PNL-6279 Vol. 4
UC-32

5D

Hanford Meteorological Station Computer Codes

Volume 4 - The SUM Computer Code

G. L. Andrews
J. W. Buck

September 1987

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute

Battelle

PNL-6279 Vol. 4

DISCLAIMER

PACIFIC NORTHWEST LABORATORY
operated by
BATTELLE MEMORIAL INSTITUTE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC06-76RLO 1830

Printed in the United States of America
Available from
National Technical Information Service
United States Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161

NTIS Price Codes
Microfiche A01

Printed Copy

Pages	Price Codes
001-025	A02
026-050	A03
051-075	A04
076-100	A05
101-125	A06
126-150	A07
151-175	A08
176-200	A09
201-225	A010
226-250	A011
251-275	A012
276-300	A013

PNL-6279 Vol.4
UC-32

HANFORD METEOROLOGICAL STATION COMPUTER CODES

Volume 4 - The SUM Computer Code

G. L. Andrews
J. W. Buck

September 1987

Prepared for
the U.S. Department of Energy
under Contract DE-AC06-76RLO 183D

Pacific Northwest Laboratory
Richland, Washington 99352

PREFACE

This volume is the fourth in a series of volumes that describe computer programs routinely used at the Hanford Meteorological Station (HMS) (e.g., data entry programs). Each volume, which documents one computer code, consists of a program overview, user's guide, description of input, a detailed program description and flowchart, and a listing of the source code.

The first seven volumes present the data entry programs used at the HMS for archiving and checking various types of data. All of these programs use a data entry form to facilitate data input, and each code calls the same series of subroutines that control and display the data entry form at the user's terminal. The subroutines were generated from the program FORMEDIT, which was developed by John Wiberg of the Computer Science staff in the Engineering Physics Department at Pacific Northwest Laboratory. An informal user's guide to the FORMEDIT program that describes how to create, modify, and eliminate data entry forms is available from the HMS system manager.

SUMMARY

At the end of each swing shift, the Hanford Meteorological Station (HMS), operated by Pacific Northwest Laboratory, archives a set of daily weather observations. These weather observations are a summary of the maximum and minimum temperature, total precipitation, maximum and minimum relative humidity, total snowfall, total snow depth at 1200 Greenwich Mean Time (GMT), and maximum wind speed plus the direction from which the wind occurred and the time it occurred. This summary also indicates the occurrence of rain, snow, and other weather phenomena. The SUM computer code is used to archive the summary and apply quality assurance checks to the data. This code accesses an input file that contains the date of the previous archive and an output file that contains a daily weather summary for the current month. As part of the program, a data entry form consisting of 21 fields must be filled in by the user. The information on the form is appended to the monthly file, which provides an archive for the daily weather summary. This volume describes the implementation and operation of the SUM computer code at the HMS.

ACKNOWLEDGMENTS

The authors would like to thank the staff at the Hanford Meteorological Station for their assistance during the preparation of this document. Special thanks to the HMS Project Manager Dana Hoitink for his continued support and Van Ramsdell for his helpful suggestions and ideas.

CONTENTS

PREFACE iii

SUMMARY v

ACKNOWLEDGMENTS vii

INTRODUCTION 1

THE SUM COMPUTER CODE 3

PROGRAM OVERVIEW 3

USER'S GUIDE FOR THE SUM COMPUTER CODE 3

DESCRIPTION OF INPUT 6

TROUBLE-SHOOTING THE SUM COMPUTER CODE 13

TERMINAL PROBLEMS/FAILURES. 13

SYSTEM PROBLEMS/FAILURES 13

PROGRAM PROBLEMS/FAILURES 14

APPENDIX A - PROGRAM DESCRIPTION AND FLOWCHART A.1

APPENDIX B - SUM SOURCE CODE LISTING B.1

INTRODUCTION

The Hanford Meteorological Station (HMS) was established in 1944 on the Hanford Site to collect and archive meteorological data and to provide weather forecasts and related services for Hanford project activities. The HMS is located in the northwest quadrant of the Hanford Site and is operated by the Pacific Northwest Laboratory (PNL).

At the end of each swing shift, the HMS staff archive specific daily weather observations and phenomena. This daily weather summary includes observations of maximum and minimum temperature, maximum and minimum relative humidity, total snowfall, total snow depth at 1200 Greenwich Mean Time (GMT), maximum wind speed plus the direction from which the wind occurred and the time it occurred, total precipitation, and the occurrence of rain, snow, and other weather phenomena. Forecasters use the SUM computer code to archive and apply quality assurance checks to the daily weather observations. The archive is maintained in disk files on the HMS computer system (DEC VAX 11/750).

The following sections in the volume describe the implementation and operation of the SUM computer code. Appendix A contains a description and flowchart of the SUM computer code and Appendix B contains a source listing of the SUM computer code.

THE SUM COMPUTER CODE

The SUM computer code provides a method for archiving data obtained from daily weather observations. The code has replaced manual entry of data via computer cards and a keypunch. The SUM code was written, compiled, and linked on the DEC VAX 11/750 at the HMS and is executed once during a 24-hr period. It is executed during the graveyard shift, after the HMS staff have verified the data.

PROGRAM OVERVIEW

The SUM computer code accesses one input file and one output file. The input file contains the date of the previous archive, and the output file consists of daily weather summaries for the current month. The convention used in naming the monthly forecast files is SUMMARYxxx.DAT where the xxx is the three-character abbreviation of the current month (e.g., AUG for August). (Refer to Appendix A for more information about input/output operations.)

The program begins by displaying a data entry form on the terminal screen (Fig. 1). The length of each field is indicated by the number of X's next to the field name. The program fills in the date field by accessing an input file to obtain the previous archive's date. You are then prompted to enter data for the remaining input fields. You can exit the data entry form after filling in all the input fields. The screen clears, and a prompt to make any needed corrections appears on the screen. Once all the input values are correct, you can exit the program and the forecast is appended to the current monthly file of daily weather summaries.

