Fermilab Library
0 1160 0038905 0

IDENTIFICATION

MEMORY DUMP/SAVE Subroutines - MU SAVE
704 FORTRAN Subroutines Coded in FAP
Terry W. Edwards - Revised September 13, 1965
Midwestern Universities Research Association, Stoughton, Wisconsin

PURPOSE

To dump or save the entire 704 memory and console configurations on magnetic tape, with or without terminating the user's calling program, in a form such that continuation of the calling program at a later time (next week, say) is possible.

METHOD

The entire memory and console (sense indicators, etc.) configurations are written on an optionally specified magnetic tape as self-loading records. Each record consists of a five-word loader and the complete memory and console configurations. Successive records may be placed on the same magnetic tape, with an end of file always following the last such record.

An auxiliary one-card self-loading program is included which enables the reloading of any of the successive memory dumps and from any desired tape number.

USAGE

MU SAVE/DUMP may be entered via the following FORTRAN calling statements:

CALL SAVE	CALL SDUMP (ID)
CALL SAVE (NTAPE)	CALL SDUMP (ID, NTAPE)

where NTAPE is an optionally specified magnetic tape number $1 \leq$ NTAPE ≤ 10 (if not specified, a standard tape number 10 is used), and where ID is a zero or non-zero argument returned by SDUMP at write or reload time, respectively.

Note that SAVE terminates the calling program by rewinding NTAPE and then calling subroutine EXIT, whereas, SDUMP returns control to the calling program for further calculations without rewinding NTAPE.

Upon reloading from either a SAVE or DUMP tape record, the calling program is re-entered immediately following the CALL statement originally used to write the tape record. Upon reloading from a DUMP record, the argument ID contains the BCD representation of the six sense switch positions present at the prior write time, e.g., UDDUUD.

DISCLAIMER
Although this program has been carefully tested by its contributor, no guarantee is made of its correct functioning under all conditions, and no responsibility is taken by him in case of possible failure.

RELOADING

An auxiliary one-card LD TAPE program is included to reload any of the successive memory dumps on a magnetic tape. Loading may occur from any tape number $1 \leq$ LTAPE ≤ 10. The decrement portions of two words on the card may be altered as desired:

Loading Tape No. - Decrement of Word 17(8) = 10-LTAPE
Record Load No. - Decrement of Word 27 (8) = NDUMP.

Note that if no alterations are made on the LD TAPE card, loading occurs from the last record present on tape 10.

This option of variable tape number writing and reloading permits the user to retain a prior DUMP/SAVE tape without overwriting it while generating a new one.

CREDITS

The original version of MU SAVE is that of G. A. Westlund - December 1, 1959. Revisions of that version to eliminate internal sense switch interrogation and to facilitate multiple memory dumps on variable tape numbers have been included herein. The method of saving the memory and console configurations remains basically unchanged.

CODING INFORMATION

This revision of MU SAVE/DUMP requires 189 words of core storage and is available from the MURA system tapes.

MUSAVE MURA PROGRAM SAVE/DUMP SUBROUTINES - EDWARDS

LINKAGES FROM FORTRAN PROGRAMS

```
CALL SAVE            CALL SDUMP(ID)
CALL SAVE(NTAPE)     CALL SDUMP(ID,NTAPE)
```

THESE ROUTINES SAVE THE ENTIRE MEMORY AND CONSOLE CONFIGURATIONS AS SELF-LOADING RECORDS ON MAGNETIC TAPE IN A FORM SUCH THAT THE CALLING PROGRAM CAN BE RESUMED AT ANY LATER TIME FROM THE POINT FROM WHICH ENTRY WAS MADE INTO ONE OF THESE ROUTINES. A ONE CARD PROGRAM TO RELOAD ANY ONE SUCH RECORD FROM MAGNETIC TAPE IS INCLUDED.

IF SAVE IS CALLED, THE CALLING PROGRAM IS TERMINATED AFTER MEMORY AND CONSOLE CONFIGURATIONS ARE WRITTEN ON TAPE.

