50-333

INTEGRATED LEAK RATE TEST COMPUTER PROGRAM

FOR THE PRIMARY CONTAINMENT, FRITZPATRICK

ltr 5/20/74 #5134

THE ATTACHED FILES ARE OFFICIAL RECORDS OF THE OFFICE OF REGULATION. THEY HAVE BEEN CHARGED TO YOU FOR A LIMITED TIME PERIOD AND MUST BE RETURNED TO THE CENTRAL RECORDS STATION 008. ANY PAGE(S) REMOVED FOR REPRODUCTION MUST BE RETURNED TO ITS/THEIR ORIGINAL ORDER.

NOTICE NOTICE

DEADLINE RETURN DATE _____

_____ _____

_____ _____

_____ _____

W. L. DONALDSON, CHIEF
CENTRAL RECORDS STATION

Received w/Ltr Dated 5-20-74

Section 7.6

CONTENTS

I. PURPOSE AND SCOPE

The American Nuclear Society (ANS) Standard (Ref. 1) specifies uniform methods for determining the ability of a reactor containment structure to retain, within the limits of permissable leakage rates, any hazardous air and water vapor. The purpose of this document is to describe the absolute and reference volume methods to be implemented at PASNY - Fitzpatrick, and the on-line computer programs installed to condition the data, perform the calculations, and control the output.

Leakage rates are reported as the percentage by weight of the original content of air at the leakage rate test pressure that escapes to the outside atmosphere during a 24-hour test period. A 4-hour initial waiting period will be allowed before the commencement of the test to allow temperature and pressure to come to equilibrium.

A manually operated nitrogen bleed system provides a means for insuring a positive pressure at all times within the containment.

II. ABSOLUTE METHOD

The absolute method of leakage-rate testing consists of the determination and calculation of air losses by containment structure leakage over 24 hours by means of direct pressure, temperature, and moisture content observations during the period of test, with the temperature detectors properly located to provide an average air temperature. It is assumed that temperature variations during the test will be insignificant. The absolute test consists of subtracting the final mass in the containment from the initial mass, computing the masses by the ideal gas law.

The containment mass is computed as follows via the perfect gas law:

$$\frac{M = (P-Pv)\ V}{RT} \quad \frac{= 14.696\ (144)}{29.92} \quad \frac{(P-Pv)V}{RT}$$

where the rightmost identity has the units:

M = lb gas
P (total pressure) - inches Hg
Pv (vapor pressure - inches Hg
R = 53.35 ft lbf / lbm°F (for air)
T = containment temp °R

The leakage rate is then determined by plotting the mass as a function of time, using a least squares fit to determine the slope, dM/dt. The leak rate is expressed as fraction of contained mass lost per 24 hours or symbolically:

$$(1)\quad \text{Leak rate} = \frac{dM/dt}{Mo} * -24. * 100.$$

when t is elapsed time expressed in hours and Mo is the containment mass at time zero. The sign convention is such that an outward leak is positive. The mass of air must be corrected for the nitrogen added by the manually operated bleed system which insures a positive containment pressure. The nitrogen meter is a flow totalizer; thus, the weight of nitrogen added may be computed and subtracted from the containment mass as calculated above. Note: Comments concerning N_2 bleed refer only to continuous monitoring of leak rate when plant is fully operational.

III. REFERENCE VESSEL METHOD

The reference vessel method consists of the calculation of air losses by observations of the pressure differentials between the containment structure and a gas-tight reference system located so as to represent the average temperature of the aggregate containment air. That is, the reference vessels are so placed and are of such a geometry that they will assume the temperatures of the contained atmosphere within a time lag compatible to the frequency of data taking.

The reference volume-measurement test differs from the absolute test primarily in that the mass at a given instant is computed by a differential leak rate rather than by use of the ideal gas law. That is,

$$(2) \quad M = M_o \left(1.-\frac{L' t}{24.}\right)$$

where L' is the differential leak rate (fraction of contained mass lost/hr.)

Again, mass is plotted as a function of time, the slope is determined by a least squares fit and the 24 hour leak rate is determined by equation (1) above. In equation (2), the initial mass Mo is computed by the ideal gas law.

Derived in Appendix A, the differential leak rate is:

$$L' = \frac{24.}{t} \cdot \frac{1}{(P_o - P_{vo})} \left\{ \Delta P_i \frac{To}{T_i} - \Delta P_{ro} - \left(P_{vo} - Pv_i \frac{To}{T_i}\right) \right\}$$

where the subscripts indicate:

R = reference
O = initial
and
P = pressure differential in H_2O
t = elapsed time, hrs

The reference volume method (Equation (2)) is used to achieve more accuracy in determining M. The containments are very large (order of 100,000 ft^3) which casts doubt on temperature and pressure measurements. This doubt is considerably lessened by the inclusion of a reference volume or container within the main containment. Rather than use absolute pressure, the differential pressure between reference volume and containment is measured instead. The error in temperature measurement by the temperature detectors is of much less effect because the reference system temperature follows that of the containment.

IV. CORRELATION OF RESULTS

In the Fitzpatrick plant, two containments exist: torus (or suppression chamber) and dry well (or bulb). The masses for each containment are computed separately, added together, and the result correlated as a function of time by means of a least squares curve fit of form:

$$y = mx + b$$

The slope, d(mass)/d(hours) is then used in equation (1) to determine the leak rate. Thus, the least squares fit is executed only for the total mass in both containments, i.e. the masses of air in the torus and dry well are summed and the result fitted against time. If desired, the computer program may be easily modified to fit each containment singly and separately. Two separate fits are required: one for each of two basic methods, absolute and reference volume.

The least square fits, as described above, use all available data up to and including, but not preceding, the prior 24 hours, where results are computed hourly. Thus, the number of points fitted will never exceed 25 (without operator intervention). As a result, the 24 hr leak rate should become more accurate as time progresses up to 24 hr.

A 95 percent "Student T" confidence level is associated with each hourly leak rate computation. The leak rate (in percent mass loss per 24 hr) may be described as 95 percent accurate to within the value of the printed confidence level.

The leak rate testing package is divided into two separately executable parts, the first being the computations themselves, as outlined above. This program is executed once each hour as determined by the real time clock of the GEPAC process control computer. The other part of the package consists of real time programs executed at intervals of 1 minute, 10 minutes, and 1 hour which scan the analog inputs and perform the signal conditioning necessary to store the necessary engineering reading into the computer memory. These readings must be used by the main leak rate program, and therefore should be as up-to-date as possible when the ILRT program is executed. In particular, analog readings from the

Beckman MAZ-870 moisture analyzer require a 5 minute cycle to assemble the necessary readings. An analyzer routine must therefore be executed 5.5 to 5.0 minutes prior to the execution of the ILRT program.

V. EQUIPMENT

a. Temperature Sensors:

A total of 18 RTD's are provided as follows:

16-1-RTD 113 and 16-1-RTD 114 are located in the torus and the remaining 16 in the dry bulb. All RTD'S are arranged in pairs to provide an average temperature for each arbitrarily assigned zone of containment volume. Zones 0-7 are located in the dry bulb and Zone 8 in the torus. Each RTD pair is averaged: the resulting averages are multiplied by a volume weighting factor assigned as the fraction of total volume represented by each zone. The two containments, dry well and torus, are handled separately in the program, that is, the mass of air in each of the containments is computed individually.

16-1-RTD	Zone	Weight factor
Suppression chamber (torus)		
113 114	8 (Torus)	1.0
Dry well (Bulb)		
101 120	0 (Vent Header)	0.1133
102 119	1 (Dry Well)	0.1652
103 104	2 (Dry Well)	0.3560
105 106	3 (Dry Well)	0.1313
107 108	4 (Dry Well)	0.0470
109 117	5 (Dry Well)	0.0534
110 111	6 (Dry Well)	0.0715
112 118	7 (Dry Well)	0.0621

ILRT ANALOG INPUTS

INSTRUMENT	LOCATION	COMPUTER POINTS	MEASURING UNITS
16-1-PI-103	TORUS REF VESSEL	M098	PSIA
16-1-PI-101	DRYWELL REF VESSEL	M096	PSIA
16-1-RTD-113	TOR AREA 8	M095	DEGF
16-1-RTD-114	TOR AREA 8	M102	DEGF
16-1-RTD-101	DWLL AREA 0	M103	DEGF
16-1-RTD-120	DWLL AREA 0	M116	DEGF
16-1-RTD-102	DWLL AREA 1	M084	DEGF
16-1-RTD-119	DWLL AREA 1	M115	DEGF
16-1-RTD-103	DWLL AREA 2	M085	DEGF
16-1-RTD-104	DWLL AREA 2	M086	DEGF
16-1-RTD-105	DWLL AREA 3	M087	DEGF
16-1-RTD-106	DWLL AREA 3	M088	DEGF
16-1-RTD-107	DWLL AREA 4	M089	DEGF
16-1-RTD-108	DWLL AREA 4	M090	DEGF
16-1-RTD-109	DWLL AREA 5	M091	DEGF
16-1-RTD-117	DWLL AREA 5	M0113	DEGF
16-1-RTD-110	DWLL AREA 6	M092	DEGF
16-1-RTD-111	DWLL AREA 6	M093	DEGF
16-1-RTD-112	DWLL AREA 7	M094	DEGF
16-1-RTD-118	DWLL AREA 8	M114	DEGF
LRT MOIST AZ	PNL OP MODE	M111	PPM
LRT MOIST AZ	PNL STRM ID	M112	PPM
16-1-MAZ-101	TORUS ILRT HUMIDITY	M106	PPM
16-1-MAZ-102	DRYWELL ILRT HUMIDITY	M069	PPM
BAROMETRIC	PRESS	F125	IN HG
16-1-dPIT-102	REF VES TO TORUS	M101	PSID
16-1-dPIT-101	REF VES TO DRYWELL	M100	PSID
16-1-PI-104	TORUS PRESSURE	M099	PSIA
16-1-PI-102	DRYWELL PRESSURE	M097	PSIA

If the two zone temperature readings differ by more than ± 2.0 degrees F, it is assumed that at least one RTD reading is faulty. Faulty readings are corrected by the operator by removing the point from scan and inserting an arbitrary value of zero. Refer to Appendix C, Operator Guide, for details. To allow the operator to accomplish this, the program is put into a wait state and the required action is printed on the programmer's typer. This action will consist of suppressing the standard action keys on the operator's console. In addition, the operator may wish to de-energize the RTD in error. After the operator has acted, the program is continued by inserting a 0 into a computer point called IFLAG. (See Section VI(a) - Program).

b. Pressure and Pressure Differential Sensors:

Total pressures (psia) in the containments and reference vessels are converted from analog readings as follows: (These conversions were originally coded into the ILRT program. On-site at PASNY, conversions will be handled by GEPAC system subroutines)

P = Reading (70./100.)

i.e. 0 - 100. Mv corresponds to 0. - 70. psia

Differential pressures (psia) are converted as follows:

P = Reading (5.0/100.)

i.e. 0 - 100. Mv corresponds to 0. - 5.0 psia

Barometric pressure conversion:

Barom (inches Hg) = (Reading - 16.)/64. (30.0)

i.e. 16 - 80. Mv corresponds to 0. - 30. in. Hg

c. Moisture Analyzers (Beckman Model 870)

The Beckman moisture analyzers provide a reading of parts per million (volume) of water in the containment volumes. The analyzer is set up to measure 5 sample streams which represent 5 definite volumes within the total containment (torus and dry bulb). The instrument has an internal timer which switches streams at 1 minute intervals. Stream No. 1 represents the volume contained in the torus; whereas streams 2-5 represent certain portions of the volume of the dry bulb. Two analyzers are present: 16-MAZ-101 and 16-MAZ-102 are both capable of measuring streams Nos. 1-5 selected continuously. In

addition, analyzer 101 may be set up to measure only stream No. 1 with analyzer 102 measuring streams 2-5 selected continuously. Thus, three modes of operation are possible:

1. Both analyzers in operation: 16-MAZ-101 measuring stream No. 1, 16-MAZ-102 measuring streams 2-5 continuously (normal mode)

2. Only 16-MAZ-101 in operation, measuring all 5 streams selected continuously

3. Only 16-MAZ-102 in operation, measuring all 5 streams selected continuously

These modes are identified by an operator selected mode switch which produces a 20, 30, 40 ma signal for modes 1-3, respectively. To determine which stream is under analysis (in the case of continuously selected streams), a 14, 18, 22, 26, and 30 ma signal is provided. The respective signals are in the order of streams 1-5. All signals are in the 10-50 ma range which translate to 16-80 mv using a 1.6 ohm resistor. The partial pressures of the water vapor in the two containments (torus and dry bulb) are computed from the stream values of ppm by volume as measured and a volume weighting factor. The weighting factors are assigned to account for the fractional containment volume represented by each stream, as follows:

Zone	Stream	Weight factor
8 (Torus)	1	1.0
0 (Vent Header)	3	0.1133
1 (Dry Well)	5	0.5833
2 (Dry Well)	5	
7 (Dry Well)	5	
3 (Dry Well)	2	0.1783
4 (Dry Well)	2	
5 (Dry Well)	4	0.1249
6 (Dry Well)	4	

Since the 24 hr leak rate test program is to be executed once per hour, a routine to secure the proper moisture values must be executed at least 5 minutes prior to the execution of the main program. That is, a minimum of 1 minute per stream is required to adequately handle the transient data. Maximum accuracy is achieved by executing the moisture content routine at 5 minute intervals and arranging the interval to begin 2.5 to 3.0 minutes prior to execution of the ILRT program.

The ILRT program is set up to accept the signals for modes, stream, and ppmv readings and convert these readings to the desired partial pressure of water vapor in the containment. An error of ± 4.0 ma is accepted for the mode readings, while an error of ± 1.0 ma is accepted for the stream identifications. If these errors are exceeded, the stream or mode with least total error is selected. However, an on-line warning is printed on the programmer's typer when this occurs.

The conversion of the moisture analyzer reading in mv to parts per million by volume is:

$$\text{ppmv} = (\text{Reading} - 16.)/64.\ (15{,}000.)$$

i.e., 16. - 80 mv corresponds to 0. - 15,000. ppmv

Parts per million by volume is converted to partial pressure (psia) by:

$$P\ (H_2O) = (\text{ppmv}/(1.E6 + \text{ppmv}) * (P\ \text{total})$$

VI. COMPUTER PROGRAM

a. Required computations (in sequential order)

1. Initial mass: Suppression chamber and dry well

$$Mso = \frac{144.\ (Pso - Psvo)\ Vs}{R\ Tso}$$

$$M_{DO} = \frac{144.\ (Pdo - Pdvo)\ Vd}{R\ Tdo}$$

(pressures in psia)

2. Differential leak rate: suppression chamber and dry well

$$L'_{sr} = \frac{24.}{t}\ \frac{1}{(P_{so} - P_{svo})}\left[\Delta P_{sr}\frac{T_{so}}{T_s} - \Delta P_{sro} - (P_{sv} - P_{sv}\frac{T_{so}}{Ts})\right]$$

$$L'_{dr} = \frac{24.}{t}\ \frac{1}{(P_{do} - P_{dro})}\left[\Delta P_{dr}\ \frac{T_{do}}{T_d} - \Delta P_{dro} - (P_{dvo} - P_{dv}\frac{T_{do}}{Td})\right]$$

3. Mass as computed by reference volume method (current):

M_{sr} = Mso (1.-L'sr * t/24.)

M_{dr} =Mdo (1.-L'dr * t/24.)

4. Mass (by absolute method) at current time:

$$Msa = \frac{144.\ (Ps-Psv)Vs}{RTs} \qquad Mda = \frac{144.(Pd-Pdv)Vd}{RTd}$$

5. Totals:

Mtr = Msr + Mdr

Mta = Msa + Mda

6. Least squares fit of Mtr vs t
and Mta vs t :

let y = mass , m=slope
x = time , b=intercept
n = no. of data points

$$m = \left\{\frac{dMtr}{dt}\ ,\ \frac{dMta}{dt}\right\} = \frac{n\ \Sigma xy - \Sigma x \Sigma y}{n\ \Sigma x^2 - (\Sigma x)^2}$$

$$b = \frac{\Sigma y \Sigma x^2 - \Sigma x \Sigma xy}{n\Sigma x^2 - (\Sigma x)^2}$$

Std. deviation = $\sigma_m = \sigma / (\Sigma x^2 - (\Sigma x)^2/n)^2$

where σ = (Variance)$^{1/2}$ = $\left[\frac{\Sigma (y-\bar{y})^2}{n-2}\right]$ 1/2

The "Student T" 95 percent confidence level is a function of the standard deviation and the total number of samples i.e.

$$95 \text{ percent confidence} = \sigma_m \frac{(+2400.)}{Mo} f(n)$$

(expressed as percent by weight leakage rate)

where f(n) is fitted using data from statistical tables:

$$f(n) = 1.95996 + 2.37226/n + 2.8225/n^2$$

Note: 95 percent confidence level = 2.06
(Student T for 25 data points)

Note: Fits will begin at N=3; data will be a maximum of 24 points (1 day); the most recent 25 points will be considered i.e., when data for 24 hours is collected, the earliest point will be discarded.

7. Fraction of total containment mass lost/day:

$$Ltr = \frac{dMtr/dt}{Mto} *24.$$

$$Ltd = \frac{dMtd/dt}{Mdo} *24.$$

NOMENCLATURE

Subscripts:

S - suppression chamber (or torus)
D - dry well (or bulb)
O - initial values
R - reference volume method
A - absolute method
T - total

Variables:

M - mass air in containment, lb

t - time, hr

p - total pressure in containment, psia

pv - vapor pressure in containment, psia

Δp - differential pressure between reference vessel and containment psia

T - temperature, °R

L' - differential leak rate computed for reference volume method (fraction of contained mass lost/hour)

V - containment volume, ft 3

R - gas constant, air 53.35 ft lbf/lbm °R

$\bar{L}$ - 24 hour leak rate, computed from least squares fit of M vs t, fraction of containment mass lost/day.

b. Organization and Flow Chart

A list of subroutines and a flow chart are attached. Appendix B contains definitions of program variables. Program control through the operator's console is accomplished by manipulation of the variable IFLAG.

The computer point designated IFLAG will at any given time contain an integer which determines the mode of ILRT program operation. This integer is set by the operator and allows him to control program execution as follows:

Value of IFLAG	Result
0	Normal Operation
1	Reinitialize program
3	Reinitialize, setting t=0
4	Minimum output (1 line)
5	Provide short printout (current hour)
6	Provide long printout (latest 24 hr)
8	RTD error
9	Abort program

When the program is started or reinitiated, the variable IEDIT is set to 1 and the PRINT subroutine subsequently outputs an abbreviated data set consisting of leak rate, confidence level, and the moisture readings for the 5 streams corresponding to the 5 containment volumes (4 in dry well + torus). Thus, normal output will always be of this abbreviated form.

To obtain output as depicted in Appendix C, that is, complete data and calculations, it is necessary for the operator to set IFLAG to 5 or 6. If IFLAG = 5, the variable IEDIT is set to 2 and only the data and calculations for the current hour are printed (short form). If IFLAG = 6, IEDIT is set to 3 and data plus calculations are printed for 24 hours (or all output available up to 24 hours).

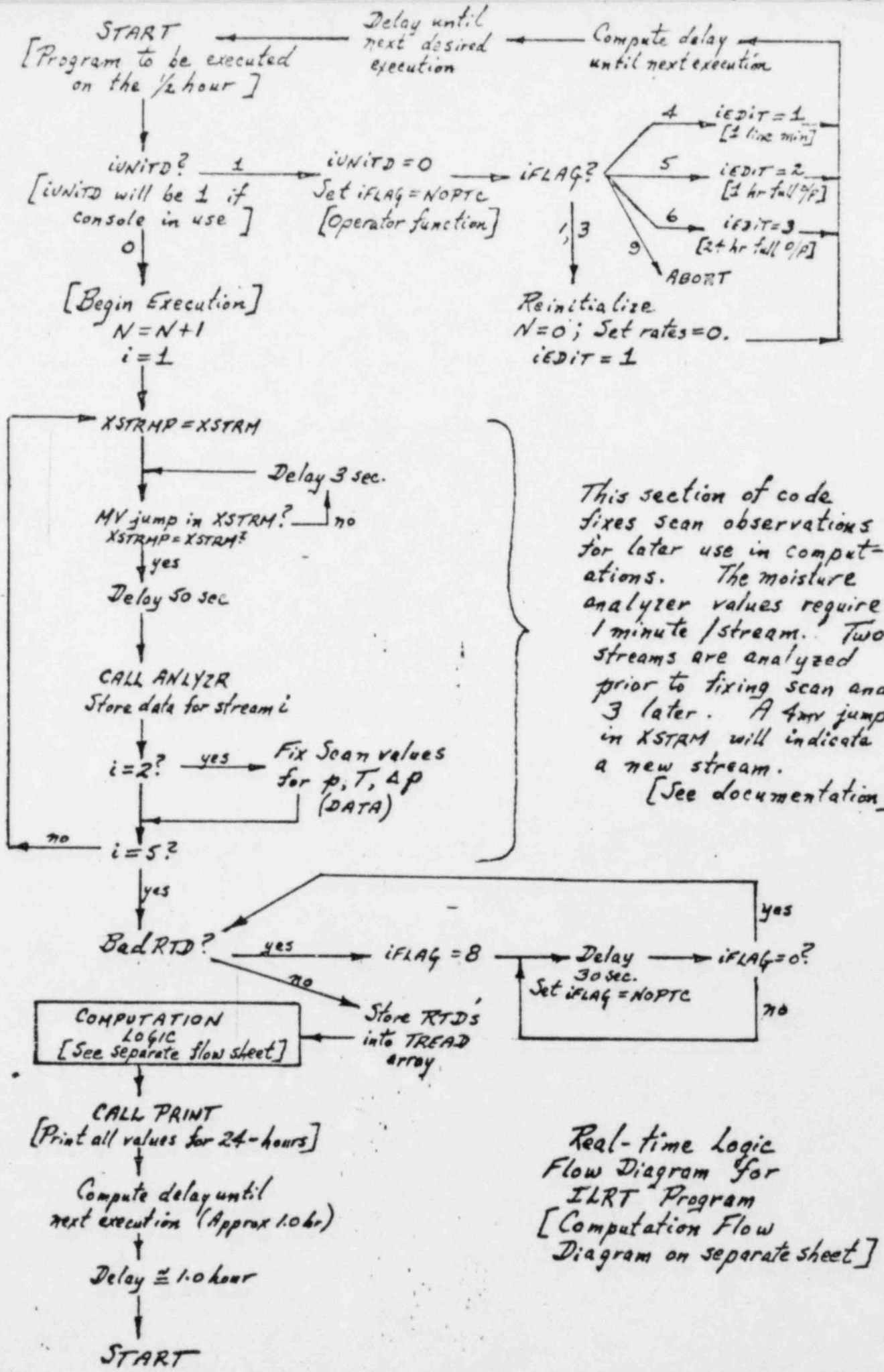
Refer to Appendix B-VI for more detail.

The program sets the computer point IFLAG equal to 8 whenever an RTD reading is determined false. After operator action (as outlined above), resetting IFLAG to 0 will cause the program to resume.

Reinitialization consists of resetting the values for initial mass, pressure, vapor pressure, and temperature in the containments, and initial pressure difference between containment and reference volume. The computed leakages (See calculations - Appendix A) require these initial observations. In addition, since only the most recent 24-hour period of test is printed, the program arrays which contain the hourly readings must be compressed so as to reflect the more recent hourly observations.

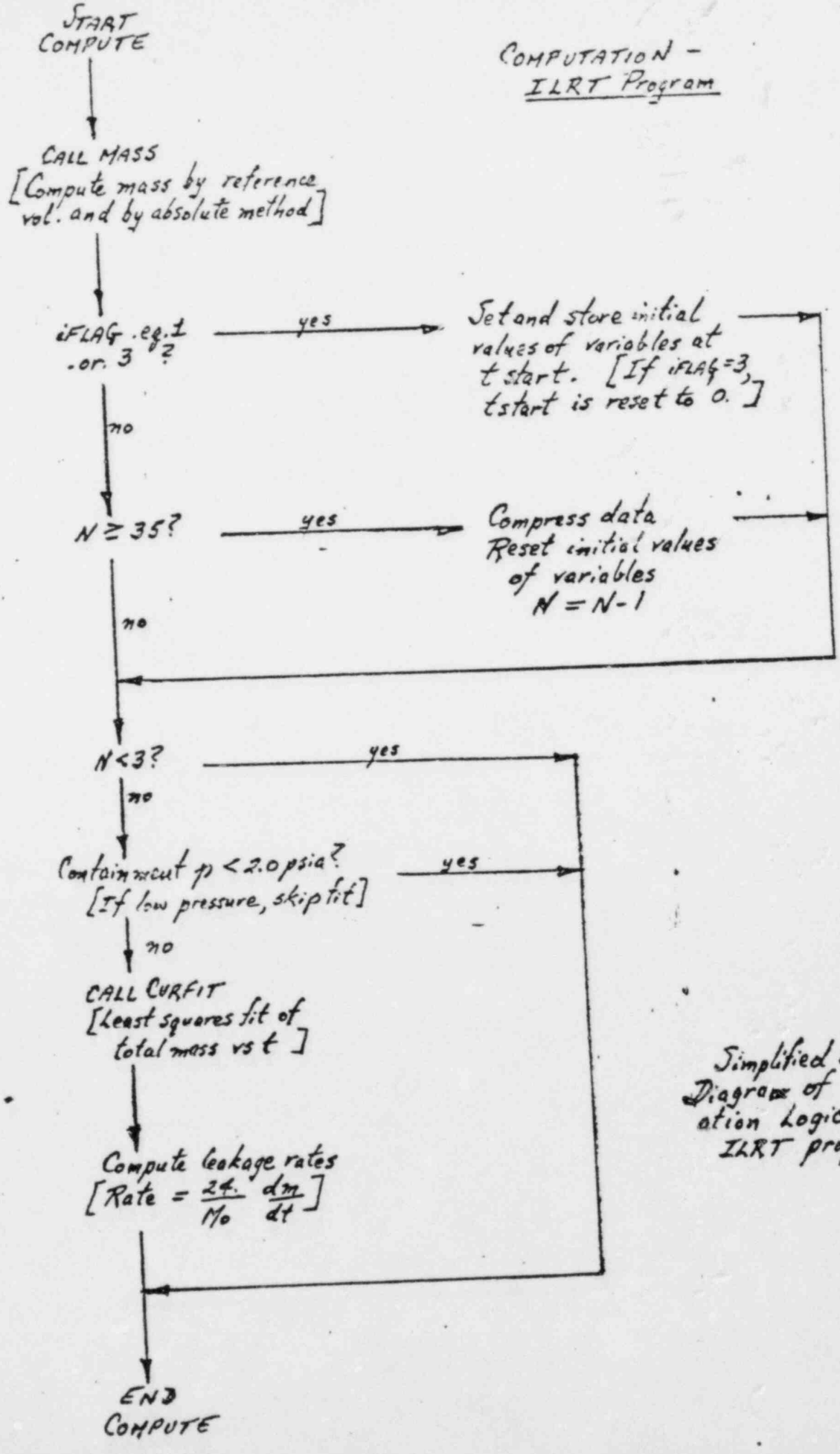
Usually, the test is started at arbitrary hour 0. and all subsequent readings are tabulated in increments from time 0. hours. If the program is reinitialized using ITYPE = 1, however, the initial time is

set to the current time and all subsequent readings are tabulated in increments from this new initial time (not equal to 0.). The only difference between ITYPE = 1 above, and ITYPE = 3 is that the latter resets the initial time to 0. and resets the subsequent times of observation relative to 0.



