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Computer Programs for Thermodynamic and Transport Properties of Hydrogen (Tabcode-II)

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COMPUTER PROGRAMS FOR THERMODYNAMIC AND TRANSPORT PROPERTIES OF HYDROGEN

(Tabcode-II)

H. M. Roder, R. D. McCarty, and W. J. Hall

The thermodynamic and transport properties of para and equilibrium hydrogen have been programmed into a series of computer routines. Input variables are the pair's pressure-temperature and pressure-enthalpy. The programs cover the range from 1 to 5000 psia (34 MN/m^2) with temperatures from the triple point to 6000°R (3300 K) or enthalpies from -130 BTU/lb (-623 J/mol) to 25,000 BTU/lb (117000 J/mol). Output variables are enthalpy or temperature, density, entropy, thermal conductivity, viscosity, velocity of sound, heat capacity at constant pressure, heat capacity at constant volume, the heat capacity ratio, and a heat transfer parameter. Property values on the liquid and vapor boundaries are conveniently obtained through two small routines. The programs achieve high speed by using linear interpolation in a grid of precomputed points which define the surface of the property returned. The maximum errors arising from the linear interpolation are shown on individual deviation plots for each combination of variables. Error estimates for the sources of data are similarly displayed.

Key Words: Computer programs; density; enthalpy; entropy; heat capacity at constant pressure; heat capacity at constant volume; heat capacity ratio; heat transfer coefficient; hydrogen; pressure; saturation boundary; temperature; thermal conductivity; velocity of sound; viscosity.

1. INTRODUCTION

Extensive use of hydrogen in the chemical industry and as a propellant in the U. S. space program requires that the engineer be provided values of thermodynamic and transport properties of this fluid in useful form. In many problems the properties have to be evaluated at numerous thermodynamic state points. The problems are often handled on a computer and they involve iterative computational methods. In the present report we describe a series of computer routines which are fast, moderately accurate, and operate over wide ranges of input variables. They are based on selected source data. The input (entry) and output (returned) variables are:

Input	Output	Input	Output
pressure-temperature	enthalpy	pressure-enthalpy	temperature, and phase or state
	density		density
	entropy		entropy
	thermal conductivity		thermal conductivity
	viscosity		viscosity
	velocity of sound		velocity of sound
	heat capacity, C_v		heat capacity, C_v
	heat capacity, C_p		heat capacity, C_p
	heat capacity ratio		heat capacity ratio
	heat transfer parameter		heat transfer parameter

In addition there are two small saturation routines which return values on the saturation boundaries. The computer routines were developed primarily for nuclear rocket engine design. The programs cover a wide range of conditions as follows: for temperatures from the triple point (24.845°R, 13.803 K) to about 6000°R (3300 K), for pressures from 1 to 5000 psia (34 MN/m^2), and for enthalpies from -130 to 25,000 BTU/lb (-623 to 117000 J/mol). In addition, the thermodynamic and transport properties of both para hydrogen and equilibrium hydrogen are available through these programs. An important criterion for many applications is computational speed, as some process control calculations have to be made in real time. The linear interpolation employed achieves speed but sacrifices accuracy. As an aid to the user, we have determined the maximum error due to the interpolation scheme and estimated the error in the source data. These errors are displayed in departure graphs for each program.

An older version of the para hydrogen programs, which has been distributed widely, should now be considered obsolete (Tabcode-I, Hall, et al., 1967, and McCarty 1968). The changes and improvements over the older version are as follows:

1. The temperature range has been extended to 6000°R, the enthalpy range to 25,000 BTU/lb.
2. New measurements of thermal conductivity between 30° and 275°R are now included.
3. Improved values for both thermal conductivity and viscosity have been inserted for temperatures above 1200°R.
4. The saturation subroutines are now included in the package.
5. For equilibrium hydrogen, which was not treated previously, an entire set of programs is now provided.
6. A combination of variables is now included which describe a commonly used heat transfer parameter, designated herein as L-factor (see Section 1.1).

The main divisions of the report are text, program listings, and error graphs. The text contains all the normal description given for computer programs such as deck size, calling sequence, etc. However, for this problem the selection of source data and the computation of the property values placed in data arrays are important; they are, therefore, described in some detail.

1.1 Symbols and Units Used

The programs were developed for engineering applications; therefore, the units of this report are those commonly used in engineering, i.e., psia, BTU, etc. The sources of data, however, normally employ some version of metric units. In the discussion of the equation of state, the virial B, and in figures 11 and 12, the units of the original sources had to be retained. Conversion factors for changes from source papers to generating functions to the present program have all been taken from NASA Special Publication 7012 (Mechtly 1969).

P	pressure, psia
T	temperature, °R
H	enthalpy, BTU/lb
H_{gas}	enthalpy of saturated vapor, BTU/lb
H_{liquid}	enthalpy of saturated liquid, BTU/lb
S	entropy, BTU/lb - °R
ρ	density, lb/ft^3
C_p	specific heat at constant pressure, BTU/lb - °R
C_v	specific heat at constant volume, BTU/lb - °R
γ	the ratio C_p/C_v, dimensionless
ω	sound velocity, ft/s
η	viscosity, $lb\text{-}h/ft^2$
k	thermal conductivity BTU/h-ft - °R
L	a heat transfer parameter equal to $k^{0.6}\ C_p^{0.4}/\eta^{0.4}$, with units as shown above.[This heat transfer parameter is the combination of thermal properties occurring in the conventional Dittus-Boelter (Nusselt type) equation describing the forced convection heat transfer coefficient for turbulent flow (see, for example, equation 9-10a, page 219, McAdams 1954)].
Q	the phase designator, dimensionless

Additional symbols used in text:

B or B(T)	the second virial coefficient
E_o^o	ideal gas internal energy at absolute zero, the reference state, taken to be zero
π	general symbol for property
P_c	critical pressure
R	gas constant
RE	general symbol for the return from the liquid-vapor two phase region
superscript °	ideal gas thermodynamic properties, i.e., C_p^o, C_v^o, H^o
U	internal energy
V	volume
Z	PV/RT

Important state points for para and equilibrium hydrogen:

triple point	normal boiling point	critical point
P = 1.022 psia	P = 14.696 psia	P = 187.506 psia
T = 24.845°R	T = 36.482°R	T = 59.356°R

2. HYDROGEN MODIFICATIONS, PROPERTY DIFFERENCES, AND PHASE DIAGRAMS

A brief review of the more important features in the physics of hydrogen is essential if we are to understand what properties the programs return, and why some of the peculiarities of the programs occur.

2.1 Hydrogen Modifications

Hydrogen molecules occur in two natural modifications, parahydrogen and orthohydrogen. In the parahydrogen molecule the two nuclear spins are opposed while in orthohydrogen they are alined. Under normal conditions, the transition probability between states is practically zero; a catalyst, a sharp gradient in magnetic field, or external radiation (e.g., nuclear radiation, x-rays, ultraviolet, etc.) is required to let the transition proceed. Conversion between these two modifications is temperature dependent, as shown in figure 1, which is based on Woolley, et al., (1948). At low temperatures in the presence of an appropriate catalyst, the thermal equilibrium favors the para modification. At the normal boiling point (36.482°R), the equilibrium composition is 99.79% para and only 0.21% orthohydrogen. This composition is often simply referred to as parahydrogen or p-hydrogen.

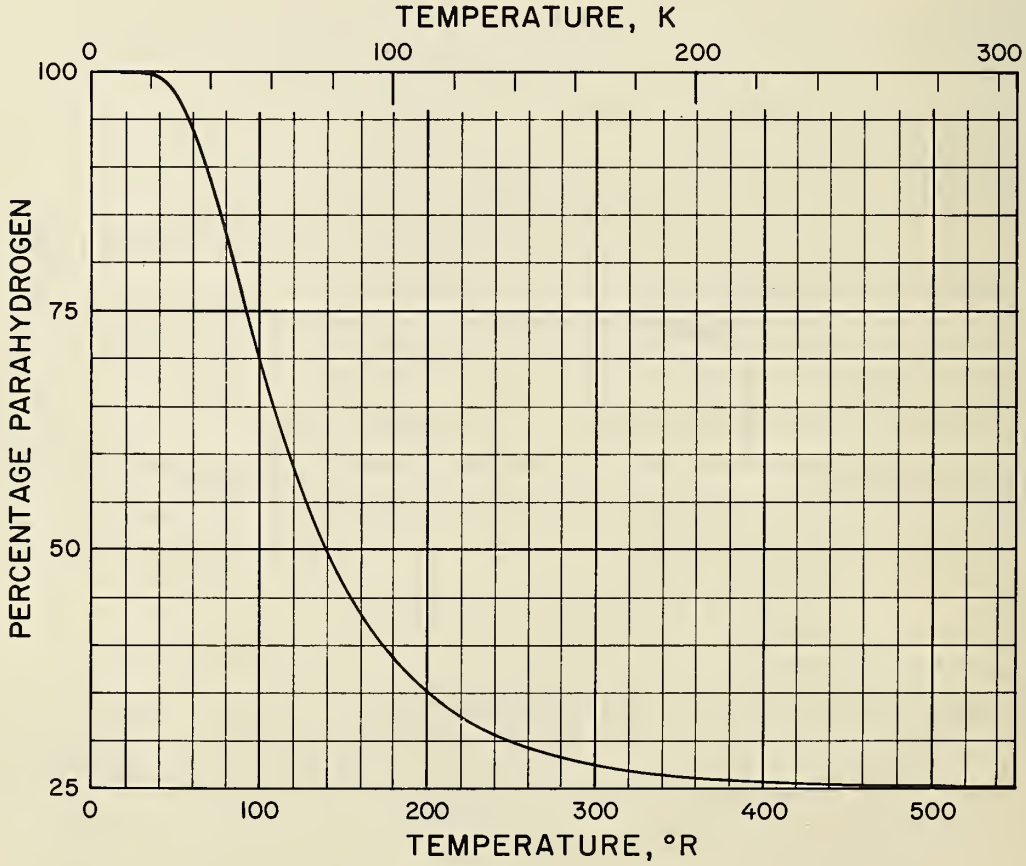


Figure 1. Hydrogen Composition at Equilibrium

Conversely, the equilibrium composition near ambient temperature is 75% ortho and 25% para. This latter composition is usually designated normal or n-hydrogen. When conversion occurs between the normal boiling point and room temperature, then the thermodynamic equilibrium mixture of para and ortho hydrogen is called "equilibrium" or e-hydrogen and the composition at intermediate temperatures varies as shown in figure 1. In this report we describe programs for both p-hydrogen and e-hydrogen.

At temperatures above 2700°R (1500 K) the hydrogen molecule dissociates into hydrogen atoms. This dissociation is both temperature and pressure dependent. Assumptions made in this report are that dissociation occurs according to the equilibrium constant for normal hydrogen, and that the property values can be obtained by adding the dissociation effects calculated for the ideal gas to the extrapolated properties of the real gas.

2.2 Property Differences

At comparable state points, property values of the various modifications of hydrogen may differ, that is, some of the properties depend on ortho-para composition. Experimentally these effects are observed in different vapor pressures and in different critical parameters. Most important to this discussion is the fact that the properties of the ideal gas for para and equilibrium hydrogen as calculated from statistical mechanics differ, and further, since the composition change depends only on temperature, that the property differences depend only on temperature. Thus, if a difference exists for an ideal gas property at low pressures, then the same difference exists at all other pressure levels for a given temperature. Stated another way, the statistical calculation, by including the temperature dependent composition change, automatically includes the reaction occurring as para-transforms to equilibrium-hydrogen — i.e., the sensible heat of e-hydrogen includes the appropriate part of the heat of chemical reaction. Not all properties are composition dependent; density and viscosity, for example, are nearly independent of composition. On the other hand, the properties with significant ortho-para dependency are specific heat, and properties related to specific heat such as velocity of sound, entropy, enthalpy, and thermal conductivity. When the properties of p- and e-hydrogen differ, they may differ considerably. For example, the value of enthalpy near the critical point for p-hydrogen is about 16 BTU/lb, whereas the value for equilibrium hydrogen is about 31 BTU/lb. The difference in properties for the ideal gas specific heats, C_p°, is illustrated in figure 2. Differences for the other properties are best expressed in terms of a table; approximate differences can be obtained by comparing corresponding entries for a pressure of 1 psia in Appendix A (pages 38 and 45).

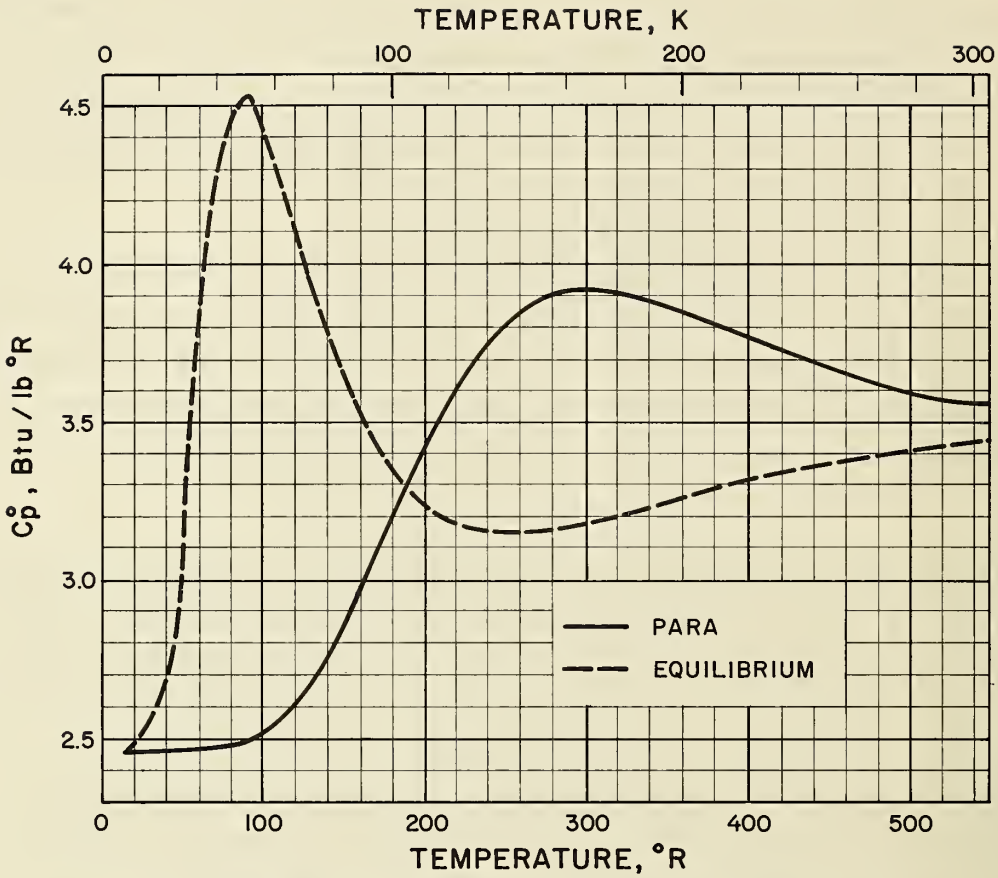


Figure 2. Ideal Gas Specific Heat of Para and Equilibrium Hydrogen

2.3 Range of the Programs and Phase Diagrams

For programs which use pressure and temperature as entry variables, the pressure range is 1 to 5000 psia and the temperature range is from the triple point (24.845°R) to 6000°R. The P-T range of the programs for both para and equilibrium hydrogen is illustrated by the shaded area in figure 3. The programs cover property values for liquid, gas or vapor states, and dissociation. Note that the programs do not cover the solid phase nor values at pressures less than 1 psia. The low pressure limit is arbitrary; it arises from the behavior of entropy as follows. At any given temperature, the value of entropy approaches infinity as the pressure approaches zero. Since we cannot represent an infinity with linear interpolation between fixed points, a cutoff, 1 psia, was chosen.

For the programs which use pressure and enthalpy as entry variables, the pressure range is the same, 1 psia to 5000 psia. The range of enthalpy is -130 BTU/lb to 25,000 BTU/lb. The enthalpy limits correspond to the enthalpy of the liquid at the triple point, and the ideal gas enthalpy at the highest temperature, 6000°R. The phase diagram of para-hydrogen in pressure-enthalpy coordinates is shown in figure 4. The phase diagram for

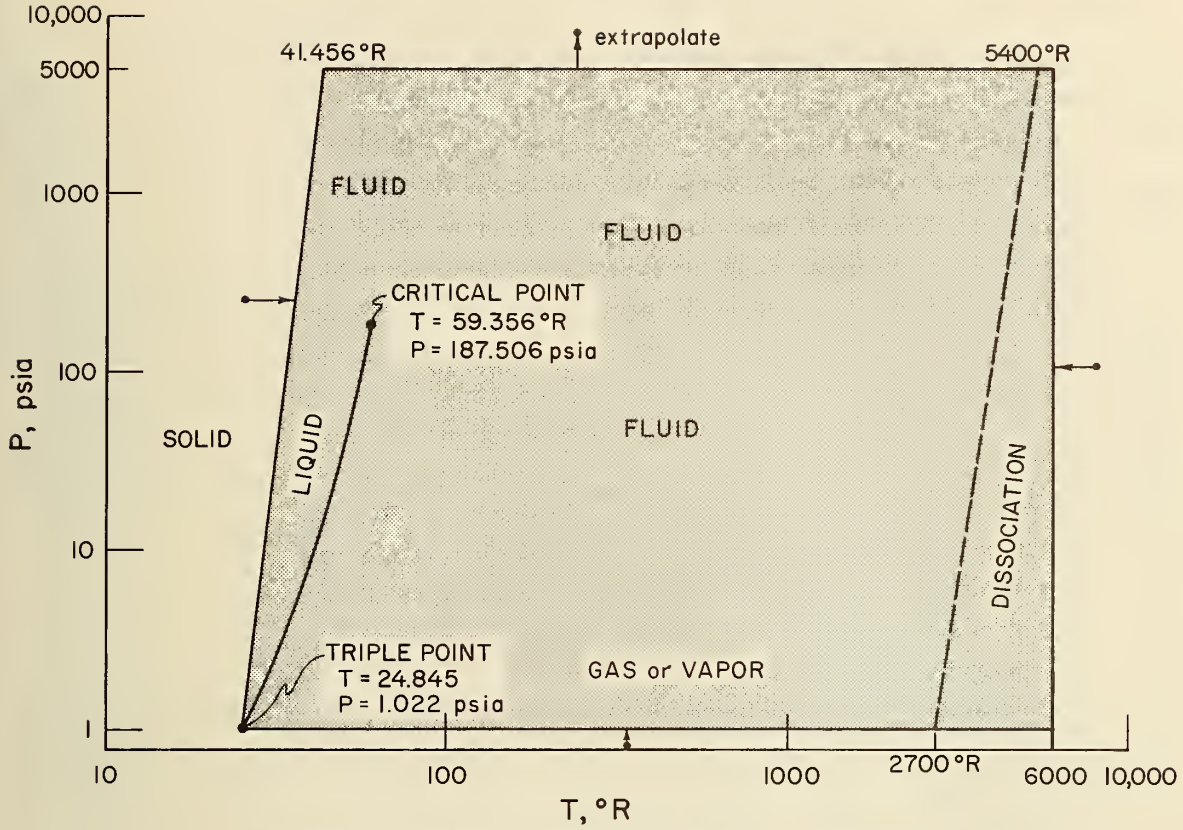


Figure 3. The P-T Phase Diagram for Hydrogen

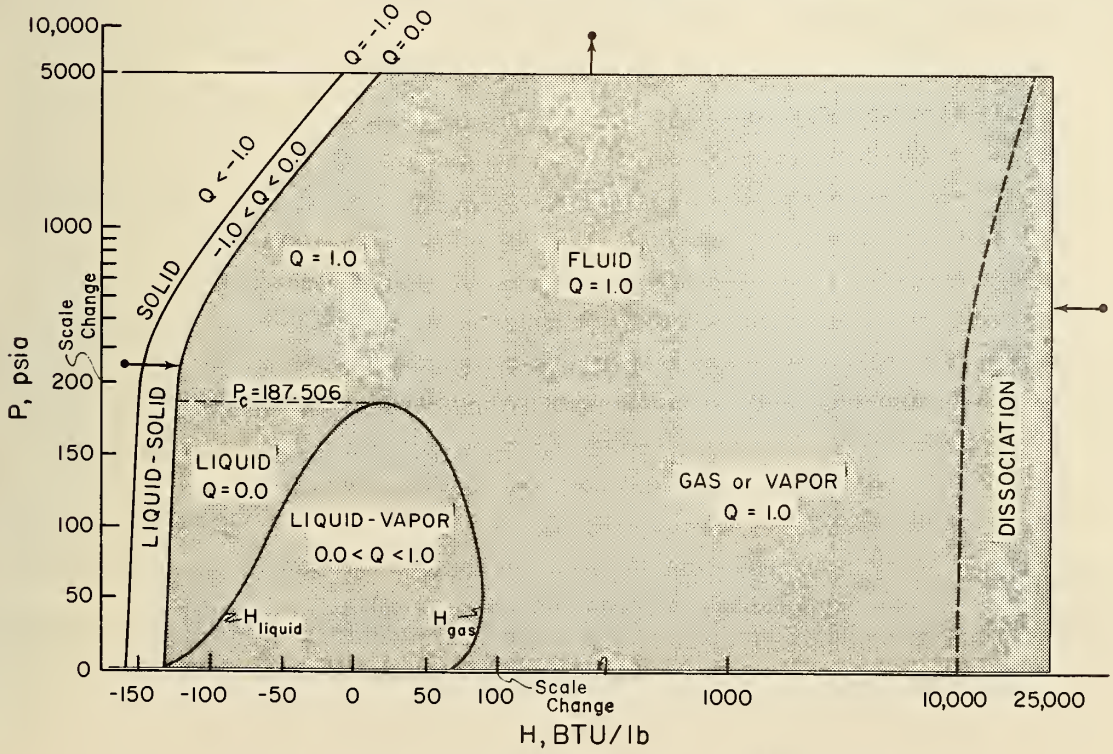


Figure 4. The P-H Phase Diagram for Parahydrogen

e-hydrogen would look quite similar to figure 4 except that the liquid-vapor two phase boundary is gradually displaced to higher values of enthalpy. For example, the enthalpy of e-hydrogen at the critical pressure is about 31 BTU/lb while the maximum value of enthalpy along the two-phase boundary is about 110 BTU/lb. The programs cover property values for liquid, gas or vapor states, and dissociation as before. They do not cover the solid phase, pressures below 1 psia, or the two phase liquid-solid ("slush") conditions.

A comparison of figures 3 and 4 discloses that the conditions, the phases or states of the hydrogen, covered by the P-T and the P-H programs are similar, except that the P-H programs cover the range of states where liquid and gas coexist while the P-T programs do not. A concise designation of the phase or state of any given point is therefore available only by reference to P-H coordinates. Since the description of phase is important in many problems, a scheme to designate the phase was devised and is presented in the next section.

2.4 The Phase Designator, Q

The various physical states possible in the P-H phase diagram are described by the phase designator, Q, available only from program PHTEMP (see also page 11). Values of Q are shown in figure 4 and in table 1. Note that figure 4 includes scale changes at 100 BTU/lb and at 200 psia. For the special case of the two phase liquid-vapor region, Q corresponds to the conventional quality, as defined on page 11.

Table 1. Values of the Phase Designator, Q

Value of Q	Applicable portions of the phase diagram, P_c = 187.506 psia
1.0	single phase gas or vapor single phase compressed fluid at pressures above P_c saturated vapor line
$0.0 < Q < 1.0$	two phase liquid-vapor region
0.0	saturated liquid line compressed liquid (fluid) states at pressures below P_c liquid-solid boundary line
$-1.0 < Q < 0.0$	two phase liquid-solid region
-1.0	solid - compressed solid boundary
$Q < -1.0$	compressed solid states

3. OVERVIEW OF THE PROGRAMS

The decks available and described in this report are listed in table 2.

Table 2. List of Available Program Decks

Input	Output	p-hydrogen	e-hydrogen
P-T	enthalpy	PTENTH	ETENTH
	entropy	TPENTR	ETENTR
	density	PTDENS	ETDENS
	C_p	PTCP	ETCP
	C_v	entry PTCV	entry ETCV
	gamma	entry PTGAMM	entry ETGAMM
	sound velocity	PTSOUN	ETSOUN
	viscosity	PTVISC	ETVISC
	thermal conductivity	PTCOND	ETCOND
	heat transfer parameter	PTLFAC	ETLFAC
P-H	temperature, and Q	PHTEMP	EHTEMP
	entropy	PHENTR	EHENTR
	density	PHDENS	EHDENS
	C_p	PHCP	EHCP
	C_v	entry PHCV	entry EHCV
	gamma	entry PHGAMM	entry EHGAMM
	sound velocity	PHSOUN	EHSOUN
	viscosity	PHVISC	EHVISC
	thermal conductivity	PHCOND	EHCOND
	heat transfer parameter	PHLFAC	EHLFAC
Saturation Routines			
P_{vap}	T_{vap}, H_{gas}, H_{liquid}	PSATH	EPSATH
T_{vap}	P_{vap}, H_{gas}, H_{liquid}	TSATH	ETSATH

Including the small saturation routines there are 36 decks (the output options C_p, C_v, and the ratio C_p/C_v are combined into one deck). Each deck exists in a CDC and an IBM version. Program listings are given in Appendix B.

3.1 Method Used

The conceptual idea of the computer programs follows from the use of a T-S or Mollier diagram. Using such a chart to obtain property data one visually or graphically interpolates between constant property lines. The computer programs imitate this procedure on the computer. However, in contrast to the visual procedure where any combination of existing variables can be used as entries to the chart, the computer programs are restricted to two entry possibilities, namely pressure-temperature and pressure-enthalpy.

Each property forms a surface with the two entry variables. A pre-determined number of points on this surface are calculated and form the array of data. The surface is divided into regions, the boundaries of which depend upon the relative linearity of the particular property surface. The P, T, or H spacings vary from region to region to compensate for the non-linearity of the property surface. In general, spacings will be small where the property is varying quite rapidly and they will be large where the property is varying more slowly. Each program consists of an array of data and an interpolation package. The interpolation package finds the four points which bracket the entry values and then performs a two dimensional linear interpolation to obtain the value of the property to be returned.

The arrays of data are necessarily limited. When coupled with linear interpolation, errors in the values returned are possible. We have, therefore, determined the error envelope for each program and these are displayed as departure graphs.

3.2 Peculiarities of the P-T Programs

One prominent feature shown in the appropriate phase diagram, figure 3, is the vapor pressure curve. In all of the P-T programs this line is mathematically thin, that is, the property value returned corresponds to either the liquid or the vapor side. In following an isobar, an isotherm, or any other path that crosses the vapor pressure curve, one will encounter sizeable changes in the different variables. In addition, for many variables these large changes also exist for conditions near or just above the critical point. Re-stating the peculiarity a different way: it is impossible to pick a P-T input which will place the coordinates inside a two phase region. Since it is often necessary to obtain property values for conditions of saturation, saturated liquid, saturated vapor, or both, we have provided a way of obtaining these values. The saturation routines listed in table 2 are designed to fill this need. They are described in Section 3.4.

3.3 Peculiarities of the P-H Programs

In contrast to the P-T programs it is quite possible to choose input values of P and H which place a point in question into a two phase region. From figure 4 it is seen that the boundaries of the programs are set specifically to omit returns from the liquid-solid (slush) two phase region. Returns from the liquid-vapor two phase region are, however, possible.

Three distinct possibilities or problems connected with these returns are discussed in some detail below.

The Phase Designator, Q, from PHTEMP - One problem often encountered is that we need to know where we are on the phase diagram. To solve this problem the program PHTEMP (EHTEMP) is structured slightly different than all of the other programs. The other P-H programs carry the two entry variables P and H in the call list. PHTEMP carries an additional variable, Q, in its call list. A call to PHTEMP (P, H, Q) and a check of the Q that is returned against table 1 will locate the point on the phase diagram. For example, if $0 < Q < 1$, then the P-H input is in the liquid-vapor coexistence region. For this region Q corresponds to the conventional quality and is defined as the percent (by mass) of the vapor phase present, or

$$Q = (H - H_{liquid}) / (H_{gas} - H_{liquid})$$

where H_{liquid} and H_{gas} are the enthalpy values at the respective phase boundary appropriate to the entry pressure (see also fig. 4). As noted before, values of Q for other parts of the phase diagram are given in table 1.

Returns from the Liquid-Vapor Two Phase Region - Assume that the input values of P and H place the point in question into the liquid-vapor two phase region. For this region the entry enthalpy H is used in all PH (EH) programs to find the phase designator or quality as defined above, and the phase designator or quality is then used to define the return, RE. For temperature, density, and entropy, these returns have the conventional meaning which is given in table 3. Other variables, that is k, η, ω, C_v, and L, are not defined for this region in the sense of thermodynamics. However, the engineer often uses these properties in this region, and then defines them according to the specific application. Therefore, the returns given are artificial involving Q and property values corresponding to the saturated liquid and saturated vapor as defined in table 3. C_p and γ are infinite in this two phase region; thus the largest value available to the machine is returned. The returns are summarized in table 3.

Property Values on the Saturation Boundaries - Property values of saturation are required in many applications. From the preceding discussions it is clear that these values are simply a special case of returns from the liquid-vapor two phase region. A property value on a phase boundary is obtained from the appropriate PH (EH) program by using pressure and the saturation enthalpy, liquid or gas, as entries. The saturation enthalpies can be obtained from the two small saturation routines.

3.4 The Saturation Routines

For points on the saturation boundary, i.e., on the vapor pressure curve of figure 3, either P or T is sufficient to specify the conditions of the point in question (phase rule). Obviously, the pressures have to be between 1.022 and 187.506 psia and the temperatures

Table 3. Returns from the Liquid-Vapor Two Phase Region

Program		return mode	description of return
PHTEMP	EHTEMP	conventional	RE = the temperature corresponding to the input pressure (vapor pressure). Additional output: the phase designator, Q.
PHDENS	EHDENS	conventional	RE = average density of mixture $= 1.0/[Q/\rho_{vapor} + (1-Q)/\rho_{liquid}]$
PHENTR	EHENTR	conventional	RE proportional to quantities of liquid and vapor present according to the equation $RE = Q(\pi_{vapor} - \pi_{liquid}) + \pi_{liquid}$, where π stands for the property in question
PHCOND	EHCOND	artificial	
PHVISC	EHVISC	artificial	
PHSOUN	EHSOUN	artificial	
PHCV	EHCV	artificial	
PHLFAC	EHLFAC	artificial	
PHCP	EHCP	infinite	RE = the largest value available to the machine
PHGAMM	EHGAMM	infinite	

between 24.845 and 59.356°R. The saturation routines need to be entered with only one variable; the corresponding other variable on the vapor pressure curve is returned. In addition, the enthalpies of the saturated liquid, H_{liquid}, and the saturated vapor, H_{gas}, are returned corresponding to the two phase boundaries of figure 4. Saturation values for all other properties can then be obtained by using pressure and the appropriate saturation enthalpy as input to the desired P-H program, as shown in the example on page 16.

4. PROGRAMMING INFORMATION

4.1 Deck Description

All of the decks are coded as FORTRAN functions. The decks are completely self-contained, including the data arrays which are used for interpolation. Each deck may be used separately or in conjunction with others.

A prefix PT (ET) on a subprogram name means that it requires pressure-temperature as input variables while the prefix PH (EH) indicates that the input variables are pressure-enthalpy. The remainder of the deck name designates the variable returned. The names of the decks and units for input and output are given in table 4 for p-hydrogen and in table 5 for e-hydrogen. Also shown in these tables are data loading routines, storage requirements, and number of cards in each deck.

Table 4. Deck Description, p-hydrogen

Input variables and units	Deck #	Sub-program name	Output variable and unit	Extra sub-routine for data loading	Storage requirement	Number of cards in deck
pressure psia and temperature °R	1	PTENTH	enthalpy BTU/lb	CDC - 2	1717	CDC 258 IBM 256
	2	PTDENS	density lb/ft^3	CDC - 3	1460	CDC 234 IBM 227
	3	PTENTR	entropy BTU/lb°R	CDC - 1	1274	CDC 208 IBM 208
	4	PTCOND	thermal conductivity BTU ft/h ft^2 °R	CDC - 1	1156	CDC 184 IBM 182
	5	PTVISC	viscosity lb h $/ft^2$	CDC - 1	978	CDC 197 IBM 195
	6	PTSOUN	velocity of sound ft/s	CDC - 1	980	CDC 164 IBM 165
	7	PTCP PTCV PTGAMM	C_p, BTU/lb°R C_v, BTU/lb°R γ, NONE	CDC - 4 IBM - 1	2151	CDC 292 IBM 291
	8	PTLFAC	$k^{0.6}\ C_p^{0.4}/\eta^{0.4}$	CDC - 1	1157	CDC 183 IBM 180
pressure psia and enthalpy BTU/lb	9	PHTEMP	temperature °R quality see text	CDC - 1	917	CDC 160 IBM 161
	10	PHDENS	density lb/ft^3	CDC - 1	1142	CDC 193 IBM 194
	11	PHENTR	entropy BTU/lb°R	CDC - 1	1130	CDC 181 IBM 180
	12	PHCOND	thermal conductivity BTU ft/h ft^2 °R	CDC - 1	1304	CDC 213 IBM 209
	13	PHVISC	viscosity lb h $/ft^2$	CDC - 1	1402	CDC 266 IBM 263
	14	PHSOUN	velocity of sound, ft/s	NONE	795	CDC 145 IBM 148
	15	PHCP PHCV PHGAMM	C_p, BTU/lb°R C_v, BTU/lb°R γ, NONE	CDC - 4 IBM - 1	2077	CDC 294 IBM 289
	16	PHLFAC	$k^{0.6}\ C_p^{0.4}/\eta^{0.4}$	CDC - 1	1304	CDC 215 IBM 210
temperature °R	17	TSATH	vapor pressure H_{gas}, BTU/lb H_{liq}, BTU/lb	NONE	161	CDC 29 IBM 32
pressure psia	18	PSATH	sat. temperature H_{gas}, BTU/lb H_{liq}, BTU/lb	NONE	161	CDC 29 IBM 32

Table 5. Deck Description, e-hydrogen

Input variables and units	Deck #	Sub-program name	Output variable and unit	Extra sub-routine for data loading	Storage requirement	Number of cards in deck
pressure psia and temperature °R	1	ETENTH	enthalpy BTU/lb	CDC - 1	1717	CDC 279 IBM 255
	2	ETDENS	density lb/ft^3	CDC - 2	1460	CDC 229 IBM 225
	3	ETENTR	entropy BTU/lb°R	CDC - 1	1274	CDC 209 IBM 206
	4	ETCOND	thermal conductivity BTU ft/h ft^2°R	CDC - 1	1156	CDC 184 IBM 182
	5	ETVISC	viscosity lb h $/ft^2$	CDC - 1	978	CDC 197 IBM 195
	6	ETSOUN	velocity of sound ft/s	CDC - 1	980	CDC 164 IBM 162
	7	ETCP ETCV ETGAMM	C_p, BTU/lb°R C_v, BTU/lb°R γ, NONE	CDC - 3 IBM - 1	2151	CDC 291 IBM 293
	8	ETLFAC	$k^{0.6} C_p^{0.4}/\eta^{0.4}$	CDC - 1	1157	CDC 191 IBM 180
pressure psia and enthalpy BTU/lb	9	EHTEMP	temperature °R quality see text	CDC - 1	917	CDC 161 IBM 160
	10	EHDENS	density lb/ft^3	CDC - 1	1142	CDC 195 IBM 194
	11	EHENTR	entropy BTU/lb°R	CDC - 1	1130	CDC 182 IBM 180
	12	EHCOND	thermal conductivity BTU ft/h ft^2°R	CDC - 1	1304	CDC 213 IBM 211
	13	EHVISC	viscosity lb h $/ft^2$	CDC - 1	1402	CDC 267 IBM 267
	14	EHSOUN	velocity of sound, ft/s	NONE	798	CDC 141 IBM 141
	15	EHCP EHCV EHGAMM	C_p, BTU/lb°R C_v, BTU/lb°R γ, NONE	CDC - 2 IBM - 1	2077	CDC 289 IBM 291
	16	EHLFAC	$k^{0.6} C_p^{0.4}/\eta^{0.4}$	CDC - 1	1304	CDC 227 IBM 210
temperature °R	17	ETSATH	vapor pressure H_{gas}, BTU/lb H_{liq}, BTU/lb	NONE	161	CDC 30 IBM 30
pressure psia	18	EPSATH	sat. temperature H_{gas}, BTU/lb H_{liq}, BTU/lb	NONE	161	CDC 30 IBM 30

Since nearly every computer has available some type of FORTRAN processing language, the programs were written in FORTRAN IV. Program listings for both the CDC and the IBM versions of all decks are given in Appendix B.

4.2 Calling Sequence

Since the decks are individual FORTRAN functions the calling sequences are predictably simple.

```
P = x.x
T = y.y
H = z.z
```

and then

```
RHO  = PTDENS (P, T),
```

or

```
RHOE = EHDENS (P, H).
```

Provided that the values of P, T, and H are valid, that is, within the program range, the density of para hydrogen is stored into RHO or the density of equilibrium hydrogen into RHOE.

The only variation on this theme occurs for the routine PHTEMP (EHTEMP) and the saturation routines. The change occurs not in the calling sequence but rather in what information is available after the call is made. Examples are given below.

```
P = x.x
H = z.z
```

TEMP = PHTEMP(P, H, Q) or TEMP = EHTEMP(P, H, Q).

The temperature corresponding to the input pressure is found in TEMP. In addition, the phase designator Q is available through the parameter list, for example,

```
QUAL = Q.
```

Note that we did not set Q prior to the call. The saturation routines use very similar logic.

```
P = x.x
```

TVAP = PSATH(P, HG, HL) or TVAP = EPSATH(P, HG, HL)

The temperature corresponding to the input pressure (vapor pressure) is found in TVAP. In addition, the enthalpy of the saturated liquid and the enthalpy of the saturated vapor are available through the parameter list; thus

```
HGAS = HG,   and
HLIQ = HL .
```

The sequence with the other saturation routine is as follows:

```
T = y.y
```

PVAP = TSATH(T, HG, HL) or PVAP = ETSATH(T, HG, HL).

Here the vapor pressure is returned in PVAP, and again the enthalpies of saturated liquid and vapor are available through the parameter list. Next, assume the call above has been made, but what really is required is the entropy of the saturated vapor. The

sequence is completed by

SGAS = PHENTR (PVAP, HG) or SGASE = EHENTR (PVAP, HG).

4.3 Exceeding the Range of the Programs

It is, of course, easy to violate the range of the programs when setting the values of the input variables. The problem seems to occur frequently if unit conversions are involved. We have omitted error messages for cases of boundary violations because each installation handles printed error messages differently.

For the PT (ET) and PH (EH) programs, the out of bounds variable is automatically set to a value acceptable to the program, and computations proceed. The value returned is, of course, in error. Possible boundary violations are shown in the phase diagrams, figures 3 and 4, by dots, and the arrows indicate what conditions are actually processed. A complete description is as follows:

Pressure P out of bounds

If the entry pressure is less than 1 psia, the value of pressure is set to 1.

If the entry pressure is greater than 5000 psia, the returned value is extrapolated from within the defined range.

Temperature T out of bounds

If the entry temperature is less than the temperature appropriate to melting conditions, the temperature is set to the melting temperature at the same pressure.

If the entry temperature is greater than 6000°R, the value of temperature is set to 6000°R.

Enthalpy H out of bounds

If the entry enthalpy is less than the enthalpy appropriate to melting conditions, the enthalpy is set to the melting enthalpy.

If the entry enthalpy is greater than 25,000 BTU/lb, the value of the enthalpy is set to 25,000 BTU/lb.

Saturation routines

If either program is entered with a value outside the pressure or temperature range of the vapor pressure curve, the variable is set to the nearest end point of the curve (see figure 3).

4.4 Conversion to Other Systems or Installations

The programs as listed in Appendix B were written to avoid known incompatibilities. We have tested them on a CDC 3600, a CDC 3800, and an IBM 360. Other installations have run them on an 1108 Univac. Thus, conversion requirements should be minimal. Incompatibilities that we are aware of include

DATA /...../	vs.	DATA (.....)
ABSF (.....)	vs.	ABS (.....)
EXPF (.....)	vs.	EXP (.....)

Another source of incompatibilities arises from the use of different key board symbols on certain types of card punches, i.e., ( ) + = vs. % < & ≠.

The programmer should note that the data arrays are entered via DATA statements. The upper limit on the number of such statements varies from installation to installation. The least number that we are aware of has been used. Since this means that in many cases not all of the data can be loaded with the actual program deck, we had recourse to data loading subroutines which are listed in tables 4 and 5. If a limitation is encountered, a possible solution is as follows (Goldberg, 1967):

Problem: File length not sufficient to include all DATA statements of routine PTENTH.

Solution: Two segments used, 1. BLOCK DATA, 2. Function PTENTH modified.

Details: 1. BLOCK DATA (new for PTENTH function) COMMON/BLKPTH/AA... AO, followed by the DATA statements for arrays AA through AO (total 1183 values equivalent to H array).

2. Main function PTENTH is revised to include all DATA arrays except H (1183). The H array is linked to the main function through named common: COMMON/BLKPTH/H(1183).

4.5 Pitfalls, Common Errors in Applications

The earlier version of these decks has been available for nearly five years. Several points, where users have encountered difficulties, are described below:

Storage Limitation - Each program is designed to be used independently of all others. Specify only those decks actually required. Total storage required is specified in tables 4 and 5. Storage requirements range from 795 to 2151.

Program Range - Observe the limits of the programs 1 - 5000 psia, 24.845 - 6000°R, -130 - 25,000 BTU/lb. Valid answers will not be obtained if these bounds are violated.

Liquid-Vapor Two Phase Conditions - There is no built-in warning in any of the PH(EH) decks telling the user that he is in the liquid-vapor two phase region. This means the user should check the value of Q to confirm the conditions he is trying to process.

Liquid-Vapor Two Phase Returns - Returns from this region for the variables k, η, ω, C_p, C_v, γ, and L, are artificial, as defined in table 3. The programs will return numbers for these variables, but what usually is desired are not these returns but rather the property values for saturated liquid or saturated vapor.

Errors - The two categories of errors, interpolation error and estimated source data errors, are discussed in detail in Section 6. The user has to be aware of the limitations inherent in linear interpolation. The detailed graphs of maximum interpolation errors given in Appendix C should alert the user to possible problems, and serve as an aid in solving those problems.

4.6 Debugging Aids

In addition to the program listings given in Appendix B, we have found that a set of selected values for the various properties is indispensable. In Appendix A we list values

obtained from the PT(ET) programs. Values for all properties for a representative set of temperatures are printed for isobars of 1, 15, 50, 150, 500, 1500, and 4500 psia. These skeleton tables are to be used to establish approximate values, to make an order of magnitude check, to check units, and to debug the running of the programs at other installations.

5. STRUCTURAL DETAILS OF THE PROGRAMS

As mentioned before, each program can be visualized as an array of data coupled with an interpolation scheme. Each property value entered into the data array corresponds to a particular pair of P-T or P-H. The spacing or increment for each entry variable is independent of the other and varies over the surface of the property. The total network of spacings is called the grid and a sequence of equal spacings defines a region.

5.1 Grid and Region Layout

The grid for each variable consists of 12 to 25 different regions. The size of each region and its relation to neighboring regions is determined by the desired interpolation error and by the relative linearity of the particular property surface. A plot of constant property lines is used as an aid in layout. An example of grid-region layout for p-hydrogen is shown in figure 5 where lines of constant C_p (in BTU/lb-°R) are plotted for entry variables P and H. Lines of constant C_p and regions G through Q are shown. Within each

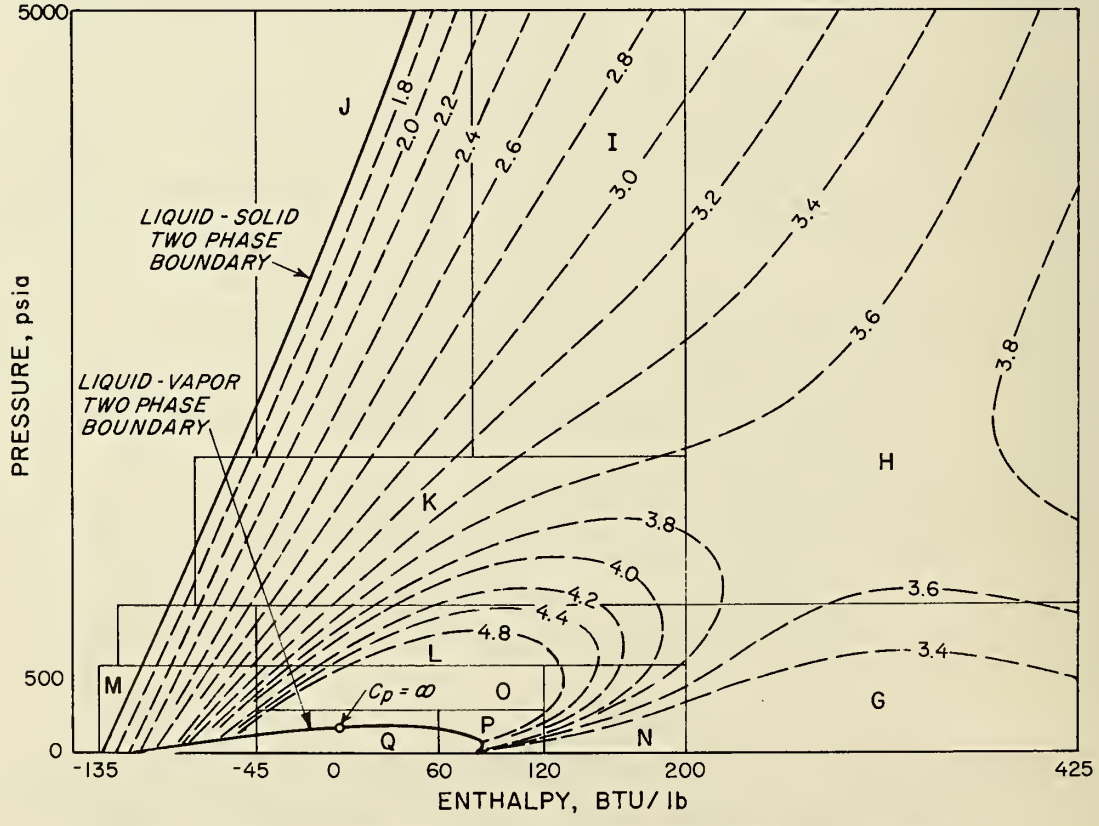


Figure 5. Region Layout for C_p with Entry Variables P-H, p-hydrogen

region increments of the entry variables, P-T or P-H, are fixed. The spacings used for the various regions were intended to yield a 1% interpolation error; however, subsequent checks show that we have not always achieved this goal. A data array developed according to this scheme will vary from variable to variable; it will minimize the number of points required to represent the surface of the variable to be interpolated.

While in general the property values entered in the data arrays are exact, there are a few cases where these entries have been adjusted to yield better results for the interpolation. One example is entries at low pressures, that is, some regions are extended to negative pressures and the entries at these negative pressures are bogus values. They do, however, insure a more precise interpolation down to the lower limit of pressure. Region B shown in the partial grid layout of figure 6 is a typical example. The lower pressure limit

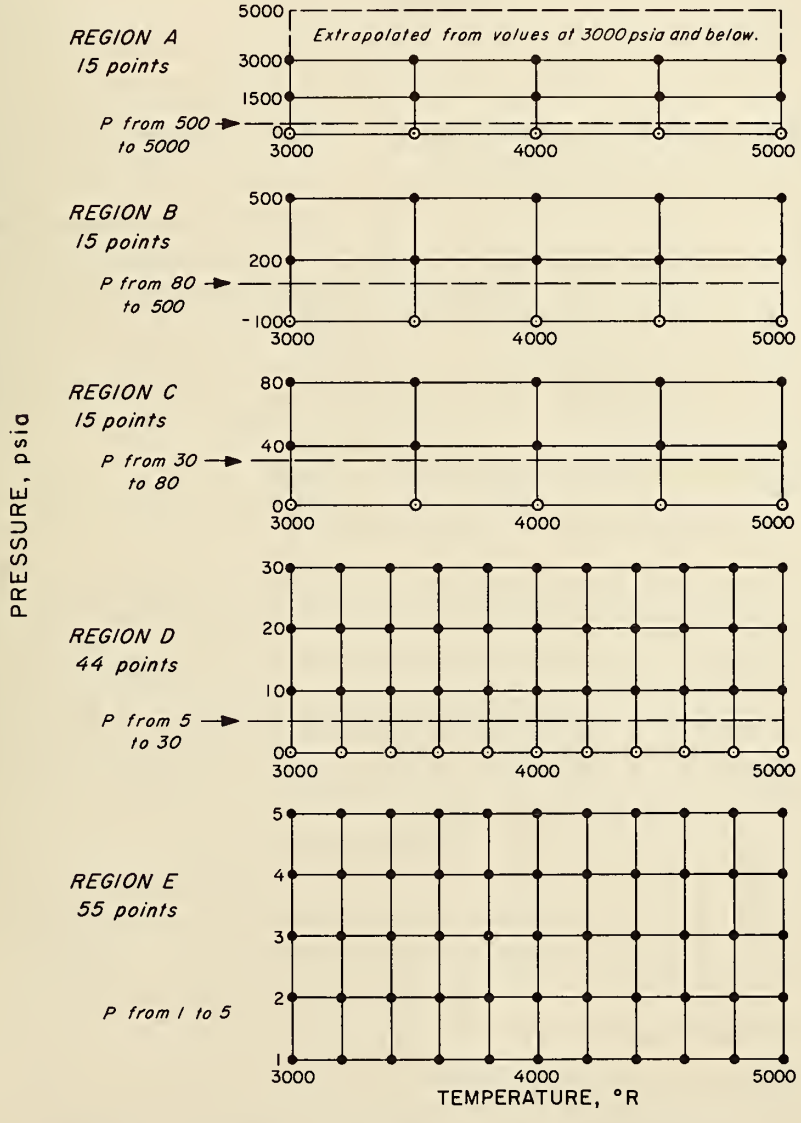


Figure 6. Partial Grid Layout for Program PTENTH

for interpolation from this region is 80 psia and entries in the data array at -100 psia are bogus values (shown as ⊙). A similar technique better described as a partial overlap of region boundaries is used in Region A, C, and D. For best accuracy values at 15 psia are interpolated from Region D, not from Regions A, B, or C. Region E is the only one illustrated in which bogus values are not used. The entire sequence illustrates how difficult it is to follow the large variation in enthalpy in the region of dissociation.

Interpolation along the two phase boundaries also involves the use of bogus points that have no counter part on the surface of the property in question. For the P-T programs, the points are across the two phase boundary while for the P-H programs they have been added inside the two phase boundaries. In either case, these bogus points are used only as interpolation aids to get from the single phase region right up to the two phase boundary.

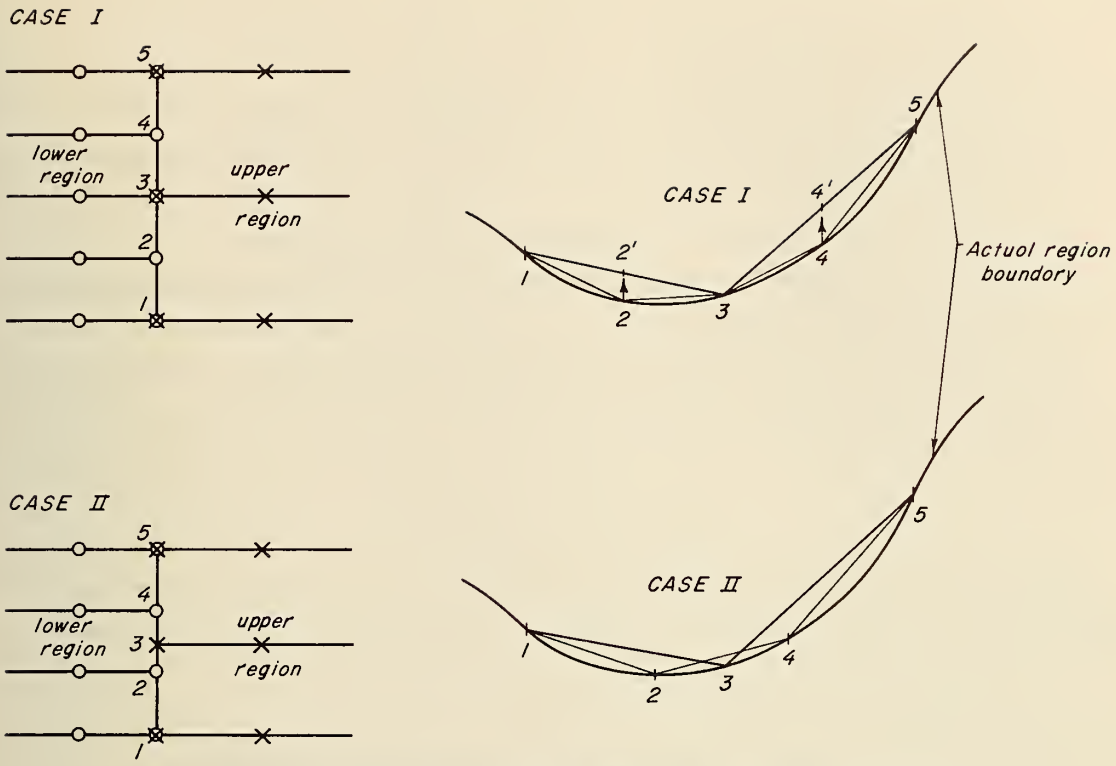
5.2 Speed

The programs gain their operational speed from performing two dimensional linear interpolation in a fixed array of data. Actual speed of computation depends, of course, on the particular installation. At our installation, a CDC 3800, returns run from 30,000 to 60,000 per minute. The data used for interpolation have been placed into compact DATA statements to provide rapid access. Access to any given region is just as fast as to any other region because of the way searching is arranged. The first branching divides the number of regions in half, the second in half again, and so on. Speed is reduced by about a factor of 2 if lookup of the phase boundaries is required for the point under consideration. The programs return a single answer with two variables (three for PHTEMP) going through the transfer vector.

5.3 Continuous Functions

In the approach taken here, continuous functions cannot be obtained because the increments of the entry variables change when crossing region boundaries. The problem is illustrated by two simple examples shown in figure 7. In case I, points 1, 2, 3, 4, and 5 lie on the boundary of the lower region, while points 1, 3, and 5 are points on the boundary of the adjacent upper region. Linear interpolation along the boundary for each region is shown by the straight lines. If points 2 and 4 are adjusted to 2' and 4', interpolation in both regions will be the same and jumps in the value of the property returned will not occur across this boundary. In case II, points 1, 2, 4, and 5 are in the lower region while 1, 3, and 5 lie in the adjacent upper region. The values of 2 and 4 cannot be adjusted to avoid a jump in the property interpolated*. An actual example where boundaries cannot be made to match can be seen in the transition from 30 psia, Region D, to 30 psia, Region C, of figure 6.

* We cannot adjust the value of point 3 as the interpolation error at 3 would be larger than the desired 1%.



If the points on the boundary are common to both regions, then the boundaries con be mode continuous.

Figure 7. Matching of Values at Boundaries

5.4 Modifications, Future Developments

Changes are a way of life with computer programs. Improvements will be dictated by the user — they may arise from better source data. One possible modification is described below.

Return of Values on the Two Phase Boundary - In many applications involving the PH (EH) programs, some of the returns are from the two phase region. In this case, the property values on the respective boundaries are required. Since the programs calculate the values at the boundaries for the regular return, a slight change in program structure will yield the desired answers. The changes are illustrated by the following example for entropy:

	FUNCTION PHENTR (PRES, ENTH) change to
	FUNCTION PHENTR (PRESS, ENTH, SGG, SLL)
and add at 25 + 2	SGG = SGAS
	SLL = SLIQ

In other words, the new logic is similar to that used in PHTEMP(P, H, Q) and is accomplished at the expense of having two additional variables pass through the transfer vector.

Future Possibilities - It is interesting to speculate on improvements that might be accomplished in the future based on what we have learned about the linear interpolation scheme. An advanced scheme of interpolation would save storage, improve accuracy, and allow a large combination of variables. It would be based on the following elements:

1. The development of a single program to include
   a) an interpolation package
   b) a data array of fixed size, about 350 points per property.
2. The use of higher order or, perhaps spline interpolation in the interpolation package.
3. The use of the distribution in grid entries obtained during the present error analysis (see for example tables 8 and 9) to create an optimum point distribution for the new array of data.
4. A separate program which would call the generating functions (see Section 6.8) and create the array of data desired.

6. ESTIMATION OF ERRORS

Terms such as accuracy, precision, uncertainty, and error are used in scientific and engineering papers with many shades of meaning. To avoid ambiguity, the terms used in this report are defined as follows:

First, we define error as the quantitative difference which exists between the true value and the value which is measured, calculated, or otherwise determined.

Second, uncertainty is defined as an estimate of the error that may exist between reported and true values. Since usually we do not know the true value, the estimate is by nature a variable quantity. The estimate of error or uncertainty will vary according to the information available and the manner in which the estimate is obtained.

Statistical methods normally are used to arrive at estimates of error or uncertainties. However, statistical methods are valid only for random processes, and therefore uncertainties based on statistical methods are estimates based on the presence of random errors only. In contrast to statistics, the nature of thermophysical data is such that systematic errors usually are present, i.e., errors which are not random. Not only are systematic errors present but often they are of much greater importance than the truly random errors.

To be realistic in assigning uncertainties we have combined the estimates of both random and systematic errors, except where the uncertainties are labeled "statistical uncertainties" in which case only random errors are given. To minimize the risk of a true value being outside of the interval specified by our assigned uncertainty, the assignment of uncertainties is large enough to give a 99% chance of including the correct value, i.e., a 3σ level. The σ is used here in the conventional sense of standard deviation.

Differentiation is made between uncertainties in the data of the sources chosen and interpolation error, i.e., the difference between the values returned by linear interpolation and the source chosen. Maximum interpolation errors and estimated source errors for each program are displayed graphically in Appendix C in three ranges of temperature: 25 to 180°R, 180 to 1200°R, and 1200 to 6000°R. The ranges of enthalpy for the PH and EH type

programs correspond closely to the temperature ranges just mentioned. All plots are given in percentages except for the low temperature range of enthalpy, i.e., 25 to 180°R for program PTENTH (ETENTH). The enthalpy in this range of temperature can assume both negative and positive values (see also fig. 4); therefore, the interpolation and source errors for this range only are plotted in BTU/lb. The symbol ---- in the plots signifies that the PVT surface for these temperatures is extrapolated.

Estimated source errors are discussed in some detail in Section 7. The estimated source errors are established by the authors of the source data, by comparison with experimental values, by noting the spread of values if several experimental sets exist, or by intercomparison of several methods of calculation if no experimental values are available. For the high temperature extrapolations we combine the estimates of Woolley (1972) for the ideal gas, our estimates of errors for the real gas contribution, and an arbitrary estimate for errors due to dissociation.

Interpolation errors are apt to intrude on most applications. These errors are nominally 3% except for the critical region and the region of dissociation where departures from best values become large. The critical parameters are P_c = 187.506 psia, T_c = 59.357°R, and H_c = 16.455 BTU/lb for p-hydrogen or H_c = 31.225 BTU/lb for e-hydrogen. The onset of dissociation varies from 2700°R at the lower pressures to 5400°R at the highest pressures. The interpolation errors plotted are the envelope of maximum error in interpolation at the temperature or enthalpy in question. They are established from an intercomparison of values returned by the interpolation routine and the generating functions. The comparisons are made at a large number of temperatures and a large number of pressures for each temperature, selecting the largest deviation in a given range of temperature or enthalpy for the plot. The distribution of temperatures and pressures at which the intercomparisons were made are established from the grids of the properties by collecting values at 1/2 of each normal grid increment and eliminating duplicates. As an example, each program was checked in the low temperature range at every combination of P and T given in tables 6 and 7.

Table 6. Low Temperature Error Grid, Pressures, psia

1.022	36.740	146.960	225.000	308.616	418.836	734.800	1763.520
1.500	44.088	154.308	230.000	315.964	426.184	771.540	2000.000
2.000	51.436	161.656	235.000	323.312	433.532	808.280	2500.000
3.000	58.784	169.004	240.000	330.660	440.880	845.020	2645.280
4.000	66.132	176.352	245.000	338.008	459.250	881.760	3233.120
5.000	73.480	180.026	250.000	345.356	477.620	918.500	3820.960
6.000	80.828	183.700	255.000	352.704	495.990	955.240	4408.800
7.000	88.176	187.370	260.000	360.052	514.360	991.980	5000.000
8.000	95.524	190.000	265.000	367.400	532.730	1028.720	
9.000	102.872	195.000	270.000	374.748	551.100	1065.460	
10.000	110.220	200.000	275.000	382.096	569.470	1102.200	
11.022	117.568	205.000	280.000	389.444	587.840	1138.940	
14.696	124.916	210.000	285.000	396.792	624.580	1175.680	
22.044	132.264	215.000	293.920	404.140	661.320	1322.640	
29.392	139.612	220.000	301.268	411.488	698.060	1469.600	

Table 7. Low Temperature Error Grid, Temperatures, °R

25.000	40.700	55.100	62.500	70.500	90.000
26.000	41.600	56.000	63.000	70.571	93.600
27.500	42.500	56.500	63.500	71.500	97.200
29.000	43.400	57.000	64.000	72.000	100.800
30.500	44.300	57.500	64.500	72.900	104.400
30.800	45.200	58.000	65.000	73.800	108.000
31.700	46.100	58.500	65.500	74.700	112.500
32.600	47.000	59.000	66.000	75.600	117.000
33.500	47.900	59.400	66.500	76.500	121.500
34.400	48.800	59.625	67.000	77.400	126.000
35.300	49.700	59.850	67.500	78.300	135.000
36.200	50.600	60.000	68.000	79.200	144.000
37.100	51.500	60.500	68.500	80.000	153.000
38.000	52.400	61.000	69.000	82.500	162.000
38.900	53.300	61.500	69.500	85.000	171.000
39.800	54.200	62.000	70.000	86.400	180.000

For the most part, users will be concerned only with the interpolation error because in most cases the uncertainties in the source data are negligible in comparison to the interpolation error. Interpolation errors can be established quickly by visual estimate from the appropriate plot. If the generating functions (Section 7.8) are used, only the estimated source errors need to be considered.

7. SOURCES OF PROPERTIES DATA

To calculate values of the various properties, we require the thermodynamic functions of the ideal gas, a description of the PVT surface, a model to calculate the effects of dissociation, and descriptions of the behavior of viscosity and thermal conductivity. The major references used are shown in figure 8 and are discussed in more detail below.

7.1 Ideal Gas Properties

As sources for the thermodynamic properties of the ideal gas we have considered Woolley, et al. (1948), NBS Circular 564 (Hilsenrath, et al., 1955) and NBS Monograph 20 (Haar, et al., 1961). The first two sources are virtually identical; they differ only because Woolley includes the effect of nuclear spin in his tabulations for entropy (i.e., 2 R ln 2). Normally the nuclear spin contributions are omitted; both Circular 564 and Monograph 20 are tabulated according to this convention. Slight differences in thermal properties between Circular 564 and Monograph 20 exist. They can be detected at temperatures above 1260°R (700 K); they increase as the temperature increases. For C_p° the difference is about 1% at 5000°R (2800 K) while for $H^\circ - E_o^\circ$ the difference is 44.6 BTU/lb (209 J/mol). A more recent calculation (Baehr, et al., 1966) is very close to the earlier values of Woolley, et al. (1948). We have, therefore, elected to use the properties given by Woolley for parahydrogen up to 3600°R (2000 K). At this temperature Woolley discontinues the entries for parahydrogen but continues the entries for normal hydrogen on up to 9000°R (5000 K). At 3600°R, differences between the ideal gas properties of para and normal hydrogen are

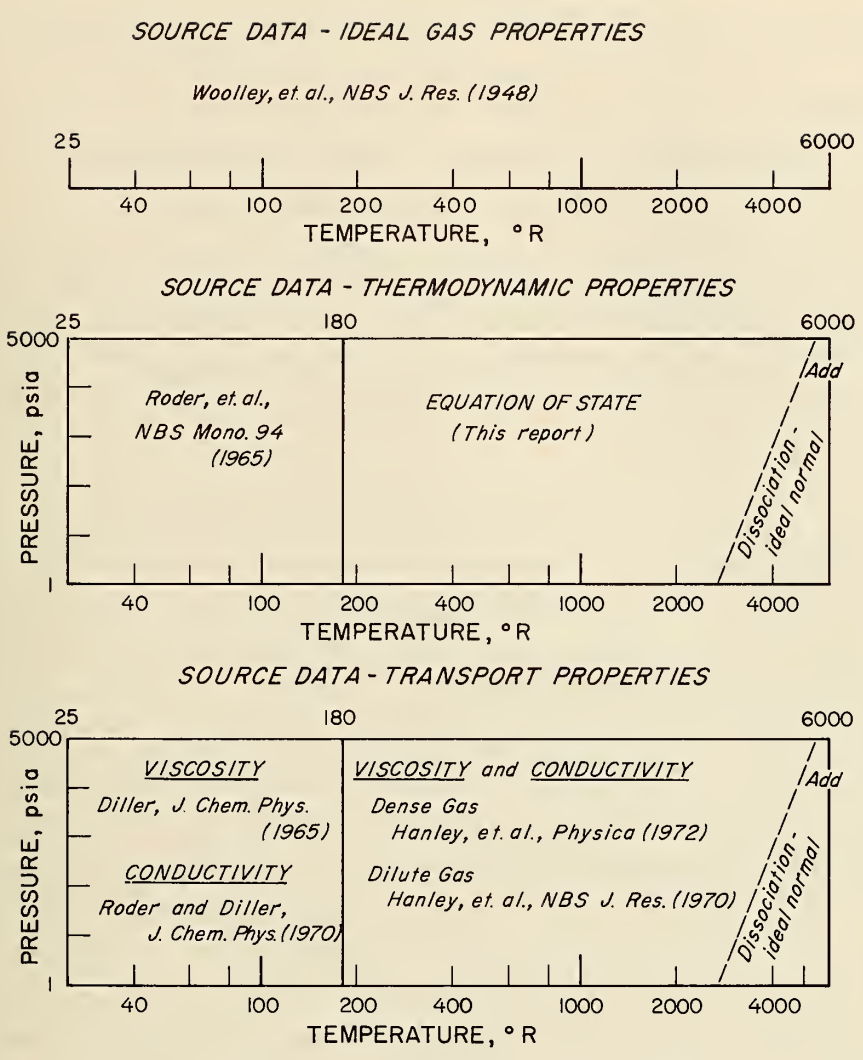


Figure 8. Primary Sources of Data

negligible except in the case of entropy where the difference is 1.367 BTU/lb-°R. The difference represents the change in order or configuration between para and normal hydrogen. Above 3600°R the next temperature entry in Woolley's tables is 5400°R (3000 K). For temperatures of 5400°R and above, the ideal gas properties of normal hydrogen were used for both para and equilibrium hydrogen since at these temperatures, equilibrium and normal hydrogen properties are identical.

While the entries for equilibrium hydrogen are perfectly proper, for parahydrogen this means that we assume complete conversion to normal hydrogen between 3600° and 5400°R. A higher order interpolation insures that the transition in entropy for the parahydrogen decks is smooth and continuous. It becomes necessary to switch to the normal mixture at some point because the dissociation calculations (Section 7.5) are based on normal hydrogen. It should be noted that the present programs are oriented toward a partic-

ular process which begins in the cryogenic range and ends at high temperatures. It would not be proper to use the parahydrogen programs on a process which begins in the cryogenic range, goes to high temperatures, and then is returned to the cryogenic range, because most likely the hydrogen would not be returned to the para form on cooling.

7.2 The PVT Surface at Low Temperatures

Values used in the data arrays for temperatures up to 180°R (100 K), for all properties except viscosity and thermal conductivity, were obtained from NBS Monograph 94 (Roder, et al., 1965). The uncertainties in source data were taken from this reference and are displayed as estimated source errors in Appendix C for temperatures from 25 to 180°R (-130 to 425 BTU/lb or 675 BTU/lb).

7.3 The PVT Surface at Intermediate Temperatures

Initially, we considered using the exponential equation of state (Woolley, et al., 1948). The difficulties with this equation are that it cannot be integrated in closed form to find the derived properties, it has a limited range, 500 to 1200°R (273 to 673 K), and the uncertainties in the derived properties cannot be calculated easily.

As an alternative we considered a modified Benedict-Webb-Rubin (1940) equation of state. The advantages of an equation of state of this type are that the functions are internally consistent and continuous. In addition, statistical uncertainties for both PVT and derived properties can be obtained from the least squares estimation of the parameters. Various modifications of this equation have been used to correlate the PVT surfaces of nitrogen (Strobridge, 1962), helium (Mann, 1962), carbon monoxide (Hust and Stewart, 1963), neon (McCarty and Stewart, 1965), argon (Gosman, et al., 1969), and oxygen (Stewart, 1966). The equation has also been used earlier on parahydrogen (Roder and Goodwin, 1961) and on an intercomparison of normal and parahydrogen (Hust and Stewart, 1965).

The PVT data used to estimate the parameters of the equation of state included the parahydrogen isotherms from 50 to 100 K (Goodwin, et al., 1963), all of the PVT sources surveyed by Woolley, et al. (1948), and the isotherms of normal hydrogen reported by Michels, et al. (1959). The equation is as follows:

$$
\begin{aligned}
P = {} & \rho RT + \rho^2 (N_1 T + N_2 + N_3/T + N_4/T^2 + N_5/T^4) \\
& + \rho^3 (N_6 T^2 + N_7 T + N_8) + \rho^3 (N_9/T^2 + N_{10}/T_3 + N_{11}/T^4)\, e^{N_{17}\rho^2} \\
& + N_{12}\, \rho^4\, T + \rho^5 (N_{13}/T^2 + N_{14}/T^3 + N_{15}/T^4)\, e^{N_{17}\rho^2} \\
& + N_{16}\, \rho^6 \, .
\end{aligned}
$$

The coefficients are given in table 6 for P in atm, ρ in mol/ℓ, T in K, and R = 0.0820535 ℓ-atm/mol-K.

Table 8. Coefficients of the Equation of State

N_1	$1.1389049685 \times 10^{-3}$	N_{10}	$-3.7301781349 \times 10^{3}$
N_2	$1.8072093722 \times 10^{-1}$	N_{11}	$1.0789473341 \times 10^{5}$
N_3	$-5.3097164419 \times 10^{1}$	N_{12}	$8.0475741674 \times 10^{-7}$
N_4	$2.3690885344 \times 10^{3}$	N_{13}	$1.6581404268 \times 10^{-1}$
N_5	$-1.6306395805 \times 10^{6}$	N_{14}	$-1.8158230417 \times 10^{1}$
N_6	$3.2453595439 \times 10^{-8}$	N_{15}	$4.9623738040 \times 10^{2}$
N_7	$-6.3275640592 \times 10^{-7}$	N_{16}	$5.262288563 \times 10^{-8}$
N_8	$2.3115255859 \times 10^{-3}$	N_{17}	$-.0018$
N_9	$3.4448764044 \times 10^{1}$		

The equation is valid over the range of the data and was used from 180 to 1200°R. Unfortunately the major sources disagree considerably at the common boundary of 180°R (see, for example, Roder, et al., 1965) and the resulting jumps in the properties are seen clearly in the plots of maximum interpolation error of Appendix C. A comparison of calculated statistical uncertainties for PVT and derived properties with the results of Roder, et al. (1965), Woolley, et al. (1948), and Michels, et al. (1959, 1963) is shown in figure 9 where the base line is the present equation of state. The comparison confirms that the values obtained for σ are realistic for both PVT and derived properties. For temperatures from 180 to 1200°R and enthalpies from 425 to 5000 BTU/lb the calculated uncertainties are shown as source errors in the plots of Appendix C.

7.4. The PVT Extrapolation

The highest temperature for experimental PVT values is 673 K. This means the PVT surface from 1200 to 6000°R has to be extrapolated. At these temperatures the gas is nearly ideal, that is, only the lower virial coefficients contribute to the equation of state. As a first step one has to know how the virial coefficient B varies as a function of temperature, and then how much the B(T) contributes to the equation of state. The B for hydrogen attains its maximum value near 300 K. Based on what is known for helium (Keesom, 1942), the B should decrease at higher temperatures. Woolley, et al. (1948) based the temperature dependence of B on this behavior and predicted the actual temperature dependence from the Lennard-Jones (12-6) intermolecular potential function. Considering an extreme value, that is, 5000 psia (340 atm) and 5000°R (2800 K), the exponential equation of state (Woolley, et al., 1948) yields a density of 0.337 lb/ft^3 (60 Amagat). In the range in which this equation is valid, 360 to 1200°R (200 to 673 K), the virial B contributes less than 0.2% to the density for densities less than 60 Amagat. The contribution at higher temperatures can only be less; therefore, an extrapolation based on an equation of state which includes only the second virial coefficient is acceptable in terms of error.

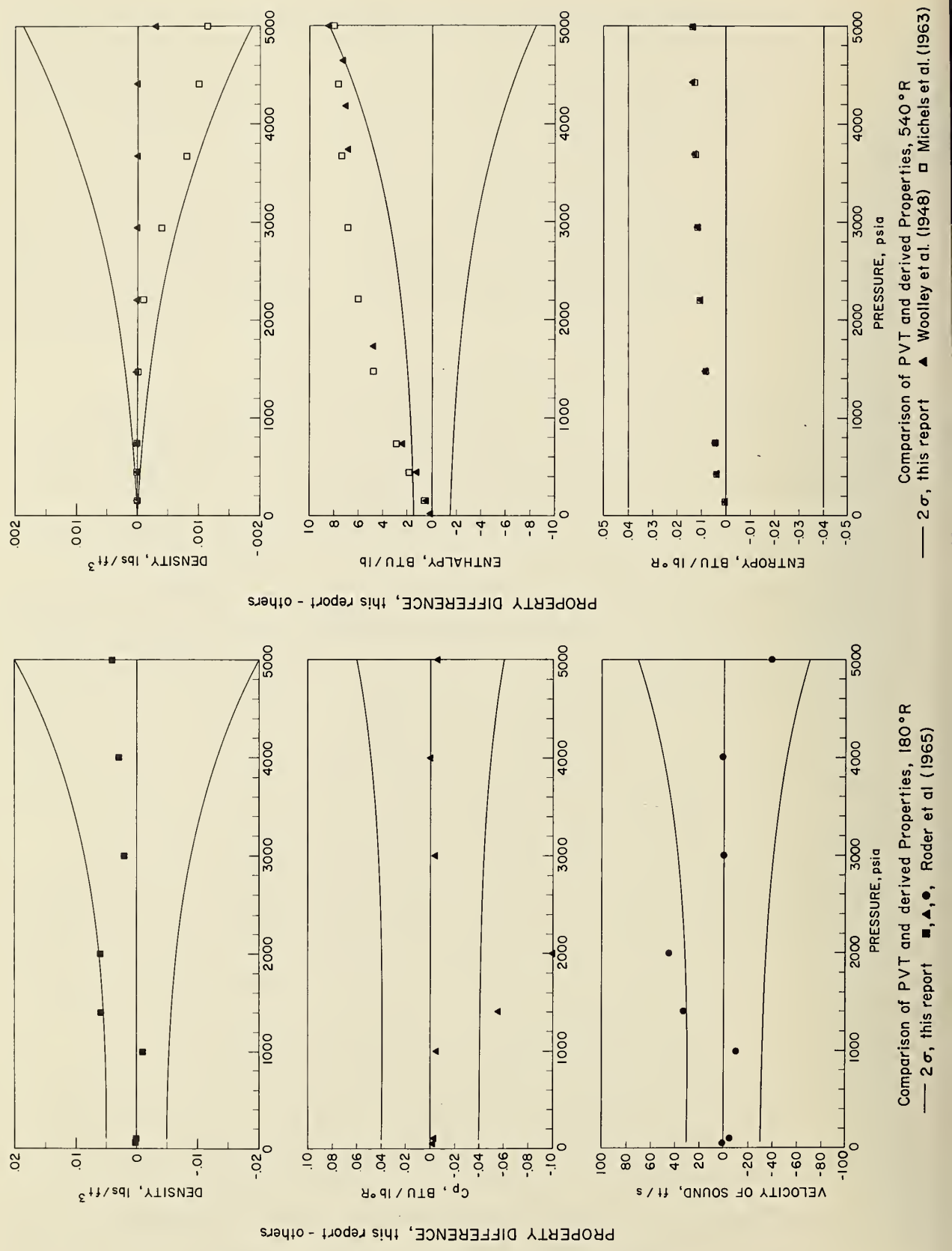


Figure 9. Comparison of PVT and Derived Properties

Next we estimate the apparent error in the extrapolation of B(T). For 5400°R (3000 K), extrapolation of the Woolley, et al. (1948) calculation yields 14.55 cm^3/mol for B while Fisher (1965) obtained 12.93 cm^3/mol. Fisher's calculation is based on a "softer" intermolecular potential function (i.e., a 9-6) and he determines the molecular parameters from the high temperature viscosity measurements of Guevara and Wageman (1965). If hydrogen at this temperature behaved as an ideal gas, B would be zero; thus a reasonable estimate for the error in B at 5400°R (3000 K0 is ± 3 cm^3/mol.

For the data arrays we extrapolate the equation of state (Section 7.3). Since the equation was fitted over the entire range of data up to 1200°R (673 K), only one additional constraint (Hust and McCarty, 1967) was required to yield acceptable results. The equation was constrained to yield 14.55 cm^3/mol for B(T) at 5400°R (3000 K). Z is approximately 1.04 at 5400°R and 5000 psia, thus the real gas contribution is 0.04. Woolley (1972) estimates that the real gas contribution is uncertain by no more than 10%; therefore, we estimate the uncertainty in density to be 0.8% for these conditions. Uncertainties in the derived properties are estimated in a similar fashion assuming an uncertainty of no more than 10% for the real gas contribution, i.e., the contribution from non ideality. This estimate assumes virtually no error in the ideal gas thermodynamic functions and virtually no error in the dissociation calculation (Woolley, 1972).

7.5 Dissociation

At the highest temperatures considered in this report, molecular hydrogen will dissociate into atoms. Dissociation is both temperature and pressure dependent. To include the effects of dissociation several assumptions are required.

1. Both ortho-para and dissociation equilibria occur instantaneously.
2. Dissociation occurs according to the equilibrium constant for normal hydrogen.
3. The property values can be obtained by adding the dissociation effects calculated for the ideal gas to the extrapolated properties of the real gas.

Fortunately, the rate of ortho-para conversion is quite high (Farkas, 1935). It is proportional to the amount of atomic hydrogen. The dissociation rates are apparently also quite high (Sutton, 1962). Assumption 1 is approximated, and thus assumption 2 is plausible. Hence, it is not necessary to consider the "hypothetical" dissociation constant for para-hydrogen (Farkas, 1935) even though the hydrogen is initially para.

The dissociation constant is calculated from the ideal gas free energies. As indicated previously, the inclusion or exclusion of nuclear spin will affect entropy as well as free energy. The tables of atomic hydrogen from NBS Circular 564 (Hilsenrath, et al., 1955) and the tables for molecular normal hydrogen from NBS Monograph 20 (Haar, et al., 1961) were used. These tables according to convention.do not include the effect of nuclear spin. Equation 3.5 for free energy given by Woolley, et al., (1948) is equivalent to the table for

atomic hydrogen in Circular 564 but includes nuclear spin. The equations used to calculate dissociation effects of the ideal gas are those given by Woolley (1955).

The effects of dissociation on a variable such as enthalpy are large. They are illustrated for a limited range of temperatures and a pressure of 50 psia in figure 10 (see also figures 11 and 12). Enthalpy differences are plotted vertically and the dissociation contribution ranges from 2% to 10% of the total enthalpy. Also shown is the linear interpolation provided by program PTENTH(P, T).

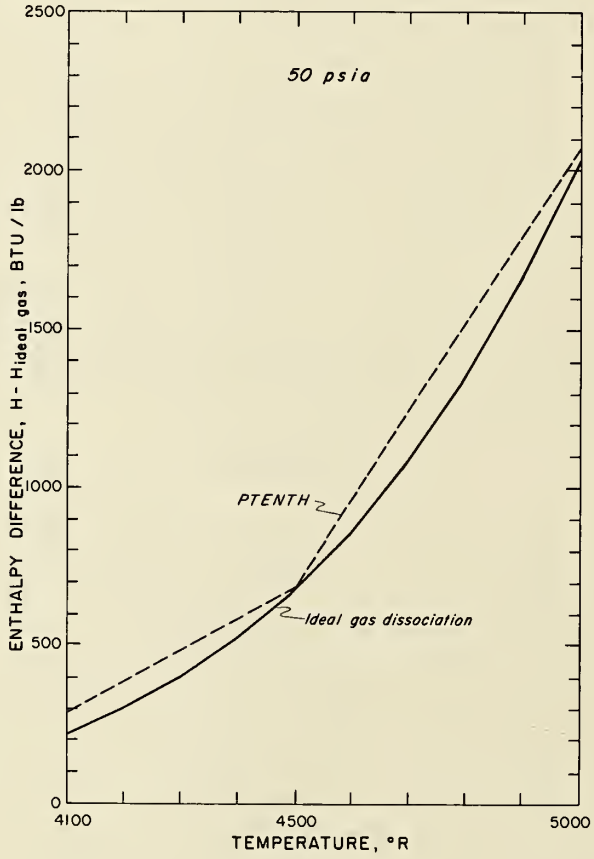


Figure 10. The Effect of Dissociation on Enthalpy

7.6 Viscosity

The primary experimental sources to consider are Diller (1965) for low temperatures, and Trautz and Zink (1930) and Guevara and Wageman (1965) for high temperatures. Differences in the latter two sources have now been resolved in favor of the more recent data (Guevara, et al., 1971) allowing a critical evaluation of viscosity and thermal conductivity coefficients for the dilute gas (Hanley, et al., 1970). The coefficients are represented by standard kinetic theory expressions and are based on a model intermolecular potential function.

For temperatures up to 180 °R for both dilute and dense gas, the analytical representation of the results by Diller (1965) was chosen as source data. At intermediate and high temperatures including dissociation, the evaluation of Hanley, et al., (1970) was chosen for the dilute gas while the dense gas contributions are calculated from the theory of Enskog (Hanley, et al., 1972). The dense gas contribution vanishes at 1000 K, that is, above 1000 K the viscosity is independent of pressure or density but depends only on temperature. At yet higher temperatures with the onset of dissociation the viscosity becomes again pressure dependent as shown in figure 11 taken from Hanley, et al. (1970). We note that at the extreme temperature of 6000 °R (3333. K) the pressure dependence is still relatively small.

The uncertainty in viscosity is estimated as follows: About 2% for temperature up to 1080°R, and then gradually increasing to about 5% at 6000°R.

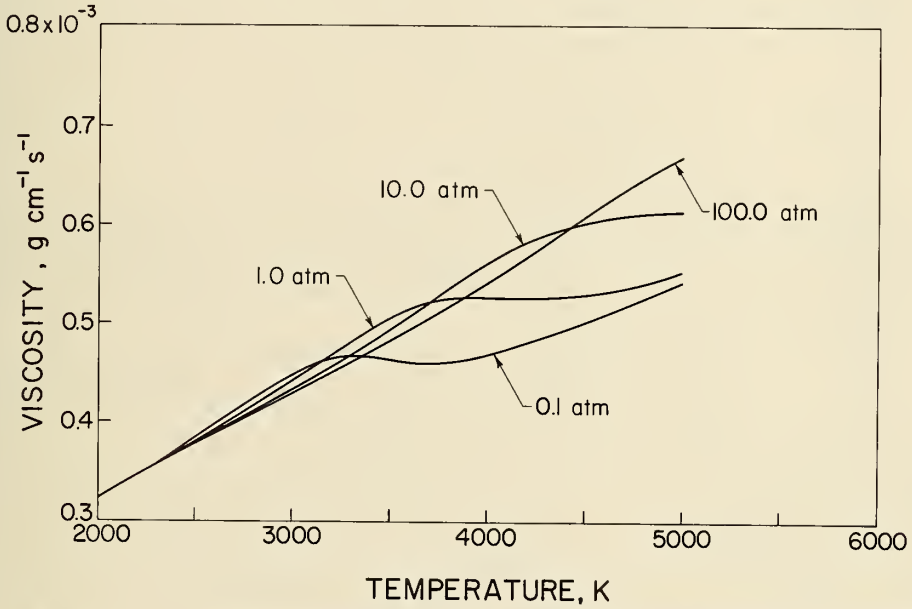


Figure 11. The Viscosity of Dissociating Hydrogen at Various Pressures

7.7 Thermal Conductivity

For temperatures up to 180 °R, the analytical representation of the experimental results by Roder and Diller (1970) was chosen as source data for para hydrogen for dilute gas, dense gas, and liquid states. Dilute gas values for normal and equilibrium hydrogen differ considerably from the para values and are calculated from the change in the ideal gas heat capacity, C^{o}_{v}. The density dependence for n- and e- hydrogen is taken to be the same as para.

At higher temperatures we again select the critical evaluation by Hanley, et al., (1970) for the dilute gas and the Enskog theory calculation (Hanley, et al., 1972) for the density

(pressure) dependence. At 180 °R, taking the difference between normal and para hydrogen into account, the agreement between the experimental results by Roder and Diller (1970, para), Golubev and Kalsina (1964, normal), and the calculation by Hanley, et al. (1972) is as good as 1% for pressures up to 1500 psia and no worse than 4% at pressures of 5000 psia. Similar to viscosity, the dense gas contribution for thermal conductivity vanishes at a particular temperature (1000 K). At higher temperatures the potential function calculations agree reasonably well with the data of Blais and Mann (1960). At yet higher temperatures, the effects of dissociation on thermal conductivity become marked, see figure 12. The

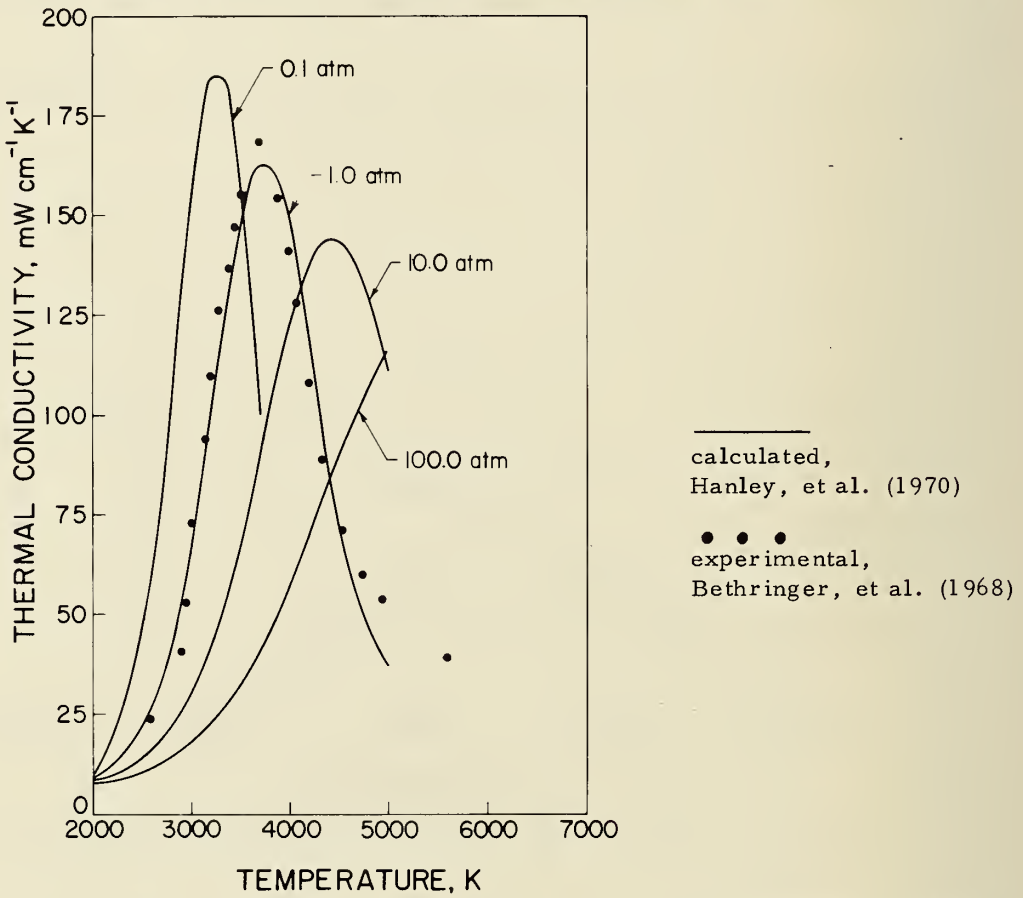


Figure 12. The Thermal Conductivity of Dissociating Hydrogen at Various Pressures

calculations become sensitive to the exact model or intermolecular potential chosen, see for example, figure 9 in the paper of Grier (1962). Two sets of data exist for the thermal conductivity in the region of dissociation. The theoretical estimates selected (Hanley, et al., 1970) are in excellent agreement with the shock wave experiment of Bethringer, et al. (1968). The data of Israel, et al., (1966) differ markedly from the former experiment and from any potential function model that could be chosen. A possible explanation is that the sintered material used in this experiment enhanced dissociation. It almost appears as if the dissociation temperatures are lowered approximately 250 K by an apparatus effect.

The uncertainty in thermal conductivity is estimated to be 3% for temperatures between 25 and 180 °R, increasing to 6% near 370 °R; about 6% for temperatures up to 3300 °R and then increasing gradually to 10% at 6000 °R. Note, however, that thermal conductivity is expected to be infinite at the critical point.

7.8 Generating Functions

The programs described in the bulk of this report are designed to perform linear interpolations in arrays of data of the various properties. Each property value used in one of the arrays has to be computed in a separate operation and entered into the array. We have used several major computer programs to accomplish this task; to distinguish them from the linear interpolation programs, we call the major programs generating functions. An example of one such generating function is the program VALUES or the subroutine THERMO which was developed in the preparation of the tables presented in NBS Monograph 94 (Roder, et al., 1965). Since a number of users have requested copies of the generating functions, we list them below.

Table 9. Generating Functions *

Temperature Range	Program Name	Input	Output
25 - 180 °R	program VALUES or subroutine THERMO	PT	ρ, S, H, U, C_p, C_v, $\left(\frac{\partial P}{\partial T}\right)_\rho$, $\left(\frac{\partial P}{\partial \rho}\right)_T$, ω
	function CONC	T, ρ, C_p	k
	function VISCOS	ρ, T	η
	program STAT	T	o - p composition and ideal gas functions, thermodynamic
180°R and up	program GO	P, T	ρ, S, H, U, C_p, C_v, γ, ω, k, η

* A recent revision incorporates the low temperature decks except STAT, an improved equation of state for high temperatures, and a new extrapolation to 10,000 psia into a single program HYPROP, see McCarty and Weber (1972).

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APPENDIX A

Tables of Values for Selected Isobars

PARAHYDROGEN (OUTPUT FROM PT PROGRAMS)

PRESSURE PSIA	TEMPERATURE DEG. R	ENTHALPY BTU/LB	DENSITY LB/CU.FT	ENTROPY BTU/LB-R	CONDUCTIVITY BTU/H -FT-R	VISCOSITY LB-H /SQ.FT *10**10	VEL.SOUND FT/S	C-P BTU/LB-R	C-V BTU/LB-R	CP/CV RATIO	L FACTOR
1	25	60.77	0.0075644	8.992	0.007202	0.0449	1011	2.531	1.483	1.707	2617
1	30	73.22	0.0063539	9.430	0.007996	0.0532	1104	2.496	1.481	1.686	2597
1	35	85.67	0.0054165	9.806	0.008791	0.0615	1196	2.470	1.480	1.669	2577
1	40	98.03	0.0047232	10.124	0.009972	0.0698	1282	2.456	1.480	1.660	2626
1	45	110.42	0.0041890	10.442	0.011250	0.0781	1362	2.451	1.479	1.657	2693
1	50	122.83	0.0037698	10.703	0.012487	0.0864	1436	2.451	1.479	1.658	2754
1	55	135.20	0.0034268	10.931	0.013697	0.0946	1504	2.465	1.479	1.666	2810
1	60	147.49	0.0031400	11.159	0.014875	0.1020	1570	2.469	1.479	1.670	2862
1	65	159.88	0.0028977	11.351	0.016005	0.1095	1633	2.469	1.479	1.670	2907
1	70	172.25	0.0026892	11.532	0.017134	0.1169	1695	2.469	1.480	1.668	2952
1	75	184.62	0.0025123	11.712	0.018256	0.1239	1754	2.470	1.482	1.666	2996
1	80	196.90	0.0023508	11.866	0.019381	0.1307	1812	2.473	1.485	1.665	3040
1	85	209.27	0.0022136	12.017	0.020510	0.1375	1865	2.478	1.490	1.664	3085
1	90	222.04	0.0020914	12.170	0.021628	0.1443	1918	2.485	1.495	1.662	3130
1	95	234.47	0.0019799	12.296	0.022747	0.1505	1967	2.496	1.507	1.656	3175
1	100	246.90	0.0018805	12.421	0.023882	0.1570	2016	2.509	1.520	1.651	3225
1	110	271.97	0.0017185	12.663	0.026288	0.1691	2104	2.547	1.559	1.633	3338
1	120	297.87	0.0015733	12.875	0.028695	0.1809	2183	2.603	1.615	1.611	3451
1	130	324.29	0.0014530	13.087	0.031184	0.1921	2247	2.679	1.693	1.582	3582
1	140	351.46	0.0013465	13.299	0.033672	0.2031	2311	2.770	1.785	1.552	3713
1	150	379.70	0.0012549	13.495	0.036726	0.2138	2375	2.862	1.876	1.525	3887
1	160	408.66	0.0011773	13.681	0.039780	0.2242	2428	2.975	1.989	1.496	4062
1	170	437.26	0.0011071	13.867	0.042965	0.2337	2480	3.088	2.102	1.469	4242
1	180	465.69	0.0010470	14.060	0.046150	0.2354	2532	3.200	2.215	1.445	4420
1	190	502.37	0.0009918	14.223	0.049327	0.2448	2582	3.307	2.321	1.425	4578
1	200	539.06	0.0009367	14.385	0.052504	0.2541	2632	3.413	2.427	1.406	4735
1	250	722.51	0.0007350	15.198	0.068390	0.3007	2886	3.799	2.803	1.351	5520
1	300	910.03	0.0006077	15.885	0.079546	0.3427	3144	3.926	2.940	1.335	5794
1	350	1103.65	0.0005219	16.510	0.088790	0.3829	3401	3.838	2.853	1.346	5901
1	400	1295.31	0.0004573	17.010	0.095114	0.4202	3657	3.750	2.765	1.356	5954
1	450	1479.37	0.0004069	17.450	0.101040	0.4559	3892	3.669	2.684	1.367	5816
1	500	1663.02	0.0003747	17.850	0.106702	0.4906	4119	3.587	2.602	1.379	5784
1	550	1837.42	0.0003436	18.123	0.112652	0.5201	4333	3.547	2.562	1.384	5823
1	600	2011.82	0.0003125	18.397	0.118601	0.5495	4532	3.507	2.522	1.391	5861
1	700	2360.62	0.0002679	18.943	0.130501	0.6084	4905	3.478	2.493	1.395	5939
1	800	2709.42	0.0002345	19.490	0.142401	0.6674	5248	3.469	2.485	1.396	6016
1	900	3058.22	0.0002085	19.860	0.154300	0.7263	5528	3.475	2.490	1.395	6094
1	1000	3407.02	0.0001877	20.230	0.166200	0.7852	5808	3.481	2.496	1.395	6171
1	1250	4279.02	0.0001505	21.020	0.194000	0.9091	6509	3.495	2.510	1.392	6358
1	1500	5151.02	0.0001252	21.667	0.221800	1.0330	7146	3.524	2.539	1.388	6545
1	1750	6043.02	0.0001076	22.218	0.249750	1.1445	7687	3.574	2.589	1.380	6778
1	2000	6935.02	0.0000942	22.710	0.277700	1.2560	8228	3.624	2.639	1.373	7011
1	2250	7859.02	0.0000837	23.120	0.306950	1.3595	8675	3.694	2.709	1.364	7303
1	2500	8783.02	0.0000752	23.530	0.336200	1.4630	9123	3.764	2.779	1.354	7594
1	2750	9751.52	0.0000689	23.885	0.373097	1.5600	9520	3.865	2.878	1.343	7966
1	3000	10720.00	0.0000627	24.240	0.410000	1.6570	9884	4.010	3.018	1.329	8337
1	3250	11757.50	0.0000582	24.575	0.479300	1.7500	10222	4.306	3.298	1.306	9162
1	3500	12900.00	0.0000536	24.910	0.605400	1.8430	10455	4.884	3.834	1.274	10829
1	3750	14237.50	0.0000501	25.310	0.835975	1.9350	10687	5.949	4.813	1.236	13330
1	4000	15900.00	0.0000465	25.710	1.239000	2.0270	10914	7.785	6.478	1.202	19305
1	4250	18267.50	0.0000432	26.365	1.960500	2.1250	11139	10.995	9.325	1.179	28631
1	4500	21605.00	0.0000399	27.020	3.059000	2.2230	11421	15.835	13.515	1.172	42466
1	4750	26337.50	0.0000364	28.220	4.592500	2.3320	11787	22.670	19.232	1.179	61402
1	5000	32960.00	0.0000329	29.420	6.528000	2.4410	12154	31.640	26.410	1.198	85130
1	5250	42359.99	0.0000292	31.440	8.629000	2.5290	12601	42.375	34.507	1.228	111276
1	5500	54329.99	0.0000256	33.460	10.313000	2.6170	13048	52.440	41.690	1.258	134155
1	5750	68294.99	0.0000226	35.965	10.957500	2.6320	13429	58.380	45.670	1.278	145669
1	6000	82919.98	0.0000195	38.470	10.220000	2.6470	13766	57.080	44.470	1.284	139178

PARAHYDROGEN (OUTPUT FROM PT PROGRAMS)

PRESSURE PSIA	TEMPERATURE DEG. R	ENTHALPY BTU/LB	DENSITY LB/CU.FT	ENTROPY BTU/LB-R	CONDUCTIVITY BTU/H -FT-R	VISCOSITY LB-H /SQ.FT *10**10	VEL.SOUND FT/S	C-P BTU/LB-R	C-V BTU/LB-R	CP/CV RATIO	L FACTOR
15	25	-132.60	4.8165105	1.192	0.043212	1.4436	4174	1.563	1.129	1.384	1537
15	30	-123.37	4.6443963	1.503	0.053047	1.0838	3898	1.845	1.242	1.485	2123
15	35	-113.19	4.4722821	1.813	0.056319	0.8333	3657	2.206	1.344	1.641	2625
15	40	90.27	0.0768321	7.375	0.010575	0.0719	1233	2.798	1.532	1.826	2813
15	45	103.72	0.0667821	7.705	0.011732	0.0800	1322	2.730	1.516	1.801	2835
15	50	117.39	0.0590916	7.979	0.012890	0.0880	1404	2.648	1.501	1.764	2864
15	55	130.63	0.0530733	8.221	0.014050	0.0960	1481	2.609	1.495	1.745	2896
15	60	143.56	0.0482165	8.463	0.015188	0.1033	1553	2.578	1.491	1.729	2930
15	65	156.42	0.0443442	8.663	0.016296	0.1106	1620	2.552	1.488	1.715	2966
15	70	169.12	0.0404964	8.849	0.017404	0.1179	1685	2.538	1.488	1.706	3002
15	75	181.80	0.0383351	9.035	0.018513	0.1249	1746	2.528	1.488	1.699	3040
15	80	194.36	0.0357877	9.191	0.019672	0.1316	1806	2.524	1.490	1.694	3087
15	85	206.98	0.0337205	9.343	0.020791	0.1383	1860	2.523	1.494	1.688	3126
15	90	219.78	0.0316321	9.496	0.021887	0.1450	1914	2.522	1.499	1.682	3165
15	95	232.40	0.0299067	9.624	0.022987	0.1512	1964	2.529	1.510	1.674	3206
15	100	245.01	0.0283662	9.752	0.024183	0.1577	2014	2.537	1.523	1.666	3256
15	110	270.43	0.0257886	10.000	0.026546	0.1698	2103	2.570	1.562	1.645	3363
15	120	296.55	0.0236160	10.214	0.028908	0.1815	2185	2.622	1.617	1.621	3470
15	130	323.15	0.0218001	10.427	0.031373	0.1927	2249	2.695	1.695	1.590	3598
15	140	350.47	0.0202015	10.640	0.033838	0.2037	2314	2.784	1.786	1.559	3726
15	150	378.83	0.0188253	10.847	0.036882	0.2143	2378	2.873	1.877	1.531	3899
15	160	407.88	0.0176616	11.050	0.039926	0.2247	2430	2.984	1.990	1.500	4071
15	170	436.66	0.0166080	11.252	0.043103	0.2341	2483	3.096	2.102	1.473	4250
15	180	465.28	0.0157050	11.445	0.046287	0.2361	2535	3.207	2.215	1.448	4427
15	190	502.00	0.0148775	11.608	0.049461	0.2454	2585	3.313	2.321	1.427	4584
15	200	538.72	0.0140500	11.771	0.052634	0.2547	2635	3.419	2.427	1.409	4741
15	250	722.33	0.0110250	12.587	0.068501	0.3012	2889	3.793	2.804	1.353	5524
15	300	909.98	0.0091163	13.273	0.079636	0.3431	3147	3.929	2.941	1.336	5796
15	350	1103.69	0.0078281	13.896	0.088858	0.3832	3404	3.840	2.853	1.346	5902
15	400	1295.43	0.0068594	14.399	0.095166	0.4204	3660	3.751	2.766	1.356	5855
15	450	1479.25	0.0061031	14.838	0.101079	0.4561	3895	3.670	2.684	1.367	5817
15	500	1663.25	0.0056205	15.235	0.106726	0.4907	4122	3.588	2.602	1.379	5785
15	550	1837.66	0.0051540	15.509	0.112673	0.5201	4336	3.548	2.562	1.385	5823
15	600	2012.07	0.0045875	15.783	0.118621	0.5496	4535	3.507	2.522	1.391	5862
15	700	2360.89	0.0040185	16.332	0.130516	0.6084	4907	3.478	2.493	1.395	5939
15	800	2709.71	0.0035175	16.880	0.142410	0.6673	5251	3.469	2.485	1.396	6016
15	900	3058.53	0.0031275	17.250	0.154305	0.7261	5531	3.475	2.490	1.395	6093
15	1000	3407.35	0.0028155	17.620	0.166200	0.7850	5811	3.481	2.496	1.395	6171
15	1250	4279.36	0.0022575	18.410	0.194000	0.9087	6511	3.495	2.510	1.392	6358
15	1500	5151.36	0.0018780	19.058	0.221800	1.0325	7147	3.524	2.539	1.388	6544
15	1750	6043.36	0.0016141	19.612	0.249750	1.1439	7688	3.574	2.589	1.380	6778
15	2000	6935.36	0.0014132	20.095	0.277700	1.2554	8229	3.624	2.639	1.373	7012
15	2250	7859.36	0.0012552	20.476	0.306948	1.3588	8678	3.694	2.709	1.364	7304
15	2500	8783.35	0.0011256	20.857	0.336196	1.4622	9126	3.764	2.779	1.354	7596
15	2750	9751.83	0.0010320	21.239	0.373057	1.5591	9534	3.845	2.860	1.345	7966
15	3000	10720.00	0.0009384	21.620	0.397600	1.6565	9916	3.931	2.944	1.335	8122
15	3250	11703.75	0.0008714	21.931	0.437113	1.7490	10283	4.068	3.076	1.323	8514
15	3500	12740.00	0.0008044	22.243	0.491850	1.8415	10589	4.270	3.267	1.307	9103
15	3750	13840.00	0.0007534	22.554	0.575012	1.9309	10895	4.572	3.548	1.289	10043
15	4000	15035.00	0.0007024	22.865	0.705750	2.0203	11138	5.169	4.093	1.263	11550
15	4250	16436.25	0.0006611	23.290	0.927138	2.1098	11366	5.972	4.819	1.239	14392
15	4500	18102.50	0.0006197	23.715	1.263750	2.1993	11604	7.302	6.006	1.216	18482
15	4750	20158.75	0.0005831	24.140	1.751375	2.2945	11857	9.228	7.690	1.200	24267
15	5000	22755.00	0.0005465	24.565	2.424000	2.3898	12110	11.550	9.705	1.190	32051
15	5250	26206.25	0.0005114	25.483	3.342250	2.4949	12451	15.169	12.708	1.194	42395
15	5500	30622.50	0.0004762	26.400	4.468500	2.6000	12792	19.333	16.070	1.203	54495
15	5750	36190.00	0.0004416	27.317	5.753000	2.7071	13167	24.314	19.970	1.218	68912
15	6000	43075.00	0.0004070	28.235	7.098499	2.8142	13565	29.900	24.150	1.238	85610

PARAHYDROGEN (OUTPUT FROM PT PROGRAMS)

PRESSURE PSIA	TEMPERATURE DEG. R	ENTHALPY BTU/LB	DENSITY LB/CU.FT	ENTROPY BTU/LB-R	CONDUCTIVITY BTU/H -FT-R	VISCOSITY LB-H /SQ.FT *10**10	VEL.SOUND FT/S	C-P BTU/LB-R	C-V BTU/LB-R	CP/CV RATIO	L FACTOR
50	25	-156.01	4.8285905	1.185	0.043421	1.4689	4196	1.560	1.130	1.380	1527
50	30	-122.27	4.6593210	1.493	0.053271	1.1025	3936	1.819	1.243	1.464	2110
50	35	-112.17	4.4900515	1.801	0.056689	0.8478	3698	2.148	1.343	1.599	2608
50	40	-100.21	4.2833894	2.127	0.058653	0.6786	3442	2.550	1.416	1.801	3130
50	45	-85.58	4.0673792	2.456	0.057643	0.5478	3161	3.297	1.467	2.248	3664
50	50	102.83	0.2243215	6.574	0.014263	0.0920	1324	3.254	1.570	2.073	3284
50	55	118.63	0.1944434	6.875	0.015167	0.0994	1424	3.005	1.542	1.949	3198
50	60	133.43	0.1728893	7.122	0.016117	0.1064	1510	2.869	1.523	1.883	3145
50	65	147.57	0.1567762	7.330	0.017135	0.1135	1588	2.781	1.511	1.840	3140
50	70	161.19	0.1437162	7.528	0.018161	0.1205	1660	2.721	1.506	1.807	3140
50	75	174.75	0.1326472	7.733	0.019218	0.1272	1726	2.680	1.503	1.783	3160
50	80	188.03	0.1230287	7.895	0.020400	0.1333	1791	2.650	1.503	1.764	3203
50	85	201.24	0.1150166	8.051	0.021493	0.1404	1848	2.633	1.506	1.749	3230
50	90	214.12	0.1077292	8.275	0.022533	0.1470	1906	2.615	1.509	1.733	3254
50	95	227.21	0.1014798	8.407	0.023587	0.1531	1958	2.611	1.519	1.719	3284
50	100	240.30	0.0959951	8.539	0.024935	0.1595	2010	2.608	1.530	1.705	3332
50	110	266.58	0.0872226	8.794	0.027188	0.1714	2102	2.625	1.568	1.675	3424
50	120	293.24	0.0795757	9.009	0.029442	0.1830	2190	2.668	1.622	1.645	3517
50	130	320.36	0.0732407	9.225	0.031847	0.1942	2255	2.735	1.698	1.611	3637
50	140	347.98	0.0677065	9.441	0.034252	0.2050	2319	2.818	1.788	1.575	3757
50	150	376.64	0.0629936	9.650	0.037271	0.2156	2384	2.900	1.879	1.543	3927
50	160	405.95	0.0590316	9.854	0.040290	0.2259	2437	3.008	1.991	1.511	4096
50	170	435.16	0.0554533	10.058	0.043449	0.2353	2490	3.116	2.103	1.482	4272
50	180	464.27	0.0523500	10.264	0.046631	0.2376	2543	3.224	2.215	1.455	4445
50	190	501.07	0.0495917	10.428	0.049795	0.2469	2592	3.329	2.322	1.434	4600
50	200	537.87	0.0468333	10.592	0.052959	0.2562	2642	3.434	2.428	1.414	4756
50	250	721.87	0.0367500	11.411	0.068779	0.3025	2897	3.803	2.806	1.355	5534
50	300	909.45	0.0303875	12.098	0.079860	0.3442	3155	3.935	2.943	1.337	5803
50	350	1103.80	0.0260938	12.721	0.089330	0.3840	3411	3.845	2.855	1.347	5967
50	400	1295.75	0.0228646	13.224	0.095296	0.4210	3667	3.755	2.767	1.357	5859
50	450	1479.71	0.0203438	13.663	0.101175	0.4565	3902	3.672	2.685	1.368	5820
50	500	1663.45	0.0187350	14.060	0.106787	0.4910	4128	3.590	2.603	1.379	5786
50	550	1838.28	0.0171800	14.335	0.112728	0.5203	4342	3.549	2.563	1.385	5824
50	600	2012.71	0.0156250	14.610	0.118669	0.5497	4541	3.508	2.523	1.391	5863
50	700	2361.58	0.0133950	15.160	0.130552	0.6084	4913	3.479	2.494	1.395	5939
50	800	2710.44	0.0117250	15.710	0.142435	0.6673	5256	3.470	2.485	1.396	6016
50	900	3059.31	0.0104250	16.078	0.154317	0.7257	5536	3.475	2.490	1.395	6093
50	1000	3408.17	0.0093850	16.447	0.166200	0.7844	5816	3.481	2.496	1.395	6170
50	1250	4280.19	0.0075250	17.235	0.194000	0.9079	6515	3.495	2.510	1.392	6356
50	1500	5152.21	0.0062600	17.883	0.221800	1.0315	7151	3.524	2.539	1.388	6543
50	1750	6044.21	0.0053803	18.437	0.249750	1.1427	7692	3.574	2.589	1.380	6779
50	2000	6936.21	0.0047108	18.920	0.277700	1.2539	8233	3.624	2.639	1.373	7016
50	2250	7860.19	0.0041841	19.301	0.306943	1.3571	8681	3.694	2.709	1.364	7307
50	2500	8784.18	0.0037361	19.683	0.336187	1.4604	9129	3.764	2.779	1.354	7599
50	2750	9752.59	0.0034267	20.064	0.372955	1.5571	9540	3.840	2.854	1.345	7969
50	3000	10720.00	0.0031174	20.445	0.395500	1.6539	9925	3.919	2.933	1.336	8091
50	3250	11713.75	0.0028957	20.746	0.433450	1.7462	10297	4.023	3.034	1.326	8467
50	3500	12707.50	0.0026739	21.047	0.471400	1.8385	10616	4.164	3.169	1.314	8722
50	3750	13801.25	0.0025067	21.349	0.543012	1.9273	10935	4.358	3.351	1.300	9532
50	4000	14895.00	0.0023394	21.650	0.614625	2.0160	11197	4.718	3.682	1.281	10341
50	4250	16195.00	0.0022067	21.991	0.776425	2.1042	11444	5.193	4.115	1.262	12260
50	4500	17495.00	0.0020741	22.333	0.938225	2.1924	11690	5.968	4.811	1.240	14180
50	4750	19251.25	0.0019633	22.674	1.277863	2.2835	11935	7.083	5.796	1.222	18041
50	5000	21007.50	0.0018525	23.015	1.617500	2.3746	12180	8.426	6.975	1.208	21983
50	5250	23621.25	0.0017546	23.616	2.227875	2.4738	12487	10.705	8.910	1.201	28547
50	5500	26235.00	0.0016568	24.217	2.838250	2.5731	12794	13.306	11.070	1.202	35311
50	5750	30220.00	0.0015667	24.819	3.749250	2.6816	13130	16.388	13.568	1.208	44936
50	6000	34205.00	0.0014767	25.420	4.660250	2.7902	13486	19.990	16.392	1.219	54361

PARAHYDROGEN (OUTPUT FROM PT PROGRAMS)

PRESSURE PSIA	TEMPERATURE DEG. R	ENTHALPY BTU/LB	DENSITY LB/CU.FT	ENTROPY BTU/LB-R	CONDUCTIVITY BTU/H -FT-R	VISCOSITY LB-H /SQ.FT *10**10	VEL.SOUND FT/S	C-P BTU/LB-R	C-V BTU/LB-R	CP/CV RATIO	L FACTOR
150	25	-152.40	4.8529367	1.184	0.044715	1.5168	4250	1.560	1.141	1.367	1536
150	30	-119.12	4.7019630	1.466	0.053909	1.1558	4043	1.800	1.240	1.451	2074
150	35	-109.27	4.5408212	1.767	0.057744	0.8895	3816	2.109	1.338	1.576	2560
150	40	-97.74	4.3510571	2.079	0.060150	0.7149	3581	2.481	1.412	1.758	3057
150	45	-84.01	4.1541375	2.393	0.059804	0.5825	3285	2.979	1.462	2.038	3553
150	50	-66.76	3.7784168	2.782	0.056825	0.4735	2882	3.810	1.499	2.542	4117
150	55	-43.96	3.3386485	3.209	0.050925	0.2863	2265	6.419	1.561	4.113	5316
150	60	92.33	0.7136857	5.556	0.021852	0.1284	1347	5.678	1.773	3.202	4717
150	65	115.75	0.5762403	5.958	0.020975	0.1300	1487	4.120	1.605	2.567	3977
150	70	134.88	0.4986615	6.261	0.021231	0.1316	1590	3.568	1.571	2.271	3727
150	75	152.61	0.4433508	6.501	0.021818	0.1358	1676	3.290	1.547	2.127	3607
150	80	168.61	0.4019304	6.706	0.022480	0.1416	1755	3.119	1.537	2.029	3535
150	85	183.93	0.3692396	6.895	0.023499	0.1474	1821	3.022	1.535	1.969	3526
150	90	197.96	0.3430227	7.070	0.024379	0.1532	1888	2.928	1.535	1.908	3509
150	95	212.40	0.3196242	7.214	0.025301	0.1590	1944	2.880	1.542	1.867	3506
150	100	226.85	0.2998829	7.359	0.027086	0.1649	2001	2.837	1.551	1.828	3549
150	110	255.59	0.2680677	7.638	0.029025	0.1762	2101	2.800	1.584	1.768	3600
150	120	283.78	0.2427220	7.877	0.030965	0.1875	2204	2.806	1.634	1.717	3651
150	130	312.17	0.2220253	8.107	0.033200	0.1985	2270	2.851	1.707	1.670	3749
150	140	340.87	0.2047782	8.320	0.035436	0.2089	2336	2.914	1.796	1.623	3848
150	150	370.38	0.1901492	8.522	0.038383	0.2192	2403	2.977	1.885	1.580	4007
150	160	400.43	0.1775102	8.719	0.041330	0.2292	2457	3.076	1.995	1.542	4166
150	170	430.89	0.1665356	8.933	0.044434	0.2387	2511	3.174	2.105	1.508	4335
150	180	461.39	0.1570500	9.146	0.047612	0.2480	2564	3.272	2.216	1.477	4494
150	190	498.41	0.1487750	9.311	0.050749	0.2512	2614	3.374	2.323	1.452	4646
150	200	535.44	0.1405000	9.477	0.053886	0.2604	2664	3.476	2.431	1.430	4799
150	250	720.57	0.1102500	10.304	0.069571	0.3061	2920	3.833	2.812	1.363	5560
150	300	909.48	0.0911625	10.998	0.080499	0.3471	3177	3.953	2.948	1.341	5821
150	350	1104.09	0.0782813	11.626	0.089519	0.3862	3433	3.959	2.859	1.349	5919
150	400	1296.65	0.0685938	12.129	0.095668	0.4227	3688	3.764	2.771	1.359	5868
150	450	1481.03	0.0610312	12.568	0.101450	0.4577	3922	3.673	2.688	1.369	5827
150	500	1665.55	0.0559525	12.965	0.106960	0.4918	4148	3.595	2.606	1.380	5789
150	550	1840.05	0.0513225	13.240	0.112884	0.5209	4361	3.553	2.565	1.385	5927
150	600	2014.54	0.0466925	13.515	0.118808	0.5500	4559	3.511	2.524	1.391	5865
150	700	2363.53	0.0400550	14.065	0.130656	0.6082	4930	3.481	2.495	1.395	5940
150	800	2712.53	0.0350750	14.615	0.142504	0.6664	5272	3.470	2.485	1.396	6016
150	900	3061.52	0.0311975	14.983	0.154352	0.7246	5551	3.476	2.491	1.396	6092
150	1000	3410.51	0.0280925	15.352	0.166200	0.7827	5830	3.482	2.497	1.395	6167
150	1250	4282.57	0.0224863	16.140	0.194000	0.9055	6527	3.496	2.511	1.392	6353
150	1500	5154.63	0.0186856	16.788	0.221800	1.0284	7162	3.524	2.539	1.388	6540
150	1750	6046.63	0.0160717	17.342	0.249750	1.1390	7702	3.574	2.589	1.380	6782
150	2000	6938.63	0.0140794	17.830	0.277700	1.2497	8242	3.624	2.639	1.373	7025
150	2250	7862.59	0.0125101	18.210	0.306930	1.3524	8690	3.694	2.709	1.364	7317
150	2500	8786.54	0.0111944	18.590	0.336160	1.4551	9138	3.764	2.779	1.354	7609
150	2750	9754.77	0.0102686	18.970	0.372665	1.5514	9551	3.836	2.852	1.345	7975
150	3000	10720.00	0.0093429	19.350	0.394583	1.6477	9942	3.912	2.927	1.337	8086
150	3250	11710.83	0.0086793	19.646	0.428658	1.7395	10322	3.999	3.012	1.328	8357
150	3500	12701.67	0.0080156	19.942	0.462733	1.8314	10660	4.105	3.114	1.318	8628
150	3750	13765.00	0.0075160	20.239	0.516958	1.9198	10998	4.240	3.242	1.308	9188
150	4000	14828.33	0.0070163	20.535	0.571183	2.0081	11287	4.468	3.453	1.294	9749
150	4250	16024.17	0.0066229	20.833	0.679633	2.0957	11564	4.762	3.723	1.279	10469
150	4500	17220.00	0.0062294	21.130	0.788083	2.1833	11824	5.228	4.145	1.261	11988
150	4750	18700.83	0.0059066	21.427	1.005208	2.2735	12059	5.893	4.737	1.244	14549
150	5000	20181.67	0.0055838	21.725	1.222333	2.3637	12294	6.689	5.443	1.229	17111
150	5250	22180.83	0.0053068	22.157	1.611083	2.4615	12552	7.931	6.679	1.187	21310
150	5500	24180.00	0.0050298	22.590	1.999833	2.5593	12809	9.387	7.943	1.182	25509
150	5750	27021.67	0.0047813	23.022	2.604333	2.6659	13088	11.164	9.274	1.204	31721
150	6000	29863.33	0.0045328	23.455	3.208833	2.7725	13381	12.915	10.976	1.177	37934

PARAHYDROGEN (OUTPUT FROM PT PROGRAMS)

PRESSURE PSIA	TEMPERATURE DEG. R	ENTHALPY BTU/LB	DENSITY LB/CU.FT	ENTROPY BTU/LB-R	CONDUCTIVITY BTU/H -FT-R	VISCOSITY LB-M /SQ.FT *10**10	VEL.SOUND FT/S	C-P BTU/LB-R	C-V BTU/LB-R	CP/CV RATIO	L FACTOR
500	25	-139.74	4.9339590	1.181	0.048684	1.6706	4450	1.553	1.171	1.327	1569
500	30	-108.02	4.8360185	1.385	0.055883	1.3443	4342	1.715	1.236	1.388	1960
500	35	-98.78	4.6990388	1.670	0.060972	1.0344	4164	1.976	1.330	1.486	2423
500	40	-88.18	4.5401384	1.953	0.064549	0.8378	3974	2.257	1.404	1.608	2877
500	45	-76.10	4.3757578	2.236	0.065639	0.6954	3772	2.572	1.457	1.765	3293
500	50	-62.30	4.1496206	2.531	0.064735	0.5899	3529	2.943	1.495	1.968	3681
500	55	-46.40	3.9070313	2.831	0.062008	0.5016	3260	3.404	1.520	2.240	4055
500	60	-28.20	3.6066790	3.149	0.057727	0.4271	2943	4.036	1.541	2.619	4430
500	65	-5.89	3.2640811	3.521	0.052670	0.3629	2593	4.941	1.564	3.159	4859
500	70	21.80	2.8084677	3.924	0.048123	0.3074	2254	6.107	1.594	3.831	5377
500	75	54.47	2.3100633	4.370	0.043237	0.2561	2016	6.772	1.623	4.171	5602
500	80	86.70	1.8955697	4.769	0.038723	0.2269	1937	6.020	1.623	3.709	5309
500	85	114.93	1.6003867	5.120	0.036154	0.2107	1959	5.304	1.613	3.287	4941
500	90	140.83	1.4068329	5.420	0.034804	0.2034	1980	4.572	1.604	2.850	4625
500	95	160.44	1.2519303	5.621	0.034204	0.1997	2028	4.202	1.606	2.615	4435
500	100	180.04	1.1366356	5.822	0.034012	0.1996	2076	3.867	1.610	2.401	4309
500	110	218.16	0.9751344	6.201	0.035454	0.2026	2175	3.516	1.633	2.154	4214
500	120	251.94	0.8576120	6.491	0.036296	0.2089	2252	3.334	1.675	1.991	4119
500	130	285.13	0.7690770	6.761	0.037938	0.2169	2324	3.262	1.739	1.876	4142
500	140	317.44	0.6993679	7.000	0.039580	0.2251	2396	3.253	1.822	1.785	4165
500	150	349.91	0.6427857	7.224	0.042275	0.2335	2468	3.243	1.906	1.702	4287
500	160	382.51	0.5955868	7.438	0.044970	0.2422	2525	3.307	2.009	1.646	4410
500	170	416.72	0.5555336	7.666	0.047894	0.2509	2583	3.371	2.113	1.595	4555
500	180	451.30	0.5235001	7.878	0.051048	0.2576	2640	3.435	2.217	1.549	4666
500	190	489.11	0.4959167	8.046	0.054091	0.2663	2689	3.525	2.326	1.515	4817
500	200	526.93	0.4683333	8.213	0.057133	0.2751	2739	3.616	2.438	1.483	4968
500	250	716.00	0.3675000	9.051	0.072346	0.3189	3001	3.980	2.871	1.388	5654
500	300	908.21	0.3038750	9.792	0.088736	0.3574	3255	4.017	2.968	1.353	5985
500	350	1105.11	0.2609375	10.388	0.091232	0.3941	3508	3.907	2.876	1.358	5962
500	400	1299.80	0.2286458	10.949	0.096969	0.4286	3761	3.796	2.784	1.364	5903
500	450	1485.63	0.2034375	11.367	0.102413	0.4620	3992	3.704	2.699	1.372	5852
500	500	1671.50	0.1825750	11.785	0.107567	0.4946	4215	3.612	2.614	1.382	5802
500	550	1846.22	0.1676625	12.061	0.113430	0.5228	4426	3.567	2.572	1.387	5838
500	600	2020.94	0.1527550	12.337	0.119293	0.5511	4621	3.521	2.530	1.392	5873
500	700	2370.38	0.1313500	12.888	0.131020	0.6076	4988	3.487	2.499	1.395	5944
500	800	2719.82	0.1152500	13.440	0.142747	0.6640	5326	3.473	2.487	1.397	6016
500	900	3069.26	0.1026550	13.808	0.154473	0.7205	5603	3.478	2.492	1.396	6087
500	1000	3418.70	0.0925550	14.177	0.166200	0.7770	5879	3.484	2.498	1.395	6158
500	1250	4290.90	0.0742925	14.968	0.194600	0.8973	6571	3.497	2.511	1.392	6343
500	1500	5163.10	0.0618445	15.617	0.221800	1.0175	7201	3.524	2.539	1.388	6528
500	1750	6055.10	0.0532503	16.167	0.249750	1.1260	7738	3.574	2.589	1.380	6793
500	2000	6947.10	0.0466770	16.650	0.277700	1.2350	8275	3.624	2.639	1.373	7057
500	2250	7870.95	0.0415014	17.033	0.306883	1.3358	8721	3.694	2.709	1.364	7351
500	2500	8794.80	0.0372984	17.415	0.336067	1.4367	9167	3.764	2.779	1.355	7645
500	2750	9762.40	0.0342154	17.797	0.371650	1.5313	9579	3.835	2.850	1.346	7997
500	3000	10730.00	0.0311323	18.180	0.393833	1.6260	9969	3.908	2.923	1.337	8118
500	3250	11715.00	0.0289219	18.473	0.425117	1.7163	10350	3.983	2.997	1.329	8375
500	3500	12700.00	0.0267116	18.765	0.456400	1.8067	10693	4.057	3.079	1.321	8633
500	3750	13740.00	0.0250485	19.058	0.497800	1.8935	11036	4.163	3.171	1.313	8975
500	4000	14780.00	0.0233855	19.350	0.539200	1.9803	11336	4.306	3.305	1.303	9316
500	4250	15903.33	0.0220793	19.620	0.608217	2.0658	11626	4.482	3.469	1.292	10057
500	4500	17026.67	0.0207732	19.890	0.677233	2.1513	11899	4.749	3.712	1.279	10799
500	4750	18301.67	0.0197033	20.160	0.802200	2.2385	12147	5.121	4.046	1.265	12131
500	5000	19576.67	0.0186434	20.430	0.927167	2.3257	12396	5.563	4.442	1.252	13464
500	5250	21128.33	0.0177393	20.759	1.143583	2.4183	12646	6.242	5.038	1.239	15751
500	5500	22680.00	0.0168352	21.087	1.360000	2.5110	12897	7.038	5.728	1.229	18038
500	5750	24666.67	0.0160322	21.416	1.701167	2.6108	13161	8.008	6.557	1.221	21478
500	6000	26653.33	0.0152293	21.745	2.042333	2.7107	13433	9.171	7.534	1.217	24918

PARAHYDROGEN (OUTPUT FROM PT PROGRAMS)

PRESSURE PSIA	TEMPERATURE DEG. R	ENTHALPY BTU/LB	DENSITY LB/CU.FT	ENTROPY BTU/LB-R	CONDUCTIVITY BTU/H -FT-R	VISCOSITY LB-H /SQ.FT *10**10	VEL.SOUND FT/S	C-P BTU/LB-R	C-V BTU/LB-R	CP/CV RATIO	L FACTOR
1500	25	-104.56	5.1646222	1.199	0.060313	1.9612	4925	1.559	1.212	1.287	1660
1500	30	-104.56	5.1543206	1.219	0.061016	1.9179	4925	1.559	1.212	1.287	1701
1500	35	-67.76	5.0271414	1.473	0.068128	1.4588	4835	1.759	1.299	1.354	2160
1500	40	-58.40	4.8999621	1.717	0.073829	1.1743	4737	1.968	1.378	1.428	2581
1500	45	-48.04	4.7727828	1.959	0.076766	0.9808	4603	2.166	1.435	1.510	2946
1500	50	-36.70	4.6456035	2.200	0.077833	0.8471	4468	2.365	1.491	1.586	3264
1500	55	-24.40	4.5122087	2.439	0.077409	0.7432	4334	2.556	1.524	1.677	3537
1500	60	-11.14	4.3539517	2.666	0.075723	0.6559	4199	2.747	1.554	1.767	3765
1500	65	3.05	4.1956948	2.892	0.073408	0.5937	4052	2.931	1.576	1.859	3944
1500	70	18.14	4.0374378	3.119	0.071092	0.5416	3905	3.104	1.585	1.958	4122
1500	75	34.08	3.8667813	3.338	0.068516	0.4965	3758	3.277	1.595	2.055	4256
1500	80	50.83	3.6878586	3.551	0.065940	0.4558	3611	3.421	1.604	2.133	4389
1500	85	68.33	3.5089358	3.764	0.063627	0.4244	3502	3.562	1.613	2.209	4491
1500	90	86.47	3.3300131	3.978	0.061314	0.3953	3392	3.677	1.623	2.266	4594
1500	95	105.50	3.1622829	4.170	0.059472	0.3752	3283	3.748	1.637	2.290	4640
1500	100	124.52	2.9945528	4.363	0.057380	0.3560	3173	3.819	1.650	2.314	4712
1500	110	162.58	2.6738837	4.737	0.055546	0.3282	3079	3.828	1.683	2.275	4725
1500	120	200.68	2.4123798	5.063	0.053712	0.3114	2984	3.792	1.728	2.195	4738
1500	130	238.44	2.1796805	5.369	0.053500	0.3053	2973	3.748	1.792	2.091	4722
1500	140	275.69	1.9901883	5.646	0.053288	0.2992	2962	3.720	1.877	1.982	4707
1500	150	312.78	1.8314030	5.902	0.054923	0.2972	2952	3.692	1.962	1.881	4794
1500	160	349.75	1.6930890	6.144	0.056558	0.2979	2973	3.707	2.054	1.805	4882
1500	170	387.13	1.5818402	6.434	0.058768	0.3011	2994	3.723	2.147	1.734	4994
1500	180	424.67	1.4854167	6.592	0.060910	0.3038	3016	3.739	2.239	1.670	5090
1500	190	464.61	1.4055000	6.773	0.063657	0.3112	3046	3.812	2.353	1.620	5205
1500	200	504.54	1.3255833	6.953	0.066405	0.3186	3075	3.885	2.467	1.575	5319
1500	250	704.21	1.0417167	7.855	0.080142	0.3558	3281	4.137	2.881	1.436	5892
1500	300	905.30	0.8640583	8.642	0.088979	0.3869	3508	4.155	3.016	1.378	6049
1500	350	1108.52	0.7442556	9.255	0.095987	0.4163	3741	4.014	2.916	1.376	6075
1500	400	1309.06	0.6540139	9.830	0.100582	0.4452	3980	3.872	2.817	1.375	5994
1500	450	1498.89	0.5836250	10.255	0.105075	0.4739	4200	3.763	2.726	1.381	5920
1500	500	1688.50	0.5258500	10.680	0.109300	0.5023	4414	3.655	2.635	1.387	5838
1500	550	1863.86	0.4840750	10.958	0.114990	0.5282	4615	3.600	2.590	1.390	5867
1500	600	2039.22	0.4423000	11.235	0.120680	0.5541	4803	3.546	2.544	1.394	5896
1500	700	2389.94	0.3819500	11.790	0.132060	0.6060	5156	3.502	2.508	1.396	5955
1500	800	2740.66	0.3363000	12.345	0.143440	0.6578	5484	3.482	2.492	1.397	6014
1500	900	3091.38	0.3004500	12.713	0.154820	0.7097	5754	3.486	2.496	1.396	6073
1500	1000	3442.10	0.2715000	13.082	0.166200	0.7615	6024	3.489	2.501	1.395	6132
1500	1250	4314.70	0.2192500	13.873	0.194000	0.8748	6700	3.499	2.512	1.393	6313
1500	1500	5187.30	0.1833500	14.523	0.221800	0.9880	7317	3.525	2.539	1.388	6495
1500	1750	6079.30	0.1581188	15.077	0.249750	1.0908	7845	3.574	2.589	1.381	6822
1500	2000	6971.30	0.1387725	15.560	0.277700	1.1930	8374	3.623	2.638	1.373	7149
1500	2250	7894.85	0.1235213	15.941	0.306750	1.2885	8814	3.693	2.708	1.364	7448
1500	2500	8818.40	0.1111950	16.323	0.335800	1.3840	9255	3.763	2.778	1.355	7748
1500	2750	9784.20	0.1020625	16.704	0.368750	1.4740	9663	3.833	2.848	1.346	8059
1500	3000	10750.00	0.0929300	17.085	0.393500	1.5640	10050	3.904	2.919	1.337	8235
1500	3250	11735.00	0.0863450	17.376	0.423550	1.6500	10430	3.974	2.989	1.330	8479
1500	3500	12720.00	0.0797600	17.667	0.453600	1.7360	10779	4.055	3.067	1.322	8723
1500	3750	13750.00	0.0748250	17.959	0.489400	1.8185	11128	4.149	3.157	1.314	8990
1500	4000	14780.00	0.0698900	18.250	0.525200	1.9010	11445	4.243	3.247	1.306	9257
1500	4250	15870.00	0.0660125	18.506	0.576850	1.9805	11753	4.353	3.361	1.298	9788
1500	4500	16960.00	0.0621350	18.762	0.628500	2.0600	12046	4.590	3.566	1.287	10318
1500	4750	18145.00	0.0589825	19.019	0.712500	2.1385	12314	4.816	3.772	1.277	11164
1500	5000	19330.00	0.0558300	19.275	0.796500	2.2170	12583	5.042	3.978	1.268	12009
1500	5250	20685.00	0.0531750	19.550	0.934250	2.2950	12825	5.550	4.421	1.255	13435
1500	5500	22040.00	0.0505200	19.825	1.072000	2.3730	13068	6.057	4.864	1.245	14860
1500	5750	23650.00	0.0481925	20.100	1.284500	2.4535	13310	6.564	5.307	1.237	16994
1500	6000	25260.00	0.0458650	20.375	1.497000	2.5340	13551	7.255	5.898	1.230	19127

PARAHYDROGEN (OUTPUT FROM PT PROGRAMS)

PRESSURE PSIA	TEMPERATURE DEG. R	ENTHALPY BTU/LB	DENSITY LB/CU.FT	ENTROPY BTU/LB-R	CONDUCTIVITY BTU/H -FT-R	VISCOSITY LB-H /SQ.FT *10**10	VEL.SOUND FT/S	C-P BTU/LB-R	C-V BTU/LB-R	CP/CV RATIO	L FACTOR
4500	25	-5.75	5.5473082	1.318	0.090891	2.3119	6048	1.665	1.339	1.244	2077
4500	30	-5.75	5.5473082	1.318	0.090891	2.3119	6048	1.665	1.339	1.244	2077
4500	35	-5.75	5.5473082	1.318	0.090891	2.3119	6048	1.665	1.339	1.244	2077
4500	40	32.38	5.5323171	1.354	0.092290	2.2159	6044	1.684	1.348	1.249	2152
4500	45	41.30	5.4485682	1.555	0.098312	1.8054	5980	1.826	1.417	1.288	2505
4500	50	50.84	5.3648192	1.757	0.101876	1.5407	5915	1.969	1.487	1.324	2807
4500	55	60.91	5.2810703	1.954	0.103472	1.3480	5851	2.088	1.532	1.363	3059
4500	60	71.66	5.1973214	2.134	0.103212	1.1935	5787	2.206	1.576	1.400	3264
4500	65	83.05	5.1135724	2.315	0.102388	1.0948	5713	2.314	1.612	1.435	3442
4500	70	94.85	5.0298235	2.495	0.101116	1.0088	5640	2.408	1.637	1.471	3596
4500	75	107.10	4.9409797	2.664	0.099564	0.9355	5566	2.502	1.662	1.505	3726
4500	80	119.89	4.8487393	2.825	0.097900	0.8705	5493	2.582	1.681	1.536	3840
4500	85	132.98	4.7564989	2.986	0.096164	0.8188	5420	2.660	1.700	1.564	3941
4500	90	146.37	4.6642586	3.147	0.094436	0.7703	5346	2.735	1.719	1.591	4034
4500	95	160.69	4.5720182	3.292	0.092738	0.7325	5273	2.803	1.736	1.614	4118
4500	100	175.00	4.4797778	3.437	0.091282	0.6963	5199	2.872	1.754	1.637	4190
4500	110	204.05	4.2978369	3.721	0.089001	0.6385	5072	2.988	1.791	1.668	4330
4500	120	234.75	4.1260550	3.983	0.086720	0.5944	4945	3.099	1.839	1.685	4469
4500	130	266.22	3.9542731	4.238	0.085350	0.5615	4833	3.210	1.904	1.686	4597
4500	140	298.87	3.7824912	4.479	0.083980	0.5287	4721	3.320	1.986	1.672	4724
4500	150	332.76	3.6282626	4.712	0.084511	0.5052	4609	3.431	2.068	1.659	4884
4500	160	367.48	3.4857361	4.939	0.085042	0.4881	4540	3.523	2.153	1.636	5045
4500	170	403.32	3.3432096	5.164	0.086182	0.4744	4470	3.615	2.238	1.615	5201
4500	180	439.40	3.1993333	5.355	0.087186	0.4488	4401	3.708	2.324	1.596	5354
4500	190	480.29	3.0852222	5.532	0.089092	0.4516	4361	3.814	2.439	1.563	5466
4500	200	521.17	2.9711111	5.709	0.090997	0.4544	4320	3.920	2.555	1.534	5577
4500	250	725.60	2.4976944	6.594	0.100525	0.4684	4264	4.276	2.985	1.432	6137
4500	300	932.52	2.1500000	7.380	0.105196	0.4755	4355	4.334	3.120	1.389	6260
4500	350	1143.19	1.8950000	8.016	0.108300	0.4822	4495	4.168	3.005	1.387	6249
4500	400	1350.62	1.6939444	8.613	0.110000	0.4942	4667	4.002	2.890	1.385	6139
4500	450	1545.08	1.5322500	9.051	0.112037	0.5090	4947	3.870	2.786	1.389	6055
4500	500	1739.50	1.4504500	9.317	0.114500	0.5255	5024	3.730	2.683	1.394	5945
4500	550	1916.78	1.3423500	9.598	0.119670	0.5453	5197	3.670	2.628	1.396	5956
4500	600	2094.06	1.2342500	9.878	0.124840	0.5650	5361	3.601	2.574	1.399	5967
4500	700	2448.62	1.0755500	10.439	0.135180	0.6045	5673	3.537	2.528	1.400	5988
4500	800	2803.18	0.9536000	11.000	0.145520	0.6440	5967	3.507	2.507	1.399	6010
4500	900	3157.74	0.8567000	11.370	0.155860	0.6835	6219	3.507	2.509	1.398	6032
4500	1000	3512.30	0.7779500	11.740	0.166200	0.7231	6470	3.507	2.511	1.397	6053
4500	1250	4386.10	0.6336250	12.530	0.194000	0.8179	7098	3.507	2.517	1.393	6224
4500	1500	5259.90	0.5332000	13.180	0.221800	0.9127	7677	3.526	2.539	1.388	6394
4500	1750	6151.90	0.4617500	13.737	0.249750	1.0009	8181	3.574	2.588	1.381	6910
4500	2000	7043.90	0.4066750	14.220	0.277700	1.0870	8684	3.622	2.637	1.374	7426
4500	2250	7966.55	0.3630000	14.600	0.305350	1.1685	9109	3.692	2.706	1.364	7740
4500	2500	8889.20	0.3273000	14.980	0.335000	1.2500	9533	3.761	2.776	1.355	8055
4500	2750	9849.60	0.3008250	15.360	0.360050	1.3280	9927	3.830	2.845	1.346	8247
4500	3000	10810.00	0.2743500	15.740	0.393300	1.4060	10301	3.899	2.913	1.338	8575
4500	3250	11795.00	0.2553500	16.032	0.422350	1.4800	10669	3.968	2.982	1.331	8818
4500	3500	12780.00	0.2363500	16.325	0.451400	1.5540	11011	4.039	3.052	1.323	9061
4500	3750	13810.00	0.2217925	16.617	0.482700	1.6255	11354	4.112	3.123	1.317	9372
4500	4000	14840.00	0.2072350	16.910	0.514000	1.6970	11672	4.186	3.195	1.310	9683
4500	4250	15900.00	0.1959525	17.156	0.551750	1.7665	11984	4.274	3.278	1.304	9951
4500	4500	16960.00	0.1846700	17.403	0.589500	1.8360	12282	4.417	3.410	1.295	10218
4500	4750	18075.00	0.1754400	17.649	0.640500	1.9035	12560	4.560	3.541	1.287	10693
4500	5000	19190.00	0.1662100	17.895	0.691500	1.9710	12838	4.703	3.673	1.280	11167
4500	5250	20385.00	0.1583500	18.126	0.764850	2.0370	13086	5.002	3.938	1.270	11915
4500	5500	21580.00	0.1507400	18.358	0.838200	2.1030	13335	5.302	4.204	1.261	12662
4500	5750	22890.00	0.1441425	18.589	0.944600	2.1695	13578	5.601	4.469	1.253	13747
4500	6000	24200.00	0.1375450	18.820	1.051000	2.2360	13816	6.003	4.800	1.251	14831

EQUILIBRIUM HYDROGEN (OUTPUT FROM ET PROGRAMS)

PRESSURE PSIA	TEMPERATURE DEG. R	ENTHALPY BTU/LB	DENSITY LB/CU.FT	ENTROPY BTU/LB-R	CONDUCTIVITY BTU/H -FT-R	VISCOSITY LB-H /SQ.FT *10**10	VEL.SOUND FT/S	C-P BTU/LE-R	C-V BTU/LB-R	CP/CV RATIO	L FACTOR
1	25	60.63	0.0075644	8.995	0.007202	0.0449	1008	2.535	1.487	1.705	2613
1	30	73.35	0.0063539	9.436	0.008148	0.0532	1097	2.536	1.521	1.668	2642
1	35	86.14	0.0054165	9.829	0.009094	0.0615	1180	2.584	1.594	1.621	2672
1	40	99.35	0.0047232	10.175	0.010875	0.0698	1246	2.702	1.726	1.566	2875
1	45	113.32	0.0041880	10.522	0.012865	0.0781	1299	2.893	1.921	1.506	3121
1	50	128.69	0.0037698	10.849	0.015361	0.0864	1341	3.125	2.152	1.452	3437
1	55	145.22	0.0034268	11.163	0.018193	0.0946	1379	3.450	2.464	1.400	3799
1	60	163.16	0.0031400	11.478	0.021074	0.1020	1419	3.740	2.749	1.360	4146
1	65	182.47	0.0028977	11.781	0.024027	0.1095	1459	4.006	3.016	1.328	4470
1	70	202.94	0.0026892	12.079	0.026912	0.1169	1500	4.191	3.202	1.309	4772
1	75	224.22	0.0025123	12.378	0.029525	0.1239	1545	4.342	3.354	1.295	4988
1	80	246.10	0.0023508	12.653	0.032141	0.1307	1591	4.445	3.457	1.286	5210
1	85	268.54	0.0022136	12.925	0.034320	0.1375	1638	4.483	3.494	1.283	5335
1	90	291.34	0.0020914	13.155	0.036178	0.1443	1684	4.505	3.515	1.281	5407
1	95	313.32	0.0019799	13.390	0.037747	0.1505	1733	4.464	3.475	1.285	5437
1	100	335.31	0.0018805	13.625	0.039042	0.1570	1781	4.416	3.427	1.288	5430
1	110	378.77	0.0017185	14.064	0.040768	0.1691	1878	4.258	3.271	1.302	5330
1	120	420.17	0.0015739	14.382	0.042495	0.1809	1975	4.081	3.093	1.319	5230
1	130	460.33	0.0014530	14.699	0.043334	0.1921	2068	3.914	2.929	1.336	5084
1	140	498.62	0.0013465	15.017	0.044172	0.2031	2162	3.763	2.777	1.355	4937
1	150	535.44	0.0012549	15.275	0.045121	0.2138	2255	3.612	2.626	1.375	4837
1	160	571.28	0.0011773	15.494	0.046070	0.2242	2340	3.520	2.534	1.389	4737
1	170	603.70	0.0011071	15.714	0.046990	0.2337	2425	3.428	2.442	1.404	4667
1	180	629.01	0.0010470	15.940	0.047910	0.2354	2510	3.335	2.350	1.419	4596
1	190	661.83	0.0009918	16.086	0.049360	0.2448	2585	3.290	2.305	1.428	4599
1	200	694.65	0.0009367	16.232	0.050809	0.2541	2660	3.245	2.259	1.436	4601
1	250	858.73	0.0007350	16.964	0.058058	0.3007	2990	3.149	2.164	1.455	4614
1	300	1021.61	0.0006077	17.535	0.066682	0.3427	3266	3.190	2.204	1.447	4782
1	350	1182.69	0.0005219	18.047	0.075638	0.3829	3516	3.245	2.259	1.436	4985
1	400	1345.12	0.0004573	18.485	0.084549	0.4202	3749	3.299	2.314	1.426	5174
1	450	1512.98	0.0004069	18.877	0.093097	0.4559	3959	3.348	2.363	1.417	5340
1	500	1681.02	0.0003747	19.240	0.101402	0.4906	4165	3.397	2.412	1.408	5517
1	550	1853.62	0.0003436	19.510	0.107871	0.5201	4362	3.418	2.433	1.405	5585
1	600	2026.22	0.0003125	19.780	0.114341	0.5495	4551	3.438	2.453	1.402	5654
1	700	2371.42	0.0002679	20.320	0.127280	0.6084	4912	3.455	2.470	1.399	5790
1	800	2716.62	0.0002345	20.860	0.140219	0.6674	5250	3.460	2.476	1.398	5927
1	900	3061.82	0.0002085	21.227	0.153158	0.7263	5530	3.467	2.483	1.397	6063
1	1000	3407.02	0.0001877	21.593	0.166097	0.7852	5810	3.474	2.490	1.396	6199
1	1250	4279.02	0.0001505	22.385	0.193896	0.9091	6509	3.492	2.507	1.393	6371
1	1500	5151.02	0.0001252	23.037	0.221694	1.0330	7145	3.523	2.538	1.388	6543
1	1750	6043.02	0.0001076	23.587	0.249697	1.1445	7686	3.574	2.589	1.381	6784
1	2000	6935.02	0.0000942	24.070	0.277700	1.2560	8227	3.624	2.639	1.373	7024
1	2250	7859.02	0.0000837	24.480	0.306900	1.3595	8673	3.694	2.709	1.364	7308
1	2500	8783.02	0.0000752	24.890	0.336100	1.4630	9120	3.764	2.779	1.354	7592
1	2750	9751.52	0.0000689	25.245	0.373397	1.5600	9515	3.867	2.881	1.342	7972
1	3000	10720.00	0.0000627	25.600	0.410700	1.6570	9877	4.018	3.026	1.328	8353
1	3250	11757.50	0.0000582	25.935	0.480700	1.7500	10213	4.320	3.312	1.304	9196
1	3500	12900.00	0.0000536	26.270	0.607200	1.8430	10445	4.900	3.852	1.272	10839
1	3750	14237.50	0.0000501	26.670	0.838100	1.9350	10677	5.969	4.832	1.235	13966
1	4000	15900.00	0.0000465	27.070	1.242000	2.0270	10904	7.805	6.498	1.201	19346
1	4250	18267.50	0.0000432	27.725	1.963500	2.1250	11128	11.015	9.345	1.179	28673
1	4500	21605.00	0.0000399	28.380	3.061500	2.2230	11408	15.855	13.535	1.171	42503
1	4750	26337.50	0.0000364	29.585	4.593750	2.3320	11770	22.683	19.245	1.179	61433
1	5000	32960.00	0.0000329	30.790	6.529000	2.4410	12133	31.650	26.420	1.198	85144
1	5250	42359.99	0.0000292	32.805	8.629750	2.5290	12601	42.375	34.507	1.228	111434
1	5500	54329.99	0.0000256	34.820	10.313000	2.6170	13048	52.440	41.690	1.258	134343
1	5750	68294.99	0.0000226	37.325	10.957500	2.6320	13429	58.373	45.663	1.278	146106
1	6000	82919.98	0.0000195	39.830	10.220000	2.6470	13766	57.070	44.460	1.284	139164

EQUILIBRIUM HYDROGEN (OUTPUT FROM ET PROGRAMS)

PRESSURE PSIA	TEMPERATURE DEG. R	ENTHALPY BTU/LB	DENSITY LB/CU.FT	ENTROPY BTU/LB-R	CONDUCTIVITY BTU/H -FT-R	VISCOSITY LB-M /SQ.FT *10**10	VEL.SOUND FT/S	C-P BTU/LB-R	C-V BTU/LB-R	CP/CV RATIO	L FACTOR
15	25	-132.68	4.8165105	1.190	0.043185	1.4436	4188	1.567	1.133	1.382	1537
15	30	-123.26	4.6443963	1.509	0.053150	1.0838	3881	1.877	1.274	1.473	2143
15	35	-112.70	4.4722821	1.829	0.056593	0.8333	3607	2.310	1.449	1.595	2683
15	40	91.59	0.0768321	7.427	0.011477	0.0719	1193	3.044	1.778	1.712	3067
15	45	106.63	0.0667821	7.788	0.013347	0.0800	1253	3.172	1.958	1.620	3262
15	50	123.25	0.0590916	8.127	0.015762	0.0880	1304	3.321	2.174	1.527	3542
15	55	140.64	0.0530733	8.453	0.018540	0.0960	1351	3.594	2.480	1.449	3880
15	60	159.24	0.0482165	8.779	0.021381	0.1033	1396	3.848	2.761	1.394	4209
15	65	179.00	0.0443442	9.090	0.024315	0.1106	1441	4.089	3.025	1.352	4523
15	70	199.81	0.0404964	9.396	0.027182	0.1179	1486	4.259	3.209	1.327	4817
15	75	221.40	0.0383351	9.702	0.029782	0.1249	1533	4.400	3.360	1.310	5027
15	80	243.56	0.0357877	9.979	0.032432	0.1316	1581	4.496	3.462	1.299	5252
15	85	266.24	0.0337205	10.252	0.034601	0.1383	1629	4.527	3.499	1.294	5370
15	90	289.08	0.0316321	10.480	0.036437	0.1450	1677	4.542	3.519	1.291	5437
15	95	311.25	0.0299067	10.718	0.037987	0.1512	1727	4.497	3.478	1.293	5403
15	100	333.43	0.0283662	10.955	0.039343	0.1577	1776	4.444	3.430	1.296	5455
15	110	377.23	0.0257886	11.400	0.041026	0.1698	1875	4.281	3.273	1.308	5350
15	120	418.85	0.0236160	11.719	0.042708	0.1815	1975	4.099	3.095	1.324	5246
15	130	459.19	0.0218001	12.039	0.043523	0.1927	2069	3.930	2.935	1.341	5097
15	140	497.62	0.0202015	12.358	0.044337	0.2037	2163	3.776	2.778	1.359	4949
15	150	534.56	0.0188253	12.626	0.045277	0.2143	2257	3.623	2.627	1.379	4847
15	160	570.50	0.0176616	12.859	0.046216	0.2247	2342	3.529	2.535	1.392	4746
15	170	603.10	0.0166080	13.092	0.047128	0.2341	2428	3.436	2.442	1.407	4675
15	180	628.61	0.0157050	13.325	0.048047	0.2361	2513	3.342	2.350	1.422	4603
15	190	661.46	0.0148775	13.472	0.049494	0.2454	2588	3.297	2.305	1.430	4605
15	200	694.30	0.0140500	13.619	0.050940	0.2547	2663	3.251	2.260	1.439	4607
15	250	858.54	0.0110250	14.353	0.058173	0.3012	2993	3.153	2.165	1.457	4619
15	300	1021.56	0.0091163	14.925	0.066776	0.3431	3270	3.193	2.205	1.448	4785
15	350	1182.73	0.0078281	15.437	0.075711	0.3832	3520	3.247	2.260	1.437	4988
15	400	1345.25	0.0068594	15.871	0.084606	0.4204	3752	3.300	2.315	1.426	5176
15	450	1513.16	0.0061031	16.264	0.093139	0.4561	3962	3.349	2.363	1.417	5341
15	500	1681.26	0.0056205	16.630	0.101428	0.4907	4167	3.398	2.412	1.408	5518
15	550	1853.86	0.0051540	16.900	0.107891	0.5201	4365	3.418	2.433	1.405	5586
15	600	2026.47	0.0046875	17.170	0.114354	0.5496	4553	3.438	2.453	1.402	5654
15	700	2371.69	0.0040185	17.710	0.127280	0.6084	4914	3.455	2.470	1.399	5790
15	800	2716.91	0.0035175	18.250	0.140206	0.6673	5253	3.460	2.476	1.398	5927
15	900	3062.13	0.0031275	18.617	0.153132	0.7261	5532	3.467	2.483	1.397	6063
15	1000	3407.35	0.0028155	18.983	0.166057	0.7850	5812	3.475	2.490	1.396	6199
15	1250	4279.36	0.0022575	19.772	0.193835	0.9087	6511	3.492	2.507	1.393	6371
15	1500	5151.36	0.0018780	20.423	0.221612	1.0325	7147	3.523	2.538	1.388	6543
15	1750	6043.36	0.0016141	20.977	0.249656	1.1439	7688	3.574	2.589	1.381	6784
15	2000	6935.36	0.0014132	21.460	0.277700	1.2554	8228	3.624	2.639	1.373	7026
15	2250	7859.36	0.0012552	21.843	0.306898	1.3588	8676	3.694	2.709	1.364	7309
15	2500	8783.35	0.0011256	22.225	0.336096	1.4622	9123	3.764	2.779	1.354	7593
15	2750	9751.83	0.0010320	22.607	0.373357	1.5591	9532	3.848	2.863	1.344	7973
15	3000	10720.00	0.0009384	22.990	0.398400	1.6565	9915	3.939	2.952	1.334	8139
15	3250	11703.75	0.0008714	23.300	0.438475	1.7490	10282	4.081	3.089	1.321	8541
15	3500	12740.00	0.0008044	23.610	0.493675	1.8415	10584	4.287	3.284	1.305	9137
15	3750	13840.00	0.0007534	23.920	0.577150	1.9309	10886	4.591	3.567	1.287	10082
15	4000	15035.00	0.0007024	24.230	0.708050	2.0203	11125	5.189	4.113	1.262	11692
15	4250	16436.25	0.0006611	24.656	0.929563	2.1098	11349	5.992	4.839	1.238	14432
15	4500	18102.50	0.0006197	25.083	1.265750	2.1993	11582	7.319	6.023	1.215	18517
15	4750	20158.75	0.0005831	25.509	1.752875	2.2945	11831	9.241	7.703	1.200	24294
15	5000	22755.00	0.0005465	25.935	2.425000	2.3898	12081	11.560	9.713	1.190	32068
15	5250	26206.25	0.0005114	26.851	3.342625	2.4949	12451	15.173	12.711	1.194	42401
15	5500	30622.50	0.0004762	27.768	4.468250	2.6000	12792	19.330	16.067	1.203	54851
15	5750	36190.00	0.0004416	28.684	5.752500	2.7071	13167	24.305	19.961	1.218	68900
15	6000	43075.00	0.0004070	29.600	7.097499	2.8142	13565	29.890	24.140	1.238	83592

EQUILIBRIUM HYDROGEN (OUTPUT FROM ET PROGRAMS)

