STANDARD PROCEDURES AND QUALITY-CONTROL PRACTICES FOR THE U.S. GEOLOGICAL SURVEY NATIONAL FIELD QUALITY ASSURANCE PROGRAM FROM 1982 THROUGH 1993

by Daniel L. Stanley

U.S. GEOLOGICAL SURVEY

Open-File Report 95-317

Tallahassee, Florida
1995

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CONVERSION FACTORS, ACRONYMS, AND ADDITIONAL ABBREVIATIONS

Multiply	*By*	*To obtain*
liter (L)	**1.057**	**quart, liquid**
milligram (mg)	**0.00003527**	**ounce**
milliliter (mL)	**0.0338**	**ounce, fluid**

Temperature in degrees Fahrenheit (^{o}F) may be converted to degrees Celsius (^{o}C) as follows:
$^{o}C = 5/9 \times (^{o}F-32)$

Acronyms

ASCII = American Standard Code for Information Interchange
CO = compile
COMP = compress
<CR> = carriage return
DCOLKA = Colorado District Prime Computer
DG = Data General
EMACS = editor on the DCOLKA Prime computer
E-mail = EDOC or Email
ID = identity
INFO = data base on the DCOLKA Prime computer
INIT = initialize
JOI = subset INFO data base
ML = milliliter
NFQA = National Field Quality Assurance Program
QWSU = Quality Water Service Unit
U = unsatisfactory
USGS = U.S. Geological Survey
WATSTORE = National Water Data Storage and Retrieval Systems
WRD = Water Resources Division

Additional abbreviations

mg/L = milligrams per liter
mg/L as $CaCO_3$ = milligrams per liter as calcium carbonate
mL = milliliter
MPV = most probable value
SD = standard deviation
µS/cm at 25° C = microsiemens per centimeter at 25 degrees Celsius
UV = ultraviolet

STANDARD PROCEDURES AND QUALITY-CONTROL PRACTICES FOR THE U.S. GEOLOGICAL SURVEY NATIONAL FIELD QUALITY ASSURANCE PROGRAM FROM 1982 THROUGH 1993

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ABSTRACT

The U.S. Geological Survey operates the National Field Quality Assurance Program to provide quality-assurance reference samples to field personnel who make water-quality field measurements. The program monitors the accuracy and precision of pH, specific conductance, and alkalinity field measurements. This report documents the operational procedures and quality-control techniques used in operating the quality-assurance program.

INTRODUCTION

Part of the mission of the Water Resources Division of the U.S. Geological Survey (USGS) is to collect water-quality information on the water resources of the Nation. Implementation of this part of the mission requires both the collection of water-quality samples for laboratory analyses and field measurements of alkalinity, pH, and specific conductance. An estimated 45,000 field measurements are made annually by USGS field analysts (hydrologists and hydrologic technicians). All USGS personnel who perform field determinations are required to participate in this National Field Quality Assurance Program (NFQA). Contract and cooperator personnel who collect these types of field data to be used in USGS reports or stored in the USGS National Water Data Storage and Retrieval Systems (WATSTORE) are encouraged to participate in this quality-assurance program.

The formal quality-assurance program to monitor the accuracy and precision of pH and specific conductance field measurements made by USGS personnel was initiated In March 1979. Initially, a set of two pH and two specific conductance proficiency samples was distributed about every 6 months to participating personnel in the USGS. The measurement of alkalinity was added as a test parameter in 1985. The frequency of distribution of the subsequent rounds of proficiency samples was changed in 1985 to two sets of proficiency samples to each participant about every 15 months. The frequency of distribution was changed to facilitate the addition of a followup or secondary sample distribution to individuals who received an unsatisfactory performance rating on any proficiency sample.

Under the NFQA, alkalinity, pH, and specific conductance proficiency samples are distributed to more than 180 USGS offices. Approximately 10 USGS offices request proficiency samples for contractor or cooperator personnel participating in the program. The most probable value (MPV) of alkalinity, pH, and specific conductance of proficiency samples is calculated from all the values submitted from the participating region (fig. 1). Contractor and cooperator data normally are not differentiated from USGS data in determining the MPV of alkalinity, pH, and specific conductance proficiency samples. The data for each proficiency sample are summarized by the NFQA manager in a report, which is then distributed to the USGS offices. All the NFQA data are stored in a computerized data base managed by the Quality Water Service Unit (QWSU) of the Florida district office of the U.S. Geological Survey.

The NFQA provides documentation of the precision of the field measurements related to water quality. In addition, the NFQA provides a mechanism for identifying field personnel requiring additional training and equipment in need of calibration or repair. USGS offices in the regions and districts provide training and instrument calibration or repair as needed.

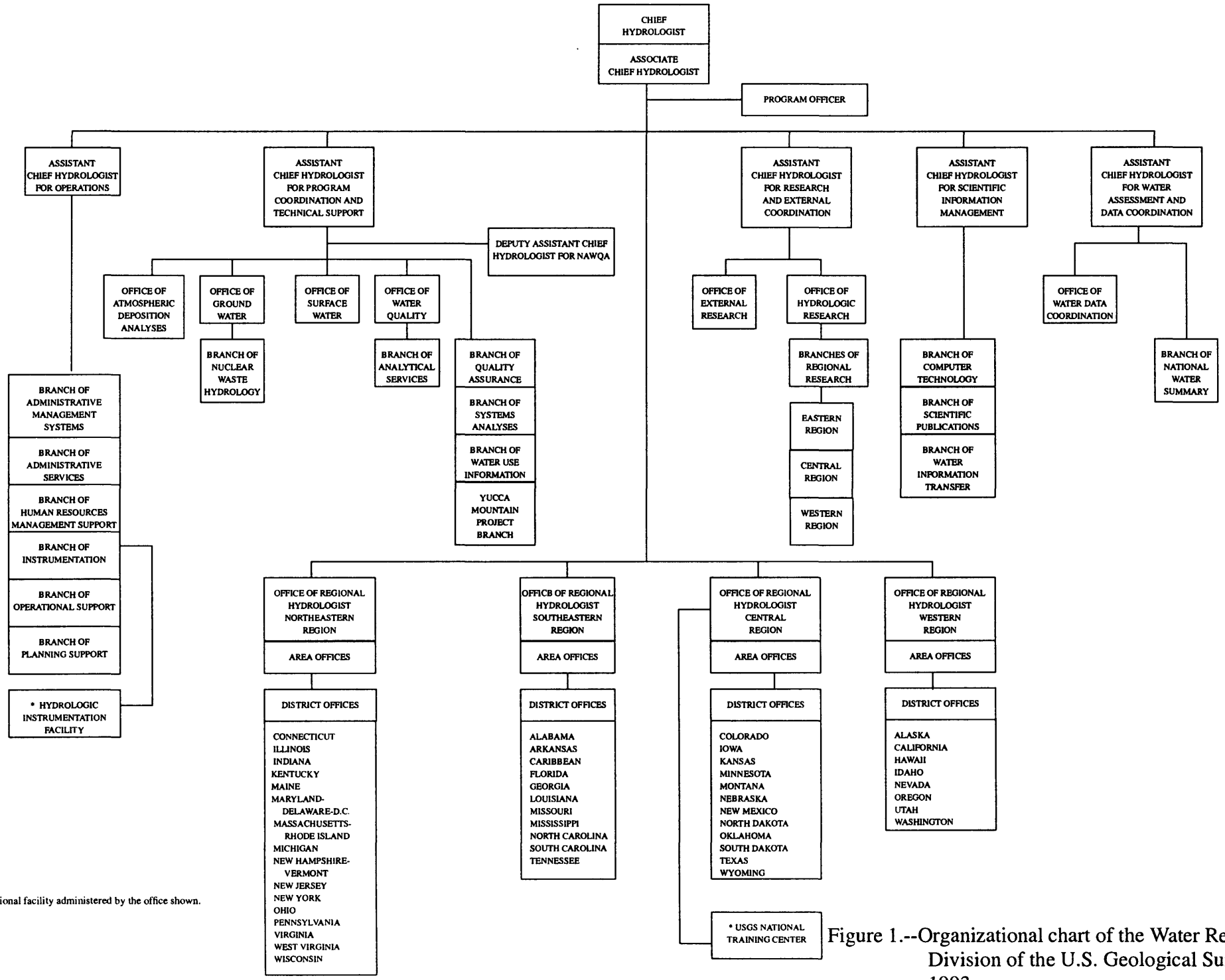
PURPOSE AND SCOPE

This report describes the standard operational procedures (SOP's) and the quality-control practices necessary to efficiently operate the NFQA. This report also details the use of the computer data base and computer programs used in the day-to-day activities of the NFQA. The NFQA manager can use this report to ensure the appropriate operational procedures are followed for each process. The Branch of Technical Development and

Quality Systems (formerly the Branch of Quality Assurance) may use this report as a quality-control document to provide oversight and guidance to the program.

The scope of this report is to present in detail the chronological processes for generating the appropriate files, electronically mailing update requests for participant information, uploading information in the appropriate computer files, preparing samples for bottling, and bottling instructions. This report documents the protocols used to generate the data reporting forms, bottle labels, and address labels; and defines the shipping procedures and data handling protocol. Each WRD office is provided a proficiency report which is prepared and distributed using the step-by-step procedures described in this report.

This report discusses the procedures and protocol of computer software programs to store, manipulate, and process NFQA information from 1982 through 1993. The step-by-step procedures in this report are sometimes followed by a gray shaded box which contains the computer response to the user's reply or keyboard entry.



* National facility administered by the office shown.

Figure 1.--Organizational chart of the Water Resources Division of the U.S. Geological Survey, 1993.

General Quality-Control Actions for Files

The NFQA executable files are stored in two directories managed by an INFO data base. The executable files for pH and specific conductance are stored in the directory OCALA>QA>NFQA>PH.COND.SYSTEM. The executable files for alkalinity and chloride are stored in another directory called OCALA>QA>NFQA> ALK.CL.SYSTEM. The EMACS editor is the editor of choice by the NFQA manager. Any editor on the DCOLKA Prime computer may be used. Any commands given in these operating statements will be in reference to the EMACS editor. The term "system" refers to the executable files found in either the pH and specific conductance or the alkalinity and chloride directory.

A working knowledge of the INFO programs and INFO programing language is recommended before working in the INFO data base. A novice user can damage files or delete or destroy needed programs. Extreme caution is recommended.

1. <CR> = Carriage return. On some computers the carriage return (<CR>) will be labeled as the ENTER key, RETURN key, NEW LINE key, INPUT KEY, or EOL key.
2. If INFO programs are modified, the data base system will need to by recompiled by executing the following command--Type: CO COMPILE.SYSTEM.COMI <CR>
3. When modifications are made to the executable files located in either the PH.COND.SYSTEM or in the ALK.CL.SYSTEM, similar or sometimes identical modifications may also be needed to the executable files located on the other system.
4. The INFO data base name (JOI) can only be executed when you are attached to either of the two systems.
5. When editing changes to the files have been saved, check to make sure your changes have been saved by listing the data to the screen and checking for accuracy of the data.
6. When editing data for a region (fig. 1) while working with the INFO data base, make sure you are working in the correct file by checking the district codes for that region in that file; for example, district codes AL, FL, and GA would only be found in the region file S.E.R. (C.R. = Central Region, N.E.R. = Northeast Region, S.E.R. = Southeast Region, W.R. = Western Region).
7. When copying files into another directory, check the filenames in the command line to ensure they are alike before issuing the copy command.

8. When editing the worksheets or update lists, check the data to make sure you are working with the correct file by checking the following:
   a. Verify the header information in the table by determining if the district name is listed in the appropriate region (fig. 1),
   b. Verify that the correct worksheets are being edited by matching the lab-id's (Stanley and others, 1992) with the worksheet table heading.
9. When saving a file, or when a file is created, use filenames that are relevant to the file contents; for example, the filename for alkalinity results from the initial round (Stanley and others, 1992) from the Southeast Region could be written as "SER.ALK.DATA."
10. The EMACS editor located on the DCOLKA Prime computer can be accessed using many different makes and models of computer terminals. Data General (DG) workstations and TAB terminals were used by the NFQA program manager. The procedures used to invoke the EMACS editor follows:
    a. To invoke EMACS on the DCOLKA Prime computer using a DG workstation, execute the following:

       RESUME <OCALA>STAFF>DSTANLEY>EM.DG.CPL "FILENAME" <CR>.

    b. To invoke EMACS on the DCOLKA Prime computer using a TAB terminal, execute the following;

       RESUME <OCALA>STAFF>DSTANLEY>EM.CPL "FILENAME" <CR>.

    c. To invoke EMACS when columns are wider than 80 characters, execute the following;

       EMACS -TTP VT132 "FILENAME" <CR> (TAB or DG terminals)

12. Remember to save the file often when working across the network (using the DCOLKA Prime computers from another city). Sometimes the network aborts, and disconnects all users, resulting in a loss of data.
13. Remember to use all capital letters when issuing INFO commands. Make sure that all the alpha data entries are capital letters also. Capital letters are not required for the data, but consistency makes the search routine easier to write.

GENERATING PARTICIPANT FILES FOR UPDATING

Participant information is stored in two directories in a computerized data base currently on the DCOLKA Prime computer located in Denver, Colorado. The pH and specific conductance information is stored in the directory <OCALA>QA>NFQA>PH.COND.SYSTEM. Alkalinity and chloride information is stored in the directory <OCALA>QA>NFQA>ALK.CL.SYSTEM. The data are stored by region and managed by the INFO data system.

An American Standard Code for Information Interchange (ASCII) file, which contains all the information about the participants and their equipment, is copied from the computer data base and sent by electronic mail (EDOC or E-mail) to the Water Quality Specialists in each district office for updating. Updates are requested approximately 30 to 45 days before the samples are to be shipped. The following describes this procedure.

1. Connect to the DCOLKA Prime computer and login, (see the Computer Specialists in your office for the procedures necessary to obtain access to the DCOLKA Prime Computer and for login).
2. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM <CR>. (Access the pH and specific conductance executable directory).
3. Type: INFO <CR> (Invokes the INFO program).
4. Type: JOI <CR> (Allows access into the INFO data base called JOI).
5. Type: SEL N.E.R., or SEL S.E.R., or SEL C.R., or SEL W.R. (Selects region).
6. Type: MOVE ' ' TO SAMP# <CR> (Replaces the sample number with a blank space).
7. Type: CALC VALUE = 0.0 <CR> (Replaces the value of the sample with a value of 0.0).
8. Type: SORT ON LAB-ID <CR> (Sorts the file by district name and unique number) (Stanley and others, 1992).
9. Type: SAVE "FILENAME.PH" COMP INIT <CR> (Saves selected data into the current directory).
10. Type: QUIT STOP <CR> (To exit INFO data base).
11. Type: CREATE "NEW WORKING DIRECTORY NAME" <CR> (Creates a new directory).
12. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM>"NEW WORKING DIRECTORY NAME" <CR> (Accesses the working directory).
13. Type: COPY <OCALA>QA>NFQA>PH.COND.SYSTEM> "FILENAME.PH" <CR> (Copies the newly created pH and specific conductance file into the new directory).

