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COMPUTER DIVISION

SORT MERGE UTILITY

MRS. R.R. JOSHI

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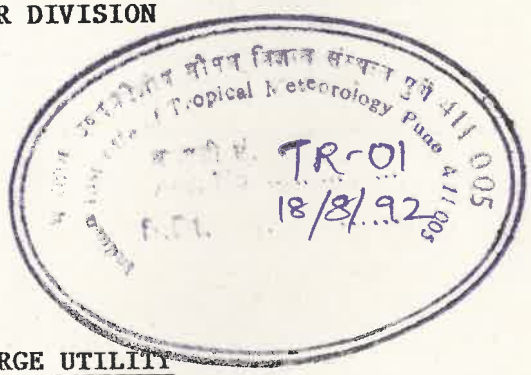

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17 Abstract: This document describes the procedures for handling SORT/MERGE utility of ND-system. The document is self explanatory and describes salient features and terms of this utility. Any user familiar with SINTRAN operating system will find it easy to use this utility by following this document.

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18 Keywords: Major key, Minor key,Ascending,Descending,Record,File.

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19 Whether Refereed: Yes

SORT-MERGE UTILITY

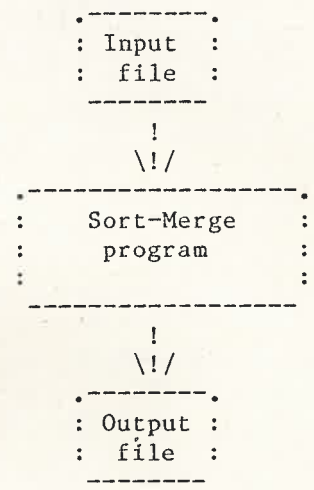
INTRODUCTION : SORT-MERGE Utility is one of the many system utilities available on ND-560/CX supermini computer system. In this report, the author has tried to present a brief description about it's usage. Details are provided where ever felt necessary. An effort is also made to highlight the points which are not given in the concerned manual but are crucial in the proper use of this utility and in understanding of the relevant features. Author has tried to document this report in simple terms to facilitate its understanding by the new users.

SORT-MERGE package has ND - version E for ND-500

This utility can be used for rearranging data on mass storage files. It can be used in two ways.

1. SINTRAN III subsystem
2. Subroutine in application program.

There is no much difference in CPU time when we use sort utility by SINTRAN III system and by subroutine program.Sort means all records or lines in one input file are ordered (ascending or descending) according to the contents of one or several fields.



Requirements for sort utility: Input file, Output file, File organization Record size, No. of sort fields, Position of fields in the record, Size and type of each field.

One can run sort-merge program directly from terminal by giving commands in one line or separated by carriage return.

How to use sort utility : Suppose one wants to sort a file with record length of 80 characters,text type and only on one field. Position of the field is starting from 9th column and length is 12 columns. Output file should be in ascending order. Detailed information regarding commands is given below. In case of any error repeat the command i.e preceded by * (which is a prompt for this utility) and not the parameter. HELP command gives an explanation of error messages or list of all commands and their parameters.

Help command will give the information as follows :

```
EXIT
HELP
SCRATCH-FILE                        (File name)
BLOCK-FACTOR-OUT                    (Number) (Records/Characters)
BLOCK-FACTOR-IN                     (Number) (Records/Characters)
ALTERNATIVE-COLLATING-SEQUENCE      (File name)
RECORD-DESCRIPTION                  (Rec-length) (Number of keys) (Record type)
KEY-DESCRIPTION                     (Key-position) (Key length) (Sequence)
                                    (Type) (Pos) (Length)
SORT                                (Input-File) (Output-File)
MERGE                               (Number of Files)  (Input-File),...
                                    (Output- File)
SECURE                              (Off/On)
ON-SEGMENT                          (Off/On)
```

:DATA is the default file extension.