Real-time Logic Flow Diagram for ILRT Program
[Computation Flow Diagram on separate sheet]

COMPUTATION -
ILRT Program



Simplified Flow Diagram of Computation Logic for ILRT program

SUBROUTINES:

1. Main program - All flow chart logic, including the compression of data when arrays are full, or during reinitialization.

2. MASS - Computes mass of air in torus and in the dry well and the total mass in both containments. This is done through the perfect gas law (absolute method) and through the differential leak rate computation (reference volume method).

3. CURFIT - Computes slope and intercept of total mass in containment vs time by means of a least squares curve fit of the form $y = mx + b$.

4. TSL - Computes saturation temperature in deg F given the saturation pressure on the water - water vapor saturation line. It is used to compute the dew points within the torus and dry bulb containments as functions of total pressure.

5. SETUP - Performs signal modifications to engineering units for all process variables. Also, accuracy checks are performed on all RTD readings.

6. ANALYZER - Performs signal modifications for process variables connected with moisture analyzer. Accuracy checks on analog mv readings are performed.

7. PRINT - Outputs data and results in EPA approved format.

INHIBT, PERMIT - GEPAC routines which inhibit and permit interrupts, respectively. These routines in the ILRT program are needed to avoid interrupting the GEPAC timer when delay times are being computed.

BEGQUE, ENDQUE - GEPAC routines which start and end the placement of output messages into a queue. These routines are used in the ILRT program to avoid computation delays.

PANFUN - panel function number (on console)

NPRIO - program priority number

IUNITD - console activity flag

1 (console in use)
0 (console not in use)

NOPTC (identical to IFLAG program variable)
This operator function takes its input from the console. In GEPAC programs, to check NOPTC, IUNITD must be set to 1; after checking NOPTC in the ILRT program, IUNITD is set to 0 so that other programs may be executed from the console.

NTA - Output device logical unit designation for alarm typer

TIME - GEPAC time counter; time is measured in terms of digital counts, 0.5 second/count (mod 7,200 seconds/hr)

APPENDIX A

DERIVATION OF DIFFERENTIAL LEAK RATE BY REFERENCE VOLUME METHOD

The fractional leakage rate:

$$L' = \frac{1}{P_o - P_{vo}} \left[\left(\Delta P_o - \Delta P_i \frac{T_o}{T_i} \right) - \left(P_{vo} - P_{vi} \frac{T_o}{T_i} \right) \right] \quad (1)$$

is developed below based on the pressure differential between containment vessel and reference volume as defined: $\Delta P_o = P_o - P_{ro}$

$$\Delta P_i = P_i - Pri \quad (2)$$

Note that care must be taken to insure that the containment pressure is higher than the reference volume pressure at the start of the test. If this is not true, equation (1) must be modified by reversing the signs of ΔP_o and ΔP_i. For example, a leak in the containment volume might cause this situation. The derivation of (1) is found in reference (1) below. The steps in the derivation are:

a. Express values of P in equation (2) by ideal gas law and rearrange to solve for M_o and M_i.

b. Form the ratio, $\frac{M_o - M_i}{M_o}$ and replace Mr and M_o by $M_r = \frac{P_{ro} V_r}{R T_{ro}}$ and $M_o = \frac{P_o V_o}{R T_o}$

c. If the temperatures in the reference vessel and the containment are allowed to equalize, then To = Tro and Ti = Tri. The result is:

$$\frac{Mo - Mi}{Mo} = \frac{To}{Po} \left(\frac{\Delta Po}{To} - \frac{\Delta Pi}{Ti} \right)$$

d. Correcting for vapor pressure, P is replaced by (P-Pv) and equation (1) results.

Ref (1): Proposed Standard for Leakage-Rate Testing for Containment Structures for Nuclear Reactors - Amer. Nat. Std N45.4

(Amer. Nuclear Soc. Standards Committee, September 15, 1971)

APPENDIX B

FORTRAN VARIABLES

I. Initial values (at t = 0.)

PSØ - Pso, initial total pressure, suppression chamber

PDØ - Pdo, initial total pressure, dry bulb

PSVØ - Psvo, initial vapor pressure, suppression chamber

PDVØ - Pdvo, initial vapor pressure, dry well

TSØ - Tso, initial temperature, suppression chamber

DPSRØ - Psro, initial differential pressure between ref. volume and suppression chamber

DPDRØ - Pdro, initial differential pressure between ref. volume and dry well

YMØS - Mso, initial mass air in torus

YMØD - Mdo, initial mass air in dry well

WTN2Ø - W_{n2} Weight of nitrogen added to system at time 0. (from totalizing meter)

II. Current values

Time - t, hours elapsed since test started

PS,PD - Ps, Pd, total pressure, torus and dry well

PSV,PDV - Psv,Pdv, vapor pressures, torus and dry well

TS,TD - Ts,Td, temperatures, torus and dry well

DPSR, DPDR - Psr, Pdr, differential pressures between ref. volume and containment, torus and dry well

BAROM - barometric pressure, inches Hg

DEWPTD - Dew Point, dry well

DEWPTS - Dew point, torus

PSR,PDR - Psr, Pdr, pressure, reference volumes, torus and dry well.

RLEAKS L'sr, Differential leak rate from torus, fractional loss of mass per hour.

RLEAKD L'dr, Differential leak rate from dry well, fractional loss of mass per hour

TAVER(i),i=1,9 - Tav, average of the 2 RTDS located within each of the 9 zones of the containment volume

IMODE Mode of moisture analyzer operation

1. Both
2. 16-MAZ-101 only
3. 16-MAZ-102 only

(See moisture analyzer section for details)

ISTRM Number designation of stream (1-5)

1	Torus
2-5	Dry Well

N Counter for index of number time steps in current leak rate evaluation

III. Stored Results (dimensioned for maximum of 26 time steps or 26 hours)

Rate (1,j), j=1, 26	dMta/dt, rate absolute method
Rate (2,j), j=1, 26	dMtr/dt, rate reference volume method
VAR (1,j), j=1, 26	Variance of least squares fit, Mta vs t, absolute method
VAR (2,j) j=1, 26	Variance of least squares fit, Mts vs t, reference volume method
STDM (1,j), j=1,26	Standard deviation of fit, Mtr vs t, absolute method. Units: lb/hr
STDM (2,j) j=1, 26	Standard deviation of fit, Mtr vs t, reference volume method. Units: lb/hr
CON(2,j), j=1,26	95 percent confidence level based on number of observations.
PBAR (j), j=1, 26	Barometric pressure
RTD (18,j) j=1, 26	RTD temperature readings
XTIME (j), j=1, 26	Time, hours
PPMV (i,j), j=1,26	Parts per million by volume of moisture in stream i, where i = 1,5

YMASS (1, j), j=1, 26	Msa, Mass air in torus, absolute
YMASS (2, j), j=1, 26	Mda, Mass air in dry well, absolute
YMASS (3, j), J=1, 26	Msa + Mda, ttoal mass, absolute
YMASS (4, j), j=1, 26	Msr, mass air in torus, ref. volume
YMASS (5, j), j=1, 26	Mdr, mass air in dry well, ref. volume
YMASS (6, j), j=1, 26	Msr + Mdr, total mass, ref. volume
OUT (1, j), j=1, 26	Ps, total pressure, torus
OUT (2, j), j=1, 26	Pd, total pressure, dry well
OUT (3, j), j= 1,26	Psv, vapor pressure, torus
OUT (4,j), j = 1,26	Pdv, vapor pressure, dry well
OUT (5,j), j = 1,26	Ts, temperature, torus
OUT (6,j), j = 1,26	Td, temperature, dry well
OUT (7,j), j = 1,26	Psr, pressure, differential reference volume and torus
OUT (8,j), j = 1,26	Pdr, pressure, differential reference volume and dry well
OUT (9,j), j = 1,26	Psr, pressure, reference volume, torus
OUT (10,j), j = 1,26	Pdr, pressure, reference volume, dry well
OUT (11,j), j = 1,26	Dew point, torus
OUT (12,j), j = 1,26	Dew point, dry well
OUT (13,j), j = 1,26	Nitrogen bleed, lbs (total added)
YMØ (1)	Ba, intercept of L. S. fit of Mta vs t, absolute method
YMØ (2)	Br, intercept of L.S. fit of Mtr vs t, ref. volume method
DMDT (1)	Ma, slope, dMta/dt
DMDT (2)	Mr, slope, dMtr/dt
WTN2	Nitrogen bleed, lb. (total added)
WTCOR(j), j = 1,26	Cumulative weight N_2 bleed added to containment from time base (N=1) i.e. from time XTIME(1)

IV. Fixed values:

VS, VD	VS,VD, volumes of torus and dry well
TWT (i), i - 1,9	Volume weighting factors for temperature measurements in 9 zones of volume
WATWT (i), i = 1,5	Volume weighting factors for moisture measurements in 5 moisture analyzer streams
R	Gas constant for air, 53.35 ft lbf/lbm R

V. Within the setup subroutine, which accepts the real time analog readings into Fortran variables by means of equivalence statements, the following define unprocessed signals:

TREAD (i), i=1,18	Current scan of 18 RTD'S (degrees F)
PSREF	Current scan of reference vessel pressure in torus (mv)
CFN2	Nitrogen bleed, cu ft (total added)
PDREF	Current scan of reference vessel pressure in dry well (mv)
XMODE	Current scan of mode switch of moisture analyzer (mv)
XSTRM	Current scan of stream ID of moisture analyzer (mv)
XRDG1	Current scan of moisture reading (16-MAZ-101), mv
XRDG2	Current scan of moisture reading (16-MAZ-102), mv
BARRD	Current scan of barometric pressure, mv
CTIME	Current time, hours
PSVPR	Current scan of total pressure in torus, mv
PBULB	Current scan of total pressure in dry well, mv
DPSREF	Current scan of differential pressure between torus and reference vessel, mv
DPDREF	Current scan of differential pressure between dry well and reference vessel, mv
IDUMMY	Current scan of operator set program control variable. This value will be set as an integer (0-9) (See IFLAG below)

VI. Manually set variables:

IEDIT	(1 - Abbreviated output (2 - One hr output (3 - 24 hr (or max. output)	) As set) by IFLAG below
IFLAG	0 Normal operation of IRLT program	
	1 Reinitialize	IEDIT = 1
	3 Reinitialize, setting t = 0.	
	4 Provide abbreviated output (1 line containing rate, cont. level, moistures)	- IEDIT = 1
	5 Current output (1 hr)	- IEDIT = 2
	6 Long output (24 hr)	- IEDIT = 3
	9 Abort program	

Note: In addition, IFLAG may be set to 8 within the scan program, if an RTD measurement error exists. After manual correction of the RTD error, the IRLT program is restarted by manually setting IFLAG = 0. If program is running normally or being reinitialized (i.e. ITYPE = 0, 1, or 3) IEDIT is set to 1 and the output will be of the abbreviated form. (See Section VI-a for details).

APPENDIX C

Operator Guide

The procedure for starting the ILRT program is as follows:

on the GEPAC 4030 console,

1) Dial into location labeled "FUNCTION" the value 29
   (Function switch 29)

2) Dial into location labeled "NUMBER," the value 0
   (This is the program value for ITYPE).

3) Press the "ACTION" button

After starting the ILRT program, the program may be reinitialized by the same procedure as above except that ITYPE ("NUMBER" dial) is set to 1 to reinitialize with the time variable automatically reset to 0. Follow the above procedure with ITYPE = 3.

When the program is started or reinitialized, an abbreviated, shortened set of results is printed (leak rate, confidence level, and moisture analyzer readings only). If complete output is desired, i.e. all measurements and calculations, perform the start program procedure as above with "NUMBER" dial set to 0; then repeat the procedure with "NUMBER" dial set to 5 or 6. Note: ITYPE = 5 produces output for current hour, ITYPE = 6 produces a log of the output for the preceding 24 hours (or less than 24 hours, depending upon the maximum time the program has been executing).

In the case the ILRT program detects an RTD measurement error, it enters into a "wait" state of 30 seconds duration pending operator action, and internally sets IFLAG = 8. As long as the value of IFLAG remains 8, the program will continue in the wait state. That is, in order to continue the program, the operator must dial another value on the "NUMBER" dial (usually 0) and press the "ACTION" button.

While in the wait state the operator must correct the RTD observation by either of the following two methods:

1) a) Dial in the computer point number corresponding to the bad RTD on the GEPAC console.

   b) Manually dial in a corrected observation (in deg F) using "INPUT" dial

   c) Remove the computer point from scan (by depressing "REMOVE SCAN" button on console) and insert new value (by depressing "INSERT" button). This new value will remain constant in the computer until it is changed manually or the RTD computer point is returned to SCAN (a console push-button is also provided for this purpose).

2) Same as above except dial in a value of 0. instead of a corrected observation. With this procedure, the scanned reading will be ignored. For example, each of the 9 containment volumes contains 2 RTD's which are averaged. If one of these 2 RTD's reads 0., it will be ignored and the "average" will consist only of one good reading.

Caution: After the operator breaks the computer out of the WAIT state, no further corrections will be possible. Therefore, all corrections must be made before proceding.

To abort or end the ILRT program, dial the value 9 into "NUMBER" and press "ACTION".

For further details, see Section VI and Appendix B-VI of documentation.

APPENDIX D

SAMPLE OUTPUT
IBM 370 PROGRAM

***** JAFNPP-1 14 PSIA K .TE TEST AFTER 8.00 HRS *****

TOTAL RATE (PCT/DAY)	95PCT CONF (PCT/DAY)	MOISTURE READING STREAMS - PPMV VOLUME A	B	C	D	E
5.8189	0.9559	9375.00	9375.00	9375.00	9375.00	9375.00
5.8189	0.9559					

16-1-RTD INDEX 113 OR 114 IS BAD
OPERATOR ACTION REQUIRED TO SET BAD VALUE TO 0.
AFTER FIXUP, SET IFLAG=0 TO RESUME PROGRAM
DEENERGIZE BAD RTD
OR SET IFLAG=9 TO ABORT PROGRAM

16-1-RTD	RDG
113	100.00
114	98.00
101	93.00
120	94.00
102	95.00
119	96.00
103	97.00
104	98.00
105	99.00
106	100.00
107	101.00
108	102.00
109	103.00
117	104.00
110	105.00
111	106.00
112	107.00
118	108.00

EXAMPLE:

ABBREVIATED OUTPUT
(IFLAG = 1, IEDIT = 1)

***** JAFNPP-1 14 PSIA LE/ TE TEST AFTER 9.00 HRS *****
REF.DWG 11025-FM- . AND FX-18A

EXAMPLE: LONG OUTPUT

TEMPERATURE (DEG F) 14-1-RTD-/AREA

HRS	113/8	114/8	101/1	120/1	102/1	119/1	103/2	104/2	105/3	106/3	107/4	108/4	109/5	117/5	110/6	111/6	112/7	113/7
0	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
1	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
2	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
3	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
4	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
5	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
6	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
7	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
8	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
9	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00

HRS	AVE TEMP TORUS	AVE TEMP DRYWELL	PRESSURES (PSIA) TORUS TOTAL (P1-104)	TORUS REF VOL (P1-103)	TORUS DP (DP1-102)	DRYWELL TOTAL (P1-102)	DRYWELL REF VOL (P1-101)	DRYWELL DP (DP1-101)	BAROMETRIC PRESSURE INCHES HG
0	99.00	98.55	14.00	14.00	0.0	14.00	14.00	0.0	28.50
1	99.00	98.55	14.00	14.00	0.0	14.00	14.00	0.0	28.50
2	99.00	98.55	13.86	14.00	0.1400	13.99	14.00	0.0140	28.50
3	99.00	98.55	13.86	14.00	0.1400	13.99	14.00	0.0140	28.50
4	99.00	98.55	13.72	14.00	0.2800	13.97	14.00	0.0280	28.50
5	99.00	98.55	13.72	14.00	0.2800	13.97	14.00	0.0280	28.50
6	99.00	98.55	13.58	14.00	0.4200	13.96	14.00	0.0420	28.50
7	99.00	98.55	13.58	14.00	0.4200	13.96	14.00	0.0420	28.50
8	99.00	98.55	13.44	14.00	0.5600	13.94	14.00	0.0560	28.50
9	99.00	98.55	13.44	14.00	0.5600	13.94	14.00	0.0560	28.50

HRS	MOISTURE READINGS PPM VOLUME FOR STREAMS A-E A	B	C	D	E	TORUS VAPOR PRES (PSIA)	TORUS DEW POINT (DEG F)	DRYWELL VAPOR PRES (PSIA)	DRYWELL DEW POINT, (DEG F)
0	9375.00	9375.00	9375.00	9375.00	9375.00	0.1300	41.76	0.1300	41.75
1	9375.00	9375.00	9375.00	9375.00	9375.00	0.1300	41.76	0.1300	41.75
2	9375.00	9375.00	9375.00	9375.00	9375.00	0.1287	41.50	0.1299	41.73
3	9375.00	9375.00	9375.00	9375.00	9375.00	0.1287	41.50	0.1299	41.73
4	9375.00	9375.00	9375.00	9375.00	9375.00	0.1274	41.24	0.1297	41.70
5	9375.00	9375.00	9375.00	9375.00	9375.00	0.1274	41.24	0.1297	41.70
6	9375.00	9375.00	9375.00	9375.00	9375.00	0.1261	40.99	0.1296	41.67
7	9375.00	9375.00	9375.00	9375.00	9375.00	0.1261	40.98	0.1296	41.67
8	9375.00	9375.00	9375.00	9375.00	9375.00	0.1248	40.71	0.1295	41.65
9	9375.00	9375.00	9375.00	9375.00	9375.00	0.1248	40.71	0.1295	41.65

MASS AIR IN CONTAINMENTS - LBS

HRS	IDEAL GAS LAW TORUS	IDEAL GAS LAW DRYWELL	IDEAL GAS LAW SUM	REF VESSEL METHOD TORUS	REF VESSEL METHOD DRYWELL	REF VESSEL METHOD SUM
0	7755.33	10353.84	18109.17	7755.33	10353.84	18109.17
1	7755.33	10353.84	18109.17	7755.33	10353.84	18109.17
2	7677.78	10343.49	18021.27	7677.78	10343.49	18021.27
3	7677.78	10343.49	18021.27	7677.78	10343.49	18021.27
4	7600.23	10333.13	17933.36	7600.23	10333.13	17933.36
5	7600.23	10333.13	17933.36	7600.23	10333.13	17933.36
6	7522.67	10322.78	17845.45	7522.67	10322.78	17845.45
7	7522.67	10322.78	17845.45	7522.67	10322.78	17845.45
8	7445.12	10312.43	17757.54	7445.12	10312.43	17757.54
9	7445.12	10312.43	17757.54	7445.12	10312.43	17757.54

LONG OUTPUT (CONT.)

INTEGRATED LEAK RATE

HRS	ABSOLUTE METHOD CALC 24HR LEAK RATE(PCT)	ABSOLUTE METHOD STD DEV OF SLOPE	ABSOLUTE METHOD 95PCT CONF LIMIT(PCT)	REF VESSEL METHOD CALC 24HR LEAK RATE(PCT)	REF VESSEL METHOD STD DEV OF SLOPE	REF VESSEL METHOD 95PCT CONF LIMIT(PCT)
0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0
2	5.8204	25.3766	10.2975	5.8204	25.3766	10.2974
3	4.6579	12.4319	4.4948	4.6579	12.4319	4.4948
4	5.8195	6.7907	2.9648	5.8195	6.7907	2.9648
5	5.3222	6.1522	1.9830	5.3222	6.1522	1.9830
6	5.8191	4.8638	1.5174	5.8191	4.8638	1.5174
7	5.5433	3.8213	1.1642	5.5433	3.8213	1.1642
8	5.8189	3.1972	0.9559	5.8189	3.1972	0.9559
9	5.6436	2.6639	0.7850	5.6436	2.6639	0.7850

16-1-RTD INDEX 113 OR 114 IS BAD
OPERATOR ACTION REQUIRED TO SET BAD VALUE TO 0.
AFTER FIXUP, SET IFLAG=0 TO RESUME PROGRAM
DEENERGIZE BAD RTD
OR SET IFLAG=9 TO ABORT PROGRAM

16-1-RTD	RDG
113	100.00
114	98.00
101	93.00
120	94.00
102	95.00
119	96.00
103	97.00
104	98.00
105	99.00
106	100.00
107	101.00
108	102.00
109	103.00
117	104.00
110	105.00
111	106.00
112	107.00
118	108.00

***** JAFNPP-1 14 PSIA LE ATE TEST AFTER 10.00 HRS *****
REF.DWG 11825-FM , AND FM-18A

EXAMPLE: SHORT OUTPUT

TEMPERATURE (DEG F) 16-1-RTD-/AREA

HRS	113/8	114/8	101/1	120/1	102/1	119/1	103/2	104/2	105/3	106/3	107/4	108/4	109/5	117/5	110/6	111/6	112/7	118/7
10	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00

HRS	AVE TEMP TORUS	AVE TEMP DRYWELL	PRESSURES (PSIA) TORUS TOTAL (P1-104)	TORUS REF VOL (P1-103)	TORUS DP (DP1-102)	DRYWELL TOTAL (P1-102)	DRYWELL REF VOL (P1-101)	DRYWELL DP (DP1-101)	BAROMETRIC PRESSURE INCHES HG
10	99.00	98.55	13.30	14.00	0.7000	13.93	14.00	0.0700	28.50

MOISTURE READINGS PPM VOLUME FOR STREAMS A-E

HRS	A	B	C	D	E	TORUS VAPOR PRES (PSIA)	TORUS DEW POINT (DEG F)	DRYWELL VAPOR PRES (PSIA)	DRYWELL DEW POINT (DEG F)
10	9375.00	9375.00	9375.00	9375.00	9375.00	0.1235	40.45	0.1294	41.62

MASS AIR IN CONTAINMENTS - LBS

HRS	IDEAL GAS LAW TORUS	IDEAL GAS LAW DRYWELL	IDEAL GAS LAW SUM	REF VESSEL METHOD TORUS	REF VESSEL METHOD DRYWELL	REF VESSEL METHOD SUM
10	7367.57	10302.07	17669.64	7367.57	10302.07	17669.64

INTEGRATED LEAK RATE

HRS	ABSOLUTE METHOD CALC 24HR LEAK RATE(PCT)	ABSOLUTE METHOD STD DEV OF SLOPE	ABSOLUTE METHOD 95PCT CONF LIMIT(PCT)	REF VESSEL METHOD CALC 24HR LEAK RATE(PCT)	REF VESSEL METHOD STD DEV OF SLOPE	REF VESSEL METHOD 95PCT CONF LIMIT(PCT)
10	5.8187	2.3070	0.6716	5.8187	2.3070	0.6716

16-1-RTD INDEX 113 OR 114 IS BAD
OPERATOR ACTION REQUIRED TO SET BAD VALUE TO 0.
AFTER FIXUP, SET IFLAG=0 TO RESUME PROGRAM
DEENERGIZE BAD RTD
OR SET IFLAG=9 TO ABORT PROGRAM

16-1-RTD	RDG
113	100.00
114	98.00
101	93.00
120	94.00
102	95.00
119	96.00
103	97.00
104	98.00
105	99.00
106	100.00
107	101.00
108	102.00
109	103.00
117	104.00
110	105.00
111	106.00
112	107.00
118	108.00

EXAMPLE: SHORT OUTPUT

***** JAFNPP-1 14 PSIA LEAK RATE TEST AFTER 11.00 HRS *****
REF.DWG 11825-FM-4 AND FM-1RA

TEMPERATURE (DEG F) 16-1-RTD-/AREA

HRS	113/9	114/8	101/1	120/1	102/1	119/1	103/2	104/2	105/3	106/3	107/4	108/4	109/5	117/5	110/6	111/6	112/7	118/7
11	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00

HRS	AVE TEMP TORUS	AVE TEMP DRYWELL	PRESSURES (PSIA) TORUS TOTAL (P1-104)	TORUS REF VOL (P1-103)	TORUS DP (DP1-102)	DRYWELL TOTAL (P1-102)	DRYWELL REF VOL (P1-101)	DRYWELL DP (DP1-101)	BAROMETRIC PRESSURE INCHES HG
11	99.00	98.55	13.30	14.00	0.7000	13.93	14.00	0.0700	28.50

HRS	MOISTURE READINGS PPM VOLUME FOR STREAMS A-E A	B	C	D	E	TORUS VAPOR PRES (PSIA)	TORUS DEW POINT (DEG F)	DRYWELL VAPOR PRES (PSIA)	DRYWELL DEW POINT (DEG F)
11	9375.00	9375.00	9375.00	9375.00	9375.00	0.1235	40.45	0.1294	41.62

MASS AIR IN CONTAINMENTS - LBS

HRS	IDEAL GAS LAW TORUS	IDEAL GAS LAW DRYWELL	IDEAL GAS LAW SUM	REF VESSEL METHOD TORUS	REF VESSEL METHOD DRYWELL	REF VESSEL METHOD SUM
11	7367.57	10302.07	17669.64	7367.57	10302.07	17669.64

INTEGRATED LEAK RATE

HRS	ABSOLUTE METHOD CALC 24HR LEAK RATE(PCT)	ABSOLUTE METHOD STD DEV OF SLOPE	ABSOLUTE METHOD 95PCT CONF LIMIT(PCT)	REF VESSEL METHOD CALC 24HR LEAK RATE(PCT)	REF VESSEL METHOD STD DEV OF SLOPE	REF VESSEL METHOD 95PCT CONF LIMIT(PCT)
11	5.6976	1.9920	0.5742	5.6976	1.9920	0.5742

16-1-RTD INDEX 113 OR 114 IS BAD
OPERATOR ACTION REQUIRED TO SET BAD VALUE TO 0.
AFTER FIXUP, SET IFLAG=0 TO RESUME PROGRAM
DEENERGIZE BAD RTD
OR SET IFLAG=9 TO ABORT PROGRAM

16-1-RTD	DEG
113	100.00
114	98.00
101	93.00
120	94.00
102	95.00
119	96.00
103	97.00
104	98.00
105	99.00
106	100.00
107	101.00
108	102.00
109	103.00
117	104.00
110	105.00
111	106.00
112	107.00
118	108.00

(ONLY) MOST RECENT 24 HOUR ***** JAFNPP-1 14 PSIA LEA[illegible]E TEST AFTER 26.00 HRS *****
REF.DWG 11825-FM-[illegible] AND FM-18A

