NOAA Techniques Development Laboratory
Computer Program NWS TDL CP 88-1

AFOS TERMINAL FORECAST DECODING

Silver Spring, Md.
August 1988

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 Cross Sectional Analysis of Wind Speed and Richardson Number. Gilhousen, Kemper, and Vercelli, May 1983. (PB83 205062)
CP 83-2 Simulation of Spilled Oil Behavior in Bays and Coastal Waters. Hess, October 1983. (PB84 122597)
CP 83-3 AFOS-Era Forecast Verification. Heffernan, Newton, and Miller, October 1983. (PB84 129303)
CP 83-4 AFOS Monitoring of Terminal Forecasts. Vercelli, December 1983.
CP 83-5 Generalized Exponential Markov (GEM) Updating Procedure for AFOS. Herrmann, December 1983.
CP 84-1 AFOS Display of MDR Data on Local Map Background. Newton, July 1984.
CP 84-2 AFOS Surface Observation Decoding. Perrotti, September 1984.
CP 84-3 AFOS-Era Forecast Verification. Miller, Heffernan, and Ruth, September 1984.
CP 85-1 AFOS Monitoring of Terminal Forecasts. Vercelli and Norman, May 1985.
CP 85-2 AFOS Terminal Forecast Decoding. Vercelli, Norman, and Heffernan, October 1985.
CP 85-3 AFOS-Era Forecast Verification. Ruth, Miller, and Heffernan, October 1985.
CP 87-1 AFOS Terminal Aerodrome Forecast Formatting. Wantz and Eggers, July 1987.
CP 87-2 AFOS-Era Forecast Verification. Ruth and Alex, July 1987.
CP 87-3 Forecast Review. Wolf, July 1987.
CP 87-4 AFOS Monitoring of MDR Data Using Flash Flood Guidance. Norman and Newton, October 1987.
CP 87-5 AFOS Terminal Forecast Quality Control. Vercelli and Leaphart, December 1987.

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National Oceanic and
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David J. Vercelli and Mark Leaphart

1. INTRODUCTION

Terminal forecasts (FT's) are issued by Weather Service Forecast Offices (WSFO's) for approximately 500 airports nationwide. These forecasts are issued both on a scheduled and non-scheduled basis to "serve the pre-flight and in-flight meteorological service requirements of domestic aviation operations by providing . . . definitive weather information about cloud heights and amounts, visibility, weather, obstructions to visibility, and wind" (NWS, 1984).

A regularly scheduled FT is valid for the 24-h period following its issuance. This period is broken down into two distinct parts--specific forecasts for the first 18 hours and categorical forecasts for the last 6 hours. Each part may be subdivided into one or more forecast groups depending on expected weather changes. Additionally, the specific forecast groups are divided into two segments--the prevailing conditions and the remarks.

The FT's are prepared manually each day at WSFO's which have FT responsibilities. Once prepared, they are then stored in the local Automation of Field Operations and Services (AFOS) database and transmitted over the AFOS communications circuits. The information in the forecasts is available for use by various applications programs at the local office (e.g., Vercelli and Norman, 1985; Wantz and Eggers, 1987). To use this information, however, the forecasts must first be decoded. This paper describes a FORTRAN subroutine, called DCDFT, and its subordinate subroutines which can be used to decode FT's. This is a major revision to the original FT decoder program (Vercelli et. al., 1985). The new DCDFT has a different structure, expanded error checking, and additional user options which were made necessary by field requests for a quality control program for FT's (Vercelli and Leaphart, 1987) and a terminal aerodrome forecast (TAF) encoder program (Wantz and Eggers, 1987).

2. METHODOLOGY AND SOFTWARE STRUCTURE

DCDFT is not a stand-alone program. It is a FORTRAN subroutine which must be called by a user-supplied program as shown by the data flow and program relationships in Fig. 1. The input to DCDFT is one unpacked* FT and certain other control data; the output is the decoded FT and diagnostic information. The call to DCDFT is:

```
CALL DCDFT(IFT,ICALL,ITIME,IDIAG,IOVLY,IDATA,NERR1,ICEP,NERR2)
```

where:

---

* The FT products are stored in the AFOS database in packed ASCII format, i.e., two ASCII characters per 16-bit word. An unpacked FT will have one ASCII character per word stored in the right-hand 8-bits (= 1 byte) and a null (0) in the left-hand byte.

IFT( ) = Array containing one unpacked, coded FT. Dimension of IFT( ) is 512 words. (Input)

ICALL( ) = Array to hold the xxx portion of the cccFTAxxx product identifier (packed) or ASCII blanks. Dimension of ICALL( ) is 2 words. (Input)

ITIME = Group selection variable. (Input)
-1: Decode entire FT (all groups).
0 through 24, inclusive: Decode only that group valid at ITIME, where ITIME is the whole hour (0 = 00Z*, 5 = 05Z, 21 = 21Z, etc.).

IDIAG = Diagnostic print statements are included in many of the subroutines. These statements can be activated through IDIAG. Normally, IDIAG should be set to zero. Consult the maintenance programmer if diagnostic print is needed. Specific values of IDIAG activate specific diagnostic print statements. (Input)

IOVLY = Overlay channel number. (Input)

IDATA( ) = Array containing the decoded FT data. Dimension of IDATA( ) is 1306 words. (Output)

NERR1(I,J) = One of two output error message arrays. NERR1(,) will hold the error message values for decoding errors (NERR2( ) is used for consistency and data validity errors). The dimensions of NERR1 are I=15 and J=3 words. I is the maximum number of errors allowed and J defines the error as follows:

J	Contents
1	Error number (Table 1).
2	Time of FT group in which error was found.
3	FT phrase where error was found (Table 2).

ICEP = The number of NERR1(,) errors found (maximum of 15). (Output)

NERR2( ) = Second error message array used for consistency and data validity checks (Table 3). Dimension of NERR2( ) is 18 words. (Output)

To use DCDFT, a single FT must be retrieved from the AFOS database, unpacked, and passed to DCDFT for decoding. An FT can be retrieved from the database with subroutines KSRCF, RDBKF, and NXBKF, which are located in the AFOSE.LB. Once retrieved, the FT can be unpacked into the array IFT( ) with subroutine UNPACK, which is located in UTIL.LB. DCDFT will not accept an FT which is more than two AFOS blocks (256 words) in length. Unpacked, this would be 512 characters--the dimension of IFT( ).

In addition to IFT( ), the calling program must pass certain other information to DCDFT. The two-word array, ICALL( ), must contain either ASCII blanks (40K) or the xxx (packed format) found in the cccFTAxxx product. If the xxx is used, DCDFT will compare it with the call letters found in the FT itself. An error flag will be set if the two do not match. For example, if the product identifier is WBCFTADCA but the FT stored under that identifier is BWI, then DCDFT would flag the discrepancy. If ICALL( ) contains blanks, DCDFT will not do this comparison, it will decode the FT no matter what the call letters are.

In some cases, the user may only need the information for one FT group, in

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* "Z" will be used for time designations rather than "UTC," since "Z" is the format used in FT's.

which case, decoding the entire FT would be inefficient. The variable ITIME is used to tell DCDFT whether to decode the entire FT or only one particular group. To decode the entire FT, set ITIME equal to "-1." To decode a single group, set ITIME equal to an integer value between 0 and 23, inclusive, where the value is the time in whole hours (e.g., 0 = 00Z, 5 = 05Z, 21 = 21Z, etc.). This tells DCDFT to decode the header information (call letters, date/time, etc.) and then search for and decode only that group valid at ITIME.

DCDFT and its subordinate subroutines are set up in an overlay structure as shown by the load line in Fig. 2. Therefore, the calling program must get an available channel and open it for the overlay. The channel number must be passed to DCDFT in the variable IOVLY. DCDFT will then load the overlays as needed. Note, several relocatable binary files, including DCDFT.RB, must be part of the root segment in the load line (Fig. 2). The software structure for all of the subroutines is shown in Figs. 3 through 7.

The decoded FT array, IDATA( ), consists of three record types (Type 1, Type 2, and Type 3), which correspond to the information found in the header (terminal identification, date/time, etc.), specific groups (first 18 hours of a regularly scheduled FT), and categorical groups (last 6 hours), respectively.

There will be one Type 1 record which is 12 words long. The content of each word is defined in Table 4. It should be noted that the sum of words 10 (specific groups) and 11 (categorical groups) is the total number of groups in the FT. The program defines a group to be all information found up to the occurrence of an ASCII period (56K).

Within each specific group (Type 2), the program subdivides the information into phrases. The prevailing section of a forecast group is considered to be one phrase. Each individual remark type (OCNL, CHC, etc.) is also considered to be a phrase. There can be up to 10 specific groups per FT, each of which can have up to five phrases. Twenty-five words are reserved in IDATA( ) for each Type 2 phrase (a total of 1250 words) as shown in Table 5. Each group of 25 words will contain information on the phrase number, phrase type, valid time, sky condition, visibility, weather and obstructions to vision (see Table 6 for their definitions), wind, and frontal passage.

