```
                ;                                       RCSL: 52-AA 899
                ;                                       AUTHOR: JSP
                ;                                       EDITED: 23 JUNI 79
                ;               TEST OF EXTENDED
                ;               INSTRUCTION SET FOR CPU 720
                ;               REVISION 1.0
                ; KEYWORDS: CPU 720, TESTPROGRAM, LISTNING, REV 1.0
                ; ------------------------------------------------------------
                ; ABSTRACT: THIS PAPER DESCRIBES A TEST OF THE EXTENDED
                ;           INSTRUCTION SET FOR CPU 720.
                ;               S-BINARY TAPE:  RCSL 52-AA 900
                ;               ASCII TAPES:    RCSL 52-AA 901
```

```
;*****************************************************
;                                                     *
;                                                     *
;       DESCRIPTION: TESTPROGRAM FOR CPU 720          *
;                                                     *
;       REVISION HISTORY:                             *
;                                                     *
;               REV     DATE            INITIALS      *
;                                                     *
;               0.0     79.01.10        LAB           *
;               1.0     79.06.23        JEP           *
;                                                     *
;                                                     *
;                                                     *
;                                                     *
;*****************************************************
```



```
;2. MACHINE REQUIREMENTS
;       PROCESSOR, CPU 720 (UNDER TEST)         CPU
;       MINIMUM 16K WORDS MEMORY                MEM
;       MEMORY BUS TIMEOUT, MBT 701 IF
;               NOT 64K WORDS MEM               MBT
;       MAIN CONSOLE INCL IOC 704/707           TTY     *NOTE
;       LINEPRINTER, OPTIONALLY                 LP1     *NOTE
;       TECHNICAL PANEL, TCP 701, OPTIONALLY    TCP
;
;       *NOTE: IF THIS DEVICES IS SET ONLINE AFTER PROGRAM
;       START, THE PROGRAM MUST BE RESTARTED TO GET OUTPUT.
```

```
;3. STANDARD OPERATING PROCEDURE.
;                   1.  LOADING
;                   2.  LOADING MESSAGE
;                   3.  START
;                   4.  ANSWERING TO QUESTIONS
;                   5.  PROGRAM DATA
;                   6.  SWITCH CONTROL
;                   7.  UTILITY START ADDRESSES
;                   8.  TERMINATE
;                   9.  RESTART FROM TTI
;                   10. RESTART FROM TCP
;                   11. RESTART FROM CPU FRONT EDGE
;                   12. POWER RESTART
;                   13. RESTART WITH BREAK OPTION
;                   14. RESTART PROGRAM AS WHEN LOADED
;                   15. MEMORY SIZE
;                   16. EXAMINE/DEPOSIT MEMORY
;                   17. PROGRAM BREAK MESSAGE .
;                   18. BINARY LOADER
;                   19. PROGRAM SUPERVISOR
;                   20. VOLTAGE UNIT ADMINISTRATION
;                   21. CPU TYPE NO
;                   22. PRINTER ALPHABETH
;
;       3.1 LOADING:
;                   IF FROM PTR:
;       1           AUTOLOAD TAPE
;       OR 2        USE BOOTSTRAP FOR AUTOLOAD-TAPE (END OF CHAPTER)
;       OR 3        USE BINARY LOADER STARTING TAPE AFTER 1. BLOCK
;
;                   IF FROM ANOTHER DEVICE:
;                   READ THE INSTRUCTIONS ATTACHED TO THE MEDIUM.
;
;       3.2 LOADING MESSAGE:
;                   AFTER LOADING THE PROGRAM WILL WRITE FOLLOWING:
;
;                   ACTUAL PROGRAM NAME
;                   SWITCHES: 000030
;                   SET SWITCHES TO CONTROL, (3.6), STARTADDR 400 ?
;
;       3.3 START
;                   OF PROGRAM AFTER LOADING:
;
;                   SET SWITCHES TO CONTROL, READ 3.6
;                   BEFORE START READ ADDITIONAL OPERATING PROCEDURE
;
;       3.4 ANSWERING TO QUESTIONS:
;                   IF THE SUGGESTED ANSWER IS OK,
;                   ANSWER ONLY NL (RETURN),
;                   ELSE INPUT YOUR CHOICE.
;
;                   THE LAST DIGIT ANSWERED CAN BE ERASED WITH
;                   RUBOUT (CANCEL OR DELETE).
;                   MORE DIGITS CAN'T BUT PASS LIMIT BY GIVING TO
;                   MANY DIGITS.
;
;                   IF THE ANSWER IS BEYOND LIMITS THE QUESTION
;                   IS REPEATED.
```

```
;
;       3.5 PROGRAM DATA:
;
;               AFTER LOADING IT IS POSSIBLE TO KNOW MORE ABOUT
;               THE PROGRAM AND THE MACHINE BY STARTING IN
;               SA 2226. FOLLOWING DATA ARE PRINTED:
;
;               ACTUAL PROGRAM NAME
;               RCSL 44-R1 XXXX  DATE: DD.MM.YEAR  VERSION: 0.0
;               CPU TYPE: 000021 RC 3600 NORMAL
;               MIKROPROG VERSION:     0, CPU 708
;               LAST LOC. 077777
;               BINARY LOADER OK          ; SEE 3.18
;               SWITCHES: 000030
;               SET SWITCHES TO CONTROL, (3.6), STARTADDR 400 ?
;
;               GO TO 3.3 START
;
;       3.6 SWITCH CONTROL: NORMAL ALL ZERO.
;
;               SW0:  LOOP IN TEST IN CASE OF ERROR. ( SCOPING).
;               SW10: INHIBIT PRINTOUT IN TESTLOOP-PROGRAM.
;               SW11: PRINT FAILURE RATE IN TESTLOOP-PROGRAM.
;               SW12: NO HALT IN CASE OF ERROR IN TESTLOOP-PROGR.
;               SW13: WAIT AFTER DIS MESSAGE.  DIS IS THE 16 CHAR
;               SW14: HALT AFTER DIS MESSAGE.  DISPLAY AT OPERAT.
;               SW15: CLEAR DIS AFTER MESSAGE. CONTROL PANEL. OCP
;
;       3.7 UTILITY START ADDRESSES:
;
;               2202 GET A NEW PRINTER ALPHABETH
;               2204 SET TO 64K WORDS MODE, MEM SIZE ?
;               2206 SET TO 32K WORDS MODE, MEM SIZE ?
;               2210 EXAMINE MEMORY
;               2212 DEPOSIT MEMORY
;               2214 TROUBLE BREAKPOINT HALT
;               2216 TROUBLE BREAKPOINT LOOP REPORT
;               2220 TROUBLE BREAKPOINT RESET
;               2222 START BINARY LOADER, READ FROM PTR/TTI (SW 0)
;               2224 RESTART PROGRAM AS WHEN LOADED
;               2226 PRINT PROGRAM DATA
;               2230 INCREASE/DECREASE VOLTAGE UNIT ADMINISTRATION
;
;       3.8 TERMINATE:
;
;               NORMALLY IT IS POSSIBLE TO TERMINATE THE PROGRAM
;               BY PRESSING ESC AT MAIN CONSOLE (TTI) OR PRESSING
;               INT AT OPERATORS CONTROL PANEL (OCP).
;
;               IF THE PROGRAM IS WAITING FOR INPUT TO A QUESTION
;               ANSWER ENOUGH DIGITS TO PASS THE LIMIT, AND WHEN
;               THE QUESTION STARTS REPEATING, PRESS ESC
;               IMMEDIATELY.
```

```
;
;       3.9 RESTART FROM TTI:
;
;               ANSWER THE START ADDRESS QUESTION AFTER
;               TERMINATING.
;
;       3.10 RESTART FROM TCP:
;
;               THE BEST WAY TO INSURE
;               CORRECT SWITCH SETTINGS:
;               RESET
;               SET SWITCHES TO START ADDR.
;               EXAMINE
;               SET SWITCHES TO CONTROL. (3.6).
;               CONTINUE.
;               THE START ADDR IS LISTED AT TTO, LPT AND DIS.
;
;       3.11 RESTART FROM CPU FRONT EDGE
;               ONLY IF RESTART OPTION (RC 3603):
;
;               SET DATASWITCH 0, 10 - 15 UP (1)
;               SET RESET PARITY ERROR DOWN (ON)
;               PRESS AUTOLOAD AND RELEASE
;               SET RESET PARITY ERROR UP (OFF)
;               SET SWITCHES TO CONTROL (3.6).
;               ANSWER THE QUESTION WRITTEN ON TTY/OCP.
;
;       3.12 POWER RESTART
;               ONLY IF POWER MONITOR OPTION:
;
;               SET KEY IN LOCK BEFORE REMOVING POWER
;               AFTER POWERING UP THE PROGRAM WRITES:
;               POWER
;               ACTUAL PROGRAM NAME
;               SET SWITCHES TO CONTROL. (3.6).
;               ANSWER THE START ADDRESS QUESTION.
;
;       3.13 RESTART WITH BREAK OPTION (RC 3603):
;
;               RESET
;               SET SWITCHES TO HALT INSTR      063077
;               SET REGISTER SELECT TO 6
;               DEPOSIT INTO REGISTER
;               SET SWITCHES TO ADDRESS         000003
;               SET REGISTER SELECT TO 5
;               DEPOSIT INTO REGISTER
;               SET BREAK SWITCH TO ON
;               GO TO 3.10 RESTART WITH SA = 2224
;
;       3.14 RESTART PROGRAM AS WHEN LOADED:
;
;               USING START ADDRESS 2224 WILL START THE PROGRAM
;               THE SAME WAY AS WHEN LOADED. IT SEARCHS FOR
;               CPU TYPE, MEMORY SIZE (IF SWITCH FOR MEMORY
;               EXTENSION IS ON, THE FLAG IS SET).
;               SEE 3.21 AND 3.15.
```

3.15 MEMORY SIZE:

IF THE MEMORY SIZE IS CHANGED THE PROGRAM MUST START IN ONE OF FOLLOWING ADDRESSES:
2204 SET MEM EXT FLAG AND FIND MEMSIZE
2206 RESET MEM EXT FLAG AND FIND MEMSIZE
2224 SEE RESTART 3.14
EACH TIME THE PROGRAM IS STARTED IN ONE OF THE OTHER STARTADDRESSES, THE MEM EXT FLAG IS SET/RESET IN THE STATE USED LAST TIME MEMSIZE WAS FOUND. (BY RESET ROUTINE).

3.16 EXAMINE/DEPOSIT MEMORY:

IT IS POSSIBLY TO SUPERVISE SMALL PARTS OF MEMORY BY SA 2210:
ANSWER THE QUESTIONS FROM LOC TO LOC AND THAT PART IS PRINTED IN OCTAL.
IT IS PUSSIBLE TO CHANGE A DATABUFFER OR THE PROGRAM BY USING SA 2212:
ANSWER DEPOSIT WITH THE WANTED PATTERN IN OCT
(THE SAME CONTENT TO ALL LOCATIONS SPECIFIED)
ANSWER FROM LOC TO LOC QUESTION.

COMMON FOR BOTH START ADDRESSES:
IF "FROM LOC" AND "TO LOC (INCL.)" ARE ANSWERED EQUAL, ONLY ONE LOCATION IS USED.
THE PROGRAMS WORK IN THE WHOLE MEMORY (0-64K WORDS) IF THE MEMORY EXTENSION FLAG IS SET. SEE 3.15 MEMORY SIZE.

3.17 PROGRAM BREAK MESSAGE:

AFTER START OF THE MAIN PROGRAM(S) (SA 400,..) THE NOT USED PART OF MEMORY IS FILLED WITH THE PROGRAM BREAK COMMAND PROIN (LOC 6 ?).
IF THE PROGRAM IS DESTROYED AND THE PC HITS ONE OF THESE UNUSED LOCATIONS, A MESSAGE IS PRINTED IF THAT PART OF PROGRAM TO DO THIS STILL EXISTS:
"PROGRAM BREAK AT 067652"

3.18 BINARY LOADER:

THE BINARY LOADER FOR PAPER TAPES IS PLACED IN TOP OF MEMORY (MAX 32K) AFTER LOADING OF THIS PROGRAM REGARDLESS OF WHICH LOAD MEDIUM THERE WAS USED TO INPUT THIS PROGRAM. RESTART IN SA 2222 WILL RESTORE THE LOADER AGAIN. IT IS A SLIGHTLY MODIFIED VERSION (TS) INCL BOOTSTRAP.
AFTER MESSAGE "WAITING" SET SWITCH 0 TO CORRECT STATE ( 1=PTR, 0=TTY ), LOAD READER AND ANSWER NL OR ESC.
IF SUMCHECK OR OVERWRITING CHECK REACTS:
ERRORHALT: XX7751
IF USED TO LOAD NOT SELFSTARTING PROGRAMS:
READYHALT: XX7676

```
;
;
;       3.19 PROGRAM SUPERVISOR:
;            IF THE PROGRAM DESTROYES ITSELF OR IN ANOTHER
;            WAY DISBEHAVE THEN USE THE BUILT IN SUPERVISING
;            METHOD:
;            ALL LOOPS ARE STARTED WITH JMP .+1
;            BY HAND IT IS POSSIBLE TO SHORTEN THE PROGRAM,
;            THEREBY NOT RUNNING ALL LOOPS BY CHANGING TO A
;            HALT OR JMP ARTEST (CAUSES PASS MESSAGE FOR
;            LOOPS IN USE UP TO THIS POINT).
;            AUTOMATICALLY IT'S POSSIBLE TO INSERT
;            1.      HALT                    SA 2214
;            2.      CALL LOOP REPORT        SA 2216
;            3.      JMP .+1 (NO ACTION)     SA 2220
;            IN ALL THE BREAKPOINTS CHOOSEN BY THE PROGRAMMER,
;            WHO HAS PUT THE ADDRESS OF ALL LOOP START POINTS
;            IN THE TABLE TROTB.
;             SA 2216 IS VERY USEFUL, IT IS POSSIBLE TO
;            FOLLOW THE PROGRAM STEP BY STEP AS THE START
;            ADDR OF EACH LOOP ARE PRINTED.
;
;       3.20 INCREASE/DECREASE VOLTAGE UNIT ADMINISTRATION:
;
;            FOR MARGINAL TEST IS AN IDU-UNIT DEVELOPED.
;            WITH THIS UNIT IT IS POSSIBLE TO LET THE
;            PROGRAM CHANGE THE VOLTAGE AFTER A PASS MESSAGE.
;            THE PROGRAM IS GIVEN SOME PARAMETERS BY MEANS OF
;            SA 2230:
;            IDUMODE:  (Y)
;            0 OR N  NO, IDU DISABLED, VOLTAGE 100 %
;            1 OR Y  YES, VOLTAGE PROGRAM 100, 105, 95 %
;            2       VOLTAGE PROGRAM 100, 95, 105 %
;            3                       100, 105 %
;            4                       100, 95 %
;            5                       105, 95 %
;            6                       100 %
;            7                       105 %
;            8                       95 %
;            P       PASS, NEW QUESTION:
;                    NO OF PASSES BEFORE VOLTAGE SHIFT:  (4)
;            D       DEVICE NUMBER FOR IDU, NEW QUESTION:
;                    DEVICE NO:  (5)
;
;            EACH TIME THE VOLTAGE IS SHIFTED A MESSAGE IS
;            PRINTED.
;
;       3.21 CPUNO:
;            FOR TIMING PURPOSE THE PROGRAM DETERMINES IN
;            WHICH CPU IT RESIDUES. IF IT FAILS THE PROGRAM
;            WILL TRY TO CONTINUE AFTER THE MESSAGE
;            "MISERABLE TIMING". IF IMPOSSIBLE THE PROGRAM
;            WILL ASK YOU TO IDENTIFY THE CPU WITH A NUMBER
;            BETWEEN 0 AND 6. USE 2 FOR NOVA1200, RC3603-BREAK
;                                 4 FOR RC3603
;                                 . FOR NOVA 2-16K
;                                 6 FOR NOVA 2-8K WHERE
;            THE MEMORY TYPE FOR THE FIRST 8K IS RELEVANT.
;            STANDARD QUESTION FORMAT USED.
```

```
;
;       3.22 PRINTER ALPHABETH:
;
;               THIS PROGRAM CONTAINS 4 PRINTER ALPHABETHS.
;               AFTER LOADING OF THE PROGRAM THE ASCII IS USED.
;               IF ANOTHER IS WANTED OR YOU WANT TO DESIGN YOUR
;               OWN SPECIAL TABLE, READ FOLLOWING.
;
;       PRINTER ALPHABETH CHANGE:
;AT ANY TIME AFTER LOADING THIS PROGRAM IT IS POSSIBLE TO CHANGE
;THE ALPHABETH USED ON THE LINEPRINTER. THERE ARE 2 METHODS:
;  1.                    GET ONE OF THE BUILD-IN ALPHABETHS:
;       START PROGRAM IN $A 2202
;       REMEMBER SWITCHES TO CONTROL. (3.6).
;       ANSWER ALPHABETH 0, SEE EXISTING BELOW
;THE PROGRAM WILL RESTART AFTER CHANGING THE ALPHABETH.
;       ANSWER NEXT START ADDRESS.
;  2.                              GET AN -ADD ON- TAPE WITH
;A NEW ALPHABETH AND LOAD THIS UPON THE PROGRAM AND RESTART. THE
;TAPES WITH PRINTER TABLE ALPHABETH ARE DESCRIBED BELOW:
;EXISTING: 01    44-RT 535       ASCII
;          02    44-RT 529       RC STANDARD TYPE 71/78 START
;          03    44-RT 532       RC STANDARD TYPE 71/78 START
;                                      (SKEWED 4 POSITIONS)
;          04    44-RT 1213      PL 1, TYPE 70
;
;HOW TO PRODUCE A NEW TABLE:
;THE TABLE HAS 200 OKTAL (128 DECIMAL) BOXES. INPUT KEY
;IS THE ASCII VALUE OF THE CHARACTER TO PRINT ADDED TO 2000.
;THE RESULT IS ADDRESS OF A BOX. EACH BOX OCCUPIES A CORE WORD.
;IT IS BUILT UP OF TWO FIGURES. THE FIRST IS THE CLASS OF THE
;CHARACTER TO BE PRINTED: 0 FOR PRINT, 6 FOR BLIND. THE SECOND
;IS THE CHARACTER VALUE AT THE PRESENT PRINT DRUM. BELOW
;VALUE 40 OCTAL FOLLOWING CHARACTERS MAY BE USED: 11 TAB,
;12 LF, 14 FF AND 15 CR. ALL OTHERS BELOW 40 WILL GIVE SPACE.
;THE FIRST BOX SHOULD CONTAIN THE VALUE FOR THE NULL CHAR
;AND THE LAST THE VALUE FOR THE DEL CHAR, WHICH BOTH NORMALLY
;ARE BLIND. IF YOU COUNT 0,1,2, ,7,10, , THE BOX 101 SHALL
;CONTAIN THE PRINT DRUM VALUE FOR AN A. IF THE DRUM DO NOT
;HAVE SMALL LETTERS, FILL IN THE VALUE FOR BIG ONES. NOW PUNCH
;AN ASCII TAPE LIKE THIS:
;   .LOC 2000
;   .RDX 8          ;WHICH-RDX YOU WANT
;   .TXTE?
;   <6><0>          ;(2000) FIRST BOX, BOX 0
;   <6><0>
;   .
;   .
;   .
;   <0><101>        ;(2101) BOX 101 FOR A. FOR ASCII DRUM
;   .               ;101 IS USED, FOR TYPE 71 137 IS USED.
;   .
;   .
;   <6><0>?         ;(2177) BOX 177, LAST
;   .RDX 8
;   .END 101        ;AUTOMATIC RESTART OF MAIN PROGRAM.
;PRODUCE A BINARY TAPE AND LOAD THIS TO MEMORY WITH
;BINARY LOADER AFTER LOADING OF MAIN PROGRAM.
```

```
                ;       BOOTSTRAP FOR AUTOLOAD-TAPES, PTR.
                ;       **********************************

                ;SELF, A PROGRAM SIMILAR TO AUTOLOAD PROM FOR PTR, BUT
                ;READ TO MEMORY BY THE OPERATOR THROUGH FRONT PANEL SWITCHES.

                ;DEPOSIT SELF PROGRAM.
                ;START IN LOCATION 50.

00050 060112 BEGIN:  NIOS    PTR       ;START READER
00051 126440         SUBO    1,1       ;CLEAR AC1, CLEAR CARRY
00052 004413 LOOP:   JSR     GET1      ;GET A BYTE
00053 101065         MOVC    0,0,SNR   ;IS IT ZERO ?
00054 000776         JMP     LOOP      ;YES, IGNORE AND GET NEXT
00055 050420         LDA     2,SAPRE   ;NO, IT WAS TAPE SYNCRONIZER, DROP IT
                                       ;AND SET AC2 TO FIRST MEM LOC FOR PREAM
00056 004406 LOOP1:  JSR     GET       ;GET A FULL WORD, FIRST = WORD COUNT
00057 045000         STA     1,0,2     ;STORE INTO MEMORY FROM COUNT
00060 151400         INC     2,2       ;INCREMENT ADDR TO NEXT
00061 010417         ISZ     COUNT     ;BUMP WORD COUNT, DONE ?
00062 000774         JMP     LOOP1     ;NO, REPEAT, STILL DATA
00063 000410         JMP     PREAM     ;YES, FINISHED, GIVE CONTROL TO
                                       ;FIRST WORD IN PREAM PROGRAM
00064 126420 GET:    SUBZ    1,1       ;CLEAR AC1, SET CARRY
00065 063512 GET1:   SKPBZ   PTR       ;
00066 000777         JMP     .-1       ;WAIT NON-BUSY
00067 060412         DIA     0,PTR     ;READ A BYTE TO AC0
00070 060112         NIOS    PTR       ;START READER FOR NEXT BYTE
00071 107363         ADDCS   0,1,SNC   ;ADD 2 BYTES SWAPPED, GOT SECOND ?
00072 000773         JMP     GET1      ;NO, GO BACK AFTER IT
00073 125300         MOVS    1,1       ;YES, SWAP AC1
00074 001400         JMP     0,3       ;RETURN WITH FULL WORD
00075 000100 SAPRE:  .+3               ;START ADDR FOR LOADING PREAM
00076 000050 SADDR:  50                ;SPARE, NOT USED ,(START ADDR FOR SELF)

                ;AFTER DEPOSITING ABOVE PROGRAM, SET SWITCHES TO 000050 AND
                ;LOAD THE PAPER TAPE READER WITH SUITABLE TAPE (S-BIN OR H-BIN).
                ;PRESS RESET, START. NOW THE BINARY LOADER IN NORMAL OR
                ;SELFSTART VERSION IS READ IN, THEN THE MAIN PROGRAM.

                ;TAPES WHICH CAN BE READ BY THIS BOOTSTRAP:

                ;       1       TESTPROGAMS IN S-BIN FORMAT (WITH S-BIN HEAD).

                ;       OR 2    S-BIN HEAD ITSELF (RCSL 44-RT 1711), WHEN PTR
                ;               HAS FINISHED LOAD NORMAL ABS BINARY TAPE (A-BIN)
                ;               AND THE PTR CONTINUES AUTOMATICALLY.
                ;               (OR CONNECT THE TAPES TO ONE WITH ADHESIVE TAPE)

                ;       OR 3    H-BIN TAPE (RCSL 44-RT 1712) WHICH LOADS THE
                ;               BINARY LOADER AND HALTS. SWITCH=1X7777, START.

                ;       FOR MORE INFORMATION READ RCSL 44-RT 1710, PROGRAM LOAD.
```

```
;
;4. ADDITIONAL OPERATING PROCEDURE FOR THIS PROGRAM.
;
;       BEFORE LOADING:         ENABLE MEMORY EXTENSION (128K)
;
;       TO PREVENT THE PIKKUPPOGRAM FROM STOPPING IF NOT 64K
;       WORDS MEMORY THE MBT 701 SHOULD BE USED !
;
;       THE PROGRAM IS SELFSTARTING.
;
;       START ADDRESSES:
;               400     DIAGNOSTIC TEST
;               2224    IF MEMORY SWITCH (128K/64K) OR
;                       MEMSIZE HAS BEEN CHANGED.
;
;       AFTER START FOLLOWING MESSAGES ARE PRINTED:
;
;       000400   STARTADDR
;       SWITCHES: 000010
;
;               NOW THE PROGRAM RUNS.
;
;               A PASS MESSAGE IS PRINTED WITH ABOUT 150 SEC.
;               (2,5 MIN.) INTERVAL.
;
;               IN CASE OF ERRORS THE PROGRAM WILL PRINT
;               THE PC AND THE AC'S.
;               THE FURTHER FLOW WILL DEPEND OF THE SWITCHES.
;               USE THE LISTING FOR FURTHER INFORMATION ABOUT
;               THE ERROR SYMPTOMS.
;
;       IF TROUBLES, I. E. IMPOSSIBLE TO LOAD/START PROGRAM OR
;       NO NORMAL ERROR REACTION:
;       RUN STANDARD INSTRUCTION TEST, WITH EXTENDED MEMORY
;       DISABLED: RC 3600 CPU LOGIC TEST.
;       IF NO ERRORS FOUND, LOAD THIS PROGRAM WITHOUT ENABLING
;       MEMORY EXTENSION. THEN ENABLE MEMORY EXTENSION AND START
;       MANUALLY IN SA 375. THE PROGRAM WILL THEN SET MEM EXT
;       FLAG AND HALT. DO NOT PRESS RESET ANY MORE AS THE
;       FLAG THEN IS CLEARED. NOW START IN LOC 200, TCPLO LOC
;       21363 OR TCPHI LOC 100666 TO TEST ADDRESSING. IF AN
;       ERROR IS FOUND THE PROGRAM HALTS. IF NOT CHECK STEP BY
;       STEP USING TECRN. CONTR. PANEL TCP 701. (EXAMINE AC'S
;       INSTRUCTION STEP.
;       AFTER HAVING SOLVED THE ADDRESSING PROBLEM START THE
;       TEST IN SA 2224.
;
;       INTERRUPT CHECK:
;       THE RUN NUMBER IS USED TO DECIDE IF INTR IS CHECKED OR
;       NOT. IT IS POSSIBLE TO CHANGE THE PROGRAM TO RUN ALL
;       THE TIME WITH INTR CHECK OR WITHOUT. READ PAGE 157,
;       LABEL XNTRL, TO KNOW HOW (CHANGING A JMP INSTR.).
;       THE INTR OF THE MUSIL COMMAND (PLACED IN LABEL NTRLC)
;       ENABLES THE USER TO PERFORM THE COMMAND STEP BY STEP:
;       CHANGE JMP TO HALT IN LABEL NHERE, SAME PAGE AS MENTIONED
;       ABOVE AND EXAMINE AC'S BEFORE PRESSING CONTINUE.
```

```
;
;5. PROGRAM DESCRIPTION
;       5.1 TESTLOOP FAILURE RATE
;       5.2 STRUCTURE OF PROGRAM, NEXT PAGE.
;               5.1 TESTLOOP FAILURE RATE:
;THERE ARE TWO DIFFERENT WAYS TO USE THE ROUTINES FOR TESTLOOP:
;SINGLE OR MULTIPLE ERRORHALT:

;SINGLE:        SETP1       MULTIPLE:   SETP1
;               ERRORHALT               ERRORHALT
;               LOOP                    ERRORHALT
;                                       ERRORHALT
;                                       LOOP

;IN CASE OF A CONSTANT ERROR THE RATE WILL BE PRINTED
;THIS WAY:
;PC XXXXXX 100 %                        PC XXXXXX 300 %
;WERE THE LAST IS A MULTIPLE OF 100 %.

;THERE ARE THREE POSSIBILITIES FOR THE NUMBER OF LOOPS IN A
;CYCLE, I. E. HOW MANY TIMES THE PROGRAM RUNS THROUGH THE
;INSTRUCTIONS BETWEEN SETP1 AND LOOP. IF SWITCH 0 IS 0 FIRST
;TIME AN ERROR IS DETECTED THE PROGRAM PROCEEDS TO NEXT
;INSTRUCTION AFTER LOOP.

;NUMBER OF LOOPS:       SETP0:  1
;                       SETP1:  10
;                       SETP2:  100

;IF THE ERROR IS NOT CONSTANTLY IT IS POSSIBLE TO SEE THESE
;FAILURE RATES IF SINGLE OPERATION:

;SETP0: 100 % ERROR IN THE ONE LOOP.
;SETP1: 100,50,33,25,20,16,14,12,11,10 % FOR ERROR IN
;         1, 2, 3, 4, 5, 6, 7, 8, 9, 10 -TH LOOP.
;SETP2: LIKE SETP1, ONLY ADD 9...1 % FOR ERROR IN
;        11...100 -TH LOOP.

;IF MULTIPLE OPERATION THE RATES DEPENDS ON HOW MANY OF THE
;ERRORS ARE FOUND IN THE FIRST LOOP WITH ERROR:
;       100 % COULD BE  1 ERROR IN FIRST LOOP
;                   OR  2 ERRORS IN SECOND LOOP
;                   OR  3 ERRORS IN THIRD LOOP ETC.

;IF SWITCH 0 IS 1 THE PROGRAM WILL REMAIN IN THE LOOP WITH
;ERROR. FIRST TIME AN ERROR IS SEEN THE PROGRAM WILL HALT
;(IF NOT SWITCH 12). THEN THE PROGRAM CONTINUES UNTILL ALL
;NUMBER OF LOOPS ARE PERFORMED. THEN A NEW CYCLE IS
;ENTERED CALLED ERRORCYCLE. AFTER EACH ERRORCYCLE A NEW IS
;STARTED UNTILL SWITCH 0 IS SET TO 0.

;IN ALL CYCLES (FIRST OR ERROR) THE PC (PROGRAM COUNTER OF ERROR)
;IS WRITTEN FIRST TIME AN ERROR IS SEEN AND IN MULTIPLE OPERATION
;MORE THAN ONE ERRORHALT COULD WRITE THE PC. BUT ONLY WITHIN
;THAT FIRST LOOP WITH ERROR. THE FAILURE RATE IS PRINTED WHEN
;THE CYCLE IS FINISHED. THE PROGRAM ONLY HALTS IN THE FIRST CYCLE
;(DEPENDING ON SW 12). THE ERRORCYCLES HAVE ANOTHER AMOUNT OF
;LOOPS THAN FIRST CYCLE:
```

```
;NUMBER OF LOOPS:          FIRST CYCLE      ERROR CYCLE
;                SETP0:    1                10
;                SETP1:    10               100
;                SETP2:    100              100

;IN SINGLE OPERATION FAILURE RATE IS TELLING HOW OFTEN THE ERROR
;APPEARS. IN MULTIPLE OPERATION FAILURE RATE SHOULD BE USED
;VERY CAREFULLY.

;                5.2 STRUCTURE OF PROGRAM:

;       THIS CPU 720 TEST IS A MAINTENANCE PROGRAM DESIGNED TO
;       TEST THE SPECIAL INSTRUCTIONS INCLUDED IN CPU 720, BUT
;       NOT IN CPU 708.
;       BEFORE RUNNING THIS TEST THE STANDARD INSTRUCTION
;       TEST SHOULD RUN, WITH EXTENDED MEM DISABLED (64K).
;       (EC 3600 CPU LOGIC TEST).
;       NOTE: THIS PROGRAM WILL NOT TEST THE SPECIAL DMA
;       INTERRUPT OF THE MUSIL INSTRUCTIONS.
;
;       THE PROGRAM IS A NORMAL DIAGNOSTIC PROGRAM, I. E. IN
;       CASE OF ERROR THE PROGRAM WILL HALT WITH AC3 = PC. TH
;       OPERATOR SHOULD THEN LOOK UP IN THE LISTNING TO KNOW WHAT
;       WAS CAUSING THE ERRORHALT. THE PROGRAM INCLUDES ONLY FEW
;       SUBROUTINES TO MAKE IT EASYER FOR THE OPERATOR.
;       THE PROGRAM ALSO CONTAINS NORMAL TESTLOOP FACILITIES, SEE
;       5.1. IN CASE OF SEVERAL ERRORHALTS ATTENTION SHOULD ONLY
;       BE GIVEN TO THE FIRST (THE LOWEST PC) BECAUSE THE REST
;       COULD BE DERIVED FROM THE FIRST. TIMING IN A LOOP IS
;       AFFECTED BY PRINTING FIRST ERROR, TOO.
;
;       THE PROGRAM WILL TEST THE CPU 720 WITH AID OF FOLLOWING
;       TEST LOOPS:
;       A00     ADDR BIT 0 AND MEM EXT FLAG
;               MULTILEVEL INDIRECT ADDRESSING DISABLED
;       A01     ADDR BIT 0 AND NOT MEM EXT FLAG
;               MULTILEVEL INDIRECT ADDRESSING NOT DISABLED
;       A77/99  ADDRESSING TEST
;       A02     INSTRUCTIONS PLACED BEYOND 32K WORDS MEM
;               MULTILEVEL INDIRECT ADDRESSING DISABLED INCL
;       A0216   ADDRESSING TEST
;       A03     CPU IDENTIFY COMMAND
;       A04     LOAD BYTE
;       A05
;       A06
;       A07
;       A08     STORE BYTE
;       A09
;       A10
;       A11
;       A12     BYTE MOVE COMMAND
;       A13     WORD MOVE COMMAND
;       A14     SEARCH ITEM COMMAND
;       A15
;       A16
;       A17     SEARCH FREE
;       A18
```

```
01
02                ,
03
04                ;        A19      PROCESS LINK
05                ;        A20      PROCESS REMOVE
06                ;        A21      PROCESS LINK PRIORITY
07                ;        A42      MUSIL FETCH
08                ;        A43
09                ;        A44
10                ;        A45      TAKE ADDRESS
11                ;        A46
12                ;        B22
13                ;        B23
14                ;        B24
15                ;        B25
16                ;        B26
17                ;        A47      TAKE VALUE
18                ;        A48
19                ;        A49
20                ;        A50
21                ;        A51
22                ;        A52
23                ;        A53
24                ;        A54
25                ;        B17      COMPARE BYTE STRING
26                ;        B18
27                ;        B19
```

```
01
02                ;
03                ;
04                ;6. MESSAGES FROM THIS PROGRAM.
05                ;       ALL MESSAGES ARE WRITTEN ON TTY, LPT AND THE 16 CHAR DIS
06                ;       ON OPERATORS CONTROL PANEL. IT IS POSSIBLE TO ANSWER
07                ;       QUESTIONS AT TTY OR NUK, NUMERIC KEYBOARD ON OPERATORS
08                ;       CONTROL PANEL.
09                ;       ABOUT THE NUMBERS:
10                ;               0-5 DIGITS IS A DECIMAL NUMBER
11                ;                   RANGE -32768 TO -1 AND 0 TO 32767
12                ;                 6 DIGITS IS AN OCTAL NUMBER
13                ;               0-6 DIGITS IS AN OCTAL NUMBER WITH
14                ;                   LEADING ZEROES SUPPRESSED, DON'T USE.
15                ;                 8 DIGITS IS A BINARY NUMBER.
16                ;
17                ;       MESSAGES:
18                ;
19                ;       CPU 720 EXT TEST
20                ;       000400  START ADDR
21                ;       SWITCHES: 000030
22
23                ;       000000  177777  002422
24                ;       AC0     AC1     AC2
25                ;       PC  13610
26                ;       LOOP FAILURE RATE   10.0 %
27
28                ;       TERMINATED
29                ;       SWITCHES: 000030
30                ;       SET SWITCHES TO CONTROL, (3,6), STARTADDR 400 ?
31                ;
32
33                ;TAPE 1
34
35                .EOT
```

```
01
02                ;NAME 2          PAGE ZERO FOR TAPE 5,4,5
03
04        000000 .LOC 0
05
06 000000 003774 LOC0:   2*IELOC          ;ADDRESS AFTER RDOS LOAD, LATER USED FOR
07                                         ;POWER INTR (POWZE) OR PC IF NORMAL INTR
08 000001 017420          SERINT           ;ADDR OF INTR. SERVICE ROUTINE
09 000002 001405          REBIN            ;SELFSTART ADDR FOR RDOS ETC.
10 000003 000001 LOC3:   1                 ;0=HALT, 1=SELFSTART PROG AFTER REBIN
11 000004 000400 LOC4:   400               ;ADDR FOR SELFSTART PROG AFTER REBIN
12 000005 000000 LOC5:   0                 ;FOR LOAD RDOS, USED BY POW. INTR. FITYP
13 000006 006007 PROIN:  JSR      @PROAD   ;PROGRAM BREAK INSTRUCTION
14 000007 000143 PROAD:  PROAK             ;ADDR OF PROGRAM BREAK ROUTINE.
15 000010 177777 LOC10:  177777
16
17        000020 .LOC 20
18
19 000020 000000 IDX0:   0                 ;AUTO INCREMENT LOCATION
20 000021 000000 IDX1:   0                 ;AUTO INCREMENT LOCATION
21 000022 000000 IDX2:   0                 ;AUTO INCREMENT LOCATION
22 000023 000000 IDX3:   0                 ;AUTO INCREMENT LOCATION
23
24        000026 .LOC 26
25
26 000026 000000 LOC26:  0
27 000027 000000 LOC27:  0
28
29        000035 .LOC 35
30
31 000035 000000 LOC35:  0
32 000036 001411 LOC36:  JMP      11,3
33 000037 000000 LOC37:  0
34
35        000040 .LOC 40                   ;INDIRECT ADDRESSES
36                                         ;NOT IN AUTO INC,DEC LOC.
37 000040 000000 LOC40:  0                 ;LOC 40 USED IN SEARCH AND FETCH COMMAND.
38 000041 000716 ICHAR:  XCHAR
39 000042 000724 ITYPE:  XTYPE
40 000043 001045 ICRLF:  XCRLF
41 000044 001135 IDISP:  XDISP
42 000045 001107 IDOUT:  XDOUT
43 000046 001215 IDICL:  XDICL
44 000047 001257 IDATT:  DISATT
45 000050 001265 IHAAT:  HAATT
46 000051 001015 ITBIN:  XTBIN
47 000052 000554 ITOCT:  XTOCT
48 000053 000465 ITDEC:  XTDEC
49 000054 000000 LOC54:  0                 ;LOC 54 USED IN LINK PRIO COMMAND.
50 000055 001021 IDBIN:  XDBIN
51 000056 000560 IDOCT:  XDOCT
52 000057 000461 IDDEC:  XDDEC
53 000060 000550 IDZOC:  XDZOC
54 000061 003050 IWAIT:  XWAIT
55 000062 002651 IWAOP:  XWTOP
56 000063 003120 ITISK:  RTIME
57 000064 003177 ITIMS:  MSTIM
58 000065 003320 ITIRO:  XTIMS
```

```
01
02 000000 013277 IMULT:  XMULT
03 000001 013311 IDIVS:  XDIVS
04 000002 013312 IDIVD:  XDIVD
05 000003 136470 IMUES:  XMUES
06 000004 011551 ISAMS:  XSAMS
07 000005 011514 IRESW:  XRESW
08 000006 015111 IBILO:  XBILO
09 000007 000000 HMEND:  0                    ;TOP OF MEMORY, LOADER PROTECT
10 000010 000000 DIGIN:  0                    ;INPUT BUFFER FOR INPUT ROUTINES.
11
12                ;PRINTER TABLE HANDLING AND (POWER) RESTART:
13
14        000077 .LOC 77
15
16 000077 006141 IRESA:  SWISA                ;PROGRAM RESTART ADDR.
17 000100 006054 POWRE:  POWON                ;POWER RESTART ADDR. IMPORTANT KEEP NEXT
18 000101 002077 RETAB:  JMP      AIRESA      ;IN 101 BECAUSE PRINTER TABLE SELFSTART
19 000102 002100 POWZE:  JMP      APOWRE      ;INSTRUCTION TO BE STORED IN LOC ZERO
20
21 000103 007373 IGTBI:  GETBI
22 000104 007245 IGTOK:  GETOK
23 000105 006735 IGTDC:  GETDC
24 000106 007164 IGTSC:  GETSC
25 000107 007502 IGTTX:  GETTX
26 000110 010014 ISTP0:  ENTP0
27 000111 010021 ISTP1:  ENTP1
28 000112 010026 ISTP2:  ENTP2
29 000113 007757 ILOOP:  CYCLE
30 000114 010156 IHALT:  ERROR
31 000115 010251 ISTAA:  XSTAA
32 000116 010264 ISTAN:  XSTAN
33 000117 010275 ISTAW:  XSTAW
34 000120 010326 ISTAS:  XSTAS
35 000121 010311 ISTAP:  XSTAP
36 000122 011535 JHALT:  XHALT
37 000123 011515 ILORE:  XLORE
38 000124 010631 IPASS:  XPASS
39 000125 002446 ITHLT:  XTHLT
40 000126 010531 IDRST:  XDRST
41 000127 000000 SHALT:  0                    ;AC3 SAVED FOR HALT ROUTINE
42 000130 000000 INDEV:  0                    ;DEVICE NUMBER AFTER INTA IN SERINT
43 000131 000000 INFLG:  0                    ;INTR FLAG, AFTER INTR = -1
44
45 000132 000000 QCSTA:  0                    ;STATUS BITS FOR STATW, FIXED.
46
47                ;  DEFINITIONS
48
49        000032 FUN=32
50        000033 FUB=33
51        000034 NUK=34
52        000035 DIS=35
53        000010 XTTI=TTI          ;TTI=10
54        000011 XTTO=TTO          ;TTO=11
55        000014 XRTC=RTC          ;RTC=14
56        000017 XLPT=LPT          ;LPT=17
57
58 000133 000412 IMESS:  XMESS
59 000134 000544 ITZOC:  XTZOC
```

```
                                                                    .TAL
01
02          006077 RHALT=HALT
03          062077 ALRST=IORST
04          076701 MEMEX=DICP       3,1
05          070477 RDSWI=READS      2
06          006135 CMESS=JSR        AIMESS  ;EACH DEFINITION BELOW CORRESPONDS
07          006041 CCHAR=JSR        AICHAR  ;WITH A CALL OF A ROUTINE.
08          006042 CTYPE=JSR        AITYPE
09          006043 CCRLF=JSR        AICRLF
10          006044 CDISP=JSR        AIDISP
11          006045 CDOUT=JSR        AIDOUT
12          006046 CDICL=JSR        AIDICL
13          006047 CDATT=JSR        AIDATT
14          006050 CHAAT=JSR        AIHAAT
15          006051 CTBIN=JSR        AITBIN
16          006052 CTOCT=JSR        AITOCT
17          006053 CTDEC=JSR        AITDEC
18          006134 CTZOC=JSR        AITZOC
19          006055 CDBIN=JSR        AIDBIN
20          006056 CDOCT=JSR        AIDOCT
21          006057 CDDEC=JSR        AIDDEC
22          006060 CDZOC=JSR        AIDZOC
23          006061 CWAIT=JSR        AIWAIT
24          006062 WAITOP=JSR       AIWAOP
25          006063 TIMSK=JSR        AITISK
26          006064 TIMMS=JSR        AITIMS
27          006065 TIMRO=JSR        AITIRO
28          006066 MULTI=JSR        AIMULT
29          006067 DIVIS=JSR        AIDIVS
30          006070 DIVID=JSR        AICIVD
31          006071 CQUES=JSR        AIQUES
32          006072 CSAMS=JSR        AISAMS
33          006073 CRESW=JSR        AIRESW
34          006074 BINLO=JSR        AIBILO
35          006125 THALT=JSR        AITHLT
36          006126 RESET=JSR        AIDRST
37          006103 CGTBI=JSR        AIGTBI
38          006104 CGTOK=JSR        AIGTOK
39          006105 CGTDC=JSR        AIGTDC
40          006106 CGTSC=JSR        AIGTSC
41          006107 CGTTX=JSR        AIGTTX
42          006110 SETP0=JSR        AISTP0
43          006111 SETP1=JSR        AISTP1
44          006112 SETP2=JSR        AISTP2
45          006113 LOOP=JSR         AILOOP
46          006114 EHALT=JSR        AIHALT
47          006115 STATA=JSR        AISTAA
48          006116 STATN=JSR        AISTAN
49          006117 STATW=JSR        AISTAW
50          006120 STATS=JSR        AISTAS
51          006121 STATP=JSR        AISTAP
52          006122 CHALT=JSR        AJHALT
53          006123 CLORE=JSR        AILORE
54          006124 CPASS=JSR        AIPASS
55
56          000030 DEV=30                   ;CHANGE TO ACTUAL
57
58 00135 000030 DEVNQ:  DEV                 ;DEVICE CODE QUEST.
59 00136 000000 DEVNA:  0                   ;ACTUAL DEVICE CODE, ANSWER
```

```
01
02                          ;PAGE ZERO SPEC FOR THIS PROGRAM
03
04 00157 000000 INAC3:  0                   ;AC3 SAVED FOR INTR OF COMMAND
05 00160 000000 EHAC3:  0                   ;AC3 SAVED FOR EHALT
06 00161 000000 PARP0:  0                   ;PARAM POINTER IN LOOP
07 00162 012155 XNIPL:  INIPL               ;SUBROUTINE GENERATE CHAINS
08 00163 013703 INTRL:  XNTRL
09 00164 000000 NTRLF:  0
10 00165 000000 NTREX:  0
11 00166 000400 C400:   400
12 00167 000377 MASKR:  377
13 00170 177400 MASKL:  177400
14 00171 052525 TEPAT:  052525              ;TESTPATTERN
15 00172 014664 MULIN:  A023
16 00173 000000 MUSIR:  0
17 00174 022123 WORKA:  LASTP+1             ;          16K      32K      48K      64K
18 00175 022123 WORKB:  LASTP+1             ; ADD:          0  040000   040000   040000
19 00176 037777 MASK6:  037777              ;16K MEM MASK
20 00177 077777 MASK2:  077777              ;32K MEM MASK
21 00200 040000 ADAD2:  40000               ;ADDR ADD 32K
22 00201 100000 ADAD3:  100000              ;ADDR ADD 48K
23 00202 140000 ADAD4:  140000              ;ADDR ADD 64K
24 00203 000000 ADAM0:  0                   ;            16K      32K      48K      6
25 00204 000000 ADAM1:  0                   ; ADD:          0  040000   040000   0400
26 00205 000000 ADAM2:  0                   ; ADD:          0  040000   100000   100000
27 00206 000000 ADAM3:  0                   ; ADD:          0  040000   100000   140000
28
29         000167 .LOC 167
30
31 00167 177400 L0167:  177400
32 00170 000166 L0170:  .-2
33 00171 002422 L0171:  VMEND
34 00172 000173 L0172:  L0173
35 00173 012345 L0173:  012345
36 00174 000174 L0174:  .
37 00175 037601 L0175:  037601  ;FIRST AFTER MMEND IF 16K !
38 00176 000377 L0176:  377
39 00177 100153 L0177:  AMULIN+1
```

```
01
02                          ;ADDRESSING TEST TO INSURE THAT PROGRAMS CAN BE RUN
03                          ;AFTER ENABLING MEMORY EXTENSION.
04
05                          ;THIS TEST IS PLACED IN 5 DIFFERENT PLACES:
06                          ;       A PAGE ZERO     FOR TCP         LOC 200
07                          ;       B LOW MEMORY    FOR TCP         TCPLO LOC 21363
08                          ;       C HIGH MEMORY   FOR TCP         TCPHI LOC 100666
09                          ;       D LOW, PART OF MAIN TEST:  A77 + A99 LOC 14061
10                          ;       E HIGH, PART OF MAIN TEST:  A0216 LOC 100206
11
12                          ;A,B AND C ARE DESIGNED TO USE WITH TCP 701 AND
13                          ;DEMANDS 64K WORDS OF MEMORY.
14                          ;EACH OF THE SMALL TESTPARTS CAN BE RUN SEPERATELY BY
15                          ;CHANGING THE FIRST INSTRUCTION IN THE NEXT TESTPART TO
16                          ; JMP .-X.
17                          ;EACH TIME RESET IS PRESSED THE FIRST START ADDR TO BE
18                          ;USED IS 375. IT WILL SET MEM EXT FLAG AND HALT. NOW IT
19                          ;IS POSSIBLE TO USE TCP 701 FOR EXAMINE, DEPOSIT AND
20                          ;START/CONTINUE IN ADDRESSES WITH BIT 0.
21
22                          ;LOW PAGE ZERO ADDR
23 00200 020010 L0200:      LDA     0,L0C10 ;CONTENT=177777
24 00201 100014             COMO    0,0,SZR
25 00202 063077             HALT
26
27                          ;HIGH PAGE ZERO ADDR
28 00203 024367             LDA     1,L0367 ;CONTENT=177777
29 00204 124014             COMO    1,1,SZR
30 00205 063077             HALT
31
32                          ;RELATIVE, +DISPL.
33 00206 020401             020401  ;       LDA     0,.+1
34 00207 024400             024400  ;       LDA     1,.+0
35 00210 106414             SUBO    0,1,SZR
36 00211 063077             HALT
37
38                          ;RELATIVE, -DISPL.
39 00212 020400             020400  ;       LDA     0,.+0
40 00213 024777             024777  ;       LDA     1,.-1
41 00214 106414             SUBO    0,1,SZR
42 00215 063077             HALT
43
44                          ;INDEX REG, +DISPL.
45 00216 030370             LDA     2,L0370 ;CONTENT=367
46 00217 155400             INC     2,3
47 00220 021001             LDA     0,1,2
48 00221 025400             LDA     1,0,3   ;ADDR=370
49 00222 106414             SUBO    0,1,SZR ;CONT=367
50 00223 063077             HALT
51
52                          ;INDEX REG, -DISPL.
53 00224 030370             LDA     2,L0370 ;CONTENT=367
54 00225 155400             INC     2,3
55 00226 021000             LDA     0,0,2
56 00227 025777             LDA     1,-1,3  ;ADDR=367
57 00230 106414             SUBO    0,1,SZR ;CONT=177777
58 00231 063077             HALT
59
60                          ;INDEX-REG, +DISPL.
61 00232 030367             LDA     2,L0367 ;CONTENT=-1
62 00233 155400             INC     2,3
63 00234 021177             LDA     0,177,2
64 00235 025576             LDA     1,176,3 ;ADDR=176
65 00236 106414             SUBO    0,1,SZR ;CONT=377
66 00237 063077             HALT
```

```
01
02                              ;INDEX REG, -DISPL.
03 00240 050370                 LDA     2,L0370 ;CONTENT=367
04 00241 054170                 LDA     3,L0170 ;CONTENT=166
05 00242 021200                 LDA     0,-200,2
06 00243 025401                 LDA     1,1,3   ;ADDR=167
07 00244 106414                 SUBO    0,1,SZR ;CONT=177400
08 00245 063077                 HALT
09
10                              ;INDEX REG ABOVE PAGE ZERO
11 00246 054171                 LDA     3,L0171 ;CONTENT=VMEND (2422)
12 00247 171400                 INC     3,2
13 00250 025377                 LDA     1,-1,2
14 00251 021400                 LDA     0,0,3   ;ADDR=VMEND
15 00252 106414                 SUBO    0,1,SZR ;CONT=000101
16 00253 063077                 HALT
17
18                              ;TEST OF JMP
19 00254 000402                 000402  ;       JMP     .+2
20 00255 063077                 HALT            ;RELATIVE, +DISPL.
21
22 00256 000260                 JMP     .+2
23 00257 000257                 .               ;ADDR
24 00260 030257                 LDA     2,.-1
25 00261 155000                 MOV     2,3
26 00262 001005                 JMP     5,2
27 00263 063077                 HALT            ;INDEX REG 2
28
29 00264 001407                 JMP     7,3
30 00265 063077                 HALT            ;INDEX REG 3
31
32 00266 000036                 JMP     LOC36
33 00267 063077                 HALT            ;PAGE ZERO
34
35                              ;AUTO INCR ADDR (OR DSZ)
36 00270 020172                 LDA     0,L0172
37 00271 040027                 STA     0,LOC27
38 00272 026027                 LDA     1,ALOC27
39 00273 014027                 DSZ     LOC27
40 00274 030027                 LDA     2,LOC27
41 00275 112414                 SUBO    0,2,SZR
42 00276 063077                 HALT            ;ADDR=173 BEFORE COUNT
43 00277 021001                 LDA     0,1,2
44 00300 106414                 SUBO    0,1,SZR
45 00301 063077                 HALT            ;CONT=174
46
47                              ;AUTO DECR ADDR (OR ISZ)
48 00302 020370                 LDA     0,L0370
49 00303 040037                 STA     0,LOC37
50 00304 026037                 LDA     1,ALOC37
51 00305 010037                 ISZ     LOC37
52 00306 030037                 LDA     2,LOC37
53 00307 112414                 SUBO    0,2,SZR
54 00310 063077                 HALT            ;ADDR=367 BEFORE COUNT
55 00311 021377                 LDA     0,-1,2
56 00312 106414                 SUBO    0,1,SZR
57 00313 063077                 HALT            ;CONT=135700
```

```
01
02                              ;TEST INDIRECT RELATIVE AND JSR RETURN ADDR
03 00314 026405                 026405  ;       LDA     1,A.+5
04 00315 004405                 004405  ;       JSR     .+5
05 00316 063077                 HALT
06 00317 000324                 JMP     .+5
07 00320 000316                 .-2             ;ADDR
08 00321 000320                 .-1
09 00322 101000                 MOV     3,0
10 00323 106414                 SUBO    0,1,SZR
11 00324 063077                 HALT
12
13                              ;TEST INDIRECT PAGE ZERO TO PAGE ZERO
14 00325 022172                 LDA     0,AL0172
15 00326 030173                 LDA     2,L0173
16 00327 112414                 SUBO    0,2,SZR
17 00330 063077                 HALT
18
19                              ;TEST INDIRECT INDEX TO PAGE ZERO
20 00331 030173                 LDA     2,L0173
21 00332 034174                 LDA     3,L0174
22 00333 027776                 LDA     1,A-2,3
23 00334 132414                 SUBO    1,2,SZR
24 00335 063077                 HALT
25
26                              ;TEST OF JMP INDIRECT
27 00336 030175                 LDA     2,L0175
28 00337 020343                 LDA     0,.+4
29 00340 041000                 STA     0,0,2
30 00341 024347                 LDA     1,.+6
31 00342 045001                 STA     1,1,2
32 00343 002401                 002401  ;       JMP     A.+1
33 00344 037601                 037601          ;LDA 3,A-177,3 IF ERRONOUSLY PERFORMED.
34 00345 063077                 HALT
35 00346 000350                 JMP     .+2     ;037601= JMP A.+1
36 00347 000350                 .+1             ;037602= THIS ADDR
37
38                              ;TEST INDIRECT PAGE ZERO TO LOW MEM
39 00350 030171                 LDA     2,L0171
40 00351 025000                 LDA     1,0,2
41 00352 022171                 LDA     0,AL0171 ;ADDR=VMEND (2422)
42 00353 106414                 SUBO    0,1,SZR ;CONT=000101
43 00354 063077                 HALT
44
45                              ;TEST INDIRECT INDEX FROM HERE TO PAGE ZERO
46 00355 000360                 JMP     .+3
47 00356 000173                 L0173
48 00357 000356                 .-1             ;ADDR
49 00360 030357                 LDA     2,.-1   ;POINT TO L0172
50 00361 026172                 LDA     1,AL0172
51 00362 023000                 LDA     0,A0,2  ;ADDR=173
52 00363 106414                 SUBO    0,1,SZR ;CONT=012345
53 00364 063077                 HALT
54
55 00365 000200                 JMP     L0200   ;******* AGAIN
```

```
                .LOC 300
LOC300: 155700
LOC301: 177777
LOC370: .-1
HIGH1:  .MULIN
HIGHR:  0

AC=0
DEV1=1
DEV2=2

                ;CPU IDENTIFY COMMAND, DEV2
IDFY =  DIA     AC,DEV2 ;

                ;BYTE MANIPULATION COMMANDS, DEV 1
LDB  =  DICC    AC,DEV1 ;LOAD BYTE
STB  =  DOCC    AC,DEV1 ;STORE BYTE

                ;ARITHMETIC COMMANDS, DEV 1
MULT =  DOCP    AC,DEV1 ;MULTIPLY
DIV  =  DOCS    AC,DEV1 ;DIVIDE

                ;DATA MOVING COMMANDS, DEV 2
BMOVE=  DIC     AC,DEV2 ;BYTE MOVE
WMOVE=  DICS    AC,DEV2 ;WORD MOVE

                ;SINGLE LINKED CHAIN COMMANDS, DEV 2
SEARCH= DICC    AC,DEV2 ;SEARCH ITEM
SFREE=  DICP    AC,DEV2 ;SEARCH FREE

                ;DOUBLE LINKED CHAIN COMMANDS, DEV 2
LINK =  DOC     AC,DEV2 ;PROCESS LINK
REMOV=  DOCS    AC,DEV2 ;PROCESS REMOVE
PLINK=  DOCC    AC,DEV2 ;PROCESS LINK PRIORITY

                ;MUSIL COMMANDS, DEV 2
FETCH=  DOCP    AC,DEV2 ;INSTRUCTION FETCH
TKADD=  SKPBN   DEV2    ;TAKE ADDRESS
TKVAL=  SKPBZ   DEV2    ;TAKE VALUE

                ;COMPARE COMMAND, DEV 2
COMP =  SKPDN   DEV2    ;COMPARE BYTE STRING
```

```
                                                    ;RETURN ADDR FROM TESTLOOPS

                .LOC 375
                        MEMEX           ;SET MEMORY EXT FLAG
                        HALT            ;TO HAVE ADDR BIT 0 WORKING.
                        JMP     .-2

                .LOC 400
                        JSR     AIDIAG  ;DIAGNOSTIC TESTPROGRAM START ADDR

                IDIAG:  XDIAG

                ;THIS PROGRAM USES STANDARD TEST ROUTINES. NOT LISTED.
                ;IF NEEDED, ASK FOR SPECIAL LISTING FOR STANDARD TEST ROUTINES.

                ;THE STANDARD ROUTINES ARE NOT MODIFIED.
                ;IF MODIFICATIONS, LIST HERE:

                ;       LOC 3 AND 4 SELFSTART
                ;       LOC 10,27,36,37
                ;       LOC 40 COMMENT
                ;       LOC 54 COMMENT


                ;THIS PROGRAM WILL USE FOLLOWING MEMORY LOCATIONS ALLTHOUGH
                ;NOT DIRECTLY SHOWN IN THE ASSEMBLING LIST:

                ;       VMEND + 100000  USED IN MEMSIZE ROUTINE, PLUS A LDA/STA
                ;                       FOR EACH 4K SLICE, CONTENT RESTORED.
                ;       0X7600 (0X7635) TO 0X7777, BINARY LOADER, SA 2222

                ;       NOT USED MEM ABOVE LASTP IS FILLED WITH PROGRAM BREAK
                ;       COMMAND (SEE LOC 6).

                ;       LASTP + XXX     SEE XREFF LIST, BUFFERS ETC.

                ;       037601, 037602, 077775, 077776, 100075, 100076 AND
                ;       100152 TO 101355 ( AMULIN TO HIGHL )
                ;                       ALL USED BY ADDR TEST LOOPS.


                ;TAPE 2

                .EOT
```

```
0024  .TAIT
01
02                ;THE PAGES MISSING UP TO PAGE 133
03                ;ARE THE STANDARD TEST ROUTINES.
04                ;IF THE LISTING IS IMPORTANT FOR YOU,
05                ;UNDER THE ASCII TAPES FOR THIS PROGRAM,
06                ;PCSL 52-A2 4.01.
07                ;PRODUCE YOUR OWN COMPLETE LISTING
08                ;BY MEANS OF THE ASSEMBLER.
```

```
                        ;TAPE 6
                        PROG:   .TXT !CPU 720 EXT TEST! ;"CPU 720 EXT TEST"
11612 050103
11613 020123
11614 051167
11615 020157
11616 041505
11617 020124
11620 042524
11621 052123
11622 000000

                        PROG4:  .TXT !RCSL 52-AA 899   DATE: 23.06.79   VERSION: 1.0!
11613 041522
11614 046123
11615 052440
11616 026462
11617 040501
11620 034040
11621 034471
11622 020040
11623 042040
11624 052101
11625 035105
11626 031040
11627 027063
11630 033060
11631 033456
11632 020071
11633 020040
11634 042526
11635 051522
11636 047511
11637 035116
11640 030440
11641 030056
11642 000000
                                ;"RCSL 52-AA 899   DATE: 23.06.79   VERSION: 1.0"

11643 000012 PASS#:  10.                ;USER DEFINITION OF PASS: 0 OF RUNS
                                        ;THROUGH ALL TESTLOOPS BEFORE PASS
                                        ;MESSAGE IS PRINTED. MAX 99 DECIMAL.
                                ;NOTE:   IN THIS PROGRAM IT MUST STAY
                                        ;AN EVEN NUMBER.
```

```
                                        ;ADDRESS TABLE FOR LOOPS WITH
                                        ;AUTO BREAKPOINTS.
11644 011644 TABLE:     .
                        A00
11645 013747            A001
11646 014425            A01
11647 014025            A02
11650 014041            A77
11651 014061            A99
11652 014431            A025+1 ;AMLLIN=100152  ;USED IN A02, PART IN UPPER MEM
11653 014722
11654 016103            A03
11655 016130            A04
11656 016151            A05
11657 016170            A06
11660 016210            A07
11661 016226            A08
11662 016250            A09
11663 016273            A10
11664 016313            A11
11665 016340            A12
11666 016356            A13
11667 016424            A14
11670 017012            A15
11671 017174            A16
11672 017354            A17
11673 017445            A18
11674 017543            A19
11675 017666            A20
11676 020010            A21
11677 020211            A22
11700 020271            A42
11701 020325            A43
11702 020352            A44
11703 020377            A45
11704 020430            A46
11705 020670            A47
11706 020710            A48
11707 020737            A49
11710 020762            A50
11711 021012            A51
11712 021042            A52
11713 021066            A53
11714 021112            A54
11715 021143            B17
11716 021206            B18
11717 021262            B19
11720 020475            B22
11721 020523            B23
11722 020554            B24
11723 020607            B25
11724 020634            B26
11725 022120            AXX
11726 000000            0               ;END OF TABLE

                        ;TABLE FOR ADDRESSES TO CORRECT DEVICE NUMBER.

11727 010254 COTBL:     SDEV1
11730 010267            SDEV2
11731 010303            SDEV3
11732 010317            SDEV4
11733 010331            SDEV5
11734 000000            0               ;END OF TABLE
```

