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no. 87-5

NOAA Techniques Development Laboratory  
Computer Program NWS TDL CP 87-5



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## AFOS TERMINAL FORECAST QUALITY CONTROL

Silver Spring, MD  
December 1987

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**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.



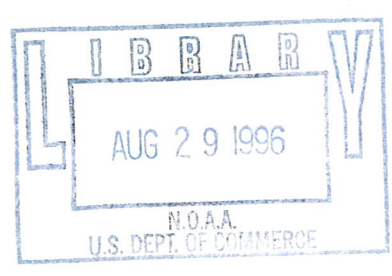
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## AFOS TERMINAL FORECAST QUALITY CONTROL

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). Each FT is written according to the guidelines published in NWS (1984, 1985).

To assist WSFO's in preparing error free FT's, an Automation of Field Operations and Services (AFOS) applications program has been written to perform quality control checks for the forecaster. The program, called FTQC, checks FT's for typographical errors, format inconsistencies, and some meteorological inconsistencies. It can be used either on multiple FT's stored together in a workfile or on individual FT products. FTQC produces a summary of its findings which can be displayed on the forecaster's alphanumeric display module (ADM).

This document provides a description of the FTQC program's operation, definitions of the error messages, and suggested corrective measures. Forecasters should also carefully note the cautions provided in Section 4.

### 2. METHODOLOGY AND SOFTWARE STRUCTURE

FT's are prepared manually each day at all WSFO's which have FT responsibilities. When they are prepared, they are stored in the local AFOS database and are transmitted over the AFOS communications circuits to other users. Each regularly scheduled FT is valid for the 24-h period following its issuance. This period is composed of two 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 forecast groups are divided into two segments--the prevailing conditions and the remarks.

Forecast offices enter their FT's into the AFOS system in one of three ways. First, when multiple FT's are to be composed, the forecaster can use the AFOS message composition or edit modes to enter all the forecasts into an AFOS workfile product. An AFOS applications program (e.g., ALEMBIC) is then run to separate the individual FT's from the workfile and to store them under their respective cccFTAxxx product identifiers. Here, and in the remainder of this document, ccc is the WSFO's call letters, FTA is the AFOS product category identifier for terminal forecasts, and xxx represents the call letters of the individual terminals.

In the second method, the FT's are entered into a workfile in a micro-computer. That file is then transmitted to the AFOS system where it is stored as an AFOS workfile. The remainder of the process is the same as the first method. The third method is the direct creation of the individual cccFTAxxx

products. This method is generally used only when a limited number of FT's are being edited, such as when amendments are necessary.

The FTQC program can perform the quality control checking on either individual cccFTAxxx products or an AFOS workfile product which contains multiple FT's. This is shown by the data flow and program relationships illustrated in Fig. 1. In most instances, the forecaster will want to run the FTQC program on the workfile rather than the individual cccFTAxxx products. This is because, when an individual cccFTAxxx product is created and stored, the AFOS operating system usually queues it for transmission over the communications circuits. A workfile, on the other hand, is not automatically queued for transmission so that any errors detected by FTQC can be corrected first.

The FTQC program uses a new version of the FT decoder, DCDFT (Vercelli and Leaphart, 1988). The significant feature of the new DCDFT is its expanded error checking capabilities. It will return specific error messages when it does not recognize or cannot interpret a word, abbreviation, or phrase in an FT which it expects was written according to the guidelines outlined in NWS (1984, 1985). In addition, the main FTQC program will produce error messages if it has trouble reading products from the AFOS database, extracting FT's from a workfile, or decoding the header information in the products.

The results of the quality control checking for each FT are added to an AFOS product called cccTAPxxx, where xxx is set to "ERR" unless the appropriate runtime switch is used to override the default (see Section 3). The forecaster is alerted to program completion by activation of the alarm light on the console. The product can then be displayed on the ADM by depressing the alarm light button. An example of such a product is shown in Fig. 2a with the FT's used to produce the output shown in Fig. 2b. All of the error messages which can be produced by the program are shown in the Appendix along with a discussion on what the program was looking for at the time the error occurred, and suggestions on how to correct the problem.

The software structure and load line for the FTQC program are shown in Fig 3. The software structure charts for DCDFT and several subordinate subroutines are shown in Figs. 4-8. FTQC begins by interpreting the information passed to it in the command line. The program assumes that it will find all the FT's contained in a workfile product called cccWRKFTA. The forecaster can override this default product identifier by setting one or more of the optional runtime switches. These switches are described in more detail in Section 3.

If individual cccFTAxxx products are to be checked, FTQC will retrieve them one at a time from the AFOS database and pass them to the DCDFT subroutines to be decoded. If a workfile, which contains multiple FT's, is to be checked, the program will extract the individual FT's and pass them to the decoder.

The DCDFT subroutines will first search through the unpacked, undecoded FT array for the required FT terminator of two consecutive periods (..). Once the terminator has been located, the program will remove carriage returns and line feeds and compress the array so that no more than one blank separates characters in the FT.

The next step is to decode the header portion of the FT which consists of all information from the call letters up to the start of the cloud phrase in the

first time group. It then locates the starting and ending positions for each FT group. The starting position is the location of the first character of the group time (first character after the heading for the first group) while the ending position is the location of the period (.) at the end of the group. Once these positions have been determined, the information within each group is decoded.

The program will attempt to narrow down the location of each error in an FT to the specific time group and phrase. If available, this additional information will precede the error messages (Fig. 2a), and will consist of the terminal's call letters and one of the phrases shown in Table 1. Note, however, that the nature of the error dictates just how specific the error message will be. Also, note that there will be cases where, upon visual inspection, the actual error is different than that specified by FTQC. This is because, even though specific structures may be typed correctly, they may be placed out of sequence, so that the program's left to right scanning will not find them. For example, the message "24 COULDN'T FIND 6 DIGIT DATE/TIME GROUP (DDHHHH)," where "24" is the error number, would be produced for the following FT:

xxx FT AMD 1 COR 201209 1220Z ...

This is because, after the call letters are found (xxx FT), the program looks for either the six-digit date/time group, or the words RTD, AMD, or COR to immediately follow "FT." In this case, AMD was found which tells the program that it should be followed by an amendment number and then the six-digit date/time group. The amendment number is found, but the next word is not the time group. It is the word "COR," which has been misplaced. The error message reflects the fact that FTQC did not find the time group where it was expected. The correct structure is:

xxx FT COR AMD 1 201209 1220Z ...

