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COMPUTER AUTOMATION OF CONTINUOUS-FLOW ANALYZERS FOR TRACE CONSTITUENTS IN WATER

Volume 4. Description of Program Segments Part 2. TAAINRE

R. W. Crawford

January 18, 1979

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FOREWORD

There are 13 programs used in the computer automation of continuous-flow analyzers for trace constituents in water. Each program segment is published separately as a part of this volume:

- Part 1. TAAIN
- Part 2. TAAINRE
- Part 3. TAASTART
- Part 4. TAACAL
- Part 5. TAA
- Part 6. TAAQCOP
- Part 7. TAA01
- Part 8. TAA02
- Part 9. TAA03
- Part 10. TAA04
- Part 11. TAARESTART
- Part 12. Utility Programs (TAAPRINT, TAAPEAK, TAAFILE)
- Part 13. Assembly Language Code

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COMPUTER AUTOMATION OF CONTINUOUS-FLOW ANALYZERS FOR TRACE CONSTITUENTS IN WATER

Volume 4. Description of Program Segments Part 2. TAAINRE

ABSTRACT

This report describes TAAINRE, the second program in the series of programs necessary in automating the Technicon AutoAnalyzer. A flow chart and sequence list that describes and illustrates the function of each logical group of coding, and a description of the contents and function of each section and subroutine in the program is included. In addition, all arrays, strings, and variables are listed and defined, and a sample program listing with a complete list of symbols and references provided.

PROGRAM DESCRIPTION

The computer program TAAINRE is the second program in the series of programs used in automating the Technicon AutoAnalyzer. Its primary purpose is to print a sample wheel pattern using the data entered in TAAIN.

The arrangement of the entire group of samples to be run, including Calibration Standards, all quality control standards and samples is called a *sample wheel pattern* (see Fig. 1). The beginning sequence, starting with the Set Standards and going through the Calibration Standards is called the *calibrate pattern*. The operator-established sequence of Blanks, Check Standards, Samples, Spikes, Samples, and Duplicates is called the *quality control pattern* or *QC pattern*. Thus, a sample wheel pattern consists of one *calibrate pattern* followed by as many QC patterns as necessary to run all samples in the group.

This program allows the operator to enter* useful header information such as the operator's

name, the instrument conditions, the study or group title, and the source of the standards. This data is then stored and printed on the Sample Wheel Pattern as well as the Summary Report at the end of the run.

Included in the program is a simple editor that gives the operator the option of changing certain variables in any selected record in file TAAID.XX. The variables that can be changed are:

NO	The record number of the standard or sample.
DIL	The dilution of the sample.
CONC	The concentration of the standard.
S1	The first sample number in the first set of samples that go with a Reagent Blank, or the record number of the spiked or duplicated sample that goes with the Spike or Duplicate.
S2	The last sample number in the first set of samples that go with a Reagent Blank or the consecutive number of a Spike.

On multi-analyte runs, data must be entered for each channel when a record is edited. Editing can be done before or after printing the Sample

*The term *enter* means to type a value in on the terminal. It does not indicate what happens to the data. *Get* applies to memory and *retrieve* applies to disk files. The term *write* is used with memory. *Write file* and *store* are used with disk files. *Save* is reserved for storing a program on disk.

Wheel Pattern.

This program also provides for the addition or deletion of samples. Additional samples can be added only at the end of the sample wheel pattern, but any sample can be deleted. TAAINRE does not actually rewrite the file TAAID.XX, but inserts flags that allow TAAIN to rewrite the file properly.

This program also allows the operator to go back into TAAIN after printing the Sample Wheel Pattern by asking the question ANY OTHER CHANGES?. If this question is answered "Y" for yes, the prompt USE THE RE-START OPTION is issued. The operator can then change almost any variable such as Calibration Standard concentrations or the number of Blanks without retyping all the Sample ID's and dilutions.

TAAINRE normally chains to TAASTART (or TAAISTART). In the case of additions, dele-

tions, or any other changes, it chains to TAAIN (or TAAIIN).

Although there are no unusual algorithms in this program, the only slightly confusing section might be the "delete" option. Here, the second variable in the record to be deleted from TAAID.XX, the variable Q, is changed from -1 to +1. When TAAIN reads through the file, writing all the sample ID's and dilutions into file SCRATCH, it skips any records where Q is +1.

