```
BOOTSTRAP          ,008047/047046              BOOTSTRAP L038038,054061,068072,0010401040                 1
CLEAR STORAGE      /099H166B163200R1,001/199001    CLEAR L038200,167171,179180,184191B163                 2
BOOTSTRAP          ,008047/047046              BOOTSTRAP L038038,054061,068072,0010401040                 3

                        PUNCH CORE IN LOADABLE FORM - PUNCH PUNCH AREA                           PAGE    1

SEQ PG LIN  LABEL  OP    OPERANDS                                         SFX CT  LOCN  INSTRUCTION TYPE  CARD

 101               JOB   PUNCH CORE IN LOADABLE FORM - PUNCH PUNCH AREA
 103         *
 104               ORG   1                                                              0001
 105               SW    A1,A2                                                  7  0001  , 008 015            4
 106         A1    SW    A3,A4                                                  7  0008  , 016 023            4
 107         A2    CW                                                           1  0015  )                    4
 108         A3    SW    A5,A6                                                  7  0016  , 031 038            4
 109         A4    B     A5                                                     4  0023  B 031                4
 110               ORG   B3                                                             0031
 111         A5    SW    A7,A8                                                  7  0031  , 045 052            5
 112         A6    SW    A9,ADONE                                               7  0038  , 059 063            5
 113         A7    SW    APUNCH,AREAD                                           7  0045  , 064 065            5
 114         A8    B     A9                                                     4  0052  B 059                5
 115               ORG   CDONE                                                          0059
 116         A9    SW    BKBL                                                   4  0059  , 069                6
 117         ADONE NOP                                                          1  0063  N                    6
 118         APUNCH P                                                           1  0064  4                    6
 119         AREAD R     BLOOP                                                  4  0065  1 001                6
 120               DCW   #1                                                     1  0069                       6
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SEQ PG LIN  LABEL  OP    OPERANDS                                         SFX CT  LOCN  INSTRUCTION TYPE  CARD

 121               JOB   PUNCH WORD MARKS IN PUNCH AREA AS ONES
 122         *
 123               ORG   1                                                           0001
 124         BLOOP MCW   BREAD,101                                             7  0001  M 065 101            7
 125         B1    BW    BWM,101                                               8  0008  V 023 101 1          7
 126         B2    MCW   BKBL,101                                              7  0016  M 069 101            7
 127         BWM   BCE   BDONE,BLOOP+5,8                                       8  0023  B 063 006 8          7
 128         B3    A     BREAD,BLOOP+6                                         7  0031  A 065 007            7
 129         B4    A     BREAD,B1+6                                            7  0038  A 065 014            8
 130               A     BREAD,B2+6                                            7  0045  A 065 022            8
 131               B     BLOOP                                                 4  0052  B 001                8
 132               ORG   EDONE                                                       0063
 133         BDONE NOP                                                         1  0063  N                    9
 134               P                                                           1  0064  4                    9
 135         BREAD R     CSTART                                                4  0065  1 031                9
 136         BKBL  DCW   #1                                                    1  0069                       9
```

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SEQ PG LIN  LABEL  OP    OPERANDS                                          SFX CT  LOCN  INSTRUCTION TYPE  CARD

 137               JOB   MOVE A SKELETON LOAD CARD TO THE PUNCH AREA
 138         *
 139               ORG   1                                                          0001
 140         CLOAD LCA   020,100                                               7  0001  L 020 100           10
 141               ORG   B3                                                         0031
 142         CSTART LCA  CREAD+3,171                                           7  0031  L 079 171           11
 143               LCA   CSW+6,160                                             7  0038  L 075 160           11
