

.REM

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DZTUE-D-D

PRODUCT NAME: TU16 UTILITY DRIVER

DATE CREATED: 21 APRIL 76

MAINTAINER: DIAGNOSTIC ENGINEERING

AUTHOR: R. B. BARNES

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

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

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

COPYRIGHT ©. 1974, 1976 BY DIGITAL EQUIPMENT CORPORATION

Vertical text on the left margin, possibly a page number or document identifier.

CO1

MITSUBISHI TRUCK DRIVER

:TABLE OF CONTENTS

PARAGRAPH	SUBJECT	PAGE
1.	ABSTRACT	1
2.	REQUIREMENTS	1
3.	LOADING PROCEDURE	1
4.	STARTING PROCEDURE	1
5.	CONSOLE SWITCHES	1
6.	OPERATION	2
7.	PROGRAM DESCRIPTION	
8.	LISTING	

(PAGE 1)

1. ABSTRACT

THIS PROGRAM IS INTENDED AS A BRUTE FORCE ROUTINE TO EXECUTE AN OPERATION OR SERIES OF OPERATIONS, CONTINUOUSLY REGARDLESS OF THE RESULTS OF THE OPERATION. BECAUSE OF THE COMPLEXITY OF THE TUI6 MAG TAPE SYSTEM AS OPERATED ON THE MASSBUS, IT IS NOT ALWAYS POSSIBLE TO PROVIDE FOR EVERY CONTINGENCY IN THE NORMAL PROGRAMS. THEREFORE THIS UTILITY DRIVER WILL ALLOW AN OPERATOR TO EXECUTE ANYTHING DESIRED IN ANY ORDER. THERE ARE NO ERROR CHECKS OR PRINTOUTS MADE, AND ANY VARIATION FROM PRESET SEQUENCES AND VALUES ARE MADE BY CHANGING THE APPROPRIATE MEMORY LOCATIONS.

2. REQUIREMENTS2.1 HARDWARE:

- A. ANY PDP-11 PROCESSOR - WITH OR WITHOUT HARDWARE SWITCH REGISTER.
- B. RM MASSBUS CONTROLLER
- C. TMO2 MAG TAPE CONTROLLER
- D. AT LEAST ONE (1) TUI6 SLAVE

2.2 STORAGE:

THIS PROGRAM REQUIRES AT LEAST 3K OF CORE

3. LOADING PROCEDURE:

USE STANDARD BINARY LOADING PROCEDURE

4. STARTING PROCEDURE

THE PROGRAM IS ALWAYS STARTED AT LOCATION 200 (8)

***LOC. 176 (SWREG) IS DEFINED AS THE SOFTWARE SWITCH REGISTER
(REFER TO SECTION 5 FOR MORE DETAIL)

***IF THE SOFTWARE SWITCH REGISTER IS USED THE DIAGNOSTIC TYPES OUT THE FOLLOWING MESSAGE: SWR=XXXXXX NEW= (REFER TO SECTION 5 FOR OPERATOR OPTIONS)
AT THE START OF THE PROGRAM.

5. CONSOLE SWITCH SETTINGS

IF THE DIAGNOSTIC IS RUN ON A CPU WITHOUT A SWITCH REGISTER THEN A SOFTWARE SWITCH REGISTER IS USED WHICH ALLOWS THE USER THE SAME SWITCH OPTIONS AS THE HARDWARE SWITCH REGISTER. IF THE HARDWARE SWITCH REGISTER DOES NOT EXIST OR IF ONE DOES AND IT CONTAINS ALL ONES (177777) THEN THE SOFTWARE SWITCH REGISTER (LOC. 176) IS USED.

CONTROL:

THIS PROGRAM ALSO SUPPORTS THE DYNAMIC LOADING OF THE SOFTWARE SWITCH REGISTER (LOC. 176) FROM THE TTY. THIS CAN BE ACCOMPLISHED BY DOING THE FOLLOWING:

- 1) TYPE CONTROL G (↑G); THIS WILL ALLOW THE TTY TO ENTER DATA INTO LOC. 176 AT SELECTED POINTS WITHIN THE PROGRAM.
- 2) THE MACHINE WILL THEN TYPE: SWR=XXXXXXNEW= (XXXXXX IS THE OCTAL CONTENTS OF THE SOFTWARE SWITCH REGISTER.)
- 3) AFTER THE "NEW=" HAS BEEN TYPED THEN THE OPERATOR CAN DO ONE OF THE FOLLOWING AT THE TTY:

A) TYPE A NUMBER TO BE LOADED INTO LOC. 176 FOLLOWED BY A (CR). (ONLY NUMBERS BETWEEN 0-7 WILL BE ACCEPTED AND ONLY 5 NUMBERS WILL BE ALLOWED)
 IF A (CR) IS THE FIRST KEY DEPRESSED THE SOFTWARE SWITCH REGISTER CONTENTS WILL NOT BE CHANGED.

B) IF A CONTROL U (↑U) IS DEPRESSED THEN THE PROGRAM WILL SEND YOU BACK TO STEP 2.