If an error is detected while decoding the header information or while locating the starting or ending positions of the groups, all decoding will stop on that FT; the program will write out the necessary error message to the output product and move on to the next terminal. If an error is detected while decoding the information contained within a particular group, decoding will stop on that group but FTQC will attempt to decode the next group. Therefore, only one error message per time group is possible even though there may be more than one error in that group. Also, if any errors are encountered during the decoding process, no consistency checking of the individual decoded values can be done on that FT since the decoded array used for this purpose cannot be built. Therefore, to ensure that the full range of quality control checking is done, the FTQC program should be run at least a second time, after the errors detected in the earlier run have been corrected. After the decoding and checking have been completed for the terminal, FTQC will either write out the appropriate error messages to the output product or write out "xxx OK" to signify that no errors were detected. Any terminal for which the message "xxx OK" is displayed has passed all of the programs decoding and consistency checks.

The above process will continue until all specified terminals have been checked. Then FTQC will activate the alarm light at the forecaster's console to signify that the program has completed and that the product is available for display on the ADM.

### 3. PROCEDURES

FTQC should be installed in the WSFO's applications directory with links from the master directory to the program. If the WSFO uses the MONITR program (Vercelli and Norman, 1985), then an appropriate link should be made to the MONITR.D1 RDOS file if it is not physically located in the same directory as the FTQC program. Several switches are available to pass information to the program at runtime. The switches are needed only if the program defaults are to be changed. The switches and their defaults are shown in Table 2.

The FTQC program is initiated from the ADM by entering:

```
RUN:FTQC
```

Since no switches were set, the program assumes that all of the FT's to be checked are located in the product with the identifier cccWRKFTA and that the output will be stored in cccTAPERR, where the ccc is obtained from the SKEL file. This run command is the simplest available for FTQC. If the WSFO cannot use cccWRKFTA as the workfile to hold the FT's prior to transmission, or cccTAPERR for the output, then one or more of the optional switches must be used to provide the program with the workfile or the output product name identifiers.

There are three local switches which can be used to redefine the workfile name. They are the /C, /N, and /X local switches (Table 2) and can be used to redefine the ccc, nnn, and xxx portions of the product identifier, respectively. In general, the /C switch will not need to be used at a WSFO since the information can be obtained from the SKEL file.

Consider the following example of how the /N and /X switches might be used to redefine the default values for the workfile. If a dummy product (DUM) is used to hold the FT's prior to storage under their individual product identifiers, and the xxx portion of this dummy workfile is "001," then the proper run command for FTQC would be:

```
RUN:FTQC DUM/N 001/X
```

This would cause FTQC to build the product identifier cccDUM001 and to read all of the FT's found in it.

Another use of the switches would be for those situations where FTQC is to be run on individual FTA products of the form cccFTAxxx. This could very easily be the case if amendments are issued and the individual FTA products are edited directly. To run FTQC for a single FTA product (e.g., DCA), the user could enter either of the following two run commands with the same result:

```
RUN:FTQC FTA/N DCA/X  
RUN:FTQC FTA/N DCA
```

Notice that the only difference between the two is that the /X is absent from the second command. That is because, if data are found but no local switch is used, FTQC assumes that data should be interpreted as the xxx portion of the nine-character product identifier. Although a maximum of four terminals can be entered this way, the actual number will be determined by the number of additional switches used since there is a 31 character limit on the ADM command



line. With the /X switch, only one xxx can be entered at a time. If the FTA products for the WSFO Washington (WBC) terminals DCA, IAD, BWI, and RIC are to be checked, then the following run command would be used:

RUN:FTQC FTA/N DCA IAD BWI RIC

The program would then read in and check the following four products, where the WBC would have been obtained from the SKEL file:

WBCFTADCA  
WBCFTAIAD  
WBCFTABWI  
WBCFTARIC

The default output product is cccTAPERR, where the ccc is obtained from the SKEL file. To redefine the xxx from "ERR" to some other identifier, the /Z switch is used. Any xxx can be used except "AMD" and "ALT," which are used by the MONITR program (Vercelli and Norman, 1985). For those locations which use MONITR, the FTQC program provides a simple way to check all cccFTAxxx products. When the global "A" switch is used, FTQC will read the ccc and xxx portions of the product identifier from the MONITR.D1 station directory file, and it will force the nnn portion of the identifier to be set to FTA. Here, as with MONITR, the limit is 25 terminals. Note, the ccc for the output product will be obtained from the SKEL file, not from MONITR.D1. An example of the run command would be:

RUN:FTQC/A

Based upon 10 terminals, the runtime of the program is approximately 6 seconds per terminal when individual cccFTAxxx products are checked and 5 seconds per terminal when a multiterminal workfile is used. The alarm light will be activated at the forecaster's console to signify program completion. The product can then be displayed on the ADM by depressing the alarm light button on the console.

#### 4. CAUTIONS

1. It is better to run FTQC on workfiles rather than individual cccFTAxxx products. This is because any errors found in a workfile FT can be corrected prior to product transmission, while cccFTAxxx products will usually be transmitted before the forecaster has a chance to run FTQC.
2. FTQC reads each FT from left to right. It expects to see various FT structures in a specific order (there are exceptions). If this order is not followed, or if a typographical error makes it appear as though the order is not being followed, FTQC will produce an error message. The following FT group can be used to illustrate 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 it's location in the FT group, the error message produced by FTQC is "48 EXPECTED 'VCNTY' TO FOLLOW WX TYPE IN REMARK." Why did it expect "VCNTY?" Once the prevailing conditions have been decoded, DCDFE checks to see if there are more characters

before the period at the end of the group. In this case, there are. DCDFE 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 DCDFE 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 message is produced.

3. 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, DCDFE 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 non-blank 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..

4. The characters "FT" must follow the call letters (xxx FT . . .). If they are missing, DCDFE does not know which three- or four-character string to use for the call letters so the error message will read "??? HEADING: 22 CAN'T FIND CALL LETTERS ('XXX FT OR '|XXX FT')." Here, the "|" character is an optional control character used in many workfile formats.
5. 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 DCDFE will not realize it or decode it improperly. For example, decoding "XXX FT 200909 1/4F. 03Z VFR.." would produce:

XXX 03Z (PREVAIL): 35 EXPECTED WX OR OBSTRUC TO VIS  
03Z (CATEG): 28 NO CATEGORICAL OUTLOOK GROUP FOUND (EG. VFR)

6. For those circumstances when an "either/or" situation exists, forecasters should use the "/" symbol to separate the weather types rather than the word "OR" (3RW/TRW instead of 3RW OR TRW).



7. It is strongly suggested that, once the errors have been corrected, the FTQC program be run again to ensure the full range of quality control checks have been made. This is because certain errors will prevent the program from using all of its error checking capabilities. All error checking has been completed when the message "xxx OK" is displayed for each terminal.
8. Special care must be taken when FTQC is run on FT's contained in a workfile. The program will work for multi-FT workfiles with or without the use of the vertical bar (|) to signify the start of an FT. If two vertical bars are found without the intervening double period (..) to signify the end of an FT, an appropriate error message will be generated.

