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**ENVIRONMETRICS OF
SYNFUELS: I**
**Processing the Automated PDP-11
Data Components for the
UMD Gasifier Facility**

R. H. Strand
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ENVIRONMENTAL SCIENCES DIVISION
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ENVIRONMETRICS OF SYNFUELS: I. PROCESSING THE
AUTOMATED PDP-11 DATA COMPONENTS FOR
THE UMD GASIFIER FACILITY

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FOREWORD

DOE's "Gasifiers in Industry" program is part of a large-scale activity to develop and improve technologies for conversion of coal into clean gaseous fuels that can be used as substitutes for oil and natural gas.

This program involves the demonstration and evaluation of existing technology for low-Btu coal gasification in several different industrial, commercial, and institutional settings. The projects include various types of commercially available gasifiers, environmental control systems, and sources of coal.

An integral part of the demonstration effort is the assessment of potential health and environmental hazards associated with coal gasification. In 1977 the Oak Ridge National Laboratory (ORNL) was requested by the Assistant Secretary for Environment (ASEV), Department of Energy (DOE), to develop an integrated comprehensive environmental plan for the gasifier under construction at the University of Minnesota-Duluth. A similar request was subsequently made which involved the Pike County Coal Gasification facility.

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ABSTRACT

STRAND, R. H., M. P. FARRELL, C. W. GUDMUNDSON,
T. K. BIRCHFIELD, S. S. CASADA, and M. E. VANSUCH.
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facility. ORNL/TM 7428. Oak Ridge National Laboratory,
Oak Ridge, Tennessee. 40 pp.

This report summarizes the techniques and procedures used to handle automated data collected at the University of Minnesota-Duluth (UMD) campus coal gasification facility. This facility, which is partially funded by the Department of Energy, is being evaluated by scientists at Oak Ridge National Laboratory (ORNL) for its potential health and environmental effects. Automatic data collections and manually collected and sample results data are used for this assessment. A data management project at ORNL handles these and other UMD data for the Gasifiers in Industry Program (GIIP). Specifically, this report documents the procedures developed within the data management project for handling two categories of automated data: (1) process and (2) environmental. The examples included use actual data from the first one and a half years of gasifier operation.

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INTRODUCTION

The University of Minnesota-Duluth (UMD) campus coal gasification facility, which is partially funded by the Department of Energy, is being evaluated by scientists at the Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee, for its potential health and environmental effects. Automated data collections (Items I and II, Table 1) and manually collected and sample results data (Items III and IV, Table 1) are used for this assessment. A data management project at ORNL handles these and other UMD data for the Gasifiers in Industry Program (GIIP).

This report summarizes the techniques and procedures developed for handling two categories of the automated data: (1) process and (2) environmental. Illustrative examples used in the report are from actual data collected during the first one and a half years of gasifier operation. The automatically recorded process and environmental data are represented by dashed lines in Fig. 1. Solid lines represent sample information. Figure 2 describes the flow of these data through the data processing programs.

PROCESS DATA

The process data consist of continuously monitored variables within the process streams of the gasifier; instrument data are those manually read from instruments or gauges; industrial hygiene data are manually obtained on site; and on-site gas analysis results are obtained from manually collected samples from the process streams.

Table 1. Data components from the UMD gasifier facility,
with automatically recorded data in the process
and environmental categories

I.	Process data (see Table 2 for list of data points)
II.	Environmental data Meteorological and air quality
III.	Manually collected data Industrial hygiene CO dosimeter CO monitoring Operations Log Medical Onsite Gas chromatograph analyses
IV.	Sample analyses and effects results Collection and shipment Disbursement and return of results Transfer to archives Summary of results - to date

UMD -- SITE DATA

Fig. 1. UMD-site data collections. Dashed lines represent data. Solid lines represent samples.

Fig. 2. Flow chart of handling of process data for the UMD gasifier.

The process data are automatically collected on a PDP-11 minicomputer at the UMD site. The process monitoring points shown in Table 2 along with a tag mnemonic represent temperatures, pressures, flows and gaseous components that were originally selected for monitoring from the gasifier process streams. During the gasifier operation, the process points are monitored at approximately 5-minute intervals and recorded on magnetic disk files on site. Biweekly accumulations are copied from disk to magnetic tape and transferred to ORNL. Upon receipt, the tape is used to create an IBM-compatible file using the ORNL computers. Two computer programs (available from authors) are used to create a sequential copy of all files on magnetic tape (Program 1) and an on-line disk file (Program 2). The Statistical Analysis System (SAS) (SAS Institute, Inc., Cary, North Carolina) is used to implement the files at ORNL. Program 2 creates a SAS file with each variable's name, type, and length standardized to a nomenclature established for the GIIP Program. Each of the program listings contains comments to enable the interested person to determine how the programs are used to input, manipulate, and store the data.

Several other programs have been implemented to summarize, plot, and tabulate the process data. An example of the output from the process data summary program (Program 3, available from authors) is shown in Table 3, where the tag mnemonic has been combined with the process point code. These data can be summarized for a specific time period or for a specific process monitoring point. Many other statistics, e.g., standard deviation, coefficient of variation, and