The program TAAINRE has another version called TAAIINRE. These programs are identical except for the CHAIN statements. There is also a special modification of these programs, used by Larry Kamphake of MERL, in which Blanks are used in the two lines that display the pattern of samples and standards where others might use Spikes.

PROGRAM SEQUENCE AND LOGIC-FLOW DIAGRAM

To aid in following the logic of TAAINRE, a verbal description of the sequential movement through the program using line reference numbers is presented. These steps are somewhat similar to the diagrammatic flow chart shown in Fig. 2.

1. *Normal Run, Enter Header Info, Print Results, No Edit, No Additions or Deletions, No Other Changes*
180 Input header info
310 Retrieve variables from files, open files
Jump from 390 to 810
840 Print header info
1090 Print Sample Wheel Pattern
2010 Chain to TAASTART
2. *Need to Edit, Header Info Not Entered, No Additions or Deletions, No Other Changes*

- Jump from 200 to 310
Jump from 390 to 810
840 Print header info
1090 Print Sample Wheel Pattern
Jump from 1995 to 400
400 Edit Files
Jump from 820 to 1970
7010 Chain to TAASTART
3. *Additions or Deletions, No Header Info Entered, No Edit, Print Sample Wheel Pattern, No Other Changes*
Jump from 200 to 310
Jump from 390 to 810
840 Print header info
1090 Print Sample Wheel Pattern
2004 Go to sub 3100 to add or delete
2009 Chain to TAAIN

FIG. 2. Logic flow diagram of Program TAAINRE.

FIG. 2. (Continued).

APPENDIX A.

PROGRAM SECTIONS AND SUBROUTINES

10 - 170 Initialize variables, set dimensions.
180 - 300 Input header information.
310 - 370 Retrieve variables from files and open TAAID.XX files
380 - 800 Edit routine.
810 - 830 Decision whether to print.
840 - 1080 Print header information.
1090 - 1960 Print Sample Wheel Pattern.
1970 - 2000 Decision whether to edit.
2002 - 2004 Decision whether to add or delete samples.
2006 - 2009 Decision whether to make additional changes and chain to TAAIN.
2010 Chain to TAASTART.
3000 - 3080 Subroutine to handle busy line printer.
3100 - 3195 Routine to handle additions to samples.
3200 - 3340 Routine to handle deletion of samples and chain to TAAIN
3350 End.

APPENDIX B.

VARIABLES

A1	Number of runs made using the same parameters.
A2	First record number in run.
A9	Used as a counter to see how many times the line printer was busy when attempting to print the Sample Wheel Pattern.
C4	Concentration of Calibration Standards, the number of sets of Samples associated with the reagent Blank (4 maximum).
F1	Wheel number (third variable in TAAID.XX records). Starts with 1 and increments each time a wheel has been filled (40 or 100 samples and standards).
I	Counter used for loops.
J	Counter used for loops.
K	Number of the record in TAAID.XX being edited.
M1	Total number of samples and standards in the run.
N0	Number of analytes.
N9	Record number of the last sample or standard in the run.
P	Position in the sample wheel (fourth variable in TAAID.XX records).
Q	Quality of the analysis (second variable in TAAID.XX records). Always reads - 1 at this point to indicate sample or standard has not been analyzed.
Q5	Record number of samples to be deleted.
S1	Record number of the spiked or duplicated sample, or the first sample number in the first set of samples that go with a Reagent Blank. This number is the eighth variable in TAAID.XX records.
S2	The consecutive number of a Spike or the last sample number in the first set of samples which go with a Reagent Blank. This number is the ninth variable in TAAID.XX records.
T	Type of run, used in file TAAID.XX (the first variable in each record). T has the following values: <ol style="list-style-type: none"> 1 Set Standard 2 Blank 3 Calibration Standard 4 Sample 5 Check Standard 6 Spike 7 Duplicate 8 Reagent Blank 9 Last Run
T0	Original dilution factor for Samples. For repeats it is the new dilution factor. Used in file TAAID.XX (sixth variable in records).
T1	Label for samples and standards. For Blanks and Check Standards it is the consecutive number. For Spikes and Duplicates it is the identification of the spiked or duplicated sample. Used in file TAAID.XX (fifth variable in records).
W	Sample wheel pattern number. This number can vary between 1 and 9 and causes the record number in files TAAID.XX and TAAQC.XX to increment by 300. For example, sample wheel pattern 1 starts at record 1, sample wheel pattern 2 starts at record 301, sample wheel pattern 3 starts at 601, etc.
X	A scratch variable.

