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

Volume 4. Description of Program Segments Part 1. TAAIN

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.	TAAACAL
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 1. TAAIN

ABSTRACT

This report describes TAAIN, the first program in the series of programs necessary in automating the Technicon AutoAnalyzer. A flow chart and sequence list that describes and illustrates each logical group of coding, and a description of the contents and functions 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 is provided.

PROGRAM DESCRIPTION

TAAIN is the first program used by the operator of the Technicon AutoAnalyzer (TAA), and the major input program used to enter* all information about quality control standards, sample identification and dilutions. TAAIN is also used to enter detailed data about each channel, such as units of concentration, A/D channel number, and the method of relating sample concentration to standards.

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 initial run, 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.

Disk files are used extensively for data storage (see File Structure for the Multichannel Technicon AutoAnalyzer Programs Vol. 2). The program TAAIN creates the initial data for the TAAIN.XX and TAAQC.XX files, where XX are the first two letters of the analytes name (example: SO₄, NH₃, N/trite), and stores all the data in file TAAINF. The disk file SCRATCH is used by the program for restarts and additions or deletions.

The file TAAINF is more or less permanent and contains all the fixed information about a particular chemistry or group of chemistries. Once the operator has entered this data it never needs to be entered again. To use this feature the operator enters an N (none) in answer to the question: DO YOU WANT TO ENTER NEW DATA FOR EACH CHAN., QC PATT., STND. CONC., QC LIMITS? By entering an S (some) or A (all), the data can be modified or completely replaced.

Files TAAID.XX and TAAQC.XX contain the detailed information about each sample and standard. The storage of data in these files is in the order that the sample and standards are located in the sample wheel. For example, the 23rd solution in the wheel would be described in record 23 of the file. An exception to this case is when more than

*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.

one sample wheel pattern is stored at a time. When sample wheel pattern numbers greater than 1 are used, the record number is determined by subtracting 1 from the wheel pattern number, multiplying the difference by 300, and adding the position. As an example, the solution at position 33 of wheel pattern No. 4 would have a record number of 933.

Three different chemistry channels can be run simultaneously, making it possible to enter data for as many as three analytes. A sequence of quality-control standards and samples (QC Pattern) is established. There can be no more than 40 samples and standards in a single QC pattern and no more than 300 in an entire sample wheel pattern. There can be no more than 9 Calibration Standards in a calibrate pattern or 16 different Check Standards, Spikes or Duplicates in a single QC pattern.

Samples are split into two groups. The first group is used with Spikes, and it should contain at least as many Samples as Spikes. The second group is used with Duplicates; Samples to be duplicated for quality control purposes must be in this group.

Although the TAAIN program contains no unusual algorithms, one section that may not be clear, and can be modified by the user, is the subroutine (6000) that checks the analyte name and gets quality control parameters. There is a DATA entry for each analyte that may be encountered, and 5 pieces of information in each DATA line: a string name for the analyte, or chemistry channel, and four numbers. The first two letters of each string name must be unique in any given Directory, as they are used for naming files. The numbers are used in the cumulative sums (Cusum) method of

quality control charting and the quality control method developed by Shewhart and must be calculated and entered by the analyst for each analyte.

The numbers used, from H1 through H4, are:

H1- Precision standard deviation for Cusum.

H2- Accuracy standard deviation for Cusum.

H3- Precision standard deviation for Shewhart.

H4- Accuracy standard deviation for Shewhart.

To add or delete DATA lines, the counter on line 6010 must be changed from the existing 20. For example, to add low sulfate and high sulfate to the program, the following change could be made:

6010 for J = 1 to 20

to read

6010 for J = 1 to 22

and add

6280 DATA "LSO4", 1.93, 1.72, 1.24, 2.38

6290 DATA "HSO4", 1.21, 1.07, 0.89, 1.96

TAAIN has another version called TAAIN. Both programs are identical with the exception of the CHAIN statement. There is a special modification of these programs, used by Larry Kamphake of MERL, that causes the first solution after standardizing to fall at wheel position 26 and all subsequent QC patterns to be 25 solutions in length as follows:

2 Blanks

1 Check standard

10 Samples

2 Blanks

10 Samples

PROGRAM SEQUENCE AND LOGIC-FLOW DIAGRAM

To aid in following the logic of TAAIN, 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 (Fig. 2).

1. Generate IDs, old variables (SS = "N", CS = "NNNNNN")
Jump from 366 to 7000
Jump from 7175 to 7420
7420 Write stored Check Std
data into C array

- 7490 Write stored Spike data into
S array
Jump from 7600 to 1700
1740 Enter ID and dilution, write
in A array
1910 Enter missing ID's, write in
D array
2000 Enter RBL's, write in B array
Jump from 2190 to 7610
7610 Write files for Set Stnds and

Blanks

7755 Retrieve Cal Stnd data and store

Jump from 7890 to 2800

2800 Store QCP Blanks

3000 Store QCP Check Stnds

3500 Get ID's and dilutions from A array, store in 1st set (N(4))

3800 Store Spike from S array

4200 Get ID's and dilutions from A array, store in 2nd set (N(6))

4500 Write files for Duplicates if done, go to 8000, if not, go to 2800

8000 Store last Blanks, tidy up, chain out to TAAINRE

2. *Restart* (S\$ = "Y", C\$ = "NNNNNN")

Jump from 366 to 7000

7000 Set A1, N9, retrieve N0-N9, enter 1st (A2) and last (A6) file No.

7180 Set T\$ to "G", store Sample & RBL ID's and dilutions in file SCRATCH, also write Samples related to RBL's in B array, set K1 at 1; B1 = number of sets of samples with RBL's, K = No. of samples and RBL's.

7420 Retrieve Chk Stnd data, write into C array

7490 Retrieve Spike data, write into S array

Jump from 7555 to 7610

7610 Write files for Set Stnds and Blanks; set N9 = A2-1

7755 Retrieve Cal Stnd data and store

Jump from 7890 to 2800

2800 Store QCP Blanks

3000 Store QCP Set Stnds

3500 Go to subroutine 5100, retrieve Sample ID and dilution data from the file SCRATCH, store in 1st set (N(4)).

3800 Store Spikes from S array

4200 Go to subroutine 5100, retrieve Sample ID and dilution data from the file SCRATCH, store in 2nd set (N(6))

4500 Store Duplicates in file

If done, go to 8000, otherwise back to 2800

8000 Store last Blanks, tidy up, chain out to TAAINRE

3. *New Start, change all variables, generate ID's* (S1\$ = "A", C = "OOOOOO")

Jump from 348 to 460

460 Enter detail data about each channel

1000 Enter QC sampling pattern

1200 Enter concentrations and allowable error for Chk Stnd, store in TAAINF, write in C array

1500 Enter Spike concentrations, minimum and maximum recovery, store TAAINF, write in S array

1670 Enter allowable error for Duplicates, store in TAAINF

1740 Enter ID and dilution for Samples, write in A array

1910 Enter missing ID's, write in D array

2000 Enter Reagent Blanks, write in B array

2200 Write file for Set Stnds and Blanks

2500 Enter Calibration Stnd concentrations, store in TAAINF and TAAID.XX

2800 Store QCP Blanks

3000 Store QCP Check Stnds

3500 Get IDs and dilutions from A array, store in 1st set (N(4))

3800 Store Spikes from S array

4200 Get IDs and dilutions from A array, store in 2nd set (N(6))

4500 Write files for Duplicates if done go to 8000, if not, go to 2800

8000 Store last Blanks, tidy up, chain to TAAINRE

FIG. 1. Sample Wheel Pattern.

FIG. 2. Logic flow diagram of program TAAIN.

FIG. 2. (Continued).

FIG. 2. (Continued).

APPENDIX A.

