

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary and Conclusions

Methane sorption isotherms have been completed for 31 coal samples.

A series of 10°C, 20°C and 30°C tests between 15 and 25 working days to perform. By duplicating the system and using 12 bombs a moderate throughput has been achieved.

Theoretically isotherm for 10°C should lie above the 20°C isotherm, which in turn should be above that for 30°C. Often this is not the case with the Langmuir plots of the measured results. The volumes of methane desorbed (column 4 of test data on page 140) is generally highest for the 10°C, followed by 20°C and lowest for 30°C tests. Much of this is due to the higher relative compressibilities and only some of this is due to higher adsorption at lower temperatures.

Nonetheless the measured results more often than not, support the findings of overseas researchers who have noted this inverse relationship between methane content and temperature. Other researchers estimate that methane sorption testing is only accurate to 20 percent. This causes appreciable scatter which sometimes upsets this relationship or causes the isotherms to cross each other.

Although the isotherms do not conform exactly to the expected relationship they can still be used successfully. The gas pressures and temperatures measured underground are under 2,0 MPa and, in general, lie between 18-24°C. The range between 10°C,

20°C and 30°C isotherms below 2,0 MPa, is not large. Also since the underground gas temperatures are close to 20°C and the 20°C isotherm has the least scatter good predictions can be made. A narrow band around the 20°C isotherm from 0-3 MPa can be used to predict the in-situ methane content in the area from which the sample was taken.

Thus the main objective of this work, i.e. to provide data on the in-situ gas content of coal seams by determining the methane isotherms has been met.

6.2 Recommendations

The prediction of methane make during mining is complex and involves the use of the isotherms. A knowledge of permeability and measured data on seam gas pressure and temperature is also needed.

Borehole probes have been made at the University's Mining Department workshop. These should be used to simultaneously measure underground seam gas temperature as well as for seam gas pressure for which they were made. This will enable the isotherms to be used to determine the methane content of the coal seam far more accurately than at present.

Future sorption tests should be run for 0,25; 0,5; 0,75; 1,0; 1,5; 2,0; 2,5; 3,0; 3,5 and 4,0 MPa. This will take 3-5 days longer to complete the tests for 6 samples than it is presently taking. Outliers can easily be noted and the confidence in the results will be far higher. Pressures over 4,0 MPa are not expected underground in South Africa.

An even better recommendation would be to make use of a gravimetric test apparatus and this alternative is being seriously considered. The test procedure is so much faster that the tests could be re-run three times in less time than it takes to do it once with the present apparatus. The confidence in the accuracy of the isotherm plots would be far greater.

Comparisons between methane make, mining method and production rate, and geology of surrounding strata using a continuous recording methanometer should also be undertaken. Ermelo Colliery already has such a methanometer and the Chamber of Mines Coal Mines Laboratory as well as other collieries have expressed interest in this idea.

Permeability test work is already proceeding and a good base of data on methane content, permeability and methane make for Ermelo Colliery will allow mathematical modelling of the methane problem. This work can then be extended to other South African collieries.

The U.S. Bureau of Mines have developed a methane prediction software package, called Methpro. It has undergone field trial tests to compare how accurately its predictions conform to the measured methane make and is now available to interested concerns for around \$100. This appears to be the best commercially available tool for modelling methane flows. The Chamber of Mines now have a copy of Methpro.

A simple system, drawing from a local data base and capable of being used by colliery personnel is obviously the ultimate aim of the research which has been initiated by this present study. Using sorption data of this test together with that of ongoing tests

on sorption capability, gas pressure and temperature, permeability and underground methanometer readings can make up this data base. It may be able to then adapt the Methpro system to use our data base in place of some of the American data. This is the direction in which future work should proceed.

Appendix A

Didgi-Quartz Barometric Pressure Program 1

The Rand Mines Didgi-quartz barometer number 2 gives two values for the barometric pressure. The L.E.D. value "N" is related to the barometric pressure and the L.C.D. value "R" gives the resistance of the internal circuitry. The two calibration factors for this unit have been put in lines 50-70.

Program 1 (didgi-quartz program) listed below, has been written in basic. To load it press F3 [LOAD"] DIDGI. Following the prompts will give the barometric pressure in kPa.

This is a two step calculation using the calibration factors below. A, B, c, d, e and x are constants for a particular instrument and f, g and h are constants for the instrument's thermistor.

	A	B	c	d	e
1	481.201	850.261	-0.000085	-0.000050	0.01335

	f	g	h	T	x
4	979.683	12.018087	325	25.47764	0.039

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	A	B	c	d	e
1	481.201	850.261	-0.000085	-0.000050	0.01335

	f	g	h	T	x
4	979.683	12.018087	325	25.47764	0.039

(i) Uncorrected barometric pressure:

$$P = A (1 - T / T_0)^{-B} - B (1 - T / T_0)$$

(ii) Corrected barometric pressure:

$$P = P + (dP + e)(t - 21) + c (t - 21)^2 + x$$

$$\text{where temperature } t \text{ (c)} = \frac{f}{\ln R + g} - h$$

```

10 ***** DIDGI-QUARTZ BAROMETER PRESSURE CALCULATION PROGRAM *****
20 -----
30 INPUT "L.E.D VALUE":N
40 INPUT "L.C.D VALUE":R
50 X=1481.201*(1-25.47764/N)-850.261*(1-25.47764/N)^2
60 T=4979.683/(LOG(R)+12.018087#)-325
70 P=X+(X*(-.00005)+.01335)*(T-21)+.00085*(T-21)^2 + 0.019
80 PRINT "Barometric pressure is ";P
90 END

```

Appendix B

Relative Compressibility Factor Calculations Program 2

Compressibility factors have been determined for most gasses. This factor compares how compressible a gas is, relative to the so called ideal gas. Figures for methane determined independantly in Russia (9) and France (19) are exactly the same to the fourth decimal place except for two figures which disagreed by 0,0001.

These figures are for pure gases and are given in terms of absolute pressure. The industrial grade methane used for our tests is 98% pure, and the helium was 99.5% pure. Air makes up the balance. However, this is not a problem as firedamp is not 100% pure methane either.

Our tests were run using guage pressure readings. It is necessary to compare the compressibility of helium to methane and not to an ideal gas, which is why "relative" compressibility factors have been used.

The method used was:-

- i) Interpolate from the compressibility tables to the pressures (absolute) required.
- ii) Obtain the compressibility factor for methane, helium and air at the gauge pressure for which tests could be run by interpolation. Average barometric pressure recorded in the laboratory is 82 kPa.
- iii) Interpolate these figures for the temperatures given, to the temperatures at which the tests were run.

- iv) Proportionate the methane/air and helium/air compressibility relative to their concentration.
- v) The final figure is the ratio of helium to methane.

METHANE

TEMPERATURE (K)		280	298	300	325
Pressure (MPa)	0,2	0,9959	0,9961	0,9964	0,9978
	0,4	0,9912	0,9923	0,9930	0,9949
	0,5			0,9915*	
	0,6	0,9871	0,9884	0,9898	0,9926
	0,8	0,9824	0,9848	0,9865	0,9899
	1,0	0,9779	0,9808	0,9827	0,9874
				0,9828*	
	1,5	0,9670	0,9709	0,9744	0,9815
	2,0	0,9565	0,9615	0,9665	0,9757
				0,9663*	
	3,0	0,9355	0,9433	0,9501	0,9638
	4,0	0,9140	0,9248	0,9342	0,9522
				0,9342*	
	6,0	0,8736	0,8903	0,9042	0,9316
	8,0	0,8368	0,8591	0,8773	0,9134
				0,8773*	
	10,0	0,8056	0,8323	0,8548	0,8983
				0,8548*	
	12,0	0,7824	0,8120	0,8374	0,8870

AIR

<u>Temperature (K)</u>		280	290	300	320
Pressure	0,2	0,9987	0,9992	0,9996	0,9995
(MPa)	0,4	0,9981	0,9984	0,9989	0,9993
	0,6	0,9971	0,9974	0,9983	0,9992
	0,8	0,9961	0,9973	0,9975	0,9988
	1,0	0,9952	0,9959	0,9974	0,9986
	2,0	0,9908	0,9930	0,9949	0,9977
	3,0	0,9870	0,9901	0,9929	0,9974
	4,0	0,9837	0,9877	0,9915	0,9974
	6,0	0,9792	0,9851	0,9899	0,9986
	8,0	0,9766	0,9839	0,9901	1,001
	10,0	0,9764	0,9853	0,9932	1,005
	12,5	0,9814	0,9897	0,9988	1,012

HELIUM

<u>Temperature (C)</u>		15	50
Pressure	0,1	1,0005	1,0004
(MPa)	0,5	1,0024	1,0022
	1,0	1,0049	1,0043
	2,0	1,0098	1,0086
	3,0	1,0147	1,0129
	5,0	1,0244	1,0125 ?
	10,0	1,0437	1,0429
	15,0	1,0727	1,0641

It is almost certain that 1,0115 is a printing error in reference (19). It should be 1,0215. A copy of Helium compressibility plot provided by African Oxygen (AFROX) shown below, supports my reasoning.

An example for 3,0 MPa is shown below:-

11) Methane

$$280 \text{ K-R} = 0,9355 + 0,082(0,9140 - 0,9355) = 0,93374$$

$$290 \text{ K-S} = 0,9433 + 0,082(0,9248 - 0,9433) = 0,94178$$

$$300 \text{ K-} \quad 0,9501 + 0,082 (0,9342 - 0,9501) \quad = 0,94880$$

$$325 \text{ K-} \quad 0,9638 + 0,082 (0,9522 - 0,0638) \quad = 0,96285$$

Air

$$280 \text{ K-T} = 0,9870 + 0,082 (0,9837 - 0,9870) = 0,98673$$

$$290 \text{ K-U} = 0,9901 + 0,082 (0,9877 - 0,9901) = 0,98990$$

$$300 \text{ K-} \quad 0,9929 + 0,082 (0,9915 - 0,9929) = 0,99279$$

$$320 \text{ K-} \quad 0,9974 + 0,082 (0,9974 - 0,9974) = 0,99740$$

Helium

$$15 \text{ C-Y} = 1,0147 + 0,082/2 (1,0244 - 1,0147) = 1,01510$$

$$50 \text{ C-Z} = 1,0129 + 0,082/2 (1,0125 - 1,01029) = 1,01288$$

Methane

$$283,15 \text{ K-V} = 0,93374 + 3,15/10 (0,94178 - 0,93374) \\ = 0,93627$$

$$293,15 \text{ K-} \quad 0,94178 + 3,15/10 (0,94880 - 0,94178) \\ = 0,94399$$

$$303,15 \text{ K-} \quad 0,94880 + 3,15/25 (0,96285 - 0,94880) \\ = 0,95057$$

Air

$$283,15 \text{ K-W}=0,98673+3,15/10 \text{ (0,98990-0,98673)} = 0,98773$$

$$293,15 \text{ K-0,98990}+3,15/10 \text{ (0,99279-0,98990)} = 0,99081$$

$$303,15 \text{ K-0,99279}+3,15/20 \text{ (0,99740-0,99279)} = 0,99351$$

Helium

$$283,15 \text{ K-AI}=1,01510-5/35 \text{ (1,01325-1,01510)} = 1,01495$$

(Q = -1 or 1 or 3)

$$293,15 \text{ K-1,01510}+5/35 \text{ (0,01325-1,01510)} = 1,01484$$

$$303,15 \text{ K-1,01510}+15/35 \text{ (0,01325-1,01510)} = 1,01431$$

Methane/Air

$$283,15 \text{ K-X}=0,98 \text{ (0,93627)} + 0,02 \text{ (0,98773)} = 0,93730$$

$$293,15 \text{ K-0,98 (0,94399)} + 0,02 \text{ (0,99081)} = 0,94493$$

$$303,15 \text{ K-0,98 (0,95057)} + 0,02 \text{ (0,99351)} = 0,95143$$

Helium

$$283,15 \text{ K-A2}=0,995 \text{ (1,01495)}+0,005 \text{ (0,98773)} = 1,01481$$

$$293,15 \text{ K-0,995 (1,01484)} + 0,005 \text{ (1,99081)} = 1,01472$$

$$303,15 \text{ K-0,995 (1,01431)} + 0,005 \text{ (0,99352)} = 1,01421$$

(v) Relative Compressibility Z (3,082 MPa absolute)

$$10 \text{ C} - A3 = 1,01481 / 0,93730 = 1,97380$$

$$20 \text{ C} - \quad 1,01472 / 0,94493 = 1,07380$$

$$30 \text{ C} - \quad 1,01421 / 0,95143 = 1,06582$$

These calculations were performed by Program 2 (relative compressibility factor calculation program) listed in Appendix . Type in GWBASIC then F3 [LOAD"] COMPR then F2 [RUN"]. All the values that are input can be seen from the example for 3,0 MPa (Guage pressure) shown above. J can be 10 or 25 and K can be 10 or 20.

```

10 ***** RELATIVE COMPRESSIBILITY FACTOR PROGRAM *****
20 -----
30 INPUT "A"; A
40 INPUT "B"; B
50 INPUT "C"; C
60 INPUT "D"; D
70 INPUT "E"; E
80 INPUT "F"; F
90 INPUT "G"; G
100 INPUT "H"; H
110 INPUT "I"; I
120 INPUT "J"; J
130 INPUT "K"; K
140 INPUT "L"; L
150 INPUT "M"; M
160 INPUT "N"; N
170 INPUT "O"; O
180 INPUT "P"; P
190 INPUT "Q"; Q
200 R=A+C*(B-A)
210 S=D+C*(E-D)
220 T=F+C*(G-F)
230 U=H+C*(I-H)
240 V=R+(3.15/J)*(S-R)
250 W=T+(3.15/J)*(U-T)
260 X=(.98*V)+(.02*W)
270 Y=L+N*(M-L)
280 Z=O+N*(P-O)
290 A1=Y+Q*(5/35)*(Z-Y)
300 A2=(.995*A1)+(.005*W)
310 A3=A2/X
320 PRINT "R="; R
330 PRINT "S="; S
340 PRINT "T="; T
350 PRINT "U="; U
360 PRINT "V="; V
370 PRINT "W="; W
380 PRINT "X="; X
390 PRINT "Y="; Y
400 PRINT "Z="; Z
410 PRINT "A1="; A1
420 PRINT "A2="; A2
430 PRINT "A3="; A3
440 END