 144               LCA   CSW+6,153                                             7  0045  L 075 153           11
 145               LCA   CLOAD+6,146                                           7  0052  L 007 146           11
 146         CDONE SW    101                                                   4  0059  , 101               11
 147               NOP                                                         1  0063  N                   11
 148               NOP                                                         1  0064  N                   11
 149               R     DSTART                                                4  0065  1 001               12
 150         CSW   SW    40,40                                                 7  0069  , 040 040           12
 151         CREAD R     40                                                    4  0076  1 040               12
```

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SEQ PG LIN  LABEL  OP    OPERANDS                                        SFX CT  LOCN  INSTRUCTION TYPE  CARD

 152               JOB   MOVE THE INDEX AREA -- 81-100 -- TO THE PUNCH AREA
 153          *
 154               ORG   1                                                         0001
 155         DSTART MCW   81,101                                               7  0001  M 081 101           13
 156               BCE   DDONE,DSTART+2,0   UP TO 100 YET?                     8  0008  B 059 003 0         13
 157               A     DREAD+3,DSTART+6                                     7  0016  A 068 007           13
 158               BW    DSTART,81                                            8  0023  V 001 081 1         13
 159               MCW   DCLEAR+6,153  EMIT CW FOR 81 IF NO WM IN 81          7  0031  M 075 153           13
 160               B     DSTART                                               4  0038  B 001               14
 161               ORG   A9                                                        0059
 162         DDONE  SW    E1                                                   4  0059  , 024               15
 163               CW                                                         1  0063  )                   15
 164               P                  PUNCH THE CARD WITH LCA (AND MAYBE CW)  1  0064  4                   15
 165         DREAD  R     ESTART                                               4  0065  1 001               15
 166         DCLEAR CW    81,81                                                7  0069  ) 081 081           15
```

```
SEQ PG LIN  LABEL  OP    OPERANDS                                            SFX CT  LOCN  INSTRUCTION TYPE  CARD

 167               JOB   PUT WORD MARK ADDRESSES INTO LOAD CARD AT 44-46
 168          *
 169               ORG   1                                                                0001
 170         ESTART MCW   ENOP+6,146    CHANGE LOAD AT 40 TO SET NOP               7  0001  M 075 146            16
 171         ETESTW BW    ESETWM,82                                                8  0008  V 045 082 1          16
 172         ELOOP  BCE   EREAD,ETESTW+5,0   UP TO 100 YET?                        8  0016  B 065 013 0          16
 173         E1     A     EREAD,ETESTW+6                                           7  0024  A 065 014            16
 174                B     ETESTW                                                   4  0031  B 008                16
 175                DC    #10                                                     10  0044                       17
 176         ESETWM MCW   ETESTW+6,143  STORE ADDRESS OF WM                        7  0045  M 014 143            17
 177                MCW   154,140       CHANGE LOAD AT 40 TO SW                    7  0052  M 154 140            17
 178         EPUNCH P     ELOOP                                                    4  0059  4 016                17
 179         EDONE  NOP                                                            1  0063  N                    17
 180                NOP                                                            1  0064  N                    18
 181         EREAD  R     FSTART                                                   4  0065  1 031                18
 182         ENOP   NOP   82,40                                                    7  0069  N 082 040            18
```

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SEQ PG LIN  LABEL  OP    OPERANDS                                      SFX CT  LOCN  INSTRUCTION TYPE  CARD

 183               JOB   MOVE A SKELETON LOAD CARD TO THE PUNCH AREA
 184        *
 185               ORG   1                                                         0001
 186        FLOAD  LCA   030,210                                             7  0001  L 030 210             19
 187               ORG   B3                                                        0031