The categorical groups (Type 3) are not subdivided into phrases. DCDFT allows for a maximum of four categorical groups per FT. Eleven words are reserved for each categorical group for a total of 44 words. The content of each word is shown in Table 7.

IDATA( ) is first initialized to all "9999's" by DCDFT. The header information (Type 1) will then be entered into IDATA( ) locations 1 through 12, inclusive, as it is decoded. Following entry of the header information, the decoded forecast data for each phrase in each specific group (Type 2) will be entered beginning at IDATA(13). There will be one 25-word Type 2 record for each phrase. The decoded categorical group data (Type 3) will then be added to the array as the 11-word records immediately after the last Type 2 record.

In order to describe how the decoding process works, it is important to understand the basic structure of an FT as shown below:

xxx FT [COR RTD AMD #] ddsheh [issuZ] prevailing [remark(s)].

```
[hh[mm]Z prevailing [remark(s)].]  ----->  hh[mm]Z categorical.
[hh[mm]Z categorical]..
```

where,

[ ]	=	Optional, but required under certain circumstances.
xxx	=	Call letters.
FT	=	Product identifier.
COR	=	Corrected FT.
RTD	=	Routine delayed FT.
AMD #	=	Amended FT with amendment number, #, separated from "AMD" by one blank.
ddsheh	=	Six-digit date/time group, where "dd" is the two-digit date, "sh" is the two-digit starting hour of the FT, and "eh" is the two-digit ending hour.
issuZ	=	Four-digit issuance time required when "COR," "RTD," and/or "AMD #" is used. It is the hour (two-digits) and minute (two-digits) that the FT was issued, followed immediately by a "Z."
prevailing	=	Prevailing forecast conditions. At a minimum, it will contain a cloud group. It may also contain one or more of the following: frontal passage, visibility, weather type, obstruction to vision, wind (direction, speed, gust).
remark(s)	=	One or more phrases which contain information that is different from or expands on the information contained in the prevailing phrase. "OCNL," "CHC," "SLGT CHC," "VCNTY," "WND," and "LLWS" phrases are those handled by DCDFT. Note, although a flag will be set that a "LLWS" phrase was found, the information specific to it (speed, direction, height) will not be decoded.
hh[mm]Z	=	Group time at which the forecast information following it (up to the "." which terminates the group) is expected to occur. Group times are shown in whole hours, hh, or hours and minutes, hhmm, followed immediately by a "Z."
categorical	=	Categorical forecasts for "VFR," "MVFR," "IFR," or "LIFR" conditions. These may be followed by general information on sky conditions, weather, obstructions to vision, and/or wind.
.	=	Terminator for FT group.
..	=	Terminator for FT.

As shown above, many sections or words are optional. However, in many cases, when one of the options is used, one or more of the other options become mandatory. Also, this does not account for all scenarios which are possible and which are checked for by DCDFT (e.g., "DLAD TIL hhmmZ," "FT NOT AVBL," "event TIL hhZ," etc.).

The FT shown in Fig. 8 will be used to describe the decoding process. Fig. 9 shows the FT in the decoded array IDATA( ). The call letters appear in packed ASCII format in line 1, words 1 and 2 (Fig. 9). The "BU" of "BUF" is stored in word 1 and the "F" followed by a null byte is stored in word 2. This is a routine FT which does not contain AUTOB input, so words 3, 4, and 5 are set to "0." The FT was valid from 09Z on the 21st day of the month to 09Z the next day. Therefore, the date (word 6) is "21," the start time is "9" (word 7), and the end time is "9" (word 8). Since this was a routine FT, there is no

four-digit issuance time, so word 9 remains set to "9999." Words 10, 11, and 12 are actually updated following the decoding process when the decoder has determined the number of specific and categorical groups and the total number of specific phrases. It can be seen from the FT, however, that there are two specific groups, 09Z and 14Z, and one categorical group at 03Z, which is reflected by the contents of words 10 and 11, respectively. Within the specific groups, there are a total of eight phrases (prevailing - 2, OCNL - 2, LLWS - 2, and CHC - 2) as shown in word 12.

The decoded values for each of the eight specific phrases are shown in lines 2 through 9. Note that all phrases within one group are labeled with the same group number (word 1). In this example, the starting (word 3) and ending (word 4) times for each phrase within a group are the same. If the FT had contained a time qualifier (e.g., TIL or AFT) which modified the time of a particular phrase, then this would appear in words 3 and 4.

All 25 words will be updated for each prevailing phrase (word 2 = 0), except for words 8, 12, and 16, which will always be "9999." If an element does not physically appear in a prevailing phrase, a default value will be assigned. For instance, a prevailing visibility of 7 mi or greater will not actually appear in an FT, so DCDFT will assign the default value of 700 (7 mi) for that phrase (word 17). If no weather or obstructions to vision are forecast in the prevailing phrase, DCDFT will set words 18, 19, 20, and 21 equal to "0." If the prevailing wind speed forecast is less than 6 kt, neither the speed nor the direction will appear. Here, DCDFT will set the direction, speed, and gust locations (words 22, 23, and 24) to "0." The frontal passage indicator (word 25) will also be set to "0" if no frontal passage is forecast.

The structure of an OCNL phrase is such that only those elements which differ from their prevailing phrase counterparts must actually appear in the phrase. Those elements not appearing in the OCNL phrase are automatically assigned the corresponding value from the prevailing phrase. This occurs in both groups in the example. Note in Fig. 8 that a wind group is included in each prevailing phrase but not in the OCNL phrases. DCDFT will then assign the prevailing wind to the corresponding OCNL phrase as shown by words 22, 23, and 24 of lines 4 and 8 (Fig. 9). The occurrence of a CHC or SLGT CHC phrase must be handled differently, however. Only those elements specifically stated will be included in the decoded array--no copying of values will be done. If an element is not stated, DCDFT will leave the locations set to "9999." This is necessary because there is no way to tell whether the "missing" elements should be taken from the prevailing phrase, the OCNL phrase (if different), or both. Lines 5 and 9 show the decoded CHC phrases. It is left up to the user to decide how to interpret this information.

For a LLWS, VCNTY, or WND phrase, only certain words will be updated in IDATA( ). This would be words 1 through 4 for LLWS, words 1 through 4 and 18 through 21 for VCNTY, and 1 through 4 and 22, 23, and/or 24 for WND. All other words will remain as "9999."

The group number associated with the categorical groups (line 10, word 1) will begin where the specific group numbers left off. This way all groups, specific and categorical, are consecutively numbered. The categorical phrase type (word 2) will always be set to "6." The phrase start and end times are determined the same way as they are for the specific groups. Similar to the

prevailing phrases in the specific groups, all words will be updated to either the forecast value or to a default value.

3. CAUTIONS

1. Both error code arrays (NERR1(,) and NERR2( )) should be checked before any data from IDATA ( ) are used. If any error codes are set, then all the IDATA( ) values for that FT should be considered questionable until visually inspected.

2. IDATA( ) is initialized to all "9999's." Therefore, a value of "9999" does not necessarily mean an error was encountered. It only indicates that the value was not modified during the decoding process because either the structure of the phrase being decoded did not require any modification or a decoding error prevented modification.

3. The decoder reads an FT from left to right. It expects to see various FT structures in a specific order. If this order is not followed, or if a typographical error makes it appear as though the order is not being followed, an error flag will be set. The following FT group illustrates the latter point:

   10Z C20 BKN 2R 2310G30 SLT CHC TRW.

   The error is that "SLT" should have been "SLGT." However, because of that particular spelling error and its location in the FT group, error code 29 (Table 1) will be set, which means that it expected to find the phrase "VCNTY" after a weather type. Why did it expect "VCNTY"? Once the prevailing conditions have been decoded, DCDFT checks to see if there are more characters before the period at the end of the group. In this case, there are. DCDFT begins to decode them as the remark phrase. The first word is compared to a list of possible words (e.g., OCNL, CHC, LLWS, SLGT, etc.) which can signal the start of a remark phrase. "SLT" is not one of the acceptable words so DCDFT checks to see if it is a string of weather characters. Here, the "SLT" can be decoded as snow (S), drizzle (L), and thunder (T). The only FT remark structure which would allow for a weather type to start a remark phrase is "VCNTY" (e.g., TRW VCNTY). Since the next word is not "VCNTY," the error flag is set.

4. Consecutive weather and/or obstruction to vision characters cannot be separated by blanks nor continued on a separate line (the program will replace the carriage return/line feed characters with blanks). For example, "3RW F" is not acceptable but "3RWF" is acceptable. This format requirement is necessary to allow proper interpretation of the following structure:

   . . . 3RWF TRW VCNTY

   If blanks were allowed between the weather types, then "RWF" and "TRW" would be treated as being part of the same weather group. Finding the word "VCNTY" would then result in an error. With the blank signifying the end of the prevailing weather string, DCDFT can properly decode the "RWF" associated with the 3 mi visibility and the "TRW" with

"VCNTY." An exception to splitting weather types between lines is when the "/" symbol is used (e.g., RW/TRW). This structure will be handled properly if the "/" is either the last character on one line or the first nonblank character on the next line. The following two examples illustrate acceptable formats:

1.) xxx FT 170808 C50 OVC 3RW/
TRW. 02Z MVFR..