Table 2. Process monitoring points and mnemonics for the UMD gasifier

TAG	PROCESS
F010	JACKET MAKEUP WATER, 0-10 GPM
F020	MAKEUP WATER TO ASH PAN, 0-0.6 GPM
F077	VENTED STEAM FLOW, 0-800 LB/HR, SQUARED
F21A	STEAM TO VENTURI, 0-970 LB/HR, SQUARED
F21B	STEAM TO VENTURI, 0-2800 LB/HR, SQUARED
GNOX	NITROGEN OXIDES IN STACK GAS, PPM
GSOX	SULPHUR OXIDES IN STACK GAS, PPM
G111	CLEAN TOP GAS, SO2, PERCENT
G101	CLEAN TOP GAS, N2, PERCENT
G102	CLEAN TOP GAS, O2, PERCENT
G103	CLEAN TOP GAS, CO, PERCENT
G104	CLEAN TOP GAS, CO2, PERCENT
G105	CLEAN TOP GAS, C1, PERCENT
G106	CLEAN TOP GAS, C2, PERCENT
G107	CLEAN TOP GAS, C3, PERCENT
G108	CLEAN TOP GAS, H2O, PERCENT
G109	CLEAN TOP GAS, H2, PERCENT
G110	CLEAN TOP GAS, H2S, PPM
G112	CLEAN TOP GAS, COS, PPM
G117	CLEAN TOP GAS, CS2, PPM
G114	CLEAN TOP GAS, CH3SH, PPM
G115	CLEAN TOP GAS, C2H5SH, PPM
G116	CLEAN TOP GAS, THIOPHENE, PPM
G201	COMBINED GAS, N2, PERCENT
G202	COMBINED GAS, O2, PERCENT
G203	COMBINED GAS, CO, PERCENT
G204	COMBINED GAS, CO2, PERCENT
G205	COMBINED GAS, C1, PERCENT
G206	COMBINED GAS, C2, PERCENT
G207	COMBINED GAS, C3, PERCENT
G208	COMBINED GAS, H2O, PERCENT
G209	COMBINED GAS, H2, PERCENT
G210	COMBINED GAS, H2S, PPM
G211	COMBINED GAS, SO2, PPM
G212	COMBINED GAS, COS, PPM
G213	COMBINED GAS, CS2, PPM
G214	COMBINED GAS, CH3SH, PPM
G215	COMBINED GAS, C2H5SH, PPM
G216	COMBINED GAS, THIOPHENE, PPM
G301	MAIN STACK GAS, N2, PERCENT
G302	MAIN STACK GAS, O2, PERCENT
G303	MAIN STACK GAS, CO, PERCENT
G304	MAIN STACK GAS, CO2, PERCENT
G305	MAIN STACK GAS, C1, PERCENT
G306	MAIN STACK GAS, C2, PERCENT
G307	MAIN STACK GAS, C3, PERCENT
G308	MAIN STACK GAS, H2O, PERCENT
G309	MAIN STACK GAS, H2, PERCENT
G310	MAIN STACK GAS, H2S, PPM
G311	MAIN STACK GAS, SO2, PPM
G312	MAIN STACK GAS, COS, PPM
G313	MAIN STACK GAS, CS2, PPM
G314	MAIN STACK GAS, CH3SH, PPM
G315	MAIN STACK GAS, C2H5SH, PPM
G316	MAIN STACK GAS, THIOPHENE, PPM
P029	BOTTOM GAS PRESSURE, 0-80 IN. H2O
P033	TOP GAS PRESSURE, 0-60 IN. H2O
P079	AIR TO VENTURI PRESSURE, 0-60 IN. H2O
T018	THERMOCOUPLE--TYPE J--BLAST MIXTURE, DEG C.
T021	THERMOCOUPLE--TYPE J--DIRTY TOP GAS, DEG C.
T022	THERMOCOUPLE--TYPE J--DIRTY BOTTOM GAS, DEG C.
T023	THERMOCOUPLE--TYPE J--HOT CLEAN GAS, DEG C.
T037	THERMOCOUPLE--TYPE J--CLEAN TOP GAS, DEG C.
T064	THERMOCOUPLE--TYPE K--DIRTY BOTTOM GAS, DEG C.
T065	THERMOCOUPLE--TYPE J--DIRTY TOP GAS, DEG C.
T066	THERMOCOUPLE--TYPE J--HOT CLEAN GAS, DEG C.
T067	THERMOCOUPLE--TYPE J--MAKEUP WATER, DEG C.
T068	THERMOCOUPLE--TYPE J--AIR SUPPLY TO VENTURI, DEG C.
T069	THERMOCOUPLE--TYPE J--ASH PAN WATER, DEG C.
T070	THERMOCOUPLE--TYPE J--BLAST MIXTURE, DEG C.
T071	THERMOCOUPLE--TYPE K--GASIFIER BED, DEG C.
T072	THERMOCOUPLE--TYPE K--GASIFIER BED, DEG C.
T073	THERMOCOUPLE--TYPE K--GASIFIER BED, DEG C.
T074	THERMOCOUPLE--TYPE K--GASIFIER BED, DEG C.
T075	THERMOCOUPLE--TYPE K--GASIFIER BED, DEG C.
T076	THERMOCOUPLE--TYPE K--GASIFIER BED, DEG C.
T081	THERMOCOUPLE--TYPE J--CLEAN TOP GAS, DEG C.
T121	THERMOCOUPLE--TYPE K--GASIFIER BED, DEG C.
T122	THERMOCOUPLE--TYPE K--GASIFIER BED, DEG C.
G401	STUB STACK GAS, N2, PERCENT
G402	STUB STACK GAS, O2, PERCENT
G403	STUB STACK GAS, CO, PERCENT
G404	STUB STACK GAS, CO2, PERCENT
G405	STUB STACK GAS, C1, PERCENT
G406	STUB STACK GAS, C2, PERCENT
G407	STUB STACK GAS, C3, PERCENT
G408	STUB STACK GAS, H2O, PERCENT
G409	STUB STACK GAS, H2, PERCENT
G410	STUB STACK GAS, H2S, PPM
G411	STUB STACK GAS, SO2, PPM
G412	STUB STACK GAS, COS, PPM
G413	STUB STACK GAS, CS2, PPM
G414	STUB STACK GAS, CH3SH, PPM
G415	STUB STACK GAS, C2H5SH, PPM
G416	STUB STACK GAS, THIOPHENE, PPM

Table 3. Example of output from summary program for UMD process data tapes; "records" indicate number of data points in file for that variable; "mean" indicates arithmetic mean values in the file during the period of record.