 188        FSTART CS    *+1,139                                             7  0031  / 038 139             20
 189               SW    101,101                                             7  0038  , 101 101             20
 190               LCA   FSW+6,153                                           7  0045  L 075 153             20
 191               LCA   FLOAD+6,146                                         7  0052  L 007 146             20
 192               CW    H1                                                  4  0059  ) 024                 20
 193               SW                                                        1  0063  ,                     20
 194               NOP                                                       1  0064  N                     20
 195               R     GSTART                                              4  0065  1 001                 21
 196        FSW    SW    40,40                                               7  0069  , 040 040             21
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SEQ PG LIN  LABEL  OP    OPERANDS                                          SFX CT  LOCN  INSTRUCTION TYPE  CARD

 197               JOB   MOVE THE 181-210 AREA TO THE PUNCH AREA
 198         *
 199               ORG   1                                                              0001
 200         GSTART MCW  181,101                                                7  0001  M 181 101          22
 201               BCE   GDONE,GSTART+2,1   UP TO 210 YET?                      8  0008  B 059 003 1        22
 202               A     GREAD+3,GSTART+6                                       7  0016  A 068 007          22
 203         G1    BW    GSTART,181                                             8  0023  V 001 181 1        22
 204               MCW   GCLEAR+6,153  EMIT CW FOR 81 IF NO WM IN 81            7  0031  M 075 153          22
 205               B     GSTART                                                 4  0038  B 001              23
 206               ORG   A9                                                             0059
 207         GDONE SW    H1                                                     4  0059  , 024              24
 208               CW                                                           1  0063  )                  24
 209               P                   PUNCH THE CARD WITH LCA (AND MAYBE CW)   1  0064  4                  24
 210         GREAD R     HSTART                                                 4  0065  1 001              24
 211         GCLEAR CW   181,181                                                7  0069  ) 181 181          24
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SEQ PG LIN  LABEL  OP    OPERANDS                                             SFX CT  LOCN  INSTRUCTION TYPE  CARD

 212               JOB   PUT WORD MARK ADDRESSES INTO LOAD CARD AT 44-46
 213         *
 214               ORG   1                                                                 0001
 215         HSTART MCW   HNOP+6,146    CHANGE LOAD AT 40 TO SET NOP                 7  0001  M 075 146           25
 216         HTESTW BW    HSETWM,82                                                  8  0008  V 045 082 1         25
 217         HLOOP  BCE   HREAD,HTESTW+5,1   UP TO 210 YET?                          8  0016  B 065 013 1         25
 218         H1     A     HREAD,HTESTW+6                                             7  0024  A 065 014           25
 219                A     HREAD,HNOP+3                                               7  0031  A 065 072           25
 220                B     HTESTW                                                     4  0038  B 008               26
 221                DC    #3                                                         3  0044                      26
 222         HSETWM MCW   HTESTW+6,143  STORE ADDRESS OF WM                          7  0045  M 014 143           26
 223                MCW   154,140       CHANGE LOAD AT 40 TO SW                      7  0052  M 154 140           26
 224         HPUNCH P     HLOOP                                                      4  0059  4 016               26
 225         HDONE  NOP                                                              1  0063  N                   26
 226                NOP                                                              1  0064  N                   26
 227         HREAD  R     ISTART                                                     4  0065  1 031               26
 228         HNOP   NOP   182,40                                                     7  0069  N 182 040           27
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SEQ PG LIN  LABEL  OP    OPERANDS                                                    SFX CT  LOCN  INSTRUCTION TYPE  CARD

 229                JOB   CLEAR THE READ AREA, BOOTSTRAP
 230                ORG   CSTART                                                                   0031
