IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DZTJE-D-0
PRODUCT NAME: T1UE UTILITY DRIVER
DATE CREATED: 21 APRIL 76
MAINTAINER: DIAGNOSTIC ENGINEERING
AUTHOR: R. B. BARNES

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1. ABSTRACT

THIS PROGRAM IS INTENDED AS A BRUTE FORCE ROUTINE TO ENABLE AN OPERATION OR SERIES OF OPERATIONS, CONTINUOUSLY, REGARDLESS OF THE RESULTS OF THE OPERATION. BECAUSE OF THE COMPLEXITY OF THE TULG 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. REQUIREMENTS

2.1 HARDWARE:
A. ANY PDP-11 PROCESSOR - WITH OR WITHOUT HARDWARE SWITCH REGISTER.
B. ANY MASSBUS CONTROLLER
C. ANY MAG TAPE CONTROLLER
D. AT LEAST ONE (1) TULG 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 (B)

***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: SW=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 (1G): This will allow the tty to enter data into loc. 176 at selected points within the program.

2) The machine will then type: SWR=xxxxx,NEW= (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 6 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(1DD000): 1=Stop after each operation
D=Proceed
SW14(040000): 1=Stop at the end of the operation sequence
D=Proceed
SW13(020000): 1=Ignore end of tape (EOT)
D=Rewind at end of tape (EOT)

5.1 HALT

***To change the contents of SWREG type <G> before pressing continue after a <A>
### OPERATION

The program operation is quite simple, but does require the operator to have knowledge of the 726 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 (B) words of all ones data to slave zero (0) on drive zero (0) in PE (1600 BPS) with a nine-track normal data format. The data address is 3000 (B). The operation sequence is set to do a single write. If loaded and started at 200 (B) with no changes made and switch 14 and is 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:

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>LOCATION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>RH ADDRESS</td>
<td>600</td>
<td>Address of RH (the first register address: 51</td>
</tr>
<tr>
<td>DRIVE NUMBER</td>
<td>700</td>
<td>Set to select TM02 number address 0-7</td>
</tr>
<tr>
<td>UNIT DESCRIPTION</td>
<td>702</td>
<td>Set selected slave number (0-7), in bits 0.1.2:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Select parity in bit 3 (0=odd 1=even)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Select data format in bits 4.5.6.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Select density in bits 8.9.10</td>
</tr>
<tr>
<td>FRAME COUNT</td>
<td>704</td>
<td>Set number of frames to write per word count and in twos' compliment</td>
</tr>
<tr>
<td>WORD COUNT</td>
<td>706</td>
<td>Set number of words to be transferred in twos' comp</td>
</tr>
<tr>
<td>READ ADDRESS</td>
<td>710</td>
<td>Set desired address for start of read buffer.</td>
</tr>
<tr>
<td>WRITE ADDRESS</td>
<td>712</td>
<td>Set desired address for start of write buffer.</td>
</tr>
<tr>
<td>READY DELAY</td>
<td>714</td>
<td>This delay value is used by the program to establish a maximum time to wait the completion of an IPL before proceeding to the next. <strong>(default is app</strong></td>
</tr>
<tr>
<td>READY MULTIPLIER</td>
<td>716</td>
<td>If the value set into 714 does not allow enough increase the size of the multiplier, each increase multiplier will cause the 714 delay to be exactly that many more times.</td>
</tr>
</tbody>
</table>
OPERATION DELAY 720

This delay is used to allow for some amount of time between the execution of each operation. It loaded and used just as in the ready delay (74). *(default is approx 54 ms for PDP-11/20)*

OPERATOR MULTIPLIER 722

This is used just as the ready delay multiplier.

OPERATION NUMBER 724

This is the number of operations to be performed in a sequence and should reflect the numbers of operations set into the operation table.

OPERATION TABLE 740-770

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 each 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 (CPNUM).