PERIOD) EXAMPLE: LONG OUTPUT

TEMPERATURE (DEG F) 16-1-RTD-/AREA

HRS	113/8	114/9	101/1	120/1	102/1	119/1	103/2	104/2	105/3	106/3	107/4	108/4	109/5	117/5	110/6	111/6	112/7	115/7
2	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
3	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
4	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
5	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
6	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
7	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
8	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
9	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
10	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
11	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
12	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
13	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
14	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
15	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
16	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
17	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
18	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
19	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
20	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
21	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
22	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
23	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
24	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
25	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00
26	100.00	98.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00

HRS	AVE TEMP TORUS	AVE TEMP DRYWELL	PRESSURES (PSIA) TORUS TOTAL (P1-104)	TORUS REF VOL (P1-103)	TORUS DP (DP1-102)	DRYWELL TOTAL (P1-102)	DRYWELL REF VOL (P1-101)	DRYWELL DP (DP1-101)	BAROMETRIC PRESSURE INCHES HG
2	99.00	98.55	13.86	14.00	0.1400	13.99	14.00	0.0140	28.50
3	99.00	98.55	13.86	14.00	0.1400	13.99	14.00	0.0140	28.50
4	99.00	98.55	13.72	14.00	0.2800	13.97	14.00	0.0280	28.50
5	99.00	98.55	13.72	14.00	0.2800	13.97	14.00	0.0280	28.50
6	99.00	98.55	13.58	14.00	0.4200	13.96	14.00	0.0420	28.50
7	99.00	98.55	13.58	14.00	0.4200	13.96	14.00	0.0420	28.50
8	99.00	98.55	13.44	14.00	0.5600	13.94	14.00	0.0560	28.50
9	99.00	98.55	13.44	14.00	0.5600	13.94	14.00	0.0560	28.50
10	99.00	98.55	13.30	14.00	0.7000	13.93	14.00	0.0700	28.50
11	99.00	98.55	13.30	14.00	0.7000	13.93	14.00	0.0700	28.50
12	99.00	98.55	13.16	14.00	0.8400	13.92	14.00	0.0840	28.50
13	99.00	98.55	13.16	14.00	0.8400	13.92	14.00	0.0840	28.50
14	99.00	98.55	13.02	14.00	0.9800	13.90	14.00	0.0980	28.50
15	99.00	98.55	13.02	14.00	0.9800	13.90	14.00	0.0980	28.50
16	99.00	98.55	12.88	14.00	1.1200	13.89	14.00	0.1120	28.50
17	99.00	98.55	12.88	14.00	1.1200	13.89	14.00	0.1120	28.50
18	99.00	98.55	12.74	14.00	1.2600	13.87	14.00	0.1260	28.50
19	99.00	98.55	12.74	14.00	1.2600	13.87	14.00	0.1260	28.50
20	99.00	98.55	12.60	14.00	1.4000	13.86	14.00	0.1400	28.50
21	99.00	98.55	12.60	14.00	1.4000	13.86	14.00	0.1400	28.50
22	99.00	98.55	12.46	14.00	1.5400	13.85	14.00	0.1540	28.50
23	99.00	98.55	12.46	14.00	1.5400	13.85	14.00	0.1540	28.50
24	99.00	98.55	12.32	14.00	1.6800	13.83	14.00	0.1680	28.50
25	99.00	98.55	12.32	14.00	1.6800	13.83	14.00	0.1680	28.50
26	99.00	98.55	12.18	14.00	1.8200	13.82	14.00	0.1820	28.50

Long Report (cont)

	MOISTURE READINGS PPM VOLUME FOR STREAMS A-E					TORUS		VESSEL	
	A	B	C	D	E	VAPOR PRES (PSIA)	DEW POINT (DEG F)	VAPOR PRES (PSIA)	DEW POINT (DEG F)
2	9375.00	9375.00	9375.00	9375.00	9375.00	0.1287	41.50	0.1299	41.73
3	9375.00	9375.00	9375.00	9375.00	9375.00	0.1287	41.50	0.1299	41.73
4	9375.00	9375.00	9375.00	9375.00	9375.00	0.1274	41.24	0.1297	41.70
5	9375.00	9375.00	9375.00	9375.00	9375.00	0.1274	41.24	0.1297	41.70
6	9375.00	9375.00	9375.00	9375.00	9375.00	0.1261	40.98	0.1296	41.67
7	9375.00	9375.00	9375.00	9375.00	9375.00	0.1261	40.98	0.1296	41.67
8	9375.00	9375.00	9375.00	9375.00	9375.00	0.1248	40.71	0.1295	41.65
9	9375.00	9375.00	9375.00	9375.00	9375.00	0.1248	40.71	0.1295	41.65
10	9375.00	9375.00	9375.00	9375.00	9375.00	0.1235	40.45	0.1294	41.62
11	9375.00	9375.00	9375.00	9375.00	9375.00	0.1235	40.45	0.1294	41.62
12	9375.00	9375.00	9375.00	9375.00	9375.00	0.1222	40.18	0.1292	41.60
13	9375.00	9375.00	9375.00	9375.00	9375.00	0.1222	40.18	0.1292	41.60
14	9375.00	9375.00	9375.00	9375.00	9375.00	0.1209	39.91	0.1291	41.57
15	9375.00	9375.00	9375.00	9375.00	9375.00	0.1209	39.91	0.1291	41.57
16	9375.00	9375.00	9375.00	9375.00	9375.00	0.1196	39.63	0.1290	41.55
17	9375.00	9375.00	9375.00	9375.00	9375.00	0.1196	39.63	0.1290	41.55
18	9375.00	9375.00	9375.00	9375.00	9375.00	0.1183	39.36	0.1289	41.52
19	9375.00	9375.00	9375.00	9375.00	9375.00	0.1183	39.36	0.1289	41.52
20	9375.00	9375.00	9375.00	9375.00	9375.00	0.1170	39.08	0.1287	41.49
21	9375.00	9375.00	9375.00	9375.00	9375.00	0.1170	39.08	0.1287	41.49
22	9375.00	9375.00	9375.00	9375.00	9375.00	0.1157	38.79	0.1286	41.47
23	9375.00	9375.00	9375.00	9375.00	9375.00	0.1157	38.79	0.1286	41.47
24	9375.00	9375.00	9375.00	9375.00	9375.00	0.1144	38.51	0.1284	41.44
25	9375.00	9375.00	9375.00	9375.00	9375.00	0.1144	38.51	0.1284	41.44
26	9375.00	9375.00	9375.00	9375.00	9375.00	0.1131	38.22	0.1283	41.42

MASS AIR IN CONTAINMENTS - LBS

	IDEAL GAS LAW			REF VESSEL METHOD		
HRS	TORUS	DRYWELL	SUM	TORUS	DRYWELL	SUM
2	7677.78	10343.49	18021.27	7677.78	10343.49	18021.27
3	7677.78	10343.49	18021.27	7677.78	10343.49	18021.27
4	7600.23	10333.13	17933.36	7600.23	10333.13	17933.36
5	7600.23	10333.13	17933.36	7600.23	10333.13	17933.36
6	7522.67	10322.78	17845.45	7522.67	10322.78	17845.45
7	7522.67	10322.78	17845.45	7522.67	10322.78	17845.45
8	7445.12	10312.43	17757.54	7445.12	10312.43	17757.54
9	7445.12	10312.43	17757.54	7445.12	10312.43	17757.54
10	7367.57	10302.07	17669.64	7367.57	10302.07	17669.64
11	7367.57	10302.07	17669.64	7367.57	10302.07	17669.64
12	7290.01	10291.72	17581.73	7290.01	10291.72	17581.73
13	7290.01	10291.72	17581.73	7290.01	10291.72	17581.73
14	7212.46	10281.36	17493.82	7212.46	10281.36	17493.82
15	7212.46	10281.36	17493.82	7212.46	10281.36	17493.82
16	7134.91	10271.01	17405.92	7134.91	10271.01	17405.92
17	7134.91	10271.01	17405.92	7134.91	10271.01	17405.92
18	7057.35	10260.66	17318.01	7057.35	10260.66	17318.01
19	7057.35	10260.66	17318.01	7057.35	10260.66	17318.01
20	6979.80	10250.30	17230.10	6979.80	10250.30	17230.10
21	6979.80	10250.30	17230.10	6979.80	10250.30	17230.10
22	6902.25	10239.95	17142.19	6902.25	10239.95	17142.19
23	6902.25	10239.95	17142.19	6902.25	10239.95	17142.19
24	6824.69	10229.60	17054.29	6824.69	10229.60	17054.29
25	6824.69	10229.60	17054.29	6824.69	10229.60	17054.29
26	6747.14	10219.24	16966.38	6747.14	10219.24	16966.38

INTEGRATED LEAK RATE

ABSOLUTE METHOD

REF VESSEL METHOD

Log #1P
CONT.

HRS	CALC 24HR LEAK RATE(PCT)	STD DEV OF SLOPE	95PCT CONF LIMIT(PCT)	CALC 24HR LEAK RATE(PCT)	STD DEV OF SLOPE	95PCT CONF LIMIT(PCT)
2	5.8204	25.3766	10.2975	5.8204	25.3766	10.2974
3	4.6579	12.4319	4.4948	4.6579	12.4319	4.4948
4	5.8195	8.7907	2.9648	5.8195	8.7907	2.9648
5	5.3222	6.1522	1.9830	5.3222	6.1522	1.9830
6	5.8191	4.8638	1.5174	5.8191	4.8638	1.5174
7	5.5433	3.8213	1.1642	5.5433	3.8213	1.1642
8	5.8189	3.1972	0.9559	5.8189	3.1972	0.9559
9	5.6436	2.6639	0.7850	5.6436	2.6639	0.7850
10	5.8187	2.3070	0.6716	5.8187	2.3070	0.6716
11	5.6976	1.9920	0.5742	5.6976	1.9920	0.5742
12	5.8186	1.7657	0.5047	5.8186	1.7657	0.5047
13	5.7300	1.5616	0.4433	5.7300	1.5616	0.4433
14	5.8186	1.4076	0.3970	5.8186	1.4076	0.3970
15	5.7509	1.2666	0.3554	5.7509	1.2666	0.3554
16	5.8185	1.1563	0.3229	5.8185	1.1563	0.3229
17	5.7652	1.0541	0.2931	5.7652	1.0541	0.2931
18	5.8185	0.9718	0.2692	5.8185	0.9718	0.2692
19	5.7753	0.8949	0.2471	5.7753	0.8949	0.2471
20	5.8184	0.8317	0.2289	5.8184	0.8317	0.2289
21	5.7829	0.7722	0.2120	5.7829	0.7722	0.2120
22	5.8184	0.7223	0.1978	5.8184	0.7223	0.1978
23	5.7886	0.6751	0.1844	5.7886	0.6751	0.1844
24	5.8184	0.6350	0.1731	5.8184	0.6350	0.1731
25	5.8319	0.6350	0.1735	5.8319	0.6350	0.1735
26	5.8467	0.6350	0.1739	5.8467	0.6350	0.1739

16-1-RTD INDEX 113 OR 114 IS BAD
OPERATOR ACTION REQUIRED TO SET BAD VALUE TO 0.
AFTER FIXUP, SET IFLAG=0 TO RESUME PROGRAM
DEENERGIZE BAD RTD
OR SET IFLAG=9 TO ABORT PROGRAM

16-1-RTD	RDG
113	100.00
114	99.00
101	93.00
120	94.00
102	95.00
119	96.00
103	97.00
104	98.00
105	99.00
106	100.00
107	101.00
108	102.00
109	103.00
117	104.00
110	105.00
111	106.00
112	107.00
118	108.00

APPENDIX E

ERROR ANALYSIS

The error analysis which has been performed determines the relative error of the previously defined functions which have been used to calculate the leak rate by both the absolute and reference vessel methods. Relative error is defined as the absolute error divided by the true value of the quantity. The absolute error is expressed in terms of the unit used and is the numerical difference between the true value of a quantity and the given value as given or obtained by measurement or calculation. The percentage error is defined as the relative error times one hundred (100). It can be said that the true index of accuracy of measurement is relative error.

A development of the general formula for errors follows:

let $N = f(u_1, u_2, u_3, \ldots, u_n)$ (a)

denote any function of several independent variables u_1, u_2, u_3, ..., u_n which are subjected to the errors Δu_1, Δu_2, Δu_3, ..., Δu_n, respectively. These errors will cause an error ΔN in the function N, according to the relationship

$$N + \Delta N = f(u_1 + \Delta u_1, u_2 + \Delta u_2, u_3 + \Delta u_3, \ldots, u_n + \Delta u_n) \quad (b)$$

To find an expression for ΔN expand the right-hand member by Taylors' Theorem for a function of several variables. Then

$$f(u_1 + \Delta u_1, u_2 + \Delta u_2, u_3 + \Delta u_3, \ldots, u_n + \Delta u_n) =$$

$$f(u_1, u_2, \ldots, u_n) + \Delta u_1 \frac{\partial f}{\partial u_1} + \frac{\Delta u_2 \partial f}{\partial u_2} + \ldots + \Delta u_n \frac{\partial f}{\partial u_n} +$$

$$1/2 \left[(\Delta u_1)^2 \frac{\partial^2 f}{\partial u_1^2} + \ldots + \frac{(\Delta u_n^2 \partial^2 f}{\partial u_n^2} + 2 \Delta u_1 u_2 \frac{\partial^2 f}{\partial u_1 \partial u_2} + \ldots \right.$$

$$\left. + \ldots \right. \quad (c)$$

Since the errors Δu_1, Δu_2, ... Δu_n are always relatively small*, their squares, products, and higher powers may be neglected. Then

$$N + \Delta N = f(u_1, u_2, u_3, \ldots, u_n) + \Delta u_1 \frac{\partial f}{\partial u_1} + \Delta u_2 \frac{\partial f}{\partial u_2}$$

$$+ \ldots + \Delta u_n \frac{\partial f}{\partial u_n} \qquad (d)$$

Subtracting (a) from (d)

$$\Delta N = \frac{\partial f}{\partial u_1} \Delta u_1 + \frac{\partial f}{\partial u_2} \Delta u_2 + \ldots + \frac{\partial f}{\partial u_n} \Delta u_n, \qquad (e) \text{ or}$$

$$\Delta N = \frac{\partial N}{\partial u_1} \Delta u_1 + \frac{\partial N}{\partial u_2} \Delta u_2 + \ldots + \frac{\partial N}{\partial u_n} \Delta u_n \qquad (f)$$

which is a general formula for computing the error of a function. The right hand member of (f) is merely the total differential of N. For the relative error of the function N

$$E_r = \frac{\Delta N}{N} = \frac{\partial N}{\partial u_1} \frac{\Delta u_1}{N} + \frac{\partial N}{\partial u_2} \frac{\Delta u_2}{N} + \ldots + \frac{\partial N}{\partial u_n} \frac{\Delta u_n}{N} \qquad (g)$$

The equations used to determine the leak rate and the relative error calculated from them will now be treated for the absolute method and the reference vessel method.

ABSOLUTE METHOD

$$Mta = Msa + Mda$$

$$= \frac{144(Ps-Psv)Vs}{RTs} + \frac{144(Pd-Pdv)Vd}{RTd}$$

$$= \frac{144}{RTsTd} \left[(Ps-Psv)\ Vs + (Pd-Pdv)\ Vd \right]$$

* A quantity Q is relatively small in comparison with a second quantity Q_2 if the ratio is small in comparison with unity. The squares and products of such small ratios are negligible in most calculations.

$$E_r = \frac{\Delta Mta}{Mta} = \frac{144}{R}\left[\frac{(Vs\,\Delta Ps}{Ts\ \ Mta} - \frac{Vs\,\Delta Psv}{Ts\ \ Mta} + \frac{Vd\,\Delta Pd}{Td\ \ Mta}\right.$$

$$- \frac{Vd\,\Delta Pdv}{Td\ \ Mta} + \frac{(Ps - Psv)\,\Delta Vs}{Ts\ \ Mta} + \frac{(Pd-Pdv)\,\Delta Vd}{Td\ \ Mta}$$

$$\left. - \frac{(Ps-Psv)Vs\,\Delta Ts}{Ts^2} - \frac{(Pd-Pdv)\ \ Vd\,\Delta Td}{Td^2}\right]$$

$$= \frac{Vs\ Td\,\Delta Ps}{(Ps-Psv)Vs+(Pd-Pdv)Vd} - \frac{Vs\ Td\ \Delta Psv}{(Ps-Psv)Vs+(Pd-Pdv)Vd}$$

$$+ \frac{Vd\ Ts\,\Delta Pd}{(Ps-Psv)Vs+(Pd-Pdv)Vd} - \frac{Vd\ Ts\ \Delta Pdv}{(Ps-Psv)Vs+(Pd-Pdv)Vd}$$

$$+ \frac{(Pd-Pdv)\ \Delta Vd}{Ts\,[(Ps-Psv)Vs+(Pd-Pdv)Vd]} + \frac{(Ps-Psv)\ \Delta\ Vs}{Td\ [(Ps-Psv)Vs+(Pd-Pdv)Vd]}$$

$$+ \frac{-(Ps-Psv)Vs\,\Delta Ts\ \ Td}{Ts\ [(Ps-Psv)Vs+(Pd-Pdv)Vd]} + \frac{-(Pd-Pdv)Vd\,\Delta Td\ \ Ts}{Td\ [(Ps-Psv)Vs+(Pd-Pdv)Vd]}$$

Since the errors of ΔPs, ΔPsv, ΔPd, ΔPdv, ΔVd, ΔVs, ΔTs, and ΔTd are just as likely to be negative as positive, the terms must be taken with the positive sign in order to be sure of the maximum error in the leak rate. Therefore

$$E_r \leq \left|\frac{Vs\ Td\ \ \Delta Ps}{(Ps-Psv)Vs + (Pd-Pdv)Vd}\right| + - \left|\frac{Vs\ Td\ \ \Delta Psv}{(Ps-Psv)Vs + (Pd-Pdv)Vd}\right|$$

$$+ \left|\frac{Vd\ Ts\ \ \Delta Pd}{(Ps-Psv)Vs + (Pd-Pdv)Vd}\right| + \left|\frac{Vd\ Ts\ \ \Delta Pdv}{(Ps-Psv)Vs + (Pd-Pdv)Vd}\right|$$

$$+ \left|\frac{(Pd-Pdv)\ \ \Delta Vd}{Ts\ [(Ps-Psv)Vs + (Pd-Pdv)Vd]}\right| + \left|\frac{(Ps-Psv)\ \ \Delta\ Vs}{Td\ [(Ps-Psv)Vs + (Pd-Pdv)Vd]}\right|$$

$$+ \left|\frac{(Ps-Psv)Vs\ Td\ \ \Delta Ts}{Ts\ [(Ps-Psv)Vs + (Pd-Pdv)Vd]}\right| + \left|\frac{(Pd-Pdv)Vd\ Ts\ \ \Delta\ Td}{Td\ [(Ps-Psv)Vs + (Pd-Pdv)Vd]}\right|$$

REFERENCE VESSEL METHOD

$$Mtr = Msr + Mdr$$

$$= Mso\,(1-L'sr\,*t/24) + Mdo\,(1-L'dr\,*t/24)$$

$$= \frac{144\,(Pso-Psvo)Vs}{RTso}\,(1-L'sr\,*t/24)$$

$$+ \frac{144\,(Pdo-Pdvo)Vd}{RTdo}\,(1-L'dr\,*t/24)$$

$$= \frac{144Vs}{RTso}\,(Pso + Psro) - \frac{144Vs}{RTs}\,(\Delta Psr + Psv)$$

$$+ \frac{144Vd}{Tdo}\,(Pd + \Delta Pdro) - \frac{144Vd}{RTd}\,(\Delta Pdr + Pdv)$$

$$E_r - \frac{\Delta Mtr}{Mtr} \leq \left|\frac{(Pso + \Delta Psro)\,\Delta Vs\,Ts\,Td\,Tdo}{D}\right|$$

$$+ \left|\frac{(\Delta Psr + Psv)\,\Delta Vs\,Tso\,Td\,Tdo}{D}\right| + \left|\frac{(Pdo + \Delta Pdro)\,\Delta Vd\,Ts\,Tso\,Td}{D}\right|$$

$$+ \left|\frac{(\Delta Pdr + Pdv)\,\Delta Vd\,Ts\,Tso\,Tdo}{D}\right| + \left|\frac{(Pso + \Delta Psro)\,Vs\,\Delta Tso\,Ts\,Td\,Tdo}{D}\right|$$

$$+ \left|\frac{(\Delta Psr + Psv)\,\Delta Ts\,Vs\,Tso\,Td\,Tdo}{Ts\,D}\right| + \left|\frac{(Pdo + \Delta Pdro)\,Vd\,\Delta Tdo\,Ts\,Tso\,Td}{Tdo\,D}\right|$$

$$+ \left|\frac{(\Delta Pdr + Pdv)\,\Delta Td\,Vd\,Ts\,Tso\,Tdo}{Td\,D}\right| + \left|\frac{Vs\,\Delta Pso\,Ts\,Td\,Tdo}{D}\right|$$

$$+ \left|\frac{Vs\,\Delta Psv\,Tso\,Td\,Tdo}{D}\right| + \left|\frac{Vd\,\Delta Pdo\,Ts\,Tso\,Td}{D}\right|$$

$$+ \left|\frac{Vd\,\Delta Pdv\,Ts\,Tso\,Tdo}{D}\right|$$

Where $D = (Pso + \Delta Psro)\,Ts\,Td\,Tdo\,Vs - (\Delta Psr + Psv)\,Tso\,Td\,Tdo\,Vs$
$+ (Pdo + \Delta Pdro)\,Ts\,Tso\,Td\,Vd - (\Delta Pdr + Pdv)\,Tdo\,Ts\,Tso\,Vd$

The relative error of the Absolute and Reference Vessel Methods were evaluated at 14.7 psia, 38 psia, and 60 psia. The results are summarized in Table B. The instrument errors used are as follows:

Instrument	Property Measured	Error
RTD	Temperature	.1 F from 70 F to 100 F
Quartz manometer	Pressure	.032% ($\pm$0.010% reading $\pm$0.022% full scale)
Bi-Directional quartz manometer	Pressure	.012% ($\pm$0.010% reading $\pm$0.002% full scale)
Beckman moisture analyzer	Vapor pressure	1% (full scale)
	Volume	2% (reading)

The variables and their associated values which were used to calculate the relative error are shown in Table A.

TABLE A

Variable	Units	Value
Td = Tdo	^{o}R	98.55
Ts = Tso	^{o}R	99.00
Vd	ft^3	154476.00
Vs	ft^3	115800.00
Psc	psia	14.7, 38.0, 60.0
Psro	psia	14.7, 38.00, 60.00
Psr	psia	14.7, 38.00, 60.00
Psv	psia	.1300
Pdc	psia	14.7, 38.00, 60.00
Pdro	psia	14.7, 38.00, 60.00
Pdr	psia	14.7, 38.00, 60.00
Pdv	psia	.1300
$\Delta Td = \Delta Ts = \Delta Tso = \Delta Tdo$	^{o}R	.1
ΔVd	ft^3	3089.52
ΔVs	ft^3	2316.00
ΔPso	psia	.004704, .01216, .0192
$\Delta Psro$	psia	.004704, .01216, .0192
ΔPsr	psia	.001764, .00456, .0072
ΔPsv	psia	.0013
ΔPdo	psia	.004704, .01216, .0192
$\Delta Pdro$	psia	.004764, .01216, .0192
ΔPdr	psia	.001764, .00456, .0072
ΔPdv	psia	.0013

Test, psia	Method	Relative error	Percent error
14.7	absolute	.14202	14.2
	reference	.08466	8.47
38	absolute	.13538	13.5
	reference	.08403	8.40
60	absolute	.13410	13.4
	reference	.07820	7.82

APPENDIX F

```
3238L 93  03-20-74   23.074   LEAK RATE TEST SEGMENT ONE

      1   CLRT01      LEAK RATE TEST SEGMENT ONE
      2   C
      3   C                 FOR  FITZPATRICK
      4   CC**********************************************************************
      5   CC**********************************************************************
      6   CC***                                                                ***
      7   CC***             LEAK RATE TEST SEGMENT ONE                         ***
      8   CC***                                                                ***
      9   CC**********************************************************************
     10   CC**********************************************************************
     11   C       PURPOSE OF THIS ROUTINE IS TO STORE ANALOG VALUES AS THEY ARE SENSED  364
     12   C         INTO VARIABLES USED BY PROGRAM AND TO CONVERT VALUES AS NECESSARY    365
                                                                                  CDNO 366
     13   C
     14   C       EQUIVALENCES - 18 RTD READINGS, 5 MOISTURE ANALYZER READINGS, ANDCDNO 367
     15   C         TEMP VARIANCE(ELPSON) FOR RTD ERROR TEST.                    CDNO 368
     16   CC**********************************************************************
     17          COMMON /OUTPUT/   RTD(18,26),     PPMV(5,26),     OUT(12,26),
     18         $  XTIME(26),      IUNIT,          INUM,           XSTAMP                A
     19          COMMON /DATA/     PS,             PD,             PSV,
     20         $  PDV,            TS,             TD,             DPSR,                 A
     21         $  DPDR,           VS,             VD,             TYME,                 B
     22         $  PSR,            PDR,            BAROM,          DEWPTD,               C
     23         $  DEWPTS,         WTN2,           UTCOR(26),      WTN20                 D
     24          COMMON /RESULT/   RATE(2,26),     CON(2,26),      STDM(2,26),
     25         $  YMASS(6,26),    PBAR(26),       YMO(2),         DMDT(2)               A
     26          COMMON /INIT/     PSO,            PDO,            PSVO,
     27         $  PDVO,           TSO,            TDO,            DPSRO,                A
     28         $  DPDRO,          YMOS,           YMOD,           IFLAG,                B
     29         $  NN,             N,              IEDIT,          NTH                   C
     30          DOUBLE PRECISION XTIME,YMASS,DMDT,YMO,PS,PD,DPSR,DPDR,PSV,PPMV,
     31         $        PDV,PSR,PDR,TS,TD,VS,VD,PSO,PDO,PSVO,PDVO,TSO,TDO,DPSRO,
     32         $        DPDRO,YMOS,YMOD,RATE,CON,STDM,PBAR,WTN2,WTC05,WTN20,VAR
     33          DOUBLE PRECISION TAT,WATWT,TAVER,TREAD,DPSREF,DPDREF,PSUPR,FBULB,
     34         1                 PDREF,PSREF
     35          DOUBLE PRECISION SVOT,CFN2
                                                                                  CDNO 373
     36   C
     37          DIMENSION         TWT(9),         WATWT(5),       TAVER(9),
     38         $  TREAD(18),      RTDNME(18)                                            A
                                                                                  CDNO 375
     39   C
     40          INTEGER TIME,RTDNME
     41          INTEGER PANFUN,XSTRMA
     42          LOGICAL IFRST
                                                                                  CDNO 378
     43   C
     44          DATA TWT /.1D1,.113300,.165200,.350D0,.1313D0,.47D-1,.534D-1,
     45         1          .7.50-1,.6210-1/
     46          DATA WATWT /.1D1,.176300,.1133D0,.1249D0,.583300/
     47          DATA RTDNME/3H113,3H114,3H101,3H121,3H102,3H119,3H103,3H104,3H105,
     48         $            3H106,3H107,3H108,3H109,3H117,3H110,3H111,3H112,3H118/
     49          DATA ELPSON/2.0/
     50          DATA NPRIO /29/
     51          ENTER PAL
     52   PSREFX EQU AVALUE+M098
```