PROGRAM SECTIONS AND SUBROUTINES

10 - 325	Initialize variables, set G\$ ("Y" if run on stored data).
327 - 366	Branching depending on type of run. S\$ is "Y" for restart, S1\$ is "A", "S", or "N" for entering new data (all, some, or none).
368 - 450	Set up to change some data (S1\$ = "S"). Sets C\$ to a series of Yes ("Y") or No ("N") answers.
460 - 995	Enter detail data about each analytical channel, such as name, A/D channel No., etc.
1000 - 1110	Enter quality control pattern (number of Blanks, Check Standards, Samples, etc.).
1200 - 1370	Enter concentration and allowable error for Check standards, store in file TAAINF, write in C array.
1500 - 1668	Enter Spike concentrations, and minimum and maximum recovery, store in file TAAINF, write in S array.
1670 - 1687	Enter allowable difference between Duplicates, store on file TAAINF.
1700 - 1730	Branching depending on whether generating or typing sample ID's (T\$ is "T" or "G").
1740 - 1990	Enter the Sample ID's using the "generate" option. Sample ID's are written in the A array. Missing sample numbers are written in the D array.
2000 - 2190	Enter the relationship between Reagent Blanks and Sample ID's. This information is written in the B array.
2200 - 2300	Writes file: TAAID.XX (where XX are the first two letters of the analyte name) for 3 set standards and 2 blanks.
2500 - 2690	Enter Calibration Standards and store on files TAAINF and TAAID.XX.
2800 - 2870	Store Blanks that are part of QC pattern on TAAID.XX.
3000 - 3210	Store Check Standards on file TAAID.XX from C array.
3500 - 3790	Store Sample ID's and dilution factors on file TAAID.XX. This data comes from three different possible sources. If in the type mode (T\$ is "T") the data is entered directly from the terminal. If in generate mode (T\$ is "G") the data is gotten from the A array. If a restart (S\$ is "Y") the data is retrieved from SCRATCH.
3791 - 3796	Routine to set counters properly when last sample encountered.
3800 - 4020	Store Spikes on TAAID.XX from the S array.
4200 - 4490	Store second set of Samples. Same as 3500 to 3790 above.
4500 - 4640	Store Duplicate samples on TAAID.XX. The first Sample(s) of the second set of Samples are duplicated unless they are Reagent Blanks.
4650 - 4710	End of one QC pattern, decisions whether to do another pattern.
5000 - 5095	Subroutine to write files TAAID.XX and TAAQC.XX for Samples and Reagent Blanks.
5100 - 5192	Subroutine to index A array or file SCRATCH to get or retrieve Sample IDs and dilutions.
5200 - 5400	Subroutine to associate Reagent Blanks with Sample numbers.
6000 - 6270	Subroutine to check analyte name against list and set up Cusum and Shewhart variables.
6500 - 6570	Subroutine to close TAAQC.XX files and open TAAID.XX files.
6600 - 6670	Subroutine to close TAAID.XX files and open TAAQC.XX files.
7000 - 7178	Set up to use stored variables if not starting from scratch (S1\$ not "N").
7180 - 7340	On a restart (S\$ is "Y"), store all Sample ID's and dilutions on the file SCRATCH and write Reagent Blank ID's and associated Sample ID's in B array.
7419 - 7480	Write Check Standard data stored on TAAINF into C array.
7489 - 7550	Write Spike data stored on TAAINF into the S array.
7555 - 7600	Branch according to S\$ or C\$.
7610 - 7754	Write files TAAID.XX for three Set Standards and two Blanks.
7755 - 7890	Retrieve Cal Standard concentrations from TAAINF and store on to TAAID.XX.

8000 - 8130	Store final two blanks on TAAID.XX.
8110 - 8260	Store total number of runs in TAAINF, store date and time in TAAPASS and chain to TAAINRE.
8300 - 8360	Subroutine to zero D, F, and R arrays.
8400 - 8430	Sets variables correctly for run on stored data.
8500 - 8580	Chain here from TAAINRE if additions or deletions are to be made.

APPENDIX B.

VARIABLES

A1	Number of runs made using the same parameters.
A2	First record number in run.
A6	Last record number in run.
B1	Number of Reagent Blanks.
C4	Concentration of Calibration Standards, the number of sets of Samples associated with the Reagent Blank (4 maximum).
F1	Wheel number. Starts with 1 and increments each time a wheel has been filled (40 or 100 samples and standards).
H1 to H4	Quality control parameters for the Cusum and Shewhart calculations.
	H1- Precision standard deviation for Cusum.
	H2- Accuracy standard deviation for Cusum.
	H3- Precision range for Shewhart.
	H4- Accuracy range for Shewhart.
I	Counter used for loops.
I1	Counter used for loops.
I2	Counter used for a loop.
J	Counter used for loops.
J ²	Counter used for loops.
K	Counter used for loops.
K1	Counter used to retrieve Sample ID's and dilutions from the file SCRATCH when restart with standards is used or additions or deletions made.
L	Used to increment through the A array, always increments by 3.
M	Counter used for storing and retrieving Spike data.
M0	Number of positions in the sample wheel. Normally set at 40 at line 145, except for MERL which uses 100.
M1	Sequential number of samples and standards, starting at 1, as they are stored in files. Used to calculate the wheel number and position, F1 and P.
M2	A scratch variable for retrieving.
M4	Number of Samples in sample group 1; used to match Spikes with Samples.
M6	Number of Samples in sample group 2; used to match Duplicates with Samples.
M9	Keeps track of the number of patterns stored on disk.
N0	Number of analytes.
N1	Number of Calibration Standards.
N9	Total number of samples and standards in the run.
P	Position in the sample wheel.
Q	Always - 1. Stored as the quality index in the files to show the sample or standard has not been run yet.
S1	Used to store on TAAID.XX file. This is the record number of the spiked or duplicated sample, or the first sample number in set No. 1 of samples that go with a Reagent Blank.
S2	Used to store on TAAID.XX file. This is the consecutive number of a Spike or the last sample number in set No. 1 of samples which go with a Reagent Blank.
T	The type of run. Used in storing on TAAID.XX.
	T has the following values:
	1- Set Standard
	2- Blank
	3- Calibration Standard
	4- Sample
	5- Check Standard

	6- Spike
	7- Duplicate
	8- Reagent Blank
	9- Last Run
T0	The original dilution factor for Samples. For repeats it is the new dilution factor. Used in storing on TAAID.XX.
T1	The 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 storing on TAAID.XX.
T2	Used to write sample identification numbers temporarily until put in T1 above.
T3	Used to test whether another QC pattern is to be stored.
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. As an example, wheel pattern 1 starts at record 1, wheel pattern 2 starts at record 301, wheel pattern 3 starts at 601, etc.
W1	Record number at which to start storing patterns. This number is calculated from W above using the equation $W1 = 300 * (W-1)$.
Y	Used at the end of sample set 1 to count the number of Blanks and Check Standards and remove these from the QC pattern if there are no Samples in set 1.
Z9	Number of samples per hour, either as samples per hour or the number of 2/15-s ticks between samples.

APPENDIX C.

ARRAYS

- A [X] Initially used when entering new values for parameters such as channel, places after decimal, etc. Identifying numbers and dilutions are written in this array when the "generate" option of entering sample ID's is used. The format is:
A [X] First ID number in set.
A [X+1] Last ID number in set.
A [X+2] Dilution of set.
where X is the number of the set entered. A zero in A [X] indicates there are no more sets.
- B [X,Y] Used to store the information about Reagent Blanks. The format is:
B [X,1] ID of the Reagent Blank.
B [X,2] First sample number related to this Reagent Blank.
B [X,3] Last sample number related to this Reagent Blank.
where X is the sequential number of Reagent Blank entries.
- C [X] Concentration of the Check Standards.
- D [X] Check Standard concentrations written here temporarily until stored on disk file. Maximum recovery of Spikes written here temporarily until stored on disk file. Missing ID's written here when "generate" option is used.
- F [X] Spike concentrations written here temporarily until stored on disk file.
- N [X] 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].
N [12] - Number of Check Standards on the previous run.
N [13] - Number of Spikes on the previous run.
- R [X] Retrieves and stores the error on Check Standards, minimum recovery on Spikes, error on Duplicates, concentration of Calibration Standards, and the samples associated with Reagent Blanks.
- R [20] Used as a counter for Spikes and Duplicates.
- S [X] The concentration of Spikes.

APPENDIX D.