USER'S GUIDE FOR THE SUM COMPUTER CODE

This section describes how to invoke the SUM computer code on the HMS DEC VAX 11/750 computer and how to respond to the various prompts associated with the code. We assume that you know how to access the FCST account on the HMS computer, and that you have some basic knowledge of the VAX operating system. The terminal must be in the DEC VT100 terminal mode before executing the SUM computer code. To determine the terminal status, simply type SHOW

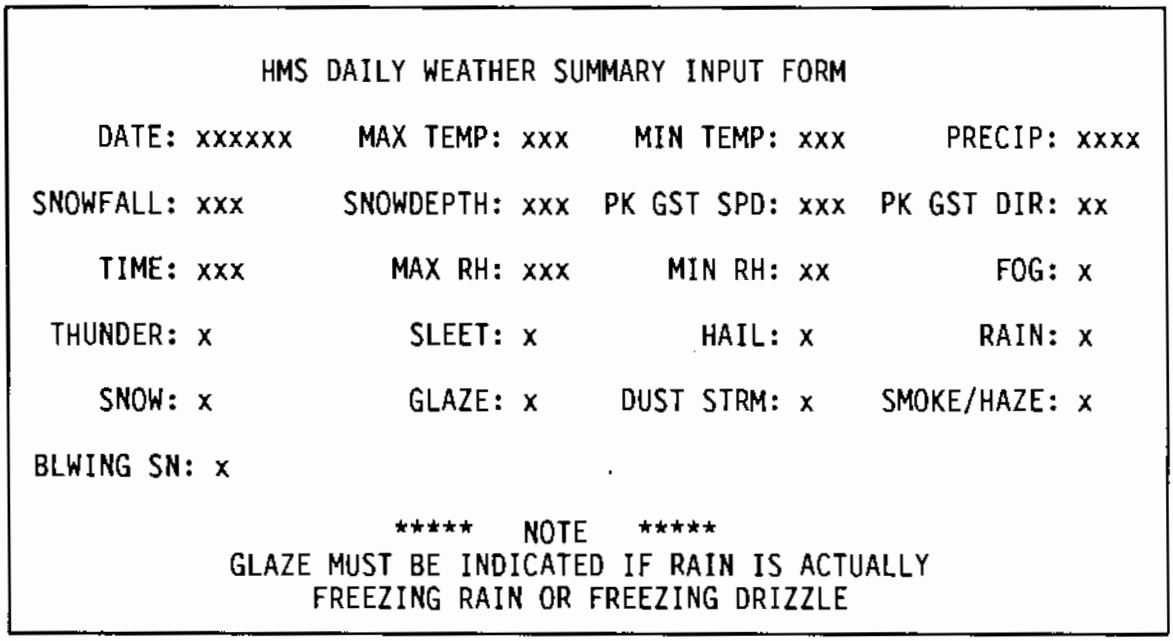


FIGURE 1. Example of the Data Entry Form Used by the SUM Computer Code

TERMINAL and depress the RETURN key. A list of terminal characteristics appears on the screen. Check to make sure the terminal type is set to VT100. If it is not, type SET TERMINAL/VT100 and depress the RETURN key. Currently, the HMS is equipped with several Tektronix 4107 terminals that can emulate the VT100 terminal.

Basically, there are six steps to executing the SUM computer code, filling in the data entry form, and terminating the program. These steps are listed below, and each step is discussed in detail in the following paragraphs:

- log in to the HMS computer (need the FCST password)
- type RUN SUM, then depress the RETURN key
- fill in the data entry form
- exit the form
- answer "yes" or "no" to "need corrections" prompt
- terminate program.

To log in, depress the RETURN key a couple of times. The computer responds with the prompt USERNAME:. Enter FCST and depress the RETURN key. The computer responds with the prompt PASSWORD:. You must know the password to the FCST account before logging in to the HMS computer. Enter the correct password.

If you fail to answer either of these prompts correctly, the computer repeats the appropriate prompt. You are given three chances to enter the correct response. By logging into the FCST account, you are placed in the [FCST] directory and can immediately invoke the SUM computer code.

The SUM code is invoked by typing RUN SUM and depressing the RETURN key. When this is done, the screen clears and the data entry form appears on the terminal. You can now begin data entry. If problems occur when executing the code, refer to the "Trouble-Shooting" section for help.

The data entry form appears on the screen as shown in Figure 1 with the cursor in field two (MAX TEMP). The date field (first field) is automatically filled in by the program. When the cursor is moved to a new field, a prompt for the field appears on the screen below the data entry form for each field. Included with each prompt is a default value and a valid range or list of values from which the input must be selected. To enter data into a field, simply type in the requested data and depress the RETURN key. Integers are used for all input. The default value may be entered by depressing the ENTER key or the SELECT DEFAULT key, which is found on some Tektronix terminals. This action enters the default value. The input value appears in the field (assuming a valid value or default value was entered) while the cursor moves from left to right into the next field. After data are entered in the rightmost field, the cursor moves down one line to the leftmost field. When values have been entered in all fields, you should check the fields for mistakes. If corrections are needed use the up, down, right, and left arrow keys (↑,↓,→,←) located at the top of the keyboard to move within the form. Once you are satisfied that the entered values are correct, depress the EXIT key to exit the form. You may exit the data entry form from any field.

The SUM program provides for two phases of quality assurance to the input data. The first phase is applied as you enter the input data for each field. An error message appears at the bottom of the form if the input value is not within the valid range or valid list of matching numbers, and you are then given the opportunity to enter another value for that field. The second phase occurs when you exit the form and the "need corrections" prompt appears below

the information entered in the form. You can check the input values for validity and make necessary corrections.

After exiting the form, the program displays the information entered into the data entry form on the terminal in the format in which it is appended to the monthly file (e.g., SUMMARYxxx.DAT). A prompt appears just below the information asking if you would care to make any corrections. If no corrections are needed, enter an N or n and the program appends the data to the monthly file. If corrections are needed, enter a Y or y and the program returns to the data entry form mode. This time, the previously entered values appear in their respective fields. Incorrect value(s) can be corrected by using the arrow keys to move the cursor to the appropriate field(s) and revising the incorrect entry. When all corrections have been made, you can exit the form by depressing the EXIT key. The data entry form may be exited from any field; it is not necessary to move to the last field.

The SUM program is terminated by answering n or N to the "need corrections" prompt. The entered data are appended to the monthly file and the program terminates with a FORTRAN STOP message written to your terminal. The monthly data files for the daily weather summary are located in the [FCST.DAT] directory. Each file contains all of the daily weather summaries for any single month.

DESCRIPTION OF INPUT

The data entry form consists of 21 fields; integer values must be provided for 20 of these fields. The program provides the value for the first field, which is the date field. When you move the cursor to one of the other 20 input fields, the code provides a prompt related to the required input. The prompt consists of a brief description of the field, the valid range or list of matching numbers from which the input value must be selected, and a default value (refer to the "User's Guide" section for information on how to input the default value). You will notice a message at the bottom of the form explaining that glaze is to be indicated when freezing rain and/or drizzle has occurred during the day. Table 1 describes each of the input fields. Each field refers to weather observations made during the current day.