```

Appendix CSorption Program 3A. Description of the Program

- 310 - 490 Lists the relative compressibility factors in a matrix of 13 rows by 4 columns. The second column is the relative compressibility factors for 10°C, third column for 20°C and fourth column for 30°C.
- 500 - 620 Lists the pressures which make up the first column. This is explained in lines 30-70.
- The pressures for the relative compressibility factors are listed as COMPR (x%, 0) where the x% is determined by the pressure input in (z%, y%, 1).
- The actual relative compressibility is then found for the correct temperature under COMPR (x%, 1 or 2 or 3).
- eg. relative compressibility factor for 4,0 MPa (COMPR (10,0) at 20°C COMPR (10,2).
- 630 - 950 Sets up first mask on the VDU for input data.
- 960 - 1070 Sets up 2 colours for the screen, the second colour being the input data. How the computer knows whether to call up a file for editing or to input into a new file is explained in 760-790 ie. when 1 is entered CNT. % remains = 0, 2 is entered CNT. % = 1.

1080 - 3340 This is a routine to input new data or edit old data on the first screen. There are checks to ensure that values inputted are of the correct dimensions. An error message comes up and explains what type of dimension is expected and asks the operator to press ENTER when he is ready to correct it. He then puts in the correct value and the program can continue. The values are inputted where the cursor shows.
There are five subroutines.

7100 - 7290 First subroutine. Selects the correct compressibility factor for the temperature at which the test is being run and the pressure that is inputted. It has been written in such a way that there is 10% leeway above or below the correct pressure for the relevant relative compressibility factor ie. for 10°C, 4,0 MPa, if 3,6 - 4,4 MPa is inputted, the program will select 1.11296.

The second and third subroutines use a similar approach to check for numeric and non-numeric data. In the program all inputted variables are temporarily renamed Z%. This dummy Z% is used in these two subroutines. If Z% is numeric, then ERR\$ = @. If Z% is non-numeric ERR\$ = *.

4830 - 4950 Second subroutine. All data must be numeric ie. ERR\$ = @. If ERR\$ = * then it prints "NON-NUMERIC DATA. RE-INPUT DATA".

- 4650 - 4710 Third subroutine. Checks if data is numeric or not. If ERR\$ = @ then it might justify the value. If ERR\$ = * then it inputs the data as is.
- 5030 - 5410 Fourth subroutine. If CNT% = 1 ie. operator typed in 2 to edit then this subroutine displays the values which were originally in the file FIL\$. This enables the operator to see what value he wants to change.
- 7320 - 7550 Fifth subroutine. Allows the operator to change values on the first screen by inputting the appropriate selection number 1 - 19. This selection number determines to which line in the program it must go. The value where the cursor is, is overwritten by the new value. If X is typed in the program goes to line 2940 to start the second screen. Now the next screens are set up.
- 3240 - 3320 Dimensions the arrays which are set up.
- 3330 For Z% = 1 the second screen for 100C test data is set up.
For Z% = 2 the fourth screen for 200C test data is set up.
For Z% = 3 the sixth screen for 300C test data is set up.
- 3340 Gives the temperature T% (0) = Z% x 10 automatically.
- 3350 Explains what is happening in the following lines.

3360 Clears the screen so the next screen can be set up.

3370 Uses colour or highlighting for a monochrome VDU for input data.

3380 - 3650 Sets up the mask for input data.

3660 Re-sets CNT% = 0.

3670 - 4760 Inputs data in the mask on the screen.

4770 - 4820 The operator is asked if he wishes to alter any of the data he has inputed. If he types Y the program branches to line 7340 to begin the edit routine. Typing in N branches the program to line 5120 to begin the calculation routine.

5420 - 6270 This routine performs all the calculations for the results which are given in the third, fifth and seventh screen.
For Z% = 1 the third screen for 100C test results is set up.
For Z% = 2 the fifth screen for 200C test results is set up.
For Z% = 3 the seventh screen for 300C test results is set up.

6280 - 6360 Sets up the mask for displaying calculated results.

6370 - 6600 Prints the calculated data in the mask on the VDU.

- 6610 - 7090 This is a routine to add/delete/ maintain the number of inputed data for the second, fourth and sixth screens. For M the inputed data is displayed and there is an option to edit these.
- 6700 - 6790 For A the program branches to line 6380 to add to the number of test pressures NP%. Assume tests had been run for 8 different pressures and subsequently tests for another six intermediate pressures were performed. New NP% = J% = $8+6 = 14$.
- 6800 - 7090 For D the program branches to line 6530. If eight tests had been run for 300C and the fifth test is to be deleted then VALS\$ (3, 5, 2-15) become = 0. New NP% = $8-1 = 7$. The program only saves VALS\$ (Z i.e. Zed, Y% 1-15) for Y% from 1 - NP%. As 99 is > NP%, the fifth test is discarded.
- 7660 - 7990 This is the second edit routine to edit the second, fourth and sixth screens. It is similar to the first edit routine, except that the position of the cursor has to be given as a row 1 - NP% and column Q - W.
- 7250 - 7260 End of the Z% loop from line 3070 - 6940.
- 7270 - 7310 If the operator is finally satisfied with all the inputed data he can save it to disc. Values are saved as files #1 and #2.

- 9650 - 0080 Saves all the inputted data and calculated results as file # File #1 is listed on the directory as ZFILENAME.
- 8280 - 9640 Prints file #1 above on the printer.
- 8000 - 8270 Routine to calculate X-Y co-ordinates from the Langmuir constants. This ASCII file #2 is listed in the directory as FILENAME.DAT. File #2 can then be called by the Statgraphics package to plot the isotherms.
- 10090 - 11210 Reads data from disc if the operator wants to look at data he has previously inputted. He can then edit it.
- 11220 - 11550 Error routines. If the program picks up a problem or erroneous data format, it will print out an error message on line 24 on the screen. The operator then has the opportunity to correct the problem and continue without the program "crashing".
- 11560 - 11830 Sort routine. Sorts the input data on screens two to seven in ascending order wrt pressure.

```

10 KEY OFF
20 CLS
30 REM ***** AP      - Approximated pressure          *****
40 REM ***** AR$     - Area of the mine where sample was taken *****
50 REM ***** ASH     - Ash content                      *****
60 REM ***** AT      - Approximate temperature          *****
70 REM ***** COLL$   - Name of the colliery             *****
80 REM ***** CS$     - Name of the coal seam being mined *****
90 REM ***** FC      - Fixed Carbon                    *****
100 REM ***** FIL$   - Data storage file #1             *****
110 REM ***** FILLS$  - Isotherm storage file #2 for Statgraphics plots *****
120 REM ***** HGI     - Hardgrove Grindability Index     *****
130 REM ***** M$      - Mass of crushed coal sample in "bomb" *****
140 REM ***** MAP$    - Answer "Gas pressure measured or approximated" *****
150 REM ***** MAT$    - Answer "Gas temperature measured or approximated" *****
160 REM ***** MH$     - Mining height                    *****
170 REM ***** MP      - Measured pressure                *****
180 REM ***** MST     - Moisture content                 *****
190 REM ***** OB$     - Depth of overburden              *****
200 REM ***** NT      - Measured temperature            *****
210 REM ***** OB$     - Depth of overburden              *****
220 REM ***** R$      - Rank                             *****
230 REM ***** SD$     - Date when sample was taken from the colliery *****
240 REM ***** SECT    - Name of the section from which sample was taken *****
250 REM ***** SE$     - Surface elevation of mine        *****
260 REM ***** SN$     - Sample number                   *****
270 REM ***** TX      - Test temperature                *****
280 REM ***** TD$     - Test date                       *****
290 REM ***** TN$     - Test number                     *****
300 REM ***** VTS     - Volatiles                       *****
310 REM *****          COMPRESSABILITY FACTORS          *****
320 REM *****          COMPR(x,0) = TEST PRESSURE eg. 0.25 (MPa) *****
330 REM *****          COMPR(x,1) = FACTOR AT 10 C      *****
340 REM *****          COMPR(x,2) = FACTOR AT 20 C      *****
350 REM *****          COMPR(x,3) = FACTOR AT 30 C      *****
360 DIM COMPR(13,3)
370 COMPR(1,1)=1.0085:   COMPR(1,2)=1.00774:   COMPR(1,3)=1.00709
380 COMPR(2,1)=1.01494:   COMPR(2,2)=1.01354:   COMPR(2,3)=1.01217
390 COMPR(3,1)=1.02173:   COMPR(3,2)=1.01929:   COMPR(3,3)=1.01748
400 COMPR(4,1)=1.02907:   COMPR(4,2)=1.02547:   COMPR(4,3)=1.02306
410 COMPR(5,1)=1.04124:   COMPR(5,2)=1.03692:   COMPR(5,3)=1.0329
420 COMPR(6,1)=1.05555:   COMPR(6,2)=1.04958:   COMPR(6,3)=1.0442
430 COMPR(7,1)=1.06978:   COMPR(7,2)=1.0616:   COMPR(7,3)=1.05502
440 COMPR(8,1)=1.0827:   COMPR(8,2)=1.07386:   COMPR(8,3)=1.06598
450 COMPR(9,1)=1.09805:   COMPR(9,2)=1.08585:   COMPR(9,3)=1.07552
460 COMPR(10,1)=1.1122:   COMPR(10,2)=1.09897:   COMPR(10,3)=1.08795
470 COMPR(11,1)=1.17104:   COMPR(11,2)=1.15323:   COMPR(11,3)=1.13176
480 COMPR(12,1)=1.22999:   COMPR(12,2)=1.19881:   COMPR(12,3)=1.17433
490 COMPR(13,1)=1.28558:   COMPR(13,2)=1.24523:   COMPR(13,3)=1.2134
500 COMPR(1,0) = .25
510 COMPR(2,0) = .5
520 COMPR(3,0) = .75
530 COMPR(4,0) = 1
540 COMPR(5,0) = 1.5
550 COMPR(6,0) = 2
560 COMPR(7,0) = 2.5
570 COMPR(8,0) = 3
580 COMPR(9,0) = 3.5
590 COMPR(10,0) = 4
600 COMPR(11,0) = 6
610 COMPR(12,0) = 8
620 COMPR(13,0) = 10
630 COLOR 2
640 REM *****          SET UP MASK FOR FIRST SCREEN          *****
650 LOCATE 1,30 :PRINT"SORPTION PROGRAM"
660 LOCATE 7,30 :PRINT"-----"