PRESSURE PSIA	TEMPERATURE DEG. R	ENTHALPY BTU/LB	DENSITY LB/CU.FT	ENTROPY BTU/LB-R	CONDUCTIVITY BTU/H -FT-R	VISCOSITY LB-H /SQ.FT *10**10	VEL.SOUND FT/S	C-P BTU/LB-R	C-V BTU/LB-R	CP/CV RATIO	L FACTOR
50	25	-156.01	4.8285905	1.183	0.043395	1.4689	4210	1.565	1.134	1.380	1528
50	30	-122.16	4.6593210	1.500	0.053374	1.1025	3919	1.847	1.271	1.454	2130
50	35	-111.68	4.4900515	1.817	0.056959	0.8478	3648	2.245	1.446	1.553	2666
50	40	-98.83	4.2833894	2.169	0.059423	0.6786	3325	2.778	1.660	1.674	3271
50	45	-82.48	4.0673792	2.531	0.059163	0.5478	2895	3.867	1.894	2.042	3926
50	50	108.69	0.2243215	6.713	0.017136	0.0920	1212	3.972	2.243	1.771	3937
50	55	128.64	0.1944434	7.091	0.019664	0.0994	1281	4.046	2.527	1.601	4162
50	60	149.10	0.1728893	7.435	0.022316	0.1064	1340	4.186	2.793	1.499	4467
50	65	170.16	0.1567762	7.754	0.025157	0.1135	1396	4.325	3.048	1.419	4682
50	70	191.88	0.1437162	8.071	0.027940	0.1205	1450	4.467	3.227	1.384	4940
50	75	214.35	0.1326472	8.399	0.030487	0.1272	1503	4.564	3.375	1.352	5132
50	80	237.23	0.1230287	8.685	0.033160	0.1338	1555	4.631	3.475	1.333	5358
50	85	260.50	0.1150166	8.961	0.035303	0.1404	1607	4.637	3.510	1.321	5458
50	90	283.42	0.1077292	9.260	0.037083	0.1470	1660	4.635	3.529	1.313	5513
50	95	306.07	0.1014798	9.501	0.038587	0.1531	1712	4.579	3.487	1.313	5529
50	100	328.72	0.0959951	9.743	0.040095	0.1595	1764	4.516	3.438	1.314	5516
50	110	373.38	0.0872226	10.194	0.041668	0.1714	1867	4.338	3.279	1.323	5401
50	120	415.54	0.0795757	10.517	0.043242	0.1830	1976	4.146	3.100	1.337	5287
50	130	456.35	0.0732407	10.841	0.043996	0.1942	2071	3.971	2.933	1.354	5132
50	140	495.13	0.0677065	11.164	0.044751	0.2050	2166	3.810	2.781	1.370	4977
50	150	532.37	0.0629936	11.435	0.045666	0.2156	2262	3.650	2.629	1.388	4873
50	160	568.57	0.0590316	11.670	0.046580	0.2259	2347	3.553	2.536	1.401	4769
50	170	601.61	0.0554533	11.906	0.047474	0.2353	2433	3.456	2.443	1.415	4696
50	180	627.60	0.0523500	12.140	0.048391	0.2376	2519	3.359	2.351	1.429	4620
50	190	660.53	0.0495917	12.287	0.049829	0.2469	2595	3.313	2.305	1.437	4621
50	200	693.45	0.0468333	12.435	0.051267	0.2562	2671	3.266	2.261	1.445	4623
50	250	858.09	0.0367500	13.172	0.058459	0.3025	3002	3.164	2.167	1.460	4630
50	300	1021.43	0.0303875	13.748	0.067010	0.3442	3278	3.199	2.207	1.450	4794
50	350	1182.83	0.0260938	14.262	0.075894	0.3840	3527	3.251	2.261	1.438	4993
50	400	1345.57	0.0228646	14.696	0.084747	0.4210	3759	3.304	2.316	1.427	5180
50	450	1513.62	0.0203438	15.089	0.093244	0.4565	3969	3.352	2.365	1.417	5344
50	500	1681.85	0.0187350	15.455	0.101495	0.4910	4174	3.399	2.413	1.409	5519
50	550	1854.48	0.0171800	15.725	0.107941	0.5203	4372	3.419	2.433	1.405	5587
50	600	2027.11	0.0156250	15.995	0.114388	0.5497	4560	3.439	2.454	1.402	5655
50	700	2372.38	0.0133950	16.535	0.127280	0.6084	4920	3.456	2.471	1.399	5791
50	800	2717.64	0.0117250	17.075	0.140173	0.6670	5258	3.461	2.476	1.398	5927
50	900	3062.91	0.0104250	17.443	0.153066	0.7257	5538	3.468	2.483	1.397	6062
50	1000	3408.17	0.0093850	17.812	0.165958	0.7844	5817	3.475	2.490	1.396	6198
50	1250	4280.19	0.0075250	18.600	0.193683	0.9079	6515	3.492	2.507	1.393	6370
50	1500	5152.21	0.0062600	19.248	0.221408	1.0315	7151	3.523	2.538	1.388	6542
50	1750	6044.21	0.0053803	19.802	0.249554	1.1427	7691	3.574	2.589	1.381	6785
50	2000	6936.21	0.0047108	20.285	0.277700	1.2539	8232	3.624	2.639	1.373	7029
50	2250	7860.19	0.0041841	20.666	0.306894	1.3571	8679	3.694	2.709	1.364	7313
50	2500	8784.18	0.0037361	21.048	0.336088	1.4604	9127	3.764	2.779	1.354	7597
50	2750	9752.59	0.0034267	21.429	0.373257	1.5571	9536	3.843	2.857	1.345	7976
50	3000	10720.00	0.0031174	21.810	0.396300	1.6539	9921	3.927	2.941	1.335	8107
50	3250	11713.75	0.0028957	22.112	0.434750	1.7462	10292	4.036	3.047	1.325	8432
50	3500	12707.50	0.0026739	22.415	0.473200	1.8385	10609	4.181	3.186	1.312	8756
50	3750	13801.25	0.0025067	22.718	0.545075	1.9273	10926	4.377	3.371	1.299	9570
50	4000	14895.00	0.0023394	23.020	0.616950	2.0160	11183	4.738	3.702	1.280	10383
50	4250	16195.00	0.0022067	23.360	0.778688	2.1042	11426	5.213	4.134	1.261	12299
50	4500	17495.00	0.0020741	23.700	0.940425	2.1924	11669	5.985	4.828	1.240	14215
50	4750	19251.25	0.0019633	24.040	1.279462	2.2835	11912	7.096	5.809	1.222	18108
50	5000	21007.50	0.0018525	24.380	1.618500	2.3746	12154	8.434	6.983	1.208	22001
50	5250	23621.25	0.0017546	24.982	2.228250	2.4738	12487	10.708	8.913	1.201	28657
50	5500	26235.00	0.0016568	25.585	2.838000	2.5731	12794	13.303	11.068	1.202	35313
50	5750	30220.00	0.0015667	26.188	3.748625	2.6816	13130	16.380	13.559	1.208	44827
50	6000	34205.00	0.0014767	26.790	4.659250	2.7902	13486	19.980	16.382	1.220	54341

EQUILIBRIUM HYDROGEN (OUTPUT FROM ET PROGRAMS)

PRESSURE PSIA	TEMPERATURE DEG. R	ENTHALPY BTU/LB	DENSITY LB/CU.FT	ENTROPY BTU/LB-R	CONDUCTIVITY BTU/H -FT-R	VISCOSITY LB-H /SQ.FT *10**10	VEL.SOUND FT/S	C-P BTU/LB-R	C-V BTU/LB-R	CP/CV RATIO	L FACTOR
150	25	-152.40	4.8529367	1.182	0.044696	1.5168	4259	1.567	1.147	1.366	1539
150	30	-119.00	4.7019630	1.472	0.054013	1.1558	4026	1.828	1.268	1.441	2093
150	35	-108.78	4.5408212	1.782	0.058005	0.8895	3765	2.209	1.441	1.533	2618
150	40	-96.36	4.3510571	2.122	0.060917	0.7149	3466	2.717	1.655	1.641	3199
150	45	-80.91	4.1541375	2.468	0.061324	0.5825	3082	3.396	1.889	1.798	3813
150	50	-60.84	3.7784168	2.924	0.059485	0.4735	2600	4.477	2.167	2.066	4529
150	55	-33.90	3.3386485	3.426	0.055268	0.2863	1668	7.309	2.540	2.878	5912
150	60	107.90	0.7136857	5.869	0.028110	0.1284	1120	6.977	3.044	2.292	5945
150	65	138.33	0.5762403	6.382	0.029159	0.1300	1246	5.658	3.142	1.801	5497
150	70	165.57	0.4986615	6.803	0.031144	0.1316	1336	5.327	3.293	1.618	5493
150	75	192.21	0.4433508	7.167	0.033281	0.1358	1411	5.175	3.419	1.514	5567
150	80	217.81	0.4019304	7.496	0.035240	0.1416	1483	5.098	3.509	1.453	5662
150	85	243.19	0.3692396	7.805	0.037309	0.1474	1547	5.026	3.539	1.420	5709
150	90	267.26	0.3430227	8.097	0.038929	0.1532	1612	4.948	3.555	1.392	5727
150	95	291.26	0.3196242	8.338	0.040301	0.1590	1673	4.848	3.510	1.381	5716
150	100	315.26	0.2998829	8.579	0.042246	0.1649	1733	4.744	3.459	1.372	5690
150	110	362.39	0.2680677	9.040	0.043505	0.1762	1848	4.511	3.295	1.369	5547
150	120	406.08	0.2427220	9.413	0.044765	0.1875	1977	4.284	3.112	1.377	5403
150	130	448.21	0.2220253	9.755	0.045349	0.1985	2076	4.086	2.942	1.389	5230
150	140	488.02	0.2047782	10.048	0.045934	0.2089	2175	3.907	2.789	1.401	5057
150	150	526.11	0.1901492	10.312	0.046777	0.2192	2274	3.727	2.635	1.415	4946
150	160	563.05	0.1775102	10.556	0.047620	0.2292	2362	3.621	2.540	1.426	4835
150	170	597.34	0.1665356	10.796	0.048463	0.2387	2450	3.514	2.445	1.437	4756
150	180	624.72	0.1570500	11.025	0.049372	0.2420	2538	3.407	2.351	1.450	4668
150	190	657.87	0.1487750	11.174	0.050787	0.2512	2615	3.358	2.307	1.456	4667
150	200	691.02	0.1405000	11.323	0.052202	0.2604	2692	3.308	2.263	1.462	4666
150	250	856.78	0.1102500	12.066	0.059276	0.3061	3027	3.194	2.173	1.470	4661
150	300	1021.06	0.0911625	12.645	0.067681	0.3471	3302	3.217	2.212	1.454	4817
150	350	1183.12	0.0782813	13.162	0.076417	0.3862	3550	3.265	2.266	1.441	5010
150	400	1346.47	0.0685938	13.600	0.085151	0.4227	3781	3.313	2.320	1.428	5192
150	450	1514.94	0.0610312	13.994	0.093544	0.4577	3990	3.359	2.368	1.419	5353
150	500	1683.55	0.0559525	14.360	0.101685	0.4918	4194	3.405	2.416	1.409	5524
150	550	1856.25	0.0513225	14.630	0.108084	0.5209	4390	3.423	2.435	1.406	5591
150	600	2028.94	0.0466925	14.900	0.114483	0.5500	4578	3.442	2.455	1.402	5658
150	700	2374.33	0.0400550	15.440	0.127281	0.6082	4936	3.458	2.472	1.399	5793
150	800	2719.73	0.0350750	15.980	0.140079	0.6664	5274	3.461	2.476	1.398	5927
150	900	3065.12	0.0311975	16.348	0.152877	0.7246	5552	3.468	2.483	1.397	6061
150	1000	3410.51	0.0280925	16.717	0.165675	0.7827	5831	3.475	2.490	1.396	6196
150	1250	4282.57	0.0224863	17.508	0.193250	0.9055	6528	3.493	2.508	1.393	6367
150	1500	5154.63	0.0186856	18.157	0.220825	1.0284	7162	3.523	2.538	1.388	6538
150	1750	6046.63	0.0160717	18.707	0.249263	1.1390	7701	3.574	2.589	1.381	6788
150	2000	6938.63	0.0140794	19.190	0.277700	1.2497	8241	3.624	2.639	1.373	7038
150	2250	7862.59	0.0125101	19.572	0.306883	1.3524	8688	3.694	2.709	1.364	7322
150	2500	8786.54	0.0111944	19.955	0.336065	1.4551	9135	3.764	2.779	1.354	7607
150	2750	9754.77	0.0102686	20.337	0.372970	1.5514	9547	3.840	2.855	1.345	7982
150	3000	10720.00	0.0093429	20.720	0.395300	1.6477	9934	3.920	2.935	1.336	8102
150	3250	11710.83	0.0086793	21.016	0.429917	1.7395	10312	4.012	3.024	1.326	8395
150	3500	12701.67	0.0080156	21.313	0.464533	1.8314	10650	4.122	3.131	1.317	8688
150	3750	13765.00	0.0075160	21.609	0.519008	1.9198	10988	4.260	3.261	1.306	9245
150	4000	14828.33	0.0070163	21.905	0.573483	2.0081	11274	4.488	3.473	1.292	9802
150	4250	16024.17	0.0066229	22.201	0.681867	2.0957	11546	4.782	3.743	1.278	11028
150	4500	17220.00	0.0062294	22.498	0.790250	2.1833	11804	5.245	4.162	1.260	12254
150	4750	18700.83	0.0059066	22.794	1.006792	2.2735	12039	5.906	4.750	1.243	14692
150	5000	20181.67	0.0055838	23.090	1.223333	2.3637	12274	6.698	5.451	1.229	17131
150	5250	22180.83	0.0053068	23.524	1.611583	2.4615	12552	7.934	6.682	1.187	21318
150	5500	24180.00	0.0050298	23.958	1.999833	2.5593	12809	9.384	7.941	1.182	25506
150	5750	27021.67	0.0047813	24.391	2.603417	2.6659	13088	11.156	9.267	1.204	31709
150	6000	29863.33	0.0045328	24.825	3.207000	2.7725	13381	12.905	10.967	1.177	37913

EQUILIBRIUM HYOROGEN (OUTPUT FROM ET PROGRAMS)

PRESSURE PSIA	TEMPERATURE DEG. R	ENTHALPY BTU/LB	OENSITY LB/CU.FT	ENTROPY BTU/LB-R	CONDUCTIVITY BTU/H -FT-R	VISCOSITY LB-H /SQ.FT *10**10	VEL.SOUNO FT/S	C-P BTU/LB-R	C-V BTU/LB-R	CP/CV RATIO	L FACTOR
500	25	-139.74	4.9339590	1.181	0.048695	1.6706	4440	1.565	1.183	1.322	1573
500	30	-107.91	4.8360185	1.391	0.055986	1.3443	4324	1.743	1.264	1.379	1979
500	35	-98.28	4.6990388	1.685	0.061232	1.0344	4113	2.073	1.427	1.453	2481
500	40	-86.79	4.5401384	1.996	0.065316	0.8378	3866	2.497	1.644	1.519	3020
500	45	-73.00	4.3757578	2.311	0.067162	0.6954	3576	3.001	1.887	1.590	3559
500	50	-56.38	4.1496206	2.673	0.067406	0.5899	3248	3.610	2.163	1.669	4105
500	55	-36.34	3.9070313	3.047	0.066351	0.5016	2886	4.386	2.502	1.753	4670
500	60	-12.67	3.6066790	3.461	0.063943	0.4271	2502	5.322	2.827	1.882	5248
500	65	16.56	3.2640811	3.945	0.060740	0.3629	2114	6.478	3.101	2.089	5888
500	70	52.35	2.8084677	4.467	0.057937	0.3024	1771	7.844	3.330	2.356	6641
500	75	94.04	2.3100633	5.036	0.054637	0.2561	1553	9.276	3.505	2.647	7118
500	80	135.92	1.8955697	5.559	0.051483	0.2269	1497	8.002	3.598	2.224	7069
500	85	174.19	1.6003867	6.031	0.049964	0.2107	1540	7.309	3.618	2.020	6796
500	90	210.13	1.4068329	6.447	0.049356	0.2034	1582	6.592	3.624	1.819	6607
500	95	239.29	1.2519303	6.745	0.049203	0.1997	1650	6.169	3.574	1.726	6452
500	100	268.45	1.1366356	7.043	0.049772	0.1996	1717	5.774	3.518	1.641	6299
500	110	324.96	0.9751344	7.604	0.049934	0.2026	1853	5.227	3.344	1.563	6055
500	120	374.24	0.8576120	8.027	0.050096	0.2089	1981	4.811	3.152	1.526	5811
500	130	421.17	0.7690770	8.410	0.050084	0.2169	2094	4.498	2.974	1.512	5575
500	140	464.59	0.6993679	8.732	0.050072	0.2251	2207	4.245	2.815	1.508	5339
500	150	505.65	0.6427857	9.016	0.050666	0.2335	2320	3.993	2.656	1.504	5202
500	160	545.13	0.5955868	9.275	0.051260	0.2422	2415	3.852	2.554	1.508	5064
500	170	583.16	0.5555336	9.527	0.051924	0.2509	2509	3.711	2.453	1.513	4968
500	180	614.62	0.5235000	9.726	0.052808	0.2576	2604	3.570	2.352	1.518	4837
500	190	648.57	0.4959167	9.878	0.054141	0.2663	2686	3.509	2.311	1.518	4827
500	200	682.51	0.4683333	10.031	0.055473	0.2751	2767	3.448	2.271	1.519	4818
500	250	852.22	0.3675000	10.793	0.062136	0.3188	3115	3.291	2.192	1.501	4772
500	300	1019.79	0.3038750	11.448	0.070027	0.3574	3385	3.281	2.232	1.470	4898
500	350	1184.15	0.2609375	11.944	0.078249	0.3941	3629	3.313	2.282	1.452	5068
500	400	1349.62	0.2286458	12.416	0.086564	0.4286	3856	3.345	2.333	1.434	5235
500	450	1519.54	0.2034375	12.798	0.094596	0.4620	4061	3.383	2.378	1.423	5384
500	500	1689.50	0.1825700	13.180	0.102350	0.4946	4262	3.422	2.424	1.412	5539
500	550	1862.42	0.1676625	13.451	0.108583	0.5228	4456	3.437	2.443	1.407	5604
500	600	2035.34	0.1527550	13.722	0.114817	0.5511	4640	3.452	2.461	1.403	5669
500	700	2381.18	0.1313500	14.263	0.127283	0.6076	4995	3.464	2.476	1.399	5798
500	800	2727.02	0.1152500	14.805	0.139750	0.6640	5328	3.484	2.478	1.398	5928
500	900	3072.86	0.1026550	15.173	0.152217	0.7205	5604	3.471	2.485	1.397	6057
500	1000	3418.70	0.0925550	15.542	0.164683	0.7770	5881	3.477	2.491	1.396	6187
500	1250	4290.90	0.0742925	16.333	0.191733	0.8973	6572	3.494	2.508	1.393	6357
500	1500	5163.10	0.0618445	16.983	0.218783	1.0175	7201	3.523	2.538	1.388	6527
500	1750	6055.10	0.0532503	17.537	0.248242	1.1260	7737	3.574	2.589	1.381	6797
500	2000	6947.10	0.0466770	18.020	0.277700	1.2350	8274	3.624	2.639	1.373	7068
500	2250	7870.95	0.0415014	18.401	0.306842	1.3358	8719	3.694	2.709	1.364	7356
500	2500	8794.80	0.0372984	18.783	0.335983	1.4367	9165	3.764	2.779	1.355	7643
500	2750	9762.40	0.0342154	19.164	0.371967	1.5313	9575	3.838	2.853	1.345	8004
500	3000	10730.00	0.0311323	19.545	0.394633	1.6260	9962	3.916	2.931	1.336	8135
500	3250	11715.00	0.0289219	19.838	0.426417	1.7163	10340	3.996	3.010	1.328	8401
500	3500	12700.00	0.0267116	20.130	0.458200	1.8067	10683	4.084	3.096	1.319	8668
500	3750	13740.00	0.0250485	20.422	0.499900	1.8935	11026	4.182	3.191	1.311	9014
500	4000	14780.00	0.0233855	20.715	0.541600	1.9803	11323	4.326	3.325	1.301	9359
500	4250	15903.33	0.0220793	20.984	0.610517	2.0658	11609	4.502	3.489	1.290	10078
500	4500	17026.67	0.0207732	21.252	0.679433	2.1513	11879	4.766	3.729	1.278	10798
500	4750	18301.67	0.0197083	21.521	0.803850	2.2385	12125	5.134	4.059	1.265	12140
500	5000	19576.67	0.0186434	21.790	0.928267	2.3257	12371	5.571	4.450	1.252	13483
500	5250	21128.33	0.0177393	22.121	1.143967	2.4183	12646	6.245	5.041	1.239	15758
500	5500	22680.00	0.0168352	22.453	1.359667	2.5110	12897	7.036	5.726	1.229	18033
500	5750	24666.67	0.0160322	22.784	1.700167	2.6108	13161	8.002	6.551	1.221	21483
500	6000	26653.33	0.0152293	23.115	2.040667	2.7107	13433	9.162	7.525	1.218	24894

EQUILIBRIUM HYDROGEN (OUTPUT FROM ET PROGRAMS)

PRESSURE PSIA	TEMPERATURE DEG. R	ENTHALPY BTU/LB	DENSITY LB/CU.FT	ENTROPY BTU/LB-R	CONDUCTIVITY BTU/H -FT-R	VISCOSITY LB-M /SQ.FT *10**10	VEL.SOUND FT/S	C-P BTU/LB-R	C-V BTU/LB-R	CP/CV RATIO	L FACTOR
1500	25	-104.56	5.1646222	1.210	0.060373	1.9612	4903	1.632	1.285	1.270	1685
1500	30	-104.56	5.1543206	1.231	0.061091	1.9179	4903	1.632	1.285	1.270	1727
1500	35	-67.30	5.0271414	1.489	0.068413	1.4588	4773	1.893	1.434	1.320	2220
1500	40	-57.03	4.8999621	1.774	0.074581	1.1743	4632	2.230	1.640	1.360	2721
1500	45	-44.94	4.7727828	2.066	0.078296	0.9808	4418	2.635	1.903	1.385	3213
1500	50	-30.74	4.6456035	2.357	0.080533	0.8471	4203	3.040	2.166	1.403	3695
1500	55	-14.26	4.5122087	2.658	0.081759	0.7432	3989	3.522	2.489	1.415	4159
1500	60	4.57	4.3539517	2.994	0.081943	0.6559	3774	4.011	2.818	1.423	4587
1500	65	25.66	4.1956948	3.330	0.081428	0.5937	3589	4.446	3.092	1.438	4952
1500	70	48.79	4.0374378	3.666	0.080912	0.5416	3404	4.801	3.282	1.463	5317
1500	75	73.70	3.8667813	4.001	0.079806	0.4965	3219	5.155	3.473	1.484	5586
1500	80	100.06	3.6878586	4.336	0.078700	0.4558	3034	5.365	3.547	1.512	5856
1500	85	127.57	3.5089358	4.670	0.077282	0.4244	2937	5.555	3.606	1.541	6030
1500	90	155.77	3.3300131	5.005	0.075864	0.3953	2840	5.684	3.630	1.566	6204
1500	95	184.35	3.1622829	5.294	0.074332	0.3752	2743	5.704	3.592	1.588	6270
1500	100	212.93	2.9945528	5.584	0.072540	0.3560	2646	5.724	3.555	1.610	6372
1500	110	269.38	2.6738837	6.139	0.070026	0.3282	2613	5.534	3.389	1.633	6278
1500	120	322.98	2.4123798	6.599	0.067512	0.3114	2591	5.268	3.204	1.644	6184
1500	130	374.49	2.1796805	7.018	0.065648	0.3053	2646	4.983	3.028	1.646	5976
1500	140	422.85	1.9901883	7.378	0.063784	0.2992	2701	4.712	2.870	1.642	5768
1500	150	468.51	1.8314030	7.694	0.063316	0.2972	2757	4.442	2.712	1.638	5629
1500	160	512.37	1.5930890	7.981	0.062848	0.2979	2826	4.252	2.599	1.636	5489
1500	170	553.57	1.5818402	8.295	0.062790	0.3011	2896	4.063	2.487	1.634	5378
1500	180	588.00	1.4854167	8.442	0.062670	0.3038	2966	3.874	2.374	1.632	5251
1500	190	624.06	1.4055000	8.607	0.063746	0.3112	3034	3.796	2.337	1.624	5222
1500	200	660.12	1.3255833	8.772	0.064823	0.3186	3102	3.718	2.299	1.617	5193
1500	250	840.43	1.0417167	9.596	0.070205	0.3558	3408	3.497	2.241	1.560	5049
1500	300	1016.89	0.8640583	10.296	0.076608	0.3869	3650	3.419	2.280	1.499	5108
1500	350	1187.56	0.7442556	10.809	0.083361	0.4163	3872	3.420	2.323	1.472	5221
1500	400	1358.88	0.6540139	11.298	0.090495	0.4452	4081	3.421	2.366	1.446	5349
1500	450	1532.80	0.5836250	11.686	0.097515	0.4739	4274	3.443	2.405	1.431	5468
1500	500	1706.50	0.5258500	12.075	0.104250	0.5023	4463	3.465	2.445	1.417	5583
1500	550	1880.06	0.4840750	12.348	0.110010	0.5282	4647	3.471	2.460	1.411	5641
1500	600	2053.62	0.4423000	12.620	0.115770	0.5541	4823	3.477	2.475	1.405	5698
1500	700	2400.74	0.3819500	13.165	0.127290	0.6060	5164	3.479	2.485	1.400	5814
1500	800	2747.86	0.3363000	13.710	0.138810	0.6578	5486	3.473	2.483	1.399	5929
1500	900	3094.98	0.3004500	14.080	0.150330	0.7097	5756	3.478	2.489	1.397	6045
1500	1000	3442.10	0.2715000	14.450	0.161850	0.7615	6026	3.483	2.495	1.396	6161
1500	1250	4314.70	0.2192500	15.240	0.187400	0.8748	6701	3.496	2.509	1.393	6327
1500	1500	5187.30	0.1833500	15.888	0.212950	0.9880	7317	3.524	2.538	1.388	6493
1500	1750	6079.30	0.1581188	16.442	0.245325	1.0908	7845	3.574	2.588	1.381	6824
1500	2000	6971.30	0.1387725	16.925	0.277700	1.1930	8373	3.623	2.638	1.373	7156
1500	2250	7894.85	0.1235213	17.306	0.306725	1.2885	8813	3.693	2.708	1.364	7450
1500	2500	8818.40	0.1111950	17.688	0.335750	1.3840	9253	3.763	2.778	1.355	7745
1500	2750	9784.20	0.1020625	18.069	0.369100	1.4740	9660	3.836	2.851	1.345	8066
1500	3000	10750.00	0.0929300	18.450	0.394300	1.5640	10044	3.912	2.927	1.336	8252
1500	3250	11735.00	0.0863450	18.741	0.424850	1.6500	10421	3.987	3.002	1.328	8505
1500	3500	12720.00	0.0797600	19.033	0.455400	1.7360	10769	4.071	3.084	1.320	8758
1500	3750	13750.00	0.0748250	19.324	0.491500	1.8185	11118	4.166	3.175	1.312	9029
1500	4000	14780.00	0.0698900	19.615	0.527600	1.9010	11431	4.262	3.267	1.305	9299
1500	4250	15870.00	0.0660125	19.870	0.579150	1.9805	11736	4.383	3.380	1.297	9826
1500	4500	16960.00	0.0621350	20.125	0.630700	2.0600	12025	4.605	3.582	1.286	10352
1500	4750	18145.00	0.0589825	20.380	0.714150	2.1385	12289	4.828	3.784	1.276	11188
1500	5000	19330.00	0.0558300	20.635	0.797600	2.2170	12554	5.051	3.986	1.267	12024
1500	5250	20685.00	0.0531750	20.913	0.934300	2.2950	12825	5.553	4.424	1.255	13441
1500	5500	22040.00	0.0505200	21.190	1.071000	2.3730	13068	6.055	4.863	1.245	14858
1500	5750	23650.00	0.0481925	21.467	1.283500	2.4535	13310	6.558	5.301	1.237	16983
1500	6000	25260.00	0.0458650	21.745	1.496000	2.5340	13551	7.248	5.891	1.230	19107

EQUILIBRIUM HYDROGEN (OUTPUT FROM ET PROGRAMS)

PRESSURE PSIA	TEMPERATURE DEG. R	ENTHALPY BTU/LB	DENSITY LB/CU.FT	ENTROPY BTU/LB-R	CONDUCTIVITY BTU/H -FT-R	VISCOSITY LB-H /SQ.FT *10**10	VEL.SOUND FT/S	C-P BTU/LB-R	C-V BTU/LB-R	CP/CV RATIO	L FACTOR
4500	25	-5.75	5.5473082	1.366	0.091561	2.3119	5968	1.901	1.575	1.207	2195
4500	30	-5.75	5.5473082	1.366	0.091561	2.3119	5968	1.901	1.575	1.207	2195
4500	35	-5.75	5.5473082	1.366	0.091561	2.3119	5968	1.901	1.575	1.207	2195
4500	40	33.72	5.5323171	1.411	0.093050	2.2159	5945	1.946	1.611	1.208	2278
4500	45	44.46	5.4485682	1.662	0.099812	1.8054	5813	2.295	1.885	1.217	2756
4500	50	56.96	5.3648192	1.914	0.104504	1.5407	5681	2.643	2.161	1.223	3218
4500	55	71.02	5.2810703	2.173	0.107840	1.3480	5550	3.054	2.498	1.222	3654
4500	60	87.39	5.1973214	2.463	0.109420	1.1935	5418	3.470	2.840	1.222	4048
4500	65	105.79	5.1135724	2.753	0.110400	1.0948	5301	3.829	3.128	1.224	4404
4500	70	125.52	5.0298235	3.043	0.110920	1.0089	5184	4.105	3.334	1.231	4712
4500	75	146.72	4.9409797	3.328	0.111040	0.9355	5067	4.380	3.540	1.237	4972
4500	80	169.20	4.8487393	3.610	0.110700	0.8706	4950	4.525	3.625	1.248	5185
4500	85	192.21	4.7564989	3.892	0.109960	0.8188	4874	4.653	3.693	1.260	5354
4500	90	215.67	4.6642586	4.174	0.108960	0.7703	4797	4.741	3.725	1.273	5484
4500	95	239.54	4.5720182	4.416	0.107720	0.7326	4721	4.759	3.692	1.289	5578
4500	100	263.41	4.4797778	4.657	0.106460	0.6963	4645	4.777	3.659	1.305	5636
4500	110	310.85	4.2978369	5.123	0.103494	0.6385	4559	4.693	3.497	1.342	5673
4500	120	357.05	4.1260550	5.519	0.100528	0.5944	4474	4.575	3.315	1.380	5711
4500	130	402.27	3.9542731	5.887	0.097499	0.5615	4435	4.445	3.139	1.416	5669
4500	140	446.02	3.7824912	6.211	0.094470	0.5287	4397	4.313	2.979	1.448	5627
4500	150	488.49	3.6282626	6.504	0.092901	0.5052	4359	4.181	2.818	1.484	5597
4500	160	530.10	3.4857361	6.776	0.091332	0.4881	4349	4.068	2.698	1.508	5567
4500	170	569.77	3.3432096	7.024	0.090207	0.4744	4340	3.955	2.578	1.534	5533
4500	180	602.73	3.1993333	7.204	0.088946	0.4488	4331	3.843	2.459	1.563	5495
4500	190	639.74	3.0852222	7.366	0.089338	0.4516	4337	3.797	2.423	1.567	5484
4500	200	676.76	2.9711111	7.527	0.089730	0.4544	4344	3.752	2.387	1.572	5474
4500	250	861.82	2.4976944	8.336	0.091692	0.4684	4418	3.637	2.346	1.550	5420
4500	300	1044.10	2.1500000	9.035	0.094115	0.4755	4528	3.598	2.384	1.509	5439
4500	350	1222.23	1.8950000	9.571	0.096943	0.4822	4652	3.574	2.411	1.482	5484
4500	400	1400.44	1.6939444	10.080	0.100926	0.4942	4787	3.551	2.439	1.456	5554
4500	450	1578.99	1.5322500	10.483	0.105242	0.5090	4934	3.550	2.466	1.440	5625
4500	500	1757.50	1.4504500	10.705	0.109950	0.5255	5082	3.549	2.492	1.424	5714
4500	550	1932.98	1.3423500	10.983	0.114290	0.5453	5233	3.540	2.499	1.417	5751
4500	600	2108.46	1.2342500	11.260	0.118630	0.5650	5384	3.532	2.505	1.410	5788
4500	700	2459.42	1.0755500	11.815	0.127310	0.6045	5682	3.514	2.504	1.403	5862
4500	800	2810.38	0.9536000	12.370	0.135990	0.6440	5971	3.498	2.498	1.400	5935
4500	900	3161.34	0.8567000	12.740	0.144670	0.6835	6222	3.499	2.501	1.399	6009
4500	1000	3512.30	0.7779500	13.110	0.153350	0.7231	6473	3.500	2.505	1.398	6083
4500	1250	4386.10	0.6336250	13.900	0.174400	0.8179	7099	3.504	2.514	1.394	6238
4500	1500	5259.90	0.5332000	14.547	0.195450	0.9127	7677	3.525	2.539	1.389	6393
4500	1750	6151.90	0.4617500	15.097	0.236575	1.0009	8179	3.574	2.588	1.381	6905
4500	2000	7043.90	0.4066750	15.580	0.277700	1.0870	8682	3.622	2.637	1.374	7418
4500	2250	7966.55	0.3630000	15.963	0.306375	1.1685	9106	3.692	2.706	1.364	7735
4500	2500	8889.20	0.3273000	16.345	0.335050	1.2500	9530	3.761	2.776	1.355	8052
4500	2750	9849.60	0.3008250	16.728	0.360500	1.3280	9925	3.833	2.848	1.346	8254
4500	3000	10810.00	0.2743500	17.110	0.394100	1.4060	10299	3.907	2.921	1.337	8592
4500	3250	11795.00	0.2553500	17.400	0.423650	1.4800	10667	3.981	2.995	1.329	8846
4500	3500	12780.00	0.2363500	17.690	0.453200	1.5540	11006	4.055	3.068	1.322	9099
4500	3750	13810.00	0.2217925	17.980	0.484700	1.6255	11345	4.130	3.141	1.315	9415
4500	4000	14840.00	0.2072350	18.270	0.516200	1.6970	11659	4.205	3.214	1.308	9730
4500	4250	15900.00	0.1959525	18.516	0.553850	1.7665	11967	4.293	3.298	1.302	9997
4500	4500	16960.00	0.1846700	18.763	0.591500	1.8360	12262	4.432	3.425	1.294	10264
4500	4750	18075.00	0.1754400	19.009	0.642050	1.9035	12539	4.571	3.553	1.287	10727
4500	5000	19190.00	0.1662100	19.255	0.692600	1.9710	12816	4.711	3.681	1.280	11190
4500	5250	20385.00	0.1583500	19.489	0.765800	2.0370	13086	5.005	3.942	1.270	11927
4500	5500	21580.00	0.1507400	19.723	0.839000	2.1030	13335	5.300	4.202	1.261	12665
4500	5750	22890.00	0.1441425	19.956	0.944500	2.1695	13578	5.595	4.463	1.254	13735
4500	6000	24200.00	0.1375450	20.190	1.050000	2.2360	13816	5.995	4.792	1.251	14804

APPENDIX B. PROGRAM LISTINGS: CDC AND IBM

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 FUNCTION PTENTH(PRES,TEMP)
 COMMON/PTENTHAL/H(1183)
 DIMENSION LOC(29),JP(24),MX(24),BP(24),DP(24),BT(29),DT(24),PS(20)
1,TS(20),TL(10),HS(10)
 DATA((H(I),I=1,  91)=10720.,10750.,10780.,12690.,12720.,12750.,147
180.,14780.,14810.,17060.,16960.,16960.,19700.,19330.,19260.,10720.
2,10720.,10730.,12710.,12700.,12700.,14920.,14810.,14780.,17620.,17
3140.,17030.,21390.,19940.,19580.,10720.,10720.,10720.,12730.,12710
4.,12700.,15020.,14910.,14850.,18000.,17550.,17330.,22560.,21170.,2
50520.,10720.,10720.,10720.,10720.,11520.,11500.,11500.,11520.,1236
60.,12320.,12310.,12320.,13260.,13180.,13150.,13160.,14250.,14090.,
714040.,14050.,15400.,15090.,14980.,14940.,16780.,16220.,16030.,160
830.,18500.,17540.,17200.,17120.,20680.,19110.,18560.,18430.,23480.
9,21030.,20170.,19980.,27100.,23410.,22100.,21520.,10720.,10720.)
 DATA((H(I),I=92, 188)=10720.,10720.,10720.,11540.,11520.,11520.,11
1510.,11510.,12410.,12370.,12360.,12350.,12340.,13390.,13300.,13260
2.,13230.,13220.,14520.,14330.,14250.,14210.,14170.,15900.,15560.,1
35400.,15310.,15250.,17680.,17060.,16780.,16620.,16500.,20030.,1897
40.,18490.,18210.,18020.,23180.,21440.,20670.,20210.,19890.,27390.,
524680.,23470.,22750.,22260.,32960.,28900.,27080.,26000.,25260.,166
63.,1748.,3407.,3524.,5151.,5272.,6935.,7056.,8783.,8901.,10720.,10
7820.,419.7,385.5,377.1,385.1,401.5,830.7,823.8,826.2,835.9,851.,12
861.,1270.,1282.,1297.,1315.,1668.,1687.,1706.,1724.,1743.,102.2,12
99.1,159.,159.9,182.2,209.4,221.1,238.9,263.6,284.8,299.1,321.3)
 DATA((H(I),I=189, 295)=350.8,362.7,383.,419.,429.4,446.8,88.34,86.
13,87.94,91.61,96.51,102.2,162.4,155.2,152.9,153.5,156.1,159.9,232.
25,224.,219.6,218.2,218.9,221.1,299.,291.1,286.2,284.,283.7,284.8,3
364.3,357.6,353.2,350.8,350.1,350.8,431.8,424.8,422.9,420.9,418.9,4
419.,126.4,109.2,98.33,91.88,88.34,201.9,188.4,177.2,168.7,162.4,26
55.3,255.1,246.2,238.6,232.5,325.1,317.4,310.4,304.2,299.,384.9,378
6.8,373.4,368.5,364.3,448.8,444.5,440.3,436.,431.8,222.2,174.7,126.
74,266.9,233.7,201.9,313.5,288.4,265.3,362.4,342.7,325.1,414.5,398.
87,384.9,465.8,457.3,448.8,-36.57,-.635,35.58,-24.27,11.37,46.52,-1
90.41,24.51,59.14,5.035,39.1,73.14,22.05,54.99,88.32,40.42,72.09)
 DATA(LOC=1,16,31,46,90,145,157,177,195,231,261,279,306,378,441,468
1,558,612,642,682,847,892,1028,1073,1103,1112,1121,1130,1160)
 DATA(JP=3,3,3,4,5,2,5,3,6,5,3,3,6,9,9,9,9,5,5,11,9,17,5,5)
 DATA(MX=1,1,1,2,3,0,3,1,4,3,1,1,4,7,7,7,7,3,3,9,7,15,3,3)
 DATA(BP=0,-100.,0,0,.999999,0,300.,2645.28,1175.68,587.84,0,2645.2
18,1175.68,0,587.84,587.84,293.92,0,440.88,293.92,176.352,176.352,0
2,117.568)
 DATA(DP=1500.,300.,40.,10.,1.,5000.,1100.,1175.68,293.92,146.96,
1293.92,1175.68,293.92,146.96,73.48,73.48,36.74,73.48,36.74,14.696,
214.696,7.348,44.088,14.696)
 DATA(BT=3000.,3000.,3000.,3000.,3000.,500.,170.,90.,90.,90.,90.,
132.4,30.6,27.,75.6,59.4,72.,72.,59.4,59.4,64.8,59.4,28.8,54.,5000.
2,5000.,5000.,5000.,5000.)
 DATA(DT=500.,500.,500.,200.,200.,500.,110.,18.,18.,18.,18.,7.2,5.4
1,5.4,7.2,1.8,3.6,3.6,1.8,.9,1.8,,.9,5.4,1.8)
 DATA(PS=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
1.,185.,186.5,187.25,187.46875,187.506,187.6385)
 DATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4)
 DATA(TL=24.846,27.175,29.310,31.299,33.176,34.962,36.672,38.317,
139.904,41.456)
 DATA(HS=-157.82,-136.56,-115.76,-95.46,-75.59,-56.08,-36.93,-17.99
1,0.69,19.30)
 P=PRES
```

```
 FUNCTION PTENTH(PRES,TEMP)
 DIMENSION LOC(29),JP(24),MX(24),BP(24),DP(24),BT(29),DT(24),PS(20)
1,TS(20),TL(10),HS(10), H(1183)
 DIMENSION AA( 93),AB(100),AC(110),AD(101),AE(101),AF(113),AG(103)
1 ,AH(112),AI(106),AJ(119),AK(104),AL( 21)
 EQUIVALENCE( H,AA),( H(  94),AB),( H( 194),AC),( H( 304),AD)
1    ,( H( 405),AE),( H( 506),AF),( H( 619),AG),( H( 722),AH)
2    ,( H( 834),AI),( H( 940),AJ),( H(1059),AK),( H(1163),AL)
 DATA LOC/1,16,31,46,90,145,157,177,195,231,261,279,306,378,441,468
1,558,612,642,682,847,892,1028,1073,1103,1112,1121,1130,1160/
 DATA JP/3,3,3,4,5,2,5,3,6,5,3,3,6,9,9,9,9,5,5,11,9,17,5,5/
 DATA MX/1,1,1,2,3,0,3,1,4,3,1,1,4,7,7,7,7,3,3,9,7,15,3,3/
 DATA BP/0.,-100.,0.,0.,.9999999,0.,300.,2645.28,1175.68,587.84,0.,
12645.28,1175.68,0.,587.84,587.84,293.92,0.,440.88,293.92,176.352,1
276.352,0.,117.568/
 DATA DP/1500.,300.,40.,10.,1.,5000.,1100.,1175.68,293.92,146.96,
1293.92,1175.68,293.92,146.96,73.48,73.48,36.74,73.48,36.74,14.696,
214.696,7.348,44.088,14.696/
 DATA BT/3000.,3000.,3000.,3000.,3000.,500.,170.,90.,90.,90.,90.,
132.4,30.6,27.,75.6,59.4,72.,72.,59.4,59.4,64.8,59.4,28.8,54.,
25000.,5000.,5000.,5000.,5000./
 DATA DT/500.,500.,500.,200.,200.,500.,110.,18.,18.,18.,18.,7.2,5.4
1,5.4,7.2,1.8,3.6,3.6,1.8,.9,1.8,.9,5.4,1.8/
 DATA PS/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
1.,185.,186.5,187.25,187.46875,187.506,187.6385/
 DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4/
 DATA TL/24.846,27.175,29.310,31.299,33.176,34.962,36.672,38.317,
139.904,41.456/
 DATA HS/-157.82,-136.56,-115.76,-95.46,-75.59,-56.08,-36.93,-17.99
1,0.69,19.30/
 DATAAA/10720.,10750.,10780.,12690.,12720.,12750.,14780.,14780.,148
110.,17060.,16960.,16960.,19700.,19330.,19260.,10720.,10720.,10730.
2,12710.,12700.,12700.,14920.,14810.,14780.,17620.,17140.,17030.,21
3390.,19940.,19580.,10720.,10720.,10720.,12730.,12710.,12700.,15020
4.,14910.,14850.,18000.,17550.,17330.,22560.,21170.,20520.,10720.,1
50720.,10720.,10720.,11520.,11500.,11500.,11520.,12360.,12320.,1231
60.,12320.,13260.,13180.,13150.,13160.,14250.,14090.,14040.,14050.,
715400.,15090.,14980.,14940.,16780.,16220.,16030.,16030.,18500.,175
840.,17200.,17120.,20680.,19110.,18560.,18430.,23480.,21030.,20170.
9,19980.,27100.,23410.,22100.,21520.,10720.,10720.,10720.,10720./
 DATAAB/10720.,11540.,11520.,11520.,11510.,11510.,12410.,12370.,123
160.,12350.,12340.,13390.,13300.,13260.,13230.,13220.,14520.,14330.
2,14250.,14210.,14170.,15900.,15560.,15400.,15310.,15250.,17680.,17
3060.,16780.,16620.,16500.,20030.,18970.,18490.,18210.,18020.,23180
4.,21440.,20670.,20210.,19890.,27390.,24680.,23470.,22750.,22260.,3
52960.,28900.,27080.,26000.,25260.,1663.,1748.,3407.,3524.,5151.,52
672.,6935.,7056.,8783.,8901.,10720.,10820.,419.7,385.5,377.1,385.1,
7401.5,830.7,823.8,826.2,835.9,851.,1261.,1270.,1282.,1297.,1315.,1
8668.,1687.,1706.,1724.,1743.,102.2,129.1,159.,159.9,182.2,209.4,22
91.1,238.9,263.6,284.8,299.1,321.3,350.8,362.7,383.,419.,429.4/
 DATAAC/446.8,88.34,86.3,87.94,91.61,96.51,102.2,162.4,155.2,152.9,
1153.5,156.1,159.9,232.5,224.,219.6,218.2,218.9,221.1,299.,291.1,28
26.2,284.,283.7,284.8,364.3,357.6,353.2,350.8,350.1,350.8,431.8,424
3.8,422.9,420.9,418.9,419.,126.4,109.2,98.33,91.88,88.34,201.9,188.
44,177.2,168.7,162.4,265.3,255.1,246.2,238.6,232.5,325.1,317.4,310.
54,304.2,299.,384.9,378.8,373.4,368.5,364.3,448.8,444.5,440.3,436.,
6431.8,222.2,174.7,126.4,266.9,233.7,201.9,313.5,288.4,265.3,362.4,
```

```
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.LT.90.0) GO TO 10
      IF(T.LT.3000.0) GO TO 5
      IF(T.GE.6000.0)T=5999.9999
      IF(P.LT.30.0) GO TO 3
      IF(P.LT.80.0) GO TO 2
      IF(P.LT.500.0) GO TO 1
      N=1
      N1=25
      GO TO 33
    1 N=2
      N1=26
      GO TO 33
    2 N=3
      N1=27
      GO TO 33
    3 IF(P.LT.5.0) GO TO 4
      N=4
      N1=29
      GO TO 33
    4 N=5
      N1=28
      GO TO 33
    5 IF(T.LT.180.0) GO TO 70
      IF(T.LT.500.0) GO TO 6
      N=6
      GO TO 33
    6 N=7
      GO TO 33
   70 IF(P.LT.1175.68) GO TO 8
      IF(P.LT.2645.28) GO TO 7
      N=8
      GO TO 33
    7 N=9
      GO TO 33
    8 IF(P.LT.587.84) GO TO 9
      N=10
      GO TO 33
    9 N=11
      GO TO 33
   10 IF(P.LT.1175.68) GO TO 12
      IF(P.LT.2645.28) GO TO 11
      N=12
      GO TO 30
   11 N=13
      GO TO 30
   12 IF(T.GE.59.4) GO TO 15
      N=14
      IF(P.GE.187.6385) GO TO 30
      DO 13 I=2,20
      IF(P-PS(I))14,14,13
   13 CONTINUE
      I=20
   14 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
      IF(T.LE.TM) GO TO 30
      GO TO 23
   15 IF(P.LT.293.92) GO TO 20
```

```
7342.7,325.1,414.5,398.7,384.9,465.8,457.3,448.8,-36.57,-.635,35.58
8,-24.27,11.37,46.52,-10.41,24.51,59.14,5.035,39.1,73.14,22.05,54.9
99,88.32,40.42,72.09,104.7,59.98,90.22,122.,80.6,109.3,140.1,102.2/
 DATAAD/129.1,159.,-85.55,-76.17,-66.88,-57.67,-48.54,-39.65,-76.14
1,-67.02,-57.86,-48.74,-39.63,-30.42,-65.46,-56.63,-47.73,-38.82,-2
29.88,-20.81,-53.51,-45.09,-36.51,-27.86,-19.15,-10.41,-40.29,-32.3
38,-24.23,-15.89,-7.47,1.17,-25.74,-18.56,-10.9,-2.96,5.14,13.54,-9
4.88,-3.58,3.41,10.88,18.6,26.64,7.34,12.46,18.68,25.57,32.85,40.42
5,25.89,29.54,34.83,41.04,47.82,54.09,45.69,47.61,51.79,57.23,63.43
6,70.29,66.61,66.57,69.53,74.12,79.68,86.,88.34,86.3,87.94,91.61,96
7.51,102.2,-129.4,-124.6,-119.8,-115.,-110.3,-105.5,-100.8,-96.08,-
891.37,-119.4,-114.9,-110.4,-105.8,-101.2,-96.51,-91.88,-87.21,-82.
941,-107.4,-103.4,-99.26,-94.98,-90.6,-86.19,-81.71,-77.23,-72.58/
 DATAAE/-92.77,-89.71,-86.23,-82.46,-78.47,-74.37,-70.19,-65.93,-61
1.48,-73.53,-72.8,-70.77,-67.93,-64.6,-61.,-57.2,-53.28,-49.11,-41.
228,-49.57,-51.87,-50.91,-48.74,-45.9,-42.7,-39.24,-35.44,39.,-18.9
3,-26.49,-30.41,-30.39,-28.88,-26.55,-23.74,-20.45,46.52,40.72,37.0
41,34.66,33.21,32.38,32.04,32.06,32.49,88.56,79.51,72.99,68.32,65.0
51,62.69,61.11,60.1,59.63,126.4,117.8,109.2,103.8,98.33,95.1,91.88,
690.11,88.34,-30.39,-29.64,-28.88,-27.72,-26.55,-25.15,-23.74,-22.1
77,-20.45,-23.63,-23.33,-22.72,-21.84,-20.77,-19.57,-18.24,-16.82,-
815.17,-16.47,-16.59,-16.27,-15.65,-14.8,-13.76,-12.58,-11.27,-9.88
9,-8.89,-9.51,-9.56,-9.23,-8.6,-7.75,-6.72,-5.57,-4.14,-.85,-2.07/
 DATAAF/-2.56,-2.55,-2.18,-1.55,-.7,.3,1.6,7.68,5.74,4.76,4.38,4.45
1,4.85,5.5,6.34,7.34,16.7,13.93,12.37,11.57,11.3,11.45,11.88,12.53,
213.52,26.21,22.5,20.28,19.02,18.39,18.24,18.43,18.89,19.7,36.36,31
3.44,28.52,26.72,25.7,25.22,25.15,25.4,25.89,46.52,40.72,37.01,34.6
46,32.21,32.38,32.04,32.06,32.49,95.17,80.15,65.54,53.23,44.02,37.3
58,32.55,28.95,26.21,115.7,104.1,92.37,81.05,70.96,62.55,55.86,50.6
62,46.52,132.6,123.2,113.6,104.,94.83,86.45,79.09,72.87,67.54,147.7
7,139.7,131.4,123.3,115.3,107.6,100.5,94.17,88.56,161.6,154.5,147.3
8,140.2,133.2,126.3,119.8,113.7,107.5,174.7,168.7,162.6,156.6,150.5
9,144.5,138.5,132.4,126.4,177.4,161.6,143.4,121.8,95.2,186.3,171.7/
 DATAAG/155.4,136.8,115.7,195.1,181.6,166.8,150.5,132.6,204.,191.4,
1177.9,163.3,147.7,212.9,201.2,188.7,175.5,161.6,222.2,210.3,198.5,
2186.6,174.7,-30.41,-30.63,-30.67,-30.59,-30.39,-22.5,-23.09,-23.44
3,-23.6,-23.63,-13.86,-14.96,-15.7,-16.18,-16.47,-4.37,-6.14,-7.4,-
48.28,-8.89,6.14,3.46,1.54,.16,-.85,17.79,13.93,11.18,9.17,7.68,30.
552,25.28,21.52,18.77,16.7,44.02,37.38,32.55,28.95,26.21,-26.48,-27
6.26,-27.92,-28.45,-28.92,-29.3,-29.62,-29.88,-30.1,-30.28,-30.41,-
721.02,-22.11,-23.,-23.75,-24.38,-24.9,-25.36,-25.73,-26.06,-26.32,
8-26.46,-14.94,-16.45,-17.67,-18.68,-19.53,-20.25,-20.85,-21.37,-21
9.81,-22.19,-22.5,-8.03,-10.16,-11.84,-13.21,-14.34,-15.28,-16.09/
 DATAAH/-16.77,-17.35,-17.85,-18.18,.01,-3.05,-5.37,-7.22,-8.72,-9.
196,-11.01,-11.9,-12.66,-13.31,-13.86,9.41,5.12,1.87,-.61,-2.6,-4.2
23,-5.58,-6.72,-7.69,-8.52,-9.12,20.71,14.43,10.1,6.72,4.1,1.99,.26
3,-1.19,-2.42,-3.47,-4.37,33.45,25.24,19.25,14.8,11.45,8.74,6.54,4.
471,3.17,1.87,.88,45.95,36.79,29.44,23.8,19.44,16.07,13.29,11.02,9.
512,7.51,6.14,56.31,47.94,39.94,33.35,28.09,23.89,20.51,17.76,15.44
6,13.49,11.96,66.66,58.21,50.23,43.14,37.17,32.25,28.21,24.89,22.11
7,19.78,17.79,74.56,67.32,59.73,52.62,46.26,40.81,36.2,32.35,29.11,
826.37,24.15,82.45,75.41,68.34,61.5,55.11,49.35,44.34,40.03,36.35,3
93.21,30.52,88.81,82.65,76.12,69.66,63.44,57.66,52.4,47.78,43.74/
 DATAAI/40.24,37.27,95.17,89.16,83.15,77.23,71.38,65.54,60.61,55.69
1,51.39,47.7,44.02,104.9,98.01,90.23,81.37,71.12,59.16,45.59,31.88,
220.95,113.3,107.3,100.8,93.63,85.67,76.79,66.95,56.39,45.95,120.4,
3115.8,110.2,104.2,97.75,90.73,83.18,75.1,66.66,127.6,123.6,118.7,1
413.4,107.8,102.1,95.85,89.29,82.45,134.8,130.4,126.1,121.8,116.4,1
```

```
      IF(P.GE.587.84) GO TO 18
      IF(T.GE.72.0) GO TO 17
      IF(P.LT.440.88) GO TO 16
      N=19
      GO TO 33
   16 N=20
      GO TO 33
   17 N=17
      GO TO 33
   18 IF(T.LT.75.6) GO TO 19
      N=15
      GO TO 33
   19 N=16
      GO TO 33
   20 IF(T.GE.72.0)GO TO 22
      IF(P.LT.176.352) GO TO 23
      IF(T.LT.65.7) GO TO 21
      N=21
      GO TO 33
   21 N=22
      GO TO 33
   22 N=18
      GO TO 33
   23 N=23
      IF(P.GE.117.568.AND.T.LE.63.) N=24
      GO TO 33
   30 F=P/587.84
      I=F
      IF(I.GT.8) I=8
      F=F-I
      FP=1.0-F
      TQ=FP*TL(I+1)+F*TL(I+2)
      IF(T.GE.TQ) GO TO 33
      PTENTH=FP*HS(I+1)+F*HS(I+2)
      RETURN
   33 IF(T.LT.5000.)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N1))/DT(N)
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      PTENTH=FP*FT*H(I)+F*FT*H(I+1)+FP*FF*H(J)+F*FF*H(J+1)
      RETURN
      END

      SUBROUTINE PTHDATA1
      COMMON/PTENTHAL/H(1183)
      DATA((H(I),I=296, 395)=104.7,59.98,90.22,122.,80.6,109.3,140.1,102
     1.2,129.1,159.,-85.55,-76.17,-66.88,-57.67,-48.54,-39.65,-76.14,-67
     2.02,-57.86,-48.74,-39.63,-30.42,-65.46,-56.63,-47.73,-38.82,-29.88
     3,-20.81,-53.51,-45.09,-36.51,-27.86,-19.15,-10.41,-40.29,-32.38,-2
     44.23,-15.89,-7.47,1.17,-25.74,-18.56,-10.9,-2.96,5.14,13.54,-9.88,
     511.1,105.8,100.5,95.17,65.16,51.82,-3.47,-10.85,-14.26,-16.57,-18.
     637,-19.82,-21.02,-22.04,-22.92,-23.69,-24.38,-24.99,-25.54,-26.04,
     7-26.48,74.13,67.69,57.36,39.09,5.99,-3.23,-7.63,-10.52,-12.65,-14.
     837,-15.78,-16.98,-18.,-18.9,-19.69,-20.39,-21.02,83.09,77.17,70.3,
     961.77,50.17,31.98,12.48,3.55,-1.09,-4.43,-6.93,-8.9,-10.49,-11.86/
      DATAAJ/-13.03,-14.04,-14.94,89.04,84.56,79.06,72.84,65.52,56.54,44
     1.99,30.6,17.92,9.94,4.89,1.51,-1.24,-3.43,-5.22,-6.72,-8.03,94.98,
     290.77,86.16,81.07,75.42,69.01,61.59,52.84,42.58,31.64,22.32,15.46,
     310.57,6.94,4.28,1.95,.01,99.84,96.27,92.24,87.87,83.15,77.97,72.25
     4,65.86,58.68,50.67,42.06,33.59,26.31,20.44,15.88,12.29,9.41,104.7,
     5101.3,97.67,93.82,89.72,85.3,80.54,75.38,69.76,63.63,56.98,49.93,4
     62.76,35.94,29.96,24.89,20.71,109.1,105.9,102.6,99.07,95.49,91.5,87
     7.5,82.95,78.39,73.16,67.98,62.13,56.27,50.2,44.14,38.79,33.45,71.,
     837.3,0.,0.,0.,84.3,57.3,0.,0.,0.,97.6,72.9,43.,0.,0.,110.9,89.8,62
     9.,0.,0.,124.2,107.4,83.28,48.,0.,137.5,123.5,105.9,81.,0.,150.7/
      DATAAK/138.8,124.9,108.5,85.9,164.1,153.6,142.,128.9,113.3,177.4,1
     167.9,158.,147.,134.8,78.8,62.3,45.4,0.,0.,89.8,78.3,61.,41.9,29.1,
     298.8,90.1,78.9,60.1,27.8,106.7,99.5,91.1,80.6,65.2,114.,107.8,100.
     38,92.8,83.1,120.8,115.2,109.2,102.5,95.,19700.,19330.,19260.,23000
     4.,22040.,21810.,27350.,25260.,24730.,21390.,19940.,19580.,27180.,2
     53580.,22680.,36230.,28590.,26650.,22560.,21170.,20520.,30320.,2664
     60.,25020.,42210.,35060.,31640.,32960.,28900.,27090.,26000.,25260.,
     740130.,34330.,31710.,30130.,29050.,49050.,41170.,37530.,35320.,338
     810.,59610.,49530.,44710.,41750.,39690.,71190.,59240.,53210.,49420.
     9,46750.,82920.,69950.,62910.,58310.,55020.,27100.,23410.,22100./
      DATAAL/21520.,31750.,26350.,24440.,23590.,37610.,30000.,27280.,260
     170.,44900.,34480.,30730.,29050.,53610.,39900.,34870.,32610.,63710.
     2,46340.,39810.,36850./
      P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.LT.90.0) GO TO 10
      IF(T.LT.3000.0) GO TO 5
      IF(T.GE.6000.0) T=5999.99999
      IF(P.LT.30.0) GO TO 3
      IF(P.LT.80.0) GO TO 2
      IF(P.LT.500.0) GO TO 1
      N=1
      N1=25
      GO TO 33
    1 N=2
      N1=26
      GO TO 33
    2 N=3
      N1=27
      GO TO 33
    3 IF(P.LT.5.0) GO TO 4
      N=4
      N1=29
      GO TO 33
    4 N=5
      N1=28
      GO TO 33
    5 IF(T.LT.180.0) GO TO 70
      IF(T.LT.500.0) GO TO 6
      N=6
      GO TO 33
    6 N=7
```

```
5-3.58,3.41,10.88,18.6,26.64,7.34,12.46,18.68,25.57,32.85,40.42,25.
689,29.54,34.83,41.04,47.82,54.09,45.69,47.61,51.79,57.23,63.43,70.
729,66.61,66.57,69.53,74.12,79.68,86.,88.34,86.3,87.94,91.61,96.51,
8102.2,-129.4,-124.6,-119.8,-115.,-110.3,-105.5,-100.8,-96.08,-91.3
97,-119.4,-114.9,-110.4,-105.8,-101.2,-96.51,-91.88,-87.21,-82.41)
 DATA((H(I),I=396, 492)=-107.4,-103.4,-99.26,-94.98,-90.6,-86.19,-8
11.71,-77.23,-72.58,-92.77,-89.71,-86.23,-82.46,-78.47,-74.37,-70.1
29,-65.93,-61.48,-73.53,-72.8,-70.77,-67.93,-64.6,-61.,-57.2,-53.28
3,-49.11,-41.28,-49.57,-51.87,-50.91,-48.74,-45.9,-42.7,-39.24,-35.
444,39.,-18.9,-26.49,-30.41,-30.39,-28.88,-26.55,-23.74,-20.45,46.5
52,40.72,37.01,34.66,33.21,32.38,32.04,32.06,32.49,88.56,79.51,72.9
69,68.32,65.01,62.69,61.11,60.1,59.63,126.4,117.8,109.2,103.8,98.33
7,95.1,91.88,90.11,88.34,-30.39,-29.64,-28.88,-27.72,-26.55,-25.15,
8-23.74,-22.17,-20.45,-23.63,-23.33,-22.72,-21.84,-20.77,-19.57,-18
9.24,-16.82,-15.17,-16.47,-16.59,-16.27,-15.65,-14.8,-13.76,-12.58)
 DATA((H(I),I=493, 602)=-11.27,-9.88,-8.89,-9.51,-9.56,-9.23,-8.6,-
17.75,-6.72,-5.57,-4.14,-.85,-2.07,-2.56,-2.55,-2.18,-1.55,-.7,.3,1
2.6,7.68,5.74,4.76,4.38,4.45,4.85,5.5,6.34,7.34,16.7,13.93,12.37,11
3.57,11.3,11.45,11.88,12.53,13.52,26.21,22.5,20.28,19.02,18.39,18.2
44,18.43,18.89,19.7,36.36,31.44,28.52,26.72,25.7,25.22,25.15,25.4,2
55.89,46.52,40.72,37.01,34.66,32.21,32.38,32.04,32.06,32.49,95.17,8
60.15,65.54,53.23,44.02,37.38,32.55,28.95,26.21,115.7,104.1,92.37,8
71.05,70.96,62.55,55.86,50.62,46.52,132.6,123.2,113.6,104.,94.83,86
8.45,79.09,72.87,67.54,147.7,139.7,131.4,123.3,115.3,107.6,100.5,94
9.17,88.56,161.6,154.5,147.3,140.2,133.2,126.3,119.8,113.7,107.5)
 DATA((H(I),I=603, 705)=174.7,168.7,162.6,156.6,150.5,144.5,138.5,1
132.4,126.4,177.4,161.6,143.4,121.8,95.2,186.3,171.7,155.4,136.8,11
25.7,195.1,181.6,166.8,150.5,132.6,204.,191.4,177.9,163.3,147.7,212
3.9,201.2,188.7,175.5,161.6,222.2,210.3,198.5,186.6,174.7,-30.41,-3
40.63,-30.67,-30.59,-30.39,-22.5,-23.09,-23.44,-23.6,-23.63,-13.86,
5-14.96,-15.7,-16.18,-16.47,-4.37,-6.14,-7.4,-8.28,-8.89,6.14,3.46,
61.54,.16,-.85,17.79,13.93,11.18,9.17,7.68,30.52,25.28,21.52,18.77,
716.7,44.02,37.38,32.55,28.95,26.21,-26.48,-27.26,-27.92,-28.45,-28
8.92,-29.3,-29.62,-29.88,-30.1,-30.28,-30.41,-21.02,-22.11,-23.,-23
9.75,-24.38,-24.9,-25.36,-25.73,-26.06,-26.32,-26.46,-14.94,-16.45)
 END

 SUBROUTINE PTHDATA2
 COMMON/PTENTHAL/H(1183)
 DATA((H(I),I=706, 812)=-17.67,-18.68,-19.53,-20.25,-20.85,-21.37,-
121.81,-22.19,-22.5,-8.03,-10.16,-11.84,-13.21,-14.34,-15.28,-16.09
2,-16.77,-17.35,-17.85,-18.18,.01,-3.05,-5.37,-7.22,-8.72,-9.96,-11
3.01,-11.9,-12.66,-13.31,-13.86,9.41,5.12,1.87,-.61,-2.6,-4.23,-5.5
48,-6.72,-7.69,-8.52,-9.12,20.71,14.43,10.1,6.72,4.1,1.99,.26,-1.19
5,-2.42,-3.47,-4.37,33.45,25.24,19.25,14.8,11.45,8.74,6.54,4.71,3.1
67,1.87,.88,45.95,36.79,29.44,23.8,19.44,16.07,13.29,11.02,9.12,7.5
71,6.14,56.31,47.94,39.94,33.35,28.09,23.89,20.51,17.76,15.44,13.49
8,11.96,66.66,58.21,50.23,43.14,37.17,32.25,28.21,24.89,22.11,19.78
9,17.79,74.56,67.32,59.73,52.62,46.26,40.81,36.2,32.35,29.11,26.37)
 DATA((H(I),I=813, 916)=24.15,82.45,75.41,68.34,61.5,55.11,49.35,44
1.34,40.03,36.35,33.21,30.52,88.81,82.65,76.12,69.66,63.44,57.66,52
2.4,47.78,43.74,40.24,37.27,95.17,89.16,83.15,77.23,71.38,65.54,60.
361,55.69,51.39,47.7,44.02,104.9,98.01,90.23,81.37,71.12,59.16,45.5
49,31.88,20.95,113.3,107.3,100.8,93.63,85.67,76.79,66.95,56.39,45.9
55,120.4,115.8,110.2,104.2,97.75,90.73,83.18,75.1,66.66,127.6,123.6
6,118.7,113.4,107.8,102.1,95.85,89.29,82.45,134.8,130.4,126.1,121.8
7,116.4,111.1,105.8,100.5,95.17,65.16,51.82,-3.47,-10.85,-14.26,-16
8.57,-18.37,-19.82,-21.02,-22.04,-22.92,-23.69,-24.38,-24.99,-25.54
```

```
   GO TO 33
70 IF(P.LT.1175.68) GO TO 8
   IF(P.LT.2645.28) GO TO 7
   N=8
   GO TO 33
 7 N=9
   GO TO 33
 8 IF(P.LT.587.84) GO TO 9
   N=10
   GO TO 33
 9 N=11
   GO TO 33
10 IF(P.LT.1175.68) GO TO 12
   IF(P.LT.2645.28) GO TO 11
   N=12
   GO TO 30
11 N=13
   GO TO 30
12 IF(T.GE.59.4) GO TO 15
   N=14
   IF(P.GE.187.6385) GO TO 30
   DO 13 I=2,20
   IF(P-PS(I))14,14,13
13 CONTINUE
   I=20
14 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
   IF(T.LE.TM) GO TO 30
   GO TO 23
15 IF(P.LT.293.92) GO TO 20
   IF(P.GE.587.84) GO TO 18
   IF(T.GE.72.0) GO TO 17
   IF(P.LT.440.88) GO TO 16
   N=19
   GO TO 33
16 N=20
   GO TO 33
17 N=17
   GO TO 33
18 IF(T.LT.75.6) GO TO 19
   N=15
   GO TO 33
19 N=16
   GO TO 33
20 IF(T.GE.72.0)GO TO 22
   IF(P.LT.176.352) GO TO 23
   IF(T.LT.65.7) GO TO 21
   N=21
   GO TO 33
21 N=22
   GO TO 33
22 N=18
   GO TO 33
23 N=23
   IF(P.GE.117.568.AND.T.LE.63.) N=24
   GO TO 33
30 F=P/587.84
   I=F
   IF(I.GT.8) I=8
```

```
9,-26.04,-26.48,74.13,67.69,57.36,39.09,5.99,-3.23,-7.63,-10.52)
 DATA((H(I),I=917,1023)=-12.65,-14.37,-15.78,-16.98,-18.,-18.9,-19.
169,-20.39,-21.02,83.09,77.17,70.3,61.77,50.17,31.98,12.48,3.55,-1.
209,-4.43,-6.93,-8.9,-10.49,-11.86,-13.03,-14.04,-14.94,89.04,84.56
3,79.06,72.84,65.52,56.54,44.99,30.6,17.92,9.94,4.89,1.51,-1.24,-3.
443,-5.22,-6.72,-8.03,94.98,90.77,86.16,81.07,75.42,69.01,61.59,52.
584,42.58,31.64,22.32,15.46,10.57,6.94,4.28,1.95,.01,99.84,96.27,92
6.24,87.87,83.15,77.97,72.25,65.86,58.68,50.67,42.06,33.59,26.31,20
7.44,15.88,12.29,9.41,104.7,101.3,97.67,93.82,89.72,85.3,80.54,75.3
88,69.76,63.63,56.98,49.93,42.76,35.94,29.96,24.89,20.71,109.1,105.
99,102.6,99.07,95.49,91.5,87.5,82.95,78.39,73.16,67.98,62.13,56.27)
 DATA((H(I),I=1024,1137)=50.2,44.14,38.79,33.45,71.,37.3,0.,0.,0.,8
14.3,57.3,0.,0.,0.,97.6,72.9,43.,0.,0.,110.9,89.8,62.,0.,0.,124.2,1
207.4,83.28,48.,0.,137.5,123.5,105.9,81.,0.,150.7,138.8,124.9,108.5
3,85.9,164.1,153.6,142.,128.9,113.3,177.4,167.9,158.,147.,134.8,78.
48,62.3,45.4,0.,0.,89.8,78.3,61.,41.9,29.1,98.8,90.1,78.9,60.1,27.8
5,106.7,99.5,91.1,80.6,65.2,114.,107.8,100.8,92.8,83.1,120.8,115.2,
6109.2,102.5,95.,19700.,19330.,19260.,23000.,22040.,21810.,27350.,2
75260.,24730.,21390.,19940.,19580.,27180.,23580.,22680.,36230.,2859
80.,26650.,22560.,21170.,20520.,30320.,26640.,25020.,42210.,35060.,
931640.,32960.,28900.,27090.,26000.,25260.,40130.,34330.,31710.)
 DATA((H(I),I=1138,1183)=30130.,29050.,49050.,41170.,37530.,35320.,
133810.,59610.,49530.,44710.,41750.,39690.,71190.,59240.,53210.,494
220.,46750.,82920.,69950.,62910.,58310.,55020.,27100.,23410.,22100.
3,21520.,31750.,26350.,24440.,23590.,37610.,30000.,27280.,26070.,44
4900.,34480.,30730.,29050.,53610.,39900.,34870.,32610.,63710.,46340
5.,39810.,36850.)
 END
```

```
      FI=I
      F=F-FI
      FP=1.0-F
      TQ=FP*TL(I+1)+F*TL(I+2)
      IF(T.GE.TQ) GO TO 33
      PTENTH=FP*HS(I+1)+F*HS(I+2)
      RETURN
   33 IF(T.LE.5000.)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      FI=IP
      F=FP-FI
      FP=1.0-F
      FT=(T-BT(N1))/DT(N)
      IT=FT
      FI=IT
      FF=FT-FI
      FT=1.0-FF
      I=IT*JP(N)+IP+LDC(N1)
      J=I+JP(N)
      PTENTH=FP*FT*H(I)+F*FT*H(I+1)+FP*FF*H(J)+F*FF*H(J+1)
      RETURN
      END
```



```
 FUNCTION PTDENS(PRES,TEMP)
 DIMENSION PS(20),TS(20),JP(28),MX(28),LDC(30),BP(28),DP(28),BT(30)
1,DT(28)
 COMMON/DENSITYY/R(886)
 DATA(PS=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,
1182.,185.,186.5,187.25,187.46875,187.506,187.6385)
 DATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4)
 DATA(LDC=1,23,78,105,141,155,183,201,225,240,267,321,341,377,401,
1 425,437,453,469,494,534,546,586,682,722,752,800,848,866,878)
 DATA(JP=2,5,3,4,2,4,3,4,3,3,3,4,4,4,3,3,4,4,5,8,4,5,12,5,3,6,6,6)
 DATA(MX=0,3,1,2,0,2,1,2,1,1,1,2,2,2,1,1,2,2,3,6,2,3,10,3,1,4,4,4)
 DATA(BP=0.,200.,-100., 0.,0.,0.,-4.,0.,2645.28,1469.6,881.76,0.,0.
1,-44.088,587.84,293.92,73.48,-14.696,293.92,36.74,-7.348,293.92,
2180.,0.,0.,29.392,102.872,29.392)
 DATA(DP=800.,1200.0,200.0,1000.0,100.0,1000.0,7.0,1000.0,1175.68,
1 587.84,293.92,293,92,293.92,58.784,146.96,146.96,73.48,29.392,
2 73.48,36.74,14.696,73.48,10.0,7.348,1.4696,14.696,14.696,29.392)
 DATA(BT=180.0,180.0,500.0,500.0,1300.0,1300.0,2500.0,2500.0,36.0,
1 36.0,27.0,27.0,108.0,108.0,57.6,86.4,86.4,86.4,72.0,72.0,72.0,
2 59.4,59.4,30.0,23.4,39.6,52.2,64.8,5000.0,5000.0)
 DATA(DT=30.0,30.0,100.0,100.0,200.0,200.0,500.0,500.0,36.0,18.0,
1 9.0,9.0,9.0,14.4,7.2,7.2,7.2,7.2,3.6,3.6,7.2,1.8,1.8,6.0,5.4,3.6,
2 1.8,3.6)
```

```
 FUNCTION PTDENS(PRES,TEMP)
 DIMENSION PS(20),TS(20),JP(28),MX(28),LDC(30),BP(28),DP(28),BT(30)
1,DT(28),R(886)
 DIMENSION AA(109),AB( 97),AC(108),AD(106),AE(106),AF(108),AG(101)
1 ,AH(111),AI( 41)
 EQUIVALENCE( R,AA),( R( 110),AB),( R( 207),AC),( R( 315),AD)
1    ,( R( 421),AE),( R( 527),AF),( R( 635),AG),( R( 736),AH)
2    ,( R( 847),AI)
 DATA PS/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,
1182.,185.,186.5,187.25,187.46875,187.506,187.6385/
 DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4/
 DATA LDC/1,23,78,105,141,155,183,201,225,240,267,321,341,377,401,
1 425,437,453,469,494,534,546,586,682,722,752,800,848,866,878/
 DATA JP/2,5,3,4,2,4,3,4,3,3,3,4,4,4,3,3,4,4,5,8,4,5,12,5,3,6,6,6/
 DATA MX/0,3,1,2,0,2,1,2,1,1,1,2,2,2,1,1,2,2,3,6,2,3,10,3,1,4,4,4/
 DATA BP/0.,200.,-100., 0.,0.,0.,-4.,0.,2645.28,1469.6,881.76,0.,0.
1,-44.088,587.84,293.92,73.48,-14.696,293.92,36.74,-7.348,293.92,
2180.,0.,0.,29.392,102.872,29.392/
 DATA DP/800.,1200.0,200.0,1000.0,100.0,1000.0,7.0,1000.0,1175.68,
1 587.84,293.92,293.92,293.92,58.784,146.96,146.96,73.48,29.392,
2 73.48,36.74,14.696,73.48,10.0,7.348,1.4696,14.696,14.696,29.392/
 DATA BT/180.0,180.0,500.0,500.0,1300.0,1300.0,2500.0,2500.0,36.0,
1 36.0,27.0,27.0,108.0,108.0,57.6,86.4,86.4,86.4,72.0,72.0,72.0,
```

```
      P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.LT.180.0) GO TO 8
      IF(T.GE.1300.0) GO TO 4
      IF(T.GE.480.0) GO TO 2
      IF(P.GE.800.) GO TO 1
      N=1
      GO TO 33
    1 N=2
      GO TO 33
    2 IF(P.GE.300.0) GO TO 3
      N=3
      GO TO 33
    3 N=4
      GO TO 33
    4 IF(T.GE.2500.0) GO TO 6
      IF(P.GE.100.0) GO TO 5
      N=5
      GO TO 33
    5 N=6
      GO TO 33
    6 IF(T.GE.6000.0)T=5999.99999
      IF(P.GE.10.0) GO TO 7
      N=7
      N1=30
      GO TO 33
    7 N=8
      N1=29
      GO TO 33
    8 TZ=24.84+0.00317*P
      IF(T.LT.TZ) T=TZ
      IF(P.LT.881.76) GO TO 11
      IF(P.LT.2645.28) GO TO 9
      N=9
      GO TO 33
    9 IF(P.LT.1469.6) GO TO 10
      N=10
      GO TO 33
   10 N=11
      GO TO 33
   11 IF(T.GE.59.4) GO TO 14
      N=12
      IF(P.GE.187.6385) GO TO 33
      DO 12 I=2,20
      IF(P-PS(I))13,13,12
   12 CONTINUE
      I=20
   13 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
      IF(T.GE.TM) GO TO 24
      GO TO 33
   14 IF(T.LT.108.0) GO TO 16
      IF(P.LT.132.264) GO TO 15
      N=13
      GO TO 33
   15 N=14
      GO TO 33
   16 IF(P.LT.587.84) GO TO 17
```

```
     2 59.4,59.4,30.0,23.4,39.6,52.2,64.8,5000.,5000./
      DATA DT/30.0,30.0,100.0,100.0,200.0,200.0,500.0,500.0,36.0,18.0,
     1 9.0,9.0,9.0,14.4,7.2,7.2,7.2,7.2,3.6,3.6,7.2,1.8,1.8,6.0,5.4,3.6,
     2 1.8,3.6/
      DATAAA/0.,.8376,0.,.7052,0.,.6114,0.,.5412,0.,.4862,0.,.4419,0.,.4
     1053,0.,.3746,0.,.3483,0.,.3255,0.,.3056,.2652,1.41,2.315,2.924,3.3
     296,.2314,1.179,1.979,2.584,3.052,.1998,1.023,1.739,2.309,2.765,.17
     366,.9058,1.554,2.087,2.526,.1577,.8147,1.407,1.905,2.325,.1424,.74
     414,1.286,1.754,2.154,.1297,.6809,1.186,1.626,2.008,.1192,.63,1.102
     5,1.516,1.881,.1101,.5865,1.029,1.421,1.769,.1021,.5489,.9656,1.338
     6,1.671,.0953,.5159,.91,1.264,1.584,-.03747,.03747,.1114,-.03125,.0
     73125,.09302,-.02679,.02679,.07985,-.02345,.02345,.06995,-.02085,.0
     82085,.06224,-.01877,.01877,.05606,-.01706,.01706,.05099,-.01565,.0
     91565,.04677,-.01445,.01445,.04282,.00464,.3605,.6912,.9949,.00341/
      DATAAB/.3021,.5825,.8432,.0026,.2601,.5038,.7325,.002,.2285,.4441,
     1.6479,.00161,.2037,.3972,.581,.00131,.1838,.3592,.5267,.0011,.1674
     2,.3279,.4818,.0009,.1538,.3017,.4439,.00027,.1422,.2793,.4116,0.,.
     301445,0.,.01252,0.,.01105,0.,.009892,0.,.008951,0.,.008174,0.,.007
     4521,.000267,.1422,.2793,.4116,.000189,.1235,.2432,.3592,.000144,.1
     5092,.2154,.3187,.00012,.09785,.1933,.2864,9.8E-5,.08864,.1753,.260
     61,8.1E-5,.08101,.1604,.2382,6.9E-5,.07459,.1478,.2196,-.0003009,.0
     7002256,.0007521,-.000251,.0001882,.0006272,-.000215,.0001611,.0005
     8373,-.0001878,.0001402,.0004686,-.0001656,.0001221,.0004119,-.0001
     9452,.0001042,.0003599,6.9E-6,.07459,.1478,.2196,4.6E-6,.06226/
      DATAAC/.1236,.1839,3.1E-6,.05342,.1061,.1582,9.E-7,.04677,.09301,.
     11387,-3.6E-6,.04155,.08272,.1235,-1.32E-5,.0373,.07436,.1111,5.27,
     25.489,5.68,4.501,4.845,5.107,3.616,4.126,4.483,2.857,3.466,3.895,2
     33.319,2.935,3.395,4.994,5.143,5.27,4.533,4.743,4.886,3.958,4.27,4.5
     401,3.307,3.752,4.059,2.698,3.243,3.616,2.226,2.796,3.236,1.886,2.4
     535,2.857,1.639,2.15,2.588,1.453,1.924,2.319,5.033,5.112,5.183,4.81
     66,4.91,4.994,4.558,4.676,4.764,4.248,4.405,4.533,3.88,4.094,4.246,
     73.442,3.743,3.958,2.953,3.361,3.633,2.481,2.975,3.307,2.093,2.616,
     83.002,1.804,2.309,2.698,1.588,2.059,2.462,1.423,1.856,2.226,1.293,
     91.691,2.056,1.187,1.555,1.886,1.1,1.441,1.754,1.026,1.344,1.639/
      DATAAD/.9627,1.262,1.546,.9076,1.189,1.453,4.742,4.853,4.946,5.031
     1,4.43,4.584,4.709,4.816,4.024,4.279,4.417,4.558,3.165,3.778,4.05,4
     2.248,1.43,2.988,3.595,3.88,-.0233,.5581,1.189,1.804,-.015,.503,1.0
     35,1.588,-.0099,.4591,.945,1.423,-.0065,.4231,.8618,1.293,-.0042,.3
     4928,.7943,1.187,-.0025,.3669,.7379,1.1,-.0015,.3445,.6898,1.026,-.
     50007,.3249,.6483,.9627,-.0001,.3075,.612,.9076,-.07704,.02568,.130
     67,.2384,-.06786,.02262,.1144,.2079,-.06066,.02022,.1018,.1844,-.05
     7484,.01828,.09179,.1659,-.05004,.01668,.0836,.1508,-.04602,.01534,
     8.07677,.1383,3.887,3.986,4.105,3.447,3.646,3.792,2.91,3.226,3.442,
     92.323,2.76,3.051,1.857,2.317,2.67,1.549,1.963,2.326,1.34,1.701/
      DATAAE/2.035,1.189,1.497,1.804,.7859,1.309,1.857,.6864,1.106,1.549
     1,.6141,.9689,1.34,.5581,.8735,1.189,.1675,.3524,.5577,.7859,.153,.
     23178,.4955,.6864,.1409,.2902,.4479,.6141,.1307,.2674,.4127,.5581,-
     3.03228,.03224,.09858,.1675,-.02974,.02971,.09043,.153,-.02756,.027
     454,.08359,.1409,-.02568,.02568,.07819,.1307,1.226,1.807,2.329,2.67
     54,2.91,1.052,1.481,1.941,2.326,2.616,.9378,1.279,1.656,2.019,2.323
     6,.8526,1.141,1.456,1.774,2.089,.7859,1.047,1.309,1.583,1.857,.0997
     75,.2084,.3279,.461,.6115,.7847,.9864,1.226,.09478,.1962,.3063,.426
     84,.5585,.7052,.8693,1.052,.08981,.1855,.2878,.3977,.5164,.6451,.78
     951,.9388,.0859,.176,.2717,.3734,.4817,.5972,.7207,.8526,.08199/
      DATAAF/.1675,.2599,.3524,.455,.5577,.6718,.7859,-.01936,.01932,.05
     1888,.09975,-.01756,.01753,.05323,.08981,-.01615,.01611,.04882,.081
     299,3.304,3.422,3.541,3.659,3.777,3.044,3.29,3.45,3.572,3.667,2.74,
     33.102,3.304,3.449,3.557,2.322,2.88,3.141,3.315,3.447,1.861,2.621,2
```

```
      N=15
      GO TO 33
   17 IF(T.LT.72.0) GO TO 23
      IF(T.LT.86.4) GO TO 20
      IF(P.LT.293.92) GO TO 18
      N=16
      GO TO 33
   18 IF(P.LT.73.48) GO TO 19
      N=17
      GO TO 33
   19 N=18
      GO TO 33
   20 IF(P.LT.293.92) GO TO 21
      N=19
      GO TO 33
   21 IF(P.LT.36.74) GO TO 22
      N=20
      GO TO 33
   22 N=21
      GO TO 33
   23 IF(P.LT.293.92) GO TO 24
      N=22
      GO TO 33
   24 IF(P.LT.180.0) GO TO 25
      N=23
      GO TO 33
   25 IF(P.GE.29.0) GO TO 27
      IF(P.LT.2.9392) GO TO 26
      N=24
      GO TO 33
   26 N=25
      GO TO 33
   27 IF(T.GE.64.8) GO TO 29
      IF(P.GE.102.0) GO TO 28
      N=26
      GO TO 33
   28 N=27
      GO TO 33
   29 N=28
   33 IF(T.LE.5000.0)N1=N
      FP=(P-BP(N))/OP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N1))/DT(N)
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      PTOENS=FP*FT*R(I)+F*FT*R(I+1)+FP*FF*R(J)+F*FF*R(J+1)
      RETURN
      END

      SUBROUTINE OATADENS
      COMMON/OENSITYY/R(886)
      DATA((R(I),I=1,107)=0.,.8376,0.,.7052,0.,.6114,0.,.5412,0.,.4862,0
     4.959,3.17,3.313,1.551,2.329,2.76,3.014,3.179,1.358,2.045,2.546,2.8
     548,3.044,1.226,1.807,2.329,2.674,2.91,.6295,2.42,2.726,2.849,2.937
     6,3.005,3.061,3.11,3.153,3.191,3.227,3.259,.9338,1.076,1.265,1.599,
     72.202,2.506,2.659,2.768,2.85,2.918,2.976,3.026,.8297,.9234,1.03,1.
     8159,1.322,1.542,1.835,2.136,2.356,2.509,2.618,2.709,.759,.8323,.91
     921,1.001,1.103,1.22,1.359,1.523,1.713,1.916,2.106,2.267,.7053/
      DATAAG/.767,.8326,.9039,.9807,1.066,1.16,1.265,1.383,1.513,1.655,1
     1.803,.6621,.7161,.7728,.8331,.8976,.9656,1.04,1.12,1.206,1.299,1.4
     2,1.507,.6259,.6745,.725,.778,.8337,.8927,.9537,1.019,1.089,1.163,1
     3.242,1.325,.5941,.6412,.6883,.7355,.7826,.8372,.8921,.9469,1.005,1
     4.07,1.135,1.2,-.000743,.04849,.09854,0.,0.,-.000787,.04023,.08466,
     5.1315,.1915,-.000437,.03393,.07032,.1097,.1534,-.000257,.02941,.06
     6027,.09278,.1275,-.000177,.02599,.05289,.0808,.1098,-.000122,.0233
     7,.0472,.07177,.09714,-8.3E-5,.02112,.04266,.06465,.08719,-6.5E-5,.
     801932,.0381,.05888,.07931,0.,.01172,.02363,-.000111,.009736,.0198,
     9-5.9E-5,.008154,.01648,-3.6E-5,.007021,.01414,-2.4E-5,.006166/
      OATAAH/.0124,-1.5E-5,.005498,.01104,-1.1E-5,.004962,.009954,-9.E-6
     1,.004521,.009063,-7.E-6,.004153,.008321,-2.2E-5,.003846,.007715,.1
     2664,.248,0.,0.,0.,0.,.1469,.2418,.3397,0.,0.,0.,.1315,.2117,.3091,
     3.4233,.5318,0.,.1195,.1891,.2684,.3626,.4811,.6115,.1098,.1717,.24
     4,.3166,.4051,.5124,.1017,.1578,.2183,.2841,.3568,.4387,.09486,.146
     53,.2009,.2592,.322,.3903,.08892,.1377,.1865,.2407,.295,.3565,.5712
     6,.727,.9725,0.,0.,0.,.5124,.6559,.8514,1.116,0.,0.,.4755,.5827,.73
     729,.9604,1.252,1.718,.4387,.5333,.6477,.7994,1.068,1.534,.4145,.49
     856,.5914,.706,.8535,1.082,.3903,.4653,.5491,.6447,.7575,.8985,.373
     94,.4399,.5151,.5986,.6928,.802,.3565,.4181,.4898,.5616,.6487/
      DATAAI/.7358,.08892,.1865,.295,.4181,.5616,.7358,.08373,.1743,.273
     11,.3822,.5044,.6439,.07931,.1649,.2562,.3545,.461,.5814,-1.32E-5,.
     20373,.07436,.111,-2.97E-5,.0337,.06734,.1007,-5.14E-5,.03051,.0612
     32,.09175,-.0001453,.0001042,.0003599,-.000124,8.541E-5,.0003076,-9
     4.95E-5,6.714E-5,.0002542,0./
      P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.LT.180.0) GO TO 8
      IF(T.GE.1300.0) GO TO 4
      IF(T.GE.480.0) GO TO 2
      IF(P.GE.800.) GO TO 1
      N=1
      GO TO 33
    1 N=2
      GO TO 33
    2 IF(P.GE.300.0) GO TO 3
      N=3
      GO TO 33
    3 N=4
      GO TO 33
    4 IF(T.GE.2500.0) GO TO 6
      IF(P.GE.100.0) GO TO 5
      N=5
      GO TO 33
    5 N=6
      GO TO 33
    6 IF(T.GE.6000.0) T=5999.99999
      IF(P.GE.10.0) GO TO 7
      N=7
      N1=30
      GO TO 33
```

```
1.,.4419,0.,.4053,0.,.3746,0.,.3483,0.,.3255,0.,.3056,.2652,1.41,2.
2315,2.924,3.396,.2314,1.179,1.979,2.584,3.052,.1998,1.023,1.739,2.
3309,2.765,.1766,.9058,1.554,2.087,2.526,.1577,.8147,1.407,1.905,2.
4325,.1424,.7414,1.286,1.754,2.154,.1297,.6809,1.186,1.626,2.008,.1
5192,.63,1.102,1.516,1.881,.1101,.5865,1.029,1.421,1.769,.1021,.548
69,.9656,1.338,1.671,.0953,.5159,.91,1.264,1.584,-.03747,.03747,.11
714,-.03125,.03125,.09302,-.02679,.02679,.07985,-.02345,.02345,.069
895,-.02085,.02085,.06224,-.01877,.01877,.05606,-.01706,.01706,.050
999,-.01565,.01565,.04677,-.01445,.01445,.04282,.00464,.3605,.6912)
 DATA((R(I),I=108,202)=.9949,.00341,.3021,.5825,.8432,.0026,.2601,.
15038,.7325,.002,.2285,.4441,.6479,.00161,.2037,.3972,.581,.00131,.
21838,.3592,.5267,.0011,.1674,.3279,.4818,.0009,.1538,.3017,.4439,.
300027,.1422,.2793,.4116,0.,.01445,0.,.01252,0.,.01105,0.,.009892,0
4.,.008951,0.,.008174,0.,.007521,.000267,.1422,.2793,.4116,.000189,
5.1235,.2432,.3592,.000144,.1092,.2154,.3187,.00012,.09785,.1933,.2
6864,9.8E-5,.08864,.1753,.2601,8.1E-5,.08101,.1604,.2382,6.9E-5,.07
7459,.1478,.2196,-.0003009,.0002256,.0007521,-.000251,.0001882,.000
86272,-.000215,.0001611,.0005373,-.0001878,.0001402,.0004686,-.0001
9656,.0001221,.0004119,-.0001452,.0001042,.0003599,6.9E-6,.07459)
 OATA((R(I),I=203,307)=.1478,.2196,4.6E-6,.06226,.1236,.1839,3.1E-6
1,.05342,.1061,.1582,9.E-7,.04677,.09301,.1387,-3.6E-6,.04155,.0827
22,.1235,-1.32E-5,.0373,.07436,.1111,5.27,5.489,5.68,4.501,4.845,5.
3107,3.616,4.126,4.483,2.857,3.466,3.895,2.319,2.935,3.395,4.994,5.
4143,5.27,4.533,4.743,4.886,3.958,4.27,4.501,3.307,3.752,4.059,2.69
58,3.243,3.616,2.226,2.796,3.236,1.886,2.435,2.857,1.639,2.15,2.588
6,1.453,1.924,2.319,5.033,5.112,5.183,4.816,4.91,4.994,4.558,4.676,
74.764,4.248,4.405,4.533,3.88,4.094,4.246,3.442,3.743,3.958,2.953,3
8.361,3.633,2.481,2.975,3.307,2.093,2.616,3.002,1.804,2.309,2.698,1
9.588,2.059,2.462,1.423,1.856,2.226,1.293,1.691,2.056,1.187,1.555)
 ENO

 SUBROUTINE SUB1
 COMMON/OENSITYY/R(886)
 OATA((R(I),I=308,411)=1.886,1.1,1.441,1.754,1.026,1.344,1.639,.962
17,1.262,1.546,.9076,1.189,1.453,4.742,4.853,4.946,5.031,4.43,4.584
2,4.709,4.816,4.024,4.279,4.417,4.558,3.165,3.778,4.05,4.248,1.43,2
3.988,3.595,3.88,-.0233,.5581,1.189,1.804,-.015,.503,1.05,1.588,-.0
4099,.4591,.945,1.423,-.0065,.4231,.8618,1.293,-.0042,.3928,.7943,1
5.187,-.0025,.3669,.7379,1.1,-.0015,.3445,.6898,1.026,-.0007,.3249,
6.6483,.9627,-.0001,.3075,.612,.9076,-.07704,.02568,.1307,.2384,-.0
76786,.02262,.1144,.2079,-.06066,.02022,.1018,.1844,-.05484,.01828,
8.09179,.1659,-.05004,.01668,.0836,.1508,-.04602,.01534,.07677,.138
93,3.887,3.986,4.105,3.447,3.646,3.792,2.91,3.226,3.442,2.323,2.76)
 OATA((R(I),I=412,515)=3.051,1.857,2.317,2.67,1.549,1.963,2.326,1.3
14,1.701,2.035,1.189,1.497,1.804,.7859,1.309,1.857,.6864,1.106,1.54
29,.6141,.9689,1.34,.5581,.8735,1.189,.1675,.3524,.5577,.7859,.153,
3.3178,.4955,.6864,.1409,.2902,.4479,.6141,.1307,.2674,.4127,.5581,
4-.03228,.03224,.09858,.1675,-.02974,.02971,.09043,.153,-.02756,.02
5754,.08359,.1409,-.02568,.02568,.07819,.1307,1.226,1.807,2.329,2.6
674,2.91,1.052,1.481,1.941,2.326,2.616,.9378,1.279,1.656,2.019,2.32
73,.8526,1.141,1.456,1.774,2.089,.7859,1.047,1.309,1.583,1.857,.099
875,.2084,.3279,.461,.6115,.7847,.9864,1.226,.09478,.1962,.3063,.42
964,.5585,.7052,.8693,1.052,.08981,.1855,.2878,.3977,.5164,.6451)
 OATA((R(I),I=516,620)=.7851,.9388,.0859,.176,.2717,.3734,.4817,.59
172,.7207,.8526,.08199,.1675,.2599,.3524,.455,.5577,.6718,.7859,-.0
21936,.01932,.05888,.09975,-.01756,.01753,.05323,.08981,-.01615,.01
3611,.04882,.08199,3.304,3.422,3.541,3.659,3.777,3.044,3.29,3.45,3.
4572,3.667,2.74,3.102,3.304,3.449,3.557,2.322,2.88,3.141,3.315,3.44

 7 N=8
   N1=29
   GO TO 33
 8 TZ=24.84+0.00317*P
   IF(T.LT.TZ) T=TZ
   IF(P.LT.881.76) GO TO 11
   IF(P.LT.2645.28) GO TO 9
   N=9
   GO TO 33
 9 IF(P.LT.1469.6) GO TO 10
   N=10
   GO TO 33
10 N=11
   GO TO 33
11 IF(T.GE.59.4) GO TO 14
   N=12
   IF(P.GE.187.6385) GO TO 33
   OO 12 I=2,20
   IF(P-PS(I))13,13,12
12 CONTINUE
   I=20
13 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
   IF(T.GE.TM) GO TO 24
   GO TO 33
14 IF(T.LT.108.0) GO TO 16
   IF(P.LT.132.264) GO TO 15
   N=13
   GO TO 33
15 N=14
   GO TO 33
16 IF(P.LT.587.84) GO TO 17
   N=15
   GO TO 33
17 IF(T.LT.72.0) GO TO 23
   IF(T.LT.86.4) GO TO 20
   IF(P.LT.293.92) GO TO 18
   N=16
   GO TO 33
18 IF(P.LT.73.48) GO TO 19
   N=17
   GO TO 33
19 N=18
   GO TO 33
20 IF(P.LT.293.92) GO TO 21
   N=19
   GO TO 33
21 IF(P.LT.36.74) GO TO 22
   N=20
   GO TO 33
22 N=21
   GO TO 33
23 IF(P.LT.293.92) GO TO 24
   N=22
   GO TO 33
24 IF(P.LT.180.0) GO TO 25
   N=23
   GO TO 33
25 IF(P.GE.29.0) GO TO 27
```

```
57,1.861,2.621,2.959,3.17,3.313,1.551,2.329,2.76,3.014,3.179,1.358,
62.045,2.546,2.848,3.044,1.226,1.807,2.329,2.674,2.91,.6295,2.42,2.
7726,2.849,2.937,3.005,3.061,3.11,3.153,3.191,3.227,3.259,.9338,1.0
876,1.265,1.599,2.202,2.506,2.659,2.768,2.85,2.918,2.976,3.026,.829
97,.9234,1.03,1.159,1.322,1.542,1.835,2.136,2.356,2.509,2.618)
 RETURN
 END

 SUBROUTINE SUB2
 COMMON/DENSITYY/R(886)
 DATA((R(I),I=621,722)=2.709,.759,.8323,.9121,1.001,1.103,1.22,1.35
19,1.523,1.713,1.916,2.106,2.267,.7053,.767,.8326,.9039,.9807,1.066
2,1.16,1.265,1.383,1.513,1.655,1.803,.6621,.7161,.7728,.8331,.8976,
3.9656,1.04,1.12,1.206,1.299,1.4,1.507,.6259,.6745,.725,.778,.8337,
4.8927,.9537,1.019,1.089,1.163,1.242,1.325,.5941,.6412,.6883,.7355,
5.7826,.8372,.8921,.9469,1.005,1.07,1.135,1.2,-.000743,.04849,.0985
64,0.,0.,-.000787,.04023,.08466,.1315,.1915,-.000437,.03393,.07032,
7.1097,.1534,-.000257,.02941,.06027,.09278,.1275,-.000177,.02599,.0
85289,.0808,.1098,-.000122,.0233,.0472,.07177,.09714,-8.3E-5,.02112
9,.04266,.06465,.08719,-6.5E-5,.01932,.0381,.05888,.07931,0.)
 DATA((R(I),I=723,827)=.01172,.02363,-.000111,.009736,.0198,-5.9E-5
1,.008154,.01648,-3.6E-5,.007021,.01414,-2.4E-5,.006166,.0124,-1.5E
2-5,.005498,.01104,-1.1E-5,.004962,.009954,-9.E-6,.004521,.009063,-
37.E-6,.004153,.008321,-2.2E-5,.003846,.007715,.1664,.248,0.,0.,0.,
40.,.1469,.2418,.3397,0.,0.,0.,.1315,.2117,.3091,.4233,.5318,0.,.11
595,.1891,.2684,.3626,.4811,.6115,.1098,.1717,.24,.3166,.4051,.5124
6,.1017,.1578,.2183,.2841,.3568,.4387,.09486,.1463,.2009,.2592,.322
7,.3903,.08892,.1377,.1865,.2407,.295,.3565,.5712,.727,.9725,0.,0.,
80.,.5124,.6559,.8514,1.116,0.,0.,.4755,.5827,.7329,.9604,1.252,1.7
918,.4387,.5333,.6477,.7994,1.068,1.534,.4145,.4956,.5914,.706)
 DATA((R(I),I=828,886)=.8535,1.082,.3903,.4653,.5491,.6447,.7575,.8
1985,.3734,.4399,.5151,.5986,.6928,.802,.3565,.4181,.4898,.5616,.64
287,.7358,.08892,.1865,.295,.4181,.5616,.7358,.08373,.1743,.2731,.3
3822,.5044,.6439,.07931,.1649,.2562,.3545,.461,.5814,-1.32E-5,.0373
4,.07436,.111,-2.97E-5,.0337,.06734,.1007,-5.14E-5,.03051,.06122,.0
59175,-.0001453,.0001042,.0003599,-.000124,8.541E-5,.0003076,-9.95E
6-5,6.714E-5,.0002542)
 RETURN
 END
```

```
   IF(P.LT.2.9392) GO TO 26
   N=24
   GO TO 33
26 N=25
   GO TO 33
27 IF(T.GE.64.8) GO TO 29
   IF(P.GE.102.0) GO TO 28
   N=26
   GO TO 33
28 N=27
   GO TO 33
29 N=28
33 IF(T.LE.5000.)N1=N
   FP=(P-BP(N))/DP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   FI=IP
   F=FP-FI
   FP=1.0-F
   FT=(T-BT(N1))/DT(N)
   IT=FT
   FI=IT
   FF=FT-FI
   FT=1.0-FF
   I=IT*JP(N)+IP+LOC(N1)
   J=I+JP(N)
   PTDENS=FP*FT*R(I)+F*FT*R(I+1)+FP*FF*R(J)+F*FF*R(J+1)
   RETURN
   END
```

```
 FUNCTION   PTENTR(PRES,TEMP)
 DIMENSION LOC(30),JP(26),MX(26),BP(26),DP(26),BT(30),DT(26),PS(20)
1,TS(20)
 COMMON/PTENTROP/S(748)
 DATA((S(I),I=1,109)=17.4,15.9,15.22,14.82,18.93,17.43,16.74,16.34,
120.11,18.59,17.91,17.51,21.23,19.63,18.92,18.51,19.67,18.17,17.49,
217.09,21.2,19.69,19.01,18.61,22.42,20.88,20.19,19.79,23.92,22.11,2
31.34,20.9,21.8,20.44,19.75,19.35,23.33,21.96,21.28,20.88,24.67,23.
422,22.51,22.1,27.23,25.05,24.08,23.55,22.71,22.02,21.62,21.34,23.5
53,22.85,22.45,22.16,24.24,23.55,23.15,22.87,24.91,24.2,23.8,23.51,
625.71,24.93,24.49,24.18,27.02,26.,25.46,25.08,29.42,27.85,27.05,26
7.52,12.54,11.03,10.33,9.925,14.19,12.69,12.,11.6,15.3,13.79,13.11,
812.71,16.14,14.64,13.95,13.55,16.82,15.32,14.64,14.24,17.4,15.9,15
```

```
 FUNCTION   PTENTR(PRES,TEMP)
 DIMENSION LOC(30),JP(26),MX(26),BP(26),DP(26),BT(30),DT(26),PS(20)
1,TS(20),S(748)
 DIMENSION AA(111),AB(110),AC(111),AD(112),AE(110),AF(111),AG( 83)
 EQUIVALENCE( S,AA),( S( 112),AB),( S( 222),AC),( S( 333),AD)
1    ,( S( 445),AE),( S( 555),AF),( S( 666),AG)
 DATA LOC/1,17,33,49,77,101,125,149,167,187,207,227,242,278,328,364
1,384,404,434,464,484,520,536,635,663,683,713,721,729,737/
 DATA JP/4,4,4,4,4,4,4,3,5,4,4,3,4,5,6,5,5,6,5,5,6,4,11,4,4,5/
 DATA MX/2,2,2,2,2,2,2,1,3,2,2,1,2,3,4,3,3,4,3,3,4,2,9,2,2,3/
 DATA BP/0.,0.,0.,1.,0.,0.,0.,1.,    0.,0.,0.,1.,1469.6,587.84,0.,
10.,0.,0.,440.88,146.96,257.18,183.7,183.7,58.784,0.,0./
 DATA DP/1000.,100.,10.,1.,1000.,100.,10.,1.,1000.,100.,10.,1.,
```

```
9.22,14.82,14.81,13.31,12.62,12.22,16.46,14.96,14.27,13.87,17.57)
 DATA((S(I),I=110.217)=16.06,15.38,14.98,18.41,16.9,16.22,15.82,19.
109,17.59,16.9,16.51,19.67,18.17,17.49,17.09,17.08,15.58,14.89,14.4
29,18.73,17.22,16.54,16.14,19.83,18.33,17.65,17.25,20.68,19.17,18.4
39,18.09,21.36,19.86,19.17,18.77,21.94,20.44,19.75,19.35,17.85,17.1
46,16.76,19.49,18.81,18.41,20.6,19.91,19.51,21.44,20.76,20.36,22.12
5,21.44,21.04,22.71,22.02,21.62,8.61,6.812,6.012,5.557,5.304,10.34,
68.766,8.027,7.589,7.28,11.63,10.1,9.39,8.972,8.674,12.54,11.03,10.
733,9.925,9.634,11.03,9.498,8.793,8.371,12.33,10.82,10.12,9.713,13.
837,11.87,11.18,10.77,14.18,12.67,11.99,11.58,14.81,13.31,12.62,12.
922,13.3,11.79,11.1,10.7,14.6,13.09,12.41,12.01,15.64,14.14,13.45)
 DATA((S(I),I=218,326)=13.05,16.45,14.94,14.26,13.86,17.08,15.58,14
1.89,14.49,14.06,13.37,12.97,15.36,14.68,14.28,16.41,15.72,15.32,17
2.21,16.53,16.13,17.85,17.16,16.76,1.521,1.365,1.245,1.155,2.387,2.
316,1.993,1.863,3.191,2.876,2.66,2.5,3.943,3.52,3.256,3.067,4.624,4
4.105,3.793,3.577,5.212,4.628,4.278,4.041,5.713,5.101,4.724,4.468,6
5.153,5.532,5.14,4.871,6.756,6.015,5.57,5.254,.694,.661,.635,.612,.
659,1.702,1.638,1.58,1.529,1.482,2.706,2.584,2.484,2.401,2.33,3.832
7,3.552,3.359,3.221,3.112,5.045,4.541,4.209,3.994,3.837,5.854,5.342
8,4.96,4.692,4.494,6.407,5.933,5.561,5.231,5.066,6.855,6.409,6.054,
95.779,5.56,7.246,6.822,6.482,6.215,5.998,7.749,7.252,6.941,6.756)
 DATA(LOC=1,17,33,49,77,101,125,149,167,187,207,227,242,278,328,364
1,384,404,434,464,484,520,536,635,663,683,713,721,729,737)
 DATA(JP=4,4,4,4,4,4,4,4,3,5,4,4,3,4,5,6,5,5,6,5,5,6,4,11,4,4,5)
 DATA(MX=2,2,2,2,2,2,2,1,3,2,2,1,2,3,4,3,3,4,3,3,4,2,9,2,2,3)
 DATA(BP=0,0,0,1.,0,0,0,1.,    0.,0,0,1.,1469.6,587.84,0,0,0,0,
1440.88,146.96,257.18,183.7,183.7,58.784,0,0)
 DATA(DP=1000.,100.,10.,1.,1000.,100.,10.,1.,1000.,100.,10.,1.,
11175.68,293.92,146.96,14.696,1.4696,146.96,73.48,73.48,36.74,
229.392,7.348,44.088,14.696,1.4696)
 DATA(BT=2000.,2000.,2000.,2000.,500.,500.,500.,500.,170.,180.,180.
1,180.,36.,18.,90.,72.,72.,27.,54.,68.4,59.4,63.,59.4,46.8,32.4,18.
2,5000.,5000.,5000.,5000.)
 DATA(DT=1000.,1000.,1000.,500.,300.,300.,300.,300.,110.,80.,80.,80
1.,18.,18.,18.,36.,36.,9.,7.2,7.2,1.8,1.8,.45,7.2,14.4,14.4)
 DATA(PS=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
1.,185.,186.5,187.25,187.46875,187.506,187.6385)
 DATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4)
 P=PRES
 IF(P.LT.1.0) P=1.0
 T=TEMP
 IF(T.LT.180.) GO TO 12
 IF(T.LT.2000.)GO TO 4
 IF(T.GE.6000.)T=5999.99999
 IF(P.LT.35.3) GD TO 2
 IF(P.LT.353.) GO TD 1
 N=1
 N1=27
 GO TO 33
1 N=2
 N1=28
 GD TO 33
2 IF(P.LT.4.57) GD TO 3
 N=3
 N1=29
 GD TD 33
3 N=4
```



```
11175.68,293.92,146.96,14.696,1.4696,146.96,73.48,73.48,36.74,
229.392,7.348,44.088,14.696,1.4696/
 DATA BT/2000.,2000.,2000.,2000.,500.,500.,500.,500.,170.,180.,180.
1,180.,36.,18.,90.,72.,72.,27.,54.,68.4,59.4,63.,59.4,46.8,32.4,18.
2,5000.,5000.,5000.,5000./
 DATA DT/1000.,1000.,1000.,500.,300.,300.,300.,300.,110.,80.,80.,80
1.,18.,18.,18.,36.,36.,9.,7.2,7.2,1.8,1.8,.45,7.2,14.4,14.4/
 DATA PS/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
1.,185.,186.5,187.25,187.46875,187.506,187.6385/
 DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4/
 DATAAA/17.4,15.9,15.22,14.82,18.93,17.43,16.74,16.34,20.11,18.59,1
17.91,17.51,21.23,19.63,18.92,18.51,19.67,18.17,17.49,17.09,21.2,19
2.69,19.01,18.61,22.42,20.88,20.19,19.79,23.92,22.11,21.34,20.9,21.
38,20.44,19.75,19.35,23.33,21.96,21.28,20.88,24.67,23.22,22.51,22.1
4,27.23,25.05,24.08,23.55,22.71,22.02,21.62,21.34,23.53,22.85,22.45
5,22.16,24.24,23.55,23.15,22.87,24.91,24.2,23.8,23.51,25.71,24.93,2
64.49,24.18,27.02,26.,25.46,25.08,29.42,27.85,27.05,26.52,12.54,11.
703,10.33,9.925,14.19,12.69,12.,11.6,15.3,13.79,13.11,12.71,16.14,1
84.64,13.95,13.55,16.82,15.32,14.64,14.24,17.4,15.9,15.22,14.82,14.
981,13.31,12.62,12.22,16.46,14.96,14.27,13.87,17.57,16.06,15.38/
 DATAAB/14.98,18.41,16.9,16.22,15.82,19.09,17.59,16.9,16.51,19.67,1
18.17,17.49,17.09,17.08,15.58,14.89,14.49,18.73,17.22,16.54,16.14,1
29.83,18.33,17.65,17.25,20.68,19.17,18.49,18.09,21.36,19.86,19.17,1
38.77,21.94,20.44,19.75,19.35,17.85,17.16,16.76,19.49,18.81,18.41,2
40.6,19.91,19.51,21.44,20.76,20.36,22.12,21.44,21.04,22.71,22.02,21
5.62,8.610,6.812,6.012,5.557,5.304,10.34,8.766,8.027,7.589,7.28,11.
663,10.1,9.39,8.972,8.674,12.54,11.03,10.33,9.925,9.634,11.03,9.498
7,8.793,8.371,12.33,10.82,10.12,9.713,13.37,11.87,11.18,10.77,14.18
8,12.67,11.99,11.58,14.81,13.31,12.62,12.22,13.3,11.79,11.1,10.7,14
9.6,13.09,12.41,12.01,15.64,14.14,13.45,13.05,16.45,14.94,14.26/
 DATAAC/13.86,17.08,15.58,14.89,14.49,14.06,13.37,12.97,15.36,14.68
1,14.28,16.41,15.72,15.32,17.21,16.53,16.13,17.85,17.16,16.76,1.521
2,1.365,1.245,1.155,2.387,2.16,1.993,1.863,3.191,2.876,2.66,2.5,3.9
343,3.52,3.256,3.067,4.624,4.105,3.793,3.577,5.212,4.628,4.278,4.04
41,5.713,5.101,4.724,4.468,6.153,5.532,5.14,4.871,6.756,6.015,5.57,
55.254,.694,.661,.635,.612,.59,1.702,1.638,1.58,1.529,1.482,2.706,2
6.584,2.484,2.401,2.33,3.832,3.552,3.359,3.221,3.112,5.045,4.541,4.
7209,3.994,3.837,5.854,5.342,4.96,4.692,4.494,6.407,5.933,5.561,5.2
881,5.066,6.855,6.409,6.054,5.779,5.56,7.246,6.822,6.482,6.215,5.99
98,7.749,7.252,6.941,6.756,6.571,8.628,7.088,6.213,5.608,5.141/
 DATAAD/4.793,9.082,7.606,6.811,6.3,5.91,5.598,9.461,8.037,7.279,6.
1807,6.454,6.17,9.84,8.42,7.682,7.23,6.897,6.632,10.18,8.773,8.049,
27.61,7.29,7.034,10.64,9.167,8.397,7.997,7.749,7.5,10.43,9.048,8.34
33,7.921,7.617,11.35,9.972,9.279,8.869,8.574,12.11,10.74,10.05,9.64
44,9.355,12.91,11.47,10.72,10.35,10.13,12.53,11.34,10.65,10.25,9.96
5,13.41,12.25,11.57,11.17,10.88,14.18,13.01,12.33,11.93,11.64,14.74
6,13.73,13.,12.6,12.4,1.32,1.286,1.254,1.224,1.198,1.173,1.881,1.82
78,1.782,1.742,1.704,1.67,2.488,2.395,2.32,2.257,2.204,2.157,3.399,
83.096,2.915,2.801,2.715,2.645,4.313,4.157,3.659,3.404,3.254,3.168,
92.768,2.734,2.7,2.672,2.645,3.293,3.215,3.151,3.096,3.063,3.914/
 DATAAE/3.749,3.633,3.544,3.482,4.653,4.368,4.172,4.029,3.912,5.214
1,4.934,4.703,4.519,4.353,5.608,5.374,5.141,4.967,4.793,6.198,5.528
2,4.808,4.203,3.914,6.523,5.983,5.495,5.042,4.653,6.804,6.318,5.899
3,5.536,5.214,7.088,6.65,6.213,5.91,5.608,3.444,3.361,3.311,3.261,3
4.212,3.162,3.689,3.553,3.464,3.396,3.341,3.293,4.081,3.793,3.655,3
5.562,3.491,3.448,4.621,4.117,3.884,3.749,3.654,3.603,4.957,4.502,4
6.16,3.963,3.835,3.759,5.168,4.809,4.506,4.203,4.059,3.914,5.383,5.
```

```
      N1=30
      GO TO 33
    4 IF(T.LT.500.) GO TO 8
      IF(P.LT.35.3) GO TO 6
      IF(P.LT.353.) GO TO 5
      N=5
      GO TO 33
    5 N=6
      GO TO 33
    6 IF(P.LT.3.53) GO TO 7
      N=7
      GO TO 33
    7 N=8
      GO TO 33
    8 IF(P.LT.35.3) GO TO 10
      IF(P.LT.353.) GO TO 9
      N=9
      GO TO 33
    9 N=10
      GO TO 33
   10 IF(P.LT.3.53) GO TO 11
      N=11
      GO TO 33
   11 N=12
      GO TO 33
   12 IF(T.GE.59.4) GO TO 18
      TZ=24.84+0.00317*P
      IF(T.LT.TZ) T=TZ
      IF(P.LT.1763.52) GO TO 14
      N=13
      GO TO 33
   14 IF(P.LT.734.8) GO TO 15
      N=14
      GO TO 33
   15 N=18
      IF(P.GE.187.6385)GO TO 33
      DO 16 I=2,20
      IF(P-PS(I))17,17,16
   16 CONTINUE
      I=20
   17 TZ=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
      IF(T.LT.TZ) GO TO 33
      GO TO 28
   18 IF(P.LT.734.8) GO TO 20
      IF(P.LT.1763.52) GO TO 19
      N=13
      GO TO 33
   19 N=14
      GO TO 33
   20 IF(T.LT.90.) GO TO 23
      IF(P.GE.67.16) GO TO 22
      IF(P.LT.6.716) GO TO 21
      N=16
      GO TO 33
   21 N=17
      GO TO 33
   22 N=15
      GO TO 33
```

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     701,4.358,3.804,5.543,5.265,4.86,4.382,5.703,5.447,5.13,4.785,5.863
     8,5.595,5.312,5.024,4.8,3.855,3.722,3.656,3.609,3.571,3.539,3.512,3
     9.487,3.464,3.444,4.906,4.675,3.932,3.777,3.703,3.653,3.611,3.577/
      DATAAF/3.548,3.521,3.505,5.011,4.874,4.555,3.994,3.832,3.751,3.695
     1,3.651,3.615,3.584,3.566,5.117,4.995,4.795,4.466,4.043,3.881,3.797
     2,3.737,3.69,3.652,3.628,5.222,5.088,4.929,4.723,4.411,4.081,3.926,
     33.841,3.778,3.729,3.689,5.262,5.164,5.028,4.867,4.66,4.38,4.118,3.
     4971,3.881,3.819,3.787,5.302,5.23,5.109,4.972,4.81,4.609,4.365,4.15
     5,4.011,3.921,3.885,5.342,5.289,5.178,5.057,4.921,4.761,4.572,4.359
     6,4.176,4.048,3.983,5.383,5.29,5.197,5.103,5.01,4.847,4.684,4.521,4
     7.358,4.219,4.081,6.153,5.054,3.633,0.,6.657,5.81,4.872,3.95,7.039,
     86.324,5.749,5.117,7.335,6.694,6.213,5.793,7.631,6.997,6.555,6.192,
     97.863,7.259,6.841,6.505,8.095,7.55,7.088,6.825,8.321,6.889,6.071/
      DATAAG/5.473,9.283,7.84,7.07,6.568,9.939,8.536,7.812,7.369,10.46,9
     1.072,8.364,7.94,10.89,9.51,8.811,8.395,9.14,8.02,7.35,6.94,6.65,10
     2.45,9.26,8.56,8.14,7.84,11.36,10.18,9.49,9.08,8.79,12.01,10.84,10.
     315,9.75,9.46,12.53,11.36,10.68,10.27,9.99,12.97,11.79,11.11,10.71,
     410.42,21.23,19.63,18.92,18.51,22.71,20.78,19.97,19.51,23.92,22.11,
     521.34,20.9,26.84,24.,22.91,22.53,27.23,25.05,24.08,23.55,33.82,29.
     619,27.28,26.33,29.42,27.85,27.05,26.52,33.46,30.94,29.69,28.88,38.
     747,35.25,33.5,32.35/
      P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.LT.180.) GO TO 12
      IF(T.LT.2000.)GO TO 4
      IF(T.GE.6000.0) T=5999.
      IF(P.LT.35.3) GO TO 2
      IF(P.LT.353.) GO TO 1
      N=1
      N1=27
      GO TO 33
    1 N=2
      N1=28
      GO TO 33
    2 IF(P.LT.4.57) GO TO 3
      N=3
      N1=29
      GO TO 33
    3 N=4
      N1=30
      GO TO 33
    4 IF(T.LT.500.) GO TO 8
      IF(P.LT.35.3) GO TO 6
      IF(P.LT.353.) GO TO 5
      N=5
      GO TO 33
    5 N=6
      GO TO 33
    6 IF(P.LT.3.53) GO TO 7
      N=7
      GO TO 33
    7 N=8
      GO TO 33
    8 IF(P.LT.35.3) GO TO 10
      IF(P.LT.353.) GO TO 9
      N=9
      GO TO 33
```

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23 IF(P.LT.183.7) GO TO 28
   IF(P.LT.440.88) GO TO 24
   N=19
   GO TO 33
24 IF(T.LT.68.4) GO TO 25
   N=20
   GO TO 33
25 IF(P.LT.257.18) GO TO 26
   N=21
   GO TO 33
26 IF(T.LT.63) GO TO 27
   N=22
   GO TO 33
27 N=23
   GO TO 33
28 IF(P.LT.6.716) GO TO 30
   IF(P.LT.48.5)  GO TO 29
   N=24
   GO TO 33
29 N=25
   GO TO 33
30 N=26
33 IF(T.LE.5000.)N1=N
   FP=(P-BP(N))/DP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   F=FP-IP
   FP=1.0-F
   FT=(T-BT(N1))/DT(N)
   IT=FT
   FF=FT-IT
   FT=1.0-FF
   I=IT*JP(N)+IP+LOC(N1)
   J=I+JP(N)
   PTENTR=FP*FT*S(I)+F*FT*S(I+1)+FP*FF*S(J)+F*FF*S(J+1)
   RETURN
   END

   SUBROUTINE PTSDATA
   COMMON/PTENTROP/S(748)
   DATA((S(I),I=327,435)=6.571,8.628,7.088,6.213,5.608,5.141,4.793,9.
  1082,7.606,6.811,6.3,5.91,5.598,9.461,8.037,7.279,6.807,6.454,6.17,
  29.84,8.42,7.682,7.23,6.897,6.632,10.18,8.773,8.049,7.61,7.29,7.034
  3,10.64,9.167,8.397,7.997,7.749,7.5,10.43,9.048,8.343,7.921,7.617,1
  41.35,9.972,9.279,8.869,8.574,12.11,10.74,10.05,9.644,9.355,12.91,1
  51.47,10.72,10.35,10.13,12.53,11.34,10.65,10.25,9.96,13.41,12.25,11
  6.57,11.17,10.88,14.18,13.01,12.33,11.93,11.64,14.74,13.73,13.,12.6
  7,12.4,1.32,1.286,1.254,1.224,1.198,1.173,1.881,1.828,1.782,1.742,1
  8.704,1.67,2.488,2.395,2.32,2.257,2.204,2.157,3.399,3.096,2.915,2.8
  901,2.715,2.645,4.313,4.157,3.659,3.404,3.254,3.168,2.768,2.734)
   DATA((S(I),I=436,543)=2.7,2.672,2.645,3.293,3.215,3.151,3.096,3.06
  13,3.914,3.749,3.633,3.544,3.482,4.653,4.368,4.172,4.029,3.912,5.21
  24,4.934,4.703,4.519,4.353,5.608,5.374,5.141,4.967,4.793,6.198,5.52
  38,4.808,4.203,3.914,6.523,5.983,5.495,5.042,4.653,6.804,6.318,5.89
  49,5.536,5.214,7.088,6.65,6.213,5.91,5.608,3.444,3.361,3.311,3.261,
  53.212,3.162,3.689,3.553,3.464,3.396,3.341,3.293,4.081,3.793,3.655,
  63.562,3.491,3.448,4.621,4.117,3.884,3.749,3.654,3.603,4.957,4.502,
  74.16,3.963,3.835,3.759,5.168,4.809,4.506,4.203,4.059,3.914,5.383,5
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 9 N=10
   GO TO 33
10 IF(P.LT.3.53) GO TO 11
   N=11
   GO TO 33
11 N=12
   GO TO 33
12 IF(T.GE.59.4) GO TO 18
   TZ=24.84+0.00317*P
   IF(T.LT.TZ) T=TZ
   IF(P.LT.1763.52) GO TO 14
   N=13
   GO TO 33
14 IF(P.LT.734.8) GO TO 15
   N=14
   GO TO 33
15 N=18
   IF(P.GE.187.6385)GO TO 33
   DO 16 I=2,20
   IF(P-PS(I))17,17,16
16 CONTINUE
   I=20
17 TZ=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
   IF(T.LT.TZ) GO TO 33
   GO TO 28
18 IF(P.LT.734.8) GO TO 20
   IF(P.LT.1763.52) GO TO 19
   N=13
   GO TO 33
19 N=14
   GO TO 33
20 IF(T.LT.90.) GO TO 23
   IF(P.GE.67.16) GO TO 22
   IF(P.LT.6.716) GO TO 21
   N=16
   GO TO 33
21 N=17
   GO TO 33
22 N=15
   GO TO 33
23 IF(P.LT.183.7) GO TO 28
   IF(P.LT.440.88) GO TO 24
   N=19
   GO TO 33
24 IF(T.LT.68.4) GO TO 25
   N=20
   GO TO 33
25 IF(P.LT.257.18) GO TO 26
   N=21
   GO TO 33
26 IF(T.LT.63.)GO TO 27
   N=22
   GO TO 33
27 N=23
   GO TO 33
28 IF(P.LT.6.716) GO TO 30
   IF(P.LT.48.5)  GO TO 29
   N=24
```

```
8.01,4.358,3.804,5.543,5.265,4.86,4.382,5.703,5.447,5.13,4.785,5.86
93,5.595,5.312,5.024,4.8,3.855,3.722,3.656,3.609,3.571,3.539,3.512)
 DATA((S(I),I=544,651)=3.487,3.464,3.444,4.906,4.675,3.932,3.777,3.
1703,3.653,3.611,3.577,3.548,3.521,3.505,5.011,4.874,4.555,3.994,3.
2832,3.751,3.695,3.651,3.615,3.584,3.566,5.117,4.995,4.795,4.466,4.
3043,3.881,3.797,3.737,3.69,3.652,3.628,5.222,5.088,4.929,4.723,4.4
411,4.081,3.926,3.841,3.778,3.729,3.689,5.262,5.164,5.028,4.867,4.6
56,4.38,4.118,3.971,3.881,3.819,3.787,5.302,5.23,5.109,4.972,4.81,4
6.609,4.365,4.15,4.011,3.921,3.885,5.342,5.289,5.178,5.057,4.921,4.
7761,4.572,4.359,4.176,4.048,3.983,5.383,5.29,5.197,5.103,5.01,4.84
87,4.684,4.521,4.358,4.219,4.081,6.153,5.054,3.633,0.,6.657,5.81,4.
9872,3.95,7.039,6.324,5.749,5.117,7.335,6.694,6.213,5.793,7.631)
 DATA((S(I),I=652,748)=6.997,6.555,6.192,7.863,7.259,6.841,6.505,8.
1095,7.55,7.088,6.825,8.321,6.889,6.071,5.473,9.283,7.84,7.07,6.568
2,9.939,8.536,7.812,7.369,10.46,9.072,8.364,7.94,10.89,9.51,8.811,8
3.395,9.14,8.02,7.35,6.94,6.65,10.45,9.26,8.56,8.14,7.84,11.36,10.1
48,9.49,9.08,8.79,12.01,10.84,10.15,9.75,9.46,12.53,11.36,10.68,10.
527,9.99,12.97,11.79,11.11,10.71,10.42,21.23,19.63,18.92,18.51,22.7
61,20.78,19.97,19.51,23.92,22.11,21.34,20.9,26.84,24.,22.91,22.33,2
77.23,25.05,24.08,23.55,33.82,29.19,27.28,26.33,29.42,27.85,27.05,2
86.52,33.46,30.94,29.69,28.88,38.47,35.25,33.5,32.35)
 END
```

```
   GO TO 33
29 N=25
   GO TO 33
30 N=26
33 IF(T.LE.5000.)N1=N
   FP=(P-BP(N))/DP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   FI=IP
   F=FP-FI
   FP=1.0-F
   FT=(T-BT(N1))/DT(N)
   IT=FT
   FI=IT
   FF=FT-FI
   FT=1.0-FF
   I=IT*JP(N)+IP+LOC(N1)
   J=I+JP(N)
   PTENTR=FP*FT*S(I)+F*FT*S(I+1)+FP*FF*S(J)+F*FF*S(J+1)
   RETURN
   END
```

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```
 FUNCTION PTCOND(PRES,TEMP)
 DIMENSION PS(19),TS(19),JP(19),MX(19),LOC(19),BP(19),DP(19),BT(19)
1,DT(19)
 COMMON/LAMBDA/C(730)
 DATA(JP=7,5,3,6,4,3,6,6,7,5,5,9,5,2,5,4,3,3,3)
 DATA(MX=5,3,1,4,2,1,4,4,5,3,3,7,3,0,3,2,1,1,1)
 DATA(LOC=1,78,123,168,204,236,251,281,329,392,417,442,487,512,524,
1 604,668,689,710)
 DATA(BP=52.,700.,2500.,0.,100.,142.5,187.5,187.5,400.,700.,0.,0.,
1 0.,0.,1.,0.,0.,-100.,0.)
 DATA(DP=108.,450.,1250.,20.,30.,22.5,42.5,42.5,50.,450.,175.,625.,
1 1250.,3000.,1.,10.,40.,300.,1500.)
 DATA(BT=26.,28.,30.,25.,52.,56.,56.,59.,56.,60.,80.,100.,180.,500.
1 ,3000.,3000.,3000.,3000.,3000.)
 DATA(DT=3.,4.,5.,11.,4.,1.,3.,3.,3.,10.,5.,20.,80.,500.,200.,200.,
1 500.,500.,500.)
 DATA(PS=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.506)
 DATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,
154.79,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356)
 DATA((C(I),I=1, 94)=.04565,.04628,.04642,.04702,.04764,.04823,.048
18,.0523,.05288,.05324,.05384,.0544,.05494,.05546,.05525,.05616,.05
2701,.05781,.05858,.05931,.06,.05671,.05785,.05891,.0599,.06084,.06
3173,.06258,.05833,.05974,.06103,.06223,.06336,.06443,.06544,.05886
4,.06058,.06213,.06355,.06488,.06612,.0673,.05826,.0604,.06226,.063
594,.06548,.06691,.06825,.05654,.05926,.06153,.06351,.06529,.06693,
6.06844,.05354,.05716,.06002,.06239,.06446,.06632,.06803,.04842,.05
7389,.05773,.06065,.06308,.06522,.06714,.05024,.04964,.05431,.05804
8,.06095,.0634,.06556,.05332,.05581,.05804,.06097,0.,.06,.06266,.06
9501,.0672,.06944,.06357,.067,.07001,.07273,.07524,.0668,.07099)
```

```
 FUNCTION PTCOND(PRES,TEMP)
 DIMENSIDN PS(19),TS(19),JP(19),MX(19),LOC(19),BP(19),DP(19),BT(19)
1,DT(19),C(730)
 DIMENSION AA( 96),AB(101),AC(114),AD( 97),AE( 97),AF(112),AG(110)
1 ,AH(  3)
 EQUIVALENCE( C,AA),( C(  97),AB),( C( 198),AC),( C( 312),AD)
1    ,( C( 409),AE),( C( 506),AF),( C( 618),AG),( C( 728),AH)
 DATAAA/.04565,.04628,.04642,.04702,.04764,.04823,.0488,.0523,.0528
18,.05324,.05384,.0544,.05494,.05546,.05525,.05616,.05701,.05781,.0
25858,.05931,.06,.05671,.05785,.05891,.0599,.06084,.06173,.06258,.0
35833,.05974,.06103,.06223,.06336,.06443,.06544,.05886,.06058,.0621
43,.06355,.06488,.06612,.0673,.05826,.0604,.06226,.06394,.06548,.06
5691,.06825,.05654,.05926,.06153,.06351,.06529,.06693,.06844,.05354
6,.05716,.06002,.06239,.06446,.06632,.06803,.04842,.05389,.05773,.0
76065,.06308,.06522,.06714,.05024,.04964,.05431,.05804,.06095,.0634
8,.06556,.05332,.05581,.05804,.06097,0.,.06,.06266,.06501,.0672,.06
9944,.06357,.067,.07001,.07273,.07524,.0668,.07099,.07464,.07791/
 DATAAB/.08092,.06825,.07318,.07739,.08114,.08456,.06836,.07402,.07
1875,.08292,.0867,.06748,.0739,.07913,.08368,.08778,.06556,.07279,.
207849,.08337,.08773,.06284,.07094,.07709,.08227,.08684,.06705,.070
377,0.,.07359,.08025,.08729,.08092,.0883,.09495,.08523,.09383,.1013
4,.08735,.09689,.1052,.08789,.09818,.107,.08684,.09768,.1069,.08538
5,.09667,.1062,.08361,.09529,.105,.08167,.09366,.1035,.07965,.0919,
6.1019,.07765,.09011,.1002,.07572,.08834,.0985,.07389,.08663,.09681
7,.0722,.085,.09517,.00717,.0078,0.,0.,0.,0.,.0089,.0099,.01175,.01
8343,0.,0.,.01173,.01235,.01324,.0142,.016,.0195,.0144,.01486,.0153
99,.01603,.01683,.01787,.01689,.01728,.01771,.01819,.01871,.01929/
 DATAAC/.01936,.01971,.02008,.02047,.02088,.02132,.1355,.0765,.02,0
1.,.1997,.1266,.0583,-.097,.2737,.1956,.1145,.0183,.355,.2739,.1924
2,.106,.4435,.3594,.2766,.1922,.5389,.4519,.3672,.2827,.6412,.5509,
```

```
 OATA((C(I),I=95,193)=.07464,.07791,.08092,.06825,.07318,.07739,.08
1114,.08456,.06836,.07402,.07875,.08292,.0867,.06748,.0739,.07913,.
208368,.08778,.06556,.07279,.07849,.08337,.08773,.06284,.07094,.077
309,.08227,.08684,.06705,.07077,0.,.07359,.08025,.08729,.08092,.088
43,.09495,.08523,.09383,.1013,.08735,.09689,.1052,.08789,.09818,.10
57,.08684,.09768,.1069,.08538,.09667,.1062,.08361,.09529,.105,.0816
67,.09366,.1035,.07965,.0919,.1019,.07765,.09011,.1002,.07572,.0883
74,.0985,.07389,.08663,.09681,.0722,.085,.09517,.00717,.0078,0.,0.,
80.,0.,.0089,.0099,.01175,.01343,0.,0.,.01173,.01235,.01324,.0142,.
9016,.0195,.0144,.01486,.01539,.01603,.01683,.01787,.01689,.01728)
 OATA((C(I),I=194,304)=.01771,.01819,.01871,.01929,.01936,.01971,.0
12008,.02047,.02088,.02132,.1355,.0765,.02,0.,.1997,.1266,.0583,-.0
297,.2737,.1956,.1145,.0183,.355,.2739,.1924,.106,.4435,.3594,.2766
3,.1922,.5389,.4519,.3672,.2827,.6412,.5509,.464,.3784,.7503,.6568,
4.5673,.4801,.186,.1823,.1688,.1471,.1327,.117,.116,.0897,.06738,0.
5,.1033,.02061,0.,.0923,-.03742,.1647,.5027,.8584,1.215,1.575,1.935
6,.0205,.3245,.6437,.9728,1.317,1.664,.02782,.2195,.4653,.7696,1.08
73,1.402,-.051,.1085,.3222,.5864,.8749,1.178,0.,0.,.175,.3979,.6745
8,.9617,.002,.14,0.,.1714,.468,.7537,.0676,.171,.4237,.4227,0.,0.,.
91345,.1942,.3248,.4415,.5429,0.,.1993,.2479,.3348,.458,.5758,.693)
 P=PRES
 IF(P.LT.1.0) P=1.0
 T=TEMP
 IF(T.GE.6000.)T=5999.9999
 OIV=1.0
 IF(T.GE.100.0) GO TO 15
 TZ=24.84+.00317*P
 IF(T.LT.TZ)T=TZ
 IF(P.GE.700.0) GO TO 4
 IF(T.GE.80.0) GO TO 3
 IF(P.LT.187.506) GO TO 7
 IF(T.LT.56.0) GO TO 12
 IF(P.GT.400.0) GO TO 2
 TM=(-0.000052346 7*P+0.08698291)*P+44.882441
 IF(T.GE.TM) GO TO 1
 N=7
 OIV=(P-187.506)*.083+TM-T
 GO TO 33
1 N=8
 OIV=(P-187.506)*.083+T-TM
 GO TO 33
2 N=9
 GO TO 33
3 N=11
 GO TO 33
4 IF(P.GE.2500.0) GO TO 6
 IF(T.GE.60.0) GO TO 5
 N=2
 GO TO 33
5 N=10
 GO TO 33
6 N=3
 GO TO 33
7 DO 8 I=2,19
 IF(P-PS(I)) 10,9,8
8 CONTINUE
9 TM=TS(I)
 GO TO 11
```

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3.464,.3784,.7503,.6568,.5673,.4801,.186,.1823,.1688,.1471,.1327,.1
417,.116,.0897,.06738,0.,.1033,.02061,0.,.0923,-.03742,.1647,.5027,
5.8584,1.215,1.575,1.935,.0205,.3245,.6437,.9728,1.317,1.664,.02782
6,.2195,.4653,.7696,1.083,1.402,-.051,.1085,.3222,.5864,.8749,1.178
7,0.,0.,.175,.3979,.6745,.9617,.002,.14,0.,.1714,.468,.7537,.0676,.
8171,.4237,.4227,0.,0.,.1345,.1942,.3248,.4415,.5429,0.,.1993,.2479
9,.3348,.458,.5758,.693,.2666,.3146,.3851,.4838,.603,.7319,.3369/
 DATAAO/.3841,.4481,.5344,.6445,.7709,.4104,.4577,.5192,.5976,.6964
1,.8146,.4874,.5352,.5954,.6698,.7616,.8713,.05874,.06009,.06134,.0
26249,.06357,.06459,.06556,.05558,.05724,.05872,.06007,.06131,.0624
37,.06355,.05203,.05394,.05574,.05734,.05878,.06011,.06134,.0492,.0
45102,.05267,.05431,.056,.05753,.05892,.04593,.0481,.05003,.05176,.
505332,.05476,.05634,.04202,.04488,.04717,.04916,.05093,.05253,.053
699,.0379,.04145,.0442,.04647,.04845,.05021,.05182,.0349,.03832,.04
7131,.04383,.046,.04792,.04965,.03308,.03602,.03886,.04143,.04371,.
804574,.04758,.06284,.07094,.07709,.08227,.08684,.0547,.0655,.07269
9,.07856,.08361,.0477,.05964,.06774,.07422,.07965,.04222,.0551/
 OATAAE/.06309,.07,.07572,.03963,.05101,.05952,.06634,.0722,.01936,
1.023,.02998,.04018,.04758,.02049,.024,.0294,.03728,.04452,.02161,.
202484,.02949,.03569,.04217,.02273,.02573,.02979,.03494,.04058,.023
385,.02667,.03028,.03472,.03963,.02386,.0373,.05312,.06377,.0722,.0
47907,.085,.09031,.09517,.02868,.0382,.0496,.05988,.06779,.07458,.0
5805,.08576,.09056,.03366,.04106,.04988,.0584,.06584,.07229,.07796,
6.08305,.0877,.03977,.04627,.05363,.06095,.06769,.07374,.07918,.084
713,.08869,.04614,.052,.05841,.06483,.07091,.07653,.08169,.08644,.0
89085,.04614,.05841,.07091,.08169,.09085,.07156,.08113,.08993,.0979
98,.1054,.08752,.09393,.09962,.1049,.11,.09764,.1017,.1053,.1087/
 DATAAF/.112,.1067,.1091,.1111,.1131,.1151,.1067,.1119,.1662,.1662,
1.2218,.2218,.2777,.2777,.3362,.3354,.41,.3934,.41,.405,.4028,.4015
2,.4006,.4594,.4467,.441,.4376,.4353,.539,.5096,.4966,.4888,.4835,.
36718,.6102,.5829,.5666,.5555,.8907,.772,.7193,.6878,.6663,1.239,1.
4026,.9316,.8749,.8362,1.769,1.412,1.252,1.156,1.09,2.535,1.971,1.7
516,1.563,1.458,3.583,2.744,2.361,2.129,1.97,4.929,3.762,3.217,2.88
65,2.654,6.528,5.024,4.297,3.845,3.53,8.24,6.483,5.58,5.005,4.598,9
7.796,8.013,6.995,6.318,5.825,10.83,9.407,8.405,7.686,7.141,11.,10.
837,9.587,8.935,8.402,10.22,10.65,10.31,9.865,9.44,.4028,.3984,.396
98,.3961,.441,.4296,.4256,.4238,.4967,.4703,.461,.4569,.5831,.5278/
 OATAAG/.5083,.4996,.7197,.6129,.5751,.5583,.9325,.7399,.6716,.6412
1,1.254,.9269,.8108,.7592,1.721,1.196,1.008,.9249,2.371,1.569,1.282
2,1.153,3.238,2.071,1.649,1.459,4.339,2.721,2.127,1.857,5.664,3.531
3,2.729,2.362,7.155,4.495,3.463,2.981,8.69,5.592,4.324,3.717,10.05,
46.751,5.285,4.555,10.99,7.887,6.31,5.475,.3974,.3957,.3949,.4875,.
54731,.4663,.6955,.6232,.5889,1.217,.9678,.8495,2.344,1.695,1.385,4
6.337,3.001,2.35,7.09,4.936,3.833,.396,.3943,.3938,.4754,.4602,.456
74,.6346,.5585,.5392,1.008,.7441,.6772,1.804,1.106,.9271,3.249,1.75
8,1.36,5.438,2.763,2.042,.394,.3935,.3934,.4578,.4536,.4525,.5462,.
95252,.5196,.7016,.6285,.609,.9925,.7965,.744,1.504,1.072,.9551/
 OATAAH/2.315,1.497,1.274/
 OATA JP/7,5,3,6,4,3,6,6,7,5,5,9,5,2,5,4,3,3,3/
 OATA MX/5,3,1,4,2,1,4,4,5,3,3,7,3,0,3,2,1,1,1/
 OATA LOC/1,78,123,168,204,236,251,281,329,392,417,442,487,512,524,
1 604,668,689,710/
 OATA BP/52.,700.,2500.,0.,100.,142.5,187.5,187.5,400.,700.,0.,0.,
1 0.,0.,1.,0.,0.,-100.,0./
 DATA OP/108.,450.,1250.,20.,30.,22.5,42.5,42.5,50.,450.,175.,625.,
1 1250.,3000.,1.,10.,40.,300.,1500./
 OATA BT/26.,28.,30.,25.,52.,56.,56.,59.,56.,60.,80.,100.,180.,500.
1 ,3000.,3000.,3000.,3000.,3000./
```

```
10 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
11 IF(T.GE.TM) GO TO 13
   IF(T.LT.56.0) GO TO 12
   N=6
   DIV=(187.506-P)*.083+TM-T
   GO TO 33
12 N=1
   GO TO 33
13 IF(P.GE.100.0) GO TO 14
   N=4
   GO TO 33
14 N=5
   OIV=(187.506-P)*.083+T-TM
   GO TO 33
15 IF(T.GE.3000.0) GO TO 18
   IF(T.GE.500.0) GO TO 17
   IF(T.GE.180.0) GO TO 16
   N=12
   GO TO 33
16 N=13
   GO TO 33
17 N=14
   GO TO 33
18 IF(P.GE.30.0) GO TO 20
   IF(P.GE.5.0) GO TO 19
   N=15
   GO TO 33
19 N=16
   GO TO 33
20 IF(P.GE.500.0) GO TO 22
   IF(P.GE.100.0) GO TO 21
   N=17
   GO TO 33
21 N=18
   GO TO 33
22 N=19
33 FP=(P-BP(N))/DP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   F=FP-IP
   FP=1.0-F
   FT=(T-BT(N))/OT(N)
   IT=FT
   FF=FT-IT
   FT=1.0-FF
   I=IT*JP(N)+IP+LOC(N)
   J=I+JP(N)
   PTCONO=(FP*FT*C(I)+F*FT*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))/OIV
   RETURN
   END

   SUBROUTINE DATACONO
   COMMON/LAMBDA/C(730)
   DATA((C(I),I=305,400)=.2666,.3146,.3851,.4838,.603,.7319,.3369,.38
  141,.4481,.5344,.6445,.7709,.4104,.4577,.5192,.5976,.6964,.8146,.48
  274,.5352,.5954,.6698,.7616,.8713,.05874,.06009,.06134,.06249,.0635
  37,.06459,.06556,.05558,.05724,.05872,.06007,.06131,.06247,.06355,.
  405203,.05394,.05574,.05734,.05878,.06011,.06134,.0492,.05102,.0526
   DATA OT/3.,4.,5.,11.,4.,1.,3.,3.,3.,10.,5.,20.,80.,500.,200.,200.,
  1 500.,500.,500./
   DATA PS/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
  1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.506/
   DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,
  154.79,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356/
   P=PRES
   IF(P.LT.1.0) P=1.0
   T=TEMP
   IF(T.GE.6000.)T=5999.9999
   OIV=1.0
   IF(T.GE.100.0) GO TO 15
   TZ=24.84+.00317*P
   IF(T.LT.TZ)T=TZ
   IF(P.GE.700.0) GO TO 4
   IF(T.GE.80.0) GO TO 3
   IF(P.LT.187.506) GO TO 7
   IF(T.LT.56.0) GO TO 12
   IF(P.GT.400.0) GO TO 2
   TM=(-0.0000523467*P+0.08698291)*P+44.882441
   IF(T.GE.TM) GO TO 1
   N=7
   DIV=(P-187.506)*.083+TM-T
   GO TO 33
 1 N=8
   OIV=(P-187.506)*.083+T-TM
   GO TO 33
 2 N=9
   GO TO 33
 3 N=11
   GO TO 33
 4 IF(P.GE.2500.0) GO TO 6
   IF(T.GE.60.0) GO TO 5
   N=2
   GO TO 33
 5 N=10
   GO TO 33
 6 N=3
   GO TO 33
 7 DO 8 I=2,19
   IF(P-PS(I)) 10,9,8
 8 CONTINUE
 9 TM=TS(I)
   GO TO 11
10 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
11 IF(T.GE.TM) GO TO 13
   IF(T.LT.56.0) GO TO 12
   N=6
   OIV=(187.506-P)*.083+TM-T
   GO TO 33
12 N=1
   GO TO 33
13 IF(P.GE.100.0) GO TO 14
   N=4
   GO TO 33
14 N=5
   OIV=(187.506-P)*.083+T-TM
   GO TO 33
```

```
57,.05431,.056,.05753,.05892,.04593,.0481,.05003,.05176,.05332,.054
676,.05634,.04202,.04488,.04717,.04916,.05093,.05253,.05399,.0379,.
704145,.0442,.04647,.04845,.05021,.05182,.0349,.03832,.04131,.04383
8,.046,.04792,.04965,.03308,.03602,.03886,.04143,.04371,.04574,.047
958,.06284,.07094,.07709,.08227,.08684,.0547,.0655,.07269,.07856)
 OATA((C(I),I=401,494)=.08361,.0477,.05964,.06774,.07422,.07965,.04
1222,.0551,.06309,.07,.07572,.03963,.05101,.05952,.06634,.0722,.019
236,.023,.02998,.04018,.04758,.02049,.024,.0294,.03728,.04452,.0216
31,.02484,.02949,.03569,.04217,.02273,.02573,.02979,.03494,.04058,.
402385,.02667,.03028,.03472,.03963,.02386,.0373,.05312,.06377,.0722
5,.07907,.085,.09031,.09517,.02868,.0382,.0496,.05988,.06779,.07458
6,.0805,.08576,.09056,.03366,.04106,.04988,.0584,.06584,.07229,.077
796,.08305,.0877,.03977,.04627,.05363,.06095,.06769,.07374,.07918,.
808413,.08869,.04614,.052,.05841,.06483,.07091,.07653,.08169,.08644
9,.09085,.04614,.05841,.07091,.08169,.09085,.07156,.08113,.08993)
 OATA((C(I),I=495,602)=.09798,.1054,.08752,.09393,.09962,.1049,.11,
1.09764,.1017,.1053,.1087,.112,.1067,.1091,.1111,.1131,.1151,.1067,
2.1119,.1662,.1662,.2218,.2218,.2777,.2777,.3362,.3354,.41,.3934,.4
31,.405,.4028,.4015,.4006,.4594,.4467,.441,.4376,.4353,.539,.5096,.
44966,.4888,.4835,.6718,.6102,.5829,.5666,.5555,.8907,.772,.7193,.6
5878,.6663,1.239,1.026,.9316,.8749,.8362,1.769,1.412,1.252,1.156,1.
609,2.535,1.971,1.716,1.563,1.458,3.583,2.744,2.361,2.129,1.97,4.92
79,3.762,3.217,2.885,2.654,6.528,5.024,4.297,3.845,3.53,8.24,6.483,
85.58,5.005,4.598,9.796,8.013,6.995,6.318,5.825,10.83,9.407,8.405,7
9.686,7.141,11.,10.37,9.587,8.935,8.402,10.22,10.65,10.31,9.865)
 OATA((C(I),I=603,710)=9.44,.4028,.3984,.3968,.3961,.441,.4296,.425
16,.4238,.4967,.4703,.461,.4569,.5831,.5278,.5083,.4996,.7197,.6129
2,.5751,.5583,.9325,.7399,.6716,.6412,1.254,.9269,.8108,.7592,1.721
3,1.196,1.008,.9249,2.371,1.569,1.282,1.153,3.238,2.071,1.649,1.459
4,4.339,2.721,2.127,1.857,5.664,3.531,2.729,2.362,7.155,4.495,3.463
5,2.981,8.69,5.592,4.324,3.717,10.05,6.751,5.285,4.555,10.99,7.887,
66.31,5.475,.3974,.3957,.3949,.4875,.4731,.4663,.6955,.6232,.5889,1
7.217,.9678,.8495,2.344,1.695,1.385,4.337,3.001,2.35,7.09,4.936,3.8
833,.396,.3943,.3938,.4754,.4602,.4564,.6346,.5585,.5392,1.008,.744
91,.6772,1.804,1.106,.9271,3.249,1.75,1.36,5.438,2.763,2.042,.394)
 OATA((C(I),I=711,730)=.3935,.3934,.4578,.4536,.4525,.5462,.5252,.5
1196,.7016,.6285,.609,.9925,.7965,.744,1.504,1.072,.9551,2.315,1.49
27,1.274)
 ENO
```

```
 15 IF(T.GE.3000.0) GO TO 18
    IF(T.GE.500.0) GO TO 17
    IF(T.GE.180.0) GO TO 16
    N=12
    GO TO 33
 16 N=13
    GO TO 33
 17 N=14
    GO TO 33
 18 IF(P.GE.30.0) GO TO 20
    IF(P.GE.5.0) GO TO 19
    N=15
    GO TO 33
 19 N=16
    GO TO 33
 20 IF(P.GE.500.0) GO TO 22
    IF(P.GE.100.0) GO TO 21
    N=17
    GO TO 33
 21 N=18
    GO TO 33
 22 N=19
 33 FP=(P-BP(N))/DP(N)
    IP=FP
    IF(IP.GT.MX(N)) IP=MX(N)
    F=FP-IP
    FP=1.0-F
    FT=(T-BT(N))/OT(N)
    IT=FT
    FF=FT-IT
    FT=1.0-FF
    I=IT*JP(N)+IP+LOC(N)
    J=I+JP(N)
    PTCONO=(FP*FT*C(I)+F*FT*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))/OIV
    RETURN
    ENO
```

```
 FUNCTION PTVISC(PRES,TEMP)
 COMMON /VISCOT/V(536)
 OIMENSION PS(20),TS(20),JP(21),MX(21),LOC(21),BP(21),OP(21),BT(21)
1,DT(21)
 DATA(PS=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,
1182.,185.,186.5,187.25,187.46875,187.506,187.6385)
 OATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4)
 DATA(LOC=1,21,37,46,55,90,112,134,155,176,204,216,276,296,320,
1356,376,436,480,510,528)
 OATA(JP=4,4,3,3,5,3,3,3,3,4,3,6,4,6,4,5,5,11,6,3,3)
 DATA(MX=2,2,1,1,3,1,1,1,1,2,1,4,2,4,2,3,3,9,4,1,1)
 OATA(BP=      0,0,-1.,     0,1.,-10.,    0,1469.6,1469.6,1469.6,1469.
```

```
   FUNCTION PTVISC(PRES,TEMP)
   OIMENSION PS(20),TS(20),JP(21),MX(21),LOC(21),8P(21),OP(21),BT(21)
  1,OT(21),V(536)
   OIMENSION AA( 66),AB( 67),AC( 67),AO( 66),AE( 67),AF( 66),AG( 66)
  1 ,AH( 66),AI(  5)
   EQUIVALENCE( V,AA),( V(  67),AB),( V( 134),AC),( V( 201),AD)
  1    ,( V( 267),AE),( V( 334),AF),( V( 400),AG),( V( 466),AH)
  2    ,( V( 532),AI)
   OATA PS/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,
  1182.,185.,186.5,187.25,187.46875,187.506,187.6385/
   OATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
  179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4/
   DATA LOC/1,21,37,46,55,90,112,134,155,176,204,216,276,296,320,356,
```

```
16,0,0,0,587.84,0,293.92,190.,190.,190.,190.)
 OATA(DP=1000. ,1000.,3.,1500.,1.,20.,1500.,1763.52,1763.52,1175.68
1,1763.52,293.92,73.48,293.92,293.92,146.96,73.48,10.,20.,50.,50.)
 DATA(BT=180.,500.,2000.,2000.,3000.,3000.,3000.,30.6,41.4,63.,126.
1,27.,36.,126.,54.,99.,59.4,59.4,64.8,72.,81.)
 DATA(DT=80.,500.,500.,500.,500.,500.,500.,1.8,3.6,9.,18.,3.6,18.,
118.,9.,9.,3.6,1.8,1.8,1.8,9.)
 DATA((V(I),I=1, 64)=2.354E-11,2.797E-11,3.278E-11,3.762E-11,3.1E-1
11,3.452E-11,3.812E-11,4.172E-11,3.754E-11,3.99E-11,4.22E-11,4.451E
2-11,4.351E-11,4.498E-11,4.638E-11,4.779E-11,4.906E-11,4.986E-11,5.
306E-11,5.138E-11,4.906E-11,4.986E-11,5.06E-11,5.138E-11,7.852E-11,
47.688E-11,7.543E-11,7.418E-11,1.033E-10,1.002E-10,9.74E-11,9.495E-
511,1.256E-10,1.213E-10,1.174E-10,1.14E-10,1.256E-10,1.256E-10,1.25
66E-10,1.463E-10,1.463E-10,1.462E-10,1.657E-10,1.657E-10,1.657E-10,
71.256E-10,1.193E-10,1.14E-10,1.463E-10,1.384E-10,1.317E-10,1.657E-
810,1.564E-10,1.485E-10,1.657E-10,1.657E-10,1.657E-10,1.657E-10,1.6
957E-10,1.843E-10,1.843E-10,1.842E-10,1.842E-10,1.842E-10)
 DATA((V(I),I=65,129)=2.027E-10,2.024E-10,2.023E-10,2.023E-10,2.022
1E-10,2.223E-10,2.215E-10,2.21E-10,2.208E-10,2.206E-10,2.441E-10,2.
2427E-10,2.418E-10,2.412E-10,2.407E-10,2.617E-10,2.635E-10,2.634E-1
30,2.631E-10,2.626E-10,2.647E-10,2.742E-10,2.782E-10,2.801E-10,2.81
41E-10,1.658E-10,1.657E-10,1.655E-10,1.844E-10,1.842E-10,1.842E-10,
25.026E-10,2.021E-10,2.018E-10,2.221E-10,2.201E-10,2.194E-10,2.446E-
610,2.394E-10,2.377E-10,2.681E-10,2.608E-10,2.576E-10,2.782E-10,2.8
721E-10,2.794E-10,0.,1.657E-10,1.564E-10,1.485E-10,1.842E-10,1.736E
8-10,1.645E-10,2.02E-10,1.901E-10,1.799E-10,2.197E-10,2.06E-10,1.94
98E-10,2.38E-10,2.217E-10,2.094E-10,2.58E-10,2.373E-10,2.238E-10)
 DATA((V(I),I=130,195)=2.799E-10,2.534E-10,2.385E-10,0.,1.838E-10,2
1.745E-10,0.,1.645E-10,2.572E-10,0.,1.496E-10,2.341E-10,3.211E-10,1
2.381E-10,2.145E-10,2.94E-10,1.266E-10,1.958E-10,2.659E-10,1.182E-1
30,1.804E-10,2.432E-10,1.1E-10,1.674E-10,2.237E-10,1.1E-10,1.674E-1
40,2.237E-10,9.723E-11,1.467E-10,1.938E-10,8.717E-11,1.308E-10,1.71
57E-10,7.898E-11,1.184E-10,1.547E-10,7.217E-11,1.084E-10,1.413E-10,
66.587E-11,9.78E-11,1.297E-10,6.091E-11,9.124E-11,1.209E-10,6.091E-
711,8.175E-11,1.02E-10,1.209E-10,5.159E-11,7.068E-11,8.807E-11,1.04
83E-10,4.432E-11,6.179E-11,7.734E-11,9.191E-11,3.911E-11,5.524E-11,
96.936E-11,8.264E-11,3.553E-11,5.021E-11,6.317E-11,7.54E-11)
 P=PRES
 IF(P.LT.1.0) P=1.0
 T=TEMP
 IF(T.LT.180.0) GO TO 7
 IF(T.GE.500.0) GO TO 1
 N=1
 GO TO 30
1 IF(T.GE.3000.0) GO TO 4
 IF(T.GE.2000.0) GO TO 2
 N=2
 GO TO 30
2 IF(P.GT.5.0) GO TO 3
 N=3
 GO TO 30
3 N=4
 GO TO 30
4 IF(T.GE.6000.0) T=5999.99999
 IF(P.GE.5.0) GO TO 5
 N=5
 GO TO 30
5 IF(P.GE.30.0) GO TO 6
```

```
1376,436,480,510,528/
 DATA JP/4,4,3,3,5,3,3,3,3,4,3,6,4,6,4,5,5,11,6,3,3/
 OATA MX/2,2,1,1,3,1,1,1,1,2,1,4,2,4,2,3,3,9,4,1,1/
 OATA BP/0.   ,0.,-1., 0.  ,1.,-10., 0. ,1469.6,1469.6,1469.6,1469.
16,0.,0.,0.,587.84,0.,293.92,190.,190.,190.,190./
 DATA DP/1000., 1000.,3.,1500.,1.,20.,1500.,1763.52,1763.52,1175.68
1,1763.52,293.92,73.48,293.92,293.92,146.96,73.48,10.,20.,50.,50./
 OATA BT/180.,500.,2000.,2000.,3000.,3000.,3000.,30.6,41.4,63.,126.
1,27.,36.,126.,54.,99.,59.4,59.4,64.8,72.,81./
 DATA DT/80.,500.,500.,500.,500.,500.,500.,1.8,3.6,9.,18.,3.6,18.,
118.,9.,9.,3.6,1.8,1.8,1.8,9./
 DATAAA/2.354E-11,2.797E-11,3.278E-11,3.762E-11,3.1E-11,3.452E-11,3
1.812E-11,4.172E-11,3.754E-11,3.99E-11,4.22E-11,4.451E-11,4.351E-11
2,4.498E-11,4.638E-11,4.779E-11,4.906E-11,4.986E-11,5.06E-11,5.138E
3-11,4.906E-11,4.986E-11,5.06E-11,5.138E-11,7.852E-11,7.688E-11,7.5
443E-11,7.418E-11,1.033E-10,1.002E-10,9.74E-11,9.495E-11,1.256E-10,
51.213E-10,1.174E-10,1.14E-10,1.256E-10,1.256E-10,1.256E-10,1.463E-
610,1.463E-10,1.462E-10,1.657E-10,1.657E-10,1.657E-10,1.256E-10,1.1
793E-10,1.14E-10,1.463E-10,1.384E-10,1.317E-10,1.657E-10,1.564E-10,
81.485E-10,1.657E-10,1.657E-10,1.657E-10,1.657E-10,1.657E-10,1.843E
9-10,1.843E-10,1.842E-10,1.842E-10,1.842E-10,2.027E-10,2.024E-10/
 OATAAB/2.023E-10,2.023E-10,2.022E-10,2.223E-10,2.215E-10,2.21E-10,
12.208E-10,2.206E-10,2.441E-10,2.427E-10,2.418E-10,2.412E-10,2.407E
2-10,2.617E-10,2.635E-10,2.634E-10,2.631E-10,2.626E-10,2.647E-10,2.
3742E-10,2.782E-10,2.801E-10,2.811E-10,1.658E-10,1.657E-10,1.655E-1
40,1.844E-10,1.842E-10,1.84E-10,2.026E-10,2.021E-10,2.018E-10,2.221
5E-10,2.201E-10,2.194E-10,2.446E-10,2.394E-10,2.377E-10,2.681E-10,2
6.608E-10,2.576E-10,2.782E-10,2.821E-10,2.794E-10,0.,1.657E-10,1.56
74E-10,1.485E-10,1.842E-10,1.736E-10,1.645E-10,2.02E-10,1.901E-10,1
8.799E-10,2.197E-10,2.06E-10,1.948E-10,2.38E-10,2.217E-10,2.094E-10
9,2.58E-10,2.373E-10,2.238E-10,2.799E-10,2.534E-10,2.385E-10,0./
 OATAAC/1.838E-10,2.745E-10,0.,1.645E-10,2.572E-10,0.,1.496E-10,2.3
141E-10,3.211E-10,1.381E-10,2.145E-10,2.94E-10,1.266E-10,1.958E-10,
22.659E-10,1.182E-10,1.804E-10,2.432E-10,1.1E-10,1.674E-10,2.237E-1
30,1.1E-10,1.674E-10,2.237E-10,9.723E-11,1.467E-10,1.938E-10,8.717E
4-11,1.308E-10,1.717E-10,7.898E-11,1.184E-10,1.547E-10,7.217E-11,1.
5084E-10,1.413E-10,6.587E-11,9.78E-11,1.297E-10,6.091E-11,9.124E-11
6,1.209E-10,6.091E-11,8.175E-11,1.02E-10,1.209E-10,5.159E-11,7.068E
7-11,8.807E-11,1.043E-10,4.432E-11,6.179E-11,7.734E-11,9.191E-11,3.
8911E-11,5.524E-11,6.936E-11,8.264E-11,3.553E-11,5.021E-11,6.317E-1
91,7.54E-11,3.28E-11,4.627E-11,5.823E-11,6.956E-11,3.134E-11/
 DATAAD/4.364E-11,5.458E-11,6.503E-11,3.05E-11,4.65E-11,6.177E-11,2
1.946E-11,4.211E-11,5.525E-11,2.962E-11,4.035E-11,5.165E-11,3.034E-
211,3.954E-11,4.874E-11,1.29E-10,1.48E-10,1.677E-10,1.866E-10,2.058
3E-10,2.25E-10,1.033E-10,1.183E-10,1.335E-10,1.493E-10,1.656E-10,1.
4825E-10,8.563E-11,9.818E-11,1.107E-10,1.233E-10,1.363E-10,1.496E-1
50,7.246E-11,8.358E-11,9.433E-11,1.05E-10,1.158E-10,1.267E-10,6.196
6E-11,7.234E-11,8.199E-11,9.135E-11,1.006E-10,1.1E-10,5.305E-11,6.3
724E-11,7.223E-11,8.073E-11,8.902E-11,9.723E-11,4.487E-11,5.552E-11
8,6.423E-11,7.216E-11,7.974E-11,8.717E-11,3.647E-11,4.869E-11,5.747
9E-11,6.505E-11,7.214E-11,7.898E-11,6.15E-12,4.232E-11,5.16E-11/
 DATAAE/5.906E-11,6.576E-11,7.217E-11,6.56E-12,3.651E-11,4.645E-11,
15.353E-11,6.013E-11,6.587E-11,6.3E-12,7.49E-12,5.8E-12,0.,9.3E-12,
21.004E-11,1.209E-11,2.554E-11,1.198E-11,1.249E-11,1.318E-11,1.434E
3-11,1.442E-11,1.483E-11,1.53E-11,1.587E-11,1.667E-11,1.701E-11,1.7
438E-11,1.78E-11,1.877E-11,2.006E-11,2.192E-11,2.457E-11,2.739E-11,
53.019E-11,2.075E-11,2.185E-11,2.325E-11,2.513E-11,2.729E-11,2.946E
6-11,2.263E-11,2.36E-11,2.473E-11,2.617E-11,2.785E-11,2.962E-11,2.4
```