14. Type: ATTACH <OCALA>QA>NFQA>ALK.CL.SYSTEM <CR> (Attaches to the Alkalinity executable directory).
15. Repeat steps 3 through 8. The data are segregated in two directories, the pH and specific conductance data have just been prepared and copied into the working directory. Now the data files for alkalinity (which are located in the ALK.CL.SYSTEM) need to be prepared by repeating the same procedures in steps 3 through 8.
16. Type: SAVE "FILENAME.ALK" COMP INIT <CR> (Saves selected data into the current directory).
17. Type: QUIT STOP <CR> (To exit INFO data base).
18. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM> "NEW WORKING DIRECTORY NAME" <CR> (Accesses the working directory).
19. Type: COPY <OCALA>QA>NFQA>ALK.CL.SYSTEM> "FILENAME.ALK" <CR> (Copies the newly created alkalinity file into the new directory).
20. Consolidate the alkalinity file and the pH and specific conductance file into a temporary file. Using the temporary file and the EMACS editor, combine the data for pH, specific conductance, and alkalinity for each district and copy the combined data into a separate file. Name the file using the district code for the district followed by the number 1, (Example: FL1, CO1, IN1...). These district filenames are used in the SEND program to transmit the data electronically using the E-mail utility called EDOC. The EDOC users identity (ID) is identified in the SEND program by the district filename (FL1, CO1, IN1...).
21. COPY <OCALA>STAFF>DSTANLEY>NFQA>LETTERS>UPDATE.LETTER
    (Copy the file UPDATE.LETTER into the newly created working directory), see step 11. If the name of the update letter is changed, the name must be two words separated by a period (Example: UPDATE.LET, SER.LET...).
22. Edit this file (UPDATE.LETTER) for the correct date, appropriate region, and the selected data-return date.
23. Type : RESUME <OCALA>QA>NFQA>RMAIL.CPL <CR> (To transmit the data electronically) then follow instructions on the computer screen.

Quality-Control Actions

1. See section on **General Quality-Control Actions for Files.**

2. When editing the update letter, make sure the letter is addressed to the correct region and that the current date and the selected data-return date are correct.
3. Check the following before executing this command:

RESUME <OCALA>QA>NFQA>RMAIL.CPL <CR>:

a. List the file names in the working directory to the computer screen to ensure that all the data files are stored there for the appropriate region, by comparing the district filename against the district name in the WRD directory. The files should be named a two-letter alpha designation for the district followed by the number 1; (Example FL1, GA1, AL1,...). These codes for the districts are used by the RMAIL.CPL program to check for the E-mail user-ID of the person who is to receive this data.

b. List the filenames in the working directory to the computer screen; only the individual district files and the update letter should be in the working directory. Any other files stored in the working directory will cause the RMAIL.CPL program to halt. Remove unnecessary files.

c. Type: ATTACH <OCALA>QA>NFQA. Using the EMACS editor, edit the file "USERS.COMI". To add or replace user names, search for the district name, then add the appropriate user-ID for the person designated to receive the data for that district. After changes have been made to the file, "USERS.COMI", compile the file by typing: "CO USERS.COMI". This file contains the district-ID and the EDOC user-ID for the person designated to receive the data. This person is usually the District Water Quality Specialist.

d. The file "USERS.COMI" (Global Variable file) should only be edited using the EMACS editor. Always keep an updated spare copy of this file. If any other editor is used to edit this file, the file can be damaged to the extent that the SEND program will not work correctly. **Therefore, extreme caution is recommended when editing this file.**

CREATE A WORKING FILE

After the participant list has been updated by each office, files are returned by EDOC, or a paper copy is mailed to the NFQA program manager. The files are edited using the EMACS editor to reflect the changes on the paper copy. The edited file is loaded into the appropriate data-base system. The following describes the steps in preparing the working file.

In this section, any statements that are written inside the shaded boxes are the computer response to commands that were entered.

1. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM <CR>. (Accesses the pH and conductance executable directory).
2. Type: COPY <OCALA>QA>NFQA>PH.COND.SYSTEM>"DIRECTORY NAME">"FILENAME") (Copies the edited participants file into the directory where you are attached).
3. Type: INFO <CR> (Invokes the INFO program).
4. Type: JOI <CR> (Allows access into the INFO data base called JOI).
5. Type: SEL N.E.R., or SEL S.E.R., or SEL C.R., or SEL W.R., (Selects region).
6. Type: SAVE "FILENAME" COMP INIT <CR> (Saves selected data into the current directory).
7. Type: PURGE <CR> (Removes the selected data from the data base).

THIS COMMAND WILL DELETE SELECTED RECORDS. OK?>

8. Type: "Y" <CR> (Answer yes to this question).
9. Type: GET "EDITED FILENAME" COPY <CR> (Loads data file into data base).
10. Type: RES FOR PARAMETER = 'A' <CR> (Selects the alkalinity records).
11. Type: SAVE "ALKALINITY FILENAME" COMP INIT <CR> (Saves selected data into the current directory).
12. Type: PURGE <CR> (Removes selected data from the data base).
13. Type: "Y" <CR> (Answer yes to this question).
14. Type: QUIT STOP <CR> (To exit INFO data base).

15. Type: ATTACH <OCALA>QA>NFQA>ALK.CL.SYSTEM <CR> (Attaching to the Alkalinity directory).
16. Type: COPY <OCALA>QA>NFQA>PH.COND.SYSTEM> "ALKALINITY FILENAME") <CR> (Copy the newly created alkalinity file from the PH.COND.SYSTEM into the ALK.CL.SYSTEM directory).
17. Type: INFO <CR> (Invokes the INFO program).
18. Type: JOI <CR> (Allows access into the INFO data base called JOI).
19. Type: SEL N.E.R., or SEL S.E.R., or SEL C.R., or SEL W.R., (Select region).
20. Type: SAVE "FILENAME" COMP INIT <CR> (Saves selected data into current the directory).
21. Type: PURGE <CR> (Removes selected data from the data base).
22. Type: "Y" <CR> (Answer yes to this question).
23. Type: GET "ALKALINITY FILENAME" COPY <CR>.

Quality-Control Actions

1. See section on **General Quality-Control Actions for Files.**
2. Before copying a file into the INFO data base make sure you are working with the correct file by checking the data in the file.
3. When saving a file make sure to use the compress (COMP) and initialize (INIT) commands after the filename; example, (Type: SAVE "FILENAME" COMP INIT <CR>).
4. Remember to use the command COPY after the filename when copying a file into the INFO data base; example; (Type: GET "FILENAME" COPY <CR>).
5. Before purging a file, make sure you have either saved the file or be certain that you don't need the data. Once the data have been purged they are not retrievable except through the computer systems administrator on the DCOLKA Prime. The file may be restored from a backup tape. Newly created files will NOT have a backup file.

SELECTING AND ADDING SAMPLE NUMBERS TO DATA FILE

After the newly created update files have been loaded into the INFO data base, the series of sample numbers that are to be randomized also need to be added to the data base. Sample numbers already exist for most of the samples but not for the new participants. The following describes how to add the new series of sample numbers and to generate a new set of sample numbers for the entire data set.

In this section, any statements that are written inside the shaded boxes are the computer response to commands that were entered.

1. Type: RESUME <OCALA>QA>NFQA>SELECT.SYSTEM.CPL <CR> (To select a system).

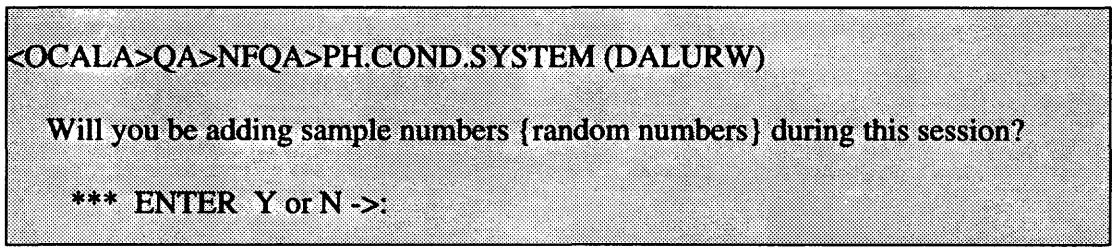
The following instructions will be displayed on the screen:

```
Type 'A' to go to the alkalinity and chloride system! !
Otherwise you will go to the pH and conductance system.

TYPE 'A' OR HIT RETURN ->:
```

2. Type: A or press the <CR> (By typing an A you will select the alkalinity chloride directory. A null carriage return (<CR>) will move you to the pH and specific conductance directory).

If you have typed an A proceed to step 5.

If you have selected to access the pH and conductance system, the following display informs you of the directory you have attached to. The next question will also be displayed on the screen:



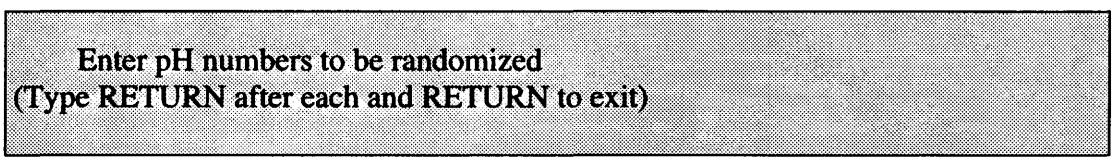
3. Type: N OR Y <CR>

   An 'N' response means you do NOT want to create new series of sample numbers.

   A Y response means you want to create a new series of sample numbers

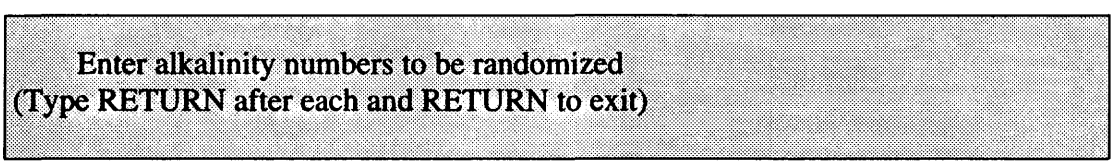
If you entered a response of N you will proceed to step 8 in this section.

If you entered a response of 'Y' (add a new series of sample numbers to randomize) the following instructions will appear on the screen:



4. Type in sample numbers for the parameter requested (Example: 11, 12, 13,... for pH), (21, 22, 23,... for specific conductance).

5. If you have typed an 'A' in step 2 and answered 'Y' in step 3 then the following will be displayed:



6. Type in sample numbers for the parameter requested (Example: (31, 32, 33, 34, for alkalinity). The program also will ask for samples numbers for chloride.

```
Enter chloride numbers to be randomized
(Type RETURN after each and RETURN to exit)
```

7. Type: <CR> (Chloride samples are not a part of the NFQA program at this time)

After this portion of the program has finished its operation, the following menus are displayed on the screen in succession.

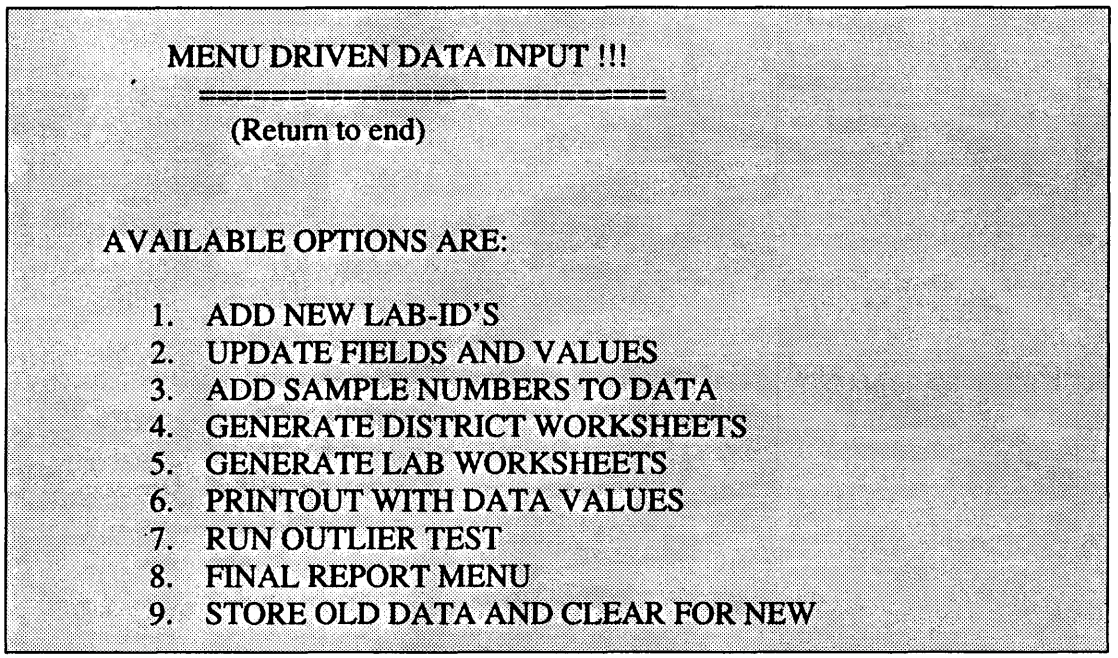
```
NOW GENERATING THE RANDOM NUMBERS REQUESTED
```

```
*** pH and Conductance QC System ***
   ==========================

REGION OPTIONS ARE :

  1. SOUTHEAST REGION (S.E.R.)
  2. CENTRAL REGION (C.R.)
  3. WESTERN REGION (W.R.)
  4. NORTHEAST REGION (N.E.R.)
  5. UNSAT. S.E.R.
  6. UNSAT. C.R.
  7. UNSAT. W.R.
  8. UNSAT. N.E.R.

        **** RETURN TO END ****
        WHICH REGION DO YOU WANT TO WORK ON?? :
```

8. Type: 1, 2, 3, or 4 <CR> (Selects region you need to work in).

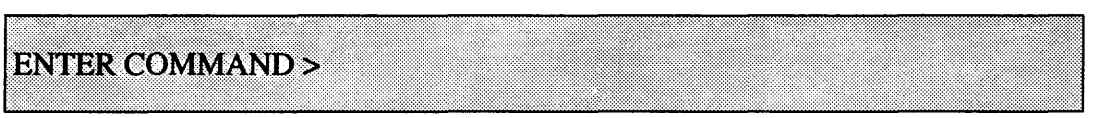
Options 5, 6, 7, and 8 are not functional at this time.