```

```

670 LOCATE 4,2:PRINT "1. COLLIERY CODE:"
680 LOCATE 4,31:PRINT "2. NAME:"
690 LOCATE 5,2:PRINT "3. SAMPLE NO.:"
700 LOCATE 6,2:PRINT "4. SAMPLE DATE:"
710 LOCATE 7,2:PRINT "5. SECTION REF.:"
720 LOCATE 7,31:PRINT "6. AREA:"
730 LOCATE 9,2:PRINT "7. SURFACE ELEVATION:"
740 LOCATE 9,37:PRINT "m 8. OVERBURDEN:"
750 LOCATE 9,68:PRINT "m"
760 LOCATE 10,2:PRINT "9. COAL SEAM:"
770 LOCATE 10,40:PRINT "10. MINING HEIGHT:"
780 LOCATE 10,68:PRINT "m"
790 LOCATE 12,1:PRINT "11. RANK:"
800 LOCATE 12,40:PRINT "12. H.G.I.:"
810 LOCATE 13,1:PRINT "13. FIXED CARBON:"
820 LOCATE 13,37:PRINT "%"
830 LOCATE 14,1:PRINT "14. VOLATILES:"
840 LOCATE 14,37:PRINT "% 17.          GAS PRESSURE:"
850 LOCATE 14,75:PRINT "MPa"
860 LOCATE 15,1:PRINT "15. ASH:"
870 LOCATE 15,37:PRINT "% 18.          GAS TEMP.:"
880 LOCATE 15,75:PRINT "C"
890 LOCATE 16,1:PRINT "16. MOISTURE:"
900 LOCATE 16,37:PRINT "% 19. DRY BULB TEMP.:"
910 LOCATE 16,75:PRINT "C"
920 LOCATE 17,21:PRINT "TOTAL:"
930 LOCATE 17,37:PRINT "%"
940 COLOR 4
950 LOCATE 24,1:PRINT "MESSAGE:";
960 REM ***** OPERATOR TO ENTER 1 IF A NEW SET OF DATA IS TO BE SUPPLIED *****
970 REM *****      & 2 IF EXISTING DATA NEEDS TO BE UPDATED *****
980 CNT% = 0
990 COLOR 28
1000 LOCATE 24,10:INPUT;"ENTER 1 FOR FIRST ENTRY, 2 FOR UPDATE: ",INPT$
1010 IF INPT$ = "1" GOTO 1070
1020 IF INPT$ = "2" THEN COLOR 11: GOTO 10100
1030 GOTO 1000
1040 REM ***** THE CNT% VARIABLE IS USED TO DETERMINE WHETHER THE DATA *****
1050 REM ***** SUPPLIED IS A CHANGE TO EXISTING DATA (CNT% = 1) OR NEW *****
1060 REM ***** DATA (CNT% = 0) *****
1070 REM ***** INPUT DATA ON FIRST SCREEN *****
1080 COLOR 11
1090 GOSUB 11820
1100 LOCATE 4,20:PRINT "          "
1110 LOCATE 4,20:INPUT " ",FIL$
1120 IF LEN(FIL$) > 0 AND LEN(FIL$) < 8 GOTO 1160
1130 GOSUB 11820
1140 LOCATE 24,10:PRINT "COLLIERY CODE TOO LONG (MAX=7 CHARS)";
1150 GOTO 1100
1160 IF CNT% <> 0 GOTO 7320
1170 LOCATE 4,40:PRINT "          "
1180 LOCATE 4,40:INPUT " ",COLL$
1190 IF CNT% <> 0 GOTO 7320
1200 LOCATE 5,20:PRINT "          "
1210 LOCATE 5,20:INPUT " ",Z$
1220 GOSUB 4960
1230 SN$ = Z$
1240 IF ERR$ = "*" GOTO 1310
1250 SN% = VAL(Z$)
1260 IF SN% >= 0 AND SN% <= 9999 GOTO 1300
1270 GOSUB 11820
1280 LOCATE 24,10:PRINT "INVALID SAMPLE NUMBER (MIN=0,MAX=9999)";
1290 GOTO 1200
1300 LOCATE 5,20:PRINT USING "####";SN%
1310 IF CNT% <> 0 GOTO 7320
1320 LOCATE 6,20:PRINT "          "

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1330 LOCATE 6,20:INPUT " ",Z$
1340 IF CNT% <> 0 GOTO 7320
1350 LOCATE 7,19:PRINT " "
1360 LOCATE 7,20:INPUT " ",Z$
1370 GOSUB 4960
1380 SECT% = Z$
1390 IF ERRS% = "*" GOTO 1460
1400 SECT% = VAL(Z$)
1410 IF SECT% >= 0 AND SECT% <= 9999 GOTO 1450
1420 GOSUB 11820
1430 LOCATE 24,10:PRINT "INVALID SECTION NUMBER (MIN=0,MAX=9999)";
1440 GOTO 1350
1450 LOCATE 7,20:PRINT USING "####";SECT%
1460 IF CNT% <> 0 GOTO 7320
1470 LOCATE 7,40:PRINT " "
1480 LOCATE 7,40:INPUT " ",AR$
1490 IF CNT% <> 0 GOTO 7320
1500 LOCATE 9,30:PRINT " "
1510 LOCATE 9,30:INPUT " ",Z$
1520 GOSUB 4960
1530 SE% = Z$
1540 IF ERRS% = "*" GOTO 1610
1550 SE = VAL(Z$)
1560 IF SE >= 0 AND SE <= 9999.99 GOTO 1600
1570 GOSUB 11820
1580 LOCATE 24,10:PRINT "INVALID SURFACE ELEVATION (MIN=0,MAX=9999.9)";
1590 GOTO 1500
1600 LOCATE 9,29:PRINT USING "####.##";SE
1610 IF CNT% <> 0 GOTO 7320
1620 LOCATE 9,60:PRINT " "
1630 LOCATE 9,61:INPUT " ",Z$
1640 GOSUB 4960
1650 OB% = Z$: OB = 0
1660 IF ERRS% = "*" GOTO 1730
1670 OB = VAL(Z$)
1680 IF OB >= 0 AND OB <= 9999.99 GOTO 1720
1690 GOSUB 11820
1700 LOCATE 24,10:PRINT "INVALID OVERBURDEN (MIN=0,MAX=9999.9)";
1710 GOTO 1620
1720 LOCATE 9,60:PRINT USING "####.##";OB
1730 IF CNT% <> 0 GOTO 7320
1740 LOCATE 10,16:PRINT " "
1750 LOCATE 10,16:INPUT " ",CS$
1760 IF CNT% <> 0 GOTO 7320
1770 LOCATE 10,61:PRINT " "
1780 LOCATE 10,61:INPUT " ",Z$
1790 GOSUB 4960
1800 MH% = Z$
1810 IF ERRS% = "*" GOTO 1880
1820 MH = VAL(Z$)
1830 IF MH >= 0 AND MH <= 999.99 GOTO 1870
1840 GOSUB 11820
1850 LOCATE 24,10:PRINT "INVALID MINING HEIGHT (MIN=0,MAX=999.99)";
1860 GOTO 1770
1870 LOCATE 10,61:PRINT USING "####.##";MH
1880 IF CNT% <> 0 GOTO 7320
1890 LOCATE 24,10:INPUT "HAS PROXIMATE ANALYSIS BEEN DONE (Y/N)?",ANSWER$
1900 IF ANSWER$="N" OR ANSWER$="n" GOTO 2600
1910 LOCATE 12,16:PRINT " "
1920 LOCATE 12,16:INPUT " ",R$
1930 IF CNT% <> 0 GOTO 7320
1940 LOCATE 12,61:PRINT " "
1950 LOCATE 12,61:INPUT " ",Z$
1960 GOSUB 4960
1970 HGI% = Z$
1980 IF ERRS% = "*" GOTO 2050

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1990 HGI = VAL(Z#)
2000 IF HGI >= 0 AND HGI <= 999.99 GOTO 2040
2010 GOSUB 11820
2020 LOCATE 24,10:PRINT "INVALID H.G.I. (MIN=0,MAX=999.99)";
2030 GOTO 1940
2040 LOCATE 12,61:PRINT USING "###.##";HGI
2050 IF CNT% <> 0 GOTO 7320
2060 LOCATE 13,30:PRINT "      "
2070 LOCATE 13,30:INPUT "",Z#
2080 GOSUB 4830
2090 IF ERRS# = "*" GOTO 2060
2100 FC = VAL(Z#)
2110 IF FC >= 0 AND FC <= 99.99 GOTO 2150
2120 GOSUB 11820
2130 LOCATE 24,10:PRINT "INVALID FIXED CARBON (MIN=0,MAX=99.99)";
2140 GOTO 2060
2150 LOCATE 13,30:PRINT USING "###.##";FC
2160 IF CNT% <> 0 GOTO 7560
2170 LOCATE 14,30:PRINT "      "
2180 LOCATE 14,30:INPUT "",Z#
2190 GOSUB 4830
2200 IF ERRS# = "*" GOTO 2170
2210 VTS = VAL(Z#)
2220 IF VTS >= 0 AND VTS <= 99.99 GOTO 2260
2230 GOSUB 11820
2240 LOCATE 24,10:PRINT "INVALID VOLATILES (MIN=0,MAX=99.99)";
2250 GOTO 2170
2260 LOCATE 14,30:PRINT USING "###.##";VTS
2270 IF CNT% <> 0 GOTO 7560
2280 LOCATE 15,30:PRINT "      "
2290 LOCATE 15,30:INPUT "",Z#
2300 GOSUB 4830
2310 IF ERRS# = "*" GOTO 2280
2320 ASH = VAL(Z#)
2330 IF ASH >= 0 AND ASH <= 99.99 GOTO 2370
2340 GOSUB 11820
2350 LOCATE 24,10:PRINT "INVALID ASH (MIN=0,MAX=99.99)";
2360 GOTO 2280
2370 LOCATE 15,30:PRINT USING "###.##";ASH
2380 IF CNT% <> 0 GOTO 7560
2390 LOCATE 16,30:PRINT "      "
2400 LOCATE 16,30:INPUT "",Z#
2410 GOSUB 4830
2420 IF ERRS# = "*" GOTO 2390
2430 MST = VAL(Z#)
2440 IF MST >= 0 AND MST <= 99.99 GOTO 2480
2450 GOSUB 11820
2460 LOCATE 24,10:PRINT "INVALID MOISTURE (MIN=0,MAX=99.99)";
2470 GOTO 2390
2480 LOCATE 16,30:PRINT USING "###.##";MST
2490 IF CNT% <> 0 GOTO 7560
2500 N = FC + VTS + ASH + MST
2510 I% = CINT(N)
2520 LOCATE 17,30:PRINT USING "###.##";N
2530 IF I% = 100 GOTO 2590
2540 GOSUB 11820
2550 LOCATE 24,10:PRINT "FIXED CARBON + VOLATILES + ASH + MOISTURE MUST = 100";
2560 LOCATE 22,10:INPUT "PRESS RETURN WHEN READY TO CORRECT",Z#
2570 LOCATE 22,10:PRINT "      "
2580 GOTO 2060
2590 GOSUB 11820
2600 LOCATE 24,10:INPUT "IS GAS PRESSURE MEASURED OR APPROXIMATED? (M/A) ",MAP#
2610 IF MAP# = "m" OR MAP# = "M" OR MAP# = "a" OR MAP# = "A" GOTO 2630
2620 GOTO 2600
2630 LOCATE 14,44
2640 IF MAP# = "m" OR MAP# = "M" THEN PRINT "MEASURED" ELSE PRINT " APPROX."

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2650 IF MAP$ = "a" OR MAP$ = "A" GOTO 2790
2660 LOCATE 14,68:PRINT " "
2670 LOCATE 14,68:INPUT "",Z$
2680 GOSUB 4960
2690 MP$ = Z$
2700 IF ERR$ = "" GOTO 2770
2710 MP = VAL(Z$)
2720 IF MP >= 0 AND MP <= 99.99 GOTO 2760
2730 GOSUB 11820
2740 LOCATE 24,10:PRINT "INVALID MEASURED GAS PRESSURE (MIN=0,MAX=99.99)";
2750 GOTO 2590
2760 LOCATE 14,68:PRINT USING "###.##";MP
2770 IF CNTX <> 0 GOTO 7320
2780 GOTO 2830
2790 AP = QB * .101972 * .067
2800 AP$ = STR$(AP)
2810 LOCATE 14,68:PRINT USING "###.##";AP
2820 IF CNTX <> 0 GOTO 7320
2830 GOSUB 11820
2840 LOCATE 24,10:INPUT;"IS GAS TEMPERATURE MEASURED OR APPROXIMATED? (M/A) ",MA
T$
2850 IF MAT$ = "m" OR MAT$ = "M" OR MAT$ = "a" OR MAT$ = "A" GOTO 2870
2860 GOTO 2840
2870 LOCATE 15,44
2880 IF MAT$ = "a" OR MAT$ = "M" THEN PRINT "MEASURED" ELSE PRINT " APPROX."
2890 IF MAT$ = "a" OR MAT$ = "A" GOTO 3030
2900 LOCATE 15,68:PRINT " "
2910 LOCATE 15,68:INPUT "",Z$
2920 GOSUB 4960
2930 MT$ = Z$
2940 IF ERR$ = "" GOTO 3010
2950 MT = VAL(Z$)
2960 IF MT >= 0 AND MT <= 999.99 GOTO 3000
2970 GOSUB 11820
2980 LOCATE 24,10:PRINT "INVALID MEASURED GAS TEMPERATURE (MIN=0,MAX=999.99)";
2990 GOTO 2830
3000 LOCATE 15,68:PRINT USING "###.##";MT
3010 IF CNTX <> 0 GOTO 7320
3020 GOTO 3150
3030 LOCATE 15,68:PRINT " "
3040 LOCATE 15,68:INPUT "",Z$
3050 GOSUB 4830
3060 AT$ = Z$
3070 IF ERR$ = "" GOTO 3140
3080 AT = VAL(Z$)
3090 IF AT >= 0 AND AT <= 999.99 GOTO 3130
3100 GOSUB 11820
3110 LOCATE 24,10:PRINT "INVALID APPROX. GAS TEMPERATURE (MIN=0,MAX=999.99)";
3120 GOTO 3030
3130 LOCATE 15,68:PRINT USING "###.##";AT
3140 IF CNTX <> 0 GOTO 7320
3150 LOCATE 16,68:PRINT " "
3160 LOCATE 16,68:INPUT "",TDB$
3170 IF TDB$ >= "0" AND TDB$ <= "99.99" THEN LOCATE 16,68:TDB = VAL(TDB$):PRINT
USING "###.##";TDB
3180 IF CNTX <> 0 GOTO 7320
3190 GOSUB 11820
3200 LOCATE 24,10:INPUT;"DO YOU WISH TO ALTER ANY OF THE ABOVE? (Y/N) ",Z$
3210 IF Z$ = "y" OR Z$ = "Y" THEN CNTX = 1: GOTO 7320
3220 IF Z$ = "n" OR Z$ = "N" THEN CNTX = 0: GOTO 3240
3230 GOTO 3190
3240 REM ***** INPUT FOR SECOND,THIRD & FOURTH SCREENS *****
3250 DIM K1(3)
3260 DIM K2(3)
3270 DIM K1DS(3)
3280 DIM K2DS(3)

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3290 DIM VCH4(3,15), VHE(3,15), VHEEQ(3,15)
3300 REM ***** IF INPT# = 2 THEN THESE DIM'S WERE INITIALISED AS PART OF *****
3310 REM ***** THE RETRIEVE PROCESS WHEN THE EXISTING DATA WAS READ IN *****
3320 IF INPT# = "1" THEN DIM VALS#(3,15,15), TN%(3), TD%(3), M(3), NP%(3), NK%(3)
    ), TX(3), TN*(3), M*(3)
3330 FOR ZX = 1 TO 3
3340 TX(0) = ZX * 10
3350 REM ***** SET UP MASKS FOR SECOND, THIRD & FOURTH SCREENS *****
3360 CLS
3370 COLOR 2
3380 LOCATE 1,2:PRINT " COLLIERY CODE: " FIL#
3390 LOCATE 1,31:PRINT " NAME: " COLL#
3400 LOCATE 2,1:PRINT "20. TEST NUMBER:"
3410 LOCATE 2,40:PRINT "21. TEST DATE:"
3420 LOCATE 3,2:PRINT " TEST TEMPERATURE: C"
3430 LOCATE 3,40:PRINT "22. SAMPLE MASS: g"
3440 LOCATE 4,6:PRINT "TEST BAROMETRIC VOLUME WATER VOLUM
E WATER"
3450 LOCATE 5,4:PRINT "PRESSURE PRESSURE METHANE TEMP. HEL
IUM TEMP."
3460 LOCATE 6,16:PRINT "METH He"
3470 LOCATE 7,5:PRINT "(MPa) (KPa) (KPa) (cc) (C) (cc)
) (C)"
3480 LOCATE 8,2:PRINT "1."
3490 LOCATE 9,2:PRINT "2."
3500 LOCATE 10,2:PRINT "3."
3510 LOCATE 11,2:PRINT "4."
3520 LOCATE 12,2:PRINT "5."
3530 LOCATE 13,2:PRINT "6."
3540 LOCATE 14,2:PRINT "7."
3550 LOCATE 15,2:PRINT "8."
3560 LOCATE 16,2:PRINT "9."
3570 LOCATE 17,2:PRINT "10."
3580 LOCATE 18,2:PRINT "11."
3590 LOCATE 19,2:PRINT "12."
3600 LOCATE 20,2:PRINT "13."
3610 LOCATE 21,2:PRINT "14."
3620 LOCATE 22,2:PRINT "15."
3630 LOCATE 23,6:PRINT "(Q.) (R.) (S.) (T.) (U.) (V.
) (W.)"
3640 COLOR 4
3650 LOCATE 24,1:PRINT "MESSAGE:";
3660 CNTX = 0
3670 COLOR 11
3680 GOSUB 11820
3690 LOCATE 3,30:PRINT "" TX(0)
3700 IF INPT# = "2" THEN GOSUB 5030: GOTO 4770
3710 LOCATE 24,10:INPUT;"ARE THERE ANY TESTS FOR TEST TEMPERATURE ABOVE? (Y/N) "
,Z#
3720 IF Z# = "N" OR Z# = "n" THEN TX(ZX) = 1: GOTO 7260
3730 IF Z# = "Y" OR Z# = "y" THEN TX(ZX) = 0: GOTO 3750
3740 GOTO 3710
3750 LOCATE 2,29:PRINT " "
3760 LOCATE 2,29:INPUT "" ,Z#
3770 GOSUB 4960
3780 TN*(ZX) = Z#
3790 IF ERRS# = "*" GOTO 3860
3800 TN%(ZX) = VAL(Z#)
3810 IF TN%(ZX) >= 0 AND TN%(ZX) <= 9999 GOTO 3850
3820 GOSUB 11820
3830 LOCATE 24,10:PRINT "INVALID TEST NUMBER (MIN=0,MAX=9999)";
3840 GOTO 3750
3850 LOCATE 2,29:PRINT USING "####";TN%(ZX)
3860 IF CNTX <> 0 GOTO 7660
3870 LOCATE 2,65:PRINT " "
3880 LOCATE 2,65:INPUT "" ,TD*(ZX)

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3690 IF CNTX <> 0 GOTO 7660
3900 LOCATE 3,66:PRINT " "
3910 LOCATE 3,66:INPUT "",Z$
3920 GOSUB 4830
3930 M$(Z%) = Z$
3940 IF ERRS$ = "*" GOTO 4010
3950 M(Z%) = VAL(Z$)
3960 IF M(Z%) >= 0 AND M(Z%) <= 9999.99 GOTO 4000
3970 GOSUB 11820
3980 LOCATE 24,10:PRINT "INVALID SAMPLE MASS (MIN=0,MAX=9999.99)";
3990 GOTO 3900
4000 LOCATE 3,66:PRINT USING "####.##";M(Z%)
4010 IF CNTX <> 0 GOTO 7660
4020 GOSUB 11820
4030 LOCATE 24,10:INPUT;"INPUT NO. OF PRESSURES (MIN=0,MAX=15) ",Z$
4040 GOSUB 4830
4050 IF ERRS$ = "*" GOTO 4020
4060 NP$(Z%) = VAL(Z$)
4070 TX(Z%) = NP$(Z%)
4080 IF NP$(Z%) >= 0 AND NP$(Z%) <= 15 GOTO 4100
4090 GOTO 4020
4100 IX = 1
4110 FOR Y% = IX TO NP$(Z%)
4120 LOCATE Y% + 7,5:PRINT " "
4130 LOCATE Y% + 7,5:INPUT "",Z$
4140 GOSUB 4830
4150 IF ERRS$ = "*" GOTO 4120
4160 VALS$(Z%,Y%,1) = VAL(Z$)
4170 IF VALS$(Z%,Y%,1) >= 0 AND VALS$(Z%,Y%,1) <= 999.99 GOTO 4190
4180 GOTO 4120
4190 ERRS$ = "*"
4200 FOR X% = 1 TO 13
4210 IF COMPR(X%,0) >= (VALS$(Z%,Y%,1) * .9) AND COMPR(X%,0) <= (VALS$(Z%,Y%,1)
* 1.1) THEN X% = 13: ERRS$ = "@"
4220 NEXT X%
4230 IF ERRS$ = "@" GOTO 4270
4240 GOSUB 11820
4250 LOCATE 24,10:PRINT "NO COMPRESSABILITY FACTOR FOR ABOVE TEST PRESSURE";
4260 GOTO 4120
4270 LOCATE Y% + 7,5:PRINT USING "###.##";VALS$(Z%,Y%,1)
4280 LOCATE Y% + 7,15:PRINT " "
4290 LOCATE Y% + 7,15:INPUT "",Z$
4300 GOSUB 4830
4310 IF ERRS$ = "*" GOTO 4280
4320 VALS$(Z%,Y%,2) = VAL(Z$)
4330 IF VALS$(Z%,Y%,2) >= 0 AND VALS$(Z%,Y%,2) <= 999.99 GOTO 4350
4340 GOTO 4280
4350 LOCATE Y% + 7,15:PRINT USING "###.##";VALS$(Z%,Y%,2)
4360 LOCATE Y% + 7,23:PRINT " "
4370 LOCATE Y% + 7,23:INPUT "",Z$
4380 GOSUB 4830
4390 IF ERRS$ = "*" GOTO 4360
4400 VALS$(Z%,Y%,3) = VAL(Z$)
4410 IF VALS$(Z%,Y%,3) >= 0 AND VALS$(Z%,Y%,3) <= 999.99 GOTO 4430
4420 GOTO 4360
4430 LOCATE Y% + 7,23:PRINT USING "###.##";VALS$(Z%,Y%,3)
4440 LOCATE Y% + 7,35:PRINT " "
4450 LOCATE Y% + 7,35:INPUT "",Z$
4460 GOSUB 4830
4470 IF ERRS$ = "*" GOTO 4440
4480 VALS$(Z%,Y%,4) = VAL(Z$)
4490 IF VALS$(Z%,Y%,4) >= 0 AND VALS$(Z%,Y%,4) <= 9999.99 GOTO 4510
4500 GOTO 4440
4510 LOCATE Y% + 7,35:PRINT USING "#####";VALS$(Z%,Y%,4)
4520 LOCATE Y% + 7,46:PRINT " "
4530 LOCATE Y% + 7,46:INPUT "",Z$

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4540 GOSUB 4830
4550 IF ERRS# = "*" GOTO 4520
4560 VALS#(Z%,Y%,5) = VAL(Z%)
4570 IF VALS#(Z%,Y%,5) >= 0 AND VALS#(Z%,Y%,5) <= 999.99 GOTO 4590
4580 GOTO 4520
4590 LOCATE Y% + 7,46:PRINT USING "###.##";VALS#(Z%,Y%,5)
4600 LOCATE Y% + 7,58:PRINT " "
4610 LOCATE Y% + 7,58:INPUT "",Z%
4620 GOSUB 4830
4630 IF ERRS# = "*" GOTO 4600
4640 VALS#(Z%,Y%,6) = VAL(Z%)
4650 IF VALS#(Z%,Y%,6) >= 0 AND VALS#(Z%,Y%,6) <= 99999! GOTO 4670
4660 GOTO 4600
4670 LOCATE Y% + 7,58:PRINT USING "###.###";VALS#(Z%,Y%,6)
4680 LOCATE Y% + 7,69:PRINT " "
4690 LOCATE Y% + 7,69:INPUT "",Z%
4700 GOSUB 4830
4710 IF ERRS# = "*" GOTO 4680
4720 VALS#(Z%,Y%,7) = VAL(Z%)
4730 IF VALS#(Z%,Y%,7) >= 0 AND VALS#(Z%,Y%,7) <= 999.99 GOTO 4750
4740 GOTO 4680
4750 LOCATE Y% + 7,69:PRINT USING "###.###";VALS#(Z%,Y%,7)
4760 NEXT Y%
4770 GOSUB 11820
4790 GOTO 6610
4790 LOCATE 24,10:INPUT;"DO YOU WISH TO ALTER ANY OF THE ABOVE? (Y/N) ",Z%
4800 IF Z% = "n" OR Z% = "N" THEN CNT% = 0: GOTO 5430
4810 IF Z% = "y" OR Z% = "Y" THEN CNT% = 1: GOTO 7660
4830 GOTO 4790
4830 REM ***** ROUTINE TO CHECK DATA FOR NUMERICS *****
4840 REM ***** ERRS# = "@" INDICATES NO ERROR FOUND *****
4850 REM ***** ERRS# = "*" INDICATES AN ERROR EXISTS *****
4860 ERRS# = "g"
4870 FOR X% = 1 TO 6
4880 IF MID$(Z%,X%,1) = "." GOTO 4910
4890 IF MID$(Z%,X%,1) = "" OR MID$(Z%,X%,1) = " " OR (MID$(Z%,X%,1) >= "0" AND MID$(Z%,X%,1) <= "9") GOTO 4910
4900 ERRS# = "*"
4910 NEXT X%
4920 IF ERRS# = "@" GOTO 4950
4930 GOSUB 11820
4940 LOCATE 24,10:PRINT "NON-NUMERIC DATA : RE-INPUT DATA";
4950 RETURN
4960 ERRS# = "@"
4970 FOR X% = 1 TO 20
4980 IF MID$(Z%,X%,1) = "." GOTO 5010
4990 IF MID$(Z%,X%,1) = "" OR MID$(Z%,X%,1) = " " OR (MID$(Z%,X%,1) >= "0" AND MID$(Z%,X%,1) <= "9") GOTO 5010
5000 ERRS# = "*"
5010 NEXT X%
5020 RETURN
5030 REM ***** ROUTINE TO DISPLAY DATA TO SCREEN FOR 2nd, 3rd, 4th SCREENS *****
5040 LOCATE 3,66
5050 Z% = M$(Z%)
5060 GOSUB 4960
5070 IF ERRS# = "*" GOTO 5110
5080 M(Z%) = VAL(M$(Z%))
5090 PRINT USING "###.###";M(Z%)
5100 GOTO 5120
5110 PRINT "" M$(Z%)
5120 T%(0) = Z% * 10
5130 LOCATE 3,30:PRINT "" T%(0)
5140 LOCATE 2,29
5150 Z% = T%(Z%)
5160 GOSUB 4960
5170 IF ERRS# = "*" GOTO 5210

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5180 TN%(Z%) = VAL(TN%(Z%))
5190 PRINT USING "####"; TN%(Z%)
5200 GOTO 5220
5210 PRINT "" TN%(Z%)
5220 LOCATE 2,66: PRINT "" TD%(Z%)
5230 LOCATE 1,20: PRINT "" FIL#
5240 LOCATE 1,40: PRINT "" COLL#
5250 FOR IX = 1 TO NP%(Z%)
5260 FOR JX = 1 TO 7
5270 IF JX = 1 THEN LX = 5
5280 IF JX = 2 THEN LX = 15
5290 IF JX = 3 THEN LX = 23
5300 IF JX = 4 THEN LX = 35
5310 IF JX = 5 THEN LX = 46
5320 IF JX = 6 THEN LX = 58
5330 IF JX = 7 THEN LX = 69
5340 LOCATE IX + 7,LX
5350 IF JX = 4 OR JX = 6 GOTO 5380
5360 PRINT USING "###.###"; VALS%(Z%,IX,JX)
5370 GOTO 5390
5380 PRINT USING "#####"; VALS%(Z%,IX,JX)
5390 NEXT JX
5400 NEXT IX
5410 RETURN
5420 REM ***** CALCULATION ROUTINES *****
5430 GOSUB 11820
5440 LOCATE 24,10:PRINT "PLEASE BE PATIENT - CALCULATING RESULTS";
5450 FOR Y% = 1 TO NP%(Z%)
5460 IF VALS%(Z%,Y%,5) = -273 THEN VCH4%(Z%,Y%) = 0: GOTO 5480
5470 VCH4%(Z%,Y%) = VALS%(Z%,Y%,4) * (T%(0) + 273) / (VALS%(Z%,Y%,5) + 273)
5480 IF VALS%(Z%,Y%,7) = -273 THEN VHE%(Z%,Y%) = 0: GOTO 5510
5490 VHE%(Z%,Y%) = VALS%(Z%,Y%,6) * (T%(0) + 273) / (VALS%(Z%,Y%,7) + 273)
5500 GOSUB 7100
5510 IF VALS%(Z%,Y%,2) = 0 OR COMPR(L%,Z%) = 0 THEN VHEEQ%(Z%,Y%) = 0: GOTO 5530
5520 VHEEQ%(Z%,Y%) = VHE%(Z%,Y%) * VALS%(Z%,Y%,3) / VALS%(Z%,Y%,2) * COMPR(L%,Z%)
5530 IF M(Z%) = 0 THEN VALS%(Z%,Y%,8) = 0: GOTO 5550
5540 VALS%(Z%,Y%,8) = (VCH4%(Z%,Y%) - VHEEQ%(Z%,Y%)) / M(Z%)
5550 IF (100 - MST - ASH) = 0 OR T(0) = -273 THEN VALS%(Z%,Y%,12) = 0: GOTO 5570
5560 VALS%(Z%,Y%,12) = VALS%(Z%,Y%,8) * VALS%(Z%,Y%,2) / 101.3 * 273 / (T(0) + 273) * 136.9863014# / (100 - MST - ASH)
5570 NEXT Y%
5580 A# = 0: B# = 0: C# = 0: D# = 0: E# = 0: F# = 0: G# = 0: H# = 0
5590 FOR Y% = 1 TO NP%(Z%)
5600 IF VALS%(Z%,Y%,1) > 4 GOTO 5750
5610 NK%(Z%) = NK%(Z%) + 1
5620 U# = VALS%(Z%,Y%,1) + .0825#
5630 IF VALS%(Z%,Y%,8) = 0 THEN V# = 0: GOTO 5650
5640 V# = (VALS%(Z%,Y%,1) + .0825#) / VALS%(Z%,Y%,8)
5650 IF VALS%(Z%,Y%,12) = 0 THEN VDS# = 0: GOTO 5670
5660 VDS# = (VALS%(Z%,Y%,1) + .0825#) / VALS%(Z%,Y%,12)
5670 A# = A# + U#
5680 B# = B# + U# ^ 2
5690 C# = C# + V#
5700 D# = D# + V# ^ 2
5710 E# = E# + U# * V#
5720 F# = F# + VDS#
5730 G# = G# + VDS# ^ 2
5740 H# = H# + U# * VDS#
5750 NEXT Y%
5760 IF NK%(Z%) = 0 GOTO 6140
5770 X# = ABS((B# - A# ^ 2 / NK%(Z%)) * (D# - C# ^ 2 / NK%(Z%)))
5780 IF X# = 0 THEN R#(Z%) = 0: GOTO 5800
5790 R#(Z%) = (E# - A# * C# / NK%(Z%)) / SQR(X#)

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5800 IF (B# - A# ^ 2) = 0 THEN J# = 0: GOTO 5820
5810 J# = (E# - A# * C# / NK%(Z%)) / (B# - A# ^ 2 / NK%(Z%))
5820 IF (G# - F# ^ 2) = 0 THEN S# = 0: GOTO 5840
5830 S# = ABS((B# - A# ^ 2 / NK%(Z%)) * (G# - F# ^ 2 / NK%(Z%)))
5840 IF S# = 0 THEN RDS#(Z%) = 0: GOTO 5860
5850 RDS#(Z%) = (H# - A# * F# / NK%(Z%)) / SQR(S#)
5860 IF (B# - A# ^ 2) = 0 THEN JDS# = 0: GOTO 5880
5870 JDS# = (H# - A# * F# / NK%(Z%)) / (B# - A# ^ 2 / NK%(Z%))
5880 IF J# = 0 THEN K1(Z%) = 0: GOTO 5900
5890 K1(Z%) = 1 / J#
5900 IF (A# ^ 2 - (B# * NK%(Z%))) = 0 THEN L# = 0: GOTO 5920
5910 L# = ((A# * E#) - (C# * B#)) / (A# ^ 2 - (B# * NK%(Z%)))
5920 IF L# = 0 THEN K2(Z%) = 0: GOTO 5940
5930 K2(Z%) = J# / L#
5940 IF JDS# = 0 THEN K1DS(Z%) = 0: GOTO 5960
5950 K1DS(Z%) = 1 / J#
5960 IF (A# ^ 2 - (B# * NK%(Z%))) = 0 THEN LDS# = 0: GOTO 5980
5970 LDS# = ((A# * H#) - (F# * S#)) / (A# ^ 2 - (B# * NK%(Z%)))
5980 IF LDS# = 0 THEN K2DS(Z%) = 0: GOTO 6000
5990 K2DS(Z%) = JDS# / LDS#
6000 FOR Y% = 1 TO NP%(Z%)
6010 IF L# = 0 THEN VALS#(Z%,Y%,9) = 0: GOTO 6030
6020 VALS#(Z%,Y%,9) = VALS#(Z%,Y%,1) / (L# * (1 + J# * (VALS#(Z%,Y%,1) / L#)))
6030 VALS#(Z%,Y%,10) = VALS#(Z%,Y%,8) - VALS#(Z%,Y%,9)
6040 IF VALS#(Z%,Y%,9) = 0 THEN VALS#(Z%,Y%,11) = 0: GOTO 6060
6050 VALS#(Z%,Y%,11) = ABS(VALS#(Z%,Y%,10) / VALS#(Z%,Y%,9) * 100)
6060 IF LDS# = 0 THEN VALS#(Z%,Y%,13) = 0: GOTO 6080
6070 VALS#(Z%,Y%,13) = VALS#(Z%,Y%,1) / (LDS# * (1 + JDS# * VALS#(Z%,Y%,1) / LDS#))
6080 VALS#(Z%,Y%,14) = VALS#(Z%,Y%,12) - VALS#(Z%,Y%,13)
6090 IF VALS#(Z%,Y%,9) = 0 THEN VALS#(Z%,Y%,15) = 0: GOTO 6110
6100 VALS#(Z%,Y%,15) = ABS(VALS#(Z%,Y%,14) / VALS#(Z%,Y%,9) * 100)
6110 NEXT Y%
6120 GOSUB 6280
6130 GOTO 7260
6140 X# = 0
6150 R#(Z%) = 0
6160 J# = 0
6170 S# = 0
6180 RDS#(Z%) = 0
6190 JDS# = 0
6200 K1(Z%) = 0
6210 L# = 0
6220 K2(Z%) = 0
6230 K1DS(Z%) = 0
6240 LDS# = 0
6250 K2DS(Z%) = 0
6260 GOSUB 6280
6270 GOTO 7260
6280 REM ***** ROUTINE TO DISPLAY TEST RESULTS TO SCREEN *****
6290 CLS
6300 COLOR 4
6310 LOCATE 24,1:PRINT "MESSAGE";
6320 COLOR 2
6330 LOCATE 4,1:PRINT "          MEASURE   CALC.   DIFF   ERROR   MEASURE
CALC.   DIFF   ERROR"
6340 LOCATE 5,1:PRINT " TEST   METHANE  METHANE   METHANE  M
ETHANE
"
6350 LOCATE 6,1:PRINT "PRESSURE
af STP
"
6360 LOCATE 7,1:PRINT "          (m /t)   (m /t)   (m /t)   (%)   (m /t)
(m /t)   (m /t)   (%)"
6370 COLOR 11
6380 FOR Y% = 1 TO NP%(Z%)
6390 LOCATE 7 + Y%,1:PRINT USING "###.###": VALS#(Z%,Y%,1)
6400 LOCATE 7 + Y%,8:PRINT USING "#####.###": VALS#(Z%,Y%,8)

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6410 LOCATE 7 + Y%,18:PRINT USING "#####.##"; VALS#(Z%,Y%,9)
6420 LOCATE 7 + Y%,27:PRINT USING "#####.##"; VALS#(Z%,Y%,10)
6430 LOCATE 7 + Y%,35:PRINT USING "#####.##"; VALS#(Z%,Y%,11)
6440 LOCATE 7 + Y%,44:PRINT USING "#####.##"; VALS#(Z%,Y%,12)
6450 LOCATE 7 + Y%,55:PRINT USING "#####.##"; VALS#(Z%,Y%,13)
6460 LOCATE 7 + Y%,65:PRINT USING "#####.##"; VALS#(Z%,Y%,14)
6470 LOCATE 7 + Y%,74:PRINT USING "#####.##"; VALS#(Z%,Y%,15)
6480 NEXT Y%
6490 LOCATE 1,1:PRINT "LANGMUIR CONSTANT:                K1 =                K
1DS ="
6500 LOCATE 2,1:PRINT "LANGMUIR CONSTANT:                K2 =                K
2DS ="
6510 LOCATE 3,1:PRINT "CORRELATION COEFFICIENT:          =
="
6520 LOCATE 1,39:PRINT USING "###.#####"; K1(Z%)
6530 LOCATE 1,67:PRINT USING "###.#####"; K1DS(Z%)
6540 LOCATE 2,39:PRINT USING "###.#####"; K2(Z%)
6550 LOCATE 2,67:PRINT USING "###.#####"; K2DS(Z%)
6560 LOCATE 3,39:PRINT USING "###.#####"; R#(Z%)
6570 LOCATE 3,67:PRINT USING "###.#####"; RDS#(Z%)
6580 GOSUB 11820
6590 LOCATE 24,10:INPUT;"PRESS RETURN WHEN READY TO CONTINUE ",Z$
6600 RETURN
6610 REM *****      ROUTINE TO ADD/DELETE TEST DETAILS      *****
6620 LOCATE 24,10:INPUT;"DO YOU WISH TO ADD/DELETE/MAINTAIN THE NO. OF RESULTS?
(A/D/M) ",Z$
6630 IF Z$ = "A" OR Z$ = "a" GOTO 6700
6640 IF Z$ = "D" OR Z$ = "d" GOTO 6850
6650 IF Z$ = "M" OR Z$ = "m" THEN GOSUB 11820: GOTO 4790
6660 GOTO 6620
6670 REM *****      ROUTINE TO ADD EXTRA TEST DATA      *****
6680 REM *****      NP%(Z%) HAS TO BE INCREASED TO THE TOTAL NUMBER OF      *****
6690 REM *****      NEW + OLD TEST DATA      *****
6700 GOSUB 11820
6710 LOCATE 24,10:INPUT;"INPUT NO. OF ADDITIONAL PRESSURES REQUIRED ",Z$
6720 GOSUB 4830
6730 IF ERR$ = "*" GOTO 6620
6740 X% = VAL(Z$)
6750 J% = X% + NP%(Z%)
6760 IF J% > 15 GOTO 6700
6770 I% = NP%(Z%) + 1
6780 NP%(Z%) = J%
6790 GOTO 4110
6800 REM ***** ROUTINE TO DELETE A SPECIFIC SET OF TEST DATA BY ZEROISING *****
6810 REM *****      VALS#(X,Y,2-15) & SETTING VALS#(X,Y,1) = 99. *****
6820 REM ***** AT SORT TIME, IMMEDIATELY PRIOR TO SAVING THE DATA TO DISC *****
6830 REM ***** THE VALS#(X,Y,1) = 99 WILL BE PLACED AFTER THE LAST VALID *****
6840 REM *****      DATA AND NOT SAVED TO DISC *****
6850 GOSUB 11820
6860 LOCATE 24,10:INPUT;"SELECTION NO. OR X TO END ",Z$
6870 IF Z$ = "X" OR Z$ = "x" GOTO 7080
6880 IF (Z$ >= "1" AND Z$ <= "9") OR (Z$ >= "10" AND Z$ <= "15") GOTO 6900
6890 GOTO 6850
6900 J% = VAL(Z$)
6910 VALS#(Z%,J%,1) = 99
6920 VALS#(Z%,J%,2) = 0
6930 VALS#(Z%,J%,3) = 0
6940 VALS#(Z%,J%,4) = 0
6950 VALS#(Z%,J%,5) = 0
6960 VALS#(Z%,J%,6) = 0
6970 VALS#(Z%,J%,7) = 0
6980 VALS#(Z%,J%,8) = 0
6990 VALS#(Z%,J%,9) = 0
7000 VALS#(Z%,J%,10) = 0
7010 VALS#(Z%,J%,11) = 0
7020 VALS#(Z%,J%,12) = 0

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7030 VALS#(Z%,J%,13) = 0
7040 VALS#(Z%,J%,14) = 0
7050 VALS#(Z%,J%,15) = 0
7060 LOCATE J% + 7,15:PRINT "
"
7070 GOTO 6850
7080 GOSUB 11820
7090 GOTO 4790
7100 REM ***** ROUTINE TO SELECT THE APPLICABLE COMPRESSABILITY FACTOR *****
7110 IF VALS#(Z%,Y%,1) > .37 AND VALS#(Z%,Y%,1) <= .37 THEN L% = 1:GOTO 7240
7120 IF VALS#(Z%,Y%,1) > .62 AND VALS#(Z%,Y%,1) <= .62 THEN L% = 2:GOTO 7240
7130 IF VALS#(Z%,Y%,1) > .87 AND VALS#(Z%,Y%,1) <= .87 THEN L% = 3:GOTO 7240
7140 IF VALS#(Z%,Y%,1) > 1.37 AND VALS#(Z%,Y%,1) <= 1.37 THEN L% = 4:GOTO 7240
7150 IF VALS#(Z%,Y%,1) > 1.87 AND VALS#(Z%,Y%,1) <= 1.87 THEN L% = 5:GOTO 7240
7160 IF VALS#(Z%,Y%,1) > 2.37 AND VALS#(Z%,Y%,1) <= 2.37 THEN L% = 6:GOTO 7240
7170 IF VALS#(Z%,Y%,1) > 2.87 AND VALS#(Z%,Y%,1) <= 2.87 THEN L% = 7:GOTO 7240
7180 IF VALS#(Z%,Y%,1) > 3.37 AND VALS#(Z%,Y%,1) <= 3.37 THEN L% = 8:GOTO 7240
7190 IF VALS#(Z%,Y%,1) > 3.87 AND VALS#(Z%,Y%,1) <= 3.87 THEN L% = 9:GOTO 7240
7200 IF VALS#(Z%,Y%,1) > 5! AND VALS#(Z%,Y%,1) <= 5! THEN L% = 10:GOTO 7240
7210 IF VALS#(Z%,Y%,1) > 7! AND VALS#(Z%,Y%,1) <= 7! THEN L% = 11:GOTO 7240
7220 IF VALS#(Z%,Y%,1) > 9! AND VALS#(Z%,Y%,1) <= 9! THEN L% = 12:GOTO 7240
7230 IF VALS#(Z%,Y%,1) > 9! THEN L% = 13:GOTO 7240
7240 RETURN
7250 GOSUB 11820
7260 NEXT Z%
7270 GOSUB 11820
7280 LOCATE 24,10:INPUT;"DO YOU WISH TO SAVE THE RESULTS TO DISC? (Y/N) ",Z%
7290 IF Z% = "n" OR Z% = "N" GOTO 8200
7300 IF Z% = "y" OR Z% = "Y" THEN GOSUB 9650: GOTO 8000
7310 GOTO 7280
7320 REM ***** ROUTINE TO CHANGE INPUT ON FIRST SCREEN *****
7330 GOSUB 11820
7340 LOCATE 24,10:INPUT;"INPUT SELECTION NO. OR X TO END: ",Z%
7350 IF Z% = "x" OR Z% = "X" GOTO 3240
7360 IF Z% = "1" GOTO 1100
7370 IF Z% = "2" GOTO 1170
7380 IF Z% = "3" GOTO 1200
7390 IF Z% = "4" GOTO 1320
7400 IF Z% = "5" GOTO 1350
7410 IF Z% = "6" GOTO 1470
7420 IF Z% = "7" GOTO 1500
7430 IF Z% = "8" GOTO 1620
7440 IF Z% = "9" GOTO 1740
7450 IF Z% = "10" GOTO 1770
7460 IF Z% = "11" GOTO 1910
7470 IF Z% = "12" GOTO 1940
7480 IF Z% = "13" GOTO 2060
7490 IF Z% = "14" GOTO 2170
7500 IF Z% = "15" GOTO 2280
7510 IF Z% = "16" GOTO 2390
7520 IF Z% = "17" GOTO 2590
7530 IF Z% = "18" GOTO 2830
7540 IF Z% = "19" GOTO 3150
7550 GOTO 7340
7560 REM ***** TEST THAT FIXED CARBON + VOLATILES + ASH + MOISTURE = 100% *****
7570 N = FC + VTS + ASH + MST
7580 LOCATE 17,30:PRINT USING "###.##";N
7590 I% = CINT(N)
7600 IF I% = 100 GOTO 7320
7610 GOSUB 11820
7620 LOCATE 24,10:PRINT "FIXED CARBON + VOLATILES + ASH + MOISTURE MUST = 100";
7630 LOCATE 22,10:INPUT "PRESS RETURN WHEN READY TO CORRECT",Z%
7640 LOCATE 22,10:PRINT "
"
7650 GOTO 7320
7660 GOSUB 11820
7670 LOCATE 24,10:INPUT;"INPUT SELECTION NO. OR X TO END: ",Z%

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7680 IF Z$ = "X" OR Z$ = "x" GOTO 5430
7690 IF Z$ = "20" GOTO 3750
7700 IF Z$ = "21" GOTO 3870
7710 IF Z$ = "22" GOTO 3900
7720 IF (Z$ > "0" AND Z$ <= "9") OR (Z$ >= "10" AND Z$ < "16") GOTO 7740
7730 GOTO 7660
7740 I% = VAL(Z$)
7750 LOCATE 24,50: INPUT "COLUMN CODE: ", Z$
7760 IF Z$ = "Q" THEN J% = 1: GOTO 7840
7770 IF Z$ = "R" THEN J% = 2: GOTO 7840
7780 IF Z$ = "S" THEN J% = 3: GOTO 7840
7790 IF Z$ = "T" THEN J% = 4: GOTO 7840
7800 IF Z$ = "U" THEN J% = 5: GOTO 7840
7810 IF Z$ = "V" THEN J% = 6: GOTO 7840
7820 IF Z$ = "W" THEN J% = 7: GOTO 7840
7830 GOTO 7750
7840 LOCATE 24,66: INPUT "VALUE: ", Z$
7850 CHNG# = VAL(Z$)
7860 IF J% = 4 OR J% = 6 AND (CHNG# >= 0 AND CHNG# <= 99999) GOTO 7890
7870 IF J% = 1 OR J% = 2 OR J% = 3 OR J% = 5 OR J% = 7 AND (CHNG# >= 0 AND CHNG#
<= 999.99) GOTO 7930
7880 GOTO 7840
7890 IF J% = 4 THEN L% = 35: VALS#(Z%, I%, J%) = CHNG#
7900 IF J% = 6 THEN L% = 58: VALS#(Z%, I%, J%) = CHNG#
7910 LOCATE I% + 7, L%: PRINT USING "#####"; CHNG#
7920 GOTO 7660
7930 IF J% = 1 THEN L% = 5: VALS#(Z%, I%, J%) = CHNG#
7940 IF J% = 2 THEN L% = 15: VALS#(Z%, I%, J%) = CHNG#
7950 IF J% = 3 THEN L% = 23: VALS#(Z%, I%, J%) = CHNG#
7960 IF J% = 5 THEN L% = 46: VALS#(Z%, I%, J%) = CHNG#
7970 IF J% = 7 THEN L% = 69: VALS#(Z%, I%, J%) = CHNG#
7980 LOCATE I% + 7, L%: PRINT USING "###.###"; CHNG#
7990 GOTO 7660
8000 REM *** ROUTINE TO STORE DATA TO DISC FOR STATGRAF PLOTTING PROGRAM ****
8010 CLOSE #1
8020 FILLS# = "A:" + FIL# + ".DAT"
8030 OPEN FILLS# FOR OUTPUT AS #2
8040 DIM Y(101)
8050 DIM Q(101)
8060 DIM QDS(101)
8070 DIM P(101)
8080 DIM PDS(101)
8090 DIM S(101)
8100 DIM SDS(101)
8110 FOR N% = 0 TO 100
8120 Y(N%) = N% * .1
8130 Q(N%) = Y(N%) * K1(1) * K2(1) * (1 / (1 + K2(1) * Y(N%)))
8140 P(N%) = Y(N%) * K1(2) * K2(2) * (1 / (1 + K2(2) * Y(N%)))
8150 S(N%) = Y(N%) * K1(3) * K2(3) * (1 / (1 + K2(3) * Y(N%)))
8160 QDS(N%) = Y(N%) * K1DS(1) * K2DS(1) * (1 / (1 + K2DS(1) * Y(N%)))
8170 PDS(N%) = Y(N%) * K1DS(2) * K2DS(2) * (1 / (1 + K2DS(2) * Y(N%)))
8180 SDS(N%) = Y(N%) * K1DS(3) * K2DS(3) * (1 / (1 + K2DS(3) * Y(N%)))
8190 PRINT #2, USING " ###.###"; Y(N%);
8200 PRINT #2, USING " ###.#####"; Q(N%);
8210 PRINT #2, USING " ###.#####"; P(N%);
8220 PRINT #2, USING " ###.#####"; S(N%);
8230 PRINT #2, USING " ###.#####"; QDS(N%);
8240 PRINT #2, USING " ###.#####"; PDS(N%);
8250 PRINT #2, USING " ###.#####"; SDS(N%);
8260 NEXT N%
8270 CLOSE #2
8280 GOSUB 11820
8290 LOCATE 24,10: INPUT "DO YOU WISH TO PRINT THE INPUT & THE RESULTS? (Y/N) ", Z$
8300 IF Z$ = "Y" OR Z$ = "y" GOTO 8330
8310 IF Z$ = "N" OR Z$ = "n" GOTO 9640

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8320 GOTO 8280
8330 GOSUB 11820
8340 LOCATE 24,10:INPUT;"NO. OF COPIES REQUIRED (MIN=0 MAX=9) ",Z#
8350 IF Z# >= "0" AND Z# <= "9" GOTO 8370
8360 GOTO 8330
8370 J% = VAL(Z#)
8380 LPRINT CHR$(27);"G"
8390 FOR I% = 1 TO J%
8400 LPRINT: LPRINT: LPRINT: LPRINT: LPRINT
8410 LPRINT: LPRINT: LPRINT: LPRINT: LPRINT
8420 LPRINT"          " SPC(10) COLL#" COLLIERY"
8430 QQQQ=LEN(COLL#)+9
8440 LPRINT"          " SPC(10) :LPRIN: STRING$(QQQQ,45)
8450 LPRINT: LPRINT: LPRINT
8460 LPRINT"          COMPUTER REFERENCE: " USING"\          \";FIL#: LPRINT
8470 IF SN% = 0 THEN LPRINT"          SAMPLE NO.:          " SN#: LP
RINT: GOTO 8490
8480 LPRINT"          SAMPLE NO.:          " USING"          #####";SN#: LPRINT

8490 LPRINT"          SAMPLING DATE:          " USING"          \"          \";SD#: LPRIN
T
8500 IF SECT% = 0 THEN LPRINT"          SECTION REFERENCE:          " SECT#:
GOTO 8520
8510 LPRINT"          SECTION REFERENCE: " USING"\          \";SECT#
8520 LPRINT"          AREA:          " USING"\
          \";AR#
8530 LPRINT"          COAL SEAM:          " USING"\
          \";CS#: LPRINT
8540 IF SE = 0 THEN LPRINT"          SURFACE ELEVATION:          " SE#: GO
TO 8560
8550 LPRINT"          SURFACE ELEVATION: " USING"          ##### m";SE
8560 IF OB = 0 THEN LPRINT"          OVERBURDEN:          " OB#: GO
TO 8580
8570 LPRINT"          OVERBURDEN:          " USING"          ##### m";OB
8580 IF MH = 0 THEN LPRINT"          MINING HEIGHT:          " MH#: GO
TO 8600
8590 LPRINT"          MINING HEIGHT:          " USING"          ##### m";MH
8600 LPRINT
8610 LPRINT"          SAMPLE ANALYSES          "
8620 LPRINT"          -----          "
8630 LPRINT
8640 IF ANSWER# = "N" OR ANSWER# = "n" GOTO 8750
8650 LPRINT"          RANK:          " USING"\
          \";R#: LPRINT
8660 IF HGI = 0 THEN LPRINT"          H.G.I.:          " HGI#: G
OTO 8680
8670 LPRINT"          H.G.I.:          " USING"          #####";HGI
8680 LPRINT"          FIXED CARBON:          " USING"          ##### %";FC
8690 LPRINT"          VOLATILES:          " USING"          ##### %";VTS
8700 LPRINT"          ASH:          " USING"          ##### %";ASH
8710 LPRINT"          MOISTURE:          " USING"          ##### %";MST
8720 LPRINT
8730 LPRINT
8740 GOTO 8780
8750 LPRINT"          No proximate analysis has been done."
8760 LPRINT
8770 LPRINT
8780 IF MAP# = "a" OR MAP# = "A" GOTO 8820
8790 IF MP = 0 THEN LPRINT"          MEASURED GAS PRESSURE:          " MP#: GO
TO 8840
8800 LPRINT"          MEASURED GAS PRESSURE: " USING"          ##### MPa";MP
8810 GOTO 8840
8820 IF AP = 0 THEN LPRINT"          APPROXIMATE GAS PRESSURE:          " AP#: GO
TO 8840
8830 LPRINT"          APPROXIMATE GAS PRESSURE: " USING"          ##### MPa";AP
8840 IF MAT# = "a" OR MAT# = "A" GOTO 8880

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8850 IF MT = 0 THEN LPRINT "          MEASURED GAS TEMPERATURE: " MT$: GO
      TO 8900
8860 LPRINT"          MEASURED GAS TEMPERATURE:" USING "    ##.## C";MT
8870 GOTO 8900
8880 IF AT = 0 THEN LPRINT "          APPROXIMATE GAS TEMPERATURE: " AT$: GO
      TO 8900
8890 LPRINT"          APPROXIMATE GAS TEMPERATURE:" USING "    ##.## C";AT
8900 LPRINT"          DRY BULB TEMPERATURE:";
8910 IF TDB$ >= "0" AND TDB$ <= "99.99" GOTO 8940
8920 LPRINT "          " TDB$
8930 GOTO 8960
8940 TDB = VAL(TDB$)
8950 LPRINT USING "          ##.## C";TDB
8960 LPRINT CHR$(12)
8970 FOR ZX = 1 TO 3
8980 IF NP$(ZX) = 0 GOTO 9620
8990 LPRINT
9000 LPRINT"          TEST DETAILS"
9010 LPRINT"          -----"
9020 LPRINT
9030 IF TN$(ZX) = 0 THEN LPRINT "          TEST NUMBER:" USING " \          \";TN$(
      ZX) SPC(1): GOTO 9050
9040 LPRINT"          TEST NUMBER:" USING "          ####";TN$(ZX);
9050 LPRINT"          TEST DATE:" USING "          \          \";TD$(ZX)
9060 TX = ZX * 10
9070 LPRINT"          TEST TEMPERATURE:" USING "    ## C";TX;
9080 IF M(ZX) = 0 THEN LPRINT "          SAMPLE MASS:" USING " \          \";M$
      (ZX): GOTO 9100
9090 LPRINT"          SAMPLE MASS:" USING "          ###.## g";M(ZX)
9100 LPRINT
9110 LPRINT"          TEST          BAROMETRIC          VOLUME          WATER          VOLUME          W
      ATER"
9120 LPRINT"          PRESSURE          PRESSURE          METHANE          TEMP.          HELIUM          T
      EMP."
9130 LPRINT"          METH          He          "
9140 LPRINT"          (MPa)          (KPa)          (KPa)          (cc)          (C)          (cc)
      (C)"
9150 LPRINT
9160 FOR YX = 1 TO NP$(ZX)
9170 LPRINT USING "          ##.##";VAL$(ZX,YX,1);
9180 LPRINT USING "          ###.##";VAL$(ZX,YX,2);
9190 LPRINT USING "          ###.##";VAL$(ZX,YX,3);
9200 LPRINT USING "          ###.##";VAL$(ZX,YX,4);
9210 LPRINT USING "          ###.##";VAL$(ZX,YX,5);
9220 LPRINT USING "          ###.##";VAL$(ZX,YX,6);
9230 LPRINT USING "          ###.##";VAL$(ZX,YX,7)
9240 NEXT YX
9250 LPRINT
9260 LPRINT
9270 LPRINT"          TEST RESULTS "
9280 LPRINT"          ----- "
9290 LPRINT
9300 LPRINT"          MEASURE  CALC.          DIFF  ERROR  MEASURE  CALC.          DIFF  E
      RROR"
9310 LPRINT"          METHANE  METHANE          METHANE  METHANE"
9320 LPRINT"          CONTENT  CONTENT          CONTENT  CONTENT"
9330 LPRINT"          daf STP  daf STP"
9340 LPRINT"          (m /t)  (m /t)  (m /t)  (%)  (m /t)  (m /t)  (m /t)
      (%)"
9350 LPRINT
9360 FOR YX = 1 TO NP$(ZX)
9370 LPRINT USING "          #####.##";VAL$(ZX,YX,8);
9380 LPRINT USING "          #####.##";VAL$(ZX,YX,9);
9390 LPRINT USING "          #####.##";VAL$(ZX,YX,10);
9400 LPRINT USING "          #####.##";VAL$(ZX,YX,11);
9410 LPRINT USING "          #####.##";VAL$(ZX,YX,12);

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9420 LPRINT USING " #####.##"; VALS#(Z%, /%, 13);
9430 LPRINT USING " #####.##"; VALS#(Z%, Y%, 14);
9440 LPRINT USING " #####"; VALS#(Z%, Y%, 15)
9450 NEXT Y%
9460 LPRINT
9470 LPRINT
9480 LPRINT "          Langmuir constant K1   =";
9490 LPRINT USING "###.#####"; K1(Z%)
9500 LPRINT "          Langmuir constant K2   =";
9510 LPRINT USING "###.#####"; K2(Z%)
9520 LPRINT "          Correlation coefficient =";
9530 LPRINT USING "###.#####"; R#(Z%)
9540 LPRINT
9550 LPRINT "          Langmuir constant K1dS =";
9560 LPRINT USING "###.#####"; K1dS(Z%)
9570 LPRINT "          Langmuir constant K2dS =";
9580 LPRINT USING "###.#####"; K2dS(Z%)
9590 LPRINT "          Correlation coefficient =";
9600 LPRINT USING "###.#####"; RdS#(Z%)
9610 LPRINT CHR$(12)
9620 NEXT Z%
9630 NEXT I%
9640 END
9650 REM ***** WRITE DATA TO DISC *****
9660 ON ERROR GOTO 11230
9670 FILLERS# = "A:Z" + FIL#
9680 OPEN FILLERS# FOR OUTPUT AS #1
9690 PRINT #1, COLL#
9700 PRINT #1, SN#
9710 PRINT #1, SD#
9720 PRINT #1, SECT#
9730 PRINT #1, AR#
9740 PRINT #1, CS#
9750 PRINT #1, SE#
9760 PRINT #1, OB#
9770 PRINT #1, MH#
9780 PRINT #1, TDB#
9790 PRINT #1, R#
9800 PRINT #1, FC
9810 PRINT #1, VTS
9820 PRINT #1, ASH
9830 PRINT #1, HGI#
9840 PRINT #1, MST
9850 PRINT #1, MAP#
9860 IF MAP# = "A" OR MAP# = "a" THEN MP# = AP#
9870 PRINT #1, MP#
9880 PRINT #1, MAT#
9890 IF MAT# = "A" OR MAT# = "a" THEN MT# = AT#
9900 PRINT #1, MT#
9910 GOSUB 11560
9920 FOR LX = 1 TO 3
9930 PRINT #1, TN$(LX)
9940 PRINT #1, TD$(LX)
9950 PRINT #1, M$(LX)
9960 NP$(LX) = TX(LX)
9970 PRINT #1, NP$(LX)
9980 TX(0) = LX * 10
9990 PRINT #1, TX(0)
10000 NEXT LX
10010 FOR LX = 1 TO 3
10020 FOR J% = 1 TO NP$(LX)
10030 FOR I% = 1 TO 7
10040 PRINT #1, VALS#(LX, J%, I%)
10050 NEXT I%
10060 NEXT J%
10070 NEXT LX