****** INFORMATION UNDERLINED SHOULD BE GIVEN BY USER ******

```
@ SORT-MERGE-500
  --------------
*REC-DESC
 --------
RECORD-LENGTH     :  1:80
                     ----
NUMBER OF KEYS    :  1
                     -
RECORD TYPE       :  Text
                     ----
*KEY-DESC
 ---------
POSITION          :  9
                     -
LENGTH OF FIELD   :  12
                     --
SEQUENCE          :  Ascending
                     ---------
TYPE OF DATA      :  ASCII
                     -----
*SORT
 ----
INPUT-FILE        :  A:symb
                     ------
OUTPUT-FILE       :  "ASORT:Symb"
                     ------------
```

Details of Commands :

1. RECORD-DESCRIPTION : There are three parameters.

   i. Record length - It can be given as single number or two numbers separated by colon. e.g. 80 or 50:80
   50 - Minimum number of characters in the record
   80 - Maximum number of characters in the record

   ii. No. of keys - You can have 10 fields if sort-merge is used in interactive mode or from mode file and 99 fields in case of calling subroutine.

iii. Record Type - 1. Text : The file is written in 7 bit ASCII character each record is terminated by CR+LF (carriage return and line feed).

2. Fixed: All records of file are of the same length. For record length add two characters more in your record length for CR+LF. This type is five times faster than text type.

Example :

```
@ SORT - MERGE - 500
*REC-DES  50:80,2,TEXT
*KEY-DES  10 30 A A
*SORT  RDATA:DATA  "OUT:DATA"
EXIT
```

2. KEY DESCRIPTION : There are 4 parameters. Position, length, sequence, type of data.

i.Position : Position of the record where the field begins.

ii.Length : Size of the field in character. This parameter can not exceed the maximum length of the record and also not more than 255 bytes.

iii.Sequence : Ascending e.g. 1,2,3.....9
Descending e.g. 9,8,7.....1

iv.Type of data : ASCII : field is treated according to ASCII alphabet.

Integer : field is treated as binary word, length either 2 or 4 bytes

If there are more than one key first key from left is treated as 'Major Key' and others are treated as 'Minor Keys'. Priority is given from left to right for Minor keys. Examples can be seen on page No. 8 and 9. On page No. 8 Major key description is 18 2 A A and Minor key descriptions are 20 1 A A , 1 5 A A. On page No. 9 Major key is 1 5 A A and Minor keys are 18 2 A A , 20 1 A A.

3. SORT : There are two parameters : Input-file and output-file.

For input and output file peripheral device such as line printer,terminal can not be used. For Output-file if it is non existing file give file name in double quotes and if it is existing file then give only file name with proper extension. After completion of successful sorting it gives the message ----records sorted. We can give same name for Input-file as well as Output-file but after sorting contents in Input-file will be replaced by Output-file (sorted file). Utility Opens and closes the files itself.

All commands can be put in one mode file and can be used to save the typing every time.

Sort utility used as subroutine called from program.

Example: There are two fields to be sorted, one field is starting from 1st column with field length 20 col. 0- ascending seq. 9- ASCII TYPE and second field starting with 25th column with 5 field length. Format for call sort is as follows:

CALL SORT(INPUT,OUTPUT,SCRATCH,MINLEN,MAXLEN,RECTYPE,NO. OF FIELDS,FIELD ARRAY,BUFFSIZE,BUFFAREA, BLOCK-IN, BLOCK-OUT, COLL-FILE, STATUS)

Input, Output, Scratch are some file names which are used in sort. Output file should be existing file. Before execution sort should be loaded in linkage loader. Command is LOAD SORT.

MINLEN : Minimum length in bytes of the record in the file.
MAXLEN : Maximum length in bytes of the record in the file.
RECTYPE: An integer value indicating specific type
0- Fixed
1- Text
NO.OF FIELDS: Maximum 99 fields can be sorted.
FIELD ARRAY : Consist of four parameters i.e. position, length, sequence, type
BUFFER SIZE : An integer giving the size can be declared in program.
BUFFER AREA : An integer array of the size specified in program.
BLOCK-IN : An integer specifying the size of mag. tape blocks in bytes used in input file.
BLOCK-OUT : An interger specifying the size of mag. tape blocks in bytes used in output file.
0- tape is not used or in case of standard block size.
COLL-FILE : The name of a file containing the ALTERNATIVE - ASCII character set. If there is no ALTERNATIVE - ASCII field in use, this parameter must be zero. Default file is :DATA.
STATUS : An integer =0 in case of sucessful sorting
= Non zero indicate an error.

