NOAA Techniques Development Laboratory
Computer Program NWS TDL CP 93-4

DECODING NESTED GRID MODEL STATISTICAL FORECASTS

Silver Spring, Md.
October 1993

U.S. DEPARTMENT OF COMMERCE / **National Oceanic and Atmospheric Administration** / National Weather Service

PREFACE

The Techniques Development Laboratory's (TDL's) computer program (CP) series is a subset of TDL's technical memorandum series. The CP series documents computer programs written at TDL primarily for the Automation of Field Operations and Services (AFOS) computers.

The format for the series follows that given in the AFOS Handbook 5, Reference Handbook, Volume 6: Applications Programs, Part 1: Policy and Procedures, published by the Office of Technical Services/AFOS Operations Division.

NOAA Techniques Development Laboratory
Computer Program NWS TDL

CP 83-1 Gross Sectional Analysis of Wind Speed and Richardson Number. Gilhousen, Kemper, and Vercelli, May 1983. (PB83205062)
CP 83-2 Simulation of Spilled Oil Behavior in Bays and Coastal Waters. Hess, October 1983. (PB84122597)
CP 83-3 AFOS-Era Forecast Verification. Heffernan, Newton, and Miller, October 1983. (PB84129303)
CP 83-4 AFOS Monitoring of Terminal Forecasts. Vercelli, December 1983. (PB84145697LL)
CP 83-5 Generalized Exponential Markov (GEM) Updating Procedure for AFOS. Herrmann, December 1983. (PB84154822LL)
CP 84-1 AFOS Display of MDR Data on Local Map Background. Newton, July 1984. (PB84220797)
CP 84-2 AFOS Surface Observation Decoding. Perrotti, September 1984. (PB85137586)
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CP 85-3 AFOS-Era Forecast Verification. Ruth, Miller, and Heffernan, October 1985. (PB86148319LL)
CP 87-1 AFOS Terminal Aerodrome Forecast Formatting. Wantz and Eggers, July 1987. (PB8810449LL)
CP 87-2 AFOS-Era Forecast Verification. Ruth and Alex, July 1987. (PB88125570LL)
CP 87-3 Forecast Review. Wolf, July 1987. (PB88125588LL)
CP 87-4 AFOS Monitoring of MDR Data Using Flash Flood Guidance. Norman and Newton, October 1987. (PB88137450LL)
CP 87-5 AFOS Terminal Forecast Quality Control. Vercelli and Leaphart, December 1987. (PB88169925LL)
CP 88-1 AFOS Terminal Forecast Decoding. Vercelli and Leaphart, August 1988. (PB89101240LL)
CP 89-1 Structure Flow Diagram Generator. Adams, March 1989. (PB89195978AS)
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CP 89-3 Extended Memory Library for AFOS Applications. Leaphart, June 1989. (PB92216290)

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DECODING NESTED GRID MODEL STATISTICAL FORECASTS

Robert A. Beasley

1. INTRODUCTION

This subroutine, FWCDEC, and its accompanying driver program, NGMMOSDRV, decode Nested Grid Model (NGM) statistical forecasts (NGM MOS) [National Weather Service (NWS) 1992b] transmitted on the NWS's Automation of Field Operations and Services (AFOS) communications system (NWS 1989 and 1992a) under the product category FWC. NGM MOS guidance is produced twice daily at the National Meteorological Center (NMC) from the 0000 Universal Time Coordinated (UTC) and 1200 UTC model cycles. The guidance is subsequently transmitted via the NWS's Telecommunications Gateway for distribution on the AFOS system approximately 4 hours after model cycle time. This guidance is available for over 300 stations across the contiguous United States.

NGM MOS contains forecast guidance for a variety of weather elements used daily in the preparation of NWS forecasts for up to 60 hours from the initial model time (0000 or 1200 UTC). A sample AFOS NGM MOS product is illustrated in Fig. 1. Forecast elements include:

- maximum and minimum temperature;
- temperature and dewpoint at specific times;
- categorical opaque cloud cover at specific times;
- wind speed and direction at specific times;
- probabilities of precipitation for 6- and 12-hour periods;
- quantitative precipitation forecasts for 6- and 12-hour periods;
- unconditional probabilities of thunderstorms for 6- and 12-hour periods;
- conditional probabilities of severe thunderstorms for 6- and 12-hour periods;
- categorical precipitation type (liquid, freezing, frozen) at specific times;
- probabilities of freezing precipitation (e.g., freezing rain and snow at specific times);
- categorical snowfall amounts for 6- and 12-hour periods;
- categorical ceiling height and visibility at specific times;
- categorical obstruction to vision (i.e., haze or fog) at specific times.

Subroutine FWCDEC can be incorporated into any applications program provided sufficient memory is available. The subroutine returns the decoded data to the calling program in an array (i.e., in memory). When used in conjunction with the driver program, decoded data can also be output to a disk file. In addition, the driver program affords the user the opportunity to obtain a hard copy of the decoded data.