```

```

10080 RETURN
10090 REM ***** READ DATA FROM DISC *****
10100 ON ERROR GOTO 11230
10110 LOCATE 24,10: INPUT; " INPUT COLLIERY CODE OF FILE CONTAINING DATA (MAX=7 CH
ARS): "; FIL$
10120 IF LEN(FIL$) > 7 GOTO 10110
10130 FILLERS$ = "A:Z" + FIL$
10140 OPEN FILLERS$ FOR INPUT AS #1
10150 LOCATE 4,20: PRINT " " FIL$
10160 INPUT #1, COLL$: LOCATE 4,40: PRINT " " COLL$
10170 INPUT #1, SN$
10180 LOCATE 5,20
10190 Z$ = SN$
10200 GOSUB 4960
10210 IF ERRS$ = "*" GOTO 10230
10220 SN% = VAL(SN$)
10230 PRINT USING "####"; SN%
10240 GOTO 10260
10250 PRINT " " SN$
10260 INPUT #1, SD$: LOCATE 6,20: PRINT " " SD$
10270 INPUT #1, SECT$
10280 LOCATE 7,20
10290 Z$ = SECT$
10300 GOSUB 4960
10310 IF ERRS$ = "*" GOTO 10330
10320 SECT% = VAL(SECT$)
10330 PRINT USING "####"; SECT%
10340 GOTO 10360
10350 PRINT " " SECT$
10360 INPUT #1, AR$: LOCATE 7,40: PRINT " " AR$
10370 INPUT #1, CS$: LOCATE 10,16: PRINT " " CS$
10380 INPUT #1, SE$
10390 LOCATE 9,29
10400 Z$ = SE$
10410 GOSUB 4960
10420 IF ERRS$ = "*" GOTO 10440
10430 SE = VAL(SE$)
10440 PRINT USING "####.##"; SE
10450 GOTO 10470
10460 PRINT " " SE$
10470 INPUT #1, OB$
10480 LOCATE 9,60
10490 Z$ = OB$
10500 GOSUB 4960
10510 IF ERRS$ = "*" GOTO 10530
10520 OB = VAL(OB$)
10530 PRINT USING "####.##"; OB
10540 GOTO 10560
10550 PRINT " " OB$
10560 INPUT #1, MH$
10570 LOCATE 10,61
10580 Z$ = MH$
10590 GOSUB 4960
10600 IF ERRS$ = "*" GOTO 10640
10610 MH = VAL(MH$)
10620 PRINT USING "###.##"; MH
10630 GOTO 10650
10640 PRINT " " MH$
10650 INPUT #1, TDB$: LOCATE 16,68
10660 IF TDB$ >= "0" AND TDB$ <= "999.99" THEN LX = VAL(TDB$): PRINT USING "###.
##"; LX ELSE PRINT " " TDB$
10670 INPUT #1, R$: LOCATE 12,16: PRINT " " R$
10680 INPUT #1, FC: LOCATE 13,30: PRINT USING "####.##"; FC
10690 INPUT #1, VTS: LOCATE 14,30: PRINT USING "####.##"; VTS
10700 INPUT #1, ASH: LOCATE 15,30: PRINT USING "####.##"; ASH
10710 INPUT #1, HGI$