 231         ISTART LCA   ISW+3,84                                                         7  0031  L 062 084            28
 232                LCA   IREAD+3,88                                                       7  0038  L 068 088            28
 233                SW    89,89                                                            7  0045  , 089 089            28
 234                CS    81,80                                                            7  0052  / 081 080            28
 235         ISW    SW    1                                                                4  0059  , 001                28
 236                DCW   #1                                                               1  0063                       28
 237                DCW   #1                                                               1  0064                       28
 238         IREAD  R     1                                                                4  0065  1 001                29
```

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SEQ PG LIN  LABEL  OP    OPERANDS                                           SFX CT  LOCN  INSTRUCTION TYPE  CARD

 239               JOB   DUMP THE REST
 240               ORG   87                                                                0087
 241        X1     DC    #3            USED FOR CORE ADDRESS                      3  0089                       30
 242               DC    #2                                                       2  0091                       30
 243        X2     DC    #3            USED FOR CARD ADDRESS                      3  0094                       30
 244               DC    #2                                                       2  0096                       30
 245        X3     DC    #3            USED FOR PLACE TO STORE WORD MARK          3  0099                       30
 246               ORG   333                                                               0333
 247        RSTART CS    180                                                      4  0333  / 180                31
 248               CS                                                             1  0337  /                    31
 249               SBR   RTOP                                                     4  0338  H 569                31
 250               SBR   X1,211        START DUMP AT 211                          7  0342  H 089 211            31
 251               SW    X1-2,X2-2                                                7  0349  , 087 092            31
 252        * SET UP FOR A NEW CARD
 253        RNEWCD SW    101                                                      4  0356  , 101                31
 254               MCW   RCARD,171                                                7  0360  M 601 171            31
 255               SBR   X2,1          START CARD AT COLUMN 1                     7  0367  H 094 001            32
 256               SBR   X3,150        FIRST WM ADDRESS AT COLUMN 50              7  0374  H 099 150            32
 257               B     RLOOP                                                    4  0381  B 404                32
 258        * SKIP AREAS THAT ARE BLANK WITH NO WORD MARKS
 259        RSKIP  C     X1,RTOP     Q. DONE WITH ALL MEMORY?                     7  0385  C 089 569            32
 260               BE    RDONE         YES                                        5  0392  B 552 S              32
 261               SBR   X1,1+X1       BUMP MEMORY ADDRESS                        7  0397  H 089 0’1            32
 262        RLOOP  BW    RSTORE,0+X1   WORD MARK?                                 8  0404  V 446 0’0 1          33
 263               BCE   RSKIP,0+X1,   SKIP IF BLANK AND NO WM                    8  0412  B 385 0’0            33
 264        RNOWM  MCW   X1,153        NON-BLANK WITH NO WM -- CREATE A           7  0420  M 089 153            33
 265               MCW   RCLRWM+3       CLEAR WORD MARK INSTRUCTION               4  0427  M 566                33
 266               SBR   X3,157        UPDATE SET-WORD-MARK ADDRESS               7  0431  H 099 157            33
 267        RWM    BW    RWM2,0+X1     Q. NEED TO EMIT A "SET WORD MARK"?         8  0438  V 502 0’0 1          34
 268        * STORE CORE DATA INTO THE CARD AREA
 269        RSTORE MCW   0+X1,100+X2   PUT THE CHARACTER INTO THE CARD            7  0446  M 0’0 1!0            34
 270               MCW   X1,146        CORE ADDRESS TO LCA IN 40-46               7  0453  M 089 146            34
 271               MCW   X2            CARD ADDRESS TO LCA IN 40-46               4  0460  M 094                34
 272               C     X1,RTOP     Q. ARE WE DONE?                              7  0464  C 089 569            34
 273               BE    RPDONE        YES, PUNCH THE CARD AND QUIT               5  0471  B 551 S              34
 274               SBR   X1,1+X1       BUMP CORE ADDRESS                          7  0476  H 089 0’1            35