```
      N=6
      GO TO 30
    6 N=7
      GO TO 30
    7 IF(P.LT.1469.6) GO TO 12
      IF(T.GE.  63.0) GO TO 10
      IF(T.GE.41.4)   GO TO 9
      N=8
    8 TZ=24.84+0.00317*P
      IF(T.LT.TZ) T=TZ
      GO TO 30
    9 N=9
      GO TO 30
   10 IF(T.GE.117.0) GO TO 11
      N=10
      GO TO 30
   11 N=11
      GO TO 30
   12 IF(T.GE.59.4)  GO TO 17
      N=12
      IF(P.GE.187.6385) GO TO 8
      DO 13 I=2,20
      IF(P-PS(I))15,14,13
   13 CONTINUE
   14 TL=TS(I)
      GO TO 16
   15 TL=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
   16 IF(T.LE.TL) GO TO 8
      N=13
      GO TO 30
   17 IF(T.LT.126.0) GO TO 18
      N=14
      GO TO 30
   18 IF(P.LT.587.84) GO TO 19
      N=15
      GO TO 30
   19 IF(T.LT.99.0) GO TO 20
      N=16
      GO TO 30
   20 IF(P.GE.190.0)GO TO 21
      N=13
      GO TO 30
   21 IF(P.LT.293.92) GO TO 22
      N=17
      GO TO 30
   22 IF(T.GE.72.0) GO TO 24
      IF(T.GE.64.8) GO TO 23
      N=18
      GO TO 30
   23 N=19
      GO TO 30
   24 IF(T.GE.81.0) GO TO 25
      N=20
      GO TO 30
   25 N=21
   30 FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
```

```
     728E-11,2.532E-11,2.625E-11,2.744E-11,2.88E-11,3.029E-11,5.444E-11,
     86.191E-11,6.881E-11,7.543E-11,4.154E-11,4.921E-11,5.559E-11,6.091E
     9-11,3.164E-11,3.988E-11,4.613E-11,5.159E-11,2.517E-11,3.308E-11/
      DATAAF/3.919E-11,4.432E-11,2.234E-11,2.867E-11,3.427E-11,3.911E-11
     1,2.131E-11,2.623E-11,3.099E-11,3.553E-11,2.113E-11,2.509E-11,2.9E-
     211,3.28E-11,2.141E-11,2.463E-11,2.792E-11,3.134E-11,2.192E-11,2.45
     37E-11,2.739E-11,3.019E-11,1.557E-11,1.635E-11,1.739E-11,1.901E-11,
     42.131E-11,1.667E-11,1.738E-11,1.826E-11,1.948E-11,2.113E-11,1.774E
     5-11,1.839E-11,1.916E-11,2.014E-11,2.141E-11,1.877E-11,1.941E-11,2.
     6006E-11,2.099E-11,2.192E-11,3.651E-11,3.9E-11,4.148E-11,4.397E-11,
     74.645E-11,2.868E-11,3.35E-11,3.675E-11,3.938E-11,4.154E-11,2.076E-
     811,2.766E-11,3.178E-11,3.483E-11,3.716E-11,1.748E-11,2.262E-11,2.7
     922E-11,3.068E-11,3.329E-11,1.649E-11,2.E-11,2.377E-11,2.712E-11/
      DATAAG/3.E-11,1.614E-11,1.857E-11,2.156E-11,2.448E-11,2.72E-11,1.6
     112E-11,1.79E-11,2.025E-11,2.27E-11,2.517E-11,1.625E-11,1.766E-11,1
     2.95E-11,2.154E-11,2.37E-11,1.649E-11,1.766E-11,1.913E-11,2.086E-11
     3,2.268E-11,1.676E-11,1.774E-11,1.896E-11,2.044E-11,2.202E-11,1.707
     4E-11,1.79E-11,1.892E-11,2.019E-11,2.157E-11,1.739E-11,1.82E-11,1.9
     501E-11,2.016E-11,2.131E-11,2.484E-11,2.818E-11,2.97E-11,3.086E-11,
     63.181E-11,3.261E-11,3.335E-11,3.401E-11,3.461E-11,3.52E-11,3.573E-
     711,1.431E-11,1.56E-11,1.812E-11,2.297E-11,2.59E-11,2.757E-11,2.885
     8E-11,2.987E-11,3.076E-11,3.154E-11,3.225E-11,1.368E-11,1.429E-11,1
     9.511E-11,1.626E-11,1.791E-11,2.015E-11,2.259E-11,2.458E-11/
      DATAAH/2.611E-11,2.728E-11,2.831E-11,1.35E-11,1.394E-11,1.438E-11,
     11.508E-11,1.578E-11,1.689E-11,1.8E-11,1.949E-11,2.099E-11,2.246E-1
     21,2.394E-11,1.35E-11,1.438E-11,1.578E-11,1.8E-11,2.099E-11,2.394E-
     311,1.347E-11,1.412E-11,1.503E-11,1.634E-11,1.815E-11,2.032E-11,1.3
     453E-11,1.404E-11,1.471E-11,1.562E-11,1.683E-11,1.833E-11,1.363E-11
     5,1.405E-11,1.459E-11,1.526E-11,1.615E-11,1.725E-11,1.377E-11,1.414
     6E-11,1.458E-11,1.512E-11,1.582E-11,1.664E-11,1.377E-11,1.484E-11,1
     7.664E-11,1.393E-11,1.486E-11,1.635E-11,1.409E-11,1.489E-11,1.61E-1
     81,1.427E-11,1.499E-11,1.604E-11,1.445E-11,1.509E-11,1.6E-11,1.464E
     9-11,1.523E-11,1.604E-11,1.464E-11,1.523E-11,1.604E-11,1.563E-11/
      DATAAI/1.606E-11,1.658E-11,1.662E-11,1.697E-11,1.736E-11/
      P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.LT.180.0) GO TO 7
      IF(T.GE.500.0) GO TO 1
      N=1
      GO TO 30
    1 IF(T.GE.3000.0) GO TO 4
      IF(T.GE.2000.0) GO TO 2
      N=2
      GO TO 30
    2 IF(P.GT.5.0) GO TO 3
      N=3
      GO TO 30
    3 N=4
      GO TO 30
    4 IF(T.GE.6000.0) T=5999.99999
      IF(P.GE.5.0) GO TO 5
      N=5
      GO TO 30
    5 IF(P.GE.30.0) GO TO 6
      N=6
      GO TO 30
    6 N=7
```

```
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N))/DT(N)
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N)
      J=I+JP(N)
      PTVISC=FP*FT*V(I)+F*FT*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
      RETURN
      ENO

      SUBROUTINE LOVISC
      COMMON /VISCOT/V(536)
      OATA((V(I),I=196,259)=3.28E-11,4.627E-11,5.823E-11,6.956E-11,3.134
     1E-11,4.364E-11,5.458E-11,6.503E-11,3.05E-11,4.65E-11,6.177E-11,2.9
     246E-11,4.211E-11,5.525E-11,2.962E-11,4.035E-11,5.165E-11,3.034E-11
     3,3.954E-11,4.874E-11,1.29E-10,1.48E-10,1.677E-10,1.866E-10,2.058E-
     410,2.25E-10,1.033E-10,1.183E-10,1.335E-10,1.493E-10,1.656E-10,1.82
     55E-10,8.563E-11,9.818E-11,1.107E-10,1.233E-10,1.363E-10,1.496E-10,
     67.246E-11,8.358E-11,9.433E-11,1.05E-10,1.158E-10,1.267E-10,6.196E-
     711,7.234E-11,8.199E-11,9.135E-11,1.006E-10,1.1E-10,5.305E-11,6.324
     8E-11,7.223E-11,8.073E-11,8.902E-11,9.723E-11,4.487E-11,5.552E-11,6
     9.423E-11,7.216E-11,7.974E-11,8.717E-11,3.647E-11,4.869E-11)
      DATA((V(I),I=260,324)=5.747E-11,6.505E-11,7.214E-11,7.898E-11, .61
     15E-11,4.232E-11,5.16E-11,5.906E-11,6.576E-11,7.217E-11,6.56E-12,3.
     2651E-11,4.645E-11,5.353E-11,6.013E-11,6.587E-11,6.3E-12,7.49E-12,5
     3.8E-12,0.,9.3E-12,1.004E-11,1.209E-11,2.554E-11,1.198E-11,1.249E-1
     41,1.318E-11,1.434E-11,1.442E-11,1.483E-11,1.53E-11,1.587E-11,1.667
     5E-11,1.701E-11,1.738E-11,1.78E-11,1.877E-11,2.006E-11,2.192E-11,2.
     6457E-11,2.739E-11,3.019E-11,2.075E-11,2.185E-11,2.325E-11,2.513E-1
     71,2.729E-11,2.946E-11,2.263E-11,2.36E-11,2.473E-11,2.617E-11,2.785
     8E-11,2.962E-11,2.428E-11,2.532E-11,2.625E-11,2.744E-11,2.88E-11,3.
     9029E-11,5.444E-11,6.191E-11,6.881E-11,7.543E-11,4.154E-11)
      OATA((V(I),I=325,388)=4.921E-11,5.559E-11,6.091E-11,3.164E-11,3.98
     18E-11,4.613E-11,5.159E-11,2.517E-11,3.308E-11,3.919E-11,4.432E-11,
     22.234E-11,2.867E-11,3.427E-11,3.911E-11,2.131E-11,2.623E-11,3.099E
     3-11,3.553E-11,2.113E-11,2.509E-11,2.9E-11,3.28E-11,2.141E-11,2.463
     4E-11,2.792E-11,3.134E-11,2.192E-11,2.457E-11,2.739E-11,3.019E-11,1
     5.557E-11,1.635E-11,1.739E-11,1.901E-11,2.131E-11,1.667E-11,1.738E-
     611,1.826E-11,1.948E-11,2.113E-11,1.774E-11,1.839E-11,1.916E-11,2.0
     714E-11,2.141E-11,1.877E-11,1.941E-11,2.006E-11,2.099E-11,2.192E-11
     8,3.651E-11,3.9E-11,4.148E-11,4.397E-11,4.645E-11,2.868E-11,3.35E-1
     91,3.675E-11,3.938E-11,4.154E-11,2.076E-11,2.766E-11,3.178E-11)
      DATA((V(I),I=389,453)=3.483E-11,3.716E-11,1.748E-11,2.262E-11,2.72
     12E-11,3.068E-11,3.329E-11,1.649E-11,2.E-11,2.377E-11,2.712E-11,3.E
     2-11,1.614E-11,1.857E-11,2.156E-11,2.448E-11,2.72E-11,1.612E-11,1.7
     39E-11,2.025E-11,2.27E-11,2.517E-11,1.625E-11,1.766E-11,1.95E-11,2.
     4154E-11,2.37E-11,1.649E-11,1.766E-11,1.913E-11,2.086E-11,2.268E-11
     5,1.676E-11,1.774E-11,1.896E-11,2.044E-11,2.202E-11,1.707E-11,1.79E
     6-11,1.892E-11,2.019E-11,2.157E-11,1.739E-11,1.82E-11,1.901E-11,2.0
     716E-11,2.131E-11,2.484E-11,2.818E-11,2.97E-11,3.086E-11,3.181E-11,
     83.261E-11,3.335E-11,3.401E-11,3.461E-11,3.52E-11,3.573E-11,1.431E-
     911,1.56E-11,1.812E-11,2.297E-11,2.59E-11,2.757E-11,2.885E-11)
      OATA((V(I),I=454,517)=2.987E-11,3.076E-11,3.154E-11,3.225E-11,1.36
     18E-11,1.429E-11,1.511E-11,1.626E-11,1.791E-11,2.015E-11,2.259E-11,
     22.458E-11,2.611E-11,2.728E-11,2.831E-11,1.35E-11,1.394E-11,1.438E-
     311,1.508E-11,1.578E-11,1.689E-11,1.8E-11,1.949E-11,2.099E-11,2.246
        GO TO 30
    7 IF(P.LT.1469.6) GO TO 12
      IF(T.GE.  63.0) GO TO 10
      IF(T.GE.41.4)   GO TO 9
      N=8
    8 TZ=24.84+0.00317*P
      IF(T.LT.TZ) T=TZ
      GO TO 30
    9 N=9
      GO TO 30
   10 IF(T.GE.117.0) GO TO 11
      N=10
      GO TO 30
   11 N=11
      GO TO 30
   12 IF(T.GE.59.4)  GO TO 17
      N=12
      IF(P.GE.187.6385) GO TO 8
      OO 13 I=2,20
      IF(P-PS(I))15,14,13
   13 CONTINUE
   14 TL=TS(I)
      GO TO 16
   15 TL=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
   16 IF(T.LE.TL) GO TO 8
      N=13
      GO TO 30
   17 IF(T.LT.126.0) GO TO 18
      N=14
      GO TO 30
   18 IF(P.LT.587.84) GO TO 19
      N=15
      GO TO 30
   19 IF(T.LT.99.0) GO TO 20
      N=16
      GO TO 30
   20 IF(P.GE.190.0)GO TO 21
      N=13
      GO TO 30
   21 IF(P.LT.293.92) GO TO 22
      N=17
      GO TO 30
   22 IF(T.GE.72.0) GO TO 24
      IF(T.GE.64.8) GO TO 23
      N=18
      GO TO 30
   23 N=19
      GO TO 30
   24 IF(T.GE.81.0) GO TO 25
      N=20
      GO TO 30
   25 N=21
   30 FP=(P-BP(N))/OP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N))/OT(N)
```

```
4E-11,2.394E-11,1.35E-11,1.438E-11,1.578E-11,1.8E-11,2.099E-11,2.39
54E-11,1.347E-11,1.412E-11,1.503E-11,1.634E-11,1.815E-11,2.032E-11,
61.353E-11,1.404E-11,1.471E-11,1.562E-11,1.683E-11,1.833E-11,1.363E
7-11,1.405E-11,1.459E-11,1.526E-11,1.615E-11,1.725E-11,1.377E-11,1.
8414E-11,1.458E-11,1.512E-11,1.582E-11,1.664E-11,1.377E-11,1.484E-1
91,1.664E-11,1.393E-11,1.486E-11,1.635E-11,1.409E-11,1.489E-11)
 DATA((V(I),I=518,536)=1.61E-11,1.427E-11,1.499E-11,1.604E-11,1.445
1E-11,1.509E-11,1.6E-11,1.464E-11,1.523E-11,1.604E-11,1.464E-11,1.5
223E-11,1.604E-11,1.563E-11,1.606E-11,1.658E-11,1.662E-11,1.697E-11
3,1.736E-11)
 END
```

```
 FUNCTION PTSOUN(PRES,TEMP)
 DIMENSION LOC(23),JP(19),MX(19),BP(19),DP(19),BT(23),DT(19),PS(20)
1,TS(20),TL(10)
 COMMON/SPEED/V(522)
 DATA((V(I),I=1,103)=5248.,5250.,5264.,5403.,6048.,6929.,6930.,6940
1.,7044.,7537.,8228.,8229.,8237.,8322.,8736.,9301.,9305.,9313.,9386
2.,9748.,10170.,10220.,10250.,10320.,10640.,10710.,10950.,11060.,11
3160.,11460.,11250.,11490.,11720.,11900.,12210.,12160.,12100.,12280
4.,12540.,12880.,2135.,3067.,4414.,2590.,3466.,4524.,3033.,3865.,47
582.,3445.,4229.,5059.,3824.,4560.,5327.,4169.,4861.,5580.,4488.,51
640.,5819.,4783.,5403.,6048.,2183.,2252.,2559.,3409.,4133.,4709.,51
780.,2375.,2468.,2663.,3240.,3842.,4374.,4844.,2532.,2640.,2795.,32
836.,3726.,4189.,4613.,2681.,2788.,2927.,3284.,3688.,4088.,4471.,28
934.,2950.,3067.,3404.,3741.,4077.,4414.,4935.,5128.,5390.,5878.)
 DATA(TL=24.846,27.175,29.310,31.299,33.176,34.962,36.672,38.317,
139.904,41.456)
 DATA(PS=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
1.,185.,186.5,187.25,187.46875,187.506,190.)
 DATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.517)
 DATA(JP=5,5,5,5,3,7,6,6,11,3,4,4,6,7,4,6,12,7,4)
 DATA(MX=0,0,0,0,1,3,2,0,9,1,2,2,4,5,2,4,10,1,0)
 DATA(BP=1000.,100.,10.,0,-3000.,1000.0,2000.,1000.,0,600.,0,300.,
1300.,0,10.,100.,190.,0,1000.)
 DATA(DP=4000.,900.,90.,10.,4000.,1000.,1000.,500.,100.,200.,200.,
1100.,50.,50.,60.,40.,10.,500.,500.)
 DATA(BT=800.,800.,800.,800.,240.,120.,20.,20.,80.,25.,25.,50.,63.,
168.,28.,50.,60.,120.,80.,5000.,5000.,5000.)
 DATA(DT=600.,600.,600.,600.,80.,30.,20.,20.,10.,10.,5.,5.,2.,4.,5.
1,2.,1.,30.,10.)
 DATA(LOC=4,3,2,1,41,67,102,100,136,191,212,236,264,300,328,364,400
1,65,330,511,510,509,508)
 P=PRES
 IF(P.LT.1.0) P=1.0
 T=TEMP
 IF(T.LT.120.) GO TO 6
 IF(T.LT.800.) GO TO 4
 IF(T.GE.6000.) T=5999.99999
 IF(P.LT.100.) GO TO 2
 IF(P.LT.1000.) GO TO 1
 N=1
```

```
 IT=FT
 FF=FT-IT
 FT=1.0-FF
 I=IT*JP(N)+IP+LOC(N)
 J=I+JP(N)
 PTVISC=FP*FT*V(I)+F*FT*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
 RETURN
 END
```

```
 FUNCTION PTSOUN(PRES,TEMP)
 DIMENSION LOC(23),JP(19),MX(19),BP(19),DP(19),BT(23),DT(19),PS(20)
1,TS(20),TL(10),V(522)
 DIMENSION AA(105),AB(108),AC(108),AD(112),AE( 89)
 EQUIVALENCE( V,AA),( V( 106),AB),( V( 214),AC),( V( 322),AD)
1     ,( V( 434),AE)
 DATA TL/24.846,27.175,29.310,31.299,33.176,34.962,36.672,38.317,
139.904,41.456/
 DATA PS/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
1.,185.,186.5,187.25,187.46875,187.506,190./
 DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.517/
 DATA JP/5,5,5,5,3,7,6,6,11,3,4,4,6,7,4,6,12,7,4/
 DATA MX/0,0,0,0,1,3,2,0,9,1,2,2,4,5,2,4,10,1,0/
 DATA BP/1000.,100.,10.,0.,-3000.,1000.,2000.,1000.,0.,600.,0.,300.
1,300.,0.,10.,100.,190.,0.,1000./
 DATA DP/4000.,900.,90.,10.,4000.,1000.,1000.,500.,100.,200.,200.,
1100.,50.,50.,60.,40.,10.,500.,500./
 DATA BT/800.,800.,800.,800.,240.,120.,20.,20.,80.,25.,25.,50.,63.,
168.,28.,50.,60.,120.,80.,5000.,5000 .,5000.,5000./
 DATA DT/600.,600.,600.,600.,80.,30.,20.,20.,10.,10.,5.,5.,2.,4.,5.
1,2.,1.,30.,10./
 DATA LOC/4,3,2,1,41,67,102,100,136,191,212,236,264,300,328,364,400
1,65,330,511,510,509,508/
 DATAAA/5248.,5250.,5264.,5403.,6048.,6929.,6930.,6940.,7044.,7537.
1,8228.,8229.,8237.,8322.,8736.,9301.,9305.,9313.,9386.,9748.,10170
2.,10220.,10250.,10320.,10640.,10710.,10950.,11060.,11160.,11460.,1
31250.,11490.,11720.,11900.,12210.,12160.,12100.,12280.,12540.,1288
40.,2135.,3067.,4414.,2590.,3466.,4524.,3033.,3865.,4782.,3445.,422
59.,5059.,3824.,4560.,5327.,4169.,4861.,5580.,4488.,5140.,5819.,478
63.,5403.,6048.,2183.,2252.,2559.,3409.,4133.,4709.,5180.,2375.,246
78.,2663.,3240.,3842.,4374.,4844.,2532.,2640.,2795.,3236.,3726.,418
89.,4613.,2681.,2788.,2927.,3284.,3688.,4088.,4471.,2834.,2950.,306
97.,3404.,3741.,4077.,4414.,4935.,5128.,5390.,5878.,6057.,6300./
 DATAAB/4403.,4737.,5022.,5496.,5895.,6193.,3713.,4199.,4570.,5146.
1,5601.,5972.,2957.,3611.,4084.,4775.,5286.,5700.,2578.,3173.,3665.
2,4418.,4982.,5416.,2559.,2984.,3409.,4133.,4709.,5180.,1812.,1769.
3,1741.,1741.,1793.,1937.,2154.,2374.,2594.,2774.,2954.,1918.,1894.
4,1881.,1888.,1915.,1980.,2087.,2228.,2385.,2545.,2701.,2016.,2003.
5,1999.,2009.,2034.,2076.,2144.,2232.,2338.,2455.,2578.,2104.,2099.
6,2102.,2115.,2139.,2175.,2225.,2290.,2366.,2453.,2568.,2183.,2197.
```

```
      N1=20
      GO TO 33
    1 N=2
      N1=21
      GO TO 33
    2 IF(P.LT.10.)GO TO 3
      N=3
      N1=22
      GO TO 33
    3 N=4
      N1=23
      GO TO 33
    4 IF(T.LT.240.) GO TO 5
      N=5
      GO TO 33
    5 N=6
      IF(P.LT.1000.) N=18
      GO TO 33
    6 IF(P.LT.1000.)GO TO 8
      IF(P.LT.2000.)GO TO 7
      N=7
      GO TO 30
    7 N=8
      IF((T.LT.100.).AND.(T.GE.80.).ANO.(P.LT.1500.)) N=19
      GO TO 30
    8 IF(T.LT.80.) GO TO 9
      N=9
      GO TO 33
    9 IF(P.LT.600.) GO TO 10
      N=10
      GO TO 30
   10 IF(P.LT.300.) GO TO 12
      IF(T.LT.50.) GO TO 11
      N=12
      IF((P.LT.550.).ANO.(T.GE.63.).AND.(T.LE.73.)) N=13
      GO TO 33
   11 N=11
      GO TO 30
   12 IF(T.LT.68.) GO TO 13
      N=14
      GO TO 33
   13 IF(T.LT.60.) GO TO 15
      IF(P.LT.190.) GO TO 14
      N=17
      GO TO 33
   14 N=15
      GO TO 33
   15 N=15
      DO 16 I=2,20
      IF(P.LT.PS(I)) GO TO 17
   16 CONTINUE
      GO TO 18
   17 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
      IF(T.GT.TM) GO TO 33
   18 IF(T.LT.50.) GO TO 19
      N=16
      GO TO 33
   19 N=11
```

```
     7,2211.,2224.,2238.,2252.,2313.,2375.,2436.,2498.,2559.,4579.,4693.
     8,4798.,4251.,4405.,4544.,3885.,4080.,4252.,3419.,3685.,3905.,2847.
     9,3225.,3512.,2306.,2774.,3125.,2002.,2414.,2783.,4163.,4305./
      OATAAC/4446.,4580.,3882.,4097.,4268.,4415.,3639.,3875.,4077.,4251.
     1,3372.,3651.,3880.,4068.,3009.,3377.,3658.,3885.,2470.,3019.,3391.
     2,3652.,3205.,3391.,3529.,3652.,2839.,3073.,3260.,3419.,2337.,2692.
     3,2943.,3133.,1699.,2297.,2598.,2847.,1536.,1742.,2204.,2576.,1656.
     4,1757.,2016.,2306.,1741.,1793.,1937.,2154.,1954.,2205.,2455.,2596.
     5,2736.,2849.,1680.,2008.,2249.,2437.,2593.,2730.,1542.,1812.,2071.
     6,2279.,2451.,2610.,1544.,1692.,1918.,2132.,2315.,2491.,1586.,1656.
     7,1816.,2010.,2192.,2371.,1608.,1679.,1751.,1921.,2091.,2252.,1671.
     8,1632.,1592.,1553.,1518.,1503.,1543.,1720.,1687.,1656.,1627.,1603.
     9,1595.,1586.,1766.,1739.,1714.,1692.,1676.,1669.,1673.,1812./
      OATAAO/1790.,1769.,1755.,1741.,1741.,1741.,1016.,677.,2957.,3641.,
     11117.,828.,2701.,3392.,1215.,993.,2578.,3173.,1304.,1121.,0.,0.,13
     285.,1230.,1039.,0.,1461.,1351.,1180.,895.,1532.,1450.,1342.,1166.,
     31599.,1538.,1468.,1392.,1663.,1616.,1569.,1525.,2745.,2854.,2964.,
     43056.,3131.,3205.,2498.,2652.,2783.,2892.,2992.,3059.,2195.,2385.,
     52560.,2700.,2820.,2912.,1800.,2040.,2285.,2475.,2625.,2739.,0.,134
     62.,1880.,2197.,2400.,2538.,0.,523.,1301.,1804.,2129.,2337.,1249.,1
     7302.,1669.,1804.,1885.,1967.,2048.,2129.,2181.,2233.,2285.,2337.,1
     8310.,1285.,1247.,1427.,1634.,1789.,1886.,1966.,2038.,2103.,2161.,2
     9209.,1357.,1337.,1319.,1302.,1347.,1509.,1660.,1786.,1875.,1953./
      DATAAE/2021.,2081.,1392.,1380.,1369.,1358.,1349.,1369.,1468.,1587.
     1,1697.,1789.,1874.,1954.,1420.,1411.,1402.,1394.,1389.,1386.,1400.
     2,1458.,1540.,1634.,1724.,1817.,1450.,1442.,1435.,1428.,1422.,1418.
     3,1420.,1435.,1468.,1532.,1603.,1680.,1476.,1468.,1462.,1457.,1452.
     4,1448.,1448.,1454.,1469.,1496.,1538.,1611.,1501.,1494.,1488.,1485.
     5,1482.,1479.,1478.,1479.,1485.,1498.,1518.,1542.,1525.,1518.,1515.
     6,1512.,1509.,1506.,1503.,1511.,1519.,1527.,1535.,1543.,12160.,1210
     70.,12280.,12540.,12880.,13260.,12930.,12900.,13120.,13480.,14050.,
     813900.,13610.,13700.,14050./
      P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.LT.120.) GO TO 6
      IF(T.LT.800.) GO TO 4
      IF(T.GE.6000.0) T=5999.99999
      IF(P.LT.100.) GO TO 2
      IF(P.LT.1000.) GO TO 1
      N=1
      N1=20
      GO TO 33
    1 N=2
      N1=21
      GO TO 33
    2 IF(P.LT.10.)GO TO 3
      N=3
      N1=22
      GO TO 33
    3 N=4
      N1=23
      GO TO 33
    4 IF(T.LT.240.) GO TO 5
      N=5
      GO TO 33
    5 N=6
      IF(P.LT.1000.) N=18
```

```
      GO TO 30
   30 F =P/587.84
      I=F
      IF(I.GT.8) I=8
      F=F-I
      TQ=(1.-F)*TL(I+1)+F*TL(I+2)
      IF(T.LT.TQ) T=TQ
   33 IF(T.LE.5000.0)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N1))/OT(N)
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      PTSOUN=FP*FT*V(I)+F*FT*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
      RETURN
      END

      SUBROUTINE VSOUNO
      COMMON/SPEED/V(522)
      DATA((V(I),I=104,209)=6057.,6300.,4403.,4737.,5022.,5496.,5895.,61
     193.,3713.,4199.,4570.,5146.,5601.,5972.,2957.,3611.,4084.,4775.,52
     286.,5700.,2578.,3173.,3665.,4418.,4982.,5416.,2559.,2984.,3409.,41
     333.,4709.,5180.,1812.,1769.,1741.,1741.,1793.,1937.,2154.,2374.,25
     494.,2774.,2954.,1918.,1894.,1881.,1888.,1915.,1980.,2087.,2228.,23
     585.,2545.,2701.,2016.,2003.,1999.,2009.,2034.,2076.,2144.,2232.,23
     638.,2455.,2578.,2104.,2099.,2102.,2115.,2139.,2175.,2225.,2290.,23
     766.,2453.,2568.,2183.,2197.,2211.,2224.,2238.,2252.,2313.,2375.,24
     836.,2498.,2559.,4579.,4693.,4798.,4251.,4405.,4544.,3885.,4080.,42
     952.,3419.,3685.,3905.,2847.,3225.,3512.,2306.,2774.,3125.,2002.)
      DATA((V(I),I=210,315)=2414.,2783.,4163.,4305.,4446.,4580.,3882.,40
     197.,4268.,4415.,3639.,3875.,4077.,4251.,3372.,3651.,3880.,4068.,30
     209.,3377.,3658.,3885.,2470.,3019.,3391.,3652.,3205.,3391.,3529.,36
     352.,2839.,3073.,3260.,3419.,2337.,2692.,2943.,3133.,1699.,2297.,25
     498.,2847.,1536.,1742.,2204.,2576.,1656.,1757.,2016.,2306.,1741.,17
     593.,1937.,2154.,1954.,2205.,2455.,2596.,2736.,2849.,1680.,2008.,22
     649.,2437.,2593.,2730.,1542.,1812.,2071.,2279.,2451.,2610.,1544.,16
     792.,1918.,2132.,2315.,2491.,1586.,1656.,1816.,2010.,2192.,2371.,16
     808.,1679.,1751.,1921.,2091.,2252.,1671.,1632.,1592.,1553.,1518.,15
     903.,1543.,1720.,1687.,1656.,1627.,1603.,1595.,1586.,1766.,1739.)
      OATA((V(I),I=316,424)=1714.,1692.,1676.,1669.,1673.,1812.,1790.,17
     169.,1755.,1741.,1741.,1741.,1016.,677.,2957.,3641.,1117.,828.,2701
     2.,3392.,1215.,993.,2578.,3173.,1304.,1121.,0.,0.,1385.,1230.,1039.
     3,0.,1461.,1351.,1180.,895.,1532.,1450.,1342.,1166.,1599.,1538.,146
     48.,1392.,1663.,1616.,1569.,1525.,2745.,2854.,2964.,3056.,3131.,320
     55.,2498.,2652.,2783.,2892.,2992.,3059.,2195.,2385.,2560.,2700.,282
     60.,2912.,1800.,2040.,2285.,2475.,2625.,2739.,0.,1342.,1880.,2197.,
     72400.,2538.,0.,523.,1301.,1804.,2129.,2337.,1249.,1302.,1669.,1804
     8.,1885.,1967.,2048.,2129.,2181.,2233.,2285.,2337.,1310.,1285.,1247
     9.,1427.,1634.,1789.,1886.,1966.,2038.,2103.,2161.,2209.,1357.)
      OATA((V(I),I=425,522)=1337.,1319.,1302.,1347.,1509.,1660.,1786.,18
     175.,1953.,2021.,2081.,1392.,1380.,1369.,1358.,1349.,1369.,1468.,15
     287.,1697.,1789.,1874.,1954.,1420.,1411.,1402.,1394.,1389.,1386.,14
      GO TO 33
    6 IF(P.LT.1000.)GO TO 8
      IF(P.LT.2000.)GO TO 7
      N=7
      GO TO 30
    7 N=8
      IF((T.LT.100.).ANO.(T.GE.80.).AND.(P.LT.1500.)) N=19
      GO TO 30
    8 IF(T.LT.80.) GO TO 9
      N=9
      GO TO 33
    9 IF(P.LT.600.) GO TO 10
      N=10
      GO TO 30
   10 IF(P.LT.300.) GO TO 12
      IF(T.LT.50.) GO TO 11
      N=12
      IF((P.LT.550.).ANO.(T.GE.63.).AND.(T.LE.73.)) N=13
      GO TO 33
   11 N=11
      GO TO 30
   12 IF(T.LT.68.) GO TO 13
      N=14
      GO TO 33
   13 IF(T.LT.60.) GO TO 15
      IF(P.LT.190.) GO TO 14
      N=17
      GO TO 33
   14 N=15
      GO TO 33
   15 N=15
      DO 16 I=2,20
      IF(P.LT.PS(I)) GO TO 17
   16 CONTINUE
      GO TO 18
   17 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
      IF(T.GT.TM) GO TO 33
   18 IF(T.LT.50.) GO TO 19
      N=16
      GO TO 33
   19 N=11
      GO TO 30
   30 F =P/587.84
      I=F
      IF(I.GT.8) I=8
      FI=I
      F=F-FI
      TQ=(1.-F)*TL(I+1)+F*TL(I+2)
      IF(T.LT.TQ) T=TQ
   33 IF(T.LE.5000.)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      FI=IP
      F=FP-FI
      FP=1.0-F
      FT=(T-BT(N1))/DT(N)
      IT=FT
```

```
     300.,1458.,1540.,1634.,1724.,1817.,1450.,1442.,1435.,1428.,1422.,14
     418.,1420.,1435.,1468.,1532.,1603.,1680.,1476.,1468.,1462.,1457.,14
     552.,1448.,1448.,1454.,1469.,1496.,1538.,1611.,1501.,1494.,1488.,14
     685.,1482.,1479.,1478.,1479.,1485.,1498.,1518.,1542.,1525.,1518.,15
     715.,1512.,1509.,1506.,1503.,1511.,1519.,1527.,1535.,1543.,12160.,1
     82100.,12280.,12540.,12880.,13260.,12930.,12900.,13120.,13480.,1405
     90.,13900.,13610.,13700.,14050.)
      END
```

```
      FUNCTION PTCP(PRES,TEMP)
      COMMON/SPHEAT/CP(823),CV(823)
      OIMENSION LOC(23),JP(19),MX(19),BP(19),DP(19),BT(23),OT(19),PS(12)
     1,TS(12),TL(10)
      DATA(PS=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,160.)
      OATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,
     154.79,56.72,57.46)
      OATA(LOC=1,50,71,113,133,141,170,165,228,264,348,372,426,492,528,
     1584,626,638,734,654,682,694,718)
      DATA(JP=7,3,6,5,2,4,9,9,4,7,4,9,6,6,7,7,2,2,5)
      DATA(MX=5,1,4,3,0,2,2,4,2,5,2,7,4,4,5,5,0,0,3)
      OATA(BP=0,20.,0,1000.,100.,-1000.,1469.6,0,1469.6,587.84,587.84,0,
     1100.,100.,40.,40.,0,0,1.)
      DATA(BT=2600.,2600.,2600.,2600.,800.,300.,120.,120.,25.2,27.,72.,
     181.,25.,56.,26.,41.,25.,25.,2600.,5000.,5000.,5000.,5000.)
      DATA(OP=5.,40.,200.,1000.,4900.,2000.,1175.68,293.92,1175.68,
     1146.96,146.96,73.48,100.,100.,20.,20.,40.,40.,1.)
      OATA(DT=400.,400.,400.,800.,600.,100.,30.,30.,12.6,9.,3.6,9.,5.,
     15.,4.,8.,4.,8.,200.)
      DATA(TL=24.846,27.175,29.310,31.299,33.176,34.962,36.672,38.317,
     139.904,41.456)
      KTR=1
      GO TO 1
      ENTRY PTCV
      KTR=2
      GO TO 1
      ENTRY PTGAMM
      KTR=3
    1 P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.LT.126.) GO TO 9
      IF(T.LT.2600.) GO TO 5
      IF(T.GE.6000.) T=5999.99999
      IF(P.GE.100.) GO TO 3
      IF(P.GE.30.) GO TO 2
      IF(P.GE.5.)GO TO 20
      N=19
      N1=19
      GO TO 33
   20 N=1
      N1=20
      GO TO 33
    2 N=2
```

```
      FI=IT
      FF=FT-FI
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      PTSOUN=FP*FT*V(I)+F*FT*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
      RETURN
      END
```

```
      FUNCTION PTCP(PRES,TEMP)
      PTCP=PTHEAT(PRES,TEMP,1)
      RETURN
      END
      FUNCTION PTCV(PRES,TEMP)
      PTCV=PTHEAT(PRES,TEMP,2)
      RETURN
      END
      FUNCTION PTGAMM(PRES,TEMP)
      PTGAMM=PTHEAT(PRES,TEMP,3)
      RETURN
      END
      FUNCTION PTHEAT(PRES,TEMP,KTRANS)
      COMMON/SPHEAT/CP(823),CV(823)
      OIMENSION LOC(23),JP(19),MX(19),BP(19),DP(19),BT(23),OT(19),PS(12)
     1,TS(12),TL(10)
      OATA PS/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,160./
      OATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,
     154.79,56.72,57.46/
      DATA LOC/1,50,71,113,133,141,170,165,228,264,348,372,426,492,528,
     1584,626,638,734,654,682,694,718/
      OATA JP/7,3,6,5,2,4,9,9,4,7,4,9,6,6,7,7,2,2,5/
      OATA MX/5,1,4,3,0,2,2,4,2,5,2,7,4,4,5,5,0,0,3/
      OATA BP/0.,20.,0.,1000.,100.,-1000.,1469.6,0.,1469.6,587.84,587.84
     1,0.,100.,100.,40.,40.,0.,0.,1./
      OATA BT/2600.,2600.,2600.,2600.,800.,300.,120.,120.,25.2,27.,72.,
     181.,25.,56.,26.,41.,25.,25.,2600.,5000.,5000.,5000.,5000./
      OATA DP/5.,40.,200.,1000.,4900.,2000.,1175.68,293.92,1175.68,
     1146.96,146.96,73.48,100.,100.,20.,20.,40.,40.,1./
      DATA DT/400.,400.,400.,800.,600.,100.,30.,30.,12.6,9.,3.6,9.,5.,
     15.,4.,8.,4.,8.,200./
      OATA TL/24.846,27.175,29.310,31.299,33.176,34.962,36.672,38.317,
     139.904,41.456/
    1 P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      KTR=KTRANS
      IF(T.LT.126.) GO TO 9
      IF(T.LT.2600.) GO TO 5
      IF(T.GE.6000.) T=5999.99999
      IF(P.GE.100.) GO TO 3
      IF(P.GE.30.) GO TO 2
      IF(P.GE.5.)GO TO 20
      N=19
```

```
      N1=21
      GO TO 33
    3 IF(P.GE.1000.) GO TO 4
      N=3
      N1=22
      GO TO 33
    4 N=4
      N1=23
      GO TO 33
    5 IF(T.LT.300.)GO TO 7
      IF(T.LT.800.)GO TO 6
      N=5
      GO TO 33
    6 N=6
      GO TO 33
    7 IF(P.LT.1469.6) GO TO 8
      N=7
      GO TO 33
    8 N=8
      GO TO 33
    9 IF(P.LT.587.84) GO TO 12
      IF(P.LT.1469.6) GO TO 10
      N=9
      GO TO 30
   10 IF(P.LT.1028.72.AND.T.GE.72.0.AND.T.LT.90.0) GO TO 11
      N=10
      GO TO 30
   11 N=11
      GO TO 33
   12 IF(T.LT.81.) GO TO 13
      N=12
      GO TO 33
   13 IF(P.LT.160.) GO TO 15
      TM=((.86867647E-7*P-.12613701E-3)*P+.10353383)*P+43.8056878
      IF(T.GT.TM) GO TO 14
      N=13
      GO TO 30
   14 N=14
      GO TO 33
   15 OO 16 I=2,12
      IF(P-PS(I))17,17,16
   16 CONTINUE
      I=12
   17 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
      IF(T.GE.TM) GO TO 18
      N=15
      IF(P.LT.40.) N=17
      GO TO 30
   18 N=16
      IF(P.LT.40.) N=18
      GO TO 33
   30 F=P/587.84
      I=F
      IF(I.GT.8) I=8
      F=F-I
      TQ=(1.0-F)*TL(I+1)+F*TL(I+2)
      IF(T.LT.TQ) T=TQ
   33 IF(T.LE.5000.0)N1=N
```

```
      N1=19
      GO TO 33
   20 N=1
      N1=20
      GO TO 33
    2 N=2
      N1=21
      GO TO 33
    3 IF(P.GE.1000.) GO TO 4
      N=3
      N1=22
      GO TO 33
    4 N=4
      N1=23
      GO TO 33
    5 IF(T.LT.300.)GO TO 7
      IF(T.LT.800.)GO TO 6
      N=5
      GO TO 33
    6 N=6
      GO TO 33
    7 IF(P.LT.1469.6) GO TO 8
      N=7
      GO TO 33
    8 N=8
      GO TO 33
    9 IF(P.LT.587.84) GO TO 12
      IF(P.LT.1469.6) GO TO 10
      N=9
      GO TO 30
   10 IF(P.LT.1028.72.AND.T.GE.72.0.AND.T.LT.90.0) GO TO 11
      N=10
      GO TO 30
   11 N=11
      GO TO 33
   12 IF(T.LT.81.) GO TO 13
      N=12
      GO TO 33
   13 IF(P.LT.160.) GO TO 15
      TM=((.86867647E-7*P-.12613701E-3)*P+.10353383)*P+43.8056878
      IF(T.GT.TM) GO TO 14
      N=13
      GO TO 30
   14 N=14
      GO TO 33
   15 OO 16 I=2,12
      IF(P-PS(I))17,17,16
   16 CONTINUE
      I=12
   17 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
      IF(T.GE.TM) GO TO 18
      N=15
      IF(P.LT.40.) N=17
      GO TO 30
   18 N=16
      IF(P.LT.40.) N=18
      GO TO 33
   30 F=P/587.84
```

```
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N1))/DT(N)
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      IF(KTR.EQ.2) GOTO 37
      CTCP=FP*FT*CP(I)+F*FT*CP(I+1)+FP*FF*CP(J)+F*FF*CP(J+1)
      IF(N.LT.13.OR.N.GE.17) GO TO 36
      IF(N.LT.15) GO TO 35
      CTCP=CTCP/(187.506-P+ABSF(T-TM)*28.13)
      GO TO 36
   35 CTCP=CTCP/(ABSF(T-TM)/1.8+ABSF(P-187.506)*.008008982)
   36 IF(KTR.GE.2) GO TO 37
      PTCP=CTCP
      RETURN
   37 PTCP=FP*FT*CV(I)+F*FT*CV(I+1)+FP*FF*CV(J)+F*FF*CV(J+1)
      IF(KTR.LT.3) RETURN
      PTCP=CTCP/PTCP
      RETURN
      END

      SUBROUTINE C SUB P
      COMMON/SPHEAT/CP(823),CV(823)
      DATA((CP(I),I=1,109)=3.804,3.796,3.794,3.794,3.793,3.793,3.793,4.0
     125,3.951,3.937,3.931,3.927,3.924,3.922,4.655,4.259,4.184,4.15,4.13
     2,4.117,4.107,6.495,5.032,4.755,4.632,4.559,4.509,4.472,10.98,6.839
     3,6.054,5.706,5.498,5.356,5.252,20.06,10.48,8.646,7.834,7.35,7.02,6
     4.776,35.35,16.83,13.18,11.55,10.58,9.919,9.429,3.793,3.792,3.792,3
     5.924,3.917,3.913,4.117,4.076,4.059,4.51,4.359,4.298,5.36,4.931,4.7
     657,7.028,6.027,5.62,9.936,7.923,7.103,3.793,3.791,3.791,3.791,3.79
     71,3.79,3.916,3.91,3.908,3.907,3.906,3.905,4.075,4.043,4.031,4.025,
     84.022,4.02,4.36,4.236,4.192,4.172,4.161,4.183,4.933,4.581,4.457,4.
     9401,4.369,4.346,6.03,5.21,4.92,4.791,4.715,4.759,7.93,6.276,5.692)
      DATA((CP(I),I=110,217)=5.433,5.279,5.173,3.79,3.79,3.789,3.789,3.7
     189,4.02,4.014,4.011,4.01,4.008,4.346,4.29,4.265,4.25,4.24,5.173,4.
     2912,4.796,4.726,4.679,3.47,3.511,3.504,3.507,3.624,3.622,3.792,3.7
     389,3.744,4.108,4.297,4.346,3.658,3.842,3.961,4.015,3.537,3.637,3.7
     408,3.749,3.479,3.535,3.579,3.608,3.461,3.495,3.523,3.542,3.461,3.4
     578,3.494,3.511,2.586,2.981,3.396,3.693,3.806,3.785,3.434,3.187,3.0
     636,2.861,3.089,3.309,3.498,3.628,3.693,3.64,3.501,3.379,3.2,3.342,
     73.474,3.584,3.673,3.737,3.8,3.744,3.681,3.519,3.633,3.738,3.826,3.
     8903,3.957,4.03,4.041,4.015,3.744,3.838,3.921,3.994,4.06,4.111,4.22
     93,4.248,4.243,3.877,3.951,4.018,4.079,4.133,4.179,4.292,4.333)
      DATA((CP(I),I=218,326)=4.343,3.926,3.98,4.033,4.087,4.125,4.152,4.
     1263,4.317,4.346,1.334,1.264,1.217,1.2,1.884,1.742,1.667,1.587,2.38
     27,2.151,2.025,1.947,2.871,2.506,2.337,2.232,3.311,2.792,2.584,2.46
     31,3.668,3.035,2.789,2.652,3.846,3.23,2.968,2.821,3.84,3.37,3.113,2
     4.963,3.767,3.475,3.25,3.104,1.543,1.515,1.491,1.468,1.447,1.428,1.
     5414,2.003,1.96,1.922,1.89,1.862,1.835,1.812,2.51,2.426,2.357,2.301
     6,2.253,2.21,2.173,3.151,2.967,2.836,2.734,2.652,2.585,2.529,4.07,3
     7.651,3.383,3.198,3.063,2.956,2.871,5.417,4.486,3.997,3.69,3.477,3.
     8318,3.196,5.793,5.081,4.509,4.119,3.844,3.64,3.484,4.855,4.893,4.6
      I=F
      IF(I.GT.8) I=8
      FI=I
      F=F-FI
      TQ=(1.0-F)*TL(I+1)+F*TL(I+2)
      IF(T.LT.TQ) T=TQ
   33 IF(T.LE.5000.)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      FI=IP
      F=FP-FI
      FP=1.0-F
      FT=(T-BT(N1))/DT(N)
      IT=FT
      FI=IT
      FF=FT-FI
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      IF(KTR.EQ.2) GOTO 37
      CTCP=FP*FT*CP(I+1)+FP*FF*CP(J)+F*FF*CP(J+1)
      IF(N.LT.13.OR.N.GE.17) GO TO 36
      IF(N.LT.15) GO TO 35
      CTCP=CTCP/(187.506-P+ABS (T-TM)*28.13)
      GO TO 36
   35 CTCP=CTCP/(ABS (T-TM)/1.8+ABS (P-187.506)*.008008982)
   36 IF(KTR.GE.2) GO TO 37
      PTHEAT=CTCP
      RETURN
   37 PTHEAT=FP*FT*CV(I)+F*FT*CV(I+1)+FP*FF*CV(J)+F*FF*CV(J+1)
      IF(KTR.LT.3) RETURN
      PTHEAT=CTCP/PTHEAT
      RETURN
      END

      BLOCK DATA
      COMMON/SPHEAT/AA(111),AB(111),AC(111),AD(111),AE(116),AF(112),
     1AG(111),AH(40),
     2          AI(110),AJ(111),AK(111),AL(111),AM(116),AN(112),AO(111)
     3,AP(41)
      DATAAA/3.804,3.796,3.794,3.794,3.793,3.793,3.793,4.025,3.951,3.937
     1,3.931,3.927,3.924,3.922,4.655,4.259,4.184,4.15,4.13,4.117,4.107,6
     2.495,5.032,4.755,4.632,4.559,4.509,4.472,10.98,6.839,6.054,5.706,5
     3.498,5.356,5.252,20.06,10.48,8.646,7.834,7.35,7.02,6.776,35.35,16.
     483,13.18,11.55,10.58,9.919,9.429,3.793,3.792,3.792,3.924,3.917,3.9
     513,4.117,4.076,4.059,4.51,4.359,4.298,5.36,4.931,4.757,7.028,6.027
     6,5.62,9.936,7.923,7.103,3.793,3.791,3.791,3.791,3.791,3.79,3.916,3
     7.91,3.908,3.907,3.906,3.905,4.075,4.043,4.031,4.025,4.022,4.02,4.3
     86,4.236,4.192,4.172,4.161,4.183,4.933,4.581,4.457,4.401,4.369,4.34
     96,6.03,5.21,4.92,4.791,4.715,4.759,7.93,6.276,5.692,5.433,5.279/
      DATAAB/5.173,3.79,3.79,3.789,3.789,3.789,4.02,4.014,4.011,4.01,4.0
     108,4.346,4.29,4.265,4.25,4.24,5.173,4.912,4.796,4.726,4.679,3.47,3
     2.511,3.504,3.507,3.624,3.622,3.792,3.789,3.744,4.108,4.297,4.346,3
     3.658,3.842,3.961,4.015,3.537,3.637,3.708,3.749,3.479,3.535,3.579,3
     4.608,3.461,3.495,3.523,3.542,3.461,3.478,3.494,3.511,2.586,2.981,3
     5.396,3.693,3.806,3.785,3.434,3.187,3.036,2.861,3.089,3.309,3.498,3
     6.628,3.693,3.64,3.501,3.379,3.2,3.342,3.474,3.584,3.673,3.737,3.8,
```

```
937,4.339,4.084,3.879,3.714,4.14,4.37,4.391,4.286,4.134,3.98,3.841)
 DATA((CP(I),I=327,434)=3.735,3.956,4.069,4.083,4.035,3.954,3.863,3
1.505,3.692,3.819,3.881,3.891,3.868,3.824,3.378,3.516,3.654,3.712,3
2.77,3.769,3.767,5.417,4.486,3.997,3.69,5.82,4.795,4.229,3.862,5.88
37,5.022,4.43,4.033,5.639,5.107,4.573,4.163,5.23,5.054,4.643,4.251,
44.855,4.893,4.637,4.339,2.47,2.73,3.077,3.551,4.192,4.958,5.659,5.
5946,5.793,2.482,2.678,2.916,3.205,3.549,3.916,4.304,4.637,4.855,2.
6503,2.656,2.833,3.033,3.255,3.496,3.725,3.949,4.14,2.535,2.659,2.7
795,2.942,3.1,3.264,3.43,3.59,3.735,2.582,2.683,2.792,2.907,3.026,3
8.148,3.27,3.391,3.505,2.641,2.731,2.822,2.913,3.003,3.097,3.191,3.
9284,3.378,25.22,30.03,35.61,40.25,44.37,48.45,24.47,30.12,36.7)
 END

 SUBROUTINE DATA1
 COMMON/SPHEAT/CP(823),CV(823)
 DATA((CP(I),I=435,547)=42.16,47.08,51.94,22.95,29.45,36.95,43.16,4
18.74,54.28,20.18,27.65,36.2,43.19,49.41,55.58,16.12,24.74,34.5,42.
23,49.15,55.9,10.33,20.63,31.93,40.59,48.07,55.4,1.494,15.13,28.59,
338.11,46.15,53.98,-19.29,10.62,24.91,35.,43.5,51.78,0.,8.28,17.76,
430.56,39.53,48.33,0.,-55.,4.28,17.23,31.9,42.56,0.,0.,-9.11,3.79,1
57.,32.36,11.93,-5.256,1.59,0.,.11,16.88,15.48,11.,4.18,-13.56,0.,0
6.,23.81,18.76,13.42,-1.68,-17.82,0.,31.05,25.95,27.7,16.41,3.2,-10
7.31,38.05,32.9,33.42,32.03,20.87,9.05,44.95,39.75,39.57,39.66,34.9
85,24.46,1027.,1148.,1238.,1311.,1362.,1407.,1445.,962.3,1099.,1202
9.,1285.,1344.,1394.,1438.,869.,1026.,1142.,1235.,1301.,1357.)
 DATA((CP(I),I=548,656)=1405.,727.5,906.9,1040.,1145.,1219.,1282.,1
1335.,533.3,742.1,895.5,1016.,1099.,1170.,1230.,333.8,512.8,696.3,8
238.4,934.9,1015.,1083.,91.2,290.2,434.2,603.4,720.3,814.5,893.8,0.
3,0.,153.4,302.5,433.2,558.1,653.3,343.4,72.4,-162.,20.,151.5,276.4
4,378.8,929.7,692.1,477.8,288.3,134.,90.2,-120.,1489.,1269.,1082.,9
507.6,759.5,607.4,444.7,2037.,1817.,1634.,1469.,1331.,1195.,1053.,2
6584.,2363.,2180.,2016.,1881.,1751.,1620.,3135.,2911.,2726.,2563.,2
7428.,2299.,2173.,1.566,1.557,1.78,1.77,2.059,2.037,2.377,2.333,2.9
826,2.724,1.091,3.21,2.46,5.286,2.456,3.245,2.428,3.431,2.434,3.025
9,2.461,2.813,2.463,2.7,2.465,2.638,2.47,2.612,35.34,16.83,13.18)
 DATA((CP(I),I=657,764)=11.55,10.58,9.919,9.429,54.51,26.45,20.19,1
17.34,15.62,14.45,13.58,64.37,38.42,29.61,25.31,22.66,20.81,19.43,5
26.31,49.66,39.93,34.49,30.94,28.41,26.46,9.931,7.923,7.103,15.62,1
30.89,9.417,22.66,15.12,12.73,30.94,20.32,16.85,7.93,6.276,5.692,5.
4433,5.279,5.173,10.9,7.934,6.883,6.417,6.14,5.95,15.15,10.31,8.585
5,7.82,7.364,7.052,17.43,13.27,10.71,9.57,8.89,8.424,5.173,4.912,4.
6796,4.726,4.679,7.052,6.278,5.935,5.731,5.591,9.796,8.258,7.575,7.
7167,6.891,0.,3.802,3.799,3.797,3.797,3.796,3.886,3.875,3.87,3.867,
83.865,4.01,3.979,3.965,3.956,3.951,4.216,4.14,4.106,4.085,4.072,4.
9576,4.408,4.333,4.289,4.259,5.191,4.855,4.707,4.618,4.558,6.202)
 DATA((CP(I),I=765,823)=5.582,5.308,5.144,5.032,7.785,6.713,6.238,5
1.954,5.761,10.15,8.396,7.619,7.155,6.839,13.53,10.8,9.588,8.865,8.
2372,18.14,14.09,12.29,11.21,10.47,24.18,18.44,15.86,14.32,13.26,31
3.64,23.93,20.41,18.28,16.82,40.2,30.53,25.96,23.16,21.23,48.9,37.9
43,32.38,28.89,26.45,55.98,45.39,39.27,35.23,32.33,59.18,51.55,45.7
56,41.58,38.42,57.08,54.85,50.68,47.04,44.04)
 END

 SUBROUTINE C SUB V
 COMMON/SPHEAT/CP(823),CV(823)
 DATA((CV(I),I=1,108)=2.819,2.811,2.809,2.809,2.808,2.808,2.808,3.0
132,2.963,2.95,2.944,2.94,2.938,2.936,3.624,3.255,3.186,3.155,3.136
2,3.124,3.114,5.313,3.972,3.717,3.604,3.537,3.491,3.457,9.333,5.61,
73.744,3.681,3.519,3.633,3.738,3.826,3.903,3.957,4.03,4.041,4.015,3
8.744,3.838,3.921,3.994,4.06,4.111,4.223,4.248,4.243,3.877,3.951,4.
9018,4.079,4.133,4.179,4.292,4.333,4.343,3.926,3.98,4.033,4.087/
 DATAAC/4.125,4.152,4.263,4.317,4.346,1.334,1.264,1.217,1.2,1.884,1
1.742,1.667,1.587,2.387,2.151,2.025,1.947,2.871,2.506,2.337,2.232,3
2.311,2.792,2.584,2.461,3.668,3.035,2.789,2.652,3.846,3.23,2.968,2.
3821,3.84,3.37,3.113,2.963,3.767,3.475,3.25,3.104,1.543,1.515,1.491
4,1.468,1.447,1.428,1.414,2.003,1.96,1.922,1.89,1.862,1.835,1.812,2
5.51,2.426,2.357,2.301,2.253,2.21,2.173,3.151,2.967,2.836,2.734,2.6
652,2.585,2.529,4.07,3.651,3.383,3.198,3.063,2.956,2.871,5.417,4.48
76,3.997,3.69,3.477,3.318,3.196,5.793,5.081,4.509,4.119,3.844,3.64,
83.484,4.855,4.893,4.637,4.339,4.084,3.879,3.714,4.14,4.37,4.391,4.
9286,4.134,3.98,3.841,3.735,3.956,4.069,4.083,4.035,3.954,3.863/
 DATAAD/3.505,3.692,3.819,3.881,3.891,3.868,3.824,3.378,3.516,3.654
1,3.712,3.77,3.769,3.767,5.417,4.486,3.997,3.69,5.82,4.795,4.229,3.
2862,5.887,5.022,4.43,4.033,5.639,5.107,4.573,4.163,5.23,5.054,4.64
33,4.251,4.855,4.893,4.637,4.339,2.47,2.73,3.077,3.551,4.192,4.958,
45.659,5.946,5.793,2.482,2.678,2.916,3.205,3.549,3.916,4.304,4.637,
54.855,2.503,2.656,2.833,3.033,3.255,3.496,3.725,3.949,4.14,2.535,2
6.659,2.795,2.942,3.1,3.264,3.43,3.59,3.735,2.582,2.683,2.792,2.907
7,3.026,3.148,3.27,3.391,3.505,2.641,2.731,2.822,2.913,3.003,3.097,
83.191,3.284,3.378,25.22,30.03,35.61,40.25,44.37,48.45,24.47,30.12,
936.7,42.16,47.08,51.94,22.95,29.45,36.95,43.16,48.74,54.28,20.18/
 DATAAE/27.65,36.2,43.19,49.41,55.58,16.12,24.74,34.5,42.3,49.15,55
1.9,10.33,20.63,31.93,40.59,48.07,55.4,1.494,15.13,28.59,38.11,46.1
25,53.98,-19.29,10.62,24.91,35.,43.5,51.78,0.,8.28,17.76,30.56,39.5
33,48.33,0.,-55.,4.28,17.23,31.9,42.56,0.,0.,-9.11,3.79,17.,32.36,1
41.93,-5.256,1.59,0.,.11,16.88,15.48,11.,4.18,-13.56,0.,0.,23.81,18
5.76,13.42,-1.68,-17.82,0.,31.05,25.95,27.7,16.41,3.2,-10.31,38.05,
632.9,33.42,32.03,20.87,9.05,44.95,39.75,39.57,39.66,34.95,24.46,10
727.,1148.,1238.,1311.,1362.,1407.,1445.,962.3,1099.,1202.,1285.,13
844.,1394.,1438.,869.,1026.,1142.,1235.,1301.,1357.,1405.,727.5,906
9.9,1040.,1145.,1219.,1282.,1335.,533.3,742.1,895.5,1016.,1099./
 DATAAF/1170.,1230.,333.8,512.8,696.3,838.4,934.9,1015.,1083.,91.2,
1290.2,434.2,603.4,720.3,814.5,893.8,0.,0.,153.4,302.5,433.2,558.1,
2653.3,343.4,72.4,-162.,20.,151.5,276.4,378.8,929.7,692.1,477.8,288
3.3,134.,90.2,-120.,1489.,1269.,1082.,907.6,759.5,607.4,444.7,2037.
4,1817.,1634.,1469.,1331.,1195.,1053.,2584.,2363.,2180.,2016.,1881.
5,1751.,1620.,3135.,2911.,2726.,2563.,2428.,2299.,2173.,1.566,1.557
6,1.78,1.77,2.059,2.037,2.377,2.333,2.926,2.724,1.091,3.21,2.46,5.2
786,2.456,3.245,2.428,3.431,2.434,3.025,2.461,2.813,2.463,2.7,2.465
8,2.638,2.47,2.612,35.34,16.83,13.18,11.55,10.58,9.919,9.429,54.51,
926.45,20.19,17.34,15.62,14.45,13.58,64.37,38.42,29.61,25.31,22.66/
 DATAAG/20.81,19.43,56.31,49.66,39.93,34.49,30.94,28.41,26.46,9.931
1,7.923,7.103,15.62,10.89,9.417,22.66,15.12,12.73,30.94,20.32,16.85
2,7.93,6.276,5.692,5.433,5.279,5.173,10.9,7.934,6.883,6.417,6.14,5.
395,15.15,10.31,8.585,7.82,7.364,7.052,17.43,13.27,10.71,9.57,8.89,
48.424,5.173,4.912,4.796,4.726,4.679,7.052,6.278,5.935,5.731,5.591,
59.796,8.258,7.575,7.167,6.891,0.,3.802,3.799,3.797,3.797,3.796,3.8
686,3.875,3.87,3.867,3.865,4.01,3.979,3.965,3.956,3.951,4.216,4.14,
74.106,4.085,4.072,4.576,4.408,4.333,4.289,4.259,5.191,4.855,4.707,
84.618,4.558,6.202,5.582,5.308,5.144,5.032,7.785,6.713,6.238,5.954,
95.761,10.15,8.396,7.619,7.155,6.839,13.53,10.8,9.588,8.865,8.372/
 DATAAH/18.14,14.09,12.29,11.21,10.47,24.18,18.44,15.86,14.32,13.26
1,31.64,23.93,20.41,18.28,16.82,40.2,30.53,25.96,23.16,21.23,48.9,3
27.93,32.38,28.89,26.45,55.98,45.39,39.27,35.23,32.33,59.18,51.55,4
35.76,41.58,38.42,57.08,54.85,50.68,47.04,44.04/
 DATAAI/2.819,2.811,2.809,2.809,2.808,2.808,2.808,3.032,2.963,2.95,
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34.898,4.582,4.394,4.265,4.17,17.15,8.823,7.203,6.481,6.049,5.754,5
4.536,29.47,14.22,11.11,9.705,8.862,8.284,7.855,2.808,2.807,2.807,2
5.938,2.931,2.928,3.124,3.086,3.07,3.492,3.353,3.296,4.268,3.878,3.
6719,5.762,4.865,4.498,8.3,6.533,5.809,2.807,2.807,2.806,2.806,2.80
76,2.806,2.931,2.925,2.923,2.922,2.921,2.92,3.085,3.055,3.044,3.039
8,3.036,3.034,3.353,3.239,3.199,3.181,3.17,3.189,3.879,3.559,3.446,
93.395,3.365,3.345,4.867,4.129,3.867,3.751,3.682,3.72,6.541,5.077)
 DATA((CV(I),I=109,216)=4.557,4.327,4.189,4.095,2.806,2.806,2.805,2
1.804,2.803,3.034,3.029,3.026,3.024,3.022,3.345,3.294,3.271,3.257,3
2.247,4.095,3.861,3.757,3.694,3.652,2.485,2.509,2.519,2.52,2.639,2.
3637,2.807,2.803,2.884,2.996,3.078,3.134,2.728,2.802,2.86,2.9,2.578
4,2.626,2.663,2.689,2.506,2.538,2.562,2.578,2.482,2.504,2.52,2.53,2
5.48,2.489,2.5,2.509,1.602,1.634,1.665,1.682,1.694,1.706,1.758,1.8,
61.838,1.876,1.893,1.911,1.929,1.947,1.961,2.005,2.046,2.084,2.215,
72.216,2.217,2.219,2.229,2.238,2.271,2.304,2.338,2.533,2.543,2.552,
82.56,2.571,2.58,2.617,2.653,2.684,2.759,2.776,2.791,2.806,2.82,2.8
933,2.882,2.92,2.951,2.892,2.91,2.926,2.943,2.958,2.972,3.023)
 DATA((CV(I),I=217,324)=3.062,3.093,2.94,2.956,2.973,2.989,3.003,3.
1015,3.063,3.101,3.134,1.113,1.083,1.06,1.05,1.353,1.335,1.325,1.31
22,1.496,1.498,1.494,1.491,1.572,1.591,1.601,1.603,1.595,1.63,1.655
3,1.672,1.617,1.662,1.696,1.724,1.651,1.699,1.738,1.771,1.693,1.741
4,1.782,1.819,1.757,1.807,1.85,1.888,1.173,1.171,1.168,1.165,1.16,1
5.156,1.149,1.345,1.341,1.34,1.338,1.334,1.332,1.329,1.456,1.455,1.
6454,1.453,1.452,1.45,1.449,1.517,1.519,1.521,1.523,1.525,1.526,1.5
727,1.551,1.552,1.556,1.561,1.564,1.569,1.572,1.583,1.571,1.571,1.5
875,1.581,1.587,1.591,1.61,1.591,1.584,1.584,1.589,1.594,1.6,1.61,1
9.61,1.608,1.608,1.61,1.615,1.621,1.616,1.623,1.627,1.632,1.635)
 DATA((CV(I),I=325,432)=1.641,1.646,1.632,1.64,1.646,1.653,1.659,1.
1665,1.671,1.665,1.673,1.68,1.687,1.693,1.7,1.707,1.715,1.723,1.731
2,1.738,1.744,1.751,1.757,1.583,1.571,1.571,1.575,1.597,1.578,1.574
3,1.579,1.608,1.587,1.581,1.582,1.61,1.596,1.589,1.589,1.61,1.604,1
4.598,1.598,1.61,1.61,1.608,1.608,1.485,1.511,1.534,1.557,1.577,1.6
504,1.621,1.621,1.61,1.495,1.516,1.534,1.552,1.569,1.583,1.596,1.60
66,1.61,1.516,1.532,1.548,1.563,1.577,1.591,1.602,1.61,1.616,1.549,
71.562,1.574,1.585,1.597,1.608,1.619,1.627,1.632,1.595,1.606,1.615,
81.625,1.634,1.642,1.652,1.66,1.665,1.656,1.664,1.671,1.679,1.686,1
9.693,1.701,1.708,1.715,1.131,1.132,1.133,1.133,1.133,1.131,1.24)
 END

 SUBROUTINE DATA2
 COMMON/SPHEAT/CP(823),CV(823)
 DATA((CV(I),I=433,545)=1.239,1.238,1.237,1.236,1.235,1.342,1.338,1
1.335,1.332,1.33,1.328,1.417,1.412,1.409,1.406,1.404,1.402,1.464,1.
2462,1.46,1.459,1.457,1.456,1.501,1.497,1.495,1.495,1.495,1.495,1.5
365,1.535,1.523,1.52,1.52,1.522,1.754,1.78,1.564,1.546,1.541,1.541,
41.943,2.3,1.71,1.585,1.564,1.557,0.,2.4,1.808,1.653,1.594,1.573,0.
5,0.,1.62,1.683,1.624,1.591,1.583,2.3,3.1,0.,1.632,1.608,1.33,1.976
6,2.608,1.56,0.,0.,1.522,1.66,1.736,1.617,1.495,0.,1.527,1.589,1.67
79,1.663,1.609,1.56,1.522,1.563,1.608,1.648,1.627,1.601,1.52,1.551,
81.579,1.613,1.622,1.609,1.151,1.152,1.152,1.152,1.153,1.153,1.153,
91.243,1.242,1.241,1.241,1.24,1.24,1.24,1.327,1.326,1.325,1.324)
 DATA((CV(I),I=546,654)=1.323,1.322,1.321,1.393,1.392,1.391,1.39,1.
1389,1.388,1.387,1.44,1.439,1.438,1.438,1.437,1.436,1.436,1.478,1.4
274,1.473,1.472,1.471,1.471,1.47,1.508,1.503,1.506,1.504,1.501,1.5,
31.498,0.,0.,1.547,1.546,1.548,1.539,1.533,1.646,1.78,1.938,1.602,1
4.615,1.628,1.641,1.544,1.607,1.69,1.805,1.978,2.346,2.652,1.517,1.
5544,1.578,1.623,1.687,1.787,1.962,1.504,1.518,1.534,1.551,1.57,1.5
692,1.618,1.498,1.508,1.517,1.526,1.536,1.546,1.556,1.499,1.506,1.5
12.944,2.94,2.938,2.936,3.624,3.255,3.186,3.155,3.136,3.124,3.114,5
2.313,3.972,3.717,3.604,3.537,3.491,3.457,9.333,5.61,4.898,4.582,4.
3394,4.265,4.17,17.15,8.823,7.203,6.481,6.049,5.754,5.536,29.47,14.
422,11.11,9.705,8.862,8.284,7.855,2.808,2.807,2.807,2.938,2.931,2.9
528,3.124,3.086,3.07,3.492,3.353,3.296,4.268,3.878,3.719,5.762,4.86
65,4.498,8.3,6.533,5.809,2.807,2.807,2.806,2.806,2.806,2.806,2.931,
72.925,2.923,2.922,2.921,2.92,3.085,3.055,3.044,3.039,3.036,3.034,3
8.353,3.239,3.199,3.181,3.17,3.189,3.879,3.559,3.446,3.395,3.365,3.
9345,4.867,4.129,3.867,3.751,3.682,3.72,6.541,5.077,4.557,4.327/
 DATAAJ/4.189,4.095,2.806,2.806,2.805,2.804,2.803,3.034,3.029,3.026
1,3.024,3.022,3.345,3.294,3.271,3.257,3.247,4.095,3.861,3.757,3.694
2,3.652,2.485,2.509,2.519,2.52,2.639,2.637,2.807,2.803,2.884,2.996,
33.078,3.134,2.728,2.802,2.86,2.9,2.578,2.626,2.663,2.689,2.506,2.5
438,2.562,2.578,2.482,2.504,2.52,2.53,2.48,2.489,2.5,2.509,1.602,1.
5634,1.665,1.682,1.694,1.706,1.758,1.8,1.838,1.876,1.893,1.911,1.92
69,1.947,1.961,2.005,2.046,2.084,2.215,2.216,2.217,2.219,2.229,2.23
78,2.271,2.304,2.338,2.533,2.543,2.552,2.56,2.571,2.58,2.617,2.653,
82.684,2.759,2.776,2.791,2.806,2.82,2.833,2.882,2.92,2.951,2.892,2.
991,2.926,2.943,2.958,2.972,3.023,3.062,3.093,2.94,2.956,2.973/
 DATAAK/2.989,3.003,3.015,3.063,3.101,3.134,1.113,1.083,1.06,1.05,1
1.353,1.335,1.325,1.312,1.496,1.498,1.494,1.491,1.572,1.591,1.601,1
2.603,1.595,1.63,1.655,1.672,1.617,1.662,1.696,1.724,1.651,1.699,1.
3738,1.771,1.693,1.741,1.782,1.819,1.757,1.807,1.85,1.888,1.173,1.1
471,1.168,1.165,1.16,1.156,1.149,1.345,1.341,1.34,1.338,1.334,1.332
5,1.329,1.456,1.455,1.454,1.453,1.452,1.45,1.449,1.517,1.519,1.521,
61.523,1.525,1.526,1.527,1.551,1.552,1.556,1.561,1.564,1.569,1.572,
71.583,1.571,1.571,1.575,1.581,1.587,1.591,1.61,1.591,1.584,1.584,1
8.589,1.594,1.6,1.61,1.61,1.608,1.608,1.61,1.615,1.621,1.616,1.623,
91.627,1.632,1.635,1.641,1.646,1.632,1.64,1.646,1.653,1.659,1.665/
 DATAAL/1.671,1.665,1.673,1.68,1.687,1.693,1.7,1.707,1.715,1.723,1.
1731,1.738,1.744,1.751,1.757,1.583,1.571,1.571,1.575,1.597,1.578,1.
2574,1.579,1.608,1.587,1.581,1.582,1.61,1.596,1.589,1.589,1.61,1.60
34,1.598,1.598,1.61,1.61,1.608,1.608,1.485,1.511,1.534,1.557,1.577,
41.604,1.621,1.621,1.61,1.495,1.516,1.534,1.552,1.569,1.583,1.596,1
5.606,1.61,1.516,1.532,1.548,1.563,1.577,1.591,1.602,1.61,1.616,1.5
649,1.562,1.574,1.585,1.597,1.608,1.619,1.627,1.632,1.595,1.606,1.6
715,1.625,1.634,1.642,1.652,1.66,1.665,1.656,1.664,1.671,1.679,1.68
86,1.693,1.701,1.708,1.715,1.131,1.132,1.133,1.133,1.133,1.131,1.24
9,1.239,1.238,1.237,1.236,1.235,1.342,1.338,1.335,1.332,1.33,1.328/
 DATAAM/1.417,1.412,1.409,1.406,1.404,1.402,1.464,1.462,1.46,1.459,
11.457,1.456,1.501,1.497,1.495,1.495,1.495,1.495,1.565,1.535,1.523,
21.52,1.52,1.522,1.754,1.78,1.564,1.546,1.541,1.541,1.943,2.3,1.71,
31.585,1.564,1.557,0.,2.4,1.808,1.653,1.594,1.573,0.,0.,1.62,1.683,
41.624,1.591,1.583,2.3,3.1,0.,1.632,1.608,1.33,1.976,2.608,1.56,0.,
50.,1.522,1.66,1.736,1.617,1.495,0.,1.527,1.589,1.679,1.663,1.609,1
6.56,1.522,1.563,1.608,1.648,1.627,1.601,1.52,1.551,1.579,1.613,1.6
722,1.609,1.151,1.152,1.152,1.152,1.153,1.153,1.153,1.243,1.242,1.2
841,1.241,1.24,1.24,1.24,1.327,1.326,1.325,1.324,1.323,1.322,1.321,
91.393,1.392,1.391,1.39,1.389,1.388,1.387,1.44,1.439,1.438,1.438/
 DATAAN/1.437,1.436,1.436,1.478,1.474,1.473,1.472,1.471,1.471,1.47,
11.508,1.503,1.506,1.504,1.501,1.5,1.498,0.,0.,1.547,1.546,1.548,1.
2539,1.533,1.646,1.78,1.938,1.602,1.615,1.628,1.641,1.544,1.607,1.6
39,1.805,1.978,2.346,2.652,1.517,1.544,1.578,1.623,1.687,1.787,1.96
42,1.504,1.518,1.534,1.551,1.57,1.592,1.618,1.498,1.508,1.517,1.526
5,1.536,1.546,1.556,1.499,1.506,1.512,1.519,1.526,1.532,1.539,1.129
6,1.13,1.22,1.22,1.31,1.307,1.38,1.378,1.432,1.43,1.477,1.469,1.477
7,1.7,1.475,1.671,1.476,1.619,1.477,1.544,1.478,1.517,1.478,1.504,1
8.481,1.498,1.485,1.499,29.47,14.22,11.11,9.705,8.862,8.284,7.855,4
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```
712,1.519,1.526,1.532,1.539,1.129,1.13,1.22,1.22,1.31,1.307,1.38,1.
8378,1.432,1.43,1.477,1.469,1.477,1.7,1.475,1.671,1.476,1.619,1.477
9,1.544,1.478,1.517,1.478,1.504,1.481,1.498,1.485,1.499,29.47)
 DATA((CV(I),I=655,762)=14.22,11.11,9.705,8.862,8.284,7.855,43.57,2
11.93,16.86,14.51,13.08,12.09,11.36,50.02,30.81,24.1,20.75,18.65,17
2.17,16.06,44.26,38.61,31.58,27.55,24.89,22.97,21.48,8.3,6.533,5.80
39,13.08,9.068,7.803,18.65,12.54,10.56,24.89,16.66,13.88,6.611,5.07
47,4.557,4.327,4.189,4.095,10.09,6.517,5.6,5.191,4.947,4.78,12.6,8.
552,7.052,6.395,6.001,5.732,16.8,10.95,8.824,7.865,7.289,6.894,4.09
65,3.861,3.757,3.694,3.652,5.732,5.06,4.761,4.584,4.46,8.056,6.756,
76.173,5.816,5.449,0.,2.817,2.813,2.812,2.811,2.811,2.899,2.888,2.8
883,2.881,2.879,3.018,2.989,2.976,2.968,2.963,3.214,3.142,3.111,3.0
992,3.079,3.55,3.394,3.325,3.284,3.255,4.119,3.809,3.672,3.59)
 DATA((CV(I),I=763,823)=3.534,5.044,4.476,4.225,4.074,3.972,6.478,5
1.504,5.071,4.813,4.637,8.587,7.014,6.314,5.895,5.609,11.54,9.137,8
2.061,7.417,6.976,15.49,11.99,10.42,9.471,8.822,20.48,15.66,13.46,1
32.13,11.22,26.41,20.15,17.23,15.45,14.22,32.93,25.35,21.67,19.4,17
4.81,39.24,30.92,26.61,23.87,21.93,44.14,36.29,31.69,28.62,26.38,46
5.18,40.53,36.27,33.17,30.8,44.47,42.64,39.57,36.91,34.71)
 END
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```
 FUNCTION PTLFAC(PRES,TEMP)
 COMMON/PTFAC /C(730)
 DIMENSION PS(19),TS(19),JP(19),MX(19),LDC(19),BP(19),DP(19),BT(19)
1,DT(19)
 DATA(JP=7,5,3,6,4,3,6,6,7,5,5,9,5,2,5,4,3,3,3)
 DATA(MX=5,3,1,4,2,1,4,4,5,3,3,7,3,0,3,2,1,1,1)
 DATA(LDC=1,78,123,168,204,236,251,281,329,392,417,442,487,512,524,
1 604,668,689,710)
 DATA(BP=52.,700.,2500.,0.,100.,142.5,187.5,187.5,400.,700.,0.,0.,
1 0.,0.,1.,0.,0.,-100.,0.)
 DATA(DP=108.,450.,1250.,20.,30.,22.5,42.5,42.5,50.,450.,175.,625.,
1 1250.,3000.,1.,10.,40.,300.,1500.)
 DATA(BT=26.,28.,30.,25.,52.,56.,56.,59.,56.,60.,80.,100.,180.,500.
1 ,3000.,3000.,3000.,3000.,3000.)
 DATA(DT=3.,4.,5.,11.,4.,1.,3.,3.,3.,10.,5.,20.,80.,500.,200.,200.,
1 500.,500.,500.)
 DATA(PS=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.506)
 DATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,
154.79,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356)
 DATA((C(I),I=1,107)=1646.,1614.,1581.,1551.,1524.,1500.,1475.,2004
1.,1967.,1933.,1898.,1865.,1834.,1804.,2321.,2276.,2235.,2198.,2163
2.,2130.,2099.,2607.,2555.,2508.,2466.,2428.,2392.,2359.,2919.,2854
3.,2799.,2751.,2707.,2667.,2631.,3234.,3148.,3079.,3021.,2971.,2926
4.,2886.,3557.,3441.,3352.,3281.,3221.,3169.,3123.,3872.,3745.,3624
5.,3533.,3460.,3399.,3346.,4373.,4091.,3907.,3784.,3692.,3618.,3556
6.,5028.,4556.,4222.,4043.,3921.,3830.,3757.,6565.,5584.,4603.,4313
7.,4146.,4029.,3941.,1695.,1577.,1476.,1391.,0.,2099.,1982.,1881.,1
8795.,1718.,2449.,2325.,2223.,2135.,2058.,2803.,2666.,2557.,2467.,2
9389.,3123.,2970.,2854.,2758.,2678.,3417.,3242.,3116.,3016.,2933.)
 DATA((C(I),I=108,218)=3691.,3489.,3353.,3247.,3161.,3941.,3703.,35
156.,3445.,3356.,4173.,3889.,3729.,3613.,3522.,1562.,1327.,0.,1972.
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93.57,21.93,16.86,14.51,13.08,12.09,11.36,50.02,30.81,24.1,20.75/
 DATAAD/18.65,17.17,16.06,44.26,38.61,31.58,27.55,24.89,22.97,21.48
1,8.3,6.533,5.809,13.08,9.068,7.803,18.65,12.54,10.56,24.89,16.66,1
23.88,6.611,5.077,4.557,4.327,4.189,4.095,10.09,6.517,5.6,5.191,4.9
347,4.78,12.6,8.52,7.052,6.395,6.001,5.732,16.8,10.95,8.824,7.865,7
4.289,6.894,4.095,3.861,3.757,3.694,3.652,5.732,5.06,4.761,4.584,4.
546,8.056,6.756,6.173,5.816,5.449,0.,2.817,2.813,2.812,2.811,2.811,
62.899,2.888,2.883,2.881,2.879,3.018,2.989,2.976,2.968,2.963,3.214,
73.142,3.111,3.092,3.079,3.55,3.394,3.325,3.284,3.255,4.119,3.809,3
8.672,3.59,3.534,5.044,4.476,4.225,4.074,3.972,6.478,5.504,5.071,4.
9813,4.637,8.587,7.014,6.314,5.895,5.609,11.54,9.137,8.061,7.417/
 DATAAP/6.976,15.49,11.99,10.42,9.471,8.822,20.48,15.66,13.46,12.13
1,11.22,26.41,20.15,17.23,15.45,14.22,32.93,25.35,21.67,19.4,17.81,
239.24,30.92,26.61,23.87,21.93,44.14,36.29,31.69,28.62,26.38,46.18,
340.53,36.27,33.17,30.8,44.47,42.64,39.57,36.91,34.71/
 END
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 FUNCTION PTLFAC(PRES,TEMP)
 EQUIVALENCE( C,AA),( C( 110),AB),( C( 223),AC),( C( 331),AD)
1    ,( C( 439),AE),( C( 546),AF),( C( 639),AG)
 DIMENSION AA(109),AB(113),AC(108),AD(108),AE(107),AF( 93),AG( 92)
 DIMENSION PS(19),TS(19),JP(19),MX(19),LDC(19),BP(19),DP(19),BT(19)
1,DT(19),C(730)
 DATA JP/7,5,3,6,4,3,6,6,7,5,5,9,5,2,5,4,3,3,3/
 DATA MX/5,3,1,4,2,1,4,4,5,3,3,7,3,0,3,2,1,1,1/
 DATA LDC/1,78,123,168,204,236,251,281,329,392,417,442,487,512,524,
1 604,668,689,710/
 DATA BP/52.,700.,2500.,0.,100.,142.5,187.5,187.5,400.,700.,0.,0.,
1 0.,0.,1.,0.,0.,-100.,0./
 DATA DP/108.,450.,1250.,20.,30.,22.5,42.5,42.5,50.,450.,175.,625.,
1 1250.,3000.,1.,10.,40.,300.,1500./
 DATA BT/26.,28.,30.,25.,52.,56.,56.,59.,56.,60.,80.,100.,180.,500.
1 ,3000.,3000.,3000.,3000.,3000./
 DATA DT/3.,4.,5.,11.,4.,1.,3.,3.,3.,10.,5.,20.,80.,500.,200.,200.,
1 500.,500.,500./
 DATA PS/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.506/
 DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,
154.79,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356/
 DATAAA/1646.,1614.,1581.,1551.,1524.,1500.,1475.,2004.,1967.,1933.
1,1898.,1865.,1834.,1804.,2321.,2276.,2235.,2198.,2163.,2130.,2099.
2,2607.,2555.,2508.,2466.,2428.,2392.,2359.,2919.,2854.,2799.,2751.
3,2707.,2667.,2631.,3234.,3148.,3079.,3021.,2971.,2926.,2886.,3557.
4,3441.,3352.,3281.,3221.,3169.,3123.,3872.,3745.,3624.,3533.,3460.
5,3399.,3346.,4373.,4091.,3907.,3784.,3692.,3618.,3556.,5028.,4556.
6,4222.,4043.,3921.,3830.,3757.,6565.,5584.,4603.,4313.,4146.,4029.
7,3941.,1695.,1577.,1476.,1391.,0.,2099.,1982.,1881.,1795.,1718.,24
849.,2325.,2223.,2135.,2058.,2803.,2666.,2557.,2467.,2389.,3123.,29
970.,2854.,2758.,2678.,3417.,3242.,3116.,3016.,2933.,3691.,3489./
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2,1805.,1690.,2389.,2220.,2106.,2745.,2573.,2459.,3050.,2874.,2762.
3,3311.,3130.,3011.,3522.,3335.,3216.,3704.,3515.,3394.,3860.,3669.
4,3547.,3993.,3800.,3676.,4109.,3915.,3790.,4213.,4018.,3890.,4304.
5,4111.,3983.,4383.,4195.,4067.,4450.,4270.,4144.,2622.,2522.,0.,0.
6,0.,0.,2557.,2874.,3567.,4000.,0.,0.,2711.,2888.,3162.,3509.,3988.
7,5125.,2839.,2942.,3068.,3226.,3411.,3693.,2940.,3012.,3091.,3181.
8,3261.,3376.,3037.,3092.,3149.,3210.,3275.,3345.,3291.,2340.,12.,0
9.,4316.,3001.,1643.,0.,5465.,4047.,2559.,469.,6663.,5229.,3763.)
 DATA((C(I),I=219,324)=2207.,7893.,6460.,5025.,3539.,9160.,7722.,63
106.,4884.,10450.,9008.,7602.,6214.,11760.,10320.,8917.,7532.,2311.
2,2005.,1712.,2110.,1707.,1320.,1453.,1416.,888.7,0.,2017.,377.2,0.
3,1184.,-681.6,1802.,4607.,7225.,9629.,11920.,14060.,877.9,3856.,65
492.,9051.,11410.,13630.,1100.,4828.,6455.,8789.,11060.,13210.,-927
5.,1743.,7056.,8834.,10900.,12970.,0.,0.,2666.,7605.,10270.,12620.,
6-177.9,11140.,0.,2542.,8301.,11230.,1309.,4017.,8470.,7587.,0.,0.,
72353.,4013.,6493.,8368.,8974.,0.,3590.,4681.,6388.,8346.,9534.,107
820.,4605.,5580.,6880.,8609.,9970.,11040.,5622.,6503.,7606.,8991.,1
90530.,11920.,6619.,7455.,8453.,9660.,11050.,12510.,7638.,8426.)
 P=PRES
 IF(P.LT.1.0) P=1.0
 T=TEMP
 IF(T.GE.6000.)T=5999.9999
 DIV=1.0
 IF(T.GE.100.0) GO TO 15
 TZ=24.84+.00317*P
 IF(T.LT.TZ)T=TZ
 IF(P.GE.700.0) GO TO 4
 IF(T.GE.80.0) GO TO 3
 IF(P.LT.187.506) GO TO 7
 IF(T.LT.56.0) GO TO 12
 IF(P.GT.400.0) GO TO 2
 TM=(-0.000523467*P+0.08698291)*P+44.882441
 IF(T.GE.TM) GO TO 1
 N=7
 OIV=((P-187.506)*.083+TM-T)/10.
 GO TO 33
 1 N=8
 DIV=((P-187.506)*.083+T-TM)/10.
 GO TO 33
 2 N=9
 GO TO 33
 3 N=11
 GO TO 33
 4 IF(P.GE.2500.0) GO TO 6
 IF(T.GE.60.0) GO TO 5
 N=2
 GO TO 33
 5 N=10
 GO TO 33
 6 N=3
 GO TO 33
 7 DO 8 I=2,19
 IF(P-PS(I)) 10,9,8
 8 CONTINUE
 9 TM=TS(I)
 GO TO 11
10 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
11 IF(T.GE.TM) GO TO 13
```

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 DATAAB/3353.,3247.,3161.,3941.,3703.,3556.,3445.,3356.,4173.,3889.
1,3729.,3613.,3522.,1562.,1327.,0.,1972.,1805.,1690.,2389.,2220.,21
206.,2745.,2573.,2459.,3050.,2874.,2762.,3311.,3130.,3011.,3522.,33
335.,3216.,3704.,3515.,3394.,3860.,3669.,3547.,3993.,3800.,3676.,41
409.,3915.,3790.,4213.,4018.,3890.,4304.,4111.,3983.,4383.,4195.,40
567.,4450.,4270.,4144.,2622.,2522.,0.,0.,0.,0.,2557.,2874.,3567.,40
600.,0.,0.,2711.,2888.,3162.,3509.,3988.,5125.,2839.,2942.,3068.,32
726.,3411.,3693.,2940.,3012.,3091.,3181.,3261.,3376.,3037.,3092.,31
849.,3210.,3275.,3345.,3291.,2340.,12.,0.,4316.,3001.,1643.,0.,5465
9.,4047.,2559.,469.,6663.,5229.,3763.,2207.,7893.,6460.,5025./
 DATAAC/3539.,9160.,7722.,6306.,4884.,10450.,9008.,7602.,6214.,1176
10.,10320.,8917.,7532.,2311.,2005.,1712.,2110.,1707.,1320.,1453.,14
216.,888.7,0.,2017.,377.2,0.,1184.,-681.6,1802.,4607.,7225.,9629.,1
31920.,14060.,877.9,3856.,6592.,9051.,11410.,13630.,1100.,4828.,645
45.,8789.,11060.,13210.,-927.,1743.,7056.,8834.,10900.,12970.,0.,0.
5,2666.,7605.,10270.,12620.,-177.9,11140.,0.,2542.,8301.,11230.,130
69.,4017.,8470.,7587.,0.,0.,2353.,4013.,6493.,8368.,8974.,0.,3590.,
74681.,6388.,8346.,9534.,10720.,4605.,5580.,6880.,8609.,9970.,11040
8.,5622.,6503.,7606.,8991.,10530.,11920.,6619.,7455.,8453.,9660.,11
9050.,12510.,7638.,8426.,9358.,10450.,11720.,13110.,4269.,4191./
 DATAAD/4126.,4070.,4022.,3979.,3941.,4552.,4439.,4351.,4277.,4216.
1,4163.,4115.,4903.,4715.,4588.,4489.,4410.,4343.,4286.,5419.,5078.
2,4859.,4710.,4607.,4524.,4454.,6056.,5439.,5184.,4972.,4818.,4699.
3,4616.,6232.,5879.,5474.,5222.,5035.,4893.,4780.,5838.,5894.,5626.
4,5402.,5211.,5058.,4934.,5361.,5552.,5555.,5447.,5306.,5171.,5051.
5,4977.,5210.,5333.,5349.,5294.,5208.,5115.,4173.,3889.,3729.,3613.
6,3522.,4723.,4243.,4088.,3958.,3860.,5130.,4525.,4350.,4211.,4109.
7,4954.,4799.,4535.,4403.,4304.,4663.,4808.,4652.,4538.,4450.,3037.
8,3618.,4721.,5407.,5130.,3082.,3600.,4324.,5044.,5089.,3127.,3573.
9,4165.,4702.,4949.,3173.,3562.,4052.,4499.,4781.,3220.,3564./
 DATAAE/3976.,4362.,4635.,3223.,4580.,4803.,4576.,4450.,4351.,4270.
1,4202.,4144.,3450.,4286.,4743.,4731.,4669.,4603.,4539.,4480.,4426.
2,3712.,4278.,4647.,4796.,4826.,4809.,4774.,4733.,4688.,4061.,4497.
3,4812.,4987.,5060.,5080.,5074.,5051.,5019.,4421.,4770.,5035.,5211.
4,5310.,5353.,5365.,5361.,5346.,4420.,5035.,5310.,5365.,5346.,5677.
5,5973.,6138.,6221.,6268.,5910.,6069.,6179.,6246.,6287.,5835.,5946.
6,6022.,6073.,6109.,5784.,5841.,5898.,5955.,6012.,5784.,5891.,6171.
7,6092.,6545.,6444.,7011.,7288.,7594.,7901.,8337.,8405.,8337.,8250.
8,8212.,8189.,8174.,8924.,8731.,8636.,8579.,8540.,9956.,9435.,9319.
9,9193.,9108.,11700.,10760.,10390.,10190.,10010.,14670.,12910./
 DATAAF/12130.,11690.,11450.,19300.,16260.,14900.,14150.,13590.,261
190.,21230.,19000.,17760.,16840.,35940.,28270.,24830.,22870.,21450.
2,48990.,37820.,32740.,29840.,27790.,65540.,50130.,43030.,39020.,36
3020.,85130.,65220.,56090.,50400.,46470.,1.063E5,82580.,71370.,6413
40.,58900.,1.261E5,1.01E5,88280.,79430.,73090.,1.422E5,1.187E5,1.05
52E5,95480.,88320.,1.468E5,1.334E5,1.198E5,1.104E5,1.031E5,1.392E5,
61.385E5,1.295E5,1.221E5,1.157E5,8211.,8135.,8109.,8099.,8636.,8445
7.,8378.,8350.,9320.,8895.,8745.,8680.,10490.,9536.,9234.,9146.,123
860.,10540.,9980.,9830.,15190.,12140.,11160.,10830.,19370.,14490.,1
92870.,12270.,25320.,17800.,15270.,14290.,33410.,22320.,18540./
 DATAAG/17020.,43970.,28250.,22840.,20570.,57160.,35780.,28330.,251
160.,72840.,44970.,35100.,30840.,90410.,55770.,43180.,37570.,1.087E
25,67930.,52540.,45530.,1.254E5,80760.,62850.,54720.,1.38E5,93430.,
373790.,64480.,8117.,8093.,8084.,9324.,8748.,8645.,11930.,10460.,99
473.,18510.,14570.,13000.,32030.,22950.,19090.,54800.,37230.,29540.
5,85310.,57530.,44860.,8079.,8087.,8118.,8936.,8566.,8590.,10740.,9
6551.,9316.,13860.,11610.,10820.,24500.,15630.,13460.,40390.,22530.
7,18040.,63360.,32850.,24920.,8059.,8235.,8405.,8588.,8723.,8892.,9
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```
      IF(T.LT.56.0) GO TO 12
      N=6
      OIV=((187.506-P)*.083+TM-T)/10.
      GO TO 33
   12 N=1
      GO TO 33
   13 IF(P.GE.100.0) GO TO 14
      N=4
      GO TO 33
   14 N=5
      DIV=((187.506-P)*.083+T-TM)/10.
      GO TO 33
   15 IF(T.GE.3000.0) GO TO 18
      IF(T.GE.500.0) GO TO 17
      IF(T.GE.180.0) GO TO 16
      N=12
      GO TO 33
   16 N=13
      GO TO 33
   17 N=14
      GO TO 33
   18 IF(P.GE.30.0) GO TO 20
      IF(P.GE.5.0) GO TO 19
      N=15
      GO TO 33
   19 N=16
      GO TO 33
   20 IF(P.GE.500.0) GO TO 22
      IF(P.GE.100.0) GO TO 21
      N=17
      GO TO 33
   21 N=18
      GO TO 33
   22 N=19
   33 FP=(P-BP(N))/OP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N))/OT(N)
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N)
      J=I+JP(N)
      PTLFAC=(FP*FT*C(I)+F*FT*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))/OIV
      RETURN
      ENO

      SUBROUTINE PTLFOATA
      COMMON/PTFAC /C(730)
      OATA((C(I),I=325,429)=9358.,10450.,11720.,13110.,4269.,4191.,4126.
     1,4070.,4022.,3979.,3941.,4552.,4439.,4351.,4277.,4216.,4163.,4115.
     2,4903.,4715.,4588.,4489.,4410.,4343.,4286.,5419.,5078.,4859.,4710.
     3,4607.,4524.,4454.,6056.,5439.,5184.,4972.,4818.,4699.,4616.,6232.
     4,5879.,5474.,5222.,5035.,4893.,4780.,5838.,5894.,5626.,5402.,5211.
     5,5058.,4934.,5361.,5552.,5555.,5447.,5306.,5171.,5051.,4977.,5210.
     6,5333.,5349.,5294.,5208.,5115.,4173.,3889.,3729.,3613.,3522.,4723.
     8346.,9257.,9470.,11040.,10320.,10270.,14190.,12010.,11590.,19630.,
     914860.,13760.,27810.,19130.,16980./
      P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.GE.6000.)T=5999.9999
      OIV=1.0
      IF(T.GE.100.0) GO TO 15
      TZ=24.84+.00317*P
      IF(T.LT.TZ)T=TZ
      IF(P.GE.700.0) GO TO 4
      IF(T.GE.80.0) GO TO 3
      IF(P.LT.187.506) GO TO 7
      IF(T.LT.56.0) GO TO 12
      IF(P.GT.400.0) GO TO 2
      TM=(-0.0000523467*P+0.08698291)*P+44.882441
      IF(T.GE.TM) GO TO 1
      N=7
      OIV=((P-187.506)*.083+TM-T)/10.
      GO TO 33
    1 N=8
      OIV=((P-187.506)*.083+T-TM)/10.
      GO TO 33
    2 N=9
      GO TO 33
    3 N=11
      GO TO 33
    4 IF(P.GE.2500.0) GO TO 6
      IF(T.GE.60.0) GO TO 5
      N=2
      GO TO 33
    5 N=10
      GO TO 33
    6 N=3
      GO TO 33
    7 OO 8 I=2,19
      IF(P-PS(I)) 10,9,8
    8 CONTINUE
    9 TM=TS(I)
      GO TO 11
   10 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
   11 IF(T.GE.TM) GO TO 13
      IF(T.LT.56.0) GO TO 12
      N=6
      OIV=((187.506-P)*.083+TM-T)/10.
      GO TO 33
   12 N=1
      GO TO 33
   13 IF(P.GE.100.0) GO TO 14
      N=4
      GO TO 33
   14 N=5
      OIV=((187.506-P)*.083+T-TM)/10.
      GO TO 33
   15 IF(T.GE.3000.0) GO TO 18
      IF(T.GE.500.0) GO TO 17
      IF(T.GE.180.0) GO TO 16
      N=12
```

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     7,4243.,4088.,3958.,3860.,5130.,4525.,4350.,4211.,4109.,4954.,4799.
     8,4535.,4403.,4304.,4663.,4808.,4652.,4538.,4450.,3037.,3618.,4721.
     9,5407.,5130.,3082.,3600.,4324.,5044.,5089.,3127.,3573.,4165.)
      DATA((C(I),I=430,532)=4702.,4949.,3173.,3562.,4052.,4499.,4781.,32
     120.,3564.,3976.,4362.,4635.,3223.,4580.,4803.,4576.,4450.,4351.,42
     270.,4202.,4144.,3450.,4286.,4743.,4731.,4669.,4603.,4539.,4480.,44
     326.,3712.,4278.,4647.,4796.,4826.,4809.,4774.,4733.,4688.,4061.,44
     497.,4812.,4987.,5060.,5080.,5074.,5051.,5019.,4421.,4770.,5035.,52
     511.,5310.,5353.,5365.,5361.,5346.,4420.,5035.,5310.,5365.,5346.,56
     677.4,5973.1,6137.8,6220.6,6268.1,5909.9,6069.,6179.,6246.,6287.,58
     735.,5946.,6022.,6073.,6109.,5784.,5841.,5898.,5955.,6012.,5784.,58
     891.4,6171.,6092.4,6544.9,6444.5,7011.,7287.9,7594.,7901.,8337.,840
     95.,8337.,8250.1,8211.9,8189.1,8173.7,8923.6,8731.,8636.,8579.)
      DATA((C(I),I=533,622)=8540.,9956.,9434.7,9319.,9193.,9107.6,11702.
     1,10761.,10388.,10190.,10015.,14672.,12910.,12128.,11691.,11453.,19
     2305.,16256.,14900.,14149.,13595.,26195.,21226.,18998.,17761.,16843
     3.,35937.,28274.,24829.,22875.,21450.,48995.,37818.,32739.,29840.,2
     47793.,65538.,50134.,43035.,39022.,36021.,85130.,65221.,56088.,5040
     54.,46466.,106326.,82576.,71371.,64130.,58905.,126126.,100980.,8828
     60.,79430.,73091.,142184.,118704.,105200.,95480.,88316.,146831.,133
     7421.,119800.,110400.,103100.,139178.,138471.,129500.,122100.,11570
     80.,8211.,8135.5,8109.4,8098.6,8636.,8445.2,8378.4,8349.6,9320.,889
     94.8,8745.1,8679.5,10494.,9536.4,9234.,9146.3,12362.,10544.,9980.2)
      DATA((C(I),I=623,715)=9829.8,15185.,12141.,11159.,10831.,19370.,14
     1486.,12868.,12272.,25317.,17799.,15272.,14289.,33410.,22316.,18541
     2.,17024.,43972.,28250.,22842.,20572.,57156.,35776.,28326.,25156.,7
     32837.,44973.,35096.,30835.,90411.,55771.,43180.,37566.,108699.,679
     433.,52537.,45529.,125441.,80759.,62850.,54721.,137972.,93428.,7379
     53.,64475.,8117.,8093.,8084.,9324.,8748.,8645.,11932.,10464.,9973.,
     618505.,14573.,12999.,32032.,22948.,19087.,54798.,37234.,29542.,853
     713.,57529.,44857.,8079.,8087.,8118.,8936.,8566.,8590.,10740.,9551.
     8,9316.,13865.,11613.,10816.,24504.,15632.,13464.,40394.,22532.,180
     938.,63363.,32848.,24918.,8059.,8235.,8405.,8588.,8723.,8892.)
      DATA((C(I),I=716,730)=9346.,9257.,9470.,11039.,10318.,10268.,14191
     1.,12009.,11588.,19627.,14860.,13761.,27813.,19127.,16979.)
      END
```

```
      FUNCTION TSATH(TEMP,HG,HL)
      DIMENSION R(19),TL(19),TG(19),TF(19)
      DATA(R=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
     1165.,176.0,182.0,185.0,186.5,187.25,187.46875,187.506),(TF=24.845,
     227.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.79,56.72,57.80,
     358.57,58.99,59.18,59.29,59.34,59.353,59.356),(TG=60.31,65.11,70.59
     4,76.35,80.98,85.11,87.40,86.54,81.94,74.15,64.83,56.86,47.34,39.56
     5,33.46,28.34,22.31,18.66,16.55),(TL=-132.8,-129.13,-124.25,-117.79
     6,-110.86,-101.3,-89.04,-74.22,-58.58,-43.43,-30.07,-20.56,-11.13,
     7-4.27,1.17,5.54,10.83,14.29,16.36)
      T=TEMP
      IF(T.LT.24.845)T=24.845
      IF(T.GE.59.356)T=59.356
      DO 104 I=2,19
      IF(T-TF(I))102,101,104
  101 HL=TL(I)
      GO TO 33
  16  N=13
      GO TO 33
  17  N=14
      GO TO 33
  18  IF(P.GE.30.0) GO TO 20
      IF(P.GE.5.0) GO TO 19
      N=15
      GO TO 33
  19  N=16
      GO TO 33
  20  IF(P.GE.500.0) GO TO 22
      IF(P.GE.100.0) GO TO 21
      N=17
      GO TO 33
  21  N=18
      GO TO 33
  22  N=19
  33  FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N))/DT(N)
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N)
      J=I+JP(N)
      PTLFAC=(FP*FT*C(I)+F*FT*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))/DIV
      RETURN
      END
```

```
      FUNCTION TSATH(TEMP,HG,HL)
      DIMENSION R(19),TL(19),TG(19),TF(19)
      DATA R/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
     1165.,176.0,182.0,185.0,186.5,187.25,187.46875,187.506/
      DATA                                                    TF/24.845,
     227.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.79,56.72,57.80,
     358.57,58.99,59.18,59.29,59.34,59.353,59.356/
      DATA                                          TG/60.31,65.11,70.59
     4,76.35,80.98,85.11,87.40,86.54,81.94,74.15,64.83,56.86,47.34,39.56
     5,33.46,28.34,22.31,18.66,16.55/
      DATA                                TL/-132.8,-129.13,-124.25,-117.79
     6,-110.86,-101.3,-89.04,-74.22,-58.58,-43.43,-30.07,-20.56,-11.13,
     7-4.27,1.17,5.54,10.83,14.29,16.36/
      T=TEMP
      IF(T.LT.24.845)T=24.845
      IF(T.GE.59.356)T=59.356
```

```
      HG=TG(I)
      TSATH=R(I)
      RETURN
  102 D=TF(I)-TF(I-1)
      TRR=TF(I)-T
      TTR=T-TF(I-1)
      HL=(TL(I)*TTR+TL(I-1)*TRR)/D
      HG=(TG(I)*TTR+TG(I-1)*TRR)/D
      TSATH=(R (I)*TTR+R (I-1)*TRR)/D
      RETURN
  104 CONTINUE
      RETURN
      END
```

```
      FUNCTION PSATH(PRESS,HG,HL)
      DIMENSION R(19),TL(19),TG(19),TF(19)
      DATA(R=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
     1165.,176.0,182.0,185.0,186.5,187.25,187.46875,187.506),(TF=24.845,
     227.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.79,56.72,57.80,
     358.57,58.99,59.18,59.29,59.34,59.353,59.356),(TG=60.31,65.11,70.59
     4,76.35,80.98,85.11,87.40,86.54,81.94,74.15,64.83,56.86,47.34,39.56
     5,33.46,28.34,22.31,18.66,16.55),(TL=-132.8,-129.13,-124.25,-117.79
     6,-110.86,-101.3,-89.04,-74.22,-58.58,-43.43,-30.07,-20.56,-11.13,
     7-4.27,1.17,5.54,10.83,14.29,16.36)
      P=PRESS
      IF(P.LT.1.022)P=1.022
      IF(P.GE.187.506)P=187.506
      DO 104 I=2,19
      IF(P-R(I))102,101,104
  101 HL=TL(I)
      HG=TG(I)
      PSATH =TF(I)
      RETURN
  102 D=R(I)-R(I-1)
      PRR=R(I)-P
      PPR=P-R(I-1)
      HL=(TL(I)*PPR+TL(I-1)*PRR)/D
      HG=(TG(I)*PPR+TG(I-1)*PRR)/D
      PSATH =(TF(I)*PPR+TF(I-1)*PRR)/D
      RETURN
  104 CONTINUE
      RETURN
      END
```

```
      DO 104 I=2,19
      IF(T-TF(I))102,101,104
  101 HL=TL(I)
      HG=TG(I)
      TSATH=R(I)
      RETURN
  102 D=TF(I)-TF(I-1)
      TRR=TF(I)-T
      TTR=T-TF(I-1)
      HL=(TL(I)*TTR+TL(I-1)*TRR)/D
      HG=(TG(I)*TTR+TG(I-1)*TRR)/D
      TSATH=(R (I)*TTR+R (I-1)*TRR)/D
      RETURN
  104 CONTINUE
      RETURN
      END
```

```
      FUNCTION PSATH(PRESS,HG,HL)
      DIMENSIDN R(19),TL(19),TG(19),TF(19)
      DATA R/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
     1165.,176.0,182.0,185.0,186.5,187.25,187.46875,187.506/
      DATA                                                TF/24.845,
     227.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.79,56.72,57.80,
     358.57,58.99,59.18,59.29,59.34,59.353,59.356/
      DATA                                      TG/60.31,65.11,70.59
     4,76.35,80.98,85.11,87.40,86.54,81.94,74.15,64.83,56.86,47.34,39.56
     5,33.46,28.34,22.31,18.66,16.55/
      DATA                              TL/-132.8,-129.13,-124.25,-117.79
     6,-110.86,-101.3,-89.04,-74.22,-58.58,-43.43,-30.07,-20.56,-11.13,
     7-4.27,1.17,5.54,10.83,14.29,16.36/
      P=PRESS
      IF(P.LT.1.022)P=1.022
      IF(P.GE.187.506)P=187.506
      DO 104 I=2,19
      IF(P-R(I))102,101,104
  101 HL=TL(I)
      HG=TG(I)
      PSATH =TF(I)
      RETURN
  102 D=R(I)-R(I-1)
      PRR=R(I)-P
      PPR=P-R(I-1)
      HL=(TL(I)*PPR+TL(I-1)*PRR)/D
      HG=(TG(I)*PPR+TG(I-1)*PRR)/D
      PSATH =(TF(I)*PPR+TF(I-1)*PRR)/D
      RETURN
  104 CONTINUE
      RETURN
      END
```

```
 FUNCTION PHTEMP(PRES,ENTH,QUAL)
 COMMON /TEMPRTR/ T(429)
 DIMENSION LOC(16),JP(13),       OP(13),DH(13),BP(13),BH(16),MX(13)
1,R(19),TL(19),TG(19),TF(19),SH(10),TS(10)
 DATA (R=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.506),(TG=60.31,
265.11,70.59,76.35,80.98,85.11,87.40,86.54,81.94,74.15,64.83,56.86,
347.34,39.56,33.46,28.34,22.31,18.66,16.55),(TL=-132.8,-129.13,
4-124.25,-117.79,-110.86,-101.3,-89.04,-74.22,-58.58,-43.43,-30.07,
5-20.56,-11.13,-4.27,1.17,5.54,10.83,14.29,16.36),(TF=24.845,27.07,
629.81,33.07,36.18,39.96,44.12,48.33,51.97,54.79,56.72,57.80,58.57,
758.99,59.18,59.29,59.34,59.353,59.356)
 OATA (SH=-132.8,-109.96,-87.59,-65.71,-44.27,-23.18,-2.45,18.06,
138.32,58.50),(TS=24.846,27.175,29.310,31.299,33.176,34.962,36.672,
238.317,39.904,41.456)
 DATA(LOC=7,100,118,150,1,178,218,9,283,331,340,358,376,400,406,
1418)
 DATA(JP=11,3,8,7,11,8,13,11,8,3,3,3,4)
 DATA(MX=0,1,6,5,9,6,11,1,6,1,1,1,2)
 DATA(BP=0,0,881.76,0,587.84,881.76,0,0,73.48,0,-40.0,-2.0,1500.0)
 DATA(DP=3000.0,750.0,587.84,146.96,440.88,587.84,73.48,293.32,
173.48,1500.0,120.0,6.0,1000.0)
 DATA(BH=1800.0,425.0,170.61,170.61,-110.9,42.65,42.65,-134.4,
1-53.32,10000.0,10000.0,10000.0,425.0,20000.,20000.,20000.)
 DATA(OH=3000.0,275.0,85.306,85.306,19.194,31.99,31.99,20.26,19.194
1,5000.0,2000.0,2000.0,275.0)
 DATA((T(I),I=1,113)=26.93,18.54,10.35,0.,0.,0.,538.5,524.3,24.22,1
18.56,11.13,37.28,29.73,21.66,13.12,0.,0.,1400.,1379.,34.98,30.38,2
24.94,45.61,40.14,32.85,24.73,10.16,0.,2236.,2217.,42.93,40.14,36.2
32,52.51,48.58,43.,35.98,28.21,19.23,3020.,3008.,48.76,47.69,45.19,
458.36,55.84,51.48,45.9,39.12,31.21,23.56,0.,52.66,53.63,52.51,63.3
58,62.26,58.95,54.38,48.8,42.25,34.65,27.13,19.19,0.,0.,67.7,68.04,
665.68,61.94,57.24,51.72,45.36,38.02,30.67,23.1,0.,71.5,73.35,71.91
7,68.91,64.87,60.1,54.65,48.49,41.47,33.99,26.07,74.93,78.3,77.75,7
85.4,71.97,67.79,62.98,57.6,51.59,44.88,37.44,165.5,175.4,180.2,258
9.4,248.8,250.5,316.,316.5,316.3,387.6,386.3,384.7,461.9,459.4)
 DATA((T(I),I=114,222)=456.6,538.5,535.,531.4,106.4,112.,112.8,111.
12,108.2,104.2,99.5,94.3,128.7,134.5,136.4,135.9,134.,131.2,127.7,1
223.6,152.8,157.6,159.5,159.5,158.2,156.,153.3,150.,177.,180.5,182.
3,182.,181.1,179.2,176.9,174.1,69.28,80.43,88.86,95.21,99.97,103.6,
4106.4,103.7,110.,115.2,119.6,123.2,126.2,128.7,136.4,140.2,143.5,1
546.4,148.9,151.,152.8,166.,168.5,170.7,172.6,174.3,175.7,177.,77.8
6,77.75,74.35,69.24,62.98,55.67,47.21,37.67,84.89,86.83,84.76,80.75
7,75.55,69.44,62.53,54.74,91.8,95.41,94.51,91.44,87.08,81.83,75.86,
869.24,98.89,103.7,103.8,101.5,97.9,93.33,88.07,82.24,106.4,112.,11
92.8,111.2,108.2,104.2,99.5,94.3,17.02,50.26,55.6,62.01,66.36)
 DATA((T(I),I=223,331)=69.49,71.82,73.58,74.93,75.97,76.77,77.4,77.
18,30.6,46.62,57.11,64.14,69.25,73.12,76.12,78.5,80.39,81.9,83.13,8
24.12,84.89,43.29,54.15,62.43,68.86,73.91,77.95,81.22,83.9,86.11,87
3.94,89.47,90.76,91.8,56.29,64.12,70.62,76.07,80.62,84.38,87.59,90.
431,92.61,94.57,96.25,97.67,98.89,69.28,74.86,80.43,84.65,88.86,92.
503,95.21,97.59,99.97,101.8,103.6,105.,106.4,52.78,53.15,53.39,53.6
63,53.35,53.07,52.79,52.51,56.63,56.25,57.33,57.97,58.34,58.5,58.5,
758.35,59.99,57.71,59.72,61.2,62.13,62.78,63.18,63.37,0.,57.51,60.9
81,63.37,65.1,66.27,67.12,67.69,0.,56.68,61.52,65.01,67.46,69.21,70
9.52,71.49,0.,56.25,62.01,66.36,69.49,71.82,73.47,74.93,2825.)
```

```
 FUNCTION PHTEMP(PRES,ENTH,QUAL)
 DIMENSION LOC(16),JP(13),T(429),OP(13),OH(13),BP(13),BH(16),MX(13)
1,R(19),TL(19),TG(19),TF(19),SH(10),TS(10)
 DIMENSION AA(116),AB(112),AC(112),AO( 89)
 EQUIVALENCE( T,AA),( T( 117),AB),( T( 229),AC),( T( 341),AO)
 OATA  R/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.506/, TG/60.31,
265.11,70.59,76.35,80.98,85.11,87.40,86.54,81.94,74.15,64.83,56.86,
347.34,39.56,33.46,28.34,22.31,18.66,16.55/, TL/-132.8,-129.13,
4-124.25,-117.79,-110.86,-101.3,-89.04,-74.22,-58.58,-43.43,-30.07,
5-20.56,-11.13,-4.27,1.17,5.54,10.83,14.29,16.36/, TF/24.845,27.07,
629.81,33.07,36.18,39.96,44.12,48.33,51.97,54.79,56.72,57.80,58.57,
758.99,59.18,59.29,59.34,59.353,59.356/
 DATA  SH/-132.8,-109.96,-87.59,-65.71,-44.27,-23.18,-2.45,18.06,
138.32,58.50/, TS/24.846,27.175,29.310,31.299,33.176,34.962,36.672,
238.317,39.904,41.456/
 DATA LOC/7,100,118,150,1,178,218,9,283,331,340,358,376,400,406,
1418/
 DATA JP/11,3,8,7,11,8,13,11,8,3,3,3,4/
 DATA MX/0,1,6,5,9,6,11,1,6,1,1,1,2/
 DATA BP/0.,0.,881.76,0.,587.84,881.76,0.,0.,73.48,0.,-40.,-2.,1500
1.0/
 DATA DP/3000.0,750.0,587.84,146.96,440.88,587.84,73.48,293.32,
173.48,1500.0,120.0,6.0,1000.0/
 OATA BH/1800.0,425.0,170.61,170.61,-110.9,42.65,42.65,-134.4,
1-53.32,10000.0,10000.0,10000.0,425.0,20000.,20000.,20000./
 DATA DH/3000.0,275.0,85.306,85.306,19.194,31.99,31.99,20.26,19.194
1,5000.0,2000.0,2000.0,275.0/
 DATAAA/26.93,18.54,10.35,0.,0.,0.,538.5,524.3,24.22,18.56,11.13,37
1.28,29.73,21.66,13.12,0.,0.,1400.,1379.,34.98,30.38,24.94,45.61,40
2.14,32.85,24.73,10.16,0.,2236.,2217.,42.93,40.14,36.22,52.51,48.58
3,43.,35.98,28.21,19.23,3020.,3008.,48.76,47.69,45.19,58.36,55.84,5
41.48,45.9,39.12,31.21,23.56,0.,52.66,53.63,52.51,63.38,62.26,58.95
5,54.38,48.8,42.25,34.65,27.13,19.19,0.,0.,67.7,68.04,65.68,61.94,5
67.24,51.72,45.36,38.02,30.67,23.1,0.,71.5,73.35,71.91,68.91,64.87,
760.1,54.65,48.49,41.47,33.99,26.07,74.93,78.3,77.75,75.4,71.97,67.
879,62.98,57.6,51.59,44.88,37.44,165.5,175.4,180.2,258.4,248.8,250.
95,316.,316.5,316.3,387.6,386.3,384.7,461.9,459.4,456.6,538.5,535./
 DATAAB/531.4,106.4,112.,112.8,111.2,108.2,104.2,99.5,94.3,128.7,13
14.5,136.4,135.9,134.,131.2,127.7,123.6,152.8,157.6,159.5,159.5,158
2.2,156.,153.3,150.,177.,180.5,182.,182.,181.1,179.2,176.9,174.1,69
3.28,80.43,88.86,95.21,99.97,103.6,106.4,103.7,110.,115.2,119.6,123
4.2,126.2,128.7,136.4,140.2,143.5,146.4,148.9,151.,152.8,166.,168.5
5,170.7,172.6,174.3,175.7,177.,77.8,77.75,74.35,69.24,62.98,55.67,4
67.21,37.67,84.89,86.83,84.76,80.75,75.55,69.44,62.53,54.74,91.8,95
7.41,94.51,91.44,87.08,81.83,75.86,69.24,98.89,103.7,103.8,101.5,97
8.9,93.33,88.07,82.24,106.4,112.,112.8,111.2,108.2,104.2,99.5,94.3,
917.02,50.26,55.6,62.01,66.36,69.49,71.82,73.58,74.93,75.97,76.77/
 OATAAC/77.4,77.8,30.6,46.62,57.11,64.14,69.25,73.12,76.12,78.5,80.
139,81.9,83.13,84.12,84.89,43.29,54.15,62.43,68.86,73.91,77.95,81.2
22,83.9,86.11,87.94,89.47,90.76,91.8,56.29,64.12,70.62,76.07,80.62,
384.38,87.59,90.31,92.61,94.57,96.25,97.67,98.89,69.28,74.86,80.43,
484.65,88.86,92.03,95.21,97.59,99.97,101.8,103.6,105.,106.4,52.78,5
53.15,53.39,53.63,53.35,53.07,52.79,52.51,56.63,56.25,57.33,57.97,5
68.34,58.5,58.5,58.35,59.99,57.71,59.72,61.2,62.13,62.78,63.18,63.3
77,0.,57.51,60.91,63.37,65.1,66.27,67.12,67.69,0.,56.68,61.52,65.01
```

```
      P=PRES
      IF(P.LT.1.0) P=1.0
      H=ENTH
      IF(H.GE.25000.) H=24999.99999
      Q=1.0
      IF(H.LT.42.65) GO TO 10
      IF(H.GE.170.61) GO TO 1
      N=6
      GO TO 2
    1 IF(H.GE.426.53) GO TO 3
      N=3
    2 IF(P.LT.881.76) N=N+1
      GO TO 15
    3 IF(H.GE.1800.0) GO TO 4
      N=2
      IF(P.GE.1500.0) N=13
      GO TO 20
    4 IF(H.GE.10800.0) GO TO 5
      N=1
      GO TO 20
    5 IF(P.LE.200.0) GO TO 6
      N=10
      N1=14
      GO TO 20
    6 IF(P.LE.11.0) GO TO 7
      N=11
      N1=15
      GO TO 20
    7 N=12
      N1=16
      GO TO 20
   10 IF(P.LT.587.84) GO TO 11
      N=5
      GO TO 15
   11 IF(H.GE.-53.36) GO TO 12
      N=8
      GO TO 15
   12 N=9
   15 IF(H.GT.87.55) GO TO 20
      I=PR=P/587.84
      IF(I.GT.8) I=8
      F=PR-I
      FP=1.0-F
      HS=FP*SH(I+1)+F*SH(I+2)
      TQ=FP*TS(I+1)+F*TS(I+2)
      IF(H.LT.HS) GO TO 17
      IF(P.GT.187.506) GO TO 20
      IF(P.LT.1.021) GO TO 105
      DO 104 I=2,19
      IF(P-R(I))102,101,104
  101 HL=TL(I)
      HG=TG(I)
      TQ=TF(I)
      GO TO 106
  102 O=R(I)-R(I-1)
      PRR=R(I)-P
      PPR=P-R(I-1)
      HL=(TL(I)*PPR+TL(I-1)*PRR)/O
```

```
     8,67.46,69.21,70.52,71.49,0.,56.25,62.01,66.36,69.49,71.82,73.47,74
     9.93,2825.,2816.,2810.,4043.,4051.,4045.,4991.,5132.,5153.,2819./
      OATAAO/2815.,2814.,3321.,3327.,3327.,3766.,3807.,3813.,4119.,4243.
     1,4264.,4374.,4617.,4665.,4561.,4928.,5010.,2813.,2821.,2818.,3294.
     2,3318.,3323.,3663.,3759.,3780.,3908.,4110.,4163.,4079.,4376.,4463.
     3,4209.,4581.,4697.,180.2,181.6,179.8,176.1,250.5,250.7,248.9,245.9
     4,316.3,314.9,312.5,309.3,384.7,382.,378.7,374.8,456.6,452.7,448.5,
     5444.,531.4,526.7,521.9,517.2,4991.,5131.,5151.,5664.,5963.,6043.,4
     6560.,4929.,5010.,4706.,5186.,5301.,4826.,5402.,5549.,4928.,5587.,5
     7849.,4213.,4581.,4698.,4318.,4746.,4887.,4405.,4883.,5044.,4480.,5
     8000.,5178./
      P=PRES
      IF(P.LT.1.0) P=1.0
      H=ENTH
      IF(H.GE.25000.) H=24999.9999
      Q=1.0
      IF(H.LT.42.65) GO TO 10
      IF(H.GE.170.61) GO TO 1
      N=6
      GO TO 2
    1 IF(H.GE.426.53) GO TO 3
      N=3
    2 IF(P.LT.881.76) N=N+1
      GO TO 15
    3 IF(H.GE.1800.0) GO TO 4
      N=2
      IF(P.GE.1500.0) N=13
      GO TO 20
    4 IF(H.GE.10800.0) GO TO 5
      N=1
      GO TO 20
    5 IF(P.LE.200.0) GO TO 6
      N1=14
      N=10
      GO TO 20
    6 IF(P.LE.11.0) GO TO 7
      N=11
      N1=15
      GO TO 20
    7 N=12
      N1=16
      GO TO 20
   10 IF(P.LT.587.84) GO TO 11
      N=5
      GO TO 15
   11 IF(H.GE.(-53.32)) GO TO 12
      N=8
      GO TO 15
   12 N=9
   15 IF(H.GT.87.55) GO TO 20
      PR=P/587.84
      I=PR
      IF(I.GT.8) I=8
      FI=I
      F=PR-FI
      FP=1.0-F
      HS=FP*SH(I+1)+F*SH(I+2)
      TQ=FP*TS(I+1)+F*TS(I+2)
```

```
      HG=(TG(I)*PPR+TG(I-1)*PRR)/O
      TQ=(TF(I)*PPR+TF(I-1)*PRR)/O
      GO TO 106
  104 CONTINUE
  105 HL=-132.8
      HG=60.31
      TQ=24.84
  106 IF(H.GT.HL) GO TO 16
      Q=0.0
      GO TO 20
   16 IF(H.GT.HG) GO TO 20
      Q=(H-HL)/(HG-HL)
      GO TO 30
   17 Q=(H-HS)/(0.0026806*P+25.021)
      GO TO 30
   20 IF(H.LE.20000.)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FH=(H-BH(N1))/DH(N)
      IH=FH
      FF=FH-IH
      FH=1.0-FF
      I=IH*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      TQ=FP*FH*T(I)+F*FH*T(I+1)+FP*FF*T(J)+F*FF*T(J+1)
   30 QUAL=Q
      PHTEMP=TQ
      RETURN
      ENO

      SUBROUTINE TEMPOATA
      COMMON /TEMPRTR/ T(429)
      OATA((T(I),I=332,429)=2816.,2810.,4043.,4051.,4045.,4991.,5132.,51
     153.,2819.,2815.,2814.,3321.,3327.,3327.,3766.,3807.,3813.,4119.,42
     243.,4264.,4374.,4617.,4665.,4561.,4928.,5010.,2813.,2821.,2818.,32
     394.,3318.,3323.,3663.,3759.,3780.,3908.,4110.,4163.,4079.,4376.,44
     463.,4209.,4581.,4697.,180.2,181.6,179.8,176.1,250.5,250.7,248.9,24
     55.9,316.3,314.9,312.5,309.3,384.7,382.,378.7,374.8,456.6,452.7,448
     6.5,444.,531.4,526.7,521.9,517.2,4991.,5131.,5151.,5664.,5963.,6043
     7.,4560.,4929.,5010.,4706.,5186.,5301.,4826.,5402.,5549.,4928.,5587
     8.,5849.,4213.,4581.,4698.,4318.,4746.,4887.,4405.,4883.,5044.,4480
     9.,5000.,5178.)
      RETURN
      ENO
```

```
      IF(H.LT.HS) GO TO 17
      IF(P.GT.187.506) GO TO 20
      IF(P.LT.1.021) GO TO 105
      OO 104 I=2,19
      IF(P-R(I))102,101,104
  101 HL=TL(I)
      HG=TG(I)
      TQ=TF(I)
      GO TO 106
  102 O=R(I)-R(I-1)
      PRR=R(I)-P
      PPR=P-R(I-1)
      HL=(TL(I)*PPR+TL(I-1)*PRR)/O
      HG=(TG(I)*PPR+TG(I-1)*PRR)/O
      TQ=(TF(I)*PPR+TF(I-1)*PRR)/O
      GO TO 106
  104 CONTINUE
  105 HL=-132.8
      HG=60.31
      TQ=24.84
  106 IF(H.GT.HL) GO TO 16
      Q=0.0
      GO TO 20
   16 IF(H.GT.HG) GO TO 20
      Q=(H-HL)/(HG-HL)
      GO TO 30
   17 Q=(H-HS)/(0.0026806*P+25.021)
      GO TO 30
   20 IF(H.LE.20000.)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      FI=IP
      F=FP-FI
      FP=1.0-F
      FH=(H-BH(N1))/DH(N)
      IH=FH
      FI=IH
      FF=FH-FI
      FH=1.0-FF
      I=IH*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      TQ=FP*FH*T(I)+F*FH*T(I+1)+FP*FF*T(J)+F*FF*T(J+1)
   30 QUAL=Q
      PHTEMP=TQ
      RETURN
      ENO
```

```
      FUNCTION PHOENS(PRES,ENTH)
      COMMON /PHOENSIT/R(612)
      DIMENSION PO(19),HL(19),HG(19),RL(19),RG(19),HS(11),RS(11),LOC(19)
     1,JP(16),OP(16),DH(16),BP(16),BH(19),MX(16)
      DATA(LOC=1,19,37,70,88,100,136,172,244,280,310,370,398,440,480,508
```

```
      FUNCTION PHDENS(PRES,ENTH)
      OIMENSION PO(19),HL(19),HG(19),RL(19),RG(19),HS(11),RS(11),LOC(19)
     1,JP(16),OP(16),OH(16),BP(16),BH(19),MX(16),R(612)
      OIMENSION AA( 85),AB(110),AC(107),AD(113),AE(119),AF( 78)
      EQUIVALENCE( R,AA),( R(  86),AB),( R( 196),AC),( R( 303),AO)
```

```
1,571,583,595)
 DATA(JP=3,3,3,3,2,4,4,6,3,5,4,7,7,4,7,7)
 DATA(MX=1,1,1,1,0,2,2,4,1,3,2,5,5,2,5,5)
 DATA(BP=-1000.,0.,0.,-1000.,0.,0.,0.,400.,-300.,1000.,600.,0.,0.,
1 300.,0.,0.)
 DATA(DP=2000.,50.,5.,2000.,100.,1000.,100., 800.,450.,1000.,300.,
1100.,100.,100.,50.,50.)
 DATA(BH=10000.,10000.,10000.,5000.,5000.,1800.,1800.,370.,370.,
1-75.,-130.,-120.,250.,-20.,160.,0,20000.,20000.,20000.)
 DATA(DH=2000.,2000.,1000.,1000.,1000.,400.,400.,130.,130.,100.,40.
1,40.,35.,30.,30.,20.)
 DATA(PD=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.506)
 DATA(HL=-132.8,-129.13,-124.25,-117.79,-110.86,-101.3,-89.04,
1-74.22,-58.58,-43.43,-30.07,-20.56,-11.13,-4.27,1.17,5.54,10.83,
214.29,16.36)
 DATA(HG=60.31,65.11,70.59,76.35,80.98,85.11,87.40,86.54,81.94,
174.15,64.83,56.86,47.34,39.56,33.46,28.34,22.31,18.66,16.55)
 DATA(RL=4.808,4.743,4.680,4.546,4.430,4.274,4.074,3.827,3.556,
13.279,3.024,2.825,2.620,2.445,2.263,2.110,2.033,2.027,1.962)
 DATA(RG=.007837,.01420,.02622,.04854,.08002,.1358,.2268,.3642,
1.5413,.7476,.9581,1.134,1.323,1.489,1.665,1.814,1.889,1.911,1.962)
 DATA(HS=-132.82,-113.35,-94.24,-75.47,-57.04,-38.91,-21.05,-3.4,
114.08,31.36,48.53)
 DATA(RS=4.809,4.923,5.026,5.119,5.204,5.282,5.355,5.422,5.484,5.54
15,5.6)
 DATA((R(I),I=1, 83)=-.06627,.06635,.1966,-.05618,.05624,.1669,-.04
1897,.04904,.1457,-.04358,.04368,.1297,-.03943,.0396,.1174,-.03623,
2.03643,.1077,4.E-7,.003336,.006671,1.E-6,.002827,.005652,3.4E-6,.0
302471,.004935,7.4E-6,.002217,.004415,1.16E-5,.002033,.004036,1.47E
4-5,.001897,.003751,2.E-8,.0003338,.0006675,8.E-8,.0003061,.0006168
5,2.3E-7,.0002833,.0005662,4.6E-7,.0002646,.0005315,7.3E-7,.0002493
6,.0004969,1.04E-6,.0002367,.0004731,1.3E-6,.0002264,.0004493,1.51E
7-6,.0002178,.0004326,1.71E-6,.0002104,.0004159,1.84E-6,.0002041,.0
8004035,1.93E-6,.0001986,.0003912,-.1274,.1277,.3744,-.107,.1072,.3
9153,-.09236,.09251,.2729,-.08145,.08157,.2411,-.07301,.07311)
 DATA((R(I),I=84,191)=.2164,-.06627,.06635,.1966,0.,.0129,0.,.01081
1,0.,.009319,0.,.00821,0.,.007354,0.,.006671,.00331,.3383,.6554,.94
24,.00224,.2809,.5474,.8004,.00161,.2398,.4692,.6887,.00123,.2091,.
34104,.6041,.00094,.1854,.3647,.5379,.00077,.1665,.3281,.4848,.0006
4,.1512,.2983,.4413,.00053,.1384,.2734,.4051,.00044,.1277,.2511,.37
544,0.,.03483,.06943,.1038,0.,.02877,.05738,.08584,0.,.02447,.04883
6,.07307,0.,.02128,.04248,.06359,0.,.01883,.03759,.05628,0.,.01688,
7.03371,.05049,0.,.0153,.03056,.04578,0.,.014,.02796,.04189,0.,.012
89,.02578,.03862,.5023,1.319,2.,2.55,3.008,3.398,.3996,1.082,1.671,
92.169,2.595,2.966,.3329,.9168,1.437,1.89,2.288,2.639,.2884,.8025)
 DATA((R(I),I=192,295)=1.269,1.684,2.055,2.387,.2557,.7165,1.14,1.5
122,1.87,2.184,.2297,.6476,1.034,1.389,1.714,2.012,.2082,.5903,.946
2,1.276,1.581,1.863,.1902,.5415,.8712,1.179,1.465,1.732,.1747,.4995
3,.8063,1.094,1.364,1.617,.1614,.4634,.7495,1.019,1.274,1.514,.1499
4,.4315,.6996,.954,1.194,1.422,.1397,.4033,.6554,.8951,1.123,1.34,-
5.368,.184,.7065,-.2952,.1476,.5702,-.2468,.1234,.4789,-.2144,.1072
6,.4169,-.1903,.09514,.3709,-.1711,.08555,.3342,-.1552,.07762,.3037
7,-.1418,.07091,.278,-.1303,.06517,.2559,-.1205,.06026,.2369,-.1119
8,.05595,.2203,-.1043,.05216,.2056,4.837,5.389,5.871,6.286,6.637,3.
9601,4.337,4.915,5.386,5.777,2.537,3.423,4.088,4.598,5.024,1.754)
 P=PRES
 IF(P.LT.1.0) P=1.0
```

```
1    ,( R( 416),AE),( R( 535),AF)
 DATALOC/1,19,37,70,88,100,136,172,244,280,310,370,398,440,480,508,
1571,583,595/
 DATA JP/3,3,3,3,2,4,4,6,3,5,4,7,7,4,7,7/
 DATA MX/1,1,1,1,0,2,2,4,1,3,2,5,5,2,5,5/
 DATA BP/-1000.,0.,0.,-1000.,0.,0.,0.,400.,-300.,1000.,600.,0.,0.,
1 300.,0.,0./
 DATA DP/2000.,50.,5.,2000.,100.,1000.,100., 800.,450.,1000.,300.,
1100.,100.,100.,50.,50./
 DATA BH/10000.,10000.,10000.,5000.,5000.,1800.,1800.,370.,370.,
1-75.,-130.,-120.,250.,-20.,160.,0.,20000.,20000.,20000./
 DATA DH/2000.,2000.,1000.,1000.,1000.,400.,400.,130.,130.,100.,40.
1,40.,35.,30.,30.,20./
 DATA PD/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.506/
 DATA HL/-132.8,-129.13,-124.25,-117.79,-110.86,-101.3,-89.04,
1-74.22,-58.58,-43.43,-30.07,-20.56,-11.13,-4.27,1.17,5.54,10.83,
214.29,16.36/
 DATA HG/60.31,65.11,70.59,76.35,80.98,85.11,87.40,86.54,81.94,
174.15,64.83,56.86,47.34,39.56,33.46,28.34,22.31,18.66,16.55/
 DATA RL/4.808,4.743,4.680,4.546,4.430,4.274,4.074,3.827,3.556,
13.279,3.024,2.825,2.620,2.445,2.263,2.110,2.033,2.027,1.962/
 DATA RG/.007837,.01420,.02622,.04854,.08002,.1358,.2268,.3642,
1.5413,.7476,.9581,1.134,1.323,1.489,1.665,1.814,1.889,1.911,1.962/
 DATA HS/-132.82,-113.35,-94.24,-75.47,-57.04,-38.91,-21.05,-3.4,
114.08,31.36,48.53/
 DATA RS/4.809,4.923,5.026,5.119,5.204,5.282,5.355,5.422,5.484,5.54
15,5.6/
 DATAAA/-.06627,.06635,.1966,-.05618,.05624,.1669,-.04897,.04904,.1
1457,-.04358,.04368,.1297,-.03943,.0396,.1174,-.03623,.03643,.1077,
24.E-7,.003336,.006671,1.E-6,.002827,.005652,3.4E-6,.002471,.004935
3,7.4E-6,.002217,.004415,1.16E-5,.002033,.004036,1.47E-5,.001897,.0
403751,2.E-8,.0003338,.0006675,8.E-8,.0003061,.0006168,2.3E-7,.0002
5833,.0005662,4.6E-7,.0002646,.0005315,7.3E-7,.0002493,.0004969,1.0
64E-6,.0002367,.0004731,1.3E-6,.0002264,.0004493,1.51E-6,.0002178,.
70004326,1.71E-6,.0002104,.0004159,1.84E-6,.0002041,.0004035,1.93E-
86,.0001986,.0003912,-.1274,.1277,.3744,-.107,.1072,.3153,-.09236,.
909251,.2729,-.08145,.08157,.2411,-.07301,.07311,.2164,-.06627/
 DATAAB/.06635,.1966,0.,.0129,0.,.01081,0.,.009319,0.,.00821,0.,.00
17354,0.,.006671,.00331,.3383,.6554,.944,.00224,.2809,.5474,.8004,.
200161,.2398,.4692,.6887,.00123,.2091,.4104,.6041,.00094,.1854,.364
37,.5379,.00077,.1665,.3281,.4848,.0006,.1512,.2983,.4413,.00053,.1
4384,.2734,.4051,.00044,.1277,.2511,.3744,0.,.03483,.06943,.1038,0.
5,.02877,.05738,.08584,0.,.02447,.04883,.07307,0.,.02128,.04248,.06
6359,0.,.01883,.03759,.05628,0.,.01688,.03371,.05049,0.,.0153,.0305
76,.04578,0.,.014,.02796,.04189,0.,.0129,.02578,.03862,.5023,1.319,
82.,2.55,3.008,3.398,.3996,1.082,1.671,2.169,2.595,2.966,.3329,.916
98,1.437,1.89,2.288,2.639,.2884,.8025,1.269,1.684,2.055,2.387/
 DATAAC/.2557,.7165,1.14,1.522,1.87,2.184,.2297,.6476,1.034,1.389,1
1.714,2.012,.2082,.5903,.946,1.276,1.581,1.863,.1902,.5415,.8712,1.
2179,1.465,1.732,.1747,.4995,.8063,1.094,1.364,1.617,.1614,.4634,.7
3495,1.019,1.274,1.514,.1499,.4315,.6996,.954,1.194,1.422,.1397,.40
433,.6554,.8951,1.123,1.34,-.368,.184,.7065,-.2952,.1476,.5702,-.24
568,.1234,.4789,-.2144,.1072,.4169,-.1903,.09514,.3709,-.1711,.0855
65,.3342,-.1552,.07762,.3037,-.1418,.07091,.278,-.1303,.06517,.2559
7,-.1205,.06026,.2369,-.1119,.05595,.2203,-.1043,.05216,.2056,4.837
8,5.389,5.871,6.286,6.637,3.601,4.337,4.915,5.386,5.777,2.537,3.423
9,4.088,4.598,5.024,1.754,2.708,3.411,3.95,4.393,1.352,2.206,2.893/
```

```
      H=ENTH
      IF(H.LT.425.0)GO TO 9
      IF(H.LT.5000.0)GO TO 5
      IF(H.LT.10000.0)GO TO 3
      IF(H.GE.25000.0) H=24999.9999
      IF(P.LT.100.0)GO TO 1
      N=1
      N1=17
      GO TO 33
    1 IF(P.LT.10.0)GO TO 2
      N=2
      N1=18
      GO TO 33
    2 N=3
      N1=19
      GO TO 33
    3 IF(P.LT.100.0) GO TO 4
      N=4
      GO TO 33
    4 N=5
      GO TO 33
    5 IF(H.LT.1800.0) GO TO 7
      IF(P.LT.300.0) GO TO 6
      N=6
      GO TO 33
    6 N=7
      GO TO 33
    7 IF(H.LT.600.0) GO TO 8
      N=8
      GO TO 33
    8 N=9
      GO TO 33
    9 IF(H.LT.90.0) GO TO 16
      IF(P.LT.600.0)GO TO 12
   10 IF(P.LT.1500.0)GO TO 11
      N=10
      GO TO 33
   11 N=11
      GO TO 33
   12 IF(H.LT.250) GO TO 13
      N=13
      GO TO 33
   13 IF(P.LT.300.0)GO TO 14
      N=14
      GO TO 33
   14 IF(H.LT.160.0) GO TO 15
      N=15
      GO TO 33
   15 N=16
      GO TO 33
   16 PR=P/500.0
      I=PR
      IF(I.GT.9)I=9
      F=PR-I
      FP=1.0-F
      HSOL=FP*HS(I+1)+F*HS(I+2)
      IF(H.LT.HSOL) H=HSOL
      PHOENS=FP*RS(I+1)+F*RS(I+2)
```



```
       DATAAO/3.433,3.879,1.039,1.861,2.507,3.031,3.471,5.248,5.452,5.713
     1,0.,4.657,4.895,5.106,5.295,4.079,4.361,4.6,4.81,3.481,3.835,4.116
     2,4.354,2.875,3.314,3.644,3.915,2.318,2.821,3.196,3.498,1.864,2.389
     3,2.789,3.112,1.521,2.032,2.437,2.771,1.271,1.747,2.14,2.473,1.086,
     41.523,1.897,2.222,.9481,1.348,1.7,2.012,.8427,1.209,1.54,1.837,.76
     508,1.099,1.409,1.691,.6956,1.01,1.301,1.569,.637,.9304,1.19,1.433,
     64.576,4.676,4.771,4.861,4.944,5.023,5.098,3.849,3.981,4.108,4.222,
     74.326,4.423,4.513,3.,3.176,3.359,3.536,3.685,3.815,3.932,0.,2.022,
     82.433,2.756,2.986,3.171,3.328,0.,.1834,.3618,.5343,.7003,.8596,1.0
     912,0.,.1615,.3196,.4733,.6222,.7662,.9052,0.,.145,.287,.4258/
       OATAAE/.5611,.6927,.8203,0.,.1319,.2614,.3884,.5125,.6337,.7518,0.
     1,.1213,.2407,.3581,.4731,.5856,.6956,0.,.1129,.2231,.3332,.4395,.5
     2458,.6443,3.16,3.346,3.499,3.632,2.554,2.806,3.007,3.176,1.984,2.2
     387,2.528,2.728,1.529,1.843,2.1,2.318,1.201,1.494,1.747,1.967,.9702
     4,1.233,1.469,1.68,.8079,1.04,1.254,1.451,.69,.8957,1.09,1.271,.602
     51,.7862,.9614,1.127,.5343,.7003,.8596,1.012,0.,.1437,.2849,.4226,.
     65558,.6843,.8079,0.,.1211,.2402,.3571,.4711,.5822,.69,0.,.1046,.20
     779,.3094,.4091,.5067,.6021,0.,.0917,.1834,.2726,.3618,.4481,.5343,
     80.,0.,0.,2.115,2.433,2.595,2.756,0.,0.,0.,1.685,1.95,2.18,2.355,0.
     9,0.,0.,1.271,1.562,1.793,1.984,0.,.3859,1.123,.9977,1.259,1.477/
       DATAAF/1.665,0.,.2866,.5559,.8065,1.029,1.228,1.407,0.,.23,.4519,.
     16617,.857,1.036,1.201,0.,.1917,.3786,.5581,.7283,.8885,1.038,0.,.1
     2642,.3252,.4812,.6311,.774,.9101,0.,.1437,.2849,.4226,.5558,.6843,
     3.8079,-.03397,.03644,.1078,-.03364,.03395,.1,-.03159,.03194,.09375
     4,-.02785,.03027,.08839,1.47E-5,.001897,.003751,1.708E-5,.00179,.00
     5353,1.843E-5,.001703,.003351,1.875E-5,.00163,.0032,1.925E-6,.00019
     686,.0003912,2.013E-6,.0001936,.0003809,2.075E-6,.0001891,.0003716,
     71.363E-6,.000185,.0003632,2.15E-6,.0001812,.0003554,2.2E-6,.000177
     86,.0003482/
       P=PRES
       IF(P.LT.1.0) P=1.0
       H=ENTH
       IF(H.LT.425.0)GO TO 9
       IF(H.LT.5000.0)GO TO 5
       IF(H.LT.10000.0)GO TO 3
       IF(H.GE.25000.) H=24999.9999
       IF(P.LT.100.0)GO TO 1
       N=1
       N1=17
       GO TO 33
     1 IF(P.LT.10.0)GO TO 2
       N=2
       N1=18
       GO TO 33
     2 N=3
       N1=19
       GO TO 33
     3 IF(P.LT.100.0) GO TO 4
       N=4
       GO TO 33
     4 N=5
       GO TO 33
     5 IF(H.LT.1800.0) GO TO 7
       IF(P.LT.300.0) GO TO 6
       N=6
       GO TO 33
     6 N=7
       GO TO 33
```

```
      IF(H.EQ.HSOL) RETURN
      IF(P.GE.600.0) GO TO 10
      IF(H.LT.0.0) GO TO 18
      IF(P.LT.300.0)GO TO 17
      N=14
      GO TO 33
   17 N=16
      GO TO 19
   18 N=12
   19 IF(P.GE.187.506) GO TO 33
      DO 20 I=2,19
      IF(P-PD(I))21,21,20
   20 CONTINUE
   21 D=PD(I)-PD(I-1)
      DF=PD(I)-P
      DB=P-PD(I-1)
      HLIQ=(HL(I)*DB+HL(I-1)*DF)/D
      IF(H.LE.HLIQ) GO TO 33
      HGAS=(HG(I)*DB+HG(I-1)*DF)/D
      IF(H.GE.HGAS) GO TO 33
      RLIQ=(RL(I)*DB+RL(I-1)*DF)/D
      PHDENS=RLIQ/((H-HLIQ)/(HGAS-HLIQ)*(RLIQ*D/(RG(I)*DB+RG(I-1)*DF)-1.
     1)+1.)
      RETURN
   33 IF(H.LE.20000.)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FH=(H-BH(N1))/DH(N)
      IH=FH
      FF=FH-IH
      FH=1.0-FF
      I=IH*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      PHDENS=FP*FH*R(I)+F*FH*R(I+1)+FP*FF*R(J)+F*FF*R(J+1)
      RETURN
      END

      SUBROUTINE PHRDATA
      COMMON /PHDENSIT/R(612)
      DATA((R(I),I=296,405)=2.708,3.411,3.95,4.393,1.352,2.206,2.893,3.4
     133,3.879,1.039,1.861,2.507,3.031,3.471,5.248,5.452,5.713,0.,4.657,
     24.895,5.106,5.295,4.079,4.361,4.6,4.81,3.481,3.835,4.116,4.354,2.8
     375,3.314,3.644,3.915,2.318,2.821,3.196,3.498,1.864,2.389,2.789,3.1
     412,1.521,2.032,2.437,2.771,1.271,1.747,2.14,2.473,1.086,1.523,1.89
     57,2.222,.9481,1.348,1.7,2.012,.8427,1.209,1.54,1.837,.7608,1.099,1
     6.409,1.691,.6956,1.01,1.301,1.569,.637,.9304,1.19,1.433,4.576,4.67
     76,4.771,4.861,4.944,5.023,5.098,3.849,3.981,4.108,4.222,4.326,4.42
     83,4.513,3.,3.176,3.359,3.536,3.685,3.815,3.932,0.,2.022,2.433,2.75
     96,2.986,3.171,3.328,0.,.1834,.3618,.5343,.7003,.8596,1.012,0.)
      DATA((R(I),I=406,520)=.1615,.3196,.4733,.6222,.7662,.9052,0.,.145,
     1.287,.4258,.5611,.6927,.8203,0.,.1319,.2614,.3884,.5125,.6337,.751
     28,0.,.1213,.2407,.3581,.4731,.5856,.6956,0.,.1129,.2231,.3332,.439
     35,.5458,.6443,3.16,3.346,3.499,3.632,2.554,2.806,3.007,3.176,1.984
     4,2.287,2.528,2.728,1.529,1.843,2.1,2.318,1.201,1.494,1.747,1.967,.
     59702,1.233,1.469,1.68,.8079,1.04,1.254,1.451,.69,.8957,1.09,1.271,
      7 IF(P.LT.600.0) GO TO 8
      N=8
      GO TO 33
      8 N=9
      GO TO 33
      9 IF(H.LT.90.0) GO TO 16
      IF(P.LT.600.0)GO TO 12
     10 IF(P.LT.1500.0)GO TO 11
      N=10
      GO TO 33
     11 N=11
      GO TO 33
     12 IF(H.LT.250.)GO TO 13
      N=13
      GO TO 33
     13 IF(P.LT.300.0)GO TO 14
      N=14
      GO TO 33
     14 IF(H.LT.160.0) GO TO 15
      N=15
      GO TO 33
     15 N=16
      GO TO 33
     16 PR=P/500.0
      I=PR
      IF(I.GT.9)I=9
      FI=I
      F=PR-FI
      FP=1.0-F
      HSDL=FP*HS(I+1)+F*HS(I+2)
      IF(H.LT.HSOL) H=HSDL
      PHDENS=FP*RS(I+1)+F*RS(I+2)
      IF(H.EQ.HSDL) RETURN
      IF(P.GE.600.0) GO TO 10
      IF(H.LT.0.0) GO TO 18
      IF(P.LT.300.0)GO TO 17
      N=14
      GO TO 33
     17 N=16
      GO TO 19
     18 N=12
     19 IF(P.GE.187.506) GO TO 33
      DO 20 I=2,19
      IF(P-PD(I))21,21,20
     20 CONTINUE
     21 D=PD(I)-PD(I-1)
      DF=PD(I)-P
      DB=P-PD(I-1)
      HLIQ=(HL(I)*DB+HL(I-1)*DF)/D
      IF(H.LE.HLIQ) GO TO 33
      HGAS=(HG(I)*DB+HG(I-1)*DF)/D
      IF(H.GE.HGAS) GO TO 33
      RLIQ=(RL(I)*DB+RL(I-1)*DF)/D
      PHDENS=RLIQ/((H-HLIQ)/(HGAS-HLIQ)*(RLIQ*D/(RG(I)*DB+RG(I-1)*DF)-1
     1)+1.)
      RETURN
     33 IF(H.LE.20000.)N1=N
      FP=(P-BP(N))/DP(N)
```

```
6.6021,.7862,.9614,1.127,.5343,.7003,.8596,1.012,0.,.1437,.2849,.42
726,.5558,.6843,.8079,0.,.1211,.2402,.3571,.4711,.5822,.69,0.,.1046
8,.2079,.3094,.4091,.5067,.6021,0.,.0917,.1834,.2726,.3618,.4481,.5
9343,0.,0.,0.,2.115,2.433,2.595,2.756,0.,0.,0.,1.685,1.95,2.18)
 DATA((R(I),I=521,612)=2.355,0.,0.,0.,1.271,1.562,1.793,1.984,0.,.3
1859,1.123,.9977,1.259,1.477,1.665,0.,.2866,.5559,.8065,1.029,1.228
2,1.407,0.,.23,.4519,.6617,.857,1.036,1.201,0.,.1917,.3786,.5581,.7
3283,.8885,1.038,0.,.1642,.3252,.4812,.6311,.774,.9101,0.,.1437,.28
449,.4226,.5558,.6843,.8079,-.03397,.03644,.1078,-.03364,.03395,.1,
5-.03159,.03194,.09375,-.02785,.03027,.08839,1.47E-5,.001897,.00375
61,1.708E-5,.00179,.00353,1.843E-5,.001703,.003351,1.875E-5,.00163,
7.0032,1.925E-6,.0001986,.0003912,2.013E-6,.0001936,.0003809,2.075E
8-6,.0001891,.0003716,1.363E-6,.000185,.0003632,2.15E-6,.0001812,.0
9003554,2.2E-6,.0001776,.0003482)
 END
```

```
 IP=FP
 IF(IP.GT.MX(N)) IP=MX(N)
 FI=IP
 F=FP-FI
 FP=1.0-F
 FH=(H-BH(N1))/DH(N)
 IH=FH
 FI=IH
 FF=FH-FI
 FH=1.0-FF
 I=IH*JP(N)+IP+LOC(N1)
 J=I+JP(N)
 PHDENS=FP*FH*R(I)+F*FH*R(I+1)+FP*FF*R(J)+F*FF*R(J+1)
 RETURN
 END
```

```
 FUNCTION PHENTR(PRES,ENTH)
 DIMENSION LOC(23),JP(20),       DP(20),DH(20),BP(20),BH(23),MX(20)
1,R(19),HL(19),HG(19),SL(19),SG(19),HS(10),SS(10),TS(10)
 COMMON/ENTRPY/S(573)
 DATA((S(I),I=1,108)=6.726,6.143,5.816,5.583,7.632,6.986,6.615,6.35
1,8.317,7.649,7.26,6.978,8.925,8.188,7.755,7.55,8.568,7.719,7.285,6
2.998,6.78,9.577,8.684,8.231,7.926,7.691,10.29,9.388,8.928,8.619,8.
3379,10.88,9.945,9.536,9.196,8.992,10.89,9.841,9.479,9.169,8.923,11
4.96,10.83,10.48,10.16,9.914,12.68,11.53,11.19,10.87,10.63,13.23,12
5.1,11.81,11.52,11.23,8.371,7.003,6.279,5.814,5.445,9.707,8.295,7.5
658,7.095,6.741,10.69,9.268,8.53,8.072,7.726,11.47,10.05,9.32,8.868
7,8.529,12.12,10.71,9.979,9.532,9.2,12.67,11.26,10.54,10.1,9.771,10
8.63,9.264,8.585,8.188,11.97,10.6,9.916,9.512,12.95,11.58,10.89,10.
949,13.74,12.37,11.68,11.28,14.39,13.02,12.33,11.93,14.94,13.57)
 DATA((S(I),I=109,216)=12.88,12.48,15.6,12.1,11.13,10.63,10.3,16.95
1,13.56,12.47,11.97,11.64,17.92,14.54,13.45,12.95,12.62,18.71,15.32
2,14.24,13.73,13.4,19.36,15.97,14.89,14.38,14.05,19.91,16.52,15.44,
314.93,14.6,12.96,11.55,10.83,10.39,14.4,13.,12.29,11.87,15.38,13.9
49,13.29,12.87,16.14,14.76,14.06,13.64,15.23,13.86,13.17,12.77,16.6
56,15.29,14.61,14.21,17.64,16.28,15.59,15.19,18.41,17.04,16.36,15.9
65,20.21,16.81,15.73,15.22,14.89,21.7,18.25,17.17,16.65,16.33,22.68
7,19.23,18.15,17.64,17.31,23.44,19.99,18.91,18.4,18.07,16.14,14.76,
814.06,13.64,17.77,16.39,15.7,15.29,18.89,17.52,16.83,16.42,19.76,1
98.4,17.71,17.3,20.32,18.94,18.25,17.85,20.92,19.55,18.86,18.46)
 DATA (R=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.506)
 DATA (HG=60.31,65.11,70.59,76.35,80.98,85.11,87.40,86.54,81.94,
174.15,64.83,56.86,47.34,39.56,33.46,28.34,22.31,18.66,16.55)
 DATA (HL=-132.8,-129.13,-124.25,-117.79,-110.86,-101.3,-89.04,
1-74.22,-58.58,-43.43,-30.07,-20.56,-11.13,-4.27,1.17,5.54,10.83,
214.29,16.36)
 DATA (SG=8.961,8.508,8.038,7.567,7.190,6.796,6.401,6.022,5.680,
15.375,5.117,4.930,4.742,4.596,4.485,4.397,4.312,4.253,4.195)
 DATA (SL=1.185,1.322,1.491,1.693,1.886,2.126,2.398,2.692,2.974,
13.229,3.444,3.595,3.744,3.858,3.942,4.015,4.089,4.154,4.195)
 DATA (HS=-132.8,-109.96,-87.59,-65.71,-44.27,-23.18,-2.45,18.06,
138.32,58.50)
```