Summary of data October 2-December 13, 1979

TAG	RECORDS	MEAN
P010-JACKET MAKEUP WATER, 0-10 GPM	9712	1.91
P077-VENTED STEAM FLOW, 0-800 LB/HR, SQ.	7999	259.13
P21A-STEAM TO VENTURI, 0-970 LB/HR, SQ.	8193	1057.82
P21B-STEAM TO VENTURI, 0-2800 LB/HR, SQ.	173	584.66
GNCX-NITROGEN OXIDES IN STACK GAS, PPM	7700	37.29
GSOX-SULPHUR OXIDES IN STACK GAS, PPM	8188	251.92
P029-BOTTOM GAS PRESSURE, 0-80 IN. H2O	9859	26.26
P033-TOP GAS PRESSURE, 0-60 IN. H2O	8865	21.27
P079-AIR TO VENTURI PRES., 0-60 IN. H2O	8870	32.30
T018-T-TYPE J--BLAST MIXTURE, DEG C.	1585	55.45
T021-T-TYPE J--DIRTY TOP GAS, DEG C.	1589	121.40
T022-T-TYPE J--DIRTY BOTTOM GAS, DEG C.	1589	379.42
T023-T-TYPE J--HOT CLEAN GAS, DEG C.	1589	161.78
T037-T-TYPE J--CLEAN TOP GAS, DEG C.	1589	102.72
T064-T-TYPE K--DIRTY BOTTOM GAS, DEG C.	10581	358.18
T065-T-TYPE J--DIRTY TOP GAS, DEG C.	10581	123.64
T066-T-TYPE J--HOT CLEAN GAS, DEG C.	10581	154.49
T067-T-TYPE J--MAKEUP WATER, DEG C.	10573	26.08
T068-T-TYPE J--AIR TO VENTURI, DEG C	10578	46.64
T069-T-TYPE J--ASH PAN WATER, DEG C.	10573	41.80
T070-T-TYPE J--BLAST MIXTURE, DEG C.	10578	55.91
T071-T-TYPE K--GASIFIER BED, DEG C.	9512	277.40
T072-T-TYPE K--GASIFIER BED, DEG C.	9501	249.22
T073-T-TYPE K--GASIFIER BED, DEG C.	9501	294.49
T074-T-TYPE K--GASIFIER BED, DEG C.	9501	345.84
T075-T-TYPE K--GASIFIER BED, DEG C.	9501	259.09
T076-T-TYPE K--GASIFIER BED, DEG C.	9501	277.23
T081-T-TYPE J--CLEAN TOP GAS, DEG C.	10581	101.92
T121-T-TYPE K--GASIFIER BED, DEG C.	9501	295.04
T122-T-TYPE K--GASIFIER BED, DEG C.	9501	302.11

Table 3. (continued)

Summary of data February 2-18, 1980

TAG	RECORDS	MEAN
P010-JACKET MAKEUP WATER, 0-10 GPM	3791	1.53
P077-VENTED STEAM FLOW, 0-800 LB/HR, SQ.	4035	173.31
P21A-STEAM TO VENTURI, 0-970 LB/HR, SQ.	4250	753.66
P21B-STEAM TO VENTURI, 0-2800 LB/HR, SQ.	4266	745.99
GNCX-NITROGEN OXIDES IN STACK GAS, PPM	3369	142.98
GSCX-SULPHUR OXIDES IN STACK GAS, PPM	3628	724.19
P029-BOTTOM GAS PRESSURE, 0-80 IN. H2O	4269	25.03
P033-TOP GAS PRESSURE, 0-60 IN. H2O	3389	21.20
P079-AIR TO VENTURI PRES., 0-60 IN. H2O	4269	28.55
T018-T-TYPE J--BLAST MIXTURE, DEG C.	712	61.31
T021-T-TYPE J--DIRTY TOP GAS, DEG C.	712	101.46
T022-T-TYPE J--DIRTY BOTTOM GAS, DEG C.	712	293.03
T023-T-TYPE J--HOT CLEAN GAS, DEG C.	712	143.44
T037-T-TYPE J--CLEAN TOP GAS, DEG C.	712	96.72
T064-T-TYPE K--DIRTY BOTTOM GAS, DEG C.	4269	294.87
T065-T-TYPE J--DIRTY TOP GAS, DEG C.	4269	102.58
T066-T-TYPE J--HOT CLEAN GAS, DEG C.	4269	144.11
T067-T-TYPE J--MAKEUP WATER, DEG C.	4269	26.60
T068-T-TYPE J--AIR TO VENTURI, DEG C	4269	52.61
T069-T-TYPE J--ASH PAN WATER, DEG C.	4269	50.12
T070-T-TYPE J--BLAST MIXTURE, DEG C.	4269	61.42
T071-T-TYPE K--GASIFIER BED, DEG C.	4269	249.08
T072-T-TYPE K--GASIFIER BED, DEG C.	4269	260.99
T073-T-TYPE K--GASIFIER BED, DEG C.	4269	310.56
T074-T-TYPE K--GASIFIER BED, DEG C.	4269	358.10
T075-T-TYPE K--GASIFIER BED, DEG C.	4269	256.47
T076-T-TYPE K--GASIFIER BED, DEG C.	4269	308.40
T081-T-TYPE J--CLEAN TOP GAS, DEG C.	4269	96.76
T121-T-TYPE K--GASIFIER BED, DEG C.	4269	304.41
T122-T-TYPE K--GASIFIER BED, DEG C.	4269	314.67

variance, can be included in the summary table. A fourth program (available from authors) has been implemented to provide a summary by process tag, day, and hour. In order to provide statistics in graphical form, a fifth program (available from authors) has been written that will plot the mean, the minimum, and the maximum on one graph for each tag and day in the process data files. When a particular day or process tag is of interest, a selection statement can be included at the data step creation point in the program (notes included in listing).

ENVIRONMENTAL DATA

The environmental data contain meteorological and air quality measurements collected on data logging devices with DATEL cassettes in trailers located approximately 0.8 km upwind and downwind (based on prevailing wind direction) from the UMD gasifier facility. Cassette tapes from the data logging devices are periodically copied using a PDP-11/34 minicomputer at the University of Minnesota-St. Paul campus. Magnetic tapes from the PDP-11 are sent to ORNL and translated to IBM computers using the programs described below. To read the environmental data, two steps are required: (1) the transfer of the data on the PDP-11 tape to ORNL's PDP-10 and (2) the conversion of the raw environmental data from the PDP-10 to an on-line SAS data set. The procedures for these two steps are outlined below. (Note: Underscored materials are computer generated; lower case text is to be substituted by user; " <CR> " represents a carriage return.)

STEP 1: To transfer the environmental data from the PDP-11 tape to the PDP-10

- (a) Send the PDP-11 tape (with an external label; e.g., UMD101) to the PDP-10 tape librarian at ORNL;
- (b) Check to ensure that the tape is at the PDP-10 before continuing by either
 - 1. calling the PDP-10 operator or
 - 2. sending the operator a message via the computer terminal; e.g.,
SEND OPR IS TAPE UMD101 IN MACHINE ROOM? <CR>
- (c) Type: MOUNT MTA:PDP11/REELID:nnnnnn/WLOCK<CR> where
nnnnnn = external label assigned the PDP-11 tape in
(a) of Step 1 above,
WLOCK = requests for the PDP-10 operator to put a
lock on the tape so that nothing can be
written on it;
- (d) Type: R RPDP11<CR>
when the PDP-11 tape is mounted. This is a
conversion program which creates a file name
PDP11.TAP in your PDP-10 file area. Change the name
of this file by keying in

RENAME new.ext=PDP11.TAP<CR>

before rerunning RPDP11, where "new.ext" is a unique user-supplied file name. Rerun the conversion program, RPDP11, for each file on the tape. Be sure

to enter all file names on a log sheet for future reference. The only files that are of interest are the files with extension DAT as supplied on the PDP-11 tape. Each data file with extension 'DAT' on the PDP-11 tape is preceded by a character block representing the tape header labels and terminated by a character block of trailer labels. The RPDP11 program treats each character block of labels as a separate file. All label files contain the four digit DATEL cassette tape number assigned at the UMD site. This number should be used as part of all data set names created from processing the PDP-11 tape on the PDP-10. Thus, it is necessary to read the trailing header label to obtain the identification number for use in the next data file to be read. If your PDP-10 area is not large enough to handle all the data files from the PDP-11 tape, move some of the files to a dec tape using the FILE command (ask HELP files on the PDP10 for HELP FILE) or transfer each file immediately to an IBM 360/370 system disk storage unit using the procedures described in STEP 2 below.