If the value of STATUS is in the range 0-256 decimal it denotes an operating system error,usually from the file system and for detail information refer SINTRAN III REFERENCE MANUAL. If the value of STATUS from the sort subroutine is in the range of 2584 to 2604 decimal , types of errors are described on page No. 61 of ND-100/500 SORT-MERGE User Guide.

Example:

```
   PROGRAM SORT1
   PARAMETER (IBUFSZ=2000B)
   CHARACTER*32 INFILE,OUTFILE
   INTEGER BUFFER(IBUFSZ)
   INTEGER IFNO,IFIELD(8)
   DATA IFNO/2/IFIELD/1,20,0,9,25,5,1,2/
   INFILE=  '      '
   OUTFILE=  '      '
   IRECT=1
   CALL SORT(INFILE,OUTFILE,0,80,80,IRECT,IFNO,IFIELD,IBUFSZ,BUFFER,0,0,0,
  1ISTATUS)
   IF (ISTATUS.NE.0)WRITE(1,90)ISTATUS
90 FORMAT(*ERROR IN SORT*,I6)
   END
```

Table for type of record

Code No.		Type
0	-	ASCII
1	-	Alternative ASCII
2	-	Numeric unsigned
3	-	Numeric leading separate
4	-	Numeric trailing separate
5	-	Numeric leading embedded
6	-	Numeric trailing embedded
7	-	Integer
8	-	BCD
9	-	ASCII upper case
10	-	Bit string
11	-	Real

If there is huge amount of data and we have to save the space on storage media we can use code Nos. 5 and 6.Here Numeric trailing (leading) embeded means the sign of the numeric quantity is over punched on the last (first) numeric digit. Characters corresponding to

i) + + + + + + + + + + are {,A,B,C,D,E,F,G,H,I and
   0 1 2 3 4 5 6 7 8 9
ii)- - - - - - - - - -
   0 1 2 3 4 5 6 7 8 9 are },J,K,L,M,N,O,P,Q,R.

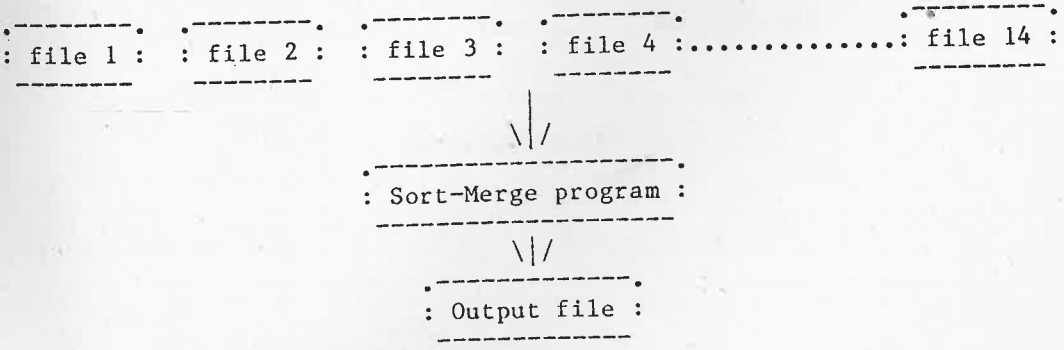
Example is as follows:

Code No.	Input Data	Data Display	Data to be punched
5	-1250	1250	J250
6	-1250	1250	125}

****** MERGE UTILITY ******

Merge : It combines two or more input files already sorted according to the contents of specified fields. The result is a single sorted file. Maximum 14 files can be merged. Each file should have same record layout, organization and sorted in the same sequence.

Advantages : i) With one command, number of files can be merged.
ii) When data files are extremely larger or if there is limited disk space then one can sort small separate files and then merge into one output file.



Each data set can have different frequency but it should be organized in the same way. If two input sorted files (to be merged) have some identical records then those identical records also appear in output file i.e. the multiplicity of a record occurance is maintained.

