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LASL Computerized Quality Assurance Record-Keeping System for Analytical Chemistry

by

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LASL COMPUTERIZED QUALITY ASSURANCE RECORD- KEEPING SYSTEM FOR ANALYTICAL CHEMISTRY

by

J. W. Dahlby and J. R. Phillips

ABSTRACT

Research programs requiring quality assurance surveillance, certification procedures, and associated record keeping have increased markedly at the Los Alamos Scientific Laboratory. A computer-based system, accessible through time-sharing terminals, performs many routine operations, including continued records updating for equipment calibration, personnel certification, quality assurance procedure listings, and controlled-document distribution lists. The system described here has operated successfully for more than a year, resulting in a significant savings in man-hours required to keep quality assurance records.

I. INTRODUCTION

Quality assurance (QA) programs have been an integral part of many projects funded by the US Energy Research and Development Administration (ERDA), particularly for projects supported by the Division of Reactor Development and Demonstration (RDD). The Analytical Chemistry Group of the Los Alamos Scientific Laboratory (LASL) supports most of the research and development programs requiring specified QA programs.

Quality assurance requirements stated by the ERDA-RDD document RDT-F2-2¹ include accurate and continually updated records of equipment calibration; personnel certification; QA procedure numbers, including the latest revision number; and controlled-document distribution lists. In small QA programs, it is possible to maintain records on card-filing systems, but the card-filing

system is unwieldy and cumbersome for QA programs like ours with more than 90 analysts, over 125 QA procedures, and large numbers of specialized equipment requiring calibration records. Our computer-based system is far superior to card-filing systems. A time-sharing computer system is used because of the advantageous interactive capabilities. The programs are written in FORTRAN.

II. DISCUSSION

Individual computer programs

1. provide a listing of QA equipment requiring calibration and preventive maintenance on a monthly schedule,
2. provide a certification sheet listing the QA procedures each analyst is certified to perform,
3. provide a listing of current QA procedures by number (including revision number) and title, and
4. provide an updated listing of each person requiring a copy of each procedure, including analysts and off-site experimenters.

Each of these tasks is a requirement stated in the ERDA-RDT-F2-2 quality assurance document. The specific computer programs are described in Appendixes A-D. Examples of input, output, and complete listings of the programs are given. Reliable computer time-sharing greatly aids in updating current files and purging obsolete data. The interactive capability of the programs allows specified portions of the data base to be withdrawn or edited without requiring rearrangement of the entire data base.

III. CONCLUSIONS

The four interactive computer programs described are not presented as being applicable to all QA programs, but rather as examples of how a computer-based data system can help the manager who must implement a comprehensive QA program. The described operating system has resulted in substantial manpower savings and has eliminated many errors associated with a manual filing system. The programs are easy to operate and require no computer training for the operator other than how to turn on the keyboard terminal.

ACKNOWLEDGMENTS

The authors wish to thank A. P. Lovell for his assistance in improving and operating the system.

REFERENCE

1. "Quality Assurance Program Requirements," RDT Standard RDT-F2-2, Division of Reactor Research and Development, United States Atomic Energy Commission (August 1973).

APPENDIX A

PROGRAM QANEW2

Program "QANEW2," run monthly, lists equipment due for calibration and preventive maintenance. Printouts (Appendix A-1) are obtained for date, person in charge, line number location of listing on file, equipment identification number, instrument description, room where instrument is located, and the required operation to be performed. An example of the data files used in this program is shown in Appendix A-2. The program also has an option providing great time savings, in which the dates the required operations were performed can be updated quickly and accurately without disturbing other data on the file. Appendix A-3 shows this option in operation, with the simple inputs by the operator underlined. Appendix A-4 is a complete listing of program "QANEW2."

APPENDIX A-1
QANW2 PROGRAM OUTPUT

QUALITY ASSURANCE RECALIBRATION SCHEDULE FOR CMB-1

QA CALIBRATION REQUIRED FOR 5 76 IN SECTION - ASHLEY

LINE NO.	IDENT NO.	INSTRUMENT DESCRIPTION	ROOM NO.	REQUIRED OPERATION	DATE	INITIAL
1220	199260	SPECTROPHOTOMETER	3122	CHANGE DESICCANT		
1230	219369	SPECTROPHOTOMETER	3136	CHANGE DESICCANT		

PLEASE INITIAL AND DATE IN THE BLANKS PROVIDED TO
CERTIFY THAT THE OPERATION WAS DONE, THEN RETURN THIS COPY
TO J. DAHLBY. THANKS

QA CALIBRATION REQUIRED FOR 5 76 IN SECTION - SMITH

LINE NO.	IDENT NO.	INSTRUMENT DESCRIPTION	ROOM NO.	REQUIRED OPERATION	DATE	INITIAL
1180	21621	MASS SPEC	7157	REPLACE TWO BELTS		
1190	21620	MASS SPEC	7129	REPLACE TWO BELTS		
1200	166551	LEAK DETECTOR	7119	CHANGE BELT		

PLEASE INITIAL AND DATE IN THE BLANKS PROVIDED TO
CERTIFY THAT THE OPERATION WAS DONE, THEN RETURN THIS COPY
TO J. DAHLBY. THANKS

APPENDIX A-2 FILES QADATA, PMDATA, AND SECTION

A partial listing of files QADATA, PMDATA, and SECTION used with program QANEW2 is shown. Information in QADATA and PMDATA is line number, identification number, instrument description, room number, required operation, frequency (in months the required operation is to be repeated), person responsible (supervisor), and the last date the required operation was done.

FILE QADATA

830	181968	BALANCE, AINSWORTH	3117	PREV MAINT) CALIB	12	ASHLEY	11976
840	244529	BALANCE, SART.	3112	PREV MAINT) CALIB	12	ASHLEY	11 175
850	232703	BALANCE, SART.	3120	PREV MAINT) CALIB	12	ASHLEY	11 175
860	000001	WEIGHT SET, CI-1	3128	CALIBRATE	12	ASHLEY	11 175
870	017818	WEIGHT SET, SEC.ST.	3117	CALIBRATE	25	ASHLEY	10 274
880	121802	BALANCE, C.B.	3118	PREV MAINT) CALIB	12	ASHLEY	11 175
890	244528	BALANCE, SART.	3136	PREV MAINT) CALIB	12	ASHLEY	62475
900	029958	WEIGHT SET	3112	CALIBRATE	12	ASHLEY	71575
910	120300	BALANCE	3128	PREV MAINT) CALIB	12	ASHLEY	8 175
920	120747	BALANCE	3128	PREV MAINT) CALIB	12	ASHLEY	8 175
930	117724	BALANCE	3136	PREV MAINT) CALIB	12	ASHLEY	8 175
940	009670	WEIGHT SET, AINS.	3117	CALIBRATE	12	ASHLEY	10 175
950	017794	WEIGHT SET, AINS.	3117	CALIBRATE	12	ASHLEY	10 175
960	237348	BALANCE, SARTORIUS	3172	PREV MAINT) CALIB	12	ASHLEY	10 175
970	071789	BALANCE	3110	PREV MAINT) CALIB	12	ASHLEY	8 175
980	117726	BALANCE	3112	PREV MAINT) CALIB	12	ASHLEY	71575
990	030698	WEIGHT SET	3136	CALIBRATE	12	ASHLEY	71575
1000	012170	WEIGHT SET	3120	CALIBRATE	12	ASHLEY	71575
1010	017818	WEIGHT SET	3117	CALIBRATE	12	ASHLEY	102875