- (e) Rewind the PDP-11 tape or advance several files if necessary by typing (notes for each command are given in lower cases):

```
.      PIP<CR>
*MTA:(MW)=<CR>rewinds tape
*MTA:(M#nA)=<CR>advances n files
*↑C    (Type 'control-c' to exit PIP;)
```

- (f) Dismount the PDP-11 tape after finishing the processing by typing:

```
.DISMOUNT MTA/R<CR>
```

STEP 2: Two files, RD.MIC and TR2.MIC below, can be executed on the PDP-10 to speed the processing of data from the PDP-11 tapes to the IBM 360/370 system disks. RD.MIC contains the following statements:

```
.R  RPDP11<CR>
.RENAME  'A.DAT=PDP11.TAP<CR>
.R  PIP<CR>
*MTA:(M#1A)=<CR>
*↑C
.R  RPDP11<CR>
.TY PDP11.TAP<CR>
.DELETE PDP11.TAP<CR>
```

RD.MIC when executed, reads in a data file, renames it, skips to the next header file, reads the header file, prints it out, and deletes it. TR2.MIC contains the following statements (Note: The

sequence ↑ [in above files represents a single escape key execution).

```
.R      RPDP11<CR>
.RENAME  'A.DAT=PDP11.TAP<CR>
.FTECO   TRTOTS.JCL<CR>
*SSYSUT2↑[S,↑[-5C↑[KI'A,<CR>↑[-LT↑[EX↑[↑[
.R      SUBMIT<CR>
*@TRTOTS.JCL<CR>
*='A.DAT<CR>
*ENDINPUT<CR>
.R      PIP<CR>
*MTA:(M#1A)=<CR>
*↑C
.R      RPDP11<CR>
.TY     2PDP11.TAP<CR>
.DELETE  PDP11.TAP<CR>
```

TR2.MIC when executed, does the same as RD.MIC and also submits a job which transfers the data to an IBM 360/370 system disk file.

The two files above are executed on the PDP-10 with a DO command of the form:

```
.DO  RD  7106<CR>
```

where 7106 is the DATEL cassette number, read from the print-out of the trailer header label in the preceding execution of RD. Thus RD lists the header of the next data file on the PDP11 tape.

TR2.MIC makes use of file TRTOTS.JCL which, when submitted to the IBM 360/370 via the PDP-10, creates an IBM file from a PDP-10 file. This card image JCL file makes use of program IEBGENER as follows:

```
// EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=A
//SYSIN DD DUMMY
//SYSUT2 DD DSN=T.CWG18883.UMD101.DAT7206,
// DISP=(NEW,CATLG),UNIT=SPDA,
// SPACE=(TRK,(4,2),RLSE),DCB=(RECFM=FB,LRECL=80,
// BLKSIZE=4240)
//SYSUT1 DD DATA
```

The Job Control Statements in file TRTOTS.JCL can be submitted as batch remote job entry from the PDP-10 to the IBM systems as follows:

```
.R SUBMIT CR
*TRTOTS.JCL CR
*=7206.DAT CR
*ENDINPUT CR
```

The file 7206.DAT is created by executing the RD.MIC file described above.

A summary (Table 4) of these data for any period and list of parameters can be produced to show statistics by locations. Maximum number of data entries for a day as well as mean daily values have been produced to illustrate the output from Program 3 (available from authors). Plotting summaries similar to those previously described for the process data can be made of these data. Optionally, the data can be summarized by hour or combinations of time periods to allow comparison with ambient air quality standards.

Table 4. Example summary of a number of air quality and meteorological measurements surrounding the UMD gasifier facility; maximum data points for a day are represented by MAX_N, regardless of variable represented; "Down" and "Up" refer to nominal downwind and upwind stations, respectively (see text)

UMD-GASIFIER FACILITY METEOROLOGICAL DATA
 POLLUTANT DATA VARIABLE NAMES IN DATA SET AS FOLLOWS:
 OZ=OZONE(PPB), NC=NITRIC OXIDE(PPB), NOX=OXIDES OF NITROGEN(PPB)
 CO=CARBON MONOXIDE(PPM), HC=TOTAL HYDROCARBONS(PPM)
 SO2=SULFUR DIOXIDE(PPB)
 . = INDICATOR OF NO DATA AVAILABLE

DATE	SITE	MAX_N
27 JAN 80	UP	85
28 JAN 80	DOWN	260
28 JAN 80	UP	286
29 JAN 80	DOWN	288
29 JAN 80	UP	288
30 JAN 80	DOWN	288
30 JAN 80	UP	287
31 JAN 80	DOWN	288
31 JAN 80	UP	286
01 FEB 80	DOWN	288
01 FEB 80	UP	285
02 FEB 80	DOWN	288
02 FEB 80	UP	288
03 FEB 80	DOWN	268
03 FEB 80	UP	140
04 FEB 80	DOWN	288
05 FEB 80	DOWN	288
06 FEB 80	DOWN	288
07 FEB 80	DOWN	288
08 FEB 80	DOWN	156
09 FEB 80	DOWN	80
10 FEB 80	DOWN	288
11 FEB 80	DOWN	288
11 FEB 80	UP	63
12 FEB 80	DOWN	288
12 FEB 80	UP	238
13 FEB 80	DOWN	273
13 FEB 80	UP	288
14 FEB 80	DOWN	288
14 FEB 80	UP	288
15 FEB 80	DOWN	288
15 FEB 80	UP	288
16 FEB 80	DOWN	288
16 FEB 80	UP	288
17 FEB 80	DOWN	288
17 FEB 80	UP	288
18 FEB 80	DOWN	288
18 FEB 80	UP	288
19 FEB 80	DOWN	288
19 FEB 80	UP	288
20 FEB 80	DOWN	288
20 FEB 80	UP	288
21 FEB 80	DOWN	288
21 FEB 80	UP	288
22 FEB 80	DOWN	288
22 FEB 80	UP	288
23 FEB 80	DOWN	288
23 FEB 80	UP	240
24 FEB 80	DOWN	238
24 FEB 80	UP	287
25 FEB 80	DOWN	288

Table 4 (cont.)