2. METHODOLOGY AND SOFTWARE STRUCTURE

To facilitate the use of the NGM MOS guidance decoding subroutine FWCDEC, a driver program, NGMMOSDRV, was developed. The driver program simulates the action which a user-designed program must take.

The first task of the driver program is to read the command line switches. One of the switches (/C) determines the Real Time Disk Operating System (RDOS) (Data General Corporation 1974 and 1978) file which is input as the decoding control file NGMMOSDEC.cc (where the default cc=CN). This file designates what will be decoded (i.e., stations, periods, and elements). Other switches allow the user to specify the month, day, and cycle of the guidance to be decoded. Still more switches afford the user the opportunity to obtain diagnostics and to output the decoded data to an RDOS file.

The decoding control file NGMMOSDEC.cc (see Fig. 2) contains (1) the name of the AFOS NGM MOS guidance product to be read (both bulletins and collectives are accepted), (2) the three-letter AFOS node identifier, (3) the number of stations to be decoded, (4) the number of projections to decode (either 10 or 20), and (5) the number of different forecast elements to decode (acceptable values range from 1 to 22). The driver program is fixed so that the number of projections to decode is set at 20 and the number of different forecast elements to decode is set at 22. Both of these are maximum settings. The user can change these parameters through his/her own calling program.

After the driver program determines the product(s) to be decoded and what information is to be decoded from the product(s), it then calls subroutine FWCDEC, which retrieves from the AFOS database the requested NGM MOS guidance products (AFOS keys CCCFWCXXX) and decodes the requested information. The subroutine returns the decoded data to NGMMOSDRV in an array. Then, depending on the settings of the command line switches, the decoded data may be printed and/or stored as the RDOS file NGMMOSDEC.DT. Any previously existing RDOS NGMMOSDEC.DT files in the designated directory will be deleted.

Fig. 3 illustrates the logical flow of the driver program from the input of the decoding control file to where it calls the subroutine FWCDEC.

3. PROCEDURES

The NGM MOS driver program and subsequent NGM MOS decoder subroutine are initiated from the DASHER by entering:

```
NGMMOSDRV/F/X cc/C dd/D mm/M tt/T
```

This entry will execute all actions from setting the optional switches and input of the decoding control file to calling subroutine FWCDEC to decode the guidance. In addition, this entry will also write the decoded data to the RDOS file NGMMOSDEC.DT and/or a line printer or PPM. The command line switches are listed and defined in Section 6, Part B.

Regardless of the method used to call subroutine FWCDEC (i.e., the driver program or otherwise), the following information must be passed to the subroutine:

1. The AFOS key name of the product containing the NGM MOS guidance for one or more stations which are to be decoded.
2. The call letters of the station(s) for which guidance is to be decoded.
3. The code (see Table 1) for each element that is to be decoded.
4. The number of periods (NPD) which are to be decoded from the NGM MOS guidance product. The only acceptable values for NPD are 10 (for 6-hourly projections) and 20 (for 3-hourly projections).

5. The number of different forecast elements (NFG) (e.g., maximum/minimum temperature, wind direction and speed, etc...) which are to be decoded.
6. The month, day, and cycle (0000 UTC or 1200 UTC) of the guidance which is to be decoded.

It is important to note that subroutine FWCDEC must be called once for each station for which guidance is to be decoded. Then, for each call to the subroutine, an array (dimensioned NPD x NFG) is returned which contains the decoded data desired by the user. Each row of the array contains the decoded guidance for NPD periods for each desired element (e.g., the first row might be the 3-hourly projections of temperature).

Subroutine FWCDEC also returns an error code to the calling program. The driver program interprets these codes, as the user's own program should also do. Additional error codes unique to the driver program are also included. A list of the error return codes and their meaning from both the subroutine and the driver program is given in Section 6, Part B.

Detailed information concerning the calling arguments (i.e., their order, dimension, and type) is given in Table 2. A list of the element codes required for input to subroutine FWCDEC is given in Table 1. Finally, Fig. 1 illustrates an input NGM MOS guidance product and Fig. 4 gives the output decoded array (which can be obtained on a line printer or PPM using the global "X" switch) for the NGM MOS guidance illustrated in Fig. 1.

4. CAUTIONS

a. Codes used to specify which elements will be decoded are listed in Table 1. No other values are acceptable.

b. Subroutine FWCDEC requires 4634 octal (2460 decimal) words of memory.

c. Subroutine FWCDEC is designed to decode only NGM MOS guidance in the format specified in TPB No. 408. Errors in this format will result in erroneously decoded data and possible program termination.

d. The number of forecast periods (NPD) must be set to either 10 (for 6-hourly projections) or 20 (for 3-hourly projections). Any other value will result in a fatal error. (The driver program sets this variable to 20.)

e. The number of decodable forecast guidance elements (NFG) may range from 1 to 22. All other values will result in a fatal error. (The driver program sets this variable to 22, the maximum.)

f. For the driver program, the default extension of the decoding control file NGMMOSDEC.cc is "CN". This file must exist, unless you specify otherwise through the local "C" switch.

g. A minimum of 49 RDOS blocks should be available for installation of the driver program NGMMOSDRV and the decoding control file (NGMMOSDEC.cc). If the global "F" switch is used, an RDOS file NGMMOSDEC.DT is created, which requires a minimum additional 5 blocks.

h. For the driver program, two digits are required for specification of the month through the local "M" switch, the day through the local "D" switch, and the cycle through the local "T" switch. Any number of digits other than two will result in a fatal error.