```

```

10090 RETURN
10090 REM ***** READ DATA FROM DISC *****
10100 ON ERROR GOTO 11230
10110 LOCATE 24,10: INPUT " INPUT COLLIERY CODE OF FILE CONTAINING DATA (MAX=7 CH
ARS: " ,FIL$
10120 IF LEN(FIL$) > 7 GOTO 10110
10130 FILLERS$ = "A:Z" + FIL$
10140 OPEN FILLERS$ FOR INPUT AS #1
10150 LOCATE 4,20: PRINT " " FIL$
10160 INPUT #1,COLL$: LOCATE 4,40: PRINT " " COLL$
10170 INPUT #1,SN$
10180 LOCATE 5,20
10190 Z$ = SN$
10200 GOSUB 4960
10210 IF ERRS$ = "*" GOTO 10250
10220 SN% = VAL(SN$)
10230 PRINT USING "####";SN%
10240 GOTO 10260
10250 PRINT " " SN$
10260 INPUT #1,SD$: LOCATE 6,20: PRINT " " SD$
10270 INPUT #1,SECT$
10280 LOCATE 7,20
10290 Z$ = SECT$
10300 GOSUB 4960
10310 IF ERRS$ = "*" GOTO 10350
10320 SECT% = VAL(SECT$)
10330 PRINT USING "####";SECT%
10340 GOTO 10360
10350 PRINT " " SECT$
10360 INPUT #1,AR$: LOCATE 7,40: PRINT " " AR$
10370 INPUT #1,CS$: LOCATE 10,16: PRINT " " CS$
10380 INPUT #1,SE$
10390 LOCATE 9,29
10400 Z$ = SE$
10410 GOSUB 4960
10420 IF ERRS$ = "*" GOTO 10460
10430 SE = VAL(SE$)
10440 PRINT USING "####.##";SE
10450 GOTO 10470
10460 PRINT " " SE$
10470 INPUT #1,OB$
10480 LOCATE 9,60
10490 Z$ = OB$
10500 GOSUB 4960
10510 IF ERRS$ = "*" GOTO 10550
10520 OB = VAL(OB$)
10530 PRINT USING "####.##";OB
10540 GOTO 10560
10550 PRINT " " OB$
10560 INPUT #1,MH$
10570 LOCATE 10,61
10580 Z$ = MH$
10590 GOSUB 4960
10600 IF ERRS$ = "*" GOTO 10640
10610 MH = VAL(MH$)
10620 PRINT USING "###.##";MH
10630 GOTO 10650
10640 PRINT " " MH$
10650 INPUT #1,TDB$: LOCATE 16,68
10660 IF TDB$ >= "0" AND TDB$ <= "999.99" THEN L% = VAL(TDB$): PRINT USING "###.
##";L% ELSE PRINT " " TDB$
10670 INPUT #1,R$: LOCATE 12,16: PRINT " " R$
10680 INPUT #1,FC: LOCATE 13,30: PRINT USING "####.##";FC
10690 INPUT #1,VT$: LOCATE 14,30: PRINT USING "####.##";VT$
10700 INPUT #1,ASH: LOCATE 15,30: PRINT USING "####.##";ASH
10710 INPUT #1,HGI$

