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COMPUTER PROGRAM DOCUMENTATION

CYBER TO UNIVAC

BINARY CONVERSION

USER'S GUIDE

Job Order 52-309

CPD-924

Prepared By

Lockheed Engineering & Management Services Co., Inc.

Houston Division

Houston, Texas

Contract NAS 9-15800

For

STRUCTURES AND MECHANICS DIVISION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER
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1. INTRODUCTION

The establishment of an account on the United Computing System (UCS) network for the purpose of making SINDA production runs introduced the need to provide special input/output (I/O) programs to transfer data between the Univac 1110 at NASA/JSC and the CYBERs at UCS.

The most important I/O requirement was to be able to return from UCS the temperature history data of SINDA to the Univac 1110 for processing with an analysis/plotting package. Reference 1 describes the previous system, which required the CYBER binary output to be converted to Binary Coded Decimal (BCD), mailed on magnetic tape to Houston, and then reconverted from BCD to Univac binary.

The BCD conversions in this process proved both cumbersome and expensive, thus it was decided to create a program for the CYBER that would write the temperature history data directly in Univac Binary format.

2. DISCUSSION

It might be desirable when making the Univac binary tape to transfer only a portion of the data, thus it was decided to provide some user control over the conversion process. Since a Univac program in the ES3*SINDA file, UTIL/HIST, reference 2, provides this capability it was used as the basis of the CYBER software. The user controls the transfer of the binary data and the printed output through a namelist.

Table I lists the input variables of the namelist, $INDATA, along with their function and default values.

The logical variable, ACTREL, is used to specify whether or not the actual-relative dictionaries are to be printed. The program always prints the relative-actual dictionaries (actual numbers in relative order) for each of the types of thermal parameters. If ACTREL is .TRUE. the program also prints the dictionaries ordered by increasing actual number giving both the relative number within the individual parameter set and the relative number in the complete data set.

Though not commonly used, the SINDA I/O package has always been structured to have multiple history data sets on single logical unit, the data sets being separated by software end of files. The variables INFILE and IOFILE are used to specify the input file number which contains the original HSTFLO or HISTRY data and the output file number which will hold the processed data. The user is responsible for providing the correct CYBER control cards for the assignment of the input and output files.

The variables PRINT and NPRINT control the printed output. If PRINT is false, only the relative-actual dictionaries and a completion summary message will be printed. When PRINT is true, the temperature history data will also be printed at a time interval determined by NPRINT. For NPRINT=0 or 1, each time step will be listed. For NPRINT=2 a time step will be skipped between output; for NPRINT=3 two time steps will be skipped, etc. The variables WRTOUT and NSKIP perform exactly the same function for binary output (the transfer of actual history data between devices) as do PRINT and NPRINT for printed output. That is, if WRTOUT is false there will be no binary output, and when WRTOUT is true the data from the input unit will be transferred to the output unit.

Another control over the amount of data which is printed or written is provided through the variables START, STOP and TFACT. The input is searched until a time value equal to or greater than START is found and the program stops when a time point equal to or greater than STOP has been processed. Occasionally, it is deşirable to change the time values of history data. This can be accomplished by setting TFACT to a non-zero value. TFACT is added to the time value before each binary output. It may be either positive or negative.

Runstream examples are shown in Figures 1 and 2. In the example in Figure 1, all of the default namelist input variable values are used. Line 5 contains the actual name ofthe input data file (HFLODTA) which is to be converted to UNIVAC internal format. BINDATA is the name of the file that will contain the converted data (output). OUTBIN is the name of the file that will contain the printed output. BINDAY is the name of the file that contains the day file, which shows the results of the run. The program always requires logical unit 23 (TAPE23) for data input, and writes the binary output to unit 7 (TAPE7).

In the example in Figure 2, all of the default namelist input variable values will be used except NPRINT. With NPRINT=2 the temperature history data will be printed every other time.

The maximum number of thermal parameters within a data set is 40,000.

