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AFWL-TR-
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(Supp.)

USER'S MANUAL

Volume I

Boundary Layer Integral Matrix Procedure (BLIMP)

Larry W. Anderson Howard L. Morse

Aerotherm Corporation

TECHNICAL REPORT NO. AFWL-TR-69-114, Vol. I (Supp.)

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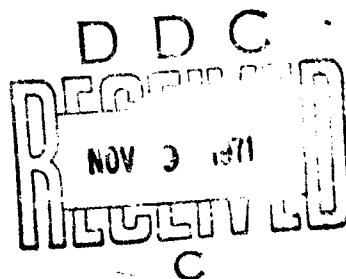
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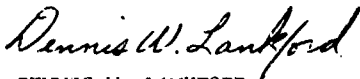
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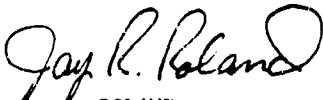
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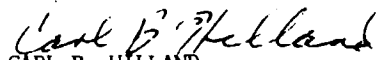
This technical report has been reviewed and is approved.



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ABSTRACT

(Distribution Limitation Statement A)

A supplement to the BLIMP computer program report is presented. Major new additions in the input section describe the data start procedure and the entropy layer option. For convenience, however, an entire new input section is included in this supplement. Also a new Fortran Variables List, a complete listing of the code, and two new check cases are included.

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SECTION I

INPUT

The revised input instructions are contained in this section.

GROUP 1 CONTROL CARD, TITLE, AND IDENTIFICATION (CALLED FROM RECASE)

CARD 1. FORMAT(20).15A4). KR

FIELD 1 (COLUMNS 1-20) THIS IS THE VARIABLE KR(DIMENSIONED 20) WHICH IS USED TO CONTROL THE VARIOUS PROGRAM OPTIONS

COLUMN 1 DETERMINES WHETHER A NEW SET OF ETA VALUES IS TO BE INPUT FOR PRESENT CASE (SEE GROUP 4)

- 0 USES RESIDENT VALUES FROM PREVIOUS CASE
- 1 VALUES INPUT BY USER (MANDATORY FOR FIRST CASE)

COLUMN 2 DESIGNATES TYPE OF FIRST GUESSES TO BE UTILIZED FOR PRIMARY VARIABLES (SEE GROUP 9)

- 0 USES BUILT-IN RELATIONS TO CALCULATE FIRST GUESSES (REQUIRES READING ONLY GUESS FOR ENTHALPY OF THE GAS AT THE WALL). RECOMMENDED FOR MOST SITUATIONS.
- 1 FIRST GUESSES INPUT BY USER
- 2 USES RESIDENT VALUES FROM PREVIOUS CASE (CANNOT BE USED FOR FIRST CASE OR WHEN COMPOSITION OF EDGE GAS IS DIFFERENT FROM PREVIOUS CASE)
- 3 FIRST GUESSES INPUT BY USER ARE ACCEPTED AS SOLUTION AT FIRST TIME AND FIRST OR SUBSEQUENT (FOR RESTART) STATION. USE THIS OPTION FOR DATA START AND RESTART (SEE GROUP 9).

COLUMN 3 DETERMINES TREATMENT OF STREAMWISE DERIVATIVES.
SEE REFERENCE 1, SECTION III FOR EXPLANATION OF DIFFERENCE RELATIONS.

- 0 PERFORMS SIMILAR SOLUTION AT EACH STREAMWISE STATION
- 1 CONSIDERS TWO-POINT DIFFERENCE RELATIONS AT ALL STATIONS WITH THE FOLLOWING EXCEPTIONS (A SIMILAR SOLUTION IS PERFORMED AT THE FIRST STATION FOR NON-RLUNT BODIES AND AT THE FIRST TWO STATIONS FOR RLUNT BODIES)
- 2 CONSIDERS THREE POINT DIFFERENCE RELATIONS AT ALL STATIONS WITH THE FOLLOWING EXCEPTIONS (A SIMILAR SOLUTION IS PERFORMED AT THE FIRST STATION AND A TWO-POINT SOLUTION IS PERFORMED AT THE SECOND STATION FOR NON-RLUNT BODIES, SIMILAR SOLUTIONS ARE PERFORMED AT THE FIRST AND SECOND STATIONS AND A TWO-POINT SOLUTION IS PERFORMED AT THE THIRD STATION FOR RLUNT BODIES, AND A TWO-POINT SOLUTION IS PERFORMED FOR THE FIRST STATION AFTER A DISCONTINUITY - SEE CARD SET 4 OF GROUP 3).

COLUMN 4 DETERMINES WHEN OUTPUT BLOCK IS TO BE PRINTED

0 OUTPUT BLOCK PRINTED FOR CONVERGED SOLUTION OR FOR NONCONVERGED SOLUTION AFTER 50 ITERATIONS (WITH APPROPRIATE COMMENT)

1 OUTPUT BLOCK PRINTED AFTER EACH ITERATION

COLUMN 5 DETERMINES TREATMENT OF ENTROPY LAYER (SEE CARD SET 1 AND CARD 2 OF GROUP 15). $KR(7) = 0$ OR 2 ONLY.

0 A1 (ENTROPIC EXPANSION AROUND THE BODY IS PERFORMED (IN THE CASE OF A BLUNT BODY, THE ENTROPY CORRESPONDS TO THAT BEHIND A NORMAL SHOCK)

1 NOT USED

2 AXISYMMETRIC SHOCK LAYER

3 ENTROPY LAYER - INVISCID FLOW FIELD ENTROPY GRADIENTS ARE CONSIDERED (SEE GROUP 15)

4 ENTROPY AND ENERGY LAYER - BOTH INVISCID FLOW FIELD ENTROPY AND ENERGY GRADIENTS ARE CONSIDERED (SEE GROUP 15). NOT USED IN THIS VERSION

5 A NONENTROPIC EXPANSION AROUND THE BODY IS PERFORMED; THE USER SUPPLYING ENTROPY CHANGES BETWEEN STREAMWISE STATIONS (THIS IS A ZEROth APPROXIMATION TO AN ENTROPY LAYER. THE VELOCITY GRADIENT AT THE BOUNDARY LAYER EDGE BEING NEGLECTED)

COLUMN 6 DESIGNATES BODY SHAPE (IN THE CASE OF AXISYMMETRIC SHARP BODIES AND AXISYMMETRIC AND PLANAR BLUNT BODIES, A TRANSFORMATION OF STREAMWISE DISTANCE, S , TO S^{**3} , S^{**4} , AND S^{**2} , RESPECTIVELY, IS UTILIZED TO PERFORM STREAMWISE INTEGRATIONS IN ORDER TO TAKE ADVANTAGE OF THE WAY THAT EDGE VELOCITY AND LOCAL BODY RADIUS VARY WITH S IN THE VICINITY OF THE TIP OR STAGNATION REGION. THEREFORE, A 4 OR 9 IN COL. 6 IS REQUIRED IF THE SOLUTION DOES NOT START FROM A SHARP TIP OR STAGNATION POINT. FURTHERMORE, IN THE CASE OF SHARP OR BLUNT BODIES, A DISCONTINUITY INTRODUCED AT A DOWNSTREAM STATION REVERTS TO INTEGRATION WITH RESPECT TO S STARTING AT THAT STATION. IT IS RECOMMENDED THAT THIS BE DONE AFTER AN APPRECIABLE CHANGE OF SURFACE INCLINATION WITH RESPECT TO THE FREE-STREAM VELOCITY FROM THAT AT THE TIP OR STAGNATION POINT. THE OPTIMUM SWITCH-OVER POINT DEPENDS ON THE SPECIFIC BODY SHAPE. IT IS LEFT TO THE USER TO ESTABLISH THIS FOR THE BODY SHAPE OF INTEREST. THE METHOD FOR IMPLEMENTING A DISCONTINUITY IS DISCUSSED UNDER CARD SET 4 OF GROUP 3).

- 0 AXISYMMETRIC BLUNT BODY
- 1 PLANAR BLUNT BODY
- 2 AXISYMMETRIC SHARP BODY
- 3 PLANAR SHARP BODY
- 4 AXISYMMETRIC SHAPE WHICH HAS NO BLUNT STAGNATION POINT,
FOR EXAMPLE, A NOZZLE
- 5 AXISYMMETRIC BLUNT BODY WITH TRANSVERSE CURVATURE
- 6. NOT USED
- 7 AXISYMMETRIC SHARP BODY WITH TRANSVERSE CURVATURE
- 8 AXISYMMETRIC SHAPE WITH INTERNAL FLOW AND TRANSVERSE CURVATURE
- 9 EXTERNAL FLOW OVER AXISYMMETRIC SHAPE WHICH HAS NO SHARP TIP OR
BLUNT STAGNATION POINT AND WITH TRANSVERSE CURVATURE

COLUMN 7 DESIGNATES WHETHER OR NOT TURBULENT FLOW WILL BE CONSIDERED.

- 0 LAMINAR FLOW ONLY
- 1 NOT USED IN PRESENT VERSION OF PROGRAM
- 2 TURBULENT FLOW WILL BE COMPUTED IF TRANSITION CRITERIA IS EXCEEDED
(SEE GROUP 4).

COLUMN 8 DESIGNATES FORM IN WHICH WALL MASS FLUXES ARE INPUT. (KR(8)
IS NOT UTILIZED IF WALL FLUXES ARE NOT INPUT. THE FLUX
NORMALIZING PARAMETER IS NOT GENERALLY KNOWN IN ADVANCE SO
KR(8)=0 IS NORMALLY USED WHEN FLUXES ARE INPUT). UTILIZED IN
CARD SETS 7 AND 11 IN GROUPS 16, 17, 18, ...

- 0 WALL FLUXES INPUT IN LBS/SEC FT**2
- 1 WALL FLUXES INPUT IN NORMALIZED FORM (I.E., DIVIDED BY -ALPHASTAR,
SEE EQUATION 44 OF NASA CR-1062)

COLUMN 9 TOGETHER WITH COLUMN 11. THIS SPECIFIES THE TYPE OF WALL
BOUNDARY CONDITIONS. THE USER IS URGED TO FAMILIARIZE
HIMSELF WITH THE DISCUSSION IN APPENDIX I BEFORE CHOOSING
THESE OPTIONS.

- 0 NOT GENERALLY USED. ASSIGNED ELEMENTAL MASS FRACTIONS AND SURFACE FUNCTION AT THE WALL (REQUIRES KR(11) = 0 OR 1).
- 1 NOT GENERALLY USED. ASSIGNED ELEMENTAL MASS FRACTIONS AND TOTAL MASS FLUX AT THE WALL (REQUIRES KR(11) = 0 OR 1).
- 2 ASSIGNED COMPONENT MASS FLUXES AT THE WALL (MDOT FGOE GAS, MDOT PYROLYSIS GAS, MDOT CHAR-- REQUIRES KR(11) = 0, 1, OR 2).
- 3 NOT USED
- 4 WALL STEADY STATE ENERGY BALANCE WHILE SATISFYING WALL MASS BALANCES AND LIMITED SURFACE EQUILIBRIUM (USE KR(11) = 0, KR(7) = 0 OR 2).

COLUMN 10 DETERMINES TYPE OF CURVE FITS EMPLOYED TO REPRESENT THE PRIMARY VARIABLES OF VELOCITY RATIO, TOTAL ENTHALPY, AND ELEMENTAL MASS FRACTIONS (KR(10)=0 IS RECOMMENDED FOR ACCURACY FOR MOST PROBLEMS, HOWEVER, KR(10)=1 IS BETTER FOR SEVERE PROBLEMS (E.G., NEARLY BLOWN OFF BOUNDARY LAYERS) FOR WHICH CUBICS CAN BECOME POORLY BEHAVED)

- 0 UTILIZES CONNECTED CUBICS
- 1 UTILIZES CONNECTED QUADRATICS EXCEPT FOR OUTERMOST SEGMENT WHERE CONNECTED CUBICS ARE EMPLOYED
- 2 UTILIZES CONNECTED QUADRATICS EVERYWHERE.

COLUMN 11 TOGETHER WITH COLUMN 9, THIS DESIGNATES THE TYPE OF WALL BOUNDARY CONDITION (SEE APPENDIX II). SEE GROUPS 16, 17, 18,...

- 0 ASSIGNED WALL TEMPERATURE. ALSO USED WITH KR(9)=4. THIS OPTION TOGETHER WITH KR(9)=2 WILL YIELD SURFACE EQUILIBRIUM OR KINETIC SURFACE SOLUTION IF THE ASSIGNED TEMPERATURE IS GREATER THAN THE ASSIGNED AMBIENT TEMPERATURE (SEE GROUP 11, CARD 1, FIELD 7). THE PROGRAM WILL CALCULATE THE APPROPRIATE CHAR FLUX. ASSIGNED CHAR FLUX SHOULD BE SET TO ZERO (SEE GROUP 16, CARD SET 11).
- 1 ASSIGNED WALL ENTHALPY.
- 2 SURFACE EQUILIBRIUM WITH ASSIGNED COMPONENT MASS FLUXES (REQUIRES KR(9) = 2). THE PROBLEM IS WELL-POSED AND WILL CONVERGE ONLY IF THERE EXISTS A TEMPERATURE ABOVE 250K GIVING SURFACE EQUILIBRIUM FOR THE ASSIGNED COMPONENT MASS FLUXES. USE WITH CAUTION FOR ANALYSES OF MATERIALS WITH PLATEAU-LIKE BEHAVIOR.
- 3 CABLE SOLUTIONS ONLY. ASSIGNED WALL TEMPERATURE.
- 4 CABLE SOLUTIONS ONLY. SURFACE EQUILIBRIUM.

COLUMN 12 DETERMINES WHETHER OR NOT NEW DATA FOR THERMODYNAMIC AND TRANSPORT PROPERTIES ARE TO BE USED AND WHETHER OR NOT SURFACE KINETIC DATA ARE TO BE CONSIDERED (SEE GROUPS 11, 12, 13, AND 14). APPLIES ONLY FOR KR(7)=0 OR 2. (KR(12) MUST BE 0, 2, 5, OR 7 FOR FIRST CASE). IN THE FOLLOWING, X=5 FOR KINETIC DATA AND X=0 FOR NO KINETIC DATA.

X USER INPUTS NEW DATA FOR ELEMENTS AND MOLECULAR, ATOMIC, AND IONIC SPECIES. THERMOCHEMICAL DATA NOT PRINTED IN OUTPUT.

1+X USES RESIDENT ELEMENTAL AND SPECIES DATA.

2+X SAME AS KR(12)=X EXCEPT THERMOCHEMICAL DATA ARE PRINTED IN OUTPUT. (WHEN X=5 KINETIC DATA ALWAYS PRINTED IN OUTPUT).

COLUMN 13 PERMITS THE ASSIGNMENT OF A CONVERGENCE DAMPING FACTOR (THIS IS OVERRIDDEN IF A SMALLER DAMPING FACTOR IS COMPUTED INTERNALLY BY SOME CONSTRAINT)

0 NO DAMPING FACTOR IS ASSIGNED

J IF J IS GREATER THAN ZERO, CORRECTIONS ARE DAMPED UNIFORMLY BY J/10 THIS PROCEDURE IS NOT RECOMMENDED AS IT IS VERY INEFFICIENT AND THE DAMPING COMPUTED BY THE PROGRAM IS USUALLY ADEQUATE

COLUMN 14 DETERMINES MODEL TO BE EMPLOYED FOR MULTICOMPONENT TRANSPORT PROPERTIES. APPLIES ONLY FOR KR(7) = 0 OR 2. CONSIDERING UNEQUAL DIFFUSION COEFFICIENTS CAN SUBSTANTIALLY INCREASE THE NUMBER OF ITERATIONS (AND SOMETIMES CONVERGENCE DOES NOT OCCUR IN THE ALLOWED NUMBER OF ITERATIONS) DUE TO THE USE OF INEXACT DERIVATIVES IN THE NEWTON-RAPHSON ITERATION PROCEDURE

0 CONSIDERS UNEQUAL DIFFUSION AND THERMAL DIFFUSION COEFFICIENTS FOR ALL SPECIES

1 CONSIDERS UNEQUAL DIFFUSION COEFFICIENTS FOR ALL SPECIES BUT NEGLECTS THERMAL DIFFUSION

2 CONSIDERS EQUAL DIFFUSION COEFFICIENTS AND NEGLECTS THERMAL DIFFUSION

COLUMN 15 NON-ZERO ENTRY PROVIDES DEBUG OUTPUT FOR FIRST GUESSES AND LINEAR MATRICES (SEE DEBUG INSTRUCTIONS FOR MORE DETAILED INFORMATION ON COLUMNS 15 THROUGH 20)

0 NO DEBUG

1 FIRST GUESSES ARE DUMPED

2 LINEAR MATRICES BEFORE AND AFTER INVERSION ARE ALSO DUMPED

COLUMN 16 NON-ZERO ENTRY PROVIDES DEBUG OUTPUT FOR WALL FLUXES AND SURFACE EQUILIBRIUM ITERATION (SOME OF THE TESTS ARE ACTUALLY MADE ON KR(7). SEE DEBUG INSTRUCTIONS)

0 NO DEBUG

X FOR X GREATER THAN ZERO, THE DERIVATIVES OF WALL ENERGY AND MASS FLUXES WITH RESPECT TO REDUCED NONLINEAR VARIABLES (DOJRN1), AND THE ASSOCIATED ERRORS (WALLQJ AND DELQJW) ARE DUMPED. ALSO, THE MATRIX OF WALL RELATIONS BEFORE AND AFTER MATRIX INVERSION IS DUMPED FOR KP(1)=2 PROBLEMS.

Y FOR Y GREATER THAN UNITY, SURFACE EQUILIBRIUM ITERATION INFORMATION IS ALSO DUMPED (AS IN KR(18)) AND IF KR(17) IS GREATER THAN ZERO, THE DERIVATIVES OF WALL ENERGY AND MASS FLUXES WITH RESPECT TO ALL NONLINEAR VARIABLES (DOJNL) ARE ALSO DUMPED.

COLUMN 17 NON-ZERO ENTRY PROVIDES DEBUG OUTPUT FOR COEFFICIENTS IN NON-LINEAR EQUATIONS AND FOR STREAMWISE DERIVATIVES

0 NO DEBUG

X FOR X GREATER THAN ZERO, STREAMWISE DERIVATIVE INFORMATION IS DUMPED.

Y FOR (Y+1)-ITS GREATER THAN ZERO, WHERE ITS IS THE NUMBER OF THE CURRENT BOUNDARY LAYER ITERATION, THE COEFFICIENTS WHICH COMBINE TO MAKE UP THE NONLINEAR EQUATIONS (COEQV ARRAY) AND CERTAIN LINEAR AND NONLINEAR ERROR INFORMATION ARE DUMPED AND THE DERIVATIVES OF THE NONLINEAR EQUATIONS WITH RESPECT TO THE NONLINEAR VARIABLES (AM ARRAY) ARE DUMPED BEFORE AND AFTER INVERSION.

COLUMN 18 NON-ZERO ENTRY PROVIDES DEBUG OUTPUT FOR CHEMISTRY ITERATION (KR(7) = 0 OR 2 ONLY). (THE TESTS ARE ACTUALLY MADE ON KR(7). SEE DEBUG INSTRUCTIONS).

0 NO DEBUG

1 DUMPS CHEMISTRY ITERATIONS IN DETAIL FOR ITS GREATER THAN 45 WHERE ITS IS THE COUNTER ON CHEMISTRY ITERATIONS

2 DUMPS ONE LINE PER ITERATION DURING EACH CHEMISTRY ITERATION

Y FOR Y OF 3 THROUGH 6, DUMPS CHEMISTRY ITERATIONS IN DETAIL WHEN $(5*(Y-2)-ITS)$ IS GREATER THAN ZERO.

X FOR X OF 7 THROUGH 9, DUMPS CHEMISTRY ITERATIONS IN DETAIL WHEN ITS IS GREATER THAN $10X-50$.

COLUMN 19 NON-ZERO ENTRY PROVIDES DEBUG OUTPUT FOR LINEAR AND NONLINEAR ERRORS

0 NO DEBUG

1 DUMPS (FOR EACH ITERATION) THE FOLLOWING. ERRORS FOR NONLINEAR

COLUMN 20 NON-ZERO ENTRY PROVIDES DEBUG OUTPUT FOR THERMODYNAMIC AND TRANSPORT PROPERTIES (KR(7) = 0 OR 2 ONLY).

0 NO DEBUG

X FOR X GREATER THAN ZERO, GIVES THERMODYNAMIC AND TRANSPORT PROPERTY INFORMATION FOR EACH CHEMISTRY SOLUTION

2 GIVES MATRIX OF PROPERTY DERIVATIVES BEFORE AND AFTER INVERSION

FIELD 2 (COLUMNS 21-80), CASE

TITLE OF CASE (ALPHANUMERIC). USED FOR IDENTIFICATION OF PRINTED OUTPUT)

CARD 2

INSERT A BLANK CARD HERE

GROUP 2 NUMBER OF ELEMENTS (CALLED FROM RECASE)

CARD 1. FORMAT(I2,8X,40I1)

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), NSP

NUMBER OF ELEMENTS IN THE SYSTEM NOT INCLUDING ELECTRONS (MAX. OF 9)

FIELDS 2-51 (COLUMNS 11-60), KS(M), M=1,NS ***** USED ONLY FOR KR(9)
OR ANY OF THE KRY = 2 OR 4 *****

THE SURFACE MATERIAL IS SPECIFIED IN ADVANCE BY THE USER FOR KR(9) = 2 OR 4. UP TO THREE MATERIAL COMBINATIONS ARE ALLOWED. EACH COMBINATION MAY HAVE A SEPARATE PYROLYSIS GAS AND CHAR MATERIAL SPECIFIED IN GROUP 11, FIELD 5. ENTER A 1, 2, OR 3 TO DENOTE MATERIAL COMBINATION 1, 2, OR 3 STARTING WITH THE STATION 1 ENTRY IN COLUMN 11. STATION 2 IN COLUMN 12, ETC. SEE ALSO GROUP 6, CARDS 1 AND 2.

GROUP 3 TIMES AND STATIONS (CALLED FROM RECASE)

CARD 1. FORMAT(I2)

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), NITEM

NUMBER OF TIMES (OR SURCASES) BEING CONSIDERED IN PRESENT CASE. (MAXIMUM OF 50). A SERIES OF PROBLEMS CAN BE CONSIDERED AS A SEQUENCE OF TIMES (OR SURCASES) IN THE SAME CASE AS LONG AS THE FOLLOWING ARE UNCHANGED, NUMBER OF ELEMENTS (GROUP 2), STREAMWISE STATIONS (CARD 3 AND CARD SET 4 OF THIS GROUP), NODAL SPACING (GROUP 4), BODY SHAPE (GROUP 5), AND ELEMENTAL AND SPECIES DATA (GROUP 10 OR 11 THRU 14) (AND THUS EDGE GAS AND WALL MATERIAL). CALCULATIONS ARE PERFORMED FOR ALL TIMES AT A GIVEN STATION BEFORE PROCEEDING TO NEXT STATION AND THUS APPEAR IN THIS ORDER IN THE PRINTED AND PUNCHED CARD OUTPUT.

CARD SET 2. FORMAT(MF10.4)

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD, TIME (M). M=1,NITEM (SEE CARD 1 OF THIS GROUP)

TIME, SEC. THIS VARIABLE SERVES ONLY TO IDENTIFY SOLUTIONS SINCE TIME DOES NOT ENTER INTO THE SOLUTION OF THE PROBLEM. USE A NEGATIVE ENTRY FOR TIME(1) IF IT IS DESIRED THAT THESE IDENTIFICATION NUMBERS BE CALLED CASES IN THE OUTPUT FORMAT (OTHERWISE, THEY ARE IDENTIFIED AS TIMES).

CARD 3. FORMAT(I2,MX,40)11

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), NS

NUMBER OF STREAMWISE STATIONS (MAXIMUM OF 40)

FIELD 2 (COLUMNS 11-50), KR9

VALUES TO BE ASSIGNED TO KR(9) WHEN WALL BOUNDARY CONDITIONS ARE TO BE CHANGED AT DOWNSTREAM STATIONS (SEE CARD 1 OF GROUP 1). COLUMN 11 CORRESPONDS TO STATION S(1), COLUMN 12 TO STATION S(2), AND SO ON. IF WALL BOUNDARY CONDITIONS ARE NOT TO BE CHANGED AT DOWNSTREAM STATIONS, THIS FIELD SHOULD BE LEFT BLANK. WHEN THE KR9() ARE EMPLOYED, KR(9) SHOULD BE GIVEN THE VALUE NECESSARY TO READ ALL APPROPRIATE WALL DATA (GROUP 16). AT THE PRESENT TIME, IT IS POSSIBLE TO CONSIDER ANY COMBINATIONS KR9 OF 2, 3, AND 4 COMPRISING REGIONS OF AN ABLATION MATERIAL AND REGIONS WHERE THERE IS NO ABLATION (THESE NON-ABLATING REGIONS ARE OBTAINED BY USE OF KR9() = 2 WHILE ASSIGNING ZERO COMPONENT MASS FLUXES, SEE CARD SET 11 OF GROUP 16)

CARD SET 4. FORMAT(ME10,4)

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD,
S(L), I=1,NS (SEE CARD 3 OF THIS GROUP)

STREAMWISE DISTANCE UPON WHICH BOUNDARY-LAYER SOLUTION IS BASED, FEET.
A BLUNT-BODY PROBLEM (KR(6) = 0.1 OR 5) SHOULD START WITH AN S(1) OF 0.
A SHARP-BODY PROBLEM (KR(6) = 2.3 OR 7) OR A NOZZLE-TYPE PROBLEM (KR(6) =
4 OR 8) MUST NOT START WITH A S(1) OF 0, BUT MUST START WITH SOME FINITE
DISTANCE. THE BOUNDARY LAYER IS ASSUMED TO BE SIMILAR UP TO AND INCLUD-
ING THIS FIRST STATION. A NEGATIVE ENTRY FOR S(L) SIGNIFIES A DISCON-
TINUITY AT THAT STATION. THIS PRODUCES A TWO-POINT DIFFERENCE SOLUTION
AT THE FIRST STATION AFTER THE DISCONTINUITY AND THUS HAS AN EFFECT ONLY
FOR THREE-POINT SOLUTIONS (KR(3)=2). ALSO, FOR BLUNT BODIES, A MINUS
SIGN AT A STATION CAUSES STREAMWISE INTEGRATIONS TO REVERT TO S AS THE
INDEPENDENT VARIABLE - SEE DISCUSSION UNDER CARD 1, COLUMN 6 OF GROUP 1.
FOR DATA START OPTION (SEE GROUP 9) IT IS SUGGESTED THAT THE SECOND
STATION BE 0.01 FEET DOWNSTREAM OF THE FIRST AND THE THIRD, ABOUT 0.05
FEET DOWNSTREAM.

GROUP 4 NODAL DATA (CALLED FROM RECASE) *** SKIP THIS GROUP FOR KR(1)=0 ***

CARD 1. FORMAT(I2) ***** USED ONLY IF KR(1)=1 *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), NETA

NUMBER OF NODAL POINTS ACROSS THE BOUNDARY LAYER INCLUDING WALL AND
BOUNDARY LAYER EDGE (MAXIMUM OF 15).

CARD SET 2. FORMAT(ME10,4) ***** USED ONLY IF KR(1)=1 *****

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD,
ETA(I), I=1,NETA (SEE CARD 1 OF THIS GROUP)

ETA STATIONS ACROSS THE BOUNDARY LAYER, STARTING AT THE WALL
(ETA = 0.0). NOTE THAT THESE ARE ACTUALLY η VALUES, AS DEFINED
BY EQUATION NO. 77, NASA CR 1062. OTHER REFERENCES TO ETA IN THE
INPUT SECTION OF THIS MANUAL ALSO REFER TO η . IT IS
RECOMMENDED THAT THE VALUE OF ETA AT THE BOUNDARY-LAYER EDGE BE GIVEN
A VALUE OF ABOUT 5.0 SO THAT THE STRETCHING PARAMETER WILL BE NEAR
UNITY. ALSO, THERE SHOULD NOT BE MUCH MORE THAN A TWO-FOLD CHANGE
IN DISTANCE BETWEEN TWO NEIGHBORING NODES. BEST ACCURACY FOR A GIVEN
NUMBER OF NODES IS OBTAINED IF THE NODES ARE CLOSER TOGETHER NEAR
THE WALL. FOR LAMINAR PROBLEMS, 7 NODES ARE OFTEN SUFFICIENT WITH
A TYPICAL SPACING BEING 0.0, 0.5, 1.0, 1.5, 2.0, 3.0, 5.0 AND WITH
KAPPA = 5, CHAR = 0.4 (SEE CARD 3, FIELDS 1 AND 2 OF THIS GROUP). FOR
TURBULENT BOUNDARY LAYERS, MORE NODES ARE NEEDED CLOSE TO THE WALL DUE
TO THE STEEP GRADIENTS THERE. A TYPICAL SPACING WOULD BE 0.0, 0.024,
0.040, 0.072, 0.120, 0.200, 0.320, 0.440, 0.400, 1.400, 2.000, 3.200,
5.000, WITH KAPPA = 11 AND CHAR = 0.45. WHATEVER THE NODE SPACING THE

USER MUST EXAMINE THE SOLUTIONS TO BE SURE THAT A REASONABLE CURVEFIT IS OBTAINED NEAR THE WALL. THIS CAN BE A PROBLEM FOR LARGE STREAMWISE DISTANCES IN TURBULENT FLOWS. IN CHECKING THE RESULTS, FOR TURBULENT BOUNDARY LAYERS, THE DIMENSIONLESS EDU VISCOSITY SHOULD BE LESS THAN 0.05 ($\rho \mu_{0.5} \epsilon / \rho_{0.5} \mu_{0.5}$ IN THE OUTPUT) FOR THE SECOND ETA NODE TO INSURE GOOD WALL CURVEFITS. OPTIMUM MODELING OF THE TRANSITION REGION OF THE PROFILE REQUIRES SUFFICIENT ETA SPACING BETWEEN THE VISCOSITY RATIO VALUES OF 0.1 TO 10. IT IS SUGGESTED THIS INTERVAL CONTAIN AT LEAST SEVEN NODES.

CARD 3. FORMAT(I2,F10.4) ***** USED ONLY IF KR(1)=1 *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED). KAPPA

THE VARIABLE KAPPA IS ASSOCIATED WITH THE CONSTRAINT WHICH IS UTILIZED TO EFFECT A STRETCHING OF ETA, THE BOUNDARY-LAYER COORDINATE NORMAL TO THE SURFACE. IN ORDER TO EFFECTIVELY USE THE ASSIGNED NODAL SPACING (SEE CARDS 1 AND 2 OF THIS GROUP). KAPPA IS THE INDEX FOR THE NODAL POINT AT WHICH THE VELOCITY RATIO IS FIXED. TO ILLUSTRATE, IF KAPPA IS 5, THEN THE FIFTH NODAL POINT COUNTING FROM THE WALL AND INCLUDING THE WALL WILL HAVE A VALUE OF CRAR (A QUANTITY WHICH IS INPUT IN THE SECOND FIELD OF THIS CARD).

FIELD 2 (COLUMNS 3-12). CRAR

CRAR IS THE VALUE OF THE VELOCITY RATIO AT THE BOUNDARY-LAYER NODE DESIGNATED KAPPA (SEE DISCUSSION UNDER FIELD 1 OF THIS CARD). FOR EDGE VORTICITY, THE VELOCITY AT KAPPA IS RATIOED TO THE LINEAR EXTRAPOLATION OF THE EDGE VELOCITY TO THE KAPPA NODE.

GROUP 5 BODY SHAPE DATA (CALLED FROM RECASE)

CARD 1. FORMAT(2F10.4) ***** USED ONLY IF BLUNT BODY. KR(6)=0.1, OR 5 *****

FIELD 1 (COLUMNS 1-10). CONE

CONE HALF-ANGLE IN SPHERE-CONE SHAPE BODIES. LEAVE BLANK FOR OTHER BODY SHAPES.

FIELD 2 (COLUMNS 11-20). RNOSE

EFFECTIVE NOSE RADIUS, FEET. THE VALUE READ INTO THIS FIELD IS OVERRIDDEN IF THE PRESSURE RATIO AT THE FIRST STATION, PRE(1), IS READ IN AS A ZERO (SEE CARD SET 3 OF GROUP 15). IF PRE(1) IS NON-ZERO, THEN A NON-ZERO ENTRY IN THE CURRENT FIELD IS USED IN THE CALCULATION OF STAGNATION POINT VELOCITY GRADIENT FROM THE NEWTONIAN RELATION

$$DUES = \text{SQRT}(2./RHOE * PE * 32.1740 * 2116.) / RNOSE$$

WHERE DUES IS THE STAGNATION POINT VELOCITY GRADIENT AND RHOE AND PE ARE LOCAL STAGNATION DENSITY (LB/FT³) AND PRESSURE (ATM), RESPECTIVELY. THIS LATTER APPROACH IS REQUIRED FOR BLUNT-BODY PROBLEMS IF THERE IS ONLY ONE STATION (NS = 1, SEE CARD 3 OF GROUP 3). WHEN RNOSE IS READ INTO THE CURRENT FIELD AND NOT BEING OVERRIDDEN (I.E., WHEN PRE(1) IS NOT SET EQUAL TO ZERO) A MACH NUMBER CORRECTION (IMPORTANT FOR LOW FREE-STREAM MACH NUMBERS) CAN BE MADE BY INPUTTING

$$RNOSE = REFF / \text{SQRT}(1. - PINF / PE)$$

WHERE REFF IS THE TRUE EFFECTIVE NOSE RADIUS (FEET) AND PINF IS THE FREE STREAM STATIC PRESSURE (LB/FT²). (IF THE CURRENT FIELD IS LEFT BLANK AND PRE(1) IS NON-ZERO, THE STAGNATION-POINT VELOCITY GRADIENT IS COMPUTED FROM A CURVE FIT OF THE PRE AROUND THE BODY. IN ANY EVENT, A CURVE FIT OF PRESSURE IS USED TO COMPUTE VELOCITY GRADIENT FOR STATIONS 2 AND BEYOND).

CARD SET 2. FORMAT(RF10.4) ***** NOT USED IF KR(6)=1 OR 3 *****

FIELD 1 (COLUMNS 1-10). FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD, ROKAP(1). I=1, NS (SEE CARD 3 OF GROUP 3)

THIS IS THE LOCAL BODY RADIUS IN FEET NORMAL TO THE BODY CENTERLINE RAISED TO THE KAPPA POWER WHERE KAPPA IS UNITY FOR AXISYMMETRIC BODIES AND ZERO FOR PLANAR BODIES. THEREFORE, ROKAP IS UNITY FOR PLANAR BODIES AND LOCAL BODY RADIUS FOR AXISYMMETRIC BODIES. TWO SPECIAL INPUT FORMATS CAN BE USED. FOR SPHERE CONE BODIES, SET ROKAP(1) EQUAL TO MINUS THE NOSE RADIUS. THE NOSE RADIUS IS THEN SET TO -ROKAP(1) AND ROKAP(1) IS SET TO ZERO. IF SUBSEQUENT ROKAP() ARE INPUT AS ZEROES, THE PROGRAM COMPUTES ROKAP FROM S FOR A SPHERICAL NOSE. THE FIRST NON-ZERO ENTRY IS THE ROKAP AT THE CONE TANGENT POINT. IF THIS IS AGAIN FOLLOWED BY ZEROES, LINEAR INTERPOLATION IS USED TO THE NEXT NONZERO ENTRY TO YIELD ROKAP ALONG A CONICAL AFTERBODY.

FOR SHARP CONES, KR(6) = 2 OR 7, SET ROKAP(1) EQUAL TO MINUS THE CONE HALF ANGLE IN DEGREES. ROKAP(1) IS THEN SET TO ZERO AND THE PROGRAM COMPUTES ROKAP FROM S FOR A SHARP CONE OF THE SPECIFIED HALF ANGLE.

GROUP 6 MATERIAL PROPERTY DATA NEEDED FOR WALL QUASI-STEADY ENERGY BALANCE
(CALLED FROM RECASE) *****CONSIDER THIS GROUP ONLY IF KR(9) OR ANY OF
THE KR9 IS EQUAL TO 3 OR GREATER*****

CARD 1. FORMAT(9F4.3) ** USED ONLY IF KR(9) OR ANY OF THE KR9 IS 3 OR 4 **

FIELDS 1,4,7 (COLUMNS 1-8, 25-32, 49-56), EMIV(I), I=1,3

SURFACE EMITTANCE OF THE MATERIAL COMBINATIONS BEING CONSIDERED UNDER
KR(9) OR KR9 OF 3 OR 4.

FIELDS 2,5,8 (COLUMNS 9-16, 33-40, 57-64), MCARR(I), I=1,3

HEAT OF FORMATION (HTU/LB) OF THE VIRGIN STATE OF THE ABLATION MATERIALS
BEING CONSIDERED UNDER KR(9) OR KR9 OF 3 OR 4.

FIELDS 3,6,9 (COLUMNS 17-24, 41-48, 65-72), HPG(I), I=1,3

HEAT OF FORMATION (HTU/LB) OF THE TRANSPIRANTS BEING CONSIDERED UNDER
KR(9) OR KR9 OF 3 OR 4.

CARD 2. FORMAT(6A4) ** USED ONLY WITH CARD 1 **

FIELDS 1,2, AND 3 (COLUMNS 1-8, 9-16, 17-24)

NAMES OF SURFACE SPECIES FOR MATERIAL COMBINATIONS 1,2, AND 3 EXACTLY AS
THEY APPEAR IN THE THERMODYNAMIC DATA TABLES (GROUP 13), LEFT JUSTIFIED.

GROUP 7 FUNCTION-OF-TIME DATA (CALLED FROM RECASE)

CARD SET 1. FORMAT(HE10.4)

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD,
PTET(M), M=1, NITEM (SEE CARD 1 OF GROUP 3)

LOCAL STAGNATION PRESSURE FOR EACH TIME BEING CONSIDERED, ATMOSPHERES

CARD SET 2. FORMAT(4F10.4)

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD.
GE (M), M=1,NITEM (SEE CARD 1 OF GROUP 3)

STAGNATION ENTHALPY FOR EACH TIME BEING CONSIDERED, BTU/LR

CARD SET 3. FORMAT(4F10.4)

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD.
RADFL (M), M=1,NITEM (SEE CARD 1 OF GROUP 3)

INCIDENT RADIATION FLUX ABSORBED BY THE SURFACE AT STATION S(1) FOR EACH TIME BEING CONSIDERED, BTU/SEC FT² (IF A SURFACE ABSORPTIVITY LESS THAN UNITY IS TO BE CONSIDERED, THESE ENTRIES SHOULD BE CORRECTED FOR SURFACE ABSORPTIVITY). THIS INFORMATION IS USED ONLY FOR KH(9) OR KH9 OF 4 OR 6. INPUT BLANKS IN THIS FIELD FOR OTHER TYPES OF PROBLEMS. RADIATION FLUX AT OTHER STATIONS WILL BE INPUT AS RATIOS IN GROUP 15.

GROUP 4 TURBULENT FLOW PARAMETERS (CALLED FROM TREMBL) **** CONSIDER THIS GROUP ONLY IF KH(7)=2 OR 3 ****

CARD 1. FORMAT(6F10.3)

FIELDS 1-6. (COLUMNS 1-10, 11-20, 21-30, 31-40, 41-50, 51-60) ELCON, YAP, CLNUM, SCT, PRT, RETR

ELCON IS THE PRANDTL MIXING LENGTH CONSTANT (0.44 IS A TYPICAL VALUE).

YAP IS A CONSTANT OF PROPORTIONALITY IN THE MIXING LENGTH EXPRESSION (11.823 IS A TYPICAL VALUE).

CLNUM IS THE CLAUSER CONSTANT OF PROPORTIONALITY IN WAKE REGION (0.018 IS A TYPICAL VALUE).

SCT IS THE TURBULENT SCHMIDT NUMBER.

PRT IS THE TURBULENT PRANDTL NUMBER.

RETR IS THE TRANSITION REYNOLDS NUMBER BASED ON MOMENTUM THICKNESS. IF RETR IS EXCEEDED, TURBULENCE TERMS WILL BE INCLUDED IN THE GOVERNING EQUATIONS.

GROUP 4 FIRST GUESS OR RESTART INFORMATION (CALLED FROM FIRSTG) **** SKIP THIS GROUP FOR KR(2)=2. CONSIDER ONLY CARD 6 FOR KR(2)=0 ****

CARD 1. FORMAT(3F10.4,5X,15) **** USED ONLY FOR KR(2)=1 OR 3 ****

FIELD 1 (COLUMN 1-10) ALPH (NON-DIMENSIONAL)

FIRST GUESS, RESTART, OR DATA START (INPUT OF A MEASURED PROFILE) VALUE FOR THE BOUNDARY LAYER NORMALIZING PARAMETER, ALPHA. FOR A DATA START, THE VALUE OF ALPHA MUST BE CONSISTENT WITH THE INPUTS IN FIELDS 2 AND 3 OF THIS CARD AND OF CARD 3 OF THIS GROUP. MAY BE CALCULATED FROM EQUATION 61 OF REFERENCE 1.

FIELD 2 (COLUMNS 11-20) F(1,1) (NON-DIMENSIONAL)

FIRST GUESS, RESTART, OR DATA START VALUE FOR THE STREAM FUNCTION AT THE WALL. THE VALUE OF THIS PARAMETER MUST BE EQUAL TO THE VALUE OF EQUATION 63 OF REFERENCE 1 ASSUMING A CONSTANT INTEGRAND WITH ALL QUANTITIES EVALUATED AT THE INPUT STATION. THE VALUE OF THE INTEGRATION VARIABLE, η , IS FOUND IN EQUATION 61 OF REFERENCE 1 BY AGAIN SETTING THE INTEGRAND CONSTANT AT THE VALUE OF THE INPUT STATION WITH THE INTEGRATION VARIABLE, η , SET EQUAL TO THE FIRST ASSIGNED STREAMWISE DISTANCE (SEE CARD SET 4 OF GROUP 3). THE ABOVE PROCEDURE IS ESSENTIAL BECAUSE RLIMP CALCULATES THESE QUANTITIES AT THE FIRST STATION ASSUMING THAT ALL UPSTREAM QUANTITIES ARE CONSTANT AND EQUAL TO THE ASSIGNED VALUES AT THE FIRST STATION. TO INPUT VALUES OF ALPH, AND F(1,1) INCONSISTENT WITH THESE VALUES MAY RESULT IN NON-CONVERGENCE AT THE SECOND STREAMWISE STATION.

FIELD 3 (COLUMNS 21-30) F(3,1) (NON-DIMENSIONAL)

FIRST GUESS, RESTART, OR DATA START VALUE FOR NORMALIZED VELOCITY GRADIENT AT THE WALL. THE CORRECT FORM OF THIS TERM IS

$$\frac{\partial(u/u_e)}{\partial\eta} \Big|_{\text{wall}}$$

THIS IS EQUIVALENT TO

$$\frac{1}{u_e} \frac{\partial(u/u_e)}{\partial\eta} \Big|_{\text{wall}}$$

WHERE η IS DEFINED BY EQUATION 33 OF NASA CX-1047. FOR RESTART PURPOSES, THE FPD NUMERICAL VALUE PRINTED OUT BY RLIMP AT THE WALL NODE IS CORRECT. THE RLIMP FP-6, AND ELEMENTAL MASS FRACTION OUTPUT IS ALSO IN THE CORRECT FORM FOR INPUT IN CARD SETS 2, 3, AND 4.

FIELD 4 (COLUMN 36-40, RIGHT JUSTIFIED) IST

STATION NUMBER FOR RESTART. MEANINGFUL ONLY FOR KR(2)=3.

CARD SET 2. FORMAT(4F10.4) **** USED ONLY FOR KR(2)=1 OR 3 ****

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., N TO A CARD.
F(2,I), I=1,NF1A.

FIRST GUESSES, RESTART, OR DATA START VALUES FOR VELOCITY RATIO F(2,I) ACROSS THE BOUNDARY LAYER. THE VALUES MUST BE CONSISTENT WITH THE INPUT FTA DISTRIBUTION OF GROUP 4. THAT IS, THEY MUST BE RELATED TO THE FTA DISTRIBUTION BY A CURVE FIT PROCEDURE IDENTICAL TO THAT SPECIFIED BY KR(1) IN GROUP 1.

CARD SET 3. FORMAT(4F10.4) **** USED ONLY FOR KR(2)=1 OR 3 ****

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD.
G(2,I), G(1,I), I=1,NETA

FIRST GUESSES, RESTART, OR DATA START VALUES FOR THE TOTAL ENTHALPY GRADIENT AT THE WALL DIVIDED BY ALPH (G(2,I)) AND THE TOTAL ENTHALPY G(1,I) ACROSS THE BOUNDARY LAYER.

CARD SET 4. FORMAT(4F10.4) **** USED ONLY FOR KR(2)=1 OR 3 AND NSP GREATER THAN 1 ****

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD.
(SP(2,I,K), SP(1,I,K), I=1,NETA) K=1, NSP-1

FIRST GUESSES, RESTART, OR DATA START VALUES FOR ELEMENTAL MASS FRACTION GRADIENT AT THE WALL SP(2,I,K) AND ELEMENTAL MASS FRACTION VALUES SP(1,I,K) ACROSS THE BOUNDARY LAYER. READ IN WALL GRADIENT AND VALUES AT NODES FOR EACH SPECIES BEFORE GOING ON TO NEXT SPECIES. START EACH SPECIES ON A NEW CARD.

CARD SET 5. FORMAT(4I12) **** USED ONLY FOR KR(2)=1 OR 3 AND NSP GREATER THAN 1 ****

FIELD 1 (COLUMNS 1-2, RIGHT JUSTIFIED), FIELD 2 (COLUMNS 3-4, RIGHT JUSTIFIED), ETC., (LEF(K), K=1,NSP) (SEE CARD 1 OF GROUP 2)

ENTRIES IN THESE FIELDS MUST INDIVIDUALLY CORRESPOND TO THE ELEMENTS AS THEY ARE SELECTED FROM THE THERMODYNAMIC DATA (SEE DISCUSSION UNDER GROUP 1) ACCORDING TO WHETHER, FOR THE FIRST STATION, THE ELEMENT IS

- 0 NOT PRESENT
- 1 PRESENT DUE TO LOCAL INJECTION
- 2 PRESENT DUE TO UPSTREAM INJECTION (NOT POSSIBLE AT FIRST STATION)
- 3 PRESENT FROM THE EDGE GAS

CARD 6. FORMAT(F10.4) ***** USED ONLY FOR KR(2)=0 *****

FIELD 1 (COLUMNS 1-10). GW

FIRST GUESS FOR ENTHALPY OF THE GAS AT THE WALL, BTU/LR

GROUP 10 THIS CARD GROUP NOT USED IN THE PRESENT VERSION OF THE PROGRAM

GROUP 11 ELEMENTAL DATA (CALLED FROM INPUT)

**** SKIP THIS GROUP FOR KR(12)=1 OR 6 OR FOR KR(7)=1 OR 3 ****

CARD 1. FORMAT(I3,F7.0,7F10.4) **** USED ONLY FOR KR(12)=0,2,5, OR 7

FIELD 1 (COLUMNS 1-3, RIGHT-JUSTIFIED). IS

NUMBER OF ELEMENTS IN THE SYSTEM INCLUDING ELECTRONS IF CONSIDERED (THIS ENTRY WILL BE THE SAME AS CARD 1 OF GROUP 2 (EXCEPT FOR THE DIFFERENT FORMAT) FOR SYSTEMS NOT CONTAINING ELECTRONS BUT WILL BE ONE GREATER FOR SYSTEMS CONTAINING ELECTRONS)

FIELDS 2 AND 3 (COLUMNS 4-10,11-20) FFAR, FITMOL

CONSTANTS IN THE CURVEFIT OF FF(J) IN TERMS OF MOLECULAR WEIGHT..

$$FF(J) = (WTM(J)/FITMOL) ** FFAR$$

FFAR AND FITMOL ARE PRESUMED TO BE 0.431 AND 23.4 IF NO ENTRY IS MADE.

FIELDS 4, 5, AND 6 (COLUMNS 21-30, 31-40, 41-50) RASMOL, SIGMA, EPOVRK

THESE VARIABLES DEFINE THE REFERENCE SPECIES PROPERTIES FOR FF(J) (REF. 5). RASMOL IS THE MOLECULAR WEIGHT OF THE REFERENCE SPECIES. SIGMA AND EPOVRK ARE THE SPECIES SIGMA AND EPSILON/K AS DEFINED BY REFERENCE 6. FOR THE CONVENIENCE OF THE USER, A TABLE OF SIGMA AND EPOVRK REPRODUCED FROM REFERENCE 6 IS INCLUDED AS APPENDIX II TO THIS MANUAL. STANDARD VALUES DESCRIBED IN REFERENCE 5 ARE USED IF NO ENTRIES ARE MADE.

FIELD 7 (COLUMNS 71-80) TF(N+1) **** USED ONLY FOR KR(9) = 2 WITH KR(11) = 0 ****

ABLATION TEMPERATURE, ABOVE WHICH EQUILIBRIUM CHAR REMOVAL RATE WILL BE DETERMINED. BELOW THIS TEMPERATURE, SURFACE EQUILIBRIUM IS SUPPRESSED. AUTOMATICALLY SET TO 50,000 K IF NO ENTRY. AN ABLATION TEMPERATURE MUST BE ENTERED HERE IF SURFACE CHEMISTRY IS TO BE CONSIDERED.

CARDS 2,3,...,15 (ONE FOR EACH ELEMENT. SEE CARD 1, FIELD 1 OF THIS GROUP),
FORMAT(I3,3A4,F9.3,7E8.3) **** USED ONLY FOR KR(12)=0,2,5, OR 7 ***

FIELD 1 (COLUMNS 1-3, RIGHT-JUSTIFIED), KAT(K)

ATOMIC NUMBER OF ELEMENT (99 FOR ELECTRON). CARDS MUST BE ORDERED WITH THIS NUMBER ASCENDING WITH ELECTRON LAST (WHEN CONSIDERED).

FIELD 2, (COLUMNS 4-15) ATA(K), ATR(K), ATC(K)

NAME OF ELEMENT (USED FOR OUTPUT ONLY). FOR BEST LOOKING OUTPUT, ELEMENTS WITH 3 OR 4 LETTERS (e.g., IRON) SHOULD START IN COLUMN 6, ELEMENTS WITH 5, 6, OR 7 LETTERS (e.g., CARBON) SHOULD START IN COLUMN 5, AND ELEMENTS WITH 8 OR MORE LETTERS (e.g., NITROGEN) SHOULD START IN COL. 4.

FIELD 3 (COLUMNS 16-24), WAT(K)

ATOMIC WEIGHT OF ELEMENT

FIELD 4 (COLUMNS 25-32) TK(K,1)

AMOUNT OF ELEMENT IN BOUNDARY-LAYER EDGE GAS. SEE BELOW FOR UNITS.

FIELDS 5 TO 10 (COLUMNS 33-40, 41-48, 49-56, 57-64, 65-72, 73-80) TK(K,J)
J=2,7

AMOUNT OF ELEMENT IN PYROLYSIS GAS AND CHAR FOR EACH OF THE THREE ALLOWABLE MATERIALS. FIELDS 5 AND 6 ARE FOR MATERIAL 1, FIELDS 7 AND 8 FOR MATERIAL 2, ETC. NEGATIVE VALUES ARE USED TO DESIGNATE RELATIVE MASSES OF ELEMENTS, WHEREAS POSITIVE VALUES ARE USED TO DESIGNATE RELATIVE NUMBERS OF ATOMS. AS AN EXAMPLE OF THE LATTER, THE ENTRIES FOR A SILICA CHAR COULD BE 1. FOR THE ELEMENT SILICON AND 2. FOR OXYGEN.

GROUP 12 DIFFUSION FACTOR DATA (CALLED FROM INPUT)

**** SKIP THIS GROUP FOR KR(7)=1 OR 3 OR FOR KR(12)=1 OR 6 OR IF IT IS DESIRED TO USE THE MOLECULAR WEIGHT APPROXIMATION FOR DIFFUSION FACTORS (SEE FIELDS 2 AND 3 OF CARD 1 OF GROUP 11). ALWAYS SKIP FOR KR(7)=1 OR 3. ****

CARD 1. FORMAT(I3) ***** USED ONLY FOR KR(12)=0, 2, 5 OR 7 AND THEN ONLY IF IT IS DESIRED TO READ IN DIFFUSION FACTOR DATA FOR ONE OR MORE SPECIES *****

FIELD 1 (COLUMNS 1-3, RIGHT-JUSTIFIED) NFF

NUMBER OF MOLECULES FOR WHICH DIFFUSION FACTOR DATA ARE TO BE READ (SEE FIELDS 2 AND 3 OF CARD 1 OF GROUP 11).

CARDS 2, 3, ... AS REQUIRED (DIFFUSION FACTOR DATA REQUESTED BY CARD 1 OF THIS GROUP ARE ENTERED HERE 4 TO A CARD) FORMAT(4(2A4,E12.4))
 ***** USED ONLY FOR KR(12)=0, 2, 5 OR 7 AND THEN ONLY IF THE CONDITIONS OF CARD 1 OF THIS GROUP ARE MET *****

FIELDS 1, 3, 5, AND 7 (COLUMNS 1-8, 21-28, 41-48, AND 61-68, RESPECTIVELY) NFIA(J) AND NFIB(J) IN EACH FIELD

NAME OF MOLECULE AS IT APPEARS IN COLUMNS 73-80 ON FIRST CARD OF 3-CARD THERMODYNAMIC DATA SET FOR THE MOLECULE (SEE GROUP 13, CARDS 1, 4, 7, .)

FIELDS 2, 4, 6, AND 8 (COLUMNS 9-20, 29-40, 49-60, AND 69-80 RESPECTIVELY) FFIN(J) IN EACH FIELD

A SET OF FF(J) ARE INCLUDED IN THE PROGRAM. IF ANY OF THESE ARE TO BE CHANGED, THE NEW VALUES FOR EACH OF THE SPECIES NAMED IN FIELDS 1,3,5 ETC. ARE ENTERED HERE UNDER THE VARIABLE NAME FFIN(J). THEY ARE THEN SORTED BY SPECIES NAME AND ENTERED INTO THE PROPER SLOTS IN THE FF(J) ARRAY. THESE DIFFUSION FACTORS ARE REFERENCED TO OXYGEN (O2) OR OTHER REFERENCE SPECIES INDICATED IN GROUP 11. TO OBTAIN ACCURATE VISCOSITY CALCULATIONS USE

$$FF(J) = (SIGMA(J) * WTM(J) ** .25 * EPOVRK(J) ** .0795) / (SIGMA(REF) * WTM(REF) ** .25 * EPOVRK(REF) ** .0795)$$

GROUP 13 THERMOCHEMICAL DATA (CALLED FROM INPUT)

***** SKIP THIS GROUP FOR KR(12)=1 OR 6 OR KR(7)=1 OR 3 *****

THERE ARE THREE CARDS FOR EACH MOLECULAR, ATOMIC, CONDENSED, OR IONIC SPECIES. A TOTAL OF 70 SPECIES OF ALL TYPES ARE ALLOWED. THE NUMBER OF ALLOWABLE CONDENSED-PHASE MATERIALS WHICH CAN BE SIMULTANEOUSLY PRESENT IN ANY SOLUTION IS 4. ANY NUMBER OF CONDENSED PHASE SPECIES CAN BE INCLUDED IN THE THERMOCHEMICAL DATA DECK. (NOTE... CONDENSED SPECIES ARE REQUIRED IN SURFACE EQUILIBRIUM CALCULATIONS FOR CONSIDERATION AS CANDIDATE SURFACE MATERIALS BUT ARE NOT PRESENTLY CONSIDERED AS CANDIDATE SPECIES WITHIN THE BOUNDARY LAYER). A BLANK CARD AFTER THE LAST SET CONCLUDES THE THERMODYNAMIC DATA. THE ARRANGEMENT OF THESE CARD SETS IS OF CONSEQUENCE IN SO FAR AS IT DETERMINES THE BASE SPECIES UPON WHICH MASS BALANCES ARE PERFORMED. THE FIRST INDEPENDENT SET OF BASE SPECIES BEING SELECTED. SINGULAR MATRICES CAN RESULT FROM CERTAIN SETS OF THEORETICALLY ACCEPTABLE BASE SPECIES DUE TO ROUND-OFF ERRORS. FURTHERMORE, MASS BALANCES, ETC. FOR THE (NSP)TH BASE SPECIES (SEE CARD 1 OF GROUP 2) IS OBTAINED BY DIFFERENCE. THEREFORE, THE ELEMENT REPRESENTED BY THIS BASE SPECIES SHOULD BE PRESENT IN APPRECIABLE QUANTITIES THROUGHOUT THE BOUNDARY LAYER. FOR EXAMPLE, FOR ABLATION IN AIR, MOLECULAR NITROGEN IS A GOOD CHOICE FOR THE (NSP)TH BASE SPECIES. FINALLY, THE ORDER OF THE BASE SPECIES DETERMINES THE REACTANTS FOR KINETICS PROBLEMS (SEE GROUP 14, CARD 3) EXCEPT FOR THESE CONSIDERATIONS, ATOMIC, MOLECULAR, AND CONDENSED SPECIES CAN BE ARRANGED IN ANY ORDER. WHEN IONIZED FLOWS ARE CONSIDERED, THE ATOMIC, MOLECULAR AND CONDENSED SPECIES DATA MUST APPEAR FIRST AND BE FOLLOWED BY, FIRST, ELECTRON SPECIES DATA, AND THEN THE IONIC SPECIES DATA (WHICH CAN BE IN ANY ORDER). THE DATA FORMAT ACCEPTED BY THE PROGRAM (DESCRIBED BELOW) IS AS GENERATED BY THE AEROTHERM TCDATA PROGRAM AND IS THE SAME AS THAT USED IN NAVWEPS REPORT 7043. THERMOCHEMICAL DATA DECKS HAVE BEEN GENERATED FOR ABOUT 600 SPECIES, BASED MOSTLY ON CURVE FITS OF JANAF DATA.

CARDS 1, 4, 7, ... ONE FOR EACH MOLECULE FORMAT(7(F3.0,I3),30X,2A4)

***** USED ONLY FOR KR(12)=0, 2, 5 OR 7 *****

FIELDS 1, 3, 5, ... ONE FOR EACH ELEMENT IN MOLECULE (COLUMNS 1-3, 7-9, 13-15, ...), ALPT(N) IN EACH FIELD

NUMBER OF ATOMS (OF ATOMIC NUMBER GIVEN IN SUBSEQUENT FIELD) IN A MOLECULE OF THIS SPECIES. IF FIELD ONE IS ZERO THIS CARD IS PRESUMED TO BE THE END OF THE THERMODYNAMIC DATA.

FIELDS 2, 4, 6, ... ONE FOR EACH ELEMENT IN MOLECULE (COLUMNS 4-6, 10-12, 16-18, ...), JAT(N) IN EACH FIELD

ATOMIC NUMBERS OF ELEMENTS IN MOLECULES (LISTED IN ASCENDING SEQUENCE).

LAST FIELD (COLUMNS 73-80)

MOLECULAR DESIGNATION (e.g., SI02) FOR OUTPUT AND AS IDENTIFIER FOR DIFFUSION FACTOR DATA.

CARDS 2, 5, 8, ... ONE FOR EACH MOLECULE FORMAT(6E9.6,6X,F6.0,I1)
 ***** USED ONLY FOR KR(12)=0, 2, 5 OR 7 *****

FIELD 1 (COLUMNS 1-9), HA(J)

HEAT OF FORMATION OF MOLECULE AT 298 DEG K FROM JANAF BASE STATE
 (ELEMENTS IN MOST NATURAL FORM AT 298 DEG. K), CAL/MOLE.

FIELDS 2-6 (COLUMNS 10-18, 19-27, 28-36, 37-45, AND 46-54), CH(J,1),
 RC(J,1),RD(J,1),RE(J,1), RF(J,1)

CONSTANTS APPROPRIATE TO LOWER TEMPERATURE RANGE OF THERMODYNAMIC DATA.
 TAKING F2, F3, ... AS FIELDS 2, 3, ETC., THE CURVE FITS ARE AS FOLLOWS
 WITH T IN DEG K, H IN CAL/MOLE, AND S IN CAL/MOLE DEG K.

HEAT CAPACITY, $CH = F3 + F4 \cdot T + F5/T^{**2}$

ENTHALPY, $H - H_{298} = F2 + F3 \cdot (T - 3000) + 0.5 \cdot F4 \cdot (T^{**2} - 3000^{**2})$
 $- F5 \cdot (1/T - 1/3000)$

ENTROPY, $S = F6 + F3 \cdot \ln(T/3000) + F4 \cdot (T - 3000) - 0.5 \cdot F5 \cdot (1/T^{**2} - 1/3000^{**2})$

FIELD 7 (COLUMNS 61-66), TU(J,1)

UPPER LIMIT OF LOWER TEMPERATURE RANGE IN DEG K. (FOR CONDENSED-PHASE
 MATERIALS WHICH MELT, IT IS APPROPRIATE TO USE MELT TEMPERATURES).

FIELD 8 (COLUMN 67), KPHA(1)

1 SIGNIFIES GASEOUS SPECIES

2 SIGNIFIES SOLID SPECIES

3 SIGNIFIES LIQUID SPECIES

CARDS 3, 6, 9, .. ONE FOR EACH MOLECULE FORMAT(6E9.6,6X,F6.0,I1)
 ***** USED ONLY FOR KR(12)=0, 2, 5 OR 7 *****

FIELDS 1-8 (COLUMNS 1-67)

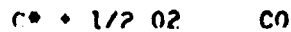
SAME AS CARDS 2, 5, 8, ... EXCEPT USE CONSTANTS FOR UPPER TEMPERATURE
 RANGE AND FIELD 7 IS THE FAIL TEMPERATURE OF THIS SPECIES AS A SURFACE.

LAST CARD AS MENTIONED PREVIOUSLY, A BLANK CARD IS USED TO SIGNIFY THE
 END OF THERMOCHEMICAL DATA

GROUP 14 SURFACE KINETIC DATA (CALLED FROM INPUT)

**** SKIP THIS GROUP FOR KR(12)=0.1, OR 2 OR KR(7)= 1 OR 3 ****

REACTIONS OF THE SURFACE MATERIALS WITH ADJACENT BOUNDARY LAYER GASES CAN BE KINETICALLY CONTROLLED ACCORDING TO AN ARRHENIUS TYPE RELATION. FOR EXAMPLE, IN THE REACTION



THE MASS FLUX RELATION IS

$$\frac{\dot{m}_C}{M_C} = FKF \cdot \exp\left(\frac{EAK}{(1.9869 \cdot T)}\right) \cdot \left(P_{O_2}^h - \frac{P_{CO}}{K_P}\right)^{EXK}$$

WHERE

- $\dot{m}_C$ = CARBON MASS FLUX
- M_C = CARBON MOLECULAR WEIGHT
- FKF = PRE-EXPONENTIAL FACTOR
- EAK = ACTIVATION ENERGY
- T = TEMPERATURE
- P = PARTIAL PRESSURE OF THE SUBSCRIPTED SPECIES
- K = EQUILIBRIUM CONSTANT
- EXK = REACTION ORDER

THESE CONSTANTS AND FACTORS ARE INPUT ON THE CARDS DESCRIBED BELOW. FURTHER DISCUSSION OF KINETIC MODELS FOR ABLATION CAN BE FOUND IN REFERENCE 7. FOR EXAMPLE-

CARD 1. FORMAT(I3)

FIELD 1 (COLUMNS 1-3, RIGHT JUSTIFIED), MT

NUMBER OF KINETICALLY CONTROLLED REACTIONS TO BE CONSIDERED. IF TWO PROBLEMS ARE STACKED TOGETHER SEPARATED BY A COMMA (SEE CARD 1 OF LAST GROUP) AND IF THE FIRST IS A KINETICS PROBLEM AND THE SECOND IS TO BE EQUILIBRIUM, THEN FOR THE SECOND, KINETICS MUST BE TURNED OFF USING KR(12)=5.6 OR 7 AND MT=0.

CARDS 2,5,8,... ONE FOR EACH KINETICALLY CONTROLLED REACTION. FORMAT(8E10.4)

FIELD 1 (COLUMNS 1-10), FKF(N)

PRE-EXPONENTIAL FACTOR FOR SURFACE MASS BALANCES IN LB-MOLES OF REACTANT PER FT**2 PER SECOND.

FIELD 2 (COLUMNS 11-20). EAK(N)

ACTIVATION ENERGY FOR THE FORWARD REACTION IN CALORIES PER GRAM-MOLE

FIELD 3 (COLUMNS 21-30). EXK(N)

REACTION EXPONENT: THE DRIVING POTENTIAL AS OBTAINED FROM THE REACTION STOICHIOMETRY IS RAISED TO THIS POWER IN EVALUATING THE REACTION RATE. EXK = 1.0 IS RECOMMENDED.

CARDS 3,6,9,... ONE FOR EACH KINETICALLY CONTROLLED REACTION. FORMAT(8E10.4)

FIELDS 1,2,3,... ONE FOR EACH BASE SPECIES (COLUMNS 1-10,11-20,...).
RMU(K,N)

STOICHIOMETRIC COEFFICIENTS ON REACTANTS. IN THE PRESENT FORMULATION ONLY BASE SPECIES MAY BE USED AS REACTANTS. THUS SOME CARE MUST BE USED IN ESTABLISHING THE ORDER OF GROUP 13.

CARDS 4,7,10,... ONE FOR EACH KINETICALLY CONTROLLED REACTION.
FORMAT(8E10.4)

FIELDS 1,2,3,... ONE FOR EACH BASE SPECIES (COLUMNS 1-10,11-20,...).
PMU(K,N)

STOICHIOMETRIC COEFFICIENTS ON THE PRODUCTS, OR ON THEIR EQUILIBRIUM BASE SPECIES EQUIVALENTS IF THEY ARE NOT BASE SPECIES. FOR EXAMPLE IF THE BASE SPECIES ARE CO, H2O, H2, AND C* FOR A SYSTEM WHERE C* IS THE ONLY ISOLATED (NONEQUILIBRIUM) SPECIES, A REACTION WRITTEN AS



COULD EQUIVALENTLY BE WRITTEN



AND THIS IS THE MANNER IN WHICH THE PRODUCT COEFFICIENTS WOULD BE INPUT. THIS EQUIVALENT REPRESENTATION CAN NOT BE USED FOR REACTANTS.

GROUP 15 STREAMWISE DISTRIBUTIONS FOR EDGE CONDITIONS (CALLED FROM REFCN)

CARD SET 1. FORMAT(8E10.4) ***** USED ONLY FOR KR(5)=5 *****

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD.
DSIP(L), L=1,NS (SEE CARD 3 OF GROUP 3)

DECREASE IN EDGE ENTROPY FROM PREVIOUS STATION TO CURRENT STATION,
CAL/GM DEG K (THE STAGNATION POINT ENTROPY IS COMPUTED BY THE PROGRAM.
DSIP IS USED TO DECREMENT THE ENTROPY AT DOWNSTREAM STATIONS TO TAKE
INTO ACCOUNT SHOCK CURVATURE. DSIP(1) SHOULD BE SET EQUAL TO ZERO.)

CARD 2. FORMAT (12,E8.5,7E10.5) ***** USED ONLY FOR KR(5) = 2,3 OR 4*****

FIELD 1-5 (COLUMN 1-2, 3-10, 11-20, 21-30, 31-40) NEN, UINF, RHOINF,
HINF, PINF

NEN NUMBER OF ENTROPY OR SHOCK LAYER POINTS (MAXIMUM OF 20)

*UINF FREE STREAM VELOCITY, FT/SEC

*RHOINF FREE STREAM DENSITY, LB/FT³

*HINF FREE STREAM ENTHALPY, BTU/LB

*PINF STATIC PRESSURE, ATMOSPHERES

- * ENTRY REQUIRED IF FREE STREAM STREAM FUNCTION POSITION GIVEN
- * ENTRY REQUIRED IF ENTROPY DATA GIVEN IN TERMS OF SHOCK ANGLE
(SEE CARD SET 3 AND 4)

CARD SET 3. FORMAT (A1,E9.4,7E10.4/8E10.4) ***** USED ONLY IF KR(5) =
2,3 OR 4 AND NEN > 0

FIELD 1 (COLUMN 1) IRED,

ALPHABETIC CHARACTER DESCRIPTIVE OF DATA IN SUBSEQUENT FIELDS:

I FREE STREAM STREAM FUNCTION POSITION IN INCHES (NORMAL TO
CENTERLINE)

F FREE STREAM STREAM FUNCTION POSITION IN FEET (NORMAL TO
CENTERLINE)

BLANK STREAM FUNCTION VALUE IN LB/SEC/RAD FOR AXISYMMETRIC
BODIES OR LB/SEC/FT FOR PLANAR BODIES

FIELDS 2,3, ... NEN-1 (COLUMNS 2-10, 11-20, 21-30 ETC. 8 TO A CARD)
SF(I), I=1,NEN

WHERE THE SF ARE AS DESCRIBED ABOVE

CARD SET 4. FORMAT (A1, E9.4, 7E10.4/RE10.4) ***** USED ONLY IF
KR(5) = 2, 3 OR 4

FIELD 1 (COLUMN 1) I(ED)

ALPHABETIC CHARACTER DESCRIPTIVE OF DATA IN SUBSEQUENT FIELDS:

D SHOCK ANGLE* IN DEGREES
R SHOCK ANGLE* IN RADIANS
BLANK ENTROPY (BTU/LB DEG R) RELATIVE TO CENTERLINE VALUE

*THE SHOCK ANGLE IS DEFINED RELATIVE TO THE CENTERLINE.

FIELDS 2, 3, ... NFN+1 (COLUMNS 2-10, 11-20, 21-30, ETC 8 TO A CARD)
CS(I), I=1, NFN

WHERE THE CS ARE AS DESCRIBED ABOVE, CORRESPONDING TO STREAM FUNCTION
DATA OF CARD SET 3. IF NFN ENTERED AS ZERO ON CARD 2, NFN SET TO
NUMBER OF STATIONS AND STREAM FUNCTIONS CORRESPOND TO ROKAP VALUES OF
CARD SET 2 OF GROUP 5.

CARD SET 5. FORMAT (RE10.4) ***** USED ONLY IF KR(5) = 4

FIELDS 1, 2, ... NFN

TOTAL ENTHALPY, HTU/LH, RELATIVE TO CENTERLINE VALUE CORRESPONDING
TO STREAM FUNCTION DATA OF CARD SET 3.

CARD 6. FORMAT(12) ***** USED ONLY IF CARD SET 1 OR 2 IS USED *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), IDSIP

ITEM WHEN DATA ABOVE (CARD SET 1 TO 5) IS TO BE UPDATED WHERE ITEM IS
INDEX ON TIME (ON SURFACE) USE BLANK CARD IF DATA IS TO REMAIN UNCHANGED
FOR ALL REMAINING TIMES OR IF NO MORE TIMES ARE TO BE CONSIDERED.

CARD SET 7. FORMAT(RE10.4)

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD,
PRE(L), L=1, NS (SEE CARD 3 OF GROUP 3)

RATIO OF LOCAL STATIC TO STAGNATION PRESSURE. IN ADDITION TO DEFINING
THE LOCAL PRESSURE, THIS DATA IS USED TO FORM THE LOCAL VELOCITY GRAD-
IENT AT THE STAGNATION POINT AND OTHER BODY STATIONS. DUE TO THE SENSI-
TIVITY OF THE PROGRAM TO THE VELOCITY GRADIENT IN THE STAGNATION REGION,
TWO OPTIONS HAVE BEEN INCORPORATED TO ALLOW A SMOOTHER VELOCITY GRADIENT
DISTRIBUTION THAN IS TYPICALLY OBTAINED BY HEADING NUMBERS FROM A SET
OF CURVES, FOR EXAMPLE. THE VARIOUS OPTIONS ARE CONTROLLED BY THE
ENTRIES IN THIS PRESSURE TABLE AND THE EFFECTIVE NOSE RADIUS ENTRY
(GROUP 5, CARD 1, FIELD 2).

- 1) PRE(1) IS READ IN BUT RNOSE IS NOT

THE INPUT PRESSURES ARE CURVE FITTED AND PRESSURE AND VELOCITY GRADIENTS ARE EVALUATED DIRECTLY FROM THE RESULTING CURVE.

- 2) PRE(1) AND RNOSE BOTH READ IN.

STAGNATION POINT VELOCITY GRADIENT EVALUATED FROM

$$DUES = 1./RNOSE * SQRT(2.*PE/RHOE * 32.174 * 2116.)$$

- 3) PRE(1) NOT READ IN, AND PRE () NOT READ IN FOR AN ARBITRARY NUMBER OF STATIONS.

IN THIS INSTANCE THE VELOCITY GRADIENT IS ASSUMED TO BE LINEAR AND A NEWTONIAN PRESSURE DISTRIBUTION FOR SMALL S/R IS ASSUMED AT THOSE STATIONS FOR WHICH NO PRESSURE IS INPUT. FIRST, AN EFFECTIVE NOSE RADIUS, RNOSE, IS COMPUTED FROM THE FIRST NONZERO PRESSURE ENTRY FROM THE RELATION

$$RNOSE = S(L)/SQRT(1-PRE(L))$$

THE STAGNATION POINT VELOCITY GRADIENT IS THEN FOUND AS IN OPTION (2) ABOVE. PRESSURE FOR STATION LL LESS THAN L IS FOUND FROM

$$PRE(LL) = 1. - (S(LL)/RNOSE)**2$$

CARD 8. FORMAT(I2) ***** USED ONLY IF CARD SET 3 IS USED *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), IPRE

ITEM WHEN PRE IS TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR SUBCASE) USE BLANK CARD IF PRE IS TO REMAIN UNCHANGED FOR ALL REMAINING TIMES OR IF NO MORE TIMES ARE TO BE CONSIDERED.

CARD SET 9. FORMAT(RE10.4)

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD, RADR(L), L=1,NS (SEE CARD 3 OF GROUP 3)

RATIO OF LOCAL TO STAGNATION POINT INCIDENT RADIATION. THIS INFORMATION IS USED ONLY FOR KR(9) OR KR9 OF 4. INPUT BLANKS INTO THIS FIELD FOR OTHER TYPES OF PROBLEMS.

CARD 10. FORMAT(I2)

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), IRAD

ITEM WHEN RADR IS TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR SUBCASE) USE BLANK CARD IF RADR IS TO REMAIN UNCHANGED FOR ALL REMAINING TIMES OR IF NO MORE TIMES ARE TO BE CONSIDERED.

GROUP 16 STREAMWISE DISTRIBUTIONS FOR INPUT WALL CONDITIONS
(CALLED FROM REFCN)

CARD SET 1. FORMAT(RF10.4) *** USED ONLY FOR KR(11)=1 AND KR(9)=0,1, OR 2 **

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD,
HW(L,1), L=1,NS (SEE CARD 3 OF GROUP 3)

ENTHALPY OF THE GAS AT THE WALL, BTU/LB

CARD 2. FORMAT(I2) ***** USED ONLY IF CARD SET 1 IS USED *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), IHW

ITEM WHEN HW IS TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR SUBCASE).
USE BLANK CARD IF HW IS TO REMAIN UNCHANGED FOR ALL REMAINING TIMES OR
IF NO MORE TIMES ARE TO BE CONSIDERED.

CARD SET 3. FORMAT(RF10.4) ***** USED ONLY IF KR(11)=0 AND KR(9)=0,1, OR 2,
IF KR(9)=3 OR IF ANY OF THE KR9=2 OR 3 ****

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD,
TW(L,1), L=1,NS (SEE CARD 3 OF GROUP 3)

WALL TEMPERATURE, DEG R

CARD 4. FORMAT(I2) ***** USED ONLY IF CARD SET 3 IS USED *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), ITW

ITEM WHEN TW IS TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR SUBCASE).
USE BLANK CARD IF TW IS TO REMAIN UNCHANGED FOR ALL REMAINING TIMES OR
IF NO MORE TIMES ARE TO BE CONSIDERED.

CARD SET 5. FORMAT(RF10.4) ***** USED ONLY FOR KR(9)=0 AND KR(11)=0 OR 1 ***

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD,
FW(L,1), L=1,NS (SEE CARD 3 OF GROUP 3)

WALL STREAM-FUNCTION (NEGATIVE FOR MASS ADDITION)

CARD 6. FORMAT(I2) ***** USED ONLY IF CARD SET 5 IS USED *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), IFW

ITEM WHEN FW IS TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR SUBCASE).
USE BLANK CARD IF FW IS TO REMAIN UNCHANGED FOR ALL REMAINING TIMES OR
IF NO MORE TIMES ARE TO BE CONSIDERED.

CARD SET 7. FORMAT(8F10.4) ***** USED ONLY FOR KR(9)=1 AND KR(11)=0 OR 1 ***

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD,
RHOVW(L,1), L=1,NS (SEE CARD 3 OF GROUP 3)

TOTAL MASS FLUX AT THE WALL (LB/SEC FT²) DIMENSIONLESS FOR KR(8)=0 OR
1, RESPECTIVELY, POSITIVE FOR MASS INJECTION)

CARD 8. FORMAT(I2) ***** USED ONLY IF CARD SET 7 IS USED *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), IRHOVW

ITEM WHEN RHOVW IS TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR
SUBCASE). USE BLANK CARD IF RHOVW IS TO REMAIN UNCHANGED FOR ALL RE-
MAINING TIMES OR IF NO MORE TIMES ARE TO BE CONSIDERED.

CARD SET 9. FORMAT(8F10.4) ***** USED ONLY FOR KR(7)=0 OR 2, KR(9)=0 OR 1,
AND KR(11)=0 OR 1.

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD,
DO K=1,NSPM1 SPW(K,L,1), L=1,NS NSPM1=NSP-1 (SEE CARD 1 OF GROUP
2 AND CARD 3 OF GROUP 3)

WALL ELEMENTAL MASS FRACTIONS IN THE SAME ORDER THAT THEY ARE SELECTED
FROM THE THERMODYNAMIC DATA (SEE DISCUSSION UNDER GROUP 13)

CARD 10. FORMAT(I2) ***** USED ONLY IF CARD SET 9 IS USED *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), ISPW

ITEM WHEN THE SPW ARE TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR SUB-
CASE). USE BLANK CARD IF THE SPW ARE TO REMAIN UNCHANGED FOR ALL RE-
MAINING TIMES OR IF NO MORE TIMES ARE TO BE CONSIDERED.

CARD SET 11. FORMAT(8F10.4) ***** USED ONLY FOR KR(7)=0 OR 2 WITH KR(9)=2 AND
KR(11)=0,1, OR 2, OR WITH ANY OF THE KR9=2

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD,
DO N=1,3 FLUXJ(N,L,1), L=1,NS (SEE CARD 3 OF GROUP 3)

WALL MASS FLUXES OF BOUNDARY LAYER EDGE GAS, PYROLYSIS GAS, AND CHAR, RESPECTIVELY (SEE GROUP 11, CARDS 2,3, ..., FIELD 4), LB/SEC FT² OR DIMENSIONLESS FOR $KR(8) = 0$ OR 1, RESPECTIVELY. POSITIVE FOR MASS INJECTION WHEN $KR(8) = 0$ AND NEGATIVE FOR MASS INJECTION WHEN $KR(8)=1$. READ IN ALL EDGE GAS VALUES, THEN START PYROLYSIS GAS VALUES ON A NEW CARD AND READ ALL PYROLYSIS GAS VALUES, ETC.

CARD 12 FORMAT(I2) ***** USED ONLY IF CARD SET 11 IS USED *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), IFLUXJ

ITEM WHEN THE FLUXJ ARE TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR SUBCASE). USE BLANK CARD IF THE FLUXJ ARE TO REMAIN UNCHANGED FOR ALL REMAINING TIMES OR IF NO MORE TIMES ARE TO BE CONSIDERED.

GROUPS 17,18,19, ..., (13+NITEM) SEE CARD 1 OF GROUP 3 (CALLED FROM REFCON)

UPDATING INFORMATION FOR STREAMWISE DISTRIBUTIONS OF EDGE AND WALL CONDITIONS FOR TIMES 1,2,3, ..., NITEM-1. NO ADDITIONAL INFORMATION AFTER GROUP 16 IS REQUIRED FOR NITEM = 1 OR IF CARDS 2,4,6,... OF GROUPS 15 AND 16 ARE ALL BLANK. DATA ARE SUPPLIED FOR EACH SET AND ONLY EACH SET OF STREAMWISE INFORMATION FOR WHICH THE CURRENT TIME HAS BEEN DESIGNATED IN A PREVIOUS GROUP (E.G. CONSIDER TW AT TIME 4 (GROUP 19). TW DATA (I.E., CARD SET 3 AND CARD 4 OF GROUP 16) WOULD BE REQUIRED IF A 4 HAS APPEARED IN CARD 4 OF GROUP 18,17 OR 16) ALL DATA REQUIRED AT TIME 2 (IF ANY) ARE SUPPLIED. FIRST (GROUP 17), THEN FOR TIME 3 (GROUP 18), TIME 4 (GROUP 19), ETC. FOR EACH TIME, THESE DATA ARE SUPPLIED IN THE SAME ORDER AS LISTED UNDER GROUPS 15 AND 16. FORMATS ARE THE SAME AS IN GROUPS 15 AND 16. IN PARTICULAR, IT SHOULD BE NOTED THAT EACH ODD-NUMBERED CARD MUST BE FOLLOWED BY THE APPROPRIATE EVEN-NUMBERED CARD SIGNIFYING FOR WHAT TIME (IF ANY) DATA OF THIS SAME TYPE IS TO BE UPDATED AGAIN.

LAST GROUP (CALLED FROM RLIMP)

CARD 1 FORMAT(A1)

FIELD 1 (COLUMN 1), JAST

THE PURPOSE OF THIS ENTRY IS TO PERMIT A TEST ON WHETHER OR NOT A NEW CASE IS TO FOLLOW. IN THE EVENT A CASE DOES NOT CONVERGE IN THE ALLOTTED NUMBER OF ITERATIONS. ANY REMAINING CARDS FOR THAT CASE ARE READ AND THEN IGNORED UNTIL A COMMA (,) OR A PERIOD (.) IS ENCOUNTERED IN COLUMN 1. A COMMA SIGNIFIES ANOTHER CASE, WHILE A PERIOD SIGNIFIES THAT THERE ARE NO CASES TO FOLLOW.

SECTION II
FORTRAN VARIABLES LIST

The revised Fortran Variables List is contained in this section.