Example:

Input file 1	Input file 2	Output file
5	5	5
		5
6		6
7	7	7
		7
8	8	8
		8

Merge : No. of input files,name of input files,output file.

No. : maximum 14
Input-file : names of the input files separated by commas or blanks
Output-file : output file must be different from all input files

Similar to sort operation after sucessful completion of merge it gives no. of records merged.

```
@ SORT-MERGE
  ----------
* REC-DES : 80;1,TEXT
  -------------------
* KEY-DES : 11,30,A,A
  -------------------
* MERGE : 3 TEST1, TEST2, TEST3, FINAL-TEST
  -----------------------------------------
* EXIT
  ---
```

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References:

ND 100/500 Sort-Merge User Guide ND - 60.236.1 EN
ND FORTRAN Reference Manual ND - 60.145
SINTRAN III Reference Manual ND - 60.128

Symbols used @ : IITM>

: Carriage return

* : Ready for commands.

*** UNSORTED DATA FILE ***

```
40372  2913  475988110144101071008 3 -99910025  9968  9913  9939  9997100631012810137
40372  2913  475988210214101751015 1 -99910089 10031  9976 100021006010129101951020 6
40372  2913  4759883  118  155  197 -999  326  359  380  375  341  285  196  146
40372  2913  4759884   95   96   99 -999   93   99  105  116   92  158  103   96
40372  2913  4759885   38    8   13 -999   00   00   00   00   00   00   00    8
40427  2616  503788110195101591013 4 -99910068 10016  9967  9992 10044 -999 -99910186
40427  2616  503788210197101611013 6 -99910070 10018  9969  9994 10046 -999 -99910188
40427  2616  5037883  162  179  205 -999  301  329  339  345  330 -999 -999  196
40427  2616  5037884  131  152  159 -999  221  251  304  322  316 -999 -999  162
40427  2616  5037885   15  107    2 -999   00   00   00   00   00 -999 -999    1
40372  2913  475971110132100981009510047  9997  9944 -999  9935  9998100741011810131
40372  2913  475972110137101311007710054 10030  9967  9931  9949100111007310114 0156
40372  2913  475973110148101071009410048 10012  9954  9917  9925  9989100551012310143
40372  2913  475974110120101171008810046 10011  9951  9915  9936  9993100601011310136
40372  2913  475975110141101181009210057 10007  9946 -999  9926  998310058 -99910140
40372  2913  475976110133101111009310071 10032  9969  9934  9948100131006010110124
40372  2913  475977110146 -99910108100411 0012  9951  9904  9938100011007610119 0134
40372  2913  475978110149101241008610052 10009  9949  9915  9943100001007010140 0137
40372  2913  475979110143101011008610059 10033  9976  9936  9942  9996100681010010129
40372  2913  475980110135100981007110045 10012  9940  9915  993910004 -99910110124
40372  2913  4759811 -99910110100741004 2 10021  9960  9913  9935100021007010108 0134
40372  2913  475982110128101161008910053 10031  9967 -999  9936100111006710118 0145
40372  2913  475983110158101231010310062 10012  9977 -999  9937  9992100751012010142
40372  2913  475984110130101231007 5 -99910012  9944  9923  9948100021008310115 0142
40372  2913  475985110123101151010110046 10008  9956  9931  9938  9998100741011610139
40372  2913  475986110144101101007810047 10017  9957  9933  9947100141007010112 -999
40372  2913  475987110162101171007510073 10019  9974  9943  9950100071007010120 0147
40427  2616  503771110185101531015510103 10051  9994  9971  9989100531012710173 0185
40427  2616  503772110190101861013910115 10087 10034  9982100081006610129101651 0179
40427  2616  503773110207101661014610103 10063 10002  9972  9983100511011210172 0195
40427  2616  503774110178101741014210100 10068 10005  9970  9989100481011810170 0188
40427  2616  503775110193101731014610113 10055  9993  9973  9978100351010910167 0191
40427  2616  503776110186101611014110120 10073 10007  9978  9992100551010910157 0176
40427  2616  503777110191 -99910156100971 0063  9999  9957  9993100531012410162 0185
40427  2616  503778110199101791014010106 10061  9997  9970  9993100501012 2 -999 -999
40427  2616  503779110192101511013 7 -99910084 10016  9989 -999100621012710162 0188
40427  2616  503780110195101591013210103 10070  9999 -999 -999100651011810171 0185
40427  2616  503781110183101761013810101 10073 10021  9973  9994100621012910165 0193
40427  2616  503782110188101741015 0 -99910086 -999 -999 -999 -999 -999 -999 -999
40427  2616  5037831 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999101821 0199
40427  2616  503784110188101841013310102 10067  9997  9979100011005810141 0169 0191
40427  2616  503785110178101691015210107 10061 10009  9985  9996100551012610169 0193
40427  2616  503786110199101721013910105 10069 10006  9991100061007310130 1016510205
40427  2616  503787110218101791013710131 -99910029 1000010007 1006510130 1016910199
```

