

IDENTIFICATION

PRODUCT CODE: MAINDEC-X8-DIKLB-B-D
PRODUCT NAME: DEC/X8 MODULE "TTYLUP"
KL8E/KL8F/KL8J EXERCISER
DATE CREATED: MAY 15, 1975
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1. MODULE DESCRIPTION

"TTYLUP" IS A DEC/X8 SOFTWARE MODULE WHICH EXERCISES TWO (2) KL8E/KL8F/KL8J OPTIONS IN THE "EIA" OR "CURRENT" LOOPBACK MODE. AS MANY "TTYLUP" SOFTWARE MODULES AS DESIRED MAY BE BUILT INTO A CUSTOMIZED EXERCISER.

THE DATA PATTERN USED FOR TESTING IS THE STANDARD BINARY UP COUNT SEQUENCE (I.E. 0,1,2,3,4 ETC.), EACH KL8E/KL8F/KL8J HARDWARE MODULE IS OPERATED INDEPENDENTLY OF THE OTHER, THEREFORE, DATA PATTERNS WILL VARY BETWEEN UNITS, ANY STANDARD LEVEL CONFIGURATION (1-8) IS HANDLED AND CHANGABLE (VIA ODT) INDEPENDENTLY.

2. REQUIREMENTS

1. PROCESSORS: PDP-8, 8/I, 8/L, 8/E, 8/M, AND PDP-12,
2. OPTIONS: ONE OR TWO KL8E/KL8F/KL8J OPTIONS
3. SPECIAL: NONE

(NOTE: THIS MODULE IS OPERATIONAL ON OTHER DEVICES COMPATIBLE WITH THE KL8E/KL8F/KL8J UNITS)

3. RESTRICTIONS

NONE

4. OPERATING INFORMATION

4.1 SPECIAL CONSIDERATIONS

THE MODULE MUST BE INITIALIZED BEFORE RUNNING.

4.2 BUILDING

1. JOB TYPE: INTERRUPT DRIVE
2. PRIORITY: NON-CRITICAL ; MAY HAVE RAPID INTERRUPT FREQUENCY.
3. JOB SLOTS: ANY EXISTENT JOB SLOT; 2 PAGES REQUIRED.
4. STANDARD DEVICE CODES: NONE; DEVICE CODE IS SPECIFIED WHEN MODULE IS INITIALIZED.

4.3 INITIALIZING

AFTER THE TTY LEVEL (0 OR 1) IS PRINTED, TYPE THE FOLLOWING:

TTYLUP
2 [AA] [BB]
1 [AA] [BB]

WHERE "AA" IS THE KEYBOARD DEVICE CODE AND "BB" THE TRANSMITTER DEVICE CODE FOR THE TTI/TTO AT THE INDICATED LEVEL. TYPE "00" FOR ANY KEYBOARD OR TRANSMITTER LEVEL THAT DOES NOT EXIST. LEVELS 0 AND 1 MUST BE INITIALIZED.

IN ADDITION, THE FOLLOWING TWO LOCATIONS CAN BE CHANGED TO MODIFY THE DESIRED LEVEL (1-8) OF THE TTI/TTO IN USE, USING RELATIVE CONTROL +0.

LOCATION -----	RELATIVE -----	PURPOSE -----
MASK0	0526	DATA LEVEL MASK FOR DEVICE 0
MASK1	0556	DATA LEVEL MASK FOR DEVICE 1

4.4 DEVICE SETUP

CONNECT THE KL8J MODULE IN EIA OR CURRENT LOOPBACK OR THE KL8E OR KL8F IN EIA LOOPBACK USING THE FOLLOWING PIN CONNECTIONS:

EIA CONNECTIONS: F-J E-M

CURRENT CONNECTIONS: E-H K-KK S-AA

NOTE: THE KL8E OR KL8F OPTION CANNOT BE CONNECTED IN THE CURRENT LOOPBACK MODE.