FORTRAN VARIABLES LIST

A(N,NN)	ERROR COEFFICIENT ARRAY IN CHEMISTRY SOLUTION, N PERTAINS TO EQUATION WHEREAS NN PERTAINS TO VARIABLE.	C EQTCOM
AA	PRODUCT OF PRESSURE TIMES MOLECULAR WEIGHT.	C EQTCOM
AAA	DEFUNCT VARIABLE, SET TO UNITY.	C EQPCOM
AR	LOCALLY DEFINED VARIABLE	L SLOPQ
ARR	LOCALLY DEFINED VARIABLE	L SLOPQ
ARER	ABSOLUTE VALUE OF RATIO OF A MASS BALANCE ERROR TO LARGEST TERM IN THAT MASS BALANCE.	L MATER
ABSV	ABSOLUTE VALUE OF CONTRIBUTION OF A SPECIES TO A MASS BALANCE.	L MATER
ARX	ABSOLUTE VALUE OF LOG CORRECTION ON TEMPERATURE.	L CRECT
AC	LOCALLY DEFINED VARIABLE	L SLOPQ
ACC	LOCALLY DEFINED VARIABLE	L SLOPQ
ACH	MACH NUMBER	L OUTPUT
ADIM	COEFFICIENT IN SURFACE KINETIC LATION FOR MATERIAL BEING CONSIDERED UNDER (R(9) : 5 OR SEE INPUT INSTRUCTIONS).	C CRBCOM
AF	LOCALLY DEFINED VARIABLE	L TRMBL
ALF	DERIVATIVE OF LOG MOLECULAR WEIGHT WITH RESPECT TO LOG TEMPERATURE AT CONSTANT PRESSURE.	L EQUIL
ALP(K)	INPUT MASS QUANTITY OF ELEMENTS, EQ(25) OF NASA CR-1064.	C EQTCOM
ALPH	NORMALIZING PARAMETER FOR BOUNDARY LAYER NORMAL COORDINATE, SFE EQ. (33) OF NASA CR-1062.	C VARCOM
ALPHD	D1*ALPH + D2*HALPH WHERE D1 AND D2 ARE DEFINED BY EQ(88) OR (89) OF NASA CR-1062.	C HISCOM
ALPT(N)	NUMBER OF ATOMS OF AN ELEMENT WITH ATOMIC NUMBER JAT(N) IN A SPECIES.	L INPUT
ALSO	ALPH**2	L FIRSTG

AM(N,NN)	COEFFICIENTS IN THE MATRIX DEFINED AS (BNL) IN EQ(150) OF NASA CR-1062.	C NONCOM
AMOA	ALPHANUMERIC VARIABLE, FIRST OF TWO PORTIONS OF SPECIES NAME.	L INPUT
AMOB	ALPHANUMERIC VARIABLE, SECOND OF TWO PORTIONS OF SPECIES NAME.	L INPUT
AMUS	$VN(J) * WTM(J) / (FF(J) * (W0Z - VN(J) * FF(J) * WD7))$ SUMMED OVER ALL SPECIES N *.	L PROPS
APE(N,NN)	SAVED ARRAY A(N,NN) DURING INVERSION.	L EQUIL
AR	WEIGHTING FACTOR IN LINEARIZING EQUILIBRIUM ASPECT OF KINETICALLY CONTROLLED MASS BALANCE.	L KINET
AREA	AREA PER UNIT MASS FLOW DURING EXPANSION.	L EQUIL
ARPH	ELEMENTAL MASS FRACTION OF ATOM.	L EQUIL
ARPHM	MAXIMUM CONTRIBUTION TO CALCULATION OF AN ARPH.	L EQUIL
ASTAR	A* USED IN TRANSPORT PROPERTIES	L PROPS
ASU	FIRST FOUR CHARACTERS OF ALPHANUMERIC NAME OF ASSIGNED SURFACE SPECIES	C CRRCOM
ATA(K)	ALPHANUMERIC VARIABLE, FIRST OF THREE PORTIONS OF ELEMENT NAME.	C EQPCOM
ATB(K)	ALPHANUMERIC VARIABLE, SECOND OF THREE PORTIONS OF ELEMENT NAME.	C EQPCOM
ATC(K)	ALPHANUMERIC VARIABLE, THIRD OF THREE PORTIONS OF ELEMENT NAME.	C EQPCOM
ATEMP	ABSOLUTE VALUE OF DTEMP	L NONCER
B(N)	ERRORS USED WITH COEFFICIENTS TO YIELD CORRECTIONS IN CHEMISTRY ITERATIONS, IDENTICAL TO BB*.	C EQTCOM
H(N)	ARRAY OF CONSTANTS DEFINED IN BLIMP, IDENTICAL TO BB*.	C INTCOM
B1	SAVED VALUE OF B(1) DURING INVERSION. EQUALS SURFACE EQUILIBRIUM ERROR FOR THAT OPTION.	L EQUIL
B1(I)	$DSQ(I-1)/6$	C ETACOM
B2(I)	$DSQ(I-1)/3$	C ETACOM
BA1(N,NN)	MATRIX (BLFF) DEFINED BY FIGURE (3) OF NASA CR-1062 PREMULTIPLIED BY INVERSE OF (ALFF).	C ETACOM

HAP(N,NN)	MATRIX (RIHM) OR (ALKK) DEFINED BY FIGURE (3) OF NASA CR 1062 PREMULTIPLIED BY INVERSE OF (ALHM) OR (ALKK), RESPECTIVELY.	C ETACOM
HASMOL	MOLECULAR WEIGHT OF REFERENCE SPECIES IN DIFFUSION FACTOR CALCULATIONS	C EQTCOM
HDM	COEFFICIENT IN SURFACE KINETIC RELATION FOR MATERIAL BEING CONSIDERED UNDER KR(9) = 5 OR 6 (SEE INPUT INSTRUCTIONS).	C CRBCOM
HFTA	HETAM(I)	C HISCOM
HETAM(I)	STREAMWISE PRESSURE GRADIENT PARAMETER DEFINED BY EQ(53) OF NASA CR-1062.	C HISCOM
HFTN	DERIVATIVE OF LOG MOLECULAR WEIGHT WITH RESPECT TO LOG PRESSURE AT CONSTANT TEMPERATURE.	L EQUIL
HF	LOCALLY DEFINED VARIABLE	L TRMBL
HIP	NOMINALLY ZERO. SET TO 1. TO PREVENT PREMATURE CONVERGENCE	L NONCER
BLOW	BLOWING PARAMETER BASED ON GAS MASS FLUX GIVEN BY $\text{RHOVW}(IS,1)/(C3 * CH)$.	C OUTCOM
BLOWCH	CHAR FLUX NORMALIZED BY HEAT TRANSFER COEFFICIENT	L OUTPUT
BLOWPG	PYROLYSIS GAS FLUX NORMALIZED BY HEAT TRANSFER COEFFICIENT	L OUTPUT
BLQEQV	VARIABLE EQUIVALENCED TO BLOCOM FOR DUMPING PURPOSES	L DUMCOM
HS(N)	SAVED ARRAY OF H(N) DURING INVERSION	L EQUIL
BSU	SECOND FOUR CHARACTERS OF ALPHAMERIC VALUE OF ASSIGNED SURFACE SPECIES	C CRBCOM
BULP	LOG (RUMP)	L CRECT
HUMEQV	VARIABLE EQUIVALENCED TO HUMCOM FOR DUMPING PURPOSES	L DUMCOM
HUMP	CONTRIBUTION TO DAMPING FACTOR ERROR RESULTING FROM SIGN CHANGES IN CRITICAL ERRORS.	C BUMCOM
HIMP	$10^{*4} * P$. CONSTRAINTS ON CORRECTIONS ARE RELAXED FOR PARTIAL PRESSURES BELOW THIS VALUE.	L CRECT
CI(K)	GRAM ATOMS OF ELEMENT K IN A MOLECULE.	L INPUT
C1	$1. + DZ$ WHERE DZ IS DEFINED BY EQ(88) OR (89) OF NASA CR-1062.	C HISCOM
C2	$-(1+2*DZ)$ WHERE DZ IS DEFINED BY EQ(88) OR (89) OF NASA CR-1062.	C HISCOM

C3	$C3M(L)$	C HISCOM
$C3M(L)$	$-1/ALPHASTAR$ WHERE ALPHASTAR IS THE FLUX NORMALIZING PARAMETER DEFINED BY EQ (44) OF NASA CR-1062.	C HISCOM
C4	$HETA = 1 + D7$ WHERE D7 IS DEFINED BY EQ(88) OR (89) OF NASA CR-1062.	C HISCOM
C5	$1./ALPH$	C COECOM
C6	$HETA * ALPH**2$	C COECOM
C7	$-(UE(L)**2)/((ALPH**2)*25036.5)$	C COECOM
C8	$ALPHD/ALPH$	C COECOM
C9	$HETA*1.+D7 - ALPHD/ALPH$	C COECOM
C10	$C7*F(2,I)$	C COECOM
C11	DEFINED IN ICoeff	C COECOM
C12	DEFINED IN ICoeff	C COECOM
C13	$C7 * F(3,I)$	C COECOM
C14	$(1.+D7)*F(1,I)+HF(I,5)$	C COECOM
C15	$PR(I)-1$	C COECOM
C16	$1./PR(I)$	C COECOM
C17	$1./SC(I)$	C COECOM
C18	$CTR*T(I)$	C COECOM
C19	$CAPC(I)/(ALPH*SC(I))$	C COECOM
C20	$CAPC(I)/(ALPH*PR(I))$	C COECOM
C21	DEFINED IN ICoeff	C COECOM
C22	DEFINED IN ICoeff	C COECOM
C23	DEFINED IN ICoeff	C COECOM
C24	DEFINED IN ICoeff	C COECOM
C25	DEFINED IN ICoeff	C COECOM
C26	$RHUE(L)/PHO(I)$	C COECOM
C28	DEFINED IN ICoeff	C COECOM

C31	DEFINED IN ICoeff	C COECOM
C32	NORMALIZED DIFFUSIVE HEAT FLUX CALCULATED IN ICoeff	C COECOM
C43	DEFINED IN ICoeff	C COECOM
C53	$\rho H O P(1) / \rho H O(1)$	C COECOM
C56	$F(2,1) / \alpha \mu H$	C COECOM
C73	$(1.0Z) * F(2,1)$	C COECOM
C74	DEFINED IN ICoeff	C COECOM
C75	DEFINED IN ICoeff	C COECOM
C76	$(1.0Z) * G(1,1)$	C COECOM
C77	DEFINED IN ICoeff	C COECOM
C78	DEFINED IN ICoeff	C COECOM
C79	DEFINED IN ICoeff	C COECOM
CR0	DEFINED IN ICoeff	C COECOM
CR1	DEFINED IN ICoeff	C COECOM
CR2	DEFINED IN ICoeff	C COECOM
CR3	DEFINED IN ICoeff	C COECOM
CR4	DEFINED IN ICoeff	C COECOM
CR5	DEFINED IN ICoeff	C COECOM
CR6	DEFINED IN ICoeff	C COECOM
CR7	DEFINED IN ICoeff	C COECOM
CR8	DEFINED IN ICoeff	C COECOM
CR9	$HETA * (\alpha \mu H ** 2) * C R M O 1$	L IONLY
CR9	$-C3 * \alpha \mu H * V M U F(L)$	L OUTPUT
CAPC(I)	PRODUCT OF DENSITY AND VISCOSITY NORMALIZED BY EDGE VALUE.	C PRPCOM
CASE(N)	ALPHANUMERIC NAME OF CASE.	C INTCOM
CRAP	VALUE OF THE VELOCITY RATIO AT BOUNDARY LAYER NODE KAPPA.	C INTCOM

CDUM	COEFFICIENT IN SURFACE KINETIC RELATION FOR MATERIAL BEING CONSIDERED UNDER KR(9) = 5 OR 6 (SEE INPUT INSTRUCTIONS).	C CRBCOM
CF	MOMENTUM TRANSFER COEFFICIENT GIVEN BY $CAPC(1)/ALPH * VMUF(15)/CH99F(3.1)$	C OUTCOM
CG(MS)	TOTAL ENTHALPY CORRESPONDING TO SF(MS)	C EDGCOM
CGP(MS)	DERIVATIVE OF CG(MS) WITH RESPECT TO ETA	C EDGCOM
CH	HEAT TRANSFER COEFFICIENT BASED ON ENTHALPY POTENTIAL. GIVEN BY $-WALIQ/(C3*(G(1+NETA)-G(1.1)))$	C OUTCOM
CHA	HEAT-TRANSFER COEFFICIENT CALCULATED BY EQ (21) OF REFERENCE 6 FOR THE SPECIAL CASE OF EQUAL DIFFUSION COEFFICIENTS	L FELTRU
CHE(N)	HEAT-TRANSFER COEFFICIENT CALCULATED FROM EQ (21) OF REFERENCE 6	L FELTRU
CHFLUX	LESS THAN ZERO VALUE IMPLIES PRESENCE OF CHAR ELEMENTS IN SURFACE CHEMISTRY	L EQUIL
CHL	VALUE OF HEAT-TRANSFER COEFFICIENT CALCULATED USING LEWIS NUMBER CORRELATION (EQ (22) OF REFERENCE 6)	L FELTRU
CH(N)	CURVE FIT CONSTANTS FOR THERMODYNAMIC DATA (THE QUANTITY $F2 + H29H$ DISCUSSED IN GROUP 12 OF INPUT INSTRUCTIONS) N=1 FOR LOW AND 2 FOR HIGH TEMPERATURE RANGE, IDENTICAL TO CCHH.	C EQPCOM
CIJ(K,KK)	GRAM ATOM OF ELEMENT K IN BASE SPECIES KK.	E EQPCOM
CK1(K)	CALCULATED IN IC0EFF	C COECON
CK6(K)	NORMALIZED ELEMENTAL MASS FLUX CALCULATED IN IC0EFF	C COECON
CK9(K)	DEFINED IN IC0EFF	C COECON
CK13(K)	DEFINED IN IC0EFF	C COECON
CK17(K)	DEFINED IN IC0EFF	C COECON
CK18(K)	DEFINED IN IC0EFF	C COECON
CK19(K)	DEFINED IN IC0EFF	C COECON
CK21(K)	DEFINED IN IC0EFF	C COECON
CK22(K)	DEFINED IN IC0EFF	C COECON
CK23(K)	$DSO(I-1) * DPHEK(K) / 3.$	L ONLY

CK24(K)	$C7 * F(3,J) * CK23(K)$	L IONLY
CK25(K)	$DETA(1-1) * DUM(K,K)$	L IONLY
CK26(K)	$C7 * F(2,J) * CK25(K)$	L IONLY
CKK1(K,KK)	DEFINED IN ICOFF	C COECON
CKK2(K,KK)	DEFINED IN ICOFF	C COECON
CKK3(K,KK)	DEFINED IN ICOFF	C COECON
CL	1 (1) IN MIXING LENGTH FORMULATION.	C EPSCOM
CLMIM	CLAUSE NUMBER USED IN DEFINING EDDY VISCOSITY IN THE WAKE PORTION OF THE BOUNDARY LAYER.	C EPSCOM
CMCHL	RATIO CM(K) TO CHL	L FELTRU
CME(N)	AVERAGE OF THE CM(K,N)	L FELTRU
CM(K)	ELEMENTAL MASS TRANSFER COEFFICIENTS BASED ON MASS FRACTION POTENTIAL, GIVEN BY $VJK(K)/(DUM(K)*WAT(K))$ WHERE $DUM(K)$ IS THE SUMMATION OVER KK OF $(SP(1,NFA,KK) - SP(1,J,KK))/WTM(KK)*CIJ(K,KK)$	L OUTPUT
CMF	THE FACTOR BY WHICH ALL CORRECTIONS ARE DAMPED DURING CHEMISTRY ITERATIONS.	L CRECT
CMFF(J)	THE VALUE OF CMF AFTER CONSIDERATION OF CONSTRAINTS ON THE CORRECTION TO BE APPLIED TO THE PARTIAL PRESSURE OF THE JTH SPECIES.	L CRECT
CMK(N)	ELEMENTAL MASS-TRANSFER COEFFICIENT CALCULATED BY EQ (16) OF REFERENCE 6	C EOTCOM
COEFOV(N)	GLOBAL SET OF COEFFICIENTS C5,C6,C7, ETC.	C COECON
COEFOV(N)	GLOBAL SET OF COEFFICIENTS CK1,CK2, ETC.	E COECON
COND	THERMAL CONDUCTIVITY	L OUTPUT
CONF	CONF HALF-ANGLE FOR SPHERE-CONE SHAPED BODIES.	C PRMCOM
CONFQV	VARIABLE EQUIVALENT TO COECON FOR DUMPING PURPOSES	L DUMCON
CORAR(N)	CORRECTION ARRAY, COMPOSED OF CORRECTIONS IN $H(I)$, $I=1$ TO NFA, AND $SP(I,J,K)$, $I=1$ TO NFA, $J=1$ TO NSPM.	E MONCON
CORMA	THE VALUE OF THE MAXIMUM CORAR.	C RUNCOM
CP(J)	SPECIFIC HEAT.	C EOTCOM

CPA	LOCALLY DEFINED VARIABLE	L MATER
CPHAR(I)	FROZEN SPECIFIC HEAT OF THE MIXTURE.	C PRPCOM
CPF	FROZEN SPECIFIC HEAT, IDENTICAL TO CCPF+.	C EQTCOM
CPG	FROZEN SPECIFIC HEAT OF GAS, IDENTICAL TO CCPG+.	C EQTCOM
CPT	FROZEN SPECIFIC HEAT OF GAS.	L STATE
CPTIL	PROPERTY OF THE GAS MIXTURE WHICH REDUCES TO CPHAR FOR EQUAL DIFFUSION COEFFICIENTS, SEE EQ(28) OF NASA CR-1062.	C PRPCOM
CRPEOV	VARIABLE EQUIVALENCED TO CRBCOM FOR DUMPING PURPOSES	L DUMCOM
CRHO(I-1)	$CPG * DELTA(I-1) * (1. - (RHOP(I)/RH0(I)) * DELTA(I-1)/6)$	C PRPCOM
CRH01	$(RHOF(I) / RH0(I)) * DELTA(I-1) * (1. + DELTA(I-1) * RHOP(I) / (RH0(I) * 6.))$	L IONLY
CS(MS)	ENTROPY CORRESPONDING TO SF(MS)	C EDGCOM
CSRR(MS)	ENTROPY DERIVATIVE WITH RESPECT TO SF(MS)	C EDGCOM
CSP	EQUILIBRIUM SPECIFIC HEAT OF GAS.	L EQUIL
CT	COEFFICIENT APPEARING IN THE APPROXIMATION FOR THERMAL DIFFUSION COEFFICIENTS, SEE EQ(26) OF NASA CR-1062. NUMERICALLY EQUAL TO -0.5, SET EQUAL TO ZERO WHEN THERMAL DIFFUSION NEGLECTED.	C PRPCOM
CTR	$CT * UNIVERS$ GAS CONSTANT.	C PRPCOM
CXM	LOCALLY DEFINED VARIABLE	L IONLY
CYM	LOCALLY DEFINED VARIABLE	L IONLY
CYSP	LOCALLY DEFINED VARIABLE	L IONLY
D	SET OF CONSTANT VECTORS CONVERTED TO SOLUTION VECTORS	L RERAY
D	ARGUMENT REPRESENTING DELTA ETA	L TAYLOR
D1	THE D SUB ONE OF EQ(89) IN NASA CR-1062.	L HISTXI
D2	THE D SUB TWO OF EQ(89) IN NASA CR-1062.	L HISTXI
D2UFDC	SECOND DERIVATIVE OF UEDGE WITH RESPECT TO STREAM FUNCTION, SEE EQ(68) OF NASA CR-1062 (SET EQUAL TO ZERO IN PRESENT PROGRAM).	C EDGCOM

DRAR	REFERENCE DIFFUSION COEFFICIENT INTRODUCED IN APPROXIMATION 1. PROPS FOR UNEQUAL DIFFUSION COEFFICIENTS. NUMERICALLY EQUAL TO $4.16F-A * T * \text{SORT}(I) / (\text{OMEGA} * P)$.	
DCAPCH	DERIVATIVE OF CAPC WITH RESPECT TO H.	C PRPCOM
DCAPCK(K)	DERIVATIVE OF CAPC WITH RESPECT TO MASS FRACTION OF ELEMENT K	C PRPCOM
UCLL	DERIVATIVE OF CL AT I WITH RESPECT TO CL AT I-1	L TRMBL
UCLPI	DERIVATIVE OF CL AT I WITH RESPECT TO PI AT I	L TRMBL
UCLPM	DERIVATIVE OF CL AT I WITH RESPECT TO PIM AT I-1	L TRMBL
DCPRH	DERIVATIVE OF CPRAR WITH RESPECT TO H, SET EQUAL TO ZERO IN C PRPCOM CURRENT PROGRAM.	
DCPRK(K)	DERIVATIVE OF CPRAR WITH RESPECT TO MASS FRACTION OF ELEMENT K, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DCPTH	DERIVATIVE OF CPTIL WITH RESPECT TO H, SET EQUAL TO ZERO IN C PRPCOM CURRENT PROGRAM.	
DCPTK(K)	DERIVATIVE OF CPTIL WITH RESPECT TO MASS FRACTION OF ELEMENT K, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DCU(I)	$(\text{DELTA}(I))^{**3}$	C ETACOM
DELJW(K)	ERROR IN DIFFUSIVE MASS FLUX, WALLJ(K), INTRODUCED DURING NEWTON-RAPHSON ITERATION.	C FLXCOM
DELOW(N)	GLOBAL SET DELOW AND DELJW(K).	E FLXCOM
DELOW	ERROR IN DIFFUSIVE HEAT FLUX, WALLQ, INTRODUCED DURING NEWTON-RAPHSON ITERATION	C FLXCOM
DELST	DISPLACEMENT THICKNESS GIVEN BY $Y(\text{NETA}) - C89 * (F(1, \text{NETA}) - F(1, 1)) / \text{ALPH}$.	C OUTCOM
DEPC	CONSTANT IN CORRECTION COEFFICIENTS ON EPSA(I) RESULTING FROM LINEAR CORRECTION COEFFICIENTS	C EPSCOM
DEPS(I)	DERIVATIVE OF EPSA(I) WITH RESPECT TO NONLINEAR VARIABLES	C EPSCOM
DER(L)	DIMENSIONED VARIABLE USED IN VARIOUS SUBROUTINES BUT NOT USED FOR TRANSMITTING INFORMATION BETWEEN SUBROUTINES.	C TEMCOM
DETA(I)	$\text{ETA}(I+1) - \text{ETA}(I)$	C ETACOM
DHTILH	DERIVATIVE OF HTIL WITH RESPECT TO H.	C PRPCOM

DHTLK(K)	DERIVATIVE OF HILL WITH RESPECT TO MASS FRACTION OF ELEMENT K.	C PRPCOM
DTV	ROW NORMALIZING FACTOR IN GAUSSIAN ELIMINATION.	L RERAY
DIVC	PRODUCT OF 'DIV' AND ELEMENT OF ROW.	L RERAY
DKPT(MK)	DERIVATIVE OF LOG KP WITH RESPECT TO LOG TEMPERATURE.	C KINCOM
DI I(I)	DERIVATIVE OF EL(I) WITH RESPECT TO NONLINEAR VARIABLES	C EPSCOM
DLPH	A(3,1) EVALUATED AT THE WALL.	C NONCOM
DLPK(K)	A(3,K+2) EVALUATED AT THE WALL.	C NONCOM
DLX1	ALOG(XI(I) / XI(L-1))	L HISTXI
DLX2	STORED (HISTORIC) VALUE FOR DLOGXI DEFINED BY EQ(90) OF NASA CR-1062.	C HISCOM
DMU12H	DERIVATIVE OF VMU12 WITH RESPECT TO H, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DMU12K(K)	DERIVATIVE OF VMU12 WITH RESPECT TO MASS FRACTION OF ELEMENT K, SET EQUAL TO ZERO IN PRESENT PROGRAM.	C PRPCOM
DMU3H	DERIVATIVE OF VMU3 WITH RESPECT TO H.	C PRPCOM
DMU3K(K)	DERIVATIVE OF VMU3 WITH RESPECT TO MASS FRACTION OF ELEMENT K.	C PRPCOM
DMU4H	DERIVATIVE WITH RESPECT TO H OF THE COEFFICIENT MU4 DEFINED IN EQ(28) OF NASA CR-1062.	C PRPCOM
DMU4K(K)	DERIVATIVE WITH RESPECT TO MASS FRACTION OF ELEMENT K OF THE COEFFICIENT MU4 DEFINED IN EQ(28) OF NASA CR-1062.	C PRPCOM
DPHIKH(K)	DERIVATIVE OF PHIK WITH RESPECT TO H, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DPHIKK(K,KK)	DERIVATIVE OF K TH PHIK WITH RESPECT TO MASS FRACTION OF ELEMENT KK, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DPI(3+K,2)	(ARRAY OF DERIVATIVES OF PI WITH RESPECT TO PRIMARY VARIABLES)/TREF	C EPSCOM
DPRH	DERIVATIVE OF PR WITH RESPECT TO H, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DPRK(K)	DERIVATIVE OF PR WITH RESPECT TO MASS FRACTION OF ELEMENT K, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DQJNL(N)	GLOBAL SET OF DONL AND DJNL(K).	E FLXCOM

DDJRN(N)	DERIVATIVE OF DIFFUSIVE HEAT AND MASS FLUXES, WALLQJ WITH RESPECT TO NTH REDUCED NONLINEAR VARIABLE.	E NONCOM
DQNL(N)	DERIVATIVE OF DIFFUSIVE HEAT FLUX, WALLQ, WITH RESPECT TO NTH NONLINEAR VARIABLE.	C FLXCOM
DQRH	DERIVATIVE OF QR WITH RESPECT TO H, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DQRK(K)	DERIVATIVE OF QR WITH RESPECT TO MASS FRACTION OF ELEMENT K, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DRHOH	DERIVATIVE OF RHO WITH RESPECT TO H.	C PRPCOM
DRHOI	DERIVATIVE OF VELOCITY DEFECT THICKNESS WITH RESPECT TO RHO AT I	L TRMBL
DRHOK(K)	DERIVATIVE OF RHO WITH RESPECT TO MASS FRACTION OF ELEMENT K.	C PRPCOM
DRNL(N)	REDUCED NONLINEAR ERRORS BEFORE MATRIX INVERSION, CORRECTIONS OF VARIABLES IN REDUCED NONLINEAR SET AFTER MATRIX INVERSION.	C ERRCOM
DSCH	DERIVATIVE OF SC WITH RESPECT TO H, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DSCK(K)	DERIVATIVE OF SC WITH RESPECT TO MASS FRACTION OF ELEMENT K, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DSIP(L)	DECREASE IN ENTROPY FROM PREVIOUS STATION TO CURRENT STATION L AT BOUNDARY LAYER EDGE DUE TO SHOCK CURVATURE (DSIP(1) = 0 BY DEFINITION).	C EDGCOM
DSQ(T)	(DETA(T))**2	C ETACOM
DSV	LOCALLY DEFINED VARIABLE	L MATS1
DTD	DOWNWARD TEMPERATURE STEP USED IN SEEKING SURFACE EQUILIBRIUM SOLUTION.	L EQUIL
DTMP	PREDICTED CHANGE IN SURFACE TEMPERATURE FOR THE CURRENT ITERATION DURING A KR(9) = 6 PROBLEM.	L NONCER
DTH	DERIVATIVE OF T WITH RESPECT TO H.	C PRPCOM
DTHW	DTH EVALUATED AT THE WALL.	C NONCOM
DTK(K)	DERIVATIVE OF T WITH RESPECT TO MASS FRACTION OF ELEMENT K	C PRPCOM
DTKW(K)	DTK EVALUATED AT THE WALL.	C NONCOM
DTM	LIMIT VALUE OF DELTA (1./T) IN CHEMISTRY SOLUTION.	L CRECT

DTU	UPWARD TEMPERATURE STEP USED IN SEEKING SURFACE EQUILIBRIUM L EQUIL SOLUTION.	
DU82	-	L INPUT
DU83	LOCALLY INPUT VARIABLES, IF NON-ZERO ASSIGNED TO FITMOL,	L INPUT
DU84	RASMOI, SIGMA AND EPOVRK, RESPECTIVELY	L INPUT
DU85	-	L INPUT
DU85(L)	DERIVATIVE OF EDGE VELOCITY WITH RESPECT TO S IN REFCON, TEMPORARY STORAGE AREA IN OTHER ROUTINES.	C TEMCOM
DUEDGE	DERIVATIVE UEDGE WITH RESPECT TO STREAM FUNCTION, SEE EQ (69) OF NASA CR-1062 (SET EQUAL TO ZERO IN PRESENT PROG).	C EDGCOM
DUES	DERIVATIVE OF EDGE VELOCITY WITH RESPECT TO STREAMWISE COORDINATE S.	C EDGCOM
DUM	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM1	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM2	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM3	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM4	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM5	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM6	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM7	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM8	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUMP	P * 10**7, LIMIT PRESSURE IN CONTROLLING DAMPING OF CHEMISTRY SOLUTION.	L CRECT
DU7	LOCALLY DEFINED VARIABLE	L OUTPUT
DVNL(N)	DAMPED NONLINEAR CORRECTIONS (GIVEN BY EQ(156) OF NASA CR-1062 MULTIPLIED BY EASE).	C NONCOM
DVS	VELOCITY DEFECT THICKNESS OVER DEL.	C EPSCOM
DY(J)	CORRECTION ON VARIABLE Y(J)* IN CHEMISTRY SOLUTION.	C EQTCOM
DYT	DAMPED CORRECTION ON VARIABLE Y(J)* IN CHEMISTRY SOLUTION.	L CRECT
DZ	THE D SUB ZERO OF EQ(89) IN NASA CR-1062.	L HISTXI

D7KH(K)	DERIVATIVE OF ZK WITH RESPECT TO H.	C PRPCOM
D7KK(K, KK)	DERIVATIVE OF K TH ZK WITH WITH RESPECT TO MASS FRACTION OF ELEMENT KK.	C PRPCOM
E(N)	ERRORS IN CHEMISTRY EQUATIONS (MASS BALANCE ERRORS FOR N EQUAL TO OR LESS THAN IS*. EQUILIBRIUM ERRORS FOR N GREATER THAN IS*. WHERE IS* IS NUMBER OF ELEMENTS INCLUDING ELECTRON).	C EQTCOM
EAR	ABSOLUTE VALUE OF EQUILIBRIUM ERROR FOR A SPECIES IN CHEMISTRY SOLUTION.	L MATER
EAK(MK)	ACTIVATION ENERGY.	C KINCOM
EASE	DAMPING FACTOR, APPLIED UNIFORMLY TO ALL CORRECTIONS.	C BUMCOM
ER(K)	MAGNITUDE OF LARGEST CONTRIBUTION TO K TH MASS BALANCE.	C EQTCOM
ERL(K)	MINIMUM CONTRIBUTION ACCEPTED TO K TH MASS BALANCE, =ER/(10**8)	C EQTCOM
ECD(N)	RESIDUAL ERROR IN CONDENSED EQUILIBRIUM IMPOSED IN CHEMISTRY SOLUTION AS A CONSEQUENCE OF BOUNDARY LAYER DAMPING.	L MATER
ECRP	LIMIT CHANGE OF CONDENSED SPECIES QUANTITIES DURING CHEMISTRY ITERATION.	C EQTCOM
ECRT	NOT CURRENTLY USED.	C EQTCOM
EDGEON	VARIABLE EQUIVALENCED TO EDGCOM FOR DUMPING PURPOSES	L DUMCOM
EER	EQUILIBRIUM ERROR OF CONDENSED SPECIES BEING INTRODUCED DURING CURRENT ITERATION.	L MATER
EERE(N)	RESIDUAL ERROR IN MASS BALANCE IMPOSED IN CHEMISTRY SOLUTION AS A CONSEQUENCE OF BOUNDARY LAYER DAMPING.	L MATER
EG2	CONTRIBUTION TO THERMAL FLUX DUE TO INEQUALITY OF TURBULENT PRANDTL AND SCHMIDT NUMBERS	L TRMBL
EG3	CONTRIBUTION TO THERMAL FLUX DUE TO TURBULENT VISCOUS DISSIPATION	L TRMBL
EH*	ERROR IN ENTHALPY OR ENTROPY FOR ASSIGNED ENTHALPY OR ENTROPY CHEMISTRY SOLUTIONS.	L MATER
EL	MAXIMUM EQUILIBRIUM ERROR, IDENTICAL TO EEL*.	C EQTCOM
EL(I)	MIXING LENGTH NORMALIZED BY DEL.	C EPSCOM
ELCON	MIXING LENGTH CONSTANT AS IN $L = ELCON * Y$.	C EPSCOM

ELK	LOG OF EQUILIBRIUM IMBALANCE OF KINETIC REACTION.	L KINET
ELKM	LOG OF NON-EQUILIBRIUM OF KINETIC RELATION	L KINET
ELM(N)	GLOBAL SET OF MAXIMUM VALUES OF ERRORS FOR VARIOUS SETS OF TAYLOR SERIES EXPANSIONS.	C ERRCOM
ELMM	MAXIMUM VALUE OF ELM(N).	C ERRCOM
EMIS	SURFACE EMITTANCE OF THE MATERIAL BEING CONSIDERED UNDER $KR(9) = 3, 4, 5$ OR 6 .	C CRBCOM
EMISC	SURFACE EMITTANCE OF THE MATERIAL BEING CONSIDERED UNDER $KR(9) = 3$ OR 4 .	C CRBCOM
EMIST	SURFACE EMITTANCE OF THE MATERIAL BEING CONSIDERED UNDER $KR(9) = 5$ OR 6 .	C CRBCOM
EMIV	SURFACE EMISSIVITY	C CRBCOM
ENL	MAXIMUM MASS BALANCE ERROR, IDENTICAL TO EE_{NL+} .	C EQTCOM
ENL(N)	GLOBAL SET OF ERRORS FOR LINEARIZED CONSERVATION EQUATIONS AND BOUNDARY CONDITIONS.	C ERRCOM
ENLM(N)	GLOBAL SET OF MAXIMUM VALUES OF ERRORS FOR THE VARIOUS SETS OF LINEARIZED CONSERVATION EQUATIONS AND BOUNDARY CONDITIONS.	C ERRCOM
ENLMM	LARGEST VALUE OF ENLM.	C ERRCOM
EOL	MULTIPLYING FACTOR USED TO SMOOTHLY TRANSFORM KINETIC MASS BALANCE TO EQUIVALENT EQUILIBRIUM EQUATION.	L KINET
EP	ERROR IN OVERALL PRESSURE BALANCE.	L MATER
EPSA(I)	$\rho_0(I)**2*(\text{EDDY VISCOSITY})/(\rho_{H0}(L)*\nu_{H0}(L))$.	C EPSCOM
EPT	LOCALLY DEFINED VARIABLE	L TRMBL
EPOVRK	EPSILON/K. OF REFERENCE SPECIES IN DIFFUSION CALCULATIONS	C EQTCOM
EPS	KINEMATIC EDDY VISCOSITY	L TRMBL
EPS1	KINEMATIC EDDY VISCOSITY IN WALL REGION	C EPSCOM
EPS2	KINEMATIC EDDY VISCOSITY IN WAKE REGION	L TRMBL
EPSOUT	VARIABLE EQUIVALENCED TO EPSCOM FOR OUTPUT PURPOSES	L TRMBL
EOPEQV	VARIABLE EQUIVALENCED TO EOPCOM FOR DUMPING PURPOSES	L DUMCOM
EOTEQV	VARIABLE EQUIVALENCED TO EOTCOM FOR DUMPING PURPOSES	L DUMCOM

EP	ERROR IN MASS BALANCE RELATION.	L MATER
ERPP1	DERIVATIVE OF DAWSON FUNCTION WITH RESPECT TO ITS ARGUMENT AT I	L TRMBL
ERPP2	DERIVATIVE OF DAWSON FUNCTION WITH RESPECT TO ITS ARGUMENT AT I-1	L TRMBL
ERPI	DAWSON FUNCTION OF ARGUMENT AT I	L TRMBL
EPP2	DAWSON FUNCTION OF ARGUMENT AT I-1	L TRMBL
ERREQV	VARIABLE EQUIVALENCED TO ERRCOM FOR DUMPING PURPOSES	L DUMCOM
ETA(I)	TRANSFORMED COORDINATE IN A DIRECTION NORMAL TO THE SURFACE DEFINED BY EQ (33) OF NASA CR-1062.	C ETACOM
ETAFOV	VARIABLE EQUIVALENCED TO ETACOM FOR DUMPING PURPOSES	L DUMCOM
ETAT	LOCALLY DEFINED VARIABLE	L FIRSTG
EXEL	RATIO OF FORWARD TO REVERSE DRIVING POTENTIAL IN KINETIC EQUATIONS.	L KINET
EXK(MK)	ALWAYS SET TO 1.0. (REACTION EXPONENT).	C KINCOM
F(N,I)	STREAM FUNCTION (N=1), VELOCITY RATIO (N=2) AND DERIVATIVES OF ORDER N-2 OF VELOCITY RATIO WITH RESPECT TO ETA.	C VARCOM
FAMOA(J)	ALPHANUMERIC VARIABLE, FIRST OF TWO PORTIONS OF SPECIES NAME. IDENTICAL TO MOA+.	C BLQCOM
FAMOB(J)	ALPHANUMERIC VARIABLE, SECOND OF TWO PORTIONS OF SPECIES NAME. IDENTICAL TO MOB+.	C BLQCOM
FO(N)	$D1 * F(N+1,I) + D2 * HF(I,N+1)$ FOR N=1 THROUGH 3, $D1 * F(4,I-1) + D2 * HF(I-1,4)$ FOR N=4.	L HISYXI
FF(J)	DIFFUSION FACTOR INTRODUCED BY THE APPROXIMATION FOR DIFFUSION COEFFICIENTS BY EQ(19) OF NASA CR-1062.	C EQPCOM
FFA	POWER ON MOLECULAR WEIGHT IF IT IS ASSUMED THAT THE DIFFUSION FACTORS, FF(J), ARE PROPORTIONAL TO SPECIES MOLECULAR WEIGHTS, WTM(J), RAISED TO A POWER.	C EQPCOM
FFAK	POWER ON MOLECULAR WEIGHT READ IN IF IT IS ASSUMED THAT THE DIFFUSION FACTORS, FF(J), ARE PROPORTIONAL TO SPECIES MOLECULAR WEIGHTS, WTM(J), RAISED TO A POWER OTHER THAN 0.5.	L INPUT
FFF	RATIO OF GAS MOLECULAR WEIGHT TO 'VMU2'.	L MATER
FFIN(J)	DIFFUSION FACTOR, FF(J), WHICH IS READ IN.	L INPUT

FFK2	PARAMETER SET EQUAL TO WM/VMU2 FOR EQUAL DIFFUSION COEFFICIENTS (KKR(14)=2) AND TO FF(K) FOR UNEQUAL DIFFUSION COEFFICIENTS (KKR(14)=0 OR 1).	L PROPS
FITMOL	CONSTANT IN CURVE FIT OF DIFFUSION FACTORS BASED ON MOLECULAR WEIGHTS	L INPUT
FKF(MK)	PRE-EXPONENTIAL FACTOR, POUND MOLES OF REACTANT PER SECOND PER FT**2.	C KINCOM
FLO(N,NN)	CURVE FIT CONSTANT; FOR THERMODYNAMIC DATA FOR THE FLUID MIXTURE IN KR(7)=1 OPTION (SIMILAR TO THE QUANTITIES DISCUSSED IN GROUP 12 OF THE INPUT INSTRUCTIONS). NN= 1,2 OR 3 FOR TEMPERATURE RANGES LESS THAN 3600 DEG R, EQUAL TO OR GREATER THAN 3600 DEG R BUT LESS THAN 5400 DEG R, OR, EQUAL TO OR GREATER THAN 5400 DEG R, RESPECTIVELY. N REFERS TO COMPONENT OF THE NONREACTING FLUID MIXTURE.	C STTCOM
FLE(N)	ERROR FOR THE TAYLOR SERIES EXPANSIONS INVOLVING F(1,I) AND THEIR DERIVATIVES.	C ERRCOM
FLEM	MAXIMUM VALUE OF FLE(N).	C ERRCOM
FLIQ	FRACTION OF A SPECIES WHICH IS LIQUID.	C EQTCOM
FLPEQV	VARIABLE EQUIVALENCED TO FPCOM FOR DUMPING PURPOSES	L DUMCOM
FLUXJ(N,L,1)	CONVERGED VALUE FOR MASS FLUX OF COMPONENT N INTO THE BOUNDARY LAYER AT THE WALL. N = 1 TO 3 FOR EDGE GAS, PYROLYSIS GAS AND CHAR, RESPECTIVELY.	C WALCOM
FLXFOV	VARIABLE EQUIVALENCED TO FLXCOM FOR DUMPING PURPOSES	L DUMCOM
FM(J)	3 IF UNIMPORTANT SPECIES (NOT SIGNIFICANT IN ANY MASS BALANCE). OTHERWISE 1.	C EQTCOM
FN	LOCALLY DEFINED VARIABLE	L ERP
FNLFM	ERROR FOR THE LINEARIZED MOMENTUM EQUATIONS AND BOUNDARY CONDITIONS.	C ERRCOM
FNU(K)	VNU(J,K) FOR CURRENT J.	C EQTCOM
FPPW	F(3,1) PRINTED IN ONE-LINE-PER-ITERATION OUTPUT.	L ITERAT
FR(J,1)	MOLE FRACTION.	C BLOCOM
FW(L,1)	CONVERGED VALUE OF STREAM FUNCTION AT SURFACE OF BODY.	C WALCOM
FWCON(L)	INTEGRAND IN CALCULATION OF FW IN HEFCOM. TEMPORARY STORAGE AREA IN OTHER ROUTINES.	C TEMCOM

FWDUM(L)	FW * SORT(2*XI) IN REFCOM. TEMPORARY STORAGE AREA IN OTHER ROUTINES.	C TEMCOM
G(N,I)	TOTAL ENTHALPY (N=1) AND ITS DERIVATIVES OF ORDER N-1 WITH RESPECT TO ETA.	C VARCOM
GAM	ISENTROPIC EXPONENT.	L EQUIL
GAM(N)	PARAMETER GAMMA APPEARING IMPLICITLY IN EQ (17) OF REF. 6	L FELTRU
GAM1	ISENTROPIC EXPONENT FOR HOMOGENEOUS MIXTURE	C STTCOM
GAMF(K)	DEFINED BY EQ(79) OF NASA CR-1064.	C EQTCOM
GAMH(K)	DEFINED BY EQ(80) OF NASA CR-1064.	C EOTCOM
GAMK(K,KK)	DEFINED BY EQ(81) OF NASA CR-1064.	E NONCOM
GD(N)	$G1 = G(N,I) + D2 * HG(I,N)$ FOR N=1 THROUGH 3. $D1 = G(3, I-1) + D2 * HG(I-1,3)$ FOR N=4.	L HISTXI
GF(M)	STAGNATION ENTHALPY AT BOUNDARY LAYER EDGE.	C PRMCOM
GEP	DERIVATIVE OF TOTAL ENTHALPY AT BOUNDARY-LAYER EDGE WITH RESPECT TO ETA	
GLE(N)	ERROR FOR THE TAYLOR SERIES EXPANSIONS INVOLVING G(1,I) AND THEIR DERIVATIVES.	C EPRCOM
GLEM	MAXIMUM VALUE OF GLE(N).	C ERRCOM
GMR	ISENTROPIC EXPONENT FROM EQUILIBRIUM CALCULATION	C PRPCOM
GNLFM	ERROR FOR THE LINEARIZED ENERGY CONSERVATION EQUATIONS.	C ERRCOM
GRADRO	NORMAL-TO-PITCH-PLANE STAGNATION-POINT VELOCITY GRADIENT RATIO	C PRMCOM
GW	FIRST GUESS FOR WALL ENTHALPY WHICH IS READ IN WHEN KR(2)=0	L FIRSTG
H(I)	STATIC ENTHALPY OF THE MIXTURE. IDENTICAL TO HH*.	C PRPCOM
H(J)	ENTHALPY. IDENTICAL TO HH*.	C EOTCOM
HALPH	STORED (HISTORIC) VALUE OF ALPH ONE STATION UPSTREAM.	C HISCOM
HCA99	HEAT OF FORMATION AT 298 DEG. K OF THE SURFACE MATERIAL BEING CONSIDERED UNDER KR(9) = 3 OR 4.	C CRBCOM
HCH	CHAMFER (OR STAGNATION) ENTHALPY	L EQUIL
HCHAF	CHAR ENTHALPY	C CRBCOM

HCWAL	ENTHALPY OF SURFACE SPECIES DURING KR(9) = 3 OR 4 OPTIONS.	C EQPCOM
HF	STATIC ENTHALPY OF GAS AT BOUNDARY-LAYER EDGE.	C EDGCOM
HFA(I.)	STATIC ENTHALPY DISTRIBUTION AT BOUNDARY-LAYER EDGE	C EDGCOM
HFT	TOTAL ENTHALPY OF GAS AT BOUNDARY-LAYER EDGE.	L STATE
HF(I,N)	STORED (HISTORIC) VALUE OF F(N,I) ONE STATION UPSTREAM FOR N=1 THROUGH 4. $HF(I,5) = D1*F(I,1) + D2*HF(I,1)$ WHERE D1 AND D2 ARE DEFINED BY EQ(88) OR (89) OF NASA CR-1062.	C HISCOM
HG	ENTHALPY OF GAS, IDENTICAL TO HHG*.	C EQTCOM
HG(I,N)	STORED (HISTORIC) VALUE OF G(N,I) ONE STATION UPSTREAM.	C HISCOM
HH(I)	STATIC ENTHALPY OF THE MIXTURE, IDENTICAL TO H*.	C PRPCOM
HH(J)	ENTHALPY, IDENTICAL TO H(J)*.	C EQTCOM
HINF	FREE-STREAM STATIC ENTHALPY	C EDGCOM
HIP	ENTHALPY INPUT.	C EQTCOM
HISFOV	VARIABLE EQUIVALENCED TO HISCOM FOR DUMPING PURPOSES	L DUMCOM
HIST1(N)	SET OF VARIABLES STARTING WITH X1(1) TO BE STORED ON TAPE.	E HISCOM
HIST2(N)	SET OF VARIABLES STARTING WITH PE(1,1) TO BE STORED ON TAPE	E EDGCOM
HIST3(N)	SET OF VARIABLES STARTING WITH F(1,1) TO BE STORED ON TAPE	E VARCOM
HIST4(N)	SET OF VARIABLES STARTING WITH FW(1,1) TO BE STORED ON TAPE	E WALCOM
HM(J)	ENTHALPY OF FUSION.	C EQPCOM
HMAT	HEAT OF FORMATION AT 298 DEG. K OF THE MATERIAL BEING CONSIDERED UNDER KR(N) = 3,4,5 OR 6.	C CRBCOM
HMET	HM(J) IF J TH SPECIES IS CHANGING PHASE, OTHERWISE 0.	C EQTCOM
HOS	ENTHALPY OR ENTROPY OF SPECIES IN ASSIGNED ENTHALPY OR ENTROPY CHEMISTRY SOLUTION.	L WATER
HP	DERIVATIVE OF H WITH RESPECT TO ETA.	C PRPCOM
HPG	HEAT OF FORMATION AT 298 DEG. K OF THE PYROLYSIS GAS BEING CONSIDERED UNDER KR(N) = 3 OR 4.	C CRBCOM
HPYG	PYROLYSIS GAS ENTHALPY	C CRBCOM

HSP(I,N,K)	STORED (HISTORIC) VALUE OF SPIN(I,K) ONE STATION UPSTREAM.	C HISCOM
HTEF	HEAT OF FORMATION AT 298 DEG. K OF THE MATERIAL BEING CON- SIDERED UNDER KH(9) = 5 OR 6.	C CRBCOM
HTIL	PROPERTY OF THE GAS MIXTURE WHICH REDUCES TO W(1) FOR EQUAL DIFFUSION COEFFICIENTS. SEE EQ(28) OF NASA CR-1062.	C PRPCOM
HTILP	DERIVATIVE OF HTIL WITH RESPECT TO ETA.	C PRPCOM
HW(L,1)	CONVERGED ENTHALPY OF GAS AT THE WALL.	C WALCOM
I	INDEX ON ETA. I=1 AT WALL. IDENTICAL TO II*.	
II	LOCAL INDEX	L KINET
I777	VARIABLE TO CHECK IF SUBROUTINE HAS PREVIOUSLY BEEN ENTERED	C BUMCOM
IAT	ASSIGNED THE VALUE COMMA (,) THROUGH A DATA STATEMENT FOR USE IN TEST OF WHETHER THERE IS TO BE ANOTHER CASE.	L BLIMP
IR(K)	INDEX ON SPECIES WITH LARGEST CONTRIBUTION TO K TH MASS BALANCE. SUBSEQUENTLY ORDERED ON IB WITH DUPLICATES SET TO 1000.	C EQTCOM
IRLANK	ASSIGNED THE VALUE BLANK () THROUGH A DATA STATEMENT FOR USE IN TEST OF WHETHER THERE IS TO BE ANY PUNCHED CARD OUT- PUT.	L OUTPUT
IC(K)	NEGATIVE INDEX OF ELEMENT CORRESPONDING TO KTH BASE SPECIES	L INPUT
ICORR	INDEX CORRESPONDING TO CORRA IN THE CORAR ARRAY.	C BUMCOM
ICT	CYCLE COUNTER ON POST INVERSION MODIFICATION IN CHEMISTRY SOLUTION	L EQUIL
IDENT	ALPHANUMERIC IDENTIFICATION SYMBOL APPEARING ON PUNCHED CARD DATA (NO CARDS PUNCHED IF IDENT IS INPUT AS A BLANK).	C INTCOM
DISC(L)	CONTROL VARIABLE FOR DISCONTINUITY (1 IF DISCONTINUITY, OTHERWISE 0).	C PRMCOM
IDSTP	ITEM WHEN DSTP IS TO BE UPDATED.	C EDGCOM
IDUM	LOCALLY DEFINED VARIABLE	L SETUP
IF	EQUATION INDEX FOR CONDENSED SPECIES.	L WATER
IFM N	INDICES ON MAXIMUM NON-LINEAR ERRORS FOR EACH SET OF CONSERVATION EQUATIONS	L RMPCR
IFM W	INDICES ON MAXIMUM NON-LINEAR ERRORS FOR EACH SET OF CONSERVATION EQUATIONS	L NONCEP

IFR	EQUATION NUMBER TO REPRESENT NEWLY APPEARING CONDENSED SPECIES.	C EQTCOM
IFC(J)	CONTROL FLAG (0 GAS, -1 NONPRESENT CONDENSED, +1 PRESENT CONDENSED, PRIOR FLAGS DECREMENTED BY 1 IF SPECIES CONTAINS NONPRESENT ELEMENT OR INCREMENTED BY 3 IF IT IS A BASE SPECIES REPRESENTING A NONPRESENT ELEMENT).	C EQPCOM
IFLM	INDEX OF THE SET OF LINEAR EQUATIONS WHICH HAS THE LARGEST ERROR FLEM.	C ERRCOM
IFLUXJ	ITEM WHEN FLUXJ IS TO BE UPDATED.	C WALCOM
IFN	INDEX ON LINEAR VARIABLE F(1,I)	L IMONE
IFN	INDEX ON LINEAR VARIABLE F(1,I)	L IONLY
IFNEM	INDEX OF THE LINEARIZED MOMENTUM EQUATION WHICH HAS THE LARGEST ERROR FNEEM.	C ERRCOM
IFP	INDEX ON NON-LINEAR VARIABLE F(2,I)	L IMONE
IFP	INDEX ON NON-LINEAR VARIABLE F(2,I)	L IONLY
IFPP	INDEX ON LINEAR VARIABLE F(3,I)	L IMONE
IFPP	INDEX ON LINEAR VARIABLE F(3,I)	L IONLY
IFPPP	INDEX ON LINEAR VARIABLE F(4,I)	L IMONE
IFPPP	INDEX ON LINEAR VARIABLE F(4,I)	L IONLY
IFW	ITEM WHEN FW IS TO BE UPDATED.	C WALCOM
IG	NOMINALLY ZERO, EQUALS ONE ON FIRST SET OF BOUNDARY LAYER CHEMISTRY SOLUTIONS. FIRST GUESS AT I+ IS SOLUTION AT I-IG.	L EQUIL
IG	ELIMINATION INDEX IN BASE SPECIES-ELEMENT CORRESPONDENCE LOGIC.	L INPUT
IGLM	INDEX OF THE SET OF LINEAR EQUATIONS WHICH HAS THE LARGEST ERROR GLEM.	C ERRCOM
IGNLM	INDEX OF THE LINEARIZED ENERGY CONSERVATION EQUATION WHICH HAS THE LARGEST ERROR GNEEM.	C ERRCOM
IHW	ITEM WHEN HW IS TO BE UPDATED.	C WALCOM
IT	INDEX ON FTA. IT=1 AT WALL, IDENTICAL TO I+.	C INTCOM
ITS	LOCAL INDEX	L RECASE

IL	LOCAL INDEX	L PROPS
IK	LOCAL INDEX	L PROPS
IL	INDEX ON FIRST CHEMISTRY EQUATION TO BE SOLVED (1 FOR UNKNOWN T AND 2 FOR KNOWN T).	C EQTCOM
ILMM	INDEX OF THE LINEAR EQUATION WHICH HAS THE LARGEST ERROR FLMM.	C ERRCOM
IM(K)	ROW AND COLUMN INDEX IN INVERSION OF CIJ TO UM.	L INPUT
IMI	LOCAL INDEX	L INPUT
IMJ	LOCAL INDEX	L INPUT
IML	LOCAL INDEX	L INPUT
IN	NUMBER OF EQUATIONS BEING SOLVED (HAS THE VALUE OF THE LOCAL VARIABLE TSPQ IF TEMPERATURE IS UNKNOWN OR ISPO-1 IF TEMPERATURE IS KNOWN).	C EQTCOM
INLMM	INDEX OF THE NONLINEAR EQUATION WHICH HAS THE LARGEST ERROR FNLMM.	C ERRCOM
INP	IN+2	L CRECT
IPRF	ITEM WHEN PRE IS TO BE UPDATED.	C PRMCOM
INTEOV	VARIABLE EQUIVALENCED TO INTCOM (EXCEPT KR(20)) FOR DUMPING PURPOSES	L DUMCOM
INV	FLAG ON RESTART OF CHEMISTRY (PERMITS ONLY ONE RESTART)	L EQUIL
IQ	FOR EACH NON-BASE GASEOUS SPECIES INITIALIZED TO ZERO, SET TO ONE IF SPECIES IS SIGNIFICANT IN ANY MASS BALANCE.	L MATER
IQQ	DEBUG(-2) AND NONCONVERGENT(-1) FLAG ON CALL TO AND RETURN FROM RERAY, RESPECTIVELY.	L EQUIL
IR(K)	CORRESPONDENCE VECTOR BETWEEN BASE SPECIES AND ELEMENTS.	C EQPCOM
IRAD	ITEM WHEN RADP IS TO BE UPDATED.	C PRMCOM
IRE	INDEX ON NEWLY APPEARING CONDENSED SPECIES.	C EQTCOM
IRHOVW	ITEM WHEN RHOVW IS TO BE UPDATED.	C WALCOM
IS	NUMBER OF ELEMENTS INCLUDING ELECTRON, IDENTICAL TO IZ+.	C EQPCOM
IS	INDEX ON S, IS=1 AT STAGNATION POINT OR LEADING EDGE, IDENTICAL TO ISS*.	C INTCOM

ISH	VALUE OF IS AT PREVIOUS STREAMWISE STATION AT WHICH A BOUNDARY-LAYER SOLUTION HAS BEEN OBTAINED	C INTCOM
ISM	NSP-1	L PROPS
ISP	NUMBER OF ELEMENTS INCLUDING ELECTRON PLUS ONE.	C BUMCOM
ISP	SAME AS ISP IN INPUT.	L EQUIL
ISP	(IS*) + 1 WHERE IS* IS THE NUMBER OF ELEMENTS INCLUDING ELECTRONS.	L INPUT
ISP	NSP + 1	L PROPS
ISP2	NUMBER OF ELEMENTS INCLUDING ELECTRON PLUS TWO.	C KINCOM
ISP2	NSP + 2	L PROPS
ISPLM(K)	INDEX OF THE SET OF LINEAR EQUATIONS WHICH HAS THE LARGEST ERROR SPLEM(K).	C ERRCOM
ISPN	INDEX ON NON-LINEAR VARIABLE (G(1,I) OR SP(1,I,K))	L IMONE
ISPN	INDEX ON NON-LINEAR VARIABLE (G(1,I) OR SP(1,I,K))	L IONLY
ISPNUM(K)	INDEX OF THE LINEARIZED ELEMENTAL CONSERVATION EQUATION WHICH HAS THE LARGEST ERROR SPNLEM(K).	C ERRCOM
ISPP	INDEX ON LINEAR VARIABLE (G(2,I) OR SP(2,I,K))	L IMONE
ISPP	INDEX ON LINEAR VARIABLE (G(2,I) OR SP(2,I,K))	L IONLY
ISPPP	INDEX ON LINEAR VARIABLE (G(3,I) OR SP(3,I,K))	L IMONE
ISPI	INDEX ON LINEAR VARIABLE (G(3,I) OR SP(3,I,K))	L IONLY
ISPO	ISP2 + NUMBER OF PRESENT CONDENSED SPECIES.	C KINCOM
ISPO	NUMBER OF EQUATIONS SOLVED IN CHEMISTRY SOLUTIONS, IS+2+ NUMBER OF PRESENT CONDENSED SPECIES.	L EQUIL
ISPW	ITEM WHEN SPW IS TO BE UPDATED.	C WALCOM
ISS	INDEX ON S, ISS=1 AT STAGNATION POINT OR LEADING EDGE, IDENTICAL TO IS+.	C INTCOM
IST	LOCAL INDEX	L FIRSTG
ISU	INDEX OF SPECIES REPRESENTATIVE OF SURFACE	C CRBCON
ISV	ISV IS SET EQUAL TO IS* NEAR BEGINNING OF SUBROUTINE PROPS IS* THEN BEING SET TO NSP. IS* RESTORED TO ISV AT THE END OF PROPS.	L PROPS

ISV2	LOCALLY DEFINED VARIABLE	L PROPS
ISVP	ISV+1	L PROPS
IT	NOT USED IN CURRENT VERSION, IDENTICAL TO IIT+.	C EQTCOM
IT	CURRENTLY SET TO UNITY, IDENTICAL TO IIT*.	C INTCOM
ITEM	TIME (OR SUBCASE).	C INTCOM.
ITFF	NEGATIVE COUNT ON SUCCEEDING CHEMISTRY SOLUTIONS WHICH WILL ACCEPT RESIDENT SOLUTION AS FIRST GUESS.	L EQUIL
ITS	COUNTER FOR CHEMISTRY ITERATIONS, IDENTICAL TO IITS+.	C EQTCOM
ITS	COUNTER FOR BOUNDARY LAYER ITERATIONS, IDENTICAL TO MITS*.	C INTCOM
IIT	CURRENTLY SET TO UNITY, IDENTICAL TO IT+.	C INTCOM
ITW	ITEM WHEN TW IS TO BE UPDATED.	C WALCOM
IU	COUNTER ON NUMBER OF STREAMWISE STATIONS AT WHICH BOUNDARY LAYER SOLUTIONS HAVE BEEN OBTAINED	C INTCOM
IX	VARIABLE IN RERAY CALL SEQUENCE HAVING TO DO WITH PRINTING OF DEBUG OUTPUT. -2 GIVES DEBUG, COMES BACK 3 IF INVERSION SUCCEEDED, 1 IF SINGULAR.	C BUMCOM
IX	DIAGNOSTIC FLAG PREVIOUSLY USED TO INDICATE TYPE OF BAD INPUT DETECTED.	L INPUT
IX	DEBUG FLAG.	L RERAY
I7	NUMBER OF ELEMENTS INCLUDING ELECTRON, IDENTICAL TO IS*.	C EQPCOM
J	LOCAL INDEX (VARIOUS ROUTINES)	
JAT	READ IN AS COMMA (,) OR PERIOD (.) FOR TEST OF WHETHER THERE IS TO BE ANOTHER CASE (SEE INPUT INSTRUCTIONS).	L BLIMP
JAT(N)	ATOMIC NUMBER OF AN ELEMENT WHICH CONTAINS ALPT(N) ATOMS IN A SPECIES.	L INPUT
JR	LOCAL INDEX	L MATS1
JC	INDEX ON SURFACE CONDENSED SPECIES.	C EQTCOM
JJ	LOCAL INDEX (VARIOUS ROUTINES)	
JL	LOCAL INDEX	L TRMBL
JM	J-1, WHERE 'J' IS BASE SPECIES COUNT.	L INPUT

JRHOVW	SET EQUAL TO UNITY IF RHOVW OR FLUXJ ARE READ IN FOR CURRENT TIME. OTHERWISE ZERO.	L REFCOM
JT	LOCAL INDEX	L EQUIL
KAPPA	INDEX OF THE NODAL POINT AT WHICH THE VELOCITY RATIO IS FIXED.	C INTCOM
KAT(K)	ATOMIC NUMBER.	C EQPCOM
KIN	NUMBER OF TAPE FROM WHICH DATA IS READ.	C INTCOM
KINEQV	VARIABLE EQUIVALENCED TO KINCOM FOR DUMPING PURPOSES	L DUMCOM
KIP	CONTROL VARIABLE 0 UNLESS PERFORMING ASSIGNED TEMPERATURE CALCULATION DURING KR(9)=6 ENERGY BALANCE PROBLEMS (SEE DEFINITION OF IFZ).	C BUMCOM
KK	LOCAL INDEX (VARIOUS ROUTINES)	
KKR(I)	ARRAY OF INPUT INTEGERS WHICH CONTROL THE VARIOUS OPTIONS OF THE PROGRAM. IDENTICAL TO KR*.	C INTCOM
KOUT	NUMBER OF TAPE ONTO WHICH DATA IS WRITTEN.	C INTCOM
KPHA(N)	PHASE INDEX FOR A SPECIES, 1=GAS, 2=SOLID, 3=LIQUID.	L INPUT
KD(N)	(IDENTICAL TO KR(N))* BY TRANSMITTAL THROUGH CALL LISTS OF PROGRAMS EQUIL AND INPUT. ALSO IDENTICAL TO KD(N)*.	C INTCOM
KR(N)	CONTROL CARD FOR CHEMISTRY CALCULATION (KR(1) = 0 FOR ASSIGNED TEMPERATURE, 1 FOR SURFACE EQUILIBRIUM, 2 FOR ASSIGNED ENTHALPY, KR(2) AND KR(3) ARE 1 IF ELEMENT AND SPECIES DATA ARE TO BE READ IN, OTHERWISE 0, KR(4) IS NOT USED, KR(5) IS 0 IF IT IS NOT A BOUNDARY LAYER EDGE SOLUTION, 1 FOR EXPANSION, 2 FOR STAGNATION, KR(6) IS 0 FOR BOUNDARY LAYER CALCULATION, 2 FOR SURFACE MASS BALANCE, KR(7) CONTROLS DEBUG, IDENTICAL TO KZ(N)*.	C EQPCOM
KR(N)	ARRAY OF INPUT INTEGERS WHICH CONTROL THE VARIOUS OPTIONS OF THE PROGRAM. IDENTICAL TO KKR*.	C INTCOM
KR2	KKR(2) (FIRST GUESS FLAG) PRESERVES VALUE SINCE KKR(2) IS RESET TO ZERO IN SETUP.	L EQUIL
KR9(L)	VALUES OF KR(9) WHEN WALL BOUNDARY CONDITIONS ARE TO BE CHANGED AT DOWNSTREAM STATIONS, CURRENT KR(9) ASSIGNMENT MADE NEAR BEGINNING OF SUBROUTINE NONCEH.	C INTCOM
KR17	SAVED VALUE FOR KR(17).	C INTCOM
KS	SURFACE MATERIAL INDEX (FOR EACH STATION)	C CRBCOM

LI(N)	INDEX ON COLUMNS DURING INVERSION.	L RERAY
LAM(K,J)	UNITY IF J TH SPECIES CONTAINS K TH ELEMENT, OTHERWISE ZERO	C EQPCOM
LAR(N)	INDEX USED FOR REARRANGING ELEMENTS IN MATRIX OF NONLINEAR EQUATIONS (AM).	C ETACOM.
LAST	ASSIGNED THE VALUE PERIOD (.) THROUGH A DATA STATEMENT FOR USE IN TEST OF WHETHER THERE IS TO BE ANOTHER CASE.	L BLIMP
LEF(K)	FLAG REGARDING MISSING ELEMENTS FOR CURRENT SOLUTION, 3 ALWAYS PRESENT FROM EDGE, 2 ALWAYS PRESENT DUE TO UPSTREAM INJECTION, 1 PRESENT DUE TO LOCAL INJECTION, 0 NOT PRESENT.	C BLOCOM
LEFS(K)	FLAG REGARDING MISSING ELEMENTS FROM PRIOR SOLUTION, SEE LEF FOR NUMERICAL VALUES.	C BLOCOM
LEFT(K,N)	TEMPORARY STORAGE FOR LEF(K) DURING TAPE FLIP-FLOP FOR N = 1 AND 2.	C FLPCOM
LEFUP	UPDATE LEF IF EQUAL TO ZERO (=MITS+II-2 FOR BOUNDARY LAYER SOLUTION, OTHERWISE=1).	L EQUIL
LEFW(K)	FLAG REGARDING MISSING ELEMENTS FOR CURRENT WALL SOLUTION, SEE LEF FOR NUMERICAL VALUES.	C BLOCOM
LI	LOCAL INDEX	L LINMAT
LIM(K,KK)	LAM(K,KK) FOR KKTH BASE SPECIES.	L INPUT
LI(MK)	INDEX ON MASS BALANCE WHICH IS CONTROLLED BY N TH KINETIC REACTION.	C KINCOM
LL(N)	ROW INDEX OF PIVOT FOR NTH COLUMN.	L RERAY
LLL(N)	COLUMN INDEX OF PIVOT FOR NTH ROW.	L RERAY
LNZ	LOCAL INDEX	L RECASE
LPI	LOCAL INDEX (VARIOUS ROUTINES)	
LP	LOCAL INDEX	L TRMBL
LPR	LOCAL INDEX	L TRMBL
LS	INDEX USED TO REARRANGE COLUMNS IN RERAY (SEE LAR)	L RERAY
LSKIP	LOCAL INDEX	L NONCER
L2	INDEX ON PYROLYSIS GAS COMPONENT	C EQTCOM
L3	INDEX ON CHAR COMPONENT	C EQTCOM

M	LOCAL INDEX (VARIOUS ROUTINES)	
M1	COUNT ON PRINCIPAL SPECIES AFTER ORDERING IB.	L CRECT
MA(MK)	ORDERING VECTOR BASED ON HAVING MAT IN DESCENDING SEQUENCE	C KINCOM
MAT1I	3 * NETA - 2. NUMBER OF TAYLOR SERIES EXPANSIONS AND LINEAR BOUNDARY CONDITIONS INVOLVING F(1,I) AND ITS DERIVATIVES.	C INTCOM
MAT1J	NETA + 3. NUMBER OF LINEARIZED MOMENTUM EQUATIONS AND BOUNDARY CONDITIONS.	C INTCOM
MAT2I	2 * NETA. NUMBER OF TAYLOR SERIES EXPANSIONS AND LINEAR BOUNDARY CONDITIONS INVOLVING G(1,I) AND ITS DERIVATIVES OR THE K TH SPECIES, SP(1,I,K), AND ITS DERIVATIVES.	C INTCOM
MAT2J	NETA. NUMBER OF LINEARIZED ENERGY OR K TH ELEMENTAL CONSERVATION EQUATIONS AND BOUNDARY CONDITIONS.	C INTCOM
MFLT	INDEX ON PHASE CHANGING SPECIES.	C EQTCOM
MT	MA(K)	L KINET
MITS	COUNTER FOR BOUNDARY LAYER ITERATIONS, IDENTICAL TO ITS*.	C INTCOM
MM	LOCAL INDEX (VARIOUS ROUTINES)	
MOA(J)	ALPHANUMERIC VARIABLE, FIRST OF TWO PORTIONS OF SPECIES NAME, IDENTICAL TO FAMOA*.	C BLQCOM
MOR(J)	ALPHANUMERIC VARIABLE, SECOND OF TWO PORTIONS OF SPECIES NAME, IDENTICAL TO FAMOR*.	C BLQCOM
MODE	STORED VALUE FOR KR(1)*.	C EQTCOM
MOE	FLAG SET IN EQUIL AND USED IN CRECT. ZERO RESULTS IN EMPHASIZING EQUILIBRIUM EQUATIONS DURING CHEMISTRY CONVERGENCE, ONE RESULTS IN EMPHASIZING MASS BALANCES.	L EQUIL
MP	INDICES USED IN REARRANGING REACTIVE MASS BALANCES ACCORDING TO CONTROLLING REACTIONS.	L KINET
MP1	LOCAL INDEX (VARIOUS ROUTINES)	L IMONE
MPJ	LOCAL INDEX (VARIOUS ROUTINES)	L IMONE
MSD(N)	HAS THE VALUE OF IS AT THE BEGINNING OF N TH REGION BOUNDED BY DISCONTINUITIES (MSD(1)=1 BY DEFINITION) WHERE IS IS THE INDEX ON S.	C PRMCOM
MT	NUMBER OF KINETICALLY CONTROLLED REACTIONS.	C KINCOM

MMF	CONTROL VARIABLE (-1 FOR NEW CASE, SET TO ZERO AT THE END OF SUBROUTINE SETUP).	C INTCOM
NI	NUMBER OF ROWS + 1	L RERAY
NAM	NUMBER OF NONLINEAR EQUATIONS NOT INCLUDING NONLINEAR WALL BOUNDARY CONDITIONS, NNLEQ=NRNL.	C INTCOM
NAT	NUMBER OF ONE OF TWO TAPES USED IN FLIP-FLOP.	C INTCOM
NAT2	NUMBER OF ONE OF TWO TAPES USED IN FLIP-FLOP.	C INTCOM
NC	NUMBER OF COMPONENTS OF THE NONREACTING FLUID MIXTURE IN KR(7)=1 OPTION.	C STTCOM
NCV	NONCONVERGENCE COUNT, INITIALLY ZERO, INCREMENTED BY ONE FOR EACH NONCONVERGENT CHEMISTRY SOLUTION.	L EQUIL
ND	DIMENSION TRANSMITTED THROUGH CALL	L RERAY
NDISC	NUMBER OF DISCONTINUITIES.	C PRMCOM
NELM	NUMBER OF MAXIMUM LINEAR ERRORS ELM.	C ERRCOM
NEN	NUMBER OF ENTRIES IN ENTROPY TABLE	C EDGCOM
NENLM	NUMBER OF MAXIMUM NONLINEAR ERRORS ENLM.	C ERRCOM
NFTA	NUMBER OF NODAL POINTS ACROSS BOUNDARY LAYER INCLUDING WALL AND EDGE.	C INTCOM
NFF	NUMBER OF SPECIES FOR WHICH DIFFUSION FACTORS, FF(J), ARE TO BE READ IN.	L INPUT
NFTA(J)	FIRST OF TWO PORTIONS OF NAME OF MOLECULE FOR WHICH DIFFUSION FACTOR, FF(J), IS BEING READ IN.	L INPUT
NFTM(J)	SECOND OF TWO PORTIONS OF NAME OF MOLECULE FOR WHICH DIFFUSION FACTOR, FF(J), IS BEING READ IN.	L INPUT
NFN	NUMBER OF SIGNIFICANT SPECIES PLUS NUMBER OF NONPRESENT ELEMENTS.	L MATER
NITEM	NUMBER OF TIMES (OR SUBCASES).	C INTCOM
NLEQ	NUMBER OF LINEAR EQUATIONS, MAT11+NSP*MAT21.	C INTCOM
NM	NUMBER OF ROWS LESS ONE	L RERAY
NN	NUMBER BY WHICH COLUMNS EXCEED ROWS IN PRINCIPAL ARRAY	L RERAY
NNLEQ	MAT1J + NSP * MAT2J, TOTAL NUMBER OF NONLINEAR EQUATIONS.	C INTCOM

NNN	NUMBER OF COLUMN VECTORS IN SECONDARY ARRAY	L RERAY
VON	CONTROL VARIABLE USED AFTER RETURNING FROM SUBROUTINE OUTPUT (-) WHEN RETURNING FROM OUTPUT DURING ITERATIONS, 0 WHEN CONVERGED, +1 WHEN NONCONVERGED AFTER ALLOWED NUMBER OF ITERATIONS).	C INTCOM
NP	NUMBER OF COLUMNS IN PRIMARY ARRAY.	L RERAY
NPR	NUMBER OF DERIVATIVE PROPERTIES TO BE EVALUATED	L PROPS
NRNL	NSP + 1, NUMBER OF REDUCED NONLINEAR EQUATIONS.	C INTCOM
NS	NUMBER OF STREAMWISE STATIONS.	C INTCOM
NSD(N)	NUMBER OF STATIONS CONTAINED IN N TH REGION BOUNDED BY DISCONTINUITIES (S(I) CONSIDERED A DISCONTINUITY IN THIS DEFINITION).	C PRMCOM
NSP	NUMBER OF ELEMENTS IN THE SYSTEM, NOT INCLUDING ELECTRONS.	C INTCOM
NSPEC	NUMBER OF SPECIES, IDENTICAL TO N*.	C BLOCOM
NSPM1	NSP-1	C INTCOM
NTIME	CURRENTLY SET TO UNITY.	C INTCOM
NUL	ZERO.	L HISTXI
N2I	LOCAL INDEX	L NONCER
N7	ITERATION AT WHICH DIAGNOSTIC OUTPUT WILL COMMENCE	L EQUIL
OMEGA	PARAMETER OF THIS NAME USED IN TRANSPORT PROPERTY CALCULATIONS INTRODUCED IN EQ(4) OF NASA CR-1063, NUMERICALLY EQUAL TO $1.07/(T/106.7)^{0.159}$	L PROPS
OUTEQV	VARIABLE EQUIVALENCED TO OUTCOM FOR DUMPING PURPOSES	L DUMCOM
P	PRESSURE.	C EQPCOM
PA(K,XX)	PARTIAL DERIVATIVE OF PROPERTY K WITH RESPECT TO LOG T, LOG AA, LOG(Y(KK-2)).	L PROPS
PE(L,1)	STATIC PRESSURE.	C EDGCOM
PHIK(I,K)	SOURCE TERM FOR KTH ELEMENT (EQUAL TO ZERO IN MIXED EQUILIBRIUM-FROZEN BOUNDARY LAYER).	C PRPCOM
PHIKPIK	DERIVATIVE OF PHIK WITH RESPECT TO ETA.	C PRPCOM
PI	P(I) IN MIXING LENGTH FORMULATION.	C EPSCOM

PID	LOCALLY DEFINED VARIABLE	L TMMBL
PIFASF	PRODUCT OF DAMPING FACTORS.	C 9LQCOM
PTM	P AT NODE I-1	L TMMBL
PTN	$P = (1000/-5)$ USED TO INITIALIZE PARTIAL PRESSURES.	L EQUIL
PTN	SAME AS IN EQUIL.	L WATER
PINF	FREE-STREAM STATIC PRESSURE	C EDGCOM
PINI	LOG (PIN).	L EQUIL
PRF(MK)	FORWARD RATE OF REACTION.	C KINCOM
PRR(MK)	REVERSE RATE OF REACTION.	C KINCOM
PLM	SUMMATION $VN(J) \cdot WTM(J)$ FOR ALL CONDENSED SPECIES.	L EQUIL
PRF(MK)	NET FORWARD RATE OF REACTION.	C KINCOM
PMI(K,MK)	STOICHIOMETRIC PRODUCT COEFFICIENT ON K TH BASE SPECIES.	C KINCOM
PMU1	$VN(J) \cdot FF(J)$ SUMMED OVER ALL GASEOUS SPECIES (=VMU1 * P).	L PROPS
PMU2	$VN(J) \cdot WTM(J) / FF(J)$ SUMMED OVER ALL SPECIES N* (=VMU2 * P).	L PROPS
PMU6	$VN(J) / (FF(J) \cdot (W04 - VN(J) \cdot FF(J) \cdot W08))$ SUMMED OVER ALL SPECIES N*.	L PROPS
PMUS(K)	SUMMATION $VNU(J,K) \cdot VN(J)$ OVER ALL GASES J.	L WATER
PR(T)	PRANDTL NUMBER.	C PRPCOM
PRA	CONSTANT IN THE PRANDTL NUMBER RELATION DEFINING PR (SEE PRJUM).	C SITCOM
PRR	CONSTANT IN THE PRANDTL NUMBER RELATION DEFINING PR (SEE PRJUM).	C SITCOM
PRC	CONSTANT IN THE PRANDTL NUMBER RELATION DEFINING PR (SEE PRJUM).	C SITCOM
PRD	CONSTANT IN THE PRANDTL NUMBER RELATION DEFINING PR (SEE PRJUM).	C SITCOM
PROUM	PRANDTL NUMBER IF CONDENSED COMPONENT. OTHERWISE, IT IS A CONSTANT IN THE RELATION/ $PR = PROUM \cdot PRA \cdot T \cdot PRR \cdot PRC \cdot PRD$ USED IN PR(T) = 1 OPTION ONLY.	C SITCOM
PRFIL	RATIO OF LOCAL STATIC PRESSURE TO STAGNATION PRESSURE PTET	C CHNCOM

PRFO	VARIABLE EQUIVALENCED TO PORTION OF PRPCOM FOR STORAGE TRANSFER	L NONCER
PRF	LOCALLY DEFINED VARIABLE	L TRMBL
PRMFOV	VARIABLE EQUIVALENCED TO PRMCOM FOR DUMPING PURPOSES	L DUMCOM
PRMU(K,MM)	PMU-RMU	C KINCOM
PRP	LOCALLY DEFINED VARIABLE RELATIVE TO ARRAY OF DERIVATIVE PROPERTIES BEING CALCULATED	L PROPS
PRPEOV	VARIABLE EQUIVALENCED TO PRPCOM FOR DUMPING PURPOSES	L DUMCOM
PPR	ARGUMENT REPRESENTING PRESSURE	L EQUIL
PRI	TURBULENT PRANDTL NUMBER	C EPSCOM
PTF(L,1)	LOCAL TOTAL PRESSURE.	C EDGCOM
PTEY(M)	STAGNATION PRESSURE.	C PRMCOM
PV(N,NN)	DERIVATIVES OF VMU3 (NN=1), VMU4 (NN=2), HTIL (NN=3) AND ZK(K) (NN=3+K) WITH RESPECT TO ENTHALPY (N=1), PRESSURE (N=2) AND K TH ELEMENTAL MASS FRACTION (N=2+K).	L PROPS
QA	LOCALLY DEFINED VARIABLE	L SLOPQ
QB	LOCALLY DEFINED VARIABLE	L SLOPQ
QC	LOCALLY DEFINED VARIABLE	L SLOPQ
QCHEM(N)	DIFFERENCE BETWEEN DIFFUSIVE HEAT FLUX AND THAT CALCULATED USING CHL FOR HEAT-TRANSFER COEFFICIENT	L FELTRU
QT	NUMBER INTRODUCED INTO CALCULATION OF BETAM (WHICH DIFFERS FOR VARIOUS BODY SHAPES) DUE TO CHANGE IN MANNER OF INTEGRATION IN THE VICINITY OF THE STAGNATION POINT OR LEADING EDGE.	L REFCON
QR(1)	NET RADIATION FLUX TOWARD THE SURFACE (SET EQUAL TO ZERO IN C PRPCOM HLIMP, COMPUTED BY SUBROUTINE RAD IN RAHLE).	C PRPCOM
QS	LOCALLY DEFINED VARIABLE	L TRMBL
QW	DIFFUSIVE HEAT FLUX AT THE WALL, C32/C3 EVALUATED AT WALL.	C FLXCOM
R	LOCALLY DEFINED VARIABLE	L ERP
RA(N)	HEAT OF FORMATION OF MOLECULE AT 298 DEG K FROM JANAF BASE STATE, CAL/MOLE. N=1 OR 2 FOR LOW AND HIGH TEMPERATURE RANGES, RESPECTIVELY.	L INPUT

RADFL(M)	INCIDENT RADIATION FLUX ABSORBED BY THE SURFACE AT STATION S(1).	C PRMCOM
RADNO	ACTUAL NOSE RADIUS OF A SPHERICALLY TIPPED BODY.	C PRMCOM
RADR(L)	RATIO OF INCIDENT RADIATION FLUX ABSORBED BY THE SURFACE TO THE VALUE AT STATION S(1). RADFL.	C PRMCOM
RADS(L)	INCIDENT RADIATION FLUX ABSORBED BY THE SURFACE.	C PRMCOM
RAT1(N)	FRACTIONAL CONTRIBUTION OF $\rho h_0 c_p$ TERM TO DIFFUSIVE HEAT FLUX	L FELTRU
RAT2(N)	FRACTIONAL CONTRIBUTION OF $\rho h_0 c_p$ TERM TO DIFFUSIVE HEAT FLUX	L FELTRU
RAT3(N)	RATIO OF MASS TO HEAT-TRANSFER COEFFICIENTS	L FELTRU
RAT(MK)	LARGEST OF PKP, PKR, PMR. MEASURE OF REACTION IMPORTANCE.	C KINCOM
RC(J,N)	CURVE FIT CONSTANT FOR THERMODYNAMIC DATA (THE QUANTITY F3 DISCUSSED IN GROUP 12 OF INPUT INSTRUCTIONS), N=1 OR 2 FOR LOW AND HIGH TEMPERATURE RANGES, RESPECTIVELY.	C EQPCOM
RD(J,N)	CURVE FIT CONSTANT FOR THERMODYNAMIC DATA (THE QUANTITY F4 DISCUSSED IN GROUP 12 OF INPUT INSTRUCTIONS), N=1 OR 2 FOR LOW AND HIGH TEMPERATURE RANGES, RESPECTIVELY.	C EQPCOM
RE(J,N)	CURVE FIT CONSTANT FOR THERMODYNAMIC DATA (THE QUANTITY F5 DISCUSSED IN GROUP 12 OF INPUT INSTRUCTIONS), N=1 OR 2 FOR LOW AND HIGH TEMPERATURE RANGES, RESPECTIVELY.	C EQPCOM
RED	REYNOLDS NUMBER ON DEL WHERE DEL IS THE Y DIMENSION NORMALIZING PARAMETER. ALSO, $RED = \rho V_\infty \Delta / \mu$ WHERE ALPHA-STAR IS THE FLUX NORMALIZING PARAMETER DEFINED BY EQ. 44 OF NASA CR 1062.	C EPSCOM
RFF2	LOCALLY DEFINED VARIABLE	L OUTPUT
RFF3	LOCALLY DEFINED VARIABLE	L OUTPUT
RFF4	LOCALLY DEFINED VARIABLE	L OUTPUT
RFG2	LOCALLY DEFINED VARIABLE	L OUTPUT
REG3	LOCALLY DEFINED VARIABLE	L OUTPUT
RERAD	RADIATION FLUX FROM WALL	L OUTPUT
RES	REYNOLDS NUMBER BASED ON DISTANCE S.	C OUTCOM
RETA	LOCALLY DEFINED VARIABLE	L OUTPUT

RFTMO	REYNOLDS NUMBER BASED ON MOMENTUM THICKNESS	L OUTPUT
RETR	TRANSITION REYNOLDS NUMBER BASED ON MOMENTUM THICKNESS.	C EPSCOM
RF(J,N)	CURVE FIT CONSTANT FOR THERMODYNAMIC DATA (THE QUANTITY F6 DISCUSSED IN GROUP 13 OF INPUT INSTRUCTIONS), N=1 OR 2 FOR LOW AND HIGH TEMPERATURE RANGES, RESPECTIVELY.	C EQPCOM
RHO(I)	DENSITY OF GAS MIXTURE.	C PRPCOM
RHOE(I)	DENSITY OF BOUNDARY LAYER EDGE GAS.	C EDGCOM
RHOINF	FREE-STREAM DENSITY	C EDGCOM
RHOP(I)	DERIVATIVE OF RHO WITH RESPECT TO ETA.	C PRPCOM
RHOVS	-RHOVW(I,1)/ALPHASTAR. SEE NASA CR 1062 FOR ALPHASTAR.	C EPSCOM
RHOVW(L,1)	CONVERGED VALUE FOR SURFACE ABLATION RATE.	C WALCOM
RHR	DENSITY.	L EQUIL
RI	LOCALLY DEFINED VARIABLE	L TRMBL
RMMG	RATIO OF MOLECULAR WEIGHT OBTAINED BY SUMMING PARTIAL PRESSURES OVER ALL SPECIES TO THE MOLECULAR WEIGHT OBTAINED BY SUMMING OVER GAS PHASE SPECIES ONLY.	C EQTCOM
RMMGS	RMMG*RMMG	L MATER
RMU(K,MK)	STOICHIOMETRIC REACTAN. COEFFICIENT ON K TH BASE SPECIES.	C KINCOM
RNOSE	EFFECTIVE NOSE RADIUS.	C PRMCOM
ROKAP(L)	1 FOR PLANAR BODIES. LOCAL BODY RADIUS FOR AXISYMMETRIC BODIES. SPREADING FACTOR WHEN USING AXISYMMETRIC ANALOGY (SEE REFERENCE 6) BODIES.	C PRMCOM
RR	DENSITY RATIO	L TRMBL
RRFD	LOCALLY DEFINED VARIABLE	L TRMBL
RRP	LOCALLY DEFINED VARIABLE	L TRMBL
RRPD	LOCALLY DEFINED VARIABLE	L TRMBL
RSIG(MK)	RELATIVE SIGNIFICANCE OF KINETIC REACTION IN MASS BALANCE.	C KINCOM
RSQA	RMMGS*FFF/AA	L MATER
RT	PERFECT GAS CONSTANT, R, TIMES TEMPERATURE, T.	L KINET

S(L)	STREAMWISE COORDINATE ALONG BODY.	C PRMCOM
S(N)	LARGEST CONTRIBUTION TO TERM IN N TH COLUMN.	L RERAY
SALPH	SIGNED VALUE OF ALPH	L TRMBL
SB(J)	ENTROPY.	C EQTCOM
SC(I)	REFERENCE SCHMIDT NUMBER. SEE EQ(46) OF NASA CR-1062.	C PRPCOM
SCT	TURBULENT SCHMIDT NUMBER	C EPSCOM
SD(N)	RATIO OF RESIDUAL TERM IN N TH COLUMN TO S(N).	L RERAY
SDUM1(L)	VARIABLE OF INTEGRATION IN CALCULATION OF XI IN REFCOM, TEMPORARY STORAGE AREA IN OTHER ROUTINES.	C TEMCOM
SDUM2(L)	VARIABLE OF INTEGRATION IN CALCULATION OF FW IN REFCOM, TEMPORARY STORAGE AREA IN OTHER ROUTINES.	C TEMCOM
SDY	LOCALLY DEFINED VARIABLE	L TRMBL
SF(MS)	STREAMFUNCTION IN ENTROPY LAYER TABLE	C EDGCOM
SHAPE	OFLST/THMM, SHAPE FACTOR.	C OUTCOM
SHEAR	WALL SHEAR GIVEN BY $CAPC(1)/ALPH * VMUE(1S) * UE(1S)/C89 * F(3,1)/32.1740$	C OUTCOM
SHIP	SAVED VALUE OF INPUT ENTHALPY.	L EQUIL
SHMFLT	ENTHALPY OR ENTROPY OF FUSION OF A SPECIES IF TEMPERATURE EQUALS FUSION TEMPERATURE OF THAT SPECIES.	L MATER
SIGMA	COLLISION CROSS SECTION FOR REFERENCE SPECIES	C EQTCOM
STP	ENTROPY INPUT.	C EQTCOM
SLAM(K)	DEFINED BY EQ(83) OF NASA CR-1064.	C EQTCOM
SM(J)	ENTROPY OF FUSION.	C EQPCOM
SMELT	SM(J) IF J TH SPECIES IS CHANGING PHASE, OTHERWISE 0.	C EQTCOM
SP(N,I,K)	ELEMENTAL MASS FRACTION (N=1) AND ITS DERIVATIVES OF ORDER N-1 WITH RESPECT TO ETA.	C VARCOM
SPEASE	SAVED VALUE OF PTEASE	L EQUIL
SPD(N)	$D1 * SP(N,I,K) * D2 * HSP(I,N,K)$ FOR N=1 THROUGH 3, $D1 * SP(3,I-1,K) * D2 * HSP(I-1,3,K)$ FOR N=4.	L HISTXI