2.) xxx FT 170808 C50 OVC 3RW
/TRW. 02Z MVFR..

5. The characters "FT" must follow the call letters (xxx FT . . .). If they are missing, DCDFT does not know which three- or four-character string to use for the call letters so the error code 3 (Table 1) will be set.

6. At a minimum, each FT specific group is required to contain a cloud phrase in the prevailing section. If it is missing, it is possible that DCDFT will not realize it or decode it improperly. For example, decoding "xxx FT 200909 1/4F. 03Z VFR.." results in error codes 9 and 16 (Table 1).

7. For those circumstances when an "either/or" situation exists, use of the "/" symbol to separate the weather types will be accepted but the word "OR" will not (3RW/TRW vs. 3RW OR TRW).

8. The three or four consecutive, nonblank characters immediately preceding the "FT" character string will be used as the call letter sequence. If four characters are found, the first must be the vertical bar symbol (¦), which does not get stored. The following examples illustrate what will be stored in words 1 and 2 (Type 1) when those characters are not the call letters (first two examples) and when they are the call letters (last example):

FT's	Stored characters
¦AA FT 150808 CLR. 02Z VFR..	¦AA
¦BBB COR FT RTD 151208 1145Z CLR. 02Z VFR..	COR
¦CCC FT COR RTD 151208 1145Z CLR. 02Z VFR..	CCC

9. LLWS phrases are not decoded nor checked for consistency. DCDFT will scan past a LLWS phrase until it finds another valid phrase (e.g., OCNL) or the end of the group (i.e., the period).

10. The variable IDIAG must be set to 0. This argument was used during development to allow for easy printing of diagnostic data in each routine. If this variable is not set to 0, unwanted dasher printing may occur.

4. REFERENCES

National Weather Service, 1984: Aviation terminal forecasts. NWS Operations Manual, Chapter D-21, Manual Issuance 84-14, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 44 pp.

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Vercelli, D. J. and G. A. Norman, Jr., 1985: AFOS monitoring of terminal forecasts. NOAA Techniques Development Laboratory Computer Program NWS TDL CP 85-1, National Weather Service, NOAA, U.S. Department of Commerce, 23 pp.

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_____ and M. Leaphart, 1987: AFOS terminal forecast quality control. NOAA Techniques Development Laboratory Computer Program NWS TDL CP 87-5, National Weather Service, NOAA, U.S. Department of Commerce, 26 pp.

Wantz, J. and C. Eggers, 1987: AFOS terminal aerodrome forecast formatting. NOAA Techniques Development Laboratory Computer Program NWS TDL CP 87-1, National Weather Service, NOAA, U.S. Department of Commerce, 11 pp.

5. SUBPROGRAM INFORMATION

AFOS TERMINAL FORECAST DECODING

SUBPROGRAM INFORMATION AND INITIATION

PROGRAM NAME: DCDFT AAL ID: LBS020
Revision No.: 1.00

PURPOSE: Decodes one aviation terminal forecast (FT) each time it is called. DCDFT, a FORTRAN callable subroutine, expects the input data to be one unpacked FT which is no longer than two AFOS blocks. It also expects that the FT was written according to the requirements and guidelines defined in NWS (1984, 1985). The output will be an array which contains the decoded FT information.

Special Note: Although this FT decoder has the same name as the original FT decoder (NWS, 1985), they are not compatible. The calling arguments, definitions, array sizes, array structures, options, error returns, and load line structure have all been changed. To avoid any confusion, the new DCDFT is being issued as a collection of .RB's in a file called LBS020. The old decoder (DCDFT and REMDEC) will remain with the library identifier, LBS016.LB. This is because there are a number of applications programs which will continue to use the old decoder for the foreseeable future. Note, however, that the old decoder will no longer be supported. Users are encouraged to use the new decoder for all future development.

PROGRAM INITIATION:

FORTRAN call statement:

```
CALL DCDFT (IFT,ICALL,ITIME,IDIAG,IOVLY,IDATA,NERR1,ICEP,NERR2)
```

IFT( ) = Array containing one unpacked, coded FT. Dimension of IFT( ) is 512 words. (Input)

ICALL( ) = Array to hold the xxx portion of the cccFTAxxx product identifier (packed) or ASCII blanks. Dimension of ICALL( ) is 2 words. (Input)

ITIME = Group selection variable. (Input)
-1: Decode entire FT (all groups).
0 through 24, inclusive: Decode only that group valid at ITIME, where ITIME is the whole hour (0 = 00Z*, 5 = 05Z, 21 = 21Z, etc.).

IDIAG = Diagnostic print statements are included in many of the subroutines. These statements can be activated through IDIAG. Normally, IDIAG should be set to zero. Consult the maintenance programmer if diagnostic print is needed. Specific values of IDIAG activate specific diagnostic print statements. (Input)

IOVLY = Overlay channel number. (Input)

IDATA( ) = Array containing the decoded FT data. Dimension of IDATA( ) is 1306 words. (Output)

NERR1(I,J) = One of two output error message arrays. NERR1(,) will hold the error message values for decoding errors (NERR2( ) is used for consistency and data validity errors). The dimensions of NERR1 are I=15 and J=3 words. I is the maximum number of errors allowed and J defines the error as follows:

J	Contents
1	Error number (Table 1).
2	Time of FT group in which error was found.
3	FT phrase where error was found (Table 2).

ICEP = The number of NERR1(,) errors found (maximum of 15). (Output)

NERR2( ) = Second error message array used for consistency and data validity checks (Table 3). Dimension of NERR2( ) is 18 words. (Output)

COMMON BLOCKS: These common blocks are used internally by DCDFT and should not be defined in the calling program.

```
/WX1/IWX1(10), ITN1(10), IDEF1(10)
/WX2/IWX2(28), ITN2(14), IDEF2(14)
/WX3/IWX3(3), ITN3(1), IDEF3(1)
/CDCDFT/ICCVR(3,4), IDCVR(4)
/MNTH/MON(12)
/CKVIS/NVIS(12)
/XWI/IWEX(25)
/SPW/ISPW4(20), ISPW3(33)
```

DISK FILES: There are no disk files accessed by DCDFT.

LOAD LINE:

```
RLDR (user-defined code)...DCDFT CLD COUNT SSEARCH IUANDEC NXTWRD DCDGRP
POUT BLNKPH WXCHKR CHKR3 CHKR2 CHKR1 DUBWX [FTCOMP SPLTWX FINDSCL DFTYPE
DDSHEH AMD CKDLAU CKDLDA CKAUTOB CKDLPER FINDGRPS POSFIND, CATPHR CATDCD
CATCW FRONTAL PHRCLD DRVWW VSBLTY VBWXWD SPWCHKR TQCHKR SPWIND NEWPWD
NEWWXP WXWD VCNTY REMARKS OCNL CDVSSPWX WNDTQ CPYPRV CHC OBWX SLGTCHC LLWS
WIND COMPCAT, FNLCHK FNL1 FNL2 FNL3 FNL4 FNL5 FNL6 FNL7 FNL8 FNL9
FNL10]....
```

PROGRAM SPECIFICATIONS

Development Programmer(s):	Maintenance Programmer(s):
David J. Vercelli Mark Leaphart	David J. Vercelli
Location: Techniques Development Laboratory	Location: Techniques Development Laboratory
Phone: FTS - 427-7393	Phone: FTS - 427-7393
Language: FORTRAN IV/Rev 5.20	Type: FORTRAN CALLable Overlay
Library creation date: -	July 1988
Running time (based upon 10 terminals):	5 sec/FT
Disk space: Program files -	211 RDOS blocks

PROGRAM REQUIREMENTS

Program files:

NAME	COMMENTS
LBS020	DCDFT and all subordinate subroutines are contained in this file.

Data files: None

ERROR CONDITIONS

See Tables 1 and 3 for error return codes, discussion, and suggested actions.

Table 1. NERR1(,) error codes. The number in the first column is the number returned in NERR1(,). The number and error message in the second column are what appear in the display produced by the FTQC program (Vercelli and Leaphart, 1987). The discussion and suggested actions are the same as that given for the FTQC program with a few minor modifications. The discussion provides information on likely causes for the errors, and suggested actions which may be followed by the user to correct the problem. Note, a value of "-1" in location NERR1(1,1) means that no decoding errors were found. NERR2( ) errors should be checked seperately.