UMD-GASIFIER FACILITY METEOROLOGICAL DATA
POLLUTANT DATA VARIABLE NAMES IN DATA SET AS FOLLOWS:
OZ=OZONE(PPB), NC=NITRIC OXIDE(PPB), NOX=OXIDES OF NITROGEN(PPB)
CO=CARBON MONOXIDE(PPM), HC=TOTAL HYDROCARBONS(PPM)
SO2=SULFUR DIOXIDE(PPB)
. = INDICATOR OF NO DATA AVAILABLE

DATE	SITE	MAX_N
25FEB80	UP	288
26FEB80	DOWN	288
26FEB80	UP	288
27FEB80	DOWN	288
27FEB80	UP	288
28FEB80	DOWN	288
28FEB80	UP	288
29FEB80	DOWN	288
29FEB80	UP	288
01MAR80	DOWN	288
01MAR80	UP	288
02MAR80	DOWN	288
02MAR80	UP	288
03MAR80	DOWN	288
03MAR80	UP	288
04MAR80	DOWN	288
04MAR80	UP	288
05MAR80	DOWN	288
05MAR80	UP	288
06MAR80	DOWN	288
06MAR80	UP	288
07MAR80	DOWN	253
07MAR80	UP	288
08MAR80	UP	288
09MAR80	UP	165

Table 4 (cont.)

UMD-GASIFIER FACILITY METEOROLOGICAL DATA
WIND VARIABLE NAMES AT DOWNWIND SITE ARE AS FOLLOWS:
WS=WIND SPEED(KM/HR), WAD=Ave WIND DIRECTION(DEG)
WVD=VECTOR DEVIATION OF WIND ANGLE
WVC=VERTICAL COMPONENT OF WIND SPEED
. = NO DATA AVAILABLE

DATE	MAX_N
28 JAN80	260
29 JAN80	288
30 JAN80	288
31 JAN80	288
01 FEB80	288
02 FEB80	288
03 FEB80	268
04 FEB80	288
05 FEB80	288
06 FEB80	288
07 FEB80	288
08 FEB80	156
09 FEB80	80
10 FEB80	288
11 FEB80	288
12 FEB80	288
13 FEB80	273
14 FEB80	288
15 FEB80	288
16 FEB80	288
17 FEB80	288
18 FEB80	288
19 FEB80	288
20 FEB80	288
21 FEB80	288
22 FEB80	288
23 FEB80	288
24 FEB80	238
25 FEB80	288
26 FEB80	288
27 FEB80	288
28 FEB80	288
29 FEB80	288
01 MAR80	288
02 MAR80	288
03 MAR80	288
04 MAR80	288
05 MAR80	288
06 MAR80	288
07 MAR80	253

Table 4 (cont.)

UMD-GASIFIER FACILITY METEOROLOGICAL DATA
 WEATHER DATA VARIABLE NAMES AND UNITS IN DATA SET AS FOLLOWS:
 PCP=PRECIPITATION(MM/HR), RH=RELATIVE HUMIDITY,
 DEWPT=DEW POINT(DEG C), PRS=PRESSURE(MM HG),
 TEMP=TEMPERATURE(DEG C), SOLRAD=SOLAR RADIATION(LY/HR)
 . = INDICATION OF NO DATA AVAILABLE

DATE	MAX_N
28 JAN 80	260
29 JAN 80	288
30 JAN 80	288
31 JAN 80	288
01 FEB 80	288
02 FEB 80	288
03 FEB 80	268
04 FEB 80	288
05 FEB 80	288
06 FEB 80	288
07 FEB 80	288
08 FEB 80	156
09 FEB 80	80
10 FEB 80	288
11 FEB 80	288
12 FEB 80	288
13 FEB 80	273
14 FEB 80	288
15 FEB 80	288
16 FEB 80	288
17 FEB 80	288
18 FEB 80	288
19 FEB 80	288
20 FEB 80	288
21 FEB 80	288
22 FEB 80	288
23 FEB 80	288
24 FEB 80	238
25 FEB 80	288
26 FEB 80	288
27 FEB 80	288
28 FEB 80	288
29 FEB 80	288
01 MAR 80	288
02 MAR 80	288
03 MAR 80	288
04 MAR 80	288
05 MAR 80	288
06 MAR 80	288
07 MAR 80	253