SPDUM(K)	DIMENSIONED VARIABLE USED IN VARIOUS SUBROUTINES BUT NOT USED FOR TRANSMITTING INFORMATION BETWEEN SUBROUTINES.	C TEMCOM
SPE(K,I,1)	ELEMENTAL MASS FRACTION AT BOUNDARY LAYER EDGE.	C EDGCOM
SPLF(N,K)	ERROR FOR THE TAYLOR SERIES EXPANSIONS INVOLVING SP(I,I,K) AND THEIR DERIVATIVES.	C ERRCOM
SPLEM(K)	MAXIMUM VALUE OF SPLE(N,K).	C ERRCOM
SPNEW	VARIABLE USED TO DENOTE PRESENCE OF NEW ELEMENT IN SYSTEM	L RNLCEP
SPNEW	VARIABLE USED TO DENOTE PRESENCE OF NEW ELEMENT IN SYSTEM	L NONCEP
SPNLEM(K)	ERROR FOR THE LINEARIZED ELEMENTAL CONSERVATION EQUATIONS.	C ERRCOM
SPW(K,L,1)	CONVERGED VALUE FOR ELEMENTAL MASS FRACTION OF BOUNDARY LAYER GAS AT THE WALL.	C WALCOM
SREF	ENTROPY OF REFERENCE STREAMLINE	C EDGCOM
SS	LOCALLY DEFINED VARIABLE	L SLOPD
SSTP	SAVED VALUE OF INPUT ENTROPY.	L EQUIL
SSTAG	STAGNATION ENTROPY BASED ON 1 ATM PRESSURE.	L STATE
SSTAGA	STAGNATION ENTROPY BASED ON ACTUAL PRESSURE.	L STATE
STFF	STEFAN-BOLTZMANN CONSTANT.	C CRBCOM
STTEQV	VARIABLE EQUIVALENCED TO STTCOM FOR DUMPING PURPOSES	L DUMCOM
SUMD	RT* Δ LOG KP/ Δ LOG T OF KINETIC REACTION.	L KINET
SUMG	OFF-DIAGONAL COLUMN SUMS OF GAMK USED TO STRENGTHEN DIAGONAL DOMINANCE OF ARRAY.	L EQUIL
SUMK	LOG KP OF KINETIC REACTION.	L KINET
SUML	LOG (SUMN/P)	C EQTCOM
SUMN	SUMMATION OF PARTIAL PRESSURES FOR ALL GAS PHASE SPECIES.	C EQTCOM
SUMP	SUM OF PRODUCT Y(N)	L KINET
SUMR	SUM OF REACTANT Y(N)	L KINET
T	STATIC TEMPERATURE IN DEG K. IDENTICAL TO Z*	C EQPCOM
T(I)	STATIC TEMPERATURE IN DEG R. IDENTICAL TO TT*.	C PRPCOM
TAU(K,KK)	INTERMEDIATE ARRAY USED IN FORMING UM.	L INPUT

TC(J)	-D LOG KP / D LOG T FOR FORMATION REACTION OF J TH SPECIES	C EQTCOM
TCW	TC EVALUATED AT THE WALL FOR THE (ISP)TH ELEMENT.	C NONCOM
TE(L)	TEMPERATURE AT BOUNDARY LAYER EDGE.	C EDGCOM
TEMEOV	VARIABLE EQUIVALENCED TO TEMCOM FOR DUMPING PURPOSES	L DUMCOM
TE(J)	FAIL TEMPERATURE OF SPECIES J.	E EQPCOM
TFMAX	MAXIMUM FAIL TEMPERATURE OF CANDIDATE SURFACE SPECIES.	L INPUT
TFZ	SURFACE TEMPERATURE TO WHICH CONVERGENCE IS TEMPORARILY ATTEMPTED DURING ENERGY BALANCE PROBLEMS USING KR(9)=6.	C BUMCOM
THCOND	ENTHALPY THICKNESS	L OUTPUT
THELFM(K)	MASS THICKNESSES GIVEN BY $DUZ(K)/DUM(K)$ WHERE $DUZ(K)$ IS THE SUMMATION OVER KK OF $C89/ALPH * ((F(1,NETA)-F(1,1)) * SP(1,NETA,KK)-XSP(S,KK))/WTM(KK) * CIJ(K,KK)$ AND $DUM(K)$ IS THE SUMMATION OVER KK OF $(SP(1,NETA,KK)-SP(1,1,KK))/WTM(KK) * CIJ(K,KK)$.	L OUTPUT
THENGY	ENERGY THICKNESS GIVEN BY $C89/ALPH * ((F(1,NETA)-F(1,1)) * G(1,NETA)-XG(S))/(G(1,NETA)-G(1,1))$	C OUTCOM
THMOM	MOMENTUM THICKNESS GIVEN BY $C89/ALPH * ((F(1,NETA)-F(1,1)) -XM(S)/ALPH)$	C OUTCOM
TIME	REAL ELAPSED TIME SINCE BEGINNING OF SOLUTION	L ITERAT
TIME(M)	TIME (OR SUBCASE)	C PRMCOM
TION	TEMPERATURE BELOW WHICH IONIZATION WILL BE SUPPRESSED	L EQUIL
TITL(N)	TYPE OF AVEPAGING EMPLOYED TO CMK(N)	L FELTRU
TK(K,N)	GRAM ATOMS OF ELEMENT K PER UNIT MASS OF COMPONENT N.	C EQPCOM
TM	MAXIMUM OR MINIMUM TEMPERATURE IF DELTA T IS POSITIVE OR NEGATIVE. RESPECTIVELY.	L CRECT
TMAX	MAXIMUM TEMPERATURE ALLOWED FOR CURRENT ITERATION.	C EQTCOM
TMIN	MINIMUM TEMPERATURE ALLOWED FOR CURRENT ITERATION.	C EQTCOM
TMU3	$VM(J) / FF(J)$ SUMMED OVER ALL SPECIES N. (=VMU3 * VMU2 * P).	L PROPS
TP	DERIVATIVE OF T WITH RESPECT TO ETA.	C PRPCOM
TR(K,N)	GRAM ATOMS OF BASE SPECIES K PER UNIT MASS OF COMPONENT N. SEE W(N) FOR DEFINITION OF COMPONENTS	C EQPCOM

TREF	GROUP OF TERMS WHICH APPEARS IN DERIVATIVES OF PI. (REYNOLDS NUMBER ON DELST)/C26/(2.*CAPC(1)**2*YAP**2*PI).	C EPSCOM
TS	PHASE CHANGE TEMPERATURE.	L INPUT
IT(I)	STATIC TEMPERATURE IN DEG R, IDENTICAL TO T+.	C PRPCOM
ITMAX	MAXIMUM TEMPERATURE ALLOWED FOR THIS SOLUTION.	C EQTCOM
ITMIN	MINIMUM TEMPERATURE ALLOWED FOR THIS SOLUTION.	C EQTCOM
ITVC	VARIABLE T USED IN TRANSVERSE CURVATURE CALCULATIONS	C EDGCOM
IT(J,N)	UPPER TEMPERATURE OF TEMPERATURE RANGE FOR INPUTTING THERMODYNAMIC PROPERTY DATA FOR SPECIES J, N=1 OR 2 FOR LOWER AND UPPER TEMPERATURE RANGES, RESPECTIVELY.	C EQPCOM
TVCC(IS)	CONSTANT USED IN TVC CALCULATIONS	C EDGCOM
TW(L,1)	CONVERGED VALUE OF SURFACE TEMPERATURE.	C WALCOM
TWC(N)	BASE TEMPERATURE USED IN HEAT-TRANSFER-COEFFICIENT CALCULATION	L FELTRU
UF(L)	BOUNDARY-LAYER EDGE VELOCITY.	C EDGCOM
UFGE	PARAMETER ENTERING INTO ENTROPY LAYER OPTION. SEE EQ(68) OF NASA CR-1062 (SET EQUAL TO UNITY IN PRESENT PROGRAM).	C EDGCOM
UGH	NORMALIZING FACTOR IN GAUSSIAN ELIMINATION.	L INPUT
UTNF	FREE-STREAM VELOCITY	C EDGCOM
UKAP	EDGE VELOCITY NORMALIZED BY REFERENCE VELOCITY	L NONCER
UM(K,KK)	MOLECULES OF BASE SPECIES K IN ELEMENT KK.	L INPUT
UNIT(N)	COMPLEX FACTOR HAVING TO DO WITH DAMPING OF KINETICALLY CONTROLLED MASS BALANCES.	C KINCOM
UNIT(N)	SMOOTHING FACTOR RELATED TO IMPOSING RESIDUAL ERROR INTO REACTIVE MASS BALANCES AS A RESULT OF BOUNDARY LAYER DAMP- ING.	L KINET
V	LOCALLY DEFINED VARIABLE	L INPUT
VA	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
VAREIV	VARIABLE EQUIVALENCED TO VARCOM FOR DUMPING PURPOSES	L DUMCOM
VR	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
VC	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	

VD	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
VF	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
VFL	VELOCITY.	L EQUIL
VELSQ	SQUARE OF VELOCITY.	L EQUIL
VINT	$P * 10^{**}(-6)$	L INPUT
VJKW(K)	DIFFUSIVE MASS FLUX OF BASE SPECIES AT THE WALL. CK6(K)/C3 EVALUATED AT THE WALL (IN OUTPUT, VJKW(K) IS MODIFIED TO REPRESENT DIFFUSIVE MASS FLUXES OF ELEMENTS AT THE WALL.	C FLXCOM
VX(K)	SP(1,J,K)	L PROPS
VKAP	FLAG FOR BODY SHAPE (0 FOR PLANAR, 1 FOR AXISYMMETRIC).	C PRPCOM
VK1	LOCALLY DEFINED VARIABLE	L KINET
VK2	LOCALLY DEFINED VARIABLE	L KINET
VK3	LOCALLY DEFINED VARIABLE	L KINET
VLAN	MIXTURE THERMAL CONDUCTIVITY GIVEN BY $\text{RHO}(I) * \text{DHAR} * \text{VMU6} * 1.9869 / (\text{WM} * \text{VMU1})$.	L PROPS
VLAM(J,K)	LAMBDA, DEFINED IN EQ(83) OF NASA CR-1064	E NONCOM
VLEN(J)	LOG KP FOR FORMATION REACTION OF J TH SPECIES	C EQTCOM
VLENK	VLEN EVALUATED AT THE WALL FOR THE (ISP)TH ELEMENT.	C NONCOM
VMACH	MACH NUMBER	L EQUIL
VMACH	MACH NUMBER.	L STATE
VMAT(N)	SET OF VARIABLES STARTING WITH C1 TO BE STORED ON TAPE.	E HISCOM
VMFCH	SURFACE MASS LOSS RATE DUE TO LIQUID LAYER FLOW	L OUTPUT
VMU(I)	VISCOSITY OF MIXTURE, COMPUTED IN SUBROUTINE PROPS AS $\text{RHO}(I) * \text{DHAR} * \text{VMU5}/\text{VMU1}$	C PRPCOM
VMU1	COEFFICIENT MU1 DEFINED IN EQ(22) OF NASA CR-1062.	L PROPS
VMU2	SAME AS VMU2 IN PROPS.	L MATER
VMU2	COEFFICIENT MU2 DEFINED IN EQ(22) OF NASA CR-1062.	L PROPS
VMU1	PROPERTY OF THE GAS MIXTURE WHICH REDUCES TO 1/MM FOR EQUAL DIFFUSION COEFFICIENTS. SEE EQ(28) OF NASA CR-1062	C PRPCOM

VMU3P	DERIVATIVE OF VMU3 WITH RESPECT TO ETA.	C PRPCOM
VMU4P	DERIVATIVE OF VMU4 WITH RESPECT TO ETA.	C PRPCOM
VMU5	CONTRIBUTION TO MIXTURE VISCOSITY GIVEN BY $AMU5 * RMMG/AA$.	L PROPS
VMU6	CONTRIBUTION TO MIXTURE THERMAL CONDUCTIVITY GIVEN BY $(PMU6 * L PROPS + CPT11 / 1.9869 - 2.5 * TMU3) / P$	L PROPS
VMU12	PRODUCT OF THE TWO COEFFICIENTS MU1 AND MU2 DEFINED IN EQ (22) OF NASA CR-1062	C PRPCOM
VMUA	CONSTANT IN THE VISCOSITY RELATION $MU = (VMUA * T ** VMUR) / (VMUC * T + VMUD)$. USED IN KR(7)=1 OPTION ONLY	C STTCOM
VMUH	CONSTANT IN THE VISCOSITY RELATION DEFINED UNDER VMUA.	C STTCOM
VMUC	CONSTANT IN THE VISCOSITY RELATION DEFINED UNDER VMUA.	C STTCOM
VMUD	CONSTANT IN THE VISCOSITY RELATION DEFINED UNDER VMUA.	C STTCOM
VMUE(I)	VISCOSITY AT BOUNDARY LAYER EDGE.	C EDGCOM
VMW(I)	MOLECULAR WEIGHT OF THE MIXTURE.	C PRPCOM
VMWF	MOLECULAR WEIGHT OF GAS AT BOUNDARY LAYER EDGE.	C EDGCOM
VN(J)	PARTIAL PRESSURE.	C EQPCOM
VNU(J,K)	STOICHIOMETRIC COEFFICIENT ON K IN BASE SPECIES IN FORMATION OF J TH SPECIES.	C EQPCOM
VVOL	LOCALLY DEFINED VARIABLE	L REFCOM
WIN)	COMPONENT MASS FLUX AT WALL. W(1) IS EDGE GAS, W(2) IS PY-POLYSIS GAS, W(3) IS CHAR	C BLOCOM
WALFQV	VARIABLE EQUIVALENCED TO WALCOM FOR DUMPING PURPOSES	L DUMCOM
WALLJ(K)	NORMALIZED DIFFUSIVE MASS FLUX AT WALL (DEFINED BY EQ(48) OF NASA CR-1062). CK6(K) EVALUATED AT THE WALL	C FLXCOM
WALLQ	NORMALIZED DIFFUSIVE HEAT FLUX AT THE WALL (DEFINED BY EQ (50) OF NASA CR-1062). C32 EVALUATED AT THE WALL	C FLXCOM
WALLQJ(N)	GLOBAL SET OF WALLQ AND WALLJ.	E FLXCOM
WAT(K)	ATOMIC WEIGHT.	C EQPCOM
WD7	$1.2 * AISTAN / PMU1$	L PROPS
WD8	$0.284 * WD7$	L PROPS

WD5	$0.32 * AISTAR / PMU1$	L PROPS
WD7	$WDZ/PMU1 - WD2$	L PROPS
WD8	$WD4/PMU1 - WD5$	L PROPS
WDOT	ABLATION RATE IN THE CONVERGED SOLUTION OF MATERIAL CONSIDERED UNDER $KR(9) = 3$ THROUGH 6	C BUMCOM
WDZ	CONSTANT 1.385 WHICH ENTERS INTO CALCULATION OF MIXTURE TRANSPORT PROPERTIES.	L PROPS
WM	MOLECULAR WEIGHT OF MIXTURE.	C EQPCOM
WS	SUM OF PYROLYSIS AND CHAR MASS RATES.	L MATER
WSUM	$W(1) + W(2) + W(3)$	L NONCER
WT	MOLECULAR WEIGHT AS SUMMED.	L INPUT
WTG	PRESSURE * GAS MOLECULAR WEIGHT.	L MATER
WTL	SUMMATION OF $VH(J) * WTM(J)$ FOR ALL CONDENSED SPECIES.	L MATER
WTM(J)	MOLECULAR WEIGHT OF SPECIES J.	C EQPCOM
X(N)	CORRECTIONS OF NONLINEAR VARIABLES IN CHEMISTRY SOLUTION.	E EQTCOM
X1	DAMPED VALUE OF DELTA LN T.	L CRECT
X0	LOCALLY DEFINED VARIABLE	L SLOPO
XG(N)	DEFINED BY EQU(46) OF NASA CR-1062 EVALUATED FOR $P=G(1,1)$, $N=1$ TO 4. $XG(5)$ IS THE INTEGRAL OF $(F(2,1)*G(1,1)*DETA)$ GIVEN BY EQU (45).	C COECON
XT(L)	TRANSFORMED STREAMWISE COORDINATE DEFINED BY EQS(31) AND (33) OF NASA CR-1052	C HISCOM
ATCON(I)	INTEGRAND IN CALCULATION OF $X1$ IN REFCON. TEMPORARY STORAGE AREA IN OTHER ROUTINES.	C TENCOM
X1	LOCALLY DEFINED VARIABLE	L MATS1
XK	LOCALLY DEFINED VARIABLE	L MATS1
XKP	LOCALLY DEFINED VARIABLE	L MATS1
XW(N)	DEFINED BY EQU(46) OF NASA CR-1062 EVALUATED FOR $P=F(2,1)$, $N=1$ TO 4. $XW(5)$ IS THE INTEGRAL OF $(F(2,1)*F(2,1)*DETA)$ GIVEN BY EQU(45)	C COECON
X0T	LOCALLY DEFINED VARIABLE	L SLOPO

XDTT	LOCALLY DEFINED VARIABLE	L SLOPO
XS	LOCALLY DEFINED VARIABLE	L MATSI
XSPIN,K)	DEFINED BY EQ(86) OF NASA CR-1062 EVALUATED FOR $P=SP(1,I,K)$ C CUECON $N=1$ TO 4. XSP(5,K) IS THE INTEGRAL OF $(F(2,I)*SP(1,I,K)*\Delta T)$ GIVEN BY EQ(85)	
XT	LOCALLY DEFINED VARIABLE	L ABMAX
XTO	LOCALLY DEFINED VARIABLE	L SLOPO
XTY	LOCALLY DEFINED VARIABLE	L SLOPO
Y(I)	ACTUAL DISTANCE FROM BODY MEASURED NORMAL TO SURFACE.	C OUTCOM
Y(I)	NATURAL LOG OF PARTIAL PRESSURE (=0 FOR PRESENT CONDENSED SPECIES). IDENTICAL TO YYY(J).	C EOPCOM
YAP	CONSTANT IN MIXING LENGTH EQUATION.	C EPSCOM
YC	INITIAL VALUE OF Y(J)	L INPUT
YDI	LOCALLY DEFINED VARIABLE	L TRMBL
YDIQ	LOCALLY DEFINED VARIABLE	L TRMBL
YDQD	LOCALLY DEFINED VARIABLE	L TRMBL
YDS	LOCALLY DEFINED VARIABLE	L TRMBL
YINT	ALOG(VINT)	L INPUT
YS	LOCALLY DEFINED VARIABLE	L SLOPO
YWK)	VALUE OF YYY(J) AT WALL (SAVED)	C EOPCOM
Z	STATIC TEMPERATURE IN DEG K. IDENTICAL TO T*.	C EOPCOM
ZG(N,I)	DEFINED BY EQ(94) OF NASA CR-1062 EVALUATED FOR $P=G(1,I)$, $N = 1$ TO 4	C HISCOM
ZK(K)	QUANTITY FOR ELEMENT K WHICH IS INTRODUCED AS A RESULT OF THE APPROXIMATION FOR BINARY DIFFUSION COEFFICIENTS AND REDUCES TO $SP(1,I,K)$ FOR EQUAL DIFFUSION COEFFICIENTS (SEE EQ(95) OF NASA CR-1062)	C PRPCOM
ZKPIK)	DERIVATIVE OF ZK WITH RESPECT TO ETA.	C PRPCOM
ZM(N,I)	DEFINED BY EQ(94) OF NASA CR-1062 EVALUATED FOR $P=F(2,I)$, $N = 1$ TO 4.	C HISCOM

ZSP(N,I,K) DEFINED BY EQ(94) OF NASA CR-1062 EVALUATED FOR P=SP(1,I,K) C HISCOM
N = 1 TO 4

SECTION III

LISTING OF FORTRAN V SOURCE DECKS

Listings of Fortran V source code decks for BLIMP are presented in this section. The various subroutines are listed numerically in terms of their file code names.

<u>File Code Name</u>	<u>Routine</u>	<u>Page</u>
B01A	DUMCOM	73
B02A	BLIMP	74
B03A	SETUP	75
B04A	ITERAT	77
B05B	NONCER	79
B05C	RNLCER	87
B06A	LINCER	91
B07A	REFCON	93
B08B	ICOEFF	99
B09A	RECASE	101
B10A	HISTXI	104
B11A	OUTPUT	106
B11B	FELTRU	111
B12B	IMONE	117
B13B	IONLY	121
B14A	STATE	123
B14B	STATEN	126
B15B	RERAY	127
B16A	SLOPQ	130
B17A	ABMAX	131
B18A	MATS1	131
B18B	MATS2	133
B19A	TRMBL	133
B19T	TRANCR	138
B20A	EQUIL	141
B21A	THERM	151
B22A	MATER	153
B23A	CRECT	162
B24A	INPUT	165
B25A	PROPS	172
B26A	TAYLOR	177
B27A	LINMAT	178
B28A	KINET	179
B29A	FIRSTG	183
B30A	ERP	185
B30B	ETIMEF	185
B30C	LIAD	186
B30D	TLEFT	186
B30E	DATE	186
B30F	TOD	186
B36A	OGLE	186

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1  C801A
2  SUBROUTINE DUMCOM(ICK)
3  COMMON/BLQCOM/ MOA( 71), MOB( 71),N2PEC,FR( 71,15),W(3),LEF(10)
4  1 ,LEFS(10),PIEASE,LEFW(10),L2,L3
5  COMMON/BUHCOM/ BUMP,CORMA,EASE,ICORN,WDOT,TFZ,I777,DTEMP,KIP,IX
6  COMMON/COECON/ C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15
7  1,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C31
8  232,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C48
9  3,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,C65
10 465,C66,C67,C68,C69,C70,C71,C72,C73,C74,C75,C76,C77,C78,C79,C80,C81
11 5,C82,C83,C84,C85,C86,C87,C88
12 COMMON/COECON/ CK1( 8),CK2( 8),CK3( 8),CK4( 8),CK5( 8),CK6( 8)
13 1,CK7( 8),CK8( 8),CK9( 8),CK10( 8),CK11( 8),CK12( 8),CK13( 8)
14 2,CK14( 8),CK15( 8),CK16( 8),CK17( 8),CK18( 8),CK19( 8),CK20( 8)
15 3,CK21( 8),CK22( 8),CKK1( 8, 8),CKK2( 8, 8),XM(5),XG(5),XSP(5, 9)
16 4,CKK3( 8, 8)
17 COMMON/CRBCOM/HCARB,EMIS,STEF,ADUM,BDUM,CDUM,HTEF,HMAT,EMISC,EMIST
18 1,HPG,ASU(3),BSU(3),HPYG(3),HCHAR(3),EMIV(3),KS(40),ISU
19 COMMON/EDCCOM/ PE(-0, 1),PTE(40, 1),SPE( 8,40, 1),DUES,
20 1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDE,D2UEDG,VMWE,CGE,C90
21 2,DSIP(40),IDSIP,TTVC,TVCC(40),HEA(40),SF(20),CS(20),CSPR(20),
22 3CG(20),CGP(20),SREF,GEP,NEN,UINF,RHCINF,HINF,PINF
23 COMMON/EPSCOM/ELCON,YAP,CLNUM,SCT,PRT,RED,DVS,RHOVS,PI,PIM,CL,
24 1 EPSA(15),EPS1,EL(15),DPI(15,2),DEPC,TREF,RETR,VINTR(15)
25 COMMON/EQPCOM/ RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2),
26 1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),HAT(10),
27 2 KAT(10),IR(10),IZ,KZ(10),LANI( 71),P,Z,TK(10, 71),VN( 71),
28 3 VNU( 71,10),ITFF,KR2,HCH,NGV,NM,WTM( 71),YYY( 71),YH( 71),GG( 71)
29 4 ,TQ(10, 71),EPOVRK,SIGMA,BASMOI
30 COMMON/EQTCOM/SIP,HIP,EEL,EENL,FLIQ,CPF,IRE,IER,AA,IITS,IN,IL,IIT,
31 1 HODE,HMELT,SMELT,THAX,THIN,MELT,SUMN,SUML,WS,WSS,8X,ISP2,ISPO,
32 2 ISP,KKJ,SVA,SVB,SVC,SVD,SUMC,FFF,CMF,EP,RV,IFCJC,WTG,HTL,JC,HMG,
33 3 CPGG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(10),A(16,16),88(16),
34 4 IP( 71),ALP(10),FNU(10),GAMH(10),GAMF(10),SLAM(10),DY( 71),RVS,
35 5 CP( 71),HH( 71),SB( 71),TC( 71),VLNK( 71),E( 71),PNUS(10),
36 6 BC(10),BLNK(10),BY(10),IBC(10),BE(10),JZ( 4)
37 COMMON/ERRCOM/FLE( 43),GLE(30),SPLE(30, 8),ELA(313),FLEM,GLEM
38 1,SPLEM( 8),ELH(14),ELMH,IFLM,IGLM,ISPLM( 8),NELM,ILMM,DFL(43)
39 2,DGL(30),DSPL(30, 8),FNLE(10),GNLE(15),SPNLE(15, 8),ENL(153)
40 3,FNLEM,GNLEM,SPNLEM( 8), ENLMM,IFNLM,IGNLM,ISPNLM( 8)
41 4,NENLM,INLMM,DFNL(10),DGNL(15),DSPNL(15, 8),DRNL(10)
42 COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)
43 1,LAR(153),BA1(43,18),BA2(30,15)
44 COMMON/FLPCOM/TXI(2),TUE(2),TRHOE(2),TTE(2),TMUE(2),TMAT(566,2)
45 2,THF(15,2),LEFT(10,2),TPE(2),TRACS(2),TDSIP(2),KQT(2)
46 COMMON/FLXCOM/DELQW,DELJW( 8),DQNL(153),DJNL(153, 8),WALLQ
47 1,WALLJ( 8),QW,VJKW( 9),TPWALL
48 COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZH(4,14),ZG(4,14),ZSP(4,14),
49 1 ,XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HMUE,HFW,DLX2
50 2,C3M(40),BETAM(40)
51 COMMON/INTCOM/ KR(20),KIN,KCUT,HAT1I,HAT2I,MAT1J,MAT2J,NETA,I,IS,NB
52 1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15)
53 2,B(8), HWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40)
54 3,KAUXO,JTIME,JSPEC,MD(3),IU,ISH
55 COMMON/KINCOM/MT,FKF(10),EAK(10),EXK(10),PMU(10,10),RMU(10,10),
56 1 OKPT(10),PKP(10),PKR(10),RAT(10),RSIG(10),MA(10),LL(10),PMR(10),
57 2 PRMU(10,10),EASE(10)
58 COMMON/NONCOM/AN(153,153),DVNL(153),TCW,

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59 1VLNKH,OLPH( 9),OLPK( 8, 9),DTHW,DTKH( 8),FLUXJB( 9) B01A 58
60 COMMON/OUTCOM/Y(15),RES,DELST,THENG,THMOM,CH,BLOW,SHEAR,CF,SHAPE B01A 59
61 1,CH( 9),THELEM( 9) B01A 60
62 COMMON/PRNCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) B01A 61
63 1,RNOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO, B01A 62
64 2CONE,RADFL( 50),RADR(40),RADS(40),IRAD B01A 63
65 COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15) B01A 64
66 1,CPBAR(15),VMW(15),PHIK(15, 8),ORHOM,DRHOK( 8),ZK( 8),DZKH( 8), DB01A 65
67 2MU3K( 8),DMU4K( 8),DTK( 8),DPHIKH( 8),DPRK( 8),DSCK( 8),DCAPCK( 8) B01A 66
68 3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8) B01A 67
69 4,DPHIKK( 8, 8), DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL B01A 68
70 5,VMU13,DTH,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15), RHOP B01A 69
71 6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15) B01A 70
72 COMMON/STTCOM/GAM1,PRDUM,PRA,PRB,PRC,PRO,VMUA,VMUB,VMUC,VMUD,NC, B01A 71
73 1 FLD(6,3),VMWD B01A 72
74 COMMON/TEMCOM/SPDUM( 8),DER(40),DUMM1(15),SLOPE(15),REDUM(15) B01A 73
75 1,SDUM1(40),SDUM2(40),FWDUM(40),XICON(40),FWCON(40),FWINIT( 1) B01A 74
76 2,XIINIT( 1),NUDS( 40) B01A 75
77 COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH B01A 76
78 COMMON/WALCOM/FW(40, 1),TW(40, 1),HW(40, 1),SPW( 8,40, 1) B01A 77
79 1,RHOVH(40, 1),FLUXJ( 3,40, 1),IHW,ITW,IFW,ISPW,IRHOVH,IFLUXJ B01A 78
80 EQUIVALENCE (FLPEQV,TXI),(BLQEQV,MOA),(BUMEQV,BUMP),(COEQV,C5),
81 1(CONEQV,CK1),(CRBEQV,HCARB),(EDGEQV,PE),(EQPEQV,RB),(EPSEQV,ELCON)
82 2,(KINEQV,MT),(EQTEQV,SIP),(ERREQV,FLE),(ETAQV,ETA),(HISEQV,C1),
83 3 (INTEQV,KIN),(NONEQV,AM),(PRMEQV,TIME),(PRPEQV,PR),(STTEQV,GAM1),
84 4 (TEMEQV,SPDUM),(VAREQV,F),(WALEQV,FW),(FLXEQV,DELOW),(OUTEQV,Y)
85 DIMENSION BLQEQV( 1242),BUMEQV( 10),COEQV( 84),CONEQV( 423)
86 1,CRBEQV( 67),EDGEQV( 649),EPSEQV( 381),EQPEQV( 2352)
87 2, EQTEQV( 1033),ERREQV( 1468),ETAQV( 1463),FLPEQV( 1200)
88 3, FLXEQV( 1406),HISEQV( 1171),INTEQV( 108),KINEQV( 421) ENTR-MOD
89 4, NONEQV(23663),OUTEQV( 42),PRMEQV( 517),PRPEQV( 608)
90 5, STTEQV( 30),TEMEQV( 335),VAREQV( 511),WALEQV( 606)
91 DATA ATA(1),ATB(1),ATC(1)/4H, 4H, 4H /
92 IF (ICK-101) 70,10,40
93 10 READ( 12 ) FLPEQV,BLQEQV,BUMEQV,COEQV,CONEQV,CRBEQV,EPSEQV,
94 1 EDGEQV, EQPEQV, KINEQV, EQTEQV, ERREQV, ETAQV,
95 2 FLXEQV, HISEQV, INTEQV, NONEQV, OUTEQV, PRMEQV,
96 3 PRPEQV, STTEQV, TEMEQV, VAREQV, WALEQV
97 GO TO 70
98 40 WRITE(12 ) FLPEQV,BLQEQV,BUMEQV,COEQV,CONEQV,CRBEQV,EPSEQV,
99 1 EDGEQV, EQPEQV, KINEQV, EQTEQV, ERREQV, ETAQV,
100 2 FLXEQV, HISEQV, INTEQV, NONEQV, OUTEQV, PRMEQV,
101 3 PRPEQV, STTEQV, TEMEQV, VAREQV, WALEQV
102 70 CONTINUE
103 5 RETURN C01A 067
104 END C01A 068
105 CBLIMP BOUNDARY LAYER INTEGRAL MATRIX PROCEDURE BLIM 001
106 DIMENSION FT(21)
107 COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB02A
108 1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRL, ITS,KAPPA,CBAR,CASE(15) B02A 4
109 2,B(8), MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NET2,IDENT,KR9(40) B02A 5
110 3,KAUXO,JTIME,JSPEC,MD(3),IU,ISH ENTR-MOD
111 COMMON/PRNCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) ENTR-MOD
112 1, RNOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO ENTR-MOD
113 2, CONE,RADFL( 50),RADR(40),RADS(40),IRAD ENTR-MOD
114 COMMON/WALCOM/FW(40, 1),TW(40, 1),HW(40, 1),SPW( 8,40, 1) B02A 7
115 1,RHOVH(40, 1),FLUXJ( 3,40, 1),IHW,ITW,IFW,ISPW,IRHOVH,IFLUXJ B02A 8
116 1 FORMAT(A1)

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117 DATA IAST/1H,/
118 DATA LAST/1H./
119 DATA IBLANK/2H /
120 KIN=5
121 KOUT=6
122 JTIME=1
123 B(1)=.5
124 B(2)=.33333333
125 B(3)=.16666666
126 B(4)=.125
127 B(5)=.04166666
128 B(6)=.03333333
129 B(7)=.01388888
130 B(8)=.003968254
131 IT=1
132 46 MWE=-1
133 NBT=13
134 NBT2=14
135 IS=1
136 IU=1
137 41 ITEM=1
138 42 CALL SETUP
139 43 CALL ITERAT
140 CALL OUTPUT
141 IF (IDENT.EQ.IBLANK) GO TO 55
142 CALL FELTRU
143 55 CONTINUE
144 IF(NON)43,44,40
145 44 ITEM=ITEM+1
146 IF(ITEM-NITEM) 42,42,45
147 45 ISH=IS
148 IU=IU+1
149 49 IS=IS+1
150 IF(KQ(10)+IS.EQ.-10)KQ(10)=1
151 IF(IDISC(IS).EQ.2)GO TO 49
152 IF(IS-NS) 41,41,40
153 40 READ(KIN,1) JAST
154 IF(IAST-JAST) 47,46,47
155 47 IF(LAST-JAST) 40,48,40
156 48 STOP
157 END
158 CB03A
159 SUBROUTINE SETUP
160 DIMENSION HIST1(605),HIST2(607),HIST3(511),VMAT(566),HIST4(600)
161 COMMON/BLQCOM/ MOA( 71), MOB( 71),NSPEC,FR( 71,15),W(3),LEF(10)
162 1,LEFS(10),PIEASE,LEFW(10)
163 COMMON/EDGCOM/ PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,
164 1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEGE,D2UEDG,VMWE,CGE,C90
165 2,DSIP(40),IDSIP,TTVC,TVCC(40),MEA(40),SF(20),CS(20),CSPR(20),
166 3CG(20),CGP(20),SREF,GEP,NEN,UNF,RHOINF,HINF,PINF
167 COMMON/FLPCOM/TXI(2),TUE(2),TRHOE(2),TTE(2),TVMUE(2),THAT(566,2)
168 2,THF(15,2),LEFT(10,2),TPE(2),TRAQS(2),TOSIP(2),KGT(2)
169 COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZH(4,14),ZG(4,14),ZSP(4,14,
170 1),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HMUE,HFW,DLX2
171 2,C3H(40),BETAM(40)
172 COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB03A
173 1S,IT,NTIME,NSP,NSPM1,NAM,NLEG,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15)
174 2,B(8), MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NET2,IDENT,KR9(40)

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ENTR-MOD
ENTR-MOD

BLIM 015
BLIM 016
BLIM 017
BLIM 018
BLIM 019
BLIM 020
BLIM 021
BLIM 022
BLIM 023

ENTR-MOD
ENTR-MOD
BLIM 025
ENTR-MOD
BLIM 026
BLIM 027
BLIM 031
BLIM 032

BLIM 033
BLIM 034
BLIM 035
ENTR-MOD
ENTR-MOD
ENTR-MOD
ENTR-MOD
BLIM 037

BLIM 038
B03A 001
B03A 002
B03A 003
B03A 4
B03A 5
B03A 6
ENTR-MOD
ENTR-MOD
ENTR-MOD
B03A 9
B03A 10
B03A 11
B03A 12
B03A 13
B03A 14
B03A 15
B03A 15

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175      3,KAUXO,JTIME,JSPEC,MD(3),IU,ISH      ENTR-MOD
176      COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) B03A 18
177      1,RNOSE,VKAP,NOISC,IOISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO, B03A 19
178      2CONE,RADFL( 50),RADR(40),RADS(40),IRAD B03A 20
179      COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH B03A 21
180      COMMON/WALCOM/FW(40, 1),TW(40, 1),HW(40, 1),SPW( 8,40, 1) B03A 22
181      1,RHOVW(40, 1),FLUXJ( 3,40, 1),IHW,ITW,IFW,ISPW,IRHOVW,IFLUXJ B03A 23
182      EQUIVALENCE(HIST1,XI),(HIST2,PE),(HIST3,F),(VMAT,C1),(HIST4,FW) C03A 008
183      2 FORMAT(1H18X4HTIMEE12.5,56H SECONDS - - - - - C03A 022
184      1- - - - - ,2X3A6)
185      3 FORMAT(/1H17X4HTIMEE12.5,35H SECONDS - - - STREAMWISE DIMENSICNE12C03A 024
186      1.5,11HFEET ~ - -,2X3A6)
187      4 FORMAT(1H18X4HCASEI3,32(2H -)2X3A6)
188      5 FORMAT(1H17X4HCASEI3,11(2H -)21H STREAMWISE DIMENSIONE12.5,13H FEE
189      1T - - - -3A6)
190      99J1 FORMAT(I3,7E10.3) C03A 026
191      DATA MD(2)/6H /
192      MD(1)=MD(2)
193      MD(3)=MD(2)
194      CALL ETIME
195      CALL DATE(9,MD)
196      CALL TOD(18,MD)
197      KR(2)=2
198      J=MOD(ITEM,2)+1
199      IF(MWE)101,154,154 C03A 028
200      C INPUT CONTROL AND TITLE CARD, NUMBER OF ELEMENTAL SPECIES TO BE C03A 029
201      C CONSIDERED, TIMES AND BODY POSITIONS TO BE CALCULATED, AND C03A 030
202      C REFERENCE CONDITIONS(WHEN GIVEN AT THESE PRECISE TIMES AND BODY C03A 031
203      C POSITIONS C03A 032
204      101 CALL RECASE C03A 033
205      KQ(10)=0 C03A 034
206      IF(KR(7).GT.1) CALL TRMBL(1)
207      IS=1 C03A 037
208      IT=1 C03A 038
209      C INPUT ETA VALUES AND SET UP AND INVERT LINEAR MATRICES.NOTE..KR(1) C03A 039
210      C MUST BE UNITY FOR FIRST CASE, BUT FORMATION OF BA1 AND BA2 CAN BE C03A 040
211      C AVOIDED FOR SUBSEQUENT CASES BY SETTING KR(1) EQUAL TO ZERO. THIS C03A 041
212      C CAN BE DONE IF AND ONLY IF ETA SPACING IS THE SAME C03A 042
213      IF(KR(1)) 104,104,103 C03A 043
214      103 CALL LINMAT C03A 044
215      104 KR17=KR(17) C03A 045
216      154 IF(IS+ITEM-2) 105,105,1572
217      1572 IF(KR(3)) 1570,1577,1570
218      1570 DO 1573 K=1,10
219      IF(LEF(K)-1) 1573,1575,1573
220      1575 LEF(K)=2
221      1573 CONTINUE
222      1577 IF(NITEM-1) 1574,107,1574
223      1574 WRITE(NBT)HIST1,HIST2,HIST3,HIST4,W,LEF,RADS,KQ(10)
224      IF(ITEM-1) 157,156,157
225      156 IDUM=NBT
226      NBT=NET2
227      NBT2=IDUM
228      DO 153 I=1,NITEM
229      153 BACKSPACE NBT2
230      GO TO 155
231      157 IF(IS-1) 105,105,155
232      155 READ(NBT2)HIST1,HIST2,HIST3,HIST4,W,LEF,RADS,KQ(10)

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233      GO TO 187
234      C      INITIAL GUESSES FOR PRINCIPAL DEPENDENT VARIABLES. CALCULATE(KR(2) C03A 063
235      C      =0), INPUT(KR(2)=1), OR USE VALUES FROM FROM PREVIOUS CASE(KR(2) C03A 066
236      C      =2). NOTE..LATTER REQUIRES SAME ETA VALUES AND SAME SPECIES. ITS C03A 067
237      C      UTILITY IS FOR REPEATED SIMILARITY SOLUTIONS. IT OBVIOUSLY CANNOT C03A 068
238      C      BE USED FOR FIRST CASE. C03A 069
239      185 CALL FIRSTG C03A 070
240      IF(TIME(1)) 1851,1852,1852 C03A 071
241      1851 ITAB=ABS(TIME(ITEM))
242      WRITE(KOUT,4) ITAB, MD
243      GO TO 186
244      1852 WRITE(KOUT,2) TIME(ITEM),MD
245      186 IF(KR(7))204,204,203
246      203 IF(KR(12).NE.1) CALL STATEN
247      GO TO 202
248      204 IF(KR(12).NE.1) CALL INPUT(PTET(1))
249      202 CALL REFCOM
250      IF(KQ(9).NE.0) CALL TRANCR(1)
251      KR(12)=1
252      IS=1
253      187 DO 1262 I=1,18 C03A 076
254      IF(IS.EQ.1.AND.LEF(I).EQ.2.AND.KR(2).GE.0)LEF(I)=1 C03A 077
255      1262 LEFT(I,J)=LEF(I) ENTR-NOO
256      C-----COMPUTE HISTORIC INFORMATION ENTR-NOO
257      CALL HISTXI C03A 080
258      IF(TIME(1)) 1853,1854,1854
259      1853 ITAB=ABS(TIME(ITEM))
260      WRITE(KOUT,5) ITAB, S(IS), MD
261      GO TO 126
262      1854 WRITE(KOUT,3)TIME(ITEM),S(IS),MD
263      126 DO 1261 I=1,META
264      1261 THF(I,J)=HF(I,5) C03A 085
265      TXI(J)=XI(15) C03A 086
266      TRADS(J)=RAD3(15)
267      TOSIP(J)=OSIP(15)
268      TUE(J)=UE(15) C03A 087
269      TRHOE(J)=RHDE(15) C03A 088
270      TTE(J)=TE(15) C03A 089
271      KQT(J)=KQ(18)
272      TVMUE(J)=VWUE(15) C03A 090
273      DO 184 I=1,566 C03A 091
274      184 THAT(I,J)=VWAT(I) C03A 092
275      TPE(J)=PE(15,1) C03A 093
276      NME=0 C03A 094
277      C      START OF ITERATION LOOP C03A 095
278      158 ITS=0 C03A 096
279      KR(17)=KR17 C03A 097
280      159 RETURN C03A 098
281      END C03A 099
282      C004A C04A 001
283      SUBROUTINE ITERAT C04A 002
284      COMMON/BLQCOM/ NDA( 71), NDB( 71),NSPEC,FR( 71,15),W(3),LEF(18) C04A 003
285      1,LEF3(18),PIEASE,LEFM(18) C04A 004
286      COMMON/BURCOM/ BUMP,CORRA,EASE,ICORN,NDOY,TFZ,I777,OTEMP,KIP,IX C04A 005
287      COMMON/ERRCOM/PLE( 43),GLE(13),SPLE(13, 8),ELA(131),FLEN,CLEN C04A 006
288      1,SPLEN( 8),ELN(14),ELNW,IFLN,ICLN,ISPLN( 8),NELN,ILNW,DPL(43) C04A 007
289      2,DEL(13),OSPL(13, 8),FMLE(13),CMLE(15),SPMLE(15, 8),DML(15) C04A 008
290      3,FMLN,CMLN,SPMLN( 8), EMLNW,IFMLN,ICMLN,ISPMLE( 8) C04A 009

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291      4,NENLM,INLHM,DFNL(18),DGNL(15),DSPNL(15,8),DRNL(10)      B04A 10
292      COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB04A 11
293      1S,IT,NTIME,NSP,NSPM1,NAH,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B04A 12
294      2,B(8), MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B04A 13
295      3,KAUXO,JTIME,JSPEC,MO(3) B04A 14
296      COMMON/PRMCOM/TIME(50),PRE(40),PTET(50),GE(50),S(40),ROKAP(40) B04A 15
297      1,RNOSE,VKAP,NOISC,IOISC(40),NSD(10),MSD(10),ITF(50),IPRE,RADFO, B04A 16
298      2CONE,RADFL(50),RADR(40),RAOS(40),IRAD B04A 17
299      COMMON/VARCOM/F(4,15),G(3,15),SP(3,15,9),ALPH B04A 18
300      5 FORMAT(I3,1X,F8.3,F6.3,F7.4,F6.4,1PE7.0,8(I3,E8.1))
301      6 FCRMAT(/1X15HITERATED VALUE 11X47HDAMP MAX.LIN MAX.ERRORS IN CO
302      INSERVATION EQS./1X58HITS TIME ALPH FPPW ERROR MOMEN
303      1TUM ENERGY 6(5XA4,A2))
304      1 FORMAT(22H NON-CONVERGENT OUTPUT) B04A 018
305      101 ITS=ITS+1 B04A 019
306      JTIME=MAX0(JTIME,0)
307      CALL TLEFT(ILEFT) RDG
308      IF(ILEFT-JTIME) 30,30,31
309      30 JTIME=-JTIME
310      KR(4)=1 RDG
311      KR(16)=1 RDG
312      KR(18)=1 ENTR-MOD
313      KR(19)=1 ENTR-MOD
314      31 CONTINUE RDG
315      NON=2
316      323 IF(ITS-5) 328,328,321
317      320 IF(KR(2)) 325,321,321
318      321 IF(KQ(10)+10) 326,322,326
319      326 IF(NON-2) 325,330,325
320      325 RETURN
321      322 KQ(10)=2
322      IOISC(ITS)=1
323      EASE=0.11
324      ITS=2
325      WRITE(KOUT,324)
326      324 FORMAT(96H1 PRIOR LAMINAR SOLUTION AFTER TRANSITION. TURBULENCE
327      1 WILL BE INCLUDED AND SOLUTION CONTINUED //)
328      328 IF(NON) 325,330,330
329      330 NON=0 ENTR-MOD
330      CALL NOMGER B04A 021
331      CALL ETIMEF(TIMO)
332      FPPW=F(3,1)/(ALPH*ALPH) B04A 022
333      IF(KQ(18).EQ.2) GO TO 1900
334      IF(KR(4)+KR(16)+KR(17)+KR(18)/2+KR(19)+KR(20)+NON) 189,189,1901
335      189 IF(ITS-1) 1901,1901,1911 B04A
336      1900 KQ(10)=1
337      1901 IF(NSPM1) 192,192,190 B04A
338      190 WRITE(KOUT,6) (MOA(K),MOB(K),K=1,NSPM1) B04A 025
339      GO TO 191
340      192 WRITE(KOUT,7)
341      GO TO 194
342      1911 IF(NSPM1) 194,194,191
343      191 WRITE(KOUT,5) ITS,TIMO,ALPH,FPPW,EASE,ELNM,IFNLM,FNLEM,IGNLK,CNLEN,
344      1(ISPMLN(K),SPNLEN(K),K=1,NSPM1),NON
345      GO TO 1920
346      194 WRITE(KOUT,5) ITS,TIMO,ALPH,FPPW,EASE,ELNM,IFNLM,FNLEM,IGNLK,CNLEN
347      1920 IF(KR(2)) 162,1921,1921
348      1921 IF(ELNLM+ELNM-C.0002) 162,162,159

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349      7 FORMAT(//7X65HITERATED VALUES      DAMP      MAX.LIN      MAX.ERRORS      IN CONSE
350      1RVATION EQS./1X50HITS      TIME      ALPH      FPPM      ERROR      MOMENTUM
351      2      ENERGY      )
352      162 NON=0
353      GO TO 329
354      159 IF(ITS=50) 161,160,160
355      168 WRITE(KOUT,1)
356      IF (ELMH+ENLMH-.02) 162,162,1601
357      1601 NON=1
358      GO TO 320
359      C      ITERATE OR OUTPUT
360      161 IF(KR(4)) 181,181,193
361      193 NON=-1
362      GO TO 323
363      END
364      C      8850
365      SUBROUTINE NONCR
366      INTEGER ASU,BSU
367      DIMENSION OQJNL( 71,1)
368      DIMENSION DELQJN(1) ,OQJNL(153,1) ,WALLCJ(1)
369      DIMENSION COEEQV(84) ,COEFQV(423)
370      COMMON/BLQCOM/ MOA( 71) , MOB( 71) ,NSPEC,FR( 71,15) ,W(3) ,LEF(10)
371      1 ,LEFS(10) ,PIEASE,LEFW(10) ,L2,L3
372      COMMON/BUMCOM/ BUNP,CORNA,EASE,ICORN,MOOT,TFZ,I777,OTEMP,KIP,IXB050
373      COMMON/COECON/ C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C150050
374      1,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C31,C8050
375      232,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C480050
376      3,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,C8050
377      465,C66,C67,C68,C69,C70,C71,C72,C73,C74,C75,C76,C77,C78,C79,C80,C810050
378      5,C82,C83,C84,C85,C86,C87,C88
379      COMMON/COECON/ CK1( 8) ,CK2( 8) ,CK3( 8) ,CK4( 8) ,CK5( 8) ,CK6( 8)
380      1,CK7( 8) ,CK8( 8) ,CK9( 8) ,CK10( 8) ,CK11( 8) ,CK12( 8) ,CK13( 8)
381      2,CK14( 8) ,CK15( 8) ,CK16( 8) ,CK17( 8) ,CK18( 8) ,CK19( 8) ,CK20( 8)
382      3,CK21( 8) ,CK22( 8) ,CKK( 8, 8) ,CKK2( 8, 8) ,XM(5) ,XG(5) ,XSP(5, 9)
383      4,CKK3( 8, 8)
384      COMMON/CRBCOM/HCARB,ENIS,STEF,ADUM,BDUM,CDUM,MTEF,MWAT,ENISC,ENIST0050
385      1,MPG,ASU(3) ,BSU(3) ,MPV6(3) ,MCHAR(3) ,EMIV(3) ,KS(40) ,ISU
386      COMMON/EDGCOM/ PE(40, 1) ,PTE(40, 1) ,SPE( 8,40, 1) ,DUES,0050
387      1UE(40) ,RMOE(40) ,VMUE(40) ,TE(40) ,UEDGE,DUEGE,D2UEGE,WME,CGE,C90
388      2,DSIP(40) ,IDSIP,TVVC,TVCC(40) ,MEA(40) ,SF(20) ,CS(20) ,CSPR(20) ,
389      3CG(20) ,CSP(20) ,SREF,CEP,MEN,UINF,RMCINF
390      COMMON/EPSCOM/ELCON,YAP,CLNLN,SCT,PRT,RED,DVS,RHOVS,PI,PIM,CL,
391      1 EPSA(15) ,EPS1,EL(15) ,OPI(15,2) ,DEPC,TREF,RETR,VINTR115)
392      COMMON/EOPCOM/ RB( 71,2) ,RC( 71,2) ,RD( 71,2) ,RE( 71,2) ,RF( 71,2) ,0050
393      1 TU( 71,2) ,FF( 71) ,FFA,IFC( 71) ,ATA(10) ,ATR(10) ,ATC(10) ,MAT(10) ,
394      2 KAT(10) ,IR(10) ,IZ,KZ(10) ,LANI( 71) ,P,2,TK(10, 7) ,VM( 71) ,
395      3 VMU( 71,10) ,ITFF,KR2,MCH,NCV,MN,MTM( 71) ,VYY( 71) ,VM( 71) ,GC( 71) 0050
396      4 ,TQ(10, 7) ,EPOVRK,SIGMA,BASHOL
397      COMMON/EOTCOM/SIP,MIP,EEL,EENL,FLIQ,CPF,IRE,IER,AA,IITS,IN,IL,IIT,0050
398      1 NODE,MHMT,SMELT,THAX,THIN,RELT,SUMH,SUML,NS,MPS,BX,ISP2,ISPO,
399      2 ISP,KKJ,SVA,SVB,SVC,SVD,SUNC,FFF,CWF,EP,RV,IFCJC,HTG,NYL,JC,MHG,
400      3 CCGP,TTWIN,TTMAX,L7,10,10(11) ,ED(10) ,EDL(10) ,A(16,16) ,BB(16) ,
401      4 IP( 71) ,ALP(10) ,FNU(10) ,GAMP(10) ,GAMP(10) ,SLAN(10) ,DY( 71) ,RIS,
402      5 CPI( 71) ,MH( 71) ,SO( 71) ,TC( 71) ,VLNK( 71) ,EI( 71) ,PMUS(10) ,
403      6 UC(10) ,BLNK(10) ,BY(10) ,IBC(10) ,DE(10) ,JZ( 4)
404      COMMON/ERRCOM/FLEI( 43) ,GLE(30) ,SPL(30, 8) ,ELA(313) ,FLEN,GLEP
405      1,SPLN( 8) ,ELN(14) ,ELMH,IFLR,IGLN,ISPLN( 8) ,NELM,ILMH,OFL(43)
406      2,DGL(30) ,DSPL(30, 8) ,FMLE(12) ,GMLE(15) ,SPMLE(15, 8) ,ENL(153)

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407 3,FNLEN,GNLEN,SPNLEN( 8), ENLHM,IFNLM,IGNLM,ISPLM( 8) 8058 43
408 4,NEPLM,INLHM,DFNL(18),DGNL(15),DSPNL(15, 8),DRNL(10) 8058 44
409 COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14) 8058 45
410 1,LAR(153),BA1(43,18),BA2(30,15) 8058 46
411 COMMON/FLXCOM/DELQW,DELQW( 8),DQML(153),DJNL(153, 8),WALLQ 8058 47
412 1,WALLJ( 8),QW,VJKW( 9),TPWALL 8058 48
413 COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZH(4,14),ZG(4,14),ZSP(4,14, 8058 49
414 1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HMUE,HFW,DLX2 8058 50
415 2,C3H(40),BETAM(40) 8058 51
416 COMMON/INTCOM/ KR(20),XIN,KCUT,MAT1I,MAT2I,PAT1J,MAT2J,META,I,IS,M 8058 52
417 15,IT,NTIME,NSP,NSPH1,NAH,NLEQ,MNLEQ,MNRL, ITS,KAPPA,CBAR,CASE(15) 8058 53
418 2,B(8), MWE,NON,KO(10),ITEN,NITEM,KR17,ADT,MOT2,IDENT,KR9(40) 8058 54
419 3,KAUXO,JTIME,JSPEC,MO(3),IU,ISH 8058 55
420 COMMON/NONCOM/AN(153,53),DVNL(153),TCW, 8058 56
421 1VLNKN,OLPH( 9),OLPK( 8, 9),DTHW,DTKN( 8),FLUXJB( 9) 8058 57
422 COMMON/PRMCOM/TIME(50),PRE(40),PTET(50),GE(50),S(40),ROKAP(40) 8058 58
423 COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15) 8058 59
424 1,CBAR(15),VMW(15),PHIK(15, 8),ORNOH,ORNOK( 8),ZK( 8),DZKN( 8), 8058 59
425 2HUK( 8),DMU4K( 8),DYK( 8),OPHIKH( 8),DPRK( 8),DSCK( 8),DCAPCK( 8) 8058 60
426 3,DHTILK( 8),DQRK( 8),DCPK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8) 8058 61
427 4,OPHIKK( 8, 8), DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL 8058 62
428 5,VMU3,DTH,DCAPCH,DPRH,DSCH,DQRH,DCPH,DCPTH,DMU12H,VMU(15), RHO 8058 63
429 6(15),PHIKP(15),MP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),CMR(15) 8058 64
430 COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH 8058 65
431 COMMON/WALCOM/FW(40, 1),TN(40, 1),HW(40, 1),SPH( 8,40, 1) 8058 66
432 1,RHOVN(40, 1),FLUXJ( 3,40, 1),IHW,ITW,IFW,ISPH,IARHOVN,IFLUXJ 8058 67
433 DIMENSION ENLM(1),IENLM(1)
434 EQUIVALENCE (ENLM(1),FNLEM), (IENLM(1),IFNLM)
435 EQUIVALENCE (DELQW,DELQW), (DQML,DQJNL), (WALLQ,WALLQJ) 805A0380
436 DIMENSION CORAR(1) 805A0470
437 EQUIVALENCE (CORAR(1),AN(1)) 805A0480
438 EQUIVALENCE (AM,DQJNL) 805A0490
439 DIMENSION PREQ(1)
440 DIMENSION ZEIT(9)
441 EQUIVALENCE (PREQ(1),ORNOH) 8058
442 EQUIVALENCE (C5,COEEQV), (CK1(1),COZFOV) 805A0680
443 C**NB**NOTE 240+1,549+1,725,730+1 WHEN REDIMENSICING 805A0690
444 EASE=AMIN1(EASE*2.,1.0)
445 IF (ITS-1) 11,5,11
446 5 EASE=0.05
447 BUMP = 1.0 805A0740
448 IF (ITEM+IL-2) 3,3,2 805A0750
449 2 IF (MOT) 4,3,3
450 3 MOOT=-.12/C1
451 4 PIEASE=1.
452 ICORW = 1 805A0760
453 CORMA = 1.E + 10 805A0770
454 TFZ = 0. 805A0780
455 IF (KR9(15)) 0,0,7
456 7 KR(9)=KR9(15)
457 8 DO 17 I=1,META
458 17 EPSA(I)=0.
459 IF (KR(9)-2) 11,10,9
460 9 FLUXJ(3,IS,IT)=-1. 805A0785
461 10 ISP=IZ+1
462 KR=MAX0(1,K5(15))
463 M(1) = FLUXJ(1,IS, IT)
464 M(2)=FLUXJ(2,IS,IT)

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465      M(3)=FLUXJ(3,IS,IT)
466      L2=2*KK
467      L3=L2+1
468      IF(KR(9)-2) 11,11,16
469      16 HPG=HPYG(KK)
470      EMISC=EMIV(KK)
471      HCARB=HCHAR(KK)
472      DO 12 J=ISP,NSPEC
473      IF(MO4(J)-ASU(KK)) 12,13,12
474      13 IF(MOB(J)-BSU(KK)) 12,14,12
475      14 ISU=J
476      GO TO 11
477      12 CONTINUE
478      ISU=ISP
479      11 KIP=0
480      IX = 0
481      C---- EVALUATE COEFFICIENTS AND ERRORS FOR NONLINEAR EQUATIONS      805A0810
482      C      INITIALIZE AN MATRIX      805A0830
483      DO 19 I=1,MNLEQ      805A0840
484      ENL(I)=0.      805A0850
485      DO 15 J=1,MNLEQ
486      15 AN(I,J) = 0.      805A0860
487      C      EVAL. GROUPINGS WHICH CHANGE DURING ITERATION BUT ARE NOT F(ETA)      805A0870
488      40 C5 = 1. / ALPH      805A0880
489      DUM1 = ALPH * ALPH      805A0890
490      C6 = BETA * DUM1      805A0900
491      C7 = - UE(IS) / DUM1 * UE(IS) / 25036.5      805A0960
492      C8 = ALPH0 * C5      805A0970
493      C9 = C6 - C8      805A0980
494      C      FINALLY, EVAL CONTRIBUTIONS TO AN AND ERRORS FROM OTHER COEFFS      805A0990
495      C---- START OF MAJOR DO LOOP FOR EVAL OF COEFFS AND ERRORS AT EACH ETA      805A1140
496      KQ(1)=2      805A1290
497      KQ(5)=0
498      CALL ETIMEF(ZEIT(1))
499      DO 49 I=1,META
500      H(I)=G(1,I)+0.5*F(2,I)*C7*F(2,I)
501      HP=G(2,I)+F(2,I)*C7*F(3,I)
502      IF(KR(7)) 47,47,46
503      46 CALL STATE
504      GO TO 48
505      47 CALL EQUIL(KQ,H(I),PR(IS,IT))
506      48 IF(I-1) 50,50,54
507      50 IF(NSPW1) 53,53,51
508      51 DO 52 K=1,NSPW1
509      DO 31 KK=1,12
510      31 DLPK(K,KK) = A(KK+2, K+2)      ENTR-MOD
511      52 DTKW(K)= DTK(K)
512      DO 32 KK=1,12
513      32 DLPK(KK)= A(KK+2,1)      ENTR-MOD
514      VLKRW=VLWK(ISU)
515      TCM=TC(ISU)
516      MCVAL = NN(ISU)/MTN(ISU)*1.0
517      53 DTHW=DTW
518      54 RHOP(I)=ORNON*HP
519      IF(NSPW1) 58,58,56
520      56 DO 57 K=1,NSPW1
521      57 RHOP(I)=RHOP(I)+ORNOK(K)*SP(2,I,K)
522      58 L=0

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523 M=NAT1J+I-MAT2J
524 C-----UPPER LIMIT IS MAX NUMBER OF SPECIES (MXNSP) =LAST DIM ON SP
525 DO 49 MM=1, 9
526 M=M+MAT2J
527 C-----UPPER LIMIT CORRESPONDS TO DIMENSIONS ON AN ARRAY
528 DO 49 N=124,153
529 L=L+1
530 49 AN(N,N)=PREQ(L)
531 CONJ=25836.5
532 UEDGE=1.
533 DUEGE=0.
534 GEP=0.
535 CGE=0.
536 CGEP=0.
537 DUM=-RHOE(IS)*ROKAP(IS)*C3*VMUE(IS)
538 SFE=DUM*F(1,META)*UE(IS)
539 IF (KR(5)-2) 486,487,488
540 487 IF (XI(15)) 488,489,488
541 489 FEDGE=-RHOINF/2.*UINF/(RHOE(IS)*C3*VMUE(IS)*DUES)
542 GO TO 497
543 488 FEDGE=RHOINF/DUM*UINF/UE(IS)*(ROKAP(IS))*2/2.
544 497 SFE=FEDGE*DUM*UE(IS)
545 486 IF (KR(5)-4) 498,496,499
546 498 IF (KR(5)-2) 499,491,491
547 496 CALL OGLE (1,SFE,CGE,CGEP,MEN,SF,CG,CGP)
548 491 CALL OGLE (1,SFE,CSE,CSEP,MEN,SF,CS,CSPR)
549 DUB=CSE+SREF-SIP
550 CHE=1.8*HIP+T(META)*DUB*(1.+0.5*DTM*DUB)-NEA(IS)
551 CTE=T(META)*(1.+DTM*DUB)
552 CHEP=CTE*CSEP
553 IF (XI(15)) 492,492,495
554 492 IF (KR(6)-1) 493,496,496
555 493 DUEGE=-RHOE(IS)/DUES*(CGEP-CHEP)*C3*VMUE(IS)*CONJ
556 UEDGE=SORT(1.+2.*DUEGE*F(1,META))
557 GEP=0.
558 GO TO 499
559 494 GPP=(CGP(2)-CGP(1)+CTE*(CSPR(2)-CSPR(1)))/(SF(2)-SF(1))
560 DUEGE=GPP*DUM*DUM*F(1,META)*CONJ
561 UEDGE=SORT(1.+DUEGE*F(1,META))
562 GEP=0.
563 GO TO 499
564 495 UEDGE=SORT(1.+2.*CONJ/UE(IS)*(CGE-CHE)/UE(IS))
565 GEP=DUM*UE(IS)*CGEP*UEGE
566 DUEGE=DUM/UE(IS)*(CGEP-CHEP)*CONJ
567 499 DUF=DUEGE/UEGE
568 CGE=CGE+GE(ITEM)
569 CALL LINGER
570 CALL ETIMEF(ZEIT(2))
571 IF (NO(10).GT.0) CALL TRMDL(2)
572 CALL ETIMEF(ZEIT(3))
573 TVC=1.0
574 DO 120 I=1,META
575 L=3
576 M=NAT1J+I-MAT2J
577 C-----UPPER LIMIT IS MAX NUMBER OF SPECIES (MXNSP) LAST DIM ON SP
578 DO 59 MM=1, 9
579 M=M+MAT2J
580 C-----UPPER LIMIT CORRESPONDS TO DIMENSIONS ON AN ARRAY

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581	DO 59 N=124,153	8058
582	L=L+1	
583	PREQ(L)=AN(M,N)	
584	59 AN(M,N)=0.	
585	C TEST TO BYPASS COMMANDS THAT CANNOT BE PERFORMED AT ETA(1)	805A1310
586	IF (I - 1) 60,68,55	805A1320
587	55 CALL IHOME	805A1330
588	IF(KQ(9).NE.0) CALL TRANCR(3)	
589	IF(KQ(10).GT.0) CALL TRMBL(4)	
590	C COMPUTE STATIC ENTHALPY AND DETERMINE STATE OF GAS	805A1340
591	60 C10 = C7 * F(2,I)	805A1350
592	C13 = C7 * F(3,I)	805A1370
593	HP = G(2,I) + F(2,I) * C13	805A1380
594	C---- EVAL GROUPINGS WHICH ARE USED AT I-1 AS WELL AS AT I	805A1460
595	75 CALL ICOEFF	805A1470
596	IF(KQ(9).NE.0) CALL TRANCR(2)	
597	IF(KQ(10).GT.0) CALL TRMBL(3)	
598	IF (I - 1) 100,88,100	805A1480
599	C DLPK,TCM,VLMW,DLPK, AND Y1 NEEDED ONLY FOR CARBON PROBLEM	805A1490
600	88 IF (NSPW1) 95,95,85	805A1500
601	85 DO 90 K=1,NSPW1	805A1510
602	MALL(K) = CK6(K)	805A1520
603	VJKN(K) = CK6(K) / C3	805A1530
604	90 CONTINUE	
605	95 MALLQ = C32	805A1620
606	QW = C32 / C3	805A1630
607	TPMALL = TP	
608	GOTO 105	805A1640
609	C---- BACK TO CONSERVATION EQUATIONS	805A1650
610	100 CALL IONLY	805A1660
611	IF(KQ(10).GT.0) CALL TRMBL(5)	
612	IF(KQ(9).NE.0) CALL TRANCR(4)	
613	105 IF (KQ(17)) 120,120-115	805A1670
614	110 FORMAT(21H ALL THE COEFFICIENTS/(1X1P1ZE10.3))	805A1680
615	115 WRITE(KOUT,118)C1,C2,C3,C4,COEEGV,COEEGV	805A1690
616	IX = - 2	805A1700
617	120 CONTINUE	805A1710
618	DO 121 I=2,4	ENTR-MOD
619	DO 121 J=1,NMLEQ	ENTR-MOD
620	122 AN(I,J)=0.	ENTR-MOD
621	ENL(4)=-(ALPH*UEGE-F(2,META))	ENTR-MOD
622	AN(4,1)=UEGE	ENTR-MOD
623	AN(4,MAT1J)=-1.	ENTR-MOD
624	CALL LIAD(-1,4,META-1,ALPH*QUP)	ENTR-MOD
625	ENL(3)=-F(2,1)	ENTR-MOD
626	AN(3,4)=1.	ENTR-MOD
627	IF(KR(9)-2) 123,121,123	ENTR-MOD
628	121 ENL(2)=F(1,META)-FEDGE*TYVC	ENTR-MOD
629	CALL LIAD(-1,2,META-1,-1.)	ENTR-MOD
630	GO TO 124	ENTR-MOD
631	123 ENL(2)=CBAR*F(2,META)-F(2,KAPPA)	ENTR-MOD
632	IF(KR(9).GT.1.AND.KR(9).NE.5)ENL(2)=ENL(2)-CBAR*F(3,META)*(ETA(META)-ETA(KAPPA))	ENTR-MOD
633	AN(2,KAPPA+3)=1.	ENTR-MOD
634	AN(2,MAT1J)=-CBAR	ENTR-MOD
635	IF(KR(9).GT.1.AND.KR(9).NE.5)CALL LIAD(-1,2,META+META-2,CBAR*(ETA(META)-ETA(KAPPA)))	ENTR-MOD
636	124 CALL ETIMEF(ZEIT(6))	ENTR-MOD

639	IF (ITS - 1) 125,125,145	B05A1720
640	125 DO 140 K=1,NSP	B05A1730
641	IF (LEFS(K)) 130,130,140	B05A1740
642	130 IF (LEF(K)) 140,140,135	
643	135 EASE = .05	B05A1760
644	140 CONTINUE	B05A1770
645	145 IF (KR(19)) 170,190,170	B05A1850
646	170 CONTINUE	B05A1860
647	WRITE(KOUT,175)	B05A1870
648	175 FORMAT(2X21HDEBUG FNLE,GNLE,SPNLE)	B05A1880
649	180 FORMAT(/2X1P11E10.3/(12X1P10E10.3))	B05A1890
650	WRITE (KOUT,180) (ENL(I),I=1,NNLEQ)	
651	C SEEK MAXIMUM ERROR FOR EACH CONSERVED QUANTITY	
652	190 M=2	
653	MM=MAT1J	
654	DO 200 I=1,NRNL	
655	CALL ABMAX(MM-1,ENL(M),ENLM(I),IENLM(I))	
656	IENLM(I) = IENLM(I)+1	
657	M=M+MM	
658	200 MM=MAT2J	
659	C SOLVE REDUCED SET OF EQUATIONS	B05A2070
660	IF (KR(2).LT.0) RETURN	
661	C SCRUNCH DEFINED ROWS OF AM MATRIX TO THE TOP	B05A2090
662	LSKIP=MAT1J+1	B05A2100
663	L=1	B05A2110
664	LL=0	
665	DO 240 M=1,NAM	B05A2130
666	L=L+1	B05A2140
667	IF (L-LSKIP) 235,230,235	
668	230 LSKIP=LSKIP+MAT2J	
669	LL=LL+1	
670	DO 231 J=1,NNLEQ	
671	231 DQJNL(J,LL)=AM(L,J)	
672	DELQJW(LL)=-ENL(L)	
673	L=L+1	
674	235 ENL(M)=ENL(L)	
675	DO 240 J=1,NNLEQ	
676	240 AM(M,J)=AM(L,J)	B05A2180
677	C THE FOLLOWING ROUTINE REARRANGES COLUMNS OF THE NOW RECTANGULAR	B05A2250
678	C AM MATRIX, ACCORDING TO LAR, INVERTS ((AM(I,J),J=2,NAM),I=1,NAM) AND	B05A2260
679	C MULTIPLIES THE INVERSE TIMES THE REMAINING COLUMNS OF AM MATRIX	B05A2270
680	C AND TIMES THE ENL.	B05A2280
681	CALL ETIMEF(ZEIT(5))	
682	CALL RERAY(NAM,AM,NSP < 1,ENL,1,LAR,IX,153)	B05A2290
683	CALL ETIMEF(ZEIT(6))	
684	DO 243 I=1,NAM	
685	243 AM(I,NAM)=AM(I,1)	
686	244 IF (KR(17)) 245,265,245	
687	245 CONTINUE	B05A2310
688	250 FORMAT(2X1P11E10.3)	B05A2320
689	WRITE(KOUT,255)	B05A2330
690	255 FORMAT(2X18HDEBUG FLE,GLE,SPLE)	B05A2340
691	WRITE(KOUT,250)FLE,GLE	B05A2350
692	IF (NSPM1) 265,265,260	B05A2360
693	260 WRITE(KOUT,250) ((SPLE(I,K),K=1,NSPM1),I=1,MAT2I)	B05A2370
694	C****SURFACE OPTIONS TREATED IN RNLCE WITH REDUCED NONLINEAR SET	
695	265 CALL ETIMEF(ZEIT(7))	
696	CALL RNLCE	

697	CALL ETIMEF(ZEIT(8))	
698	C DETERMINE MAXIMUM NONLINEAR ERRORS	B05A4010
699	C EQUIVALENCE ENLM TO FNLEM, GNLEM, AND SPNLEM	B05A4020
700	595 DO 605 I=1,NRNL	
701	IF (ABS(ENLM(I))-ABS(DRNL(I))) 600,605,605	
702	600 ENLM(I) = DRNL(I)	
703	IENLM(I) = 1	
704	605 CONTINUE	
705	ENLM(1)=ENLM(1)*10.	
706	ENLM(2)=ENLM(2)/1000.	
707	CALL ABMAX(NRNL,ENLM,ENLMM,INLMM)	
708	ENLMM=ENLMM/10.	
709	ENLM(1)=ENLM(1)/10.	
710	ENLM(2)=ENLM(2)*1000.	
711	ELMM = ABS(ENLMM)	B05A4160
712	BIP = KIP	
713	ENLMM = ABS(ENLMM) + 3. * BIP	
714	C EVALUATE NONLINEAR CORRECTIONS FROM THE REDUCED SET	B05A4180
715	DO 615 I=1,NAM	B05A4190
716	L = LAR(I)	B05A4200
717	DVNL(L) = ENL(I)	B05A4210
718	DO 615 K=1,NRNL	B05A4220
719	J = K + NAM	B05A4230
720	615 DVNL(L) = DVNL(L) - DRNL(K) * AM(I,J)	B05A4240
721	DO 620 K=1,NRNL	B05A4250
722	I = NAM + K	B05A4260
723	J = LAR(I)	B05A4270
724	620 DVNL(J) = DRNL(K)	B05A4280
725	C-----RECYCLE IF ALPH WANTS TO GO NEGATIVE	
726	IF (DVNL(1)+0.9*ALPH) 626,626,629	
727	626 NUL=0	ENTR-MOD
728	DO 627 K=NUL,NSPM1	ENTR-MOD
729	WALLJ(K)=VJKW(K)*C3	
730	627 DELQJW(K+1)=0.	
731	LIM=NAM+1	
732	DO 628 I=2,NNLEQ	
733	DUM=AM(I,NAM)/AM(1,NAM)	
734	ENL(I)=ENL(I)-ENL(1)*DUM	
735	DO 628 J=LIM,NNLEQ	
736	628 AM(I,J)=AM(I,J)-DUM*AM(1,J)	
737	ENL(1)=0.	
738	DO 631 J=LIM,NNLEQ	
739	631 AM(1,J)=0.	
740	ITS=ITS+1	
741	EASE=AMIN1(EASE,0.2)	ENTR-MOD
742	IF (ITS-51) 244,244,850	
743	629 CONTINUE	
744	C-----EVALUATE LINEAR CORRECTIONS	B05A4300
745	DO 630 I=1,MAT1I	B05A4310
746	DO 630 J=1,MAT1J	B05A4320
747	630 FLE(I) = FLE(I) - DVNL(J) * BA1(I,J)	B05A4330
748	JJ = MAT1J	B05A4340
749	DO 635 J=1,MAT2J	B05A4350
750	JJ = JJ + 1	B05A4360
751	DO 635 I=1,MAT2I	B05A4370
752	635 GLE(I) = GLE(I) - DVNL(JJ) * BA2(I,J)	B05A4380
753	CORAR(1)=DVNL(1)/ALPH*0.5	
754	L=NETA	

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755      J=MAT1J+2
756      DO 640 I=2,NETA
757      CORAR(I)=DVNL(J)/10000.
758      640 J=J+1
759      IF (NSPM1) 665,665,645
760      645 DO 660 K=1,NSPM1
761      DO 650 J=1,MAT2J
762      JJ = JJ + 1
763      DO 650 I=1,MAT2I
764      650 SPLE(I,K) = SPLE(I,K) - DVNL(JJ) * BA2(I,J)
765      J=MAT1J+K*MAT2J+2
766      DO 655 I=2,NETA
767      L = L + 1
768      CORAR(L)=DVNL(J)
769      655 J=J+1
770      660 CONTINUE
771      665 CONTINUE
772      IF (EASE-0.2) 673,670,670
773      670 IF (0.33+CORAR(ICORM)/CORMA) 671,675,675
774      671 BUMP=BUMP*2.0
775      GO TO 675
776      673 IF (ABS(1.0-CORAR(ICORM)/CORMA)-0.25) 674,674,675
777      674 BUMP=BUMP/2.
778      675 CALL ABMAX(L,CORAR,CORMA,ICORM)
779      IF (KR(17)) 680,680,685
780      680 IF (KR(19)) 690,705,690
781      685 CONTINUE
782      KR(17) = KR(17) - 1
783      690 CONTINUE
784      695 FORMAT(2X38HDEBUG CORRECTIONS RNL,NL,FL AND GL,SPL)
785      CALL ETIMEF(ZEIT(9))
786      WRITE(KOUT,696) ZEIT
787      696 FORMAT(5X33HTIMES BEFOR AND AFTER . . . . /6X 9HCHEMISTRY9X
788      1 13HERRORS+MATRIX9X9HINVERSION12X6HNRNLCER11X3HNOW/10F10.4)
789      WRITE(KOUT,695)
790      WRITE(KOUT,250) DRNL
791      WRITE(KOUT,250) DVNL
792      WRITE(KOUT,250) FLE,GLE
793      IF (NSPM1) 705,705,700
794      700 WRITE(KOUT,250) ((SPLE(I,K),K=1,NSPM1),I=1,MAT2I)
795      705 CONTINUE
796      C CORRECT PRIMARY VARIABLES
797      DUM = .05 / BUMP
798      EASE=AMIN1(1.5*EASE,1.0,DUM/ABS(CORMA))
799      IF (ITS.EQ.2) BUMP=AMAX1(BUMP,.02/ABS(CORMA))
800      IF (KQ(10).GT.0) EASE=AMIN1(EASE,ABS(F(3,1))/ABS(DVNL(3)+1.E-30)*.5)
801      710 IF (KR(13)) 720,720,715
802      715 DUM = KR(13)
803      EASE = AMIN1(DUM / 10.,EASE)
804      720 IF (EASE - 1.0) 725,740,740
805      725 DO 730 I=1,313
806      730 FLE(I) = FLE(I) * EASE
807      DO 735 I=1,153
808      735 DVNL(I) = DVNL(I) * EASE
809      740 CONTINUE
810      PIEASE = PIEASE * (1. - EASE)
811      IF (TFZ) 745,750,750
812      745 TFZ = EASE * DTEMP - TFZ

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B05A4430
B05A4440
B05A4450
B05A4460
B05A4470
B05A4480
B05A4510
B05A4520
B05A4540
B05A4550
B05A4580
B05A4590
B05A4600
B05A4610
B05A4620
B05A4630
B05A4640
B05A4650
B05A4660
B05A4670
B05A4680
B05A4690
B05A4700
B05A4710
B05A4720
B05A4730
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B05A4760
B05A4770
B05A4780
B05A4790
B05A4800
B05A4810
B05A4820
B05A4830
B05A4840
B05A4850
B05A4860

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813      750 NUL=0
814      DFWE=F(1,NETA)-F(1,1)-XM(5)/ALPH
815      DO 790 I=1,NETA
816      NI=NETA+I
817      N2I=NETA+NI-2
818      F(2,I)=F(2,I)+DVNL(I+3)
819      F(4,I)=F(4,I)+FLE(N2I)
820      IF(I-1) 760,760,765
821      760 F(1,1)=F(1,1) + DVNL(2)
822      F(3,1)=F(3,1)+DVNL(3)
823      GO TO 770
824      765 F(1,I)= F(1,I)+FLE(I-1)
825      F(3,I)=F(3,I)+FLE(NI-2)
826      770 LPI=MAT1J+I+1
827      DO 785 K=NUL,NSPM1
828      IF(I-NETA) 772,771,772
829      771 SP(1,I,K)=SP(1,I,K)+SPLE(1,K)
830      GO TO 773
831      772 SP(1,I,K)=SP(1,I,K)+DVNL(LPI)
832      773 SP(3,I,K)=SP(3,I,K)+SPLE(NI,K)
833      IF(I-1) 775,775,780
834      775 SP(2,1,K)= SP(2,1,K) + DVNL(LPI-1)
835      GO TO 785
836      780 SP(2,I,K)=SP(2,I,K)+SPLE(I,K)
837      785 LPI=LPI+MAT2J
838      790 CONTINUE
839      ALPH=ALPH+DVNL(1)
840      IF(KR(19).GT.0)WRITE(KOUT,250) (F(2,J),J=1,NETA), (G(1,J),J=1,NETA), ENTR-MOD
841      1((SP(1,J,K),J=1,NETA),K=1,NSPM1),ALPH ENTR-MOD
842      IF (ITS - 49) 850,840,850 B05A5300
843      840 IF (I777 - 777) 845,850,845 B05A5310
844      845 I777 = 777 B05A5320
845      ITS = 30 B05A5330
846      850 CONTINUE B05A5340
847      IF(KQ(10).GT.-1) RETURN
848      IF(KQ(10).LT.-10) RETURN ENTR-MOD
849      RETHMO=-C3*RHOE(1S)*UE(1S)*DFWE ENTR-MOD
850      IF(RETHMO.GT.RETR) KQ(10)=-10
851      IF(RETHMO.LT.RETR) KQ(10)=-1
852      RETURN B05A5350
853      END B05A5360
854      C
855      SUBROUTINE RNLGER
856      DIMENSIONDQJNL( 71,1) B05C 003
857      DIMENSIONDELQJW(1) ,DQJNL(153,1) ,WALLOJ(1) B05C 004
858      COMMON/BLQCOM/ MOA( 71), MOB( 71),NSPEC,FR( 71,15),W(3),LEF(10) B05C 5
859      1 ,LEFS(10),PIEASE,LEFW(10),L2,L3 ENTR-MOD
860      COMMON/BUMCOM/ BUMP,CORNA,EASE,ICORN,MOOT,TFZ,I777,OTEMP,KIP,IX B05C 7
861      COMMON/GRGCOM/HCARB,EMIS,STEF,AQUM,ODUM,COUM,MTEF,MMAT,EMISC,EMIST B05C 8
862      1,HPG,ASU(3),BSU(3),HPYG(3),HCHAR(3),EMIV(3),KS(40),YSU B05C 9
863      COMMON/EDGCOM/ PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES, B05C A9
864      1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEGE,DZUEGE,VWHE,CGE,C90 ENTR-MOD
865      2,DSIP(40),JDSIP,TTVC,TVCC(40),HEA(40),SF(20),CS(20),CSPR(20), ENTR-MOD
866      JCG(20),CGP(20),SREF,GEP,NEN,UINF,RHOINF,MINF,PINF ENTR-MOD
867      COMMON/EPSCOM/ELCON,YAP,CLNUM,SCT,PRT,RED,DVS,RHOVS,PI,PIM,CL, B05C 10
868      1 EPSA(15),EPS1,EL(15),DPI(15,2),DEPC,TREF,RETR,VINTR(15) ENTR-MOD
869      COMMON/EQPCOM/ RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2), B05C 12
870      1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),WAT(10), B05C 13