If the vertical bar is not used at the start of an FT, FTQC will use the double period terminator alone to distinguish individual workfile FT's. If the double period is missing, the program will continue reading the next FT and append it to the array for the preceeding FT until either the second FT's terminator is found or the maximum number of characters is exceeded. If this occurs, FTQC will encounter decoding problems for the first FT due to the inadvertant inclusion of the second FT in the array, and the second FT will appear to have been skipped by the program in the output display.

9. FTQC will use the three or four consecutive, nonblank characters immediately preceeding the "FT" character string as the call letter sequence. If four characters are found, the first must be the vertical bar symbol (|) which will be stripped off in the output display. The following examples illustrate what will be displayed when those characters are not the call letters (first two examples) and when they are the call letters (last example):

<u>FT's</u>	<u>FTQC Output</u>
AA FT 150808 CLR. 02Z VFR..	AA OK
BBB COR FT RTD 151208 1145Z CLR. 02Z VFR..	COR OK
CCC FT COR RTD 151208 1145Z CLR. 02Z VFR..	CCC OK

Therefore, the user should routinely scan the call letters in the output display to look for unexpected characters.

10. LLWS phrases are not decoded nor checked for consistency. FTQC 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).

5. 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.

\_\_\_\_\_, 1985: Aviation terminal forecasts. NWS Operations Manual, Chapter D-21, Manual Issuance 85-1 (Rev. 1), National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 10 pp.

Vercelli, D. J. and M. Leaphart, 1988: AFOS terminal forecast decoding. NOAA Techniques Development Laboratory Computer Program NWS TDL CP 88-x, National Weather Service, NOAA, U.S. Department of Commerce, (in preparation).

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6. PROGRAM INFORMATION AND PROCEDURES FOR INSTALLATION AND EXECUTION

AFOS TERMINAL FORECAST QUALITY CONTROL

PART A: PROGRAM INFORMATION and INSTALLATION PROCEDURE

PROGRAM NAME: FTQC

AAL ID: DBC079

Revision No.: 01.30

FUNCTION: Performs quality control checks on FT's while they are still in a workfile, or on individual cccFTAxxx products, at the user's option. Creates a local use alphanumeric product which can be displayed on the ADM.

PROGRAM INFORMATION:

Development Programmers:

David J. Vercelli  
Mark Leaphart

Location: Techniques Development  
Laboratory

Phone: FTS 427-7393

Language: FORTRAN IV/ Rev 5.20

Save file creation dates:

Original release/ Rev 01.01 -  
Release/Rev 1.02 -  
Release/Rev 1.10 -  
Release/Rev 1.20 -  
Release/Rev 1.30 -

Maintenance Programmers:

David J. Vercelli  
Mark Leaphart

Location: Techniques Development  
Laboratory

Phone: FTS 427-7393

Type: Overlay

April 1987  
September 1987  
September 1987  
October 1987  
December 1987

Running time (based upon 10 terminals):

Workfile - 5 sec/FT  
cccFTAxxx - 6 sec/FT

Disk space: Program files - 365 RDOS blocks  
Data files - 5 RDOS blocks

PROGRAM REQUIREMENTS

Program Files:

NAME

COMMENTS

FTQC.SV  
FTQC.OL

None

Data files:

<u>NAME</u>	<u>READ/WRITE</u>	<u>COMMENTS</u>
MONITR.D1	R	Used to obtain ccc and xxx's for individual FTA products. Only available at those sites which use the FT monitoring program MONITR. The /A global switch must be used to access the file.

AFOS Products:

ccctAPxxx	W	Output product which contains results of the quality control checks. The ccc will be obtained from the SKEL file. The xxx will be set to "ERR" unless overridden by the local /Z switch.
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LOAD LINE

RLDR FTQC DCDFT CLD COUNT SSEARCH IUANDEC NXTWRD DCDGRP POUT BLNKPX WXCHKR  
CHKR3 CHKR2 CHKR1 DUBWX INITIT [GETNODE RCOMLN RDSDIR CKEY FNDEOH CHARCK  
NXTBLK SETEND FCHAR, DSPLAY OPNOUT HEADER BANNER WRITIT CONVERT, 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] BG.LB UTIL.LB FORT.LB SYS.LB AFOSE.LB

PROGRAM INSTALLATION

1. Move FTQC.SV and FTQC.OL to applications directory. Create links in master directory to FTQC.SV, FTQC.OL, and MONITR.D1.
2. Make sure the ccctAPxxx key for the output product is in the PIL. To avoid the need to use the /Z switch, it is recommended that the xxx be set to "ERR." Note, the MONITR program (Vercelli and Norman, 1985) uses ccctAPAMD and ccctAPALT for its output. Therefore, "AMD" and "ALT" are not acceptable alternatives to "ERR;" any other xxx identifier is acceptable. The light alarm should be set to alert the forecaster to product storage.



AFOS TERMINAL FORECAST QUALITY CONTROL

PART B: PROGRAM EXECUTION and ERROR CONDITIONS

PROGRAM NAME: FTQC

AAL ID: DBC079

Revision No.: 01.30

PROGRAM EXECUTION

1. The simplest way to run the FTQC program is to enter "RUN:FTQC" at the ADM. In this case, the program expects to find all of the FT's contained in a workfile called cccWRKFTA and the output will be stored in ccctAPERR, where the ccc is obtained by FTQC from the SKEL file.
2. If the workfile identifier is not cccWRKFTA, then one or more of three local switches will need to be used. These switches are the /C, /N, and /X switches and allow the user to redefine the ccc, nnn, and xxx portions of the nine-character product identifier, respectively. If the output product identifier is not ccctAPERR, then the /Z local switch will be used to redefine the xxx portion of the identifier. Note, use of "AMD" and "ALT" is not advisable since these are used by the MONITR program (Vercelli and Norman, 1985).
3. If individual cccFTAxxx products are to be checked, then either of two methods can be used. First, if only one FTA product is to be checked, the user can enter either "RUN:FTQC FTA/N xxx/X" or "RUN:FTQC FTA/N xxx." These commands tell FTQC to build the nine-character identifier cccFTAxxx, where the ccc is obtained from the SKEL file and the xxx is the terminal's call letters. Second, if several individual FTA's are to be checked, then "RUN:FTQC FTA/N xx1 xx2 xx3 xx4" can be used, where xx1, xx2, xx3, and xx4 are the call letters for up to four individual terminals. (Note, if the /C switch must also be used, only two terminals can be checked at a time. This is because of the character limit allowed on the command line. Use of the /Z switch will limit this even further.)
4. If the WSFO uses the FT monitoring program, MONITR, there is a simple way to check all cccFTAxxx products with one RUN: command. The global /A switch will tell FTQC to obtain the ccc and xxx identifiers from the MONITR.D1 file and to force the nnn = FTA. This switch cannot be used in conjunction with any of the local switches used to redefine the workfile (/C, /N, or /X), but can be used if the output product identifier is redefined (/Z). The command would be "RUN:FTQC/A" or "RUN:FTQC/A xxx/Z."