x4 6
5

OK ON ASCII / BIN

```
                        ;ROUTINE TO MONITOR QUESTIONS AND ANSWERS.
11755 054420 XQLOA:     STA     3,DSINK
11756 000403            JMP     0,3         ;;;NO QUESTIONS


11757 060071 RPDVN:     CKQES
11760 011767            TXDVN               ;DEVICE NO ?
11761 011767            TADVN
11762 000135            REVNM
11763 000134            CTLOC
11764 000000            CWZOC
11765 006104            CGTOK
11766 000402            JMP     .+2         ;SUGGESTED ACCEPTED
11767 000770            JMP     RPDVN       ;ERROR RETURN
11770 020076            LDA     0,DIGIN     ;ANSWER INPUTTED
11771 024415            LDA     1,DVNLL     ;UPPER LIMIT
11772 030415            LDA     2,DVNLL     ;LOWER LIMIT
11773 122035            ADCZO   1,0,SNC
11774 112032            ADCZO   0,2,SZC     ;AC2=<ACU=<AC1 ?
11775 000762            JMP     RPDVN       ;OUTSIDE LIMITS
11776 040136            STA     0,DEVNA     ;INPUT ACCEPTED
11777 000403            JSR     AICORD      ;CORRECT OLD DEV NO.
12000 102440 RPEND:     SUBO    0,0         ;NO, CLEAR STATUS
12001 040132            STA     0,QCSTA     ;KNOWN STATUS CONSTANTS
12002 002401            JMP     @RNIWA
12003 000000 RNIWA:     0
12004 010340 ICORD:     CORDV
12005 000002 DVNLL:     2
12006 000076 DVNUL:     76

                TXDVN:  .TXT !DEVICE NO!        ;"DEVICE NO"
    11767 042504
    11770 044520
    11771 042503
    11772 047040
    11773 000117


                        ;ROUTINE USER INITIALIZE.
                        ;USED IF SPECIAL INITIALIZATION IS REQUIRED FOR UNIT
                        ;UNDER TEST. THIS ROUTINE IS CALLED FROM STANDARD
                        ;INITIALIZING ROUTINE (XNITI).
11774 054414 USINI:     STA     3,USINK
11775 020075            LDA     0,MMEND ;  =XX7600

11776 024160            LDA     1,ADAD2 ;  =040000 FOR 32K AND MORE
11777 101113            MOVLO   0,0,SNC ;SETUP ADDR ADD MODE
12000 107400            AND     0,1     ;  16K     32K     48K     64K
12001 044164            STA     1,ADAM1 ;     0  040000  040000  040000

12002 024161            LDA     1,ADAD8 ;  =100000 FOR 48K AND MORE
12003 101113            MOVLO   0,0,SNC
12004 024160            LDA     1,ADAD2
12005 107400            AND     0,1
12006 044165            STA     1,ADAM2 ;     0  040000  100000  100000

12007 024162            LDA     1,ADAD4 ;  =140000 FOR 64K
12010 107400            AND     0,1
12011 044166            STA     1,ADAM3 ;     0  040000  100000  140000
```

```
01
02 12012 020120 INI1:   LDA     2,INI0  ;INI FOR LDB/STB
03 12013 024155         LDA     1,WORKB
04 12014 107400         ADD     0,1
05 12015 020164         LDA     0,ADAM1
06 12016 107400         ADD     0,1     ;  16K     32K     48K     64K
07 12017 044155         STA     1,WORKB ;     0  040000  040000  040000
08
09 12020 030415 INI2:   LDA     2,INI21 ;INI FOR BMOVE
10 12021 050022         STA     2,IDX2
11 12022 020157 INI2J:  LDA     0,MASK2
12 12023 032022         LDA     2,AIDX2
13 12024 151015         MOVO    2,2,SNR ;END ?
14 12025 000415         JMP     INI3    ;YES
15 12026 025000         LDA     1,0,2
16 12027 107400         AND     0,1
17 12030 020164         LDA     0,ADAM1
18 12031 101120         MOVZL   0,0
19 12032 107000         ADD     0,1
20 12033 045000         STA     1,0,2   ;     0  100000  100000  100000
21 12034 000760         JMP     INI20
22
23 12035 012035 INI21:  .               ;ADDR-1 OF ADDR TABLE
24 12036 016052         BMOV3+3
25 12037 016056         BMOV4+2
26 12040 016513         BMOV5+2
27 12041 016514         BMOV5+3
28 12042 000000         0
29
30 12043 030417 INI3:   LDA     2,INI31 ;INI FOR WMOVE
31 12044 050022         STA     2,IDX2
32 12045 034427         LDA     3,INI32
33 12046 054023         STA     3,IDX3
34 12047 020156 INI30:  LDA     0,MASK6
35 12050 032022         LDA     2,AIDX2
36 12051 151015         MOVO    2,2,SNR ;END ?
37 12052 000454         JMP     INI4    ;YES
38 12053 025000         LDA     1,0,2
39 12054 107400         AND     0,1
40 12055 030023         LDA     3,AIDX3
41 12056 021400         LDA     0,0,3
42 12057 107000         ADD     0,1
43 12060 045000         STA     1,0,2
44 12061 000760         JMP     INI30
45
46 12062 012062 INI31:  .               ;ADDR-1 OF ADDR TABLE
47 12063 016071         WMOV3+3
48 12064 016074         WMOV4+2
49 12065 016700         WMOV5+2
50 12066 016701         WMOV5+3
51 12067 016704         WMOV6+2
52 12070 016705         WMOV6+3
53 12071 016710         WMOV7+2
54 12072 016711         WMOV7+3
55 12073 000000         0
```

```
                                                                    PAGE  1
 1
 2 12074 012074 INTSZ:  .                       ;ADDR-1 OF ADDR TABLE
 3 12075 000166         ADAM3
 4 12076 000166         ADAM3
 5 12077 000165         ADAM2
 6 12100 000165         ADAM2
 7 12101 000165         ADAM2
 8 12102 000164         ADAM1
 9 12103 000164         ADAM1
10 12104 000165         ADAM2
11 12105 000000         0
12
13 12106 004447 IN14:   JSR     INIPL   ;GENERATE CHAINS
14
15              INI5:
16 12107 002401         JMP     AUSINR
17 12110 000000 USINR:  0
18
19                      ;ROUTINE USER RESET.
20                      ;USED IF SPECIAL RESETTING IS REQUIRED FOR UNIT
21                      ;UNDER TEST. THIS ROUTINE IS CALLED FROM STANDARD
22                      ;RESET ROUTINE (RESET).
23                      ;SAVE/RESTORE ALL USED AC'S !
24 12111 054402 USDER:  STA     3,USDRR
25                                      ;INSERT HERE, SAVE AC'S
26                      ;INTEN'         ;IF INTR ON WANTED AFTER RESET
27 12112 002401         JMP     AUSDRR
28 12113 000000 USDRR:  0
```

```
                        ;ROUTINE USER SETUP.
                        ;USED IF SPECIAL SETUP IS REQUIRED FOR UNIT
                        ;UNDER TEST. THIS ROUTINE IS CALLED FROM STANDARD
                        ;SETUP ROUTINE (SETP0, SETP1, SETP2).
12114 054420 USSET:     STA     3,USSTR
12115 006126            RESET           ;INSERT/CHANGE HERE
12116 054417            LDA     3,USDRM
12117 076077            MSKO    3       ;MASK OUT TTI/TTO/LPT/DIS
12120 054416            LDA     3,USDRF
12121 075014            DOA     3,XRTC
12122 060114            NIOS    XRTC    ;START RTC
12123 040414            STA     0,USDR0
12124 044414            STA     1,USDR1
12125 006063            TIMSK
12126 000002            2               ;2 MSEC
12127 063614            SKPDN   XRTC
12130 006114            EHALT           ;RTC NO DONE AFTER 2 MSEC
12131 020406            LDA     0,USDR0
12132 024406            LDA     1,USDR1
12133 002401            JMP     AUSSTR
12134 000000 USSTR:     0
12135 000413 USDRM:     413             ;MASKOUT BITS
12136 000003 USDRF:     3               ;RTC FREQ. 1000 HZ
12137 000000 USDR0:     0
12140 000000 USDR1:     0

                        ;ROUTINE USER LOOP.
                        ;USED IF SPECIAL LOOP ACTION IS REQUIRED FOR UNIT
                        ;UNDER TEST. THIS ROUTINE IS CALLED FROM STANDARD
                        ;LOOP ROUTINE (LOOP).
12141 054404 USLOP:     STA     3,USLOR
                        ;RESET          ;INSERT/CHANGE HERE
12142 006402            JSR     AUSLTM  ;IS TERMINATION WAITING ?
12143 002402            JMP     AUSLOR
12144 010404 USLTM:     TERMW
12145 000000 USLOR:     0

                        ;ROUTINE USER SERVICE INTERRUPT.
                        ;USED IF SPECIAL INTERPUPT HANDLING IS REQUIRED.
                        ;THIS ROUTINE IS CALLED FROM STANDARD SERVICE INTERRUPT
                        ;(SERINT), WHICH HAS STORED RETURN ADDR IN LOC 5 AND
                        ;DEVICE NUMBER AFTER INTA IN PAGE ZERO (INDEV) AND
                        ;RESTORED LOC 0 FOR POWER RESTART AND STORED -1 IN
                        ;PAGE ZERO (INFLG), INTR FLAG.
12146 054406 USSEI:     STA     3,USSER ;ALL AC'S AND CARRY ARE SAVED/RESTOR
                                        ;IN SERINT. ANY RESULT FROM THIS ROUTINE
                                        ;HAVE TO BE STORED IN MEM.
                        ;ISZ    USSER   ;IF USED: INTEN COMMAND WHEN LEAVING
                                        ;INTR SERVICE ROUTINE (SERINT).
12147 010005            ISZ     LOC5    ;PC:=PC+1
12150 000401            JMP     .+1     ;SKIP SAFETY
12151 010144            ISZ     NTRLF   ;COUNT 0 OF INTR'S
12152 000401            JMP     .+1     ;SKIP SAFETY
12153 002401            JMP     AUSSER
12154 000000 USSER:     0
```

```
01
02 12155 054473 INIPL:  STA     3,INIPR ;INI FOR SEARCH, SEARCH FREE,
03 12156 052462         LDA     2,INI44 ;PROCESS LINK, REMOVE AND LINK PRIORITY.
04 12157 052422         STA     2,ICX2
05 12160 052423         STA     2,ICX3
06 12161 052022 IN140:  LDA     2,@ICX2
07 12162 151013         MOVO    2,2,SNR ;END ?
08 12163 000473         JMP     @INIPR  ;YES
09 12164 027375         LDA     1,A-C,2
10 12165 055375         LDA     3,-3,2
11 12166 137000         ADD     1,3
12 12167 055377         STA     3,-1,2  ;STORE RESULTING CHAIN/HEAD ADDR
13 12170 102440         SUBO    0,0     ;ACO:=0 FOR NO ITEMS
14 12171 040461         STA     0,INI46 ;PREV ELEM ADDR TILL NOW
15 12172 040457 INI41:  STA     0,INI45 ; LAST ITEM ADDR TILL NOW (0 IF NONE)
16 12173 024444         LDA     1,INI43 ;LENGTH
17 12174 021000 IN142:  LDA     0,0,2   ;MOVE CHAIN, ITEM/HEAD, ELEM
18 12175 041400         STA     0,0,3   ;TO CORRECT PLACE, BUT WITHOUT
19 12176 175400         INC     3,3     ;ADDR ADD IN POINTER TO NEXT ITEM/ELEM.
20 12177 151400         INC     2,2
21 12200 125404         INC     1,1,SZR ;END ITEM ?
22 12201 000775         JMP     IN142
23 12202 020455         LDA     0,INI45 ;YES, SUBTRACT COUNTS FROM AC3
24 12203 117000         ADD     0,3     ;TO POINT TO ITEM/ELEM START.
25 12204 025374         LDA     0,4-4,2
26 12205 025375         LDA     1,-5,2
27 12206 125000         ADD     1,0     ;ADDR ADD
28 12207 041402         STA     0,2,3   ;CORRECT POINTER TO NEXT ITEM
29 12210 021400         LDA     0,0,3   ;GET STATE PROCESS
30 12211 041413         STA     0,13,3  ;STORE IT IN +13
31 12212 021401         LDA     0,1,3   ;GET PRIORITY PROCESS
32 12213 041415         STA     0,15,3  ;STORE IT IN +15
33 12214 020436         LDA     0,IN146 ;GET PREV ELEM ADDR
34 12215 041401         STA     0,1,3   ;STORE POINTER TO PREV ELEM IN +1
35 12216 054434         STA     3,INI46 ;STORE ACTUAL ELEM ADDR FOR NEXT'S PREV.
36 12217 021402         LDA     0,2,3   ;GET POINTER TO NEXT ITEM (INCL ADDR ADD)
37 12220 041400         STA     0,0,3   ;STORE POINTER TO NEXT ELEM IN +0
38 12221 115000         MOV     0,3
39 12222 125014         MOVO    1,1,SZR ;END CHAIN ?
40 12223 000747         JMP     IN141
41 12224 054425         LDA     3,IN145 ;YES
42 12225 052023         LDA     2,A1DX3 ;STORE FINAL LAST ITEM/ELEM ADDR
43 12226 055374         STA     3,-4,2  ;0=NONE, ONLY CHAIN OR HEAD
44 12227 021377         LDA     0,-1,2  ;GET RESULTING HEAD ADDR
45 12230 175015         MOVO    3,3,SNR ;ONLY CHAIN OR HEAD ?
46 12231 115000         MOV     0,3     ;YES, POINT TO IT
47 12232 041400         STA     0,0,3   ;CLOSE CHAIN, POINTER NEXT=HEAD
48 12233 054417         LDA     3,INI46 ;PREV ELEM ADDR NOW = ACTUAL ELEM
49 12234 111000         MOV     0,2     ;HEAD ADDR
50 12235 055001         STA     3,1,2   ;CLOSE CHAIN, POINTER PREV = HEAD
51 12236 000723         JMP     IN140
52 12237 177771 IN143:  -7              ;-LENGTH OF ITEM, ELEMENTS SPEC GENERATE
53 12240 012240 IN144:  .               ;ADDR-1 OF ADDR TABLE
54 12241 012260         SCHA1
55 12242 012273         SCHA2
56 12243 012306         SCHA3
57 12244 012321         SCHA4
58 12245 012334         SCHA5
59 12246 012565         SCHA6
60 12247 013012         SCHA7
61 12250 000000         0
62 12251 000000 IN145:  0               ;TEMP LAST ITEM ADDR
63 12252 000000 IN146:  0               ;TEMP PREV ELEM ADDR
64 12253 000000 INIPR:  0
```

```
01
02 12254 000000          0                ;ADDR OF LAST ITEM
03 12255 022221          LASTP+77         ;ADDR OF CHAIN
04 12256 000163          ADAM0            ;  0   0   0   0
05 12257 000000          0                ;RESULTING CHAIN ADDR
06 12260 177777 SCHA1:   177777           ;NEXT ELEM (RIGHT)
07 12261 000036          36               ;PREV ELEM (LEFT)
08 12262 000000          0                ;NEXT ITEM
09 12263 000163          ADAM0            ;DON'T CHANGE, MUST STAY ZERO
10 12264 000000          0                ;ADDR ADD IF POSSIBLE
11 12265 000000          0                ; 16K 32K 48K 64K
12 12266 000000          0
13
14 12267 000000          0
15 12270 022241          LASTP+117
16 12271 000164          ADAM1            ;  0  40  40  40
17 12272 000000          0
18 12273 177777 SCHA2:   177777
19 12274 000057          57
20 12275 000000          0
21 12276 000163          ADAM0            ;DON'T CHANGE, MUST STAY ZERO
22 12277 000000          0
23 12300 000000          0
24 12301 000000          0
25
26 12302 000000          0
27 12303 022261          LASTP+137
28 12304 000165          ADAM2            ;  0  40  100 100
29 12305 000000          0
30 12306 177777 SCHA3:   177777
31 12307 010040          10040
32 12310 000000          0
33 12311 000163          ADAM0            ;DON'T CHANGE, MUST STAY ZERO
34 12312 000000          0
35 12313 000000          0
36 12314 000000          0
37
38 12315 000000          0
39 12316 022301          LASTP+157
40 12317 000166          ADAM3            ;  0  40  100 140
41 12320 000000          0
42 12321 177777 SCHA4:   177777
43 12322 040077          40077
44 12323 000000          0
45 12324 000163          ADAM0            ;DON'T CHANGE, MUST STAY ZERO
46 12325 000000          0
47 12326 000000          0
48 12327 000000          0
49
50 12330 000000          0                ;SINGLE CHAIN AND HEAD IN DOUBLE CHAIN
51 12331 022701          LASTP+557
52 12332 000166          ADAM3
53 12333 000000          0
54 12334 177777 SCHA5:   177777           ;STATE PROCESS TO STORE +137 NEXT +0
55 12335 000007          7                ;PRIORITY PROCESS TO STORE +15/ PREV +1
56 12336 022721          LASTP+577        ;POINTER TO NEXT ITEM/ELEMENT
57 12337 000166          ADAM3            ;ADDR ADD IF POSSIBLE
58 12340 000000          0
59 12341 000000          0
60 12342 000000          0
```

```
* 0141  .*21.
01
02 12343 177777          177777          ;FIRST ITEM
03 12344 020007          20007
04 12345 022541          LASTP+217
05 12346 000163          ADAM0
06 12347 052525          052525          ;00
07 12350 000000          0               ;FREE
08 12351 000000          0
09
10 12352 177777          177777
11 12353 012000          12000
12 12354 022401          LASTP+257
13 12355 000164          ADAM1
14 12356 052525          052525
15 12357 177776          177776
16 12360 020040          020040          ;SPACE,SPACE
17
18 12361 177777          177777
19 12362 011000          11000
20 12363 022601          LASTP+457
21 12364 000165          ADAM2
22 12365 052525          052525
23 12366 177775          177775
24 12367 020040          020040
25
26 12370 177777          177777
27 12371 010400          10400
28 12372 023021          LASTP+677
29 12373 000166          ADAM3
30 12374 052525          052525
31 12375 177773          177773
32 12376 020040          020040
33
34 12377 177777          177777
35 12400 010200          10200
36 12401 022561          LASTP+437
37 12402 000165          ADAM2
38 12403 052525          052525
39 12404 177767          177767
40 12405 020040          020040
41
42 12406 177777          177777
43 12407 010100          10100
44 12410 022401          LASTP+537
45 12411 000164          ADAM1
46 12412 052525          052525
47 12413 177757          177757
48 12414 020040          020040
49
50 12415 177777          177777
51 12416 010040          10040
52 12417 022321          LASTP+177
53 12420 000163          ADAM0
54 12421 052525          052525
55 12422 177737          177737
56 12423 020040          020040
```

```
01
02 12424 177777          177777
03 12425 [illegible]     [illegible]
04 12426 022621          LASTP+477
05 12427 [illegible]     ADA42
06 12430 052525          052525
07 12431 177677          177477
08 12432 177777          177777
09
10 12433 177777          177777
11 12434 [illegible]     [illegible]
12 12435 022741          LASTP+617
13 12436 000165          ADA43
14 12437 052525          052525
15 12440 177577          177577
16 12441 040501          040501          ;AA
17
18 12442 177777          177777
19 12443 010000          10000
20 12444 022421          LASTP+277
21 12445 000164          ADA41
22 12446 052525          052525
23 12447 177377          177377
24 12450 040501          040501
25
26 12451 177777          177777
27 12452 004000          4000
28 12453 022541          LASTP+417
29 12454 000165          ADA42
30 12455 052525          052525
31 12456 176777          176777
32 12457 040501          040501
33
34 12460 177777          177777
35 12461 002000          2000
36 12462 022361          LASTP+237
37 12463 000163          ADA40
38 12464 052525          052525
39 12465 175777          175777
40 12466 040501          040501
41
42 12467 177777          177777
43 12470 001000          1000
44 12471 022441          LASTP+317
45 12472 000164          ADA41
46 12473 052525          052525
47 12474 173777          173777
48 12475 040501          040501
49
50 12476 177777          177777
51 12477 000400          400
52 12500 022761          LASTP+637
53 12501 000166          ADA43
54 12502 052525          052525
55 12503 167777          167777
56 12504 040501          040501
```

```
                                                    ;HI
                                                    ;DON'T CHANGE, MUST STAY ZERO
                                                    ;ADDR OF LAST ITEM
                                                    ;ADDR OF CHAIN
                                                    ;ADDR ADD
                                                    ;RESULTING CHAIN ADDR
SCHAO:                                              ;STATE PROCESS TO STORE +13
                                                    ;PRIORITY PROCESS TO STORE +15
                                                    ;POINTER TO NEXT ITEM
                                                    ;ADDR ADD
```

```
                                177777          ;FIRST ITEM
                                177777
                                LASTP+1127
                                ADAM0
                                052525          ;UU
                                077777
                                0
                                177777
                                100700
                                LASTP+1267
                                ADAM2
                                125252
                                0               ;FREE
                                020040          ;SPACE,SPACE

                                177777
                                100000
                                LASTP+1247
                                ADAM2
                                052525
                                000001
                                020040

                                177777
                                40000
                                LASTP+1407
                                ADAM3
                                052525
                                000002
                                020040

                                177777
                                20000
                                LASTP+1367
                                ADAM3
                                052525
                                000004
                                020040

                                177777
                                14000
                                LASTP+1047
                                ADAM1
                                052525
                                000010
                                020040

                                177777
                                12000
                                LASTP+767
                                ADAM0
                                052525
                                000020
                                020040
```

```
01
02 12653 177777          177777
03 12654 011[illegible]  11[illegible]
04 12655 023671          LASTP+1147
05 12656 000102          000002
06 12657 052525          052525
07 12660 000040          000040
08 12661 177777          177777
09
10 12662 177777          177777
11 12663 010000          10000
12 12664 023737          LASTP+1027
13 12665 000104          ADAM1
14 12666 052525          052525
15 12667 000100          000100
16 12670 040501          040501          ;AA
17
18 12671 177777          177777
19 12672 000057          57
20 12673 023671          LASTP+1347
21 12674 000103          ADAM3
22 12675 052525          052525
23 12676 000200          000200
24 12677 040501          040501
25
26 12700 177777          177777
27 12701 000056          56
28 12702 023551          LASTP+1227
29 12703 000102          ADAM2
30 12704 052525          052525
31 12705 000400          000400
32 12706 040501          040501
33
34 12707 177777          177777
35 12710 000055          55
36 12711 023051          LASTP+727
37 12712 000101          ADAM0
38 12713 052525          052525
39 12714 001000          001000
40 12715 040501          040501
41
42 12716 177777          177777
43 12717 000055          55
44 12720 023611          LASTP+1067
45 12721 000104          ADAM1
46 12722 052525          052525
47 12723 002000          002000
48 12724 040501          040501
49
50 12725 177777          177777
51 12726 000047          47
52 12727 023511          LASTP+1107
53 12730 000103          ADAM3
54 12731 052525          052525
55 12732 004000          004000
56 12733 040501          040501
```

```
01
02 12734 177777          177777
03 12735 000036          36
04 12736 023547          LASTP+1425
05 12737 000165          ADAM0
06 12740 052525          052525
07 12741 010000          010000
08 12742 044111          044111          ;HI
09
10 12743 177777          177777
11 12744 000034          34
12 12745 023331          LASTP+1207
13 12746 000165          ADAM2
14 12747 052525          052525
15 12750 020000          020000
16 12751 044111          044111
17
18 12752 177777          177777
19 12753 000032          32
20 12754 023131          LASTP+1007
21 12755 000164          ADAM1
22 12756 052525          052525
23 12757 040000          040000
24 12760 044111          044111
25
26 12761 177777          177777
27 12762 000026          26
28 12763 023071          LASTP+747
29 12764 000163          ADAM0
30 12765 052525          052525
31 12766 100000          100000
32 12767 044111          044111
33
34 12770 177777          177777
35 12771 000017          17
36 12772 023451          LASTP+1327
37 12773 000166          ADAM3
38 12774 052525          052525
39 12775 052525          052525
40 12776 044111          044111
41
42 12777 177777          177777
43 13000 000016          16
44 13001 000000          0
45 13002 000163          ADAM0           ;DON'T CHANGE, MUST STAY ZERO
46 13003 052525          052525
47 13004 125252          125252
48 13005 044111          044111
49
50 13006 000000          0               ;ADDR OF LAST ITEM
51 13007 023566          LASTP+1444      ;ADDR OF CHAIN
52 13010 000164          ADAM1           ;ADDR ADD
53 13011 000000          0               ;RESULTING CHAIN ADDR
54 13012 177777 SCHA7:   177777          ;STATE PROCESS TO STORE +13
55 13013 000007          7               ;PRIORITY PROCESS TO STORE +15
56 13014 023604          LASTP+1462      ;POINTER TO NEXT ITEM/ELEMENT
57 13015 000163          ADAM0           ;ADDR A_D
58 13016 000000          0
59 13017 000000          0
60 13020 000000          0
```

```
.0147  .ml.
01
02 13021 177777          177777.
03 13022 177007          177007
04 13023 000000          0
05 13024 000155          ADASD          ;DON'T CHANGE, MUST STAY ZERO
06 13025 111111          111111
07 13026 155555          155553
08 13027 177777          177777
09
10 13030 013707 XNITI:   XNITI
11 13031 013733 XINIA:   XINIA
12 13032 013035 RENOQ:   YDIAG-4 ;RESTART NO QUESTION, ASM VALUE TO POINT FOR
13                                ;MAX 0 OF QUES IN CASE OF START BEFORE ANY QUES
14                                ;IS ANSWERED, DON'T FORGET HOW USED: JMP 1,RENOQ
15
16 13033 165000 XDIAG:   MOV      3,1      ;PRINT START ADDR
17 13034 006072          CSAMS
18 13035 006774          JSR      AINIQA   ;ANSWER QUESTIONS
19 13036 006772          JSR      AINITI   ;INITIALIZE (PASSCOUNT, BUFFER ETC.)
20 13037 004401          JSR      .+1      ;NO QUESTION RESTART ADDR
21 13040 054772          STA      3,RENOQ  ;THIS 2 INSTR JUST ABOVE LOOP LABEL
22 13041 006405 YDIAG:   JSR      AZDIAG   ;PERFORM TESTLOOPS AS ONE ROUTINE
23 13042 006124          CPASS             ;CALL PASS ADMINI.
24 13043 000770          JMP      YDIAG    ;LOOP
25 13044 013746 ZDIAG:   TEST
26
27 13045 165000 XLIST:   MOV      3,1      ;PRINT START ADDR
28 13046 006072          CSAMS
29 13047 006762          JSR      AINIQA
30 13050 006760          JSR      AINITI
31 13051 004401          JSR      .+1
32 13052 054760          STA      3,RENOQ
33 13053 002401 YLIST:   JMP      A.+1
34 13054 013053          YLIST             ;CHANGE HERE
35
36 13055 165000 AANSW:   MOV      3,1      ;PRINT START ADDR
37 13056 006072          CSAMS
38 13057 006751          JSR      AINITI   ;INITIALIZE, SEE XDIAG
39 13060 054752          LDA      3,RENOQ
40 13061 001401          JMP      1,3      ;RESTART, NO QUESTIONS, LAST ANSWERS
41
42
43                ;TAPE 6
44
45                .EOT
```

```
01
02                      ;TASK 7
03
04                              ;ROUTINES USED FROM TESTLOOPS:
05
06                              ;GENERATE WORD STRING.
07                              ;CALL:  JSR     GENEW
08                              ;       AC0= WORD COUNT
09                              ;       AC1= ADDR OF WANTED PATTERN
10                              ;       AC2= ADDR OF SOURCE STRING
11 13062 053022 GENEW:  STA     2,IDA2
12 13063 044023         STA     1,IDA3
13 13064 040424         STA     0,GENEI
14 13065 014022         DSZ     ID2
15 13066 014023         DSZ     ID3
16 13067 022023 GENE2:  LDA     0,@IDA3
17 13070 042022         STA     0,@IDA2
18 13071 014417         DSZ     GENEI   ;END STRING ?
19 13072 000775         JMP     GENE2
20 13073 001400         JMP     @3      ;YES, RETURN
21
22                              ;GENERATE BYTE STRING.
23                              ;CALL:  JSR     GENEB
24                              ;       AC0= BYTE COUNT
25                              ;       AC1= ADDR OF WANTED PATTERN
26                              ;       AC2= ADDR OF SOURCE STRING
27 13074 044413 GENEB:  STA     1,GENEA
28 13075 040415         STA     0,GENEI
29 13076 024411 GENEI:  LDA     1,GENEA
30 13077 002001         LDA     0
31 13100 145000         MOV     2,1
32 13101 006201         STB     0
33 13102 151400         INC     2,2
34 13103 010404         ISZ     GENEA
35 13104 014404         DSZ     GENEI   ;END STRING ?
36 13105 000771         JMP     GENEI
37 13106 001400         JMP     0,3     ;YES, RETURN
38 13107 000000 GENEA:  0
39 13110 000000 GENEI:  0
40
41                              ;GENERATE COUNTING PATTERN BYTE STRING.
42                              ;CALL:  JSR     GENEC
43                              ;       AC0= BYTE START VALUE
44                              ;       AC1= START ADDR OF BUFFER, BYTE ADDR
45                              ;       AC2= LENGTH IN BYTES
46 13111 150400 GENEC:  NEG     2,2
47 13112 006201 GENE3:  STB     0
48 13113 101400         INC     0,0
49 13114 125400         INC     1,1
50 13115 151404         INC     2,2,SZR ;END STRING ?
51 13116 000774         JMP     GENE3
52 13117 001400         JMP     0,3     ;YES, RETURN
```

```
                        ;CLEAR WORD STRING.
                        ;HEAD AND TAIL CLEARED TOO, ONE WORD.
                        ;CALL:  JSR     CLEAR
                        ;       AC0= CLEAR PATTERN
                        ;       AC1= ADDR OF DEST STRING
                        ;       AC2= WORD COUNT MAX
15121 035427 CLEAR:     STA     2,CLEAI
15122 035417            LDA     2,CLEAA
15123 140000            SUB     2,1
15124 044022            STA     1,IDX2
15125 042022 CLEA3:     STA     0,@IDX2
15126 014422            DSZ     CLEA1   ;END STRING ?
15127 000773            JMP     CLEA3
15130 001400            JMP     0,3     ;YES, RETURN
15131 000002 CLEAA:     2

                        ;CLEAR BYTE STRING.
                        ;HEAD AND TAIL CLEARED TOO, UP TO 3 BYTES (MIN ONE WORD).
                        ;CALL:  JSR     CLEAB
                        ;       AC0= CLEAR PATTERN
                        ;       AC1= ADDR OF DEST STRING
                        ;       AC2= BYTE COUNT MAX
15134 101500 CLEAB:     MOVS    0,0     ;STORE LEFT FIRST
15135 035413            STA     2,CLEAI
15136 035413            LDA     2,CLEAC
15137 140000            SUB     2,1
15140 125212            MOVRO   1,1,SZC
15141 000435            JMP     CLEA2   ;START IN FASE
15142 063401 CLEA1:     STB     0
15143 101500            MOVS    0,0
15144 125400 CLEA2:     INC     1,1
15145 014403            DSZ     CLEAI   ;END STRING ?
15146 000774            JMP     CLEA1
15147 125212            MOVRO   1,1,SZC ;YES, END IN FASE
15150 063401            STB     0
15151 001400            JMP     0,3     ;RETURN
15152 000000 CLEAI:     0
15153 000005 CLEAC:     5
```

```
                        ;COMPARE WORD STRINGS.
                        ;CALL:  JSR     COMPW   AC0= WORD COUNT
                        ;                       AC1= ADDR OF FIRST STRING (SO
                        ;                       AC2= ADDR OF SEC. STRING (DES.
                        ;       ERROR RETURN    AC0= WORD SOURCE STRING
                        ;                       AC1= WORD DEST STRING
                        ;                       AC2= DEST WORD ADDR
13151 050022 COMPW:     STA     2,IDX2
13152 044023            STA     1,IDX3
13153 040446            STA     0,COMPI
13154 014022            DSZ     IDX2
13155 014023            DSZ     IDX3
13156 022023 COMP2:     LDA     0,@IDX3
13157 020022            LDA     1,@IDX2
13160 030022            LDA     2,IDX2
13161 100414            SUBO    0,1,SZR
13162 001400            JMP     0,3     ;AN ERROR FOUND
13163 014436            DSZ     COMPI   ;END STRINGS ?
13164 000772            JMP     COMP2
13165 001401            JMP     1,3     ;YES, NON ERROR RETURN

                        ;COMPARE BYTE STRINGS.
                        ;CALL:  JSR     COMPB   AC0= CONVERT ADDR (0=NON CONVERT)
                        ;                       AC1= ADDR OF FIRST STRING (SO
                        ;                       AC2= ADDR OF SEC. STRING (DES.
                        ;       ARG                = BYTE COUNT
                        ;       ERROR RETURN    AC0= BYTE SOURCE STRING
                        ;                       AC1= BYTE DEST STRING
                        ;                       AC2= DEST BYTE ADDR
13166 034432 COMPB:     STA     3,COMPR
13167 101015            MOVO    0,0,SNR ;ADDR OF CONVERT TABLE ?
13170 020434            LDA     0,COMPN ;NO, USE ASCII TABLE (1:1).
13171 040432            STA     0,COMPT
13172 021400            LDA     0,@3
13173 040426            STA     0,COMPI
13174 044426            STA     1,COMPA
13175 024425 COMPT:     LDA     1,@COMPA
13176 062001            LDB     0
13177 024424            LDA     1,COMPT
13200 107000            ADD     0,1
13201 062001            LDB     0
13202 115000            MOV     0,3
13203 145000            MOV     2,1
13204 062001            LDB     0
13205 105000            MOV     0,1
13206 1e1000            MOV     3,0
13207 100414            SUBO    0,1,SZR
13210 000406            JMP     COMPL   ;AN ERROR FOUND
13211 151400            INC     2,2
13212 010410            ISZ     COMPA
13213 014406            DSZ     COMPI   ;END STRINGS ?
13214 000761            JMP     COMPT
13215 010403            ISZ     COMPR   ;YES, PASS ERROR RETURN
13216 010402 COMPL:     ISZ     COMPR   ;PASS ARG
13217 002401            JMP     @COMPR
13220 000000 COMPR:     0
13221 000000 COMPI:     0
13222 000000 COMPA:     0
13223 000000 COMPT:     0
```

```
01
02 13224 [illegible]  [illegible]:  .+1+.+1          ;BYTE ADDR OF NON CONV TABLE
03       [illegible]                .TXTM 1
04                   BITMSK:  .TXT !<0><1>
   13225 [illegible]
05 13226 001003 <2><3>
06 13227 002005 <4><5>
07 13230 003007 <6><7>
08 13231 004011 <10><11>
09 13232 005013 <12><13>
10 13233 006015 <14><15>
11 13234 007017 <16><17>
12 13235 010021 <20><21>
13 13236 011023 <22><23>
14 13237 012025 <24><25>
15 13240 013027 <26><27>
16 13241 014031 <30><31>
17 13242 015033 <32><33>
18 13243 016035 <34><35>
19 13244 017037 <36><37>
20 13245 020041 <40><41>
21 13246 021043 <42><43>
22 13247 022045 <44><45>
23 13250 023047 <46><47>
24 13251 024051 <50><51>
25 13252 025053 <52><53>
26 13253 026055 <54><55>
27 13254 027057 <56><57>
28 13255 030061 <60><61>
29 13256 031063 <62><63>
30 13257 032065 <64><65>
31 13260 033067 <66><67>
32 13261 034071 <70><71>
33 13262 035073 <72><73>
34 13263 036075 <74><75>
35 13264 037077 <76><77>
36 13265 040101 <100><101>
37 13266 041103 <102><103>
38 13267 042105 <104><105>
39 13270 043107 <106><107>
40 13271 044111 <110><111>
41 13272 045113 <112><113>
42 13273 046115 <114><115>
43 13274 047117 <116><117>
44 13275 050121 <120><121>
45 13276 051123 <122><123>
46 13277 052125 <124><125>
47 13300 053127 <126><127>
48 13301 054131 <130><131>
50 13302 055133 <132><133>
51 13303 056135 <134><135>
52 13304 057137 <136><137>
53 13305 060141 <140><141>
54 13306 061143 <142><143>
55 13307 062145 <144><145>
56 13310 063147 <146><147>
```

```
02 13311 [illegible] <150><151>
03 13312 [illegible] <152><153>
04 13313 [illegible] <154><155>
05 13314 [illegible] <156><157>
06 13315 [illegible] <160><161>
07 13316 [illegible] <162><163>
08 13317 [illegible] <164><165>
09 13320 [illegible] <166><167>
10 13321 [illegible] <170><171>
11 13322 [illegible] <172><173>
12 13323 [illegible] <174><175>
13 13324 [illegible] <176><177>
14 13325 [illegible] <200><201>
15 13326 [illegible] <202><203>
16 13327 [illegible] <204><205>
17 13330 [illegible] <206><207>
18 13331 [illegible] <210><211>
19 13332 [illegible] <212><213>
20 13333 [illegible] <214><215>
21 13334 [illegible] <216><217>
22 13335 [illegible] <220><221>
23 13336 [illegible] <222><223>
24 13337 [illegible] <224><225>
25 13340 [illegible] <226><227>
26 13341 [illegible] <230><231>
27 13342 [illegible] <232><233>
28 13343 [illegible] <234><235>
29 13344 [illegible] <236><237>
30 13345 [illegible] <240><241>
31 13346 [illegible] <242><243>
32 13347 [illegible] <244><245>
33 13350 [illegible] <246><247>
34 13351 [illegible] <250><251>
35 13352 [illegible] <252><253>
36 13353 [illegible] <254><255>
37 13354 [illegible] <256><257>
38 13355 [illegible] <260><261>
39 13356 [illegible] <262><263>
40 13357 [illegible] <264><265>
41 13360 [illegible] <266><267>
43 13361 [illegible] <270><271>
44 13362 [illegible] <272><273>
45 13363 [illegible] <274><275>
46 13364 [illegible] <276><277>
47 13365 [illegible] <300><301>
48 13366 [illegible] <302><303>
49 13367 [illegible] <304><305>
50 13370 [illegible] <306><307>
51 13371 [illegible] <310><311>
52 13372 [illegible] <312><313>
53 13373 [illegible] <314><315>
54 13374 [illegible] <316><317>
```

```
02 13375 150521 <320><321>
03 13376 151523 <322><323>
04 13377 152523 <324><325>
05 13400 153527 <326><327>
06 13401 154531 <330><331>
07 13402 155533 <332><333>
08 13403 156535 <334><335>
09 13404 157537 <336><337>
10 13405 160541 <340><341>
11 13406 161543 <342><343>
12 13407 162545 <344><345>
13 13410 163547 <346><347>
14 13411 164551 <350><351>
15 13412 165553 <352><353>
16 13413 166555 <354><355>
17 13414 167557 <356><357>
18 13415 170561 <360><361>
19 13416 171563 <362><363>
20 13417 172565 <364><365>
21 13420 173567 <366><367>
22 13421 174571 <370><371>
23 13422 175573 <372><373>
24 13423 176575 <374><375>
25 13424 177577 <376><377>!
   13425 000000
26       000000          .TXTM 0
27 13426 027056 COMPC:   .+1+.+1          ;BYTE ADDR OF CONV TABLE
28       000001          .TXTM 1
29               BTABC:  .TXT !<377><376>
   13427 177776
30 13430 176774 <375><374>
31 13431 175772 <373><372>
32 13432 174770 <371><370>
33 13433 173766 <367><366>
34 13434 172764 <365><364>
35 13435 171762 <363><362>
36 13436 170760 <361><360>
37 13437 167756 <357><356>
38 13440 166754 <355><354>
39 13441 165752 <353><352>
40 13442 164750 <351><350>
41 13443 163746 <347><346>
42 13444 162744 <345><344>
43 13445 161742 <343><342>
44 13446 160740 <341><340>
45 13447 157736 <337><336>
46 13450 156734 <335><334>
47 13451 155732 <333><332>
48 13452 154730 <331><330>
49 13453 153726 <327><326>
50 13454 152724 <325><324>
51 13455 151722 <323><322>
52 13456 150720 <321><320>
```

```
[illegible]
12 13457 147710 <317><316>
13 13458 147714 <316><314>
14 13459 147712 <315><312>
15 1345A 144710 <312><310>
16 1345B 143700 <307><300>
17 1345C 142704 <305><304>
18 1345D 141702 <303><302>
19 1345E 140700 <301><300>
1A 1345F 137676 <277><276>
1B 13460 136674 <275><274>
1C 13461 135672 <273><272>
1D 13462 134670 <271><270>
1E 13463 133668 <267><266>
1F 13464 132664 <265><264>
20 13465 131662 <263><262>
21 13466 130660 <261><260>
22 13467 127656 <257><256>
23 13468 126654 <255><254>
24 13469 125652 <253><252>
25 1346A 124650 <251><250>
26 1346B 121644 <247><246>
27 1346C 120642 <245><244>
28 1346D 117636 <237><236>
29 1346E 116634 <235><234>
30 1346F 115632 <233><232>
31 13470 114630 <231><230>
32 13471 113626 <227><226>
33 13472 112624 <225><224>
34 13473 111622 <223><222>
35 13474 110620 <221><220>
36 13475 107614 <217><216>
37 13476 106612 <215><214>
38 13477 105610 <213><212>
39 13478 104610 <211><210>
40 13479 103606 <207><206>
41 1347A 102604 <205><204>
42 1347B 101602 <203><202>
43 1347C 100600 <201><200>
44 1347D 077576 <177><176>
45 1347E 076574 <175><174>
46 1347F 075572 <173><172>
47 13480 074570 <171><170>
48 13481 073566 <167><166>
49 13482 072564 <165><164>
50 13483 071562 <163><162>
51 13484 070560 <161><160>
52 13485 067556 <157><156>
53 13486 066554 <155><154>
54 13487 065552 <153><152>
55 13488 064550 <151><150>
```

```
52 13543 003543 <147><146>
53 13544 003544 <145><144>
54 13545 003542 <143><142>
55 13546 003541 <141><140>
56 13547 003537 <137><136>
57 13550 003534 <135><134>
58 13551 003532 <133><132>
59 13552 003530 <131><130>
60 13553 003527 <127><126>
61 13554 003526 <125><124>
62 13555 003524 <123><122>
63 13556 003520 <121><120>
64 13557 003515 <117><116>
65 13560 003514 <115><114>
66 13561 003512 <113><112>
67 13562 003510 <111><110>
68 13563 003506 <107><106>
69 13564 003504 <105><104>
70 13565 003502 <103><102>
71 13566 003500 <101><100>
72 13567 003476 <77><76>
73 13570 003474 <75><74>
74 13571 003472 <73><72>
75 13572 003470 <71><70>
76 13573 003466 <67><66>
77 13574 003464 <65><64>
78 13575 003462 <63><62>
79 13576 003460 <61><60>
80 13577 003456 <57><56>
81 13600 003454 <55><54>
82 13601 003452 <53><52>
83 13602 003450 <51><50>
84 13603 003446 <47><46>
85 13604 003444 <45><44>
86 13605 003442 <43><42>
87 13606 003440 <41><40>
88 13607 003436 <37><36>
89 13610 003434 <35><34>
90 13611 003432 <33><32>
91 13612 003430 <31><30>
92 13613 003426 <27><26>
93 13614 003424 <25><24>
94 13615 003422 <23><22>
95 13616 003420 <21><20>
96 13617 003416 <17><16>
97 13620 003414 <15><14>
98 13621 003412 <13><12>
99 13622 003410 <11><10>
100 13623 003406 <7><6>
101 13624 003404 <5><4>
102 13625 003402 <3><2>
103 13626 003400 <1><0>!
    13627 000000
104       000000          .TXTEN 0
```

```
                                ;CHECK HEAD AND TAIL OF WORDSTRING.
                                ;ONE WORD BEFORE AND AFTER STRING IS CHECKED TO
                                ;CONTENT CLEAR DATA.
                                ;CALL:  JSR     METAW   AC0= CLEAR PATTERN
                                ;                       AC1= ADDR OF DEST STRING
                                ;                       AC2= WORD COUNT
                                ;       ERROR RETURN    AC0= WORD CLEAR PATTERN
                                ;                       AC1= WORD DEST STRING
                                ;                       AC2= DEST WORD ADDR
13653 135400 METAW:  ADD     1,2     ;FIRST FREE
13654 054444         STA     2,METAP
13655 131000         MOV     1,2
13656 025377         LDA     1,-1,2  ;JUST BEFORE STRING
13657 106414         SUBO    0,1,SZR
13660 001403         JMP     .+3     ;AN ERROR FOUND
13661 054437         LDA     2,METAP
13662 025000         LDA     1,0,2
13663 106414         SUBO    0,1,SZR
13664 001400         JMP     .+3     ;AN ERROR FOUND
13665 001401         JMP     .+1     ;NON ERROR RETURN

                                ;CHECK HEAD AND TAIL OF BYTESTRING.
                                ;ONE BYTE BEFORE AND AFTER STRING IS CHECKED TO
                                ;CONTENT CLEAR DATA.
                                ;CALL:  JSR     METAB   AC0= CLEAR PATTERN
                                ;                       AC1= ADDR OF DEST STRING
                                ;                       AC2= BYTE COUNT
                                ;       ERROR RETURN    AC0= BYTE CLEAR PATTERN
                                ;                       AC1= BYTE DEST STRING
                                ;                       AC2= DEST BYTE ADDR
13666 054431 METAB:  STA     3,METAP
13667 135000         ADD     1,2     ;FIRST FREE
13670 054430         STA     2,METAP
13671 044430         STA     1,METAJ
13672 024427         DSZ     METAJ   ;JUST BEFORE STRING
13673 040427         STA     0,METAP
13674 020427         LDA     0,METAC
13675 040427         STA     0,METAI
13676 024423         LDA     1,METAJ
13677 062001 META1:  LDB     0,1
13700 115000         MOV     0,3
13701 020421         LDA     1,METAP
13702 125213         MOVRO   1,1,SNC ;LEFT BYTE ?
13703 101303         MOVS    0,0     ;YES, SWAP CLEAR PATTERN
13704 034421         LDA     2,METAP
13705 142400         AND     2,0     ;MASK CLEAR PATTERN
13706 131000         MOV     1,2     ;BYTE ADDR
13707 165000         MOV     3,1
13710 106414         SUBO    0,1,SZR
13711 000405         JMP     METAL   ;AN ERROR FOUND
13712 024406         LDA     1,METAP
13713 014411         DSZ     METAI   ;END ?
13714 000763         JMP     META1
13715 010402         ISZ     METAP   ;YES, PASS ERROR RETURN
13716 002401 METAL:  JMP     @METAR
13717 000000 METAR:  0
13720 000000 METAP:  0
13721 000000 METAJ:  0
13722 000002 METAC:  2
13723 000000 METAI:  0
13724 000377 METAM:  377
```

```
                                ;ROUTINE USED TO CONTROL INTR OF MUSIL COMMANDS.
13743 034453 A INTL:    STA     3,.+3
13744 000401            JMP     .+1             ;INTERRUPT WANTED, CHANGE TO JMP .+35
                        ;JMP    .+35            ; 000455 IF NO INTERRUPT WANTED
13745 000403            JMP     .+3             ;INTERRUPT WANTED ONLY EVERY SECOND
                        ;JMP    .+4             ;NOW, CHANGE TO JMP .+4
                                                ; 000404 IF ALWAYES INTERRUPT WANTED.
13746 034431            LDA     3,.TRLC ;FIRST RUN IN A PASS IS EVEN NUMBER
13747 177213            COM#0   3,3,SZC ;IF ODD TEST INTERRUPT OF COMMAND.
13750 000451            JMP     .TRLP   ;NO INTERRUPT WANTED.

                        ;INTERRUPT WANTED.
13751 034427            LDA     3,.TRLC ;GET COMMAND TO TEST
13752 125420            ISZ     .TRLC   ;PASS COMMAND BACK IN TEST LOOP
13753 034427            STA     3,.TRLC ;TEST HERE, NOT IN TEST LOOP
13754 177777            ADC     3,3     ;SET INTR COUNTER TO -1 TO COMPENSATE
13755 034434            STA     3,.NTRLF ;FOR THE INTR AFTER THE COMMAND.
13756 034417            LDA     3,.NTMAS
13757 034415            STA     3,.NTMAX ;SET MAX NO OF ALLOWED INTR'S
13760 034157            LDA     3,.PAC3 ;AC3 PARAM FOR COMMAND
13761 000777 .TRLA:     .TRLC
13762 000000 .TRLC:     0                       ;PERFORM MUSIL COMMAND PLACED HERE
13763 000402            JMP     .TRLI   ;PC NOT INCR BY COMMAND
13764 002414            JMP     @.+TRL  ;PC INCR, FINISHED

13765 034411 .TRLI:     STA     3,.TRLS
13766 000401 .HERE:     JMP     .+1             ;PLACE HALT OR EHALT HERE IF YOU WANT
13767 034407            LDA     3,.NTRLS ;TO CONTROL THE COMMAND STEP BY STEP
13770 174404            DSZ     .NTMAX  ;COUNT DOWN NO OF INTR
13771 000770            JMP     .TRLA   ;AGAIN, CONTINUE COMMAND
13772 000174            EHALT                   ;TOO MANY LOOPS IN COMMAND UNDER TEST
                                                ;SEE AC'S (AC3 IN .NTRLS)
                                                ;AND .NTRLC FOR COMMAND.
13773 002405            JMP     @.+TRL

13774 000003 .NTMAX:    3
13775 000410 .NTMAS:    410
13776 000000 .NTRLS:    0
13777 010701 .NTRUN:    PASSC
14000 000000 .NTRLC:    0

                        ;NO INTERRUPT WANTED.
14001 174400 .NTRLF:    SUB     3,3
14002 034145            STA     3,.NTREX ;SET EXP. 0 OF INTR'S = 0
14003 034144            STA     3,.NTRLF ;SET INTR COUNTER TO 0
14004 034137            LDA     3,.PAC3 ;PARAM FOR COMMAND
14005 002773            JMP     @.+TRL  ;RETURN TO COMMAND IN TEST LOOP


                ;TAPE 7

                .EOT
```

```
                ;TAPE 6
                
                
13745 054373 TEST:   STA     3,@TEST ;RETURN ADDR USED WHEN ALL LOOP FINIS
                
                
                     ;TEST OF ADDR BIT 0 AND MEM EXT. FLAG.
                     ;TEST OF MULTILEVEL INDIRECT ADDRESSING DISABLED.
13747 000401 AU0:    JMP     .+1
13750 000112         SETP2           ;*******
13751 076701         MEMEX           ;SET MEM EXT FLAG
13752 063601         SKPDN   DEV1
13753 000402         JMP     .+2
13754 000404         JMP     AU02
13755 006114         EMALT           ;MEM EXT FLAG NOT SET, SWITCH 64/128 K ?
                                     ;IT IS POSSIBLE TO SET MEM EXT FLAG
                                     ;REGARDLESS OF MEM SIZE.
                
13756 002401         JMP     A.+1
13757 002264         2264    ; NOTE: RESTARTING PROGRAM IN SA 2264 (OR 2224)
                                     ;TO SET NEW MEMSIZE BEFORE RUNNING
                                     ;FOLLOWING LOOPS. !!!
13760 062077 AU02:   ALRST           ;IORST, X-REFF LIST
13761 063701         SKPDZ   DEV1
13762 006114         EMALT           ;MEM EXT FLAG NOT CLEARED AFTER IORST
13763 076701         MEMEX           ;SET FLAG AGAIN
13764 050435         LDA     2,AOOLO
13765 054455         LDA     3,AOOUP
13766 021000         LDA     0,0,2   ;SAVE LOWER LOC CONTENT
13767 040432         STA     0,AOOSL
13770 025400         LDA     1,0,3   ;SAVE UPPER LOC CONTENT
13771 044451         STA     1,AOOSU
13772 102440         SUB0    0,0     ;AC0:=0
13773 120000         ADC     1,1     ;AC1:=177777
13774 045000         STA     1,0,2   ;ALL ONES IN LOW ADDR
13775 041400         STA     0,0,3   ;ALL ZEROES IN HIGH ADDR OR IN NO MEM
13776 021000         LDA     0,0,2   ;LOAD FROM LOW ADDR
13777 106414         SUBO    0,1,SZR
14000 006114         EMALT           ;ADDR BIT 0 NOT IN USE
14001 034172         LDA     3,LC172 ;ADDR 173
14002 055000         STA     3,0,2   ;TO VMEND
14003 054415         LDA     3,ACOUP
14004 025400         LDA     1,0,3   ;GET EXPECTED
14005 022415         LDA     0,AACOUP
14006 106414         SUBO    0,1,SZR
14007 006114         EMALT           ;MULTILEVEL NOT DISABLED
14010 054410         LDA     3,AOOUP
14011 020411         LDA     0,AOOSU
14012 041400         STA     0,0,3   ;RESTORE UPPER LOC CONTENT
14013 024406         LDA     1,AOOSL
14014 045000         STA     1,0,2   ;RESTORE LOWER LOC CONTENT
14015 006115         LOOP            ;*******
14016 000407         JMP     AU1     ;GO TO NEXT LOOP
                
14017 002422 AOOLO:  VMEND           ;LOWER ADDR
14020 102422 AOOUP:  AVMEND          ;UPPER ADDR 16 BIT, NOT INDIRECT
14021 000000 AOOSL:  0
14022 000000 AOOSU:  0
```

```
01
02 14023 114017 AADLO:  .+17                    ;INDIRECT CHAIN ADDR
03 14024 000151 AD1TA:  TEPAT                   ;ADDR OF TESTPATTERN
04
05                      ;TEST OF ADDR BIT 0 WITH NOT MEM EXT. FLAG.
06                      ;TEST OF MULTILEVEL INDIRECT ADDRESSING NOT DISABLED.
07 14025 000401 AD1:    JMP     .+1
08 14026 006112         SETP2           ;*******
09 14027 062577         ALRST           ;IORST, X-REFF LIST, CLEAR MEM EXT FLAG
10 14030 030767         LDA     2,AADLO
11 14031 034767         LDA     3,AADUP
12 14032 021000         LDA     0,0,2   ;SAVE LOWER LOC CONTENT
13 14033 040760         STA     0,ADDSL
14 14034 025400         LDA     1,0,3   ;SAVE UPPER LOC CONTENT (IF ERROR)
15 14035 044765         STA     1,ADDSU
16 14036 126000         ADC     1,1
17 14037 045000         STA     1,0,2   ;"CLEAR" LOW
18 14040 020764         LDA     0,AD1TA ;TESTPATTERN ADDR
19 14041 041400         STA     0,0,3   ;STORE IN LOW AS BIT 0 IS CLIPPED
20 14042 025000         LDA     1,0,2   ;LOAD FROM LOW ADDR
21 14043 106414         SUBO    0,1,SZR ;CONTENT = TEPAT (ADDR OF TESTPATTERN)
22 14044 006114         EMALT           ;ADDR BIT 0 NOT CLIPPED
23 14045 102440         SUBO    0,0     ;AC0:=0, CARRY:=0
24 14046 126060         ADCC    1,1     ;AC1:=177777, CARRY:=1
25 14047 022754         LDA     0,AADDCH ;END ADDR = VMEND
26 14050 026747         LDA     1,AADDLO ;CONTENT = TEPAT (ADDR OF TESTPAT)
27 14051 106414         SUBO    0,1,SZR
28 14052 006114         EMALT           ;MULTILEVEL DISABLED
29 14053 034745         LDA     3,ADDUP
30 14054 020746         LDA     0,ADDSU
31 14055 041400         STA     0,0,3   ;RESTORE UPPER LOC CONTENT (IF ERROR
32 14056 024745         LDA     1,ADDSL ; IN BIT 0)
33 14057 045000         STA     1,0,2   ;RESTORE LOWER LOC CONTENT
34 14060 006113         LOOP            ;*******
```

```
                        ;ADDRESSING TEST TO INSURE THAT PROGRAMS CAN BE RUN
                        ;AFTER ENABLING MEMORY EXTENSION.

                        ;THIS TEST IS PLACED IN 5 DIFFERENT PLACES:
                        ;       A PAGE ZERO     FOR TCP         LOC 200
                        ;       B LOW MEMORY    FOR TCP         TCPLO LOC 21363
                        ;       C HIGH MEMORY   FOR TCP         TCPHI LOC 100666
                        ;       D LOW, PART OF MAIN TEST:  A77 + A99 LOC 14061
                        ;       E HIGH, PART OF MAIN TEST:  A0216 LOC 100206

14061 000401 A77:       JMP     .+1
14062 006111            SETP1           ;*******

                        ;LOW PAGE ZERO ADDR
14063 020010            LDA     0,LOC10 ;CONTENT=177777
14064 100014            COMO    0,0,SZR
14065 006114            EHALT

                        ;HIGH PAGE ZERO ADDR
14066 024367            LDA     1,LO367 ;CONTENT=177777
14067 124014            COMO    1,1,SZR
14070 006114            EHALT

                        ;RELATIVE, +DISPL.
14071 020401            LDA     0,.+1
14072 024400            LDA     1,.+0
14073 100414            SUBO    0,1,SZR
14074 006114            EHALT

                        ;RELATIVE, -DISPL.
14075 020400            LDA     0,.+0
14076 024777            LDA     1,.-1
14077 100414            SUBO    0,1,SZR
14100 006114            EHALT

                        ;INDEX REG, +DISPL.
14101 030370            LDA     2,LO370 ;CONTENT=367
14102 155400            INC     2,3
14103 021001            LDA     0,1,2
14104 025400            LDA     1,0,3   ;ADDR=370
14105 100414            SUBO    0,1,SZR ;CONT=367
14106 006114            EHALT

                        ;INDEX REG, -DISPL.
14107 030370            LDA     2,LO370 ;CONTENT=367
14110 155400            INC     2,3
14111 021000            LDA     0,0,2
14112 025777            LDA     1,-1,3  ;ADDR=367
14113 100414            SUBO    0,1,SZR ;CONT=177777
14114 006114            EHALT

                        ;INDEX REG, +DISPL.
14115 030367            LDA     2,LO367 ;CONTENT=-1
14116 155400            INC     2,3
14117 021177            LDA     0,177,2
14120 025576            LDA     1,176,3 ;ADDR=176
14121 100414            SUBO    0,1,SZR ;CONT=377
14122 006114            EHALT
```

```
01
02                              ;INDEX REG, +DISPL.
03 14123 020370                 LDA     2,L0370 ;CONTENT=367
04 14124 034170                 LDA     3,L0170 ;CONTENT=166
05 14125 021200                 LDA     0,-200,2
06 14126 025401                 LDA     1,1,3   ;ADDR=167
07 14127 106414                 SUBO    0,1,SZR ;CONT=177400
08 14130 006114                 EHALT
09
10                              ;INDEX REG ABOVE PAGE ZERO
11 14131 034171                 LDA     3,L0171 ;CONTENT=VMEND (2422)
12 14132 177400                 INC     3,2
13 14133 025377                 LDA     1,-1,2
14 14134 021400                 LDA     0,0,3   ;ADDR=VMEND
15 14135 106414                 SUBO    0,1,SZR ;CONT=000101
16 14136 006114                 EHALT
17
18                              ;TEST OF JMP
19 14137 000402                 JMP     .+2
20 14140 006114                 EHALT           ;RELATIVE, +DISPL.
21
22 14141 000402                 JMP     .+2
23 14142 014142                 .               ;ADDR
24 14143 030377                 LDA     2,.-1
25 14144 155000                 MOV     2,3
26 14145 001005                 JMP     5,2
27 14146 006114                 EHALT           ;INDEX REG 2
28
29 14147 001407                 JMP     7,3
30 14150 006114                 EHALT           ;INDEX REG 3
31
32 14151 000036                 JMP     LOC36
33 14152 006114                 EHALT           ;PAGE ZERO
34
35                              ;AUTO INCR ADDR (OR DSZ)
36 14153 020172                 LDA     0,L0172
37 14154 040027                 STA     0,LOC27
38 14155 026027                 LDA     1,XLOC27
39 14156 014027                 DSZ     LOC27
40 14157 030027                 LDA     2,LOC27
41 14160 112414                 SUBO    0,2,SZR
42 14161 006114                 EHALT           ;ADDR=173 BEFORE COUNT
43 14162 021001                 LDA     0,1,2
44 14163 106414                 SUBO    0,1,SZR
45 14164 006114                 EHALT           ;CONT=174
46
47                              ;AUTO DECR ADDR (OR ISZ)
48 14165 020370                 LDA     0,L0370
49 14166 040037                 STA     0,LOC37
50 14167 026037                 LDA     1,ALOC37
51 14170 010037                 ISZ     LOC37
52 14171 030037                 LDA     2,LOC37
53 14172 112414                 SUBO    0,2,SZR
54 14173 006114                 EHALT           ;ADDR=367 BEFORE COUNT
55 14174 021377                 LDA     0,-1,2
56 14175 106414                 SUBO    0,1,SZR
57 14176 006114                 EHALT           ;CONT=135700
```

```
01
02                      ;TEST INDIRECT RELATIVE AND JSR RETURN ADDR
03 14177 020405         LDA     1,A.+5
04 14200 004405         JSR     .+5
05 14201 006114         EHALT
06 14202 000405         JMP     .+5
07 14203 014201         .-2             ;ADDR
08 14204 014203         .-1
09 14205 101000         MOV     3,0
10 14206 106414         SUBO    0,1,SZR
11 14207 006114         EHALT
12
13                      ;TEST INDIRECT PAGE ZERO TO PAGE ZERO
14 14210 022172         LDA     0,AL0172
15 14211 030173         LDA     2,L0173
16 14212 112414         SUBO    0,2,SZR
17 14213 006114         EHALT
18
19                      ;TEST INDIRECT INDEX TO PAGE ZERO
20 14214 030173         LDA     2,L0173
21 14215 034174         LDA     3,L0174
22 14216 027776         LDA     1,A-2,3
23 14217 132414         SUBO    1,2,SZR
24 14220 006114         EHALT
25
26                      ;TEST OF JMP INDIRECT
27 14221 030175         LDA     2,L0175
28 14222 020404         LDA     0,.+4
29 14223 041000         STA     0,0,2
30 14224 024406         LDA     1,.+6
31 14225 045001         STA     1,1,2
32 14226 002401         JMP     A.+1
33 14227 037601         037601          ;LDA 3,A-177,3 IF ERRONOUSLY PERFORMED.
34 14230 006114         EHALT
35 14231 000402         JMP     .+2     ;037601= JMP A.+1
36 14232 014233         .+1             ;037602= THIS ADDR
37
38                      ;TEST INDIRECT PAGE ZERO TO LOW MEM
39 14233 030171         LDA     2,L0171
40 14234 025000         LDA     1,0,2
41 14235 022171         LDA     0,AL0171 ;ADDR=VMEND (2422)
42 14236 106414         SUBO    0,1,SZR ;CONT=000101
43 14237 006114         EHALT
44
45                      ;TEST INDIRECT INDEX FROM HERE TO PAGE ZERO
46 14240 000403         JMP     .+3
47 14241 000173         L0173
48 14242 014241         .-1             ;ADDR
49 14243 030777         LDA     2,.-1   ;POINT TO L0172
50 14244 026172         LDA     1,AL0172
51 14245 023000         LDA     0,A0,2  ;ADDR=173
52 14246 106414         SUBO    0,1,SZR ;CONT=012345
53 14247 006114         EHALT
```

```
01
02                              ;TEST INDIRECT INDEX FROM HERE TO LOW MEM
03 14250 000403                 JMP     .+3
04 14251 014252                 .+1
05 14252 037601                 037601
06 14253 024366                 LDA     1,L0366
07 14254 044175                 STA     1,ALO175
08 14255 030774                 LDA     2,.-4
09 14256 023000                 LDA     0,A0,2  ;ADDR=037601
10 14257 100414                 SUB0    0,1,SZR ;CONT=135700
11 14260 000114                 EHALT
12
13                              ;TEST INDIRECT INDEX FROM HERE TO HERE
14 14261 000404                 JMP     .+4
15 14262 014263                 .+1
16 14263 014264                 .+1
17 14264 000000                 0               ;WORK ADDR
18 14265 024151                 LDA     1,TEPAT
19 14266 044776                 STA     1,.-2
20 14267 030773                 LDA     3,.-5
21 14270 023400                 LDA     0,A0,3  ;ADDR=RELATIVE -4
22 14271 100414                 SUB0    0,1,SZR ;CONT=052525 (TEPAT)
23 14272 000114                 EHALT
24
25                              ;TEST INDIRECT INDEX AUTO INCR ADDRESSING.
26 14273 000404                 JMP     .+4
27 14274 000027                 LOC27           ;TEST ADDR
28 14275 014275                 .               ;ADDR-1 OF DATA
29 14276 000173                 L0173           ;DATA
30 14277 024776                 LDA     1,.-2
31 14300 044027                 STA     1,LOC27 ;ADDR-1 OF DATA TO TEST ADDR
32 14301 030775                 LDA     2,.-5   ;AC2=LOC27 ADDR
33 14302 023000                 LDA     0,A0,2
34 14303 125400                 INC     1,1
35 14304 030027                 LDA     2,LOC27 ;ADDR OF DATA
36 14305 132414                 SUB0    1,2,SZR ;INDIRECT INDEX ADDRESSING OF LOC27
37 14306 000114                 EHALT           ;DON'T AUTO INCR ?
38 14307 025000                 LDA     1,0,2   ;DATA=173
39 14310 100414                 SUB0    0,1,SZR ;MULTILEVEL INDIRECT IF DATA = 012345
40 14311 000114                 EHALT
41
42                              ;TEST INDIRECT INDEX AUTO DECR ADDRESSING.
43 14312 000404                 JMP     .+4
44 14313 000036                 LOC36           ;TEST ADDR-1
45 14314 014315                 .+1             ;ADDR OF DATA
46 14315 000172                 L0172           ;DATA
47 14316 024776                 LDA     1,.-2
48 14317 131400                 INC     1,2
49 14320 050037                 STA     2,LOC37 ;ADDR+1 OF DATA TO TESTADDR
50 14321 030772                 LDA     3,.-6   ;AC3=LOC36 ADDR
51 14322 023401                 LDA     0,A1,3  ;A LOC37
52 14323 030037                 LDA     2,LOC37 ;ADDR OF DATA
53 14324 132414                 SUB0    1,2,SZR ;INDIRECT INDEX ADDRESSING OF LOC37
54 14325 000114                 EHALT           ;DON'T AUTO DECR ?
55 14326 025000                 LDA     1,0,2   ;DATA=172
56 14327 100414                 SUB0    0,1,SZR ;MULTILEVEL INDIRECT IF DATA = 173 ?
57 14330 000114                 EHALT
```

```
                        ;TEST THAT MEMORY EXTENSION FLAG IS CLEARED AFTER IORST.
14351 062677            ALRST           ;IORST, X-REFF LIST
14352 000401            SKPBZ   DEV1
14353 000114            EHALT           ;FLAG NOT CLEARED.

                        ;TEST THAT THE STATE OF BIT0 IS USED BEFORE COUNT OF AN
                        ;AUTO INCR LOCATION. BIT0 = 0 COUNTED TO 1 AND
                        ;MULTILEVEL INDIRECT ADDRESSING NOT DISABLED.
14354 062677            ALRST           ;IORST, X-REFF LIST, CLEAR MEM EXT FLAG.
14355 000403            JMP     .+3
14356 000000            00000           ;15 BIT ADDR AFTER COUNT
14357 177777            177777          ;ADDR TO COUNT
14360 020777            LDA     0,.-1
14361 040027            STA     0,LOC27
14362 034774            LDA     3,.-4
14363 027400            LDA     1,0,3
14364 032027            LDA     2,ALOC27 ;LOC0 = 002100 ?
14365 020027            LDA     0,LOC27 ;LOC 2100 = 040000 ?
14366 132414            SUBO    1,2,SZR ;LOC 100000 = 006007 ?
14367 000114            EHALT           ;A27 = 000000
                                        ;AC0=ADDR IN LOC27
                                        ;AC1=GOOD
                                        ;AC2=BAD

                        ;TEST THAT THE STATE OF BIT0 IS USED BEFORE COUNT OF AN
                        ;AUTO INCR LOCATION. BIT0 = 1 COUNTED TO 0 AND
                        ;MULTILEVEL INDIRECT ADDRESSING NOT DISABLED.
14370 062677            ALRST           ;IORST, X-REFF LIST, CLEAR MEM EXT FLAG.
14371 000403            JMP     .+3
14372 000000            00000           ;15 BIT ADDR AFTER COUNT
14373 177777            177777          ;ADDR TO COUNT
14374 020777            LDA     0,.-1
14375 040027            STA     0,LOC27
14376 034774            LDA     3,.-4
14377 027400            LDA     1,A0,3
14400 032027            LDA     2,ALOC27 ;LOC0 = 2100 ?
14401 020027            LDA     0,LOC27 ;LOC 2100 = 040000 ?
14402 132414            SUBO    1,2,SZR
14403 000114            EHALT           ;A27 = A0 = 2100
                                        ;AC0=ADDR IN LOC27
                                        ;AC1=GOOD
                                        ;AC2=BAD

                        ;NO TEST, ONLY LOOK FOR MEMSIZE.
14404 000402            JMP     .+2
14405 037600            037600          ;HMEND IF 16K WORDS MEM
14406 024777            LDA     1,.-1
14407 030075            LDA     2,HMEND ;XX7600
14410 132415            SUBO    1,2,SNR ;IS THERE 16K WORDS ONLY ?
14411 000431            JMP     A771    ;YES, PASS NEXT TESTS
```

```
01
02                              ;TEST THAT THE STATE OF BIT0 IS USED BEFORE COUNT OF AN
03                              ;AUTO DECR LOCATION. BIT0 = 1 COUNTED TO 0 AND
04                              ;MULTILEVEL INDIRECT ADDRESSING NOT DISABLED.
05 14376 062077                 ALRST           ;IORST, X-REFF LIST, CLEAR MEM EXT FLAG.
06 14375 000403                 JMP     .+3
07 14374 077777                 77777           ;15 BIT ADDR AFTER COUNT
08 14375 100000                 100000          ;ADDR TO COUNT
09 14376 020777                 LDA     0,.-1
10 14377 040037                 STA     0,LOC37
11 14400 034774                 LDA     3,.-4
12 14401 025400                 LDA     1,0,3
13 14402 032037                 LDA     2,ALOC37 ;LOC 706 = 034470 ?
14 14403 020037                 LDA     0,LOC37 ;LOC 077777 = 000706 ?
15 14404 132414                 SUBO    1,2,SZR
16 14405 006114                 EHALT           ;A37 = A77777 = 706
17                                              ;AC0=ADDR IN LOC27
18                                              ;AC1=GOOD
19                                              ;AC2=BAD
20
21                              ;TEST THAT THE STATE OF BIT0 IS USED BEFORE COUNT OF AN
22                              ;AUTO DECR LOCATION. BIT0 = 0 COUNTED TO 1 AND
23                              ;MULTILEVEL INDIRECT ADDRESSING NOT DISABLED.
24 14406 062077                 ALRST           ;IORST, X-REFF LIST, CLEAR MEM EXT FLAG.
25 14407 000403                 JMP     .+3
26 14410 077777                 77777           ;15 BIT ADDR AFTER COUNT
27 14411 000000                 000000          ;ADDR TO COUNT
28 14412 020777                 LDA     0,.-1
29 14413 040037                 STA     0,LOC37
30 14414 034774                 LDA     3,.-4
31 14415 025400                 LDA     1,0,3
32 14416 032037                 LDA     2,ALOC37 ;LOC 77777 = 000706 ?
33 14417 020037                 LDA     0,LOC37 ;LOC 706 = 034470 ?
34 14420 132414                 SUBO    1,2,SZR ;LOC 177777 = 006007 ?
35 14421 006114                 EHALT           ;A37 = 077777
36                                              ;AC0=ADDR IN LOC37
37                                              ;AC1=GOOD
38                                              ;AC2=BAD
39
40 14422 000113 A771:   LOOP            ;*******
```

```
                        ;*** TEST, ONLY LOOK FOR MEMSIZE.
14425 000401 A001:      JMP     .+1
14424 030075            LDA     2,[-100 ;XX760
14425 151112            SUBZL   2,2,SZC ;MORE THAN 32K WORDS ?
14426 000405            JMP     A99     ;YES, NEXT LOOP
14427 000401            JMP     A.+1    ;NO, PASS NEXT LOOP
14430 000103            HLT             ;IF A ISN'T WORKING THIS WORKS NOT AS
                                        ;NEW ADDR BUT AS THE INSTRUCTION ISZ AT ?

                        ;ADDRESSING TEST, SECOND PART OF A77.
                        ;THIS PART REMAINS MINIMUM 46K WORDS OF MEMORY.

14431 000401 A99:       JMP     .+1
14432 000111            SETP1           ;*******

                        ;INDEX REG ADDR HIGH MEM
14433 034371            LDA     3,HIGHI
14434 171400            INC     3,2
14435 021000            LDA     0,0,2
14436 025401            LDA     1,1,3   ;ADDR=AMULIN=100152
14437 106414            SUBO    0,1,SZR ;CONT=024414
14440 000114            EHALT

                        ;TEST INDIRECT PAGE ZERO TO HIGH MEM
14441 030177            LDA     2,LO177
14442 025000            LDA     1,0,2
14443 022177            LDA     0,@LO177 ;ADDR=AMULIN+1
14444 106414            SUBO    0,1,SZR ;CONT=161000
14445 000114            EHALT

                        ;TEST THAT BIT10 CHANGES, RELATIVE (PC-DISPL.)
                        ;TEST THAT BIT10 CHANGES, INDEX (AC2-DISPL.)
14446 000405            JMP     .+5
14447 020700            LDA     0,.-100
14450 001400            JMP     0,3
14451 077775            077775          ;NOT USED ADDR IN BINARY LOADER 32K.
14452 000100            100             ;ADDR ADD TO HIGH MEM
14453 030776            LDA     2,.-2
14454 024173            LDA     1,LO173
14455 045000            STA     1,0,2   ;ADDR 077775 = 012345
14456 020774            LDA     0,.-4
14457 113000            ADD     0,2
14460 020767            LDA     0,.-11
14461 041000            STA     0,1,2   ;ADDR 100075 = LDA 0,.-100
14462 020766            LDA     0,.-12
14463 041001            STA     0,1,2   ;ADDR 100076 = JMP 0,3
14464 005000            JSR     0,2
14465 106414            SUBO    0,1,SZR
14466 000114            EHALT           ;RELATIVE
14467 021300            LDA     0,-100,2
14470 106414            SUBO    0,1,SZR
14471 000114            EHALT           ;INDEX
```

```
                        ;TEST THAT BIT 15 CHANGES, RELATIVE (PC+DISPL.)
                        ;TEST THAT BIT 15 CHANGES, INDEX (AC2+DISPL.)
14472 [illegible]       JMP     .+5
14473 [illegible]       LDA     0,.+100
14474 [illegible]       JMP     0,3
14475 077775            077775          ;NOT USED ADDR IN BINARY LOADER 32K.
14476 [illegible]       100             ;ADDR ADD TO HIGH MEM
14477 [illegible]       LDA     2,.-2
14500 [illegible]       LDA     0,.-5
14501 [illegible]       STA     0,0,2   ;ADDR 077775 = LDA 0,.+100
14502 [illegible]       LDA     0,.-9
14503 041001            STA     0,1,2   ;ADDR 077776 = JMP 0,3
14504 034772            LDA     3,.-6
14505 157000            ADC     2,3
14506 024173            LDA     1,LOC173
14507 045400            STA     1,0,3   ;ADDR 100075 = 012345
14510 005000            JSR     0,2
14511 106414            SUBO    0,1,SZR
14512 006114            EHALT           ;RELATIVE
14513 021700            LDA     0,100,2
14514 106414            SUBO    0,1,SZR
14515 006114            EHALT           ;INDEX

                        ;TEST THAT INDIRECT ADDRESSING TO 32K+26 DON'T
                        ;AUTOINCREMENT THIS ADDR.
14516 000404            JMP     .+4
14517 100026            LOC26+100000    ;TEST ADDR
14520 014521            .+1             ;ADDR OF DATA
14521 000173            LOC173          ;DATA
14522 024770            LDA     1,.-2
14523 034774            LDA     3,.-4
14524 030170            LDA     2,LOC170
14525 050026            STA     2,LOC26
14526 045400            STA     1,0,3   ;ADDR OF DATA TO TEST ADDR
14527 023400            LDA     0,A0,3
14530 031400            LDA     2,0,3
14531 132414            SUBO    1,2,SZR
14532 006114            EHALT           ;ADDR IN 32K+26 CHANGED
14533 025000            LDA     1,0,2   ;DATA=173
14534 106414            SUBO    0,1,SZR ;LOC26 USED IF DATA = 177400
14535 006114            EHALT

                        ;TEST THAT INDIRECT ADDRESSING TO 32K+35 DON'T
                        ;AUTODECREMENT THIS ADDR.
14536 000404            JMP     .+4
14537 100035            LOC35+100000    ;TEST ADDR
14540 014541            .+1             ;ADDR OF DATA
14541 000172            LOC172          ;DATA
14542 024770            LDA     1,.-2
14543 034774            LDA     3,.-4
14544 030174            LDA     2,LOC174
14545 050035            STA     2,LOC35
14546 045400            STA     1,0,3   ;ADDR OF DATA TO TEST ADDR
14547 023400            LDA     0,A0,3
14550 031400            LDA     2,0,3
14551 132414            SUBO    1,2,SZR
14552 006114            EHALT           ;ADDR IN 32K+35 CHANGED
14553 025000            LDA     1,0,2   ;DATA=172
14554 106414            SUBO    0,1,SZR ;LOC35 USED IF DATA = 012345
14555 006114            EHALT
```

```
                        ;TEST THAT THE STATE OF BIT0 IS CHANGED WHEN COUNTING
                        ;IN AN AUTO INCR LOCATION. BIT0 = 0 COUNTED TO 1.
14556 000403            JMP     .+3
14557 100000            100000          ;16 BIT ADDR AFTER COUNT
14560 077777            077777          ;ADDR TO COUNT
14561 020777            LDA     0,.-1
14562 040027            STA     0,LOC27
14563 034774            LDA     3,.-4
14564 025400            LDA     1,0,3
14565 032027            LDA     2,ALOC27
14566 020027            LDA     0,LOC27 ;LOC0 = 002100 ?
14567 132414            SUBO    1,2,SZR ;LOC 100000 = 006007 ?
14570 006114            EHALT           ;A27 = 100000
                                        ;AC0=ADDR IN LOC27
                                        ;AC1=GOOD
                                        ;AC2=BAD

                        ;TEST THAT THE STATE OF BIT0 IS CHANGED WHEN COUNTING
                        ;IN AN AUTO INCR LOCATION. BIT0 = 1 COUNTED TO 0.
14571 000403            JMP     .+3
14572 000000            000000          ;16 BIT ADDR AFTER COUNT
14573 177777            177777          ;ADDR TO COUNT
14574 020777            LDA     0,.-1
14575 040027            STA     0,LOC27
14576 034774            LDA     3,.-4
14577 025400            LDA     1,0,3
14600 032027            LDA     2,ALOC27
14601 020027            LDA     0,LOC27 ;LOC0 = 2100 ?
14602 132414            SUBO    1,2,SZR ;LOC 2100 = 040000 ?
14603 006114            EHALT           ;A27 = 000000
                                        ;AC0=ADDR IN LOC27
                                        ;AC1=GOOD
                                        ;AC2=BAD

                        ;TEST THAT THE STATE OF BIT0 IS CHANGED WHEN COUNTING
                        ;IN AN AUTO DECR LOCATION. BIT0 = 1 COUNTED TO 0.
14604 000403            JMP     .+3
14605 077777            077777          ;16 BIT ADDR AFTER COUNT
14606 100000            100000          ;ADDR TO COUNT
14607 020777            LDA     0,.-1
14610 040037            STA     0,LOC37
14611 034774            LDA     3,.-4
14612 025400            LDA     1,0,3
14613 032037            LDA     2,ALOC37
14614 020037            LDA     0,LOC37 ;LOC 706 = 034470 ?
14615 132414            SUBO    1,2,SZR ;LOC 077777 = 000706 ?
14616 006114            EHALT           ;A37 = 077777
                                        ;AC0=ADDR IN LOC37
                                        ;AC1=GOOD
                                        ;AC2=BAD

                        ;NO TEST, ONLY LOOK FOR MEMSIZE.
14617 000402            JMP     .+2
14620 177600            177600          ;HMEND IF 64K WORDS MEM
14621 024777            LDA     1,.-1
14622 030075            LDA     2,HMEND ;XX7600
14623 132414            SUBO    1,2,SZR ;ARE THERE 64K WORDS ?
14624 000414            JMP     A991    ;NO, PASS NEXT TEST
```

```
                        ;TEST THAT THE STATE OF PITO IS CHANGED WHEN COUNTING
                        ;[illegible] PITO BACK LOCATION. BITO = 0 COUNTED TO 1.
14625 000403            JMP     .+3
14626 177777                    177777          ;TO HIT ADDR AFTER COUNT
14627 000000                    000000          ;ADDR TO COUNT
14630 024777            LDA     0,.-1
14631 040037            STA     0,LOC37
14632 034774            LDA     3,.-4
14633 025403            LDA     1,0,3
14634 042037            LDA     2,ALOC37        ;LOC 177777 = 000706 ?
14635 026037            LDA     0,LOC37         ;LOC 706 = 035447 ?
14636 132414            SUBO    1,2,SZR         ;LOC 177777 = 004007 ?
14637 000114            HALT                    ;A37 = 177777
                                                ;AC0=ADDR IN LOC37
                                                ;AC1=GOOD
                                                ;AC2=BAD
14640 000173 A991:      LOOP                    ;*******
```

```
01
02                              ;TEST OF INSTRUCTIONS PLACED BEYOND 32K WORLS MEMORY.
03                              ;TEST OF DISABLED MULTILEVEL INDIRECT ADDRESSING.
04 14641 000401 A02:    JMP     .+1
05 14642 006113 @       SETP    @0              ;*******
06 14643 020451         LDA     1,AA02L ;LAST ADDR DATA BUFFER
07 14644 030451         LDA     2,A025  ;START ADDR DATA BUFFER
08 14645 034413         LDA     3,A022  ;START ADDR DESTINATION
09 14646 021000 A020:   LDA     0,0,2
10 14647 041400         STA     0,0,3   ;MOVE DATA (INSTRUCTIONS)
11 14650 152415         SUBS    1,2,SNR ;LAST DATA ?
12 14651 000404         JMP     A021    ;YES
13 14652 151400         INC     2,2
14 14653 175400         INC     3,3     ;NEXT DATA ADDR
15 14654 000772         JMP     A020
16 14655 034464 A021:   LDA     3,A026
17 14656 174000         COM     3,3     ;AC3:=COMPLEMENT OF EXPECTED AFTER JSR
18 14657 006401         JSP     A.+1    ;IF FIRST LEVEL INDIRECT ADDR NOT
19 14660 100152 A022:   AMULIN          ;WORKING, THIS IS INSTR COM 0,0
20 14661 006114         EHALT           ;FIRST LEVEL INDIRECT FAILED
21 14662 006113         LOOP            ;*******
22 14663 000427         JMP     A0215   ;GIVE UP AND GO TO NEXT LOOP
23
24 14664 006114 A023:   EHALT           ;MULTILEVEL INDIRECT NOT DISABLED
25 14665 006113         LOOP            ;*******
26 14666 000424         JMP     A0215   ;GIVE UP AND GO TO NEXT LOOP
27
28 14667 006114 A0245:  EHALT           ;AC0=AC3 AFTER JSR, ADDR BIT0=0
29                                      ;AC1=EXPECTED
30 14670 006113         LOOP            ;*******
31 14671 000421         JMP     A0215   ;GIVE UP AND GO TO NEXT LOOP
32
33 14672 006114 A0244:  EHALT           ;AC0=AC3 AFTER JSR, ADDR BIT0=1
34                                      ;AC1=EXPECTED
35 14673 006113         LOOP            ;*******
36 14674 000416         JMP     A0215   ;GIVE UP AND GO TO NEXT LOOP
37
38 14675 054140 A0243:  STA     3,EHAC3
39 14676 006114         EHALT           ;ERROR IN ADDRESSING, SEE START OF A0216
40                                      ;EHAC3 WILL TELL WHERE (PC)
41 14677 006113         LOOP            ;*******
42 14700 000412         JMP     A0215   ;GIVE UP AND GO TO NEXT LOOP
43
44 14701 006114 A0242:  EHALT           ;AC0=? EXPECTED=1
45                                      ;STA, DSZ ADDR "AMULIN+X" FAILED, NO SKIP
46 14702 006113         LOOP            ;*******
47 14703 000407         JMP     A0215   ;GIVE UP AND GO TO NEXT LOOP
48
49 14704 006114 A0241:  EHALT           ;ISZ FAILED, SKIP PERFORMED
50 14705 006113         LOOP            ;*******
51 14706 000404         JMP     A0215   ;GIVE UP AND GO TO NEXT LOOP
52
53 14707 006114 A024:   EHALT           ;ISZ FAILED TO INCREMENT
54 14710 006113         LOOP            ;*******
55 14711 000401         JMP     A0215   ;GIVE UP AND/OR GO TO NEXT LOOP
56
57 14712 002401 A0215:  JMP     A.+1
58 14713 016103         A03             ;NEXT LOOP
59
60 14714 016102 A02L:   A0214
```

```
01
02                                  ;THESE INSTRUCTIONS ARE PLACED JUST ABOVE 32K WORDS.
03 14715 014716 A025:   .+1         ;ADDR OF INSTR TABLE
04 14716 000401         JMP   .+1   ;PLACED IN ADDR "AMULIN" (=100152)
05 14717 101000         MOV   3,0   ;TEST OF JMP AND MOV          +4   6
06 14720 002422         LDA   1,A026;TEST OF LDA
07 14721 122414         SUB0  1,0,SZR ;TEST OF AC3 AFTER JSR (BIT0=0)
08 14722 002423         JMP   AA027
09 14723 004401         JSR   .+1   ;TEST OF JSR
10 14724 101000         MOV   3,0
11 14725 024415         LDA   1,A027
12 14726 122414         SUB0  1,1,SZR ;TEST OF AC3 AFTER JSR (BIT0=1)
13 14727 002415         JMP   AA0210
14 14730 004422         JSR   A0216 ;PERFORM ADDRESS TEST LOOP
15 14731 002415         JMP   AAL2AE ;IF NO JSR JUMP PC WILL POINT TO JSR
16 14732 102520         SUBZL 0,0   ;AC0:=1
17 14733 040410         STA   0,A028
18 14734 014407         DSZ   A028  ;TEST OF STA AND DSZ
19 14735 002402         JMP   AA0211
20 14736 010413         ISZ   A0213 ;TEST OF ISZ
21 14737 002412         JMP   AA0213 ;OK,RETURN
22 14740 002410         JMP   AA0212 ;ERROR, SKIPPED
23 14741 014600 A026:   A022
24 14742 100160 A027:   AMULIN+6    ;POINT TO A025+7 INSTR HIGH MEM
25 14743 000000 A028:   0
26 14744 014607 A029:   A0245
27 14745 014672 A0210:  A0244
28 14746 014675 A02AE:  A0243
29 14747 014701 A0211:  A0242
30 14750 014704 A0212:  A0241
31 14751 014707 A0213:  A024
```