NDIX C.

WAYS

- C [X]** Used to retrieve or get an ... at the concentration of Calibration Standards, Check Standards and Spikes.
- N [X]** Used to store the number of each sample and standard type in a wheel pattern. The contents are as follows:
- N [2]** Number of Blanks.
 - N [3]** Number of Check Standards.
 - N [4]** Number of Samples in group 1.
 - N [5]** Number of Spikes.
 - N [6]** Number of Samples in group 2.
 - N [7]** Number of Duplicates.
 - N [8]** Sum of N [2] through N [7].
- R [X]** Used to retrieve a variety of variables from files and print them.

APPENDIX D.

STRINGS

AS	Scratch string used to temporarily write the name of the analyte.
FS	Scratch string used as the name of several files, either TAAID.XX or TAAQC.XX where XX are the first two letters of the analyte name.
F1\$	Used in PRINT USING statements as a format for printing concentration values. Is normally set at ###.##.
SS	Used to decide whether to use the "paired-sample" option or not. Normally set to "N" by TAAIN. Set to "Y" by a special program that puts in two of each sample.
TS	A scratch string used for retrieving and printing files, and for storing a T or D for printing "paired sample" data.
X\$	A scratch string used to retrieve and print the source of standards and the analyte name.
Y\$	A scratch string used to enter answers to prompts and to retrieve and print files.
Z\$	A scratch string used to enter answers to prompts and to retrieve and print files.

APPENDIX E.
PROGRAM LISTING

LISTING OF FILE TAAINRE
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0010 REM ***** TAAINRE *****
0015 REM ***** 8/2/78 *****
0020 REM * * * TAAIN,REPT FOR MERL
0030 REM * * * PROGRAM TO PRINT SAMPLE WHEEL PATTERN FOR AUTOANALYZERS
0040 REM * * * CHAINED BY "TAAIN" AND "TAAIN,PR"
0050 REM * * * MODIFIED FOR CHAINING DEC. 4, 1975
0060 REM * * * LESTER P. RIGDON, LAWRENCE LIVERMORE LABORATORY
0065 CLOSE
0070 DIM A$(15),F$(15),Y$(5),S$(5)
0080 DIM F$(7),T$(10),Z$(100)
0090 DIM C160,N120,R120
0095 DIM X$(25)
0100 LET K=0
0110 LET C4=0
0120 LET T0=1
0130 LET T1=0
0140 LET Q=-1
0150 LET N1=0
0160 LET N9=0
0165 LET A9=0
0170 CLOSE
0180 OPEN FILE(0,0),"TAAINF"
0190 INPUT "HEADER INFO ? ",Y$
0200 IF Y$(1,1)="N" THEN GOTO 0310
0210 INPUT "OPERATOR " ,Z$
0220 WRITE FILE(0,1),Z$
0250 INPUT "INSTRUMENT CONDITIONS " ,Z$
0260 WRITE FILE(0,3),Z$
0270 INPUT "STUDY OR GROUP TITLE " ,Z$
0280 WRITE FILE(0,4),Z$
0290 INPUT "STANDARDS SOURCE " ,Z$
0300 WRITE FILE(0,5),Z$
0310 READ FILE(0,6),N0,X,N(2),N(3),N(4),N(5),N(6),N(7),N(8),N9
0320 READ FILE(0,7),A1,A2,M1,N9,S$
0330 FOR I=1 TO N0
0340 READ FILE(0,10+I),Z$
0350 LET FS="TAAID.",Z$
0360 OPEN FILE(1,0),FS
0370 NEXT I
0380 INPUT "EDIT FILES ? ",Y$
0390 IF Y$(1,1)="N" THEN GOTO 0810
0400 INPUT "RECORD NO. ",K
0410 IF K=0 THEN GOTO 0810
0420 PRINT
0430 PRINT "CONST"; TAB(8);"TYPE"; TAB(20);"NO."; TAB(30);"DIL";
TAB(40);"CONC"; TAB(50);"S1"; TAB(60);"S2"
0440 PRINT
0450 FOR J=1 TO N0
0460 READ FILE(0,J+10),Z$