5. REFERENCES

Data General Corporation, 1974: RDOS/DOS User's Handbook, Ordering No. 93-000053, Data General Corporation, Southboro, Massachusetts, 235 pp.

_____, 1978: RDOS/DOS User's Handbook, Ordering No. 093-000105, Data General Corporation, Southboro, Massachusetts, 216 pp.

National Weather Service, 1989: AFOS Handbook No. 2, Vol. 1, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

_____, 1992a: Guide to AFOS System Z, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 266 pp.

_____, 1992b: NGM-Based MOS Guidance - The FOUS14/FWC Message. NWS Technical Procedures Bulletin No. 408, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 16 pp.

6. PROGRAM INFORMATION AND PROCEDURES FOR INSTALLATION AND EXECUTION

PART A: PROGRAM INFORMATION and INSTALLATION PROCEDURE

PROGRAM NAME: NGMMOSDRV/FWCDEC

AAL ID: DBC083
Revision No.: 1.10

FUNCTION: Extracts and decodes NGM MOS guidance forecasts and returns the guidance in an array, and optionally as a disk file. Employs subroutine FWCDEC which may be called by any appropriately developed user program using the information listed in this CP.

PROGRAM INFORMATION:

Development Programmer(s):

Robert A. Beasley

Location: Techniques Development Laboratory

Phone: 301-713-0056

Maintenance Programmer(s):

Robert A. Beasley

Location: Techniques Development Laboratory

Phone: 301-713-0056

Language: FORTRAN IV/Rev 5.57
MAC Assembler/Rev 6.30

Save file creation dates: NGMMOSDRV.SV

Original release/revision 1.00	-	June 1992
TDL release/revision 1.01	-	November 1992
TDL release/revision 1.10	-	September 1993

Relocatable binary file creation dates: FWCDEC.RB

Original release/revision 1.00	-	June 1992
TDL release/revision 1.01	-	November 1992
TDL release/revision 1.10	-	September 1993

Running time:
9 seconds per station

Disk space:

Program files:

NGMMOSDRV.SV (includes FWCDEC.RB)	-	48 RDOS blocks

Subroutines required:

FWCDEC.RB	-	17 RDOS blocks
IPANDEC.RB	-	1 RDOS block
CCAT.RB	-	1 RDOS block
ICEQAL.RB	-	1 RDOS block
INITAR.RB	-	1 RDOS block
BMOVE.RB	-	1 RDOS block
SEARCH.RB	-	1 RDOS block
NAFREAD.RB	-	9 RDOS blocks
AFDTIM.RB	-	5 RDOS blocks
DCMPR.RB	-	3 RDOS blocks

Data files:
(used only by NGMMOSDRV)

NGMMOSDEC.cc	-	(141 * n_{stns})/512 RDOS blocks
NGMMOSDEC.DT	-	(2235 * n_{stns})/512 RDOS blocks

PROGRAM REQUIREMENTS

Program files:

NAME
NGMMOSDRV.SV
FWCDEC.RB

Data files:

NAME	Disk location	READ/WRITE	COMMENTS
NGMMOSDEC.cc	Master directory	R	Created by RDOS text editor
NGMMOSDEC.DT	Master directory	R/W	Optionally produced by NGMMOSDRV.

AFOS Products:

ID	ACTION	COMMENTS
CCCFWCXXX	Read	CCC = your AFOS node; FWC = product category for NGM MOS guidance products; XXX = station ID for which guidance is given (except in the case of collectives).

LOAD LINE

```
RLDR/P/E NGMMOSDRV FWCDEC IPANDEC CCAT ICEQAL INITAR BMOVE SEARCH ^
NAFREAD AFDTIM DCMPR NGMDRVREV ^
<BG UTIL SYS FORT AFOSE>.LB NGMMOSDRV.LM/L
```

PROGRAM INSTALLATION

WHEN USED AS THE INDEPENDENT PROGRAM NGMMOSDRV:

1. Move the executable module NGMMOSDRV.SV to the master directory (usually SYSZ) or to an applications directory with links to the master directory.

2. Create, using an RDOS text editor, at least one decoding control list (NGMMOSDEC.cc) using the format given in Fig. 2. The default name is NGMMOSDEC.CN.