FILE PMDATA

100	206753	DELPHI OX ANALYZER	5165	WASH CELL	06	KOSIEWICZ	121675
110	206753	DELPHI OX ANALYZER	5165	REPLACE ELECTROLYTE	06	KOSIEWICZ	121675
120	215972	RECIRCULATING PUMP	5165	REPLACE BELT	03	KOSIEWICZ	31076
130	215972	RECIRCULATING PUMP	5165	REPLACE OIL	12	KOSIEWICZ	121675
140	117459	1405 PUMP	5165	CHECK BELT) OIL	09	KOSIEWICZ	121675
150	206311	OX ANALYZER PUMP	5165	CHECK BELT) OIL	06	KOSIEWICZ	121675
160	052266	OX ANALYZER PUMP	7023	CHECK BELT) OIL	06	KOSIEWICZ	3 976
170	183903	AIR LOCK PUMP	7023	CHECK BELT) OIL	12	KOSIEWICZ	93075
180	190930	BECKMAN OX ANALYZER	7023	WASH CELL	03	KOSIEWICZ	41576
190	123456	DAHLBY TEST PHDATA	5000	MONTHLY TEST OF FILE	01	DAHLBY	4 176
200	000009	TAG UPDATE	9000	UPDATE STORAGE TAGS	06	DAHLBY	5 776
210	190930	BECKMAN OX ANALYZER	7023	REPLACE ELECTROLYTE	03	KOSIEWICZ	41576
220	223529	RECIRCULATING PUMP	7023	REPLACE OIL	12	KOSIEWICZ	112575
230	215971	RECIRCULATING PUMP	7023	REPLACE BELT	03	KOSIEWICZ	3 976
240	242465	SCRUBBER	5023	REPLACE OIL	05	KOSIEWICZ	52576
250	000005	WATER STILL	5200	CLEAN) CHECK	04	DAHLBY	5 776
260	251515	VACUUM PUMP	9160	CHANGE OIL,CHECK BELT	02	DAHLBY	5 176

FILE SECTION

00100 ASHLEY
00110 MATLACK
00120 STEINHAUS
00130 REIN
00140 SMITH
00150 DAHLBY
00160 HAKKILA
00170 PHILLIPS
00180 KOSIEWICZ

Note: File SECTION is a list of individuals (supervisors) responsible for specific items or equipment. The program as written will accommodate up to 15 individuals, but can be changed easily to accommodate any number.

APPENDIX A-3

EXAMPLE OF UPDATE FEATURES OF PROGRAM QANW2

(The input data are underlined.)

TYPE IN THE OPTION YOU WANT - QA, PM, UPQA, UPPM

UPQA

TYPE IN LINE NUMBER TO BE CHANGED - 00000 OR STOP IF DONE

00100

100 253801 BALANCE.NET. 5123 PREV MAINT - CALIB 12 KOSIEWICZ 4 576

TYPE IN NEW DATE - MMDDYY

042576

100 253801 BALANCE.NET. 5123 PREV MAINT - CALIB 12 KOSIEWICZ 42576

TYPE IN LINE NUMBER TO BE CHANGED - 00000 OR STOP IF DONE

00190

190 169797 BALANCE.REMOTE 9160 CALIBRATE 12 KOSIEWICZ 9 175

TYPE IN NEW DATE - MMDDYY

091376

190 169797 BALANCE.REMOTE 9160 CALIBRATE 12 KOSIEWICZ 91375

TYPE IN LINE NUMBER TO BE CHANGED - 00000 OR STOP IF DONE

STOP

LASL IDENTIFICATION: LP-0636

APPENDIX A-4

QANEW2 SOURCE CODE (FORTRAN IV)

```

C      PROGRAM QANEW2 (INPUT,OUTPUT,TAPE1,TAPE2)
C      -----THIS PROGRAM PRINTS OUT THE QA CALIBRATIONS OR PREV. MAINT. T
C      HAT
C      -----NEEDS TO BE DONE IN GROUP CMB-1. ANOTHER OPTION ALLOWS THE
C      -----OPERATOR TO UPDATE THE CALIBRATION OR PREV. MAINT. DATES AS T
C      HESE
C      -----OPERATIONS ARE COMPLETED. THE PROGRAM WILL ACCOMMODATE 15 IND
C      IV.
C      -----HAVING EQUIPMENT LISTED.
C      -----IRUN=TIMES THE PROGRAM HAS RUN.IT RUNS TWICE TO GET 2 PRINTOU
C      TS.
C      -----ANSWER=PROGRAM OPTION NUMBER CHOSEN BY OPERATOR.
C      -----IOPT=OPTION NUMBER.
C      -----ICOUNT=COUNTER TO FIND # OF PEOPLE HAVING EQUIPMENT(15 MAX.).
C      -----IP=ASSESSES THROUGH THE PROGRAM SO ONLY THE NUMBER OF PASSES
C      -----EQUA!. TO ICOUNT PEOPLE ARE MADE.
C      -----IPRINT=COUNTER FOR NOTE, TO PRINT NOTE ONLY WHEN ITEM IS LIST
C      ED.
      DIMENSION ISECT(15)
      IRUN=0
      PRINT 180
      READ 190, ANSWER
      IF (ANSWER.EQ.4HQQA ) IOPT=1
      IF (ANSWER.EQ.4HPM ) IOPT=2
      IF (ANSWER.EQ.4HUPQA) IOPT=3
      IF (ANSWER.EQ.4HUPPN) IOPT=4
      IF (IOPT.LT.3) GO TO 10
      CALL UPDATE (IOPT)
      STOP
10  CONTINUE
      PRINT 200
      READ 210, IMONTH, IYEAR
      REWIND 1
      CALL GET (5HTAPE1,7HSECTION,0,0)
      ICOUNT=0
      DO 20 I=1,15
      ICOUNT=ICOUNT+1
      READ (1,220) ISECT(I)
      IF (EOF,1) 30,20
20  CONTINUE
30  CONTINUE
      REWIND 1
      REWIND 2
      IF (IOPT.EQ.1) CALL GET (5HTAPE1,6HQADATA,0,0)
      IF (IOPT.EQ.2) CALL GET (5HTAPE1,6HPMDATA,0,0)
40  CONTINUE
      IP=0
      IF (IOPT.EQ.2) GO TO 50
      PRINT 230
      GO TO 60
50  PRINT 240
60  CONTINUE
      REWIND 1
      IP=IP+1
C      -----WHEN IP=ICOUNT, ALL NAMES HAVE BEEN SEARCHED FOR, SO WE ARE
C      -----THROUGH WITH A RUN.
      IF (IP.EQ.ICOUNT) GO TO 170
      IPRINT=0
70  CONTINUE
      READ (1,250) LINE, IDENTNO, IDESC1, IDESC2, LOC, ITASK1, ITASK2, IPERIOD, N