Version sent to Fitzpatrick Site.

```
3238L 03  03-20-74   23.074   LEAK RATE TEST SEGMENT ONE

        53   PDREFX EQL AVALUE+M095
        54   *
        55   TRD01  EQL AVALUE+M095
        56   TRD02  EQL AVALUE+M102
        57   TRD03  EQL AVALUE+M103
        58   TRD04  EQL AVALUE+M116
        59   TRD05  EQL AVALUE+M084
        60   TRD06  EQL AVALUE+M115
        61   TRD07  EQL AVALUE+M085
        62   TRD08  EQL AVALUE+M086
        63   TRD09  EQL AVALUE+M087
        64   TRD10  EQL AVALUE+M088
        65   TRD11  EQL AVALUE+M089
        66   TRD12  EQL AVALUE+M090
        67   TRD13  EQL AVALUE+M091
        68   TRD14  EQL AVALUE+M113
        69   TRD15  EQL AVALUE+M092
        70   TRD16  EQL AVALUE+M093
        71   TRD17  EQL AVALUE+M094
        72   TRD18  EQL AVALUE+M114
        73   *
        74   XMODE  EQL AVALUE+M111
        75   XSTRH  EQL AVALUE+M112
        76   XRDG1  EQL AVALUE+M106
        77   XSTRHA EQL ADATA+M112
        78   XRDG2  EQL AVALUE+M069
        79   CFN24  EQL AVALUE+T078
        80   *
        81   BARRNX EQL AVALUE+F125
        82   DESREX EQL AVALUE+M101
        83   DPDREX EQL AVALUE+M100
        84   PSOPRX EQL AVALUE+M098
        85   PSOLNX EQL AVALUE+M097
        86   PANFUN EQL IFNUMB+714
        87   NUM    EQL ATMOS
        88         LEAVE PAL
        89   C                                                          CDNO 415
        90   C
        91   C     VARIABLE IFLAG IS THE PROGRAM OPTION NUMBER,  THE OPTION
        92   C     NUMBER IS SET VIA NUMBER (OPERATOR'S CONSOLE) WHEN DEMANDING
        93   C     THE LEAK RATE TEST,
        94   C
        95   C              IFLAG=0  =  NORMAL OPERATION; (SET BY PROGRAM)
        96   C              IFLAG=1  =  REINITIALIZE                    CDNO  66
        97   C              IFLAG=3  =  REINITIALIZE, SETTING TIME TO 0.  CDNO  67
        98   C              IFLAG=4  =  MINIMUM EDIT SELECTED
        99   C              IFLAG=5  =  CURRENT EDIT SELECTED
       100   C              IFLAG=6  =  24HR EDIT SELECTED
       101   C              IFLAG=8  =  SET BY PROGRAM IF RTD MEAS ERROR  CDNO  68
       102   C                          (PROGRAM WILL ENTER WAIT STATE FOR CDNO  69
       103   C                          OPERATOR ACTION AT CONSOLE)       CDNO  70
       104   C              IFLAG=9  =  ABORT PROGRAM                     CDNO  71
```

```
3238L 03  03=20=74   23.074   LEAK RATE TEST SEGMENT ONE

      105   C
      106         1 IF(PANFUN,NE,KPEIOT GO TO 25                                  COMO  72
      107           IF(IUNITD,EQ,0) GO TO 25
      108           IFLAG = MOPTC
      109           IUNIT = IUNITD
      110           IUNITD = 0
      111           IF(IFLAG,EQ,1) GO TO 2
      112           IF(IFLAG,EQ,3) GO TO 15
      113           IF(IFLAG,EQ,4) GO TO 16
      114           IF(IFLAG,EQ,5) GO TO 17
      115           IF(IFLAG,EQ,6) GO TO 18
      116           GO TO 9
      117        14 CALL BEGQUE (NTA)
      118           WRITE(NTA,1002)
      119           CALL ENDQUE (NTA)
      120      1002 FORMAT(1HO,37H ILRT TERMINATED BY OPERATOR REQUEST,)
      121           NUM = 1
      122           CALL TPF02
      123        16 IEDIT = 1
      124           CALL BEGQUE (NTA)
      125           WRITE(NTA,1005)
      126           CALL ENDQUE (NTA)
      127      1005 FORMAT(1HO,38H ILRT MINIMUM OUTPUT SELECTED,)
      128           IFLAG = 0
      129           IF(NUM,NE,2) CALL TPF02
      130           GO TO 13
      131        17 IEDIT = 2
      132           CALL BEGQUE (NTA)
      133           WRITE(NTA,1006)
      134           CALL ENDQUE (NTA)
      135      1006 FORMAT(1HO,35H ILRT CURRENT HOUR OUTPUT SELECTED,)
      136           IFLAG = 0
      137           IF(NUM,NE,2) CALL TPF02
      138           GO TO 13
      139        18 IEDIT = 3
      140           CALL BEGQUE (NTA)
      141           WRITE(NTA,1007)
      142           CALL ENDQUE (NTA)
      143      1007 FORMAT(1HO,34H ILRT LATEST 24HR OUTPUT SELECTED,)
      144           IFLAG = 0
      145           IF(NUM,NE,2) CALL TPF02
      146           GO TO 13
      147        9 CALL BEGQUE (NTA)
      148          WRITE(NTA,1000)
      149          CALL ENDQUE (NTA)
      150     1000 FORMAT(1HO,33HILLEGAL OPTION OF LEAK RATE TEST,,/
      151     $          1H ,47HDEMAND AGAIN WITH EITHER OPTION 1,3,4,5,6 OR 9,)
      152          IFLAG = 0
      153          IF(NUM,NE,2) CALL TPF02
      154          GO TO 13
      155       11 NTH = 0
```

260

```
3648L 03  03:20-74   23,074   LEAK RATE TEST SEGMENT ONE
      157           GO TO 18
      158         7 NTA = 1
      159        16 CONTINUE
      160           NUM = 2
      161           CALL BEGQUE (NTA)
      162           WRITE(NTA,1003) IFLAG
      163           CALL ENDQUE (NTA)
      164      1003 FORMAT(1H0,27H ILRT INITIALIZED.  OPTION ,I2,1H.)
      165           IEDIT = 1
      166           N = 0
      167           DO 5 I=1,20
      168           WTCOR(I) = 0.0
      169           DO 5 J=1,2
      170           RATE(J,I) = 0.0
      171           CON(J,I) = 0.0
      172           STD*(J,I) = 0.0
      173         5 CONTINUE
      174        15 CALL INHIB;
      175           IONTIM = 27,5060,02,  -> 27.0
      176           IDLAY = TIME-(TIME/7201)*7200
      177           IDELAY = IONTIM-IDLAY
      178           IF(IDELAY.LT.0) IDELAY = IONTIM+IDLAY
      179           CALL PERMIT
      180           CALL DLYG1 (,IDELAY)
      181           GO TO 1
      182        25 N = N+1
      183           IFRST = .TRUE.
      184        30 TREAD( 1) = TRD01
      185           TREAD( 2) = TRD02
      186           TREAD( 3) = TRD03
      187           TREAD( 4) = TRD04
      188           TREAD( 5) = TRD05
      189           TREAD( 6) = TRD06
      190           TREAD( 7) = TRD07
      191           TREAD( 8) = TRD08
      192           TREAD( 9) = TRD09
      193           TREAD(10) = TRD10
      194           TREAD(11) = TRD11
      195           TREAD(12) = TRD12
      196           TREAD(13) = TRD13
      197           TREAD(14) = TRD14
      198           TREAD(15) = TRD15
      199           TREAD(16) = TRD16
      200           TREAD(17) = TRD17
      201           TREAD(18) = TRD18
      202           IF(.NOT.IFFST) GO TO 35
      203           VS = 115800.
      204           VD = 154470.
      205     C
      206     C  ***********************************************************CDNO 454
      207     C  ***GET PPM(VOL) FROM MOISTURE ANALYSIS, THIS ROUTINE HAS BEEN CODEDCDNO 455
                                                                            CDNO 456
                                                                            CDNO 457
```