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871 2 KAT(10),IR(10),IZ,KZ(10),LAMI( 71),P,Z,TK(10, 7),VN( 71),      805C 14
872 3 VNU( 71,10),ITFF,KR2,HCH,NCV,WM,WTH( 71),YYY( 71),YM( 71),GG( 71) 805C 15
873 4 ,TQ(10, 7),EPOVRK,SIGMA,BASHOL      805C 16
874 COMMON/EQTCON/SIP,HIP,EEL,EENL,FLIQ,CPF,IRE,IER,AA,IITS,IN,IL,IIT, 805C 17
875 1 MODE,HMELT,SMELT,THA,THIN,HELT,SUMN,SUML,MS,MSS,OX,ISP2,ISPO,      805C 18
876 2 ISP,KKJ,SVA,SVB,SVC,SVD,SUNC,FFF,CHF,EP,RV,IFCJC,WTG,MTL,JC,HMG, 805C 19
877 3 CCPG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(10),A(16,16),BB(14),      ENTR-MOD
878 4 IP( 71),ALP(10),FNU(10),GAPH(10),GAMF(10),SLAM(10),DY( 71),RVS, 805C 21
879 5 CP( 71),HH( 71),SB( 71),TC( 71),VLNK( 71),E( 71),PNUS(10),      805C 22
880 6 BC(10),BLNK(10),BY(10),IBC(10),BE(10),JZ( 4)      805C 23
881 COMMON/ERRCON/FLE( 43),GLE(30),SPLE(30, 8),ELA(313),FLEM,GLEM      805C 24
882 1,SPLEM( 8),ELN(14),ELMH,IFLM,IGLM,ISPLN( 8),NELN,ILMH,OFL(43)      805C 25
883 2,DGL(30),DSPL(30, 8),FNLE(10),GNLE(15),SPNLE(15, 8),ENL(153)      805C 26
884 3,FNLEM,GNLEM,SPNLEM( 8),      ENLMH,IFNLH,IGNLM,ISPNLM( 8)      805C 27
885 4,NENLM,INLMH,DFNL(10),OGNL(15),DSPNL(15, 8),ORNL(10)      805C 28
886 COMMON/ETACON/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),D2(14)      805C 29
887 1,LAR(153),BA1(43,10),BA2(30,15)      805C 30
888 COMMON/FLXCON/DELQM,DELJM( 8),DQNL(153),DJNL(153, 8),WALLQ      805C 31
889 1,WALLJ( 8),QW,VJKN( 9),TPWALL      805C 32
890 COMMON/HISCON/C1,C2,C3,C4,ALPHD,BETA,ZH(4,14),ZG(4,14),ZSP(4,14, 805C 33
891 1),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HMJE,MFW,DLX2 805C 34
892 2,C3H(40),BETAM(40)      805C 35
893 COMMON/INTCON/ KR(20),KIN,KCUT,HAT1I,HAT2I,HAT1J,HAT2J,NETA,I,IS,M 805C 36
894 1,S,IT,NTIME,NSP,NSPH1,NAH,HLEQ,MNLEQ,MNRL, ITS,MAPPA,CBAR,CASE(15) 805C 37
895 2,B(8),      MNE,NCN,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) 805C 38
896 3,KAUXO,JTIME,JSPEC,MO(3)      805C 39
897 COMMON/NONCON/AM(153,153),DVNL(153),TCM,      805C 40
898 1VLNKN,DLPH( 9),DLPK( 8, 9),OTMN,DTKM( 8),FLXJ8( 9)      805C 41
899 COMMON/PRMCON/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) 805C 42
900 1,RNOSE,VKAP,NOISC,IDISC(40),MSD(10),MSD(10),ITF( 50),IPRE,RADNO, 805C 43
901 2CONE,RADFL( 50),RADR(40),RADSI(40),IRAD      805C 44
902 COMMON/PRPCON/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),N(15) 805C 45
903 1,CBAR(15),VMW(15),PHIK(15, 8),DRHON,DRHOK( 8),ZK( 8),DZKH( 8), 805C 46
904 2MUJK( 8),DMUJK( 8),DTK( 8),DPHIKH( 8),DPRK( 8),DSCK( 8),DCAPCK( 8) 805C 47
905 3,DHTLK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8) 805C 48
906 4,DPHIKK( 8, 8),      DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL 805C 49
907 5,VMU3,DTM,DCAPCH,DPRH,OSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15),      RHOP 805C 50
908 6(15),PHIKP(15),MP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15) 805C 51
909 COMMON/TEMCON/SPDUM( 8),DER(40),DUMH1(15),SLOPE(15),REDUM(15) 805C 52
910 1,SDUM1(40),SDUM2(40),FMDUM(40),XICON(40),FWCON(40),FWINIT( 1) 805C 53
911 2,XIINIT( 1),DUDS( 40)      805C 54
912 COMMON/VARCON/F(14,15),G(13,15),SP(13,15, 9),ALPH      805C 55
913 COMMON/MALCON/FM(40, 1),TM(40, 1),HM(40, 1),SPM( 8,40, 1)      805C 56
914 1,RHOVM(40, 1),FLUXJ( 3,40, 1),IMH,ITM,IFM,ISPM,IRHOVM,IFLUXJ 805C 57
915 EQUIVALENCE(DELQM,DELQJM),(DQNL,DQJNL),(WALLQ,WALLQJ) 805A0380
916 DIMENSION(CORAR(1) 805A0470
917 EQUIVALENCE(CORAR(1),AM(1)) 805A0480
918 EQUIVALENCE(AM,DQJNL) 805A0490
919 C EVALUATES REDUCED SET OF DQNL AND DJNL. NOTE...DQNL FOLLOWED BY 805A2390
920 C DJNL IS EQUIVALENCED TO DQJNL FOR CONVENIENCE OF FOLLOWING LOOP. 805A2400
921 C ALSO, THE REDUCED SET DQJNL IS EQUIV. TO AP(1) FOR STORAGE ECON. 805A2410
922 DO 275 I=1,NRML 805A2420
923 M = I + NAM 805A2430
924 L = LAR(M) 805A2440
925 DO 275 K=1,NSP 805A2450
926 DQJNL(I,K) = DQJNL(L,K) 805A2460
927 DO 275 J=1,NAM 805A2470
928 JJ = LAR(J) 805A2480

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929      IF (I - 1) 275,278,275
930      270 DELQJW(K) = DELQJW(K) + DQJNL(JJ,K) * ENL(J)
931      275 DQJRN(1,K) = DQJRN(1,K) - DQJNL(JJ,K) * AP(J,M)
932      RHOVS = C1 * F(1,1) + MF(1,9)
933      DO 278 K=1,NSP
934      278 WALLQJ(K)=WALLOJ(K)+DELQJW(K)
935      IF(KR(9)-2) 315,285,315
936      285 DO 290 L=1,3
937      290 W(L) = FLUXJ(L,IS,IT)
938      C PREPARE DQJRN AND WALLQJ FOR SURFACE MASS BALANCE
939      295 WSUM = W(1) + W(2) + W(3)
940      DO 310 K=2,NSP
941      DQJRN(1,K) = DQJRN(1,K) / C1
942      WALLJ(K - 1) = WALLJ(K - 1) - DQJRN(1,K) * RHOVS - DQJRN(2,K) *
943      1G(1,1)
944      DO 310 KK=3,NRNL
945      310 WALLJ(K - 1) = WALLJ(K - 1) - DQJRN(KK,K) * SP(1,1,KK - 2)
946      315 IF (KR(16) - 1) 345,348,320
947      320 IF (KR(17)) 340,340,335
948      325 FORMAT(52H DEBUG DQJRN(NRNL,HSP) BY ROWS, DELQW(5),WALLQJ(5)/
949      1 (8X1P10E10.3))
950      330 FORMAT(35H DEBUG DQJNL(MNLEQ,HSP) ROW BY ROW / (8X1P10E10.3))
951      335 WRITE(KOUT,330) ((DQJNL(I,K),K=1,NSP),I=1,MNLEQ)
952      340 WRITE(KOUT,325) ((DQJRN(I,K),K=1,NSP),I=1,NRNL),DELQW,DELQJW,WALLO,
953      1WALLJ
954      IX = - 2
955      345 CONTINUE
956      IF(KIP) 346,346,375
957      346 IF(KR(9)-2) 347,355,395
958      347 DRNL(1)=FW(IS,IT)-F(1,1)
959      DRNL(2)=0.
960      IF(NSPM1) 350,350,348
961      348 DO 349 K=1,NSPM1
962      DRNL(K+2)=SPW(K,IS,IT)-SP(1,1,K)
963      349 DRNL(2)=DRNL(2)+DRNL(K+2)*DTKW(K)
964      350 IF(KR(11)) 351,351,352
965      351 DRNL(2)=(TW(IS,IT)-T(1)-DRNL(2))/DTW
966      GO TO 595
967      352 DRNL(2)=MW(IS,IT)-G(1,1)
968      GO TO 595
969      355 IF (KR(11) - 1) 375,365,368
970      360 IF (KR(11) - 3) 370,375,370
971      365 KQ(1) = 2
972      DRNL(2)=MW(IS,IT)-G(1,1)
973      MIP=(G(1,1)+EASE*(MW(IS,IT)-G(1,1)))/1.0
974      GO TO 380
975      370 KQ(1)=1
976      IF(T(1)-1000.) 374,374,372
977      372 IF(EASE-.05) 380,374,380
978      374 TW(IS,IT)=AMAX1(T(1),1500.)
979      375 T(1)=T(1)+EASE*(TW(IS,IT)-T(1))
980      KIP=MAX0(KIP-1,0)
981      376 KQ(1)=0
982      380 KQ(6) = 2
983      KQ(4) = 6
984      IF (KR(7)) 385,385,390
985      385 CALL EQUIL(KQ,0.,PE(IS,IT))
986      390 KQ(6) = 0

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B05A2490
 B05A2500
 B05A2510
 B05A2520
 ENTR-MOD
 ENTR-MOD
 B05A2550
 B05A2560
 B05A2570
 B05A2580
 B05A2590
 B05A2610
 B05A2670
 B05A2680
 B05A2690
 B05A2700
 B05A2710
 B05A2720
 B05A2730
 B05A2740
 B05A2750
 B05A2760
 B05A2770
 B05A2780
 B05A2790
 B05A2800
 B05A2830
 B05A2840
 B05A2850
 ENTR-MOD
 B05A2910
 B05A2920
 B05A2930
 B05A2940

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987      FW(IS,IT) = (RHOVM(IS,IT) - HF(1,5)) / C1      B05A2950
988      IF(KR(11)-1) 391,392,391
989      391 DRNL(2)=(HM(IS,IT)-G(1,1))/EASE
990      392 DRNL(1)=FW(IS,IT)-F(1,1)
991      IF(NSPM1) 595,595,393
992      393 DO 394 K=1,NSPM1
993      394 DRNL(K+2)=(SPW(K,IS,IT)-SP(1,1,K))/EASE
994      GO TO 595
995      C      KIP=1 IF USING ASSIGNED TEMPERATURE ON ENERGY BALANCE FOR TEFLON      B05A2970
996      395 KIP = 0      B05A2980
997      W(3)=RHOVS-W(2)
998      K9R=KR(9)-2      ENTR-MOD
999      GO TO (450,460,490,400),K9R      ENTR-MOD
1000      400 MHAT = HTEF
1001      EMIS = EMIST
1002      IF (ITS - 1) 465,465,405      B05A3070
1003      405 IF (TFZ) 465,465,410      B05A3080
1004      410 IF (ABS(T(1) - TFZ) - 10.) 465,435,435      B05A3090
1005      415 IF (DTEMP * DUM2) 440,440,420      B05A3100
1006      420 IF (DUM1 * 20. + MOCT) 425,425,430      B05A3110
1007      425 TFZ = T(1) - 50. / DTEMP * ATEMP      B05A3120
1008      BUMP = 1.      B05A3130
1009      GOTO 435      B05A3140
1010      430 TFZ = T(1)
1011      435 TW(IS,IT) = TFZ      B05A3160
1012      GOTO 445      B05A3170
1013      440 TW(IS,IT) = T(1) + 50. / DTEMP * ATEMP      B05A3180
1014      BUMP = 1.      B05A3190
1015      445 KIP = 1      B05A3200
1016      GO TO 490      ENTR-MOD
1017      450 DRNL(1) = TW(IS,IT) - T(1)      ENTR-MOD
1018      AM(1,4) = 0.      ENTR-MOD
1019      AM(2,5) = DTHW      ENTR-MOD
1020      DO 455 K=1,NSPM1      ENTR-MOD
1021      455 AM(1,K + 5) = DTKW(K)      ENTR-MOD
1022      460 MHAT=MCARB
1023      EMIS=EMISC
1024      465 TFZ = 0.
1025      DUM1 = STEF * EMIS * (T(1)) * * 3. * C3      B05A3330
1026      DRNL(2) = - WALLQ + RHOVS * (MHAT - G(1,1)) - DUM1 * T(1) + RADSC(
1027      (IS)*C3+W(2)*(MPG-MHAT)
1028      DUM2 = DRNL(2)      B05A3360
1029      AM(2,4) = DQJRN(1,1) + C1 * (G(1,1) - MHAT)
1030      DUM1 = DUM1 * 4.      B05A3380
1031      AM(2,5) = DQJRN(2,1) + DUM1 * DTHW + RHOVS      B05A3390
1032      DO 470 K=1,NSPM1      B05A3400
1033      470 AM(2,K + 5) = DQJRN(K + 2,1) + DUM1 * DTKW(K)      B05A3410
1034      IF(KR(9)-4) 510,475,495      ENTR-MOD
1035      475 DRNL(1)= VLNK
1036      DO 472 K=1,IZ      ENTR-MOD
1037      J=-IR(K)
1038      FNU(J)=VNU(ISU,J)
1039      IF (LEF(K)+LEFM(K)) 471,471,472
1040      471 FNU(J)=0.
1041      472 CONTINUE
1042      DO 476 K=1,IZ      ENTR-MOD
1043      476 DRNL(1)=DRNL(1)+YW(K)*FNU(K)
1044      AM(1,4) = 0.      B05A3440

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1045	DUM1 = TCW / Y(1)	B05A3450
1046	AM(1,5) = DUM1 * DTHW	
1047	DO 477 K=1,I2	ENTR-MOD
1048	477 AM(1,5)=AM(1,5)-DLPH(K)*FNU(K)	
1049	DO 488 K=1,NSPM1	B05A3470
1050	AM(1,K+5) = DUM1*DTKW(K)	
1051	DO 488 KK=1,I2	ENTR-MOD
1052	488 AM(1,K+5)=AM(1,K+5)-DLPH(K,KK)*FNU(KK)	ENTR-MOD
1053	GOTO 510	B05A3490
1054	490 WDOT = C3 * EXP((ADUM * TW(1S,1T) + BOUN) * TW(1S,1T) + COUN)	B05A3510
1055	KIP=KIP+1	
1056	W(3) = WDOT	B05A3540
1057	W(2) = 0.	B05A3550
1058	W(1) = 0.	B05A3560
1059	GOTO 295	B05A3570
1060	495 WDOT = C3 * EXP((ADUM * T(1) + BOUN) * T(1) + COUN)	B05A3580
1061	AM(1,5) = WDOT * (ADUM * 2. * T(1) + BOUN)	B05A3590
1062	500 DRNL(1) = RHOVS - WDOT	B05A3600
1063	DUM1 = ABS(DRNL(1))	B05A3610
1064	AK(1,4) = - C1	B05A3620
1065	DO 505 K=1,NSPM1	B05A3630
1066	505 AM(1,K + 5) = AM(1,5) * DTKW(K)	B05A3640
1067	AM(1,5) = AM(1,5) * DTHW	B05A3650
1068	510 DO 520 K=1,NSPM1	B05A3660
1069	DRNL(K+2)=-WALLJ(K)-RHOVS*(SP(1,1,K)-TQ(K,L3)*WTH(K))+W(2)*WTH(K)*	
1070	1 (TQ(K,L2)-TQ(K,L3))	
1071	DO 515 KK=1,NRNL	B05A3680
1072	515 AM(K + 2, KK + 3) = DQJRN(KK,K + 1)	B05A3690
1073	AM(K+2,4)=AM(K+2,4)+C1*(SP(1,1,K)-TQ(K,L3)*WTH(K))	
1074	520 AM(K + 2, K + 5) = AM(K + 2, K + 5) + RMCVS	B05A3710
1075	II = 0	B05A3720
1076	IF(KR(9)-3) 525,540,525	ENTR-MOD
1077	525 IF(W(3)) 540,530,530	
1078	530 DRNL(1)=(WDOT-W(3))/C1	
1079	W(3)=WDOT	
1080	DO 535 K=2,NRNL	B05A3760
1081	535 DRNL(K) = DRNL(K) - DRNL(1) * AM(K,4)	B05A3770
1082	II = 1	B05A3780
1083	540 IXX = IX	B05A3790
1084	CALL RERAY(NRNL-II,AM(II+1,II+4),0,DRNL(II+1),1,0,IXX,153)	B05C3800
1085	IF (KR(9) + KIP - 6) 560,545,560	B05A3820
1086	545 DTEMP = DRNL(2) * DTHW	B05A3830
1087	DO 550 K=1,NSPM1	B05A3840
1088	550 DTEMP = DTEMP + DTKW(K) * DRNL(K + 2)	B05A3850
1089	ATEMP = ABS(DTEMP)	B05A3860
1090	IF (ATEMP - 50.) 555,560,415	B05A3870
1091	555 TFZ = - T(1)	B05A3880
1092	560 CONTINUE	B05A3890
1093	WDOT=W(3)	
1094	595 RETURN	
1095	END	B05A5360
1096	0006A	B06A 001
1097	SUBROUTINE LINGER	B06A 002
1098	COMMON/EDGCOM/	
1099	PE(40, 1),PTE(40, 1),SPE(8,40, 1),QUES,B06A 3	
1100	1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMWE,CGE,C90	ENTR-MOD
1101	2,DSIP(40),IDSIP,TVVC,TVCC(40),HEA(40),SF(20),CS(20),CSPR(20),	ENTR-MOD
1102	JCG(20),CGP(20),SREF,GEP,NEM	ENTR-MOD
	COMMON/ETRCOM/FLE(43),GLE(30),SPL(30, 0),ELA(313),FLEM,GLEM	B06A 6

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1103      1,SPLE( 0),ELM(14),ELMH,IFLP,IGLM,ISPLN( 0),NELM,ILMH,OFL(43)      806A      7
1104      2,DGL(30),DSPL(30, 0),FNLE(10),GNLE(15),SPNLE(15, 0),ENL(153)      806A      8
1105      3,FNLEH,GNLEH,SPNLEH( 0),      ENLMH,IFNLM,IGNLM,ISPMLN( 0)      806A      9
1106      4,NENLM,INLMH,DFNL(10),DGNL(15),DSPNL(15, 0),DRNL(10)      806A     10
1107      COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)      806A     11
1108      1,LAR(153),BA1(43,10),BA2(30,15)      806A     12
1109      COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,META,I,IS,N      806A     13
1110      1S,IT,PTIME,NSP,NSPM1,NAH,NLEQ,MNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) 806A     14
1111      2,B(10),      HWE,NON,KQ(10),ITEN,MITEN,KR17,ABT,NB2,IDENT,KR9(40) 806A     15
1112      3,KAUXO,JTIME,JSPEC,MO(3)      806A     16
1113      COMMON/PRNCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) 806A     17
1114      1,RNOSE,VKAP,NOISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO, 806A     18
1115      2,CONE,RADFL( 50),RADR(40),RADS(40),IRAD      806A     19
1116      COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH      806A     20
1117      C      EVALUATE LINEAR ERRORS FOR PCHEMUM AND ENERGY      806A     21
1118      NENL=NSP+1      806A     22
1119      NENLM=NELM      806A     23
1120      NUL=0
1121      DO 400 I=1,MAT1I      ENTR-MOD
1122      400 BA1(I,1)=9.      ENTR-MOD
1123      DO 401 I=2,META
1124      IF(I-2) 4004,4003,4004
1125      4003 IF(KR(10)) 4000,4000,4001
1126      4004 IF(I-META) 4002,4005,4002
1127      4005 IF(KR(10)-1) 4002,4000,4002
1128      4000 DUM1=B(4)
1129      DUM2=B(5)
1130      DUM3=B(2)
1131      DUM4=B(3)
1132      DUM5=B(1)
1133      DUM6=1.0
1134      GO TO 4002
1135      4001 DUM1=B(3)
1136      DUM2=0.
1137      DUM3=B(1)
1138      DUM4=0.
1139      DUM5=1.0
1140      DUM6=0.
1141      4002 CONTINUE
1142      FLE(I-1)=-(F(1,I-1)+DETA(I-1)*F(2,I-1)+DSQ(I-1)/2.*F(3,I-1)+DCU(
1143      1I-1)*(DUM1*F(4,I-1)+DUM2*F(4,I))-F(1,I))
1144      M=I+META-2
1145      FLE(M)=-(F(2,I-1)+DETA(I-1)*F(3,I-1)+DSQ(I-1)*(DUM3*F(4,I-1)+DUM4*
1146      1F(4,I))-F(2,I))
1147      M=M+1
1148      DO 403 K=NUL,NSPM1
1149      SPLE(I,K)=-(SP(1,I-1,K)+DETA(I-1)*SP(2,I-1,K)+DSQ(I-1)*(DUM3*SP(3,
1150      1I-1,K)+DUM4*SP(3,I,K))-SP(1,I,K))
1151      403 SPLE(M,K)=-(SP(2,I-1,K)+DETA(I-1)*DUM5*(SP(3,I-1,K)+DUM6*SP(3,7,K)
1152      1I-1,K))-SP(2,I,K))
1153      M=I+2*META-3
1154      401 FLE(M)=-(F(3,I-1)+DETA(I-1)*DUM5*(F(4,I-1)+DUM6*F(4,I))-F(3,I))
1155      FLE(MAT1I)=DUM6*(F(3,META)-ALPH*ALPH*QUEDEGE)      ENTR-MOD
1156      B1(MAT1I,1)=-2.*DUM6*QUEDEGE*ALPH      ENTR-MOD
1157      IF(ABS(BA1(MAT1I,1)).GT.0.) CALL MATS1(BA1)      ENTR-MOD
1158      GLE(1)=-(G(1,META)-CGE)      ENTR-MOD
1159      GLE(MAT2I)=DUM6*(G(2,META)-ALPH*CGE)      ENTR-MOD
1160      IF(NSPM1) 404,404,405

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1161      405 DO 402 K=1,NSPH1
1162          SPLE(1,K)=-SP(1,META,K)-SPE(K,IS,IT))
1163          SPLE(MAT2I,K)=-SP(2,META,K) * DUM6
1164      C      DETERMINE MAXIMUM LINEAR ERRORS
1165      402 CALL ABMAX(MAT2I,SPLE(1,K),SPLEN(K),ISPLN(K))
1166      404 CALL ABMAX(MAT1I,FLE,FLEN,IFLN)
1167      CALL ABMAX(MAT2I,GLE,GLEN,IGLN)
1168      ELN(1)=FLEN
1169      ELN(2)=GLEK*.001
1170      IF(NSPH1)406,406,407
1171      407 DO 404 K=3,NELN
1172          ELN(K)=SPLEN(K-2)*.1
1173      406 CALL ABMAX(ELN,ELX,ELMN,ILMN)
1174      C      FORM PRODUCT OF A**1 AND LINEAR ERRORS
1175      469 CALL MATS1(FLE)
1176      DO 474 K=NUL,NSPH1
1177      474 CALL MATS2.SPLE(1,K))
1178      RETURN
1179      END
1180      CB#7A
1181      SUBROUTINE REFCOM
1182      COMMON/EDGCOM/      PE(40, 1),PTE(40, 1),SPE( 8,40, 1),QUES,
1183      1UE(40),RHOE(40),VME(40),TE(40),UEGE,DUEGE,DZUEGE,VME,CGE,C90
1184      2,DSIP(40),IOSIP,TVCC,TVCC(40),NEA(40),SF(20),CS(20),CSPR(20),
1185      3CG(20),CGP(20),SREF,GEP,MEN,UIHF,RHCINF,MINF,PINF
1186      COMMON/MISCOM/C1,C2,C3,C4,ALPHD,BETA,ZH(4,14),ZG(4,14),ZSP(4,14),
1187      1),XI(40),HF(15,5),HG(15,3),HSP(15,3, 0),HALPH,HUE,HMUE,MFM,DLX2
1188      2,C3H(40),BETAH(40)
1189      COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,META,I,IS,N
1190      1S,IT,NTIME,MSP,NSPH1,NAH,NLEQ,NMLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15)
1191      2,B(8), MWE,MOM,KQ(10),ITEN,NITEN,KR17,ABT,MRT2,IDENT,KR9(40)
1192      3,KAUXO,JTIME,JSPEC,MD(3)
1193      COMMON/PRNCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40)
1194      1,RNCSE,VKAP,NDISC,IDISC(40),WSD(10),WSD(10),ITF( 50),IPRE,RADNO,
1195      2CONE,RADFL( 50),RADR(40),RADS(40),IRAD
1196      COMMON/TEHCOM/SPOUN( 8),DER(40),DUMH1(15),SLOPE(15),REDUM(15)
1197      1,SDUM1(40),SDUM2(40),FHOM(40),XICON(40),FWCON(40),FWINIT( 1)
1198      2,XIINIT( 1),DUOS( 40)
1199      COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH
1200      COMMON/MALCOM/FW(40, 1),TW(40, 1),HW(40, 1),SPH( 8,40, 1)
1201      1,RMOVH(40, 1),FLUXJ( 3,40, 1),INW,ITW,IFW,ISPH,IRNOVH,IFLUXJ
1202      DATA INR,IND,IMI,IMF/1HR,1MC,1MI,1MF/
1203      7007 FORMAT(8E10.4)
1204      7008 FORMAT(A1,E9.4,7E10.4/(8E10.4))
1205      9901 FORMAT(I3,7E10.3)
1206      106 FORMAT(I2,E0.3,7E10.5)
1207      15 FORMAT(1M1)
1208      16 FORMAT (/,1X,23NOISTANCE,FT ,0E12.5/(24X,0E12.5))
1209      17 FORMAT (/,1X,23MPRESSURE RATIO ,0E12.5/(24X,0E12.5))
1210      18 FORMAT (/,1X,23MENTROPY DROP,BTU/LB R ,0E12.5/(24X,0E12.5))
1211      19 FORMAT (/,1X,23HWALL ENTHALPY,BTU/LB ,0E12.5/(24X,0E12.5))
1212      20 FORMAT (/,1X,23HWALL TEMPERATURE,DEC R ,0E12.5/(24X,0E12.5))
1213      21 FORMAT (/,1X,23HWALL STREAM FUNCTION ,0E12.5/(24X,0E12.5))
1214      22 FORMAT (/,1X,23HWALL MASS FLUX,LB/SEC FT**2 ,0E12.5/(24X,0E12.5))
1215      23 FORMAT (/,1X,23HELEMENTAL MASS FRACTION,0E12.5/(24X,0E12.5))
1216      24 FORMAT (/,1X,23HCOMP FLUX,LB/SEC FT**2 ,0E12.5/(24X,0E12.5))
1217      25 FORMAT (/,1X,23HSTATIC PRESSURE,ATM ,0E12.5/(24X,0E12.5))
1218      26 FORMAT (/,1X,23HVI,(LB/SEC)**2 ,0E12.5/(24X,0E12.5))

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1219	27 FORMAT (/,1X,23H0ETA	,0E12.5/(24X,0E12.5))	007A 038
1220	28 FORMAT (/,1X,23H0KAP	,0E12.5/(24X,0E12.5))	007A 039
1221	29 FORMAT (/,1X,23HEDGE VELOCITY,FT/SEC	,0E12.5/(24X,0E12.5))	007A 040
1222	30 FORMAT (/,1X,23HNORMALIZED MASS FLUX	,0E12.5/(24X,0E12.5))	007A 041
1223	31 FORMAT (/,1X,23HNORMALIZED COMP FLUX	,0E12.5/(24X,0E12.5))	007A 042
1224	32 FORMAT (/,1X,23HINCIDENT RADIATION FLUX,0E12.5/(24X,0E12.5))		
1225	33 FORMAT (/,1X,23H-1/FLUX NORM.PARAMETER	,0E12.5/(24X,0E12.5))	007A 044
1226	34 FORMAT (/,1X,23HSTREAM FUNCTION, LB/SEC	,0E12.5/(24X,0E12.5))	ENTR-MOD
1227	35 FORMAT (/,1X,23HENTROPY CHANGE, BTU/LB M,0E12.5/(24X,0E12.5))		ENTR-MOD
1228	36 FORMAT (/,1X,23HENTHALPY CHANGE, BTU/LB	,0E12.5/(24X,0E12.5))	ENTR-MOD
1229	37 FORMAT (/,24H SHOCK ANGLE, DEGREES	0E12.5/(24X,0E12.5))	ENTR-MOD
1230	38 FORMAT (/,24H SHOCK ANGLE, RADIAN	0E12.5/(24X,0E12.5))	ENTR-MOD
1231	1532 IF (ITEM-1) 1539,1538,1539		007A 051
1232	1538 IOSIP=1		007A 052
1233	IPRE=1		007A 053
1234	IRAO=1		
1235	NEN=0		ENTR-MOD
1236	DO 1540 I=1,NS		007A 054
1237	1540 IOSIP(I)=0.		007A 055
1238	1539 IF (IOSIP-ITEM) 1536,1537,1536		ENTR-MOD
1239	1537 IF (KR(5)-5) 1522,1535,1536		ENTR-MOD
1240	1522 IF (KR(5)-2) 1536,1524,1524		ENTR-MOD
1241	1524 READ(KIN,106) NEN,UINF,RHOINF,HINF,PINF		ENTR-MOD
1242	HINF=HINF/1.8		ENTR-MOD
1243	IF (NEN) 1527,1527,1526		ENTR-MOD
1244	1526 READ(KIN,7000) IRED,(SF(I),I=1,NEN)		ENTR-MOD
1245	IF (IRED.NE.IMI.AND.IRED.NE.IMF) GO TO 1530		ENTR-MOD
1246	DO 1547 I=1,NEN		ENTR-MOD
1247	IF (IRED.EQ.IMI) SF(I)=SF(I)/12.		ENTR-MOD
1248	DUM=RHOINF*UINF*SF(I)		ENTR-MOD
1249	IF (ABS(KR(6)-2).EQ.1) GO TO 1547		ENTR-MOD
1250	DUM=DUM/2.*SF(I)		ENTR-MOD
1251	1547 SF(I)=DUM		ENTR-MOD
1252	GO TO 1530		ENTR-MOD
1253	1527 NEN=NS		ENTR-MOD
1254	DO 1528 I=1,NS		ENTR-MOD
1255	1528 SF(I)=RHOINF*UINF/2.*ROKAP(I)**2		ENTR-MOD
1256	1530 READ(KIN,7000) IRED,(CS(I),I=1,NEN)		ENTR-MOD
1257	WRITE(KOUT,36) (SF(I),I=1,NEN)		ENTR-MOD
1258	IF (IRED.NE.IMD) GO TO 1548		ENTR-MOD
1259	WRITE (KOUT,37) (CS(I),I=1,NEN)		ENTR-MOD
1260	DO 1551 I=1,NEN		ENTR-MOD
1261	1551 CS(I)=CS(I)/57.29577		ENTR-MOD
1262	IRED=IMR		ENTR-MOD
1263	GO TO 1549		ENTR-MOD
1264	1549 IF (IRED.NE.IMR) GO TO 1550		ENTR-MOD
1265	WRITE(KOUT,38) (CS(I),I=1,NEN)		ENTR-MOD
1266	GO TO 1549		ENTR-MOD
1267	1550 WRITE(KOUT,35) (CS(I),I=1,NEN)		ENTR-MOD
1268	1549 IF (KR(5)-4) 1529,1529,1529		ENTR-MOD
1269	1529 READ (KIN,7007) (CG(I),I=1,NEN)		ENTR-MOD
1270	CALL SLOPC (NEN,SF,CG,C6P,DIR)		ENTR-MOD
1271	WRITE(KOUT,36) (CG(I),I=1,NEN)		ENTR-MOD
1272	GO TO 1529		ENTR-MOD
1273	1535 READ (KIN,7007) (IOSIP(I),I=1,NS)		007A 058
1274	1529 READ (KIN,106) IOSIP		ENTR-MOD
1275	1536 IF (IPRE-ITEM) 1534,1533,1534		007A 060
1276	1533 READ (KIN,7007) (IPRE(I),I=1,NS)		007A 061

1277	READ (KIN,106) IPRE	
1278	1534 IF (PRE(I)) 1541,1542,1541	807A 062
1279	1542 DO 1543 I=2,NS	
1280	IF (PRE(I)) 1544,1543,1544	
1281	1544 L=I	
1282	GO TO 1545	
1283	1543 CONTINUE	
1284	1545 RNOSE=S(L)/SQRT(1.-PRE(L))	
1285	DO 1546 I=2,L	
1286	1546 PRE(I-1)=1.-S(I-1)/RNOSE*S(I-1)/RNOSE	
1287	1541 DO 1531 I=1,NS	
1288	PTE(I,1)=PTE(I,ITEM)	
1289	1531 PE(I,1)=PTE(I,1)*PRE(I)	807A 064
1290	IF (IRAD-ITEM) 1554,1552,1554	807A 065
1291	1552 READ (KIN,7007) (RADR(I),I=1,NS)	
1292	READ (KIN,106) IRAD	
1293	1554 DO 1553 I=1,NS	
1294	1553 RADR(I)=RADR(I)*RADR(I)	
1295	105 DO 104 IS=1,NS	
1296	201 IF (IS-1) 207,207,203	807A 066
1297	207 KQ(1)=2	807A 068
1298	KQ(5)=2	807A 070
1299	KQ(6)=0	807A 071
1300	KQ(4)=0	807A 072
1301	IF (KR(7)) 8003,8003,9002	807A 073
1302	8002 CALL STATE	807A
1303	WRITE(KOUT,992)	
1304	WRITE(KOUT,994)	
1305	992 FORMAT(1M1,10X20MISENTROPIC EXPANSION /12X15HEDGE CONDITIONS //)	
1306	994 FORMAT(5X117HSTREAMWISE TEMP CP STATIC DENS	
1307	ITY VISCOSITY VELOCITY ENTHALPY ENTROPY MACH NO. /	
1308	25X45MDIMENSION FROZEN PRESSURE /7X101M(FEET)	
1309	3 (DEG R) (BTU/ (ATM) (LB/SEC FT) (LB/SEC FT) (FT	
1310	4/SEC (BTU/LB) (BTU/ /30X10HLB DEG R) 62X10HLB DEG R) //	
1311	GO TO 8004	
1312	8003 CALL EQUIL(KQ,GE(ITEM),PTE(1,IT))	807A
1313	9004 KQ(1)=3	807A
1314	KQ(2)=0	807A
1315	KQ(3)=6	807A 076
1316	KQ(5)=1	807A 077
1317	IF (KR(6)-2) 210,203,203	807A 078
1318	203 IF (KR(7)) 8006,8006,8005	
1319	8005 CALL STATE	807A
1320	GO TO 210	
1321	8006 CALL EQUIL(KQ,U.,PE(IS,IT))	
1322	210 IF (NSPW1) 205,205,215	807A
1323	215 DO 216 K=1,NSPW1	
1324	216 SPE(K,IS,IT)=SP(1,META,K)	807A 084
1325	205 IF (KR(15)) 9903,9904,9903	807A 085
1326	9903 WRITE(KOUT,9901) IS,ME(I,IS),UE(I,IS),PTE(I,IS),TE(I,IS),RNOSE(I,IS)	807A 096
1327	1,VALUE(I,IS)	ENTR-MOD
1328	9904 CONTINUE	ENTR-MOD
1329	104 CONTINUE	807A 099
1330	IF (IRED.ME.IHR) GO TO 103	807A 100
1331	KQ(1)=2	ENTR-MOD
1332	KQ(5)=3	ENTR-MOD
1333	DO 102 I=1,MEN	ENTR-MOD
1334	CALL EQUIL(KQ,CS(I),PTE(1,1))	ENTR-MOD

1335	IF (I.EQ.1) CS1=CS(1)	ENTR-MOD
1336	102 CS(I)=CS(I)-CS1	ENTR-MOD
1337	103 IF (NEN.GT.0) CALL SLOPQ(NEN,SF,CS,CSPR,DER)	ENTR-MOD
1338	C END OF EDGE PROPERTY LOOP, START OF BETA AND XI CALCULATION	ENTR-MOD
1339	605 XI(1)=0.	B07A 105
1340	J=NDISC+1	B07A 106
1341	DO 111 II=1,J	B07A 107
1342	K=NSD(II)	B07A 108
1343	M=MSD(II)	B07A 109
1344	MM=M+1	
1345	LL=K+M-1	B07A 110
1346	IF (II-1) 6052,6052,402	B07A 111
1347	6052 IF (KR(6)-1) 400,401,402	B07A 112
1348	C AXISYMETRIC BLUNT	B07A 113
1349	400 DO 403 I=M,LL	B07A 114
1350	SDUM2(I)=S(I)*S(I)	B07A 115
1351	IF (S(I)) 403,403,4031	B07A 116
1352	4031 DUM1=ROKAP(I)/S(I)	B07A 117
1353	XICON(I)=UE(I)/S(I)*RHOE(I)/4.*VMUE(I)*DUM1*DUM1	B07A 118
1354	403 SDUM1(I)=SDUM2(I)*SDUM2(I)	B07A 119
1355	QI=4.	B07A 120
1356	BETAM(1)=0.5	B07A 121
1357	GO TO 406	B07A 122
1358	C PLANAR BLUNT	B07A 123
1359	401 DO 404 I=M,LL	B07A 124
1360	SDUM2(I)=S(I)	B07A 125
1361	IF (S(I)) 404,404,4041	B07A 126
1362	4041 XICON(I)=UE(I)/S(I)*RHOE(I)/2.*VMUE(I)	B07A 127
1363	404 SDUM1(I)=S(I)*S(I)	B07A 128
1364	QI=2.	B07A 129
1365	BETAM(1)=1.	B07A 130
1366	GO TO 406	B07A 131
1367	402 IF (KR(6)-2) 408,407,408	B07A 132
1368	C AXISYMETRIC SHARP	B07A 133
1369	407 DO 409 I=M,LL	B07A 134
1370	SDUM2(I)=S(I)*S(I)	B07A 135
1371	DUM1=ROKAP(I)/S(I)	B07A 136
1372	XICON(I)=RHOE(I)*UE(I)*VMUE(I)*DUM1/3.*DUM1	B07A 137
1373	409 SDUM1(I)=S(I)*SDUM2(I)	B07A 138
1374	XI(1)=XICON(1)*S(1)*S(1)*S(1)	B07A 139
1375	QI=3.	B07A 140
1376	IF (II-1) 4051,4051,406	
1377	C PLANAR SHARP	B07A 142
1378	408 DO 405 I=M,LL	B07A 143
1379	SDUM2(I)=S(I)	B07A 144
1380	XICON(I)=RHOE(I)*UE(I)*VMUE(I)*ROKAP(I)*ROKAP(I)	B07A 145
1381	405 SDUM1(I)=S(I)	B07A 146
1382	QI=1.	B07A 147
1383	IF (II-1) 4052,4052,406	
1384	4052 XI(1)=XICON(1)*S(1)	B07A 149
1385	4051 MM=M	
1386	406 CONTINUE	B07A 152
1387	CALL SLOPQ(K,S(M),UE(M),DUOS(M),DER(M))	B07A 153
1388	IF (KR(6)-2) 4066,4062,4062	B07A 154
1389	4066 IF (M-1) 4061,4061,4062	B07A 155
1390	4061 IF (RNOSE) 4063,4063,4064	B07A 156
1391	COMMENT...DUES COMPUTED BY SLOPQ	B07A 157
1392	4063 DUES=DUOS(1)	B07A 158

1393	GO TO 4065	B07A 159
1394	COMMENT...DUES FROM EFFECTIVE NOSE RADIUS USING NEWTONIAN FLOW	B07A 160
1395	4064 DUES=SQRT(2./RHOE(1)*PE(1,11)*32.1740*2116.)/RNOSE	B07A 161
1396	4065 XICON(1)=RHOE(1)*VMUE(1)/(2.*VKAP+2.)*DUES	B07A 162
1397	4062 CALL SLOPQ(K,SDUM1(M),XICON(M),DER(M),XI(M))	B07A 163
1398	IF (LL-MM) 111,4101,4101	B07A 165
1399	4101 DO 410 L=MM,LL	B07A 166
1400	410 BETAM(L)=2./QI*X1(L)/UE(L)*S(L)/SDUM1(L)*DUDS(L)/XICON(L)	B07A 167
1401	111 CONTINUE	B07A 168
1402	9803 FORMAT(8E10.4)	B07A 172
1403	WRITE(KOUT,15)	
1404	WRITE(KOUT,16) (S(I),I=1,NS)	
1405	WRITE(KOUT,28) (ROKAP(I),I=1,NS)	
1406	WRITE(KOUT,26) (XI(I),I=1,NS)	
1407	WRITE(KOUT,17) (PRE(I),I=1,NS)	
1408	WRITE(KOUT,25) (PE(I,1),I=1,NS)	
1409	WRITE(KOUT,29) (UE(I),I=1,NS)	
1410	WRITE(KOUT,27) (BETAM(I),I=1,NS)	
1411	WRITE(KOUT,32) (RADS(I),I=1,NS)	
1412	WRITE(KOUT,18) (OSIP(I),I=1,NS)	
1413	C CALCULATION OF C3 MATRIX	B07A 173
1414	DO 138 I=1,NS	B07A 174
1415	IF (KR(6)-1) 137,137,158	B07A 175
1416	137 IF (I-1) 139,139,158	B07A 176
1417	139 C3M(I)=-SQRT (BETAM(I)/(DUES*RHOE(I)*VMUE(I)))	B07A 177
1418	GO TO 138	B07A 178
1419	158 C3M(I)=-SQRT(2.*XI(I)/(RHOE(I)*ROKAP(I)*UE(I)*VMUE(I)))	B07A 179
1420	138 CONTINUE	B07A 180
1421	WRITE(KOUT,33) (C3M(I),I=1,NS)	
1422	C READ WALL CONDITIONS IF UNCOUPLED	B07A 189
1423	JRHOVW=0	
1424	IF (ITEM-1) 108,108,7004	
1425	108 IHW=1	B07A 191
1426	ITW=1	B07A 192
1427	IFW=1	B07A 193
1428	IRHOVW=1	B07A 194
1429	ISPW=1	B07A 195
1430	IFLUXJ=1	B07A 196
1431	DO 49 I=1,NS	
1432	DO 49 L=1,3	
1433	49 FLUXJ(L,I,1) = 0.	
1434	107 IF (KR(9)-3) 7054,7005,1071	
1435	1071 IF (KR(9)-5) 7047,7005,7047	
1436	7054 IF (KR(11)-2) 7062,7040,7047	B07A 198
1437	7062 IF (KR(11)) 7004,7005,7004	B07A 199
1438	7004 IF (IHW-ITEM) 1091,109,1091	B07A 200
1439	1091 IF (IHW-1) 1201,7005,1201	
1440	109 READ(KIN,7007) ((HW(J,JJ),JJ=1,NTIME),J=1,NS)	B07A 201
1441	READ (KIN,106) IHW	B07A 202
1442	1201 WRITE (KOUT,19) (HW(I,1),I=1,NS)	
1443	IF (ITEM-1) 7038,7038,7060	
1444	7005 IF (ITW-ITEM) 1092,110,1092	B07A 205
1445	1092 IF (ITW-1) 1202,7050,1202	
1446	110 READ(KIN,7007) ((TW(J,JJ),JJ=1,NTIME),J=1,NS)	B07A 206
1447	READ (KIN,106) ITW	B07A 207
1448	1202 WRITE (KOUT,20) (TW(I,1),I=1,NS)	
1449	IF (ITEM-1) 117,117,7060	
1450	117 IF (KR(9)-3) 7038,7047,7047	B07A 209

1451	7038 IF(KR(9)-1) 7060,7061,7040	807A 210
1452	7060 IF (IFW-ITEM) 1093,112,1093	807A 211
1453	1093 IF(IFW-1) 1203,7061,1203	
1454	112 READ(KIN,7007)((FW(J,JJ),JJ=1,NTIME),J=1,NS)	807A 212
1455	READ (KIN,106) IFW	807A 213
1456	1203 WRITE (KOUT,21)(FW(I,1),I=1,NS)	
1457	GO TO 7006	807A 215
1458	7061 IF (IRHOVW-ITEM) 1094,118,1094	807A 216
1459	1094 IF (IRHOVW-1) 1204,7006,1204	
1460	118 READ(KIN,7007)((RHOVW(J,JJ),JJ=1,NTIME),J=1,NS)	807A 217
1461	READ (KIN,106) IRHOVW	807A 218
1462	JRHOVW=1	
1463	1204 IF(KR(8)-JRHOVW) 1102,1101,1101	
1464	1102 WRITE (KOUT,22)(RHOVW(I,1),I=1,NS)	807A 220
1465	GO TO 7006	807A 221
1466	1101 WRITE (KOUT,30)(RHOVW(I,1),I=1,NS)	807A 222
1467	7006 IF(NSPM1) 7043,7043,7015	807A 223
1468	7015 IF (ISPW-ITEM) 1095,114,1095	807A 224
1469	1095 IF(ISPW-1) 1205,7040,1205	
1470	114 DO 7014 K=1,NSPM1	807A 225
1471	7014 READ(KIN,7007)((SPW(K,J,JJ),JJ=1,NTIME),J=1,NS)	807A 226
1472	READ (KIN,106) ISPW	807A 227
1473	1205 DO 1097 K=1,NSPM1	
1474	1097 WRITE (KOUT,23)(SPW(K,I,1),I=1,NS)	807A 229
1475	GO TO 7043	807A 230
1476	7040 IF (IFLUXJ-ITEM)1096,115,1096	807A 231
1477	1096 IF(IFLUXJ-1) 1206,7043,1206	
1478	115 DO 7041 K=1,3	807A 232
1479	7041 READ(KIN,7007)((FLUXJ(K,J,JJ),JJ=1,NTIME),J=1,NS)	807A 233
1480	READ (KIN,106) IFLUXJ	807A 234
1481	JRHOVW=1	
1482	1206 DO 1098 K=1,3	
1483	IF(KR(8)-JRHOVW) 1104,1103,1103	
1484	1104 WRITE (KOUT,24)(FLUXJ(K,I,1),I=1,NS)	807A 237
1485	DO 7039 J=1,NS	
1486	7039 FLUXJ(K,J,1)=FLUXJ(K,J,1) * C3M(J)	
1487	GO TO 1098	807A 238
1488	1103 WRITE (KOUT,31)(FLUXJ(K,I,1),I=1,NS)	807A 239
1489	1098 CONTINUE	807A 240
1490	GO TO 7047	
1491	7043 IF(JRHOVW) 7047,7047,7045	
1492	C CALCULATE FW IF RHOVW GIVEN	807A 253
1493	7045 J=NDISC+1	807A 254
1494	DO 7046 II=1,J	807A 255
1495	K=NSD(II)	807A 256
1496	M=MSD(II)	807A 257
1497	LL=K+M-1	807A 258
1498	DO 209 I=M,LL	807A 259
1499	IF(I.EQ.M.AND.II.NE.1) GO TO 209	ENTR-MOD
1500	IF (KR(8)) 7049,7049,2291	807A 260
1501	7049 RHOVW(I,IT)=RHOVW(I,IT)*C3M(I)	807A 261
1502	2291 IF (II-1) 7048,7048, 230	807A 262
1503	7048 IF (KR(6)) 229,229,230	807A 263
1504	C VALID AT AXISYMETRIC STAGNATION POINT ONLY	807A 264
1505	229 FWCON(I)=-RHOVW(I,IT)/(2.*C3M(I))	807A 265
1506	IF(I-1) 209,209,232	807A 266
1507	C MODIFICATION FOR AXISYMETRIC BLUNT AWAY FROM STAGNATION POINT	807A 267
1508	232 FWCON(I)=FWCON(I)/S(I)*RCKAP(I)	807A 268

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1509      GO TO 209                                     B07A 269
1510      C      VALID FOR ALL PLANAR                     B07A 270
1511      230 FWCON(I)=-RHOVW(I,IT)/C3H(I)*ROKAP(I)      ENTR-MOD
1512      IF(KR(6)-2) 209,236,209                        B07A 272
1513      C      MODIFICATION FOR AXISYMETRIC SHARP      B07A 273
1514      236 FWCON(I)=FWCON(I)/S(I)*ROKAP(I)/2.        B07A 274
1515      209 FLUXJ(2,I,1)=RHOVW(I,1)
1516      FWDUM(1)=FWCON(1)*S(1)                          B07A 276
1517      IF(KR(6)-2) 241,237,241                        B07A 277
1518      C      MODIFICATION FOR AXISYMETRIC SHARP      B07A 278
1519      237 FWDUM(1)=FWDUM(1)*S(1)                    B07A 279
1520      241 CONTINUE                                    B07A 280
1521      7046 CALL SLOPQ(K,S0UM2(M),FWCON(M),DER(M),FWDUM(M)) B07A 281
1522      DO 126 I =1,NS                                  B07A 282
1523      IF(I -1) 124,124,123                            B07A 283
1524      124 IF (KR(6)-1) 133,133,123                  B07A 284
1525      133 IF (S(I)) 113,113,123                      B07A 285
1526      113 FW(1,IT)=RHOVW(1,IT)                      B07A 286
1527      GO TO 126                                       B07A 287
1528      123 FW(I,IT)=FWDUM(I)/SQRT(2.*XI(I))          B07A 288
1529      126 CONTINUE                                    B07A 289
1530      7047 RETURN                                     B07A 290
1531      END                                             B07A 291
1532      C808A                                          B08A 001
1533      SUBROUTINE ICOEFF                               B08A 002
1534      COMMON/COECON/ C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15 B08B 3
1535      1,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C31,C808B 4
1536      232,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C48 B08B 5
1537      3,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,C808B 6
1538      465,C66,C67,C68,C69,C70,C71,C72,C73,C74,C75,C76,C77,C78,C79,C80,C81 B08B 7
1539      5,C82,C83,C84,C85,C86,C87,C88                B08B 8
1540      COMMON/COECON/ CK1( 8),CK2( 8),CK3( 8),CK4( 8),CK5( 8),CK6( 8) B08B 9
1541      1,CK7( 8),CK8( 8),CK9( 8),CK10( 8),CK11( 8),CK12( 8),CK13( 8) B08B 10
1542      2,CK14( 8),CK15( 8),CK16( 8),CK17( 8),CK18( 8),CK19( 8),CK20( 8) B08B 11
1543      3,CK21( 8),CK22( 8),CKK1( 8, 8),CKK2( 8, 8),XM(5),XG(5),XSP(5, 9) B08B 12
1544      4,CKK3( 8, 8)                                  B08B 13
1545      COMMON/EDGCOM/ PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES, B08B 14
1546      1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEGE,D2UEGE,VMUE,CGE,C90 ENTR-MOD
1547      2,DSIP(40),IDSIP,TTVC,TVCC(40),HEA(40),SF(20),CS(20),CSPR(20), ENTR-MOD
1548      3CG(20),CGP(20),SREF,GEP,NEN                  ENTR-MOD
1549      COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14) B08B 17
1550      1,LAR(15),BA1(43,18),BA2(30,15)              B08B 18
1551      COMMON/HISCOM/C1,C2,C3,C4,ALPH0,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, 8 B08B 19
1552      1),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HMUE,HFW,DLX2 B08B 20
1553      2,C3H(40),BETAM(40)                          B08B 21
1554      COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NE B08B 22
1555      1S,IT,NTIME,NSP,NSPH1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B08B 23
1556      2,B(8), HWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B08B 24
1557      3,KAUX0,JTIME,JSPEC,MD(3)                    B08B 25
1558      COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15) B08B 26
1559      1,CPBAR(15),VKW(15),PHIK(15, 8),DRH0H,DRH0K( 8),ZK( 8),DZKH( 9), D308B 27
1560      2MU3K( 8),DMU4K( 8),DTK( 8),CPHIKH( 8),DPRK( 8),DSCK( 8),DCAPCK( 8) B08B 28
1561      3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8) B08B 29
1562      4,DPHIKK( 8, 8), DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL B08B 30
1563      5,VMU3,OTH,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15), RHOP B08B 31
1564      6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15) B08B 32
1565      COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH B08B 33
1566      C      FIRST, EVAL DERIVATIVES OF STATE PROPERTIES WITH RESPECT TO ETA B08A 028

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1567	VMU4P=DMU4H*HP	808A 029
1568	VMU3P=DMU3H*HP	808A 030
1569	HTILP=DHTILH*HP	808A 031
1570	TP=DTM*HP	808A 032
1571	RHOP(I)=DRHOM*HP	808A 033
1572	IF(NSPM1)401,401,402	808A 034
1573	402 DO 408 K=1,NSPM1	808A 035
1574	ZKP(K)=DZKH(K)*HP	808A 036
1575	PHIKP(K)=DPHIKH(K)*HP	808A 037
1576	VMU4P=VMU4P+DMU4K(K)*SP(2,I,K)	808A 038
1577	VMU3P=VMU3P+DMU3K(K)*SP(2,I,K)	808A 039
1578	HTILP=HTILP+DHTILK(K)*SP(2,I,K)	808A 040
1579	TP=TP+DTK(K)*SP(2,I,K)	808A 041
1580	RHOP(I)=RHOP(I)+DRHOK(K)*SP(2,I,K)	808A 042
1581	DO 408 J=1,NSPM1	808A 043
1582	ZKP(K)=ZKP(K)+DZKK(K,J)*SP(2,I,J)	808A 044
1583	408 PHIKP(K)=PHIKP(K)+DPHIKK(K,J)*SP(2,I,J)	808A 045
1584	C NEXT, EVALUATE OTHER GROUPINGS FOR USE AT I AND I-1	808A 046
1585	C C'S DEFINED IN HISTXI - C1=1.+DZ,C2=-C1-DZ,C3=-1./ALPHA*,C4=BETA+C1	ENTR-MOD
1586	C C'S DEFINED IN NONCER - C5=1./ALPH,C6=BETA*ALPH**2,	1 ENTR-MOD
1587	C C7=-(UE(IS)/ALPH)**2*25036.5,C8=ALPHD/ALPH,C9=C4-C8,	ENTR-MOD
1588	C C10=C7*F(2,I),C13=C7*F(3,I)	ENTR-MOD
1589	401 C11=C5 * F(3,I) * TTVC	
1590	C12 = C5 * CAPC(I) * TTVC	
1591	C14=C1*F(1,I)+HF(I,5)	808A 049
1592	C15=PR(I)-1.	808A 050
1593	C16=1./PR(I)	808A 051
1594	C17=1./SC(I)	808A 052
1595	C18=CTR*T(I)	808A 053
1596	C19=C17*C12	808A 054
1597	C20=C16*C12	808A 055
1598	C21 = C13 * C15	
1599	C22 = C21*C20	
1600	C23 = DCAFCH/CAPC(I)	
1601	C24 = C20 * (G(2,I)-C21*F(2,I))	
1602	C25= C20 * C16 * (G(2,I)+C13*F(2,I))	
1603	C26 = RHOE(IS)/RHO(I)	
1604	C28 = C12 * F(3,I)	
1605	C31 = HTILP-(CPTIL+CT/VMU12*CTR)*TP+C18 * VMU3P+(HTIL-H(I)+CTR*	
1606	1 VMU3* T(I)) *VMU4P	
1607	C32 = (-F(2,I)*C13+TP/PR(I)*CPEAR(I)+C31/SC(I)) * C12 - C3*QR(I)	
1608	1 *TTVC	
1609	C43=C24*C23-C25*OPRH-C3*DQRH*TTVC	
1610	C53=RHOP(I)/RHO(I)	
1611	C56 = F(2,I)/ALPH	
1612	C73 = C1 * F(2,I)	
1613	C74 = C11 * C10 * DCAPCH + C14	
1614	C75=C11*DCAPCH	808A 100
1615	C76=C1*G(1,I)	808A 101
1616	C77=-C22+C43*C10	
1617	C78=-C20*C15*C10	
1618	C79=C43	
1619	C80=C20	
1620	C81=-C28*(C10*C56*C23+C5)	
1621	C82=-C20*C5*G(2,I)+3.0*C22*(C56-C43*C10*C56	
1622	C83=C28+C14 * F(2,I)	
1623	412 C84=C32+G(1,I)*C14	808A 109
1624	C85 = -C6/RHO(I)*C26/2.	

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1625      C86=C85*C10*DRHON
1626      C87=BETA*ALPH*C26-C86*C56
1627      C88=C85*DRHON
1628      DUM1=C23-DSCH/SC(I)
1629      IF(NSPM1)403,403,404
1630 404 DO 406 K=1,NSPM1
1631      CK3(K) = DCAPCK(K)/CAPC(I)
1632 406 CK4(K)=CK3(K)-DSCK(K)/SC(I)
1633      DO 410 K=1,NSPM1
1634      DUM2=C19 * SP(2,I,K)
1635      CK1(K)=C24*CK3(K)-C25*DPRK(K)-C3*DQRK(K)*TTVC
1636      CK2(K)=0.
1637      CK5(K)=0.
1638      DUM3=ZK(K)-SP(1,I,K)
1639      CK6(K)=C19*(ZKP(K)+VMU4P*DUM3)
1640      CK9(K)= DUM2*DUM1
1641      CK13(K)=C85*DRHOK(K)
1642      CK14(K)=0.
1643      CK15(K)=0.
1644      CK16(K)=0.
1645      CK17(K)=C11*DCAPCK(K)
1646      CK18(K)=C1*SP(1,I,K)
1647      CK19(K)=CK9(K)*C10
1648      CK20(K)=0.
1649      CK21(K)=-CK19(K)*C56-DUM2/ALPH
1650 414 CK22(K)=CK6(K)+SP(1,I,K)*C14
1651      DO 410 KK=1,NSPM1
1652      CKK1(K,KK)=C19*(DZKK(K,KK)+DUM3*DMU4K(KK))
1653      CKK3(K,KK)=OPHIKK(K,KK)
1654 410 CKK2(K,KK)=DUM2*CK4(KK)
1655 403 CONTINUE
1656      RETURN
1657      END
1658 CB09A
1659      SUBROUTINE RECASE
1660      COMMON/CRBCOM/HCARB,EMIS,STEF,ADUM,BDUM,CDUM,HTEF,HMAT,EMISC,EMIST
1661      1,HPG,ASU(3),BSU(3),HPYG(3),HCHAR(3),EMIV(3),KS(40),ISU
1662      COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)
1663      1,LAR(153),BA1(43,18),BA2(30,15)
1664      COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,FAT1J,MAT2J,NETA,I,IS,NE
1665      1S,IY,NTIME,NSP,NSPM1,NAH,NLEQ,NKLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15)
1666      2,B(8), MWE,NON,KQ(10),ITEM,NITEM,KR17,ABT,NBT2,IDENT,KP9(40)
1667      3,KAUXO,JTIME,JSPEC,MD(3)
1668      COMMON/PRNCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40)
1669      1,RNOSE,VKAP,NOISC,IOISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO,
1670      2CONE,RADFL( 50),RADR(40),RADS(40),IRAD
1671      1 FORMAT(20I1,15A4)
1672      2 FORMAT(I2)
1673      3 FORMAT(I2/(8E10.4))
1674      4 FORMAT(1H114X56HBOUNDARY LAYER INTEGRAL MATRIX PROGRAM (BLIMP)
1675      1 //8X47HAEROTHERM CORPCRATION,PALC ALTO,CALIF (RMK,EPB)
1676      1,2X3A6 //1X,
1677      2CASE,15A4,/,9X,75HCONTROL NUMBERS 1 2 3 4 5 6 7 8 9 10
1678      311 12 13 14 15 16 17 18 19 20,/,23X,20I3//8X14HPUNCH CONTROL /8X
1679      412HIDENT JSPEC/10XA2,7XI2/)
1680      5 FORMAT(8E10.4)
1681      6 FORMAT(I2,E10.4)
1682      7 FORMAT(/9X20HVISCOISITY LAW MU=(E10.3,4H*T*E10.3,3H)/(E10.3,3H*T

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1683      1+E10.3,1H)//9X19HENTHALPY LAW      T=E10.3,1H+E10.3,4H*H**E10.3,1H+ B09A 029
1684      2/42X2H((E10.3,7H+1.)*H/E10.3,8H)**(1./(E10.3, 5H+1.))//9X19HPRANDT B09A 030
1685      3L NUMBER PR=E10.3,1H+E10.3,4H*T**E10.3,1H+E10.3,4H*T**E10.3/) B09A 031
1686      9 FORMAT(21I1) B09A 032
1687      10 FORMAT (/,10X70HU/UE TO NODAL PT. GAMMA MOLECULAR B09A 033
1688      1 /9X18HNORM. ETA AT WHICH13X40HWEIGHT B09A 034
1689      2 /19X9HETA NORM.) B09A 035
1690      8 FORMAT(3X1PE10.3,9XI2,6X9E10.3/(30X9E10.3))
1691      11 FORMAT (/,5X70HU/UE TO NODAL PT. B09A 037
1692      1 ETA VALUES /4X23HNORM. ETA AT WHICH B09A 038
1693      2 /19X9HETA NORM.) B09A 039
1694      12 FORMAT (/2X,15HNOSE RADIUS,FT ,1PE12.5,5X,16HCONE HALF ANGLE ,1PE1 B09A 040
1695      12.5,8H DEGREES) B09A 041
1696      13 FORMAT (/,1X,23HTIME,SEC ,1P8E12.5/(24X,1P8E12.5)) B09A 042
1697      14 FORMAT (/,1X,23HTOTAL ENTHALPY,BTU/LB ,1P8E12.5/(24X,1P8E12.5)) B09A 043
1698      18 FORMAT (/,1X,23HCASE ,1P8E12.5/(24X,1P8E12.5))
1699      15 FORMAT (/,1X,23HTOTAL PRESSURE,ATM ,1P8E12.5/(24X,1P8E12.5)) B09A 044
1700      16 FORMAT(A2,I2,I6)
1701      17 FORMAT (/,1X,23HINCIDENT RAD FLUX,B/SF2,1P8E12.5/(24X,1P8E12.5))
1702      20 FORMAT(/,1X,56HSURFACE RECESSION - WALL TEMPERATURE RELATION FOR T
1703      1EFLON//5X,43HSURFACE RECESSION RATE, LB/SEC FT2 = EXP(((,1P E12.5,
1704      26H)*TW+(,1P E12.5,7H))*TW+(,1P E12.5,2H)),//5X,37HWHERE TW IS WALL
1705      3 TEMPERATURE IN DEG R)
1706      C NOTE...KR(5)=4 FOR EQUIL,3 FOR EQUIL WITH ENTROPY LAYER, 1 B09A 046
1707      C FOR NONEQUIL, AND 2 FOR NONEQUIL WITH ENTROPY LAYER...ROKAP=1 FOR B09A 047
1708      C PLANAR..(KR(6)=1 AND 3 FOR BLUNT AND SHARP, RESP) AND IS EQUAL TO B09A 048
1709      C DISTANCE FROM AXIS OF SYMMETRY TO BODY SURFACE FOR AXISYM.. B09A 049
1710      C (KR(6)=0 AND 2 FOR BLUNT AND SHARP, RESPECTIVELY)... KR(7)=0 FOR B09A 050
1711      C MULTICOMPONENT B.L. AND=1 FOR HOMOGENEOUS B.L..IDISC=0 FOR NO B09A 051
1712      C DISCONTINUITY AND UNITY FOR DISC. IN ROKAP,FW, OR RHOWVW B09A 052
1713      DATA MD(2)/6H /
1714      CALL DATE (9,MD)
1715      CALL TOD ( 18, MD)
1716      READ(KIN,1)KR,CASE B09A 053
1717      READ(KIN,16) IDENT,JSPEC,JTIME
1718      WRITE(KOUT,4) MD,CASE,KR,IDENT,JSPEC
1719      KQ(9)=0
1720      IF(KR(6)-8) 245,240,245
1721      240 KQ(9)=-1
1722      KR(6)=4
1723      GO TO 255
1724      245 IF(KR(6)-4) 255,255,250
1725      250 KQ(9)=1
1726      KR(6)=KR(6)-5
1727      255 READ(KIN,24) NSP,KS
1728      24 FORM 1(I2,8X70I1)
1729      NSPM1=NSP-1 B09A 057
1730      READ(KIN,24)NTIME,IDISC ENTR-MOD
1731      READ(KIN,5)(TIME(IT),IT=1,NTIME) ENTR-MOD
1732      NITEM=NTIME B09A 059
1733      NTIME=1 B09A 060
1734      READ(KIN,24) NS,KR9
1735      READ(KIN,5)(S(IS),IS=1,NS)
1736      KAU XO=1 RDG
1737      IF(KR (14)-2) 303,303,302 RDG
1738      302 KAU XO=KR (14)-1 RDG
1739      KR (14)=KR (14)-3 RDG
1740      C COMPUTE INFORMATION NEEDED TO CONSIDER DISCONTINUITIES B09A 062

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1741	303 J=1	809A 063
1742	102 MSD(1)=1	809A 064
1743	IDISC(1)=MAX0(IDISC(1),1)	ENTR-MOD
1744	S(1)=ABS(S(1))	809A 066
1745	IF (NS-1) 105,105,1021	809A 067
1746	1021 DO 101 IS=2,NS	809A 068
1747	IF(S(IS)) 103,101,101	809A 070
1748	103 NSD(J)=IS-MSD(J)+1	809A 071
1749	S(IS)=-S(IS)	809A 072
1750	IDISC(IS)=MAX0(IDISC(IS),1)	ENTR-MOD
1751	J=J+1	809A 074
1752	MSD(J)=IS	809A 075
1753	101 CONTINUE	809A 076
1754	105 NSD(J)=NS-MSD(J)+1	809A 077
1755	IDISC=J-1	809A 078
1756	IF (KR(1)) 1051,1051,1052	809A 080
1757	1052 READ (KIN,3) NETA,(ETA(I),I=1,NETA)	809A 081
1758	READ (KIN,6) KAPPA,CBAR	809A 079
1759	1051 CONTINUE	809A
1760	605 WRITE (KOUT,11)	809A 091
1761	WRITE (KOUT,8) CBAR,KAPPA,(ETA(I),I=1,NETA)	809A 092
1762	606 IF (KR(6)-1) 203,203,204	809A 093
1763	203 READ (KIN,5) CONE, RNOSE	809A 094
1764	204 IF (IABS(KR(6)-2)-1) 207,208,207	809A 095
1765	207 READ (KIN,5) (ROKAP(IS),IS=1,NS)	809A 096
1766	IF (NS-1) 234,234,2071	809A 097
1767	2071 IIS=2	809A 099
1768	LNZ=1	809A 099
1769	IF (ROKAP(1)) 223,226,226	809A 100
1770	223 RADNO=-ROKAP(1)	809A 101
1771	WRITE (KOUT, 12) RADNO,CONE	809A 102
1772	ROKAP(1)=0.	809A 103
1773	DO 229 IS=1,NS	
1774	IF (ROKAP(IS)) 224,224,225	809A 105
1775	224 IF (KR(6)) 221,221,222	809A 106
1776	222 ROKAP(IS)=S(IS)*SIN(RADNO/57.29578)	809A 107
1777	GO TO 229	809A 108
1778	221 ROKAP(IS)=RADNO*SIN(S(IS)/RADNO)	809A 109
1779	229 CONTINUE	809A 110
1780	GO TO 234	809A 111
1781	225 IF (IS-NS) 2251,234,234	809A 112
1782	2251 IIS=IS+1	809A 113
1783	LNZ=IS	809A 114
1784	226 DO 233 IS=IIS,NS	809A 115
1785	IF (ROKAP(IS)) 233,233,227	809A 116
1786	227 IF (IS-1-LNZ) 232,232,228	809A 117
1787	228 LNZ=LNZ+1	809A 118
1788	ROKAP(LNZ)=ROKAP(LNZ-1)+(S(LNZ)-S(LNZ-1))/(S(IS)-S(LNZ-1))*(ROKAP(	809A 119
1789	1IS)-ROKAP(LNZ-1))	809A 120
1790	GO TO 227	809A 121
1791	232 LNZ=IS	809A 122
1792	233 CONTINUE	809A 123
1793	234 VKAP=1.	809A 124
1794	GO TO 210	809A 125
1795	208 DO 209 IS=1,NS	809A 126
1796	209 ROKAP(IS)=1.	809A 127
1797	VKAP=0.	809A 128
1798	210 CONTINUE	809A

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1799      181 STEF = .481E-12
1800          IF (KR(9)-3) 197,193,198
1801      198 IF (KR(9)-4) 193,193,197
1802      197 DO 191 J=1,NS
1803          IF (KR9(J)-3) 191,193,192
1804      192 IF (KR9(J)-4) 191,193,191
1805      191 CONTINUE
1806          GO TO 199
1807      193 READ(KIN,21) (EMIV(I),HCHAR(I),HPYG(I), I=1,3)
1808          READ(KIN,22) (ASU(I),BSU(I), I=1,3)
1809      22 FORMAT(6A4)
1810      21 FORMAT(9E8.3)
1811      19 FORMAT(/1X39HQUASI-STEADY ENERGY BALANCE AT THE WALL//5X14HSURFACE
1812      1 NUMBER28X1H114X1H214X1H3/5X17HSURFACE EMITTANCE17X1P3E14.5/5X34HE
1813      2NTHALPY OF CHAR AT REFERENCE TEMP3E15.5/5X34HENTHALPY OF PYROLYSIS
1814      3 GAS (8TU/LB)3E15.5/5X27HEQUILIBRIUM SURFACE SPECIES9X3(7X2A4))
1815          WRITE(KOUT,19) EMIV, HCHAR, HPYG, (ASU(I), BSU(I), I=1,3)
1816      199 IF (KR(9)-5) 194,196,196
1817      194 DO 195 J=1,NS
1818          IF (KR9(J)-5) 195,196,196
1819      195 CONTINUE
1820          GO TO 182
1821      196 READ (KIN,5) EMIST,HTEF,ADUM,BDUM,CDUM
1822          WRITE (KOUT,20) ADUM,BDUM,CDUM
1823          WRITE (KOUT,19) EMIST,HTEF
1824      182 READ(KIN,5) (PTET(IT),IT=1,NITEM)
1825          READ(KIN,5) (GE(IT),IT=1,NITEM)
1826          READ(KIN,5) (RADFL(IT),IT=1,NITEM)
1827      2200 IF (TIME(1)) 2201,220,220
1828      2201 TIME(1)=-TIME(1)
1829          WRITE (KOUT,18) (TIME(I),I=1,NITEM)
1830          TIME(1)=-TIME(1)
1831          GO TO 2202
1832      220 WRITE (KOUT,13) (TIME(I),I=1,NITEM)
1833      2202 WRITE (KOUT,14) ( GE(I),I=1,NITEM)
1834          WRITE (KOUT,15) (PTET(I),I=1,NITEM)
1835          WRITE (KOUT,17) (RADFL(I),I=1,NITEM)
1836          RETURN
1837      END
1838 CB10A
1839      SUBROUTINE HISTXI
1840      COMMON/EDGCOM/      PE(40, 1),PTE(40, 1),SPE( 8,40, 1),QUES, ENTR-MOO
1841      1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,OUEDGE,DZUEOG,VMUE,CGE,C90 ENTR-MOO
1842      2,OSIP(40),IDSIP,TVVC,TVCC(40),MEA(40),SF(20),CS(20),CSPR(20), ENTR-MOO
1843      3CG(20),CGP(20),SREF,GEP,MEN ENTR-MOO
1844      COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),OCU(14),B1(14),B2(14) B10A 3
1845      1,LAR(153),BA1(43,18),BA2(30,15) B10A 4
1846      COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZH(4,14),ZG(4,14),ZSP(4,14, B10A 5
1847      1 ),XI(40),MF(15,5),MG(15,3),MSP(15,3, 8),MALPH,MUE,MMUE,MFN,DLX2 B10A 6
1848      2,CJM(40),BETAM(40) B10A 7
1849      COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,META,I,IS,NE10A 8
1850      1S,IT,NTIME,NSP,NSPHI,NAM,NLEQ,NMLEQ,WRNL, ITS,KAPPA,CULP,CASE(15) B10A 9
1851      2, @ (8), HME,MON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B10A 1
1852      3,KAUXO,JTIME,JSPEC,MO(3),IU,ISM ENTR-MOO
1853      COMMON/PRNCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) B10A 12
1854      1,RNOSE,VKAP,NOISC,IOISC(40),MSD(10),MSD(10),ITF( 50),IPRE,RAONO, B10A 13
1855      2CONE,RADFL( 50),RADR(40),RADG(40),IRAD B10A 14
1856      COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH B10A 15

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1857	COMMON/HALCON/FN(40, 1),TN(40, 1),HM(40, 1),SPN(8,40, 1)	ENTR-MOD
1858	1,RHGVH(40, 1),FLUXJ(3,40, 1),IMW,ITW,IFW,ISPW,IRHOVW,IFLUXJ	ENTR-MOD
1859	DIMENSION FD(4),GO(4),SPD(4)	010A 018
1860	C INITIALIZE AXIAL VARIATION TERMS	010A 019
1861	NUL=0	010A 020
1862	IF(IS.NE.1)GO TO 399	ENTR-MOD
1863	398 IF(IDISC(IS).NE.2)GO TO 399	ENTR-MOD
1864	IS=IS+1	ENTR-MOD
1865	GO TO 398	ENTR-MOD
1866	399 IF(KR(3).EQ.0)GO TO 154	ENTR-MOD
1867	IF(IU-2) 154,152,155	ENTR-MOD
1868	152 DLX1=2.3	ENTR-MOD
1869	IF(KR(6).EQ.0)DLX1=3.5	ENTR-MOD
1870	IF(XI(ISH)) 157,157,155	ENTR-MOD
1871	154 DZ=0.	010A 030
1872	O1=0.	010A 031
1873	O2=0.	010A 032
1874	IF(KR(2).LT.0) IS=-KR(2)	
1875	IF(KR(2).LT.0) IDISC(IS)=1	
1876	M=META-1	010A 033
1877	DO 140 I=1,M	010A 034
1878	DO 140 J=1,4	010A 035
1879	ZM(J,I)=0.	010A 036
1880	139 DO 140 K=NUL,MSPH1	010A 037
1881	ZSP(J,I,K)=0.	010A 038
1882	140 CONTINUE	010A 039
1883	DO 141 I=1,META	010A 040
1884	DO 142 J=1,3	010A 041
1885	MF(I,J)=0.	010A 042
1886	159 DO 142 K=NUL,MSPH1	010A 043
1887	MSP(I,J,K)=0.	010A 044
1888	142 CONTINUE	010A 045
1889	MF(I,4)=0.	010A 046
1890	141 MF(I,5)=0.	010A 047
1891	ALPHD=0.	010A 048
1892	MALPH=0.	010A 049
1893	DLX2=0.	010A 050
1894	GO TO 130	010A 051
1895	C COMPUTE TWO- OR THREE-POINT DIFFERENCE RELATIONS	010A 052
1896	155 DLX1=ALOG(XI(IS)/XI(ISH))	ENTR-MOD
1897	IF(IU.GT.2.AND.KR(3).EQ.2.AND.IDISC(ISH).NE.1) GO TO 121	ENTR-MOD
1898	157 DZ=2./DLX1	ENTR-MOD
1899	O1=-DZ	010A 054
1900	DZ=0.	010A 055
1901	GO TO 145	010A 056
1902	121 DZ=DLX1+DLX2	010A 059
1903	O1=-O2/(DLX1+DLX2)*2.	010A 060
1904	O2=DLX1/(O2+DLX2)*2.	010A 061
1905	OZ=-O1-O2	010A 062
1906	145 DLX2=DLX1	010A 063
1907	ALPHD=O1*ALPH+O2*MALPH	010A 064
1908	MALPH=ALPH	010A 065
1909	122 FD(3)=O1*F(4,1)+O2*MF(1,4)	010A 066
1910	GO(3)=O1*G(3,1)+O2*MG(1,3)	010A 067
1911	DO 147 I=2,META	010A 068
1912	FD(1)=O1*F(2,I)+O2*MF(I,2)	010A 069
1913	FD(2)=O1*F(3,I)+O2*MF(I,3)	010A 070
1914	FD(4)=FD(3)	010A 071

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1915      FD(3)=D1*F(4,I)+D2*HF(I,4)                                810A 072
1916      CALL TAYLOR(DETA(I-1),F(2),FD(1),ZM(1,I-1))              810A 073
1917      GD(1)=D1*G(1,I)+D2*HG(I,1)                                810A 074
1918      GD(2)=D1*G(2,I)+D2*HG(I,2)                                810A 075
1919      GD(4)=GD(3)                                                 810A 076
1920      GD(3)=D1*G(3,I)+D2*HG(I,3)                                810A 077
1921      147 CALL TAYLOR(DETA(I-1),GD(2),GD(1),ZG(1,I-1))          810A 078
1922      IF(NSPM1) 162,162,166                                       810A 079
1923      166 DO 151 K=1,NSPM1                                         810A 080
1924      SPD(3)=D1*SP(3,I,K)+D2*HSP(I,3,K)                          810A 081
1925      DO 151 I=2,NEYA                                              810A 082
1926      SPD(1)=D1*SP(1,I,K)+D2*HSP(I,1,K)                          810A 083
1927      SPD(2)=D1*SP(2,I,K)+D2*HSP(I,2,K)                          810A 084
1928      SPD(4)=SPD(3)                                               810A 085
1929      SPD(3)=D1*SP(3,I,K)+D2*HSP(I,3,K)                          810A 086
1930      151 CALL TAYLOR(DETA(I-1),SPD(2),SPD(1),ZSP(1,I-1,K))      810A 087
1931      C-----SAVE HISTORIC VALUES                               810A 088
1932      162 DO 164 I=1,NEYA                                         810A 089
1933      HF(I,4)=F(4,I)                                              810A 090
1934      HF(I,5)=D1*F(1,I)+D2*HF(I,1)                               810A 091
1935      DO 164 J=1,3                                                810A 092
1936      HF(I,J)=F(J,I)                                              810A 093
1937      HG(I,J)=G(J,I)                                              810A 094
1938      IF(NSPM1) 164,164,165                                       810A 095
1939      165 DO 149 K=1,NSPM1                                         810A 096
1940      149 HSP(I,J,K)=SP(J,I,K)                                    810A 097
1941      164 CONTINUE                                                810A 098
1942      C COMPUTE GROUPINGS WHICH DEPEND ON DZ                     810A 099
1943      130 C1=1.+DZ                                                 810A 100
1944      C2=-C1-DZ                                                    810A 101
1945      C3=C3H(IS)                                                  810A 102
1946      BETA=BETAM(IS)                                              810A 103
1947      C4=BETA+C1                                                  810A 104
1948      9904 FORMAT(6X12/8X1P10E10.3/8X8E10.3/(6X10E10.3))        810A 105
1949      IF(KR(17)) 9905,9906,9905                                    810A 106
1950      9905 CONTINUE                                              810A 107
1951      WRITE(KOUT,9907)                                             810A 108
1952      9907 FORMAT(2X27HDEBUG IS,DLX1...ZM,ZG,HF,HG)              810A 109
1953      WRITE(KOUT,9904) IS,DLX1,DLX2,DZ,D1,D2,ALPHC,HALPH,C1,C2,C4, 810A 110
1954      1,GO,((ZM(I,J),J=1,6),I=1,4),((ZG(I,J),J=1,6),I=1,4),((HF(I,J), 810A 111
1955      2 J=1,5),I=1,7),((HG(I,J),J=1,3),I=1,7)                   810A 112
1956      IF(NSPM1) 9906,9906,9908                                    810A 113
1957      9908 WRITE(KOUT,9909)((ZSP(I,J,K),K=1,NSPM1),J=1,6),1-1,4),((HSP(I,J, 810A 114
1958      1 K),K=1,NSPM1),J=1,3),I=1,7)                               810A 115
1959      9909 FORMAT(2X13HDEBUG ZSP,HSP/(2X10E10.3))                810A 116
1960      9906 CONTINUE                                              810A 117
1961      RETURN                                                       810A 118
1962      END                                                         810A 119
1963      CM114                                                       811A 001
1964      SUBROUTINE OUTPUT                                           811A 002
1965      DIMENSION CIJ( 71,1)                                         811A 03
1966      COMMON/BLDCOM/  MOA( 71),  MOB( 71),MSPEC,FR( 71,15),M(3),LEF(10) 811A 4
1967      1 ,LEFS(10),PIEASE,LEFN(10),L2,L3                           ENTR-MO:
1968      COMMON/COECCOM/  C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15,811A 6
1969      1,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C31,811A 7
1970      Z32,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C48,811A 8
1971      1,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,811A 9
1972      465,C66,C67,C68,C69,C70,C71,C72,C73,C74,C75,C76,C77,C78,C79,C80,811A 10

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1973	5, C82, C83, C84, C85, C86, C87, C88	811A	11
1974	COMMON/COECON/ CK1(8), CK2(8), CK3(8), CK4(8), CK5(8), CK6(8)	811A	12
1975	1, CK7(8), CK8(8), CK9(8), CK10(8), CK11(8), CK12(8), CK13(8)	811A	13
1976	2, CK14(8), CK15(8), CK16(8), CK17(8), CK18(8), CK19(8), CK20(8)	811A	14
1977	3, CK21(8), CK22(8), CKK1(8, 8), CKK2(8, 8), XM(5), XG(5), XCP(5, 9)	811A	15
1978	4, CKK3(8, 8)	811A	16
1979	COMMON/CRBCOM/HCARB, ENIS, STEF, ADUM, BDUM, CDUM, HTEF, MHAT, EMISC, EMIST	811A	17
1980	1, HPG, ASU(3), BSU(3), HPG(3), HCHAR(3), ENIV(3), KS(40), ISU	811A	18
1981	COMMON/EDGCON/ PE(40, 1), PTE(40, 1), SPE(8, 40, 1), DUES, 811A	811A	19
1982	1UE(40), RHOE(40), VMUE(40), TE(40), UEDGE, DUEGE, D2UEGS, VMUE, CGE, C90	ENTR-MOD	
1983	2, DSIP(40), IOSIP, TVVC, TVCC(40), MEA(40), SF(20), CS(20), CSPP(20),	ENTR-MOD	
1984	3CG(20), CGP(20), SREF, GEP, MEN	ENTR-MOD	
1985	COMMON/EPSCON/ELCON, YAP, CLNUM, SCT, PRT, RED, OVS, RHOVS, PI, PIM, CL,	811A	22
1986	1EPSA(15), EPS1, EL(15), OPI(15, 2), DEPC, TREF, RETR	ENTR-MOD	
1987	COMMON/EQPCOM/ RB(71, 2), RC(71, 2), RD(71, 2), RE(71, 2), RF(71, 2),	811A	24
1988	1 TU(71, 2), FFI(71), FFA, IFC(71), ATA(10), ATB(10), ATC(10), NAT(10),	811A	25
1989	2 KAT(10), IR(10), IZ, K2(10), LAMI(71), P, Z, TK(10, 71), VN(71),	811A	26
1990	3 VNU(71, 10), ITFF, KR2, HCH, NCV, NH, WTH(71), VYY(71), YN(71), GG(71)	811A	27
1991	4 , TO(10, 71), EPOVRK, SIGNA, BASHOL	811A	29
1992	COMMON/EQTCON/SIP, HIP, EEL, EENL, FLIQ, CPF, IRE, IER, AA, IITS, IN, IL, IIT,	811A	29
1993	1 MODE, HMELT, SMELT, TMAX, TMIN, MELT, SUMN, SUHL, NS, NSS, BX, ISP2, ISPC,	811A	30
1994	2 ISP, KKJ, SVA, SVB, SVC, SVD, SURC, FFF, CHF, EP, RV, IFUJC, WTC, WTL, JC, PHG,	811A	31
1995	3 CCG, TTMZ, TTHAX, L7, L8, I8(11), EB(10), EBL(10), A(16, 16), BB(16),	ENTR-MOD	
1996	4 IP(71), ALP(10), FNU(10), GAMH(10), GAMF(10), SLAM(10), DY(71), RVS,	811A	33
1997	5 CP(71), HHC(71), SB(71), TC(71), VLNK(71), E(71), PNUS(10),	811A	34
1998	6 BC(10), BLNK(10), BY(10), IBC(10), BE(10), JZ(4)	811A	35
1999	COMMON/ETACON/ETA(15), DETA(15), DSQ(14), DCU(14), B1(14), B2(14)	811A	36
2000	1, LAR(153), BA1(43, 10), BA2(20, 15)	811A	37
2001	COMMON/FLXCON/DELQW, DELJM(9), DQNL(153), DJNL(153, 8), WALLQ	811A	38
2002	1, WALLJ(8), GN, VJKH(9), TPKALL	811A	39
2003	COMMON/HISCON/C1, C2, C3, C4, ALPHO, BETA, ZH(4, 14), ZG(4, 14), ZSP(4, 14),	811A	40
2004	1 , XI(40), HF(15, 5), HG(15, 3), HSP(15, 3, 8), HALPH, HUE, HHJE, HFW, OL, Z	811A	41
2005	2, C3H(40), BETAH(40)	811A	42
2006	COMMON/INTCON/ KR(20), KIM, KCUT, MAT1I, MAT2I, MAT1J, MAT2J, META, I, IS, N811A	811A	43
2007	1S, IT, NTIME, NSP, NSPM1, NAK, NLEQ, NMLEQ, NRNL, ITS, KAPPA, CBAR, CASE(15)	811A	44
2008	2, B(8), HNE, MON, KQ(10), ITH, NITEM, KR17, NBT, NBT2, IDENT, KR9(40)	811A	45
2009	3, KAUXO, JTIME, JSPEC, MD(3)	811A	46
2010	COMMON/OUTCON/Y(15), RES, DELST, THENG, THMMH, CH, BLOW, SHEAR, CF, SHAPE	811A	47
2011	1 , CH(9), THELEM(9)	811A	48
2012	COMMON/PRMCON/TIME(50), PRE(40), PTET(50), CE(50), S(40), ROKAP(40)	811A	49
2013	1, RHOSE, VKAP, NOISC, IDISC(40), NSD(10), NSD(10), ITF(50), IPRE, RADNO,	811A	50
2014	2 COME, RADFL(50), RADR(40), RAD5(40), IRAD	811A	51
2015	COMMON/PRPCON/PR(15), T(15), RHO(15), SC(15), CAPC(15), QR(15), H(15)	811A	52
2016	1, CPBAR(15), VNU(15), PHIK(15, 8), DRMON, DRMOK(8), ZKI(8), DZNM(8),	811A	53
2017	2, HUK(8), ONUK(8), OTK(8), OPHIKH(8), DPRK(8), DSCK(8), DCAPCA(8)	811A	54
2018	3, DHTILK(8), DQRK(8), DCPBK(8), DCPYK(8), DMU12K(8), DZK(8, 8)	811A	55
2019	4, DPHIKK(8, 8), DMU4H, DMU3H, DHTILH, VNU12, CT, CTR, CPTIL, HTIL	811A	56
2020	5, VNU3, DTH, DCAPCH, DPRH, DSCH, CORH, DCPBH, DCPYH, DMU12H, VNU(15),	811A	57
2021	6(15), PHIKP(15), HP, TP, ZKP(8), VNU3P, VNU4P, HTILP, CRHO(16), GHR(15)	811A	58
2022	COMMON/TENCON/SPDUM(8), DER(40), DUMH(15), SLOPE(15), REQUM(15)	811A	59
2023	1, SDUM1(40), SDUM2(40), FNDUM(40), XICON(40), FNDUM(40), FNDUM(1)	811A	60
2024	2, XIINIT(1), DUOS(40)	811A	61
2025	COMMON/VARCON/F(4, 15), G(3, 15), SP(3, 15, 9), ALPH	811A	62
2026	COMMON/KALCON/FM(40, 1), TM(40, 1), HM(40, 1), SPH(8, 40, 1)	811A	63
2027	1, RMQVH(40, 1), FLUXJ(3, 40, 1), INH, ITM, IFM, ISPM, IRMQVH, IFLUXJ	811A	64
2028	EQUIVALENCE (YNU, CIJ)	811A	637
2029	1 FORMAT(6X109H ALPHA XI ROKAP PRESSURE EDGE	811A	647
2030	10ETA FLUX MCR- HEAT FLUXES /5X110H		

