IBM / Technical Newsletter

IBM 1410 GENERALIZED SORTING PROGRAM
USING 1301 DISK STORAGE

This newsletter contains replacement pages and notes for corrections to the publication, IBM 1410 Generalized Sorting Program Using 1301 Disk Storage, Form C28-0304.

Since the changes affecting pages 34 and 37 are extensive, pages 33, 34, 37, and 38 have been replaced. Text changes are indicated by a vertical bar at the left of the lines affected.

Other changes are to be made as shown below:

Page	Amendment
27	In column two, the paragraph preceding the Note should read: "... will be reloaded and re-executed. This time, the reduced number of merge sequences created by the first two merge passes will, of course, be used."
30	In column one, under General Information, the third line should read: "... are more economical than the adoption of alternate ..."
30	In column one, the tenth line from the bottom should read: "... constants and phase-to-phase information will nor-..."

Exit	Location of Branch Constant	Logical Point of Exit
Exit 3A	02310-02314	After loading Phase 3, but before the assignment routines are executed.
Exit 1A	02315-02319	After loading Phase 1, but before the assignment routines are executed.
Exit SA	02320-02324	Before reading Control Cards Two, Three, and Four. Located in Sort System Control.
Exit SB	02325-02329	After reading Control Cards Two, Three, and Four. Located in Sort System Control.

The branch constants provided for the following exits are loaded with Phase 1. All added program cards associated with these exits, including the overlays of the branch constants, must be loaded by the user's load program at the time of Exit 1A.

Exit	Location of Branch Constant	Logical Point of Exit
Exit 1B	02320-02324	Before moving a data record from the input area to the record-storage area.
Exit 1C	02325-02329	Before moving a data record from the input area to the record-storage area.
Exit 1D	02330-02334	After reading an input tape header label.
Exit 1E	02335-02339	After reading an input tape trailer label.
Exit 1F	02340-02344	Before writing the dump tape header label.

The branch constants provided for the following exits are loaded with Phase 3. All added program cards associated with these exits including the overlays of the branch constants must be loaded by the user's load program at the time of Exit 3A.

Exit	Location of Branch Constant	Logical Point of Exit
Exit 3B	02315-02319	At the end of the assignment routines.
Exit 3C	02320-02324	Before moving a data record from the work area to the output area.
Exit 3D	02325-02329	After moving a data record from the work area to the output area.
Exit 3E	02330-02334	Before reading the Output Tape Reader Label Card.
Exit 3F	02335-02339	Before writing an output tape header label.
Exit 3G	02340-02344	Before writing an output tape trailer label.
Exit 3H	02345-02349	At the end of the sort.

DESCRIPTION OF MODIFICATION CONSTANTS AND EXITS

The modification constants and exits provided in each phase of the sort are described in detail in the following pages.

Where significant, procedures are described to illustrate some of the possible uses of the exits. In each case, the description is limited to those operations which are essential to satisfactory program performance. Each modification must, of course, include additional instructions as necessary to meet the user's individual requirements. The programming technique to be used, within the framework of the specifications for each exit, is left to the discretion of the user.

The format used for the description of each of the exits is as follows:

Description: This paragraph describes the logical point at which the sort will branch to added programming.

Branch Constant Location: xxxxx-yyyyy -- The address given is the location of the branch constant which must be overlaid by the user to activate this exit.

Load Added Programming: This paragraph explains the procedure for loading added program cards associated with this exit.

Return Branches: This paragraph describes the number and function of the branch instructions which must be provided as the first instructions of the added programming associated with this exit.

Comments on Use: This paragraph explains the use of the modification constants and index registers which are particularly applicable, and describes special techniques which may be utilized.

Required Index Register Conditions on Re-entry: Contents, (including word marks or absence of same) must be restored, or left undisturbed, as specified.

LOADER 1 (DSLD1) MODIFICATION

There are no modification constants or exits in this section.

Loader 1 will bypass the card-reader operations associated with Control Card One if the contents of this card are loaded into core-storage positions 01509 through 01517 at the same time this section of the program is loaded. This may be accomplished by.

inserting a program card, punched as follows, into the program deck immediately preceding the "Execute" card (serial No. 999) for Loader 1:

Columns	1	2-6	7	8-12	13	14-22	23-80
Contents	w/s	01509	w/s	00009	w/s	Cols 1-9 of CC1	As desired

LOADER 2 (DSLD2) MODIFICATION

Loader 2 will always bypass the card reader operations associated with Control Card One if the sorting program is loaded from tape or from cards, since Loader 1 will already have obtained the necessary Control Card One information. If, however, the program is stored permanently in the 1301, Loader 2 will bypass the reading of Control Card One if the contents of this card are loaded into core-storage positions 01509 through 01517 at the time this section of the program is loaded. This may be accomplished by inserting a program card, punched as follows, in the program deck immediately preceding the "Execute" card (serial No. 999) for Loader 2:

Columns	1	2-6	7	8-12	13	14-22	23-80
Contents	w/s	01509	w/s	00009	w/s	Cols 1-9 of CC1	As desired

DSLD2 Modification Constants

The following modification constants are provided in DSLD2.