261

```
3238L 03  03=20=74   23.074   LEAK RATE TEST SEGMENT ONE

      C  •  FOR EXECUTION ON AN IBM 370, ON THE GEPAC IT MUST BE A SEPERATE  •CDMO 456
      C  •  PROGRAM EXECUTED 2.5 MIN PRIOR TO LEAK RATE MAIN PROGRAM         •CDMO 459
      C  •                                                                   •CDMO 460
      C  ••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••CDMO 461
      C                                                                      CDMO 462
      C                                                                      CDMO 463
            I = 1
            XSTRMP = XSTRM
         50 IF(XSTRM.NE.XSTRMP) GO TO 40
            IF BIT(XSTRMA,22) GO TO 51
            IF BIT(XSTRMA,23) GO TO 51
            CALL DLY01 (1,6)
            IF(PANFUN.NE.XPRIO) GO TO 50
            IF(IUNITD.EQ.0) GO TO 50
            IUNITD = 0
            CALL BEGQUE (NTA)
            WRITE(NTA,1004)
            CALL ENDQUE (NTA)
            GO TO 50
         51 CALL BEGQUE (NTA)
            WRITE(NTA,2000)
            CALL ENDQUE (NTA)
       2000 FORMAT(1H0,43H ILRT ABORTED.  STREAM SELECTED SENSOR BAD.)
            CALL TPF02
         40 XSTRMP = XSTRM
            IDELAY = 110
            CALL DLY01 (1,IDELAY)
            IF(PANFUN.NE.XPRIO) GO TO 41
            IF(IUNITD.EQ.0) GO TO 41
            IUNITD = 0
            CALL BEGQUE (NTA)
            WRITE(NTA,1004)
            CALL ENDQUE (NTA)
       1004 FORMAT(1H0,47H ILRT CAN NOT BE DEMANDED WHILE GATHERING DATA.)
         41 CALL ANLYZE (XMODE,XSTEM,XRDG1,XRDG2)
            IF(I.NE.2) GO TO 49
            TREAD( 1) = TRD01
            TREAD( 2) = TRD02
            TREAD( 3) = TRD03
            TREAD( 4) = TRD04
            TREAD( 5) = TRD05
            TREAD( 6) = TRD06
            TREAD( 7) = TRD07
            TREAD( 8) = TRD08
            TREAD( 9) = TRD09
            TREAD(10) = TRD10
            TREAD(11) = TRD11
            TREAD(12) = TRD12
            TREAD(13) = TRD13
            TREAD(14) = TRD14
            TREAD(15) = TRD15
            TREAD(16) = TRD16
```

```
3238L 03  03-20-74   23.074   LEAK RATE TEST SEGMENT ONE

      TREAD(17) = TRD17                                                    CDNO 470
      TREAD(18) = TRD18                                                    CDNO 471
      PSREF = PSREFX                                                       CDNO 472
      PDREF = PDREFX                                                       CDNO 473
      BARPD = BARPDX                                                       CDNO 474
      DPSREF = DPSREX                                                      CDNO 475
      DPDREF = DPDREX                                                      CDNO 476
      PSUCR = PSUCRX                                                       CDNO 477
      PBULB = PBULBX                                                       CDNO 478
      CFN2 = CFN2X                                                         CDNO 479
      CFN2 = 0.0                                                           CDNO 480
      ISAVE = TIME
   45 IF(I.EQ.5) GO TO 12                                                  CDNO 482
      I = I+1                                                              CDNO 483
      GO TO 50
   12 CONTINUE                                                             CDNO 491
C
C
C  ***  CHECK RTD READINGS IN EACH ZONE FOR ERRORS
C       IT IS ASSUMED THAT ERROR EXISTS IF BOTH RTD MEASUREMENTS
C       IN A GIVEN AREA DIFFER BY MORE THAN 2 DEG F
C
   85 CONTINUE
      DO 80 I=1,9
      K = I*2
      KK = K+1
      IF (TREAD(K).EQ.0.).OR.TREAD(KK).EQ.0.) GO TO 80
      DF = DABS(TREAD(K)-TREAD(KK))
      IF (DF.LT.ELPSON) GO TO 80
      IFLAG = 0
      CALL BEGQUE(NTA)
      WRITE(NTA,700) RTDNME(K),RTDNME(K)
  701 FORMAT(1H0,15H16-1-RTD INDEX ,A3,4H OR ,A2,7H IS BAD,/
     $10X,47HOPERATOR ACTION REQUIRED TO SET BAD VALUE TO 0.,/
     $10X,45HREMOVE POINT FROM SCAN AND USING ENTER VALUE,,/
     $10X,21HENTER 0. FOR BAD RTD.,/
     $10X,56HAFTER FIXUP, SET IFLAG=0 (DEMAND OPTION ZERO OF PROGRAM),/
     $10X,59HTO RESUME PROGRAM, OR SET IFLAG=9 (DEMAND OPTION NINE OF PR
     $,24HOGRAM) TO ABORT PROGRAM.,/)
      WRITE(NTA,703)
      CALL ENDQUE(NTA)
  703 FORMAT(1H0,6X,16H16-1-RTD   RDG,/)
      DO 73 J=1,18
      CALL BEGQUE(NTA)
      WRITE(NTA,702) RTDNME(J),TREAD(J)
      CALL ENDQUE(NTA)
  702 FORMAT(6X,A3,2X,F8.2)
   73 CONTINUE                                                             CDNO 494
C                                                                          CDNO 495
C  ***  NOW GO TO WAIT STATE UNTIL OPERATOR CHANGES IFLAG TO A             CDNO 496
C       VALUE OTHER THAN 8                                                 CDNO 497
C                                                                          CDNO 498
```

```
3238L 03  03/20/74   23.07.4   LEAK RATE TEST SEGMENT ONE

      313        74 IF(IFLAG.EQ.9) GO TO 14
      314           IF(IFLAG.EQ.0) GO TO 30
      315           CALL BEGOUE (ATA)
      316           WRITE(NTA,1001)
      317           CALL ENDOUE (ATA)
      318     1001 FORMAT(1H0,43HDEMAND OPTION 0 TO CONTINUE LEAK RATE TEST,/
      319          $       1H ,32HOR OPTION 9 TO ABORT THE PROGRAM)
      320           CALL DLY01 (1,60)
      321           IF(PANFUN.NE.APRIO) GO TO 74
      322           IF(IUNITD.EQ.0) GO TO 74
      323           IFLAG = NOPTC
      324           IUNIT = IUNITD
      325           IUNITD = 0
      326           IFRST = .FALSE.
      327           GO TO 74
      328    80     CONTINUE                                                  CDNO 505
      329    C                                                               CDNO 507
      330    C      STORE RTD READINGS INTO OUTPUT ARRAY                     CDNO 508
      331           DO 8 I=1,18                                               CDNO 509
      332            RTD(I,N) = TREAD(I)                                      CDNO 510
      333    8      CONTINUE                                                  CDNO 511
      334    C                                                               CDNO 512
      335    C  **** START PROGRAM                                           CDNO 513
      336    C                                                               CDNO 514
      337    C      STORE CLOCK TIME (HOURS)                                 CDNO 515
      338           TYME = FLOAT(ISAVE)/7200.
      339           IF(NTM.EQ.0) TYME = FLOAT(N-1)
      340    C                                                               CDNO 517
      341    C      IF EITHER RTD IN THE CONTAINMENT AREA IS 0.0 IGNORE IT IN CDNO 518
      342    C           COMPUTING AVERAGE TEMPERATURE                       CDNO 519
      343           TAVER(1) = (TREAD(1)+TREAD(2))/2.0                        CDNO 520
      344           TS = TAVER(1)*TMT(1)                                      CDNO 521
      345           IF (TREAD(1).EQ.0.) TS=TREAD(2)                           CDNO 522
      346           IF (TREAD(2).EQ.0.) TS=TREAD(1)                           CDNO 523
      347           SVOT = 0.0
      348           DO 10 I=2,9                                               CDNO 525
      349            K = 2*I                                                  CDNO 526
      350            KK = K-1                                                 CDNO 527
      351            TAVER(I) = (TREAD(K)+TREAD(KK))/2.0                      CDNO 528
      352            IF (TREAD(K).EQ.0.) TAVER(I) = TREAD(KK)                 CDNO 529
      353            IF (TREAD(KK).EQ.0.) TAVER(I)=TREAD(K)                   CDNO 530
      354       10 SVOT = SVOT+TMT(I)/TAVER(I)
      355           TD = 1.0/SVOT
      356    C                                                               CDNO 532
      357    C      STORE TOTAL PRESSURES AND REFERENCE VOLUMES DP VALUES (PSIA) CDNO 533
      358    C                                                               CDNO 534
      359           PS = PSUPR
      360           PC = PBULR
      361           DPSR = DPSREF
      362           DPDR = DPDREF
      363    C
      364    C  CONVERT CFN2 TO SCFN2 AND THEN TO WT N2 BLEED ADDED
```

```
3238L 03  03=20=74   23.074   LEAK RATE TEST SEGMENT ONE

      C
      WTN2 = CFN2*28.7359,*PI/14.696*492./(TD+460.)                    CDNO 539
      C     ARRAY PPMV IS PPM BY VOLUME  -  FIND VAPOR PRESSURES (PSIA)  CDNO 540
      C                                                                CDNO 541
            PSV = 0.                                                   CDNO 542
            DO 15 I=1,3                                                CDNO 543
      15    PSV = PSV + (PPMV(I,N)*WATWT(I)*PS)/(1.E6*PPMV(I,N))       CDNO 544
            PDV = 0.                                                   CDNO 545
            DO 20 I=2,5                                                CDNO 546
      20    PDV = PDV + (PPMV(I,N)*WATWT(I)*PDT/(1.E6*PPMV(I,N))       CDNO 547
      C                                                                CDNO 548
      C  *** COMPUTE DEW POINTS                                        CDNO 549
            DEWPTS = TSL(PSV)                                          CDNO 550
            DEWPTD = TSL(PDV)                                          CDNO 551
      C                                                                CDNO 552
      C     REFERENCE PRESSURES                                        CDNO 553
      C
            PSR = PSREF
            PDR = PDREF                                                CDNO 562
      C                                                                CDNO 563
      C     STORE BAROMETRIC PRESSURE (IN HG)
            BARON = BARRD                                              CDNO 565
      C
            CALL SEGMNT (29,2)                                         CDNO 567
            END
     * THE FOLLOWING SYSTEM SYMBOLS HAVE BEEN USED)
     *  NTA,SEGMNT,ENDQUE,BEGQUE,IUNITD,TIME,NOPTC
```

```
32384 03  03=20=74   23.107   MASS

      1   CMASS       MASS
      2   C
      3   C                 FOR  FITZPATRICK
      4         SUBROUTINE MASS
      5   CC***********************************************************************
      6   CC***********************************************************************
      7   CC***                                                                 ***
      8   CC***             SUBROUTINE MASS                                   ***
      9   CC***             COMPUTES MASS OF AIR IN SUPPRESSION CHAMBER AND DRY ***
     10   CC***             WELL (PLUS COMBINED MASS) BY ABSOLUTE METHOD AND   ***
     11   CC***             REFERENCE VOLUME METHOD)                           ***
     12   CC***                                                                 ***
     13   CC***********************************************************************
     14   CC***********************************************************************
     15         COMMON /OUTPUT/   RTD(25,26),      PPMV(5,26),      OUT(12,26),
     16        $  XTIME(26),      IUNIT,           NUM,             XSTRMP                A
     17         COMMON /DATA/     PS,              PD,              PSV,
     18        $  PDV,            TS,              TD,              DPSR,                 A
     19        $  DPDR,           VS,              VD,              TYNE,                 B
     20        $  PSR,            PDR,             BAROM,           DEWPTD,               C
     21        $  DEWPTS,         WTN2,            WTCOR(26),       WTN20                 D
     22         COMMON /RESULT/   RATE(2,26),      CON(2,26),       STDM(2,26),
     23        $  YMASS(3,26),    PBAR(26),        YMO(2),          DMDT(2)               A
     24         COMMON /INIT/     PSO,             PDO,             PSVO,
     25        $  PDVO,           TSO,             TDO,             DPSRO,                A
     26        $  DPDRO,          YMOS,            YMOD,            IFLAG,                B
     27        $  NN,             N,               IEDIT,           NTH                   C
     28         DOUBLE PRECISION XTIME,YMASS,DMDT,YMO,PS,PD,DPSR,DPDR,PSV,PPMV,
     29        $       PDV,PSR,PDR,TS,TD,VS,VD,PSO,PDO,PSVO,PDVO,TSO,TDO,DPSRO,
     30        $       DPDRO,YMOS,YMOD,RATE,CON,STDM,PBAR,WTN2,WTCOR,WTN20,VAR
     31         DOUBLE PRECISION RLEAKS,RLEAKD,TRAT,CONV1,CONV2,R
     32   C                                                                    CDNO 195
     33   C                                                                    CDNO 192
     34   C      CONSTANTS                                                     CDNO 193
     35   C        CONV2=27.70 INCHES H20/PSIA (FOR USE IF NEEDED)             CDNO 194
     36   C        GAS CONSTANT,R = 53.35 FT-LB/LB-F                           CDNO 195
     37   C                                                                    CDNO 196
     38         DATA CONV1,CONV2,R /.144D3,,277D2,,5335D2/
     39   C                                                                    CDNO 198
     40   C      COMPUTE MASSES OF AIR BY PERFECT GAS LAW                      CDNO 199
     41   C                                                                    CDNO 200
     42         YMASS(1,N) = (PS-PSV)*VS*CONV1/R/(TS+460.)                    CDNO 201
     43         YMASS(2,N) = (PD-PDV)*VD*CONV1/R/(TD+460.)                    CDNO 202
     44         YMASS(3,N) = YMASS(1,N) + YMASS(2,N)                          CDNO 203
     45   C                                                                    CDNO 204
     46   C      COMPUTE MASSES OF AIR BY REFERENCE VOLUME METHOD              CDNO 205
     47   C        FIRST COMPUTE DIFFERENTIAL LEAKAGE RATES                    CDNO 206
     48   C        DPSR,DPSRO,PSO ARE IN INCHES H20 - USE CONV2                CDNO 207
     49   C                                                                    CDNO 208
     50         IF (N.EQ.1) GO TO 50                                          CDNO 209
     51         TRAT = (TSO+460.)/(TS+460.)                                   CDNO 210
     52         RLEAKS = (DPSR*TRAT-DPSRO-PSVO+PSV*TRAT)/(PSO-PSVO)           CDNO 211
```

```
3230L 03  03-20-74   23,107   MASS

      TRAT = (TD0+460.)/(TD+460.)                                          CDNO 212
      RLEAKD = (DPD0*TRAT-DPDR0-PDV0+PDV*TRAT)/(PD0-PDV0)                  CDNO 213
C                                                                          CDNO 214
      YMASS(4,N) = YMOS * (1.0-RLEAKS)                                     CDNO 215
      YMASS(5,N) = YMOD * (1.0-RLEAKD)                                     CDNO 216
      YMASS(6,N) = YMASS(4,N) + YMASS(5,N)                                 CDNO 217
      RETURN                                                               CDNO 218
C                                                                          CDNO 219
50    YMASS(4,N) = YMASS(1,N)                                              CDNO 220
      YMASS(5,N) = YMASS(2,N)                                              CDNO 221
      YMASS(6,N) = YMASS(3,N)                                              CDNO 222
      RETURN                                                               CDNO 223
C                                                                          CDNO 224
      END                                                                  CDNO 225
```

```
3230L 03  03-20-74   23.110   MASS
      67   CCURFIT     CURFIT
      68   C
      69   C                 FOR  FITZPATRICK
      70         SUBROUTINE CURFIT
      71   CC*****************************************************************
      72   CC*****************************************************************
      73   CC***                                                           ***
      74   CC***             SUBROUTINE CURFIT                             ***
      75   CC***             ROUTINE FITS DATA TO Y=AX+B AND COMPUTES VARIANCE   ***
      76   CC***             AND STANDARD DEVIATION OF SLOPES FOR 2 SETS OF      ***
      77   CC***             DATA (TOTAL CONTAINMENTS)                     ***
      78   CC***                                                           ***
      79   CC*****************************************************************
      80   CC*****************************************************************
      81         COMMON /OUTPUT/   RTD(18,26),      FPMV(5,26),      OUT(12,26),
      82        $  XTIME(26),      IUNIT,           NUM,             XSTRMR                A
      83         COMMON /DATA/     PS,              PD,              PSV,
      84        $  PDV,            TS,              TD,              DPSP,                 A
      85        $  DPDR,           VS,              VD,              TYME,                 B
      86        $  PSR,            PDR,             BAROM,           DEWPTD,               C
      87        $  DEWPTS,         WTN2,            WTCOR(26),       WTN2O                 D
      88         COMMON /RESULT/   RATE(2,26),      CON(2,26),       STDM(2,26),
      89        $  YMASS(6,26),    PBAR(26),        YMO(2),          DMDT(2)               A
      90         COMMON /INIT/     PSO,             PDO,             PSVO,
      91        $  PDVO,           TSO,             TDO,             DPSRO,                A
      92        $  DPDRO,          YMOS,            YMOD,            IFLAG,                B
      93        $  NN,             N,               IEDIT,           NTM                   C
      94         DOUBLE PRECISION XTIME,YMASS,DMDT,YMO,PS,PD,DPSR,DPDR,PSV,FPMV,
      95        $       PDV,PSR,PDR,TS,TD,VS,VD,PSO,PDO,PSVO,PDVO,TSO,TDO,DPSRO,
      96        $       DPDRO,YMOS,YMOD,RATE,CON,STDM,PBAR,WTN2,WTCOR,WTN2O,VAR
      97   C                                                                    CDNO 229
      98         DOUBLE PRECISION SX,SY,SXSQ, SXY,AN,DENOM,STD,XD,DELY,X,Y,SLPE,B
      99   C                                                                    CDNO 231
     100         DIMENSION         X(26),           Y(6,26),         SLPE(2),
     101        $  B(2)                                                              A
     102         EQUIVALENCE (XTIME,X),(YMASS,Y),(DMDT,SLPE),(YMO,B)
     103   C                                                                    CDNO 233
     104   C     FIT MUST BE ON ELAPSED TIME (X(I)-X(1))                        CDNO 234
     105   C                                                                    CDNO 235
     106         AN = N
     107         DO 200 J=1,2                                                   CDNO 237
     108          L = J+3                                                       CDNO 238
     109          SX = 0.                                                       CDNO 239
     110          SY = 0.                                                       CDNO 240
     111          SXSQ = 0.                                                     CDNO 241
     112          SXY = 0.                                                      CDNO 243
     113         DO 100 I=1,N
     114          XD = X(I)-X(1)                                                CDNO 245
     115         YY = Y(L,I)-WTCOR(I)
     116           SX = SX + XD                                                 CDNO 246
     117         SY = SY + YY
     118         SXY = SXY + XD*YY
```

```
3238L 03  03-20-74   23.110   MASS

      SXSQ = SXSQ + XD*XD                                                CDNO 249
  100 CONTINUE                                                           CDNO 251
      DENOM = AN*SXSQ-SX*SX                                              CDNO 252
      SLPE(J) = (AN*SXY-SX*SY)/DENOM                                     CDNO 253
      B(J) = (SY*SXSQ -SX*SXY)/DENOM                                     CDNO 254
      VAR = 0.0
      DO 150 I=1,N
      YY = Y(L,I)-WTCOR(I)
      DELY = YY-(SLPE(J)*(X(I)-X(1))+B(J))
      VAR = VAR+DELY*DELY
  150 CONTINUE                                                           CDNO 259
      STD = DSQRT(VAR/(AN-2.0))
      STDM(J,N) = STD/DSQRT(SXSQ-SX*SX/AN)                               CDNO 261
      CON(J,N) = STDM(J,N)*(2400./B(J))*(1.95996+2.37226/AN+2.8225/AN/AN
     1)
  200 CONTINUE                                                           CDNO 262
      RETURN                                                             CDNO 263
      END                                                                CDNO 264
```

```
3238L 03  03/20/74   23.113   MASS
      137   CANLYZR      ANALYZER
      138   C
      139   C                FOR  FITZPATRICK
      140         SUBROUTINE ANLYZR (XMODE,XSTRM,XRDG1,XRDG2)
      141   CC*****************************************************************
      142   CC*****************************************************************
      143   CC***                                                           ***
      144   CC***              SUBROUTINE ANLYZR                            ***
      145   CC***              CONVERTS MOISTURE ANALYZER READINGS TO PPM BY VOL ***
      146   CC***                                                           ***
      147   CC*****************************************************************
      148   CC*****************************************************************
      149         COMMON /OUTPUT/   RTD(18,26),     PPMV(5,26),     OUT(12,26),
      150        $  XTIME(26),      IUNIT,          NOM,            XSTRM          A
      151         COMMON /DATA/     PS,             PD,             PSV,
      152        $  PDV,            TS,             TD,             DPSR,          A
      153        $  DPDR,           VS,             VD,             TYME,          B
      154        $  PSR,            PDR,            BAROM,          DEWPTD,        C
      155        $  DEWPTS,         WTN2,           WTCOR(26),      WTN2O          D
      156         COMMON /RESULT/   RATE(2,26),     CON(2,26),      STDM(2,26),
      157        $  YMASS(6,26),    PBAR(26),       YMO(2),         DMDT(2)        A
      158         COMMON /INIT/     PSO,            PDO,            PSVO,
      159        $  PDVO,           TSO,            TDO,            DPSRO,         A
      160        $  DPDRO,          YMOS,           YMOD,           IFLAG,         B
      161        $  NN,             N,              IEDIT,          NTM            C
      162         DOUBLE PRECISION XTIME,YMASS,DMDT,YMO,PS,PD,DPSR,DPDR,PSV,PPMV,
      163        $       PDV,PSR,PDR,TS,TD,VS,VD,PSO,PDO,PSVO,PDVO,TSO,TDO,DPSRO,
      164        $       DPDRO,YMOS,YMOD,RATE,CON,STDM,PBAR,WTN2,WTCOR,WTN2O,VAR
      165   C                                                                  CDNO 592
      166   C                                                                  CDNO 594
      167   C      IF XMODE=2(MA, BOTH ANALYZERS ARE OPERATING                 CDNO 595
      168   C            ANALYZER 101 MONITORS THE TORUS (STREAM A)            CDNO 596
      169   C            ANALYZER 102 MONITORS THE 4 DRY WELL STREAMS          CDNO 597
      170   C                  B THROUGH E CONSECUTIVELY                       CDNO 598
      171   C      IF XMODE=3(MA, ONLY ANALYZER 101 IS OPERATING, MONITORING   CDNO 599
      172   C            ALL 5 STREAMS (A-E) CONSECUTIVELY                     CDNO 600
      173   C      IF XMODE=4(MA, ONLY ANALYZER 102 IS OPERATING, MONITORING   CDNO 601
      174   C            ALL 5 STREAMS (A-E) CONSECUTIVELY                     CDNO 602
      175   C                                                                  CDNO 603
      176   C      IF XSTRM = 14 MA, STREAM A IS BEING MONITORED               CDNO 604
      177   C      IF XSTRM = 18 MA, STREAM B IS BEING MONITORED               CDNO 605
      178   C      IF XSTRM = 22 MA, STREAM C IS BEING MONITORED               CDNO 606
      179   C      IF XSTRM = 26 MA, STREAM D IS BEING MONITORED               CDNO 607
      180   C      IF XSTRM = 30 MA, STREAM E IS BEING MONITORED               CDNO 608
      181   C                                                                  CDNO 609
      182   C      IT IS ASSUMED THAT THE CONVERSION FROM XSTRM TO PPMV IS LINEAR CDNO 610
      183   C          XRDG1 = MA SIGNAL FROM ANALYZER 101                     CDNO 611
      184   C          XRDG2 = MA SIGNAL FROM ANALYZER 102                     CDNO 612
      185   C                                                                  CDNO 613
      186   C  **  CONVERT XMODE TO IMODE INTEGER SIGNAL                       CDNO 614
      187   C              AND XSTRM TO ISTRM                                  CDNO 615
      188   C                                                                  CDNO 616
```

```
3238L 03  03-20-74   23.113   MASS

      189           IMODE = 0                                                    CDNO 617
      190           IF (XMODE.GT.36..AND.XMODE.LT.44.) IMODE=1                   CDNO 618
      191           IF (XMODE.GT.26..AND.XMODE.LT.34.) IMODE=2                   CDNO 619
      192           IF (XMODE.GT.16..AND.XMODE.LT.24.) IMODE=3                   CDNO 620
      193           IF (IMODE.GT.0) GO TO 5                                      CDNO 621
      194           IMODE = IFIX((XMODE-15.)/10.)                                CDNO 622
      195           IF (IMODE.GT.3) IMODE=3                                      CDNO 623
      196           IF (IMODE.LT.1) IMODE=1                                      CDNO 624
      197           CALL BEGQUE(NTA)
      198           WRITE(NTA,101) XMODE,IMODE
      199           CALL ENDQUE(NTA)
      200       101 FORMAT(1H0,35HMOISTURE ANALYZER MODE READING BAD ,F8.2,/
      201          $ 2X,23HIMODE INDICATOR SET TO ,I2)
      202    5      CONTINUE                                                     CDNO 628
      203    C                                                                   CDNO 629
      204           ISTRM = 0                                                    CDNO 630
      205           IF (XSTRM.GT.13..AND.XSTRM.LT.15.) ISTRM=1                   CDNO 631
      206           IF (XSTRM.GT.17..AND.XSTRM.LT.19.) ISTRM=2                   CDNO 632
      207           IF (XSTRM.GT.21..AND.XSTRM.LT.23.) ISTRM=3                   CDNO 633
      208           IF (XSTRM.GT.25..AND.XSTRM.LT.27.) ISTRM=4                   CDNO 634
      209           IF (XSTRM.GT.29..AND.XSTRM.LT.31.) ISTRM=5                   CDNO 635
      210           IF (ISTRM.GT.0) GO TO 8                                      CDNO 636
      211           ISTRM = IFIX((XSTRM-8.0)/4.0)                                CDNO 637
      212           IF (XSTRM.GT.32.) ISTRM=5                                    CDNO 638
      213           IF (XSTRM.LT.12.) ISTRM=1                                    CDNO 639
      214           CALL BEGQUE(NTA)
      215           WRITE(NTA,100) XSTRM,ISTRM
      216           CALL ENDQUE(NTA)
      217       100 FORMAT(1H0,43HMOISTURE ANALYZER STREAM INDEX READING BAD ,F8.2,/
      218          $ 2X,20HSTREAM INDEX SET TO ,I2)
      219    8      CONTINUE                                                     CDNO 643
      220    C                                                                   CDNO 644
      221    20     CONTINUE                                                     CDNO 645
      222           IF (IMODE.GT.1) GO TO 30                                     CDNO 646
      223            PPMV(1,N) = XRDG1
      224            PPMV(ISTRM,N) = XRDG2
      225           GO TO 50                                                     CDNO 649
      226    C                                                                   CDNO 650
      227    30     CONTINUE
      228           IF (IMODE.EQ.2)  XD=XRDG1
      229           IF (IMODE.EQ.3)  XD=XRDG2
      230           PPMV(ISTRM,N) = XD
      231    50     CONTINUE                                                     CDNO 653
      232           RETURN                                                       CDNO 654
      233           END                                                          CDNO 655
            *  THE FOLLOWING SYSTEM SYMBOLS HAVE BEEN USED:
            *     NTA,ENDQUE,BEGQUE

271
```

```
3238L 03  33=20=74   23.116   MASS

      234   CTSL        TSL    *
      235   C
      236   C                FOR  FITZPATRICK                                          00001
      237         FUNCTION TSL(P)
      238   CC*****************************************************************
      239   CC*****************************************************************    CDNO 569
      240   CC***                                                                ***
      241   C.      I  GIVEN  P       SATURATION LINE                            ***
      242   CC***                                                                ***
      243   CC*****************************************************************
      244   CC*****************************************************************
      245         DIMENSION       A(13)
      246         DOUBLE PRECISION  P                                            CDNO 571
      247         DATA A/24,572568,2,1162369,-0,3414474,0,1574642,-0,0313295E5,  CDNO 572
      248        13,8650282E-3,-2,4901784E-4,6,8015596E-6,-8386,0142,2477,7661,  CDNO 573
      249        2=363,44271,24,690978,-0,780738137                              00012
      250         IF(P-450,012,4,4                                               00013
      251       2 N=0                                                            00014
      252         NN=8                                                           00015
      253         TSL=35,157810                                                  00016
      254         TPX = 10,*P                                                    00017
      255         GOTO6                                                          00018
      256       4 N=6                                                            00019
      257         NN=5                                                           00020
      258         TSL=11545,144                                                  00021
      259         TPX = P                                                        00022
      260       6 DO 5 I=1,NN                                                    00023
      261         M=N+I                                                          CDNO 587
      262         XTP = ALOG(TPX)                                                00026
      263       5 TSL=TSL+A(M)*(XTP**I)
      264     100 RETURN
      265         END
```

```
YD          2123
YDO         3523
YIME        2052    * LDA   5646  LDA   5651
YS          2121
YSO         3521
YYME        2135
VD          2133
VS          2131
WYCOR       2147
WYN2        2145
WYN20       2233
XSTRHD      2110
XTIME       2022      FAD   3607  DLD   3630
XTIMEX      5716      STA   3632  LDK   3642
VMASS1      5735      STA   5245  LDK   5274
VMASS2      5736      STA   5250  LDK   5276
VMASS3      5737      STA   5253  LDK   5300
VMASS4      5740      STA   5256  LDK   5302
VMASS5      5741      STA   5261  LDK   5304
VMASS6      5742      STA   5264  LDK   5306
VMASS       2725      DLD   5243  DLD   5246  DLD   5251  DLD   5254  DLD   5257  DLD   5262
VMO         3501
VMOD        3533
VMOS        3531
```

```
3238L 03  03-20-74   23.08P   LEAK RATE TEST SEGMENT TWO

      1   CLPT(2      LEAK RATE TEST SEGMENT TWO
      2   C
      3   C                  FOR  FITZPATRICK
      4   CC***********************************************************************
      5   CC***********************************************************************
      6   CC***
      7   CC***              LEAK RATE TEST SEGMENT TWO                          ***
      8   CC***                                                                  ***
      9   CC***********************************************************************
     10   CC***********************************************************************
     11   C      CONTROLLING ROUTINE FOR LEAK RATE TESTS                                  CDNO  19
     12   C                                                                               CDNO  20
     13         COMMON /OUTPUT/   RTD(18,26),     FPMV(5,26),     OUT(12,26),
     14        $  XTIME(26),      IUNIT,          FUN,            XSTRMR                 A
     15         COMMON /DATA/     PS,             FD,             PSV,
     16        $  PDV,            TS,             TD,             DPSR,                  A
     17        $  DPDR,           VS,             VD,             TYME,                  B
     18        $  PSR,            PDR,            FAROM,          DEWPTD,                C
     19        $  DEWPTS,         WTN2,           WTCOR(26),      WTN20                  D
     20         COMMON /RESULT/   RATE(2,26),     CON(2,26),      STDM(2,26),
     21        $  YMASS(6,26),    PBAR(26),       YMO(2),         DMDT(2)                A
     22         COMMON /INIT/     PSO,            FDO,            PSVO,
     23        $  PDVO,           TSO,            TDO,            DPSRO,                 A
     24        $  DFDRO,          YMOS,           YMOD,           IFLAG,                 B
     25        $  NN,             N,              IEDIT,          NTH                    C
     26         DOUBLE PRECISION XTIME,YMASS,DMDT,YMO,PS,PD,DPSR,DPDR,PSV,FPMV,
     27        $       PDV,PSR,PDR,TS,TD,VS,VD,PSO,PDO,PSVO,PDVO,TSO,TDO,DFSRO,
     28        $       DPDFO,YMOS,YMOD,RATE,CON,STDM,PBAR,WTN2,WTCOR,WTN20,VAR
     29   C
     30   C                                                                             CDNO  27
     31         XTIME(N) = TYME                                                         CDNO  29
     32         PBAR(N)=BAROM
     33         OUT(1,N) = PS                                                         CDNO  48
     34         OUT(2,N) = PD                                                         CDNO  49
     35         OUT(3,N) = PSV                                                        CDNO  50
     36         OUT(4,N) = PDV                                                        CDNO  51
     37         OUT(5,N) = TS                                                         CDNO  52
     38         OUT(6,N) = TD                                                         CDNO  53
     39         OUT(7,N) = DPSR                                                       CDNO  54
     40         OUT(8,N) = DPDR                                                       CDNO  55
     41         OUT(9,N) = PSR                                                        CDNO  56
     42         OUT(10,N) = PDR                                                       CDNO  57
     43         OUT(11,N) = DEWPTS                                                    CDNO  58
     44         OUT(12,N) = DEWPTD                                                    CDNO  59
     45         OUT(13,N) = WTN2                                                      CDNO  60
     46   C
     47   C  **  PROGRAM START  -  ALL SENSOR DATA HAS BEEN SET INTO PROPER          CDNO  74
     48   C        VARIABLES                                                          CDNO  75
     49   C                                                                           CDNO  76
     50   C      CALCULATE MASS OF AIR IN THE CONTAINMENTS                            CDNO  77
     51   C                                                                           CDNO  78
     52         CALL MASS                                                             CDNO  79
```

```
3238L 03  03=20=74   23,080   LEAK RATE TEST SEGMENT TWO

      C                                                                 CDNO  81
   12 IF (N.EQ.1) GO TO 40                                              CDNO  82
      IF (IFLAG.EQ.1) GO TO 40                                          CDNO  83
      IF(IFLAG.EQ.3) GO TO 40                                           CDNO  84
      IF (N.GE.26) GO TO 15
      GO TO 60                                                          CDNO  86
      C                                                                 CDNO  87
      C    **COMPRESS DATA AND RESET INITIAL VALUES                     CDNO  88
      C                                                                 CDNO  89
   15 CONTINUE                                                          CDNO  90
      IFLAG = 0                                                         CDNO  91
      N = N - 1                                                         CDNO  92
      DO 19 I=1,N                                                       CDNO  93
      WTCOR(I) = WTCOR(I+1)
      DO 19 J=1,6                                                       CDNO  94
      YMASS(J,I)=YMASS(J,I+1)                                           CDNO  95
   19 CONTINUE                                                          CDNO  96
      DO 20 I=1,N                                                       CDNO  97
       XTIME(I) = XTIME(I+1)                                            CDNO  98
       DO 20 J=1,2                                                      CDNO  99
       RATE(J,I) = RATE(J,I+1)                                          CDNO 100
       CON(J,I) = CON(J,I+1)
       STDM(J,I) = STDM(J,I+1)
   20 CONTINUE                                                          CDNO 102
      DO 21 I=1,N                                                       CDNO 103
      DO 21 J=1,13                                                      CDNO 104
       OUT(J,I) = OUT(J,I+1)
   21 CONTINUE                                                          CDNO 106
      DO 22 I=1,N                                                       CDNO 107
       DO 22 J=1,18                                                     CDNO 108
        RTD(J,I) = RTD(J,I+1)                                           CDNO 109
   22 CONTINUE                                                          CDNO 110
      DO 24 I=1,N                                                       CDNO 111
      DO 24 J=1,5                                                       CDNO 112
       PPMV(J,I) = PPMV(J,I+1)                                          CDNO 113
   24 CONTINUE                                                          CDNO 114
      DPSRO = OUT(7,1)                                                  CDNO 115
      DPDRO = OUT(8,1)                                                  CDNO 116
      PSO = OUT(1,1)                                                    CDNO 117
      PDO = OUT(2,1)                                                    CDNO 118
      TSO = OUT(5,1)                                                    CDNO 119
      TDO = OUT(6,1)                                                    CDNO 120
      PSVO = OUT(3,1)                                                   CDNO 121
      PDVO = OUT(4,1)                                                   CDNO 122
      WTN2O = OUT(13,1)                                                 CDNO 123
      YMOS = YMASS(1,1)
      YMOD = YMASS(2,1)                                                 CDNO 124
      GO TO 60                                                          CDNO 125
      C                                                                 CDNO 126
      C    SET INITIAL VALUES OF VARIABLES IF N=1                       CDNO 127
      C      OR IF IFLAG = 1 OR 3                                       CDNO 128
      C
                                                                        CDNO 130
```

```
3238L 03  03-20-74   23.088   LEAK RATE TEST SEGMENT TWO

      40 CONTINUE                                                        CDNO 133
         DO 45 I=1,13                                                    CDNO 134
         OUT(I,1) = OUT(I,N)                                             CDNO 135
   45    CONTINUE                                                        CDNO 136
         XTIME(1) = XTIME(N)
         IF(IFLAG.EQ.3) XTIME(1)=0.                                      CDNO 137
         IFLAG = 0                                                       CDNO 138
         DO 46 J=1,3                                                     CDNO 139
         YMASS(J,1)=YMASS(J,N)                                           CDNO 140
         YMASS(J+3,1)=YMASS(J,N)                                         CDNO 141
      46 CONTINUE                                                        CDNO 142
         YMOD = YMASS(2,N)                                               CDNO 143
         YMOS = YMASS(1,N)                                               CDNO 144
         PSO  = PS                                                       CDNO 145
         PDO  = PD                                                       CDNO 146
         TSO  = TS                                                       CDNO 147
         TDO  = TD                                                       CDNO 148
         PSVO  = PSV                                                     CDNO 149
         PDVO  = PDV                                                     CDNO 150
         DPSRO  =DPSR
         DPDRO  = DPDR
         WTN2O = WTN2
         WTCOR(1) = 0.0
C                                                                        CDNO 156
   60    CONTINUE                                                        CDNO 157
         WTCOR(N) = WTN2O-WTN2                                           CDNO 158
C
C     IF TEST HAS LESS THAN 3 RDGS ONLY THE CONTAINMENT MASS             CDNO 160
C        IS COMPUTED AND PRINTED                                         CDNO 161
         IF (N.LT.3) GO TO 64
         GO TO 65
      64 NN = 2
         CALL SEGMNT (29,3)                                              CDNO 166
C
      65 CALL CURFIT                                                     CDNO 168
C                                                                        CDNO 169
C      COMPUTE LEAKAGE RATES (FRACTION OF CONTAINED MASS PER 24 HRS)     CDNO 170
C                                                                        CDNO 171
         DO 70 J=1,2
         RATE(J,N) = DMDT(J)/YMO(J) * (-2400.)                           CDNO 173
   70    CONTINUE                                                        CDNO 174
C
         NN = 1
         CALL SEGMNT (29,3)                                              CDNO 176
C                                                                        CDNO 179
         END
    * THE FOLLOWING SYSTEM SYMBOLS HAVE BEEN USED:
    *   SEGMNT
```

```
TRD16    32567  =  LDA   4570  LDA   4657
TRD17    32570  =  LDA   4573  LDA   4662
TRD18    31465  =  LDA   4576  LDA   4665
TREAD    6030       DST   4315  DST   4320  DST   4323  DST   4326  DST   4331  DST   4334  DST   4337  DST   4342
                    DST   4345  DST   4350  DST   4353  DST   4356  DST   4361  DST   4364  DST   4367  DST   4372
                    DST   4375  DST   4400  DST   4404  DST   4407  DST   4412  DST   4415  DST   4420  DST   4423
                    DST   4426  DST   4431  DST   4434  DST   4437  DST   4442  DST   4445  DST   4450  DST   4453
                    DST   4456  DST   4461  DST   4464  DST   4467  FAD   4756  FAD   4763  DLD   4771  FSU   4772
                    LDK   5252  DLD   5417  DLD   5441  FAD   5443  FAD   5451  DLD   5454  FAD   5457  DLD   5462
                    DLD   5513  FAD   5515  FAD   5521  DLD   5524  FAD   5527  DLD   5532
TS       2121       DST   5447  DST   5455  DST   5463
TSL      6162       SPB   5557  SPB   5562
TSO      3521
TWT      5752       FMP   5446  DLD   5534  LOC   6163  LOC   5754  LOC   5756  LOC   5760  LOC   5762  LOC   5764
                    LOC   5766  LOC   5770  LOC   5772
TYME     2135       STA   5430  STA   5440
VD       2133       DST   4407
VS       2131       DST   4405
WATWT    5774       FMP   5615  FMP   5650  LOC   5774  LOC   5776  LOC   6000  LOC   6002  LOC   6004
WTCOR    2147       DST   4223
WTN2     2145       DST   5570
WTN20    2233
XMODE    31465  =  LDK   4572
XRDG1    31465  =  LDK   4574
XRDG2    32542  =  LDK   4575
XSTRM    31465  =  LDA   4412  FSU   4416  LDA   4512  LDK   4573
XSTRMA   27725  =  LDA   4421
XSTRMP   2110       STA   4413  LDA   4414  STA   4513
XTIME    2022
YMASS    2725
YMO      3501
YMOD     3533
YMOS     3531
```

```
3230L 03  03-20-74   23.096   LEAK RATE TEST SEGMENT THREE

      1   CLRT03      LEAK RATE TEST SEGMENT THREE
      2   C
      3   C                 FOR FITZPATRICK
      4   CC*****************************************************************
      5   CC*****************************************************************
      6   CC***
      7   CC***             LEAK RATE TEST SEGMENT THREE                    ***
      8   CC***                                                             ***
      9   CC*****************************************************************
     10   CC*****************************************************************
     11   C       ROUTINE PRINTS INPUT AND OUTPUT VALUES                          CDNO 266
     12   C         TEMPERATURE,RTD, DEG F          - TREAD(18)                   CDNO 267
     13   C         MOISTURE CONTENT, PPM BY VOL    - PPMV(5)                     CDNO 268
     14   C         TOTAL PRESS,TORUS AND BULB (PSIA)          - PS,PD            CDNO 269
     15   C            REF VOL AND CONTAINMENT (PSIA)          - DPSR,DPDR        CDNO 270
     16   C         REFERENCE VOLUME PRESS,TORUS,BULB (PSIA)   - PSP,PDR          CDNO 271
     17   C         DIFFERENTIAL PRESSURES -                                      CDNO 272
     18   C         BAROMETRIC PRESS, IN HG         - BAROM                       CDNO 273
     19   C         LEAKAGE RATE - FRACTION OF CONTAINED                          CDNO 274
     20   C                MASS PER 24 HOURS                  - RATE(6)          CDNO 275
     21   C         VARIANCE OF LEAK RATE DATA      - VAR(6)                      CDNO 276
     22   C         STANDARD DEVIATION OF SLOPE     - STDM(6)                     CDNO 277
     23   CC*****************************************************************
     24         COMMON /OUTPUT/   RTD(18,26),     PPMV(5,26),     OUT(12,26),
     25        $  XTIME(26),      IUNIT,          NUM,            XSTRMP          A
     26         COMMON /DATA/     PS,             PD,             PSV,
     27        $  PDV,            TS,             TD,             DPSR,           A
     28        $  DPDR,           VS,             VD,             TYME,           B
     29        $  PSR,            PDR,            BAROM,          DEWPTD,         C
     30        $  DEWPTS,         WTN2,           WTCOR(26),      WTN2O           D
     31         COMMON /RESULT/   RATE(2,26),     CON(2,26),      STDM(2,26),
     32        $  YMASS(6,26),    PBAR(26),       YMO(2),         DMDT(2)         A
     33         COMMON /INIT/     PSO,            PDO,            PSVO,
     34        $  PDVO,           TSO,            TDO,            DPSRO,          A
     35        $  DPDRO,          YMOS,           YMOD,           IFLAG,          B
     36        $  NN,             N,              IEDIT,          NTH             C
     37         DOUBLE PRECISION XTIME,YMASS,DMDT,YMO,PS,PD,DPSR,DPDR,PSV,PPMV,
     38        $       PDV,PSR,PDR,TS,TD,VS,VD,PSO,PDO,PSVO,PDVO,TSO,TDO,DPSRO,
     39        $       DPDRO,YMOS,YMOD,RATE,CON,STDM,PBAR,WTN2,WTCOR,WTN2O,VAR
     40   C                                                                      CDNO 278
     41         INTEGER TIME
     42         ITIME = XTIME(N)+0.5
     43   C                                                                      CDNO 287
     44         IPD = PD+0.5
     45         XTIMEX = XTIME(N)
     46         CALL BEGOUE (NIO)
     47         WRITE( NIO,900) IPD,XTIMEX
     48     900 FORMAT(1H1,34X,5H***** ,10HJAFNPP-1  ,12,
     49        1 27H PSIA LEAK RATE TEST AFTER ,F6.2,
     50        1 11H HRS  *****)
     51   C                                                                      CDNO 292
     52         ISTRT = 1
```