STRINGS

A\$	Used for entering "Y" yes or "N" no
B\$	Used to see if the constituent entered by the analyst is in the file of allowable constituents.
C\$	The six characters of this string are used to signify if any changes have been made between this run and the previous run. The characters can be the letters "O", "N", or "Y". "O" stands for <i>original</i> and all characters are set to this to begin with. If it is a new set up or a complete change of parameters, they stay as "O". "N" stands for <i>no</i> and means don't change the particular parameter. "Y" stands for <i>Yes</i> , change the particular parameter. The position of the letter in the string stands for the following parameters: C\$ [1,1] Quality control pattern. C\$ [2,2] Check Standard concentration and allowable error. C\$ [3,3] Spike concentration and allowable recovery range. C\$ [4,4] Calibration Standard number and concentration. C\$ [5,5] Allowable error between Duplicates. C\$ [6,6] Reset file number to 1.
F\$	The name of several files; either TAAID.XX or TAAQC.XX, where XX is the first two letters of the analyte name.
F3\$	The level (such as low or high) of the constituent.
G\$	A single character that is either "Y" (yes) or "N" (no) as an answer to the question DO YOU WANT TO RUN PREVIOUSLY STORED SAMPLE ID NOS.?
Gi\$	Normally blank, but set to "Y" if the addition or deletion option was used in TAAINRE.
P\$	The width of the peak top, either "B" (broad) or "N" (narrow).
S\$	Option "N" (no) or "Y" (yes) depending on the answer to: IS THIS A RESTART OF AN INTERRUPTED RUN?
Si\$	Option "A" (all), "S" (some) or "N" (none) in answer to the question DO YOU WANT TO ENTER NEW DATA FOR EACH CHAN., Q.C. PATT., STND. CONC., OC LIMITS.
T\$	Option "T" (type) or "G" (generate) in response to the question TYPE OR GENERATE ID'S?
U\$	A scratch string, used mainly to check answers to yes or no inputs.
Z\$	The analyte (constituent) name.

APPENDIX E.
PROGRAM LISTING

LISTING OF FILE TAAIN
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 PAGE 1

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0010 REM ***** TAAIN *****
0015 REM *****8/3/78*****
0020 REM * * * * TAAIN FOR EPA REGION V, CHICAGO
0030 REM PROGRAM TO SET UP RUN FOR TECHNICON AUTOANALYZERS
0040 REM CHAINS TO TAA, WHICH CHAINS TO TAAOUT
0042 CLOSE
0045 DIM G$(11),G$(11),G1$(11),S1$(11)
0050 REM WRITTEN AUGUST, 1975 AT LAWRENCE LIVERMORE LABORATORY
0060 REM BASIC PROGRAM BY LESTER RIGDON
0061 PRINT
0062 INPUT "DO YOU WANT TO RUN PREVIOUSLY STORED SAMPLE ID NOS, ? ",G$
0070 DIM A$(15),B$(15),C$(10),F$(15)
0080 DIM F3$(15),P$(20)
0090 DIM T$(7),U$(10),Y$(5),Z$(10)
0100 DIM A1(60),B1(60,3),C1(30),N1(13),S1(30)
0110 DIM D1(60),F1(16),R1(20)
0115 IF G$(1,1)="Y" THEN GOTO 0330
0120 LET K=0
0130 LET T3=1
0140 LET F1=1
0145 LET M0=40
0150 FOR I=1 TO 60
0155   FOR J=1 TO 3
0160     LET B1(I,J)=0
0190   NEXT J
0200   IF I>30 THEN GOTO 0260
0210   LET C1(I)=0
0220   LET S1(I)=0
0230   IF I>20 THEN GOTO 0260
0240   LET A1(I)=0
0260 NEXT I
0270 LET C4=0
0280 LET T0=1
0290 LET T1=0
0293 LET T2=1
0300 LET Q=-1
0310 LET M1=0
0312 LET M4=0
0314 LET M6=0
0315 LET A2=0
0320 LET N9=0
0325 LET C$="C000000000"
0327 IF G1$="Y" THEN GOTO 0364
0330 OPEN FILE(0,0),"TAAINF"
0332 READ FILE(0,50),Z9
0333 CLOSE
0334 INPUT "WHEEL PATTERN NO, (1 TO 9) ",W
0335 IF W<=9 THEN GOTO 0338

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LISTING OF FILE TAAIN
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0336 PRINT "TOO MANY RUNS FOR FILES"
0337 GOTO 0334
0338 LET W1=300*(W-1)
0339 IF G$(1,1)="Y" THEN GOTO 7010
0340 INPUT "IS THIS A RE-START OF AN INTERRUPTED RUN ? ",S$
0344 PRINT "DO YOU WANT TO ENTER NEW DATA "
0345 PRINT "FOR EACH CHAN., QC PATT., STND, CONC., QC LIMITS"
0346 INPUT "ANSWER ALL, SOME, OR NONE (A,S,N) ? ",S1$
0348 IF S1$(1,1)="A" THEN GOTO 0460
0350 IF S1$(1,1)="S" THEN GOTO 0368
0352 IF S1$(1,1)="N" THEN GOTO 0364
0353 GOTO 0346
0364 LET C$="NNNNNN"
0366 GOTO 7000
0368 PRINT "WHICH VARIABLES DO YOU WANT TO CHANGE(Y OR N) ?"
0370 PRINT
0380 PRINT " QCP"; TAB(12);"CS"; TAB(22);"SPK"; TAB(32);"STDS";
      TAB(40);"DUP DIFF"; TAB(50);"FILE NO,"
0390 FOR I=1 TO 6
0400 PRINT TAB(10*(I-1));
0410 INPUT Y$;
0420 LET C$(I,1)=Y$(1,1)
0430 NEXT I
0431 PRINT
0432 INPUT "NUMBER OF SAMPLES PER HOUR? ",Z9
0436 LET Z9=27000/Z9
0440 PRINT
0450 GOTO 7000
0460 REM * * * * INPUT HEADER AND ANALYTE INFO, FILE TAAINF
0470 LET A1=1
0475 LET A2=W1+1
0477 LET N9=W1
0480 OPEN FILE(0,0),"TAAINF"
0490 INPUT "NUMBER OF SAMPLES PER HOUR? ",Z9
0500 LET Z9=27000/Z9
0590 INPUT "NO. OF CONSTITUENTS ",NO
0600 PRINT
0610 FOR I=1 TO NO
0619 PRINT TAB(35);"PLACES"; TAB(47);"BLK LIM"; TAB(58);"ALLOW NOISE"
0620 PRINT "CONSTITUENT CHAN LEV AFTER DEC, (CONC)
      X F S"
0630 INPUT A$;
0640 GOSUB 6000
0650 IF B$(A$) THEN GOTO 0620
0660 PRINT TAB(14);
0670 INPUT A(2);
0680 PRINT TAB(23);
0690 INPUT F3$;
0700 PRINT TAB(32);

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LISTING OF FILE TAAIN
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0710 INPUT A[11];
0715 LET A[3]=1
0720 PRINT TAB(46);
0730 INPUT A[4];
0735 PRINT TAB(58);
0737 INPUT A[12];
0738 LET A[12]=A[12]*81.92
0740 PRINT
0750 PRINT "UNITS OF CONC      TYPE OF PEAK      DATA RATE
DEGREE OF LSF"
0760 PRINT TAB(21);"B OR N"; TAB(36);"15 TO 60"; TAB(51);"1 TO 4"
0770 INPUT US;
0780 PRINT TAB(20);
0790 INPUT PS;
0800 IF PS="B" THEN LET A[10]=21
0810 IF PS="N" THEN LET A[10]=11
0820 PRINT TAB(36);
0830 INPUT A[5];
0850 PRINT TAB(49);
0860 INPUT A[6];
0870 PRINT
0880 PRINT "INPUT FOR      ";A$;" OK";
0890 INPUT Y$
0900 IF Y$[1,1]="N" THEN GOTO 0620
0910 WRITE FILE(0,1+10),A$,A[2],F3$,A[3],A[4],US,A[5],A[10],
A[11],A[12]
0920 WRITE FILE(0,1+20),A[6],H1,H2,H3,H4
0930 LET FS="TAAID,";A$
0940 OPEN FILE(1,0),FS
0950 PRINT
0960 NEXT I
0970 FOR I=1 TO 20
0980 LET A[I]=0
0990 NEXT I
0995 IF C$[1,1]="N" THEN GOTO 1110
1000 REM * * * INPUT SAMPLING PATTERN
1010 PRINT "QCP      BLK      CS      SAMP      SPK
SAMP      DUP"
1015 LET N(8)=0
1020 FOR I=2 TO 7
1030 PRINT TAB(10*(I-1));
1040 INPUT N[I];
1050 LET N(8)=N(8)+N[I]
1052 NEXT I
1054 IF N(8)<=40 THEN GOTO 1060
1056 PRINT "PATTERN TOO LARGE, REDUCE NO. OF SAMPLES TO ";40-N(2)-N(3)-N
(5)-N(7)
1058 GOTO 1010
1060 PRINT