```

```

NAME, IMO, IYR
IF (EOF, 1) 150, 80
80 CONTINUE
C -----COMPARE NAMES
IF (ISECT(IP).NE.NAME) GO TO 70
C -----CALCULATE TIME ELAPSED FROM LAST OPERATION. IF EQ TO OR CT.TH
C E
C -----PERIOD LISTED, THE OPERATION IS DUE. IF LT. THE PERIOD, THE
C -----OPERATION IS NOT YET DUE.
NIMO=IMO+IPERIOD
90 IF (NIMO.LT.13) GO TO 100
NIMO=NIMO-12
IYR=IYR+1
GO TO 90
100 CONTINUE
IF (IYEAR.NE.IYR) GO TO 70
IF (IMONTH+1.GT.NIMO) GO TO 110
GO TO 70
110 CONTINUE
IPRINT=IPRINT+1
C -----PRINT HEADING.
IF (IPRINT.NE.1) GO TO 140
IF (IOPT.EQ.2) GO TO 120
PRINT 260, IMONTH, IYEAR, ISECT(IP)
GO TO 130
120 CONTINUE
PRINT 270, IMONTH, IYEAR, ISECT(IP)
130 CONTINUE
PRINT 280
140 PRINT 290, LINE, IDENTNO, IDESC1, IDESC2, LOC, ITASK1, ITASK2
GO TO 70
150 IF (IPRINT.GT.0) GO TO 160
GO TO 60
160 PRINT 300
GO TO 60
170 IRUN=IRUN+1
C -----THE PROGRAM SHOULD RUN TWICE TO GET 2 LISTINGS SO STOP IF RUN
C -----EQUALS 2, OTHERWISE RUN AGAIN.
IF (IRUN.GT.1) STOP
GO TO 40
STOP
C
180 FORMAT (*TYPE IN THE OPTION YOU WANT--,QA,PM,UPQA,UPPM*)
190 FORMAT (A4)
200 FORMAT (*TYPE IN DAY OF LISTING- MMDDYY*)
210 FORMAT (12,2X,12)
220 FORMAT (6X,A10)
230 FORMAT (3/,15X,*,*QUALITY ASSURANCE RECALIBRATION SCHEDULE FOR CMB-
11*,3/)
240 FORMAT (3/,15X,*,*CMB-1 PREVENTATIVE MAINTENANCE SCHEDULE*,3/)
250 FORMAT (15,1X,16,1X,A10,A8,1X,14,1X,2A10,1X,12,1X,A10,1X,12,2X,12)
260 FORMAT (3/,*QA CALIBRATION REQUIRED FOR*,1X,12,2X,12,1X,*IN SECTION
1N=*,1X,A10,2/)
270 FORMAT (3/,*PREVENTATIVE MAINTENANCE REQUIRED FOR*,1X,12,2X,12,1X,
1*IN SECTION-*1X,A10,2/)
280 FORMAT (2/,* LINE IDENT INSTRUMENT ROOM REQUIRE
1D *,* DATE INITIAL*,/,* NO. NO. DESCRIPTION N
20. OPERATION*,/,*-----
3-----*,*-----*,//)
290 FORMAT (15,2X,16,2X,A10,A8,2X,14,2X,2A10)
300 FORMAT (/,*PLEASE INITIAL AND DATE IN THE BLANKS PROVIDED TO*,/,*C
1ERTIFY THAT THE OPERATION WAS DONE, THEN RETURN THIS COPY*,/,*TO J
2. DAHLBY. THANKS*,/,*-----
3-----*,/,*-----
4-----*)

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```

      END
C      -----
C      SUBROUTINE UPDATE(IOPT)
C      -----THIS SUBROUTINE UPDATES THE LISTED DATE THE OPERATION WAS COM
C      PLETED
C      -----IT READS THE LINES ON TAPE1 AND WRITES THEM ON TAPE2 UNTIL TH
C      E
C      -----LINE NUMBER IS LOCATED. THEN IT PRINTS THAT LINE, ASKS FOR N
C      EW
C      -----DATE, PRINTS LINE WITH NEW DATE, AND WRITES THAT CORRECTED LI
C      NE
C      -----ON TAPE2. THEN IT READS THE REST OF THE LINES ON TAPE1 AND
C      -----WRITES THEM ON TAPE2. THEN TAPE2 IS COPIED ON PERMFILE TO
C      -----REPLACE TAPE1. THEN IT REPEATS UNTIL STOP IS TYPED.
      DIMENSION T(7)
      REWIND 1
      REWIND 2
10    CONTINUE
      IF (IOPT.EQ.3) CALL GET (5HTAPE1,6HQADATA,0,0)
      IF (IOPT.EQ.4) CALL GET (5HTAPE1,6HPMDATA,0,0)
      REWIND 1
      REWIND 2
      PRINT 100
      READ 150, ILINE
20    CONTINUE
C      -----READ LINE ON FILE.
      READ (1,110)LINE,(T(KK),KK=1,7),IMO,IDA,IYR
      IF (EOF,1) 30,40
30    PRINT 120
      STOP
40    CONTINUE
      IF (LINE.EQ.ILINE) GO TO 50
      WRITE (2,110)LINE,(T(KK),KK=1,7),IMO,IDA,IYR
      GO TO 20
50    PRINT 110, LINE,(T(KK),KK=1,7),IMO,IDA,IYR
      PRINT 130
      READ 140, IMO,IDA,IYR
      PRINT 110, LINE,(T(KK),KK=1,7),IMO,IDA,IYR
      WRITE (2,110)LINE,(T(KK),KK=1,7),IMO,IDA,IYR
60    CONTINUE
      READ (1,110)LINE,(T(KK),KK=1,7),IMO,IDA,IYR
      IF (EOF,1) 80,70
70    WRITE (2,110)LINE,(T(KK),KK=1,7),IMO,IDA,IYR
      GO TO 60
80    REWIND 2
      IF (IOPT.EQ.4) GO TO 90
      CALL REPLACE (5HTAPE2,6HQADATA,0,0)
      GO TO 10
90    CALL REPLACE (5HTAPE2,6HPMDATA,0,0)
      GO TO 10
      RETURN
C
100  FORMAT (*TYPE IN LINE NUMBER TO BE CHANGED--00000.OR STOP IF DONE*
1)
110  FORMAT (A5,6A10,A7,12,12,12)
120  FORMAT (*LINE NUMBER NOT LOCATED,CHECK FOR CORRECT ENTRY*)
130  FORMAT (*TYPE IN NEW DATE--MMDDYY*)
140  FORMAT (12,12,12)
150  FORMAT (A5)
      END

```

APPENDIX B
PROGRAM PERCERT

Program "PERCERT" is run whenever an analyst's certification changes (usually by being certified for new procedures or when a revision number of any procedure for which he is certified is changed). The output from this program is an up-to-date QA personnel certification form for any certified analyst (Appendix B-1). This program uses two files, PROINDEX and CERDATA (Appendix B-2). File PROINDEX contains a listing of each QA procedure by key number (a cross-reference number interacting files PROINDEX and CERDATA), procedure number, and procedure title. File CERDATA contains a listing of each certified analyst and the key number of each QA procedure for which he is certified. Appendix B-3 is a complete listing of program "PERCERT."

When an analyst is certified for more than 18 procedures, a break in the printout is made permitting the output list to be cut into two or more 28-cm (11-in.) pages, making the output more easily filed and copied for further distribution. The pages are cross referenced by the analyst's name and page number, which are printed on each 28-cm (11-in.) section. This fulfills the page cross-reference requirement for QA documentation.

Some QA procedures are long and complicated, requiring that one analyst do a part of the procedure and another analyst do the remainder of the procedure. In this case, the program has an option that notes a partial certification on the certification sheet. A "flag" in the program recognizes any key number prefixed with an 8 as a partial certification. In that case, the following note is printed on the certification sheet immediately before the procedure number and title for which the analyst has a partial certification.

NOTE: Partial certification for the following procedure.

Certified for steps _____ through _____.

The supervisor then fills in the step numbers indicating the section of the procedure the analyst is certified to perform.

APPENDIX B-1

CERTIFICATION SHEET GENERATED BY PROGRAM PERCERT

CMB-1 PERSONNEL CERTIFICATION

THIS CERTIFIES THAT C. H. WARD HAS THE NECESSARY TECHNICAL BACKGROUND AND HAS BEEN ADEQUATELY TRAINED TO APPLY EACH OF THE PROCEDURES LISTED BELOW. TRAINING FOR EACH EACH PROCEDURE INCLUDES STUDYING THE PROCEDURE, WATCHING IT BEING APPLIED BY A CERTIFIED ANALYST, AND USING THE PROCEDURE ON KNOWN MATERIAL UNTIL THE STATED RELIABILITY IS OBTAINED REPEATEDLY.

ANALYSTS SIGNATURE

PROCEDURE NUMBER	PROCEDURE TITLE
*****	*****
ANC-CP-1-1,R2	CALIBRATION OF WEIGHTS
ANC-CP-1-2,R2	CALIBRATION OF GLASSWARE
ANC-CP-1-3,R2	CALIBRATION OF THERMOCOUPLES
ANC-DE-1-PA-3,R3	SPECTROPHOTOMETRIC DETERMINATION OF NITRIDE NITROGEN IN URANIUM-PLUTONIUM FUEL MATERIALS
ANC-DE-1-PA-3,R2	DETERMINATION OF OXYGEN TO METAL ATOM RATIO IN URANIUM-PLUTONIUM OXIDES
ANC-DE-1-PA-4,R3	GRAVIMETRIC DETERMINATION OF HYDROGEN AND CARBON IN OXIDE OR CARBIDE FUELS AND IN CLADDING MATERIAL
ANC-DE-1-PA-5,R2	SPECTROPHOTOMETRIC DETERMINATION OF PHOSPHOROUS IN OXIDE OR CARBIDE FUELS AND CLADDING MATERIAL
ANC-DE-1-PA-6,R2	SPECTROPHOTOMETRIC DETERMINATION OF IRON IN PLUTONIUM MATERIALS
ANC-DE-1-PA-8,R2	DETERMINATION OF WATER IN MINERAL OIL USING KARL FISCHER REAGENT
ANC-DE-1-PA-9,R3	SPECTROPHOTOMETRIC DETERMINATION OF CHLORIDE IN MINERAL OIL
ANC-DE-1-PA-12,R2	SPECTROPHOTOMETRIC DETERMINATION OF TUNGSTEN IN URANIUM-PLUTONIUM FUEL MATERIALS
ANC-DE-1-PA-13,R2	DETERMINATION OF CHLORIDE AND FLUORIDE IN URANIUM-PLUTONIUM FUEL MATERIALS AND BORON CARBIDE
ANC-DE-1-PA-14,R2	DETERMINATION OF TOTAL VOLATILES IN FUEL MATERIALS
ANC-DE-1-PA-17,R2	SPECTROPHOTOMETRIC DETERMINATION OF IRON IN URANIUM-PLUTONIUM FUEL MATERIALS
ANC-DE-1-PA-18,R3	DETERMINATION OF NICKEL IN URANIUM-PLUTONIUM FUEL MATERIALS

SUPERVISOR

GROUP LEADER

DATE (A)

DATE (A)

(A) CERTIFICATION IS INVALID AFTER ONE YEAR.

