TM02/TU45

DATA TAPE CREATE
CZTUNA0

AH-E485A-MC

FICHE 1 OF 1

JUL 1978
digital
MADE IN USA

```
        .NLIST  SEQ,LOC,BIN
        .REM_
```

IDENTIFICATION

PRODUCT CODE: AC-E484A-MC

PRODUCT NAME: CZTUNA0 TM02/TU45 DATA TAPE CREATE

DATE: 25 MAY 1978

MAINTAINER: COMPUTER SPECIAL SYSTEMS

AUTHOR: R. B. BARNES/R. J. COLLINS

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1. ABSTRACT

THIS IS NOT A TEST PROGRAM! IT IS A SUPPLEMENT
TO BOTH THE TM11/TU10 AND TM02/TU45 DATA
RELIBILITY PROGRAMS. ITS PURPOSE IS TO ALLOW THE
OPERATOR TO CREATE A PAPER TAPE OF WHATEVER DATA
PATTERN IS DESIRED, TO BE USED BY THE DATA RELIBILITY
PROGRAMS, WHEN DATA PATTERN ZERO (0) IS SELECTED.

2. REQUIREMENTS

A. ANY PDP-11 PROCESSOR
B. TELETYPE OR LA30 KEYBOARD
C. HIGH SPEED OR LOW SPEED PUNCH
D. 1K OF CORE

3. LOADING PROCEDURE

USE STANDARD BINARY LOADING PROCEDURE

4. STARTING PROCEDURE

THE PROGRAM MAY BE STARTED AT EITHER 200 (8)
OR 204 (8). WHEN STARTED AT 200 (8), OPERATING
INSTRUCTIONS WILL BE PRINTED BEFORE STARTING
INPUT. WHEN STARTED AT 204 (8), INPUT IS
IMMEDIATELY STARTED. INPUT START IS NOTED BY AN ASTERISCK (*).

SAMPLE START AT 200: (LOAD 200, PRESS START)

EXTERNAL DATA TAPE CREATE PROGRAM
MAXIMUM OF 377 OCTAL CHARACTERS.
ENTER 3 DIGITS (0-7) FOR EACH CHARACTER.
CR WILL ECHO CR-LF.
CONTROL C ENDS INPUT AT LESS THAN 377.
A SINGLE CHARACTER CORRECTION MAY BE DONE
BY TYPING A SLASH AND RETYPING THE CHARACTER.

* (THE ASTERISCK INDICATES START OF INPUT)

SAMPLE START AT 204: (LOAD 204 PRESS START)

* (START INPUT)

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5. OPERATION:

WHEN THE ASTERISCK IS PRINTED AFTER THE START AT 200 OR 204, START INPUTTING CHARACTERS. EACH GROUP OF THREE (3) DIGITS (0-7) EQUALS ONE (1) CHARACTER ON TAPE. ENTER AS MANY 3 DIGIT GROUPS PER THE NUMBER OF CHARACTERS DESIRED IN THE PATTERN. THE PROGRAM WILL ACCEPT UP TO 256 CHARACTERS (377 OCTAL). IF LESS THAN 256 ARE DESIRED, TERMINATE INPUT BY TYPING A CONTROL C. A CARRIAGE RETURN (CR) MAY BE TYPED ANY TIME AND WILL ECHO A CR-LF BUT WILL NOT BE PLACED IN THE DATA PATTERN NOR COUNTED AS AN INPUT CHARACTER. ANY INPUT OTHER THAN AN OCTAL DIGIT (0-7), A CARRIAGE RETURN (CR), OR A CONTROL C WILL BE CONSIDERED ILLEGAL AND BE FLAGGED BY A QUESTION MARK (?). THE ILLEGAL ENTRY IS NEITHER PLACED IN THE DATA PATTERN NOR COUNTED AS A CHARACTER. WHEN INPUT IS COMPLETED (CONTROL C OR 256 CHARACTERS), THE PROGRAM TYPES END OF INPUT AND REQUESTS SELECTION OF HIGH SPEED OR LOW SPEED PUNCH FOR OUTPUT. A RESPONSE OF L TO THIS REQUEST WILL CAUSE OUTPUT ON THE TTY PUNCH, A RESPONSE OF H TO THIS REQUEST WILL OUTPUT ON THE HIGH SPEED PUNCH.
WHEN OUTPUT IS COMPLETE, THE PROGRAM WILL AGAIN REQUEST AN OUTPUT RESPONSE. IF EITHER H OR L IS TYPED, THE SAME DATA PATTERN IS AGAIN OUTPUT. THIS CAN BE REPEATED AS MANY TIMES AS DESIRED. IF NO MORE OUTPUT IS NEEDED, BUT A DIFFERENT PATTERN IS DESIRED, TYPE A CR TO RETURN TO START OF INPUT WHICH WILL BE INDICATED BY AN ASTERISCK (*).
THE FIRST CHARACTER PUNCHED ON THE TAPE IS THE NUMBER OF CHARACTERS ON THAT TAPE AND IS NOT USED AS PART OF THE PATTERN BY THE EXERCISERS. THE DATA ON THE TAPE WILL APPEAR AS BYTES IN CORE WHEN USED BY THE EXERCISERS.