SW15(100000): 1=STOP AFTER EACH OPERATION
 0=PROCEED

SW14(040000): 1=STOP AT THE END OF THE OPERATION SEQUENCE
 0=PROCEED

SW13(020000): 1=IGNORE END OF TAPE (EOT)
 0=REWIND AT END OF TAPE (EOT)

5.1 HALT

***TO CHANGE THE CONTENTS OF SWREG TYPE (↑G) BEFORE PRESSING CONTINUE AFTER G ↑

(PAGE 2)

6. OPERATION

THE PROGRAM OPERATION IS QUITE SIMPLE, BUT DOES REQUIRE THE OPERATOR TO HAVE KNOWLEDGE OF THE TJ16 TAPE SYSTEM AS OPERATED ON THE RH MASSBUS CONTROLLER. THE OPERATOR MUST BE ABLE TO DECIDE WHICH SEQUENCE OF OPERATION IS REQUIRED, AND WHAT VALUES TO ASSIGN TO THE VARIOUS PARAMETERS REQUIRED TO EXECUTE THEM. THE OPERATION SEQUENCE IS SET UP BY LOADING A TABLE WITH THE FUNCTION CODES OF THE DESIRED OPERATIONS AND SETTING THE NUMBER OF OPERATIONS IN A COUNTER. THE PROGRAM IS SET UP TO DO A WRITE OF TEN (8) WORDS OF ALL ONES DATA TO SLAVE ZERO (0) ON DRIVE ZERO (0) IN PE (1600 BPI) WITH A NINE TRACK NORMAL DATA FORMAT. THE DATA ADDRESS IS 3000 (8). THE OPERATION SEQUENCE IS SET TO DO A SINGLE WRITE. IF LOADED AND STARTED AT 200 (8) WITH NO CHANGES MADE AND SWITCH 14 AND 15 SET TO A ZERO (0), THIS OPERATION WILL BE EXECUTED CONTINUOUSLY.

THE FOLLOWING IS THE LIST OF PARAMETERS WHICH MAY BE VARIED AND A DESCRIPTION OF EACH ALONG WITH THEIR CORE LOCATION:

PARAMETER	LOCATION	DESCRIPTION
RH ADDRESS	600	ADDRESS OF RH (THE FIRST REGISTER ADDRESS: 001)
DRIVE NUMBER	700	SET TO SELECT TMO2 NUMBER ADDRESS 0-7
UNIT DESCRIPTION	702	SET SELECTED SLAVE NUMBER (0-7), IN BITS 0,1,2 SELECT PARITY IN BIT 3 (0=ODD 1=EVN) SELECT DATA FORMAT IN BITS 4,5,6,7 SELECT DENSITY IN BITS 8,9,10
FRAME COUNT	704	SET NUMBER OF FRAMES TO WRITE PER WORD COUNT AND IN TWO'S COMPLIMENT
WORD COUNT	706	SET NUMBER OF WORDS TO BE TRANSFERRED IN TWO'S C
READ ADDRESS	710	SET DESIRED ADDRESS FOR START OF READ BUFFER.
WRITE ADDRESS	712	SET DESIRED ADDRESS FOR START OF WRITE BUFFER.
READY DELAY	714	THIS DELAY VALUE IS USED BY THE PROGRAM TO ESTAB A MAXIMUM TIME TO AWAIT THE COMPLETION OF AN OPE BEFORE PROCEEDING TO THE NEXT. ** (DEFAULT IS APP
READY MULTIPLIER	716	IF THE VALUE SET INTO 714 DOES NOT ALLOW ENOUGH INCREASE THE SIZE OF THE MULTIPLIER. EACH INCRE MULTIPLIER WILL CAUSE THE 714 DELAY TO BE EXECUT THAT MANY MORE TIMES.

TAPES 11 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

(PAGE 3)

OPERATION DELAY 720

OPER MULTIPLIER 722

OPERATION NUMBER 724

OPERATION TABLE 740-770

THIS DELAY IS USED TO ALLOW FOR SOME AMOUNT OF TIME BETWEEN THE EXECUTION OF EACH OPERATION. I LOADED AND USED JUST AS IN THE READY DELAY(714).
 ** (DEFAULT IS APPROX 54 MS FOR POP-11/20) **

THIS IS USED JUST AS THE READY DELAY MULTIPLIER.

THIS IS THE NUMBER OF OPERATIONS TO BE PERFORMED IN A SEQUENCE AND SHOULD REFLECT THE NUMBERS OF OPERATIONS SET INTO THE OPERATION TABLE.

THIS TABLE (CONSISTING OF 15 LOCATIONS) IS TO BE LOADED WITH THE FUNCTION CODES FOR EACH OPERATION TO BE PERFORMED IN SEQUENCE. THE NUMBER OF ENTRIES MAY BE FROM ONE (1) TO FIFTEEN (15). MAKE SURE THE NUMBER OF FUNCTION CODES SET IN THE TABLE IS BY THE NUMBER IN LOCATION 724 (OPNUM)

6.1 FUNCTION CODES

- 20=READ IN PRESET
- 02=REWIND-OFF LINE
- 06=REWIND
- 10=DRIVE CLEAR
- 26=WRITE TAPE MARK
- 24=ERASE
- 30=SPACE FORWARD
- 32=SPACE REVERSE
- 50=WRITE CHECK FORWARD
- 56=WRITE CHECK REVERSE
- 60=WRITE FORWARD
- 70=READ FORWARD
- 76=READ REVERSE