Mod Constant No.	Location	Description
01	02330-02333	This field normally contains four zeros. If the data record length is to be changed through user modification in Phase 1, the input data-record length must be placed here at the time of loading DSLD2. (Procedures for changing data-record length in Phase 1 are described under "Exit 1C.")
02	02334-02337	This field normally contains four zeros. If the data-record length is to be changed through user modification in Phase 3, the output data-record length must be placed here at the time of loading DSLD2. See Exit 3C. (Procedures for changing data-record length in Phase 3 are described under "Exit 3C.")

DSLD2 Branch Constants

Although there are no exits provided in DSLD2, added programming for the following exits, as well as overlays for the branch constants associated with these exits, should be loaded with DSLD2:

Exit	Branch Constant Location
INQUIRY	02300-02304
ERROR STOP	02305-02309
3A	02310-02314
1A	02315-02319
SA	02320-02324
SB	02325-02329

Through the use of this method, user modifications to the sorting program for different applications can be developed and maintained without disturbing the unmodified sorting program which may be kept in disk storage permanently. In addition, updating the sorting program (i.e. incorporating corrections in modification letters applicable to the sort) effectively updates all of the sorting applications, including user-modified sorts, of the installation.

EXITS COMMON TO ALL PHASES OF THE SORT

INQUIRY Exit

Description: A branch to added programming will be executed following an inquiry interrupt.

Branch Constant Location: 02300-02304

Load Added Programming: The overlay of the branch constant and the added programming associated with this exit should be loaded with DSLD2.

Return Branches: The first instruction in the added programming for this exit must be a branch instruction with a zero address. The sorting program will place the proper return address in this instruction, and the user's routine must branch here to return to the sorting program. (The return address will be updated as each new phase is loaded.)

Comments on Use: This exit may be used:
 (1) to temporarily interrupt the sort so that a processing routine of more urgent priority can be executed.
 (2) to enter data into the system from the console for later use by the sorting program or a following program.
 (3) to discontinue the sort in process and go on to another program.

turn to this exit before moving the next record in the input area, so that any number of data record may be added in sequence.

If a record is not to be added, return to the sorting program is made via the first return branch.

Required Index Register Conditions on Re-entry: Index register 14 must be used as noted above. The contents of any other index register used (including word marks or absence of same) must be saved and restored. Index Registers 13, 14, and 15 must be saved prior to, and restored subsequent to, the execution of any IOCS macro-instructions.

Exit 1C

Description: A branch to added programming will be executed prior to the movement of each data record from the input area to the record storage area. (This exit follows Exit 1B, thus facilitating all the functions of both exits in the same sorting application.)

Branch Constant Location: 02325-02329

Load Added Programming: The overlay of the branch constant and the added programming associated with this exit must be loaded at the time of Exit 1A.

Return Branches: The first two instructions in the added programming for this exit must be branch instructions with zero addresses. The sorting program will place the proper return addresses in these instructions. The first branch must be used to return to the sorting program when data records are to be edited (i. e. altered); the second branch must be used to return to the sorting program when data records are to be deleted and/or data-record length is to be changed. Routines that change data-record length may also include editing.

Comments on Use: At the time of this exit, Index Register 13 contains the location of the next record to be moved from the input area to the record storage area, and Index Register 14 contains the location in the record storage area to which the next record will be moved. If the input blocking factor is 000 or V00, a record mark will have been added to the data record in its input location.

When this exit is to be used to change data-record length the input data-record length (or maximum input length if variable) must be placed in modification constant 01 at the time of loading DSLD2. Field 16 of Control Card Three must show the new length (or maximum length if variable) of the data record, including a record mark. The record mark will be added by the program, if the input file consists of Form 1 or Form 3 data records that do not end with a record mark.

Editing of the current data record must be performed in the input area, using Index Register 13 to refer to the record. For these cases, or if the cur-

rent record is unmodified, the return to the sorting program is made via the first return branch.