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6. EXAMPLES

THE FOLLOWING EXAMPLES SHOW THE TAPE LAYOUT RESULTING
FROM ITS INPUT AND THE RESULTANT CORE MAP IN THE EXERCISER,
(READ THE EXERCISER DOCUMENT TO SEE HOW TO USE THESE PATTERN TAPES)

EXAMPLE 1: LOAD AND START AT 204 (8)

```
*00011122333444 9?377/6(CONTROL C)

END OF INPUT
ASSURE PUNCH IS ON
AND TYPE L FOR LOW SPEED
OR H FOR HIGH SPEED
OR CR FOR RESTART WITH NO PUNCH

L (OUTPUT IS NOW MADE ON TTY PUNCH)

        OUTPUT TAPE BIT LAYOUT:

        00000.110 (NUMBER OF CHARACTERS IN PATTERN IS 6)
        00000.000
        01001.001
        10010.010 (THE DOT . REPRESENTS THE SPROCKET HOLE)
        11011.011
        00100.100
        11111.110

        EXERCISER CORE MAP:

WRITE BUFFER:   0100100100000000
          +2:   1101101110010010        (6 CHARACTER = 3 WORDS)
          +4:   1111111011011011
```

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. EXAMPLE 2: LOAD AND START 204 (8)

```
*377(CR)
500(CR)
8?G?3(CR)
334266(CONTROL C)

END OF INPUT
ASSURE PUNCH IS ON
AND TYPE L FOR LOW SPEED
OR H FOR HIGH SPEED
OR CR FOR RESTART WITH NO PUNCH

H(OUTPUT IS NOW MADE OF HIGH SPEED PUNCH)

        OUTPUT TAPE BIT LAYOUT:

        00000.101 (NUMBER OF CHARACTERS IS 5)
        11111.111
        01000.000
        11011.011 (THE DOT REPRESENTS THE SPROCKET HOLE)
        00010.110
        10000.000

        EXERCISER CORE MAP:

WRITE BUFFER:   0100000011111111
          +2:   0001011011011011        (5 CHARACTER = 2 WORDS + 1 BYTE)
          +4:   0000000010000000
```

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7. EXCEPTION

NOTE THAT THE FIRST DIGIT OF THE 3 DIGITS PER CHARACTER IS LEFT JUSTIFIED. BECAUSE THE TAPE IS ONLY EIGHT (8) BITS WIDE, THE MOST SIGNIFICANT BIT OF THE FIRST DIGIT INPUT FOR EACH CHARACTER IS LOST. SEE EXAMPLE ONE (1), THE FIFTH (5) CHARACTER INPUT IS 444, BUT THE TAPE OUTPUT SHOWS 00100100 BECAUSE THE MOST SIGNIFICANT BIT IS LOST. EXAMPLE 2, THE SECOND (2) CHARACTER INPUT, ALSO SHOWS THIS. REMEMBER, THE FIRST DIGIT INPUT FOR EACH CHARACTER WILL ONLY SHOW THE TWO (2) LEAST SIGNIFICANT BITS OF THAT DIGIT.
THE OTHER EXCEPTION TO KEEP IN MIND, IS THAT IF INPUT IS TERMINATED AT SOME NUMBER OF DIGITS NOT DIVISIABLE BY THREE (3), THE PARTIAL CHARACTER AT THE END OF THE FIELD WILL BE FILLED TO THE RIGHT WITH ZEROS (0). EXAMPLE 2, THE FIFTH (5) CHARACTER, HAS NOT BEEN COMPLETED BY INPUT BEFORE TERMINATION. SEE THE TAPE LAYOUT, CHARACTER 5 WHICH SHOWS THAT THE TWO (2) LEAST SIGNIFICANT DIGIT POSITIONS ARE FILLED WITH ZEROES (0) TO COMPLETE THE CHARACTER FOR OUTPUT.