DE
 OPER
 DELAY
 MULTIPLIER
 OPERATIONS
 TABLE
 FUNCTION
 CODES
 20=READ
 IN PRESET
 02=REWIND
 OFF LINE
 06=REWIND
 10=DRIVE
 CLEAR
 26=WRITE
 TAPE MARK
 24=ERASE
 30=SPACE
 FORWARD
 32=SPACE
 REVERSE
 50=WRITE
 CHECK FORWARD
 56=WRITE
 CHECK REVERSE
 60=WRITE
 FORWARD
 70=READ
 FORWARD
 76=READ
 REVERSE

(PAGE 4)

6.2 DATA FORMATS (BIT 7,6,5,4 OF UNIT DESCRIPTION)

14=NINE TRACK NORMAL: 2 FRAMES PER WORD
15=CORE DUMP: 4 FRAMES PER WORD

6.3 DENSITY (BITS 10,9,8 OF UNIT DESCRIPTION)

4=1600 BPI:PE (PE USES ONLY ODD PARITY)
3=800 BPI:NRZI
2=900 BPI:NRZI
1=556 BPI:NRZI
0=200 BPI:NRZI

6.4 PARITY (BIT 3 OF UNIT DESCRIPTION)

1=EVEN PARITY
0=ODD PARITY

6.5 SLAVE SELECT (BITS 2,1,0 OF UNIT DESCRIPTIONS)

SET TO DEVICE SLAVE ADDRESS (0-7)

UNIT 1 UNIT 2 UNIT 3 UNIT 4 UNIT 5 UNIT 6 UNIT 7 UNIT 8 UNIT 9 UNIT 10 UNIT 11 UNIT 12 UNIT 13 UNIT 14 UNIT 15 UNIT 16 UNIT 17 UNIT 18 UNIT 19 UNIT 20 UNIT 21 UNIT 22 UNIT 23 UNIT 24 UNIT 25 UNIT 26 UNIT 27 UNIT 28 UNIT 29 UNIT 30 UNIT 31 UNIT 32 UNIT 33 UNIT 34 UNIT 35 UNIT 36 UNIT 37 UNIT 38 UNIT 39 UNIT 40 UNIT 41 UNIT 42 UNIT 43 UNIT 44 UNIT 45 UNIT 46 UNIT 47 UNIT 48 UNIT 49 UNIT 50 UNIT 51 UNIT 52 UNIT 53 UNIT 54 UNIT 55 UNIT 56 UNIT 57 UNIT 58 UNIT 59 UNIT 60 UNIT 61 UNIT 62 UNIT 63 UNIT 64 UNIT 65 UNIT 66 UNIT 67 UNIT 68 UNIT 69 UNIT 70 UNIT 71 UNIT 72 UNIT 73 UNIT 74 UNIT 75 UNIT 76 UNIT 77 UNIT 78 UNIT 79 UNIT 80 UNIT 81 UNIT 82 UNIT 83 UNIT 84 UNIT 85 UNIT 86 UNIT 87 UNIT 88 UNIT 89 UNIT 90 UNIT 91 UNIT 92 UNIT 93 UNIT 94 UNIT 95 UNIT 96 UNIT 97 UNIT 98 UNIT 99 UNIT 100

(PAGE 5)

7. PROGRAM DESCRIPTION

IN ORDER TO MAINTAIN THE CONTINUOUS EXECUTION OF THE OPERATIONS DESCRIBED THE PROGRAM IS ORGANIZED AS FOLLOWS:

START
INITIALIZE THE RH
SET UP TAPE PARAMETERS (DENSITY, PARITY, FORMAT: WORD COUNT, FRAME COUNT, BUS ADDRESS)
SELECT DEVICE TO TEST (DRIVE NUMBER, SLAVE NUMBER)
EXECUTE OPERATION (SET FUNCTION AND FROM OF TABLE AND SET GO=1)
AWAIT END OF OPERATION (READY DELAY)
STOP IF SWITCH 15=1
DO OPERATION DELAY (OP DELAY)
STOP IF LAST OPERATION IN SEQUENCE AND SWITCH 14=1
POINT TO NEXT FUNCTION CODE IN OP TABLE
JUMP BACK TO START

7.1 FLOW: START: HOUSEKEEPING
INIT: CLEAR MASSBUS AND TMO2
SET UP: SET UP REQUIRED REGISTERS
EXECUTE: SET FUNCTION AND GO=1
AWAIT END: LOOP ON DRY=1 AS LONG AS ALLOWED BY READY DELAY
STOP: IF SWITCH 15=1
DELAY: PER OP DELAY
END OF RSEQUENCE? IF NOT JUMP TO START
STOP: IF SWITCH 14=1
JUMP TO START RESTART SEQUENCE

7.2 VARIATIONS: THERE ARE TWO VARIATIONS MADE FROM THIS FLOW. BOTH ARE CAUSED BY A PARTICULAR FUNCTION CODE. IF A READ REVERSE IS TO BE EXECUTED, THEN THE BUS ADDRESS IS INCREMENTED BY THE SIZE OF THE RECORD BECAUSE THE DATA IS LOADED INTO MEMORY IN REVERSE (I.E: HIGH ADDRESS TO LOW ADDRESS). THE SECOND VARIATION IS CAUSED BY A SPACE (FORWARD OR REVERSE) OPERATION AND IT IS THAT THE FRAME COUNTER IS SET TO A -1 SO THAT ONLY ONE (1) RECORD IS SPACED OVER. IF YOU WISH TO SPACE OVER MORE THAN ONE (1) RECORD, SET LOCATION 1100 (G) TO THE TWO'S COMPLIMENT OF THE NUMBER OF RECORDS DESIRED.