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2031      2      (LB      (FT)      (ATM)      VELOCITY      MALIZINB11A 059
2032      3G DIFFUSIONAL TOT ENTH RERAD      QCCND /5X110H      /SEC)
2033      4**2      (FT/SEC)      PARAMETER
2034      5 (BTU/SEC SQ FT)      /5X1P11E10.3)
2035      2 FORMAT(1/6X109H WALL      MASS FLUXES      ELB11A 069
2036      1EMENTAL MASS DIFFUSIVE FLUXES (LB/SEC SQ FT) FOR      /5X 50H B11A 070
2037      2SHEAR MECH R2H PYROL GAS CHAR TOTAL GAS 8(1X2A4,1X))
2038      1. FORMAT      (5X 50H(LB/SQ FT) B11A 073
2039      3      (LB/SEC SQ FT)      ) B11A 074
2040      3 FORMAT(5X1P12E10.3)
2041      18 FORMAT(1/5X109HMM TRANS HEAT TRANS      BLOWING PARAMETERS      ELB11A 076
2042      1EMENTAL MASS TRANSFER COEFFICIENTS,      /5X110H B11A 077
2043      2COEFF, COEFF, (BASED ON CH: FOR      RHOE*UE*CM (LB11A 078
2044      2B/SEC SQ FT) FOR      /4X51HRHO*UE*CF/2 B11A 079
2045      3RHO*UE*CH PYROL GAS CHAR TOTAL GAS      B11A 080
2046      4 8(1X2A4,1X))
2047      4 FORMAT(5X110H MOMENTUM DISPLACE. EFFECTIVE ENTHALPY REYNOLDS MA
2048      1SS THICKNESSES (FT) FOR      /5X110H THB11A 083
2049      2ICKNESS, THICKNESS, BODY THICKNESS, NUMEER
2050      3      /5X 50H THETA DELSTAB11A 085
2051      4R DISPLACE. LAMBDA PER FOOT 8(1X2A4,1X))
2052      20 FORMAT(2X,4(6X,4H(FT))/5X1P12E10.3)
2053      5 FORMAT(1/2X17HMODAL INFORMATION) B11A 091
2054      6 FORMAT(5X9HDISTANCE,4X3HETA,8X1HF,9X2HFP,7X3HFPP,7X5HSHEAR,2X11HTO
2055      1TAL ENTH-,3X2HGP,7X3HGPP,6X6HSTATIC 5X4HTEMP,5X8HELECTRON/
2056      25X9HFROM WALL,23X7H(=U/UE),23X7HHALPY,G,23X8HENTHALPY,12X9HCOLL FR
2057      3EQ/8X4H(FT),44X9H(LB/FTSQ),2X8H(BTU/LB),2X8H(BTU/LB),2X8H(BTU/LB),
2058      42X8H(BTU/LB),2X7H(DEG R),4X7H(1/SEC))
2059      7 FORMAT(5X110H DISTANCE DENSITY, VISCOSITY, RHO*MU SPECIFIC THB11A 098
2060      1ERMAL PRANDTL MODIFIED MOLECULAR RHOSQ*EPS MACH /5X110HFR
2061      2OM WALL RHO MU /RHOE*MUE, HEAT COND (BTU NUMBERB11A 100
2062      3 SCHMIDT WEIGHT /RHOE*MUE NUMBER /5X110H (FT) (LB/OU
2063      4FT) LB/SEC FT (BTU/LB R) SEC FT R) NUMBER B11A 10
2064      5 ) B11A 103
2065      8 FORMAT (1/2X78HELEMENTAL FRACTIONS AND THEIR FIRST AND SECOND DERIVB11A 104
2066      1ATIVES WITH RESPECT TO ETA,/) B11A 105
2067      12 FORMAT(/) B11A 126
2068      13 FORMAT(/ 43X21HDISTANCE FROM WALL,FT/(15X,1P10E10.3/20X,
2069      1 1P9E10.3))
2070      14 FORMAT(6X,2A4,1X,1P10E10.3/20X,1P9E10.3/(15X,1P10E10.3/20X,1P
2071      1 9E10.3))
2072      15 FORMAT (15X,1P10E10.3/20X1P9E10.3)
2073      16 FORMAT (1/2X14HMOLE FRACTIONS,/) B11A 130
2074      17 FORMAT(1/23H SURFACE SPECIES IS 2A4)
2075      310 FORMAT(A2,3I2,1P6E12.5) B11A 131
2076      312 FORMAT(A2,3I2,1P6E12.5/(8X,1P6E12.5)) B11A 132
2077      313 FORMAT (A2,6X,18A4/(20A4)) B11A 133
2078      DATA IBLANK/2H /
2079      TVGF(X)=(SQRT(AMAX1(0.,1.+2.*COSOR*X))-1.)/COSOR
2080      IF (KR(11)-1) 300,300,301 B11A 134
2081      300 IF(KR(9)) 302,302,307 B11A 135
2082      307 IF(KR(9)-2) 301,301,302 B11A 136
2083      302 RHOVW(IS,IT)= C1*F(1,1) +HF(1,5) B11A 137
2084      301 C89=-C3*ALPH*VMUE(IS) B11A 140
2085      DUM1=-1./C3 B11A 141
2086      DUM2=RHOVW(IS,IT)/C3 B11A 142
2087      IF (UE(IS)-1.0) 3012,3011,3012 B11A 143
2088      3011 UE(IS)=0. B11A 144

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2089	3012 CONTINUE	B11A
2090	WALLQ=-WALLQ/C3	B11A 147
2091	DER(3)=WALLQ-DUM2*G(1,1)	B11A 148
2092	WALLJ(NSP)=0.	B11A 149
2093	IF (NSPM1) 3051,3051,3050	B11A
2094	3050 DO 305 K=1,NSPM1	B11A
2095	WALLJ(K)=VJKW(K)	B11A 151
2096	305 WALLJ(NSP)=WALLJ(NSP)-WALLJ(K)	B11A 152
2097	3051 CONTINUE	B11A
2098	DER(1)=W(2)/C3	B11A 153
2099	DER(2)=W(3)/C3	B11A 154
2100	VMECH=DER(1)+DER(2)-DUM2	B11A 155
2101	DUM4=VMECH*100.	B11A 156
2102	IF (DUM4-DUM2) 1901,190,190	B11A 157
2103	1901 VMECH=0.	B11A 158
2104	190 IF (ABS(BETA)-.0001) 303,304,304	B11A 159
2105	303 BETA=0.	B11A 160
2106	304 Y(1)=0.	B11A 161
2107	SHFAC=-UE(IS)/(C3*ALPH*ALPH*32.174)	
2108	DUOS(1)=(CAPC(1)+EPSA(1))*F(3,1)*SHFAC	
2109	DO 182 I=2,NETA	B11A 162
2110	DUOS(I)=(CAPC(I)+EPSA(I))*F(3,I)*SHFAC	
2111	182 Y(I)=Y(I-1)+C89*CRHO(I-1)	B11A 163
2112	QCOND=VMUE(IS)/PR(1)*CAPC(1)/C89*G(2,1)+DUM2*G(1,1)	B11A 164
2113	SHEAR=DUOS(1)	
2114	IF (KR(9)-3) 2101,2102,2102	
2115	2101 EMIS=0.	
2116	2102 RERAD=(.481E-12)*(T(1))**4.*EMIS	
2117	QDIFU=-CAPC(1)/ALPH*CPBAR(1)/PR(1)*TPHALL/C3	
2118	WRITE (KOUT,1) ALPH,XI(IS),RCKAP(IS),PE(IS,IT),UE(IS),BETA,DUM1,	
2119	1 WALLQ,DER(3),RERAD,QDIFU	
2120	212 DUM1=RHOF(IS)*UE(IS)/VMUE(IS)	B11A 179
2121	CH= WALLQ / (G(1,NETA)-G(1,1))	B11A 180
2122	CF=CAPC(1)/ALPH*VMUE(IS)/C89*F(3,1)	B11A 181
2123	213 WRITE(KOUT,2) (ATA(K),ATB(K),K=1,NSP)	B11A 183
2124	WRITE (KOUT,19)	B11A 184
2125	DUM4=ALPH*ALPH	B11A 185
2126	DO 203 I=1,NETA	B11A 186
2127	SP(1,I,NSP)=1.0	B11A 187
2128	SP(2,I,NSP)=0.	B11A 188
2129	203 SP(3,I,NSP)=0.	B11A 189
2130	IF (NSPM1) 2021,2021,2020	B11A
2131	2020 DO 202 K=1,NSPM1	B11A
2132	DO 202 I=1,NETA	B11A 191
2133	SP(1,I,NSP)=SP(1,I,NSP)-SP(1,I,K)	B11A 192
2134	SP(2,I,K)=SP(2,I,K)/ALPH	B11A 193
2135	SP(2,I,NSP)=SP(2,I,NSP)-SP(2,I,K)	B11A 194
2136	SP(3,I,K)=SP(3,I,K)/DUM4	B11A 195
2137	202 SP(3,I,NSP)=SP(3,I,NSP)-SP(3,I,K)	B11A 196
2138	2021 CONTINUE	B11A
2139	XSP(5,NSP)=F(1,NETA)-F(1,1)	B11A 197
2140	IF (NSPM1) 2138,2138,2135	
2141	2138 VJKW(1)=0.	
2142	CM(1)=0.	
2143	THELEM(1)=0.	
2144	GO TO 2137	
2145	2135 DO 2136 I=1,NSPM1	B11A
2146	2136 XSP(5,NSP)=XSP(5,NSP)-XSP(5,I)	B11A 199

2147	DO 2131 I=1,NSP	B11A 200
2148	VJKW(I)=0.	B11A 201
2149	DO 2132 K=1,NSF	B11A 202
2150	2132 VJKW(I)=VJKW(I)-WALLJ(K)/WTM(K)*CIJ(I,K)	B11A 203
2151	2131 VJKW(I)=VJKW(I)*WAT(I)	B11A 204
2152	2137 CONTINUE	
2153	WRITE(KOUT,3) SHEAR,VMECH,DER(1),DER(2),DUM2, (VJKW(I),I=1,NSP)	B11A 205
2154	214 RES=DUM1*S(IS)	B11A 206
2155	DUM3=C89*(F(1,NETA)-F(1,1))/ALPH	B11A 207
2156	DELST=Y(NETA)-DUM3	B11A 208
2157	REDELST=DUM1*DELST	B11A 209
2158	THENGY=(DUM3*G(1,NETA)-C89/ALPH*XG(5))/(G(1,NETA)-G(1,1))	B11A 210
2159	RETHEN=DUM1*THENGY	B11A 211
2160	THMOM=DUM3-C89/ALPH*XM(5)/ALPH	B11A 212
2161	RETHMO=DUM1*THMOM	B11A 213
2162	DELBD=Y(NETA)-C89/ALPH*F(1,NETA)	
2163	THCOND=CPBAR(1)/RHO(1)*RHOE(IS)/G(2,1)*C89*(T(NETA)-T(1))	B11A 215
2164	BLOW=DUM2/CH	B11A 216
2165	207 BLOWPG=DER(1)/CH	B11A 218
2166	BLOWCH=DER(2)/CH	B11A 219
2167	IF(NSPM1) 2074,2074,2070	
2168	2070 DO 2071 I=1,NSP	
2169	THELEM(I)=0.	B11A 221
2170	DUZ=0.	
2171	DO 2072 K=1,NSP	B11A 223
2172	DUZ=DUZ+(DUM3*SP(1,NETA,K)-C89/ALPH*XSP(5,K))/WTM(K)*CIJ(I,K)	
2173	2072 THELEM(I)=THELEM(I)+(SP(1,NETA,K)-SP(1,1,K))/WTM(K)*CIJ(I,K)	B11A 226
2174	CM(I)=VJKW(I)/(THELEM(I)*WAT(I))	
2175	2071 THELEM(I)=DUZ/THELEM(I)	
2176	2074 IF(KQ(9)) 2075,2078,2075	
2177	2075 COSOR=-TVCC(IS)/VMUE(IS)*0.5/G3*FLOAT(KQ(9))	
2178	DO 2076 I=1,NETA	
2179	Y(I)=TVCF(Y(I))	
2180	2076 DUDS(I)=DUDS(I)*(1.+COSOR*Y(I))	
2181	DELST=TVCF(DELST)	
2182	DELBD=TVCF(DELBD)	
2183	THMOM=TVCF(THMOM)	
2184	THENGY=TVCF(THENGY)	
2185	DO 2077 K=1,NSP	
2186	2077 THELEM(K)=TVCF(THELEM(K))	
2187	2078 CONTINUE	
2188	WRITE(KOUT,18) (ATA(K),ATB(K),K=1,NSP)	B11A 228
2189	WRITE(KOUT,3) CF,CH,BLOWPG,BLOWCH,BLOW,(CM(I),I=1,NSP)	B11A 229
2190	WRITE(KOUT,12)	B11A 232
2191	WRITE(KOUT,4) (ATA(K),ATB(K),K=1,NSP)	B11A 233
2192	WRITE(KOUT,20) THMOM,DELST,DELBD,THENGY,DUM1,(THELEM(K),K=1,NSP)	
2193	209 WRITE(KOUT,5)	B11A 238
2194	WRITE(KOUT,6)	B11A 239
2195	DO 183 I=1,NETA	B11A 240
2196	C COMPUTE TRUE VALUES OF F(I,J) AND ETA	B11A 241
2197	DER(1)=F(1,I)	
2198	DER(2)=F(2,I)/ALPH	
2199	DER(3)=F(3,I)/DUM4	
2200	DER(4)=DUDS(I)	
2201	DER(5)=G(1,I)	
2202	DER(6)=G(2,I)/ALPH	
2203	DER(7)=G(3,I)/DUM4	
2204	RETA=ETA(I)*ALPH	

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2205      DER(8)=5.814E+12*PE(IS,IT)/SQRT(T(I)/1.8)
2206 183 WRITE(KOUT,3) Y(I),RETA,(DER(J),J=1,7),
2207      1 H(I),T(I),DER(8)
2208      WRITE(KOUT,12)
2209 216 WRITE(KOUT,7)
2210      DO 184 I=1,NETA
2211      COND=CPBAR(I)/PR(I)*VMU(I)
2212      GMR(I)=ABS(GMR(I))
2213      ACH=F(2,I)/ALPH*UE(IS)/SQRT(GMR(I)/VMU(I)*T(I)*49732.)
2214 184 WRITE(KOUT,3)Y(I),RHO(I),VMU(I),CAPC(I),CPBAR(I),COND,PR(I),SC(I),
2215      1 VMU(I),EPSA(I),ACH
2216      IF (KR(7).EQ.1) GO TO 193
2217      WRITE(KOUT,13)(Y(I),I=1,NETA)
2218      WRITE(KOUT, 8)
2219      DO 201 K=1,NSP
2220      WRITE (KOUT,14) MOA(K),MOB(K),(SP(1,I,K),I=1,NETA)
2221      WRITE (KOUT,15)(SP(2,I,K),I=1,NETA)
2222 201 WRITE (KOUT,15)(SP(3,I,K),I=1,NETA)
2223      IF (NSPM1) 2041,2041,2040
2224 2040 DO 204 K=1,NSPM1
2225      DO 204 I=1,NETA
2226      SP(2,I,K)=SP(2,I,K)*ALPH
2227      204 SP(3,I,K)=SP(3,I,K)*DUM4
2228 2041 CONTINUE
2229      WRITE (KOUT,16)
2230      DO 196 J=1,NSPEC
2231      196 WRITE(KOUT,14) MOA(J),MOB(J),(FR(J,I),I=1,NETA)
2232      IF(KR(9).EQ.3.OR.KR(9).EQ.4) WRITE(KOUT,17) MOA(ISU),MOB(ISU)
2233      193 CONTINUE
2234      325 WALLQ=-WALLQ*C3
2235      RETURN
2236      END
2237
2238 08118 SUBROUTINE FELTRU
2239      DIMENSION HIW( 71,3),VKIE( 71),VKIW( 71),ZIE( 71),ZIW( 71),
2240      1ZIESTR( 71),ZIWSTR( 71),ZKWSRT( 9),ZKESRT( 9),ZKWSTT( 9),ZKESTT( 9),
2241      2),ZISDIF( 71),ZKDIF( 9),ZKTDIF( 9),CMK( 9)
2242      DIMENSION CIJ( 71,1)
2243      COMMON/BLQCOM/ MOA( 71), MOB( 71),NSPEC,FR( 71,15),W(3),LEF(10)
2244      1,LEFS(10),PIEASE,LEFW(10),L2,L3
2245      COMMON/COECON/ CK1( 8),CK2( 8),CK3( 8),CK4( 8),CK5( 8),CK6( 8)
2246      1,CK7( 8),CK8( 8),CK9( 8),CK10( 8),CK11( 8),CK12( 8),CK13( 8)
2247      2,CK14( 8),CK15( 8),CK16( 8),CK17( 8),CK18( 8),CK19( 8),CK20( 8)
2248      3,CK21( 8),CK22( 8),CKK1( 8, 8),CKK2( 8, 8),XH(5),XG(5),XSP(5, 9)
2249      4,CKK3( 8, 8)
2250      COMMON/CRBCOM/HCARB,EMIS,STEF,ADUM,BDUM,CDUM,HTEF,HMAT,EMISC,EMIST
2251      1,HPG,ASU(3),BSU(3),HPYG(3),HCHAR(3),EMIV(3),KS(40),ISU
2252      COMMON/EDGCOM/ PE(40, 1),PTE(40, 1),SPE( 8,40, 1),QUES,
2253      1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDEGE,D2UEDEGE,VMUE,HE,C90
2254      2,DSIP(40),IDSIP,TTVC,TVCC(40)
2255      COMMON/EPSCOM/ELCON,YAP,CLNUM,SCT,PRT,RED,DVS,RHCVS,PI,PIM,CL,
2256      1 EPSA(15),EPS1,EL(15),DPI(15,2),DEPC,YREF,RETR,VINTR(15)
2257      COMMON/EQPCOM/ RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2),
2258      1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),WAT(10),
2259      2 KAT(10),IR(10),IZ,KZ(10),LAMI( 71),P,Z,TK(10, 7),VN( 71),
2260      3 VNU( 71,10),ITFF,KR2,HCH,NCV,WM,WTN( 71),YYY( 71),YW( 71),GG( 71)
2261      4, TQ(10, 7),EPQVRK,SIGMA,2ASHOL
2262      COMMON/EQTCOM/SIP,HIF,EEL,EENL,FLIQ,CPF,IRE,IER,AA,IITS,IN,IL,IIT,

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2263	1 MODE, HMELT, SMELT, TMAX, TMIN, MELT, SUMN, SUML, WS, WSS, BX, ISP2, ISPO,	B11B	27
2264	2 ISP, KKJ, SVA, SVD, SVC, SVO, SUNC, FFF, CMF, EP, RV, IFCJC, WTC, WTL, JC, HHG,	B11B	28
2265	3 CCPG, TTMIN, TTMAX, L7, L8, IB(11), EB(10), EBL(10), A(16,16), BB(16),	ENTR-MOD	
2266	4 IP(71), ALP(10), FNU(10), GAMH(10), GAMF(10), SLAM(10), DY(71), RVS,	B11B	30
2267	5 CP(71), HH(71), SB(71), TC(71), VLNK(71), E(71), PNUS(10),	B11B	31
2268	6 BC(10), BLNK(10), BY(10), IBC(10), BE(10), JZ(4)	B11B	32
2269	COMMON/ETACOM/ETA(15), DETA(15), DSQ(14), DCU(14), B1(14), B2(14)	B11B	33
2270	1, LAR(153), BA1(43,18), BA2(30,15)	B11B	34
2271	COMMON/FLXCOM/DELQH, DELJW(8), DONL(153), DJNL(153, 8), WALLQ	B11B	35
2272	1, WALLJ(8), QW, VJKW(9), TPWALL	B11B	36
2273	COMMON/HISCOM/C1, C2, C3, C4, ALPHD, BETA, ZH(4,14), ZG(4,14), ZSP(4,14,	B11B	37
2274	1), XI(40), HF(15,5), HG(15,3), HSP(15,3, 8), HALPH, HUE, HHUE, HFW, DLX2	B11B	38
2275	2, C3M(40), BETAM(40)	B11B	39
2276	COMMON/INICOM/ KR(20), KIN, KOUT, MAT1I, MAT2I, MAT1J, MAT2J, NETA, I, IS, NB11B	40	
2277	1S, IT, NTIME, NSP, NSPM1, NAM, NLEQ, NNLEQ, NRNL, ITS, KAPPA, CBAR, CASE(15)	B11B	41
2278	2, B(8), MWE, NON, KQ(10), ITEM, NITEM, KR17, NBT, NBT2, IDENT, KR9(40)	B11B	42
2279	3, KAUXO, JTIME, JSPEC, MO(3)	B11B	43
2280	COMMON/OUTCOM/Y(15), RES, DELST, THENGY, THMOM, CH, BLOW, SHEAR, CF, SHAPE	B11B	44
2281	1, CM(9), THELEM(9)	B11B	45
2282	COMMON/PRMCOM/TIME(50), PRE(40), PTET(50), GE(50), S(40), ROKAP(40)	B11B	46
2283	1, RNOSE, VKAP, NOISC, IDISC(40), NSD(10), MSD(10), ITF(50), IPRE, RADNO,	B11B	47
2284	2CONE, RADFL(50), RADR(40), RADSD(40), IRAD	B11B	48
2285	COMMON/PRPCOM/PR(15), T(15), RHO(15), SC(15), CAPC(15), QR(15), H(15)	B11B	49
2286	1, CPBAR(15), VMW(15), PHIK(15, 8), DRHOH, DRHOK(8), ZK(8), DZKH(8),	B11B	50
2287	2MU3K(8), DMU4K(8), DTK(8), DPHIKH(8), DPRK(8), DSCK(8), DCAPCK(8)	B11B	51
2288	3, DHTILK(8), DQRK(8), DCPBK(8), DCPTK(8), DMU12K(8), DZKK(8, 8)	B11B	52
2289	4, DPHIKK(8, 8), DMU4H, DMU3H, DHTILH, VMU12, CT, CTR, CPTIL, HTIL	B11B	53
2290	5, VMU3, DTH, DCAPCH, DPRH, DSCH, DQRH, DCPBH, DCPTH, DMU12H, VMU(15),	B11B	54
2291	6(15), PHIKP(15), HP, TP, ZKP(8), VMU3P, VMU4P, HTILP, CRHO(14), GMR(15)	B11B	55
2292	COMMON/TEMCOM/SPDUM(8), DER(40), DUMM1(15), SLOPE(15), REDUM(15)	B11B	56
2293	1, SDUM1(40), SDUM2(40), FWDUM(40), XICON(40), FWCON(40), FWINIT(1)	B11B	57
2294	2, XIINIT(1), DUUS(40)	B11B	58
2295	COMMON/VARCOM/F(4,15), G(3,15), SP(3,15, 9), ALPH	B11B	59
2296	COMMON/WALCOM/FW(40, 1), TW(40, 1), HW(40, 1), SPW(8,40, 1)	B11B	60
2297	1, RHQVW(40, 1), FLUXJ(3,40, 1), IHW, ITW, IFW, ISPW, IRHOVW, IFLUXJ	B11B	61
2298	DIMENSION GAM(10), TWC(3), SHWFP(3), SHWFE(3), SDPTIL(3), SDCP(3), CHA(3)	B11B	
2299	1, CME(3), CHE(3), RAT1(3), RAT2(3), RAT3(3), TITL(3), QCHEM(3)	B11B	
2300	EQUIVALENCE (VNU, CIJ)	B11A	037
2301	310 FORMAT(A2,3I2,1P6E12.5)	B11A	131
2302	312 FORMAT(A2,3I2,1P6E12.5/(8X,1P6E12.5))	B11A	132
2303	313 FORMAY (A2,6X,18A4/(20A4))	B11A	133
2304	316 FORMAT(E12.4,3X3A6,2X2A4,3X13HMASS FRACTION /(35X2A4))	RDG	
2305	317 FORMAT(40I2)	RDG	
2306	318 FORMAT(E12.4,3X3A6,2X2A4,3X13HMOLE FRACTION)	RDG	
2307	319 FORMAT(3(13X9(2H**),14HNON-CONVERGENT 9(2H**)/))	RDG	
2308	320 FORMAT(F12.4,3X3A6,2X11A4)	RDG	
2309	321 FORMAT(5X65(1H*)/20X27HFOLLOWING CARDS FOR RESTART)	RDG	
2310	322 FORMAT(5X65(1H*)/10X27HFOLLOWING -NTH SPECIES DATA/5X65(1H*))	RDG	
2311	323 FORMAT(5X65(1H*)/30X17HEND RESTART CARDS)	RDG	
2312	324 FORMAT(5X65(1H*)/30X21HFOLLOWING SPECIE DATA/5X65(1H*)/E12.4,3X3ARDG	RDG	
2313	16,2X11A4)	RDG	
2314	325 FORMAT(3E10.3,5X,15,22X,3A6)	ENTR-MOD	
2315	481 FORMAT(/38X43HELEMENTAL MASS TRANSPORT DRIVING POTENTIALS//19X 7HRDG		
2316	1ELEMENT 5X8HZKETILDA0X8HZKWTILDA7X10HDIFFERENCE5X11HMOLE-ZKETIL5X1RD		
2317	21HMOLE-ZKWTIL 5X10HDIFFERENCE/(4X15,9X2A4,6(3X1PE12.4)))	RDG	
2318	482 FORMAT(/9XA4,2X0PFF.0,2X7(2X1PE12.4))	RDG	
2319	483 FORMAT(/10X3HAVG3X4HBASE 9X3HCHE11X3HCHE 9X7HCHE/CHE	RDG	
2320	19X8HRATIO-CH 6X8HRATIO-CH 8X)	RDG	

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2321      23HCHL10X5HQCHEM/16X4HTEMP//)                                RDG
2322      490 FORMAT(1H148X24HUNEQUAL DIFFUSION OUTPUT///17X20HDIFFUSIVE HEAT FLRDG
2323      1UX=1PE12.4,11X9HBASE TEMP16X5HSHBFE16X6HSHDBFE/3(61X0PF6.0,14X2(1PRCG
2324      1E12.4,10X)/)                                                    RDG
2325      2)///2X2(6HSPECIE10X8HENTHALPY33X)/2(10X3HTE=0PF6.0,6X3HTB=F6.0,6X3RDG
2326      3HTB=F6.0,10X)                                                    RDG
2327      4      //(3X2A4,2X3(      2X1PE12.4),13X2A4,2X3(2X1PE12.4)))    RDG
2328      491 FORMAT (1H142X33HEQUAL DIFFUSION ADDITIONAL OUTPUT ///10X6HSPECIE3RDG
2329      10X8HENTHALPY24X9HWALL MASS 8X9HEDGE MASS/27X3HTB=F6.0,9X3HTB=F6.0,RDG
2330      29X3HTB=F6.0, 8X8HFRACTION9X8HFRACTION                          RDG
2331      3      //(11X2A4,5(5X1PE12.4)))                                  RDG
2332      492 FORMAT(///10X9HBASE TEMP8X9HRHO UE CH  X8HRATIO-CP10X8HRATIO-CH11X5RDG
2333      2HCM/CH11X5HQCHEM//(11X0PF6.0,3X5(5X1PE12.4)))                RDG
2334      494 FORMAT(      //42X36HGAMMA DEPENDENT TRRDG
2335      1ANSPORT PROPERTIES//55X 6HGAMMA=F4.2///48X23HFILM DRIVING POTENTIALRDG
2336      2LS//2X2(      6HSPECIE10X6HZIESTR10X6HZIWSTR6X10HDIFFERENCE11X)///(3X2RDG
2337      3A4,2X3(2X1PE12.4),13X2A4,2X3(2X1PE12.4)))                      RDG
2338      496 FORMAT(///47X9HBASE TEMP16X5HSCMDP//3(48X0PF6.0,12X1PE12.4)///35X9HRDG
2339      3LEWIS-2/34X6HSMOIF1                                             RDG
2340      2      6X6HSMOIF2 6X 6HSUMZDF//32X4(1PE12.4)                    RDG
2341      1      //46X36HELEMENTAL MASS TRANSPORT COEFFICIENT //          RDG
2342      249X7HELEMENT10X14H RHOE UE CM(K)/                                RDG
2343      4      (/ 34X15,9X2A4,1(10X1PE12.4)))                          RDG
2344      497 FORMAT(///(20X2I5,5X1PE12.4))                                RDG
2345      498 FORMAT(E12.4,1X3A6,1X4(1PE12.4)/(2X,2A4,5X1PE12.4))        RDG
2346      499 FORMAT(E12.4,3X3A6,2I5,2(1PE12.4))                        RDG
2347      514 FORMAT(E12.4,3X3A6,2X3I5/(8(1PE10.4)))                      RDG
2348      515 FORMAT(8E10.3)                                                ENTR-MOD
2349      516 FORMAT(E12.4,1X3A6,1X4(1PE12.4)/6X6(1PE12.4))              RDG
2350      517 FORMAT(///31X2HCM15X3HCHL11X6HCM/CHL11X5HQWALL//19X4(5X(1PE12.4))//RDG
2351      1)                                                                RDG
2352      518 FORMAT(27X9HBASE TEMP10X5HSCMDP12X5HSHBFE11X6HSHDBFE//(30X0PF6.0,3RDG
2353      1(5X1PE12.4)))                                                    RDG
2354      DATA GAM(1),GAM(2),GAM(3),GAM(4),GAM(5),GAM(6),GAM(7),NGAM/0.0,0.2RDG
2355      1,0.4,0.6,0.8,1.0,1.5,7//                                       RDG
2356      DATA TITL(1),TITL(2),TITL(3)/4HMEAN,4HMASS,4HMOLE /           RDG
2357      DATA IFG/2HFG/,IBO/2HBO/                                         RDG
2358      DATA IBLANK/2H /                                                  RDG
2359      NUL=0
2360      WALLQ=-WALLQ/C3
2361      VLEX=(PR(1)/SC(1))* (2./3.)
2362      RERAD = (.481E-12) * (T(1))**4. * EMIS
2363      DUM1 = RHOE(IS)*UE(IS)/VMUE(IS)
2364      DUM2 = RHOVM(IS,IT)/C3
2365      TIME0=ABS(TIME(ITEM) )
2366      IF(NON) 621,622,611
2367      621 IF(JTIME) 611,405,405
2368      622 IF(IDENT-IBLANK) 194,309,194
2369      194 IF(IDENT-IFG) 308, 607,308
2370      611 PUNCH 319
2371      GO TO 607
2372      308 DUM3=RHOE(IS)*UE(IS)                                             B11A 279
2373      DUM4=-1./C3                                                         B11A 279
2374      PUNCH 320,TIME0,MD, (CASE(I),I=1,11)
2375      L=0                                                                  B11A 280
2376      PUNCH 310,IDENT,L,IS,ITEM,RAONO,CONE,GE(ITEM),PTET(ITEM),S(IS),  B11A 281
2377      1 TIME(ITEM)                                                         B11A 282
2378      IF (IS+ITEM-2) 315,314,315                                         B11A 283

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2379 314 PUNCH 313, IDENT, (MOA(J), MOE(J), J=1, NSPEC), (ATA(J), ATB(J), J=1, NSP) B11A 284
2380 315 L=1 B11A 285
2381 PUNCH 310, IDENT, L, IS, ITEM, DUM2, T(1), PE (IS, 1), BLOW, CH, CF B11A 286
2382 L=2 B11A 287
2383 PUNCH 310, IDENT, L, IS, ITEM, WALLQ, DER(3), RERAD
2384 L=3 B11A 289
2385 PUNCH 310, IDENT, L, IS, ITEM, DUM4, DUM3, DUM1, UE (IS), PR(1), SC(1) B11A 290
2386 L=4 B11A 291
2387 PUNCH 310, IDENT, L, IS, ITEM, CAPC(1), SHEAR, DELST, THMOM, SHAPE, THENGY B11A 292
2388 IF (KR(7)) 309, 311, 309 B11A 293
2389 311 L=5 B11A 294
2390 PUNCH 310, IDENT, L, IS, ITEM, (VJKH(J), J=1, NSP) B11A 295
2391 L=6 B11A 296
2392 PUNCH 310, IDENT, L, IS, ITEM, ( CM(J), J=1, NSP) B11A 297
2393 L=7 B11A 298
2394 PUNCH 310, IDENT, L, IS, ITEM, (THELEM(J), J=1, NSF) B11A 299
2395 L=8 B11A 300
2396 PUNCH 312, IDENT, L, IS, ITEM, (FR(J, 1), J=1, NSPEC) B11A 301
2397 L=9 B11A 302
2398 PUNCH 312, IDENT, L, IS, ITEM, (FR(J, NETA), J=1, NSPEC) B11A 303
2399 IF (IDENT-IBO) 606, 607, 606
2400 606 IF (IDENT-IFG) 608, 607, 608
2401 607 IF (IDISC(IS)) 608, 608, 609
2402 609 PUNCH 320, TIMEO, MD, (CASE(I), I=1, 11)
2403 PUNCH 514, TIMEO, MD, NSP, NSPEC, NETA, (Y(I), I=1, NETA)
2404 PUNCH 316, TIMEO, MD, (MOA(K), MOB(K), K=1, NSP)
2405 PUNCH 321
2406 ALSQ=ALPH*ALPH
2407 DER(1)=F(3, 1)/ALSQ
2408 PUNCH 325, ALPH, F(1, 1), DER(1), IS, MD
2409 DO 603 J=1, NETA
2410 603 DER(J)=F(2, J)/ALPH
2411 PUNCH 515, (DER(J), J=1, NETA)
2412 DO 601 K=NUL, NSPM1
2413 DER(1)=SP(2, 1, K)/ALPH
2414 601 PUNCH 515, DER(1), (SP(1, J, K), J=1, NETA)
2415 PUNCH 317, (LEF(K), K=1, NSP)
2416 PUNCH 323
2417 608 IF (NON) 405, 309, 405
2418 309 IF (JSPEC) 624, 623, 624
2419 624 PUNCH 324, TIMEO, MD, (CASE(I), I=1, 11)
2420 PUNCH 514, TIMEO, MD, NSP, NSPEC, NETA, (Y(I), I=1, NETA)
2421 DO 602 J=1, NSPEC
2422 PUNCH 318, TIMEO, MD, MOA(J), MOB(J)
2423 602 PUNCH 515, (FR(J, I), I=1, NETA)
2424 623 GO TO (405, 404, 404, 404), KAUXO
2425 404 TWC(1)=T(1) / 1.8
2426 TWC(3)=T(NETA) / 1.8
2427 TWC(2)=(TWC(1)+TWC(3)) / 2.0
2428 SOP(1)=0.
2429 SOP(2)=0.
2430 SOP(3)=0.
2431 SUME=0.
2432 SUMW=0.
2433 SUMZIE=0.0
2434 SUMZIW=0.0
2435 DO 1001 LT=1, 3
2436 TB = TWC(LT)-3000.0

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2437      TCC=(TWC(LT)+3000.0)/2.0
2438      TO = TWC(LT)* 3000.0
2439      SHWFE (LT)= 0.0
2440      SHWFP(LT)=0.0
2441      DO 400 I=1,NSPEC
2442      IF(IFC(I)) 419,418,419
2443      419 IF(IABS(IFC(I)) - 3) 420,418,420
2444      420 ZTW(I)=0.0
2445      ZIE(I)=0.0
2446      GO TO 400
2447      418 VKIE(I) = WTM(I) * FR(I,NETA)/VMW(NETA)
2448      VKIW(I) = WTM(I) * FR(I,1)/VMW(1)
2449      IF(TU(I,1)-TWC(LT)) 401,402,402
2450      401 KT=2
2451      GO TO 403
2452      402 KT=1
2453      403 HIW(I,LT)=(RB(I,KT)+TB*(RC(I,KT)+RD(I,KT)*TCC+RE(I,KT
2454      1)/TD))* 1.8/WTM(I)
2455      SDP(LT) = SDP(LT) + (VKIE(I)-VKIW(I)) * HIW(I,LT)
2456      SHWFP(LT)=SHWFP(LT)+VKIW(I)*(HIW(I,1)-HIW(I,LT))
2457      SHWFE(LT) = SHWFE(LT) + HIW(I,LT) * VKIE(I)
2458      GO TO (400,406,406,400),KAUX0
2459      406 ZIE(I)=VKIE(I)*VMW(NETA)/FF(I)
2460      SUMZIE=SUMZIE + ZIE(I)
2461      ZIW(I) = VKIW(I)*VMW(1)/FF(I)
2462      SUMZIW = SUMZIW + ZIW(I)
2463      400 CONTINUE
2464      1001 CONTINUE
2465      IF(KAUX0-4) 408,417,405
2466      417 CHL=CM(NSP)/VLEX
2467      DO 1417 LT=1,3
2468      QCHEM(LT)=WALLQ-CM(NSP)*SDP(LT)-CHL*(G(1,NETA)-SHWFE(LT)-SHWFP(LT)
2469      1)
2470      CHA(LT) = (WALLQ-CM(NSP) * SDP(LT))/(G(1,NETA)-SHWFE(LT)-SHWFP(LT)
2471      1)
2472      RAT1(LT)=SDP(LT)/WALLQ*CM(NSP)
2473      RAT2(LT)=(G(1,NETA)-SHWFE(LT)-SHWFP(LT))/WALLQ*CHA(LT)
2474      1417 RAT3(LT)=CM(NSP)/CHA(LT)
2475      WRITE (KOUT,491) (TWC(LT),LT=1,3), (MOA(I),MCB(I),(HIW(I,LT),LT=1,3
2476      1),VKIW(I),VKIE(I),I=1,NSPEC)
2477      CMCHL=CM(NSP)/CHL
2478      WRITE(KOUT,517) CM(NSP),CHL,CMCHL, WALLQ
2479      WRITE(KOUT,518) (TWC(LT),SDP(LT),SHWFE(LT),SHWFP(LT),LT=1,3)
2480      WRITE (KOUT,492) (TWC(LT),CHA(LT),RAT1(LT),RAT2(LT),RAT3(LT),CCHM(
2481      1LT),LT=1,3)
2482      GO TO 405
2483      408 DO 409 I=1,NSPEC
2484      ZIE(I) = ZIE(I) / SUMZIE
2485      ZIW(I) = ZIW(I)/SUMZIW
2486      SUME=SUME+ZIE(I)
2487      409 SUMW=SUMW+ZIW(I)
2488      PUNCH 320,TIME0,MD, (CASE(I),I=1,11)
2489      PUNCH 499,TIME0,MD,NGAM,NSP,PE(15,IT),M(NETA)
2490      WRITE(KOUT,490) WALLQ, (TWC(LT),SHWFE(LT),SHWFP(LT),LT=1,3), (TWC(LT
2491      1),LT=1,3), (TWC(LT),LT=1,3), (MOA(I),MOB(I),
2492      2(HIW(I,LT),LT=1,3),I=1,NSPEC)
2493      ISP=IZ+1
2494      DO 410 L=1,NGAM

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2495      SUME=0.
2496      SUMH=0.
2497      SUMZIE=0.0
2498      SUMZIH=0.0
2499      BETS= 1-GAM(L)
2500      DO 411 I=1,NSPEC
2501      ZIESTR(I)=ZIE(I) ** GAM(L) * VKIE(I) ** BETS
2502      ZIWSTR(I)=ZIM(I) ** GAM(L) * VKIM(I) ** BETS
2503      SUMZIE=SUMZIE+ZIESTR(I)
2504 411 SUMZIH=SUMZIH + ZIWSTR(I)
2505      SDPTIL(1) = 0.0
2506      SDPTIL(2) = 0.0
2507      SDPTIL(3) = 0.0
2508      CMKA=0.0
2509      CMKB=0.0
2510      SUMELT = 0.0
2511      SUMSDF=0.0
2512      DO 414 I=1,NSPEC
2513      ZIESTR(I) = ZIESTR(I)/SUMZIE
2514      ZIWSTR(I)=ZIWSTR(I) / SUMZIH
2515      ZISDIF(I)=ZIESTR(I)-ZIWSTR(I)
2516      SUMSDF=SUMSDF+ZISDIF(I)
2517      DO 414 LT=1,3
2518 414 SDPTIL(LT) = SDPTIL(LT) +(ZIESTR(I)-ZIWSTR(I)) * HIW(I,LT)
2519      SMDIF1=0.0
2520      SMDIF2=0.0
2521      DO 413 KK=1,NSP
2522      IF (LEF(KK)-0) 416,416,415
2523 416 CMK(KK)=0.0
2524      GO TO 413
2525 415 ZKESRT(KK)=0.0
2526      ZKWSRT(KK)=0.0
2527      ZKESTT(KK)=0.0
2528      ZKWSTT(KK)=0.0
2529      DO 421 I=1,NSP
2530      BETS=CIJ(KK,I)/WTM(I)*WAT(KK)
2531      ZKESRT(KK)=ZKESRT(KK)+BETS*ZIESTR(I)
2532 421 ZKWSRT(KK)=ZKWSRT(KK)+BETS*ZIWSTR(I)
2533      DO 412 I=ISP,NSPEC
2534      DO 412 K=1,NSP
2535      BETS=VNU(I,K)*CIJ(KK,K)/WTM(I)*WAT(KK)
2536      ZKESRT(KK) = ZKESRT(KK) + BETS * ZIESTR(I)
2537 412 ZKWSRT(KK)=ZKWSRT(KK) + BETS*ZIWSTR(I)
2538      ZKDIF(KK)=ZKESRT(KK)-ZKWSRT(KK)
2539      SMDIF1=SMDIF1+ABS(ZKESRT(KK)-ZKWSRT(KK))
2540      ZKESTT(KK)=ZKESRT(KK)/WAT(KK)*VMH(META)
2541      ZKWSTT(KK)=ZKWSRT(KK)/WAT(KK)*VMH(1)
2542      ZKTDIF(KK)=ZKESTT(KK)-ZKWSTT(KK)
2543      SMDIF2=SMDIF2+ABS(ZKESTT(KK)-ZKWSTT(KK))
2544      CMK(KK)=VJAW(KK)/(ZKESRT(KK)-ZKWSRT(KK))
2545      CMKA=CMKA+CMK(KK)
2546      SUMELT=SUMELT + 1.0
2547 413 CONTINUE
2548      WRITE(KOUT,494) GAM(L),( MCA(I),MOB(I),ZIESTR(I),ZIWSTR(I),ZISDIF
2549      1(I),I=1,NSPEC)
2550      WRITE(KOUT,491) (K,ATA(K),ATB(K),ZKESRT(K),ZKWSRT(K),ZKDIF(K),ZKES
2551      1TT(K),ZKWSTT(K),ZKTDIF(K),K=1,NSP)
2552      WRITE(KOUT,496) (TMO(LT),SDPTIL(LT),LT=1,3),VLEX,SMDIF1,SMDIF2,SUMS

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2553      1DF,(K,ATA(K),ATB(K),CHK(K),K=1,NSP)
2554      WRITE(KOUT,483)
2555      DO 680 LL=1,3
2556      CME(LL)=0.0
2557      GO TO (643, 645,646),LL
2558      643 CME(LL)=CMKA/SUMELT
2559      GO TO 647
2560      645 DO 667 K=1,NSP
2561      IF (LEF(K)) 667,667,666
2562      666 CME(LL)=CME(LL)+ABS(VJKH(K) )
2563      667 CONTINUE
2564      CME(LL)=CME(LL)/SHOIF1
2565      GO TO 647
2566      646 DO 668 K=1,NSP
2567      IF (LEF(K)) 668,668,665
2568      665 CME(LL)=CHK(K)*ABS(ZKESIT(K)-ZKMSTT(K)) +CME(LL)
2569      668 CONTINUE
2570      CME(LL)=CME(LL)/SHOIF2
2571      647 CHL=CME(LL)/VLEX
2572      DO 1009 LT=1,3
2573      QCHEM(LL)=WALLQ-CME(LL)*SDPTIL(LT) -CHL*(G(1,NETA)-SHWFE(LT)-SHWF
2574      1P(LT))
2575      CHE(LL)=(WALLQ-CHE(LL) * SDPTIL(LT))/(G(1,NETA)-SHWFE(LT)-SHWFP(LT
2576      1))
2577      RAT1(LL)= SDPYIL(LT)/WALLQ*CME(LL)
2578      RAT2(LL)= (G(1,NETA) -SHWFE(LT)-SHWFP(LT))/WALLQ*CME(LL)
2579      RAT3(LL)=CME(LL)/CHE(LL)
2580      WRITE (KOUT,482)TITL(LL),TMC(LT), CME(LL),CHE(LL),RAT3(LL),
2581      1RAT1(LL),RAT2(LL),CHL,QCHEM(LL)
2582      IF (IDENT-IBLANK) 1410,1009,1410
2583      1410 PUNCH 516,TIMEO,MO,PE(15,IT),H(NETA),GAM(L),CHE(LL),CHE(LL),RAT3(L
2584      1L),RAT1(LL),RAT2(LL),CHL,QCHEM(LL)
2585      1009 CONTINUE
2586      680 CONTINUE
2587      IF (IDENT-IBLANK) 1411,410,1411
2588      1411 PUNCH 498,TIMEO,MO,PE(15,IT),H(NETA),GAM(L),CHE(1),(ATA(K)-ATB(K),
2589      1CMK(K),K=1 ,NSP)
2590      410 CONTINUE
2591      405 WALLQ=-WALLQ*03
2592      RETURN
2593      END
2594      CB128
2595      SUBROUTINE IMONE
2596      COMMON/COECOM/ C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15,B128 3
2597      1,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C31,CB128 4
2598      232,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C48,B128 5
2599      3,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,CB128 6
2600      465,C66,C67,C68,C69,C70,C71,C72,C73,C74,C75,C76,C77,C78,C79,C80,C81,B128 7
2601      5,C82,C83,C84,C85,C86,C87,C88 B128 8
2602      COMMON/COECOM/ CK1( 8),CK2( 8),CK3( 8),CK4( 8),CK5( 8),CK6( 8) B128 9
2603      1,CK7( 8),CK8( 8),CK9( 8),CK10( 8),CK11( 8),CK12( 8),CK13( 8) B128 10
2604      2,CK14( 8),CK15( 8),CK16( 8),CK17( 8),CK18( 8),CK19( 8),CK20( 8) B128 11
2605      3,CK21( 8),CK22( 8),CKK1( 8, 8),CKK2( 8, 8),XN(5),XG(5),XSP(5, 9) B128 12
2606      4,CKK3( 8, 8) B128 13
2607      COMMON/ERRCOM/FLE( 43),GLE(30),SPLE(30, 8),ELA(313),FLEN,GLEN B128 14
2608      1,SPLEN( 8),ELN(16),ELMN,IFLN,IGLN,ISPLN( 8),NELN,ILMN,DFL(43) B128 15
2609      2,DGL(30),DSPL(30, 8),FNLE(18),GMLE(15),SPNLE(15, 8),EML(153) B128 16
2610      3,FNLEN,GMLEN,SPNLEN( 8), ENLMN,IFNLM,IGNLM,ISPMLN( 8) B128 17

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2611      4,NEWLM,INLMM,DFNL(18),DGNL(15),DSPNL(15,8),DRNL(10)      8128 18
2612      COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCJ(14),B1(14),B2(14)      8128 19
2613      1,LAR(153),BA1(43,18),BA2(30,15)      8128 20
2614      COMMON/HISCOM/C1,C2,C3,C4,ALPHO,BETA,ZH(4,14),ZG(4,14),ZSP(4,14),      8128 21
2615      1),XI(40),HF(15,5),HG(15,3),HSP(15,3,8),HALPH,HUE,HMUE,HFN,OLX2      8128 22
2616      2,CJM(40),BETAM(40)      8128 23
2617      COMMON/INTCOM/ KR(20),KLN,KOUT,MAT1I,MAT2I,PAT1J,MAT2J,META,I,IS,M      8128 24
2618      1S,IT,NTIME,NSP,NSPM1,NAH,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15)      8128 25
2619      2,B(8), MHE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40)      8128 26
2620      3,KAUXO,JTIME,JSPEC,MO(3)      8128 27
2621      COMMON/NONCOM/AM(153,153),DVNL(153),TCM,      8128 28
2622      1VLNKH,OLPH(9),OLPK(8,9),DTHW,DTKH(8),FLXJB(9)      8128 29
2623      COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),M(15)      8128 30
2624      1,CPBAR(15),VMH(15),PHIK(15,8),ORNOH,DRHOK(8),ZK(8),DZKH(8),      8128 31
2625      2MUJK(8),DMU4K(8),DTK(8),OPHKH(8),CPRK(8),DSCK(8),DCAPCK(8)      8128 32
2626      3,DHTILK(8),DQRK(8),DCPBK(8),DCPTK(8),DMU12K(8),DZKK(8,8)      8128 33
2627      4,DPHIKK(8,8), DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPYIL,HTIL      8128 34
2628      5,VMU3,DTH,DCAPCH,OPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15), RHO      8128 35
2629      6(15),PHIKP(15),HP,TP,ZKP(8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15)      8128 36
2630      COMMON/VARCOM/F(4,15),G(3,15),SP(3,15,9),ALPH      8128 37
2631      C EVALUATE GROUPINGS WHICH CONTRIBUTE TO (I-1) PORTION OF COEFFS      8128 041
2632      C VARIABLES WITH DIMENSION (META-1)      8128 042
2633      4000 CRHO(I-1)=C26*DETA(I-1)*(1.-C53/(1.0*DETA(I-1)))      8128 044
2634      C63=C6*CRHO(I-1)      8128 045
2635      IF (I-2) 4001,4002,4001      8128 052
2636      4002 XM(5)=0.      8128 053
2637      XG(5)=0.      8128 054
2638      IF (NSPM1) 401,401,4003      8128 055
2639      4003 DO 4034 K=1,NSPM1      8128 056
2640      4004 XSP(5,K)=0.      8128 057
2641      4001 CONTINUE
2642      C EVALUATE XM,XG,AND XSP (WHICH CONTRIBUTE TO ERRORS AND TO COEFFS      8128 065
2643      C AT (I) AND AT (I-1))      8128 066
2644      401 CALL TAYLOR (DETA(I-1),F(2,I-1),F(2,I),XM)      8128 067
2645      CALL TAYLOR (DETA(I-1),G(1,I-1),G(1,I),XG)      8128 068
2646      IF (NSPM1) 403,403,404      8128 069
2647      404 DO 414 K=1,NSPM1      8128 070
2648      414 CALL TAYLOR (DETA(I-1),SP(1,I-1,K),SP(1,I,K),XSP(1,K))      8128 071
2649      C EVAL PORTION OF NLE DEPENDENT CN XM,... AND GROUPINGS EVAL AT I-1      8128 072
2650      403 C72=F(2,I)*XM(1) +F(3,I)*XM(2) +F(4,I)*XM(3) +F(4,I-1)*XM(4)      8128 073
2651      XM(5)=XM(5)+C72      8128 074
2652      ENL(I+3)=-(-C43+C63/2.-C9*C72-2.*(F(2,I)*ZM(1,I-1)+F(3,I)*ZM(2      8128 076
2653      1,I-1)+F(4,I)*ZM(3,I-1)+F(4,I-1)*ZM(4,I-1)))      8128 076
2654      DUM1=F(2,I)*XG(1)+F(3,I)*XG(2)+F(4,I)*XG(3)+F(4,I-1)*XG(4)      8128 077
2655      XG(5)=XG(5)+DUM1      8128 078
2656      MPI=MAT1J+I
2657      ENL(MPI)=-(-C84+C2*DUM1-(F(2,I)*ZG(1,I-1)+F(3,I)*ZG(2,I-1)+F(4,I)*      8128 080
2658      23,I-1)+F(4,I-1)*ZG(4,I-1))-(G(1,I)*ZM(1,I-1)+G(2,I)*ZM(2,I-1)+G(3,I)      8128 081
2659      3I)*ZM(3,I-1)+G(3,I-1)*ZM(4,I-1)))      8128 082
2660      IF (NSPM1) 405,405,406      8128 085
2661      406 DO 407 K=1,NSPM1
2662      MPI=MPI+MAT2J
2663      DUM1=F(2,I)*XSP(1,K)+F(3,I)*XSP(2,K)+F(4,I)*XSP(3,K)+F(4,I-1)*      8128 087
2664      XSP(4,K)      8128 088
2665      XSP(5,K)=XSP(5,K)+DUM1      8128 089
2666      ENL(MPI)=-(-C822(K)+C2*DUM1-(F(2,I)*ZSP(1,I-1,K)+F(      8128 091
2667      23,I)*ZSP(2,I-1,K)+F(4,I)*ZSP(3,I-1,K)+F(4,I-1)*ZSP(4,I-1,K))-      8128 091

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2669      3,I,K)*ZH(1,I-1)+SP(2,I,K)*ZH(2,I-1)+SP(3,I,K)*ZH(3,I-1)+SP(3,I-1,KB128 092
2670      4)*ZH(4,I-1)))      B128 093
2671      407 CONTINUE
2672      C      EVAL PORTION OF ORIG COEFFS OF AN DEPENDENT UPON PARAM EVAL AT I-1B128 096
2673      C**** ESTABLISH INDICES ON VARIABLES
2674      405 NUL=0
2675      IFN=I-2
2676      IFP=I+2
2677      IFPP=NETA+I-3
2678      IFPPP=IFPP+NETA
2679      ISPN=I
2680      ISPP=I-1
2681      ISPPP=IFPP+2
2682      C**** MOMENTUM EQUATION CORRECTION COEFFICIENTS
2683      AM(I+3,1)=-C81+C87*DETA(I-1)
2684      AM(I+3,IFP)=-C74+C86*DETA(I-1)
2685      IF(I-2) 410,410,415
2686      410 AM(I+3,2)=-C73
2687      AM(I+3,3)=-C12
2688      GO TO 420
2689      415 CALL LIAD(-1,I+3,IFN,-C73)
2690      CALL LIAD(-1,I+3,IFPP,-C12)
2691      420 CALL LIAD(-1,I+3,IFPPP,-2.*(C9 * XM(4)+ZH(4,I-1)))
2692      LPI=ISPN+MAT1J
2693      DO 450 K=NUL, NSPM1
2694      IF(K) 425,425,430
2695      425 DUM1=C88*DETA(I-1)-C75
2696      DUM2=0.
2697      GO TO 435
2698      430 DUM1=CK13(K)*DETA(I-1)-CK17(K)
2699      DUM2=0.
2700      435 AM(I+3,LPI)=DUM1
2701      IF(I-2) 440,440,445
2702      440 AM(I+3,LPI-1) = DUM2
2703      GO TO 450
2704      445 CALL LIAD(K,I+3, ISPP, DUM2)
2705      450 LPI=LPI+MAT2J
2706      C**** ENERGY AND SPECIES EQUATIONS
2707      NPJ=MAT1J+I
2708      DO 535 K=NUL, NSPM1
2709      C* * ALF, F, FP, FPP, FPP ERROR DERIVITIVES ARE DUM1 TO DUM5. DUM6 TO
2710      C* * DUM8 ARE FLUX DERIVITIVES FOR ALF, FP, FPP.
2711      IF(K) 455,455,458
2712      C- - ENERGY EQUATIONS
2713      455 DUM1=-C82
2714      DUM2=-C76
2715      DUM3=-C77
2716      DUM4=-C78
2717      DUM6=C82
2718      DUM7=C77
2719      DUM8=C78
2720      GO TO 465
2721      C- - SPECIES EQUATIONS
2722      460 DUM1=-(CK21(K)+2.*C56 *CK15(K))
2723      DUM2=-CK15(K)
2724      DUM3=-CK1*(K)+CK15(K)
2725      DUM4=-CK28(K)+C10*CK14(K)
2726      DUM6=CK21(K)

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2727      DUM7=CK19(K)
2728      DUM8=CK20(K)
2729      465 DUM5=C2 *XSP(4,K)-ZSP(4,I-1,K)
2730      AM(MPJ,1)=DUM1
2731      AM(MPJ,IFP)= DUM3
2732      IF(I-2) 470,470,472
2733      470 AM(MPJ,2)=DUM2
2734      AM(MPJ,3)= DUM4
2735      AM(MPJ-1,1)= DUM6
2736      AM(MPJ-1, IFP)= DUM7
2737      AM(MPJ-1,3)= DUM9
2738      GO TO 475
2739      472 CALL LIAD(-1,MPJ,IFN,DUM2)
2740      CALL LIAD(-1, MPJ, IFPP, DUM4)
2741      475 CALL LIAD(-1,MPJ, IFPP, DUM5)
2742      LPI= ISPN+1AT1J
2743      DO 530 KK=NUL, NSPM1
2744      C * * DUM1/DUM4 AND DUM2/DUM5 ARE ERROR/FLUX DERIVATIVES WRT G OR SP AND
2745      C * * GP OR SPP, RESP.
2746      IF(K+KK) 480,480,485
2747      C - - ENERGY EQ. G VARIABLES
2748      480 DUM2=-C80
2749      DUM4=C43
2750      DUM5=C80
2751      GO TO 515
2752      485 IF(K) 490,490,495
2753      C - - ENERGY EQUATION, SP VARIABLES
2754      490 DUM1=-CK1(KK)
2755      DUM2=-CK2(KK)
2756      DUM4=-DUM1
2757      DUM5=-DUM2
2758      GO TO 508
2759      495 IF(KK) 500,500,505
2760      C - - SPECIES EQS., G VARIABLES
2761      500 DUM1=-CK9(K)
2762      DUM2=-CK5(K) + CK14(K)
2763      DUM4=CK9(K)
2764      DUM5=CK5(K)
2765      GO TO 508
2766      C - - SPECIES EQS., SP VARIABLES
2767      505 DUM1=-CKK2(K,KK)
2768      DUM2=-CKK1(K,KK)+B1(I-1)*CKK3(K,KK)
2769      DUM4=-DUM1
2770      DUM5=CKK1(K,KK)
2771      IF(K-KK) 508,515,508
2772      515 DUM1=-DUM4-C14
2773      508 AM(MPJ,LPI)=DUM1
2774      IF(I-2) 510,510,525
2775      510 AM(MPJ, LPI-1)= DUM2
2776      520 AM(MPJ-1, LPI) =DUM4
2777      AM(MPJ-1,LPI-1)=DUM5
2778      GO TO 530
2779      525 CALL LIAD(KK,MPJ, ISPP, DUM2)
2780      530 LPI=LPI+MAT2J
2781      CALL LIAD(K,MPJ, ISPPP,C2 *XM(4)-ZM(4,I-1))
2782      535 MPJ=MPJ+MAT2J
2783      RETURN
2784      END

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2785	CB138		B138	001
2786		SUBROUTINE IONLY	B138	002
2787		DIMENSION CK23(8),CK24(8),CK25(8),CK26(8)	B138	003
2788		COMMON/GOECOM/ C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15	B138	4
2789		1,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C31,C8138	B138	5
2790		232,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C48	B138	6
2791		3,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,C8138	B138	7
2792		465,C66,C67,C68,C69,C70,C71,C72,C73,C74,C75,C76,C77,C78,C79,C80,C81	B138	8
2793		5,C82,C83,C84,C85,C86,C87,C88	B138	9
2794		COMMON/GOECON/ CK1(8),CK2(8),CK3(8),CK4(8),CK5(8),CK6(8)	B138	10
2795		1,CK7(8),CK8(8),CK9(8),CK10(8),CK11(8),CK12(8),CK13(8)	B138	11
2796		2,CK14(8),CK15(8),CK16(8),CK17(8),CK18(3),CK19(8),CK20(3)	B138	12
2797		3,CK21(8),CK22(8),CKK1(8, 8),CKK2(8, 8),XM(5),XG(5),XSP(5, 9)	B138	13
2798		4,CKK3(8, 8)	B138	14
2799		COMMON/ERRCOM/FLE(43),GLE(30),SPLE(30, 8),ELA(313),FLEM,GLEM	B138	15
2800		1,SPLEM(8),ELM(14),ELMM,IFLM,IGLM,ISPLM(8),NELM,ILMM,DFL(43)	B138	16
2801		2,DGL(30),DSPL(30, 8),FNLE(18),GNLE(15),SPNLE(15, 8),ENL(153)	B138	17
2802		3,FNLEM,GNLEM,SPNLEM(8), FNLMH,IFNLM,IGNLM,ISPMLM(8)	B138	18
2803		4,NENLM,INLMM,DFNL(18),DGNL(15),DSPNL(15, 8),DRNL(10)	B138	19
2804		COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)	B138	20
2805		1,LAR(153),BA1(43,18),BA2(30,15)	B138	21
2806		COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZH(4,14),ZG(4,14),ZSP(4,14,	B138	22
2807		1),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HHUE,HFW,DLX2	B138	23
2808		2,C3M(40),BETAM(40)	B138	24
2809		COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB138	B138	25
2810		1S,IT,NTIME,NSP,NSPM1,NAH,NLEQ,NNLEQ,NRNL, IIS,KAPPA,CBAR,CASE(15)	B138	26
2811		2,B(8), MNE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40)	B138	27
2812		3,KAUXO,JTIME,JSPEC,MD(3)	B138	28
2813		COMMON/NONCOM/AM(153,153),DVWL(153),TCW,	B138	29
2814		1VLNKH,DLPH(9),DLPK(8, 9),DTHW,DTKW(8),FLUXJB(9)	B138	30
2815		COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15)	B138	31
2816		1,CPBAR(15),VMW(15),PHIK(15, 8),DRHCH,DRHOK(8),ZK(8),DZKH(8),	B138	32
2817		2MU3K(8),DMU4K(8),DTK(8),DPHIKH(8),DPRK(8),DSCK(8),DCAPCK(8)	B138	33
2818		3,DHTILK(8),DQRK(8),DCPBK(8),DCPTK(8),DMU12K(8),DZKK(8, 8)	B138	34
2819		4,DPHIK(8, 8), DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL	B138	35
2820		5,VMU3,DTH,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15), RHOP	B138	36
2821		6(15),PHIKP(15),HP,T2,ZKP(8),V2U3P,VMU4P,HTILP,CRHO(14),GMR(15)	B138	37
2822		DIMENSION CYM(3),CYM(3),CYSP(3)		
2823	C	ADD CONTRIBUTIONS OF I TO NONLINEAR ERRORS	B138	038
2824	C	EVALUATE GROUPINGS WHICH ARE USED ONLY AT I (NOT AT I-1)	B138	039
2825	4000	CRHO1= C26*DETA(I-1)*(1.+C53/6.0*DETA(I-1))	B138	041
2826		C89=C6*CRHO1	B138	042
2827		CRHO(I-1)=(CRHO(I-1)+CRHO1)/2.	B138	043
2828		ENL(I+3)=ENL(I+3)-(C83+C89/2.)		
2829		MPI=MAT1J+I		
2830		ENL(MPI)=ENL(MPI)-C84		
2831		IF(NSPM1)403,403,402	B138	051
2832	402	DO 436 K=1,NSPM1	B138	052
2833		MPI=MPI+MAT2J		
2834		ENL(MPI) =ENL(MPI) -(CK22(K)-(PHIK(I,K)*DETA(I-1)-PHIKP(K)*B2(I-1)		
2835		1-CK16(K)))		
2836	436	CONTINUE		
2837	404	DO 467 K=1,NSPM1	B138	057
2838		CK23(K)=B2(I-1)*DPHIKH(K)	B138	058
2839		CK24(K)=C13*CK23(K)	B138	059
2840		CK25(K)=DETA(I-1)*DPHIKH(K)	B138	060
2841	467	CK26(K)=C10*CK25(K)	B138	061
2842	C	EVAL PORTION OF ORIG COEFFS OF AM DEPENDENT UPON PARAM EVAL AT I	B138	062

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2843 C**** ESTABLISH INDICES FOR VARIABLES
2844 403 NUL=C
2845 IFN=I-1
2846 IFP=I+3
2847 IFPP=NETA+I-2
2848 IFPPP=IFPP+NETA
2849 ISPN=I+1
2850 ISPP=I
2851 ISPPP=IFPP+2
2852 DO 405 L=1,3
2853 CYM(L)=C2*XM(L)-ZM(L,I-1)
2854 405 CXM(L)=- (C9*XM(L) + ZM(L,I-1))*2.
2855 C**** MOMENTUM EQUATION
2856 AM(I+3,1)=AM(I+3,1)+C81-C5*C8*C72+C87*DETA(I-1)
2857 AM(I+3,IFP)=AM(I+3,IFP)+C74+C86*DETA(I-1)+CXM(1)
2858 CALL LIAD(-1,I+3,IFN,C73)
2859 CALL LIAD(-1,I+3,IFPP,C12+CXM(2))
2860 CALL LIAD(-1,I+3,IFPPP,CXM(3))
2861 LPI= ISPN+MAT1J
2862 DO 425 K=NUL, NSPM1
2863 IF(K) 410,410,415
2864 410 DUM1=C75+C88*DETA(I-1)
2865 DUM2=0.
2866 GO TO 416
2867 415 DUM1=CK13(K)*DETA(I-1)+CK17(K)
2868 DUM2=0.
2869 416 IF(I-NETA) 420,417,420
2870 417 CALL LIAD(K,I+3,1,DUM1)
2871 GO TO 421
2872 420 AM(I+3,LPI)=AM(I+3,LPI)+DUM1
2873 421 CALL LIAD (K,I+3,ISPP,DUM2)
2874 425 LPI=LPI+MAT2J
2875 C**** ENERGY AND SPECIES EQUATIONS
2876 MPJ=MAT1J+I
2877 DO 490 K=NUL, NSPM1
2878 DO 428 L=1,3
2879 428 CYSP(L)=C2*XSP(L,K)-ZSP(L,I-1,K)
2880 C * * ALF, F, FP, FPP, FPPP ERROR DERIVITIVES ARE DUM1 TO DUM5.
2881 IF(K) 430,430,435
2882 C - - ENERGY EQ.
2883 430 DUM1=C82
2884 DUM2=C76
2885 DUM3=C77+CYSP(1)
2886 DUM4=C78+CYSP(2)
2887 GO TO 440
2888 C - - SPECIES EQS.
2889 435 DUM1= CK21(K) +C56 *(CK26(K)-2. *CK24(K))
2890 DUM2=CK18(K)
2891 DUM3=CK19(K) + CK24(K)-CK26(K)+CYSP(1)
2892 DUM4=C10*(CK5(K)+CK23(K)) + CYSP(2)
2893 440 DUM5= CYSP(3)
2894 AM(MPJ,1)= AM(MPJ,1) + DUM1
2895 AM(MPJ, IFP)= AM(MPJ, IFP) + DUM3
2896 CALL LIAD(-1, MPJ, IFN,DUM2)
2897 CALL LIAD(-1, MPJ, IFPP, DUM4)
2898 CALL LIAD(-1, MPJ, IFPPP, DUM5)
2899 LPI= ISPN+MAT1J
2900 DO 485 KK=NUL,NSPM1

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2901 C * * DUM1 AND DUM2 ARE ERROR DERIVITIVES WRT G OR SP AND GP OR SPP
2902 IF(K+KK) 445,445,450
2903 C - - ENERGY EQ., G VARIABLES
2904 445 DUM1=C43
2905 DUM2=C80
2906 GO TO 475
2907 450 IF(K) 455,455,460
2908 C - - ENERGY EQ., SP VARIABLES
2909 455 DUM1=CK1(KK)
2910 DUM2=CK2(KK)
2911 GO TO 480
2912 460 IF(KK) 465,465,470
2913 C - - SPECIES EQS., G VARIABLES
2914 465 DUM1= CK9(K)-CK25(K)
2915 DUM2=CK5(K)+CK23(K)
2916 GO TO 480
2917 C - - SPECIES EQS., SPECIES VARIABLES
2918 470 DUM1=CCK2(K,KK)-DPHIKK(K,KK)*DETA(I-1)
2919 DUM2=CCK1(K,KK)+B2(I-1) * DPHIKK(K,KK)
2920 IF(K-KK) 480,475,480
2921 475 DUM1=DUM1+CYM(1)+C14
2922 DUM2=DUM2+CYM(2)
2923 480 IF(I-NETA) 483,482,483
2924 482 CALL LIAD(KK,MPJ,1,DUM1)
2925 GO TO 484
2926 483 AM(MPJ,LPI)=AM(MPJ,LPI)+DUM1
2927 484 CALL LIAD(KK,MPJ,ISPP,DUM2)
2928 485 LPI= LPI+MAT2J
2929 CALL LIAD(K,MPJ,ISPPF, CYM(3))
2930 490 MPJ=MPJ+MAT2J
2931 RETURN
2932 END
2933 CB14A B13B 307
2934 B14A 001
2935 SUBROUTINE STATE
2936 COMMON/EDGCOM/ PE(40,1),PTE(40,1),SPE( 8,40,1),DUES,B14A 3
2937 1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMWE,HE,C90 B14A 4
2938 2 ,DSIP(40),IDSIP,TTVC,TVCC(40) B14A 5
2939 COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB14A 6
2940 1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B14A 7
2941 2,B(8), MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B14A 8
2942 3,KAUX0,JTIME,JSPEC,MD(3) B14A 9
2943 COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) B14A 10
2944 1,RNOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO, B14A 11
2945 2CONE,RADFL( 50),RADR(40),RAD(40),IRAD B14A 12
2946 COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15) B14A 13
2947 1,CPBAR(15),VMW(15),PHIK(15, 8),DRHOH,DRHOK( 8),ZK( 8),DZKH( 8), DB14A 14
2948 2MU3K( 8),DMU4K( 8),DTK( 8),DPHIKH( 8),DPRK( 8),DSCK( 8),DCAPCK( 8) B14A 15
2949 3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8) B14A 16
2950 4,DPHIKK( 8, 8), DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL B14A 17
2951 5,VMU3,DTH,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15), RHOP B14A 18
2952 6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15) B14A 19
2953 COMMON/STTCOM/GAM1,PROUH,PRA,PRB,PRC,PRD,VMUA,VMUB,VMUC,VMUD,NC, B14A 20
2954 1 FLD(6,3),VMWD B14A 21
2955 VMWE=VMWD
2956 KQ(6)=KQ(6)-1 B14A 025
2957 KQ(7)=IABS(KR(18)*5)-4 B14A 026
2958 IF (KQ(5)-1) 100,200,100
2959 100 TE(15)=3000.

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2959      WRITE(KOUT,991)
2960      IHET=50
2961      IJK=3
2962      HE=GE(ITEM)
2963      110 HET=FLD(1,IJK)+FLD(2,IJK)+FLD(3,IJK)*(TE(IS)-5400.)*.5*FLD(4,IJK)*
2964      1(TE(IS)**2.-5400.**2.)-FLD(5,IJK)*(1./TE(IS)-1./5400.)
2965      CPT=FLD(3,IJK)+FLD(4,IJK)*TE(IS)+FLD(5,IJK)/TE(IS)**2.
2966      ERC=(HET-HE)/CPT
2967      ITER=51-IHET
2968      ERC=SIGN(AMIN1(ABS(ERC),700.),ERC)
2969      TE(IS)=TE(IS)-ERC
2970      IF(TE(IS).LT.3600.) GO TO 120
2971      IF(TE(IS).GE.5400.) GO TO 125
2972      IJK=2
2973      GO TO 130
2974      120 IJK=1
2975      GO TO 130
2976      125 IJK=3
2977      130 CONTINUE
2978      IHET=IHET-1
2979      IF (IHET) 400,400,140
2980      140 IF (ABS(ERC)-.1)150,150,110
2981      150 SSTAG=FLD(6,IJK)+FLD(3,IJK)*ALOG(TE(IS)/5400.)+FLD(4,IJK)*(TE(IS)-
2982      15400.)*.5*FLD(5,IJK)*((1./TE(IS))**2.-(1./5400.))**2.)
2983      DO 155 II=1,NS
2984      155 TE(II)=TE(IS)
2985      VMACH=0.
2986      160 RHOE(IS)=PE(IS,IT)/TE(IS)*VMWE/0.7303
2987      UE(IS)=SQRT((GE(ITEM)-HE)*50073.)
2988      VMUE(IS)=(VMUA*TE(IS)**VMUB)/(VMUC*TE(IS)+VMUD)
2989      GAM1=CPT/(CPT-1.9869/VMWE)
2990      IF (KQ(5).EQ.2) GO TO 165
2991      WRITE(KOUT,995) S(IS),TE(IS),CPT,PE(IS,IT),RHOE(IS),VMUE(IS),UE(IS)
2992      1,HE,SSTAG,VMACH
2993      GO TO 166
2994      165 WRITE(KOUT,993) TE(IS),PE(IS,IT),UE(IS),VMACH,GAM1,HET,SSTAG,CPT,
2995      1RHOE(IS),VMUE(IS)
2996      166 KQ(6)=-1
2997      170 RETURN
2998      200 SSTAG=SSTAG-DSIP(IS)
2999      SSTAGA=SSTAG+1.9869/VMWE*ALOG(1./PTET(ITEM))
3000      DUM1=SSTAG+1.9869/VMWE*ALOG(PRE(IS))
3001      IST=50
3002      210 DS=-DUM1+FLD(6,IJK)+FLD(3,IJK)*ALOG(TE(IS)/5400.)+FLD(4,IJK)*(TE(I
3003      1S)-5400.)*.5*FLD(5,IJK)*((1./TE(IS))**2.-(1./5400.))**2.)
3004      CPT=FLD(3,IJK)+FLD(4,IJK)*TE(IS)+FLD(5,IJK)/TE(IS)**2.
3005      ERC=DS*TE(IS)/CPT
3006      ITER=51-IST
3007      ERC=SIGN(AMIN1(ABS(ERC),700.),ERC)
3008      TE(IS)=TE(IS)-ERC
3009      IF(TE(IS).LT.3600.) GO TO 212
3010      IF(TE(IS).GE.5400.) GO TO 214
3011      IJK=2
3012      GO TO 216
3013      212 IJK=1
3014      GO TO 216
3015      214 IJK=3
3016      216 CONTINUE

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3017      IST=IST-1
3018      IF (IST) 400,400,220
3019      220 IF (ABS(ERC)-.1) 230,230,210
3020      230 HE=FLO(1,IJK)+FLO(2,IJK)+FLO(3,IJK)*(TE(IS)-5400.)+.5*FLO(4,IJK)*(
3021      1TE(IS)**2.-5400.**2.)-FLO(5,IJK)*(1./TE(IS)-1./5400.)
3022      VMACH=SQRT(2.*(GE(ITEM)-HE)*VMWE/GAM1/TE(IS)/1.9869)
3023      GO TO 160
3024      300 IHT=50
3025      IF (IS+ITEM-2) 301,301,302
3026      301 T(I)=3000.
3027      302 HT=FLO(1,IJK)+FLO(2,IJK)+FLO(3,IJK)*(T(I)-5400.)+.5*FLO(4,IJK)*(T(
3028      1I)**2.-5400.**2.)-FLO(5,IJK)*(1./T(I)-1./5400.)
3029      CPBAR(I)=FLO(3,IJK)+FLO(4,IJK)*T(I)+FLO(5,IJK)/T(I)**2.
3030      ERC=(HT-H(I))/CPBAR(I)
3031      ERC=SIGN(AMIN1(ABS(ERC),700.),ERC)
3032      T(I)=T(I)-ERC
3033      IF(T(I).LT.3600.) GO TO 305
3034      IF(T(I).GE.5400.) GO TO 306
3035      IJK=2
3036      GO TO 307
3037      305 IJK=1
3038      GO TO 307
3039      306 IJK=3
3040      307 CONTINUE
3041      IHT=IHT-1
3042      IF (IHT) 400,400,310
3043      310 IF (ABS(ERC)-.1) 320,320,302
3044      320 CPTIL=CPBAR(I)
3045      DTH=1./CPBAR(I)
3046      DCPBH=DTH*(FLO(4,IJK)-2.*FLO(5,IJK)/T(I)**3.)
3047      DCPTH=DCPBH
3048      PR(I)=PRODH+PRA*T(I)**PRB+PRC*T(I)**PRD
3049      DPRH=DTH*(PRA*PRB*T(I)**(PRB-1.)+PRC*PRD*T(I)**(PRD-1.))
3050      SC(I)=PR(I)
3051      DSCH=DPRH
3052      RHO(I)=RHOE(IS)/T(I)*TE(IS)
3053      DRHOH=-RHO(I)/T(I)*DTH
3054      VMU(I)=(VMUA*T(I)**VMUB)/(VMUC*T(I)+VMUD)
3055      VMW(I)=VMWE
3056      CAPC(I)=(T(I)/TE(IS))*(VMUB-1.)/(VMUC*T(I)+VMUD)+
3057      1 (VMUC*TE(IS)+VMUD)
3058      DCAPCH=CAPC(I)*DTH*((VMUB-1.)/T(I)-VMUC/(VMUC*T(I)+VMUD))
3059      HTIL=H(I)
3060      GMR(I)=CPBAR(I)/(CPBAR(I)-1.9869/VMWE)
3061      DHTILH=1.
3062      VMU12=VMWE
3063      DMU12H=0.
3064      VMU3=1./VMWE
3065      DMU3H=0.
3066      DMU4H=0.
3067      QR(I)=0.
3068      DQRH=0.
3069      CT=0.
3070      CTR=0.
3071      RETURN
3072      400 WRITE(KOUT,99)KQ(5)
3073      99 FORMAT(//40H**** STATE DOES NOT CONVERGE FOR KQ(5)=I2,6H ****//)
3074      991 FORMAT(1H1,10X19HSTAGNATION SOLUTION /12X15HEDGE CONDITIONS //)

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B14A 048
 B14A 049
 B14A 050
 B14A 052
 B14A 053
 B14A 054
 B14A 055
 B14A 056
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 B14A 060
 B14A 061
 B14A 062
 B14A 063
 B14A 064
 B14A 065
 B14A 066
 B14A 067

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3075 993 FORMAT(5X14HTEMPERATURE = E10.4,14H DEG R //5X14HPRESSURE
3076 1 = E10.4,14H ATMOSPHERES //5X14HVELOCITY = E10.4,14H FT/SEC
3077 2 //5X14HMACH NUMBER = E10.4, //5X14HGAMMA = E10.4, //5X
3078 314HENTHALPY = E10.4,14H BTU/LB //5X14HENTROPY = E10.
3079 44,14H BTU/LB DEG R //5X14HCP-FROZEN = E10.4,14H BTU/LB DEG R /
3080 5/5X14HDENSITY = E10.4,14H LB/CU FT //5X14HVISCOSITY =
3081 6E10.4,14H LB/SEC FT )
3082 995 FORMAT(3X10(2XE10.4))
3083 STOP
3084 END
3085
3086 CB148 SUBROUTINE STATEN
3087 COMMON/STTCOM/GAM1,PRODM,PRA,PRB,PRC,PRD,VMUA,VMUB,VMUC,VMUD,NC,
3088 1 FLO(6,3),VMWJ
3089 COMMON/INTCOM/ KR(20),KIN,XCUT
3090 DIMENSION TK(20,2),VMW(20),EF(6,20,3),ETMIN(20,3),ETMAX(20,3),
3091 1PVMW(20),PVOL(20),BTA(20),BTB(20),BTC(20),BTD(20),BTE(20)
3092 8000 READ (KIN,5) PRODM,PRA,PRB,PRC,PRD
3093 READ (KIN,6) VMUA,VMUB,VMUC,VMUD
3094 READ (KIN,2) NC
3095 2 FORMAT(I3)
3096 DO 8105 JJ=1,NC
3097 READ(KIN,74)BTA(JJ),BTB(JJ),BTC(JJ),BTD(JJ),BTE(JJ),VMW(JJ),TK(JJ,
3098 11),IFRAC
3099 DO 8101 JK=1,2
3100 8101 READ(KIN,75)(EF(JI,JJ,JK),JI=1,6),ETMIN(JJ,JK),ETMAX(JJ,JK)
3101 8113 IF(ETMIN(JJ,2).LE.2500.) GO TO 8103
3102 DO 8102 JI=1,6
3103 EF(JI,JJ,3)=EF(JI,JJ,2)
3104 8102 EF(JI,JJ,2)=EF(JI,JJ,1)
3105 GO TO 8105
3106 8103 DO 8104 JI=1,6
3107 8104 EF(JI,JJ,3)=EF(JI,JJ,2)
3108 8105 CONTINUE
3109 IF (IFRAC.EQ.1) GO TO 8111
3110 DO 801 I=1,NC
3111 801 PVOL(I)=TK(I,1)/VMW(I)
3112 VVOL=0.
3113 DO 802 I=1,NC
3114 802 VVOL=VVOL+PVOL(I)
3115 DO 803 I=1,NC
3116 803 TK(I,2)=PVOL(I)/VVOL
3117 GO TO 8112
3118 8111 DO 804 I=1,NC
3119 804 TK(I,2)=TK(I,1)
3120 8112 DO 805 I=1,NC
3121 805 PVMW(I)=TK(I,2)*VMW(I)
3122 VMWE=0.
3123 DO 806 I=1,NC
3124 806 VMWE=VMWE+PVMW(I)
3125 VMWD=VMWE
3126 IF (IFRAC.EQ.2) GO TO 807
3127 DO 807 I=1,NC
3128 807 TK(I,1)=PVMW(I)/VMWE
3129 808 DO 8106 JI=1,6
3130 DO 8106 JJ=1,3
3131 8106 FLO(JI,JJ)=0.
3132 DO 8107 JK=1,3

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B14A 068

B14B 3
B14B 4

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3133      DO 8107 JJ=1,NC
3134      DO 8107 JI=1,6
3135      8107 FLD(JI,JK)=FLD(JI,JK)+EF(JI,JJ,JK)*TK(JJ,2)
3136      DO 8108 JK=1,3
3137      FLD(1,JK)=FLO(1,JK)*1.8/VMWE
3138      FLD(2,JK)=FLO(2,JK)*1.8/VMWE
3139      FLD(3,JK)=FLO(3,JK)/VMWE
3140      FLD(4,JK)=FLO(4,JK)/1.8/VMWE
3141      FLD(5,JK)=FLO(5,JK)*1.8*1.8/VMWE
3142      8108 FLD(6,JK)=FLO(6,JK)/VMWE
3143      1 FORMAT(6E9.6)
3144      5 FORMAT(5E10.4)
3145      6 FORMAT(4E10.4)
3146      7 FORMAT(/9X20H VISCOSITY LAW MU=(E10.3,4H*T**E10.3,3H)/(E10.3,3H*T
3147      1+E10.3,1H)//9X19H PRANDTL NUMBER PR=E10.3,1H+E10.3,4H*T**E10.3,1H+
3148      2E10.3,4H*T**E10.3,/)
3149      71 FORMAT(/9X36H TEMPERATURE LESS THAN 3600 DEG R. /)
3150      72 FORMAT(/9X75H TEMPERATURE EQUAL TO OR GREATER THAN 3600 DEG R, BUT
3151      1 LESS THAN 5400 DEG R. /)
3152      73 FORMAT(/9X69H TEMPERATURE EQUAL TO OR GREATER THAN 5400 DEG R. /)
3153      74 FORMAT(5A4,2E10.4 I2)
3154      75 FORMAT(6E9.6,2F6.1)
3155      77 FORMAT(/9X19H ENTHALPY LAW H=E10.3,1H+E10.3,1H+E10.3,11H*(T-540
3156      10.)+/40X3H,5*E10.3,17H*(T**2-5400.**2)-E10.3,16H*(1./T-1./5400.)//
3157      29X19H ENTROPY LAW S=E10.3,1H+E10.3,15H*ALOG(T/5400.)+E10.3,11H
3158      3*(T-5400.)-/40X3H,5*E10.3,22H*(1./T**2-1./5400.**2) /)
3159      WRITE(KOUT,7) VMUA, VMUB, VMUC, VMUD, PROUH, PRA, PRB, PRC, PRO
3160      WRITE(KOUT,71)
3161      WRITE(KOUT,77) (FLD(JI,1), JI=1,6), (FLD(JJ,1), JJ=3,5)
3162      WRITE(KOUT,72)
3163      WRITE(KOUT,77) (FLD(JI,2), JI=1,6), (FLD(JJ,2), JJ=3,5)
3164      WRITE(KOUT,73)
3165      WRITE(KOUT,77) (FLD(JI,3), JI=1,6), (FLD(JJ,3), JJ=3,5)
3166      WRITE(KOUT,78)
3167      DO 1500 JJ=1,NC
3168      1500 WRITE(KOUT,79) BTA(JJ), BTB(JJ), BTC(JJ), BTD(JJ), BTE(JJ), TK(JJ,2),
3169      1 TX(JJ,1)
3170      78 FORMAT(1H1/////21X13H FLUID MIXTURE ///11X9H COMPONENT 10X4H MCLE
3171      18X4H MASS /20X9H FRACTION 4X8H FRACTION /)
3172      79 FORMAT(1H0,5X5A4,2(2XE10.4))
3173      WRITE(KOU),80) VMWE
3174      80 FORMAT(/5X18H MOLECULAR WEIGHT = F(2.7//)
3175      RETURN
3176      END
3177      SUBROUTINE RERAY(N,C,MQ,D,NQN,LS,IS,ND)
3178      C DIRECT INVERSION PROCEDURE -- C IS REPLACED BY C*-1
3179      DIMENSION D(ND,1),SD(153),C(ND,1),L(153),S(153),LL(153),LLL(153),
3180      1 LS(1)
3181      NMN=IABS(NQN)
3182      NN = IABS(MQ)
3183      KOUT=6
3184      N1 = N + 1
3185      NP = N + NN
3186      DO 15 I=1,NP
3187      LLL(I) = I
3188      IF (LS(1)) 10,10,5
3189      5 L(I) = LS(I)
3190      GOTO 15