IF SDUMP IS CALLED, THE CALLING PROGRAM IS CONTINUED AFTER MEMORY AND CONSOLE CONFIGURATIONS ARE WRITTEN ON TAPE WITH THE ARGUMENT ID SET TO ZERO. (WHEN THE CALLING PROGRAM IS RELOADED FROM A DUMP, THE ARGUMENT ID CONTAINS THE BCD REPRESENTATION OF THE SENSE SWITCH SETTINGS WHEN SDUMP WAS CALLED, E.G. UDDUUD). HENCE THE CALLING PROGRAM CAN DISTINGUISH THE DIFFERENCE BETWEEN THE TWO TYPES OF RETURNS FROM A CALL TO SDUMP.

THE NUMBER OF THE TAPE UPON WHICH THE MEMORY AND CONSOLE CONFIGURATIONS WILL BE RETAINED CAN BE SPECIFIED VIA THE ARGUMENT NTAPE FROM THE CALLING PROGRAM. IF NTAPE IS NOT SPECIFIED BY THE CALLING PROGRAM, THE STANDARD SAVE TAPE NUMBER (10) IS INTERNALLY SELECTED.

THE MEMORY AND CONSOLE CONFIGURATIONS CAN BE RELOADED FROM ANY NUMBER TAPE BY APPROPRIATE MODIFICATION OF THE ONE CARD LOADING PROGRAM. (INDEX 1 VIA THE DECREMENT OF WORD 17(8) MUST CONTAIN 10-LTAPE). IF THE CARD LOADING PROGRAM IS NOT MODIFIED, RELOADING OCCURS FROM THE STANDARD SAVE TAPE NUMBER (10).

```
                 00006          ENTRY   SAVE
                 00011          ENTRY   SDUMP


 TRANSFER VECTOR
00000  256731636060      EXIT

 LINKAGE DIRECTOR
00001  000000000000
00002  622165256060

00003 +000000000012      SVTAP DEC     10                STANDARD SAVE/DUMP TAPE NUMBER
00004  0 00000 0 00000   PZERG PZE     0,0               ALLOWABLE ARGUMENT DECREMENT AND TAG
00005  0074 00 0 00000   TSXRG TSX     0,0               ALLOWABLE ARGUMENT DECREMENT AND TAG

00006 -0600 00 0 00262   SAVE  STQ     STRG              SAVE ROUTINE ENTRY POINT
00007  0560 00 0 00010          LDQ     *+1               SAVE CONTENTS OF MQ
00010  0020 00 0 00013          TRA     STOSW

00011 -0600 00 0 00262   SDUMP STQ     STRG              DUMP ROUTINE ENTRY POINT
00012  0560 00 0 00165          LDQ     NOPER             SAVE CONTENTS OF MQ

00013 -0620 00 0 00025   STOSW SLQ     SWCH1
00014 -0620 00 0 00167          SLQ     SWCH2             SET SAVE/DUMP SWITCHES
00015 -0620 00 0 00216          SLQ     SWCH3

00016  0601 00 0 00263          STO     STRG+1
00017  0771 00 0 00043          ARS     35                SAVE CONTENTS OF AC
00020  0601 00 0 00264          STO     STRG+2

00021 -0634 00 1 00036          SXD     X1,1
00022 -0634 00 2 00041          SXD     X2,2              SAVE INDEX REGISTERS
00023 -0634 00 4 00044          SXD     X4,4

00024 -0534 00 2 00031          LXD     D1,2              SETUP TO COMPUTE RETURN ADDRESS
00025  0020 00 0 00033   SWCH1 TRA     TAPNO             NOP IF DUMP ENTRY

00026  0500 00 4 00001   DARG  CLA     1,4               IF DUMP ENTRY, PICK UP AND
00027  0621 00 0 00170          STA     IDAD1             STORE ADDRESSES OF ARGUMENT
00030  0621 00 0 00220          STA     IDAD2
00031  1 00001 2 00032   D1    TXI     *+1,2,1           INCREMENT RETURN ADDRESS AND
00032  1 77777 4 00033          TXI     TAPNO,4,-1        ARGUMENT LOCATION INDICES
```

```
00033 -0500 00 4 00001   TAPNO CAL    1,4              LOOK FOR USER SPECIFIED
00034 -0320 00 0 00270         ANA    LMASK            SAVE/DUMP TAPE NUMBER
00035  0340 00 0 00004         CAS    PZERG