8. EXERCISER USAGE

THE EXERCISERS WILL READ THE TAPE CREATED BY DTC AND FILL THEIR ENTIRE WRITE BUFFER WITH REPITIONS OF THE DATA TAPE SO THAT ANY SIZE RECORD CAN BE WRITTEN.

9. LISTING

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```
                                .LIST   SEQ,LOC,BIN
                                        .TITLE DATA TAPE CREATE
                                        ;CZTUNA0
                                        ;R. BARNES/R. J. COLLINS
                                        ;25 MAY 1978

                                .ENABLE ABS

            000000                      R0=%0
            000001                      R1=%1
            000002                      R2=%2
            000003                      R3=%3
            000004                      R4=%4
            000005                      R5=%5
            000006                      SP=%6
            000007                      PC=%7

            000000                      .=0
            000200                      .REPT 200
                                        .+2
                                        HALT
                                        .ENDR

            000200                      .=200
000200      000167  000774              JMP     START           ;STARTING ADDRESS=200(8) FOR HELP

            000204                      .=204
000204      000167  001012              JMP     ST1             ;STARTING ADDRESS FOR NO HELP

            001000                      .=1000
                                        ;CONSTANTS**********

001000      177560          TKS:    177560                  ;LOW SPEED PUNCH
001002      177562          TKB:    177562
001004      177564          TPS:    177564
001006      177566          TPB:    177566
001010      177554          PPS:    177554                  ;HIGH SPEED PUNCH
001012      177556          PPB:    177556
001014      177776          PSW:    177776                  ;PROGRAM STATUS WORD

                                        ;BUFFERS**********

001016      000000          TIB:    0                       ;INPUT BUFFER
001020      000000          TOB:    0                       ;OUTPUT BUFFER
```

```
                        001200                          .=1200
                                                ;PROGRAM START AND HOUSEKEEPING**********

001200  012777  000340  177606  START:  MOV     #340,@PSW       ;SET TO PRIORITY LEVEL 7
001206  012706  000500                  MOV     #500,SP         ;SET STACK TO 500
001212  012704  002176                  MOV     #MSG1,R4
001216  004767  000532                  JSR     PC,TTOUT        ;TYPE HELP MESSAGE
001222  012777  000340  177564  ST1:    MOV     #340,@PSW
001230  012706  000500                  MOV     #500,SP
001234  005067  177560                  CLR     TOB
001240  005067  177552                  CLR     TIB             ;CLEAR BUFFERS
001244  012700  000250                  MOV     #250,R0         ;SET SIZE IF DATA AREA
001250  012702  002754                  MOV     #DAM40,R2       ;SET START OF AREA TO CLEAR
001254  005022                  ST2:    CLR     (R2)+           ;CLEAR DATA AREA
001256  005300                          DEC     R0              ;CLEAR R0 FOR USE AS CHARACTER COUNTER
001260  001375                          BNE     ST2             ;BR IF NOT DONE
001262  005001                          CLR     R1              ;CLEAR R1 FOR USE AS DIGIT POSITION POINTER
001264  012702  003017                  MOV     #DA+1,R2        ;SET START OF DATA AREA
001270  004767  000642          ST3:    JSR     PC,CRLF         ;TYPE CR,LF AND *