OK ON ASCII/BIN

```
                        ;EXPRESSION TEST TO INSURE THAT PROGRAMS CAN BE RUN
                        ;AFTER EXPLICIT MEMORY EXTENSION.
                        ;
                        ;THIS TEST IS PLACED IN 5 DIFFERENT PLACES:
                        ;       A PAGE ZERO     FOR TCP         LOC 200
                        ;       B LOW MEMORY    FOR TCP         TCPLO LOC 21365
                        ;       C HIGH MEMORY   FOR TCP         TCPHI LOC 100666
                        ;       D LOW, PART OF MAIN TEST:  A77 + A99 LOC 14061
                        ;       E HIGH, PART OF MAIN TEST:  A0216 LOC 100206

        100205 PLACE=.+0,-A0215-1   ;ACTUAL ADDR OF NEXT INSTR

14752 054372 A0216:     STA     3,HIGHR

                        ;LOW PAGE ZERO ADDR
14753 020010            LDA     0,LOC10 ;CONTENT=177777
14754 100014            COMO    0,0,SZR
14755 006771            JSR     AA02AE

                        ;HIGH PAGE ZERO ADDR
14756 024367            LDA     1,LO367 ;CONTENT=177777
14757 100714            COMO    1,1,SZR
14760 006766            JSR     AA02AE

                        ;RELATIVE, +DISPL.
14761 020401            LDA     0,.+1
14762 024400            LDA     1,.+0
14763 100414            SUBO    0,1,SZR
14764 006762            JSR     AA02AE

                        ;RELATIVE, -DISPL.
14765 020400            LDA     0,.+0
14766 024777            LDA     1,.-1
14767 100414            SUBO    0,1,SZR
14770 006756            JSR     AA02AE

                        ;INDEX REG, +DISPL.
14771 020370            LDA     2,LO37O ;CONTENT=367
14772 155400            INC     2,3
14773 021002            LDA     0,1,2
14774 025400            LDA     1,0,3   ;ADDR=37O
14775 100414            SUBO    0,1,SZR ;CONT=367
14776 006750            JSR     AA02AE

                        ;INDEX REG, -DISPL.
14777 020370            LDA     2,LO37O ;CONTENT=367
15000 155400            INC     2,3
15001 021000            LDA     0,0,2
15002 025777            LDA     1,-1,3  ;ADDR=367
15003 100414            SUBO    0,1,SZR ;CONT=177777
15004 006742            JSR     AA02AE

                        ;INDEX REG, +DISPL.
15005 020367            LDA     2,LO367 ;CONTENT=-1
15006 155400            INC     2,3
15007 021177            LDA     0,177,2
15010 025576            LDA     1,176,3 ;ADDR=176
15011 100414            SUBO    0,1,SZR ;CONT=377
15012 006734            JSP     AA02AE
```

```
                        ;INDEX REG, +DISPL.
15013 035075            LDA     2,LO375 ;CONTENT=367
15014 034175            LDA     3,LO175 ;CONTENT=100
15015 021200            LDA     0,-200,2
15016 002401            LDA     1,1,3   ;ADDR=167
15017 101414            SUBO    0,1,SZR ;CONT=177400
15020 000725            JSR     AAU2AE

                        ;INDEX REG ABOVE PAGE ZERO
15021 034171            LDA     3,LO171 ;CONTENT=VMEND (2422)
15022 171400            LOC     3,2
15023 025577            LDA     1,-1,2
15024 021400            LDA     0,0,3   ;ADDR=VMEND
15025 101414            SUBO    0,1,SZR ;CONT=000101
15026 000725            JSR     AAU2AE

                        ;TEST OF JMP
15027 000402            JMP     .+2
15030 000716            JSR     AAU2AE  ;RELATIVE, +DISPL.

15031 000402            JMP     .+2
15032 177600            AMULIA+.-AU25-1 ;       .               ;ADDR
15033 035777            LDA     2,.-1
15034 155000            MOV     2,3
15035 001005            JMP     5,2
15036 000710            JSR     AAU2AE  ;INDEX REG 2

15037 001407            JMP     7,3
15040 000706            JSR     AAU2AE  ;INDEX REG 3

15041 000036            JMP     LOC36
15042 000704            JSR     AAU2AE  ;PAGE ZERO

                        ;AUTO INCR ADDR (OR DSZ)
15043 020172            LDA     0,LO172
15044 040027            STA     0,LOC27
15045 020027            LDA     1,ALOC27
15046 014027            DSZ     LOC27
15047 030027            LDA     2,LOC27
15050 112414            SUBO    0,2,SZR
15051 000675            JSR     AAU2AE  ;ADDR=173 BEFORE COUNT
15052 021001            LDA     0,1,2
15053 101414            SUBO    0,1,SZR
15054 000672            JSR     AAU2AE  ;CONT=174

                        ;AUTO DECR ADDR (OR ISZ)
15055 020370            LDA     0,LO370
15056 040037            STA     0,LOC37
15057 020037            LDA     1,ALOC37
15060 010037            ISZ     LOC37
15061 030037            LDA     2,LOC37
15062 112414            SUBO    0,2,SZR
15063 000663            JSR     AAU2AE  ;ADDR=367 BEFORE COUNT
15064 021377            LDA     0,-1,2
15065 101414            SUBO    0,1,SZR
15066 000660            JSR     AAU2AE  ;CONT=135700
```

```
                        ;TEST T DIRECT RELATIVE AND JSR RETURN ADDR
15097 020405            LDA     1,A.+5
15098 000405            JSR     .+5
15099 000000            JSR     AAU2AE
15072 000405            JMP     .+5
15073 100525            AMULIN+.-2-AU25-1       ;       .-2             ;ADDR
15074 100527            AMULIN+.-1-AU25-1       ;       .-1
15075 151000            MOV     3,L
15076 100414            SUB0    0,1,SZR
15077 000047            JSR     AAU2AE
                        ;TEST INDIRECT PAGE ZERO TO PAGE ZERO
15100 022172            LDA     0,AL0172
15101 030173            LDA     2,L0173
15102 112414            SUB0    0,2,SZR
15103 000043            JSR     AAU2AE
                        ;TEST INDIRECT INDEX TO PAGE ZERO
15104 030173            LDA     2,L0173
15105 034174            LDA     3,L0174
15106 027775            LDA     1,A-2,3
15107 152414            SUB0    1,2,SZR
15110 000035            JSR     AAU2AE
                        ;TEST OF JMP INDIRECT
15111 030175            LDA     2,L0175
15112 020404            LDA     0,.+4
15113 041000            STA     0,0,2
15114 020406            LDA     1,.+6
15115 041001            STA     1,1,2
15116 002401            JMP     A.+1
15117 037601            037601          ;LDA 3,A-177,3 IF ERRONOUSLY PERFORMED.
15120 000026            JSR     AAU2AE
15121 000402            JMP     .+2     ;037601= JMP A.+1
15122 100357            AMULIN+.+1-AU25-1       ;       .+1 ;037602= THIS ADDR
                        ;TEST INDIRECT PAGE ZERO TO LOW MEM
15123 030171            LDA     2,L0171
15124 025000            LDA     1,0,2
15125 022171            LDA     0,AL0171 ;ADDR=VMEND (2422)
15126 100414            SUB0    0,1,SZR ;CONT=000101
15127 000017            JSR     AAU2AE
                        ;TEST INDIRECT INDEX FROM HERE TO PAGE ZERO
15130 000403            JMP     .+3
15131 000173            L0173
15132 100365            AMULIN+.-1-AU25-1       ;       .-1             ;ADDR
15133 030777            LDA     2,.-1   ;POINT TO L0172
15134 026172            LDA     1,AL0172
15135 023000            LDA     0,AL,2  ;ADDR=173
15136 100414            SUB0    0,1,SZR ;CONT=012345
15137 000007            JSR     AAU2AE
```

```
                        ;TEST INDIRECT INDEX FROM HERE TO LOW MEM
15143 000403            JMP     .+3
15144 100375            AMULIN+.+1-A025-1       ;       .+1
15145 037601            037601
15146 024000            LDA     1,L0000
15147 040175            STA     1,AL0175
15150 034774            LDA     2,.-4
15151 025000            LDA     0,AL,2  ;ADDR=037601
15152 100414            SUBO    0,1,SZR ;CONT=135700
15153 006511            JSR     AA02AF
                        ;TEST INDIRECT INDEX FROM HERE TO HERE
15154 000404            JMP     .+4
15155 100407            AMULIN+.+1-A025-1       ;       .+1
15156 100410            AMULIN+.+1-A025-1       ;       .+1
15157 000000            0                       ;WORK ADDR
15160 024151            LDA     1,TEPAT
15161 044776            STA     1,.-2
15162 034773            LDA     2,.-5
15163 025000            LDA     0,AL,2  ;ADDR=RELATIVE -4
15164 100414            SUBO    0,1,SZR ;CONT=052525 (TEPAT)
15165 006477            JSR     AA02AF
                        ;TEST INDIRECT INDEX AUTO INCR ADDRESSING.
15166 000404            JMP     .+4
15167 000027            LOC27                   ;TEST ADDR
15170 100421            AMULIN+.-A025-1         ;       . ;ADDR-1 OF DATA
15171 000173            L0173                   ;DATA
15172 024775            LDA     1,.-2
15173 044027            STA     1,LOC27 ;ADDR-1 OF DATA TO TEST ADDR
15174 034773            LDA     2,.-5   ;AC2=LOC27 ADDR
15175 025000            LDA     0,AL,2
15176 125400            INC     1,1
15177 050027            LDA     2,LOC27 ;ADDR OF DATA
15200 132414            SUBO    1,2,SZR ;INDIRECT INDEX ADDRESSING OF LOC27
15201 006465            JSR     AA02AF  ;DON'T AUTO INCR ?
15202 025000            LDA     1,0,2   ;DATA=173
15203 100414            SUBO    0,1,SZR ;MULTILEVEL INDIRECT IF DATA = 012345
15204 006463            JSR     AA02AF
                        ;TEST INDIRECT INDEX AUTO DECR ADDRESSING.
15205 000404            JMP     .+4
15206 000036            LOC36                   ;TEST ADDR-1
15207 100441            AMULIN+.+1-A025-1       ;       . ;ADDR OF DATA
15210 000172            L0172                   ;DATA
15211 024776            LDA     1,.-2
15212 131400            INC     1,2
15213 050037            STA     2,LOC37 ;ADDR+1 OF DATA TO TESTADDR
15214 034772            LDA     3,.-6   ;AC3=LOC36 ADDR
15215 023401            LDA     0,A1,3  ;A LOC37
15216 050037            LDA     2,LOC37 ;ADDR OF DATA
15217 132414            SUBO    1,2,SZR ;INDIRECT INDEX ADDRESSING OF LOC37
15220 006444            JSR     AA02AF  ;DON'T AUTO DECR ?
15221 025000            LDA     1,0,2   ;DATA=172
15222 100414            SUBO    0,1,SZR ;MULTILEVEL INDIRECT IF DATA = 173 ?
15223 006441            JSR     AA02AF
```

```
                                ;INDEX REG AFTER HIGH MEM
15221 034071                    LDA     3,.HIGH
15222 171400                    INC     3,2
15223 021000                    LDA     0,0,2
15224 025401                    LDA     1,1,3   ;ADDR=AMULIN=100152
15225 106414                    SUBO    0,1,SZR ;CONT=024414
15226 000433                    JSR     AA02AF
                                ;TEST INDIRECT PAGE ZERO TO HIGH MEM
15227 030177                    LDA     2,L0177
15230 025000                    LDA     1,0,2
15231 022177                    LDA     0,AL0177 ;ADDR=AMULIN+1
15232 106414                    SUBO    0,1,SZR ;CONT=161000
15233 000426                    JSR     AA02AF
                                ;TEST THAT BIT0 CHANGES, RELATIVE (PC-DISPL.)
                                ;TEST THAT BIT0 CHANGES, INDEX (AC2-DISPL.)
15234 000405                    JMP     .+5
15235 021700                    LDA     0,.-100
15236 001400                    JMP     0,3
077775                          .77775          ;NOT USED ADDR IN BINARY LOADER 32K.
000100                          100             ;ADDR ADD TO HIGH MEM
15241 030776                    LDA     2,.-2
15242 024173                    LDA     1,L0173
15243 045000                    STA     1,0,2   ;ADDR 077775 = 012345
15244 020774                    LDA     0,.-4
15245 113000                    ADD     0,2
15246 020767                    LDA     0,.-11
15247 041000                    STA     0,0,2   ;ADDR 100075 = LDA 0,.-100
15250 020766                    LDA     0,.-12
15251 041001                    STA     0,1,2   ;ADDR 100076 = JMP 0,3
15252 005000                    JSR     0,2
15253 106414                    SUBO    0,1,SZR
15254 006405                    JSR     AA02AF  ;RELATIVE
15255 021500                    LDA     0,-100,2
15256 106414                    SUBO    0,1,SZR
15257 006402                    JSR     AA02AF  ;INDEX

                                ;NO TEST, ONLY INDIRECT ERROR ADDR.
15260 000402                    JMP     .+2
15261 014675 AA02AF:            AC243
```

```
                        ;TEST THAT [illegible] CHANGES, RELATIVE (PC+DISPL.)
                        ;TEST THAT [illegible] CHANGES, INDEX (AC2+DISPL.)
15262 [illegible]       JMP     .+5
15263 [illegible]       LDA     0,.+100
15264 [illegible]       JMP     0,3
15265 077775            077775          ;NOT USED ADDR IN MINARY LOADER 32K.
15266 [illegible]       INC             ;ADDR ADD TO HIGH MEM
15267 030775            LDA     2,.-2
15270 020773            LDA     0,.-5
15271 041000            STA     0,0,2   ;ADDR 077775 = LDA 0,.+100
15272 020772            LDA     0,.-6
15273 041001            STA     0,1,2   ;ADDR 077776 = JMP 0,3
15274 034772            LDA     3,.-6
15275 157000            ADD     2,3
15276 024173            LDA     1,L0173
15277 045400            STA     1,0,3   ;ADDR 100075 = 012345
15300 005000            JSP     0,2
15301 106414            SUBO    0,1,SZR
15302 000757            JSR     AA02AF  ;RELATIVE
15303 021000            LDA     0,100,2
15304 106414            SUBO    0,1,SZR
15305 000754            JSR     AA02AF  ;INDEX

                        ;TEST THAT INDIRECT ADDRESSING TO 32K+26 DON'T
                        ;AUTOINCREMENT THIS ADDR.
15306 000404            JMP     .+4
15307 100026            LOC26+100000    ;TEST ADDR
15310 100543            AMULIN+.+1-AA25-1       ;       .+1 ;ADDR OF DATA
15311 000173            L0173           ;DATA
15312 024776            LDA     1,.-2
15313 034774            LDA     3,.-4
15314 030170            LDA     2,L0170
15315 030026            STA     2,LOC26
15316 045400            STA     1,0,3   ;ADDR OF DATA TO TEST ADDR
15317 023400            LDA     0,A0,3
15320 031400            LDA     2,0,3
15321 132414            SUBO    1,2,SZR
15322 000757            JSR     AA02AF  ;ADDR IN 32K+26 CHANGED
15323 025000            LDA     1,0,2   ;DATA=173
15324 106414            SUBO    0,1,SZR ;LOC26 USED IF DATA = 177400
15325 000754            JSP     AA02AF

                        ;TEST THAT INDIRECT ADDRESSING TO 32K+35 DON'T
                        ;AUTODECREMENT THIS ADDR.
15326 000404            JMP     .+4
15327 100035            LOC35+100000    ;TEST ADDR
15330 100563            AMULIN+.+1-AA25-1       ;       .+1 ;ADDR OF DATA
15331 000172            L0172           ;DATA
15332 024776            LDA     1,.-2
15333 034774            LDA     3,.-4
15334 030174            LDA     2,L0174
15335 030035            STA     2,LOC35
15336 045400            STA     1,0,3   ;ADDR OF DATA TO TEST ADDR
15337 023400            LDA     0,A0,3
15340 031400            LDA     2,0,3
15341 132414            SUBO    1,2,SZR
15342 000717            JSR     AA02AF  ;ADDR IN 32K+35 CHANGED
15343 025000            LDA     1,0,2   ;DATA=172
15344 106414            SUBO    0,1,SZR ;LOC35 USED IF DATA = 012345
15345 000714            JSR     AA02AF
```

```
                        ;TEST THAT THE STATE OF BIT0 IS CHANGED WHEN COUNTING
                        ;IN AN AUTO INCR LOCATION. BIT0 = 0 COUNTED TO 1.
15346 000403            JMP     .+3
15347 177777            177777          ;16 BIT ADDR AFTER COUNT
15350 077777            077777          ;ADDR TO COUNT
15351 020777            LDA     0,.-1
15352 040027            STA     0,LOC27
15353 034774            LDA     3,.-4
15354 025400            LDA     1,0,3
15355 032027            LDA     2,LOC27 ;LOC0 = 002100 ?
15356 020027            LDA     0,LOC27 ;LOC 2100 = 040000 ?
15357 132414            SUBO    1,2,SZR ;LOC 100000 = 000007 ?
15360 006701            JSR     AA02AF  ;A27 = 100000
                                        ;AC0=ADDR IN LOC27
                                        ;AC1=GOOD
                                        ;AC2=BAD

                        ;TEST THAT THE STATE OF BIT0 IS CHANGED WHEN COUNTING
                        ;IN AN AUTO INCR LOCATION. BIT0 = 1 COUNTED TO 0.
15361 000403            JMP     .+3
15362 000000            000000          ;16 BIT ADDR AFTER COUNT
15363 177777            177777          ;ADDR TO COUNT
15364 020777            LDA     0,.-1
15365 040027            STA     0,LOC27
15366 034774            LDA     3,.-4
15367 025400            LDA     1,0,3
15370 032027            LDA     2,LOC27
15371 020027            LDA     0,LOC27 ;LOC0 = 2100 ?
15372 132414            SUBO    1,2,SZR ;LOC 2100 = 040000 ?
15373 006655            JSR     AA02AF  ;A27 = 000000
                                        ;AC0=ADDR IN LOC27
                                        ;AC1=GOOD
                                        ;AC2=BAD

                        ;TEST THAT THE STATE OF BIT0 IS CHANGED WHEN COUNTING
                        ;IN AN AUTO DECR LOCATION. BIT0 = 1 COUNTED TO 0.
15374 000403            JMP     .+3
15375 077777            077777          ;16 BIT ADDR AFTER COUNT
15376 100000            100000          ;ADDR TO COUNT
15377 020777            LDA     0,.-1
15400 040037            STA     0,LOC37
15401 034774            LDA     3,.-4
15402 025400            LDA     1,0,3
15403 032037            LDA     2,LOC37
15404 020037            LDA     0,LOC37 ;LOC 706 = 034470 ?
15405 132414            SUBO    1,2,SZR ;LOC 077777 = 000706 ?
15406 006653            JSR     AA02AF  ;A37 = 077777
                                        ;AC0=ADDR IN LOC37
                                        ;AC1=GOOD
                                        ;AC2=BAD

                        ;NO TEST, ONLY LOOK FOR MEMSIZE.
15407 000402            JMP     .+2
15410 177600            177600          ;HMEND IF 64K WORDS MEM
15411 024777            LDA     1,.-1
15412 030075            LDA     2,HMEND ;XX7600
15413 132414            SUBO    1,2,SZR ;ARE THERE 64K WORDS ?
15414 000414            JMP     AD217   ;NO, PASS NEXT TEST
```

```
01
02                      ;TEST THAT THE STATE OF BIT0 IS CHANGED WHEN COUNTING
03                      ;IT AN AUTO CHECK LOCATION. BIT0 = 0 COUNTED TO 1.
04 15415 [illegible]    JMP     .+3
05 15416 177777                 177777          ;16 BIT ADDR AFTER COUNT
06 15417 [illegible]            [illegible]     ;ADDR TO COUNT
07 15420 [illegible]    LDA     0,.-1
08 15421 [illegible]    STA     0,LOC37
09 15422 [illegible]    LDA     3,.-4
10 15423 [illegible]    LDA     1,0,3
11 15424 [illegible]    LDA     2,LOC37 ;LOC 177777 = 000706 ?
12 15425 [illegible]    LDA     0,LOC37 ;LOC 706 = 034470 ?
13 15426 152414         SUBO    1,2,SZR ;LOC 177777 = 006037 ?
14 15427 000656         JSR     @ADDR   ;437 = 177777
15                                      ;AC0=ADDR IN LOC37
16                                      ;AC1=GOOD
17                                      ;AC2=BAD
18
19 15430 010372 A0217:  ISZ     HIGHR
20 15431 002372         JMP     @HIGHR  ;RETURN TO REST OF HIGH PLACED INSTR.
```

```
01
02                      ;AUTOMATIC TEST TO INSURE THAT PROGRAMS CAN BE RUN
03                      ;AFTER ENABLING MEMORY EXTENSION.
04
05                      ;THIS TEST IS PLACED IN 5 DIFFERENT PLACES:
06                      ;       A PAGE ZERO     FOR TCP         LOC 200
07                      ;       B LOW MEMORY    FOR TCP         TCPLO LOC 21563
08                      ;       C HIGH MEMORY   FOR TCP         TCPHI LOC 100666
09                      ;       D LOW, PART OF MAIN TEST:  A77 + A99 LOC 14061
10                      ;       E HIGH, PART OF MAIN TEST:  AU216 LOC 100206
11
12                      ;A,B AND C ARE DESIGNED TO USE WITH TCP 701 AND
13                      ;DEMANDS 64K WORDS OF MEMORY.
14                      ;EACH OF THE SMALL TESTPARTS CAN BE RUN SEPERATELY BY
15                      ;CHANGING THE FIRST INSTRUCTION IN THE NEXT TESTPART TO
16                      ; JMP .-X.
17                      ;EACH TIME RESET IS PRESSED THE FIRST START ADDR TO BE
18                      ;USED IS 375. IT WILL SET MEM EXT FLAG AND HALT. NOW IT
19                      ;IS POSSIBLE TO USE TCP 701 FOR EXAMINE, DEPOSIT AND
20                      ;START/CONTINUE IN ADDRESSES WITH BIT 0.
21
22          100666      TCPHI=AUULIN+.-AU25-1   ;ACTUAL ADDR OF NEXT INSTR
23
24                      ;LOW PAGE ZERO ADDR
25 15432 020010         LDA     0,LOC10 ;CONTENT=177777
26 15433 100014         COMO    0,0,SZR
27 15434 063077         HALT
28
29                      ;HIGH PAGE ZERO ADDR
30 15435 024367         LDA     1,LO367 ;CONTENT=177777
31 15436 124014         COMO    1,1,SZR
32 15437 063077         HALT
33
34                      ;RELATIVE, +DISPL.
35 15440 020401         LDA     0,.+1
36 15441 024400         LDA     1,.+0
37 15442 106414         SUBO    0,1,SZR
38 15443 063077         HALT
39
40                      ;RELATIVE, -DISPL.
41 15444 020400         LDA     0,.+0
42 15445 024777         LDA     1,.-1
43 15446 106414         SUBO    0,1,SZR
44 15447 063077         HALT
45
46                      ;INDEX REG, +DISPL.
47 15450 030370         LDA     2,LO370 ;CONTENT=367
48 15451 155400         INC     2,3
49 15452 021001         LDA     0,1,2
50 15453 025400         LDA     1,0,3   ;ADDR=370
51 15454 106414         SUBO    0,1,SZR ;CONT=367
52 15455 063077         HALT
53
54                      ;INDEX REG, -DISPL.
55 15456 030370         LDA     2,LO370 ;CONTENT=367
56 15457 155400         INC     2,3
57 15460 021000         LDA     0,0,2
58 15461 025777         LDA     1,-1,3  ;ADDR=367
59 15462 106414         SUBO    0,1,SZR ;CONT=177777
60 15463 063077         HALT
61
62                      ;INDEX REG, +DISPL.
63 15464 030367         LDA     2,LO367 ;CONTENT=-1
64 15465 155400         INC     2,3
65 15466 021177         LDA     0,177,2
66 15467 025576         LDA     1,176,3 ;ADDR=176
67 15470 106414         SUBO    0,1,SZR ;CONT=377
68 15471 063077         HALT
```

```
                        ;INDEX REG ABOVE PAGE ZERO
15500 034171            LDA     3,L0171 ;CONTENT=VMEND (2422)
15501 111400            INC     3,2
15502 025377            LDA     1,-1,2
15503 021400            LDA     0,0,3   ;ADDR=VMEND
15504 100414            SUBO    0,1,SZR ;CONT=000101
15505 063077            HALT
                        ;TEST OF JMP
15506 000402            JMP     .+2
15507 063077            HALT            ;RELATIVE, +DISPL.
15510 000402            JMP     .+2
15511 100745            ABSLIN+.-PG25-1 ;       .               ;ADDR
15512 030777            LDA     2,.-1
15513 125000            MOV     2,3
15514 000400            JMP     5,2
15515 063077            HALT            ;INDEX REG 2
15516 000407            JMP     7,3
15517 063077            HALT            ;INDEX REG 3
15520 000036            JMP     LOC36
15521 063077            HALT            ;PAGE ZERO
                        ;AUTO INCR ADDR (OR DSZ)
15522 020172            LDA     0,L0172
15523 040027            STA     0,LOC27
15524 026027            LDA     1,ALOC27
15525 014027            DSZ     LOC27
15526 030027            LDA     2,LOC27
15527 112414            SUBO    0,2,SZR
15530 063077            HALT            ;ADDR=173 BEFORE COUNT
15531 021001            LDA     0,1,2
15532 100414            SUBO    0,1,SZR
15533 063077            HALT            ;CONT=174
                        ;AUTO DECR ADDR (OR ISZ)
15534 020370            LDA     0,L0370
15535 040037            STA     0,LOC37
15536 026037            LDA     1,ALOC37
15537 010037            ISZ     LOC37
15540 030037            LDA     2,LOC37
15541 112414            SUBO    0,2,SZR
15542 063077            HALT            ;ADDR=367 BEFORE COUNT
15543 021377            LDA     0,-1,2
15544 100414            SUBO    0,1,SZR
15545 063077            HALT            ;CONT=135700
```

```
01
02                              ;TEST INDIRECT RELATIVE AND JSR RETURN ADDR
03 15545 020405                 LDA     1,4,+5
04 15547 004405                 JSR     .+5
05 15550 063077                 HALT
06 15551 000405                 JMP     .+5
07 15552 101004                 AMULIN+.-2-AD25-1       ;       .-2 ;ADDR
08 15553 101006                 AMULIN+.-1-AL25-1       ;       .-1
09 15554 161000                 MOV     3,0
10 15555 106414                 SUBO    0,1,SZR
11 15556 063077                 HALT
12
13                              ;TEST INDIRECT PAGE ZERO TO PAGE ZERO
14 15557 022172                 LDA     0,AL0172
15 15560 030173                 LDA     2,L0173
16 15561 112414                 SUBO    0,2,SZR
17 15562 063077                 HALT
18
19                              ;TEST INDIRECT INDEX TO PAGE ZERO
20 15563 030173                 LDA     2,L0173
21 15564 034174                 LDA     3,L0174
22 15565 027770                 LDA     1,A-2,3
23 15566 132414                 SUBO    1,2,SZR
24 15567 063077                 HALT
25
26                              ;TEST OF JMP INDIRECT
27 15570 030175                 LDA     2,L0175
28 15571 024404                 LDA     0,.+4
29 15572 041000                 STA     0,0,2
30 15573 024406                 LDA     1,.+6
31 15574 045001                 STA     1,1,2
32 15575 002401                 JMP     A.+1
33 15576 037601                 037601          ;LDA 3,A-177,3 IF ERRONOUSLY PERFORMED.
34 15577 063077                 HALT
35 15600 000402                 JMP     .+2     ;037601= JMP A.+1
36 15601 101036                 AMULIN+.+1-AD25-1       ;       .+1 ;037602= THIS ADDR
37
38                              ;TEST INDIRECT PAGE ZERO TO LOW MEM
39 15602 030171                 LDA     2,L0171
40 15603 025000                 LDA     1,0,2
41 15604 022171                 LDA     0,AL0171 ;ADDR=VMEND (2422)
42 15605 106414                 SUBO    0,1,SZR ;CONT=000101
43 15606 063077                 HALT
44
45                              ;TEST INDIRECT INDEX FROM HERE TO PAGE ZERO
46 15607 000403                 JMP     .+3
47 15610 000173                 L0173
48 15611 101044                 AMULIN+.-1-AD25-1       ;       .-1             ;ADDR
49 15612 030777                 LDA     2,.-1   ;POINT TO L0172
50 15613 026172                 LDA     1,AL0172
51 15614 023000                 LDA     0,AD,2  ;ADDR=173
52 15615 106414                 SUBO    0,1,SZR ;CONT=012345
53 15616 063077                 HALT
```

```
* 0155  .=A1?
01
02                      ;TEST INDIRECT INDEX FROM HERE TO LOW MEM
03 15627 000403         JMP     .+3
04 15630 101055         AMULIN+.+1-AU25-1       ;       .+1
05 15631 037601         037601
06 15632 024366         LDA     1,L0366
07 15633 046175         STA     1,AL0175
08 15634 030774         LDA     2,.-4
09 15635 025000         LDA     0,A0,2  ;ADDR=037601
10 15636 106414         SUBO    0,1,SZR ;CONT=135700
11 15637 063077         HALT
12
13                      ;TEST INDIRECT INDEX FROM HERE TO HERE
14 15640 000404         JMP     .+4
15 15641 101066         AMULIN+.+1-AU25-1       ;       .+1
16 15642 101067         AMULIN+.+1-AU25-1       ;       .+1
17 15643 000000         0                       ;WORK ADDR
18 15644 024151         LDA     1,TEPAT
19 15645 044776         STA     1,.-2
20 15646 034773         LDA     3,.-5
21 15647 025400         LDA     0,A0,3  ;ADDR=RELATIVE -4
22 15650 106414         SUBO    0,1,SZR ;CONT=052525 (TEPAT)
23 15651 063077         HALT
24
25                      ;TEST INDIRECT INDEX AUTO INCR ADDRESSING.
26 15652 000404         JMP     .+4
27 15653 000027         LOC27                   ;TEST ADDR
28 15654 101100         AMULIN+.-AU25-1 ;       .  ;ADDR-1 OF DATA
29 15655 000173         L0173                   ;DATA
30 15656 024776         LDA     1,.-2
31 15657 044027         STA     1,LOC27 ;ADDR-1 OF DATA TO TEST ADDR
32 15660 030773         LDA     2,.-5   ;AC2=LOC27 ADDR
33 15661 025000         LDA     0,A0,2
34 15662 125400         INC     1,1
35 15663 030027         LDA     2,LOC27 ;ADDR OF DATA
36 15664 132414         SUBO    1,2,SZR ;INDIRECT INDEX ADDRESSING OF LOC27
37 15665 063077         HALT            ;DON'T AUTO INCR ?
38 15666 025000         LDA     1,0,2   ;DATA=173
39 15667 106414         SUBO    0,1,SZR ;MULTILEVEL INDIRECT IF DATA = 012345
40 15670 063077         HALT
41
42                      ;TEST INDIRECT INDEX AUTO DECR ADDRESSING.
43 15671 000404         JMP     .+4
44 15672 000036         LOC36                   ;TEST ADDR-1
45 15673 101120         AMULIN+.+1-AU25-1       ;       .  ;ADDR OF DATA
46 15674 000172         L0172                   ;DATA
47 15675 024776         LDA     1,.-2
48 15676 131400         INC     1,2
49 15677 050037         STA     2,LOC37 ;ADDR+1 OF DATA TO TESTADDR
50 15700 034772         LDA     3,.-6   ;AC3=LOC36 ADDR
51 15701 023401         LDA     0,A1,3  ;A LOC37
52 15702 030037         LDA     2,LOC37 ;ADDR OF DATA
53 15703 132414         SUBO    1,2,SZR ;INDIRECT INDEX ADDRESSING OF LOC37
54 15704 063077         HALT            ;DON'T AUTO DECR ?
55 15705 025000         LDA     1,0,2   ;DATA=172
56 15706 106414         SUBO    0,1,SZR ;MULTILEVEL INDIRECT IF DATA = 173 ?
57 15707 063077         HALT
```

```
                        ;INDEX FLG ADDR HIGH MEM
15700 034571            LDA     3,.+171
15701 171400            INC     3,2
15702 021000            LDA     0,0,2
15703 023401            LDA     1,1,3   ;ADDR=AMULIN=100152
15704 106414            SUBO    0,1,SZR ;CONT=024414
15705 063077            HALT
                        ;TEST INDIRECT PAGE ZERO TO HIGH MEM
15706 034177            LDA     2,@177
15707 023000            LDA     1,0,2
15710 022177            LDA     0,@177  ;ADDR=AMULIN+1
15711 106414            SUBO    0,1,SZR ;CONT=161000
15712 063077            HALT

                        ;TEST THAT BIT0 CHANGES, RELATIVE (PC-DISPL.)
                        ;TEST THAT BIT0 CHANGES, INDEX (AC2-DISPL.)
15713 000405            JMP     .+5
15714 020700            LDA     0,.-100
15715 001400            JMP     0,3
15716 077775            077775          ;NOT USED ADDR IN BINARY LOADER 32K.
15717 000100            100             ;ADDR ADD TO HIGH MEM
15720 030776            LDA     2,.-2
15721 024173            LDA     1,@173
15722 045000            STA     1,0,2   ;ADDR 077775 = 012345
15723 020774            LDA     0,.-4
15724 113000            ADD     0,2
15725 020767            LDA     0,.-11
15726 041000            STA     0,0,2   ;ADDR 100075 = LDA 0,.-100
15727 020766            LDA     0,.-12
15730 041001            STA     0,1,2   ;ADDR 100076 = JMP 0,3
15731 005000            JSR     0,2
15732 106414            SUBO    0,1,SZR
15733 063077            HALT            ;RELATIVE
15734 021500            LDA     0,-100,2
15735 106414            SUBO    0,1,SZR
15736 063077            HALT            ;INDEX
```

```
                        ;TEST THAT WILL CHANGES, RELATIVE (PC+DISPL.)
                        ;TEST THAT STILL CHANGES, INDEX (AC2+DISPL.)
15737 020405            JMP     .+5
15740 024500            LDA     0,.+100
15741 041402            JSR     @3
15742 077775            077775          ;NOT USED ADDR IN BINARY LOADER 32K.
15743 000100            100             ;ADDR ADD TO HIGH MEM
15744 050776            LDA     2,.-2
15745 024775            LDA     1,.-3
15746 041000            STA     1,@2    ;ADDR 077775 = LDA 0,.+100
15747 020772            LDA     1,.-6
15750 041001            STA     0,1,2   ;ADDR 077776 = JMP 0,3
15751 054772            LDA     3,.-6
15752 157000            ADD     2,3
15753 024773            LDA     1,LO173
15754 045400            STA     1,0,3   ;ADDR 100075 = 012345
15755 005000            JSR     0,2
15756 106414            SUBO    0,1,SZR
15757 063077            HALT            ;RELATIVE
15760 021100            LDA     0,100,2
15761 106414            SUBO    0,1,SZR
15762 063077            HALT            ;INDEX

                        ;TEST THAT INDIRECT ADDRESSING TO 32K+26 DON'T
                        ;AUTOINCREMENT THIS ADDR.
15763 000404            JMP     .+4
15764 100026            LOC26+100000    ;TEST ADDR
15765 101222            ARULIN+.+1-AU25-1       ;       .+1 ;ADDR OF DATA
15766 000173            LO173           ;DATA
15767 024776            LDA     1,.-2
15770 054774            LDA     3,.-4
15771 050770            LDA     2,LO170
15772 050026            STA     2,LOC26
15773 045400            STA     1,0,3   ;ADDR OF DATA TO TEST ADDR
15774 023400            LDA     0,A0,3
15775 051400            LDA     2,0,3
15776 152414            SUBO    1,2,SZR
15777 063077            HALT            ;ADDR IN 32K+26 CHANGED
16000 025000            LDA     1,0,2   ;DATA=173
16001 106414            SUBO    0,1,SZR ;LOC26 USED IF DATA = 177400
16002 063077            HALT

                        ;TEST THAT INDIRECT ADDRESSING TO 32K+35 DON'T
                        ;AUTODECREMENT THIS ADDR.
16003 000404            JMP     .+4
16004 100035            LOC35+100000    ;TEST ADDR
16005 101242            ARULIN+.+1-AU25-1       ;       .+1 ;ADDR OF DATA
16006 000172            LO172           ;DATA
16007 024776            LDA     1,.-2
16010 054774            LDA     3,.-4
16011 050774            LDA     2,LO174
16012 050035            STA     2,LOC35
16013 045400            STA     1,0,3   ;ADDR OF DATA TO TEST ADDR
16014 023400            LDA     0,A0,3
16015 051400            LDA     2,0,3
16016 152414            SUBO    1,2,SZR
16017 063077            HALT            ;ADDR IN 32K+35 CHANGED
16020 025000            LDA     1,0,2   ;DATA=172
16021 106414            SUBO    0,1,SZR ;LOC35 USED IF DATA = 012345
16022 063077            HALT
```

```
                        ;TEST THAT THE STATE OF BIT0 IS CHANGED WHEN COUNTING
                        ;IN AN AUTO INCR LOCATION. BIT0 = 0 COUNTED TO 1.
16025 000403            JMP     .+3
16026 100000            100000          ;16 BIT ADDR AFTER COUNT
16027 177777            177777          ;ADDR TO COUNT
16030 020777            LDA     0,.-1
16031 040027            STA     0,LOC27
16032 034774            LDA     3,.-4
16033 025400            LDA     1,0,3
16034 032027            LDA     2,ALOC27
16035 020027            LDA     0,LOC27 ;LOC0 = 002100 ?
16036 132414            SUBO    1,2,SZR ;LOC 100000 = 006007 ?
16037 063077            HALT            ;A27 = 100000
                                        ;AC0=ADDR IN LOC27
                                        ;AC1=GOOD
                                        ;AC2=BAD

                        ;TEST THAT THE STATE OF BIT0 IS CHANGED WHEN COUNTING
                        ;IN AN AUTO INCR LOCATION. BIT0 = 1 COUNTED TO 0.
16040 000403            JMP     .+3
16041 000000            000000          ;16 BIT ADDR AFTER COUNT
16042 177777            177777          ;ADDR TO COUNT
16043 020777            LDA     0,.-1
16044 040027            STA     0,LOC27
16045 034774            LDA     3,.-4
16046 025400            LDA     1,0,3
16047 032027            LDA     2,ALOC27
16050 020027            LDA     0,LOC27 ;LOC0 = 2100 ?
16051 132414            SUBO    1,2,SZR ;LOC 2100 = 040000 ?
16052 063077            HALT            ;A27 = 000000
                                        ;AC0=ADDR IN LOC27
                                        ;AC1=GOOD
                                        ;AC2=BAD

                        ;TEST THAT THE STATE OF BIT0 IS CHANGED WHEN COUNTING
                        ;IN AN AUTO DECR LOCATION. BIT0 = 1 COUNTED TO 0.
16053 000403            JMP     .+3
16054 077777            077777          ;16 BIT ADDR AFTER COUNT
16055 100000            100000          ;ADDR TO COUNT
16056 020777            LDA     0,.-1
16057 040037            STA     0,LOC37
16060 034774            LDA     3,.-4
16061 025400            LDA     1,0,3
16062 032037            LDA     2,ALOC37
16063 020037            LDA     0,LOC37 ;LOC 706 = 034470 ?
16064 132414            SUBO    1,2,SZR ;LOC 077777 = 000706 ?
16065 063077            HALT            ;A37 = 077777
                                        ;AC0=ADDR IN LOC37
                                        ;AC1=GOOD
                                        ;AC2=BAD
```

```
                        ;TEST THAT THE STATE OF BIT0 IS CHANGED WHEN COUNTING
                        ;[illegible] BACK LOCATION. BIT0 = 0 COUNTED TO 1.
16004 000403            JMP     .+3
16005 177777                    177777          ;TO FILL ADDR AFTER COUNT
16006 000000                    000000          ;ADDR TO COUNT
16007 020177            LDA     0,.-1
16010 040037            STA     0,LOC37
16011 034774            LDA     3,.-4
16012 025400            LDA     1,0,3
16013 026037            LDA     2,@LOC37 ;LOC 177777 = 000706 ?
16014 026037            LDA     0,LOC37 ;LOC 706 = 034470 ?
16015 152414            SUBO    1,2,SZR ;LOC 177777 = 006007 ?
16016 006077            HALT            ;A37 = 177777
                                        ;AC0=ADDR IN LOC37
                                        ;AC1=GOOD
                                        ;AC2=BAD

16017 002401            JMP     A.+1
16020 160000            ISPHI           ;CHANGE TO 2224 IF YOU WANT TO GO BACK
                                        ;TO MAIN PROGRAM.

16021 161355 HIGHL:     AHULIN+.-A025-1 ;   .   ;THIS IS LAST ADDR

16022 016101 A0214:     .-1             ;ADDR OF LAST INSTR TO MOVE
                                        ;TO HIGH MEM.
```

```
01
02                              ;TEST OF CPU IDENTIFY COMMAND.
03 16103 000401 AU3:    JMP     .+1
04 16104 006112         SETP2           ;*******
05 16105 024422         LDA     1,AU31  ;CORRECT ANSWER
06 16106 025151         LDA     2,TEPAT ;AC2:=052525
07 16107 071002         DIA     2,DEV2  ;(CPU 711 - MIMA - AC8)
08 16110 060402         IDFY    0       ;READ CPU IDENT TO AC0
09 16111 115414         SUBO    0,1,SZR ;(IDFY = CPU 711 - MFMA - AC8)
10 16112 006114         EHALT           ;AC0=READ IDENT
11                                      ;AC1=EXPECTED
12 16113 060402         IDFY    1       ;READ CPU IDENT TO AC1
13 16114 106414         SUBO    0,1,SZR
14 16115 006114         EHALT           ;AC0=FIRST READ
15                                      ;AC1=SECOND READ
16 16116 070402         IDFY    2       ;READ CPU IDENT TO AC2
17 16117 112414         SUBO    0,2,SZR
18 16120 006114         EHALT           ;AC0=FIRST READ
19                                      ;AC2=THIRD READ
20 16121 074402         IDFY    3       ;READ CPU IDENT TO AC3
21 16122 165000         MOV     3,1
22 16123 106414         SUBO    0,1,SZR
23 16124 006114         EHALT           ;AC0=FIRST READ
24                                      ;AC1=FOURTH READ
25 16125 006113         LOOP            ;*******
26 16126 000402         JMP     AU4     ;NEXT LOOP
27 16127 000002 AU31:   2               ;CORRECT CPU IDENT
```

```
01
02                          ;TEST OF LOAD BYTE INSTR, RIGHT BYTE
03                          ;WITH ALL ONES STORED IN LEFT BYTE.
04 16150 000401 AU4:        JMP     .+1
05 16151 152520             SUBZL   2,2
06 16152 000112 AU41:       SETP2               ;*******
07 16153 034154             LDA     3,WORKA
08 16154 020150             LDA     0,MASKL
09 16155 145000             ADD     2,0
10 16156 041400             STA     0,0,3
11 16157 024154             LDA     1,WORKA
12 16160 125140             MOVOL   1,1
13 16161 062001             LDB     0
14 16162 112414             SUBO    0,2,SZR
15 16163 000114             EHALT               ;AC0=READ VALUE
16                                              ;AC1=BYTE POINTER
17                                              ;AC2=EXPECTED VALUE
18 16164 000113             LOOP                ;*******
19 16165 151120             MOVZL   2,2
20 16166 034147             LDA     3,MASKR
21 16167 173404             AND     3,2,SZR
22 16170 000762             JMP     AU41
23
24                          ;TEST OF LOAD BYTE INSTR, RIGHT BYTE
25                          ;WITH ALL ZEROES STORED IN LEFT BYTE.
26 16171 000401 AU5:        JMP     .+1
27 16172 152520             SUBZL   2,2
28 16173 000112 AU51:       SETP2               ;*******
29 16174 034155             LDA     3,WORKB
30 16175 051400             STA     2,0,3
31 16176 024155             LDA     1,WORKB
32 16177 125140             MOVOL   1,1
33 16200 062001             LDB     1
34 16201 112414             SUBO    0,2,SZR
35 16202 000114             EHALT               ;AC0=READ VALUE
36                                              ;AC1=BYTE POINTER
37                                              ;AC2=EXPECTED VALUE
38 16203 000113             LOOP                ;*******
39 16204 151120             MOVZL   2,2
40 16205 034147             LDA     3,MASKR
41 16206 173404             AND     3,2,SZR
42 16207 000764             JMP     AU51
```

```
01
02                              ;TEST OF LOAD BYTE INSTR, LEFT BYTE
03                              ;WITH ALL ONES STORED IN RIGHT BYTE.
04 16170 000401 AU6:    JMP     .+1
05 16171 030146         LDA     2,C400
06 16172 000112 AU61:   SETP2           ;*******
07 16173 034155         LDA     3,WORKB
08 16174 020147         LDA     0,MASKR
09 16175 143000         ADD     2,0
10 16176 041400         STA     0,0,3
11 16177 024155         LDA     1,WORKB
12 16200 125120         MOVZL   1,1
13 16201 072601         LDB     2
14 16202 101300         MOVS    0,0
15 16203 112414         SUBO    0,2,SZR
16 16204 000114         EHALT           ;AC0=READ VALUE
17                                      ;AC1=BYTE POINTER
18                                      ;AC2=EXPECTED VALUE
19 16205 000113         LOOP            ;*******
20 16206 151124         MOVZL   2,2,SZR
21 16207 000765         JMP     AU61
22
23                              ;TEST OF LOAD BYTE INSTR, LEFT BYTE
24                              ;WITH ALL ZEROES STORED IN RIGHT BYTE.
25 16210 000401 A07:    JMP     .+1
26 16211 030146         LDA     2,C400
27 16212 000112 A071:   SETP2           ;*******
28 16213 034154         LDA     3,WORKA
29 16214 051400         STA     2,0,3
30 16215 024154         LDA     1,WORKA
31 16216 125120         MOVZL   1,1
32 16217 076601         LDB     3
33 16220 101300         MOVS    0,0
34 16221 112414         SUBO    0,2,SZR
35 16222 000114         EHALT           ;AC0=READ VALUE
36                                      ;AC1=BYTE POINTER
37                                      ;AC2=EXPECTED VALUE
38 16223 000113         LOOP            ;*******
39 16224 151124         MOVZL   2,2,SZR
40 16225 000765         JMP     A071
```

```
                        ;TEST OF STORE BYTE INSTR, RIGHT BYTE
                        ;WITH ALL ONES STORED IN LEFT BYTE.
16226 000401 AU0:       JMP     .+1
16227 152500            SUBZL   0,0
16230 000112 AU01:      SETP2           ;*******
16231 034155            LDA     3,=CRRR
16232 025150            LDA     2,MASKL
16233 051400            STA     2,0,3
16234 024155            LDA     1,WORKR
16235 125140            MOVOL   1,1
16236 077201            STB     3
16237 113000            ADD     0,2
16240 025410            LDA     1,0,3
16241 146414            SUBO    2,1,SZR
16242 000114            EHALT           ;ACU=STORED BYTE
                                        ;AC1=MEM WORD CONTENT
                                        ;AC2=EXPECTED WORD
16243 000113            LOOP            ;*******
16244 125120            MOVZL   0,0
16245 034147            LDA     3,MASKR
16246 163404            AND     3,0,SZR
16247 000761            JMP     AU01

                        ;TEST OF STORE BYTE INSTR, RIGHT BYTE
                        ;WITH ALL ZEROES STORED IN LEFT BYTE.
16250 000401 AU9:       JMP     .+1
16251 152520            SUBZL   2,2
16252 000112 AU91:      SETP2           ;*******
16253 034154            LDA     3,WORKA
16254 102400            SUB     0,0
16255 041400            STA     0,0,3
16256 024154            LDA     1,WORKA
16257 125140            MOVOL   1,1
16260 020150            LDA     0,MASKL
16261 143000            ADD     2,0
16262 075201            STB     2
16263 025400            LDA     1,0,3
16264 146414            SUBO    2,1,SZR
16265 000114            EHALT           ;ACU=STORED BYTE
                                        ;AC1=MEM WORD CONTENT
                                        ;AC2=EXPECTED WORD
16266 000113            LOOP            ;*******
16267 151120            MOVZL   2,2
16270 034147            LDA     3,MASKR
16271 173404            AND     3,2,SZR
16272 000760            JMP     AU91
```

```
                        ;TEST OF STORE BYTE INSTR, LEFT BYTE
                        ;WITH ALL ONES STORED IN RIGHT BYTE.
A10:    JMP     .+1
        LDA     0,C400
A101:   SETP2           ;*******
        LDA     3,WORKA
        LDA     2,MASKA
        STA     2,0,3
        LDA     1,WORKA
        MOVZL   1,1
        MOVS    0,0
        STB     1
        MOVS    0,0
        LDA     1,0,3
        ADD     0,2
        SUBO    1,2,SZR
        EMALT           ;ACO=STORED BYTE
                        ;AC1=MEM WORD CONTENT
                        ;AC2=EXPECTED WORD
        LOOP            ;*******
        MOVZL   0,0,SZR
        JMP     A101

                        ;TEST OF STORE BYTE INSTR, LEFT BYTE
                        ;WITH ALL ZEROES STORED IN RIGHT BYTE.
A11:    JMP     .+1
        LDA     2,C400
A111:   SETP2           ;*******
        LDA     3,WORKB
        SUB     0,0
        STA     0,0,3
        LDA     1,WORKB
        MOVZL   1,1
        LDA     0,MASKB
        ADD     2,0
        MOVS    0,0
        STB     0
        MOVS    0,0
        LDA     1,0,3
        SUBO    2,1,SZR
        EMALT           ;ACO=STORED BYTE
                        ;AC1=MEM WORD CONTENT
                        ;AC2=EXPECTED WORD
        LOOP            ;*******
        MOVZL   2,2,SZR
        JMP     A111
```

```
01
02                              ;TEST OF BYTE MOVE COMMAND.
03 16340 001401 A12:    JMP     .+1
04 16341 020511         LDA     0,A125  ;INITIALIZE POINTER
05 16342 040021         STA     0,IDX1
06 16343 032021 A120:   LDA     2,AIDX1
07 16344 151015         MOVO    2,2,SNR
08 16345 002314         JMP     AA126   ;END THIS LOOP
09 16346 030141         STA     2,PARPO
10 16347 006111         SETP1           ;*******
11 16350 030141         LDA     2,PARPO
12 16351 021004         LDA     0,4,2   ;BYTE COUNT
13 16352 040145         STA     0,NTREX ;SET EXP 0 OF INTR'S
14 16353 020510         LDA     1,AA126 ;WORD ADDR DATA
15 16354 125120         MOVZL   1,1     ;BYTE ADDR DATA
16 16355 031002         LDA     2,2,2   ;BYTE ADDR SOURCE STRING
17 16356 006470         JSR     AA121   ;       ***GENERATE
18 16357 022505         LDA     0,AA129 ;CLEAR DATA
19 16360 030141         LDA     2,PARPO
20 16361 025003         LDA     1,3,2   ;BYTE ADDR DEST STRING
21 16362 032500         LDA     2,AA127 ;BYTE COUNT MAX
22 16363 006464         JSR     AA122   ;       ***CLEAR
23 16364 030141         LDA     2,PARPO
24 16365 050022         STA     2,IDX2
25 16366 022022         LDA     0,AIDX2 ;CONVERT ADDR
26 16367 026022         LDA     1,AIDX2 ;FROM ADDR (SOURCE)
27 16370 032022         LDA     2,AIDX2 ; TO  ADDR (DEST)
28 16371 030022         LDA     3,AIDX2 ;BYTE COUNT
29 16372 054137         STA     3,INAC3
30 16373 006143         JSR     AINTRL  ;INTERRUPT CONTROL
31
32 16374 076402         BMOVE   3       ;       ***BYTE MOVE COMMAND
33
34 16375 175014         MOVO    3,3,SZR
35 16376 006114         EHALT           ;AC3 <> 0 AFTER BMOVE
36 16377 034141         LDA     3,PARPO
37 16400 054023         STA     3,IDX3
38 16401 036023         LDA     3,AIDX3 ;CONVERT ADDR
39 16402 116414         SUBO    0,3,SZR
40 16403 006114         EHALT           ;AC0=CHANGED CONV ADDR AFTER BMOVE
41 16404 034141         LDA     3,PARPO
42 16405 035404         LDA     3,4,3   ;BYTE COUNT
43 16406 054140         STA     3,EHAC3
44 16407 022023         LDA     0,AIDX3 ;FROM ADDR (SOURCE)
45 16410 163000         ADD     3,0
46 16411 106414         SUBO    0,1,SZR
47 16412 006114         EHALT           ;AC0="FIRST FREE"
48                                      ;AC1=FROM ADDR AFTER BMOVE
49 16413 022023         LDA     0,AIDX3 ;TO ADDR (DEST)
50 16414 034140         LDA     3,EHAC3
51 16415 163000         ADD     3,0
52 16416 112414         SUBO    0,2,SZR
53 16417 006114         EHALT           ;AC0=FIRST FREE TO ADDR
54                                      ;AC2=TO ADDR AFTER BMOVE
55 16420 030141         LDA     2,PARPO
56 16421 050022         STA     2,IDX2
57 16422 022022         LDA     0,AIDX2 ;CONVERT ADDR
58 16423 026022         LDA     1,AIDX2 ;FROM ADDR (SOURCE)
59 16424 032022         LDA     2,AIDX2 ; TO  ADDR (DEST)
60 16425 036022         LDA     3,AIDX2 ;BYTE COUNT
```

```
01
02 16426 054402          STA     3,.+2
03 16427 000401          JSR     AA123   ;       ***COMPARE
04 16430 000001          1
05 16431 006114          EMALT           ;ACU=BYTE SOURCE STRING
06                                       ;AC1=BYTE DESTINATION STRING
07                                       ;AC2=DESTINATION BYTE ADDR
08 16432 022432          LDA     0,AA129 ;CLEAR DATA
09 16433 030141          LDA     2,PARP0
10 16434 025003          LDA     1,3,2   ;BYTE ADDR DEST STRING
11 16435 051004          LDA     2,4,2   ;BYTE COUNT
12 16436 000413          JSR     AA124   ;       ***CHECK HEAD/TAIL
13 16437 006114          EMALT           ;ACU=BYTE CLEAR PATTERN
14                                       ;AC1=BYTE DEST STRING
15                                       ;AC2=DEST BYTE ADDR
16 16440 020144          LDA     0,NTRLP ;CHECK NO OF INTR'S
17 16441 024145          LDA     1,NTREX
18 16442 100414          SUBS    0,1,SZR
19 16443 006114          EMALT           ;ACU=NO OF INTR'S
20                                       ;AC1=EXPECTED
21 16444 006113          LOOP            ;*******
22 16445 000675          JMP     A120    ;NEXT PARAM SET
23
24 16446 013074 A121:    GENEB
25 16447 013151 A122:    CLEAB
26 16450 013166 A123:    COMPB
27 16451 013043 A124:    RETAB
28 16452 016452 A125:    .               ;ADDR-1 OF PARAM SET
29 16453 016465          BMOV1
30 16454 016472          BMOV2
31 16455 016477          BMOV3
32 16456 016504          BMOV4
33 16457 016511          BMOV5
34 16460 000000          0
35 16461 016530 A126:    A13
36 16462 016516 A127:    BMOVL
37 16463 016517 A128:    BMOVD
38 16464 000006 A129:    PROIN           ;ADDR OF CLEAR DATA
```

```
                                                                    Page  4-1
01
02 16500 016500 BMOV1:  .                       ;ADDR-1 OF PARAM
03 16501 000000         0                       ;CONVERT ADDR
04 16502 044254         LASTP+LASTP+10          ;FROM ADDR
05 16503 044504         LASTP+LASTP+40+1        ;TO ADDR
06 16504 000001         1                       ;BYTE COUNT
07 16505 016505 BMOV2:  .
08 16506 000000         0
09 16507 044255         LASTP+LASTP+10+1
10 16510 044504         LASTP+LASTP+40
11 16511 000002         2
12 16512 016512 BMOV3:  .
13 16513 000000         0                       ;ADDR ADD:
14 16514 044254         LASTP+LASTP+10          ;  16K      32K      48K      64K
15 16515 044504         LASTP+LASTP+40          ;      0   100000   100000   100000
16 16516 000020         20
17 16517 016517 BMOV4:  .
18 16520 000000         0
19 16521 044255         LASTP+LASTP+10+1        ;      0   100000   100000   100000
20 16522 044504         LASTP+LASTP+40
21 16523 000017         17
22 16524 016524 BMOV5:  .
23 16525 013427         STABC
24 16526 044504         LASTP+LASTP+40          ;      0   100000   100000   100000
25 16527 044254         LASTP+LASTP+10          ;      0   100000   100000   100000
26 16530 000020         20
27 16531 000025 BMOVL:  20+5                    ;BYTE COUNT MAX, + UP TO 5 BYTES
28                                              ;BEFORE/AFTER STRING CLEARED.
29 16532 016533 BMOVD:  .+1                     ;ADDR OF DATA TO MOVE
30 16533 177777         177777
31 16534 000000         000000
32 16535 125252         125252
33 16536 052525         052525
34 16537 177400         177400
35 16540 000377         000377
36 16541 052400         052400
37 16542 000125         000125
```

```
                                ;TEST OF WORD MOVE COMMAND.
                        A13:    JMP     .+1
                                LDA     0,AA135 ;INITIALIZE POINTER
                                STA     0,IEA0
                        AA13:   LDA     2,AIDXL
                                MOVO    2,2,SNR
                                JMP     @AA136  ;END THIS LOOP
                                STA     2,PARPO
                                SETP1           ;*******
                                LDA     2,PARPO
                                LDA     0,1,2   ;WORD COUNT
                                STA     0,NTREX ;SET EXP 0 OF INTP'S
                                LDA     1,AA138 ;WORD ADDR DATA
                                LDA     2,2,2   ;WORD ADDR SOURCE STRING
                                JSR     @AA131  ;       ***GENERATE
                                LDA     0,@AA139 ;CLEAR DATA
                                LDA     2,PARPO
                                LDA     1,3,2   ;WORD ADDR DEST STRING
                                LDA     2,@AA137 ;WORD COUNT MAX
                                JSR     @AA132  ;       ***CLEAR
                                LDA     2,PARPO
                                STA     2,IDX1
                                LDA     0,AIDX1 ;WORD COUNT
                                LDA     1,AIDX1 ;FROM ADDR (SOURCE)
                                LDA     2,AIDX1 ;TO ADDR (DEST)
                                LDA     3,A1311 ;NOT USED PATTERN
                                STA     3,INAC3
                                JSR     AINTRL  ;INTERRUPT CONTROL

                        WMOVE   3       ;       ***WORD MOVE COMMAND

                                STA     3,EHAC3
                                MOVO    0,0,SZR
                                EHALT           ;ACU<>0 AFTER WMOVE
                                LDA     0,PARPO
                                STA     0,IDX1
                                LDA     3,AIDX1 ;WORD COUNT
                                STA     3,A1310
                                LDA     0,AIDX1 ;FROM ADDR (SOURCE)
                                ADD     3,0
                                SUBO    0,1,SZR
                                EHALT           ;ACU="FIRST FREE" FROM ADDR
                                                ;AC1=FROM ADDR AFTER WMOVE
                                LDA     0,AIDX1 ;TO ADDR (DEST)
                                LDA     3,A1310
                                ADD     3,0
                                SUBO    0,2,SZR
                                EHALT           ;ACO="FIRST FREE" TO ADDR
                                                ;AC2=TO ADDR AFTER WMOVE
                                LDA     0,EHAC3
                                LDA     1,A1311
                                SUBO    0,1,SZR
                                EHALT           ;ACO=AC3 AFTER WMOVE
                                                ;AC1=EXPECTED OLD AC3
```

```
                                                                    Page  2
01
02 16613 053141          LDA     2,PARPO
03 16611 050121          STA     2,TDX1
04 16612 022021          LDA     0,AIDX1 ;WORD COUNT
05 16613 026121          LDA     1,AIDX1 ;FROM ADDR (SOURCE)
06 16614 052021          LDA     2,AIDX1 ;TO ADDR (DEST)
07 16615 000427          JSR     @A135   ;       ***COMPARE
08 16616 060114          EMALT           ;AC0=WORD SOURCE STRING
09                                       ;AC1=WORD DEST STRING
10                                       ;AC2=DEST WORD ADDR
11 16617 022434          LDA     0,@A139 ;CLEAR DATA
12 16620 053141          LDA     2,PARPO
13 16621 025003          LDA     1,3,2   ;WORD ADDR DEST STRING
14 16622 051001          LDA     2,1,2   ;WORD COUNT
15 16623 000413          JSR     @A134   ;       ***CHECK HEAD/TAIL
16 16624 060114          EMALT           ;AC0=WORD CLEAR PATTERN
17                                       ;AC1=WORD DEST STRING
18                                       ;AC2=DEST WORD ADDR
19 16625 020144          LDA     0,NTRLP ;CHECK NO OF INTR'S
20 16626 024145          LDA     1,NTPEX
21 16627 100414          SUBO    0,1,SZR
22 16630 000114          EMALT           ;AC0=NO OF INTR'S
23                                       ;AC1=EXPECTED
24 16631 000113          LOOP            ;*******
25 16632 000701          JMP     A130    ;NEXT PARAM SET
26
27 16633 015062 A131:    GENEW
28 16634 015120 A132:    CLEAN
29 16635 015151 A133:    COMPW
30 16636 015050 A134:    RETAN
31 16637 016037 A135:    .               ;ADDR=1 OF PARAM SET
32 16640 016056          WMOV1
33 16641 016064          WMOV2
34 16642 016066          WMOV3
35 16643 016072          WMOV4
36 16644 016076          WMOV5
37 16645 016102          WMOV6
38 16646 016106          WMOV7
39 16647 000000          0
40 16650 016124 A136:    A14
41 16651 016712 A137:    WMOVL
42 16652 016713 A138:    WMOVD
43 16653 000006 A139:    PROIN           ;ADDR OF CLEAR DATA
44 16654 000000 A1310:   0               ;IMI. STORE
45 16655 012345 A1311:   012345          ;NOT USED PATTERN
```

```
                                        ;ADDR=1 OF PARAM
                        1               ;WORD COUNT
                        LASTP+44        ;FROM ADDR
                        LASTP+50+1      ;TO ADDR
                        .
                        2
                        LASTP+44+1
                        LASTP+50
                        .
                        10              ;ADDR ADD:
                        LASTP+44        ;  16K      32K      48K      64K
                        LASTP+50        ;      0    40000   100000   140000
                        .
                        7
                        LASTP+44+1      ;      0    40000   100000   140000
                        LASTP+50
                        .
                        10
                        LASTP+50        ;      0    40000   100000   140000
                        LASTP+44        ;      0    40000   100000   140000
                        .
                        10
                        LASTP+44+1      ;      0    40000   100000   100000
                        LASTP+50+1      ;      0    40000    40000    40000
                        .
                        10
                        LASTP+44        ;      0    40000    40000    40000
                        LASTP+50+1      ;      0    40000   100000   100000
                        10+2            ;WORD COUNT MAX + 2 WORDS CLEARED
                        .+1             ;ADDR OF DATA TO MOVE
                        177777
                        000000
                        125252
                        052525
                        063146
                        146314
                        031463
                        014631
```

```
                        ;TEST OF SEARCH ITEM, NO ITEMS.
16724 000401 A14:       JMP     .+1
16725 000142            JSR     AXCTRL  ;       ***GENERATE CHAINS
16726 020155            LDA     0,A144
16727 040021            STA     0,IDX0
16730 020151            LDA     1,A145
16731 040040            STA     1,LOC40
16732 030021 A140:      LDA     2,@IDX0 ;ADDR OF CHAIN ADDR
16733 151013            MOVO    2,2,SNR
16734 000435            JMP     A15     ;END THIS LOOP
16735 100400            SUB     0,0
16736 040145            STA     0,NTREX ;SET EXP. 0 OF INTRS
16737 031000            LDA     2,0,2   ;ADDR OF CHAIN
16740 030141            STA     2,PARP0
16741 000112            SETP2           ;*******
16742 021432            LDA     0,A141  ;NOT USED PATTERN
16743 021141            LDA     1,PARP0 ;ADDR OF CHAIN
16744 030432            LDA     2,A145  ;ADDR OF NAME
16745 034430            LDA     3,A142  ;NOT USED PATTERN
16746 054137            STA     3,INAC3
16747 000143            JSR     @INTFL  ;INTERRUPT CONTROL

16750 066002            SEARCH  1       ;       ***SEARCH ITEM COMMAND

16751 054140            STA     3,EHAC3
16752 151014            MOVO    2,2,SZR
16753 000114            EHALT           ;AC2<>0 AFTER SEARCH
16754 030141            LDA     2,PARP0
16755 132414            SUBO    1,2,SZR
16756 000114            EHALT           ;AC1=CHANGED CHAIN ADDR
                                        ;AC2=EXPECTED
16757 030415            LDA     2,A141
16760 112414            SUBO    0,2,SZR
16761 000114            EHALT           ;AC0=CHANGED PATTERN
                                        ;AC1=CHAIN ADDR
                                        ;AC2=EXPECTED PATTERN
16762 020140            LDA     0,EHAC3
16763 030420            LDA     2,A145
16764 112414            SUBO    0,2,SZR
16765 000114            EHALT           ;AC0=AC3 AFTER SEARCH
                                        ;AC1=CHAIN ADDR
                                        ;AC2=EXPECTED AC3=LOC40
16766 020144            LDA     0,NTKLP ;CHECK NO OF INTRS
16767 024143            LDA     1,NTREX
16770 100414            SUBO    0,1,SZR
16771 000114            EHALT           ;AC0=NO OF INTRS
                                        ;AC1=EXPECTED
16772 000113            LOOP            ;*******
16773 000737            JMP     A140    ;NEXT PARAM
```

```
01
02 16774 042104 A141:   042104
03 16775 010421 A142:   010421
04 16776 016777 A143:   .+1                ;ADDR OF NAME
05       000001         .TXTM 1
06                      .TXT !NONAME!
   16777 047117
   17000 047101
   17001 046505
   17002 000000
07       000000         .TXTM 0
08 17003 017003 A144:   .                  ;ADDR-1 OF PARAM
09 17004 012257         SCHA1-1            ;ADDR OF CHAIN ADDR
10 17005 012272         SCHA2-1
11 17006 012305         SCHA3-1
12 17007 012320         SCHA4-1
13 17010 000000         0
14 17011 107070 A145:   107070             ;LOC 40 CONTENT
```

```
01
02                              ;TEST OF SEARCH ITEM, NOT FOUND.
03 17042 000401 A15:    JMP     .+1
04 17043 006142         JSR     AXGIPL  ;       ***GENERATE CHAINS
05 17044 020454         LDA     0,A154
06 17045 040020         STA     0,IDX0
07 17046 024455         LDA     1,A156
08 17047 044040         STA     1,LOC40
09 17050 032020 A150:   LDA     2,AIDX0 ;ADDR OF NAME
10 17051 151015         MOVO    2,2,SNR
11 17052 000552         JMP     A16     ;END THIS LOOP
12 17053 050141         STA     2,PARP0
13 17054 025375         LDA     1,-3,2
14 17055 044145         STA     1,NTREX ;SET EXP # OF INTRS
15 17056 027376         LDA     1,A-2,2 ;CHAIN ADDR
16 17057 044440         STA     1,A153
17 17060 027377         LDA     1,A-1,2 ;LAST ITEM ADDR
18 17061 044451         STA     1,A155
19 17062 000111         SETP1           ;*******
20 17063 020452         LDA     0,A151  ;NOT USED PATTERN
21 17064 024435         LDA     1,A153  ;ADDR OF CHAIN
22 17065 030141         LDA     2,PARP0 ;ADDR OF NAME
23 17066 034450         LDA     3,A152  ;NOT USED PATTERN
24 17067 054137         STA     3,INAC3
25 17070 006143         JSR     AINTRL  ;INTERRUPT CONTROL
26
27 17071 072602         SEARCH  2       ;       ***SEARCH ITEM COMMAND
28
29 17072 054140         STA     3,EHAC3
30 17073 151014         MOVO    2,2,SZR
31 17074 000114         EHALT           ;AC2<>0 AFTER SEARCH
32 17075 030435         LDA     2,A155
33 17076 132414         SUBO    1,2,SZR
34 17077 006114         EHALT           ;AC1=BAD LAST ITEM ADDR
35                                      ;AC2=EXPECTED
36 17100 030415         LDA     2,A151
37 17101 112414         SUBO    0,2,SZR
38 17102 006114         EHALT           ;AC0=CHANGED AC0 AFTER SEARCH
39                                      ;AC1=LAST ITEM ADDR
40                                      ;AC2=EXPECTED OLD AC0
41 17103 020140         LDA     0,EHAC3
42 17104 030427         LDA     2,A156
43 17105 112414         SUBO    0,2,SZR
44 17106 006114         EHALT           ;AC0=AC3 AFTER SEARCH
45                                      ;AC1=LAST ITEM ADDR
46                                      ;AC2=EXPECTED AC3=LOC40
47 17107 020144         LDA     0,NTRLF ;CHECK NO OF INTRS
48 17110 024145         LDA     1,NTREX
49 17111 106414         SUBO    0,1,SZR
50 17112 006114         EHALT           ;AC0=NO OF INTRS
51                                      ;AC1=EXPECTED
52 17113 006113         LOOP            ;*******
53 17114 000734         JMP     A150    ;NEXT PARAM
```

```
01
02 17065 021042 A151:   021042
03 17066 104210 A152:   104210
04 17067 000000 A153:   0                       ;CHAIN ADDR
05 17070 017070 A154:   .                       ;ADDR-1 OF PARAM
06 17071 017107         SEAR1                   ;NAME ADDR
07 17072 017116         SEAR2
08 17073 017125         SEAR3
09 17074 017134         SEAR4
10 17075 017143         SEAR5
11 17076 017152         SEAR6
12 17077 017161         SEAR7
13 17100 017170         SEAR8
14 17101 000000         0
15 17102 000000 A155:   0                       ;LAST ITEM ADDR
16 17103 070707 A156:   070707                  ;LOC 40 CONTENT
17
18       000001         .TXTM 1
19 17104 000024         24                      ;EXP NO OF INTRS
20 17105 012333         SCHA5-1                 ;ADDR OF CHAIN ADDR
21 17106 012330         SCHA5-4                 ;ADDR OF LAST ITEM ADDR
22                SEAR1: .TXT !UU<377><377><40><40>!
   17107 052525
   17110 177777
   17111 020040
   17112 000000
23 17113 000024         24
24 17114 012333         SCHA5-1
25 17115 012330         SCHA5-4
26                SEAR2: .TXT !UU<377><377>AA!
   17116 052525
   17117 177777
   17120 040501
   17121 000000
27 17122 000024         24
28 17123 012333         SCHA5-1
29 17124 012330         SCHA5-4
30                SEAR3: .TXT !UU<377><377>HI!
   17125 052525
   17126 177777
   17127 044111
   17130 000000
31 17131 000024         24
32 17132 012333         SCHA5-1
33 17133 012330         SCHA5-4
34                SEAR4: .TXT !<325>U<377><373><40><40>!
   17134 152525
   17135 177773
   17136 020040
   17137 000000
```

```
                                    24
                                    SCHA5=1
                                    SCHA5=4
                    SEAR5:          .TXT !UU<375><377>AA!
                                    24
                                    SCHA6=1
                                    SCHA6=4
                    SEAR6:          .TXT !UU<U><U><40><40>!
                                    24
                                    SCHA6=1
                                    SCHA6=4
                    SEAR7:          .TXT !UU<U><U>AA!
                                    24
                                    SCHA6=1
                                    SCHA6=4
                    SEAR8:          .TXT !UU<U><U>HI!
                                    .TXTM 0
```

```
01
02                              ;TEST OF SEARCH ITEM, FOUND.
03 17174 000401 A16:    JMP     .+1
04 17175 000142         JSR     AXNIPL  ;       ***GENERATE CHAINS
05 17176 020462         LDA     0,A164
06 17177 040020         STA     0,IDXD
07 17200 024471         LDA     1,A166
08 17201 044040         STA     1,LOC40
09 17202 032020 A160:   LDA     2,AIDXD ;ADDR OF NAME
10 17203 151015         MOVO    2,2,SNR
11 17204 000550         JMP     A17     ;END THIS LOOP
12 17205 030141         STA     2,PARPD
13 17206 025374         LDA     1,-4,2
14 17207 044145         STA     1,NTREX ;SET EXP D OF INTRS
15 17210 027375         LDA     1,A-3,2 ;CHAIN ADDR
16 17211 044446         STA     1,A163
17 17212 025376         LDA     1,-2,2  ;ITEM ADDR
18 17213 037377         LDA     3,A-1,2 ;ADDR ADD
19 17214 157000         ADD     1,3
20 17215 054455         STA     3,A165
21 17216 030555         LDA     2,A168
22 17217 157000         ADD     2,3
23 17220 054532         STA     3,A167  ;ITEM ADDR+6
24 17221 000112         SETP2           ;*******
25 17222 020435         LDA     0,A161  ;NOT USED PATTERN
26 17223 024434         LDA     1,A163  ;ADDR OF CHAIN
27 17224 030141         LDA     2,PARPD ;ADDR OF NAME
28 17225 034431         LDA     3,A162  ;NOT USED PATTERN
29 17226 054137         STA     3,INAC3
30 17227 000143         JSR     AINTRL  ;INTERRUPT CONTROL
31
32 17230 076002         SEARCH  3       ;       ***SEARCH ITEM COMMAND
33
34 17231 054140         STA     3,EHAC3
35 17232 034520         LDA     3,A167
36 17233 136414         SUBD    1,3,SZR
37 17234 000114         EHALT           ;AC1=ADDR OF 3. ELEMENT OF NAME SEARCHED
38                                      ;FOR, NOT CORRECT
39 17235 024420         LDA     1,A161
40 17236 106414         SUBD    0,1,SZR
41 17237 000114         EHALT           ;AC0=CHANGED AC0 AFTER SEARCH
42                                      ;AC1=EXPECTED OLD AC0
43                                      ;AC2=ITEM ADDR
44 17240 024430         LDA     1,A165
45 17241 132414         SUBD    1,2,SZR
46 17242 000114         EHALT           ;AC1=EXPECTED ITEM ADDR
47                                      ;AC2=BAD ITEM ADDR
48 17243 020140         LDA     0,EHAC3
49 17244 030425         LDA     2,A166
50 17245 112414         SUBD    0,2,SZR
51 17246 000114         EHALT           ;AC0=AC3 AFTER SEARCH
52                                      ;AC2=EXPECTED AC3=LOC40
53 17247 020144         LDA     0,NTRLF ;CHECK NO OF INTRS
54 17250 024145         LDA     1,NTREX
55 17251 106414         SUBD    0,1,SZR
56 17252 000114         EHALT           ;AC0=NO OF INTRS
57                                      ;AC1=EXPECTED
58 17253 000113         LOOP            ;*******
59 17254 000726         JMP     A160    ;NEXT PARAM
```

```
01
02 17255 031403 A1O1:   031403
03 17256 146314 A1O2:   146314
04 17257 000000 A1O3:   0                ;ADDR OF CHAIN
05 17260 017261 A1O4:   .                ;ADDR-1 OF PARAM
06 17261 017270         SEAC1            ;NAME ADDR
07 17262 017316         SEAC2
08 17263 017340         SEAC3
09 17264 017325         SEAC4
10 17265 017350         SEAC5
11 17266 017346         SEAC6
12 17267 000000         0                ;END OF TABLE
13 17270 000000 A1O5:   0                ;ADDR OF ITEM TO FIND.
14 17271 100770 A1O6:   100770           ;LOC 40 CONTENT
15
16       000001         .TXTM 1
17 17272 000005         5                ;EXP NO OF INTRS
18 17273 012333         SCHA5-1          ;ADDR OF CHAIN ADDR
19 17274 022561         LASTP+457        ;ADDR OF ITEM TO FIND
20 17275 000163         ADAM2            ;ADDR ADD
21                SEAC1: .TXT !UU<377><357><40><40>!
   17276 052525
   17277 177757
   17300 020040
   17301 000000
22 17302 000011         11
23 17303 012333         SCHA5-1
24 17304 022741         LASTP+617
25 17305 000165         ADAM3
26                SEAC2: .TXT !UU<376><377>AA!
   17306 052525
   17307 177377
   17310 040501
   17311 000000
27 17312 000023         23
28 17313 012333         SCHA5-1
29 17314 022501         LASTP+357
30 17315 000164         ADAM1
31                SEAC3: .TXT !UU<252><252>HI!
   17316 052525
   17317 125252
   17320 044111
   17321 000000
32 17322 000005         5
33 17323 012502         SCHA6-1
34 17324 023511         LASTP+1367
35 17325 000166         ADAM3
36                SEAC4: .TXT !UU<0><010><40><40>!
   17326 052525
   17327 000010
   17330 020040
   17331 000000
```

```
01
02 17352 000015                13
03 17353 012562                SCHAR=1
04 17354 023551                LASTP+1227
05 17355 000165                ADDR2
06                     SEAC5:  .TXT !UU<2><0>AA!
   17356 052525
   17357 001000
   17360 044501
   17361 000000
07 17362 000021                21
08 17363 012562                SCHAR=1
09 17364 023151                LASTP+1007
10 17365 000164                ADDR1
11                     SEAC6:  .TXT !UU<2UU><0>HI!
   17366 052525
   17367 100000
   17370 044111
   17371 000000
12          000000             .TXT= 0
13
14 17372 000000 A167:  J                  ;ADDR OF ITEM+6=ADDR OF 3. NAME ELEMENT
15 17373 000006 A16R:  6                  ;ITEM ADDR ADD
```

```
                        ;TEST OF SEARCH FREE, NO FREE ITEMS.
17354 000401 A171:      JMP     .+1
17355 000142            JSR     AX*IRL  ;       ***GENERATE CHAINS
17356 020454            LDA     0,A174
17357 040020            STA     0,IDX0
17360 032023 A173:      LDA     2,AIDX0 ;ADDR OF FIRST ITEM
17361 151015            MOVO    2,2,SNR
17362 000465            JMP     A18     ;END THIS LOOP
17363 056027            LDA     3,AIDX0 ;ADDR ADD
17364 025403            LDA     1,0,3
17365 155000            ADD     1,2
17366 050141            STA     2,PARP0
17367 032023            LDA     2,AIDX0 ;ADDR OF LAST ITEM ADDR
17370 025003            LDA     1,0,2   ;LAST ITEM ADDR
17371 044455            STA     1,A175
17372 026020            LDA     1,AIDX0
17373 044145            STA     1,NTREX ;SET EXP # OF INTRS
17374 000112            SETP2           ;*******
17375 020432            LDA     0,A171  ;NOT USED PATTERN
17376 024432            LDA     1,A172  ;NOT USED PATTERN
17377 050141            LDA     2,PARP0 ;ADDR OF FIRST ITEM
17400 054431            LDA     3,A175  ;NOT USED PATTERN
17401 054137            STA     3,INAC3
17402 000145            JSR     AINTRL  ;INTERRUPT CONTROL

17403 056702            SFREE   1       ;       ***SEARCH FREE COMMAND

17404 054140            STA     3,EHAC3
17405 151014            MOVO    2,2,SZR
17406 000114            EHALT           ;AC2<>0 AFTER SFREE
17407 050420            LDA     2,A171
17410 112414            SUB0    0,2,SZR
17411 000114            EHALT           ;AC0=CHANGED AC0 AFTER SFREE
                                        ;AC2=EXPECTED OLD AC0
17412 050416            LDA     2,A172
17413 132414            SUB0    1,2,SZR
17414 000114            EHALT           ;AC1=CHANGED AC1 AFTER SFREE
                                        ;AC2=EXPECTED OLD AC1
17415 030414            LDA     2,A173
17416 024140            LDA     1,EHAC3
17417 132414            SUB0    1,2,SZR
17420 000114            EHALT           ;AC1=CHANGED AC3 AFTER SFREE
                                        ;AC2=EXPECTED OLD AC3
17421 020144            LDA     0,NTRLF ;CHECK NO OF INTRS
17422 024145            LDA     1,NTREX
17423 106414            SUB0    0,1,SZR
17424 000114            EHALT           ;AC0=NO OF INTRS
                                        ;AC1=EXPECTED
17425 000113            LOOP            ;*******
17426 000732            JMP     A170    ;NEXT PARAM
```

```
01
02 17427 111111 A171:   111111
03 17430 022222 A172:   022222
04 17431 044444 A173:   044444
05 17432 017432 A174:   .                ;ADDR-1 OF PARAM
06 17433 022341         LASTP+217        ;FIRST ITEM ADDR
07 17434 070103         ADA#0            ;ADDR ADD
08 17435 012350         SCHA5-4          ;ADDR OF LAST ITEM ADDR
09 17436 000023         23               ;EXP NO OF INTRS
10 17437 023411         LASTP+1257
11 17440 000103         ADA#2
12 17441 012357         SCHA6-4
13 17442 000022         22
14 17443 000000         0
15 17444 000000 A175:   0                ;LAST ITEM ADDR
```

```
01
02                              ;TEST OF SEARCH FREE, FOUND.
03 17445 000401  A180:          JMP     .+1
04 17445 006142                 JSP     AINIPL  ;       ***GENERATE CHAINS
05 17447 020457                 LDA     0,A184
06 17451 041021                 STA     0,ILAC
07 17451 020420  A180:          LDA     0,AIDX0 ;ADDR OF FIRST ITEM
08 17452 101013                 MOVO    0,0,SNR
09 17453 000470                 JMP     A19     ;END THIS LOOP
10 17454 030021                 LDA     3,AIDX0 ;ADDR ADD
11 17455 020401                 LDA     1,0,3
12 17456 135000                 ADD     1,2
13 17457 030141                 STA     2,PAPP0
14 17460 020021                 LDA     1,AIDX0 ;ITEM ADDR
15 17461 030020                 LDA     3,AIDX0 ;ADDR ADD
16 17462 031401                 LDA     2,0,3
17 17463 135000                 ADD     1,2
18 17464 030456                 STA     2,A185
19 17465 032020                 LDA     2,AIDX0
20 17466 030145                 STA     2,NTREX ;SET EXP 0 OF INTRS
21 17467 006112                 SETP2           ;*******
22 17470 020435                 LDA     0,A181  ;NOT USED PATTERN
23 17471 024435                 LDA     1,A182  ;NOT USED PATTERN
24 17472 030141                 LDA     2,PAPP0 ;ADDR OF FIRST ITEM
25 17473 034432                 LDA     3,A183  ;NOT USED PATTERN
26 17474 034137                 STA     3,INAC3
27 17475 006145                 JSR     AINTRL  ;INTERRUPT CONTROL
28
29 17476 072702                 SFREE   2       ;       ***SEARCH FREE COMMAND
30
31 17477 034140                 STA     3,EHAC3
32 17500 034423                 LDA     3,A181
33 17501 116414                 SUBO    0,3,SZR
34 17502 006114                 EHALT           ;AC0=CHANGED ACC AFTER SFREE
35                              ;A181=EXPECTED OLD AC0
36 17503 020437                 LDA     0,A185