ERROR CONDITIONS

All error conditions are described in the Appendix.

Table 1. Whenever possible, FTQC will precede an error message (see Appendix) with one of the following phrases. This is done to aid the forecaster in locating the error. The "xxx" is the terminal's call letters and "hh" is the group time.

---



---

xxx HEADING:
xxx hhZ (PREVAIL):
xxx hhZ (OCNL):
xxx hhZ (CHC):
xxx hhZ (SLGT CHC):
xxx hhZ (WND):
xxx hhZ (CATEG):

---

Table 2. Runtime switches and their default values.

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Switch	Type	Default
A	Global	Do not access MONITR.D1 file
C	Local	ccc set from SKEL file for input product identifier
N	Local	nnn = WRK (input)
X	Local	xxx = FTA (input)
Z	Local	xxx = ERR (output)

---

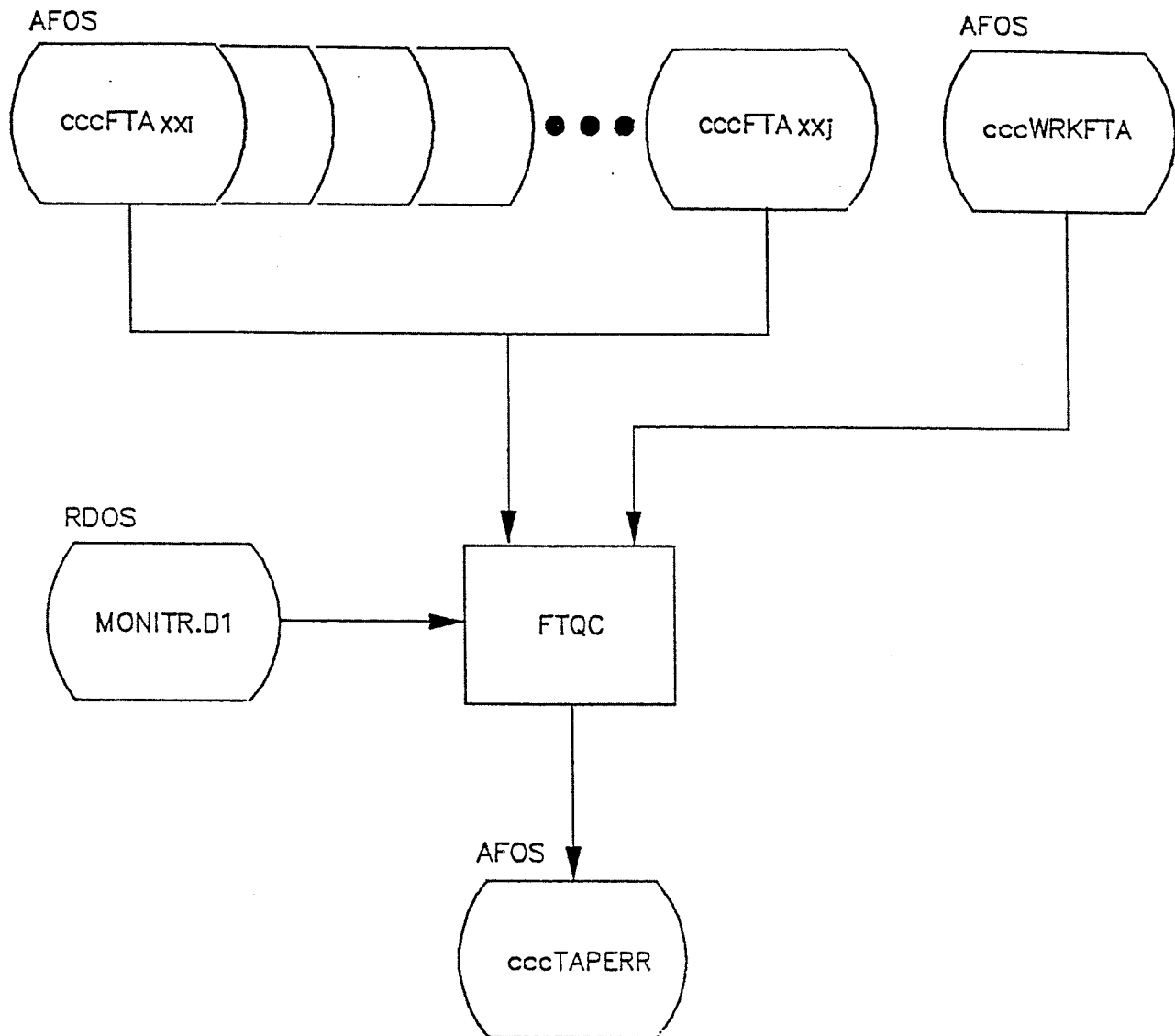


Figure 1. Data flow and program relationships for the FT quality control program, FTQC. The program task is designated by the box and AFOS and RDOS disk files by cylinders. The FT's are obtained either from individual cccFTAxxx products (designated cccFTAxxi through cccFTAxxj in the figure) or from a multi-FT workfile (cccWRKFTA). The output will be stored as an AFOS product with the identifier cccTAPxxx, where the default xxx is ERR.

FTQC SUMMARY 171501

AAA 08Z (OCNL): 52 MISSING 'Z' IN HHZ-HHZ TIME STRUCTURE

BBB 13Z (PREVAIL): 40 DOESN'T START WITH VALID REMARK WORD (EG. OCNL)  
17Z (PREVAIL): 40 DOESN'T START WITH VALID REMARK WORD (EG. OCNL)

CCC 08Z (CHC): 39 MUST HAVE PRECIP IN CHC/SLGT CHC REMARK

DDD OK

EEE 75 CHECK FOR POSSIBLE DATE ERR IN 6-DIGIT DATE/TIME  
77 CATEGORICAL GRP DOESN'T START 6-HRS BEFORE FT END  
78 STARTING VALID TIME INCONSISTENT W/ 4-DIGIT ISS.  
82 CHECK FOR ILLEGAL WIND DIRECTION (< 0 OR > 36)  
83 CHECK FOR INVALID VISIBILITY VALUE (SEE CHAP D21)  
86 CLOUD AMOUNTS APPEAR OUT OF ORDER (EG. BKN SCT)  
87 CLOUD HEIGHTS DECREASE UPWARDS  
90 GROUP TIMES ARE NOT IN SEQUENTIAL ORDER

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Figure 2a. Sample run of FTQC program. FT's used are shown in Fig. 2b.