Then the following MENU is displayed:



9. Type: 3 <CR> (ADD SAMPLE NUMBERS TO DATA). This option will randomize the numbers and add the new series of sample numbers to the data base.

10. Type: <CR> <CR> (a single carriage return will move you back to the previous menu. Two carriages returns will move you to the (ENTER COMMAND >) prompt.



11. Type: QUIT STOP <CR> (To exit the INFO data base).

Quality-Control Actions

1. See section on **General Quality-Control Actions for Files.**
2. Always enter a two-digit sample number only. Sample numbers 11-18 are for pH samples. Sample numbers 21-28 are for specific conductance samples. Sample numbers 31-34 are for alkalinity samples.

SAMPLE PREPARATION

Currently, the NFQA program prepares and distributes more than 6,700 proficiency samples annually. Sample preparation, labeling, and distribution are standardized; and expected target values are selected before sample preparation. The standardized procedures and varying concentrations values produce a program that tests most alkalinity, pH, and specific conductance ranges found in natural waters (Hem, 1985).

Four alkalinity, eight pH, and eight specific conductance sample concentration ranges are prepared for each proficiency test. A number of different sample concentrations are required to test the analytical range of the instruments and to reduce the possibility of field analysts sharing results. The need for 20 different sample ranges for each test requires that twenty 100-liter samples be prepared.

The following reagents are used in the proficiency-sample preparation. The references cited are for the preparation procedures of each parameter:

1. pH--potassium hydrogen phthalate, potassium phosphate monobasic, and sodium hydroxide (Robinson and Stokes, 1959; Bates, 1964).

2. Conductivity--potassium chloride (American Public Health Association, 1989).

3. Alkalinity--sodium bicarbonate (American Public Health Association, 1989); 0.04 mg/L (milligrams per liter) of thymol is added to each sample to inhibit biological activity (Fishman and Friedman, 1989).

The target value for each of the 20 proficiency samples is chosen by the NFQA program manager at the QWSU in an attempt to cover the alkalinity, pH, and specific conductance ranges commonly found in natural waters. The quantity of reagents needed to produce a 100-liter proficiency sample is calculated using computer algorithms. Appendix I lists the target-value ranges used by the NFQA.

One hundred liters of water are pumped from a distilled water-holding tank into a polyethylene preparation

tank (fig. 2) using a peristaltic pump and mixed with the appropriate quantity of reagents for the proficiency solution being prepared. The alkalinity, pH, and conductivity solutions are stirred continuously for 4 to 5 hours; pH and conductivity solutions are allowed to stand at least 12 hours before ultraviolet (UV) sterilization and bottling. Alkalinity solutions are allowed to stand for 5 days before sterilization and bottling because unpublished test results (Khanh K. Doan, U.S. Geological Survey, oral commun., 1985) indicate this amount of time is necessary to allow the solution to achieve gaseous equilibrium with the atmosphere (Stanley and others, 1992).

After the solutions have been quiescent for the appropriate amount of time, the water is pumped through clear vinyl tubing and an in-line UV radiation unit, at a rate between 1.5 and 2.0 liters per minute. The UV sterilization unit is used to prevent degradation of the test samples by inhibiting biological activity. The sample bottles and caps are composed of high density polyethylene and are treated with UV radiation under a UV hood for about 15 minutes prior to being filled. A minimum of 2 liters of the test sample is pumped through the system before any samples are bottled. The bottling and capping process is completed under the UV radiation hood.

The following describes these procedures:

In this section, any statements that are written inside the shaded boxes are the computer response to commands that were entered.
Instructions for the preparation of test samples follows:

1. Determine the test samples concentration ranges for all three parameters being tested.
2. Type: ATTACH <OCALA>STAFF>DSTANLEY>NFQA>STANDARDS <CR> (Attaches to the directory called "STANDARDS").
3. Type: COMO "FILENAME" <CR> (Opens a screen capture file).
4. Type: BASICV ALK.STDS <CR> or BASICV PH.STDSD <CR> or BASICV COND.STDS <CR> (Invokes programs to calculate the amount of reagents needed for the specified concentration and volume of water).

The following will be displayed:

ENTER CONCENTRATION OF STANDARD

5. Enter the concentration of the solution (Example: Type: 35 <CR> for pH Type: 5.6 <CR>). It is usually more convenient to prepare samples in ascending order of concentration (Appendix II).

The following will be displayed:

ENTER VOLUME REQUIRED IN LITERS

6. Enter the volume required in liters (Example: Type: 100 <CR>).

7. Continue to enter the concentrations and the required volumes for all the selected sample ranges.
8. Type: 0 <CR> [Enter a "0" (zero) for the concentration to end the program.]
9. Type: COMO -E <CR> (Closes the screen capture file. For output see Appendix II).
10. Print the screen capture file.
11. Repeat steps 2 through 10 for the next parameter.

Instructions for preparing and bottling the samples follows:

12. Using a peristaltic pump, transfer 100 liters of distilled water into 4 tanks.
13. Attach the stirring assembly to each motor.
14. Weigh out the appropriate chemical salts for 4 solutions.
15. Label the tanks with the appropriate sample number.
16. Turn on stirrers.
17. Add distilled water to each beaker of salts to make a slurry. Pour the slurry into the appropriate tank. Rinse beaker three times with distilled water and pour rinse water into the proper tank.
18. Stir the solutions for 4 to 5 hours. Remove the stirring assembly, place a lid on each tank, and store the solutions overnight before bottling.

19. After the solutions have been quiescent for the appropriate amount of time (12 hours for pH and specific conductance and 5 days for alkalinity solutions), the test sample is ready for bottling.
20. Using a peristaltic pump and clear vinyl tubing, pass the sample through a UV sterilization box and into the UV radiation hood. Rinse the pumping system with at least 2 liters of sample.
21. Place the empty bottles and caps under the UV hood and radiate them for 15 minutes before bottling.
22. All bottling and capping MUST be completed under the UV hood.
23. Before the bottling process is started, for each sample, label the storage box with the corresponding sample number.
24. After the bottles are tightly capped, place them in the large, cardboard storage box.
25. Remember to wear UV protective eye ware, gloves, and lab coat. UV radiation can burn you.

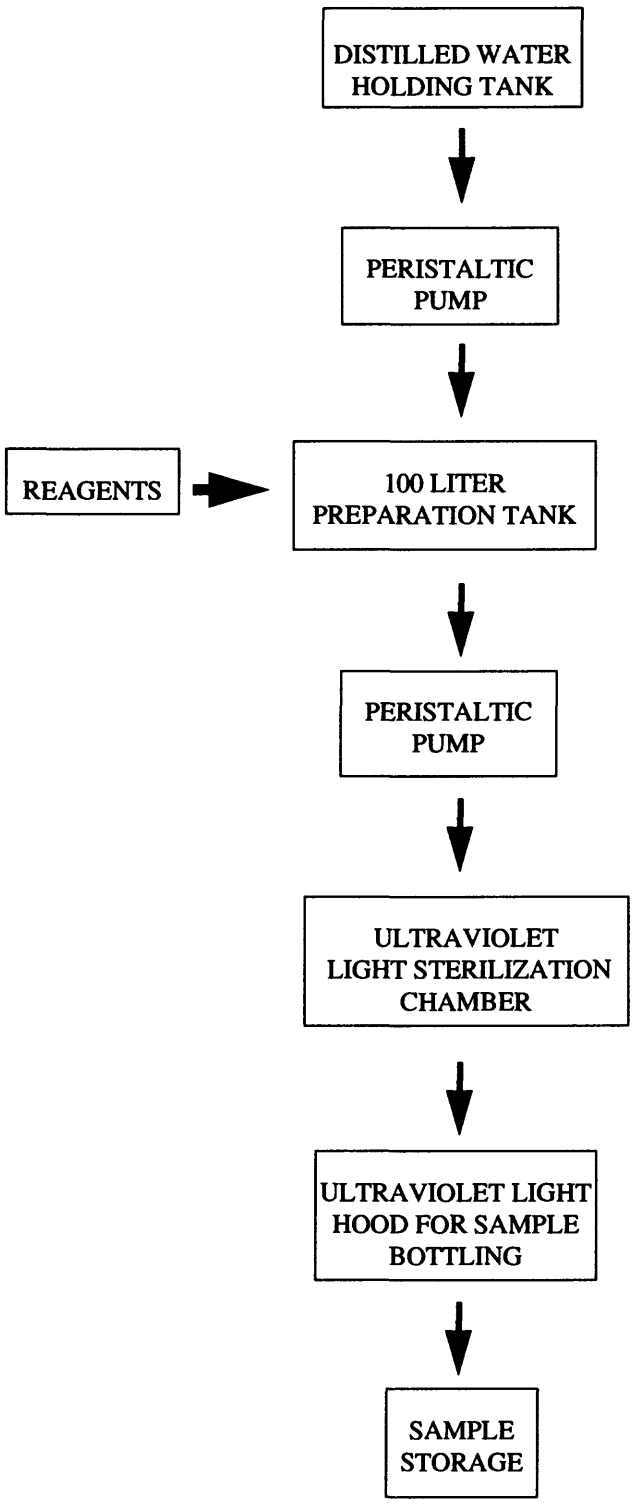


Figure 2.--Proficiency sample preparation process from holding tank to sample storage.

Quality-Control Actions

1. Make sure to prepare samples in ascending order of concentration by selecting the lowest concentrations first when executing the standard preparations program.
2. Only weigh out the chemical salts for four samples at a time.
3. Remember to allow the pH and specific conductance samples to set undisturbed overnight before bottling.
4. Remember to allow the alkalinity samples to set undisturbed for 5 days before bottling.
5. Remember to wear the proper protective equipment when bottling the samples.
6. Remember to turn on both the UV sterlilization box and UV hood before bottling.
7. The UV light bulbs need to be changed after 100 hours of operation. After this period of time the UV bulbs' capacity to generate the short-wave-radiation necessary for sterilization decreases.

GENERATING SAMPLE DATA REPORTING FORMS

Reporting forms or worksheets are mailed with the samples to each office and may be used to record the analytical values for each sample. The worksheets are returned by mail to the NFQA program manager. The following describes the procedure used to generate the worksheets.

In this section, any statements that are written inside the shaded boxes are the computer response to commands that were entered.

1. Type: RESUME <OCALA>QA>NFQA>SELECT.SYSTEM.CPL <CR> (To select a system).

The following instructions will be displayed on the screen:

```
Type 'A' to go to the alkalinity and chloride system! !
 Otherwise you will go to the pH and conductance system.

 TYPE 'A' OR HIT RETURN ->:
```

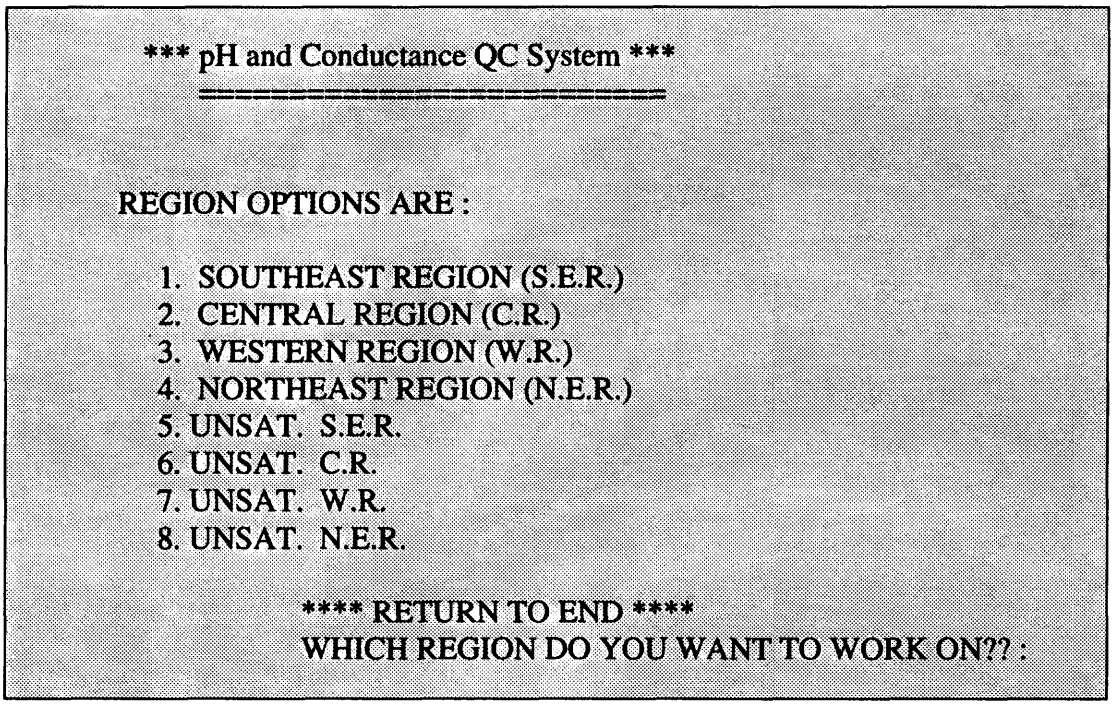
2. Type: A or press the <CR> (By typing an 'A' you will select the alkalinity chloride directory. A carriage return (<CR>) will select the pH and specific conductance directory).

After you have selected the system, the following display informs you of the directory you have attached to. The next question will also be displayed on the screen:

```
<OCALA>QA>NFQA>PH.COND.SYSTEM (DALURW)

 Will you be adding sample numbers {random numbers} during this session?

  *** ENTER Y or N ->:
```

3. Type: N <CR> (An 'N' response means you do NOT want to create new series of sample numbers).

The following will also be displayed:



Select the appropriate region.

4. Type: 1, 2, 3, or 4 <CR> (Selects region).

   Options 5, 6, 7, and 8 do not function.