FOR USE AS THE DEPENDENT SUBROUTINE FWCDEC:

1. Develop a Fortran IV program which will call subroutine FWCDEC with calling arguments, including order, dimension, and type, as listed in Table 2. Compile the program using revision 5.57 of the Data General RDOS FORTRAN IV compiler.

2. Create a load line for your calling program using the load line given above as a template. Replace every occurrence of NGMMOSDRV with the name of your calling program. In addition to subroutine FWCDEC, you must also include the other subroutines listed in the load line above. All of these subroutines are included in the initial package distributed with this CP.

3. Load the program to create an executable save file (named after your calling program) using the Data General RDOS Relocatable Binary Loader (RLDR).

4. Move your newly created executable save file to the master partition or to an applications partition with links to the master partition. This action is just as you have done (or would have done) with the sample driver program NGMMOSDRV.

PART B: PROGRAM EXECUTION and ERROR CONDITIONS

PROGRAM NAME: NGMMOSDRV/FWCDEC

AAL ID: DBC083
Revision No.: 01.10

PROGRAM EXECUTION

1. Run NGMMOSDRV.

   At the DASHER enter:

   NGMMOSDRV/F/X cc/C dd/D mm/M tt/T

   Definition of switches:

   GLOBAL

   /F = Write decoded NGM MOS guidance to the RDOS file NGMMOSDEC.DT. If a previous copy of this file exists in the designated directory, it will first be deleted.

   /X = Print decoded NGM MOS guidance on the line printer or PPM.

   LOCAL

   cc/C = Designates the decoding control file (NGMMOSDEC.cc) through the RDOS extension "cc" on the file NGMMOSDEC.cc.

   dd/D = Denotes the day of the month of the guidance which is to be decoded. Two digits must always be specified when using this switch.

   mm/M = Denotes the month of the year of the guidance which is to be decoded. Two digits must always be specified when using this switch.

   tt/T = Denotes the cycle hour of the guidance which is to be decoded. The only acceptable values are "00" and "12" for 0000 UTC and 1200 UTC, respectively. Two digits must always be specified when using this switch.

   Defaults (Switch not used):

   Global

   /F = Do not create an RDOS file of decoded NGM MOS guidance.

   /X = Do not print decoded NGM MOS guidance on the line printer or PPM.

   Local

   /C = Use the decoding control file NGMMOSDEC.CN.

/D = Use the system day as a basis for obtaining the NGM MOS guidance cycle which will be decoded. If the system hour is > 0300 UTC, then the day of the cycle to decode will be the current system day. If the system hour is between 0000 UTC and 0300 UTC inclusive, then the cycle day used will be the previous calendar day.

/M = Use the system month as a basis for obtaining the NGM MOS guidance cycle which will be decoded. On all days except the first day of the month, the cycle month to decode will be the same as the current system month. On the first day of the month between the hours of 0000 and 0300 UTC inclusive, the cycle month to decode will be the previous calendar month.

/T = Use the system time as a basis for determining the NGM MOS guidance cycle which will be decoded. Between the hours of 0000 UTC and 0300 UTC inclusive, and 1500 UTC to 2359 UTC inclusive, the 1200 UTC guidance cycle will be used. Between the hours of 0301 UTC and 1459 UTC inclusive, the 0000 UTC guidance cycle will be used.

2. Before executing the program, you must establish a decoding control file (NGMMOSDEC.cc). This file determines the stations, cycle, number of periods, and elements of the NGM MOS guidance which is to be decoded. See Fig. 2 for details on how to establish this file. The default RDOS extension for this file is "CN".

PROGRAM ERROR CONDITIONS

ERROR CONDITIONS	MEANING
[1] - CYCLE SPECIFIED CAN ONLY BE 00Z OR 12Z.	A cycle other than 0000 UTC or 1200 UTC was specified through the local "T" switch.
[2] - INVALID DAY OF MONTH SPECIFIED THROUGH LOCAL "D" SWITCH.	A day other than 00 through 31 was specified through the local "D" switch.
[3] - INVALID MONTH OF YEAR SPECIFIED THROUGH LOCAL "M" SWITCH.	A month other than 01 through 12 was specified through the local "M" switch.
[4] - PROBLEM OPENING NGMMOSDEC.CN	Unable to find or read the specified decoding control file NGMMOSDEC.cc.
[5] - MAXIMUM NUMBER OF STATIONS TO DECODE > 99.	Only 99 MOS stations may be decoded at one time.

[6] - PROBLEM READING LINE 1 FROM NGMMOSDEC.CN FILE.

Format for line 1 of the specified decoding control file NGMMOSDEC.cc is invalid.

[7] - PROBLEM READING STATION NAMES FROM NGMMOSDEC.CN

Unable to read the names of the stations for which MOS data is to be decoded from the specified decoding control file NGMMOSDEC.cc

[8] - PROBLEM READING FORECAST ELEMENT CODES FROM THE NGMMOSDEC.CN CONTROL FILE.

Unable to read the code numbers for the elements which are to be decoded as specified in the decoding control file NGMMOSDEC.cc.