TDLWRKFTA

TTAA00 KTDL 171450

AAA FT 170808 30 SCT 250 -BKN 6H OCNL 4FH 11-13Z.  
17Z 40 SCT 2308 OCNL C40 BKN CHC C15 BKN  
2TRW. 02Z VFR..

BBB FT AMD 1 171108 1100Z 7 SCT C45 BKN 3F OCNL  
C7 BKN 1F. 13Z 12 SCT C45 BKN 5H SCT OCNL BKN.  
17Z 45 SCT C250 BKN SCT OCNL BKN SLGT CHC  
C12 OVC 2TRW. 02Z VFR..

CCC FT 170808 C2 X 1/4L- 2708 CHC F. 14Z  
C5 BKN 3F. 15Z 20 SCT C80 BKN 3310 OCNL  
C20 BKN. 02Z VFR..

DDD FT 170808 11 SCT C25 BKN 4R-F OCNL C11 OVC  
1 1/2F CHC C6 OVC 1TRWF. 15Z 15 SCT C45  
BKN 5H 0910 OCNL C15 OVC 2RW-/TRW-.  
02Z MVFR CIG TRW..

EEE FT AMD 1 160908 0825Z C50 BKN 12 SCT OCNL  
7578 78 87 86 87 86  
C50 OVC 1/3RWF CHC 1RW/TRW. 05Z 25 SCT  
83 90  
C80 OVC 5RW-F 4510 OCNL C20 OVC 2RW/TRW.  
82  
03Z MVFR CIG..  
77

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Figure 2b. Workfile of FT's used as input to FTQC. Errors are underlined in the first three FT's. In the fifth FT, the error numbers are also included for clarity.

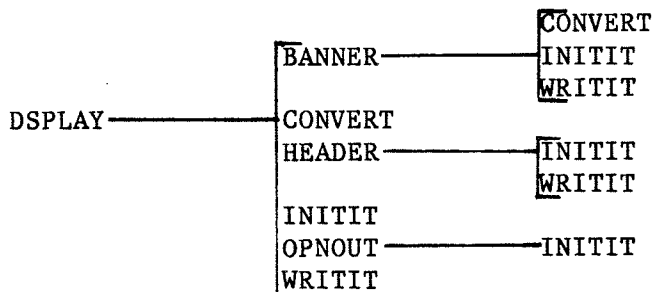


FTQC

MAIN PROGRAM  
FTQC

SUBROUTINES

GETNODE  
RCOMLN  
RSDIR  
CKEY  
FNDEOH  
SETEND  
FCHAR  
NXTBLK ————— INITIT  
INITIT  
CHARCK  
DCDFT\*



LOAD LINE

RLDR FTQC DCDFT CLD COUNT SSEARCH IUANDEC NXTWRD DCDGRP POUT BLNKPH WXCHKR  
CHKR3 CHKR2 CHKR1 DUBWX INITIT [GETNODE RCOMLN RSDIR CKEY FNDEOH CHARCK NXTBLK  
SETEND FCHAR, DSPLAY OPNOUT HEADER BANNER WRITIT CONVERT, 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] BG.LB  
UTIL.LB FORT.LB SYS.LB AFOSE.LB

Figure 3. Software structure and load line for the FTQC program. \*See Fig. 4. for the structure of DCDFT.

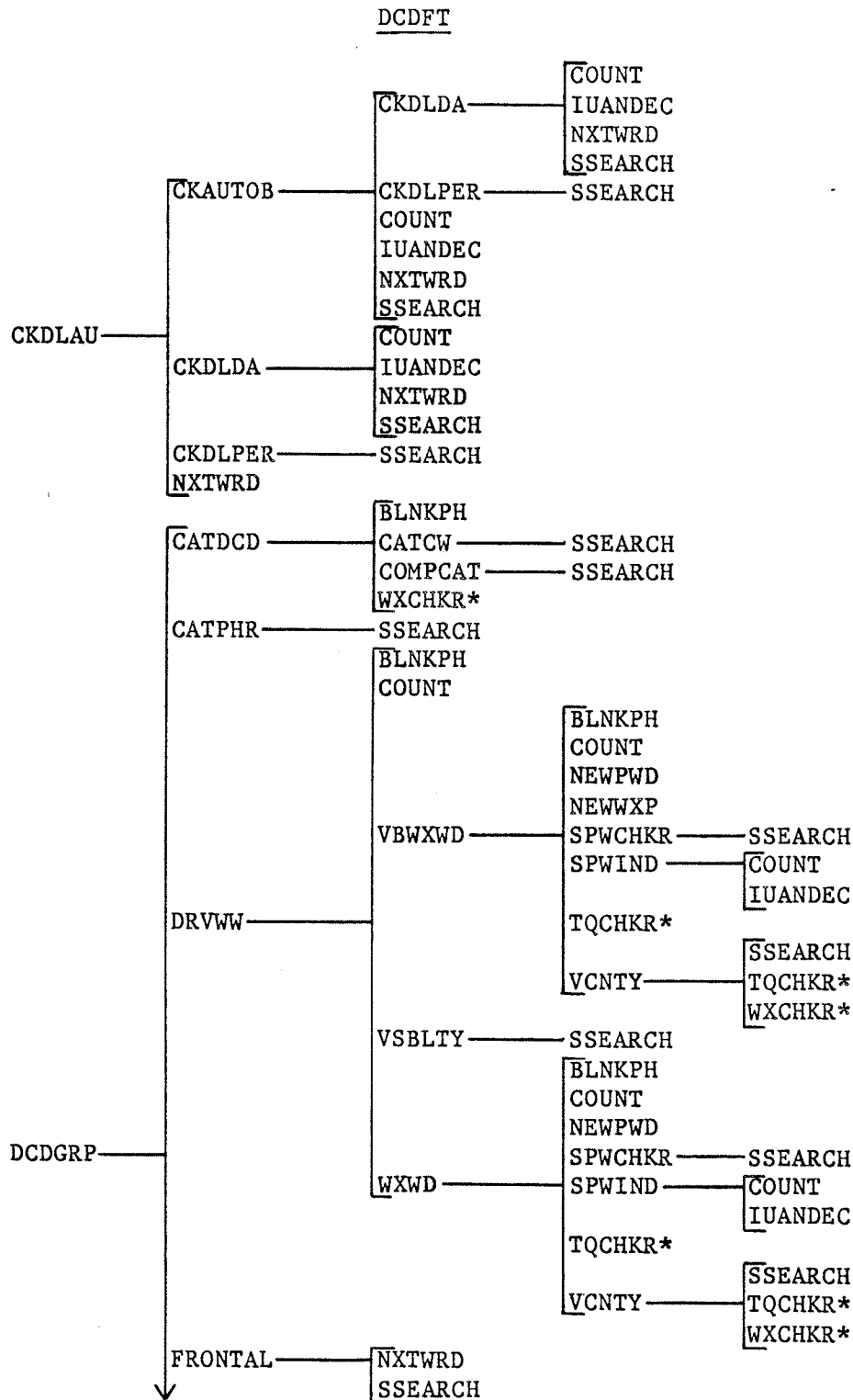


Figure 4. Software structure for the DCDFT routines. \*See Figs. 5, 6, 7, and 8 for the structure of subroutines OCNL, CHC, TQCHKR, and WXCHKR, respectively.