00036  1 00000 0 00040   X1    TXI    *+2,0,**         IF ADDITIONAL ARGUMENT EXISTS,
00037  0020 00 0 00045         TRA    USRTP            BRANCH TO USE SPECIFIED TAPE
00040  0340 00 0 00005         CAS    TSXRG
00041  1 00000 0 00043   X2    TXI    *+2,0,**
00042  0020 00 0 00045         TRA    USRTP
00043  0502 00 0 00003   STDTP CLS    SVTAP            IF NO SPECIFIED TAPE, USE
00044  1 00000 0 00052   X4    TXI    MOTNO,0,**       STANDARD DUMP/SAVE TAPE NUMBER

00045  0500 00 4 00001   USRTP CLA    1,4              PICK UP AND SHIFT USER
00046  0621 00 0 00047         STA    *+1              SPECIFIED TAPE NUMBER
00047  0502 00 0 00000         CLS    **
00050  0771 00 0 00022         ARS    18               IF SPECIFIED TAPE NUMBER EXISTS,
00051  1 00001 2 00052         TXI    MOTNO,2,1        INCREMENT RETURN ADDRESS INDEX

00052  0400 00 0 00272   MOTNO ADD    TEN              COMPUTE TAPE NUMBER INDEX
00053  0734 00 1 00000         PAX    0,1              AS X1 = 10 - NTAPE
00054 -3 00011 1 00056         TXL    *+2,1,9
00055  0534 00 1 00053         LXA    *-2,1

00056 -0754 00 2 00000   STRAD PXD    0,2
00057  0771 00 0 00022         ARS    18               PLANT RETURN ADDRESS
00060  0621 00 0 00261         STA    RETN

00061 -0534 00 2 00063   SLTSV LXD    *+2,2            SAVE SENSE LITE STATUS
00062 -0760 00 0 00141         SLT    1
00063  1 00001 2 00064         TXI    *+1,2,1
00064 -0760 00 0 00142         SLT    2
00065  1 00002 2 00066         TXI    *+1,2,2
00066 -0760 00 0 00143         SLT    3
00067  1 00004 2 00070         TXI    *+1,2,4
00070 -0760 00 0 00144         SLT    4
00071  1 00010 2 00072         TXI    *+1,2,8
00072 -0634 00 2 00210         SXD    XSLT,2

00073  0560 00 0 00166   TPCK  LDQ    TRANS            SAVE TAPE CHECK STATUS
00074 -0760 00 0 00012         RTT                     TRA IF OFF / NOP IF ON
00075  0560 00 0 00165         LDQ    NOPER
00076 -0620 00 0 00221         SLQ    RTPCK
```

```
00077  0500 00 0 00077   DIVCK CLA     *                 SAVE DIVIDE CHECK STATUS
00100  0760 00 0 00012         DCT                       NON-ZERO IF OFF / ZERO IF ON
00101 -0754 00 0 00000         PXD     0,0
00102  0601 00 0 00265         STO     STRG+3

00103  0560 00 0 00104   ACOV  LDQ     *+1               SAVE AC OVERFLOW STATUS
00104  0140 00 0 00106         TOV     *+2               TOV IF OFF / NOP IF ON
00105  0560 00 0 00165         LDQ     NOPER
00106 -0620 00 0 00234         SLQ     RACIN

00107  0500 00 0 00271   MQOV  CLA     NUMBR             SAVE MQ OVERFLOW STATUS
00110  0161 00 0 00112         TQO     *+2               ZERO IF OFF / SMALL IF ON
00111 -0754 00 0 00000         PXD     0,0
00112  0601 00 0 00266         STO     STRG+4

00113  0534 00 2 00114   SSWSV LXA     *+1,2             SAVE SENSE SWITCH STATUS
00114 -0754 00 0 00006         PXD     6,0               E.G. (UUDDUD)
00115  0560 00 0 00273         LDQ     DN
00116  0760 00 2 00167         SWT     7,2
00117  0560 00 0 00274         LDQ     UP
00120  2 00001 2 00115         TIX     *-3,2,1
00121  0602 00 0 00267         SLW     STRG+5