[9] - PROBLEM OPENING NGMMOSDEC.DT FILE FOR OUTPUT.

Unable to open the NGMMOSDEC.DT for the optional write of the specified decoded NGM MOS data. Make sure the file is not attribute protected.

[10] - ERROR RETURNED FROM FWCDEC FOR STATION xxx, FWCDEC ERROR RETURN CODE = iii.

An error condition was encountered in the NGM MOS decoding subroutine FWCDEC.

MEANINGS OF iii

iii = 1: (NO ERROR)
iii = 2: The number of periods (NPD) to be decoded is not an acceptable value of 10 or 20.
iii = 3: The number of forecast guidance elements (NFG) to be decoded (NFG) is not an acceptable value from 1 to 22 inclusive.
iii = 4: Error from subroutine NAFREAD. Cannot open specified product.
iii = 5: Error from subroutine NAFREAD. Unable to read specified product.
iii = 6: End of file encountered in NAFREAD. Specified station cannot be found.
iii = 7: Maximum number of previous version checks exceeded.
iii = 8: Error from subroutine NAFREAD. Cannot obtain previous version of specified product.
iii = 9: Error from subroutine NAFREAD. Problem reading station or product header information.
iii = 10: Unexpected end of file encountered in NAFREAD reading station header.
iii = 11: Error from subroutine NAFREAD. Problem reading forecast data.
iii = 12: Invalid data in NGM MOS guidance product. Attempt to decode unrecognized forecast element.
iii = 13: Unable to find the phrase "NGM MOS GUIDANCE" in the header line of the FWC product.

Table 1. Element code numbers required as input to the NGM MOS decoding subroutine FWCDEC. The code numbers of the elements to be decoded are passed to the subroutine FWCDEC through the array IFG.

Description of Element to be Decoded	Code Number
Maximum/Minimum Temperature (MN/MX or MX/MN)	100
3-hourly temperature (TEMP)	200
3-hourly dewpoint (DEWPT)	300
3-hourly opaque cloud cover (CLDS)	400
3-hourly surface wind direction (WDIR)	500
3-hourly surface wind speed (WSPD)	600
6-hourly PoP (POP06)	700
12-hourly PoP (POP12)	800
6-hourly QPF (QPF)	900
12-hourly QPF (QPF)	901
6-hourly unconditional thunderstorm probability (TSV06)	1000
6-hourly conditional severe thunderstorm probability (TSV06)	1001
12-hourly unconditional thunderstorm probability (TSV12)	1100
12-hourly conditional severe thunderstorm probability (TSV12)	1101
3-hourly conditional precipitation type (PTYPE)	1200
3-hourly conditional probability of freezing precipitation (POZP)	1300
3-hourly conditional probability of snow (POSN)	1400
6-hourly unconditional probability of snowfall amount (SNOW)	1500
12-hourly unconditional probability of snowfall amount (SNOW)	1501
3-hourly ceiling height forecast (CIG)	1600
3-hourly visibility forecast (VIS)	1700
3-hourly obstruction to visibility forecast (OBVIS)	1800

Table 2. The calling arguments required for subroutine FWCDEC. The calling order must be exactly as listed here. The dimension and type are also indicated. In the column labeled "Type", "A" refers to ASCII format (packed) and "I" to integer. The number following the type designator denotes the number of digits or spaces that the variable or element in an array will occupy.

Calling Argument	Dimension	Type	Definition
KEYIN	5	A2	AFOS product name CCCNNNXXX
ISTN	2	A2	3-letter station ID for the station to be decoded.
IFG	NFG	I4	Code numbers for the elements to be decoded (see Table 1).
JFG	NPD x NPG	I5	Two-dimensional array of decoded forecast guidance.
NPD	None	I2	Number of projections to be decoded (either 10 or 20).
NFG	None	I2	Number of forecast guidance elements which are to be decoded (from 1 to 22).
IMON	None	I2	The integer value for the month of the year for the guidance cycle which is to be decoded.
IDAY	None	I2	The day of the month for the guidance cycle which is to be decoded.
ICYC	None	I2	The guidance cycle (00 UTC or 12 UTC only) to be decoded.
IRC	None	I2	Error Return Code (see Error No. 10, Section 6, Part B.

Table 3. Quantitative Precipitation Forecast (QPF) categories used in the NGM MOS guidance product and displayed on line 13 of Fig. 1.

Code Number	Meaning	
	6-h period	12-h period
0	None	None
1	0.01"-0.09"	0.01"-0.09"
2	0.10"-0.24"	0.10"-0.24"
3	0.25"-0.49"	0.25"-0.49"
4	0.50"-0.99"	0.50"-0.99"
5	≥ 1.00"	1.00"-1.99"
6	not used	≥ 2.00"

Table 4. Snow amount categories (SNOW) used in the NGM MOS guidance product and displayed on line 19 of Fig. 1.