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LISTING OF FILE TAAINRE
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0470 READ FILE(J,K),T,Q,F1,P,T1,T0,C4,S1,S2
0480 ON T THEN GOTO 0490, 0510, 0530, 0550, 0570, 0590, 0610,
      0630, 0650
0490 LET TS="SET STD"
0500 GOTO 0660
0510 LET TS="SET BLK"
0520 GOTO 0660
0530 LET TS="CAL STD"
0540 GOTO 0660
0550 LET TS="SAMPLE"
0560 GOTO 0660
0570 LET TS="CS"
0580 GOTO 0660
0590 LET TS="SPK"
0600 GOTO 0660
0610 LET TS="DUP"
0620 GOTO 0660
0630 LET TS="RBL"
0640 GOTO 0660
0650 LET TS="LAST BLK"
0660 PRINT Z$; TAB(8);TS; TAB(20);T1; TAB(30);T0; TAB(40);C4;
      TAB(50);S1; TAB(60);S2
0670 PRINT TAB(20);
0680 INPUT T1;
0690 PRINT TAB(30);
0700 INPUT T0;
0710 PRINT TAB(40);
0720 INPUT C4;
0730 PRINT TAB(50);
0740 INPUT S1;
0750 PRINT TAB(60);
0760 INPUT S2
0770 PRINT
0780 WRITE FILE(J,K),T,Q,F1,P,T1,T0,C4,S1,S2
0790 NEXT J
0800 GOTO 0400
0810 INPUT "PRINT FILES ? ",YS
0820 IF YS="N" THEN GOTO 1970
0830 IF YS(1,1)="Y" THEN GOTO 0840
0840 REM * * * SUBROUTINE TO PRINT RUN SET UP ON LPT
0850 READ FILE(0,8),I,J,T,T0,T1,W
0860 LET F1$="0000.00"
0865 ON ERR THEN GOTO 3000
0870 OPEN FILE(7,1),"SLPT"
0875 ON ERR THEN STOP
0880 IF SS(1,1)="Y" THEN GOTO 0910
0890 PRINT FILE(7), TAB(40);"***** SAMPLE WHEEL PATTERN
      *****"
0900 GOTO 0920

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0910 PRINT FILE(7), TAB(26);"***** SPECIAL SAMPLE WHEEL PATTERN
    FOR PAIRED SAMPLES *****"
0920 PRINT FILE(7)
0930 PRINT FILE(7), "WHEEL PATTERN NO. "; W; TAB(40); "TIME ";
    I; "J"; "DATE "; T; "/"; TO; "/"; TI
0940 PRINT FILE(7)
0950 READ FILE(0,1), Z$
0960 PRINT FILE(7), "OPERATOR:"; TAB(25); Z$; TAB(35); "INSTRUMENT:";
    TAB(60); "TECHNICON AUTOANALYZER"
0970 PRINT FILE(7)
0980 READ FILE(0,5), X$
0985 READ FILE(0,3), Z$
0990 PRINT FILE(7), "STANDARDS SOURCE:"; TAB(25); X$; TAB(35); "INSTRUMENT
    CONDITIONS:"; TAB(60); Z$
1000 PRINT FILE(7)
1010 READ FILE(0,4), Z$
1020 PRINT FILE(7), "STUDY GROUP OR TITLE"; TAB(30); Z$
1030 PRINT FILE(7)
1035 PRINT FILE(7), "QCP"; TAB(10); "BLK"; TAB(20); "CS"; TAB(30); "SAMP";
1040 PRINT FILE(7), TAB(7); "SPK"; TAB(17); "SAMP"; TAB(27); "DUP"
1050 PRINT FILE(7), TAB(10); N(2); TAB(20); N(3); TAB(30); N(4);
    TAB(40); N(5); TAB(50); N(6); TAB(60); N(7)
1051 PRINT FILE(7)
1052 READ FILE(0,50), X
1053 PRINT FILE(7), "SAMPLES PER HOUR: "; 27000/X
1054 PRINT FILE(7)
1055 PRINT FILE(7), " ", "A/D", "APPROX", " ", "BLANK", " ", "DATA RATE",
    "PEAK", "PLACES", "ALLOWABLE"
1056 PRINT FILE(7), "CHANNEL", "NO.", "LEVEL", "DRIFT", "UNITS", "PTS/MIN",
    "WIDTH", "PAST DEC", "NOISE, %FS"
1057 FOR I=1 TO NO
1058   READ FILE(0,1+10), X$, R(1), Z$, R(2), R(3), T$, R(4), R(5), R(6), R(7)
1059   IF R(5)=11 THEN LET Y$="N"
1060   IF R(5)=21 THEN LET Y$="B"
1062   PRINT FILE(7), X$, R(1), Z$, R(3), T$, R(4), Y$, R(6), R(7)/81.92
1064 NEXT I
1065 PRINT FILE(7)
1070 PRINT FILE(7), TAB(52); "CONCENTRATIONS"
1080 PRINT FILE(7), "RECORD"; TAB(10); "POS"; TAB(20); "NUMBER";
    TAB(30); "TYPE"; TAB(40); "DIL";
1090 FOR I=1 TO NO
1100   READ FILE(0,1+10), Z$
1110   IF I=1 THEN PRINT FILE(7), TAB(10); Z$;
1120   IF I>1 THEN PRINT FILE(7), TAB(13-LEN(A$)); Z$;
1130   LET A$=Z$
1140 NEXT I
1150 PRINT FILE(7)
1160 READ FILE(0,11), Z$