FUNCTION CODES

20 = READ IN PRESET
02 = REWIND-OFF LINE
06 = REWIND
10 = DRIVE CLEAR
34 = WRITE TAPE MARK
30 = SPACER FORWARD
32 = SPACER REVERSE
50 = WRITE CHECK FORWARD
56 = WRITE CHECK REVERSE
60 = WRITE FORWARD
70 = READ FORWARD
76 = READ REVERSE
6.6 DATA FORMATS (BIT 7, 6, 5, 4 OF UNIT DESCRIPTION)

1 = 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 = 600 BPI: NRZI
1 = 500 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)
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, BJS AC
SELECT DEVICE TO TEST (DRIVE NUMBER, SLAVE NUMBER))
EXECUTE OPERATION (SET FUNCTION AND FROM OP TABLE AND SET GO=1)
WAIT 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 TMD2
SET UP: SET UP REQUIRED REGISTERS
EXECUTE: SET FUNCTION AND GO=1
WAIT END: LOOP ON DRY=1 AS LONG AS ALLOWED BY READY DELAY
STOP: IF SWITCH 15=1
DELAY: PER OP DELAY
END OF SEQUENCE? 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 (R)
TO THE TWO'S COMPLEMENT OF THE NUMBER OF RECORDS DESIRED.

8. LISTING

%.
.TITLE TUI6 UTILITY DRIVER
:MAINDIR-11-DZUE-D-D
:15 FEB 76
:R. BARNES
:REVISED APRIL 1976 BY S. CARPENTER
:1) SUPPORTS SOFTWARE SWITCH REGISTER
:2) SUPPORTS THE DYNAMIC LOADING OF THE SOFTWARE SWITCH REGISTER
:89
: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 (EDT)
; 0 REWIND AT END OF TAPE (EDT)

:Register Equivs

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
=500

;TM02 REGISTERS

000600 172440  C1:  172440
000601 172448  AC:  172448
000602 172444  BA:  172444
000603 172446  FC:  172446
000604 172450  CS:  172450
000606 172452  DS:  172452
000610 172460  ES:  172460
000612 172464  FS:  172464
000614 172466  GS:  172466
000618 172458  RS:  172458
;PROCESSOR ADDRESSES

CC: 172460
DB: 172462
TR: 172464
DT: 172455
SN: 172470
C2: 172472

;PROCESSOR STATUS
PSW: 172778
SWR: 177570

;SWITCH REGISTER

;TTY REGISTERS
TKS: 177560
TKB: 177562
TPS: 177563
TPB: 177566
SET PARAMETERS DESIRED FOR UNIT UNDER TEST

DRVE: 0
UDES: 2300
FCNT: -20
WCNT: -10
RADDR: 4000
WADDR: 5000
RDLY: 100000
RDYDX: 10000
RDYDL: 10000
OPDL: 0
OPDX: 1
OPNUM: 1
TIB: 0
TOB: 0
COUNT: 0
RDST: 0
TEMPST: 0

OPERATION TABLE

OPERATION DESCRIPTION
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
55 = WRITE CHECK REVERSE
60 = WRITE FORWARD
70 = READ FORWARD
76 = READ REVERSE

FILL WITH OPERATION SEQUENCE
B02

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001366 00477 000152 JSR PC.RWND :GO SEE IF REWIND
001266 005300 DEC RD :IF SEQUENCE NOT DONE: BR
001267 001254 BNE A :SE;E IF HILT ON SEQUENCE
001272 003777 040000 177336 BIT #10000.3SWR
001277 001401 BEQ 1% :CHECK FOR CNTL G
001282 000000 HALT
001283 000476 000230 1%: JSR PC.CKSWR
001284 000160 177464 JMP START