Error code	FTQC display code number and error message	Discussion	Suggested Action
1	20 UNDEFINED PROBLEM - PERFORM VISUAL CK	Problem was encountered during decoding but nature of problem could not be determined.	Perform visual quality control on FT. Make hard copy of FT and forward to TDL.
2	21 COULDN'T FIND PERIODS TO END FT (..)	Program will accomodate an FT up to 512 characters in length (2 AFOS blocks). Either the FT was exceptionally long or the FT terminator (two consecutive periods) was missing. Loop indices are set based upon location of the two periods.	Verify that FT ends with two consecutive periods.
3	22 CAN'T FIND CALL LETTERS ('XXX FT' OR ' XXX FT')	DCDFT uses the characters "_FT" to key on the location of the call letters, where "_" signifies a required blank. It will use the three or four preceding nonblank characters as the call letters. This error may also occur if there is an error immediately following the "FT," such as the date/time group, amendment number, or issuance time being typed wrong or placed in the wrong order.	Make sure call letters are followed by at least one blank and then the "FT" characters. If this appears correct then check the date/time group (must be six digits); AMD_#, RTD, or COR characters if present; or the issuance time (four digits followed by "Z"). See NWS (1984) for the correct ordering of the words.
4	23 EXPECT 'FT' THEN 'DDHHHH', 'AMD', 'RTD', OR 'COR'	Similar to # 3. Sequence of events will determine which error message appears.	Same as # 3.
5	24 COULDN'T FIND 6 DIGIT DATE/TIME GROUP (DDHHHH)	Similar to # 3.	Same as # 3.
6	25 COULDN'T FIND AMD # (FORMAT: AMD #)	Word AMD was found but the amendment number was not.	Make sure the amendment number follows word AMD and is separated from it by at least one blank. ("AMD 1" will work, "AMD1" will not).

Table 1. Continued.

7	26 EXPECT 'COR' THEN 'RTD', 'AMD', OR 'DDHHHH'	Word COR was found but program expected it to be followed by RTD, AMD, or the six digit date/time group.	Make sure that, if this is a corrected FT, word COR immediately follows the "FT" characters separated by at least one blank.
8	27 EXPECTED 'DLAD..', 'DLAD TIL HHZ (OR HHMMZ)..'	Sequence of characters found indicated this would be a delayed FT.	Make sure format is correct for delayed FT. Program will look for the following three structures: DLAD.. DLAD_TIL_hhZ.. DLAD_TIL_hhmmZ.. There can be no blanks between the last character and the two periods, the "_" is a required blank, and the hh and mm are hours and minutes, respectively.
9	28 NO CATEGORICAL OUTLOOK GROUP FOUND (EG. VFR)	At least one categorical outlook group is expected to be found.	Check for missing or misspelled word.
10	29 EXPECTED GRP TIME (FORMAT: HHZ OR HHMMZ)	Program begins by searching for the period (.) following each group and the group time for each (two or four digits followed immediately by "Z").	Make sure all groups (except first) begin with a two or four digit time followed by a "Z." This applies to the first group only for a nonscheduled issuance.
11	30 TOO MANY SENTENCES - PROGRAM LIMIT OF 14	A maximum of 14 FT groups (sentences) will be decoded, where a period (.) terminates a group.	If there are more than 14 groups, perform visual quality control on FT. Otherwise, look for extraneous period(s) in text, delete them, and rerun program.
12	31 TROUBLE FINDING USER SPECIFIED TIME GROUP	FT group valid for the specified time could not be found.	Check that ITIME variable is set to a hourly value (0 through 24).
13	32 INVALID REMARK APPENDED TO CATEGOR (EG. VFR CIG)	Program checks that any words which follow the categorical forecast are acceptable. For example, "VFR CIG" would not be acceptable.	Verify that words following the categorical forecast are acceptable for the stated condition.
14	33 MORE THAN 3 CLOUD DECKS FOUND	Program will allow for a maximum of three consecutive cloud decks in any FT phrase (prevailing or remark). Note, a partial (-X) obscuration will be counted as a cloud deck towards the limit.	Make sure that no more than three consecutive cloud decks are used in any one cloud phrase (two decks if a partial obscuration is included).

Table 1. Continued.

15	34	INVALID WORD FOLLOWING VISIBILITY (EG. 5 CHC)	Value appearing to be visibility was found but following word could not be decoded as the weather group.	Check for missing or misspelled weather words.
16	35	EXPECTED WX OR OBSTRUC TO VIS	After the cloud group has been decoded, program looks for a visibility followed by weather and/or obstructions to vision or the weather and/or obstructions to vision alone if the visibility is not present (i.e., greater than 6 mi).	Check for words out of order or words which have been combined because of a missing blank or by an extra blank (e.g. "CLR 2 510." will interpret the "2" as the visibility and expect the weather to follow it.)
17	36	INTENSITY SYMBOL NOT ALLOWED	Obstructions to vision should not have an intensity symbol and weather types should only have light (-), moderate (no symbol), or heavy (+) following them.	Check intensities for all weather and obstruction elements in the specified group.
18	37	WX INTENSITY NOT ALLOWED IN CATEGORICAL GROUP	According to NWS (1984), standard weather abbreviations are to be used "without precipitation intensities."	Delete intensity symbols from weather types in categorical outlook group.
19	38	EXPECTED END OF SENTENCE (.)	Program was looking for a period (.) to end a group but did not find it.	Make sure each FT group ends with a period and that there are no extraneous periods in the FT. Occasionally, a misspelled word or unusual character string will disrupt the left to right scanning sequence resulting in this error. For example, "hhZ 50 -OVC KLYR." will produce this error.
20	39	MUST HAVE PRECIP IN CHC/SLGT CHC REMARK	According to NWS (1984), "'Chance' (CHC) or 'Slight Chance' (SLGT CHC) shall be used to indicate the forecast Probability of Precipitation values..." Therefore, precipitation and/or thunderstorms must be part of a CHC or SLGT CHC phrase.	Make sure that a CHC or SLGT CHC group has precipitation and/or thunderstorm as part of the phrase. CHC or SLGT CHC with only obstructions, clouds, and/or winds is not acceptable.
21	40	DOESN'T START WITH VALID REMARK WORD (EG. OCNL)	According to NWS (1984), "Each remarks section shall begin with a valid remarks indicator (e.g., OCNL)." Phrases such as "SCT OCNL BKN" do not meet this criterion.	Rephrase remarks (such as "SCT OCNL BKN") to ensure each phrase begins with a valid remarks indicator. An exception is with the use of the word VCNTY. Here, a valid weather type will be accepted prior to VCNTY.

Table 1. Continued.

22	41	REWORD PHRASE TO AVOID USE OF LYR(S) OR LWR	Similar to # 21.	Same as # 21.
23	42	EXPECTED WIND DIRECTION AND SPEED AFTER 'WND'	Word WND found without corresponding ddff group.	Check for missing or misplaced wind group.
24	43	PHRASE INCOMPLETE (EG. 'SLGT' WITHOUT 'CHC')	Certain words or phrases are expected to be found in combination with other words (SLGT followed by CHC, TIL followed by a time, etc.)	Check for possible missing (or misspelled) words which should normally be found together.
25	44	CK PREVAILING AND REMARK CLD PHRASES - REDUNDANCY	Program looks for phrases which repeat themselves (e.g., CLR OCNL CLR).	Reword phrase to avoid redundancy.
26	45	NEED CLD HGT SINCE PREVAILING WAS CLR	Program checks to see that any cloud amount in a remark has a height associated with it if the prevailing amount was clear. For example, "CLR OCNL SCT" would not be accepted.	Check that all cloud amounts have a height value.
27	46	FOUND MORE THAN 1 LLWS PHRASE IN GRP	Program will not decode any LLWS phrase. It will read past the entire phrase until it finds another remark phrase (e.g., OCNL) or a period. Program will only allow for one LLWS phrase for each group.	Reword remark to include only one LLWS phrase or perform visual quality control.
28	47	UNEXPECTED/UNKN WORD FOUND - PERFORM VISUAL CK	Program checks for a variety of standard words and abbreviations which are common to FT's. If it does not recognize a word, it checks to see if it is a weather type or combination of weather types. If this fails, then program will produce this error message.	Look for misspelled words (e.g., SLDT instead of SLGT, etc.).
29	48	EXPECTED 'VCNTY' TO FOLLOW WX TYPE IN REMARK	Once DCDFT has decoded the prevailing information, it begins to decode the remarks. It expects each remark phrase to begin with a valid remark indicator (OCNL, CHC, etc.). If these are not found, but non-numeric characters are found, then DCDFT attempts to decode them as weather types. If all characters can be associated with weather and/or obstruction to vision, then DCDFT expects to find the word VCNTY immediately after them.	Check for a misspelled word where each character in the word could be a weather and/or obstruction to to vision element. For example, this error will be produced for the following case "... 2215G35 SLT CHC TRW." Since "SLT" is not a recognized word (should have been "SLGT"), DCDFT checks for weather (S-snow, L-drizzle, T-thunder) and then "VCNTY," which does not appear; hence, the error.

Table 1. Continued.