278

```
03  03-20-74   23.096   LEAK RATE TEST SEGMENT THREE

53          GO TO (1,2,3),IEDIT
54    C
55    C  OPTION 1 - PRINT ONLY RATE, CONFIDENCE LEVEL AND MOISTURE
56    C             CONTENT OF STREAMS.
57    C
58          1 CONTINUE
59            WRITE(NIO,653)
60       653 FORMAT(1H0,10HTOTAL RATE,5X,10H95PCT CONF,5X,10X,38HMOISTURE READI
61            1NG STREAMS - PPMV VOLUME,/2X,9H(PCT/DAY),5X,9H(PCT/DAY),14X,1HA,7X
62            2,1HB,7X,1HC,7X,1HD,7X,1HE)
63            RATE1 = RATE(1,N)
64            RATE2 = RATE(2,N)
65            CON1 = CON(1,N)
66            CON2 = CON(2,N)
67            PPMV1 = PPMV(1,N)
68            PPMV2 = PPMV(2,N)
69            PPMV3 = PPMV(3,N)
70            PPMV4 = PPMV(4,N)
71            PPMV5 = PPMV(5,N)
72            WRITE(NIO,954) RATE1,CON1,PPMV1,PPMV2,PPMV3,PPMV4,PPMV5
73       954 FORMAT(1H ,2F10.4,10X,5F10.2)
74            WRITE(NIO,955) RATE2,CON2
75       955 FORMAT(1H ,2F10.4)
76            CALL ENDQUE(NIO)
77            GO TO 100
78    C
79    C  OPTION 2 - PRINT ALL DATA AND CALCULATIONS FOR CURRENT HOUR
80    C             (SET ISTRT = N AND USE SAME CODE AS OPTION 3)
81    C
82          2 ISTRT = N
83    C
84          3 CONTINUE
85            WRITE( NIO,908)
86       908 FORMAT(1H ,44X,31HREF.DWG 11825-FM-49A AND FM-18A)                  CDNO 295
87    C
88            WRITE( NIO,901)
89       901 FORMAT(1HC,45X,36HTEMPERATURE (DEG F)   16-1-RTD=/AREA)
90            WRITE( NIO,902)
91            CALL ENDQUE (NIO)
92       902 FORMAT(1H ,52HHRS   113/8  114/8  103/1  120/1  102/1  119/1  103/
93           $     ,57H2  104/2  105/3  106/3  107/4  108/4  109/5  117/5  110/6
94           $     ,21H  111/6  112/7  116/7.7)
95            DO 10 K=ISTRT,N                                                  CDNO 303
96             KK = ITIME - N + K
97            CALL BEGQUE (NIO)
98            WRITE( NIO,915) KK,(RTD(J,K),J=1,18)
99            CALL ENDQUE (NIO)
100      915 FORMAT(1X,I2,2X,9F7.2,9F7.2)                                        CDNO 306
101   10     CONTINUE                                                           CDNO 307
102   C
103           CALL BEGQUE (NIO)
104           WRITE( NIO,904)
```

```
      CALL ENDOUE (NIO)
  904 FORMAT(1H1,7HHRS,9X,8HAVE TEMP,35X,
     1 17HPRESSURES (PSIA) ,20X,10HBAROMETRIC,/
     2 8X,5HTORUS,5X,7HDRYWELL,18X,5HTORUS,
     3 28X,7HDRYWELL,20X,8HPRESSURE,/33X,27H  TOTAL    REF VOL       DP,
     4 47X,24HTOTAL    REF VOL       DP,10X,9HINCHES HG,/3
     5 63H  (P1-104)   (P1-103)   (DP1-102)   (P1-102)   (P1-101)   (DP1-
     6 4H101),/)
      DO 12 K=ISTRT,N
       KK = ITIME + N + K                                              CDNO 315
      PBARX = PBAR(K)
      CALL BEGOUE (NIO)
      WRITE(NIO,916) KK,OUT(5,K),OUT(6,K),OUT(1,K),OUT(9,K),OUT(7,K),
     1OUT(2,K),OUT(10,K),OUT(8,K),PBARX
      CALL ENDOUE (NIO)
  916 FORMAT(1X,I2,3X,2F10.2,5X,2F10.2,F10.4,3X,2F10.2,F10.4,5X,F10.2)
   12 CONTINUE                                                         CDNO 319
C                                                                      CDNO 320
      CALL BEGOUE (NIO)
      WRITE( NIO,907)
      CALL ENDOUE (NIO)
  907 FORMAT(1H1,25X,19HMOISTURE READINGS ,27X,5HTORUS,23X,7HDRYWELL,/
     $3X,3HHRS,1S),26HPPM VOLUME FOR STREAMS A-E,15X,
     $23HVAPOR PRES    DEW POINT,5X,23HVAPOR PRES    DEW POINT,/
     $6X,45H  A         B         C         D         E,
     $9X,21H (PSIA)      ( DEG F),7X,21H (PSIA)       (DEG F),/)
      DO 16 K=ISTRT,N
       KK = ITIME + N + K                                              CDNO 328
      PPMV1 = PPMV(1,K)
      PPMV2 = PPMV(2,K)
      PPMV3 = PPMV(3,K)
      PPMV4 = PPMV(4,K)
      PPMV5 = PPMV(5,K)
      CALL BEGOUE (NIO)
      WRITE( NIO,917) KK,PPMV1,PPMV2,PPMV3,PPMV4,PPMV5,OUT(3,K),
     $              OUT(11,K),OUT(4,K),OUT(12,K)
      CALL ENDOUE (NIO)
  917 FORMAT(1X,I2,F10.2,4F11.2,F13.4,F13.2,1X,F13.4,F13.2)
   16 CONTINUE                                                         CDNO 332
C                                                                      CDNO 333
      CALL BEGOUE (NIO)
      WRITE( NIO,909)
      CALL ENDOUE (NIO)
  909 FORMAT(1H1,45X,31HMASS AIR IN CONTAINMENTS - LBS,/
     $   40X,13HIDEAL GAS LAW,20X,17HREF VESSEL METHOD,/
     $   25X,3HHRS,6X,23HTORUS    DRYWELL    SUM,12X,
     $   23HTORUS    DRYWELL    SUM,/)
      DO 18 K=ISTRT,N
       KK = ITIME + N + K                                              CDNO 340
      YMASS1 = YMASS(1,K)
      YMASS2 = YMASS(2,K)
      YMASS3 = YMASS(3,K)
```

```
3238L 07  13=20=71   23,095   LEAK RATE TEST SEGMENT THREE

      157          YMASS4 = YMASS(4,K)
      158          YMASS5 = YMASS(5,K)
      159          YMASS6 = YMASS(6,K)
      160          CALL BEGQUE (NIO)
      161          WRITE( NIO,918) K,YMASS1,YMASS2,YMASS3,YMASS4,YMASS5,YMASS6
      162          CALL ENDQUE (NIO)
      163      918 FORMAT(23X,I5,3F11.2,2X,3F11.2)
      164   16     CONTINUE
      165   C
      166   C  **  IF LOW PRESSURE TEST , NOW THROUGH                          CDNO 343
      167   C                                                                  CDNO 344
      168          IF (NN.EQ.2) GO TO 100                                      CDNO 345
      169   C                                                                  CDNO 346
      170          CALL BEGQUE (NIO)                                           CDNO 347
      171          WRITE( NIO,910)                                             CDNO 348
      172          CALL ENDQUE (NIO)
      173      910 FORMAT(1H1,47X,20HINTEGRATED LEAK RATE,//29X,15HABSOLUTE METHOD,
      174         1  25X,17HREF VESSEL METHOD,/
      175         214X,3HHRS,4X,9HCALC 24HR,6X,9H STD DEV ,5X,10H95 PCT CONF,
      176         3          10X,9HCALC 24HR,6X,9H STD DEV ,5X,10H95 PCT CONF,/
      177         418X,14HLEAK RATE(PCT),1X,14H(LBS PER HOUR),3X,10HLIMIT(PCT),
      178         5 7X,14HLEAK RATE(PCT),1X,14H(LBS PER HOUR),3X,10HLIMIT(PCT))
      179          DO 20 I=ISTRT,N
      180            J = ITIME + N * I
      181          RATE1 = RATE(1,I)                                           CDNO 356
      182          RATE2 = RATE(2,I)
      183          CON1 = CON(1,I)
      184          CON2 = CON(2,I)
      185          STDM1 = STDM(1,I)
      186          STDM2 = STDM(2,I)
      187          CALL BEGQUE (NIO)
      188          WRITE(NIO,911) J,RATE1,STDM1,CON1,RATE2,STDM2,CON2
      189          CALL ENDQUE (NIO)
      190      911 FORMAT(1H ,9X,I6,4X,F10.4,4X,F10.4,6X,F10.4,9X,F10.4,4X,F10.4,7X,
      191         1F10.4)
      192   20     CONTINUE
      193   C                                                                  CDNO 359
      194     100 CALL INRIBT                                                  CDNO 360
      195          ICNTIM = 27.5*60.*2.
      196          IDLAY = TIME-(TIME/7200)*7200
      197          IDELAY = ICNTIM-IDLAY
      198          IF(IDELAY.LT.0) IDELAY = ICNTIM+IDLAY
      199          CALL PERMIT
      200          CALL DLY01 (1,IDELAY)
      201          CALL SEGMNT (29,1)
      202          END
             *  THE FOLLOWING SYSTEM SYMBOLS HAVE BEEN USED:                 CDNO 362
             *    SEGMNT,ENDQUE,BEGQUE,NIO,TIME
```

281

```
-3230L 03  05-20-74  23.096  LEAK RATE TEST SEGMENT THREE
      1   CLRT03      LEAK RATE TEST SEGMENT THREE
      2   C
      3   C                 FOR  FITZPATRICK
      4   CC*****************************************************************
      5   CC*****************************************************************
      6   CC***
      7   CC***             LEAK RATE TEST SEGMENT THREE                    ***
      8   CC***                                                             ***
      9   CC*****************************************************************
     10   CC*****************************************************************
     11   C       ROUTINE PRINTS INPUT AND OUTPUT VALUES
     12   C         TEMPERATURE,RTD, DEG F          - TREAD(18)                  CDNO 266
     13   C         MOISTURE CONTENT, PPM BY VOL    - PPMV(5)                    CDNO 267
     14   C         TOTAL PRESS,TORUS AND BULB (PSIA)          - PS,PD           CDNO 268
     15   C           REF VOL AND CONTAINMENT (PSIA)           - DPSR,DPDR       CDNO 269
     16   C         REFERENCE VOLUME PRESS,TORUS,BULB (PSIA)   - PSP,PDR         CDNO 270
     17   C         DIFFERENTIAL PRESSURES -                                     CDNO 271
     18   C         BAROMETRIC PRESS, IN HG         - BAROM                      CDNO 272
     19   C         LEAKAGE RATE - FRACTION OF CONTAINED                         CDNO 273
     20   C              MASS PER 24 HOURS                     - RATE(6)         CDNO 274
     21   C         VARIANCE OF LEAK RATE DATA      - VAR(6)                     CDNO 275
     22   C         STANDARD DEVIATION OF SLOPE     - STDM(6)                    CDNO 276
     23   CC*****************************************************************   CDNO 277
     24         COMMON /OUTPUT/  RTD(16,26),    PPMV(5,26),    OUT(12,26),
     25        $  XTIME(26),     IUNIT,         NUM,           XSTRMP              A
     26         COMMON /DATA/    PS,            PD,            PSV,
     27        $  PDV,           TS,            TD,            DPSR,               A
     28        $  DPDR,          VS,            VD,            TYME,               B
     29        $  PSP,           PDR,           BAROM,         DEWPTD,             C
     30        $  DEWPTS,        WTN2,          WTCOR(26),     WTN20               D
     31         COMMON /RESULT/  RATE(2,26),    CON(2,26),     STDM(2,26),
     32        $  YMASS(6,26),   PBAR(26),      YMO(2),        DMDT(2)             A
     33         COMMON /INIT/    PSO,           PDO,           PSVO,
     34        $  PDVO,          TSO,           TDO,           DPSRO,              A
     35        $  DPDRO,         YMOS,          YMOD,          IFLAG,              B
     36        $  NN,            N,             IEDIT,         NTH                 C
     37         DOUBLE PRECISION XTIME,YMASS,DMDT,YMO,PS,PD,DPSR,DPDR,PSV,PPMV,
     38        $       PDV,PSP,PDR,TS,TD,VS,VD,PSO,PDO,PSVO,PDVO,TSO,TDO,DPSRO,
     39        $       DPDRO,YMOS,YMOD,RATE,CON,STDM,PBAR,WTN2,WTCOR,WTN20,VAR
     40   C
     41         INTEGER TIME                                                   CDNO 278
     42         ITIME = XTIME(N)+0.5
     43   C
     44         IPD = PD+0.5                                                   CDNO 287
     45         XTIMEX = XTIME(N)
     46         CALL BEGOUE (NIO)
     47         WRITE( NIO,900) IPD,XTIMEX
     48    900 FORMAT(1H1,34X,6H*****,10HJAFNPP-1  ,I2,
     49        127H PSIA LEAK RATE TEST AFTER ,F6.2,
     50        1 11H HRS  *****)
     51   C
     52         ISTRT = 1                                                      CDNO 292
```

```
                *       COMMON /DATA/   PS,             PD,             PSV,
                *     $ PDV,            TS,             TD,             DPSR,           A
                *     $ DPDR,           VS,             VD,             TYME,           B
                *     $ PSR,            PDR,            BAROM,          DEWPTD,         C
                *     $ DEWPTS,         WTN2,           WTCOR(26),      WTN2O           D
                *       COMMON /RESULT/ RATE(2,26),     CON(2,26),      STDH(2,26),
                *     $ YMASS(6,26),    PBAR(26),       YMO(2),         DMDT(2)         A
                *       COMMON /INIT/   PSO,            PDO,            PSVO,
                *     $ PDVO,           TSO,            TDO,            DPSRO,          A
                *     $ DPDRO,          YMOS,           YMOD,           IFLAG,          B
                *     $ NN,             N,              IEDIT,          NTH             C
                *       DOUBLE PRECISION XTIME,YMASS,DMDT,YMO,PS,PD,DPSR,DPDR,PSV,PPMV,
283             *     $       PDV,PSR,PDR,TS,TD,VS,VD,PSO,PDO,PSVO,PDVO,TSO,TDO,DPSRO,
                *     $       DPDRO,YMOS,YMOD,RATE,CON,STDH,PBAR,WTN2,WTCOR,WTN2O,VAR
                *
                                                                                CDWD 278
                *       INTEGER TIME
000001  14003600  14043577           BRU $41
        623652524 623652524          CMD OUTPUT
        624052524 624052524
000002  300002107 300002107  $60     BSS 1095
        00000002             RTD     EQL $B0+0
        00000726             PPMV    EQL $B0+468
        00001332             OUT     EQL $B0+728
        00002022             XTIME   EQL $B0+1040
        00002106             IUNIT   EQL $B0+1092
        00002107             NUM     EQL $B0+1093
        00002110             XSTRMP  EQL $B0+1094
        621040524 621040524          CMD DATA
        620220040 620220040
002111  300000124 300000124  $B1     BSS 84
        00002111             PS      EQL $B1+0
        00002113             PD      EQL $B1+2
        00002115             PSV     EQL $B1+4
        00002117             PDV     EQL $B1+6
```

```
                00002121                        TS      EQL $B1+8
                00002123                        TD      EQL $B1+10
                00002125                        DPSR    EQL $B1+12
                00002127                        DPDR    EQL $B1+14
                00002131                        VS      EQL $B1+16
                00002133                        VD      EQL $B1+18
                00002135                        TYME    EQL $B1+20
                00002136                        PSR     EQL $B1+21
                00002140                        PDR     EQL $B1+23
                00002142                        BAROS   EQL $B1+25
                00002143                        DEWPTD  EQL $B1+26
                00002144                        DEWPTS  EQL $B1+27
                00002145                        WTN2    EQL $B1+28
                00002147                        WTCOF   EQL $B1+30
                00002233                        WTN20   EQL $B1+82
                624442523  624442523                    CMD RESULT
                625246124  625246124
002235          300001254  300001254            $B2     BSS 684
                00002835                        RATE    EQL $B2+0
                00002405                        CON     EQL $B2+104
                00002555                        STDM    EQL $B2+208
                00002725                        YMASS   EQL $B2+312
                00003415                        PBAR    EQL $B2+624
                00003501                        YMO     EQL $B2+676
                00003505                        DMDT    EQL $B2+680
                622247111  622247111                    CMD INIT
                625020040  625020040
003511          300000031  300000031            $B3     BSS 25
                00003511                        PSO     EQL $B3+0
                00003513                        PDO     EQL $B3+2
                00003515                        PSVO    EQL $B3+4
                00003517                        PDVO    EQL $B3+6
                00003521                        TSO     EQL $B3+8
                00003523                        TDO     EQL $B3+10
                00003525                        DPSRO   EQL $B3+12
                00003527                        DPDRO   EQL $B3+14
                00003531                        YMOS    EQL $B3+16
                00003533                        YMOD    EQL $B3+18
                00003535                        IFLAG   EQL $B3+20
                00003536                        NN      EQL $B3+21
                00003537                        N       EQL $B3+22
                00003540                        IEDIT   EQL $B3+23
                00003541                        NTM     EQL $B3+24
003542          300000036  300000036                    BSS *+63/64*64-*
003600          14003601   14040001             $M1     BRU $M2

                                        *       ITIME = XTIME(N)*0.5
003601          42003537   42077736             $M2     LDQ N
003602          00005675   00042073                     LDA $FXCON
003603          55005676   55042073                     MPY $FXCON+1
```

```
003604  44000003  44000003  *          STQ 3
003605  41005712  41042105             DLD $DPCON
003606  74014002  74014002             FMS 2
003607  70302020  70376211             FAD XTIME+2,3
003610  05045627  05045627             TER 23
003611  74000027  74000027             FIX 23
003612  34003614  34040002             BTS *+2
003613  05013000  05013000             NEG
003614  32005714  32042100             STA ITIME

                                  *                                          CDNO 287

                                  *     IPD = PD+0,5
003615  41005712  41042075             DLD $DPCON
003616  70002113  70076275             FAD PD
003617  05045627  05045627             TER 23
003620  74000027  74000027             FIX 23
003621  34003623  34040002             BTS *+2
003622  05013000  05013000             NEG
003623  32005715  32042072             STA IPD

                                  *     XTIMEX = XTIME(N)
003624  42003537  42077713             LDQ N
003625  00005675  00042000             LDA $FXCON
003626  55005676  55042000             MPY $FXCON+1
003627  44000003  44000003             STQ 3
003630  41302020  41376170             DLD XTIME+2,3
003631  33005751  33042120             SPB $DRCVT
003632  32005716  32042064             STA XTIMEX

                                  *     CALL BEGQUE (NIO)
003633  33000576  33000576             SPB BEGQUE
003634  40022446  40022446             LDK NIO

                                  *     WRITE( NIO,900) IPD,XTIMEX
003635  40003645  40040011             LDK $900
003636  42022446  42022446             LDQ NIO
003637  33000561  33000561             SPB $FBEGW
003640  40005715  40042055             LDK IPD
003641  33000562  33000562             SPB $FPROW
003642  40005716  40042054             LDK XTIMEX
003643  33000562  33000562             SPB $FPROW
003644  33000563  33000563             SPB $FHLTW

                                  * 900 FORMAT(1H1,34X,6H***** ,10HJAFNPP=1  ,I2,

                                  *    12?H PSIA LEAK RATE TEST AFTER ,F6.2,

                                  *    5 11H HRS  *****)
003645  14003705  14040040             BRU $H3
```

```
003646  60000000  60000000  *     3900    CON 0,60000000
003647  00010001  00010001                CON 0,00010001
003650  14200000  14200000                CON 0,14200000
003651  40007601  40007601                CON 0,40007601
003652  40000601  40000601                CON 0,40000601
003653  00060001  00060001                CON 0,00060001
003654  12425052  12425052                CON 0,12425052
003655  12425040  12425040                CON 0,12425040
003656  00120001  00120001                CON 0,00120001
003657  22440506  22440506                CON 0,22440506
003660  23450120  23450120                CON 0,23450120
003661  13230440  13230440                CON 0,13230440
003662  10000000  10000000                CON 0,10000000
003663  20400002  20400002                CON 0,20400002
003664  00330001  00330001                CON 0,00330001
003665  10050123  10050123                CON 0,10050123
003666  22240440  22240440                CON 0,22240440
003667  23042501  23042501                CON 0,23042501
003670  22620122  22620122                CON 0,22620122
003671  20252105  20252105                CON 0,20252105
003672  10052105  10052105                CON 0,10052105
003673  24652040  24652040                CON 0,24652040
003674  20243124  20243124                CON 0,20243124
003675  21251040  21251040                CON 0,21251040
003676  21404024  21404024                CON 0,21404024
003677  00130001  00130001                CON 0,00130001
003700  10044122  10044122                CON 0,10044122
003701  24620040  24620040                CON 0,24620040
003702  12425052  12425052                CON 0,12425052
003703  12425000  12425000                CON 0,12425000
003704  77777420  77777420                CON 0,77777420
```