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1061 IF C$(1,1)="0" THEN GOTO 1080
1062 IF N(3)>N(12) THEN GOTO 1072
1064 IF N(5)>N(13) THEN GOTO 1076
1066 GOTO 1079
1072 PRINT "NOT ENOUGH CS IN FILE"
1074 GOTO 1000
1076 PRINT "NOT ENOUGH SPIKES IN FILE"
1078 GOTO 1000
1079 PRINT
1080 LET MU=40
1090 INPUT "PATTERN OK ? ",Y$
1100 IF Y$(1,1)="N" THEN GOTO 1010
1110 IF C$(2,2)="N" THEN GOTO 1500
1200 REM * * * INPUT CONC AND ALLOWABLE ERROR FOR CHECK STDS
1204 IF N(3)<.5 THEN GOTO 1500
1205 GOSUB 8300
1210 LET K=1
1220 FOR I=1 TO NO
1230 READ FILE(0,I+10),Z$
1240 PRINT Z$; TAB(10);
1250 FOR J=1 TO N(3)
1260 PRINT " CS";J;
1270 INPUT C(K);
1275 LET D(J)=C(K)
1280 INPUT " ERR ",R(J);
1290 LET K=K+1
1300 NEXT J
1310 PRINT
1320 LET K=1+1*N(3)
1330 WRITE FILE(0,I+30),D(1),D(2),D(3),D(4),D(5),D(6),D(7),D(8),
D(9),D(10),D(11),D(12),D(13),D(14),D(15),D(16)
1335 WRITE FILE(0,I+40),R(1),R(2),R(3),R(4),R(5),R(6),R(7),R(8),
R(9),R(10),R(11),R(12),R(13),R(14),R(15),R(16)
1350 NEXT I
1355 IF N(3)<.5 THEN GOTO 1500
1360 INPUT "CHECK STDS OK ",Y$
1370 IF Y$(1,1)="N" THEN GOTO 1200
1500 REM * * * INPUT SPIKE CONC, MIN AND MAX RECOVERY
1505 IF C$(13,3)="N" THEN GOTO 1664
1507 IF N(5)<.5 THEN GOTO 1664
1510 LET M=1
1515 GOSUB 8300
1520 FOR I=1 TO NO
1530 READ FILE(0,I+10),Z$
1540 PRINT Z$; TAB(10);
1550 FOR J=1 TO N(5)
1560 PRINT " SPK ";J;
1570 INPUT S(M);

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1575     LET F(J)=S(M)
1580     INPUT "  MIN  ",R(J);
1590     INPUT "  MAX  ",D(J);
1600     LET M=M+J
1605     NEXT J
1610     WRITE FILE(0,1+50),F(1),F(2),F(3),F(4),F(5),F(6),F(7),F(8),
F(9),F(10),F(11),F(12),F(13),F(14),F(15),F(16)
1615     WRITE FILE(0,1+60),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)
1620     WRITE FILE(0,1+70),D(1),D(2),D(3),D(4),D(5),D(6),D(7),D(8),
D(9),D(10),D(11),D(12),D(13),D(14),D(15),D(16)
1630     PRINT
1635     NEXT J
1640     PRINT
1645     IF N(5)<.5 THEN GOTO 1662
1650     INPUT "SPIKES OK ? ",Y$
1660     IF Y$(1,1)="N" THEN GOTO 1500
1662     PRINT
1664     IF C$(5,5)="N" THEN GOTO 1687
1668     IF N(7)<.5 THEN GOTO 1700
1670     REM * * INPUT ALLOWABLE DIFF FOR DUPS
1672     FOR I=1 TO NO
1674         READ FILE(0,10+11),Z$
1676         PRINT Z$; TAB(10);
1678         INPUT "DIFF IN DUPS ",R(1)
1679         WRITE FILE(0,1+80),R(1)
1682     NEXT I
1683     INPUT "DIFF FOR DUPS OK ",Y$
1685     IF Y$(1,1)="N" THEN GOTO 1670
1687     IF S$(1,1)="Y" THEN GOTO 7176
1700     INPUT "TYPE OR GENERATE IDS (T OR G) ? ",T$
1710     PRINT
1720     LET I=1
1730     IF T$="T" THEN GOTO 2000
1740     REM * * * * INPUT I D AND DIL INFO FOR INDEXING
1750     PRINT "ENTER ID'S AND DIL FOR THE SET"
1760     PRINT "      I ST NO,          LAST NO,          DIL"
1770     INPUT A(1);
1780     IF A(1)=0 THEN GOTO 1870
1790     PRINT TAB(15);
1800     INPUT A(1+1);
1810     PRINT TAB(30);
1820     INPUT A(1+2);
1830     LET I=I+3
1840     GOTO 1770
1850     PRINT
1860     PRINT
1870     LET T2=A(11-1)

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1875 PRINT
1880 INPUT "IDS AND DIL OK ? ",YS
1890 IF Y$(1,1)="N" THEN GOTO 1710
1900 PRINT
1910 PRINT "TYPE ALL MISSING SAMPLE NUMBERS"
1915 GOSUB 8300
1920 LET I=1
1930 INPUT "NO. ",D(I)
1940 IF D(I)=0 THEN GOTO 1965
1950 LET I=I+1
1960 GOTO 1930
1965 IF I=1 THEN GOTO 1990
1970 INPUT "NUMBERS OK ? ",YS
1980 IF Y$(1,1)="N" THEN GOTO 1910
1990 PRINT
2000 REM * * * * INPUT RBL'S AND 1 ST AND LAST SAMPLE ASSOCIATED
2010 PRINT "ENTER ALL REL NOS, AND THE FIRST AND LAST SAMPLE NO,
    ASSOCIATED"
2020 PRINT
2030 PRINT "      RBL NO.          1 ST SAMP      LAST SAMP"
2040 LET I=1
2050 INPUT B(1,1);
2060 IF B(1,1)=0 THEN GOTO 2130
2070 PRINT TAB(15);
2080 INPUT B(1,2);
2090 PRINT TAB(30);
2100 INPUT B(1,3)
2110 LET I=I+1
2120 GOTO 2050
2130 LET B1=1
2140 LET L=1
2150 PRINT
2160 PRINT
2170 INPUT "RBL'S OK ? ",YS
2180 IF Y$(1,1)="N" THEN GOTO 2000
2190 IF C$(4,4)="N" THEN GOTO 7610
2200 REM * * * * WRITE FILES FOR SET STDS AND BLANKS
2210 LET T=1
2215 LET M1=0
2220 LET S1=0
2225 LET T=1
2230 LET S2=0
2240 FOR I=1 TO 5
2245   LET M1=M1+1
2250   LET N9=N9+1
2260   LET T1=1
2270   IF I>3 THEN LET T=2
2275   IF I>3 THEN LET T1=I-3

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2280 GOSUB 5000
2290 NEXT I
2300 PRINT
2500 REM * * * * INPUT CALIB STDS DATA AND WRITE FILES
2510 INPUT "NO. OF CALIB STDS ? ",N1
2513 IF N1<10 THEN GOTO 2520
2515 PRINT "SORRY, MAXIMUM OF 9 STANDARDS"
2517 GOTO 2510
2520 PRINT "ENTER CONC OF STDS"
2530 FOR I=1 TO N0
2540 READ FILE(0,1+10),Z$
2550 PRINT Z$; TAB(10);
2560 FOR J=1 TO N1
2570 PRINT " S";J;
2580 INPUT C4;
2590 IF (M1+J)-(F1-1)*M0>M0 THEN LET F1=F1+1
2600 LET P=(M1+J)-(F1-1)*M0
2610 WRITE FILE(1,N9+J),3,0,F1,P,J,T0,C4,S1,S2,0,0,0,0,0,0
2615 LET R(J)=C4
2620 NEXT J
2630 PRINT
2635 WRITE FILE(10,1+90),R(1),R(2),R(3),R(4),R(5),R(6),R(7),R(8),
R(9),R(10),R(12),R(13),R(14),R(15),R(16)
2640 NEXT I
2660 PRINT
2670 INPUT "STDS CK ? ",Y$
2680 IF Y$(1,1)="N" THEN GOTO 2510
2685 LET N9=N9+N1
2687 LET M1=M1+N1
2690 PRINT "WRITING FILES"
2800 REM * * * * WRITE FILES FOR QCP BLANKS
2810 FOR I=1 TO N(2)
2820 LET N9=N9+1
2825 LET M1=M1+1
2830 LET C4=0
2833 LET T0=1
2836 LET S1=0
2840 IF M1-(F1-1)*M0>M0 THEN LET F1=F1+1
2850 LET T=2
2855 LET T=T-I
2860 GOSUB 5000
2870 NEXT I
3000 REM * * * * WRITE FILES FOR QCP CHECK STDS
3010 LET K=1
3020 LET T0=1
3030 LET T=5
3040 FOR I=1 TO N(3)
3050 LET N9=N9+1