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8074 201

8158 003
8158 004

RER0070
RER0080
RER0090
RER0110
RER0120
RER0130
RER0140

3191	10 L(I) = I	RERA0150
3192	15 CONTINUE	RERA0160
3193	IX = - 1	RERA0170
3194	IF (IS + 2) 45,35,45	RERA0180
3195	20 FORMAT(11H L(I),I=1,I3,5X (30I3))	RERA0190
3196	25 FORMAT(15H ((C(I,J),J=1,I3,12H), (D(J),J=1,I3, 6H),I=1,I3,15H)	BERERA0200
3197	1FORE RERAY)	RERA0210
3198	30 FORMAT(2X 11E10.3/(12X 10E10.3))	RERA0220
3199	35 WRITE(KOUT,25) NP,NNN,N	RERA0230
3200	WRITE(KOUT,20) NP,(L(I),I=1,NP)	RERA0240
3201	IX = 0	RERA0250
3202	DO 40 I=1,N	RERA0260
3203	40 WRITE(KOUT,30) (C(I,J),J=1,NP), (D(I,J),J=1,NNN)	RERA0270
3204	45 IS = - 1	RERA0280
3205	C TRIANGULATE MATRIX	RERA0290
3206	DO 130 I=1,N	RERA0300
3207	DO 50 M=1,NP	
3208	50 S(M)=ABS(C(I,M))	RERA0330
3209	IF (IS) 55,60,60	RERA0340
3210	55 IS = 0	RERA0350
3211	GOTO 90	RERA0360
3212	C REDUCE ROW I BY PRECEDING ROWS	RERA0370
3213	60 DO 85 J=2,I	RERA0380
3214	K = L(J - 1)	RERA0390
3215	DIV = - C(I,K)	RERA0400
3216	IF (DIV) 65,85,65	RERA0410
3217	65 C(I,K) = 0.	RERA0420
3218	DO 70 M=1,NP	RERA0430
3219	DIVC = DIV * C(J - 1,M)	
3220	S(M)=AMAX1(S(M),ABS(DIVC))	RERA0450
3221	70 C(I,M) = C(I,M) + DIVC	RERA0460
3222	IF (NNN) 85,85,75	RERA0470
3223	75 DO 80 M=1,NNN	RERA0480
3224	80 D(I,M) = D(I,M) + DIV * D(J - 1,M)	RERA0490
3225	65 CONTINUE	RERA0500
3226	C SEEK MAXIMUM PIVOT	RERA0510
3227	90 DIV = 0.	RERA0520
3228	DO 100 JJ=I,N	RERA0530
3229	M = L(JJ)	RERA0540
3230	IF (ABS(C(I,M)) - DIV) 100,100,95	RERA0550
3231	95 DIV = ABS(C(I,M))	RERA0560
3232	K = M	RERA0570
3233	J = JJ	ENR-MOD
3234	IF (I,LE,4) GO TO 180	
3235	IF (ND-20) 100,100,181	RERA0580
3236	180 CONTINUE	
3237	101 SO(I)=DIV/S(K)	
3238	L(J)=L(I)	
3239	L(I)=K	
3240	IF (SO(I)-1.E-9) 104,104,110	
3241	104 C(I,K)=0.	
3242	IF (SO(I)) 105,105,90	
3243	C SINGULAR MATRIX RETURN	
3244	105 IS=-1	
3245	WRITE(KOUT,135) (I,L(I),SO(I),I, I)	
3246	RETURN	
3247	110 DIV = C(I,K)	RERA0670
3248	C(I,K) = 1.0	RERA0680

3240	K = LLL(J)	RERA0690
3250	LLL(J) = LLL(I)	RERA0710
3251	LLL(I) = K	RERA0720
3252	LL(K) = I	RERA0730
3253	C NORMALIZE ROW	RERA0740
3254	IF (NNN) 125,125,115	RERA0750
3255	115 DO 120 J=1,NNN	RERA0760
3256	120 D(I,J) = D(I,J) / DIV	RERA0770
3257	125 DO 130 J=1,MP	RERA0780
3258	130 C(I,J) = C(I,J) / DIV	RERA0790
3259	IF (IX) 145,145,145	RERA0800
3260	135 FORMAT(24H PIVOT ROW/COL/RES.RATIO 5(I4,1H/I3,1H/E9.2,1H,))	RERA0810
3261	140 WRITE(KOUT,135) (I,L(I),SO(I),I=1,MP)	RERA0820
3262	C DIAGONALIZE MATRIX	RERA0830
3263	145 NM = N - 1	RERA0840
3264	C INTERCHANGE COLUMNS	RERA0850
3265	DO 225 II=1,MP	RERA0860
3266	I = II	RERA0870
3267	180 J = L(I)	RERA0880
3268	L(I) = I	RERA0890
3269	IF (J - I) 185,225,135	RERA0900
3270	185 IF (IS) 200,190,200	RERA0910
3271	190 DO 195 M=1,N	RERA0920
3272	S(M) = C(M,I)	RERA0930
3273	195 C(M,I) = C(M,J)	RERA0940
3274	IS = I	RERA0950
3275	I = J	RERA0960
3276	GOTO 180	RERA0970
3277	200 IF (IS - J) 205,215,205	RERA0980
3278	205 DO 210 M=1,N	RERA0990
3279	210 C(M,I) = C(M,J)	RERA1000
3280	I = J	RERA1010
3281	GOTO 180	RERA1020
3282	215 DO 220 M=1,N	RERA1030
3283	220 C(M,I) = S(M)	RERA1040
3284	IS = 0	RERA1050
3285	225 CONTINUE	RERA1060
3286	IF (NMN + NQ) 149,149,144	RERA1070
3287	144 IF (NMN+NQ-NM-MNM) 149,147,149	RERA1080
3288	C*****SOLUTION VECTOR ONLY	RERA1090
3289	147 K=N	RERA1100
3290	DO 153 I=1,NN	RERA1110
3291	K=K-1	RERA1120
3292	DO 153 IL=K,NN	RERA1130
3293	DUM=C(K,IL+1)	RERA1140
3294	IF (NN) 152,152,151	RERA1150
3295	151 DO 146 M=N1,MP	RERA1160
3296	146 C(K,M) = C(K,M) - DUM * C(IL+1,M)	RERA1170
3297	C(K,1)=C(K,1)-DUM*C(IL+1,1)	
3298	IF (NNN) 153,153,152	
3299	152 DO 148 M=1,NNN	
3300	148 D(K,M)=D(K,M)-DUM*D(IL+1,M)	
3301	153 CONTINUE	
3302	GO TO 176	
3303	C*****FULL INVERSION AND SOLUTION VECTOR	
3304	149 DO 175 I=1,NN	RERA1180
3305	DO 175 J=1,I	RERA1190
3306	DIV = - C(J,I+1)	

3307	IF (DIV) 150,175,150	RERA0980
3308	150 C(J,I+1) = 0.	
3309	IF (NNN) 165,165,15	RERA0900
3310	155 DO 161 M=1,NNN	RERA0910
3311	160 D(J,M) = D(J,M) + DIV * D(I + 1,M)	RERA0920
3312	165 DO 170 M=1,NP	RERA0930
3313	170 C(J,M) = C(J,M) + DIV * C(I + 1,M)	RERA0940
3314	175 CONTINUE	RERA0950
3315	C INTERCHANGE ROWS	RERA1180
3316	176 DO 320 II=1,N	RERA1190
3317	I = II	RERA1200
3318	230 J = LL(I)	RERA1210
3319	LL(I) = I	RERA1220
3320	IF (J - I) 235,320,235	RERA1230
3321	235 IF (IS) 265,240,265	RERA1240
3322	240 DO 245 M=1,NP	RERA1250
3323	S(M) = C(I,M)	RERA1260
3324	245 C(I,M) = C(J,M)	RERA1270
3325	IF (NNN) 260,260,250	RERA1280
3326	250 DO 255 M=1,NNN	RERA1290
3327	SD(M) = D(I,M)	RERA1300
3328	255 D(I,M) = D(J,M)	RERA1310
3329	260 IS = I	RERA1320
3330	I = J	RERA1330
3331	GOTO 230	RERA1340
3332	265 IF (IS - J) 270,295,270	RERA1350
3333	270 DO 275 M=1,NP	RERA1360
3334	275 C(I,M) = C(J,M)	RERA1370
3335	IF (NNN) 280,290,280	RERA1380
3336	280 DO 285 M=1,NNN	RERA1390
3337	285 D(I,M) = D(J,M)	RERA1400
3338	290 I = J	RERA1410
3339	GOTO 230	RERA1420
3340	295 DO 300 M=1,NP	RERA1430
3341	300 C(I,M) = S(M)	RERA1440
3342	IF (NNN) 315,315,305	RERA1450
3343	305 DO 310 M=1,NNN	RERA1460
3344	310 D(I,M) = SD(M)	RERA1470
3345	315 IS = 0	RERA1480
3346	320 CONTINUE	RERA1490
3347	IF (IX) 340,330,340	RERA1500
3348	325 FORMAT(15H ((C(I,J),J=1,I3,12H), (D(J),J=1,I3, 6H), I=1,I3,15H)	AFRERA1510
3349	1YER RERAY)	RERA1520
3350	330 WRITE(KOUT,325)NP,NNN,N	RERA1530
3351	DO 335 I=1,N	RERA1540
3352	335 WRITE(KOUT,30) (C(I,J),J=1,NP), (D(I,J),J=1,NNN)	RERA1550
3353	340 RETURN	RERA1560
3354	END	
3355	CB16A	B16A 001
3356	SUBROUTINE SLOPQ(N,X,Y,S,Z)	B16A 002
3357	DIMENSION X(1),Y(1),S(1),Z(1)	B16A 003
3358	IF(N-1) 9,9,8	B16A 004
3359	8 S(2)=(Y(2)-Y(1))/(X(2)-X(1))	B16A 005
3360	S(1)=S(2)	B16A 006
3361	QC=S(2)	B16A 007
3362	DO 7 I=1,N	B16A 008
3363	IF(I+1-N)2,1,6	B16A 009
3364	1 QB=QC	B16A 010

3365	IF (I-2)7,6,5	B16A 011
3366	2 XOT=X(I)-X(I+1)	B16A 012
3367	XTT=X(I+1)-X(I+2)	B16A 013
3368	XTO=X(I+2)-X(I)	B16A 014
3369	AA=Y(I)/(XOT*XTO)	B16A 015
3370	XOTT=XOT*XTT	B16A 016
3371	AB=Y(I+1)/XOTT	B16A 017
3372	AC=Y(I+2)/(XTT*XTO)	B16A 018
3373	AAA=AA*XTT	B16A 019
3374	ABB=AB*XTO	B16A 020
3375	ACC=AC*XOT	B16A 021
3376	QA=7C	B16A 022
3377	QB=S(I)	B16A 023
3378	QC=S(I+1)	B16A 024
3379	S(I)=AA*(XTO-XOT)+ABB-ACC	B16A 025
3380	S(I+1)=AB*(XOT-XTT)+ACC-AAA	B16A 026
3381	S(I+2)=AC*(XTT-XTO)+AAA-ABB	B16A 027
3382	3 IF (I-2)7,5,4	B16A 028
3383	4 S(I)=(S(I)+QA)/2.	B16A 029
3384	5 S(I)=(S(I)+QB)/2.	B16A 030
3385	6 XD=X(I)-X(I-1)	B16A 031
3386	YS=Y(I)+Y(I-1)	B16A 032
3387	SD=S(I)-S(I-1)	B16A 033
3388	SS=S(I)	B16A 034
3389	Z(I)=Z(I-1)+XD/2.*(YS-XD/6.*SD)	B16A 035
3390	S(I)=SS	B16A 036
3391	7 CONTINUE	B16A 037
3392	9 RETURN	B16A 038
3393	END	B16A 039
3394	CB17A	B17A 001
3395	SUBROUTINE ABMAX(N,X,XM,I)	B17A 002
3396	DIMENSION X(1)	B17A 003
3397	I=1	B17A 004
3398	XM=ABS (X(1))	B17A 005
3399	IF (N-1) 4,4,5	B17A 006
3400	5 DO 3 J=2,N	B17A 007
3401	XT=ABS (X(J))	B17A 008
3402	IF (XM-XT) 2,3,3	B17A 009
3403	2 XM=XT	B17A 010
3404	I=J	B17A 011
3405	3 CONTINUE	B17A 012
3406	4 XM=X(I)	B17A 013
3407	RETURN	B17A 014
3408	END	B17A 015
3409	CB18A	B18A 001
3410	SUBROUTINE MATS1(X)	
3411	COMMON/INTCOM/KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA	
3412	COMMON/ETACOM/ETA(15),DETA(15)	B18A 004
3413	DIMENSION X(1),A(14),B(14),C(14)	B18A 005
3414	IF (KR(1).LT.-50) GO TO 16	
3415	JB=NETA	
3416	IF (KR(10)-1) 11,18,19	
3417	16 KR(1)=KR(1)+100	
3418	JB=2	
3419	X(NETA)=X(NETA)+X(1)	
3420	IF (KR(10)-1) 11,18,19	
3421	18 LIM=NETA-2	
3422	GO TO 20	

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3423      19 LIM=NETA-1
3424      20 J=JB
3425          K=JB+NETA-1
3426          XJ=0.
3427          DO 25 I=1,LIM
3428              XK=(X(J)/DETA(I)-XJ)*2.
3429              X(J)=-X(K)+XK
3430              X(K)=XK/DETA(I)
3431              IF (JB-2) 21,23,21
3432      23 IF (I+1-NETA) 24,27,27
3433      21 X(I)=(XJ/2.+XK/6.)*DETA(I)*DETA(I)-X(I)
3434          IF (I+1-NETA) 22,27,27
3435      22 X(I+1)=X(I+1)-X(I)
3436      24 XJ=X(J)
3437          X(K+1)=X(K+1)-XJ
3438          J=J+1
3439      25 K=K+1
3440          I=NETA-1
3441          XK=(3.*(X(J)/DETA(I)-XJ)-X(K)-X(K+1))*2.
3442          XKP=X(K)*2.-XK
3443          X(J)=X(K+1)
3444          X(K+1)=XKP/DETA(I)
3445          X(K)=XK/DETA(I)
3446          IF (JB-2) 26,27,26
3447      26 X(I)=(XJ/2.+XK/8.+XKP/24.)*DETA(I)*DETA(I)-X(I)
3448      27 RETURN
3449      11 DSV=DETA(NETA)
3450          DETA(NETA)=0.
3451      1 B(1)=.5
3452          A(1)=DETA(1)/4.+DETA(2)/2.
3453          DO 2 I=3,NETA
3454              C(I-2)=DETA(I-1)/(6.*A(I-2))
3455              B(I-1)=.5-C(I-2)*B(I-2)
3456      2 A(I-1)=(1./3.-C(I-2)*B(I-2))*DETA(I-1)+B(I-1)*DETA(I)
3457      12 J=NETA-1
3458          K=J+JB-1
3459          L=K+J
3460          X(L)=X(L)+X(L+1)
3461      3 X(L-1)=X(L-1)+X(L)
3462          X(L)=X(L)-X(K)/DETA(J)
3463          L=L-1
3464          K=K-1
3465          J=J-1
3466          IF (J-1) 4,4,3
3467      4 X(L)=X(L)-X(K)/DETA(1)*1.5
3468          J=L
3469          DO 5 I=3,NETA
3470              X(J+1)=X(J+1)-C(I-2)*X(J)
3471      5 J=J+1
3472          XS=X(J+1)
3473          I=NETA-1
3474          GO TO 8
3475      6 M=L
3476          DUM=X(J+1)*(DETA(I+1)+DETA(I+2))
3477          DO 7 K=1,I
3478              X(M)=X(M)-DUM*B(K)
3479      7 M=M+1
3480          J=J-1

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3481      8 X(J+1)=X(J)/A(I)
3482      I=I-1
3483      IF (I) 9,9,6
3484      9 DUM=DETA(1)*DETA(1)
3485      X(J)=X(JB)/DUM*3.-.5*X(J+1)
3486      IF(JB-2) 13,14,13
3487      13 X(1)=DUM*DETA(1)*(X(J)/8.+X(J+1)/24.)-X(1)
3488      14 L=JB
3489      DO 10 I=3,NETA
3490      J=J+1
3491      X(L)=X(L+1)/DETA(I-1)-DETA(I-1)/3.*(X(J)+.5*X(J+1))
3492      IF(JB-2) 15,10,15
3493      15 DUM=DETA(I-1)*DETA(I-1)
3494      X(I-1)=X(I-2)-X(I-1)+DUM*(X(L)/2.+DETA(I-1)*(X(J)/8.+X(J+1)/24.))
3495      10 L=L+1
3496      X(L)=XS
3497      DETA(NETA)=DSV
3498      RETURN
3499      END
3500  CB188
3501      SUBROUTINE MATS2(X)
3502      COMMON /INTCOM/ KR(20)
3503      KR(1)=KR(1)-100
3504      CALL MATS1(X)
3505      RETURN
3506      END
3507  CB19A
3508      SUBROUTINE TRMBL(ILK)
3509      DIMENSION EPSOUT(379)
3510      DIMENSION XP(4)
3511      COMMON/GOECOM/ C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15 B19A 003
3512      1,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C31,CB19A 4
3513      232,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C48 B19A 5
3514      3,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,CB19A 6
3515      465,C66,C67,C68,C69,C70,C71,C72,C73,C74,C75,C76,C77,C78,C79,C80,C81 B19A 7
3516      5,C82,C83,C84,C85,C86,C87,C88 B19A 8
3517      COMMON/GOECOM/ CK1( 8),CK2( 8),CK3( 8),CK4( 8),CK5( 8),CK6( 8) B19A 9
3518      1,CK7( 8),CK8( 8),CK9( 8),CK10( 8),CK11( 8),CK12( 8),CK13( 8) B19A 10
3519      2,CK14( 8),CK15( 8),CK16( 8),CK17( 8),CK18( 8),CK19( 8),CK20( 8) B19A 11
3520      3,CK21( 8),CK22( 8),CKK1( 8, 8),CKK2( 8, 8),XM(5),XG(5),XSP(5, 9) B19A 12
3521      4,CKK3( 8, 8) B19A 13
3522      COMMON/EDGCOM/ PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES, B19A 14
3523      1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEGE,D2UEGE,VMWE,CGE,C90 B19A 15
3524      2,DSIP(40),IDSIP,TTVC,TVCC(40),HEA(40), SF(20),CS(20),CSPR(20), ENTR-MOD
3525      3CG(20),CGP(20),SREF,GEP,NEN,UINF,RHOINF,HINF,PINF ENTR-MOD
3526      COMMON/EPSCOM/ELCON,YAP,CLNUM,SCT,PRT,RED,DVS,RHCVS,PI,PIM,CL, B19A 16
3527      1 EPSA(15),EPS1,EL(15),DPI(15,2),DEPC,TREF,RETR,VINTR(15) ENTR-MOD
3528      COMMON/ERRCOM/FLE( 43),GLE(30),SPLE(30, 8),ELA(313),FLEM,GLEM B19A 17
3529      1,SPLEM( 8),ELM(14),ELHM,IFLM,IGLM,ISPLM( 8),NELM,ILHM,DFL(43) B19A 18
3530      2,DGL(30),CSPL(30, 8),FNLE(18),GNLE(15),SPNLE(15, 8),ENL(153) B19A 19
3531      3,FNLEM,GNLEM,SPNLEM( 8), ENLHM,IFNLM,IGNLM,ISPNLM( 8) B19A 20
3532      4,NENLM,INLHM,DFNL(18),DGNL(15),DSPNL(15, 8),DRNL(10) B19A 21
3533      COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14) B19A 22
3534      1,LAR(153),BA1(43,18),BA2(30,15) B19A 23
3535      COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZH(4,14),ZG(4,14),ZSP(4,14, 8) B19A 24
3536      1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HMUE,HFW,DLX2 B19A 25
3537      2,C3M(40),BETAM(40) B19A 26
3538      COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB19A 27

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3539 1S,IT,NTIME,NSP,NSPM1,NAH,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B19A 31
3540 2,B(8), MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B19A 32
3541 3,KAUXO,JTIME,JSPEC,MD(3) B19A 33
3542 COMMON/NONCOM/AM(153,153),DVNL(153),TCW, B19A 34
3543 1VLNKH,DLPH( 9),DLPK( 8, 9),DTHW,DTKH( 8),FLUXJB( 9) B19A 35
3544 COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15) B19A 36
3545 1,CPBAR(15),VMH(15),PHIK(15, 8),DRHOH,DRHOK( 8),ZK( 8),DZKH( 8), DB19A 37
3546 2MU3K( 8),DMU4K( 8),DTK( 8),DPHIKH( 8),DPRK( 8),DSCK( 8),DCAPCK( 8) B19A 38
3547 3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8) B19A 39
3548 4,DPHIKK( 8, 8), DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL B19A 40
3549 5,VMU3,DTH,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15), RHOP B19A 41
3550 6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15) B19A 42
3551 COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH B19A 43
3552 EQUIVALENCE(EPSOUT(1),ELCON)
3553 GO TO (1001,1002,1003,1004,1005),ILK
3554 1001 CONTINUE
3555 1 FORMAT(8E10.3)
3556 2 FORMAT(/30H MIXING LENGTH CONSTANT =1PE11.4
3557 1 /30H SUBLAYER CONSTANT, YA+ =1PE11.4
3558 2 /30H CLAUSER NUMEER =1PE11.4
3559 3 /30H TURBULENT SCHMIDT NUMBER=1PE11.4
3560 4 /30H TURBULENT PRANDTL NUMBER=1PE11.4
3561 5 /30H TRANSITION MOM.THICK.RE =1PE11.4//)
3562 READ(KIN,1) ELCON,YAP,CLNUM,SCT,PRT,RETR
3563 WRITE(KOUT,2)ELCON,YAP,CLNUM,SCT,PRT,RETR
3564 KQ(10)=1
3565 KR(7)=KR(7)-2
3566 IF(RETR.GT.0.) KQ(10)=-1
3567 IF(RETR.LT.-1.999) KQ(10)=-10.01+RETR ENTR-MOD
3568 CONE=NETA-KAPPA ENTR-MOD
3569 RNOSE=FLOAT(KAPPA) ENTR-MOD
3570 DO 13 I=1,NETA ENTR-MOD
3571 IF(I.LT.KAPPA.OR.YAP.GE.0.) GO TO 12 ENTR-MOD
3572 VINTR(I)=1.-(FLOAT(I)-RNOSE)/CONE ENTR-MOD
3573 GO TO 13 ENTR-MOD
3574 12 VINTR(I)=1. ENTR-MOD
3575 13 CONTINUE ENTR-MOD
3576 YAP=ABS(YAP) ENTR-MOD
3577 RETURN
3578 1002 CONTINUE
3579 C**** CALCULATES EPS2/NUE AND ITS DERIVITIVES AS DVS AND AM(1,...)
3580 NUL=0
3581 COMMENT .. C3=-DEL/VMUE , RHOVS=-DEL/VMUE*RHOV=-RED*RHOV/(RHOE*UE)
3582 RED=-C3 *RHOE(1S) *UE(1S)
3583 RC=RED*CLNUM
3584 P1=0.
3585 EPS1=0.
3586 DEPC=0.
3587 RHOVS=C1*F(1,1)+HF(1,5)
3588 IF(RC)75,4,4 ENTR-MOD
3589 4 RR=RHOE(1S)/RHO(1) ENTR-MOD
3590 RRP=RR/RHO(1)*RHOP(1)
3591 YDI=0.
3592 QI=0.
3593 SDY=0.
3594 YDIQ=0.
3595 DVS=0.
3596 JO 66 I=1,NETA

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3597      RRPD=-RRP
3598      RI=RR
3599      YDS=YDI
3600      QS=QI
3601      YDQD=-YDIQ
3602      IF(I-NETA) 5,15,15
3603      5 RR=RHOE(15)/RHO(I+1)
3604      RRP=RR/RHO(I+1)*RHO(I+1)
3605      RRFD=F(3,I)/RI-F(3,I+1)/RR
3606      RRPD=RRPD+RRP
3607      YDI=DETA(I)/2.*(RR+RI+DETA(I)/6.*RRPD)
3608      SDY=SDY+YDI
3609      DUM1=YDI/6.*RRFD
3610      DUM2=F(2,NETA)-(F(2,I)+F(2,I+1))*0.5
3611      DVS=DVS+YDI*(DUM2-DUM1/2.)
3612      YDIQ=YDI*YDI
3613      YDQD=YDQD+YDIQ
3614      QI=DETA(I)/2.*(DUM2-DUM1)
3615      QS=QS+QI
3616      YDS=YDS+YDI
3617      15 DRHOI=-QS*RI/RHO(I)-F(3,I)/12.*YDQD/RHOE(15)
3618      LR=MAT1J+I
3619      DUM=AM(LR,124)*DRHOI*RC
3620      AM(1,I+3)=AM(1,I+3)-0.5*RC*YDS+C7*DUM*F(2,I)
3621      IF(I-1) 20,20,25
3622      20 AM(1,3)=AM(1,3)-RC/RI*YDQD/12.
3623      GO TO 30
3624      25 CALL LIAD(-1,1,NETA-2+I,-RC/RI*YDQD/12.)
3625      30 AM(1,1)=AM(1,1)-DUM*C7*F(2,I)*F(2,I)/ALPH
3626      MPJ=MAT1J+1+I
3627      DO 60 K=NUL, NSPM1
3628      IF(K) 40,40,35
3629      35 LRK=MAT1J+MAT2J+I
3630      DUM=AM(LR,K+124)*DRHOI*RC
3631      40 IF(I-NETA) 50,55,50
3632      50 AM(1,MPJ)=AM(1,MPJ)+DUM
3633      GO TO 60
3634      55 CALL LIAD(K,1,1,DUM)
3635      60 MPJ=MPJ+MAT2J
3636      IF(KR(17)) 66,66,65
3637      65 WRITE (KOUT,640) RC,RR,SDY,RRP,RRPD,RRFD,YDI,YDS,DUM1,DUM2,DVS
3638      1,YDIQ,YDQD,QI,QS,DRHOI,AM(LP,104),(AM(LRK,K+107),K=1,NSPM1),
3639      2(AM(1,J),J=1,NNLEQ),ENL(1)
3640      66 CONTINUE
3641      DVS=AMAX1(0.,RC*DVS)
3642      AM(1,MAT1J)=AM(1,MAT1J)+SDY*RC
3643      RETURN
3644      75 RC=-R(
3645      DVS=0.
3646      DO 80 I=2,NETA
3647      CALL TAYLOR(DETA(I-1),F(2,I-1),F(2,I),XP)
3648      DVS=DVS+(F(2,I)*XP(1)+F(3,I)*XP(2)+F(4,I)*XP(3)+F(4,I-1)*XP(4))
3649      IFP=I+3
3650      IFPP=NETA+I-2
3651      IFPPP=IFPP+NETA
3652      AM(1,IFP)=XP(1)+AM(1,IFP)
3653      CALL LIAD(-1,1,IFPP,XP(2))
3654      CALL LIAD(-1,1,IFPPP,XP(3))

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3655	CALL LIAD(-1,1,IFPPP-1,XP(4))	ENTR-MOD
3656	80 CONTINUE	ENTR-MOD
3657	DVS=DVS*RC/F(2,NETA)	ENTR-MOD
3658	DO 85 I=1,NNLEQ	ENTR-MOD
3659	85 AM(1,I)=-AM(1,I)*RC*2./F(2,NETA)	ENTR-MOD
3660	AM(1,2)=AM(1,2)-RC	ENTR-MOD
3661	AM(1,MAT1J)=AM(1,MAT1J)+DVS/F(2,NETA)	ENTR-MOD
3662	CALL LIAD(-1,1,NETA-1,RC)	ENTR-MOD
3663	DVS=AMAX1(RC*(F(1,NETA)-F(1,1))-DVS,0.)	ENTR-MOD
3664	RETURN	ENTR-MOD
3665	1003 CONTINUE	
3666	C**** CALCULATES MIXING LENGTH AND ITS DERIVITIVES	
3667	100 PIM=PI	
3668	PI=SQR7(ABS(RED/C26*(CAPC(1)*F(3,1)-ALPH*RHCVS*F(2,I)))/	
3669	1 (CAPC(I)*YAP)	
3670	IF(I-1) 305,305,101	
3671	101 EPI=EXP(-(PI+PIM)/2.*DETA(I-1))	
3672	PID=PI-PIM	
3673	IF(PID/PI-.0001) 102,102,103	
3674	102 PI=AMAX1(PI,PIM)	
3675	PID=1.0	
3676	AF=1.0	
3677	ERP1=1./PI	
3678	ERPP1=-2./(PI*PI)	
3679	ERP2=1./PIM	
3680	ERPP2=-2./(PIM*PIM)	
3681	GO TO 104	
3682	103 AF=SQR7(2./PID*DETA(I-1))	
3683	ERP1=ERP(AF/2.*PI)	
3684	ERPP1=1.-AF*PI*ERP1	
3685	ERP2=ERP(AF/2.*PIM)	
3686	ERPP2=1.-AF*PIM*ERP2	
3687	104 BF=ERP1-EPI*ERP2	
3688	DCLL=EPI	
3689	DUM1=DETA(I-1)/2.*EPI*(AF*ERP2-CL)	
3690	CL=CL*EPI+AF*BF	
3691	EL(I)=ALPH*ELCON*(ETA(I)-CL)	
3692	DUM2=AF/PID*(BF/2.+ERPP1/4.*AF*PI-EPI*ERPP2/4.*AF*PIM)	
3693	DUM3=AF/2.*AF	
3694	DCLPI=DUM1-DUM2+DUM3*ERPP1	
3695	DCLPM=DUM1+DUM2-DUM3*ERPP2*EPI	
3696	IF(I-2) 305,330,320	
3697	305 EL(1)=0.	
3698	DO 307 J=1,NNLEQ	
3699	307 AM(2,J)=0.	ENTR-MOD
3700	CL=0.	
3701	DPI(1,2)=CAPC(1)	
3702	DPI(3,1)=F(3,1)*DCAPCH	
3703	IF(NSPM1) 350,350,310	
3704	310 DO 315 K=1,NSPM1	
3705	315 DPI(K+3,1)=F(3,1)*DCAPCK(K)	
3706	GO TO 350	
3707	320 DO 325 J=1,NNLEQ	
3708	325 AM(2,J)=AM(2,J)*DCLL	ENTR-MOD
3709	330 DUM=-YREF*DCLPM*ELCON*ALPH	
3710	AM(2,1)=AM(2,1)+(EL(I)-DCLL*EL(I-1))/ALPH	ENTR-MOD
3711	L=L-1	
3712	331 AM(2,1)=AM(2,1)+DPI(1,1)*DUM	ENTR-MOD

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3713      AM(2,2)=AM(2,2)+DPI(2,1)*DUM
3714      AM(2,3)=AM(2,3)+DPI(1,2)*DUM
3715      AM(2,L+3)=AM(2,L+3)+DPI(2,2)*DUM
3716      J=MAT1J+2
3717      DO 340 K=NUL,NSPM1
3718      AM(2,J)=AM(2,J)+DPI(K+3,1)*DUM
3719      JL=J+L-1
3720      AM(2,JL)=AM(2,JL)+DPI(K+3,2)*DUM
3721      340 J=J+MAT2J
3722      345 IF(L-I) 350,400,400
3723      350 TREF= RED/C26 / (2.*CAPC(I)*YAP*PI*YAP*CAPC(I))
3724      DPI(3,2)=-PI/TREF*(DCAPCH/CAPC(I)-DRHOH/(2.*RHO(I)))
3725      DPI(2,2)= C10*DPI(3,2)-RHOVS*ALPH
3726      DPI(1,1)=-C56*C10*DPI(3,2)-RHOVS*F(2,I)
3727      DPI(2,1)=-ALPH*C1*F(2,I)
3728      IF(NSPM1) 362,362,355
3729      355 DO 360 K=1,NSPM1
3730      360 DPI(K+3,2)=-PI/TREF*(DCAPCH(K)/CAPC(I)-DRHOH(K)/(2.*RHO(I)))
3731      362 L=I
3732      DUM=-TREF*DCLPI*ELCON*ALPH
3733      IF(I-1) 445,445,365
3734      365 IF(I-META) 331,400,400
3735      C**** CALCULATES EPS1 AND EPS2 -- COMPARES TO GET EPS -- CALCULATES EPS
3736      C
3737      400 DUM1=EL(I)/ALPH*EL(I)/ALPH*RED/C26
3738      C26S=C26*C26
3739      EPS1=AMAX1(DUM1*F(3,I),EPS1)
3740      EPS2=OVS/C26S
3741      IF(EPS1-EPS2) 405,401,401
3742      401 EPS=EPS2*VINTR(I)
3743      ENL(3)=ZNL(1)/C26S*VINTR(I)
3744      DO 402 J=1,NMLEQ
3745      402 AM(3,J)=AM(1,J)/C26S*VINTR(I)
3746      DUM1=2.0*EPS/RHO(I)
3747      GO TO 415
3748      405 EPS=EPS1*VINTR(I)
3749      ENL(3)=0.
3750      DO 410 J=1,NMLEQ
3751      410 AM(3,J)=2.*EPS/EL(I)*AM(2,J)
3752      AM(3,1)=AM(3,1)-2./ALPH*EPS
3753      CALL LIAD(-1,3,META+I-2,DUM1)
3754      DUM1=EPS/RHO(I)
3755      415 DUM=DUM1*DRHOH
3756      EPSA(I)=EPS
3757      AM(3,1)=AM(3,1)-C56*C10*DUM
3758      AM(3,I+3)=AM(3,I+3)+DUM*C10
3759      J=MAT1J+I+1
3760      L=MAT1J
3761      DO 420 K=NUL,NSPM1
3762      IF(I-META) 410,410,410
3763      410 CALL LIAD(K,3,1,DUM)
3764      GO TO 419
3765      410 AM(3,J)=AM(3,J)+DUM
3766      419 J=J+MAT2J
3767      420 DUM=DUM1*DRHOH(K+1)
3768      DEPC=ENL(3)
3769      445 RETURN
3770      1034 CONTINUE

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3771 C**** MODIFIES ENL AND AM AFTER IPONE
3772 L=I-1
3773 SALPH=-ALPH/TTVC
3774 IF(I-2) 650,650,600
3775 1005 CONTINUE
3776 C**** MODIFIES ENL AND AM AFTER ICNLY
3777 L=I
3778 SALPH= ALPH/TTVC
3779 600 IFPP=L+NETA-2
3780 ISPP=L
3781 DUM=F(3,L)/SALPH
3782 ENL(I+3)=ENL(I+3)-DUM*(EPS-DEPC)
3783 AM(I+3,1)=AM(I+3,1)-DUM*EPS/ALPH
3784 C28=C28+DUM*EPS
3785 DO 605 J=1,NNLEQ
3786 605 AM(I+3,J)=AM(I+3,J)+DUM*AM(3,J) ENTR-MOD
3787 CALL LIAD(-1,I+3,IFPP,EPS/SALPH)
3788 MPJ=MAT1J+I
3789 PRF=1.-1./PRT
3790 EG1=G(2,L)/(SALPH*PRT)
3791 EG4=-PRF/SALPH*C13*F(2,L) ENTR-MOD
3792 EG3=EG4*EPS ENTR-MOD
3793 EG4=EG4+EG1 ENTR-MOD
3794 EG2=EPS/SALPH*(1./SCT-1./PRT)*(HP-CPBAR(L)*TP)
3795 ENL(MPJ)=ENL(MPJ)-EG1*(EPS-DEPC)-EG2-EG3
3796 C32=C32+EG1*EPS+EG2+EG3
3797 AM(MPJ,1)=AM(MPJ,1)-EG1/ALPH*EPS-3.0/ALPH*EG3
3798 DO 610 J=1,NNLEQ
3799 610 AM(MPJ,J)=AM(MPJ,J)+EG4*AM(3,J) ENTR-MOD
3800 AM(MPJ,L+3)=AM(MPJ,L+3)-PRF*C13/SALPH*EPS
3801 CALL LIAD(-1,MPJ,NETA+L-2,-PRF*C10/SALPH*EPS)
3802 CALL LIAD(0,MPJ,ISPP,EPS/(SALPH*PRT))
3803 IF(NSPM1) 650,650,615
3804 615 DO 630 K=1,NSPM1
3805 DUM=SP(2,L,K)/(SALPH*SCT)
3806 MPJ=MPJ+MAT2J
3807 CK6(K)=CK6(K)+DUM*EPS
3808 ENL(MPJ)=ENL(MPJ)-DUM*(EPS-DEPC)
3809 AM(MPJ,1)=AM(MPJ,1)-DUM/ALPH*EPS
3810 DO 620 J=1,NNLEQ
3811 620 AM(MPJ,J)=AM(MPJ,J)+DUM*AM(3,J) ENTR-MOD
3812 630 CALL LIAD(K,MPJ,ISPP,EPS/(SALPH*SCT))
3813 650 IF(KR(17)) 660,660,655
3814 655 WRITE(KOUT,640) EPSOUT
3815 640 FORMAT(1P10E12.3)
3816 660 RETURN
3817 END
3818 CB19T
3819 SUBROUTINE TRANC(I60)
3820 COMMON/COECON/ C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15,C19T 4
3821 1,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C31,C319T 5
3822 232,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C48,C49T 6
3823 3,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,C619T 7
3824 465,C66,C67,C68,C69,C70,C71,C72,C73,C74,C75,C76,C77,C78,C79,C80,C81,C819T 8
3825 5,C82,C83,C84,C85,C86,C87,C88 819T 9
3826 COMMON/COECON/ CK1( 8),CK2( 8),CK3( 8),CK4( 8),CK5( 8),CK6( 8) 819T 10
3827 1,CK7( 8),CK8( 8),CK9( 8),CK10( 8),CK11( 8),CK12( 8),CK13( 8) 819T 11
3828 2,CK14( 8),CK15( 8),CK16( 8),CK17( 8),CK18( 8),CK19( 8),CK20( 8) 819T 12

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3829      3,CK21( 8),CK22( 8),CKK1( 8, 8),CKK2( 8, 8),XM(5),XG(5),XSP(5, 9) 819T 13
3830      4,CKK3( 8, 8) 819T 14
3831      COMMON/EDGCOM/ PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES, 819T 15
3832      1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEGE,DZUEGE,VMUE,CGE,C90 ENTR-MOD
3833      2,DSIP(40),IDSIP,TTVC,TVCC(40),MEA(40),SF(20),CS(20),CSPR(20), ENTR-MOD
3834      JCG(20),CGP(20),SREF,GEP,MEN ENTR-MOD
3835      COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14) 819T 18
3836      1,LAR(153),BA1(43,18),BA2(38,15) 819T 19
3837      COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZH(4,14),ZG(4,14),ZSP(4,14, 819T 20
3838      1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HMUE,HFN,OLX2 819T 21
3839      2,C3M(40),BETAM(40) 819T 22
3840      COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,META,I,IS,M819T 23
3841      1S,IT,NTIME,NSP,NSPM1,NAH,NLEQ,NMLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) 819T 24
3842      2,B(8), MNE,MON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) 819T 25
3843      3,KAUXO,JTIME,JSPEC,MO(3) 819T 26
3844      COMMON/NONCOM/AM(153,153),DYNL(153),TCM, 819T 27
3845      1VLNKH,OLPH( 9),OLPK( 8, 9),DTM,DTKM( 8),FLUXJB( 9) 819T 28
3846      COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) 819T 29
3847      1,RNOSE,VKAP,NOISC,IOISC(40),NSD(10),M'D(10),ITF( 50),IPRE,RAONO, 819T 30
3848      2CONE,RADFL( 50),RAOR(40),RADSI(40),IRAD 819T 31
3849      COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15) 819T 32
3850      1,CPBAR(15),VMH(15),PHIK(15, 8),DRMOH,DRHOK( 8),ZK( 8),DZKH( 8), 819T 33
3851      2MU3K( 8),DMU4K( 8),DTK( 8),DPHKK( 8),DPRK( 8),DSCK( 8),DCAPCK( 8) 819T 34
3852      3,DHTLK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 6),DZKK( 8, 8) 819T 35
3853      4,DPHKK( 8, 8), DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL 819T 36
3854      5,VMU3,DTM,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMJ(15), RNOP 819T 37
3855      6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(16),GMR(15) 819T 38
3856      COMMON/TEPCOM/SPOUM( 8),DER(40),DUMN1(15),SLOPE(15),REDUM(15) 819T 39
3857      1,SDUM1(40),SDUM2(40),FNDUM(40),XICON(40),FWCON(40),FWINIT( 1) 819T 40
3858      2,XIINIT( 1),DUOS( 40) 819T 41
3859      COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH 819T 42
3860      GO TO (1001,1002,1003,1004), IGO
3861      1001 LOW=1
3862      IF(KR(6)) 20,20,35
3863      20 LIM= NSD(1)
3864      DO 25 IS=2,LIM
3865      SDUM1(IS) = S(IS) * S(IS)
3866      25 SDUM2(IS) = 1.-ROKAP(IS)/S(IS)
3867      SDUM1(1)=0.
3868      SDUM2(1)=0.
3869      CALL SLOPC(LIM, SDUM1, SDUM2, DER, DER)
3870      DO 38 IS=2,LIM
3871      DUM=1. - SDUM2(1S)
3872      38 TVCC(1S) = SQRT(4.*DER(1S)*(DUM-SDUM1(1S)*DER(1S))+ SDUM2(1S)/SDUM
3873      11(1S)*(1.+DUM))/DUM
3874      TVCC(1) = SQRT(6.*DER(1))
3875      LOW=2
3876      IL=1
3877      IF(NDISC) 50,50,40
3878      35 IL=0
3879      40 LIM=NDISC+1
3880      DO 45 II=LOW,LIM
3881      M=NSD(II)
3882      CALL SLOPC(NSD(II), S(M), ROKAP(M), DER(M), DER(M))
3883      MM=M+IL
3884      IL=1
3885      IGH=M+NSD(II)-1
3886      DO 45 IS=MM,IGH

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3887      45 TVCC(15) = SQRT(1.-DER(15)*DER(15))/ROKAP(15)
3888      50 DO 55 IS=1,NS
3889      55 TVCC(15)=-TVCC(15)*2.*C3H(15)*VMUE(15)
3890      RETURN
3891  1002 CONTINUE
3892  CALLED IMMEDIATELY AFTER ICoeff
3893      IF(I-1) 115,115,125
3894      115 RHS=0.
3895      DO 120 J=1,NMLEQ
3896      120 AM(4,J)=0.
3897      GO TO 130
3898      125 IND=I-1
3899      SIX=-6.
3900      GO TO 140
3901      130 IND=I
3902      SIX=6.
3903      C27=ORHOM
3904      DO 135 K=1,NSPH1
3905      135 CK11(K)=ORMOK(K)
3906      IF(I-1) 165,165,140
3907      140 DUM=DETA(I-1)/2. *RHOE(15)/RHO(IND)
3908      IF(KQ(9).LT.0) DUM=-DUM
3909      RHS=RHS+DUM*(1.+RHO(IND)/RHO(IND)*DETA(I-1)/SIX)
3910      DUM=-DUM/RHO(IND)
3911      LPS=MAT1J+IND+1
3912      IF(NSPH1) 155,155,145
3913      145 LPI=LPS
3914      DO 150 K=1,NSPH1
3915      LPI=LPI+MAT2J
3916      150 AM(4,LPI)=AM(4,LPI)+DUM*CK11(K)
3917      155 DUM=DUM*C27
3918      AM(4,LPS)=AM(4,LPS) + DUM
3919      DUM=DUM*C7*F(2,IND)
3920      AM(4,IND+3) = AM(4,IND+3) + DUM
3921      AM(4,1) = AM(4,1)-DUM/ALPH*F(2,IND)
3922      IF(IND-I) 130,160,160
3923      160 TTVC=AMAX1(1.+RHS*ALPH*TVCC(15),0.0001)
3924      165 RETURN
3925  1003 CONTINUE
3926  CALLED IMMEDIATELY AFTER INOME
3927      IND=I-1
3928      DUM1=-TVCC(15)/TTVC
3929      GO TO 205
3930  1004 CONTINUE
3931      IND=I
3932      DUM1=TVCC(15)/TTVC
3933      205 DUM2=DUM1*C28
3934      DUM3=DUM1* C32
3935      AM(I+3,1)=AM(I+3,1)+DUM2*RHS
3936      M= MAT1J+I
3937      AM(M,1)=AM(M,1)+DUM3*RHS
3938      DUM2=DUM2*ALPH
3939      DUM3=DUM3* ALPH
3940      DO 210 J=1,NMLEQ
3941      AM(I+3,J)=AM(I+3,J)+DUM2*AM(4,J)
3942      210 AM(M,J)=AM(M,J)+DUM3*AM(4,J)
3943      IF(NSPH1) 225,225,215
3944      215 DO 220 K=1,NSPH1

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ENTR-MOD

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3945      DUM3=DUM1*CK6(K)
3946      H=M*HAT2J
3947      AM(N,1)=AM(N,1)+DUM3*RHS
3948      DUM3=DUM3*ALPH
3949      DO 228 J=1,MMLEQ
3950      228 AM(N,J) = AM(N,J) + DUM3*AM(4,J)
3951      225 RETURN
3952      END
3953  CB28A
3954      SUBROUTINE EQUIL(KQ,Z,PRR)
3955      INTEGER FAMOA,FAMOB
3956      EQUIVALENCE(TU( 72),TF),(VNU,CIJ)
3957      DIMENSION CIJ( 71,1),TF(1)
3958      COMMON/TENCON/APE(16,16),BS(16)
3959      DIMENSION VLAN( 71,1), X(16),GANK( 71,1),KQ(16),DOJRN( 71,1)
3960      EQUIVALENCE(AM( 74),DOJRN( 74),GANK,VLAN)
3961      COMMON /BLOCON/FAMOA( 71),FAMOB( 71),M ,FR( 71,15),W(3),LEF(16)
3962      1,LEFS(16),PIEASE,LEFN(16),L2,L3
3963      COMMON/BUMCON/ BUMP,CORNA,EASE,ICORN,MOOT,TFZ,I777,DTEMP,KIP,IXB20A
3964      COMMON/EDGCON/ PE(48, 1),PTE(48, 1),SPE( 8,48, 1),QUES,B20A
3965      1UE(48),RHOE(48),VMUE(48),YE(48),UEDGE,DUEGE,DZUEGE,VNUE,CGE,C90
3966      2,DSIP(48),IDSIP,TVVC,TVCC(48),MEA(48), SF(28),CS(28),CSPR(28),
3967      3CG(28),CGP(28),SREF,CEP,MEN,UINF,RHOINF,MINF,PINF
3968      COMMON /EQPCOM/ RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2),
3969      1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(16),ATB(16),ATC(16),MAT(16),
3970      2 KAT(16),IR(16),IS,KR(16),LAMI( 71),P,T,TK(16, 71),VN( 71),
3971      3 VNU( 71,16),ITFF,KR2,HCH,NCV,WH,WTN( 71),Y( 71),VM( 71),GG( 71)
3972      4 ,TO(16, 71),EPOVRK,SIGNA,BASHOL
3973      COMMON /EQTCOM/SIP,HIP,EL,ENL,FLIU,CPF,IRE,IER,AA,ITS,IN,IL,IT,
3974      1 MODE,MHMT,SMELT,THAX,THIN,MELT,SUMN,SUML,NS,NSS,OI,ISP2,ISPO,
3975      2 ISP,KKJ,SVA,SVB,SVC,SVD,SUNC,FFF,CMF,EP,RV,IFCJC,WTG,NTL,JC,HG,
3976      3 CPG,ITIN,ITMAX,L7,L8,IB(11),EB(16),EOL(16),A(16,16),D(16),
3977      4 IP( 71),ALP(16),FNU(16),GANK(16),GANK(16),SLAN(16),DY( 71),RVS,
3978      5 CP( 71),H( 71),SB( 71),TC( 71),VLWK( 71),E( 71),PMUS(16),
3979      6 BC(16),BLNK(16),BY(16),IBC(16),BE(16),JIE( 4)
3980      COMMON/FLPCOM/TXI(2),TUE(2),TRHOE(2),TIE(2),TVNUE(2),TNAT(566,2)
3981      2,TMF(15,2),LEFT(16,2),TPE(2),TRAOS(2),TOSIP(2),KOT(2)
3982      COMMON/FLXCON/DELQN,DELMI( 8),DONL(153),DJNL(153, 8),WALLQ
3983      1,WALLJ( 8),QM,VJKN( 9),TPMALL
3984      COMMON /INTCON/KKR(28),KIN,KOUT,NAT11,NAT21,NAT1J,NAT2J,META,II,
3985      1ISS,NS,ITT,NTIME,NSP,NSPM1,KAN,MLEQ,MNLEQ,MNHL,MITS,KAPPA,CBAR,
3986      2CASE(15),BB(16), MNE,MOM,KQ(16),ITEM,NITEM,KR17,NBT,NBT2,IDENT,
3987      3KRS(48),KAUXO,JTIME,JSPEC,NO(3),IU,ISM
3988      COMMON/MONCON/AM(153,153),OVNL(153),TCN,
3989      1VLNKH,OLPH( 9),OLPK( 8, 9),DTNH,DTKH( 8),FLUXJB( 9)
3990      COMMON /PRPCOM/PR(15),TT(15),RHO(15),SC(15),CAPC(15),QR(15),PM(15)
3991      1,CPBAR(15),VNU(15),PHK(15, 8),DRNH,DRHOK( 8),ZK( 8),DZKH( 8),
3992      2NUZK( 8),DNUZK( 8),DTK( 8),OPHK( 8),OPRK( 8),DSCK( 8),DCAPCK( 8)
3993      3,DMTILK( 8),DQRK( 8),DCPRK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8)
3994      4,OPHIKK( 8, 8), DNUNH,DMU1H,DMTILH,VNU12,CT,CTR,CPTIL,MTZL
3995      5,VNUJ,DTN,DCAPCH,OPRN,DSCH,DRNH,DCPRH,DCPTH,DMU12H,VNU(15), RHOJ
3996      6(15),PHIKP(15),HP,TP,ZKP( 8),VNU1P,VNU4P,MTILP,CRCO(16),CHR(15)
3997      COMMON/VARCON/F(4,15),G(3,15),SP(3,15, 9),ALPH
3998      COMMON/MALCON/FN(48, 1),TN(48, 1),MN(48, 1),SPN( 8,48, 1)
3999      1,RMOVN(48, 1),FLUXJ( 3,48, 1),INW,ITW,IFW,ISPW,IRMOVN,IFLUXJ
4000      EQUIVALENCE(8,X)
4001      1 FORMAT(10I1,3F10.5)
4002      2 FORMAT(19HTEMP =F10.4,17H DEG-C PRES =F8.4,17H ATM MOL W20A

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4003      1T =F11.7)                                B20A 049
4004      3 FORMAT( /87H SPECIES PAR.PRES.      D-LOG-PP      LOG-PP      LOB20A 050
4005      1G-KP      FLAG      ERROR      CP /((1X2A4,4E13.5,15,2E13.5))      B20A 051
4006      4 FORMAT(/10X60H CP-FROZEN      CP-EQUIL      DLNM/DLNT      DLNM/DLNP      GB20A 052
4007      1AMHA      /10X5E12.5)                                B20A 053
4008      7 FORMAT(I3,F8.2,11E10.3/91X3E10.3)
4009      8 FORMAT(10X10HENTHALPY =E14.7,20H CAL/GM      ENTROPY =E12.5,13H CAL/B20A 055
4010      1GM-DEG K/10X 9HDENSITY =E13.6, 8H LB/CUFT)                                B20A 056
4011      6 FORMAT(//)                                          B20A 057
4012      9 FORMAT(5X 5HVEL =E10.3,16H FT/SEC      MACH =E10.3, 9H      AREA =E10.3B20A 058
4013      1,12H SQFT/LB/SEC)                                B20A 059
4014      10 FORMAT(10X17HFRACTION LIQUID =F8.5)                                B20A 060
4015      42 FORMAT(8F10.4)                                B20A 061
4016      DTU=500.
4017      DTD=DTU
4018      LEFUP=1                                B20A 063
4019      TTMIN=100.                                ENTR-MOD
4020      TTMAX=100000.                                ENTR-MOD
4021      IQQ=0                                ENTR-MOD
4022      MELT=1                                ENTR-MOD
4023      FLIQ=0.                                ENTR-MOD
4024      HMELT=0.                                ENTR-MOD
4025      ITS=0                                B20A 065
4026      IG=0
4027      INV=0
4028      SPEASE=PIEASE
4029      TION=1000.                                ENTR-MOD
4030      IF(II.NE.NETA.AND.KR(5).EQ.0) TION=1000.                                ENTR-MOD
4031      ISP=IS+1                                B20A 066
4032      DO 302 I=1,6
4033      302 KR(I)=KQ(I)                                B20A 068
4034      MODE=KR(1)                                B20A 069
4035      IF(KR(5).NE.3)P=PRR                                ENTR-MOD
4036      KKKJ=0                                ENTR-MOD
4037      KR(8)=0
4038      KR(6)=KR(6)-1                                B20A 071
4039      IF(KKR(18)-6) 3021,3021,3022
4040      3021 KR(7)=KKR(18)*5-9
4041      N7=51-KKR(18)*5
4042      GO TO 3023
4043      3022 KR(7)=0
4044      N7=KKR(18)*10-50
4045      3023 IF(KR(5)-1) 310,304,306
4046      C*****ISENTROPIC EXPANSION                                B20A 074
4047      304 SIP=SIP-DSIP(ISS)                                B20A 075
4048      IEW=2                                B20A 076
4049      II=NETA                                B20A 077
4050      GO TO 324                                B20A 078
4051      C*****STAGNATION POINT AND INITIALIZATION                                B20A 079
4052      306 IF(KR(5).EQ.3) GO TO 307                                ENTR-MOD
4053      KR(8)=0
4054      ITFF=0
4055      PIEASE=0.
4056      KQ(6)=0                                B20A 081
4057      HIP=Z/1.8                                B20A 082
4058      MITS=1                                B20A 083
4059      II=NETA                                B20A 084
4060      VMW(NETA)=VMWE                                ENTR-MOD

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4061	T=3000.	B20A 085
4062	WM=20.	B20A 086
4063	AA=P*WM	B20A 087
4064	DO 309 I=1,IS	
4065	309 ALP(I)=TQ(I,1)	B20A 089
4066	KR(6)=-1	B20A 090
4067	IF(ITEM-1) 350,308,350	
4068	308 IF(KKR(2)-2) 311,350,311	
4069	310 IF(KR(6)) 312,330,330	B20A 092
4070	311 LEFUP = -1	
4071	IF (KKR(12)-1) 384,350,384	
4072	C*****SHOCK ENTROPY CALCULATION	ENTR-MOD
4073	307 SA1=Z	ENTR-MOD
4074	KKJ=-1	ENTR-MOD
4075	SVA=(1.3146*RHOINF*UINF*COS(SA1))**2/90108.	ENTR-MOD
4076	SVB=SVA*2./1.9869	ENTR-MOD
4077	SVC=(UINF*COS(SA1))**2/90108.+HINF	ENTR-MOD
4078	SVD=PINF+SVB/(1.3146*RHOINF)	ENTR-MOD
4079	IF(SA1.GT.0.0001)GO TO 324	ENTR-MOD
4080	P=PYE(1,1)	ENTR-MOD
4081	T=TCH	ENTR-MOD
4082	GO TO 324	ENTR-MOD
4083	C*****BOUNDARY LAYER	B20A 093
4084	312 DO 3120 K=NSP,IS	ENTR-MOD
4085	3120 ALP(K)=0.	ENTR-MOD
4086	LEFUP=MITS+II-2	
4087	HIP=Z/1.8	B20A 096
4088	ALP(NSP)=1.0	B20A 097
4089	IF(NSPM1) 3141,3141,313	
4090	313 DO 314 K=1,NSPM1	
4091	ALP(K)=SP(1,II,K)/WTM(K)	B20A 099
4092	314 ALP(NSP)=ALP(NSP)-SP(1,II,K)	B20A 100
4093	3141 ALP(NSP)=ALP(NSP)/WTM(NSP)	
4094	DO 319 I=1,IS	ENTR-MOD
4095	IF(KAT(I).EQ.99) GO TO 319	ENTR-MOD
4096	ARPH=0.	B20A 103
4097	ARPHM=0.	B20A 104
4098	DO 315 K=1,NSP	B20A 105
4099	DUM=CIJ(I,K)*ALP(K)	B20A 106
4100	ARPHM=AMAX1(ARPHM,ABS(DUM))	B20A 107
4101	315 ARPH=ARPH+DUM	B20A 108
4102	IF(II.EQ.1.AND.LEFW(I).EQ.1.AND.LEF(I).LE.0) LEF(I)=1	ENTR-MOD
4103	IF(ARPH-.0001*ARPHM) 316,316,319	
4104	316 IF(II.EQ.1.AND.LEF(I).EQ.1) LEF(I)=0	
4105	LEF(I)=-IABS(LEF(I))	
4106	LEFS(I)=-IABS(LEFS(I))	
4107	319 CONTINUE	B20A 111
4108	320 IF(ITFF) 326,350,350	B20A 112
4109	C*****ACCEPT RESIDENT VALUES AS FIRST GUESSES	B20A 113
4110	324 IF(T-TION) 328,398,398	
4111	326 ITFF=ITFF+1	B20A 115
4112	IF(II-1) 323,323,322	
4113	322 IG=1	
4114	GO TO 350	
4115	323 IF (ITFF) 327,329,329	
4116	327 IF(KR2-1) 328,329,328	
4117	329 GO TO 350	
4118	328 IF(KAT(IS).EQ.99) LEF(IS)=-IABS(LEF(IS))	ENTR-MOD

4119	IF (LEFUP) 393,364,393	
4120	C*****WALL SOLUTION	B20A 118
4121	330 IEW=1	B20A 119
4122	ITFF=-1	B20A 120
4123	II=1	B20A 122
4124	CHFLUX=W(3)	
4125	PIEASE=PIEASE*0.989*(1.0-EASE)	
4126	KR(7)=MAX0(KR(7),KKR(16)*5-4)	
4127	IF (TT(1)/1.8.GT.TF(N+1)) KR(8)=1	
4128	IF (MODE=1) 333,331,333	B20A 123
4129	331 TTMIN=TT(1)/1.8-500.	
4130	TTMAX=TT(1)/1.8+500.	
4131	KR(8)=0	
4132	333 IF (KR(8).EQ.1) CHFLUX=-1.	
4133	DO 332 K=1,IS	
4134	IF (LEF(K)) 332,3331,332	
4135	3331 IF (W(2)*TK(K,L2)+CHFLUX*TK(K,L3).LT.0.) LEF(K)=1	
4136	332 ALP(K)=TQ(K,L2)*AMIN1(0.,W(2))+TQ(K,L3)*AMIN1(0.,W(3))+TQ(K,1)*	
4137	1 AMIN1(0.,W(1))	
4138	WS=-W(1)-W(2)-W(3)	
4139	WSS=-AMIN1(0.,W(1))-AMIN1(0.,W(2))-AMIN1(0.,W(3))	
4140	DO 335 L=NSP,IS	B20A 129
4141	DO 334 K=1,IS	B20A 130
4142	GAMK(K,1)=0.	B20A 131
4143	334 GAMK(L,K)=0.	B20A 132
4144	GAMH(L)=0.	B20A 133
4145	335 GAMF(L)=0.	B20A 134
4146	IF (NSPM1) 3361,3361,3351	
4147	3351 DO 336 K=2,NSP	
4148	GAMH(NSP)=GAMH(NSP)-DQJRN(2,K)/WTH(NSP)*1.8	B20A 136
4149	GAMF(NSP)=GAMF(NSP)-DQJRN(1,K)/WTH(NSP)	B20A 137
4150	ALP(NSP)=ALP(NSP)+WALLJ(K-1)/WTH(NSP)	B20A 138
4151	ALP(K-1)=ALP(K-1)-WALLJ(K-1)/WTH(K-1)	B20A 139
4152	GAMH(K-1)=DQJRN(2,K)/WTH(K-1)*1.8	B20A 140
4153	GAMF(K-1)=DQJRN(1,K)/WTH(K-1)	B20A 141
4154	DO 336 KK=2,NSP	B20A 142
4155	336 GAMK(KK-1,NSP)=GAMK(KK-1,NSP)-GAMK(KK-1,K-1)	B20A 143
4156	3361 DO 3362 K=1,IS	
4157	DO 3362 J=ISP,N	
4158	3362 VLAM(J,K)=WS*WTH(J)*GAMF(K)	
4159	DUM1=NSPM1	B20A 144
4160	DO 340 K=1,NSP	B20A 145
4161	GAMH(K)=-GAMH(K)	
4162	SUMG=0.	B20A 146
4163	IF (NSPM1) 3392,3392,3391	
4164	3391 DO 339 KK=1,NSP	
4165	IF (KK-K) 337,339,337	B20A 148
4166	337 SUMG=SUMG+GAMK(KK,K)	B20A 149
4167	339 CONTINUE	B20A 150
4168	SUMG=SUMG/DUM1	B20A 151
4169	ALP(K)=-ALP(K)+SUMG/WTH(K)	
4170	3392 DO 338 KK=1,NSP	
4171	338 GAMK(KK,K)=-GAMK(KK,K)-SUMG/WTH(K)*WTH(KK)	
4172	DO 340 KK=1,NSP	B20A 157
4173	DO 3401 J=ISP,N	
4174	3401 VLAM(J,K)=VLAM(J,K)+GAMK(KK,K)*VNU(J,KK)	
4175	340 GAMK(KK,K)=GAMK(KK,K)+WTH(KK)*GAMF(K)*WS	
4176	C*****RECALL STORED VALUES OF BOUNDARY LAYER SOLUTION AND	B20A 159

4177	C	RE-INITIALIZED OMITTED SPECIES	820A 160
4178	350	II=II-IG	
4179		PIN=1.E-4*P	
4180		PINL=ALOG(PIN)	
4181		LIM=N+KR(8)	
4182		DO 354 I=1,LIM	
4183		IF(IFC(I)-1) 342,342,341	820A 165
4184	341	IFC(I)=IFC(I)-3	820A 166
4185		GO TO 345	820A 167
4186	342	IF(IFC(I)+1) 343,345,345	820A 168
4187	343	IFC(I)=IFC(I)+3	820A 169
4188	345	IF (IFC(I)) 346,349,346	820A 170
4189	346	VN(I)=FR(I,II)*P	
4190		IFC(I)=1	820A 172
4191		Y(I)=0.	820A 173
4192		IF(VN(I)) 347,347,354	820A 175
4193	347	IFC(I)=-1	820A 176
4194		IF (I-IS) 348,348,354	820A 177
4195	348	Y(J)=PINL	820A 178
4196		GO TO 3530	
4197	349	IF(FR(I,II))357,357,352	820A 180
4198	357	IF(VN(I)) 351,351,358	
4199	358	IF(II-1) 353,351,353	
4200	351	VN(I)=PIN	820A 183
4201		GO TO 353	820A 184
4202	352	VN(I)=FR(I,II)*P	
4203	353	Y(I)=ALOG(VN(I)+1.E-35)	
4204	3530	IF(II-1) 354,3531,354	
4205	3531	IF(IS-I) 354,3532,3532	
4206	3532	Y(I)=YH(I)	
4207		IF(FR(I,1)-1.E-30) 354,3533,354	
4208	3533	VN(I)=EXP(Y(I))	
4209	354	CONTINUE	820A 187
4210		T=TT(II)/1.8	820A 188
4211		IF(T.GT.TION.OR.KAT(IS).NE.99) GO TO 356	ENTR-MOD
4212		LEF(IS)=-IABS(LEF(IS))	ENTR-MOD
4213	356	WM=VMW(II)	
4214		II=II+IG	
4215		IF(LEFUP) 384,364,393	
4216	C****	REEVALUATE ABSENT ATOM ARRAY	820A 193
4217	364	JT=MOD(ITEM,2)+1	
4218		DO 382 K=1,IS	ENTR-MOD
4219		LEFW(K)=0	
4220		LEFS(K)=LEF(K)	
4221		LEF(K)=ISIGN(LEFT(K,JT),LEF(K))	
4222		IF(LEF(K)-2) 369,365,382	820A 198
4223	365	IF(IU-1)369,369,367	ENTR-MOD
4224	367	IF(KKR(3)) 369,369,382	
4225	369	LEF(K)=MIN0(LEF(K),0)	820A 200
4226		IF (KKR(9)-2) 370,382,381	
4227	370	DUM1=1.0	820A 202
4228		DUM2=0.	820A 203
4229		IF(NSPM1) 3721,3721,3701	
4230	3701	DO 372 J=1,NSPM1	
4231		DUM1=DUM1-SPM(J,ISS,ITY)	820A 205
4232	372	DUM2=DUM2+SPM(J,ISS,ITY)*CIJ(K,J)	820A 206
4233	3721	IF (ABS(DUM1)-1.E-7) 376,374,374	
4234	374	DUM2=DUM2+DUM1*CIJ(K,NSP)	820A 208

4235	376 IF(DUM2) 382,382,380	B20A 209
4236	380 LEF(K)=1	
4237	GO TO 382	
4238	381 IF (W(2)*TK(K,L2)+W(3)*TK(K,L3).LT.0.0) LEFH(K)=1	
4239	382 CONTINUE	B20A 212
4240	GO TO 393	B20A 213
4241	C*****INITIALIZE SP(,,) AND VN() ON FIRST STAGNATION SOLUTION	B20A 214
4242	384 ITFF=-NETA	B20A 215
4243	NCV=0	B20A 216
4244	TT(1)=3000.	
4245	VMW(1)=20.	
4246	KR2=KKR(2)	
4247	IF(KR2.LT.0) KR2=1	
4248	IF(KR2.EQ.1) GO TO 387	
4249	385 DO 386 K=1,NSP	
4250	DO 386 I=1,NETA	B20A 220
4251	SP(1,I,K)=ALP(K)*WTH(K)	B20A 221
4252	SP(2,I,K)=0.	B20A 222
4253	386 SP(3,I,K)=0.	B20A 223
4254	W(1)=0.	
4255	W(2)=0.	
4256	W(3)=0.	
4257	DO 3868 I=1,IS	ENTR-MOD
4258	IF(KAT(I).EQ.99) GO TO 3867	ENTR-MOD
4259	LEF(I)=0	B20A 226
4260	IF(TK(I,1)) 3868,3868,3867	B20A 227
4261	3867 LEF(I)=3	B20A 228
4262	3868 CONTINUE	B20A 229
4263	387 DO 388 I=1,IS	B20A 230
4264	IF(ALP(I)) 393,388,388	B20A 231
4265	388 CONTINUE	B20A 232
4266	DO 3881 J=1,N	
4267	SB(J)=0.	ENTR-MOD
4268	H(J)=0.	ENTR-MOD
4269	DO 3881 I=1,NETA	ENTR-MOD
4270	3881 FR(J,I)=0.	
4271	DO 392 I=1,IS	B20A 233
4272	VN(I)=AMAX1(VN(I)/P*.1,ALP(I)*AA)	B20A 234
4273	IF(IFC(I)) 390,391,390	B20A 235
4274	390 IFC(I)=1	B20A 236
4275	Y(I)=0.	B20A 237
4276	GO TO 392	B20A 238
4277	391 Y(I)=ALOG(VN(I))	B20A 239
4278	392 CONTINUE	B20A 240
4279	C*****DELETE MOLECULES BASED ON AESENT ATOM ARRAY	B20A 241
4280	393 LAMD=1	
4281	DO 3971 K=1,IS	
4282	IF(LEF(K)) 394,3930,3934	
4283	3934 IF(PIEASE-.99) 3931,3931,3933	
4284	3930 IF(PIEASE-.01) 394,394,3933	
4285	3933 IF (LEFS(K)) 3932,394,3931	
4286	3931 IF(II-META) 397,3932,397	B20A 244
4287	3932 IF(LEF(K)-3) 394,397,394	B20A 245
4288	394 DO 396 J=1,M	B20A 246
4289	IF(IABS(IFC(J))-1) 389,389,396	B20A 247
4290	389 IF(MOD(LAMI(J)/LAMD,2)) 395,396,395	
4291	395 VN(J)=0.	
4292	IFC(J)=IFC(J)-3	B20A 250

4293	396 CONTINUE	B20A 251
4294	J=-IR(K)	B20A 253
4295	IF(IFC(J)-1) 3961,3961,397	B20A 254
4296	3961 IFC(J)=IFC(J)+6	B20A 255
4297	397 LAMD=LAMD+LAMD	
4298	LEF(K)=IABS(LEF(K))	
4299	3971 LEFS(K)=IABS(LEFS(K))	
4300	C****DELETE CONDENSED SPECIES FROM BOUNDARY LAYER	
4301	IF(KR(6)) 3980,398,398	
4302	3980 DO 3984 J=1,N	
4303	IF(IABS(IFC(J))-1) 3984,3981,3984	
4304	3981 IFC(J)=IFC(J)-3	
4305	VN(J)=0.	
4306	3984 CONTINUE	
4307	398 IF(KR(7)-1) 21,21,1902	B20A 258
4308	C****EVALUATE PROPERTIES	B20A 259
4309	170 CPF=CPF/AA	
4310	IF(KR(5).EQ.3) GO TO 19	ENTR-MOD
4311	HG=0.	ENTR-MOD
4312	HL=0.	ENTR-MOD
4313	WTL=0.	ENTR-MOD
4314	SIP=0.	ENTR-MOD
4315	DO 1703 J=1,N	ENTR-MOD
4316	SIP=SIP+VN(J)*(SB(J)-1.9869*Y(J))	ENTR-MOD
4317	IF(IFC(J)) 1703,1704,1705	ENTR-MOD
4318	1704 HG=HG+VN(J)*H(J)	ENTR-MOD
4319	GO TO 1703	ENTR-MOD
4320	1705 HL=HL+VN(J)*H(J)	ENTR-MOD
4321	WTL=WTL+VN(J)*WTH(J)	ENTR-MOD
4322	1703 CONTINUE	ENTR-MOD
4323	SIP=SIP/AA	ENTR-MOD
4324	HIP=(HG+HL)/AA	ENTR-MOD
4325	IF(KR(6)) 1701,1932,1702	
4326	1702 RV=RVS+(RV-RVS)/EASE	ENTR-MOD
4327	IF(KR(8).GT.0) W(3)=W(3)-VN(N+1)/AA	
4328	WS=-W(1)-W(2)-W(3)+1.E-38	
4329	HIP=(HG+(HL-WTL/AA*HG)/WS)/AA	
4330	GO TO 1932	
4331	1701 IN=IS+2	
4332	IG=MI(0(IQ0,-KKR(20))	
4333	CALL RERAY(IN,A,0,0,0,0,IG,16)	B20A 263
4334	ALF=A(2,1)/A(1,1)	B20A 265
4335	CSP=1./(A(1,1)*AA)	B20A 266
4336	BETH=P*(A(2,2)-A(1,2)*ALF)-1.	B20A 267
4337	IF(MODE-3) 1931,1932,1931	B20A 268
4338	1931 CSP=CSP/T	B20A 269
4339	1932 CALL PROPS	B20A 270
4340	WM=AA/P	
4341	GAM=1.-ALF	
4342	GAM=1./(1.+BETH-1.9869/AA*GAM/CSP*GAM*P)	
4343	GMR(II)=GAM	
4344	IF(KR(5)) 195,195,194	B20A 271
4345	195 IF(KR(7)) 11,11,194	B20A 272
4346	194 WRITE (KOUT,4) CPF,CSP,ALF,BETH,GAM	
4347	ITS=-1	B20A 276
4348	C*****OUTPUT PACKAGE	B20A 277
4349	19 WM=AA/P	B20A 278
4350	1902 WRITE(KOUT, 2) T,P,WM	B20A 279

4351	WRITE(KOUT,1901)M	B20A 280
4352	1901 FORMAT(5X40HRELATIVE MASSES OF COMPONENTS 1,2 AND 3 3E12.5)	B20A 281
4353	SHIP=HIP	B20A 282
4354	SSIP=HIP	B20A 283
4355	HIP=0.	B20A 284
4356	SIP=0.	B20A 285
4357	DO 20 J=1,N	B20A 286
4358	HIP=HIP+H(J)*SIGN(VN(J),WTH(J))	
4359	20 SIP=SIP+ VN(J)*(SB(J)-1.9869*Y(J))	B20A 288
4360	N=N+KR(8)	
4361	HIP=(HIP+VN(MELT)*FLIQ*HMELT)/AA	B20A 289
4362	SIP=(SIP+VN(MELT)*FLIQ*SMELT)/AA	B20A 290
4363	RHR=P/T*MM/1.3146	B20A 291
4364	WRITE(KOUT,8) HIP,SIP,RHR	B20A 292
4365	IF(FLIQ) 204,205,204	B20A 293
4366	204 WRITE(KOUT,10) FLIQ	B20A 294
4367	205 IF(ITS) 2051,203,203	B20A 295
4368	2051 IF(KR(5)-1) 203,202,201	B20A 296
4369	201 IF(KR(5).EQ.2)GO TO 200	ENTR-MOD
4370	Z=SIP	ENTR-MOD
4371	GO TO 203	ENTR-MOD
4372	200 HCH=HIP	ENTR-MOD
4373	TCH=Y	ENTR-MOD
4374	SREF=SIP	ENTR-MOD
4375	202 VELSQ=(HCH-HIP)*2.	B20A 298
4376	VMACH=SQRT(VELSQ/GAM*MM/(1.9869*T))	B20A 299
4377	VEL=SQRT(VELSQ*45054.)	B20A 300
4378	UE(ITS)=VEL	B20A 301
4379	HEA(ITS)=1.8*HIP	ENTR-MOD
4380	IF (VEL) 2021,2021,2022	
4381	2021 AREA=0.	
4382	GO TO 2623	
4383	2022 AREA=1./(VEL*RHR)	
4384	2023 WRITE(KOUT,9) VEL,VMACH,AREA	
4385	203 IF(IQQ) 2036,1203,1203	
4386	1203 IF(ITS) 2031,2036,2036	B20A 305
4387	2031 DO 2033 I=1,M	B20A 306
4388	2033 VN(I)=VN(I)/P	B20A 307
4389	WRITE(KOUT,2032) (FAMOA(I),FAMOB(I),VN(I),I=1,M)	B20A 308
4390	DO 2035 I=1,M	B20A 309
4391	2035 VN(I)=VN(I)*P	B20A 310
4392	IF(MODE-1) 2034,2037,2034	B20A 311
4393	2037 WRITE(KOUT,2038) FAMOA(JC),FAMOB(JC)	B20A 312
4394	2038 FORMAT(22H SURFACE SPECIES IS 244)	B20A 313
4395	2032 FORMAT(/3(5X7MSPECIESJX8MMOLE FR.2X)/3(5X2A4,E12.5,5X2A4,E12.5,5X2A4)20A 314	B20A 314
4396	14,E12.5))	B20A 315
4397	GO TO 2036	B20A 316
4398	2036 WRITE(KOUT,3) (FAMOA(I),FAMOB(I),VN(I),DY(I),Y(I),VLMK(I),IFC(I),E	B20A 317
4399	1(I),CP(I),I=1,M)	B20A 318
4400	2034 WRITE(KOUT,6)	B20A 320
4401	N=N-KR(8)	
4402	IF(ITS) 11,1021,1021	B20A 321
4403	1021 HIP=SHIP	B20A 322
4404	SIP=SSIP	B20A 323
4405	C*****PRINCIPAL ITERATIVE LOOP	B20A 324
4406	21 IF(ITS) 109,110,109	B20A 325
4407	109 IF(MODE) 111,111,110	B20A 326
4408	1091 ITS=ITS+1	

4409	110 CALL THERM	
4410	111 MODE=KR(1)	820A 327
4411	IQQ=0	820A 328
4412	FLIQ=0.	
4413	CALL WATER	820A 329
4414	B1=B(1)	820A 331
4415	211 MOE=1	820A 332
4416	IF(KR(7)-1) 2101,210,2102	820A 333
4417	2102 IQQ=-2	820A 334
4418	WRITE(KOUT,2100)(I,I=1,IS)	820A 335
4419	210 WRITE(KOUT,7) ITS,T,AA,EL,ENL,CHF,(E(I),I=1,IS)	
4420	2100 FORMAT (50H1ITS TEMP PRES=HWT EQUIL ER MASHAL ER SCALE 7(IJ,	
4421	17H MASHAL)/90X3(IJ,7H MASHAL))	
4422	2101 IF(ITS) 2103,221,221	820A 337
4423	2103 IF(MODE-1) 170,2104,170	820A 338
4424	2104 TVALG=T	820A 339
4425	GO TO 170	820A 340
4426	221 ITS=ITS+1	820A 341
4427	IF(ITS-50) 2219,2219,222	
4428	2219 IF(ITS-N7) 22 2222,2222	
4429	222 IF(KKR(10)) 2226,2226,2225	
4430	2225 WRITE(KOUT,2000)	
4431	2000 FORMAT (///2X,50H-----FOLLOWING OUTPUT NON-CONVERGENT-----	820A 344
4432	1-/70H ISS,ITEM,II,MITS,ITS,IQQ,KR(6),HIP,SIP,TT(II)/ALP(I)/LEF(I)	
4433	2/FR(I,II))	
4434	WRITE(KOUT,3017)ISS,ITEM,II,MITS,ITS,IG,KR(6),HIP,SIP,TT(II)	
4435	WRITE(KOUT,3018) ALP	
4436	WRITE(KOUT,3019) LEF	
4437	WRITE(KOUT,3018) (FR(I,II),I=1,N)	
4438	3017 FORMAT(7I5,2X1P3E12.5)	
4439	3018 FORMAT(2X1P10E11.4)	
4440	3019 FORMAT(2X10I5)	
4441	IQQ=-2	820A 353
4442	KR(7)=1	820A 352
4443	2226 ITS=-1	
4444	NCV=NCV+1	820A 353
4445	NON=NCV	
4446	IF(NCV-20) 170,170,2220	820A 354
4447	2220 MITS=100	
4448	GO TO 170	
4449	2222 KR(7)=3	
4450	IQQ=-2	
4451	GO TO 22	
4452	22 ISPO=IN+7L-1	820A 356
4453	ICT=10	
4454	DUMJ=0.	
4455	DO 2205 I=1,ISPO	820A 357
4456	2205 BS(I)=B(I)	820A 358
4457	GO TO 2200	820A 359
4458	2207 DO 2206 I=1L,ISPO	820A 360
4459	2206 B(I)=BS(I)	820A 361
4460	2200 DO 2204 I=1,ISPO	820A 362
4461	DO 2200 J=1,ISPO	820A 363
4462	2200 APE(I,J)=A(I,J)	820A 364
4463	IF(I-2) 2204,2204,2201	820A 365
4464	2201 IF(IFC(I-2)-1) 2204,2204,2202	820A 366
4465	2202 B(I)=0.	820A 367
4466	DO 2203 J=1,ISPO	820A 368

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4467     APE(J,I)=0.
4468 2203 APE(I,J)=0.
4469     APE(I,I)=1.0
4470 2204 CONTINUE
4471     IG=IQQ
4472     CALL RERAY(IN,APE(IL,IL),0,0(IL),1,0,7C,16)
4473     ICT=ICT-1
4474     IF (ICT-IQQ) 222,2209,2210
4475 2209 IQQ=-2
4476 2210 IF (IG) 2212,2221,2221
4477 2212 IF (INV) 2216,2213,222
4478 2213 IF (KR(6)) 2227,2230,2230
4479 2230 LAMD=1
4480     DO 2229 K=1,IS
4481     J=-IR(K)
4482     IF (IFC(J).GT.1) GO TO 2229
4483     DO 2228 J=1,N
4484     IF (VN(J).GT.1.E-30 .AND. MOD(LAMH(J)/LAMD,2).NE.0) GO TO 2229
4485 2228 CONTINUE
4486     LEF(K)=-IABS(LEF(K))
4487     LEFW(K)=-IABS(LEFW(K))
4488     INV=-1
4489     ITS=1
4490     GO TO 393
4491 2229 LAMD=LAMD+LAMD
4492 2227 INV=-1
4493     PIN=P*1.E-5
4494     DO 2215 I=1,N
4495     IF (IFC(I)) 2215,2214,2215
4496 2214 VN(I)=VN(I)+PIN
4497     Y(I)=ALOG(VN(I))
4498 2215 CONTINUE
4499     GO TO 111
4500 2216 IF (KR(6)) 2217,222,222
4501 2217 ITS=999
4502     GO TO 111
4503 C*****IF TRYING TO PUSH THROUGH TMIN OR TMAX -- REINVERT AND DT TO ZERO
4504 2221 IF (T-TMIN) 2223,227,220
4505 2223 T=TMIN
4506     GO TO 1091
4507 2227 IF (X(1)) 220,220,220
4508 2220 IF (T-TMAX) 223,229,2224
4509 2224 T=TMAX
4510     GO TO 1091
4511 2229 IF (X(1)) 223,223,220
4512 C*****IF NEW CONDENSED HAS NEG CORRECTION, DELETE AFTER REINVERT
4513 223 IF (IER) 226,212,226
4514 2226 IF (X(1)) 225,212,212
4515 2225 DO 2252 I=1,ISPO
4516     A(IER,I)=0.
4517 2252 A(I,IER)=0.
4518     BS(IER)=-1.E-8
4519     A(IER,IER)=1.0
4520     GO TO 2207
4521 C*****IF S.E. ERROR AND CORRECTION ON Y OF CONFLICTING SIGN, REINVERT
4522 212 IF (MODE-1) 224,213,224
4523 213 IF (X(1)*01+.00001) 220,210,210
4524 C*****ON S.E. IF DELTA LN T .GT. .9 REINVERT NO DT IF EL AND ENL ARE SAME

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820A 369
820A 370
820A 371
820A 373

820A 370
820A 379
820A 380
820A 381

820A 384
820A 385
820A 386

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4525      210 IF(ABS(X(1))-0.9)224,224,224
4526 C*****IF CONVERGED EXCEPT FOR T ON M OR S OPTIONS -- NON CONVERGENT      820A 393
4527      220 IF(MODE-1) 2201,214,2200      820A 394
4528      2200 IF(EL+100.*ENL-1.E-4) 222,222,2201      820A 395
4529 C*****ON S.E. OPTION RESULT IN CONFLICTING ERROR/CORRECTION OR T USH 820A 396
4530 C*****IF OTHER BALANCES RELATIVELY GOOD, SET T TO TMIN/TMAX AS PER ERROR 820A 397
4531 C*****AND GO TO THERM (IF T ALREADY THERE - NONCONVERGE) ELSE DT TO ZERO 820A 398
4532      214 IF(ABS(B1)-100.*(EL+ENL)) 2201,215,215      820A 399
4533      215 TMIN=TT(1)/1.0-500.
4534          TMAX=TMIN+1000.
4535          IF(B1) 216,216,217
4536      216 IF(T-TMIN) 170,170,2161      820A 401
4537      2161 T=AMAX1(T-DT0,TMIN)
4538          TMAX=T
4539          DT0=DT0/2.
4540          GO TO 1091
4541      217 IF(T-TMAX) 2171,170,170
4542      2171 T=AMIN1(TMAX,T+DTU)
4543          TMIN=T
4544          DT0=DTU/2.
4545          GO TO 1091
4546      2201 X(1)=0.      820A 407
4547          MODE=0      820A 408
4548          IN=IN-1      820A 411
4549          IL=2      820A 412
4550          GO TO 2207      820A 413
4551      224 IF(X(2)+1.0)2240,2249,2249
4552      2240 BS(2)=0.
4553          A(2,2)=1.E25
4554          GO TO 2207
4555      2249 CALL CRECT(MOE)
4556          TMIN=TMIN
4557          TMAX=TMAX
4558          IF(KR(7)-1) 21,21,19      820A 415
4559      11 PIEASE=SPEASE
4560          RETURN
4561          END      820A 417
4562 C821A      821A 801
4563      SUBROUTINE THERM      821A 802
4564      DIMENSION CIJ( 71,1),TF(1)      821A 803
4565      EQUIVALENCE(TU( 72),TF),(VNU,CIJ)      821A 804
4566      COMMON /BLOCOM/FAMOA( 71),FAMOB( 71),M ,FR( 71,15),M(3),LEF(10) 821A 5
4567      1 ,LEFS(10),PIEASE,LEFM(10),L2,L3      ENTR-MOD
4568      COMMON /EQPCOM/ RC( 71,2),RC( 71,2),RC( 71,2),RE( 71,2),RF( 71,2), 821A 7
4569      1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),NAT(10), 821A 8
4570      2 KAT(10),IR(10),IS,KR(10),LAMI( 71),P,V,TK(10, 71),W( 71), 821A 9
4571      3 VNU( 71,10),ITFF,KR2,WCH,WCV,WN,WTN( 71),V( 71),VM( 71),CG( 71) 821A 10
4572      4 ,TQ(10, 71),EPOVRK,SIGMA,BASINOL      821A 11
4573      COMMON /EQVCOM/SIP,NIP,EL,ENL,FLIO,CPF,IRE,IER,AB,ITS,IN,IL,IV, 821A 12
4574      1 MODE,MWELT,SMELT,TMAX,TMIN,KELT,SUMH,SUML,NS,NSS,B1,ISP2,ISPO, 821A 13
4575      2 ISP,KRJ,SYA,SVD,SVC,SVD,SUNC,FFF,CWF,EP,RV,IFCJC,ATC,MTL,JC,NG, 821A 14
4576      3 CPG,TMIN,TMAX,L7,L0,IB(11),EB(10),ED(10),A(10,10),B(10), 821A 15
4577      4 IP( 71),ALP(10),FNU(10),GAM(10),GAMF(10),SLAN(10),DV( 71),RVS, 821A 16
4578      5 CP( 71),-C( 71),SD( 71),TC( 71),VLNK( 71),C( 71),PWUS(10), 821A 17
4579      6 BC(10),BLNK(10),BY(10),IBC(10),DE(10),JJ( 4)      821A 18
4580      COMMON/INTCOM/KKR(20),KIN,KOUT
4581      5      MODE=KR(1)      29
4582          IF (I15) 50,10,50      30