30	49 EXPECT WX IN DESCENDING SIGNIF ORDER (EG. TRWF)	Program expects to find weather and obstructions to vision in decreasing order of significance (i.e., TRWF, not FRWT).	Check order of weather types.
31	50 INVALID TIME FOUND (< 0000 OR > 2400)	Character string expected to be a time (two or four digits followed by "Z").	Check character strings which consist of two or four numeric digits which may be incorrectly placed in the specified group.
32	51 NEED CLD HGT FOR CLD AMT	When a cloud amount is found, a corresponding height is expected. For example, "OCNL BKN" is not acceptable.	Check the specified FT group for a cloud amount without a corresponding height.
33	52 MISSING 'Z' IN HHZ-HHZ TIME STRUCTURE	Decoder has located a character string which it expects to be a time, however, to be a time a "Z" is required to immediately follow it.	Check for group times which may have a blank between the time and the "Z" or a missing "Z." Also, check for a misplaced wind group.
34	53 CK FOR REDUNDANT PHRASE (EG. OCNL--- OCNL---)	Multiple occurrences of the same remark indicator in the same group will be flagged.	Reword phrase to avoid redundancy.
35	54 UNEXPECTED/UNKN WORD/PHRASE - PERFORM VISUAL CHECK	Similar to # 28.	Similar to # 28.
36	55 ILLEGAL VISIBILITY, VALUE IS 7 MI OR GREATER	Numeric value found where visibility was expected but value is too large.	Check for misplaced numeric value or mistyped visibility (e.g., 12 instead of 1/2).
37	56 PROBLEM WITH VISIBILITY	Searching for expected visibility value. Found a.) "/" indicating possible fractional value or b.) non-numeric character in possible visibility string (e.g., 1 1/c).	Same as # 36; also check for possible error in weather string.
38	57 NEED BLANK BETWEEN CALL LETTERS AND 'FT'	Possible call letter string found immediately preceding the "FT" which indicates there is no blank separating them (e.g., xxxFT).	Check for missing blank between call letters and word "FT."
39	58 FT CALL LETTERS DON'T MATCH THOSE REQUESTED	Verifies that call letters passed to program match those found in FT. Only used when cccFTAxxx products are being checked, not for workfile.	Verify that cccFTAxxx product contains the proper "xxx FT" (i.e., the xxx's match).

Table 1. Continued.

40	59 ILLEGAL VALUE FOR DATE	Gross date check for first two digits of six-digit date/time group (DDhhhh) indicates that the "DD" is not between 01 and 31, inclusive.	Check for mistyped date in six-digit date/time group.
41	60 ILLEGAL START TIME (6 DIGIT GROUP)	Similar to # 40 except for the middle two digits which make up the FT starting valid time (ddHHhh). Allowable values are 00 through 23, inclusive.	Check the FT starting valid time for error.
42	61 ILLEGAL END TIME (6 DIGIT GROUP)	Similar to # 41 except for the last two digits which make up the ending time (ddhhHH). Allowable values are 01 through 24, inclusive.	Check the FT ending valid time for error.
43	62 NEED BLANK AFTER 'AMD'	Found the word AMD but nonblank character found immediately following the last character (e.g., AMD1).	Check for nonblank character immediately after last character in the word AMD.
44	63 NEED BLANK AFTER 'RTD'	Similar to # 43 but for word RTD.	Similar to # 43.
45	64 NEED BLANK AFTER 'COR'	Similar to # 43 but for word COR.	Similar to # 43.
46	65 NEED BLANK AFTER 'TIL'	In process of decoding "DLAD" phrase. Found word TIL but nonblank character found immediately after the "L."	Check for missing blank after word TIL in "DLAD TIL hhmmZ.." phrase.
47	66 EXPECTED TWO CONSECUTIVE PERIODS AFTER DLAD TIME	Similar to # 46 but the FT terminator (..) does not immediately follow the "Z" in the "DLAD TIL hhmmZ.." phrase.	Check for extraneous character following the "Z" in the "DLAD" phrase
48	67 CHECK DLAD FOR TIME PROBLEM	Expected to find two numeric characters (hours) or four numeric characters (hours and minutes) in "DLAD" phrase indicating time.	Check for mistyped or extraneous characters in the time portion of the "DLAD" phrase.
49	68 NEED 'Z' FOLLOWING DLAD TIME	Expected to find "Z" immediately following the time portion of the "DLAD" phrase (hhmmZ).	Check for missing "Z" in "DLAD" time.
50	69 'Z' MISSING FROM AFT/TIL TIME STRUCTURE	Time group found following words AFT or TIL (e.g., TRW AFT 15Z) but the "Z" does not immediately follow the time (e.g., 15 Z).	Check for mistyped or misplaced character following time field in "AFT" or "TIL" phrase.
51	70 INVALID WIND GUST FIELD FOLLOWING 'G'	Found wind gust field but value is less than 10 or greater than 999.	Check for mistyped or misplaced wind gust field.

Table 1. Continued.

52	71 NEED BLANK OR PERIOD AFTER WIND FIELD	After wind direction and speed are found, program looks for either a blank, period, or gust field.	Check for mistyped or misplaced character after wind field (ddff).
53	72 TIME PROBLEM FOUND - EXPECTED 2 OR 4 DIGITS	A time field of two or four consecutive numeric digits was expected but not found.	Check for error in time group (e.g., 155Z instead of 15Z or 1550Z).

Table 2. To assist the user in locating the position of an error, a code value corresponding to the phrase being checked (or last checked) is stored in NERR1(,3) as shown below.

Code value	Phrase	Comments
-1	Heading	Problem occured while decoding header information (e.g., call letters, date, group times, or group terminators).
0	Prevailing	For code values 0 through 5, the program was either decoding the specified phrase or, in some cases, beginning to decode another phrase but an error was encountered prior to identifying its type, so the code for the last decoded phrase is used.
1	OCNL	
2	CHC	
3	SLGT CHC	
4	WND	
5	Categorical	

Table 3. NERR2( ) is an 18 word array. Each word, N, corresponds to a different error check in the program. If NERR2(N) = 0, then no error was found. If NERR2(N) = 1, then the error is that listed below. Each N must be checked separately. The number, N, in the first column is the array location in NERR2( ). The number and error message in the second column are what appear in the display produced by the FTQC program (Vercelli and Leaphart, 1987). The discussion and suggested actions are the same as that given for the FTQC program. NERR1(,) errors should be checked separately.

N	FTQC display code number and error message	Discussion	Suggested action
1	73 SYSTEM DATE READ ERR - CAN'T VERIFY DATE/TIME	A comparison is made between the system's date and the date found in the FT. This indicates a problem reading the system date.	Possible system error. Check system clock and rerun FTQC.
2	74 SYSTEM TIME READ ERR - CAN'T VERIFY DATE/TIME	Similar to # 1 but for the system time (hours and minutes).	Same as # 1.
3	75 CHECK FOR POSSIBLE DATE ERR IN 6-DIGIT DATE/TIME	Comparison between system date and FT date indicates possible error in the date portion of the six-digit FT date/time group.	Check for possible error in first two digits of six-digit date/time group (e.g., system date = 15, FT date = 18).
4	76 FT END TIME (6-DIGIT GRP) SHOULD BE 24, NOT 00	If the FT ending valid time is the change of day, then the value should be "24" and not "00." The opposite is true for the FT starting time (e.g., xxx FT dd0024).	Check the last two digits in the six-digit date/time group and ensure that they are not set to "00."
5	77 CATEGORICAL GRP DOESN'T START 6-HRS BEFORE FT END	The categorical outlook group (e.g., VFR) begins 6 hours prior to end of FT valid period. Program compares first categorical group time to the last two digits of the six-digit date/time group.	Check that the first categorical outlook group time begins 6 hours prior to end of FT.
6	78 STARTING VALID TIME INCONSISTENT W/ 4-DIGIT ISS.	The starting FT valid time (middle two digits in six-digit date/time group) is compared to the four-digit issuance time (e.g., amended FT's). Current hour (H) should be used if issuance time is H + 00 through H + 29, inclusive; H + 1 is used if issuance time is H + 30 through H + 59, inclusive.	Check that starting FT valid time and issuance time are consistent.
7	79 CHECK FOR ISSUANCE TIME PROBLEM	Check is made to ensure issuance time is between 0000 and 2359, inclusive.	Check for mistyped numeric characters in issuance time.
8	80 START/END VALID TIMES (6-DIGIT GRP) DON'T MATCH	For a regularly scheduled FT (i.e., four-digit issuance time not required), start and end times should match (exception - 0024 is allowed).	Check six-digit date/time group for error in the starting and ending valid times.

Table 3. Continued.