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3055 LET M1=M1+1
3060 IF M1-(F1-1)*M0>M0 THEN LET F1=F1+1
3070 LET P=M1-(F1-1)*M0
3080 FOR J=1 TO N0
3090 WRITE FILE(J,N9),T,Q,F1,P,I,T0,C(K),S1,S2,0,0,0,0,0,0
3180 LET K=K+N(3)
3190 NEXT J
3200 LET K=I+1
3210 NEXT I
3500 REM * * * GET ID'S AND WRITE FILES FOR SAMPLE GROUP 1, N(4)
3505 LET M4=0
3510 FOR I=1 TO N(4)
3520 LET T=4
3530 LET C4=0
3540 IF T$="C" THEN GOTO 3610
3550 INPUT "ID ",T1;
3555 LET T2=T1
3560 IF T1=0 THEN GOTO 3791
3570 PRINT TAB(15);
3572 INPUT "OIL ",T3
3575 GOSUB 5200
3580 GOSUB 3750
3590 GOSUB 5000
3600 GOTO 3700
3610 GOSUB 5100
3620 LET T1=T2
3630 IF T1=0 THEN GOTO 3800
3640 FOR I1=1 TO 60
3645 IF D(I1),5 THEN GOTO 3670
3650 IF T1-C(I1) THEN GOTO 3610
3660 NEXT I1
3670 GOSUB 5200
3680 GOSUB 3750
3690 GOSUB 5000
3700 NEXT I
3705 GOTO 3800
3750 LET N9=N9+1
3760 LET M1=M1+1
3770 LET M4=M4+1
3780 IF M1-(F1-1)*M0>M0 THEN LET F1=F1+1
3790 RETURN
3791 IF I>1 THEN GOTO 3800
3792 LET Y=N(3)+N(2)
3793 LET N9=N9-Y
3794 LET M1=M1-Y
3795 IF P-Y<1 THEN LET F1=F1-1
3796 GOTO 8000
3800 REM * * * WRITE FILES FOR QCP SPIKES

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3820 IF M4=0 THEN GOTO 4010
3830 LET R(20)=M4
3840 LET K=1-M4
3850 FOR I=1 TO N(5)
3855   LET M=I
3860   LET R(20)=R(20)+I
3870   READ FILE(I,N9+K),T,Q,M2,P,T1,T0,C4,S1,S2
3880   IF T<>8 THEN GOTO 3890
3881   LET K=K+1
3892   IF R(20)=0 THEN GOTO 4200
3893   GOTO 3860
3890   LET N9=N9+1
3900   LET M1=M1+1
3910   IF M1-(F1-1)*M0>M0 THEN LET F1=F1+1
3920   LET P=M1-(F1-1)*M0
3930   LET T=6
3940   LET S1=N9+K-1
3950   FOR J=1 TO N0
3970     WRITE FILE(J,N9),T,Q,F1,P,T1,T0,S(M1),S1,I,0,0,0,0,0,0
3975     LET M=M+N(5)
3980   NEXT J
3990   IF R(20)=0 THEN GOTO 4010
4000 NEXT I
4010 IF T2>0 THEN GOTO 4200
4015 IF N9-(5+N1+N(2)+N(3)+W1)<.5 THEN GOTO 4200
4020 GOTO 8000
4200 REM * * * * GET IDS AND WRITE FILES FOR SAMPLE GROUP 2, N(6)
4205 LET M6=0
4210 FOR I=1 TO N(6)
4220   LET T=4
4230   LET C4=0
4240   IF T$="G" THEN GOTO 4300
4245   INPUT "ID ",T1;
4247   LET T2=T1
4250   IF T1=0 THEN GOTO 4500
4260   PRINT TAB(15);
4262   INPUT "DIL ",T0
4265   GOSUB 5200
4270   GOSUB 4450
4280   GOSUB 5000
4290   GOTO 4390
4300   GOSUB 5100
4310   LET T1=T2
4320   IF T1=0 THEN GOTO 4500
4330   FOR I1=1 TO 60
4335     IF D(I1)<.5 THEN GOTO 4360
4340     IF T1=D(I1) THEN GOTO 4300
4350   NEXT I1

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4360 GOSUB 5200
4370 GOSUB 4450
4380 GOSUB 5000
4390 NEXT I
4400 GOTO 4500
4450 LET N9=N9+1
4460 LET M1=M1+1
4470 LET M6=M6+1
4480 IF M1-(F1-1)*M0>M0 THEN LET F1=F1+1
4490 RETURN
4500 REM * * * * WRITE FILES FOR DUPLICATES
4505 IF M6=0 THEN GOTO 4660
4508 LET R(20)=-M6
4510 LET K=1-M6
4520 FOR I=1 TO N(7)
4525 LET R(20)=R(20)+1
4530 READ FILE(1,N9+K),T,Q,M2,P,T1,T0,C4,S1,S2
4540 IF T<>0 THEN GOTO 4545
4542 LET K=K+1
4543 IF R(20)=0 THEN GOTO 4650
4544 GOTO 4525
4545 LET N9=N9+1
4547 LET M1=M1+1
4550 IF M1-(F1-1)*M0>M0 THEN LET F1=F1+1
4555 LET P=M1-(F1-1)*M0
4560 LET T=7
4565 LET S1=N9+K-1
4570 FOR J=1 TO N0
4580 WRITE FILE(J,N9),T,Q,F1,P,T1,T0,C4,S1,S2,0,0,0,0,0,0,0
4595 NEXT J
4600 IF R(20)=0 THEN GOTO 4660
4630 NEXT I
4640 LET M9=M9+1
4650 PRINT M9:" PATTERNS COMPLETED"
4660 IF T$="T" THEN GOTO 4700
4665 IF S$(1,1)="Y" THEN GOTO 4692
4670 IF T2+1>A(L+1) THEN LET T3=L+3
4680 IF A(T3)<>0 THEN GOTO 2800
4690 GOTO 8000
4692 IF T2=0 THEN GOTO 8000
4694 READ FILE(7,K1),T2
4695 REM LOOK AHEAD TO SEE IF MORE SAMPLES
4696 IF T2=0 THEN CLOSE FILE(7)
4700 IF T2=0 THEN GOTO 8000
4710 GOTO 2800
5000 REM * * * * SUB TO WRITE FILES
5005 LET P=M1-(F1-1)*M0
5010 FOR J=1 TO N0

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5015 WRITE FILE(J,N9),T,Q,F1,P,T1,T0,C4,S1,S2,0,0,0,0,0,0
5020 NEXT J
5025 IF C4=1 THEN GOTO 5040
5030 IF C4>1 THEN GOTO 5055
5040 LET S1=0
5045 LET S2=0
5050 RETURN
5055 GOSUB 6600
5060 FOR J=1 TO N0
5065 WRITE FILE(J,N9),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)
5070 NEXT J
5075 FOR J=1 TO 16
5080 LET R(J)=0
5085 NEXT J
5090 GOSUB 6500
5095 RETURN
5100 REM * * * * SUB TO INDEX ID NUMBERS AND DIL
5105 IF SS(1,1)="Y" THEN GOTO 5183
5110 LET T0=A(L+2)
5120 LET T2=T2+1
5130 IF T2>A(L+1) THEN GOTO 5150
5140 RETURN
5150 LET L=L+3
5160 LET T2=A(L)
5170 LET T0=A(L+2)
5180 RETURN
5183 READ FILE(7,K1),T2,T0
5186 IF T2=0 THEN CLOSE FILE(7)
5189 LET K1=K1+1
5192 RETURN
5200 REM * * * * SUB TO GET RBL NOS. AND SAMPLES ASSOCIATED
5210 FOR J=1 TO B1
5220 IF B(J,1)<>T1 THEN GOTO 5390
5225 LET T=B
5230 LET C4=C4+1
5240 ON C4 THEN GOTO 5250, 5280, 5320, 5350, 5370
5250 LET S1=B(J,2)
5260 LET S2=B(J,3)
5270 GOTO 5390
5280 LET R(1)=B(J,2)
5290 LET R(2)=B(J,3)
5300 GOTO 5390
5320 LET R(12)=B(J,2)
5330 LET R(13)=B(J,3)
5340 GOTO 5390
5350 LET R(14)=B(J,2)
5355 LET R(15)=B(J,3)