TABLE 1. Reference Guide to Input Fields

Input Field	Description	Range or List
DATE	YYMMDD	86D101-990101 /999999
MAX TEMP	max. temp. (°F)	-13 - 125 / 999
MIN TEMP	min. temp. (°F)	-37 - 92 / 999
PRECIP	total precip. (to nearest .01)	1-100 & 9998-9999 / 0
SNOWFALL	total snowfall (to nearest .1)	100 & 998-999 / 0
SNOWDEPTH	total snow depth @ 1200 GMT (in.)	0-30 & 998-999 / 0
PK GST SPD	speed of peak gust (mph)	0 - 92 / 999
PK GST DIR	direction of peak gust (code)	11-34 & 44-88 / 99
TIME	time of peak gust (hour and code)	1 - 239 / 999
MAX RH	maximum relative humidity (%)	1 - 100 / 999
MIN RH	minimum relative humidity (%)	1 - 99 / 99
FOG	fog occurrence	1 or 0 / 0
THUNDER	thunder occurrence	1 or 0 / 0
SLEET	sleet occurrence	1 or 0 / 0
HAIL	hail occurrence	1 or 0 / 0
RAIN	rain occurrence	1 or 0 / 0
SNOW	snow occurrence	1 or 0 / 0
GLAZE	glaze occurrence	1 or 0 / 0
DUST STRM	dust storm occurrence	1 or 0 / 0
SMOKE/HAZE	smoke/haze occurrence	1 or 0 / 0
BLWING SN	blowing snow occurrence	1 or 0 / 0

The following list describes each input field, the associated range or list of matching values from which the input must be selected, and the default value. All variables refer to the current day's weather observations.

1) DATE - The date format is YYMMDD: where YY is the last two digits of the current year (e.g., 87 for 1987), MM is the numerical equivalent of the month (e.g., 04 represents April), and OD is the day of the month. An example of a date is 870421 which is April 21, 1987. The range of the date is 860101 (i.e., January 1, 1986) through 990101 (i.e., January 1, 1999). The default value for the date is 999999 (refer to the User's Guide Section for details on entering default values). This value indicates that the date is missing for the daily weather summary.

2) MAX TEMP - The input value for this field is the maximum temperature for the current day in units of whole degrees Fahrenheit (°F). The range of valid values for this parameter is from -13°F through 125°F. The default value is 999, which indicates a value was not observed.

3) MIN TEMP - The input value for this field is the minimum temperature for the current day in units of whole degrees Fahrenheit (°F). The range of valid values is from -37°F through 92°F. The default value is 999, which indicates a value was not observed.

4) PRECIP - The input value for this field is the total precipitation (liquid equivalent) for the current day. The units are in hundredths of inches (e.g., 45 indicates .45 inches of precipitation). The range of valid values is from 1 through 100, with a default value of 0. The default value indicates no precipitation occurred. If there was a trace of precipitation (<0.01 in.) a value of 999 is entered.

5) SNOWFALL - The input value for this field is the total amount of snow for the current day. The units are in tenths of inches (e.g., 28 indicates 2.8 inches of snow). The range is from 1 through 100, with a default value of 0. The default value indicates no snow fell during the day. If there was a trace of snow then a value of 999 is entered.

6) SNOW DEPTH - The input value for this field is the depth of the snow measured at 1200 GMT. The units are in inches (e.g., 4 indicates 4.0 inches of snow on the ground). The range is from 0 through 30, with a default value of 0. The default value indicates no snow was on the ground at 0400 PST. If there was a trace of snow on the ground a value of 999 is entered.

7) PK GST SPD - The input value for this field is the maximum wind speed for the current day. The units are in miles per hour. The range is from 0 through 92, with a default value of 999. The default value indicates a missing maximum wind speed.

8) PK GST DIR - The input value for this field is the wind direction of the maximum wind speed for the current day. Table 2 shows the codes used to indicate wind direction. The range is from 11 through 34 and 44 through 88, with a default value of 99. The default value indicates a missing maximum wind speed direction.

TABLE 2. Code for Wind Directions

Code	Wind Direction
11	North
12	North-northeast
22	Northeast
32	East-northeast
33	East
34	East-southeast
44	Southeast
54	South-southeast
55	South
56	South-southwest
66	Southwest
76	West-southwest
77	West
78	West-northwest
88	Northwest
18	North-northwest

9) TIME - The input value for this field is the time of the maximum wind speed for the current day. The first two digits of the value represent the hour and the third digit represents a code for the minute. Table 3 shows the code for the minutes. An entry of 086 indicates the maximum wind speed occurred in the hour of 0800 between the minutes of 36 and 41, inclusive. The range is 1 through 239, with a default value of 999. The default value indicates a missing time for the maximum wind speed.

TABLE 3. Codes for Minutes in the Hour

Code	Minutes in Hour
0	0 - 5
1	6 - 11
2	12 - 17
3	18 - 23
4	24 - 29
5	30 - 35
6	36 - 41
7	42 - 47
8	48 - 53
9	54 - 59

10) MAX RH - The input value for this field is the maximum relative humidity for the current day. The units are in whole percent. The range is from 1 through 100, with a default value of 999. The default value indicates a missing maximum relative humidity.

11) MIN RH - The input value for this field is the minimum relative humidity for the current day. The units are in percent. The range is from 1 through 99, with a default value of 99. The default value indicates a 99% minimum relative humidity.

12) FOG - The input value for this field is a code that indicates whether fog occurred during the current day. The list of matching values is 1 or 0. An entry of 1 indicates fog occurred during the

day, while an entry of 0 indicates no occurrence of fog. The default value is 0.

13) THUNDER - The input value for this field is a code that indicates whether thunder occurred during the current day. The list of matching values is 1 or 0. An entry of 1 indicates thunder occurred during the day, while an entry of 0 indicates no occurrence of thunder. The default value is 0.

14) SLEET - The input value for this field is a code that indicates whether sleet occurred during the current day. The list of matching values is 1 or 0. An entry of 1 indicates sleet occurred during the day, while an entry of 0 indicates no occurrence of sleet. The default value is 0.

15) HAIL - The input value for this field is a code that indicates whether hail occurred during the current day. The list of matching values is 1 or 0. An entry of 1 indicates hail occurred during the day, while an entry of 0 indicates no occurrence of hail. The default value is 0.