The following MENU is then displayed:

```
MENU DRIVEN DATA INPUT !!!
==========================
(Return to end)

AVAILABLE OPTIONS ARE:

1. ADD NEW LAB-ID'S
2. UPDATE FIELDS AND VALUES
3. ADD SAMPLE NUMBERS TO DATA
4. GENERATE DISTRICT WORKSHEETS
5. GENERATE LAB WORKSHEETS
6. PRINTOUT WITH DATA VALUES
7. RUN OUTLIER TEST
8. FINAL REPORT MENU
9. STORE OLD DATA AND CLEAR FOR NEW
```

5. Type: 4 <CR> (Selects option 4. GENERATE DISTRICT WORKSHEETS).

The next menu will be displayed. Select which type of worksheets you need.

```
*****************************************
*                                       *
*     Type of worksheets???             *
*        (return to end)                *
*    ENTER   1 for pH or                *
*            2 for conductance          *
*                                       *
*****************************************
```

6. Type: 1 <CR> (To get the pH worksheets)

```
File now being printed!!  Please wait
```

7. Type: 2 <CR> (To get the conductance worksheets).

```
File now being printed!!  Please wait
```

The worksheets will be generated and will be copied into the directory

<OCALA>QA>NFQA>PH.COND.SYSTEM>TEMP.FILES

The filenames are PH.WORKSHEET, COND.WORKSHEET, or ALKALINITY.WORKSHEETS

8. Type: <CR> <CR> <CR> (a single carriage return will move you back to the previous menu. Three carriage returns will move you to the (ENTER COMMAND >) prompt.

```
ENTER COMMAND >
```

9. Type: QUIT STOP <CR> (To exit the INFO data base).

Repeat steps 1 through 8 to prepare all three worksheets. If you had first selected pH and specific conductance system, then begin with step 1 again by selecting the alkalinity system and then continue through step 8.

10. ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM>TEMP.FILES

Using the EMACS editor, combine the three worksheet files into one file. The combined file is edited to remove the FORTRAN control characters (1 in column 1), and replaced with an ASCII page eject ("Press and hold the control key" X Q, "Press and hold the control key" L). Next, replace the current date from the line at the top of the worksheet that contains the "PAGE" number, with the suggested data return date (Example, "Return Results by NOVEMBER 18, 1994"). Remember to leave the page number on the worksheet to aid in sorting the worksheets after they are returned from the field. An example of a typical worksheet is found in Appendix III. After the worksheet file has been edited, the worksheets are ready for printing. Save the file as wks.sheets and contact the systems administrator for the procedure for printing files at your workstation.

1. See section on **General Quality-Control Actions for Files.**
2. Make sure you have selected the correct region by looking at the district codes (Example: FL1, GA1,...).
3. Visually check the file before printing, to make sure all the worksheets for all offices are included in the file by comparing the district name to the district list in the WRD directory.
4. Before printing the file, visually scan the electronic file to determine if the 1 in column 1 has been replaced by "?" produced by the command (Press and hold the control key, X, Q, L).

GENERATING BOTTLE LABELS

The bottle labels for the NFQA test samples are prepared using a computer program. The information on the bottle labels are used by the program manager to identify the USGS, contractor, or cooperator offices that are to receive test samples. The identity of the field analyst, parameter designation, sample number, unique-ID number, and meter identification are also included on the bottle label.

The unique identification number is an alpha-numeric code that is used by the program manager to designate individual bottles that are assigned to a specific office, field analyst, and instrument combination. The field analyst is the person who is making field measurements for alkalinity, pH, or specific conductance.

The following describes the procedure used to generate the sample bottle labels.

In this section, any statements that are written inside the shaded boxes are the computer response to commands that were entered.

1. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM <CR> (Accesses the pH and conductance executable directory).
2. Type: INFO <CR> (Invokes the INFO program).
3. Type: JOI <CR> (Allows access into the INFO data base called JOI).
4. Type: SEL N.E.R., or SEL S.E.R., or SEL C.R., or SEL W.R., (Selects a region).
5. Type: SORT ON DISTRICT,SUBDIST,SAMP#, (Sorts data in the correct order).

Bottle labels are sorted in this arrangement to make it easier for the placement of the labels on the correct sample bottles during the process of preparing the samples for shipment.

6. Type: OUTPUT "FILENAME" <CR> (Names the output data file).
7. Type: SF LABELS <CR> [Invokes the process (short forms) that writes the data to the file].

The following is then displayed:

OUTPUT TO PRINTER(Y OR N)?>

8. Type: Y <CR> (A response of 'N' will direct the output to the screen. A response of 'Y' directs the data to a file which you have named in step 6).
9. Type: QUIT STOP <CR> (To exit the INFO data base).

Labels will be copied into the system directory where you are currently working. A typical bottle label is found in Appendix IV.

10. Using the EMACS editor, edit the "OUTPUT FILENAME" by searching for the word 'HYDRO'. Tab over to column 28 and Type: LITER (do not enter a <CR>). Continue this step through the entire file. Put the cursor at the beginning of the file. There are two blank lines between each label; delete one of them. Continue this step through the entire file. Save the file and exit the EMACS editor. Deleting the blank line between labels is not required for the alkalinity samples labels.

    The labels are usually placed on a 250-milliliter (mL) bottle of sample. Some meters require a larger volume of water to measure correctly. The word LITER is used to identify labels that are only needed for a one-liter pH or specific conducfance sample. All alkalinity samples are prepared in 250-mL bottles.

11. Type: ATTACH <OCALA>QA>NFQA>ALK.CL.SYSTEM
    (Accesses the alkalinity and chloride executable directory).
12. Repeat steps 2 through 9.
13. Print all labels. See your Systems Administrator for proper procedures to print labels:

The QWSU uses the following procedures:

Terminal ----- Tab

Printer ----- Spinwriter

a. Using a "TAB" terminal that is connected to a "SPINWRITER" printer, login on the DCOLKA Prime computer.
b. Set function key (set up print) to 1200 baud rate.

c. Load in blank labels (3 1/2 X 15/16 inches, fanfolded labels 1 inch wide) on the printer.

d. Type: RESUME STAFF>DSTANLEY>SPL.CPL "OUTPUT FILENAME"

(Executes the program to print the file containing the labels.)

Quality-Control Actions

1. See section on **General Quality-Control Actions for Files.**
2. Check output file to ensure the correct region's labels were generated, by looking at the district codes (Example: FL1, GA1... will only be in the Southeast Region).
3. The output file for pH and specific conductance labels generates an extra blank line between labels this blank line must be deleted before printing the labels.
4. Before printing the labels remember to search the label file for the word "HYDRO" and add the word "LITER" starting in column 28 (See step 10).

GENERATING MAILING ADDRESS LABELS

Address labels are stored in the directory <OCALA>STAFF>DSTANLEY>NFQA>DIST.ADDR on the DCOLKA Prime computer. Each region's address labels are stored in their respective files named SER (Southeast), NER (Northeast), WR (Western), or CR (Central). The following describes the procedure used to generate the mailing address labels.

1. Type: ATTACH <OCALA>STAFF>DSTANLEY>NFQA>DIST.ADDR <CR> (Attaches to DIST.ADDR directory).
2. Use the EMACS editor to make any changes to the address of the offices.
3. Using a TAB terminal that is connected to a SPINWRITER printer login on the DCOLKA Prime computer.
4. Set function key (set up print) to 1200 baud rate.
5. Load in blank address labels (form number 9-160-A) on the printer.
6. Type: RESUME STAFF>DSTANLEY>SPL.CPL "FILENAME" <CR> (Execute this program to print the mailing-address labels) for each region.

Example of typical address labels are found in Appendix V.

Quality-Control Actions

1. See section on **General Quality-Control Actions for Files**
2. Make sure you are printing out the correct mailing address labels for the region by looking at the district codes.
   (Example: FL1, GA1... will only be in the Southeast Region).
3. Make sure a sufficient quantity of labels are loaded into the printer to print all the address labels.
4. Make sure the labels are aligned correctly on the printer.

5. Verify office shipping address by comparing the office address in the file with the WRD directory. Since many offices move after the directory is printed, it may be necessary to check with the Administrative Officer in each region to verify an office address.

SAMPLE SHIPPING PROCEDURES

Approximately 30 days prior to the shipment of the NFQA test samples, each district office is requested to supply all participants' names, meter identification, and methodology for each sample type. The major objective of this inventory is to ensure that all personnel and instrument combinations being used to obtain onsite values for pH, specific conductance, and alkalinity data are evaluated. Because a meter may have multiple users and an individual may use multiple meters, the program strives to test all of the combinations. Each field analyst and meter combination is assigned a unique number, and a set of samples needed for the measurements is sent to the participant. The sample set consists of two pH and specific conductance samples and, if requested, two alkalinity samples.

The boxes of samples are segregated by parameter and arranged in ascending numerical order. The worksheets with the instruction letter, mailing address labels, and bottle labels are placed on the packing table. The following describes the shipping protocol:

1. Separate all the bottle labels for one office from the prepared set of the bottle labels.
2. By parameter, separate the pH sample bottle labels from the specific conductance labels then separate the alkalinity labels.
3. Beginning with one office's pH labels, count the number of bottle labels with the lowest sample number.
4. Go to the box of prepared samples with the corresponding sample number from the labels and retrieve one bottle for each label.
5. Peel off all the self-adhesive labels and place the labels on a 250-mL bottle. Some labels contain the word "LITER" above the sample number; place this label on a liter size sample. Continue with this procedure (working with only one sample number) until all the pH labels for the first office have been placed on the bottles and the bottles are placed on the packing table.
6. Follow the same procedure for conductance and alkalinity samples for the first office.
7. With a black marker, blacken out the sample number, leaving the alpha designation for the parameter.
8. Place bottles in a shipping container or corrugated box, and add packing material (styrofoam peanuts).
9. Match the office code on the bottles with the office code on the worksheets. Place the worksheets with the instruction letter (Appendix VI) in the shipping container. If more than one box is needed for shipping add an instruction letter to each box.

10. Place the appropriate address label on the box and ship by carrier of choice. During the winter months, to prevent the samples from freezing, the samples should be sent by overnight mail to offices in the northern States.
11. By E-mail notify each district that samples are being shipped.

Quality-Control Actions

1. When labeling sample bottles, work with one sample number at a time.
2. When blackening out the sample number, remember to leave the alpha designation for the parameter on the label.
3. Match the office code on the bottle with the office code on the worksheets with the office code on the address labels. All office codes must match for each box of samples.
4. Check to determine that the correct worksheets for pH, specific conductance, and alkalinity samples, and the instruction letter are placed on top of the samples. Do NOT place the worksheets with the instruction letter in the bottom of the shipping box.
5. If more than one box is required to ship the NFQA samples be sure to include an instruction letter with each box.

RECORDING THE RESULTS AND COPYING THE FILES INTO THE INFO DATA BASE

The field analysts record the results from the analysis of the alkalinity, pH, and specific conductance reporting forms (District worksheets) provided by the NFQA. The worksheets are returned to the NFQA manager within 30 days after the samples are received.

The reporting criterion for alkalinity is two significant figures, for pH it is to one-tenth unit, and for specific conductance values less than 1,000 µS/cm are reported to 1 µS/cm and specific conductance values greater than 1,000 µS/cm are reported to 10 µS/cm.

The reporting forms are placed in alphabetical order by district name to simplify the data entry into the data file for the appropriate region. The data file in the INFO data base is sorted in alphabetical order by district name and the file is stored out of the data base using the SAVE command. The field analyst results are entered into this file, and the file is loaded into the INFO data base using the GET command.

The following describes these procedures.

In this section, any statements that are written inside the shaded boxes are the computer response to commands that were entered.

Before starting this section make sure you have saved the data from the previous round of testing. If not save the file before continuing with these commands.

1. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM <CR> (Accesses the pH and conductance executable directory).
2. Type: INFO <CR> (Invokes the INFO program).
3. Type: JOI <CR> (Allows access into the INFO data base called JOI).
4. Type: SEL N.E.R., or SEL S.E.R., or SEL C.R., or SEL W.R. <CR> (Selects region).
5. Type: SORT ON LAB-ID <CR> (Sorts the data file by district and unique number).
6. Type: CALC VALUE = 1.0 <CR> (Sets the location of the decimal point in the output file).

The value of 1.0 is added to each record. The decimal point is used to align the sample values in the correct column in the EMACS file. The value of 1.0 is overwritten during data input.

7. Type: MOVE ' ' TO STATUS <CR> (Deletes the status code from the previous round).
8. Type: MOVE 'X' TO COMMENT <CR> (Comment code place holder).

The name "COMMENT" is the INFO programing name for the NFQA response code. The letter "X" is used in the EMACS file as a place holder for the NON-RESPONSE CODE (code for no response). The letter "X" is overwritten during data input for participants who did not record a sample value but provided an explanation (NON-RESPONSE CODE) on the district worksheet. Participants who failed to record a value and provided no explanation for the missing results are given the non-response code of "B" (see steps 33 and 34 of this section). The letter "X" is removed from the COMMENT field in the INFO data base for participants who reported a value (see steps 36 through 37 of this section).

9. Type: SAVE "FILENAME.PH" COMP INIT <CR> (Saves selected data into the current directory).

Filenames are composed of: region, month of report, year, and parameter, (NER.APR.93.PH). If the file contains followup data then the region's identity is followed by a 'U' (NER.U.APR.93.PH).

10. Type: QUIT STOP <CR> (Exits the INFO data base).
11 Type: CREATE "DIRECTORYNAME" <CR> (Creates a new directory to work in).
12. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM> "DIRECTORYNAME" <CR> (Accesses the newly created directory).
13. Type: COPY <OCALA>QA>NFQA>PH.COND.SYSTEM> "FILENAME.PH" <CR> (Copies the pH and specific conductance data into the working directory).

In step 11, the working directory is created in order to keep the files segregated. Since at any one time you may be working on the data from multiple regions, step 11 is necessary. Steps 12 and 13 are the commands to attach to that directory and copy files into the working directory.