9	81 AMENDMENT ISSUANCE TIME NOT FOUND	"AMD #" was found but the required four-digit issuance time was not found.	Check for mistyped or misplaced issuance time.
10	82 CHECK FOR ILLEGAL WIND DIRECTION (< 0 OR > 36)	Gross wind direction check is made for directions less than 0 or greater than 360 deg.	Check for illegal wind direction value.
11	83 CHECK FOR INVALID VISIBILITY VALUE (SEE CHAP D21)	According to NWS (1984) only visibility values of 0, 1/4, 1/2, 3/4, 1, 1 1/2, 2, 3, 4, 5, 6, and 6+ are allowed in the FT.	Make sure visibility values are only those allowed by NWS (1984). Check for mistyped values (e.g., 2 1/2 instead of 1 1/2).
12	84 REVIEW CLD HGTS-SEE CHAP D21 FOR SUGGESTED VALS	According to NWS (1984) heights should be expressed in hundreds of feet up to 3,000; 500 foot increments from 3,000 to 5,000; and 1,000 foot increments above 5,000. Since specified increments are not mandatory, FTQC will only suggest the user check the values for correctness.	Make sure cloud height values are as desired. For example,"C33 OVC" would be flagged and "C30 OVC" would not be flagged, but both are acceptable.
13	85 -X OR X APPEARS FOR MID OR HIGH CLOUD DECK	Up to three cloud layers can be included in an FT group. A check is made that a cloud layer does not preceed a partial (-X) or total (X) obscuration.	Check for misplaced cloud layer or obscuration (-X or X).
14	86 CLOUD AMOUNTS APPEAR OUT OF ORDER (EG. BKN SCT)	Cloud amounts are cumulative with increasing altitude. A check is made that each higher cloud amount is equal to or greater than the previous layer.	Check for misplaced or mistyped cloud amounts (e.g., C30 BKN 50 SCT).
15	87 CLOUD HEIGHTS DECREASE UPWARDS	Cloud heights increase with each succeeding cloud layer. Program compares cloud heights within each group to ensure heights increase.	Check for mistyped cloud heights (e.g., C30 BKN 5 OVC).
16	88 CAN'T FIND PREVAILING CONDITIONS IN FIRST GROUP	The first phrase in each FT group should be the prevailing conditions. Decoder detected remarks information before the prevailing conditions.	Check for misplaced remark phrase.

Table 4. Type 1 record in array IDATA( ). There will be one Type 1 record per decoded FT. All words are initialized to 9999.

Word	Title	Range/allowable values	Comments
1-2	Call letters	A thru Z, 0 thru 9, 9999	Call letters are stored in packed ASCII format (i.e., two characters per word).
3	Forecast type	0 thru 7, 9999	0 = Routine 1 = Amended (AMD) 2 = Routine delayed (RTD) 3 = Corrected (COR) 4 = Corrected routine delayed (COR RTD) 5 = Corrected amendment (COR AMD) 6 = Delayed (DLAD, DLAD TIL hhZ, DLAD TIL hhmmZ). Note, if a delayed time is given in hours (hh) or hours and minutes (hhmm), then word 9 will contain that time. 7 = FT not available (FT NOT AVBL)
4	Amendment number	0 thru 9, 9999	0 = Routine 1 thru 9 = Amendment number
5	Forecast preparation	0, 1, 9999	0 = Routine 1 = AUTOB input
6	Date	1 thru 31, 9999	Day of the month. First two digits of the six digit date/time group.
7	Start time	0 thru 23, 9999	Starting valid period. Second two digits of the six digit date/time group.
8	End time	1 thru 24, 9999	Ending valid period. Third two digits of the six digit date/time group.
9	Issuance time	0 thru 9999	Any four digit value followed immediately by "Z" will be accepted as the issuance time as long as it appears in the location where the issuance time would be expected.

Table 4. Continued.

Word	Title	Range/allowable values	Comments
10	Number of groups (specific)	0 thru 10, 9999	Number of specific groups (first 18-h of a routine FT, less for unscheduled FT), where the occurrence of an ASCII period (56K) terminates a group. Note, word 10 plus word 11 is the total number of groups in the FT.
11	Number of groups (categorical)	0 thru 4, 9999	Number of categorical groups (last 6-h of routine and unscheduled FT's), where the occurrence of an ASCII period (56K) terminates a group.
12	Number of phrases (categorical)	0 thru 50, 9999	Each specific group can be divided into one or more phrases, where a phrase is defined to be the prevailing conditions or any of the remark types such as "OCNL," "CHC," etc. The total number of records (Types 1, 2, and 3, combined) is equal to: word 12 + word 11 + 1.

Table 5. Type 2 record in IDATA array. There will be one Type 2 record for each phrase in the specific groups. All words are initialized to 9999.

Word	Title	Range/allowable values	Comments
1	Group number	0 thru 10, 9999	All phrases within a group (i.e., up to occurrence of an ASCII period), will be assigned the same group number.
2	Phrase type	0 thru 7, 9999	0 = Prevailing conditions 1 = OCNL 2 = CHC 3 = SLGT CHC 4 = LLWS - Note, LLWS flag will be set if LLWS is found, but any additional LLWS information will not be decoded except for the group time (i.e., only words 1 through 4 will be set, words 5 through 25 will remain 9999). 5 = VCNTY - Note, the event must precede the word VCNTY (e.g., TRW VCNTY). 6 = Categorical - Reserved for type 3 records, see Table 7. 7 = WND
3	Phrase start time	$0 \leq$ time $<$ 2400, 9999	Only a gross check of time values is made. A two digit time is converted to a four digit time by multiplying by 100, four digit times remain unchanged. The four digit time is checked to see if it falls within the given range. If it does, it is accepted; otherwise, an error flag is set. Note, however, if the original FT time is four digits and the minutes portion is wrong (i.e., between 60 and 99), it will still be stored (e.g., 1583Z).
4	Phrase end time	$0 \leq$ time $<$ 2400, 9999	Same as word 3.
5	Cloud height (first layer)	0 thru 500, 888, 9999	Height is in hundreds of feet. A value of 888 signifies unlimited height (i.e., clear) from this level upwards. Initialization value (9999) is used for cloud group decoding problems and for certain remark phrase types (see text). Note, for a partial obscuration (-X), words 5, 6, and 7 will be set to 0, 4, and 1, respectively.

Table 5. Continued.

Word	Title	Range/allowable values	Comments
6	Cloud amount (first layer)	0 thru 4, 9999	0 = CLR 1 = SCT 2 = BKN 3 = OVC 4 = Obscuration
7	Cloud characteristic (first layer)	0, 1, 9999	Used with word 6. 0 = opaque cloud or total obscuration 1 = thin cloud or partial obscuration
8	Cloud type (first layer)	9999	Not used by DCDFT.
9	Cloud height (second layer)	0 thru 500, 888, 9999	Height is in hundreds of feet. A value of 888 signifies unlimited height from this level upwards (i.e. no more than one cloud layer was found). A value of 9999 is defined the same as given in word 5.
10	Cloud amount (second layer)	0 thru 4, 9999	Same as word 6. Note, if an obscuration was found in the second layer, an error flag would be set.
11	Cloud characteristic (second layer)	0, 1, 9999	Same as word 7 for second cloud layer.
12	Cloud type (second layer)	9999	Same as word 8.
13	Cloud height (third layer)	0 thru 500, 888, 9999	Same as word 9, except that no more than two cloud layers were found.
14	Cloud amount (third layer)	0 thru 4, 9999	Same as word 10 for third cloud layer.
15	Cloud characteristic (third layer)	0, 1, 9999	Same as word 7 for third cloud layer.

Table 5. Continued.

Word	Title	Range/allowable values	Comments
16	Cloud type (third layer)	9999	Same as word 8.
17	Visibility	0, 1/4, 1/2, 3/4, 1, 1 1/2, 2, 3, 4, 5, 6, 6+, 9999	These forecast values are stored as whole integers as follows: 0 = 0 1 1/2 = 150 6 = 600 1/4 = 25 2 = 200 6+ = 700 1/2 = 50 3 = 300 9999 = 9999 3/4 = 75 4 = 400 1 = 100 5 = 500 Note, visibilities greater than 6 mi do not actually appear in an FT (except limited use of 6+), so word 7 will be set to the default value of 700 if no visibility is found.
18	Weather/obstruction (first)	See Table 7.	All decoded weather types and obstructions to vision are assigned a code number as defined in Table 6. DCDFT will allow a maximum of four weather codes per phrase. These codes are stored in words 18 through 21.
19	Weather/obstruction (second)	Same as word 18.	Same as word 18.
20	Weather/obstruction (third)	Same as word 18.	Same as word 18.
21	Weather/obstruction (fourth)	Same as word 18.	Same as word 18.
22	Wind direction	0 thru 36, 9999	Wind direction is in tens of degrees. Wind direction and speed will not appear in FT if speed is less than 6 kt. In this case, direction value stored will be 0.
23	Wind speed	0 thru 99, 9999	Wind speed is in knots. Wind speed and direction will not appear in FT if speed is less than 6 kt. In this case, speed value stored will be 0.

Table 5. Continued.

Word	Title	Range/allowable values	Comments
24	Wind gust	10 thru 999, 9999	Wind gust is in knots. Any two or three digit value will be accepted. If no gust is forecast, this word will be set to 0.
25	Frontal passage indicator	0 thru 3, 9999	0 = no frontal passage 1 = CFP (cold) 2 = WFP (warm) 3 = OFP (occluded)

Table 6. Weather and obstruction to vision code numbers. These values may appear in words 18 through 21 (Type 2 records) and words 7 through 10 (Type 3 records). "P" is the precipitation symbol for an AUTOB site and is assigned code number 25.