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5360 GOTO 5390
5370 PRINT "TOO MANY SETS FOR FILES FOR RBL ";T1
5380 STOP
5390 NEXT J
5400 RETURN
6000 REM SUBROUTINE TO CHECK ANALYTE AND GET STAT PARAMETERS
6010 FOR J=1 TO 20
6020 READ B$,H1,H2,H3,H4
6030 IF B$=A$ THEN GOTO 6060
6040 NEXT J
6050 PRINT "ANALYTE NOT IN FILE"
6060 RESTORE
6070 RETURN
6080 DATA "NH3",1,25E-02,2,88E-02,9,7E-03,,386
6090 DATA "NO3NO2",1,1,1,1
6100 DATA "NITRITE",4E-02,,064,7,7E-02,3,5E-02
6110 DATA "SO4",1,395,1,244,,95,2,17
6120 DATA "SO2",1,1,1,1
6130 DATA "TKN",1,1,1,1
6140 DATA "CL",1,1,1,1
6150 DATA "ORTHCP",1,1,1,1
6160 DATA "TP",1,1,1,1
6170 DATA "DISP",1,1,1,1
6180 DATA "COD",1,1,1,1
6190 DATA "SI",1,1,1,1
6200 DATA "ALK",1,1,1,1
6210 DATA "HG",1,1,1,1
6220 DATA "PH",1,1,1,1
6230 DATA "CN",1,1,1,1
6240 DATA "PHENOL",1,1,1,1
6250 DATA "MBAS",1,1,1,1
6260 DATA "F",1,1,1,1
6270 DATA "NO2",1,1,1,1
6500 REM * * * * SUB TO CLOSE QC FILES AND OPEN ID FILES
6510 FOR J3=1 TO N0
6520 READ FILE(0,J3+10),Z$
6530 LET F$="TAAID.",Z$
6540 CLOSE FILE(J3)
6550 OPEN FILE(J3,0),F$
6560 NEXT J3
6570 RETURN
6600 REM * * * * SUB TO CLOSE ID FILES AND OPEN QC FILES
6610 FOR J3=1 TO N0
6620 READ FILE(0,J3+10),Z$
6630 CLOSE FILE(J3)
6640 LET F$="TAAQC.",Z$
6650 OPEN FILE(J3,0),F$
6660 NEXT J3

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6670 RETURN
7000 REM * * * * SUB TO CONTINUE RUN
7010 OPEN FILE(0,0),"TAAINF"
7020 READ FILE(0,7),A1,A2,M1
7030 LET A1=A1+1
7035 LET A2=W1+1
7040 PRINT "RUN NUMBER      ":A1
7050 PRINT M1;" ID FILES IN LAST RUN"
7055 IF G$(1,1)="Y" THEN GOTO 7177
7060 READ FILE(0,6),N0,N1,N(2),N(3),N(4),N(5),N(6),N(7),N(8),N9,M0
7080 LET N9=W1
7090 IF C$(6,6)="Y" THEN LET N9=0
7100 LET N(12)=N(3)
7110 LET N(13)=N(5)
7130 FOR I=1 TO N0
7140   READ FILE(0,1+10),Z$
7150   LET F$="TAAID,"Z$
7160   OPEN FILE(1,0),F$
7165 NEXT I
7170 IF G1$="Y" THEN GOTO 7185
7172 IF S$(1,1)="N" THEN GOTO 7420
7174 IF C$(1,6)<>"NNNNNN" THEN GOTO 6995
7175 INPUT "FIRST RECORD NO, ",A2
7177 INPUT "LAST RECORD NO, ",A6
7178 IF G$(1,1)="Y" THEN GOTO 8400
7180 REM * * * * RESTART AN INTERRUPTED RUN
7185 LET K=0
7187 LET T$="G"
7190 LET J=1
7195 OPEN FILE(7,0),"SCRATCH"
7200 FOR I=A2 TO A6
7205   READ FILE(1,1),T,Q,F1,P,T1,T0,C4,S1,S2
7210   ON T THEN GOTO 7320, 7320, 7320, 7215, 7320, 7320, 7320,
7215, 7320
7215   LET K=K+1
7217   WRITE FILE(7,K),T1,T0
7220   IF T=4 THEN GOTO 7320
7225   LET B(J,1)=T1
7230   LET B(J,2)=S1
7235   LET B(J,3)=S2
7240   IF C4=1 THEN GOTO 7315
7245   GOSUB 6600
7250   READ FILE(1,1),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)
7255   LET B(J+1,1)=T1
7260   LET B(J+1,2)=R(1)
7265   LET B(J+1,3)=R(2)
7270   IF C4=2 THEN GOTO 7310
7275   LET B(J+2,1)=T1

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7280 LET B(J+2,2)=R(12)
7285 LET B(J+2,3)=R(13)
7290 IF C4=3 THEN GOTO 7310
7295 LET B(J+3,1)=T1
7300 LET B(J+3,2)=R(14)
7305 LET B(J+3,3)=R(15)
7310 GOSUB 6500
7315 LET J=J+C4
7320 NEXT I
7330 WRITE FILE(7,K+1),0,0
7335 LET K1=1
7340 LET B1=J
7419 REM * * * PUT STORED CHK STND DATA IN C ARRAY
7420 LET K=1
7430 FOR I=1 TO N0
7440 READ FILE(0,I+30),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)
7450 FOR J=1 TO N(3)
7455 LET C(K)=R(J)
7460 LET K=K+J
7470 NEXT J
7480 NEXT I
7489 REM * * * PUT STORED SPK DATA IN R ARRAY
7490 LET M=1
7500 FOR I=1 TO N0
7510 READ FILE(0,I+50),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)
7515 FOR J=1 TO N(5)
7520 LET S(M)=R(J)
7530 LET M=M+1
7540 NEXT J
7550 NEXT I
7555 IF S(1,1)="Y" THEN GOTO 7610
7560 IF C(1,1)="Y" THEN GOTO 1000
7570 IF C(2,2)="Y" THEN GOTO 1200
7580 IF C(3,3)="Y" THEN GOTO 1500
7590 IF C(5,5)="Y" THEN GOTO 1664
7600 GOTO 1700
7610 REM * * * * WRITE FILES FOR SET STDS AND BLANKS
7615 IF S(1,1)="Y" THEN LET N9=A2-1
7620 LET T0=1
7630 LET M1=0
7640 LET S1=0
7645 LET F1=1
7650 LET T=1
7660 LET S2=0
7670 FOR I=1 TO 5
7680 LET N9=N9+1

```


LISTING OF FILE TAAIN
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```

7690 LET M1=M1+1
7700 LET T1=1
7710 IF I>3 THEN LET T=2
7720 IF I>3 THEN LET T1=1-3
7730 GOSUB 5000
7740 NEXT I
7750 PRINT
7752 IF C$(4,4)="Y" THEN GOTO 2510
7754 IF S1$(1,1)="A" THEN GOTO 2510
7755 LET T=3
7760 FOR I=1 TO N0
7770 READ FILE(0,I+10),Z$
7780 PRINT Z$
7784 READ FILE(0,I+90),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)
7790 FOR J=6 TO N1+5
7810 IF (M1+J-5)-(F1-1)*M0>M0 THEN LET F1=F1+1
7820 LET P=(M1+J-5)-(F1-1)*M0
7825 LET C4=R(J-5)
7830 WRITE FILE(1,N9+J-5),T,Q,F1,P,J-5,T0,C4,S1,S2
7840 NEXT J
7850 PRINT
7860 NEXT I
7870 LET N9=N9+N1
7880 LET M1=M1+N1
7890 GOTO 2800
9000 REM * * * SET UP TWO BLKS AFTER LAST SAMPLE AND FINISH
FILE TAAINF
9010 IF M1-(F1-1)*M0>M0 THEN LET F1=F1+1
9020 LET T=2
9030 LET T0=1
9040 LET T1=1
9050 LET N9=N9+1
9060 LET M1=M1+1
9070 GOSUB 5000
9080 LET N9=N9+1
9090 LET M1=M1+1
9100 IF M1-(F1-1)*M0>M0 THEN LET F1=F1+1
9110 LET T1=2
9120 LET T=9
9130 GOSUB 5000
9140 WRITE FILE(0,6),N0,N1,N(2),N(3),N(4),N(5),N(6),N(7),N(8),
N9,M0,0,0,0,0,0
9150 LET I=INT((SYS(0)/3600)
9160 LET J=INT((SYS(0)-I*3600)/60)
9170 LET T=SYS(2)
9180 LET T0=SYS(1)
9190 LET T1=SYS(3)
9200 WRITE FILE(0,8),I,J,T,T0,T1,M