37 17504 112414                 SUBO    0,2,SZR
38 17505 006114                 EHALT           ;AC0=EXPECTED ITEM ADDR
39                              ;AC2=BAD ITEM ADDR
40 17506 020416                 LDA     0,A182
41 17507 106414                 SUBO    0,1,SZR
42 17510 006114                 EHALT           ;AC0=EXPECTED OLD AC1
43                              ;AC1=CHANGED AC1 AFTER SFREE
44                              ;AC2=ITEM ADDR
45 17511 020414                 LDA     0,A183
46 17512 024140                 LDA     1,EHAC3
47 17513 106414                 SUBO    0,1,SZR
48 17514 006114                 EHALT           ;AC0=EXPECTED OLD AC3
49                              ;AC1=CHANGED AC3 AFTER SFREE
50                              ;AC2=ITEM ADDR
51 17515 020144                 LDA     0,NTRLF ;CHECK NO OF INTRS
52 17516 024145                 LDA     1,NTREX
53 17517 106414                 SUBO    0,1,SZR
54 17520 006114                 EHALT           ;AC0=NO OF INTRS
55                              ;AC1=EXPECTED
56 17521 006113                 LOOP            ;*******
57 17522 000727                 JMP     A180    ;NEXT PARAM
```

```
.01
02 17523 066666 A181:   066666          ;NOT USED PATTERNS
03 17524 155555 A182:   155555
04 17525 133333 A183:   133333
05 17526 017520 A184:   .               ;ADDR-1 OF PARAM
06 17527 022721         LASTP+577       ;FIRST ITEM ADDR
07 17530 000166         ADAM3           ;ADDR ADD
08 17531 022721         LASTP+577       ;ADDR OF ITEM TO FIND
09 17532 000166         ADAM3           ;ADDR ADD
10 17533 000000         0               ;EXP NO OF INTRS
11 17534 023231         LASTP+1107
12 17535 000164         ADAM1
13 17536 023251         LASTP+1127
14 17537 000163         ADAM0
15 17540 000001         1
16 17541 000000         0
17 17542 000000 A185:   0               ;ADDR OF ITEM TO FIND
```

```
                                ;TEST OF PROCESS LINK.
17543 [illegible] A194:  JMP     .+1
17544 102400             SUB     0,0
17545 [illegible]        STA     0,INTEX ;SET EXP C OF INTPS
17546 024474             LDA     0,A193
17547 [illegible]        STA     0,INTXC
17550 [illegible] A193:  JSR     AXNLPL  ;        ***GENERATE CHAINS
17551 [illegible]        LDA     2,@INTXC ;ADDR OF HEAD ADDR
17552 151013             DSZ     2,2,SKP
17553 000515             JMP     .+2     ;END THIS LOOP
17554 021000             LDA     2,0,2   ;HEAD ADDR
17555 050141             STA     2,PARPO
17556 021001             LDA     0,1,2   ;OLD PREV.HEAD
17557 040505             STA     0,A194
17560 050020             LDA     3,@INTXC ;ADDR OF ELEMENT NEW ADDR
17561 035400             LDA     3,0,3   ;ELEM.NEW ADDR
17562 054503             STA     3,A195
17563 000111             SETP1           ;*******
17564 000142             JSR     AXNLPL  ;        ***GENERATE CHAINS
17565 020453             LDA     0,A191  ;NOT USED PATTERN
17566 024141             LDA     1,PARPO ;ADDR OF HEAD
17567 030476             LDA     2,A195  ;ADDR OF ELEMENT
17570 034451             LDA     3,A192  ;NOT USED PATTERN
17571 054157             STA     3,INTAC3
17572 000145             JSR     AINTRL  ;INTERRUPT CONTROL
17573
17573 077002             LINK    3       ;        ***PROCESS LINK COMMAND
17574
17574 054140             STA     3,EHAC3
17575 136414             SUBO    1,3,SZR
17576 006114             EHALT           ;AC1=HEAD ADDR SPECIFIED
17577                                    ;AC3=HEAD ADDR USED, SEE EHAC3 PAGE ZERO
17577 054141             LDA     3,PARPO
17600 136414             SUBO    1,3,SZR
17601 006114             EHALT           ;AC1=HEAD ADDR SPECIFIED AFTER
17602                                    ;AC3=HEAD ADDR SPEC BEFORE COMMAND,
17602                                    ;        SEE PARPO IN PAGE ZERO
17602 024465             LDA     1,A195
17603 132414             SUBO    1,2,SZR
17604 006114             EHALT           ;AC1=ELEMENT ADDR SPEC BEFORE
17605                                    ;AC2=ELEMENT ADDR SPEC AFTER COMMAND
17605 024457             LDA     1,A194
17606 100414             SUBO    0,1,SZR
17607 006114             EHALT           ;AC0=OLD PREV.HEAD AFTER COMMAND
17610                                    ;AC1=OLD PREV.HEAD BEFORE
17610 030454             LDA     2,A194
17611 021000             LDA     0,0,2
17612 024455             LDA     1,A195
17613 100414             SUBO    0,1,SZR
17614 006114             EHALT           ;AC0=ELEM.LEFT POINTER TO ELEM.NEW
17615                                    ;AC1=EXPECTED, ADDR OF ELEM.NEW
17615 030141             LDA     2,PARPO
17616 021001             LDA     0,1,2
17617 100414             SUBO    0,1,SZR
17620 006114             EHALT           ;AC0=HEAD POINTER TO ELEM.NEW
17621                                    ;AC1=EXPECTED, ADDR OF ELEM.NEW
```

```
01
02 17621 030444          LDA     2,A195
03 17622 021000          LDA     0,0,2
04 17623 024141          LDA     1,DESED
05 17624 106414          SUBO    0,1,SZR
06 17625 006114          EHALT                   ;ACO=ELEM.NEW POINTER TO HEAD
07                                               ;AC1=EXPECTED, ADDR OF HEAD
08 17626 021001          LDA     0,1,2
09 17627 024135          LDA     1,A194
10 17630 106414          SUBO    0,1,SZR
11 17631 006114          EHALT                   ;ACO=ELEM.NEW POINTER TO ELEM.LEFT
12                                               ;AC1=EXPECTED, ADDR OF ELEM.LEFT
13 17632 020144          LDA     0,GTNLF ;CHECK NO OF INTRS
14 17633 024145          LDA     1,NTNEX
15 17634 106414          SUBO    0,1,SZR
16 17635 006114          EHALT                   ;ACO=NO OF INTRS
17                                               ;AC1=EXPECTED
18 17636 006113          LOOP                    ;*******
19 17637 000711          JMP     A190    ;NEXT PARAM
20
21 17640 123456 A191:    123456
22 17641 012345 A192:    012345
23 17642 017642 A193:    .                       ;ADDR-1 OF PARAM
24 17643 012257          SCHA1-1                 ;ADDR OF HEAD ADDR
25 17644 012272          SCHA2-1                 ;ADDR OF NEW ELEMENT ADDR
26 17645 012305          SCHA3-1
27 17646 012320          SCHA4-1
28 17647 012320          SCHA4-1
29 17650 012257          SCHA1-1
30 17651 012272          SCHA2-1
31 17652 012305          SCHA3-1
32 17653 012335          SCHA5-1
33 17654 012272          SCHA2-1
34 17655 012335          SCHA5-1
35 17656 012305          SCHA3-1
36 17657 012562          SCHA6-1
37 17660 012320          SCHA4-1
38 17661 012562          SCHA6-1
39 17662 012257          SCHA1-1
40 17663 000000          0
41 17664 000000 A194:    0                       ;ELEM.LEFT ADDR
42 17665 000000 A195:    0                       ;ELEM.NEW ADDR
```

```
                        ;TEST OF PROCESS REMOVE.
17636 000401 A20:       JMP     .+1
17637 102400            SUB     0,0
17640 040145            STA     0,INTREX ;SET EXP 0 OF INTRS
17641 020477            LDA     0,A204
17642 040021            STA     0,IDXU
17643 000142 A200:      JSR     @AXMIPL  ;       ***GENERATE CHAINS
17644 032020            LDA     2,@IDXU  ;ADDR OF ELEMENT
17645 151413            MOVZ    2,2,SNR
17646 000512            JMP     A21      ;END THIS LOOP
17647 030120            LDA     3,A1DXU  ;ADDR ADD
17650 025400            LDA     1,0,3
17651 153000            ADD     1,2
17652 050141            STA     2,PARPO
17653 021000            LDA     0,0,2    ;NEXT.ELEM
17654 040502            STA     0,A205
17655 021001            LDA     0,1,2    ;PREV.ELEM
17656 040501            STA     0,A206
17657 006111            SETP1            ;*******
17660 006142            JSR     @AXMIPL  ;       ***GENERATE CHAINS
17661 020454            LDA     0,A201   ;NOT USED PATTERN
17662 024454            LDA     1,A202   ;NOT USED PATTERN
17663 050141            LDA     2,PARPO  ;ADDR OF ELEMENT TO REMOVE
17664 034455            LDA     3,A203   ;NOT USED PATTERN
17665 054157            STA     3,INAC3
17666 006143            JSR     @AINTRL  ;INTERRUPT CONTROL
                        
17667 077102            REMOV   3        ;       ***PROCESS REMOVE COMMAND

17670 054140            STA     3,EHAC3
17671 034445            LDA     3,A202
17672 156414            SUBO    1,3,SZR
17673 006114            EHALT            ;AC1=CHANGED AC1 AFTER REMOV
                                         ;A202=EXPECTED
17674 024465            LDA     1,A206
17675 106414            SUBO    0,1,SZR
17676 006114            EHALT            ;AC0=PREV.ELEM
                                         ;AC1=EXPECTED
17677 020140            LDA     0,EHAC3
17700 024456            LDA     1,A205
17701 106414            SUBO    0,1,SZR
17702 006114            EHALT            ;AC0=AC3 AFTER REMOV
                                         ;AC1=EXPECTED AC3 = NEXT.ELEM
17703 024141            LDA     1,PARPO
17704 152414            SUBO    1,2,SZR
17705 006114            EHALT            ;AC1=EXPECTED ELEMENT ADDR
                                         ;AC2=CHANGED AC2 AFTER REMOV
17706 030451            LDA     2,A206
17707 021000            LDA     0,0,2
17710 024446            LDA     1,A205
17711 106414            SUBO    0,1,SZR
17712 006114            EHALT            ;AC0=NEXT.ELEM IN PREV
                                         ;AC1=EXPECTED, NEXT ELEM
17713 030443            LDA     2,A205
17714 021001            LDA     0,1,2
17715 024442            LDA     1,A206
17716 106414            SUBO    0,1,SZR
17717 006114            EHALT            ;AC0=PREV.ELEM IN NEXT
                                         ;AC1=EXPECTED, PREV ELEM
```

```
* 0214  . 41
01
02 17750 020141          LDA     2,PARPO
03 17751 021000          LDA     0,0,2
04 17752 142414          SUBO    0,2,SZR
05 17753 000114          EHALT                   ;AC0=NEXT ELEM IN REMOVED
06                                               ;AC2=EXPECTED REMOVED ELEM
07 17754 020001          LDA     1,1,2
08 17755 132414          SUBO    1,2,SZR
09 17756 000114          EHALT                   ;AC1=PREV ELEM IN REMOVED
10                                               ;AC2=EXPECTED REMOVED ELEM
11 17757 020144          LDA     0,CTRLP ;CHECK NO OF INTRS
12 17760 024145          LDA     1,NTREX
13 17761 103414          SUBO    0,1,SZR
14 17762 000114          EHALT                   ;AC0=NO OF INTRS
15                                               ;AC1=EXPECTED
16 17763 000113          LOOP                    ;*******
17 17764 000707          JMP     A200            ;NEXT PARAM
18
19 17765 101234 A201:    101234
20 17766 070123 A202:    070123
21 17767 167012 A203:    167012
22 17770 017770 A204:    .                       ;ADDR=1 OF PARAM
23 17771 022721          LASTP+577               ;ELEMENT TO REMOVE ADDR
24 17772 000165          ADAM3                   ;ADDR ADD
25 17773 022321          LASTP+177
26 17774 000163          ADAM0
27 17775 023251          LASTP+1107
28 17776 000164          ADAM1
29 17777 023351          LASTP+1207
30 20000 000165          ADAM2
31 20001 023451          LASTP+1327
32 20002 000166          ADAM3
33 20003 023604          LASTP+1462
34 20004 000163          ADAM0
35 20005 000000          0
36 20006 000000 A205:    0                       ;NEXT ELEMENT
37 20007 000000 A206:    0                       ;PREV ELEMENT
```

```
                        ;TEST OF PROCESS LINK PRIORITY.
20010 000401 A21:       JMP     .+1
20011 020015            LDA     0,A214
20012 040020            STA     0,JDX0
20013 000142 A210:      JSR     AXNIPL  ;       ***GENERATE CHAINS
20014 032020            LDA     2,A1DX0 ;ADDR OF PROCESS.NEW ADDR
20015 101015            MOVO    2,2,SNR
20016 000573            JMP     A22     ;END THIS LOOP
20017 031000            LDA     2,0,2   ;PROCESS.NEW ADDR
20020 050141            STA     2,PARPO
20021 024507            LDA     1,A216
20022 045015            STA     1,13,2  ;SET STATE OF PROCESS.NEW
20023 036020            LDA     3,A1DX0 ;ADDR OF HEAD ADDR
20024 035400            LDA     3,0,3   ;HEAD ADDR
20025 054054            STA     3,LOC54
20026 032020            LDA     2,A1DX0 ;ADDR OF PROC.R (NEXT, RIGHT)
20027 036020            LDA     3,A1DX0 ;ADDR ADD
20030 025400            LDA     1,0,3
20031 133000            ADD     1,2
20032 050555            STA     2,A215
20033 021001            LDA     0,1,2   ;PREV.PROC.R
20034 040552            STA     0,A216  ;= PROC.L AFTER COMMAND
20035 025015            LDA     1,15,2  ;PRIORITY OF PROC.R
20036 044551            STA     1,A217
20037 036020            LDA     3,A1DX0
20040 054145            STA     3,INTREX ;SET EXP 0 OF INTRS
20041 000111            SETP1           ;*******
20042 000142            JSR     AXNIPL  ;       ***GENERATE CHAINS
20043 024460            LDA     0,A211  ;NOT USED PATTERN
20044 024460            LDA     1,A212  ;NOT USED PATTERN
20045 030141            LDA     2,PARPO ;ADDR OF PROCESS.NEW
20046 034457            LDA     3,A213  ;NOT USED PATTERN
20047 054157            STA     3,INACS
20050 000143            JSR     AINIRL  ;INTERRUPT CONTROL

20051 077202            PLINK   3       ;       ***PROCESS LINK PRIORITY COMMAND

20052 054140            STA     3,EHAC3
20053 034141            LDA     3,PARPO
20054 156414            SUBO    2,3,SZR
20055 000114            EHALT           ;AC2=CHANGED PROC. ADDR
                                        ;PARPO=EXPECTED (SEE PAGE ZERO)
20056 030550            LDA     2,A216
20057 112414            SUBO    0,2,SZR
20060 000114            EHALT           ;AC0=OLD PREV.PROC.R
                                        ;AC2=EXPECTED
20061 020140            LDA     0,EHAC3
20062 030525            LDA     2,A215
20063 112414            SUBO    0,2,SZR
20064 000114            EHALT           ;AC0=AC3 AFTER PLINK=PROC.R (NEXT)
                                        ;AC2=EXPECTED
20065 030520            LDA     2,A215
20066 152414            SUBO    1,2,SZR
20067 000114            EHALT           ;AC1=AC1 AFTER PLINK=PROC.R (NEXT)
                                        ;AC2=EXPECTED
```

```
* 0216  .MAC
01
02 20070 050515          LDA     2,A215
03 20071 021001          LDA     0,1,2
04 20072 024141          LDA     1,PARP0
05 20073 106414          SUB0    0,1,SZR
06 20074 006114          EHALT                   ;AC0=PROC.R (NEXT) POINTER TO PROC.NEW
07                                               ;AC1=EXPECTED, ADDR OF PROC.NEW
08 20075 050511          LDA     2,A216
09 20076 021000          LDA     0,0,2
10 20077 106414          SUB0    0,1,SZR
11 20100 006114          EHALT                   ;AC0=PROC.L (PREV) POINTER TO PROC.NEW
12                                               ;AC1=EXPECTED, ADDR OF PROC.NEW
13 20101 050141          LDA     2,PARP0
14 20102 021000          LDA     0,0,2
15 20103 024502          LDA     1,A215
16 20104 106414          SUB0    0,1,SZR
17 20105 006114          EHALT                   ;AC0=PROC.NEW POINTER TO PROC.R
18                                               ;AC1=EXPECTED, ADDR OF PROC.R
19 20106 021001          LDA     0,1,2
20 20107 024477          LDA     1,A216
21 20110 106414          SUB0    0,1,SZR
22 20111 006114          EHALT                   ;AC0=PROC.NEW POINTER TO PROC.L
23                                               ;AC1=EXPECTED, ADDR OF PROC.L
24 20112 021013          LDA     0,13,2
25 20113 101014          MOV0    0,0,SZR
26 20114 006114          EHALT                   ;AC0=STATE OF PROC.NEW
27                                               ;EXPECTED ZERO
28 20115 020144          LDA     0,NTRLF ;CHECK NO OF INTRS
29 20116 024145          LDA     1,NTREX
30 20117 106414          SUB0    0,1,SZR
31 20120 006114          EHALT                   ;AC0=NO OF INTRS
32                                               ;AC1=EXPECTED
33 20121 006113          LOOP                    ;*******
34 20122 000071          JMP     A210            ;NEXT PARAM
35
36 20123 056701 A211:    056701
37 20124 145670 A212:    145670
38 20125 034567 A213:    034567
```

```
01
02 20126 020126 A214:   .                       ;ADDR-1 OF PARAM
03 20127 012257         SCHA1-1                 ;ADDR OF PROCESS.NEW ADDR
04 20130 012535         SCHA5-1                 ;ADDR OF HEAD ADDR
05 20131 022701         LASTP+557               ;ADDR OF NEXT PROC AFTER COMMAND
06 20132 000160         ADAM3                   ;ADDR ADJ
07 20133 000025         25                      ;EXP NO OF INTRS
08
09 20134 012272         SCHA2-1
10 20135 012553         SCHA5-1
11 20136 022521         LASTP+377
12 20137 000164         ADAM1
13 20140 000023         23
14
15 20141 012505         SCHA3-1
16 20142 012535         SCHA5-1
17 20143 022741         LASTP+617
18 20144 000160         ADAM3
19 20145 000012         12
20
21 20146 012520         SCHA4-1
22 20147 012553         SCHA5-1
23 20150 022721         LASTP+577
24 20151 000160         ADAM3
25 20152 000001         1
26
27 20153 012257         SCHA1-1
28 20154 012562         SCHA6-1
29 20155 023547         LASTP+1425
30 20156 000165         ADAM2
31 20157 000020         20
32
33 20160 012272         SCHA2-1
34 20161 012562         SCHA6-1
35 20162 023471         LASTP+1347
36 20163 000160         ADAM3
37 20164 000013         13
38
39 20165 012505         SCHA3-1
40 20166 012562         SCHA6-1
41 20167 023271         LASTP+1147
42 20170 000165         ADAM2
43 20171 000011         11
44
45 20172 012520         SCHA4-1
46 20173 012562         SCHA6-1
47 20174 023571         LASTP+1247
48 20175 000165         ADAM2
49 20176 000004         4
50
51 20177 013011         SCHA7-1
52 20200 012562         SCHA6-1
53 20201 023431         LASTP+1307
54 20202 000165         ADAM2
55 20203 000025         25
56 20204 000000         0
57 20205 000000 A215:   0                       ;ADDR OF PROC.R (NEXT)
58 20206 000000 A216:   0                       ;ADDR OF PROC.L (PREV)
59 20207 000000 A217:   0                       ;PRIORITY OF PROC.R
60 20210 177777 A218:   177777                  ;PREV STATE OF PROC.NEW
```

```
* 0215  .TAPE
01
02                              ;TEST OF
03 20211 000401 A22:            JMP     .+1
04 20212 002401                 JMP     A.+1
05 20213 020271                 A42
06
07
08                      ;TAPE 8
09
10                      .EOT
```

```
                ;TAPE 9


                ; BUFFERS FOR BYTE COMMANDS.

20214 025615 BUFB0:  LASTP+5474              ;MIN. LENGTH = 201
20215 026017 BUFB1:  LASTP+5474+201          ;MIN. LENGTH = 201
20216 026220 BUFB2:  LASTP+5474+201+201      ;MIN. LENGTH = 201

                ; BUFFERS USED FOR MUSIL COMMANDS.

20217 026421 BUFB3:  LASTP+4277              ;MIN. LENGTH = 1002
20220 027423 BUFB4:  LASTP+4277+1002         ;MIN. LENGTH = 102
20221 027525 BUFB5:  LASTP+4277+1002+102     ;MIN. LENGTH = 20

                ; ROUTINE USED FOR TEST OF THE MUSIL FETCH COMMAND.
                ; A MUSIL JUMP TABLE IS GENERATED.
                ; INSERT ADDRESS BUFB3+2+X+400 FROM BUFB3+2+0 TO BUFB3+2+377
                ; AND INSERT JSR AMUSIR FROM BUFB3+2+400.

                     ;BUFB3+2        ; START OF MUSIL ADDR TABLE.
                     ;BUFB3+2+400    ; START OF MUSIL INSTR ROUTINE AREA.
20222 006155 A402:   JSR     AMUSIR  ; MUSIL INSTR ROUTINE
20223 000400 A403:   400             ; ADDR TABLE/ROUTINE AREA LENGTH
20224 000000 A404:   0               ; WORK COUNT
20225 000000 A405:   0               ; SAVE AC3.
                     ;BUFB4+33       ;ADDR OF MUSIL PC (MUS.PC OR "PC")
20226 020217 A407:   BUFB3           ;ADDR OF MUSIL INSTR PART I, R
20227 000000 A408:   0       ;BUFB3+1 ;ADDR OF FETCH COMMAND
20230 020220 A409:   BUFB4           ;ADDR OF ACTUAL PROCESS
20231 000040 A4010:  LOC40           ;CUR. POINTER TO ACTUAL PROCESS
20232 077502 A4011:  FETCH   3       ;MUSIL COMMAND

20233 054772 A40:    STA     3,A405  ; CALL: MUSTAB
20234 020767         LDA     0,A403
20235 024765         LDA     1,A402
20236 032770         LDA     2,AA407
20237 151400         INC     2,2
20240 151400         INC     2,2     ; AC2=ADDR OF MUSIL JUMP ADDR TABLE.
20241 155000         MOV     2,3
20242 117000         ADD     0,3     ; AC3=ADDR OF ROUTINE AREA
20243 040761         STA     0,A404  ; NO OF TABLE ENTRIES.
20244 045400 A411:   STA     1,0,3   ; SET ROUTINE
20245 055000         STA     3,0,2   ; SET JUMP ADDR
20246 151400         INC     2,2
20247 175400         INC     3,3
20250 014754         DSZ     A404
20251 000773         JMP     A411
20252 032756         LDA     2,AA409
20253 026753         LDA     1,AA407 ; SET BUFB4+33 MUS PROGRAM COUNTER
20254 045033         STA     1,33,2  ; TO BUFB3
20255 022753         LDA     0,AA409 ; SET LOC40, CUR. POINTER TO ACTUAL
20256 042753         STA     0,AA4010 ; PROCESS TO BUFB4
20257 135400         INC     1,3
20260 054747         STA     3,A408
20261 024751         LDA     1,A4011 ; SET FETCH COMMAND
20262 045400         STA     1,0,3   ; BEFORE ADDR TABLE.
20263 002742         JMP     AA405
```

```
* 0220  .+1
01
02                ; LOOP TO TEST THAT FETCH OF A MUSIL INSTRUCTION
03                ; IN THE RANGE 0-377 SHIFT RIGHT 8 CAUSES A CORRECT JUMP
04                ; IN THE JUMP TABLE IN CONNECTION TO THE
05                ; MUSIL INSTRUCTION.
06 20264 000000 A412:   0                 ; MUSIL INSTR ROUTINE, JSR AC3 VALUE.
07 20265 000403 A412C:  2+400+1           ;BUF#3 DISPLACEMENT FOR A412
08 20266 000377 A413:   377
09 20267 000000 A414:   0
10 20270 020311 A417:   A423
11
12 20271 000401 A42:    JMP     .+1
13 20272 022734         LDA     0,AA407
14 20273 024772         LDA     1,A412C
15 20274 107003         ADD     0,1
16 20275 044767         STA     1,A412
17 20276 023771         LDA     0,A413  ; SET INIT VALUE.
18 20277 040770         STA     0,A414
19 20300 006112         SETP2
20 20301 004732         JSR     A40     ;INI TABLE
21 20302 020765         LDA     0,A414
22 20303 022723         LDA     2,AA407
23 20304 101300         MOVS    0,0
24 20305 041000         STA     0,0,2   ; SET MUSIL INSTRUC.
25 20306 024762         LDA     1,A417
26 20307 044755         STA     1,MUSIR ;SET RETURN FROM MUSIL INSTR ROUTINE
27 20310 002717         JMP     AA40B   ;GO TO FETCH COMMAND
28 20311 020755 A423:   LDA     0,A412
29 20312 171000         MOV     3,2
30 20313 112420         SUBZ    0,2     ; AC2=JUMP ENTRY.
31 20314 024755         LDA     1,A414
32 20315 146414         SUBO    2,1,SZR ; AC2="FETCH" I-VALUE.
33 20316 000114         EMALT           ; AC1=WANTED I-VALUE.
34 20317 000113         LOOP
35 20320 002401         JMP     A.+1
36 20321 020325         A43
```

```
                        ; LOOP TO TEST THAT THE MUSIL FETCH
                        ; INSTRUCTION WITH-15 IS LOADED INTO ACC AFTER
                        ; EXECUTION OF THIS INSTRUCTION.
20322 000200 A421:      200             ;START DATA, LOOP SHIFT -1
20323 000000 A422:      0               ;USED DATA, R-VALUE
20324 020347 A425:      A424
20325 000401 A45:       JMP     .+1     ;SET INI VALUE
20326 020774            LDA     1,A421
20327 040774 A431:      STA     0,A422
20330 000111            SETP1
20331 004702            JSR     A40     ;INI TABLE
20332 020771            LDA     0,A422
20333 032075            LDA     2,AA407
20334 041000            STA     0,0,2   ; SET MUSIL INSTRUCTION.
20335 020767            LDA     0,A425
20336 040153            STA     0,MUSIR ;SET RETURN FROM MUSIL INSTR ROUTINE
20337 002070            JMP     AA408   ;GO TO FETCH COMMAND
20340 024765 A424:      LDA     1,A422
20341 122414            SUBO    1,0,SZR ; AC0="FETCH" R-VALUE.
20342 000114            EHALT           ; AC1=WANTED R-VALUE.
20343 000113            LOOP
20344 020757            LDA     0,A422
20345 101224            MOVZR   0,0,SZR
20346 000761            JMP     A431
20347 002401            JMP     A.+1
20350 020352            A44

                        ; LOOP TO TEST THAT THE FETCH MUSIL INSTRUCTION
                        ; INCREMENTS THE MUSIL "PC".
20351 020363 A452:      A434

20352 000401 A44:       JMP     .+1
20353 000112            SETP2
20354 004657            JSR     A40     ;INI TABLE
20355 102400            SUB     0,0
20356 032050            LDA     2,AA407
20357 041000            STA     0,0,2   ;SET MUSIL INSTR
20360 020771            LDA     0,A432
20361 040153            STA     0,MUSIR ;SET RETURN FROM MUSIL INSTR ROUTINE
20362 002045            JMP     AA408   ;GO TO FETCH COMMAND
20363 026643 A434:      LDA     1,AA407 ; "OLD" PC.
20364 125400            INC     1,1     ;MUS.PC:=MUS.PC+1
20365 032643            LDA     2,AA409
20366 021033            LDA     0,33,2  ; "NEW" PC.
20367 122414            SUBO    0,1,SZR
20370 000114            EHALT
20371 000113            LOOP
20372 002401            JMP     A.+1
20373 020377            A45
```

```
L1
02                ; TEST THAT THE TAKEADDRESS INCREMENT ST(AC2+33)
03                ; MODIF: 00,01,10.
04 20374 020220 A443:   BUFB4             ;ADDR OF ACTUAL PROCESS
05 20375 000200 A445:   200               ;START DATA, LOOP SHIFT -1
06 20376 000000 A446:   0                 ;USED DATA, MUS PC
07
08 20377 000401 A45:    JMP     .+1
09 20400 020775         LDA     0,A445    ; SET INIT.
10 20401 040775 A458:   STA     0,A446
11 20402 006112         SETP2
12 20403 032771         LDA     2,AA443
13 20404 020772         LDA     0,A446
14 20405 041033         STA     0,33,2    ; SET "PC".
15 20406 063402         TKADD   0
16 20407 020767         LDA     0,A446
17 20410 032764         LDA     2,AA443
18 20411 025033         LDA     1,33,2    ; AC1= NEW "PC".
19 20412 101400         INC     0,0       ; AC0=OLD "PC"+1.
20 20413 106414         SUBO    0,1,SZR
21 20414 006114         EHALT
22 20415 006113         LOOP
23 20416 020760         LDA     0,A446
24 20417 101224         MOVZR   0,0,SZR
25 20420 000761         JMP     A458
26 20421 002401         JMP     A.+1
27 20422 020430         A46
28
29                ; TEST THAT AC1=ADDR=WORD(PC) AFTER EXECUTION OF
30                ; THE TAKEADDR INSTRUCTION.
31                ; MODIF: 00,01,10.
32 20423 000040 A451:   LOC40
33 20424 000200 A452:   200               ;START DATA, LOOP SHIFT -1
34 20425 000000 A453:   0                 ;USED DATA, MUS PC
35 20426 020220 A454:   BUFB4             ;ADDR OF ACTUAL PROCESS
36 20427 000000 A455:   0
37
38 20430 000401 A46:    JMP     .+1
39 20431 020773         LDA     0,A452    ; SET INIT.
40 20432 040775 A461:   STA     0,A453
41 20433 006112         SETP2
42 20434 032772         LDA     2,AA454   ; AC2=CUR.
43 20435 020770         LDA     0,A453
44 20436 041033         STA     0,33,2    ; SET "PC".
45 20437 050764         STA     2,A451    ;SET CUR
46 20440 037033         LDA     3,A33,2
47 20441 054766         STA     3,A455
48 20442 067402         TKADD   1
49 20443 050764         LDA     2,A455
50 20444 146414         SUBO    2,1,SZR   ; AC2=WANTED WORD(PC).
51 20445 006114         EHALT             ; AC1=TAKADD WORD(PC).
52 20446 006113         LOOP
53 20447 020756         LDA     0,A453
54 20450 101224         MOVZR   0,0,SZR
55 20451 000761         JMP     A461
56 20452 002401         JMP     X.+1
57 20453 020775         B22
```

```
* 0223  .PL.
01
02                ; ROUTINE USED FOR TEST OF THE "TAKADD" INSTRUCTION, MODIF 11.
03                ; BUF35 IS BUF34+1(3 (41+40)
04                ; ACO IN BUF34+33
05                ; AC1 IN BUF35+17.
06                ; AC2 IN BUF33
07                        ;BUF34+41+40      ;ADDR OF ZONE NO 40 ADDR
08                        ;BUF34+33         ;ADDR OF MUS.PC
09                        ;BUF35+17         ;ZFIRST.ZONEND=ADDR OF DATA AREA ADDR FOR
10                                          ;ACTUAL ZONE NO, ZONE DESCRIPTION IN
11                                          ;BUF35, OR: ADDR OF FIRST WORD IN ZONE
12 20454 020217 B205:     BUF33             ;ADDR OF MUS INSTR PART Z,F
13 20455 020221 B204:     BUF35             ;ZONE NO 40 ADDR (ADDR OF DESCRIPTION)
14 20456 000000 B203:     0                 ; SAVE AC3.
15 20457 020220 B206:     BUF34             ;ADDR OF ACTUAL PROCESS
16
17 20460 054776 B21:      STA       3,B205  ; CALL: GENVAL
18 20461 050775           LDA       3,AB205
19 20462 051400           STA       2,0,3
20 20463 050772           LDA       3,AB204
21 20464 045417           STA       1,17,3
22 20465 052772           LDA       2,AF206
23 20466 041055           STA       0,55,2
24 20467 055101           STA       3,101,2
25 20470 002750           JMP       AB205   ; RETURN.
26
27                ; TEST THAT (BUF34+33)AND377 IS ADDED TO
28                ; BUF35+17(CONTENTS OF AC1).
29 20471 020000 B211:     40*400+0          ; Z,F
30 20472 100000 B212:     100000            ;START DATA, LOOP SHIFT -1
31 20473 000000 B213:     0                 ;USED DATA, ADDR OF FIRST WORD IN ZONE Z
32 20474 000003 B214:     3                 ;MODIF BITS
33
34 20475 000401 B22:      JMP       .+1
35 20476 020774           LDA       0,B212  ;SET INIT
36 20477 040774 B221:     STA       0,B213
37 20500 006112           SETP2
38 20501 022753           LDA       0,AB205 ;SET MUS.PC
39 20502 024771           LDA       1,B213  ;SET ADDR OF DATA AREA
40 20503 030760           LDA       2,B211  ;SET ZONE NO + FIELD ( Z,F )
41 20504 004754           JSR       B21     ;GEN VAL
42 20505 032752           LDA       2,AB206
43 20506 020760           LDA       0,B214
44 20507 073402           TAKADD    2
45 20510 020763           LDA       0,B213  ;ADDR OF FIRST WORD IN ZONE Z
46 20511 100414           SUBO      0,1,SZR ; AC0=WANTED VALUE.
47 20512 000114           EHALT             ; AC1="TAKADD" VALUE.
48 20513 000115           LOOP
49 20514 020757           LDA       0,B213
50 20515 101224           MOVZR     0,0,SZR
51 20516 000761           JMP       B221
52 20517 002401           JMP       A.+1
53 20520 020523           B23
```

```
; 0224  .+11
01
02                      ; SAME AS B220 BUT CHANGE (BUF+3+33)BIT(8:15).
03 20521 000200 B222:   200                     ;START DATA, LOOP SHIFT -1
04 20522 000000 B223:   0                       ;USED DATA, FIELD F
05
06 20523 000401 B23:    JMP     .+1
07 20524 020775         LDA     0,B222  ;SET INIT
08 20525 040775 B231:   STA     0,B223
09 20526 006112         SETP2
10 20527 031742         LDA     2,B211  ;ZONE Z
11 20530 021776         LDA     1,B223  ;FIELD F
12 20531 133000         ADD     1,2     ;SET ZONE NO + FIELD
13 20532 126400         SUB     1,1     ;SET ADDR OF DATA AREA = 0
14 20533 022721         LDA     0,AB205 ;SET MUS.PC
15 20534 004724         JSR     B21     ;GEN VAL
16 20535 032722         LDA     2,AB206
17 20536 020736         LDA     0,B214
18 20537 077402         TKADD   3
19 20540 020762         LDA     0,B223  ; AC0=WANTED VALUE.
20 20541 106414         SUBO    0,1,SZR ; AC1="TAKADD" VALUE.
21 20542 006114         EHALT           ;ADDR OF WORD F IN ZONE Z, START 0
22 20543 006113         LOOP
23 20544 020750         LDA     0,B223
24 20545 101224         MOVZR   0,0,SZR
25 20546 000757         JMP     B231
26 20547 002401         JMP     A.+1
27 20550 020554         B24
28
29                      ; TEST THAT AC2=ST(40) AFTER EXECUTION OF
30                      ; "TAKADD" WITH MODIF 11.
31 20551 100000 B232:   100000          ;START DATA, LOOP SHIFT -1
32 20552 000000 B233:   0               ;USED DATA, CUR = ST(LOC40)
33 20553 000040 B234:   LOC40
34
35 20554 000401 B24:    JMP     .+1
36 20555 020774         LDA     0,B232  ;SET INIT
37 20556 040774 B241:   STA     0,B233
38 20557 006112         SETP2
39 20560 020776         LDA     0,B233
40 20561 042772         STA     0,AB234 ;SET LOC 40
41 20562 020707         LDA     0,B211  ;SET MUS.PC
42 20563 126400         SUB     1,1     ;SET ADDR OF DATA AREA = 0
43 20564 030705         LDA     2,B211  ;SET ZONE NO + FIELD
44 20565 004675         JSR     B21     ;GEN VAL
45 20566 032671         LDA     2,AB206
46 20567 020705         LDA     0,B214
47 20570 063402         TKADD   0
48 20571 020761         LDA     0,F233  ; AC0=WANTED VALUE.
49 20572 020761         LDA     1,AB234 ; AC1=TAKADD VALUE IN LOC 40
50 20573 106414         SUBO    0,1,SZR
51 20574 006114         EHALT           ;LOC 40 CHANGED
52 20575 112414         SUBO    0,2,SZR
53 20576 006114         EHALT           ;AC0=WANTED VALUE
54                                      ;AC2=TKADD VALUE
55 20577 006113         LOOP
56 20600 020752         LDA     0,B233
57 20601 101224         MOVZR   0,0,SZR
58 20602 000754         JMP     B241
59 20603 002401         JMP     A.+1
60 20604 020607         B25
```

```
01
02                      ; TEST THAT ACO=ACOSHIFT(-2)
03                      ; AFTER EXECUTION OF "TAKADD" INSTRUCTION.
04                      ; MODIF: 00,01,10.
05 20604 000200 B244:   200                     ;START DATA, LOOP SHIFT -1
06 20605 000000 B245:   0                       ;USED DATA, MODIF BITS
07
08 20606 000401 B25:    JMP     .+1
09 20607 020775         LDA     0,B244  ; SET INIT.
10 20610 040775 B251:   STA     0,B245
11 20611 006112         SETP2
12 20612 032643         LDA     2,AB206
13 20613 020772         LDA     0,B245
14 20614 041033         STA     0,33,2  ; SET MUS.PC
15 20615 067402         TKADD   1
16 20616 024767         LDA     1,B245
17 20617 125220         MOVZR   1,1
18 20620 125220         MOVZR   1,1
19 20621 106414         SUBO    0,1,SZR ; ACO=TAKADD VALUE.
20 20622 006114         EHALT           ; AC1=WANTED VALUE.
21 20623 006113         LOOP
22 20624 020751         LDA     0,B245
23 20625 101224         MOVZR   0,0,SZR
24 20626 000762         JMP     B251
25 20627 002401         JMP     A.+1
26 20630 020633         B26
27
28                      ; TEST THAT ACO=ACOSHIFT(-2)
29                      ; AFTER EXECUTION OF "TAKADD" INSTRUCTION.
30                      ; MODIF: 11.
31 20631 000377 B262:   377                     ;START DATA, LOOP SHIFT -1
32 20632 000000 B263:   0                       ;USED DATA, MODIF BITS
33
34 20633 000401 B26:    JMP     .+1
35 20634 020775         LDA     0,B262  ;SET INIT
36 20635 040775 B261:   STA     0,B263
37 20636 006112         SETP2
38 20637 022617         LDA     0,AB206 ;SET MUS.PC
39 20640 126400         SUB     1,1     ;SET ADDR OF DATA AREA = 0
40 20641 030627         LDA     2,B211  ;SET ZONE NO + FIELD
41 20642 004615         JSR     B21     ;GEN VAL
42 20643 032613         LDA     2,AB206
43 20644 020766         LDA     0,B263
44 20645 073402         TKADD   2
45 20646 024764         LDA     1,B263
46 20647 125220         MOVZR   1,1     ; AC1=WANTED VALUE.
47 20650 125220         MOVZR   1,1     ; ACO=TAKADD VALUE.
48 20651 106414         SUBO    0,1,SZR
49 20652 006114         EHALT
50 20653 006113         LOOP
51 20654 020756         LDA     0,B263
52 20655 101220         MOVZR   0,0
53 20656 101224         MOVZR   0,0,SZR
54 20657 000756         JMP     B261
55 20660 002401         JMP     A.+1
56 20661 020667         A47
```

```
01
02                ; TEST OF THE TAKEVAL INSTRUCTION.
03                ; IF MODIF=01 THEN AC1=ST(AC2+32).
04 20663 020220 A462:   BUFB4
05 20664 100000 A463:   100000          ;START DATA, LOOP SHIFT -1
06 20665 000000 A464:   0               ;USED DATA, AC-R
07 20666 000001 A465:   1               ;MODIF BITS, 01
08 20667 000003 A466:   3               ;MODIF BITS, 11
09
10 20670 000401 A47:    JMP     .+1
11 20671 020775         LDA     0,A463  ; SET INIT.
12 20672 040775 A471:   STA     0,A464
13 20673 006112         SETP2
14 20674 032767         LDA     2,@A462 ; AC2=CUR.
15 20675 020770         LDA     0,A464
16 20676 041032         STA     0,32,2  ; SET R.
17 20677 020767         LDA     0,A465  ; ACU:=01, MODIF BITS
18 20700 065502         TKVAL   0
19 20701 020764         LDA     0,A464
20 20702 106414         SUBO    0,1,SZR ; ACU=WANTED VAL.
21 20703 006114         EHALT           ; AC1="TAKVAL" VAL.
22 20704 006113         LOOP
23 20705 020760         LDA     0,A464
24 20706 101224         MOVZR   0,0,SZR
25 20707 000763         JMP     A471
26
27                ; SAME AS A470, BUT WITH MODIF=11.
28
29 20710 000401 A48:    JMP     .+1
30 20711 020753         LDA     0,A463  ; SET INIT.
31 20712 040753 A481:   STA     0,A464
32 20713 006112         SETP2
33 20714 032747         LDA     2,@A462 ; AC2=CUR.
34 20715 020750         LDA     0,A464
35 20716 041032         STA     0,32,2  ; SET R.
36 20717 020750         LDA     0,A466  ; MODIF=11.
37 20720 067502         TKVAL   1
38 20721 020744         LDA     0,A464
39 20722 106414         SUBO    0,1,SZR ; ACU=WANTED VAL.
40 20723 006114         EHALT           ; AC1="TAKVAL" VAL.
41 20724 006113         LOOP
42 20725 020740         LDA     0,A464
43 20726 101224         MOVZR   0,0,SZR
44 20727 000763         JMP     A481
45 20730 006401         JSR     A.+1
46 20731 020737         A49
```

```
- USER  .MAC.
01
02                ; TEST OF THE TAKEVAL INSTRUCTION.
03                ; MODIF=00
04                ; TEST THAT AC1=ST(ST(AC2+33)).
05 20732 020217 A482:    .+115           ;ADDR OF MUS INSTR, PART V
06 20733 100000 A483:    100000          ;START DATA, LOOP SHIFT -1
07 20734 000000 A484:    0               ;USED DATA, MUS INSTR PART V
08 20735 020220 A485:    .+116           ;ADDR OF ACTUAL PROCESS
09 20736 000000 A486:    0               ;MODIF BITS, 00
10
11 20737 000401 A49:     JMP     .+1
12 20740 020733          LDA     0,A483  ; SET INIT.
13 20741 040733 A491:    STA     0,A484
14 20742 006112          SETP2
15 20743 036767          LDA     3,AA482
16 20744 020733          LDA     0,A484
17 20745 041400          STA     0,0,3   ; SET VAL.
18 20746 032767          LDA     2,AA485 ; AC2=CUR.
19 20747 055033          STA     3,33,2  ; SET "PC".
20 20750 020760          LDA     0,A486  ;AC0:=00, MODIF BITS
21 20751 073502          TKVAL   2
22 20752 036760          LDA     3,AA482
23 20753 021400          LDA     0,0,3   ; AC0=WANTED VAL.
24 20754 100404          SUB     0,1,SZR ; AC1="TAKEVAL" VAL.
25 20755 006114          EHALT
26 20756 006113          LOOP
27 20757 020755          LDA     0,A484
28 20760 101224          MOVZR   0,0,SZR
29 20761 000760          JMP     A491
30
31                ; TEST OF THE TAKEVAL INSTRUCTION.
32                ; MODIF=00.
33                ; TEST THAT ST(AC2+33)=ST(AC2+33)+1. INCR "PC".
34 20762 000401 A50:     JMP     .+1
35 20763 006112          SETP2
36 20764 032751          LDA     2,AA485 ; AC2=CUR.
37 20765 036745          LDA     3,AA482
38 20766 055033          STA     3,33,2  ; SET "PC".
39 20767 020747          LDA     0,A486  ;AC0:=00, MODIF BITS
40 20770 073502          TKVAL   3
41 20771 032744          LDA     2,AA485
42 20772 021033          LDA     0,33,2  ; AC0= NEW "PC".
43 20773 020737          LDA     1,AA482
44 20774 125400          INC     1,1     ; AC1=WANTED "PC" = OLD "PC"+1.
45 20775 100414          SUB0    0,1,SZR
46 20776 006114          EHALT
47 20777 006113          LOOP
48 21000 006401          JSR     A.+1
49 21001 021012          A51
```

```
                ; TEST OF THE TAKEVAL INSTRUCTION.
                ; MODIF=10.
                ; TEST AC1=ST(ST(ST(AC2+33))) AFTER "TAKVAL".
21002 020220 A501:   BUFP4           ;ADDR OF ACTUAL PROCESS
21003 020217 A502:   BUFP3           ;ADDR OF MUSIL INSTR PART V
21004 100000 A504:   100000          ;START DATA, LOOP SHIFT -1
21005 000000 A505:   0               ;USED DATA, MUS INSTR PART K
21006 000000 A506:   0               ;ADDR OF PART K, USED AS PART V
21007 000402 A5066:  2+400           ;BUFP3 DISPLACEMENT FOR A506
21010 000040 A507:   LOC40
21011 000002 A508:   2               ;MODIF BITS, 10

21012 000401 A51:    JMP     .+1
21013 022770         LDA     0,AA502
21014 024773         LDA     1,A5066
21015 107000         ADD     0,1
21016 044770         STA     1,A506
21017 020765         LDA     0,A504  ; SET INIT.
21020 040765 A511:   STA     0,A505
21021 006112         SETP2
21022 032760         LDA     2,AA501 ;AC2=CUR
23 21023 030760      LDA     3,AA502
24 21024 020761      LDA     0,A505
25 21025 055033      STA     3,33,2  ; SET "PC".
26 21026 042760      STA     0,AA506 ;SET VAL, PART K
27 21027 020757      LDA     0,A506
28 21030 041400      STA     0,0,3   ;SET INSTR, PART V
29 21031 020750      LDA     0,A508  ;AC0:=10, MODIF BIT
30 21032 063502      TKVAL   0
31 21033 022753      LDA     0,AA506 ; AC0=WANTED VAL.
32 21034 100414      SUBO    0,1,SZR ; AC1="TAKVAL" VAL.
33 21035 006114      EHALT
34 21036 000113      LOOP
35 21037 020746      LDA     0,A505
36 21040 101224      MOVZR   0,0,SZR
37 21041 000757      JMP     A511
38
39                ; TEST OF THE TAKEVAL INSTRUCTION.
40                ; MODIF=10.
41                ; TEST ST(ST(40)+33)=ST(ST(40)+33)+1.
42
43 21042 000401 A52:     JMP     .+1
44 21043 006112          SETP2
45 21044 026737          LDA     1,AA502
46 21045 032735          LDA     2,AA501 ;AC2=CUR
47 21046 034742          LDA     3,A507
48 21047 051400          STA     2,0,3   ;SET LOC 40
49 21050 045033          STA     1,33,2  ;SET MUS.PC
50 21051 020740          LDA     0,A508  ;AC0:=10, MODIF BITS
51 21052 063502          TKVAL   1
52 21053 032727          LDA     2,AA501
53 21054 021033          LDA     0,33,2  ; AC0="TAKVAL"."PC".
54 21055 026726          LDA     1,AA502
55 21056 125400          INC     1,1     ; AC1=WANTED "PC" =OLD "PC"+1.
56 21057 122414          SUBO    1,0,SZR
57 21060 006114          EHALT
58 21061 000113          LOOP
59 21062 000401          JSR     A,+1
60 21063 021066          A53
```

```
0 0224  .TAIL
01
02                      ; TEST OF THE TAKEVAL INSTRUCTION.
03                      ; TEST THAT ACO=MODIF SHIFT (-2).
04                      ; MODIF: 00,01,10.
05 21064 100000 A532:   100000          ;START DATA, LOOP SHIFT -1
06 21065 000000 A533:   0               ;USED DATA, MODIF BITS
07
08 21066 000401 A53:    JMP     .+1
09 21067 020775         LDA     0,A532  ; SET INIT.
10 21070 040775 A531:   STA     0,A533
11 21071 006112         SETP2
12 21072 032710         LDA     2,@A501 ; AC2=CUR.
13 21073 020772         LDA     0,A533
14 21074 073502         TKVAL   2
15 21075 024770         LDA     1,A533
16 21076 125220         MOVZR   1,1
17 21077 125220         MOVZR   1,1
18 21100 122414         SUBO    1,0,SZR ; AC1=WANTED VAL.
19 21101 006114         EHALT           , ACO="TAKVAL" MODIF.
20 21102 006113         LOOP
21 21103 020762         LDA     0,A533
22 21104 101224         MOVZR   0,0,SZR
23 21105 000763         JMP     A531
24 21106 002401         JMP     A.+1
25 21107 021112         A54
26
27                      ; TEST OF THE TAKEVAL INSTRUCTION.
28                      ; TEST THAT ACO=MODIF SHIFT (-2).
29                      ; MODIF: 11.
30 21110 177777 A542:   177777          ;START DATA, LOOP SHIFT -1
31 21111 000000 A543:   0               ;USED DATA, MODIF BITS
32
33 21112 000401 A54:    JMP     .+1
34 21113 020775         LDA     0,A542  ;SET INIT
35 21114 040775 A541:   STA     0,A543
36 21115 006112         SETP2
37 21116 032664         LDA     2,AA501 ;AC2=CUR
38 21117 020772         LDA     0,A543
39 21120 077502         TKVAL   3
40 21121 024770         LDA     1,A543
41 21122 125220         MOVZR   1,1
42 21123 125220         MOVZR   1,1
43 21124 106414         SUBO    0,1,SZR
44 21125 006114         EHALT           ;ACO="TAKVAL" MODIF
45                                      ;AC1=EXPECTED
46 21126 006113         LOOP
47 21127 020762         LDA     0,A543
48 21130 101220         MOVZR   0,0
49 21131 101224         MOVZR   0,0,SZR
50 21132 000762         JMP     A541
51 21133 002401         JMP     A.+1
52 21134 021143         R17
```

```
* 0250  .TM1
01
02                ; TEST OF THE COMPARE BYTESTRING.
03                ; GEN A BYTESTRING IN BUFB0 AND BUFB1
04                ; USE THE COMP TO TEST THAT (BUFB0)=(BUFB1).
05
06 21155 020214 B172:    BUFB0            ; SOURCE.
07 21156 020215 B173:    BUFB1            ; DESTINATION.
08 21157 000400 B174:    400              ;LENGTH IN BYTES
09 21160 010200 B175:    200              ;START DATA, LOOP SHIFT -1
10 21161 000000 B176:    0                ;USED DATA, START PATTERN COUNTING DATA.
11 21162 013111 B177:    GENBC
12
13 21163 000401 B17:     JMP      .+1
14 21164 034175           LDA      3,B174
15 21165 054165           STA      3,NTPEX ;SET EXP 0 OF INTRS
16 21166 020772           LDA      0,B175  ;SET INIT.
17 21167 040772 B171:     STA      0,B176
18 21170 000111           SETP1
19 21171 020770           LDA      0,B176  ;FIRST BYTE
20 21172 020763           LDA      1,AB172
21 21173 125120           MOVZL    1,1     ;BYTE ADDR, LEFT
22 21174 030763           LDA      2,B174  ;BUFFER LENGTH
23 21175 000763           JSR      AB177   ;GEN COUNTING BYTES
24 21176 020763           LDA      0,B176  ;FIRST BYTE
25 21177 026757           LDA      1,AB173
26 21200 125120           MOVZL    1,1     ;BYTE ADDR, LEFT
27 21201 030756           LDA      2,B174  ;BUFFER LENGTH
28 21202 000760           JSR      AB177   ;GEN COUNTING BYTES
29 21203 026752           LDA      1,AB172
30 21204 125120           MOVZL    1,1
31 21205 032751           LDA      2,AB173
32 21206 151120           MOVZL    2,2
33 21207 020750           LDA      0,B174
34 21210 000145           JSR      AIM-TRL  ; INTERRUPT CONTROL
35 21211 067602           COMP     1        ; COMPARE (BUFB0)AND(BUFB1).
36 21212 101004           MOV      0,0,SZR  ; AC1=SOURCE ERR.ADDR.+1
37 21213 000114           EHALT             ; AC2=DEST.ERR.ADDR.+1
38 21214 020144           LDA      0,NTPLF ;CHECK NO OF INTRS
39 21215 024145           LDA      1,NTPEX
40 21216 106414           SUBO     0,1,SZR
41 21217 000114           EHALT             ;ACU=NO OF INTRS
42                                          ;AC1=EXPECTED
43 21220 000113           LOOP
44 21221 020740           LDA      0,B176
45 21222 101224           MOVZR    0,0,SZR
46 21223 000744           JMP      B171
47 21224 002401           JMP      4,.+1
48 21225 021206           B18
```

```
                ; SAME AS B17, BUT STARTING AT RIGHT BYTE ADDRESS.

21206 000401 B18:    JMP     .+1
21207 020730         LDA     2,B174
21210 040745         STA     2,NTREX ;SET EXP # OF INTRS
21211 020727         LDA     0,B175  ;SET INIT.
21212 040727 B181:   STA     0,B176
21213 006111         SETP1
21214 020725         LDA     0,B170  ;FIRST BYTE
21215 020720         LDA     1,AB172
21216 125140         MOVOL   1,1     ;BYTE ADDR, RIGHT
21217 020720         LDA     2,B174  ;BUFFER LENGTH
21220 006722         JSR     AB177   ;GEN COUNTING BYTES
21221 020720         LDA     0,B176  ;FIRST BYTE
21222 020714         LDA     1,AB173
21223 125140         MOVOL   1,1     ;BYTE ADDR, RIGHT
21224 020713         LDA     2,B174  ;BUFFER LENGTH
21225 006715         JSR     AB177   ;GEN COUNTING BYTES
21226 020707         LDA     1,AB172
21227 125140         MOVOL   1,1
21230 020706         LDA     2,AB173
21231 151140         MOVOL   2,2
21232 020703         LDA     0,B174
21233 006143         JSR     AINTRL  ; INTERRUPT CONTROL
21234 073002         COMP    2       ; COMPARE (BUFB0)AND(BUFB1).
21235 101004         MOV     0,0,SZR ; AC1=SOURCE ERR.ADDR.+1
21236 006114         EHALT           ; AC2=DEST.ERR.ADDR.+1
21237 020144         LDA     0,NTRLF ;CHECK NO OF INTRS
21240 024145         LDA     1,NTREX
21241 100414         SUBO    0,1,SZR
21242 006114         EHALT           ;AC0=NO OF INTRS
                                     ;AC1=EXPECTED
21243 006113         LOOP
21244 020675         LDA     0,B176
21245 101224         MOVZR   0,0,SZR
21246 000744         JMP     B181
21247 002401         JMP     A.+1
21250 021262         B19

                ; GEN A BYTESTRING IN BUFB0 AND BUFB1,
                ; CONSTRUCT AN ERROR IN BUFB0 AND TEST THAT
                ; "COMP" FIND THIS ERROR.

21251 020214 B192:   BUFB0
21252 020215 B193:   BUFB1
21253 000400 B194:   400             ;LENGTH IN BYTES
21254 000000 B195:   0               ;ERROR BYTE ADDR, COUNTING
21255 000000 B196:   0               ;WORK COUNT NO OF ERROR ADDR
21256 000000 B197:   0               ; SAVE "COMP" AC1.
21257 000000 B198:   0               ; SAVE "COMP" AC2
21260 000000 B199:   0               ; SAVE "COMP" AC0
21261 013111 B190:   GENEC

21262 000401 B19:    JMP     .+1
21263 022766         LDA     0,AB192
21264 101120         MOVZL   0,0
21265 040767         STA     0,B195  ; SET ERR POINTER, (BYTE ADDR COUNTING).
21266 020765         LDA     0,B194
21267 040766         STA     0,B196  ;SET ERROR "NO OF ADDR" COUNTER
```

```
* 0232  .+1
01
02 21270 006114 B191:   SETPG
03 21271 102400          SUB     0,0     ;FIRST BYTE
04 21272 020757          LDA     1,AB192
05 21273 125120          MOVZL   1,1     ;BYTE ADDR, LEFT
06 21274 030757          LDA     2,B194  ;BUFFER LENGTH
07 21275 000764          JSR     AB190   ;GEN COUNTING BYTES
08 21276 102400          SUB     0,0     ;FIRST BYTE
09 21277 020755          LDA     1,AB193
10 21300 125120          MOVZL   1,1     ;BYTE ADDR, LEFT
11 21301 030752          LDA     2,B194  ;BUFFER LENGTH
12 21302 000757          JSR     AB190   ;GEN COUNTING BYTES
13 21303 024751          LDA     1,B195  ; SET ERR.
14 21304 062601          LDB     0
15 21305 100000          COM     0,0
16 21306 063201          STB     0
17 21307 034744          LDA     3,B194
18 21310 020745          LDA     0,B196
19 21311 110400          SUB     0,3
20 21312 054145          STA     3,NTREX ;SET EXP O OF INTRS
21 21313 020750          LDA     1,AB192
22 21314 125120          MOVZL   1,1
23 21315 030735          LDA     2,AB193
24 21316 151122          MOVZL   2,2
25 21317 020734          LDA     0,B194
26 21320 000143          JSR     AINTRL  ; INTERRUPT CONTROL
27 21321 077002          COMP    3
28 21322 101005          MOV     0,0,SNR ; ERROR NOT FOUND.
29 21323 006114          EHALT
30 21324 044732          STA     1,B197  ;NEXT ADDR STRING 1
31 21325 050732          STA     2,B198  ;NEXT ADDR STRING 2
32 21326 040732          STA     0,B199
33 21327 124400          NEG     1,1
34 21330 124000          COM     1,1     ;AC1:=AC1-1=ACTUAL ADDR STRING 1
35 21331 062601          LDB     0
36 21332 115000          MOV     0,3
37 21333 150400          NEG     2,2
38 21334 144000          COM     2,1     ;AC1:=AC2-1=ACTUAL ADDR STRING 2
39 21335 062601          LDB     0
40 21336 116420          SUBZ    0,3
41 21337 165000          MOV     3,1
42 21340 020720          LDA     0,B199
43 21341 106414          SUBO    0,1,SZR ; AC0= "COMP" DIFFERENS
44 21342 006114          EHALT           ; AC1= CALCULATED DIFFERENS
45                                       ; ( STRING 1 - STRING 2 )
46 21343 024713          LDA     1,B197
47 21344 030710          LDA     2,B195  ;EXPECTED ERROR ADDR
48 21345 151400          INC     2,2
49 21346 132414          SUBO    1,2,SZR ; AC1= "COMP" ERROR ADDR.+1
50 21347 006114          EHALT           ; AC2= CALCULATED ERROR ADDR.+1
51 21350 020144          LDA     0,NTRLF ;CHECK NO OF INTRS
52 21351 024145          LDA     1,NTREX
53 21352 106414          SUBO    0,1,SZR
54 21353 006114          EHALT           ;AC0=NO OF INTRS
55                                       ;AC1=EXPECTED
56 21354 006113          LOOP
57 21355 010677          ISZ     B195
58 21356 000401          JMP     .+1     ;SKIP SAFETY
59 21357 014676          DSZ     B196
60 21360 000710          JMP     B191
61 21361 002401          JMP     A.+1    ;PASS TCP LOOP
62 21362 022120          AXX             ;NEXT LOOP
```

```
* 0235  .TA1:
01
02                          ;ADDRESSING TEST TO INSURE THAT PROGRAMS CAN BE RUN
03                          ;AFTER ENABLING MEMORY EXTENSION.
04
05                          ;THIS TEST IS PLACED IN 3 DIFFERENT PLACES:
06                          ;       A PAGE ZERO     FOR TCP         LOC 200
07                          ;       B LOW MEMORY    FOR TCP         TCPLO LOC 21363
08                          ;       C HIGH MEMORY   FOR TCP         TCPHI LOC 100366
09                          ;       D LOW, PART OF MAIN TEST:  A77 + A99 LOC 14061
10                          ;       E HIGH, PART OF MAIN TEST:  A0216 LOC 100200
11
12                          ;A,B AND C ARE DESIGNED TO USE WITH TCP 701 AND
13                          ;DEMANDS 64K WORDS OF MEMORY.
14                          ;EACH OF THE SMALL TESTPARTS CAN BE RUN SEPERATELY BY
15                          ;CHANGING THE FIRST INSTRUCTION IN THE NEXT TESTPART TO
16                          ; JMP .-X.
17                          ;EACH TIME RESET IS PRESSED THE FIRST START ADDR TO BE
18                          ;USED IS 375. IT WILL SET MEM EXT FLAG AND HALT. NOW IT
19                          ;IS POSSIBLE TO USE TCP 701 FOR EXAMINE, DEPOSIT AND
20                          ;START/CONTINUE IN ADDRESSES WITH BIT 0.
21
22                          ;LOW PAGE ZERO ADDR
23 21363 020010 TCPLO:      LDA     0,LOC10 ;CONTENT=177777
24 21364 100014             COMO    0,0,SZR
25 21365 063077             HALT
26
27                          ;HIGH PAGE ZERO ADDR
28 21366 024367             LDA     1,LO367 ;CONTENT=177777
29 21367 124014             COMO    1,1,SZR
30 21370 063077             HALT
31
32                          ;RELATIVE, +DISPL.
33 21371 020401             LDA     0,.+1
34 21372 024400             LDA     1,.+0
35 21373 100414             SUBO    0,1,SZR
36 21374 063077             HALT
37
38                          ;RELATIVE, -DISPL.
39 21375 020400             LDA     0,.+0
40 21376 024777             LDA     1,.-1
41 21377 100414             SUBO    0,1,SZR
42 21400 063077             HALT
43
44                          ;INDEX REG, +DISPL.
45 21401 050370             LDA     2,LO370 ;CONTENT=367
46 21402 155400             INC     2,3
47 21403 021001             LDA     0,1,2
48 21404 025400             LDA     1,0,3   ;ADDR=370
49 21405 100414             SUBO    0,1,SZR ;CONT=367
50 21406 063077             HALT
51
52                          ;INDEX REG, -DISPL.
53 21407 050370             LDA     2,LO370 ;CONTENT=367
54 21410 155400             INC     2,3
55 21411 021000             LDA     0,0,2
56 21412 025777             LDA     1,-1,3  ;ADDR=367
57 21413 100414             SUBO    0,1,SZR ;CONT=,77777
58 21414 063077             HALT
59
60                          ;INDEX REG, +DISPL.
61 21415 050367             LDA     2,LO367 ;CONTENT=-1
62 21416 155400             INC     2,3
63 21417 021177             LDA     0,177,2
64 21420 025576             LDA     1,176,3 ;ADDR=176
65 21421 100414             SUBO    0,1,SZR ;CONT=377
66 21422 063077             HALT
```

```
- 0254  . AT
01
02                              ;INDEX REG, -DISPL.
03 21423 030370                 LDA     2,L0370 ;CONTENT=367
04 21424 034170                 LDA     3,L0170 ;CONTENT=166
05 21425 021200                 LDA     0,-200,2
06 21426 025401                 LDA     1,1,3   ;ADDR=167
07 21427 106414                 SUBO    0,1,SZR ;CONT=177400
08 21430 063077                 HALT
09
10                              ;INDEX REG ABOVE PAGE ZERO
11 21431 034171                 LDA     3,L0171 ;CONTENT=VMEND (2422)
12 21432 171400                 INC     3,2
13 21433 025377                 LDA     1,-1,2
14 21434 021400                 LDA     0,0,3   ;ADDR=VMEND
15 21435 106414                 SUBO    0,1,SZR ;CONT=000101
16 21436 063077                 HALT
17
18                              ;TEST OF JMP
19 21437 000402                 JMP     .+2
20 21440 063077                 HALT            ;RELATIVE, +DISPL.
21
22 21441 000402                 JMP     .+2
23 21442 021442                 .               ;ADDR
24 21443 030777                 LDA     2,.-1
25 21444 155000                 MOV     2,3
26 21445 001005                 JMP     5,2
27 21446 063077                 HALT            ;INDEX REG 2
28
29 21447 001407                 JMP     7,3
30 21450 063077                 HALT            ;INDEX REG 3
31
32 21451 000036                 JMP     LOC36
33 21452 063077                 HALT            ;PAGE ZERO
34
35                              ;AUTO INCR ADDR (OR DSZ)
36 21453 020172                 LDA     0,L0172
37 21454 040027                 STA     0,LOC27
38 21455 026027                 LDA     1,ALOC27
39 21456 014027                 DSZ     LOC27
40 21457 030027                 LDA     2,LOC27
41 21460 112414                 SUBO    0,2,SZR
42 21461 063077                 HALT            ;ADDR=173 BEFORE COUNT
43 21462 021001                 LDA     0,1,2
44 21463 106414                 SUBO    0,1,SZR
45 21464 063077                 HALT            ;CONT=174
46
47                              ;AUTO DECR ADDR (OR ISZ)
48 21465 020370                 LDA     0,L0370
49 21466 040037                 STA     0,LOC37
50 21467 026037                 LDA     1,ALOC37
51 21470 010037                 ISZ     LOC37
52 21471 030037                 LDA     2,LOC37
53 21472 112414                 SUBO    0,2,SZR
54 21473 063077                 HALT            ;ADDR=367 BEFORE COUNT
55 21474 021377                 LDA     0,-1,2
56 21475 106414                 SUBO    0,1,SZR
57 21476 063077                 HALT            ;CONT=135700
```

```
= 0253  .TI.
01
02                              ;TEST INDIRECT RELATIVE AND JSR RETURN ADDR
03 21477 120403                 LDA     1,.+5
04 21500 004403                 JSR     .+5
05 21501 063077                 HALT
06 21502 000403                 JMP     .+5
07 21503 021501                 .-2             ;ADDR
08 21504 021503                 .-1
09 21505 161000                 MOV     3,0
10 21506 106414                 SUBO    0,1,SZR
11 21507 063077                 HALT
12
13                              ;TEST INDIRECT PAGE ZERO TO PAGE ZERO
14 21510 022172                 LDA     0,AL0172
15 21511 030173                 LDA     2,L0173
16 21512 112414                 SUBO    0,2,SZR
17 21513 063077                 HALT
18
19                              ;TEST INDIRECT INDEX TO PAGE ZERO
20 21514 030173                 LDA     2,L0173
21 21515 034174                 LDA     3,L0174
22 21516 127776                 LDA     1,A-2,3
23 21517 132414                 SUBO    1,2,SZR
24 21520 063077                 HALT
25
26                              ;TEST OF JMP INDIRECT
27 21521 030175                 LDA     2,L0175
28 21522 020404                 LDA     0,.+4
29 21523 041000                 STA     0,0,2
30 21524 024406                 LDA     1,.+6
31 21525 045001                 STA     1,1,2
32 21526 000401                 JMP     A.+1
33 21527 037601                 037601          ;LDA 3,A-177,3 IF ERRONOUSLY PERFORMED.
34 21530 063077                 HALT
35 21531 000402                 JMP     .+2     ;037601= JMP A.+1
36 21532 021533                 .+1             ;037602= THIS ADDR
37
38                              ;TEST INDIRECT PAGE ZERO TO LOW MEM
39 21533 030171                 LDA     2,L0171
40 21534 025000                 LDA     1,0,2
41 21535 022171                 LDA     0,AL0171 ;ADDR=VMEND (2422)
42 21536 106414                 SUBO    0,1,SZR ;CONT=000101
43 21537 063077                 HALT
44
45                              ;TEST INDIRECT INDEX FROM HERE TO PAGE ZERO
46 21540 000403                 JMP     .+3
47 21541 000173                 L0173
48 21542 021541                 .-1             ;ADDR
49 21543 030777                 LDA     2,.-1   ;POINT TO L0172
50 21544 026172                 LDA     1,AL0172
51 21545 023000                 LDA     0,A0,2  ;ADDR=173
52 21546 106414                 SUBO    0,1,SZR ;CONT=012345
53 21547 063077                 HALT
```

```
* 0230  .TITL
01
02                              ;TEST INDIRECT INDEX FROM HERE TO LOW MEM
03 21550 000403                 JMP     .+3
04 21551 021552                 .+1
05 21552 037601                 037601
06 21553 024360                 LDA     1,L0360
07 21554 044175                 STA     1,TL0175
08 21555 050774                 LDA     2,.-4
09 21556 025000                 LDA     0,A0,2  ;ADDR=037601
10 21557 106414                 SUBO    0,1,SZR ;CONT=135700
11 21560 063077                 HALT
12
13                              ;TEST INDIRECT INDEX FROM HERE TO HERE
14 21561 000404                 JMP     .+4
15 21562 021563                 .+1
16 21563 021564                 .+1
17 21564 000000                 0                       ;WORK ADDR
18 21565 024151                 LDA     1,TEPAT
19 21566 044776                 STA     1,.-2
20 21567 034773                 LDA     3,.-5
21 21570 025003                 LDA     0,A0,3  ;ADDR=RELATIVE -4
22 21571 106414                 SUBO    0,1,SZR ;CONT=052525 (TEPAT)
23 21572 063077                 HALT
24
25                              ;TEST INDIRECT INDEX AUTO INCR ADDRESSING.
26 21573 000404                 JMP     .+4
27 21574 000027                 LOC27           ;TEST ADDR
28 21575 021575                 .               ;ADDR-1 OF DATA
29 21576 000173                 L0173           ;DATA
30 21577 024776                 LDA     1,.-2
31 21600 044027                 STA     1,LOC27 ;ADDR-1 OF DATA TO TEST ADDR
32 21601 050775                 LDA     2,.-5   ;AC2=LOC27 ADDR
33 21602 025003                 LDA     0,A0,2
34 21603 125400                 INC     1,1
35 21604 030027                 LDA     2,LOC27 ;ADDR OF DATA
36 21605 132414                 SUBO    1,2,SZR ;INDIRECT INDEX ADDRESSING OF LOC27
37 21606 063077                 HALT            ;DON'T AUTO INCR ?
38 21607 025000                 LDA     1,0,2   ;DATA=173
39 21610 106414                 SUBO    0,1,SZR ;MULTILEVEL INDIRECT IF DATA = 012345
40 21611 063077                 HALT
41
42                              ;TEST INDIRECT INDEX AUTO DECR ADDRESSING.
43 21612 000404                 JMP     .+4
44 21613 000036                 LOC36           ;TEST ADDR-1
45 21614 021615                 .+1             ;ADDR OF DATA
46 21615 000172                 L0172           ;DATA
47 21616 024776                 LDA     1,.-2
48 21617 151400                 INC     1,2
49 21620 050037                 STA     2,LOC37 ;ADDR+1 OF DATA TO TESTADDR
50 21621 054772                 LDA     3,.-6   ;AC3=LOC36 ADDR
51 21622 025401                 LDA     0,A1,3  ;A LOC37
52 21623 030037                 LDA     2,LOC37 ;ADDR OF DATA
53 21624 132414                 SUBO    1,2,SZR ;INDIRECT INDEX ADDRESSING OF LOC37
54 21625 063077                 HALT            ;DON'T AUTO DECR ?
55 21626 025000                 LDA     1,0,2   ;DATA=172
56 21627 106414                 SUBO    0,1,SZR ;MULTILEVEL INDIRECT IF DATA = 173 ?
57 21630 063077                 HALT
```

```
* 0257  .TITL
01
02                              ;TEST THAT MEMORY EXTENSION FLAG IS CLEARED AFTER IORST.
03 21651 062677                 ALRST           ;IORST, X-REFF LIST
04 21652 063701                 SKPDZ   DEV1
05 21653 063077                 HALT            ;FLAG NOT CLEARED.
06
07                              ;TEST THAT THE STATE OF BIT0 IS USED BEFORE COUNT OF AN
08                              ;AUTO INCR LOCATION. BIT0 = 0 COUNTED TO 1 AND
09                              ;MULTILEVEL INDIRECT ADDRESSING NOT DISABLED.
10 21654 062677                 ALRST           ;IORST, X-REFF LIST, CLEAR MEM EXT FLAG.
11 21655 000403                 JMP     .+3
12 21656 000000                 00000           ;15 BIT ADDR AFTER COUNT
13 21657 077777                 077777          ;ADDR TO COUNT
14 21660 020777                 LDA     0,.-1
15 21661 040027                 STA     0,LOC27
16 21662 034774                 LDA     3,.-4
17 21663 025400                 LDA     1,0,3
18 21664 032027                 LDA     2,ALOC27 ;LOC0 = 002100 ?
19 21665 020027                 LDA     0,LOC27 ;LOC 2100 = 040000 ?
20 21666 132414                 SUBO    1,2,SZR ;LOC 100000 = 006007 ?
21 21667 063077                 HALT            ;A27 = 000000
22                                              ;AC0=ADDR IN LOC27
23                                              ;AC1=GOOD
24                                              ;AC2=BAD
25
26                              ;TEST THAT THE STATE OF BIT0 IS USED BEFORE COUNT OF AN
27                              ;AUTO INCR LOCATION. BIT0 = 1 COUNTED TO 0 AND
28                              ;MULTILEVEL INDIRECT ADDRESSING NOT DISABLED.
29 21650 062677                 ALRST           ;IORST, X-REFF LIST, CLEAR MEM EXT FLAG.
30 21651 000403                 JMP     .+3
31 21652 000000                 00000           ;15 BIT ADDR AFTER COUNT
32 21653 177777                 177777          ;ADDR TO COUNT
33 21654 020777                 LDA     0,.-1
34 21655 040027                 STA     0,LOC27
35 21656 034774                 LDA     3,.-4
36 21657 027400                 LDA     1,A0,3
37 21660 032027                 LDA     2,ALOC27 ;LOC0 = 2100 ?
38 21661 020027                 LDA     0,LOC27 ;LOC 2100 = 040000 ?
39 21662 132414                 SUBO    1,2,SZR
40 21663 063077                 HALT            ;A27 = A0 = 2100
41                                              ;AC0=ADDR IN LOC27
42                                              ;AC1=GOOD
43                                              ;AC2=BAD
44
```

```
= 0256  .*41*
,01
;02                             ;TEST THAT THE STATE OF BIT0 IS USED BEFORE COUNT OF AN
03                              ;AUTO DECR LOCATION. BIT0 = 1 COUNTED TO 0 AND
04                              ;MULTILEVEL INDIRECT ADDRESSING NOT DISABLED.
05 21664 062677                 ALRST               ;IORST, X-REFF LIST, CLEAR MEM EXT FLAG.
06 21665 000403                 JMP     .+3
07 21666 077777                 77777               ;15 BIT ADDR AFTER COUNT
08 21667 100000                 100000              ;ADDR TO COUNT
09 21670 020777                 LDA     0,.-1
10 21671 040037                 STA     0,LOC37
11 21672 034774                 LDA     3,.-4
12 21673 027400                 LDA     1,A0,3
13 21674 032037                 LDA     2,ALOC37 ;LOC 706 = 034470 ?
14 21675 020037                 LDA     0,LOC37 ;LOC 077777 = 000706 ?
15 21676 132414                 SUBO    1,2,SZR
16 21677 063077                 HALT                ;A37 = A77777 = 706
17                                                  ;AC0=ADDR IN LOC27
18                                                  ;AC1=GOOD
19                                                  ;AC2=BAD
20
21                              ;TEST THAT THE STATE OF BIT0 IS USED BEFORE COUNT OF AN
22                              ;AUTO DECR LOCATION. BIT0 = 0 COUNTED TO 1 AND
23                              ;MULTILEVEL INDIRECT ADDRESSING NOT DISABLED.
24 21700 062677                 ALRST               ;IORST, X-REFF LIST, CLEAR MEM EXT FLAG
25 21701 000403                 JMP     .+3
26 21702 077777                 77777               ;15 BIT ADDR AFTER COUNT
27 21703 000000                 000000              ;ADDR TO COUNT
28 21704 020777                 LDA     0,.-1
29 21705 040037                 STA     0,LOC37
30 21706 034774                 LDA     3,.-4
31 21707 025400                 LDA     1,0,3
32 21710 032037                 LDA     2,ALOC37 ;LOC 77777 = 000706 ?
33 21711 020037                 LDA     0,LOC37 ;LOC 706 = 034470 ?
34 21712 132414                 SUBO    1,2,SZR ;LOC 177777 = 006007 ?
35 21713 063077                 HALT                ;A37 = 077777
36                                                  ;AC0=ADDR IN LOC37
37                                                  ;AC1=GOOD
38                                                  ;AC2=BAD
39
40 21714 076701                 MEMEX               ;SET MEMORY EXT FLAG AGAIN
41 21715 063601                 SKPDN   DEV1
42 21716 063077                 HALT                ;FLAG NOT SET
```

```
* 0259  .PAT
01
02                          ;INDEX REG ADDR HIGH MEM
03 21717 034571             LDA     3,HIGHI
04 21720 171400             INC     3,2
05 21721 021000             LDA     0,0,2
06 21722 025401             LDA     1,1,3   ;ADDR=AMULIN=100152
07 21723 106414             SUBO    0,1,SZR ;CONT=024414
08 21724 063077             HALT
09
10                          ;TEST INDIRECT PAGE ZERO TO HIGH MEM
11 21725 034177             LDA     2,L0177
12 21726 025000             LDA     1,0,2
13 21727 022177             LDA     0,AL0177 ;ADDR=AMULIN+1
14 21730 106414             SUBO    0,1,SZR ;CONT=161000
15 21731 063077             HALT
16
17                          ;TEST THAT BIT0 CHANGES, RELATIVE (PC-DISPL.)
18                          ;TEST THAT BIT0 CHANGES, INDEX (AC2-DISPL.)
19 21732 000405             JMP     .+5
20 21733 020700             LDA     0,.-100
21 21734 001400             JMP     0,3
22 21735 077775             077775          ;NOT USED ADDR IN BINARY LOADER 32K.
23 21736 000100             100             ;ADDR ADD TO HIGH MEM
24 21737 030776             LDA     2,.-2
25 21740 024173             LDA     1,L0173
26 21741 045000             STA     1,0,2   ;ADDR 077775 = 012345
27 21742 020774             LDA     0,.-4
28 21743 113000             ADD     0,2
29 21744 020767             LDA     0,.-11
30 21745 041000             STA     0,0,2   ;ADDR 100075 = LDA 0,.-100
31 21746 020766             LDA     0,.-12
32 21747 041001             STA     0,1,2   ;ADDR 100076 = JMP 0,3
33 21750 005000             JSR     0,2
34 21751 106414             SUBO    0,1,SZR
35 21752 063077             HALT            ;RELATIVE
36 21753 021300             LDA     0,-100,2
37 21754 106414             SUBO    0,1,SZR
38 21755 063077             HALT            ;INDEX
```

```
* 0241  .TEL
01
02                          ;TEST THAT BIT0 CHANGES, RELATIVE (PC+DISPL.)
03                          ;TEST THAT BIT0 CHANGES, INDEX (AC2+DISPL.)
04 21756 000405             JMP     .+5
05 21757 020500             LDA     0,.+100
06 21760 031400             JMP     0,3
07 21761 077775             077775          ;NOT USED ADDR IN BINARY LOADER 32K.
08 21762 000100             100             ;ADDR ADD TO HIGH MEM
09 21763 030776             LDA     2,.-2
10 21764 020775             LDA     0,.-5
11 21765 041001             STA     1,0,2   ;ADDR 077775 = LDA 0,.+100
12 21766 020772             LDA     0,.-6
13 21767 041001             STA     0,1,2   ;ADDR 077776 = JMP 0,3
14 21770 034772             LDA     3,.-6
15 21771 157000             ADD     2,3
16 21772 024773             LDA     1,L0173
17 21773 045400             STA     1,0,3   ;ADDR 100075 = 012345
18 21774 005000             JSR     0,2
19 21775 100414             SUBO    0,1,SZR
20 21776 063077             HALT            ;RELATIVE
21 21777 021100             LDA     0,100,2
22 22000 100414             SUBO    0,1,SZR
23 22001 063077             HALT            ;INDEX
24
25                          ;TEST THAT INDIRECT ADDRESSING TO 32K+26 DON'T
26                          ;AUTOINCREMENT THIS ADDR.
27 22002 000404             JMP     .+4
28 22003 100026             LOC26+100000    ;TEST ADDR
29 22004 022005             .+1             ;ADDR OF DATA
30 22005 000173             L0173           ;DATA
31 22006 024776             LDA     1,.-2
32 22007 034774             LDA     3,.-4
33 22010 030170             LDA     2,L0170
34 22011 050026             STA     2,LOC26
35 22012 045400             STA     1,0,3   ;ADDR OF DATA TO TEST ADDR
36 22013 023400             LDA     0,@0,3
37 22014 031400             LDA     2,0,3
38 22015 132414             SUBO    1,2,SZR
39 22016 063077             HALT            ;ADDR IN 32K+26 CHANGED
40 22017 025000             LDA     1,0,2   ;DATA=173
41 22020 100414             SUBO    0,1,SZR ;LOC26 USED IF DATA = 177400
42 22021 063077             HALT
43
44                          ;TEST THAT INDIRECT ADDRESSING TO 32K+35 DON'T
45                          ;AUTODECREMENT THIS ADDR.
46 22022 000404             JMP     .+4
47 22023 100035             LOC35+100000    ;TEST ADDR
48 22024 022025             .+1             ;ADDR OF DATA
49 22025 000172             L0172           ;DATA
50 22026 024776             LDA     1,.-2
51 22027 034774             LDA     3,.-4
52 22030 030174             LDA     2,L0174
53 22031 050035             STA     2,LOC35
54 22032 045400             STA     1,0,3   ;ADDR OF DATA TO TEST ADDR
55 22033 023400             LDA     0,@0,3
56 22034 031400             LDA     2,0,3
57 22035 132414             SUBO    1,2,SZR
58 22036 063077             HALT            ;ADDR IN 32K+35 CHANGED
59 22037 025000             LDA     1,0,2   ;DATA=172
60 22040 100414             SUBO    0,1,SZR ;LOC35 USED IF DATA = 012345
61 22041 063077             HALT
```

```
01
02                      ;TEST THAT THE STATE OF BIT0 IS CHANGED WHEN COUNTING
03                      ;IN AN AUTO INCR LOCATION. BIT0 = 0 COUNTED TO 1.
04 22042 000403         JMP     .+3
05 22043 100000         100000          ;16 BIT ADDR AFTER COUNT
06 22044 077777         077777          ;ADDR TO COUNT
07 22045 020777         LDA     0,.-1
08 22046 040027         STA     0,LOC27
09 22047 034774         LDA     3,.-4
10 22050 025400         LDA     1,0,3
11 22051 032127         LDA     2,ALOC27 ;LOC0 = 002100 ?
12 22052 020027         LDA     0,LOC27 ;LOC 2100 = 040000 ?
13 22053 132414         SUBO    1,2,SZR ;LOC 100000 = 002007 ?
14 22054 063077         HALT            ;A27 = 100000
15                                      ;AC0=ADDR IN LOC27
16                                      ;AC1=GOOD
17                                      ;AC2=BAD
18
19                      ;TEST THAT THE STATE OF BIT0 IS CHANGED WHEN COUNTING
20                      ;IN AN AUTO INCR LOCATION. BIT0 = 1 COUNTED TO 0.
21 22055 000403         JMP     .+3
22 22056 000000         000000          ;16 BIT ADDR AFTER COUNT
23 22057 177777         177777          ;ADDR TO COUNT
24 22060 020777         LDA     0,.-1
25 22061 040027         STA     0,LOC27
26 22062 034774         LDA     3,.-4
27 22063 025400         LDA     1,0,3
28 22064 032027         LDA     2,ALOC27
29 22065 020027         LDA     0,LOC27 ;LOC0 = 2100 ?
30 22066 132414         SUBO    1,2,SZR ;LOC 2100 = 040000 ?
31 22067 063077         HALT            ;A27 = 000000
32                                      ;AC0=ADDR IN LOC27
33                                      ;AC1=GOOD
34                                      ;AC2=BAD
35
36                      ;TEST THAT THE STATE OF BIT0 IS CHANGED WHEN COUNTING
37                      ;IN AN AUTO DECR LOCATION. BIT0 = 1 COUNTED TO 0.
38 22070 000403         JMP     .+3
39 22071 077777         077777          ;16 BIT ADDR AFTER COUNT
40 22072 100000         100000          ;ADDR TO COUNT
41 22073 020777         LDA     0,.-1
42 22074 040037         STA     0,LOC37
43 22075 034774         LDA     3,.-4
44 22076 025400         LDA     1,0,3
45 22077 032037         LDA     2,ALOC37
46 22100 020037         LDA     0,LOC37 ;LOC 706 = 034470 ?
47 22101 132414         SUBO    1,2,SZR ;LOC 077777 = 000706 ?
48 22102 063077         HALT            ;A37 = 077777
49                                      ;AC0=ADDR IN LOC37
50                                      ;AC1=GOOD
51                                      ;AC2=BAD
52
```

```
* 2242   .=41
01
02                      ;TEST THAT THE STATE OF BIT0 IS CHANGED WHEN COUNTING
03                      ;IN AN AUTO DECR LOCATION. BIT0 = 0 COUNTED TO 1.
04 22103 000403         JMP     .+3
05 22104 177777         177777          ;16 BIT ADDR AFTER COUNT
06 22105 000000         000000          ;ADDR TO COUNT
07 22106 020777         LDA     0,.-1
08 22107 040037         STA     0,LOC37
09 22110 034774         LDA     3,.-4
10 22111 025400         LDA     1,0,3
11 22112 032037         LDA     2,@LOC37 ;LOC 077777 = 000706 ?
12 22113 020037         LDA     0,LOC37 ;LOC 706 = 034470 ?
13 22114 152414         SUBO    1,2,SZR ;LOC 177777 = 006007 ?
14 22115 063077         HALT            ;A37 = 177777
15                                      ;ACO=ADDR IN LOC37
16                                      ;AC1=GOOD
17                                      ;AC2=BAD
18
19 22116 002401         JMP     .+1
20 22117 021303         TCPLO           ;CHANGE TO 2224 IF YOU WANT TO GO BACK
21                                      ;TO MAIN PROGRAM.
```

```
                .TITLE
01                      ;TAPE 9 END
02 022120 000401 AXX:   JMP     .+1     ;SPACE FOR PROGRAM TROUBLESHOOTING
03 022121 000575        JMP     ARTEST  ;RETURN, END OF TEST LOOPS.
04 022122 022122 LASTP: .               ;LAST LOC OF PROGRAM
05
06        001435        .END PRGIN
  0244  .PAGE
```