```

```

10720 LOCATE 12,61
10730 Z$ = HGI$
10740 GOSUB 4960
10750 IF ERRS$ = "*" GOTO 10790
10760 HGI = VAL(HGI$)
10770 PRINT USING "###.##";HGI
10780 GOTO 10800
10790 PRINT "" HGI$
10800 INPUT #1,MST: LOCATE 16,30: PRINT USING "###.##";MST
10810 N = FC + VTS + ASH + MST: LOCATE 17,30: PRINT USING "###.##";N
10820 INPUT #1,MAP$: LOCATE 14,44: IF MAP$ = "a" OR MAP$ = "A" THEN PRINT " A
PPROX." ELSE PRINT "MEASURED"
10830 INPUT #1,MP$
10840 LOCATE 14,68
10850 Z$ = MP$
10860 GOSUB 4960
10870 IF ERRS$ = "*" GOTO 10910
10880 MP = VAL(MP$): AP = MP
10890 PRINT USING "###.##";MP
10900 GOTO 10920
10910 PRINT "" MP$
10920 INPUT #1,MAT$: LOCATE 15,44: IF MAT$ = "a" OR MAT$ = "A" THEN PRINT " A
PPROX." ELSE PRINT "MEASURED"
10930 INPUT #1,MT$
10940 LOCATE 15,68
10950 Z$ = MT$
10960 GOSUB 4960
10970 IF ERRS$ = "*" GOTO 11010
10980 MT = VAL(MT$): AT = MT
10990 PRINT USING "###.##";MT
11000 GOTO 11020
11010 PRINT "" MT$
11020 DIM TN$(3),TD$(3),NP$(3), VALS$(3,15,15), M(3), TX(3), NK$(3), TN$(3), M$(
3)
11030 FOR LX = 1 TO 3
11040 INPUT #1,TN$(LX)
11050 INPUT #1,TD$(LX)
11060 INPUT #1,M$(LX)
11070 INPUT #1,NP$(LX)
11080 INPUT #1, TX(LX)
11090 TX(LX) = 0
11100 NEXT LX
11110 FOR LX = 1 TO 3
11120 FOR JX = 1 TO NP$(LX)
11130 FOR IX = 1 TO 7
11140 INPUT #1, VALS$(LX,JX,IX)
11150 NEXT IX
11160 NEXT JX
11170 NEXT LX
11180 AP$ = MP$
11190 AT$ = MT$
11200 CLOSE #1
11210 GOTO 3190
11220 REM ***** ERROR ROUTINES *****
11230 GOSUB 11820
11240 IF ERR = 54 OR ERR = 52 OR ERR = 68 OR ERR = 71 OR ERR = 53 GOTO 11340
11250 IF ERR = 64 OR ERR = 55 GOTO 11360
11260 IF ERR = 63 OR ERR = 57 OR ERR = 72 OR ERR = 70 OR ERR = 62 GOTO 11380
11270 IF ERR = 25 OR ERR = 24 GOTO 11400
11280 IF ERR = 27 GOTO 11420
11290 IF ERR = 61 GOTO 11500
11300 LOCATE 24,10:PRINT "UNKNOWN ERROR :";
11310 LOCATE 24,40:PRINT "ERR = " ERR;
11320 LOCATE 24,60:PRINT "ERL = " ERL;
11330 END
11340 LOCATE 24,10:PRINT "UNABLE TO OPEN FILE";