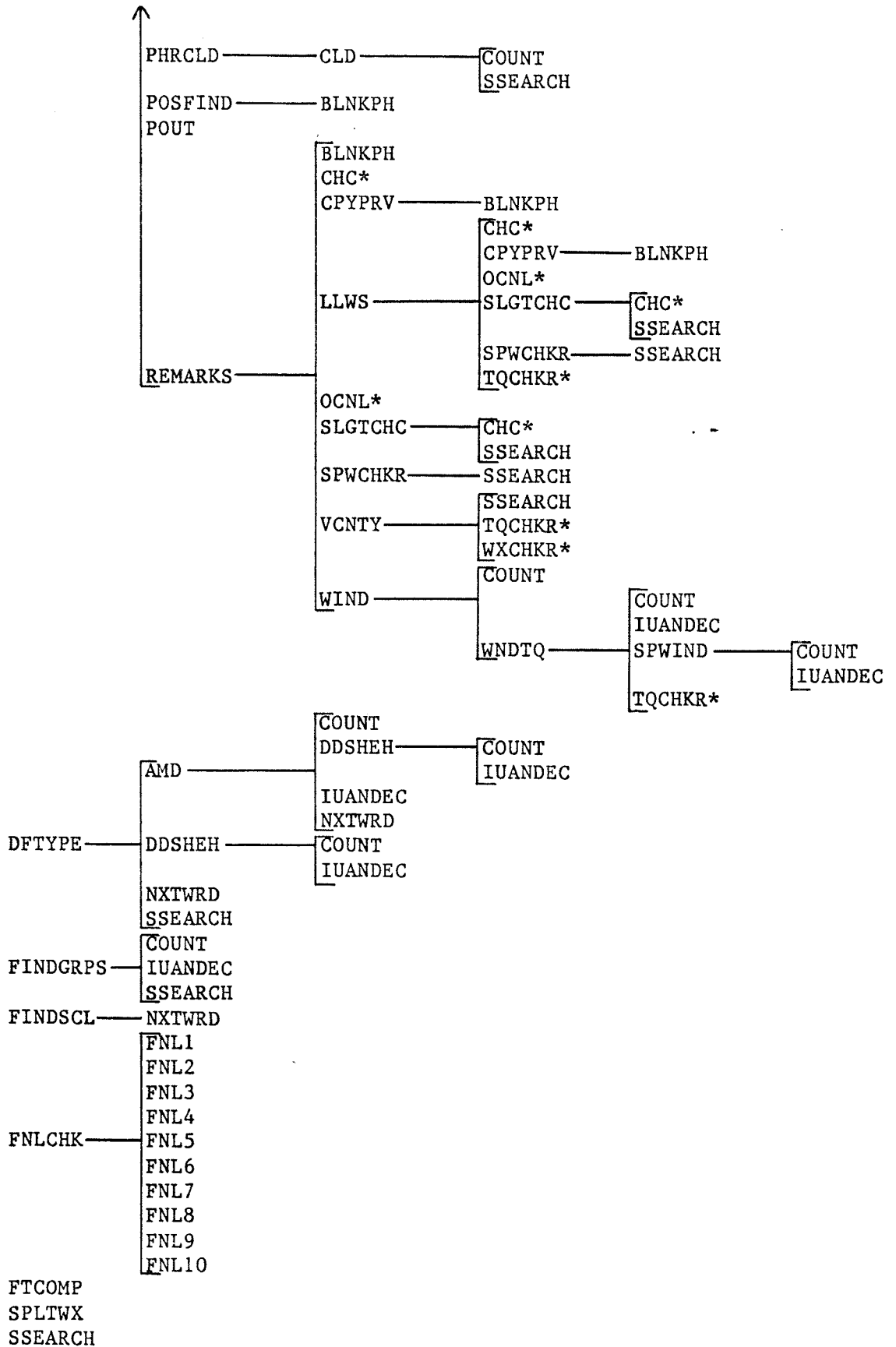


Figure 4. Continued.

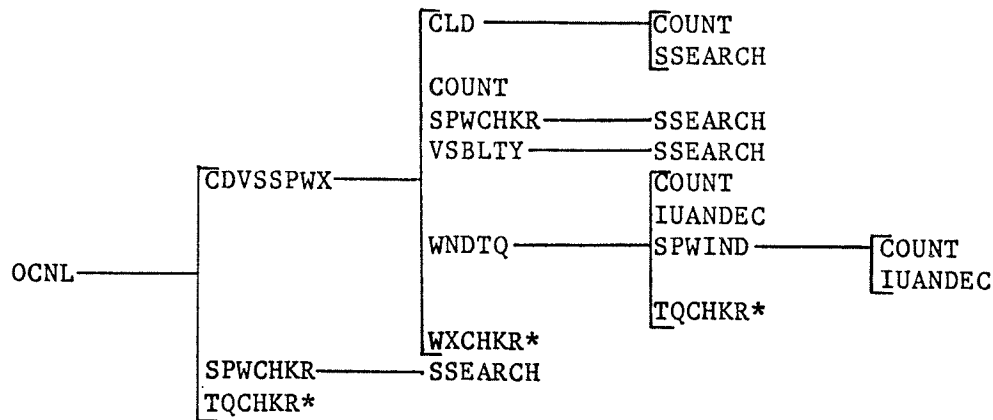


Figure 5. Software structure for subroutine OCNL. \*See Figs. 7 and 8 for the structure of subroutines TQCHKR and WXCHKR, respectively.