14. Type: ATTACH <OCALA>QA>NFQA>ALK.CL.SYSTEM <CR> (Accesses the alkalinity executable directory).
15. Repeat steps 2 through 9.
16. Type: SAVE "FILENAME.ALK" COMP INIT <CR> (Saves selected data into the current directory).
17. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM> "DIRECTORYNAME" <CR> (Accesses the newly created directory).
18. Type: COPY <OCALA>QA>NFQA>PH.COND.SYSTEM> "FILENAME.ALK" <CR> (Copies the alkalinity file into the working directory).
19. Using the EMACS editor, combine the alkalinity file and the pH and specific conductance file into one file.
20. Type: "Press the escape key" X OVERLAY_ON <CR> (Invokes the overwrite function). This will allow you to overwrite a field without changing the column format.
21. Type: "Press the escape key" X TABLIST <CR> 9 36 52 61 70 <CR>. (Sets the tab stops). The tab stops will allow you to place the cursor at each field quickly.
22. Arrange the district worksheets in alphabetical order by the name of the district.
23. Update the new information from the worksheets into the EMACS file.
24. After all the data has been entered, save the file and copy it back into the pH and conductance system directory.
25. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM <CR> (Accesses the pH and conductance executable directory).
26. Type: COPY <OCALA>QA>NFQA>PH.COND.SYSTEM>DIRECTORYNAME>FILENAME <CR> (Copies the edited file in the PH.COND.SYSTEM directory.)
27. Type: INFO <CR> (Invokes the INFO program).
28. Type: JOI <CR> (Allows access into the INFO data base called JOI).
29. Type: SEL N.E.R., or SEL S.E.R., or SEL C.R., or SEL W.R.
(Selects the region you are working on).
30. Type: PURGE <CR> (Removes the selected data from the data base).

THIS COMMAND WILL DELETE SELECTED RECORDS. OK?>

31. Type: "Y" <CR> (Answer yes to this question).

32. Type: GET "FILENAME" COPY

(Copies the edited file into the INFO data base).

33. Type: CALC VALUE = VALUE <CR> (Eliminates alpha characters from the VALUE field).
34. Type: RES FOR VALUE = 1.0 <CR> (Selects only the records where the value is 1.0).
35. Type: RES FOR COMMENT = 'X' <CR> (Selects only the records where the comment code is X).
36. Type: MOVE 'B' TO COMMENT <CR> (Replaces the comment code of X to a comment code of B, for no response).

The comment codes (Response codes) were changed only on the records in which no data had been entered and no remark codes (Response Codes), for no response, were added when the field data were entered into the file.

37. Type: ASEL <CR> (Reselects the entire file).
38. Type: RES FOR COMMENT = 'X' <CR> (Reselects for comment of X).
39. Type: MOVE ' ' TO COMMENT <CR> (Sets the comment code to a blank field for all records with a valid value).
40. Type: ASEL <CR> (Reselects the entire file).
41. Type: RES FOR VALUE = 1.0 <CR> (Selects values that equal 1.0).
42. Type: CALC VALUE = 0.0 <CR> (Sets selected records value to 0.0). If this is not done the values will be used in the calculations for the MPV's of the samples and will be assigned an unsatisfactory rating.

Each record with a value should NOT have a comment code (response code), and each record with response code should have a value of 0.0.

43. Type: ASEL <CR> (Selects the entire file).
44. Type: RES FOR PARAMETER = 'A' <CR> (Reselects the records which have a parameter code of "A") This command selects the alkalinity records).
45. Type: SAVE "ALK.FILENAME" COMP INIT <CR> (Saves selected alkalinity records into the current directory).
46. Type: PURGE <CR> (Removes the alkalinity records from the pH and specific conductance file).
47. Type: QUIT STOP <CR> (Exits the INFO data base).

48. Type: ATTACH <OCALA>QA>NFQA>ALK.CL.SYSTEM <CR> (Accesses the alkalinity executable directory).
49. Type: COPY <OCALA>QA>NFQA>PH.COND.SYSTEM> "ALK.FILENAME" <CR> (Copies the newly created alkalinity file into the alkalinity directory.
50. Type: INFO <CR> (Invokes the INFO program).
51. Type: JOI <CR> (Allows access into the INFO data base called JOI).
52. Type: SEL N.E.R., or SEL S.E.R., or SEL C.R., or SEL W.R.

(Selects the region you are working on).

53. Type: PURGE <CR> (Removes the selected data from the data base).

THIS COMMAND WILL DELETE SELECTED RECORDS. OK?>

54. Type: Y <CR> (Answer yes to this question).

55. Type: GET "ALK.FILENAME" COPY

(Copies the file into the INFO data base).

56. Type: QUIT STOP <CR> (Exits the INFO data base).

Quality-Control Actions

1. See section on **General Quality-Control Actions for Files.**
2. Make sure you have selected the correct region by looking at the district codes.
3. Make sure you have saved a copy of the data from the previous round by looking for the filename in the system you are working in before you prepare the INFO file for the next set of data.
4. When editing the files make sure you are recording the data into the correct line by matching the LAB-ID number on the worksheet (see Appendix III) with the LAB-ID number (first column) in the computer file.
5. After the data from each worksheet are entered into the file, verify the input by checking the data in the file against the data on the worksheet.

6. After the tab stops are set, verify the tab stops are set correctly by pressing the tab key and looking at the cursor placement.
7. When editing, SAVE ("Press and hold the control key" X S) often. The network disconnects you many times during the day and you can lose some of your data. Anytime you are disconnected, check the data in the file to see if you have lost the last few entries.

EXECUTING THE OUTLIER TEST

Outlying values are rejected on the basis of the T-value (Grubbs test) as described by the American Society for Testing and Materials (1969). After the rejection of outliers, a new mean and standard deviation are calculated and the mean is used as the Most Probable Value (MPV) (Dixon and Massey, 1969).

In this section, any statements that are written inside the shaded boxes are the computer response to commands that were entered.

1. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM <CR> (Accesses the pH and conductance executable directory) or
   Type: ATTACH <OCALA>QA>NFQA>ALK.CL.SYSTEM <CR> (Accesses the alkalinity executable directory).

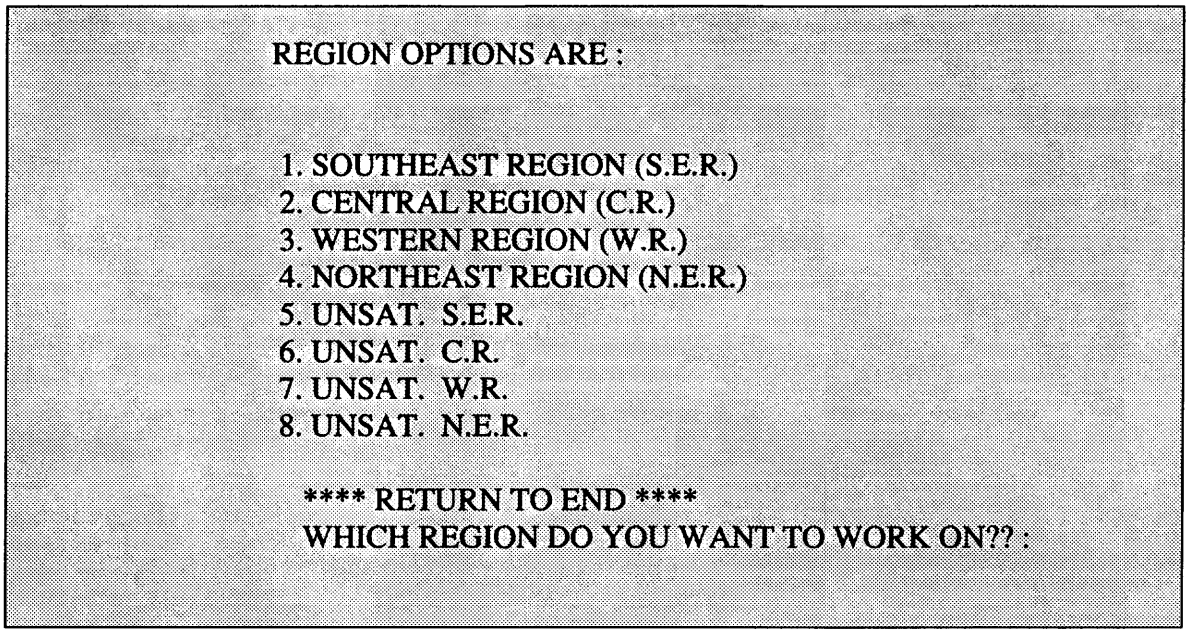
A good quality-control practice is to access the PH.COND.SYSTEM directory first, and after completion of the necessary steps, access the ALK.CL.SYSTEM directory and complete the necessary steps.

2. Type: INFO <CR> (Invokes the INFO program).
3. Type: JOI <CR> (Allows access into the INFO data base called JOI).

The following prompt will be displayed:

```
ENTER COMMAND >
```

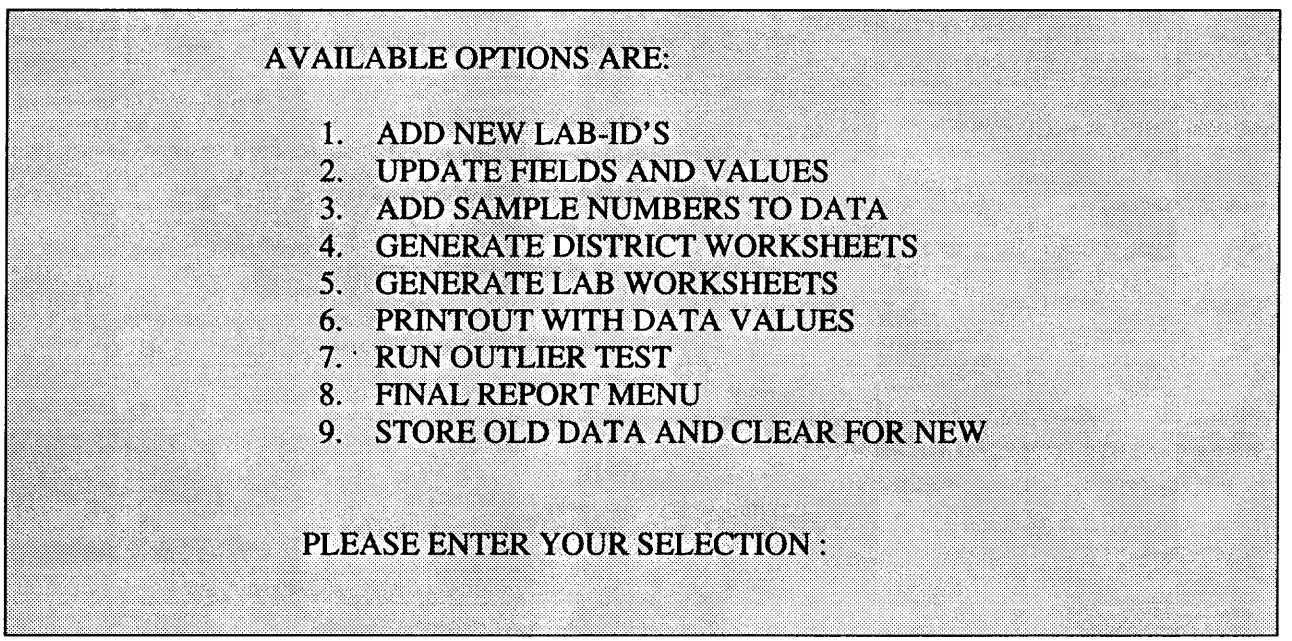
4. Type: RUN P.MENU <CR> (Invokes the NFQA entry program).



5. Type: 1, 2, 3, or 4 <CR> (Selects the file for the region).

   Options 5, 6, 7, and 8 do not function.

After you have selected the correct region, the following menu will be displayed:



6. Select option 7 (RUN OUTLIER TEST); the outlier test program will execute and the response is:

```
Do you want a hardcopy of this information?
      (Enter Y or [N])
```

7. If you need a hard copy of the outliers answer yes (Y). The file containing the outliers is copied in the directory <OCALA>QA>NFQA>PH.COND.SYSTEM>TEMP.FILES

8. Type: <CR> <CR> (a single carriage return will move you back to the previous menu. Two carriage returns will return you to the (ENTER COMMAND >) prompt.

```
ENTER COMMAND >
```

9. Type: QUIT STOP <CR> (Exits the INFO data base).

Quality-Control Actions

1. See section on **General Quality-Control Actions for Files.**
2. Make sure you select the correct option when selecting the correct data file for the region.
3. Make sure you select the correct option when choosing the need for a copy of the list of outliers results.

ASSIGNING THE STATUS CODES TO THE SAMPLES

The status codes or proficiency ratings are assigned to the samples after the outlier test is performed. The values for each sample are compared against the MPV's which were determined during the outlier test. Statistical evaluation of the results from each individual proficiency sample includes a calculation of the number of results reported, the mean, and standard deviation.

In this section, any statements that are written inside the shaded boxes are the computer response to commands that were entered.

1. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM <CR> (Accesses the pH and conductance executable directory) or,
   Type: ATTACH <OCALA>QA>NFQA>ALK.CL.SYSTEM <CR> (Accesses the alkalinity executable directory).

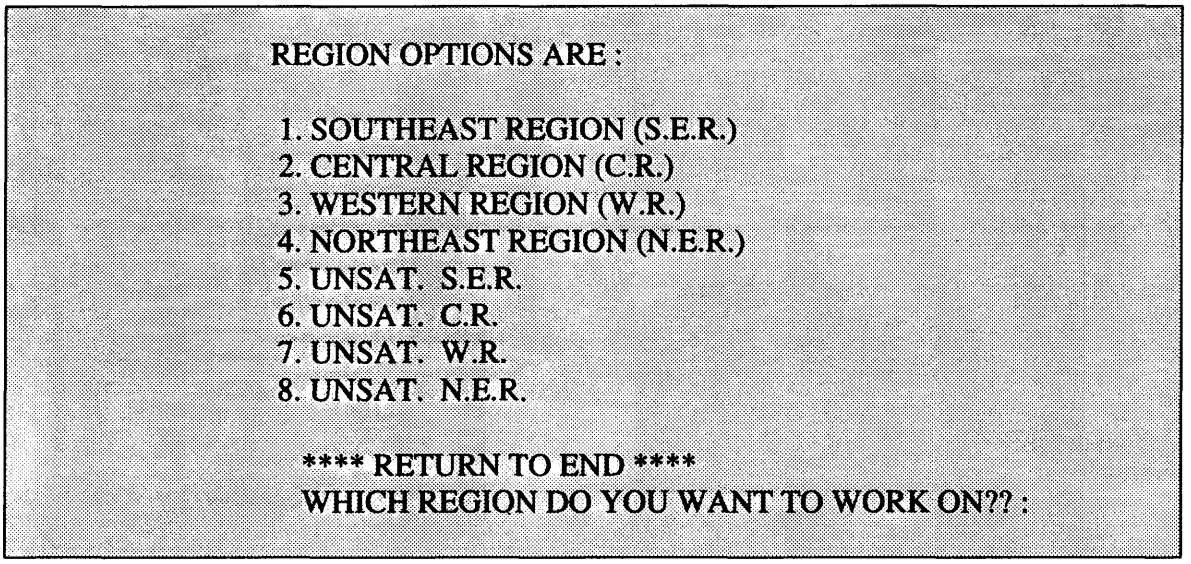
A good quality-control practice is to access the PH.COND.SYSTEM directory first, and after completion of the necessary steps, access the ALK.CL.SYSTEM directory and complete the necessary steps.

