BUFFER
23 DISK ADDRESS
24 MEMORY ADDRESS
25 # SECTORS
26 * WRITE(.WRIT) SETUP A WRITE BLOCK
27 DISK ADDRESS
28 MEMORY ADDRESS
29 # SECTORS
30 WRITP(.WITP) FORCE PARITY ERROR
31 DISK ADDRESS
32 MEMORY ADDRESS
33 # SECTORS
34 XSTAT(.XSTT) CHECK W/R STATUS 1 BLOCK
35 ADDRESS
36 FAULT RETURN
37 NORMAL RETURN
38 *
39 1ST BLOCK BLUC-CBUFF AND REMAINDER ARE GENERATED
40 IN ORDER AS ENCOUNTERED, 5 WORDS / BLOCK
41 BLOCKS ARE SET UP AS FOLLOWS IN THE QUEUE TABLE:
42
43 1 DISK, TRACK, & SECTOR ADDRESS
44 BITS 0 2-3 4-10 11-15
45 DRIVE # *
46 TRACK ADDR. *
47 SECTOR ADDR. *
48 DISK FUNCTION; READ, WRITE, IDLE,
49 VERIFY, JUMP, & HALT BIT
50 BITS 5 6 7
51 READ 0 0 0
52 WRITE 0 0 1
53 DATA VERIFY 0 1 0
54 JUMP 0 1 1
55 IDLE 1 0 0
56 WR BUFFER 1 0 1
57 RD BUFFER 1 1 0
58 MEMORY ADDRESS
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10011 .MAIN

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4 STATUS STORED BY DISK CONTROLLER  
5 FOR SOFTWARE USE  
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BIT 15 - PAGE DONE (READ,WRITE,VERIFY)  
BIT 14 - DATA VERIFY ERROR  
BIT 13 - ECC ERROR  
BIT 12 - DATA LATE  
BIT 11 - DISK UNSAFE - POWER,SPEED  
BIT 10 - DISK READY  
BIT 9 - R/W TIME OUT  
BIT 8 - DATA CHANNEL ERROR (BETWEEN CPU & DCH)  
BIT 7 - W/R PARITY ERROR (BETWEEN CHANNEL & CNTLR)  
BIT 6 - IDLE DONE  
BITS 1/5 LOADED W/O'S  
BITS 5/4 DISK CAPACITY 01 - 1MBYTE 10 - 2MBYTE  
BIT 3 - BUSS ENABLE  
BIT 0 - ERROR  
\*\*  
SHTP SETS A HALT BIT IN LAST BLOCK GENERATED  
AND STARTS PAGING @ LOC - CBUFF. BLOCKS ARE RE-  
GENERATED EACH PASS THROUGH LOOP.  
AC2 CONTAINS LAST BLOCK ADDRESS  
SPECIAL NOTES - DISK PACKS  
THE DIAGNOSTIC PROGRAM WILL WRITE OVER MOST OF  
THE DISK SURFACE BETWEEN THE LOWER/UPPER TRACK  
LIMITS SPECIFIED BY THE OPERATOR  
RUN TIME - THE RUNNING TIME FOR 2 PASSES IS  
APPROXIMATELY 4 MINUTES DEPENDING ON TRACKS TESTED  
(177 TRACKS, 1 UNIT).

10012 .MAIN

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OZOTO 14  
OCTAL DEBUG TOOL (ODT)  
THE DIAGNOSTIC IS EQUIPPED WITH A BUILT IN ODT WHICH CAN  
BE ACCESSED BY HITTING CONTROL 0 (\*0) AT ANY TIME DURING  
THE EXECUTION OF THE PROGRAM (AFTER SETTING THE PARA-  
METERS)  
ON ENTERING ODT THE ADDRESS OF THE LOCATION HAVING THE  
NEXT INSTRUCTION TO BE EXECUTED WILL BE TYPED-OUT.  
CONVENTIONS AND SYMBOLS  
THE FOLLOWING CONVENTIONS ARE USED BY THE ODT:  
? PRESSING ANY ILLEGAL KEY CAUSES THE ODT TO RES-  
POND WITH A "?".  
@ ODT IS READY AND AT YOUR SERVICE.  
COMMAND STRUCTURE  
AN ODT COMMAND HAS THE FOLLOWING FORMAT:  
[ARGUMENT] [COMMAND]  
AN ARGUMENT MAY BE ONE OF THE FOLLOWING:  
"EXPI" AN OCTAL EXPRESSION CONSISTING OF OCTAL NUMBERS  
SEPARATED BY PLUS (+) OR MINUS (-) SIGNS. LEAD-  
ING ZEROS NEED NOT BE TYPED.  
"ADR" AN ADDRESS IS THE SAME AS AN EXPRESSION EXCEPT  
THAT BIT 0 IS NEGLECTED.  
A COMMAND IS A SINGLE TELETYPE CHARACTER  
ODT COMMANDS  
THE LOCATIONS THAT CAN BE EXAMINED AND MODIFIED BY THE  
USER ARE CALLED CELLS. THESE CELLS ARE OF TWO TYPES:  
INTERNAL CPU CELLS AND MEMORY LOCATIONS.  
OPENING INTERNAL CELLS  
THE COMMAND TO OPEN ONE OF THE INTERNAL REGISTERS IS OF  
THE FORM "NA" WHERE N IS ANY OCTAL EXPRESSION BETWEEN  
0 AND 7  
0-3 FOR ACCUMULATORS 0-3  
4 FOR PC OF THE NEXT INSTRUCTION TO BE EXECUTED IN  
THE EVENT OF A "P" COMMAND.  
5 CPU AND I/O STATUS  
BIT INTERPRETATION  
15 STATUS OF I/O DONE FLAG  
14 STATUS OF INTERRUPTS (I/O FLAG)  
13 STATUS OF CARRY BIT  
6 ADDRESS OF THE LOCATION HAVING THE BREAK POINT (IF  
ANY)  
7 INSTRUCTION AT THE BREAK POINT LOCATION  
OTHER COMMANDS TO OPEN CELLS ARE:  
"ADR"/ OPEN THE CELL AND PRINT ITS CONTENTS  
./ OPEN THE CELL CURRENTLY POINTED TO BY THE POINTER  
AND PRINT ITS CONTENTS.  
.\*"ADR"/ ADD "ADR" TO THE POINTER, OPEN THE CELL  
AND PRINT ITS CONTENTS.  
-."ADR"/ AND SUBTRACT "ADR" FROM THE POINTER, OPEN  
THE CELL AND PRINT ITS CONTENTS.