4.5 RUNNING

1. CNTR: UPDATED EACH TIME ALL INITIALIZED TTI/TTO LINES PROCESS A CHARACTER (INTERRUPT)
2. SR10: NO EFFECT
3. SR11: NO EFFECT

5. ERROR INFORMATION

ERRORS ARE INDICATED IN THE FOLLOWING MANNER:

1. DATA ERRORS ARE REPORTED IN THE STANDARD STATUS ERROR FORMAT.
2. ERROR HALTS INDICATING "UNDEFINED OR UNEXPECTED INTERRUPTS".

3. BY THE UPDATE OF "CNTR" INDICATING NO INTERRUPTS.

5.1

ERROR SYMBOL DEFINITIONS

1. CODE: INDICATES THE TTI DEVICE CODE OF THE FAILING UNIT,

2. SA: CHARACTER EXPECTED BITS 4-11

3. SB: CHARACTER READ BITS 4-11

SPECIAL: THE LOCATION "CNTR" WILL NOT UPDATE IF ANY TTI/TTO FAIL TO INTERRUPT. TO DETERMINE WHICH DEVICE FAILED TO INTERRUPT, EXAMINE LOCATION "CNTFLG" BITS 8-11. BITS SET TO A 1 ARE THE PARTICULAR TTI/TTO FAILING TO INTERRUPT. BIT 8=1 FOR DEVICE 0 TTI, BIT 9=1 FOR DEVICE 0 TTO, BIT 10=1 FOR DEVICE 1 TTI, AND BIT 11=1 FOR DEVICE 1 TTO.

LOCATION -----	RELATIVE -----	PURPOSE -----
CNTFLG	0566	INTERRUPT INDICATOR

SPECIAL: UNEXPECTED INTERRUPT FLAGS WILL RESULT IN AN ERROR HALT AT THE FOLLOWING LOCATIONS:

LOCATION -----	RELATIVE -----	PURPOSE -----
REHLT0	0513	UNEXPECTED DEVICE 0
REHLT1	0543	UNEXPECTED DEVICE 1

6.

LISTING

ATTACHED

/DEC/X8 EXTERNAL SYMBOL TABLE "EXTSYN"
/FOR USE IN ASSEMBLING DEC/X8 SOFTWARE MODULES.
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PAUSE

PAL10 V142A 3-APR-75 8151 PAGE 2

/MAINDEC-X8-DIKLB-B-L "DEC/X8" TTYLUP
/MULTIPLE (2) KL8F/KL8E/KL8J TTY LOOP BACK EXERCISER FOR DEC/X8.
/COPYRIGHT 1974, 1975 DIGITAL EQUIPMENT CORPORATION, MAYNARD, MASS.
/THIS MODULE OPERATIONAL ON PDP-8/I,8/L,8/E,8/M AND PDP-12.
/SPECIAL DW8E ADAPTER NEEDED FOR 8/I, 8/L, AND PDP-12.
/PRG, JOHN VROBEL
/NOTE: IF YOU MODIFY OR RE-ASSEMBLE THIS MODULE PROGRAM,
/WATCH THE LOCATION TAGGED "KLUDG", ITS USED AS A CONSTANT.
/HARDWARE LOOP BACK SETUP
/CONNECT THE KL8J MODULE IN EIA OR CURRENT LOOPBACK OR THE
/KL8E OR KL8F MODULE IN EIA LOOPBACK. (NOTE: THE KL8E OR KL8F MODULE
/CANNOT BECONNECTED IN THE CURRENT LOOP BACK MODE.
/EIA PIN CONNECTIONS F-J E-H
/CURRENT PIN CONNECTIONS E-H K-KK S-AA
/BUILDER INSTRUCTIONS:
/1, PRIORITY: NON-CRITICAL; MAY HAVE RAPID INTERRUPT FREQUENCY
/2, JOB SLOT: 2 PAGES REQUIRED; ANY EXISTENT JOB SLOT.
/3, ANY AMOUNT OF "TTYLUP" MODULES MAY BE BUILT INTO A
/CUSTOMIZED EXERCISER. THE ONLY LIMITATION IS THE MEMORY AVAILABLE.
/INITIALIZER INSTRUCTIONS
/THIS MODULE MUST BE INITIALIZED PRIOR TO RUNNING.
/AFTER THE TTY LEVEL IS PRINTED (0 AND 1), TYPE:
/ TTYLUP [AA] [BB]
/WHERE AA IS THE KEYBOARD DEVICE CODE, AND BB IS THE
/TELEPRINTER DEVICE CODE FOR THE TTY AT THE INDICATED LEVEL.
/TYPE "00" FOR ANY LEVEL TTY THAT DOES NOT EXIST.
/DO THIS FOR LEVELS 0 AND 1.
/SPECIAL USER MODIFICATIONS VIA *0.
/1, THE FOLLOWING LOCATIONS MAY BE CHANGED TO CORRECTLY
/MASK THE DATA WORD FOR TTI/TTO 0 AND 1. THESE LOCATIONS
/ARE NORMALLY SET TO 0377.
/0526 MASK0 DATA MASK FOR DEVICE 0
/0556 MASK1 DATA MASK FOR DEVICE 1
/ERRORS
/1. ALL DATA ERRORS WILL BE REPORTED IN THE STANDARD STATUS