```

```

10720 LOCATE 12,61
10730 Z$ = HGI$
10740 GOSUB 4960
10750 IF ERRS$ = "*" GOTO 10790
10760 HGI = VAL(HGI$)
10770 PRINT USING "###.##";HGI
10780 GOTO 10800
10790 PRINT "" HGI$
10800 INPUT #1,MST: LOCATE 16,30: PRINT USING "###.##";MST
10810 N = FC + VTS + ASH + MST: LOCATE 17,30: PRINT USING "###.##";N
10820 INPUT #1,MP$: LOCATE 14,44: IF MAP$ = "a" OR MAP$ = "A" THEN PRINT " A
PPROX." ELSE PRINT "MEASURED"
10830 INPUT #1,MP$
10840 LOCATE 14,68
10850 Z$ = MP$
10860 GOSUB 4960
10870 IF ERRS$ = "*" GOTO 10910
10880 MP = VAL(MP$): AP = MP
10890 PRINT USING "###.##";MP
10900 GOTO 10920
10910 PRINT "" MP$
10920 INPUT #1,MAT$: LOCATE 15,44: IF MAT$ = "a" OR MAT$ = "A" THEN PRINT " A
PPROX." ELSE PRINT "MEASURED"
10930 INPUT #1,MT$
10940 LOCATE 15,68
10950 Z$ = MT$
10960 GOSUB 4960
10970 IF ERRS$ = "*" GOTO 11010
10980 MT = VAL(MT$): AT = MT
10990 PRINT USING "###.##";MT
11000 GOTO 11020
11010 PRINT "" MT$
11020 DIM TN$(3),TD$(3),NP$(3), VALS$(3,15,15), M(3), T$(3), NK$(3), TN$(3), M$(
3)
11030 FOR LX = 1 TO 3
11040 INPUT #1,TN$(LX)
11050 INPUT #1,TD$(LX)
11060 INPUT #1,M$(LX)
11070 INPUT #1,NP$(LX)
11080 INPUT #1, T$(LX)
11090 T$(LX) = 0
11100 NEXT LX
11110 FOR LX = 1 TO 3
11120 FOR JX = 1 TO NP$(LX)
11130 FOR IX = 1 TO 7
11140 INPUT #1, VALS$(LX,JX,IX)
11150 NEXT IX
11160 NEXT JX
11170 NEXT LX
11180 AP$ = MP$
11190 AT$ = MT$
11200 CLOSE #1
11210 GOTO 3190
11220 REM ***** ERROR ROUTINES *****
11230 GOSUB 11820
11240 IF ERR = 54 OR ERR = 52 OR ERR = 68 OR ERR = 71 OR ERR = 53 GOTO 11340
11250 IF ERR = 64 OR ERR = 55 GOTO 11360
11260 IF ERR = 63 OR ERR = 57 OR ERR = 72 OR ERR = 70 OR ERR = 62 GOTO 11380
11270 IF ERR = 25 OR ERR = 24 GOTO 11400
11280 IF ERR = 27 GOTO 11420
11290 IF ERR = 61 GOTO 11500
11300 LOCATE 24,10:PRINT "UNKNOWN ERROR !";
11310 LOCATE 24,40:PRINT "ERR = " ERR;
11320 LOCATE 24,60:PRINT "ERL = " ERL;
11330 END
11340 LOCATE 24,10:PRINT "UNABLE TO OPEN FILE";