Weather/obstruction	Code number
None	0
A	1
BD	2
BN	3
BS	4
BY	5
D	6
F	7
GF	8
H	9
IPW, IPW-, IPW+	10, 210, 310
IP, IP-, IP+	11, 211, 311
IF	12
IC, IC-, IC+	13, 213, 313
K	14
L, L-, L+	15, 215, 315
RW, RW-, RW+	16, 216, 316
R, R-, R+	17, 217, 317
SW, SW-, SW+	18, 218, 318
SP, SP-, SP+	19, 219, 319
SG, SG-, SG+	20, 220, 320
S, S-, S+	21, 221, 321
T, T+	22, 322
ZL, ZL-, ZL+	23, 223, 323
ZR, ZR-, ZR+	24, 224, 324
P	25

Table 7. Type 3 record array IDATA( ). There will be one Type 3 record for each categorical group. All words are initialized to 9999.

Word	Title	Range/allowable values	Comments
1	Group number	0 thru 14, 9999	Each categorical group assigned a group number one greater than the last stored in record Type 2, word 1. Categorical groups are not subdivided into phrases.
2	Phrase type	6, 9999	All categorical groups assigned phrase Type 6.
3	Phrase start time	Same as word 3, Table 5.	Same as word 3, Table 5.
4	Phrase end time	Same as word 4, Table 5.	Same as word 4, Table 5.
5	Category type	1 thru 4, 9999	1 = VFR 2 = MVFR 3 = IFR 4 = LIFR
6	Cloud type	0 thru 4, 9999	0 = no cloud 1 = CLR 2 = NO CIG 3 = CIG 4 = CIG ABV 100
7	Weather/ obstruction (first)	See Table 6.	Code numbers are defined in Table 6. The codes are stored in words 7 through 10. Intensity symbols are not allowed.
8	Weather/ obstruction (second)	Same as word 7.	Same as word 7.
9	Weather/ obstruction (third)	Same as word 7.	Same as word 7.
10	Weather/ obstruction (fourth)	Same as word 7.	Same as word 7.
11	Wind	0, 1, 9999	0 = no WND 1 = WND

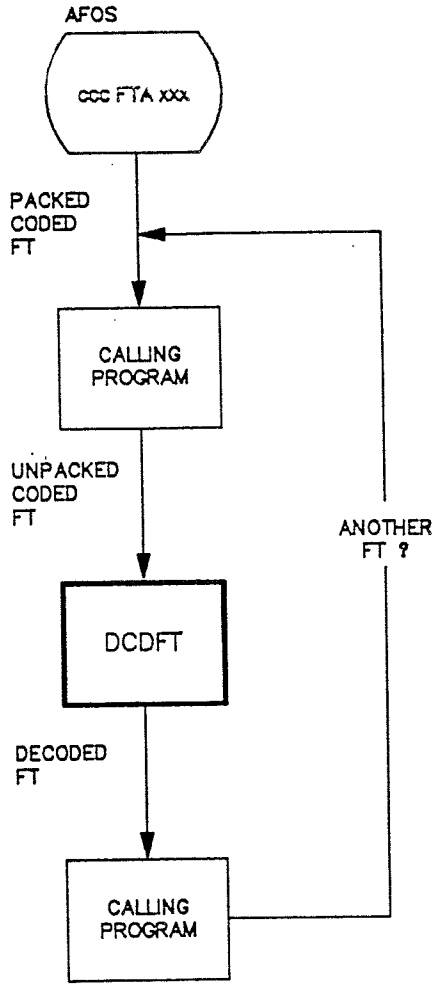

Figure 1. Data flow and program relationships for the FT decoder. The decoder, DCDFT, is designated by the heavy box, user defined code by the light boxes, and the AFOS database by the cylinder.

LOAD LINE

RLDR (user-defined code)...DCDFT CLD COUNT SSEARCH IUANDEC NXTWRD DCDGRP POUT BLNKPH WXCHKR CHKR3 CHKR2 CHKR1 DUBWX [FTCOMP SPLTWX FINDSCL DFTYPE DDSHEH AMD CKDLAU CKDLDA CKAUTOB CKDLPER FINDGRPS POSFIND, CATPHR CATDCD CATCW FRONTAL PHRCLD DRVWW VSBLTY VBWXWD SPWCHKR TQCHKR SPWIND NEWPWD NEWWXP WXWD VCNTY REMARKS OCNL CDVSSPWX WNDTQ CPYPRV CHC OBWX SLGTCHC LLWS WIND COMPCAT, FNLCHK FNL1 FNL2 FNL3 FNL4 FNL5 FNL6 FNL7 FNL8 FNL9 FNL10] ....

Figure 2. Load line for DCDFT subroutines. The root segment and overlay structure must be set up as shown.

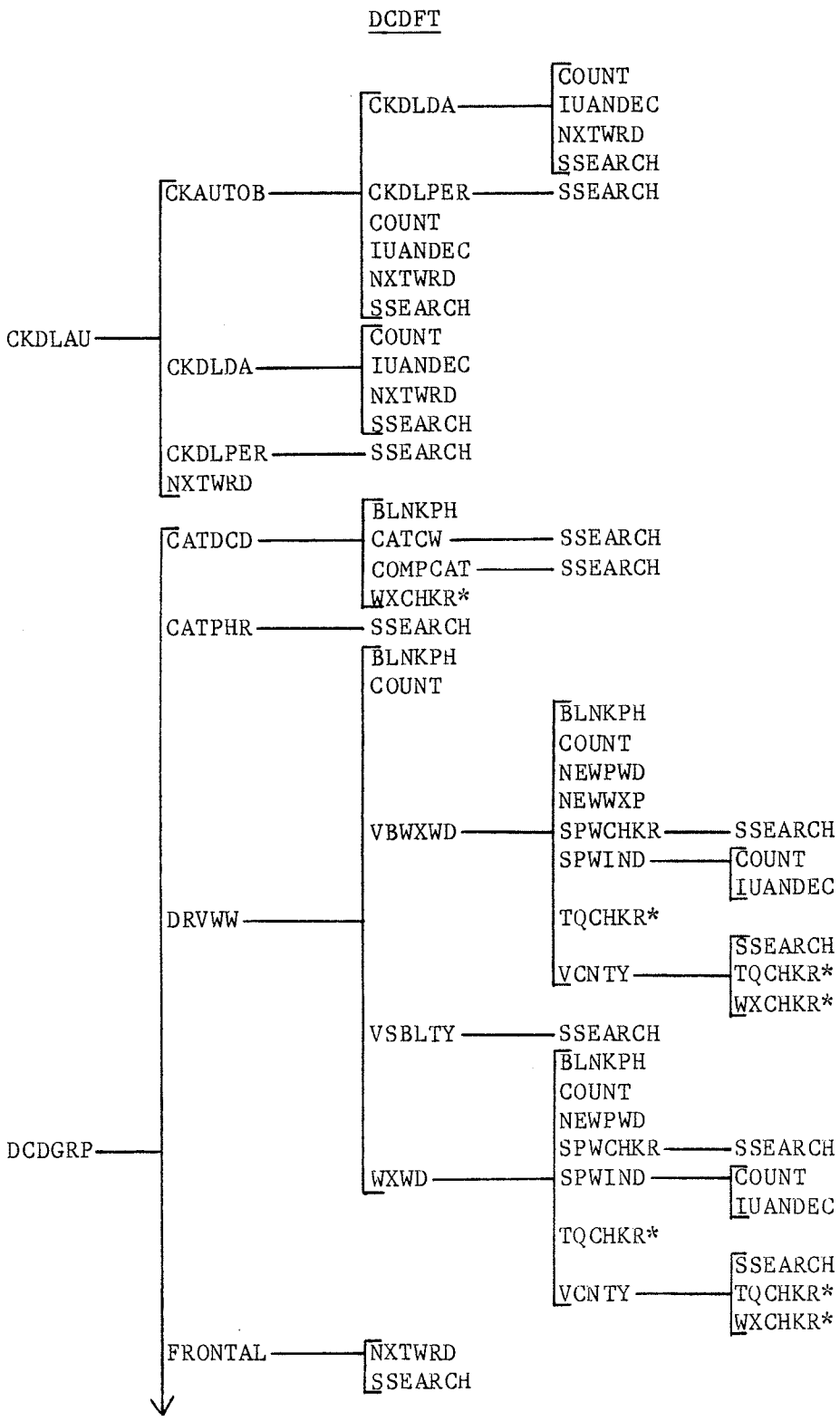

Figure 3. Software structure for the DCDFT subroutines. *See Figs. 4, 5, 6, and 7 for the structure of subroutines OCNL, CHC, TQCHKR, and WXCHKR, respectively.