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1170 CLOSE FILE(0)
1180 LET FS="TAAQC,"Z$
1190 OPEN FILE(0,0),FS
1200 PRINT FILE(7)
1210 FOR I=N9-MI+1 TO N9
1220   READ FILE(1,1),T,Q,F1,P,T1,T0,C4,S1,S2,R(10),R(11),R(12),
      R(13),R(14),R(15),R(16)
1230   IF R(15)=-2 THEN LET TS="T"
1240   IF R(15)=-1 THEN LET TS="D"
1250   REM * * * * 1      2      3      4      5      6      7      8      9
1260   REM * * * * SET   BLK      S      SAM      CS      SPK      DUP
      RBL LAST BLK
1270   ON T THEN GOTO 1310, 1330, 1360, 1580, 1470, 1780, 1900,
      1630, 1330
1280   PRINT "BAD FILE"
1290   GOTO 1960
1300   REM * * * * PRINT SET STDS AND BLKS
1310   PRINT FILE(7),I; TAB(7);F1;P; TAB(30);"SET"
1320   GOTO 1950
1330   PRINT FILE(7),I; TAB(7);F1;P; TAB(30);"BLK"
1340   GOTO 1950
1350   REM * * * * PRINT CALIB STDS
1360   FOR J=1 TO N0
1370     READ FILE(J,1),T,Q,F1,P,T1,T0,C(J),S1,S2
1380     NEXT J
1390     PRINT FILE(7),I; TAB(7);F1;P; TAB(20);"S";T1; TAB(30);"STD";
      TAB(45);
1400     FOR J=1 TO N0
1410       PRINT FILE(7), TAB(6);
1420       PRINT FILE(7),USING F1$,C(J);
1430     NEXT J
1440     PRINT FILE(7)
1450     GOTO 1950
1460     REM * * * * PRINT CS DATA
1470     FOR J=1 TO N0
1480       READ FILE(J,1),T,Q,F1,P,T1,T0,C(J),S1,S2
1490       NEXT J
1500       PRINT FILE(7),I; TAB(7);F1;P; TAB(20);"CS";T1; TAB(30);"CS";
      TAB(45);
1510       FOR J=1 TO N0
1520         PRINT FILE(7), TAB(6);
1530         PRINT FILE(7),USING F1$,C(J);
1540       NEXT J
1550       PRINT FILE(7)
1560       GOTO 1950
1570       REM * * * * WRITE SAMPLES ON LPT
1580       IF S$1,1)="Y" THEN GOTO 1610
1590       PRINT FILE(7),I; TAB(7);F1;P; TAB(17);