CDNO 292

```
                          *     ISTRT = 1
003705  00005677  00041772  $H3     LDA $FXCON+2
003706  32005717  32042011          STA ISTRT

                          *     GO TO (1,2,3),IEDIT
003707  00003540  00077631          LDA IEDIT
003710  33000571  33000571          SPB $CGOTO
003711  24737775  24737775          TXH 3,7
003712  14003715  14040003          BRU $1
003713  14004131  14040216          BRU $2
003714  14004133  14040217          BRU $3

                          *
                          *  OPTION 1 - PRINT ONLY RATE, CONFIDENCE LEVEL AND MOISTURE
```

```
                                    *           CONTENT OF STREAMS.
                                    *
                                    *   1 CONTINUE
                                    *     WRITE(NIO,653)
003715  400003722  40040005    $1      LDX  $653
003716  42022446  42022446            LDQ  NIO
003717  33000561  33000561            SPB  $FBEGW
003720  33000563  33000563            SPB  $FHLTW
                                    * 653 FORMAT(1HO,10HTOTAL RATE,5X,10H25PCT CONF,5X,10X,38HMOISTURE READI
                                    *    1NG STREAMS - PPMV VOLUME,/2X,9H(PCT/DAY),5X,9H(PCT/DAY),14X,1HA,7X
                                    *    2,1HB,7X,1HC,7X,1HD,7X,1HE)
003721  14004013  14040072            GAU  1R4
003722  60000000  60000000    $653    CON  0,60000000
003723  00010001  00010001            CON  0,00010001
003724  14000000  14000000            CON  0,14000000
003725  00120001  00120001            CON  0,00120001
003726  25047524  25047524            CON  0,25047524
003727  20246040  20246040            CON  0,20246040
003730  24440524  24440524            CON  0,24440524
003731  21200000  21200000            CON  0,21200000
003732  40001201  40001201            CON  0,40001201
003733  00120001  00120001            CON  0,00120001
003734  16232520  16232520            CON  0,16232520
003735  20652040  20652040            CON  0,20652040
003736  20647516  20647516            CON  0,20647516
003737  21400000  21400000            CON  0,21400000
003740  40001201  40001201            CON  0,40001201
003741  40002401  40002401            CON  0,40002401
003742  00460001  00460001            CON  0,00460001
003743  23247511  23247511            CON  0,23247511
003744  24652125  24652125            CON  0,24652125
003745  24442440  24442440            CON  0,24442440
003746  24442501  24442501            CON  0,24442501
003747  21044516  21044516            CON  0,21044516
003750  21620123  21620123            CON  0,21620123
003751  25051105  25051105            CON  0,25051105
003752  20246523  20246523            CON  0,20246523
003753  10026440  10026440            CON  0,10026440
003754  24050115  24050115            CON  0,24050115
003755  25420126  25420126            CON  0,25420126
003756  23646125  23646125            CON  0,23646125
003757  23242400  23242400            CON  0,23242400
003760  40000100  40000100            CON  0,40000100
003761  40000401  40000401            CON  0,40000401
```

```
003762  00110001  00110001          CON 0,00110001
003763  12050103  12050103          CON 0,12050103
003764  25027504  25027504          CON 0,25027504
003765  20254451  20254451          CON 0,20254451
003766  40001201  40001201          CON 0,40001201
003767  00110001  00110001          CON 0,00110001
003770  12050103  12050103          CON 0,12050103
003771  25027504  25027504          CON 0,25027504
003772  20254451  20254451          CON 0,20254451
003773  40003401  40003401          CON 0,40003401
003774  00010001  00010001          CON 0,00010001
003775  20200000  20200000          CON 0,20200000
003776  40001601  40001601          CON 0,40001601
003777  00010001  00010001          CON 0,00010001
004000  20400000  20400000          CON 0,20400000
004001  40001601  40001601          CON 0,40001601
004002  00010001  00010001          CON 0,00010001
004003  20600000  20600000          CON 0,20600000
004004  40001601  40001601          CON 0,40001601
004005  00010001  00010001          CON 0,00010001
004006  21000000  21000000          CON 0,21000000
004007  40001601  40001601          CON 0,40001601
004010  00010001  00010001          CON 0,00010001
004011  21200000  21200000          CON 0,21200000
004012  77777100  77777100          CON 0,77777100

                                *     RATE1 = RATE(1,N)
004013  42003537  42077524    $M4   LDQ N
004014  01005675  00041661          LDA $FXCON
004015  53005730  53041663          MPY $FXCON+3
004016  44000003  44000003          STQ 3
004017  41302231  41376212          DLD RATE-4,3
004020  33005751  33041731          SPB $DRCVT
004021  32005720  32041677          STA RATE1

                                *     RATE2 = RATE(2,N)
004022  41302233  41376211          DLD RATE-2,3
004023  33005751  33041726          SPB $DRCVT
004024  32005721  32041675          STA RATE2

                                *     CON1 = CON(1,N)
004025  41302401  41376354          DLD CON-4,3
004026  33005751  33041723          SPB $DRCVT
004027  32005722  32041673          STA CON1

                                *     CON2 = CON(2,N)
004030  41302403  41376353          DLD CON-2,3
004031  33005751  33041720          SPB $DRCVT
004032  32005723  32041671          STA CON2
```

```
                        *       PPMV1 = PPMV(1,N)
1033  42003537  42077564  *       LDQ N
1034  00005675  00041641          LDA $FXCON
1035  53005701  55041644          MPY $FXCON+4
1036  44000004  44000004          STQ 4
1037  41400714  41474655          DLD PPMV-10,4
1040  33005751  33041711          SPB $DRCVT
1041  32005724  32041663          STA PPMV1

                        *       PPMV2 = PPMV(2,N)
1042  41400716  41474654          DLD PPMV-8,4
1043  33005751  33041706          SPB $DRCVT
1044  32005725  32041661          STA PPMV2

                        *       PPMV3 = PPMV(3,N)
1045  41400720  41474653          DLD PPMV-6,4
1046  33005751  33041703          SPB $DRCVT
1047  32005726  32041657          STA PPMV3

                        *       PPMV4 = PPMV(4,N)
1050  41400722  41474652          DLD PPMV-4,4
1051  33005751  33041700          SPB $DRCVT
1052  32005727  32041655          STA PPMV4

                        *       PPMV5 = PPMV(5,N)
1053  41400724  41474651          DLD PPMV-2,4
1054  33005751  33041675          SPB $DRCVT
1055  32005730  32041653          STA PPMV5

                        *       WRITE(N10,954) RATE1,CON1,PPMV1,PPMV2,PPMV3,PPMV4,PPMV5
4056  40004101  40040023          LDK 954
4057  42022446  42022446          LDQ N10
4060  33000561  33000561          SPB $FBEGW
4061  40005720  40041637          LDK RATE1
4062  33000562  33000562          SPB $FPROW
4063  40005722  40041637          LDK CON1
4064  33000562  33000562          SPB $FPROW
4065  40005724  40041637          LDK PPMV1
4066  33000562  33000562          SPB $FPROW
4067  40005725  40041636          LDK PPMV2
4070  33000562  33000562          SPB $FPROW
4071  40005726  40041635          LDK PPMV3
4072  33000562  33000562          SPB $FPROW
4073  40005727  40041634          LDK PPMV4
4074  33000562  33000562          SPB $FPROW
4075  40005730  40041633          LDK PPMV5
4076  33000562  33000562          SPB $FPROW
4077  33000563  33000563          SPB $FHLTW

                        * 954 FORMAT(1H ,2F10.4,10X,5F10.2)
```

```
                                        BRU $M5
004100  14004110  14040010      $954    CON 0,60000000
004101  60000000  60000000              CON 0,00010001
004102  00010001  00010001              CON 0,10000000
004103  10000000  10000000              CON 0,22414044
004104  22414044  22414044              CON 0,40002401
004105  40002401  40002401              CON 0,22444024
004106  22444024  22444024              CON 0,77777720
004107  77777720  77777720
                                *       WRITE(NIO,955) RATE2,CON2
004110  40004121  40040011      $M5     LDK $955
004111  42022446  42022446              LDQ NIO
004112  33000561  33000561              SPB $FBEGW
004113  41005721  40041606              LDK RATE2
004114  33000562  33000562              SPB $FPROW
004115  40005723  40041606              LDK CON2
004116  33000562  33000562              SPB $FPROW
004117  33000563  33000563              SPB $FHLTW
                                * 955 FORMAT(1H ,2F10.4)
                                        BRU $M6
004120  14004126  14040006      $955    CON 0,60000000
004121  60000000  60000000              CON 0,00010001
004122  00010001  00010001              CON 0,10000000
004123  10000000  10000000              CON 0,22414044
004124  22414044  22414044              CON 0,77777740
004125  77777740  77777740
                                *       CALL ENDQUE(NIO)
004126  33000577  33000577      $M6     SPB ENDQUE
004127  42022446  42022446              LDK NIO
                                *       GO TO 100
004130  14005634  14041504              BRU $100
                                *
                                * OPTION 2 - PRINT ALL DATA AND CALCULATIONS FOR CURRENT HOUR
                                *          (SET ISTRT = N AND USE SAME CODE AS OPTION 3)
                                *
                                *       2 ISTRT = N
004131  00003537  00077406              LDA N
004132  32005717  32041565              STA ISTRT
                                *
                                *       3 CONTINUE
```

```
                                    *      WRITE( NIO,908)
004133  40004140  40040005    I3          LDK $905
004134  42022446  42022446                LDQ NIO
004135  33000561  33000561                SPB $FBEGW
004136  33000563  33000563                SPG $FHLTW

                                    * 908 FORMAT(1H ,44X,31HREF.DWG 11825-FM-49A AND FM-18A)
004137  14004162  14040023                BRU $M7
004140  60000000  60000000    $908        CON 0,60000000
004141  00010001  00010001                CON 0,00010001
004142  10000000  10000000                CON 0,10000000
004143  40007601  40007601                CON 0,40007601
004144  40003201  40003201                CON 0,40003201
004145  00370001  00370001                CON 0,00370001
004146  24442506  24442506                CON 0,24442506
004147  13442127  13442127                CON 0,13442127
004150  21620061  21620061                CON 0,21620061
004151  14234062  14234062                CON 0,14234062
004152  15226506  15226506                CON 0,15226506
004153  23226464  23226464                CON 0,23226464
004154  16240440  16240440                CON 0,16240440
004155  20247104  20247104                CON 0,20247104
004156  10043115  10043115                CON 0,10043115
004157  13230470  13230470                CON 0,13230470
004160  20200000  20200000                CON 0,20200000
004161  77777570  77777570                CONTO,77777570

                                    *                                                    CDNO 295
                                    *      WRITE( NIO,901)
004162  40004167  40040005    $M7         LDK $901
004163  42022446  42022446                LDQ NIO
004164  33000561  33000561                SPG $FBEGW
004165  33000563  33000563                SPB $FHLTW

                                    * 901 FORMAT(1H0,45X,36HTEMPERATURE (DEG F)   16-1-RTD-7AREA)
004166  14004212  14040024                BRU $M8
004167  60000000  60000000    $901        CON 0,60000000
004170  00010001  00010001                CON 0,00010001
004171  14000000  14000000                CON 0,14000000
004172  40007601  40007601                CON 0,40007601
004173  40003401  40003401                CON 0,40003401
004174  00440001  00440001                CON 0,00440001
004175  25042515  25042515                CON 0,25042515
004176  24042522  24042522                CON 0,24042522
004177  20252125  20252125                CON 0,20252125
004200  24442440  24442440                CON 0,24442440
004201  12042105  12042105                CON 0,12042105
004202  21620106  21620106                CON 0,21620106
004203  12220040  12220040                CON 0,12220040
```

```
004204  10030466  10030466          CON 0,10030466
004205  13230455  13230455          CON 0,13230455
004206  24452104  24452104          CON 0,24452104
004207  13227501  13227501          CON 0,13227501
004210  24442501  24442501          CON 0,24442501
004211  77777560  77777560          CON 0,77777560

                                *     WRITE( NIO,902)
004212  40004221  40040007  $MB    LDK $902
004213  42022446  42022446          LDQ NIO
004214  33000561  33000561          SPB $FBEGW
004215  33000563  33000563          SPB $FHLTW

                                *     CALL ENDQUE (NIO)
004216  33000577  33000577          SPB ENDQUE
004217  42022446  42022446          LDK NIO

                                * 902 FORMAT(1H ,52HHRS   113/1  114/8  101/1  120/1  102/1  119/1  103/
                                *     $     ,57H2  104/2  105/3  106/3  107/4  108/4  109/5  117/5  110/6
                                *     $     ,21H  111/6  112/7  118/7,/)
004220  14004305  14040065          BRU $M?
004221  60000000  60000000  $902    CON 0,60000000
004222  00010001  00010001          CON 0,00010001
004223  10000000  10000000          CON 0,10000000
004224  00640001  00640001          CON 0,00640001
004225  22051123  22051123          CON 0,22051123
004226  10020040  10020040          CON 0,10020040
004227  14230463  14230463          CON 0,14230463
004230  13634040  13634040          CON 0,13634040
004231  10030461  10030461          CON 0,10030461
004232  15027470  15027470          CON 0,15027470
004233  10020061  10020061          CON 0,10020061
004234  14030457  14030457          CON 0,14030457
004235  14220040  14220040          CON 0,14220040
004236  14231060  14231060          CON 0,14231060
004237  13630440  13630440          CON 0,13630440
004240  10030460  10030460          CON 0,10030460
004241  14427461  14427461          CON 0,14427461
004242  10020061  10020061          CON 0,10020061
004243  14234457  14234457          CON 0,14234457
004244  14220040  14220040          CON 0,14220040
004245  14230063  14230063          CON 0,14230063
004246  13600000  13600000          CON 0,13600000
004247  00710001  00710001          CON 0,00710001
004250  14420040  14420040          CON 0,14420040
004251  14230064  14230064          CON 0,14230064
004252  13631040  13631040          CON 0,13631040
004253  10030460  10030460          CON 0,10030460
```

```
004254  15227463  15227463          CON 0,15227463
004255  10020061  10020061          CON 0,10020061
004256  14033057  14033057          CON 0,14033057
004257  14620040  14620040          CON 0,14620040
004260  14230067  14230067          CON 0,14230067
004261  13632040  13632040          CON 0,13632040
004262  10030460  10030460          CON 0,10030460
004263  16027464  16027464          CON 0,16027464
004264  10020061  10020061          CON 0,10020061
004265  14034457  14034457          CON 0,14034457
004266  15220040  15220040          CON 0,15220040
004267  14230467  14230467          CON 0,14230467
004270  13632440  13632440          CON 0,13632440
004271  10030461  10030461          CON 0,10030461
004272  14027466  14027466          CON 0,14027466
004273  00250001  00250001          CON 0,00250001
004274  10020061  10020061          CON 0,10020061
004275  14230457  14230457          CON 0,14230457
004276  15420040  15420040          CON 0,15420040
004277  14230462  14230462          CON 0,14230462
004300  13632440  13632440          CON 0,13632440
004301  10030461  10030461          CON 0,10030461
004302  16027467  16027467          CON 0,16027467
004303  40000100  40000100          CON 0,40000100
004304  77777150  77777150          CON 0,77777150

                                  *     DO 10 K=ISTRT,N
004305  16305717  16341412  IR9     LDX ISTRT,3
004306  06305731  06341423  $N10    STX K,3                                  CDNO 303

                                  *     KK = ITIME - N + K
004307  00005714  00041405            LDA ITIME
004310  11005731  11041421            ADD K
004311  31005737  31077226            SUB N
004312  32005732  32041420            STA KK

                                  *     CALL BEGQUE (N10)
004313  33000576  33000576            SPB BEGQUE
004314  40022446  40022446            LDX N10

                                  *     WRITE( N10,$15) KK,(RTD(J,K),J=1,10)
004315  40004341  40040024            LDX $915
004316  42022446  42022446            LDQ N10
004317  33000561  33000561            SPB $FBEGW
004320  40005732  40041412            LDX KK
004321  33000562  33000562            SPB $FPROW
004322  07400001  07400001            LXK 1,4
004323  06405733  06441420  $M11      STX J,4
004324  42005731  42041405            LDQ K
004325  00005733  00041406            LDA J
```

```
004326  55005702  55041354          MPY $FXCON+5
004327  44000005  44000005          STQ 5
004330  40577757  40573427  I       LDK RTD-19,5
004331  33000562  33000562          SPB $FPROW
004332  26400001  26400001          INX 1,4
004333  24437755  24437755          TXR 19,4
004334  30004323  30077767          BTR $M11
004335  33000563  33000563          SPB $FHLTW

                          *     CALL ENDQUE (N10)
004336  33000577  33000577          SPB ENDQUE
004337  40022446  40022446          LDK N10

                          * 915 FORMAT(1X,I2,2X,9F7.2,9F7.2)
004340  14004350  14040010          BRU $M12
004341  60000000  60000000  $915    CON 0,60000000
004342  40000201  40000201          CON 0,40000201
004343  20400002  20400002          CON 0,20400002
004344  40000401  40000401          CON 0,40000401
004345  21704024  21704024          CON 0,21704024
004346  21704024  21704024          CON 0,21704024
004347  77777720  77777720          CON 0,77777720

                          *10   CONTINUE                                    CDNO 306
004350  300000000 300000000 $M12  BSS 0
004350  16341361  16341361  $10   LDX K,3
004351  26300001  26300001          INX 1,3
004352  00003537  00077155          LDA N
004353  31000003  31000003          SUB 3
004354  05004727  05004727          TOD 23
004355  30004306  30077731          BTR $M10

                                                                           CDNO 307
                          *
                          *     CALL BEGQUE (N10)
004356  33000576  33000576          SPB BEGQUE
004357  40022446  40022446          LDK N10

                          *     WRITE( N10,"04)
004360  40004367  40040007          LDK $904
004361  42022446  42022446          LDQ N10
004362  33000561  33000561          SPB $FUEGW
004363  33000563  33000563          SPB $FHLTW

                          *     CALL ENDQUE (N10)
004364  33000577  33000577          SPB ENDQUE
004365  40022446  40022446          LDK N10

                          * 904 FORMAT(1H1,3HHRS,9X,8HAVE TEMP,35X,
```

```
                    •   117HPRESSURES (PSIA) ,25X,10HBAROMETRIC,/
                    •   28X,5HTORUS,5X,7HDRYWELL,18X,5HTORUS,
                    •   328X,7HDRYWELL,20X,8HPRESSURE,/33X,27H  TOTAL     REF VOL       DP,
                    •   47X,24HTOTAL     REF VOL       DP,10X,9HINCHES HG,/30X,
                    •   563H  (P1-104)   (P1-103)   (DP1-102)   (P1-102)   (P1-101)   (DP1-
                    •   5,4H101),/)
004366  14004541  14040153          BPU 3913
004367  60000000  60000000  3904    CON 0,60000000
004370  00010001  00010001          CON 0,00010001
004371  14200000  14200000          CON 0,14200000
004372  00030001  00030001          CON 0,00030001
004373  22051123  22051123          CON 0,22051123
004374  40002201  40002201          CON 0,40002201
004375  00100001  00100001          CON 0,00100001
004376  20253105  20253105          CON 0,20253105
004377  10052105  10052105          CON 0,10052105
004400  23250000  23250000          CON 0,23250000
004401  40007601  40007601          CON 0,40007601
004402  40001001  40001001          CON 0,40001001
004403  00210001  00210001          CON 0,00210001
004404  24051105  24051105          CON 0,24051105
004405  24651525  24651525          CON 0,24651525
004406  24442523  24442523          CON 0,24442523
004407  10024120  10024120          CON 0,10024120
004410  24644501  24644501          CON 0,24644501
004411  12220000  12220000          CON 0,12220000
004412  40007001  40007001          CON 0,40007001
004413  00120001  00120001          CON 0,00120001
004414  20440522  20440522          CON 0,20440522
004415  23646505  23646505          CON 0,23646505
004416  25051111  25051111          CON 0,25051111
004417  20600000  20600000          CON 0,20600000
004420  40000100  40000100          CON 0,40000100
004421  40002001  40002001          CON 0,40002001
004422  00050001  00050001          CON 0,00050001
004423  25047522  25047522          CON 0,25047522
004424  25251400  25251400          CON 0,25251400
004425  40001201  40001201          CON 0,40001201
004426  00070001  00070001          CON 0,00070001
004427  21051131  21051131          CON 0,21051131
004430  25642514  25642514          CON 0,25642514
004431  23000000  23000000          CON 0,23000000
004432  40004401  40004401          CON 0,40004401
004433  00050001  00050001          CON 0,00050001
004434  25047522  25047522          CON 0,25047522
```

```
004435  25251400  25251400          CON 0,25251400
004436  40007001  40007001          CON 0,40007001
004437  00070001  00070001          CON 0,00070001
004440  21051131  21051131          CON 0,21051131
004441  25642514  25642514          CON 0,25642514
004442  23000000  23000000          CON 0,23000000
004443  40005001  40005001          CON 0,40005001
004444  00100001  00100001          CON 0,00100001
004445  24051105  24051105          CON 0,24051105
004446  24651525  24651525          CON 0,24651525
004447  24442400  24442400          CON 0,24442400
004450  40000100  40000100          CON 0,40000100
004451  40007601  40007601          CON 0,40007601
004452  40000401  40000401          CON 0,40000401
004453  00330001  00330001          CON 0,00330001
004454  10020124  10020124          CON 0,10020124
004455  23652101  23652101          CON 0,23652101
004456  23020040  23020040          CON 0,23020040
004457  10020122  10020122          CON 0,10020122
004460  21243040  21243040          CON 0,21243040
004461  25447514  25447514          CON 0,25447514
004462  10020040  10020040          CON 0,10020040
004463  10020040  10020040          CON 0,10020040
004464  10042120  10042120          CON 0,10042120
004465  40001601  40001601          CON 0,40001601
004466  00300001  00300001          CON 0,00300001
004467  25047524  25047524          CON 0,25047524
004470  20246040  20246040          CON 0,20246040
004471  10020040  10020040          CON 0,10020040
004472  24442506  24442506          CON 0,24442506
004473  10053117  10053117          CON 0,10053117
004474  23020040  23020040          CON 0,23020040
004475  10020040  10020040          CON 0,10020040
004476  10042120  10042120          CON 0,10042120
004477  40002401  40002401          CON 0,40002401
004500  00110001  00110001          CON 0,00110001
004501  22247103  22247103          CON 0,22247103
004502  22042523  22042523          CON 0,22042523
004503  10044107  10044107          CON 0,10044107
004504  40000100  40000100          CON 0,40000100
004505  40007401  40007401          CON 0,40007401
004506  00770001  00770001          CON 0,00770001
004507  10020050  10020050          CON 0,10020050
004510  24030455  24030455          CON 0,24030455
004511  14230064  14230064          CON 0,14230064
004512  12220040  12220040          CON 0,12220040
004513  10024120  10024120          CON 0,10024120
004514  14226461  14226461          CON 0,14226461
004515  14031451  14031451          CON 0,14031451
004516  10020040  10020040          CON 0,10020040
```

```
004517  12042120  12042120          CON 0,12042120
004520  14226461  14226461          CON 0,14226461
004521  14031051  14031051          CON 0,14031051
004522  10020040  10020040          CON 0,10020040
004523  12050061  12050061          CON 0,12050061
004524  13230460  13230460          CON 0,13230460
004525  14424440  14424440          CON 0,14424440
004526  10020050  10020050          CON 0,10020050
004527  24030455  24030455          CON 0,24030455
004530  14230061  14230061          CON 0,14230061
004531  12220040  12220040          CON 0,12220040
004532  10024104  10024104          CON 0,10024104
004533  24030455  24030455          CON 0,24030455
004534  00040001  00040001          CON 0,00040001
004535  14230061  14230061          CON 0,14230061
004536  12200000  12200000          CON 0,12200000
004537  40000100  40000100          CON 0,40000100
004540  77776270  77776270          CON 0,77776270

                                *     DO 12 K=ISTRT,N
004541  16305717  16341156  $M13      LDX ISTRT,3
004542  06305731  06341167  $M14      STX K,3                                  CDNO 315

                                *     KK = ITIME + N * K
004543  00005714  00041151            LDA ITIME
004544  11005731  11041165            ADD K
004545  31003537  31076772            SUB N
004546  32005732  32041164            STA KK

                                *     PBARX = PBAR(K)
004547  42005731  42041162            LDQ K
004550  00005675  00041125            LDA $FXCOM
004551  55005676  55041125            MPY $FXCOM+1
004552  44000002  44000002            STQ 4
004553  41403413  41476640            DLD PBAR-2,4
004554  33005751  33041175            SPB $DRCV1
004555  32005734  32041157            STA PBARX

                                *     CALL BEGQUE (N10)
004556  33000572  33000576            SPB BEGQUE
004557  40022446  40022446            LDK N10

                                *     WRITE(N10,$16) KK,OUT(5,K),OUT(6,K),OUT(1,K),OUT(9,K),OUT(7,K),
                                *    1OUT(2,K),OUT(10,K),OUT(8,K),PBARX
004560  40004617  40040037            LDK $916
004561  42022446  42022446            LDQ N10
004562  33000561  33000561            SPB $FBEGW
004563  40005732  40041147            LDK KK
004564  33000562  33000562            SPB $FPROW
```

```
004565   42005733   42041144              LDQ K
004566   00005675   00041107              LDA $FXCON
004567   55005705   55041114              MPY $FXCON+6
004570   44000004   44000004              STQ 4
004571   40401327   40474531              LDK OUT-8,4
004572   33000562   33000562              SPB $FPROU
004573   40401323   40474530              LDK OUT-7,4
004574   33000562   33000562              SPB $FPROU
004575   40401316   40474521              LDK OUT-17,4
004576   33000557   33000562              SPB $FPROU
004577   40401326   40474527              LDK OUT-4,4
004600   33000562   33000562              SPB $FPROU
004601   40401324   40474523              LDK OUT-6,4
004602   33000562   33000562              SPB $FPROU
004603   40401317   40474514              LDK OUT-15,4
004604   33000562   33000562              SPB $FPROU
004605   40401327   40474522              LDK OUT-3,4
004606   33000562   33000562              SPB $FPROU
004607   40401325   40474516              LDK OUT-5,4
004610   33000562   33000562              SPB $FPROU
004611   40005734   40041123              LDK PRARX
004612   33000562   33000562              SPB $FPROU
004613   33000563   33000563              SPB $FHLTU

                                    *     CALL ENDOUF (NIO)
004614   33000577   33000577              SPB,ENDOUF
004615   40022446   40022446              LDK NIO

                                    * 916 FORMAT(1X,I2,3X,2F10.2,5X,2F10.2,F10.4,3X,2F10.2,F10.4,5X,F10.2)
004616   14004635   14040017              BRU $M15
004617   60000000   60000000   $916       CON 0,600(0000
004620   40000201   40000201              CON 0,400(0201
004621   20400002   20400002              CON 0,204(0002
004622   40000601   40000601              CON 0,400(0601
004623   22414024   22414024              CON 0,2241(024
004624   40001201   40001201              CON 0,400(1201
004625   22414024   22414024              CON 0,22414024
004626   22404044   22404044              CON 0,2240(044
004627   40000601   40000601              CON 0,400(0601
004630   22414024   22414024              CON 0,22414024
004631   22404044   22404044              CON 0,2240(044
004632   40001201   40001201              CON 0,400(1201
004633   22404024   22404024              CON 0,2240(024
004634   77777630   77777630              CON 0,77777630

                                    *12   CONTINUE                                          CDNO 319
004635   00000000   00000000   $M15       BSS 0
004635   16305731   16341074   $12        LDX K,3
004636   26300001   26300001              INX 1,3
004637   00003537   00076700              LDA N
```

```
004640  31000003  31000003          SUB 3
004641  05004727  05004727          TOZ 23
004642  30004542  30077700          BTP $M14                                    CDNO 320
                                  *
                                  *     CALL BEGOUF (NIO)
004643  33000576  33000576          SPB BEGOUF
004644  40022446  40022446          LDK NIO
                                  *     WRITE( NIO,907)
004645  40004634  40040007          LDK $907
004646  42022446  42022446          LDQ NIO
004647  33000561  33000561          SPB $FBEGF
004650  33000563  33000563          SPB $FHLTF
                                  *     CALL ENDOUF (NIO)
004651  33000577  33000577          SPB ENDOUF
004652  40022446  40022446          LDK NIO
                                  * 907 FORMAT(1H1,25X,18HMOISTURE READINGS ,27X,5HTORUS,23X,7HDRYWELL,/
                                  *     $3X,3HHRS,15X,26HPPM VOLUME FOR STREAMS A-E,15X,
                                  *     $23HVAPOR PRES    DEW POINT,5X,23HVAPOR PRES    DEW POINT,/
                                  *     $6X,45H   A         B         C         D         E,
                                  *     $9X,21H (PSIA)      ( DEG F),7X,21H (PSIA)      (DEG F),/)
004653  14005011  14040136          BRU *M16
004654  60000000  60000000  $907    CON 0,60000000
004655  00010001  00010001          CON 0,00010001
004656  14200000  14200000          CON 0,14200000
004657  40006201  40006201          CON 0,40006201
004660  00220001  00220001          CON 0,00220001
004661  23247511  23247511          CON 0,23247511
004662  24652125  24652125          CON 0,24652125
004663  24442440  24442440          CON 0,24442440
004664  24442501  24442501          CON 0,24442501
004665  21044516  21044516          CON 0,21044516
004666  21651440  21651440          CON 0,21651440
004667  40006601  40006601          CON 0,40006601
004670  00050001  00050001          CON 0,00050001
004671  25047522  25047522          CON 0,25047522
004672  25251400  25251400          CON 0,25251400
004673  40005601  40005601          CON 0,40005601
004674  00070001  00070001          CON 0,00070001
004675  21051131  21051131          CON 0,21051131
004676  25642514  25642514          CON 0,25642514
004677  23000000  23000000          CON 0,23000000
```

```
004700  40000100  40000100        CON 0,40000100
004701  40000601  40000601        CON 0,40000601
004702  00030001  00030001        CON 0,00030001
004703  22051123  22051123        CON 0,22051123
004704  40003601  40003601        CON 0,40003601
004705  00320001  00320001        CON 0,00320001
004706  24050115  24050115        CON 0,24050115
004707  10053117  10053117        CON 0,10053117
004710  23052515  23052515        CON 0,23052515
004711  21220105  21220106        CON 0,21220106
004712  23651040  23651040        CON 0,23651040
004713  24652122  24652122        CON 0,24652122
004714  21240515  21240515        CON 0,21240515
004715  24620101  24620101        CON 0,24620101
004716  13242400  13242400        CON 0,13242400
004717  40003601  40003601        CON 0,40003601
004720  00270001  00270001        CON 0,00270001
004721  25440520  25440520        CON 0,25440520
004722  23651040  23651040        CON 0,23651040
004723  24051105  24051105        CON 0,24051105
004724  24620040  24620040        CON 0,24620040
004725  10020104  10020104        CON 0,10020104
004726  21253440  21253440        CON 0,21253440
004727  24047511  24047511        CON 0,24047511
004730  23452000  23452000        CON 0,23452000
004731  40001201  40001201        CON 0,40001201
004732  00270001  00270001        CON 0,00270001
004733  25440520  25440520        CON 0,25440520
004734  23651040  23651040        CON 0,23651040