```

```

11350 RESUME 11310
11360 LOCATE 24,10:PRINT "UNABLE TO DELETE FILE";
11370 RESUME 11310
11380 LOCATE 24,10:PRINT "READ/WRITE ERROR TO DISC";
11390 RESUME 11310
11400 LOCATE 24,10:INPUT;"PRINTER DEVICE FAULT - PRESS RETURN WHEN READY",Z$
11410 RESUME 11440
11420 LOCATE 24,10:INPUT;"OUT OF PAPER - PRESS RETURN WHEN READY",Z$
11430 RESUME 11440
11440 LPRINT CHR$(12)
11450 IF ERL >= 8400 AND ERL <= 8960 GOTO 8400
11460 IF ERL >= 8990 AND ERL <= 9610 GOTO 8990
11470 GOSUB 11820
11480 LOCATE 24,10:PRINT "UNKNOWN PRINTER ERROR";
11490 GOTO 11430
11500 LOCATE 24,10:INPUT;"DISC FULL - INSERT NEW DISC - PRESS RETURN WHEN READY",Z$
11510 RESUME 11520
11520 IF ERL >= 9690 AND ERL <= 10080 GOTO 9690
11530 IF ERL >= 8110 AND ERL <= 8260 GOTO 8110
11540 GOSUB 11820
11550 GOTO 11380
11560 REM ***** ROUTINE TO SORT VALS#(X,Y,1) INTO ASCENDING SEQUENCE *****
11570 TX(1) = 0: TX(2) = 0: TX(3) = 0
11580 FOR J% = 1 TO 3
11590 FOR IX = 1 TO 15
11600 IF VALS#(J%,IX,1) <= 11 AND VALS#(J%,IX,1) >= .225 THEN TX(J%)=TX(J%) + 1
11610 NEXT IX
11620 NEXT J%
11630 FOR LX = 1 TO 3
11640 MM% = NP%(LX)
11650 MM% = MM% \ 2
11660 IF MM% = 0 GOTO 11800
11670 KK% = NP%(LX) - MM%
11680 J% = 1
11690 IX = J%
11700 IF VALS#(LX,IX,1) > VALS#(LX,IX + MM%,1) THEN GOTO 11710 ELSE GOTO 11780
11710 FOR NN% = 1 TO 15
11720 VALS#(LX,0,NN%) = VALS#(LX,IX,NN%)
11730 VALS#(LX,IX,NN%) = VALS#(LX,IX + MM%,NN%)
11740 VALS#(LX,IX + MM%,NN%) = VALS#(LX,0,NN%)
11750 NEXT NN%
11760 IX = IX - MM%
11770 IF IX < 1 THEN GOTO 11780 ELSE GOTO 11700
11780 J% = J% + 1
11790 IF J% > KK% THEN GOTO 11850 ELSE GOTO 11690
11800 NEXT LX
11810 RETURN
11820 LOCATE 24,10:PRINT "
";
11830 RETURN

```


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