01 THE RETURN KEY IS USED TO CLOSE THE OPEN CELL  
02 WITH OR WITHOUT MODIFICATION.  
03 LINE FEED IS USED TO CLOSE THE OPEN CELL WITH OR  
04 WITHOUT MODIFICATION AND TO OPEN THE SUCCEEDING  
05 CELL.  
06 CLOSE THE OPEN CELL WITH OK WITHOUT MODIFICATION  
07 AND OPEN THE PRECEDING CELL  
08 CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND  
09 OPEN THE CELL POINTED TO BY ITS CONTENTS.  
10 + "ADR"/ CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND  
11 OPEN THE CELL POINTED TO BY ITS CONTENTS + "ADR".  
12 - "ADR"/ CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND  
13 OPEN THE CELL POINTED TO BY ITS CONTENTS - "ADR".  
14  
15 14.3.2 MODIFICATION OF A CELL  
16 ONCE A CELL HAS BEEN OPENED ITS CONTENTS CAN BE MODIFIED  
17 BY TYPING THE NEW VALUE. THE CELL IS TO CONTAIN IN THE  
18 FORM OF AN OCTAL EXPRESSION FOLLOWED BY "CR" OR "LF".  
19 IF A + OR - IS TYPED AS THE FIRST CHARACTER OF THE EX-  
20 PRESSION THEN THE VALUE OF THE EXPRESSION IS ADDED TO OR  
21 SUBTRACTED FROM THE OLD CONTENTS OF THE CELL. THE  
22 ADDRESS ITSELF OR AN EXPRESSION RELATIVE TO THE ADDRESS  
23 CAN BE DEPOSITED BY TYPING A " " OR "\*/-OCTAL EXPRESS-  
24 ION". A RUBOUT COMMAND GIVEN RIGHT AFTER OPENING A CELL  
25 ALLOWS THE MODIFICATION OF ITS CONTENTS AS IF THEY WERE  
26 TYPED IN JUST BEFORE THE COMMAND WAS ISSUED.  
27  
28 14.3.3 OTHER ODT COMMANDS  
29 THIS KEY IS USED TO DELETE ERRONEOUSLY TYPED  
30 DIGITS. EACH TIME THE KEY IS PRESSED THE RIGHT MOST  
31 DIGIT IS DELETED AND ECHOED ON THE TERMINAL. IF  
32 THE RUBOUT KEY IS PRESSED RIGHT AFTER OPENING A  
33 CELL THEN IT DELETES THE RIGHT MOST DIGIT OF THE CELLS  
34 CONTENTS. THIS ALLOWS THE MODIFICATION OF THE CELL  
35 AS IF ITS CONTENTS WERE TYPED IN JUST BEFORE THE  
36 KEY WAS PRESSED.  
37 INSERT A BREAK POINT AT LOCATION "ADR".  
38 ONLY ONE BREAK POINT CAN BE INSERTED AND ANY  
39 ENTRY TO ODT AFTER EXECUTING A BREAK POINT WILL  
40 CAUSE IT TO BE DELETED.  
41 DELETE THE BREAK POINT IF ANY.  
42 RESTART THE EXECUTION OF THE PROGRAM AT LOCATION  
43 POINTED BY 4A.  
44 "ADR"R START EXECUTING THE PROGRAM AT "ADR" AFTER AN  
45 IO-RESET.  
46 K KILL THE STRING TYPED SO FAR. THE ODI RESPONDS  
47 WITH A "?" AND THE OPEN CELL IS CLOSED WITHOUT  
48 MODIFICATION.  
49 = PRINT THE OCTAL VALUE OF THE INPUT ONLY.  
50 THIS WILL CLOSE ANY OPEN CELLS WITHOUT  
51 MODIFICATION AND WILL NOT OPEN A CELL  
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NOTE: IN PROGRAMS WHICH RELOCATE THEMSELVES THE  
THE USER SHOULD PLACE BREAK POINTS ONLY IN THE  
THE ORIGINAL PROGRAM AREA. IF A BREAK POINT IS  
PLACED OUTSIDE THIS AREA THE RESULTS WILL  
BE UNPREDICTABLE.



10015 .MAIN

\*\*00000 TOTAL ERRORS, 00000 PASS 1 ERRORS

0016 .MAIN

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