```
 FUNCTION PHENTR(PRES,ENTH)
 DIMENSION LOC(23),JP(20),S(573),DP(20),DH(20),BP(20),BH(23),MX(20)
1,R(19),HL(19),HG(19),SL(19),SG(19),HS(10),SS(10)
 DIMENSION AA(110),AB(111),AC(115),AD(119),AE(111),AF(  7)
 EQUIVALENCE( S,AA),( S( 111),AB),( S( 222),AC),( S( 337),AD)
1    ,( S( 456),AE),( S( 567),AF)
 DATA  R/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.506/
 DATA  HG/60.31,65.11,70.59,76.35,80.98,85.11,87.40,86.54,81.94,
174.15,64.83,56.86,47.34,39.56,33.46,28.34,22.31,18.66,16.55/
 DATA  HL/-132.8,-129.13,-124.25,-117.79,-110.86,-101.3,-89.04,
1-74.22,-58.58,-43.43,-30.07,-20.56,-11.13,-4.27,1.17,5.54,10.83,
214.29,16.36/
 DATA  SG/8.961,8.508,8.038,7.567,7.190,6.796,6.401,6.022,5.680,
15.375,5.117,4.930,4.742,4.596,4.485,4.397,4.312,4.253,4.195/
 DATA  SL/1.185,1.322,1.491,1.693,1.886,2.126,2.398,2.692,2.974,
13.229,3.444,3.595,3.744,3.858,3.942,4.015,4.089,4.154,4.195/
 DATA  HS/-132.8,-109.96,-87.59,-65.71,-44.27,-23.18,-2.45,18.06,
138.32,58.50/
 DATA  SS/1.185,1.207,1.229,1.249,1.267,1.284,1.299,1.315,1.331,
11.347/
 DATA  LOC/309,1,17,37,57,87,111, 0,141,157,173,193,217,241,271,
1303,424,457,469,504,534,546,558/
 DATA  JP/11,4,5,5,5,4,5,0,4,4,5,4,4,5,8,11,3,3,7,6/
 DATA  MX/3,2,3,3,3,2,3,0,2,2,3,2,2,3,6,9,1,1,5,4/
 DATA BP/800.,150.,20.,2.,  0.,  0.,-5.,0.,0.,0.,-5.,0.,0.,-5.,
1881.76,587.84,0.,293.92,0.,0./
 DATA  BH/170.0,170.0,170.0,170.0,425.0,425.0,425.0,425.0,2000.0,
12000.0,2000.0,5000.0,5000.0,5000.0,60.0,-110.0,-137.0,42.65,42.65,
242.65,20000.,20000.,20000./
 DATA DP/900.,150.,30.,3.,1000.,100.,10.,0.,1000.,100.,10.,1000.,
1100.,10.,587.84,440.88,293.92,220.44,29.392,2.9392/
 DATA  DH/85.3,85.3,85.3,85.3,275.0,275.0,275.0,275.0,1000.0,1000.0
1,1000.0,3000.0,3000.0,3000.0,37.0,17.0,18.0,31.99,31.99,31.99/
 DATAAA/6.726,6.143,5.816,5.583,7.632,6.986,6.615,6.35,8.317,7.649,
17.26,6.978,8.925,8.188,7.755,7.55,8.568,7.719,7.285,6.998,6.78,9.5
277,8.684,8.231,7.926,7.691,10.29,9.388,8.928,8.619,8.379,10.88,9.9
```

```
      DATA (TS=24.845,27.175,29.310,31.299,33.176,34.962,36.672,38.317,
     139.904,41.456)
      DATA (SS=1.185,1.207,1.229,1.249,1.267,1.284,1.299,1.315,1.331,
     11.347)
      DATA (LOC=309,1,17,37,57,87,111, 0,141,157,173,193,217,241,271,
     1303,424,457,469,504,534,546,558)
      DATA (JP=11,4,5,5,5,4,5,0,4,4,5,4,4,5,8,11,3,3,7,6)
      DATA (MX=3,2,3,3,3,2,3,0,2,2,3,2,2,3,6,9,1,1,5,4)
      DATA (BP=800.0,150.0,20.0,2.0,  0.0,  0.0,-5.0,0,0,0,-5.0,0,0,-5.0
     1,881.76,587.84,0,293.92,0,0)
      DATA (BH=170.0,170.0,170.0,170.0,425.0,425.0,425.0,425.0,2000.0,
     12000.0,2000.0,5000.0,5000.0,5000.0,60.0,-110.0,-137.0,42.65,42.65,
     242.65,20000.,20000.,20000.)
      DATA (OP=900.,150.,30.,3.,1000.,100.,10.,0,1000.,100.,10.,1000.,
     1100.,10.,587.84,440.88,293.92,220.44,29.392,2.9392)
      DATA (OH=85.3,85.3,85.3,85.3,275.0,275.0,275.0,275.0,1000.0,1000.0
     1,1000.0,3000.0,3000.0,3000.0,37.0,17.0,18.0,31.99,31.99,31.99)
      P=PRES
      IF(P.LT.1.0) P=1.0
      H=ENTH
      IF(H.LE.170.6) GO TO 11
      IF(H.GE.425.0) GO TO 4
      IF(P.LE.700.0) GO TO 1
      N=1
      GO TO 33
    1 IF(P.LE.145.0) GO TO 2
      N=2
      GO TO 33
    2 IF(P.LE.17.0) GO TO 3
      N=3
      GO TO 33
    3 N=4
      GO TO 33
    4 IF(H.GE.1800.0) GO TO 8
      N=5
      GO TO 9
    8 IF(H.GE.5000.0) GO TO 10
      N=9
    9 IF(P.LE.375.0) N=N+1
      IF(P.LE.40.0) N=N+1
      GO TO 33
   10 N=12
      N1=21
      IF(H.GE.25000.) H=24999.9999
      IF(P.LE.375.0)N1=N1+1
      IF(P.LE.40.0)N1=N1+1
      GO TO 9
   11 IF(P.LE.800.0) GO TO 13
      IF(H.LE.60.0) GO TO 12
      N=15
      GO TO 33
   12 N=16
      GO TO 27
   13 IF(H.GE.43.0) GO TO 14
      IF(P.GE.587.84) GO TO 12
      N=17
      GO TO 20
   14 IF(P.LE.191.0) GO TO 15
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```
     345,9.536,9.196,8.992,10.89,9.841,9.479,9.169,8.923,11.96,10.83,10.
     448,10.16,9.914,12.68,11.53,11.19,10.87,10.63,13.23,12.1,11.81,11.5
     52,11.23,8.371,7.003,6.279,5.814,5.445,9.707,8.295,7.558,7.095,6.74
     61,10.69,9.268,8.53,8.072,7.726,11.47,10.05,9.32,8.868,8.529,12.12,
     710.71,9.979,9.532,9.2,12.67,11.26,10.54,10.1,9.771,10.63,9.264,8.5
     885,8.188,11.97,10.6,9.916,9.512,12.95,11.58,10.89,10.49,13.74,12.3
     97,11.68,11.28,14.39,13.02,12.33,11.93,14.94,13.57,12.88,12.48/
      DATAAB/15.6,12.1,11.13,10.63,10.3,16.95,13.56,12.47,11.97,11.64,17
     1.92,14.54,13.45,12.95,12.62,18.71,15.32,14.24,13.73,13.4,19.36,15.
     297,14.89,14.38,14.05,19.91,16.52,15.44,14.93,14.6,12.96,11.55,10.8
     33,10.39,14.4,13.,12.29,11.87,15.38,13.99,13.29,12.87,16.14,14.76,1
     44.06,13.64,15.23,13.86,13.17,12.77,16.66,15.29,14.61,14.21,17.64,1
     56.28,15.59,15.19,18.41,17.04,16.36,15.95,20.21,16.81,15.73,15.22,1
     64.89,21.7,18.25,17.17,16.65,16.33,22.68,19.23,18.15,17.64,17.31,23
     7.44,19.99,18.91,18.4,18.07,16.14,14.76,14.06,13.64,17.77,16.39,15.
     87,15.29,18.89,17.52,16.83,16.42,19.76,18.4,17.71,17.3,20.32,18.94,
     918.25,17.85,20.92,19.55,18.86,18.46,18.41,17.04,16.36,15.95,20.04/
      DATAAC/18.67,17.99,17.59,21.16,19.79,19.11,18.71,22.03,20.66,19.98
     1,19.58,22.62,21.23,20.54,20.14,23.2,21.82,21.14,20.74,23.44,19.99,
     218.91,18.41,18.07,25.07,21.62,20.54,20.04,19.7,26.2,22.74,21.66,21
     3.16,20.83,27.08,23.62,22.53,22.03,21.7,27.87,24.25,23.14,22.62,22.
     429,28.5,24.85,23.72,23.2,22.87,4.094,3.69,3.34,3.011,2.684,2.35,1.
     5994,1.609,4.526,4.112,3.772,3.462,3.166,2.873,2.575,2.272,4.921,4.
     6491,4.153,3.856,3.577,3.31,3.043,2.773,5.303,4.836,4.509,4.207,3.9
     742,3.688,3.441,3.192,1.219,.687,.192,0.,0.,0.,5.355,4.686,4.218,3.
     8814,3.435,1.74,1.229,.744,.264,0.,0.,6.094,5.376,4.91,4.53,4.189,2
     9.16,1.735,1.26,.795,.328,0.,6.708,5.958,5.49,5.12,4.798,2.518/
      DATAAD/2.136,1.739,1.295,.852,.41,7.262,6.496,6.,5.63,5.297,2.837,
     12.479,2.125,1.75,1.334,.918,.485,0.,0.,0.,0.,3.128,2.783,2.453,2.1
     22,1.768,1.376,.972,.55,0.,0.,0.,3.398,3.058,2.745,2.437,2.122,1.78
     39,1.42,1.033,.62,0.,0.,3.652,3.313,3.01,2.718,2.429,2.131,1.814,1.
     4465,1.091,.687,0.,3.894,3.55,3.253,2.973,2.7,2.427,2.142,1.841,1.5
     511,1.152,.765,4.126,3.773,3.478,3.208,2.948,2.69,2.428,2.158,1.87,
     61.557,1.216,4.348,3.993,3.69,3.428,3.176,2.929,2.684,2.434,2.172,1
     7.897,1.603,1.039,.6495,.26,1.666,1.286,.931,2.16,1.843,1.507,2.576
     8,2.283,1.997,2.945,2.664,2.397,3.286,3.004,2.747,3.615,3.319,3.062
     9,3.939,3.616,3.352,4.268,3.904,3.624,4.62,4.183,3.881,4.979,4.458/
      DATAAE/4.126,4.465,4.191,3.993,4.953,4.613,4.394,5.409,5.008,4.765
     1,5.831,5.375,5.109,6.214,5.716,5.429,0.,4.803,4.712,4.633,7.389,6.
     2438,5.895,5.619,5.436,5.305,5.176,8.168,7.143,6.547,6.223,6.005,5.
     3843,5.679,8.81,7.74,7.107,6.752,6.509,6.326,6.138,9.321,8.229,7.57
     46,7.204,6.947,6.751,6.548,8.8,7.371,6.738,6.499,0.,0.,9.906,8.456,
     57.798,7.502,7.236,7.034,10.83,9.318,8.646,8.258,7.985,7.776,11.49,
     69.959,9.283,8.888,8.611,8.396,12.02,10.47,9.789,9.393,9.113,8.896,
     720.97,19.57,18.89,18.49,21.74,20.29,19.91,19.55,22.76,21.8,21.16,2
     80.85,23.28,21.82,21.14,20.74,24.24,22.61,21.91,21.5,24.61,23.17,22
     9.87,22.6,28.44,24.85,23.72,23.2,22.87,29.07,25.46,24.35,23.85/
      DATAAF/23.68,29.67,26.09,25.22,24.68,24.25,0./
      P=PRES
      IF(P.LT.1.0) P=1.0
      H=ENTH
      IF(H.LE.170.6) GO TO 11
      IF(H.GE.425.0) GO TO 4
      IF(P.LE.700.0) GO TO 1
      N=1
      GO TO 33
    1 IF(P.LE.145.0) GO TO 2
      N=2
```

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      N=18
      GO TO 33
   15 IF(P.LE.18.0) GO TO 16
      N=19
      GO TO 20
   16 N=20
   20 IF(P.GT.187.506) GO TO 27
      OO 24 I=2,19
      IF(P-R(I))22,21,24
   21 HLIQ=HL(I)
      HGAS=HG(I)
      SLIQ=SL(I)
      SGAS=SG(I)
      GO TO 25
   22 D=R(I)-R(I-1)
      PRR=R(I)-P
      PPR=P-R(I-1)
      HLIQ=(HL(I)*PPR+HL(I-1)*PRR)/O
      HGAS=(HG(I)*PPR+HG(I-1)*PRR)/O
      SLIQ=(SL(I)*PPR+SL(I-1)*PRR)/D
      SGAS=(SG(I)*PPR+SG(I-1)*PRR)/O
      GO TO 25
   24 CONTINUE
   25 IF(H.GT.HGAS) GO TO 27
      IF(H.LT.HLIQ) GO TO 27
      PHENTR=(H-HLIQ)/(HGAS-HLIQ)*(SGAS-SLIQ)+SLIQ
      RETURN
   27 PR=P/587.84
      I=PR
      IF(I.GT.8) I=8
      F=PR-I
      FP=1.0-F
      HSOL=FP*HS(I+1)+F*HS(I+2)
      IF(H.GT.HSOL) GO TO 33
      PHENTR=FP*SS(I+1)+F*SS(I+2)
      RETURN
   33 IF(H.LE.20000.)N1=N
      FP=(P-BP(N))/OP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FH=(H-BH(N1))/DH(N)
      IH=FH
      FF=FH-IH
      FH=1.0-FF
      I=IH*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      PHENTR=FP*FH*S(I)+F*FH*S(I+1)+FP*FF*S(J)+F*FF*S(J+1)
      RETURN
      ENO

      SUBROUTINE DATAENTR
      COMMON/ENTRPY/S(573)
      DATA((S(I),I=217,328)=18.41,17.04,16.36,15.95,20.04,18.67,17.99,17
     1.59,21.16,19.79,19.11,18.71,22.03,20.66,19.98,19.58,22.62,21.23,20
     2.54,20.14,23.2,21.82,21.14,20.74,23.44,19.99,18.91,18.41,18.07,25.
     307,21.62,20.54,20.04,19.7,26.2,22.74,21.66,21.16,20.83,27.08,23.62
```

```
      GO TO 33
    2 IF(P.LE.17.0) GO TO 3
      N=3
      GO TO 33
    3 N=4
      GO TO 33
    4 IF(H.GE.1800.0) GO TO 8
      N=5
      GO TO 9
    8 IF(H.GE.5000.0) GO TO 10
      N=9
    9 IF(P.LE.375.0) N=N+1
      IF(P.LE.40.0) N=N+1
      GO TO 33
   10 N=12
      N1=21
      IF(H.GE.25000.) H=24999.9999
      IF(P.LE.375.0)N1=N1+1
      IF(P.LE.40.0)N1=N1+1
      GO TO 9
   11 IF(P.LE.800.0) GO TO 13
      IF(H.LE.60.0) GO TO 12
      N=15
      GO TO 33
   12 N=16
      GO TO 27
   13 IF(H.GE.43.0) GO TO 14
      IF(P.GE.587.84) GO TO 12
      N=17
      GO TO 20
   14 IF(P.LE.191.0) GO TO 15
      N=18
      GO TO 33
   15 IF(P.LE.18.0) GO TO 16
      N=19
      GO TO 20
   16 N=20
   20 IF(P.GT.187.506) GO TO 27
      DO 24 I=2,19
      IF(P-R(I))22,21,24
   21 HLIQ=HL(I)
      HGAS=HG(I)
      SLIQ=SL(I)
      SGAS=SG(I)
      GO TO 25
   22 D=R(I)-R(I-1)
      PRR=R(I)-P
      PPR=P-R(I-1)
      HLIQ=(HL(I)*PPR+HL(I-1)*PRR)/O
      HGAS=(HG(I)*PPR+HG(I-1)*PRR)/D
      SLIQ=(SL(I)*PPR+SL(I-1)*PRR)/D
      SGAS=(SG(I)*PPR+SG(I-1)*PRR)/O
      GO TO 25
   24 CONTINUE
   25 IF(H.GT.HGAS) GO TO 27
      IF(H.LT.HLIQ) GO TO 27
      PHENTR=(H-HLIQ)/(HGAS-HLIQ)*(SGAS-SLIQ)+SLIQ
      RETURN
```

```
4,22.53,22.03,21.7,27.87,24.25,23.14,22.62,22.29,28.5,24.85,23.72,2
53.2,22.87,4.094,3.69,3.34,3.011,2.684,2.35,1.994,1.609,4.526,4.112
6,3.772,3.462,3.166,2.873,2.575,2.272,4.921,4.491,4.153,3.856,3.577
7,3.31,3.043,2.773,5.303,4.836,4.509,4.207,3.942,3.688,3.441,3.192,
81.219,.687,.192,0.,0.,0.,5.355,4.686,4.218,3.814,3.435,1.74,1.229,
9.744,.264,0.,0.,6.094,5.376,4.91,4.53,4.189,2.16,1.735,1.26,.795)
 OATA((S(I),I=329,445)=.328,0.,6.708,5.958,5.49,5.12,4.798,2.518,2.
1136,1.739,1.295,.852,.41,7.262,6.496,6.,5.63,5.297,2.837,2.479,2.1
225,1.75,1.334,.918,.485,0.,0.,0.,0.,3.128,2.783,2.453,2.12,1.768,1
3.376,.972,.55,0.,0.,0.,3.398,3.058,2.745,2.437,2.122,1.789,1.42,1.
4033,.62,0.,0.,3.652,3.313,3.01,2.718,2.429,2.131,1.814,1.465,1.091
5,.687,0.,3.894,3.55,3.253,2.973,2.7,2.427,2.142,1.841,1.511,1.152,
6.765,4.126,3.773,3.478,3.208,2.948,2.69,2.428,2.158,1.87,1.557,1.2
716,4.348,3.993,3.69,3.428,3.176,2.929,2.684,2.434,2.172,1.897,1.60
83,1.039,.6495,.26,1.666,1.286,.931,2.16,1.843,1.507,2.576,2.283,1.
9997,2.945,2.664,2.397,3.286,3.004,2.747,3.615,3.319,3.062,3.939)
 DATA((S(I),I=446,554)=3.616,3.352,4.268,3.904,3.624,4.62,4.183,3.8
181,4.979,4.458,4.126,4.465,4.191,3.993,4.953,4.613,4.394,5.409,5.0
208,4.765,5.831,5.375,5.109,6.214,5.716,5.429,0.,4.803,4.712,4.633,
37.389,6.438,5.895,5.619,5.436,5.305,5.176,8.168,7.143,6.547,6.223,
46.005,5.843,5.679,8.81,7.74,7.107,6.752,6.509,6.326,6.138,9.321,8.
5229,7.576,7.204,6.947,6.751,6.548,8.8,7.371,6.738,6.499,0.,0.,9.90
66,8.456,7.798,7.502,7.236,7.034,10.83,9.318,8.646,8.258,7.985,7.77
76,11.49,9.959,9.283,8.888,8.611,8.396,12.02,10.47,9.789,9.393,9.11
83,8.896,20.97,19.57,18.89,18.49,21.74,20.29,19.91,19.55,22.76,21.8
9,21.16,20.85,23.28,21.82,21.14,20.74,24.24,22.61,21.91,21.5,24.61)
 DATA((S(I),I=555,573)=23.17,22.87,22.6,28.44,24.85,23.72,23.2,22.8
17,29.07,25.46,24.35,23.85,23.68,29.67,26.09,25.22,24.68,24.25,0.)
 ENO
```

```
 FUNCTION PHCONO(PRES,ENTH)
 COMMON/PHLAMB/C(735)
 OIMENSION LOC(19),JP(19),DP(19),DH(19),BP(19),BH(19),MX(19),
1PL(19),HL(19),HG(19),CL(19),CG(19),HS(11)
 DATA(LOC=1,29,50,86,149,173,191,269,339,375,407,461,493,517,529,
1 553,577,601,661)
 DATA(JP=4,3,4,7,4,3,6,7,6,4,6,4,4,2,3,3,3,4,5)
 DATA(MX=2,1,2,5,2,1,4,5,4,2,4,2,2,0,1,1,1,2,3)
 DATA(BP=0.,0.,490.,132.,305.,500.,1000.,2000.,0.,20.,500.,2000.,
1 0.,0.,0.,-100.,0.,0.,1.)
 OATA(DP=160.,250.,170.,28.,65.,250.,200.,500.,100.,160.,300.,1000.
1 ,500.,3000.,1500.,300.,40.,10.,1.)
 OATA(BH=-135.,-105.,-115.,-45.,-45.,-75.,-95.,-60.,70.,145.,25.,
1 75.,425.,1800.,11000.,11000.,11000.,11000.,11000.,11000.)
 DATA(OH=5.,10.,5.,15.,23.,20.,10.,15.,15.,40.,50.,50.,275.,1840.,
1 2000.,2000.,2000.,1000.,1000.)
 DATA(PL=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
1.,185.,186.5,187.25,187.46875,187.51)
 OATA(HL=-132.8,-129.13,-124.25,-117.79,-110.86,-101.3,-89.04,
1-74.22,-58.58,-43.43,-30.07,-20.56,-11.13,-4.27,1.17,5.54,10.83,
214.29,16.36)
 DATA(HG=60.31,65.11,70.59,76.35,80.98,85.11,87.40,86.54,81.94,
174.15,64.83,56.86,47.34,39.56,33.46,28.34,22.31,18.66,16.55)
```

```
27 PR=P/587.84
   I=PR
   IF(I.GT.8) I=8
   FI=I
   F=PR-FI
   FP=1.0-F
   HSOL=FP*HS(I+1)+F*HS(I+2)
   IF(H.GT.HSOL) GO TO 33
   PHENTR=FP*SS(I+1)+F*SS(I+2)
   RETURN
33 IF(H.LE.20000.)N1=N
   FP=(P-BP(N))/OP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   FI=IP
   F=FP-FI
   FP=1.0-F
   FH=(H-BH(N1))/DH(N)
   IH=FH
   FI=IH
   FF=FH-FI
   FH=1.0-FF
   I=IH*JP(N)+IP+LOC(N1)
   J=I+JP(N)
   PHENTR=FP*FH*S(I)+F*FH*S(I+1)+FP*FF*S(J)+F*FF*S(J+1)
   RETURN
   ENO
```

```
 FUNCTION PHCONO(PRES,ENTH)
 OIMENSION LOC(19),JP(19),OP(19),OH(19),8P(19),BH(19),MX(19),
1PL(19),HL(19),HG(19),CL(19),CG(19),HS(11) ,C(735)
 DIMENSION AA(104),AB(109),AC(107),AD( 96),AE( 96),AF(112),AG(111)
 EQUIVALENCE( C,AA),( C( 105),AB),( C( 214),AC),( C( 321),AO)
1    ,( C( 417),AE),( C( 513),AF),( C( 625),AG)
 DATAAA/.0381,.03,0.,0.,.04705,.0394,.03,0.,.05265,.04741,.0394,.03
1,.0549,.0533,.04761,.04132,.05608,.05629,.05417,.04816,.05713,.057
273,.05756,.05492,.05791,.05918,.05928,.05871,.058,.05926,.05848,.0
35795,.06169,.06273,.05648,.06196,.06522,.05419,.06097,.06571,.0512
45,.05922,.06503,.04787,.05698,.06368,.0457,.05422,.06172,.0478,.04
51,0.,0.,.05464,.0479,.04,0.,.0586,.05493,.048,.04,.0607,.05948,.05
6504,.0483,.06275,.06196,.06022,.0553,.06427,.06426,.06311,.06084,.
706514,.06606,.06563,.06414,.06553,.06715,.06769,.06688,.06556,.067
873,.06899,.06919,1.31,1.449,1.591,1.509,1.42,1.326,1.227,1.17,1.18
98,1.186,1.181,1.182,1.187,1.196,.907,1.133,.9271,.9487,1.018/
 OATAAB/1.105,1.201,0.,15.,1.11,.8018,.8992,1.049,1.219,0.,30.,3.3,
1.6988,.8161,1.016,1.248,0.,15.,2.508,.9377,.9202,1.018,1.158,2.,2.
22,1.034,.8983,.9015,.95,1.02,.85,.8424,.8352,.8358,.8431,.8564,.87
34,.57,.696,.8216,.8203,.8046,.7785,.744,.05609,.05812,.05998,.0617
42,.0504,.05202,.05421,.05625,.04754,.04834,.04985,.0515,.04554,.04
5504,.0462,.04777,.04087,.04129,.04264,.04427,.03503,.03708,.03906,
6.04099,.06571,.06873,.06954,.06368,.06884,.07263,.05938,.0656,.070
```

```
      DATA(HS=-132.82,-113.35,-94.24,-75.47,-57.04,-38.91,-21.05,-3.4,
     114.08,31.36,48.53)
      DATA(CL=.04175,.04817,.05272,.05554,.05697,.05838,.05802,.05588,
     1.05258,.04956,.05045,.05483,.06686,.09614,.1579,.2981,
     2 .7899,3.302,187.)
      DATA(CG=.00717,.00757,.00809,.00881,.00968,.01115,.01307,.01561,
     1 .01889,.02366,.03111,.04170,.06726,.12255,.2408,.5451,2.167,
     3 8.4,187.)
      DATA((C(I),I=1,102)=.0381,.03,0.,0.,.04705,.0394,.03,0.,.05265,.04
     1741,.0394,.03,.0549,.0533,.04761,.04132,.05608,.05629,.05417,.0481
     26,.05713,.05773,.05756,.05492,.05791,.05918,.05928,.05871,.058,.05
     3926,.05848,.05795,.06169,.06273,.05648,.06196,.06522,.05419,.06097
     4,.06571,.05125,.05922,.06503,.04787,.05698,.06368,.0457,.05422,.06
     5172,.0478,.041,0.,0.,.05464,.0479,.04,0.,.0586,.05493,.048,.04,.06
     607,.05948,.05504,.0483,.06275,.06196,.06022,.0553,.06427,.06426,.0
     76311,.06084,.06514,.06606,.06563,.06414,.06553,.06715,.06769,.0668
     88,.06556,.06773,.06899,.06919,1.31,1.449,1.591,1.509,1.42,1.326,1.
     9227,1.17,1.188,1.186,1.181,1.182,1.187,1.196,.907,1.133,.9271)
      DATA((C(I),I=103,209)=.9487,1.018,1.105,1.201,0.,15.,1.11,.8018,.8
     1992,1.049,1.219,0.,30.,3.3,.6988,.8161,1.016,1.248,0.,15.,2.508,.9
     2377,.9202,1.018,1.158,2.,2.2,1.034,.8983,.9015,.95,1.02,.85,.8424,
     3.8352,.8358,.8431,.8564,.874,.57,.696,.8216,.8203,.8046,.7785,.744
     4,.05609,.05812,.05998,.06172,.0504,.05202,.05421,.05625,.04754,.04
     5834,.04985,.0515,.04554,.04504,.0462,.04777,.04087,.04129,.04264,.
     604427,.03503,.03708,.03906,.04099,.06571,.06873,.06954,.06368,.068
     784,.07263,.05938,.0656,.07072,.05456,.0615,.06718,.05084,.05738,.0
     86346,.04762,.05389,.05984,.05603,.051,.046,0.,0.,0.,.06446,.06047,
     9.0558,.0438,0.,0.,.06919,.06763,.06494,.0604,.0542,0.,.07163)
      DATA((C(I),I=210,313)=.0723,.07141,.06851,.06518,.0602,.07227,.074
     124,.07519,.07484,.07265,.06897,.07191,.07465,.07669,.07789,.07797,
     2.07656,.07072,.07423,.07692,.079,.08038,.08085,.069,.07278,.07614,
     3.07907,.08119,.08272,.06718,.07114,.0747,.07794,.08085,.08327,.065
     432,.06943,.07315,.07655,.07965,.0825,.06346,.06769,.07152,.07504,.
     507829,.0813,.06163,.06595,.06987,.07347,.07682,.07994,.05984,.0642
     64,.06822,.07189,.0753,.0785,.06466,.0714,0.,0.,0.,0.,0.,.07656,.06
     765,.057,0.,0.,0.,0.,.082,.0796,.0674,.057,0.,0.,0.,.08327,.08613,.
     808214,.0694,.051,0.,0.,.08191,.08798,.08992,.0849,.0725,.0672,0.,.
     907994,.08685,.0923,.09348,.08732,.0805,0.,.07777,.08508,.09136)
      P=PRES
      H=ENTH
      R=1.0
      IF(P.LT.1.0) P=1.0
      IF(H.GE.425.) GO TO 12
      IF(P.LT.500.) GO TO 6
      IF(P.LT.2000.) GO TO 2
      IF(H.LT.75.) GO TO 1
      N=12
      GO TO 33
    1 N=8
      GO TO 22
    2 IF(H.LT.25.) GO TO 3
      N=11
      GO TO 33
    3 IF(P.GE.1000.) GO TO 5
      IF(H.LT.-75.) GO TO 4
      N=6
      GO TO 33
    4 N=3
```

```
     772,.05456,.0615,.06718,.05084,.05738,.06346,.04762,.05389,.05984,.
     805603,.051,.046,0.,0.,0.,.06446,.06047,.0558,.0438,0.,0.,.06919,.0
     96763,.06494,.0604,.0542,0.,.07163,.0723,.07141,.06851,.06518/
      DATAAC/.0602,.07227,.07424,.07519,.07484,.07265,.06897,.07191,.074
     165,.07669,.07789,.07797,.07656,.07072,.07423,.07692,.079,.08038,.0
     28085,.069,.07278,.07614,.07907,.08119,.08272,.06718,.07114,.0747,.
     307794,.08085,.08327,.06532,.06943,.07315,.07655,.07965,.0825,.0634
     46,.06769,.07152,.07504,.07829,.0813,.06163,.06595,.06987,.07347,.0
     57682,.07994,.05984,.06424,.06822,.07189,.0753,.0785,.06466,.0714,0
     6.,0.,0.,0.,0.,.07656,.0665,.057,0.,0.,0.,0.,.082,.0796,.0674,.057,
     70.,0.,0.,.08327,.08613,.08214,.0694,.051,0.,0.,.08191,.08798,.0899
     82,.0849,.0725,.0672,0.,.07994,.08685,.0923,.09348,.08732,.0805,0.,
     9.07777,.08508,.09136,.0963,.0969,.0903,.0828,.07553,.08305,.08974/
      DATAAD/.09553,.1,.1001,.0945,.07336,.08093,.08781,.09403,.09945,.1
     1036,.1033,.0713,.07885,.08575,.09216,.09803,.1031,.107,.00773,.024
     26,.03106,.03486,.038,.04099,.00868,.01861,.0267,.03189,.03576,.039
     307,.01017,.01785,.02462,.02986,.03397,.03744,.01172,.01798,.02373,
     4.02861,.03266,.03614,.01325,.01849,.0235,.02793,.03179,.03519,.014
     564,.01922,.02365,.0277,.0313,.03454,.01552,.02279,.02917,.03454,.0
     61897,.02446,.02952,.03406,.02246,.02685,.03098,.03496,.02599,.0297
     78,.03338,.03677,.02979,.03299,.03607,.03866,.03344,.03611,.03884,.
     804157,.03755,.04015,.04267,.04512,.04182,.04415,.04642,.04863,.047
     962,.05507,.0621,.06822,.07362,.0785,.04032,.04838,.05505,.06081/
      DATAAE/.06631,.0713,.03547,.0438,.05041,.05603,.06101,.06562,.0340
     14,.04154,.04788,.0533,.05809,.0624,.03496,.04161,.04733,.05233,.05
     268,.06085,.0373,.04295,.04741,.05196,.05613,.05996,.03991,.04492,.
     304963,.05394,.05791,.06155,.04423,.04872,.0529,.05679,.06043,.0638
     41,.04863,.05261,.05637,.0599,.06123,.06386,.0713,.08575,.09803,.10
     57,.06562,.07943,.0916,.103,.0624,.07492,.08587,.09652,.06085,.0724
     65,.08258,.0918,.05996,.07104,.08047,.08901,.06155,.07192,.08032,.0
     78742,.06381,.07362,.08172,.08866,.06386,.0726,.08135,.09009,.04153
     8,.04863,.05511,.05948,.06748,.07232,.07671,.08076,.08369,.08678,.0
     98962,.09228,.09386,.09586,.0977,.09942,.1024,.1035,.1046,.1056/
      DATAAF/.1111,.1116,.112,.1124,.1111,.1137,.1738,.162,.2321,.2111,.
     12897,.2874,.3485,.3448,.4245,.4,.4029,.4012,.4,.4683,.462,.4596,.5
     2567,.533,.5257,.6947,.6289,.6094,.9021,.7651,.7231,1.179,.9492,.87
     354,1.51,1.179,1.068,1.875,1.446,1.295,.4058,.4031,.4023,.4897,.471
     41,.4662,.6434,.5689,.5488,.9153,.7269,.6728,1.305,.9621,.8564,1.77
     52,1.268,1.102,2.28,1.625,1.4,2.802,2.013,1.732,.413,.4053,.4042,.5
     6407,.4867,.4785,.812,.63,.5987,1.245,.8762,.8022,1.781,1.225,1.099
     7,2.366,1.646,1.47,2.966,2.107,1.887,3.564,2.587,2.329,.4151,.409,.
     84069,.4059,.4701,.4525,.4461,.4432,.5546,.5132,.4979,.4909,.6812,.
     96012,.5705,.5562,.8549,.7235,.671,.6457,1.072,.8821,.8032,.7641/
      DATAAG/1.323,1.074,.9665,.9117,1.599,1.293,1.157,1.086,1.891,1.532
     1,1.369,1.283,2.193,1.786,1.599,1.497,2.501,2.05,1.84,1.724,2.812,2
     2.321,2.089,1.96,3.123,2.595,2.344,2.203,3.433,2.87,2.601,2.45,3.73
     39,3.146,2.86,2.699,.4245,.4179,.415,.4132,.412,.4964,.4782,.4699,.
     44648,.4613,.6112,.5721,.5535,.542,.5339,.7795,.7114,.6777,.6564,.6
     5412,.9991,.8986,.8469,.8134,.7892,1.25,1.128,1.057,1.011,.977,1.55
     61,1.389,1.301,1.242,1.199,1.861,1.673,1.569,1.499,1.446,2.184,1.97
     72,1.854,1.773,1.711,2.514,2.28,2.149,2.058,1.99,2.847,2.594,2.451,
     82.351,2.276,3.18,2.909,2.755,2.648,2.567,3.511,3.224,3.061,2.946,2
     9.859,3.84,3.538,3.365,3.244,3.151,4.163,3.848,3.666,3.54,3.442/
      DATA LOC/1,29,50,86,149,173,191,269,339,375,407,461,493,517,529,
     1 553,577,601,661/
      DATA JP/4,3,4,7,4,3,6,7,6,4,6,4,4,2,3,3,3,4,5/
      DATA MX/2,1,2,5,2,1,4,5,4,2,4,2,2,0,1,1,1,2,3/
      DATA BP/0.,0.,490.,132.,305.,500.,1000.,2000.,0.,20.,500.,2000.,
```

```
      GO TO 22
    5 N=7
      GO TO 22
    6 IF(H.LT.-45.) GO TO 11
      IF(H.GE.70.) GO TO 9
      IF(P.LT.300.) GO TO 7
      N=5
      GO TO 33
    7 N=4
      R=H-16.455
      IF(R.LT.0.) R=-R
      IF(P.LT.187.51) GO TO 8
      R=1.0/(3.1136694+.2115577*(P-187.51)+.4487232*R-.004707536*R*
     1(P-187.51))
      GO TO 33
    8 R=1.0/(3.1136694-.2115577*(P-187.51)+.4487232*R+.004707536*R*
     1(P-187.51))
      GO TO 17
    9 IF(H.GE.145.) GO TO 10
      N=9
      IF(P.GE.140.) GO TO 33
      IF(H.GE.88.) GO TO 33
      GO TO 17
   10 N=10
      GO TO 33
   11 IF(H.LT.-105.) GO TO 21
      N=2
      IF(P.LT.125.) GO TO 17
      GO TO 33
   12 IF(H.LT.11000.) GO TO 26
      IF(P.GE.80.) GO TO 15
      IF(P.GE.30.) GO TO 14
      IF(P.GE.5.) GO TO 13
      N=19
      GO TO 33
   13 N=18
      GO TO 33
   14 N=17
      GO TO 33
   15 IF(P.GT.500.) GO TO 16
      N=16
      GO TO 33
   16 N=15
      GO TO 33
   17 DO 18 I=2,18
      IF(P-PL(I))19,19,18
   18 CONTINUE
   19 D=PL(I)-PL(I-1)
      DF=PL(I)-P
      DB=P-PL(I-1)
      HGAS=(HG(I)*DB+HG(I-1)*DF)/D
      IF(H.GE.HGAS) GO TO 33
      HLIQ=(HL(I)*DB+HL(I-1)*DF)/D
      IF(H.LE.HLIQ) GO TO 33
      CLIQ=(CL(I)*DB+CL(I-1)*DF)/D
      PHCOND=((CG(I)*DB+CG(I-1)*DF)/D-CLIQ)*(H-HLIQ)/(HGAS-HLIQ)+CLIQ
      RETURN
   21 N=1
     1 0.,0.,0.,-100.,0.,0.,1./
      DATA DP/160.,250.,170.,28.,65.,250.,200.,500.,100.,160.,300.,1000.
     1 ,500.,3000.,1500.,300.,40.,10.,1./
      DATA BH/-135.,-105.,-115.,-45.,-45.,-75.,-95.,-60.,70.,145.,25.,
     1 75.,425.,1800.,11000.,11000.,11000.,11000.,11000./
      DATA DH/5.,10.,5.,15.,23.,20.,10.,15.,15.,40.,50.,50.,275.,1840.,
     1 2000.,2000.,2000.,1000.,1000./
      DATA PL/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
     1.,185.,186.5,187.25,187.46875,187.51/
      DATA HL/-132.8,-129.13,-124.25,-117.79,-110.86,-101.3,-89.04,
     1-74.22,-58.58,-43.43,-30.07,-20.56,-11.13,-4.27,1.17,5.54,10.83,
     214.29,16.36/
      DATA HG/60.31,65.11,70.59,76.35,80.98,85.11,87.40,86.54,81.94,
     174.15,64.83,56.86,47.34,39.56,33.46,28.34,22.31,18.66,16.55/
      DATA HS/-132.82,-113.35,-94.24,-75.47,-57.04,-38.91,-21.05,-3.4,
     114.08,31.36,48.53/
      DATA CL/.04175,.04817,.05272,.05554,.05697,.05838,.05802,.05588,
     1.05258,.04956,.05045,.05483,.06686,.09614,.1579,.2981,
     2 .7899,3.302,187./
      DATA CG/.00717,.00757,.00809,.00881,.00968,.01115,.01307,.01561,
     1 .01889,.02366,.03111,.04170,.06726,.12255,.2408,.5451,2.167,
     3 8.4,187./
      P=PRES
      H=ENTH
      R=1.0
      IF(P.LT.1.0) P=1.0
      IF(H.GE.425.) GO TO 12
      IF(P.LT.500.) GO TO 6
      IF(P.LT.2000.) GO TO 2
      IF(H.LT.75.) GO TO 1
      N=12
      GO TO 33
     1 N=8
      GO TO 22
     2 IF(H.LT.25.) GO TO 3
      N=11
      GO TO 33
     3 IF(P.GE.1000.) GO TO 5
      IF(H.LT.-75.) GO TO 4
      N=6
      GO TO 33
     4 N=3
      GO TO 22
     5 N=7
      GO TO 22
     6 IF(H.LT.-45.) GO TO 11
      IF(H.GE.70.) GO TO 9
      IF(P.LT.300.) GO TO 7
      N=5
      GO TO 33
     7 N=4
      R=H-16.455
      IF(R.LT.0.) R=-R
      IF(P.LT.187.51) GO TO 8
      R=1.0/(3.1136694+.2115577*(P-187.51)+.4487232*R-.004707536*R*
     1(P-187.51))
      GO TO 33
     8 R=1.0/(3.1136694-.2115577*(P-187.51)+.4487232*R+.004707536*R*
```

```
      IF(H.LE.(-132.82+0.04*P)) GO TO 22
      IF(P.LT.23.) GO TO 17
      GO TO 33
   22 PR=P/500.0
      I=PR
      IF(I.GT.9) I=9
      F=PR-I
      HSOL=F*HS(I+2)+(1.0-F)*HS(I+1)
      IF(H.LT.HSOL) H=HSOL
      GO TO 33
   26 IF(H.LT.1800.) GO TO 27
      N=14
      GO TO 33
   27 N=13
   33 FP=(P-BP(N))/OP(N)
      IP=FP
      IF(IP.GT.MX(N))IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FH=(H-BH(N))/OH(N)
      IH=FH
      FF=FH-IH
      FH=1.0-FF
      I=IH*JP(N)+IP+LOC(N)
      J=I+JP(N)
      PHCONO=(FP*FH*C(I)+F*FH*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))*R
      RETURN
      ENO

      SUBROUTINE PHLAMBOA
      COMMON/PHLAMB/C(735)
      DATA((C(I),I=314,407)=.0963,.0969,.0903,.0828,.07553,.08305,.08974
     1,.09553,.1,.1001,.0945,.07336,.08093,.08781,.09403,.09945,.1036,.1
     2033,.0713,.07885,.08575,.09216,.09803,.1031,.107,.00773,.0246,.031
     306,.03486,.038,.04099,.00868,.01861,.0267,.03189,.03576,.03907,.01
     4017,.01785,.02462,.02986,.03397,.03744,.01172,.01798,.02373,.02861
     5,.03266,.03614,.01325,.01849,.0235,.02793,.03179,.03519,.01464,.01
     6922,.02365,.0277,.0313,.03454,.01552,.02279,.02917,.03454,.01897,.
     702446,.02952,.03406,.02246,.02685,.03098,.03496,.02599,.02978,.033
     838,.03677,.02979,.03299,.03607,.03866,.03344,.03611,.03884,.04157,
     9.03755,.04015,.04267,.04512,.04182,.04415,.04642,.04863,.04762)
      DATA((C(I),I=408,500)=.05507,.0621,.06822,.07362,.0785,.04032,.048
     138,.05505,.06081,.06631,.0713,.03547,.0438,.05041,.05603,.06101,.0
     26562,.03404,.04154,.04788,.0533,.05809,.0624,.03496,.04161,.04733,
     3.05233,.0568,.06085,.0373,.04295,.04741,.05196,.05613,.05996,.0399
     41,.04492,.04963,.05394,.05791,.06155,.04423,.04872,.0529,.05679,.0
     56043,.06381,.04863,.05261,.05637,.0599,.06123,.06386,.0713,.08575,
     6.09803,.107,.06562,.07943,.0916,.103,.0624,.07492,.08587,.09652,.0
     76085,.07245,.08258,.0918,.05996,.07104,.08047,.08901,.06155,.07192
     8,.08032,.08742,.06381,.07362,.08172,.08866,.06386,.0726,.08135,.09
     9009,.04153,.04863,.05511,.05948,.06748,.07232,.07671,.08076)
      DATA((C(I),I=501,608)=.08369,.08678,.08962,.09228,.09386,.09586,.0
     1977,.09942,.1024,.1035,.1046,.1056,.1111,.1116,.112,.1124,.1111,.1
     2137,.1738,.162,.2321,.2111,.2897,.2874,.3485,.3448,.4245,.4,.4029,
     3.4012,.4,.4683,.462,.4596,.5567,.533,.5257,.6947,.6289,.6094,.9021
     4,.7651,.7231,1.179,.9492,.8754,1.51,1.179,1.068,1.875,1.446,1.295,
     5.4058,.4031,.4023,.4897,.4711,.4662,.6434,.5689,.5488,.9153,.7269,
     6.6728,1.305,.9621,.8564,1.772,1.268,1.102,2.28,1.625,1.4,2.802,2.0
     1(P-187.51))
      GO TO 17
    9 IF(H.GE.145.) GO TO 10
      N=9
      IF(P.GE.140.) GO TO 33
      IF(H.GE.88.) GO TO 33
      GO TO 17
   10 N=10
      GO TO 33
   11 IF(H.LT.-105.) GO TO 21
      N=2
      IF(P.LT.125.) GO TO 17
      GO TO 33
   12 IF(H.LT.11000.) GO TO 26
      IF(P.GE.80.) GO TO 15
      IF(P.GE.30.) GO TO 14
      IF(P.GE.5.) GO TO 13
      N=19
      GO TO 33
   13 N=18
      GO TO 33
   14 N=17
      GO TO 33
   15 IF(P.GT.500.) GO TO 16
      N=16
      GO TO 33
   16 N=15
      GO TO 33
   17 OO 18 I=2,18
      IF(P-PL(I))19,19,18
   18 CONTINUE
   19 O=PL(I)-PL(I-1)
      OF=PL(I)-P
      OB=P-PL(I-1)
      HGAS=(HG(I)*OB+HG(I-1)*OF)/O
      IF(H.GE.HGAS) GO TO 33
      HLIQ=(HL(I)*OB+HL(I-1)*OF)/O
      IF(H.LE.HLIQ) GO TO 33
      CLIQ=(CL(I)*DB+CL(I-1)*OF)/O
      PHCOND=((CG(I)*OB+CG(I-1)*DF)/O-CLIQ)*(H-HLIQ)/(HGAS-HLIQ)+CLIQ
      RETURN
   21 N=1
      IF(H.LE.(-132.82+0.04*P)) GO TO 22
      IF(P.LT.23.) GO TO 17
      GO TO 33
   22 PR=P/500.0
      I=PR
      IF(I.GT.9) I=9
      F=PR-I
      HSOL=F*HS(I+2)+(1.0-F)*HS(I+1)
      IF(H.LT.HSOL) H=HSOL
      GO TO 33
   26 IF(H.LT.1800.) GO TO 27
      N=14
      GO TO 33
   27 N=13
   33 FP=(P-BP(N))/DP(N)
      IP=FP
```

```
713,1.732,.413,.4053,.4042,.5407,.4867,.4785,.812,.63,.5987,1.245,.
88762,.8022,1.781,1.225,1.099,2.366,1.646,1.47,2.966,2.107,1.887,3.
9564,2.587,2.329,.4151,.409,.4069,.4059,.4701,.4525,.4461,.4432)
 DATA((C(I),I=609,716)=.5546,.5132,.4979,.4909,.6812,.6012,.5705,.5
1562,.8549,.7235,.671,.6457,1.072,.8821,.8032,.7641,1.323,1.074,.96
265,.9117,1.599,1.293,1.157,1.086,1.891,1.532,1.369,1.283,2.193,1.7
386,1.599,1.497,2.501,2.05,1.84,1.724,2.812,2.321,2.089,1.96,3.123,
42.595,2.344,2.203,3.433,2.87,2.601,2.45,3.739,3.146,2.86,2.699,.42
545,.4179,.415,.4132,.412,.4964,.4782,.4699,.4648,.4613,.6112,.5721
6,.5535,.542,.5339,.7795,.7114,.6777,.6564,.6412,.9991,.8986,.8469,
7.8134,.7892,1.26,1.128,1.057,1.011,.977,1.551,1.389,1.301,1.242,1.
8199,1.861,1.673,1.569,1.499,1.446,2.184,1.972,1.854,1.773,1.711,2.
9514,2.28,2.149,2.058,1.99,2.847,2.594,2.451,2.351,2.276,3.18)
 DATA((C(I),I=717,735)=2.909,2.755,2.648,2.567,3.511,3.224,3.061,2.
1946,2.859,3.84,3.538,3.365,3.244,3.151,4.163,3.848,3.666,3.54,3.44
22)
 END
```

```
 FUNCTION PHVISC(PRES,ENTH)
 COMMON/PHMU/V(820)
 DIMENSION LOC(23),JP(23),DP(23),DH(23),BP(23),BH(23),MX(23),
1PL(19),HL(19),HG(19),VL(19),VG(19),HS(11)
 DATA(LOC=1,19,29,757,39,63,93,111,165,210,235,285,325,345,400,
1425,485,525,621,661,773,791,428)
 DATA(JP=3,3,3,4,4,5,3,9,5,5,5,5,5,5,5,5,5,8,8,8,3,5,5)
 DATA(MX=1,1,1,2,2,3,1,7,3,3,3,3,3,3,3,3,3,6,6,6,1,3,0)
 DATA(BP=0,0,-1.,0,0,1000.,0,1000.,4000.,4000.,3000.,3000.,1000.,
12000.,2000.,1000.,1000.,-50.,-50.,-50.,-10.,1.,1000.)
 DATA(DP=1500.,1500.,3.,1000.,1000.,1000.,500.,500.,250.,250.,
1250.,250.,500.,250.,250.,250.,250.,150.,150.,150.,150.,20.,1.,250.)
 DATA(BH=10000.,7800.,7800.,1800.,425.,200.,200.,100.,15.,60.,-20.,
130.,40.,-55.,0,-90.,-30.,-130.,-70.,-20.,10000.,10000.,-95.)
 DATA(DH=3000.,1100.,1100.,2000.,275.,45.,45.,20.,5.,10.,5.,10.,20.
1,5.,10.,5.,10.,5.,10.,20.,3000.,3000.,5.)
 DATA(PL=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
1.,185.,186.5,187.25,187.46875,187.506)
 DATA(HL=-132.8,-129.13,-124.25,-117.79,-110.86,-101.30,-89.04,
1-74.22,-58.58,-43.43,-30.07,-20.56,-11.13,-4.27,1.17,5.54,10.83,
214.29,16.36)
 DATA(HG=60.31,65.11,70.59,76.35,80.98,85.11,87.40,86.54,81.94,
174.15,64.83,56.86,47.34,39.56,33.46,28.34,22.31,18.66,16.55)
 DATA(HS=-132.82,-113.35,-94.24,-75.47,-57.04,-38.91,-21.05,-3.4,
114.08,31.36,48.53)
 DATA(VL=1.513E-10,1.287E-10,1.112E-10,.9093E-10,.7848E-10,.6685E-1
10, .5667E-10,.4797E-10,.4112E-10,.3581E-10,.3188E-10,.2926E-10,
2   .2688E-10,.2506E-10,.2332E-10,.2197E-10,.2132E-10,.2128E-10,
3   .2074E-10),(VG=.4274E-11,.4702E-11,.5230E-11,.5867E-11,.6488E-1
41,.7270E-11,.8189E-11,.9234E-11, .1034E-10,.1156E-10,.1292E-10,
5   .1419E-10,.1567E-10,.1700E-10,.1839E-10,.1956E-10,.2016E-10,
6   .2033E-10,.2074E-10)
 DATA((V(I),I=1, 65)=1.586E-10,1.497E-10,1.42E-10,1.864E-10,1.759E-
110,1.664E-10,2.095E-10,1.992E-10,1.883E-10,2.266E-10,2.196E-10,2.0
278E-10,2.395E-10,2.371E-10,2.249E-10,2.501E-10,2.522E-10,2.398E-10
```

```
 IF(IP.GT.MX(N))IP=MX(N)
 F=FP-IP
 FP=1.0-F
 FH=(H-BH(N))/DH(N)
 IH=FH
 FF=FH-IH
 FH=1.0-FF
 I=IH*JP(N)+IP+LOC(N)
 J=I+JP(N)
 PHCOND=(FP*FH*C(I)+F*FH*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))*R
 RETURN
 END
```

```
 FUNCTION PHVISC(PRES,ENTH)
 DIMENSION LOC(22),JP(22),DP(22),DH(22),BP(22),BH(22),MX(22),
1PL(19),HL(19),HG(19),VL(19),VG(19),HS(11),V(820)
 DIMENSION AA( 67),AB( 66),AC( 68),AD( 72),AE( 65),AF( 72),AG( 71)
1 ,AH( 76),AI( 67),AJ( 70),AK( 66),AL( 60)
 EQUIVALENCE( V,AA),( V(  68),AB),( V( 134),AC),( V( 202),AD)
1    ,( V( 274),AE),( V( 339),AF),( V( 411),AG),( V( 482),AH)
2    ,( V( 558),AI),( V( 625),AJ),( V( 695),AK),( V( 761),AL)
 DATALOC/ 1,19,29,757,39,63,93,111,165,210,235,285,325,345,400,
1425,485,525,621,661,773,791/
 DATA JP/3,3,3,4,4,5,3,9,5,5,5,5,5,5,5,5,5,8,8,8,3,5/
 DATA MX/1,1,1,2,2,3,1,7,3,3,3,3,3,3,3,3,3,6,6,6,1,3/
 DATA BP/0.,0.,-1.,0.,0.,1000.,0.,1000.,4000.,4000.,3000.,3000.,
11000.,2000.,2000.,1000.,1000.,-50.,-50.,-50.,-10.,1./
 DATA DP/1500.,1500.,3.,1000.,1000.,1000.,500.,500.,250.,250.,
1250.,250.,500.,250.,250.,250.,250.,150.,150.,150.,20.,1./
 DATA BH/10000.,7800.,7800.,1800.,425.,200.,200.,100.,15.,60.,-20.,
130.,40.,-55.,0.,-90.,-30.,-130.,-70.,-20.,10000.,10000./
 DATA DH/3000.,1100.,1100.,2000.,275.,45.,45.,20.,5.,10.,5.,10.,20.
1,5.,10.,5.,10.,5.,10.,20.,3000.,3000./
 DATA PL/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
1.,185.,186.5,187.25,187.46875,187.506/
 DATA HL/-132.8,-129.13,-124.25,-117.79,-110.86,-101.30,-89.04,
1-74.22,-58.58,-43.43,-30.07,-20.56,-11.13,-4.27,1.17,5.54,10.83,
214.29,16.36/
 DATA HG/60.31,65.11,70.59,76.35,80.98,85.11,87.40,86.54,81.94,
174.15,64.83,56.86,47.34,39.56,33.46,28.34,22.31,18.66,16.55/
 DATA HS/-132.82,-113.35,-94.24,-75.47,-57.04,-38.91,-21.05,-3.4,
114.08,31.36,48.53/
 DATA VL/1.513E-10,1.287E-10,1.112E-10,.9093E-10,.7848E-10,.6685E-1
10, .5667E-10,.4797E-10,.4112E-10,.3581E-10,.3188E-10,.2926E-10,
2   .2688E-10,.2506E-10,.2332E-10,.2197E-10,.2132E-10,.2128E-10,
3   .2074E-10/
 DATA VG/          .4274E-11,.4702E-11,.5230E-11,.5867E-11,.6488E-1
11,.7270E-11,.8189E-11,.9234E-11, .1034E-10,.1156E-10,.1292E-10,
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```
3,1.355E-10,1.281E-10,1.218E-10,1.475E-10,1.392E-10,1.322E-10,1.588
4E-10,1.497E-10,1.42E-10,0.,1.356E-10,1.356E-10,1.355E-10,1.475E-10
5,1.475E-10,1.475E-10,1.587E-10,1.588E-10,1.588E-10,0.,2.204E-11,2.
6779E-11,3.305E-11,3.784E-11,2.971E-11,3.375E-11,3.761E-11,4.134E-1
71,3.565E-11,3.835E-11,4.093E-11,4.351E-11,4.115E-11,4.283E-11,4.44
84E-11,4.608E-11,4.646E-11,4.734E-11,4.82E-11,4.912E-11,5.161E-11,5
9.186E-11,5.213E-11,5.248E-11,2.604E-11,3.604E-11,4.626E-11)
 DATA((V(I),I=66,130)=5.783E-11,7.155E-11,2.57E-11,3.427E-11,4.291E
1-11,5.248E-11,6.35E-11,2.586E-11,3.331E-11,4.075E-11,4.887E-11,5.8
206E-11,2.633E-11,3.288E-11,3.937E-11,4.641E-11,5.427E-11,2.7E-11,3
3.28E-11,3.854E-11,4.474E-11,5.158E-11,2.777E-11,3.296E-11,3.844E-1
41,4.406E-11,4.968E-11,1.325E-11,1.995E-11,2.604E-11,1.56E-11,2.067
5E-11,2.57E-11,1.774E-11,2.173E-11,2.586E-11,1.967E-11,2.292E-11,2.
6633E-11,2.141E-11,2.413E-11,2.7E-11,2.298E-11,2.532E-11,2.777E-11,
73.039E-11,3.787E-11,4.532E-11,5.323E-11,6.197E-11,7.191E-11,8.349E
8-11,9.729E-11,1.143E-10,2.891E-11,3.58E-11,4.258E-11,4.967E-11,5.7
937E-11,6.593E-11,7.566E-11,8.689E-11,1.E-10,2.78E-11,3.417E-11)
 DATA((V(I),I=131,197)=4.039E-11,4.682E-11,5.371E-11,6.123E-11,6.96
14E-11,7.914E-11,8.997E-11,2.699E-11,3.288E-11,3.861E-11,4.449E-11,
25.072E-11,5.747E-11,6.489E-11,7.311E-11,8.236E-11,2.642E-11,3.188E
3-11,3.718E-11,4.259E-11,4.828E-11,5.438E-11,6.101E-11,6.831E-11,7.
4637E-11,2.604E-11,3.104E-11,3.604E-11,4.115E-11,4.626E-11,5.204E-1
51,5.783E-11,6.469E-11,7.155E-11,2.187E-10,2.894E-10,0.,5.354E-11,5
6.476E-11,1.921E-10,2.457E-10,3.17E-10,1.436E-10,1.423E-10,1.725E-1
70,2.13E-10,2.715E-10,0.,0.,1.574E-10,1.888E-10,2.363E-10,3.029E-10
8,0.,1.466E-10,1.708E-10,2.076E-10,2.644E-10,3.34E-10,1.358E-10,1.5
967E-10,1.857E-10,2.295E-10,2.88E-10,1.283E-10,1.455E-10,1.69E-10)
 DATA((V(I),I=198,267)=2.026E-10,2.512E-10,1.208E-10,1.362E-10,1.55
19E-10,1.826E-10,2.219E-10,1.152E-10,1.284E-10,1.453E-10,1.672E-10,
21.978E-10,1.097E-10,1.218E-10,1.365E-10,1.55E-10,1.796E-10,1.011E-
310,1.11E-10,1.226E-10,1.366E-10,1.54E-10,9.413E-11,1.026E-10,1.122
4E-10,1.234E-10,1.367E-10,8.837E-11,9.576E-11,1.04E-10,1.133E-10,1.
524E-10,8.349E-11,9.039E-11,9.729E-11,1.058E-10,1.143E-10,2.061E-10
6,2.623E-10,0.,0.,0.,1.787E-10,2.353E-10,3.116E-10,0.,0.,1.59E-10,2
7.025E-10,2.565E-10,0.,0.,1.441E-10,1.773E-10,2.297E-10,2.901E-10,0
8.,1.325E-10,1.589E-10,1.989E-10,2.523E-10,0.,1.238E-10,1.448E-10,1
9.758E-10,2.241E-10,2.742E-10,1.152E-10,1.336E-10,1.585E-10)
 DATA((V(I),I=268,331)=1.954E-10,2.509E-10,1.091E-10,1.245E-10,1.45
12E-10,1.742E-10,2.187E-10,1.03E-10,1.169E-10,1.345E-10,1.581E-10,1
2.921E-10,9.838E-11,1.104E-10,1.257E-10,1.454E-10,1.725E-10,9.376E-
311,1.049E-10,1.183E-10,1.352E-10,1.574E-10,8.649E-11,9.578E-11,1.0
466E-10,1.196E-10,1.358E-10,8.107E-11,8.857E-11,9.767E-11,1.082E-10
5,1.208E-10,7.565E-11,8.268E-11,9.053E-11,9.944E-11,1.097E-10,7.175
6E-11,7.775E-11,8.467E-11,9.239E-11,1.011E-10,6.786E-11,7.355E-11,7
7.975E-11,8.657E-11,9.413E-11,6.491E-11,6.992E-11,7.555E-11,8.166E-
811,8.837E-11,6.197E-11,6.694E-11,7.191E-11,7.77E-11,8.349E-11,3.80
93E-11,4.797E-11,5.87E-11,7.115E-11,8.649E-11,3.483E-11,4.377E-11)
 P=PRES
 IF(P.LT.1.0) P=1.0
 H=ENTH
 IF(H.LT.100.0)  GO TO 9
 IF(H.LT.425.0)  GO TO 5
 IF(H.LT.7800.0) GO TO 3
 IF(H.LT.10000.)GO TO 34
 IF(H.GE.25000.)H=24999.9999
 IF(P.LT.30.)GO TO 1
 N=1
 GO TO 33
```

```
2   .1419E-10,.1567E-10,.1700E-10,.1839E-10,.1956E-10,.2016E-10,
3   .2033E-10,.2074E-10/
 DATAAA/1.586E-10,1.497E-10,1.42E-10,1.864E-10,1.759E-10,1.664E-10,
12.095E-10,1.992E-10,1.883E-10,2.266E-10,2.196E-10,2.078E-10,2.395E
2-10,2.371E-10,2.249E-10,2.501E-10,2.522E-10,2.398E-10,1.355E-10,1.
3281E-10,1.218E-10,1.475E-10,1.392E-10,1.322E-10,1.588E-10,1.497E-1
40,1.42E-10,0.,1.356E-10,1.356E-10,1.355E-10,1.475E-10,1.475E-10,1.
5475E-10,1.587E-10,1.588E-10,1.588E-10,0.,2.204E-11,2.779E-11,3.305
6E-11,3.784E-11,2.971E-11,3.375E-11,3.761E-11,4.134E-11,3.565E-11,3
7.835E-11,4.093E-11,4.351E-11,4.115E-11,4.283E-11,4.444E-11,4.608E-
811,4.646E-11,4.734E-11,4.82E-11,4.912E-11,5.161E-11,5.186E-11,5.21
93E-11,5.248E-11,2.604E-11,3.604E-11,4.626E-11,5.783E-11,7.155E-11/
 DATAAB/2.57E-11,3.427E-11,4.291E-11,5.248E-11,6.35E-11,2.586E-11,3
1.331E-11,4.075E-11,4.887E-11,5.806E-11,2.633E-11,3.288E-11,3.937E-
211,4.641E-11,5.427E-11,2.7E-11,3.28E-11,3.854E-11,4.474E-11,5.158E
3-11,2.777E-11,3.296E-11,3.844E-11,4.406E-11,4.968E-11,1.325E-11,1.
4995E-11,2.604E-11,1.56E-11,2.067E-11,2.57E-11,1.774E-11,2.173E-11,
52.586E-11,1.967E-11,2.292E-11,2.633E-11,2.141E-11,2.413E-11,2.7E-1
61,2.298E-11,2.532E-11,2.777E-11,3.039E-11,3.787E-11,4.532E-11,5.32
73E-11,6.197E-11,7.191E-11,8.349E-11,9.729E-11,1.143E-10,2.891E-11,
83.58E-11,4.258E-11,4.967E-11,5.737E-11,6.593E-11,7.566E-11,8.689E-
911,1.E-10,2.78E-11,3.417E-11,4.039E-11,4.682E-11,5.371E-11/
 DATAAC/6.123E-11,6.964E-11,7.914E-11,8.997E-11,2.699E-11,3.288E-11
1,3.861E-11,4.449E-11,5.072E-11,5.747E-11,6.489E-11,7.311E-11,8.236
2E-11,2.642E-11,3.188E-11,3.718E-11,4.259E-11,4.828E-11,5.438E-11,6
3.101E-11,6.831E-11,7.637E-11,2.604E-11,3.104E-11,3.604E-11,4.115E-
411,4.626E-11,5.204E-11,5.783E-11,6.469E-11,7.155E-11,2.187E-10,2.8
594E-10,0.,5.354E-11,5.476E-11,1.921E-10,2.457E-10,3.17E-10,1.436E-
610,1.423E-10,1.725E-10,2.13E-10,2.715E-10,0.,0.,1.574E-10,1.888E-1
70,2.363E-10,3.029E-10,0.,1.466E-10,1.708E-10,2.076E-10,2.644E-10,3
8.34E-10,1.358E-10,1.567E-10,1.857E-10,2.295E-10,2.88E-10,1.283E-10
9,1.455E-10,1.69E-10,2.026E-10,2.512E-10,1.208E-10,1.362E-10/
 DATAAD/1.559E-10,1.826E-10,2.219E-10,1.152E-10,1.284E-10,1.453E-10
1,1.672E-10,1.978E-10,1.097E-10,1.218E-10,1.365E-10,1.55E-10,1.796E
2-10,1.011E-10,1.11E-10,1.226E-10,1.366E-10,1.54E-10,9.413E-11,1.02
36E-10,1.122E-10,1.234E-10,1.367E-10,8.837E-11,9.576E-11,1.04E-10,1
4.133E-10,1.24E-10,8.349E-11,9.039E-11,9.729E-11,1.058E-10,1.143E-1
50,2.061E-10,2.623E-10,0.,0.,0.,1.787E-10,2.353E-10,3.116E-10,0.,0.
6,1.59E-10,2.025E-10,2.565E-10,0.,0.,1.441E-10,1.773E-10,2.297E-10,
72.901E-10,0.,1.325E-10,1.589E-10,1.989E-10,2.523E-10,0.,1.238E-10,
81.448E-10,1.758E-10,2.241E-10,2.742E-10,1.152E-10,1.336E-10,1.585E
9-10,1.954E-10,2.509E-10,1.091E-10,1.245E-10,1.452E-10,1.742E-10/
 DATAAE/2.187E-10,1.03E-10,1.169E-10,1.345E-10,1.581E-10,1.921E-10,
19.838E-11,1.104E-10,1.257E-10,1.454E-10,1.725E-10,9.376E-11,1.049E
2-10,1.183E-10,1.352E-10,1.574E-10,8.649E-11,9.578E-11,1.066E-10,1.
3196E-10,1.358E-10,8.107E-11,8.857E-11,9.767E-11,1.082E-10,1.208E-1
40,7.565E-11,8.268E-11,9.053E-11,9.944E-11,1.097E-10,7.175E-11,7.77
55E-11,8.467E-11,9.239E-11,1.011E-10,6.786E-11,7.355E-11,7.975E-11,
68.657E-11,9.413E-11,6.491E-11,6.992E-11,7.555E-11,8.166E-11,8.837E
7-11,6.197E-11,6.694E-11,7.191E-11,7.77E-11,8.349E-11,3.803E-11,4.7
897E-11,5.87E-11,7.115E-11,8.649E-11,3.483E-11,4.377E-11,5.308E-11,
96.347E-11,7.565E-11,3.233E-11,4.048E-11,4.874E-11,5.771E-11/
 DATAAF/6.786E-11,3.039E-11,3.787E-11,4.532E-11,5.323E-11,6.197E-11
1,1.827E-10,2.403E-10,0.,0.,0.,1.573E-10,2.147E-10,2.91E-10,0.,0.,1
2.392E-10,1.821E-10,2.401E-10,0.,0.,1.258E-10,1.581E-10,2.122E-10,2
3.758E-10,0.,1.151E-10,1.409E-10,1.811E-10,2.378E-10,0.,1.066E-10,1
4.278E-10,1.587E-10,2.098E-10,2.609E-10,1.001E-10,1.175E-10,1.422E-
510,1.8E-10,2.409E-10,9.366E-11,1.091E-10,1.296E-10,1.59E-10,2.061E
```

```
 1 IF(P.LT.5.0) GO TO 2
   N=21
   GO TO 33
 2 N=22
   GO TO 33
 3 IF(H.LT.1800.0) GO TO 4
   N=4
   GO TO 33
 4 N=5
   GO TO 33
34 IF(P.LT.5.)GO TO 35
   N=2
   GO TO 33
35 N=3
   GO TO 33
 5 IF(H.LT.200.0)  GO TO 7
   IF(P.LT.1000.0) GO TO 6
   N=6
   GO TO 33
 6 N=7
   GO TO 33
 7 IF(P.LT.1000.0) GO TO 8
   N=8
   GO TO 33
 8 N=20
   GO TO 33
 9 IF(P.LT.3000.0) GO TO 13
   IF(P.LT.4000.0) GO TO 11
   IF(H.GE.60.) GO TO 10
   N=9
   GO TO 30
10 N=10
   GO TO 33
11 IF(H.GE.30.) GO TO 12
   N=11
   GO TO 30
12 N=12
   GO TO 33
13 IF(P.LT.1000.0) GO TO 18
   IF(H.LT.40.) GO TO 14
   N=13
   GO TO 33
14 IF(P.LT.2000.0) GO TO 16
   IF(H.GE.0.) GO TO 15
   N=14
   GO TO 30
15 N=15
   GO TO 33
16 IF(H.GE.-30.0) GO TO 17
   N=16
   IF(H.LT.-90..AND.P.LT.1250.) N=23
   GO TO 30
17 N=17
   GO TO 33
18 IF(H.GE.-70.0) GO TO 19
   N=18
   IF(H.GT.(-132.82+0.04*P)) GO TO 22
   GO TO 30
```

```
6-10,8.892E-11,1.021E-10,1.195E-10,1.433E-10,1.787E-10,8.419E-11,9.
7627E-11,1.113E-10,1.311E-10,1.59E-10,8.054E-11,9.122E-11,1.045E-10
8,1.214E-10,1.441E-10,7.688E-11,8.681E-11,9.868E-11,1.134E-10,1.325
9E-10,7.103E-11,7.949E-11,8.928E-11,1.009E-10,1.152E-10,6.621E-11/
 DATAAG/7.36E-11,8.196E-11,9.159E-11,1.03E-10,6.216E-11,6.874E-11,7
1.605E-11,8.429E-11,9.376E-11,5.87E-11,6.492E-11,7.115E-11,7.882E-1
21,8.649E-11,1.496E-10,2.095E-10,0.,0.,0.,1.288E-10,1.818E-10,2.455
3E-10,0.,0.,1.139E-10,1.523E-10,2.119E-10,2.993E-10,0.,1.028E-10,1.
432E-10,1.83E-10,2.446E-10,0.,9.401E-11,1.174E-10,1.544E-10,2.127E-
510,3.E-10,8.754E-11,1.063E-10,1.348E-10,1.831E-10,2.438E-10,8.108E
6-11,9.759E-11,1.205E-10,1.56E-10,2.131E-10,7.645E-11,9.049E-11,1.0
796E-10,1.372E-10,1.827E-10,7.183E-11,8.457E-11,1.009E-10,1.233E-10
8,1.573E-10,6.831E-11,7.955E-11,9.376E-11,1.125E-10,1.392E-10,6.479
9E-11,7.522E-11,8.782E-11,1.039E-10,1.256E-10,6.19E-11,7.144E-11/
 DATAAH/8.277E-11,9.679E-11,1.151E-10,5.919E-11,6.809E-11,7.84E-11,
19.085E-11,1.066E-10,5.461E-11,6.242E-11,7.12E-11,8.138E-11,9.366E-
211,5.103E-11,5.778E-11,6.546E-11,7.412E-11,8.419E-11,4.746E-11,5.3
388E-11,6.075E-11,6.832E-11,7.688E-11,4.479E-11,5.055E-11,5.68E-11,
46.355E-11,7.103E-11,4.213E-11,4.768E-11,5.343E-11,5.955E-11,6.621E
5-11,4.008E-11,4.517E-11,5.052E-11,5.613E-11,6.216E-11,3.803E-11,4.
63E-11,4.797E-11,5.333E-11,5.87E-11,1.153E-10,1.608E-10,1.999E-10,0
7.,0.,0.,0.,0.,1.005E-10,1.295E-10,1.69E-10,2.146E-10,0.,0.,0.,0.,8
8.8E-11,1.09E-10,1.379E-10,1.782E-10,2.345E-10,0.,0.,0.,7.88E-11,9.
9499E-11,1.158E-10,1.464E-10,1.863E-10,2.795E-10,0.,0.,7.15E-11/
 DATAAI/8.467E-11,1.007E-10,1.225E-10,1.55E-10,1.943E-10,2.307E-10,
10.,6.556E-11,7.668E-11,8.965E-11,1.063E-10,1.293E-10,1.637E-10,2.0
214E-10,0.,6.057E-11,7.025E-11,8.117E-11,9.458E-11,1.12E-10,1.36E-1
30,1.721E-10,2.093E-10,5.625E-11,6.491E-11,7.439E-11,8.559E-11,9.94
46E-11,1.176E-10,1.428E-10,1.8E-10,5.246E-11,6.036E-11,6.879E-11,7.
5843E-11,8.995E-11,1.043E-10,1.232E-10,1.496E-10,4.908E-11,5.639E-1
61,6.405E-11,7.256E-11,8.241E-11,9.425E-11,1.091E-10,1.288E-10,4.6E
7-11,5.289E-11,5.996E-11,6.762E-11,7.624E-11,8.632E-11,9.852E-11,1.
8139E-10,4.319E-11,4.975E-11,5.637E-11,6.337E-11,7.108E-11,7.986E-1
91,9.019E-11,1.028E-10,4.05E-11,4.689E-11,5.318E-11,5.966E-11/
 DATAAJ/6.667E-11,7.447E-11,8.343E-11,9.401E-11,3.6E-11,4.183E-11,4
1.769E-11,5.346E-11,5.945E-11,6.59E-11,7.302E-11,8.108E-11,3.E-11,3
2.781E-11,4.308E-11,4.84E-11,5.374E-11,5.931E-11,6.528E-11,7.183E-1
31,0.,3.355E-11,3.91E-11,4.415E-11,4.904E-11,5.402E-11,5.923E-11,6.
4479E-11,0.,3.001E-11,3.559E-11,4.049E-11,4.509E-11,4.965E-11,5.431
5E-11,5.919E-11,0.,2.69E-11,3.246E-11,3.731E-11,4.169E-11,4.594E-11
6,5.021E-11,5.461E-11,0.,2.1E-11,2.711E-11,3.201E-11,3.615E-11,3.99
79E-11,4.373E-11,4.746E-11,0.,1.652E-11,2.296E-11,2.787E-11,3.185E-
811,3.543E-11,3.882E-11,4.213E-11,0.,1.356E-11,1.992E-11,2.471E-11,
92.852E-11,3.188E-11,3.502E-11,3.803E-11,7.3E-13,1.111E-11/
 DATAAK/1.768E-11,2.239E-11,2.599E-11,2.914E-11,3.205E-11,3.483E-11
1,3.31E-12,1.04E-11,1.614E-11,2.07E-11,2.412E-11,2.706E-11,2.976E-1
21,3.233E-11,5.3E-12,1.069E-11,1.531E-11,1.949E-11,2.276E-11,2.551E
3-11,2.802E-11,3.039E-11,7.02E-12,1.131E-11,1.506E-11,1.869E-11,2.1
479E-11,2.438E-11,2.671E-11,2.891E-11,8.57E-12,1.207E-11,1.519E-11,
51.828E-11,2.114E-11,2.359E-11,2.576E-11,2.78E-11,9.98E-12,1.292E-1
61,1.556E-11,1.818E-11,2.075E-11,2.305E-11,2.51E-11,2.699E-11,1.129
7E-11,1.38E-11,1.607E-11,1.832E-11,2.059E-11,2.272E-11,2.465E-11,2.
8642E-11,1.258E-11,1.459E-11,1.66E-11,1.861E-11,2.062E-11,2.242E-11
9,2.423E-11,2.604E-11,5.161E-11,5.186E-11,5.213E-11,5.248E-11/
 DATAAL/8.443E-11,8.207E-11,8.E-11,7.818E-11,1.117E-10,1.078E-10,1.
1044E-10,1.013E-10,1.356E-10,1.304E-10,1.259E-10,1.218E-10,1.588E-1
20,1.587E-10,1.586E-10,1.856E-10,1.863E-10,1.864E-10,2.043E-10,2.07
39E-10,2.092E-10,2.164E-10,2.233E-10,2.265E-10,2.251E-10,2.348E-10,
```

```
19 IF(H.GE.-20.0) GO TO 20
   N=19
   GO TO 22
20 N=20
22 IF(P.GE.187.506) GO TO 33
   DO 23 I=2,19
   IF(P-PL(I))24,24,23
23 CONTINUE
24 D=PL(I)-PL(I-1)
   DF=PL(I)-P
   DB=P-PL(I-1)
   HGAS=(HG(I)*DB+HG(I-1)*DF)/D
   IF(H.GE.HGAS) GO TO 33
   HLIQ=(HL(I)*DB+HL(I-1)*DF)/D
   IF(H.LE.HLIQ) GO TO 33
   VLIQ=(VL(I)*DB+VL(I-1)*DF)/D
   PHVISC=((VG(I)*DB+VG(I-1)*DF)/D-VLIQ)*(H-HLIQ)/(HGAS-HLIQ)+VLIQ
   RETURN
30 PR=P/500.0
   I=PR
   IF(I.GT.9) I=9
   F=PR-I
   HSOL=F*HS(I+2)+(1.0-F)*HS(I+1)
   IF(H.LT.HSOL) H=HSOL
33 FP=(P-BP(N))/DP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   F=FP-IP
   FP=1.0-F
   FH=(H-BH(N))/DH(N)
   IH=FH
   FF=FH-IH
   FH=1.0-FF
   I=IH*JP(N)+IP+LOC(N)
   J=I+JP(N)
   PHVISC=FP*FH*V(I)+F*FH*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
   RETURN
   END

   SUBROUTINE PHDTMU
   COMMON/PHMU/V(820)
   DATA((V(I),I=332,401)=5.308E-11,6.347E-11,7.565E-11,3.233E-11,4.04
  18E-11,4.874E-11,5.771E-11,6.786E-11,3.039E-11,3.787E-11,4.532E-11,
  25.323E-11,6.197E-11,1.827E-10,2.403E-10,0.,0.,0.,1.573E-10,2.147E-
  310,2.91E-10,0.,0.,1.392E-10,1.821E-10,2.401E-10,0.,0.,1.258E-10,1.
  4581E-10,2.122E-10,2.758E-10,0.,1.151E-10,1.409E-10,1.811E-10,2.378
  5E-10,0.,1.066E-10,1.278E-10,1.587E-10,2.098E-10,2.609E-10,1.001E-1
  60,1.175E-10,1.422E-10,1.8E-10,2.409E-10,9.366E-11,1.091E-10,1.296E
  7-10,1.59E-10,2.061E-10,8.892E-11,1.021E-10,1.195E-10,1.433E-10,1.7
  887E-10,8.419E-11,9.627E-11,1.113E-10,1.311E-10,1.59E-10,8.054E-11,
  99.122E-11,1.045E-10,1.214E-10,1.441E-10,7.688E-11,8.681E-11)
   DATA((V(I),I=402,470)=9.868E-11,1.134E-10,1.325E-10,7.103E-11,7.94
  19E-11,8.928E-11,1.009E-10,1.152E-10,6.621E-11,7.36E-11,8.196E-11,9
  2.159E-11,1.03E-10,6.216E-11,6.874E-11,7.605E-11,8.429E-11,9.376E-1
  31,5.87E-11,6.492E-11,7.115E-11,7.882E-11,8.649E-11,1.496E-10,2.095
  4E-10,0.,1.8E-10,2.41E-10,1.288E-10,1.818E-10,2.455E-10,
  A 1.496E-10,2.095E-10,                                1.139E-10,1.523E
  5-10,2.119E-10,2.993E-10,0.,1.028E-10,1.32E-10,1.83E-10,2.446E-10,0
  42.395E-10,2.32E-10,2.441E-10,2.501E-10,1.587E-10,1.588E-10,1.588E-
  510,1.588E-10,1.588E-10,1.852E-10,1.856E-10,1.859E-10,1.86E-10,1.86
  61E-10,2.031E-10,2.048E-10,2.057E-10,2.063E-10,2.067E-10,2.149E-10,
  72.176E-10,2.191E-10,2.202E-10,2.21E-10,2.236E-10,2.271E-10,2.291E-
  810,2.305E-10,2.316E-10,2.306E-10,2.347E-10,2.37E-10,2.387E-10,2.4E
  9-10/
   P=PRES
   IF(P.LT.1.0) P=1.0
   H=ENTH
   IF(H.LT.100.0)  GO TO 9
   IF(H.LT.425.0)  GO TO 5
   IF(H.LT.7800.0) GO TO 3
   IF(H.LT.10000.)GO TO 34
   IF(H.GE.25000.)H=24999.9999
   IF(P.LT.30.)GO TO 1
   N=1
   GO TO 33
 1 IF(P.LT.5.0) GO TO 2
   N=21
   GO TO 33
 2 N=22
   GO TO 33
 3 IF(H.LT.1800.0) GO TO 4
   N=4
   GO TO 33
 4 N=5
   GO TO 33
34 IF(P.LT.5.)GO TO 35
   N=2
   GO TO 33
35 N=3
   GO TO 33
 5 IF(H.LT.200.0)  GO TO 7
   IF(P.LT.1000.0) GO TO 6
   N=6
   GO TO 33
 6 N=7
   GO TO 33
 7 IF(P.LT.1000.0) GO TO 8
   N=8
   GO TO 33
 8 N=20
   GO TO 33
 9 IF(P.LT.3000.0) GO TO 13
   IF(P.LT.4000.0) GO TO 11
   IF(H.GE.60.) GO TO 10
   N=9
   GO TO 30
10 N=10
   GO TO 33
11 IF(H.GE.30.) GO TO 12
   N=11
   GO TO 30
12 N=12
   GO TO 33
13 IF(P.LT.1000.0) GO TO 18
   IF(H.LT.40.) GO TO 14
   N=13
```

```
6.,9.401E-11,1.174E-10,1.544E-10,2.127E-10,3.E-10,8.754E-11,1.063E-
710,1.348E-10,1.831E-10,2.438E-10,8.108E-11,9.759E-11,1.205E-10,1.5
86E-10,2.131E-10,7.645E-11,9.049E-11,1.096E-10,1.372E-10,1.827E-10,
97.183E-11,8.457E-11,1.009E-10,1.233E-10,1.573E-10,6.831E-11)
 DATA((V(I),I=471,541)=7.955E-11,9.376E-11,1.125E-10,1.392E-10,6.47
19E-11,7.522E-11,8.782E-11,1.039E-10,1.256E-10,6.19E-11,7.144E-11,8
2.277E-11,9.679E-11,1.151E-10,5.919E-11,6.809E-11,7.84E-11,9.085E-1
31,1.066E-10,5.461E-11,6.242E-11,7.12E-11,8.138E-11,9.366E-11,5.103
4E-11,5.778E-11,6.546E-11,7.412E-11,8.419E-11,4.746E-11,5.388E-11,6
5.075E-11,6.832E-11,7.688E-11,4.479E-11,5.055E-11,5.68E-11,6.355E-1
61,7.103E-11,4.213E-11,4.768E-11,5.343E-11,5.955E-11,6.621E-11,4.00
78E-11,4.517E-11,5.052E-11,5.613E-11,6.216E-11,3.803E-11,4.3E-11,4.
8797E-11,5.333E-11,5.87E-11,1.153E-10,1.608E-10,1.999E-10,0.,0.,0.,
90.,0.,1.005E-10,1.295E-10,1.69E-10,2.146E-10,0.,0.,0.,0.,8.8E-11)
 DATA((V(I),I=542,610)=1.09E-10,1.379E-10,1.782E-10,2.345E-10,0.,0.
1,0.,7.88E-11,9.499E-11,1.158E-10,1.464E-10,1.863E-10,2.795E-10,0.,
20.,7.15E-11,8.467E-11,1.007E-10,1.225E-10,1.55E-10,1.943E-10,2.307
3E-10,0.,6.556E-11,7.668E-11,8.965E-11,1.063E-10,1.293E-10,1.637E-1
40,2.014E-10,0.,6.057E-11,7.025E-11,8.117E-11,9.458E-11,1.12E-10,1.
536E-10,1.721E-10,2.093E-10,5.625E-11,6.491E-11,7.439E-11,8.559E-11
6,9.946E-11,1.176E-10,1.428E-10,1.8E-10,5.246E-11,6.036E-11,6.879E-
711,7.843E-11,8.995E-11,1.043E-10,1.232E-10,1.496E-10,4.908E-11,5.6
839E-11,6.405E-11,7.256E-11,8.241E-11,9.425E-11,1.091E-10,1.288E-10
9,4.6E-11,5.289E-11,5.996E-11,6.762E-11,7.624E-11,8.632E-11)
 DATA((V(I),I=611,678)=9.852E-11,1.139E-10,4.319E-11,4.975E-11,5.63
17E-11,6.337E-11,7.108E-11,7.986E-11,9.019E-11,1.028E-10,4.05E-11,4
2.689E-11,5.318E-11,5.966E-11,6.667E-11,7.447E-11,8.343E-11,9.401E-
311,3.6E-11,4.183E-11,4.769E-11,5.346E-11,5.945E-11,6.59E-11,7.302E
4-11,8.108E-11,3.E-11,3.781E-11,4.308E-11,4.84E-11,5.374E-11,5.931E
5-11,6.528E-11,7.183E-11,0.,3.355E-11,3.91E-11,4.415E-11,4.904E-11,
65.402E-11,5.923E-11,6.479E-11,0.,3.001E-11,3.559E-11,4.049E-11,4.5
709E-11,4.965E-11,5.431E-11,5.919E-11,0.,2.69E-11,3.246E-11,3.731E-
811,4.169E-11,4.594E-11,5.021E-11,5.461E-11,0.,2.1E-11,2.711E-11,3.
9201E-11,3.615E-11,3.999E-11,4.373E-11,4.746E-11,0.,1.652E-11)
 DATA((V(I),I=679,743)=2.296E-11,2.787E-11,3.185E-11,3.543E-11,3.88
12E-11,4.213E-11,0.,1.356E-11,1.992E-11,2.471E-11,2.852E-11,3.188E-
211,3.502E-11,3.803E-11,7.3E-13,1.111E-11,1.768E-11,2.239E-11,2.599
3E-11,2.914E-11,3.205E-11,3.483E-11,3.31E-12,1.04E-11,1.614E-11,2.0
47E-11,2.412E-11,2.706E-11,2.976E-11,3.233E-11,5.3E-12,1.069E-11,1.
5531E-11,1.949E-11,2.276E-11,2.551E-11,2.802E-11,3.039E-11,7.02E-12
6,1.131E-11,1.506E-11,1.869E-11,2.179E-11,2.438E-11,2.671E-11,2.891
7E-11,8.57E-12,1.207E-11,1.519E-11,1.828E-11,2.114E-11,2.359E-11,2.
8576E-11,2.78E-11,9.98E-12,1.292E-11,1.556E-11,1.818E-11,2.075E-11,
92.305E-11,2.51E-11,2.699E-11,1.129E-11,1.38E-11,1.607E-11)
 DATA((V(I),I=744,807)=1.832E-11,2.059E-11,2.272E-11,2.465E-11,2.64
12E-11,1.258E-11,1.459E-11,1.66E-11,1.861E-11,2.062E-11,2.242E-11,2
2.423E-11,2.604E-11,5.161E-11,5.186E-11,5.213E-11,5.248E-11,8.443E-
311,8.207E-11,8.E-11,7.818E-11,1.117E-10,1.078E-10,1.044E-10,1.013E
4-10,1.356E-10,1.304E-10,1.259E-10,1.218E-10,1.588E-10,1.587E-10,1.
5586E-10,1.856E-10,1.863E-10,1.864E-10,2.043E-10,2.079E-10,2.092E-1
60,2.164E-10,2.233E-10,2.265E-10,2.251E-10,2.348E-10,2.395E-10,2.32
7E-10,2.441E-10,2.501E-10,1.587E-10,1.588E-10,1.588E-10,1.588E-10,1
8.588E-10,1.852E-10,1.856E-10,1.859E-10,1.86E-10,1.861E-10,2.031E-1
90,2.048E-10,2.057E-10,2.063E-10,2.067E-10,2.149E-10,2.176E-10)
 DATA((V(I),I=808,820)=2.191E-10,2.202E-10,2.21E-10,2.236E-10,2.271
1E-10,2.291E-10,2.305E-10,2.316E-10,2.306E-10,2.347E-10,2.37E-10,2.
2387E-10,2.4E-10)
 END
```

```
    GD TD 33
 14 IF(P.LT.2000.0) GD TO 16
    IF(H.GE.0.) GD TO 15
    N=14
    GD TO 30
 15 N=15
    GD TO 33
 16 IF(H.GE.-30.0) GD TO 17
    N=16
    GD TO 30
 17 N=17
    GD TO 33
 18 IF(H.GE.-70.0) GD TO 19
    N=18
    IF(H.GT.(-132.82+0.04*P)) GD TO 22
    GD TO 30
 19 IF(H.GE.-20.0) GD TO 20
    N=19
    GD TO 22
 20 N=20
 22 IF(P.GE.187.506) GD TO 33
    DO 23 I=2,19
    IF(P-PL(I))24,24,23
 23 CONTINUE
 24 D=PL(I)-PL(I-1)
    DF=PL(I)-P
    DB=P-PL(I-1)
    HGAS=(HG(I)*DB+HG(I-1)*DF)/D
    IF(H.GE.HGAS) GD TO 33
    HLIQ=(HL(I)*DB+HL(I-1)*DF)/D
    IF(H.LE.HLIQ) GD TO 33
    VLIQ=(VL(I)*DB+VL(I-1)*DF)/D
    PHVISC=((VG(I)*DB+VG(I-1)*DF)/D-VLIQ)*(H-HLIQ)/(HGAS-HLIQ)+VLIQ
    RETURN
 30 PR=P/500.0
    I=PR
    IF(I.GT.9) I=9
    F=PR-I
    HSDL=F*HS(I+2)+(1.0-F)*HS(I+1)
    IF(H.LT.HSDL) H=HSDL
 33 FP=(P-BP(N))/DP(N)
    IP=FP
    IF(IP.GT.MX(N)) IP=MX(N)
    F=FP-IP
    FP=1.0-F
    FH=(H-BH(N))/DH(N)
    IH=FH
    FF=FH-IH
    FH=1.0-FF
    I=IH*JP(N)+IP+LDC(N)
    J=I+JP(N)
    PHVISC=FP*FH*V(I)+F*FH*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
    RETURN
    END
```

```
 FUNCTION PHSOUN (PRES,ENTH)
 OIMENSION LOC(18),JP(18),MX(14),BP(14),OP(14),BH(18),DH(14)
1,R(19),HL(19),HV(19),VL(19),VG(19),HS(10)
 COMMON /PHVEL/ V(323)
 DATA(LOC=1,2,3,4,31,67,97,121,124,227,170,202,227,263,311,310,
1309,308)
 DATA(JP=5,5,5,5,3,6,4,7,7,9,4,5,9,9,5,5,5,5)
 DATA(MX=0,0,0,0,1,4,2,2,2,1,2,3,7,7)
 DATA(BP=1.,10.,100.,1000.,-3000.,0,2000.,-40.,500.,1000.,400.,80.,
10,0)
 DATA(DP=9.,90.,900.,4000.,4000.,1000.,1000.,180.,500.,500.,200.,80
1.,50.,50.)
 OATA(BH=5000.,5000.,5000.,5000.,600.,400.,-50.,100.,100.,-100.,
1-110.,-140.,0,20.,20000.,20000.,20000.,20000.)
 DATA(OH=3000.,3000.,3000.,3000.,400.,50.,90.,50.,50.,50.,30.,35.,
15.,20.)
 OATA(R=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182.
1,185.,186.5,187.25,187.46875,187.506)
 DATA(HL=-132.8,-129.13,-124.25,-117.79,-110.86,-101.3,-89.04,-74.2
12,-58.58,-43.43,-30.07,-20.56,-11.13,-4.27,1.17,5.54,10.83,14.29,
216.36)
 DATA(HV=60.31,65.11,70.59,76.35,80.98,85.11,87.4,86.54,81.94,74.15
1,64.83,56.86,47.34,39.56,33.46,28.34,22.31,18.66,16.55)
 DATA(VL=4177.,4049.,3903.,3743.,3604.,3406.,3158.,2826.,2498.,2140
1.,1913.,1733.,1556.,1343.,1236.,1183.,1167.,1153.,1150.)
 DATA(VG=1001.,1040.,1083.,1129.,1161.,1195.,1220.,1237.,1242.,1236
1.,1221.,1215.,1198.,1174.,1162.,1157.,1154.,1151.,1150.)
 DATA(HS=-132.8,-109.96,-87.59,-65.71,-44.27,-23.18,-2.45,18.06,
138.32,58.50)
 DATA((V(I),I=1,103)=7065.,7066.,7074.,7161.,7587.,8770.,8771.,8778
1.,8846.,9189.,10010.,10050.,10060.,10130.,10420.,10660.,10930.,110
270.,11170.,11450.,11000.,11420.,11770.,12010.,12330.,11270.,11770.
3,12210.,12760.,13130.,1909.,2993.,4441.,2600.,3480.,4506.,3222.,39
482.,4816.,3783.,4455.,5175.,4281.,4885.,5530.,4725.,5277.,5867.,51
532.,5640.,6187.,5504.,5980.,6493.,5852.,6300.,6785.,6178.,6602.,70
665.,6485.,6889.,7332.,7062.,7161.,7587.,2415.,2746.,3212.,3717.,42
709.,4682.,2500.,2825.,3258.,3719.,4177.,4628.,2578.,2879.,3270.,36
893.,4118.,4538.,2651.,2935.,3294.,3687.,4084.,4478.,2722.,2993.,33
955.,3717.,4079.,4441.,5092.,5830.,6407.,6486.,4230.,5062.,5722.)
 DATA((V(I),I=104,209)=6224.,3642.,4472.,5151.,5722.,3356.,4078.,47
121.,5279.,3238.,3842.,4409.,4931.,3212.,3717.,4209.,4682.,1266.,13
283.,1652.,1934.,2673.,3284.,3833.,1561.,1655.,1819.,2002.,2562.,30
387.,3575.,1808.,1885.,1997.,2126.,2551.,2986.,3418.,2014.,2076.,21
459.,2257.,2585.,2943.,3316.,2176.,2229.,2294.,2372.,2635.,2933.,32
551.,2307.,2349.,2404.,2469.,2690.,2943.,3226.,2402.,2461.,2521.,25
680.,2746.,2979.,3212.,4240.,4515.,4739.,4937.,3678.,3988.,4255.,44
794.,3116.,3496.,3808.,4078.,2564.,3019.,3378.,3680.,2112.,2611.,30
800.,3324.,1831.,2321.,2707.,3034.,1760.,2157.,2508.,2817.,1777.,20
982.,2377.,2673.,4450.,4572.,4678.,4778.,4876.,3599.,3746.,3880.)
 DATA((V(I),I=210,316)=4011.,4136.,2752.,2980.,3172.,3340.,3493.,17
184.,2084.,2386.,2628.,2833.,750.,1120.,1670.,1996.,2246.,4786.,520
20.,5600.,960.,1407.,1714.,1925.,2094.,2246.,4078.,4636.,5092.,900.
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 FUNCTION PHSOUN (PRES,ENTH)
 DIMENSION LOC(18),JP(18),MX(14),BP(14),OP(14),BH(18),OH(14),V(323)
1,R(19),HL(19),HV(19),VL(19),VG(19),HS(10)
 OIMENSION AA(105),AB(108),AC(109),AD(  1)
 EQUIVALENCE( V,AA),( V( 106),AB),( V( 214),AC),( V( 323),AD)
 DATA JP/5,5,5,5,3,6,4,7,7,9,4,5,9,9,5,5,5,5/
 DATA LOC/1,2,3,4,31,67,97,121,124,227,170,202,227,263,311,310,
1309,308/
 OATA MX/0,0,0,0,1,4,2,2,2,1,2,3,7,7/
 DATA BP/1.,10.,100.,1000.,-3000.,0.,2000.,-40.,500.,1000.,400.,80.
1,0.,0./
 OATA OP/9.,90.,900.,4000.,4000.,1000.,1000.,180.,500.,500.,200.,80
1.,50.,50./
 DATA BH/5000.,5000.,5000.,5000.,600.,400.,-50.,100.,100.,-100.,
1-110.,-140.,0.,20.,20000.,20000.,20000.,20000./
 OATA OH/3000.,3000.,3000.,3000.,400.,50.,90.,50.,50.,50.,30.,35.,
15.,20./
 OATA R/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182.
1,185.,186.5,187.25,187.46875,187.506/
 DATA HL/-132.8,-129.13,-124.25,-117.79,-110.86,-101.3,-89.04,-74.2
12,-58.58,-43.43,-30.07,-20.56,-11.13,-4.27,1.17,5.54,10.83,14.29,
216.36/
 DATA HV/60.31,65.11,70.59,76.35,80.98,85.11,87.4,86.54,81.94,74.15
1,64.83,56.86,47.34,39.56,33.46,28.34,22.31,18.66,16.55/
 OATA VL/4177.,4049.,3903.,3743.,3604.,3406.,3158.,2826.,2498.,2140
1.,1913.,1733.,1556.,1343.,1236.,1183.,1167.,1153.,1150./
 OATA VG/1001.,1040.,1083.,1129.,1161.,1195.,1220.,1237.,1242.,1236
1.,1221.,1215.,1198.,1174.,1162.,1157.,1154.,1151.,1150./
 DATA HS/-132.8,-109.96,-87.59,-65.71,-44.27,-23.18,-2.45,18.06,
138.32,58.50/
 DATAAA/7065.,7066.,7074.,7161.,7587.,8770.,8771.,8778.,8846.,9189.
1,10010.,10050.,10060.,10130.,10420.,10660.,10930.,11070.,11170.,11
2450.,11000.,11420.,11770.,12010.,12330.,11270.,11770.,12210.,12760
3.,13130.,1909.,2993.,4441.,2600.,3480.,4506.,3222.,3982.,4816.,378
43.,4455.,5175.,4281.,4885.,5530.,4725.,5277.,5867.,5132.,5640.,618
57.,5504.,5980.,6493.,5852.,6300.,6785.,6178.,6602.,7065.,6485.,688
69.,7332.,7062.,7161.,7587.,2415.,2746.,3212.,3717.,4209.,4682.,250
70.,2825.,3258.,3719.,4177.,4628.,2578.,2879.,3270.,3693.,4118.,453
88.,2651.,2935.,3294.,3687.,4084.,4478.,2722.,2993.,3355.,3717.,407
99.,4441.,5092.,5830.,6407.,6486.,4230.,5062.,5722.,6224.,3642./
 OATAAB/4472.,5151.,5722.,3356.,4078.,4721.,5279.,3238.,3842.,4409.
1,4931.,3212.,3717.,4209.,4682.,1266.,1383.,1652.,1934.,2673.,3284.
2,3833.,1561.,1655.,1819.,2002.,2562.,3087.,3575.,1808.,1885.,1997.
3,2126.,2551.,2986.,3418.,2014.,2076.,2159.,2257.,2585.,2943.,3316.
4,2176.,2229.,2294.,2372.,2635.,2933.,3251.,2307.,2349.,2404.,2469.
5,2690.,2943.,3226.,2402.,2461.,2521.,2580.,2746.,2979.,3212.,4240.
6,4515.,4739.,4937.,3678.,3988.,4255.,4494.,3116.,3496.,3808.,4078.
7,2564.,3019.,3378.,3680.,2112.,2611.,3000.,3324.,1831.,2321.,2707.
8,3034.,1760.,2157.,2508.,2817.,1777.,2082.,2377.,2673.,4450.,4572.
9,4678.,4778.,4876.,3599.,3746.,3880.,4011.,4136.,2752.,2980./
 OATAAC/3172.,3340.,3493.,1784.,2084.,2386.,2628.,2833.,750.,1120.,
11670.,1996.,2246.,4786.,5200.,5600.,960.,1407.,1714.,1925.,2094.,2
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3,1314.,1633.,1853.,2024.,2176.,3436.,4078.,4610.,893.,1246.,1567.,
41788.,1959.,2112.,2954.,3615.,4160.,915.,1212.,1516.,1730.,1904.,2
5053.,2673.,3284.,3833.,998.,1202.,1480.,1683.,1855.,2000.,0.,0.,0.
6,1114.,1237.,1400.,1575.,1709.,1845.,1004.,900.,1148.,1190.,1299.,
71421.,1543.,1658.,1773.,1155.,1166.,1232.,1293.,1384.,1477.,1570.,
81663.,1757.,1292.,1324.,1357.,1398.,1473.,1548.,1622.,1699.,1777.,
911270.,11770.,12240.,12650.,13040.,11520.,12060.,12610.,13140.)
 DATA((V(I),I=317,323)=13620.,11740.,12320.,12940.,13560.,14110.,0.
1)
  P=PRES
  IF(P.LT.1.0) P=1.0
  H=ENTH
  IF(H.LT.400.) GO TO 6
  IF(H.LT.5000.)GO TO 4
  IF(H.GE.25000.) H=24999.99999
  IF(P.GE.100.) GO TO 2
  IF(P.GE.10.)  GO TO 1
  N=1
  N1=18
  GO TO 33
1 N=2
  N1=17
  GO TO 33
2 IF(P.GE.1000.) GO TO 3
  N=3
  N1=16
  GO TO 33
3 N=4
  N1=15
  GO TO 33
4 IF(H.LT.600.) GO TO 5
  N=5
  GO TO 33
5 N=6
  GO TO 33
6 IF(P.LT.2000.) GO TO 7
  N=7
  GO TO 30
7 IF(H.LT.100.) GO TO 9
  IF(P.GE.500.) GO TO 8
  N=8
  GO TO 33
8 N=9
  GO TO 33
9 IF(P.LT.400.) GO TO 11
  IF(P.LT.1000.) GO TO 10
  N=10
  GO TO 30
10 N=11
  GO TO 30
11 IF(H.GE.0.) GO TO 12
  N=12
  IF(H.LT.-132.7285+P*0.08224) GO TO 30
  GO TO 20
12 IF(H.GE.20.) GO TO 13
  N=13
  GO TO 20
13 N=14
```

```
2246.,4078.,4636.,5092.,900.,1314.,1633.,1853.,2024.,2176.,3436.,40
378.,4610.,893.,1246.,1567.,1788.,1959.,2112.,2954.,3615.,4160.,915
4.,1212.,1516.,1730.,1904.,2053.,2673.,3284.,3833.,998.,1202.,1480.
5,1683.,1855.,2000.,0.,0.,0.,1114.,1237.,1400.,1575.,1709.,1845.,10
604.,900.,1148.,1190.,1299.,1421.,1543.,1658.,1773.,1155.,1166.,123
72.,1293.,1384.,1477.,1570.,1663.,1757.,1292.,1324.,1357.,1398.,147
83.,1548.,1622.,1699.,1777.,11270.,11770.,12240.,12650.,13040.,1152
90.,12060.,12610.,13140.,13620.,11740.,12320.,12940.,13560.,14110./
 OATAAO/0./
  P=PRES
  IF(P.LT.1.0) P=1.0
  H=ENTH
  IF(H.LT.400.) GO TO 6
  IF(H.LT.5000.)GO TO 4
  IF(H.GE.25000.) H=24999.99999
  IF(P.GE.100.) GO TO 2
  IF(P.GE.10.)  GO TO 1
  N=1
  N1=18
  GO TO 33
1 N=2
  N1=17
  GO TO 33
2 IF(P.GE.1000.) GO TO 3
  N=3
  N1=16
  GO TO 33
3 N=4
  N1=15
  GO TO 33
4 IF(H.LT.600.) GO TO 5
  N=5
  GO TO 33
5 N=6
  GO TO 33
6 IF(P.LT.2000.) GO TO 7
  N=7
  GO TO 30
7 IF(H.LT.100.) GO TO 9
  IF(P.GE.500.) GO TO 8
  N=8
  GO TO 33
8 N=9
  GO TO 33
9 IF(P.LT.400.) GO TO 11
  IF(P.LT.1000.) GO TO 10
  N=10
  GO TO 30
10 N=11
  GO TO 30
11 IF(H.GE.0.) GO TO 12
  N=12
  IF(H.LT.(-132.7285+P*0.08224)) GO TO 30
  GO TO 20
12 IF(H.GE.20.) GO TO 13
  N=13
  GO TO 20
13 N=14
```

```
   IF(P.GT.187.506) GO TO 33
   DO 21 I=2,19
   IF(P-R(I))22,22,21
21 CONTINUE
22 F=(P-R(I-1))/(R(I)-R(I-1))
   CHL=HL(I-1)+(HL(I)-HL(I-1))*F
   CHV=HV(I-1)+(HV(I)-HV(I-1))*F
   IF(H.LT.CHL.OR.H.GT.CHV) GO TO 33
   SVL=VL(I-1)+(VL(I)-VL(I-1))*F
   SVG=VG(I-1)+(VG(I)-VG(I-1))*F
   F=(H-CHL)/(CHV-CHL)
   PHSOUN=SVL+(SVG-SVL)*F
   RETURN
30 PR=P/587.84
   I=PR
   IF(I.GT.8) I=8
   F=PR-I
   FP=1.-F
   G=FP*HS(I+1)+F*HS(I+2)
   IF(H.LT.G)H=G
33 IF(H.LE.20000.)N1=N
   FP=(P-BP(N))/DP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   F=FP-IP
   FP=1.-F
   FH=(H-BH(N1))/DH(N)
   IH=FH
   FF=FH-IH
   FH=1.-FF
   I=IH*JP(N1)+IP+LOC(N1)
   J=I+JP(N1)
   PHSOUN=FP*FH*V(I)+F*FH*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
   RETURN
   END
```

```
   FUNCTION PHCP(PRES,ENTH)
   COMMON/HPHEAT/ CP(749),CV(749)
   DIMENSION LOC(21),JP(17),MX(17),BP(17),DP(17),BH(21),DH(17),R(19),
  1HL(19),HV(19),HS(10),CVL(19),CVV(19)
   DATA(CVV=1.483,1.488,1.504,1.525,1.551,1.583,1.619,1.666,1.733,
  11.822,1.915,2.013,2.137,2.204,2.275,2.315,2.336,2.342,2.343)
   DATA(CVL=1.126,1.152,1.234,1.305,1.365,1.419,1.459,1.491,1.525,
  11.560,1.603,1.644,1.756,1.883,2.091,2.241,2.317,2.339,2.343)
   DATA(R=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182.
  1,185.,186.5,187.25,187.46875,187.506)
   DATA(HL=-132.8,-129.13,-124.25,-117.79,-110.86,-101.3,-89.04,-74.2
  12,-58.58,-43.43,-30.07,-20.56,-11.13,-4.27,1.17,5.54,10.83,14.29,
  216.36)
   DATA(HV=60.31,65.11,70.59,76.35,80.98,85.11,87.4,86.54,81.94,74.15
```

```
   IF(P.GT.187.506) GO TO 33
   DO 21 I=2,19
   IF(P-R(I))22,22,21
21 CONTINUE
22 F=(P-R(I-1))/(R(I)-R(I-1))
   CHL=HL(I-1)+(HL(I)-HL(I-1))*F
   CHV=HV(I-1)+(HV(I)-HV(I-1))*F
   IF(H.LT.CHL.OR.H.GT.CHV) GO TO 33
   SVL=VL(I-1)+(VL(I)-VL(I-1))*F
   SVG=VG(I-1)+(VG(I)-VG(I-1))*F
   F=(H-CHL)/(CHV-CHL)
   PHSOUN=SVL+(SVG-SVL)*F
   RETURN
30 PR=P/587.84
   I=PR
   IF(I.GT.8) I=8
   FI=I
   F=PR-FI
   FP=1.-F
   G=FP*HS(I+1)+F*HS(I+2)
   IF(H.LT.G)H=G
33 IF(H.LE.20000.)N1=N
   FP=(P-BP(N))/DP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   FI=IP
   F=FP-FI
   FP=1.-F
   FH=(H-BH(N1))/DH(N)
   IH=FH
   FI=IH
   FF=FH-FI
   FH=1.-FF
   I=IH*JP(N1)+IP+LOC(N1)
   J=I+JP(N1)
   PHSOUN=FP*FH*V(I)+F*FH*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
   RETURN
   END
```

```
   FUNCTION PHCP(PRES,ENTH)
   PHCP=PHHEAT(PRES,ENTH,1)
   RETURN
   END
   FUNCTION PHCV(PRES,ENTH)
   PHCV=PHHEAT(PRES,ENTH,2)
   RETURN
   END
   FUNCTION PHGAMM(PRES,ENTH)
   PHGAMM=PHHEAT(PRES,ENTH,3)
   RETURN
   END
   FUNCTION PHHEAT(PRES,ENTH,KTRANS)
   COMMON/HPHEAT/ CP(749),CV(749)
```

```
1,64.83,56.86,47.34,39.56,33.46,28.34,22.31,18.66,16.55)
 OATA(HS=-132.8,-109.96,-87.59,-65.71,-44.27,-23.18,-2.45,18.06,
138.32,58.50)
 OATA(LOC=1,21,63,84,133,141,156,160,257,237,273,318,360,409,444,
1 528,563,671,686,710,722)
 OATA(JP=5,6,3,7,2,3,9,9,4,4,5,3,7,7,7,9)
 OATA(MX=3,4,1,5,0,1,3,3,2,2,3,1,5,5,5,7)
 OATA(BP=1000.,0,20.,0,15.,0,0,1000.,2000.,2000.,1000.,600.,0,0,300
1.,0,140.)
 OATA(OP=1000.,200.,40.,5.,4985.,2500.,250.,1000.,1000.,1000.,250.,
1200.,100.,100.,50.,50.,20.)
 OATA(BH=9200.,9200.,9200.,9200.,2600.,1000.,200.,200.,80.,-45.,
1 -120.,-125.,-135.,120.,-45.,60.,-50.,20000.,20000.,20000.,20000.)
 OATA(OH=3600.,1800.,1800.,1800.,2200.,400.,100.,100.,40.,25.,40.,
125.,15.,20.,15.,15.,10.)
 OATA(VERYBIG=3777777777777777B)
 KTR=1
 GO TO 1
 ENTRY PHCV
 KTR=2
 GO TO 1
 ENTRY PHGAMM
 KTR=3
1 P=PRES
 IF(P.LT.1.0) P=1.0
 H=ENTH
 IF(H.LT.200.) GO TO 9
 IF(H.LT.9200.) GO TO 5
 IF(H.GE.25000.) H=24999.99999
 IF(P.LT.100.) GO TO 3
 IF(P.LT.1000.) GO TO 2
 N=1
 N1=18
 GO TO 33
2 N=2
 N1=19
 GO TO 33
3 IF(P.LT.30.) GO TO 4
 N=3
 N1=20
 GO TO 33
4 N=4
 N1=21
 GO TO 33
5 IF(H.LT.1000.) GO TO 7
 IF(H.LT.2600.) GO TO 6
 N=5
 GO TO 33
6 N=6
 GO TO 33
7 IF(P.GE.1000.) GO TO 8
 N=7
 GO TO 33
8 N=8
 GO TO 33
9 IF(P.LT.600.) GO TO 13
 IF(P.LT.2000.) GO TO 11
 IF(H.LT.80.) GO TO 10
```

```
 DIMENSION LOC(21),JP(17),MX(17),BP(17),OP(17),BH(21),OH(17),R(19),
1HL(19),HV(19),HS(10),CVL(19),CVV(19)
 DATA CVV/1.483,1.488,1.504,1.525,1.551,1.583,1.619,1.666,1.733,
11.822,1.915,2.013,2.137,2.204,2.275,2.315,2.336,2.342,2.343/
 DATA CVL/1.126,1.152,1.234,1.305,1.365,1.419,1.459,1.491,1.525,
11.560,1.603,1.644,1.756,1.883,2.091,2.241,2.317,2.339,2.343/
 DATA R/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182.
1,185.,186.5,187.25,187.46875,187.506/
 DATA HL/-132.8,-129.13,-124.25,-117.79,-110.86,-101.3,-89.04,-74.2
12,-58.58,-43.43,-30.07,-20.56,-11.13,-4.27,1.17,5.54,10.83,14.29,
216.36/
 DATA HV/60.31,65.11,70.59,76.35,80.98,85.11,87.4,86.54,81.94,74.15
1,64.83,56.86,47.34,39.56,33.46,28.34,22.31,18.66,16.55/
 DATA HS/-132.8,-109.96,-87.59,-65.71,-44.27,-23.18,-2.45,18.06,
138.32,58.50/
 DATA LOC/1,21,63,84,133,141,156,160,257,237,273,318,360,409,444,
1 528,563,671,686,710,722/
 DATA JP/5,6,3,7,2,3,9,9,4,4,5,3,7,7,7,9/
 DATA MX/3,4,1,5,0,1,3,3,2,2,3,1,5,5,5,7/
 DATA BP/1000.,0.,20.,0.,15.,0.,0.,1000.,2000.,2000.,1000.,600.,0.,
10.,300.,0.,140./
 DATA OP/1000.,200.,40.,5.,4985.,2500.,250.,1000.,1000.,1000.,250.,
1200.,100.,100.,50.,50.,20./
 DATA BH/9200.,9200.,9200.,9200.,2600.,1000.,200.,200.,80.,-45.,
1 -120.,-125.,-135.,120.,-45.,60.,-50.,20000.,20000.,20000.,20000./
 DATA OH/3600.,1800.,1800.,1800.,2200.,400.,100.,100.,40.,25.,40.,
125.,15.,20.,15.,15.,10./
 DATA VERYBG/1.0E+38/
1 P=PRES
 IF(P.LT.1.0) P=1.0
 H=ENTH
 KTR=KTRANS
 IF(H.LT.200.) GO TO 9
 IF(H.LT.9200.) GO TO 5
 IF(H.GE.25000.) H=24999.999999
 IF(P.LT.100.) GO TO 3
 IF(P.LT.1000.) GO TO 2
 N=1
 N1=18
 GO TO 33
2 N=2
 N1=19
 GO TO 33
3 IF(P.LT.30.) GO TO 4
 N=3
 N1=20
 GO TO 33
4 N=4
 N1=21
 GO TO 33
5 IF(H.LT.1000.) GO TO 7
 IF(H.LT.2600.) GO TO 6
 N=5
 GO TO 33
6 N=6
 GO TO 33
7 IF(P.GE.1000.) GO TO 8
 N=7
```

```
      N=9
      GO TO 33
   10 IF(H.LT.-45..AND.P.LT.2250.)GO TO 24
      N=10
      GO TO 30
   11 IF(P.LT.1000.) GO TO 12
      N=11
      GO TO 30
   12 N=12
      GO TO 30
   13 IF(H.GE.-45.) GO TO 14
      N=13
      IF(H.LT.-132.7285+P*0.08224) GO TO 30
      GO TO 20
   14 IF(H.LT.120.) GO TO 15
      N=14
      GO TO 33
   15 IF(P.LT.300.) GO TO 16
      N=15
      GO TO 33
   16 IF(H.LT.60.) GO TO 17
      N=16
      GO TO 20
   17 N=17
   20 IF(P.GT.187.506) GO TO 33
      DO 21 I=2,19
      IF(P-R(I))22,22,21
   21 CONTINUE
   22 F=(P-R(I-1))/(R(I)-R(I-1))
      CHL=HL(I-1)+(HL(I)-HL(I-1))*F
      CHV=HV(I-1)+(HV(I)-HV(I-1))*F
      IF(H.LT.CHL.OR.H.GT.CHV) GO TO 33
      IF(KTR.EQ.2) GO TO 23
      PHCP=VERYBIG
      RETURN
   23 CL=CVL(I-1)+(CVL(I)-CVL(I-1))*F
      CG=CVV(I-1)+(CVV(I)-CVV(I-1))*F
      PHCP=CL+(CG-CL)*(H-CHL)/(CHV-CHL)
      RETURN
   24 N=11
   30 F=P/587.84
      I=F
      IF(I.GT.8) I=8
      F=F-I
      V=(1.0-F)*HS(I+1)+F*HS(I+2)
      IF(H.LT.V) H=V
   33 IF(H.LE.20000.)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.-F
      FH=(H-BH(N1))/DH(N)
      IH=FH
      FF=FH-IH
      FH=1.-FF
      I=IH*JP(N)+IP+LOC(N1)
      J=I+JP(N)
```

```
      GO TO 33
    8 N=8
      GO TO 33
    9 IF(P.LT.600.) GO TO 13
      IF(P.LT.2000.) GO TO 11
      IF(H.LT.80.) GO TO 10
      N=9
      GO TO 33
   10 N=10
      GO TO 30
   11 IF(P.LT.1000.) GO TO 12
      N=11
      GO TO 30
   12 N=12
      GO TO 30
   13 IF(H.GE.(-45.)) GO TO 14
      N=13
      IF(H.LT.(-132.7285+P*0.08224)) GO TO 30
      GO TO 20
   14 IF(H.LT.120.) GO TO 15
      N=14
      GO TO 33
   15 IF(P.LT.300.) GO TO 16
      N=15
      GO TO 33
   16 IF(H.LT.60.) GO TO 17
      N=16
      GO TO 20
   17 N=17
   20 IF(P.GT.187.506) GO TO 33
      DO 21 I=2,19
      IF(P-R(I))22,22,21
   21 CONTINUE
   22 F=(P-R(I-1))/(R(I)-R(I-1))
      CHL=HL(I-1)+(HL(I)-HL(I-1))*F
      CHV=HV(I-1)+(HV(I)-HV(I-1))*F
      IF(H.LT.CHL.OR.H.GT.CHV) GO TO 33
      IF(KTR.EQ.2) GO TO 23
      PHHEAT=VERYBG
      RETURN
   23 CL=CVL(I-1)+(CVL(I)-CVL(I-1))*F
      CG=CVV(I-1)+(CVV(I)-CVV(I-1))*F
      PHHEAT=CL+(CG-CL)*(H-CHL)/(CHV-CHL)
      RETURN
   30 F=P/587.84
      I=F
      IF(I.GT.8) I=8
      FI=I
      F=F-FI
      V=(1.0-F)*HS(I+1)+F*HS(I+2)
      IF(H.LT.V) H=V
   33 IF(H.LE.20000.)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      FI=IP
      F=FP-FI
      FP=1.-F
```

```
      IF(KTR.EQ.2) GO TO 35
      HCP=FP*FH*CP(I)+F*FH*CP(I+1)+FP*FF*CP(J)+F*FF*CP(J+1)
      IF(N.LT.13) GO TO 34
      S=H+500.
      HCP=HCP/(18240.46942/S-425696635.2/S/S/S-65.21553314+.07110647112*
     1S-2.644991367E-8*S*S*S)
   34 IF(KTR.GE.2) GO TO 35
      PHCP=HCP
      RETURN
   35 PHCP=FP*FH*CV(I)+F*FH*CV(I+1)+FP*FF*CV(J)+F*FF*CV(J+1)
      IF(KTR.LT.3) RETURN
      PHCP=HCP/PHCP
      RETURN
      END

      SUBROUTINE  LDHEAT
      COMMON/HPHEAT/ CP(749),CV(749)
      DATA((CP(I),I=328,437)=2.789,2.562,3.787,3.32,3.021,4.562,3.854,3.
     1453,5.298,4.344,3.838,5.762,4.71,4.144,5.757,4.872,4.338,5.381,4.8
     219,4.399,4.871,4.614,4.344,4.402,4.351,4.214,4.037,4.094,4.056,3.7
     364,3.869,3.904,1.008,.9365,.8657,.8,.74,0.,0.,1.19,1.101,1.025,.95
     4,.8864,.8249,.7596,1.296,1.201,1.12,1.05,.986,.9267,.8677,1.365,1.
     524,1.142,1.064,1.002,.9471,.8973,1.446,1.26,1.125,1.032,.9625,.906
     64,.859,1.682,1.332,1.095,.9782,.8947,.8335,.7857,2.164,1.582,1.119
     7,.926,.8181,.7479,.6971,.4942,.7064,.883,.988,1.024,1.021,.9977,.5
     8807,.7459,.8907,.9946,1.052,1.077,1.08,.6575,.7922,.9136,1.011,1.0
     973,1.113,1.132,.7164,.8282,.9306,1.017,1.079,1.126,1.155,.7496)
      DATA((CP(I),I=438,546)=.8424,.9284,1.004,1.064,1.109,1.142,.926,.8
     1721,.8181,.783,.7479,.7225,.6971,.8979,.8104,.749,.7029,.6664,.636
     2,.611,.9189,.7855,.7012,.6424,.5987,.5648,.5373,.9962,.7935,.6801,
     3.6072,.5558,.5173,.4874,1.125,.8437,.6943,.6057,.5456,.5019,.4687,
     41.227,.9052,.7409,.6406,.5728,.5236,.4864,1.226,.9639,.8085,.7069,
     5.6351,.5821,.541,1.163,.9961,.8757,.7871,.7199,.6668,.6242,1.086,1
     6.004,.9285,.8642,.8097,.763,.7233,1.03,1.004,.9683,.9306,.8931,.85
     776,.8249,.9984,1.005,.9986,.9835,.9638,.9414,.9183,.9872,1.006,1.0
     824,1.023,1.021,1.009,.9977,.2622,.5,2.,1.988,1.741,1.395,1.163,.30
     995,.53,.85,1.171,1.224,1.163,1.086,.3654,.5427,.7354,.8998,1.004)
      DATA((CP(I),I=547,658)=1.034,1.03,.4282,.5587,.6976,.8174,.9077,.9
     1699,.9984,.4942,.6003,.7064,.7944,.8823,.9449,.9872,1.293,1.268,1.
     2198,1.099,1.087,1.063,1.028,.9859,.9385,1.529,1.366,1.249,1.161,1.
     3091,1.034,.9871,.9476,.9134,1.811,1.718,1.456,1.284,1.162,1.072,1.
     4001,.9445,.8979,2.837,2.744,2.017,1.583,1.333,1.17,1.056,.9715,.90
     554,0.,4.578,3.851,2.072,1.688,1.362,1.164,1.033,.9377,0.,10.51,9.7
     687,3.748,2.244,1.633,1.333,1.132,.9962,0.,0.,37.29,7.516,3.177,2.0
     74,1.541,1.259,1.079,0.,0.,40.,9.88,3.905,2.373,1.737,1.387,1.169,0
     8.,0.,25.93,7.327,3.608,2.39,1.792,1.453,1.227,0.,6.57,7.716,4.255,
     92.784,2.1,1.692,1.426,1.238,3.,3.305,3.395,2.566,2.066,1.744)
      DATA((CP(I),I=659,749)=1.515,1.342,1.21,1.922,1.94,1.922,1.748,1.5
     188,1.454,1.341,1.247,1.163,5.363,5.087,4.955,4.873,4.814,6.779,6.2
     237,5.966,5.793,5.668,8.417,7.602,7.182,6.909,6.709,7.441,6.309,5.8
     343,5.612,5.467,5.363,8.841,7.339,6.703,6.378,6.169,6.019,10.32,8.4
     465,7.655,7.237,6.964,6.779,11.85,9.634,8.682,8.178,7.846,7.598,8.3
     567,7.36,6.875,9.997,8.72,8.09,11.69,10.16,9.395,13.4,11.64,10.74,1
     64.2,10.6,9.545,8.984,8.61,8.333,8.115,16.97,12.71,11.44,10.76,10.3
     7,9.95,9.678,19.72,14.86,13.39,12.58,12.04,11.63,11.31,22.45,16.99,
     815.33,14.42,13.8,13.33,12.96)
      ENO

      FH=(H-BH(N1))/DH(N)
      IH=FH
      FI=IH
      FF=FH-FI
      FH=1.-FF
      I=IH*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      IF(KTR.EQ.2) GO TO 35
      HCP=FP*FH*CP(I)+F*FH*CP(I+1)+FP*FF*CP(J)+F*FF*CP(J+1)
      IF(N.LT.13) GO TO 34
      S=H+500.
      HCP=HCP/(18240.46942/S-425696635.2/S/S/S-65.21553314+.07110647112*
     1S-2.644991367E-8*S*S*S)
   34 IF(KTR.GE.2) GO TO 35
      PHHEAT=HCP
      RETURN
   35 PHHEAT=FP*FH*CV(I)+F*FH*CV(I+1)+FP*FF*CV(J)+F*FF*CV(J+1)
      IF(KTR.LT.3) RETURN
      PHHEAT=HCP/PHHEAT
      RETURN
      END

      BLOCK DATA
      COMMON/HPHEAT/AA(110),AB(111),AC(115),AO(113),AE(111),AF(115),
     1AG(74),   AH(111),AI(111),AJ(114),AK(112),AL(111),AM(114),AN( 76)
      DATAAA/3.792,3.789,3.787,3.785,3.783,4.057,4.047,4.041,4.037,4.034
     1,4.463,4.382,4.345,4.321,4.305,5.363,5.087,4.955,4.873,4.814,3.797
     2,3.794,3.793,3.793,3.792,3.792,3.943,3.933,3.93,3.928,3.927,3.926,
     34.145,4.093,4.074,4.066,4.061,4.057,4.522,4.343,4.278,4.249,4.231,
     44.26,5.197,4.774,4.614,4.54,4.495,4.463,6.195,5.435,5.135,4.991,4.
     55902,4.856,7.441,6.309,5.843,5.612,5.467,5.363,3.797,3.797,3.797,3.
     66954,3.943,3.938,4.204,4.144,4.118,4.713,4.516,4.431,5.611,5.178,4.
     77984,6.869,6.15,5.814,8.307,7.36,6.875,3.797,3.797,3.797,3.797,3.79
     887,3.797,3.797,4.09,3.99,3.971,3.962,3.957,3.953,3.951,4.896,4.399,
     994.298,4.251,4.223,4.203,4.189,6.539,5.296,5.002,4.861,4.773,4.711/
      DATAAB/4.664,8.836,6.743,6.189,5.91,5.731,5.602,5.503,11.45,8.569,
     17.756,7.331,7.052,6.848,6.689,14.2,10.6,9.545,8.984,8.61,8.333,8.1
     1215,3.471,3.528,3.504,3.503,3.629,3.618,3.797,3.783,3.909,4.213,4.3
     1317,3.697,3.879,3.983,3.547,3.65,3.723,3.488,3.544,3.587,3.471,3.5,
     143.528,2.471,3.189,3.655,3.86,3.904,3.633,3.326,3.076,2.866,2.605,2
     15.949,3.228,3.437,3.576,3.698,3.577,3.411,3.236,2.939,3.151,3.331,3
     16.477,3.591,3.819,3.8,3.704,3.584,3.303,3.445,3.573,3.682,3.772,3.9
     1758,3.974,3.923,3.841,3.593,3.7,3.796,3.88,3.952,4.124,4.169,4.154,
     184.112,3.773,3.856,3.931,3.997,4.055,4.21,4.27,4.279,4.263,3.881,3.
     19946,4.006,4.059,4.107,4.245,4.312,4.337,4.339,3.925,3.977,4.025/
      DATAAC/4.07,4.11,4.232,4.303,4.34,4.356,3.909,3.939,3.97,4.,4.031,
     14.152,4.234,4.275,4.317,1.859,1.088,.462,0.,2.281,1.638,1.079,0.,2
     22.61,2.07,1.516,.84,2.87,2.38,1.916,1.35,3.08,2.613,2.223,1.787,3.2
     359,2.79,2.455,2.106,3.467,3.026,2.716,2.448,3.578,3.196,2.921,2.68
     443,3.633,3.326,3.076,2.866,.8604,.5399,.2194,0.,0.,1.934,1.697,1.47
     55,1.28,1.076,2.75,2.511,2.308,2.127,1.954,3.453,3.126,2.892,2.709,2
     66.551,4.033,3.612,3.331,3.123,2.958,4.361,3.937,3.646,3.429,3.259,4
     77.363,4.055,3.814,3.623,3.467,4.152,3.997,3.843,3.704,3.578,3.904,3
     88.836,3.768,3.701,3.633,1.089,.891,.7,1.836,1.611,1.417,2.471,2.244
     99,2.048,3.094,2.789,2.562,3.787,3.32,3.021,4.562,3.854,3.453,5.298/
      DATAAO/4.344,3.838,5.762,4.71,4.144,5.757,4.872,4.338,5.381,4.819,
     14.399,4.871,4.614,4.344,4.402,4.351,4.214,4.037,4.094,4.056,3.764,
     23.869,3.904,1.008,.9365,.8657,.8,.74,0.,0.,1.19,1.101,1.025,.95,.8
```

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 SUBROUTINE H C SUB P
 COMMON/HPHEAT/ CP(749),CV(749)
 DATA((CP(I),I=108,215)=4.861,4.773,4.711,4.664,8.836,6.743,6.189,5
1.91,5.731,5.602,5.503,11.45,8.569,7.756,7.331,7.052,6.848,6.689,14
2.2,10.6,9.545,8.984,8.61,8.333,8.115,3.471,3.528,3.504,3.503,3.629
3,3.618,3.797,3.783,3.909,4.213,4.317,3.697,3.879,3.983,3.547,3.65,
43.723,3.488,3.544,3.587,3.471,3.5,3.528,2.471,3.189,3.655,3.86,3.9
504,3.633,3.326,3.076,2.866,2.605,2.949,3.228,3.437,3.576,3.698,3.5
677,3.411,3.236,2.939,3.151,3.331,3.477,3.591,3.819,3.8,3.704,3.584
7,3.303,3.445,3.573,3.682,3.772,3.958,3.974,3.923,3.841,3.593,3.7,3
8.796,3.88,3.952,4.124,4.169,4.154,4.112,3.773,3.856,3.931,3.997,4.
9055,4.21,4.27,4.279,4.263,3.881,3.946,4.006,4.059,4.107,4.245)
 DATA((CP(I),I=216,327)=4.312,4.337,4.339,3.925,3.977,4.025,4.07,4.
111,4.232,4.303,4.34,4.356,3.909,3.939,3.97,4.,4.031,4.152,4.234,4.
2275,4.317,1.859,1.088,.462,0.,2.281,1.638,1.079,0.,2.61,2.07,1.516
3,.84,2.87,2.38,1.916,1.35,3.08,2.613,2.223,1.787,3.259,2.79,2.455,
42.106,3.467,3.026,2.716,2.448,3.578,3.196,2.921,2.683,3.633,3.326,
53.076,2.866,.8604,.5399,.2194,0.,0.,1.934,1.697,1.47,1.28,1.076,2.
675,2.511,2.308,2.127,1.954,3.453,3.126,2.892,2.709,2.551,4.033,3.6
712,3.331,3.123,2.958,4.361,3.937,3.646,3.429,3.259,4.363,4.055,3.8
814,3.623,3.467,4.152,3.997,3.843,3.704,3.578,3.904,3.836,3.768,3.7
901,3.633,1.089,.891,.7,1.836,1.611,1.417,2.471,2.244,2.048,3.094)
 END

 SUBROUTINE H C SUB V
 COMMON/HPHEAT/ CP(749),CV(749)
 DATA((CV(I),I=329,438)=1.499,1.544,1.546,1.547,1.564,1.564,1.569,1
1.581,1.572,1.576,1.598,1.582,1.583,1.608,1.596,1.597,1.612,1.608,1
2.612,1.61,1.617,1.626,1.612,1.627,1.639,1.62,1.638,1.655,1.632,1.6
357,1.679,1.1,1.057,1.017,.9735,.931,0.,0.,1.291,1.252,1.211,1.17,1
4.131,1.09,1.044,1.406,1.385,1.362,1.335,1.305,1.272,1.234,1.46,1.4
552,1.441,1.428,1.413,1.395,1.373,1.496,1.487,1.482,1.476,1.47,1.46
62,1.452,1.537,1.521,1.51,1.506,1.503,1.5,1.496,1.589,1.561,1.538,1
7.528,1.524,1.523,1.522,1.478,1.58,1.598,1.601,1.608,1.61,1.611,1.4
878,1.542,1.566,1.578,1.594,1.604,1.611,1.479,1.525,1.552,1.571,1.5
99,1.604,1.615,1.481,1.519,1.547,1.57,1.593,1.61,1.621,1.486,1.517)
 DATA((CV(I),I=439,546)=1.548,1.574,1.595,1.618,1.632,1.528,1.526,1
1.524,1.523,1.523,1.522,1.522,1.552,1.546,1.542,1.54,1.539,1.539,1.
2539,1.582,1.57,1.562,1.557,1.554,1.553,1.552,1.625,1.601,1.586,1.5
376,1.57,1.566,1.564,1.69,1.64,1.614,1.598,1.587,1.579,1.574,1.732,
41.675,1.642,1.619,1.603,1.592,1.584,1.759,1.697,1.662,1.636,1.617,
51.604,1.595,1.743,1.7,1.668,1.644,1.626,1.613,1.604,1.708,1.681,1.
6658,1.64,1.628,1.617,1.608,1.668,1.654,1.642,1.632,1.623,1.615,1.6
711,1.63,1.628,1.624,1.62,1.617,1.614,1.611,1.601,1.605,1.608,1.609
8,1.61,1.61,1.611,1.478,1.7,1.97,2.035,1.937,1.812,1.743,1.478,1.68
98,1.781,1.837,1.802,1.748,1.708,1.478,1.616,1.685,1.741,1.709)
 DATA((CV(I),I=547,658)=1.684,1.668,1.478,1.559,1.623,1.649,1.641,1
1.633,1.63,1.478,1.529,1.58,1.589,1.598,1.599,1.601,1.535,1.531,1.5
229,1.527,1.525,1.523,1.522,1.521,1.52,1.567,1.56,1.554,1.549,1.545
3,1.542,1.539,1.537,1.535,1.603,1.596,1.585,1.576,1.569,1.563,1.559
4,1.555,1.552,1.666,1.649,1.631,1.614,1.601,1.591,1.583,1.576,1.571
5,0.,1.795,1.73,1.667,1.645,1.628,1.615,1.604,1.595,0.,2.172,2.024,
61.876,1.768,1.701,1.655,1.638,1.625,0.,0.,2.336,2.12,1.942,1.817,1
7.732,1.692,1.666,0.,0.,2.442,2.244,2.065,1.898,1.791,1.745,1.709,0
8.,0.,2.356,2.234,2.093,1.943,1.83,1.773,1.732,0.,2.506,2.227,2.144
9,2.043,1.927,1.856,1.793,1.743,2.15,2.372,2.093,2.037,1.959,1.887)
 DATA((CV(I),I=659,749)=1.828,1.773,1.757,1.855,1.977,2.006,1.937,1
1.871,1.833,1.792,1.764,1.743,4.263,4.018,3.9,3.826,3.773,5.498,5.0
3864,.8249,.7596,1.296,1.201,1.12,1.05,.986,.9267,.8677,1.365,1.24,
41.142,1.064,1.002,.9471,.8973,1.446,1.26,1.125,1.032,.9625,.9064,.
5859,1.682,1.332,1.095,.9782,.8947,.8335,.7857,2.164,1.582,1.119,.9
626,.8181,.7479,.6971,.4942,.7064,.883,.988,1.024,1.021,.9977,.5807
7,.7459,.8907,.9946,1.052,1.077,1.08,.6575,.7922,.9136,1.011,1.073,
81.113,1.132,.7164,.8282,.9306,1.017,1.079,1.126,1.155,.7496,.8424,
9.9284,1.004,1.064,1.109,1.142,.926,.8721,.8181,.783,.7479,.7225/
 DATAAE/.6971,.8979,.8104,.749,.7029,.6664,.636,.611,.9189,.7855,.7
1012,.6424,.5987,.5648,.5373,.9962,.7935,.6801,.6072,.5558,.5173,.4
2874,1.125,.8437,.6943,.6057,.5456,.5019,.4687,1.227,.9052,.7409,.6
3406,.5728,.5236,.4864,1.226,.9639,.8085,.7069,.6351,.5821,.541,1.1
463,.9961,.8757,.7871,.7199,.6668,.6242,1.086,1.004,.9285,.8642,.80
597,.763,.7233,1.03,1.004,.9683,.9306,.8931,.8576,.8249,.9984,1.005
6,.9986,.9835,.9638,.9414,.9183,.9872,1.006,1.024,1.023,1.021,1.009
7,.9977,.2622,.5,2.,1.988,1.741,1.395,1.163,.3095,.53,.85,1.171,1.2
824,1.163,1.086,.3654,.5427,.7354,.8998,1.004,1.034,1.03,.4282,.558
97,.6976,.8174,.9077,.9699,.9984,.4942,.6003,.7064,.7944,.8823/
 DATAAF/.9449,.9872,1.293,1.268,1.198,1.099,1.087,1.063,1.028,.9859
1,.9385,1.529,1.366,1.249,1.161,1.091,1.034,.9871,.9476,.9134,1.811
2,1.718,1.456,1.284,1.162,1.072,1.001,.9445,.8979,2.837,2.744,2.017
3,1.583,1.333,1.17,1.056,.9715,.9054,0.,4.578,3.851,2.072,1.688,1.3
462,1.164,1.033,.9377,0.,10.51,9.787,3.748,2.244,1.633,1.333,1.132,
5.9962,0.,0.,37.29,7.516,3.177,2.04,1.541,1.259,1.079,0.,0.,40.,9.8
68,3.905,2.373,1.737,1.387,1.169,0.,0.,25.93,7.327,3.608,2.39,1.792
7,1.453,1.227,0.,6.57,7.716,4.255,2.784,2.1,1.692,1.426,1.238,3.,3.
8305,3.395,2.566,2.066,1.744,1.515,1.342,1.21,1.922,1.94,1.922,1.74
98,1.588,1.454,1.341,1.247,1.163,5.363,5.087,4.955,4.873,4.814/
 DATAAG/6.779,6.237,5.966,5.793,5.668,8.417,7.602,7.182,6.909,6.709
1,7.441,6.309,5.843,5.612,5.467,5.363,8.841,7.339,6.703,6.378,6.169
2,6.019,10.32,8.465,7.655,7.237,6.964,6.779,11.85,9.634,8.682,8.178
3,7.846,7.598,8.367,7.36,6.875,9.997,8.72,8.09,11.69,10.16,9.395,13
4.4,11.64,10.74,14.2,10.6,9.545,8.984,8.61,8.333,8.115,16.97,12.71,
511.44,10.76,10.3,9.95,9.678,19.72,14.86,13.39,12.58,12.04,11.63,11
6.31,22.45,16.99,15.33,14.42,13.8,13.33,12.96/
 DATAAH/2.809,2.805,2.803,2.8,2.797,3.07,3.061,3.055,3.051,3.048,3.
1453,3.38,3.345,3.324,3.308,4.263,4.018,3.9,3.826,3.773,2.812,2.811
2,2.811,2.81,2.81,2.809,2.956,2.948,2.944,2.943,2.942,2.94,3.152,3.
3103,3.086,3.078,3.074,3.07,3.503,3.339,3.28,3.253,3.237,3.262,4.11
48,3.735,3.59,3.523,3.482,3.453,5.013,4.331,4.061,3.932,3.852,3.801
5,6.115,5.105,4.69,4.485,4.356,4.263,2.812,2.812,2.812,2.967,2.956,
62.952,3.206,3.15,3.127,3.679,3.498,3.42,4.495,4.102,3.926,5.621,4.
7973,4.671,6.939,6.042,5.61,2.812,2.812,2.812,2.812,2.812,2.812,2.8
812,3.095,3.001,2.983,2.974,2.97,2.966,2.964,3.847,3.387,3.293,3.25
9,3.224,3.205,3.192,5.353,4.213,3.943,3.814,3.733,3.676,3.634/
 DATAAI/7.425,5.523,5.021,4.767,4.604,4.487,4.397,9.75,7.151,6.419,
16.037,5.785,5.602,5.459,12.14,8.929,7.99,7.49,7.156,6.909,6.715,2.
2486,2.52,2.519,2.516,2.643,2.633,2.812,2.797,2.924,3.039,3.121,2.7
312,2.802,2.875,2.562,2.62,2.668,2.503,2.536,2.563,2.486,2.503,2.52
4,1.486,1.563,1.617,1.652,1.679,1.751,1.777,1.784,1.784,1.621,1.702
5,1.768,1.822,1.866,1.963,1.993,1.991,1.972,1.954,2.017,2.07,2.112,
62.152,2.254,2.279,2.277,2.257,2.317,2.351,2.384,2.412,2.437,2.505,
72.53,2.524,2.496,2.607,2.635,2.659,2.682,2.702,2.761,2.792,2.801,2
8.794,2.788,2.81,2.83,2.848,2.865,2.918,2.952,2.97,2.977,2.896,2.91
94,2.93,2.946,2.96,3.009,3.045,3.069,3.084,2.94,2.955,2.969,2.983/
 DATAAJ/2.995,3.041,3.079,3.109,3.132,2.924,2.936,2.947,2.959,2.97,
13.016,3.055,3.088,3.121,1.367,1.051,.785,0.,1.507,1.29,1.069,0.,1.
2575,1.485,1.255,.908,1.606,1.579,1.453,1.202,1.617,1.627,1.572,1.4
31,1.635,1.648,1.638,1.557,1.667,1.69,1.689,1.668,1.7,1.728,1.739,1
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224,4.788,4.636,4.527,6.894,6.194,5.836,5.595,5.424,6.115,5.105,4.6
39,4.485,4.356,4.263,7.332,6.004,5.444,5.157,4.973,4.84,8.6,6.97,6.
4262,5.896,5.657,5.498,9.874,7.959,7.135,6.698,6.412,6.196,6.939,6.
5042,5.61,8.351,7.223,6.668,9.794,8.454,7.785,11.22,9.695,8.916,12.
614,8.929,7.99,7.49,7.156,6.909,6.715,14.52,10.76,9.631,9.024,8.615
7,8.31,8.069,16.86,12.57,11.28,10.58,10.1,9.742,9.459,19.12,14.37,1
82.91,12.11,11.58,11.17,10.84)
 END

 SUBROUTINE DDCVCP
 COMMON/HPHEAT/CP(749),CV(749)
 DATA((CP(I),I=1,107)=3.792,3.789,3.787,3.785,3.783,4.057,4.047,4.0
141,4.037,4.034,4.463,4.382,4.345,4.321,4.305,5.363,5.087,4.955,4.8
273,4.814,3.797,3.794,3.793,3.793,3.792,3.792,3.943,3.933,3.93,3.92
38,3.927,3.926,4.145,4.093,4.074,4.066,4.061,4.057,4.522,4.343,4.27
48,4.249,4.231,4.26,5.197,4.774,4.614,4.54,4.495,4.463,6.195,5.435,
55.135,4.991,4.902,4.856,7.441,6.309,5.843,5.612,5.467,5.363,3.797,
63.797,3.797,3.954,3.943,3.938,4.204,4.144,4.118,4.713,4.516,4.431,
75.611,5.178,4.984,6.869,6.15,5.814,8.307,7.36,6.875,3.797,3.797,3.
8797,3.797,3.797,3.797,3.797,4.09,3.99,3.971,3.962,3.957,3.953,3.95
91,4.896,4.399,4.298,4.251,4.223,4.203,4.189,6.539,5.296,5.002)
 DATA((CV(I),I=1,109)=2.809,2.805,2.803,2.8,2.797,3.07,3.061,3.055,
13.051,3.048,3.453,3.38,3.345,3.324,3.308,4.263,4.018,3.9,3.826,3.7
273,2.812,2.811,2.811,2.81,2.81,2.809,2.956,2.948,2.944,2.943,2.942
3,2.94,3.152,3.103,3.086,3.078,3.074,3.07,3.503,3.339,3.28,3.253,3.
4237,3.262,4.118,3.735,3.59,3.523,3.482,3.453,5.013,4.331,4.061,3.9
532,3.852,3.801,6.115,5.105,4.69,4.485,4.356,4.263,2.812,2.812,2.81
62,2.967,2.956,2.952,3.206,3.15,3.127,3.679,3.498,3.42,4.495,4.102,
73.926,5.621,4.973,4.671,6.939,6.042,5.61,2.812,2.812,2.812,2.812,2
8.812,2.812,2.812,3.095,3.001,2.983,2.974,2.97,2.966,2.964,3.847,3.
9387,3.293,3.25,3.224,3.205,3.192,5.353,4.213,3.943,3.814,3.733)
 DATA((CV(I),I=110,217)=3.676,3.634,7.425,5.523,5.021,4.767,4.604,4
1.487,4.397,9.75,7.151,6.419,6.037,5.785,5.602,5.459,12.14,8.929,7.
299,7.49,7.156,6.909,6.715,2.486,2.52,2.519,2.516,2.643,2.633,2.812
3,2.797,2.924,3.039,3.121,2.712,2.802,2.875,2.562,2.62,2.668,2.503,
42.536,2.563,2.486,2.503,2.52,1.486,1.563,1.617,1.652,1.679,1.751,1
5.777,1.784,1.784,1.621,1.702,1.768,1.822,1.866,1.963,1.993,1.991,1
6.972,1.954,2.017,2.07,2.112,2.152,2.254,2.279,2.277,2.257,2.317,2.
7351,2.384,2.412,2.437,2.505,2.53,2.524,2.496,2.607,2.635,2.659,2.6
882,2.702,2.761,2.792,2.801,2.794,2.788,2.81,2.83,2.848,2.865,2.918
9,2.952,2.97,2. 77,2.896,2.914,2.93,2.946,2.96,3.009,3.045,3.069)
 DATA((CV(I),I=218,328)=3.084,2.94,2.955,2.969,2.983,2.995,3.041,3.
1079,3.109,3.132,2.924,2.936,2.947,2.959,2.97,3.016,3.055,3.088,3.1
221,1.367,1.051,.785,0.,1.507,1.29,1.069,0.,1.575,1.485,1.255,.908,
31.606,1.579,1.453,1.202,1.617,1.627,1.572,1.41,1.635,1.648,1.638,1
4.557,1.667,1.69,1.689,1.668,1.7,1.728,1.739,1.732,1.751,1.777,1.78
54,1.784,.9207,.7489,.5771,0.,0.,1.351,1.271,1.186,1.115,1.02,1.523
6,1.51,1.486,1.452,1.404,1.569,1.575,1.576,1.574,1.565,1.579,1.588,
71.597,1.604,1.61,1.6,1.608,1.617,1.627,1.635,1.623,1.635,1.647,1.6
859,1.667,1.645,1.662,1.677,1.69,1.7,1.679,1.697,1.715,1.733,1.751,
9.995,.876,.797,1.289,1.213,1.155,1.452,1.424,1.387,1.515,1.51)
 END