| | | | | | | | | | |
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| A00 | 015747 | 134/04 | 158/ | | | | | | |
| A001 | 014423 | 134/05 | 160/ | | | | | | |
| A002 | 015700 | 158/15 | 158/24 | | | | | | |
| A00CH | 014025 | 159/02 | 159/25 | | | | | | |
| A00LO | 014017 | 158/28 | 158/54 | 159/02 | 159/10 | 159/26 | | | |
| A00SL | 014021 | 158/31 | 158/51 | 158/58 | 159/13 | 159/32 | | | |
| A00SU | 014022 | 158/55 | 158/49 | 158/59 | 159/15 | 159/30 | | | |
| A00UP | 014020 | 158/29 | 158/43 | 158/45 | 158/46 | 158/57 | 159/11 | 159/29 | |
| A01 | 014025 | 134/06 | 158/54 | 159/07 | | | | | |
| A011A | 014024 | 159/03 | 159/18 | | | | | | |
| A02 | 014041 | 134/07 | 170/04 | | | | | | |
| A020 | 014046 | 170/09 | 170/15 | | | | | | |
| A021 | 014055 | 170/12 | 170/16 | | | | | | |
| A021B | 014745 | 171/13 | 171/27 | | | | | | |
| A021I | 014747 | 171/19 | 171/29 | | | | | | |
| A021C | 014750 | 171/22 | 171/30 | | | | | | |
| A021S | 014751 | 171/26 | 171/21 | 171/31 | | | | | |
| A021A | 016102 | 170/60 | 167/25 | | | | | | |
| A021D | 014712 | 170/22 | 170/26 | 170/31 | 170/36 | 170/42 | 170/47 | 170/51 | 170/55 |
| | | 170/57 | | | | | | | |
| A021O | 014752 | 171/14 | 172/14 | | | | | | |
| A021P | 015430 | 178/59 | 179/19 | | | | | | |
| A022 | 014060 | 170/08 | 170/19 | 171/23 | | | | | |
| A023 | 014064 | 18/15 | 170/24 | | | | | | |
| A024 | 014707 | 170/53 | 171/31 | | | | | | |
| A0241 | 014704 | 170/49 | 171/30 | | | | | | |
| A0242 | 014701 | 170/44 | 171/29 | | | | | | |
| A0243 | 014075 | 170/36 | 171/28 | 176/42 | | | | | |
| A0244 | 014072 | 170/33 | 171/27 | | | | | | |
| A0245 | 014067 | 170/28 | 171/26 | | | | | | |
| A025 | 014715 | 134/10 | 170/07 | 171/03 | 172/12 | 173/23 | 174/07 | 174/08 | 174/36 |
| | | 174/48 | 175/04 | 175/15 | 175/16 | 175/28 | 175/45 | 177/29 | 177/48 |
| | | 180/22 | 181/23 | 182/07 | 182/08 | 182/36 | 182/48 | 183/04 | 183/15 |
| | | 183/16 | 183/25 | 183/45 | 185/29 | 185/48 | 187/23 | | |
| A026 | 014741 | 170/16 | 171/06 | 171/23 | | | | | |
| A027 | 014742 | 171/11 | 171/24 | | | | | | |
| A028 | 014743 | 171/17 | 171/16 | 171/25 | | | | | |
| A029 | 014744 | 171/08 | 171/20 | | | | | | |
| A02AE | 014746 | 171/15 | 171/26 | 172/19 | 172/24 | 172/30 | 172/36 | 172/44 | 172/52 |
| | | 172/60 | 173/08 | 173/16 | 173/20 | 173/27 | 173/30 | 173/33 | 173/42 |
| | | 173/45 | 173/54 | 173/57 | 174/05 | 174/11 | 174/17 | 174/24 | 174/34 |
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| A02AF | 015201 | 175/11 | 175/23 | 175/37 | 175/40 | 175/54 | 175/57 | 176/08 | 176/15 |
| | | 176/35 | 176/38 | 176/42 | 177/20 | 177/23 | 177/39 | 177/42 | 177/58 |
| | | 177/61 | 178/14 | 178/31 | 178/46 | 179/14 | | | |
| A02L | 014714 | 170/06 | 170/60 | | | | | | |
| A03 | 016103 | 134/11 | 166/08 | 170/58 | 186/03 | | | | |
| A031 | 016127 | 186/05 | 188/27 | | | | | | |
| A04 | 016130 | 134/12 | 188/26 | 189/04 | | | | | |
| A041 | 016132 | 189/06 | 189/22 | | | | | | |
| A05 | 016151 | 134/13 | 189/26 | | | | | | |
| A051 | 016153 | 189/28 | 189/42 | | | | | | |
| A06 | 016170 | 134/14 | 190/04 | | | | | | |
| A061 | 016172 | 190/06 | 190/21 | | | | | | |
| A07 | 016210 | 134/15 | 190/25 | | | | | | |
| A071 | 016212 | 190/27 | 190/40 | | | | | | |
| A08 | 016226 | 134/16 | 191/04 | | | | | | |
| A081 | 016230 | 191/06 | 191/23 | | | | | | |
| A09 | 016250 | 134/17 | 191/27 | | | | | | |