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1592 PRINT FILE(7), USING "000000", T1;
1594 PRINT FILE(7), TAB(7); "SAMP"; TAB(17); T0
1600 GOTO 1950
1610 PRINT FILE(7), I; TAB(7); F1; P; TAB(17); T1; TAB(30); "SAMP-"; T$;
    TAB(40); T0
1620 GOTO 1950
1630 REM * * * * PRINT RBLs ON LPT
1640 IF SS<>"Y" THEN GOTO 1670
1650 PRINT FILE(7), I; TAB(7); F1; P; TAB(17); T1; "R"; TAB(30); "RBL-"; T$;
    TAB(40); T0; TAB(50); "ASSOC NOS, ";
1660 GOTO 1680
1670 PRINT FILE(7), I; TAB(7); F1; P; TAB(17); T1; "R"; TAB(30); "RBL";
    TAB(40); T0; TAB(50); "ASSOC NOS, ";
1675 IF C4<1.5 THEN GOTO 1700
1680 READ FILE(0, I), R(1), R(2), R(3), R(4), R(5), R(6), R(7), R(8),
    R(9), R(10), R(11), R(12), R(13), R(14), R(15), R(16)
1690 ON C4 THEN GOTO 1700, 1720, 1740, 1760
1700 PRINT FILE(7), S1; " TO "; S2
1710 GOTO 1950
1720 PRINT FILE(7), S1; " TO "; S2; " , "; R(1); " TO "; R(2)
1730 GOTO 1950
1740 PRINT FILE(7), S1; " TO "; S2; " , "; R(1); " TO "; R(2); " , "; R(12); "
    TO "; R(13)
1750 GOTO 1950
1760 PRINT FILE(7), S1; " TO "; S2; " , "; R(1); " TO "; R(2); " , "; R(12); "
    TO "; R(13); " , "; R(14); " TO "; R(15)
1770 GOTO 1950
1780 REM * * * * WRITE SPIKE DATA ON LPT
1790 IF SS(1, 1)<>"Y" THEN GOTO 1920
1800 PRINT FILE(7), I; TAB(7); F1; P; TAB(17); T1; TAB(30); "SPK-"; T$;
    TAB(40); T0; TAB(52);
1810 GOTO 1830
1820 PRINT FILE(7), I; TAB(7); F1; P; TAB(17); T1; TAB(30); "SPK";
    TAB(40); T0; TAB(52);
1830 FOR J=1 TO N0
1840 READ FILE(J, 1), T, Q, F1, P, T1, T0, C1(J), S1, S2
1850 PRINT FILE(7), USING F1$, C1(J);
1860 PRINT FILE(7), TAB(6);
1870 NEXT J
1880 PRINT FILE(7)
1890 GOTO 1950
1900 REM * * * * PRINT DUPLICATES ON LPT
1910 IF SS(1, 1)<>"Y" THEN GOTO 1940
1920 PRINT FILE(7), I; TAB(7); F1; P; TAB(17); T1; TAB(30); "DUP-"; T$;
    TAB(40); T0
1930 GOTO 1950
1940 PRINT FILE(7), I; TAB(7); F1; P; TAB(17); T1; TAB(30); "DUP";
    TAB(40); T0

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1950 NEXT I
1960 CLOSE FILE(7)
1970 INPUT "EDIT FILES ? ",YS
1980 IF YS(1,1)="N" THEN GOTO 2000
1985 CLOSE FILE(0)
1990 OPEN FILE(0,0),"TAAINF"
1995 GOTO 0400
2000 CLOSE
2002 INPUT "ADDITIONS OR DELETIONS ? ",YS
2004 IF YS(1,1)="Y" THEN GOTO 3100
2006 INPUT "ANY OTHER CHANGES ? ",YS
2007 IF YS(1,1)="N" THEN GOTO 2010
2008 PRINT "USE THE RE-START OPTION"
2009 CHAIN "TAAIN"
2010 CHAIN "TAASTART"
3000 IF A9>0 THEN GOTO 3010
3005 PRINT "LINEPRINTER IN USE, WILL RETRY EVERY 10 SECS, FOR 2 MINS."
3010 LET A9=A9+1
3020 IF A9>12 THEN GOTO 3050
3025 LET X=600
3030 CALL 1,X
3031 REM WAIT 10 SECS
3040 GOTO 0870
3050 PRINT "<7>";"LINEPRINTER STILL IN USE AFTER 2 MIN., TYPE  
CON TO KEEP TRYING";"<7>"
3060 STOP
3070 LET A9=0
3080 GOTO 0870
3100 OPEN FILE(0,0),"TAAINF"
3102 LET T=4
3103 LET Q=-1
3105 READ FILE(0,1),AS
3106 LET FS="TAAID,"AS
3107 OPEN FILE(1,0),FS
3110 PRINT "ADDITIONS, 0 TO END"
3120 INPUT "ID ",T1:
3130 IF T1=0 THEN GOTO 3190
3140 INPUT "DIL ",T0
3145 LET N9=N9+1
3150 LET M1=M1+1
3170 WRITE FILE(1,N9),T,Q,0,0,T1,T0
3180 GOTO 3120
3190 WRITE FILE(1,1+N9),0,0
3195 PRINT
3200 PRINT "DELETIONS, 0 TO END"
3210 INPUT "RECORD NO. ",Q5
3220 IF Q5=0 THEN GOTO 3300
3230 READ FILE(1,Q5),T,X,X,X,T1