APPENDIX B-2

PARTIAL LISTING OF FILES CERDATA AND PROINDX

FILE CERDATA

The key in file CERDATA indicates the numbers reserved for procedures and separated by section, e.g., CP = calibration procedures, GS = gamma scanning procedures, etc.

00100	KEY-----	CP=100, GS=200, HC=300, IA=400, MS=500, PA=600, RC=700
00110		SC=800, UA=900, XR=1000, MP=1100, PART. CERT.=8000
00120	W. H. ASHLEY	101 102 103 901 902 903 904 905 906 907 908 909
00130		910 911 912 913 914 915 916 917 918 919 920 935
00140		922 923 924 925 926 927 928 929 930 931 932 933
00150		939 941 942 943 934 000
00160	B. H. BACA	101 102 103 901 902 903 904 905 906 907 908 909
00170		910 911 912 913 914 915 916 917 918 919 920 935
00180		922 923 924 925 926 927 928 929 930 931 932 939
00190		941 942 943 934 000
00730	M. S. LEW	101 102 702 703 704 705 000
00740	L. A. MAESTAS	07038704 000
00750	G. B. NELSON	101 102 702 703 704 000
00760	J. H. PATTERSON	101 102 702 703 704 000
00770	J. R. PHILLIPS	201 202 203 106 107 000
00780	B. K. BARNES	201 202 203 106 107 000
00790	A. S. MURRAY	201 202 106 107 000
00800	J. R. NETUSCHIL	020182028203 000

FILE PROINDX

01530	021	SC-21,R2	SPECTROCHEMICAL DETM OF METALLIC IMPURITIES IN PU
01540	000		BY THE ANION-EXCHANGE GRAPHITE-SPARK TECHNIQUE
01560	901	UA-1,R3	DETERMINATION OF CARBON IN STAINLESS STEEL USING
01570	000		THE LECO LOW CARBON ANALYZER
01580	902	UA-2,R3	DETERMINATION OF SULFUR IN STAINLESS STEEL USING
01590	000		THE LECO SULFUR DETERMINATOR
01600	903	UA-3,R3	DETERMINATION OF NITRIDE NITROGEN IN STAINLESS
01610	000		STEEL BY A DISTILLATION-TITRATION PROCEDURE
01620	904	UA-4,R3	GRAVIMETRIC DETERMINATION OF NICKEL IN STAINLESS
01630	000		STEEL USING DIMETHYLGLYOXIME
01640	905	UA-5,R3	DETERMINATION OF CHROMIUM IN STAINLESS STEEL BY
01650	000		OXIDATION-REDUCTION TITRIMETRY
01660	906	UA-6,R2	GRAVIMETRIC ASSAY OF CADMIUM METAL
01670	907	UA-7,R2	GRAVIMETRIC DETERMINATION OF TOTAL CARBON IN
01680	000		URANIUM CARBIDE-ZIRCONIUM CARBIDE MIXTURES
01690	908	UA-8,R2	DETERMINATION OF FREE CARBON IN URANIUM CARBIDE-
01700	000		ZIRCONIUM CARBIDE MIXTURES
01710	909	UA-9,R3	DETERMINATION OF ZIRCONIUM AND URANIUM IN URANIUM
01720	000		CARBIDE-ZIRCONIUM CARBIDE MIXTURES
01730	910	UA-10,R3	DETERMINATION OF DENSITY OF URANIUM CARBIDE-
01740	000		ZIRCONIUM CARBIDE FUEL ELEMENTS
01750	911	UA-11,R3	DETERMINATION OF TANTALUM IN MIXED CARBIDES OF
01760	000		URANIUM AND ZIRCONIUM
01770	912	UA-12,R3	THE DETERMINATION OF NITROGEN IN URANIUM CARBIDE-

LASL IDENTIFICATION: LP-0637

APPENDIX B-3

PERCERT SOURCE CODE (FORTRAN IV)

```

PROGRAM PERCERT (INPUT,OUTPUT,TAPE1,TAPE2)
C -----THIS PROGRAM PRINTS THE CERTIFICATION SHEET FOR CMB-1 ANALYST
C S
C -----CERTIFIED IN THE QUALITY ASSURANCE PROGRAM.
C -----INPUTS ARE ANALYSTS NAME, FILE CERDATA, AND FILE PROINDX.
C -----OUTPUT IS CERTIFICATION SHEET FOR CMB-1 CERTIFIED ANALYSTS.
C DIMENSION NAME3(200), NAME4(200), ICODE1(100), ICODE2(400), ISORT(
1100)
C -----CALL FILES,CERDATA AND PROINDX.
REWIND 1
REWIND 2
CALL GET (5HTAPE1,7HCERDATA,0,0)
CALL GET (5HTAPE2,7HPROINDX,0,0)
10 CONTINUE
REWIND 1
REWIND 2
ILL=-11
IHL=0
PRINT 270
READ 280, NAME1,NAME2
C -----READ NAMES OF CERTIFIED ANALYSTS ON CERDATA, AND COMPARE
C -----TO NAME READ IN.
DO 20 I=1,200
READ (1,290)NAME3(I),NAME4(I)
IF (NAME1.EQ.NAME3(I).AND.NAME2.EQ.NAME4(I)) GO TO 40
IF (EOF,1) 30,20
20 CONTINUE
30 PRINT 300, NAME1,NAME2
STOP
C -----IF NAMES COMPARE, PRINT OUT CERTIFICATION SHEET.
40 PRINT 310, NAME1,NAME2
C -----BACKSPACE TAPE1, READ PROCEDURE CODE UNTIL 000 IN ICODE1 IS R
C EAD
BACKSPACE 1
50 CONTINUE
ILL=ILL+12
IHL=IHL+12
READ (1,320)(ICCODE1(I),I=ILL,IHL)
IF (ICCODE1(2).LT.1) GO TO 140
DO 60 I=ILL,IHL
IF (ICCODE1(I).LT.1) GO TO 70
60 CONTINUE
GO TO 50
70 CONTINUE
C -----SORT ICODE1 NUMBERS INTO ASCENDING ORDER TO MAKE THEM PRINT 0
C UT
C -----THE PROCEDURES IN ORDER.
DO 80 I=1,100
IF (ICCODE1(I).LT.1) GO TO 90
ISORT(I)=ICCODE1(I)
80 CONTINUE
C -----THE LIMIT OF THE SORT IS THE NO. OF ICODE1 NOS. READ LESS ONE
C .
90 NL=I-1
IPASS=1
DO 110 IOUT=2,NL
ISWAP=0
DO 100 INNER=2,NL
I=INNER
IF (IPASS.LT.0) I=(2+NL)-INNER