Code Number	Meaning	
	6-h period	12-h period
0	No snow	No snow
1	Trace - < 2"	Trace - < 2"
2	≥ 2"	2 - < 4"
3	not used	not used
4	not used	4 - < 6"
5	not used	not used
6	not used	≥ 6"

Table 5. Ceiling categories (CIG) used in the NGM MOS guidance product and displayed on line 20 of Fig. 1.

Code Number	Meaning (ft)
1	< 200
2	200 - 400
3	500 - 900
4	1000 - 3000
5	3100 - 6500
6	6600 - 12000
7	> 12000

Table 6. Visibility categories (VIS) used in the NGM MOS guidance product and displayed on line 21 of Fig. 1.

Code Number	Meaning (miles)
1	< 1/2
2	1/2 - 7/8
3	1 - 2 3/4
4	3 - 5
5	> 5

```
FOUS14 KWBC 161606                                                              line 1
PWM  EC   NGM MOS GUIDANCE   9/16/93  1200 UTC                                 line 2
DAY /SEPT 16 /SEPT 17                  /SEPT 18                        /        line 3
HOUR   18 21 00 03 06 09 12 15 18 21 00 03 06 09 12 15 18 21 00                 line 4
MN/MX                    47          61          52          67                 line 5
TEMP   60 58 54 52 50 49 51 57 59 58 55 55 54 54 56 63 65 63 59                 line 6
DEWPT  46 47 50 49 48 48 49 52 54 55 55 55 54 54 56 58 59 58 58                 line 7
CLDS   BK SC BK OV OV OV OV OV OV OV OV OV OV OV OV OV OV OV OV                 line 8
WDIR   06 08 07 04 03 04 05 09 10 12 13 12 05 04 04 11 12 14 15                 line 9
WSPD   11 06 03 06 06 08 08 08 07 04 05 04 04 03 03 04 06 06 05                 line 10
POP06        9    14    19    39    49    35    18    14    20                 line 11
POP12                   25          55          43          25                 line 12
QPF        0/    1/    1/1   3/    2/4   1/    1/1   0/    0/                 line 13
TSV06     0/ 0  0/ 0  0/ 0  6/ 1  0/ 0  0/ 0  5/ 0  3/ 1 20/ 3                 line 14
TSV12           0/ 0        6/ 0        2/ 0        9/ 1                       line 15
PTYPE  R  R  R  R  R  R  R  R  R  R  R     R     R     R     R                  line 16
POZP   0  0  0  0  0  0  0  0  0  0  0     0     0     0     0                  line 17
POSN   0  0  0  0  0  0  0  0  1  2  4     0     3     2     0                  line 18
SNOW       0/    0/    0/0   0/    0/0   0/    0/0   0/    0/0                 line 19
CIG    6  6  7  5  4  5  4  4  3  4  3     2     2                            line 20
VIS    5  5  5  5  5  5  5  5  5  4  4     2     1                            line 21
OBVIS  N  N  N  N  N  N  N  N  N  N  F     F     F                            line 22
```

Explanation:

line 1 - WMO Header and date/time group;
line 2 - Station ID, RDC transmission circuits, title, and model cycle;
line 3 - Forecast projection days (with time in UTC);
line 4 - Forecast projection hours in UTC;
line 5 - Maximum or minimum temperature for daytime/nighttime period (°F);
line 6 - Temperature at specified time (°F);
line 7 - Dewpoint temperature at specified time (°F);
line 8 - Opaque cloud cover forecast for specified time, where CL = CLR, SC = SCT, BK = BKN, and OV = OVC;
line 9 - Wind direction in tens of degrees for specified time;
line 10 - Wind speed in knots for specified time;
line 11 - Probability of precipitation for 6-hour period ending at specified time;
line 12 - Probability of precipitation for 12-hour period ending at specified time;
line 13 - Precipitation amount forecast (see Table 3) for 6- and 12-hour periods ending at specified time;
line 14 - Thunderstorm/conditional severe thunderstorm probabilities for 6-hour periods ending at specified time;
line 15 - Thunderstorm/conditional severe thunderstorm probabilities for 12-hour periods ending at specified time;
line 16 - Conditional precipitation type forecast for specified time, where Z = freezing rain, freezing drizzle, and/or sleet, S = snow, and R = rain or drizzle;
line 17 - Conditional probability of freezing precipitation or ice pellets for specified time;
line 18 - Conditional probability of snow for specified time;
line 19 - Snowfall amount (see Table 4) for 6- and 12-hour periods;
line 20 - Ceiling height forecast (see Table 5) for specified time;
line 21 - Visibility forecast (see Table 6) for specified time;
line 22 - Obstruction to vision forecast for specified time, where H = haze, F = fog, and N = no haze and no fog.