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0305 7200 CLA /NOT ALL DONE!
0306 3220 DCA KILLED
0307 5214 JMP INTACK /EXIT AND WAIT FOR REST!
0310 1236 TAD CODE
0311 7640 SEA CLA /ANY ERRORS?
0312 5304 JMP AUF /UPDATE WAIT COUNTER
0313 1242 TAD INT
0314 3241 DCA ERRSB /SETUP FOR ERROR PRINTER
0315 1270 TAD SRVIN
0316 3242 DCA INT /SAVE RETURN ADDRESS
0317 1670 TAD I SRVIN /GET CHARACTER INDICATOR
0320 2270 ISE SRVIN /UPDATE ADDRESS POINTER
0321 0670 AND I SRVIN /MASK LEVEL
0322 3240 DCA ERRSA /SAVE EXPECTED DATA
0323 2367 ISE DWAIT /GET ISE WAIT POINTER
0324 7610 SKP CLA /ONLY IF THIS POINTER IS 0!
0325 5344 JMP RERROR /YES
0326 1240 TAD ERRSA
0327 7041 CIA
0330 1241 TAD ERRSB
0331 7640 SEA CLA /DATA THE SAME?
0332 5344 JMP RERROR /NO DATA ERROR!
0333 2642 ISE I INT /O.K. UPDATE PATTERN
0334 1642 TAD I INT /GET NEXT CHARACTER
0335 0130 AND K177
0336 1372 TAD M12
0337 7650 SNA CLA /HAS IT A 12?
0340 2642 ISE I INT /YES DON'T TRANSMIT, UPDATE.
0341 7100 CLL
0342 2270 ISE SRVIN /UPDATE FOR RETURN
0343 5670 JMP I SRVIN /RETURN AND START TRANSMITTER

0344 7344 RERROR, CLA CLL CMA RAL
0345 1242 TAD INT
0346 3242 DCA INT /SETUP ADDRESS POINTER
0347 1642 TAD I INT /GET READ IOT
0350 3236 DCA CODE /CODE INDICATOR FOR ERROR PRINTER
0351 1374 TAD (PNTR1
0352 5214 JMP INTACK

0353 7776 /TTITAB, -2
0354 0011 +11
0355 6001 KSF -30
0356 0015 +15
0357 6006 KRB -30
0360 7775 /TTOTAB, -3
0361 0000 0
0362 6001 TSP -40
0363 0006 +6
0364 6002 TCF -40
0365 0022 +22
0366 6006 TLS -40

0367 0000 /
0370 0000 DWAIT, 0
CNTCHK, 0

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0371 7772 M6, -6
0372 7766 M12, -12
/
0373 /
/