20

Blank

Appendix A. Conversion, Analysis, and Summary Computer Programs for Handling the UMD Gasifier Process Data

```

/** THIS IS THE FIRST JOB USED IN PROCESSING THE
/** PROCESS DATA.
/**
/** *****
/** WHEN THE PROCESS TAPES ARRIVE THE FOLLOWING THINGS
/** SHOULD BE DONE:
/** 1) LOG IN THE TAPES IN THE UMD LOG BOOK
/**     IN ROOM 2249 K-1007. THE DATES ON THE TAPE
/**     ARE MOST IMPORTANT, SO BE SURE TO RECORD THEM.
/** 2) A GUMMED LABEL SHOULD THEN BE ATTACHED
/**     TO THE TAPE WHICH WILL IDENTIFY IT TO THE X-10
/**     OPERATOR AS THE VOLUME SERIAL NUMBER.
/**     VOLUME SERIAL NUMBERS USED SHOULD ALSO BE RECORDED
/**     IN THE TAPE LOG. USUALLY VOLSER NUMBERS AS
/**     ORTAPX ARE USED WHERE X IS A NUMBER 1-9.
/** 3) THE TAPE(S) SHOULD THEN BE SENT TO
/**     THE X-10 TAPE LIBRARIAN WITH A NOTE INSTRUCTING HER
/**     TO HOLD THE TAPE UNTIL FURTHER NOTICE.
/** *****
/**
/** ONCE THE TAPES ARE AT THE X-10 SITE. (USUALLY WITHIN
/** AN HOUR AFTER BEING SENT -- IF BY COURIER.) THEN
/** JOB UMD.PDS(COPY1) CAN BE SUBMITTED.
/**
/** SETTING UP THE JOB.
/**
/** THE PURPOSE OF THIS JOB IS TO COPY THE PROCESS TAPE(S)
/** AND PUT THE DATA ON A STANDARD LABELED IBM TAPE. ALL THE
/** FILES ON THE PROCESS TAPE ARE CONCATENATED INTO ONE FILE ON
/** THE STANDARD LABELED TAPE. EACH FILE ON THE PROCESS
/** TAPE IS ONE DAY'S WORTH OF DATA. THUS, A TAPE COVERING
/** TEN DAYS OF DATA WILL HAVE TEN FILES.
/**
/**
/** MAKE THE FOLLOWING CHANGES:
/** 1) CHANGE THE /*NOTES S/ CARD TO THE CORRECT TAPE NUMBER.
/** 2) IN STEP1 BELOW, MAKE SURE THAT THE SAME TAPE IS USED FOR
/**     THE VOLUME SERIAL NUMBER AS THE ONE IN THE NOTES CARD.
/** 3) FOR A TAPE COVERING MORE THAN ONE DAY'S WORTH OF DATA
/**     EXECUTE THE INSTREAM PROCEDURE THAT MANY
/**     TIMES. EXAMPLE: A TAPE COVERING DAYS 2/3 TO 2/6
/**     SHOULD LOOK LIKE THIS.
/**
/** AFTER STEP1 WHICH GETS THE FIRST FILE (DAY 2/3)
/** YOU WOULD NEED:
/**
/** // EXEC COPY,L=2      (FOR DAY 2/4)
/** // EXEC COPY,L=3      (FOR DAY 2/5)
/** // EXEC COPY,L=4      (FOR DAY 2/6)
/**

```

Appendix A (cont.)

```

/** ONCE THIS PROGRAM HAS SUCCESSFULLY EXECUTED, YOU MAY CALL
/** THE TAPE LIBRARIAN AND HAVE THE PROCESS TAPES SENT BACK TO
/** YOU.
/**
/** THE NEXT JOB TO RUN IS
/**     UMD.PDS(COPY2)
/**
/**
/**CLASS R=64,IO=5,CPU91=209,C=0,L=5,SPECIAL=TAPE
/**NOTES S/ *****
/**NOTES S/
/**NOTES S/ TAPE ORTP7B IS IN THE HOLD BIN
/**NOTES S/ EJN HAS GIVEN PERMISSION TO USE TAPE X11823
/**NOTES S/
/**NOTES S/ *****
/**JOB LIB DD DSN=GIIP.EJN17308.LOAD.MODULE.LIBRARY,DISP=SHR
/**
/** *****
/** THE FOLLOWING DEFINES THE PROCEDURE TO BE USED TO
/**     COPY ALL FILES AFTER THE FIRST ONE.
/** *****
/**COPY PROC L=1
/**STEP EXEC PGM=COPYOLT
/**CTAB DD DSN=GIIP.EJN17308.TRANSLTE.TABLE,DISP=SHR
/**TAPIN DD UNIT=TAPE9,DISP=(OLD,PASS),
/** VOL=REF=*.STEP1.TAPIN,LABEL=(8L,NL)
/**TAPOU DD DSN=A.SXC17308.ENVIR.UMD101,UNIT=TAPE9,DISP=(MOD,PASS),
/** VOL=REF=*.STEP1.TAPOU,LABEL=(1,SL)
/**SOPT DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=1064)
/**SYSDUMP DD SYSOUT=T
/**  PEND
/** *****
/** THE FOLLOWING STEP DEFINES THE FIRST FILE ONLY. THE
/** REASON THIS STEP IS NEEDED IS TO DEFINE THE
/** DISPOSITION OF THE TAPE AS NEW THE FIRST TIME USED.
/** *****
/**STEP1 EXEC PGM=COPYOLT
/**CTAB DD DSN=GIIP.EJN17308.TRANSLTE.TABLE,DISP=SHR
/**TAPIN DD UNIT=TAPE9,DISP=(OLD,PASS),
/** VOL=SER=ORTP7B,LABEL=(1,NL)
/**TAPOU DD DSN=A.SXC17308.ENVIR.UMD101,UNIT=TAPE9,DISP=(NEW,PASS),
/** VOL=SER=X11823,LABEL=(1,SL)
/**SOPT DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=1064)
/**SYSDUMP DD SYSOUT=T
/**

```

Appendix A (cont.)

```

/** *****
/**  HERE YOU NEED TO CALL THE PROCEDURE DEFINED
/**  ABOVE FOR EACH FILE NEEDED AFTER THE FIRST FILE.
/** *****
/**  EXEC COPY,L=2  12/8/79
/**  EXEC COPY,L=3  12/9/79
/**  EXEC COPY,L=4  12/10/79
/**  EXEC COPY,L=5  12/11/79
/**  EXEC COPY,L=6  12/12/79
/**  EXEC COPY,L=7  12/13/79
/**  EXEC COPY,L=8  2/19/80
/**  EXEC COPY,L=9  2/20/80
/**  EXEC COPY,L=10 2/21/80
/**  EXEC COPY,L=11 2/22/80
/**  EXEC COPY,L=12 2/23/80
/**  EXEC COPY,L=13 2/24/80
/**  EXEC COPY,L=14 2/25/80
/**  EXEC COPY,L=15
/**  EXEC COPY,L=16
/** CONTINUE IN LIKE MANNER FOR EACH FILE NEEDED.
/*
/** *****
/**NOTES  S/ EJM HAS GIVEN PERMISSION TO USE TAPE X11823
/** *****
/**
/**
/** THIS IS THE SECOND JOB USED TO PROCESS THE PROCESS DATA.
/** THE FIRST WAS UMD.PDS(COPY1)
/**
/** BEFORE EXECUTING THIS JOB OBSERVE THE FOLLOWING POINTS.
/**
/** 1) MAKE SURE THAT JOB UMD.PDS(COPY1) HAS SUCCESSFULLY RUN.
/** 2) BE SURE THAT THE TAPE THIS JOB READS FROM IS THE SAME
/**    ONE USED IN THE DD STATEMENT IN THE OUTPUT PART OF
/**    UMD.PDS(COPY1).
/** 3) MOST IMPORTANT .....
/**    MAKE SURE THAT THE SAS DATA SET THIS JOB CREATES HAS NOT
/**    BEEN PREVIOUSLY USED IN THE OUTPUT FILE. TO CHECK THIS
/**    DO THE FOLLOWING:
/**
/**      EXECUTE IN TSO:
/**        ALLOC FI(MYDD) DA('GIIP.UMD17308.EJM.DATAFILE') SHR
/**        EX SAS(SAS)
/**        PROC CONTENTS DATA=MYDD._ALL_ SHORT; RUN;
/**
/**      THIS WILL SHOW YOU WHAT SAS DATA SETS ARE ON THE FILE, THEN
/**      ASSIGN THE CORRECT DATA SET NAME USED IN THE FIRST
/**      SAS STATEMENT IN THIS JOB.
/** *****