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 324                                          ;DATA READ FROM TTY**********
 325
 326  001274  004767  000552          READ:   JSR     PC,TTIN         ;GO INPUT DATA
 327  001300  122767  000215  1775 `          CMPB    #215,TIB
 328  001306  001007                         BNE     RD1             ;BR IF NOT CR
 329  001310  012767  000212  177502         MOV     #212,TOB
 330  001316  004767  000512                 JSR     PC,TOG          ;DO LF
 331  001322  000167  177746                 JMP     READ            ;GET NEXT DATA
 332  001326  122767  000203  177462  RD1:   CMPB    #203,TIB
 333  001334  001004                         BNE     RD2             ;BR IF NOT CONTROL C
 334  001336  005700                         TST     R0
 335  001340  001753                         BEQ     ST3             ;BR IF FIRST INPUT
 336  001342  000167  000234                 JMP     PUNCH           ;GO TO PUNCH ROUTINE
 337  001346  122767  000257  177442  RD2:   CMPB    #257,TIB        ;SEE IF RUBOUT
 338  001354  001002                         BNE     RD2A            ;IF NOT: BR
 339  001356  000167  000042                 JMP     RUBOUT          ;ELSE RUBOUT LAST ENTRY
 340  001362  122767  000260  177426  RD2A:  CMPB    #260,TIB
 341  001370  101407                         BLOS    RD3             ;BR IF NOT TOO LOW
 342  001372  012767  000277  177420  RD2B:  MOV     #277,TOB
 343  001400  004767  000430                 JSR     PC,TOG          ;TYPE?
 344  001404  000167  177664                 JMP     READ
 345  001410  122767  000267  177400  RD3:   CMPB    #267,TIB
 346  001416  103031                         BHIS    RD4             ;BR IF NOT TOO HIGH
 347  001420  000167  177746                 JMP     RD2B
 348
```

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                                        ;LAST ENTRY RUBOUT ROUTINE**********
                                
001424  000240          RUBOUT: NOP
001426  022701  000001          CMP     #1,R1           ;SEE WHERE LAST ENTRY WAS
001432  101006                  BHI     RB0             ;IF POSITION 0: BR
001434  103414                  BLO     RB1             ;IF POSITION 1: BR
001436  142712  000300          BICB    #300,(R2)
001442  005001                  CLR     R1              ;RESET POSITION POINTER
001444  000167  177624          JMP     READ            ;REENTER
001450  142742  000007  RB0:     BICB    #7,-(R2)
001454  005300                  DEC     R0              ;RESET CHAR POINTER
001456  012701  000002          MOV     #2,R1           ;RESET POSITION POINTER
001462  000167  177606          JMP     READ            ;REENTER
001466  142712  000070  RB1:     BICB    #70,(R2)
001472  012701  000001          MOV     #1,R1           ;RESET POSITION POINTER
001476  000167  177572          JMP     READ            ;REENTER
                                
                                        ;POSITION DIGITS TO FORM CHARACTER AND LOAD DATA AREA**********
                                
001502  016703  177310  RD4:     MOV     TIB,R3
001506  142703  000370          BICB    #370,R3         ;R3=STRIPPED DIGIT(0-7)
001512  022701  000001          CMP     #1,R1           ;TEST POSITION POINTER
001516  101016                  BHI     RD6             ;DO POSITION 2
001520  103410                  BLO     RD5             ;DO POSITION 0
001522  000241                  CLC
001524  106103                  ROLB    R3
001526  106103                  ROLB    R3              ;POSITION DIGIT 1
001530  106103                  ROLB    R3
001532  150312                  BISB    R3,(R2)         ;LOAD DIGIT 1
001534  005201                  INC     R1              ;BUMP POINTER
001536  000167  000026          JMP     RDEX            ;CHECK FOR END
001542  150322          RD5:    BISB    R3,(R2)+        ;LOAD DIGIT 0
001544  005001                  CLR     R1              ;CLEAR POSITION POINTER
001546  005200                  INC     R0              ;BUMP CHARACTER COUNTER
001550  000167  000014          JMP     RDEX            ;LOAD DIGIT
001554  000303          RD6:    SWAB    R3
001556  000241                  CLC
001560  006003                  ROR     R3              ;POSITION DIGIT 2
001562  006003                  ROR     R3
001564  150312                  BISB    R3,(R2)         ;LOAD DIGIT 2 AND BUMP CHARACTER ADDRESS
001566  005201                  INC     R1              ;BUMP POINTER
001570  022700  000377  RDEX:   CMP     #377,R0
001574  001402                  BEQ     PUNCH           ;BR IF FILLED DATA AREA
001576  000167  177472          JMP     READ
```

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                                        ;TAPE PUNCH ROUTINE**********
                                        