```

```

        IF (ISORT(I-1).LE.ISORT(I)) GO TO 100
        TEMP=ISORT(I-1)
        ISORT(I-1)=ISORT(I)
        ISORT(I)=TEMP
        ISWAP=1
100  CONTINUE
        IF (ISWAP.LT.1) GO TO 120
        IPASS=-IPASS
110  CONTINUE
120  CONTINUE
        DO 130 I=1,NL
        ICODE1(I)=ISORT(I)
130  CONTINUE
        ICODE1(NL+1)=000
        ICOUNT=0
C      -----COMPARE PROCEDURE CODES READ FROM CERDATA WITH THOSE READ FROM
C      N
C      -----PROINDX.  WHEN THEY COMPARE, PRINT OUT PROCEDURE NO. AND TITLE
C      E.
140  CONTINUE
        DO 240 I=1,100
        IF (ICODE1(I).LT.1) GO TO 260
C      -----CHECK FOR PARTIAL CERTIFICATION (ICODE1 GT 8000).
        IF (ICODE1(I).LT.8000) GO TO 150
        PRINT 330
        ICODE1(I)=ICODE1(I)-8000
        REWIND 2
150  CONTINUE
        DO 200 J=1,400
        READ (2,340) ICODE2(J)
        IF (EOF,2) 250,160
160  CONTINUE
        IF (ICODE1(I).NE.ICODE2(J)) GO TO 200
        BACKSPACE 2
        READ (2,350) T1,T2,T3,T4,T5,T6,ICODE,T7,T8,T9,T10,T11
        IF (ICODE1(I).EQ.ICODE2(J).AND.ICODE1(I).LT.200) GO TO 170
        IF (ICODE1(I).EQ.ICODE2(J).AND.ICODE1(I).GT.199) GO TO 180
170  CONTINUE
        PRINT 360, T1,T2,T3,T4,T5,T6
        GO TO 190
180  CONTINUE
        PRINT 370,T1,T2,T3,T4,T5,T6,
190  CONTINUE
        IF (ICODE.GT.000) GO TO 210
        PRINT 380, T7,T8,T9,T10,T11
        GO TO 210
200  CONTINUE
210  CONTINUE
        BACKSPACE 2
        ICOUNT=ICOUNT+1
C      -----CHECK FOR FULL PAGE ON PAGE 1 AND PAGE 2.
        IF (ICOUNT.EQ.13) GO TO 220
        IF (ICOUNT.EQ.41) GO TO 230
        GO TO 240
220  PRINT 390, NAME1,NAME2
        GO TO 240
230  PRINT 400, NAME1,NAME2
240  CONTINUE
250  PRINT 410
        STOP
260  CONTINUE
C      -----PRINT BOTTOM OF CERTIFICATION SHEET.
        PRINT 420
        GO TO 10

```


STOP

C

```

270 FORMAT (1X,*ENTER NAME OF ANALYST AFTER ? X. X. XXXXXXXXXX*,/,1X,*
10R IF YOU ARE DONE, ENTER STOP.*)
280 FORMAT (2A10)
290 FORMAT (6X,2A10)
300 FORMAT (1X,2A10,*IS EITHER NOT A CERTIFIED ANALYST OR THE *,/,1X,*
1NAME WAS ENTERED (HPROPERLY. PLEASE CHECK FOR PROPER ENTRY*,/,1X.*
2FORMAT.X. X. XXXXXXXXXX*)
310 FORMAT (///,20X,*CMB-1 PERSONNEL CERTIFICATION*,///,5X,*THIS CERTI
FIES THAT*,2X,2A10,*HAS THE NECESSARY*,/,5X,*TECHNICAL BACKGROUND
2AND HAS BEEN ADEQUATELY TRAINED TO*,/,5X,*APPLY EACH OF THE PROCED
URES LISTED BELOW. TRAINING FOR*,/,5X,*EACH PROCEDURE INCLUDES STU
DYING THE PROCEDURE, WATCHING*,/,5X,*IT BEING APPLIED BY A CERTIFI
5ED ANALYST, AND USING THE*,/,5X,*PROCEDURE ON KNOWN MATERIAL UNTIL
6 THE STATED RELIABILITY*,/,5X,*IS OBTAINED REPEATEDLY*,/,5X,*---
7-----*,/,5X,*ANALYSTS SIGNATURE*,///,5X,*PROCEDURE NUM
8BER PROCEDURE TITLE*,/,5X,17H*****3X,40H*****
9*****
320 FORMAT (26X,1214)
330 FORMAT (*NOTE: PARTIAL CERTIFICATION FOR FOLLOWING PROCEDURE *,/,6
1X,*CERTIFIED FOR STEPS( THROUGH )*)
340 FORMAT (6X,14)
350 FORMAT (11X,6A10,/,6X,14,11X,5A10)
360 FORMAT (9X,*ANC-CP*,6A10)
370 FORMAT (6X,*ANC-DE-1-*,6A10)
380 FORMAT (25X,5A10)
390 FORMAT (//,25X,*CONTINUED ON PAGE 2*,///,10X,*-----
1-----*,///,32X,*PAGE 2*,10X,2A10,///,5X,*PROCEDURE NUMBER
2 PROCEDURE TITLE*,/,5X,17H*****3X,40H*****
3*****
400 FORMAT (//,25X,*CONTINUED ON PAGE 3*,///,10X,*-----
1---*,///,32X,*PAGE 3*,10X,2A10,///,5X,*PROCEDURE NUMBE
2R PROCEDURE TITLE*,/,5X,17H*****3X,40H*****
3*****
410 FORMAT (5X,*INVALID PROCEDURE CODED IN CERDATA*)
420 FORMAT (//,5X,*-----
1-----*,/,5X,* SUPERVISOR
2 GROUP LEADER*,/,5X,/,3X,*-----
3 -----*,/,5X,* DATE (A)
4 DATE (A)*,/,5X,/,3X,*(A) CERTIFICATION IS INVALID AFT
5ER ONE YEAR*,/,5X,*
END

```

APPENDIX C

PROGRAM LISTING

Program "LISTING" is run each time a procedure number or revision number is changed, and when a new procedure is added to or an outdated procedure is deleted from the QA system. The output from this program continuously provides the required personnel in the Analytical Chemistry Group and the Quality Assurance Manager with an up-to-date list of current QA procedures. Options of the program allow the listing of procedures used in individual sections of the group, or a complete list of all QA procedures currently being used in the group. The program output is shown in Appendix C-1, listing the procedures used in one of the sections of the group. The data file used in this program is PROINDX (Appendix C-2). Appendix C-3 is a complete listing of program "LISTING."

The program output prints 25 procedures per 28-cm (11-in.) section, then a break in the printing allows the printout to be stored easily and copied for further distribution. The pages of the listing are cross referenced by the date of the listing and the page number, which are printed on each 28-cm (11-in.) section. This fulfills the page cross-reference requirement for QA documentation.

APPENDIX C-1
OUTPUT OF PROGRAM LISTING

CMB-1 QUALITY ASSURANCE PROCEDURES

DATE OF LISTING IS 50576

PROCEDURE NUMBER	PROCEDURE TITLE
*****	*****
ANC-DE-1-SC-1,R2	SPECTROGRAPHIC DETERMINATION OF METALLIC CONSTITUENTS IN STAINLESS STEEL.
ANC-DE-1-SC-2,R2	SPECTROGRAPHIC DETERMINATION OF METALLIC IMPURITIES IN PLUTONIUM MATERIALS.
ANC-DE-1-SC-3,R2	SPECTROGRAPHIC DETERMINATION OF METALLIC IMPURITIES IN URANIUM MATERIALS.
ANC-DE-1-SC-4,R2	SPECTROCHEMICAL DETERMINATION OF METAL IMPURITIES IN CERAMIC URANIUM-PLUTONIUM FUEL MATERIALS.
ANC-DE-1-SC-5,R2	SPECTROGRAPHIC DETERMINATION OF METALLIC IMPURITIES IN GADOLINIUM.
ANC-DE-1-SC-6,R2	SPECTROGRAPHIC DETERMINATION OF BORON IN STAINLESS STEEL.
ANC-DE-1-SC-7,R2	TESTING OF PHOTOGRAPHIC MATERIALS FOR USE IN SPECTROCHEMICAL ANALYSIS.
ANC-DE-1-SC-8,R2	QUALITATIVE SPECTROCHEMICAL ANALYSIS OF MISCELLANEOUS SAMPLES FOR METALLIC IMPURITIES.
ANC-DE-1-SC-9,R2	SEMIQUANTITATIVE SPECTROCHEMICAL ANALYSIS OF MISCELLANEOUS SAMPLES FOR METALLIC IMPURITIES.
ANC-DE-1-SC-10,R2	SPECTROCHEMICAL DETERMINATION OF HAFNIUM IN ZIRCONIUM.
ANC-DE-1-SC-11,R2	SPECTROCHEMICAL DETERMINATION OF ZIRCONIUM IN HAFNIUM.
ANC-DE-1-SC-12,R2	SPECTROCHEMICAL DETERMINATION OF METALLIC IMPURITIES IN URANIUM-ZIRCONIUM-HAFNIUM CARBIDES.
ANC-DE-1-SC-13,R2	SPECTROGRAPHIC DETERMINATION OF METAL IMPURITIES IN BORON CARBIDE.
ANC-DE-1-SC-14,R2	SPECTROCHEMICAL ANALYSIS OF PLUTONIUM AND URANIUM FOR SAMARIUM, EUROPIUM, GADOLINIUM, AND DYSPROSIUM.
ANC-DE-1-SC-15,R2	SPECTROCHEMICAL DETERMINATION OF METALLIC IMPURITIES IN URANIUM ALLOYS.
ANC-DE-1-SC-16,R2	DETERMINATION OF ARSENIC IN URANIUM-MOLYBDENUM ALLOYS BY ATOMIC ABSORPTION SPECTROPHOTOMETRY.
ANC-DE-1-SC-17,R2	SPECTROCHEMICAL DETERMINATION OF METAL IMPURITIES IN FBR PLUTONIUM OXIDE.
ANC-DE-1-SC-18,R2	SPECTROCHEMICAL DETERMINATION OF METAL IMPURITIES IN FBR URANIUM-PLUTONIUM OXIDE.
ANC-DE-1-SC-19,R2	SPECTROCHEMICAL DETERMINATION OF METALLIC IMPURITIES IN SODIUM.
ANC-DE-1-SC-20,R2	DETERMINATION OF VARIOUS ELEMENTS IN PLUTONIUM OR URANIUM-PLUTONIUM OXIDES OR CARBIDES.