2. Type: INFO <CR> (Invokes the INFO program).
3. Type: JOI <CR> (Allows access into the INFO data base called JOI).

The following prompt will be displayed:

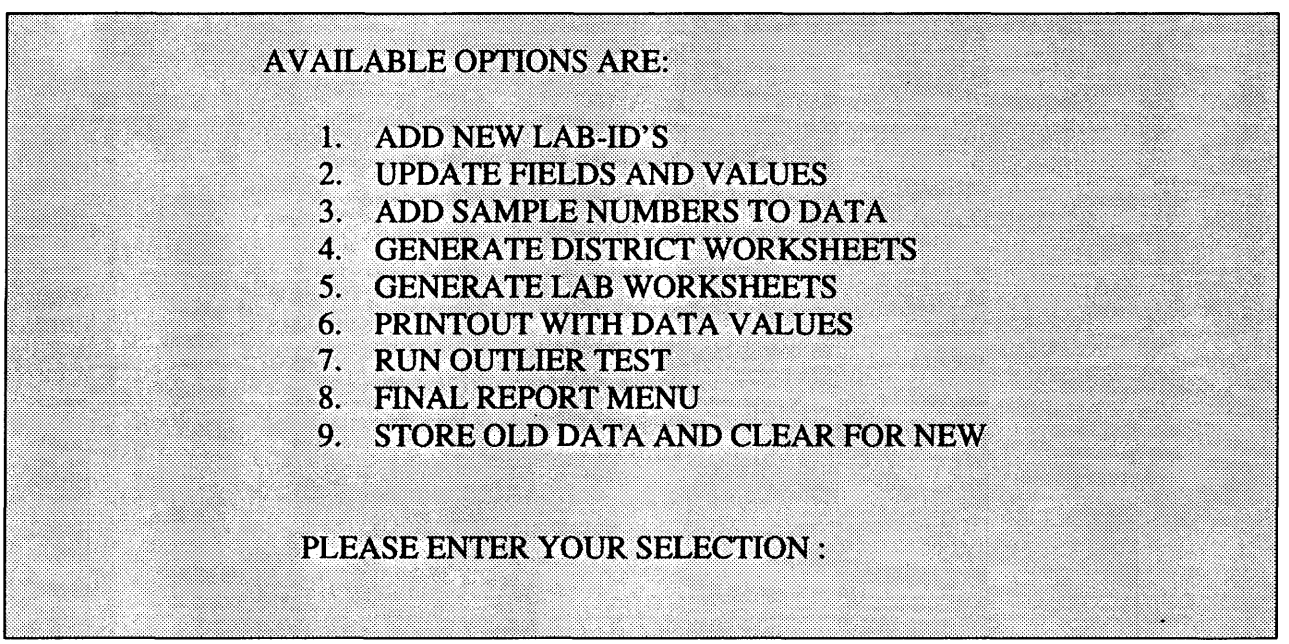
```
ENTER COMMAND >
```

4. Type: RUN P.MENU <CR> (Invokes the NFQA entry program).



5. Type: 1, 2, 3, or 4 <CR> (Selects the file for the region). Options 5, 6, 7, and 8 do not function.

After you have selected the region, the following menu will be displayed:



6. Type: 8 <CR> (Select option 8. FINAL REPORT MENU).

The following menu will be displayed:

```
AVAILABLE OPTIONS ARE:

    1.  ASSIGN STATUS TO ALL SAMPLES
    2.  SAMPLE # SUMMARY LISTING
    3.  DISTRICT SUMMARY LISTING
    4.  FINAL LISTING
    5.  METER ID LISTING
    6.  UNSATISFACTORY ANALYST LISTING
    7.  FINAL LISTING BY OFFICE

PLEASE ENTER YOUR SELECTION :
```

7. Type: 1 <CR> (Selects option 1. ASSIGN STATUS TO ALL SAMPLES. Assigns the rating or rank to all samples).

8. Type: <CR> <CR> <CR> [a single carriage return will move you back to the previous menu. Three carriage returns will move you to the (ENTER COMMAND >) prompt].

```
ENTER COMMAND >
```

9. Type: QUIT STOP <CR>. (Exit the INFO data base).

Quality-Control Actions

1. See section on **General Quality-Control Actions for Files.**
2. Make sure you select the correct option when selecting the file for the region. Select options1, 2, 3, or 4.
3. Select option 8 to obtain the final report menu.

4. When selecting the FINAL REPORT MENU, make sure you do not press option 9. Option 9 will save the file and will name it with the current date appended to the region name. Option 9 will also prepare the INFO file for the next round of data. Save the file manually with a filename you choose.
5. In the final report menu, select option 1 to execute the program to assign status to all samples (to rank the results in the file for a region).

PRINTING THE DATA EVALUATION TABLES BY DISTRICT OR OFFICE

The data are stored in the INFO files. After the status of the samples has been assigned, the data are ready for tabulation. Computer programs will sort the data by district or by office and write the data to a file for editing and subsequently for printing. The following describes these procedures:

In this section, any statements that are written inside the shaded boxes are the computer response to commands that were entered.

1. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM <CR> (Accesses the pH and conductance executable directory) or,
   Type: ATTACH <OCALA>QA>NFQA>ALK.CL.SYSTEM <CR> (Accesses the alkalinity executable directory).

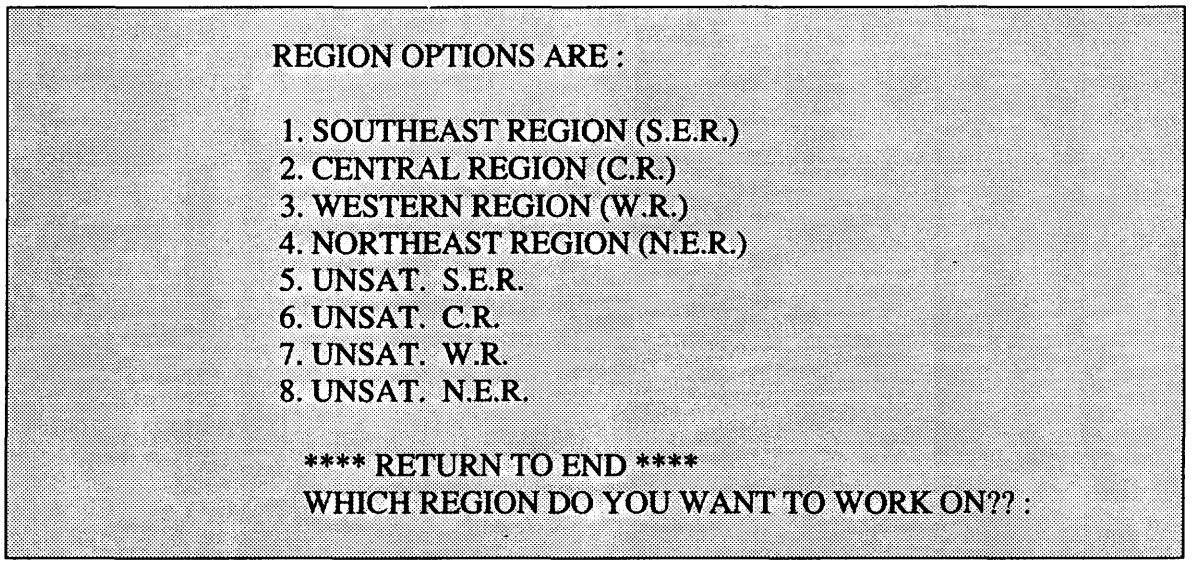
A good quality-control practice is to access the PH.COND.SYSTEM directory first, and after completion of the necessary steps, access the ALK.CL.SYSTEM directory and complete the necessary steps.

2. Type: INFO <CR> (Invokes the INFO program).
3. Type: JOI <CR> (Allows access into the INFO data base called JOI).

The following prompt will be displayed:

```
ENTER COMMAND >
```

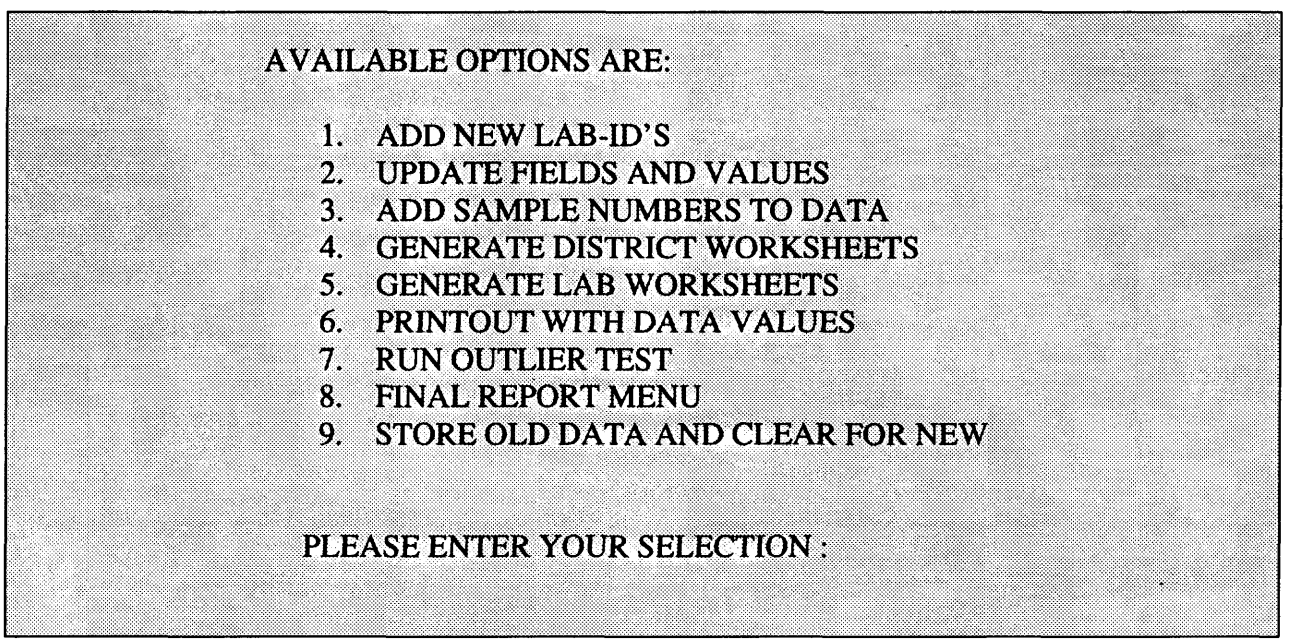
4. Type: RUN P.MENU <CR> (Invokes the NFQA entry program).



5. Type: 1, 2, 3, or 4 <CR> (Selects the file for the region).

   Options 5, 6, 7, and 8 do not function.

After you have selected the file for the region, the following menu will be displayed:



6. Type: 8 <CR> (Select option 8. FINAL REPORT MENU)

The following menu will be displayed:

```
AVAILABLE OPTIONS ARE:

  1. ASSIGN STATUS TO ALL SAMPLES
  2. SAMPLE # SUMMARY LISTING
  3. DISTRICT SUMMARY LISTING
  4. FINAL LISTING
  5. METER ID LISTING
  6. UNSATISFACTORY ANALYST LISTING
  7. FINAL LISTING BY OFFICE

PLEASE ENTER YOUR SELECTION :
```

7. Type: 4 or 7 <CR> (Select option 4 FINAL LISTING, or 7 FINAL LISTING BY OFFICE).

Option 4 (FINAL LISTING) will sort and print the data by district. Option 7 (FINAL LISTING BY OFFICE) will sort and print the data by office.

The following prompt will be displayed:

```
ENTER THE MONTH AND YEAR OF THIS QC BATCH
(i.e. FEBRUARY 1984 )
```

8. Type: "month year" <CR> (Enter the month and year in which the samples were analyzed by the field analysts).

   (Example: FEBRUARY 1994 <CR>)

The following prompt will be displayed:

```
DO YOU WANT TO VIEW THE COND. DATA AT YOUR TERMINAL?
***** REMEMBER THIS PRINT REQUIRES 132 COLUMN SCREEN *****
(Enter Y or [N])
```

9. Type: Y <CR> and the data tables are printed to the screen one page at a time.

or

Type: N <CR> and the following response will be displayed on the screen.

```
DO YOU WANT TO PRINT A HARDCOPY OF THIS DATA?
        (Enter Y or [N])
```

10. Type: Y <CR> and the files are copied into the directory:

    <OCALA>QA>NFQA>PH.COND.SYSTEM>TEMP.FILES

    The filenames are PH.ANAL.LIST for the pH data, COND.ANAL.LIST for the specific conductance data, and ALKALINITY.ANALYST.LIST for the alkalinity data.

11. Type: <CR> <CR> <CR> (a single carriage return will move you back to the previous menu. Three carriage returns will move you to the (ENTER COMMAND >) prompt.

```
ENTER COMMAND >
```

12. Type: QUIT STOP <CR> (To exit the INFO data base).
13. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM>TEMP.FILES <CR> (Accesses the directory called TEMP.FILES).

Using the EMACS editor combine the data files into a file in this order; (1) pH (PH.ANAL.LIST), (2) specific conductance (COND.ANAL.LIST), and (3) alkalinity (ALKALINITY.ANALYST.LIST).

14. Remove the FORTRAN control character (1 in column 1) for the page eject and replace it with an ASCII page eject ("Press and hold the control key" X Q, "Press and hold the control key" L) then delete the line which contains the "date" and the word "PAGE". Continue these commands through the end of the file. After this process is finished move the cursor to the beginning of the file.

15. At the bottom of each page that contains a remark code for A "No Response", place this line;

* = RESPONSE CODES ARE LISTED IN TABLE 1

16. Add a section title page for each parameter starting on line 20 for: pH (Evaluation of pH by district); Specific Conductance (Specific Conductance evaluation by district); and Alkalinity (Evaluation of alkalinity by district).
17. Type: "Press and hold the control key" X S, (Save the file).
18. Type: "Press and hold the control key" X C, (Exit the EMACS editor).