0374 0256
0375 0566
0376 0475
0377 0504
0400 0400 +400
/
/INITIALIZER
/

0400 4454 INITLP, CRLF
0401 4444 INIT, MESSAGE /PRINT TITLE
0402 0201 I1, TEXT1
0403 3271 DCA TTYCNT /0 TO TTY COUNTER
0404 3777 DCA CNTCHK /CLEAR FLAG
0405 1776 KLU D, TAD TTITAB /2 LEVELS
0406 3325 KLU D, DCA CHAR0
0407 1375 TAD (IOTAOS-30 /CHAIN SEG POINTER -30.
0410 3355 DCA CHAR1
0411 1355 INITB, TAD CHAR1 /+30 TO POINTER
0412 1103 TAD K30
0413 3355 DCA CHAR1
0414 4454 CRLF /
0415 7326 CLA CLL CML RTL
0416 1325 TAD CHAR0 /PRINT LEVEL
0417 4451 PRNT1
0420 4232 JMS INITA /SERVICE FOR T1.
0421 0352 13, TTITAB-1
0422 4232 JMS INITA /SERVICE FOR T0.
0423 0357 14, TTOTAB-1
0424 1316 TAD FLAG0 /GET TO DC
0425 7640 SEA CLA
0426 2271 ISE TTYCNT /UPDATE TTY COUNTER
0427 2325 ISE CHAR0 /DONE?
0430 5211 JMP INITB /NO.
0431 5020 INITEX /YES

/
0432 0000 INITA, 0 /SERVICE.
0433 4455 SPACE2 /2 SP.
0434 4441 THDOCT /GET DC.
0435 5200 JMP INITLP /ERROR
0436 3316 DCA FLAG0 /SAVE DC
0437 1632 TAD I INITA /GET TABLE PNTR.
0440 2232 ISE INITA /MOVE TO EXIT.

0441 3017 AUA, DCA AUTO
0442 1417 AUB, TAD I AUTO /GET TALLY.
0443 3346 DCA FLAG1 /SAVE.
0444 1417 AUC, TAD I AUTO /GET BIAS
0445 1355 TAD CHAR1 /ADD TO POINTER

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0446 3304 DCA SRVDEV /SAVE
0447 1316 TAD FLAG0 /GET DC
0450 7450 SNA
0451 5265 JMP AUE-2 /ZERO
0452 1367 TAD K1000 /ADD IN INT. POINTER
0453 7106 CLL RTL /JUSTIFY
0454 7204 RAL
0455 1417 AUD, TAD I AUTO /ADD IOT
0456 3704 DCA I SRVDEV /STASH IN CHAIN.
0457 2346 ISE FLAG1 /DONE?
0460 5244 JMP AUC /NO.
0461 1777 TAD CNTCHK
0462 7304 RAL
0463 3777 DCA CNTCHK
0464 5632 JMP I INITA /YES, EXIT.
0465 1774 TAD KNOP /DC=00, INSERT "NOP"
0466 7100 CLL /
0467 2017 AUE, ISE AUTO /UPDATE AUTOINDEX
0470 5256 JMP AUD+1 /BACK

0471 0000 /
TTYCNT, 0
/
/PROGRAM COMES HERE ON INITIAL START OF JOB
/OR FOR RESTART AFTER AN ERROR REPORT OR DELAY WAIT,
/
0472 3773 RUN, DCA CNTR /CLEAR INTERRUPT INDICATOR
0473 1777 TAD CNTCHK
0474 3366 DCA CNTFLG /SETUP INT. BIT LATCH
0475 1271 TAD TTYCNT
0476 7241 CIA
0477 3017 AUG, DCA AUTO /CLEAR KILL COUNTER
0500 3772 DCA CODE /CLEAR CODE INDICATOR
0501 7120 CLL CML /SET LINK IND. FOR SERVEX MODE
0502 6002 IOP
0503 5327 JMP RUNG00 /START UP DEVICES

/
/ROUTINE TO CHECK AND SERVICE THE INTERRUPTS
/
0504 0000 SRVDEV, 0
0505 1366 TAD CNTFLG /GET LATCH FLAG
0506 7000 IOTA0S, NOP/TSF /SKIP ON TIO FLAG FOR 0.
0507 5317 JMP IOTAIS /NO SKIP, CHECK TTI
0510 0100 AND K13 /LATCH BIT 9
0511 3366 DCA CNTFLG /SET LATCH
0512 2316 ISE FLAG0 /CHECK REENTRY ERROR
0513 7402 REHLT0, HLT /ERROR INT. REENTRY FOR 0.
0514 7000 NOP/TCF /CLEAR TIO FLAG
0515 5771 JMP INTACK /EXIT, WAIT FOR TTI