8. LISTING

%
.TITLE TU16 UTILITY DRIVER
:MAINDEC-11-DZTUE-D-D
:15 FEB 75
:R. BARNES
:REVISED APRIL 1976 BY S. CARPENTER
: 1) SUPPORTS SOFTWARE SWITCH REGISTER
: 2) SUPPORTS THE DYNAMIC LOADING OF THE SOFTWARE SWITCH REGISTER
.ABS

324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379

000000
000001
000002
000003
000004
000005
000006
000007

000046
000170

000176
000000

000200
000167
000600

000600 172440
000602 172442
000604 172444
000606 172446
000610 172450
000612 172452
000614 172454
000616 172456

001110

;CONSOLE SWITCHES

;SW 15=1(100000) STOP ON EACH OPERATION
; 0 CONTINUE
;SW 14=1(040000) STOP AT END OF SEQUENCE
; 0 CONTINUE
;SW 13=1(020000) IGNORE END OF TAPE (EOT)
; 0 REWIND AT END OF TAPE (EOT)

;REGISTER EQUIVES

R0=%0
R1=%1
R2=%2
R3=%3
R4=%4
R5=%5
SP=%6
PC=%7

 .=46
RESTART: 170 ;ALLOW RESTART WHEN <LF> IS PRESSED
 ;DURING CHANGING OF SWREG IF SOFTWARE SWITCH
 ;REGISTER IS USED.

;SOFTWARE SWITCH REGISTER*****

 .=176
SWREG: 0 ;SOFTWARE SWITCH REGISTER

;*****

;THIS PROGRAM SUPPORTS THE SOFTWARE SWITCH REGISTER LOC.176.
;REFER TO SECTION 5 OF DOCUMENT FOR DESCRIPTION

;*****

;STARTING ADDRESS

 .=200
JMP SETUR
 .=600

;TMO2 REGISTERS

C1: 172440
WC: 172442
BA: 172444
FC: 172446
CS: 172450
DS: 172452
ER: 172454
AS: 172456

380 000620 172460
381 000622 172462
382 000624 172464
383 000626 172466
384 000630 172470
385 000632 172472

CC: 172460
DB: 172462
IR: 172464
OT: 172466
SN: 172470
C2: 172472

;PROCESSOR ADDRESSES

389 000634 177776
390 000636 177570

PSW: 177776 ;PROCESSOR STATUS
SWR: 177570 ;SWITCH REGISTER

;TTY REGISTERS

394 000640 177560
395 000642 177562
396 000644 177564
397 000646 177566

TKS: 177560 ;TTY READER STATUS
TKB: 177562 ;TTY READ BUFFER
TPS: 177564 ;TTY PUNCH STATUS
TPB: 177566 ;TTY PUNCH BUFFER

398 000700
 399
 400
 401 000700 000000
 402 000702 002300
 403 000704 177760
 404 000706 177770
 405 000710 004000
 406 000712 005000
 407 000714 100000
 408 000716 000001
 409 000720 010000
 410 000722 000001
 411 000724 000001
 412 000726 000000
 413 000730 000000
 414 000732 000000
 415 000734 000000
 416 000736 000000

.=700
 ;SET PARAMETERS DESIRED FOR UNIT UNDER TEST*****
 DRVN: 0 ;DRIVE NUMBER
 UDES: 2300 ;SLAVE DESCRIPTION
 FCNT: -20 ;FRAME COUNT
 WCNT: -10 ;WORD COUNT
 RADDR: 4000 ;READ ADDRESS
 WADDR: 5000 ;WRITE ADDRESS
 RDYDLY: 100000 ;READY DELAY
 RDYDX: 1 ;READY DELAY MULTIPLIER
 OPDLY: 10000 ;OPERATION DELAY
 OPDX: 1 ;OPERATION DELAY MULTIPLIER
 OPNUM: 1 ;NUMBER OF OPERATION (1 TO 15)
 TIB: 0
 TOB: 0
 COUNT: 0
 RDSW: 0
 TEMPST: 0

417
 418
 419
 420
 421
 422
 423
 424
 425
 426
 427
 428
 429
 430
 431
 432
 433
 434
 435
 436
 437
 438
 439
 440 000740 000060
 441 000742 000000
 442 000744 000000
 443 000746 000000
 444 000750 000000
 445 000752 000000
 446 000754 000000
 447 000756 000000
 448 000760 000000
 449 000762 000000
 450 000764 000000
 451 000766 000000
 452 000770 000000
 453

;;OPERATION TABLE*****
 ;;ENTER OPERATION SEQUENCE DESIRED.
 ;;MUST HAVE AT LEAST 1 OPERATION, AND
 ;;MAY HAVE UP TO 15(8).
 ;;SET THE OPERATION COUNTER EQUAL
 ;;TO THE NUMBER OF OPERATIONS IN
 ;;THE SEQUENCE.