 275               SBR   X2,1+X2       BUMP CARD ADDRESS                          7  0483  H 094 0!1            35
 276               BCE   RPUNCH,100+X2,L  Q. IS THE DATA AREA FULL?               8  0490  B 543 1!0 L          35
 277               B     RWM           GO AROUND AGAIN                            4  0498  B 438                35
 278        * EMIT A SET WORD MARK INSTRUCTION
 279        RWM2   BCE   RPUNCH,X3-1,7  Q. WORD MARK AREA FULL (X3=171)?          8  0502  B 543 098 7          35
 280               MCW   X1,0+X3       STORE CORE ADDRESS IN SW INSTRUCTION       7  0510  M 089 0?0            36
 281               SBR   X3,3+X3       BUMP THE WORD MARK ADDRESS                 7  0517  H 099 0?3            36
 282               BCE   RSTORE,15994+X3,,  Q. WAS IT THE FIRST WM IN SW INST     8  0524  B 446 IID ,          36
 283               SBR   X3,1+X3       NO, BUMP ONE MORE                          7  0532  H 099 0?1            36
 284               B     RSTORE        GO CHECK IF WE ARE DONE                    4  0539  B 446                36
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* PUNCH THE CARD
RPUNCH P                                                  1  0543  4                 36
       CS    RNEWCD,180                                   7  0544  / 356 180         37
* ALL DONE
RPDONE P                  PUNCH                           1  0551  4                 37
RDONE  SW    40,47                                        7  0552  , 040 047         37
       R     40           LOAD THE NEXT OVERLAY           4  0559  1 040             37
RCLRWM CW    039                                          4  0563  ) 039             37
RTOP   DCW   #3                                           3  0569                    37
RCARD  DCW   @L000000,040040,040040,0400401040@          32  0601                    38
       EX    RSTART                                                B 333
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SEQ PG LIN  LABEL  OP    OPERANDS                                              SFX CT  LOCN  INSTRUCTION TYPE  CARD

 296               JOB   POSTPROCESS THE FIRST TWO CARDS PUNCHED
 297               ORG   333                                                               0333
 298        PSTART CS    180                                                         4  0333  / 180              41
 299               R                   DATA FROM 101-180                             1  0337  1                  41
 300               MCW   80,AREA+79                                                  7  0338  M 080 721          41
 301               R                   WORD MARKS FROM 101-180                       1  0345  1                  41
 302               SBR   X1,1                                                        7  0346  H 089 001          41
 303        * SET WORD MARKS IN  AREA  CORRESPONDING TO 1S IN THE CARD AREA
 304        PSETWM BCE   PNOSET,0+X1,  Q. DON'T NEED A WORD MARK?                    8  0353  B 365 0'0          41
 305               SW    AREA-1+X1                                                   4  0361  , 6U1              41
 306        PNOSET BCE   PDUMP,X1-1,8  Q. DONE?                                      8  0365  B 384 088 8        42
 307               SBR   X1,1+X1                                                     7  0373  H 089 0'1          42
 308               B     PSETWM                                                      4  0380  B 353              42
 309        PDUMP  SBR   PTOP,180                                                    7  0384  H 609 180          42
 310               SBR   X1,101        START DUMP AT DATA FROM 101                   7  0391  H 089 101          42
 311        * SET UP FOR A NEW CARD
 312        PNEWCD SW    101                                                         4  0398  , 101              42
 313               MCW   PCARD,171                                                   7  0402  M 641 171          43
 314               SBR   X2,1          START CARD AT COLUMN 1                        7  0409  H 094 001          43
 315               SBR   X3,150        FIRST WM ADDRESS AT COLUMN 50                 7  0416  H 099 150          43
 316               B     PLOOP                                                       4  0423  B 446              43
 317        * SKIP AREAS THAT ARE BLANK WITH NO WORD MARKS
 318        PSKIP  C     X1,PTOP       Q. DONE WITH ALL MEMORY?                      7  0427  C 089 609          43
 319               BE    PDONE         YES                                           5  0434  B 594 S            43
 320               SBR   X1,1+X1       BUMP MEMORY ADDRESS                           7  0439  H 089 0'1          44
 321        PLOOP  BW    PSTORE,AREA-101+X1   Q. WORD MARK?                          8  0446  V 488 5U1 1        44