Figure 1. A sample NGM MOS guidance product for Portland, Maine (PWM) available on AFOS under the product category FWC. A full explanation of this product can be found in NWS TPB 408.

```
PWMFWCPWM  PWM 001 020 022                    ||line 1
PWM                                           ||line 2
 100                                          ||line 3
 200                                          ||line 4
 300                                          ||line 5
 400                                          ||line 6
 500                                          ||line 7
 600                                          ||line 8
 700                                          ||line 9
 800                                          ||line 10
 900                                          ||line 11
 901                                          ||line 12
1000                                          ||line 13
1001                                          ||line 14
1100                                          ||line 15
1101                                          ||line 16
1200                                          ||line 17
1300                                          ||line 18
1400                                          ||line 19
1500                                          ||line 20
1501                                          ||line 21
1600                                          ||line 22
1700                                          ||line 23
1800                                          ||line 24
-------------------------------------------------
```

Explanation:

line 1 - CCCNNNXXX__CCC_NST_NPD_NEL, where:
CCCNNNXXX = AFOS product to be read;
CCC = your AFOS node;
NST = The number of stations for which guidance is to be decoded;
NPD = The number of periods or projections to decode (10 or 20);
NEL = The number of weather elements which are to be decoded (from 1 to 22)
_ = denotes a mandatory blank space.

line 2 - begins the list of stations which are to be decoded from the indicated AFOS product. In the event that a product were to contain a collective of NGM MOS guidance, additional stations would be listed from line 3 to line 3+NST. Each station identifier begins a new line in column 1.

line 3-line 24 - Code numbers (see Table 1) for the elements which are to be decoded from the NGM MOS guidance product. All of the possible elements to decode are listed here. Only one code number is listed per line with 3-digit codes beginning in column 2 and 4-digit codes beginning in column 1.

Note: The total number of lines = 1 + NST + NEL. If more than one station is being decoded, then the codes for the elements would begin on the line immediately following the last station.

Figure 2. A sample decoding control file NGMMOSDEC.CN to decode the NGM MOS guidance product shown in Fig. 1.