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```
3240 IF T<>4 THEN GOTO 3330
3250 PRINT "WANT TO DELETE SAMPLE NO. ";T1;
3255 INPUT Y$
3260 IF Y$(1,1)="N" THEN GOTO 3210
3270 WRITE FILE(1,Q5),1
3280 LET M1=M1-1
3290 GOTO 3210
3300 WRITE FILE(0,7),A1,A2,M1,N9,S$
3310 CLOSE
3320 CHAIN "TAAIN" THEN GOTO 8500
3330 PRINT "BAD RECORD NO., NOT A SAMPLE"
3340 GOTO 3210
3350 END
```

APPENDIX F.
SYMBOL TABLE LISTING

REFERENCES AND SYMBOLS IN TAINRE
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0310 IS REFERENCED ON LINES:
0200

0400 IS REFERENCED ON LINES:
0800 1995

0490 IS REFERENCED ON LINES:
0480

0510 IS REFERENCED ON LINES:
0480

0530 IS REFERENCED ON LINES:
0480

0550 IS REFERENCED ON LINES:
0480

0570 IS REFERENCED ON LINES:
0480

0590 IS REFERENCED ON LINES:
0480

0610 IS REFERENCED ON LINES:
0480

0630 IS REFERENCED ON LINES:
0480

0650 IS REFERENCED ON LINES:
0480

0660 IS REFERENCED ON LINES:
0500 0520 0540 0560 0580
0600 0620 0640

0810 IS REFERENCED ON LINES:
0390 0410

0840 IS REFERENCED ON LINES:
0830

REFERENCES AND SYMBOLS IN TAINRE

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0870 IS REFERENCED ON LINES:
3040 3080

0910 IS REFERENCED ON LINES:
0880

0920 IS REFERENCED ON LINES:
0900

1310 IS REFERENCED ON LINES:
1270

1330 IS REFERENCED ON LINES:
1270

1360 IS REFERENCED ON LINES:
1270

1470 IS REFERENCED ON LINES:
1270

1580 IS REFERENCED ON LINES:
1270

1610 IS REFERENCED ON LINES:
1580

1630 IS REFERENCED ON LINES:
1270

1670 IS REFERENCED ON LINES:
1640

1680 IS REFERENCED ON LINES:
1660

1700 IS REFERENCED ON LINES:
1675 1690

1720 IS REFERENCED ON LINES:
1690

1740 IS REFERENCED ON LINES:
1690

REFERENCES AND SYMBOLS IN TAAINRE

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1760 IS REFERENCED ON LINES:

1690

1780 IS REFERENCED ON LINES:

1270

1820 IS REFERENCED ON LINES:

1790

1830 IS REFERENCED ON LINES:

1810

1900 IS REFERENCED ON LINES:

1270

1940 IS REFERENCED ON LINES:

1910

1950 IS REFERENCED ON LINES:

1320 1340 1450 1560 1600

1620 1710 1730 1750 1770

1890 1930

1960 IS REFERENCED ON LINES:

1290

1970 IS REFERENCED ON LINES:

0820

2000 IS REFERENCED ON LINES:

1980

2010 IS REFERENCED ON LINES:

2007

3000 IS REFERENCED ON LINES:

0865

3010 IS REFERENCED ON LINES:

3000

3050 IS REFERENCED ON LINES:

3020

REFERENCES AND SYMBOLS IN TAATNRE

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3100 IS REFERENCED ON LINES:
2004

3120 IS REFERENCED ON LINES:
3180

3190 IS REFERENCED ON LINES:
3130

3210 IS REFERENCED ON LINES:
3260 3290 3340

3300 IS REFERENCED ON LINES:
3220

3330 IS REFERENCED ON LINES:
3240

8500 IS REFERENCED ON LINES:
3320

A5 OCCURS ON LINES:
0070 1120 1130 3105 3106

A1 OCCURS ON LINES:
0320 3300

A2 OCCURS ON LINES:
0320 3300