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4583		WTC=9.	
4584		WTL=0.	
4585		IF (KR(8)) 40,40,15	31
4586	15	IF (IFC(N+1)-1) 25,20,25	32
4587	20	IF (T+.001-TF(N+1)) 25,25,30	33
4588	25	IFC(N+1)=-1	34
4589		VN(N+1)=0.	35
4590	30	DO 35 K=1,IS	36
4591		35 VNU(N+1,K)=-TQ(K,L3)	37
4592		WTL=-VN(N+1)	38
4593	40	DUM2=0.	40
4594		SUMN=0.	41
4595		DO 45 I=1,IS	42
4596		PNUS(I)=0.	43
4597	45	SLAN(I)=0.	44
4598	50	HMELT=0.	45
4599		FLIO=0.	46
4600		SMELT=0.	47
4601		MELT=1	48
4602		TMIN=TYMIN	49
4603		TMAX=TYMAX	50
4604		TFMAX=500.	51
4605		VA=ALOG(T/3000.)	52
4606		VB=T-3000.	53
4607		VC=(T+3000.)/2.	54
4608		VD=T*3000.	55
4609		VE=VC/(VD*VD)	56
4610		RT=1.9869*T	57
4611		I=1	58
4612		DO 235 IK=1,N	60
4613		J=2	67
4614		IF (IFC(I)+1) 165,85,85	68
4615	85	IF (IFC(I)) 90,95,120	74
4616	90	IF (MODE-1) 165,160,165	75
4617	95	IF (ITS) 165,100,165	76
4618	100	SUMN=SUNN+VN(I)	77
4619		DUM1=WM(I)*VN(I)	78
4620		WTC=WTC+DUM1	79
4621		DUM2=DUM2+DUM1/FF(I)	80
4622		IF (VN(I).GT.1.E-29) Y(I)=ALCG(VN(I))	81
4623		IF (IK-IS) 105,105,110	
4624	105	PNUS(I)=VN(I)	82
4625		SLAN(I)=VN(I)/FF(I)	83
4626		GO TO 165	84
4627	110	DO 115 K=1,IS	85
4628		DUM1=VNU(I,K)*VN(I)	86
4629		PNUS(K)=PNUS(K)+DUM1	87
4630	115	SLAN(K)=SLAN(K)+DUM1/FF(I)	88
4631		GO TO 165	89
4632	120	IF (IFC(I)-1) 125,125,165	90
4633	125	IF (ITS) 150,130,150	91
4634	130	IF (KR(6)) 145,135,135	92
4635	135	IF (T-TF(I)+.001) 140,140,145	93
4636	140	IFC(I)=-1	94
4637		VN(I)=0.	95
4638		GO TO 90	96
4639	145	WTL=WTL+VN(I)*WM(I)	97
4640	150	IF (MODE-1) 165,155,165	98
			99

4641	155	TMIN=AMAX1(TM,TF(I))	100
4642	160	TFMAX=AMAX1(TF(I),TFMAX)	101
4643	165	IF (T-ABS(TU(I,1))) 170,175,175	102
4644	170	J=1	103
4645	175	CP(I)=RC(I,J)+T*RD(I,J)+RE(I,J)/(T*T)	104
4646		H(I)=RD(I,J)+VB*(RC(I,J)+RD(I,J)+VC+RE(I,J)/VD)	105
4647		SB(I)=RF(I,J)+RC(I,J)*VA+VB*(RD(I,J)+RE(I,J)*VE)	106
4648		IF (MODE-2) 210,100,100	107
4649	100	IF (IPC(I)-1) 210,105,210	108
4650	105	IF (TU(I,1)) 190,210,210	109
4651	190	IF (T+TU(I,1)) 200,195,205	110
4652	195	HMELT=-H(I)-HMELT	111
4653		SMELT=-SB(I)-SMELT	112
4654		MELT=I	113
4655		IF (J-2) 210,170,210	114
4656	200	THAX=AMIN1(THAX,-TU(I,1))	115
4657		GO TO 210	116
4658	205	TMIN=AMAX1(TM,-TU(I,1))	117
4659	210	TC(I)=-H(I)/RT	118
4660		VLNK(I)=TC(I)+SB(I)/1.9869	119
4661		IF (IK-IS) 215,215,220	120
4662	215	BLNK(I)=VLNK(I)	121
4663		IBC(I)=IFC(I)	122
4664		BC(I)=TC(I)	123
4665		GO TO 235	124
4666	220	DO 230 K=1,IS	125
4667		IF (IBC(K)+1) 230,225,225	126
4668	225	VLNK(I)=VLNK(I)-VNU(I,K)*BLNK(K)	127
4669		TC(I)=TC(I)-VNU(I,K)*BC(K)	128
4670	230	CONTINUE	129
4671	235	I=I+1	130
4672		IF (MODE-1) 250,240,250	132
4673	240	IF (TFMAX-T) 245,250,250	133
4674	245	T=TFMAX	134
4675		IF (T-500.) 248,248,5	
4676	248	WRITE(KOUT,249)	
4677		STOP	
4678	249	FORMAT(///38H NO AVAILABLE SURFACE SPECIES. . .STOP)	
4679	250	IF (ITS) 305,255,305	136
4680	255	AA=P*MM	137
4681	305	SUMN=SUMN/P	100
4682		SUML=ALOG(SUMN)	101
4683		FFF=MTG/DUMZ	102
4684		MTG=MTG/SUMN	103
4685		MTL=MTL/SUMN	104
4686		SUMC=1.0	
4687		IF (KR(6)) 305,309,309	
4688	309	DO 370 I=1,IS	
4689		PMUS(I)=PMUS(I)/SUMN	106
4690	370	SLAM(I)=SLAM(I)/SUMN*FFF	107
4691	375	IF (MTL/MTG-MS) 305,305,300	101
4692	300	SUMC=MTL/(MTG*MS)	102
4693		MTL=MTL/SUMC	103
4694	305	RETURN	104
4695		END	105-
4696	C022A		022A 001
4697		SUBROUTINE WATER	022A 002
4698		DIMENSION VLAM(71,1), X(10)	022A 005

4699	EQUIVALENCE(AM(74),VLAM)	822A 006
4700	DIMENSION CIJ(71,1),TF(1)	822A 007
4701	DIMENSION ECD(71)	822A 008
4702	EQUIVALENCE(TU(72),TF),(VNU,CIJ)	822A 009
4703	COMMON /BLQCOM/FAHQA(71),FAHQB(71),N ,FR(71,15),W(3),LEF(10)	822A 10
4704	1 ,LEFS(10),PIEASE,LEFW(10),L2,L3	ENR-MOD
4705	COMMON/BUHCOM/ BUMP,CORNA,EASE,ICORN,WDOT,TFZ,I777,DTEMP,KIP,IX	822A 12
4706	COMMON /EQPCOM/ RB(71,2),RC(71,2),RD(71,2),RE(71,2),RF(71,2),	822A 13
4707	1 TU(71,2),FF(71),FFA,IFC(71),ATA(10),ATB(10),ATC(10),WAT(10),	822A 14
4708	2 KAT(10),IR(10),IS,KR(10),LAMI(71),P,T,TK(10, 7),VN(71),	822A 15
4709	3 VNU(71,10),ITFF,KR2,HCH,NCV,WH,WTH(71),Y(71),YW(71),GG(71)	822A 16
4710	4 ,TQ(10, 7),EPOVRK,SIGMA,BASMOL	822A 17
4711	COMMON /EQTCOM/SIP,HIP,EL,ENL,FLIQ,CPF,IRE,IER,AA,ITS,IN,IL,IT,	822A 18
4712	1 MODE,HMELT,SMELT,TMAX,TMIN,MELT,SUMN,SUML,SS,WSS,B1,ISP2,ISPO,	822A 19
4713	2 ISP,KKJ,SVA,SVB,SVC,SVD,SUMC,FFF,CHF,EP,RV,IFCJC,WTG,WTL,JC,HG,	822A 20
4714	3 CPG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(10),A(16,16),B(16),	ENTR-MOD
4715	4 IP(71),ALP(10),FNU(10),GAMH(10),GAMF(10),SLAM(10),DY(71),RVS,	822A 22
4716	5 CP(71),H(71),SB(71),TC(71),VLNK(71),E(71),PNUS(10),	822A 23
4717	6 BC(10),BLNK(10),BY(10),IBC(10),BE(10),JJ(4)	822A 24
4718	COMMON, KINCOM/MT,FKF(10),EAK(10),EXK(10),PMU(10,10),RMU(10,10),	822A 25
4719	1 DKPT(10),PKP(10),PKR(10),RAT(10),RSIG(10),MA(10),LL(10),PMR(10),	822A 26
4720	2 PRMU(10,10),EESE(10)	822A 27
4721	COMMON/NONCOM/AM(153,153),DVNL(153),TCW,	822A 28
4722	1 VLNKW,DLPK(9),DLPK(8, 9),DTHW,DTKW(8),FLUXJB(9)	822A 29
4723	COMMON/INTCOM/KKR(20),KIN,KCUT	
4724	EQUIVALENCE(B,X)	822A 021
4725	WSS=WS	28
4726	DO 5 I=1,IS	29
4727	5 IBC(I)=IFC(I)	30
4728	IF(KR(6)) 40,20,20	
4729	20 IF (ITS) 25,40,40	36
4730	25 DO 35 I=1,IS	37
4731	IF (IBC(I)-1) 35,30,35	38
4732	30 IBC(I)=-1	39
4733	35 CONTINUE	40
4734	40 RV=WS-WTL/WTG	41
4735	IF(ITS.EQ.0) RVS =RV	
4736	IF (KR(7)-1) 70,45,50	42
4737	45 IF (ITS) 70,60,70	43
4738	50 WRITE (KOUT,55) FFF,WTL,WTG,AA,RV,ALP,PNUS,SLAM	44
4739	55 FORMAT (32H FFF,WTL,WTG,AA,RV/ALP/PNUS/SLAM/1X5E12.5/(1X10E12.5))	45
4740	KR(7)=KR(7)-1	46
4741	IF (KR(7)-1) 70,60,70	47
4742	60 WRITE (KOUT,65) (I,I=1,IS)	48
4743	65 FORMAT (50H1ITS TEMP PRES*MWT EQUIL ER MASBAL ER SCALE 7(I3,	49
4744	17H MASBAL)/90X3(I3,7H MASBAL))	50
4745	C INITIALIZE	51
4746	70 EL=0.	52
4747	CPG=0.	53
4748	EP=0	54
4749	CPF=0.	55
4750	JC=0	56
4751	JCS=0	57
4752	ISP=IS+1	
4753	ISPQ=IS+2	58
4754	B(1)=0.	59
4755	B(2)=0.	60
4756	A(1,1)=0.	61

4757		A(1,2)=0.	62
4758		A(2,1)=0.	63
4759		A(2,2)=0.	64
4760	C	-----INITIALIZE CONTRIBUTION OF MOST SIGNIFICANT SPECIES IN EACH M	65
4761		DO 75 I=1,IS	66
4762		EB(I)=0.	67
4763	75	E(I)=AA*ALP(I)	68
4764		ISP2=ISPQ	69
4765	C	- - - MAIN BASE SPECIES LOOP	70
4766		DO 325 IK=1,IS	71
4767		I=2-IR(IK)	72
4768		IF (KAT(IK)-99) 85,80,85	73
4769	80	PNUS(I-2)=0.	74
4770	C	ZERO MATRIX	75
4771	85	DO 90 K=1,ISPQ	76
4772	90	A(K,I)=0.	77
4773		IF (ITS) 110,95,110	78
4774	C	NORMALIZE ON PRESSURE ON FIRST PASS	79
4775	95	VN(I-2)=VN(I-2)/SUMN	80
4776		ECQ(I-2)=(1.-EASE)*Y(I-2)	
4777		EBL(I-2)=0.	81
4778		IF (IBC(I-2)) 110,100,105	82
4779	100	Y(I-2)=Y(I-2)-SUML	83
4780		GO TO 110	84
4781	105	VN(I-2)=VN(I-2)/SUMC	85
4782	C	INITIALIZE SOME MORE	86
4783	110	B(I)=0.	87
4784		A(I,1)=0.	88
4785		IP(I-2)=0.	89
4786	C	SET FLAG INDICATING SIGNIFICANCE OF SPECIES IN MASS	90
4787	C	BALANCE(S) AND INCREMENT COUNT ON SIGNIFICANT SPECIES	91
4788		IF (VN(I-2)-EBL(I-2)) 120,120,115	92
4789	115	IP(I-2)=-1	93
4790	C	TREAT BASE SPECIES CONTAINING BUT NOT REPRESENTING NON-PRESENT	94
4791	C	ELEMENTS IN SAME MANNER AS NON-PRESENT CONDENSED SPECIES	95
4792	120	IF (IBC(I-2)+1) 325,125,125	96
4793	125	IF (IBC(I-2)) 180,215,130	97
4794	130	A(I,I)=1.	98
4795		VA=VN(I-2)	99
4796		IF (IABS(IBC(I-2)-3)-1) 135,280,140	100
4797	135	A(2,I)=1.0	101
4798		GO TO 280	102
4799	140	IF (EB(I-2)-ABS(VA)) 145,150,150	103
4800	145	EB(I-2)=ABS(VA)	104
4801		IB(I-2)=I-2	105
4802	150	E(I-2)=E(I-2)-VA	106
4803		IF (KR(6)) 155,160,160	107
4804	155	IF (MODE-1) 280,170,280	108
4805	160	DO 165 K=1,IS	109
4806	165	A(K+2,I)=-WTM(I-2)*(PNUS(K)/WTG+GAMF(K))	110
4807		A(I,I)=A(I,I)+1.	111
4808	170	TMIN=AMAX1(TMIN,TF(I-2))	112
4809		IF (T-TF(I-2)+.001) 175,175,180	113
4810	175	A(I,I)=1.0E+10	114
4811		E(I-2)=-VN(I-2)*1.001E+10	115
4812		MODE=0	116
4813	180	IF (MODE-1) 185,190,185	117
4814	185	IF (KR(8)) 280,280,190	118

4815	190	IF (TF(I-2)+.001-T) 325,195,195	
4816	195	IF (JC) 205,205,200	119
4817	200	IF (Y(I-2)-BJC) 325,325,205	120
4818	205	BJC=Y(I-2)-ECO(I-2)	121
4819		JCS=JC	
4820		TMAX=TF(I-2)	123
4821		JC=I-2	124
4822		IFCJC=IBC(I-2)	125
4823		IF (KR(8)) 210,210,280	126
4824	210	A(1,JCS+2)=0.	127
4825		A(1,I)=-1.0	128
4826		B(1)=BJC	129
4827		GO TO 325	
4828	C	-----GAS PHASE	130
4829	215	VA=LN(I-2)	131
4830		CPG=CPG+VA*CP(I-2)	132
4831		A(1,I)=VA	133
4832		A(2,I)=VA	134
4833		EP=EP-VA	135
4834		IF (KAT(IK)-99) 220,275,220	136
4835	220	IF (KR(6)) 275,250,225	137
4836	225	DO 230 K=1,IS	138
4837	230	A(K+2,I)=(VLAM(I-2,K)+GAMH(K)*H(I-2))*VA	139
4838		A(I,I)=A(I,I)+VA*RV	
4839		DUM2=WTH(I-2)/WTG*WTL/WTG*VA	141
4840		DO 245 K=1,IS	142
4841		IF (EBL(K).GT.ABS(A(K+2,I))) GO TO 240	143
4842		IP(I-2)=-1	ENTR-MOD
4843		IF (EB(K)-ABS(A(K+2,I))) 235,240,240	ENTR-MOD
4844	235	EB(K)=ABS(A(K+2,I))	144
4845		IB(K)=I-2	145
4846	240	E(K)=E(K)-A(K+2,I)	146
4847	245	A(K+2,I)=A(K+2,I)+DUM2*PNUS(K)	147
4848		GO TO 280	148
4849	250	DUM1=WTH(I-2)/WTG*VA	149
4850		DUM2=WTL/WTG*DUM1	150
4851		IF (KR(4)) 255,255,260	151
4852	255	DUM1=0.	152
4853		VA=(RV+1.)*VA	153
4854		GO TO 265	154
4855	260	DUM1=DUM1*(1.-FFF/FF(I-2))	155
4856		VA=(RV+FFF/FF(I-2))*VA	156
4857	265	DO 270 K=1,IS	157
4858	270	A(K+2,I)=DUM1*SLAM(K)+DUM2*FNUS(K)	158
4859		A(I,I)=A(I,I)+VA	159
4860	275	EB(I-2)=ABS(VA)	160
4861		IB(I-2)=I-2	161
4862		E(I-2)=E(I-2)-VA	162
4863	280	IF (MODE-2) 320,300,285	163
4864	285	IF (IBC(I-2)) 325,295,290	164
4865	290	HOS=SB(I-2)	
4866		GO TO 305	166
4867	295	HOS=SB(I-2)-1.9869*Y(I-2)-1.9869	167
4868		GO TO 310	168
4869	300	HOS=H(I-2)	169
4870		IF (IBC(I-2)) 325,310,305	170
4871	305	A(1,I)=HOS	171
4872		GO TO 315	172
			173

4873	310	A(1,I)=HOS*VN(I-2)	174
4874	315	A(1,2)=A(1,2)-HOS*VN(I-2)	175
4875	320	CPF=CPF+CP(I-2)*VN(I-2)	176
4876	325	CONTINUE	177
4877		DO 330 I=1,IS	178
4878		BE(I)=E(I)	179
4879	330	BY(I)=Y(I)	180
4880		IER=0	30
4881		IRE=0	31
4882		EER=0.	32
4883	C	- - - MAIN NON-BASE SPECIES LOOP	33
4884	350	LIM=N+KR(8)	36
4885		IF (LIM-ISP) 730,355,355	37
4886	355	J=ISP	38
4887		DO 725 IK=ISP,LIM	39
4888		IF (IK-N) 365,365,360	40
4889	360	E(J)=1.E-10	41
4890		IF (IFC(J)) 410,725,445	42
4891	365	IF (IFC(J)+1) 725,370,370	43
4892	370	IF (ITS) 390,375,390	44
4893	375	VN(J)=VN(J)/SUMN	45
4894		IF (IFC(J)) 390,385,380	46
4895	380	VN(J)=VN(J)/SUMC	47
4896		GO TO 390	48
4897	385	Y(J)=Y(J)-SUML	49
4898	390	E(J)=VLNK(J)-Y(J)	50
4899		DO 405 I=1,IS	51
4900		IF (IBC(I)) 400,400,395	52
4901	395	FNU(I)=0.	53
4902		GO TO 405	54
4903	400	FNU(I)=VNU(J,I)	55
4904		E(J)=E(J)+FNU(I)*BY(I)	56
4905	405	CONTINUE	57
4906		IF (KR(6)) 409,409,406	
4907	406	IF (ITS) 408,407,408	
4908	407	ECO(J)=(1.-EASE)*E(J)	
4909	408	E(J)=E(J)-ECO(J)	
4910	409	EAB=ABS(E(J))	
4911		IF (IFC(J)) 410,590,445	59
4912	C	CONDENSED SPECIES	60
4913	410	EAB=E(J)	61
4914		IF (KR(6)) 425,415,415	62
4915	415	IF (T-TF(J)+.001) 420,425,425	63
4916	420	EAB=0.	64
4917		IF (KR(8)) 535,535,545	65
4918	425	IF (E(J)-EER) 535,535,430	66
4919	430	EER=E(J)	67
4920		IF (IER) 435,435,440	68
4921	435	ISPQ=ISPQ+1	69
4922		IER=ISPQ	70
4923	440	IE=IER	71
4924		IRE=IK	72
4925		GO TO 450	73
4926	445	ISPQ=ISPQ+1	74
4927		IE=ISPQ	75
4928	450	WTR=0.	76
4929		IF (KR(6)) 460,455,455	77
4930	455	TMIN=AMAX1(TF(J),TMIN)	78

4931		WTR=WTN(J)/WTG	79
4932	460	DO 465 I=1,ISPQ	80
4933		A(I,IE)=0.	81
4934	465	A(IE,I)=0.	82
4935		DO 480 K=1,IS	83
4936		DUM1=VNU(J,K)	84
4937		IF (IBC(K)-1) 470,470,480	85
4938	470	VA=DUM1*VN(J)	86
4939		A(K+2,IE)=DUM1-WTR*(PNUS(K)+GAMF(K)*WTG)	87
4940		BE(K)=BE(K)-VA	88
4941		IF (ABS(VA)-EB(K)) 480,480,475	89
4942	475	EB(K)=ABS(VA)	90
4943		IB(K)=IK	91
4944	480	CONTINUE	92
4945		K=IE-ISP2	93
4946		IF (IK-N) 505,505,485	94
4947	485	JJ(K)=JC	95
4948		B(IE)=Y(JC)	96
4949		IF (JC-IS) 495,495,490	97
4950	490	A(IE,1)=TC(JC)	98
4951		B(IE)=E(JC)	99
4952	495	EAB=-B(IE)	100
4953		IF (IFCJC) 715,715,500	101
4954	500	EAB=ABS(EAB)	102
4955		GO TO 715	103
4956	505	JJ(K)=J	104
4957		A(IE,1)=TC(J)	106
4958		B(IE)=E(J)	107
4959		IF (T+.001-TF(J)) 515,510,510	108
4960	510	IF (KR(8)) 530,530,540	109
4961	515	IF (MODE-1) 520,525,520	110
4962	520	IF (KR(6)) 530,525,525	111
4963	525	A(IE,IE)=1.E+10	112
4964		B(IE)=-VN(J)*1.001E+10	113
4965		MODE=0	114
4966	530	IF (MODE-2) 535,575,580	115
4967	535	IF (MODE-1) 715,540,715	116
4968	540	IF (T-TF(J)-.001) 545,545,560	117
4969	545	IF (JC) 555,555,550	118
4970	550	IF (E(J)-BJC) 725,725,555	119
4971	555	BJC=E(J)	120
4972		JC=IK	121
4973		IFCJC=IFC(JC)	122
4974		TMAX=TF(J)	123
4975		IF (KR(8)) 565,565,560	124
4976	560	IF (MODE-2) 725,575,580	125
4977	565	B(1)=BJC	126
4978		DO 570 K=1,IS	127
4979	570	A(1,K+2)=-FNU(K)	128
4980		A(1,1)=TC(J)	129
4981		GO TO 725	130
4982	575	MOS=M(J)	131
4983		GO TO 585	132
4984	580	MOS=SB(J)	133
4985	585	A(1,IE)=MOS	134
4986		A(1,2)=A(1,2)-VN(J)*MOS	135
4987		CPF=CPF+CP(J)*VN(J)	136
4988		GO TO 715	137

4989	C	GAS PHASE SPECIES	
4990	590	IP(J)=0	137
4991		IF (VN(J)) 595,715,595	139
4992	595	IQ=0	140
4993		CPG=CPG+VN(J)*CP(J)	141
4994		IF (KR(6)) 625,600,605	142
4995	600	FFJ=FFF/FF(J)	143
4996	605	DUM1=WTM(J)/WTG*VN(J)	144
4997		DUM2=DUM1/WTG*WTL	145
4998		IF (KR(6)) 610,610,625	146
4999	610	IF (KR(4)) 615,615,620	147
5000	615	DUM1=0.	148
5001		FFJ=1.0	149
5002		GO TO 625	150
5003	620	DUM1=DUM1*(1.-FFJ)	151
5004	625	DO 680 KI=1,IS	152
5005		I=2-IR(KI)	153
5006		VA=VNU(J,I-2)*VN(J)	154
5007		IF (KAT(KI)-99) 630,645,630	155
5008	630	IF (KR(6)) 645,640,635	156
5009	635	VA=VA*RV+VN(J)*(VLAM(J,I-2)+GAMH(I-2)*H(J))	157
5010		BE(I-2)=BE(I-2)-VA	158
5011		ABSVA=ABS(VA)	159
5012		VA=VA+PNUS(I-2)*DUM2	160
5013		GO TO 650	161
5014	640	VB=VA*FFJ	162
5015		VA=RV*VA+VB	163
5016		BE(I-2)=BE(I-2)-VA	164
5017		ABSVA=ABS(VA)	165
5018		VA=VA+SLAM(I-2)*DUM1+DUM2*PNUS(I-2)	166
5019		GO TO 650	167
5020	645	BE(I-2)=BE(I-2)-VA	168
5021		ABSVA=ABS(VA)	169
5022	650	IF (ABSVA-EBL(I-2)) 660,660,655	170
5023	655	IQ=1	171
5024		IF (ABSVA-EB(I-2)) 670,670,665	172
5025	660	IF (ABS(VA)-EBL(I-2)) 680,680,670	173
5026	665	EB(I-2)=ABSVA	174
5027		IB(I-2)=IK	175
5028	670	DO 675 K=3,ISP2	176
5029	675	A(I,K)=A(I,K)+VA*FNU(K-2)	177
5030		B(I)=B(I)-VA*E(J)	178
5031		A(I,1)=A(I,1)-VA*TC(J)	179
5032		A(2,I)=A(2,I)+VN(J)*FNU(I-2)	180
5033	690	CONTINUE	181
5034		IF (IQ) 715,715,685	182
5035	685	EP=EP-VN(J)	183
5036		IP(J)=-1	184
5037		B(2)=B(2)-VN(J)*E(J)	185
5038		A(2,1)=A(2,1)-VN(J)*TC(J)	186
5039		IF (MODE-2) 710,690,695	187
5040	690	MOS=M(J)*VN(J)	188
5041		GO TO 700	189
5042	695	MOS=VN(J)*(SB(J)-1.9869*Y(J)-1.9869)	190
5043	700	DO 705 I=3,ISP2	191
5044	705	A(1,I)=MOS*FNU(I-2)+A(1,I)	192
5045		A(1,2)=A(1,2)-MOS	193
5046		A(1,1)=A(1,1)-MOS*TC(J)	194
			195

5047		B(1)=B(1)-MOS*E(J)	
5048	710	CPF=CPF+VN(J)*CP(J)	196
5049	715	IF (EL-EAB) 720,725,725	197
5050	720	EL=EAB	198
5051	725	J=J+1	199
5052	730	CONTINUE	200
5053		ISP3=IS+3	201
5054		IF (MODE-2) 785,735,760	29
5055	735	CPA=CPF*T	30
5056		SHMLT=HMLT*VN(MELT)	31
5057		EMS=AA*HIP+A(1,2)	32
5058		IF (KKJ+1) 750,740,750	33
5059	740	DUM1=SVA/AA*T	34
5060		EMS=AA*SVC-DUM1+A(1,2)	35
5061		HIP=-A(1,2)/AA	36
5062		A(1,2)=-AA*SVC-DUM1	37
5063		CPA=(CPF+2.*DUM1/T)*T	38
5064		DUM2=SVB/AA*T	39
5065		P=P-EP	40
5066		EP=0.	41
5067		IF (ABS(EMS/AA)-10.) 745,745,750	42
5068	745	EP=-P+SVD-DUM2	43
5069		A(2,1)=A(2,1)+DUM2	44
5070		A(2,2)=-DUM2	45
5071	750	IF (KR(2)-MODE) 765,755,765	46
5072	755	A(1,2)=-AA*HIP	47
5073		GO TO 765	48
5074	760	CPA=CPF	49
5075		SHMLT=SMELT*VN(MELT)	50
5076		EMS=AA*SIP+A(1,2)-1.9869*(P-EP)	51
5077		A(1,2)=-AA*SIP	52
5078	765	B(1)=B(1)+EMS	53
5079		A(1,1)=A(1,1)+CPA	54
5080		IF (SHMLT) 785,785,770	55
5081	770	IF (EMS) 785,785,775	56
5082	775	EMS=EMS-SHMLT	57
5083		B(1)=B(1)-SHMLT	58
5084		IF (EMS) 780,785,785	59
5085	780	FLIQ=1.+EMS/SHMLT	60
5086		MODE=0	61
5087		A(1,1)=1.E+10	62
5088		TMIN=500.	63
5089		TMAX=5800.	64
5090	785	ENL=ABS(EP)/P*100.	65
5091		DO 810 I=3,ISP2	66
5092		E(I-2)=BE(I-2)	67
5093		EBL(I-2)=EB(I-2)*1.E-7	69
5094		A(I,2)=-AA*ALP(I-2)	70
5095		IF (IFC(I-2)-1) 795,795,790	71
5096	790	NFM=NFM+1	72
5097		GO TO 810	73
5098	795	IF (KR(6)) 805,805,800	74
5099	800	A(I,1)=A(I,1)+GAMM(I-2)*T*CPG	75
5100		E(I-2)=E(I-2)+M*TL*GAMF(I-2)	76
5101	805	ER=E(I-2)	77
5102		ABER=ABS(ER)/(EB(I-2)+1.E-20)	78
5103		ENL=AMAX1(ABER,ENL)	79
5104		B(I)=B(I)+ER	80
			81

5105	810	CONTINUE	82
5106		IF (ISP2-ISPQ) 815,880,880	83
5107	815	IV=C	84
5108		JZ=0	85
5109	C	ADD CONDENSED NONBASE SPECIES TO ARRAY	86
5110		DO 840 IE=ISP3,ISPQ	87
5111		J=IE-ISP2	88
5112		J=JJ(J)	89
5113		IF (J-IS) 820,820,830	90
5114	820	DO 825 K=1,IS	91
5115	825	A(IE,K+2)=0.	92
5116		A(IE,J+2)=-1.0	93
5117		GO TO 840	94
5118	830	DO 835 K=1,IS	95
5119	835	A(IE,K+2)=-VMU(J,K)	96
5120	840	CONTINUE	97
5121	C	ELIMINATE TERMS CORRESPONDING TO PRESENT BASE CONDENSED	98
5122		DO 855 K=1,IS	99
5123		IF (IFC(K)) 855,855,845	100
5124	845	DO 850 IE=ISP3,ISPQ	101
5125	850	A(IE,K+2)=0.	102
5126	855	CONTINUE	103
5127	880	B(2)=EP+0(2)	111
5128		IF (NR(6)) 5979,5979,5976	
5129	5976	ENL=ABS(EP)/P*100.	
5130		IF (MT) 5973,5973,5974	
5131	5974	CALL KINET	
5132	5973	CONTINUE	
5133		DO 5975 I=1,IS	
5134		IF (EB(I)) 5986,5986,5985	
5135	5985	EB(I)=AMAX1(EB(I),ABS(E(I)))	
5136		IF (ITS) 5970,5977,5970	
5137	5977	EESE(I)=E(I)*(1.-EASE)	
5138	5970	E(I)=E(I)-EESE(I)	
5139		B(I+2)=B(I+2)-EESE(I)	
5140	5986	EB(I)=ABS(EB(I))	
5141		IF (IFC(I)-1) 5971,5971,5975	
5142	5971	ENL=AMAX1(ENL,ABS(E(I)/(EB(I)+1.E-20)))	
5143	5975	CONTINUE	
5144	5979	CONTINUE	
5145		IF (MODE-1) 910,890,885	112
5146	885	IF (ABS(EMS/A(1,1))-0.001) 910,910,920	113
5147	890	IF (IFCJC) 895,900,905	114
5148	895	IF (JC-IRE) 900,905,900	115
5149	905	MODE=0	117
5150		TMIN=TYMIN	118
5151		TMAX=TYMAX	119
5152	900	IF (ABS(B(1))-1.E-4) 910,910,920	116
5153	910	IF (EL-1.E-4) 915,915,920	121
5154	915	IF (ENL-1.E-5) 935,935,920	122
5155	920	IN=ISPQ	123
5156		IL=1	124
5157		IF (MODE) 925,925,930	125
5158	925	IN=ISPQ-1	126
5159		IL=2	127
5160		X(1)=0.	128
5161	930	RETURN	129
5162	935	IT=IT+1	130

5163	ITS=-1	
5164	GO TO 930	132
5165	END	133-
5166		
5167	C023A	823A 001
5168	SUBROUTINE CRECT(MOE)	823A 002
5169	INTEGER FAMOA,FAMOB	823A 004
5170	COMMON/INTCOM/KKR(20),KIN,KCUT	
5171	DIMENSION CIJ(71,1),TF(1)	923A 005
5172	EQUIVALENCE(TU(72),TF),(VNU,CIJ)	823A 006
5173	DIMENSION X(16)	823A 007
5174	DIMENSION CMFF(71)	823A 008
5175	COMMON /BLOCOM/FAMOA(71),FAMOB(71),M ,FR(71,15),M(3),LEF(10)	823A 9
5176	1 ,LEFS(10),PIEASE,LEFN(10),L2,L3	ENTR-MOD
5177	COMMON /EQPCOM/ RB(71,2),RC(71,2),RD(71,2),RE(71,2),RF(71,2),	823A 11
5178	1 TU(71,2),FF(71),FFA,IFC(71),ATA(10),ATB(10),ATC(10),WAT(10),	823A 12
5179	2 KAT(10),IR(10),IS,KR(10),LANI(71),P,T,TK(10, 71),VN(71),	823A 13
5180	3 VNU(71,10),ITFF,KR2,HCH,NCV,WM,NTN(71),Y(71),VN(71),GG(71)	823A 14
5181	4 ,TQ(10, 71),EPOVRK,SIGNA,BASHOL	823A 15
5182	COMMON /EQTCOM/SIP,MIP,EL,ERL,FLIG,CPF,IRE,IER,AA,ITS,IN,IL,IT,	823A 16
5183	1 MODE,MHMT,SMELT,TMAX,TMIN,MELT,SUMN,SUNL,NS,WSS,B1,ISP2,ISPO,	823A 17
5184	2 ISP,KKJ,SYA,SVB,SVC,SVD,SUNC,FFF,CMF,EP,RV,IFCJC,MTG,NTL,JC,HG,	823A 18
5185	3 CPG,TTHIN,TTHAX,L7,L8,IB(11),EB(10),EEL(10),A(16,16),B(16),	ENTR-MOD
5186	4 IP(71),ALP(10),FNU(10),GAMH(10),GAMF(10),SLAM(10),DY(71),RVS,	923A 20
5187	5 CP(71),H(71),SB(71),TC(71),VLNK(71),E(71),PNUS(10),	823A 21
5188	6 BC(10),BLNK(10),BY(10),IBC(16),EE(10),JJ(4)	823A 22
5189	EQUIVALENCE(DYA,DY)	
5190	DIMENSION DYA(1,1)	
5191	EQUIVALENCE(B,X)	823A 010
5192	CLIM=AMAX1(1.,M(2)+M(3))*0.2*MTG	31
5193	DWTL=0.	32
5194	DWTG=0.	33
5195	BUMP=P*1.E-7	34
5196	BUMP=P*1.E-4	35
5197	BULP=A LOG(BUMP)	36
5198	CMF=1.	37
5199	5 K=0	38
5200	DO 20 J=2,IS	39
5201	IF (IB(J)-IB(J-1)) 19,15,20	40
5202	10 JA=IB(J)	41
5203	IB(J)=IB(J-1)	42
5204	IB(J-1)=JA	43
5205	K=1	44
5206	GO TO 20	45
5207	15 IB(J)=1000	46
5208	20 CONTINUE	47
5209	IF (K) 25,23,5	48
5210	25 IB(IS+1)=1000	49
5211	M=IB(1)	50
5212	M1=1	51
5213	L=IS+2	52
5214	I=0	53
5215	LL=1	54
5216	LIM=M+KR(4)	55
5217	DO 200 IK=1,LIM	56
5218	I=I+1	57
5219	IF (IK-IS) 30,30,45	58
5220	30 SLAM(I)=0.	59

5221		IOC(I)=IFC(I)	
5222		PMUS(I)=0.	60
5223		IF (IFC(I)-1) 35,35,75	61
5224	35	OVI=X(I+2)	62
5225		IF (IFC(I)+1) 275,40,40	63
5226	40	IF (IFC(I)) 205,95,230	64
5227	45	IF (IFC(I)+1) 75,50,50	65
5228	50	IF (IFC(I)) 70,95,85	66
5229	55	VA=E(I)-TC(I)*X(I)	67
5230		DO 65 J=1,IS	68
5231		IF (IOC(J)) 60,60,65	69
5232	60	VA=VA+VMU(I,J)*X(J+2)	70
5233	65	CONTINUE	71
5234		OVI=VA	72
5235		GO TO 95	73
5236	70	IF (IK-IRE) 75,80,75	74
5237	75	OVI=0.	75
5238		GO TO 275	76
5239	80	IFC(I)=1	77
5240		OVI=X(IER)	78
5241		GO TO 230	79
5242	85	L=L+1	80
5243		IF (L-IER) 90,85,90	81
5244	90	OVI=X(L)	82
5245		GO TO 230	83
5246	95	DMTG=DMTG+VN(I)*OVI*WTH(I)	84
5247		IF (IP(I)) 100,195,100	85
5248	100	IF (IK-M) 105,145,105	86
5249	105	IF (VN(I)-DUMP) 110,140,140	87
5250	110	IF (MOE) 195,195,115	88
5251	115	IF (OVI) 120,275,125	89
5252	120	IF (VN(I)/DUMP-.9599995-CMF*OVI) 275,275,130	90
5253	125	IF (DUMP/VN(I)-1.-CMF*OVI) 135,275,275	91
5254	130	CMF=(VN(I)/DUMP-.9999995)/OVI	92
5255		GO TO 275	93
5256	135	CMF=(DUMP/VN(I)-1.)/OVI	94
5257		GO TO 275	95
5258	140	IF (MOE) 175,175,150	96
5259	145	M1=M1+1	97
5260		M=IB(M1)	98
5261	150	IF (OVI) 155,275,160	99
5262	155	IF (OVI*CMF+.999) 165,275,275	100
5263	160	IF (OVI*CMF-.9.) 275,275,170	101
5264	165	CMF=-.999/OVI	102
5265		GO TO 275	103
5266	170	CMF=.9./OVI	104
5267		GO TO 275	105
5268	175	IF (OVI*CMF-2.303) 180,190,190	106
5269	180	IF (OVI*CMF+6.909) 185,275,275	107
5270	185	CMF=-6.909/OVI	108
5271		GO TO 275	109
5272	190	CMF=2.303/OVI	110
5273		GO TO 275	111
5274	195	IF (Y(I)-DUMP+ABS(OVI)*CMF) 275,200,200	112
5275	200	CMF=-(Y(I)-DUMP)/ABS(OVI)	113
5276		GO TO 275	114
5277	C	NON-PRESENT BASE	115
5278	205	IF (KR(6)) 215,210,210	116
			117

5279	210	IF (Y-TF(I)+.001) 275,215,215	118
5280	215	IF (Y(I)+CMF*DYI-0.1) 275,220,220	119
5281	220	DUM1=(.1-Y(I))/DYI	120
5282		IF (DUM1-.001) 275,275,225	121
5283	225	CMF=DUM1	122
5284		GO TO 275	123
5285	230	ONTL=ONT+.DYI*WTN(I)	124
5286		IF (DYI) 235,275,250	125
5287	235	IF (VN(I)) 250,250,240	126
5288	240	IF (VN(I)+DYI*CMF) 245,250,250	127
5289	245	CMF=-VN(I)/DYI*1.00001	128
5290	250	IF (KR(6)) 265,295,255	129
5291	255	CLIP=ABS(CLIN/WTN(I))	130
5292		IF (ABS(CMF*DYI)-CLIP) 275,275,260	131
5293	260	CMF=CLIP/ABS(DYI)	132
5294		GO TO 275	133
5295	265	IF (ABS(CMF*DYI)-P) 275,275,270	134
5296	270	CMF=P/ABS(DYI)	135
5297	275	CMFF(I)=CMF	136
5298	280	DY(IK)=DYI	137
5299		IF (KR(6)) 290,285,285	138
5300	285	RVL=AMAX1(.1,RV/2.)	139
5301		CMF=AMIN1(CMF,NTG/ABS(ABS(ONTL-ONTG/NTG*NTL)/RVL-ONTG))	140
5302	290	IF (KR(7)-1) 315,315,300	141
5303	295	FORMAT (1X2(0X2HVN9X1HY8X2H0Y7X5HSCALE7X1ME4X6HIFC IP)/(1XA4,5E10.	142
5304		13,I3,I2,1X,A4,5E10.3,I3,I2))	143
5305	300	NQ=I	144
5306		WRITE (KOUT,295) (FAMOA(J),VN(J),Y(J),DYA(J,LL),CMFF(J),E(J),IFC(J	145
5307		1),IP(J),J=1,NQ)	146
5308		WRITE (KOUT,310) (EB(I),I=1,IS)	147
5309		WRITE (KOUT,310) (X(I),I=1,ISPO)	148
5310		WRITE (KOUT,305) (IB(I),I=1,IS)	149
5311	305	FORMAT (10I5)	150
5312	310	FORMAT (0E12.4)	151
5313	315	CONTINUE	152
5314		IF (X(1)) 320,360,320	153
5315	320	X1=X(1)*CMF	154
5316		ABX=ABS(X(1))	155
5317		IF (ABS(X1)-.5) 330,330,325	156
5318	325	CMF=.5/ABX	157
5319		X1=CMF*X(1)	158
5320	330	IF (X1) 340,360,335	159
5321	335	TM=THAX	160
5322		X1=AMIN1(.2,X1)	161
5323		GO TO 345	162
5324	340	TM=TMIN	163
5325		X1=AMAX1(-0.2,X1)	164
5326	345	OTM=(TM-T)/(TM*X1)	165
5327		IF (OTM-1.) 350,355,355	166
5328	350	CMF=OTM*CMF	167
5329		T=TM	168
5330		GO TO 360	169
5331	355	T=T/(1.-X1)	170
5332	360	AA=AA*EXP(CMF*X(2))	171
5333		M1=1	172
5334		M=IB(1)	173
5335		NTL=0.	174
5336		NTG=0.	175

5337	DUM2=0.	34
5338	I=1	35
5339	LIM=KR(8)+N	36
5340	DO 495 IK=1,LIM	37
5341	DYI=CNF*DY(IK)	38
5342	IF (DYI) 395,390,395	39
5343	390 IF (IFC(I)) 495,435,485	40
5344	395 IF (IFC(I)) 495,480,480	41
5345	480 IF (IP(I)) 485,430,485	42
5346	485 IF (M-IK) 410,415,410	43
5347	410 IF (MOE) 430,430,420	44
5348	415 M1=M1+1	45
5349	M=I0(M1)	46
5350	420 VN(I)=VN(I)*(1.+DYI)	47
5351	IF (VM(I)) 430,430,425	48
5352	425 Y(I)=ALOG(VN(I))	49
5353	GO TO 435	50
5354	430 Y(I)=Y(I)+DYI	51
5355	VN(I)=EXP(Y(I))	52
5356	435 VA=MTH(I)*VN(I)	53
5357	WTG=WTG+VA	54
5358	DUM2=DUM2+VA/FF(I)	55
5359	IF (IK-IS) 440,440,445	56
5360	440 PMUS(I)=VM(I)	57
5361	SLAM(I)=VN(I)/FF(I)	58
5362	GO TO 495	59
5363	445 DO 450 K=1,IS	60
5364	VA=VMU(I,K)*VN(I)	61
5365	PMUS(K)=PMUS(K)+VA	62
5366	450 SLAM(K)=SLAM(K)+VA/FF(I)	63
5367	GO TO 495	64
5368	C NON-PRESENT BASE CORRECTIONS AND TESTS	65
5369	455 Y(I)=Y(I)+DYI	66
5370	IF (Y(I)) 495,460,460	67
5371	460 IF (IFC(I)+1) 495,465,465	68
5372	465 IF (KR(6)) 475,470,470	69
5373	470 IF (T-TF(I)+.001) 495,475,475	70
5374	475 Y(I)=0.	71
5375	IFC(I)=+1	72
5376	GO TO 495	73
5377	480 VN(I)=VN(I)+DYI	74
5378	IF (VM(I)) 490,490,485	75
5379	485 WTL=MTL+VN(I)*MTH(I)	76
5380	GO TO 495	77
5381	490 VM(I)=0.	78
5382	IFC(I)=-1	79
5383	495 I=I+1	80
5384	FFF=WTG/DUM2	81
5385	DO 500 I=1,IS	82
5386	500 SLAM(I)=SLAM(I)*FFF	83
5387	RETURN	84
5388	END	85-
5389	C024A	024A 001
5390	SUBROUTINE INPUT(PP)	
5391	INTEGER FAMOA,FAMOB,CHAR,BLANK	
5392	INTEGER ANOA,ANOB,ATA,ATB,ATC	024A 005
5393	COMMON/INTCON/KR(20),KIM,KCUT	
5394	DIMENSION CII(71,1),TF(1)	024A 006

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5395      DIMENSION UM(10,10)                                B24A 007
5396      EQUIVALENCE(TU( 72),TF),(VNU,CIJ)                  B24A 008
5397      DIMENSION C(10),KPHA(2),RA(2), IM(10),JAT(8),ALPT(8),TAU(10,10) B24A 009
5398      DIMENSION IC( 10),LIM(10,10)                        B24A 010
5399      DIMENSION FFIN( 71),NFIA( 71),NFIB( 71)            B24A 011
5400      DIMENSION IFMET( 71),IGMET( 71),ZIGEPS(2),SORCE(8)  B24A 012
5401      COMMON /BLQCOM/FAMOA( 71),FAMOB( 71),N              ,FR( 71,15),W(3),LEF(10) B24A 13
5402      1 ,LEFS(10),PIEASE,LEFH(10),L2,L3                  ENTR-MOD
5403      COMMON /EQPCOM/ RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2), B24A 15
5404      1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),WAT(10), B24A 16
5405      2 KAT(10),IR(10),IS,KR(10),LAMI( 71),P,T,TK(10, 7),VN( 71), B24A 17
5406      3 VNU( 71,10),ITFF,KR2,HCH,NCV,WM,WTM( 71),Y( 71),YM( 71),GG( 71) B24A 18
5407      4 ,TQ(10, 7),EPOVRK,SIGMA,BASHOL                   B24A 19
5408      COMMON /EQTCOM/SIP,HIP,EL,ENL,FLIQ,CPF,IRE,IER,AA,ITS,IN,IL,IT, B24A 20
5409      1 MODE,HMELT,SMELT,TMAX,TMIN,MELT,SUMN,SUML,WS,WSS,B1,ISP2,ISPG, B24A 21
5410      2 ISP,KKJ,SVA,SVB,SVQ,SVQ,SUMC,FFF,CMF,EP,RV,IFCJC,WTG,WTL,JC,HG, B24A 22
5411      3 CPG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(10),A(16,16),B(16), ENTR-MOD
5412      4 IP( 71),ALP(10),FNU(10),GAMF(10),GAMF(10),SLAM(10),DY( 71),RVS, B24A 24
5413      5 CP( 71),K( 71),SB( 71),TC( 71),VLNK( 71),E( 71),PNUS(10), B24A 25
5414      6 BC(10),BLNK(10),BY(10),IBC(10),BE(10),JJ( 4) B24A 26
5415      COMMON/KINCOM/MT,FKF(10),FAK(10),EXK(10),PMU(10,10),RMU(10,10), B24A 27
5416      1 DKPT(10),PKP(10),PKR(10),RAT(10),RSIG(10),MA(10),LL(10),FMR(10), B24A 28
5417      2 PRMU(10,10),EESE(10)                               B24A 29
5418      301  FORMAT (I3,F7.0,7F10.4)
5419      302  FORMAT (6E9.6,2F6.0,I1)
5420      3020 FORMAT(1X6E12.5,F10.4,F11.4,I2/1X6E12.5,F10.4,F11.4,I2)
5421      3021 FORMAT(2A4,E12.4,2A4,E12.4,2A4,E12.4,2A4,E12.4) B24A 029
5422      303  FORMAT(1H /1H ) B24A 030
5423      304  FORMAT(I3,3A4,E9.3,7E8.3)
5424      305  FORMAT(54HRELATIVE ELEMENTAL COMPOSITIONS, ATOMIC WTS/UNIT MASS B24A 032
5425      1/6X6HAT.NO.3X7HELEMENT4X9HATCHMIC WTSX8HEDGE GAS4X10HPYRO.GAS 15X
5426      2 6HCHAR 15X10HPYRO.GAS 25X6HCHAR 25X10HPYRO.GAS 35X6HCHAR 3/
5427      3 (7XI3,3X3A4,F10.5,7F13.7)
5428      306  FORMAT(7(F3.0,I3), A2,9A4)
5429      DATA CHAR,BLANK/4HCHAR,4H /
5430      P=PP
5431      KR(3)=2
5432      KR(2)=KKR(12)+1
5433      IF(KR(2).EQ.3.OR.KR(2).EQ.8) KR(3)=6
5434      IF(KR(2).EQ.7) GO TO 3751
5435      3062 MT=0
5436      FFA=0.489
5437      FITMOL=26.7
5438      FITGMW=24.3
5439      GGA = 0.454
5440      BASHOL=32.0
5441      SIGMA=3.467
5442      EPOVRK=106.7
5443      NFF=0 B24A 042
5444      VINT=P*1.E-6 B24A 043
5445      YINT=ALOG(VINT) B24A 044
5446      RMWG=1. B24A 045
5447      IF (KR(2)) 334,334,321 B24A 046
5448      321 READ(KIN,301) IS,FFAR,DUB2,DUB3,DUB4,DUB5,DUB6,DUB7,DUB8
5449      IF (DUB2.GT.0.) FITMOL=DUB2
5450      IF (DUB3.GT.0.) BASHOL=DUB3
5451      IF (DUB4.GT.0.) SIGMA=DUB4
5452      IF (DUB5.GT.0.) EPOVRK=DUB5

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5453	IF (DUB6.GT.0.) GGA =DUB6	
5454	IF (DUB7.GT.0.) FITSMW=DUB7	
5455	IF (FFAR) 3213,3212,3211	824A 048
5456	3213 FFA=0.	824A 049
5457	GO TO 3212	824A 050
5458	3211 FFA=FFAR	824A 051
5459	3212 CONTINUE	824A 052
5460	JAT(6)=0	824A 053
5461	IX=3	824A 054
5462	IF (IS-10) 311,311,399	824A 055
5463	311 READ(KIN,304) (KAT(J), ATA(J), ATB(J), ATC(J), WAT(J), (TK(J,I),	
5464	1 I=1,7),J=1,IS)	
5465	DO 327 K=1,7	
5466	VA=0.	824A 059
5467	DO 322 J=1,IS	824A 060
5468	IF (KAT(J)-99) 3111,325,3111	824A 061
5469	3111 IF (TK(J,K)) 324,322,325	824A 062
5470	324 VA=VA-TK(J,K)	824A 063
5471	TK(J,K)=-TK(J,K)/WAT(J)	824A 064
5472	GO TO 322	824A 065
5473	325 VA=VA+TK(J,K)*WAT(J)	824A 066
5474	322 CONTINUE	824A 067
5475	IF (VA) 326,327,325	
5476	326 DO 323 J=1,IS	
5477	323 TK(J,K)=TK(J,K)/VA	824A 069
5478	327 CONTINUE	
5479	WRITE (KOUT,305) (KAT(J), ATA(J), ATB(J), ATC(J), WAT(J), (TK(J,I),	
5480	1 I=1,7),J=1,IS)	
5481	WRITE (KOUT,308)	
5482	308 FORMAT(/,3X61HTHERMODYNAMIC PROPERTY CURVE-FIT DATA (SEE MANUAL FO	
5483	1R FORMAT)/)	
5484	ISP=IS+1	824A 072
5485	IF (KR(3)) 399,399,334	824A 073
5486	334 TFMAX=0.	824A 074
5487	AAA=0.	824A 075
5488	N=0	824A 076
5489	II=ISP	824A 077
5490	J=1	824A 078
5491	342 READ(KIN,306) (ALPT(K), JAT(K),K=1,7),SORCE,AMOA,AMOB	
5492	IF (ALPT(1)) 3421,399,3420	
5493	3420 IF (JAT(1)) 344,3421,344	
5494	3421 NFF=ABS(ALPT(1))	
5495	READ(KIN,3021) (NFIA(I),NFIB(I),FFIN(I),I=1,NFF)	824A 082
5496	GO TO 342	824A 083
5497	344 DO 345 K=1,IS	
5498	345 C(K)=0.	
5499	DO 349 I=1,7	
5500	IF (JAT(I)) 346,349,346	
5501	346 DO 347 K=1,IS	
5502	IF (JAT(I)-KAT(K)) 347,348,347	
5503	347 CONTINUE	
5504	READ(KIN,303)	
5505	GO TO 342	
5506	348 C(K)=ALPT(I)	
5507	349 CONTINUE	
5508	WT=0.	
5509	L=1	
5510	LAMKK=0	

5511	DO 388 I=1,IS	
5512	IF(C(I)) 387,388,387	
5513	387 LAMKK=LAMKK+L	
5514	WT=WT+C(I) * WAT(I)	
5515	388 L=L+L	
5516	IF(J-IS) 360,360,369	
5517	360 JM=J-1	B24A 099
5518	DO 3601 L=1,IS	B24A 100
5519	3601 CIJ(L,J)=C(L)	B24A 101
5520	LAMI(J) = LAMKK	
5521	IF (JM) 320,320,313	
5522	313 DO 314 L=1,JM	B24A 104
5523	IML=IM(L)	B24A 105
5524	UGH=C(IML)	B24A 106
5525	UM(L,J)=0.	B24A 107
5526	IF(UGH) 353,314,353	B24A 108
5527	353 DO 393 I=1,L	B24A 109
5528	393 UM(I,J)=UM(I,J)-UM(I,L)*UGH	B24A 110
5529	DO 394 I=IML,IS	B24A 111
5530	394 C(I)=C(I)-.AU(I,L)*UGH	B24A 112
5531	314 UM(J,L)=0.	B24A 113
5532	320 DO 316 I=1,IS	B24A 114
5533	IF(ABS (C(I))- .001) 316,316,317	B24A 115
5534	316 TAU(I,J)=0.	B24A 116
5535	DO 396 I=1,JM	B24A 117
5536	396 VNU(II,I)=-UM(I,J)	B24A 118
5537	DO 397 I=J,IS	B24A 120
5538	397 VNU(II,I)=0.	B24A 121
5539	LAMI(II)=LAMKK	B24A 123
5540	GO TO 370	
5541	317 IM(J)=I	B24A 124
5542	UM(J,J)=1.	B24A 125
5543	DO 398 L=1,J	B24A 126
5544	398 UM(L,J)=UM(L,J)/C(I)	B24A 127
5545	DO 328 L=I,IS	B24A 128
5546	328 TAU(L,J)=C(L)/C(I)	B24A 129
5547	YC=YINT	B24A 130
5548	KK=J	B24A 131
5549	J=J+1	B24A 132
5550	IF(J-IS) 372,372,329	B24A 133
5551	329 DO 330 L=2,IS	B24A 134
5552	JM=ISP-L	B24A 135
5553	IMJ=IM(JM+1)	B24A 136
5554	DO 330 K=1,JM	B24A 137
5555	UGH=TAU(IMJ,K)	B24A 138
5556	DO 330 I=1,IS	B24A 139
5557	330 UM(I,K)=UM(I,K)-UGH*UM(I,JM+1)	B24A 140
5558	DO 337 I=1,IS	B24A 141
5559	337 IMI=IM(I)	B24A 142
5560	IF(IMI-I) 336,333,336	B24A 143
5561	336 DO 338 K=1,IS	B24A 144
5562	V=UM(K,IMI)	B24A 145
5563	UM(K,IMI)=UM(K,I)	B24A 146
5564	338 UM(K,I)=V	B24A 147
5565	IM(I)=IM(IMI)	B24A 148
5566	IM(IMI)=IMI	B24A 149
5567	GO TO 337	B24A 150
5568	333 CONTINUE	B24A 151
		B24A 152

5569	C-----ELEMENT -- BASE GAS CORRESPONDENCE	824A 153
5570	C INITIALIZE ROW AND COLUMN SUMS	824A 154
5571	IG=IS	824A 155
5572	DO 401 I=1,IS	824A 156
5573	IR(I)=-1	824A 157
5574	401 IC(I)=-1	824A 158
5575	C EVALUATE INITIAL SUMS	824A 159
5576	LAMD=1	
5577	DO 402 I=1,IS	
5578	DO 403 J=1,IS	
5579	LIM(I,J)=MOD(LANI(J)/LAMD,2)	
5580	IC(J) = IC(J) + LIM(I,J)	
5581	403 IR(I) = IR(I) + LIM(I,J)	
5582	402 LAMD=LAMD+LAMD	
5583	C CHECK FOR ZEROS	824A 167
5584	426 IZ=0	824A 168
5585	404 DO 412 I=1,IS	824A 169
5586	IF(IC(I)-IZ) 408,405,408	824A 170
5587	405 DO 406 J=1,IS	824A 171
5588	IF(LIM(J,I)) 407,406,407	824A 172
5589	406 CONTINUE	824A 173
5590	407 IC(I)=-J	824A 174
5591	IR(J)=-I	824A 175
5592	DO 428 K=1,IS	824A 176
5593	LIM(J,I)=0	824A 177
5594	IF(LIM(J,K)) 425,427,425	824A 178
5595	425 IC(K)=IC(K)-1	824A 179
5596	LIM(J,K)=0	824A 180
5597	427 IF(LIM(K,I)) 422,428,422	824A 181
5598	422 LIM(K,I)=0	824A 182
5599	IR(K)=IR(K)-1	824A 183
5600	428 CONTINUE	824A 184
5601	CO TO 413	824A 185
5602	408 IF(IR(I)-IZ) 412,409,412	824A 186
5603	409 DO 410 J=1,IS	824A 187
5604	IF(LIM(I,J)) 411,410,411	824A 188
5605	411 IC(J)=-I	824A 189
5606	IR(I)=-J	824A 190
5607	LIM(I,J)=0	824A 191
5608	GO TO 4101	824A 192
5609	410 CONTINUE	824A 193
5610	4101 DO 430 K=1,IS	824A 194
5611	IF(LIM(K,J)) 424,429,424	824A 195
5612	424 IR(K)=IR(K)-1	824A 196
5613	LIM(K,J)=0	824A 197
5614	429 IF(LIM(I,K)) 423,430,423	824A 198
5615	423 LIM(I,K)=0	824A 199
5616	IC(K)=IC(K)-1	824A 200
5617	430 CONTINUE	824A 201
5618	GO TO 413	824A 202
5619	412 CONTINUE	824A 203
5620	IZ=IZ+1	824A 204
5621	GO TO 404	824A 205
5622	413 IG=IG-1	824A 206
5623	J=IS+1	824A 207
5624	IF(IG) 414,414,426	824A 208
5625	414 FAMOA(IS)=AMOA	ENTR-MOD
5626	FAMOB(IS)=AMOB	824A 211

5627	DO 416 I=1,IS	B24A 212
5628	K=-IR(I)	B24A 213
5629	IC(I)=FAMOA(K)	B24A 214
5630	416 IM(I)=FAMOB(K)	B24A 215
5631	417 FORMAT(///5X9HELEMENT ,18A4)	
5632	418 FORMAT(5X9HBASE SP 6(4X2A4))	B24A 219
5633	GO TO 372	B24A 220
5634	369 DO 361 L=1,IS	B24A 221
5635	VNU(II,L)=0.	B24A 223
5636	DO 361 I=1,IS	B24A 224
5637	361 VNU(II,L)=VNU(II,L)+C(I)*UM(L,I)	B24A 225
5638	LAMI(II)=LAMKK	
5639	370 KK=II	B24A 226
5640	II=II+1	B24A 227
5641	YC= 0.	B24A 228
5642	372 READ(KIN,302) (RA(K),RB(KK,K), RC(KK,K), RD(KK,K), RE(KK,K),	
5643	1RF(KK,K), ZIGEPS(K), TU(KK,K),KPHA(K),K=1,2)	
5644	IF(KPHA(1)-KPHA(2)) 3733,3736,3734	
5645	3733 IF(KPHA(1)+KPHA(2)-5) 3734,3737,3734	
5646	3734 WRITE(KOUT,3735) AMOA,AMOB	
5647	3735 FORMAT(///25H BAD PHASE NUMBERING FOR 2A4)	
5648	STOP	
5649	3736 IF(KPHA(1)-1) 3734,3727,3728	
5650	3737 TU(KK,1)=-TU(KK,1)	
5651	3728 FF(KK) = 1.E+10	
5652	GG(KK) = 1.E+10	
5653	GO TO 3729	
5654	3727 FF(KK)=(WT/FITHOL) **FFA	
5655	IFMET(KK)=2	
5656	GG(KK) = -1.	
5657	3729 IF(NFF) 3726,3449,3730	
5658	3730 DO 3723 I=1,NFF	B24A 233
5659	IF(NFIA(I)-AMOA) 3723,3724,3723	B24A 234
5660	3724 IF(NFIB(I)-AMOB) 3723,3720,3723	
5661	3720 IF(FFIN(I)-100.) 3725,3731,3731	
5662	3725 IF (FFIN(I)) 3480,3480,3481	
5663	3480 GG(KK) = -FFIN(I)	
5664	IGMET(KK)=1	
5665	GO TO 3723	
5666	3481 FF(KK) = FFIN(I)	
5667	IFMET(KK)=1	
5668	GO TO 3723	
5669	3731 TF(KK)=FFIN(I)	
5670	3723 CONTINUE	
5671	IF (GG(KK)) 3449,3449,3455	
5672	3449 IF (ZIGEPS(1)-100.) 3453,3452,3452	
5673	3453 IF (ZIGEPS(1)) 3452,3452,3441	
5674	3441 IF (ZIGEPS(2)) 3452,3452,3443	
5675	3443 GG(KK) = ZIGEPS(1)/SIGMA * (ZIGEPS(2)/EPOVRK) **.0795 *	
5676	1 (WT/BASMOL) **.25	
5677	IGMET(KK)=3	
5678	GO TO 3455	
5679	3452 IF (KPHA(1)-1) 3456,3457,3456	
5680	3456 GG(KK) = 1.E+10	
5681	GO TO 3455	
5682	3457 GG(KK) = (WT/FITGMW) **GGA	
5683	IGMET(KK)=2	
5684	3455 CONTINUE	

5685	3726 IF (KR(3)-6) 3722,3721,3722	B24A 243
5686	3721 WRITE(KOUT,306) (ALPT(K),JAT(K), K=1,7), SORCE,AMOA,AMOB	
5687	WRITE(KOUT,3020) (RA(K), RB(KK,K), RC(KK,K), RD(KK,K), RE(KK,K),	
5688	1RF(KK,K),ZIGEPS(K),TU(KK,K),KPHA(K),K=1,2)	
5689	3722 FAMOA(KK)=AMOA	B24A 247
5690	FAMOB(KK)=AMOB	B24A 248
5691	WTM(KK)=WT	B24A 251
5692	RB(KK,1)= RB(KK,1) + RA(1)	
5693	RB(KK,2) = RB(KK,2) + RA(2)	
5694	N=N+1	B24A 254
5695	IF (KPHA(1)-1) 3734,362,364	
5696	364 IFC(KK)=-1	B24A 267
5697	VN(KK)=0.	B24A 268
5698	Y(KK)=YC	B24A 269
5699	IF (TF(KK)-TFMAX) 342,342,371	B24A 270
5700	371 TFMAX=TF(KK)	B24A 271
5701	GO TO 342	B24A 272
5702	362 IFC(KK)=0	B24A 273
5703	VN(KK)=VINT	B24A 274
5704	Y(KK)=YINT	B24A 275
5705	GO TO 342	B24A 276
5706	399 WRITE (KOUT,417) (ATA(I),ATB(I),ATC(I),I=1,IS)	
5707	WRITE (KOUT,418) (IC(I),IM(I),I=1,IS)	
5708	5001 WRITE(KOUT,110) SIGMA,EPOVRK,BASHOL	
5709	110 FORMAT(//3X30HMOLECULAR TRANSPORT PROPERTIES/5X75HVIScosity	
5710	1 BUDDENBERG - WILKE MIXTURE FORMULA WITH MU(I) CALCULATED ON/21X34	
5711	2HTHE BASIS OF D(I,I) = DBAR/G(I)**2//5X80HTHERMAL CONDUCTIVITY ...	
5712	3.. MASON - SAXENA MIXTURE FORMULA WITH EUCKEN CORRECTION//5X73HDIF	
5713	4FUSION COEFFICIENTS D(I,J) = DBAR/(F(I)*F(J)) WITH DBAR BASE	
5714	5D ON/21X8HSIGMA = ,F8.4,11H, EPOVRK = ,F9.4,13H, AND MREF = ,F8.4)	
5715	WRITE (KOUT,111) FITHOL,FFA,FITGMW,GGA	
5716	111 FORMAT(//7X16HMETHODS EMPLOYED//8X63H0 CONDENSED PHASE, VALUES FOR	
5717	1 F(I) AND G(I) SET EQUAL TO 1.E+10//8X42H1 VALUES FOR F(I) (OR G(I	
5718	2)) INPUT DIRECTLY//8X71H2 VALUES FOR F(I) ? G(I)) CALCULATED BY	
5719	3 F(I) =(M(I)/FITHOL)**FFA AND/10X65H5(I) (I)/FITGMW)**GGA WHERE	
5720	4E M(I) IS SPECIES MOLECULAR WEIGHT,/10X,S MOL = ,F8.4,12H, AND	
5721	5FFA = ,F6.4,11H, FITGMW = F8.4,12H, AND GGA = ,F6.4)	
5722	WRITE (KOUT,112)	
5723	112 FORMAT(//8X79H3 VALUES FOR G(I) CALCULATED BY G(I) = SQRT(DBAR/D(I,	
5724	1I)) = (SIGMA(I)/SIGMA) /10X73H* (EPS(I)/EPOVRK) **0.0795 * (M(I	
5725	2)/MREF) **0.25 WHERE SIGMA(I) AND EPS(I)/10X33HARE GIVEN WITH THER	
5726	3MODYNAMIC JATA//7X73HSPECIES F(I) METHOD G(I) METHOD SPECI	
5727	4ES F(I) METHOD G(I) METHOD)	
5728	WRITE (KOUT,113) ((FAMOA(KK),FAMOB(KK),FF(KK),IFMET(KK),GG(KK),IGME	
5729	1T(KK)),KK=1,N)	
5730	113 FORMAT(7X,2A4,1X,F5.3,3X,I1,3X,F5.3,3X,I1,10X,2A4,1X,F5.3,3X,I1,3X	
5731	1,F5.3,3X,I1)	
5732	WRITE (KOUT,419)	
5733	419 FORMAT (//3X61HSTAGNATION SOLUTION FOLLOWED BY BOUNDARY-LAYER EDGE	
5734	1 EXPANSION/)	
5735	DO 375 L=1,7	
5736	DO 375 I=1,IS	B24A 278
5737	TQ(I,L)=0.	B24A 279
5738	DO 375 K=1,IS	B24A 280
5739	375 TQ(I,L)=TQ(I,L)+UM(I,K)*TK(K,L)	B24A 281
5740	IF (KR(2)-5) 3752,3752,3751	
5741	3751 CONTINUE	
5742	240 FORMAT(8F10.6)	THER1330

5743	245 FORMAT (2I3)	THER1340
5744	250 FORMAT (3E10.4)	THER1350
5745	255 READ(KIN,245)MT	THER1370
5746	IF(MT) 3752,3752,256	
5747	256 DO 260 M=1,MT	THER1380
5748	READ(KIN,250)FKF(M),EAK(M),EXK(M)	THER1390
5749	READ(KIN,240)(RMU(I,M),I=1,IS)	THER1400
5750	260 READ(KIN,240)(PMU(I,M),I=1,IS)	THER1410
5751	265 FORMAT (/3X,7HKINETIC)	
5752	270 FORMAT (3X,11HREACTION---,I7,9I10)	
5753	275 FORMAT (/3X,8HREACTANT)	
5754	280 FORMAT (5X,12HCOEFFICIENTS/)	
5755	285 FORMAT (8X,2A4,F8.2,9F10.2)	THER1460
5756	290 FORMAT (/3X,7HPRODUCT)	
5757	295 FORMAT (/3X,12HPRE-EXPONENT)	
5758	200 FORMAT (5X,6HFACTOR,4X,10E10.3)	
5759	205 FORMAT (/3X,10HACTIVATION)	
5760	210 FORMAT (5X,6HENERGY,4X,10E10.3)	
5761	215 FORMAT (/3X,8HREACTION)	
5762	220 FORMAT (5X,5HORDER,5X,10E10.3)	
5763	WRITE(KOUT,265)	
5764	WRITE(KOUT,270)(M,M=1,MT)	THER1
5765	WRITE(KOUT,275)	
5766	WRITE(KOUT,280)	
5767	DO 225 I=1,IS	
5768	225 WRITE(KOUT,285)FAMOA(I),FAMOB(I),(RMU(I,M),M=1,MT)	
5769	WRITE(KOUT,290)	
5770	WRITE(KOUT,280)	
5771	DO 230 I=1,IS	
5772	230 WRITE(KOUT,285)FAMOA(I),FAMOB(I),(PMU(I,M),M=1,MT)	
5773	WRITE(KOUT,295)	
5774	WRITE(KOUT,200)(FKF(M),M=1,MT)	
5775	WRITE(KOUT,205)	
5776	WRITE(KOUT,210)(EAK(M),M=1,MT)	
5777	WRITE(KOUT,215)	
5778	WRITE(KOUT,220)(EXK(M),M=1,MT)	
5779	3752 VN(N+1)=0.	
5780	IFC(N+1)=-1	
5781	WTH(N+1)=-1.	
5782	FAMOA(N+1)=CHAR	
5783	FAMOB(N+1)=BLANK	
5784	TF(N+1)=500J0.	
5785	IF(DUB8.GT.0.) TF(N+1) = DUB8	
5786	RETURN	
5787	END	B24A 283
5788	CB25A	B25A 001
5789	SUBROUTINE PROPS	B25A 002
5790	INTEGER FAMOA,FAMOB	B25A 004
5791	DIMENSION VK(10),PA(12,12),PV(11,12)	B25A 005
5792	COMMON /BLQCOM/FAMOA(71),FAMOB(71),N ,FR(71,15),W(3),LEF(10)	B25A 5
5793	1 ,LEFS(10),PIEASE,LEFM(19),L2,L3	ENTR-MOD
5794	COMMON/EDGCOM/ PE(40, 1),PTE(40, 1),SPE(8,40, 1),DUES,	B25A 7
5795	1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,D2UEDG,VMHE,CGE,C90	ENTR-MOD
5796	2 ,OSIP(40),IOSIP,TTVC,TVCC(40)	B25A 9
5797	COMMON /EQPCOM/ RB(71,2),RC(71,2),RD(71,2),RE(71,2),RF(71,2),	B25A 10
5798	1 TU(71,2),FF(71),FFA,IFC(71),ATA(10),ATB(10),ATC(10),WAT(10),	B25A 11
5799	2 KAT(10),IR(10),IS,KR(10),LAMI(71),P,T,TK(10, 71),VN(71),	B25A 12
5800	3 VNU(71,10),ITFF,KR2,HCH,NCV,WM,WTH(71),Y(71),YW(71),GG(71)	B25A 13

5801	4 ,TQ(10, 7),EPOVRK,SIGMA,BASMOL	B25A	14
5802	COMMON /EQTCOH/SIP,HIP,EL,ENL,FLIQ,CPF,IRE,IER,AA,ITS,IN,IL,IT,	B25A	15
5803	1 MODE,HMELT,SMELT,TMAX,THIN,MELT,SUMN,SUHL,WS,WSS,B1,ISP2,ISPO,	B25A	16
5804	2 ISP,KKJ,SVA,SVB,SVC,SVD,SUMC,FFF,CHF,EP,RV,IFCJC,MTG,WTL,JC,HG,	B25A	17
5805	3 CPG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(11),A(16,16),B(16),	ENTR-MOD	
5806	4 IP(71),ALP(10),FNU(10),GAMH(10),GAMF(10),SLAH(10),DY(71),RVS,	B25A	19
5807	5 CP(71),H(71),SB(71),TC(71),VLNK(71),E(71),PNUS(10),	B25A	20
5808	6 BC(10),BLNK(10),BY(10),IBC(10),BE(10),JJ(4)	B25A	21
5809	COMMON /INTCOM/KKR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,II,	B25A	22
5810	1ISS,NS,ITT,NTIME,NSP,NSPH1,NAH,NLEQ,NNLEQ,NRNL,HITS,KAPPA,CBAR,	B25A	23
5811	2CASE(15),BB(8), MWE,NON,KD(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,	B25A	24
5812	3 KR9(40),KAUXO,JTIME,JSPEC,NO(3)	B25A	25
5813	COMMON /PRPCO /PR(15),TT(15),RHO(15),SC(15),CAPC(15),QR(15),HH(15)	B25A	26
5814	1,CPBAR(15),VNH(15),PHIK(15, 8),DRHON,DRHOK(8),ZK(8),DZKH(8),	B25A	27
5815	2MU3K(8),DMU4K(8),OTK(8),OPHIKH(8),DPRK(8),OSCK(8),DCAPCK(8)	B25A	28
5816	3,DHTILK(8),DQRK(8),DCPBK(8),DCPTK(8),DMU12K(8),DZKK(8, 8)	B25A	29
5817	4,OPHIKK(8, 8), DMU4H,DMU3H,DHTILH,VHU12,CT,CTR,CPTIL,HTIL	B25A	30
5818	5,VHU3,DTM,DCAPCH,DPRH,OSCH,CQRH,DCPBH,DCPTH,DMU12H,VHU(15), RHOP	B25A	31
5819	6(15),PHIKP(15),HP,TP,ZKP(8),VNU3P,VHU4P,HTILP,CRMO(14),GMR(15)	B25A	32
5820	COMMON/WALCON/FH(40, 1),TW(40, 1),HW(40, 1),SPW(8,40, 1)	B25A	33
5821	1,RHOVN(40, 1),FLUXJ(3,40, 1),IHW,ITW,IFW,ISPH,IRHOVN,IFLUXJ	B25A	34
5822	DIMENSION PRP(1)		
5823	EQUIVALENCE (PRP(1),PV(1))		
5824	IF(II-1) 310,300,310	B25A	032
5825	300 IF(KKR(14)-10) 310,302,302	B25A	033
5826	302 KKR(14)=KKR(14)-10	B25A	034
5827	310 IF(1-300.001) 312,312,320	B25A	035
5828	312 KKR(14)=KKR(14)+10	B25A	036
5829	320 NH=AA/P		
5830	ISV=IS	B25A	038
5831	IS=NSP	B25A	039
5832	ISVP=ISV+1	B25A	040
5833	543 ISV2=ISV+2		
5834	CT=-0.5	B25A	041
5835	ISM=IS-1	B25A	042
5836	ISP=IS+1	B25A	043
5837	ISP2=IS+2	B25A	044
5838	TT(II)=T*1.8	B25A	046
5839	RHO(II)=AA/(1.3146*T)		
5840	CTR=CT*1.9876	B25A	049
5841	C FORM NECESSARY SUMMATIONS	B25A	051
5842	PMU2=0.	B25A	052
5843	CPTIL=0.	B25A	053
5844	WTG=0.		
5845	HG=0.		
5846	CPG=0.		
5847	HTIL=0.	B25A	054
5848	PMU1=0.	B25A	055
5849	TNU3=0.	B25A	056
5850	I=1		
5851	DO 451 IK=1,N		
5852	IF(KAT(ISV)-99) 544,541,544	ENTR-MOD	
5853	541 IF(IK-ISV) 544,451,542		
5854	542 H(I)=H(I)-VNU(I,ISV)*H(ISV)		
5855	WTH(I)=WTH(I)-VNU(I,ISV)*WTH(ISV)		
5856	CP(I)=CP(I)-VNU(I,ISV)*CP(ISV)		
5857	544 IF(IFC(I)) 451,4550,451		
5858	4550 PMU1=PMU1+VN(I)*FF(I)	B25A	060

5859	451 I=I+1	
5860	VNU1=PMU1/P	
5861	AMU5=0.	825A 062
5862	PMU6=0.	825A 063
5863	WDZ=1.385	825A 064
5864	WD4 = 0.284*WDZ	825A 065
5865	I = 1	
5866	DO 454 IK = 1,N	
5867	IF(IK-IS) 4510,4510,4509	
5868	4510 VK(I)=0.	ENTR-MOD
5869	ZK(I)=0.	ENTR-MOD
5870	4509 IF(IFC(I).NE.0) GO TO 454	ENTR-MOD
5871	ASTAR = 1.13 * GG(I)/FF(I) * GG(I)/FF(I)	ENTR-MOD
5872	WD2=1.2*ASTAR/PMU1	
5873	WD7=WD2/PMU1-WD2	
5874	WD5=.32*ASTAR/PMU1	
5875	WD8=WD4/PMU1-WD5	
5876	VA=VN(I)/FF(I)	825A 074
5877	VB=VA*WTH(I)	825A 075
5878	VC=VN(I)*FF(I)	825A 076
5879	IF(IK-IS) 4511,4511,4560	ENTR-MOD
5880	4511 VK(I)=VN(I)	825A 081
5881	452 ZK(I)=VA	825A 082
5882	GO TO 457	825A 083
5883	4560 IF(IK-ISV) 4562,4562,456	ENTR-MOD
5884	4562 IF(KAT(I).NE.99) GO TO 457	ENTR-MOD
5885	WTH(I)=0.	ENTR-MOD
5886	CP(I)=0.	
5887	H(I)=0.	
5888	GO TO 454	
5889	456 DO 453 K=1,ISM	ENTR-MOD
5890	VK(K)=VK(K)+VN(I)*VNU(I,K)	825A 087
5891	453 ZK(K)=ZK(K)+VA*VNU(I,K)	825A 088
5892	457 PMU2=PMU2+VB	825A 089
5893	TMU3=TMU3+VA	825A 090
5894	CPTIL=VA*CP(I)+CPTIL	825A 091
5895	HTIL=HTIL+VA*H(I)	825A 092
5896	MTG=MTG+VN(I)*WTH(I)	
5897	HG=HG+VN(I)*H(I)	
5898	CPG=CPG+VN(I)*CP(I)	
5899	AMU5=AMU5+VB/(WDZ-VC*WD7)	
5900	PMU6=PMU6+VA/(WD4-VC*WD8)	
5901	454 I=I+1	
5902	VNU5=AMU5/MTG	
5903	VNU6=(PMU6 +CPTIL/1.9869-2.5*TMU3)/P	825A 097
5904	VNU2=PMU2/P	825A 098
5905	VNU3=TMU3/PMU2	825A 099
5906	CPTIL = CPTIL / PMU2	PROP1110
5907	HTIL = HTIL / PMU2 * 1.8	PROP1120
5908	HG=HG/MTG	
5909	CPG=CPG/MTG	
5910	WM=MTG/P	
5911	ZKS = 1.0	PROP1020
5912	VKS=1.0	
5913	DO 95 K=1,ISM	PROP1030
5914	VK(K)=VK(K)/MTG*WTH(K)	
5915	95 ZK(K) = ZK(K) / PMU2 * WTH(K)	PROP1050
5916	OMEGA=1.07/(T/EPOVRK) **0.129	

5917	DBAR = 2.82861E-6/(SIGMA * SIGMA) * T/P * SQRT(T/BASHOL)/OMEGA	
5918	VMU(II)=RHO(II)*DBAR * VMU5/VMU1	825A 107
5919	IF (KKR(5)) 461,461,460	825A 108
5920	460 RHOE(ISS)=RHO(II)	825A 109
5921	VMUE(ISS)=VMU (II)	825A 110
5922	VMUE=WM	825A 111
5923	IS=ISV	825A 112
5924	RETURN	825A 113
5925	461 CONTINUE	825A 114
5926	CAPC(II)=RHO(II)/RHOE(ISS) * VMU(II)/VMUE(ISS)	825A 115
5927	VMU(II)=WM	825A 116
5928	VLAN=RHO(II)*DBAR/WM*VMU6/VMU1*1.9869	825A 117
5929	SC(II)=VMU5/VMU2*WM	825A 118
5930	IF (KKR(14)-1) 4613,4612,4611	825A 122
5931	4611 FFK2=WM/VMU2	825A 123
5932	VMU1=FFK2	825A 124
5933	VMU3=1./WM	825A 125
5934	CPTIL=CPG	
5935	MTIL=HG*1.8	
5936	DO 4614 K=1,ISM	825A 128
5937	4614 ZK(K)=VK(K)	825A 129
5938	4612 CT=0.	825A 130
5939	CTR=0.	825A 131
5940	4613 VMU12=VMU1*VMU2	825A 132
5941	IF (KKR(20)) 9004,9005,9004	825A 133
5942	9004 WRITE(KOUT,9006) OMEGA, DBAR, VLAN, SC(II), FR(II), VMU1, VMU2, VMU3, T	825A 134
5943	1T(II), VMU5, VMU6, FF(1), FF(2), FF(3), CPTIL, MTIL, (VK (I), WTM(I), ZK(I),	825A 135
5944	2I=1,ISM), VMU(II)	825A 136
5945	9005 CONTINUE	825A 137
5946	IF (KKR(6)) 5000,5340,5340	825A 139
5947	5000 CPBAR(II)=CPG	
5948	PR(II)=CPG/VMU6*VMU5/1.9869*WM	
5949	NPR=ISP2	
5950	DO 501 I=1,NPR	
5951	DO 501 J=1,ISV2	
5952	501 PA(I,J)=0.	825A 142
5953	PA(3,1)=PMU2*CPTIL*T	825A 143
5954	DO 502 K=3,ISV2	ENTR-MOD
5955	IF (KKR(14)-1) 5016,5016,5017	825A 145
5956	5016 FFK2=FF(K-2)	825A 146
5957	5017 IF (IFC(K-2)) 502,5011,5014	ENTR-MOD
5958	5011 PA(1,K)=VN(K-2)/FFK2	825A 148
5959	GO TO 5013	825A 149
5960	5014 PA(1,K)=1./FFK2	
5961	5013 PA(2,K)=PA(1,K)*WTM(K-2)	825A 154
5962	PA(3,K)=PA(1,K)*M(K-2)	825A 155
5963	IF (K-ISP) 5018,5018,5019	
5964	5018 PA(K+1,K)=PA(1,K)	
5965	5019 CONTINUE	
5966	502 CONTINUE	825A 157
5967	J=ISVP	
5968	IF (ISVP.GT.N) GO TO 5078	
5969	DO 507 IJ=ISVP,N	
5970	IF (IFC(IJ)) 507,5021,507	825A 159
5971	5021 PRP(1)=VN(IJ)/FFK2	
5972	IF (KKR(14)-1) 5022,5022,5023	825A 161
5973	5022 PRP(1)=VN(IJ)/FF(IJ)	
5974	5023 PRP(2)=PRP(1)*WM(IJ)	

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5975 PRP(3)=PRP(1)*K(J)
5976 DO 5024 I=4,ISP2
5977 5024 PRP(I)=PRP(1)*VNU(J,I-3)
5978 DO 505 I=1,NPR
5979 PA(I,1)=PA(I,1)-TC(J)*PRP(I)
5980 DO 505 K=1,ISV
5981 IF(IFC(K)) 506,506,505
5982 506 PA(I,K+2)=PA(I,K+2)+PRP(I)*VNU(J,K)
5983 505 CONTINUE
5984 507 J=J+1
5985 5070 VA=AA/WTM(IS)
5986 DO 511 I=1,ISV2
5987 A(I,1)=A(I,1)*AA/1.8
5988 511 A(I,ISP2)=A(I,ISP2)*VA
5989 DO 512 J=3,ISP
5990 VA=AA/WTM(J-2)
5991 DO 512 I=1,ISV2
5992 512 A(I,J)=A(I,J)*VA-A(I,ISP2)
5993 C FORM PA,A PRODUCT AND TRANSPOSE (TO ESTABLISH EQUIVALENCE
5994 DO 521 I=1,NPR
5995 DO 521 J=1,ISP
5996 PV(J,I)=PA(I,1)*A(1,J)
5997 DO 521 L=3,ISV2
5998 521 PV(J,I)=PV(J,I)+PA(I,L)*A(L,J)
5999 DO 533 K=1,ISM
6000 PV(K,1)=(PV(K,1)-VNU3*PV(K,2))/PMU2
6001 PV(K,3)=(PV(K,3)+1.8-MTIL*PV(K,2))/PMU2
6002 DO 531 J=1,ISM
6003 531 PV(K,J+3)=(PV(K,J+3)*WTM(J)-ZK(J)*PV(K,2))/PMU2
6004 533 PV(K,2)=CT*A(1,K)+PV(K,2)/PMU2
6005 PV(2,2)=PV(2,2)-1./P
6006 C POOR MAN-S EQUIVALENCE
6007 QR(II)=0.
6008 DCAPCH=CAPC(II)*(2.*A(2,1)-0.341*A(1,1))
6009 DPRM=0.
6010 DSCH=0.
6011 DQRH=0.
6012 DCPBM=0.
6013 OCPTH=0.
6014 DMU12H=0.
6015 DRHOM=RHO(II)*(A(2,1)-A(1,1))
6016 DTH=T*A(1,1)*1.8
6017 DMU3H=PV(1,1)
6018 DMU4H=PV(1,2)
6019 DMU1LH=PV(1,3)
6020 IF (ISPM1) 5340,5340,5320
6021 5320 DO 534 K=1,ISM
6022 PHIK(II,K)=0.
6023 DPHIKH(K)=0.
6024 DRHOK(K)=RHO(II)*A(2,K+2)-A(1,K+2)
6025 DPRK(K)=0.
6026 DSCK(K)=0.
6027 DTK(K)=T*A(1,K+2)*1.8
6028 DCAPCK(K)=CAPC(II)*(2.*A(2,K+2)-0.341*A(1,K+2))
6029 DQRK(K)=0.
6030 DCPBK(K)=0.
6031 OCPTK(K)=0.
6032 DMU12K(K)=0.