00122  0766 00 1 00232   WRTAP WTB     10,1              SAVE/DUMP MEMORY CONTENTS
00123 -0534 00 2 00133         LXD     D5,2
00124  0700 00 2 00201         CPY     LOADR+5,2         WRITE 5 WORD LOADER
00125  2 00001 2 00124         TIX     *-1,2,1
00126 -0534 00 2 00160         LXD     DM5,2
00127  0700 00 2 00000         CPY     0,2               WRITE LOCATIONS 5 - 77777
00130  2 00001 2 00127         TIX     *-1,2,1
00131  0766 00 0 00333         IOD
00132 -0760 00 0 00012         RTT
00133  1 00005 0 00163   D5    TXI     TRYOV,0,5         IF WRITE ERROR, TRY AGAIN

00134  0770 00 1 00212   WEOF  WEF     10,1              IF NO ERROR, END FILE,
00135  0764 00 1 00212         BST     10,1              BACKSPACE TWICE, AND
00136  0764 00 1 00212         BST     10,1

00137  0762 00 1 00232   CHECK RTB     10,1              READ AGAIN FOR COMPARISON
00140 -0534 00 2 00133         LXD     D5,2
00141 -0534 00 4 00160         LXD     DM5,4
```

```
00142  0700 00 0 00000   CPYLD CPY     0
00143  0500 00 0 00000         CLA     0
00144  0402 00 2 00201         SUB     LOADR+5,2          CHECK LOADER WORDS
00145  0100 00 0 00147         TZE     *+2
00146  0760 00 0 00141         SLN     1                  IF ERROR, TURN ON LITE 1
00147  2 00001 2 00142         TIX     CPYLD,2,1
00150  0700 00 0 00000   CPYCR CPY     0
00151  0500 00 0 00000         CLA     0
00152  0402 00 4 00000         SUB     0,4                CHECK LOCATIONS 5 - 77777
00153  0100 00 0 00155         TZE     *+2
00154  0760 00 0 00141         SLN     1                  IF ERROR, TURN ON LITE 1
00155  2 00001 4 00150         TIX     CPYCR,4,1
00156  0766 00 0 00333         IOD
00157 -0760 00 0 00012         RTT
00160  1 77773 0 00163   DM5   TXI     TRYOV,0,-5         IF READ ERROR, TRY AGAIN
00161 -0760 00 0 00141         SLT     1
00162  0020 00 0 00167         TRA     SWCH2              IF LITE 1 ON, TRY AGAIN

00163  0764 00 1 00212   TRYOV BST     10,1               IF WRITE OR READ ERROR,
00164 -0760 00 0 00141         SLT     1                  BACKSPACE AND GO WRITE AGAIN
00165  0761 00 0 00000   NOPER NOP
00166  0020 00 0 00122   TRANS TRA     WRTAP

00167  0020 00 0 00172   SWCH2 TRA     SVEND              NOP IF DUMP ENTRY
00170  0600 00 0 00000   IDAD1 STZ     **                 IF DUMP, SET ID ARGUMENT,
00171  0020 00 0 00221         TRA     RSTOR              AND GO RESTORE CONSOLE

00172  0772 00 1 00212   SVEND REW     10,1               IF SAVE, REWIND SAVE TAPE
00173  0074 00 4 00000         TSX     $EXIT,4            AND CALL EXIT SUBROUTINE

00174  0534 00 4 00000   LOADR LXA     0,4                FIVE WORD SELF-LOADER
00175  0700 00 4 00002         CPY     2,4                TO RELOAD MEMORY
00176  1 77777 4 00001         TXI     1,4,-1
00177  0000 00 0 00001         HTR     1
00200  0020 00 0 00201         TRA     RTN                RETURN TO THIS ROUTINE

00201 -3 00011 1 00203   RTN   TXL     *+2,1,9            WHEN RETURN, LIMIT TAPE NUMBER
00202  0534 00 1 00213         LXA     AC,1               X1 = 10-LTAPE, TO 0 THRU 9