001602  110067  001210        PUNCH:  MOVB    R0,DA           ;LOAD DATA AREA SIZE
001606  062700  000100                ADD     #100,R0         ;EXPAND FOR LEADER/TRAILER
001612  012701  002754                MOV     #DAM40,R1       ;LOAD PUNCH START ADDRESS
001616  012704  002574        PG:     MOV     #MSG2,R4
001622  004767  000126                JSR     PC,TTOUT        ;TYPE PUNCH REQUEST(H OR L)
001626  004767  000220        P0:     JSR     PC,TTIN         ;GET RESPONSE
001632  122767  000314  177156        CMPB    #314,TIB
001640  001421                        BEQ     P1              ;BR IF LS PUNCH
001642  122767  000310  177146        CMPB    #310,TIB
001650  001427                        BEQ     P2              ;BR IF HS PUNCH
001652  122767  000215  177136        CMPB    #215,TIB        ;SEE IF CR
001660  001002                        BNE     PE              ;IF NOT: BR
001662  000167  177334                JMP     ST1             ;ELSE RESTART
001666  012767  000277  177124  PE:   MOV     #277,TOB
001674  004767  000134                JSR     PC,TOG          ;TYPE?
001700  000167  177722                JMP     P0
                                        
                                        ;PUNCH TAPE ON LOW SPEED**********
                                        
001704  112167  177110        P1:     MOVB    (R1)+,TOB
001710  004767  000120                JSR     PC,TOG          ;PUNCH CHARACTER
001714  005300                        DEC     R0
001716  001372                        BNE     P1              ;BR IF NOT DONE
001720  116700  001072                MOVB    DA,R0
001724  000167  177652                JMP     PUNCH           ;RESTART
                                        