COMMANDS FOR YEARWISE SORTING

```
@SORT-MERGE
 --- ND-500 SORT/MERGE SYSTEM VERSION E---
*REC-DES 1:80,3,TEXT
*KEY-DES 18 2 A A,20 1 A A,1 5 A A
*SORT 88:SYMB Y88:SYMB
       48 RECORDS SORTED
CPU TIME= 0.1 SECONDS

*EXIT    - EXIT -
```

*** YEAR WISE SORTING ***

```
40372  2913  475971110132100981009510047 9997 9944 -999 9935 9998100741011810131
40427  2616  503771110185101531015510103100 51 9994 9971 9989100531012710173 10185
40372  2913  475972110137101311007710054100 30 9967 9931 9949100111007310114 10156
40427  2616  503772110190101861013910115100 8710034 9982100081006610129 10165 10179
40372  2913  475973110148101071009410048100 12 9954 9917 9925 9989100551012310143
40427  2616  503773110207101661014610103100 6310002 9972 9983100511011210172 10195
40372  2913  475974110120101171008810046100 11 9951 9915 9936 9993100601011310136
40427  2616  503774110178101741014210100100 6810005 9970 9989100481011810170 10188
40372  2913  475975110141101181009210057100 07 9946 -999 9926 998310058 -99910140
40427  2616  503775110193101731014610113100 55 9993 9973 9978100351010910167 10191
40372  2913  475976110133101111009310071100 32 9969 9934 9948100131006010110 10124
40427  2616  503776110186101611014110120100 7310007 9978 9992100551010910157 10176
40372  2913  475977110146 -999101081004110012 9951 9904 9938100011007610119 10134
40427  2616  503777110191 -999101561009710063 9999 9957 9993100531012410162 10185
40372  2913  475978110149101241008610052100 09 9949 9915 9943100001007010140 10137
40427  2616  503778110199101791014010106100 61 9997 9970 99931005010122 -999 -999
40372  2913  475979110143101011008610059100 33 9976 9936 9942 9996100681010010129
40427  2616  503779110192101511013710 -999100841001 6 9989 -999100621012710162 10188
40372  2913  475980110135100981007110045100 12 9940 9915 993910004 -999101101012 4
40427  2616  503780110195101591013210103100 70 9999 -999 -999100651011810171 10185
40372  2913  4759811 -999101101007410042100 21 9960 9913 9935100021007010108 10134
40427  2616  503781110183101761013810101100 7310021 9973 9994100621012910165 10193
40372  2913  475982110128101161008910053100 31 9967 -999 9936100111006710118 10145
40427  2616  503782110188101741015 0 -99910086 -999 -999 -999 -999 -999 -999 -999
40372  2913  475983110158101231010310062100 12 9977 -999 9937 9992100751012010142
40427  2616  5037831 -999 -999 -999 -999 -999 -999 -999 -999 -999 -999101821019 9
40372  2913  475984110130101231007 5 -99910012 9944 9923 9948100021008310115 10142
40427  2616  503784110188101841013310102100 67 9997 9979100011005810141 10169 10191
40372  2913  475985110123101151010110046100 08 9956 9931 9938 9998100741011610139
40427  2616  503785110178101691015210107100 6110009 9985 9996100551012610169 10193
40372  2913  475986110144101101007810047100 17 9957 9933 9947100141007010112 -999
40427  2616  503786110199101721013910105100 6910006 9991100061007310130 10165 10205
40372  2913  475987110162101171007510073100 19 9974 9943 9950100071007010120 10147
40427  2616  503787110218101791013710131 -999100291000010007100651013010169 10199
40372  2913  475988110144101071008 3 -99910025 9968 9913 9939 9997100631012810137