- ;;20 = READ IN PRESET
- ;;02 = REWIND-OFFLINE
- ;;06 = REWIND
- ;;10 = DRIVE CLEAR
- ;;26 = WRITE TAPE MARK
- ;;24 = ERASE
- ;;30 = SPACE FORWARD
- ;;32 = SPACE REVERSE
- ;;50 = WRITE CHECK FORWARD
- ;;56 = WRITE CHECK REVERSE
- ;;60 = WRITE FORWARD
- ;;70 = READ FORWARD
- ;;76 = READ REVERSE

OPTBL: 60
 0
 0
 0
 0
 0
 0
 0
 0
 0
 0
 0
 0
 0
 0
 0
 0
 0
 0

;FILL WITH OPERATION SEQUENCE

MO1

454

```

455          001000          . = 1000
456          ; START OF PROGRAM*****
457
458 001000 012706 000500 START: MOV #500, SP
459 001004 012777 000340 177622 MOV #340, @PSW
460
461 001012 016700 177706 MOV OPNUM, R0 ; SET COUNTER
462 001016 012701 000740 MOV #OPTBL, R1 ; SET POINTER
463 001022 012777 000040 177560 A: MOV #40, @CS ; INIT
464 001030 016777 177644 177552 MOV DRVN, @CS ; DRIVE NUMBER
465 001036 016777 177640 177556 MOV UDES, @C2 ; UNIT DESCRIPTION
466 001044 016777 177636 177530 MOV WCNT, @WC ; WORD COUNT
467 001052 016777 177626 177526 MOV FCNT, @FC ; FRAME COUNT
468 001060 012102 MOV (R1)+, R2 ; SET OP CODE
469 001062 022702 000030 CMP #30, R2 ; SEE IF SPACE FORWARD
470 001066 001403 BEQ AA ; IF SO: BR
471 001070 022702 000032 CMP #32, R2 ; SEE IF SPACE REVERSE
472 001074 001003 BNE A0 ; IF NOT: BR
473 001076 012777 177777 177502 AA: MOV #-1, @FC ; SET TO SPACE ONE RECORD
474 001104 022702 000060 A0: CMP #60, R2 ; SEE IF READ OP
475 001110 103404 BLO A1 ; IF SO: BR
476 001112 016777 177574 177464 MOV WADDR, @BA ; SET WRITE ADDRESS
477 001120 000413 BR A3
478 001122 016777 177562 177454 A1: MOV RADDR, @BA ; SET READ ADDRESS
479 001130 022702 000070 CMP #70, R2 ; SEE IF READ OPERATION
480 001134 001405 BEQ A3 ; IF SO: BR
481 001136 016703 177542 MOV FCNT, R3 ; GET FRAME COUNT
482 001142 005403 NEG R3
483 001144 060377 177434 ADD R3, @BA ; SET BUS ADDRESS FOR READ REVERSE
484 001150 052702 000001 A3: BIS #1, R2 ; SET GO BIT
485 001154 000240 NOP
486 001156 000240 NOP
487 001160 010277 177414 MOV R2, @C1 ; START OPERATION
488 001164 000240 NOP
489 001166 000240 NOP
490 001170 016704 177522 MOV RDYDX, R4 ; SET DELAY MULTIPLIER
491 001174 016703 177514 BO: MOV RDYDLY, R3 ; SET READY DELAY
492 001200 032777 000200 177404 B: BIT #200, @DS
493 001206 001005 BNE C ; IF DRY: BR
494 001210 005303 DEC R3
495 001212 001372 BNE B
496 001214 005304 DEC R4
497 001216 001366 BNE BO ; DELAY FOR DRIVE READY
498 001220 000240 NOP
499 001222 005777 177410 C: TST @SWR ; SEE IF STOP ON OPERATION
500 001226 100001 BPL D ; IF NOT: BR
501 001230 000000 HALT
502 001232 004767 000302 D: JSR PC, CKSWR ; CHECK FOR CNTL G
503 001236 000240 NOP
504 001240 000240 NOP
505 001242 016704 177454 MOV OPDX, R4 ; SET DELAY MULTIPLIER
506 001246 016703 177446 EO: MOV OPDLY, R3 ; SET OPERATION DELAY
507 001252 005303 E: DEC R3
508 001254 001376 BNE E
509 001256 005304 DEC R4
510 001260 001372 BNE EO ; DELAY BETWEEN OPERATIONS
    
```

```

001262 004767 000152 JSR PC,RWND ;GO SEE IF REWIND
001266 005300 DEC RD ;
001270 001254 BNE A ;IF SEQUENCE NOT DONE: BR

001272 032777 040000 177336 BIT #40000,DSWR ;SEE IF HALT ON SEQUENCE
001300 001401 BEQ IS ;
001302 000000 HALT ;
001304 004767 000230 JSR PC,CKSWR ;CHECK FOR CNTL G
001310 000167 177464 JMP START ;

;RH REGISTER SETUP*****

001314 000240 SETUP: NOP ;
001316 016701 177256 MOV #15,R1 ;GET ADDRESS OF CS1
001322 012700 000015 MOV #WC,R2 ;SET NUMBER OF REGISTERS
001326 012702 000602 MOV #2,R1 ;GET FIRST ADDRESS
001330 062701 000002 SETA: ADD R1,(R2)+ ;INCREMENT
001336 010122 MOV RD ;LOAD ADDRESS
001340 005300 DEC RD ;SEE IF DONE
001342 001373 BNE SETA ;IF NOT: BR
001344 012706 000500 MOV #500,SP ;
001350 013746 000006 SUSWR: MOV #6,-(SP) ;SAVE VECTORS
001354 013746 000004 MOV #4,-(SP) ;
001360 012737 001400 000004 MOV #15,#4 ;SET UP FOR TIMEOUT
001366 022777 177777 177242 CMP #-1,DSWR ;REFERENCE HARDWARE SWITCH REGISTER
001374 001402 BEQ 2$ ;
001376 000404 BR 3$ ;
001400 022626 15: CMP (SP)+(SP)+ ;ADJUST STACK
001402 012767 000176 177226 23: MOV #SWREG,SWR ;POINT TO SOFTWARE SWITCH REG
001410 012637 000004 35: MOV (SP)+,#4 ;RESTORE VECTORS
001414 012637 000006 MOV (SP)+,#6 ;
001420 023727 000636 000176 CMP #SWR,#SWREG ;IS SOFTWARE REG USED
001426 001002 BNE GO ;BRANCH IF NO
001430 004767 000156 JSR PC,CNTLU ;ALLOW SOFTWARE SWITCH REGISTER TO BE CHANGED
001434 000167 177340 GO: JMP START ;ELSE GO START EXECUTION

;REWIND FROM EOT (PER SW13)

001440 032777 020000 177170 RWND: BIT #20000,DSWR ;SEE IF IGNORE EOT
001446 001033 BNE RWNDX ;IF SO: BR
001450 032777 002000 177134 BIT #2000,DS ;SEE IF AT EOT
001456 001427 BEQ RWNDX ;IF NOT: BR
001460 012777 000040 177122 MOV #40,DCS ;INIT
001466 016777 177206 177114 MOV DRVN,DCS ;SET DRIVE NUMBER
001474 016777 177202 177130 MOV UDES,DC2 ;SET SLAVE NUMBER
001502 012777 000007 177070 MOV #7,DC1 ;START REWIND
001510 032777 000200 177074 RWNDA: BIT #200,DS ;SEE IF DRY
001516 001774 BEQ RWNDA ;IF NOT: BR
001520 032777 020000 177064 RWNDB: BIT #20000,DS ;SEE IF PIP RESET
001526 001374 BNE RWNDB ;IF NOT: BR
001530 005726 TST (SP)+ ;RESET STACK
001532 000167 177242 JMP START ;RESTART SEQUENCE
001536 000207 RWNDX: RTS PC ;RETURN