16) RAIN - The input value for this field is a code that indicates whether rain occurred during the current day. The list of matching values is 1 or 0. An entry of 1 indicates rain occurred during the day, while an entry of 0 indicates no occurrence of rain. The default value is 0.

17) SNOW - The input value for this field is a code that indicates whether snow occurred during the current day. The list of matching values is 1 or 0. An entry of 1 indicates snow occurred during the day, while an entry of 0 indicates no occurrence of snow. The default value is 0.

18) GLAZE - The input value for this field is a code that indicates whether glaze occurred (visibility less than or equal to 5/8 mile) during the current day. The list of matching values is 1 or 0. An entry of 1 indicates glaze occurred during the day, while an entry of 0 indicates no occurrence of glaze. The default value is 0.

19) DUST STRM - The input value for this field is a code that indicates whether a dust storm occurred during the current day. The list of matching values is 1 or 0. An entry of 1 indicates a dust storm occurred during the day, while an entry of 0 indicates no occurrence of dust storms. The default value is D.

20) SMOKE/HAZE - The input value for this field is a code that indicates whether smoke/haze occurred during the current day. The list of matching values is 1 or 0. An entry of 1 indicates smoke/haze occurred during the day, while an entry of 0 indicates no occurrence of smoke/haze. The default value is 0.

21) BLWING SN - The input value for this field is a code that indicates whether blowing snow occurred during the current day. The list of matching values is 1 or 0. An entry of 1 indicates blowing snow occurred during the day, while an entry of 0 indicates no occurrence of blowing snow. The default value is 0.

TROUBLE-SHOOTING THE SUM COMPUTER CODE

This section provides information that may help resolve problems that occur when operating the SUM computer code. We assume that you are familiar with the VAX EDT editor and the VAX operating system commands. Basically, there are three types of failure or problem areas: terminal (i.e., CRT), system, and/or program. The following sections will discuss problems or failures that may occur when using the SUM computer code and the suggested recovery procedures. If a series of recovery actions are suggested, you should try them in sequence until the problems or failure is resolved. Remember that the date is incremented each time you execute the SUM program. Therefore, you may need to edit the [FCST.PREVIOUS_DATE] SUMMARY_DATE.DAT file to reflect the desired date after you have tried the recovery procedures.

TERMINAL PROBLEMS/FAILURES

Problem: Terminal does not respond.

Recovery: Determine if terminal is on. On Tektronix terminals the on/off switch is located in the front and to the right.

Determine if the dimmer switch is turned all the way down. On Tektronix terminals the dimmer switch is located in the front and to the right. Turn the switch clockwise to increase the light intensity on the screen.

If the above actions fail to get a response from the terminal, ask the instrument specialist (the HMS Room 125) to check the terminal.

SYSTEM PROBLEMS/FAILURES

Problem: System does not respond to operating system commands or carriage returns.

Recovery: Check with the Emergency Meteorological System (EMS) computer manager (Eric Stephan, 376-1107, or Ora Gifford, 373-3216) to see if the HMS computer system is down for maintenance or repair.

If the EMS computer manager indicates the HMS computer system is operating, turn the terminal off, wait approximately 15 to 20 seconds, and turn the terminal back on. Depress the RETURN key several times to get attention of the computer system.

If the above actions fail ask an instrument specialist to examine the computer and notify the EMS computer manager.

PROGRAM PROBLEMS/FAILURES

Problem: Terminal not correctly displaying data entry form.
Recovery: Depress the CTRL key and the Y key simultaneously to get to the dollar sign prompt. Type SET TERMINAL/VT100 and depress RETURN. Try running the program again.

Depress the SETUP key at the top of the keyboard. The terminal should respond with an asterisk. Type CODE ANSI and depress RETURN, then depress the SETUP key. Try running the program again.

Problem: Terminal displaying garbled data.
Recovery: Depress the SETUP key at the top of the keyboard. The terminal should respond with an asterisk. Type CODE ANSI, depress RETURN, then depress the SETUP key.

Problem: Program SUM.EXE cannot be found or program has been "trashed" in some way.
Recovery: Copy backup version to the FCST directory. Type COPY [FCST.DATA_ENTRY]SUM.EXE [FCST]SUM.EXE. Try program again.

Problem: Input file ([FCST.PREVIOUS_DATE]SUMMARY_DATE.DAT) or output file ([FCST.DAT]SUMMARYxxx.DAT where xxx is the three-character abbreviation of the current month) cannot be found.

Recovery: Check the [FCST.PREVIOUS_DATE] directory for the input file or the [FCST.DAT] directory for the output file.
If file(s) is intact, try copying the backup version of SUM.EXE to the [FCST] directory (see above for directions).
Try running the code again.