40427  2616  503788110195101591013 4 -999100681001 6 9967 999210044 -999 -99910186
40372  2913  475988210214101751015 1 -999100891003 1 9976100021006010129 10195 10206
40427  2616  503788210197101611013 6 -999100701001 8 9969 999410046 -999 -99910188
40372  2913  4759883  118  155  197 -999  326  359  380  375  341  285  196  146
40427  2616  5037883  162  179  205 -999  301  329  339  345  330 -999 -999  196
40372  2913  4759884   95   96   99 -999   93   99  105  116   92  158  103   96
40427  2616  5037884  131  152  159 -999  221  251  304  322  316 -999 -999  162
40372  2913  4759885   38    8   13 -999   00   00   00   00   00   00   00    8
40427  2616  5037885   15  107    2 -999   00   00   00   00   00 -999 -999    1
```

```
*** COMMANDS FOR INDEX NUMBER WISE SORTING ***

@SORT-MERGE
 --- ND-500 SORT/MERGE SYSTEM VERSION E---
*REC-DES 1:80,3,TEXT
*KEY-DES 1 5 A A,18 2 A A,20 1 A A
*SORT 88:SYMB I88:SYMB

       48 RECORDS SORTED
CPU TIME= 0.1 SECONDS
*EXIT
- EXIT -
*** INDEX NUMBER WISE SORTING  ***

40372 2913  475971110132100981009510047 9997 9944 -999 9935 9998100741011810131
40372 2913  475972110137101311007710054 10030 9967 9931 9949100111007310114 10156
40372 2913  475973110148101071009410048 10012 9954 9917 9925 9989100551012310143
40372 2913  475974110120101171008810046 10011 9951 9915 9936 9993100601011310136
40372 2913  475975110141101181009210057 10007 9946 -999 9926 998310058 -99910140
40372 2913  475976110133101111009310071 10032 9969 9934 9948100131006010110124
40372 2913  475977110146 -99910108100411 0012 9951 9904 9938100011007610119 10134
40372 2913  475978110149101241008610052 10009 9949 9915 9943100001007010140 10137
40372 2913  475979110143101011008610059 10033 9976 9936 9942 9996100681010010129
40372 2913  475980110135100981007110045 10012 9940 9915 993910004 -9991011010124
40372 2913  4759811 -99910110100741004210021 9960 9913 9935100021007010108 10134
40372 2913  475982110128101161008910053 10031 9967 -999 9936100111006710118 10145
40372 2913  475983110158101231010310062 10012 9977 -999 9937 9992100751012010142
40372 2913  475984110130101231007 5 -99910012 9944 9923 9948100021008310115 10142
40372 2913  475985110123101151010110046 10008 9956 9931 9938 9998100741011610139
40372 2913  475986110144101101007810047 10017 9957 9933 9947100141007010112 -999
40372 2913  475987110162101171007510073 10019 9974 9943 9950100071007010120 10147
40372 2913  475988110144101071008 3 -99910025 9968 9913 9939 9997100631012810137
40372 2913  475988210214101751015 1 -99910089 10031 9976100021006010129 10195 10206
40372 2913  4759883  118  155  197 -999  326  359  380  375  341  285  196  146
40372 2913  4759884   95   96   99 -999   93   99  105  116   92  158  103   96
40372 2913  4759885   38    8   13 -999   00   00   00   00   00   00   00    8
40427 2616  503771110185101531015510103 10051 9994 9971 9989100531012710173 10185
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भारतीय उष्णकटिबंधीय मौसम विज्ञान संस्थान पुणे 411 005
Indian Institute of Tropical Meteorology Pune 411 005
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