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| A10 | 016273 | 134/19 | 192/34 | |
| A101 | 016275 | 192/00 | 192/23 | |
| A11 | 016315 | 134/19 | 192/27 | |
| A111 | 016317 | 192/29 | 192/47 | |
| A12 | 016340 | 134/20 | 193/03 | |
| A120 | 016343 | 193/06 | 194/22 | |
| A121 | 016446 | 193/17 | 194/24 | |
| A122 | 016447 | 193/22 | 194/25 | |
| A123 | 016450 | 194/03 | 194/26 | |
| A124 | 016451 | 194/12 | 194/27 | |
| A125 | 016452 | 193/04 | 194/28 | |
| A126 | 016461 | 193/08 | 194/35 | |
| A127 | 016462 | 193/21 | 194/36 | |
| A128 | 016463 | 193/14 | 194/37 | |
| A129 | 016464 | 193/16 | 194/38 | 194/38 |
| A13 | 016530 | 134/21 | 194/35 | 196/03 |
| A130 | 016533 | 196/06 | 197/25 | |
| A131 | 016533 | 196/16 | 197/27 | |
| A1310 | 016654 | 196/39 | 196/46 | 197/44 |
| A1311 | 016655 | 196/27 | 196/52 | 197/45 |
| A132 | 016634 | 196/21 | 197/28 | |
| A133 | 016635 | 197/07 | 197/29 | |
| A134 | 016636 | 197/15 | 197/30 | |
| A135 | 016637 | 196/04 | 197/31 | |
| A136 | 016650 | 196/08 | 197/40 | |
| A137 | 016651 | 196/20 | 197/41 | |
| A138 | 016652 | 196/14 | 197/42 | |
| A139 | 016653 | 196/17 | 197/11 | 197/43 |
| A14 | 016724 | 134/22 | 197/40 | 199/03 |
| A140 | 016732 | 199/09 | 199/50 | |
| A141 | 016774 | 199/17 | 199/35 | 200/02 |
| A142 | 016775 | 199/20 | 200/03 | |
| A143 | 016776 | 199/19 | 200/04 | |
| A144 | 017003 | 199/05 | 200/08 | |
| A145 | 017011 | 199/07 | 199/39 | 200/14 |
| A15 | 017012 | 134/23 | 199/11 | 201/03 |
| A150 | 017020 | 201/09 | 201/53 | |
| A151 | 017065 | 201/20 | 201/36 | 202/02 |
| A152 | 017066 | 201/25 | 202/03 | |
| A153 | 017067 | 201/16 | 201/21 | 202/04 |
| A154 | 017070 | 201/05 | 202/05 | |
| A155 | 017102 | 201/16 | 201/32 | 202/15 |
| A156 | 017103 | 201/07 | 201/42 | 202/16 |
| A16 | 017174 | 134/24 | 201/11 | 204/03 |
| A160 | 017202 | 204/09 | 204/59 | |
| A161 | 017255 | 204/25 | 204/39 | 205/02 |
| A162 | 017256 | 204/28 | 205/03 | |
| A163 | 017257 | 204/16 | 204/26 | 205/04 |
| A164 | 017260 | 204/05 | 205/05 | |
| A165 | 017270 | 204/20 | 204/44 | 205/13 |
| A166 | 017271 | 204/07 | 204/49 | 205/14 |
| A167 | 017352 | 204/23 | 204/35 | 206/14 |
| A168 | 017353 | 204/21 | 206/15 | |
| A17 | 017354 | 134/25 | 204/11 | 207/03 |
| A170 | 017360 | 207/07 | 207/51 | |
| A171 | 017427 | 207/20 | 207/32 | 208/02 |
| A172 | 017430 | 207/21 | 207/36 | 208/03 |
| A173 | 017431 | 207/25 | 207/40 | 208/04 |