```

;CKSWR ROUTINE THAT ALLOWS THE LOADING OF LOC.176, SWREG*****
;FROM THE TTY AT SELECTED POINTS WITHIN THE PROGRAM*****

```

001540 022767 0001.0 177070 CKSWR: CMP #SWREG,SWR ;SOFTWARE SWITCH REG PRESENT
001546 001041 BNE OUT ;NO GET OUT
001550 105.77 177064 TST #TKS ;YES WAIT FOR
001554 100036 BPL OUT ;READY GET CHARACTER
001556 017767 177060 177142 MOV #TKB,TIB ;AND STRIP OFF
001564 042767 177600 177134 BIC #177600,TIB ;THE GARBAGE
001572 022767 000007 177126 CMP #7,TIB ;IS IT A (TG)
001600 001024 BNE OUT
001602 012704 002512 MOV #SCNTG,R4
001606 004767 000242 JSR PC,TTOUT
001612 012704 002516 CNTLU: MOV #MSWR,R4
001616 004767 000232 JSR PC,TTOUT
001622 017703 177010 MOV #SWR,R3
001626 004767 000354 JSR PC,OCPE
001632 012704 002525 MOV #SMNEW,R4
001636 004767 000212 JSR PC,TTOUT
001642 005037 000735 CLR #TEMPST
001646 004767 000002 JSR PC,$READ ;GO READ A LINE
001652 000207 OUT: RTS ;RETURN TO MAIN BODY OF PROGRAM

001654 005067 177056 $READ: CLR TEMPST
001660 012767 000007 177044 MOV #7,COUNT
001666 004767 000546 1$: JSR PC,TTIN ;GO READ A CHARACTER
001672 042767 177600 177026 BIC #177600,TIB ;STRIP OFF GARBAGE
001700 122767 000025 177020 CMPB #25,TIB ;IS IT A (U)?
001706 001002 BNE 2$ ;BRANCH IF NOT
001710 005726 3$: TST (SP)+ ;POP THE STACK
001712 000737 BR CNTLU ;START OVER
001714 122767 000015 177004 2$: CMPB #15,TIB ;IS IT A (CR)?
001722 001013 BNE 4$ ;BRANCH IF NOT
001724 012767 000200 177002 MOV #200,RDSW
001732 004767 000150 JSR PC,TCRLF ;ECHO IT WITH (LF)
001736 022767 000007 176766 CMP #7,COUNT ;WAS IT FIRST CHARACTER
001744 001037 BNE 7$ ;CHANGE SWR IF NOT FIRST ONE
001746 005726 8$: TST (SP)+ ;POP THE STACK
001750 000740 BR OUT ;GET OUT
001752 122767 000060 176746 4$: CMPB #60,TIB
001760 003004 BGT 5$
001762 122767 000067 176736 CMPB #67,TIB
001770 003005 BGT 6$
001772 012704 002535 5$: MOV #SQUEST,R4
001776 004767 000052 JSR PC,TTOUT
002002 000742 BR 3$ ;START OVER IF NOT LEGAL CHARACTER
002004 006367 176726 6$: ASL TEMPST
002010 006367 176722 ASL TEMPST
002014 006367 176716 ASL TEMPST
002020 142767 000060 176700 BICB #60,TIB ;GET NITTY-GRITTY
002026 156767 176674 176702 BICB TIB,TEMPST
002034 005367 176672 DEC COUNT ;ONLY WANT 6 DIGITS
002040 001754 BEQ 5$
002042 000711 BR 1$
002044 016777 176666 176564 7$: MOV TEMPST,$SWR ;CHANGE SWITCH REGISTER CONTENTS
002052 000735 BR 8$