0516 0000 /
FLAG0, 0 /ERROR REENTRY FLAG FOR DEVICE 0

0517 7000 IOTAIS, NOP/KSF /SKIP ON TTI FLAG FOR 1.
0520 5336 JMP IOTB0S /NO SKIP, CHECK NEXT TTY
0521 0075 AND K7 /LATCH BIT 0
0522 3366 DCA CNTFLG /SET LATCH

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0523 7000 READ0, NOP/KRB /READ DATA AND CLEAR FLAG
0524 4770 JMS SRVIN /SERVICE TTI, COMPARE DATA
0525 0000 CHAR0, 0 /CHARACTER FOR DEVICE 0.
0526 0377 MASK0, 0377 /MASK FOR DEVICE 0
0527 1325 RUNG00, TAD CHAR0
0530 7000 NOP/TL5 /TRANSMIT DATA
0531 7240 CLA CMA
0532 3316 DCA FLAG0 /SETUP REENTRY FLAG FOR 0.
0533 7420 SNL /INTERRUPT OR DEFERRED SERVICE?
0534 5771 JMP INTACK /INT., EXIT TO MONITOR
0535 5357 JMP RUNG01 /DEFERRED, SEND AND START NEXT TTI
0536 7000 IOTB0S, NOP/TSF /SKIP ON TTI FLAG
0537 5347 JMP IOTBIS /NO SKIP, CHECK TTI
0540 0205 AND KLUDC /LATCH BIT 11. **** SEE NOTE AT THE
/BEGINNING OF THIS MODULE****
0541 3366 DCA CNTFLG /SET LATCH
0542 2346 ISE FLAG1 /CHECK REENTRY ERROR
0543 7402 REHLT1, HLT /ERROR REENTRY FOR DEVICE 1
0544 7000 NOP/TCF /CLEAR TTI FLAG
0545 5771 JMP INTACK /EXIT WAIT FOR TTI

0546 0000 /
FLAG1, 0 /REENTRY FLAG FOR DEVICE 0.

0547 7000 IOTBIS, NOP/KSF /SKIP ON TTI FLAG
0550 3704 JMP I SRVDEV /EXIT NO INT. HERE!
0551 0112 AND K215 /LATCH BIT 10
0552 3366 DCA CNTFLG /SET LATCH
0553 7000 READ0, NOP/KRB /READ DATA AND CLEAR FLAG
0554 4770 JMS SRVIN /SERVICE TTI, COMPARE DATA
0555 0000 CHAR1, 0 /CHARACTER FOR DEVICE 1.
0556 0377 MASK1, 0377 /MASK LEVEL FOR DEVICE 1.
0557 1355 RUNG01, TAD CHAR1
0560 7000 NOP/TL5 /TRANSMIT DATA
0561 7240 CLA CMA
0562 3346 DCA FLAG1 /SETUP REENTRY FLAG FOR DEVICE 1
0563 7420 SNL /INTERRUPT OR DEFERRED SERVICE?
0564 5771 JMP INTACK /INT., EXIT TO MONITOR
0565 5004 SERVEX /EXIT TO MONITOR

/
/
0566 0000 CNTFLG, 0
0567 1000 K1000, 1000
/
/
0570 *
/
0570 EOP2,
0402 *I1; TEXT1
0402 0201 *I3; TITAB=1
0421 0421 *I4; TTOTAB=1
0423 0423 *EOP2
0570 0570
/
/
0570 0270

```


0571 0214
0572 J236
0573 0221
0574 0276
0575 0456
0576 0353
0577 0370

0001 FIELD 1

0000
0100
0200 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111
0300 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11101111
0400 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111
0500 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111

0600
0700

1300
1100

1200
1300

1400
1500

1600
1700

2000
2100

2200
2300

2400
2500

2600
2700

3000
3100

3200
3300

3400
3500

3600
3700

4000
4100

4200
4300

4400
4500

4600
4700

5000
5100

5200
5300

5400
5500

5600
5700

6000
6100

6200
6300

6400
6500

6600
6700

7000
7100

7200
7300

7400
7500

7600
7700