APPENDIX C-2
PARTIAL LISTING OF FILE PROINDX

FILE PROINDX

01150	802	SC-2, R3	SPECTROCHEMICAL DETERMINATION OF METALLIC
01160	000		IMPURITIES IN PLUTONIUM MATERIALS
01170	803	SC-3, R2	SPECTROCHEMICAL DETERMINATION OF METALLIC
01180	000		IMPURITIES IN URANIUM MATERIALS
01190	804	SC-4, R3	SPECTROCHEMICAL DETERMINATION OF METAL IMPURITIES
01200	000		IN CERAMIC URANIUM-PLUTONIUM FUEL MATERIALS
01210	805	SC-5, R2	SPECTROCHEMICAL DETERMINATION OF METALLIC
01220	000		IMPURITIES IN GADOLINIUM
01230	806	SC-6, R2	SPECTROGRAPHIC DETERMINATION OF BORON IN
01240	000		STAINLESS STEEL
01250	807	SC-7, R2	TESTING OF PHOTOGRAPHIC MATERIALS FOR USE IN
01260	000		SPECTROCHEMICAL ANALYSIS
01270	808	SC-8, R2	QUALITATIVE SPECTROCHEMICAL ANALYSIS OF
01280	000		MISCELLANEOUS SAMPLES FOR METALLIC IMPURITIES
01290	809	SC-9, R2	SEMIQUANTITATIVE SPECTROCHEMICAL ANALYSIS OF
01300	000		MISCELLANEOUS SAMPLES FOR METALLIC IMPURITIES
01310	810	SC-10, R2	SPECTROCHEMICAL DETERMINATION OF HAFNIUM IN
01320	000		ZIRCONIUM
01330	811	SC-11, R2	SPECTROCHEMICAL DETERMINATION OF ZIRCONIUM IN
01340	000		HAFNIUM
01350	812	SC-12, R3	SPECTROCHEMICAL DETERMINATION OF METALLIC
01360	000		IMPURITIES IN URANIUM-ZIRCONIUM-HAFNIUM CARBIDES
01370	813	SC-13, R2	SPECTROGRAPHIC DETERMINATION OF METAL IMPURITIES
01380	000		IN BORON CARBIDE
01390	814	SC-14, R3	SPECTROCHEMICAL ANALYSIS OF PLUTONIUM AND URANIUM
01400	000		FOR SAMARIUM, EUROPIUM, GADOLINIUM, AND DYSPROSIUM
01410	815	SC-15, R2	SPECTROCHEMICAL DETERMINATION OF METALLIC
01420	000		IMPURITIES IN URANIUM ALLOYS
01430	816	SC-16, R2	DETERMINATION OF ARSENIC IN URANIUM-MOLYBDENUM
01440	000		ALLOYS BY ATOMIC ABSORPTION SPECTROPHOTOMETRY
01450	817	SC-17, R2	SPECTROCHEMICAL DETERMINATION OF METAL IMPURITIES
01460	000		IN FBR PLUTONIUM OXIDE
01470	818	SC-18, R2	SPECTROCHEMICAL DETERMINATION OF METAL IMPURITIES
01480	000		IN FBR URANIUM-PLUTONIUM OXIDE
01490	819	SC-19, R2	SPECTROCHEMICAL DETERMINATION OF METALLIC
01500	000		IMPURITIES IN SODIUM
01510	820	SC-20, R2	DETERMINATION OF VARIOUS ELEMENTS IN PLUTONIUM OR
01520	000		URANIUM-PLUTONIUM OXIDES OR CARBIDES

LASL IDENTIFICATION: LP-0638

APPENDIX C-3

LISTING SOURCE CODE (FORTRAN IV)

```

PROGRAM LISTING (INPUT,OUTPUT,TAPE2)
C -----THIS PROGRAM SEGMENT PRINTS THE CURRENT PROCEDURE INDEX FOR C
C MB-1
C -----QA PROCEDURES EITHER BY SECTION OR AS A TOTAL LIST
C -----INPUTS ARE CODE FOR SECTION OR ALL SECTIONS
C -----OUTPUTS APPROPRIATE QA PROCEDURE LISTS BY NUMBER AND TITLE
C -----IPAGE IS PAGE COUNT.
C -----ICOUNT IS COUNT OF 25 PROCEDURE TITLES PER PAGE.
C -----ICODE2 IS THE CODE " OF THE PROCEDURE READ ON PROINDX FILE.
C -----ICODE1 IS THE CODE READ ON PROINDX FILE TO DET. IF TITLE IS
C -----ONE OR TWO LINES.
C -----IDENT IS CODE " ENTERED TO DET. WHICH PROCEDURES TO PRINT OUT
C .
C -----IDENT1 IS VARIABLE IDENT AS PROCEDURES ARE PRINTED.
C -----IDENT2 IS USED AS VARIABLE IDENT TO PRINT ALL SECTIONS PROCED
C URES.
C DIMENSION ICODE2(500)
C -----CALL FILE,PROINDX
C REWIND 2
C CALL GET (5HTAPE2,7HPROINDX,0,0)
C PRINT 170
C READ , IDATE
C -----IPAGE COUNTS PAGES. ICOUNT COUNTS OUT 25 TITLES/PAGE.
C IPAGE=2
C ICOUNT=0
C REWIND 2
C PRINT 180
C -----READ CODE NUMBER FOR PROCEDURES DESIRED (IDENT)
C READ , IDENT
C PRINT 190, IDATE
C -----CHECK IF ALL PROCEDURES ARE WANTED (IDENT=2000)
C IF (IDENT.EQ.2000) GO TO 10
C -----IDENT1 IS VARIABLE IDENT AS PROCEDURES ARE PRINTED
C IDENT1=IDENT
C GO TO 30
C -----IF ALL PROCEDURES ARE DESIRED, START IDENT2 AT 100, INCREASE
C BY
C -----100 AFTER EACH SECTIONS PROCEDURES ARE PRINTED TO GET TO THE
C -----START OF THE NEXT SECTIONS PROCEDURES
C 10 CONTINUE
C IDENT2= IDENT-2000
C 20 CONTINUE
C -----BACKSPACE BECAUSE WE ALREADY READ THE FIRST PROCEDURE IN THE
C NEXT
C -----SECTION
C BACKSPACE 2
C IDENT2= IDENT2+100
C IF (IDENT2.GT.1199) STOP
C IDENT1=IDENT2
C 30 CONTINUE
C -----PRINT PROCEDURES THAT COMPARE TO IDENT SECTION AND ALL PROCED
C URES
C -----CORRESPONDING TO IDENT1 IN THAT SECTION
C DO 150 I=1,1000
C READ (2,200) ICODE2(I)
C IF (EOF,2) 160,40
C 40 CONTINUE
C IF (IDENT.LT.2000.AND. ICODE2(I).LT. IDENT) GO TO 120
C IDENT1=IDENT1+1
C IF (ICODE2(I).EQ. IDENT1) GO TO 70