Quality-Control Actions

1. See section on **General Quality-Control Actions for Files.**
2. Make sure you select the correct option when selecting the file for the region. Select only options 1, 2, 3, or 4.
3. When selecting the FINAL REPORT MENU, make sure you do not press option 9. Option 9 will save the file and will name it with the current date appended to the region name. Option 9 will also prepare the INFO file for the next round of data. Save the file manually with a filename you choose.
4. When you look at the file before printing make sure all the information is there.
   a. Check for the MPV's.
   b. The remark codes have been added.
   c. Make sure you have selected the correct file by comparing the district codes in the file with the district codes from the WRD directory.
5. When combining the files into one file, make sure you load the district evaluation files in the correct order, which is (1) pH, (2) specific conductance, and (3) the alkalinity evaluation file.

PREPARING THE PROFICIENCY RATING TABLES

Proficiency Tables are listed by district and by office. These tables are used to summarize the district performance of the participants for the measurement of pH, specific conductance, and alkalinity. The evaluation tables are listed for USGS and non-USGS offices. The following describes the procedure to generate these tables.

In this section, any statements that are written inside the shaded boxes are the computer response to commands that were entered.

1. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM <CR> (Accesses the pH and conductance executable directory) or,

   Type: ATTACH <OCALA>QA>NFQA>ALK.CL.SYSTEM <CR> (Accesses the alkalinity executable directory).

A good quality-control practice is to access the PH.COND.SYSTEM directory first, and after completion of the necessary steps, access the ALK.CL.SYSTEM directory and complete the necessary steps.

2. Type: RESUME DISTRICT.STATS.CPL <CR> (This command will generate the proficiency tables for USGS offices).

The following prompt will be displayed:

ENTER REGION FILE NAME S.E.R. - W.R. - C.R. - N.E.R. :

3. Type: S.E.R., OR W.R., OR C.R., OR N.E.R.

(Enter the region you are working on).

The following prompt will be displayed:

ENTER REGION NAME YOU ARE WORKING ON:

4. Type: SOUTHEAST, CENTRAL, WESTERN, or NORTHEAST

(Enter the name of the region).

During the editing procedure in step 11 the word "REGION" will be added after the region name (Example: SOUTHEAST REGION, CENTRAL REGION, WESTERN REGION, or NORTHEAST REGION) to complete the heading name for the USGS offices. The name change is accomplished in the editing procedures because the computer program will allow only the entry of one word.

5. Type: QUIT STOP <CR> (To exit the INFO data base).
6. Type: RESUME OTHER.AG.STATS.CPL <CR> (This command will generated the tables for non-USGS offices).

The following prompt will be displayed:

ENTER REGION FILE NAME S.E.R. - W.R. - C.R. - N.E.R. :

7. Type: S.E.R., OR W.R., OR C.R., OR N.E.R.

(Enter the region you are working on).

The following prompt will be displayed:

ENTER REGION NAME YOU ARE WORKING ON:

8. Type: OTHER <CR> (Enters the word "OTHER" into the table heading).

During the editing procedure in step 11 the word "AGENCY" will be added after the word "OTHER" (Example: OTHER AGENCY) to complete the heading name for the non-USGS offices. The name change is accomplished in the editing procedures because the computer program will allow entry of only one word.

The following prompt will be displayed:

```
ENTER COMMAND >
```

9. Type: QUIT STOP <CR> (To exit the INFO data base).
10. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM>TEMP.FILES <CR> (Accesses the directory called TEMP.FILES).

11. Type: COPY <OCALA>QA>NFQA>PH.COND.SYSTEM>REG-STATS <CR>
12. Type: COPY <OCALA>QA>NFQA>PH.COND.SYSTEM>OTHER.AGENCY.PH <CR>

(Copies files from the PH.COND.SYSTEM directory to the directory TEMP.FILES).

13. Type: COPY <OCALA>QA>NFQA>ALK.CL.SYSTEM>REG-STATS.ALK <CR>
14. Type: COPY <OCALA>QA>NFQA>ALK.CL.SYSTEM>ALK.OTHER.AGENCY <CR>

(Copies files from the ALK.CL.SYSTEM directory to the directory TEMP.FILES).

15. Combine these files into one file in this order: (1) REG-STATS, (2) REG-STATS.ALK, (3) OTHER.AGENCY.PH, and (4) ALK.OTHER.AGENCY.

16. Using the EMACS editor, edit this new file containing the above four files to remove the FORTRAN control character (1 in column 1 at the top left of page) for page ejects, and add an ASCII page eject ("Press and hold the control key" X Q, "Press and hold the control key" L), then delete the line which contains the "date" and the word "PAGE". Continue these commands through the end of the file. After this process is finished move the cursor to the beginning of the file.

17. Delete the following lines from the table headings beginning with "REPORTING" and "DISTRICT"

```
REPORTING    SUB-DIST   S  %-S   M   %-M  U   %-U  RAT   N...
 DISTRICT    CITY...
```

Then insert the file called "HEADER", which is located in the "TEMP.FILES" directory. An example of what is in the "HEADER" file is:

```
                        Satisfact    Marginal    Unsatisfact          No. ...
Reporting                 No.  %      No.  %      No.  %     No.      Not ...
District    Office          S           M           U       Rated    Rated ...
```

Continue this same process of deleting lines and inserting the "HEADER" file for all of the tables.

18. Type: "Press and hold the control key" X S (Save the file).

19. Place the cursor at the start of the file and search for the name of the region (Example: "SOUTHEAST", "CENTRAL"...) and add the word "REGION" after the region name (Example: "SOUTHEAST REGION", "CENTRAL REGION"...). This process is continued until all USGS data tables have been modified.

20. Place the cursor at the start of the file. Search for the word "OTHER" and add the word "AGENCY" after the word "OTHER", (Example: "OTHER AGENCY"). This process is continued until the remaining tables (non-USGS) have been modified.

21. Delete the line that contains the date and the word PAGE in the title and any blank lines that are above the title.
22. Type: "Press the escape key" X TABLIST <CR> 90 <CR> (Set this tab).
23. On the line that contains this phrase "PROFICIENCY RATINGS FOR", tab to column 90, and add the word "TABLE" (begin in column 90). Then number the tables beginning with 3 (Example: TABLE 3).

Begin numbering the tables starting with the number 3 because Table 1 is the table of response codes and Table 2 is the listing of the sample statistics.

24. Place the cursor on the line below the "REGION NAME" or "OTHER AGENCY" and delete the date. Add the month and year these data were obtained (Example: March 1994). An example of a completed title and table header is presented in Appendix VII.
25. Calculate the regions performance ratings for SATISFACTORY, MARGINAL, UNSATISFACTORY, and PERCENT ACCEPTABLE (number of samples in each column divided by the total number of samples RATED) for each table and type the percentages into the correct column. Add these percentages into the last line of the table.
26. Add the words "REGION TOTALS" at the beginning of this last line for each table.
27. In the line above the REGION TOTALS replace the hyphens with an equal sign and add a blank line just above the equal signs.
28. Type: "Press and hold the control key" X S (Save the file).
29. Type: "Press and hold the control key" X C (Exit the EMACS editor).

Quality-Control Actions

1. See section on **General Quality-Control Actions for Files.**
2. When executing the "DISTRICT.STATS" programs:
   a. Make sure you use all capital letters when typing information for use in this program.
   b. Make sure you select the correct region filename when selecting the files you need.
   c. When typing in the region name limit the name to 10 characters.
3. Make sure when numbering tables that you change the number when accessing a different table, NOT when changing to a new page for the same table.
4. Save the file. Type: ("Press and hold the control key" X S) after each time you make any changes to the tables in the file.
5. Use this command to invoke EMACS when columns are wider than 80 characters; EMACS -TTP VT132 "filename" (TAB or DG terminals).
6. To check the percent acceptable for the region for satisfactory, marginal, and unsatisfactory performance, sum the region performance ratings. Added together, the total must be 100 percent.
7. Spot check the calculations; and if an error is found during the spot check, check all calculated values.

PREPARING THE ALKALINITY METHODS TABLE

Alkalinity methods tables are listed by district and method. These tables are used to summarize the field methods used by the participants in each district for the measurement of alkalinity. The evaluation tables are prepared separately for USGS and non-USGS offices. The following describes the procedures to generate these tables.

In this section, any statements that are written inside the shaded boxes are the computer response to commands that were entered.

1. Type: ATTACH <OCALA>QA>NFQA>ALK.CL.SYSTEM <CR> (Accesses the alkalinity executable directory).

2. Type: RESUME ALK.METHOD.CPL <CR>. (This command will generate the methods tables).

The following prompt will be displayed:

ENTER REGION FILE NAME S.E.R. - W.R. - C.R. - N.E.R. :

3. Type: S.E.R., OR W.R., OR C.R., OR N.E.R.
(Selects the file).

The following prompt will be displayed:

ENTER REGION NAME YOU ARE WORKING ON:

4. Type: SOUTHEAST, CENTRAL, WESTERN, or NORTHEAST
(Enter the name of the region).

During the editing procedure in step 19 the word "REGION" will be added after the region name (Example: SOUTHEAST REGION, CENTRAL REGION, WESTERN REGION, or NORTHEAST REGION) to complete the heading name for the USGS offices. The name change is accomplished in the editing procedures because the computer program will allow only the entry of one word or a maximum of 10 characters.

The following prompt will be displayed:

```
ENTER COMMAND >
```

5. Type: QUIT STOP <CR> (To exit the INFO data base).
6. Type: ATTACH <OCALA>QA>NFQA>PH.COND.SYSTEM>TEMP.FILES <CR> (Accesses the directory called TEMP.FILES).
7. Type: COPY <OCALA>QA>NFQA>ALK.CL.SYSTEM>REG-STATS-MET <CR>
8. Type: COPY <OCALA>QA>NFQA>ALK.CL.SYSTEM>METHOD-REP <CR>

(Copies files from the ALK.CL.SYSTEM directory to the directory you are attached to (TEMP.FILES).

9. Combine these files into one file in this order: 1, REG-STATS-MET; 2, METHOD-REP;
10. Using the EMACS editor edit this new file containing the above two files to remove the FORTRAN control character (1 in column 1 at the top left of page) for page ejects, and add an ASCII page eject ("Press and hold the control key" X Q, L).
11. Delete the following lines from the "PROFICIENCY RATINGS FOR: ALKALINITY" table headings, beginning with "REPORTING" and "DISTRICT". (An example is listed below).

```
REPORTING   SUB-DIST  S  %-S  M  %-M  U  %-U  RAT  N...
 DISTRICT    CITY...
```

12. Then insert the file called "HEADER.METHOD", which is located in the "TEMP.FILES" directory. An example of the "HEADER" file is listed below.

Reporting District	Method	Satisfact No. S	%	Marginal No. M	%	Unsatisfact No. U	%	No. Rated	No. Not Rated	Total No. Mailed	% Percent Acceptable

Continue this same process of deleting lines and inserting the "HEADER.METHOD" file for all of the tables.

13. Type: "Press and hold the control key" X S (Save the file).
14. Search for this table heading "COMPARISON OF ALKALINITY METHODS",
15. Move down the heading until you locate the following lines, and then delete the lines.

METHOD	S	%-S	M	%-M	U	%-U	RAT	N MAIL	TOTA	%-AC

16. Next insert the file called "HEADER.METHOD", which is located in the "TEMP.FILES" directory (See step 12).
17. Maintain column format and delete the words "Reporting" and "Method".
18. Maintain column format and overwrite the word "district" with the word "Method". An example of these corrections are listed below.

Method	Satisfact No. S	%	Marginal No. M	%	Unsatisfact No. U	%	No. Rated	No. Not Rated	Total No. Mailed	% Percent Acceptable

19. Place the cursor at the start of the file, and search for the name of the region (Example: "SOUTHEAST", "CENTRAL"...) and add the word "REGION" after the region name (Example: "SOUTHEAST REGION", "CENTRAL REGION"...). This process is continued until all USGS data tables have been modified.

20. Place the cursor at the start of the file, and search for the word "OTHER" and add the word "AGENCY" after the word "OTHER" (Example: "OTHER AGENCY"). This process is continued until the remaining tables (non USGS) have been modified.

21. Place the cursor at the start of the file.
22. Remove the FORTRAN control character (1 in column 1) for the page eject and replace it with an ASCII page eject ("Press and hold the control key" X Q, L) then delete the line which contains the "date" and the word "PAGE".

This process is continued until all data tables have been modified. After this process is finished place the cursor at the start of the file.

23. Type: "Press the escape key" X TABLIST <CR> 90 <CR> (Set this tab).
24. On the line that contains this phrase "PROFICIENCY RATINGS FOR", tab to column 90, and add the word "TABLE" (begin in column 90). The numbering sequence is continued for the tables as established in step 22 of the section "PREPARING THE PROFICIENCY RATING TABLES". (Example: TABLE 9).
25. Place the cursor at the line below the "REGION NAME" or "OTHER AGENCY" and delete the date. Add the month and year these data were obtained (Example: March 1994). An example of a completed title and table headers are presented in Appendix VIII, A and B.
26. Calculate the performance ratings for SATISFACTORY, MARGINAL, UNSATISFACTORY, and PERCENT ACCEPTABLE (number of samples divided by the number of samples RATED) for each table and type the percentages into the correct column. Add these percentages into the last line of the table.
27. Add the words "REGION TOTALS" at the beginning of this last line for each table.
28. In the line above the REGION TOTALS replace the hyphens with an equal sign and add a blank line just above the equal signs.
29. Type: "Press and hold the control key" X S (Save the file).
30. Type: "Press and hold the control key" X C (Exit the EMACS editor).
31. Append this file to the end of the Proficiency Rating tables for the districts.

The part of the alkalinity methods table that contains the documentation of the comparison of the end-point and incremental titrations is not used by the NFQA. These pages should be deleted from the table before the tables is saved electronically or printed.

Quality-Control Actions

1. See section on **General Quality-Control Actions for Files.**
2. When executing the "DISTRICT.STATS" programs:
   a. Make sure you use all capital letters when typing information for use in this program.
   b. Make sure you select the correct region filename when selecting the file you need.
   c. When typing in the region name limit the name to 10 characters.
3. Make sure when numbering tables that you change the table numbers when accessing a different table, NOT when changing to a new page for the same table.
4. Save the file (Type: ("Press and hold the control key" X S) after each time you make any changes to all the tables in the file.
5. Use this command to invoke EMACS when columns are wider than 80 characters.
   EMACS -TTP VT132 "filename" (TAB or DG terminals).
6. To check the percent acceptable for the region for satisfactory, marginal, and unsatisfactory performance, sum the region performance ratings. Added together, the total must be 100 percent.
7. Spot check the calculations; if an error is found during the spot check, check all calculated values.