4.732,1.751,1.777,1.784,1.784,.9207,.7489,.5771,0.,0.,1.351,1.271,1
5.186,1.115,1.02,1.523,1.51,1.486,1.452,1.404,1.569,1.575,1.576,1.5
674,1.565,1.579,1.588,1.597,1.604,1.61,1.6,1.608,1.617,1.627,1.635,
71.623,1.635,1.647,1.659,1.667,1.645,1.662,1.677,1.69,1.7,1.679,1.6
897,1.715,1.733,1.751,.995,.876,.797,1.289,1.213,1.155,1.452,1.424,
91.387,1.515,1.51,1.499,1.544,1.546,1.547,1.564,1.564,1.569,1.581/
 DATAAK/1.572,1.576,1.598,1.582,1.583,1.608,1.596,1.597,1.612,1.608
1,1.612,1.61,1.617,1.626,1.612,1.627,1.639,1.62,1.638,1.655,1.632,1
2.657,1.679,1.1,1.057,1.017,.9735,.931,0.,0.,1.291,1.252,1.211,1.17
3,1.131,1.09,1.044,1.406,1.385,1.362,1.335,1.305,1.272,1.234,1.46,1
4.452,1.441,1.428,1.413,1.395,1.373,1.496,1.487,1.482,1.476,1.47,1.
5462,1.452,1.537,1.521,1.51,1.506,1.503,1.5,1.496,1.589,1.561,1.538
6,1.528,1.524,1.523,1.522,1.478,1.58,1.598,1.601,1.608,1.61,1.611,1
7.478,1.542,1.566,1.578,1.594,1.604,1.611,1.479,1.525,1.552,1.571,1
8.59,1.604,1.615,1.481,1.519,1.547,1.57,1.593,1.61,1.621,1.486,1.51
97,1.548,1.574,1.595,1.618,1.632,1.528,1.526,1.524,1.523,1.523/
 DATAAL/1.522,1.522,1.552,1.546,1.542,1.54,1.539,1.539,1.539,1.582,
11.57,1.562,1.557,1.554,1.553,1.552,1.625,1.601,1.586,1.576,1.57,1.
2566,1.564,1.69,1.64,1.614,1.598,1.587,1.579,1.574,1.732,1.675,1.64
32,1.619,1.603,1.592,1.584,1.759,1.697,1.662,1.636,1.617,1.604,1.59
45,1.743,1.7,1.668,1.644,1.626,1.613,1.604,1.708,1.681,1.658,1.64,1
5.628,1.617,1.608,1.668,1.654,1.642,1.632,1.623,1.615,1.611,1.63,1.
6628,1.624,1.62,1.617,1.614,1.611,1.601,1.605,1.608,1.609,1.61,1.61
7,1.611,1.478,1.7,1.97,2.035,1.937,1.812,1.743,1.478,1.688,1.781,1.
8837,1.802,1.748,1.708,1.478,1.616,1.685,1.741,1.709,1.684,1.668,1.
9478,1.559,1.623,1.649,1.641,1.633,1.63,1.478,1.529,1.58,1.589/
 DATAAM/1.598,1.599,1.601,1.535,1.531,1.529,1.527,1.525,1.523,1.522
1,1.521,1.52,1.567,1.56,1.554,1.549,1.545,1.542,1.539,1.537,1.535,1
2.603,1.596,1.585,1.576,1.569,1.563,1.559,1.555,1.552,1.666,1.649,1
3.631,1.614,1.601,1.591,1.583,1.576,1.571,0.,1.795,1.73,1.667,1.645
4,1.628,1.615,1.604,1.595,0.,2.172,2.024,1.876,1.768,1.701,1.655,1.
5638,1.625,0.,0.,2.336,2.12,1.942,1.817,1.732,1.692,1.666,0.,0.,2.4
642,2.244,2.065,1.898,1.791,1.745,1.709,0.,0.,2.356,2.234,2.093,1.9
743,1.83,1.773,1.732,0.,2.506,2.227,2.144,2.043,1.927,1.856,1.793,1
8.743,2.15,2.372,2.093,2.037,1.959,1.887,1.828,1.773,1.757,1.855,1.
9977,2.006,1.937,1.871,1.833,1.792,1.764,1.743,4.263,4.018,3.9/
 DATAAN/3.826,3.773,5.498,5.024,4.788,4.636,4.527,6.894,6.194,5.836
1,5.595,5.424,6.115,5.105,4.69,4.485,4.356,4.263,7.332,6.004,5.444,
25.157,4.973,4.84,8.6,6.97,6.262,5.896,5.657,5.498,9.874,7.959,7.13
35,6.698,6.412,6.196,6.939,6.042,5.61,8.351,7.223,6.668,9.794,8.454
4,7.785,11.22,9.695,8.916,12.14,8.929,7.99,7.49,7.156,6.909,6.715,1
54.52,10.76,9.631,9.024,8.615,8.31,8.069,16.86,12.57,11.28,10.58,10
6.1,9.742,9.459,19.12,14.37,12.91,12.11,11.58,11.17,10.84/
 END
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      FUNCTION PHLFAC(PRES,ENTH)
      COMMON/DATLFAC/C(735)
      DIMENSION LOC(19),JP(19),DP(19),DH(19),BP(19),BH(19),MX(19),
     1PL(19),HL(19),HG(19),CL(19),CG(19),HS(11)
      DATA(LOC=1,29,50,86,149,173,191,269,339,375,407,461,493,517,529,
     1553,577,601,661)
      DATA(JP=4,3,4,7,4,3,6,7,6,4,6,4, 4,2,3,3,3,4,5)
      DATA(MX=2,1,2,5,2,1,4,5,4,2,4,2,2,0,1,1,1,2,3)
      DATA(BP=0.,0.,490.,132.,305.,500.,1000.,2000.,0.,20.,500.,2000.,
     1 0.,0.,0.,-100.,0.,0.,1.)
      DATA(DP=160.,250.,170.,28.,65.,250.,200.,500.,100.,160.,300.,1000.
     1 ,500.,3000.,1500.,300.,40.,10.,1.)
      DATA(BH=-135.,-105.,-115.,-45.,-45.,-75.,-95.,-60.,70.,145.,25.,
     1 75.,425.,1800.,11000.,11000.,11000.,11000.,11000.)
      DATA(DH=5.,10.,5.,15.,23.,20.,10.,15.,15.,40.,50.,50.,275.,1840.,
     1 2000.,2000.,2000.,1000.,1000.)
      DATA(PL=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
     1.,185.,186.5,187.25,187.46875,187.51)
      DATA(HL=-132.8,-129.13,-124.25,-117.79,-110.86,-101.3,-89.04,
     1-74.22,-58.58,-43.43,-30.07,-20.56,-11.13,-4.27,1.17,5.54,10.83,
     214.29,16.36)
      DATA(HG=60.31,65.11,70.59,76.35,80.98,85.11,87.40,86.54,81.94,
     174.15,64.83,56.86,47.34,39.56,33.46,28.34,22.31,18.66,16.55)
      DATA(HS=-132.82,-113.35,-94.24,-75.47,-57.04,-38.91,-21.05,-3.4,
     114.08,31.36,48.53)
      DATA(CG=2.639E+003   ,2.638E+003,2.658E+003,2.719E+003,2.824E+003,
     13.038E+003,3.358E+003,3.861E+003,4.649E+003,5.987E+003,8.220E+003,
     221.152E+004,1.959E+004,3.697E+004,7.380E+004,1.678E+005,6.630E+005,
     333.929E+009,8.667E+008)
      DATA(CL=1.507E+003   ,1.802E+003,2.114E+003,2.447E+003,2.751E+003,
     13.148E+003,3.583E+003,4.073E+003,4.659E+003,5.491E+003,6.927E+003,
     229.125E+003,1.352E+004,2.265E+004,4.104E+004,8.249E+004,2.283E+005,
     339.773E+005,1.041E+009)
      DATA((C(I),I=1,107)=1300.,860.8,0.,0.,1775.,1268.,1000.,0.,2077.,1
     11680.,1205.,925.,2355.,2021.,1613.,1200.,2587.,2291.,1957.,1566.,28
     217.,2523.,2233.,1899.,3036.,2750.,2465.,2179.,3036.,2588.,2140.,34
     323.,3013.,2606.,3777.,3371.,3004.,4139.,3687.,3335.,4567.,3987.,36
     417.,5137.,4287.,3868.,6122.,4602.,4091.,1526.,1100.,0.,0.,1876.,14
     550.,1100.,0.,2160.,1796.,1362.,1100.,2395.,2089.,1717.,1663.,2623.
     66,2330.,2021.,1643.,2832.,2558.,2267.,1934.,3019.,2769.,2497.,2207.
     77,3190.,2956.,2710.,2439.,3348.,3126.,2898.,2654.,180.9,149.82,129.
     826,141.38,157.83,180.42,214.69,228.61,229.79,192.44,192.79,198.14,
     99207.53,223.33,177.21,221.36,371.59,300.97,268.82,250.63,241.33,0.)
      DATA((C(I),I=108,210)=1799.45,1457.59,557.53,389.43,311.37,263.65,
     110.,53610.,3967.33,1196.72,582.57,384.47,286.32,0.,198135.,21576.9,
     221843.59,745.97,430.93,293.32,1302.67,10580.,1556.75,896.35,553.2,3
     3388.82,294.95,553.64,493.83,567.88,457.52,379.3,322.32,282.48,259.9
     446,273.61,279.78,277.09,272.2,266.3,262.48,4421.,4301.,4187.,4091.,
     555184.,4879.,4688.,4548.,6435.,5650.,5264.,5006.,7673.,6312.,5777.,
     665422.,7571.,6513.,5970.,5625.,6364.,6009.,5739.,5534.,3335.,3015.,
     772661.,3868.,3586.,3316.,4295.,3988.,3755.,4657.,4296.,4072.,5060.,
     884540.,4323.,5409.,4768.,4529.,1656.,1197.,1100.,0.,0.,0.,2218.,183
     993.,1413.,1300.,0.,0.,2654.,2344.,1995.,1580.,1400.,0.,3015.,2753.)
      DATA((C(I),I=211,324)=2459.,2118.,1745.,1362.,3308.,3085.,2844.,25
     1176.,2267.,1921.,3553.,3356.,3151.,2929.,2682.,2403.,3755.,3585.,34
     203.,3213.,3007.,2781.,3923.,3763.,3607.,3448.,3272.,3081.,4072.,39
     317.,3772.,3630.,3484.,3327.,4205.,4053.,3917.,3785.,3653.,3518.,43
     423.,4173.,4042.,3920.,3799.,3677.,4426.,4278.,4152.,4036.,3925.,38
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      FUNCTION PHLFAC(PRES,ENTH)
      DIMENSION LOC(19),JP(19),DP(19),DH(19),BP(19),BH(19),MX(19),
     1PL(19),HL(19),HG(19),CL(19),CG(19),HS(11),C(735)
      DIMENSION AA(112),AB(112),AC(116),AD(108),AE(106),AF( 96),AG( 85)
      EQUIVALENCE( C,AA),( C( 113),AB),( C( 225),AC),( C( 341),AD)
     1    ,( C( 449),AE),( C( 555),AF),( C( 651),AG)
      DATA LOC/1,29,50,86,149,173,191,269,339,375,407,461,493,517,529,
     1553,577,601,661/
      DATA JP/4,3,4,7,4,3,6,7,6,4,6,4, 4,2,3,3,3,4,5/
      DATA MX/2,1,2,5,2,1,4,5,4,2,4,2,2,0,1,1,1,2,3/
      DATA BP/0.,0.,490.,132.,305.,500.,1000.,2000.,0.,20.,500.,2000.,
     1 0.,0.,0.,-100.,0.,0.,1./
      DATA DP/160.,250.,170.,28.,65.,250.,200.,500.,100.,160.,300.,1000.
     1 ,500.,3000.,1500.,300.,40.,10.,1./
      DATA BH/-135.,-105.,-115.,-45.,-45.,-75.,-95.,-60.,70.,145.,25.,
     1 75.,425.,1800.,11000.,11000.,11000.,11000.,11000./
      DATA DH/5.,10.,5.,15.,23.,20.,10.,15.,15.,40.,50.,50.,275.,1840.,
     1 2000.,2000.,2000.,1000.,1000./
      DATA PL/1.022,2.,4.,8.,14..25.,43.,69.,99.,128.,151.,165.,176.,182
     1.,185.,186.5,187.25,187.46875,187.51/
      DATA HL/-132.8,-129.13,-124.25,-117.79,-110.86,-101.3,-89.04,
     1-74.22,-58.58,-43.43,-30.07,-20.56,-11.13,-4.27,1.17,5.54,10.83,
     214.29,16.36/
      DATA HG/60.31,65.11,70.59,76.35,80.98,85.11,87.40,86.54,81.94,
     174.15,64.83,56.86,47.34,39.56,33.46,28.34,22.31,18.66,16.55/
      DATA HS/-132.82,-113.35,-94.24,-75.47,-57.04,-38.91,-21.05,-3.4,
     114.08,31.36,48.53/
      DATA CG/2.639E+003   ,2.638E+003,2.658E+003,2.719E+003,2.824E+003,
     13.038E+003,3.358E+003,3.861E+003,4.649E+003,5.987E+003,8.220E+003,
     221.152E+004,1.959E+004,3.697E+004,7.380E+004,1.678E+005,6.630E+005,
     333.929E+009,8.667E+008/
      DATA CL/1.507E+003   ,1.802E+003,2.114E+003,2.447E+003,2.751E+003,
     13.148E+003,3.583E+003,4.073E+003,4.659E+003,5.491E+003,6.927E+003,
     229.125E+003,1.352E+004,2.265E+004,4.104E+004,8.249E+004,2.283E+005,
     339.773E+005,1.041E+009/
      DATAAA/1300.,860.8,0.,0.,1775.,1268.,1000.,0.,2077.,1680.,1205.,92
     115.,2355.,2021.,1613.,1200.,2587.,2291.,1957.,1566.,2817.,2523.,223
     223.,1899.,3036.,2750.,2465.,2179.,3036.,2588.,2140.,3423.,3013.,260
     336.,3777.,3371.,3004.,4139.,3687.,3335.,4567.,3987.,3617.,5137.,428
     447.,3868.,6122.,4602.,4091.,1526.,1100.,0.,0.,1876.,1450.,1100.,0.,
     552160.,1796.,1362.,1100.,2395.,2089.,1717.,1663.,2623.,2330.,2021.,
     661643.,2832.,2558.,2267.,1934.,3019.,2769.,2497.,2207.,3190.,2956.,
     772710.,2439.,3348.,3126.,2898.,2654.,180.9,149.8,129.3,141.4,157.8,
     88180.4,214.7,228.6,229.8,192.4,192.8,198.1,207.5,223.3,177.2,221.4,
     99371.6,301.,268.8,250.6,241.3,0.,1799.,1458.,557.5,389.4,311.4/
      DATAAB/263.6,0.,53610.,3967.,1197.,582.6,384.5,286.3,0.,1.981E5,21
     1580.,1844.,746.,430.9,293.3,1303.,10580.,1557.,896.3,553.2,388.8,2
     2295.,553.6,493.8,567.9,457.5,379.3,322.3,282.5,260.,273.6,279.8,277
     33.1,272.2,266.3,262.5,4421.,4301.,4187.,4091.,5184.,4879.,4688.,454
     448.,6435.,5650.,5264.,5006.,7673.,6312.,5777.,5422.,7571.,6513.,597
     550.,5625.,6364.,6009.,5739.,5534.,3335.,3015.,2661.,3868.,3586.,331
     666.,4295.,3988.,3755.,4657.,4296.,4072.,5060.,4540.,4323.,5409.,476
     778.,4529.,1656.,1197.,1100.,0.,0.,0.,2218.,1833.,1413.,1300.,0.,0.,
     882654.,2344.,1995.,1580.,1400.,0.,3015.,2753.,2459.,2118.,1745.,136
     992.,3308.,3085.,2844.,2576.,2267.,1921.,3553.,3356.,3151.,2929./
      DATAAC/2682.,2403.,3755.,3585.,3403.,3213.,3007.,2781.,3923.,3763.
     11,3607.,3448.,3272.,3081.,4072.,3917.,3772.,3630.,3484.,3327.,4205.
     22,4053.,3917.,3785.,3653.,3518.,4323.,4173.,4042.,3920.,3799.,3677.
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  514.,4515.,4370.,4247.,4137.,4033.,3931.,1668.,885.,0.,0.,0.,0.,0.,
  62427.,1576.,1300.,0.,0.,0.,0.,2968.,2324.,1474.,1200.,0.,0.,0.,333
  72.,2880.,2236.,1440.,1100.,0.,0.,3619.,3261.,2790.,2162.,1360.,100
  80.,0.,3814.,3520.,3194.,2743.,2104.,1423.,1000.,3983.,3733.,3471.,
  93135.,2685.,2050.,1342.,4120.,3901.,3668.,3415.,3096.,2646.,2015.)
    P=PRES
    H=ENTH
    R=1.0
    IF(P.LT.1.0) P=1.0
    IF(H.GE.425.) GO TO 12
    IF(P.LT.500.) GO TO 6
    IF(P.LT.2000.) GO TO 2
    IF(H.LT.75.) GO TO 1
    N=12
    GO TO 33
  1 N=8
    GO TO 22
  2 IF(H.LT.25.) GO TO 3
    N=11
    GO TO 33
  3 IF(P.GE.1000.) GO TO 5
    IF(H.LT.-75.) GO TO 4
    N=6
    GO TO 33
  4 N=3
    GO TO 22
  5 N=7
    GO TO 22
  6 IF(H.LT.-45.) GO TO 11
    IF(H.GE.70.) GO TO 9
    IF(P.LT.300.) GO TO 7
    N=5
    GO TO 33
  7 N=4
    R=H-31.225
    IF(R.LT.0.0) R=-R
    IF(P.LT.187.51) GO TO 8
    R=1.0/(3.1136694+.2115577*(P-187.51)+.4487232*R-.004707536*R*
   1(P-187.51))
    GO TO 33
  8 R=1.0/(3.1136694-.2115577*(P-187.51)+.4487232*R+.004707536*R*
   1(P-187.51))
    GO TO 17
  9 IF(H.GE.145.) GO TO 10
    N=9
    IF(P.GE.140.) GO TO 33
    IF(H.GE.88.) GO TO 33
    GO TO 17
 10 N=10
    GO TO 33
 11 IF(H.LT.-105.) GO TO 21
    N=2
    IF(P.LT.125.) GO TO 17
    GO TO 33
 12 IF(H.LT.11000.) GO TO 26
    IF(P.GE.80.) GO TO 15
    IF(P.GE.30.) GO TO 14
    IF(P.GE.5.) GO TO 13
```

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  3,4426.,4278.,4152.,4036.,3925.,3814.,4515.,4370.,4247.,4137.,4033.
  4,3931.,1668.,885.,0.,0.,0.,0.,0.,2427.,1576.,1300.,0.,0.,0.,0.,296
  58.,2324.,1474.,1200.,0.,0.,0.,3332.,2880.,2236.,1440.,1100.,0.,0.,
  63619.,3261.,2790.,2162.,1360.,1000.,0.,3814.,3520.,3194.,2743.,210
  74.,1423.,1000.,3983.,3733.,3471.,3135.,2685.,2050.,1342.,4120.,390
  81.,3668.,3415.,3096.,2646.,2015.,4235.,4038.,3836.,3614.,3369.,305
  99.,2617.,4332.,4151.,3972.,3782.,3569.,3333.,3020.,2566.,6730./
   DATAAD/7006.,6394.,5874.,5534.,2537.,4474.,5600.,5698.,5519.,5358.
  1,2635.,3930.,4810.,5142.,5173.,5147.,2718.,3608.,4321.,4712.,4875.
  2,4934.,2795.,3478.,4047.,4423.,4634.,4744.,2852.,3400.,3875.,4226.
  3,4445.,4584.,2959.,3808.,4354.,4584.,3066.,3585.,4003.,4294.,3190.
  4,3576.,3900.,4158.,3334.,3641.,3910.,4131.,3516.,3761.,3981.,4149.
  5,3706.,3901.,4088.,4260.,3937.,4115.,4279.,4427.,4180.,4331.,4471.
  6,4599.,5518.,4630.,4439.,4247.,4084.,3931.,5564.,5008.,4740.,4568.
  7,4444.,4332.,4804.,4859.,4796.,4712.,4627.,4548.,4350.,4603.,4707.
  8,4731.,4715.,4679.,4158.,4464.,4631.,4720.,4759.,4766.,4136.,4427.
  9,4577.,4698.,4774.,4816.,4189.,4460.,4654.,4793.,4890.,4952./
   DATAAE/4384.,4621.,4799.,4932.,5032.,5103.,4599.,4802.,4958.,5082.
  1,5185.,5253.,4332.,3972.,3596.,3035.,4548.,4298.,4055.,3755.,4679.
  2,4507.,4299.,4081.,4766.,4678.,4522.,4332.,4816.,4817.,4711.,4556.
  3,4952.,5000.,4915.,4758.,5103.,5186.,5138.,5014.,5253.,5371.,5338.
  4,5248.,4222.,4644.,4983.,5040.,5561.,5710.,5820.,5870.,5904.,5996.
  5,6042.,6083.,5868.,5928.,5980.,6010.,5800.,5840.,5876.,5905.,5782.
  6,5806.,5829.,5846.,5782.,5899.,6231.,6138.,6695.,6635.,7186.,7528.
  7,7685.,7967.,8487.,8439.,8130.,8298.,8460.,8699.,8793.,8951.,9502.
  8,9422.,9526.,10890.,10370.,10330.,13020.,11800.,11430.,15840.,1373
  90.,13010.,19160.,16120.,14980.,22750.,18810.,17270.,8165.,8160./
   DATAAF/8186.,9009.,8755.,8719.,10770.,9711.,9412.,14160.,11420.,10
  1710.,19000.,14050.,12670.,24480.,17410.,15490.,30290.,21220.,18440
  2.,36150.,25260.,21830.,8211.,8176.,8121.,9247.,8892.,8768.,11580.,
  310540.,10080.,15760.,13490.,12450.,20860.,17670.,15870.,26930.,226
  410.,20030.,33110.,27810.,24720.,39280.,33110.,29470.,8342.,8237.,8
  5200.,8185.,8988.,8693.,8587.,8540.,10070.,9406.,9160.,9049.,11750.
  6,10500.,10000.,9804.,14050.,12060.,11210.,10890.,16890.,14030.,128
  740.,12330.,20130.,16430.,14840.,14130.,23630.,19180.,17140.,16220.
  8,27300.,22090.,19680.,18560.,31060.,25150.,22370.,21060.,34850.,28
  9290.,25170.,23690.,38650.,31480.,28110.,26390.,42420.,34680./
   DATAAG/31010.,29130.,46160.,37860.,33930.,31890.,49840.,41030.,368
  120.,34650.,8508.,8393.,8342.,8311.,8289.,9407.,9102.,8984.,8899.,8
  2840.,10910.,10300.,10050.,9869.,9739.,13230.,12130.,11700.,11360.,
  311130.,16200.,14620.,13940.,13420.,13050.,19680.,17660.,16690.,159
  490.,15480.,23550.,21040.,19830.,18950.,18300.,27650.,24720.,23230.
  5,22180.,21400.,31810.,28500.,26800.,25590.,24700.,36030.,32440.,30
  6460.,29120.,28100.,40240.,36330.,34170.,32690.,31570.,44440.,40230
  7.,37880.,36280.,35060.,48600.,44090.,41580.,39860.,38550.,52690.,4
  87920.,45240.,43400.,42010.,56720.,51680.,48860.,46910.,45430./
   P=PRES
   H=ENTH
   R=1.0
   IF(P.LT.1.0) P=1.0
   IF(H.GE.425.) GO TO 12
   IF(P.LT.500.) GO TO 6
   IF(P.LT.2000.) GO TO 2
   IF(H.LT.75.) GO TO 1
   N=12
   GO TO 33
 1 N=8
   GO TO 22
```

```
      N=19
      GO TO 33
   13 N=18
      GO TO 33
   14 N=17
      GO TO 33
   15 IF(P.GT.500.) GO TO 16
      N=16
      GO TO 33
   16 N=15
      GO TO 33
   17 OO 18 I=2,18
      IF(P-PL(I))19,19,18
   18 CONTINUE
   19 O=PL(I)-PL(I-1)
      OF=PL(I)-P
      OB=P-PL(I-1)
      HGAS=(HG(I)*OB+HG(I-1)*OF)/O
      IF(H.GE.HGAS) GO TO 33
      HLIQ=(HL(I)*OB+HL(I-1)*OF)/O
      IF(H.LE.HLIQ) GO TO 33
      CLIQ=(CL(I)*OB+CL(I-1)*OF)/O
      PHLFAC=((CG(I)*OB+CG(I-1)*OF)/O-CLIQ)*(H-HLIQ)/(HGAS-HLIQ)+CLIQ
      RETURN
   21 N=1
      IF(H.LE.(-132.82+0.04*P)) GO TO 22
      IF(P.LT.23.) GO TO 17
      GO TO 33
   22 PR=P/500.0
      I=PR
      IF(I.GT.9) I=9
      F=PR-I
      HSOL=F*HS(I+2)+(1.0-F)*HS(I+1)
      IF(H.LT.HSOL) H=HSOL
      GO TO 33
   26 IF(H.LT.1800.) GO TO 27
      N=14
      GO TO 33
   27 N=13
   33 FP=(P-BP(N))/OP(N)
      IP=FP
      IF(IP.GT.MX(N))IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FH=(H-BH(N))/OH(N)
      IH=FH
      FF=FH-IH
      FH=1.0-FF
      I=IH*JP(N)+IP+LOC(N)
      J=I+JP(N)
      PHLFAC=(FP*FH*C(I)+F*FH*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))/R
      RETURN
      ENO

      SUBROUTINE LFACOATA
      COMMON/OATLFAC/C(735)
      OATA((C(I),I=325,430)=4235.,4038.,3836.,3614.,3369.,3059.,2617.,43
     132.,4151.,3972.,3782.,3569.,3333.,3020.,2566.,6730.,7006.,6394.,58
```

```
      2 IF(H.LT.25.) GO TO 3
        N=11
        GO TO 33
      3 IF(P.GE.1000.) GO TO 5
        IF(H.LT.-75.) GO TO 4
        N=6
        GO TO 33
      4 N=3
        GO TO 22
      5 N=7
        GO TO 22
      6 IF(H.LT.-45.) GO TO 11
        IF(H.GE.70.) GO TO 9
        IF(P.LT.300.) GO TO 7
        N=5
        GO TO 33
      7 N=4
        R=H-31.225
        IF(R.LT.0.0) R=-R
        IF(P.LT.187.51) GO TO 8
        R=1.0/(3.1136694+.2115577*(P-187.51)+.4487232*R-.004707536*R*
       1(P-187.51))
        GO TO 33
      8 R=1.0/(3.1136694-.2115577*(P-187.51)+.4487232*R+.004707536*R*
       1(P-187.51))
        GO TO 17
      9 IF(H.GE.145.) GO TO 10
        N=9
        IF(P.GE.140.) GO TO 33
        IF(H.GE.88.) GO TO 33
        GO TO 17
     10 N=10
        GO TO 33
     11 IF(H.LT.-105.) GO TO 21
        N=2
        IF(P.LT.125.) GO TO 17
        GO TO 33
     12 IF(H.LT.11000.) GO TO 26
        IF(P.GE.80.) GO TO 15
        IF(P.GE.30.) GO TO 14
        IF(P.GE.5.) GO TO 13
        N=19
        GO TO 33
     13 N=18
        GO TO 33
     14 N=17
        GO TO 33
     15 IF(P.GT.500.) GO TO 16
        N=16
        GO TO 33
     16 N=15
        GO TO 33
     17 OO 18 I=2,18
        IF(P-PL(I))19,19,18
     18 CONTINUE
     19 O=PL(I)-PL(I-1)
        OF=PL(I)-P
        OB=P-PL(I-1)
```

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274.,5534.,2537.,4474.,5600.,5698.,5519.,5358.,2635.,3930.,4810.,51
342.,5173.,5147.,2718.,3608.,4321.,4712.,4875.,4934.,2795.,3478.,40
447.,4423.,4634.,4744.,2852.,3400.,3875.,4226.,4445.,4584.,2959.,38
508.,4354.,4584.,3066.,3585.,4003.,4294.,3190.,3576.,3900.,4158.,33
634.,3641.,3910.,4131.,3516.,3761.,3981.,4149.,3706.,3901.,4088.,42
760.,3937.,4115.,4279.,4427.,4180.,4331.,4471.,4599.,5518.,4630.,44
839.,4247.,4084.,3931.,5564.,5008.,4740.,4568.,4444.,4332.,4804.,48
959.,4796.,4712.,4627.,4548.,4350.,4603.,4707.,4731.,4715.,4679.)
 DATA((C(I),I=431,532)=4158.,4464.,4631.,4720.,4759.,4766.,4136.,44
127.,4577.,4698.,4774.,4816.,4189.,4460.,4654.,4793.,4890.,4952.,43
284.,4621.,4799.,4932.,5032.,5103.,4599.,4802.,4958.,5082.,5185.,52
353.,4332.,3972.,3596.,3035.,4548.,4298.,4055.,3755.,4679.,4507.,42
499.,4081.,4766.,4678.,4522.,4332.,4816.,4817.,4711.,4556.,4952.,50
500.,4915.,4758.,5103.,5186.,5138.,5014.,5253.,5371.,5338.,5248.,42
622.,4644.,4983.,5040.4,5561.,5710.,5820.,5870.,5904.,5996.,6042.1,
76083.,5868.4,5928.1,5980.1,6010.,5800.2,5840.1,5875.7,5905.,5782.1
8,5806.5,5828.6,5846.,5782.1,5898.9,6230.9,6138.,6695.4,6635.,7185.
98,7528.,7685.,7966.8,8487.,8438.7,8130.,8297.6,8459.8,8699.)
 DATA((C(I),I=533,624)=8792.7,8951.3,9502.,9422.4,9525.7,10891.,103
172.,10326.,13023.,11796.,11431.,15844.,13735.,13010.,19162.,16118.
2,14985.,22751.,18812.,17268.,8165.,8159.9,8186.3,9009.,8754.5,8718
3.8,10773.,9711.4,9412.,14159.,11416.,10714.,19005.,14050.,12675.,2
44477.,17405.,15489.,30287.,21217.,18443.,36152.,25265.,21827.,8211
5.,8176.,8121.,9247.,8892.1,8768.,11581.,10545.,10085.,15758.,13490
6.,12450.,20859.,17667.,15872.,26929.,22613.,20032.,33110.,27810.,2
74721.,39285.,33105.,29472.,8342.,8237.,8200.4,8184.8,8988.3,8692.7
8,8586.8,8540.,10073.,9405.5,9159.7,9048.6,11751.,10501.,10000.,980
94.2,14052.,12056.,11209.,10886.,16890.,14032.,12840.,12332.)
 DATA((C(I),I=625,715)=20130.,16429.,14840.,14128.,23635.,19175.,17
1144.,16225.,27300.,22092.,19677.,18558.,31062.,25148.,22373.,21065
2.,34850.,28292.,25174.,23692.,38652.,31476.,28110.,26390.,42419.,3
34677.,31013.,29135.,46159.,37863.,33925.,31892.,49838.,41030.,3682
43.,34650.,8508.1,8393.2,8341.6,8310.7,8289.5,9406.8,9101.8,8984.3,
58899.2,8840.5,10909.,10304.,10055.,9869.1,9739.1,13234.,12134.,116
697.,11363.,11126.,16202.,14618.,13935.,13423.,13054.,19676.,17660.
7,16687.,15989.,15479.,23550.,21037.,19826.,18949.,18300.,27655.,24
8721.,23228.,22183.,21405.,31813.,28502.,26798.,25595.,24696.,36027
9.,32437.,30461.,29116.,28105.,40245.,36335.,34169.,32687.,31571.)
 OATA((C(I),I=716,735)=44441.,40228.,37884.,36278.,35064.,48597.,44
1093.,41584.,39856.,38548.,52692.,47918.,45244.,43404.,42011.,56719
2.,51683.,48858.,46913.,45434.)
 ENO
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      HGAS=(HG(I)*DB+HG(I-1)*DF)/D
      IF(H.GE.HGAS) GO TO 33
      HLIQ=(HL(I)*DB+HL(I-1)*DF)/D
      IF(H.LE.HLIQ) GO TO 33
      CLIQ=(CL(I)*DB+CL(I-1)*DF)/O
      PHLFAC=((CG(I)*DB+CG(I-1)*DF)/D-CLIQ)*(H-HLIQ)/(HGAS-HLIQ)+CLIQ
      RETURN
   21 N=1
      IF(H.LE.(-132.82+0.04*P)) GO TO 22
      IF(P.LT.23.) GO TO 17
      GO TO 33
   22 PR=P/500.0
      I=PR
      IF(I.GT.9) I=9
      F=PR-I
      HSOL=F*HS(I+2)+(1.0-F)*HS(I+1)
      IF(H.LT.HSOL) H=HSDL
      GO TO 33
   26 IF(H.LT.1800.) GO TO 27
      N=14
      GO TO 33
   27 N=13
   33 FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N))IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FH=(H-BH(N))/DH(N)
      IH=FH
      FF=FH-IH
      FH=1.0-FF
      I=IH*JP(N)+IP+LDC(N)
      J=I+JP(N)
      PHLFAC=(FP*FH*C(I)+F*FH*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))/R
      RETURN
      END
```

```
      FUNCTIDN ETENTH(PRES,TEMP)
      DIMENSIDN LDC(29),JP(24),MX(24),BP(24),DP(24),BT(29),DT(24),PS(20)
     1,TS(20),TL(10),HS(10)
      COMMDN/ETENTHAL/H(1183)
      DATA(LDC=1,16,31,46,90,145,157,177,195,231,261,279,306,378,441,468
     1,558,612,642,682,847,892,1028,1073,1103,1112,1121,1130,1160)
      DATA(JP=3,3,3,4,5,2,5,3,6,5,3,3,6,9,9,9,9,5,5,11,9,17,5,5)
      DATA(MX=1,1,1,2,3,0,3,1,4,3,1,1,4,7,7,7,7,3,3,9,7,15,3,3)
      DATA(BP=0,-100.,0,0,.999999,0,300.,2645.28,1175.68,587.84,0,2645.2
     18,1175.68,0,587.84,587.84,293.92,0,440.88,293.92,176.352,176.352,0
     2,117.568)
      DATA(DP=1500.,300.,40.,10.,1.,5000.,1100.,1175.68,293.92,146.96,
     1293.92,1175.68,293.92,146.96,73.48,73.48,36.74,73.48,36.74,14.696,
     214.696,7.348,44.088,14.696)
      DATA(BT=3000.,3000.,3000.,3000.,3000.,500.,170.,90.,90.,90.,90.,
     132.4,30.6,27.,75.6,59.4,72.,72.,59.4,59.4,64.8,59.4,28.8,54.,5000.
     2,5000.,5000.,5000.,5000.)
      DATA(DT=500.,500.,500.,200.,200.,500.,110.,18.,18.,18.,18.,7.2,5.4
     1,5.4,7.2,1.8,3.6,3.6,1.8,.9,1.8,.9,5.4,1.8)
      DATA(PS=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
     1.,185.,186.5,187.25,187.46875,187.506,187.6385)
      DATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
     179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4)
      DATA(TL=24.846,27.175,29.310,31.299,33.176,34.962,36.672,38.317,
     139.904,41.456)
      DATA(HS=-157.82,-136.56,-115.76,-95.46,-75.59,-56.08,-36.93,-17.99
     1,0.69,19.30)
      DATA((H(I),I=1, 15)=10720.,10750.,10780.,12690.,12720.,12750.,1478
     10.,14780.,14810.,17060.,16960.,16960.,19700.,19330.,19260.)
      DATA((H(I),I=157,176)=586.9,552.7,544.3,552.3,568.7,955.3,948.4,95
     10.8,960.5,975.6,1314.,1323.,1335.,1350.,1368.,1686.,1705.,1724.,17
     242.,1761.)
      DATA((H(I),I=16, 30)=10720.,10720.,10730.,12710.,12700.,12700.,149
     120.,14810.,14780.,17620.,17140.,17030.,21390.,19940.,19580.)
      DATA((H(I),I=31, 45)=10720.,10720.,10720.,12730.,12710.,12700.,150
     120.,14910.,14850.,18000.,17550.,17330.,22560.,21170.,20520.)
      DATA((H(I),I=46, 89)=10720.,10720.,10720.,10720.,11520.,11500.,115
     100.,11520.,12360.,12320.,12310.,12320.,13260.,13180.,13150.,13160.
     2,14250.,14090.,14040.,14050.,15400.,15090.,14980.,14940.,16780.,16
     3220.,16030.,16030.,18500.,17540.,17200.,17120.,20680.,19110.,18560
     4.,18430.,23480.,21030.,20170.,19980.,27100.,23410.,22100.,21520.)
      DATA((H(I),I=90,144)=10720.,10720.,10720.,10720.,10720.,11540.,115
     120.,11520.,11510.,11510.,12410.,12370.,12360.,12350.,12340.,13390.
     2,13300.,13260.,13230.,13220.,14520.,14330.,14250.,14210.,14170.,15
     3900.,15560.,15400.,15310.,15250.,17680.,17060.,16780.,16620.,16500
     4.,20030.,18970.,18490.,18210.,18020.,23180.,21440.,20670.,20210.,1
     59890.,27390.,24680.,23470.,22750.,22260.,32960.,28900.,27080.,2600
     60.,25260.)
      DATA((H(I),I=145,156)=1681.,1766.,3407.,3524.,5151.,5272.,6935.,70
     156.,8783.,8901.,10720.,10820.)
      DATA((H(I),I=1103,1111)=19700.,19330.,19260.,23000.,22040.,21810.,
     127350.,25260.,24730.)
      DATA((H(I),I=1112,1120)=21390.,19940.,19580.,27180.,23580.,22680.,
     136230.,28590.,26650.)
      DATA((H(I),I=1121,1129)=22560.,21170.,20520.,30320.,26640.,25020.,
     142210.,35060.,31640.)
      DATA((H(I),I=1160,1183)=27100.,23410.,22100.,21520.,31750.,26350.,
     124440.,23590.,37610.,30000.,27280.,26070.,44900.,34480.,30730.,290
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      FUNCTION ETENTH(PRES,TEMP)
      DIMENSION LDC(29),JP(24),MX(24),BP(24),DP(24),BT(29),DT(24),PS(20)
     1,TS(20),TL(10),HS(10),H(1183)
      DIMENSION AA( 93),AB(100),AC(109),AD(101),AE(101),AF(110),AG(103)
     1 ,AH(110),AI(107),AJ(110),AK(102),AL( 37)
      EQUIVALENCE( H,AA),( H(  94),AB),( H( 194),AC),( H( 303),AD)
     1    ,( H( 404),AE),( H( 505),AF),( H( 615),AG),( H( 718),AH)
     2    ,( H( 828),AI),( H( 935),AJ),( H(1045),AK),( H(1147),AL)
      DATA LDC/1,16,31,46,90,145,157,177,195,231,261,279,306,378,441,468
     1,558,612,642,682,847,892,1028,1073,1103,1112,1121,1130,1160/
      DATA JP/3,3,3,4,5,2,5,3,6,5,3,3,6,9,9,9,9,5,5,11,9,17,5,5/
      DATA MX/1,1,1,2,3,0,3,1,4,3,1,1,4,7,7,7,7,3,3,9,7,15,3,3/
      DATA BP/0.,-100.,0.,0.,.999999,0.,300.,2645.28,1175.68,587.84,0.,
     12645.28,1175.68,0.,587.84,587.84,293.92,0.,440.88,293.92,176.352,
     2176.352,0.,117.568/
      DATA DP/1500.,300.,40.,10.,1.,5000.,1100.,1175.68,293.92,146.96,
     1293.92,1175.68,293.92,146.96,73.48,73.48,36.74,73.48,36.74,14.696,
     214.696,7.348,44.088,14.696/
      DATA BT/3000.,3000.,3000.,3000.,3000.,500.,170.,90.,90.,90.,90.,
     132.4,30.6,27.,75.6,59.4,72.,72.,59.4,59.4,64.8,59.4,28.8,54.,5000.
     2,5000.,5000.,5000.,5000./
      DATA DT/500.,500.,500.,200.,200.,500.,110.,18.,18.,18.,18.,7.2,5.4
     1,5.4,7.2,1.8,3.6,3.6,1.8,.9,1.8,.9,5.4,1.8/
      DATA PS/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
     1.,185.,186.5,187.25,187.46875,187.506,187.6385/
      DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
     179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4/
      DATA TL/24.846,27.175,29.310,31.299,33.176,34.962,36.672,38.317,
     139.904,41.456/
      DATA HS/-157.82,-136.56,-115.76,-95.46,-75.59,-56.08,-36.93,-17.99
     1,0.69,19.30/
      DATAAA/10720.,10750.,10780.,12690.,12720.,12750.,14780.,14780.,148
     110.,17060.,16960.,16960.,19700.,19330.,19260.,10720.,10720.,10730.
     2,12710.,12700.,12700.,14920.,14810.,14780.,17620.,17140.,17030.,21
     3390.,19940.,19580.,10720.,10720.,10720.,12730.,12710.,12700.,15020
     4.,14910.,14850.,18000.,17550.,17330.,22560.,21170.,20520.,10720.,1
     50720.,10720.,10720.,11520.,11500.,11500.,11520.,12360.,12320.,1231
     560.,12320.,13260.,13180.,13150.,13160.,14250.,14090.,14040.,14050.,
     715400.,15090.,14980.,14940.,16780.,16220.,16030.,16030.,18500.,175
     840.,17200.,17120.,20680.,19110.,18560.,18430.,23480.,21030.,20170.
     9,19980.,27100.,23410.,22100.,21520.,10720.,10720.,10720./
      DATAAB/10720.,11540.,11520.,11520.,11510.,11510.,12410.,12370.,123
     160.,12350.,12340.,13390.,13300.,13260.,13230.,13220.,14520.,14330.
     2,14250.,14210.,14170.,15900.,15560.,15400.,15310.,15250.,17680.,17
     3060.,16780.,16620.,16500.,20030.,18970.,18490.,18210.,18020.,23180
     4.,21440.,20670.,20210.,19890.,27390.,24680.,23470.,22750.,22260.,3
     52960.,28900.,27080.,26000.,25260.,1681.,1766.,3407.,3524.,5151.,52
     672.,6935.,7056.,8783.,8901.,10720.,10820.,586.9,552.7,544.3,552.3,
     7568.7,955.3,948.4,950.8,960.5,975.6,1314.,1323.,1335.,1350.,1368.,
     81686.,1705.,1724.,1742.,1761.,171.5,198.4,228.3,263.6,285.9,313.1,
     99352.7,370.5,395.2,436.4,450.7,472.9,514.8,526.7,547.,588.5,598.9/
      DATAAC/616.3,157.6,155.6,157.2,160.9,165.8,171.5,266.1,258.9,256.6
     1,257.2,259.8,263.6,364.1,355.6,351.2,349.8,350.5,352.7,450.6,442.7
     22,437.8,435.6,435.3,436.4,528.3,521.6,517.2,514.8,514.1,514.8,601.3
     33,594.3,592.4,590.4,588.4,588.5,195.7,178.5,167.6,161.2,157.6,305.6
     44,292.1,280.9,272.4,266.1,396.9,386.7,377.8,370.2,364.1,476.7,469.,
     55462.,455.8,450.6,548.9,542.8,537.4,532.5,528.3,618.3,614.,609.8,60
     665.5,601.3,291.5,244.,195.7,370.6,337.4,305.6,445.1,420.,396.9,514.
```

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250.,53610.,39900.,34870.,32610.,63710.,46340.,39810.,36850.)
 DATA((H(I),I=1130,1159)=32960.,28900.,27090.,26000.,25260.,40130.,
134330.,31710.,30130.,29050.,49050.,41170.,37530.,35320.,33810.,596
210.,49530.,44710.,41750.,39690.,71190.,59240.,53210.,49420.,46750.
3,82920.,69950.,62910.,58310.,55020.)
 P=PRES
 IF(P.LT.1.0) P=1.0
 T=TEMP
 IF(T.LT.90.0) GO TO 10
 IF(T.LT.3000.0) GO TO 5
 IF(T.GE.6000.0)T=5999.9999
 IF(P.LT.30.0) GO TO 3
 IF(P.LT.80.0) GO TO 2
 IF(P.LT.500.0) GO TO 1
 N=1
 N1=25
 GO TO 33
 1 N=2
 N1=26
 GO TO 33
 2 N=3
 N1=27
 GO TO 33
 3 IF(P.LT.5.0) GO TO 4
 N=4
 N1=29
 GO TO 33
 4 N=5
 N1=28
 GO TO 33
 5 IF(T.LT.180.0) GO TO 70
 IF(T.LT.500.0) GO TO 6
 N=6
 GO TO 33
 6 N=7
 GO TO 33
70 IF(P.LT.1175.68) GO TO 8
 IF(P.LT.2645.28) GO TO 7
 N=8
 GO TO 33
 7 N=9
 GO TO 33
 8 IF(P.LT.587.84) GO TO 9
 N=10
 GO TO 33
 9 N=11
 GO TO 33
10 IF(P.LT.1175.68) GO TO 12
 IF(P.LT.2645.28) GO TO 11
 N=12
 GO TO 30
11 N=13
 GO TO 30
12 IF(T.GE.59.4) GO TO 15
 N=14
 IF(P.GE.187.6385) GO TO 30
 DO 13 I=2,20
 IF(P-PS(I))14,14,13
```

```
7,494.3,476.7,578.5,562.7,548.9,635.3,626.8,618.3,-36.36,-.4208,35.
879,-23.08,12.56,47.71,-6.59,28.33,62.96,14.03,48.09,82.13,39.11,72
9.05,105.4,68.26,99.93,132.5,100.7,130.9,162.7,135.4,164.1,194.9/
 DATAAO/171.5,198.4,228.3,-85.42,-76.04,-66.75,-57.54,-48.41,-39.52
1,-75.6,-66.48,-57.32,-48.2,-39.09,-29.88,-63.81,-54.98,-46.08,-37.
217,-28.23,-19.16,-49.69,-41.27,-32.69,-24.04,-15.33,-6.59,-32.86,-
324.95,-16.8,-8.457,-.03691,8.603,-13.09,-5.91,1.75,9.69,17.79,26.1
49,9.652,15.95,22.94,30.41,38.13,46.17,35.18,40.3,46.52,53.41,60.69
5,68.26,63.22,66.87,72.16,78.37,85.15,91.42,93.32,95.24,99.42,104.9
6,111.1,117.9,125.1,125.,128.,132.6,138.1,144.5,157.6,155.6,157.2,1
760.9,165.8,171.5,-129.4,-124.6,-119.8,-115.,-110.3,-105.5,-100.8,-
896.05,-91.34,-119.2,-114.7,-110.2,-105.6,-101.,-96.3,-91.67,-87.,-
982.2,-106.6,-102.6,-98.44,-94.16,-89.78,-85.37,-80.89,-76.41/
 DATAAE/-71.76,-90.54,-87.48,-84.,-80.23,-76.24,-72.14,-67.96,-63.7
1,-59.25,-68.68,-67.95,-65.92,-63.08,-59.75,-56.15,-52.35,-48.43,-4
24.26,-32.29,-40.58,-42.88,-41.92,-39.75,-36.91,-33.71,-30.25,-26.4
35,53.77,-4.132,-11.72,-15.64,-15.62,-14.11,-11.78,-8.972,-5.682,87
4.21,81.41,77.7,75.35,73.9,73.07,72.73,72.75,73.18,143.4,134.3,127.
58,123.1,119.8,117.5,115.9,114.9,114.5,195.7,187.1,178.5,173.1,167.
66,164.4,161.2,159.4,157.6,-15.62,-14.87,-14.11,-12.95,-11.78,-10.3
78,-8.972,-7.402,-5.682,-6.565,-6.265,-5.655,-4.775,-3.705,-2.505,-
81.175,.2448,1.895,3.062,2.942,3.262,3.882,4.732,5.772,6.952,8.262,
99.652,13.25,12.63,12.58,12.91,13.54,14.39,15.42,16.57,18.,24.07/
 DATAAF/22.85,22.36,22.37,22.74,23.37,24.22,25.22,26.52,35.52,33.58
1,32.6,32.22,32.29,32.69,33.34,34.18,35.18,47.59,44.82,43.26,42.46,
242.19,42.34,42.77,43.42,44.41,60.27,56.56,54.34,53.08,52.45,52.3,5
32.49,52.95,53.76,73.69,68.77,65.85,64.05,63.03,62.55,62.48,62.73,6
43.22,87.21,81.41,77.7,75.35,72.9,73.07,72.73,72.75,73.18,129.2,114
5.2,99.6,87.29,78.08,71.44,66.61,63.01,60.27,156.4,144.8,133.1,121.
67,111.7,103.2,96.55,91.31,87.21,180.2,170.8,161.2,151.6,142.5,134.
71,126.7,120.5,115.2,202.5,194.5,186.2,178.1,170.1,162.4,155.3,149.
8,143.4,223.7,216.6,209.4,202.3,195.3,188.4,181.9,175.8,169.6,244.,
9238.,231.9,225.9,219.8,213.8,207.8,201.7,195.7,211.5,195.7,177.5/
 DATAAG/155.9,129.3,227.,212.4,196.1,177.5,156.4,242.7,229.2,214.4,
1198.1,180.2,258.8,246.2,232.7,218.1,202.5,275.,263.3,250.8,237.6,2
223.7,291.5,279.6,267.8,255.9,244.,-15.64,-15.86,-15.9,-15.82,-15.6
32,-5.435,-6.025,-6.375,-6.535,-6.565,5.672,4.572,3.832,3.352,3.062
4,17.77,16.,14.74,13.86,13.25,31.06,28.38,26.46,25.08,24.07,45.63,4
51.77,39.02,37.01,35.52,61.41,56.17,52.41,49.66,47.59,78.08,71.44,6
66.61,63.01,60.27,-11.71,-12.49,-13.15,-13.68,-14.15,-14.53,-14.85,
7-15.11,-15.33,-15.51,-15.64,-5.126,-6.216,-7.106,-7.856,-8.486,-9.
8006,-9.466,-9.836,-10.17,-10.43,-10.57,2.125,.6148,-.6052,-1.615,-
92.465,-3.185,-3.785,-4.305,-4.745,-5.125,-5.435,10.25,8.118,6.438/
 DATAAH/5.068,3.938,2.998,2.188,1.508,.9279,.4279,.09789,19.54,16.4
18,14.16,12.31,10.81,9.572,8.522,7.632,6.872,6.222,5.672,30.23,25.9
24,22.69,20.21,18.22,16.59,15.24,14.1,13.13,12.3,11.7,42.85,36.57,3
32.24,28.86,26.24,24.13,22.4,20.95,19.72,18.67,17.77,56.96,48.75,42
4.76,38.31,34.96,32.25,30.05,28.22,26.68,25.38,24.39,70.87,61.71,54
5.36,48.72,44.36,40.99,38.21,35.94,34.04,32.43,31.06,82.67,74.3,66.
63,59.71,54.45,50.25,46.87,44.12,41.8,39.85,38.32,94.5,86.05,78.07,
770.98,65.01,60.09,56.05,52.73,49.95,47.62,45.63,103.9,96.67,89.08,
881.97,75.61,70.16,65.55,61.7,58.46,55.72,53.5,113.3,106.3,99.23,92
9.39,86.,80.24,75.23,70.92,67.24,64.1,61.41,121.3,115.1,108.6/
 DATAAI/102.1,95.9,90.12,84.86,80.24,76.2,72.7,69.73,129.2,123.2,11
17.2,111.3,105.4,99.6,94.67,89.75,85.45,81.76,78.08,127.,120.2,112.
24,103.5,93.26,81.3,67.73,54.02,43.09,138.2,132.2,125.7,118.5,110.6
3,101.7,91.87,81.31,70.87,148.2,143.6,138.,132.,125.6,118.6,111.,10
42.9,94.5,158.5,154.5,149.6,144.3,138.7,133.,126.7,120.2,113.3,168.
```

```
   13 CONTINUE
      I=20
   14 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
      IF(T.LE.TM) GO TO 30
      GO TO 23
   15 IF(P.LT.293.92) GO TO 20
      IF(P.GE.587.84) GO TO 18
      IF(T.GE.72.0) GO TO 17
      IF(P.LT.440.88) GO TO 16
      N=19
      GO TO 33
   16 N=20
      GO TO 33
   17 N=17
      GO TO 33
   18 IF(T.LT.75.6) GO TO 19
      N=15
      GO TO 33
   19 N=16
      GO TO 33
   20 IF(T.GE.72.0)GO TO 22
      IF(P.LT.176.352) GO TO 23
      IF(T.LT.65.7) GO TO 21
      N=21
      GO TO 33
   21 N=22
      GO TO 33
   22 N=18
      GO TO 33
   23 N=23
      IF(P.GE.117.568.ANO.T.LE.63.) N=24
      GO TO 33
   30 F=P/587.84
      I=F
      IF(I.GT.8) I=8
      F=F-I
      FP=1.0-F
      TQ=FP*TL(I+1)+F*TL(I+2)
      IF(T.GE.TQ) GO TO 33
      ETENTH=FP*HS(I+1)+F*HS(I+2)
      RETURN
   33 IF(T.LT.5000.)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N1))/OT(N)
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      ETENTH=FP*FT*H(I)+F*FT*H(I+1)+FP*FF*H(J)+F*FF*H(J+1)
      RETURN
      ENO

      SUBROUTINE ETHOATA1
```

```
59,164.5,160.2,155.9,150.5,145.2,139.9,134.6,129.2,79.93,66.59,11.3
6,3.918,.5075,-1.802,-3.602,-5.052,-6.252,-7.272,-8.152,-8.922,-9.6
712,-10.22,-10.77,-11.27,-11.71,90.02,83.58,73.25,54.98,21.88,12.66
8,8.264,5.374,3.244,1.524,.1143,-1.086,-2.106,-3.006,-3.796,-4.496,
9-5.126,100.2,94.23,87.36,78.83,67.23,49.04,29.54,20.61,15.97/
 DATAAJ/12.63,10.13,8.165,6.575,5.205,4.035,3.025,2.125,107.3,102.8
1,97.34,91.12,83.8,74.82,63.27,48.88,36.2,28.22,23.17,19.79,17.04,1
24.85,13.06,11.56,10.25,114.5,110.3,105.7,100.6,94.95,88.54,81.12,7
32.37,62.11,51.17,41.85,34.99,30.1,26.47,23.81,21.48,19.54,120.7,11
47.1,113.1,108.7,104.,98.79,93.07,86.68,79.5,71.49,62.88,54.41,47.1
53,41.26,36.7,33.11,30.23,126.8,123.4,119.8,116.,111.9,107.4,102.7,
697.52,91.9,85.77,79.12,72.07,64.9,58.08,52.1,47.03,42.85,132.6,129
7.4,126.1,122.6,119.,115.,111.,106.5,101.9,96.67,91.49,85.64,79.78,
873.71,67.65,62.3,56.96,71.06,37.36,.06246,.06246,.06246,84.65,57.6
95,.3469,.3469,.3469,98.79,74.09,44.19,1.186,1.186,113.8,92.74/
 DATAAK/64.94,2.945,2.945,130.3,113.5,89.33,54.05,6.054,148.2,134.2
1,116.6,91.72,10.72,167.8,155.9,142.,125.6,103.,189.,178.5,166.9,15
23.8,138.2,211.5,202.,192.1,181.1,168.9,87.79,71.29,54.39,8.994,8.9
394,100.5,89.02,71.72,52.62,39.82,111.5,102.8,91.55,72.75,40.45,121
4.5,114.3,105.9,95.37,79.97,131.1,124.9,117.9,109.9,100.2,140.3,134
5.7,128.7,122.,114.5,19700.,19330.,19260.,23000.,22040.,21810.,2735
60.,25260.,24730.,21390.,19940.,19580.,27180.,23580.,22680.,36230.,
728590.,26650.,22560.,21170.,20520.,30320.,26640.,25020.,42210.,350
860.,31640.,32960.,28900.,27090.,26000.,25260.,40130.,34330.,31710.
9,30130.,29050.,49050.,41170.,37530.,35320.,33810.,59610.,49530./
 DATAAL/44710.,41750.,39690.,71190.,59240.,53210.,49420.,46750.,829
120.,69950.,62910.,58310.,55020.,27100.,23410.,22100.,21520.,31750.
2,26350.,24440.,23590.,37610.,30000.,27280.,26070.,44900.,34480.,30
3730.,29050.,53610.,39900.,34870.,32610.,63710.,46340.,39810.,36850
4./
 P=PRES
 IF(P.LT.1.0) P=1.0
 T=TEMP
 IF(T.LT.90.0) GO TO 10
 IF(T.LT.3000.0) GO TO 5
 IF(T.GE.6000.0)T=5999.9999
 IF(P.LT.30.0) GO TO 3
 IF(P.LT.80.0) GO TO 2
 IF(P.LT.500.0) GO TO 1
 N=1
 N1=25
 GO TO 33
1 N=2
 N1=26
 GO TO 33
2 N=3
 N1=27
 GO TO 33
3 IF(P.LT.5.0) GO TO 4
 N=4
 N1=29
 GO TO 33
4 N=5
 N1=28
 GO TO 33
5 IF(T.LT.180.0) GO TO 70
 IF(T.LT.500.0) GO TO 6
 N=6
```

```
      COMMON/ETENTHAL/H(1183)
      OATA((H(I),I=177,194)=171.5,198.4,228.3,263.6,285.9,313.1,352.7,37
     10.5,395.2,436.4,450.7,472.9,514.8,526.7,547.,588.5,598.9,616.3)
      OATA((H(I),I=847,891)=127.,120.2,112.4,103.5,93.26,81.3,67.73,54.0
     12,43.09,138.2,132.2,125.7,118.5,110.6,101.7,91.87,81.31,70.87,148.
     22,143.6,138.,132.,125.6,118.6,111.,102.9,94.5,158.5,154.5,149.6,14
     34.3,138.7,133.,126.7,120.2,113.3,168.9,164.5,160.2,155.9,150.5,145
     4.2,139.9,134.6,129.2)
      OATA((H(I),I=892, 995)=79.93,66.59,11.3,3.918,.5075,-1.802,-3.602,
     1-5.052,-6.252,-7.272,-8.152,-8.922,-9.612,-10.22,-10.77,-11.27,-11
     2.71,90.02,83.58,73.25,54.98,21.88,12.66,8.264,5.374,3.244,1.524,.1
     3143,-1.086,-2.106,-3.006,-3.796,-4.496,-5.126,100.2,94.23,87.36,78
     4.83,67.23,49.04,29.54,20.61,15.97,12.63,10.13,8.165,6.575,5.205,4.
     5035,3.025,2.125,107.3,102.8,97.34,91.12,83.8,74.82,63.27,48.88,36.
     62,28.22,23.17,19.79,17.04,14.85,13.06,11.56,10.25,114.5,110.3,105.
     77,100.6,94.95,88.54,81.12,72.37,62.11,51.17,41.85,34.99,30.1,26.47
     8,23.81,21.48,19.54,120.7,117.1,113.1,108.7,104.,98.79,93.07,86.68,
     979.5,71.49,62.88,54.41,47.13,41.26,36.7,33.11,30.23,126.8,123.4)
      OATA((H(I),I=996,1027)=119.8,116.,111.9,107.4,102.7,97.52,91.9,85.
     177,79.12,72.07,64.9,58.08,52.1,47.03,42.85,132.6,129.4,126.1,122.6
     2,119.,115.,111.,106.5,101.9,96.67,91.49,85.64,79.78,73.71,67.65,62
     3.3,56.96)
      OATA((H(I),I=1028,1072)=71.06,37.36,.06246,.06246,.06246,84.65,57.
     165,.3469,.3469,.3469,98.79,74.09,44.19,1.186,1.186,113.8,92.74,64.
     294,2.945,2.945,130.3,113.5,89.33,54.05,6.054,148.2,134.2,116.6,91.
     372,10.72,167.8,155.9,142.,125.6,103.,189.,178.5,166.9,153.8,138.2,
     4211.5,202.,192.1,181.1,168.9)
      OATA((H(I),I=1073,1102)=87.79,71.29,54.39,8.994,8.994,100.5,89.02,
     171.72,52.62,39.82,111.5,102.8,91.55,72.75,40.45,121.5,114.3,105.9,
     295.37,79.97,131.1,124.9,117.9,109.9,100.2,140.3,134.7,128.7,122.,1
     314.5)
      OATA((H(I),I=682,783)=-11.71,-12.49,-13.15,-13.68,-14.15,-14.53,-1
     14.85,-15.11,-15.33,-15.51,-15.64,-5.126,-6.216,-7.106,-7.856,-8.48
     26,-9.006,-9.466,-9.836,-10.17,-10.43,-10.57,2.125,.6148,-.6052,-1.
     3615,-2.465,-3.185,-3.785,-4.305,-4.745,-5.125,-5.435,10.25,8.118,6
     4.438,5.068,3.938,2.998,2.188,1.508,.9279,.4279,.09789,19.54,16.48,
     514.16,12.31,10.81,9.572,8.522,7.632,6.872,6.222,5.672,30.23,25.94,
     622.69,20.21,18.22,16.59,15.24,14.1,13.13,12.3,11.7,42.85,36.57,32.
     724,28.86,26.24,24.13,22.4,20.95,19.72,18.67,17.77,56.96,48.75,42.7
     86,38.31,34.96,32.25,30.05,28.22,26.68,25.38,24.39,70.87,61.71,54.3
     96,48.72,44.36,40.99,38.21,35.94,34.04,32.43,31.06,82.67,74.3,66.3)
      OATA((H(I),I=784,846)=59.71,54.45,50.25,46.87,44.12,41.8,39.85,38.
     132,94.5,86.05,78.07,70.98,65.01,60.09,56.05,52.73,49.95,47.62,45.6
     23,103.9,96.67,89.08,81.97,75.61,70.16,65.55,61.7,58.46,55.72,53.5,
     3113.3,106.3,99.23,92.39,86.,80.24,75.23,70.92,67.24,64.1,61.41,121
     4.3,115.1,108.6,102.1,95.9,90.12,84.86,80.24,76.2,72.7,69.73,129.2,
     5123.2,117.2,111.3,105.4,99.6,94.67,89.75,85.45,81.76,78.08)
      OATA((H(I),I=642,681)=-15.64,-15.86,-15.9,-15.82,-15.62,-5.435,-6.
     1025,-6.375,-6.535,-6.565,5.672,4.572,3.832,3.352,3.062,17.77,16.,1
     24.74,13.86,13.25,31.06,28.38,26.46,25.08,24.07,45.63,41.77,39.02,3
     37.01,35.52,61.41,56.17,52.41,49.66,47.59,78.08,71.44,66.61,63.01,6
     40.27)
      ENO

      SUBROUTINE ETHOATA2
      COMMON/ETENTHAL/H(1183)
      OATA((H(I),I=195,230)=157.6,155.6,157.2,160.9,165.8,171.5,266.1,25
     18.9,256.6,257.2,259.8,263.6,364.1,355.6,351.2,349.8,350.5,352.7,45
```

```
      GO TO 33
    6 N=7
      GO TO 33
   70 IF(P.LT.1175.68) GO TO 8
      IF(P.LT.2645.28) GO TO 7
      N=8
      GO TO 33
    7 N=9
      GO TO 33
    8 IF(P.LT.587.84) GO TO 9
      N=10
      GO TO 33
    9 N=11
      GO TO 33
   10 IF(P.LT.1175.68) GO TO 12
      IF(P.LT.2645.28) GO TO 11
      N=12
      GO TO 30
   11 N=13
      GO TO 30
   12 IF(T.GE.59.4) GO TO 15
      N=14
      IF(P.GE.187.6385) GO TO 30
      OO 13 I=2,20
      IF(P-PS(I))14,14,13
   13 CONTINUE
      I=20
   14 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
      IF(T.LE.TM) GO TO 30
      GO TO 23
   15 IF(P.LT.293.92) GO TO 20
      IF(P.GE.587.84) GO TO 18
      IF(T.GE.72.0) GO TO 17
      IF(P.LT.440.88) GO TO 16
      N=19
      GO TO 33
   16 N=20
      GO TO 33
   17 N=17
      GO TO 33
   18 IF(T.LT.75.6) GO TO 19
      N=15
      GO TO 33
   19 N=16
      GO TO 33
   20 IF(T.GE.72.0)GO TO 22
      IF(P.LT.176.352) GO TO 23
      IF(T.LT.65.7) GO TO 21
      N=21
      GO TO 33
   21 N=22
      GO TO 33
   22 N=18
      GO TO 33
   23 N=23
      IF(P.GE.117.568.ANO.T.LE.63.) N=24
      GO TO 33
   30 F=P/587.84
```

```
20.6,442.7,437.8,435.6,435.3,436.4,528.3,521.6,517.2,514.8,514.1,51
34.8,601.3,594.3,592.4,590.4,588.4,588.5)
 DATA((H(I),I=231,260)=195.7,178.5,167.6,161.2,157.6,305.6,292.1,28
10.9,272.4,266.1,396.9,386.7,377.8,370.2,364.1,476.7,469.,462.,455.
28,450.6,548.9,542.8,537.4,532.5,528.3,618.3,614.,609.8,605.5,601.3
3)
 DATA((H(I),I=261,278)=291.5,244.,195.7,370.6,337.4,305.6,445.1,420
1.,396.9,514.,494.3,476.7,578.5,562.7,548.9,635.3,626.8,618.3)
 DATA((H(I),I=279,305)=-36.36,-.4208,35.79,-23.08,12.56,47.71,-6.59
1,28.33,62.96,14.03,48.09,82.13,39.11,72.05,105.4,68.26,99.93,132.5
2,100.7,130.9,162.7,135.4,164.1,194.9,171.5,198.4,228.3)
 DATA((H(I),I=306,377)=-85.42,-76.04,-66.75,-57.54,-48.41,-39.52,-7
15.6,-66.48,-57.32,-48.2,-39.09,-29.88,-63.81,-54.98,-46.08,-37.17,
2-28.23,-19.16,-49.69,-41.27,-32.69,-24.04,-15.33,-6.59,-32.86,-24.
395,-16.8,-8.457,-.03691,8.603,-13.09,-5.91,1.75,9.69,17.79,26.19,9
4.652,15.95,22.94,30.41,38.13,46.17,35.18,40.3,46.52,53.41,60.69,68
5.26,63.22,66.87,72.16,78.37,85.15,91.42,93.32,95.24,99.42,104.9,11
61.1,117.9,125.1,125.,128.,132.6,138.1,144.5,157.6,155.6,157.2,160.
79,165.8,171.5)
 DATA((H(I),I=378,440)=-129.4,-124.6,-119.8,-115.,-110.3,-105.5,-10
10.8,-96.05,-91.34,-119.2,-114.7,-110.2,-105.6,-101.,-96.3,-91.67,-
287.,-82.2,-106.6,-102.6,-98.44,-94.16,-89.78,-85.37,-80.89,-76.41,
3-71.76,-90.54,-87.48,-84.,-80.23,-76.24,-72.14,-67.96,-63.7,-59.25
4,-68.68,-67.95,-65.92,-63.08,-59.75,-56.15,-52.35,-48.43,-44.26,-3
52.29,-40.58,-42.88,-41.92,-39.75,-36.91,-33.71,-30.25,-26.45,53.77
6,-4.132,-11.72,-15.64,-15.62,-14.11,-11.78,-8.972,-5.682)
 DATA((H(I),I=441,467)=87.21,81.41,77.7,75.35,73.9,73.07,72.73,72.7
15,73.18,143.4,134.3,127.8,123.1,119.8,117.5,115.9,114.9,114.5,195.
27,187.1,178.5,173.1,167.6,164.4,161.2,159.4,157.6)
 DATA((H(I),I=558,611)=129.2,114.2,99.6,87.29,78.08,71.44,66.61,63.
101,60.27,156.4,144.8,133.1,121.7,111.7,103.2,96.55,91.31,87.21,180
2.2,170.8,161.2,151.6,142.5,134.1,126.7,120.5,115.2,202.5,194.5,186
3.2,178.1,170.1,162.4,155.3,149.,143.4,223.7,216.6,209.4,202.3,195.
43,188.4,181.9,175.8,169.6,244.,238.,231.9,225.9,219.8,213.8,207.8,
5201.7,195.7)
 DATA((H(I),I=468,557)=-15.62,-14.87,-14.11,-12.95,-11.78,-10.38,-8
1.972,-7.402,-5.682,-6.565,-6.265,-5.655,-4.775,-3.705,-2.505,-1.17
25,.2448,1.895,3.062,2.942,3.262,3.882,4.732,5.772,6.952,8.262,9.65
32,13.25,12.63,12.58,12.91,13.54,14.39,15.42,16.57,18.,24.07,22.85,
422.36,22.37,22.74,23.37,24.22,25.22,26.52,35.52,33.58,32.6,32.22,3
52.29,32.69,33.34,34.18,35.18,47.59,44.82,43.26,42.46,42.19,42.34,4
62.77,43.42,44.41,60.27,56.56,54.34,53.08,52.45,52.3,52.49,52.95,53
7.76,73.69,68.77,65.85,64.05,63.03,62.55,62.48,62.73,63.22,87.21,81
8.41,77.7,75.35,72.9,73.07,72.73,72.75,73.18)
 DATA((H(I),I=612,641)=211.5,195.7,177.5,155.9,129.3,227.,212.4,196
1.1,177.5,156.4,242.7,229.2,214.4,198.1,180.2,258.8,246.2,232.7,218
2.1,202.5,275.,263.3,250.8,237.6,223.7,291.5,279.6,267.8,255.9,244.
3)
 END
```

```
 FUNCTION ETDENS(PRES,TEMP)
 COMMON/EDENSITY/R(886)
 DATA((R(I),I=1,107)=0.,.8376,0.,.7052,0.,.6114,0.,.5412,0.,.4862,0
```

```
    I=F
    IF(I.GT.8) I=8
    F=F-I
    FP=1.0-F
    TQ=FP*TL(I+1)+F*TL(I+2)
    IF(T.GE.TQ) GO TO 33
    ETENTH=FP*HS(I+1)+F*HS(I+2)
    RETURN
 33 IF(T.LT.5000.)N1=N
    FP=(P-BP(N))/DP(N)
    IP=FP
    IF(IP.GT.MX(N)) IP=MX(N)
    F=FP-IP
    FP=1.0-F
    FT=(T-BT(N1))/DT(N)
    IT=FT
    FF=FT-IT
    FT=1.0-FF
    I=IT*JP(N)+IP+LOC(N1)
    J=I+JP(N)
    ETENTH=FP*FT*H(I)+F*FT*H(I+1)+FP*FF*H(J)+F*FF*H(J+1)
    RETURN
    END
```

```
    FUNCTION ETDENS(PRES,TEMP)
    DIMENSION PS(20),TS(20),JP(28),MX(28),LOC(30),BP(28),DP(28),BT(30)
   1,DT(28),R(886)
```

```
1.,.4419,0.,.4053,0.,.3746,0.,.3483,0.,.3255,0.,.3056,.2652,1.41,2.
2315,2.924,3.396,.2314,1.179,1.979,2.584,3.052,.1998,1.023,1.739,2.
3309,2.765,.1766,.9058,1.554,2.087,2.526,.1577,.8147,1.407,1.905,2.
4325,.1424,.7414,1.286,1.754,2.154,.1297,.6809,1.186,1.626,2.008,.1
5192,.63,1.102,1.516,1.881,.1101,.5865,1.029,1.421,1.769,.1021,.548
69,.9656,1.338,1.671,.0953,.5159,.91,1.264,1.584,-.03747,.03747,.11
714,-.03125,.03125,.09302,-.02679,.02679,.07985,-.02345,.02345,.069
895,-.02085,.02085,.06224,-.01877,.01877,.05606,-.01706,.01706,.050
999,-.01565,.01565,.04677,-.01445,.01445,.04282,.00464,.3605,.6912)
 OIMENSION PS(20),TS(20),JP(28),MX(28),LOC(30),BP(28),DP(28),BT(30)
1,OT(28)
 DATA(PS=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,
1182.,185.,186.5,187.25,187.46875,187.506,187.6385)
 DATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4)
 DATA(LOC=1,23,78,105,141,155,183,201,225,240,267,321,341,377,401,
1 425,437,453,469,494,534,546,586,682,722,752,800,848,866,878)
 OATA(JP=2,5,3,4,2,4,3,4,3,3,3,4,4,4,3,3,4,4,5,8,4,5,12,5,3,6,6,6)
 OATA(MX=0,3,1,2,0,2,1,2,1,1,1,2,2,2,1,1,2,2,3,6,2,3,10,3,1,4,4,4)
 OATA(BP=0.,200.,-100., 0.,0.,0.,-4.,0.,2645.28,1469.6,881.76,0.,0.
1,-44.088,587.84,293.92,73.48,-14.696,293.92,36.74,-7.348,293.92,
2180.,0.,0.,29.392,102.872,29.392)
 DATA(OP=800.,1200.0,200.0,1000.0,100.0,1000.0,7.0,1000.0,1175.68,
1 587.84,293.92,293.92,293.92,58.784,146.96,146.96,73.48,29.392,
2 73.48,36.74,14.696,73.48,10.0,7.348,1.4696,14.696,14.696,29.392)
 OATA(BT=180.0,180.0,500.0,500.0,1300.0,1300.0,2500.0,2500.0,36.0,
1 36.0,27.0,27.0,108.0,108.0,57.6,86.4,86.4,86.4,72.0,72.0,72.0,
2 59.4,59.4,30.0,23.4,39.6,52.2,64.8,5000.0,5000.0)
 OATA(OT=30.0,30.0,100.0,100.0,200.0,200.0,500.0,500.0,36.0,18.0,
1 9.0,9.0,9.0,14.4,7.2,7.2,7.2,7.2,3.6,3.6,7.2,1.8,1.8,6.0,5.4,3.6,
2 1.8,3.6)
 P=PRES
 IF(P.LT.1.0) P=1.0
 T=TEMP
 IF(T.LT.180.0) GO TO 8
 IF(T.GE.1300.0) GO TO 4
 IF(T.GE.480.0) GO TO 2
 IF(P.GE.800.) GO TO 1
 N=1
 GO TO 33
1 N=2
 GO TO 33
2 IF(P.GE.300.0) GO TO 3
 N=3
 GO TO 33
3 N=4
 GO TO 33
4 IF(T.GE.2500.0) GO TO 6
 IF(P.GE.100.0) GO TO 5
 N=5
 GO TO 33
5 N=6
 GO TO 33
6 IF(T.GE.6000.0)T=5999.99999
 IF(P.GE.10.0) GO TO 7
 N=7
 N1=30
 GO TO 33
```

```
 DIMENSION AA(109),AB( 97),AC(108),AO(106),AE(106),AF(108),AG(101)
1 ,AH(111),AI( 40)
 EQUIVALENCE( R,AA),( R( 110),AB),( R( 207),AC),( R( 315),AO)
1    ,( R( 421),AE),( R( 527),AF),( R( 635),AG),( R( 736),AH)
2    ,( R( 847),AI)
 DATA PS/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,
1182.,185.,186.5,187.25,187.46875,187.506,187.6385/
 OATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4/
 DATA LOC/1,23,78,105,141,155,183,201,225,240,267,321,341,377,401,
1 425,437,453,469,494,534,546,586,682,722,752,800,848,866,878/
 DATA JP/2,5,3,4,2,4,3,4,3,3,3,4,4,4,3,3,4,4,5,8,4,5,12,5,3,6,6,6/
 DATA MX/0,3,1,2,0,2,1,2,1,1,1,2,2,2,1,1,2,2,3,6,2,3,10,3,1,4,4,4/
 OATA BP/0.,200.,-100., 0.,0.,0.,-4.,0.,2645.28,1469.6,881.76,0.,0.
1,-44.088,587.84,293.92,73.48,-14.696,293.92,36.74,-7.348,293.92,
2180.,0.,0.,29.392,102.872,29.392/
 OATA DP/800.,1200.0,200.0,1000.0,100.0,1000.0,7.0,1000.0,1175.68,
1 587.84,293.92,293.92,293.92,58.784,146.96,146.96,73.48,29.392,
2 73.48,36.74,14.696,73.48,10.0,7.348,1.4696,14.696,14.696,29.392/
 OATA BT/180.0,180.0,500.0,500.0,1300.0,1300.0,2500.0,2500.0,36.0,
1 36.0,27.0,27.0,108.0,108.0,57.6,86.4,86.4,86.4,72.0,72.0,72.0,
2 59.4,59.4,30.0,23.4,39.6,52.2,64.8,5000.0,5000.0/
 DATA OT/30.0,30.0,100.0,100.0,200.0,200.0,500.0,500.0,36.0,18.0,
1 9.0,9.0,9.0,14.4,7.2,7.2,7.2,7.2,3.6,3.6,7.2,1.8,1.8,6.0,5.4,3.6,
2 1.8,3.6/
 OATAAA/0.,.8376,0.,.7052,0.,.6114,0.,.5412,0.,.4862,0.,.4419,0.,.4
1053,0.,.3746,0.,.3483,0.,.3255,0.,.3056,.2652,1.41,2.315,2.924,3.3
296,.2314,1.179,1.979,2.584,3.052,.1998,1.023,1.739,2.309,2.765,.17
366,.9058,1.554,2.087,2.526,.1577,.8147,1.407,1.905,2.325,.1424,.74
414,1.286,1.754,2.154,.1297,.6809,1.186,1.626,2.008,.1192,.63,1.102
5,1.516,1.881,.1101,.5865,1.029,1.421,1.769,.1021,.5489,.9656,1.338
6,1.671,.0953,.5159,.91,1.264,1.584,-.03747,.03747,.1114,-.03125,.0
73125,.09302,-.02679,.02679,.07985,-.02345,.02345,.06995,-.02085,.0
82085,.06224,-.01877,.01877,.05606,-.01706,.01706,.05099,-.01565,.0
91565,.04677,-.01445,.01445,.04282,.00464,.3605,.6912,.9949,.00341/
 OATAAB/.3021,.5825,.8432,.0026,.2601,.5038,.7325,.002,.2285,.4441,
1.6479,.00161,.2037,.3972,.581,.00131,.1838,.3592,.5267,.0011,.1674
2,.3279,.4818,.0009,.1538,.3017,.4439,.00027,.1422,.2793,.4116,0.,.
301445,0.,.01252,0.,.01105,0.,.009892,0.,.008951,0.,.008174,0.,.007
4521,.000267,.1422,.2793,.4116,.000189,.1235,.2432,.3592,.000144,.1
5092,.2154,.3187,.00012,.09785,.1933,.2864,9.8E-5,.08864,.1753,.260
61,8.1E-5,.08101,.1604,.2382,6.9E-5,.07459,.1478,.2196,-.0003009,.0
7002256,.0007521,-.000251,.0001882,.0006272,-.000215,.0001611,.0005
8373,-.0001878,.0001402,.0004686,-.0001656,.0001221,.0004119,-.0001
9452,.0001042,.0003599,6.9E-6,.07459,.1478,.2196,4.6E-6,.06226/
 OATAAC/.1236,.1839,3.1E-6,.05342,.1061,.1582,9.E-7,.04677,.09301,.
11387,-3.6E-6,.04155,.08272,.1235,-1.32E-5,.0373,.07436,.1111,5.27,
25.489,5.68,4.501,4.845,5.107,3.616,4.126,4.483,2.857,3.466,3.895,2
3.319,2.935,3.395,4.994,5.143,5.27,4.533,4.743,4.886,3.958,4.27,4.5
401,3.307,3.752,4.059,2.698,3.243,3.616,2.226,2.796,3.236,1.886,2.4
535,2.857,1.639,2.15,2.588,1.453,1.924,2.319,5.033,5.112,5.183,4.81
66,4.91,4.994,4.558,4.676,4.764,4.248,4.405,4.533,3.88,4.094,4.246,
73.442,3.743,3.958,2.953,3.361,3.633,2.481,2.975,3.307,2.093,2.616,
83.002,1.804,2.309,2.698,1.588,2.059,2.462,1.423,1.856,2.226,1.293,
91.691,2.056,1.187,1.555,1.886,1.1,1.441,1.754,1.026,1.344,1.639/
 OATAAO/.9627,1.262,1.546,.9076,1.189,1.453,4.742,4.853,4.946,5.031
1,4.43,4.584,4.709,4.816,4.024,4.279,4.417,4.558,3.165,3.778,4.05,4
2.248,1.43,2.988,3.595,3.88,-.0233,.5581,1.189,1.804,-.015,.503,1.0
```

```
 7 N=8
   N1=29
   GO TO 33
 8 TZ=24.84+0.00317*P
   IF(T.LT.TZ) T=TZ
   IF(P.LT.881.76) GO TO 11
   IF(P.LT.2645.28) GO TO 9
   N=9
   GO TO 33
 9 IF(P.LT.1469.6) GO TO 10
   N=10
   GO TO 33
10 N=11
   GO TO 33
11 IF(T.GE.59.4) GO TO 14
   N=12
   IF(P.GE.187.6385) GO TO 33
   DO 12 I=2,20
   IF(P-PS(I))13,13,12
12 CONTINUE
   I=20
13 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
   IF(T.GE.TM) GO TO 24
   GO TO 33
14 IF(T.LT.108.0) GO TO 16
   IF(P.LT.132.264) GO TO 15
   N=13
   GO TO 33
15 N=14
   GO TO 33
16 IF(P.LT.587.84) GO TO 17
   N=15
   GO TO 33
17 IF(T.LT.72.0) GO TO 23
   IF(T.LT.86.4) GO TO 20
   IF(P.LT.293.92) GO TO 18
   N=16
   GO TO 33
18 IF(P.LT.73.48) GO TO 19
   N=17
   GO TO 33
19 N=18
   GO TO 33
20 IF(P.LT.293.92) GO TO 21
   N=19
   GO TO 33
21 IF(P.LT.36.74) GO TO 22
   N=20
   GO TO 33
22 N=21
   GO TO 33
23 IF(P.LT.293.92) GO TO 24
   N=22
   GO TO 33
24 IF(P.LT.180.0) GO TO 25
   N=23
   GO TO 33
25 IF(P.GE.29.0) GO TO 27
```

```
35,1.588,-.0099,.4591,.945,1.423,-.0065,.4231,.8618,1.293,-.0042,.3
4928,.7943,1.187,-.0025,.3669,.7379,1.1,-.0015,.3445,.6898,1.026,-.
1,.6141,.9689,1.34,.5581,.8735,1.189,.1675,.3524,.5577,.7859,.153,.
50007,.3249,.6483,.9627,-.0001,.3075,.612,.9076,-.07704,.02568,.130
67,.2384,-.06786,.02262,.1144,.2079,-.06066,.02022,.1018,.1844,-.05
7484,.01828,.09179,.1659,-.05004,.01668,.0836,.1508,-.04602,.01534,
8.07677,.1383,3.887,3.986,4.105,3.447,3.646,3.792,2.91,3.226,3.442,
92.323,2.76,3.051,1.857,2.317,2.67,1.549,1.963,2.326,1.34,1.701/
 DATAAE/2.035,1.189,1.497,1.804,.7859,1.309,1.857,.6864,1.106,1.549
23178,.4955,.6864,.1409,.2902,.4479,.6141,.1307,.2674,.4127,.5581,-
3.03228,.03224,.09858,.1675,-.02974,.02971,.09043,.153,-.02756,.027
454,.08359,.1409,-.02568,.02568,.07819,.1307,1.226,1.807,2.329,2.67
54,2.91,1.052,1.481,1.941,2.326,2.616,.9378,1.279,1.656,2.019,2.323
6,.8526,1.141,1.456,1.774,2.089,.7859,1.047,1.309,1.583,1.857,.0997
75,.2084,.3279,.461,.6115,.7847,.9864,1.226,.09478,.1962,.3063,.426
84,.5585,.7052,.8693,1.052,.08981,.1855,.2878,.3977,.5164,.6451,.78
951,.9388,.0859,.176,.2717,.3734,.4817,.5972,.7207,.8526,.08199/
 OATAAF/.1675,.2599,.3524,.455,.5577,.6718,.7859,-.01936,.01932,.05
1888,.09975,-.01756,.01753,.05323,.08981,-.01615,.01611,.04882,.081
299,3.304,3.422,3.541,3.659,3.777,3.044,3.29,3.45,3.572,3.667,2.74,
33.102,3.304,3.449,3.557,2.322,2.88,3.141,3.315,3.447,1.861,2.621,2
4.959,3.17,3.313,1.551,2.329,2.76,3.014,3.179,1.358,2.045,2.546,2.8
548,3.044,1.226,1.807,2.329,2.674,2.91,.6295,2.42,2.726,2.849,2.937
6,3.005,3.061,3.11,3.153,3.191,3.227,3.259,.9338,1.076,1.265,1.599,
72.202,2.506,2.659,2.768,2.85,2.918,2.976,3.026,.8297,.9234,1.03,1.
8159,1.322,1.542,1.835,2.136,2.356,2.509,2.618,2.709,.759,.8323,.91
921,1.001,1.103,1.22,1.359,1.523,1.713,1.916,2.106,2.267,.7053/
 OATAAG/.767,.8326,.9039,.9807,1.066,1.16,1.265,1.383,1.513,1.655,1
1.803,.6621,.7161,.7728,.8331,.8976,.9656,1.04,1.12,1.206,1.299,1.4
2,1.507,.6259,.6745,.725,.778,.8337,.8927,.9537,1.019,1.089,1.163,1
3.242,1.325,.5941,.6412,.6883,.7355,.7826,.8372,.8921,.9469,1.005,1
4.07,1.135,1.2,-.000743,.04849,.09854,0.,0.,-.000787,.04023,.08466,
5.1315,.1915,-.000437,.03393,.07032,.1097,.1534,-.000257,.02941,.06
6027,.09278,.1275,-.000177,.02599,.05289,.0808,.1098,-.000122,.0233
7,.0472,.07177,.09714,-8.3E-5,.02112,.04266,.06465,.08719,-6.5E-5,.
801932,.0381,.05888,.07931,0.,.01172,.02363,-.000111,.009736,.0198,
9-5.9E-5,.008154,.01648,-3.6E-5,.007021,.01414,-2.4E-5,.006166/
 OATAAH/.0124,-1.5E-5,.005498,.01104,-1.1E-5,.004962,.009954,-9.E-6
1,.004521,.009063,-7.E-6,.004153,.008321,-2.2E-5,.003846,.007715,.1
2664,.248,0.,0.,0.,0.,.1469,.2418,.3397,0.,0.,0.,.1315,.2117,.3091,
3.4233,.5318,0.,.1195,.1891,.2684,.3626,.4811,.6115,.1098,.1717,.24
4,.3166,.4051,.5124,.1017,.1578,.2183,.2841,.3568,.4387,.09486,.146
53,.2009,.2592,.322,.3903,.08892,.1377,.1865,.2407,.295,.3565,.5712
6,.727,.9725,0.,0.,0.,.5124,.6559,.8514,1.116,0.,0.,.4755,.5827,.73
729,.9604,1.252,1.718,.4387,.5333,.6477,.7994,1.068,1.534,.4145,.49
856,.5914,.706,.8535,1.082,.3903,.4653,.5491,.6447,.7575,.8985,.373
94,.4399,.5151,.5986,.6928,.802,.3565,.4181,.4898,.5616,.6487/
 OATAAI/.7358,.08892,.1865,.295,.4181,.5616,.7358,.08373,.1743,.273
11,.3822,.5044,.6439,.07931,.1649,.2562,.3545,.461,.5814,-1.32E-5,.
20373,.07436,.111,-2.97E-5,.0337,.06734,.1007,-5.14E-5,.03051,.0612
32,.09175,-.0001453,.0001042,.0003599,-.000124,8.541E-5,.0003076,-9
4.95E-5,6.714E-5,.00025427
 P=PRES
 IF(P.LT.1.0) P=1.0
 T=TEMP
 IF(T.LT.180.0) GO TO 8
 IF(T.GE.1300.0) GO TO 4
 IF(T.GE.480.0) GO TO 2
```

```
      IF(P.LT.2.9392) GO TO 26
      N=24
      GO TO 33
   26 N=25
      GO TO 33
   27 IF(T.GE.64.8) GO TO 29
      IF(P.GE.102.0) GO TO 28
      N=26
      GO TO 33
   28 N=27
      GO TO 33
   29 N=28
   33 IF(T.LE.5000.0)N1=N
      FP=(P-BP(N))/OP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N1))/OT(N)
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      ETOENS=FP*FT*R(I)+F*FT*R(I+1)+FP*FF*R(J)+F*FF*R(J+1)
      RETURN
      ENO

      SUBROUTINE EOATAOEN
      COMMON/EOENSITY/R(886)
      OATA((R(I),I=108,202)=.9949,.00341,.3021,.5825,.8432,.0026,.2601,.
     15038,.7325,.002,.2285,.4441,.6479,.00161,.2037,.3972,.581,.00131,.
     21838,.3592,.5267,.0011,.1674,.3279,.4818,.0009,.1538,.3017,.4439,.
     300027,.1422,.2793,.4116,0.,.01445,0.,.01252,0.,.01105,0.,.009892,0
     4.,.008951,0.,.008174,0.,.007521,.000267,.1422,.2793,.4116,.000189,
     5.1235,.2432,.3592,.000144,.1092,.2154,.3187,.00012,.09785,.1933,.2
     6864,9.8E-5,.08864,.1753,.2601,8.1E-5,.08101,.1604,.2382,6.9E-5,.07
     7459,.1478,.2196,-.0003009,.0002256,.0007521,-.000251,.0001882,.000
     86272,-.000215,.0001611,.0005373,-.0001878,.0001402,.0004686,-.0001
     9656,.0001221,.0004119,-.0001452,.0001042,.0003599,6.9E-6,.07459)
      OATA((R(I),I=203,307)=.1478,.2196,4.6E-6,.06226,.1236,.1839,3.1E-6
     1,.05342,.1061,.1582,9.E-7,.04677,.09301,.1387,-3.6E-6,.04155,.0827
     22,.1235,-1.32E-5,.0373,.07436,.1111,5.27,5.489,5.68,4.501,4.845,5.
     3107,3.616,4.126,4.483,2.857,3.466,3.895,2.319,2.935,3.395,4.994,5.
     4143,5.27,4.533,4.743,4.886,3.958,4.27,4.501,3.307,3.752,4.059,2.69
     58,3.243,3.616,2.226,2.796,3.236,1.886,2.435,2.857,1.639,2.15,2.588
     6,1.453,1.924,2.319,5.033,5.112,5.183,4.816,4.91,4.994,4.558,4.676,
     74.764,4.248,4.405,4.533,3.88,4.094,4.246,3.442,3.743,3.958,2.953,3
     8.361,3.633,2.481,2.975,3.307,2.093,2.616,3.002,1.804,2.309,2.698,1
     9.588,2.059,2.462,1.423,1.856,2.226,1.293,1.691,2.056,1.187,1.555)
      OATA((R(I),I=308,411)=1.886,1.1,1.441,1.754,1.026,1.344,1.639,.962
     17,1.262,1.546,.9076,1.189,1.453,4.742,4.853,4.946,5.031,4.43,4.584
     2,4.709,4.816,4.024,4.279,4.417,4.558,3.165,3.778,4.05,4.248,1.43,2
     3.988,3.595,3.88,-.0233,.5581,1.189,1.804,-.015,.503,1.05,1.588,-.0
     4099,.4591,.945,1.423,-.0065,.4231,.8618,1.293,-.0042,.3928,.7943,1
     5.187,-.0025,.3669,.7379,1.1,-.0015,.3445,.6898,1.026,-.0007,.3249,
     6.6483,.9627,-.0001,.3075,.612,.9076,-.07704,.02568,.1307,.2384,-.0
     76786,.02262,.1144,.2079,-.06066,.02022,.1018,.1844,-.05484,.01828,
      IF(P.GE.800.) GO TO 1
      N=1
      GO TO 33
    1 N=2
      GO TO 33
    2 IF(P.GE.300.0) GO TO 3
      N=3
      GO TO 33
    3 N=4
      GO TO 33
    4 IF(T.GE.2500.0) GO TO 6
      IF(P.GE.100.0) GO TO 5
      N=5
      GO TO 33
    5 N=6
      GO TO 33
    6 IF(T.GE.6000.0)T=5999.99999
      IF(P.GE.10.0) GO TO 7
      N=7
      N1=30
      GO TO 33
    7 N=8
      N1=29
      GO TO 33
    8 TZ=24.84+0.00317*P
      IF(T.LT.TZ) T=TZ
      IF(P.LT.881.76) GO TO 11
      IF(P.LT.2645.28) GO TO 9
      N=9
      GO TO 33
    9 IF(P.LT.1469.6) GO TO 10
      N=10
      GO TO 33
   10 N=11
      GO TO 33
   11 IF(T.GE.59.4) GO TO 14
      N=12
      IF(P.GE.187.6385) GO TO 33
      OO 12 I=2,20
      IF(P-PS(I))13,13,12
   12 CONTINUE
      I=20
   13 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
      IF(T.GE.TM) GO TO 24
      GO TO 33
   14 IF(T.LT.108.0) GO TO 16
      IF(P.LT.132.264) GO TO 15
      N=13
      GO TO 33
   15 N=14
      GO TO 33
   16 IF(P.LT.587.84) GO TO 17
      N=15
      GO TO 33
   17 IF(T.LT.72.0) GO TO 23
      IF(T.LT.86.4) GO TO 20
      IF(P.LT.293.92) GO TO 18
      N=16
```

```
8.09179,.1659,-.05004,.01668,.0836,.1508,-.04602,.01534,.07677,.138
93,3.887,3.986,4.105,3.447,3.646,3.792,2.91,3.226,3.442,2.323,2.76)
 OATA((R(I),I=412,515)=3.051,1.857,2.317,2.67,1.549,1.963,2.326,1.3
14,1.701,2.035,1.189,1.497,1.804,.7859,1.309,1.857,.6864,1.106,1.54
29,.6141,.9689,1.34,.5581,.8735,1.189,.1675,.3524,.5577,.7859,.153,
3.3178,.4955,.6864,.1409,.2902,.4479,.6141,.1307,.2674,.4127,.5581,
4-.03228,.03224,.09858,.1675,-.02974,.02971,.09043,.153,-.02756,.02
5754,.08359,.1409,-.02568,.02568,.07819,.1307,1.226,1.807,2.329,2.6
674,2.91,1.052,1.481,1.941,2.326,2.616,.9378,1.279,1.656,2.019,2.32
73,.8526,1.141,1.456,1.774,2.089,.7859,1.047,1.309,1.583,1.857,.099
875,.2084,.3279,.461,.6115,.7847,.9864,1.226,.09478,.1962,.3063,.42
964,.5585,.7052,.8693,1.052,.08981,.1855,.2878,.3977,.5164,.6451)
 END

 SUBROUTINE EDATOEN1
 COMMON/EOENSITY/R(886)
 OATA((R(I),I=516,620)=.7851,.9388,.0859,.176,.2717,.3734,.4817,.59
172,.7207,.8526,.08199,.1675,.2599,.3524,.455,.5577,.6718,.7859,-.0
21936,.01932,.05888,.09975,-.01756,.01753,.05323,.08981,-.01615,.01
3611,.04882,.08199,3.304,3.422,3.541,3.659,3.777,3.044,3.29,3.45,3.
4572,3.667,2.74,3.102,3.304,3.449,3.557,2.322,2.88,3.141,3.315,3.44
57,1.861,2.621,2.959,3.17,3.313,1.551,2.329,2.76,3.014,3.179,1.358,
62.045,2.546,2.848,3.044,1.226,1.807,2.329,2.674,2.91,.6295,2.42,2.
7726,2.849,2.937,3.005,3.061,3.11,3.153,3.191,3.227,3.259,.9338,1.0
876,1.265,1.599,2.202,2.506,2.659,2.768,2.85,2.918,2.976,3.026,.829
97,.9234,1.03,1.159,1.322,1.542,1.835,2.136,2.356,2.509,2.618)
 OATA((R(I),I=621,722)=2.709,.759,.8323,.9121,1.001,1.103,1.22,1.35
19,1.523,1.713,1.916,2.106,2.267,.7053,.767,.8326,.9039,.9807,1.066
2,1.16,1.265,1.383,1.513,1.655,1.803,.6621,.7161,.7728,.8331,.8976,
3.9656,1.04,1.12,1.206,1.299,1.4,1.507,.6259,.6745,.725,.778,.8337,
4.8927,.9537,1.019,1.089,1.163,1.242,1.325,.5941,.6412,.6883,.7355,
5.7826,.8372,.8921,.9469,1.005,1.07,1.135,1.2,-.000743,.04849,.0985
64,0.,0.,-.000787,.04023,.08466,.1315,.1915,-.000437,.03393,.07032,
7.1097,.1534,-.000257,.02941,.06027,.09278,.1275,-.000177,.02599,.0
85289,.0808,.1098,-.000122,.0233,.0472,.07177,.09714,-8.3E-5,.02112
9,.04266,.06465,.08719,-6.5E-5,.01932,.0381,.05888,.07931,0.)
 OATA((R(I),I=723,827)=.01172,.02363,-.000111,.009736,.0198,-5.9E-5
1,.008154,.01648,-3.6E-5,.007021,.01414,-2.4E-5,.006166,.0124,-1.5E
2-5,.005498,.01104,-1.1E-5,.004962,.009954,-9.E-6,.004521,.009063,-
37.E-6,.004153,.008321,-2.2E-5,.003846,.007715,.1664,.248,0.,0.,0.,
40.,.1469,.2418,.3397,0.,0.,0.,.1315,.2117,.3091,.4233,.5318,0.,.11
595,.1891,.2684,.3626,.4811,.6115,.1098,.1717,.24,.3166,.4051,.5124
6,.1017,.1578,.2183,.2841,.3568,.4387,.09486,.1463,.2009,.2592,.322
7,.3903,.08892,.1377,.1865,.2407,.295,.3565,.5712,.727,.9725,0.,0.,
80.,.5124,.6559,.8514,1.116,0.,0.,.4755,.5827,.7329,.9604,1.252,1.7
918,.4387,.5333,.6477,.7994,1.068,1.534,.4145,.4956,.5914,.706)
 DATA((R(I),I=828,886)=.8535,1.082,.3903,.4653,.5491,.6447,.7575,.8
1985,.3734,.4399,.5151,.5986,.6928,.802,.3565,.4181,.4898,.5616,.64
287,.7358,.08892,.1865,.295,.4181,.5616,.7358,.08373,.1743,.2731,.3
3822,.5044,.6439,.07931,.1649,.2562,.3545,.461,.5814,-1.32E-5,.0373
4,.07436,.111,-2.97E-5,.0337,.06734,.1007,-5.14E-5,.03051,.06122,.0
59175,-.0001453,.0001042,.0003599,-.000124,8.541E-5,.0003076,-9.95E
6-5,6.714E-5,.0002542)
 END
```

```
    GO TO 33
 18 IF(P.LT.73.48) GO TO 19
    N=17
    GO TO 33
 19 N=18
    GO TO 33
 20 IF(P.LT.293.92) GO TO 21
    N=19
    GO TO 33
 21 IF(P.LT.36.74) GO TO 22
    N=20
    GO TO 33
 22 N=21
    GO TO 33
 23 IF(P.LT.293.92) GO TO 24
    N=22
    GO TO 33
 24 IF(P.LT.180.0) GO TO 25
    N=23
    GO TO 33
 25 IF(P.GE.29.0) GO TO 27
    IF(P.LT.2.9392) GO TO 26
    N=24
    GO TO 33
 26 N=25
    GO TO 33
 27 IF(T.GE.64.8) GO TO 29
    IF(P.GE.102.0) GO TO 28
    N=26
    GO TO 33
 28 N=27
    GO TO 33
 29 N=28
 33 IF(T.LE.5000.0)N1=N
    FP=(P-BP(N))/OP(N)
    IP=FP
    IF(IP.GT.MX(N)) IP=MX(N)
    F=FP-IP
    FP=1.0-F
    FT=(T-BT(N1))/OT(N)
    IT=FT
    FF=FT-IT
    FT=1.0-FF
    I=IT*JP(N)+IP+LOC(N1)
    J=I+JP(N)
    ETDENS=FP*FT*R(I)+F*FT*R(I+1)+FP*FF*R(J)+F*FF*R(J+1)
    RETURN
    ENO
```

```
 FUNCTION   ETENTR(PRES,TEMP)
 DIMENSION LOC(30),JP(26),MX(26),BP(26),DP(26),BT(30),DT(26),PS(20)
1,TS(20)
 COMMON/ETENTROP/S(748)
 DATA((S(I),I=1,109)=18.77,17.27,16.58,16.18,20.3,18.79,18.11,17.71
1,21.47,19.96,19.27,18.87,22.59,20.99,20.28,19.87,21.04,19.53,18.85
2,18.45,22.56,21.06,20.38,19.98,23.79,22.25,21.56,21.15,25.28,23.48
3,22.7,22.26,23.17,21.8,21.12,20.72,24.7,23.33,22.65,22.25,26.04,24
4.59,23.87,23.46,28.6,26.42,25.45,24.92,24.07,23.39,22.99,22.7,24.8
59,24.21,23.81,23.53,25.6,24.92,24.52,24.23,26.27,25.57,25.16,24.87
6,27.07,26.3,25.86,25.55,28.38,27.37,26.82,26.45,30.79,29.21,28.41,
727.89,13.94,12.42,11.73,11.32,15.56,14.05,13.37,12.97,16.66,15.16,
814.48,14.08,17.51,16.,15.32,14.92,18.19,16.69,16.,15.6,18.77,17.27
9,16.58,16.18,16.21,14.7,14.02,13.62,17.83,16.32,15.64,15.24,18.93)
 OATA((S(I),I=110,216)=17.43,16.74,16.34,19.77,18.27,17.59,17.19,20
1.46,18.95,18.27,17.87,21.04,19.53,18.85,18.45,18.48,16.97,16.29,15
2.89,20.1,18.59,17.91,17.51,21.2,19.69,19.01,18.61,22.04,20.54,19.8
35,19.45,22.73,21.22,20.54,20.14,23.31,21.8,21.12,20.72,19.24,18.56
4,18.16,20.86,20.18,19.78,21.96,21.28,20.88,22.81,22.12,21.72,23.49
5,22.81,22.41,24.07,23.39,22.99,10.47,8.677,7.877,7.422,7.169,12.04
6,10.46,9.722,9.284,8.975,13.11,11.57,10.87,10.45,10.15,13.94,12.42
7,11.73,11.32,11.03,12.90,11.38,10.67,10.25,14.08,12.56,11.87,11.46
8,14.93,13.42,12.73,12.33,15.62,14.12,13.43,13.03,16.21,14.7,14.02,
913.62,15.10,13.67,12.98,12.58,16.35,14.84,14.16,13.76,17.2,15.69)
 DATA((S(I),I=217,324)=15.01,14.61,17.89,16.39,15.7,15.3,18.48,16.9
17,16.29,15.89,15.94,15.25,14.85,17.11,16.43,16.03,17.96,17.28,16.8
28,18.66,17.97,17.57,19.24,18.56,18.16,1.538,1.382,1.262,1.172,2.58
34,2.357,2.19,2.06,3.782,3.467,3.251,3.091,4.97,4.547,4.283,4.094,6
4.,5.481,5.169,4.953,6.828,6.244,5.894,5.657,7.478,6.866,6.489,6.23
53,7.999,7.378,6.986,6.717,8.635,7.894,7.449,7.133,.6945,.6615,.635
65,.6125,.5905,1.719,1.655,1.597,1.546,1.499,2.903,2.781,2.681,2.59
78,2.527,4.423,4.143,3.95,3.812,3.703,6.072,5.568,5.236,5.021,4.864
8,7.23,6.718,6.336,6.068,5.87,8.023,7.549,7.177,6.897,6.682,8.62,8.
9174,7.819,7.544,7.325,9.092,8.668,8.328,8.061,7.844,9.628,9.131)
 OATA(LOC=1,17,33,49,77,101,125,149,167,187,207,227,242,278,328,364
1,384,404,434,464,484,520,536,635,663,683,713,721,729,737)
 OATA(JP=4,4,4,4,4,4,4,3,5,4,4,3,4,5,6,5,5,6,5,5,6,4,11,4,4,5)
 DATA(MX=2,2,2,2,2,2,2,1,3,2,2,1,2,3,4,3,3,4,3,3,4,2,9,2,2,3)
 OATA(BP=0,0,0,1.,0,0,0,1.,     0.,0,0,1.,1469.6,587.84,0,0,0,0,
1440.88,146.96,257.18,183.7,183.7,58.784,0,0)
 OATA(DP=1000.,100.,10.,1.,1000.,100.,10.,1.,1000.,100.,10.,1.,
11175.68,293.92,146.96,14.696,1.4696,146.96,73.48,73.48,36.74,
229.392,7.348,44.088,14.696,1.4696)
 OATA(BT=2000.,2000.,2000.,2000.,500.,500.,500.,500.,170.,180.,180.
1,180.,36.,18.,90.,72.,72.,27.,54.,68.4,59.4,63.,59.4,46.8,32.4,18.
2,5000.,5000.,5000.,5000.)
 OATA(OT=1000.,1000.,1000.,500.,300.,300.,300.,300.,110.,80.,80.,80
1.,18.,18.,18.,36.,36.,9.,7.2,7.2,1.8,1.8,.45,7.2,14.4,14.4)
 OATA(PS=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
1.,185.,186.5,187.25,187.46875,187.506,187.6385)
 OATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4)
 P=PRES
 IF(P.LT.1.0) P=1.0
 T=TEMP
 IF(T.LT.180.) GO TO 12
```

```
 FUNCTION   ETENTR(PRES,TEMP)
 DIMENSION LOC(30),JP(26),MX(26),BP(26),OP(26),BT(30),OT(26),PS(20)
1,TS(20),S(748)
 EQUIVALENCE( S,AA),( S( 112),AB),( S( 222),AC),( S( 333),AO)
1    ,( S( 443),AE),( S( 554),AF),( S( 663),AG)
 OIMENSION AA(111),AB(110),AC(111),AO(110),AE(111),AF(109),AG( 86)
 DATAAA/18.77,17.27,16.58,16.18,20.3,18.79,18.11,17.71,21.47,19.96,
119.27,18.87,22.59,20.99,20.28,19.87,21.04,19.53,18.85,18.45,22.56,
221.06,20.38,19.98,23.79,22.25,21.56,21.15,25.28,23.48,22.7,22.26,2
33.17,21.8,21.12,20.72,24.7,23.33,22.65,22.25,26.04,24.59,23.87,23.
446,28.6,26.42,25.45,24.92,24.07,23.39,22.99,22.7,24.89,24.21,23.81
5,23.53,25.6,24.92,24.52,24.23,26.27,25.57,25.16,24.87,27.07,26.3,2
65.86,25.55,28.38,27.37,26.82,26.45,30.79,29.21,28.41,27.89,13.94,1
72.42,11.73,11.32,15.56,14.05,13.37,12.97,16.66,15.16,14.48,14.08,1
87.51,16.,15.32,14.92,18.19,16.69,16.,15.6,18.77,17.27,16.58,16.18,
916.21,14.7,14.02,13.62,17.83,16.32,15.64,15.24,18.93,17.43,16.74/
 DATAAB/16.34,19.77,18.27,17.59,17.19,20.46,18.95,18.27,17.87,21.04
1,19.53,18.85,18.45,18.48,16.97,16.29,15.89,20.1,18.59,17.91,17.51,
221.2,19.69,19.01,18.61,22.04,20.54,19.85,19.45,22.73,21.22,20.54,2
30.14,23.31,21.8,21.12,20.72,19.24,18.56,18.16,20.86,20.18,19.78,21
4.96,21.28,20.88,22.81,22.12,21.72,23.49,22.81,22.41,24.07,23.39,22
5.99,10.47,8.677,7.877,7.422,7.169,12.04,10.46,9.722,9.284,8.975,13
6.11,11.57,10.87,10.45,10.15,13.94,12.42,11.73,11.32,11.03,12.9,11.
738,10.67,10.25,14.08,12.56,11.87,11.46,14.93,13.42,12.73,12.33,15.
862,14.12,13.43,13.03,16.21,14.7,14.02,13.62,15.1,13.67,12.98,12.58
9,16.35,14.84,14.16,13.76,17.2,15.69,15.01,14.61,17.89,16.39,15.7/
 DATAAC/15.3,18.48,16.97,16.29,15.89,15.94,15.25,14.85,17.11,16.43,
116.03,17.96,17.28,16.88,18.66,17.97,17.57,19.24,18.56,18.16,1.538,
21.382,1.262,1.172,2.584,2.357,2.19,2.06,3.782,3.467,3.251,3.091,4.
397,4.547,4.283,4.094,6.,5.481,5.169,4.953,6.828,6.244,5.894,5.657,
47.478,6.866,6.489,6.233,7.999,7.378,6.986,6.717,8.635,7.894,7.449,
57.133,.6945,.6615,.6355,.6125,.5905,1.719,1.655,1.597,1.546,1.499,
62.903,2.781,2.681,2.598,2.527,4.423,4.143,3.95,3.812,3.703,6.072,5
7.568,5.236,5.021,4.864,7.23,6.718,6.336,6.068,5.87,8.023,7.549,7.1
877,6.897,6.682,8.62,8.174,7.819,7.544,7.325,9.092,8.668,8.328,8.06
91,7.844,9.628,9.131,8.82,8.635,8.45,9.655,8.115,7.24,6.635,6.168/
 DATAAO/5.82,10.46,8.982,8.187,7.676,7.286,6.974,11.08,9.653,8.895,
18.423,8.07,7.786,11.6,10.18,9.447,8.995,8.662,8.397,12.03,10.62,9.
2895,9.456,9.136,8.88,12.52,11.05,10.28,9.876,9.628,9.379,11.02,9.6
339,8.934,8.512,8.208,12.73,11.35,10.66,10.25,9.95,13.87,12.5,11.81
4,11.41,11.12,14.79,13.34,12.6,12.23,12.01,13.12,11.93,11.24,10.84,
510.55,14.79,13.63,12.95,12.55,12.26,15.94,14.77,14.09,13.69,13.4,1
66.62,15.61,14.88,14.48,14.28,1.321,1.287,1.255,1.225,1.199,1.174,1
7.898,1.845,1.799,1.759,1.721,1.687,2.563,2.47,2.395,2.332,2.279,2.
8232,3.596,3.293,3.112,2.998,2.912,2.842,4.689,4.533,4.035,3.78,3.6
93,3.544,2.965,2.931,2.897,2.869,2.842,3.629,3.551,3.487,3.432/
 DATAAE/3.399,4.417,4.252,4.136,4.047,3.985,5.334,5.049,4.853,4.71,
14.593,6.073,5.793,5.562,5.378,5.212,6.635,6.401,6.168,5.994,5.82,6
2.701,6.031,5.311,4.706,4.417,7.204,6.664,6.176,5.723,5.334,7.663,7
3.177,6.758,6.395,6.073,8.115,7.677,7.24,6.937,6.635,3.742,3.659,3.
4609,3.559,3.51,3.46,4.025,3.889,3.8,3.732,3.677,3.629,4.457,4.169,
54.031,3.938,3.867,3.824,5.038,4.534,4.301,4.166,4.071,4.02,5.417,4
6.962,4.62,4.423,4.295,4.219,5.671,5.312,5.009,4.706,4.562,4.417,5.
7759,5.386,4.734,4.18,5.96,5.682,5.277,4.799,6.163,5.907,5.59,5.245
8,6.366,6.098,5.815,5.527,5.098,4.153,4.02,3.954,3.907,3.869,3.837,
93.81,3.785,3.762,3.742,5.214,4.983,4.24,4.085,4.011,3.961,3.919/
```

```
      IF(T.LT.2000.)GO TO 4
      IF(T.GE.6000.)T=5999.99999
      IF(P.LT.35.3) GO TO 2
      IF(P.LT.353.) GO TO 1
      N=1
      N1=27
      GO TO 33
    1 N=2
      N1=28
      GO TO 33
    2 IF(P.LT.4.57) GO TO 3
      N=3
      N1=29
      GO TO 33
    3 N=4
      N1=30
      GO TO 33
    4 IF(T.LT.500.) GO TO 8
      IF(P.LT.35.3) GO TO 6
      IF(P.LT.353.) GO TO 5
      N=5
      GO TO 33
    5 N=6
      GO TO 33
    6 IF(P.LT.3.53) GO TO 7
      N=7
      GO TO 33
    7 N=8
      GO TO 33
    8 IF(P.LT.35.3) GO TO 10
      IF(P.LT.353.) GO TO 9
      N=9
      GO TO 33
    9 N=10
      GO TO 33
   10 IF(P.LT.3.53) GO TO 11
      N=11
      GO TO 33
   11 N=12
      GO TO 33
   12 IF(T.GE.59.4) GO TO 18
      TZ=24.84+0.00317*P
      IF(T.LT.TZ) T=TZ
      IF(P.LT.1763.52) GO TO 14
      N=13
      GO TO 33
   14 IF(P.LT.734.8) GO TO 15
      N=14
      GO TO 33
   15 N=18
      IF(P.GE.187.6385)GO TO 33
      DO 16 I=2,20
      IF(P-PS(I))17,17,16
   16 CONTINUE
      I=20
   17 TZ=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
      IF(T.LT.TZ) GO TO 33
      GO TO 28
      DATAAF/3.885,3.856,3.829,3.813,5.328,5.191,4.872,4.311,4.149,4.068
     1,4.012,3.968,3.932,3.901,3.883,5.444,5.322,5.122,4.793,4.37,4.208,
     24.124,4.064,4.017,3.979,3.955,5.558,5.424,5.265,5.059,4.747,4.417,
     34.262,4.177,4.114,4.065,4.025,5.608,5.51,5.374,5.213,5.006,4.726,4
     44.464,4.317,4.227,4.165,4.133,5.658,5.586,5.465,5.328,5.166,4.965,4
     55.721,4.506,4.367,4.277,4.241,5.708,5.655,5.544,5.423,5.287,5.127,4
     66.938,4.725,4.542,4.414,4.349,5.759,5.666,5.573,5.479,5.386,5.223,5
     77.06,4.897,4.734,4.595,4.457,6.247,5.148,3.727,.09378,6.854,6.007,5
     88.069,4.147,7.375,6.66,6.085,5.453,7.838,7.197,6.716,6.296,8.312,7.
     99678,7.236,6.873,8.722,8.118,7.7,7.364,9.122,8.577,8.115,7.852/
      DATAAG/8.328,6.896,6.078,5.48,9.377,7.934,7.164,6.662,10.28,8.872,
     118.148,7.705,11.14,9.753,9.045,8.621,11.92,10.54,9.838,9.422,9.14,8
     22.02,7.35,6.94,6.65,10.46,9.267,8.567,8.147,7.847,11.45,10.27,9.584
     33,9.174,8.884,12.35,11.18,10.49,10.09,9.796,13.21,12.04,11.36,10.95
     44,10.67,14.,12.82,12.14,11.74,11.45,22.59,20.99,20.28,19.87,24.08,2
     52.15,21.34,20.88,25.28,23.48,22.7,22.26,28.21,25.37,24.28,23.7,28.
     666,26.42,25.45,24.92,35.19,30.55,28.65,27.69,30.79,29.21,28.41,27.8
     779,34.82,32.31,31.05,30.25,39.83,36.62,34.87,33.71/
      DATA LOC/1,17,33,49,77,101,125,149,167,187,207,227,242,278,328,364
     1,384,404,434,464,484,520,536,635,663,683,713,721,729,737/
      DATA JP/4,4,4,4,4,4,4,3,5,4,4,3,4,5,6,5,5,6,5,5,6,4,11,4,4,5/
      DATA MX/2,2,2,2,2,2,2,1,3,2,2,1,2,3,4,3,3,4,3,3,4,2,9,2,2,3/
      DATA BP/0.,0.,0.,1.,0.,0.,0.,1.,0.,0.,0.,1.,1469.6,587.84,0.,0.,
     110.,0.,440.88,146.96,257.18,183.7,183.7,58.784,0.,0./
      DATA OP/1000.,100.,10.,1.,1000.,100.,10.,1.,1000.,100.,10.,1.,
     111175.68,293.92,146.96,14.696,1.4696,146.96,73.48,73.48,36.74,
     1229.392,7.348,44.088,14.696,1.4696/
      DATA BT/2000.,2000.,2000.,2000.,500.,500.,500.,500.,170.,180.,180.
     1,180.,36.,18.,90.,72.,72.,27.,54.,68.4,59.4,63.,59.4,46.8,32.4,18.
     2,5000.,5000.,5000.,5000./
      DATA OT/1000.,1000.,1000.,500.,300.,300.,300.,300.,110.,80.,80.,80
     11.,18.,18.,18.,36.,36.,9.,7.2,7.2,1.8,1.8,.45,7.2,14.4,14.4/
      DATA PS/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
     11.,185.,186.5,187.25,187.46875,187.506,187.6385/
      DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
     1179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4/
      P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.LT.180.) GO TO 12
      IF(T.LT.2000.)GO TO 4
      IF(T.GE.6000.)T=5999.99999
      IF(P.LT.35.3) GO TO 2
      IF(P.LT.353.) GO TO 1
      N=1
      N1=27
      GO TO 33
    1 N=2
      N1=28
      GO TO 33
    2 IF(P.LT.4.57) GO TO 3
      N=3
      N1=29
      GO TO 33
    3 N=4
      N1=30
      GO TO 33
    4 IF(T.LT.500.) GO TO 8
```

```
18 IF(P.LT.734.8) GO TO 20
   IF(P.LT.1763.52) GO TO 19
   N=13
   GO TO 33
19 N=14
   GO TO 33
20 IF(T.LT.90.) GO TO 23
   IF(P.GE.67.16) GO TO 22
   IF(P.LT.6.716) GO TO 21
   N=16
   GO TO 33
21 N=17
   GO TO 33
22 N=15
   GO TO 33
23 IF(P.LT.183.7) GO TO 28
   IF(P.LT.440.88) GO TO 24
   N=19
   GO TO 33
24 IF(T.LT.68.4) GO TO 25
   N=20
   GO TO 33
25 IF(P.LT.257.18) GO TO 26
   N=21
   GO TO 33
26 IF(T.LT.63) GO TO 27
   N=22
   GO TO 33
27 N=23
   GO TO 33
28 IF(P.LT.6.716) GO TO 30
   IF(P.LT.48.5)  GO TO 29
   N=24
   GO TO 33
29 N=25
   GO TO 33
30 N=26
33 IF(T.LE.5000.)N1=N
   FP=(P-BP(N))/OP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   F=FP-IP
   FP=1.0-F
   FT=(T-BT(N1))/OT(N)
   IT=FT
   FF=FT-IT
   FT=1.0-FF
   I=IT*JP(N)+IP+LOC(N1)
   J=I+JP(N)
   ETENTR=FP*FT*S(I)+F*FT*S(I+1)+FP*FF*S(J)+F*FF*S(J+1)
   RETURN
   END

   SUBROUTINE ETSDATA
   COMMON/ETENTROP/S(748)
   OATA((S(I),I=325,432)=8.82,8.635,8.45,9.655,8.115,7.24,6.635,6.168
  1,5.82,10.46,8.982,8.187,7.676,7.286,6.974,11.08,9.653,8.895,8.423,
  28.07,7.786,11.6,10.18,9.447,8.995,8.662,8.397,12.03,10.62,9.895,9.
   IF(P.LT.35.3) GO TO 6
   IF(P.LT.353.) GO TO 5
   N=5
   GO TO 33
 5 N=6
   GO TO 33
 6 IF(P.LT.3.53) GO TO 7
   N=7
   GO TO 33
 7 N=8
   GO TO 33
 8 IF(P.LT.35.3) GO TO 10
   IF(P.LT.353.) GO TO 9
   N=9
   GO TO 33
 9 N=10
   GO TO 33
10 IF(P.LT.3.53) GO TO 11
   N=11
   GO TO 33
11 N=12
   GO TO 33
12 IF(T.GE.59.4) GO TO 18
   TZ=24.84+0.00317*P
   IF(T.LT.TZ) T=TZ
   IF(P.LT.1763.52) GO TO 14
   N=13
   GO TO 33
14 IF(P.LT.734.8) GO TO 15
   N=14
   GO TO 33
15 N=18
   IF(P.GE.187.6385)GO TO 33
   OO 16 I=2,20
   IF(P-PS(I))17,17,16
16 CONTINUE
   I=20
17 TZ=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
   IF(T.LT.TZ) GO TO 33
   GO TO 28
18 IF(P.LT.734.8) GO TO 20
   IF(P.LT.1763.52) GO TO 19
   N=13
   GO TO 33
19 N=14
   GO TO 33
20 IF(T.LT.90.) GO TO 23
   IF(P.GE.67.16) GO TO 22
   IF(P.LT.6.716) GO TO 21
   N=16
   GO TO 33
21 N=17
   GO TO 33
22 N=15
   GO TO 33
23 IF(P.LT.183.7) GO TO 28
   IF(P.LT.440.88) GO TO 24
   N=19
```

```
3456,9.136,8.88,12.52,11.05,10.28,9.876,9.628,9.379,11.02,9.639,8.9
434,8.512,8.208,12.73,11.35,10.66,10.25,9.95,13.87,12.5,11.81,11.41
5,11.12,14.79,13.34,12.6,12.23,12.01,13.12,11.93,11.24,10.84,10.55,
614.79,13.63,12.95,12.55,12.26,15.94,14.77,14.09,13.69,13.4,16.62,1
75.61,14.88,14.48,14.28,1.321,1.287,1.255,1.225,1.199,1.174,1.898,1
8.845,1.799,1.759,1.721,1.687,2.563,2.47,2.395,2.332,2.279,2.232,3.
9596,3.293,3.112,2.998,2.912,2.842,4.689,4.533,4.035,3.78,3.63)
 DATA((S(I),I=433,540)=3.544,2.965,2.931,2.897,2.869,2.842,3.629,3.
1551,3.487,3.432,3.399,4.417,4.252,4.136,4.047,3.985,5.334,5.049,4.
2853,4.71,4.593,6.073,5.793,5.562,5.378,5.212,6.635,6.401,6.168,5.9
394,5.82,6.701,6.031,5.311,4.706,4.417,7.204,6.664,6.176,5.723,5.33
44,7.663,7.177,6.758,6.395,6.073,8.115,7.677,7.24,6.937,6.635,3.742
5,3.659,3.609,3.559,3.51,3.46,4.025,3.889,3.8,3.732,3.677,3.629,4.4
657,4.169,4.031,3.938,3.867,3.824,5.038,4.534,4.301,4.166,4.071,4.0
72,5.417,4.962,4.62,4.423,4.295,4.219,5.671,5.312,5.009,4.706,4.562
8,4.417,5.759,5.386,4.734,4.18,5.96,5.682,5.277,4.799,6.163,5.907,5
9.59,5.245,6.366,6.098,5.815,5.527,5.098,4.153,4.02,3.954,3.907)
 DATA((S(I),I=541,647)=3.869,3.837,3.81,3.785,3.762,3.742,5.214,4.9
183,4.24,4.085,4.011,3.961,3.919,3.885,3.856,3.829,3.813,5.328,5.19
21,4.872,4.311,4.149,4.068,4.012,3.968,3.932,3.901,3.883,5.444,5.32
32,5.122,4.793,4.37,4.208,4.124,4.064,4.017,3.979,3.955,5.558,5.424
4,5.265,5.059,4.747,4.417,4.262,4.177,4.114,4.065,4.025,5.608,5.51,
55.374,5.213,5.006,4.726,4.464,4.317,4.227,4.165,4.133,5.658,5.586,
65.465,5.328,5.166,4.965,4.721,4.506,4.367,4.277,4.241,5.708,5.655,
75.544,5.423,5.287,5.127,4.938,4.725,4.542,4.414,4.349,5.759,5.666,
85.573,5.479,5.386,5.223,5.06,4.897,4.734,4.595,4.457,6.247,5.148,3
9.727,.09378,6.854,6.007,5.069,4.147,7.375,6.66,6.085,5.453,7.838)
 DATA((S(I),I=648,748)=7.197,6.716,6.296,8.312,7.678,7.236,6.873,8.
1722,8.118,7.7,7.364,9.122,8.577,8.115,7.852,8.328,6.896,6.078,5.48
2,9.377,7.934,7.164,6.662,10.28,8.872,8.148,7.705,11.14,9.753,9.045
3,8.621,11.92,10.54,9.838,9.422,9.14,8.02,7.35,6.94,6.65,10.46,9.26
47,8.567,8.147,7.847,11.45,10.27,9.584,9.174,8.884,12.35,11.18,10.4
59,10.09,9.796,13.21,12.04,11.36,10.95,10.67,14.,12.82,12.14,11.74,
611.45,22.59,20.99,20.28,19.87,24.08,22.15,21.34,20.88,25.28,23.48,
722.7,22.26,28.21,25.37,24.28,23.7,28.6,26.42,25.45,24.92,35.19,30.
855,28.65,27.69,30.79,29.21,28.41,27.89,34.82,32.31,31.05,30.25,39.
983,36.62,34.87,33.71)
 END
```

```
   GO TO 33
24 IF(T.LT.68.4) GO TO 25
   N=20
   GO TO 33
25 IF(P.LT.257.18) GO TO 26
   N=21
   GO TO 33
26 IF(T.LT.63) GO TO 27
   N=22
   GO TO 33
27 N=23
   GO TO 33
28 IF(P.LT.6.716) GO TO 30
   IF(P.LT.48.5)  GO TO 29
   N=24
   GO TO 33
29 N=25
   GO TO 33
30 N=26
33 IF(T.LE.5000.)N1=N
   FP=(P-BP(N))/DP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   F=FP-IP
   FP=1.0-F
   FT=(T-BT(N1))/DT(N)
   IT=FT
   FF=FT-IT
   FT=1.0-FF
   I=IT*JP(N)+IP+LOC(N1)
   J=I+JP(N)
   ETENTR=FP*FT*S(I)+F*FT*S(I+1)+FP*FF*S(J)+F*FF*S(J+1)
   RETURN
   END
```

```
 FUNCTION ETCOND(PRES,TEMP)
 DIMENSION PS(19),TS(19),JP(19),MX(19),LOC(19),BP(19),DP(19),BT(19)
1,DT(19)
 COMMON/EAMBDA/C(730)
 DATA(JP=7,5,3,6,4,3,6,6,7,5,5,9,5,2,5,4,3,3,3)
 DATA(MX=5,3,1,4,2,1,4,4,5,3,3,7,3,0,3,2,1,1,1)
 DATA(LOC=1,78,123,168,204,236,251,281,329,392,417,442,487,512,524,
1 604,668,689,710)
 DATA(BP=52.,700.,2500.,0.,100.,142.5,187.5,187.5,400.,700.,0.,0.,
1 0.,0.,1.,0.,0.,-100.,0.)
 DATA(DP=108.,450.,1250.,20.,30.,22.5,42.5,42.5,50.,450.,175.,625.,
1 1250.,3000.,1.,10.,40.,300.,1500.)
 DATA(BT=26.,28.,30.,25.,52.,56.,56.,59.,56.,60.,80.,100.,180.,500.
1 ,3000.,3000.,3000.,3000.,3000.)
```

```
 FUNCTION ETCOND(PRES,TEMP)
 DIMENSION PS(19),TS(19),JP(19),MX(19),LOC(19),BP(19),DP(19),BT(19)
1,DT(19),C(730)
 DIMENSION AA( 94),AB(102),AC(113),AD( 97),AE( 95),AF(110),AG(111)
1 ,AH(  8)
 EQUIVALENCE( C,AA),( C(  95),AB),( C( 197),AC),( C( 310),AD)
1    ,( C( 407),AE),( C( 502),AF),( C( 612),AG),( C( 723),AH)
 DATAAA/.04565,.04628,.04642,.04702,.04764,.04823,.0488,.05238,.052
196,.05333,.05392,.05448,.05502,.05554,.0554,.05631,.05716,.05797,.
205873,.05946,.06016,.05698,.05811,.05917,.06016,.0611,.06199,.0628
34,.05886,.06026,.06155,.06275,.06388,.06495,.06597,.05975,.06147,.
406302,.06444,.06577,.06702,.06819,.05959,.06173,.06359,.06527,.066
581,.06824,.06958,.05844,.06116,.06343,.06542,.0672,.06883,.07035,.
60562,.05982,.06268,.06505,.06713,.06899,.07069,.05203,.0575,.06134
```

```
      DATA(DT=3.,4.,5.,11.,4.,1.,3.,3.,3.,10.,5.,20.,80.,500.,200.,200.,
     1 500.,500.,500.)
      DATA(PS=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
     1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.506)
      DATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,
     154.79,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356)
      DATA((C(I),I=1, 92)=.04565,.04628,.04642,.04702,.04764,.04823,.048
     18,.05238,.05296,.05333,.05392,.05448,.05502,.05554,.0554,.05631,.0
     25716,.05797,.05873,.05946,.06016,.05698,.05811,.05917,.06016,.0611
     3,.06199,.06284,.05886,.06026,.06155,.06275,.06388,.06495,.06597,.0
     45975,.06147,.06302,.06444,.06577,.06702,.06819,.05959,.06173,.0635
     59,.06527,.06681,.06824,.06958,.05844,.06116,.06343,.06542,.0672,.0
     66883,.07035,.0562,.05982,.06268,.06505,.06713,.06899,.07069,.05203
     7,.0575,.06134,.06425,.06669,.06882,.07074,.05495,.05435,.05902,.06
     8276,.06566,.06812,.07028,.05332,.05581,.05804,.06097,0.,.06016,.06
     9281,.06516,.06735,.06959,.06391,.06733,.07034,.07306,.07557)
      DATA((C(I),I=93,192)=.06755,.07175,.07539,.07867,.08167,.06958,.07
     1451,.07872,.08247,.08589,.0705,.07615,.08088,.08505,.08883,.07075,
     2.07717,.0824,.08695,.09105,.07028,.0775,.0832,.08809,.09244,.06905
     3,.07716,.08331,.08849,.09306,.06716,.07088,0.,.07386,.08051,.08755
     4,.08167,.08906,.09571,.08673,.09533,.1028,.09001,.09956,.1078,.092
     523,.1025,.1114,.09306,.1039,.1131,.09345,.1047,.1142,.09343,.1051,
     6.1148,.09309,.1051,.115,.09241,.1047,.1147,.09147,.1039,.114,.0902
     77,.1029,.113,.08889,.1016,.1118,.08736,.1002,.1103,.00717,.0078,0.
     8,0.,0.,0.,.009233,.01023,.01208,.01376,0.,0.,.01363,.01425,.01514,
     9.0161,.0179,.0214,.01987,.02032,.02086,.0215,.02229,.02333,.02637)
      DATA((C(I),I=193,299)=.02676,.02719,.02767,.02819,.02877,.03212,.0
     13247,.03284,.03323,.03364,.03408,.1604,.0831,.0007,0.,.2525,.1540,
     2.0602,-.1200,.3682,.2566,.1448,.02011,.5029,.3803,.2607,.1391,.655
     35,.5223,.3942,.2680,.8239,.6804,.5439,.4114,1.006,.8531,.7083,.568
     47,1.199,1.037,.8847,.7385,.2036,.1996,.1846,.1577,.1463,.129,.1231
     5,.1000 ,.07479,0.,.1091,.02269,0.,.1181 ,-.00009,.1805,.5482,.9326
     6,1.317,1.704,2.09,.0225,.3633,.7182,1.082,1.459,1.839,.009368,.244
     79,.5332,.8788,1.232,1.589,-.09658,.1137,.3767,.6886,1.023,1.371,0.
     8,0.,.2093,.4863,.8152,1.153,-.0016 ,.1424,0.,.2391,.5938,.9358,.08
     9600,.1947,.454,.461,0.,0.,.1801,.2459,.3842,.51,.6221,0.,.2783)
      P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.GE.6000.)T=5999.9999
      DIV=1.0
      IF(T.GE.100.0) GO TO 15
      TZ=24.84+.00317*P
      IF(T.LT.TZ)T=TZ
      IF(P.GE.700.0) GO TO 4
      IF(T.GE.80.0) GO TO 3
      IF(P.LT.187.506) GO TO 7
      IF(T.LT.56.0) GO TO 12
      IF(P.GT.400.0) GO TO 2
      TM=(-0.0000523467*P+0.08698291)*P+44.882441
      IF(T.GE.TM) GO TO 1
      N=7
      DIV=(P-187.506)*.083+TM-T
      GO TO 33
    1 N=8
      DIV=(P-187.506)*.083+T-TM
      GO TO 33
    2 N=9
```

```
     7,.06425,.06669,.06882,.07074,.05495,.05435,.05902,.06276,.06566,.0
     86812,.07028,.05332,.05581,.05804,.06097,0.,.06016,.06281,.06516,.0
     96735,.06959,.06391,.06733,.07034,.07306,.07557,.06755,.07175/
      DATAAB/.07539,.07867,.08167,.06958,.07451,.07872,.08247,.08589,.07
     105,.07615,.08088,.08505,.08883,.07075,.07717,.0824,.08695,.09105,.
     207028,.0775,.0832,.08809,.09244,.06905,.07716,.08331,.08849,.09306
     3,.06716,.07088,0.,.07386,.08051,.08755,.08167,.08906,.09571,.08673
     4,.09533,.1028,.09001,.09956,.1078,.09223,.1025,.1114,.09306,.1039,
     5.1131,.09345,.1047,.1142,.09343,.1051,.1148,.09309,.1051,.115,.092
     641,.1047,.1147,.09147,.1039,.114,.09027,.1029,.113,.08889,.1016,.1
     7118,.08736,.1002,.1103,.00717,.0078,0.,0.,0.,0.,.009233,.01023,.01
     8208,.01376,0.,0.,.01363,.01425,.01514,.0161,.0179,.0214,.01987,.02
     9032,.02086,.0215,.02229,.02333,.02637,.02676,.02719,.02767,.02819/
      DATAAC/.02877,.03212,.03247,.03284,.03323,.03364,.03408,.1604,.083
     11,.0007,0.,.2525,.154,.0602,-.12,.3682,.2566,.1448,.02011,.5029,.3
     2803,.2607,.1391,.6555,.5223,.3942,.268,.8239,.6804,.5439,.4114,1.0
     306,.8531,.7083,.5687,1.199,1.037,.8847,.7385,.2036,.1996,.1846,.15
     477,.1463,.129,.1231,.1,.07479,0.,.1091,.02269,0.,.1181,-9.E-5,.180
     55,.5482,.9326,1.317,1.704,2.09,.0225,.3633,.7182,1.082,1.459,1.839
     6,.009368,.2449,.5332,.8788,1.232,1.589,-.09658,.1137,.3767,.6886,1
     7.023,1.371,0.,0.,.2093,.4863,.8152,1.153,-.0016,.1424,0.,.2391,.59
     838,.9358,.086,.1947,.454,.461,0.,0.,.1801,.2459,.3842,.51,.6221,0.
     9,.2783,.3339,.4294,.563,.693,.824,.3848,.4405,.5207,.6309,.7636/
      DATAAD/.9079,.4997,.5553,.6299,.7288,.8536,.9969,.6219,.6783,.7511
     1,.8433,.958,1.094,.7508,.8084,.8807,.9696,1.078,1.207,.06345,.0648
     2,.06605,.0672,.06829,.06931,.07028,.06142,.06308,.06456,.06591,.06
     3715,.06831,.0694,.059,.0609,.06271,.06431,.06575,.06707,.0683,.057
     426,.05909,.06074,.06238,.06407,.06559,.06699,.05507,.0574,.05917,
     5.0609,.06246,.0639,.06548,.05217,.05503,.05732,.05931,.06108,.0626
     68,.06414,.04902,.05256,.05531,.05758,.05956,.06133,.06293,.04689,.
     705031,.05329,.05582,.05799,.05991,.06164,.04584,.04878,.05162,.054
     819,.05647,.0585,.06034,.06905,.07716,.08331,.08849,.09306,.06451,.
     907532,.08251,.08838,.09343,.06046,.0724,.0805,.08698,.09241/
      DATAAE/.05677,.06965,.07764,.08456,.09027,.05479,.06618,.07469,.08
     115,.08736,.03212,.03576,.04274,.05294,.06034,.0343,.03781,.04321,.
     205109,.05833,.03616,.03939,.04405,.05024,.05672,.03773,.04073,.044
     378,.04994,.05557,.03901,.04183,.04544,.04989,.05479,.03902,.05246,
     4.06828,.07893,.08736,.09423,.1002,.1055,.1103,.04248,.052,.0634,.0
     57368,.08159,.08838,.0943,.09956,.1044,.04416,.05155,.06038,.06889,
     6.07633,.08278,.08846,.09354,.09819,.04606,.05256,.05992,.06724,.07
     7398,.08003,.08547,.09042,.09498,.0479,.05376,.06016,.06659,.07267,
     8.07829,.08345,.0882,.09261,.0479,.06017,.07267,.08345,.09261,.0595
     9,.06942,.07873,.08732,.09526,.07385,.08069,.08691,.09278,.09839/
      DATAAF/.08811,.09256,.0965,.1003,.104,.1014,.104,.1063,.1084,.1107
     1,.1014,.1071,.1661,.1576,.2217,.2042,.2777,.2777,.3361,.3354,.4107
     2,.3942,.4107,.4058,.4036,.4023,.4014,.4607,.4479,.4423,.4389,.4366
     3,.5407,.5113,.4982,.4905,.4851,.6737,.6121,.5848,.5685,.5574,.8929
     4,.7742,.7215,.69,.6685,1.242,1.029,.9339,.8773,.8385,1.772,1.414,1
     5.254,1.158,1.093,2.538,1.973,1.718,1.565,1.46,3.585,2.746,2.363,2.
     6131,1.972,4.93,3.763,3.219,2.886,2.656,6.529,5.025,4.298,3.847,3.5
     731,8.241,6.483,5.581,5.006,4.598,9.796,8.013,6.995,6.318,5.825,10.
     883,9.406,8.404,7.685,7.14,11.,10.37,9.586,8.934,8.402,10.22,10.65,
     910.31,9.864,9.439,.4036,.3992,.3976,.3969,.4423,.4309,.4268,.425/
      DATAAG/.4983,.472,.4627,.4585,.585,.5298,.5102,.5016,.7219,.6151,.
     15773,.5605,.9349,.7422,.6739,.6436,1.256,.9293,.8132,.7616,1.723,1
     2.198,1.011,.9272,2.373,1.571,1.283,1.155,3.239,2.073,1.65,1.46,4.3
     34,2.722,2.128,1.859,5.665,3.531,2.73,2.363,7.155,4.495,3.463,2.981
     4,8.689,5.591,4.324,3.717,10.05,6.75,5.285,4.554,10.99,7.886,6.309,
```

```
      GO TO 33
    3 N=11
      GO TO 33
    4 IF(P.GE.2500.0) GO TO 6
      IF(T.GE.60.0) GO TO 5
      N=2
      GO TO 33
    5 N=10
      GO TO 33
    6 N=3
      GO TO 33
    7 DO 8 I=2,19
      IF(P-PS(I)) 10,9,8
    8 CONTINUE
    9 TM=TS(I)
      GO TO 11
   10 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
   11 IF(T.GE.TM) GO TO 13
      IF(T.LT.56.0) GO TO 12
      N=6
      DIV=(187.506-P)*.083+TM-T
      GO TO 33
   12 N=1
      GO TO 33
   13 IF(P.GE.100.0) GO TO 14
      N=4
      GO TO 33
   14 N=5
      DIV=(187.506-P)*.083+T-TM
      GO TO 33
   15 IF(T.GE.3000.0) GO TO 18
      IF(T.GE.500.0) GO TO 17
      IF(T.GE.180.0) GO TO 16
      N=12
      GO TO 33
   16 N=13
      GO TO 33
   17 N=14
      GO TO 33
   18 IF(P.GE.30.0) GO TO 20
      IF(P.GE.5.0) GO TO 19
      N=15
      GO TO 33
   19 N=16
      GO TO 33
   20 IF(P.GE.500.0) GO TO 22
      IF(P.GE.100.0) GO TO 21
      N=17
      GO TO 33
   21 N=18
      GO TO 33
   22 N=19
   33 FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N))/DT(N)
```



```
     55.473,.3982,.3965,.3957,.4894,.4749,.4681,.6979,.6255,.5913,1.219,
     6.97,.8517,2.345,1.696,1.386,4.337,3.001,2.349,7.089,4.935,3.832,.3
     7968,.395,.3946,.4772,.462,.4582,.6369,.5608,.5416,1.01,.7463,.6794
     8,1.805,1.107,.9283,3.249,1.75,1.36,5.437,2.761,2.041,.3948,.3943,.
     93942,.4596,.4554,.4543,.5486,.5276,.5219,.7038,.6307,.6111,.9936/
      DATAAH/.7976,.7451,1.504,1.071,.955,2.313,1.496,1.273/
      OATA JP/7,5,3,6,4,3,6,6,7,5,5,9,5,2,5,4,3,3,3/
      DATA MX/5,3,1,4,2,1,4,4,5,3,3,7,3,0,3,2,1,1,1/
      DATA LOC/1,78,123,168,204,236,251,281,329,392,417,442,487,512,524,
     1 604,668,689,710/
      DATA BP/52.,700.,2500.,0.,100.,142.5,187.5,187.5,400.,700.,0.,0.,
     1 0.,0.,1.,0.,0.,-100.,0./
      OATA OP/108.,450.,1250.,20.,30.,22.5,42.5,42.5,50.,450.,175.,625.,
     1 1250.,3000.,1.,10.,40.,300.,1500./
      DATA BT/26.,28.,30.,25.,52.,56.,56.,59.,56.,60.,80.,100.,180.,500.
     1 ,3000.,3000.,3000.,3000.,3000./
      DATA DT/3.,4.,5.,11.,4.,1.,3.,3.,3.,10.,5.,20.,80.,500.,200.,200.,
     1 500.,500.,500./
      DATA PS/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
     1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.506/
      DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,
     154.79,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356/
      P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.GE.6000.)T=5999.9999
      DIV=1.0
      IF(T.GE.100.0) GO TO 15
      TZ=24.84+.00317*P
      IF(T.LT.TZ)T=TZ
      IF(P.GE.700.0) GO TO 4
      IF(T.GE.80.0) GO TO 3
      IF(P.LT.187.506) GO TO 7
      IF(T.LT.56.0) GO TO 12
      IF(P.GT.400.0) GO TO 2
      TM=(-0.0000523467*P+0.08698291)*P+44.882441
      IF(T.GE.TM) GO TO 1
      N=7
      DIV=(P-187.506)*.083+TM-T
      GO TO 33
    1 N=8
      DIV=(P-187.506)*.083+T-TM
      GO TO 33
    2 N=9
      GO TO 33
    3 N=11
      GO TO 33
    4 IF(P.GE.2500.0) GO TO 6
      IF(T.GE.60.0) GO TO 5
      N=2
      GO TO 33
    5 N=10
      GO TO 33
    6 N=3
      GO TO 33
    7 OO 8 I=2,19
      IF(P-PS(I)) 10,9,8
    8 CONTINUE
```

```
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N)
      J=I+JP(N)
      ETCONO=(FP*FT*C(I)+F*FT*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))/DIV
      RETURN
      ENO

      SUBROUTINE EATACONO
      COMMON/EAMBOA/C(730)
      OATA((C(I),I=300,396)=.3339,.4294,.563,.693,.824,.3848,.4405,.5207
     1,.6309,.7636,.9079,.4997,.5553,.6299,.7288,.8536,.9969,.6219,.6783
     2,.7511,.8433,.958,1.094,.7508,.8084,.8807,.9696,1.078,1.207,.06345
     3,.0648,.06605,.0672,.06829,.06931,.07028,.06142,.06308,.06456,.065
     491,.06715,.06831,.0694,.059,.0609,.06271,.06431,.06575,.06707,.068
     53,.05726,.05909,.06074,.06238,.06407,.06559,.06699,.05507,.05724,.
     605917,.0609,.06246,.0639,.06548,.05217,.05503,.05732,.05931,.06108
     7,.06268,.06414,.04902,.05256,.05531,.05758,.05956,.06133,.06293,.0
     84689,.05031,.05329,.05582,.05799,.05991,.06164,.04584,.04878,.0516
     92,.05419,.05647,.0585,.06034,.06905,.07716,.08331,.08849,.09306)
      DATA((C(I),I=397,489)=.06451,.07532,.08251,.08838,.09343,.06046,.0
     1724,.0805,.08698,.09241,.05677,.06965,.07764,.08456,.09027,.05479,
     2.06618,.07469,.0815,.08736,.03212,.03576,.04274,.05294,.06034,.034
     33,.03781,.04321,.05109,.05833,.03616,.03939,.04405,.05024,.05672,.
     403773,.04073,.04478,.04994,.05557,.03901,.04183,.04544,.04989,.054
     579,.03902,.05246,.06828,.07893,.08736,.09423,.1002,.1055,.1103,.04
     6248,.052,.0634,.07368,.08159,.08838,.0943,.09956,.1044,.04416,.051
     755,.06038,.06889,.07633,.08278,.08846,.09354,.09819,.04606,.05256,
     8.05992,.06724,.07398,.08003,.08547,.09042,.09498,.0479,.05376,.060
     916,.06659,.07267,.07829,.08345,.0882,.09261,.0479,.06017,.07267)
      DATA((C(I),I=490,594)=.08345,.09261,.0595,.06942,.07873,.08732,.09
     1526,.07385,.08069,.08691,.09278,.09839,.08811,.09256,.0965,.1003,.
     2104,.1014,.104,.1063,.1084,.1107,.1014,.1071,.1661,.1576,.2217,.20
     342,.2777,.2777,.3361,.3354,.4107,.3942,.4107,.4058,.4036,.4023,.40
     414,.4607,.4479,.4423,.4389,.4366,.5407,.5113,.4982,.4905,.4851,.67
     537,.6121,.5848,.5685,.5574,.8929,.7742,.7215,.69,.6685,1.242,1.029
     6,.9339,.8773,.8385,1.772,1.414,1.254,1.158,1.093,2.538,1.973,1.718
     7,1.565,1.46,3.585,2.746,2.363,2.131,1.972,4.93,3.763,3.219,2.886,2
     8.656,6.529,5.025,4.298,3.847,3.531,8.241,6.483,5.581,5.006,4.598,9
     9.796,8.013,6.995,6.318,5.825,10.83,9.406,8.404,7.685,7.14,11.)
      OATA((C(I),I=595,702)=10.37,9.586,8.934,8.402,10.22,10.65,10.31,9.
     1864,9.439,.4036,.3992,.3976,.3969,.4423,.4309,.4268,.425,.4983,.47
     22,.4627,.4585,.585,.5298,.5102,.5016,.7219,.6151,.5773,.5605,.9349
     3,.7422,.6739,.6436,1.256,.9293,.8132,.7616,1.723,1.198,1.011,.9272
     4,2.373,1.571,1.283,1.155,3.239,2.073,1.65,1.46,4.34,2.722,2.128,1.
     5859,5.665,3.531,2.73,2.363,7.155,4.495,3.463,2.981,8.689,5.591,4.3
     624,3.717,10.05,6.75,5.285,4.554,10.99,7.886,6.309,5.473,.3982,.396
     75,.3957,.4894,.4749,.4681,.6979,.6255,.5913,1.219,.97,.8517,2.345,
     81.696,1.386,4.337,3.001,2.349,7.089,4.935,3.832,.3968,.395,.3946,.
     94772,.462,.4582,.6369,.5608,.5416,1.01,.7463,.6794,1.805,1.107)
      OATA((C(I),I=703,730)=.9283,3.249,1.75,1.36,5.437,2.761,2.041,.394
     18,.3943,.3942,.4596,.4554,.4543,.5486,.5276,.5219,.7038,.6307,.611
     21,.9936,.7976,.7451,1.504,1.071,.955,2.313,1.496,1.273)
      END
```

```
    9 TM=TS(I)
      GO TO 11
   10 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
   11 IF(T.GE.TM) GO TO 13
      IF(T.LT.56.0) GO TO 12
      N=6
      DIV=(187.506-P)*.083+TM-T
      GO TO 33
   12 N=1
      GO TO 33
   13 IF(P.GE.100.0) GO TO 14
      N=4
      GO TO 33
   14 N=5
      OIV=(187.506-P)*.083+T-TM
      GO TO 33
   15 IF(T.GE.3000.0) GO TO 18
      IF(T.GE.500.0) GO TO 17
      IF(T.GE.180.0) GO TO 16
      N=12
      GO TO 33
   16 N=13
      GO TO 33
   17 N=14
      GO TO 33
   18 IF(P.GE.30.0) GO TO 20
      IF(P.GE.5.0) GO TO 19
      N=15
      GO TO 33
   19 N=16
      GO TO 33
   20 IF(P.GE.500.0) GO TO 22
      IF(P.GE.100.0) GO TO 21
      N=17
      GO TO 33
   21 N=18
      GO TO 33
   22 N=19
   33 FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N))/OT(N)
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N)
      J=I+JP(N)
      ETCONO=(FP*FT*C(I)+F*FT*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))/DIV
      RETURN
      ENO
```

```
      FUNCTION ETVISC(PRES,TEMP)
      COMMON/EVISCD/V(536)
      DIMENSION PS(20),TS(20),JP(21),MX(21),LDC(21),BP(21),DP(21),BT(21)
     1,DT(21)
      DATA(PS=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,
     1182.,185.,186.5,187.25,187.46875,187.506,187.6385)
      DATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
     179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4)
      DATA(LDC=1,21,37,46,55,90,112,134,155,176,204,216,276,296,320,
     1356,376,436,480,510,528)
      DATA(JP=4,4,3,3,5,3,3,3,3,4,3,6,4,6,4,5,5,11,6,3,3)
      DATA(MX=2,2,1,1,3,1,1,1,1,2,1,4,2,4,2,3,3,9,4,1,1)
      DATA(BP=0,0,-1.,0,1.,    -10.,0,1469.6,   1469.6,  1469.6,   1469.
     16,0,0,0,587.84,0,293.92,190.,190.,190.,190.)
       DATA(DP=1000. ,1000.,3.,1500.,1.,20.,1500.,1763.52,1763.52,1175.68
     1,1763.52,293.92,73.48,293.92,293.92,146.96,73.48,10.,20.,50.,50.)
      DATA(BT=180.,500.,2000.,2000.,3000.,3000.,3000.,30.6,41.4,63.,126.
     1,27.,36.,126.,54.,99.,59.4,59.4,64.8,72.,81.)
      DATA(DT=80.,500.,500.,500.,500.,500.,500.,1.8,3.6,9.,18.,3.6,18.,
     118.,9.,9.,3.6,1.8,1.8,1.8,9.)
      DATA((V(I),I=1, 64)=2.354E-11,2.797E-11,3.278E-11,3.762E-11,3.1E-1
     111,3.452E-11,3.812E-11,4.172E-11,3.754E-11,3.99E-11,4.22E-11,4.451E
     2-11,4.351E-11,4.498E-11,4.638E-11,4.779E-11,4.906E-11,4.986E-11,5.
     306E-11,5.138E-11,4.906E-11,4.986E-11,5.06E-11,5.138E-11,7.852E-11,
     47.688E-11,7.543E-11,7.418E-11,1.033E-10,1.002E-10,9.74E-11,9.495E-
     511,1.256E-10,1.213E-10,1.174E-10,1.14E-10,1.256E-10,1.256E-10,1.25
     66E-10,1.463E-10,1.463E-10,1.462E-10,1.657E-10,1.657E-10,1.657E-10,
     71.256E-10,1.193E-10,1.14E-10,1.463E-10,1.384E-10,1.317E-10,1.657E-
     810,1.564E-10,1.485E-10,1.657E-10,1.657E-10,1.657E-10,1.657E-10,1.6
     957E-10,1.843E-10,1.843E-10,1.842E-10,1.842E-10,1.842E-10)
      DATA((V(I),I=65,129)=2.027E-10,2.024E-10,2.023E-10,2.023E-10,2.022
     1E-10,2.223E-10,2.215E-10,2.21E-10,2.208E-10,2.206E-10,2.441E-10,2.
     2427E-10,2.418E-10,2.412E-10,2.407E-10,2.617E-10,2.635E-10,2.634E-1
     30,2.631E-10,2.626E-10,2.647E-10,2.742E-10,2.782E-10,2.801E-10,2.81
     41E-10,1.658E-10,1.657E-10,1.655E-10,1.844E-10,1.842E-10,1.84E-10,2
     5.026E-10,2.021E-10,2.018E-10,2.221E-10,2.201E-10,2.194E-10,2.446E-
     610,2.394E-10,2.377E-10,2.681E-10,2.608E-10,2.576E-10,2.782E-10,2.8
     721E-10,2.794E-10,0.,1.657E-10,1.564E-10,1.485E-10,1.842E-10,1.736E
     8-10,1.645E-10,2.02E-10,1.901E-10,1.799E-10,2.197F-10,2.06E-10,1.94
     98E-10,2.38E-10,2.217E-10,2.094E-10,2.58E-10,2.373E-10,2.238E-10)
      DATA((V(I),I=130,195)=2.799E-10,2.534E-10,2.385E-10,0.,1.838E-10,2
     1.745E-10,0.,1.645E-10,2.572E-10,0.,1.496E-10,2.341E-10,3.211E-10,1
     2.381E-10,2.145E-10,2.94E-10,1.266E-10,1.958E-10,2.659E-10,1.182E-1
     30,1.804E-10,2.432E-10,1.1E-10,1.674E-10,2.237E-10,1.1E-10,1.674E-1
     40,2.237E-10,9.723E-11,1.467E-10,1.938E-10,8.717E-11,1.308E-10,1.71
     57E-10,7.898E-11,1.184E-10,1.547E-10,7.217E-11,1.084E-10,1.413E-10,
     66.587E-11,9.78E-11,1.297E-10,6.091E-11,9.124E-11,1.209E-10,6.091E-
     711,8.175E-11,1.02E-10,1.209E-10,5.159E-11,7.068E-11,8.807E-11,1.04
     83E-10,4.432E-11,6.179E-11,7.734E-11,9.191E-11,3.911E-11,5.524E-11,
     96.936E-11,8.264E-11,3.553E-11,5.021E-11,6.317E-11,7.54E-11)
      P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.LT.180.0) GO TO 7
      IF(T.GE.500.0) GO TO 1
```

```
      FUNCTION ETVISC(PRES,TEMP)
      DIMENSION PS(20),TS(20),JP(21),MX(21),LOC(21),BP(21),DP(21),BT(21)
     1,DT(21),V(536)
      DIMENSION AA( 66),AB( 67),AC( 67),AD( 66),AE( 67),AF( 66),AG( 66)
     1 ,AH( 66),AI(  5)
      EQUIVALENCE( V,AA),( V(  67),AB),( V( 134),AC),( V( 201),AD)
     1    ,( V( 267),AE),( V( 334),AF),( V( 400),AG),( V( 466),AH)
     2    ,( V( 532),AI)
      DATA PS/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,
     1182.,185.,186.5,187.25,187.46875,187.506,187.6385/
      DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
     179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.4/
      DATA LOC/1,21,37,46,55,90,112,134,155,176,204,216,276,296,320,
     1356,376,436,480,510,528/
      DATA JP/4,4,3,3,5,3,3,3,3,4,3,6,4,6,4,5,5,11,6,3,3/
      DATA MX/2,2,1,1,3,1,1,1,1,2,1,4,2,4,2,3,3,9,4,1,1/
      DATA BP/0.,0.,-1.,0.,1.,-10.,0.,1469.6,1469.6,1469.6,1469.6,0.,0.,
     10.,587.84,0.,293.92,190.,190.,190.,190./
      DATA DP/1000.,1000.,3.,1500.,1.,20.,1500.,1763.52,1763.52, 1175.68
     1,1763.52,293.92,73.48,293.92,293.92,146.96,73.48,10.,20.,50.,50./
      DATA BT/180.,500.,2000.,2000.,3000.,3000.,3000.,30.6,41.4,63.,126.
     1,27.,36.,126.,54.,99.,59.4,59.4,64.8,72.,81./
      DATA DT/80.,500.,500.,500.,500.,500.,500.,1.8,3.6,9.,18.,3.6,18.,
     118.,9.,9.,3.6,1.8,1.8,1.8,9./
      DATAAA/2.354E-11,2.797E-11,3.278E-11,3.762E-11,3.1E-11,3.452E-11,3
     1.812E-11,4.172E-11,3.754E-11,3.99E-11,4.22E-11,4.451E-11,4.351E-11
     2,4.498E-11,4.638E-11,4.779E-11,4.906E-11,4.986E-11,5.06E-11,5.138E
     3-11,4.906E-11,4.986E-11,5.06E-11,5.138E-11,7.852E-11,7.688E-11,7.5
     443E-11,7.418E-11,1.033E-10,1.002E-10,9.74E-11,9.495E-11,1.256E-10,
     51.213E-10,1.174E-10,1.14E-10,1.256E-10,1.256E-10,1.256E-10,1.463E-
     610,1.463E-10,1.462E-10,1.657E-10,1.657E-10,1.657E-10,1.256E-10,1.1
     793E-10,1.14E-10,1.463E-10,1.384E-10,1.317E-10,1.657E-10,1.564E-10,
     81.485E-10,1.657E-10,1.657E-10,1.657E-10,1.657E-10,1.657E-10,1.843E
     9-10,1.843E-10,1.842E-10,1.842E-10,1.842E-10,2.027E-10,2.024E-10/
      DATAAB/2.023E-10,2.023E-10,2.022E-10,2.223E-10,2.215E-10,2.21E-10,
     12.208E-10,2.206E-10,2.441E-10,2.427E-10,2.418E-10,2.412E-10,2.407E
     2-10,2.617E-10,2.635E-10,2.634E-10,2.631E-10,2.626E-10,2.647E-10,2.
     3742E-10,2.782E-10,2.801E-10,2.811E-10,1.658E-10,1.657E-10,1.655E-1
     40,1.844E-10,1.842E-10,1.84E-10,2.026E-10,2.021E-10,2.018E-10,2.221
     5E-10,2.201E-10,2.194E-10,2.446E-10,2.394E-10,2.377E-10,2.681E-10,2
     6.608E-10,2.576E-10,2.782E-10,2.821E-10,2.794E-10,0.,1.657E-10,1.56
     74E-10,1.485E-10,1.842E-10,1.736E-10,1.645E-10,2.02E-10,1.901E-10,1
     8.799E-10,2.197E-10,2.06E-10,1.948E-10,2.38E-10,2.217E-10,2.094E-10
     9,2.58E-10,2.373E-10,2.238E-10,2.799E-10,2.534E-10,2.385E-10,0./
      DATAAC/1.838E-10,2.745E-10,0.,1.645E-10,2.572E-10,0.,1.496E-10,2.3
     141E-10,3.211E-10,1.381E-10,2.145E-10,2.94E-10,1.266E-10,1.958E-10,
     22.659E-10,1.182E-10,1.804E-10,2.432E-10,1.1E-10,1.674E-10,2.237E-1
     30,1.1E-10,1.674E-10,2.237E-10,9.723E-11,1.467E-10,1.938E-10,8.717E
     4-11,1.308E-10,1.717E-10,7.898E-11,1.184E-10,1.547E-10,7.217E-11,1.
     5084E-10,1.413E-10,6.587E-11,9.78E-11,1.297E-10,6.091E-11,9.124E-11
     6,1.209E-10,6.091E-11,8.175E-11,1.02E-10,1.209E-10,5.159E-11,7.068E
     7-11,8.807E-11,1.043E-10,4.432E-11,6.179E-11,7.734E-11,9.191E-11,3.
     8911E-11,5.524E-11,6.936E-11,8.264E-11,3.553E-11,5.021E-11,6.317E-1
     91,7.54E-11,3.28E-11,4.627E-11,5.023E-11,6.956E-11,3.134E-11/
      DATAAD/4.364E-11,5.458E-11,6.503E-11,3.05E-11,4.65E-11,6.177E-11,2
```

```
      N=1
      GO TO 30
    1 IF(T.GE.3000.0) GO TO 4
      IF(T.GE.2000.0) GO TO 2
      N=2
      GO TO 30
    2 IF(P.GT.5.0) GO TO 3
      N=3
      GO TO 30
    3 N=4
      GO TO 30
    4 IF(T.GE.6000.0) T=5999.99999
      IF(P.GE.5.0) GO TO 5
      N=5
      GO TO 30
    5 IF(P.GE.30.0) GO TO 6
      N=6
      GO TO 30
    6 N=7
      GO TO 30
    7 IF(P.LT.1469.6) GO TO 12
      IF(T.GE.  63.0) GO TO 10
      IF(T.GE.41.4)   GO TO 9
      N=8
    8 TZ=24.84+0.00317*P
      IF(T.LT.TZ) T=TZ
      GO TO 30
    9 N=9
      GO TO 30
   10 IF(T.GE.117.0) GO TO 11
      N=10
      GO TO 30
   11 N=11
      GO TO 30
   12 IF(T.GE.59.4)  GO TO 17
      N=12
      IF(P.GE.187.6385) GO TO 8
      DO 13 I=2,20
      IF(P-PS(I))15,14,13
   13 CONTINUE
   14 TL=TS(I)
      GO TO 16
   15 TL=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
   16 IF(T.LE.TL) GO TO 8
      N=13
      GO TO 30
   17 IF(T.LT.126.0) GO TO 18
      N=14
      GO TO 30
   18 IF(P.LT.587.84) GO TO 19
      N=15
      GO TO 30
   19 IF(T.LT.99.0) GO TO 20
      N=16
      GO TO 30
   20 IF(P.GE.190.0)GO TO 21
      N=13
      GO TO 30
```

```
     1.946E-11,4.211E-11,5.525E-11,2.962E-11,4.035E-11,5.165E-11,3.034E-
     211,3.954E-11,4.874E-11,1.29E-10,1.48E-10,1.677E-10,1.866E-10,2.058
     3E-10,2.25E-10,1.033E-10,1.183E-10,1.335E-10,1.493E-10,1.656E-10,1.
     4825E-10,8.563E-11,9.818E-11,1.107E-10,1.233E-10,1.363E-10,1.496E-1
     50,7.246E-11,8.358E-11,9.433E-11,1.05E-10,1.158E-10,1.267E-10,6.196
     6E-11,7.234E-11,8.199E-11,9.135E-11,1.006E-10,1.1E-10,5.305E-11,6.3
     724E-11,7.223E-11,8.073E-11,8.902E-11,9.723E-11,4.487E-11,5.552E-11
     8,6.423E-11,7.216E-11,7.974E-11,8.717E-11,3.647E-11,4.869E-11,5.747
     9E-11,6.505E-11,7.214E-11,7.898E-11,6.15E-12,4.232E-11,5.16E-11/
      DATAAE/5.906E-11,6.576E-11,7.217E-11,6.56E-12,3.651E-11,4.645E-11,
     15.353E-11,6.013E-11,6.587E-11,6.3E-12,7.49E-12,5.8E-12,0.,9.3E-12,
     21.004E-11,1.209E-11,2.554E-11,1.198E-11,1.249E-11,1.318E-11,1.434E
     3-11,1.442E-11,1.483E-11,1.53E-11,1.587E-11,1.667E-11,1.701E-11,1.7
     438E-11,1.78E-11,1.877E-11,2.006E-11,2.192E-11,2.457E-11,2.739E-11,
     53.019E-11,2.075E-11,2.185E-11,2.325E-11,2.513E-11,2.729E-11,2.946E
     6-11,2.263E-11,2.36E-11,2.473E-11,2.617E-11,2.785E-11,2.962E-11,2.4
     728E-11,2.532E-11,2.625E-11,2.744E-11,2.88E-11,3.029E-11,5.444E-11,
     86.191E-11,6.881E-11,7.543E-11,4.154E-11,4.921E-11,5.559E-11,6.091E
     9-11,3.164E-11,3.988E-11,4.613E-11,5.159E-11,2.517E-11,3.308E-11/
      DATAAF/3.919E-11,4.432E-11,2.234E-11,2.867E-11,3.427E-11,3.911E-11
     1,2.131E-11,2.623E-11,3.099E-11,3.553E-11,2.113E-11,2.509E-11,2.9E-
     211,3.28E-11,2.141E-11,2.463E-11,2.792E-11,3.134E-11,2.192E-11,2.45
     37E-11,2.739E-11,3.019E-11,1.557E-11,1.635E-11,1.739E-11,1.901E-11,
     42.131E-11,1.667E-11,1.738E-11,1.826E-11,1.948E-11,2.113E-11,1.774E
     5-11,1.839E-11,1.916E-11,2.014E-11,2.141E-11,1.877E-11,1.941E-11,2.
     6006E-11,2.099E-11,2.192E-11,3.651E-11,3.9E-11,4.148E-11,4.397E-11,
     74.645E-11,2.868E-11,3.35E-11,3.675E-11,3.938E-11,4.154E-11,2.076E-
     811,2.766E-11,3.178E-11,3.483E-11,3.716E-11,1.748E-11,2.262E-11,2.7
     922E-11,3.068E-11,3.329E-11,1.649E-11,2.E-11,2.377E-11,2.712E-11/
      DATAAG/3.E-11,1.614E-11,1.857E-11,2.156E-11,2.448E-11,2.72E-11,1.6
     112E-11,1.79E-11,2.025E-11,2.27E-11,2.517E-11,1.625E-11,1.766E-11,1
     2.95E-11,2.154E-11,2.37E-11,1.649E-11,1.766E-11,1.913E-11,2.086E-11
     3,2.268E-11,1.676E-11,1.774E-11,1.896E-11,2.044E-11,2.202E-11,1.707
     4E-11,1.79E-11,1.892E-11,2.019E-11,2.157E-11,1.739E-11,1.82E-11,1.9
     501E-11,2.016E-11,2.131E-11,2.484E-11,2.818E-11,2.97E-11,3.086E-11,
     63.181E-11,3.261E-11,3.335E-11,3.401E-11,3.461E-11,3.52E-11,3.573E-
     711,1.431E-11,1.56E-11,1.812E-11,2.297E-11,2.59E-11,2.757E-11,2.885
     8E-11,2.987E-11,3.076E-11,3.154E-11,3.225E-11,1.368E-11,1.429E-11,1
     9.511E-11,1.626E-11,1.791E-11,2.015E-11,2.259E-11,2.458E-11/
      DATAAH/2.611E-11,2.728E-11,2.831E-11,1.35E-11,1.394E-11,1.438E-11,
     11.508E-11,1.578E-11,1.689E-11,1.8E-11,1.949E-11,2.099E-11,2.246E-1
     21,2.394E-11,1.35E-11,1.438E-11,1.578E-11,1.8E-11,2.099E-11,2.394E-
     311,1.347E-11,1.412E-11,1.503E-11,1.634E-11,1.815E-11,2.032E-11,1.3
     453E-11,1.404E-11,1.471E-11,1.562E-11,1.683E-11,1.833E-11,1.363E-11
     5,1.405E-11,1.459E-11,1.526E-11,1.615E-11,1.725E-11,1.377E-11,1.414
     6E-11,1.458E-11,1.512E-11,1.582E-11,1.664E-11,1.377E-11,1.484E-11,1
     7.664E-11,1.393E-11,1.486E-11,1.635E-11,1.409E-11,1.489E-11,1.61E-1
     81,1.427E-11,1.499E-11,1.604E-11,1.445E-11,1.509E-11,1.6E-11,1.464E
     9-11,1.523E-11,1.604E-11,1.464E-11,1.523E-11,1.604E-11,1.563E-11/
      DATAAI/1.606E-11,1.658E-11,1.662E-11,1.697E-11,1.736E-11/
      P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.LT.180.0) GO TO 7
      IF(T.GE.500.0) GO TO 1
      N=1
      GO TO 30
    1 IF(T.GE.3000.0) GO TO 4
```

```
   IF(T.GE.2000.0) GO TO 2
   N=2
   GO TO 30
 2 IF(P.GT.5.0) GO TO 3
   N=3
   GO TO 30
 3 N=4
   GO TO 30
 4 IF(T.GE.6000.0) T=5999.99999
   IF(P.GE.5.0) GO TO 5
   N=5
   GO TO 30
 5 IF(P.GE.30.0) GO TO 6
   N=6
   GO TO 30
 6 N=7
   GO TO 30
 7 IF(P.LT.1469.6) GO TO 12
   IF(T.GE.  63.0) GO TO 10
   IF(T.GE.41.4)   GO TO 9
   N=8
 8 TZ=24.84+0.00317*P
   IF(T.LT.TZ) T=TZ
   GO TO 30
 9 N=9
   GO TO 30
10 IF(T.GE.117.0) GO TO 11
   N=10
   GO TO 30
11 N=11
   GO TO 30
12 IF(T.GE.59.4)  GO TO 17
   N=12
   IF(P.GE.187.6385) GO TO 8
   DO 13 I=2,20
   IF(P-PS(I))15,14,13
13 CONTINUE
14 TL=TS(I)
   GO TO 16
15 TL=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
16 IF(T.LE.TL) GO TO 8
   N=13
   GO TO 30
17 IF(T.LT.126.0) GO TO 18
   N=14
   GO TO 30
18 IF(P.LT.587.84) GO TO 19
   N=15
   GO TO 30
19 IF(T.LT.99.0) GO TO 20
   N=16
   GO TO 30
20 IF(P.GE.190.0)GO TO 21
   N=13
   GO TO 30
21 IF(P.LT.293.92) GO TO 22
   N=17
   GO TO 30
22 IF(T.GE.72.0) GO TO 24
   IF(T.GE.64.8) GO TO 23
   N=18
   GO TO 30
23 N=19
   GO TO 30
24 IF(T.GE.81.0) GO TO 25
   N=20
   GO TO 30
25 N=21
30 FP=(P-BP(N))/DP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   F=FP-IP
   FP=1.0-F
   FT=(T-BT(N))/DT(N)
   IT=FT
   FF=FT-IT
   FT=1.0-FF
   I=IT*JP(N)+IP+LOC(N)
   J=I+JP(N)
   ETVISC=FP*FT*V(I)+F*FT*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
   RETURN
   END

   SUBROUTINE EDVISC
   COMMON/EVISCD/V(536)
   DATA((V(I),I=196,259)=3.28E-11,4.627E-11,5.823E-11,6.956E-11,3.134
  1E-11,4.364E-11,5.458E-11,6.503E-11,3.05E-11,4.65E-11,6.177E-11,2.9
  246E-11,4.211E-11,5.525E-11,2.962E-11,4.035E-11,5.165E-11,3.034E-11
  3,3.954E-11,4.874E-11,1.29E-10,1.48E-10,1.677E-10,1.866E-10,2.058E-
  410,2.25E-10,1.033E-10,1.183E-10,1.335E-10,1.493E-10,1.656E-10,1.82
  55E-10,8.563E-11,9.818E-11,1.107E-10,1.233E-10,1.363E-10,1.496E-10,
  67.246E-11,8.358E-11,9.433E-11,1.05E-10,1.158E-10,1.267E-10,6.196E-
  711,7.234E-11,8.199E-11,9.135E-11,1.006E-10,1.1E-10,5.305E-11,6.324
  8E-11,7.223E-11,8.073E-11,8.902E-11,9.723E-11,4.487E-11,5.552E-11,6
  9.423E-11,7.216E-11,7.974E-11,8.717E-11,3.647E-11,4.869E-11)
   DATA((V(I),I=260,324)=5.747E-11,6.505E-11,7.214E-11,7.898E-11,6.15
  1E-12,4.232E-11,5.16E-11,5.906E-11,6.576E-11,7.217E-11,6.56E-12,3.6
  251E-11,4.645E-11,5.353E-11,6.013E-11,6.587E-11,6.3E-12,7.49E-12,5.
  38E-12,0.,9.3E-12,1.004E-11,1.209E-11,2.554E-11,1.198E-11,1.249E-11
  4,1.318E-11,1.434E-11,1.442E-11,1.483E-11,1.53E-11,1.587E-11,1.667E
  5-11,1.701E-11,1.738E-11,1.78E-11,1.877E-11,2.006E-11,2.192E-11,2.4
  657E-11,2.739E-11,3.019E-11,2.075E-11,2.185E-11,2.325E-11,2.513E-11
  7,2.729E-11,2.946E-11,2.263E-11,2.36E-11,2.473E-11,2.617E-11,2.785E
  8-11,2.962E-11,2.428E-11,2.532E-11,2.625E-11,2.744E-11,2.88E-11,3.0
  929E-11,5.444E-11,6.191E-11,6.881E-11,7.543E-11,4.154E-11)
   DATA((V(I),I=325,388)=4.921E-11,5.559E-11,6.091E-11,3.164E-11,3.98
  18E-11,4.613E-11,5.159E-11,2.517E-11,3.308E-11,3.919E-11,4.432E-11,
  22.234E-11,2.867E-11,3.427E-11,3.911E-11,2.131E-11,2.623E-11,3.099E
  3-11,3.553E-11,2.113E-11,2.509E-11,2.9E-11,3.28E-11,2.141E-11,2.463
  4E-11,2.792E-11,3.134E-11,2.192E-11,2.457E-11,2.739E-11,3.019E-11,1
  5.557E-11,1.635E-11,1.739E-11,1.901E-11,2.131E-11,1.667E-11,1.738E-
  611,1.826E-11,1.948E-11,2.113E-11,1.774E-11,1.839E-11,1.916E-11,2.0
  714E-11,2.141E-11,1.877E-11,1.941E-11,2.006E-11,2.099E-11,2.192E-11
```

```
8,3.651E-11,3.9E-11,4.148E-11,4.397E-11,4.645E-11,2.868E-11,3.35E-1
91,3.675E-11,3.938E-11,4.154E-11,2.076E-11,2.766E-11,3.178E-11)
 DATA((V(I),I=389,453)=3.483E-11,3.716E-11,1.748E-11,2.262E-11,2.72
12E-11,3.068E-11,3.329E-11,1.649E-11,2.E-11,2.377E-11,2.712E-11,3.E
2-11,1.614E-11,1.857E-11,2.156E-11,2.448E-11,2.72E-11,1.612E-11,1.7
39E-11,2.025E-11,2.27E-11,2.517E-11,1.625E-11,1.766E-11,1.95E-11,2.
4154E-11,2.37E-11,1.649E-11,1.766E-11,1.913E-11,2.086E-11,2.268E-11
5,1.676E-11,1.774E-11,1.896E-11,2.044E-11,2.202E-11,1.707E-11,1.79E
6-11,1.892E-11,2.019E-11,2.157E-11,1.739E-11,1.82E-11,1.901E-11,2.0
716E-11,2.131E-11,2.484E-11,2.818E-11,2.97E-11,3.086E-11,3.181E-11,
83.261E-11,3.335E-11,3.401E-11,3.461E-11,3.52E-11,3.573E-11,1.431E-
911,1.56E-11,1.812E-11,2.297E-11,2.59E-11,2.757E-11,2.885E-11)
 DATA((V(I),I=454,517)=2.987E-11,3.076E-11,3.154E-11,3.225E-11,1.36
18E-11,1.429E-11,1.511E-11,1.626E-11,1.791E-11,2.015E-11,2.259E-11,
22.458E-11,2.611E-11,2.728E-11,2.831E-11,1.35E-11,1.394E-11,1.438E-
311,1.508E-11,1.578E-11,1.689E-11,1.8E-11,1.949E-11,2.099E-11,2.246
4E-11,2.394E-11,1.35E-11,1.438E-11,1.578E-11,1.8E-11,2.099E-11,2.39
54E-11,1.347E-11,1.412E-11,1.503E-11,1.634E-11,1.815E-11,2.032E-11,
61.353E-11,1.404E-11,1.471E-11,1.562E-11,1.683E-11,1.833E-11,1.363E
7-11,1.405E-11,1.459E-11,1.526E-11,1.615E-11,1.725E-11,1.377E-11,1.
8414E-11,1.458E-11,1.512E-11,1.582E-11,1.664E-11,1.377E-11,1.484E-1
91,1.664E-11,1.393E-11,1.486E-11,1.635E-11,1.409E-11,1.489E-11)
 DATA((V(I),I=518,536)=1.61E-11,1.427E-11,1.499E-11,1.604E-11,1.445
1E-11,1.509E-11,1.6E-11,1.464E-11,1.523E-11,1.604E-11,1.464E-11,1.5
223E-11,1.604E-11,1.563E-11,1.606E-11,1.658E-11,1.662E-11,1.697E-11
3,1.736E-11)
 END
```

```
22 IF(T.GE.72.0) GO TO 24
   IF(T.GE.64.8) GO TO 23
   N=18
   GO TO 30
23 N=19
   GO TO 30
24 IF(T.GE.81.0) GO TO 25
   N=20
   GO TO 30
25 N=21
30 FP=(P-BP(N))/DP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   F=FP-IP
   FP=1.0-F
   FT=(T-BT(N))/DT(N)
   IT=FT
   FF=FT-IT
   FT=1.0-FF
   I=IT*JP(N)+IP+LDC(N)
   J=I+JP(N)
   ETVISC=FP*FT*V(I)+F*FT*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
   RETURN
   END
```



```
 FUNCTION ETSDUN(PRES,TEMP)
 COMMON/ESPEED/V(522)
 DIMENSION LOC(23),JP(19),MX(19),BP(19),DP(19),BT(23),DT(19),PS(20)
1,TS(20),TL(10)
 DATA((V(I),I=1,103)=5250.,5252.,5266.,5405.,6052.,6929.,6930.,6940
1.,7044.,7537.,8227.,8228.,8236.,8321.,8734.,9298.,9302.,9310.,9384
2.,9745.,10160.,10220.,10240.,10310.,10640.,10700.,10940.,11050.,11
3150.,11450.,11240.,11470.,11700.,11880.,12190.,12140.,12070.,12260
4.,12510.,12860.,2176.,3187.,4569.,2677.,3610.,4709.,3105.,3963.,49
505.,3490.,4284.,5127.,3846.,4587.,5360.,4179.,4873.,5595.,4490.,51
646.,5826.,4784.,5405.,6052.,1975.,1981.,2205.,2976.,3671.,4238.,47
709.,2255.,2320.,2488.,3025.,3606.,4126.,4591.,2510.,2604.,2754.,31
878.,3662.,4122.,4539.,2735.,2849.,2991.,3350.,3754.,4157.,4545.,29
934.,3052.,3187.,3504.,3857.,4217.,4569.,4999.,5196.,5491.,6053.)
 DATA(TL=24.846,27.175,29.310,31.299,33.176,34.962,36.672,38.317,
139.904,41.456)
 DATA(PS=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
1.,185.,186.5,187.25,187.46875,187.506,190.)
 DATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.517)
 DATA(JP=5,5,5,5,3,7,6,6,11,3,4,4,6,7,4,6,12,7,4)
 DATA(MX=0,0,0,0,1,3,2,0,9,1,2,2,4,5,2,4,10,1,0)
 DATA(BP=1000.,100.,10.,0,-3000.,1000.0,2000.,1000.,0,600.,0,300.,
1300.,0,10.,100.,190.,0,1000.)
 DATA(DP=4000.,900.,90.,10.,4000.,1000.,1000.,500.,100.,200.,200.,
```

```
 FUNCTION ETSDUN(PRES,TEMP)
 DIMENSION LOC(23),JP(19),MX(19),BP(19),DP(19),BT(23),DT(19),PS(20)
1,TS(20),TL(10),V(522)
 DIMENSION AA(105),AB(108),AC(108),AD(111),AE( 90)
 EQUIVALENCE( V,AA),( V( 106),AB),( V( 214),AC),( V( 322),AD)
1    ,( V( 433),AE)
 DATA TL/24.846,27.175,29.310,31.299,33.176,34.962,36.672,38.317,
139.904,41.456/
 DATA PS/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,165.,176.,182
1.,185.,186.5,187.25,187.46875,187.506,190./
 DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
179,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356,59.517/
 DATA JP/5,5,5,5,3,7,6,6,11,3,4,4,6,7,4,6,12,7,4/
 DATA MX/0,0,0,0,1,3,2,0,9,1,2,2,4,5,2,4,10,1,0/
 DATA BP/1000.,100.,10.,0.,-3000.,1000.,   2000.,1000.,0.,600.,0.,
1300.,300.,0.,10.,100.,190.,0.,1000./
 DATA DP/4000.,900.,90.,10.,4000.,1000.,1000.,500.,100.,200.,200.,
1100.,50.,50.,60.,40.,10.,500.,500./
 DATA BT/800.,800.,800.,800.,240.,120.,20.,20.,80.,25.,25.,50.,63.,
168.,28.,50.,60.,120.,80.,5000.,5000.,5000.,5000./
 DATA DT/600.,600.,600.,600.,80.,30.,20.,20.,10.,10.,5.,5.,2.,4.,5.
1,2.,1.,30.,10./
 DATA LDC/4,3,2,1,41,67,102,100,136,191,212,236,264,300,328,364,400
1,65,330,511,510,509,508/
 DATAAA/5250.,5252.,5266.,5405.,6052.,6929.,6930.,6940.,7044.,7537.
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1100.,50.,50.,60.,40.,10.,500.,500.)
 DATA(BT=800.,800.,800.,800.,240.,120.,20.,20.,80.,25.,25.,50.,63.,
168.,28.,50.,60.,120.,80.,5000.,5000.,5000.,5000.)
 DATA(DT=600.,600.,600.,600.,80.,30.,20.,20.,10.,10.,5.,5.,2.,4.,5.
1,2.,1.,30.,10.)
 DATA(LOC=4,3,2,1,41,67,102,100,136,191,212,236,264,300,328,364,400
1,65,330,511,510,509,508)
 P=PRES
 IF(P.LT.1.0) P=1.0
 T=TEMP
 IF(T.LT.120.) GO TO 6
 IF(T.LT.800.) GO TO 4
 IF(T.GE.6000.) T=5999.99999
 IF(P.LT.100.) GO TO 2
 IF(P.LT.1000.) GO TO 1
 N=1
 N1=20
 GO TO 33
1 N=2
 N1=21
 GO TO 33
2 IF(P.LT.10.)GO TO 3
 N=3
 N1=22
 GO TO 33
3 N=4
 N1=23
 GO TO 33
4 IF(T.LT.240.) GO TO 5
 N=5
 GO TO 33
5 N=6
 IF(P.LT.1000.) N=18
 GO TO 33
6 IF(P.LT.1000.)GO TO 8
 IF(P.LT.2000.)GO TO 7
 N=7
 GO TO 30
7 N=8
 IF((T.LT.100.).AND.(T.GE.80.).AND.(P.LT.1500.)) N=19
 GO TO 30
8 IF(T.LT.80.) GO TO 9
 N=9
 GO TO 33
9 IF(P.LT.600.) GO TO 10
 N=10
 GO TO 30
10 IF(P.LT.300.) GO TO 12
 IF(T.LT.50.) GO TO 11
 N=12
 IF((P.LT.550.).AND.(T.GE.63.).AND.(T.LE.73.)) N=13
 GO TO 33
11 N=11
 GO TO 30
12 IF(T.LT.68.) GO TO 13
 N=14
 GO TO 33
13 IF(T.LT.60.) GO TO 15
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1,8227.,8228.,8236.,8321.,8734.,9298.,9302.,9310.,9384.,9745.,10160
2.,10220.,10240.,10310.,10640.,10700.,10940.,11050.,11150.,11450.,1
31240.,11470.,11700.,11880.,12190.,12140.,12070.,12260.,12510.,1286
40.,2176.,3187.,4569.,2677.,3610.,4709.,3105.,3963.,4905.,3490.,428
54.,5127.,3846.,4587.,5360.,4179.,4873.,5595.,4490.,5146.,5826.,478
64.,5405.,6052.,1975.,1981.,2205.,2976.,3671.,4238.,4709.,2255.,232
70.,2488.,3025.,3606.,4126.,4591.,2510.,2604.,2754.,3178.,3662.,412
82.,4539.,2735.,2849.,2991.,3350.,3754.,4157.,4545.,2934.,3052.,318
97.,3504.,3857.,4217.,4569.,4999.,5196.,5491.,6053.,6550.,6804./
 DATAAB/4294.,4632.,4919.,5397.,5800.,6089.,3276.,3774.,4155.,4749.
1,5220.,5616.,2395.,3034.,3506.,4208.,4735.,5165.,2104.,2646.,3116.
2,3855.,4422.,4867.,2205.,2580.,2976.,3671.,4238.,4709.,1592.,1517.
3,1448.,1399.,1402.,1497.,1672.,1869.,2059.,2234.,2395.,1685.,1634.
4,1590.,1562.,1553.,1582.,1654.,1763.,1894.,2033.,2173.,1781.,1747.
5,1719.,1703.,1702.,1717.,1757.,1820.,1902.,1999.,2104.,1878.,1856.
6,1840.,1834.,1838.,1853.,1882.,1926.,1984.,2053.,2132.,1975.,1962.
7,1955.,1955.,1964.,1981.,2007.,2043.,2089.,2143.,2205.,4570.,4694.
8,4809.,4200.,4355.,4495.,3691.,3888.,4063.,3047.,3317.,3542.,2358.
9,2731.,3019.,1804.,2234.,2570.,1635.,1947.,2262.,4178.,4316./
 DATAAC/4455.,4560.,3865.,4080.,4251.,4397.,3590.,3823.,4025.,4200.
1,3255.,3536.,3766.,3965.,2801.,3176.,3460.,3691.,2166.,2724.,3100.
2,3381.,2930.,3100.,3248.,3381.,2465.,2698.,2886.,3047.,1915.,2256.
3,2502.,2701.,1294.,1791.,2114.,2358.,1214.,1428.,1768.,2045.,1309.
4,1351.,1553.,1804.,1399.,1402.,1497.,1672.,1530.,1784.,1975.,2132.
5,2267.,2386.,1294.,1573.,1791.,1966.,2114.,2243.,1189.,1396.,1619.
6,1807.,1966.,2104.,1198.,1295.,1479.,1665.,1830.,1974.,1232.,1270.
7,1391.,1552.,1712.,1858.,1270.,1283.,1354.,1476.,1618.,1758.,1484.
8,1428.,1368.,1304.,1238.,1187.,1187.,1519.,1471.,1419.,1367.,1317.
9,1276.,1251.,1555.,1513.,1469.,1426.,1386.,1351.,1328.,1592./
 DATAAD/1555.,1517.,1481.,1448.,1420.,1399.,1009.,660.,2395.,3034.,
11107.,816.,2173.,2759.,1187.,943.,2104.,2646.,1249.,1040.,0.,0.,13
200.,1124.,998.,0.,1344.,1212.,1010.,886.,1387.,1283.,1145.,894.,14
330.,1346.,1247.,1131.,1474.,1405.,1329.,1251.,2455.,2574.,2677.,27
469.,2853.,2930.,2175.,2327.,2456.,2565.,2664.,2752.,1143.,2034.,22
505.,2343.,2461.,2564.,1184.,1043.,1910.,2094.,2240.,2363.,1220.,11
614.,1506.,1802.,1996.,2148.,1253.,1165.,1049.,1422.,1718.,1915.,10
707.,1033.,1303.,1422.,1512.,1590.,1658.,1718.,1773.,1824.,1870.,19
815.,1061.,1030.,996.2,1121.,1277.,1403.,1489.,1561.,1626.,1685.,17
940.,1789.,1101.,1076.,1052.,1031.,1060.,1178.,1294.,1394.,1473./
 DATAAE/1542.,1603.,1660.,1131.,1114.,1094.,1074.,1060.,1070.,1137.
1,1228.,1317.,1393.,1465.,1530.,1158.,1144.,1126.,1109.,1094.,1085.
2,1090.,1127.,1189.,1262.,1335.,1401.,1184.,1168.,1155.,1140.,1125.
3,1114.,1108.,1113.,1134.,1178.,1233.,1294.,1208.,1192.,1180.,1167.
4,1154.,1142.,1134.,1131.,1136.,1152.,1181.,1223.,1230.,1216.,1202.
5,1194.,1182.,1171.,1162.,1156.,1154.,1158.,1169.,1189.,1251.,1238.
6,1225.,1215.,1207.,1196.,1187.,1179.,1175.,1174.,1178.,1187.,12160
7.,12100.,12280.,12540.,12880.,13260.,12930.,12900.,13120.,13480.,1
84050.,13900.,13610.,13700.,14050./
 P=PRES
 IF(P.LT.1.0) P=1.0
 T=TEMP
 IF(T.LT.120.) GO TO 6
 IF(T.LT.800.) GO TO 4
 IF(T.GE.6000.) T=5999.99999
 IF(P.LT.100.) GO TO 2
 IF(P.LT.1000.) GO TO 1
 N=1
 N1=20
```

```
      IF(P.LT.190.) GO TO 14
      N=17
      GO TO 33
   14 N=15
      GO TO 33
   15 N=15
      DO 16 I=2,20
      IF(P.LT.PS(I)) GO TO 17
   16 CONTINUE
      GO TO 18
   17 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
      IF(T.GT.TM) GO TO 33
   18 IF(T.LT.50.) GO TO 19
      N=16
      GO TO 33
   19 N=11
      GO TO 30
   30 F =P/587.84
      I=F
      IF(I.GT.8) I=8
      F=F-I
      TQ=(1.-F)*TL(I+1)+F*TL(I+2)
      IF(T.LT.TQ) T=TQ
   33 IF(T.LE.5000.0)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N1))/OT(N)
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      ETSOUN=FP*FT*V(I)+F*FT*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
      RETURN
      ENO

      SUBROUTINE ESOUNO
      COMMON/ESPEEO/V(522)
      DATA((V(I),I=104,209)=6550.,6804.,4294.,4632.,4919.,5397.,5800.,60
     189.,3276.,3774.,4155.,4749.,5220.,5616.,2395.,3034.,3506.,4208.,47
     235.,5165.,2104.,2646.,3116.,3855.,4422.,4867.,2205.,2580.,2976.,36
     371.,4238.,4709.,1592.,1517.,1448.,1399.,1402.,1497.,1672.,1869.,20
     459.,2234.,2395.,1685.,1634.,1590.,1562.,1553.,1582.,1654.,1763.,18
     594.,2033.,2173.,1781.,1747.,1719.,1703.,1702.,1717.,1757.,1820.,19
     602.,1999.,2104.,1878.,1856.,1840.,1834.,1838.,1853.,1882.,1926.,19
     784.,2053.,2132.,1975.,1962.,1955.,1955.,1964.,1981.,2007.,2043.,20
     889.,2143.,2205.,4570.,4694.,4809.,4200.,4355.,4495.,3691.,3888.,40
     963.,3047.,3317.,3542.,2358.,2731.,3019.,1804.,2234.,2570.,1635.)
      DATA((V(I),I=210,315)=1947.,2262.,4178.,4316.,4455.,4560.,3865.,40
     180.,4251.,4397.,3590.,3823.,4025.,4200.,3255.,3536.,3766.,3965.,28
     201.,3176.,3460.,3691.,2166.,2724.,3100.,3381.,2930.,3100.,3248.,33
     381.,2465.,2698.,2886.,3047.,1915.,2256.,2502.,2701.,1294.,1791.,21
     414.,2358.,1214.,1428.,1768.,2045.,1309.,1351.,1553.,1804.,1399.,14
     502.,1497.,1672.,1530.,1784.,1975.,2132.,2267.,2386.,1294.,1573.,17
     691.,1966.,2114.,2243.,1189.,1396.,1619.,1807.,1966.,2104.,1198.,12
      GO TO 33
    1 N=2
      N1=21
      GO TO 33
    2 IF(P.LT.10.)GO TO 3
      N=3
      N1=22
      GO TO 33
    3 N=4
      N1=23
      GO TO 33
    4 IF(T.LT.240.) GO TO 5
      N=5
      GO TO 33
    5 N=6
      IF(P.LT.1000.) N=18
      GO TO 33
    6 IF(P.LT.1000.)GO TO 8
      IF(P.LT.2000.)GO TO 7
      N=7
      GO TO 30
    7 N=8
      IF((T.LT.100.).ANO.(T.GE.80.).ANO.(P.LT.1500.)) N=19
      GO TO 30
    8 IF(T.LT.80.) GO TO 9
      N=9
      GO TO 33
    9 IF(P.LT.600.) GO TO 10
      N=10
      GO TO 30
   10 IF(P.LT.300.) GO TO 12
      IF(T.LT.50.) GO TO 11
      N=12
      IF((P.LT.550.).ANO.(T.GE.63.).ANO.(T.LE.73.)) N=13
      GO TO 33
   11 N=11
      GO TO 30
   12 IF(T.LT.68.) GO TO 13
      N=14
      GO TO 33
   13 IF(T.LT.60.) GO TO 15
      IF(P.LT.190.) GO TO 14
      N=17
      GO TO 33
   14 N=15
      GO TO 33
   15 N=15
      DO 16 I=2,20
      IF(P.LT.PS(I)) GO TO 17
   16 CONTINUE
      GO TO 18
   17 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
      IF(T.GT.TM) GO TO 33
   18 IF(T.LT.50.) GO TO 19
      N=16
      GO TO 33
   19 N=11
      GO TO 30
```

```
795.,1479.,1665.,1830.,1974.,1232.,1270.,1391.,1552.,1712.,1858.,12
870.,1283.,1354.,1476.,1618.,1758.,1484.,1428.,1368.,1304.,1238.,11
987.,1187.,1519.,1471.,1419.,1367.,1317.,1276.,1251.,1555.,1513.)
 DATA((V(I),I=316,423)=1469.,1426.,1386.,1351.,1328.,1592.,1555.,15
117.,1481.,1448.,1420.,1399.,1009.,660.,2395.,3034.,1107.,816.,2173
2.,2759.,1187.,943.,2104.,2646.,1249.,1040.,0.,0.,1300.,1124.,998.,
30.,1344.,1212.,1010.,886.,1387.,1283.,1145.,894.,1430.,1346.,1247.
4,1131.,1474.,1405.,1329.,1251.,2455.,2574.,2677.,2769.,2853.,2930.
5,2175.,2327.,2456.,2565.,2664.,2752.,1143.,2034.,2205.,2343.,2461.
6,2564.,1184.,1043.,1910.,2094.,2240.,2363.,1220.,1114.,1506.,1802.
7,1996.,2148.,1253.,1165.,1049.,1422.,1718.,1915.,1007.,1033.,1303.
8,1422.,1512.,1590.,1658.,1718.,1773.,1824.,1870.,1915.,1061.,1030.
9,996.2,1121.,1277.,1403.,1489.,1561.,1626.,1685.,1740.,1789.)
 DATA((V(I),I=424,522)=1101.,1076.,1052.,1031.,1060.,1178.,1294.,13
194.,1473.,1542.,1603.,1660.,1131.,1114.,1094.,1074.,1060.,1070.,11
237.,1228.,1317.,1393.,1465.,1530.,1158.,1144.,1126.,1109.,1094.,10
385.,1090.,1127.,1189.,1262.,1335.,1401.,1184.,1168.,1155.,1140.,11
425.,1114.,1108.,1113.,1134.,1178.,1233.,1294.,1208.,1192.,1180.,11
567.,1154.,1142.,1134.,1131.,1136.,1152.,1181.,1223.,1230.,1216.,12
602.,1194.,1182.,1171.,1162.,1156.,1154.,1158.,1169.,1189.,1251.,12
738.,1225.,1215.,1207.,1196.,1187.,1179.,1175.,1174.,1178.,1187.,12
8160.,12100.,12280.,12540.,12880.,13260.,12930.,12900.,13120.,13480
9.,14050.,13900.,13610.,13700.,14050.)
 END
```

```
30 F =P/587.84
   I=F
   IF(I.GT.8) I=8
   F=F-I
   TQ=(1.-F)*TL(I+1)+F*TL(I+2)
   IF(T.LT.TQ) T=TQ
33 IF(T.LE.5000.0)N1=N
   FP=(P-BP(N))/DP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   F=FP-IP
   FP=1.0-F
   FT=(T-BT(N1))/DT(N)
   IT=FT
   FF=FT-IT
   FT=1.0-FF
   I=IT*JP(N)+IP+LDC(N1)
   J=I+JP(N)
   ETSDUN=FP*FT*V(I)+F*FT*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
   RETURN
   END
```



```
 FUNCTIDN ETCP(PRES,TEMP)
 CDMMDN/EQHEAT/CP(823),CV(823)
 DIMENSIDN LDC(23),JP(19),MX(19),BP(19),DP(19),BT(23),DT(19),PS(12)
1,TS(12),TL(10)
 DATA((CP(I),I=1,108)=3.804,3.796,3.794,3.794,3.793,3.793,3.793,4.0
133,3.959,3.945,3.939,3.935,3.932,3.93,4.671,4.275,4.2,4.166,4.146,
24.133,4.123,6.515,5.052,4.775,4.652,4.579,4.529,4.492,11.,6.859,6.
3074,5.726,5.518,5.376,5.272,20.08,10.5,8.662,7.85,7.366,7.036,6.79
42,35.36,16.84,13.19,11.56,10.59,9.927,9.437,3.793,3.792,3.792,3.93
52,3.925,3.921,4.133,4.092,4.075,4.53,4.379,4.318,5.38,4.951,4.777,
67.044,6.043,5.636,9.944,7.931,7.111,3.793,3.791,3.791,3.791,3.791,
73.79,3.924,3.918,3.916,3.915,3.914,3.913,4.091,4.059,4.047,4.041,4
8.038,4.036,4.38,4.256,4.212,4.192,4.181,4.203,4.953,4.601,4.477,4.
9421,4.389,4.366,6.046,5.226,4.936,4.807,4.731,4.775,7.938,6.284)
 DATA((CP(I),I=109,217)=5.7,5.441,5.287,5.181,3.79,3.79,3.789,3.789
1,3.789,4.036,4.03,4.027,4.026,4.024,4.366,4.31,4.285,4.27,4.26,5.1
281,4.92,4.804,4.734,4.687,3.461,3.502,3.503,3.506,3.624,3.622,3.79
32,3.789,3.008,3.372,3.561,3.61,3.207,3.391,3.51,3.564,3.347,3.447,
43.518,3.559,3.41,3.466,3.51,3.539,3.438,3.472,3.5,3.519,3.452,3.46
59,3.485,3.502,4.064,4.459,4.874,5.171,5.284,5.263,4.912,4.665,4.51
64,3.611,3.839,4.059,4.248,4.378,4.443,4.39,4.251,4.129,3.335,3.477
7,3.609,3.719,3.808,3.872,3.935,3.879,3.816,3.2,3.314,3.419,3.507,3
8.584,3.638,3.711,3.722,3.696,3.147,3.241,3.324,3.397,3.463,3.514,3
9.626,3.651,3.646,3.153,3.227,3.294,3.355,3.409,3.455,3.568,3.609)
 DATA((CP(I),I=218,325)=3.619,3.19,3.244,3.297,3.351,3.389,3.416,3.
1527,3.581,3.61,1.338,1.268,1.221,1.204,2.056,1.914,1.839,1.759,3.0
278,2.842,2.716,2.638,4.314,3.949,3.78,3.675,5.211,4.692,4.484,4.36
31,5.693,5.06,4.814,4.677,5.743,5.127,4.865,4.718,5.475,5.005,4.748
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```
 FUNCTIDN ETCP(PRES,TEMP)
 ETCP=ETHEAT(PRES,TEMP,1)
 RETURN
 END
 FUNCTIDN ETCV(PRES,TEMP)
 ETCV=ETHEAT(PRES,TEMP,2)
 RETURN
 END
 FUNCTIDN ETGAMM(PRES,TEMP)
 ETGAMM=ETHEAT(PRES,TEMP,3)
 RETURN
 END
 FUNCTION ETHEAT(PRES,TEMP,KTRANS)
 CDMMON/TEHEAT/CP(823),CV(823)
 DIMENSION LOC(23),JP(19),MX(19),BP(19),DP(19),BT(23),DT(19),PS(12)
1,TS(12),TL(10)
 DATA PS/1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,160./
 DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,
154.79,56.72,57.46/
 DATA LOC/1,50,71,113,133,141,170,165,228,264,348,372,426,492,528,
1584,626,638,734,654,682,694,718/
 DATA JP/7,3,6,5,2,4,9,9,4,7,4,9,6,6,7,7,2,2,5/
 DATA MX/5,1,4,3,0,2,2,4,2,5,2,7,4,4,5,5,0,0,3/
 DATA BP/0.,20.,0.,1000.,100.,-1000.,1469.6,0.,1469.6,587.84,
1587.84,0.,100.,100.,40.,40.,0.,0.,1./
 DATA BT/2600.,2600.,2600.,2600.,800.,300.,120.,120.,25.2,27.,72.,
181.,25.,56.,26.,41.,25.,25.,2600.,5000.,5000.,5000.,5000./
 DATA DP/5.,40.,200.,1000.,4900.,2000.,1175.68,293.92,1175.68,
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     4,4.598,5.098,4.806,4.581,4.435,1.556,1.528,1.504,1.481,1.46,1.441,
     51.427,2.122,2.079,2.041,2.009,1.981,1.954,1.931,2.94,2.856,2.787,2
     6.731,2.683,2.64,2.603,4.066,3.882,3.751,3.649,3.567,3.5,3.444,5.51
     73,5.094,4.826,4.641,4.506,4.399,4.314,7.219,6.288,5.799,5.492,5.27
     89,5.12,4.998,7.785,7.073,6.501,6.111,5.836,5.632,5.476,6.875,6.913
     9,6.657,6.359,6.104,5.899,5.734,6.066,6.296,6.317,6.212,6.06,5.906)
      OATA(PS=1.022,2.,4.,8.,14.,25.,43.,69.,99.,128.,151.,160.)
      OATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,
     154.79,56.72,57.46)
      OATA(LOC=1,50,71,113,133,141,170,165,228,264,348,372,426,492,528,
     1584,626,638,734,654,682,694,718)
      OATA(JP=7,3,6,5,2,4,9,9,4,7,4,9,6,6,7,7,2,2,5)
      OATA(MX=5,1,4,3,0,2,2,4,2,5,2,7,4,4,5,5,0,0,3)
      OATA(BP=0,20.,0,1000.,100.,-1000.,1469.6,0,1469.6,587.84,587.84,0,
     1100.,100.,40.,40.,0,0,1.)
      OATA(BT=2600.,2600.,2600.,2600.,800.,300.,120.,120.,25.2,27.,72.,
     181.,25.,56.,26.,41.,25.,25.,2600.,5000.,5000.,5000.,5000.)
      OATA(OP=5.,40.,200.,1000.,4900.,2000.,1175.68,293.92,1175.68,
     1146.96,146.96,73.48,100.,100.,20.,20.,40.,40.,1.)
      OATA(OT=400.,400.,400.,800.,600.,100.,30.,30.,12.6,9.,3.6,9.,5.,
     15.,4.,8.,4.,8.,200.)
      OATA(TL=24.846,27.175,29.310,31.299,33.176,34.962,36.672,38.317,
     139.904,41.456)
      KTR=1
      GO TO 1
      ENTRY ETCV
      KTR=2
      GO TO 1
      ENTRY ETGAMM
      KTR=3
    1 P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.LT.126.) GO TO 9
      IF(T.LT.2600.) GO TO 5
      IF(T.GE.6000.) T=5999.99999
      IF(P.GE.100.) GO TO 3
      IF(P.GE.30.) GO TO 2
      IF(P.GE.5.)GO TO 20
      N=19
      N1=19
      GO TO 33
   20 N=1
      N1=20
      GO TO 33
    2 N=2
      N1=21
      GO TO 33
    3 IF(P.GE.1000.) GO TO 4
      N=3
      N1=22
      GO TO 33
    4 N=4
      N1=23
      GO TO 33
    5 IF(T.LT.300.)GO TO 7
      IF(T.LT.800.)GO TO 6
      N=5
      1146.96,146.96,73.48,100.,100.,20.,20.,40.,40.,1./
      OATA OT/400.,400.,400.,800.,600.,100.,30.,30.,12.6,9.,3.6,9.,5.,
     15.,4.,8.,4.,8.,200./
      OATA TL/24.846,27.175,29.310,31.299,33.176,34.962,36.672,38.317,
     139.904,41.456/
      KTR=KTRANS
    1 P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.LT.126.) GO TO 9
      IF(T.LT.2600.) GO TO 5
      IF(T.GE.6000.) T=5999.99999
      IF(P.GE.100.) GO TO 3
      IF(P.GE.30.) GO TO 2
      IF(P.GE.5.)GO TO 20
      N=19
      N1=19
      GO TO 33
   20 N=1
      N1=20
      GO TO 33
    2 N=2
      N1=21
      GO TO 33
    3 IF(P.GE.1000.) GO TO 4
      N=3
      N1=22
      GO TO 33
    4 N=4
      N1=23
      GO TO 33
    5 IF(T.LT.300.)GO TO 7
      IF(T.LT.800.)GO TO 6
      N=5
      GO TO 33
    6 N=6
      GO TO 33
    7 IF(P.LT.1469.6) GO TO 8
      N=7
      GO TO 33
    8 N=8
      GO TO 33
    9 IF(P.LT.587.84) GO TO 12
      IF(P.LT.1469.6) GO TO 10
      N=9
      GO TO 30
   10 IF(P.LT.1028.72.ANO.T.GE.72.0.ANO.T.LT.90.0) GO TO 11
      N=10
      GO TO 30
   11 N=11
      GO TO 33
   12 IF(T.LT.81.) GO TO 13
      N=12
      GO TO 33
   13 IF(P.LT.160.) GO TO 15
      TM=((.86867647E-7*P-.12613701E-3)*P+.10353383)*P+43.8056878
      IF(T.GT.TM) GO TO 14
      N=13
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      GO TO 33
    6 N=6
      GO TO 33
    7 IF(P.LT.1469.6) GO TO 8
      N=7
      GO TO 33
    8 N=8
      GO TO 33
    9 IF(P.LT.587.84) GO TO 12
      IF(P.LT.1469.6) GO TO 10
      N=9
      GO TO 30
   10 IF(P.LT.1028.72.AND.T.GE.72.0.AND.T.LT.90.0) GO TO 11
      N=10
      GO TO 30
   11 N=11
      GO TO 33
   12 IF(T.LT.81.) GO TO 13
      N=12
      GO TO 33
   13 IF(P.LT.160.) GO TO 15
      TM=((.86867647E-7*P-.12613701E-3)*P+.10353383)*P+43.8056878
      IF(T.GT.TM) GO TO 14
      N=13
      GO TO 30
   14 N=14
      GO TO 33
   15 DO 16 I=2,12
      IF(P-PS(I))17,17,16
   16 CONTINUE
      I=12
   17 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
      IF(T.GE.TM) GO TO 18
      N=15
      IF(P.LT.40.) N=17
      GO TO 30
   18 N=16
      IF(P.LT.40.) N=18
      GO TO 33
   30 F=P/587.84
      I=F
      IF(I.GT.8) I=8
      F=F-I
      TQ=(1.0-F)*TL(I+1)+F*TL(I+2)
      IF(T.LT.TQ) T=TQ
   33 IF(T.LE.5000.0)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N1))/DT(N)
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      IF(KTR.EQ.2) GOTO 37
      GO TO 30
   14 N=14
      GO TO 33
   15 DO 16 I=2,12
      IF(P-PS(I))17,17,16
   16 CONTINUE
      I=12
   17 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
      IF(T.GE.TM) GO TO 18
      N=15
      IF(P.LT.40.) N=17
      GO TO 30
   18 N=16
      IF(P.LT.40.) N=18
      GO TO 33
   30 F=P/587.84
      I=F
      IF(I.GT.8) I=8
      F=F-I
      TQ=(1.0-F)*TL(I+1)+F*TL(I+2)
      IF(T.LT.TQ) T=TQ
   33 IF(T.LE.5000.0)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N1))/DT(N)
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      IF(KTR.EQ.2) GOTO 37
      CTCP=FP*FT*CP(I)+F*FT*CP(I+1)+FP*FF*CP(J)+F*FF*CP(J+1)
      IF(N.LT.13.OR.N.GE.17) GO TO 36
      IF(N.LT.15) GO TO 35
      CTCP=CTCP/(187.506-P+ABS(T-TM)*28.13)
      GO TO 36
   35 CTCP=CTCP/(ABS(T-TM)/1.8+ABS(P-187.506)*.008008982)
   36 IF(KTR.GE.2) GO TO 37
      ETCP=CTCP
      ETHEAT=ETCP
      RETURN
   37 ETCP=FP*FT*CV(I)+F*FT*CV(I+1)+FP*FF*CV(J)+F*FF*CV(J+1)
      ETHEAT=ETCP
      IF(KTR.LT.3) RETURN
      ETCP=CTCP/ETCP
      ETHEAT=ETCP
      RETURN
      END

      BLOCK DATA
      COMMON/TEHEAT/AA(111),AB(111),AC(110),AD(110),AE(110),AF(111),
     1AG(111),AH(49),
     2          AI(111),AJ(111),AK(110),AL(110),AM(112),AN(109),AO(111)
     3  ,AP(49)
      DATAAA/3.804,3.796,3.794,3.794,3.793,3.793,3.793,4.033,3.959,3.945
```

```
      CTCP=FP*FT*CP(I)+F*FT*CP(I+1)+FP*FF*CP(J)+F*FF*CP(J+1)
      IF(N.LT.13.OR.N.GE.17) GO TO 36
      IF(N.LT.15) GO TO 35
      CTCP=CTCP/(187.506-P+ABSF(T-TM)*28.13)
      GO TO 36
   35 CTCP=CTCP/(ABSF(T-TM)/1.8+ABSF(P-187.506)*.008008982)
   36 IF(KTR.GE.2) GO TO 37
      ETCP=CTCP
      RETURN
   37 ETCP=FP*FT*CV(I)+F*FT*CV(I+1)+FP*FF*CV(J)+F*FF*CV(J+1)
      IF(KTR.LT.3) RETURN
      ETCP=CTCP/ETCP
      RETURN
      END

      SUBROUTINE EQCPDT
      COMMON/EQHEAT/CP(823),CV(823)
      DATA((CP(I),I=326,432)=5.767,5.492,5.713,5.826,5.84,5.792,5.711,5.
     162,5.056,5.243,5.37,5.432,5.442,5.419,5.375,4.709,4.847,4.985,5.04
     23,5.101,5.1,5.098,7.219,6.288,5.799,5.492,7.72,6.695,6.129,5.762,7
     3.856,6.991,6.399,6.002,7.649,7.117,6.583,6.173,7.256,7.08,6.669,6.
     4277,6.875,6.913,6.657,6.359,4.462,4.722,5.069,5.543,6.184,6.95,7.6
     551,7.938,7.785,4.502,4.698,4.936,5.225,5.569,5.936,6.324,6.657,6.8
     675,4.429,4.582,4.759,4.959,5.181,5.422,5.651,5.875,6.066,4.292,4.4
     716,4.552,4.699,4.857,5.021,5.187,5.347,5.492,4.133,4.234,4.343,4.4
     858,4.577,4.699,4.821,4.942,5.056,3.972,4.062,4.153,4.244,4.334,4.4
     928,4.522,4.615,4.709,25.28,30.1,35.7,40.35,44.48,48.57,24.85)
      DATA((CP(I),I=433,540)=30.59,37.28,42.84,47.85,52.8,23.99,30.82,38
     1.7,45.24,51.13,56.99,22.08,30.36,39.86,47.67,54.65,61.6,18.33,28.4
     2,39.87,49.14,57.36,65.51,11.9,24.47,38.41,49.36,58.97,68.46,3.281,
     318.04,35.4,48.29,59.46,70.47,-30.9 ,10.86,30.25,44.76,57.36,69.8,1
     41.34,12.57,19.88,37.96,51.83,65.61,17.63,-45.34,9.839,20.76,40.97,
     557.25,24.39,15.73,2.166,11.61,21.83,43.07,10.41,-4.319,8.267,0.,10
     6.68,24.21,22.39,11.76,9.006,-4.132,13.7,18.04,36.35,24.05,14.97,5.
     705,-6.046,16.89,50.01,36.78,34.35,19.82,11.46,3.68,63.8,49.89,45.9
     8,41.01,26.82,18.84,77.36,63.02,58.12,54.57,46.69,32.95,1033.,1154.
     9,1245.,1318.,1370.,1415.,1453.,977.,1116.,1221.,1305.,1365.,1416.)
      DATA((CP(I),I=541,647)=1460.,901.3,1064.,1185.,1282.,1350.,1409.,1
     1459.,780.8,973.8,1117.,1231.,1311.,1379.,1437.,591.2,823.8,995.3,1
     2130.,1224.,1304.,1373.,436.3,583.7,794.5,958.7,1071.,1166.,1246.,3
     313.1,403.,512.3,700.6,840.7,955.1,1052.,406.9,300.,363.2,347.6,495
     4.2,647.8,767.5,329.3,60.00,-66.07,317.8,361.8,313.2,325.1,1116.,80
     51.5,520.9,226.7,-17.9,-102.,42.2,2076.,1727.,1430.,1159.,927.7,697
     6.7,400.0,3197.,2797.,2462.,2163.,1910.,1666.,1421.,4378.,3943.,358
     70.,3255.,2983.,2725.,2471.,5535.,5078.,4696.,4359.,4075.,3806.,354
     87.,1.57,1.561,1.802,1.792,2.12,2.098,2.525,2.481,3.199,2.997,1.521
     9,3.64,2.464,5.29,2.517,3.306,2.701,3.704,3.045,3.636,3.571,3.923)
      DATA((CP(I),I=648,756)=4.,4.237,4.297,4.47,4.462,4.604,35.35,16.84
     1,13.19,11.56,10.59,9.927,9.437,54.51,26.45,20.19,17.34,15.62,14.45
     2,13.58,64.36,38.41,29.6,25.3,22.65,20.8,19.42,56.3,49.65,39.92,34.
     348,30.93,28.4,26.45,9.939,7.931,7.111,15.62,10.89,9.417,22.65,15.1
     41,12.72,30.93,20.31,16.84,7.938,6.284,5.7,5.441,5.287,5.181,10.9,7
     5.934,6.883,6.417,6.14,5.95,15.14,10.3,8.578,7.813,7.357,7.045,17.4
     62,13.26,10.7,9.559,8.879,8.413,5.181,4.92,4.804,4.734,4.687,7.045,
     76.271,5.928,5.724,5.584,9.786,8.248,7.565,7.157,6.881,0.,3.802,3.7
     899,3.797,3.796,3.889,3.878,3.873,3.87,3.868,4.018,3.987,3.97
     93,3.964,3.959,4.229,4.153,4.119,4.098,4.085,4.592,4.424,4.349)
      END
```



```
     1,3.939,3.935,3.932,3.93,4.671,4.275,4.2,4.166,4.146,4.133,4.123,6.
     2515,5.052,4.775,4.652,4.579,4.529,4.492,11.,6.859,6.074,5.726,5.51
     38,5.376,5.272,20.08,10.5,8.662,7.85,7.366,7.036,6.792,35.36,16.84,
     413.19,11.56,10.59,9.927,9.437,3.793,3.792,3.792,3.932,3.925,3.921,
     54.133,4.092,4.075,4.53,4.379,4.318,5.38,4.951,4.777,7.044,6.043,5.
     6636,9.944,7.931,7.111,3.793,3.791,3.791,3.791,3.791,3.79,3.924,3.9
     718,3.916,3.915,3.914,3.913,4.091,4.059,4.047,4.041,4.038,4.036,4.3
     88,4.256,4.212,4.192,4.181,4.203,4.953,4.601,4.477,4.421,4.389,4.36
     96,6.046,5.226,4.936,4.807,4.731,4.775,7.938,6.284,5.7,5.441,5.287/
      DATAAB/5.181,3.79,3.79,3.789,3.789,3.789,4.036,4.03,4.027,4.026,4.
     1024,4.366,4.31,4.285,4.27,4.26,5.181,4.92,4.804,4.734,4.687,3.461,
     23.502,3.503,3.506,3.624,3.622,3.792,3.789,3.008,3.372,3.561,3.61,3
     3.207,3.391,3.51,3.564,3.347,3.447,3.518,3.559,3.41,3.466,3.51,3.53
     49,3.438,3.472,3.5,3.519,3.452,3.469,3.485,3.502,4.064,4.459,4.874,
     55.171,5.284,5.263,4.912,4.665,4.514,3.611,3.839,4.059,4.248,4.378,
     64.443,4.39,4.251,4.129,3.335,3.477,3.609,3.719,3.808,3.872,3.935,3
     7.879,3.816,3.2,3.314,3.419,3.507,3.584,3.638,3.711,3.722,3.696,3.1
     847,3.241,3.324,3.397,3.463,3.514,3.626,3.651,3.646,3.153,3.227,3.2
     994,3.355,3.409,3.455,3.568,3.609,3.619,3.19,3.244,3.297,3.351/
      DATAAC/3.389,3.416,3.527,3.581,3.61,1.338,1.268,1.221,1.204,2.056,
     11.914,1.839,1.759,3.078,2.842,2.716,2.638,4.314,3.949,3.78,3.675,5
     2.211,4.692,4.484,4.361,5.693,5.06,4.814,4.677,5.743,5.127,4.865,4.
     3718,5.475,5.005,4.748,4.598,5.098,4.806,4.581,4.435,1.556,1.528,1.
     4504,1.481,1.46,1.441,1.427,2.122,2.079,2.041,2.009,1.981,1.954,1.9
     531,2.94,2.856,2.787,2.731,2.683,2.64,2.603,4.066,3.882,3.751,3.649
     6,3.567,3.5,3.444,5.513,5.094,4.826,4.641,4.506,4.399,4.314,7.219,6
     7.288,5.799,5.492,5.279,5.12,4.998,7.785,7.073,6.501,6.111,5.836,5.
     8632,5.476,6.875,6.913,6.657,6.359,6.104,5.899,5.734,6.066,6.296,6.
     9317,5.212,6.06,5.906,5.767,5.492,5.713,5.826,5.84,5.792,5.711/
      DATAAD/5.62,5.056,5.243,5.37,5.432,5.442,5.419,5.375,4.709,4.847,4
     1.985,5.043,5.101,5.1,5.098,7.219,6.288,5.799,5.492,7.72,6.695,6.12
     29,5.762,7.856,6.991,6.399,6.002,7.649,7.117,6.583,6.173,7.256,7.08
     3,6.669,6.277,6.875,6.913,6.657,6.359,4.462,4.722,5.069,5.543,6.184
     4,6.95,7.651,7.938,7.785,4.502,4.698,4.936,5.225,5.569,5.936,6.324,
     56.657,6.875,4.429,4.582,4.759,4.959,5.181,5.422,5.651,5.875,6.066,
     64.292,4.416,4.552,4.699,4.857,5.021,5.187,5.347,5.492,4.133,4.234,
     74.343,4.458,4.577,4.699,4.821,4.942,5.056,3.972,4.062,4.153,4.244,
     84.334,4.428,4.522,4.615,4.709,25.28,30.1,35.7,40.35,44.48,48.57,24
     9.85,30.59,37.28,42.84,47.85,52.8,23.99,30.82,38.7,45.24,51.13/
      DATAAE/56.99,22.08,30.36,39.86,47.67,54.65,61.6,18.33,28.4,39.87,4
     19.14,57.36,65.51,11.9,24.47,38.41,49.36,58.97,68.46,3.281,18.04,35
     2.4,48.29,59.46,70.47,-30.9,10.86,30.25,44.76,57.36,69.8,11.34,12.5
     37,19.88,37.96,51.83,65.61,17.63,-45.34,9.839,20.76,40.97,57.25,24.
     439,15.73,2.166,11.61,21.83,43.07,10.41,-4.319,8.267,0.,10.68,24.21
     5,22.39,11.76,9.006,-4.132,13.7,18.04,36.35,24.05,14.97,5.05,-6.046
     6,16.89,50.01,36.78,34.35,19.82,11.46,3.68,63.8,49.89,45.9,41.01,26
     7.82,18.84,77.36,63.02,58.12,54.57,46.69,32.95,1033.,1154.,1245.,13
     818.,1370.,1415.,1453.,977.,1116.,1221.,1305.,1365.,1416.,1460.,901
     9.3,1064.,1185.,1282.,1350.,1409.,1459.,780.8,973.8,1117.,1231./
      DATAAF/1311.,1379.,1437.,591.2,823.8,995.3,1130.,1224.,1304.,1373.
     1,436.3,583.7,794.5,958.7,1071.,1166.,1246.,313.1,403.,512.3,700.6,
     2840.7,955.1,1052.,406.9,300.,363.2,347.6,495.2,647.8,767.5,329.3,6
     30.,-66.07,317.8,361.8,313.2,325.1,1116.,801.5,520.9,226.7,-17.9,-1
     402.,42.2,2076.,1727.,1430.,1159.,927.7,697.7,400.,3197.,2797.,2462
     5.,2163.,1910.,1666.,1421.,4378.,3943.,3580.,3255.,2983.,2725.,2471
     6.,5535.,5078.,4696.,4359.,4075.,3806.,3547.,1.57,1.561,1.802,1.792
     7,2.12,2.098,2.525,2.481,3.199,2.997,1.521,3.64,2.464,5.29,2.517,3.
     8306,2.701,3.704,3.045,3.636,3.571,3.923,4.,4.237,4.297,4.47,4.462,
```