```

```

C      -----ACCOUNT FOR CAPS OF <? NUMBERS IN PROCEDURE NUMBERS IN A SECT
C      ION.
C      -----IF GAP IS >6, ASSUME THE NEXT PROCEDURE READ IS IN THE NEXT
C      SECTIONS LIST.
      IF (IDENT.LT.2000.AND.(ICODE2(1)-IDENT1).GT.6) STOP
      IF (IDENT.LT.2000.AND.(ICODE2(1)-IDENT1).LT.7) GO TO 50
      IF (IDENT.EQ.2000.AND.(ICODE2(1)-IDENT1).GT.6) GO TO 20
      IF (IDENT.EQ.2000.AND.(ICODE2(1)-IDENT1).LT.7) GO TO 50
C      -----DO LOOP TO ALLOW IDENT1 TO CATCH UP TO ICODE2.
50 DO 60 K=1,7
      IDENT1=IDENT1+1
      IF (ICODE2(1).EQ.IDENT1) GO TO 70
60 CONTINUE
70 CONTINUE
C      -----BACKSPACE AND READ PROCEDURE TITLE ON TWO LINES.
      BACKSPACE 2
      READ (2,210) T1,T2,T3,T4,T5,T6,ICODE,T7,T8,T9,T10,T11
C      -----DETERMINE IF PROCEDURE IS CALIB. PROCEDURE OR DIAGNOSTIC EXAM
C      .
C      -----THEN PRINT THE APPROPRIATE PREFEX TO THE PROCEDURE NUMBER.
      IF (ICODE2(1).EQ.IDENT1.AND.ICODE2(1).LT.200) GO TO 80
      IF (ICODE2(1).EQ.IDENT1.AND.ICODE2(1).GT.199) GO TO 90
80 CONTINUE
      PRINT 220, T1,T2,T3,T4,T5,T6
      ICOUNT=ICOUNT+1
      GO TO 100
90 CONTINUE
      PRINT 230, T1,T2,T3,T4,T5,T6
      ICOUNT=ICOUNT+1
100 CONTINUE
C      -----IF ICODE IS 000 PRINT THE SECOND LINE OF THE TITLE.
      IF (ICODE.GT.000) GO TO 110
      PRINT 240, T7,T8,T9,T10,T11
      GO TO 120
110 BACKSPACE 2
120 CONTINUE
C      -----CHECK TO SEE IF PAGE IS FULL.
      IF (ICOUNT.EQ.25) GO TO 130
      IF (ICOUNT.EQ.50) GO TO 130
      IF (ICOUNT.EQ.75) GO TO 130
      IF (ICOUNT.EQ.100) GO TO 130
      IF (ICOUNT.EQ.125) GO TO 130
      IF (ICOUNT.EQ.150) GO TO 130
      IF (ICOUNT.EQ.175) GO TO 130
      IF (ICOUNT.EQ.200) GO TO 130
      GO TO 140
130 PRINT 250, IPAGE, IPAGE, IDATE
      IPAGE=IPAGE+1
140 CONTINUE
150 CONTINUE
C      -----IF END OF FILE IS REACHED, PRINT THAT.
160 PRINT 260
      STOP
C
170 FORMAT (*TYPE IN TODAYS DATE,MDDYY*)
180 FORMAT (1X,* ENTER CODE FOR PROCEDURES YOU DESIRE *,/,1X,*CP=100,
1CS=200, HC=300, IA=400, IB=500, PA=600, RC=700,*,/,1X,*SC=800, UA=
2900, XR=1000, IP=1100, ALL=2000*)
190 FORMAT (//,18X,ACCB=1 QUALITY ASSURANCE PROCEDURES*,/,5X,*DATE OF
1 LISTING IS*,1X,16,/,5X,*PROCEDURE NUMBER PROCEDURE TITLE*,/,
25X,17I*****3X,40I*****
3*****/,)
200 FORMAT (6X,14)

```

```

210 FORMAT (11X,6A10,/,6X,14,11X,5A10)
220 FORMAT (9X,*ANC-CP*,6A10)
230 FORMAT (6X,*ANC-DE-1-*,6A10)
240 FORMAT (25X,5A10)
250 FORMAT (//,25X,*CONTINUED ON PAGE*,1X,12,/,10X,*-----
1-----*,///,32X,*PAGE*,1X,12,/,5X,*DATE OF LISTING IS*
2,1X,16,/,5X,*PROCEDURE NUMBER  PROCEDURE TITLE*,/.5X,17H*****
3*****,,3X,40H*****,,/
4/)
260 FORMAT (5X* END OF FILE*)
END

```

APPENDIX D

PROGRAM PRODIST

Program "PRODIST" is run whenever a procedure is changed, resulting in a new revision which requires an accurate distribution of these controlled documents to those having copies of the previous revision. The output of this program, Appendix D-1, lists the certified analysts and experimenters who require copies of each specific procedure when any changes or revisions are made in a procedure. The files used in this program are PRODIST and CERDATA, (Appendix D-2). Appendix D-3 is a complete listing of program "PRODIST."

This program is an invaluable aid for accurately distributing revised QA procedures, which are controlled documents. It ensures that each individual having a copy of a specific procedure will receive all revisions. When analysts or experimenters are sent a revised procedure, they are instructed to destroy previous revisions. Therefore, it is necessary to know exactly each person having procedures and requiring copies of new revisions, to prevent the use of outdated QA procedures.

The great advantage of the programs "PERCERT," "LISTING," and "PRODIST" is that all of them use the same two data files, PROINDX and CERDATA. Therefore, when required, simple-to-perform changes are made to only two files. These changes are then effected in the outputs of all these programs. This alone is a tremendous advantage over the card-file system.

APPENDIX D-1
LISTING OF PROGRAM PRODIST OUTPUT

KEY---CP=100,CS=200,HC=300,IA=400,MS=500,PA=600
RC=700,SC=800,UA=900,XR=1000,MP=1100,
EXAMPLE, KEY NUMBER FOR ANC-DE-1-PA-11 IS 611
ENTER KEY NO. OF PROCEDURE DESIRED, OR STOP, AFTER QUESTION MARK

101

PROCEDURE NUMBER AND TITLE=

ANC-CP-1-1,R2 CALIBRATIONS OF WEIGHTS

THE FOLLOWING SHOULD HAVE A COPY OF THIS PROCEDURE.

LANHAM
WATERBURY
FILE
W. H. ASHLEY
B. H. BACA
R. L. CARPENTER
R. D. GARDNER
A. L. HENSCHSMAN
A. D. HUES
C. G. MEYER
J. E. TROXAL
W. J. BAUGHMAN
J. W. DAHLBY
H. J. KAVANAUGH
S. T. KOSIEWICZ
A. P. LOVELL
M. A. MAEZ
N. M. SAPONARA
D. J. TEMER
L. E. THORN
C. H. WARD
D. C. CROLEY
P. J. HAKKILA
E. A. HAKKILA
J. M. HANSEL
C. J. MARTELL
G. N. MATLACK
J. BUBERNAK
M. S. LEW
C. B. NELSON
J. H. PATTERSON
J. E. REIN
R. M. ABERNATHEY
C. F. HAMMOND
D. D. JACKSON
S. F. MARSH
H. R. ORTIZ
LASL-GREEN
LASL-DAVIDSON
LASL-REIN
LASL-WAGNER
LASL-WOOD

THAT'S ALL THE NAMES FOR THIS PROCEDURE.

APPENDIX D-2

PARTIAL LISTING OF FILES CERDATA AND PROINDX

FILE CERDATA

The key in file CERDATA indicates the numbers reserved for procedures and separated by section, e.g., CP = calibration procedures, GS = gamma scanning procedures, etc.