```

:TTY OUTPUT SUBROUTINE*****

630	002054	112467	176650		TTOUT:	MOVB	(R4)+,TOB	
631	002060	122767	000043	176642		CMPB	#43,TOB	
632	002066	001446				BEQ	TEX	
633	002070	122767	000045	176632		CMPB	#45,TOB	
634	002076	001403				BEQ	TCRLF	
635	002100	004767	000064			JSR	PC,TOG	
636	002104	000763				BR	TTOUT	
637	002106	112767	000015	176614	TCRLF:	MOVB	#15,TOB	
638	002114	004767	000050			JSR	PC,TOG	
639	002120	012703	000004			MOV	#4,R3	
640	002124	005067	176600		TCRIFA:	CLR	TOB	
641	002130	004767	000034			JSR	PC,TOG	
642	002134	005303				DEC	R3	
643	002136	001372				BNE	TCRIFA	:DO FILLERS
644	002140	112767	000012	176562		MOVB	#12,TOB	
645	002146	004767	000016			JSR	PC,TOG	
646	002152	105767	176556			TSTB	RDSW	
647	002156	100401				IS	IS	
648	002160	000735				BR	TTOUT	
649	002162	005067	176546		IS:	CLR	RDSW	
650	002166	000406				BR	TEX	
651	002170	105777	176450		TOG:	TSTB	ATPS	
652	002174	100375				BPL	TOG	
653	002176	116777	176526	176442		MOVB	TOB,@TPB	
654	002204	000207			TEX:	RTS	PC	

:OCTAL OUTPUT SUBROUTINE*****

655	002206	012767	000001	000222	OCTPE:	MOV	#1,OFL	
656	002214	010304				MOV	R3,R4	
657	002216	000410				BR	OCTPO	
658	002220	005067	000212		OCTP:	CLR	OFL	:CLEAR FLAG FOR LEADING ZERO
659	002224	010304			OCTPE1:	MOV	R3,R4	:SEE IF NUMBER IS ZERO
660	002226	001004				BNE	OCTPO	:IF NOT ZERO: BR
661	002230	004767	000162			JSR	PC,OCTPG1	:ELSE PRINT ZERO
662	002234	000167	000120			JMP	OCTP3	:SPACE AND EXIT
663	002240	032704	100000		OCTPO:	BIT	#100000,R4	:SEE IF MSD = 1
664	002244	001406				BEQ	OCTP1	:IF NOT: BR
665	002246	012704	000001			MOV	#1,R4	
666	002252	004767	000116			JSR	PC,OCTPG	:PRINT 1
667	002256	000167	000006			JMP	OCTP2	
668	002262	005004			OCTP1:	CLR	R4	
669	002264	004767	000104			JSR	PC,OCTPG	:PRINT 0
670	002270	010304			OCTP2:	MOV	R3,R4	
671	002272	006004				ROR	R4	
672	002274	006004				ROR	R4	:POSITION DIGIT
673	002276	006004				ROR	R4	
674	002300	006004				ROR	R4	
675	002302	000304				SWAB	R4	
676	002304	004767	000064			JSR	PC,OCTPG	:PRINT DIGIT 2
677	002310	010304				MOV	R3,R4	
678	002312	006004				ROR	R4	
679	002314	000304				SWAB	R4	
680	002316	004767	000052			JSR	PC,OCTPG	:PRINT DIGIT 3