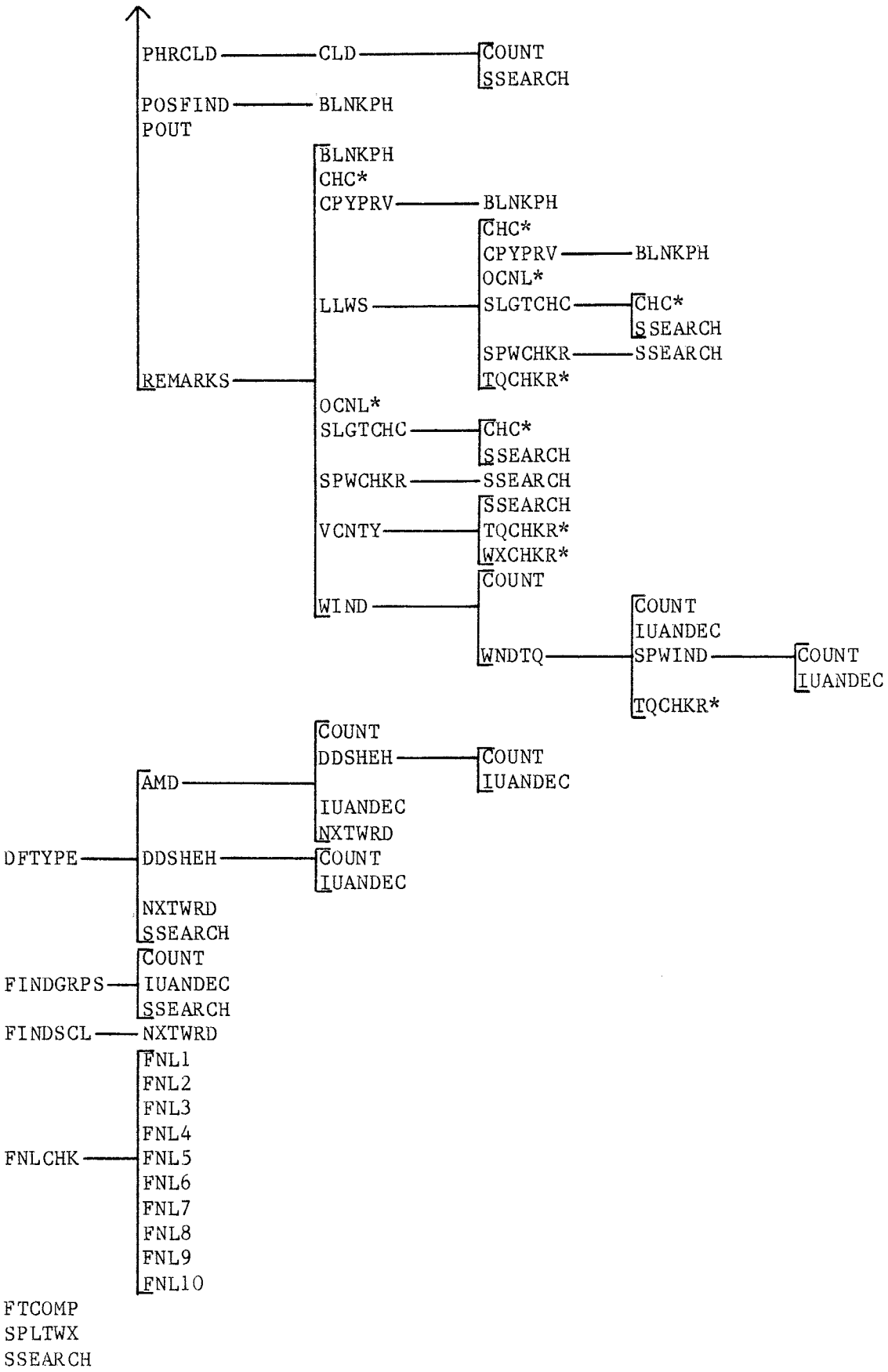

Figure 3. Continued.

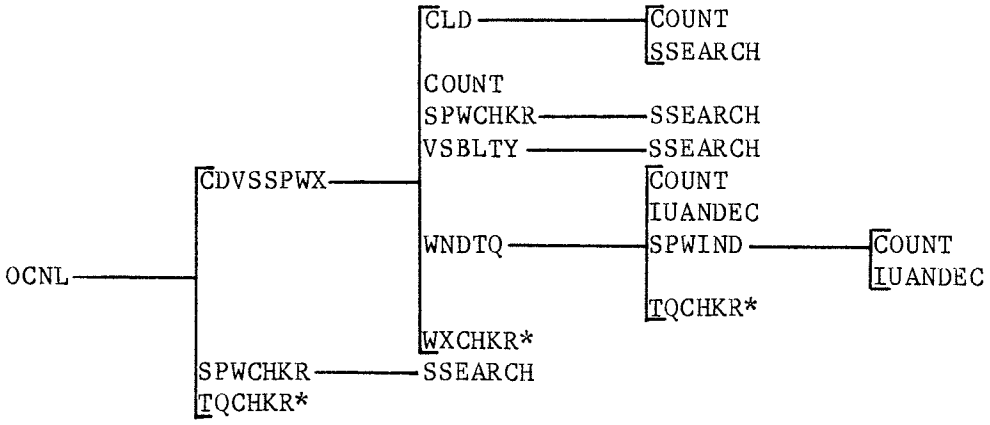

Figure 4. Software structure for subroutine OCNL. *See Figs. 6 and 7 for the structure of subroutines TQCHKR and WXCHKR, respectively.

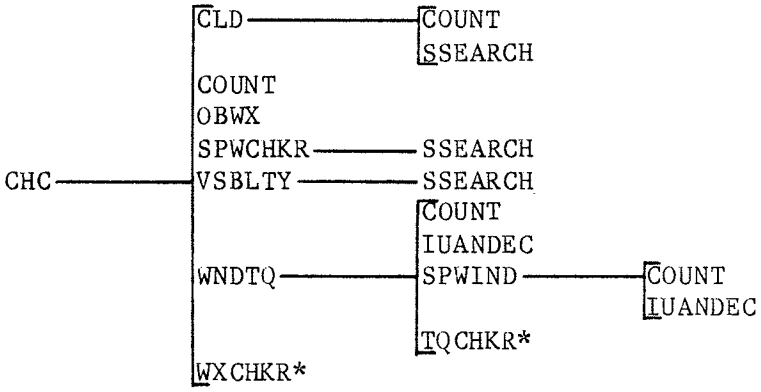

Figure 5. Software structure for subroutine CHC. *See Figs. 6 and 7 for the structures of subroutines TQCHKR and WXCHKR, respectively.

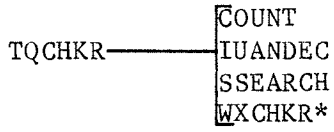

Figure 6. Software structure for subroutine TQCHKR. *See Fig. 7. for the structure of subroutine WXCHKR.

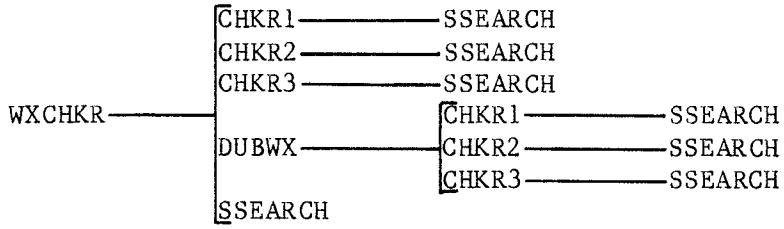

Figure 7. Software structure for subroutine WXCHKR.

```
BUFFTABUF
TTAA00 KBUF 210830
BUF FT 210909 11 SCT C35 OVC 2318G32 LLWS OCNL C11 BKN CHC 2RW-SW-.
    14Z C25 OVC 2513G26 LLWS OCNL 25 SCT CHC C11 BKN 2SW-.  03Z MVFR
    CIG SW..
```

Figure 8. Terminal forecast for Buffalo, N.Y.

WORD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
LINE																									
1	16981	17920	0	0	0	21	9	9	9999	2	1	8													
2	1	0	900	1400	11	1	0	9999	35	3	0	9999	888	0	0	9999	700	0	0	0	0	23	18	32	0
3	1	4	900	1400	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999
4	1	1	900	1400	11	2	0	9999	888	0	0	9999	888	0	0	9999	700	0	0	0	0	23	18	32	0
5	1	2	900	1400	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	200	216	218	0	0	9999	9999	9999	9999
6	2	0	1400	300	25	3	0	9999	888	0	0	9999	888	0	0	9999	700	0	0	0	0	25	13	26	0
7	2	4	1400	300	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999
8	2	1	1400	300	25	1	0	9999	888	0	0	9999	888	0	0	9999	700	0	0	0	0	25	13	26	0
9	2	2	1400	300	11	2	0	9999	9999	9999	9999	9999	9999	9999	9999	9999	200	218	0	0	0	9999	9999	9999	9999
10	3	6	300	900	2	3	18	0	0	0	0														

Figure 9. IDATA( ) array for the Buffalo FT shown in Fig. 8. The word and line numbers were added for descriptive purposes only. Line 1 is the Type 1 record, lines 2 through 9 are Type 2 records, and line 10 is a Type 3 record.