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      SUBROUTINE EQCVDT
      COMMON/EQHEAT/CP(823),CV(823)
      DATA((CP(I),I=757,823)=4.305,4.275,5.209,4.873,4.725,4.636,4.576,6
     1.222,5.602,5.328,5.164,5.052,7.805,6.733,6.258,5.974,5.781,10.17,8
     2.416,7.639,7.175,6.859,13.55,10.82,9.606,8.883,8.39,18.16,14.11,12
     3.31,11.23,10.49,24.19,18.45,15.87,14.33,13.27,31.65,23.94,20.42,18
     4.29,16.83,40.2,30.53,25.96,23.16,21.23,48.9,37.93,32.38,28.89,26.4
     55,55.98,45.39,39.27,35.23,32.33,59.17,51.54,45.75,41.57,38.41,57.0
     67,54.84,50.67,47.03,44.03)
      DATA((CV(I),I=1,108)=2.819,2.811,2.809,2.809,2.808,2.808,2.808,3.0
     14,2.971,2.958,2.952,2.948,2.946,2.944,3.64,3.271,3.202,3.171,3.152
     2,3.14,3.13,5.333,3.992,3.737,3.624,3.557,3.511,3.477,9.353,5.63,4.
     3918,4.602,4.414,4.285,4.19,17.17,8.839,7.219,6.497,6.065,5.77,5.55
     42,29.48,14.23,11.12,9.713,8.87,8.292,7.863,2.808,2.807,2.807,2.946
     5,2.939,2.936,3.14,3.102,3.086,3.512,3.373,3.316,4.288,3.898,3.739,
     65.778,4.881,4.514,8.308,6.541,5.817,2.807,2.807,2.806,2.806,2.806,
     72.806,2.939,2.933,2.931,2.93,2.929,2.928,3.101,3.071,3.06,3.055,3.
     8052,3.05,3.373,3.259,3.219,3.201,3.19,3.209,3.899,3.579,3.466,3.41
     95,3.385,3.365,4.883,4.145,3.883,3.767,3.698,3.736,6.549,5.085)
      DATA((CV(I),I=109,216)=4.565,4.335,4.197,4.103,2.806,2.806,2.805,2
     1.804,2.803,3.05,3.045,3.042,3.04,3.038,3.365,3.314,3.291,3.277,3.2
     267,4.103,3.869,3.765,3.702,3.66,2.476,2.5,2.518,2.519,2.639,2.637,
     32.807,2.803,2.148,2.26,2.342,2.398,2.277,2.351,2.409,2.449,2.388,2
     4.436,2.473,2.499,2.437,2.469,2.493,2.509,2.459,2.481,2.497,2.507,2
     5.471,2.48,2.491,2.5,3.08,3.112,3.143,3.16,3.172,3.184,3.236,3.278,
     63.316,2.626,2.643,2.661,2.679,2.697,2.711,2.755,2.796,2.834,2.35,2
     7.351,2.352,2.354,2.364,2.373,2.406,2.439,2.473,2.214,2.224,2.233,2
     8.241,2.252,2.261,2.298,2.334,2.365,2.162,2.179,2.194,2.209,2.223,2
     9.236,2.285,2.323,2.354,2.168,2.186,2.202,2.219,2.234,2.248,2.299)
      DATA((CV(I),I=217,323)=2.338,2.369,2.204,2.22,2.237,2.253,2.267,2.
     1279,2.327,2.365,2.398,1.117,1.087,1.064,1.054,1.525,1.507,1.497,1.
     2484,2.187,2.189,2.185,2.182,3.015,3.034,3.044,3.046,3.495,3.53,3.5
     355,3.572,3.642,3.687,3.721,3.749,3.548,3.596,3.635,3.668,3.328,3.3
     476,3.417,3.454,3.088,3.138,3.181,3.219,1.186,1.184,1.181,1.178,1.1
     573,1.169,1.162,1.464,1.46,1.459,1.457,1.453,1.451,1.448,1.886,1.88
     65,1.884,1.883,1.882,1.88,1.879,2.432,2.434,2.436,2.438,2.44,2.441,
     72.442,2.994,2.995,2.999,3.004,3.007,3.012,3.015,3.385,3.373,3.373,
     83.377,3.383,3.389,3.393,3.602,3.583,3.576,3.576,3.581,3.586,3.592,
     93.63,3.63,3.628,3.628,3.63,3.635,3.641,3.542,3.549,3.553,3.558)
      DATA((CV(I),I=324,430)=3.561,3.567,3.572,3.389,3.397,3.403,3.41,3.
     1416,3.422,3.428,3.216,3.224,3.231,3.238,3.244,3.251,3.258,3.046,3.
     2054,3.062,3.069,3.075,3.082,3.088,3.385,3.373,3.373,3.377,3.497,3.
     3478,3.474,3.479,3.577,3.556,3.55,3.551,3.62,3.606,3.599,3.599,3.63
     46,3.63,3.624,3.624,3.63,3.63,3.628,3.628,3.477,3.503,3.526,3.549,3
     5.569,3.596,3.613,3.613,3.602,3.515,3.536,3.554,3.572,3.589,3.603,3
     6.616,3.626,3.63,3.442,3.458,3.474,3.489,3.503,3.517,3.528,3.536,3.
     7542,3.306,3.319,3.331,3.342,3.354,3.365,3.376,3.384,3.389,3.146,3.
     8157,3.166,3.176,3.185,3.193,3.203,3.211,3.216,2.987,2.995,3.002,3.
     901,3.017,3.024,3.032,3.039,3.046,1.135,1.136,1.137,1.137,1.137)
      END


      SUBROUTINE EQCVDT1
      COMMON/EQHEAT/CP(823),CV(823)
      DATA((CV(I),I=431,539)=1.135,1.268,1.267,1.266,1.265,1.264,1.263,1
     1.439,1.435,1.432,1.429,1.427,1.425,1.657,1.652,1.649,1.646,1.644,1
     2.642,1.894,1.892,1.89,1.889,1.887,1.886,2.169,2.165,2.163,2.163,2.
     3163,2.163,2.547,2.517,2.505,2.502,2.502,2.504,3.04,3.066,2.85,2.83
     94.604,35.35,16.84,13.19,11.56,10.59,9.927,9.437,54.51,26.45,20.19/
      DATAAG/17.34,15.62,14.45,13.58,64.36,38.41,29.6,25.3,22.65,20.8,19
     1.42,56.3,49.65,39.92,34.48,30.93,28.4,26.45,9.939,7.931,7.111,15.6
     22,10.89,9.417,22.65,15.11,12.72,30.93,20.31,16.84,7.938,6.284,5.7,
     35.441,5.287,5.181,10.9,7.934,6.883,6.417,6.14,5.95,15.14,10.3,8.57
     48,7.813,7.357,7.045,17.42,13.26,10.7,9.559,8.879,8.413,5.181,4.92,
     54.804,4.734,4.687,7.045,6.271,5.928,5.724,5.584,9.786,8.248,7.565,
     67.157,6.881,0.,3.802,3.799,3.797,3.797,3.796,3.889,3.878,3.873,3.8
     77,3.868,4.018,3.987,3.973,3.964,3.959,4.229,4.153,4.119,4.098,4.08
     85,4.592,4.424,4.349,4.305,4.275,5.209,4.873,4.725,4.636,4.576,6.22
     92,5.602,5.328,5.164,5.052,7.805,6.733,6.258,5.974,5.781,10.17/
      DATAAH/8.416,7.639,7.175,6.859,13.55,10.82,9.606,8.883,8.39,18.16,
     114.11,12.31,11.23,10.49,24.19,18.45,15.87,14.33,13.27,31.65,23.94,
     220.42,18.29,16.83,40.2,30.53,25.96,23.16,21.23,48.9,37.93,32.38,28
     33.89,26.45,55.98,45.39,39.27,35.23,32.33,59.17,51.54,45.75,41.57,38
     44.41,57.07,54.84,50.67,47.03,44.03/
      DATAAI/2.819,2.811,2.809,2.809,2.808,2.808,2.808,3.04,2.971,2.958,
     12.952,2.948,2.946,2.944,3.64,3.271,3.202,3.171,3.152,3.14,3.13,5.3
     233,3.992,3.737,3.624,3.557,3.511,3.477,9.353,5.63,4.918,4.602,4.41
     334,4.285,4.19,17.17,8.839,7.219,6.497,6.065,5.77,5.552,29.48,14.23,
     411.12,9.713,8.87,8.292,7.863,2.808,2.807,2.807,2.946,2.939,2.936,3
     5.14,3.102,3.086,3.512,3.373,3.316,4.288,3.898,3.739,5.778,4.881,4.
     66514,8.308,6.541,5.817,2.807,2.807,2.806,2.806,2.806,2.806,2.939,2.
     77933,2.931,2.93,2.929,2.928,3.101,3.071,3.06,3.055,3.052,3.05,3.373
     88,3.259,3.219,3.201,3.19,3.209,3.899,3.579,3.466,3.415,3.385,3.365,
     994.883,4.145,3.883,3.767,3.698,3.736,6.549,5.085,4.565,4.335,4.197/
      DATAAJ/4.103,2.806,2.806,2.805,2.804,2.803,3.05,3.045,3.042,3.04,3
     11.038,3.365,3.314,3.291,3.277,3.267,4.103,3.869,3.765,3.702,3.66,2.
     22476,2.5,2.518,2.519,2.639,2.637,2.807,2.803,2.148,2.26,2.342,2.398
     33,2.277,2.351,2.409,2.449,2.388,2.436,2.473,2.499,2.437,2.469,2.493
     44,2.509,2.459,2.481,2.497,2.507,2.471,2.48,2.491,2.5,3.08,3.112,3.1
     543,3.16,3.172,3.184,3.236,3.278,3.316,2.626,2.643,2.661,2.679,2.69
     667,2.711,2.755,2.796,2.834,2.35,2.351,2.352,2.354,2.364,2.373,2.406
     77,2.439,2.473,2.214,2.224,2.233,2.241,2.252,2.261,2.298,2.334,2.365
     88,2.162,2.179,2.194,2.209,2.223,2.236,2.285,2.323,2.354,2.168,2.186
     99,2.202,2.219,2.234,2.248,2.299,2.338,2.369,2.204,2.22,2.237,2.253/
      DATAAK/2.267,2.279,2.327,2.365,2.398,1.117,1.087,1.064,1.054,1.525
     11,1.507,1.497,1.484,2.187,2.189,2.185,2.182,3.015,3.034,3.044,3.046
     22,3.495,3.53,3.555,3.572,3.642,3.687,3.721,3.749,3.548,3.596,3.635,
     33.668,3.328,3.376,3.417,3.454,3.088,3.138,3.181,3.219,1.186,1.184,
     441.181,1.178,1.173,1.169,1.162,1.464,1.46,1.459,1.457,1.453,1.451,1
     55.448,1.886,1.885,1.884,1.883,1.882,1.88,1.879,2.432,2.434,2.436,2.
     66438,2.44,2.441,2.442,2.994,2.995,2.999,3.004,3.007,3.012,3.015,3.3
     7785,3.373,3.373,3.377,3.383,3.389,3.393,3.602,3.583,3.576,3.576,3.5
     8881,3.586,3.592,3.63,3.63,3.628,3.628,3.63,3.635,3.641,3.542,3.549,
     993.553,3.558,3.561,3.567,3.572,3.389,3.397,3.403,3.41,3.416,3.422/
      DATAAL/3.428,3.216,3.224,3.231,3.238,3.244,3.251,3.258,3.046,3.054
     11,3.062,3.069,3.075,3.082,3.088,3.385,3.373,3.373,3.377,3.497,3.478
     22,3.474,3.479,3.577,3.556,3.55,3.551,3.62,3.606,3.599,3.599,3.636,3
     33.63,3.624,3.624,3.63,3.63,3.628,3.628,3.477,3.503,3.526,3.549,3.56
     449,3.596,3.613,3.613,3.602,3.515,3.536,3.554,3.572,3.589,3.603,3.61
     556,3.626,3.63,3.442,3.458,3.474,3.489,3.503,3.517,3.528,3.536,3.542
     66,3.306,3.319,3.331,3.342,3.354,3.365,3.376,3.384,3.389,3.146,3.157
     77,3.166,3.176,3.185,3.193,3.203,3.211,3.216,2.987,2.995,3.002,3.01,
     883.017,3.024,3.032,3.039,3.046,1.135,1.136,1.137,1.137,1.137,1.135,
     991.268,1.267,1.266,1.265,1.264,1.263,1.439,1.435,1.432,1.429,1.427/
      DATAAM/1.425,1.657,1.652,1.649,1.646,1.644,1.642,1.894,1.892,1.89,
     111.889,1.887,1.886,2.169,2.165,2.163,2.163,2.163,2.163,2.547,2.517,
```

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42,2.827,2.827,3.48,3.837,3.247,3.122,3.101,3.094,1.736,4.136,3.544
5,3.389,3.33,3.309,1.886,1.886,3.506,3.569,3.51,3.477,2.63,3.347,4.
6147,0.,3.612,3.588,2.67,3.316,3.948,2.9,1.34,1.34,3.103,3.241,3.31
77,3.198,3.076,1.581,3.297,3.359,3.449,3.433,3.379,3.33,3.431,3.472
8,3.517,3.557,3.536,3.51,3.512,3.543,3.571,3.605,3.614,3.601,1.16,1
9.161,1.161,1.161,1.162,1.162,1.162,1.271,1.27,1.269,1.269,1.268)
 DATA((CV(I),I=540,646)=1.268,1.268,1.405,1.404,1.403,1.402,1.401,1
1.4,1.399,1.571,1.57,1.569,1.568,1.567,1.566,1.565,1.749,1.748,1.74
27,1.747,1.746,1.745,1.745,1.944,1.94,1.939,1.938,1.937,1.937,1.936
3,2.176,2.171,2.174,2.172,2.169,2.168,2.166,.9145,.9145,2.462,2.461
4,2.463,2.454,2.448,1.919,2.053,2.211,2.773,2.786,2.799,2.812,2.155
5,2.218,2.301,2.416,2.589,2.957,3.263,2.627,2.654,2.688,2.733,2.797
6,2.897,3.072,3.041,3.055,3.071,3.088,3.107,3.129,3.155,3.33,3.34,3
7.349,3.358,3.368,3.378,3.388,3.491,3.498,3.504,3.511,3.518,3.524,3
8.531,1.133,1.134,1.242,1.242,1.371,1.368,1.528,1.526,1.705,1.703,1
9.907,1.899,1.481,1.704,1.536,1.732,1.749,1.892,2.088,2.155,2.588)
 DATA((CV(I),I=647,754)=2.627,3.015,3.041,3.313,3.33,3.477,3.491,29
1.48,14.23,11.12,9.713,8.87,8.292,7.863,43.57,21.93,16.86,14.51,13.
208,12.09,11.36,50.01,30.8,24.09,20.74,18.64,17.16,16.05,44.25,38.6
3,31.57,27.54,24.88,22.96,21.47,8.308,6.541,5.817,13.08,9.068,7.803
4,18.64,12.53,10.55,24.88,16.65,13.87,6.619,5.085,4.565,4.335,4.197
5,4.103,10.09,6.517,5.6,5.191,4.947,4.78,12.59,8.513,7.045,6.388,5.
6994,5.725,16.79,10.94,8.813,7.854,7.278,6.883,4.103,3.869,3.765,3.
7702,3.66,5.725,5.053,4.754,4.577,4.453,8.046,6.746,6.163,5.806,5.4
839,0.,2.817,2.813,2.812,2.811,2.811,2.902,2.891,2.886,2.884,2.882,
93.026,2.997,2.984,2.976,2.971,3.227,3.155,3.124,3.105,3.092,3.566)
 DATA((CV(I),I=755,823)=3.41,3.341,3.3,3.271,4.137,3.827,3.69,3.608
1,3.552,5.064,4.496,4.245,4.094,3.992,6.498,5.524,5.091,4.833,4.657
2,8.607,7.034,6.334,5.915,5.629,11.56,9.155,8.079,7.435,6.994,15.51
3,12.01,10.44,9.487,8.838,20.49,15.67,13.47,12.14,11.23,26.42,20.16
4,17.24,15.46,14.23,32.93,25.35,21.67,19.4,17.81,39.24,30.92,26.61,
523.87,21.93,44.14,36.29,31.69,28.62,26.38,46.17,40.52,36.26,33.16,
630.79,44.46,42.63,39.56,36.9,34.7)
 END
```

```
22.505,2.502,2.502,2.504,3.04,3.066,2.85,2.832,2.827,2.827,3.48,3.8
337,3.247,3.122,3.101,3.094,1.736,4.136,3.544,3.389,3.33,3.309,1.88
46,1.886,3.506,3.569,3.51,3.477,2.63,3.347,4.147,0.,3.612,3.588,2.6
57,3.316,3.948,2.9,1.34,1.34,3.103,3.241,3.317,3.198,3.076,1.581,3.
6297,3.359,3.449,3.433,3.379,3.33,3.431,3.472,3.517,3.557,3.536,3.5
71,3.512,3.543,3.571,3.605,3.614,3.601,1.16,1.161,1.161,1.161,1.162
8,1.162,1.162,1.271,1.27,1.269,1.269,1.268,1.268,1.268,1.405,1.404,
91.403,1.402,1.401,1.4,1.399,1.571,1.57,1.569,1.568,1.567,1.566/
 DATAAN/1.565,1.749,1.748,1.747,1.747,1.746,1.745,1.745,1.944,1.94,
11.939,1.938,1.937,1.937,1.936,2.176,2.171,2.174,2.172,2.169,2.168,
22.166,.9145,.9145,2.462,2.461,2.463,2.454,2.448,1.919,2.053,2.211,
32.773,2.786,2.799,2.812,2.155,2.218,2.301,2.416,2.589,2.957,3.263,
42.627,2.654,2.688,2.733,2.797,2.897,3.072,3.041,3.055,3.071,3.088,
53.107,3.129,3.155,3.33,3.34,3.349,3.358,3.368,3.378,3.388,3.491,3.
6498,3.504,3.511,3.518,3.524,3.531,1.133,1.134,1.242,1.242,1.371,1.
7368,1.528,1.526,1.705,1.703,1.907,1.899,1.481,1.704,1.536,1.732,1.
8749,1.892,2.088,2.155,2.588,2.627,3.015,3.041,3.313,3.33,3.477,3.4
991,29.48,14.23,11.12,9.713,8.87,8.292,7.863,43.57,21.93,16.86/
 DATAAO/14.51,13.08,12.09,11.36,50.01,30.8,24.09,20.74,18.64,17.16,
116.05,44.25,38.6,31.57,27.54,24.88,22.96,21.47,8.308,6.541,5.817,1
23.08,9.068,7.803,18.64,12.53,10.55,24.88,16.65,13.87,6.619,5.085,4
3.565,4.335,4.197,4.103,10.09,6.517,5.6,5.191,4.947,4.78,12.59,8.51
43,7.045,6.388,5.994,5.725,16.79,10.94,8.813,7.854,7.278,6.883,4.10
53,3.869,3.765,3.702,3.66,5.725,5.053,4.754,4.577,4.453,8.046,6.746
6,6.163,5.806,5.439,0.,2.817,2.813,2.812,2.811,2.811,2.902,2.891,2.
7886,2.884,2.882,3.026,2.997,2.984,2.976,2.971,3.227,3.155,3.124,3.
8105,3.092,3.566,3.41,3.341,3.3,3.271,4.137,3.827,3.69,3.608,3.552,
95.064,4.496,4.245,4.094,3.992,6.498,5.524,5.091,4.833,4.657,8.607/
 DATAAP/7.034,6.334,5.915,5.629,11.56,9.155,8.079,7.435,6.994,15.51
1,12.01,10.44,9.487,8.838,20.49,15.67,13.47,12.14,11.23,26.42,20.16
2,17.24,15.46,14.23,32.93,25.35,21.67,19.4,17.81,39.24,30.92,26.61,
323.87,21.93,44.14,36.29,31.69,28.62,26.38,46.17,40.52,36.26,33.16,
430.79,44.46,42.63,39.56,36.9,34.7/
 END
```

```
 FUNCTION ETLFAC(PRES,TEMP)
 COMMON/ETFAC /C(730)
 DIMENSION PS(19),TS(19),JP(19),MX(19),LOC(19),BP(19),DP(19),BT(19)
1,DT(19)
 DATA(JP=7,5,3,6,4,3,6,6,7,5,5,9,5,2,5,4,3,3,3)
 DATA(MX=5,3,1,4,2,1,4,4,5,3,3,7,3,0,3,2,1,1,1)
 DATA(LOC=1,78,123,168,204,236,251,281,329,392,417,442,487,512,524,
1 604,668,689,710)
 DATA(BP=52.,700.,2500.,0.,100.,142.5,187.5,187.5,400.,700.,0.,0.,
1 0.,0.,1.,0.,0.,-100.,0.)
 DATA(DP=108.,450.,1250.,20.,30.,22.5,42.5,42.5,50.,450.,175.,625.,
1 1250.,3000.,1.,10.,40.,300.,1500.)
 DATA(BT=26.,28.,30.,25.,52.,56.,56.,59.,56.,60.,80.,100.,180.,500.
1 ,3000.,3000.,3000.,3000.,3000.)
 DATA(DT=3.,4.,5.,11.,4.,1.,3.,3.,3.,10.,5.,20.,80.,500.,200.,200.,
1 500.,500.,500.)
 DATA(PS=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.506)
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 FUNCTION ETLFAC(PRES,TEMP)
 DIMENSION PS(19),TS(19),JP(19),MX(19),LOC(19),BP(19),DP(19),BT(19)
1,DT(19),C(730)
 DIMENSION AA(109),AB(113),AC(105),AD(108),AE(108),AF( 93),AG( 94)
 EQUIVALENCE( C,AA),( C( 110),AB),( C( 223),AC),( C( 328),AD)
1    ,( C( 436),AE),( C( 544),AF),( C( 637),AG)
 DATA JP/7,5,3,6,4,3,6,6,7,5,5,9,5,2,5,4,3,3,3/
 DATA MX/5,3,1,4,2,1,4,4,5,3,3,7,3,0,3,2,1,1,1/
 DATA LOC/1,78,123,168,204,236,251,281,329,392,417,442,487,512,524,
1 604,668,689,710/
 DATA BP/52.,700.,2500.,0.,100.,142.5,187.5,187.5,400.,700.,0.,0.,
1 0.,0.,1.,0.,0.,-100.,0./
 DATA DP/108.,450.,1250.,20.,30.,22.5,42.5,42.5,50.,450.,175.,625.,
1 1250.,3000.,1.,10.,40.,300.,1500./
 DATA BT/26.,28.,30.,25.,52.,56.,56.,59.,56.,60.,80.,100.,180.,500.
1 ,3000.,3000.,3000.,3000.,3000./
 DATA DT/3.,4.,5.,11.,4.,1.,3.,3.,3.,10.,5.,20.,80.,500.,200.,200.,
1 500.,500.,500./
```

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      DATA(TS=24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,
     154.79,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356)
      DATA((C(I),I=1, 95)=1650.,1618.5,1585.3,1555.,1527.,1501.,1515.,20
     118.4,1981.1,1946.4,1911.7,1878.8,1847.1,1816.7,2351.7,2306.5,2265.
     27,2228.5,2193.9,2160.5,2129.,2665.5,2613.6,2567.3,2525.2,2486.5,24
     350.7,2417.3,3021.2,2956.7,2901.6,2853.4,2810.,2770.4,2733.5,3394.,
     43308.9,3241.6,3184.5,3134.5,3089.9,3049.3,3786.2,3673.1,3587.1,351
     57.2,3458.3,3406.9,3361.2,4198.,4059.5,3942.7,3855.,3783.9,3724.,36
     671.7,4810.,4499.9,4322.8,4204.6,4115.7,4044.2,3983.7,5515.,5067.3,
     74745.,4573.2,4456.5,4368.1,4297.,7304.,6213.3,5243.1,4961.9,4800.5
     8,4687.8,4601.5,1703.1,1600.,1499.,1436.,0.,2129.,2011.5,1910.3,181
     96.,1774.,2520.4,2395.2,2292.3,2203.6,2125.3,2944.7,2806.8,2696.9)
      DATA((C(I),I=96,194)=2604.9,2524.9,3361.2,3208.3,3090.2,2993.2,291
     10.6,3775.6,3602.3,3475.2,3372.9,3286.9,4192.5,3993.2,3855.6,3747.2
     2,3657.3,4601.5,4367.1,4217.,4102.4,4008.3,4996.4,4714.5,4550.2,442
     38.5,4330.2,1536.,1364.,0.,2026.8,1855.,1790.,2524.9,2352.,2229.,30
     404.9,2827.,2708.6,3473.1,3288.5,3170.5,3924.1,3730.1,3603.9,4330.2
     5,4126.4,3995.,4698.7,4486.3,4348.4,5021.6,4799.4,4654.5,5295.2,506
     63.8,4911.1,5521.7,5280.4,5121.,5703.,5454.4,5287.4,5840.,5587.5,54
     715.,5936.9,5683.3,5508.1,5997.5,5747.1,5571.3,2618.,2518.,0.,0.,0.
     8,0.,2661.,2994.,3521.,6105.,0.,0.,3211.,3382.5,3649.9,3955.,4404.,
     95573.,4012.,4106.4,4223.2,4371.4,4539.,4810.,4726.,4790.7,4861.3)
      DATA((C(I),I=195,290)=4940.8,5001.,5103.,5202.,5249.9,5298.7,5351.
     1,5407.3,5467.8,3825.,2380.,15.,0.,5452.6,3584.,1624.5,0.,7377.5,52
     250.7,3150.,435.5,9517.3,7249.8,5036.2,2684.6,11826.6,9439.5,7151.4
     3,4861.3,14250.3,11760.1,9398.9,7109.6,16740.9,14163.8,11737.4,9424
     4.2,19244.3,16598.7,14120.,11786.,2547.2,2236.,1923.7,2308.,1888.9,
     51479.8,1607.1,1565.,988.6,0.,1942.,408.4,0.,1281.9,-738.,2014.,522
     62.7,8233.3,11043.2,13693.8,16203.8,835.,4408.9,7570.7,10497.,13292
     7.3,15940.6,1256.,5510.9,7439.3,10236.1,12992.7,15633.2,-1058.,1990
     8.,7821.,10285.2,12862.5,15472.5,0.,0.,3103.9,8987.,12247.3,15150.,
     9-236.7,9455.,0.,3029.9,10913.,13758.,1887.5,3909.7,9088.,8750.7)
      P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.GE.6000.)T=5999.9999
      DIV=1.0
      IF(T.GE.100.0) GO TO 15
      TZ=24.84+.00317*P
      IF(T.LT.TZ)T=TZ
      IF(P.GE.700.0) GO TO 4
      IF(T.GE.80.0) GO TO 3
      IF(P.LT.187.506) GO TO 7
      IF(T.LT.56.0) GO TO 12
      IF(P.GT.400.0) GO TO 2
      TM=(-0.0000523467*P+0.08698291)*P+44.882441
      IF(T.GE.TM) GO TO 1
      N=7
      OIV=((P-187.506)*.083+TM-T)/10.
      GO TO 33
    1 N=8
      DIV=((P-187.506)*.083+T-TM)/10.
      GO TO 33
    2 N=9
      GO TO 33
    3 N=11
      GO TO 33
    4 IF(P.GE.2500.0) GO TO 6
      DATA PS/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
     1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.506/
      DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,
     154.79,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356/
      DATAAA/1650.,1619.,1585.,1555.,1527.,1501.,1515.,2018.,1981.,1946.
     1,1912.,1879.,1847.,1817.,2352.,2307.,2266.,2229.,2194.,2160.,2129.
     2,2666.,2614.,2567.,2525.,2486.,2451.,2417.,3021.,2957.,2902.,2853.
     3,2810.,2770.,2733.,3394.,3309.,3242.,3184.,3134.,3090.,3049.,3786.
     4,3673.,3587.,3517.,3458.,3407.,3361.,4198.,4059.,3943.,3855.,3784.
     5,3724.,3672.,4810.,4500.,4323.,4205.,4116.,4044.,3984.,5515.,5067.
     6,4745.,4573.,4456.,4368.,4297.,7304.,6213.,5243.,4962.,4801.,4688.
     7,4601.,1703.,1600.,1499.,1436.,0.,2129.,2011.,1910.,1816.,1774.,25
     820.,2395.,2292.,2204.,2125.,2945.,2807.,2697.,2605.,2525.,3361.,32
     908.,3090.,2993.,2911.,3776.,3602.,3475.,3373.,3287.,4193.,3993./
      DATAAB/3856.,3747.,3657.,4601.,4367.,4217.,4102.,4008.,4996.,4715.
     1,4550.,4429.,4330.,1536.,1364.,0.,2027.,1855.,1790.,2525.,2352.,22
     229.,3005.,2827.,2709.,3473.,3289.,3171.,3924.,3730.,3604.,4330.,41
     326.,3995.,4699.,4486.,4348.,5022.,4799.,4654.,5295.,5064.,4911.,55
     422.,5280.,5121.,5703.,5454.,5287.,5840.,5588.,5415.,5937.,5683.,55
     508.,5998.,5747.,5571.,2618.,2518.,0.,0.,0.,0.,2661.,2994.,3521.,61
     605.,0.,0.,3211.,3383.,3650.,3955.,4404.,5573.,4012.,4106.,4223.,43
     771.,4539.,4810.,4726.,4791.,4861.,4941.,5001.,5103.,5202.,5250.,52
     899.,5351.,5407.,5468.,3825.,2380.,15.,0.,5453.,3584.,1625.,0.,7377
     9.,5251.,3150.,435.5,9517.,7250.,5036.,2685.,11830.,9440.,7151./
      DATAAC/4861.,14250.,11760.,9399.,7110.,16740.,14160.,11740.,9424.,
     119240.,16600.,14120.,11790.,2547.,2236.,1924.,2308.,1889.,1480.,16
     207.,1565.,988.6,0.,1942.,408.4,0.,1282.,-738.,2014.,5223.,8233.,11
     3040.,13690.,16200.,835.,4409.,7571.,10500.,13290.,15940.,1256.,551
     41.,7439.,10240.,12990.,15630.,-1058.,1990.,7821.,10290.,12860.,154
     570.,0.,0.,3104.,8987.,12250.,15150.,-236.7,9455.,0.,3030.,10910.,1
     63760.,1888.,3910.,9088.,8751.,0.,0.,3469.,4954.,7489.,9140.,10760.
     7,0.,5076.,6209.,7991.,9862.,10870.,13360.,6734.,7718.,9102.,10850.
     8,12430.,13440.,8443.,9360.,10560.,12040.,13680.,15170.,10190.,1107
     90.,12170.,13490.,15000.,16580.,11960.,12810.,13850.,15070.,16480./
      DATAAD/18010.,4920.,4844.,4782.,4728.,4681.,4639.,4601.,5325.,5214
     1.,5128.,5056.,4996.,4944.,4898.,5804.,5615.,5489.,5392.,5313.,5247
     2.,5191.,6464.,6112.,5888.,5736.,5632.,5549.,5479.,7214.,6677.,6349
     3.,6128.,5967.,5843.,5758.,7655.,7178.,6786.,6511.,6311.,6159.,6038
     4.,7466.,7366.,7093.,6831.,6616.,6445.,6308.,7104.,7225.,7168.,7012
     5.,6837.,6675.,6537.,6837.,7006.,7072.,7037.,6941.,6822.,6703.,4996
     6.,4715.,4550.,4429.,4330.,5943.,5464.,5275.,5132.,5022.,6703.,6025
     7.,5807.,5644.,5522.,6810.,6433.,6139.,5968.,5840.,6538.,6512.,6286
     8.,6121.,5998.,5207.,5738.,6667.,7136.,6703.,5332.,5772.,6394.,6863
     9.,6823.,5405.,5781.,6274.,6663.,6782.,5435.,5762.,6170.,6498./
      DATAAE/6665.,5429.,5717.,6062.,6353.,6525.,5429.,6517.,6502.,6176.
     1,5998.,5860.,5747.,5652.,5571.,5229.,5957.,6217.,6135.,6015.,5907.
     2,5812.,5726.,5649.,4937.,5440.,5732.,5823.,5811.,5762.,5701.,5640.
     3,5576.,4736.,5147.,5430.,5577.,5629.,5632.,5611.,5576.,5533.,4596.
     4,4940.,5199.,5368.,5463.,5501.,5510.,5503.,5485.,4596.,5199.,5463.
     5,5510.,5485.,4617.,4981.,5172.,5357.,5444.,4947.,5165.,5318.,5424.
     6,5500.,5249.,5381.,5478.,5550.,5605.,5490.,5569.,5629.,5674.,5711.
     7,5517.,5648.,6199.,6122.,6543.,6443.,7024.,7287.,7592.,7899.,8353.
     8,8422.,8353.,8266.,8228.,8205.,8190.,8949.,8757.,8662.,8605.,8566.
     9,9937.,9467.,9352.,9226.,9140.,11740.,10790.,10430.,10220.,10050./
      DATAAF/14710.,12950.,12170.,11760.,11490.,19350.,16300.,14940.,142
     100.,13640.,26240.,21270.,19040.,17800.,16880.,35980.,28310.,24870.
     2,22910.,21490.,49030.,37850.,32780.,29870.,27830.,65570.,50160.,43
     3060.,39040.,36050.,85140.,65230.,56100.,50420.,46480.,1.063E5,8259
```

```
      IF(T.GE.60.0) GO TO 5
      N=2
      GO TO 33
    5 N=10
      GO TO 33
    6 N=3
      GO TO 33
    7 DO 8 I=2,19
      IF(P-PS(I)) 10,9,8
    8 CONTINUE
    9 TM=TS(I)
      GO TO 11
   10 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
   11 IF(T.GE.TM) GO TO 13
      IF(T.LT.56.0) GO TO 12
      N=6
      DIV=((187.506-P)*.083+TM-T)/10.
      GO TO 33
   12 N=1
      GO TO 33
   13 IF(P.GE.100.0) GO TO 14
      N=4
      GO TO 33
   14 N=5
      DIV=((187.506-P)*.083+T-TM)/10.
      GO TO 33
   15 IF(T.GE.3000.0) GO TO 18
      IF(T.GE.500.0) GO TO 17
      IF(T.GE.180.0) GO TO 16
      N=12
      GO TO 33
   16 N=13
      GO TO 33
   17 N=14
      GO TO 33
   18 IF(P.GE.30.0) GO TO 20
      IF(P.GE.5.0) GO TO 19
      N=15
      GO TO 33
   19 N=16
      GO TO 33
   20 IF(P.GE.500.0) GO TO 22
      IF(P.GE.100.0) GO TO 21
      N=17
      GO TO 33
   21 N=18
      GO TO 33
   22 N=19
   33 FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N))/DT(N)
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N)
```



```
     40.,71380.,64130.,58910.,1.268E5,1.01E5,88280.,79430.,73090.,1.419E
     55,1.185E5,1.052E5,95480.,88310.,1.475E5,1.334E5,1.198E5,1.104E5,1.
     6031E5,1.392E5,1.385E5,1.295E5,1.221E5,1.157E5,8228.,8152.,8126.,81
     715.,8662.,8471.,8404.,8375.,9353.,8927.,8778.,8712.,10480.,9573.,9
     8270.,9183.,12400.,10580.,10020.,9870.,15230.,12180.,11200.,10870.,
     919410.,14530.,12910.,12310.,25360.,17840.,15310.,14330.,33440./
      DATAAG/22350.,18570.,17060.,44000.,28280.,22870.,20600.,57170.,357
     190.,28340.,25170.,72850.,44980.,35100.,30840.,90410.,55770.,43180.
     2,37570.,1.087E5,67930.,52530.,45520.,1.254E5,80750.,62840.,54710.,
     31.379E5,93410.,73770.,64460.,8133.,8109.,8100.,9361.,8782.,8680.,1
     41980.,10510.,10020.,18540.,14610.,13040.,32050.,22970.,19110.,5478
     50.,37240.,29540.,85300.,57510.,44840.,8095.,8104.,8134.,8907.,8644
     6.,8625.,10850.,9593.,9359.,15300.,11650.,10800.,24520.,15650.,1348
     70.,40400.,22530.,18030.,63360.,32820.,24890.,8076.,8252.,8422.,862
     83.,8758.,8929.,9388.,9299.,9515.,11020.,10350.,10310.,14210.,12020
     9.,11610.,19620.,14860.,13760.,27790.,19110.,16960./
      P=PRES
      IF(P.LT.1.0) P=1.0
      T=TEMP
      IF(T.GE.6000.)T=5999.9999
      DIV=1.0
      IF(T.GE.100.0) GO TO 15
      TZ=24.84+.00317*P
      IF(T.LT.TZ)T=TZ
      IF(P.GE.700.0) GO TO 4
      IF(T.GE.80.0) GO TO 3
      IF(P.LT.187.506) GO TO 7
      IF(T.LT.56.0) GO TO 12
      IF(P.GT.400.0) GO TO 2
      TM=(-0.000523467*P+0.08698291)*P+44.882441
      IF(T.GE.TM) GO TO 1
      N=7
      DIV=((P-187.506)*.083+TM-T)/10.
      GO TO 33
    1 N=8
      DIV=((P-187.506)*.083+T-TM)/10.
      GO TO 33
    2 N=9
      GO TO 33
    3 N=11
      GO TO 33
    4 IF(P.GE.2500.0) GO TO 6
      IF(T.GE.60.0) GO TO 5
      N=2
      GO TO 33
    5 N=10
      GO TO 33
    6 N=3
      GO TO 33
    7 DO 8 I=2,19
      IF(P-PS(I)) 10,9,8
    8 CONTINUE
    9 TM=TS(I)
      GO TO 11
   10 TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
   11 IF(T.GE.TM) GO TO 13
      IF(T.LT.56.0) GO TO 12
      N=6
```

```
      J=I+JP(N)
      ETLFAC=(FP*FT*C(I)+F*FT*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))/DIV
      RETURN
      END

      SUBROUTINE ETLFDATA
      COMMON/ETFAC /C(730)
      DATA((C(I),I=291,382)=0.,0.,3468.9,4953.9,7489.,9139.6,10763.,0.,5
     1076.2,6208.8,7990.8,9861.9,10865.,13358.5,6733.9,7718.5,9101.6,108
     245.3,12429.1,13442.,8443.4,9360.4,10558.5,12037.5,13675.3,15167.,1
     30188.1,11065.6,12169.5,13488.,14995.1,16578.,11955.,12807.,13853.,
     415072.,16477.,18007.,4919.6,4844.3,4781.5,4727.7,4680.7,4639.,4601
     5.5,5324.7,5214.4,5127.9,5056.1,4996.3,4944.5,4898.3,5803.6,5615.4,
     65489.1,5391.5,5312.8,5246.9,5190.7,6463.8,6111.7,5887.7,5736.5,563
     72.5,5548.6,5478.8,7213.9,6677.5,6349.4,6128.,5966.9,5843.2,5757.8,
     87655.,7178.,6786.1,6511.4,6310.8,6158.8,6038.3,7466.,7366.,7093.,6
     9831.2,6616.,6445.2,6308.3,7103.8,7225.1,7167.9,7012.4,6836.7)
      DATA((C(I),I=383,476)=6675.3,6536.5,6837.3,7006.1,7071.6,7037.2,69
     140.5,6821.6,6703.1,4996.4,4714.5,4550.2,4428.5,4330.2,5942.5,5464.
     2,5274.7,5132.,5021.6,6703.1,6025.,5807.2,5644.3,5521.7,6810.,6433.
     3,6138.6,5968.,5840.,6538.,6512.,6286.3,6120.6,5997.5,5206.8,5737.5
     4,6667.,7136.,6703.1,5332.2,5772.2,6394.3,6862.6,6823.,5405.3,5780.
     56,6273.8,6662.9,6782.4,5435.4,5762.2,6170.2,6498.4,6665.1,5428.6,5
     6717.4,6061.7,6352.7,6524.9,5428.6,6517.,6502.,6176.4,5997.5,5859.7
     7,5747.1,5652.2,5571.3,5228.7,5957.,6217.,6135.1,6015.,5907.5,5811.
     86,5726.,5648.7,4936.6,5440.1,5731.7,5823.1,5811.3,5761.7,5701.3,56
     939.7,5576.,4736.3,5146.5,5430.,5577.3,5628.9,5631.8,5610.9,5576.)
      DATA((C(I),I=477,565)=5532.9,4595.5,4939.9,5198.5,5368.2,5462.7,55
     100.9,5510.,5502.9,5485.1,4595.5,5198.5,5462.7,5510.,5485.1,4616.6,
     24981.5,5172.5,5356.8,5443.5,4947.4,5164.8,5317.8,5424.,5500.,5249.
     32,5380.6,5477.7,5549.9,5604.7,5489.8,5568.8,5628.6,5674.5,5710.5,5
     4517.2,5648.4,6199.5,6121.7,6543.4,6442.9,7024.4,7287.,7591.7,7898.
     58,8353.1,8422.,8353.,8266.5,8228.2,8205.5,8190.,8949.,8756.8,8661.
     67,8605.,8566.4,9937.4,9467.,9351.7,9226.,9140.2,11741.5,10794.3,10
     7425.9,10224.6,10051.3,14708.1,12948.8,12166.,11757.4,11493.6,19346
     8.3,16296.8,14937.4,14195.8,13636.9,26239.,21266.2,19043.1,17801.,1
     96884.8,35975.9,28310.9,24866.6,22913.9,21488.8,49030.,37846.9)
      DATA((C(I),I=566,647)=32775.9,29868.7,27826.3,65567.8,50156.3,4305
     19.,39043.3,36046.5,85144.3,65234.9,56102.7,50416.9,46483.8,106314.
     2,82586.7,71382.8,64134.4,58914.3,126795.,101043.,88283.2,79430.2,7
     33091.5,141891.,118476.,105172.,95475.2,88308.7,147511.,133418.,119
     4809.,110420.,103086.,139164.,138468.,129522.,122112.,115660.,8228.
     51,8151.9,8125.7,8114.9,8662.,8470.8,8404.1,8375.3,9353.,8927.4,877
     67.7,8712.1,10481.7,9572.8,9270.4,9183.,12403.3,10583.9,10020.9,987
     70.5,15227.,12183.8,11201.1,10873.7,19412.4,14527.,12909.7,12313.8,
     825355.8,17837.8,15310.,14327.1,33443.8,22348.2,18573.3,17057.8,439
     997.5,28276.1,22868.5,20599.1,57174.6,35793.,28343.6,25174.1)
      DATA((C(I),I=648,730)=72847.1,44981.9,35104.7,30844.4,90412.1,5577
     10.9,43179.4,37565.9,108692.,67925.2,52529.3,45520.8,125426.,80745.
     26,62835.9,54707.2,137910.,93410.4,73773.8,64455.9,8132.6,8109.,810
     30.4,9361.4,8781.8,8679.7,11979.,10505.3,10015.7,18544.,14607.5,130
     435.5,32053.,22965.2,19106.6,54782.,37236.7,29541.3,85301.,57507.8,
     544840.5,8095.3,8103.8,8134.5,8907.2,8644.3,8625.1,10848.1,9593.1,9
     6358.7,15295.1,11645.6,10798.1,24523.,15652.3,13482.9,40401.1,22526
     7.7,18032.5,63358.,32823.8,24893.7,8075.7,8252.2,8422.,8623.4,8758.
     84,8928.8,9388.4,9299.3,9514.7,11021.,10352.3,10308.,14212.2,12024.
     93,11606.9,19619.7,14858.2,13761.4,27786.9,19107.4,16955.9)
      END

      DIV=((187.506-P)*.083+TM-T)/10.
      GO TO 33
   12 N=1
      GO TO 33
   13 IF(P.GE.100.0) GO TO 14
      N=4
      GO TO 33
   14 N=5
      DIV=((187.506-P)*.083+T-TM)/10.
      GO TO 33
   15 IF(T.GE.3000.0) GO TO 18
      IF(T.GE.500.0) GO TO 17
      IF(T.GE.180.0) GO TO 16
      N=12
      GO TO 33
   16 N=13
      GO TO 33
   17 N=14
      GO TO 33
   18 IF(P.GE.30.0) GO TO 20
      IF(P.GE.5.0) GO TO 19
      N=15
      GO TO 33
   19 N=16
      GO TO 33
   20 IF(P.GE.500.0) GO TO 22
      IF(P.GE.100.0) GO TO 21
      N=17
      GO TO 33
   21 N=18
      GO TO 33
   22 N=19
   33 FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FT=(T-BT(N))/DT(N)
      IT=FT
      FF=FT-IT
      FT=1.0-FF
      I=IT*JP(N)+IP+LOC(N)
      J=I+JP(N)
      ETLFAC=(FP*FT*C(I)+F*FT*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))/DIV
      RETURN
      END
```

```
      FUNCTION ETSATH(TEMP,HG,HL)
      DIMENSION R(19),TL(19),TG(19),TF(19)
      DATA (R=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
     1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012),
     2 (TG=60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90,
     3 76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225),
     4 (TL=-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.5,
     5 -51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
     6 31.225),(TF=24.849,27.091,29.821,33.079,36.190,39.975,44.129,
     7 48.332,51.965,54.796,56.725,57.792,58.580,58.991,59.191,59.291,
     8 59.340,59.354,59.3568)
      T=TEMP
      IF(T.LT.24.845)T=24.845
      IF(T.GE.59.356)T=59.356
      DO 104 I=2,19
      IF(T-TF(I))102,101,104
  101 HL=TL(I)
      HG=TG(I)
      ETSATH=R(I)
      RETURN
  102 D=TF(I)-TF(I-1)
      TRR=TF(I)-T
      TTR=T-TF(I-1)
      HL=(TL(I)*TTR+TL(I-1)*TRR)/D
      HG=(TG(I)*TTR+TG(I-1)*TRR)/D
      ETSATH=(R(I)*TTR+R (I-1)*TRR)/D
      RETURN
  104 CONTINUE
      RETURN
      END
```

```
      FUNCTION ETSATH(TEMP,HG,HL)
      DIMENSION R(19),TL(19),TG(19),TF(19)
      DATA  R/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
     1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012/,
     2  TG/60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90,
     3 76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225/,
     4  TL/-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.5,
     5 -51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
     6 31.225/, TF/24.849,27.091,29.821,33.079,36.190,39.975,44.129,
     7 48.332,51.965,54.796,56.725,57.792,58.580,58.991,59.191,59.291,
     8 59.340,59.354,59.3568/
      T=TEMP
      IF(T.LT.24.845)T=24.845
      IF(T.GE.59.356)T=59.356
      DO 104 I=2,19
      IF(T-TF(I))102,101,104
  101 HL=TL(I)
      HG=TG(I)
      ETSATH=R(I)
      RETURN
  102 D=TF(I)-TF(I-1)
      TRR=TF(I)-T
      TTR=T-TF(I-1)
      HL=(TL(I)*TTR+TL(I-1)*TRR)/D
      HG=(TG(I)*TTR+TG(I-1)*TRR)/D
      ETSATH=(R(I)*TTR+R (I-1)*TRR)/D
      RETURN
  104 CONTINUE
      RETURN
      END
```

```
      FUNCTION EPSATH(PRESS,HG,HL)
      DIMENSION R(19),TL(19),TG(19),TF(19)
      DATA (R=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
     1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012),
     2 (TG=60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90,
     3 76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225),
     4 (TL=-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.5,
     5 -51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
     6 31.225),(TF=24.849,27.091,29.821,33.079,36.190,39.975,44.129,
     7 48.332,51.965,54.796,56.725,57.792,58.580,58.991,59.191,59.291,
     8 59.340,59.354,59.3568)
      P=PRESS
      IF(P.LT.1.022)P=1.022
      IF(P.GE.187.506)P=187.506
      DO 104 I=2,19
      IF(P-R(I))102,101,104
```

```
      FUNCTION EPSATH(PRESS,HG,HL)
      DIMENSION R(19),TL(19),TG(19),TF(19)
      DATA  R/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
     1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012/,
     2  TG/60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90,
     3 76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225/,
     4  TL/-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.5,
     5 -51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
     6 31.225/, TF/24.849,27.091,29.821,33.079,36.190,39.975,44.129,
     7 48.332,51.965,54.796,56.725,57.792,58.580,58.991,59.191,59.291,
     8 59.340,59.354,59.3568/
      P=PRESS
      IF(P.LT.1.022)P=1.022
      IF(P.GE.187.506)P=187.506
      DO 104 I=2,19
      IF(P-R(I))102,101,104
```

```
101 HL=TL(I)
    HG=TG(I)
    EPSATH=TF(I)
    RETURN
102 D=R(I)-R(I-1)
    PRR=R(I)-P
    PPR=P-R(I-1)
    HL=(TL(I)*PPR+TL(I-1)*PRR)/D
    HG=(TG(I)*PPR+TG(I-1)*PRR)/D
    EPSATH=(TF(I)*PPR+TF(I-1)*PRR)/D
    RETURN
104 CONTINUE
    RETURN
    END
```

```
101 HL=TL(I)
    HG=TG(I)
    EPSATH=TF(I)
    RETURN
102 D=R(I)-R(I-1)
    PRR=R(I)-P
    PPR=P-R(I-1)
    HL=(TL(I)*PPR+TL(I-1)*PRR)/D
    HG=(TG(I)*PPR+TG(I-1)*PRR)/D
    EPSATH=(TF(I)*PPR+TF(I-1)*PRR)/D
    RETURN
104 CONTINUE
    RETURN
    END
```



```
    FUNCTION EHTEMP(PRES,ENTH,QUAL)
    COMMON /EEMPRTR/ T(429)
    DIMENSION LOC(16),JP(13),       DP(13),DH(13),BP(13),BH(16),MX(13)
   1,R(19),TL(19),TG(19),TF(19),SH(10),TS(10)
    DATA (R=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
   1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012),
   2 (TG=60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90,
   3 76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225),
   4 (TL=-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.5,
   5 -51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
   6 31.225),(TF=24.849,27.091,29.821,33.079,36.190,39.975,44.129,
   7 48.332,51.965,54.796,56.725,57.792,58.580,58.991,59.191,59.291,
   8 59.340,59.354,59.3568)
    DATA(SH   =-132.81,-109.93,-87.52,-65.56,-44.,-22.76,-1.79,18.98,
   1 39.60,60.07),(TS=24.845,27.174,29.308,31.298,33.175,34.962,
   2 36.672,38.316,39.904,41.442)
    DATA(LDC=7,100,118,150,1,178,218,9,283,331,340,358,376,400,406,
   1418)
    DATA(JP=11,3,8,7,11,8,13,11,8,3,3,3,4)
    DATA(MX=0,1,6,5,9,6,11,1,6,1,1,1,2)
    DATA(BP=0,0,881.76,0,587.84,881.76,0,0,73.48,0,-40.0,-2.0,1500.0)
    DATA(DP=3000.0,750.0,587.84,146.96,440.88,587.84,73.48,293.32,
   173.48,1500.0,120.0,6.0,1000.0)
    DATA(BH=1800.0,425.0,170.61,170.61,-110.9,42.65,42.65,-134.4,
   1-53.32,10000.0,10000.0,10000.0,425.0,20000.,20000.,20000.)
    DATA(DH=3000.0,275.0,85.306,85.306,19.194,31.99,31.99,20.26,19.194
   1,5000.0,2000.0,2000.0,275.0)
    DATA((T(I),I=1,114)=26.66,17.68,9.182,0.,0.,0.,535.,519.9,24.28,18
   1.29,12.78,37.3,29.94,21.2,13.2,0.,0.,1400.,1379.,35.,30.59,25.05,4
   24.51,39.95,33.,24.7,17.11,0.,2236.,2216.,42.5,39.63,36.2,50.44,46.
   396,42.1,35.71,28.27,20.9,3019.,3006.,47.55,46.44,44.12,55.34,52.91
   4,49.26,44.56,38.58,31.47,24.53,0.,51.48,51.71,50.43,59.53,57.95,55
   5.12,51.45,46.94,41.36,34.52,27.03,20.15,0.,0.,63.21,62.4,60.18,57.
   619,53.55,49.23,44.02,37.55,30.68,24.21,0.,66.49,66.44,64.72,62.21,
   759.15,55.59,51.45,46.57,40.64,34.08,27.91,69.47,70.17,68.89,66.76,
   864.11,61.05,57.56,53.6,49.01,43.55,37.31,120.8,134.1,140.1,198.4,2
   905.5,209.,285.3,287.2,287.4,371.,369.9,368.1,453.9,451.2,448.2)
    DATA((T(I),I=115,223)=535.,531.4,527.7,90.45,92.62,91.82,89.83,87.
```

```
    FUNCTION EHTEMP(PRES,ENTH,QUAL)
    DIMENSION LOC(16),JP(13),       DP(13),DH(13),BP(13),BH(16),MX(13)
   1,R(19),TL(19),TG(19),TF(19),SH(10),TS(10),T(429)
    DIMENSION AA(116),AB(111),AC(112),AD( 90)
    EQUIVALENCE( T,AA),( T( 117),AB),( T( 228),AC),( T( 340),AD)
    DATA  R/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
   1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012/
    DATA TG/60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.9
   10,76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225/
    DATA TL/-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69
   1.5,-51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
   231.225/
    DATA TF      /24.849,27.091,29.821,33.079,36.190,39.975,44.129,
   1 48.332,51.965,54.796,56.725,57.792,58.580,58.991,59.191,59.291,
   2 59.340,59.354,59.3568/
    DATA SH   /-132.81,-109.93,-87.52,-65.56,-44.,-22.76,-1.79,18.98,
   1 39.60,60.07/, TS/24.845,27.174,29.308,31.298,33.175,34.962,
   2 36.672,38.316,39.904,41.442/
    DATA LDC/7,100,118,150,1,178,218,9,283,331,340,358,376,400,406,
   1418/
    DATA JP/11,3,8,7,11,8,13,11,8,3,3,3,4/
    DATA MX/0,1,6,5,9,6,11,1,6,1,1,1,2/
    DATA BP/0.,0.,881.76,0.,587.84,881.76,0.,0.,73.48,0.,-40.0,-2.0,
   11500.0/
    DATA DP/3000.0,750.0,587.84,146.96,440.88,587.84,73.48,293.32,
   173.48,1500.0,120.0,6.0,1000.0/
    DATA BH/1800.0,425.0,170.61,170.61,-110.9,42.65,42.65,-134.4,
   1-53.32,10000.0,10000.0,10000.0,425.0,20000.,20000.,20000./
    DATA DH/3000.0,275.0,85.306,85.306,19.194,31.99,31.99,20.26,19.194
   1,5000.0,2000.0,2000.0,275.0/
    DATAAA/26.66,17.68,9.182,0.,0.,0.,535.,519.9,24.28,18.29,12.78,37.
   13,29.94,21.2,13.2,0.,0.,1400.,1379.,35.,30.59,25.05,44.51,39.95,33
   2.,24.7,17.11,0.,2236.,2216.,42.5,39.63,36.2,50.44,46.96,42.1,35.71
   3,28.27,20.9,3019.,3006.,47.55,46.44,44.12,55.34,52.91,49.26,44.56,
   438.58,31.47,24.53,0.,51.48,51.71,50.43,59.53,57.95,55.12,51.45,46.
   594,41.36,34.52,27.03,20.15,0.,0.,63.21,62.4,60.18,57.19,53.55,49.2
   63,44.02,37.55,30.68,24.21,0.,66.49,66.44,64.72,62.21,59.15,55.59,5
   71.45,46.57,40.64,34.08,27.91,69.47,70.17,68.89,66.76,64.11,61.05,5
```

```
     12,84.19,80.91,77.41,103.8,107.5,107.8,106.5,104.4,101.8,98.94,95.8
     26,118.9,123.2,124.3,123.6,121.9,119.7,117.,114.1,136.1,140.5,142.,
     3141.8,140.5,138.5,136.,133.1,61.94,70.69,77.7,82.88,86.46,88.86,90
     4.45,82.16,87.44,92.16,96.16,99.36,101.9,103.8,101.2,105.2,108.8,11
     51.9,114.7,117.,118.9,121.4,124.6,127.5,130.1,132.4,134.4,136.1,70.
     627,68.89,65.93,62.11,57.56,52.15,45.49,37.78,75.72,75.31,73.01,69.
     786,66.14,61.9,57.04,51.86,80.79,81.3,79.55,76.86,73.64,70.,65.99,6
     81.53,85.65,87.03,85.78,83.46,80.57,77.31,73.75,69.9,90.45,92.62,91
     9.82,89.83,87.2,84.19,80.91,77.41,17.81,32.,56.7,61.51,64.78,66.76)
      DATA((T(I),I=224,332)=68.04,68.89,69.47,69.85,70.1,70.23,70.27,30.
     131,45.53,56.18,62.62,66.86,69.7,71.63,72.98,73.95,74.64,75.14,75.4
     29,75.72,42.51,52.13,59.5,65.21,69.52,72.7,75.05,76.79,78.09,79.07,
     379.81,80.37,80.79,53.,59.33,64.73,69.35,73.18,76.27,78.73,80.67,82
     4.19,83.39,84.33,85.07,85.65,61.94,66.52,70.69,74.43,77.7,80.52,82.
     588,84.84,86.46,87.78,88.86,89.74,90.45,51.47,51.76,51.81,51.71,51.
     651,51.22,50.86,50.44,54.11,54.93,55.46,55.71,55.78,55.72,55.56,55.
     733,56.63,56.91,58.2,58.92,59.32,59.52,59.58,59.53,0.,57.95,60.03,6
     81.44,62.27,62.77,63.07,63.21,0.,57.3,61.01,63.34,64.72,65.59,66.14
     9,66.49,0.,56.7,61.51,64.78,66.76,68.04,68.89,69.47,2818.,2809.)
      P=PRES
      IF(P.LT.1.0) P=1.0
      H=ENTH
      IF(H.GE.25000.) H=24999.99999
      Q=1.0
      IF(H.LT.42.65) GO TO 10
      IF(H.GE.170.61) GO TO 1
      N=6
      GO TO 2
    1 IF(H.GE.426.53) GO TO 3
      N=3
    2 IF(P.LT.881.76) N=N+1
      GO TO 15
    3 IF(H.GE.1800.0) GO TO 4
      N=2
      IF(P.GE.1500.0) N=13
      GO TO 20
    4 IF(H.GE.10800.0) GO TO 5
      N=1
      GO TO 20
    5 IF(P.LE.200.0) GO TO 6
      N=10
      N1=14
      GO TO 20
    6 IF(P.LE.11.0) GO TO 7
      N=11
      N1=15
      GO TO 20
    7 N=12
      N1=16
      GO TO 20
   10 IF(P.LT.587.84) GO TO 11
      N=5
      GO TO 15
   11 IF(H.GE.-53.36) GO TO 12
      N=8
      GO TO 15
   12 N=9
   15 IF(H.GT.91.39) GO TO 20
```

```
     87.56,53.6,49.01,43.55,37.31,120.8,134.1,140.1,198.4,205.5,209.,285
     9.3,287.2,287.4,371.,369.9,368.1,453.9,451.2,448.2,535.,531.4/
      DATAAB/527.7,90.45,92.62,91.82,89.83,87.2,84.19,80.91,77.41,103.8,
     1107.5,107.8,106.5,104.4,101.8,98.94,95.86,118.9,123.2,124.3,123.6,
     2121.9,119.7,117.,114.1,136.1,140.5,142.,141.8,140.5,138.5,136.,133
     3.1,61.94,70.69,77.7,82.88,86.46,88.86,90.45,82.16,87.44,92.16,96.1
     46,99.36,101.9,103.8,101.2,105.2,108.8,111.9,114.7,117.,118.9,121.4
     5,124.6,127.5,130.1,132.4,134.4,136.1,70.27,68.89,65.93,62.11,57.56
     6,52.15,45.49,37.78,75.72,75.31,73.01,69.86,66.14,61.9,57.04,51.86,
     780.79,81.3,79.55,76.86,73.64,70.,65.99,61.53,85.65,87.03,85.78,83.
     846,80.57,77.31,73.75,69.9,90.45,92.62,91.82,89.83,87.2,84.19,80.91
     9,77.41,17.81,32.,56.7,61.51,64.78,66.76,68.04,68.89,69.47,69.85/
      DATAAC/70.1,70.23,70.27,30.31,45.53,56.18,62.62,66.86,69.7,71.63,7
     12.98,73.95,74.64,75.14,75.49,75.72,42.51,52.13,59.5,65.21,69.52,72
     2.7,75.05,76.79,78.09,79.07,79.81,80.37,80.79,53.,59.33,64.73,69.35
     3,73.18,76.27,78.73,80.67,82.19,83.39,84.33,85.07,85.65,61.94,66.52
     4,70.69,74.43,77.7,80.52,82.88,84.84,86.46,87.78,88.86,89.74,90.45,
     551.47,51.76,51.81,51.71,51.51,51.22,50.86,50.44,54.11,54.93,55.46,
     655.71,55.78,55.72,55.56,55.33,56.63,56.91,58.2,58.92,59.32,59.52,5
     79.58,59.53,0.,57.95,60.03,61.44,62.27,62.77,63.07,63.21,0.,57.3,61
     8.01,63.34,64.72,65.59,66.14,66.49,0.,56.7,61.51,64.78,66.76,68.04,
     968.89,69.47,2818.,2809.,2800.,4038.,4046.,4040.,4984.,5120.,5140./
      DATAAD/2818.,2818.,2817.,3317.,3324.,3325.,3758.,3803.,3809.,4102.
     1,4238.,4259.,4349.,4612.,4659.,4530.,4922.,5002.,2816.,2817.,2818.
     2,3295.,3316.,3320.,3665.,3756.,3777.,3912.,4107.,4159.,4083.,4373.
     3,4458.,4212.,4578.,4693.,140.1,141.6,135.1,139.2,209.,209.9,208.2,
     4205.1,287.4,286.,283.1,279.4,368.1,364.9,360.9,356.4,448.2,443.9,4
     539.1,434.,527.7,522.5,517.2,511.7,4984.,5120.,5140.,5605.,5949.,60
     627.,4530.,4922.,5002.,4671.,5179.,5293.,4786.,5396.,5540.,4885.,55
     781.,5754.,4212.,4578.,4693.,4316.,4743.,4883.,4403.,4880.,5040.,44
     879.,4997.,5175./
      P=PRES
      IF(P.LT.1.0) P=1.0
      H=ENTH
      IF(H.GE.25000.) H=24999.99999
      Q=1.0
      IF(H.LT.42.65) GO TO 10
      IF(H.GE.170.61) GO TO 1
      N=6
      GO TO 2
    1 IF(H.GE.426.53) GO TO 3
      N=3
    2 IF(P.LT.881.76) N=N+1
      GO TO 15
    3 IF(H.GE.1800.0) GO TO 4
      N=2
      IF(P.GE.1500.0) N=13
      GO TO 20
    4 IF(H.GE.10800.0) GO TO 5
      N=1
      GO TO 20
    5 IF(P.LE.200.0) GO TO 6
      N=10
      N1=14
      GO TO 20
    6 IF(P.LE.11.0) GO TO 7
      N=11
      N1=15
```

```
      I=PR=P/587.84
      IF(I.GT.8) I=8
      F=PR-I
      FP=1.0-F
      HS=FP*SH(I+1)+F*SH(I+2)
      TQ=FP*TS(I+1)+F*TS(I+2)
      IF(H.LT.HS) GO TO 17
      IF(P.GT.187.51012) GO TO 20
      IF(P.LT.1.021) GO TO 105
      OO 104 I=2,19
      IF(P-R(I))102,101,104
  101 HL=TL(I)
      HG=TG(I)
      TQ=TF(I)
      GO TO 106
  102 O=R(I)-R(I-1)
      PRR=R(I)-P
      PPR=P-R(I-1)
      HL=(TL(I)*PPR+TL(I-1)*PRR)/O
      HG=(TG(I)*PPR+TG(I-1)*PRR)/O
      TQ=(TF(I)*PPR+TF(I-1)*PRR)/O
      GO TO 106
  104 CONTINUE
  105 HL=-132.8
      HG=60.31
      TQ=24.84
  106 IF(H.GT.HL) GO TO 16
      Q=0.0
      GO TO 20
   16 IF(H.GT.HG) GO TO 20
      Q=(H-HL)/(HG-HL)
      GO TO 30
   17 Q=(H-HS)/(0.0026806*P+25.021)
      GO TO 30
   20 IF(H.LE.20000.)N1=N
      FP=(P-BP(N))/OP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FH=(H-BH(N1))/OH(N)
      IH=FH
      FF=FH-IH
      FH=1.0-FF
      I=IH*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      TQ=FP*FH*T(I)+F*FH*T(I+1)+FP*FF*T(J)+F*FF*T(J+1)
   30 QUAL=Q
      EHTEMP=TQ
      RETURN
      ENO

      SUBROUTINE EEMPOATA
      COMMON /EEMPRTR/ T(429)
      OATA((T(I),I=333,429)=2800.,4038.,4046.,4040.,4984.,5120.,5140.,28
     118.,2818.,2817.,3317.,3324.,3325.,3758.,3803.,3809.,4102.,4238.,42
     259.,4349.,4612.,4659.,4530.,4922.,5002.,2816.,2817.,2818.,3295.,33
     316.,3320.,3665.,3756.,3777.,3912.,4107.,4159.,4083.,4373.,4458.,42
```

```
      GO TO 20
    7 N=12
      N1=16
      GO TO 20
   10 IF(P.LT.587.84) GO TO 11
      N=5
      GO TO 15
   11 IF(H.GE.-53.36) GO TO 12
      N=8
      GO TO 15
   12 N=9
   15 IF(H.GT.91.39) GO TO 20
      PR=P/587.84
      I=PR
      IF(I.GT.8) I=8
      F=PR-I
      FP=1.0-F
      HS=FP*SH(I+1)+F*SH(I+2)
      TQ=FP*TS(I+1)+F*TS(I+2)
      IF(H.LT.HS) GO TO 17
      IF(P.GT.187.51012) GO TO 20
      IF(P.LT.1.021) GO TO 105
      OO 104 I=2,19
      IF(P-R(I))102,101,104
  101 HL=TL(I)
      HG=TG(I)
      TQ=TF(I)
      GO TO 106
  102 O=R(I)-R(I-1)
      PRR=R(I)-P
      PPR=P-R(I-1)
      HL=(TL(I)*PPR+TL(I-1)*PRR)/O
      HG=(TG(I)*PPR+TG(I-1)*PRR)/O
      TQ=(TF(I)*PPR+TF(I-1)*PRR)/O
      GO TO 106
  104 CONTINUE
  105 HL=-132.8
      HG=60.31
      TQ=24.84
  106 IF(H.GT.HL) GO TO 16
      Q=0.0
      GO TO 20
   16 IF(H.GT.HG) GO TO 20
      Q=(H-HL)/(HG-HL)
      GO TO 30
   17 Q=(H-HS)/(0.0026806*P+25.021)
      GO TO 30
   20 IF(H.LE.20000.)N1=N
      FP=(P-BP(N))/OP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FH=(H-BH(N1))/OH(N)
      IH=FH
      FF=FH-IH
      FH=1.0-FF
      I=IH*JP(N)+IP+LOC(N1)
```

```
412.,4578.,4693.,140.1,141.6,135.1,139.2,209.,209.9,208.2,205.1,287
5.4,286.,283.1,279.4,368.1,364.9,360.9,356.4,448.2,443.9,439.1,434.
6,527.7,522.5,517.2,511.7,4984.,5120.,5140.,5605.,5949.,6027.,4530.
7,4922.,5002.,4671.,5179.,5293.,4786.,5396.,5540.,4885.,5581.,5754.
8,4212.,4578.,4693.,4316.,4743.,4883.,4403.,4880.,5040.,4479.,4997.
9,5175.)
 RETURN
 END
```

```
 FUNCTION EHDENS(PRES,ENTH)
 COMMON /EHDENSIT/R(612)
 DIMENSION PD(19),HL(19),HG(19),RL(19),RG(19),HS(11),RS(11),LOC(19)
1,JP(16),DP(16),DH(16),BP(16),BH(19),MX(16)
 DATA(LOC=1,19,37,70,88,100,136,172,244,280,310,370,398,440,480,508
1,571,583,595)
 DATA(JP=3,3,3,3,2,4,4,6,3,5,4,7,7,4,7,7)
 DATA(MX=1,1,1,1,0,2,2,4,1,3,2,5,5,2,5,5)
 DATA(BP=-1000.,0.,0.,-1000.,0.,0.,0.,400.,-300.,1000.,600.,0.,0.,
1 300.,0.,0.)
 DATA(DP=2000.,50.,5.,2000.,100.,1000.,100., 800.,450.,1000.,300.,
1100.,100.,100.,50.,50.)
 DATA(BH=10000.,10000.,10000.,5000.,5000.,1800.,1800.,370.,370.,
1-75.,-130.,-120.,250.,-20.,160.,0,20000.,20000.,20000.)
 DATA(DH=2000.,2000.,1000.,1000.,1000.,400.,400.,130.,130.,100.,40.
1,40.,35.,30.,30.,20.)
 DATA(PD=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012),
2 (HG=60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90,
3 76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225),
4 (HL=-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.5,
5 -51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
6 31.225),(RL=4.808,4.741,4.655,4.545,4.430,4.273,4.073,3.826,3.556
7 ,3.280,3.025,2.831,2.627,2.461,2.331,2.223,2.118,2.040,1.9616),
8 (RG=0.007845,0.01422,0.02625,0.04856,0.08013,0.1358,0.2267,0.3637
9 ,0.5405,0.7464,0.9569,1.128,1.316,1.4732,1.598,1.702,1.804,1.881,
A 1.9616)
 DATA(HS=-132.81,-113.32,-94.17,-75.35,-56.84,-38.60,-20.58,-2.75,
1 14.94,32.50,49.96)
 DATA(RS=4.808,4.923,5.026,5.119,5.204,5.282,5.354,5.422,5.485,
1 5.545,5.601)
 DATA((R(I),I=1, 80)=-.0663,.06638,.1967,-.05622,.05628,.1671,-.049
102,.04909,.1458,-.04363,.04374,.1299,-.0395,.03967,.1176,-.03628,.
203651,.108,2.753E-7,.003338,.006674,8.955E-7,.00283,.005656,3.24E-
36,.002474,.00494,7.326E-6,.002219,.004421,1.148E-5,.002036,.004041
4,1.465E-5,.001899,.003757,2.748E-8,.0003339,.0006678,8.722E-8,.000
53063,.0006123,2.199E-7,.0002835,.0005666,4.422E-7,.0002649,.000528
68,7.277E-7,.0002495,.0004973,1.026E-6,.0002369,.0004713,1.292E-6,.
70002266,.0004497,1.512E-6,.000218,.0004317,1.687E-6,.0002106,.0004
8164,1.822E-6,.0002043,.0004031,1.926E-6,.0001987,.0003916,-.1274,.
91277,.3745,-.107,.1072,.3153,-.09237,.09252,.2729,-.08148,.08159)
 DATA((R(I),I=81,170)=.2412,-.07303,.07313,.2165,-.0663,.06638,.196
17,1.459E-7,.0129,1.016E-7,.01081,7.554E-8,.009321,5.96E-8,.008213,
25.436E-8,.007356,7.258E-8,.006674,.003325,.3406,.6601,.9603,.00224
```