697	002322	J10304			MOV	R3,R4		
698	002324	006104			ROL	R4		
699	002326	006104			ROL	R4		
700	002330	000304			SWAB	R4		
701	002332	004767	000035		JSR	PC,OCTPG		:PRINT DIGIT 4
702	002336	010304			MOV	R3,R4		
703	002340	006004			ROR	R4		
704	002342	006004			ROR	R4		
705	002344	006004			RJR	R4		
706	002346	004767	000022		JSR	PC,OCTPG		
707	002352	010304			MOV	R3,R4		
708	002354	004767	000014		JSR	PC,OCTPG		:PRINT DIGIT 5
709	002360	012767	000240	176342	OCTP3:	MOV	#240,T0B	
710	002366	004767	177576		JSR	PC,T0G		:PRINT SPACE
711	002372	000207			RTS	PC		:EXIT
712	002374	042704	177770		OCTPG:	BIC	#177770,R4	
713	002400	001004			BNE	OCTPGC		
714	002402	005767	000030		TST	OFL		
715	002406	001001			BNE	OCTPGD		
716	002410	000207			RTS	PC		
717	002412	005267	000020		OCTPGO:	INC	OFL	
718	002416	052704	000260		OCTPGI:	BIS	#260,R4	
719	002422	010467	176302		MOV	R4,T0B		
720	002426	004767	177536		JSR	PC,T0G		
721	002432	010304			MOV	R3,R4		
722	002434	000207			RTS	PC		
723	002436	000000			OFL:	0		:FIRST CHAR FLAG
724								
725								
726								
727								
728								
729	002440	005077	176174		TTIN:	CLR	@TKS	
730	002444	005077	176172			CLR	@TKB	
731	002450	005067	176252			CLR	TIB	
732	002454	005277	176160			INC	@TKS	
733	002460	105777	176154		TTIN1:	TSTB	@TKS	
734	002464	100375				BPL	TTIN1	
735	002466	017767	176150	176232		MOV	@TKB,TIB	
736	002474	105777	176144		TTIN2:	TSTB	@TPS	
737	002500	100375				BPL	TTIN2	
738	002502	116777	176220	176136		MOV	TIB,@TPB	
739	002510	000207				RTS	PC	
740								
741	002512	057045	021507		\$CNTG:	.ASCII	/%IG#	
742	002516	051445	051127	020075	\$MSWR:	.ASCII	/%SWR=#	
743	002524	043						
744	002526	040	047040	053505	\$MNEW:	.ASCII	/NEW=#	
745	002532	020075	043					
746	002535	077	021445		\$QUEST:	.ASCII	/%#	
747		004000				.=4000		
748		000100				.REPT	100	
749						0		
750						.ENDR		
751								
752		005000				.=5000		
753		000100				.REPT	100	
754						177777		

;TTY READ SUBROUTINE*****

FOR

2016 UTILITY DRIVER MACY11 27 1006 16-SEP-76 19:13 PAGE 19
22TUE3.F11 16-SEP-76 15:24

135
196
4

00001

.ENDR

.END

REPT	001022	463#	513						
	001076	474#	473#						
	000616	373#							
	001104	474#	474#						
	001122	474#	473#						
	001150	492#	484#						
	001200	492#	495#						
	000604	374#	476*	478*	482*				
	001174	491#	497#						
	001222	493#	499#						
	000620	380#							
	001540	502#	518	558#					
	001612	544	578#	595#					
	000732	474#	599*	600	616*				
	000610	376#	453*	464*	553*	554*			
	000600	372#	487*	524	556*				
	000632	385#	455*	555*					
	001232	500	502#						
	000622	381#							
	000700	401#	464	554					
	000612	377#	492	551	557	559			
	000626	383#							
	001252	507#	508						
	000614	378#							
	001246	506#	510						
	000606	375#	467*	473*					
	000704	403#	467	481					
	001434	543	545#						
	000624	392#							
	002220	556#							
	002206	558#	553#						
	002224	557#							
	002374	664	667	674	678	693	688	590	594#
	002412	695	697	699#					
	002416	659	700#						
	002240	655	658	661#					
	002262	662#	666#						
	002270	665#	668#						
	002360	650	651#						
	002436	652*	656*	696	699*	705#			
	000720	403#	506						
	000722	410#	505						
	000724	411#	461						
	000740	440#	462						
	001652	569	571	575	586#	603			
	000634	389#	459*						
	000710	405#	478						
	000734	415#	598*	641	644*				
	000714	407#	491						
	000716	408#	490						
	000046	346#							
	001440	511	549#						
	001510	557#	558#						
	001520	559#	560						
	001536	550	552	562#					
	001332	527#	520						

START	001314	367	523*											
SUSP	000630	384*												
START	001000	450*	519	545	562									
SUSP	001350	532*												
SWR	000636	390*	499	515	535	539*	542	549	568	580	519*			
SWR	000176	354*	539	542	568									
CRF	002106	599	639	632*										
CRF	002124	635*	638											
DS	000736	416*	584*	588*	611*	612*	613*	615*	619					
DS	002204	627*	645*	649*										
DS	000726	412*	572*	573*	574	591*	592	596	604	606	614*	615	711*	715*
DS		718												
DS	000642	395*	572	710*	715									
DS	000640	394*	570	709*	712*									
DS	000730	413*	625*	626	628	713								
DS	002170	630	633	636	640	632*	635*	639*	648	691*	701*			
DS	000646	397*	648*	718*		646*	647	692	702					
DS	000644	396*	646	716										
DS	002440	590	709*											
DS	002460	713*	714											
DS	002474	716*	717											
DS	002054	577	579	583	609	625*	631	643						
DS	000702	402*	465	555										
DS	000712	406*	476											
DS	000602	373*	456*	526										
DS	000706	404*	466											
DS	002512	576	721*											
DS	002525	582	724*											
DS	002516	578	722*											
DS	002535	608	726*											
DS	001654	585	588*											
DS	= 005200	345*	353*	366*	368*	398*	455*	727*	732*					

. ABS. 005200 000

ERRORS DETECTED: 0
 DEFAULT GLOBALS GENERATED: 0

DZTUED, DZTUED. SEQ/SOL/CRF/DS:ERFZ/EN:ABS=DSKM:DZTUED.P11
 RUN-TIME: 24.4 SECONDS
 RUN-TIME RATIO: 22/7=2.8
 CORE USED: 6K (11 PAGES)