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| A174 | 017432 | 207/05 | 208/05 | | | | | |
| A175 | 017444 | 207/18 | 208/15 | | | | | |
| A18 | 017445 | 154/26 | 207/09 | 209/03 | | | | |
| A180 | 017451 | 207/07 | 209/37 | | | | | |
| A181 | 017523 | 209/22 | 209/52 | 210/06 | | | | |
| A182 | 017524 | 209/23 | 209/40 | 210/03 | | | | |
| A183 | 017525 | 209/25 | 209/45 | 210/04 | | | | |
| A184 | 017526 | 209/05 | 210/05 | | | | | |
| A185 | 017542 | 209/18 | 210/36 | 210/17 | | | | |
| A19 | 017543 | 154/27 | 209/19 | 211/03 | | | | |
| A190 | 017550 | 211/06 | 212/19 | | | | | |
| A191 | 017640 | 211/21 | 212/21 | | | | | |
| A192 | 017641 | 211/24 | 212/22 | | | | | |
| A193 | 017642 | 211/06 | 212/23 | | | | | |
| A194 | 017664 | 211/15 | 211/43 | 211/47 | 212/09 | 212/41 | | |
| A195 | 017665 | 211/18 | 211/23 | 211/39 | 211/49 | 212/02 | 212/42 | |
| A20 | 017666 | 154/28 | 211/11 | 215/03 | | | | |
| A200 | 017673 | 213/08 | 214/17 | | | | | |
| A201 | 017765 | 213/22 | 214/19 | | | | | |
| A202 | 017766 | 213/23 | 213/32 | 214/20 | | | | |
| A203 | 017767 | 213/25 | 214/21 | | | | | |
| A204 | 017770 | 213/06 | 214/22 | | | | | |
| A205 | 020006 | 213/17 | 213/41 | 213/51 | 213/55 | 214/30 | | |
| A206 | 020007 | 213/19 | 213/36 | 213/49 | 213/57 | 214/37 | | |
| A21 | 020010 | 154/29 | 213/11 | 215/03 | | | | |
| A210 | 020013 | 215/06 | 216/34 | | | | | |
| A211 | 020123 | 215/30 | 216/56 | | | | | |
| A212 | 020124 | 215/31 | 216/57 | | | | | |
| A213 | 020125 | 215/33 | 216/58 | | | | | |
| A214 | 020126 | 215/04 | 217/02 | | | | | |
| A215 | 020205 | 215/21 | 215/49 | 215/53 | 216/02 | 216/15 | 217/57 | |
| A216 | 020206 | 215/23 | 215/44 | 216/08 | 216/20 | 217/56 | | |
| A217 | 020207 | 215/25 | 217/59 | | | | | |
| A218 | 020210 | 215/12 | 217/60 | | | | | |
| A22 | 020211 | 154/30 | 215/09 | 216/03 | | | | |
| A40 | 020235 | 219/35 | 220/20 | 221/13 | 221/36 | | | |
| A4010 | 020231 | 219/32 | 219/54 | | | | | |
| A4011 | 020232 | 219/33 | 219/57 | | | | | |
| A402 | 020222 | 219/24 | 219/37 | | | | | |
| A403 | 020223 | 219/25 | 219/38 | | | | | |
| A404 | 020224 | 219/26 | 219/43 | 219/46 | | | | |
| A405 | 020225 | 219/27 | 219/35 | 219/59 | | | | |
| A407 | 020226 | 219/29 | 219/58 | 219/51 | 220/13 | 220/22 | 221/15 | 221/38 | 221/43 |
| A408 | 020227 | 219/30 | 219/56 | 220/27 | 221/19 | 221/42 | | |
| A409 | 020230 | 219/31 | 219/50 | 219/53 | 221/45 | | | |
| A411 | 020244 | 219/44 | 219/49 | | | | | |
| A412 | 020264 | 220/06 | 220/16 | 220/28 | | | | |
| A4120 | 020263 | 220/07 | 220/14 | | | | | |
| A413 | 020266 | 220/08 | 220/17 | | | | | |
| A414 | 020267 | 220/09 | 220/18 | 220/21 | 220/31 | | | |
| A417 | 020270 | 220/10 | 220/25 | | | | | |
| A42 | 020271 | 154/31 | 218/05 | 220/12 | | | | |
| A421 | 020322 | 221/05 | 221/10 | | | | | |
| A422 | 020323 | 221/06 | 221/11 | 221/14 | 221/20 | 221/24 | | |
| A423 | 020311 | 220/10 | 220/28 | | | | | |
| A424 | 020340 | 221/07 | 221/20 | | | | | |
| A425 | 020324 | 221/07 | 221/17 | | | | | |
| A43 | 020325 | 154/32 | 220/30 | 221/09 | | | | |
| A431 | 020327 | 221/11 | 221/26 | | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| A452 | 020551 | 221/32 | 221/40 | | | | | | |
| A454 | 020563 | 221/32 | 221/43 | | | | | | |
| A44 | 020352 | 134/33 | 221/28 | 221/34 | | | | | |
| A443 | 020374 | 222/04 | 222/12 | 222/17 | | | | | |
| A445 | 020375 | 222/05 | 222/09 | | | | | | |
| A446 | 020376 | 222/06 | 222/10 | 222/13 | 222/16 | 222/23 | | | |
| A45 | 020377 | 134/34 | 221/51 | 222/08 | | | | | |
| A451 | 020423 | 222/32 | 222/45 | | | | | | |
| A452 | 020424 | 222/33 | 222/39 | | | | | | |
| A453 | 020425 | 222/34 | 222/40 | 222/43 | 222/53 | | | | |
| A454 | 020426 | 222/35 | 222/42 | | | | | | |
| A455 | 020427 | 222/36 | 222/47 | 222/49 | | | | | |
| A456 | 020401 | 222/10 | 222/25 | | | | | | |
| A46 | 020430 | 134/35 | 222/27 | 222/38 | | | | | |
| A461 | 020432 | 222/40 | 222/55 | | | | | | |
| A462 | 020603 | 226/04 | 226/14 | 226/33 | | | | | |
| A463 | 020604 | 226/05 | 226/11 | 226/30 | | | | | |
| A464 | 020665 | 226/06 | 226/12 | 226/15 | 226/19 | 226/23 | 226/31 | 226/34 | 226/38 |
| | | 226/42 | | | | | | | |
| A465 | 020666 | 226/07 | 226/17 | | | | | | |
| A466 | 020667 | 226/08 | 226/36 | | | | | | |
| A47 | 020670 | 134/36 | 225/56 | 226/10 | | | | | |
| A471 | 020672 | 226/12 | 226/25 | | | | | | |
| A48 | 020710 | 134/37 | 226/29 | | | | | | |
| A481 | 020712 | 226/31 | 226/44 | | | | | | |
| A482 | 020732 | 227/05 | 227/15 | 227/22 | 227/37 | 227/43 | | | |
| A483 | 020733 | 227/06 | 227/12 | | | | | | |
| A484 | 020734 | 227/07 | 227/13 | 227/16 | 227/27 | | | | |
| A485 | 020735 | 227/08 | 227/18 | 227/36 | 227/41 | | | | |
| A486 | 020736 | 227/09 | 227/20 | 227/39 | | | | | |
| A49 | 020737 | 134/38 | 226/46 | 227/11 | | | | | |
| A491 | 020741 | 227/13 | 227/29 | | | | | | |
| A50 | 020762 | 134/39 | 227/34 | | | | | | |
| A501 | 021002 | 228/05 | 228/22 | 228/46 | 228/52 | 229/12 | 229/37 | | |
| A502 | 021003 | 228/06 | 228/15 | 228/23 | 228/45 | 228/54 | | | |
| A504 | 021004 | 228/07 | 228/19 | | | | | | |
| A505 | 021005 | 228/08 | 228/20 | 228/24 | 228/35 | | | | |
| A506 | 021006 | 228/09 | 228/16 | 228/26 | 228/27 | 228/31 | | | |
| A5066 | 021007 | 228/10 | 228/16 | | | | | | |
| A507 | 021010 | 228/11 | 228/47 | | | | | | |
| A508 | 021011 | 228/12 | 228/29 | 228/50 | | | | | |
| A51 | 021012 | 134/40 | 227/49 | 228/14 | | | | | |
| A511 | 021020 | 228/20 | 228/37 | | | | | | |
| A52 | 021042 | 134/41 | 228/43 | | | | | | |
| A53 | 021066 | 134/42 | 228/60 | 229/08 | | | | | |
| A531 | 021070 | 229/10 | 229/23 | | | | | | |
| A532 | 021064 | 229/05 | 229/09 | | | | | | |
| A533 | 021065 | 229/06 | 229/10 | 229/13 | 229/15 | 229/21 | | | |
| A54 | 021112 | 134/43 | 229/25 | 229/33 | | | | | |
| A541 | 021114 | 229/35 | 229/50 | | | | | | |
| A542 | 021110 | 229/30 | 229/34 | | | | | | |
| A543 | 021111 | 229/31 | 229/35 | 229/38 | 229/40 | 229/47 | | | |
| A77 | 014061 | 134/08 | 160/12 | | | | | | |
| A771 | 014422 | 164/51 | 165/40 | | | | | | |
| A99 | 014431 | 134/09 | 166/06 | 166/14 | | | | | |
| A991 | 014640 | 168/59 | 169/19 | | | | | | |
| AAFUB | 006621 | 98/45 | 98/47 | | | | | | |
| AANUK | 006016 | 98/42 | 98/44 | | | | | | |
| AC | 000000 | 22/10 | 22/15 | 22/18 | 22/19 | 22/22 | 22/23 | 22/26 | 22/27 |

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| | | 22/30 | 22/31 | 22/34 | 22/35 | 22/36 | 22/39 | | |
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| ACTO | 000173 | 31/46 | 31/54 | | | | | | |
| ACTR | 000030 | 30/52 | 31/39 | | | | | | |
| ADA02 | 000160 | 15/21 | 135/42 | 135/49 | | | | | |
| ADA04 | 000162 | 15/23 | 135/53 | | | | | | |
| ADA05 | 000161 | 15/22 | 135/47 | | | | | | |
| ADA06 | 000153 | 15/24 | 140/04 | 140/09 | 140/21 | 140/33 | 140/45 | 141/05 | 141/53 |
| | | 142/37 | 143/45 | 144/05 | 144/53 | 145/37 | 146/05 | 146/29 | 146/45 |
| | | 146/57 | 147/05 | 206/07 | 210/14 | 214/26 | 214/34 | 217/30 | |
| ADA11 | 000164 | 15/25 | 135/45 | 136/05 | 136/17 | 137/08 | 137/09 | 140/16 | 141/13 |
| | | 141/45 | 142/21 | 142/45 | 143/29 | 143/37 | 143/57 | 144/45 | 145/13 |
| | | 145/45 | 146/21 | 146/52 | 205/30 | 206/10 | 210/12 | 214/28 | 217/12 |
| ADA12 | 000165 | 15/26 | 135/51 | 137/07 | 137/10 | 140/26 | 141/21 | 141/37 | 142/05 |
| | | 142/29 | 143/13 | 143/21 | 143/52 | 144/13 | 144/21 | 145/05 | 145/29 |
| | | 145/53 | 146/13 | 205/20 | 206/05 | 208/11 | 214/30 | 217/42 | 217/48 |
| | | 217/54 | | | | | | | |
| ADA13 | 000166 | 15/27 | 135/55 | 137/03 | 137/04 | 137/05 | 137/06 | 140/40 | 140/52 |
| | | 140/57 | 141/29 | 142/13 | 142/53 | 143/05 | 144/29 | 144/37 | 145/21 |
| | | 146/37 | 205/25 | 205/35 | 210/07 | 210/09 | 214/24 | 214/32 | 217/06 |
| | | 217/18 | 217/24 | 217/36 | | | | | |
| ADDR8 | 001743 | 39/46 | 40/17 | 40/27 | 40/37 | 40/38 | 41/20 | | |
| AGTYP | 000375 | 65/10 | 65/16 | 65/41 | | | | | |
| ALPIT | 002307 | 45/08 | 45/52 | | | | | | |
| ALPST | 002077 | 17/03 | 39/47 | 40/03 | 46/35 | 47/05 | 65/11 | 70/14 | 88/05 |
| | | 120/34 | 158/24 | 159/09 | 164/03 | 164/10 | 164/29 | 165/05 | 165/24 |
| | | 237/03 | 237/10 | 237/29 | 238/05 | 238/24 | | | |
| AMEND | 002431 | 47/48 | 47/56 | | | | | | |
| APEND | 001325 | 35/16 | 35/26 | | | | | | |
| AXX | 022120 | 134/52 | 232/62 | 243/02 | | | | | |
| B17 | 021143 | 134/44 | 229/52 | 230/13 | | | | | |
| B171 | 021147 | 230/17 | 230/46 | | | | | | |
| B172 | 021135 | 230/06 | 230/20 | 230/29 | 231/11 | 231/20 | | | |
| B173 | 021136 | 230/07 | 230/25 | 230/31 | 231/16 | 231/22 | | | |
| B174 | 021137 | 230/08 | 230/14 | 230/22 | 230/27 | 230/33 | 231/05 | 231/13 | 231/18 |
| | | 231/24 | | | | | | | |
| B175 | 021140 | 230/09 | 230/16 | 231/07 | | | | | |
| B176 | 021141 | 230/10 | 230/17 | 230/19 | 230/24 | 230/44 | 231/08 | 231/10 | 231/15 |
| | | 231/35 | | | | | | | |
| B177 | 021142 | 230/11 | 230/23 | 230/28 | 231/14 | 231/19 | | | |
| B18 | 021206 | 134/45 | 230/48 | 231/04 | | | | | |
| B181 | 021212 | 231/08 | 231/37 | | | | | | |
| B19 | 021202 | 134/46 | 231/39 | 231/55 | | | | | |
| B190 | 021201 | 231/53 | 232/07 | 232/12 | | | | | |
| B191 | 021270 | 232/02 | 232/60 | | | | | | |
| B192 | 021251 | 231/45 | 231/56 | 232/04 | 232/21 | | | | |
| B193 | 021252 | 231/46 | 232/09 | 232/23 | | | | | |
| B194 | 021253 | 231/47 | 231/59 | 232/06 | 232/11 | 232/17 | 232/25 | | |
| B195 | 021254 | 231/48 | 231/58 | 232/13 | 232/47 | 232/57 | | | |
| B196 | 021255 | 231/49 | 231/60 | 232/18 | 232/59 | | | | |
| B197 | 021256 | 231/50 | 232/30 | 232/46 | | | | | |
| B198 | 021257 | 231/51 | 232/31 | | | | | | |
| B199 | 021260 | 231/52 | 232/32 | 232/42 | | | | | |
| B203 | 020454 | 223/12 | 223/18 | 223/38 | 224/14 | | | | |
| B204 | 020455 | 223/13 | 223/20 | | | | | | |
| B205 | 020456 | 223/14 | 223/17 | 223/25 | | | | | |
| B206 | 020457 | 223/15 | 223/22 | 223/42 | 224/16 | 224/45 | 225/12 | 225/38 | 225/42 |
| B21 | 020460 | 223/17 | 223/41 | 224/15 | 224/44 | 225/41 | | | |
| B211 | 020471 | 223/29 | 223/40 | 224/10 | 224/41 | 224/43 | 225/40 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| B212 | [illegible] | 223/30 | 223/33 | | | | |
| B213 | 020473 | 223/31 | 223/36 | 223/39 | 223/45 | 223/49 | |
| B214 | 020474 | 223/32 | 223/43 | 224/17 | 224/46 | | |
| B22 | 020415 | 134/47 | 222/57 | 223/34 | | | |
| B221 | 020477 | 223/36 | 223/51 | | | | |
| B222 | 020521 | 224/03 | 224/07 | | | | |
| B223 | 020522 | 224/04 | 224/08 | 224/11 | 224/19 | 224/23 | |
| B23 | 020523 | 134/48 | 223/53 | 224/06 | | | |
| B231 | 020525 | 224/08 | 224/25 | | | | |
| B232 | 020551 | 224/31 | 224/36 | | | | |
| B233 | 020552 | 224/32 | 224/37 | 224/39 | 224/48 | 224/56 | |
| B234 | 020553 | 224/33 | 224/40 | 224/49 | | | |
| B24 | 020554 | 134/49 | 224/27 | 224/35 | | | |
| B241 | 020556 | 224/37 | 224/58 | | | | |
| B244 | 020605 | 225/05 | 225/09 | | | | |
| B245 | 020606 | 225/06 | 225/10 | 225/13 | 225/16 | 225/22 | |
| B25 | 020607 | 134/50 | 224/60 | 225/06 | | | |
| B251 | 020611 | 225/10 | 225/24 | | | | |
| B26 | 020634 | 134/51 | 225/26 | 225/34 | | | |
| B261 | 020636 | 225/36 | 225/54 | | | | |
| B262 | 020632 | 225/31 | 225/55 | | | | |
| B263 | 020633 | 225/32 | 225/56 | 225/43 | 225/45 | 225/51 | |
| BBEGI | 001652 | 40/03 | 41/21 | | | | |
| BFGET | 001723 | 41/04 | 41/15 | 41/17 | | | |
| BC20 | 001720 | 40/31 | 40/46 | | | | |
| BC377 | 001651 | 39/55 | 39/59 | | | | |
| BCOUN | 001721 | 40/21 | 40/33 | 40/39 | 40/47 | | |
| BDATA | 001673 | 40/24 | | | | | |
| BDIFF | 001717 | 40/25 | 40/45 | | | | |
| BEND | 001744 | 41/21 | | | | | |
| BGET1 | 001724 | 41/05 | 41/12 | | | | |
| BIDIG | 007436 | 106/20 | 106/43 | 106/49 | | | |
| BILAD | 003047 | 53/32 | 53/51 | | | | |
| BILEN | 003034 | 53/36 | 53/40 | | | | |
| BILFI | 003046 | 53/30 | 53/50 | | | | |
| BILLA | 003045 | 53/29 | 53/49 | | | | |
| BILNX | 003025 | 53/33 | 53/39 | | | | |
| BILOR | 003040 | 53/21 | 53/43 | 53/44 | | | |
| BILRA | 003044 | 36/39 | 46/54 | 53/26 | 53/48 | | |
| BILSA | 003041 | 53/22 | 53/42 | 53/45 | | | |
| BILSB | 003042 | 53/23 | 53/41 | 53/46 | | | |
| BILSC | 003043 | 53/24 | 53/40 | 53/47 | | | |
| BINAD | 001001 | 39/09 | 53/51 | | | | |
| BINLA | 001435 | 36/18 | 36/39 | | | | |
| BINLO | 006074 | 17/34 | 36/21 | 37/12 | 53/13 | | |
| BLOCK | 001657 | 39/58 | 40/10 | 40/12 | 40/43 | | |
| BMEND | 002442 | 47/52 | 47/57 | | | | |
| BMOV1 | 016465 | 194/29 | 195/02 | | | | |
| BMOV2 | 016472 | 194/30 | 195/07 | | | | |
| BMOV3 | 016477 | 136/24 | 194/31 | 195/12 | | | |
| BMOV4 | 016504 | 136/25 | 194/32 | 195/17 | | | |
| BMOV5 | 016511 | 136/26 | 136/27 | 194/33 | 195/22 | | |
| BMOVD | 016517 | 194/37 | 195/29 | | | | |
| BMOVL | 016516 | 194/36 | 195/27 | | | | |
| BRESW | 001367 | 35/47 | 35/52 | | | | |
| BSAVE | 001651 | 39/23 | 39/39 | 40/05 | | | |
| BSTRP | 001735 | 41/14 | | | | | |
| BTABC | 015427 | 153/29 | 195/23 | | | | |
| BTABN | 015225 | 151/04 | | | | | |

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|---|---|---|---|---|---|---|---|---|
| GETEI | 013110 | 145/13 | 147/15 | 148/28 | 146/35 | 145/39 | | |
| GETEW | 013052 | 145/11 | 147/27 | | | | | |
| GETGT | 007400 | 106/09 | 106/15 | 106/23 | | | | |
| GETGI | 007373 | 15/21 | 106/24 | | | | | |
| GETGH | 006352 | 95/04 | 100/16 | 104/33 | 109/26 | | | |
| GETGT | 006741 | 100/16 | 100/20 | 100/30 | | | | |
| GETGC | 006753 | 16/23 | 106/10 | | | | | |
| GETGT | 007252 | 104/09 | 104/13 | 104/23 | | | | |
| GETGK | 007245 | 15/22 | 104/24 | | | | | |
| GETKE | 006625 | 92/04 | 96/29 | 98/34 | 98/50 | | | |
| GETST | 007171 | 103/09 | 103/13 | 103/22 | | | | |
| GETSC | 007154 | 15/24 | 103/24 | | | | | |
| GETTT | 007507 | 106/09 | 106/13 | 108/21 | | | | |
| GETTX | 007502 | 16/25 | 108/04 | | | | | |
| GMEHO | 012420 | 30/35 | 46/39 | 47/45 | | | | |
| GTCHK | 001011 | 39/13 | 39/15 | 39/22 | 39/54 | 40/10 | 40/13 | |
| GTTTI | 001522 | 39/25 | 39/52 | | | | | |
| H1C11 | 007311 | 105/28 | 104/44 | | | | | |
| H1C32 | 007312 | 102/47 | 103/27 | 104/45 | | | | |
| H1C33 | 007313 | 102/50 | 102/56 | 104/46 | | | | |
| H1C37 | 007314 | 102/51 | 104/47 | | | | | |
| H1C44 | 007315 | 102/58 | 104/48 | | | | | |
| H2C40 | 007305 | 104/28 | 104/40 | | | | | |
| H2C60 | 007306 | 104/31 | 104/41 | 105/02 | | | | |
| H2C70 | 007307 | 104/34 | 104/42 | | | | | |
| H3C40 | 007433 | 106/28 | 106/40 | | | | | |
| H3C60 | 007434 | 106/31 | 106/41 | 106/46 | | | | |
| H3C62 | 007435 | 106/34 | 106/42 | | | | | |
| H5C11 | 007535 | 108/26 | 108/35 | | | | | |
| H5C12 | 007735 | 109/49 | 110/25 | | | | | |
| H5C15 | 007734 | 109/42 | 110/24 | | | | | |
| H5C40 | 007536 | 108/27 | 108/36 | | | | | |
| H5C79 | 007537 | 108/37 | 108/45 | | | | | |
| HAATT | 001265 | 15/45 | 34/37 | | | | | |
| HACCO | 002630 | 48/34 | 50/11 | | | | | |
| HACNO | 002632 | 48/56 | 50/13 | | | | | |
| HACON | 002627 | 48/44 | 50/10 | | | | | |
| HACOW | 002631 | 48/38 | 48/53 | 50/12 | | | | |
| HACRS | 002633 | 48/51 | 50/14 | | | | | |
| HACUS | 002634 | 48/54 | 50/15 | | | | | |
| HADIS | 002624 | 48/16 | 50/07 | | | | | |
| HAEHR | 002625 | 48/19 | 50/08 | | | | | |
| HAMCO | 002476 | 48/36 | 49/16 | 49/22 | 49/28 | | | |
| HAREP | 002626 | 48/25 | 50/09 | | | | | |
| HASAU | 002637 | 48/15 | 49/06 | 50/18 | | | | |
| HASAT | 002640 | 48/14 | 49/07 | 50/19 | | | | |
| HASAZ | 002641 | 48/13 | 49/08 | 50/20 | | | | |
| HASW2 | 002544 | 48/21 | 49/18 | | | | | |
| HASW4 | 002551 | 48/18 | 49/24 | | | | | |
| HATEW | 002636 | 48/43 | 50/17 | | | | | |
| HAYNC | 002635 | 49/02 | 50/16 | | | | | |
| HC11 | 007064 | 99/57 | 101/50 | | | | | |
| HC13 | 007065 | 99/51 | 101/51 | | | | | |
| HC15 | 007066 | 99/54 | 101/52 | | | | | |
| HC177 | 006026 | 98/33 | 98/51 | 99/05 | | | | |
| HC30 | 006047 | 99/02 | 99/09 | | | | | |
| HC40 | 007067 | 100/35 | 101/53 | | | | | |
| HC46 | 006065 | 99/19 | 99/22 | 99/32 | | | | |
| HC52 | 007070 | 99/34 | 100/40 | 101/54 | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| HCDS | 000071 | 100/46 | 101/14 | 101/55 | 102/09 | | | | |
| HCDS | 000072 | 100/49 | 101/22 | 101/56 | 102/12 | | | | |
| HCOU | 000073 | 100/37 | 100/52 | 101/34 | 101/57 | | | | |
| HC?C | 000074 | 100/43 | 101/55 | | | | | | |
| HETA1 | 013054 | 156/41 | 156/54 | | | | | | |
| HETA4 | 013043 | 156/32 | 194/27 | | | | | | |
| HETAC | 013700 | 156/35 | 156/61 | | | | | | |
| HETAF | 013073 | 156/12 | 156/17 | 156/34 | 156/52 | 156/5C | | | |
| HETAI | 013701 | 156/39 | 156/55 | 156/62 | | | | | |
| HETAJ | 013076 | 156/35 | 156/36 | 156/40 | 156/59 | | | | |
| HETAL | 013075 | 156/51 | 156/56 | | | | | | |
| HETAM | 013702 | 156/46 | 156/53 | | | | | | |
| HETAP | 013077 | 156/37 | 156/43 | 156/60 | | | | | |
| HETA9 | 013074 | 156/32 | 156/55 | 156/56 | 156/57 | | | | |
| HETAW | 013650 | 156/11 | 197/30 | | | | | | |
| HIGH1 | 000371 | 22/07 | 156/18 | 176/03 | 184/03 | 239/03 | | | |
| HIGHL | 013101 | 187/23 | | | | | | | |
| HIGHR | 000372 | 22/08 | 172/14 | 179/19 | 179/20 | | | | |
| HLFLR | 007736 | 110/14 | 110/26 | | | | | | |
| HMEMO | 000075 | 16/09 | 46/44 | 47/59 | 53/25 | 123/32 | 135/40 | 164/49 | 166/04 |
| | | 168/57 | 178/57 | | | | | | |
| IBILO | 000074 | 16/08 | 17/34 | | | | | | |
| IBZOT | 013055 | 113/44 | 115/25 | | | | | | |
| ICHAR | 000041 | 15/38 | 17/07 | | | | | | |
| ICURO | 011704 | 135/24 | 135/29 | | | | | | |
| ICRLF | 000043 | 15/40 | 17/09 | | | | | | |
| IDATT | 000047 | 15/44 | 17/13 | | | | | | |
| IDBIN | 000055 | 15/50 | 17/19 | | | | | | |
| IDDEC | 000057 | 15/52 | 17/21 | | | | | | |
| IDIAG | 000401 | 23/10 | 23/12 | | | | | | |
| IDICL | 000046 | 15/43 | 17/12 | | | | | | |
| IDISP | 000044 | 15/41 | 17/10 | | | | | | |
| IDIVO | 000070 | 16/04 | 17/30 | | | | | | |
| IDIVS | 000067 | 16/03 | 17/29 | | | | | | |
| IDOCT | 000050 | 15/51 | 17/20 | | | | | | |
| IDOUT | 000045 | 15/42 | 17/11 | | | | | | |
| IDRST | 000126 | 16/40 | 17/36 | | | | | | |
| IDUA0 | 011217 | 126/49 | 127/26 | | | | | | |
| IDUA1 | 011216 | 126/48 | 127/23 | | | | | | |
| IDUAD | 011212 | 126/44 | 127/15 | | | | | | |
| IDUAG | 011300 | 127/48 | 127/57 | | | | | | |
| IDUAL | 011220 | 126/50 | 127/28 | | | | | | |
| IDUAN | 011215 | 126/47 | 127/24 | | | | | | |
| IDUAP | 011213 | 126/45 | 127/18 | | | | | | |
| IDUAU | 011221 | 126/51 | 127/27 | | | | | | |
| IDUAY | 011214 | 126/46 | 127/21 | | | | | | |
| IDUCD | 011307 | 127/17 | 128/07 | 128/15 | 128/21 | | | | |
| IDUCO | 011100 | 125/23 | 125/26 | 125/56 | 125/59 | | | | |
| IDUCP | 011350 | 127/20 | 128/25 | 128/33 | 128/36 | | | | |
| IDUCP | 011210 | 125/04 | 125/15 | 125/36 | 125/49 | 125/51 | 126/42 | | |
| IDUCT | 011171 | 125/18 | 126/26 | 127/43 | | | | | |
| IDUDA | 011324 | 125/54 | 127/47 | 128/03 | 128/22 | | | | |
| IDUDC | 011225 | 126/55 | 127/42 | 127/56 | | | | | |
| IDUDL | 011325 | 128/04 | 128/18 | | | | | | |
| IDUDW | 011323 | 128/02 | 128/10 | | | | | | |
| IDUDX | 011320 | 127/58 | | | | | | | |
| IDUDS | 011150 | 125/50 | 127/35 | | | | | | |
| IDUEO | 011300 | 128/05 | 128/17 | | | | | | |
| IDUEX | 011322 | 125/50 | 127/60 | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| IDJ[illegible] | 011113 | 125/37 | 127/36 | | | | | | |
| IDU[illegible] | 011142 | 125/38 | 125/42 | | | | | | |
| IDUM2 | 011146 | 125/39 | 125/36 | | | | | | |
| IDUM3 | 011152 | 125/40 | 125/10 | | | | | | |
| IDUM4 | 011155 | 125/41 | 126/15 | | | | | | |
| IDUM5 | 011160 | 125/42 | 126/15 | | | | | | |
| IDUM6 | 011165 | 125/43 | 126/19 | | | | | | |
| IDUM7 | 011169 | 125/44 | 126/21 | | | | | | |
| IDUM8 | 011167 | 125/45 | 126/23 | | | | | | |
| IDUMA | 011223 | 125/05 | 126/55 | 127/55 | | | | | |
| IDUME | 011107 | 125/25 | 125/33 | 125/56 | | | | | |
| IDUMW | 011222 | 125/52 | 127/06 | | | | | | |
| IDUMI | 011175 | 125/19 | 126/37 | 127/45 | | | | | |
| IDUPA | 011227 | 125/12 | 126/57 | 125/37 | | | | | |
| IDUPL | 011124 | 125/10 | 125/46 | | | | | | |
| IDUPW | 011220 | 126/56 | 128/25 | | | | | | |
| IDUPT | 011201 | 125/52 | 126/34 | 127/48 | | | | | |
| IDUSM | 011253 | 127/05 | 127/15 | 127/31 | 128/23 | 128/36 | | | |
| IDUSA | 011224 | 125/08 | 125/16 | 126/54 | 127/41 | | | | |
| IDUW4 | 011230 | 125/26 | 126/56 | | | | | | |
| IDUXP | 011211 | 125/11 | 125/40 | 126/43 | | | | | |
| IDX0 | 000020 | 15/19 | 66/06 | 66/32 | 68/32 | 66/43 | 72/22 | 72/24 | 72/27 |
| | | 127/39 | 127/49 | 196/05 | 196/06 | 199/06 | 199/09 | 201/06 | 201/[illegible] |
| | | 204/06 | 204/09 | 207/06 | 207/07 | 207/10 | 207/14 | 207/17 | 209/[illegible] |
| | | 209/07 | 209/10 | 209/14 | 209/15 | 209/19 | 211/07 | 211/09 | 211/16 |
| | | 213/07 | 213/09 | 213/12 | 215/05 | 215/07 | 215/14 | 215/17 | 215/18 |
| | | 215/26 | | | | | | | |
| IDX1 | 000021 | 15/20 | 66/04 | 66/46 | 67/25 | 67/28 | 67/30 | 68/30 | 69/02 |
| | | 70/45 | 70/58 | 71/07 | 71/22 | 72/38 | 72/40 | 127/44 | 127/55 |
| | | 195/05 | 195/06 | 196/23 | 196/24 | 196/25 | 196/26 | 196/37 | 196/38 |
| | | 196/40 | 196/45 | 197/03 | 197/04 | 197/05 | 197/06 | | |
| IDX2 | 000022 | 15/21 | 67/44 | 67/55 | 68/03 | 69/16 | 69/19 | 70/20 | 70/38 |
| | | 127/46 | 127/55 | 136/10 | 136/12 | 136/31 | 136/35 | 139/04 | 139/06 |
| | | 148/11 | 148/14 | 148/17 | 149/11 | 149/12 | 150/09 | 150/12 | 150/15 |
| | | 150/16 | 193/24 | 193/25 | 193/26 | 193/27 | 193/28 | 193/56 | 193/57 |
| | | 193/58 | 193/59 | 193/60 | | | | | |
| IDX3 | 000023 | 15/22 | 66/08 | 67/11 | 68/34 | 132/29 | 132/37 | 132/45 | 132/47 |
| | | 136/33 | 136/40 | 139/05 | 139/42 | 148/12 | 148/15 | 148/16 | 150/10 |
| | | 150/13 | 150/14 | 193/37 | 193/38 | 193/44 | 193/49 | | |
| IDZOC | 000000 | 15/53 | 17/22 | | | | | | |
| IGNOR | 001544 | 39/43 | 39/54 | 39/57 | | | | | |
| IGTBI | 000103 | 16/21 | 17/37 | | | | | | |
| IGTDC | 000105 | 16/23 | 17/39 | | | | | | |
| IGTOK | 000104 | 16/22 | 17/38 | | | | | | |
| IGTSC | 000106 | 16/24 | 17/40 | | | | | | |
| IGTIX | 000107 | 16/25 | 17/41 | | | | | | |
| IHAAT | 000050 | 15/45 | 17/14 | | | | | | |
| IHALT | 000114 | 16/30 | 17/46 | | | | | | |
| ILL | 001070 | 31/41 | 31/42 | 31/43 | 31/44 | 31/45 | 31/47 | 31/51 | |
| ILLEG | 006674 | 99/33 | 100/42 | 100/45 | 100/54 | 104/50 | 109/30 | | |
| ILLGR | 006673 | 99/14 | 99/16 | 99/32 | | | | | |
| ILOOP | 000113 | 16/29 | 17/45 | | | | | | |
| ILOPE | 000125 | 16/37 | 17/53 | | | | | | |
| IMESS | 000133 | 16/58 | 17/06 | | | | | | |
| IMULT | 000006 | 16/02 | 17/28 | | | | | | |
| INAC3 | 000137 | 16/04 | 157/22 | 157/48 | 193/29 | 196/26 | 199/21 | 201/24 | 204/29 |
| | | 207/24 | 209/26 | 211/25 | 213/26 | 215/34 | | | |
| INDAD | 004150 | 67/12 | 67/27 | | | | | | |
| INDEV | 000150 | 16/42 | 119/14 | 121/07 | | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| ISTAA | 000115 | 16/31 | 17/47 | | | | | | |
| ISTAC | 010007 | 113/24 | 113/46 | | | | | | |
| ISTAN | 000116 | 16/32 | 17/48 | | | | | | |
| ISTAP | 000121 | 16/35 | 17/51 | | | | | | |
| ISTAS | 000120 | 16/34 | 17/50 | | | | | | |
| ISTAW | 000117 | 16/33 | 17/49 | | | | | | |
| ISTP0 | 000110 | 16/26 | 17/42 | | | | | | |
| ISTP1 | 000111 | 16/27 | 17/43 | | | | | | |
| ISTP2 | 000112 | 16/28 | 17/44 | | | | | | |
| ITBIN | 000051 | 15/46 | 17/15 | | | | | | |
| ITDEC | 000053 | 15/48 | 17/17 | | | | | | |
| ITHLT | 000125 | 16/39 | 17/35 | | | | | | |
| ITIMS | 000064 | 15/57 | 17/26 | | | | | | |
| ITIRQ | 000065 | 15/58 | 17/27 | | | | | | |
| ITISK | 000063 | 15/56 | 17/25 | | | | | | |
| ITOCT | 000052 | 15/47 | 17/16 | | | | | | |
| ITR | 010051 | 112/21 | 113/16 | 113/32 | 114/15 | | | | |
| ITRAG | 010050 | 112/20 | 113/04 | 113/09 | 113/14 | 113/31 | | | |
| ITRCT | 010052 | 112/12 | 112/22 | 113/17 | 113/33 | 114/16 | | | |
| ITRP0 | 010045 | 113/05 | 113/24 | | | | | | |
| ITRP1 | 010046 | 113/03 | 113/10 | 113/29 | | | | | |
| ITRP2 | 010047 | 113/08 | 113/13 | 113/15 | 113/30 | 114/13 | | | |
| ITYPE | 000042 | 15/39 | 17/08 | | | | | | |
| ITZOC | 000134 | 16/59 | 17/18 | | | | | | |
| IWAIT | 000061 | 15/54 | 17/23 | | | | | | |
| IWAUP | 000062 | 15/55 | 17/24 | | | | | | |
| JHALT | 000122 | 16/36 | 17/52 | | | | | | |
| JIMSW | 001507 | 34/56 | 35/53 | 35/49 | 35/54 | | | | |
| JMEND | 002440 | 46/15 | 46/34 | 47/24 | 47/31 | 47/55 | 120/49 | | |
| JPOUT | 001067 | 29/46 | 29/53 | 31/15 | 31/30 | 31/49 | 32/39 | 33/10 | 33/33 |
| | | 34/15 | 34/38 | | | | | | |
| KCP0 | 003071 | 54/33 | 73/03 | | | | | | |
| KCP1 | 003072 | 54/34 | | | | | | | |
| KCP10 | 003101 | 54/43 | | | | | | | |
| KCP11 | 003102 | 54/44 | | | | | | | |
| KCP12 | 003103 | 54/45 | | | | | | | |
| KCP13 | 003104 | 54/46 | | | | | | | |
| KCP14 | 003105 | 54/47 | | | | | | | |
| KCP15 | 003106 | 54/48 | | | | | | | |
| KCP16 | 003107 | 54/49 | | | | | | | |
| KCP17 | 003110 | 54/50 | | | | | | | |
| KCP2 | 003073 | 54/35 | | | | | | | |
| KCP20 | 003111 | 54/51 | | | | | | | |
| KCP21 | 003112 | 54/52 | | | | | | | |
| KCP22 | 003113 | 54/53 | | | | | | | |
| KCP23 | 003114 | 54/54 | | | | | | | |
| KCP24 | 003115 | 54/55 | | | | | | | |
| KCP25 | 003116 | 54/56 | | | | | | | |
| KCP3 | 003074 | 54/36 | | | | | | | |
| KCP4 | 003075 | 54/37 | | | | | | | |
| KCP5 | 003076 | 54/38 | | | | | | | |
| KCP6 | 003077 | 54/39 | | | | | | | |
| KCP7 | 003100 | 54/40 | | | | | | | |
| KEYA | 004330 | 69/19 | 69/24 | 69/27 | | | | | |
| KEYB | 004336 | 69/21 | 69/25 | | | | | | |
| KEYS | 004325 | 67/40 | 69/15 | | | | | | |
| KINC | 003117 | 54/21 | 54/22 | 54/59 | | | | | |
| KINDI | 003070 | 54/17 | 54/30 | | | | | | |
| KSTAC | 001513 | 34/60 | 35/31 | 36/40 | | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| | | 160/63 | 233/25 | 235/61 | | | | | |
| L0379 | 000379 | 19/45 | 19/55 | 20/03 | 20/48 | 22/06 | 160/38 | 160/46 | 161/ |
| | | 161/48 | 172/39 | 172/47 | 173/03 | 173/48 | 180/47 | 180/55 | 181 |
| | | 181/48 | 233/45 | 233/53 | 234/03 | 234/48 | | | |
| L0ABb | 002777 | 44/21 | 53/05 | | | | | | |
| L0C0 | 000000 | 15/06 | 36/13 | 119/17 | 119/26 | 120/03 | 120/17 | | |
| L0C10 | 000010 | 15/15 | 19/23 | 160/16 | 172/17 | 180/25 | 233/23 | | |
| L0C26 | 000026 | 15/26 | 167/25 | 167/34 | 177/28 | 177/34 | 185/28 | 185/34 | 240/28 |
| | | 240/34 | | | | | | | |
| L0C27 | 000027 | 15/27 | 20/37 | 20/38 | 20/39 | 20/40 | 161/37 | 161/38 | 161/39 |
| | | 161/40 | 163/27 | 163/31 | 163/35 | 164/15 | 164/18 | 164/19 | 164/34 |
| | | 164/37 | 164/38 | 168/08 | 168/11 | 168/12 | 168/25 | 168/28 | 168/29 |
| | | 173/37 | 173/38 | 173/39 | 173/40 | 175/27 | 175/31 | 175/35 | 178/08 |
| | | 178/11 | 178/12 | 178/25 | 178/28 | 178/29 | 181/37 | 181/38 | 181/39 |
| | | 181/40 | 183/27 | 183/31 | 183/35 | 186/08 | 186/11 | 186/12 | 186/25 |
| | | 186/28 | 186/29 | 234/37 | 234/38 | 234/39 | 234/40 | 236/27 | 236/31 |
| | | 236/35 | 237/15 | 237/18 | 237/19 | 237/34 | 237/37 | 237/38 | 241/08 |
| | | 241/11 | 241/12 | 241/25 | 241/28 | 241/29 | | | |
| L0C3 | 000003 | 15/10 | 36/27 | | | | | | |
| L0C35 | 000035 | 15/31 | 167/47 | 167/53 | 177/47 | 177/53 | 185/47 | 185/53 | 240/47 |
| | | 240/53 | | | | | | | |
| L0C36 | 000036 | 15/32 | 20/32 | 161/32 | 163/44 | 173/32 | 175/44 | 181/32 | 183/44 |
| | | 234/32 | 236/44 | | | | | | |
| L0C37 | 000037 | 15/33 | 20/49 | 20/50 | 20/51 | 20/52 | 161/49 | 161/50 | 161 |
| | | 161/52 | 163/49 | 163/52 | 165/10 | 165/13 | 165/14 | 165/29 | 165/32 |
| | | 165/33 | 168/42 | 168/45 | 168/46 | 169/08 | 169/11 | 169/12 | 173/49 |
| | | 173/50 | 173/51 | 173/52 | 175/49 | 175/52 | 178/42 | 178/45 | 178/46 |
| | | 179/08 | 179/11 | 179/12 | 181/49 | 181/50 | 181/51 | 181/52 | 183/49 |
| | | 183/52 | 186/42 | 186/45 | 186/46 | 187/08 | 187/11 | 187/12 | 234/49 |
| | | 234/50 | 234/51 | 234/52 | 236/49 | 236/52 | 238/10 | 238/13 | 238/14 |
| | | 238/29 | 238/32 | 238/33 | 241/42 | 241/45 | 241/46 | 242/08 | 242/11 |
| | | 242/12 | | | | | | | |
| L0C4 | 000004 | 15/11 | 36/29 | | | | | | |
| L0C40 | 000040 | 15/37 | 199/08 | 201/08 | 204/08 | 219/32 | 222/32 | 224/33 | 228/11 |
| L0C5 | 000005 | 15/12 | 66/60 | 67/05 | 67/06 | 67/10 | 68/17 | 69/13 | 119/24 |
| | | 119/36 | 119/44 | 138/51 | | | | | |
| L0C54 | 000054 | 15/49 | 215/16 | | | | | | |
| L0CKA | 004357 | 69/31 | 69/44 | | | | | | |
| L00P | 006113 | 17/45 | 158/53 | 159/34 | 165/40 | 169/19 | 170/21 | 170/25 | 170/30 |
| | | 170/35 | 170/41 | 170/46 | 170/50 | 170/54 | 188/25 | 189/18 | 189/38 |
| | | 190/19 | 190/38 | 191/19 | 191/43 | 192/21 | 192/45 | 194/21 | 197/24 |
| | | 199/49 | 201/52 | 204/58 | 207/50 | 209/56 | 212/18 | 214/16 | 216/33 |
| | | 220/34 | 221/23 | 221/49 | 222/22 | 222/52 | 223/48 | 224/22 | 224/55 |
| | | 225/21 | 225/50 | 226/22 | 226/41 | 227/26 | 227/47 | 228/34 | 228/58 |
| | | 229/20 | 229/46 | 230/43 | 231/34 | 232/56 | | | |
| L00PR | 010063 | 112/43 | 113/02 | 113/07 | 113/12 | 113/26 | 113/42 | | |
| LSTSW | 001377 | 35/14 | 35/18 | 35/25 | 35/37 | 35/50 | 35/53 | 35/60 | 88/36 |
| | | 124/08 | | | | | | | |
| M3bG0 | 003465 | 61/02 | 64/53 | | | | | | |
| M3bG1 | 003474 | 61/03 | 64/54 | | | | | | |
| M36G2 | 003504 | 61/04 | 64/55 | | | | | | |
| M3bG3 | 003513 | 61/05 | 64/56 | | | | | | |
| MASK2 | 000157 | 18/20 | 136/11 | | | | | | |
| MASK6 | 000156 | 18/19 | 136/02 | 136/34 | | | | | |
| MASKL | 000150 | 18/13 | 189/08 | 191/08 | 191/35 | | | | |
| MASKR | 000147 | 18/12 | 189/20 | 189/40 | 190/08 | 191/21 | 191/45 | 192/08 | 192/35 |
| MBIL0 | 001745 | 37/33 | 37/35 | 41/23 | | | | | |
| MCHI9 | 002356 | 46/16 | 46/53 | | | | | | |
| MCMEX | 002331 | 46/27 | 47/30 | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MTEPN | 000550 | 117/44 | 120/22 | 120/24 | | | | | |
| MULTA | 002152 | 16/15 | 18/39 | 22/07 | 170/19 | 171/24 | 172/12 | 173/23 | 174/07 |
| | | 174/08 | 174/36 | 174/48 | 175/04 | 175/15 | 175/16 | 175/28 | 175/ |
| | | 177/29 | 177/43 | 180/22 | 181/23 | 182/07 | 182/08 | 182/36 | 182/45 |
| | | 183/04 | 183/15 | 183/16 | 183/20 | 183/45 | 185/29 | 185/48 | 187/23 |
| MULSA | 007061 | 101/39 | 101/43 | 101/46 | | | | | |
| MULTE | 007062 | 101/26 | 101/39 | | | | | | |
| MULTI | 000064 | 17/26 | 57/15 | 72/53 | 114/14 | | | | |
| MUPRO | 005554 | 62/05 | 63/07 | | | | | | |
| MUPP1 | 005571 | 62/07 | 63/08 | | | | | | |
| MUPP2 | 005630 | 62/09 | 63/09 | | | | | | |
| MUPR3 | 005645 | 62/11 | 63/10 | | | | | | |
| MUPR4 | 005612 | 62/13 | 63/11 | | | | | | |
| MUPRU | 005617 | 63/02 | 63/12 | 63/13 | 63/14 | 63/15 | 63/16 | 63/17 | 63/18 |
| | | 63/19 | 63/20 | | | | | | |
| MUPRV | 005551 | 52/02 | 64/52 | | | | | | |
| MUSIN | 000155 | 15/16 | 219/24 | 220/26 | 221/18 | 221/41 | | | |
| MWAIT | 002545 | 50/23 | 51/17 | | | | | | |
| MX2SF | 000400 | 95/06 | 122/13 | | | | | | |
| MXMAF | 000515 | 91/07 | 92/02 | | | | | | |
| MXMAT | 000554 | 91/25 | 91/26 | 92/06 | 93/29 | 93/30 | | | |
| MXSUE | 005403 | 46/42 | 95/07 | 95/45 | | | | | |
| NBEVE | 007707 | 109/41 | 109/57 | | | | | | |
| NCSU | 005040 | 75/02 | 75/34 | | | | | | |
| NGO | 005057 | 75/30 | 75/33 | | | | | | |
| NGTYP | 004716 | 73/39 | 73/42 | 73/44 | | | | | |
| NEXIS | 004742 | 73/32 | 74/05 | | | | | | |
| NFTYP | 004707 | 73/20 | 73/37 | | | | | | |
| NHERE | 013720 | 157/29 | | | | | | | |
| NINBI | 000570 | 28/10 | 28/13 | | | | | | |
| NINSW | 000000 | 28/07 | 29/11 | 32/34 | 34/56 | 36/42 | | | |
| NIRET | 004717 | 73/09 | 73/43 | 73/45 | | | | | |
| NITYP | 004710 | 73/38 | 75/42 | | | | | | |
| NN10 | 000772 | 30/35 | 31/18 | | | | | | |
| NN500 | 005035 | 73/22 | 75/31 | | | | | | |
| NN9 | 005036 | 73/23 | 75/32 | | | | | | |
| NOEX | 010007 | 112/16 | 112/26 | 112/35 | 112/45 | | | | |
| NORAI | 010152 | 114/09 | 114/25 | | | | | | |
| NOTLO | 004777 | 74/37 | 74/43 | | | | | | |
| NOTRX | 004754 | 74/24 | 74/34 | 74/40 | | | | | |
| NOTRE | 004776 | 74/23 | 74/41 | 74/42 | | | | | |
| NOTUP | 005000 | 74/36 | 74/44 | | | | | | |
| NOTYA | 004720 | 73/46 | 74/25 | 74/28 | | | | | |
| NOTYP | 004755 | 73/38 | 74/23 | | | | | | |
| NRESW | 001565 | 35/17 | 35/50 | | | | | | |
| NRTYP | 004711 | 73/36 | 73/39 | | | | | | |
| NTDEC | 005031 | 75/03 | 75/23 | 75/28 | | | | | |
| NTMAS | 013735 | 157/20 | 157/39 | | | | | | |
| NTMAX | 013734 | 157/21 | 157/31 | 157/38 | | | | | |
| NTREP | 005005 | 75/06 | 75/24 | | | | | | |
| NTRES | 005034 | 75/04 | 75/11 | 75/18 | 75/25 | 75/29 | | | |
| NTRET | 005032 | 75/05 | 75/26 | 75/27 | | | | | |
| NTREX | 000145 | 16/10 | 157/46 | 193/13 | 194/17 | 196/13 | 197/20 | 199/13 | 199/45 |
| | | 201/14 | 201/48 | 204/14 | 204/54 | 207/16 | 207/46 | 209/20 | 209/52 |
| | | 211/05 | 212/14 | 213/05 | 214/12 | 215/27 | 216/29 | 230/15 | 230/39 |
| | | 231/06 | 231/30 | 232/20 | 232/52 | | | | |
| NTRL3 | 013736 | 157/28 | 157/30 | 157/40 | | | | | |
| NTRLA | 013721 | 157/23 | 157/32 | | | | | | |
| NTRLC | 013722 | 157/17 | 157/24 | | | | | | |