```
   J=I+JP(N)
   TQ=FP*FH*T(I)+F*FH*T(I+1)+FP*FF*T(J)+F*FF*T(J+1)
30 QUAL=Q
   EHTEMP=TQ
   RETURN
   END
```

```
 FUNCTION EHDENS(PRES,ENTH)
 DIMENSION PD(19),HL(19),HG(19),RL(19),RG(19),HS(11),RS(11),LOC(19)
1,JP(16),DP(16),DH(16),BP(16),BH(19),MX(16),R(612)
 DIMENSION AA( 82),AB( 92),AC(109),AD(116),AE(109),AF(101),AG(  3)
 EQUIVALENCE( R,AA),( R(  83),AB),( R( 175),AC),( R( 284),AD)
1     ,( R( 400),AE),( R( 509),AF),( R( 610),AG)
 DATAAA/-.0663,.06638,.1967,-.05622,.05628,.1671,-.04902,.04909,.14
158,-.04363,.04374,.1299,-.0395,.03967,.1176,-.03628,.03651,.108,2.
2753E-7,.003338,.006674,8.955E-7,.00283,.005656,3.24E-6,.002474,.00
3494,7.326E-6,.002219,.004421,1.148E-5,.002036,.004041,1.465E-5,.00
41899,.003757,2.748E-8,.0003339,.0006678,8.722E-8,.0003063,.0006123
5,2.199E-7,.0002835,.0005666,4.422E-7,.0002649,.0005288,7.277E-7,.0
6002495,.0004973,1.026E-6,.0002369,.0004713,1.292E-6,.0002266,.0004
7497,1.512E-6,.000218,.0004317,1.687E-6,.0002106,.0004164,1.822E-6,
8.0002043,.0004031,1.926E-6,.0001987,.0003916,-.1274,.1277,.3745,-.
9107,.1072,.3153,-.09237,.09252,.2729,-.08148,.08159,.2412,-.07303/
 DATAAB/.07313,.2165,-.0663,.06638,.1967,1.459E-7,.0129,1.016E-7,.0
11081,7.554E-8,.009321,5.96E-8,.008213,5.436E-8,.007356,7.258E-8,.0
206674,.003325,.3406,.6601,.9603,.002244,.2813,.5484,.802,.001612,.
32399,.4694,.6891,.001212,.2091,.4104,.6042,.0009432,.1854,.3646,.5
4379,.0007546,.1665,.3281,.4848,.0006183,.1512,.2983,.4413,.0005159
5,.1384,.2735,.4051,.0004374,.1277,.2525,.3745,1.159E-6,.03506,.069
689,.1045,7.744E-7,.02881,.05747,.08597,5.516E-7,.02448,.04884,.073
71,4.119E-7,.02128,.04248,.06359,3.189E-7,.01882,.03759,.05628,2.54
8E-7,.01688,.03371,.05049,2.074E-7,.0153,.03056,.04578,1.725E-7,.01
94,.02796,.04189,1.459E-7,.0129,.02578,.03862,.739,1.835,2.65/
 DATAAC/3.205,3.663,4.031,.553,1.447,2.165,2.714,3.169,3.549,.4282,
11.151,1.768,2.281,2.714,3.087,.3469,.9512,1.488,1.955,2.361,2.719,
2.291,.809,1.28,1.702,2.079,2.417,.2508,.7045,1.123,1.505,1.853,2.1
37,.2209,.625,1.002,1.35,1.671,1.968,.1977,.5627,.9058,1.225,1.523,
41.801,.1792,.5124,.8275,1.123,1.4,1.661,.164,.4709,.7624,1.037,1.2
597,1.542,.1514,.436,.7074,.9646,1.208,1.44,.1406,.4061,.6601,.9018
6,1.132,1.351,.5164,.2582,1.013,.402,.201,.7765,.3155,.1578,.608
79,.2573,.1287,.498,.2164,.1082,.4205,.1868,.09342,.3643,.1647,
8.08233,.3219,.1475,.07373,.289,.1337,.06686,.2625,.1224,.06123,
9.2408,.113,.05652,.2225,.105,.0525,.207,4.849,5.331,5.747,6.3/
 DATAAD/6.6,3.907,4.519,4.999,5.405,5.634,3.149,3.913,4.46,4.866,5.
12,2.473,3.365,3.995,4.448,4.808,1.93,2.864,3.548,4.046,4.44,1.53,2
2.43,3.126,3.65,4.071,5.2,5.4,5.7,0.,4.669,4.898,5.1,5.3,4.178,4.43
3,4.645,4.836,3.726,4.035,4.277,4.48,3.276,3.666,3.95,4.177,2.826,3
4.308,3.64,3.897,2.405,2.978,3.342,3.629,2.043,2.658,3.057,3.371,1.
5751,2.366,2.789,3.124,1.523,2.11,2.544,2.891,1.343,1.886,2.32,2.67
61,1.197,1.702,2.12,2.468,1.078,1.544,1.943,2.283,.9789,1.409,1.786
7,2.114,.8799,1.292,1.647,1.961,4.581,4.678,4.772,4.861,4.9,5.,5.1,
```

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34,.2813,.5484,.802,.001612,.2399,.4694,.6891,.001212,.2091,.4104,.
46042,.0009432,.1854,.3646,.5379,.0007546,.1665,.3281,.4848,.000618
53,.1512,.2983,.4413,.0005159,.1384,.2735,.4051,.0004374,.1277,.252
65,.3745,1.159E-6,.03506,.06989,.1045,7.744E-7,.02881,.05747,.08597
7,5.516E-7,.02448,.04884,.0731,4.119E-7,.02128,.04248,.06359,3.189E
8-7,.01882,.03759,.05628,2.54E-7,.01688,.03371,.05049,2.074E-7,.015
93,.03056,.04578,1.725E-7,.014,.02796,.04189,1.459E-7,.0129,.02578)
 DATA((R(I),I=171,276)=.03862,.739,1.835,2.65,3.205,3.663,4.031,.55
13,1.447,2.165,2.714,3.169,3.549,.4282,1.151,1.768,2.281,2.714,3.08
27,.3469,.9512,1.488,1.955,2.361,2.719,.291,.809,1.28,1.702,2.079,2
3.417,.2508,.7045,1.123,1.505,1.853,2.17,.2209,.625,1.002,1.35,1.67
41,1.968,.1977,.5627,.9058,1.225,1.523,1.801,.1792,.5124,.8275,1.12
53,1.4,1.661,.164,.4709,.7624,1.037,1.297,1.542,.1514,.436,.7074,.9
6646,1.208,1.44,.1406,.4061,.6601,.9018,1.132,1.351,-.5164,.2582,1.
7013,-.402,.201,.7765,-.3155,.1578,.6089,-.2573,.1287,.498,-.2164,.
81082,.4205,-.1868,.09342,.3643,-.1647,.08233,.3219,-.1475,.07373,.
9289,-.1337,.06686,.2625,-.1224,.06123,.2408,-.113,.05652,.2225)
 P=PRES
 IF(P.LT.1.0) P=1.0
 H=ENTH
 IF(H.LT.425.0)GO TO 9
 IF(H.LT.5000.0)GO TO 5
 IF(H.LT.10000.0)GO TO 3
 IF(H.GE.25000.0) H=24999.9999
 IF(P.LT.100.0)GO TO 1
 N=1
 N1=17
 GO TO 33
1 IF(P.LT.10.0)GO TO 2
 N=2
 N1=18
 GO TO 33
2 N=3
 N1=19
 GO TO 33
3 IF(P.LT.100.0) GO TO 4
 N=4
 GO TO 33
4 N=5
 GO TO 33
5 IF(H.LT.1800.0) GO TO 7
 IF(P.LT.300.0) GO TO 6
 N=6
 GO TO 33
6 N=7
 GO TO 33
7 IF(P.LT.600.0) GO TO 8
 N=8
 GO TO 33
8 N=9
 GO TO 33
9 IF(H.LT.90.0) GO TO 16
 IF(P.LT.600.0)GO TO 12
10 IF(P.LT.1500.0)GO TO 11
 N=10
 GO TO 33
11 N=11
 GO TO 33
```

```
83.904,4.041,4.159,4.266,4.363,4.453,4.538,3.,3.383,3.548,3.709,3.8
8943,3.959,4.063,0.,2.514,2.795,3.096,3.307,3.474,3.614,-4.E-5,.236/
 DATAAE/.4845,.7323,.9753,1.208,1.427,-4.E-5,.2157,.4362,.6571,.874
413,1.085,1.285,-2.E-5,.1971,.3968,.5961,.7921,.9827,1.166,-1.E-5,.1
2813,.3637,.545,.7233,.8969,1.065,-1.E-5,.1675,.3351,.5013,.6647,.8
324,.9789,0.,.1554,.3102,.4633,.6138,.7608,.9039,3.414,3.58,3.718,3
4.838,2.927,3.166,3.35,3.502,2.398,2.731,2.972,3.162,1.902,2.302,2.
5597,2.826,1.518,1.926,2.248,2.505,1.245,1.624,1.947,2.215,1.054,1.
6394,1.698,1.963,.9168,1.219,1.499,1.751,.8132,1.083,1.339,1.575,.7
7323,.9753,1.208,1.427,-6.E-5,.162,.3341,.5116,.6932,.8755,1.054,-4
8.E-5,.1425,.2927,.4464,.6029,.7605,.9168,-3.E-5,.1285,.2621,.3982,
9.5363,.6751,.8132,-4.E-5,.1177,.2382,.3607,.4845,.6087,.7323,0./
 DATAAF/0.,0.,2.589,2.795,2.962,3.096,0.,0.,0.,1.7,2.32,2.571,2.753
1,0.,0.,0.,1.3,1.86,2.169,2.398,0.,.37,1.1,1.113,1.498,1.804,2.059,
20.,.29,.5708,.9156,1.225,1.509,1.76,-.00012,.238,.4936,.7576,1.025
3,1.281,1.518,-9.E-5,.2032,.422,.649,.8807,1.108,1.326,-8.E-5,.1792
4,.3716,.5705,.774,.9766,1.174,-6.E-5,.162,.3341,.5116,.6932,.8755,
51.054,-.03628,.03651,.108,-.03373,.03403,.1003,-.03167,.03201,.094
602,-.02997,.03035,.08857,1.465E-5,.001899,.003757,1.68E-5,.001793,
7.003536,1.821E-5,.001706,.003356,1.914E-5,.001633,.003205,1.926E-6
8,.0001987,.0003916,2.007E-6,.0001938,.0003813,2.068E-6,.0001893,.0
900372,2.117E-6,.0001851,.0003635,2.154E-6,.0001813,.0003558/
 DATAAG/2.182E-6,.0001778,.0003485/
 DATA LOC/1,19,37,70,88,100,136,172,244,280,310,370,398,440,480,508
1,571,583,595/
 DATA JP/3,3,3,3,2,4,4,6,3,5,4,7,7,4,7,7/
 DATA MX/1,1,1,1,0,2,2,4,1,3,2,5,5,2,5,5/
 DATA BP/-1000.,0.,0.,-1000.,0.,0.,0.,400.,-300.,1000.,600.,0.,0.,
1 300.,0.,0./
 DATA DP/2000.,50.,5.,2000.,100.,1000.,100., 800.,450.,1000.,300.,
1100.,100.,100.,50.,50./
 DATA BH/10000.,10000.,10000.,5000.,5000.,1800.,1800.,370.,370.,
1-75.,-130.,-120.,250.,-20.,160.,0.,20000.,20000.,20000./
 DATA DH/2000.,2000.,1000.,1000.,1000.,400.,400.,130.,130.,100.,40.
1,40.,35.,30.,30.,20./
 DATA PD/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012/
 DATAHG/60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90
1,76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225/
 DATAHL/-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.
15,-51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
2 31.225/
 DATA      RL/4.808,4.741,4.655,4.545,4.430,4.273,4.073,3.826,3.556
1 ,3.280,3.025,2.831,2.627,2.461,2.331,2.223,2.118,2.040,1.9616/
 DATARG/0.007845,0.01422,0.02625,0.04856,0.08013,0.1358,0.2267,0.36
137,0.5405,0.7464,0.9569,1.128,1.316,1.4732,1.598,1.702,1.804,1.881
2,1.9616/
 DATA HS/-132.81,-113.32,-94.17,-75.35,-56.84,-38.60,-20.58,-2.75,
1 14.94,32.50,49.96/
 DATA RS/4.808,4.923,5.026,5.119,5.204,5.282,5.354,5.422,5.485,
1 5.545,5.601/
 P=PRES
 IF(P.LT.1.0) P=1.0
 H=ENTH
 IF(H.LT.425.0)GO TO 9
 IF(H.LT.5000.0)GO TO 5
 IF(H.LT.10000.0)GO TO 3
 IF(H.GE.25000.0) H=24999.9999
```

```
12 IF(H.LT.250) GO TO 13
   N=13
   GO TO 33
13 IF(P.LT.300.0)GO TO 14
   N=14
   GO TO 33
14 IF(H.LT.160.0) GO TO 15
   N=15
   GO TO 33
15 N=16
   GO TO 33
16 PR=P/500.0
   I=PR
   IF(I.GT.9)I=9
   F=PR-I
   FP=1.0-F
   HSOL=FP*HS(I+1)+F*HS(I+2)
   IF(H.LT.HSOL) H=HSOL
   EHOENS=FP*RS(I+1)+F*RS(I+2)
   IF(H.EQ.HSOL) RETURN
   IF(P.GE.600.0) GO TO 10
   IF(H.LT.0.0) GO TO 18
   IF(P.LT.300.0)GO TO 17
   N=14
   GO TO 33
17 N=16
   GO TO 19
18 N=12
19 IF(P.GE.187.51012) GO TO 33
   OO 20 I=2,19
   IF(P-PD(I))21,21,20
20 CONTINUE
21 O=PD(I)-PD(I-1)
   DF=PD(I)-P
   OB=P-PO(I-1)
   HLIQ=(HL(I)*DB+HL(I-1)*OF)/D
   IF(H.LE.HLIQ) GO TO 33
   HGAS=(HG(I)*DB+HG(I-1)*OF)/D
   IF(H.GE.HGAS) GO TO 33
   RLIQ=(RL(I)*OB+RL(I-1)*OF)/O
   EHDENS=RLIQ/((H-HLIQ)/(HGAS-HLIQ)*(RLIQ*O/(RG(I)*DB+RG(I-1)*DF)-1.
  1)+1.)
   RETURN
33 IF(H.LE.20000.)N1=N
   FP=(P-BP(N))/DP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   F=FP-IP
   FP=1.0-F
   FH=(H-BH(N1))/OH(N)
   IH=FH
   FF=FH-IH
   FH=1.0-FF
   I=IH*JP(N)+IP+LOC(N1)
   J=I+JP(N)
   EHOENS=FP*FH*R(I)+F*FH*R(I+1)+FP*FF*R(J)+F*FF*R(J+1)
   RETURN
   ENO
```

```
   IF(P.LT.100.0)GO TO 1
   N=1
   N1=17
   GO TO 33
 1 IF(P.LT.10.0)GO TO 2
   N=2
   N1=18
   GO TO 33
 2 N=3
   N1=19
   GO TO 33
 3 IF(P.LT.100.0) GO TO 4
   N=4
   GO TO 33
 4 N=5
   GO TO 33
 5 IF(H.LT.1800.0) GO TO 7
   IF(P.LT.300.0) GO TO 6
   N=6
   GO TO 33
 6 N=7
   GO TO 33
 7 IF(P.LT.600.0) GO TO 8
   N=8
   GO TO 33
 8 N=9
   GO TO 33
 9 IF(H.LT.90.0) GO TO 16
   IF(P.LT.600.0)GO TO 12
10 IF(P.LT.1500.0)GO TO 11
   N=10
   GO TO 33
11 N=11
   GO TO 33
12 IF(H.LT.250) GO TO 13
   N=13
   GO TO 33
13 IF(P.LT.300.0)GO TO 14
   N=14
   GO TO 33
14 IF(H.LT.160.0) GO TO 15
   N=15
   GO TO 33
15 N=16
   GO TO 33
16 PR=P/500.0
   I=PR
   IF(I.GT.9)I=9
   F=PR-I
   FP=1.0-F
   HSOL=FP*HS(I+1)+F*HS(I+2)
   IF(H.LT.HSOL) H=HSOL
   EHOENS=FP*RS(I+1)+F*RS(I+2)
   IF(H.EQ.HSOL) RETURN
   IF(P.GE.600.0) GO TO 10
   IF(H.LT.0.0) GO TO 18
   IF(P.LT.300.0)GO TO 17
   N=14
```

```
      SUBROUTINE EHRDATA
      COMMON /EHDENSIT/R(612)
      DATA((R(I),I=277,389)=-.105,.0525,.207,4.849,5.331,5.747,6.3,6.6,3
     1.907,4.519,4.999,5.405,5.634,3.149,3.913,4.46,4.866,5.2,2.473,3.36
     25,3.995,4.448,4.808,1.93,2.864,3.548,4.046,4.44,1.53,2.43,3.126,3.
     365,4.071,5.2,5.4,5.7,0.,4.669,4.898,5.1,5.3,4.178,4.43,4.645,4.836
     4,3.726,4.035,4.277,4.48,3.276,3.666,3.95,4.177,2.826,3.308,3.64,3.
     5897,2.405,2.978,3.342,3.629,2.043,2.658,3.057,3.371,1.751,2.366,2.
     6789,3.124,1.523,2.11,2.544,2.891,1.343,1.886,2.32,2.671,1.197,1.70
     72,2.12,2.468,1.078,1.544,1.943,2.283,.9789,1.409,1.786,2.114,.8799
     8,1.292,1.647,1.961,4.581,4.678,4.772,4.861,4.9,5.,5.1,3.904,4.041,
     94.159,4.266,4.363,4.453,4.538,3.,3.383,3.548,3.709,3.843,3.959)
      DATA((R(I),I=390,496)=4.063,0.,2.514,2.795,3.096,3.307,3.474,3.614
     1,-4.E-5,.236,.4845,.7323,.9753,1.208,1.427,-4.E-5,.2157,.4362,.657
     21,.8743,1.085,1.285,-2.E-5,.1971,.3968,.5961,.7921,.9827,1.166,-1.
     3E-5,.1813,.3637,.545,.7233,.8969,1.065,-1.E-5,.1675,.3351,.5013,.6
     4647,.824,.9789,0.,.1554,.3102,.4633,.6138,.7608,.9039,3.414,3.58,3
     5.718,3.838,2.927,3.166,3.35,3.502,2.398,2.731,2.972,3.162,1.902,2.
     6302,2.597,2.826,1.518,1.926,2.248,2.505,1.245,1.624,1.947,2.215,1.
     7054,1.394,1.698,1.963,.9168,1.219,1.499,1.751,.8132,1.083,1.339,1.
     8575,.7323,.9753,1.208,1.427,-6.E-5,.162,.3341,.5116,.6932,.8755,1.
     9054,-4.E-5,.1425,.2927,.4464,.6029,.7605,.9168,-3.E-5,.1285,.2621)
      DATA((R(I),I=497,600)=.3982,.5363,.6751,.8132,-4.E-5,.1177,.2382,.
     13607,.4845,.6087,.7323,0.,0.,0.,2.589,2.795,2.962,3.096,0.,0.,0.,1
     2.7,2.32,2.571,2.753,0.,0.,0.,1.3,1.86,2.169,2.398,0.,.37,1.1,1.113
     3,1.498,1.804,2.059,0.,.29,.5708,.9156,1.225,1.509,1.76,-.00012,.23
     48,.4936,.7576,1.025,1.281,1.518,-9.E-5,.2032,.422,.649,.8807,1.108
     5,1.326,-8.E-5,.1792,.3716,.5705,.774,.9766,1.174,-6.E-5,.162,.3341
     6,.5116,.6932,.8755,1.054,-.03628,.03651,.108,-.03373,.03403,.1003,
     7-.03167,.03201,.09402,-.02997,.03035,.08857,1.465E-5,.001899,.0037
     857,1.68E-5,.001793,.003536,1.821E-5,.001706,.003356,1.914E-5,.0016
     933,.003205,1.926E-6,.0001987,.0003916,2.007E-6,.0001938,.0003813)
      DATA((R(I),I=601,612)=2.068E-6,.0001893,.000372,2.117E-6,.0001851,
     1.0003635,2.154E-6,.0001813,.0003558,2.182E-6,.0001778,.0003485)
      END
```

```
      FUNCTION EHENTR(PRES,ENTH)
      DIMENSION LDC(23),JP(20),       DP(20),DH(20),BP(20),BH(23),MX(20)
     1,R(19),HL(19),HG(19),SL(19),SG(19),HS(10),SS(10),TS(10)
      COMMON/EETRPY/S(573)
      DATA((S(I),I=1,108)=6.862,6.338,6.058,5.863,7.946,7.346,7.013,6.78
     13,8.836,8.198,7.835,7.583,9.581,8.922,8.543,8.275,8.673,7.775,7.39
     22,7.118,6.918,9.846,8.92,8.521,8.227,8.008,10.77,9.883,9.431,9.128
     3,8.9,11.54,10.65,10.19,9.88,9.648,10.91,10.02,9.557,9.248,9.015,12
     4.1,11.2,10.74,10.43,10.19,13.04,12.13,11.67,11.36,11.12,13.81,12.9
     51,12.44,12.13,11.89,9.159,7.791,7.101,6.631,6.239,10.82,9.422,8.68
     65,8.217,7.855,11.97,10.55,9.807,9.343,8.992,12.81,11.39,10.65,10.2
     7,9.857,13.48,12.06,11.33,10.89,10.55,14.03,12.63,11.9,11.46,11.13,
     811.33,9.965,9.299,8.915,13.08,11.72,11.03,10.63,14.23,12.86,12.18,
     911.77,15.08,13.71,13.02,12.61,15.74,14.37,13.69,13.28,16.3,14.93)
      DATA((S(I),I=109,216)=14.25,13.84,16.62,12.8,11.82,11.32,10.99,18.
     106,14.67,13.59,13.08,12.75,19.21,15.82,14.74,14.23,13.9,20.05,16.6
```

```
      GO TO 33
   17 N=16
      GO TO 19
   18 N=12
   19 IF(P.GE.187.51012) GO TO 33
      DO 20 I=2,19
      IF(P-PD(I))21,21,20
   20 CONTINUE
   21 D=PD(I)-PD(I-1)
      OF=PD(I)-P
      OB=P-PD(I-1)
      HLIQ=(HL(I)*DB+HL(I-1)*DF)/D
      IF(H.LE.HLIQ) GO TO 33
      HGAS=(HG(I)*DB+HG(I-1)*OF)/O
      IF(H.GE.HGAS) GO TO 33
      RLIQ=(RL(I)*OB+RL(I-1)*DF)/D
      EHDENS=RLIQ/((H-HLIQ)/(HGAS-HLIQ)*(RLIQ*D/(RG(I)*DB+RG(I-1)*DF)-1.
     1)+1.)
      RETURN
   33 IF(H.LE.20000.)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FH=(H-BH(N1))/OH(N)
      IH=FH
      FF=FH-IH
      FH=1.0-FF
      I=IH*JP(N)+IP+LDC(N1)
      J=I+JP(N)
      EHDENS=FP*FH*R(I)+F*FH*R(I+1)+FP*FF*R(J)+F*FF*R(J+1)
      RETURN
      END
```

```
      FUNCTION EHENTR(PRES,ENTH)
      DIMENSION LOC(23),JP(20),       DP(20),DH(20),BP(20),BH(23),MX(20)
     1,R(19),HL(19),HG(19),SL(19),SG(19),HS(10),SS(10),TS(10),S(573)
      DIMENSION AA(110),AB(110),AC(115),AD(115),AE(112),AF( 11)
      EQUIVALENCE( S,AA),( S( 111),AB),( S( 221),AC),( S( 336),AD)
     1    ,( S( 451),AE),( S( 563),AF)
      DATAAA/6.862,6.338,6.058,5.863,7.946,7.346,7.013,6.783,8.836,8.198
     1,7.835,7.583,9.581,8.922,8.543,8.275,8.673,7.775,7.392,7.118,6.918
     2,9.846,8.92,8.521,8.227,8.008,10.77,9.883,9.431,9.128,8.9,11.54,10
     3.65,10.19,9.88,9.648,10.91,10.02,9.557,9.248,9.015,12.1,11.2,10.74
     4,10.43,10.19,13.04,12.13,11.67,11.36,11.12,13.81,12.91,12.44,12.13
     5,11.89,9.159,7.791,7.101,6.631,6.239,10.82,9.422,8.685,8.217,7.855
     6,11.97,10.55,9.807,9.343,8.992,12.81,11.39,10.65,10.2,9.857,13.48,
     712.06,11.33,10.89,10.55,14.03,12.63,11.9,11.46,11.13,11.33,9.965,9
     8.299,8.915,13.08,11.72,11.03,10.63,14.23,12.86,12.18,11.77,15.08,1
     93.71,13.02,12.61,15.74,14.37,13.69,13.28,16.3,14.93,14.25,13.84/
```

```
26,15.58,15.07,14.74,20.72,17.33,16.25,15.74,15.41,21.28,17.89,16.8
3,16.3,15.97,14.39,12.98,12.26,11.82,15.76,14.37,13.66,13.23,16.74,
415.35,14.65,14.23,17.51,16.12,15.43,15.01,16.66,15.29,14.6,14.2,18
5.03,16.66,15.98,15.57,19.01,17.64,16.96,16.55,19.77,18.41,17.72,17
6.32,21.63,18.24,17.16,16.66,16.32,23.,19.61,18.53,18.03,17.7,23.98
7,20.59,19.51,19.01,18.68,24.75,21.36,20.28,19.77,19.44,17.51,16.12
8,15.43,15.01,19.13,17.75,17.06,16.65,20.25,18.88,18.19,17.78,21.13
9,19.76,19.07,18.66,21.85,20.48,19.79,19.38,22.48,21.1,20.41,20.01)
 DATA (R=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012),
2 (HG=60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90,
3 76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225),
4 (HL=-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.5,
5 -51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
6 31.225)
 DATA (SG=8.961,8.499,8.032,7.572,7.206,6.828,6.466,6.133,5.843,
1 5.585,5.363,5.196,5.024,4.887,4.780,4.694,4.612,4.552,4.4935)
 DATA (SL=1.185,1.326,1.497,1.703,1.904,2.162,2.466,2.805,3.138,
1 3.441,3.690,3.861,4.026,4.147,4.237,4.311,4.384,4.439,4.4935)
 DATA(HS    =-132.81,-109.93,-87.52,-65.56,-44.,-22.76,-1.79,18.98,
1 39.60,60.07),(TS=24.845,27.174,29.308,31.298,33.175,34.962,
2 36.672,38.316,39.904,41.442)
 DATA (SS=1.185,1.208,1.231,1.254,1.276,1.297,1.318,1.341,1.366,
1 1.391)
 DATA(LDC=309,1,17,37,57,87,111,356,141,157,173,193,217,241,271,
1303,424,457,469,504,534,546,558)
 DATA(JP=11,4,5,5,5,4,5,11,4,4,5,4,4,5,8,11,3,3,7,6)
 DATA (MX=3,2,3,3,3,2,3,0,2,2,3,2,2,3,6,9,1,1,5,4)
 DATA(BP=800.0,150.0,20.0,2.0,0.0,0.0,-5.0,1.0,0.,0.,-5.0,0.,0.,-5.
1,881.76,587.84,0,293.92,0,0)
 DATA(BH=170.0,170.0,170.0,170.0,425.0,425.0,425.0,170.0,2000.0,
12000.0,2000.0,5000.0,5000.0,5000.0,60.0,-110.0,-137.0,42.65,42.65,
242.65,20000.,20000.,20000.)
 DATA(DP=900.,150.,30.,3.,1000.,100.,10.,1.,1000.,100.,10.,1000.,
1100.,10.,587.84,440.88,293.92,220.44,29.392,2.9392)
 DATA(DH=85.3,85.3,85.3,85.3,275.0,275.0,275.0,85.3,1000.0,1000.0
1,1000.0,3000.0,3000.0,3000.0,37.0,17.0,18.0,31.99,31.99,31.99)
 P=PRES
 IF(P.LT.1.0) P=1.0
 H=ENTH
 IF(H.LE.170.6) GO TO 11
 IF(H.GE.425.0) GO TO 4
 IF(P.LE.700.0) GO TO 1
 N=1
 GO TO 33
1 IF(P.LE.145.0) GO TO 2
 N=2
 GO TO 33
2 IF(P.LE.17.0) GO TO 3
 N=3
 GO TO 33
3 N=4
 IF((P.LT.2.).AND.(H.LT.340.6)) N=8
 GO TO 33
4 IF(H.GE.1800.0) GO TO 8
 N=5
 GO TO 9
8 IF(H.GE.5000.0) GO TO 10
```

```
 DATAAB/16.62,12.8,11.82,11.32,10.99,18.06,14.67,13.59,13.08,12.75,
119.21,15.82,14.74,14.23,13.9,20.05,16.66,15.58,15.07,14.74,20.72,1
27.33,16.25,15.74,15.41,21.28,17.89,16.8,16.3,15.97,14.39,12.98,12.
326,11.82,15.76,14.37,13.66,13.23,16.74,15.35,14.65,14.23,17.51,16.
412,15.43,15.01,16.66,15.29,14.6,14.2,18.03,16.66,15.98,15.57,19.01
5,17.64,16.96,16.55,19.77,18.41,17.72,17.32,21.63,18.24,17.16,16.66
6,16.32,23.,19.61,18.53,18.03,17.7,23.98,20.59,19.51,19.01,18.68,24
7.75,21.36,20.28,19.77,19.44,17.51,16.12,15.43,15.01,19.13,17.75,17
8.06,16.65,20.25,18.88,18.19,17.78,21.13,19.76,19.07,18.66,21.85,20
9.48,19.79,19.38,22.48,21.1,20.41,20.01,19.77,18.41,17.72,17.32/
 DATAAC/21.39,20.03,19.34,18.94,22.52,21.15,20.47,20.07,23.4,22.03,
121.35,20.95,24.13,22.76,22.07,21.67,24.78,23.39,22.7,22.3,24.75,21
2.36,20.28,19.77,19.44,26.37,22.98,21.9,21.39,21.06,27.5,24.11,23.0
32,22.52,22.19,28.39,24.99,23.9,23.4,23.07,29.17,25.73,24.64,24.13,
423.8,29.9,26.4,25.3,24.78,24.44,4.247,3.842,3.473,3.118,2.763,2.40
52,2.023,1.616,4.732,4.329,3.975,3.642,3.316,2.992,2.662,2.324,5.18
63,4.776,4.431,4.112,3.806,3.506,3.206,2.902,5.605,5.19,4.85,4.542,
74.25,3.967,3.687,3.408,1.243,.805,.192,0.,0.,0.,5.664,5.04,4.554,4
8.109,3.679,1.741,1.235,.68,.264,0.,0.,6.554,5.894,5.424,5.015,4.63
91,2.167,1.747,1.265,.76,.328,0.,7.33,6.633,6.168,5.779,5.424/
 DATAAD/2.536,2.146,1.752,1.3,.833,.41,8.007,7.278,6.812,6.435,6.10
11,2.869,2.502,2.137,1.756,1.335,.896,.485,0.,0.,11.55,10.91,3.175,
22.823,2.481,2.136,1.775,1.377,.96,.55,0.,12.69,12.1,3.463,3.118,2.
3792,2.471,2.143,1.798,1.422,1.027,.62,13.62,13.03,3.735,3.394,3.08
4,2.774,2.468,2.155,1.826,1.469,1.092,.687,0.,3.994,3.655,3.348,3.0
554,2.764,2.471,2.171,1.856,1.516,1.155,.765,4.243,3.903,3.601,3.31
66,3.038,2.761,2.48,2.192,1.889,1.565,1.222,4.484,4.14,3.842,3.564,
73.295,3.029,2.763,2.493,2.215,1.924,1.614,.26,.65,1.039,1.669,1.29
82,.92,2.169,1.855,1.518,2.585,2.291,2.,2.959,2.681,2.411,3.313,3.0
934,2.774,3.645,3.361,3.105,3.977,3.671,3.413,4.313,3.968,3.703/
 DATAAE/4.623,4.255,3.979,4.971,4.536,4.243,4.53,4.303,4.118,5.017,
14.754,4.558,5.487,5.181,4.971,5.936,5.588,5.361,6.4,5.975,5.731,0.
2,4.803,4.712,4.709,7.265,6.426,5.911,5.642,5.468,5.332,5.252,8.187
3,7.155,6.568,6.255,6.048,5.898,5.783,8.853,7.781,7.159,6.816,6.585
4,6.415,6.281,9.409,8.317,7.676,7.317,7.071,6.887,6.742,8.882,7.42,
56.938,6.499,0.,0.,9.923,8.455,7.796,7.431,7.187,6.995,10.8,9.326,8
6.654,8.266,7.994,7.785,11.48,9.991,9.315,8.922,8.645,8.432,12.02,1
70.55,9.868,9.473,9.194,8.978,22.48,21.1,20.41,20.01,23.06,21.66,20
8.97,20.56,23.6,22.19,21.49,21.08,24.78,23.39,22.7,22.3,25.39,23.98
9,23.28,22.87,25.99,24.57,23.86,23.45,29.9,26.4,25.3,24.78,24.44/
 DATAAF/30.6,27.04,25.91,25.39,25.05,31.29,27.65,26.5,25.97,25.62,0
1./
 DATA  R/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012/
 DATA HG/60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.9
10,76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225/
 DATA HL/-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69
1.5,-51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
2 31.225/
 DATA  SG/8.961,8.499,8.032,7.572,7.206,6.828,6.466,6.133,5.843,
1 5.585,5.363,5.196,5.024,4.887,4.780,4.694,4.612,4.552,4.4935/
 DATA  SL/1.185,1.326,1.497,1.703,1.904,2.162,2.466,2.805,3.138,
1 3.441,3.690,3.861,4.026,4.147,4.237,4.311,4.384,4.439,4.4935/
 DATA HS    /-132.81,-109.93,-87.52,-65.56,-44.,-22.76,-1.79,18.98,
1 39.60,60.07/, TS/24.845,27.174,29.308,31.298,33.175,34.962,
2 36.672,38.316,39.904,41.442/
 DATA  SS/1.185,1.208,1.231,1.254,1.276,1.297,1.318,1.341,1.366,
1 1.391/
```

```
      N=9
    9 IF(P.LE.375.0) N=N+1
      IF(P.LE.40.0) N=N+1
      GO TO 33
   10 N=12
      N1=21
      IF(H.GE.25000.) H=24999.9999
      IF(P.LE.375.0)N1=N1+1
      IF(P.LE.40.0)N1=N1+1
      GO TO 9
   11 IF(P.LE.800.0) GO TO 13
      IF(H.LE.60.0) GO TO 12
      N=15
      GO TO 33
   12 N=16
      GO TO 27
   13 IF(H.GE.43.0) GO TO 14
      IF(P.GE.587.84) GO TO 12
      N=17
      GO TO 20
   14 IF(P.LE.191.0) GO TO 15
      N=18
      GO TO 33
   15 IF(P.LE.18.0) GO TO 16
      N=19
      GO TO 20
   16 N=20
   20 IF(P.GT.187.51012)  GO TO 27
      DO 24 I=2,19
      IF(P-R(I))22,21,24
   21 HLIQ=HL(I)
      HGAS=HG(I)
      SLIQ=SL(I)
      SGAS=SG(I)
      GO TO 25
   22 D=R(I)-R(I-1)
      PRR=R(I)-P
      PPR=P-R(I-1)
      HLIQ=(HL(I)*PPR+HL(I-1)*PRR)/D
      HGAS=(HG(I)*PPR+HG(I-1)*PRR)/D
      SLIQ=(SL(I)*PPR+SL(I-1)*PRR)/D
      SGAS=(SG(I)*PPR+SG(I-1)*PRR)/D
      GO TO 25
   24 CONTINUE
   25 IF(H.GT.HGAS) GO TO 27
      IF(H.LT.HLIQ) GO TO 27
      EHENTR=(H-HLIQ)/(HGAS-HLIQ)*(SGAS-SLIQ)+SLIQ
      RETURN
   27 PR=P/587.84
      I=PR
      IF(I.GT.8) I=8
      F=PR-I
      FP=1.0-F
      HSOL=FP*HS(I+1)+F*HS(I+2)
      IF(H.GT.HSOL) GO TO 33
      EHENTR=FP*SS(I+1)+F*SS(I+2)
      RETURN
   33 IF(H.LE.20000.)N1=N
```

```
      DATA LOC/309,1,17,37,57,87,111,356,141,157,173,193,217,241,271,
     1303,424,457,469,504,534,546,558/
      DATA JP/11,4,5,5,5,4,5,11,4,4,5,4,4,5,8,11,3,3,7,6/
      DATA  MX/3,2,3,3,3,2,3,0,2,2,3,2,2,3,6,9,1,1,5,4/
      DATA BP/800.0,150.0,20.0,2.0,0.0,0.0,-5.0,1.0,0.,0.,-5.0,0.,0.,-5.
     1,881.76,587.84,0.,293.92,0.,0./
      DATA BH/170.0,170.0,170.0,170.0,425.0,425.0,425.0,170.0,2000.0,
     12000.0,2000.0,5000.0,5000.0,5000.0,60.0,-110.0,-137.0,42.65,42.65,
     242.65,20000.,20000.,20000./
      DATA DP/900.,150.,30.,3.,1000.,100.,10.,1.,1000.,100.,10.,1000.,
     1100.,10.,587.84,440.88,293.92,220.44,29.392,2.9392/
      DATA DH/85.3,85.3,85.3,85.3,275.0,275.0,275.0,85.3,1000.0,1000.0
     1,1000.0,3000.0,3000.0,3000.0,37.0,17.0,18.0,31.99,31.99,31.99/
      P=PRES
      IF(P.LT.1.0) P=1.0
      H=ENTH
      IF(H.LE.170.6) GO TO 11
      IF(H.GE.425.0) GO TO 4
      IF(P.LE.700.0) GO TO 1
      N=1
      GO TO 33
    1 IF(P.LE.145.0) GO TO 2
      N=2
      GO TO 33
    2 IF(P.LE.17.0) GO TO 3
      N=3
      GO TO 33
    3 N=4
      IF((P.LT.2.).AND.(H.LT.340.6)) N=8
      GO TO 33
    4 IF(H.GE.1800.0) GO TO 8
      N=5
      GO TO 9
    8 IF(H.GE.5000.0) GO TO 10
      N=9
    9 IF(P.LE.375.0) N=N+1
      IF(P.LE.40.0) N=N+1
      GO TO 33
   10 N=12
      N1=21
      IF(H.GE.25000.) H=24999.9999
      IF(P.LE.375.0)N1=N1+1
      IF(P.LE.40.0)N1=N1+1
      GO TO 9
   11 IF(P.LE.800.0) GO TO 13
      IF(H.LE.60.0) GO TO 12
      N=15
      GO TO 33
   12 N=16
      GO TO 27
   13 IF(H.GE.43.0) GO TO 14
      IF(P.GE.587.84) GO TO 12
      N=17
      GO TO 20
   14 IF(P.LE.191.0) GO TO 15
      N=18
      GO TO 33
   15 IF(P.LE.18.0) GO TO 16
```

```
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FH=(H-BH(N1))/DH(N)
      IH=FH
      FF=FH-IH
      FH=1.0-FF
      I=IH*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      EHENTR=FP*FH*S(I)+F*FH*S(I+1)+FP*FF*S(J)+F*FF*S(J+1)
      RETURN
      END

      SUBROUTINE EATAENTR
      COMMON/EETRPY/S(573)
      DATA((S(I),I=217,328)=19.77,18.41,17.72,17.32,21.39,20.03,19.34,18
     1.94,22.52,21.15,20.47,20.07,23.4,22.03,21.35,20.95,24.13,22.76,22.
     207,21.67,24.78,23.39,22.7,22.3,24.75,21.36,20.28,19.77,19.44,26.37
     3,22.98,21.9,21.39,21.06,27.5,24.11,23.02,22.52,22.19,28.39,24.99,2
     43.9,23.4,23.07,29.17,25.73,24.64,24.13,23.8,29.9,26.4,25.3,24.78,2
     54.44,4.247,3.842,3.473,3.118,2.763,2.402,2.023,1.616,4.732,4.329,3
     6.975,3.642,3.316,2.992,2.662,2.324,5.183,4.776,4.431,4.112,3.806,3
     7.506,3.206,2.902,5.605,5.19,4.85,4.542,4.25,3.967,3.687,3.408,1.24
     83,.805,.192,0.,0.,0.,5.664,5.04,4.554,4.109,3.679,1.741,1.235,.68,
     9.264,0.,0.,6.554,5.894,5.424,5.015,4.631,2.167,1.747,1.265,.76)
      DATA((S(I),I=329,441)=.328,0.,7.33,6.633,6.168,5.779,5.424,2.536,2
     1.146,1.752,1.3,.833,.41,8.007,7.278,6.812,6.435,6.101,2.869,2.502,
     22.137,1.756,1.335,.896,.485,0.,0.,11.55,10.91,3.175,2.823,2.481,2.
     3136,1.775,1.377,.96,.55,0.,12.69,12.1,3.463,3.118,2.792,2.471,2.14
     43,1.798,1.422,1.027,.62,13.62,13.03,3.735,3.394,3.08,2.774,2.468,2
     5.155,1.826,1.469,1.092,.687,0.,3.994,3.655,3.348,3.054,2.764,2.471
     6,2.171,1.856,1.516,1.155,.765,4.243,3.903,3.601,3.316,3.038,2.761,
     72.48,2.192,1.889,1.565,1.222,4.484,4.14,3.842,3.564,3.295,3.029,2.
     8763,2.493,2.215,1.924,1.614,.26,.65,1.039,1.669,1.292,.92,2.169,1.
     9855,1.518,2.585,2.291,2.,2.959,2.681,2.411,3.313,3.034,2.774)
      DATA((S(I),I=442,550)=3.645,3.361,3.105,3.977,3.671,3.413,4.313,3.
     1968,3.703,4.623,4.255,3.979,4.971,4.536,4.243,4.53,4.303,4.118,5.0
     217,4.754,4.558,5.487,5.181,4.971,5.936,5.588,5.361,6.4,5.975,5.731
     3,0.,4.803,4.712,4.709,7.265,6.426,5.911,5.642,5.468,5.332,5.252,8.
     4187,7.155,6.568,6.255,6.048,5.898,5.783,8.853,7.781,7.159,6.816,6.
     5585,6.415,6.281,9.409,8.317,7.676,7.317,7.071,6.887,6.742,8.882,7.
     642,6.938,6.499,0.,0.,9.923,8.455,7.796,7.431,7.187,6.995,10.8,9.32
     76,8.654,8.266,7.994,7.785,11.48,9.991,9.315,8.922,8.645,8.432,12.0
     82,10.55,9.868,9.473,9.194,8.978,22.48,21.1,20.41,20.01,23.06,21.66
     9,20.97,20.56,23.6,22.19,21.49,21.08,24.78,23.39,22.7,22.3,25.39)
      DATA((S(I),I=551,572)=23.98,23.28,22.87,25.99,24.57,23.86,23.45,29
     1.9,26.4,25.3,24.78,24.44,30.6,27.04,25.91,25.39,25.05,31.29,27.65,
     226.5,25.97,25.62)
      END

      N=19
      GO TO 20
   16 N=20
   20 IF(P.GT.187.51012)  GO TO 27
      DO 24 I=2,19
      IF(P-R(I))22,21,24
   21 HLIQ=HL(I)
      HGAS=HG(I)
      SLIQ=SL(I)
      SGAS=SG(I)
      GO TO 25
   22 O=R(I)-R(I-1)
      PRR=R(I)-P
      PPR=P-R(I-1)
      HLIQ=(HL(I)*PPR+HL(I-1)*PRR)/O
      HGAS=(HG(I)*PPR+HG(I-1)*PRR)/O
      SLIQ=(SL(I)*PPR+SL(I-1)*PRR)/O
      SGAS=(SG(I)*PPR+SG(I-1)*PRR)/O
      GO TO 25
   24 CONTINUE
   25 IF(H.GT.HGAS) GO TO 27
      IF(H.LT.HLIQ) GO TO 27
      EHENTR=(H-HLIQ)/(HGAS-HLIQ)*(SGAS-SLIQ)+SLIQ
      RETURN
   27 PR=P/587.84
      I=PR
      IF(I.GT.8) I=8
      F=PR-I
      FP=1.0-F
      HSOL=FP*HS(I+1)+F*HS(I+2)
      IF(H.GT.HSOL) GO TO 33
      EHENTR=FP*SS(I+1)+F*SS(I+2)
      RETURN
   33 IF(H.LE.20000.)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FH=(H-BH(N1))/DH(N)
      IH=FH
      FF=FH-IH
      FH=1.0-FF
      I=IH*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      EHENTR=FP*FH*S(I)+F*FH*S(I+1)+FP*FF*S(J)+F*FF*S(J+1)
      RETURN
      END
```

```
      FUNCTION EHCOND(PRES,ENTH)
      COMMON/EHLAMB/C(735)
      DIMENSION LDC(19),JP(19),DP(19),DH(19),BP(19),BH(19),MX(19),
     1PL(19),HL(19),HG(19),CL(19),CG(19),HS(11)
      DATA(LDC=1,29,50,86,149,173,191,269,339,375,407,461,493,517,529,
     1 553,577,601,661)
      DATA(JP=4,3,4,7,4,3,6,7,6,4,6,4,4,2,3,3,3,4,5)
      DATA(MX=2,1,2,5,2,1,4,5,4,2,4,2,2,0,1,1,1,2,3)
      DATA(BP=0.,0.,490.,132.,305.,500.,1000.,2000.,0.,20.,500.,2000.,
     1 0.,0.,0.,-100.,0.,0.,1.)
      DATA(DP=160.,250.,170.,28.,65.,250.,200.,500.,100.,160.,300.,1000.
     1 ,500.,3000.,1500.,300.,40.,10.,1.)
      DATA(BH=-135.,-105.,-115.,-45.,-45.,-75.,-95.,-60.,70.,145.,25.,
     1 75.,425.,1800.,11000.,11000.,11000.,11000.,11000.)
      DATA(DH=5.,10.,5.,15.,23.,20.,10.,15.,15.,40.,50.,50.,275.,1840.,
     1 2000.,2000.,2000.,1000.,1000.)
      DATA(PL=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
     1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012),
     2 (HG=60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90,
     3 76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225),
     4 (HL=-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.5,
     5 -51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
     6 31.225)
      DATA(HS=-132.81,-113.32,-94.17,-75.35,-56.84,-38.60,-20.58,-2.75,
     1 14.94,32.50,49.96)
      DATA(CL=.04175,.04817,.05282,.05572,.05732,.05913,.05937,.05809,
     1 .05584,.05382,.05544,.06022,.07254,.10198,.1638,.3041,.7958,
     2 3.308,187.)
      DATA(CG=.00717,.00758,.00819,.00899,.01003,.01190,.01442,.01783,
     1 .02215,.02792,.03610,.04709,.07294,.1284,.2467,.5510,2.167,8.4,
     2 187.)
      DATA((C(I),I=1,100)=.03825,.02977,0.,0.,.0472,.03826,.03,0.,.05279
     1,.04736,.04,.03,.05498,.05332,.04756,.04151,.05625,.05636,.05418,.
     204808,.05735,.0579,.05762,.05493,.05838,.05938,.05943,.05876,.0584
     233,.05936,.05851,.05904,.06225,.06285,.05846,.06324,.06587,.05718,.
     406319,.06713,.05541,.06258,.06747,.05323,.06164,.06737,.05062,.060
     544,.06701,.04769,.041,0.,0.,.05464,.04892,.04,0.,.05864,.05484,.04
     6843,.04,.06082,.0595,.05495,.0483,.06288,.06206,.06023,.05578,.064
     764,.06436,.06318,.06083,.06581,.06637,.06568,.06418,.06656,.06776,
     8.06795,.06689,.067,.0687,.06954,.0694,1.631,1.901,2.169,1.964,1.74
     97,1.521,1.287,1.418,1.548,1.687,1.605,1.515,1.418,1.314,1.373)
      DATA((C(I),I=101,205)=1.323,1.309,1.304,1.309,1.317,1.327,1.2,1.42
     15,1.033,1.06,1.147,1.253,1.369,0.,15.,1.173,.8758,1.015,1.203,1.41
     24,0.,30.,3.3,.7376,.9092,1.17,1.466,0.,15.,2.516,1.069,1.071,1.207
     3,1.395,1.,1.114,1.147,1.087,1.118,1.189,1.284,.5536,.8989,.9959,1.
     4055,1.092,1.122,1.149,.06214,.06394,.06555,.06701,.0587,.06106,.06
     5314,.06501,.05622,.05809,.06011,.06238,.05488,.05623,.0582,.06019,
     6.0538,.05435,.05628,.05838,.05034,.05203,.05425,.05654,.06713,.069
     733,.06947,.06737,.07138,.07408,.0663,.07151,.07533,.06424,.07039,.
     807507,.0619,.06896,.07423,.06011,.06736,.07317,.056,.04887,.044,0.
     9,0.,0.,.06418,.06046,.05576,.0438,0.,0.,.0694,.06757,.06493)
      DATA((C(I),I=206,307)=.06013,.0542,0.,.07246,.07267,.07144,.06853,
     1.06447,.05941,.07401,.07532,.07575,.07499,.07254,.06892,.07485,.07
     2677,.07808,.07866,.07828,.07654,.07533,.07765,.07946,.08074,.08143
     3,.08135,.07536,.0782,.08038,.08208,.08333,.08409,.07507,.07816,.08
     4079,.08302,.08465,.08587,.07469,.07797,.0808,.08326,.08539,.08716,
     5.07423,.0777,.08069,.08331,.08563,.08767,.07372,.07736,.0805,.0832
     67,.08572,.08791,.07317,.07696,.08024,.08313,.08572,.08804,.06467,.
     705824,0.,0.,0.,0.,0.,.07654,.06772,.057,0.,0.,0.,0.,.0829,.07944,.
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      FUNCTION EHCOND(PRES,ENTH)
      DIMENSION LOC(19),JP(19),DP(19),DH(19),BP(19),BH(19),MX(19),
     1PL(19),HL(19),HG(19),CL(19),CG(19),HS(11),C(735)
      DIMENSION AA(102),AB(108),AC(104),AD( 97),AE( 96),AF(110),AG(111)
     1 ,AH(  7)
      EQUIVALENCE( C,AA),( C( 103),AB),( C( 211),AC),( C( 315),AD)
     1    ,( C( 412),AE),( C( 508),AF),( C( 618),AG),( C( 729),AH)
      DATAAA/.03825,.02977,0.,0.,.0472,.03826,.03,0.,.05279,.04736,.04,.
     103,.05498,.05332,.04756,.04151,.05625,.05636,.05418,.04808,.05735,
     2.0579,.05762,.05493,.05838,.05938,.05943,.05876,.05843,.05936,.058
     351,.05904,.06225,.06285,.05846,.06324,.06587,.05718,.06319,.06713,
     4.05541,.06258,.06747,.05323,.06164,.06737,.05062,.06044,.06701,.04
     5769,.041,0.,0.,.05464,.04892,.04,0.,.05864,.05484,.04843,.04,.0608
     62,.0595,.05495,.0483,.06288,.06206,.06023,.05578,.06464,.06436,.06
     7318,.06083,.06581,.06637,.06568,.06418,.06656,.06776,.06795,.06689
     8,.067,.0687,.06954,.0694,1.631,1.901,2.169,1.964,1.747,1.521,1.287
     9,1.418,1.548,1.687,1.605,1.515,1.418,1.314,1.373,1.323,1.309/
      DATAAB/1.304,1.309,1.317,1.327,1.2,1.425,1.033,1.06,1.147,1.253,1.
     1369,0.,15.,1.173,.8758,1.015,1.203,1.414,0.,30.,3.3,.7376,.9092,1.
     217,1.466,0.,15.,2.516,1.069,1.071,1.207,1.395,1.,1.114,1.147,1.087
     3,1.118,1.189,1.284,.5536,.8989,.9959,1.055,1.092,1.122,1.149,.0621
     44,.06394,.06555,.06701,.0587,.06106,.06314,.06501,.05622,.05809,.0
     56011,.06238,.05488,.05623,.0582,.06019,.0538,.05435,.05628,.05838,
     6.05034,.05203,.05425,.05654,.06713,.06933,.06947,.06737,.07138,.07
     7408,.0663,.07151,.07533,.06424,.07039,.07507,.0619,.06896,.07423,.
     806011,.06736,.07317,.056,.04887,.044,0.,0.,0.,.06418,.06046,.05576
     9,.0438,0.,0.,.0694,.06757,.06493,.06013,.0542,0.,.07246,.07267/
      DATAAC/.07144,.06853,.06447,.05941,.07401,.07532,.07575,.07499,.07
     1254,.06892,.07485,.07677,.07808,.07866,.07828,.07654,.07533,.07765
     2,.07946,.08074,.08143,.08135,.07536,.0782,.08038,.08208,.08333,.08
     3409,.07507,.07816,.08079,.08302,.08465,.08587,.07469,.07797,.0808,
     4.08326,.08539,.08716,.07423,.0777,.08069,.08331,.08563,.08767,.073
     572,.07736,.0805,.08327,.08572,.08791,.07317,.07696,.08024,.08313,.
     608572,.08804,.06467,.05824,0.,0.,0.,0.,.07654,.06772,.057,0.,0.
     7,0.,0.,.0829,.07944,.06911,.057,0.,0.,0.,.08587,.08686,.08209,.072
     894,.057,0.,0.,.08747,.09042,.0905,.08459,.07433,.057,0.,.08791,.09
     9235,.09457,.09392,.08724,.07878,0.,.08806,.09304,.09679,.09845/
      DATAAD/.09717,.09102,.07628,.08799,.09339,.09768,.1009,.1021,.1003
     1,.09399,.08776,.09349,.09818,.102,.1048,.1056,.1034,.08742,.0934,.
     20984,.1026,.106,.1085,.109,.00741,.0398,.04949,.05025,.05303,.0565
     34,.00876,.02201,.03919,.04702,.05146,.05533,.01061,.022,.03505,.04
     4421,.04985,.05414,.01276,.02277,.03343,.04222,.04839,.05301,.01518
     5,.02404,.03299,.04101,.04721,.05198,.01798,.02554,.03323,.04042,.0
     64636,.05113,.01947,.03171,.04295,.05113,.02549,.03423,.0426,.04967
     7,.03055,.03709,.04344,.04919,.0346,.0396,.04455,.04919,.03767,.041
     86,.04554,.04936,.03989,.0431,.04642,.04971,.04159,.04437,.04719,.0
     95,.0429,.04529,.04773,.05017,.06011,.06865,.07514,.08024,.08446/
      DATAAE/.08804,.05613,.06523,.07236,.07828,.08319,.08742,.05231,.06
     1242,.0697,.07569,.08099,.08559,.04993,.05993,.06725,.07316,.07829,
     2.08305,.04919,.058,.06491,.07064,.07563,.08012,.04923,.0566,.06291
     3,.06836,.07318,.07753,.04953,.05582,.06144,.06644,.07098,.07514,.0
     44993,.05523,.06015,.06467,.06887,.07278,.05017,.05468,.05843,.0625
     52,.06642,.07013,.08742,.0984,.106,.109,.08559,.09784,.1072,.1145,.
     608305,.09595,.1062,.1148,.08012,.09322,.1039,.1132,.07753,.09015,.
     71008,.1104,.07514,.0873,.09781,.1071,.07278,.08431,.09462,.1039,.0
     87013,.08136,.09131,.1004,.0426,.05017,.05775,.06318,.04998,.05548,
     9.06117,.06516,.06391,.06777,.07173,.07438,.07951,.08182,.08418/
      DATAAF/.08578,.09392,.09516,.09631,.09739,.1068,.1073,.1077,.1081,
     1.1068,.1093,.1738,.162,.232,.2111,.2896,.2874,.3485,.3448,.4254,.4
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806911,.057,0.,0.,0.,.08587,.08686,.08209,.07294,.057,0.,0.,.08747,
9.09042,.0905,.08459,.07433,.057,0.,.08791,.09235,.09457,.09392)
 P=PRES
 H=ENTH
 R=1.0
 IF(P.LT.1.0) P=1.0
 IF(H.GE.425.) GO TO 12
 IF(P.LT.500.) GO TO 6
 IF(P.LT.2000.) GO TO 2
 IF(H.LT.75.) GO TO 1
 N=12
 GO TO 33
1 N=8
 GO TO 22
2 IF(H.LT.25.) GO TO 3
 N=11
 GO TO 33
3 IF(P.GE.1000.) GO TO 5
 IF(H.LT.-75.) GO TO 4
 N=6
 GO TO 33
4 N=3
 GO TO 22
5 N=7
 GO TO 22
6 IF(H.LT.-45.) GO TO 11
 IF(H.GE.70.) GO TO 9
 IF(P.LT.300.) GO TO 7
 N=5
 GO TO 33
7 N=4
 R=H-31.225
 IF(R.LT.0.) R=-R
 IF(P.LT.187.51) GO TO 8
 R=1.0/(3.1136694+.2115577*(P-187.51)+.4487232*R-.004707536*R*
1(P-187.51))
 GO TO 33
8 R=1.0/(3.1136694-.2115577*(P-187.51)+.4487232*R+.004707536*R*
1(P-187.51))
 GO TO 17
9 IF(H.GE.145.) GO TO 10
 N=9
 IF(P.GE.166.) GO TO 33
 IF(H.GE.91.27) GO TO 33
 GO TO 17
10 N=10
 GO TO 33
11 IF(H.LT.-105.) GO TO 21
 N=2
 IF(P.LT.125.) GO TO 17
 GO TO 33
12 IF(H.LT.11000.) GO TO 26
 IF(P.GE.80.) GO TO 15
 IF(P.GE.30.) GO TO 14
 IF(P.GE.5.) GO TO 13
 N=19
 GO TO 33
13 N=18
```

```
2009,.4039,.4021,.4009,.4701,.4638,.4614,.5591,.5354,.5281,.6969,.6
3311,.6115,.9036,.7664,.7244,1.179,.9495,.8756,1.509,1.179,1.067,1.
4874,1.445,1.293,.4068,.4041,.4033,.4915,.473,.468,.6458,.5713,.551
52,.9176,.729,.675,1.307,.9637,.8579,1.774,1.269,1.103,2.281,1.625,
61.399,2.803,2.013,1.731,.414,.4063,.4052,.5424,.4885,.4804,.8143,.
76324,.6011,1.247,.8785,.8045,1.783,1.227,1.101,2.368,1.647,1.471,2
8.968,2.108,1.887,3.566,2.587,2.329,.416,.41,.4078,.4069,.4717,.454
9,.4476,.4448,.5563,.515,.4997,.4927,.6834,.6034,.5727,.5584,.8573/
 DATAAG/.7259,.6734,.6481,1.074,.8845,.8056,.7664,1.326,1.076,.9688
1,.9139,1.601,1.295,1.159,1.088,1.893,1.534,1.371,1.284,2.196,1.788
2,1.6,1.498,2.503,2.052,1.841,1.725,2.814,2.322,2.09,1.961,3.125,2.
3596,2.345,2.204,3.434,2.871,2.602,2.45,3.74,3.147,2.86,2.699,.4254
4,.4189,.416,.4142,.413,.4979,.4797,.4714,.4663,.4628,.613,.5739,.5
5552,.5437,.5357,.7816,.7135,.6798,.6585,.6434,1.001,.9009,.8493,.8
6158,.7916,1.262,1.13,1.06,1.013,.9794,1.553,1.391,1.304,1.245,1.20
71,1.863,1.675,1.571,1.501,1.448,2.186,1.974,1.856,1.775,1.714,2.51
86,2.282,2.151,2.06,1.992,2.849,2.596,2.453,2.353,2.278,3.182,2.911
9,2.757,2.65,2.568,3.513,3.226,3.062,2.948,2.86,3.841,3.539,3.366/
 OATAAH/3.245,3.153,4.165,3.849,3.668,3.541,3.443/
 DATA LOC/1,29,50,86,149,173,191,269,339,375,407,461,493,517,529,
1 553,577,601,661/
 OATA JP/4,3,4,7,4,3,6,7,6,4,6,4,4,2,3,3,3,4,5/
 DATA MX/2,1,2,5,2,1,4,5,4,2,4,2,2,0,1,1,1,2,3/
 OATA BP/0.,0.,490.,132.,305.,500.,1000.,2000.,0.,20.,500.,2000.,
1 0.,0.,0.,-100.,0.,0.,1./
 OATA OP/160.,250.,170.,28.,65.,250.,200.,500.,100.,160.,300.,1000.
1 ,500.,3000.,1500.,300.,40.,10.,1./
 DATA BH/-135.,-105.,-115.,-45.,-45.,-75.,-95.,-60.,70.,145.,25.,
1 75.,425.,1800.,11000.,11000.,11000.,11000.,11000./
 DATA OH/5.,10.,5.,15.,23.,20.,10.,15.,15.,40.,50.,50.,275.,1840.,
1 2000.,2000.,2000.,1000.,1000./
 DATA PL/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012/,
2  HG/60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90,
3 76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225/,
4  HL/-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.5,
5 -51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
6 31.225/
 OATA HS/-132.81,-113.32,-94.17,-75.35,-56.84,-38.60,-20.58,-2.75,
1 14.94,32.50,49.96/
 OATA CL/.04175,.04817,.05282,.05572,.05732,.05913,.05937,.05809,
1 .05584,.05382,.05544,.06022,.07254,.10198,.1638,.3041,.7958,
2 3.308,187./
 OATA CG/.00717,.00758,.00819,.00899,.01003,.01190,.01442,.01783,
1 .02215,.02792,.03610,.04709,.07294,.1284,.2467,.5510,2.167,8.4,
2 187./
 P=PRES
 H=ENTH
 R=1.0
 IF(P.LT.1.0) P=1.0
 IF(H.GE.425.) GO TO 12
 IF(P.LT.500.) GO TO 6
 IF(P.LT.2000.) GO TO 2
 IF(H.LT.75.) GO TO 1
 N=12
 GO TO 33
1 N=8
 GO TO 22
```

```
      GO TO 33
   14 N=17
      GO TO 33
   15 IF(P.GT.500.) GO TO 16
      N=16
      GO TO 33
   16 N=15
      GO TO 33
   17 OO 18 I=2,18
      IF(P-PL(I))19,19,18
   18 CONTINUE
   19 O=PL(I)-PL(I-1)
      OF=PL(I)-P
      OB=P-PL(I-1)
      HGAS=(HG(I)*OB+HG(I-1)*OF)/O
      IF(H.GE.HGAS) GO TO 33
      HLIQ=(HL(I)*OB+HL(I-1)*OF)/O
      IF(H.LE.HLIQ) GO TO 33
      CLIQ=(CL(I)*OB+CL(I-1)*OF)/O
      EHCONO=((CG(I)*OB+CG(I-1)*OF)/D-CLIQ)*(H-HLIQ)/(HGAS-HLIQ)+CLIQ
      RETURN
   21 N=1
      IF(H.LE.(-132.82+0.04*P)) GO TO 22
      IF(P.LT.23.) GO TO 17
      GO TO 33
   22 PR=P/500.0
      I=PR
      IF(I.GT.9) I=9
      F=PR-I
      HSOL=F*HS(I+2)+(1.0-F)*HS(I+1)
      IF(H.LT.HSOL) H=HSOL
      GO TO 33
   26 IF(H.LT.1800.) GO TO 27
      N=14
      GO TO 33
   27 N=13
   33 FP=(P-BP(N))/OP(N)
      IP=FP
      IF(IP.GT.MX(N))IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FH=(H-BH(N))/OH(N)
      IH=FH
      FF=FH-IH
      FH=1.0-FF
      I=IH*JP(N)+IP+LOC(N)
      J=I+JP(N)
      EHCONO=(FP*FH*C(I)+F*FH*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))*R
      RETURN
      ENO

      SUBROUTINE EHLAMBOA
      COMMON/EHLAMB/C(735)
      OATA((C(I),I=308,402)=.08724,.07878,0.,.08806,.09304,.09679,.09845
     1,.09717,.09102,.07628,.08799,.09339,.09768,.1009,.1021,.1003,.0939
     29,.08776,.09349,.09818,.102,.1048,.1056,.1034,.08742,.0934,.0984,.
     31026,.106,.1085,.109,.00741,.0398,.04949,.05025,.05303,.05654,.008
     476,.02201,.03919,.04702,.05146,.05533,.01061,.022,.03505,.04421,.0
      2 IF(H.LT.25.) GO TO 3
        N=11
        GO TO 33
      3 IF(P.GE.1000.) GO TO 5
        IF(H.LT.-75.) GO TO 4
        N=6
        GO TO 33
      4 N=3
        GO TO 22
      5 N=7
        GO TO 22
      6 IF(H.LT.-45.) GO TO 11
        IF(H.GE.70.) GO TO 9
        IF(P.LT.300.) GO TO 7
        N=5
        GO TO 33
      7 N=4
        R=H-31.225
        IF(R.LT.0.) R=-R
        IF(P.LT.187.51) GO TO 8
        R=1.0/(3.1136694+.2115577*(P-187.51)+.4487232*R-.004707536*R*
       1(P-187.51))
        GO TO 33
      8 R=1.0/(3.1136694-.2115577*(P-187.51)+.4487232*R+.004707536*R*
       1(P-187.51))
        GO TO 17
      9 IF(H.GE.145.) GO TO 10
        N=9
        IF(P.GE.140.) GO TO 33
        IF(H.GE.88.) GO TO 33
        GO TO 17
     10 N=10
        GO TO 33
     11 IF(H.LT.-105.) GO TO 21
        N=2
        IF(P.LT.125.) GO TO 17
        GO TO 33
     12 IF(H.LT.11000.) GO TO 26
        IF(P.GE.80.) GO TO 15
        IF(P.GE.30.) GO TO 14
        IF(P.GE.5.) GO TO 13
        N=19
        GO TO 33
     13 N=18
        GO TO 33
     14 N=17
        GO TO 33
     15 IF(P.GT.500.) GO TO 16
        N=16
        GO TO 33
     16 N=15
        GO TO 33
     17 OO 18 I=2,18
        IF(P-PL(I))19,19,18
     18 CONTINUE
     19 O=PL(I)-PL(I-1)
        OF=PL(I)-P
        OB=P-PL(I-1)
```

```
54985,.05414,.01276,.02277,.03343,.04222,.04839,.05301,.01518,.0240
64,.03299,.04101,.04721,.05198,.01798,.02554,.03323,.04042,.04636,.
705113,.01947,.03171,.04295,.05113,.02549,.03423,.0426,.04967,.0305
85,.03709,.04344,.04919,.0346,.0396,.04455,.04919,.03767,.0416,.045
954,.04936,.03989,.0431,.04642,.04971,.04159,.04437,.04719,.05)
 DATA((C(I),I=403,496)=.0429,.04529,.04773,.05017,.06011,.06865,.07
1514,.08024,.08446,.08804,.05613,.06523,.07236,.07828,.08319,.08742
2,.05231,.06242,.0697,.07569,.08099,.08559,.04993,.05993,.06725,.07
3316,.07829,.08305,.04919,.058,.06491,.07064,.07563,.08012,.04923,.
40566,.06291,.06836,.07318,.07753,.04953,.05582,.06144,.06644,.0709
58,.07514,.04993,.05523,.06015,.06467,.06887,.07278,.05017,.05468,.
605843,.06252,.06642,.07013,.08742,.0984,.106,.109,.08559,.09784,.1
7072,.1145,.08305,.09595,.1062,.1148,.08012,.09322,.1039,.1132,.077
853,.09015,.1008,.1104,.07514,.0873,.09781,.1071,.07278,.08431,.094
962,.1039,.07013,.08136,.09131,.1004,.0426,.05017,.05775,.06318)
 OATA((C(I),I=497,601)=.04998,.05548,.06117,.06516,.06391,.06777,.0
17173,.07438,.07951,.08182,.08418,.08578,.09392,.09516,.09631,.0973
29,.1068,.1073,.1077,.1081,.1068,.1093,.1738,.162,.232,.2111,.2896,
3.2874,.3485,.3448,.4254,.4009,.4039,.4021,.4009,.4701,.4638,.4614,
4.5591,.5354,.5281,.6969,.6311,.6115,.9036,.7664,.7244,1.179,.9495,
5.8756,1.509,1.179,1.067,1.874,1.445,1.293,.4068,.4041,.4033,.4915,
6.473,.468,.6458,.5713,.5512,.9176,.729,.675,1.307,.9637,.8579,1.77
74,1.269,1.103,2.281,1.625,1.399,2.803,2.013,1.731,.414,.4063,.4052
8,.5424,.4885,.4804,.8143,.6324,.6011,1.247,.8785,.8045,1.783,1.227
9,1.101,2.368,1.647,1.471,2.968,2.108,1.887,3.566,2.587,2.329,.416)
 DATA((C(I),I=602,710)=.41,.4078,.4069,.4717,.454,.4476,.4448,.5563
1,.515,.4997,.4927,.6834,.6034,.5727,.5584,.8573,.7259,.6734,.6481,
21.074,.8845,.8056,.7664,1.326,1.076,.9688,.9139,1.601,1.295,1.159,
31.088,1.893,1.534,1.371,1.284,2.196,1.788,1.6,1.498,2.503,2.052,1.
4841,1.725,2.814,2.322,2.09,1.961,3.125,2.596,2.345,2.204,3.434,2.8
571,2.602,2.45,3.74,3.147,2.86,2.699,.4254,.4189,.416,.4142,.413,.4
6979,.4797,.4714,.4663,.4628,.613,.5739,.5552,.5437,.5357,.7816,.71
735,.6798,.6585,.6434,1.001,.9009,.8493,.8158,.7916,1.262,1.13,1.06
8,1.013,.9794,1.553,1.391,1.304,1.245,1.201,1.863,1.675,1.571,1.501
9,1.448,2.186,1.974,1.856,1.775,1.714,2.516,2.282,2.151,2.06,1.992)
 DATA((C(I),I=711,735)=2.849,2.596,2.453,2.353,2.278,3.182,2.911,2.
1757,2.65,2.568,3.513,3.226,3.062,2.948,2.86,3.841,3.539,3.366,3.24
25,3.153,4.165,3.849,3.668,3.541,3.443)
 END
```

```
   HGAS=(HG(I)*OB+HG(I-1)*OF)/O
   IF(H.GE.HGAS) GD TO 33
   HLIQ=(HL(I)*DB+HL(I-1)*OF)/D
   IF(H.LE.HLIQ) GD TO 33
   CLIQ=(CL(I)*OB+CL(I-1)*DF)/D
   EHCDND=((CG(I)*OB+CG(I-1)*DF)/D-CLIQ)*(H-HLIQ)/(HGAS-HLIQ)+CLIQ
   RETURN
21 N=1
   IF(H.LE.(-132.82+0.04*P)) GD TO 22
   IF(P.LT.23.) GD TO 17
   GO TO 33
22 PR=P/500.0
   I=PR
   IF(I.GT.9) I=9
   F=PR-I
   HSDL=F*HS(I+2)+(1.0-F)*HS(I+1)
   IF(H.LT.HSOL) H=HSDL
   GO TO 33
26 IF(H.LT.1800.) GO TO 27
   N=14
   GD TO 33
27 N=13
33 FP=(P-BP(N))/OP(N)
   IP=FP
   IF(IP.GT.MX(N))IP=MX(N)
   F=FP-IP
   FP=1.0-F
   FH=(H-BH(N))/DH(N)
   IH=FH
   FF=FH-IH
   FH=1.0-FF
   I=IH*JP(N)+IP+LOC(N)
   J=I+JP(N)
   EHCDND=(FP*FH*C(I)+F*FH*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))*R
   RETURN
   END
```

```
 FUNCTION EHVISC(PRES,ENTH)
 COMMON/EHMU/V(820)
 OIMENSION LOC(24),JP(24),DP(24),OH(24),BP(24),BH(24),MX(24),
1PL(19),HL(19),HG(19),VL(19),VG(19),HS(11)
 DATA(LOC=1,19,29,757,39,63,93,111,165,210,235,285,325,345,400,
1425,485,525,621,661,773,791,428,530)
 DATA(JP=3,3,3,4,4,5,3,9,5,5,5,5,5,5,5,5,5,8,8,8,3,5,5,8)
 OATA(MX=1,1,1,2,2,3,1,7,3,3,3,3,3,3,3,3,6,6,6,1,3,0,1)
 OATA(BP=0,0,-1.,0,0,1000.,0,1000.,4000.,4000.,3000.,3000.,1000.,
12000.,2000.,1000.,1000.,-50.,-50.,-50.,-10.,1.,1000.,0.)
 OATA(OP=1500.,1500.,3.,1000.,1000.,1000.,500.,500.,250.,250.,
1250.,250.,500.,250.,250.,250.,250.,150.,150.,150.,20.,1.,250.,
2 250.)
```

```
 FUNCTION EHVISC(PRES,ENTH)
 OIMENSION LOC(24),JP(24),DP(24),OH(24),BP(24),BH(24),MX(24),
1PL(19),HL(19),HG(19),VL(19),VG(19),HS(11),V(820)
 DIMENSION AA( 67),AB( 66),AC( 72),AD( 72),AE( 66),AF( 72),AG( 68)
1 ,AH( 68),AI( 70),AJ( 70),AK( 66),AL( 63)
 EQUIVALENCE( V,AA),( V(  68),AB),( V( 134),AC),( V( 206),AD)
1    ,( V( 278),AE),( V( 344),AF),( V( 416),AG),( V( 484),AH)
2    ,( V( 552),AI),( V( 622),AJ),( V( 692),AK),( V( 758),AL)
 DATAAA/1.587E-10,1.496E-10,1.419E-10,1.86E-10,1.758E-10,1.663E-10,
12.093E-10,1.99E-10,1.881E-10,2.264E-10,2.193E-10,2.075E-10,2.394E-
210,2.367E-10,2.245E-10,2.499E-10,2.517E-10,2.393E-10,1.355E-10,1.2
381E-10,1.218E-10,1.475E-10,1.392E-10,1.321E-10,1.587E-10,1.496E-10
4,1.419E-10,0.,1.355E-10,1.355E-10,1.355E-10,1.475E-10,1.475E-10,1.
```

```
 DATA(BH=10000.,7800.,7800.,1800.,425.,200.,200.,100.,15.,60.,-20.,
130.,40.,-55.,0,-90.,-30.,-130.,-70.,-20.,10000.,10000.,-95.,200.)
 DATA(DH=3000.,1100.,1100.,2000.,275.,45.,45.,20.,5.,10.,5.,10.,20.
1,5.,10.,5.,10.,5.,10.,20.,3000.,3000.,5.,45.)
 DATA(PL=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012),
2 (HG=60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90,
3 76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225),
4 (HL=-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.5,
5 -51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
6 31.225)
 DATA(HS=-132.81,-113.32,-94.17,-75.35,-56.84,-38.60,-20.58,-2.75,
1 14.94,32.50,49.96)
 DATA(VL=1.520E-10,1.283E-10,1.082E-10,9.083E-11,7.847E-11,6.680
1 E-11,5.661E-11,4.794E-11,4.112E-11,3.583E-11,3.189E-11,2.934E-11,
2 2.696E-11,2.522E-11,2.396E-11,2.296E-11,2.204E-11,2.138E-11,
3 2.073E-11),(VG=4.262E-12,4.706E-12,5.233E-12,5.869E-12,6.490E-12,
4 7.272E-12,8.190E-12,9.233E-12,1.034E-11,1.156E-11,1.291E-11,1.414
5 E-11,1.562E-11,1.688E-11,1.787E-11,1.869E-11,1.949E-11,2.010E-11,
6 2.073E-11)
 DATA((V(I),I=1, 66)=1.587E-10,1.496E-10,1.419E-10,1.86E-10,1.758E-
110,1.663E-10,2.093E-10,1.99E-10,1.881E-10,2.264E-10,2.193E-10,2.07
25E-10,2.394E-10,2.367E-10,2.245E-10,2.499E-10,2.517E-10,2.393E-10,
31.355E-10,1.281E-10,1.218E-10,1.475E-10,1.392E-10,1.321E-10,1.587E
4-10,1.496E-10,1.419E-10,0.,1.355E-10,1.355E-10,1.355E-10,1.475E-10
5,1.475E-10,1.475E-10,1.587E-10,1.587E-10,1.587E-10,0.,1.821E-11,2.
6579E-11,3.355E-11,4.13E-11,2.536E-11,3.049E-11,3.526E-11,3.971E-11
7,3.315E-11,3.641E-11,3.95E-11,4.254E-11,3.991E-11,4.179E-11,4.358E
8-11,4.541E-11,4.59E-11,4.685E-11,4.776E-11,4.873E-11,5.138E-11,5.1
964E-11,5.193E-11,5.229E-11,2.898E-11,4.309E-11,5.69E-11,7.19E-11)
 DATA((V(I),I=67,130)=8.871E-11,2.736E-11,3.988E-11,5.212E-11,6.52E
1-11,7.961E-11,2.638E-11,3.746E-11,4.837E-11,5.996E-11,7.262E-11,2.
2587E-11,3.567E-11,4.541E-11,5.574E-11,6.698E-11,2.57E-11,3.44E-11,
34.309E-11,5.232E-11,6.237E-11,2.579E-11,3.355E-11,4.13E-11,4.957E-
411,5.858E-11,1.16E-11,2.039E-11,2.898E-11,1.306E-11,1.988E-11,2.73
56E-11,1.439E-11,1.99E-11,2.638E-11,1.567E-11,2.028E-11,2.587E-11,1
6.694E-11,2.089E-11,2.57E-11,1.821E-11,2.166E-11,2.579E-11,3.625E-1
71,4.558E-11,5.466E-11,6.409E-11,7.425E-11,8.545E-11,9.807E-11,1.12
86E-10,1.3E-10,3.427E-11,4.314E-11,5.165E-11,6.037E-11,6.961E-11,7.
9961E-11,9.061E-11,1.028E-10,1.167E-10,3.258E-11,4.103E-11)
 DATA((V(I),I=131,200)=4.906E-11,5.719E-11,6.571E-11,7.481E-11,8.46
15E-11,9.539E-11,1.072E-10,3.116E-11,3.921E-11,4.681E-11,5.444E-11,
26.237E-11,7.075E-11,7.973E-11,8.938E-11,9.976E-11,2.997E-11,3.762E
3-11,4.483E-11,5.203E-11,5.946E-11,6.726E-11,7.553E-11,8.436E-11,9.
4374E-11,2.898E-11,3.624E-11,4.309E-11,4.99E-11,5.69E-11,6.42E-11,7
5.19E-11,8.006E-11,8.871E-11,2.248E-10,2.787E-10,0.,0.,0.,1.99E-10,
62.476E-10,2.988E-10,0.,0.,1.804E-10,2.197E-10,2.715E-10,0.,0.,1.66
73E-10,1.967E-10,2.394E-10,2.945E-10,0.,1.552E-10,1.797E-10,2.154E-
810,2.597E-10,0.,1.462E-10,1.666E-10,1.946E-10,2.359E-10,3.083E-10,
91.388E-10,1.561E-10,1.79E-10,2.114E-10,2.571E-10,1.324E-10)
 DATA((V(I),I=201,270)=1.476E-10,1.668E-10,1.926E-10,2.305E-10,1.27
1E-10,1.404E-10,1.569E-10,1.782E-10,2.078E-10,1.223E-10,1.343E-10,1
2.488E-10,1.668E-10,1.907E-10,1.144E-10,1.244E-10,1.36E-10,1.498E-1
30,1.668E-10,1.08E-10,1.167E-10,1.264E-10,1.376E-10,1.507E-10,1.026
4E-10,1.103E-10,1.188E-10,1.283E-10,1.39E-10,9.807E-11,1.05E-10,1.1
526E-10,1.208E-10,1.3E-10,2.095E-10,2.722E-10,0.,0.,0.,1.83E-10,2.3
606E-10,2.844E-10,0.,0.,1.642E-10,2.066E-10,2.551E-10,0.,0.,1.502E-
710,1.824E-10,2.269E-10,2.762E-10,0.,1.393E-10,1.649E-10,2.038E-10,
5475E-10,1.587E-10,1.587E-10,1.587E-10,0.,1.821E-11,2.579E-11,3.355
6E-11,4.13E-11,2.536E-11,3.049E-11,3.526E-11,3.971E-11,3.315E-11,3.
7641E-11,3.95E-11,4.254E-11,3.991E-11,4.179E-11,4.358E-11,4.541E-11
8,4.59E-11,4.685E-11,4.776E-11,4.873E-11,5.138E-11,5.164E-11,5.193E
9-11,5.229E-11,2.898E-11,4.309E-11,5.69E-11,7.19E-11,8.871E-11/
 DATAAB/2.736E-11,3.988E-11,5.212E-11,6.52E-11,7.961E-11,2.638E-11,
13.746E-11,4.837E-11,5.996E-11,7.262E-11,2.587E-11,3.567E-11,4.541E
2-11,5.574E-11,6.698E-11,2.57E-11,3.44E-11,4.309E-11,5.232E-11,6.23
37E-11,2.579E-11,3.355E-11,4.13E-11,4.957E-11,5.858E-11,1.16E-11,2.
4039E-11,2.898E-11,1.306E-11,1.988E-11,2.736E-11,1.439E-11,1.99E-11
5,2.638E-11,1.567E-11,2.028E-11,2.587E-11,1.694E-11,2.089E-11,2.57E
6-11,1.821E-11,2.166E-11,2.579E-11,3.625E-11,4.558E-11,5.466E-11,6.
7409E-11,7.425E-11,8.545E-11,9.807E-11,1.126E-10,1.3E-10,3.427E-11,
84.314E-11,5.165E-11,6.037E-11,6.961E-11,7.961E-11,9.061E-11,1.028E
9-10,1.167E-10,3.258E-11,4.103E-11,4.906E-11,5.719E-11,6.571E-11/
 DATAAC/7.481E-11,8.465E-11,9.539E-11,1.072E-10,3.116E-11,3.921E-11
1,4.681E-11,5.444E-11,6.237E-11,7.075E-11,7.973E-11,8.938E-11,9.976
2E-11,2.997E-11,3.762E-11,4.483E-11,5.203E-11,5.946E-11,6.726E-11,7
3.553E-11,8.436E-11,9.374E-11,2.898E-11,3.624E-11,4.309E-11,4.99E-1
41,5.69E-11,6.42E-11,7.19E-11,8.006E-11,8.871E-11,2.248E-10,2.787E-
510,0.,0.,0.,1.99E-10,2.476E-10,2.988E-10,0.,0.,1.804E-10,2.197E-10
6,2.715E-10,0.,0.,1.663E-10,1.967E-10,2.394E-10,2.945E-10,0.,1.552E
7-10,1.797E-10,2.154E-10,2.597E-10,0.,1.462E-10,1.666E-10,1.946E-10
8,2.359E-10,3.083E-10,1.388E-10,1.561E-10,1.79E-10,2.114E-10,2.571E
9-10,1.324E-10,1.476E-10,1.668E-10,1.926E-10,2.305E-10,1.27E-10/
 DATAAD/1.404E-10,1.569E-10,1.782E-10,2.078E-10,1.223E-10,1.343E-10
1,1.488E-10,1.668E-10,1.907E-10,1.144E-10,1.244E-10,1.36E-10,1.498E
2-10,1.668E-10,1.08E-10,1.167E-10,1.264E-10,1.376E-10,1.507E-10,1.0
326E-10,1.103E-10,1.188E-10,1.283E-10,1.39E-10,9.807E-11,1.05E-10,1
4.126E-10,1.208E-10,1.3E-10,2.095E-10,2.722E-10,0.,0.,0.,1.83E-10,2
5.306E-10,2.844E-10,0.,0.,1.642E-10,2.066E-10,2.551E-10,0.,0.,1.502
6E-10,1.824E-10,2.269E-10,2.762E-10,0.,1.393E-10,1.649E-10,2.038E-1
70,2.491E-10,0.,1.306E-10,1.517E-10,1.818E-10,2.234E-10,2.617E-10,1
8.234E-10,1.413E-10,1.655E-10,2.013E-10,2.515E-10,1.173E-10,1.329E-
910,1.53E-10,1.811E-10,2.191E-10,1.122E-10,1.259E-10,1.431E-10/
 DATAAE/1.66E-10,1.99E-10,1.077E-10,1.2E-10,1.35E-10,1.542E-10,1.80
14E-10,1.038E-10,1.149E-10,1.282E-10,1.447E-10,1.663E-10,9.717E-11,
21.066E-10,1.175E-10,1.304E-10,1.462E-10,9.177E-11,1.E-10,1.093E-10
3,1.2E-10,1.324E-10,8.723E-11,9.465E-11,1.028E-10,1.119E-10,1.223E-
410,8.334E-11,9.009E-11,9.742E-11,1.054E-10,1.144E-10,7.994E-11,8.6
517E-11,9.286E-11,1.001E-10,1.08E-10,7.694E-11,8.274E-11,8.891E-11,
69.551E-11,1.026E-10,7.425E-11,7.97E-11,8.545E-11,9.156E-11,9.807E-
711,4.464E-11,5.592E-11,6.779E-11,8.118E-11,9.717E-11,4.135E-11,5.1
883E-11,6.248E-11,7.406E-11,8.723E-11,3.859E-11,4.844E-11,5.821E-11
9,6.855E-11,7.994E-11,3.625E-11,4.558E-11,5.466E-11,6.409E-11/
 DATAAF/7.425E-11,1.844E-10,2.481E-10,0.,0.,0.,1.596E-10,2.091E-10,
12.638E-10,0.,0.,1.423E-10,1.843E-10,2.397E-10,0.,0.,1.294E-10,1.61
21E-10,2.109E-10,2.59E-10,0.,1.195E-10,1.446E-10,1.84E-10,2.336E-10
3,0.,1.116E-10,1.322E-10,1.623E-10,2.096E-10,2.675E-10,1.051E-10,1.
4226E-10,1.467E-10,1.835E-10,2.345E-10,9.966E-11,1.148E-10,1.348E-1
50,1.633E-10,2.095E-10,9.503E-11,1.084E-10,1.254E-10,1.485E-10,1.83
6E-10,9.102E-11,1.03E-10,1.178E-10,1.371E-10,1.642E-10,8.751E-11,9.
7843E-11,1.115E-10,1.281E-10,1.502E-10,8.44E-11,9.443E-11,1.062E-10
8,1.207E-10,1.393E-10,7.909E-11,8.778E-11,9.769E-11,1.093E-10,1.234
9E-10,7.471E-11,8.243E-11,9.103E-11,1.008E-10,1.122E-10,7.099E-11/
 DATAAG/7.8E-11,8.566E-11,9.416E-11,1.038E-10,6.779E-11,7.424E-11,8
1.118E-11,8.877E-11,9.717E-11,1.504E-10,2.102E-10,0.,1.804E-10,2.4E
2-10,1.299E-10,1.779E-10,2.453E-10,1.504E-10,2.136E-10,1.155E-10,1.
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     82.491E-10,0.,1.306E-10,1.517E-10,1.818E-10,2.234E-10,2.617E-10,1.2
     934E-10,1.413E-10,1.655E-10,2.013E-10,2.515E-10,1.173E-10)
      OATA((V(I),I=271,335)=1.329E-10,1.53E-10,1.811E-10,2.191E-10,1.122
     1E-10,1.259E-10,1.431E-10,1.66E-10,1.99E-10,1.077E-10,1.2E-10,1.35E
     2-10,1.542E-10,1.804E-10,1.038E-10,1.149E-10,1.282E-10,1.447E-10,1.
     3663E-10,9.717E-11,1.066E-10,1.175E-10,1.304E-10,1.462E-10,9.177E-1
     41,1.E-10,1.093E-10,1.2E-10,1.324E-10,8.723E-11,9.465E-11,1.028E-10
     5,1.119E-10,1.223E-10,8.334E-11,9.009E-11,9.742E-11,1.054E-10,1.144
     6E-10,7.994E-11,8.617E-11,9.286E-11,1.001E-10,1.08E-10,7.694E-11,8.
     7274E-11,8.891E-11,9.551E-11,1.026E-10,7.425E-11,7.97E-11,8.545E-11
     8,9.156E-11,9.807E-11,4.464E-11,5.592E-11,6.779E-11,8.118E-11,9.717
     9E-11,4.135E-11,5.183E-11,6.248E-11,7.406E-11,8.723E-11,3.859E-11)
      P=PRES
      IF(P.LT.1.0) P=1.0
      H=ENTH
      IF(H.LT.100.0)  GO TO 9
      IF(H.LT.425.0)  GO TO 5
      IF(H.LT.7800.0) GO TO 3
      IF(H.LT.10000.)GO TO 34
      IF(H.GE.25000.)H=24999.9999
      IF(P.LT.30.)GO TO 1
      N=1
      GO TO 33
    1 IF(P.LT.5.0) GO TO 2
      N=21
      GO TO 33
    2 N=22
      GO TO 33
    3 IF(H.LT.1800.0) GO TO 4
      N=4
      GO TO 33
    4 N=5
      GO TO 33
   34 IF(P.LT.5.)GO TO 35
      N=2
      GO TO 33
   35 N=3
      GO TO 33
    5 IF(H.LT.200.0)  GO TO 7
      IF(P.LT.1000.0) GO TO 6
      N=6
      GO TO 33
    6 N=7
      IF(H.LT.290..ANO.P.LT.500.) N=24
      GO TO 33
    7 IF(P.LT.1000.0) GO TO 8
      N=8
      GO TO 33
    8 N=20
      GO TO 33
    9 IF(P.LT.3000.0) GO TO 13
      IF(P.LT.4000.0) GO TO 11
      IF(H.GE.60.) GO TO 10
      N=9
      GO TO 30
   10 N=10
      GO TO 33
   11 IF(H.GE.30.) GO TO 12
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     3533E-10,2.093E-10,2.771E-10,0.,1.048E-10,1.335E-10,1.839E-10,2.433
     4E-10,0.,9.65E-11,1.195E-10,1.558E-10,2.095E-10,2.726E-10,8.986E-11
     5,1.089E-10,1.368E-10,1.843E-10,2.407E-10,8.439E-11,1.006E-10,1.231
     6E-10,1.579E-10,2.092E-10,7.979E-11,9.397E-11,1.127E-10,1.397E-10,1
     7.844E-10,7.585E-11,8.849E-11,1.045E-10,1.264E-10,1.596E-10,7.243E-
     811,8.387E-11,9.788E-11,1.162E-10,1.423E-10,6.942E-11,7.99E-11,9.23
     99E-11,1.081E-10,1.294E-10,6.674E-11,7.645E-11,8.776E-11,1.016E-10/
      OATAAH/1.195E-10,6.433E-11,7.341E-11,8.377E-11,9.611E-11,1.116E-10
     1,6.016E-11,6.827E-11,7.722E-11,8.747E-11,9.966E-11,5.665E-11,6.405
     2E-11,7.202E-11,8.088E-11,9.102E-11,5.362E-11,6.049E-11,6.775E-11,7
     3.562E-11,8.44E-11,5.098E-11,5.744E-11,6.414E-11,7.13E-11,7.909E-11
     4,4.863E-11,5.476E-11,6.104E-11,6.763E-11,7.471E-11,4.653E-11,5.24E
     5-11,5.833E-11,6.448E-11,7.099E-11,4.464E-11,5.028E-11,5.592E-11,6.
     6172E-11,6.779E-11,1.153E-10,1.603E-10,2.096E-10,0.,0.,1.16E-11,1.5
     734E-11,2.039E-11,1.005E-10,1.297E-10,1.673E-10,2.099E-10,0.,1.306E
     8-11,1.602E-11,1.988E-11,8.8E-11,1.094E-10,1.381E-10,1.743E-10,2.22
     95E-10,1.439E-11,1.687E-11,1.99E-11,7.88E-11,9.558E-11,1.162E-10/
      DATAAI/1.467E-10,1.85E-10,2.337E-10,0.,0.,7.15E-11,8.55E-11,1.014E
     1-10,1.23E-10,1.553E-10,1.958E-10,2.355E-10,0.,6.56E-11,7.776E-11,9
     2.059E-11,1.071E-10,1.298E-10,1.64E-10,2.E-10,0.,6.06E-11,7.158E-11
     3,8.24E-11,9.564E-11,1.128E-10,1.366E-10,1.709E-10,2.186E-10,5.63E-
     411,6.649E-11,7.589E-11,8.696E-11,1.006E-10,1.185E-10,1.435E-10,1.7
     554E-10,5.25E-11,6.217E-11,7.057E-11,8.012E-11,9.148E-11,1.056E-10,
     61.242E-10,1.504E-10,4.91E-11,5.843E-11,6.61E-11,7.455E-11,8.428E-1
     71,9.595E-11,1.106E-10,1.299E-10,4.6E-11,5.514E-11,6.226E-11,6.99E-
     811,7.846E-11,8.84E-11,1.004E-10,1.155E-10,4.32E-11,5.22E-11,5.89E-
     911,6.593E-11,7.361E-11,8.23E-11,9.247E-11,1.048E-10,4.05E-11/
      DATAAJ/4.953E-11,5.593E-11,6.249E-11,6.95E-11,7.725E-11,8.61E-11,9
     1.65E-11,3.6E-11,4.48E-11,5.084E-11,5.675E-11,6.283E-11,6.931E-11,7
     2.641E-11,8.439E-11,3.E-11,4.053E-11,4.658E-11,5.209E-11,5.758E-11,
     36.326E-11,6.93E-11,7.585E-11,0.,3.715E-11,4.288E-11,4.817E-11,5.32
     48E-11,5.843E-11,6.377E-11,6.942E-11,0.,3.374E-11,3.959E-11,4.479E-
     511,4.965E-11,5.444E-11,5.929E-11,6.433E-11,0.,3.047E-11,3.66E-11,4
     6.181E-11,4.651E-11,5.104E-11,5.556E-11,6.016E-11,0.,2.1E-11,3.128E
     7-11,3.672E-11,4.129E-11,4.551E-11,4.958E-11,5.362E-11,0.,1.652E-11
     8,2.666E-11,3.25E-11,3.707E-11,4.112E-11,4.493E-11,4.863E-11,0.,1.3
     956E-11,2.287E-11,2.896E-11,3.356E-11,3.752E-11,4.117E-11/
      DATAAK/4.464E-11,6.7E-13,1.111E-11,2.E-11,2.606E-11,3.064E-11,3.45
     13E-11,3.804E-11,4.135E-11,3.68E-12,9.79E-12,1.79E-11,2.377E-11,2.8
     224E-11,3.203E-11,3.542E-11,3.859E-11,5.36E-12,1.05E-11,1.644E-11,2
     3.202E-11,2.629E-11,2.994E-11,3.321E-11,3.625E-11,6.87E-12,1.089E-1
     41,1.557E-11,2.07E-11,2.475E-11,2.822E-11,3.136E-11,3.427E-11,8.11E
     5-12,1.139E-11,1.516E-11,1.972E-11,2.355E-11,2.683E-11,2.981E-11,3.
     6258E-11,9.16E-12,1.192E-11,1.506E-11,1.902E-11,2.262E-11,2.571E-11
     7,2.853E-11,3.116E-11,1.006E-11,1.246E-11,1.515E-11,1.856E-11,2.192
     8E-11,2.482E-11,2.748E-11,2.997E-11,1.087E-11,1.3E-11,1.534E-11,1.8
     929E-11,2.139E-11,2.414E-11,2.663E-11,2.898E-11,5.138E-11/
      OATAAL/5.164E-11,5.193E-11,5.229E-11,8.443E-11,8.207E-11,8.E-11,7.
     1818E-11,1.117E-10,1.078E-10,1.044E-10,1.013E-10,1.355E-10,1.304E-1
     20,1.259E-10,1.218E-10,1.587E-10,1.587E-10,1.586E-10,1.853E-10,1.86
     32E-10,1.863E-10,2.036E-10,2.077E-10,2.091E-10,2.14E-10,2.231E-10,2
     4.263E-10,2.2E-10,2.347E-10,2.393E-10,2.28E-10,2.439E-10,2.499E-10,
     51.587E-10,1.587E-10,1.587E-10,1.587E-10,1.587E-10,1.851E-10,1.855E
     6-10,1.857E-10,1.859E-10,1.86E-10,2.03E-10,2.047E-10,2.055E-10,2.06
     71E-10,2.066E-10,2.148E-10,2.175E-10,2.19E-10,2.201E-10,2.208E-10,2
     8.235E-10,2.27E-10,2.29E-10,2.304E-10,2.314E-10,2.305E-10,2.346E-10
     9,2.369E-10,2.386E-10,2.399E-10/
      OATA LOC/1,19,29,757,39,63,93,111,165,210,235,285,325,345,400,
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```
      N=11
      GO TO 30
   12 N=12
      GO TO 33
   13 IF(P.LT.1000.0) GO TO 18
      IF(H.LT.40.) GO TO 14
      N=13
      GO TO 33
   14 IF(P.LT.2000.0) GO TO 16
      IF(H.GE.0.) GO TO 15
      N=14
      GO TO 30
   15 N=15
      GO TO 33
   16 IF(H.GE.-30.0) GO TO 17
      N=16
      IF(H.LT.-90..ANO.P.LT.1250.) N=23
      GO TO 30
   17 N=17
      GO TO 33
   18 IF(H.GE.-70.0) GO TO 19
      N=18
      IF(H.GT.(-132.82+0.04*P)) GO TO 22
      GO TO 30
   19 IF(H.GE.-20.0) GO TO 20
      N=19
      GO TO 22
   20 N=20
   22 IF(P.GE.187.51012) GO TO 33
      00 23 I=2,19
      IF(P-PL(I))24,24,23
   23 CONTINUE
   24 0=PL(I)-PL(I-1)
      OF=PL(I)-P
      OB=P-PL(I-1)
      HGAS=(HG(I)*DB+HG(I-1)*OF)/O
      IF(H.GE.HGAS) GO TO 33
      HLIQ=(HL(I)*OB+HL(I-1)*OF)/O
      IF(H.LE.HLIQ) GO TO 33
      VLIQ=(VL(I)*OB+VL(I-1)*OF)/O
      EHVISC=((VG(I)*OB+VG(I-1)*OF)/O-VLIQ)*(H-HLIQ)/(HGAS-HLIQ)+VLIQ
      RETURN
   30 PR=P/500.0
      I=PR
      IF(I.GT.9) I=9
      F=PR-I
      HSOL=F*HS(I+2)+(1.0-F)*HS(I+1)
      IF(H.LT.HSOL) H=HSOL
   33 FP=(P-BP(N))/OP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.0-F
      FH=(H-BH(N))/OH(N)
      IH=FH
      FF=FH-IH
      FH=1.0-FF
      I=IH*JP(N)+IP+LOC(N)
```

```
     1425,485,525,621,661,773,791,428,530/
      OATA JP/3,3,3,4,4,5,3,9,5,5,5,5,5,5,5,5,8,8,8,3,5,5,8/
      OATA MX/1,1,1,2,2,3,1,7,3,3,3,3,3,3,3,3,6,6,6,1,3,0,1/
      OATA BP/0.,0.,-1.,0.,0.,1000.,0.,1000.,4000.,4000.,3000.,3000.,
     11000.,
     22000.,2000.,1000.,1000.,-50.,-50.,-50.,-10.,1.,1000.,0./
      OATA OP/1500.,1500.,3.,1000.,1000.,1000.,500.,500.,250.,250.,
     1250.,250.,500.,250.,250.,250.,250.,150.,150.,150.,20.,1.,250.,
     2 250./
      OATA BH/10000.,7800.,7800.,1800.,425.,200.,200.,100.,15.,60.,-20.,
     130.,40.,-55.,0.,-90.,-30.,-130.,-70.,-20.,10000.,10000.,-95.,200./
      OATA OH/3000.,1100.,1100.,2000.,275.,45.,45.,20.,5.,10.,5.,10.,20.
     1,5.,10.,5.,10.,5.,10.,20.,3000.,3000.,5.,45./
      OATA PL/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
     1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012/
      OATAHG/60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90
     1,76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225/
      OATAHL/-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.
     15,-51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
     2 31.225/
      OATA HS/-132.81,-113.32,-94.17,-75.35,-56.84,-38.60,-20.58,-2.75,
     1 14.94,32.50,49.96/
      OATA VL/1.520E-10,1.283E-10,1.082E-10,9.083E-11,7.847E-11,6.680
     1 E-11,5.661E-11,4.794E-11,4.112E-11,3.583E-11,3.189E-11,2.934E-11,
     2 2.696E-11,2.522E-11,2.396E-11,2.296E-11,2.204E-11,2.138E-11,
     3 2.073E-11/
      OATA          VG/4.262E-12,4.706E-12,5.233E-12,5.869E-12,6.490E-12,
     1 7.272E-12,8.190E-12,9.233E-12,1.034E-11,1.156E-11,1.291E-11,1.414
     2 E-11,1.562E-11,1.688E-11,1.787E-11,1.869E-11,1.949E-11,2.010E-11,
     3 2.073E-11/
      P=PRES
      IF(P.LT.1.0) P=1.0
      H=ENTH
      IF(H.LT.100.0)  GO TO 9
      IF(H.LT.425.0)  GO TO 5
      IF(H.LT.7800.0) GO TO 3
      IF(H.LT.10000.)GO TO 34
      IF(H.GE.25000.)H=24999.9999
      IF(P.LT.30.)GO TO 1
      N=1
      GO TO 33
    1 IF(P.LT.5.0) GO TO 2
      N=21
      GO TO 33
    2 N=22
      GO TO 33
    3 IF(H.LT.1800.0) GO TO 4
      N=4
      GO TO 33
    4 N=5
      GO TO 33
   34 IF(P.LT.5.)GO TO 35
      N=2
      GO TO 33
   35 N=3
      GO TO 33
    5 IF(H.LT.200.0)  GO TO 7
      IF(P.LT.1000.0) GO TO 6
```

```
      J=I+JP(N)
      EHVISC=FP*FH*V(I)+F*FH*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
      RETURN
      END

      SUBROUTINE EHDTMU
      COMMDN/EHMU/V(820)
      DATA((V(I),I=336,405)=4.844E-11,5.821E-11,6.855E-11,7.994E-11,3.62
     15E-11,4.558E-11,5.466E-11,6.409E-11,7.425E-11,1.844E-10,2.481E-10,
     20.,0.,0.,1.596E-10,2.091E-10,2.638E-10,0.,0.,1.423E-10,1.843E-10,2
     3.397E-10,0.,0.,1.294E-10,1.611E-10,2.109E-10,2.59E-10,0.,1.195E-10
     4,1.446E-10,1.84E-10,2.336E-10,0.,1.116E-10,1.322E-10,1.623E-10,2.0
     596E-10,2.675E-10,1.051E-10,1.226E-10,1.467E-10,1.835E-10,2.345E-10
     6,9.966E-11,1.148E-10,1.348E-10,1.633E-10,2.095E-10,9.503E-11,1.084
     7E-10,1.254E-10,1.485E-10,1.83E-10,9.102E-11,1.03E-10,1.178E-10,1.3
     871E-10,1.642E-10,8.751E-11,9.843E-11,1.115E-10,1.281E-10,1.502E-10
     9,8.44E-11,9.443E-11,1.062E-10,1.207E-10,1.393E-10,7.909E-11)
      DATA((V(I),I=406,471)=8.778E-11,9.769E-11,1.093E-10,1.234E-10,7.47
     11E-11,8.243E-11,9.103E-11,1.008E-10,1.122E-10,7.099E-11,7.8E-11,8.
     2566E-11,9.416E-11,1.038E-10,6.779E-11,7.424E-11,8.118E-11,8.877E-1
     31,9.717E-11,1.504E-10,2.102E-10,0.,1.804E-10,2.4E-10,1.299E-10,1.7
     479E-10,2.453E-10,1.504E-10,2.136E-10,1.155E-10,1.533E-10,2.093E-10
     5,2.771E-10,0.,1.048E-10,1.335E-10,1.839E-10,2.433E-10,0.,9.65E-11,
     61.195E-10,1.558E-10,2.095E-10,2.726E-10,8.986E-11,1.089E-10,1.368E
     7-10,1.843E-10,2.407E-10,8.439E-11,1.006E-10,1.231E-10,1.579E-10,2.
     8092E-10,7.979E-11,9.397E-11,1.127E-10,1.397E-10,1.844E-10,7.585E-1
     91,8.849E-11,1.045E-10,1.264E-10,1.596E-10,7.243E-11,8.387E-11)
      DATA((V(I),I=472,537)=9.788E-11,1.162E-10,1.423E-10,6.942E-11,7.99
     1E-11,9.239E-11,1.081E-10,1.294E-10,6.674E-11,7.645E-11,8.776E-11,1
     2.016E-10,1.195E-10,6.433E-11,7.341E-11,8.377E-11,9.611E-11,1.116E-
     310,6.016E-11,6.827E-11,7.722E-11,8.747E-11,9.966E-11,5.665E-11,6.4
     405E-11,7.202E-11,8.088E-11,9.102E-11,5.362E-11,6.049E-11,6.775E-11
     5,7.562E-11,8.44E-11,5.098E-11,5.744E-11,6.414E-11,7.13E-11,7.909E-
     611,4.863E-11,5.476E-11,6.104E-11,6.763E-11,7.471E-11,4.653E-11,5.2
     74E-11,5.833E-11,6.448E-11,7.099E-11,4.464E-11,5.028E-11,5.592E-11,
     86.172E-11,6.779E-11,1.153E-10,1.603E-10,2.096E-10,0.,0.,1.16E-11,1
     9.534E-11,2.039E-11,1.005E-10,1.297E-10,1.673E-10,2.099E-10,0.)
      DATA((V(I),I=538,605)=1.306E-11,1.602E-11,1.988E-11,8.8E-11,1.094E
     1-10,1.381E-10,1.743E-10,2.225E-10,1.439E-11,1.687E-11,1.99E-11,7.8
     28E-11,9.558E-11,1.162E-10,1.467E-10,1.85E-10,2.337E-10,0.,0.,7.15E
     3-11,8.55E-11,1.014E-10,1.23E-10,1.553E-10,1.958E-10,2.355E-10,0.,6
     4.56E-11,7.776E-11,9.059E-11,1.071E-10,1.298E-10,1.64E-10,2.E-10,0.
     5,6.06E-11,7.158E-11,8.24E-11,9.564E-11,1.128E-10,1.366E-10,1.709E-
     610,2.186E-10,5.63E-11,6.649E-11,7.589E-11,8.696E-11,1.006E-10,1.18
     75E-10,1.435E-10,1.754E-10,5.25E-11,6.217E-11,7.057E-11,8.012E-11,9
     8.148E-11,1.056E-10,1.242E-10,1.504E-10,4.91E-11,5.843E-11,6.61E-11
     9,7.455E-11,8.428E-11,9.595E-11,1.106E-10,1.299E-10,4.6E-11)
      DATA((V(I),I=606,673)=5.514E-11,6.226E-11,6.99E-11,7.846E-11,8.84E
     1-11,1.004E-10,1.155E-10,4.32E-11,5.22E-11,5.89E-11,6.593E-11,7.361
     2E-11,8.23E-11,9.247E-11,1.048E-10,4.05E-11,4.953E-11,5.593E-11,6.2
     349E-11,6.95E-11,7.725E-11,8.61E-11,9.65E-11,3.6E-11,4.48E-11,5.084
     4E-11,5.675E-11,6.283E-11,6.931E-11,7.641E-11,8.439E-11,3.E-11,4.05
     53E-11,4.658E-11,5.209E-11,5.758E-11,6.326E-11,6.93E-11,7.585E-11,0
     6.,3.715E-11,4.288E-11,4.817E-11,5.328E-11,5.843E-11,6.377E-11,6.94
     72E-11,0.,3.374E-11,3.959E-11,4.479E-11,4.965E-11,5.444E-11,5.929E-
     811,6.433E-11,0.,3.047E-11,3.66E-11,4.181E-11,4.651E-11,5.104E-11,5
     9.556E-11,6.016E-11,0.,2.1E-11,3.128E-11,3.672E-11,4.129E-11)
      DATA((V(I),I=674,739)=4.551E-11,4.958E-11,5.362E-11,0.,1.652E-11,2
```

```
        N=6
        GO TO 33
    6   N=7
        IF(H.LT.290..AND.P.LT.500.) N=24
        GO TO 33
    7   IF(P.LT.1000.0) GO TO 8
        N=8
        GO TO 33
    8   N=20
        GO TO 33
    9   IF(P.LT.3000.0) GO TO 13
        IF(P.LT.4000.0) GO TO 11
        IF(H.GE.60.) GO TO 10
        N=9
        GO TO 30
   10   N=10
        GO TO 33
   11   IF(H.GE.30.) GO TO 12
        N=11
        GO TO 30
   12   N=12
        GO TO 33
   13   IF(P.LT.1000.0) GO TO 18
        IF(H.LT.40.) GO TO 14
        N=13
        GO TO 33
   14   IF(P.LT.2000.0) GO TO 16
        IF(H.GE.0.) GO TO 15
        N=14
        GO TO 30
   15   N=15
        GO TO 33
   16   IF(H.GE.-30.0) GO TO 17
        N=16
        IF(H.LT.-90..AND.P.LT.1250.) N=23
        GO TO 30
   17   N=17
        GO TO 33
   18   IF(H.GE.-70.0) GO TO 19
        N=18
        IF(H.GT.(-132.82+0.04*P)) GO TO 22
        GO TO 30
   19   IF(H.GE.-20.0) GO TO 20
        N=19
        GO TO 22
   20   N=20
   22   IF(P.GE.187.51012) GO TO 33
        DO 23 I=2,19
        IF(P-PL(I))24,24,23
   23   CONTINUE
   24   D=PL(I)-PL(I-1)
        DF=PL(I)-P
        DB=P-PL(I-1)
        HGAS=(HG(I)*DB+HG(I-1)*DF)/D
        IF(H.GE.HGAS) GO TO 33
        HLIQ=(HL(I)*DB+HL(I-1)*DF)/D
        IF(H.LE.HLIQ) GO TO 33
        VLIQ=(VL(I)*DB+VL(I-1)*DF)/D
```

```
1.666E-11,3.25E-11,3.707E-11,4.112E-11,4.493E-11,4.863E-11,0.,1.356
2E-11,2.287E-11,2.896E-11,3.356E-11,3.752E-11,4.117E-11,4.464E-11,6
3.7E-13,1.111E-11,2.E-11,2.606E-11,3.064E-11,3.453E-11,3.804E-11,4.
4135E-11,3.68E-12,9.79E-12,1.79E-11,2.377E-11,2.824E-11,3.203E-11,3
5.542E-11,3.859E-11,5.36E-12,1.05E-11,1.644E-11,2.202E-11,2.629E-11
6,2.994E-11,3.321E-11,3.625E-11,6.87E-12,1.089E-11,1.557E-11,2.07E-
711,2.475E-11,2.822E-11,3.136E-11,3.427E-11,8.11E-12,1.139E-11,1.51
86E-11,1.972E-11,2.355E-11,2.683E-11,2.981E-11,3.258E-11,9.16E-12,1
9.192E-11,1.506E-11,1.902E-11,2.262E-11,2.571E-11,2.853E-11)
 DATA((V(I),I=740,803)=3.116E-11,1.006E-11,1.246E-11,1.515E-11,1.85
16E-11,2.192E-11,2.482E-11,2.748E-11,2.997E-11,1.087E-11,1.3E-11,1.
2534E-11,1.829E-11,2.139E-11,2.414E-11,2.663E-11,2.898E-11,5.138E-1
31,5.164E-11,5.193E-11,5.229E-11,8.443E-11,8.207E-11,8.E-11,7.818E-
411,1.117E-10,1.078E-10,1.044E-10,1.013E-10,1.355E-10,1.304E-10,1.2
559E-10,1.218E-10,1.587E-10,1.587E-10,1.586E-10,1.853E-10,1.862E-10
6,1.863E-10,2.036E-10,2.077E-10,2.091E-10,2.140E-10,2.231E-10,2.263
7E-10,2.2E-10,2.347E-10,2.393E-10,2.280E-10,2.439E-10,2.499E-10,1.5
887E-10,1.587E-10,1.587E-10,1.587E-10,1.587E-10,1.851E-10,1.855E-10
9,1.857E-10,1.859E-10,1.86E-10,2.03E-10,2.047E-10,2.055E-10)
 DATA((V(I),I=804,820)=2.061E-10,2.066E-10,2.148E-10,2.175E-10,2.19
1E-10,2.201E-10,2.208E-10,2.235E-10,2.27E-10,2.29E-10,2.304E-10,2.3
214E-10,2.305E-10,2.346E-10,2.369E-10,2.386E-10,2.399E-10)
 END
```

```
    EHVISC=((VG(I)*DB+VG(I-1)*DF)/D-VLIQ)*(H-HLIQ)/(HGAS-HLIQ)+VLIQ
    RETURN
 30 PR=P/500.0
    I=PR
    IF(I.GT.9) I=9
    F=PR-I
    HSDL=F*HS(I+2)+(1.0-F)*HS(I+1)
    IF(H.LT.HSDL) H=HSDL
 33 FP=(P-BP(N))/DP(N)
    IP=FP
    IF(IP.GT.MX(N)) IP=MX(N)
    F=FP-IP
    FP=1.0-F
    FH=(H-BH(N))/DH(N)
    IH=FH
    FF=FH-IH
    FH=1.0-FF
    I=IH*JP(N)+IP+LDC(N)
    J=I+JP(N)
    EHVISC=FP*FH*V(I)+F*FH*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
    RETURN
    END
```



```
 FUNCTION EHSOUN (PRES,ENTH)
 DIMENSION LDC(15),JP(15),MX(15),BP(15),DP(15),BH(15),DH(15)
1,R(19),HL(19),HV(19),VL(19),VG(19),HS(10)
 COMMON /EHVEL/ V(326)
 DATA(LDC=1,2,3,4,41,77,79,112,140,143,246,189,221,246,282)
 DATA(JP=5,5,5,5,3,7,7,4,7,7,9,4,5,9,9)
 DATA(MX=0,0,0,0,0,1,5,5,2,2,2,1,2,3,7,7)
 DATA(BP=1.,10.,100.,1000.,-3000.,0,1000.,2000.,5.,500.,1000.,
1 400.,80.,0.,0.)
 DATA(DP=9.,90.,900.,4000.,4000.,500.,1000.,1000.,165.,500.,500.,
1 200.,80.,50.,50.)
 DATA(BH=5000.,5000.,5000.,5000.,600.,400.,400.,-50.,100.,100.,
1 -100.,-110.,-140.,0.,20.)
 DATA(DH=3000.,3000.,3000.,3000.,400.,50.,50.,75.,50.,50.,50.,30.,
1 35.,5.,20.)
 DATA (R=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012),
2 (HV=60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90,
3 76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225),
4 (HL=-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.5,
5 -51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
6 31.225)
 DATA(HS   =-132.81,-109.93,-87.52,-65.56,-44.,-22.76,-1.79,18.98,
1 39.60,60.07)
 DATA(VL= 4161.,4041.,3879.,3706.,3536.,3290.,2968.,2577.,2176.,
1 1821.,1550.,1376.,1176.,1059.,994.,959.,939.,932.,931.5)
 DATA(VG= 1002.,1040.,1080.,1116.,1140.,1155.,1152.,1130.,1094.,
1 1053.,1013.,992.,976.,968.,959.,951.,942.,936.,931.5)
 DATA((V(I),I=1,101)=7064.,7065.,7074.,7161.,7586.,8767.,8768.,8775
```

```
 FUNCTION EHSDUN (PRES,ENTH)
 DIMENSION LDC(15),JP(15),MX(15),BP(15),DP(15),BH(15),DH(15)
1,R(19),HL(19),HV(19),VL(19),VG(19),HS(10),V(326)
 DIMENSION AA(103),AB(108),AC(112),AD(  3)
 EQUIVALENCE( V,AA),( V( 104),AB),( V( 212),AC),( V( 324),AD)
 DATA LDC/1,2,3,4,41,77,79,112,140,143,246,189,221,246,282/
 DATA JP/5,5,5,5,3,7,7,4,7,7,9,4,5,9,9/
 DATA MX/0,0,0,0,0,1,5,5,2,2,2,1,2,3,7,7/
 DATA BP/1.,10.,100.,1000.,-3000.,0.,1000.,2000.,5.,500.,1000.,
1 400.,80.,0.,0./
 DATA DP/9.,90.,900.,4000.,4000.,500.,1000.,1000.,165.,500.,500.,
1 200.,80.,50.,50./
 DATA BH/5000.,5000.,5000.,5000.,600.,400.,400.,-50.,100.,100.,
1 -100.,-110.,-140.,0.,20./
 DATA DH/3000.,3000.,3000.,3000.,400.,50.,50.,75.,50.,50.,50.,30.,
1 35.,5.,20./
 DATA  R/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012/
 DATA HV/60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.9
10, 76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225/
 DATA HL/-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69
1.5,-51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
231.225/
 DATA HS   /-132.81,-109.93,-87.52,-65.56,-44.,-22.76,-1.79,18.98,
1 39.60,60.07/
 DATA VL/ 4161.,4041.,3879.,3706.,3536.,3290.,2968.,2577.,2176.,
1 1821.,1550.,1376.,1176.,1059.,994.,959.,939.,932.,931.5/
 DATA VG/ 1002.,1040.,1080.,1116.,1140.,1155.,1152.,1130.,1094.,
1 1053.,1013.,992.,976.,968.,959.,951.,942.,936.,931.5/
```

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1.,8843.,9186.,10010.,10040.,10060.,10120.,10420.,10660.,10920.,110
260.,11170.,11450.,10990.,11410.,11750.,11990.,12310.,11260.,11750.
3,12210.,12620.,13010.,11500.,12040.,12580.,13110.,13580.,11720.,12
4300.,12910.,13530.,14080.,1500.,2748.,4276.,2430.,3340.,4445.,3162
5.,3928.,4770.,3769.,4440.,5159.,4277.,4881.,5525.,4724.,5276.,5865
6.,5130.,5640.,6186.,5504.,5980.,6493.,5853.,6299.,6785.,6178.,6602
7.,7064.,6485.,6888.,7331.,6774.,7161.,7586.,1912.,2044.,2313.,2979
8.,3615.,4176.,4669.,2045.,2174.,2416.,3013.,3605.,4139.,4613.,2167
9.,2304.,2525.,3064.,3613.,4119.,4591.,2291.,2432.,2635.,3126.)
 DATA((V(I),I=102,207)=3636.,4114.,4566.,2414.,2557.,2748.,3224.,36
190.,4156.,4276.,4991.,5952.,6941.,7450.,4080.,4940.,5710.,6320.,35
248.,4362.,5024.,5625.,3224.,4023.,4657.,5200.,3045.,3805.,4425.,49
330.,2974.,3675.,4271.,4773.,2979.,3615.,4176.,4669.,1229.,1093.,12
437.,1537.,2409.,3048.,3548.,1379.,1277.,1326.,1490.,2197.,2811.,33
514.,1486.,1423.,1450.,1557.,2107.,2671.,3150.,1598.,1564.,1585.,16
663.,2099.,2598.,3045.,1704.,1691.,1722.,1786.,2144.,2576.,2988.,18
713.,1817.,1853.,1916.,2220.,2594.,2969.,1927.,1944.,1984.,2044.,23
813.,2641.,2979.,4223.,4499.,4752.,4977.,3549.,3879.,4172.,4439.,29
927.,3297.,3613.,3895.,2389.,2807.,3148.,3443.,1942.,2409.,2774.)
 DATA((V(I),I=208,316)=3083.,1604.,2099.,2475.,2794.,1420.,1868.,22
146.,2566.,1353.,1726.,2079.,2391.,4486.,4621.,4737.,4841.,4942.,35
235.,3688.,3831.,3971.,4104.,2623.,2830.,3014.,3181.,3334.,1659.,19
382.,2244.,2460.,2648.,882.,1205.,1571.,1851.,2080.,4798.,5281.,580
48.,1148.,1400.,1610.,1788.,1941.,2080.,3895.,4510.,5041.,914.,1314
5.,1529.,1711.,1868.,2009.,3194.,3821.,4338.,826.,1196.,1462.,1638.
6,1799.,1942.,2711.,3356.,3870.,792.,1106.,1385.,1570.,1733.,1878.,
72391.,3033.,3548.,755.,1041.,1311.,1507.,1670.,1818.,0.,0.,0.,881.
8,958.,1133.,1314.,1470.,1611.,1001.,870.,978.,950.,1000.,1091.,121
97.,1339.,1468.,1144.,1124.,1057.,1027.,1050.,1105.,1186.,1282.)
 DATA((V(I),I=317,326)=1386.,1245.,1188.,1139.,1109.,1115.,1146.,12
101.,1270.,1353.)
 P=PRES
 IF(P.LT.1.0) P=1.0
 H=ENTH
 IF(H.LT.400.) GO TO 7
 IF(H.LT.5000.)GO TO 4
 IF(H.GE.25000.) H=24999.99999
 IF(P.GE.100.) GO TO 2
 IF(P.GE.10.)  GO TO 1
 N=1
 GO TO 33
1 N=2
 GO TO 33
2 IF(P.GE.1000.) GO TO 3
 N=3
 GO TO 33
3 N=4
 GO TO 33
4 IF(H.LT.600.) GO TO 5
 N=5
 GO TO 33
5 N=6
 IF(P.GE.1000.) N=7
 GO TO 33
7 IF(P.LT.2000.) GO TO 8
 N=8
 IF(H.LT.-50.) N=11
 GO TO 30
```

```
 DATAAA/7064.,7065.,7074.,7161.,7586.,8767.,8768.,8775.,8843.,9186.
1,10010.,10040.,10060.,10120.,10420.,10660.,10920.,11060.,11170.,11
2450.,10990.,11410.,11750.,11990.,12310.,11260.,11750.,12210.,12620
3.,13010.,11500.,12040.,12580.,13110.,13580.,11720.,12300.,12910.,1
43530.,14080.,1500.,2748.,4276.,2430.,3340.,4445.,3162.,3928.,4770.
5,3769.,4440.,5159.,4277.,4881.,5525.,4724.,5276.,5865.,5130.,5640.
6,6186.,5504.,5980.,6493.,5853.,6299.,6785.,6178.,6602.,7064.,6485.
7,6888.,7331.,6774.,7161.,7586.,1912.,2044.,2313.,2979.,3615.,4176.
8,4669.,2045.,2174.,2416.,3013.,3605.,4139.,4613.,2167.,2304.,2525.
9,3064.,3613.,4119.,4591.,2291.,2432.,2635.,3126.,3636.,4114./
 DATAAB/4566.,2414.,2557.,2748.,3224.,3690.,4156.,4276.,4991.,5952.
1,6941.,7450.,4080.,4940.,5710.,6320.,3548.,4362.,5024.,5625.,3224.
2,4023.,4657.,5200.,3045.,3805.,4425.,4930.,2974.,3675.,4271.,4773.
3,2979.,3615.,4176.,4669.,1229.,1093.,1237.,1537.,2409.,3048.,3548.
4,1379.,1277.,1326.,1490.,2197.,2811.,3314.,1486.,1423.,1450.,1557.
5,2107.,2671.,3150.,1598.,1564.,1585.,1663.,2099.,2598.,3045.,1704.
6,1691.,1722.,1786.,2144.,2576.,2988.,1813.,1817.,1853.,1916.,2220.
7,2594.,2969.,1927.,1944.,1984.,2044.,2313.,2641.,2979.,4223.,4499.
8,4752.,4977.,3549.,3879.,4172.,4439.,2927.,3297.,3613.,3895.,2389.
9,2807.,3148.,3443.,1942.,2409.,2774.,3083.,1604.,2099.,2475./
 DATAAC/2794.,1420.,1868.,2246.,2566.,1353.,1726.,2079.,2391.,4486.
1,4621.,4737.,4841.,4942.,3535.,3688.,3831.,3971.,4104.,2623.,2830.
2,3014.,3181.,3334.,1659.,1982.,2244.,2460.,2648.,882.,1205.,1571.,
31851.,2080.,4798.,5281.,5808.,1148.,1400.,1610.,1788.,1941.,2080.,
43895.,4510.,5041.,914.,1314.,1529.,1711.,1868.,2009.,3194.,3821.,4
5338.,826.,1196.,1462.,1638.,1799.,1942.,2711.,3356.,3870.,792.,110
66.,1385.,1570.,1733.,1878.,2391.,3033.,3548.,755.,1041.,1311.,1507
7.,1670.,1818.,0.,0.,0.,881.,958.,1133.,1314.,1470.,1611.,1001.,870
8.,978.,950.,1000.,1091.,1217.,1339.,1468.,1144.,1124.,1057.,1027.,
91050.,1105.,1186.,1282.,1386.,1245.,1188.,1139.,1109.,1115.,1146./
 DATAAD/1201.,1270.,1353./
 P=PRES
 IF(P.LT.1.0) P=1.0
 H=ENTH
 IF(H.LT.400.) GO TO 7
 IF(H.LT.5000.)GO TO 4
 IF(H.GE.25000.) H=24999.99999
 IF(P.GE.100.) GO TO 2
 IF(P.GE.10.)  GO TO 1
 N=1
 GO TO 33
1 N=2
 GO TO 33
2 IF(P.GE.1000.) GO TO 3
 N=3
 GO TO 33
3 N=4
 GO TO 33
4 IF(H.LT.600.) GO TO 5
 N=5
 GO TO 33
5 N=6
 IF(P.GE.1000.) N=7
 GO TO 33
7 IF(P.LT.2000.) GO TO 8
 N=8
 IF(H.LT.-50.) N=11
 GO TO 30
```

```
 8 IF(H.LT.100.) GO TO 10
   IF(P.GE.500.) GO TO 9
   N=9
   GO TO 33
 9 N=10
   GO TO 33
10 IF(P.LT.400.) GO TO 12
   IF(P.LT.1000.) GO TO 11
   N=11
   GO TO 30
11 N=12
   GO TO 30
12 IF(H.GE.0.) GO TO 13
   N=13
   IF(H.LT.-132.7285+P*0.08224) GO TO 30
   GO TO 20
13 IF(H.GE.20.) GO TO 14
   N=14
   GO TO 20
14 N=15
20 IF(P.GT.187.51012) GO TO 33
   00 21 I=2,19
   IF(P-R(I))22,22,21
21 CONTINUE
22 F=(P-R(I-1))/(R(I)-R(I-1))
   CHL=HL(I-1)+(HL(I)-HL(I-1))*F
   CHV=HV(I-1)+(HV(I)-HV(I-1))*F
   IF(H.LT.CHL.OR.H.GT.CHV) GO TO 33
   SVL=VL(I-1)+(VL(I)-VL(I-1))*F
   SVG=VG(I-1)+(VG(I)-VG(I-1))*F
   F=(H-CHL)/(CHV-CHL)
   EHSOUN=SVL+(SVG-SVL)*F
   RETURN
30 PR=P/587.84
   I=PR
   IF(I.GT.8) I=8
   F=PR-I
   FP=1.-F
   G=FP*HS(I+1)+F*HS(I+2)
   IF(H.LT.G)H=G
33 FP=(P-BP(N))/OP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   F=FP-IP
   FP=1.-F
   FH=(H-BH(N ))/OH(N)
   IH=FH
   FF=FH-IH
   FH=1.-FF
   I=IH*JP(N )+IP+LOC(N )
   J=I+JP(N )
   EHSOUN=FP*FH*V(I)+F*FH*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
   RETURN
   ENO
```



```
 8 IF(H.LT.100.) GO TO 10
   IF(P.GE.500.) GO TO 9
   N=9
   GO TO 33
 9 N=10
   GO TO 33
10 IF(P.LT.400.) GO TO 12
   IF(P.LT.1000.) GO TO 11
   N=11
   GO TO 30
11 N=12
   GO TO 30
12 IF(H.GE.0.) GO TO 13
   N=13
   IF(H.LT.-132.7285+P*0.08224) GO TO 30
   GO TO 20
13 IF(H.GE.20.) GO TO 14
   N=14
   GO TO 20
14 N=15
20 IF(P.GT.187.51012) GO TO 33
   00 21 I=2,19
   IF(P-R(I))22,22,21
21 CONTINUE
22 F=(P-R(I-1))/(R(I)-R(I-1))
   CHL=HL(I-1)+(HL(I)-HL(I-1))*F
   CHV=HV(I-1)+(HV(I)-HV(I-1))*F
   IF(H.LT.CHL.OR.H.GT.CHV) GO TO 33
   SVL=VL(I-1)+(VL(I)-VL(I-1))*F
   SVG=VG(I-1)+(VG(I)-VG(I-1))*F
   F=(H-CHL)/(CHV-CHL)
   EHSOUN=SVL+(SVG-SVL)*F
   RETURN
30 PR=P/587.84
   I=PR
   IF(I.GT.8) I=8
   F=PR-I
   FP=1.-F
   G=FP*HS(I+1)+F*HS(I+2)
   IF(H.LT.G)H=G
33 FP=(P-BP(N))/OP(N)
   IP=FP
   IF(IP.GT.MX(N)) IP=MX(N)
   F=FP-IP
   FP=1.-F
   FH=(H-BH(N ))/OH(N)
   IH=FH
   FF=FH-IH
   FH=1.-FF
   I=IH*JP(N )+IP+LOC(N )
   J=I+JP(N )
   EHSOUN=FP*FH*V(I)+F*FH*V(I+1)+FP*FF*V(J)+F*FF*V(J+1)
   RETURN
   ENO
```

```
      FUNCTION EHCP(PRES,ENTH)
      COMMON/EPHEAT/ CP(749),CV(749)
      DIMENSION LOC(22),JP(18),MX(18),BP(18),DP(18),BH(23),DH(18),R(19),
     1HL(19),HV(19),HS(10),CVL(19),CVV(19)
      DATA(CVV=1.490,1.505,1.538,1.601,1.686,1.826,2.024,2.274,2.537,
     1 2.786,2.988,3.186,3.304,3.404,3.483,3.536,3.566,3.568,3.562)
      DATA(CVL=1.133,1.190,1.273,1.384,1.501,1.662,1.865,2.099,2.329,
     1 2.524,2.675,2.776,2.898,3.086,3.245,3.371,3.475,3.535,3.562)
      DATA (R=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
     1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012),
     2 (HV=60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90,
     3 76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225),
     4 (HL=-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.5,
     5 -51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
     6 31.225)
      DATA(HS    =-132.81,-109.93,-87.52,-65.56,-44.,-22.76,-1.79,18.98,
     1 39.60,60.07)
      DATA(LOC=1,21,63,84,133,141,156,160,257,237,273,318,360,409,444,
     1 528,563,626,671,686,710,722)
      DATA(JP=5,6,3,7,2,3,9,9,4,4,5,3,7,7,7,7,9,9)
      DATA(MX=3,4,1,5,0,1,3,3,2,2,3,1,5,5,5,5,7,0)
      DATA(BP=1000.,0,20.,0,15.,0,0,1000.,2000.,2000.,1000.,600.,0,0,300
     1.,0,140.,0.)
      DATA(DP=1000.,200.,40.,5.,4985.,2500.,250.,1000.,1000.,1000.,250.,
     1200.,100.,100.,50.,50.,20.,150.)
      DATA(BH=9200.,9200.,9200.,9200.,2600.,1000.,200.,200.,80.,-45.,
     1 -120.,-125.,-135.,120.,-45.,60.,-50.,200.,20000.,20000.,20000.,
     2 20000.)
      DATA(DH=3600.,1800.,1800.,1800.,2200.,400.,100.,100.,40.,25.,40.,
     125.,15.,20.,15.,15.,10.,50.)
      DATA((CV(I),I=1,108)=2.813,2.811,2.809,2.806,2.803,3.084,3.075,3.0
     169,3.065,3.061,3.49,3.418,3.384,3.362,3.346,4.299,4.057,3.94,3.867
     2,3.815,2.816,2.815,2.815,2.814,2.814,2.813,2.964,2.956,2.953,2.951
     3,2.95,2.949,3.164,3.117,3.1,3.092,3.087,3.084,3.523,3.363,3.305,3.
     4278,3.262,3.251,4.144,3.768,3.625,3.559,3.518,3.49,5.039,4.365,4.0
     599,3.971,3.892,3.836,6.136,5.134,4.722,4.519,4.391,4.299,2.817,2.8
     616,2.816,2.974,2.964,2.96,3.218,3.163,3.14,3.699,3.52,3.443,4.52,4
     7.13,3.956,5.643,5.001,4.702,6.958,6.065,5.635,2.828,2.82,2.818,2.8
     818,2.817,2.817,2.817,3.101,3.008,2.99,2.982,2.977,2.974,2.972,3.84
     97,3.398,3.305,3.262,3.236,3.218,3.204,5.354,4.228,3.961,3.832)
      DATA((CV(I),I=109,216)=3.752,3.696,3.654,7.427,5.538,5.039,4.788,4
     1.627,4.511,4.422,9.751,7.164,6.436,6.056,5.807,5.625,5.483,12.15,8
     2.94,8.005,7.506,7.174,6.928,6.734,2.475,2.503,2.519,2.516,2.646,2.
     3636,2.818,2.803,2.18,2.301,2.373,2.335,2.401,2.443,2.431,2.47,2.49
     44,2.464,2.49,2.506,2.475,2.493,2.503,3.335,3.582,3.64,3.608,3.589,
     53.611,3.677,3.74,3.754,3.54,3.524,3.45,3.369,3.324,3.299,3.377,3.5
     605,3.638,3.187,3.114,3.053,3.002,2.966,2.933,2.99,3.084,3.2,2.759,
     72.714,2.679,2.653,2.639,2.633,2.673,2.743,2.83,2.437,2.398,2.38,2.
     8377,2.383,2.441,2.495,2.529,2.549,2.253,2.248,2.251,2.259,2.271,2.
     933,2.384,2.425,2.453,2.173,2.184,2.197,2.211,2.225,2.281,2.33)
      DATA((CV(I),I=217,327)=2.37,2.401,2.158,2.173,2.189,2.203,2.218,2.
     1269,2.312,2.347,2.377,2.18,2.195,2.21,2.224,2.237,2.282,2.318,2.34
     28,2.373,1.557,.82,.785,0.,2.138,1.414,.726,0.,2.642,2.028,1.254,.9
     308,3.032,2.586,1.903,1.09,3.311,3.018,2.504,1.769,3.503,3.333,2.98
     44,2.42,3.622,3.58,3.468,3.165,3.659,3.687,3.658,3.541,3.611,3.677,
     53.722,3.717,.737,.551,.577,0.,0.,1.488,1.331,1.157,.972,.777,2.295
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```
      FUNCTION EHCP(PRES,ENTH)
      EHCP=EHHEAT(PRES,ENTH,1)
      RETURN
      END
      FUNCTION EHCV(PRES,ENTH)
      EHCV=EHHEAT(PRES,ENTH,2)
      RETURN
      END
      FUNCTION EHGAMM(PRES,ENTH)
      EHGAMM=EHHEAT(PRES,ENTH,3)
      RETURN
      END
      FUNCTION EHHEAT(PRES,ENTH,KTRANS)
      COMMON/EPHEAT/CP(749),CV(749)
      DIMENSION LOC(22),JP(18),MX(18),BP(18),DP(18),BH(23),DH(18),R(19),
     1HL(19),HV(19),HS(10),CVL(19),CVV(19)
      DATA CVV/1.490,1.505,1.538,1.601,1.686,1.826,2.024,2.274,2.537,
     1 2.786,2.988,3.186,3.304,3.404,3.483,3.536,3.566,3.568,3.562/
      DATA CVL/1.133,1.190,1.273,1.384,1.501,1.662,1.865,2.099,2.329,
     1 2.524,2.675,2.776,2.898,3.086,3.245,3.371,3.475,3.535,3.562/
      DATA  R/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
     1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012/
      DATA HV/60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.9
     10,76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225/
      DATAHL/-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.
     15,-51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
     2 31.225/
      DATA HS   /-132.81,-109.93,-87.52,-65.56,-44.,-22.76,-1.79,18.98,
     1 39.60,60.07/
      DATA LOC/1,21,63,84,133,141,156,160,257,237,273,318,360,409,444,
     1 528,563,626,671,686,710,722/
      DATA JP/5,6,3,7,2,3,9,9,4,4,5,3,7,7,7,7,9,9/
      DATA MX/3,4,1,5,0,1,3,3,2,2,3,1,5,5,5,5,7,0/
      DATA BP/1000.,0.,20.,0.,15.,0.,0.,1000.,2000.,2000.,1000.,600.,0.,
     10.,300.,0.,140.,0./
      DATA DP/1000.,200.,40.,5.,4985.,2500.,250.,1000.,1000.,1000.,250.,
     1200.,100.,100.,50.,50.,20.,150./
      DATA BH/9200.,9200.,9200.,9200.,2600.,1000.,200.,200.,80.,-45.,
     1 -120.,-125.,-135.,120.,-45.,60.,-50.,200.,20000.,20000.,20000.,
     2 20000./
      DATA DH/3600.,1800.,1800.,1800.,2200.,400.,100.,100.,40.,25.,40.,
     125.,15.,20.,15.,15.,10.,50./
      DATA VERYBG/1.0E+38/
      KTR=KTRANS
    1 P=PRES
      IF(P.LT.1.0) P=1.0
      H=ENTH
      IF(H.LT.200.) GO TO 9
      IF(H.LT.9200.) GO TO 5
      IF(H.GE.25000.) H=24999.99999
      IF(P.LT.100.) GO TO 3
      IF(P.LT.1000.) GO TO 2
      N=1
      N1=19
      GO TO 33
    2 N=2
```

```
     6,2.167,2.017,1.852,1.68,2.907,2.847,2.764,2.663,2.541,3.279,3.266,
     73.236,3.191,3.131,3.493,3.501,3.499,3.488,3.468,3.597,3.608,3.616,
     83.622,3.622,3.624,3.627,3.636,3.647,3.659,3.589,3.583,3.586,3.597,
     93.611,.926,.806,.797,1.354,1.239,1.111,1.821,1.707,1.587,2.269)
      DATA(VERYBIG=37777777777777778)
      KTR=1
      GO TO 1
      ENTRY EHCV
      KTR=2
      GO TO 1
      ENTRY EHGAMM
      KTR=3
    1 P=PRES
      IF(P.LT.1.0) P=1.0
      H=ENTH
      IF(H.LT.200.) GO TO 9
      IF(H.LT.9200.) GO TO 5
      IF(H.GE.25000.) H=24999.99999
      IF(P.LT.100.) GO TO 3
      IF(P.LT.1000.) GO TO 2
      N=1
      N1=19
      GO TO 33
    2 N=2
      N1=20
      GO TO 33
    3 IF(P.LT.30.) GO TO 4
      N=3
      N1=21
      GO TO 33
    4 N=4
      N1=22
      GO TO 33
    5 IF(H.LT.1000.) GO TO 7
      IF(H.LT.2600.) GO TO 6
      N=5
      GO TO 33
    6 N=6
      GO TO 33
    7 IF(P.GE.1000.) GO TO 8
      N=7
      IF((P.LE.150.).AND.(H.LT.300.)) N=18
      GO TO 33
    8 N=8
      GO TO 33
    9 IF(P.LT.600.) GO TO 13
      IF(P.LT.2000.) GO TO 11
      IF(H.LT.80.) GO TO 10
      N=9
      GO TO 33
   10 N=10
      GO TO 30
   11 IF(P.LT.1000.) GO TO 12
      N=11
      GO TO 30
   12 N=12
      GO TO 30
   13 IF(H.GE.-45.) GO TO 14
      N1=20
      GO TO 33
    3 IF(P.LT.30.) GO TO 4
      N=3
      N1=21
      GO TO 33
    4 N=4
      N1=22
      GO TO 33
    5 IF(H.LT.1000.) GO TO 7
      IF(H.LT.2600.) GO TO 6
      N=5
      GO TO 33
    6 N=6
      GO TO 33
    7 IF(P.GE.1000.) GO TO 8
      N=7
      IF((P.LE.150.).AND.(H.LT.300.)) N=18
      GO TO 33
    8 N=8
      GO TO 33
    9 IF(P.LT.600.) GO TO 13
      IF(P.LT.2000.) GO TO 11
      IF(H.LT.80.) GO TO 10
      N=9
      GO TO 33
   10 N=10
      GO TO 30
   11 IF(P.LT.1000.) GO TO 12
      N=11
      GO TO 30
   12 N=12
      GO TO 30
   13 IF(H.GE.-45.) GO TO 14
      N=13
      IF(H.LT.-132.7285+P*0.08224) GO TO 30
      GO TO 20
   14 IF(H.LT.120.) GO TO 15
      N=14
      GO TO 33
   15 IF(P.LT.300.) GO TO 16
      N=15
      GO TO 33
   16 IF(H.LT.60.) GO TO 17
      N=16
      GO TO 20
   17 N=17
   20 IF(P.GT.187.51012) GO TO 33
      DO 21 I=2,19
      IF(P-R(I))22,22,21
   21 CONTINUE
   22 F=(P-R(I-1))/(R(I)-R(I-1))
      CHL=HL(I-1)+(HL(I)-HL(I-1))*F
      CHV=HV(I-1)+(HV(I)-HV(I-1))*F
      IF(H.LT.CHL.OR.H.GT.CHV) GO TO 33
      IF(KTR.EQ.2) GO TO 23
      EHCP=VERYBG
      EHHEAT=EHCP
```

```
      N=13
      IF(H.LT.-132.7285+P*0.08224) GO TO 30
      GO TO 20
   14 IF(H.LT.120.) GO TO 15
      N=14
      GO TO 33
   15 IF(P.LT.300.) GO TO 16
      N=15
      GO TO 33
   16 IF(H.LT.60.) GO TO 17
      N=16
      GO TO 20
   17 N=17
   20 IF(P.GT.187.51012) GO TO 33
      DO 21 I=2,19
      IF(P-R(I))22,22,21
   21 CONTINUE
   22 F=(P-R(I-1))/(R(I)-R(I-1))
      CHL=HL(I-1)+(HL(I)-HL(I-1))*F
      CHV=HV(I-1)+(HV(I)-HV(I-1))*F
      IF(H.LT.CHL.OR.H.GT.CHV) GO TO 33
      IF(KTR.EQ.2) GO TO 23
      EHCP=VERYBIG
      RETURN
   23 CL=CVL(I-1)+(CVL(I)-CVL(I-1))*F
      CG=CVV(I-1)+(CVV(I)-CVV(I-1))*F
      EHCP=CL+(CG-CL)*(H-CHL)/(CHV-CHL)
      RETURN
   30 F=P/587.84
      I=F
      IF(I.GT.8) I=8
      F=F-I
      V=(1.0-F)*HS(I+1)+F*HS(I+2)
      IF(H.LT.V) H=V
   33 IF(H.LE.20000.)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.-F
      FH=(H-BH(N1))/DH(N)
      IH=FH
      FF=FH-IH
      FH=1.-FF
      I=IH*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      IF(KTR.EQ.2) GO TO 35
      HCP=FP*FH*CP(I)+F*FH*CP(I+1)+FP*FF*CP(J)+F*FF*CP(J+1)
      IF(N.LT.13) GO TO 34
      IF(N.EQ.18) GO TO 34
      S=H+500.
      HCP=HCP/(3375.79281335/S-14.6519689802+0.0177028811778*S-6.9405665
     1 3567E-9*S*S*S)
   34 IF(KTR.GE.2) GO TO 35
      EHCP=HCP
      RETURN
   35 EHCP=FP*FH*CV(I)+F*FH*CV(I+1)+FP*FF*CV(J)+F*FF*CV(J+1)
      IF(KTR.LT.3) RETURN
      RETURN
   23 CL=CVL(I-1)+(CVL(I)-CVL(I-1))*F
      CG=CVV(I-1)+(CVV(I)-CVV(I-1))*F
      EHCP=CL+(CG-CL)*(H-CHL)/(CHV-CHL)
      EHHEAT=EHCP
      RETURN
   30 F=P/587.84
      I=F
      IF(I.GT.8) I=8
      F=F-I
      V=(1.0-F)*HS(I+1)+F*HS(I+2)
      IF(H.LT.V) H=V
   33 IF(H.LE.20000.)N1=N
      FP=(P-BP(N))/DP(N)
      IP=FP
      IF(IP.GT.MX(N)) IP=MX(N)
      F=FP-IP
      FP=1.-F
      FH=(H-BH(N1))/DH(N)
      IH=FH
      FF=FH-IH
      FH=1.-FF
      I=IH*JP(N)+IP+LOC(N1)
      J=I+JP(N)
      IF(KTR.EQ.2) GO TO 35
      HCP=FP*FH*CP(I)+F*FH*CP(I+1)+FP*FF*CP(J)+F*FF*CP(J+1)
      IF(N.LT.13) GO TO 34
      IF(N.EQ.18) GO TO 34
      S=H+500.
      HCP=HCP/(3375.79281335/S-14.6519689802+0.0177028811778*S-6.9405665
     1 3567E-9*S*S*S)
   34 IF(KTR.GE.2) GO TO 35
      EHHEAT=HCP
      RETURN
   35 EHCP=FP*FH*CV(I)+F*FH*CV(I+1)+FP*FF*CV(J)+F*FF*CV(J+1)
      EHHEAT=EHCP
      IF(KTR.LT.3) RETURN
      EHCP=HCP/EHCP
      EHHEAT=EHCP
      RETURN
      END

      BLOCK DATA
      COMMON/EPHEAT/AA(111),AB(111),AC(115),AD(121),AE(129),AF(117),
     1AG(45),   AH(111),AI(111),AJ(114),AK(112),AL(112),AM(114),AN( 75)
      DATAAA/3.798,3.795,3.793,3.791,3.789,4.071,4.061,4.055,4.051,4.048
     1,4.5,4.42,4.383,4.36,4.343,5.397,5.124,4.994,4.912,4.855,3.801,3.8
     2,3.799,3.799,3.798,3.798,3.951,3.941,3.938,3.936,3.935,3.934,4.157
     3,4.106,4.088,4.08,4.074,4.071,4.541,4.367,4.303,4.274,4.256,4.244,
     45.22,4.806,4.649,4.576,4.531,4.5,6.217,5.467,5.171,5.029,4.941,4.8
     579,7.459,6.334,5.872,5.644,5.499,5.397,3.802,3.801,3.801,3.961,3.9
     651,3.946,4.216,4.156,4.132,4.733,4.537,4.454,5.634,5.205,5.013,6.8
     789,6.175,5.842,8.381,7.379,6.896,3.814,3.805,3.804,3.803,3.803,3.8
     802,3.802,4.097,3.998,3.978,3.97,3.965,3.961,3.959,4.895,4.411,4.30
     99,4.263,4.235,4.215,4.201,6.538,5.31,5.018,4.878,4.791,4.73,4.684/
      DATAAB/8.835,6.755,6.206,5.929,5.752,5.624,5.527,11.45,8.579,7.77,
     17.348,7.07,6.868,6.71,14.19,10.6,9.555,8.996,8.623,8.347,8.13,3.46
     2,3.511,3.504,3.503,3.631,3.621,3.803,3.789,3.165,3.52,3.605,3.32,3
```

```
      EHCP=HCP/EHCP
      RETURN
      END

      SUBROUTINE  EDHEAT
      COMMON/EPHEAT/ CP(749),CV(749)
      DATA((CP(I),I=1,108)=3.798,3.795,3.793,3.791,3.789,4.071,4.061,4.0
155,4.051,4.048,4.5,4.42,4.383,4.36,4.343,5.397,5.124,4.994,4.912,4
2.855,3.801,3.8,3.799,3.799,3.798,3.798,3.951,3.941,3.938,3.936,3.9
335,3.934,4.157,4.106,4.088,4.08,4.074,4.071,4.541,4.367,4.303,4.27
44,4.256,4.244,5.22,4.806,4.649,4.576,4.531,4.5,6.217,5.467,5.171,5
5.029,4.941,4.879,7.459,6.334,5.872,5.644,5.499,5.397,3.802,3.801,3
6.801,3.961,3.951,3.946,4.216,4.156,4.132,4.733,4.537,4.454,5.634,5
7.205,5.013,6.889,6.175,5.842,8.381,7.379,6.896,3.814,3.805,3.804,3
8.803,3.803,3.802,3.802,4.097,3.998,3.978,3.97,3.965,3.961,3.959,4.
9895,4.411,4.309,4.263,4.235,4.215,4.201,6.538,5.31,5.018,4.878)
      DATA((CP(I),I=109,216)=4.791,4.73,4.684,8.835,6.755,6.206,5.929,5.
1752,5.624,5.527,11.45,8.579,7.77,7.348,7.07,6.868,6.71,14.19,10.6,
29.555,8.996,8.623,8.347,8.13,3.46,3.511,3.504,3.503,3.631,3.621,3.
3803,3.789,3.165,3.52,3.605,3.32,3.486,3.561,3.416,3.501,3.551,3.44
49,3.498,3.531,3.46,3.489,3.511,4.201,5.848,6.813,6.688,6.269,5.344
5,5.023,4.824,4.646,4.493,5.032,5.405,5.64,5.664,5.228,4.903,4.785,
64.734,4.173,4.413,4.623,4.773,4.841,4.745,4.579,4.476,4.422,3.745,
73.894,4.027,4.137,4.219,4.3,4.236,4.176,4.126,3.423,3.52,3.623,3.7
819,3.802,3.972,3.991,3.958,3.902,3.239,3.332,3.422,3.504,3.576,3.7
953,3.807,3.81,3.792,3.159,3.241,3.317,3.385,3.446,3.612,3.682)
      DATA((CP(I),I=217,328)=3.705,3.707,3.143,3.211,3.273,3.329,3.379,3
1.525,3.599,3.633,3.645,3.165,3.219,3.268,3.314,3.355,3.479,3.55,3.
2587,3.605,2.035,.857,.696,0.,2.862,1.747,.831,0.,3.538,2.569,1.479
3,1.392,4.092,3.286,2.334,1.29,4.515,3.852,3.082,2.123,4.865,4.293,
43.687,2.91,5.16,4.692,4.324,3.823,5.339,4.927,4.632,4.322,5.398,5.
5023,4.8,4.6,.692,.466,.182,0.,0.,2.061,1.754,1.45,1.149,.845,3.413
6,3.093,2.791,2.499,2.212,4.502,4.18,3.91,3.663,3.42,5.319,4.956,4.
7692,4.473,4.276,5.911,5.495,5.215,5.003,4.827,6.276,5.835,5.542,5.
8328,5.16,6.41,5.998,5.711,5.5,5.339,6.332,6.002,5.746,5.55,5.398,1
9.034,.742,1.057,1.896,1.636,1.373,2.791,2.498,2.232,3.69,3.359)
      END

      SUBROUTINE E C SUB P
      COMMON/EPHEAT/ CP(749),CV(749)
      DATA((CP(I),I=329,443)=3.077,4.541,4.139,3.839,5.356,4.829,4.489,6
1.124,5.43,5.038,6.839,5.953,5.488,7.399,6.376,5.849,7.709,6.683,6.
2122,7.74,6.861,6.306,7.522,6.892,6.398,7.177,6.801,6.404,6.803,6.6
324,6.332,1.065,.985,.919,.766,.667,0.,0.,1.177,1.087,1.006,.927,.8
451,.779,.711,1.227,1.139,1.057,.983,.916,.853,.792,1.249,1.144,1.0
557,.985,.922,.865,.812,1.23,1.112,1.015,.943,.884,.833,.787,1.277,
61.087,.954,.874,.815,.768,.728,1.313,1.067,.898,.794,.731,.686,.65
7,.343,.571,.861,1.037,1.032,.961,.889,.443,.634,.859,1.032,1.091,1
8.066,1.016,.557,.721,.897,1.051,1.133,1.144,1.119,.664,.803,.949,1
9.078,1.164,1.198,1.194,.757,.875,.996,1.107,1.185,1.228,1.238)
      DATA((CP(I),I=444,569)=.794,.76,.731,.707,.686,.668,.65,.725,.683,
1.651,.625,.604,.586,.57,.671,.616,.581,.553,.532,.515,.5,.666,.586
2,.54,.505,.482,.463,.447,.713,.593,.529,.487,.459,.436,.42,.82,.64
32,.555,.5,.465,.439,.42,.967,.733,.616,.547,.503,.473,.449,1.069,.
4832,.704,.624,.572,.533,.504,1.103,.93,.808,.723,.663,.618,.584,1.
5079,.99,.9,.825,.765,.718,.68,1.046,1.023,.973,.919,.867,.823,.784
6,1.027,1.044,1.029,.998,.961,.924,.889,.177,.319,0.,5.044,2.627,1.
7527,1.069,.197,.354,.668,1.291,1.453,1.294,1.092,.231,.366,.584,.8
3.486,3.561,3.416,3.501,3.551,3.449,3.498,3.531,3.46,3.489,3.511,4.
4201,5.848,6.813,6.688,6.269,5.344,5.023,4.824,4.646,4.493,5.032,5.
5405,5.64,5.664,5.228,4.903,4.785,4.734,4.173,4.413,4.623,4.773,4.8
641,4.745,4.579,4.476,4.422,3.745,3.894,4.027,4.137,4.219,4.3,4.236
7,4.176,4.126,3.423,3.52,3.623,3.719,3.802,3.972,3.991,3.958,3.902,
83.239,3.332,3.422,3.504,3.576,3.753,3.807,3.81,3.792,3.159,3.241,3
9.317,3.385,3.446,3.612,3.682,3.705,3.707,3.143,3.211,3.273,3.329/
      DATAAC/3.379,3.525,3.599,3.633,3.645,3.165,3.219,3.268,3.314,3.355
1,3.479,3.55,3.587,3.605,2.035,.857,.696,0.,2.862,1.747,.831,0.,3.5
238,2.569,1.479,1.392,4.092,3.286,2.334,1.29,4.515,3.852,3.082,2.12
33,4.865,4.293,3.687,2.91,5.16,4.692,4.324,3.823,5.339,4.927,4.632,
44.322,5.398,5.023,4.8,4.6,.692,.466,.182,0.,0.,2.061,1.754,1.45,1.
5149,.845,3.413,3.093,2.791,2.499,2.212,4.502,4.18,3.91,3.663,3.42,
65.319,4.956,4.692,4.473,4.276,5.911,5.495,5.215,5.003,4.827,6.276,
75.835,5.542,5.328,5.16,6.41,5.998,5.711,5.5,5.339,6.332,6.002,5.74
86,5.55,5.398,1.034,.742,1.057,1.896,1.636,1.373,2.791,2.498,2.232,
93.69,3.359,3.077,4.541,4.139,3.839,5.356,4.829,4.489,6.124,5.43/
      DATAAD/5.038,6.839,5.953,5.488,7.399,6.376,5.849,7.709,6.683,6.122
1,7.74,6.861,6.306,7.522,6.892,6.398,7.177,6.801,6.404,6.803,6.624,
26.332,1.065,.985,.919,.766,.667,0.,0.,1.177,1.087,1.006,.927,.851,
3.779,.711,1.227,1.139,1.057,.983,.916,.853,.792,1.249,1.144,1.057,
4.985,.922,.865,.812,1.23,1.112,1.015,.943,.884,.833,.787,1.277,1.0
587,.954,.874,.815,.768,.728,1.313,1.067,.898,.794,.731,.686,.65,.3
643,.571,.861,1.037,1.032,.961,.889,.443,.634,.859,1.032,1.091,1.06
76,1.016,.557,.721,.897,1.051,1.133,1.144,1.119,.664,.803,.949,1.07
88,1.164,1.198,1.194,.757,.875,.996,1.107,1.185,1.228,1.238,.794,.7
96,.731,.707,.686,.668,.65,.725,.683,.651,.625,.604,.586,.57,.671/
      DATAAE/.616,.581,.553,.532,.515,.5,.666,.586,.54,.505,.482,.463,.4
147,.713,.593,.529,.487,.459,.436,.42,.82,.642,.555,.5,.465,.439,.4
22,.967,.733,.616,.547,.503,.473,.449,1.069,.832,.704,.624,.572,.53
33,.504,1.103,.93,.808,.723,.663,.618,.584,1.079,.99,.9,.825,.765,.
4718,.68,1.046,1.023,.973,.919,.867,.823,.784,1.027,1.044,1.029,.99
58,.961,.924,.889,.177,.319,0.,5.044,2.627,1.527,1.069,.197,.354,.6
668,1.291,1.453,1.294,1.092,.231,.366,.584,.854,1.06,1.126,1.079,.2
78,.399,.553,.733,.904,1.016,1.046,.343,.451,.577,.715,.852,.965,1.
8027,1.007,.971,.941,.915,.892,.871,.853,.836,.821,1.024,.966,.923,
9.886,.856,.83,.807,.787,.77,1.117,1.003,.928,.879,.835,.799,.77/
      DATAAF/.746,.725,1.331,1.151,1.004,.902,.833,.781,.749,.717,.69,1.
1981,1.604,1.222,1.012,.886,.803,.742,.705,.67,0.,3.11,1.984,1.308,
21.029,.876,.781,.715,.673,0.,6.092,3.92,1.976,1.329,1.028,.868,.76
37,.698,4.161,5.14,12.,3.711,1.796,1.245,.993,.848,.75,4.457,5.003,
441.22,6.542,2.531,1.567,1.173,.96,.828,4.493,4.818,29.72,6.866,2.9
567,1.841,1.356,1.091,.928,0.,10.15,8.528,4.526,2.673,1.887,1.453,1
6.193,1.019,0.,4.519,3.724,2.706,2.099,1.71,1.432,1.23,1.08,5.397,5
7.124,4.994,4.912,4.855,6.782,6.243,5.974,5.802,5.679,8.389,7.575,7
8.158,6.886,6.689,7.459,6.334,5.872,5.644,5.499,5.397,8.85,7.352,6.
9717,6.395,6.189,6.04,10.32,8.469,7.665,7.249,6.978,6.782,11.83/
      DATAAG/9.635,8.669,8.165,7.833,7.591,8.381,7.379,6.896,10.,8.729,8
1.101,11.69,10.16,9.394,13.39,11.63,10.73,14.19,10.6,9.555,8.996,8.
2623,8.347,8.13,16.96,12.72,11.45,10.76,10.3,9.957,9.685,19.72,14.8
36,13.38,12.58,12.04,11.63,11.31,22.44,16.99,15.32,14.41,13.79,13.3
42,12.95/
      DATAAH/2.813,2.811,2.809,2.806,2.803,3.084,3.075,3.069,3.065,3.061
1,3.49,3.418,3.384,3.362,3.346,4.299,4.057,3.94,3.867,3.815,2.816,2
2.815,2.815,2.814,2.814,2.813,2.964,2.956,2.953,2.951,2.95,2.949,3.
3164,3.117,3.1,3.092,3.087,3.084,3.523,3.363,3.305,3.278,3.262,3.25
41,4.144,3.768,3.625,3.559,3.518,3.49,5.039,4.365,4.099,3.971,3.892
5,3.836,6.136,5.134,4.722,4.519,4.391,4.299,2.817,2.816,2.816,2.974
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854,1.06,1.126,1.079,.28,.399,.553,.733,.904,1.016,1.046,.343,.451,
9.577,.715,.852,.965,1.027,1.007,.971,.941,.915,.892,.871,.853)
 DATA((CP(I),I=570,686)=.836,.821,1.024,.966,.923,.886,.856,.83,.80
17,.787,.77,1.117,1.003,.928,.879,.835,.799,.77,.746,.725,1.331,1.1
251,1.004,.902,.833,.781,.749,.717,.69,1.981,1.604,1.222,1.012,.886
3,.803,.742,.705,.67,0.,3.11,1.984,1.308,1.029,.876,.781,.715,.673,
40.,6.092,3.92,1.976,1.329,1.028,.868,.767,.698,4.161,5.14,12.,3.71
51,1.796,1.245,.993,.848,.75,4.457,5.003,41.22,6.542,2.531,1.567,1.
6173,.96,.828,4.493,4.818,29.72,6.866,2.967,1.841,1.356,1.091,.928,
70.,10.15,8.528,4.526,2.673,1.887,1.453,1.193,1.019,0.,4.519,3.724,
82.706,2.099,1.71,1.432,1.23,1.08,5.397,5.124,4.994,4.912,4.855,6.7
982,6.243,5.974,5.802,5.679,8.389,7.575,7.158,6.886,6.689,7.459)
 DATA((CP(I),I=687,749)=6.334,5.872,5.644,5.499,5.397,8.85,7.352,6.
1717,6.395,6.189,6.04,10.32,8.469,7.665,7.249,6.978,6.782,11.83,9.6
235,8.669,8.165,7.833,7.591,8.381,7.379,6.896,10.,8.729,8.101,11.69
3,10.16,9.394,13.39,11.63,10.73,14.19,10.6,9.555,8.996,8.623,8.347,
48.13,16.96,12.72,11.45,10.76,10.3,9.957,9.685,19.72,14.86,13.38,12
5.58,12.04,11.63,11.31,22.44,16.99,15.32,14.41,13.79,13.32,12.95)
 END

 SUBROUTINE E C SUB V
 COMMON/EPHEAT/ CP(749),CV(749)
 DATA((CV(I),I=328,437)=2.19,2.091,2.641,2.601,2.539,2.932,2.923,2.
1893,3.153,3.165,3.159,3.316,3.338,3.346,3.439,3.461,3.474,3.529,3.
2545,3.556,3.588,3.597,3.605,3.622,3.623,3.624,3.632,3.624,3.617,3.
3622,3.603,3.589,1.1,1.045,.997,.96,.931,0.,0.,1.337,1.289,1.234,1.
4182,1.128,1.072,1.012,1.588,1.545,1.491,1.436,1.38,1.324,1.268,1.8
525,1.79,1.749,1.701,1.649,1.594,1.536,2.032,2.017,1.992,1.959,1.91
68,1.872,1.821,2.196,2.222,2.214,2.197,2.171,2.137,2.097,2.3,2.397,
72.41,2.408,2.397,2.377,2.35,2.03,2.749,3.215,3.435,3.533,3.567,3.5
878,2.369,2.916,3.272,3.471,3.566,3.601,3.61,2.689,3.093,3.358,3.51
9,3.591,3.622,3.629,2.959,3.251,3.44,3.547,3.608,3.629,3.632,3.172)
 DATA((CV(I),I=438,546)=3.376,3.505,3.576,3.615,3.625,3.622,2.408,2
1.403,2.397,2.388,2.377,2.364,2.35,2.592,2.595,2.595,2.592,2.588,2.
2582,2.573,2.75,2.76,2.766,2.769,2.77,2.77,2.767,2.887,2.901,2.912,
32.92,2.926,2.93,2.932,3.007,3.023,3.038,3.05,3.059,3.067,3.072,3.1
423,3.133,3.148,3.162,3.173,3.182,3.189,3.231,3.232,3.245,3.259,3.2
569,3.279,3.288,3.296,3.316,3.33,3.343,3.352,3.362,3.37,3.362,3.383
6,3.402,3.414,3.423,3.432,3.439,3.392,3.434,3.459,3.473,3.482,3.49,
73.496,3.413,3.469,3.5,3.52,3.531,3.538,3.543,3.435,3.496,3.533,3.5
854,3.567,3.575,3.578,1.467,1.836,0.,3.238,3.386,3.341,3.296,1.511,
92.031,2.575,3.055,3.28,3.33,3.362,1.612,2.098,2.543,2.934,3.23)
 DATA((CV(I),I=547,656)=3.318,3.392,1.79,2.212,2.619,2.97,3.177,3.3
121,3.413,2.023,2.393,2.737,3.012,3.203,3.34,3.435,2.347,2.348,2.34
28,2.348,2.347,2.346,2.345,2.343,2.341,2.46,2.464,2.466,2.469,2.47,
32.472,2.472,2.472,2.472,2.563,2.568,2.573,2.578,2.582,2.585,2.588,
42.59,2.592,2.656,2.663,2.67,2.677,2.682,2.688,2.692,2.697,2.7,2.74
56,2.753,2.76,2.767,2.774,2.781,2.787,2.793,2.798,0.,2.841,2.843,2.
685,2.859,2.866,2.873,2.88,2.887,0.,3.131,3.076,2.99,2.941,2.947,2.
7954,2.961,2.968,3.17,3.449,3.414,3.244,3.128,3.068,3.043,3.038,3.0
845,3.469,3.555,3.624,3.459,3.305,3.199,3.139,3.125,3.123,3.505,3.5
902,3.575,3.521,3.412,3.288,3.22,3.205,3.2,0.,3.356,3.44,3.475)
 DATA((CV(I),I=657,749)=3.429,3.345,3.28,3.264,3.257,0.,3.239,3.332
1,3.386,3.385,3.348,3.333,3.3,3.296,4.299,4.057,3.94,3.867,3.815,5.
2506,5.035,4.8,4.649,4.541,6.874,6.159,5.815,5.581,5.41,6.136,5.134
3,4.722,4.519,4.391,4.299,7.345,6.022,5.462,5.178,4.996,4.865,8.6,6
4.981,6.278,5.914,5.678,5.506,9.873,7.966,7.128,6.691,6.404,6.194,6
5.958,6.065,5.635,8.364,7.238,6.684,9.801,8.461,7.791,11.23,9.695,8
6,2.964,2.96,3.218,3.163,3.14,3.699,3.52,3.443,4.52,4.13,3.956,5.64
73,5.001,4.702,6.958,6.065,5.635,2.828,2.82,2.818,2.818,2.817,2.817
8,2.817,3.101,3.008,2.99,2.982,2.977,2.974,2.972,3.847,3.398,3.305,
93.262,3.236,3.218,3.204,5.354,4.228,3.961,3.832,3.752,3.696,3.654/
 DATAAI/7.427,5.538,5.039,4.788,4.627,4.511,4.422,9.751,7.164,6.436
1,6.056,5.807,5.625,5.483,12.15,8.94,8.005,7.506,7.174,6.928,6.734,
22.475,2.503,2.519,2.516,2.646,2.636,2.818,2.803,2.18,2.301,2.373,2
3.335,2.401,2.443,2.431,2.47,2.494,2.464,2.49,2.506,2.475,2.493,2.5
403,3.335,3.582,3.64,3.608,3.589,3.611,3.677,3.74,3.754,3.54,3.524,
53.45,3.369,3.324,3.299,3.377,3.505,3.638,3.187,3.114,3.053,3.002,2
6.966,2.933,2.99,3.084,3.2,2.759,2.714,2.679,2.653,2.639,2.633,2.67
73,2.743,2.83,2.437,2.398,2.38,2.377,2.383,2.441,2.495,2.529,2.549,
82.253,2.248,2.251,2.259,2.271,2.33,2.384,2.425,2.453,2.173,2.184,2
9.197,2.211,2.225,2.281,2.33,2.37,2.401,2.158,2.173,2.189,2.203/
 DATAAJ/2.218,2.269,2.312,2.347,2.377,2.18,2.195,2.21,2.224,2.237,2
1.282,2.318,2.348,2.373,1.557,.82,.785,0.,2.138,1.414,.726,0.,2.642
2,2.028,1.254,.908,3.032,2.586,1.903,1.09,3.311,3.018,2.504,1.769,3
3.503,3.333,2.984,2.42,3.622,3.58,3.468,3.165,3.659,3.687,3.658,3.5
441,3.611,3.677,3.722,3.717,.737,.551,.577,0.,0.,1.488,1.331,1.157,
5.972,.777,2.295,2.167,2.017,1.852,1.68,2.907,2.847,2.764,2.663,2.5
641,3.279,3.266,3.236,3.191,3.131,3.493,3.501,3.499,3.488,3.468,3.5
797,3.608,3.616,3.622,3.622,3.624,3.627,3.636,3.647,3.659,3.589,3.5
883,3.586,3.597,3.611,.926,.806,.797,1.354,1.239,1.111,1.821,1.707,
91.587,2.269,2.19,2.091,2.641,2.601,2.539,2.932,2.923,2.893,3.153/
 DATAAK/3.165,3.159,3.316,3.338,3.346,3.439,3.461,3.474,3.529,3.545
1,3.556,3.588,3.597,3.605,3.622,3.623,3.624,3.632,3.624,3.617,3.622
2,3.603,3.589,1.1,1.045,.997,.96,.931,0.,0.,1.337,1.289,1.234,1.182
3,1.128,1.072,1.012,1.588,1.545,1.491,1.436,1.38,1.324,1.268,1.825,
41.7°,1.749,1.701,1.649,1.594,1.536,2.032,2.017,1.992,1.959,1.918,1
5.872,1.821,2.196,2.222,2.214,2.197,2.171,2.137,2.097,2.3,2.397,2.4
61,2.408,2.397,2.377,2.35,2.03,2.749,3.215,3.435,3.533,3.567,3.578,
72.369,2.916,3.272,3.471,3.566,3.601,3.61,2.689,3.093,3.358,3.51,3.
8591,3.622,3.629,2.959,3.251,3.44,3.547,3.608,3.629,3.632,3.172,3.3
976,3.505,3.576,3.615,3.625,3.622,2.408,2.403,2.397,2.388,2.377/
 DATAAL/2.364,2.35,2.592,2.595,2.595,2.592,2.588,2.582,2.573,2.75,2
1.76,2.766,2.769,2.77,2.77,2.767,2.887,2.901,2.912,2.92,2.926,2.93,
22.932,3.007,3.023,3.038,3.05,3.059,3.067,3.072,3.123,3.133,3.148,3
3.162,3.173,3.182,3.189,3.231,3.232,3.245,3.259,3.269,3.279,3.288,3
4.296,3.316,3.33,3.343,3.352,3.362,3.37,3.362,3.383,3.402,3.414,3.4
523,3.432,3.439,3.392,3.434,3.459,3.473,3.482,3.49,3.496,3.413,3.46
69,3.5,3.52,3.531,3.538,3.543,3.435,3.496,3.533,3.554,3.567,3.575,3
7.578,1.467,1.836,0.,3.238,3.386,3.341,3.296,1.511,2.031,2.575,3.05
85,3.28,3.33,3.362,1.612,2.098,2.543,2.934,3.23,3.318,3.392,1.79,2.
9212,2.619,2.97,3.177,3.321,3.413,2.023,2.393,2.737,3.012,3.203/
 DATAAM/3.34,3.435,2.347,2.348,2.348,2.348,2.347,2.346,2.345,2.343,
12.341,2.46,2.464,2.466,2.469,2.47,2.472,2.472,2.472,2.563,2.
2568,2.573,2.578,2.582,2.585,2.588,2.59,2.592,2.656,2.663,2.67,2.67
37,2.682,2.688,2.692,2.697,2.7,2.746,2.753,2.76,2.767,2.774,2.781,2
4.787,2.793,2.798,0.,2.841,2.843,2.85,2.859,2.866,2.873,2.88,2.887,
50.,3.131,3.076,2.99,2.941,2.947,2.954,2.961,2.968,3.17,3.449,3.414
6,3.244,3.128,3.068,3.043,3.038,3.045,3.469,3.555,3.624,3.459,3.305
7,3.199,3.139,3.125,3.123,3.505,3.502,3.575,3.521,3.412,3.288,3.22,
83.205,3.2,0.,3.356,3.44,3.475,3.429,3.345,3.28,3.264,3.257,0.,3.23
99,3.332,3.386,3.385,3.348,3.333,3.3,3.296,4.299,4.057,3.94,3.867/
 DATAAN/3.815,5.506,5.035,4.8,4.649,4.541,6.874,6.159,5.815,5.581,5
1.41,6.136,5.134,4.722,4.519,4.391,4.299,7.345,6.022,5.462,5.178,4.
2996,4.865,8.6,6.981,6.278,5.914,5.678,5.506,9.873,7.966,7.128,6.69
31,6.404,6.194,6.958,6.065,5.635,8.364,7.238,6.684,9.801,8.461,7.79
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41,11.23,9.695,8.92,12.15,8.94,8.005,7.506,7.174,6.928,6.734,14.53,
510.76,9.642,9.035,8.627,8.323,8.083,16.86,12.58,11.29,10.58,10.11,
69.749,9.466,19.12,14.36,12.91,12.12,11.57,11.17,10.85/
 END
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 FUNCTION EHLFAC(PRES,ENTH)
 DIMENSION LDC(19),JP(19),DP(19),DH(19),BP(19),BH(19),MX(19),
1PL(19),HL(19),HG(19),CL(19),CG(19),HS(11),C(735)
 DIMENSION AA(112),AB(112),AC(117),AD(108),AE(106),AF( 96),AG( 84)
 EQUIVALENCE( C,AA),( C( 113),AB),( C( 225),AC),( C( 342),AD)
1    ,( C( 450),AE),( C( 556),AF),( C( 652),AG)
 DATA LDC/1,29,50,86,149,173,191,269,339,375,407,461,493,517,529,
1 553,577,601,661/
 DATA JP/4,3,4,7,4,3,6,7,6,4,6,4,4,2,3,3,3,4,5/
 DATA MX/2,1,2,5,2,1,4,5,4,2,4,2,2,0,1,1,1,2,3/
 DATA BP/0.,0.,490.,132.,305.,500.,1000.,2000.,0.,20.,500.,2000.,
1 0.,0.,0.,-100.,0.,0.,1./
 DATA DP/160.,250.,170.,28.,65.,250.,200.,500.,100.,160.,300.,1000.
1 ,500.,3000.,1500.,300.,40.,10.,1./
 DATA BH/-135.,-105.,-115.,-45.,-45.,-75.,-95.,-60.,70.,145.,25.,
1 75.,425.,1800.,11000.,11000.,11000.,11000.,11000./
 DATA DH/5.,10.,5.,15.,23.,20.,10.,15.,15.,40.,50.,50.,275.,1840.,
1 2000.,2000.,2000.,1000.,1000./
 DATA PL/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012/,
2 HG/ 60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90,
3 76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225/,
4  HL/-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.5,
5 -51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
6 31.225/
 DATA HS/-132.81,-113.32,-94.17,-75.35,-56.84,-38.60,-20.58,-2.75,
1 14.94,32.50,49.96/
 DATA CL/1.5037E+003,1.808E+003,2.132E+003,2.487E+003,2.824E+003,3.
1286E+003,3.815E+003,4.421E+003,5.125E+003,6.065E+003,7.602E+003,9.
2889E+003,1.440E+004,2.364E+004,4.212E+004,8.362E+004,2.295E+005,9.
3785E+005,1.040E+009/
 DATA CG/2.643E+003,2.644E+003,2.691E+003,2.781E+003,2.938E+003,3.2
154E+003,3.718E+003,4.404E+003,5.384E+003,6.892E+003,9.249E+003,1.2
262E+004,2.077E+004,3.819E+004,7.504E+004,1.690E+005,6.642E+005,3.9
327E+009,8.658E+008/
 DATAAA/1304.,862.4,0.,0.,1778.,1270.,1002.,0.,2081.,1683.,1207.,92
16.8,2367.,2031.,1616.,1202.,2611.,2312.,1967.,1574.,2857.,2559.,22
254.,1890.,3093.,2802.,2501.,2200.,3084.,2629.,2160.,3522.,3100.,26
358.,3923.,3508.,3110.,4307.,3874.,3499.,4706.,4215.,3844.,5161.,45
445.,4158.,5763.,4872.,4448.,1526.,1105.,0.,0.,1885.,1455.,1105.,0.
5,2180.,1802.,1366.,1105.,2430.,2108.,1722.,1340.,2676.,2364.,2038.
6,1657.,2910.,2610.,2300.,1950.,3125.,2847.,2548.,2238.,3326.,3063.
7,2787.,2488.,3513.,3264.,3006.,2730.,181.2,153.2,134.1,148.2,168.5
8,193.9,229.6,232.7,206.8,184.3,192.6,203.6,219.9,237.6,159.5,331.8
9,286.3,267.1,255.7,249.5,245.6,0.,718.5,582.,418.4,340.6,292.3/
 DATAAB/259.5,0.,19060.,1410.,779.8,484.4,352.1,277.2,0.,55670.,611
18.,1862.,735.3,427.8,299.,13100.,51570.,8536.,1468.,733.5,466.4,34
23.,5569.,5464.,1203.,783.,575.7,461.2,371.1,4336.,4901.,462.5,448.
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6.92,12.15,8.94,8.005,7.506,7.174,6.928,6.734,14.53,10.76,9.642,9.0
735,8.627,8.323,8.083,16.86,12.58,11.29,10.58,10.11,9.749,9.466,19.
812,14.36,12.91,12.12,11.57,11.17,10.85)
 END
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 FUNCTION EHLFAC(PRES,ENTH)
 COMMON/EHFAC/C(735)
 DIMENSION LDC(19),JP(19),DP(19),DH(19),BP(19),BH(19),MX(19),
1PL(19),HL(19),HG(19),CL(19),CG(19),HS(11)
 DATA(LDC=1,29,50,86,149,173,191,269,339,375,407,461,493,517,529,
1 553,577,601,661)
 DATA(JP=4,3,4,7,4,3,6,7,6,4,6,4,4,2,3,3,3,4,5)
 DATA(MX=2,1,2,5,2,1,4,5,4,2,4,2,2,0,1,1,1,2,3)
 DATA(BP=0.,0.,490.,132.,305.,500.,1000.,2000.,0.,20.,500.,2000.,
1 0.,0.,0.,-100.,0.,0.,1.)
 DATA(DP=160.,250.,170.,28.,65.,250.,200.,500.,100.,160.,300.,1000.
1 ,500.,3000.,1500.,300.,40.,10.,1.)
 DATA(BH=-135.,-105.,-115.,-45.,-45.,-75.,-95.,-60.,70.,145.,25.,
1 75.,425.,1800.,11000.,11000.,11000.,11000.,11000.)
 DATA(DH=5.,10.,5.,15.,23.,20.,10.,15.,15.,40.,50.,50.,275.,1840.,
1 2000.,2000.,2000.,1000.,1000.)
 DATA(PL=1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,
1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.51012),
2 (HG=60.35,65.19,70.69,76.60,81.50,86.38,89.99,91.24,89.18,83.90,
3 76.55,69.46,61.16,53.87,47.96,43.01,38.21,34.66,31.225),
4 (HL=-132.80,-129.10,-124.16,-117.53,-110.29,-100.02,-86.44,-69.5,
5 -51.29,-33.56,-18.32,-7.62,2.73,10.26,15.84,20.35,24.71,28.00,
6 31.225)
 DATA(HS=-132.81,-113.32,-94.17,-75.35,-56.84,-38.60,-20.58,-2.75,
1 14.94,32.50,49.96)
 DATA(CL=1.5037E+003,1.808E+003,2.132E+003,2.487E+003,2.824E+003,3.
1286E+003,3.815E+003,4.421E+003,5.125E+003,6.065E+003,7.602E+003,9.
2889E+003,1.440E+004,2.364E+004,4.212E+004,8.362E+004,2.295E+005,9.
3785E+005,1.040E+009)
 DATA(CG=2.643E+003,2.644E+003,2.691E+003,2.781E+003,2.938E+003,3.2
154E+003,3.718E+003,4.404E+003,5.384E+003,6.892E+003,9.249E+003,1.2
262E+004,2.077E+004,3.819E+004,7.504E+004,1.690E+005,6.642E+005,3.9
327E+009,8.658E+008)
 DATA((C(I),I=1, 91)=1304.,862.4,0.,0.,1778.3,1270.3,1001.8,0.,2081
1.,1683.,1207.3,926.8,2367.1,2031.,1616.,1202.3,2611.,2311.9,1967.0
28,1574.3,2857.3,2559.17,2253.74,1890.,3093.4,2801.6,2501.2,2200.04
3,3084.2,2629.25,2159.5,3521.9,3099.89,2657.6,3923.4,3508.2,3109.61
4,4307.5,3874.33,3498.72,4705.6,4215.22,3844.03,5160.7,4544.86,4157
5.77,5763.,4872.19,4448.34,1526.2,1105.3,0.,0.,1884.93,1454.9,1105.
63,0.,2179.87,1802.4,1366.,1105.3,2430.48,2107.78,1722.16,1340.,267
75.98,2363.77,2037.77,1656.9,2909.99,2610.26,2299.63,1950.3,3125.49
8,2846.59,2547.79,2238.,3325.69,3063.47,2786.71,2487.94,3513.27,326
93.78,3005.78,2729.85,181.16,153.18,134.1,148.22,168.51,193.85)
 DATA((C(I),I=92,180)=229.57,232.73,206.76,184.28,192.55,203.59,219
1.86,237.57,159.45,331.85,286.28,267.12,255.67,249.5,245.63,0.,718.
25,582.,418.39,340.63,292.34,259.47,0.,19059.,1410.42,779.84,484.39
3,352.11,277.21,0.,55672.,6118.41,1861.61,735.28,427.81,298.97,1310
43.1,51568.2,8535.99,1468.3,733.46,466.44,342.95,5569.14,5463.83,12
```

```
503.12,783.04,575.69,461.17,371.11,4336.32,4900.86,462.46,448.91,42
65.03,399.54,379.87,4730.2,4639.23,4539.07,4448.34,5421.8,5271.19,5
7138.89,5031.48,6362.83,5880.6,5695.72,5547.44,7611.84,6681.4,6319.
826,6060.47,8935.47,7432.9,6902.57,6550.46,9023.2,7987.1,7310.18,69
932.53,3498.72,3136.8,2736.8,4157.77,3846.6,3527.8,4714.06,4410.26)
 DATA((C(I),I=181,266)=4134.55,5168.,4870.96,4619.12,5604.8,5236.9,
15016.89,6046.5,5571.4,5353.09,1669.46,1200.,1107.4,0.,0.,0.,2249.2
2,1845.2,1375.75,1250.,0.,0.,2729.85,2385.9,2016.,1597.6,1300.,0.,3
3154.4,2852.29,2520.36,2152.6,1767.78,1357.4,3519.35,3253.66,2969.1
45,2658.37,2314.59,1944.01,3843.2,3602.09,3350.17,3081.53,2790.04,2
5469.78,4134.55,3912.91,3684.31,3444.09,3189.79,2915.46,4391.48,419
61.6,3982.59,3765.12,3536.29,3294.19,4619.12,4431.16,4243.61,4051.4
79,3844.23,3626.36,4826.4,4646.78,4472.01,4295.52,4113.27,3921.75,5
8016.89,4844.42,4678.71,4514.11,4346.57,4173.65,5191.99,5023.81,486
96.4,4711.69,4555.67,4396.67,5353.09,5188.4,5036.73,4890.31)
 DATA((C(I),I=267,362)=4744.83,4597.02,1660.,830.,0.,0.,0.,0.,0.,24
194.48,1555.4,1300.,0.,0.,0.,0.,3142.92,2386.82,1432.,1200.,0.,0.,0
2.,3631.4,3050.67,2294.3,1369.5,1100.,0.,0.,4072.3,3560.7,2964.68,2
3208.2,1317.86,0.,0.,4396.67,3970.63,3489.7,2891.36,2160.18,1520.,0
4.,4689.7,4316.07,3920.5,3428.26,2837.83,2091.6,1421.6,4940.59,4607
5.8,4247.24,3861.2,3387.2,2802.9,2063.,5155.37,4856.27,4538.56,4188
6.7,3813.,3350.,2765.8,5339.79,5067.16,4785.16,4479.18,4139.93,3775
7.8,3316.5,2556.18,8473.58,11905.,8948.6,7519.1,6932.53,2613.6,5868
8.24,8761.6,8567.39,7651.6,7091.29,2807.07,5068.2,7314.9,7936.16,75
952.77,7165.,3084.52,4816.89,6545.91,7412.61,7369.94,7161.02)
 P=PRES
 H=ENTH
 R=1.0
 IF(P.LT.1.0) P=1.0
 IF(H.GE.425.) GO TO 12
 IF(P.LT.500.) GO TO 6
 IF(P.LT.2000.) GO TO 2
 IF(H.LT.75.) GO TO 1
 N=12
 GO TO 33
1 N=8
 GO TO 22
2 IF(H.LT.25.) GO TO 3
 N=11
 GO TO 33
3 IF(P.GE.1000.) GO TO 5
 IF(H.LT.-75.) GO TO 4
 N=6
 GO TO 33
4 N=3
 GO TO 22
5 N=7
 GO TO 22
6 IF(H.LT.-45.) GO TO 11
 IF(H.GE.70.) GO TO 9
 IF(P.LT.300.) GO TO 7
 N=5
 GO TO 33
7 N=4
 R=H-31.225
 IF(R.LT.0.) R=-R
 IF(P.LT.187.51) GO TO 8
 R=1.0/(3.1136694+.2115577*(P-187.51)+.4487232*R-.004707536*R*
```



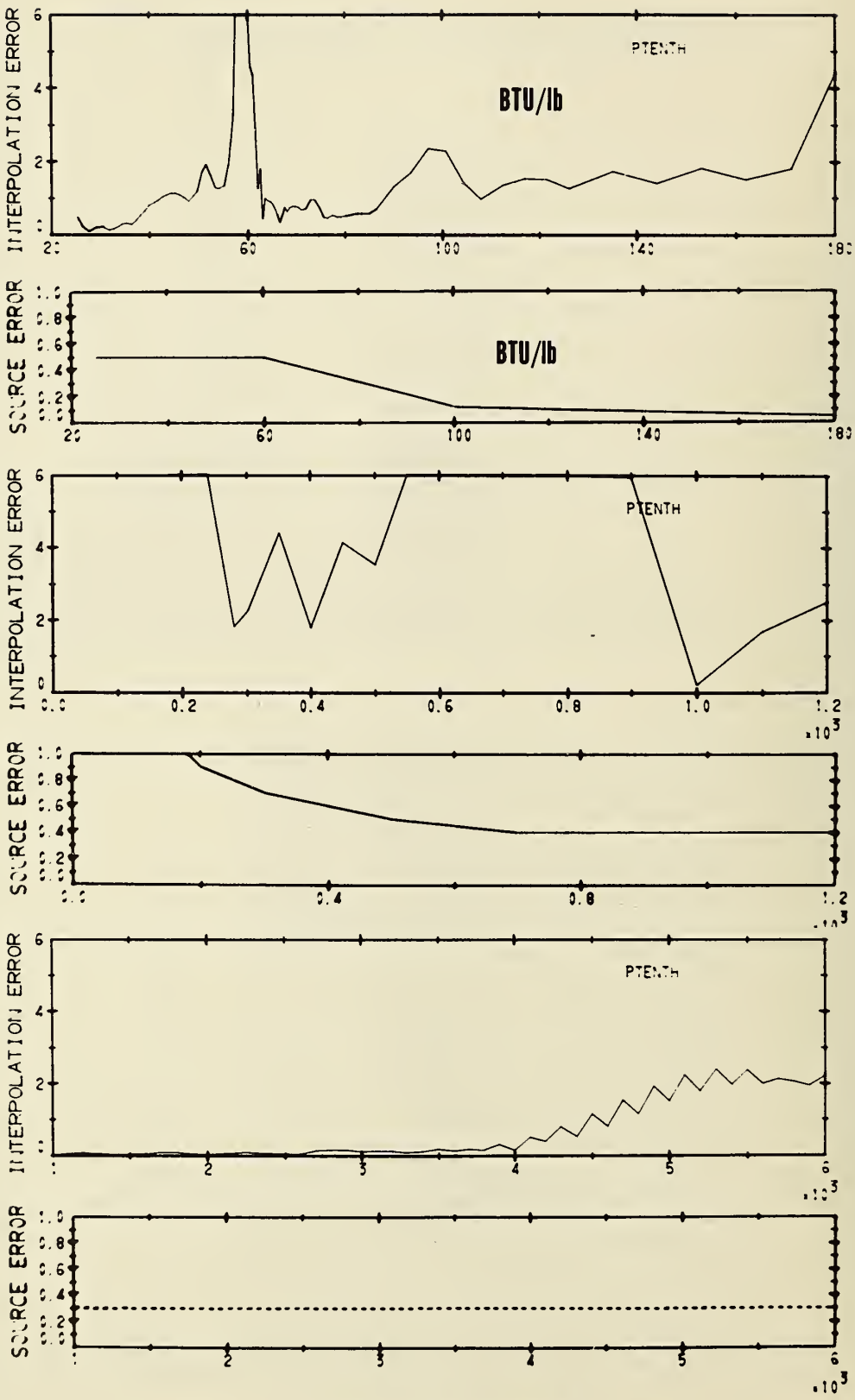
```
39,425.,399.5,379.9,4730.,4639.,4539.,4448.,5422.,5271.,5139.,5031.
4,6363.,5881.,5696.,5547.,7612.,6681.,6319.,6060.,8935.,7433.,6903.
5,6550.,9023.,7987.,7310.,6933.,3499.,3137.,2737.,4158.,3847.,3528.
6,4714.,4410.,4135.,5168.,4871.,4619.,5605.,5237.,5017.,6047.,5571.
7,5353.,1669.,1200.,1107.,0.,0.,0.,2249.,1845.,1376.,1250.,0.,0.,27
830.,2386.,2016.,1598.,1300.,0.,3154.,2852.,2520.,2153.,1768.,1357.
9,3519.,3254.,2969.,2658.,2315.,1944.,3843.,3602.,3350.,3082./
 DATAAC/2790.,2470.,4135.,3913.,3684.,3444.,3190.,2915.,4391.,4192.
1,3983.,3765.,3536.,3294.,4619.,4431.,4244.,4051.,3844.,3626.,4826.
2,4647.,4472.,4296.,4113.,3922.,5017.,4844.,4679.,4514.,4347.,4174.
3,5192.,5024.,4866.,4712.,4556.,4397.,5353.,5188.,5037.,4890.,4745.
4,4597.,1660.,830.,0.,0.,0.,0.,0.,2494.,1555.,1300.,0.,0.,0.,0.,314
53.,2387.,1432.,1200.,0.,0.,0.,3631.,3051.,2294.,1370.,1100.,0.,0.,
64072.,3561.,2965.,2208.,1318.,0.,0.,4397.,3971.,3490.,2891.,2160.,
71520.,0.,4690.,4316.,3921.,3428.,2838.,2092.,1422.,4941.,4608.,424
87.,3861.,3387.,2803.,2063.,5155.,4856.,4539.,4189.,3813.,3350.,276
96.,5340.,5067.,4785.,4479.,4140.,3776.,3317.,2556.,8474.,11900./
 DATAAD/8949.,7519.,6933.,2614.,5868.,8762.,8567.,7652.,7091.,2807.
1,5068.,7315.,7936.,7553.,7165.,3085.,4817.,6546.,7413.,7370.,7161.
2,3452.,4849.,6189.,6995.,7169.,7104.,3791.,4918.,5970.,6696.,6983.
3,7018.,4007.,5835.,6923.,7018.,4667.,5721.,6471.,6757.,5115.,5776.
4,6286.,6537.,5369.,5793.,6144.,6345.,5463.,5744.,5987.,6150.,5441.
5,5637.,5821.,5961.,5353.,5505.,5648.,5764.,5228.,5349.,5465.,5565.
6,6083.,5526.,5268.,5037.,4818.,4597.,6994.,6154.,5896.,5687.,5507.
7,5340.,7199.,6659.,6301.,6087.,5929.,5790.,6820.,6731.,6503.,6313.
8,6162.,6043.,6537.,6621.,6517.,6380.,6256.,6148.,6297.,6412.,6398.
9,6328.,6244.,6162.,6057.,6186.,6217.,6197.,6154.,6102.,5814./
 DATAAE/5944.,5997.,6012.,6003.,5980.,5565.,5695.,5730.,5771.,5793.
1,5800.,5340.,4785.,4181.,3333.,5790.,5368.,4986.,4486.,6043.,5706.
2,5390.,5058.,6148.,5877.,5637.,5399.,6162.,5934.,5743.,5570.,6102.
3,5930.,5779.,5636.,5980.,5868.,5758.,5647.,5800.,5765.,5696.,5614.
4,5215.,5565.,5750.,5740.,4576.,4783.,5000.,5070.,4704.,4856.,5005.
5,5068.,5073.,5149.,5225.,5264.,5361.,5402.,5446.,5470.,5572.,5595.
6,5615.,5633.,5572.,5678.,6246.,6157.,6694.,6634.,7184.,7527.,7686.
7,7965.,8507.,8459.,8151.,8318.,8480.,8717.,8828.,8987.,9496.,9371.
8,9570.,10970.,10300.,10360.,13240.,11700.,11510.,16210.,13600.,130
940.,19680.,15950.,14970.,23420.,18600.,17250.,8185.,8180.,8206./
 DATAAF/9026.,8789.,8754.,10960.,9705.,9454.,14280.,11450.,10750.,1
19030.,14080.,12720.,24500.,17420.,15340.,30300.,21220.,18440.,3617
20.,25250.,21810.,8228.,8196.,8182.,9553.,8926.,8802.,11960.,10590.
3,10130.,16100.,13520.,12490.,21530.,17610.,15900.,27290.,22520.,20
4150.,33340.,27750.,24790.,39540.,33020.,29540.,8361.,8257.,8220.,8
5205.,9019.,8723.,8617.,8570.,10110.,9439.,9194.,9083.,11820.,10520
6.,10040.,9845.,14120.,12070.,11280.,10930.,17010.,14040.,12910.,12
7370.,20260.,16430.,14920.,14170.,23720.,19160.,17220.,16260.,27390
8.,22070.,19760.,18590.,31160.,25110.,22460.,21090.,34950.,28250.,2
95260.,23710.,38760.,31420.,28130.,26410.,42530.,34610.,31030./
 DATAAG/29150.,46280.,37780.,33940.,31900.,49970.,40940.,36830.,346
150.,8528.,8413.,8361.,8331.,8309.,9413.,9108.,9014.,8929.,8871.,10
2940.,10310.,10090.,9902.,9773.,13240.,12170.,11740.,11400.,11170.,
316240.,14700.,13980.,13470.,13100.,19720.,17700.,16730.,16030.,155
420.,23590.,21080.,19870.,18990.,18340.,27630.,24760.,23270.,22220.
5,21440.,31770.,28540.,26840.,25630.,24730.,35980.,32390.,30500.,29
6150.,28140.,40180.,36280.,34200.,32720.,31600.,44480.,40260.,37910
7.,36310.,35090.,48630.,44120.,41610.,39880.,38570.,52720.,47950.,4
85270.,43430.,42030.,56750.,51710.,48880.,46930.,45450./
 P=PRES
 H=ENTH
```

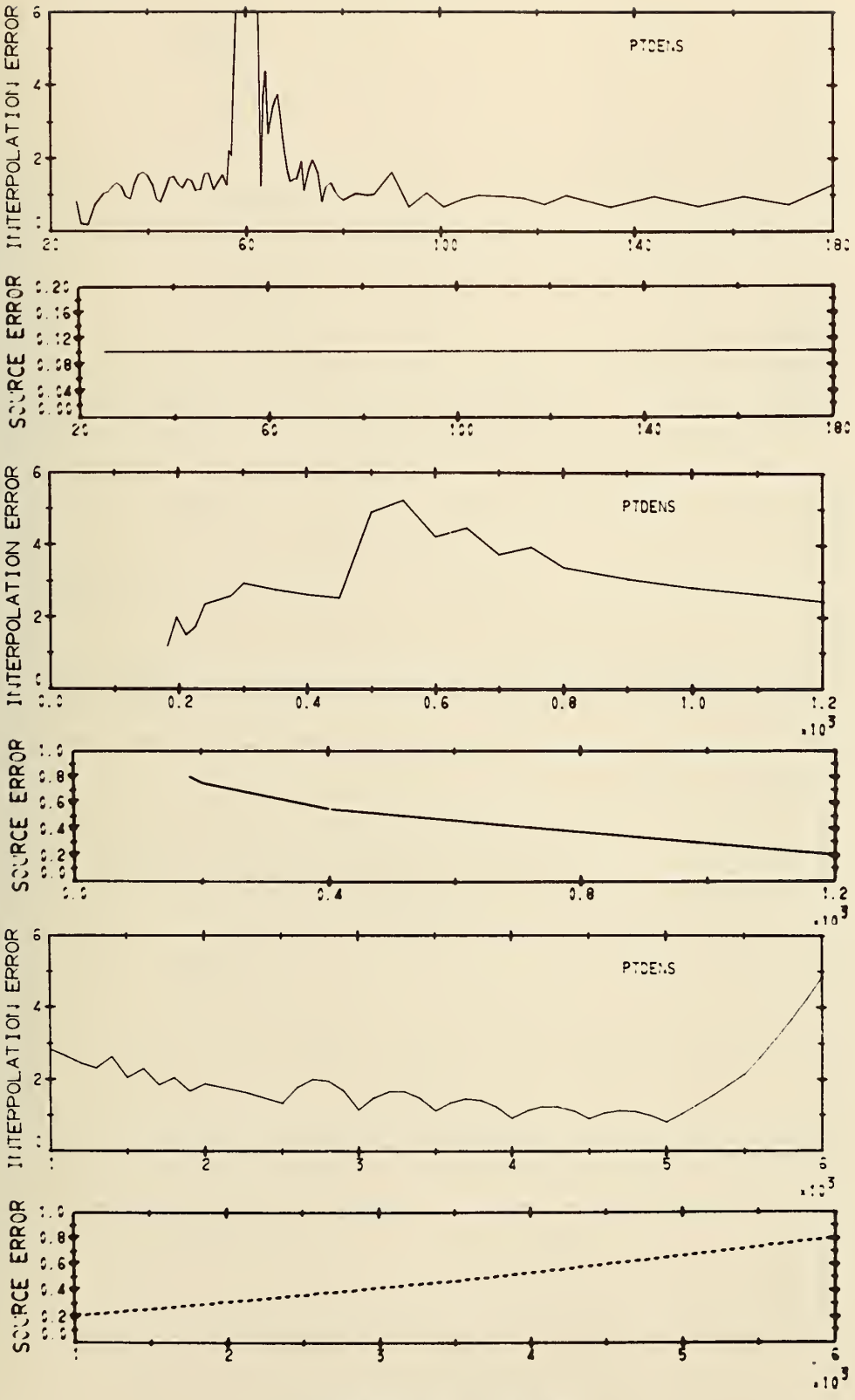
```
     1(P-187.51))
      GO TO 33
    8 R=1.0/(3.1136694-.2115577*(P-187.51)+.4487232*R+.004707536*R*
     1(P-187.51))
      GO TO 17
    9 IF(H.GE.145.) GO TO 10
      N=9
      IF(P.GE.166.) GO TO 33
      IF(H.GE.91.27) GO TO 33
      GO TO 17
   10 N=10
      GO TO 33
   11 IF(H.LT.-105.) GO TO 21
      N=2
      IF(P.LT.125.) GO TO 17
      GO TO 33
   12 IF(H.LT.11000.) GO TO 26
      IF(P.GE.80.) GO TO 15
      IF(P.GE.30.) GO TO 14
      IF(P.GE.5.) GO TO 13
      N=19
      GO TO 33
   13 N=18
      GO TO 33
   14 N=17
      GO TO 33
   15 IF(P.GT.500.) GO TO 16
      N=16
      GO TO 33
   16 N=15
      GO TO 33
   17 DO 18 I=2,18
      IF(P-PL(I))19,19,18
   18 CONTINUE
   19 D=PL(I)-PL(I-1)
      DF=PL(I)-P
      DB=P-PL(I-1)
      HGAS=(HG(I)*DB+HG(I-1)*DF)/D
      IF(H.GE.HGAS) GO TO 33
      HLIQ=(HL(I)*DB+HL(I-1)*DF)/D
      IF(H.LE.HLIQ) GO TO 33
      CLIQ=(CL(I)*DB+CL(I-1)*DF)/D
      EHLFAC=((CG(I)*DB+CG(I-1)*DF)/D-CLIQ)*(H-HLIQ)/(HGAS-HLIQ)+CLIQ
      RETURN
   21 N=1
      IF(H.LE.(-132.82+0.04*P)) GO TO 22
      IF(P.LT.23.) GO TO 17
      GO TO 33
   22 PR=P/500.0
      I=PR
      IF(I.GT.9) I=9
      F=PR-I
      HSOL=F*HS(I+2)+(1.0-F)*HS(I+1)
      IF(H.LT.HSOL) H=HSOL
      GO TO 33
   26 IF(H.LT.1800.) GO TO 27
      N=14
      GO TO 33
      R=1.0
      IF(P.LT.1.0) P=1.0
      IF(H.GE.425.) GO TO 12
      IF(P.LT.500.) GO TO 6
      IF(P.LT.2000.) GO TO 2
      IF(H.LT.75.) GO TO 1
      N=12
      GO TO 33
    1 N=8
      GO TO 22
    2 IF(H.LT.25.) GO TO 3
      N=11
      GO TO 33
    3 IF(P.GE.1000.) GO TO 5
      IF(H.LT.-75.) GO TO 4
      N=6
      GO TO 33
    4 N=3
      GO TO 22
    5 N=7
      GO TO 22
    6 IF(H.LT.-45.) GO TO 11
      IF(H.GE.70.) GO TO 9
      IF(P.LT.300.) GO TO 7
      N=5
      GO TO 33
    7 N=4
      R=H-31.225
      IF(R.LT.0.) R=-R
      IF(P.LT.187.51) GO TO 8
      R=1.0/(3.1136694+.2115577*(P-187.51)+.4487232*R-.004707536*R*
     1(P-187.51))
      GO TO 33
    8 R=1.0/(3.1136694-.2115577*(P-187.51)+.4487232*R+.004707536*R*
     1(P-187.51))
      GO TO 17
    9 IF(H.GE.145.) GO TO 10
      N=9
      IF(P.GE.166.) GO TO 33
      IF(H.GE.91.27) GO TO 33
      GO TO 17
   10 N=10
      GO TO 33
   11 IF(H.LT.-105.) GO TO 21
      N=2
      IF(P.LT.125.) GO TO 17
      GO TO 33
   12 IF(H.LT.11000.) GO TO 26
      IF(P.GE.80.) GO TO 15
      IF(P.GE.30.) GO TO 14
      IF(P.GE.5.) GO TO 13
      N=19
      GO TO 33
   13 N=18
      GO TO 33
   14 N=17
      GO TO 33
   15 IF(P.GT.500.) GO TO 16
```

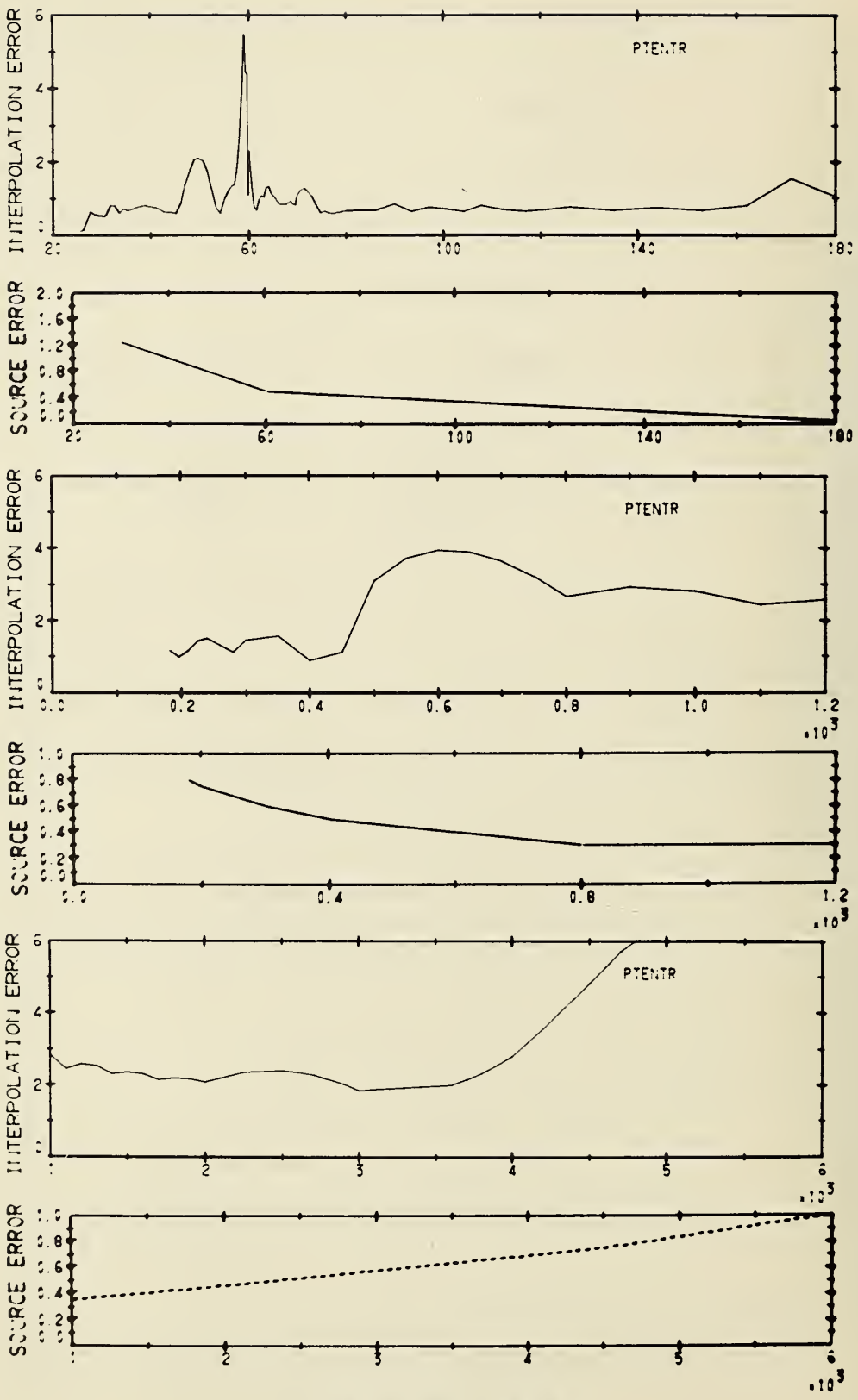
```
 27 N=13
 33 FP=(P-BP(N))/OP(N)
    IP=FP
    IF(IP.GT.MX(N))IP=MX(N)
    F=FP-IP
    FP=1.0-F
    FH=(H-BH(N))/OH(N)
    IH=FH
    FF=FH-IH
    FH=1.0-FF
    I=IH*JP(N)+IP+LOC(N)
    J=I+JP(N)
    EHLFAC=(FP*FH*C(I)+F*FH*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))/R
    RETURN
    ENO