```

LISTING OF FILE TAAIN
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```

0205 WRITE FILE(0,50),Z9
0210 LET S$(1,1)="N"
0220 WRITE FILE(0,7),A1,A2,M1,N9,S$
0230 PRINT M1;" FILES IN THIS SET UP"
0240 PRINT N9;" ID FILES IN USE"
0250 CLOSE
0260 CHAIN "TAAINRE"
0300 REM * * * SUB TO ZERO D, F, AND R ARRAYS
0310 FOR I2=1 TO 16
0320 LET D(I2)=0
0330 LET F(I2)=0
0340 LET R(I2)=0
0350 NEXT I2
0360 RETURN
0400 LET N9=A6
0410 LET A2=W1+1
0420 LET M1=A6-W1
0430 GOTO 0150
0500 DIM G$(1),G$(1),S$(1),S$(1)
0502 PRINT "TAAIN CHAINED FROM TAAINRE"
0505 LET G$="Y"
0510 LET G$="N"
0515 LET S$="Y"
0517 LET S$="N"
0520 OPEN FILE(0,0),"TAAINF"
0530 READ FILE(0,50),Z9
0540 READ FILE(0,8),I,I,I,I,I,W
0550 LET W1=300*(W-1)
0560 READ FILE(0,7),A1,A2,M1,N9
0565 CLOSE
0570 LET A6=N9
0580 GOTO 0070
0590 END

```

APPENDIX F.
SYMBOL TABLE LISTING

REFERENCES AND SYMBOLS IN TAAIN
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PAGE 1

0070 IS REFERENCED ON LINES:
0580

0260 IS REFERENCED ON LINES:
0200 0230

0330 IS REFERENCED ON LINES:
0115

0334 IS REFERENCED ON LINES:
0337

0338 IS REFERENCED ON LINES:
0335

0346 IS REFERENCED ON LINES:
0353

0364 IS REFERENCED ON LINES:
0327 0352

0368 IS REFERENCED ON LINES:
0350

0460 IS REFERENCED ON LINES:
0348

0620 IS REFERENCED ON LINES:
0650 0900

0995 IS REFERENCED ON LINES:
7174

1000 IS REFERENCED ON LINES:
1074 1078 7560

1010 IS REFERENCED ON LINES:
1058 1100

1060 IS REFERENCED ON LINES:
1054

1072 IS REFERENCED ON LINES:
1062

REFERENCES AND SYMBOLS IN TAAIN

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1076 IS REFERENCED ON LINES:
1064

1079 IS REFERENCED ON LINES:
1066

1080 IS REFERENCED ON LINES:
1061

1110 IS REFERENCED ON LINES:
0995

1200 IS REFERENCED ON LINES:
1370 7570

1500 IS REFERENCED ON LINES:
1110 1204 1355 1660 7580

1662 IS REFERENCED ON LINES:
1645

1664 IS REFERENCED ON LINES:
1505 1507 7590

1670 IS REFERENCED ON LINES:
1685

1687 IS REFERENCED ON LINES:
1664

1700 IS REFERENCED ON LINES:
1668 7600

1710 IS REFERENCED ON LINES:
1890

1770 IS REFERENCED ON LINES:
1840

1870 IS REFERENCED ON LINES:
1780

1910 IS REFERENCED ON LINES:
1980

REFERENCES AND SYMBOLS IN TAAIN

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1930 IS REFERENCED ON LINES:
1960

1965 IS REFERENCED ON LINES:
1940

1990 IS REFERENCED ON LINES:
1965

2000 IS REFERENCED ON LINES:
1730 2180

2050 IS REFERENCED ON LINES:
2120

2130 IS REFERENCED ON LINES:
2060

2510 IS REFERENCED ON LINES:
2517 2680 7752 7754

2520 IS REFERENCED ON LINES:
2513

2800 IS REFERENCED ON LINES:
4680 4710 7890

3610 IS REFERENCED ON LINES:
3540 3650

3670 IS REFERENCED ON LINES:
3645

3700 IS REFERENCED ON LINES:
3600

3750 IS REFERENCED ON LINES:
3580 3680

3791 IS REFERENCED ON LINES:
3560

3800 IS REFERENCED ON LINES:
3630 3705 3791

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3860 IS REFERENCED ON LINES:
3883

3890 IS REFERENCED ON LINES:
3880

4010 IS REFERENCED ON LINES:
3820 3990

4200 IS REFERENCED ON LINES:
3882 4010 4015

4300 IS REFERENCED ON LINES:
4240 4340

4360 IS REFERENCED ON LINES:
4335

4390 IS REFERENCED ON LINES:
4290

4450 IS REFERENCED ON LINES:
4270 4370

4500 IS REFERENCED ON LINES:
4250 4320 4400

4525 IS REFERENCED ON LINES:
4544

4545 IS REFERENCED ON LINES:
4540

4650 IS REFERENCED ON LINES:
4543

4660 IS REFERENCED ON LINES:
4505 4600

4692 IS REFERENCED ON LINES:
4665

4700 IS REFERENCED ON LINES:
4660

REFERENCES AND SYMBOLS IN TAAIN

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5000 IS REFERENCED ON LINES:

2280 2860 3590 3690 4280
4380 7730 8070 8130

5040 IS REFERENCED ON LINES:

5025

5055 IS REFERENCED ON LINES:

5030

5100 IS REFERENCED ON LINES:

3610 4300

5150 IS REFERENCED ON LINES:

5130

5183 IS REFERENCED ON LINES:

5105

5200 IS REFERENCED ON LINES:

3575 3670 4265 4360

5250 IS REFERENCED ON LINES:

5240

5280 IS REFERENCED ON LINES:

5240

5320 IS REFERENCED ON LINES:

5240

5350 IS REFERENCED ON LINES:

5240

5370 IS REFERENCED ON LINES:

5240

5390 IS REFERENCED ON LINES:

5220 5270 5300 5340 5360

6000 IS REFERENCED ON LINES:

0640

6060 IS REFERENCED ON LINES:

6030

REFERENCES AND SYMBOLS IN TAAIN

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6500 IS REFERENCED ON LINES:
5090 7310

6600 IS REFERENCED ON LINES:
5055 7245

7000 IS REFERENCED ON LINES:
0366 0450

7010 IS REFERENCED ON LINES:
0339

7176 IS REFERENCED ON LINES:
1687

7177 IS REFERENCED ON LINES:
7055

7185 IS REFERENCED ON LINES:
7170

7215 IS REFERENCED ON LINES:
7210

7310 IS REFERENCED ON LINES:
7270 7290

7315 IS REFERENCED ON LINES:
7240

7320 IS REFERENCED ON LINES:
7210 7220

7420 IS REFERENCED ON LINES:
7172

7610 IS REFERENCED ON LINES:
2190 7555

8000 IS REFERENCED ON LINES:
3796 4020 4690 4692 4700

8150 IS REFERENCED ON LINES:
8430

REFERENCES AND SYMBOLS IN TAAIN

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8300 IS REFERENCED ON LINES:

1205 1515 1915

8400 IS REFERENCED ON LINES:

7178

A\$ OCCURS ON LINES:

0070 0630 0650 0880 0910
0930 6030

A1 OCCURS ON LINES:

0470 7020 7030 7040 8220
8560

A2 OCCURS ON LINES:

0315 0475 7020 7035 7176
7200 7615 8220 8410 8560

A6 OCCURS ON LINES:

7177 7200 8400 8420 8570

A1 OCCURS ON LINES:

0100 0240 0670 0710 0715
0730 0737 0738 0800 0810
0830 0860 0910 0920 0980
1770 1780 1800 1820 1870
4670 4680 5110 5130 5160
5170

B\$ OCCURS ON LINES:

0070 0650 6020 6030

B1 OCCURS ON LINES:

2130 5210 7340

B1 OCCURS ON LINES:

0100 0160 2050 2060 2080
2100 5220 5250 5260 5280
5290 5320 5330 5350 5355
7225 7230 7235 7255 7260
7265 7275 7280 7285 7253
7300 7305

C\$ OCCURS ON LINES:

0070 0325 0364 0420 0995
1061 1110 1505 1664 2190
7030 7174 7560 7570 7580
7530 7752

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C4 OCCURS ON LINES:
 0270 2580 2610 2615 2830
 3530 3870 4230 4530 4580
 5015 5025 5030 5230 5240