Table I . $INDATA Input Variables

Name	Description	Range	Default
ACTREL	Actual, relative index print control	Logical	TRUE
INFILE	File number of unit IN for data input	Integer	1
IOFILE	File number of unit IO for data output	Integer	1
NPRINT	Printed output interval control	Integer	0
NSKIP	Binary output interval control	Integer	0
PRINT	Printed output control	Logical	TRUE
START	Start time	Real	0.
STOP	Stop time	Real	10000.
TFACT	Time scale factor	Real	0.
WRTOUT	Binary output control	Logical	TRUE

```
JOB,CM10000,T100.
ACCOUNT, N00918A,ED.
NOEXIT.
UNS,BINDATA.
GET,TAPE23=HFLODTA.
RFL,5C000.
GET,UTILBIN.
UTILBIN.
SET(EF=0).
PUT,TAPE7=BINDATA.
IF(EF.NE.0)
PUT,TAPE7=BINDATA/D.
ENDIF.
ONEEXIT.
GOTO,COST.
EXIT.
COST.
DFD,BINDAY,R.
PUT,OUTPUT=OUTBIN.
EOR
EOF
```

Figure 1. Example of runstream for UTILHST using default namelist values

```
JOB,CM10000,T100.
ACCOUNT,N00918A,ED.
NOEXIT.
UNS,BINDATA.
GET,TAPE23=HFLODTA.
RFL,50000.
GET,UTILBIN.
UTILBIN.
SET(EF=0)
PUT,TAPE7=BINDATA.
IF(EF.NE.0)
PUT,TAPE7=BINDATA/D.
ENDIF.
ONEXIT.
GOTO,COST.
EXIT.
COST.
DFD,BINDAY,R.
PUT,OUTPUT=OUTBIN.
EOR
$INDATA NPRINT=2$
EOF
```

Figure 2. Example of runstream for UTILHST using override namelist values

3. CONCLUSIONS

The executable binary of this software resides in the file UTILBIN in both accounts N00918* and N00918A. The symbolics reside in account N00918 only, both as seperate files and collected together into file UNITAPE. A description of the main program and each subroutine is contained in the appendix.

An execution which converted 45 hours of HSTFLO data for the Mid Section Thermal Model (1957 nodes) required 17.6 CP seconds and cost $50.50.

CDC2UNI - CDC2UNI is called by UBINWR to convert a CYBER floating point number to a 36 bit UNIVAC 1100 floating point number and stores it in the right most 36 bits of a 60 bit word. This integer function has one calling argument. This calling argument is the floating point number to be converted.

DCKOUT - DCKOUT is called by UTILHST to set the headings for the actual-relative dictionaries. DCKOUT receives its variables through common. This routine is called only when the logical variable ACTREL is .TRUE.

ACTOUT - ACTOUT is called by DCKOUT to print the actual-relative dictionaries.

SHELL - SHELL is called by ACTOUT to sort the actual-relative dictionaries.

GENOUT GENOUT is called by UTILHST to print the temperature history data. This routine is called only when the logical variable PRINT is .TRUE.

Appendix - Software Description

UTILHST

UTILHST is the main program. This program reads the HSTFLO or HISTRY data, determines the type of input (HSTFLO or HISTRY), calls the appropriate routines for conversion to UNIVAC internal format, controls whether the actual-relative dictionaries are to be printed, controls the amount of printed output, and controls the amount of data written to the output file. In performing this function UTILHST calls several subroutines, they are as follows:

POSIT - POSIT is called by UTILHST to position the input and output files to the correct data set on the file (see discussion of INFILE and IOFILE). This routine has two calling arguments. The first is the unit and the second is the data set number to which POSIT will position itself to read or write the data.

UBINWR - UBINWR is called by UTILHST to convert the data from CYBER internal format to UNIVAC internal format (display code to field data). This routine has five calling arguments. The first is the logical unit number to which the data will be written. The second argument is the number of variables and/or arrays to be written. The third argument is a two-dimensioned array which contains the looping parameters for each variable and/or array that is to be written. The fourth argument is an array that contains the address of every variable and/or array to be written. The fifth argument is a parity flag that indicates whether the write was successful or not.

DC2FD - DC2FD is called by UBINWR to move and convert alpha data from display code to field data. This routine has five calling arguments. The first is the number of characters to move. The second argument contains the location of the string of characters to move. The third argument contains the starting character position in the string to begin moving from. The fourth argument is the location where the string is to be moved. The fifth argument contains the starting character position in the destination line to begin moving to.

4. REFERENCES

1. "UCS/CDC to JSC/UNIVAC HSTFLO Data Conversion - BCD to Binary", TM-9042, LEMSCO-14604, Lockheed, Houston, Texas. March, 1980.

2. "Modification of the SINDA Thermal Data History I/O Package", LEC-12914, CPD 812,JSC-14596, Lockheed, Houston, Texas. November, 1978.