APPENDIX A

PROGRAM DESCRIPTION AND FLOWCHART

APPENDIX A

PROGRAM DESCRIPTION AND FLOWCHART

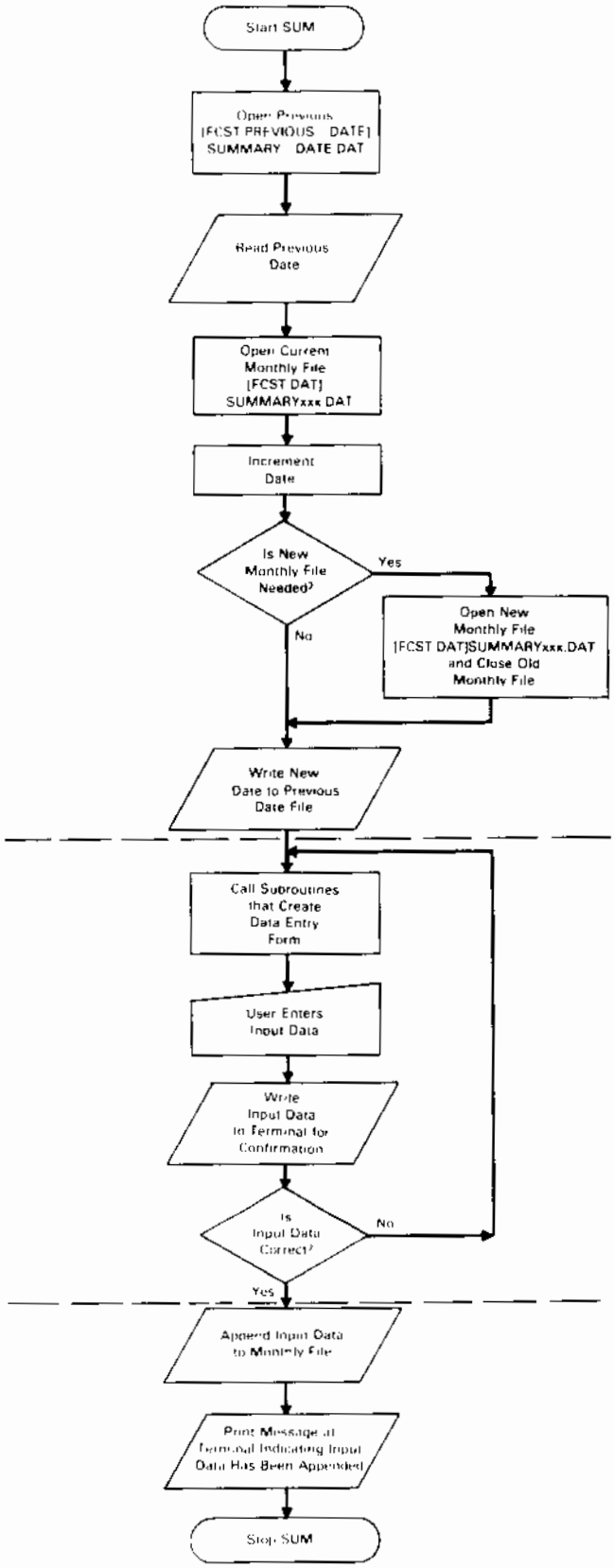
This discussion describes, in detail, the operations and logical flow of the SUM computer code. A flowchart indicating the general operations and logical sequence of the SUM code is shown at the end of this appendix. The flowchart is divided into three sections by two dashed lines. The top and bottom sections are transparent to the user and do not require input from you. The middle section involves the data entry form that requires input from you. The following three paragraphs describe the operations within each section. For a more in-depth review of the operations and logical sequence of the program, refer to the source listing in Appendix B.

The program begins by opening the file SUMMARY_DATE.DAT, which contains one record with the previous archive's date. The program then reads the data. The SUMMARY_DATE.DAT file resides in the [FCST.PREVIOUS_DATE] sub-directory. The month from that date is then used to open the file SUMMARYxxx.DAT (where xxx is the three-character abbreviation for the current month), which contains the daily weather summary data for the current month. The SUMMARYxxx.DAT file resides in the [FCST.DAT] sub-directory. The date is then incremented and is entered back into the SUMMARY_DATE.DAT file. If the incremented date crosses over into the next month, a new SUMMARYxxx.DAT file is opened (where xxx will then reflect the new month). At this point the code calls several subroutines that control and display a data entry form at your terminal.

The SUM code uses a data entry form to facilitate data entry. The form consists of several input fields (see Fig. 1 in the main text), each of which represents an observation variable. Each field is displayed in reverse video to highlight the field length. The fields are initially blank. You are prompted from the bottom of the form for an input value. The prompt consists of a brief description of the field, the valid range or list of numbers from which input must be selected, and a default value. A valid entry must be made before the cursor moves to the next field. If the numeric value is valid, the number is displayed in the appropriate field and the cursor moves to the next field when the ENTER key is depressed. If the input value is not valid,

an error message occurs at the bottom of the form while the cursor remains in that field. When this occurs, the prompt reappears.

After entering all the input data, you can terminate the data entry process by depressing the EXIT key on the Tektronix 4107 terminal. The screen then clears and the input data are displayed at the terminal in the data format it will be appended to in the SUMMARYxxx.DAT file. You are then asked if any corrections are needed before the record is appended to the current monthly file. If no corrections are needed, enter an N or n and the daily weather summary data are appended to the SUMMARYxxx.DAT file, and a message is displayed on the screen indicating the data has been appended to the current monthly file. The program terminates when the message FORTRAN STOP appears on the terminal. If corrections are needed, enter a Y or y and the code returns to the data entry form with the input values you displayed. You can move to the appropriate input field(s) (refer to the "User's Guide" section for information on how to move the cursor within the form) and change the value(s). Once all the value(s) are corrected, the data record is again displayed on the screen and you are given another opportunity to correct any mistakes.


Start SUM
Open Previous
[FCST PREVIOUS DATE]
SUMMARY DATE DAT
Read Previous
Date
Open Current
Monthly File
[FCST DAT]
SUMMARYxxx DAT
Increment
Date
Is New
Monthly File
Needed?
Yes
No
Open New
Monthly File
[FCST DAT]SUMMARYxxx.DAT
and Close Old
Monthly File
Write New
Date to Previous
Date File
Call Subroutines
that Create
Data Entry
Form
User Enters
Input Data
Write
Input Data
to Terminal for
Confirmation
Is
Input Data
Correct?
No
Yes
Append Input Data
to Monthly File
Print Message at
Terminal Indicating Input
Data Has Been Appended
Stop SUM