```

Appendix A (cont.)

```
/*CLASS R=270,IO=6,SPECIAL=TAPE
//STEP1 EXEC SAS76
//FT12F001 DD SYSOUT=T,UNIT=TSODA
//IN DD DSN=A.SXC17308.ENVIR.UMD101,DISP=(OLD,PASS),
// UNIT=TAPE9,VOL=SER=X11823
//OUT DD DSN=GIIP.UMD17308.RAS.PROCDATA,DISP=OLD
//SYSIN DD *

**PRODUCE NEW DATA SET KEEPING ONLY VARIABLES VALUE, TAG,
** AND DATE;
  DATA OUT.UMDDATA7 (KEEP=VALUE DATE TAG);

**USE FORMAT FOR DATE AND TIME COMBINED;
  FORMAT DATE DATETIME16.;
  LABEL DATE=DATE TIME OF WHEN VALUE WAS RECORDED
  TAG=COMPUTER MONITORED PROCESS VARIABLE
  VALUE=NUMERICAL READING OF TAG;

**USE TAPE PRODUCED FROM UMD.PDS(COPY1) AS DATA;
  INFILE IN END=EOF;

**INITIALIZE COUNTER AND BRING IN INPUT CARD;
  N=1;
  INPUT @;

  MORE: ** FLOW COMES HERE AS LONG AS THERE IS MORE DATA;

**LOOK FOR '*' BEFORE READING AN OBSERVATION. IT SIGNALS THAT
** NO MORE DATA IS FOUND ON THAT FILE OF TAPE;
  INPUT @N AST $1. @;
  IF AST '*' THEN STOP;

**INPUT VARIABLES FOR ONE OBSERVATION WHICH TAKE UP A
** LENGTH OF 30 BYTES ON INPUT TAPE;
  INPUT @N DATE MMDDYY6. H 2. M 2. S 2.
  TAG $CHAR4. VALUE 14. @;

**PUT DATE, HOUR, MINUTE, AND SECOND IN DATETIME VARIABLE;
**INITIALIZE RECORD COUNTER;
  DATE = DHMS(DATE, H, M, S);
  N+30;

**OUTPUT AN OBSERVATION IF NONE OF THE VALUES ARE MISSING;
  IF VALUE=. THEN RETURN;
  OUTPUT;
```

Appendix A (cont.)

```
    **CHECK FOR END OF FILE ON TAPE;  
        IF N > 3000 THEN RETURN;  
        GO TO MORE;  
        LENGTH DATE 6 VALUE 4;  
  
    **LOOK AT ALL SAS DATA SETS NOW ON FILE, MAKING SURE THE NEW ONE  
    ** JUST CREATED IS THERE;  
        PROC CONTENTS DATA=OUT._ALL_ SHORT;  
/*  
//
```


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Appendix B. Conversion, Analysis, and Summary Computer Programs for Handling the Environmental Data UMD Gasifier

```

//**CLASS ID=1.CPU91=30S                                00000020
//**ROUTE PRINT REMOTEIO                                  00000030
//** TSO=UMDMET.CNTL(TPANSF)                              00000040
//*****                                                    00000050
//** TO SCHEDULE THIS JOB USE TSO WITH ID CWG...          00000060
//** ...FOR DOWNWIND DATA:                                00000070
//** ENTER SUBMIT (UMDMET(TPANSF) UMDMET(INOUT))          00000071
//** ...FOR UPWIND DATA:                                  00000080
//** ENTER SUBMIT (UMDMET(TPANSF) UMDMET(INOUT2))          00000081
//*****                                                    00000090
//** EXEC PLIXCLG                                          00000100
//**PLI.SYSIN DD *                                         00000110
//** TRANSF: PROCEDURE OPTIONS(MAIN);                     00000120
//***** TRANSF PROGRAM *****/00000130
//** PROGRAMMER: CWGUDMUNDSON 3-27-80                    */00000140
//** INPUT TO THIS PROGRAM, WITH DDNAME IN, IS A CONCATENATION OF */00000150
//** INDIVIDUAL MET FILES STORED ON THE IBM 360/370 SYSTEMS DISK FILES */00000160
//** WHICH WERE READ FROM THE PDP11 TAPE, PROCESSED AND TRANSMITTED VIA */00000170
//** THE DEC-10 SYSTEM. FILES FOR UPWIND AND DOWNWIND DATA ARE RUN AS */00000180
//** SEPARATE GROUPS, SINCE EACH HAS A DIFFERENT FORMAT. (***) */00000190
//** UPWIND DATA REQUIRE ADDITIONAL PROCESSING WITH PROGRAM SHUFFL TO */00000200
//** CREATE A FILE WITH A COMPATIBLE FORMAT. */00000210
//** THE PURPOSE OF THIS PROGRAM IS TO PAD EACH INDIVIDUAL MET FILE */00000220
//** TO A FULL BLOCK OF 5120 BYTES. THIS PUTS THE START OF EACH FILE AT */00000230
//** THE BEGINNING OF A NEW BLOCK, THUS GIVING PROPER ALIGNMENT TO THE */00000240
//** 512 BYTE LOGICAL RECORDS CONTAINED IN THE BLOCK. A BLKSIZE OF 5120 */00000250
//** IS AN APPROPRIATE COMMON DENOMINATOR OF 80 AND 512. THE 80 BYTE */00000260
//** CARD IMAGE RECORDS OBTAINED FROM THE DEC 10 MAY BE LATER READ WITH */00000270
//** THEIR TRUE 512 BYTE LOGICAL RECORD SIZE. */00000280
//** OUTPUT, WITH DDNAME OUT, IS A COMPLETE FILE OF DOWNWIND OR */00000290
//** UPWIND RECORDS. */00000300
//**(***) */00000310
//** DOWNWIND FORMAT: */00000320
//** .RECORD LENGTH PREFIX-----4 BYTES */00000330
//** .IDENTIFICATION-----9 BYTES */00000340
//** .TIME-----20 BYTES */00000350
//** .WEATHER-----28 BYTES */00000360
//** .WIND-----43 BYTES =235 BYTES */00000370
//** .RECORD LENGTH PREFIX-----4 BYTES */00000380
//** .POLLUTANTS-----127 BYTES */00000390
//** EACH 512 BYTE LOGICAL RECORD CONTAINS 2 COMPLETE DATA OBSERVATIONS */00000400
//** PLUS 42 PADDING BYTES (2*235 + 42 = 512) */00000410
//** UPWIND FORMAT: */00000420
//** .RECORD LENGTH PREFIX-----4 BYTES */00000430
//** .IDENTIFICATION-----9 BYTES */00000440
//** .TIME-----20 BYTES =164 BYTES */00000450
//** .RECORD LENGTH PREFIX-----4 BYTES */00000460
//** .POLLUTANTS-----127 BYTES */00000470
//** EACH 512 BYTE LOGICAL RECORD CONTAINS 3 COMPLETE DATA OBSERVATIONS */00000480
//** PLUS 130 PADDING BYTES (3*164 + 130 = 512) */00000490
//***** */00000500
OCL 00000510
CT FIXED BIN(15). 00000520
IN FILE INPUT. 00000530
OUT FILE OUTPUT. 00000540
REC CHAR(80). 00000550
REC65 CHAR(16) DEF REC POS(65). 00000560
REC49 CHAR(32) DEF REC POS(49). 00000570
REC33 CHAR(48) DEF REC POS(33). 00000580
REC17 CHAR(64) DEF REC POS(17). 00000590
FILL16 CHAR(16) DEF FILL. 00000600
FILL32 CHAR(32) DEF FILL. 00000610
FILL48 CHAR(48) DEF FILL. 00000620
FILL64 CHAR(64) DEF FILL. 00000630
FILL CHAR(80) INIT(180)(' '); 00000640
ON ENDFILE(IN) GOTO FIN; 00000650
CT=0; 00000660
DO WHILE('1'8); 00000670
READ FILE(IN) INTO (REC); 00000680
IF REC65=' ' THEN DO; 00000690
IF REC17=' ' THEN DO; 00000700
REC17=FILL64; 00000710
END; 00000720
ELSE IF REC33=' ' THEN DO; 00000730
REC33=FILL48; 00000740
END; 00000750
ELSE IF REC49=' ' THEN DO; 00000760
REC49=FILL32; 00000770
END; 00000780
ELSE DO; 00000790
REC65=FILL16; 00000800
END; 00000810
WRITE FILE(OUT) FROM (REC); 00000820
CT=CT+1; 00000830
J=MOD(CT,64); 00000840
IF J>0 THEN DO; 00000850
DO I=J+1 TO 64; 00000860
WRITE FILE(OUT) FROM (FILL); 00000870
CT=CT+1; 00000880
END; 00000890
END; 00000900
END; 00000910
ELSE DO; 00000920
WRITE FILE(OUT) FROM (REC); 00000930
CT=CT+1; 00000940
END; 00000950
END; 00000960
FIN: 00000970
END TRANSF; 00000980