A9 OCCURS ON LINES:
0165 3000 3010 3020 3070

C4 OCCURS ON LINES:
0110 0470 0660 0720 0780
1220 1675 1690

C1 OCCURS ON LINES:
0090 1370 1420 1480 1530
1840 1850

F5 OCCURS ON LINES:
0070 0350 0360 1180 1190
3106 3107

REFERENCES AND SYMBOLS IN TAINRE

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F1 OCCURS ON LINES:

0470	0780	1220	1310	1330
1370	1390	1480	1500	1590
1610	1650	1670	1800	1820
1840	1920	1940		

F1\$ OCCURS ON LINES:

0080	0860	1420	1530	1850
------	------	------	------	------

I OCCURS ON LINES:

0330	0340	0360	0370	0850
0930	1057	1058	1064	1090
1100	1110	1120	1140	1210
1220	1310	1330	1370	1390
1480	1500	1590	1610	1650
1670	1680	1800	1820	1840
1920	1940	1950		

J OCCURS ON LINES:

0450	0460	0470	0780	0790
0850	0930	1360	1370	1380
1400	1420	1430	1470	1480
1490	1510	1530	1540	1830
1840	1850	1870		

K OCCURS ON LINES:

0100	0400	0410	0470	0780
------	------	------	------	------

M1 OCCURS ON LINES:

0150	0320	1210	3150	3280
3300				

N0 OCCURS ON LINES:

0310	0330	0450	1057	1090
1360	1400	1470	1510	1830

N9 OCCURS ON LINES:

0160	0310	0320	1210	3145
3170	3190	3300		

N1 OCCURS ON LINES:

0090	0310	1050
------	------	------

P OCCURS ON LINES:

0470	0780	1220	1310	1330
1370	1390	1480	1500	1590
1610	1650	1670	1800	1820
1840	1920	1940		

REFERENCES AND SYMBOLS IN TAAINRE

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Q OCCURS ON LINES:
 0140 0470 0780 1220 1370
 1480 1840 3103 3170

Q5 OCCURS ON LINES:
 3210 3220 3230 3270

RI OCCURS ON LINES:
 0090 1058 1059 1060 1062
 1220 1230 1240 1680 1720
 1740 1760

S\$ OCCURS ON LINES:
 0070 0320 0880 1580 1640
 1790 1910 3300

S1 OCCURS ON LINES:
 0470 0660 0740 0780 1220
 1370 1480 1700 1720 1740
 1760 1840

S2 OCCURS ON LINES:
 0470 0660 0760 0780 1220
 1370 1480 1700 1720 1740
 1760 1840

T OCCURS ON LINES:
 0470 0480 0780 0850 0930
 1220 1270 1370 1480 1840
 3102 3170 3230 3240

TS OCCURS ON LINES:
 0080 0490 0510 0530 0550
 0570 0590 0610 0630 0650
 0660 1058 1062 1230 1240
 1610 1650 1800 1920

TO OCCURS ON LINES:
 0120 0470 0660 0700 0780
 0850 0930 1220 1370 1480
 1534 1610 1650 1670 1800
 1820 1840 1920 1940 3140
 3170

REFERENCES AND SYMBOLS IN TAAINRE

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TI OCCURS ON LINES:

0130	0470	0660	0680	0780
0850	0930	1220	1370	1390
1480	1500	1592	1610	1650
1670	1800	1820	1840	1920
1940	3120	3130	3170	3230
3250				

W OCCURS ON LINES:

0850 0930

X OCCURS ON LINES:

0310 1052 1053 3025 3230

X\$ OCCURS ON LINES:

0395 0980 0990 1058 1062

Y\$ OCCURS ON LINES:

0070	0190	0200	0360	0390
0810	0820	0830	1059	1060
1062	1970	1980	2002	2004
2006	2007	3255	3260	

Z\$ OCCURS ON LINES:

0080	0210	0220	0250	0260
0270	0280	0290	0300	0340
0350	0460	0660	0950	0960
0985	0990	1010	1020	1058
1062	1100	1110	1120	1130
1160	1180			