    SUBROUTINE EHLFOATA
    COMMON/EHFAC/C(735)
    DATA((C(I),I=363,443)=3451.66,4849.4,6188.86,6994.94,7168.69,7104.
   109,3791.29,4918.,5969.54,6695.8,6982.69,7017.76,4006.89,5834.6,692
   22.69,7017.76,4667.14,5721.09,6470.54,6757.48,5115.49,5776.14,6285.
   399,6537.08,5368.51,5792.94,6144.19,6344.55,5462.97,5743.82,5987.3,
   46150.32,5440.93,5636.73,5821.04,5961.11,5352.98,5504.8,5648.09,576
   54.34,5228.49,5348.9,5465.28,5565.41,6083.13,5525.8,5268.48,5036.73
   6,4817.54,4597.02,6994.44,6153.8,5896.11,5686.86,5507.01,5339.79,71
   799.08,6659.,6301.02,6087.42,5929.27,5789.72,6820.36,6731.35,6503.2
   87,6312.95,6162.,6042.89,6537.08,6621.05,6516.7,6380.12,6255.98,614
   98.22,6296.57,6412.18,6398.38,6327.95,6244.16,6161.77,6056.85)
    OATA((C(I),I=444,528)=6185.82,6216.64,6197.45,6154.28,6102.33,5813
   1.89,5944.09,5996.95,6012.04,6003.13,5980.24,5565.41,5695.4,5729.92
   2,5771.31,5793.15,5799.82,5339.79,4785.16,4181.33,3333.,5789.72,536
   38.27,4986.06,4485.7,6042.89,5705.81,5389.54,5058.4,6148.22,5876.54
   4,5636.73,5398.75,6161.77,5933.88,5743.18,5569.97,6102.33,5930.31,5
   5779.14,5635.93,5980.24,5867.74,5757.56,5647.33,5799.82,5765.13,569
   65.57,5614.07,5215.,5565.,5750.,5740.,4575.5,4783.,5000.,5070.,4704
   7.4,4855.8,5005.,5068.,5072.85,5148.88,5225.,5264.,5361.22,5402.44,
   85446.,5470.,5572.24,5594.66,5614.91,5633.19,5572.24,5678.2,6245.6,
   96157.13,6693.96,6633.7,7184.27,7526.5,7685.7,7965.,8506.7,8458.8)
    DATA((C(I),I=529,617)=8150.7,8317.72,8479.83,8716.9,8828.03,8986.9
   1,9496.,9371.,9570.,10972.,10305.,10364.,13238.,11700.,11510.,
   216211.,13603.,13045.,19683.,15947.,14971.,23416.,18604.,17245.,
   3  8185.,8180.,8206.41,9026.,8789.35,8753.87,10963.,9704.8,9454.4,1
   44285.,11452.,10750.,19035.,14075.,12725.,24499.,17417.,15342.,3029
   59.,21217.,18438.,36165.,25255.,21812.,8228.,8196.,8181.94,9553.,89
   626.2,8802.3,11955.,10587.,10128.,16096.,13524.,12488.,21535.,17607
   7.,15898.,27295.,22519.,20149.,33341.,27749.,24788.,39544.,33024.,2
   89545.,8361.,8256.97,8220.39,8204.8,9019.,8722.86,8617.05,8570.3,10
   9107.,9439.43,9194.01,9082.97,11816.,10516.,10041.,9844.8,14123.)
    OATA((C(I),I=618,703)=12069.,11279.,10928.6,17005.,14039.,12915.,1
   12373.5,20257.,16427.,14917.,14167.,23724.,19164.,17223.,16260.,273
   293.,22071.,19758.,18588.7,31161.,25115.,22457.,21091.,34954.,28248
   3.,25260.,23712.7,38762.,31420.,28130.,26406.7,42535.,34609.,31028.
   4,29147.3,46280.,37784.,33936.,31900.2,49965.,40941.,36831.,34654.1
   5,8527.87,8413.02,8361.48,8330.58,8309.44,9412.7,9108.2,9014.31,892
   69.25,8870.58,10944.,10314.,10088.3,9902.45,9772.64,13239.,12174.,1
   71736.9,11402.8,11165.7,16243.,14696.,13977.,13465.1,13096.1,19718.
   8,17703.,16729.9,16031.8,15521.8,23592.,21079.,19868.,18989.9,18341
   9.5,27628.,24761.,23267.7,22222.,21444.,31773.,28539.,26835.2)
    N=16
    GO TO 33
 16 N=15
    GO TO 33
 17 OO 18 I=2,18
    IF(P-PL(I))19,19,18
 18 CONTINUE
 19 D=PL(I)-PL(I-1)
    OF=PL(I)-P
    DB=P-PL(I-1)
    HGAS=(HG(I)*OB+HG(I-1)*DF)/O
    IF(H.GE.HGAS) GO TO 33
    HLIQ=(HL(I)*OB+HL(I-1)*OF)/O
    IF(H.LE.HLIQ) GO TO 33
    CLIQ=(CL(I)*OB+CL(I-1)*OF)/O
    EHLFAC=((CG(I)*OB+CG(I-1)*OF)/O-CLIQ)*(H-HLIQ)/(HGAS-HLIQ)+CLIQ
    RETURN
 21 N=1
    IF(H.LE.(-132.82+0.04*P)) GO TO 22
    IF(P.LT.23.) GO TO 17
    GO TO 33
 22 PR=P/500.0
    I=PR
    IF(I.GT.9) I=9
    F=PR-I
    HSOL=F*HS(I+2)+(1.0-F)*HS(I+1)
    IF(H.LT.HSOL) H=HSOL
    GO TO 33
 26 IF(H.LT.1800.) GO TO 27
    N=14
    GO TO 33
 27 N=13
 33 FP=(P-BP(N))/OP(N)
    IP=FP
    IF(IP.GT.MX(N))IP=MX(N)
    F=FP-IP
    FP=1.0-F
    FH=(H-BH(N))/OH(N)
    IH=FH
    FF=FH-IH
    FH=1.0-FF
    I=IH*JP(N)+IP+LOC(N)
    J=I+JP(N)
    EHLFAC=(FP*FH*C(I)+F*FH*C(I+1)+FP*FF*C(J)+F*FF*C(J+1))/R
    RETURN
    ENO
```

```
    OATA((C(I),I=704,735)=25631.7,24731.5,35976.,32392.,30496.1,29149.
   17,28137.7,40180.,36278.,34201.7,32718.4,31601.3,44475.9,40260.,379
   213.4,36306.3,35091.5,48630.5,44122.8,41611.3,39881.4,38571.7,52722
   3.8,47945.4,45268.9,43426.9,42032.8,56748.9,51708.4,48880.7,46933.7
   4,45453.1)
    ENO
```

APPENDIX C. PLOTS OF MAXIMUM INTERPOLATION ERROR AND ESTIMATED SOURCE ERROR


INTERPOLATION ERROR
PTENTH
BTU/lb
SOURCE ERROR
BTU/lb
INTERPOLATION ERROR
PTENTH
SOURCE ERROR
INTERPOLATION ERROR
PTENTH
SOURCE ERROR
TEMPERATURE, RANKINE


INTERPOLATION ERROR
PTDENS
SOURCE ERROR
INTERPOLATION ERROR
PTDENS
SOURCE ERROR
INTERPOLATION ERROR
PTDENS
SOURCE ERROR
TEMPERATURE, RANKINE


INTERPOLATION ERROR
PTENTR
SOURCE ERROR
INTERPOLATION ERROR
PTENTR
SOURCE ERROR
INTERPOLATION ERROR
PTENTR
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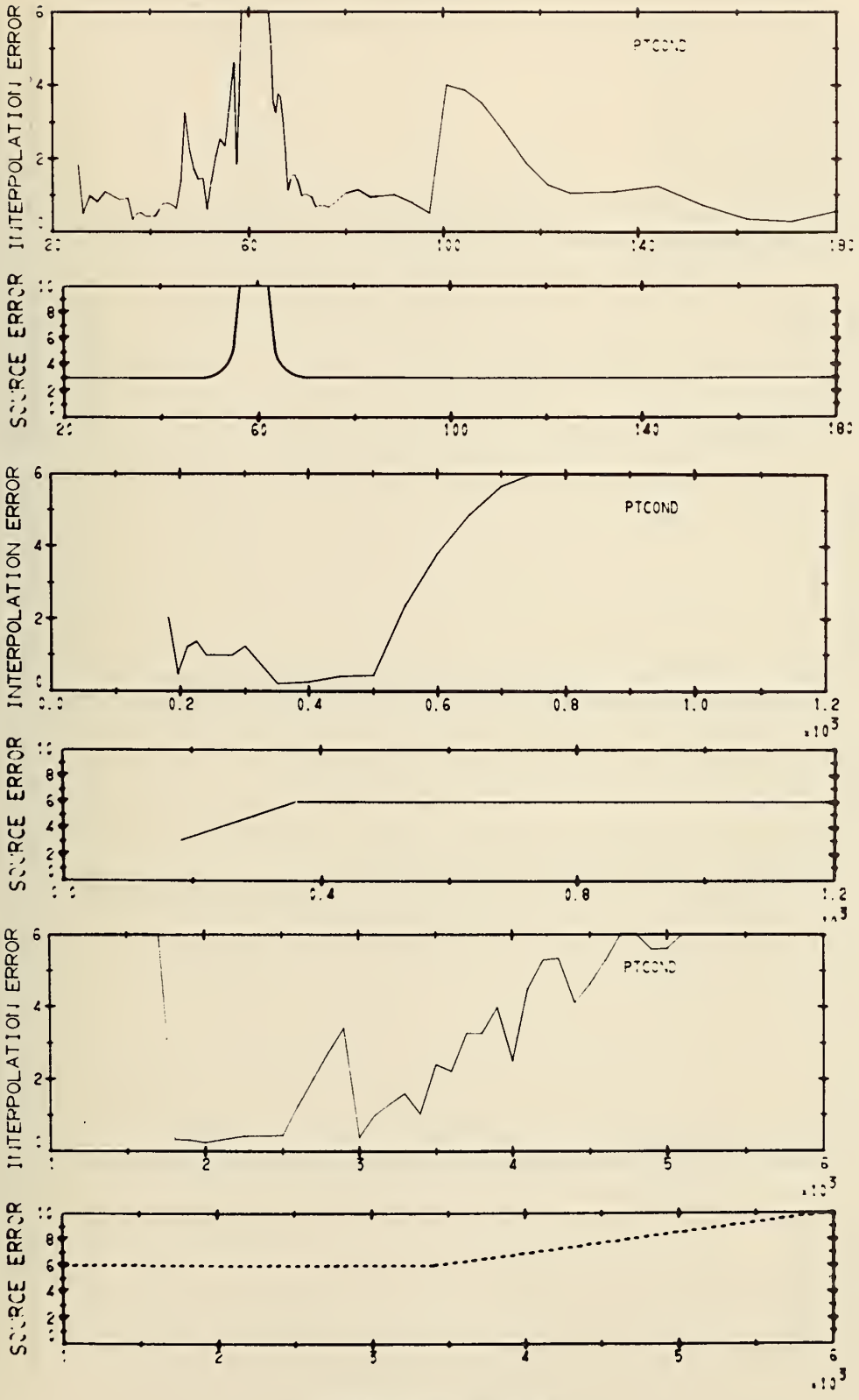
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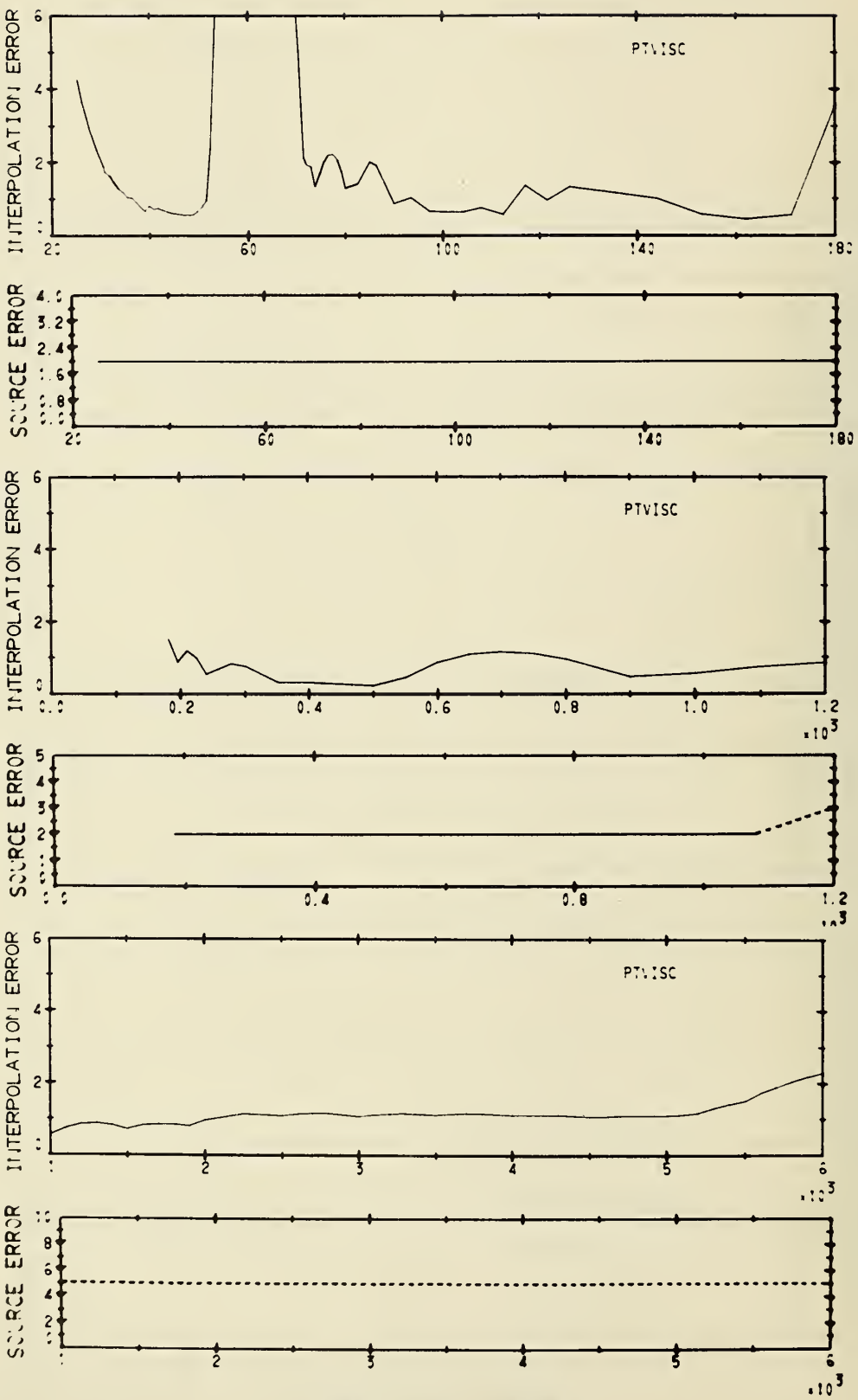
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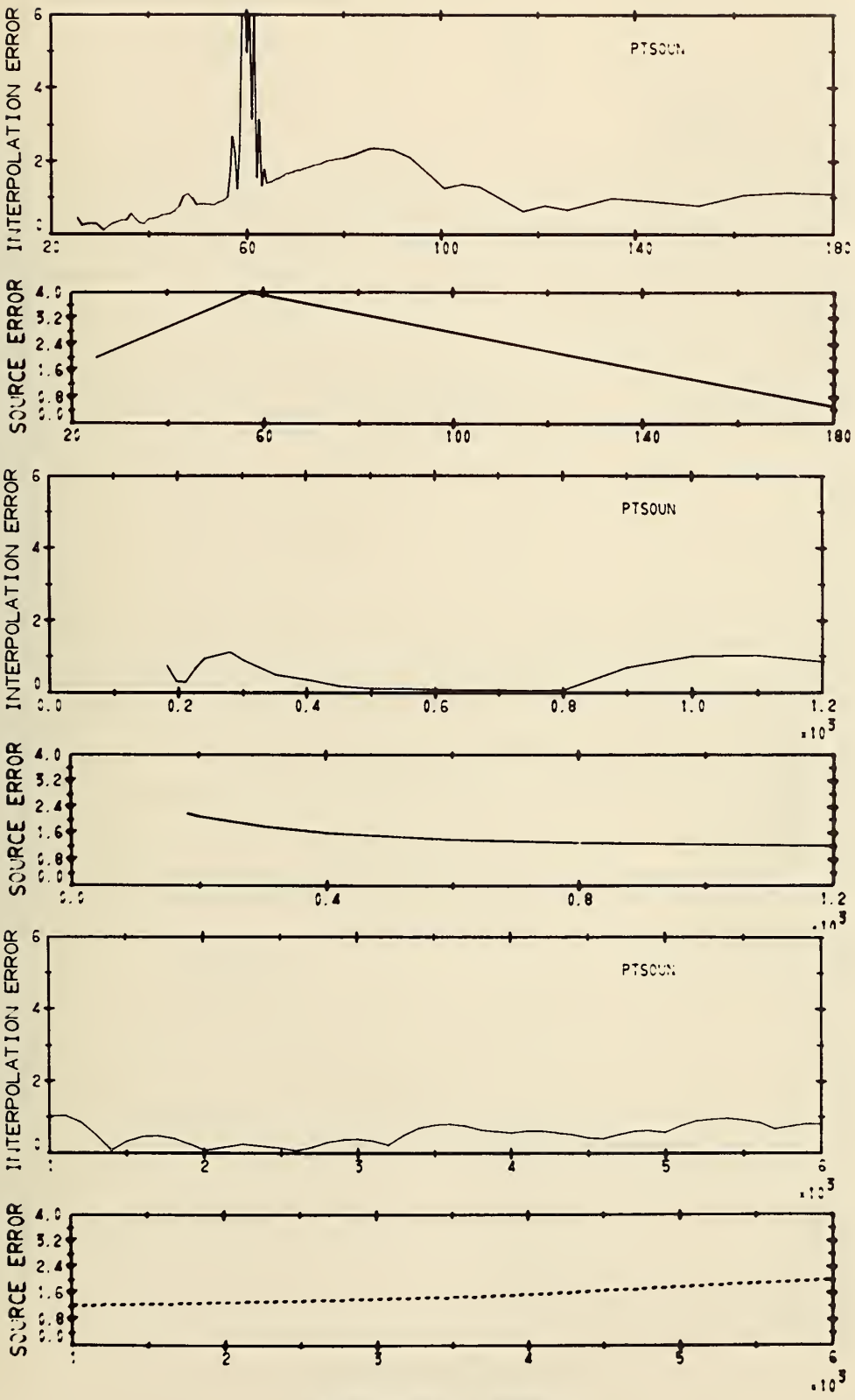
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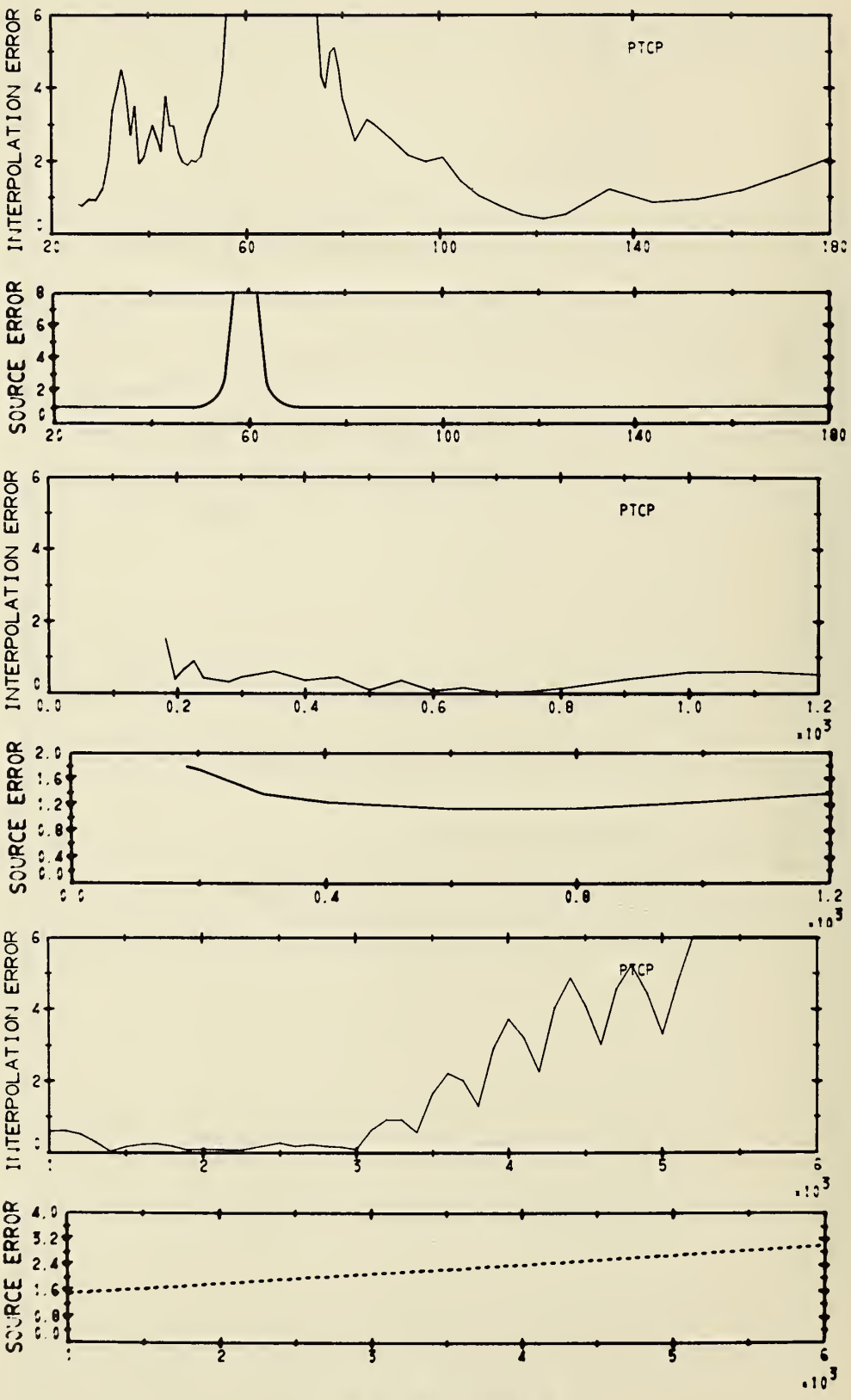
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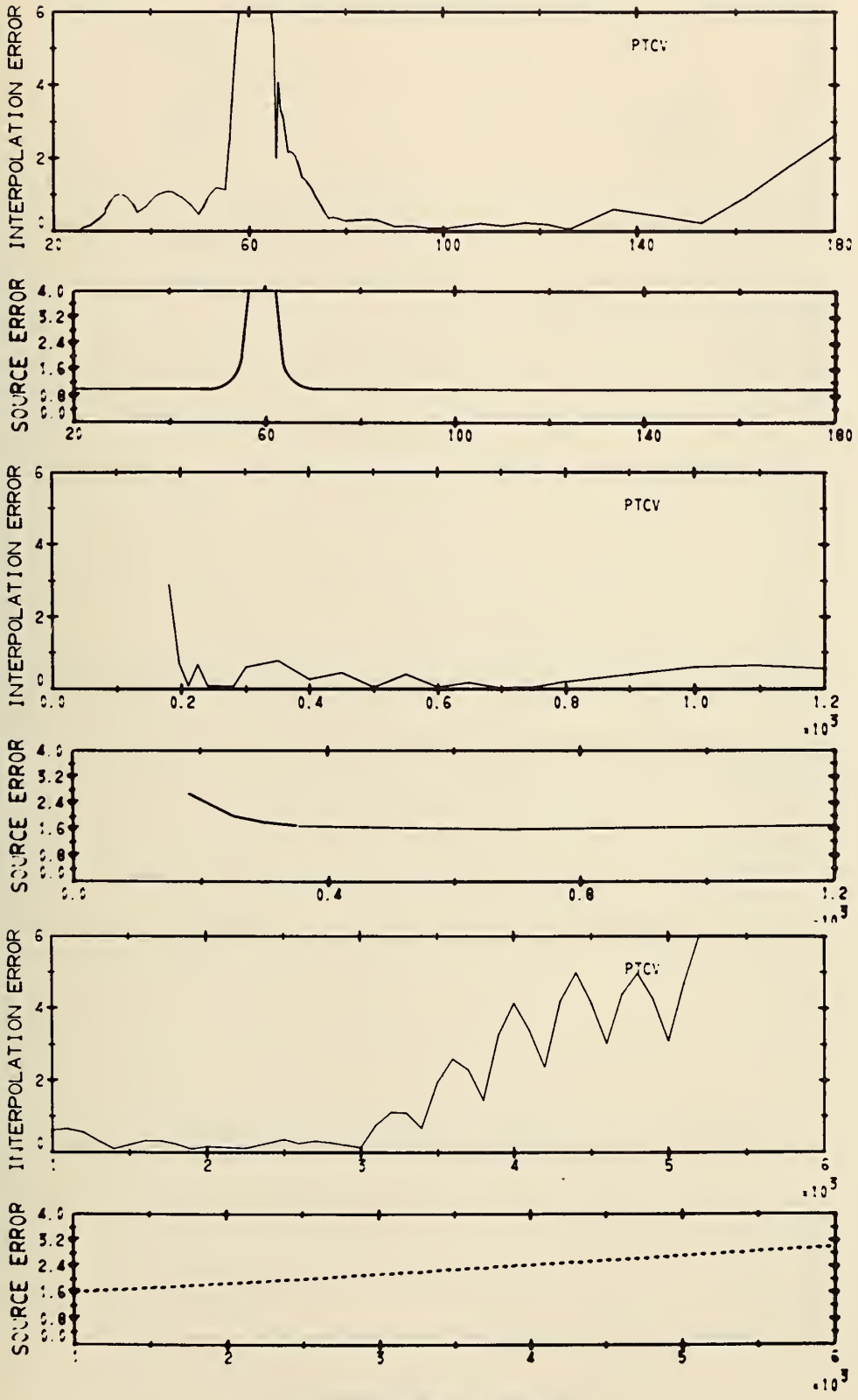
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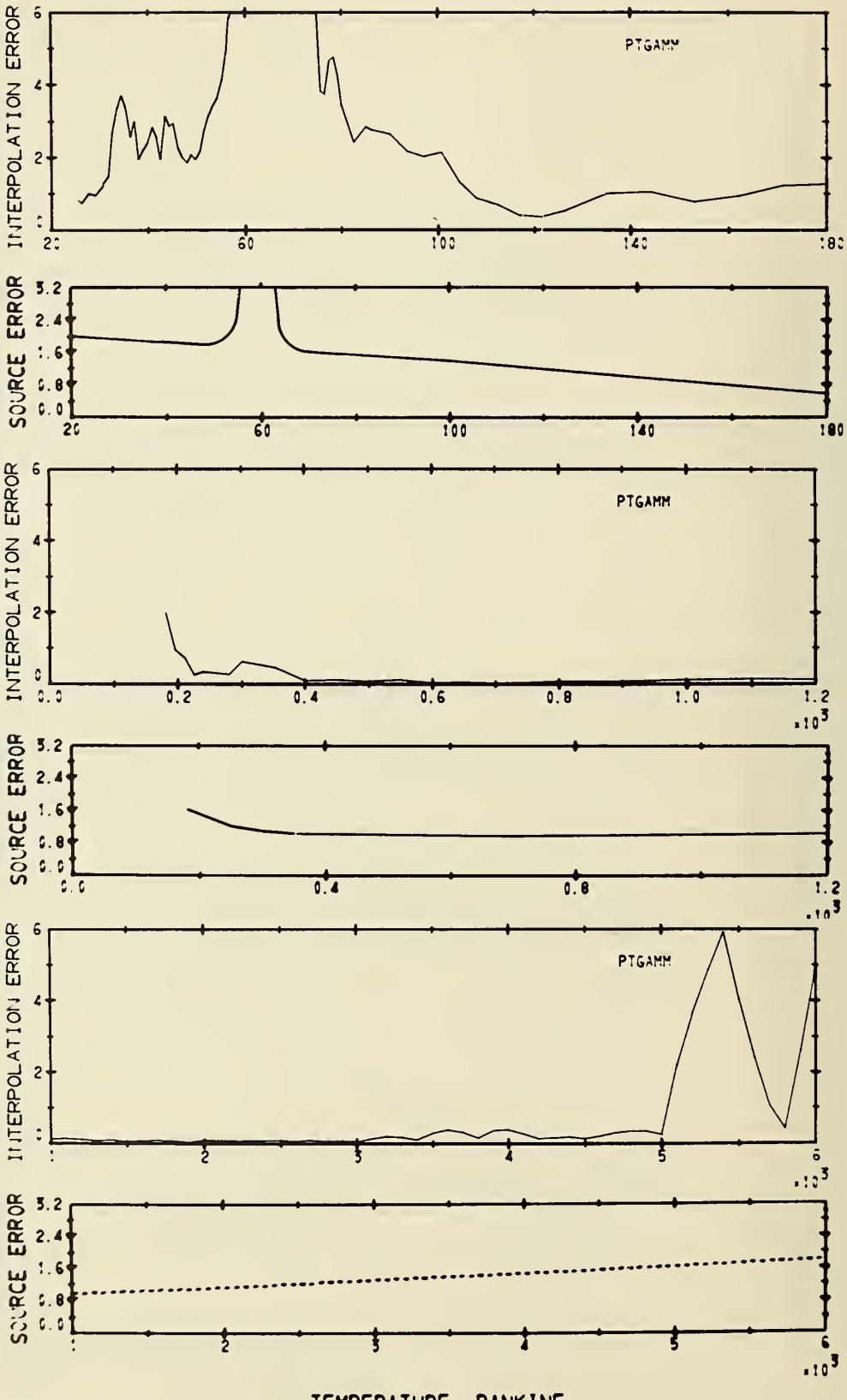
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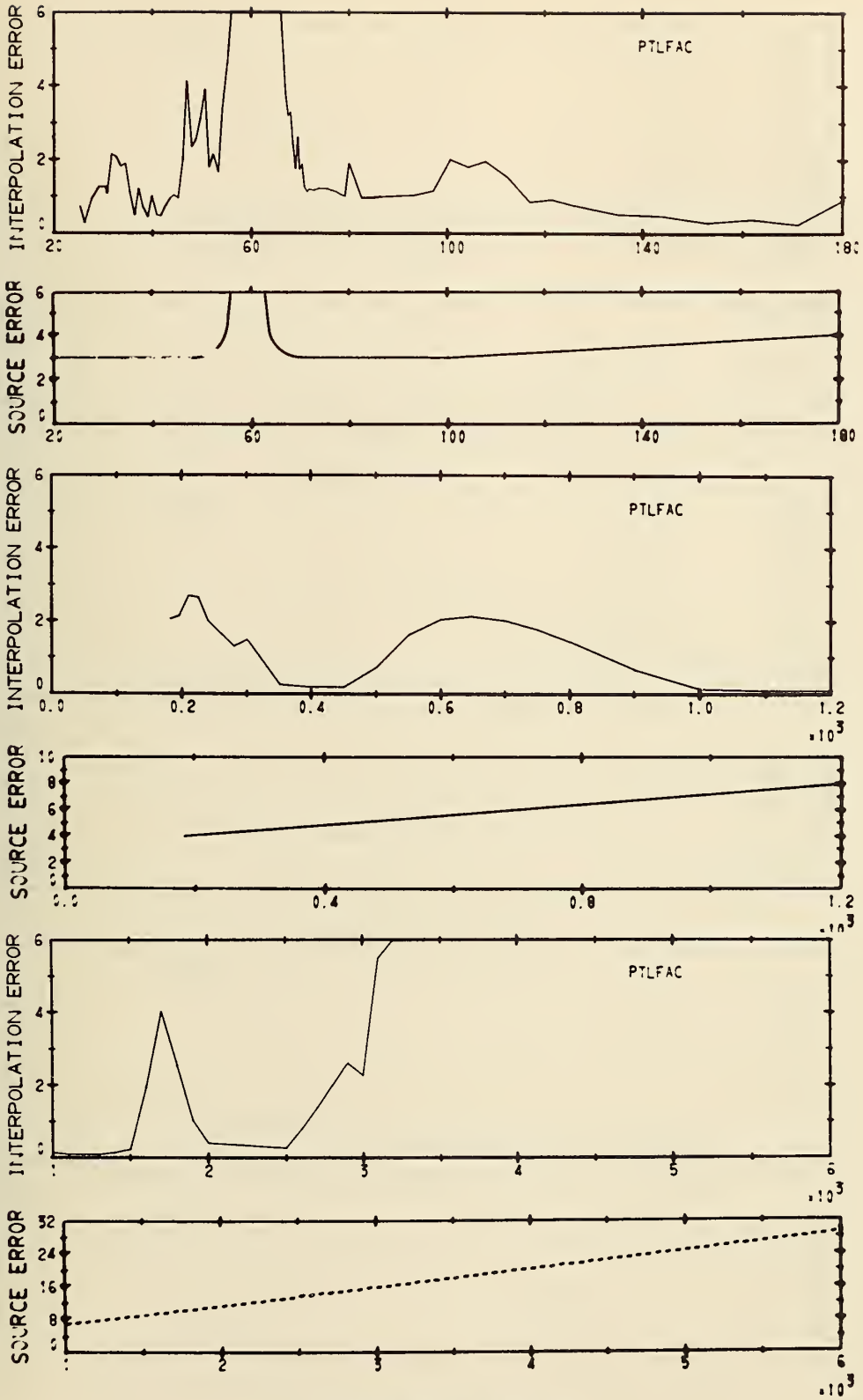
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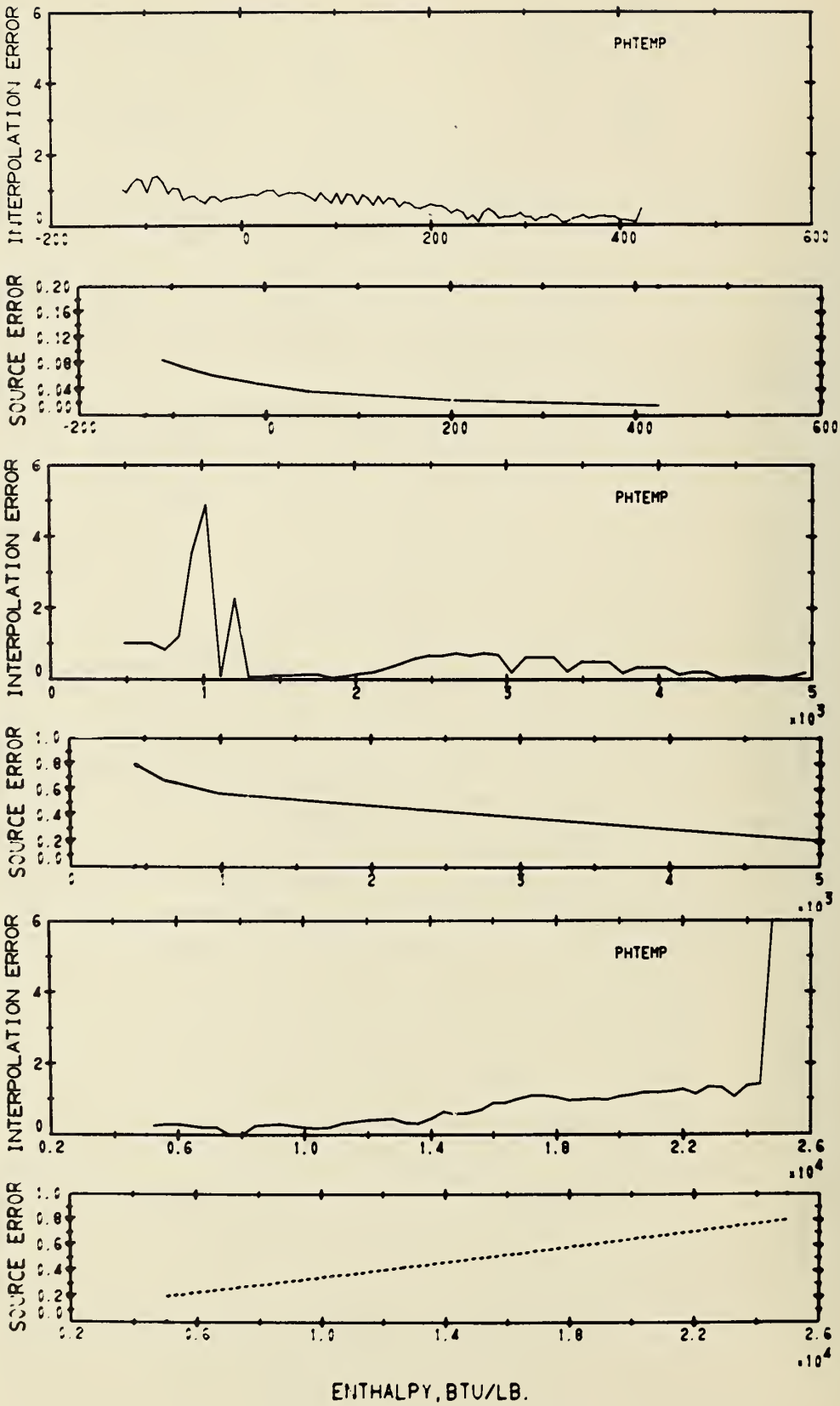
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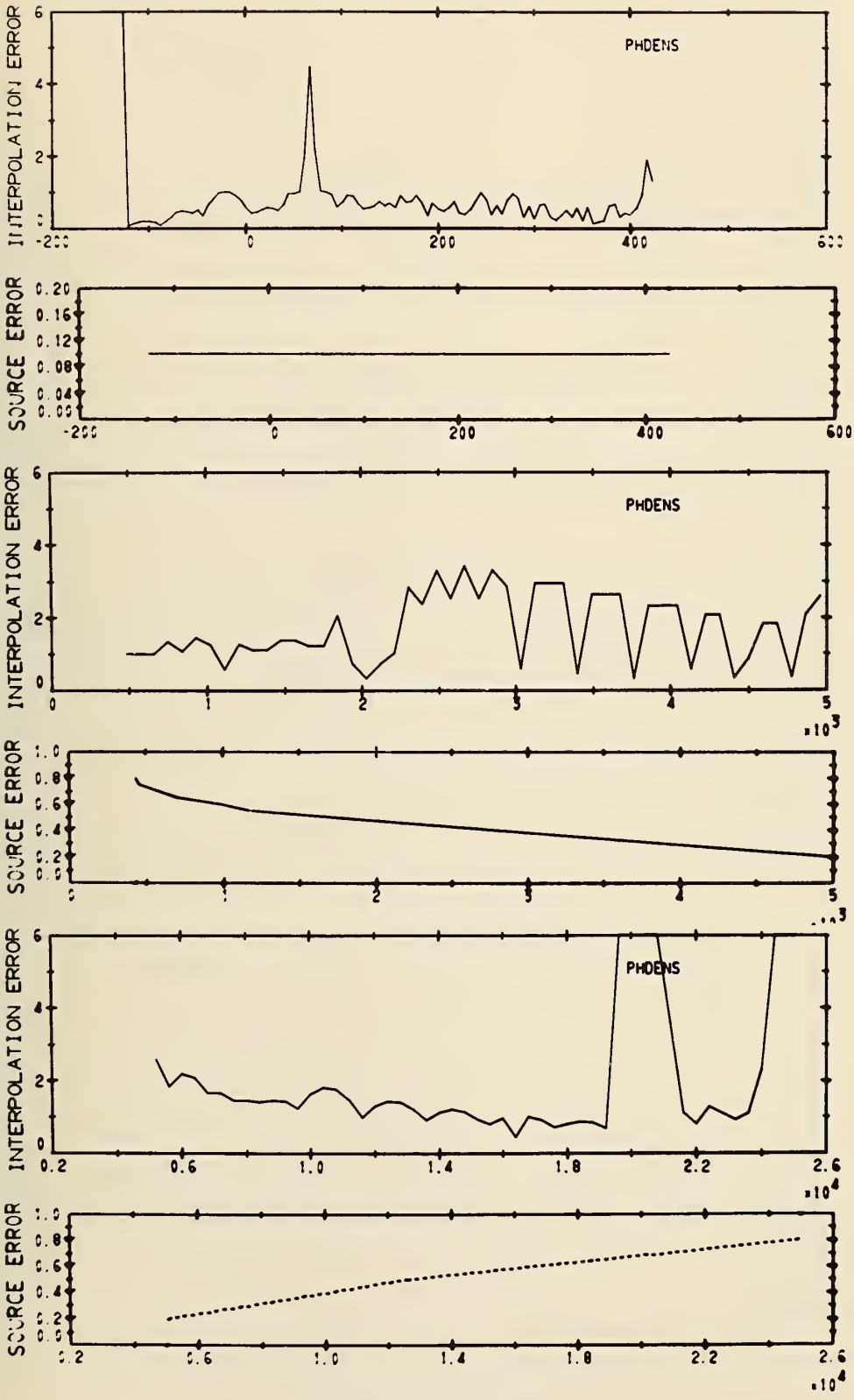
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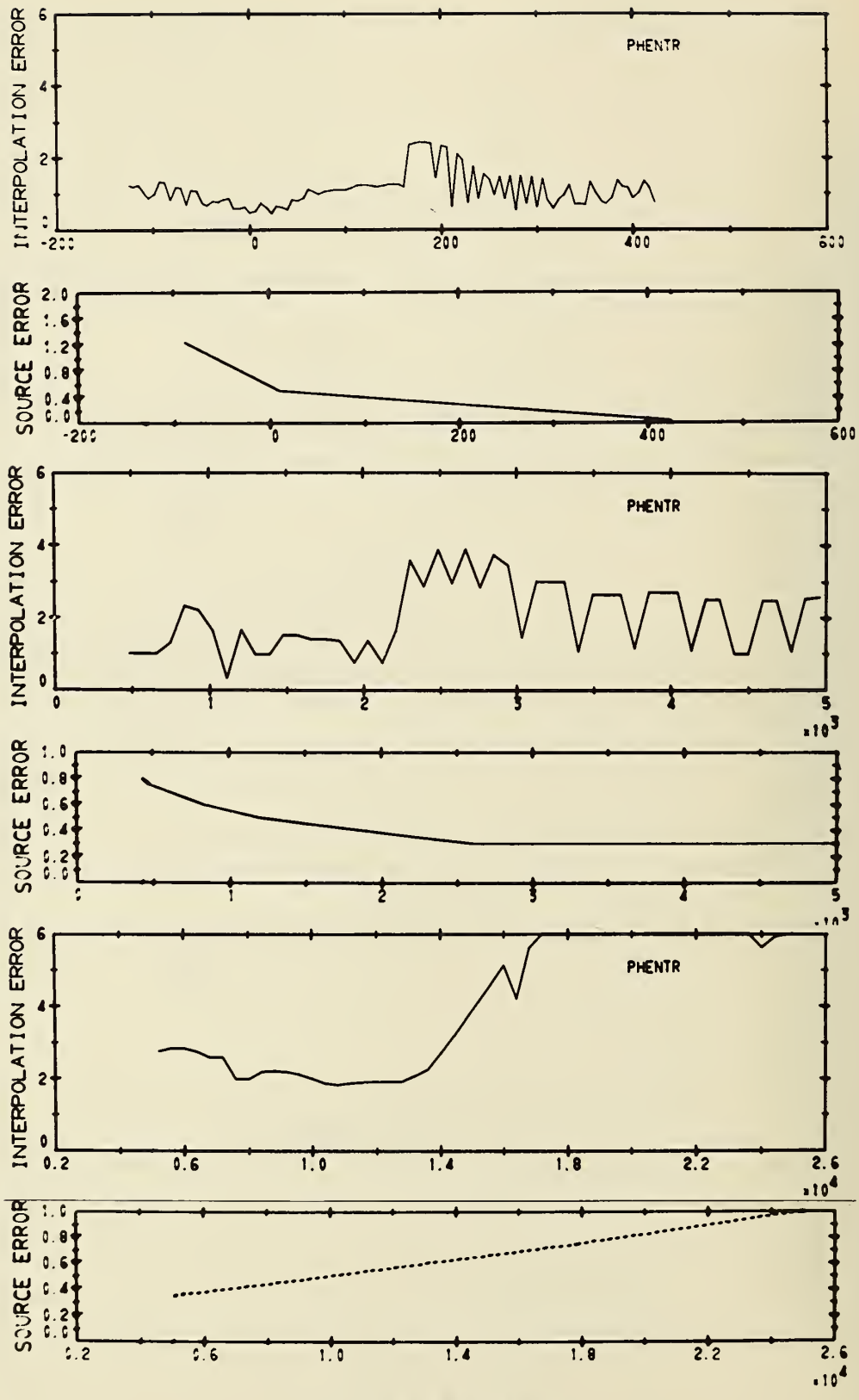
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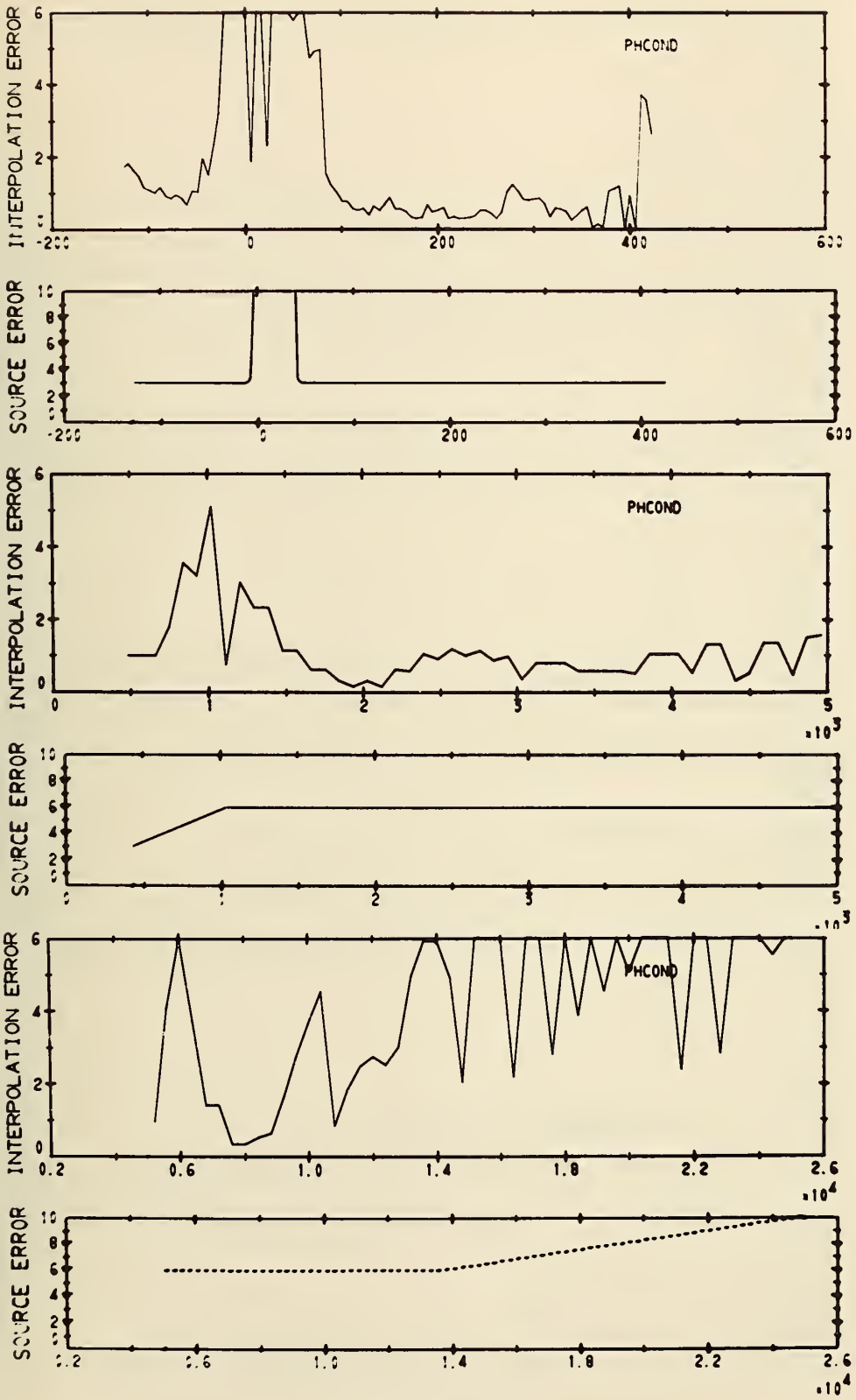
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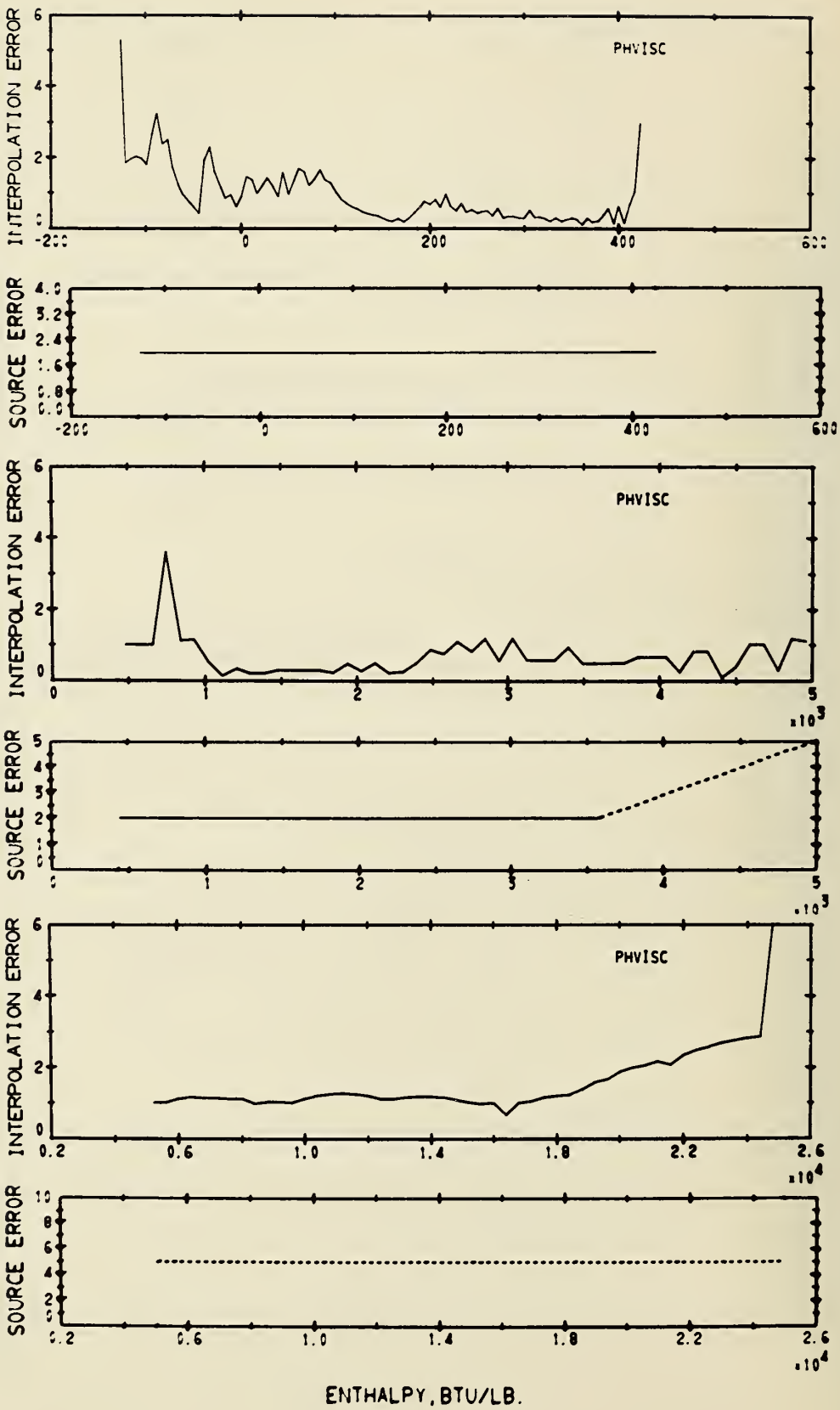
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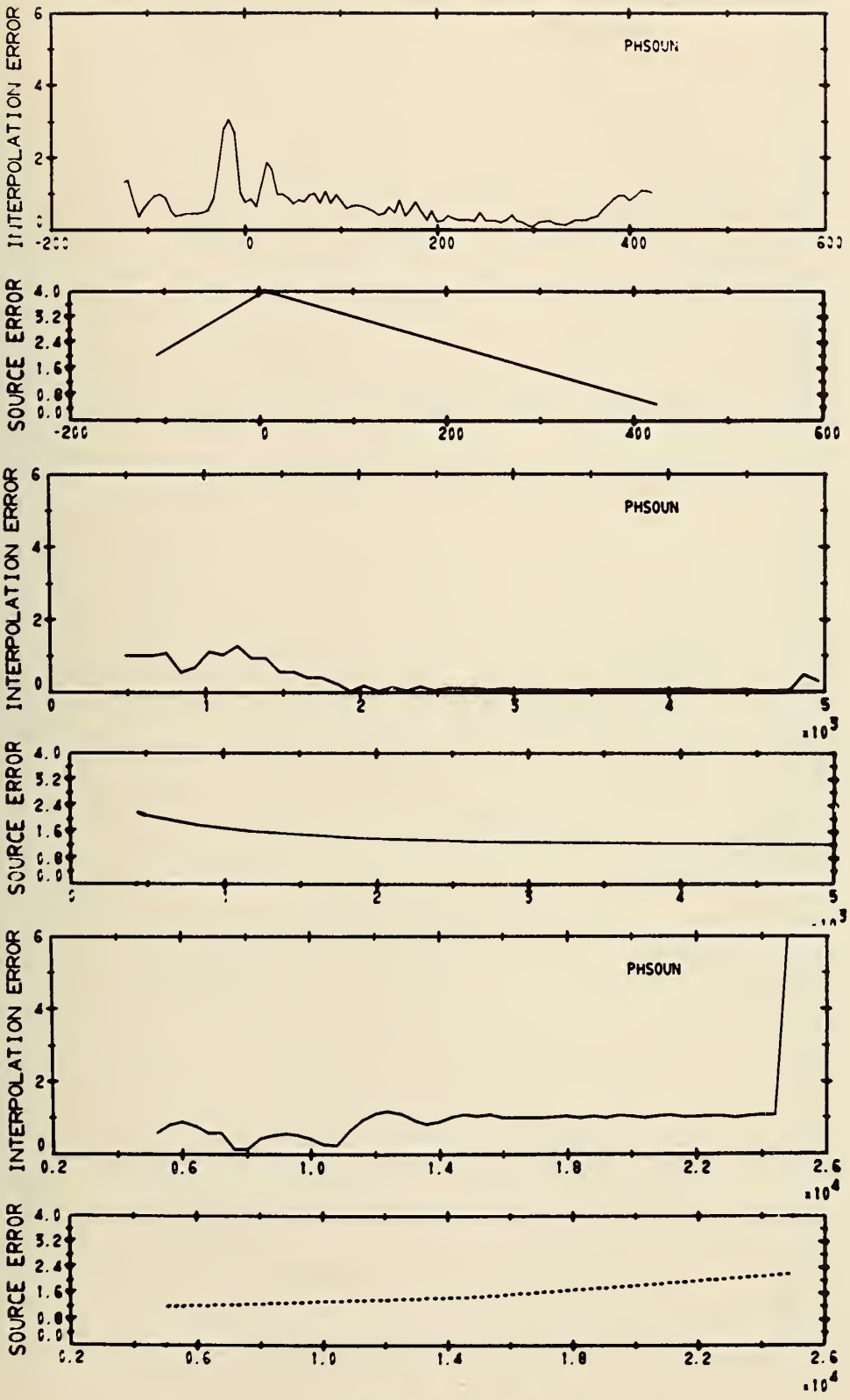
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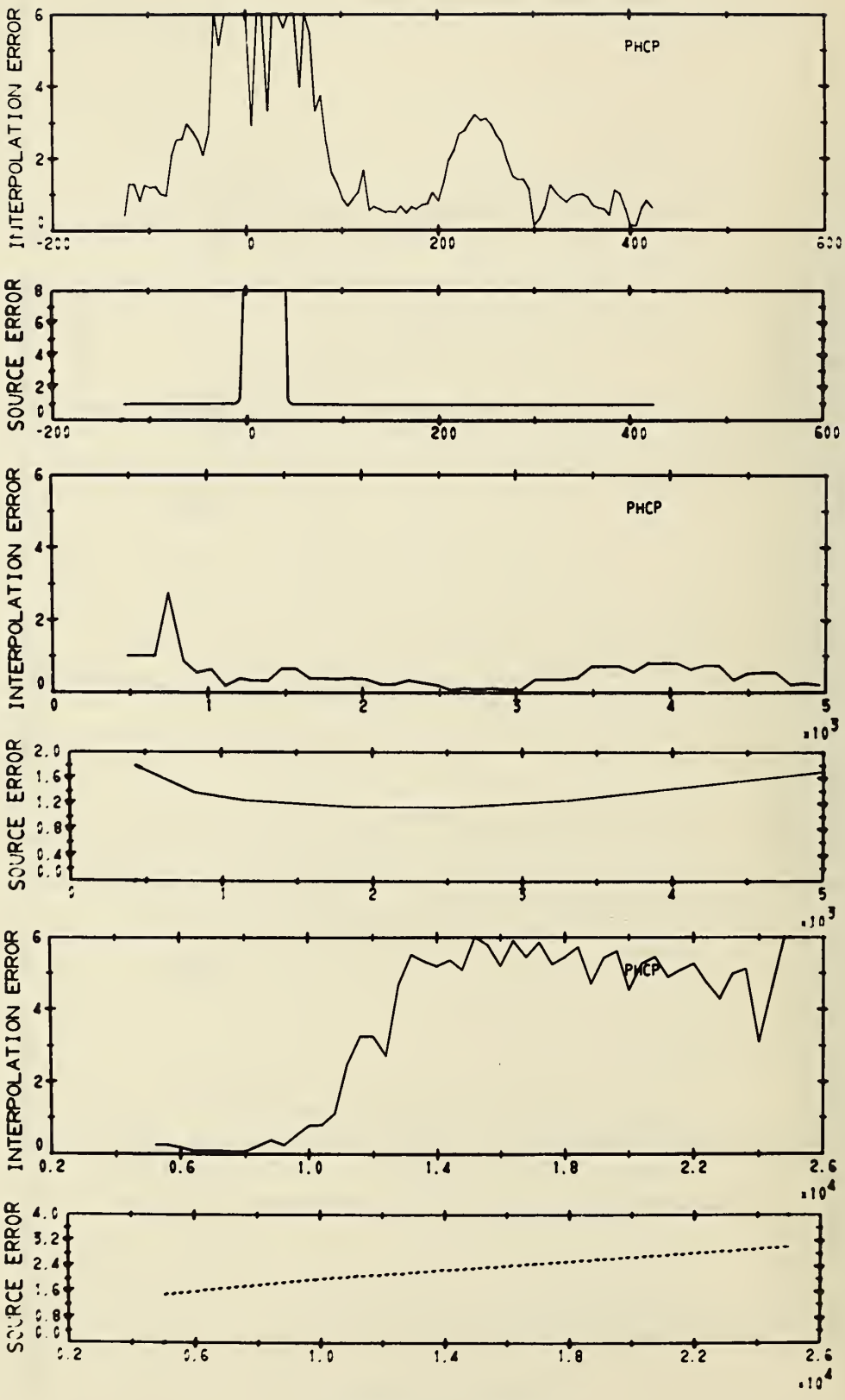
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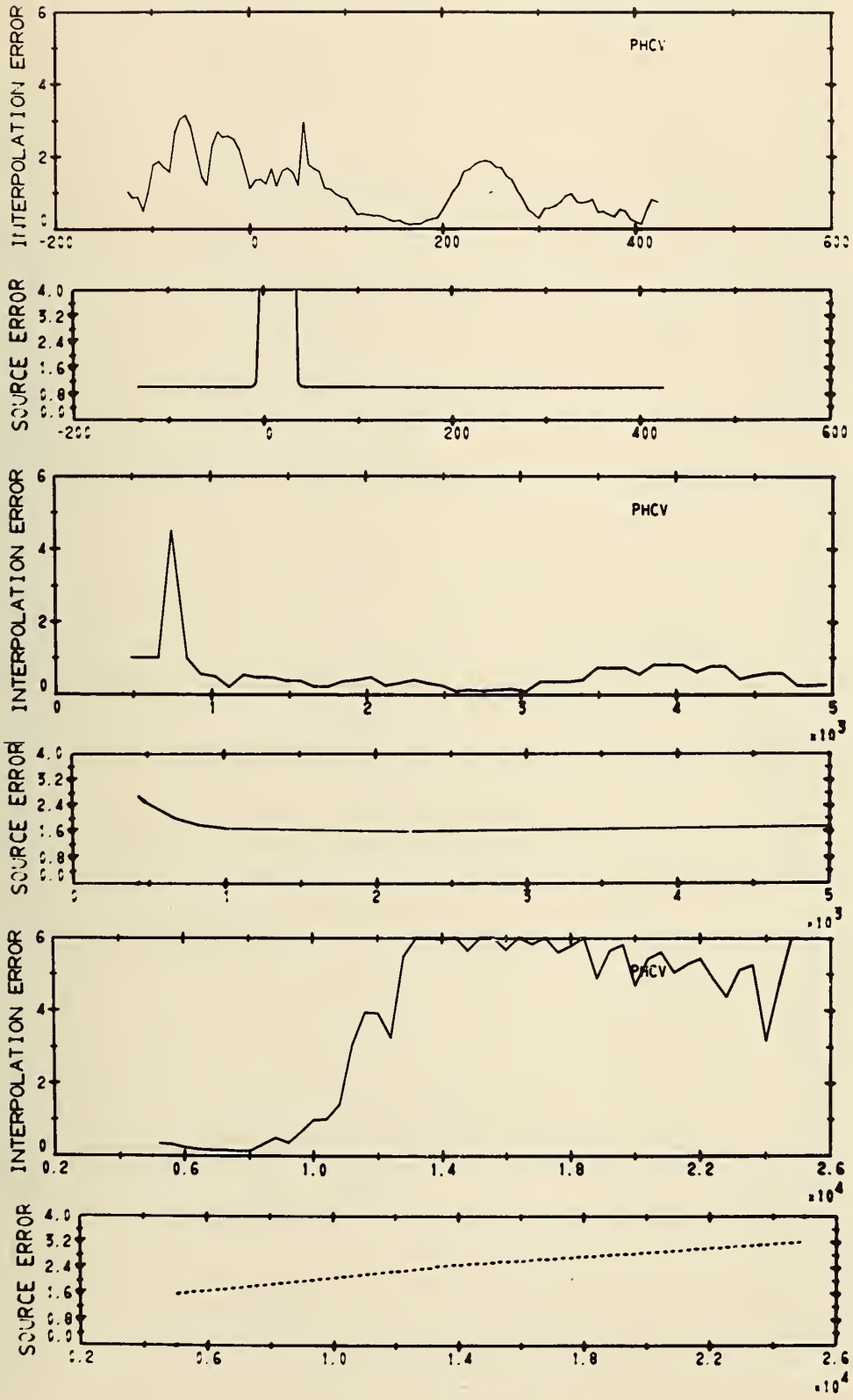
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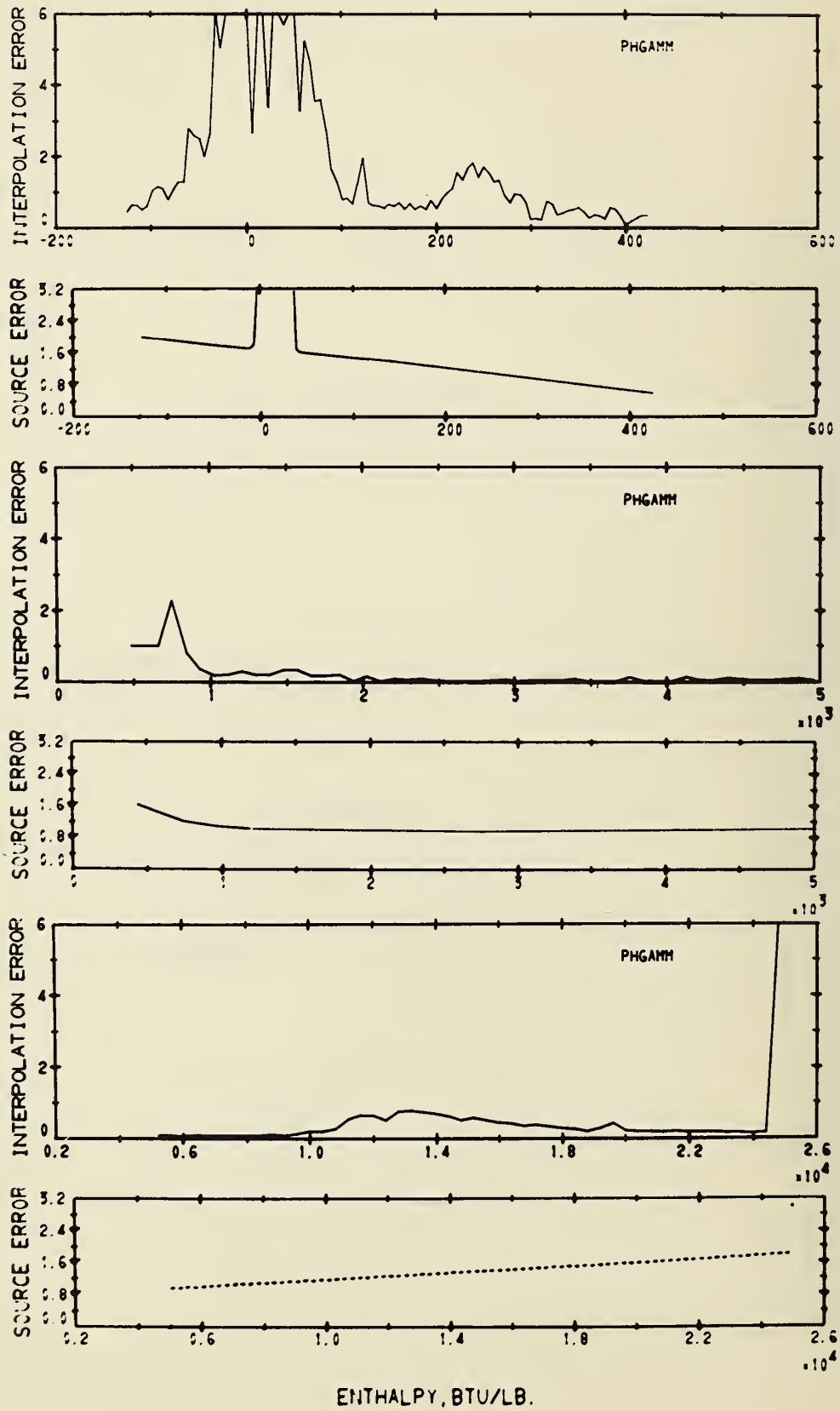
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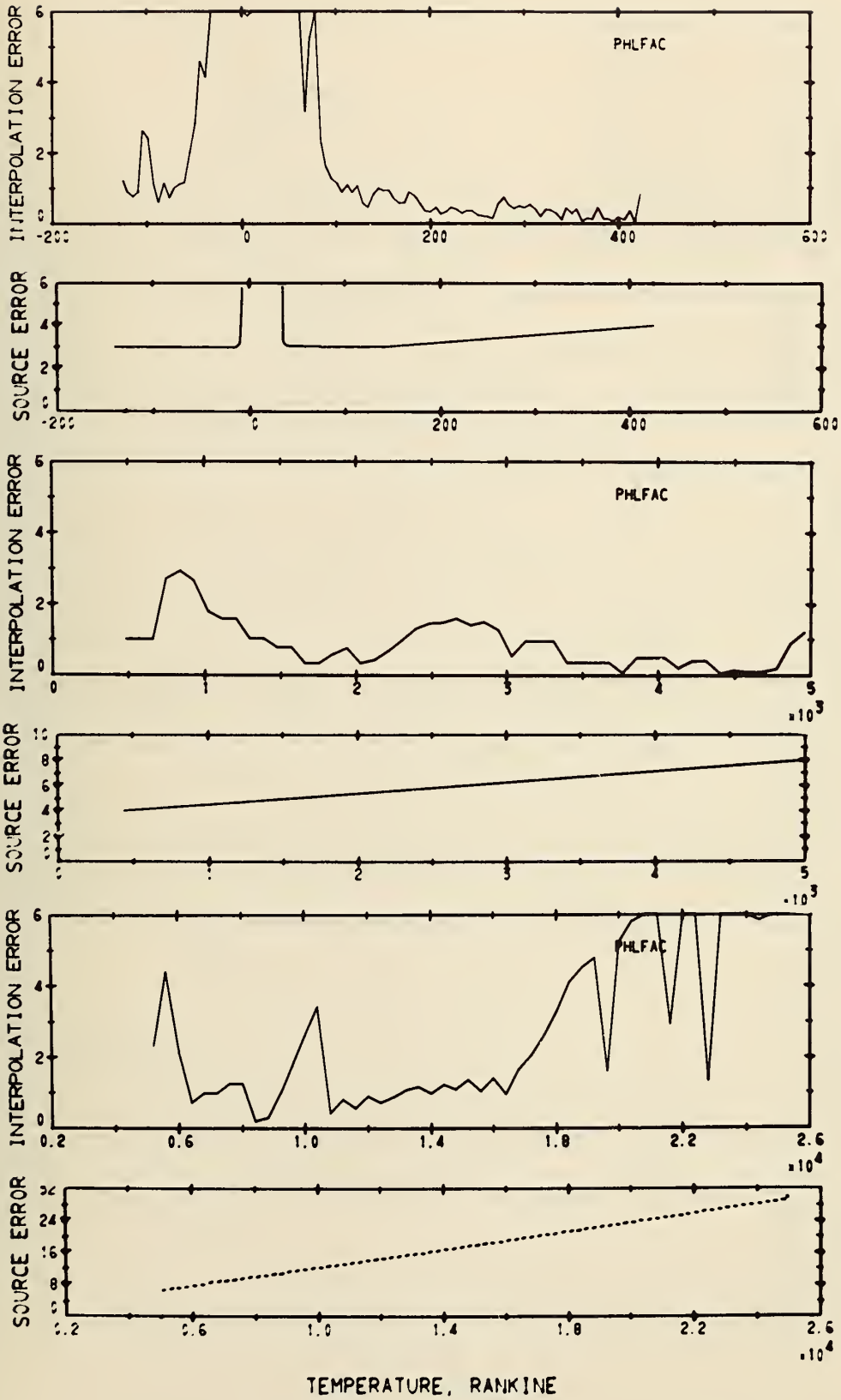
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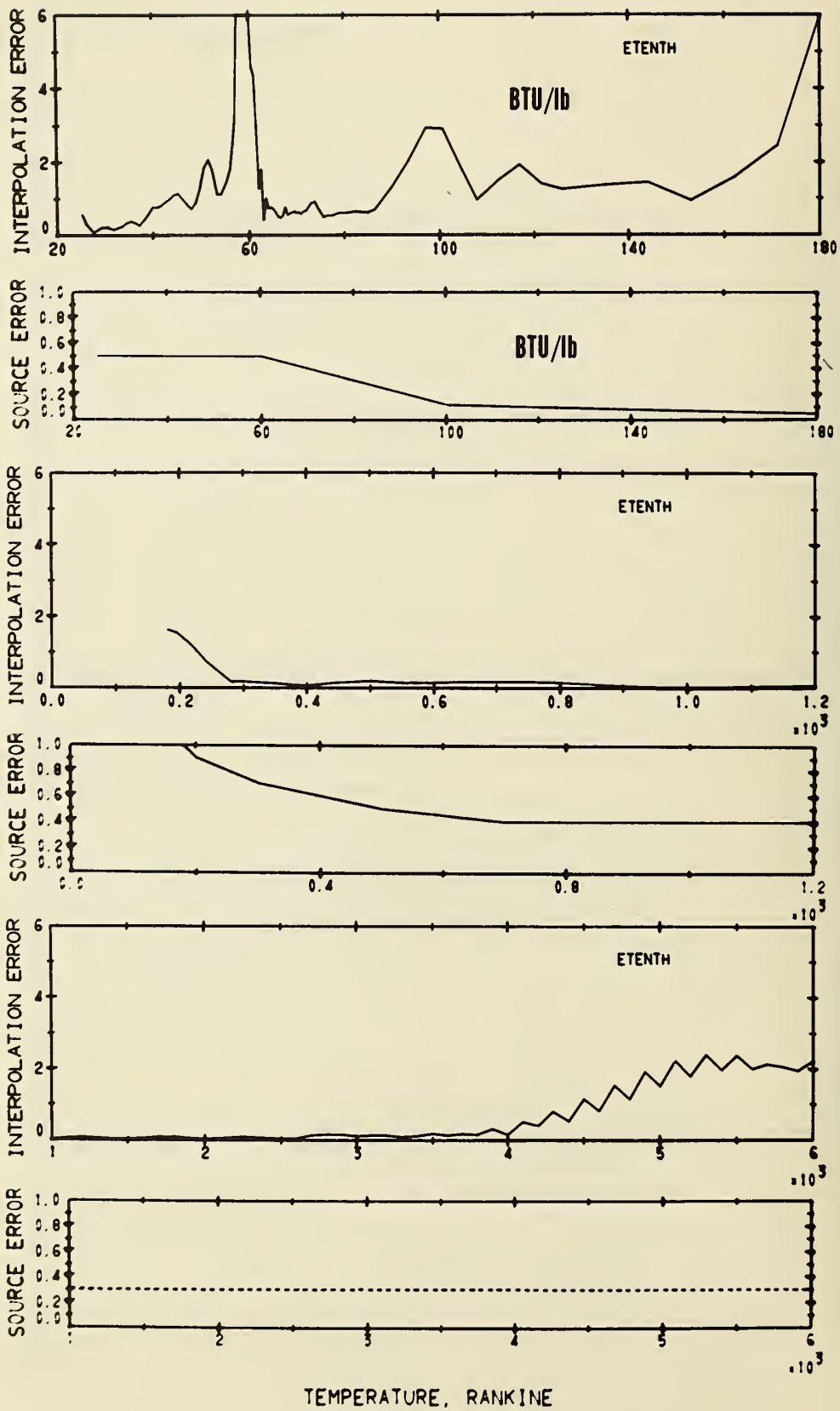
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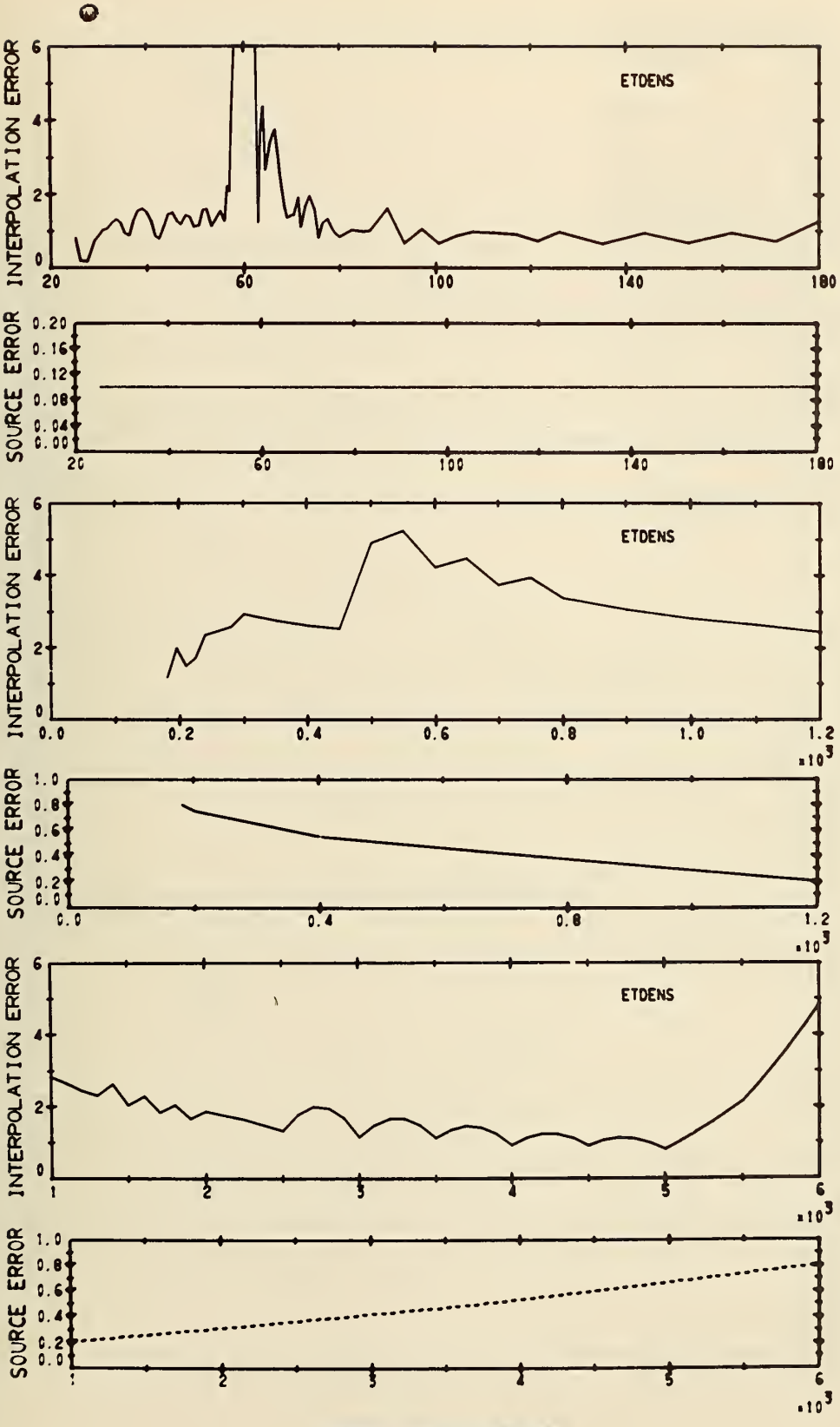
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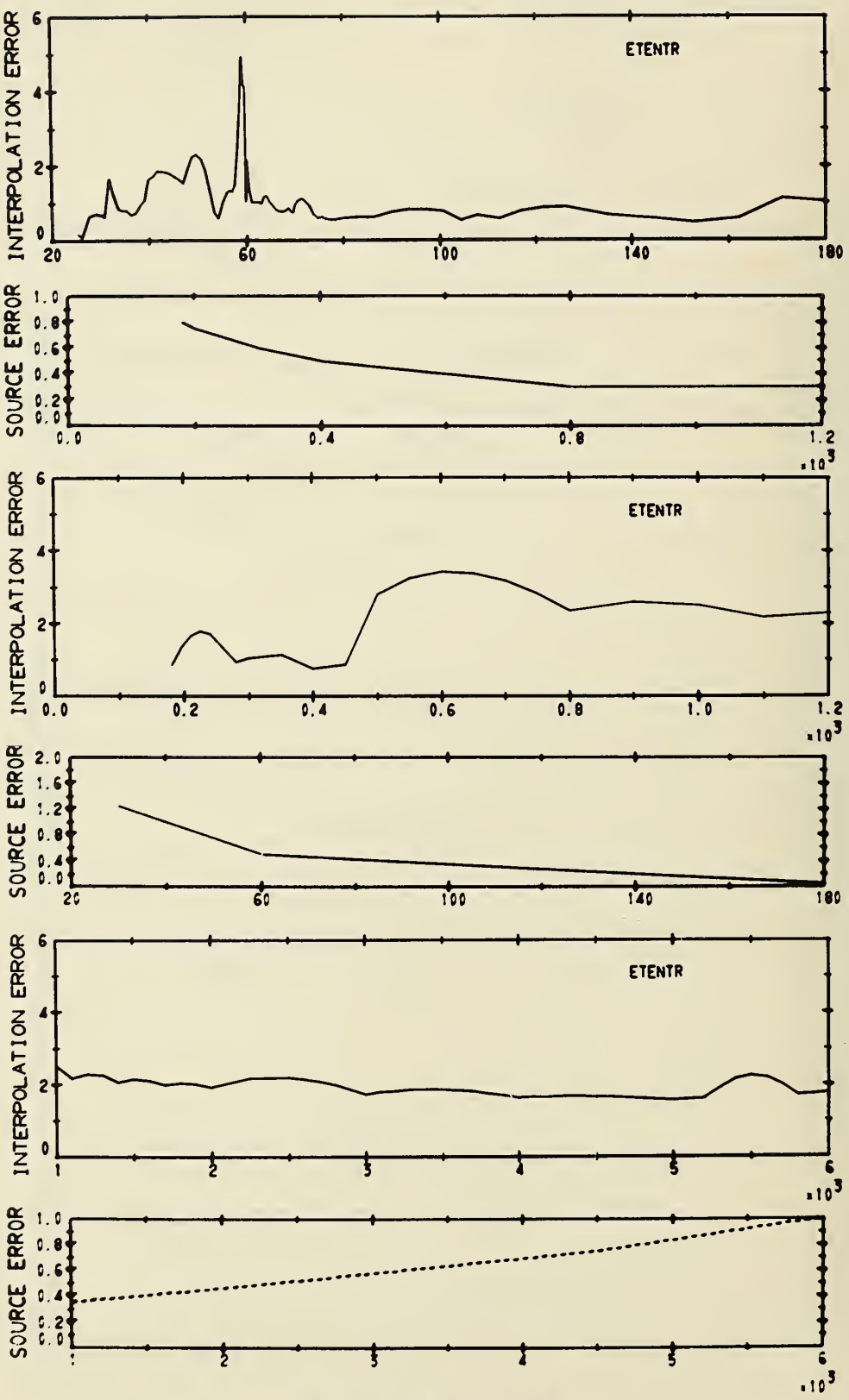
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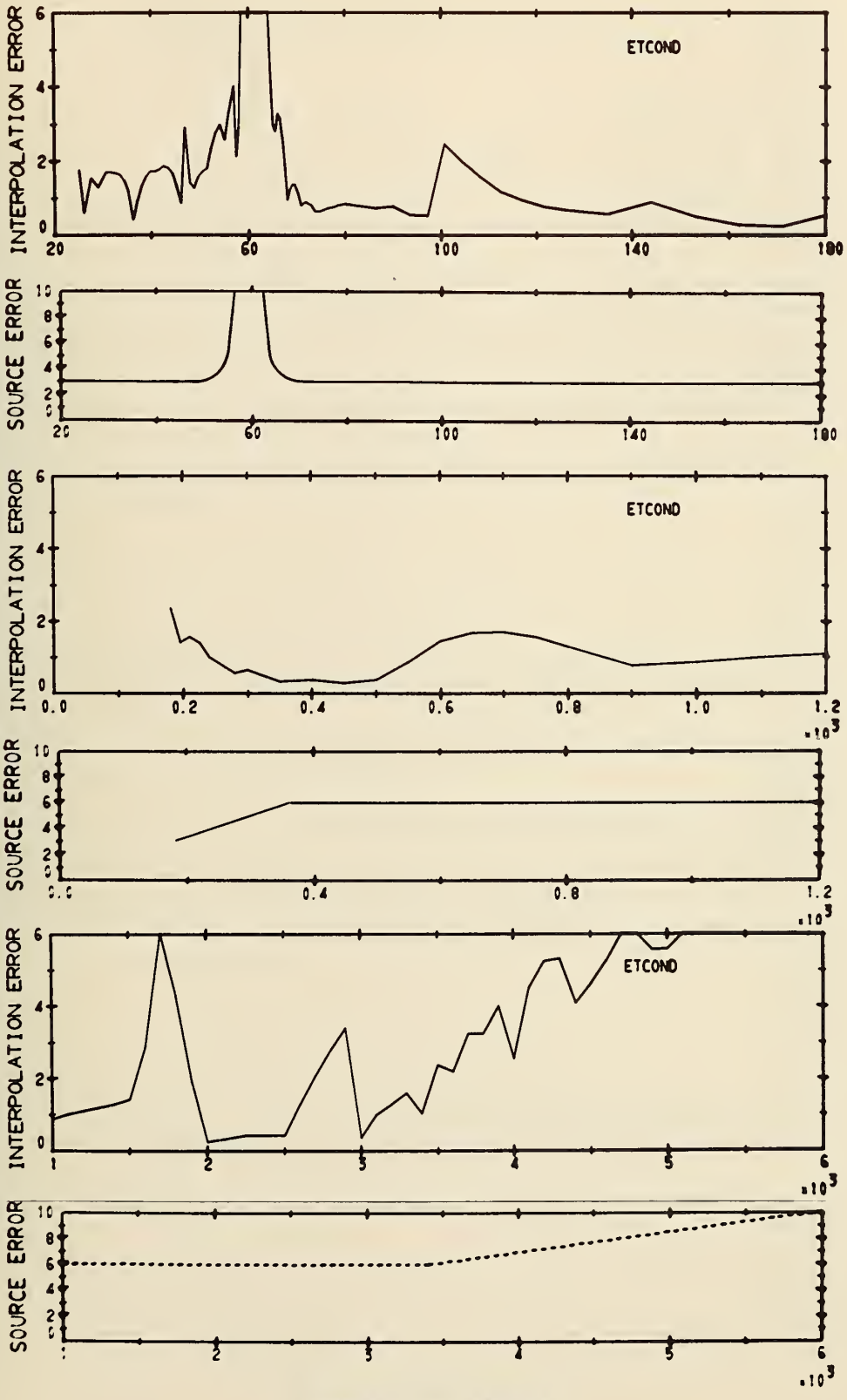
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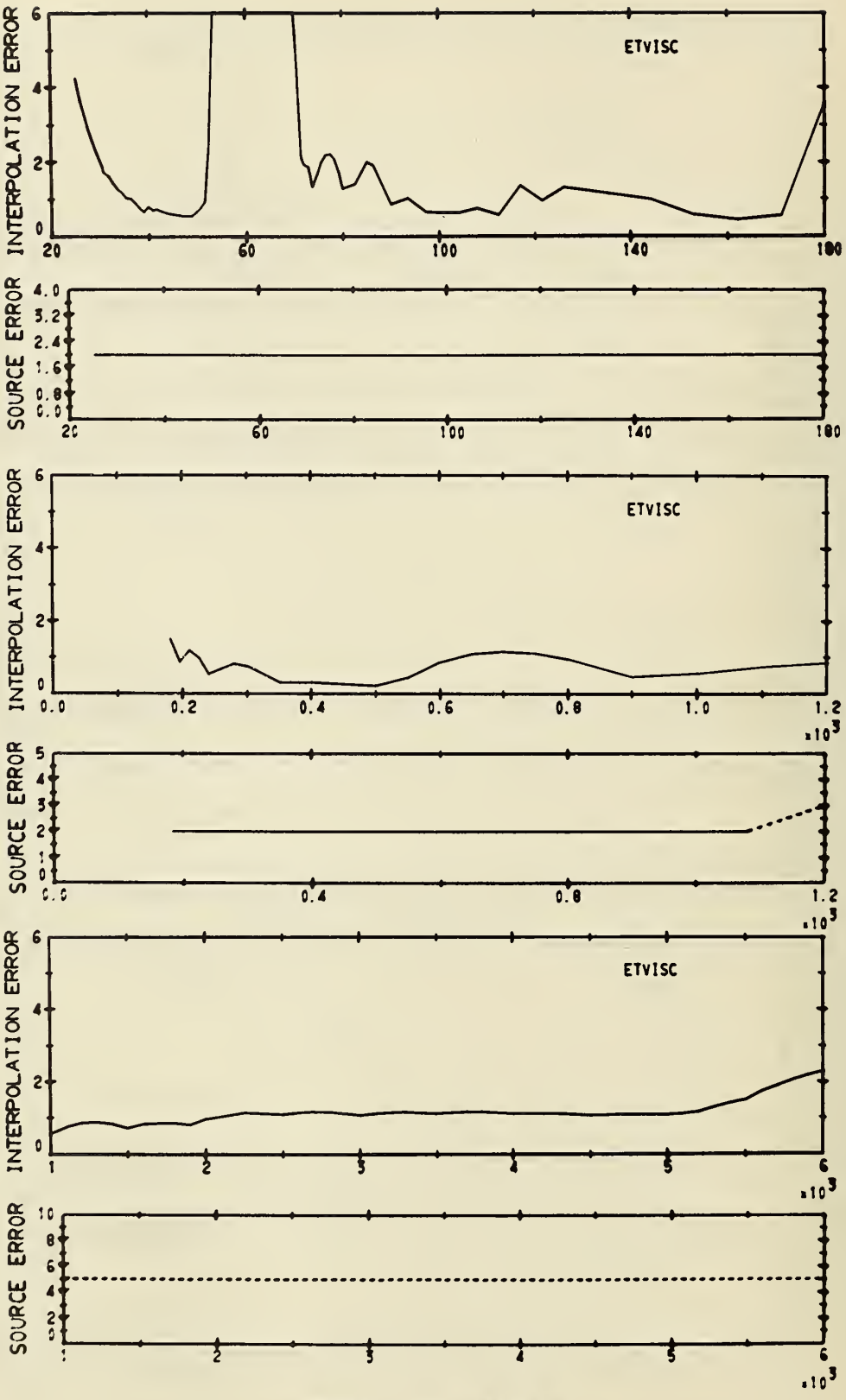
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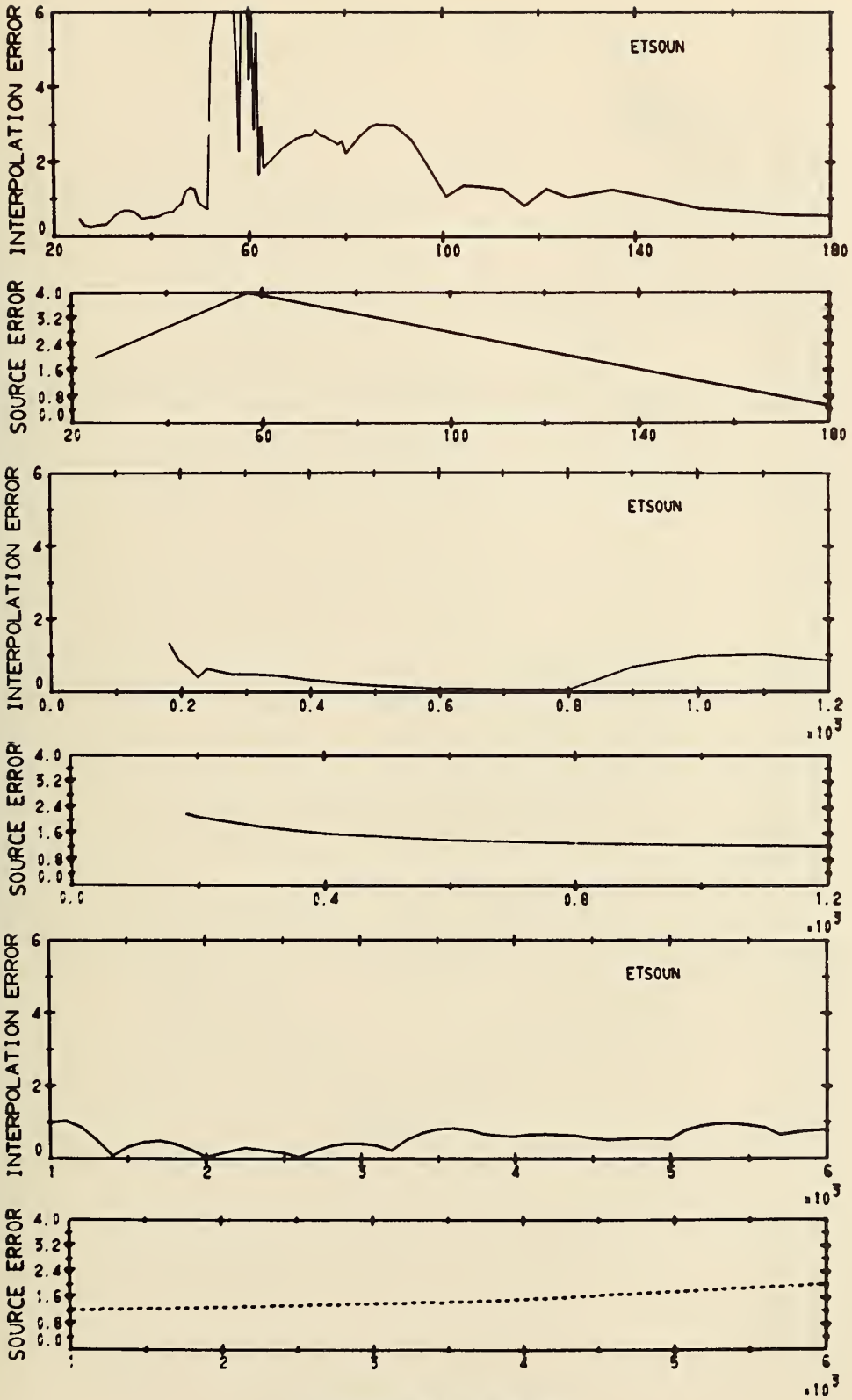
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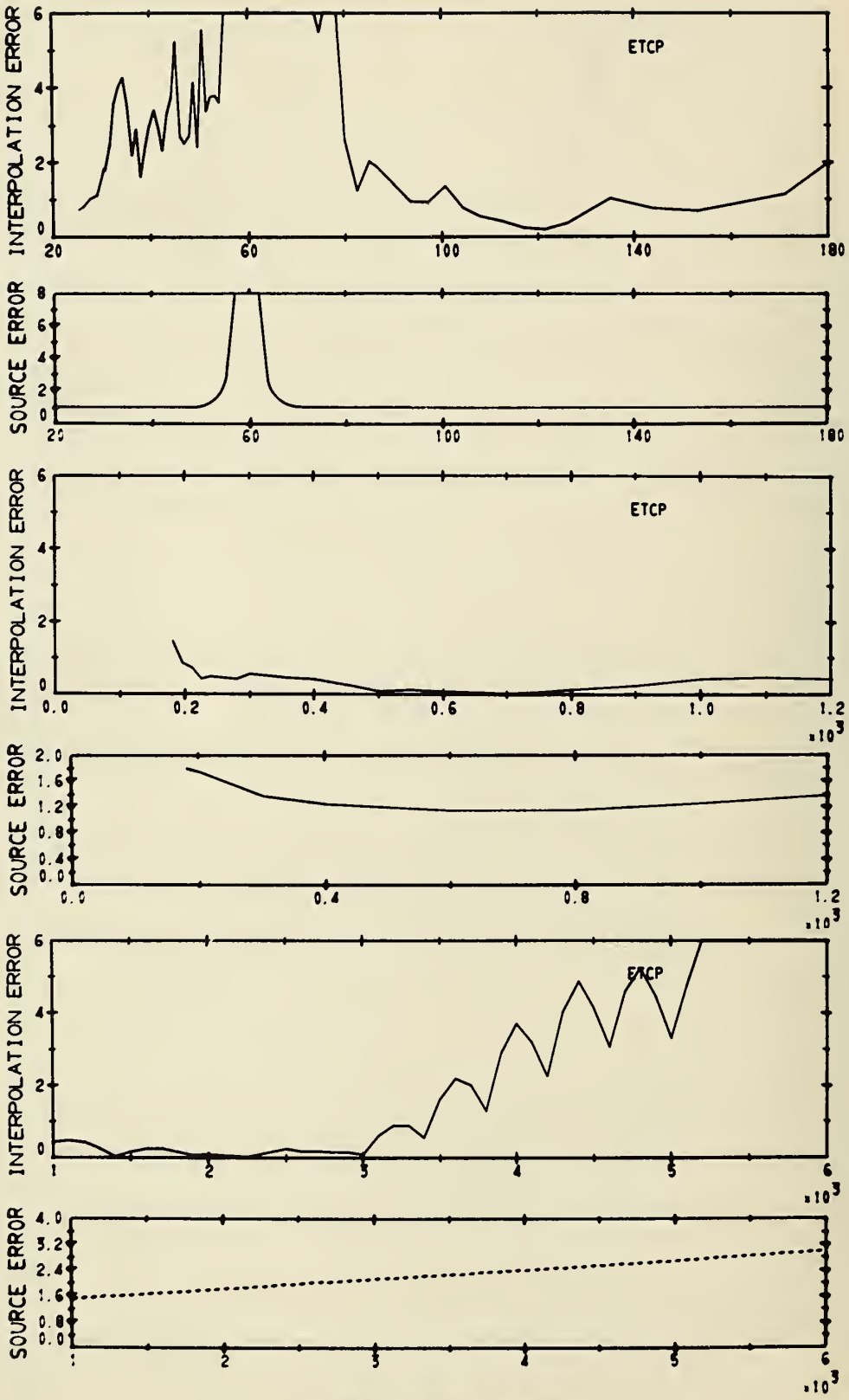
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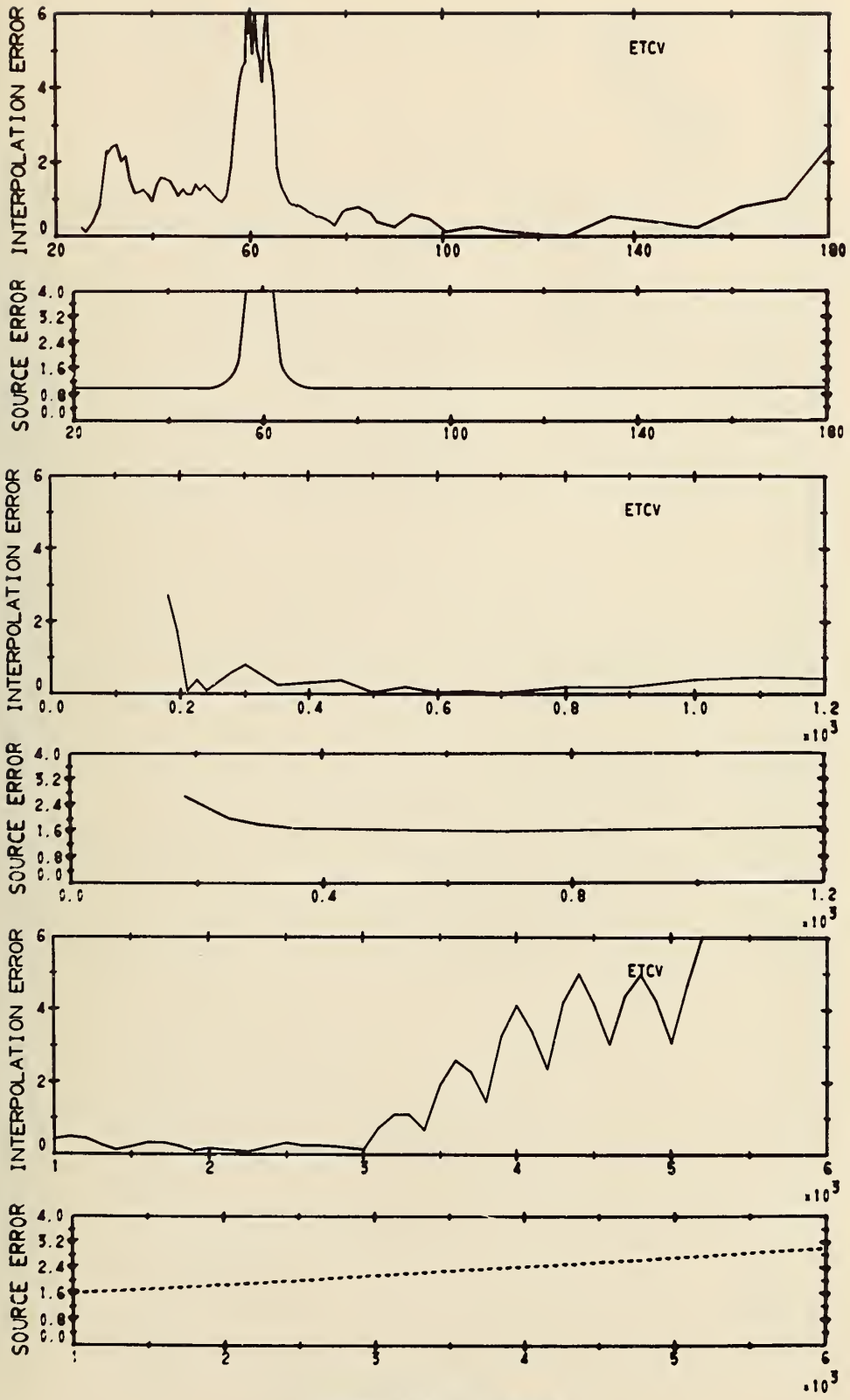
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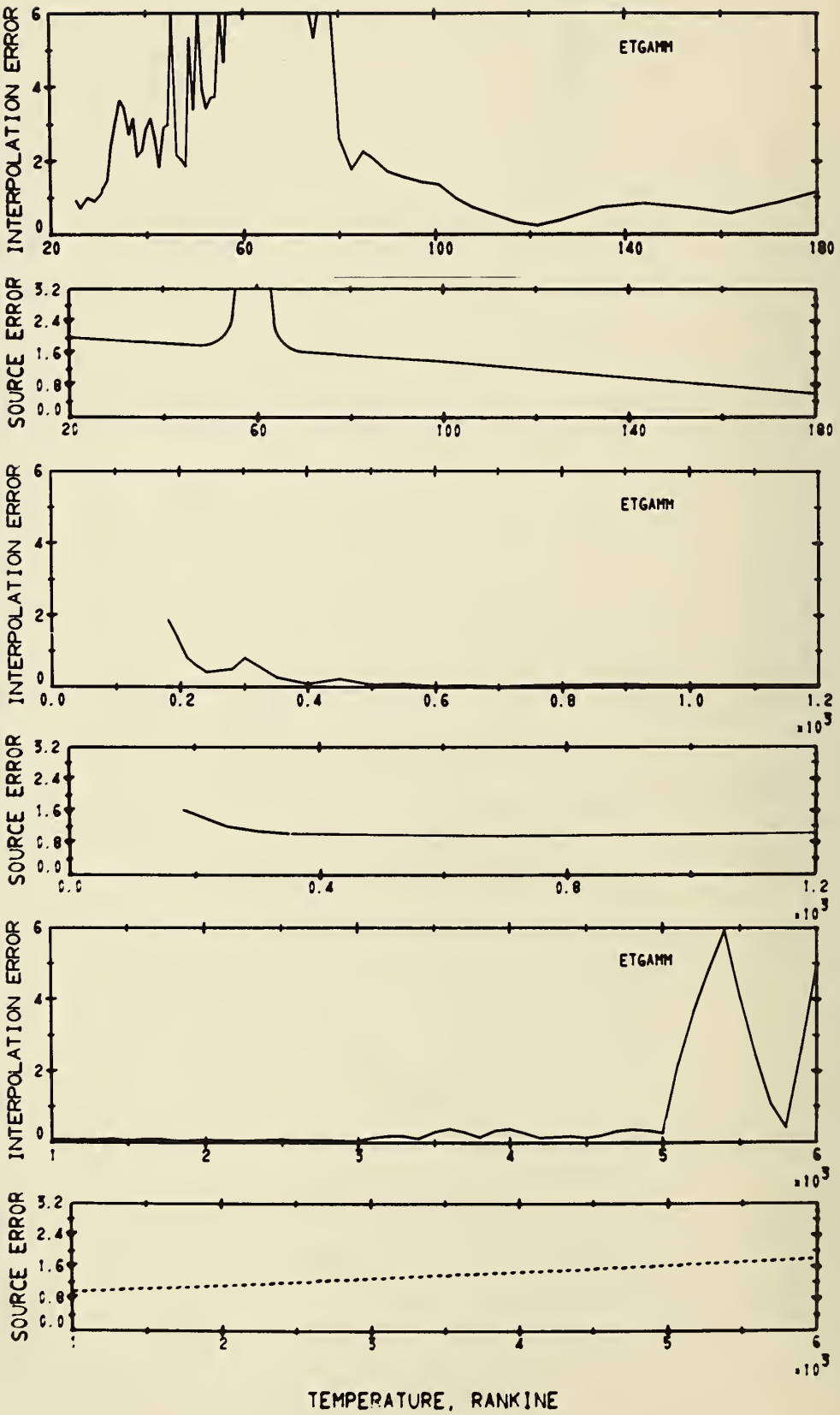
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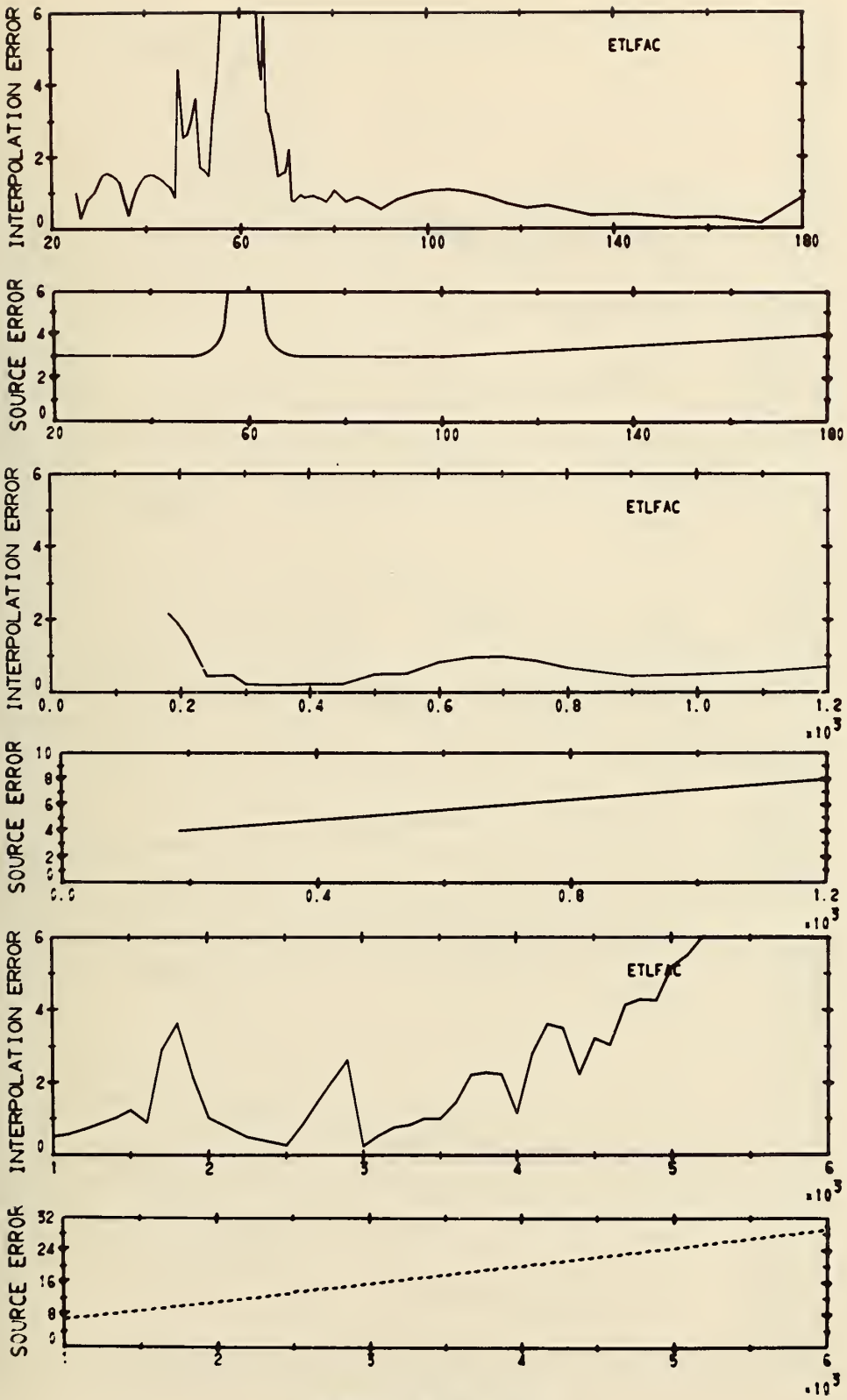
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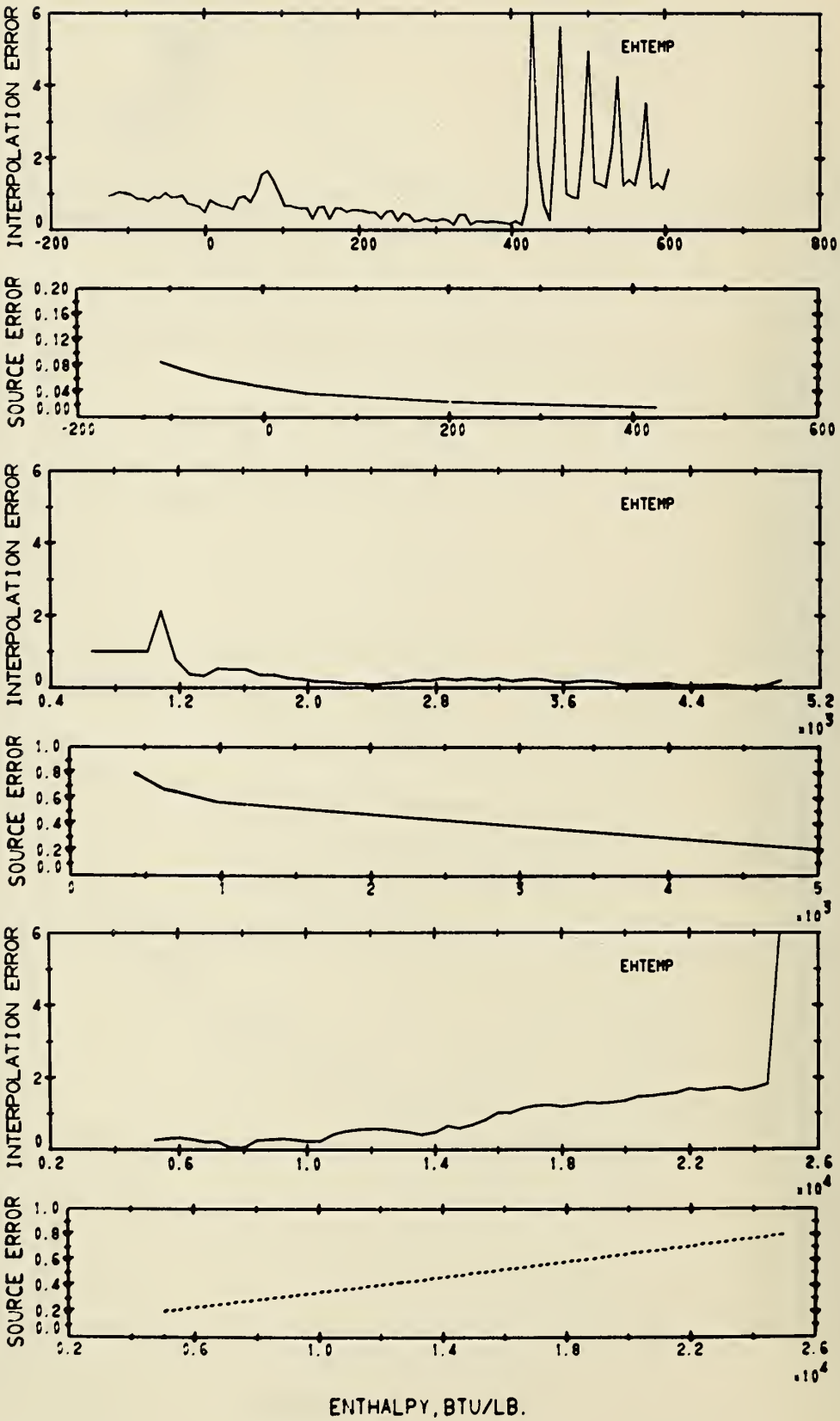
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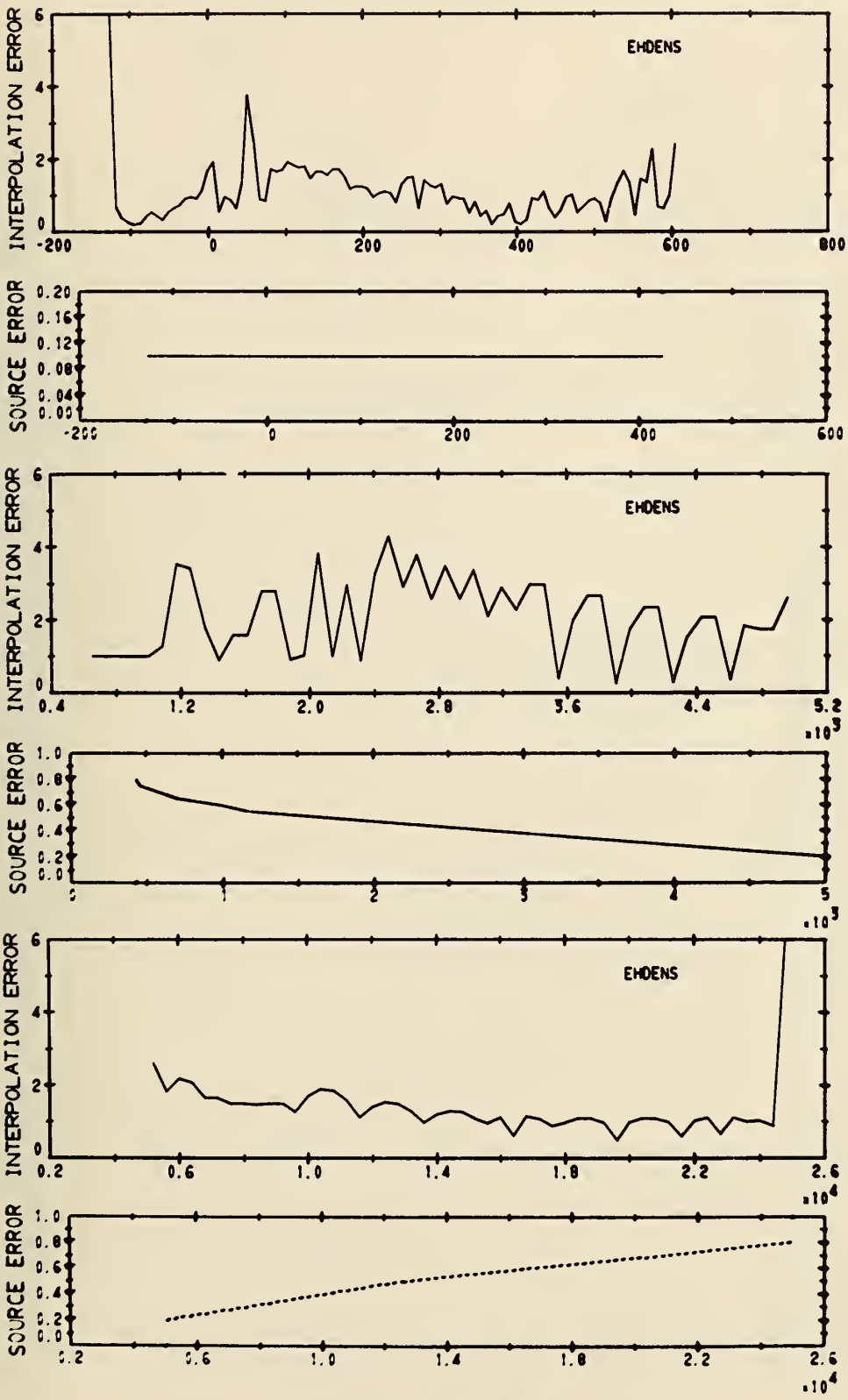
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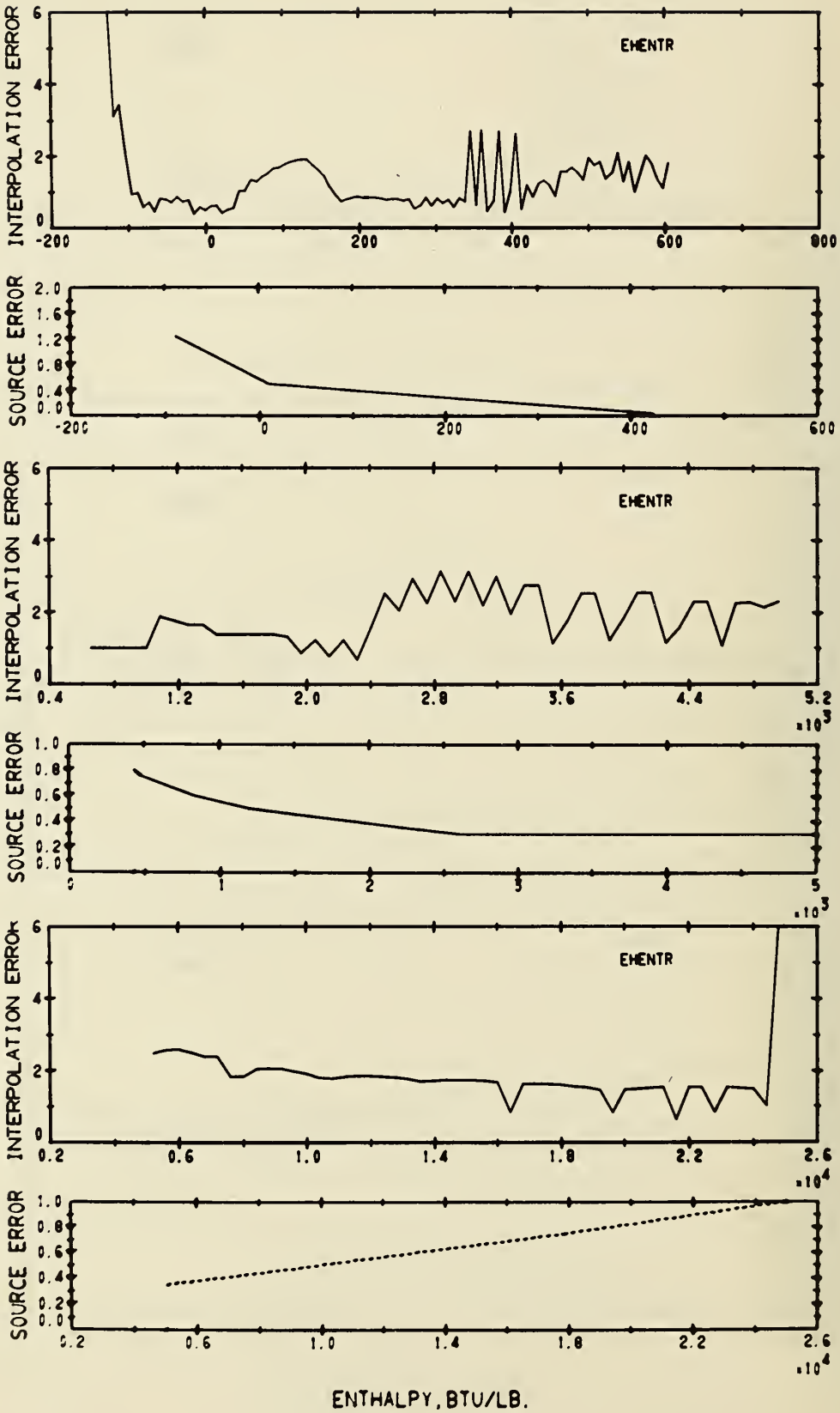
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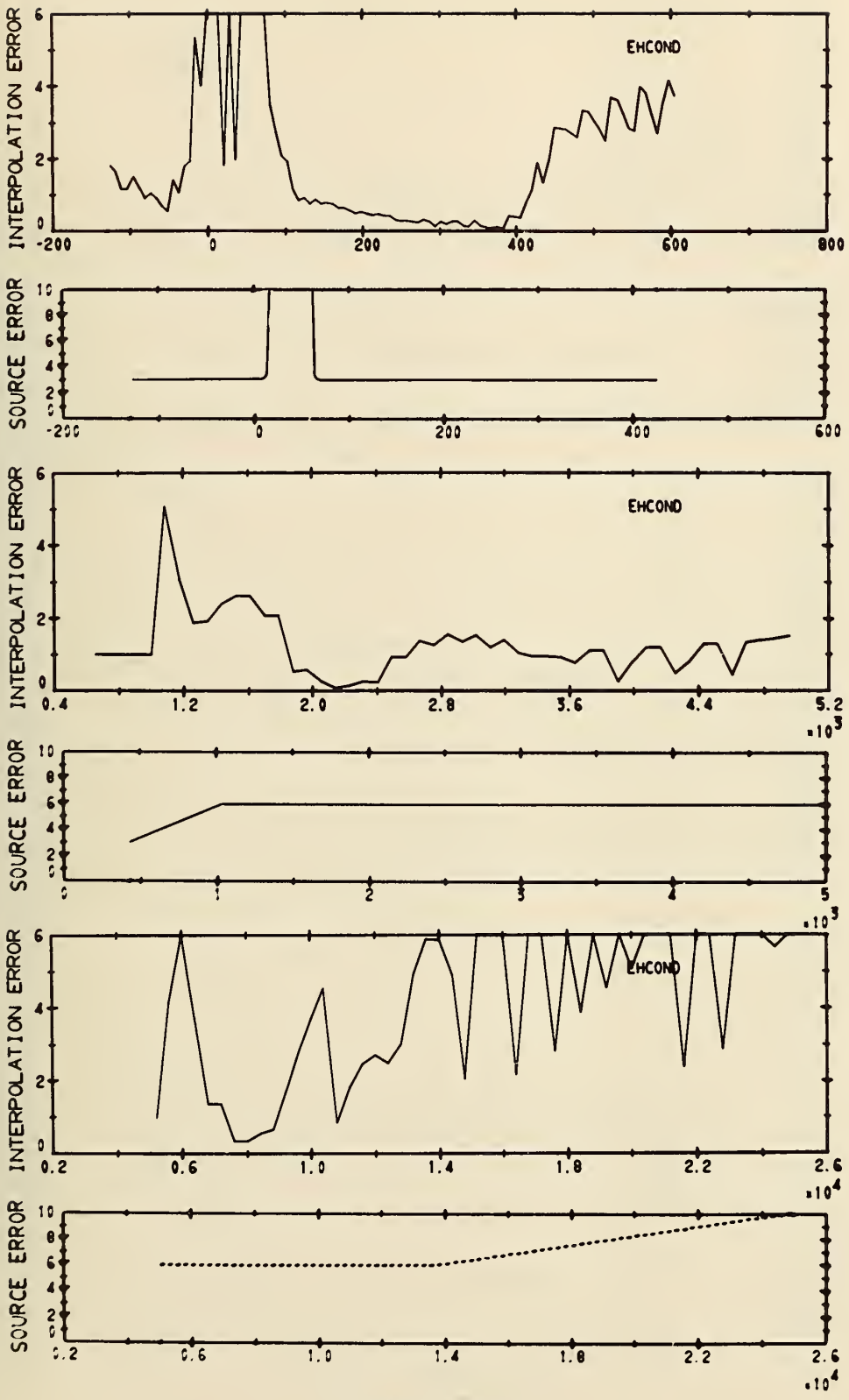
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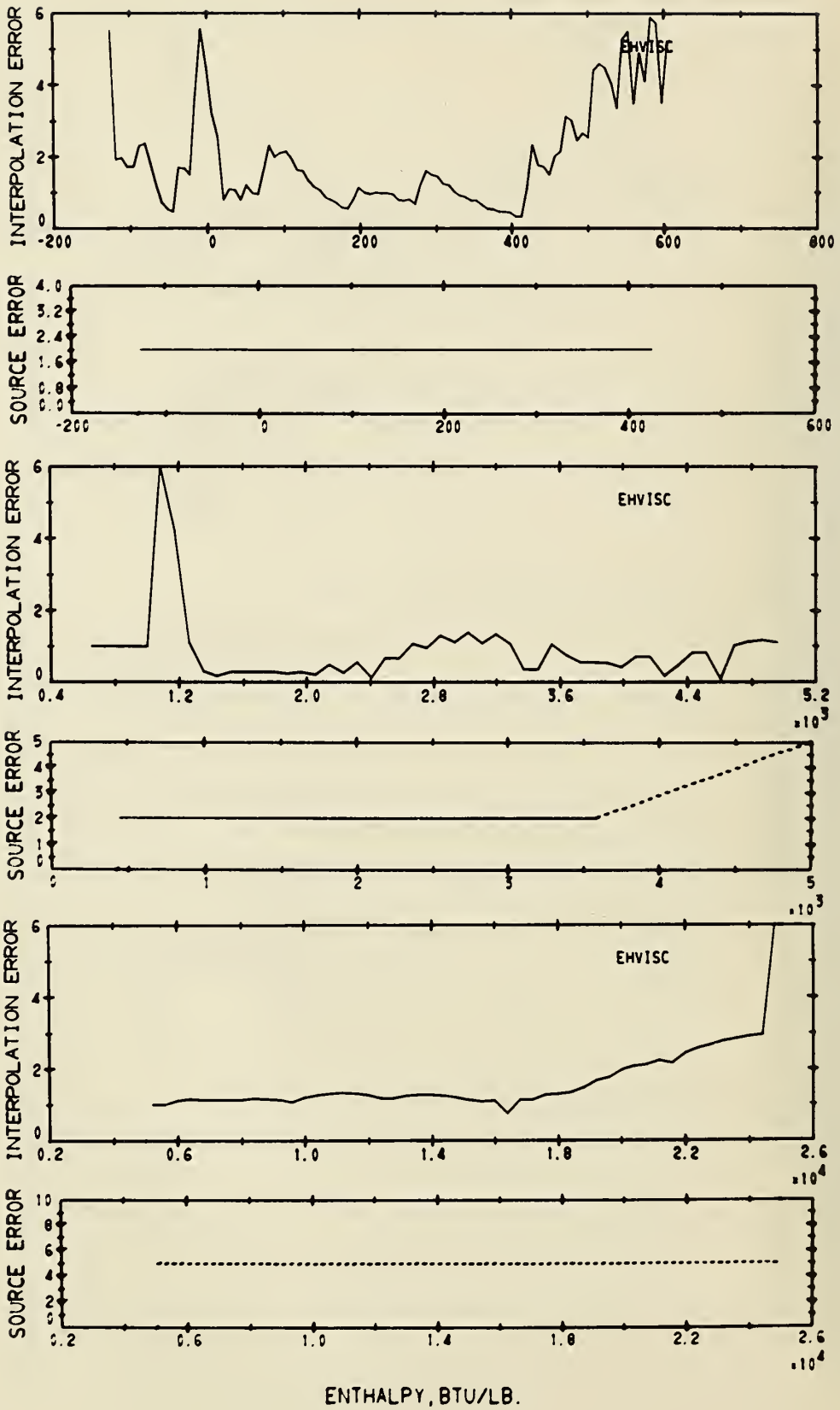
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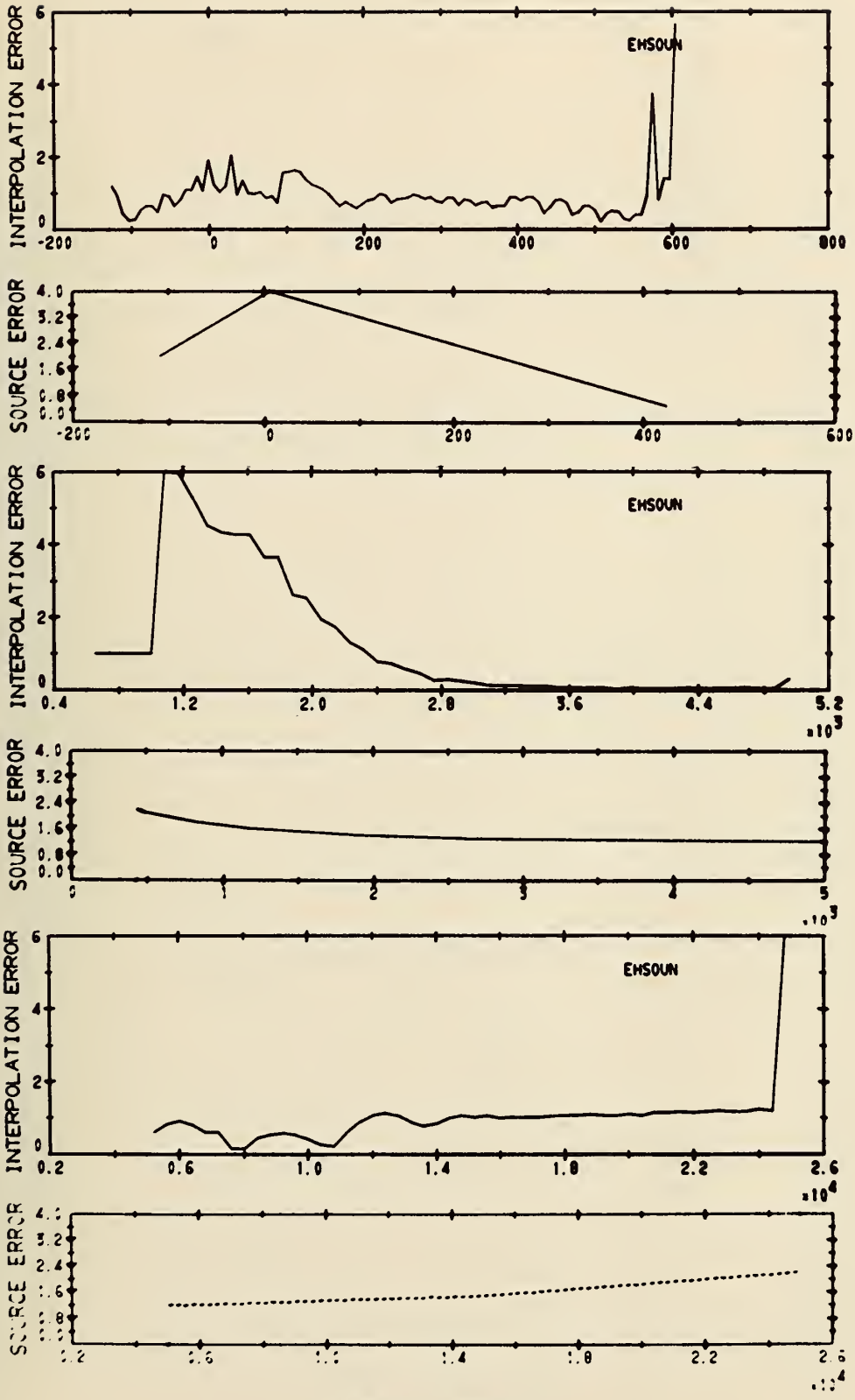
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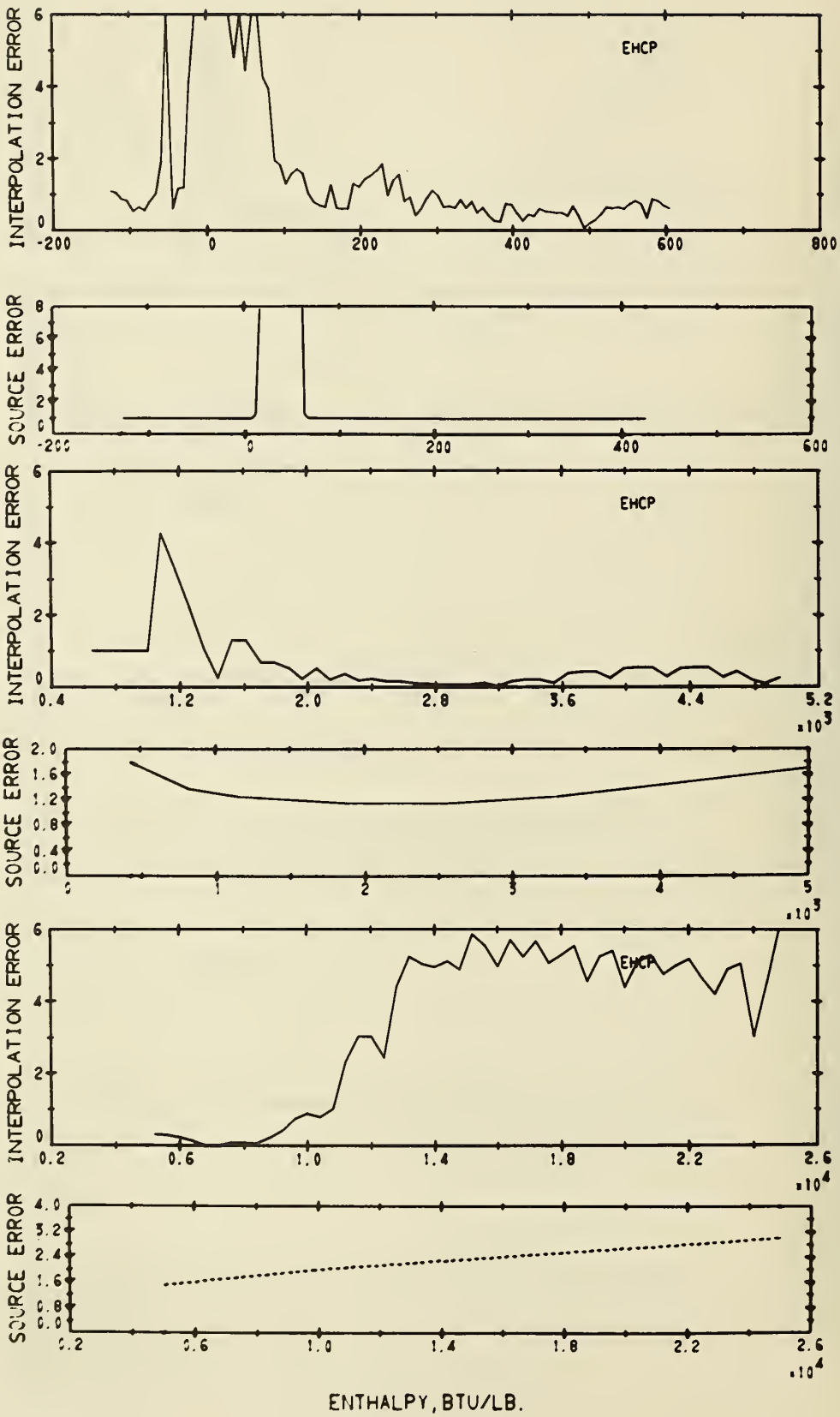
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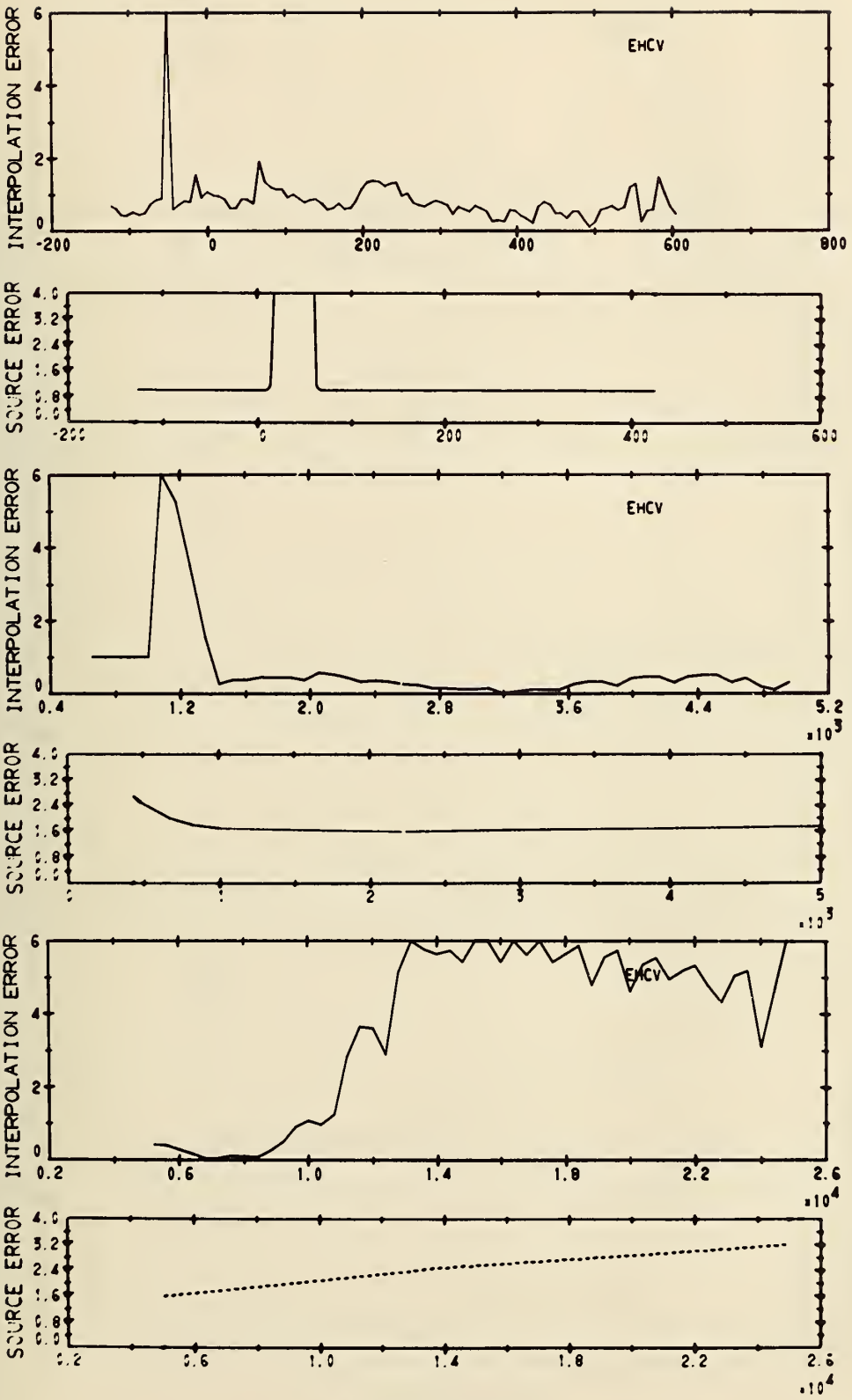
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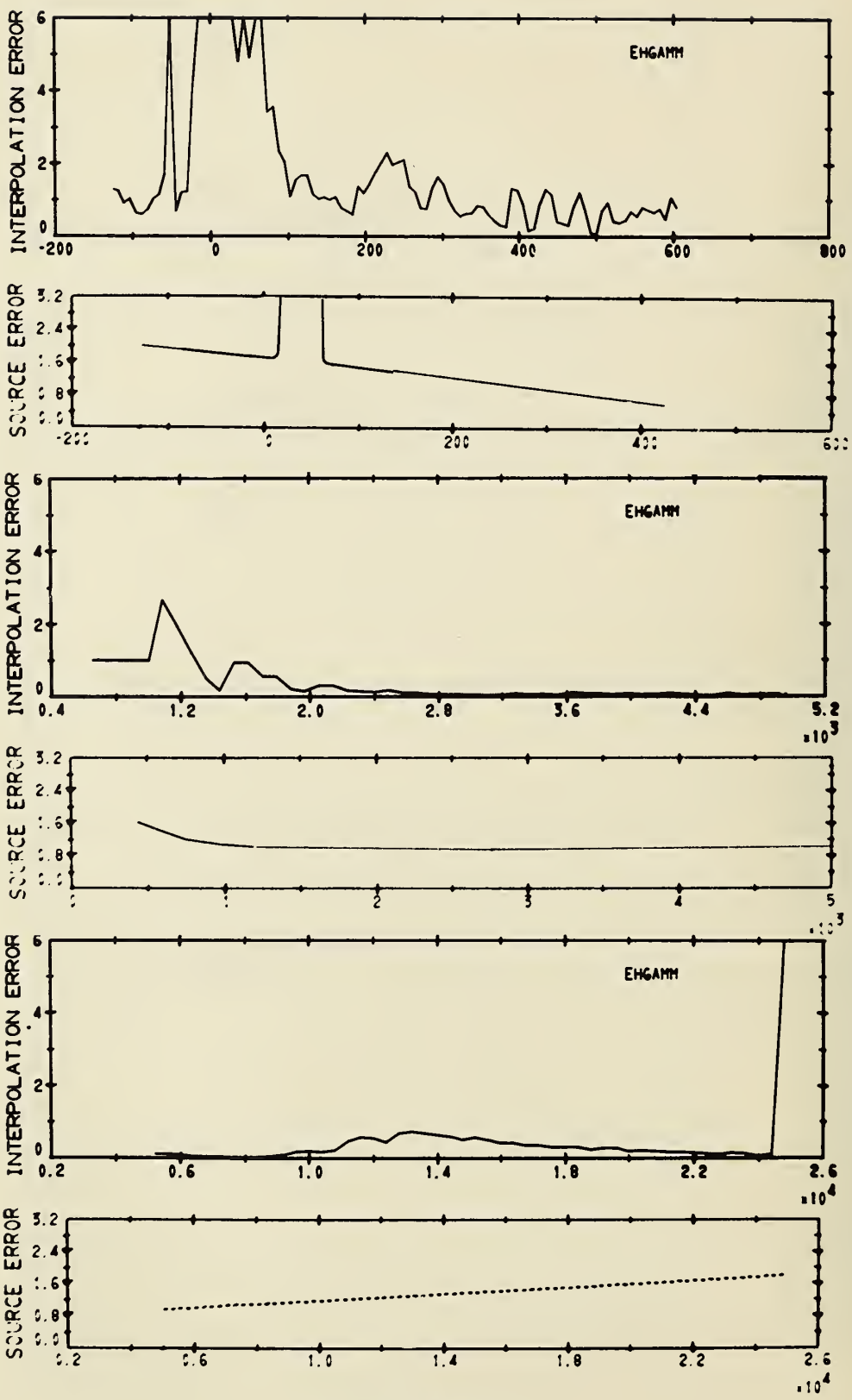
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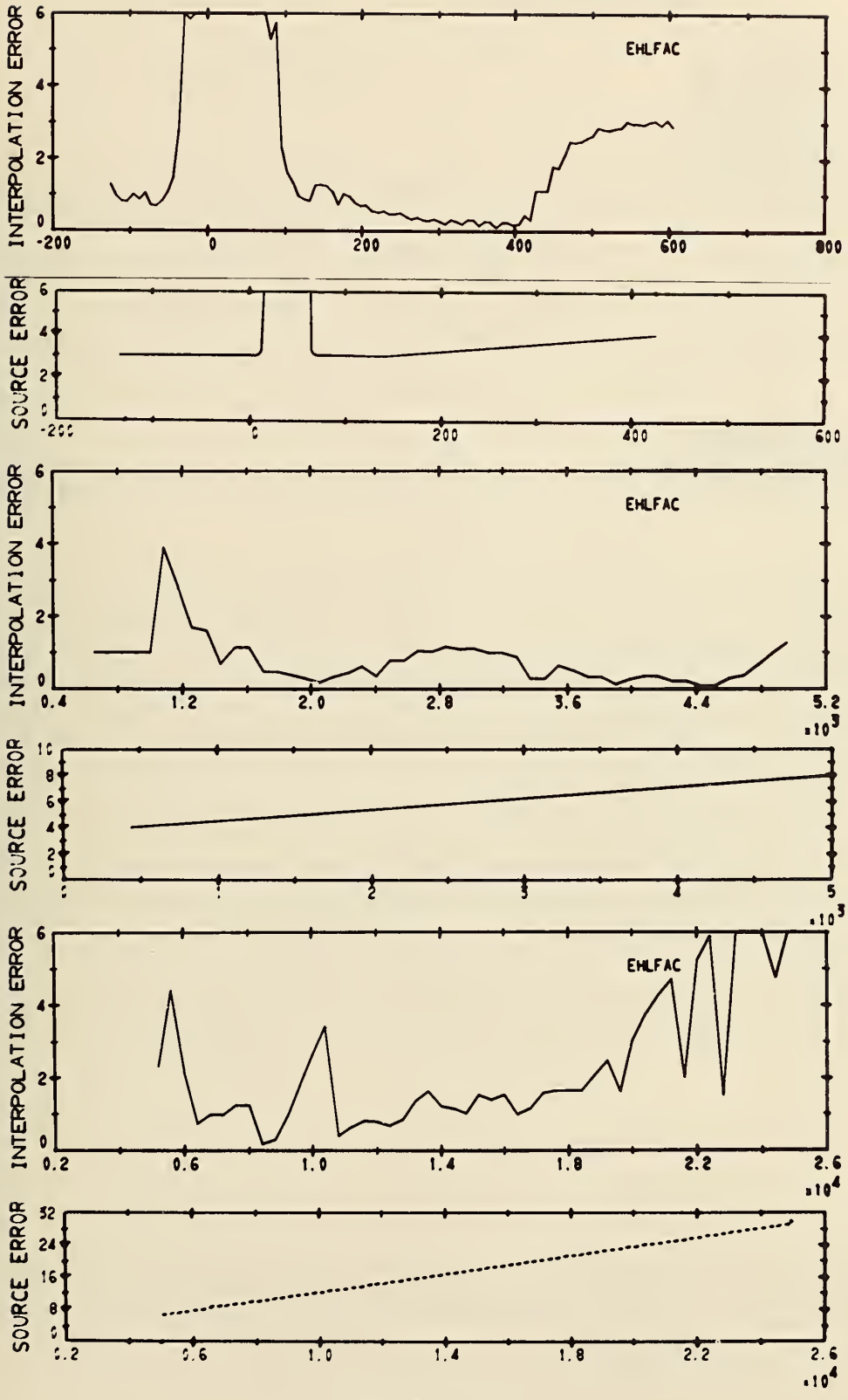
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SUPPLEMENTARY NOTES

ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)

The thermodynamic and transport properties of para and equilibrium hydrogen have been programmed into a series of computer routines. Input variables are the pair's pressure-temperature and pressure-enthalpy. The programs cover the range from to 5000psia (34 MN/m^2) with temperatures from the triple point to 6000° R (3300 K) enthalpies from -130 BTU/lb (-623 J/mol) to 25,000 BTU/lb (117000 J/mol). Output variables are enthalpy or temperature, density, entropy, thermal conductivity, viscosity, velocity of sound, heat capacity at constant pressure, heat capacity at constant volume, the heat capacity ratio, and a heat transfer parameter. Property values on the liquid and vapor boundaries are conveniently obtained through two small routines. The programs achieve high speed by using linear interpolation in a grid of precomputed points which define the surface of the property returned. The maximum errors arising from the linear interpolation are shown on individual deviation plots for each combination of variables. Error estimates for the sources of data are similarly displayed.

KEY WORDS (Alphabetical order, separated by semicolons) Computer programs; density; enthalpy; entropy; heat capacity at constant pressure; heat capacity at constant volume; heat capacity ratio; heat transfer coefficient; hydrogen; pressure; saturation boundary; temperature; thermal conductivity; velocity of sound; viscosity.

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