 322               BCE   PSKIP,AREA-101+X1,   SKIP IF BLANK AND NO WM                8  0454  B 427 5U1          44
 323        PNOWM  MCW   X1,153        NON-BLANK WITH NO WM -- CREATE A              7  0462  M 089 153          44
 324               MCW   PCLRWM+3       CLEAR WORD MARK INSTRUCTION                  4  0469  M 606              44
 325               SBR   X3,157        UPDATE SET-WORD-MARK ADDRESS                  7  0473  H 099 157          45
 326        PWM    BW    PWM2,AREA-101+X1     Q. NEED A "SET WORD MARK"?             8  0480  V 544 5U1 1        45
 327        * STORE CORE DATA INTO THE CARD AREA
 328        PSTORE MCW   AREA-101+X1,100+X2   PUT THE CHARACTER                      7  0488  M 5U1 1!0          45
 329               MCW   X1,146        CORE ADDRESS TO LCA IN 40-46                  7  0495  M 089 146          45
 330               MCW   X2            CARD ADDRESS TO LCA IN 40-46                  4  0502  M 094              45
 331               C     X1,PTOP       Q. ARE WE DONE?                               7  0506  C 089 609          46
 332               BE    PPDONE        YES, PUNCH THE CARD AND QUIT                  5  0513  B 593 S            46
 333               SBR   X1,1+X1       BUMP CORE ADDRESS                             7  0518  H 089 0'1          46
 334               SBR   X2,1+X2       BUMP CARD ADDRESS                             7  0525  H 094 0!1          46
 335               BCE   PPUNCH,100+X2,L  Q. IS THE DATA AREA FULL?                  8  0532  B 585 1!0 L        46
 336               B     PWM           GO AROUND AGAIN                               4  0540  B 480              46
 337        * EMIT A SET WORD MARK INSTRUCTION
 338        PWM2   BCE   PPUNCH,X3-1,7  Q. WORD MARK AREA FULL (X3=171)?             8  0544  B 585 098 7        47
 339               MCW   X1,0+X3       STORE CORE ADDRESS IN SW INSTRUCTION          7  0552  M 089 0?0          47
 340               SBR   X3,3+X3       BUMP THE WORD MARK ADDRESS                    7  0559  H 099 0?3          47
 341               BCE   PSTORE,15994+X3,,  Q. WAS IT THE FIRST WM IN SW INST        8  0566  B 488 IID ,        47
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       SBR   X3,1+X3       NO, BUMP ONE MORE                           7  0574  H 099 0?1             47
       B     PSTORE        GO CHECK IF WE ARE DONE                     4  0581  B 488                 48
* PUNCH THE CARD
PPUNCH P                                                               1  0585  4                     48
       CS    PNEWCD,180                                                7  0586  / 398 180             48
* ALL DONE
PPDONE P                   PUNCH                                       1  0593  4                     48
PDONE  NOP   333           SET ADDR REGS FOR HALT                      4  0594  N 333                 48
       H                   HALT                                        1  0598  .                     48
       B     PDONE         STAY HALTED                                 4  0599  B 594                 48
PCLRWM CW    039                                                       4  0603  ) 039                 49
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SEQ PG LIN  LABEL  OP    OPERANDS                                          SFX CT  LOCN  INSTRUCTION TYPE  CARD

 353         PTOP   DCW   #3                                                   3  0609                       49
 354         PCARD  DCW   @L000000,040040,040040,0400401040@                  32  0641                       50
 355         AREA   DA    1X80,C        AREA FOR THE DATA IN 101-180              0642   0722
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SEQ PG LIN  LABEL  OP    OPERANDS                                                        SFX CT  LOCN  INSTRUCTION TYPE  CARD

 356                JOB   SYMBOL TABLE
 357                END   PSTART                                                                          / 333 080
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SYMBOL	ADDRESS	SYMBOL	ADDRESS	SYMBOL	ADDRESS	SYMBOL	ADDRESS	SYMBOL	ADDRESS	SYMBOL	ADDRESS	SYMBOL	ADDRESS
A1	8	A2	15	A3	16	A4	23	A5	31	A6	38	A7	45
A8	52	A9	59	ADONE	63	APUNCH	64	AREA	642	AREAD	65	B1	8
B2	16	B3	31	B4	38	BDONE	63	BKBL	69	BLOOP	1	BREAD	65
BWM	23	CDONE	59	CLOAD	1	CREAD	76	CSTART	31	CSW	69	DCLEAR	69
DDONE	59	DREAD	65	DSTART	1	E1	24	EDONE	63	ELOOP	16	ENOP	69
EPUNCH	59	EREAD	65	ESETWM	45	ESTART	1	ETESTW	8	FLOAD	1	FSTART	31
FSW	69	G1	23	GCLEAR	69	GDONE	59	GREAD	65	GSTART	1	H1	24
HDONE	63	HLOOP	16	HNOP	69	HPUNCH	59	HREAD	65	HSETWM	45	HSTART	1
HTESTW	8	IREAD	65	ISTART	31	ISW	59	PCARD	641	PCLRWM	603	PDONE	594
PDUMP	384	PLOOP	446	PNEWCD	398	PNOSET	365	PNOWM	462	PPDONE	593	PPUNCH	585
PSETWM	353	PSKIP	427	PSTART	333	PSTORE	488	PTOP	609	PWM	480	PWM2	544
RCARD	601	RCLRWM	563	RDONE	552	RLOOP	404	RNEWCD	356	RNOWM	420	RPDONE	551
RPUNCH	543	RSKIP	385	RSTART	333	RSTORE	446	RTOP	569	RWM	438	RWM2	502
X1	89	X2	94	X3	99								