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|---|---|---|---|---|---|---|---|---|
| PDEC2 | 006515 | 27/12 | 27/16 | | | | | |
| PDEC3 | 006517 | 27/14 | 27/18 | | | | | |
| PDECR | 006640 | 27/03 | 27/32 | 28/21 | 28/45 | 28/47 | 28/48 | 28/50 |
| PGDAT | 001474 | 37/10 | 44/25 | | | | | |
| PGINI | 001401 | 36/09 | 36/13 | 44/23 | | | | |
| PINT1 | 000507 | 26/03 | 27/24 | 28/06 | 28/22 | 29/47 | 29/54 | 33/06 |
| PINC1 | 001125 | 32/17 | 32/25 | 32/28 | | | | |
| PINSW | 001105 | 32/06 | 32/14 | 33/19 | | | | |
| PLAB1 | 007462 | 106/19 | 107/17 | 107/31 | | | | |
| PLACE | 100206 | 172/12 | | | | | | |
| PLADC | 007024 | 100/26 | 101/05 | 101/15 | | | | |
| PLAOK | 007351 | 104/19 | 105/23 | 105/39 | | | | |
| PLASC | 007233 | 103/18 | 103/49 | 103/56 | | | | |
| PLAS1 | 007043 | 101/20 | 101/24 | 101/30 | | | | |
| PLASW | 006113 | 88/15 | 88/36 | | | | | |
| PLATX | 007625 | 108/18 | 109/03 | 109/36 | | | | |
| PMEND | 002421 | 47/06 | 47/35 | | | | | |
| POWIC | 010513 | 120/07 | 120/13 | | | | | |
| POWIN | 010501 | 119/05 | 120/02 | | | | | |
| POWOK | 006054 | 16/17 | 88/04 | | | | | |
| POWRE | 000100 | 16/17 | 16/19 | | | | | |
| POWT1 | 010512 | 120/05 | 120/11 | | | | | |
| POWTY | 010511 | 120/04 | 120/10 | | | | | |
| POWZE | 000102 | 16/19 | 36/12 | 119/25 | 120/02 | | | |
| PRESW | 001305 | 34/54 | 35/11 | | | | | |
| PROAD | 000007 | 15/13 | 15/14 | | | | | |
| PROAK | 006143 | 15/14 | 89/16 | | | | | |
| PROAR | 006170 | 89/16 | 89/21 | 89/30 | | | | |
| PROG | 011602 | 36/25 | 37/15 | 37/16 | 51/44 | 88/13 | 133/04 | |
| PROGA | 011613 | 37/21 | 133/06 | | | | | |
| PROIN | 000706 | 15/13 | 125/31 | 194/38 | 197/43 | | | |
| PRSET | 006167 | 89/17 | 89/29 | | | | | |
| PRTUL | 003624 | 63/04 | 64/27 | | | | | |
| PRTUU | 003625 | 63/05 | 64/26 | | | | | |
| PRTYE | 003671 | 64/16 | 64/20 | 64/24 | | | | |
| PRTYP | 003645 | 36/34 | 64/04 | | | | | |
| PSAAN | 006112 | 88/20 | 88/35 | | | | | |
| PSETP | 006114 | 88/04 | 88/37 | 89/05 | | | | |
| PTAB | 001102 | 30/45 | 33/02 | | | | | |
| PTAB1 | 005050 | 45/47 | 78/04 | | | | | |
| PTAB2 | 005251 | 45/48 | 79/04 | | | | | |
| PTAB3 | 005452 | 45/49 | 82/04 | | | | | |
| PTAB4 | 005653 | 45/50 | 85/04 | | | | | |
| QCHAR | 000665 | 29/17 | 29/49 | | | | | |
| QCSTA | 000132 | 16/45 | 116/50 | 135/26 | | | | |
| QDICL | 001223 | 33/36 | 33/39 | | | | | |
| QDOUT | 001177 | 33/13 | 33/17 | | | | | |
| QHAAT | 001273 | 34/41 | 34/44 | | | | | |
| QMEND | 002360 | 46/55 | 47/10 | 47/21 | 47/26 | | | |
| QRESW | 001306 | 34/55 | 35/20 | | | | | |
| QTYPE | 000734 | 29/56 | 30/04 | | | | | |
| QUESA | 006460 | 95/03 | 95/27 | 95/38 | | | | |
| QUESD | 006507 | 95/24 | 95/35 | | | | | |
| QUESI | 006461 | 95/04 | 95/46 | | | | | |
| QUESW | 006511 | 95/22 | 95/37 | | | | | |
| QUESS | 006515 | 95/31 | 95/41 | | | | | |
| QUEST | 006514 | 95/29 | 95/40 | | | | | |
| RALAN | 006654 | 98/25 | 98/57 | | | | | |
| RAEND | 006602 | 97/51 | 97/60 | 98/11 | 98/28 | | | |

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|---|---|---|---|---|---|---|---|---|---|
| RALIF | [illegible] | 78/09 | 98/21 | 98/52 | | | | | |
| RAMIN | 000837 | 98/19 | 98/55 | | | | | | |
| RANDI | 016500 | 93/10 | 98/14 | | | | | | |
| RAVR | 004227 | 88/21 | 89/27 | | | | | | |
| RAPLU | 005051 | 95/17 | 98/54 | | | | | | |
| RASPA | 000830 | 98/23 | 98/53 | | | | | | |
| RAZER | 000855 | 98/38 | 98/56 | | | | | | |
| RBEND | 000001 | 97/59 | 98/27 | | | | | | |
| RBFS | 000030 | 97/45 | 98/39 | | | | | | |
| RBFS1 | 016557 | 97/50 | 97/54 | | | | | | |
| RBLIS | 000855 | 97/49 | 98/58 | | | | | | |
| RBSUB | 006557 | 97/57 | 98/60 | | | | | | |
| RBZOT | 000447 | 20/22 | 20/31 | 20/33 | | | | | |
| RDRST | 010552 | 120/31 | 120/47 | 120/48 | | | | | |
| RDSW1 | 070477 | 17/05 | 23/11 | 32/21 | 35/15 | 35/26 | 40/04 | | |
| REGIN | 001405 | 15/09 | 36/12 | 243/06 | | | | | |
| REGO | 001101 | 29/51 | 30/03 | 30/09 | 30/14 | 32/07 | 33/08 | 33/16 | 35/25 |
| REG1 | 001102 | 30/04 | 30/28. | 32/08 | 33/17 | 33/28 | | | |
| REG2 | 001103 | 30/05 | 30/29 | 32/09 | 33/18 | 33/29 | | | |
| REG3 | 001104 | 29/52 | 29/55 | 30/02 | 30/30 | 32/10 | 33/09 | 33/12 | 35/15 |
| | | 33/30 | | | | | | | |
| RENOW | 013052 | 147/12 | 147/21 | 147/32 | 147/39 | | | | |
| REOF2 | 007551 | 105/06 | 105/12 | 105/13 | 105/15 | 105/19 | 105/20 | 105/21 | |
| REOF3 | 007401 | 107/02 | 107/06 | 107/07 | 107/09 | 107/13 | 107/14 | 107/15 | |
| REPHA | 011555 | 50/09 | 131/23 | | | | | | |
| REPL4 | 007045 | 101/15 | 101/29 | 101/31 | 101/32 | | | | |
| REPL5 | 007046 | 109/03 | 109/10 | 109/19 | 109/20 | | | | |
| RESET | 006126 | 17/36 | 36/26 | 38/21 | 85/26 | 125/29 | 138/07 | | |
| RETS | 007721 | 110/06 | 110/10 | 110/11 | | | | | |
| RETSR | 000101 | 16/18 | 47/36 | | | | | | |
| RETUF | 007145 | 102/02 | 102/05 | 102/06 | 102/08 | 102/41 | 102/42 | 102/44 | |
| RETUR | 010057 | 112/02 | 112/48 | 113/38 | 114/38 | 114/43 | 114/44 | 115/20 | 115/42 |
| RETYP | 003771 | 64/04 | 64/30 | 64/42 | 65/06 | 65/37 | 65/50 | | |
| REVU | 004140 | 67/39 | | | | | | | |
| REVUA | 004150 | 67/47 | 67/57 | | | | | | |
| REVUB | 004165 | 67/51 | 68/02 | | | | | | |
| REVUC | 004161 | 67/56 | 68/06 | | | | | | |
| REVUD | 004153 | 67/50 | 67/54 | | | | | | |
| RHAAI | 001304 | 34/37 | 34/40 | 34/43 | 34/52 | 34/53 | | | |
| RHAL1 | 063077 | 17/02 | 31/51 | 34/31 | 39/50 | 40/42 | 98/27 | 115/49 | 120/08 |
| | | 151/23 | | | | | | | |
| RINH1 | 003450 | 26/34 | 28/06 | 28/13 | 28/14 | | | | |
| RINSW | 001152 | 32/14 | 32/31 | 32/32 | 32/36 | | | | |
| RLPIT | 002253 | 45/05 | 45/13 | 45/19 | | | | | |
| RMEND | 002417 | 47/04 | 47/25 | 47/32 | 47/33 | 47/45 | 47/60 | | |
| RMSK | 001103 | 30/43 | 30/48 | 33/03 | | | | | |
| RNIGA | 011703 | 135/03 | 135/27 | 135/28 | | | | | |
| RNTHL | 015740 | 157/03 | 157/15 | 157/16 | 157/26 | 157/36 | 157/42 | 157/49 | |
| RPASS | 010670 | 122/10 | 122/12 | 122/30 | 122/37 | | | | |
| RPCUN | 002537 | 48/49 | 49/03 | 49/12 | | | | | |
| RPDVN | 011737 | 135/08 | 135/16 | 135/22 | | | | | |
| RPEND | 011700 | 135/25 | | | | | | | |
| RPOUT | 000460 | 26/02 | 26/05 | 26/19 | 26/20 | 26/42 | 26/44 | 26/49 | 26/60 |
| | | 27/05 | 27/42 | 27/47 | 27/52 | 27/57 | 28/23 | 31/49 | 34/54 |
| RPSAV | 006065 | 85/14 | 88/25 | 89/06 | | | | | |
| RQUES | 006457 | 95/02 | 95/20 | 95/48 | | | | | |
| RRESW | 001373 | 35/15 | 35/19 | 35/44 | 35/51 | 35/56 | | | |
| RSAMS | 001552 | 38/06 | 38/22 | 38/23 | | | | | |
| RTEST | 000373 | 23/02 | 158/05 | 243/03 | | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | 15/50 | 35/10 | | | | | | |
| [illegible] | [illegible] | 67/42 | 67/47 | 67/49 | 68/03 | 68/14 | | | |
| [illegible] | [illegible] | 26/50 | 26/54 | 26/56 | 26/62 | 26/64 | | | |
| [illegible] | [illegible] | 117/12 | 117/13 | 117/14 | 117/22 | 117/23 | 117/24 | | |
| [illegible] | [illegible] | 117/35 | 117/39 | 117/40 | 117/41 | 117/42 | | | |
| SAMIN | 001074 | 31/12 | 31/26 | 32/02 | | | | | |
| SACHA | 000773 | 29/30 | 29/33 | 29/44 | 30/36 | | | | |
| SAOIG | 000451 | 26/33 | 26/39 | 27/02 | 28/20 | | | | |
| SAIOU | 002357 | 45/45 | 46/54 | | | | | | |
| SAMEX | 002312 | 44/07 | 45/12 | | | | | | |
| SAMOS | 002341 | 46/10 | 46/26 | 46/36 | 46/39 | | | | |
| SAMAT | 002332 | 44/09 | 46/31 | | | | | | |
| SAPTO | 002231 | 44/05 | 45/03 | | | | | | |
| SCH41 | 012200 | 139/54 | 140/06 | 200/09 | 212/24 | 212/29 | 212/34 | 217/03 | 217/27 |
| SCHAC | 012273 | 139/55 | 140/10 | 200/10 | 212/25 | 212/30 | 212/33 | 217/04 | 217/33 |
| SCH43 | 012306 | 139/56 | 140/30 | 200/11 | 212/26 | 212/31 | 212/35 | 217/15 | 217/39 |
| SCH44 | 012321 | 139/57 | 140/42 | 200/12 | 212/27 | 212/28 | 212/37 | 217/21 | 217/45 |
| SCHA5 | 012334 | 139/58 | 140/54 | 202/20 | 202/21 | 202/24 | 202/25 | 202/26 | 202/29 |
| | | 202/32 | 202/33 | 205/03 | 205/04 | 205/18 | 205/23 | 205/28 | 206/08 |
| | | 212/32 | 212/34 | 217/04 | 217/10 | 217/16 | 217/22 | | |
| SCHAC | 012363 | 139/59 | 140/54 | 203/07 | 203/08 | 203/11 | 203/12 | 203/15 | 203/16 |
| | | 205/33 | 206/03 | 206/06 | 206/12 | 212/30 | 212/38 | 217/28 | 217/34 |
| | | 217/40 | 217/46 | 217/52 | | | | | |
| SCH47 | 012372 | 139/60 | 140/54 | 217/51 | | | | | |
| SCORA | 004125 | 67/24 | 67/59 | | | | | | |
| SCORB | 004133 | 67/30 | 67/34 | | | | | | |
| SCORE | 004123 | 65/34 | 67/22 | 68/45 | | | | | |
| SDEV1 | 010254 | 116/13 | 134/57 | | | | | | |
| SDEV2 | 010207 | 116/33 | 134/58 | | | | | | |
| SDEV3 | 010303 | 116/54 | 134/59 | | | | | | |
| SDEV4 | 010317 | 117/18 | 134/60 | | | | | | |
| SDEV5 | 010351 | 117/30 | 134/61 | | | | | | |
| SDIST | 001204 | 33/22 | 33/24 | 38/49 | | | | | |
| SEAC1 | 017276 | 205/06 | 205/21 | | | | | | |
| SEAC2 | 017306 | 205/07 | 205/26 | | | | | | |
| SEAC3 | 017316 | 205/08 | 205/31 | | | | | | |
| SEAC4 | 017326 | 205/09 | 205/36 | | | | | | |
| SEAC5 | 017336 | 205/10 | 206/06 | | | | | | |
| SEAC6 | 017346 | 205/11 | 206/11 | | | | | | |
| SEAR1 | 017107 | 202/06 | 202/22 | | | | | | |
| SEAR2 | 017116 | 202/07 | 202/26 | | | | | | |
| SEAR3 | 017125 | 202/08 | 202/30 | | | | | | |
| SEAR4 | 017134 | 202/09 | 202/34 | | | | | | |
| SEAR5 | 017143 | 202/10 | 203/05 | | | | | | |
| SEAR6 | 017152 | 202/11 | 203/09 | | | | | | |
| SEAR7 | 017161 | 202/12 | 203/13 | | | | | | |
| SEAR8 | 017170 | 202/13 | 203/17 | | | | | | |
| SEC3 | 001230 | 33/46 | 34/24 | 35/24 | 65/33 | 88/07 | | | |
| SEC4R | 001236 | 33/53 | 34/46 | | | | | | |
| SECC7 | 001235 | 33/52 | 34/44 | | | | | | |
| SECR2 | 001231 | 30/25 | 33/47 | 88/51 | 88/55 | 88/59 | | | |
| SECR5 | 001232 | 33/46 | 34/49 | | | | | | |
| SECS2 | 001233 | 33/50 | 34/26 | | | | | | |
| SECS4 | 001234 | 33/51 | 34/20 | | | | | | |
| SERA0 | 010470 | 119/08 | 119/31 | 119/40 | 119/45 | | | | |
| SERA1 | 010471 | 119/09 | 119/32 | 119/41 | 119/46 | | | | |
| SERA2 | 010472 | 119/10 | 119/33 | 119/42 | 119/47 | | | | |
| SERA3 | 010473 | 119/06 | 119/34 | 119/43 | 119/48 | | | | |
| SERAC | 010474 | 119/12 | 119/29 | 119/36 | 119/49 | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TCP15 | 005233 | 56/49 | | | | | | | |
| TCP16 | 005237 | 56/50 | | | | | | | |
| TCP17 | 005240 | 56/51 | | | | | | | |
| TCP2 | 005223 | 56/36 | | | | | | | |
| TCP20 | 005241 | 56/52 | | | | | | | |
| TCP21 | 005242 | 56/53 | | | | | | | |
| TCP22 | 005243 | 56/54 | | | | | | | |
| TCP23 | 005244 | 56/55 | | | | | | | |
| TCP24 | 005245 | 56/56 | | | | | | | |
| TCP25 | 005246 | 56/57 | | | | | | | |
| TCP3 | 005224 | 56/39 | | | | | | | |
| TCP4 | 005225 | 56/40 | | | | | | | |
| TCP5 | 005226 | 56/41 | | | | | | | |
| TCP6 | 005227 | 56/42 | | | | | | | |
| TCP7 | 005230 | 56/43 | | | | | | | |
| TCPHI | 100000 | 180/22 | 187/20 | | | | | | |
| TCPLO | 021505 | 233/23 | 242/20 | | | | | | |
| TDCIL | 010573 | 121/06 | 121/14 | | | | | | |
| TEPAT | 000151 | 10/14 | 159/53 | 165/18 | 175/18 | 183/16 | 188/06 | 236/18 | |
| TERBI | 007477 | 107/30 | 107/32 | | | | | | |
| TERDC | 007614 | 101/04 | 101/05 | | | | | | |
| TERDT | 007622 | 101/09 | 101/12 | | | | | | |
| TERE2 | 010417 | 118/44 | 118/51 | 118/54 | | | | | |
| TERHB | 007475 | 106/11 | 107/28 | | | | | | |
| TERHO | 007510 | 100/18 | 101/02 | | | | | | |
| TERIG | 010550 | 120/20 | 120/27 | | | | | | |
| TERI1 | 010520 | 113/46 | 113/50 | 120/19 | | | | | |
| TERMO | 007504 | 104/11 | 105/30 | | | | | | |
| TERNR | 010410 | 118/43 | 118/52 | 118/55 | | | | | |
| TERPS | 007530 | 102/60 | 103/11 | 103/53 | | | | | |
| TERRT | 006714 | 99/25 | 99/51 | 100/17 | 104/52 | 109/27 | | | |
| TERRV | 010414 | 50/41 | 59/17 | 95/04 | 118/43 | 119/07 | 120/32 | 136/36 | |
| TERSX | 007002 | 108/11 | 109/35 | | | | | | |
| TERUK | 007570 | 105/38 | 105/40 | | | | | | |
| TERSC | 007642 | 103/55 | 103/57 | | | | | | |
| TERTX | 007660 | 109/37 | 109/39 | | | | | | |
| TEST | 013740 | 147/25 | 158/05 | | | | | | |
| TEXE1 | 007024 | 105/52 | | | | | | | |
| TEXIA | 007552 | 106/50 | 109/16 | 109/53 | 110/07 | | | | |
| TEXIN | 007555 | 106/51 | | | | | | | |
| THALT | 006125 | 17/35 | 34/30 | 115/46 | 131/22 | | | | |
| TIDUD | 011374 | 125/08 | 125/09 | 128/42 | | | | | |
| TIDUR | 011506 | 127/06 | 127/07 | 128/40 | | | | | |
| TIMCT | 005215 | 56/30 | 57/15 | 57/17 | | | | | |
| TIMER | 005216 | 56/31 | 57/19 | 68/10 | | | | | |
| TIMEX | 005214 | 56/26 | 56/29 | 57/03 | 57/14 | | | | |
| TIMS | 006004 | 17/26 | 66/15 | | | | | | |
| TIMRC | 006065 | 17/27 | | | | | | | |
| TIMSK | 006005 | 17/25 | 26/23 | 26/27 | 32/56 | 33/21 | 138/15 | | |
| TINMI | 001166 | 31/16 | 31/31 | 32/41 | 33/06 | 33/11 | 33/34 | 34/16 | 34/39 |
| TMEND | 002362 | 36/36 | 46/14 | 47/04 | | | | | |
| TOMA | 004270 | 68/41 | 69/03 | | | | | | |
| TOMB | 004313 | 68/51 | 69/04 | | | | | | |
| TOMC | 004311 | 69/02 | 69/11 | | | | | | |
| TOMD | 004303 | 68/49 | 68/52 | | | | | | |
| TOMER | 004251 | 65/35 | 65/20 | | | | | | |
| TOMF | 004305 | 68/54 | 68/57 | | | | | | |
| TOMG | 004315 | 69/06 | 69/10 | | | | | | |
| TOMF | 004310 | 69/04 | 69/07 | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|
| TDJ | [illegible] | [illegible] | [illegible] | | | | | | | |
| THASS | [illegible] | 122/33 | 123/13 | 123/20 | | | | | | |
| TRTCM | 011573 | 132/31 | 132/43 | 132/47 | 132/51 | | | | | |
| TRUCT | [illegible] | 132/49 | 132/52 | | | | | | | |
| TSDSP | 011552 | 44/15 | 132/20 | | | | | | | |
| TSVPC | 011561 | 131/28 | 132/34 | | | | | | | |
| TSWLC | 011542 | 131/29 | 132/35 | | | | | | | |
| TSWLU | 011541 | 44/17 | 132/34 | | | | | | | |
| TSWRC | 011545 | 131/30 | 132/45 | | | | | | | |
| TWUSE | 011546 | 44/19 | 132/42 | | | | | | | |
| TXUSP | 011557 | 131/04 | 131/07 | 131/17 | 131/26 | | | | | |
| TYDIR | 011541 | 131/27 | 132/28 | 132/36 | 132/44 | | | | | |
| TXUTM | 011644 | 131/21 | 132/02 | | | | | | | |
| TXTYP | 003740 | 65/12 | 65/19 | | | | | | | |
| TUDSU | 004503 | 72/08 | 72/52 | | | | | | | |
| TUDUP | 004515 | 72/21 | 72/55 | | | | | | | |
| TUFCV | 004560 | 72/11 | 72/55 | 72/58 | | | | | | |
| TUMCA | 004570 | 70/41 | 71/02 | 71/25 | 72/20 | | | | | |
| TUMCM | 004565 | 71/35 | 71/39 | 71/43 | 71/45 | | | | | |
| TUSCR | 004502 | 72/07 | 72/23 | 72/50 | | | | | | |
| TUSCU | 004545 | 70/25 | 70/29 | 70/35 | 72/03 | | | | | |
| TUUSR | 004522 | 72/40 | 72/44 | | | | | | | |
| TUTER | 004570 | 65/34 | 70/13 | | | | | | | |
| TUUES | 004476 | 71/16 | 71/20 | | | | | | | |
| TUVGU | 004573 | 71/33 | 72/15 | | | | | | | |
| TUVM1 | 004574 | 71/37 | 72/17 | | | | | | | |
| TUVM2 | 004575 | 71/41 | 72/13 | | | | | | | |
| TUVSS | 004047 | 71/32 | 75/02 | | | | | | | |
| TUVI1 | 004415 | 71/29 | 119/50 | | | | | | | |
| TUVI2 | 004416 | 70/30 | 119/51 | | | | | | | |
| TUVI3 | 004422 | 70/34 | 119/52 | | | | | | | |
| TUVI4 | 004451 | 70/54 | 70/58 | | | | | | | |
| TUVI5 | 004503 | 71/19 | 71/22 | | | | | | | |
| TUVRS | 004470 | 71/14 | 71/18 | | | | | | | |
| TUVNT | 004443 | 70/52 | 70/56 | | | | | | | |
| TUVRA | 004546 | 70/19 | 70/44 | 71/06 | 72/04 | 72/21 | 72/37 | | | |
| TUVRI | 004561 | 70/21 | 70/46 | 71/08 | 72/06 | 72/23 | 72/39 | 72/45 | | |
| TUVRP | 004544 | 70/13 | 70/55 | 70/57 | 71/21 | 71/31 | 71/58 | 72/02 | 72/60 | |
| TUVRS | 004463 | 71/09 | 71/24 | | | | | | | |
| TUVRT | 004456 | 70/47 | 70/60 | | | | | | | |
| TUVRW | 004476 | 70/22 | 70/40 | | | | | | | |
| TUVSA | 004552 | 71/55 | 73/05 | | | | | | | |
| TUVSV | 004567 | 72/12 | 72/34 | 72/47 | | | | | | |
| TUVTA | 004551 | 71/51 | 73/04 | | | | | | | |
| TUVTO | 004565 | 72/10 | 72/56 | | | | | | | |
| TUVVA | 004544 | 72/09 | 72/49 | 72/54 | | | | | | |
| TUVVS | 004572 | 71/26 | 71/54 | 72/15 | | | | | | |
| TUVVT | 004571 | 71/03 | 71/29 | 71/49 | 72/14 | | | | | |
| TUVVW | 004570 | 70/42 | 71/45 | 72/13 | | | | | | |
| TUWPA | 004050 | 71/46 | 73/03 | | | | | | | |
| TXCOU | 007651 | 106/05 | 106/08 | 108/44 | 109/05 | 109/06 | 109/14 | 109/24 | 109/39 | |
| | | 109/46 | 110/02 | | | | | | | |
| TXDVN | 011707 | 135/09 | 135/10 | 135/33 | | | | | | |
| TXENO | 007722 | 109/04 | 109/57 | 110/13 | | | | | | |
| TXNOR | 007753 | 110/13 | 110/21 | 110/22 | | | | | | |
| TYLIM | 004175 | 66/20 | 68/11 | | | | | | | |
| TYMA | 004042 | 66/30 | 66/49 | | | | | | | |
| TYMB | 004066 | 66/41 | 66/50 | | | | | | | |
| TYMC | 004064 | 66/48 | 66/57 | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TY[illegible] | [illegible] | 66/39 | 66/42 | | | | | |
| TY[illegible]E | [illegible] | 65/19 | 66/23 | | | | | |
| TY[illegible] | [illegible] | 66/19 | 56/10 | | | | | |
| TY[illegible] | [illegible] | 66/24 | 67/43 | 66/68 | 66/69 | | | |
| TYPER | [illegible] | 65/12 | 66/02 | | | | | |
| TYPF | [illegible] | 66/44 | 66/47 | | | | | |
| TYPG | [illegible] | 66/52 | 66/56 | | | | | |
| TYPH | [illegible] | 66/50 | 66/53 | | | | | |
| TYPU | [illegible] | 66/42 | 66/45 | | | | | |
| TYPE1 | [illegible] | 30/11 | 31/53 | | | | | |
| TYPE2 | [illegible] | 30/14 | 31/54 | | | | | |
| TYPE3 | [illegible] | 30/17 | 30/24 | | | | | |
| TYPE4 | [illegible] | 30/20 | 30/26 | | | | | |
| TYPE5 | [illegible] | 30/27 | 30/23 | | | | | |
| TYPE6 | [illegible] | 30/23 | 30/41 | | | | | |
| TYPLW | 000664 | 99/20 | 99/24 | 99/33 | 99/35 | 100/29 | 104/54 | 109/29 |
| TYPUX | 003471 | 26/51 | 26/54 | 27/44 | 27/54 | | | |
| TYPWE | 006672 | 99/24 | 99/26 | 99/29 | 99/30 | | | |
| TYRTC | 004173 | 65/09 | 66/27 | | | | | |
| TYTIF | 004177 | 66/23 | 66/13 | | | | | |
| TYTTS | 004176 | 66/21 | 65/12 | | | | | |
| UNALT | 002042 | 48/12 | 48/24 | 49/05 | 49/10 | 50/21 | | |
| ULMTI | 002310 | 45/15 | 45/53 | | | | | |
| UPEND | 002410 | 47/17 | 47/23 | 47/26 | | | | |
| UNTIM | 003540 | 61/08 | 65/26 | 65/28 | | | | |
| UPTST | 003357 | 59/37 | 65/30 | | | | | |
| UPRND | 003777 | 64/33 | 65/43 | 65/49 | 120/10 | | | |
| UPRTA | 003026 | 65/06 | 54/35 | | | | | |
| USUER | 012111 | 120/53 | 137/24 | | | | | |
| USDMD | 012137 | 136/13 | 138/19 | 138/25 | | | | |
| USJ91 | 012140 | 136/14 | 138/20 | 138/26 | | | | |
| USDFF | 012155 | 138/10 | 138/24 | | | | | |
| USDRM | 012155 | 138/08 | 138/23 | | | | | |
| USDRR | 012113 | 137/24 | 137/27 | 137/28 | | | | |
| USINI | 011774 | 124/06 | 135/39 | | | | | |
| USINR | 012110 | 135/39 | 137/16 | 137/17 | | | | |
| USLOM | 012141 | 112/50 | 138/32 | | | | | |
| USLOR | 012145 | 138/32 | 138/35 | 138/37 | | | | |
| USLTR | 012144 | 138/34 | 138/36 | | | | | |
| USSEI | 012146 | 119/53 | 138/46 | | | | | |
| USSER | 012154 | 138/46 | 138/55 | 138/56 | | | | |
| USSEI | 012114 | 113/45 | 138/06 | | | | | |
| USSTP | 012134 | 138/06 | 138/21 | 138/22 | | | | |
| VMEND | 002422 | 18/33 | 47/34 | 47/35 | 47/36 | 158/56 | 158/57 | |
| WACSA | 002720 | 51/15 | 51/46 | 51/53 | | | | |
| WCMET | 013006 | 54/13 | 54/14 | 54/26 | 54/27 | | | |
| WAIOP | 006002 | 17/24 | 53/11 | | | | | |
| WCH44 | 002717 | 51/40 | 51/52 | | | | | |
| WHIGH | 002716 | 51/20 | 51/51 | | | | | |
| WIRET | 003067 | 54/16 | 54/24 | 54/28 | | | | |
| WLOWL | 002715 | 51/18 | 51/50 | | | | | |
| WMOV1 | 016656 | 197/32 | 198/02 | | | | | |
| WMOV2 | 016662 | 197/35 | 198/06 | | | | | |
| WMOV3 | 016666 | 136/47 | 197/34 | 198/10 | | | | |
| WMOV4 | 016672 | 136/48 | 197/35 | 198/14 | | | | |
| WMOV5 | 016676 | 136/49 | 136/50 | 197/36 | 198/18 | | | |
| WMOV6 | 016702 | 136/51 | 136/52 | 197/37 | 198/22 | | | |
| WMOV7 | 016706 | 136/53 | 136/54 | 197/38 | 198/26 | | | |
| WMOV8 | 016713 | 197/42 | 198/31 | | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| XPCPT | 001436 | 35/34 | 37/25 | | | | | | |
| XQUES | 004470 | 16/05 | 95/21 | | | | | | |
| XRAND | 004220 | 67/43 | 68/21 | 69/15 | | | | | |
| XRES. | 001314 | 16/37 | 35/09 | | | | | | |
| XSTC | 000314 | 16/55 | 65/37 | 68/38 | 68/39 | 68/53 | 68/56 | 69/05 | 69/09 |
| | | 70/17 | 70/24 | 70/25 | 70/27 | 70/48 | 70/49 | 70/51 | 70/52 |
| | | 71/05 | 71/10 | 71/11 | 71/13 | 71/17 | 73/13 | 73/14 | 73/15 |
| | | 73/17 | 73/19 | 75/07 | 75/09 | 138/11 | 138/12 | 138/17 | |
| XSAVS | 001551 | 16/06 | 36/06 | | | | | | |
| XSDIS | 001037 | 35/37 | 36/49 | | | | | | |
| XSTAB | 010251 | 16/31 | 116/10 | | | | | | |
| XSTAR | 010203 | 116/14 | 116/16 | 116/20 | 116/46 | 116/57 | | | |
| XSTAC | 001311 | 34/58 | 35/29 | 35/32 | 35/43 | 35/45 | | | |
| XSTAL | 010254 | 16/32 | 116/30 | | | | | | |
| XSTAP | 010311 | 16/35 | 117/12 | | | | | | |
| XSTAR | 010310 | 116/10 | 116/11 | 116/17 | 116/19 | 116/30 | 116/31 | 116/35 | 116/36 |
| | | 116/46 | 116/47 | 116/56 | 116/58 | 116/59 | | | |
| XSTAS | 010326 | 16/34 | 117/35 | | | | | | |
| XSTAX | 010273 | 16/33 | 116/46 | | | | | | |
| XTBIN | 001015 | 15/46 | 31/02 | | | | | | |
| XTDEC | 000465 | 15/48 | 26/49 | | | | | | |
| XTFLT | 002440 | 16/39 | 46/12 | | | | | | |
| XTIM1 | 003334 | 59/31 | 59/33 | | | | | | |
| XTIMA | 003342 | 59/19 | 59/23 | | | | | | |
| XTIMC | 003355 | 59/13 | 59/21 | 59/27 | 59/34 | | | | |
| XTIMD | 003341 | 59/16 | 59/22 | 59/32 | | | | | |
| XTIMX | 003356 | 59/11 | 59/14 | 59/15 | 59/17 | 59/18 | 59/20 | 59/25 | 59/26 |
| | | 59/29 | 59/35 | | | | | | |
| XTIMS | 003320 | 15/56 | 59/11 | | | | | | |
| XTIMT | 003340 | 59/24 | 59/27 | | | | | | |
| XTIMW | 003351 | 59/28 | 59/30 | | | | | | |
| XTUCT | 000554 | 15/47 | 27/52 | | | | | | |
| XTUIN | 006314 | 91/27 | 91/57 | 93/31 | | | | | |
| XTXMT | 007320 | 103/10 | 104/10 | 104/52 | 106/10 | | | | |
| XTTI | 000010 | 16/53 | 51/22 | 51/24 | 51/27 | 98/31 | 98/34 | 98/36 | 118/45 |
| | | 120/19 | | | | | | | |
| XTTO | 000011 | 16/54 | 26/29 | 30/26 | 30/27 | 66/10 | 66/11 | 66/12 | 66/14 |
| | | 66/15 | 66/17 | 66/26 | 66/27 | 66/28 | 66/35 | 66/43 | 66/46 |
| | | 66/51 | 66/55 | | | | | | |
| XTTOT | 000443 | 26/28 | 26/30 | 38/47 | | | | | |
| XTXCO | 006727 | 99/38 | 100/03 | | | | | | |
| XTXNO | 006730 | 99/39 | 100/04 | | | | | | |
| XTYPE | 004205 | 56/03 | 67/24 | 67/41 | 68/19 | 68/29 | | | |
| XTYPE | 000724 | 15/39 | 29/51 | | | | | | |
| XTYPN | 007322 | 102/59 | 103/21 | 104/22 | 104/54 | 106/22 | | | |
| XTZOC | 000544 | 16/59 | 27/42 | | | | | | |
| XUSER | 005775 | 65/20 | 65/39 | | | | | | |
| XWAIT | 003050 | 15/54 | 54/13 | | | | | | |
| XWTOP | 002651 | 15/55 | 51/14 | | | | | | |
| XWTYP | 005774 | 65/23 | 65/40 | | | | | | |
| XX16 | 004247 | 67/27 | 67/29 | 67/33 | 67/46 | 67/56 | 68/23 | | |
| XXLPT | 001575 | 36/32 | 38/46 | | | | | | |
| XXTTO | 001576 | 38/34 | 38/47 | | | | | | |
| YCHAR | 000064 | 26/36 | 26/55 | 29/16 | 31/04 | 31/34 | 31/36 | | |
| YDTAG | 013041 | 147/12 | 147/22 | 147/24 | | | | | |
| YDICL | 001222 | 35/38 | 34/34 | | | | | | |
| YDLTE | 007554 | 108/12 | 109/28 | | | | | | |
| YDOUT | 001175 | 26/39 | 31/09 | 32/54 | 33/15 | 33/40 | 33/42 | | |
| YESNO | 006432 | 50/16 | 94/08 | | | | | | |

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|---|---|---|---|---|---|
| YGICH | 007032 | 109/19 | 109/20 | | |
| YHMAI | 001272 | 34/13 | 34/43 | | |
| YILLO | 007056 | 106/31 | 108/47 | 109/30 | |
| YINIT | 007057 | 106/04 | 109/31 | | |
| YJOSH | 001071 | 36/30 | 38/42 | | |
| YIMTH | 007060 | 109/32 | 109/55 | | |
| YLIST | 013155 | 147/33 | 147/34 | | |
| YMCHO | 006455 | 94/09 | 94/26 | | |
| YMCHI | 006454 | 94/12 | 94/27 | | |
| YMCHA | 006451 | 94/17 | 94/23 | | |
| YMCHE | 006455 | 94/15 | 94/23 | | |
| YMCHY | 006456 | 94/18 | 94/29 | | |
| YOMTR | 007001 | 109/33 | 109/36 | | |
| YPMIN | 001025 | 31/03 | 31/08 | 31/12 | |
| YPDEC | 000477 | 26/45 | 26/50 | 27/02 | |
| YPOCT | 000502 | 27/33 | 27/38 | 28/19 | |
| YSETP | 001570 | 38/28 | 38/41 | | |
| YSTAC | 001507 | 38/27 | 38/40. | | |
| YTAB3 | 000704 | 26/40 | 29/33 | | |
| YTROT | 007055 | 108/10 | 109/27 | | |
| YTYPE | 000732 | 29/29 | 29/41 | 30/02 | |
| YTYPS | 007055 | 108/20 | 109/29 | | |
| YZOCT | 000000 | 27/43 | 27/48 | 28/16 | |
| ZCHAR | 000454 | 26/16 | 26/36 | | |
| ZCIAG | 013044 | 147/22 | 147/25 | | |
| ZCOUT | 000455 | 26/39 | 28/03 | | |
| ZSUPP | 000771 | 28/26 | 28/32 | 28/42 | 30/34 |
| ZTABS | 000456 | 26/40 | 26/58 | | |