004735  24051105  24051105        CON 0,24051105
004736  24620040  24620040        CON 0,24620040
004737  10020104  10020104        CON 0,10020104
004740  21253440  21253440        CON 0,21253440
004741  24047511  24047511        CON 0,24047511
004742  23452000  23452000        CON 0,23452000
004743  40000100  40000100        CON 0,40000100
004744  40001401  40001401        CON 0,40001401
004745  00550001  00550001        CON 0,00550001
004746  10020040  10020040        CON 0,10020040
004747  20220040  20220040        CON 0,20220040
004750  10020040  10020040        CON 0,10020040
004751  10020040  10020040        CON 0,10020040
004752  10041040  10041040        CON 0,10041040
004753  10020040  10020040        CON 0,10020040
004754  10020040  10020040        CON 0,10020040
004755  10020040  10020040        CON 0,10020040
004756  20620040  20620040        CON 0,20620040
004757  10020040  10020040        CON 0,10020040
004760  10020040  10020040        CON 0,10020040
004761  10042040  10042040        CON 0,10042040
```

```
004762  10020040  10020040          CON 0,10020040
004763  10020040  10020040          CON 0,10020040
004764  10020105  10020105          CON 0,10020105
004765  40002201  40002201          CON 0,40002201
004766  00250001  00250001          CON 0,00250001
004767  10024120  10024120          CON 0,10024120
004770  24644501  24644501          CON 0,24644501
004771  12220040  12220040          CON 0,12220040
004772  10020040  10020040          CON 0,10020040
004773  10024040  10024040          CON 0,10024040
004774  21042507  21042507          CON 0,21042507
004775  10043051  10043051          CON 0,10043051
004776  40001601  40001601          CON 0,40001601
004777  00250001  00250001          CON 0,00250001
005000  10024120  10024120          CON 0,10024120
005001  24644501  24644501          CON 0,24644501
005002  12220040  12220040          CON 0,12220040
005003  10020040  10020040          CON 0,10020040
005004  10020050  10020050          CON 0,10020050
005005  21042507  21042507          CON 0,21042507
005006  10043051  10043051          CON 0,10043051
005007  40000100  40000100          CON 0,40000100
005010  77776440  77776440          CON 0,77776440

                                *     DO 16 K=ISTRT,N
005011  16305717  16340706  $M16    LDX ISTRT,3
005012  06305731  06340717  $M17    STX K,3

                                *     KK = ITIME + N + K                          CDNO 328
005013  00005714  00040701          LDA ITIME
005014  11005731  11040715          ADD K
005015  31003537  31076522          SUB N
005016  32005732  32040714          STA KK

                                *     PPMV1 = PPMV(1,K)
005017  42005731  42040712          LDQ K
005020  00005675  00040655          LDA $FXCON
005021  55005701  55040660          MPY $FXCON+4
005022  44000004  44000004          STQ 4
005023  41400714  41473671          DLD PPMV-100,4
005024  33005751  33040725          SPB $DRCVT
005025  32005724  32040677          STA PPMV1

                                *     PPMV2 = PPMV(2,K)
005026  41400716  41473670          DLD PPMV-8,4
005027  33005751  33040722          SPB $DRCVT
005030  32005725  32040675          STA PPMV2

                                *     PPMV3 = PPMV(3,K)
005031  41400720  41473667          DLD PPMV-6,4
```

```
005032  33005751  33040717          SPB $DRCVT
005033  32005726  32040673          STA PPMV3

                                    PPMV4 = PPMV(4,K)
005034  41400722  41473666          DLD PPMV-4,4
005035  33005751  33040714          SPB $DRCVT
005036  32005727  32040671          STA PPMV4

                                    PPMV5 = PPMV(5,K)
005037  41400724  41473669          DLD PPMV-2,4
005040  33005751  33040711          SPB $DRCVT
005041  32005730  32040667          STA PPMV5

                                    CALL BEGQUE (NIO)
005042  33000576  33000576          SPB BEGQUE
005043  40022446  40022446          LDK NIO

                                    WRITE( NIO,917) KK,PPMV1,PPMV2,PPMV3,PPMV4,PPMV5,OUT(3,K),
                                   1                OUT(11,K),OUT(4,K),OUT(12,K)
005044  40005103  40040037          LDK $917
005045  42022446  42022446          LDQ NIO
005046  33000561  33000561          SPB $FBEGW
005047  40005732  40040663          LDK KK
005050  33000562  33000562          SPB $FPROW
005051  40005724  40040653          LDK PPMV1
005052  33000562  33000562          SPB $FPROW
005053  40005725  40040652          LDK PPMV2
005054  33000562  33000562          SPB $FPROW
005055  40005726  40040651          LDK PPMV3
005056  33000562  33000562          SPB $FPROW
005057  40005727  40040650          LDK PPMV4
005060  33000562  33000562          SPB $FPROW
005061  40005730  40040647          LDK PPMV5
005062  33000562  33000562          SPB $FPROW
005063  42005731  42040645          LDQ K
005064  40005675  00040611          LDA $FXCON
005065  55005703  55040616          MPY $FXCON+6
005066  44000004  44000004          STQ 4
005067  40401320  40474231          LDX OUT-10,4
005070  33000562  33000562          SPB $FPROW
005071  40401330  40474237          LDX OUT-2,4
005072  33000562  33000562          SPB $FPROW
005073  40401321  40474226          LDX OUT-9,4
005074  33000562  33000562          SPB $FPROW
005075  40401331  40474234          LDX OUT-1,4
005076  33000562  33000562          SPB $FPROW
005077  33000563  33000563          SPB $FNLTW

                                    CALL ENDQUE (NIO)
```

```
005100  33000577  33000577            SPB ENDQUE
005101  40022446  40022446            LDK NIO
                                    * 917 FORMAT(1X,10F10.2,4F11.2,F13.4,F13.2,1X,F13.4,F13.2)
005102  14000116  14040014            BRU $M18
005103  60000000  60000000    $917    CON 0,60000000
005104  40000201  40000201            CON 0,40000201
005105  20400002  20400002            CON 0,20400002
005106  22404024  22404024            CON 0,22404024
005107  22634024  22634024            CON 0,22634024
005110  23204044  23204044            CON 0,23204044
005111  23204024  23204024            CON 0,23204024
005112  40000201  40000201            CON 0,40000201
005113  23204044  23204044            CON 0,23204044
005114  23204024  23204024            CON 0,23204024
005115  77777660  77777660            CON 0,77777660
                                                                          CDNO 332
                                    $16 CONTINUE
005116  30000000  300000000   $M18    BSS 0
005116  16305731  16340613    $16     LDX K,3
005117  26300001  26300001            INX 1,3
005120  00003537  00076417            LDA N
005121  31000003  31000003            SUB 3
005122  05004727  05004727            TOD 23
005123  30005012  30077667            BTR $M17
                                                                          CDNO 333
                                    *
                                    *   CALL BEGQUE (NIO)
005124  33000576  33000576            SPB BEGQUE
005125  40022446  40022446            LDK NIO
                                    *   WRITE( NIO,$09)
005126  40005135  40040007            LDK $909
005127  42022446  42022446            LDQ NIO
005130  33000561  33000561            SPB $FBEGW
005131  33000563  33000563            SPB $FWLTW
                                    *   CALL ENDQUE (NIO)
005132  33000577  33000577            SPB ENDQUE
005133  40022446  40022446            LDK NIO
                                    * 909 FORMAT(1H1,45X,31HMASS AIR IN CONTAINMENTS - LBS,/
                                    *   $   4(X,13HIDEAL GAS LAW,23X,17HREF VESSEL METHOD,/
                                    *   $   25X,3HHRS,6X,23HTORUS    DRYWELL    SUM,12X,
                                    *   $   23HTORUS    DRYWELL    SUM,/)
005134  14005231  14040075            BRU $M19
```

```
005135  60000000  60000000        $909    CON 0,60000000
005136  00010001  00010001                CON 0,00010001
005137  14200000  14200000                CON 0,14200000
005140  40007601  40007601                CON 0,40007601
005141  40003401  40003401                CON 0,40003401
005142  00370001  00370001                CON 0,00370001
005143  23240523  23240523                CON 0,23240523
005144  24620101  24620101                CON 0,24620101
005145  22251040  22251040                CON 0,22251040
005146  22247040  22247040                CON 0,22247040
005147  20647516  20647516                CON 0,20647516
005150  25040511  25040511                CON 0,25040511
005151  23446505  23446505                CON 0,23446505
005152  23457123  23457123                CON 0,23457123
005153  10026440  10026440                CON 0,10026440
005154  23041123  23041123                CON 0,23041123
005155  13000000  13000000                CON 0,13000000
005156  40000100  40000100                CON 0,40000100
005157  40007601  40007601                CON 0,40007601
005160  40002201  40002201                CON 0,40002201
005161  00150001  00150001                CON 0,00150001
005162  22242105  22242105                CON 0,22242105
005163  20246040  20246040                CON 0,20246040
005164  21640523  21640523                CON 0,21640523
005165  10046101  10046101                CON 0,10046101
005166  25600000  25600000                CON 0,25600000
005167  40005001  40005001                CON 0,40005001
005170  00210001  00210001                CON 0,00210001
005171  24442506  24442506                CON 0,24442506
005172  10053105  10053105                CON 0,10053105
005173  24651505  24651505                CON 0,24651505
005174  23020115  23020115                CON 0,23020115
005175  21252110  21252110                CON 0,21252110
005176  23642000  23642000                CON 0,23642000
005177  40000100  40000100                CON 0,40000100
005200  40006201  40006201                CON 0,40006201
005201  40030001  00030001                CON 0,00030001
005202  22051123  22051123                CON 0,22051123
005203  40001401  40001401                CON 0,40001401
005204  00270001  00270001                CON 0,00270001
005205  25047522  25047522                CON 0,25047522
005206  25251440  25251440                CON 0,25251440
005207  10020040  10020040                CON 0,10020040
005210  21051131  21051131                CON 0,21051131
005211  25642514  25642514                CON 0,25642514
005212  23020040  23020040                CON 0,23020040
005213  10020123  10020123                CON 0,10020123
005214  25246400  25246400                CON 0,25246400
005215  40003001  40003001                CON 0,40003001
005216  00270001  00270001                CON 0,00270001
```

```
005217  25047522  25047522          CON 0,25047522
005220  25251440  25251440          CON 0,25251440
005221  10020040  10020040          CON 0,10020040
005222  21051131  21051131          CON 0,21051131
005223  25642514  25642514          CON 0,25642514
005224  23020040  23020040          CON 0,23020040
005225  10020123  10020123          CON 0,10020123
005226  25246400  25246400          CON 0,25246400
005227  40000100  40000100          CON 0,40000100
005230  77777050  77777050          CON 0,77777050

                                  *   DO 19 K=ISTRT,N
005231  16305717  16340466  $M19    LDX ISTRT,3
005232  06305731  06340477  $M20    STX K,3                                  CDNO 340

                                  *   KK = ITIME - N + K
005233  00005714  00040461          LDA ITIME
005234  11005731  11040475          ADD K
005235  31005737  31076302          SUB N
005236  32005732  32040474          STA KK

                                  *   YMASS1 = YMASS(1,K)
005237  42005731  42040472          LDQ K
005240  00005675  00040435          LDA $FXCON
005241  55005703  55040442          MPY $FXCON+6
005242  44000004  44000004          STQ 4
005243  41402711  41475446          DLD YMASS-12,4
005244  33005751  33040505          SPB $DRCVT
005245  32005735  32040470          STA YMASS1

                                  *   YMASS2 = YMASS(2,K)
005246  41402713  41475445          DLD YMASS-10,4
005247  33005751  33040502          SPB $DRCVT
005250  32005736  32040466          STA YMASS2

                                  *   YMASS3 = YMASS(3,K)
005251  41402715  41475444          DLD YMASS-8,4
005252  33005751  33040477          SPB $DRCVT
005253  32005737  32040464          STA YMASS3

                                  *   YMASS4 = YMASS(4,K)
005254  41402717  41475443          DLD YMASS-6,4
005255  33005751  33040474          SPB $DRCVT
005256  32005740  32040462          STA YMASS4

                                  *   YMASS5 = YMASS(5,K)
005257  41402721  41475442          DLD YMASS-4,4
005260  33005751  33040471          SPB $DRCVT
005261  32005741  32040460          STA YMASS5
```

```
                                    *     YMASS6 = YMASS(6,K)
005262   41402723   41475441                 DLD YMASS+2,4
005263   33005751   33040466                 SPE $DRCVT
005264   32005742   32040456                 STA YMASS6

                                    *     CALL BEGQUE (NIO)
005265   33000576   33000576                 SPB BEGQUE
005266   40022446   40022446                 LDK NIO

                                    *     WRITE( NIO,918) KK,YMASS1,YMASS2,YMASS3,YMASS4,YMASS5,YMASS6
005267   40005314   40040025                 LDK $918
005270   42022446   42022446                 LDQ NIO
005271   33000561   33000561                 SPB $FBEGW
005272   40005732   40040440                 LDK KK
005273   33000562   33000562                 SPB $FPROW
005274   40005735   40040441                 LDK YMASS1
005275   33000562   33000562                 SPB $FPROW
005276   40005736   40040440                 LDK YMASS2
005277   33000562   33000562                 SPB $FPROW
005300   40005737   40040437                 LDK YMASS3
005301   33000562   33000562                 SPB $FPROW
005302   40005740   40040436                 LDK YMASS4
005303   33000562   33000562                 SPB $FPROW
005304   40005741   40040435                 LDK YMASS5
005305   33000562   33000562                 SPB $FPROW
005306   40005742   40040434                 LDK YMASS6
005307   33000562   33000562                 SPB $FPROW
005310   33000563   33000563                 SPB $FHLTW

                                    *     CALL ENDQUE (NIO)
005311   33000577   33000577                 SPB ENDQUE
005312   40022446   40022446                 LDK NIO

                                    * 918 FORMAT(23X,I5,3F11.2,2X,3F11.2)
005313   14005323   14040010                 BRU $M21
005314   60000000   60000000    $918         CON 0,600F0000
005315   40005601   40005601                 CON 0,40005601
005316   21200002   21200002                 CON 0,21200002
005317   22624024   22624024                 CON 0,22624024
005320   40000401   40000401                 CON 0,40000401
005321   22624024   22624024                 CON 0,22624024
005322   77777720   77777720                 CON 0,77777720

                                    *18   CONTINUE                                                    CDNO 343
005323   30000000   30000000    $M21         BSS 0
005323   16305731   16340406    $16          LDX K,3
005324   26300001   26300001                 INX 1,3
005325   00003537   00076212                 LDA N
005326   31000003   31000003                 SUB 3
005327   05004727   05004727                 TOD 23
```

```
005330  30005232  30077702          BTR $M20
                                    *
                                    *  ** IF LOW PRESSURE TEST , NOW THROUGH                    CDNO 345
                                    *                                                          CDNO 346
                                    *     IF (NN.EQ.2) GO TO 100                               CDNO 347
005331  00003536  00076205          LDA NN
005332  31005676  31040344          SUB $FXCON+1
005333  05004670  05004670          TZE
005334  34005634  34040300          BTS $100
                                    *                                                          CDNO 348
                                    *     CALL BEGQUE (NIO)
005335  33005576  33000576          SPR BEGQUE
005336  40022446  40022446          LDK NIO
                                    *     WRITE( NIO,910)
005337  40005346  40040007          LDK $910
005340  42022446  42022446          LDQ NIO
005341  33005561  33000561          SPR $FBEGW
005342  33005563  33000563          SPR $FWLTW
                                    *     CALL ENDQUE (NIO)
005343  33005577  33000577          SPR ENDQUE
005344  40022446  40022446          LDK NIO
                                    * 910 FORMAT(1H1,47X,20HINTEGRATED LEAK RATE,//29X,15HABSOLUTE METHOD,
                                    *    1  25X,17HREF VESSEL METHOD,/
                                    *    2 14X,3HHRS,4X,9HCALC 24HR,6X,9H STD DEV ,5X,10H95PCT CONF,
                                    *    3         10X,9HCALC 24HR,6X,9H STD DEV ,5X,10H95PCT CONF,/
                                    *    4 18X,14HLEAK RATE(PCT),1X,14H(LBS PER HOUR),3X,10HLIMIT(PCT),
                                    *    5 7X,14HLEAK RATE(PCT),1X,14H(LBS PER HOUR),3X,10HLIMIT(PCT))
005345  14005521  14040154          BRU $M22
005346  60000000  60000000  3910    CON 0,60000000
005347  00010001  00010001          CON 0,00010001
005350  14200000  14200000          CON 0,14200000
005351  40007601  40007601          CON 0,40007601
005352  40004001  40004001          CON 0,40004001
005353  00240001  00240001          CON 0,00240001
005354  22247124  22247124          CON 0,22247124
005355  21243522  21243522          CON 0,21243522
```

```
005440  21253040  21253040  CON 0,21253040
005441  40001201  40001201  CON 0,40001201
005442  00120001  00120001  CON 0,00120001
005443  16232520  16232520  CON 0,16232520
005444  20652040  20652040  CON 0,20652040
005445  20647516  20647516  CON 0,20647516
005446  21400000  21400000  CON 0,21400000
005447  40000100  40000100  CON 0,40000100
005450  40004401  40004401  CON 0,40004401
005451  00160001  00160001  CON 0,00160001
005452  23042501  23042501  CON 0,23042501
005453  22620122  22620122  CON 0,22620122
005454  20252105  20252105  CON 0,20252105
005455  12050103  12050103  CON 0,12050103
005456  25024400  25024400  CON 0,25024400
005457  40000201  40000201  CON 0,40000201
005460  00160001  00160001  CON 0,00160001
005461  12046102  12046102  CON 0,12046102
005462  24620120  24620120  CON 0,24620120
005463  21251040  21251040  CON 0,21251040
005464  22047525  22047525  CON 0,22047525
005465  24424400  24424400  CON 0,24424400
005466  40000601  40000601  CON 0,40000601
005467  00120001  00120001  CON 0,00120001
005470  23044515  23044515  CON 0,23044515
005471  22252050  22252050  CON 0,22252050
005472  24041524  24041524  CON 0,24041524
005473  12200000  12200000  CON 0,12200000
005474  40001601  40001601  CON 0,40001601
005475  00160001  00160001  CON 0,00160001
005476  23042501  23042501  CON 0,23042501
005477  22620122  22620122  CON 0,22620122
005500  20252105  20252105  CON 0,20252105
005501  12050103  12050103  CON 0,12050103
005502  25024400  25024400  CON 0,25024400
005503  40000201  40000201  CON 0,40000201
005504  00160001  00160001  CON 0,00160001
005505  12046102  12046102  CON 0,12046102
005506  24620120  24620120  CON 0,24620120
005507  21251040  21251040  CON 0,21251040
005510  22047525  22047525  CON 0,22047525
005511  24424400  24424400  CON 0,24424400
005512  40000601  40000601  CON 0,40000601
```

```
                                                  CON 0,25024400
005456  25024400  25024400                        CON 0,40000201
005457  40000201  40000201                        CON 0,00160001
005460  00160001  00160001                        CON 0,12046102
005461  12046102  12046102                        CON 0,24620120
005462  24620120  24620120                        CON 0,21251040
005463  21251040  21251040                        CON 0,22047525
005464  22047525  22047525                        CON 0,24424400
005465  24424400  24424400                        CON 0,40000601
005466  40000601  40000601                        CON 0,00120001
005467  00120001  00120001                        CON 0,23044515
005470  23044515  23044515                        CON 0,22252050
005471  22252050  22252050                        CON 0,24041524
005472  24041524  24041524                        CON 0,12200000
005473  12200000  12200000                        CON 0,40001601
005474  40001601  40001601                        CON 0,00160001
005475  00160001  00160001                        CON 0,23042501
005476  23042501  23042501                        CON 0,22620122
005477  22620122  22620122                        CON 0,20252105
005500  20252105  20252105                        CON 0,12050103
005501  12050103  12050103                        CON 0,25024400
005502  25024400  25024400                        CON 0,40000201
005503  40000201  40000201                        CON 0,00160001
005504  00160001  00160001                        CON 0,12046102
005505  12046102  12046102                        CON 0,24620120
005506  24620120  24620120                        CON 0,21251040
005507  21251040  21251040                        CON 0,22047525
005510  22047525  22047525                        CON 0,24424400
005511  24424400  24424400                        CON 0,40000601
005512  40000601  40000601                        CON 0,00120001
005513  00120001  00120001                        CON 0,23044515
005514  23044515  23044515                        CON 0,22252050
005515  22252050  22252050                        CON 0,24041524
005516  24041524  24041524                        CON 0,12200000
005517  12200000  12200000                        CON 0,77776260
005520  77776260  77776260

                                                  SPB $DRCVT
005550  33005751  33040201                        STA STDM1
005551  32005744  32040173

                                          *       STDM2 = STDM(2,1)
                                                  DLD STDM+2,4
005552  41402553  41475001                        SPB $DRCVT
005553  33005751  33040176                        STA STDM2
005554  32005745  32040171

                                          *       CALL BEGQUE (NIO)
                                                  SPB BEGQUE
005555  33000576  33000576                        LDK NIO
005556  40022446  40022446

                                          *       WRITE(NIO,911) J,RATE1,STDM1,CON1,RATE2,STDM2,CON2
                                                  LDK $911
005557  40005604  40040025
```

```
                                        LDQ NIO
                                        SPB IFREGN
                                        LDK J
                                        SPB $FPROU
                                        LDK RATE1
                                        SPB $FPROU
                                        LDK STDM1
                                        SPB $FPROU
                                        LDK CON1
                                        SPB $FPROU
                                        LDK RATE2
                                        SPB $FPROU
                                        LDK STDM2
                                        SPB $FPROU
                                        LDK CON2
                                        SPB $FPROU
                                        SPB $FHLTU

                                *       CALL ENDQUE (NIO)
                                        SPB ENDQUE
                                        LDK NIO
                                *       911 FORMAT(1H ,9X,I6,4X,F10.4,4X,F10.4,6X,F10.4,9X,F10.4,4X,F10.4,7X,
                                *       1F10.4)
                                        BRU $M24
                                $911    CON 0,600000000
                                        CON 0,000010001
                                        CON 0,100000000
                                        CON 0,400022201
                                        CON 0,214000002
                                        CON 0,400011001
                                        CON 0,224044044
                                        CON 0,400011001
                                        CON 0,224044044
                                        CON 0,400011401
                                        CON 0,224044044
                                        CON 0,400022201
                                        CON 0,224044044
                                        CON 0,400011001
                                        CON 0,224044044
                                        CON 0,400011601
                                        CON 0,224044044
                                        CON 0,77777570
                                *20     CONTINUE                                        CDNO 359
                                $M24    BSS 0
                                $20     LDX 1,3
                                        INX 1,3
                                        LDA N
```

```
005631  35000003  31000003          SUB 3
005632  05004727  05004727          TOD 23
005633  30005522  30077667          BTR $M23
                                                                    CDNO 360
                          *
                          * 100 CALL INHIBT
005634  33005752  33040116  $100    SPB INHIBT
                          *       IONTIM = 27.5*60.*2.
005635  00005707  00040052          LDA $FLCON
005636  74014001  74014001          FMS 1
005637  72005710  72040051          FMP $FLCON+1
005640  72005711  72040051          FMP $FLCON+2
005641  05045627  05045627          TER 23
005642  74000027  74000027          FIX 23
005643  34005645  34040002          BTS *+2
005644  05013000  05013000          NEG
005645  32005746  32040101          STA IONTIM
                          *       IDLAY = TIME-(TIME/7200)*7200
005646  00002052  00002052          LDA TIME
005647  45004427  45004427          DRA 23
005650  75005705  75040034          DVH $FXCON+7
005651  00002052  00002052          LDA TIME
005652  59005705  59040033          MPY $FXCON+6
005653  45006467  45006467          DLA 23
005654  32005747  32040073          STA IDLAY
                          *       IDELAY = IONTIM-IDLAY
005655  31005746  31040071          SUB IONTIM
005656  05013000  05013000          NEG
005657  32005750  32040071          STA IDELAY
                          *       IF(IDELAY.LT.0) IDELAY = IONTIM*IDLAY
005660  31005675  31040015          SUB $FXCON
005661  05004727  05004727          TOD 23
005662  30005666  30040004          BTR $M25
005663  00005746  00040063          LDA IONTIM
005664  11005747  11040063          ADD IDLAY
005665  32005750  32040063          STA IDELAY
                          *       CALL PERMIT
005666  33005753  33040065  $M25    SPB PERMIT
                          *       CALL DLY01 (1,IDELAY)
005667  33005754  33040065          SPB DLY01
005670  40005677  40040007          LDK $FXCON+2
005671  40005750  40040057          LDK IDELAY
```

```
                                    *     CALL SEGMNT (29,1)
005672  33021041  33021041              SPC SEGMNT
005673  40005706  40040013              LDK $FXCON+9
005674  40005677  40040003              LDK $FXCON+2
                                                                                CDNO 362
                                    *     END
                                    *  THE FOLLOWING SYSTEM SYMBOLS HAVE BEEN USED:
                                    *     SEGMNT,ENDQUE,DEQQUE,NIO,TIME
005675  00000000  00000000  $FXCON CON D,0
005676  00000002  00000002        CON D,2
005677  00000001  00000001        CON D,1
005700  00000004  00000004        CON D,4
005701  00000010  00000010        CON D,16
005702  00000022  00000022        CON D,18
005703  00000014  00000014        CON D,12
005704  77761740  77761740        CON D,-7200
005705  00016040  00016040        CON D,7200
005706  00000035  00000035        CON D,29
005707  22734000  22734000  $FLCON CON F,0,275E2
005710  22360000  22360000        CON F,0,6F2
005711  21200000  21200000        CON F,0,2F1
005712  20020000  20020000  $DPCON DCN F,0,5
005713  00000000  00000000
005714  30000001  30000001  ITIME  BSS 1
005715  30000001  30000001  IPD    BSS 1
005716  30000001  30000001  XTIMEX BSS 1
005717  30000001  30000001  ISTR1  BSS 1
005720  30000001  30000001  RATE1  BSS 1
005721  30000001  30000001  RATE2  BSS 1
005722  30000001  30000001  CON1   BSS 1
005723  30000001  30000001  CON2   BSS 1
005724  30000001  30000001  PPHV1  BSS 1
005725  30000001  30000001  PPHV2  BSS 1
005726  30000001  30000001  PPHV3  BSS 1
005727  30000001  30000001  PPHV4  BSS 1
005730  30000001  30000001  PPHV5  BSS 1
005731  30000001  30000001  K      BSS 1
005732  30000001  30000001  KK     BSS 1
005733  30000001  30000001  J      BSS 1
005734  30000001  30000001  PBARX  BSS 1
005735  30000001  30000001  YMASS1 BSS 1
005736  30000001  30000001  YMASS2 BSS 1
005737  30000001  30000001  YMASS3 BSS 1
005740  30000001  30000001  YMASS4 BSS 1
005741  30000001  30000001  YMASS5 BSS 1
005742  30000001  30000001  YMASS6 BSS 1
005743  30000001  30000001  I      BSS 1
005744  30000001  30000001  STORK1 BSS 1
```

```
2745  300000001  300000001        STDMZ  BSS 1
2746  300000001  300000001        IONTIM BSS 1
2747  300000001  300000001        IDLAY  BSS 1
2750  300000001  300000001        IDELAY BSS 1
2751  911042122  911042122        $DRCVT LIB
      920653124  920653124
2752  922247110  922247110        INHIET LIB
      922241124  922241124
2753  924042522  924042522        PERMIT LIB
      923244524  923244524
2754  921046131  921046131        DLY01  LIB
      914030440  914030440
      *00000000  *00000000              END
```

```
32JUL 03  03:20:74   23.102              GE-635 GE-PAC PAL ASSEMBLER

                    *LRTC3      LEAK RATE TEST SEGMENT THREE
                    *
                    *              FOR  FITZPATRICK
                    *C*************************************************************
                    *C*************************************************************
                    *C***                                                       ***
                    *C***           LEAK RATE TEST SEGMENT THREE                ***
                    *C***                                                       ***
                    *C*************************************************************
                    *C*************************************************************
                    *     ROUTINE PRINTS INPUT AND OUTPUT VALUES                 CDNO 266
                    *       TEMPERATURE,RTD; DEG F      - TREAD(18)              CDNO 267
                    *       MOISTURE CONTENT, PPM BY VOL  - PPMV(5)              CDNO 268
                    *       TOTAL PRESS,TORUS AND BULB (PSIA)      - PS,PD       CDNO 269
                    *          REF VOL AND CONTAINMENT (PSIA)      - DPSR,DPDR   CDNO 270
                    *       REFERENCE VOLUME PRESS,TORUS,BULB (PSIA)  - PSR,PDR  CDNO 271
                    *       DIFFERENTIAL PRESSURES -                             CDNO 272
                    *       BAROMETRIC PRESS, IN HG       - BAROM                CDNO 273
                    *       LEAKAGE RATE = FRACTION OF CONTAINED                 CDNO 274
                    *            MASS PER 24 HOURS                - RATE(6)      CDNO 275
                    *       VARIANCE OF LEAK RATE DATA    - VAR(6)               CDNO 276
                    *       STANDARD DEVIATION OF SLOPE   - STDM(6)              CDNO 277
                    *C*************************************************************
                    *    COMMON /OUTPUT/  RTD(10,26),    PPMV(5,26),    OUT(12,26),
                    *   $ XTIME(26),      IUNIT,         NUM,           XSTRNP          A
000000  29020000  25020000                RAI
```

```
/S      2131
/YCOR   2147    DLD   3721  DST   3722  DST   4246  DST   4256
/YN2    2145    DLD   3661  DLD   4243  FSU   4255
/YN20   2233    DST   4132  DST   4244  DLD   4253
/STRMP  2110
/TIME   2022    DST   3667  DLD   3754  DST   3755  DLD   4157  DST   4160  DST   4166
/MASS   2725    DLD   3733  DST   3734  DLD   4133  DLD   4135  DLD   4205  DST   4206  DST   4207  DLD   4217
                DLD   4221
NO      3501    FDV   4310
NOD     3533    DST   4136  DST   4220
NOS     3531    DST   4134  DST   4222
```