00203  3 00002 4 00211         TXH     BSTR,4,2
00204 -3 00001 4 00211         TXL     BSTR,4,1           TEST FOR ALL WORDS READ
```

```
00205  0766 00 0 00333          IOD                          BRANCH IF WRONG OR READ ERROR
00206 -0760 00 0 00012          RTT
00207  0020 00 0 00211          TRA     BSTR
00210  1 00000 0 00216   XSLT   TXI     SWCH3,0,**

00211  0764 00 1 00212   BSTR   BST     10,1                 IF ERROR, BACKSPACE TAPE,
00212  0762 00 1 00232          RTB     10,1                 AND LOAD TAPE AGAIN
00213  0700 00 0 00000   AO     CPY     0
00214  0700 00 0 00001          CPY     1
00215  0020 00 0 00000          TRA     0

00216  0020 00 0 00221   SWCH3  TRA     RSTOR                NOP IF DUMP ENTRY
00217  0500 00 0 00267          CLA     STRG+5               IF DUMP RE-ENTRY, SET
00220  0601 00 0 00000   IDAD2  STO     **                   ID = SENSE SWITCH SETTINGS

                 00221   RSTOR SYN      *                    RESTORE CONSOLE CONFIGURATION

00221  0020 00 0 00230   RTPCK  TRA     *+7                  RESTOR TAPE CHECK IF NECESSARY
00222  0764 00 1 00212          BST     10,1                 BACKSPACE TAPE AND
00223  0762 00 1 00212          RTD     10,1                 READ IN WRONG MODE
00224  0700 00 0 00000          CPY     0
00225  0020 00 0 00224          TRA     *-1
00226  0020 00 0 00227          TRA     *+1
00227  0766 00 0 00333          IOD

00230  0500 00 0 00266   RMQOV  CLA     STRG+4               RESTORE MQ OVERFLOW STATUS
00231  0300 00 0 00266          FAD     STRG+4

00232  0500 00 0 00232   RACOV  CLA     *                    RESTORE AC OVERFLOW STATUS
00233  0767 00 0 00043          ALS     35
00234  0140 00 0 00235   RACIN  TOV     *+1                  NOP IF AC OFLOW ORIGINALLY ON

00235  0500 00 0 00235   RDVCK  CLA     *                    RESTORE DIVIDE CHECK STATUS
00236  0771 00 0 00001          ARS     1
00237  0221 00 0 00265          DVP     STRG+3

00240 -0534 00 2 00210   SLON   LXD     XSLT,2
00241  0760 00 0 00140          SLF
00242  2 00010 2 00244          TIX     *+2,2,8
00243  0760 00 0 00144          SLN     4
00244  2 00004 2 00246          TIX     *+2,2,4
```

```
00245  0760 00 0 00143          SLN     3
00246  2 00002 2 00250          TIX     *+2,2,2
00247  0760 00 0 00142          SLN     2
00250  2 00001 2 00252          TIX     *+2,2,1
00251  0760 00 0 00141          SLN     1

00252  0500 00 0 00264   RAC    CLA     STRG+2              RESTORE AC CONTENTS
00253  0767 00 0 00043          ALS     35
00254  0400 00 0 00263          ADD     STRG+1
00255  0560 00 0 00262   RMQ    LDQ     STRG                RESTORE MQ CONTENTS

00256 -0534 00 1 00036   RINDX  LXD     X1,1
00257 -0534 00 2 00041          LXD     X2,2                RESTORE INDEX REGISTERS
00260 -0534 00 4 00044          LXD     X4,4

00261  0020 00 4 00000   RETN   TRA     **,4                RETURN TO CALLING PROGRAM

00262  0 00000 0 00000   STRG   PZE     **                  STORAGE FOR SAVE/DUMP
00263  0 00000 0 00000          PZE     **
00264  0 00000 0 00000          PZE     **
00265  0 00000 0 00000          PZE     **