APPENDIX B

SUM SOURCE CODE LISTING

```
 9-Apr-1987 15:32:09DUA0:[FCST.DATA_ENTRY]SUM.FOR;15
0001    C ***************************************************************************
0002    C
0003    C       PROGRAM: SUM.FOR
0004    C
0005    C       PROGRAMMER: GREGG ANDREWS
0006    C
0007    C       FUNCTION: THIS PROGRAM WAS DEVELOPED TO FACILITATE THE ARCHIVING
0008    C                 OF THE DAILY SUMMARY INFORMATION. THE PROGRAM ACCESSES
0009    C                 A SCRATCH FILE TO DETERMINE THE DATE OF THE LAST ENTRY
0010    C                 THAN THE PROGRAM INCREMENTS THE DATE. IF A NEW MONTH
0011    C                 IS READY THE PROGRAM WILL OPEN A NEW FILE FOR THE
0012    C                 APPROPRIATE MONTH. IT THEN MAKES CALLS TO SUBROUTINES
0013    C                 TO CREATE THE INPUT FORM. ONCE THE DATA HAS BEEN
0014    C                 ENTERED THE DATA IS WRITTEN TO A MONTHLY FILE. THE DATA
0015    C                 IS THEN PROCESSED EACH MONTH.
0016    C
0017    C       DATE: 1/28/86
0018    C
0019    C ***************************************************************************
0020
0021
0022    C
0023            INCLUDE 'ERDS$INCLUDE:FORMFLAGS.INC'
0061            DIMENSION MONTH_NAME(12)
0062
0063            Byte        Form_Interface_Record(   84)
0064            Integer*4    Iflags( 21)      ! Form flags
0065    C
0066    C         Type         Name             Field Prompt String
0067    C
0068            Integer*4    I_VAR001         ! Date (88010101 - 99010101)/ Default = 999999
0069            Integer*4    I_VAR002         ! Today's Maximum Temp (-13 - +125)/ Default = 999
0070            Integer*4    I_VAR003         ! Today's Minimum Temp (-37 - +92) / Default = 999
0071            Integer*4    I_VAR004         ! Today's Total Precip (1-100&9998-9999)/ Default = 0
0072            Integer*4    I_VAR005         ! Today's Total Snowfall (1-100&996-999)/ Default = 0
0073            Integer*4    I_VAR006         ! Snow depth @ 0400 PST (1 - 30)/ Default = 0
0074            Integer*4    I_VAR007         ! Today's Peak Gust Speed (0 - 82)/ Default = 999
0075            Integer*4    I_VAR008         ! Today's Peak Gust Direction (11-34&44-88)/ Default = 99
0076            Integer*4    I_VAR009         ! Time of Peak Gust (0 - 239)/ Defualt = 999
0077            Integer*4    I_VAR010         ! Today's Maximum Rel Hum (1 - 100)/ Default = 999
0078            Integer*4    I_VAR011         ! Today's Minimum Rel Hum (1 - 99)/ Default  = 99
0079            Integer*4    I_VAR012         ! Fog (1 - 0)         / Default = 0
0080            Integer*4    I_VAR013         ! Thunder (0 - 1)     / Default = 0
0081            Integer*4    I_VAR014         ! Sleet (0 - 1)       / Default = 0
0082            Integer*4    I_VAR015         ! Hail (0 - 1)        / Default = 0
0083            Integer*4    I_VAR016         ! Rain (0 - 1)        / Default = 0
0084            Integer*4    I_VAR017         ! Snow (0 - 1)        / Default = 0
0085            Integer*4    I_VAR018         ! Glaze (0 - 1)       / Default = 0
0086            Integer*4    I_VAR019         ! Dust Storm (0 - 1)  / Default = 0
0087            Integer*4    I_VAR020         ! Smoke/Haze (0 - 1)  / Default = 0
0088            Integer*4    I_VAR021         ! Blowing Snow (0 - 1)/ Default = 0
```

```
0089    C
0090          INTEGER*4 YEAR, MONTH, DAY, DAYS_IN_MONTH(12),
0091         .           DAYS_IN_MONTH_LY(12)
0092
0093          CHARACTER*1 SELECT
0094          CHARACTER*3 MONTH_NAME
0095
0096          Equivalence  (Form_Interface_Record, I_VAR001)
0097    C
0098          Common /Form_Record/ I_VAR001, I_VAR002, I_VAR003, I_VAR004,
0099         .                     I_VAR005, I_VAR006, I_VAR007, I_VAR008,
0100         .                     I_VAR009, I_VAR010, I_VAR011, I_VAR012,
0101         .                     I_VAR013, I_VAR014, I_VAR015, I_VAR016,
0102         .                     I_VAR017, I_VAR018, I_VAR019, I_VAR020,
0103         .                     I_VAR021
0104
0105          DATA DAYS_IN_MONTH/31, 28, 31, 30, 31, 30, 31, 31, 30, 31,
0106         .                     30, 31/
0107
0108          DATA DAYS_IN_MONTH_LY/31, 29, 31, 30, 31, 30, 31, 31, 30,
0109         .                       31, 30, 31/
0110
0111           DATA MONTH_NAME/'JAN', 'FEB', 'MAR', 'APR', 'MAY', 'JUN',
0112         .                 'JUL', 'AUG', 'SEP', 'OCT', 'NOV', 'DEC'/
0113
0114
0115          MONTH_FLAG = 0
0116
0117          OPEN(UNIT=10, FILE='[FCST.PREVIOUS_DATE]SUMMARY_DATE.DAT',
0118         .      STATUS='OLD', IOSTAT=IER)
0119          IF(IER .NE. 0) WRITE(*,10) IER
0120    10    FORMAT(/5X,'Error Opening [FCST.PREVIOUS_DATE]SUMMARY_DATE',
0121         .        '.DAT Code - ',I4)
0122
0123
0124    C..... READ PREVIOUS DATE AND HOUR FROM SUMMARY DATE FILE
0125
0126
0127          READ(10,'(3I2)') YEAR, MONTH, DAY
0128           OPEN(UNIT=15, FILE='[FCST.DAT]SUMMARY'//MONTH_NAME(MONTH)//
0129         .      '.DAT', STATUS='OLD', ACCESS='APPEND',
0130         .      CARRIAGECONTROL='LIST', IOSTAT=IER)
0131
0132
0133    C..... INCREMENT DATE AND OPEN NEW MONTHLY FILE IF NEEDED
0134
0135
0136          IF(DAY.EQ.31 .AND. MONTH.EQ.12) THEN      ! check for end of year
0137
0138              YEAR  = YEAR + 1
0139              MONTH = 1
0140              DAY   = 1
0141              MONTH_FLAG = 1