```

Appendix B (cont.)

```

//**CLASS ID=1,CPU91=10S
//** TSO=CSG.UMDMET.CNTL(SHUFFL)
//** *****
//** TO SCHEDULE THIS JOB USE TSO WITH ID CSG..
//** ENTER SUBMIT(UMDMET(SHUFFL) UDMET(INDUT3))
//** *****
// EXEC PLIXCLG
SHUFFL: PROC OPTIONS(MAIN):
//***** SHUFFL PROGRAM *****
/* PROGRAMMER: CWGUDMUNDSON 3-27-80
/* THIS PROGRAM PROCESSES UPWIND RECORDS WHICH ARE OUTPUT
/*FROM THE PROGRAM TRANSP AND PRODUCES A FILE WITH RECORDS
/*COMPATIBLE TO DOWNWIND RECORDS.
/* IT IS IMPORTANT THAT THE INPUT DATA SET WITH INTERNAL
/*LABEL CONTAINING LRFCL=80 BE OVERRIDDEN WITH JCL AS LRECL=1024.
/*THE BLKSIZE=5120 REMAINS THE SAME. THE 1024 BYTE INPUT RECORD WITH
/*2-512 BYTE UPWIND FORMAT RECORDS CONTAINS SIX OBSERVATION DATA
/*RECORDS. THESE SIX RECORDS ARE REGROUPED AND PADDED TO PRODUCE
/*3-512 BYTE DOWNWIND FORMAT OUTPUT RECORDS.
//*****
REC CHAR(1024).
R01 CHAR(164)DEF REC,
R02 CHAR(164)DEF REC POS(165),
R03 CHAR(164)DEF REC POS(329),
R04 CHAR(164)DEF REC POS(513),
R05 CHAR(164)DEF REC POS(677),
R06 CHAR(164)DEF REC POS(841),
RECOUT CHAR(512),
RT1 CHAR(235)DEF RECOUT,
RT2 CHAR(235)DEF RECOUT POS(236),
RTFILL CHAR(42)DEF RECOUT POS(471),
1 INREC BASED(P),
2 1 IN CHAR(4),
2 R129 CHAR(29),
2 R1131 CHAR(131),
1 OUTREC BASED(Q),
2 LCUT CHAR(4),
2 R0100 CHAR(100),
2 R0131 CHAR(131),
1 PTR(6) SCINTER,
PTR(2) POINTER,
IN FILE = INPUT RECORD,
OUT FILE = OUTPUT RECORD,
Z FIXED BIN(31),
ON ENDFILE(IN)GOTO FIN:
RTFILL=(42)FILL:
PTR(1)=ADDR(R01):
PTR(2)=ADDR(R02):
PTR(3)=ADDR(R03):
PTR(4)=ADDR(R04):
PTR(5)=ADDR(R05):
PTR(6)=ADDR(R06):
PTR(1)=ADDR(RT1):
PTR(2)=ADDR(RT2):
DO WHILE('1'F):
READ FILE(IN)INTO(REC):
DO I=1 TO 6:
J=MOD(I-1,2)+1:
P=PTR(I):
Q=PTR(J):
R0100=R129:
R0131=R1131:
IF LIN='0013' THEN LCUT='0104':
ELSE LCUT=LIN:
IF J=2 THEN WRITE FILE(OUT)FROM(RECOUT):
END:
END:
FIN: END SHUFFL:

```

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