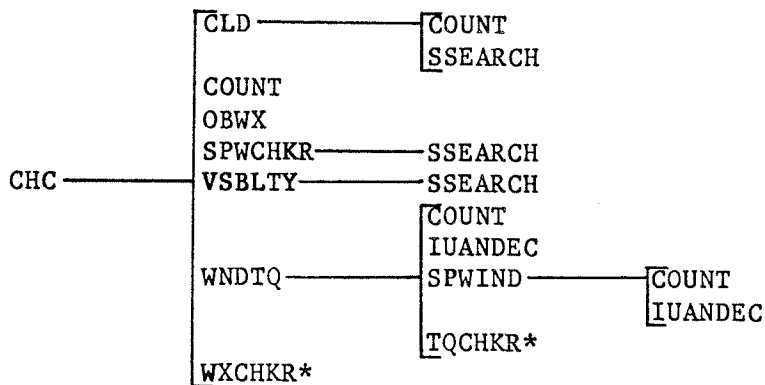
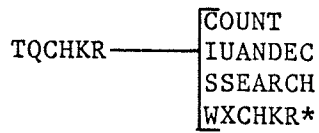


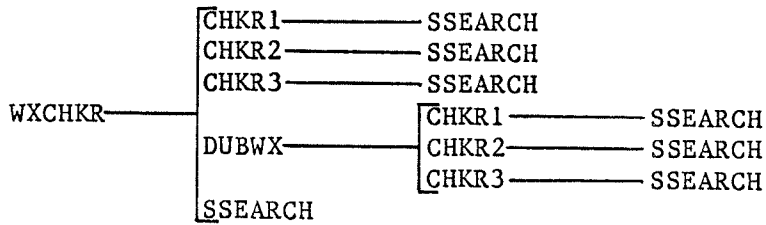
Figure 6. Software structure for subroutine CHC. \*See Figs. 7 and 8 for the structures of subroutines TQCHKR and WXCHKR, respectively.





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Figure 7. Software structure for subroutine TQCHKR. \*See Fig. 8. for the structure of subroutine WXCHKR.



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Figure 8. Software structure for subroutine WXCHKR.

APPENDIX

FTQC Error Messages

For each error message, the discussion provides information on likely causes for the error, and suggested actions which may be followed by the user to correct the problem. Note, the numbers listed in the left column are used for descriptive purposes in this document and on the ADM display for easy user reference.

Number	Error Message	Discussion	Suggested Action
1	ERROR - GROUP NUMBER NOT RECOGNIZED USER SHOULD PERFORM FT QUALITY CONTROL	Each FTQC routine has a unique error number associated with it. This error indicates that the error number itself was not recognized. This is a safety feature to prevent a possible "computed go to" error.	Check dasher for message "DISPLAY ERR - # IS NOT A LEGAL NGRP VALUE," where # is the unrecognized value. Make hard copy of product being checked and send # and hard copy to TDL.
2	ERROR - ROUTINE NUMBER NOT RECOGNIZED USER SHOULD PERFORM FT QUALITY CONTROL	Similar to # 1, except these values are internal to the individual subroutines.	Same as # 1. Dasher message will read "DISPLAY ERR - # IS NOT A LEGAL VALUE."
3	ERROR FINDING PRODUCT (KSRCF)	The identified product could not be found in the AFOS database.	RUN:FTQC (no switches) - workfile ccWRKFTA does not exist. Rerun program and use appropriate switches to define file name. RUN:FTQC (with local switches) - probably a typographical error in command line; rerun. RUN:FTQC/A - Product cccFTAXXX does not exist, where ccc and xxx were obtained from MONTR.DI file. May need to correct MONTR.DI file (see Vercelli and Norman, 1985).
4	ERROR READING PRODUCT FROM DATABASE	Error occurred while reading an AFOS block with sub-routine RDBKF. Possible database problem.	Verify product was stored correctly. Call up product in edit mode, save it, rerun program.
5	EOF (203K) EXPECTED BUT NOT FOUND	AFOS block just read indicated no additional blocks would follow. Means end of file (203K) should have been found in this block but was not.	Verify product was stored correctly. See # 4.
6	FT EXCEEDS 2 BLOCKS, TERMINATOR (..) NOT FOUND	FTQC will accommodate 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. Missing terminator in a workfile may result in error for following FT as well since a portion of it may be read in with first FT.	Verify that FT (or all FT's if in a workfile) ends with two consecutive periods. If FT exceeds 512 characters, then perform visual quality control check on it.
7	END OF BUFFER FOUND BEFORE END OF FT (203K).	FT terminator (..) not found before end of file (203K).	Verify that each FT ends with two consecutive periods.

- |    |   |  |   |
|----|---|--|---|
| 8  | ERROR GETTING CHANNEL TO READ SKEL FILE (GCHN)    | The ccc portion of the product identifier is obtained from the SKEL file. A problem was encountered while reading the ccc from the SKEL file.  | If SKEL file appears correct and rerunning program does not work, then FPRINT SKEL file in binary form (FPRINT/Z/B) and send to TDL. Also, try overriding SKEL entry by setting /C local switch to the proper ccc.  |
| 9  | ERROR OPENING SKEL FILE (OPENN)                   | Same as # 8.   | Same as # 8.  |
| 10 | ERROR POSITIONING POINTER IN SKEL FILE (SPOS)     | Same as # 8.   | Same as # 8.  |
| 11 | ERROR READING CCC FROM SKEL FILE (RDS)            | Same as # 8.   | Same as # 8.  |
| 12 | ERROR GETTING CHANNEL TO READ COMMAND LINE (FCOM) | Trouble reading the RUN: command line.   | Try rerunning FTQC.   |
| 13 | ERROR READING COMMAND LINE (COMCM-A)              | Same as # 12.  | Probable typing error; rerun FTQC.  |
| 14 | ERROR READING COMMAND LINE (COMCM-B)              | Same as # 12.  | Same as # 13.   |
| 15 | DIAGNOSTIC SWITCH VAL OUT OF RANGE (0-9999)       | Same as # 12. Used by TDL programmers for debugging.   | Contact TDL for instructions.   |
| 16 | COMMAND LINE LOCAL SWITCH SET BUT DATA MISSING    | Same as # 12.  | Probable typing error; rerun FTQC.  |
| 17 | TROUBLE READING MONITR.DI FILE - SEE DASHER       | Global A switch was used in command line. FTQC will attempt to open and read MONITR.DI RDOOS file to get ccc and xxx pairs.  | Verify proper links to MONITR.DI exist. See dasher for additional messages. See Vercelli and Norman (1985) for information on creating MONITR.DI file.  |
| 18 | COULD NOT FIND EOH <305K><200K> IN FIRST 50 CHAR  | FTQC searches through first 50 characters of product for the EOH sequence to signal the start of the product text. This error indicates that the <305K><200K> sequence was not found.  | Same as # 4.  |
| 19 | ERR READING EOH <305K><200K> IN PRODUCT HEADER    | Similar to # 18, except that the <305K> was found but the <200K> did not immediately follow it.  | Same as # 4.  |
| 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.<br>Make hard copy of FT and forward to TDL.   |
| 21 | COULDN'T FIND PERIODS TO END FT (..)              | Similar to # 6. This is a redundant check in DCDFE which is used to set loop indices.  | Same as # 6.  |
| 22 | CAN'T FIND CALL LETTERS ('XXX FT' OR 'I'XXX FT')  | DCDFE 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. |