0142              OPEN(UNIT=11, FILE='[FCST.DAT]SUMMARY'//MONTH_NAME(MONTH)//
```

```
0143          .         '.DAT', STATUS='NEW', CARRIAGECONTROL='LIST',
0144          .          IOSTAT=IER)
0145                    IF(IER .NE. 0) WRITE(*,20) IER, MONTH_NAME(MONTH)
0146    20              FORMAT(/5X,'Error Opening [FCST.DAT]SUMMARY',A3,
0147          .               '.DAT Code - ', I4)
0148
0149              ELSE
0150
0151                    IF(MOD(YEAR,4) .EQ. 0) THEN          ! check for leap year
0152
0153                        IF(DAY.EQ.DAYS_IN_MONTH_LY(MONTH)) THEN
0154
0155                            MONTH = MONTH + 1
0156                            DAY = 1
0157                                MONTH_FLAG = 1
0158                            OPEN(UNIT=11, FILE='[FCST.DAT]SUMMARY'//
0159          .                             MONTH_NAME(MONTH)//'.DAT', STATUS='NEW',
0160          .                             CARRIAGECONTROL='LIST', IOSTAT=IER)
0161                            IF(IER .NE. 0) WRITE(*,20) IER, MONTH_NAME(MONTH)
0162
0163                        ELSE
0164
0165                            DAY = DAY + 1
0166
0167                        ENDIF
0168
0169                    ELSE
0170
0171                        IF(DAY.EQ.DAYS_IN_MONTH(MONTH)) THEN
0172
0173                            MONTH = MONTH + 1
0174                            DAY = 1
0175                                MONTH_FLAG = 1
0176                            OPEN(UNIT=11, FILE='[FCST.DAT]SUMMARY'//
0177          .                             MONTH_NAME(MONTH)//'.DAT', STATUS='NEW',
0178          .                             CARRIAGECONTROL='LIST', IOSTAT=IER)
0179                            IF(IER .NE. 0) WRITE(*,20) IER, MONTH_NAME(MONTH)
0180
0181                        ELSE
0182
0183                            DAY = DAY + 1
0184
0185                        ENDIF
0186
0187                    ENDIF
0188
0189              ENDIF
0190
0191
0192    C..... WRITE NEW DATE TO PREVIOUS DATE FILE
0193
0194
0195              BACKSPACE (UNIT=10,IOSTAT=IER)
0196              IF(IER.NE.0) WRITE(*,30) IER
```

```
0197    30     FORMAT(//5X,' Error During Backspace Code - ',I4/
0198           .        5X,' Check [FCST.PREVIOUS_DATE]SUMMARY_DATE.DAT File')
0199           WRITE(10,'(3I2)') YEAR, MONTH, DAY
0200
0201
0202    C..... FIX DATE TO THE VARIABLES I_VAR001
0203
0204
0205           I_VAR001 = (YEAR*10000) + (MONTH*100) + DAY
0206
0207
0208
0209    C..... PREVENT USER FROM ENTERING DATE AND FORCE CURSOR TO START
0210    C..... AT FIRST VARIABLE
0211
0212
0213           IFLAGS(1) = FWS_NO_WRITE
0214           IFLAGS(2) = FWS_FORCE_START
0215
0216
0217    C..... MAKE CALLS TO SUBROUTINES TO CREATE INPUT FORM AND ENTER DATA
0218
0219
0220    100    CALL SUBPROCESS_OPEN_IO
0221           CALL SELECT_ANSI
0222           Call FW_Form_Open (12, 'HMSFORMS.FRM', IOerror)
0223           Call FW_Form_Input ('SUMMARY', Form_Interface_Record,
0224           .                           Iflags, Ierror, User_Check, *990)
0225           Call FW_Form_Close (IOerror)
0226           CALL SUBPROCESS_CLOSE_IO
0227
0228
0229    C..... WRITE DATA TO SCREEN AS WILL BE WRITTEN TO FILE AND
0230    C..... PROMPT FOR CORRECTION
0231
0232
0233           TYPE *,' '
0234           TYPE *,' '
0235           TYPE *,' '
0236           TYPE *,' The Following Data Record Will be Appended to ',
0237           .        'Monthly Daily Summary File :'
0238
0239            WRITE(*,40)
0240    40     FORMAT(//1X,'123456789 123456789 123456789 123456789 ',
0241           .           '123456789 123456789 123456789')
0242           WRITE(*,50) I_VAR001, I_VAR002, I_VAR003, I_VAR004,
0243           .           I_VAR005, I_VAR006, I_VAR007, I_VAR008,
0244           .           I_VAR009, I_VAR010, I_VAR011, I_VAR012,
0245           .           I_VAR013, I_VAR014, I_VAR015, I_VAR016,
0246           .           I_VAR017, I_VAR018, I_VAR019, I_VAR020,
0247           .           I_VAR021
0248
0249    50     FORMAT(/,1X,5X,I8,2I3,I4,3I3,I2,2I3,I2,10I1//)
0250
```

```
0251          SELECT = 'N'
0252
0253          TYPE *,' Do You Need To Make Any Corrections ?'
0254          TYPE *,' Enter N or Y'
0255          READ(*,'(A)') SELECT
0256
0257          IF(SELECT.EQ.'Y' .OR. SELECT.EQ.'y') GOTO 100
0258
0259
0260     C..... WRITE DATA TO DAILY FILE
0261
0262
0263          IF(MONTH_FLAG .EQ. 1) THEN
0264             LUN = 11
0265          ELSE
0266              LUN = 15
0267           ENDIF
0268
0269          WRITE(LUN, 60) I_VAR001, I_VAR002, I_VAR003, I_VAR004,
0270         +               I_VAR005, I_VAR006, I_VAR007, I_VAR008,
0271         +               I_VAR009, I_VAR010, I_VAR011, I_VAR012,
0272         +               I_VAR013, I_VAR014, I_VAR015, I_VAR016,
0273         +               I_VAR017, I_VAR018, I_VAR019, I_VAR020,
0274         +               I_VAR021
0275     60     FORMAT(5X,I6,2I3,I4,3I3,I2,2I3,I2,10I1)
0276
0277
0278          TYPE *,' '
0279          TYPE *,' '
0280          TYPE *,' Data Appended to:  [FCST.DAT]SUMMARY'
0281         .     //MONTH_NAME(MONTH)//'.DAT File.'
0282
0283          GO TO 200
0284
0285     990  TYPE *,' '
0286          TYPE *,'          Error During Form Input - Call Gregg A.'
0287           TYPE *,'              Home 946-5482    Work 376-0138'
0288     200  Call Exit
0289          END
```