ASSESSMENT AND REPORT OF RESULTS

The field analysts measure the concentration of alkalinity, pH, and specific conductance and return their results to the QWSU within 30 days. The NFQA staff immediately evaluates the results. Once the MPV is determined for a particular proficiency sample, individual results are rated according to the criteria described by Friedman and Erdmann (1982, p. 123). The specific rating criteria for alkalinity, pH, and specific conductance are presented in Appendix IX.

After the results have been tabulated, a preliminary report is prepared and sent by E-mail to the district Water Quality Specialists for review. This review process allows the districts the opportunity to submit any corrections of data entry errors to the NFQA manager. Corrections are verified and entered into the INFO data base. The data set is again subjected to the outlier test, and a new mean and standard deviation are calculated for each sample before the proficiency report is prepared.

The proficiency report is prepared and sent to the Regional Hydrologist (fig. 1) within 20 days from the receipt of the data. After the proficiency report for the initial round is submitted for review and subsequent distribution to the district offices, a followup proficiency sample is distributed to each field analyst who received an unsatisfactory (U) rating. The followup samples are usually mailed 2 to 3 weeks after the NFQA report is distributed. The followup sample is designed to help the field analyst find and correct the source of the error for the specific determinations. A secondary preliminary report on the results of the assessment is prepared and sent by E-mail to the district Water Quality Specialists. The secondary proficiency report is prepared and sent to the appropriate Regional Hydrologist for review and distribution to the district office and field analysts.

SUMMARY

The U.S. Geological Survey began the National Field Quality Assurance Program in March 1979, and it is still operating today (1995). The program was designed to test and monitor the proficiency of field measurements made by field analysts. Originally, the program was designed to assess the performance of pH and specific conductance measurements; alkalinity was added in 1985.

Nationwide, hundreds of field measurements are made daily by field analysts of the U.S Geological Survey. The data reported by the National Field Quality Assurance Program provides a confidence level to these field measurements by testing the proficiency of the instruments and the ability of the field analysts to measure prepared test samples. The proficiency data obtained through the National Field Quality Assurance Program should reflect the same quality of measurements acquired by field analysts on a daily basis. This report documents the operating procedures for the National Field Quality Assurance Program and the quality-control procedures to assure the accuracy in sample preparation and reporting of results.

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APPENDIXES

STANDARD PROCEDURES AND QUALITY-CONTROL PRACTICES FOR THE U.S. GEOLOGICAL SURVEY NATIONAL FIELD QUALITY ASSURANCE PROGRAM FROM 1982 THROUGH 1993

Appendix I.-- Concentration ranges of test samples for the National Field Quality Assurance Program.

Determination	Range
pH (units)	4.0 to 8.0
Specific conductance (µS/cm)	20 to 1,500
Alkalinity (mg/L as $CaCO_3$)	15 to 150

Appendix II.--Example of a sample preparation instruction sheet for alkalinity.

```
                ********************************************
                *                                          *
                *                                          *
                *          U S  GEOLOGICAL  SURVEY         *
                *    Q W  SERVICE  UNIT  OCALA  FLORIDA     *
                *             NFQA  STANDARDS              *
                *           ALKALINITY  SAMPLES            *
                *                Feb 16 1994               *
                *                                          *
                *                                          *
                ********************************************

*******************************************************************************


    TURN ON STIRRERS BEFORE ADDING SALTS.   ADD DISTILLED WATER TO
    THE BEAKER TO MAKE A SLURRY THEN POUR SLURRY INTO TANK, RINSE WELL.

  ENTER CONCENTRATION OF ALKALINITY STANDARD  35
  ENTER VOLUME REQUIRED IN LITERS  100

  SAMPLE NUMBER.. A-31
         FOR ALKALINITY CONCENTRATION OF 35 MG/L
         WEIGHT OUT 4.8187 GRAMS NAHCO3
         INTO A VOLUME OF 100 LITERS
         ALSO ADD .4  GRAMS THYMOL

  ENTER CONCENTRATION OF ALKALINITY STANDARD  56
  ENTER VOLUME REQUIRED IN LITERS  100

  SAMPLE NUMBER.. A-32
         FOR ALKALINITY CONCENTRATION OF 56 MG/L
         WEIGHT OUT 7.7099 GRAMS NAHCO3
         INTO A VOLUME OF 100 LITERS
         ALSO ADD .4  GRAMS THYMOL

  ENTER CONCENTRATION OF ALKALINITY STANDARD  78
  ENTER VOLUME REQUIRED IN LITERS  100

  SAMPLE NUMBER.. A-33
         FOR ALKALINITY CONCENTRATION OF 78 MG/L
         WEIGHT OUT 10.7388 GRAMS NAHCO3
         INTO A VOLUME OF 100 LITERS
         ALSO ADD .4  GRAMS THYMOL

 ENTER CONCENTRATION OF ALKALINITY STANDARD  135
ENTER VOLUME REQUIRED IN LITERS  100

SAMPLE NUMBER.. A-34
         FOR ALKALINITY CONCENTRATION OF 135 MG/L
         WEIGHT OUT 18.5865 GRAMS NAHCO3
         INTO A VOLUME OF 100 LITERS
         ALSO ADD .4  GRAMS THYMOL
```

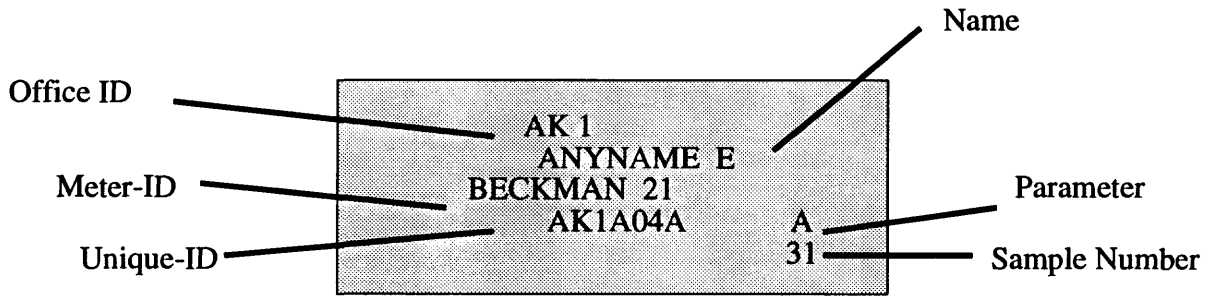
Appendix III.--Example of a worksheet used to record field values.

?
PLEASE RETURN RESULTS BY APRIL 30,1994 PAGE 1

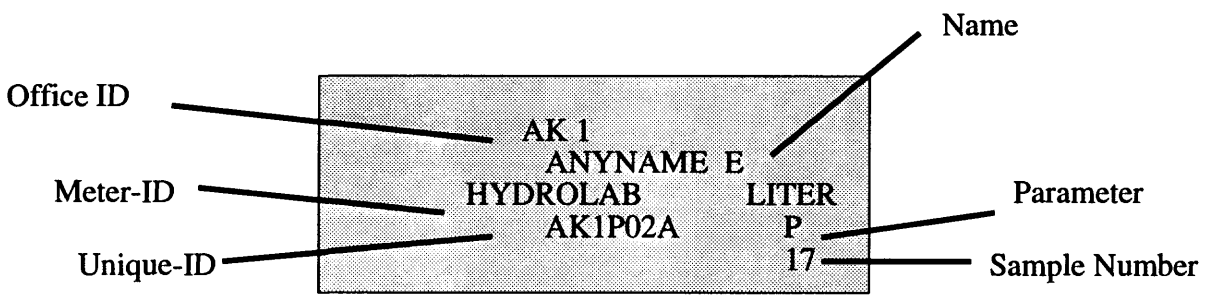
pH
WORKSHEET
NORTHEAST REGION
Return to Dan Stanley, U. S. Geological Survey, Water Quality Service Unit
4500 Southwest 40th Avenue, Ocala, FL 34474-5731

SD	ANALYST		LAB-ID	METER	WRD#	VALUES
JC 1	SPARE 1	COOP	JC1P01A		W	_____
JC 1	SPARE 1	COOP	JC1P01B		W	_____
JC 1	SPARE 2	COOP	JC1P02A		W	_____
JC 1	SPARE 2	COOP	JC1P02B		W	_____
JC 1	SPARE 3	COOP	JC1P03A		W	_____
JC 1	SPARE 3	COOP	JC1P03B		W	_____
JC 1	SPARE 4	COOP	JC1P04A		W	_____
JC 1	SPARE 4	COOP	JC1P04B		W	_____
JC 1	SPARE 5	COOP	JC1P05A		W	_____
JC 1	SPARE 5	COOP	JC1P05B		W	_____
JC 1	SPARE 6	COOP	JC1P06A		W	_____
JC 1	SPARE 6	COOP	JC1P06B		W	_____

Appendix IV.--Example of a bottle label used to identify a test sample.

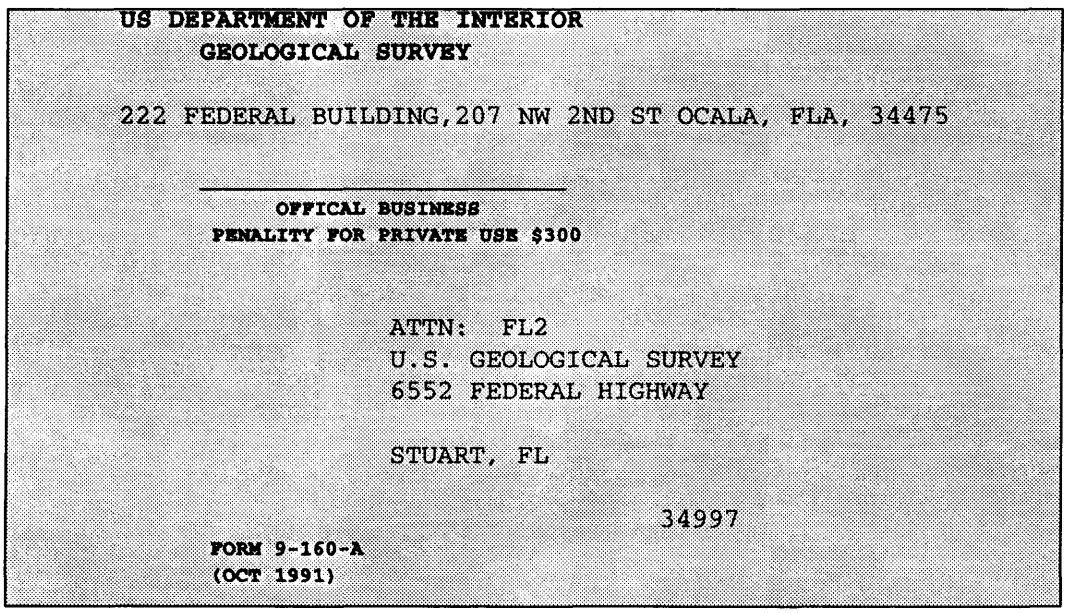


A. Typical Bottle Label



B. Modified Bottle Label

Appendix V.--Example of the mailing address labels.



Appendix VI.--Example of the instruction letter mailed with the samples.

DATE: March 15, 1993

TO: Participating Offices, Western Region, WRD

FROM: Daniel L. Stanley, Quality Water Service Unit, Ocala, Florida

SUBJECT: QUALITY ASSURANCE - National Field Quality Assurance (NFQA)

Reference samples for pH, specific conductance, and alkalinity, for the testing of water quality field instruments are enclosed. These samples should be analyzed as quickly as possible to minimize potential sample degradation effect.

Please record results of analyses on the enclosed forms and return to this office by APRIL 28, 1993. Results received after this date will NOT be accepted and will NOT be used in determining the 'most probable value' (MPV) of these samples and will be given a rating of 'N' (not rated) in the evaluation report.

Report total alkalinity as MG/L $CaCO_3$ (whole numbers). Report pH to the nearest 0.1 pH units and report specific conductance to whole numbers (three significant figures).

Please indicate the METHOD (end-point or incremental, digital titrator, or burette) and the normality of acid used to titrate the alkalinity samples.

Update any information that is missing or incorrect. To change an entry draw a single line through the item to be changed and write in the correction. To delete the total record draw a single line across the entire line.

Return reporting forms to:

USGS, WRD, QW Service Unit
207 NW 2nd Street, Room 222
Ocala, Florida 34475
Attention: Daniel L. Stanley

PLEASE DO NOT E-MAIL ANY DATA. USE THE FORMS PROVIDED.

Your cooperation is most appreciated. If there are any questions please contact me. COMM (904) 629-8931.

Daniel L. Stanley

Appendix VII.--Example of an edited title and table header for District Evaluation Tables.

?

PROFICIENCY RATINGS FOR: SP. CONDUCTANCE TABLE 3
NORTHEAST REGION
MARCH 1994

Reporting District	Office	Satisfact No. S	%	Marginal No. M	%	Unsatisfact No. U	%	No. Rated	No. Not Rated	Total No. Mailed	% Percent Acceptable

Appendix VIII.--Examples of an edited title and table header for Alkalinity Methods Tables.

Example A.

?

PROFICIENCY RATINGS FOR: ALKALINITY TABLE 9
NORTHEAST REGION
MARCH 1994

Reporting District	Method	Satisfact No. S	%	Marginal No. M	%	Unsatisfact No. U	%	No. Rated	No. Not Rated	Total No. Mailed	% Percent Acceptable

Example B.

?

COMPARISON OF ALKALINITY METHODS TABLE 12
NORTHEAST REGION
MARCH 1994

Method	Satisfact No. S	%	Marginal No. M	%	Unsatisfact No. U	%	No. Rated	No. Not Rated	Total No. Mailed	% Percent Acceptable

Appendix IX.--Rating criteria for analytical results of proficiency samples.

Determination	Satisfactory	Marginal	Unsatisfactory
pH, units	MPV ± 0.1	MPV ± >0.1 to 0.2	MPV ± >0.2
Specific conductance <67 µS/cm	MPV ± 2.0	MPV ± >2 to 4	MPV ± >4
Specific conductance >68 µS/cm	MPV ± <4 percent	MPV ± 4 to 6 percent	MPV ± >6 percent
Alkalinity, mg/L as $CaCO_3$	MPV ± <1.5 X SD	MPV ± 1.5 to 2.0 X SD	MPV ± >2.0 X SD

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