The length of the current data record may be changed by performing the following operations:

1. Move the data record to the record storage area using Index Registers 13 and 14 for the locations of the data record and the record storage area, respectively:

    MRCR   0+X13, 0+X14

2. Execute the instructions necessary to add (drop) the desired fields to (from) the data record in the record storage area. This routine must include instructions to overlay the original record mark, and to insert a new record mark at the end of the record.

3. Add the length of the input data record to Index Register 13.

4. For fixed-length records, add the new length of the data record to Index Register 14. For variable-length records, add the maximum data record length to Index Register 14. In either case, this is the length specified in Field 16 of Control Card Three.

5. Return to the sorting program using the second return branch.

The current record may be deleted by performing the following operations:

1. Add the length of the input data record to Index Register 13.

2. Subtract +1 from the current record counter, Modification Constant 01, at core-storage locations 02345 through 02349.

3. Subtract +1 from the file size adjustment counter, Modification Constant 02, at core-storage locations 02350 through 02356.

4. Return to the sorting program using the second return branch.

Required Index Register Conditions on Re-entry: Index Registers 13 and 14 must be used as noted above. The contents of any other index register used (including word marks or absence of same), must be saved and restored. Index Registers 13, 14, and 15 must be saved prior to, and restored subsequent to, the execution of any IOCS macro-instructions.

Exit 1D

Description: A branch to added programming will be executed after an input tape header label is read.

Branch Constant Location: 02330-02334

Load Added Programming: The overlay of the branch constant and the added programming associated with this exit must be loaded at the time of Exit 1A.

Return Branches: The first two instructions in the added programming for this exit must be branch instructions with zero addresses. The sorting program will place the proper return addresses in these instructions. The first branch must be used to return to the sorting program when the current input tape is to be accepted; the second branch must be used to return to the sorting program when the current input tape is to be rejected.

Comments on Use: This exit will be activated only when Field 6 of Control Card Two indicates that input tapes contain header labels.

As explained in the section "Tape Label Options," checking of header labels against header label control cards is not considered meaningful, since the input file may consist of several different reels from several different data files. This exit may be used to perform any such checking desired by the user with either standard or non-standard header labels. At the time of this exit, the header label has been read, and is located in an area whose beginning location is given in Modification Constant 03 at core-storage locations 02357-02361. If a check of the header label indicates that an incorrect tape has been mounted, a halt or waiting loop should be executed to permit mounting of the correct tape, followed by a return to the sorting program using the second return branch. The sorting program will then open the new tape and return to this exit. When the current input tape is to be accepted, the added programming simply returns to the sorting program using the first return branch.

Required Index Register Conditions on Re-entry: The contents of any index register used (including word marks or absence of same) must be saved and restored.

Exit 1E

Description: A branch to added programming will be executed after reading an input tape trailer label.

Branch Constant Location: 02335-02339

Load Added Programming: The overlay of the branch constant and the added programming associated with this exit must be loaded at the time of Exit 1A.

Return Branches: The first instruction in the added programming for this exit must be a branch instruction with a zero address. The sorting program will place the proper return address in this instruction, and the user's routine must branch here to return to the sorting program.

Comments on Use: This exit will be activated only when Field 6 of Control Card Two indicates that input tapes contain trailer labels.

At the time of this exit the trailer label has been read and is located in an area whose beginning location is given in Modification Constant 03 at core-storage locations 02357 through 02361.

This exit may be used to terminate the input file with the current input reel by performing the following operations (this provision facilitates the use of an end-of-file trailer, rather than the number of input reels, to indicate the end of the input file.):

1. Before executing the sort, punch in Field 6 of Control Card Two, a number equal to or greater than the maximum number of input reels anticipated.
2. When the input is to be terminated (e.g., when an end-of-file trailer label is detected) place a two-digit constant of 01, signed plus, in Modification Constant 04, at core-storage locations 02362-63.
3. If padding option 1, 3, or 4 is specified, in order to avoid unnecessary checking for nines padding records in Phase 3, place a two-digit constant, unsigned, of the exact number of input reels processed, in core-storage positions 01307-08.

Required Index Register Conditions on Re-entry: The contents of any index register used (including word marks or absence of same) must be saved and restored.

Exit 1F

Description: A branch to added programming will be executed before writing the dump tape header label.

Branch Constant Location: 02340-02344

Load Added Programming: The overlay of the branch constant and the added programming associated with this exit must be loaded at the time of Exit 1A.

Return Branches: The first instruction in the added programming for this exit must be a branch instruction with a zero address. The sorting program will place the proper return address in this instruction, and the user's routine must branch here to return to the sorting program.

Comments on Use: This exit will be activated only when Field 12 of Control Card Two indicates that the dump tape is to contain a header label. At the time of the exit, the header label to be written is located in an area whose beginning address is given in

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