PROGRAM SECTIONS

	Name	Bytes	Attributes
0	$CODE	1843	PIC CON REL LCL SHR EXE RD NOWRT LONG
1	$PDATA	700	PIC CON REL LCL SHR NOEXE RD NOWRT LONG
2	$LOCAL	504	PIC CON REL LCL NOSHR NOEXE RD WRT LONG
3	FORM_RECORD	84	PIC OVR REL GBL SHR NOEXE RD WRT LONG
	Total Space Allocated	3139	

ENTRY POINTS

```
   Address  Type  Name                                    References

 0-00000000       SUM$MAIN


VARIABLES

   Address  Type  Name                          Attributes  References

 2-000000E4  I*4  DAY                                       90       127=      138       140=      153
156=
       165(2)=    171       174=      183(2)=   199       205
 2-000000EC  I*4  IER                                       117=A     119(2)    128=A     142=A     145(2)
158=A
       161(2)     176=A     179(2)    195=      196(2)
 2-000000F4  I*4  IERROR                                    223A
 2-000000F0  I*4  IOERROR                                   222A      225A
 3-00000000  I*4  I_VAR001                  COMM EQUIV      68        96        98        205=      242
269

 3-00000004  I*4  I_VAR002                  COMM EQUIV      69        98        242       269
 3-00000008  I*4  I_VAR003                  COMM EQUIV      70        98        242       269
 3-0000000C  I*4  I_VAR004                  COMM EQUIV      71        98        242       269
 3-00000010  I*4  I_VAR005                  COMM EQUIV      72        98        242       269
 3-00000014  I*4  I_VAR006                  COMM EQUIV      73        98        242       269

 3-00000018  I*4  I_VAR007                  COMM EQUIV      74        98        242       269
 3-0000001C  I*4  I_VAR008                  COMM EQUIV      75        98        242       269
 3-00000020  I*4  I_VAR009                  COMM EQUIV      76        98        242       269
 3-00000024  I*4  I_VAR010                  COMM EQUIV      77        98        242       269
 3-00000028  I*4  I_VAR011                  COMM EQUIV      78        98        242       269

 3-0000002C  I*4  I_VAR012                  COMM EQUIV      79        98        242       269
 3-00000030  I*4  I_VAR013                  COMM EQUIV      80        98        242       269
 3-00000034  I*4  I_VAR014                  COMM EQUIV      81        98        242       269
 3-00000038  I*4  I_VAR015                  COMM EQUIV      82        98        242       269
 3-0000003C  I*4  I_VAR016                  COMM EQUIV      83        98        242       269

 3-00000040  I*4  I_VAR017                  COMM EQUIV      84        98        242       269
 3-00000044  I*4  I_VAR018                  COMM EQUIV      85        98        242       269
 3-00000048  I*4  I_VAR019                  COMM EQUIV      86        98        242       269
 3-0000004C  I*4  I_VAR020                  COMM EQUIV      87        98        242       269
 3-00000050  I*4  I_VAR021                  COMM EQUIV      88        98        242       269

    **       I*4  LUN                                       264=      266=      269
 2-000000E0  I*4  MONTH                                     90        127=      128       138       139=
142
       145        153       155(2)=   158       161       171
       173(2)=    178       179       199       205       280
 2-000000E8  I*4  MONTH_FLAG                                115=      141=      157=      175=      263
 2-000000D8  CHAR SELECT                                    93        251=      255=      257(2)
 2-000000F8  R*4  USER_CHECK                                223A
```

```
 2-000000DC  I*4  YEAR                                        90       127=      138(2)=   151       199
205

ARRAYS

   Address  Type  Name                          Attributes        Bytes  Dimensions      References

 2-00000054  I*4  DAYS_IN_MONTH                                    48  (12)                90       105D
171
 2-00000084  I*4  DAYS_IN_MONTH_LY                                 48  (12)                90       106D
153
 3-00000000  L*1  FORM_INTERFACE_RECORD          COMMON EQUIV      84  (84)                63        96
223A
 2-00000000  I*4  IFLAGS                                          84  (21)                64       213=
214=
  223A

 2-000000B4  CHAR MONTH_NAME                                      36  (12)                61        94
111D
  128       142       145       158       161
  176       179       200

PARAMETER CONSTANTS

  Type  Name                                          References

   I*4  FMS_FIELD_BOLD                                  47       51#
   I*4  FMS_FIELD_UNDERLINE                             47       51#
   I*4  FMS_FORCE_START                                 47       51#      214
   I*4  FMS_NO_ECHO                                     47       51#
   I*4  FMS_NO_SEE                                      47       51#

   I*4  FMS_NO_WRITE                                    47       51#      213
   I*4  FMS_SET_ERROR                                   47       51#
   I*4  FMS_SET_EXCEPTION                               47       51#
   I*4  FMS_USER_CHECK                                  47       51#

LABELS

   Address  Label                                       References

 1-0000011C  10'                                        119      120#
 1-00000165  20'                                        145      146#      161       179
 1-0000019C  30'                                        196      197#
 1-000001F9  40'                                        239      240#
 1-00000247  50'                                        242      249#

 1-00000269  60'                                        269      275#
 0-00000334  100                                        220#     257
 0-0000072C  200                                        283      288#
 0-000006D8  999                                        223A     285#
```

```
FUNCTIONS AND SUBROUTINES REFERENCED

  Type  Name                                    References

        FM_FORM_CLOSE                           225
        FM_FORM_INPUT                           223
        FM_FORM_OPEN                            222
        FOR$EXIT                                288
        FOR$OPEN                                117     128     142     158     176

        SELECT_ANSI                             221
        SUBPROCESS_CLOSE_IO                     228
        SUBPROCESS_OPEN_IO                      220


  +-----------------------------------------+
  |          KEY TO REFERENCE FLAGS         |
  |   =   - Value Modified                  |
  |   #   - Defining Reference              |
  |   A   - Actual Argument, possibly modified |
  |   D   - Data Initialization             |
  |  (n)  - Number of occurrences on line   |
  +-----------------------------------------+


COMMAND QUALIFIERS

  FOR/LIS/CROSS/CHECK=ALL SUM

  /CHECK=(BOUNDS,OVERFLOW,UNDERFLOW)
  /DEBUG=(NOSYMBOLS,TRACEBACK)
  /STANDARD=(NOSYNTAX,NOSOURCE_FORM)
  /SHOW=(NOPREPROCESSOR,NOINCLUDE,MAP,NODICTIONARY,SINGLE)
  /WARNINGS=(GENERAL,NODECLARATIONS,NOULTRIX)
  /CONTINUATIONS=19  /CROSS_REFERENCE  /NOD_LINES  /NOEXTEND_SOURCE  /F77
  /NOG_FLOATING  /I4  /NOMACHINE_CODE  /OPTIMIZE


COMPILATION STATISTICS

  Run Time:          0.11 seconds
  Elapsed Time:      10.04 seconds
  Page Faults:       748
  Dynamic Memory:    427 pages
```

DISTRIBUTION

No. of
Copies

OFFSITE

2 DOE Technical Information Center

ONSITE

DOE Richland Operations Office

J. J. Sutey

29 Pacific Northwest Laboratory

G. L. Andrews (5)
K. A. Borgeson
J. W. Buck
D. W. Dragnich
O. P. Gifford
M. J. Graham
J. M. Hales
P. C. Hays
D. J. Hoitink
D. J. Newland
W. T. Pennell
P. J. Perrault
E. R. Preston
J. V. Ramsdell
G. N. Reinecke
M. N. Schwartz
L. L. Wendell
R. E. Wildung
Publishing Coordination (2)
Technical Report Files (5)