00100	KEY-----	CP=100, GS=200, HC=300, IA=400, MS=500, PA=600, RC=700
00110		SC=800, UA=900, XR=1000, NP=1100, PART. CERT.=8000
00120	W. H. ASHLEY	101 102 103 901 902 903 904 905 906 907 908 909
00130		910 911 912 913 914 915 916 917 918 919 920 935
00140		922 923 924 925 926 927 928 929 930 931 932 933
00150		939 941 942 943 934 000
00160	B. H. BACA	101 102 103 901 902 903 904 905 906 907 908 909
00170		910 911 912 913 914 915 916 917 918 919 920 935
00180		922 923 924 925 926 927 928 929 930 931 932 939
00190		941 942 943 934 000
00200	R. L. CARPENTER	101 102 103 901 902 903 904 905 906 907 908 909
00210		910 911 912 913 914 915 916 917 918 919 920 935
00220		922 923 924 925 926 927 928 929 930 931 932 933
00230		939 941 942 943 934 000
00720	B. A. HERRERA	703 704 000
00730	M. S. LEW	101 102 702 703 704 705 000
00740	L. A. MAESTAS	80033704 000
00750	C. B. NELSON	101 102 702 703 704 000
00760	J. H. PATTERSON	101 102 702 703 704 000
00770	J. R. PHILLIPS	201 202 203 106 107 000
00780	B. K. BARNES	201 202 203 106 107 000
00790	A. S. HURRAY	201 202 106 107 000
00800	J. R. NETUSCHIL	820182028203 000
00810	J. N. QUINTANA	201 202 203 106 107 000
00820	J. E. REIN	101 102 501 502 503 504 505 000
00830	R. M. ABERNATHEY	101 102 501 502 503 504 506 507 000
00840	J. E. ALARID	502 503 504 501 000
00850	C. F. HAMMOND	101 501 502 503 504 507 000

FILE PROINDX

00100	101 -1-1,R2	CALIBRATION OF WEIGHTS
00110	102 -1-2,R2	CALIBRATION OF GLASSWARE
00120	103 -1-3,R2	CALIBRATION OF THERMOCOUPLES
00130	104 -1-4,R2	CALIBRATION OF CAPILLARY TRAP AND MANOMETER
00140	000	FOR OXYGEN DETERMINATION
00150	105 -1-5,R2	DETERMINATION OF CRUCIBLE TEMPERATURE
00160	106 -1-6,R2	ENERGY EFFICIENCY CALIBRATION OF DETECTOR
00170	000	ASSEMBLY USED IN GAMMA SCANNING
00180	107 -1-7,R2	GAMMA SCANNING LENGTH CALIBRATION
00190	201 GS-1,R3	CROSS GAMMA SCAN ANALYSIS IN HOT CELLS (MCS)
00200	202 GS-2,R2	MULTISPECTRAL GAMMA SCANNING IN HOT CELLS (ACS)
00210	203 GS-3,R2	TWO-DIMENSIONAL GAMMA SCANNING IN HOT CELLS
00220	301 HC-1,R2	DETERMINATION OF OXYGEN IN IRRADIATED FUELS
00230	000	AND CLADDING MATERIAL

LASL IDENTIFICATION: LP-0639

APPENDIX D-3

PRODIST SOURCE CODE (FORTRAN IV)

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PROGRAM PRODIST (INPUT,OUTPUT,TAPE1,TAPE2)
C -----THIS PROGRAM PRINTS OUT THE NAMES OF THOSE WHO SHOULD HAVE
C -----A COPY OF THE QA PROCEDURE NUMBER ENTERED.
C ----- INPUTS ARE PROCEDURE KEY NUMBER.
C ----- OUTPUTS ARE NAMES OF THOSE WHO PROCEDURE IS DISTRIBUTED TO.
      DIMENSION ICODE1(20), ICODE2(400)
      REWIND 1
      REWIND 2
      CALL GET (5HTAPE1,7RCERDATA,0,0)
      CALL GET (5HTAPE2,7HPR01NDX,0,0)
10  CONTINUE
      REWIND 1
      REWIND 2
      PRINT 150
C -----K IS KEY NUMBER FOR PROCEDURE.
      READ , K
      PRINT 160
      REWIND 1
      REWIND 2
C -----GET PROCEDURE NUMBER AND TITLE FROM PROINDX FILE THAT AGREES
C ----- WITH THE KEY NUMBER K , THEN PRINT THE PROCEDURE NUMBER
C ----- AND TITLE.
      DO 60 J=1,400
      READ (2,170) ICODE2(J)
      IF (EOF,2) 130,20
20  CONTINUE
      IF (K.NE.ICODE2(J)) GO TO 60
C -----WE HAVE FOUND THE PROCEDURE SO BACKSPACE TAPE2 TO READ THE
C ----- PROCEDURE TITLE.
      BACKSPACE 2
      READ (2,180) T1,T2,T3,T4,T5,T6, ICODE,T7,T8,T9,T10,T11
      IF (K.EQ.ICODE2(J).AND.K.LE.200) GO TO 30
      IF (K.EQ.ICODE2(J).AND.K.GT.199) GO TO 40
C -----PRINT THE PROCEDURE NUMBER AND TITLE.
30  CONTINUE
      PRINT 190, T1,T2,T3,T4,T5,T6
      GO TO 50
40  CONTINUE
      PRINT 200, T1,T2,T3,T4,T5,T6
50  CONTINUE
C -----PRINT SECOND LINE OF PROCEDURE TITLE IF THERE IS ONE.
      IF (ICODE.GT.000) GO TO 70
      PRINT 210, T7,T8,T9,T10,T11
      GO TO 70
60  CONTINUE
70  CONTINUE
      PRINT 220
C -----READ FIRST TWO LINES OF CERDATA FILE TO GET PAST PROCEDURE KE
C Y.
      READ (1,230) DUMMY1,DUMMY2
80  CONTINUE
C -----READ NAME OF ANALYST.
      READ (1,240) NAME3,NAME4
      IF (EOF,1) 140,90
90  CONTINUE
      BACKSPACE 1

```

```

DO 120 L=1,10
C  -----READ ALL CODE NUMBERS.  WHEN ONE IS FOUND THAT AGREES WITH
C  ----- THE KEY NUMBER K, PRINT THE NAME OF THE ANALYST.
READ (1,250)(ICODE1(I),I=1,12)
DO 110 LL=1,12
IF (ICODE1(LL).EQ.000) GO TO 80
C  -----CORRECT FOR PARTIAL CERTIFICATION NUMBERS (8000 SERIES).
IF (ICODE1(LL).LT.8000) GO TO 100
ICODE1(LL)=ICODE1(LL)-8000
100 CONTINUE
IF (K.NE.ICODE1(LL)) GO TO 110
PRINT 260, NAME3,NAME4
110 CONTINUE
120 CONTINUE
130 PRINT 270
STOP
140 PRINT 280
GO TO 10
STOP
C
150 FORMAT (5X,*KEY---CP=100,CS=200,HC=300,IA=400,MS=500,PA=600*,/,5X,
1*RC=700,SC=800,UA=900,XR=1000,HP=1100,*,/,5X,*EXAMPLE, KEY NUMBER
2FOR ANC-DE-1-PA-11 IS 011*,/,5X,*ENTER KEY NO. OF PROCEDURE DESIR
3ED, OR STOP, AFTER QUESTION MARK*)
160 FORMAT (//,5X,*PROCEDURE NUMBER AND TITLE=*,/)
170 FORMAT (6X,I4)
180 FORMAT (11X,6A10,/,6X,I4,11X,5A10)
190 FORMAT (9X,*ANC-CP*,6A10)
200 FORMAT (6X,*ANC-DE-1=*,6A10)
210 FORMAT (25X,5A10)
220 FORMAT (/,3X,*THE FOLLOWING SHOULD HAVE A COPY OF THIS PROCEDURE=*
1,/,5X,*LANHAM*,/,5X,*WATERBURY*,/,5X,*FILE*)
230 FORMAT (26X,A10,/,26X,A10)
240 FORMAT (6X,2A10)
250 FORMAT (26X,12I4)
260 FORMAT (5X,2A10)
270 FORMAT (5X,*END OF FILE PROINDX, CHECK FOR CORRECT CODE NO.*)
280 FORMAT (3X,*THAT'S ALL THE NAMES FOR THIS PROCEDURE*/,/)
END

```