 7205 7240 7270 7290 7315
 7825 7830

C1 OCCURS ON LINES:
 0100 0210 1270 1275 3090
 7455

O1 OCCURS ON LINES:
 0110 1275 1330 1590 1620
 1930 1940 3645 3650 4335
 4340 8320

F\$ OCCURS ON LINES:
 0070 0930 0940 6530 6550
 6640 6650 7150 7160

F1 OCCURS ON LINES:
 0140 2590 2600 2610 2840
 3060 3070 3090 3780 3795
 3910 3920 3970 4480 4550
 4655 4680 5005 5015 7205
 7645 7810 7820 7830 8010
 8100

F3\$ OCCURS ON LINES:
 0080 0690 0910

F1 OCCURS ON LINES:
 0110 1575 1610 8330

G\$ OCCURS ON LINES:
 0045 0062 0115 0339 7055
 7178 8500 8510

G1\$ OCCURS ON LINES:
 0045 0327 7170 8500 8505

H1 OCCURS ON LINES:
 0920 6020

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H2 OCCURS ON LINES:

0920 6020

H3 OCCURS ON LINES:

0920 6020

H4 OCCURS ON LINES:

0920 6020

I OCCURS ON LINES:

0150	0150	0200	0210	0220
0230	0240	0260	0390	0400
0420	0430	0610	0910	0920
0940	0960	0970	0980	0990
1120	1030	1040	1050	1052
1120	1230	1320	1330	1335
1350	1520	1530	1610	1615
1620	1635	1672	1674	1679
1682	1720	1770	1780	1800
1820	1830	1920	1930	1940
1950	1965	2040	2050	2060
2080	2100	2110	2130	2240
2260	2270	2275	2290	2530
2540	2610	2635	2640	2810
2855	2870	3040	3090	3200
3210	3510	3700	3791	3850
3855	3970	4000	4210	4390
4520	4630	7130	7140	7160
7165	7200	7205	7250	7320
7430	7440	7480	7500	7510
7550	7670	7700	7710	7720
7740	7760	7770	7784	7830
7860	8150	8160	8200	8540

I1 OCCURS ON LINES:

3640	3645	3650	3660	4330
4335	4340	4350		

I2 OCCURS ON LINES:

8310	8320	8330	8340	8350
------	------	------	------	------

J OCCURS ON LINES:

0155	0160	0190	1250	1260
1275	1280	1300	1550	1560
1575	1580	1590	1605	2560
2570	2590	2600	2610	2615
2620	3080	3090	3190	3960
3970	3980	4570	4580	4595
5010	5015	5020	5060	5065
5070	5075	5080	5085	5210
5220	5250	5260	5280	5290
5320	5330	5350	5355	5390
6010	6040	7190	7225	7230

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7235	7255	7260	7265	7275
7280	7285	7295	7300	7305
7315	7340	7450	7455	7470
7515	7520	7540	7790	7810
7820	7825	7830	7840	8160
8200				

J3 OCCURS ON LINES:

6510	6520	6540	6550	6560
6610	6620	6630	6650	6660

K OCCURS ON LINES:

0120	1210	1270	1275	1290
1320	3010	3090	3180	3200
3840	3870	3881	3940	4510
4530	4542	4565	7185	7215
7217	7330	7420	7455	7460

K1 OCCURS ON LINES:

4694	5183	5189	7335
------	------	------	------

L OCCURS ON LINES:

2140	4670	5110	5130	5150
5160	5170			

M OCCURS ON LINES:

1510	1570	1575	1600	3855
3970	3975	7490	7520	7530

M0 OCCURS ON LINES:

0145	1080	2590	2600	2840
3060	3070	3780	3910	3920
4480	4550	4555	5005	7060
7810	7820	8010	8100	8140

M1 OCCURS ON LINES:

0310	2215	2245	2590	2600
2687	2825	2840	3055	3060
3070	3760	3780	3794	3900
3910	3920	4460	4480	4547
4550	4555	5005	7020	7050
7630	7690	7810	7820	7880
8010	8060	8090	8100	8220
8230	8420	8560		

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M2 OCCURS ON LINES:

3870 4530

M4 OCCURS ON LINES:

0312 3505 3770 3820 3830
3840

M6 OCCURS ON LINES:

0314 4205 4470 4505 4508
4510

M9 OCCURS ON LINES:

4640 4650

N0 OCCURS ON LINES:

0590 0610 1220 1520 1672
2530 3080 3960 4570 5010
5060 6510 6610 7060 7130
7430 7500 7760 8140

N1 OCCURS ON LINES:

2510 2513 2560 2685 2687
4015 7060 7790 7870 7880
8140

N9 OCCURS ON LINES:

0320 0477 2250 2610 2685
2820 3050 3090 3750 3793
3870 3990 3940 3970 4015
4050 4530 4545 4565 4580
5015 5065 7060 7080 7090
7615 7580 7830 7870 8050
8080 8140 8220 8240 8400
8560 8570

N1 OCCURS ON LINES:

0100 1015 1040 1050 1054
1056 1062 1064 1204 1250
1320 1355 1507 1550 1645
1668 2810 3040 3180 3510
3792 3850 3975 4015 4210
4520 7060 7100 7110 7450
7515 8140

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P OCCURS ON LINES:

2600	2610	3070	3090	3795
3870	3920	3970	4530	4555
4580	5005	5015	7205	7820
7830				

P\$ OCCURS ON LINES:

0080	0790	0800	0810
------	------	------	------

Q OCCURS ON LINES:

0300	2610	3090	3870	3970
4530	4580	5015	7205	7830

RI OCCURS ON LINES:

0110	1280	1335	1580	1615
1678	1579	2615	2635	3830
3860	3382	3990	4508	4525
4543	4500	5065	5080	5290
5290	5320	5330	5350	5355
7250	7260	7265	7280	7285
7300	7305	7440	7455	7510
7520	7784	7825	8340	

S\$ OCCURS ON LINES:

0045	0340	1687	4665	5105
7172	7555	7615	8210	8220
8500	8515			

S1 OCCURS ON LINES:

2220	2610	2836	3090	3870
3940	3970	4530	4565	4580
5015	5040	5250	7205	7230
7640	7830			

S1\$ OCCURS ON LINES:

0045	0346	0348	0350	0352
7754	8500	8517		

S2 OCCURS ON LINES:

2230	2610	3090	3870	4530
4580	5015	5045	5260	7205
7235	7660	7830		

SI OCCURS ON LINES:

0100	0220	1570	1575	3970
7520				

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T OCCURS ON LINES:

2225	2270	2850	3030	3090
3520	3970	3880	3930	3970
4220	4530	4540	4560	4580
5015	5225	7205	7210	7220
7650	7710	7755	7830	8020
8120	8170	8200		

T\$ OCCURS ON LINES:

0090	1700	1730	3540	4240
4660	7187			

T0 OCCURS ON LINES:

0280	2210	2610	2833	3020
3090	3572	3870	3970	4262
4530	4580	5015	5110	5170
5183	7205	7217	7620	7830
8030	8180	8200		

T1 OCCURS ON LINES:

0290	2260	2275	2855	3550
3555	3560	3620	3630	3650
3870	3970	4245	4247	4250
4310	4320	4340	4530	4580
5015	5220	5370	7205	7217
7225	7255	7275	7295	7700
7720	8040	8110	8190	8200

T2 OCCURS ON LINES:

0293	4870	3555	3620	4010
4247	4310	4670	4692	4694
4696	4700	5120	5130	5160
5183	5186			

T3 OCCURS ON LINES:

0130	4670	4680
------	------	------

U\$ OCCURS ON LINES:

0090	0770	0910
------	------	------

W OCCURS ON LINES:

0334	0335	0338	8200	8540
8550				

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W1 OCCURS ON LINES:
0338 0475 0477 4015 7035
7080 8410 8420 8550

Y OCCURS ON LINES:
3792 3793 3794 3795

Y\$ OCCURS ON LINES:
0090 0410 0420 0890 0900
1090 1100 1360 1370 1650
1660 1683 1685 1880 1890
1970 1980 2170 2180 2670
2680

Z\$ OCCURS ON LINES:
0090 1230 1240 1530 1540
1674 1676 2540 2550 6520
6530 6620 6640 7140 7150
7770 7780

Z9 OCCURS ON LINES:
0332 0432 0436 0490 0500
8205 8530

SJJ