- 23 EXPECT 'FT' THEN 'DDHHH', 'AMD', 'RTD', OR 'COR' Same as # 22.  
Similar to # 22. Sequence of events will determine which error message appears.
- 24 COULDNT FIND 6 DIGIT DATE/TIME GROUP (DDHHH) Same as # 22.
- 25 COULDNT FIND AMD # (FORMAT: AMD #) Word AMD was found but the amendment number was not.
- 26 EXPECT 'COR' THEN 'RTD', 'AMD', OR 'DDHHH' Word COR was found but program expected it to be followed by RTD, AMD, or the six digit date/time group.
- 27 EXPECTED 'DLAD..', 'DLAD TIL HHZ (OR HHMMZ).. Sequence of characters found indicated this would be a delayed FT.  
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.
- 28 NO CATEGORICAL OUTLOOK GROUP FOUND (EG. VFR) At least one categorical outlook group is expected to be found.
- 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").
- 30 TOO MANY SENTENCES - PROGRAM LIMIT OF 14 FTQC will decode a maximum of 14 FT groups (sentences) where a period (.) terminates a group.
- 31 TROUBLE FINDING USER SPECIFIED TIME GROUP FT group valid for the specified time could not be found.
- 32 INVALID REMARK APPENDED TO CATEGOR (EG. VFR CIG) FTQC checks that any words which follow the categorical forecast are acceptable. For example, "VFR CIG" would not be acceptable.
- 33 MORE THAN 3 CLOUD DECKS FOUND FTQC 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 the amendment number follows word AMD and is separated from it by at least one blank. ("AMD I" will work, "AMD I" will not).
- Make sure that, if this is a corrected FT, word COR immediately follows the "FT" characters separated by at least one blank.
- Make sure format is correct for delayed FT. FTQC 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.
- Check for missing or misspelled word.
- 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.
- 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 FTQC.
- Not available for use in FTQC.
- Verify that words following the categorical forecast are acceptable for the stated condition.
- 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).



- 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.
- 35 EXPECTED WX OR OBSTRUC TO VIS      After the cloud group has been decoded, FTQC 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).
- 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.
- 37 WX INTENSITY NOT ALLOWED IN CATEGORICAL GROUP      According to NWS (1984), standard weather abbreviations are to be used "without precipitation intensities."
- 38 EXPECTED END OF SENTENCE (.)      FTQC was looking for a period (.) to end a group but did not find it.
- 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.
- 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.
- 41 REWORD PHRASE TO AVOID USE OF LYR(S) OR LWR      Similar to # 40.
- 42 EXPECTED WIND DIRECTION AND SPEED AFTER 'WIND'      Word WND found without corresponding ddf group.
- 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.)
- 44 CK PREVAILING AND REMARK CLD PHRASES - REDUNDANCY      FTQC looks for phrases which repeat themselves (e.g., CLR OCNL CLR).

- Check for missing or misspelled weather words.
- Check for words out of order or words which have been combined because of a missing blank or split by an extra blank (e.g. "CLR 2 510." will interpret the "2" as the visibility and expect the weather to follow it.)
- Check intensities for all weather and obstruction elements in the specified group.
- Delete intensity symbols from weather types in categorical outlook group.
- 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.
- 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.
- 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.
- Same as # 40.
- Check for missing or misplaced wind group.
- Check for possible missing (or misspelled) words which should normally be found together.
- Reword phrase to avoid redundancy.

- 45 NEED CLD HGT SINCE PREVAILING WAS CLR FTQC 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.
- 46 FOUND MORE THAN 1 LLWS PHRASE IN GRP FTQC 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.
- 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.).
- 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 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 54 UNEXPECTED/UNKN WORD/PHRASE - PERFORM VISUAL CHECK Similar to # 47.
- 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).

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 # 55; also check for possible error in weather string.
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."
58	FT CALL LETTERS DON'T MATCH THOSE REQUESTED	Verifies that call letters passed to program match those found in FT. Only used when cccFTxxxx products are being checked, not for workfile.	Verify that cccFTxxxx product contains the proper "xxx FT" (i.e., the xxx's match).
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.
60	ILLEGAL START TIME (6 DIGIT GROUP)	Similar to # 59 except for the middle two digits which make up the FT starting valid time (dhhhh). Allowable values are 00 through 23, inclusive.	Check the FT starting valid time for error.
61	ILLEGAL END TIME (6 DIGIT GROUP)	Similar to # 60 except for the last two digits which make up the ending time (dhhhh). Allowable values are 01 through 24, inclusive.	Check the FT ending valid time for error.
62	NEED BLANK AFTER 'AMD'	Found the word AMD but nonblank character found immediately following the last character (e.g., AMDI).	Check for nonblank character immediately after last character in the word AMD.
63	NEED BLANK AFTER 'RTD'	Similar to # 62 but for word RTD.	Similar to # 62.
64	NEED BLANK AFTER 'COR'	Similar to # 62 but for word COR.	Similar to # 62.
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 hhhmmz.." phrase.
66	EXPECTED TWO CONSECUTIVE PERIODS AFTER DLAD TIME	Similar to # 65 but the FT terminator (..) does not immediately follow the "Z" in the "DLAD TIL hhhmmz.." phrase.	Check for extraneous character following the "Z" in the "DLAD" phrase.
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.
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.
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.
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.

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 (dfff).
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).
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.
74	SYSTEM TIME READ ERR - CAN'T VERIFY DATE/TIME	Similar to # 73 but for the system time (hours and minutes).	Same as # 73.
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).
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."
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.
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.
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.
80	START/END VALID TIMES (6-DIGIT GRP) DON'T MATCH	For a regularly scheduled FT (i.e., four-digit issuance time not required), the starting and ending valid times in the six-digit date/time group should match (exception - 0024 is allowed).	Check six-digit date/time group for error in the starting and ending valid times.
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.
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.
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).

- 84 REVIEW CLD HCTS--SEE CHAP D21 FOR SUGGESTED VALS  
According to MWS (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, FIQC 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.
- 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 precede a partial (-X) or total (X) obscuration.  
Check for misplaced cloud layer or obscuration (-X or X).
- 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).
- 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).
- 88 CAN'T FIND PREVALLING 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.
- 89 CHECK GRP TIME AND REMARK TIME QUALIFIER (EG AFT)  
Program compares group times with each other. There is an error if successive times are the same (e.g., 15Z CLR. 15Z 30 SCT.). If time qualifier is used, it must fall within the time range of the group (e.g., 15Z CLR WND 1520 AFT 18Z. 22Z 30 SCT.)  
Check that group time was entered correctly and that qualified time range is within that of the overall group time.
- 90 GROUP TIMES ARE NOT IN SEQUENTIAL ORDER  
Program checks that each successive group time is later than the previous group time (change of day is accounted for by program).  
Check for mistyped group time which results in out of order sequence (e.g., 15Z CLR. 20Z 30 SCT. 17Z C30 BKN.)