                                        ;PUNCH TAPE ON HIGH SPEED**********
                                        
001730  112167  177064        P2:     MOVB    (R1)+,TOB
001734  004767  000160                JSR     PC,THG          ;PUNCH CHARACTER
001740  005300                        DEC     R0
001742  001372                        BNE     P2              ;BR IF NOT DONE
001744  116700  001046                MOVB    DA,R0
001750  000167  177626                JMP     PUNCH
```

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 431                                                ;TTY OUTPUT SUBROUTINE**********
 432
 433  001754  112467  177040          TTOUT:  MOVB    (R4)+,TOB
 434  001760  122767  000043  177032          CMPB    #43,TOB
 435  001766  001430                         BEQ     TEX
 436  001770  122767  000045  177022          CMPB    #45,TOB
 437  001776  001403                         BEQ     TCRLF
 438  002000  004767  000030                  JSR     PC,TOG
 439  002004  000763                         BR      TTOUT
 440  002006  112767  000015  177004  TCRLF:  MOVB    #15,TOB
 441  002014  004767  000014                  JSR     PC,TOG
 442  002020  112767  000012  176772          MOVB    #12,TOB
 443  002026  004767  000002                  JSR     PC,TOG
 444  002032  000750                         BR      TTOUT
 445  002034  105777  176744          TOG:    TSTB    @TPS
 446  002040  100375                         BPL     TOG
 447  002042  116777  176752  176736          MOVB    TOB,@TPB
 448  002050  000207                  TEX:    RTS     PC
 449
 450                                                ;TTY READ SUBROUTINE**********
 451
 452  002052  005077  176722          TTIN:   CLR     @TKS
 453  002056  005077  176720                  CLR     @TKB
 454  002062  005067  176730                  CLR     TIB
 455  002066  105777  176706          TTIN1:  TSTB    @TKS
 456  002072  100375                         BPL     TTIN1
 457  002074  017767  176702  176714          MOV     @TKB,TIB
 458  002102  105777  176676          TTIN2:  TSTB    @TPS
 459  002106  100375                         BPL     TTIN2
 460  002110  116777  176702  176670          MOVB    TIB,@TPB
 461  002116  000207                         RTS     PC
 462
 463                                                ;HIGH SPEED PUNCH SUBROUTINE**********
 464
 465  002120  105777  176664          THG:    TSTB    @PPS
 466  002124  100375                         BPL     THG
 467  002126  116777  176666  176656          MOVB    TOB,@PPB
 468  002134  000207                         RTS     PC
 469
 470                                                ;CR, LF, * TYPE SUBROUTINE**********
 471
 472  002136  012767  000215  176654  CRLF:   MOV     #215,TOB
 473  002144  004767  177664                  JSR     PC,TOG
 474  002150  012767  000212  176642          MOV     #212,TOB
 475  002156  004767  177652                  JSR     PC,TOG
 476  002162  012767  000252  176630          MOV     #252,TOB
 477  002170  004767  177640                  JSR     PC,TOG
 478  002174  000207                         RTS     PC
 479
```

```
                                                .EVEN
                                                ;MESSAGES**********

002176  022445  054105  042524  MSG1:   .ASCII  /%%EXTERNAL DATA TAPE CREATE PROGRAM%/
002204  047122  046101  042040
002212  052101  020101  040524
002220  042520  041440  042522
002226  052101  020105  051120
002234  043517  040522  022515
002242  040515  044530  052515          .ASCII  /MAXIMUM OF 377 OCTAL CHARACTERS%/
002250  020115  043117  031440
002256  033467  047440  052103
002264  046101  041440  040510
002272  040522  052103  051105
002300  022523
002302  047105  042524  020122          .ASCII  /ENTER 3 DIGITS(0-7)FOR EACH CHARACTER%/
002310  020063  044504  044507
002316  051524  030050  033455
002324  043051  051117  042440
002332  041501  020110  044103
002340  051101  041501  042524
002346  022522
002350  051103  053440  046111          .ASCII  /CR WILL ECHO CR-LF%/
002356  020114  041505  047510
002364  041440  026522  043114
002372     045
002373     103  047117  051124          .ASCII  /CONTROL C ENDS INPUT AT LESS THAN 377.%/
002400  046117  041440  042440
002406  042116  020123  047111
002414  052520  020124  052101
002422  046040  051505  020123
002430  044124  047101  031440
002436  033467  022456
002442  020101  044523  043516          .ASCII  /A SINGLE CHARACTER CORRECTION MAY BE DONE%/
002450  042514  041440  040510
002456  040522  052103  051105
002464  041440  051117  042522
002472  052103  047511  020116
002500  040515  020131  042502
002506  042040  047117  022505
002514  054502  052040  050131          .ASCII  /BY TYPING A SLASH AND RETYPING THE CHARACTER.%#/
002522  047111  020107  020101
002530  046123  051501  020110
002536  047101  020104  042522
002544  054524  044520  043516
002552  052040  042510  041440
002560  040510  040522  052103
002566  051105  022456     043

        002574                          .EVEN
002574  022445  047105  020104  MSG2:   .ASCII  /%%END OF INPUT%/
002602  043117  044440  050116
002610  052125     045
002613     101  051523  051125          .ASCII  /ASSURE PUNCH IS ON%/
002620  020105  052520  041516
002626  020110  051511  047440
```

```
  536  002634  022516
  537  002636  047101  020104  054524          .ASCII  /AND TYPE L FOR LOW SPEED%/
  538  002644  042520  046040  043040
  539  002652  051117  046040  053517
  540  002660  051440  042520  042105
  541  002666     045
  542  002667     117  020122  020110          .ASCII  /OR H FOR HIGH SPEED%/
  543  002674  047506  020122  044510
  544  002702  044107  051440  042520
  545  002710  042105     045
  546  002713     117  020122  051103          .ASCII  /OR CR FOR RESTART WITH NO PUNCH%#/
  547  002720  043040  051117  051040
  548  002726  051505  040524  052122
  549  002734  053440  052111  020110
  550  002742  047516  050040  047125
  551  002750  044103  021445
  552
  553                                          .EVEN
  554                                          ;DATA AREA**********
  555
  556  002754  000000                 DAM40:  0
  557          003016                          .=.+40
  558  003016  000000                 DA:     0
  559
  560
  561          000001                          .END
```

```
CRLF    002136          PUNCH   001602          RD2B    001372          ST3     001270          TPS     001004
DA      003016          P0      001626          RD3     001410          TCRLF   002006          TTIN    002052
DAM40   002754          P1      001704          RD4     001502          TEX     002050          TTIN1   002066
MSG1    002176          P2      001730          RD5     001542          THG     002120          TTIN2   002102
MSG2    002574          RB0     001450          RD6     001554          TIB     001016          TTOUT   001754
PE      001666          RB1     001466          READ    001274          TKB     001002          .     = 003020
PG      001616          RDEX    001570          RUBOUT  001424          TKS     001000
PPB     001012          RD1     001326          START   001200          TOB     001020
PPS     001010          RD2     001346          ST1     001222          TOG     002034
PSW     001014          RD2A    001362          ST2     001254          TPB     001006

. ABS.  003020     000


 ERRORS DETECTED:  0

 .CZTUNA.SEQ/SOL_CZTUNA.P11
 RUN-TIME: 2 5 .2 SECONDS
 RUN-TIME RATIO: 12/9=1.3
 CORE USED:  5K  (10 PAGES)
```