:RH REGISTER SETUP************

001310 000240 MOV C1.R1 :GET ADDRESS OF CSI
001311 001630 MOV #16.RO :SET NUMBER OF REGISTERS
001312 001620 MOV #16.R2 :GET FIRST ADDRESS
001313 001620 MOV #16.R2 :INCREMENT
001314 001620 MOV #51.RO :LOAD ADDRESS
001315 000002 BNE SETA :SEE IF DONE
001316 000300 BNE SETA :IF NOT: BR
001317 000300 MOV $500.SP :SAVE VECTORS
001318 001846 MOV #86,-(SP)- :SET UP FOR TIMEOUT
001319 001846 MOV #84,-(SP)- :REFERENCE HARDWARE SWITCH REGISTER
00131A 001846 MOV #84,-(SP)- :REFERENCE SOFTWARE REG
00131B 001846 MOV $2000,00156 :IS SOFTWARE REG USED
00131C 001846 MOV $2000,000 :ALLOW SOFTWARE SWITCH REGISTER TO BE CHANGED

BEQ 28
BR 38

1%: CMP (SP)+,(SP)+ :ADJUST STACK
001328 001402 MOV #SWREG, SWREG :POINT TO SOFTWARE SWITCH REG
001329 001402 MOV #SWREG, SWREG :RESTORE VECTORS
00132A 001402 MOV #SWREG, SWREG :IS SOFTWARE REG USED
00132B 001402 BNE GO :ALLOW SOFTWARE SWITCH REGISTER TO BE CHANGED
00132C 001402 JSR PC.CNTL :ELSE GO START EXECUTION

:REWIND FROM E01 (PER SH1)

001334 000162 177340 JMP START

:CKSWR ROUTINE THAT ALLOWS THE LOADING OF LOC 176, SWREG**********

:FROM THE TTY AT SELECTED POINTS WITHIN THE PROGRAM**********
C02

; SOFTWARE SWITCH REGISTER PRESENT
; NO, GET OUT
; YES, WAIT FOR
; READY, GET CHARACTER
; AND STRIP OFF
; THE GARBAGE
; IS IT A <CR>?

: GO READ A LINE
: RETURN TO MAIN 3003 OF PROGRAM

: READ:
CLR TEMPS
MOV #0, COUNT
JSR PC,TTIN

: GO READ A CHARACTER
: STRIP OFF GARBAGE
: IS IT A <LF>?
: BRANCH IF NOT
: POP THE STACK
: START OVER
: IS IT A <CR>?
: BRANCH IF NOT

: ECHO IT WITH <LF>:
: HAS IT FIRST CHARACTER
: CHANGE SW IF NOT FIRST ONE
: POP THE STACK
: GET OUT

: START OVER IF NOT LEGAL CHARACTER
: GET NITTY-GRITTY
: ONLY WANT 6 DIGITS
; CHANGE SWITCH REGISTER CONTENTS
### H02

CROSS REFERENCE TABLE -- USER SYMBOLS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LP</td>
<td>523*</td>
</tr>
<tr>
<td>TP</td>
<td>519</td>
</tr>
<tr>
<td>SP</td>
<td>545</td>
</tr>
<tr>
<td>AP</td>
<td>562</td>
</tr>
<tr>
<td>MP</td>
<td>535*</td>
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<tr>
<td>HP</td>
<td>542</td>
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<td>543</td>
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<tr>
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<td>TP</td>
<td>519*</td>
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<td>611*</td>
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<td>612*</td>
</tr>
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<td>AP</td>
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<td>635*</td>
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<tr>
<td>MP</td>
<td>701*</td>
</tr>
<tr>
<td>HP</td>
<td>716</td>
</tr>
</tbody>
</table>

### ABS.

005200  000

### ERRORS DETECTED:

0

### DEFAULTGLOBALS GENERATED:

0

### DZTUED, DZTUED, SEQ/SL, CRF/OS: ERFZ/EN: ABS=DSKM:DZTUED.P11

### RUN-TIME:

24.4 SECONDS

RUN-TIME RATIO: 22/7=2.8

### CORE USED:

6K (11 PAGES)