```

/BUILDER CALL
INIT:RUN:INT
1:HLT:HLT:HLT:HLT:HLT
-10: AUA: AUB: AUC: AUD: AUE: AUF: AUG: AUH
0
0
0
SSS

```

```

0000
0100

0200
0300

0400
0500

0600 11111111 11111111 11111000 00000000 00000000 00000000 00000000 00000000
0700 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000

1000
1100

1200
1300

1400
1500

1600
1700

2000
2100

2200
2300

2400
2500

2600
2700

3000
3100

3200
3300

3400
3500

3600
3700

```

4000
4100

4200
4300

4400
4500

4600
4700

5000
5100

5200
5300

5400
5500

5600
5700

6000
6100

6200
6300

6400
6500

6600
6700

7000
7100

7200
7300

7400
7500

7600
7700

ASBUFF	4460	K100	0107	LISN	4440
ASBUFP	0060	K1000	0067	LISNP	0040
AUA	0441	K11	0077	M12	0372
AUB	0442	K116	0071	M20	0135
AUC	0444	K13	0100	M200	0131
AUD	0455	K17	0101	M240	0127
AUE	0467	K177	0130	M260	0126
AUF	0304	K20	0102	M270	0125
AUG	0477	K200	0110	M3	0141
AUH	0262	K2000	0122	M30	0134
AUTO	0017	K212	0111	M4	0140
CHAR0	0525	K215	0112	M40	0133
CHAR1	0555	K240	0113	M43	0132
CNTCHK	0370	K260	0114	M9	0137
CNTFLG	0566	K272	0115	M6	0371
CNTR	0221	K277	0116	M7	0136
CODE	0236	K3	0072	MASK0	0526
CRLF	4454	K30	0103	MASK1	0556
CRLFP	0054	K301	0117	MESSAGE	4444
DWAIT	0367	K32	0067	MESSAGE	0044
EOP2	0570	K323	0120	MUL26P	0065
ERROR	0222	K4	0073	ONEOCP	0042
ERRP	0061	K40	0104	ONEOCT	4442
ERRSA	0240	K400	0121	PNTR1	0256
ERRSB	0241	K5	0074	PRNT1	4451
EXINIT	0020	K5200	0123	PRNT1P	0051
EXSERV	0004	K540	0124	PRNT2	4452
EXTHEM	0161	K5402	0003	PRNT2P	0052
FLAG0	0516	K64	0070	PRNT4	4453
FLAG1	0546	K7	0075	PRNT4P	0053
FOROCP	0043	K70	0105	READ0	0523
FOROCT	4443	K7510	0125	READB	0553
WOMEDF	0211	K7520	0126	REHLT0	0513
11	0402	K7540	0127	REHLT1	0543
13	0421	K7600	0131	RERROR	0344
14	0423	K77	0106	RLBUFF	4407
IHRETP	0026	K7735	0132	RLBUFP	0057
INIT	0401	K7740	0133	RUN	0472
INITA	0432	K7750	0134	RUNGO0	0527
INITB	0411	K7760	0135	RUNGO1	0557
INITEX	0020	K7771	0136	SERVEX	0004
INITLP	0400	K7773	0137	SPACE2	4455
INT	0242	K7774	0140	SPACEP	0055
INT1	0254	K7775	0141	SRVDEV	0504
INTACK	0214	KCDF	0064	SRVIN	0270
10PMSP	0056	KCIF	0005	TEXT1	0201
10TAIS	0517	KCIFDF	0020	TTITA0	0353
10TAOS	0506	KILL	0217	TTOTAB	0360
10TBIS	0547	KILLED	0220	TTYCNT	0471
10TBOS	0536	KIOP	0004	TWOOCF	0041
K0	0066	KLUDG	0405	TWOOCT	4441
K10	0076	KNOP	0276	TYPE	4490

ERRORS DETECTED: 0
LINKS GENERATED: 18
RUN-TIME: 4 SECONDS
2K CORE USED