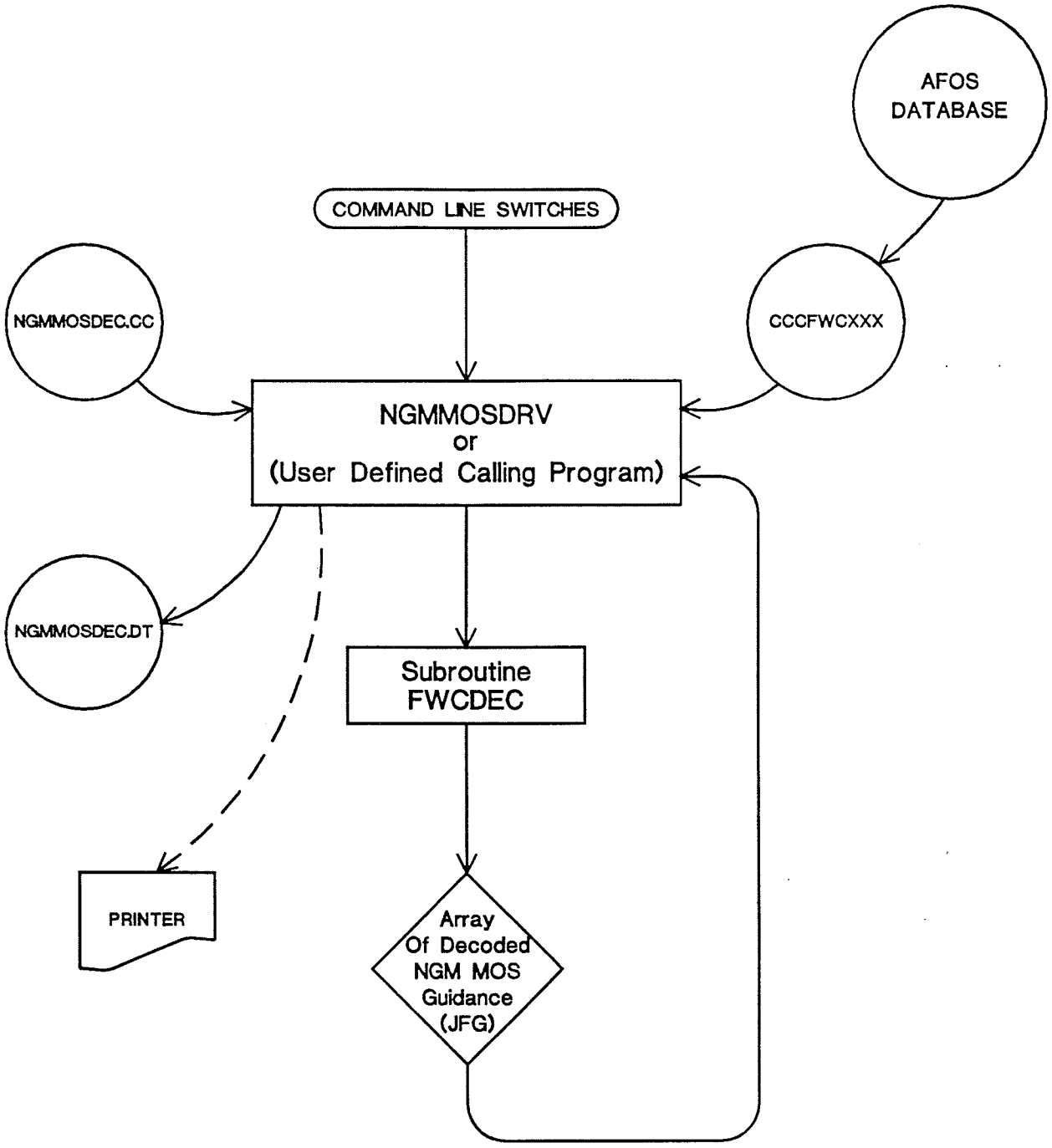

Figure 3. Logical program flow for the driver program NGMMOSDRV and the NGM MOS decoding subroutine FWCDEC. The driver program and the subroutine are denoted by rectangles and AFOS products and RDOS disk files by circles. The oval denotes optional user command input. The dashed line represents optional flow.

```
PWM 09 16 93 12
9999 9999 9999 9999 9999 9999 9999   47 9999 9999 9999   61 9999 9999 9999   52 9999 9999 9999   67
9999   60   58   54   52   50   49   51   57   59   58   55   55   54   54   56   63   65   63   59
9999   46   47   50   49   48   48   49   52   54   55   55   55   54   54   56   58   59   58   58
9999    3    2    3    4    4    4    4    4    4    4    4    4    4    4    4    4    4    4    4
9999   60   80   70   40   30   40   50   90  100  120  130  120   50   40   40  110  120  140  150
9999   11    6    3    6    6    8    8    8    7    4    5    4    4    3    3    4    6    6    5
9999 9999 9999    9 9999   14 9999   19 9999   39 9999   49 9999   35 9999   18 9999   14 9999   20
9999 9999 9999 9999 9999 9999 9999   25 9999 9999 9999   55 9999 9999 9999   43 9999 9999 9999   25
9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999
9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999 9999
9999 9999 9999    0 9999    0 9999    0 9999    6 9999    0 9999    0 9999    5 9999    3 9999   20
9999 9999 9999    0 9999    0 9999    0 9999    1 9999    0 9999    0 9999    0 9999    1 9999    3
9999 9999 9999    0 9999 9999 9999    6 9999 9999 9999    2 9999 9999 9999    9 9999 9999 9999 9999
9999 9999 9999    0 9999 9999 9999    0 9999 9999 9999    0 9999 9999 9999    1 9999 9999 9999 9999
9999    3    3    3    3    3    3    3    3    3    3    3 9999    3 9999    3 9999    3 9999    3
9999    0    0    0    0    0    0    0    0    0    0    0 9999    0 9999    0 9999    0 9999    0
9999    0    0    0    0    0    0    0    0    1    2    4 9999    0 9999    3 9999    2 9999    0
9999 9999 9999    0 9999    0 9999    0 9999    0 9999    0 9999    0 9999    0 9999    0 9999    0
9999 9999 9999 9999 9999 9999 9999    0 9999 9999 9999    0 9999 9999 9999    0 9999 9999 9999    0
9999    6    6    7    5    4    5    4    4    3    4    3 9999    2 9999    2 9999 9999 9999 9999
9999    5    5    5    5    5    5    5    5    5    4    4 9999    2 9999    1 9999 9999 9999 9999
9999    0    0    0    0    0    0    0    0    0    0    2 9999    2 9999    2 9999 9999 9999 9999
```

Figure 4. Decoded NGM MOS guidance for the NGM MOS product given in Fig. 1 for station PWM. This output is available through the JFG array which is returned by subroutine FWCDEC. This output is also available as an RDOS file when the driver program NGMMOSDRV is run with the global "F" switch. The decoded data can also be printed by using the global "X" switch. "9999" denotes a missing value. Here NPD = 20, so that the maximum amount of data has been decoded. The columns represent projection times from the initial model cycle time. The first column is 3 hours from model cycle time and the last column is 60 hours from model cycle time. The rows represent each of the elements given in the NGM MOS guidance product in the same order as there. Character encoded guidance elements are translated to integer values when decoded. For clouds: CLR = 1, SCT = 2, BKN = 3, and OVC = 4. For categoricial precipitation type: Z = 1, S = 2, and R = 3. For obstructions to vision: N = 0, H = 1 and F = 2. Wind direction has also been multiplied by 10.

(Continued from inside front cover)

Computer Program NWS TDL

CP 92-1 Separating Individual Synoptics from within Synoptic Collectives. Beasley, August 1992. (PB92232313)

CP 93-1 AFOS Profiler Software System. Battel, Leaphart, Moeller, and Petrie, August 1993.

CP 93-2 AFOS Surface Observation Decoding. Beasley, September 1993. (PB94112042)

CP 93-3 Decoding Satellite Cloud Products. Beasley, October 1993.