00266  0 00000 0 00000          PZE     **
00267  0 00000 0 00000          PZE     **

00270 -377777700000      LMASK  OCT     777777700000        CONSTANTS FOR SAVE/DUMP
00271 +010400000000      NUMBR  OCT     010400000000
00272 +000000000012      TEN    DEC     10
00273  242424242424      DN     BCI     1,DDDDDD
00274  646464646464      UP     BCI     1,UUUUUU

                                END
00275 IS THE FIRST LOCATION NOT USED BY THIS PROGRAM


    NO ERROR IN ABOVE ASSEMBLY

END OF JOB
```

```
                         LDTAPE          LDTAPE - TO LOAD DUMP/SAVE TAPES - EDWARDS

                                         DECREMENT PORTION OF WORD 27(8) = DUMP NO. LOADED
                                           0 - LAST DUMP,  1 - FIRST DUMP,  N - NTH DUMP

                                         DECREMENT PORTION OF WORD 17(8) = 10-TAPE NO.

                                 FUL                 MEMORY                FUNCTION
                  00000          ORG     0           LOCATION              COMMENTS

00000  0534 00 7 00000   INPUT  LXA     0,7            0
00001  0700 00 4 00002          CPY     2,4            1                SELF-LOADER
00002  1 77777 4 00001          TXI     *-1,4,-1       2                FOR THIS CARD
00003  0000 00 0 00001          HTR     *-2            3

00004 -0534 00 4 00027          LXD     NDUMP,4        4                LOAD DUMP NO.
00005 -0534 00 1 00017          LXD     NTAPE,1        5                LOAD 10-TAPE NO.

00006  0762 00 1 00232   READ   RTB     10,1           6                SELECT TAPE
00007  3 00001 4 00011          TXH     *+2,4,1        7
00010  3 00000 4 00025          TXH     LOAD,4,0       10               GO LOAD ON COUNT = 1

00011 -0534 00 2 00013   LXD    LXD     *+2,2          11               LOAD WORD COUNTER
00012  0700 00 0 00000   CPY    CPY     0              12               DUMMY COPY LOOP
00013  1 77777 0 00020          TXI     TXL,0,-1       13
00014  1 00001 4 00022   EOF    TXI     BST1,4,1       14               EOF - LOAD LAST DUMP
00015 -3 77776 2 00023   EOR    TXL     BST2,2,-2      15               EOR - TEST WORD COUNT
00016  2 00001 4 00017          TIX     *+1,4,1        16
00017  1 00000 0 00006   NTAPE  TXI     READ,0,**      17               DECREMENT = 10-TAPE NO.

00020 -3 00000 2 00011   TXL    TXL     LXD,2,0        20               DUMMY COPY LOOP
00021  1 77777 2 00012          TXI     CPY,2,-1       21               WORD COUNT TESTS

00022  0764 00 1 00212   BST1   BST     10,1           22               IF EOF OR EOR WITH
00023  0764 00 1 00212   BST2   BST     10,1           23               WRONG WORD COUNT,
00024  1 00000 0 00006          TXI     READ,0,0       24               BACKSPACE AND REPEAT

00025  0700 00 0 00000   LOAD   CPY     0              25               LOAD SEQUENCE
00026  0700 00 0 00001          CPY     1              26
00027  1 00000 0 00000   NDUMP  TXI     0,0,**         27               DECREMENT=DUMP NO.

                  00000          END
00030 IS THE FIRST LOCATION NOT USED BY THIS PROGRAM
```