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6033	DMU3K(K)=PV(K+2,1)	025A 227
6034	DMU4K(K)=PV(K+2,2)	025A 228
6035	DHTILK(K)=PV(K+2,3)	025A 229
6036	OZKH(K)=PV(1,K+3)	025A 230
6037	DO 532 I=1,ISM	025A 231
6038	OPHIKK(I,K)=0.	025A 232
6039	532 OZKK(I,K)=PV(K+2,I+3)	025A 233
6040	534 CONTINUE	025A 234
6041	5340 LIM=N+KR(8)	
6042	DO 535 I=1,LIM	
6043	IF(KR(6)) 5343,5344,5344	
6044	5343 IF(MOD(IFC(I),3)) 535,5344,535	
6045	5344 FR(I,II)=VN(I)/P	
6046	IF(VN(I)) 5341,5341,535	025A 237
6047	5341 IF(IFC(I)/ 535,5342,535	025A 238
6048	5342 FR(I,II)=1.E-30	025A 239
6049	535 CONTINUE	025A 240
6050	IF(KR(6)) 538,538,5350	
6051	5350 IF (KR(1)-1) 536,5361,5360	
6052	5361 Y(JC)=0.	
6053	536 HN(ISS,ITT)=HG*1.0	
6054	5360 DO 537 K=2,IS	
6055	537 SPH(K-1,ISS,ITT)=VK(K-1)	025A 244
6056	RHOVN(ISS,ITT)=-RV	
6057	538 CONTINUE	025A 246
6058	IF(KR(20)) 9001,9002,9001	025A 247
6059	9001 WRITE(KOUT,9006)DMU3H,DMU3K,DMU4H,DMU4K,DHTILH,DHTILK,DTN,OTK,ORMO	025A 248
6060	1H,DRHOK,DZKH,DZKK,HG,VK	
6061	9002 CONTINUE	025A 250
6062	IS=ISV	025A 251
6063	9006 FORMAT(/(1X10E12.5))	
6064	ISP=ISVP	
6065	ISP2=IS+2	
6066	IF(II-1) 551,539,551	
6067	539 DO 540 I=1,IS	
6068	540 YU(I)=Y(I)	
6069	551 RETURN	
6070	END	025A 253
6071	0026A	026A 001
6072	SUBROUTINE TAYLOR (D,FH,F,P)	026A 002
6073	DIMENSION FH(1),F(1),P(1)	026A 003
6074	COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,META,I	026A 004
6075	OZ=0*0	026A 005
6076	IF(KR(10)-1) 1,2,4	
6077	2 IF(I-META) 4,1,4	
6078	4 FO=0.	
6079	P(1)=(((FH(3)/6.-FO/24.)*O-F(2)/2.)*O+F(1))*O	026A 009
6080	P(2)=(((FO/30.-FH(3)/6.)*O+F(2)/3.)*O-F(1)/2.)*O2	026A 010
6081	P(3)=0.	026A 011
6082	P(4)=(((FH(3)/20.-FO/72.)*O-F(2)/6.)*O+F(1)/6.)*O2*O-P(3)	026A 012
6083	GO TO 3	026A 013
6084	1 FO=F(3)-FH(3)	026A 014
6085	P(1)=(((F(3)/6.-FO/24.)*O-F(2)/2.)*O+F(1))*O	026A 015
6086	P(2)=(((FO/30.-F(3)/6.)*O+F(2)/3.)*O-F(1)/2.)*O2	026A 016
6087	P(4)=-(11FO/252.-F(3)/72.)*O2*F(2)/30.*O-F(1)/24.*O2*O	026A 017
6088	P(3)=(((F(3)/20.-FO/72.)*O-F(2)/6.)*O+F(1)/6.)*O2*O-P(4)	026A 018
6089	3 CONTINUE	026A 019
6090	RETURN	026A 020

6091	END	B26A 021
6092	C827A	B27A 001
6093	SUBROUTINE LINMAT	B27A 002
6094	COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)	B27A 3
6095	1,LAR(153),BA1(43,18),BA2(30,15)	B27A 4
6096	COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB	B27A 5
6097	1S,IT,NTIME,NSP,NSPM1,HAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15)	B27A 6
6098	2,B(8), MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40)	B27A 7
6099	3,KAUXC,JTIME,JSPEC,MD(3)	B27A 8
6100	DO 104 I=2,NETA	B27A 008
6101	DETA(I-1)=ETA(I)-ETA(I-1)	B27A 009
6102	DSQ(I-1)=DETA(I-1)*DETA(I-1)	B27A 010
6103	B1(I-1)=B(3)*DSQ(I-1)	B27A 011
6104	B2(I-1)=2.*B1(I-1)	B27A 012
6105	104 DCU(I-1)=DETA(I-1)*DSQ(I-1)	B27A 013
6106	MAT1I=3*NETA-2	B27A 014
6107	MAT2I=2 * NETA	
6108	MAT1J= NETA+3	
6109	MAT2J= NETA	
6110	DO 108 I=1,MAT2I	
6111	DO 108 J=1,MAT2J	
6112	108 BA2(I,J)=0.	
6113	DO 105 I=1,MAT1I	B27A 017
6114	DO 105 J=1,MAT1J	B27A 018
6115	105 BA1(I,J)=0.	B27A 019
6116	BA1(1,2)=1.	B27A 020
6117	BA1(1,3)= DSQ(1)/2.	
6118	BA1(NETA,3) = DETA(1,	
6119	BA1(MAT2I-1,3)=1.	
6120	BA2(2,1)=DETA(1)	
6121	BA2(NETA+1,1)=1.	
6122	J=NETA	
6123	DO 106 I=2,NETA	B27A 022
6124	BA1(I-1,I+2)=DETA(I-1)	
6125	BA1(J,I+2)=1.	
6126	BA1(J,I+3)=-1.	
6127	BA2(I,I)=1.	
6128	IF(I-NETA) 103,106,107	
6129	103 BA2(I,I+1)=-1.	
6130	106 J=J+1	
6131	9060 FORMAT(2X1P12E10.3)	B27A 031
6132	9064 FORMAT(2X37HLINEAR MATRIX FOR MOMENTUM EQUATIONS,I3,2H XI3,	B27A 032
6133	127H, BEFORE AND AFTER SOLUTION)	B27A 033
6134	9079 FORMAT(2X44HLINEAR MATRIX FOR MASS AND ENERGY EQUATIONS,I3,2H XI3,	B27A 034
6135	127H, BEFORE AND AFTER SOLUTION)	B27A 035
6136	IF(KR(15)-1) 9052,9062,9061	B27A 036
6137	9061 WRITE(KOUT,9064) MAT1I,MAT1J	B27A 037
6138	DO 9063 I=1,MAT1I	B27A 038
6139	9063 WRITE(KOUT,9060) (BA1(I,J),J=1,MAT1J)	B27A 039
6140	9062 DO 107 LI=2,MAT1J	
6141	107 CALL MATS1(BA1(1,LI))	
6142	IF(KR(15)-1) 9069,9069,9066	B27A 055
6143	9066 DO 9067 I=1,MAT1I	B27A 056
6144	9067 WRITE(KOUT,9060) (BA1(I,J),J=1,MAT1J)	B27A 057
6145	WRITE(KOUT,9079) MAT2I,MAT2J	B27A 058
6146	DO 9068 I=1,MAT2I	B27A 059
6147	9068 WRITE(KOUT,9060) (BA2(I,J),J=1,MAT2J)	B27A 060
6148	9069 DO 110 LI=1,MAT2J	

6149	110 CALL MATS2(BA2(1,LI))	
6150	IF(KR(15)-1) 9072,9072,9071	B27A 063
6151	9071 DO 9073 I=1,MAT2I	B27A 064
6152	9073 WRITE(KOUT,9060) (BA2(I,J),J=1,MAT2J)	B27A 065
6153	9072 NLEQ=MAT1I+NSP*MAT2I	B27A J66
6154	NNLEQ=MAT1J+NSP*MAT2J	B27A 067
6155	NAM=NNLEQ-(NSPM1+2)	B27A 068
6156	NRNL=NSP+1	B27A 069
6157	LAR(NAM+1)=2	
6158	J=2+MAT1J	
6159	LL=NAM+2	
6160	DO 111 L=LL,NNLEQ	
6161	LAR(L)=J	
6162	111 J=J+MAT2J	
6163	L=NAM+1	
6164	J=0	
6165	DO 113 I=1,NAM	
6166	J=J+1	
6167	IF(LAR(L)-J) 113,112,113	
6168	112 L=L+1	
6169	J=J+1	
6170	113 LAR(I)=J	
6171	IF(KR(15)) 9901,9902,9901	B27A 085
6172	9901 CONTINUE	B27A 086
6173	9999 FORMAT(2X16HDEBUG LAR INDICE/(8X20I4))	B27A 087
6174	WRITE(KOUT,9999) LAR	B27A 088
6175	9902 CONTINUE	B27A 089
6176	RETURN	B27A 090
6177	END	B27A 091
6178	CB28A	
6179	SUBROUTINE KINET	KINE0010
6180	COMMON /HISCOM/ C1,C2,C3	
6181	COMMON /BUMCOM/ BUMP,CORMA,EASE	
6182	COMMON /INTCOM/ KKR(20),KIN,KCUT	
6183	DIMENSION ELKH(10),DELK(10)	B28A 004
6184	COMMON /EQPCOM/ RB(71,2),RC(71,2),RD(71,2),RE(71,2),RF(71,2),	B28A 5
6185	1 TU(71,2),FF(71),FFA,IFC(71),ATA(10),ATB(10),ATC(10),WAT(10);	B28A 6
6186	2 KAT(10),IR(10),IS,KR(10),LAMI(71),P,T,TK(10, 7),VN(71),	B28A 7
6187	3 VNU(71,10),ITFF,KR2,HCH,NCV,WM,WTN(71),Y(71),YH(71),GG(71)	B28A 8
6188	4 ,TQ(10, 7),EPOVRK,SIGMA,BASHOL	B28A 9
6189	COMMON /EOTCOM/ SIP,HIP,EL,ENL,FLIQ,CPF,IRE,IER,AA,ITS,IN,IL,IT,	B28A 10
6190	1 MODE,HMELT,SMELT,TMAX,TMIN,MELT,SUNN,SUML,WS,WSS,B1,ISP2,ISPQ,	B28A 11
6191	2 ISP,KKJ,SVA,SVB,SVC,SVD,SUNC,FFF,CNF,EP,RV,IFCJC,WTG,WTL,JC,HG,	B28A 12
6192	3 CPG,TTMIN,TTMAX,L2,L3,IB(11),EB(10),EBL(10),A(16,16),B(16),	B28A 13
6193	4 IP(71),ALP(10),FNU(10),GAMH(10),GAMF(10),SLAM(10),DY(71),RVS,	B28A 14
6194	5 CP(71),H(71),SB(71),TC(71),VLNK(71),E(71),PNUS(10),	B28A 15
6195	6 BC(10),BLNK(10),GY(10),IBC(10),BE(10),JJ(4)	B28A 16
6196	COMMON /KINCOM/ MT,FKF(10),EAK(10),EXK(10),PMU(10,10),RMU(10,10),	B28A 17
6197	1 DKPT(10),PKP(10),PKR(10),RAT(10),RSIG(10),PA(10),LL(10),PMR(10),	B28A 18
6198	2 PRMU(10,10),ESEE(10)	B28A 19
6199	5 FORMAT(13I3)	KINE0320
6200	10 RT = 1.9869 * T	KINE0330
6201	DO 40 M=1,MT	KINE0340
6202	SUMD = 0.	KINE0350
6203	SUMK = 0.	KINE0360
6204	SUMR = 0.	KINE0370
6205	SUMP = 0.	KINE0380
6206	DO 15 I=1,IS	KINE0390

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6207      PRMU(I,M) = PMU(I,M) - RMU(I,M)                                KINE0400
6208      SUMK = SUMK + PRMU(I,M) * VLNK(I)                                KINE0410
6209      SUMR = SUMR + RMU(I,M) * Y(I)                                    KINE0420
6210      SUMP = SUMP + PMU(I,M) * Y(I)                                    KINE0430
6211      15 SUMD = SUMD + PRMU(I,M) * H(I)                                KINE0440
6212      C      EQUILIBRIUM CONSTANTS FOR KINETIC REACTIONS IN TERMS OF BASE SPECI KINE0450
6213      C      LOG KP-S                                                    KINE0460
6214      C      DERIVATIVES OF LOGS OF ABOVE KP-S WITH RESPECT TO LOG T    KINE0480
6215      DKPT(M) = SUMD / RT                                              KINE0490
6216      C      RIGHT HAND SIDE (OR REVERSE PART) OF DRIVING POTENTIAL    KINE0500
6217      IF(ITS ) 19,14,16
6218      14 DELK(M)=0.
6219      16 IF(DELK(M)) 17,19,18
6220      17 SUMP=SUMP-DELK(M)
6221      GO TO 19
6222      18 SUMR=SUMR+DELK(M)
6223      19 ELKM(M)=SUMP-SUMK-SUMR
6224      PKP(M) = EXP(SUMP - SUMK)                                KINE0510
6225      C      LEFT HAND SIDE (OR FORWARD PART) OF DRIVING POTENTIAL    KINE0520
6226      PKR(M) = EXP(SUMR)                                KINE0530
6227      VK1 = PKR(M) - PKP(M)                                KINE0540
6228      IF (VK1) 25,20,25                                KINE0550
6229      20 VK1 = 1.E - 9 * PKR(M)                                KINE0560
6230      25 CONTINUE
6231      VK2 = A4 * FKF(M) * (ABS(VK1)) * * (EXK(M) - 1.) * EXP( - EAK(M) / KINE0580
6232      1 RT)*(-C3)
6233      VK3 = VK2                                KINE0600
6234      IF (EXK(M) - 1.) 35,30,30                                KINE0610
6235      30 VK3 = VK2 * EXK(M)                                KINE0620
6236      C      PM TIMES FORWARD RATE OF REACION I (PM=AA)                KINE0630
6237      35 PMR(M) = VK2 * VK1                                KINE0640
6238      PKP(M) = PKP(M) * VK3                                KINE0650
6239      PKR(M) = PKR(M) * VK3                                KINE0660
6240      RAT(M)=AMAX1(ABS(PKP(M)),ABS(PKR(M)))
6241      RSIG(M)=RAT(M)
6242      IF(KR(7)-1) 40,40,36
6243      36 IF(M-1) 37,37,39
6244      37 WRITE(KOUT,38)
6245      38 FORMAT(2X1HM7X3HLKP6X8HDLKP/DLT6X4HPMRR8X4HFMRP9X3HPMR9X3HRAT)
6246      39 WRITE(KOUT,41) M,SUMK,DKPT(M),PKR(M),PKP(M),PMR(M),RAT(M)
6247      1 ,ELKM(M),DELK(M)
6248      40 CONTINUE
6249      41 FORMAT(I3,2X8E12.5)
6250      45 FORMAT(1X26HA(I,J),B(I),I=1,8,J=1,8 IN)                                KINE0690
6251      50 FORMAT(1X12E10.3)                                KINE0700
6252      55 FORMAT(1X27HA(I,J),B(I),I=1,8,J=1,8 OUT)                                KINE0710
6253      IF (KR(7) - 1) 80,80,65                                KINE0730
6254      65 CONTINUE
6255      WRITE(KOUT,50)PRMU                                KINE0810
6256      WRITE(KOUT,215)                                KINE0820
6257      WRITE(KOUT,50) (EB(I),I=1,IS)                                KINE0830
6258      WRITE(KOUT,50) (E(I),I=1,IS)
6259      70 WRITE(KOUT,45)                                KINE0840
6260      DO 75 I=1,ISP2                                KINE0850
6261      75 WRITE(KOUT,50) (A(I,J),J=1,ISP0),B(I)
6262      80 CONTINUE                                KINE0870
6263      IF(ITS) 105,85,105
6264      C*****ORDER REACTIONS                                KINE0880

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6265	85 DO 86 M=1,MT	
6266	86 MA(M)=M	
6267	IF (MT-1) 105,105,90	KINE0900
6268	90 K = 0	KINE0910
6269	DO 100 M=2,MT	
6270	IF (RSIG(M)-RSIG(M-1)) 100,100,95	
6271	95 K = MA(M)	KINE0930
6272	MA(M) = MA(M - 1)	KINE0940
6273	MA(M - 1) = K	KINE0950
6274	DUM1=RSIG(M)	
6275	RSIG(M)=RSIG(M-1)	
6276	RSIG(M-1)=DUM1	
6277	100 CONTINUE	KINE0990
6278	IF (K) 105,105,85	KINE1000
6279	C*****START SECOND MAJOR LOOP ON REACTIONS	KINE1010
6280	105 DO 200 MM=1,MT	
6281	RSIG(MM)=0.	
6282	M = MA(MM)	KINE1030
6283	C*****IS IT A CONTROLLING REACTION	KINE1040
6284	IF (ITS) 106,106,106	
6285	106 L=LL(MM)	
6286	IF (L) 126,126,107	
6287	107 DUM=ABS(PRMU(L,M)*RAT(M))	
6288	GO TO 130	
6289	108 LL(MM)=0	
6290	DO 125 L=1,IS	KINE1060
6291	IF (PRMU(L,M)) 110,125,110	KINE1070
6292	110 DO 115 K=1,MM	KINE1080
6293	IF (L - LL(K)) 115,125,115	KINE1090
6294	115 CONTINUE	KINE1100
6295	DUM=ABS(PRMU(L,M)*RAT(M))	
6296	IF (ABS(PRMU(L,M))-0.001) 125,125,120	
6297	C* * YES, IT IS FOR MASS BALANCE L	KINE1120
6298	120 LL(MM) = L	KINE1130
6299	GOTO 130	KINE1140
6300	125 CONTINUE	KINE1150
6301	C* * NO, IT IS NOT, ADD INTO ALL MASS BALANCES	KINE1160
6302	126 I1=1	
6303	I2 = IS	KINE1180
6304	GOTO 170	KINE1190
6305	C*****REARRANGE ACCORDING TO CONTROLLING REACTION	KINE1200
6306	130 RSIG(MM)=DUM/EB(L)*0.1	
6307	DUM1=PRMU(L,M)	
6308	PRMU(L,M) = 0.	KINE1220
6309	DO 165 I=1,IS	KINE1230
6310	IF (PRMU(I,M)) 135,165,135	KINE1240
6311	135 DUM2 = PRMU(I,M) / DUM1	KINE1250
6312	IP(I)=1	
6313	MP = MM + 1	KINE1260
6314	IF (MT - MP) 155,140,140	KINE1270
6315	140 DO 150 K=MP,MT	KINE1280
6316	MI = MA(K)	KINE1290
6317	PRMU(I,MI) = PRMU(I,MI) - DUM2 * PRMU(L,MI)	KINE1300
6318	IF (ABS(PRMU(I,MI)) - .001) 145,150,150	KINE1310
6319	145 PRMU(I,MI) = 0.	KINE1320
6320	150 CONTINUE	KINE1330
6321	155 DO 160 K=1,ISPQ	KINE1340
6322	160 A(I + 2,K) = A(I + 2,K) - DUM2 * A(L + 2,K)	KINE1350

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6323      B(I + 2) = B(I + 2) - DUM2 * B(L + 2)      KINE1360
6324      E(I)=E(I)-DUM2*E(L)
6325      DUM2 = ABS(DUM2)      KINF1370
6326      EB(I) = AMAX1(EB(I) ,DUM2 * EB(L))      KINE1380
6327      165 CONTINUE      KINE1390
6328      PRMU(L,M) = DUM1      KINE1400
6329      C*****ADD CONTROLLING REACTION INTO ITS MASS BALANCE      KINE1410
6330      I1 = L      KINE1420
6331      I2 = L      KINE1430
6332      EOL=E(L)+PMR(M)*PRMU(L,M)
6333      IF(ITS) 170,230,170
6334      230 DELK(M)=(1.-EASE)*ELKM(M)*AMIN1(1.,ABS(EOL/EB(L)))
6335      ELKM(M)=ELKM(M)-DELK(M)
6336      IF(PKR(M)-PKP(M)) 240,170,235
6337      235 PKP(M)=PKP(M)*EXP(-DELK(M))
6338      GO TO 245
6339      240 PKR(M)=PKR(M)*EXP(DELK(M))
6340      245 PMR(M)=PKR(M)-PKP(M)
6341      170 DO 176 J=1,IS
6342      IF(IFG(J)) 171,171,176
6343      171 SUMD = RMU(J,M) * PKR(M) - FMU(J,M) * PKP(M)      KINE1450
6344      DO 175 I=I1,I2      KINE1460
6345      175 A(I + 2,J + 2) = A(I + 2,J + 2) - SUMD * PRMU(I,M)      KINE1470
6346      176 CONTINUE
6347      SUMD = - PKP(M) * DKPT(M) - EAK(M) / RT * PMR(M)      KINE1480
6348      DO 180 I=I1,I2      KINE1490
6349      DUM1 = PMR(M) * PRMU(I,M)      KINE1500
6350      A(I+2,2)=A(I+2,2)-DUM1
6351      A(I + 2,1) = A(I + 2,1) + SUMD * PRMU(I,M)      KINE1510
6352      E(I)=E(I)+DUM1
6353      B(I + 2) = B(I + 2) + DUM1      KINE1520
6354      180 EB(I) = AMAX1(EB(I) ,ABS(PRMU(I,M) * RAT(M)))
6355      EB(I) =AMAX1(EB(I),ABS(E(I)))
6356      IF (KR(7) - 1) 200,200,185
6357      185 WRITE(KOUT,215)      KINE1540
6358      WRITE(KOUT,50) (EB(I),I=1,IS)      KINE1550
6359      WRITE(KOUT,50) (E(I),I=1,IS)      KINE1560
6360      190 WRITE(KOUT,55)      KINE1570
6361      DO 195 I=1,ISP2      KINE1580
6362      WRITE(KOUT,50) (A(I,J),J=1,ISPQ),B(I)
6363      195 CONTINUE      KINE1600
6364      WRITE(KOUT,5)M,I1,I2,L,LL,MM,MA      KINE1610
6365      WRITE(KOUT,50)PRMU      KINE1620
6366      200 CONTINUE      KINE1630
6367      C*****MODIFY COEFFICIENTS TO ACHIEVE LINEARITY AS EQUIL IS APPROACHED
6368      DO 206 MM=1,MT
6369      L=LL(MM)
6370      IF (L) 201,206,201
6371      201 M=MA(MM)
6372      DUM2=RSIG(MM)
6373      IF(ITS) 250,248,250
6374      248 EESE(L)=E(L)*(1.-EASE)/(1.+DUM2)
6375      250 E(L)=E(L)-EESE(L)
6376      B(L+2)=B(L+2)-EESE(L)
6377      EB(L)=-EB(L)
6378      AR=1.
6379      EXEL=PKR(M)/PKP(M)
6380      IF(EXEL) 191,191,193

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6381      191 EXEL=1.E-35
6382      IF(PKP(M)-PKR(M)) 192,193,193
6383      192 EXEL=1.E+35
6384      193 CONTINUE
6385      EOL=E(L)*DUM2/(DUM2+1.)
6386      DUM1=(1.+DUM2)/(1.+RSIG(MM))
6387      EB(L)=EB(L)*ABS(DUM1)
6388      IF(ABS(EXEL-1.)-.1) 204,204,202
6389      202 DUM1=E(L)/(ELKM(M)*PRMU(L,M))
6390      AR=(DUM1+PKR(M))/PMR(M)
6391      AR=AMAX1(AR,0.)
6392      AR=AMIN1(1.,AR)
6393      204 DO 205 J=1,IS
6394      IF(IFC(J)) 203,203,205
6395      203 A(L+2,J+2)=A(L+2,J+2)+ EOL*(PMU(J,M)*(1.-AR)+AR*RMU(J,M))
6396      205 CONTINUE
6397      A(L+2,1)=A(L+2,1)-EOL*(DKPT(M)*(1.-AR)-L.K(M)/RT)
6398      A(L+2,2)=A(L+2,2)+EOL
6399      206 CONTINUE
6400      215 FORMAT(1X12HEB(I),I=1,IS)
6401      IF(KR(7)-1) 225,225,220
6402      220 WRITE(KOUT,55)
6403      DO 221 I=1,ISP2
6404      221 WRITE(KOUT,50) (A(I,J),J=1,ISPQ),B(I)
6405      WRITE(KOUT,50) (E(I),I=1,IS)
6406      225 RETURN
6407      END
6408      C829A
6409      SUBROUTINE FIRSTG
6410      COMMON/BLQCOM/ MOA( 71), MOB( 71),NSPEC,FR( 71,15),W(3),LEF(10)
6411      1,LEFS(10),PIEASE,LEFM(10)
6412      COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)
6413      1,LAR(153),BA1(43,18),BA2(30,15)
6414      COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB29A
6415      1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15)
6416      2,B(8), MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40)
6417      3,KAUXO,JTIME,JSPEC,MD(3)
6418      COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40)
6419      1,RNOSE,VKAP,NOISC,ID*SC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO,
6420      2CONE,RADFL( 50),RADR(40),RAD(40),IRAD
6421      COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH
6422      3 FORMAT(8E10.4)
6423      4 FORMAT (3E10.4,5X15,E10.4)
6424      5 FORMAT(40I2)
6425      NUL=0
6426      IF(1ABS(KR(2)-2)-1) 110,111,112
6427      110 DUM1=(GE(ITEM)-G(1,1))/G(1,NETA)-G(1,1))
6428      DO 113 I=1,NETA
6429      G(3,I)=G(3,I)*DUM1
6430      G(2,I)=G(2,I)*DUM1
6431      113 G(1,I)=G(1,1)+DUM1*(G(1,I)-G(1,1))
6432      GO TO 152
6433      111 READ(KIN,4) ALPH,F(1,1),F(3,1),IST,F(3,NETA)
6434      IF(KR(2).EQ.3) KR(2)=MIN0(-IST,-1)
6435      ALSO=ALPH*ALPH
6436      F(3,1)=F(3,1)*ALSO
6437      READ(KIN,3) (F(2,I),I=1,NETA)
6438      BA1(MAT1I,1) = F(3,NETA)*ALSO

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KINE1710
KINE1720
B29A 001
B29A 002
B29A 3
B29A 4
B29A 5
B29A 6
B29A 7
B29A 8
B29A 9
B29A 10
B29A 11
B29A 12
B29A 13
B29A 14
B29A 011
ENTR-MOD
B29A 013
B29A 014
B29A 015
B29A 016
B29A 017
B29A 018
ENTR-MOD
ENTR-MOD

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6439      CALL MATS1(BA1(1,1))
6440      DO 131 I=1,NETA
6441 131 F(2,I)=F(2,I)*ALPH
6442      LL=2
6443      L=1
6444      I=1
6445      DO 134 M=1,MAT1I
6446      I=I+1
6447      IF(I-NETA) 133,133,132
6448 132 I=LL
6449      L=L+LL
6450      LL=1
6451 133 F(L,I)=BA1(M,1)-BA1(M,2)*F(1,1)-BA1(M,3)*F(3,1)
6452      DO 134 J=4,MAT1J
6453 134 F(L,I)=F(L,I)-BA1(M,J)*F(2,J-3)
6454      DO 130 M=1,MAT1I
6455 130 BA1(M,1)=0
6456      BA1(1,1)=1.0
6457      CALL MATS2(BA1)
6458      DO 138 K=NUL,NSPM1
6459      READ(KIN,3) SP(2,1,K), (SP(1,I,K),I=1,NETA)
6460      SP(2,1,K)=SP(2,1,K)*ALPH
6461      L=2
6462      I=1
6463      DO 138 M=2,MAT2I
6464      I=I+1
6465      IF(I-NETA) 136,136,135
6466 135 I=1
6467      L=L+1
6468 136 SP(L,I,K)=BA1(M,1)*SP(1,NETA,K)-BA2(M,1)*SP(2,1,K)
6469      DO 138 J=2,MAT2J
6470 138 SP(L,I,K)=SP(L,I,K)-BA2(M,J)*SP(1,J-1,K)
6471      DO 140 M=1,MAT2I
6472 140 BA1(M,1)=0.
6473      IF(NSPM1.GT.0) READ(KIN,5) LEF
6474      GO TO 152
6475 112 READ (KIN,3) GW
6476 195 ALPH= 4./ETA(KAPPA)
6477      F(1,1)=0.
6478      F(2,1)=0.
6479      F(3,1)= ALPH/ETA(KAPPA)*(CBAR+CBAR+1.)
6480      DUM1=ALPH/ETA(KAPPA)*(CBAR-0.5)
6481      ETAT=ALPH/(F(3,1)-DUM1)
6482      DUM2=0.5/ETAT*ALPH/ETAT
6483      DUM3=ALPH/(ETA(KAPPA)-ETA(NETA))*2*(1.-CBAR)
6484      F(4,1)=-2.*DUM2
6485      DO 114 I=3,KAPPA
6486      IF(ETA(I-1)-ETAT) 108,109,109
6487 108 F(2,I-1)=(F(3,1)-DUM2*ETA(I-1))*ETA(I-1)
6488      F(3,I-1)=F(3,1)-2.*DUM2*ETA(I-1)
6489      F(4,I-1)=-2.*DUM2
6490      GO TO 114
6491 109 F(2,I-1)=ALPH/2.*DUM1*ETA(I-1)
6492      F(3,I-1)=DUM1
6493      F(4,I-1)=0.
6494 114 F(1,I-1)=F(1,I-2)+(F(2,I-2)+F(2,I-1))/2.*DETA(I-2)
6495      DO 107 I=KAPPA,NETA
6496      F(2,I)=ALPH-DUM3*(ETA(NETA)-ETA(I))*2

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ENTR-MOD

ENTR-MOD

ENTR-MOD

ENTR-MOD

ENTR-MOD

B29A 038

B29A 039

ENTR-MOD

ENTR-MOD

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6497      F(3,I)=2.*DUM3*(ETA(ETA)-ETA(I))
6498      F(4,I)=-2.*DUM3
6499      107 F(1,I)=F(1,I-1)+(F(2,I)+F(2,I-1))/2.*DETA(I-1)
6500      DUM=(GE(ITEM)-GW)/ALPH
6501      DO 115 I=1,NETA
6502      G(1,I)=F(2,I)*DUM+GW
6503      G(2,I)=F(3,I)*DUM
6504      115 G(3,I)=F(4,I)*DUM
6505      152 CONTINUE
6506      9901 FORMAT(1X1P12E10.3)
6507      9904 FORMAT(2X19HDEBUG FIRST GUESSES)
6508      IF(KR(15)) 9902,9903,9902
6509      9902 CONTINUE
6510      WRITE(KOUT,9904)
6511      DO 9906 I=1,4
6512      9906 WRITE(KOUT,9901) (F(I,J),J=1,NETA)
6513      DO 9905 K=NUL,NSPM1
6514      DO 9905 I=1,3
6515      9905 WRITE(KOUT,9901) (SP(I,J,K),J=1,NETA)
6516      9903 CONTINUE
6517      RETURN
6518      END
6519      FUNCTION ERP(X)
6520      TXS=2.*X*X
6521      IF(X-2.) 5,5,15
6522      5 R=0.8
6523      FN=31
6524      DO 10 I=1,15
6525      R=1.-R*TXS/FN
6526      10 FN=FN-2.
6527      ERP=R*X
6528      RETURN
6529      C SEMI CONVERGENT SERIES FOR LARGE X -- INCLUDE 0 TO RAT OF
6530      C SMALLEST TERM AND RAT TO 1. OF PRIOR TERM IF SMALLEST TERM IS
6531      C SEVENTH OR PRIOR TERM.
6532      15 IN=(TXS-1.)/2.
6533      RAT=0.68
6534      IF(IN-6) 20,20,25
6535      20 FN=IN+IN-1
6536      R= (TXS-FN-2.)/2.*RAT
6537      R=R/TXS*(FN+2.)+R/RAT-R*RAT
6538      GO TO 30
6539      25 IN=7
6540      R=1.0
6541      FN=13
6542      30 DO 35 I=1,IN
6543      R=1.+R*FN/TXS
6544      35 FN=FN-2.
6545      ERP=R/(2.*X)
6546      RETURN
6547      END
6548      C8308
6549      SUBROUTINE ETIME
6550      COMMON/START/TZ
6551      CALL SECOND(TZ)
6552      RETURN
6553      END
6554      SUBROUTINE ETIMEF(T)

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B29A 059

B29A 061

B29A 062

B29A 063

B29A 064

B29A 067

B29A 068

B29+ 0

6555	COMMON/START/TZ	
6556	CALL SECOND(T)	
6557	T=T-TZ	
6558	RETURN	
6559	END	
6560	C B30C	
6561	SUBROUTINE LIAD(L,I,J,C)	
6562	COMMON/ERRCON/FLE(43),GLE(30),SPLE(30, 8),ELA(313),FLEM,GLEM	B30C 3
6563	1,SPLEM(8),ELM(14),ELMM,IFLM,IGLM,ISPLM(8),NELM,ILMM,OFL(43)	B30C 4
6564	2,DGL(30),DSPLE(30, 8),FNLE(18),GNLE(15),SPNLE(15, 8),ENL(153)	B30C 5
6565	3,FNLEM,GNLEM,SPNLEM(8), ENLMM,IFNLF,IGNLM,ISPNLM(8)	B30C 6
6566	4,NENLM,INLMM,DFNL(18),DGNL(15),DSPNL(15, 8),DRNL(10)	B30C 7
6567	COMMON/ETACOM/ETA(15),DETA(15),DSQ(15),DOU(14),B1(14),B2(14)	B30C 8
6568	1,LAR(153),BA1(43,18),BA2(30,15)	B30C 9
6569	COMMON/NONCOM/AM(153,153),DVNL(153),TCN,	B30C 10
6570	1VLNKW,DLPH(9),DLPK(8, 9),DTHW,DTKW(8),FLUXJB(9)	B30C 11
6571	COMMON/INTCOM/KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA	
6572	IF(L) 1,3,3	
6573	1 ENL(I) = ENL(I) -C*FLE(J)	
6574	DO 2 K=1,MAT1J	ENTR-MOD
6575	2 AM(I,K)=AM(I,K)-C*BA1(J,K)	
6576	RETURN	
6577	3 ENL(I)=ENL(I)-C*SPLE(J,L)	
6578	KK=L*MAT2J+MAT1J	
6579	DO 4 K=1,MAT2J	
6580	KK=KK+1	
6581	4 AM(I,KK)=AM(I,KK)-C*BA2(J,K)	
6582	RETURN	
6583	END	B0545360
6584	CB30D	
6585	SUBROUTINE TLEFT(I)	
6586	I=100(000	
6587	RETURN	
6588	END	
6589	CB30E	
6590	SUBROUTINE DATE(I,J)	
6591	RETURN	
6592	END	
6593	CB30F	
6594	SUBROUTINE TOO(I,J)	
6595	RETURN	
6596	END	
6597	SUBROUTINE OGLEIN,XAM,PRM,OPDIM,NUMX,X,P,EM)	ENTR-MOD
6598	DIMENSION XAM(1),X(1),P(1),EM(1),PRM(1),OPDIM(1)	ENTR-MOD
6599	XOIF=X(NUMX)-X(1)	ENTR-MOD
6600	IS=1	ENTR-MOD
6601	2 DO 600 J=1,N	ENTR-MOD
6602	XA=XAM(J)	ENTR-MOD
6603	59 IO=1	ENTR-MOD
6604	IT=1	ENTR-MOD
6605	61 IF(XOIF) 72,60,71	ENTR-MOD
6606	71 IF(XA-X(IS)) 62,63,64	ENTR-MOD
6607	72 IF(X(IS)-XA) 62,63,64	ENTR-MOD
6608	62 IF(IS-1) 671,671,68	ENTR-MOD
6609	68 IS=IS-1	ENTR-MOD
6610	IT=2	ENTR-MOD
6611	GO TO (61,66),IO	ENTR-MOD
6612	672 IS=NUMX	ENTR-MOD

6613	671 I=IS	ENTR-MOD
6614	H=0.	ENTR-MOD
6615	OPDI=EM(I)	ENTR-MOD
6616	GO TO 67	ENTR-MOD
6617	63 PR=P(IS)	ENTR-MOD
6618	OPDI=EM(IS)	ENTR-MOD
6619	GO TO 601	ENTR-MOD
6620	64 IS=IS+1	ENTR-MOD
6621	IF (IS-NUXX) 69,69,672	ENTR-MOD
6622	69 IO=2	ENTR-MOD
6623	GO TO (61,65),IT	ENTR-MOD
6624	65 IS=IS-1	ENTR-MOD
6625	66 I=IS	ENTR-MOD
6626	DX=X(I+1)-X(I)	ENTR-MOD
6627	XD=X(A-X(I)	ENTR-MOD
6628	G=((P(I+1)-P(I))/DX)-EM(I)/DX	ENTR-MOD
6629	F=((EM(I+1)-EM(I))/DX)-2.*G)/DX	ENTR-MOD
6630	H=(F*(X(A-X(I+1))+G)*XD	ENTR-MOD
6631	OPDI=H+H+EM(I)+F*XD*XD	ENTR-MOD
6632	67 PR=(H+EM(I))*XD+P(I)	ENTR-MOD
6633	601 CONTINUE	ENTR-MOD
6634	PRH(J)=PR	ENTR-MOD
6635	600 OPDIM(J)=OPDI	ENTR-MOD
6636	67 CONTINUE	ENTR-MOD
6637	4 RETURN	ENTR-MOD
6638	END	ENTR-MOD
6639	CB31A	B31A 001
6640	SUBROUTINE CMA	B31A J02
6641	C TWO MOVING BOUNDARY INTERNAL CONDUCTION PACKAGE	B31A 003
6642	C AEROTHERM CORPORATION RM KENDALL C MOYER	B31A 004
6643	COMMON/CANCON/TLHC(20,10,2),TNG(20),TYS(20,10,2),TCHEM(20,10,2),	B31A 005
6644	1NLO(20),NHI(20),KHI(20),JCHA,IMG,INC,NMG,	B31A 006
6645	2TCH(2),TPR(2),TRAD(2),IAB	B31A 007
6646	3,TT2(20,2),THZ(20,2),TT1(30),TNG(30),DH12(2),TA(39),DELHG,I1,I2,CH	B31A 008
6647	4,CMD,BPRMG,KCM(10)	B31A 009
6648	EQUIVALENCE (NCLASS,JCHA)	B31A 010
6649	COMMON/LOOCON/KOUT,IEX,DEM,VR,IHI(23),ILO(23),IR(23)	B31A 011
6650	COMMON/CHACON/TEP(20,2),TCP(20,2),TKP(20,2)	B31A 012
6651	3,RHO(2),MATL(38),DEL(39),SO(20),H(38),RC(38),RA(38),RECORD(36),	B31A 013
6652	4AREA(38),EMA(38),RAV(38).	B31A 014
6653	5ROA(152),ROB(152),ROC(152),	B31A 015
6654	6 TPI(30),VFZ,CMH,NPR,	B31A 016
6655	7LCT,NPG,II,NBN,NUMN,NL, DELH,RFT,RHORA,RHORB,RHORC,TRA	B31A 017
6656	8CA,TRACB,TRACC,RHOOA,RHOOB,RHOOB,EA,EB,EC,BA,BB,BC,PSIA,PSIB,PSIC,	B31A 018
6657	9TRACH,PET,PETE,RSV,ETA,DTPR3,DTPR2,DTPRT,TPR3,TPR2,TH2RO,THFIN,WT	B31A 019
6658	COMMON/CHACON/EPST,TRES,	B31A 020
6659	1THWT,GAMA,ONG,NO,FJFH,FJFS,JF,JFHP,JFH,INPUT, DTHIN,BRP,MCONV,	B31A 021
6660	2INCH,DTMB,MN,NI,NOI,CHCRI,PYCRI,NCON, NH,TX(38),F1(38),F2(38)	B31A 022
6661	COMMON/SBCP/BF,CHMA,CHNI,DERR,DHIV,EMIV,ERFX,ERRC,ERM,ERRS,I3,I4,	B31A 023
6662	1VRH,VRP, IPR,IRA,IRB,IRC,IRO,ITL,PWI,QQ,TABC,TEMP,TSMA,TSMT,TSSQ	B31A 024
6663	COMMON/SBCP/ TMT, ONCP(3),CPE(3),TO(28),VITER(51),EITER(51)	B31A 025
6664	COMMON/SBCP/ Y2(16),O2(16),Y3(8),O3(8),Y1(2),O1(2)	B31A 026
6665	COMMON/SBCP/ CPC(50),CPV(50),CPE(50),MP (50),MCE(50),CNC(50),	B31A 027
6666	1KAT(50),ROT(50),ROI(50),XI(50),ROME(50),CHOC(50),RR (50),	B31A 028
6667	2CNC(50),A(50),B(50),C(50),D(50),EMO(50),CMO(50)	B31A 029
6668	COMMON/SBCP/BR, CHZ, CMOL, DEOT,DEOTT,DSOTB,CTH,CSMS,MW,	B31A 030
6669	1HE, ITS,PRES,QCHEM,QCHENT,QCOND,QCONDY,QCONV,QCONVT,QRA,QRP,	B31A 031
6670	2GRPT,RAD,RADY,RSU,SIG, YSAVE,VF,XP1,ASU	B31A 032

6729	9(10(2X,F10.4)))	831A 092
6730	553 FORMAT (//6X,11HOUTPUT DATA//)	831A 093
6731	554 FORMAT (10(2X,F10.4))	831A 094
6732	581 FORMAT(8F10.4/(10X7F10.4))	831A 095
6733	582 FORMAT(12E10.3)	831A 096
6734	C	831A 097
6735	C	831A 098
6736	7600 GO TO (7601,6061,761,761,761),JCNA	831A 099
6737	7601 CONTINUE	831A 100
6738	DNCP(3)=99999.	831A 101
6739	SIG=.481E-12	831A 102
6740	C CHAR AND PYROLYSIS ZONE CRITERIAL DENSITIES	831A 103
6741	DNCP(1)=RHO(2)+CMCRI*(RHO(1)-RHO(2))	831A 104
6742	DNCP(2)=RHO(2)+PYCRI*(RHO(1)-RHO(2))	831A 105
6743	C	831A 106
6744	C INITIAL VALUES FOR TIME LOOP	831A 107
6745	C	831A 108
6746	1390 ITER=-1	831A 109
6747	DTMC=DTMB	831A 110
6748	CMH=1.0	831A 111
6749	TMZRO=TPR(2)	831A 112
6750	INXT=TPR(2)	831A 113
6751	TPR2=TPR2+TMZRO	831A 114
6752	TPR3=TPR3+TMZRO	831A 115
6753	THFIN=TPR(1)	831A 116
6754	IAB=0	831A 117
6755	ITS=0	831A 118
6756	SA=0.0	831A 119
6757	GSMT=0.0	831A 120
6758	GSMS=0.	831A 121
6759	CMO=0.0	831A 122
6760	CMT=0.	831A 123
6761	OSUTR=0.0	831A 124
6762	OSDT=0.	831A 125
6763	DSI=0.	831A 126
6764	DIOT=0.	831A 127
6765	CPE(1)=0.	831A 128
6766	CPE(2)=0.	831A 129
6767	COLD=0.	831A 130
6768	POLD=0.	831A 131
6769	QCDT=0.	831A 132
6770	QDPT=0.	831A 133
6771	QCOMD=0.	831A 134
6772	QCONV=0.	831A 135
6773	QCHEM=0.	831A 136
6774	RAD=0.	831A 137
6775	QRP=0.	831A 138
6776	QCONVT=0.	831A 139
6777	QRPT=0.	831A 140
6778	RADT=0.	831A 141
6779	QCMEMT=0.	831A 142
6780	QCONVT=0.	831A 143
6781	PGPUT=0.	831A 144
6782	DECOMT=0.	831A 145
6783	DEDTT=0.	831A 146
6784	GLOSST=0.	831A 147
6785	TT=0.	831A 148
6786	TB=0.	831A 149

6787	SOEGR=0.	B31A 150
6788	GSEGR=0.	B31A 151
6789	PGPU=0.	B31A 152
6790	DECOM=0.	B31A 153
6791	EGO=0.	B31A 154
6792	HW=0.	B31A 155
6793	BR=0.	B31A 156
6794	KK=0	B31A 157
6795	TH=THZRO	B31A 158
6796	THDS=THZRO-DTHIN	B31A 159
6797	THPRT=TH	B31A 160
6798	REWIND 3	B31A 161
6799	CALL LCOUNT (-2,LCT,NPG,RECORD(35))	B31A 162
6800	WRITE (KOUT,542)	B31A 163
6801	IS=0	B31A 164
6802	DTH=DTHIN	B31A 165
6803	RSU=ABS(RSV)	B31A 166
6804	DELCR=AMIN1(DEL(1),DEL(2))/5.0	B31A 167
6805	TSAVE=TA(1)+1.0	B31A 168
6806	FA=(1.-PSIA)*BA*(RH00A**{1.-PSIA})	B31A 169
6807	FB=(1.-PSIB)*BB*(RH00B**{1.-PSIB})	B31A 170
6808	FC=(1.-PSIC)*BC*(RH00C**{1.-PSIC})	B31A 171
6809	C	B31A 172
6810	C BEGINNING OF TIME LOOP	B31A 173
6811	C	B31A 174
6812	410 ITER=ITER+1	B31A 175
6813	JCMA=1	B31A 176
6814	C	B31A 177
6815	C CALCULATION OF NODAL PROPERTIES	B31A 178
6816	C	B31A 179
6817	DO 108 N=2,NL	B31A 180
6818	108 RA(N-1)=RA(N-1)+DSI	B31A 181
6819	RA(NL)=RA(NL)+DSI/2.	B31A 182
6820	CALL OGLE(NL,RA,RR,NUMN,RAV,AREA,EMA)	B31A 183
6821	ASU=RR(1)	B31A 184
6822	J=1-JFH-JF	B31A 185
6823	100 DO 105 N=1,NL	B31A 186
6824	J=J+JF	B31A 187
6825	RR(N)=RR(N)/ASU	B31A 188
6826	CALL LOOK (3,TA(N),TT2,TCP,TKP,THZ,0,Y2,Y2(4),3)	B31A 189
6827	CN(N)=Y2(2)	B31A 190
6828	CPV(N)=Y2(1)	B31A 191
6829	HP(N)=Y2(3)+DH1	B31A 192
6830	CALL LOOK (4,TA(N),TT2(1,2),TCP(1,2),TKP(1,2),THZ(1,2),0,Y2,02,3)	B31A 193
6831	CNC(N)=Y2(2)	B31A 194
6832	CPC(N)=Y2(1)	B31A 195
6833	HC(N)=Y2(3)+DH2	B31A 196
6834	IF (HATL(N)-1) 103,101,102	B31A 197
6835	101 X(N)=1.	B31A 198
6836	CP(N)=CPV(N)	B31A 199
6837	H(N)=HP(N)	B31A 200
6838	RO(N)=RHO(1)	B31A 201
6839	ROT(N)=RHO(1)	B31A 202
6840	GO TO 105	B31A 203
6841	102 X(N)=0.	B31A 204
6842	CN(N)=Y2(2)	B31A 205
6843	H(N)=HC(N)	B31A 206
6844	CP(N)=CPC(N)	B31A 207

6845	RO(N)=RHO(2)	831A 208
6846	ROT(N)=RHO(2)	831A 209
6847	GO TO 105	831A 210
6848	103 X(N) = PETE-PET/RO(N)	831A 211
6849	H(N)=X(N)*HP(N)+(1.-X(N))*HC(N)	831A 212
6850	CP(N)=X(N)*CPV(N)+(1.-X(N))*CPC(N)	831A 213
6851	IF(N-1) 109,109,104	831A 214
6852	109 ROT(1)=GAMA*(ROA(1)+ROB(1))+OMG*ROC(1)	831A 215
6853	GO TO 105	831A 216
6854	104 ROT(N)=(ROA(J)+ROB(J))*GAMA+OMG*(ROC(J))	831A 217
6855	105 CONTINUE	831A 218
6856	IF (NUMN-NBM) 112,106,106	831A 219
6857	106 DO 107 N=NBM,NUMN	831A 220
6858	RR(N)=AREA(N)/ASU	831A 221
6859	KT=MATL(N)	831A 222
6860	CALL LOOK(KT+2,TA(N),TT2(1,KT),TCP(1,KT),TKP(1,KT),0,0,Y2,D2,2)	831A 223
6861	CP(N)=Y2(1)	831A 224
6862	CN(N)=Y2(2)	831A 225
6863	RAT(N)=DEL(N)/(CN(N)*RR(N))	831A 226
6864	107 RO(N)=RHO(KT)	831A 227
6865	112 HRES=SIG*EPSW*(TA(NUMN)+TRES)*(TA(NUMN)**2+TRES**2)+HCONV+1.E-30	
6866	RAT(NUMN+1)=1./(HRES*RR(NUMN)+.00000001)	831A 229
6867	QLOSS=(TA(NL)-TA(NBM))/(0.5*(RAT(NL)+RAT(NBM))+RC(NL)/RR(NL))	831A 230
6868	QLOSST=QLOSST+QLOSS*OTH/AREA(1)*ASU	831A 231
6869	CMT=CMT+RHO(2)*DSDT*ASU/AREA(1)*OTH	831A 232
6870	DEL(NUMN+1)=CN(NUMN)/HRES	831A 233
6871	RR(NUMN+1)=RR(NUMN)	831A 234
6872	DTHS=DTH	831A 235
6873	DTS=TSAVE-TA(1)	831A 236
6874	IF(ITER) 151,113,151	831A 237
6875	113 OEDT=0.	831A 238
6876	ITER=1	831A 239
6877	CH=TCH(2)	831A 240
6878	JCMA=2	831A 241
6879	GO TO 3000	831A 242
6880	C	831A 243
6881	C	831A 244
6882	C	831A 245
6883	151 JCMA=2	831A 246
6884	IF (TH-TNXT+.00001) 700,3000,3000	831A 247
6885	700 JCMA=1	831A 248
6886	IF (TH-TMPRT+.00001) 3410,3000,3000	831A 249
6887	3410 IDUMP=1	831A 250
6888	IF (KCM(4)) 4410,4410,3411	831A 251
6889	3000 IDUMP=0	831A 252
6890	3411 DIOT=12.*DSDTB	831A 253
6891	NDR=NBM-NL-1	831A 254
6892	NLI=(NUMN-NDR+1)/2	831A 255
6893	CALL LCOUNT(33+NLI,LCT,NPG,RECORD(35))	831A 256
6894	322 WRITE (KOUT,543)TH	831A 257
6895	WRITE (KOUT,544)	831A 258
6896	WRITE (KOUT,545) ITER,ITS,IY ,RSU,HW,HE,CH,BR	831A 259
6897	WRITE (KOUT,546)	831A 260
6898	WRITE (KOUT,547)	831A 261
6899	BPRM=(GSMS+CMD)/CH	831A 262
6900	BPRMG=GSMS/CH	831A 263
6901	WRITE (KOUT,548) BPRM,BPRMG,CMD,GSMS,CMT,GSMT	831A 264
6902	WRITE (KOUT,5480) CHCRI,PYCRI	831A 265

6903	WRITE (KOUT,5481) SA,DIOT,CPE(1),DCDT,CPE(2),DPOT	B31A 266
6904	WRITE (KOUT,5482)	B31A 267
6905	3224 WRITE (KOUT,5483) QCONV,QRP,RAD,QCHEM,QCOND,QCONVT,QRPT,RAOT,QCHEM	B31A 268
6906	1T,QCONDT	B31A 269
6907	WRITE (KOUT,5484)	B31A 270
6908	WRITE (KOUT,5485)PGPU,UECOM, TB,DEDT,QLOSS,PGPUT,DECOMT, TT,DEDTT,	B31A 271
6909	1QLOSS	B31A 272
6910	IF (NCON) 3020,3020,3021	B31A 273
6911	3021 WRITE(KOUT,5490)	B31A 274
6912	GO TO 3022	B31A 275
6913	3020 WRITE(KOUT,549)	B31A 276
6914	3022 CONTINUE	B31A 277
6915	IF(IDLMP) 3023,3023,190	B31A 278
6916	3023 IF(NOI) 190,190,183	B31A 279
6917	183 CALL SLOPQ (NL,RA(1),TA(1),EMO(1),EMO(1))	B31A 280
6918	IF(NO) 182,182,184	B31A 281
6919	184 CALL OGLE (NO,SO,TO(1),NL,RA(1),TA(1),EMO(1))	B31A 282
6920	182 IF (NI) 189,189,185	B31A 283
6921	185 DO 186 I=1,NL	B31A 284
6922	186 EMO(I)=1./EMO(I)	B31A 285
6923	CALL OGLE (NI,SO(NI+1),TO(NI+1),NL,TA,RA,EMO)	B31A 286
6924	189 IF (NN) 188,188,187	B31A 287
6925	187 WRITE (7,581) TH,TS,(TO(I), I=1,NOI)	B31A 288
6926	188 WRITE (3) TH,TS, (TO(I), I=1,NOI)	B31A 289
6927	KK=KK+1	B31A 290
6928	190 CONTINUE	B31A 291
6929	IF (NCON) 3012,3012,3006	B31A 292
6930	3006 DO 3009 I=1,NL	B31A 293
6931	IF (WT) 3007,3007,3008	B31A 294
6932	3008 CALL LOOK(11,X(I),TX,F1,F2,C,O,Y1,D1,2)	B31A 295
6933	CNO(I)=Y1(1)*CN(I)+Y1(2)*CNC(I)	B31A 296
6934	GO TO 3009	B31A 297
6935	3007 CNO(I)=X(I)*CN(I)+(1.0-X(I))*CNC(I)	B31A 298
6936	3009 CONTINUE	B31A 299
6937	3012 CONTINUE	B31A 300
6938	D 3011 J=1,NLI	B31A 301
6939	K=NLI	B31A 302
6940	L=J	B31A 303
6941	IF (L-NL) 3002,3002,3001	B31A 304
6942	3001 L=L+NDR	B31A 305
6943	GO TO 3003	B31A 306
6944	3002 IF (L+NLI-NL) 3003,3003,3005	B31A 307
6945	3005 K=NLI+NDR	B31A 308
6946	3003 N=MIN0(NUMN,K+L)	B31A 309
6947	IF (NCON) 3004,3004,3010	B31A 310
6948	3004 WRITE (KOUT,550) (I,MATL(I),TA(I),RO(I),H(I), I=L,N,K)	B31A 311
6949	GO TO 3011	B31A 312
6950	3010 WRITE(KOUT,5500) (I,MATL(I),TA(I),RO(I),CNO(I),I=L,N,K)	B31A 313
6951	3011 CONTINUE	B31A 314
6952	IF(IDLMP) 3225,3225,4410	B31A 315
6953	3225 IF (TH-THFIN+0.00001) 1151,2 ,2	B31A 316
6954	2 JCMA=JCMA-1	B31A 317
6955	IF (NOI) 1,1,3	B31A 318
6956	3 REWIND 3	B31A 319
6957	CALL LCOUNT (-1,LCT,NPG,RECORD(35))	B31A 320
6958	WRITE (KOUT,552) NO,NI,TH,TS,(SO(I), I=1,NOI)	B31A 321
6959	WRITE (KOUT,553)	B31A 322
6960	DO 4 K=1,KK	B31A 323

6961	READ (3) TH,TS, (TO(I), I=1,NOI)	B31A 324
6962	4 WRITE (KOUT,554) TH,TS, (TO(I), I=1,NOI)	B31A 325
6963	GO TO 1	B31A 326
6964	1151 IF (JCMA-2) 606,799,606	B31A 327
6965	6061 TNXT=AMAX1(TPR(1),TPR(2))	B31A 328
6966	606 IF (TH-TPR2+0.00001) 154,158,158	B31A 329
6967	158 DTPRT=DTFR2	B31A 330
6968	DTFR2=DTFR3	B31A 331
6969	TPR2=TPR3	B31A 332
6970	TPR3=THFIN	B31A 333
6971	154 THPRT=AMIN1(THPRT+DTPRT,TPR2,TNXT)	B31A 334
6972	4410 DTH=AMIN1(DTH8,DELCR/(DSDTB+.0000001),TH-THDS, 50.0/(ABS(TSAVE-TA(	B31A 335
6973	11))+.1)*DTH)	B31A 335
6974	TSAVE=TA(1)	B31A 337
6975	DTH=(THPRT-TH)/(AINT((THPRT-TH)/DTH+1.0))	B31A 338
6976	144 TH=TH+DTH	B31A 339
6977	610 IF (DTH-.000001) 162,162,608	B31A 340
6978	162 WRITE (KOUT,582) TH,DTH,DTHS,DTH8,THDS,DTS,DELCR,DSDTB	B31A 341
6979	TH=THFIN	B31A 342
6980	JCMA=0	B31A 343
6981	GO TO 3800	B31A 344
6982	C	B31A 345
6983	C INTERNAL DECOMPOSITION -- DENSITY CALCULATION	B31A 346
6984	608 N=-JFH	B31A 347
6985	C	B31A 348
6986	C SPECIFY SURFACE CHANGES DURING THIS TIME INTERVAL	B31A 349
6987	DSDT=DSDTB	B31A 350
6988	DS=DSDT*DTH	B31A 351
6989	DSI=12.0*DS	B31A 352
6990	SA=SA+DSI	B31A 353
6991	RSU=ABS(RSV+SA)	B31A 354
6992	DTH8=DTHC	B31A 355
6993	DEL(NL)=DEL(NL)-DS	B31A 356
6994	FK=0.0	B31A 357
6995	FJF=FJFH	B31A 358
6996	J1=JFHP	B31A 359
6997	DENOLD=RHO(2)	B31A 360
6998	COLD=CPE(1)	B31A 361
6999	POLD=CPE(2)	B31A 362
7000	CPE(1)=SA	B31A 363
7001	CPE(2)=SA	B31A 364
7002	IE=1	B31A 365
7003	ROOZ=0.0	B31A 366
7004	DTA=0.	
7005	TA(NL+1)=TA(NBM)	B31A 369
7006	DEL(NL+1)=DEL(NBM)	B31A 370
7007	RR(NL+1)=RR(NBM)	B31A 371
7008	DO 252 I=1,NL	B31A 372
7009	ISV=MIN0(NL,I+1)	
7010	OMDG(I)=0.0	B31A 373
7011	RON(I)=ROOZ	B31A 374
7012	OSS=FJF/DEL(I)*DSDT	B31A 375
7013	J2=J1	B31A 376
7014	DO 255 J=J2,JF	B31A 377
7015	N=N+J1-1	B31A 378
7016	IF (J-JFHP) 253,259,253	B31A 379
7017	259 IF (MATL(I)+MATL(ISV)-4) 263,260,263	
7018	263 IF (AMAX1(TA(I),TA(I+1))-TRACH) 261,261,262	B31A 381

7019	261	IF (MATL(I)+MATL(I)+MATL(ISO)-3) 262,260,262	
7020	260	J1=JFH?	B31A 383
7021		ROOZ=FJFH*RQ(I+1)	B31A 384
7022		RON(I)=RON(I)+FJFH*RO(I)	B31A 385
7023		N=N+JFH	B31A 386
7024		GO TO 264	B31A 387
7025	262	ROOZ=0.0	B31A 388
7026		J1=1	B31A 389
7027		DTA=(TA(I+1)-TA(I))/(FJFS+FJF/DEL(I)*DEL(I+1)/RR(I)*RR(I+1))	B31A 390
7028		TAS=TA(I)	B31A 391
7029	253	N=N+1	B31A 392
7030		IF (ABS(DSS)-.000001) 1016,1016,1017	B31A 393
7031	1016	DROAC=0.	B31A 394
7032		DROBC=0.	B31A 395
7033		DROCC=0.	B31A 396
7034		GO TO 1021	B31A 397
7035	1017	IF (I-NL) 1015,1018,1015	B31A 398
7036	1018	FK=FK-1.0	B31A 399
7037		IF (FK) 1019,1016,1020	B31A 400
7038	1019	FK=FJF-1.0	B31A 401
7039	1020	DSS=DSOT/DEL(I)*FK	B31A 402
7040	1015	IF (N-1) 1115,1215,1115	B31A 403
7041	1115	DROAC=(ROA(N+1)-ROA(N))*DSS	B31A 404
7042		DROBC=(ROB(N+1)-ROB(N))*DSS	B31A 405
7043		DROCC=(ROC(N+1)-ROC(N))*DSS	B31A 406
7044		GO TO 1021	B31A 407
7045	1215	CONTINUE	B31A 408
7046	1315	DROAC=(ROA(N+1)-RHORA)*DSS	B31A 409
7047		DROBC=(ROB(N+1)-RHORB)*DSS	B31A 410
7048		DROCC=(ROC(N+1)-RHORC)*DSS	B31A 411
7049		ROT(1)=RHO(2)	B31A 412
7050	1021	TAS=TAS+DTA	B31A 413
7051		IF (TAS-TRACH) 227,227,229	B31A 414
7052	229	IF (TAS -TRACA) 201,201,202	B31A 415
7053	201	DROAT=0.0	B31A 416
7054		GO TO 2113	B31A 417
7055	202	IF (RHORA-ROA(N)) 211,201,201	B31A 418
7056	211	RD=ROA(N)-RHORA	B31A 419
7057		POW=1.-PSIA	B31A 420
7058		IF (POW) 2111,2112,2111	B31A 421
7059	2111	DROAT=(-RD+((RD**POW)-FA*EXP(-EA/TAS)*DTH)**	B31A 422
7060		1(1./POW))/DTH	B31A 423
7061		GO TO 2113	B31A 424
7062	2112	DROAT=RD*(EXP(-EA*DTH*EXP(-EA/TAS))-1.)/DTH	B31A 425
7063	2113	ROA(N)=ROA(N)+(DROAT+DROAC)*DTH	B31A 426
7064	221	IF (TAS -TRACB) 203,203,204	B31A 427
7065	203	DROBT=0.0	B31A 428
7066		GO TO 2133	B31A 429
7067	204	IF (RHORB-ROB(N)) 213,203,203	B31A 430
7068	213	RD=ROB(N)-RHORB	B31A 431
7069		POW=1.-PSIB	B31A 432
7070		IF (POW) 2131,2132,2131	B31A 433
7071	2131	DROBT=(-RD+((RD**POW)-FB*EXP(-EB/TAS)*DTH)**	B31A 434
7072		1(1./POW))/DTH	B31A 435
7073		GO TO 2133	B31A 436
7074	2132	DROBT=RD*(EXP(-EB*DTH*EXP(-EB/TAS))-1.)/DTH	B31A 437
7075	2133	ROB(N)=ROB(N)+(DROBT+DROBC)*DTH	B31A 438
7076	223	IF (TAS -TRACC) 205,205,206	B31A 439

7077	205 DROCT=0.0	831A 440
7078	GO TO 2153	831A 441
7079	206 IF (RHORC-ROC(N)) 215,205,205	831A 442
7080	215 RD=ROC(N)-RHORC	831A 443
7081	POW=1.-PSIC	831A 444
7082	IF (POW) 2151,2152,2151	831A 445
7083	2151 DROCT=(-RD+((RD*POW)-	831A 446
7084	1((1./POW))/DTH	831A 447
7085	GO TO 2153	831A 448
7086	2152 DROCT=RD*(EXP(-BC*DTH*EXP(-EC/TAS))-1.)/DTH	831A 449
7087	2153 ROC(N)=ROC(N)+((DROCT+DROCC)*DTH	831A 450
7088	225 DMDC(I)=DMDC(I)-DEL(I)*((DROAT+DROBT)*GAMA+CMG*DROCT)	831A 451
7089	227 DNS=(ROA(N)+ROB(N))*GAMA+OMG*ROC(N)	831A 452
7090	RON(I)=RON(I)+DNS	831A 453
7091	IF (N-1) 2251,2253,2251	831A 454
7092	2251 IF (DNS-DNCP(IE)) 2253,2252,2252	831A 455
7093	2252 CPE(IE)=DEL(I)*((FLOAT(N)-0.5)/FJF+1.-FLOAT(I))*12.+RA(I)	831A 456
7094	CPE(IE)=CPE(IE)-DEL(I)/(DNS-DENOLD+1.E-36)*(DNS-DNCP(IE))/FJF*12.	
7095	CPE(IE)=AMAX1(CPE(IE),SA)	831A 458
7096	IE=IE+1	831A 459
7097	2253 DENOLD=DNS	831A 460
7098	255 TAS=TAS+DTA	831A 461
7099	264 DMDC(I)=DMDC(I)/FJF*RR(I)	831A 462
7100	RON(I)=RON(I)/FJF	831A 463
7101	IF (I-1) 257,257,254	831A 464
7102	257 FJF=FJFS	831A 465
7103	DTA=DTA/DEL(1)*DEL(2)/2.*RR(2)	831A 466
7104	GO TO 252	831A 467
7105	254 DTA=DTA/DEL(I)*DEL(I+1)/RR(I)*RR(I+1)	831A 468
7106	252 CONTINUE	831A 469
7107	C NOW SPECIFY NECESSARY NEW POST-DECOMPOSITION PROPERTIES	831A 470
7108	J=JFHP	831A 471
7109	DO 85 I=1,NL	831A 472
7110	IF (ABS(ROA(I)-RHO(1))-.01) 81,81,82	831A 473
7111	81 MATL(I)=1	831A 474
7112	X(I)=1.0	831A 475
7113	GO TO 85	831A 476
7114	82 IF (ABS(ROA(I)-RHO(2))-.01) 83,83,84	831A 477
7115	83 MATL(I)=2	831A 478
7116	X(I)=0.	831A 479
7117	CN(I)=CNC(I)	831A 480
7118	GO TO 85	831A 481
7119	84 MATL(I)=0	831A 482
7120	X(I)=PETE-PET/RON(I)	831A 483
7121	IF (WT) 8500,8500,8501	831A 484
7122	8501 CALL LOOK(11,X(I),TX,F1,F2,0,0,Y1,D1,2)	831A 485
7123	CN(I)=Y1(1)*CN(I)+Y1(2)*CNC(I)	831A 486
7124	GO TO 85	831A 487
7125	8500 CN(I)=X(I)*CN(I)+(1.0-X(I))*CNC(I)	831A 488
7126	85 RAT(I)=DEL(I)/(CN(I)*RR(I))	831A 489
7127	GSM=0.0	831A 491
7128	DO 122 I=1,NL	831A 492
7129	122 GSM=GSM+DMDC(I)	831A 493
7130	GSMS=GSM	831A 494
7131	GSMT=GSMT+GSMS*ASU/AREA(1)*DTH	831A 495
7132	DCDT=(CPE(1)-COLD)/DTH	831A 496
7133	DPDT=(CPE(2)-POLO)/DTH	831A 497
7134	C	831A 498

7135	C	CALCULATION OF IMPLICIT TEMPERATURE COEFFICIENTS	831A 499
7136	C	AND INTERNAL ENERGY RATE TERMS	831A 500
7137	C	MAIN BLOCK	831A 501
7138		DVB=0.	831A 502
7139		SOEGR=0.	831A 503
7140		GSEGR=0.	831A 504
7141		YB=0.	831A 505
7142		RAT(1)=2.*RAT(1)	831A 506
7143		CPNL=CP(NL)	831A 507
7144		NLM=NL-1	831A 508
7145		IMIN=0	831A 509
7146		DO 30 I=IMIN,NLM	831A 510
7147		IF (I) 15,15,14	831A 511
7148	14	GSM=GSM-DMDG(I)	831A 512
7149		DRODID=-DMDG(I)/(RR(I)*DEL(I))	831A 513
7150		FACT1=DTH/(DEL(I)*RR(I))	831A 514
7151		FACT2=GSM/(DEL(I)*KR(I))	831A 515
7152		A(I)=-FACT1*DVB	831A 516
7153		DVB=1.0/(0.5*(RAT(I)+RAT(I+1))+RC(I)/RR(I))	831A 517
7154		TERM2=RON(I)*CP(I)-DTH*(CPGAS*(DRODID-FACT2)	831A 518
7155	1	-DSOT*R01*CP1/DEL(I))	831A 519
7156		TERM1=FACT1*DVB	831A 520
7157		B(I)=TERM2-A(I)+TERM1	831A 521
7158		C(I)=-TERM1	831A 522
7159		D(I)=TA(I)*TERM2+(HGAS*DRODID-HBAR*(RON(I)	831A 523
7160	1	-RO(I))/DTH-FACT2*HGAS-DSOT*R01*H1/DEL(I))*DTH	831A 524
7161	15	R01=ROT(I+1)	831A 525
7162		X1=PETE-PET/R01	831A 526
7163		CP1=CPV(I+1)*X1+CPC(I+1)*(1.0-X1)	831A 527
7164		H1=HP(I+1)*X1+HC(I+1)*(1.0-X1)	831A 528
7165		CP(I+1)=CPV(I+1)*X(I+1)+CPC(I+1)*(1.0-X(I+1))	831A 529
7166		TN=-R01*HBAR+R01*H1+T	831A 530
7167		HBAR=PETE*HP(I+1)-PET/RHO(1)*HC(I+1)	831A 531
7168		T=-R01*H1+R01*HBAR	831A 532
7169	20	CALL LOOK (2,TA(I+1),TT1,THG,0,0,0,HGAS,CPGAS,1)	831A 533
7170		HGAS=HGAS+DELHG	831A 534
7171		GSEGR=GSEGR+HGAS*DMDG(I+1)	831A 535
7172		SOEGR=SOEGR+HBAR*DMDG(I+1)	831A 536
7173		IF (I) 24,24,25	831A 537
7174	24	EGO=GSMS*HGAS	831A 538
7175		HW=HGAS	831A 539
7176		GO TO 30	831A 540
7177	25	TERM3=(-FACT2*CPGAS-DSOT*R01*CP1/DEL(I))*DTH	831A 541
7178		C(I)=C(I)+TERM3	831A 542
7179		D(I)=D(I)+TA(I+1)*TERM3+(FACT2*HGAS+DSOT*R01*H1/DEL(I))*DTH	831A 543
7180		TB=TB-TN*DSOT*RR(I)	831A 544
7181	30	CONTINUE	831A 545
7182		A(1)=DTH/DEL(1)	831A 546
7183		TT=TT+TB*DTH/AREA(1)*ASU	831A 547
7184	C	NOW THE LAST ABLATING NODE REQUIRES DIFFERENT TREATMENT	831A 548
7185		DRODID=-DMDG(NL)/(RR(NL)*DEL(NL))	831A 549
7186		FACT1=DTH/(DEL(NL)*RR(NL))	831A 550
7187		A(NL)=-FACT1*DVB	831A 551
7188		DVB=1.0/(0.5*(RAT(NL)+RAT(NEM))+RC(NL)/RR(NL))	831A 552
7189		C(NL)=-FACT1*DVB	831A 553
7190		TERM2=RON(NL)*CP(NL)-(CPGAS*DRODID+(DSOT/DEL(NL))*	831A 554
7191	1	(RO(NL)*CPNL -R01*CP1))*DTH	831A 555
7192		B(NL)=TERM2-C(NL)-A(NL)	831A 556

7193		D(NL)=TA(NL)*TERM2+DTH*(H*AS*DROOTO-HBAR*(RCN(NL)-	831A 557
7194	1	RO(NL))/DTH+OSDT*(RU(NL)*H(NL)-RO1*M1)/DEL(NL))	831A 558
7195	C	NOW FOR BACK UPS IF ANY	831A 559
7196		K = NL	831A 560
7197		IF (NUMN-NBM) 60,40,40	831A 561
7198	40	DO 50 I=NBM,NUMN	831A 562
7199		K=K+1	831A 563
7200		FACT1=DTH/(DEL(I)*RR(I))	831A 564
7201		A(K) = -FACT1*DVB	831A 565
7202		DVB=1.0/(0.5*(RAT(I)+RAT(I+1))+RC(I)/RR(I))	831A 566
7203		C(K)=-FACT1*DVB	831A 567
7204		B(K)=RO(I)*CP(I)-C(K)-A(K)	831A 568
7205	50	D(K)=TA(I)*RO(I)*CP(I)	831A 569
7206	C	NOW IF THE LAST NODE WAS INSULATED WE MUST REPAIR LAST L AND C	831A 570
7207	60	IF (HRES) 80,70,80	831A 571
7208	70	B(K)=B(K)+C(K)	831A 572
7209		C(K)=0.	831A 573
7210	C	NOW BEFORE GAUSS REDUCTION REWRITE LAST LINE OF MATRIX	831A 574
7211	80	D(K)=D(K)-C(K)*TRES	831A 575
7212		L=K	831A 576
7213		DO 90 I=2,K	831A 577
7214		L=L-1	831A 578
7215		D(L)=D(L)-C(L)/B(L+1)*D(L+1)	831A 579
7216	90	B(L)=B(L)-C(L)/B(L+1)*A(L+1)	831A 580
7217		B(1)=B(1)/A(1)	831A 581
7218		D(1)=D(1)/A(1)	831A 582
7219		PGPU=EGO-GSEGR	831A 583
7220		PGPUT=PGPUT+PGPU*DTH/AREA(1)*ASU	831A 584
7221		DECOM=GSEGR-SOEGR	831A 585
7222		DECOMT=DECOMT+DECOM*DTH/AREA(1)*ASU	831A 586
7223	C		831A 587
7224	C	SURFACE BOUNDARY CONDITION PACKAGE	831A 588
7225	761	CALL SBOPKG	831A 589
7226	C		831A 590
7227		IF (JCHA-2) 780,780,799	831A 591
7228	780	IF (JCHA) 148,3000,148	831A 592
7229	148	CONTINUE	831A 593
7230	C		831A 594
7231	C	SHRINK (AND DROP) OF LAST ABLATING NODE	831A 595
7232	C		831A 596
7233	C	DEL(NL)=DEL(NL)-OS (SEE INT DECOMP)	831A 597
7234		IF (DEL(NL)-DELM) 149,149,150	831A 598
7235	149	ORLP=DEL(NL)*RO(NL)*RR(NL)	831A 599
7236		ORLCP=ORLP*CP(NL)	831A 600
7237		NL=NL-1	831A 601
7238		RC(NL)=RC(NL+1)	831A 602
7239		ORL=DEL(NL)*RO(NL)*RR(NL)	831A 603
7240		ORLC=ORL*CP(NL)	831A 604
7241		KAPMB=ORL*H(NL)+ORLP*H(NL+1)	831A 605
7242		TOP1=ORL+ORLP	831A 606
7243		TOP2=ORLC+ORLCP	831A 607
7244		TOP3=ORLC*TA(NL)+ORLCP*TA(NL+1)	831A 608
7245		VOL=DEL(NL)*HR(NL)+DEL(NL+1)*RR(NL+1)	831A 609
7246		DEL(NL)=DEL(NL)+DEL(NL+1)	831A 610
7247		RO(NL)=TOP1/VOL	831A 611
7248		CP(NL)=TOP2/TOP1	831A 612
7249		TA(NL)=TOP3/TOP2	831A 613
7250		H(NL)=KAPMB/TOP1	831A 614

7251	DEL R=DEL(NL+1)*RR(NL+1)/VOL	831A 615
7252	CZ=1.0-DEL R	831A 616
7253	DZ=C.0	831A 617
7254	GZ=CZ	831A 618
7255	NZ=JF*NL-JFH	831A 619
7256	N=NZ-JF+1	831A 620
7257	K=N	831A 621
7258	FZ=DEL R	831A 622
7259	EZ=GZ	831A 623
7260	GO TO 179	831A 624
7261	172 GZ=DZ+1.0	831A 625
7262	173 FZ=DZ-CZ	831A 626
7263	IF(K-NZ) 175,174,175	831A 627
7264	174 GZ=DEL R	831A 628
7265	175 K=K+1	831A 629
7266	CZ=CZ+GZ	831A 630
7267	176 EZ=CZ-DZ	831A 631
7268	IF(EZ) 176,177,177	831A 632
7269	177 ROA(N)=ROA(N)+FZ*ROA(K)	831A 633
7270	ROB(N)=ROB(N)+FZ*ROB(K)	831A 634
7271	ROC(N)=ROC(N)+FZ*ROC(K)	831A 635
7272	IF(N-NZ) 171,150,171	831A 636
7273	171 N=N+1	831A 637
7274	179 ROA(N)=ROA(K)*EZ	831A 638
7275	ROB(N)=ROB(K)*EZ	831A 639
7276	ROC(N)=ROC(K)*EZ	831A 640
7277	GO TO 172	831A 641
7278	178 ROA(N)=ROA(N)+ROA(K)*GZ	831A 642
7279	ROB(N)=ROB(N)+ROB(K)*GZ	831A 643
7280	ROC(N)=ROC(N)+ROC(K)*GZ	831A 644
7281	GO TO 173	831A 645
7282	C	831A 646
7283	150 GO TO 410	831A 647
7284	1 RETURN	831A 648
7285	799 CONTINUE	831A 649
7286	RETURN	831A 650
7287	END	831A 651
7288	C832A	832A 001
7289	SUBROUTINE INPUT	832A 002
7290	COMMON/CANCOM/TLHC(20,10,2),TNG(20),TTS(20,10,2),TCHEM(20,10,2),	832A 003
7291	1NLG(20),NHI(20),KHI(20),JCHA,IMG,IMC,MNG,	832A 004
7292	2TCH(2),TPR(2),TRAD(2),IAB	832A 005
7293	3,TT2(20,2),THZ(20,2),T71(30),TNG(30),DM12(2),YA(35),DELHG,I1,I2,CH	832A 006
7294	4,CMD,BPRMG,KCM(10)	832A 007
7295	EQUIVALENCE (NCLASS,JCHA)	832A 008
7296	COMMON/LOOCOM/KOUT,IEX,DEN,VR,IMI(23),ILO(23),IR(23)	832A 009
7297	COMMON/CHACOM/TEP(20,2),TCP(20,2),TKP(20,2)	832A 010
7298	3,RHO(2),MATL(33),DEL(39),SQ(20),M(38),RC(38),RA(38),RECORD(36),	832A 011
7299	4ARFA(38),EMA(38),RAV(38),	832A 012
7300	5ROA(172),ROB(152),ROC(152),	832A 013
7301	6 TPI(38),VFZ,CMH,NPR,	832A 014
7302	7LCT,NPG,I1,NBH,MUHN,NL, DELN,RFT,RHORA,RHORE,RHJRC,TRA	832A 015
7303	8CA,TRAB,TRAC,RHOC,RHOD,RHOC,EA,EB,EC,EA,EB,EC,PSIA,PSIB,PSIC,	832A 016
7304	9TRACH,PET,PETE,RSV,ETA,OTPR3,OTPR2,OTPR1,TPR3,TPR2,TMZRO,THEIN,MT	832A 017
7305	COMMON/CHACOM/EPN,TPES,	832A 018
7306	1YMI,GAMA,ONG,NO,FJFH,FJFS,JF,JFNP,JFH,INPUT, OTMIM,BRP,MCONV,	832A 019
7307	2INCH,OTNB,KN,NI,NOI,CHCRI,PYCRI,MCON, NW,TX(30),F1(30),F2(30)	832A 020
7308	COMMON/MISC/ BPRM,CMT,COLO,CPI,CPGAS,CPNL,CZ,OCOT,DECON,	832A 021

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7309 1DECOMT,DELCR,DELR,DENOLD,DLOT,CNS,DPDT,DRLCP,DRLC,D/LP,DRL,DRCAC, B32A 022
7310 2DROAT,DROPC,DROBT,DRGCC,DRGCT,DRGOTO,DSOT,DSI,DS,SSS,DYA,DYHC,DYHS B32A 023
7311 3,DTS,DVB,DZ,EGO,EZ,FACT1,FACT2,FA,FB,FC,FJF,FK,FZ,GSEGR,GSN,GSMT, B32A 024
7312 4GZ,H1,HAPHB,HBAR,HGAS,HRES,IE,ININ,I,IS,ISV,ITER,J1,J,KK,K,KT,L, B32A 025
7313 5NOR,NLI,NLM,N,NZ,O,PGPU,PGPUT,POLO,POW,QLOSS,QLOSS1,RO,RO1,ROO,SA B32A 026
7314 6,SEGR,TAS,TB,TEHN,TERM2,TERM3,THOS,TH,THPRT,TN,TOP1,TOP2,TOP,T, B32A 027
7315 /TT,VOL,X1 B32A 028
7316 EQUIVALENCE (DM1,DM12(1)),(DM2,DM12(2)),(YS,TA) B32A 029
7317 DIMENSION TNRV(20) B32A 030
7318 497 FORMAT(I2,3F10.5) B32A 033
7319 498 FORMAT(/7X,66MTABLE OF OPTIONAL MASS-FRACTION FUNCTIONS FOR THERM B32A 034
7320 1AL CONDUCTIVITY/25X,23M: = F1(X)*KP + F2(X)*KC/25X,1MX,12X, B32A 035
7321 25MF1(X),10X,5MF2(X)/(13X,3(5X,F10.4))) B32A 036
7322 499 FORMAT(12A6) B32A 037
7323 502 FORMAT(6X12A6) B32A 038
7324 503 FORMAT(/24X31M---REACTION KINETIC EQUATION---/1M) B32A 039
7325 504 FORMAT(15X67MHORHO/DTIME = GAMMA (BA*EXP(-EA/T)RHOOA((RHOA-RHOGA)/ B32A 040
7326 1RHOGA)*PSIA )/ 21X56M GAMMA (BB*EXP(-EB/T)RHOOB((RHOB-RHORB)/ B32A 041
7327 2RHOOB)*PSIB )/ 19X58M((1-GAMMA)(BC*EXP(-EC/T)RHOO((RHOC-RHOPC)/ B32A 042
7328 3RHOO((1-GAMMA)*PSIC )) B32A 043
7329 505 FORMAT(24X32M---REACTION KINETIC CONSTANTS---/1M) B32A 044
7330 506 FORMAT(11X8MREACTION24X4MHROO5X4MHRO8X1MH7X3MPSI8X1ME6X6KT RE/C/2 B32A 045
7331 13X10M(LB/CU FT)6X7H(1/SEC)12X7H(DEC R)3X7H(CEC R)) B32A 046
7332 507 FORMAT(14XA1,2XF9.2,2XE10.4,F7.2,2XE10.4,F8.0) B32A 047
7333 510 FORMAT(12X31MHRESIN VOLUME FRACTION, GAMMA = F5.3,17H(MASS FRACTION B32A 048
7334 1 = F5.3,1H)/1M) B32A 049
7335 511 FORMAT(24X32M---TIME INCREMENT INFORMATION---/1M) B32A 050
7336 512 FORMAT(6X18MINITIAL TIME (SEC)F7.3,26X16HFINAL TIME (SEC)F7.2) B32A 051
7337 513 FORMAT(1M/6X17HOUTPUT INTERVAL =F6.3,1X27HSEC FROM INITIAL TIME B32A 052
7338 1UNTIL F7.3,4H SEC) B32A 053
7339 514 FORMAT(6X17HOUTPUT INTERVAL =F6.3,1X8HSEC FROMF7.3,1X9HSEC UNTILF B32A 054
7340 17.3,4H SEC) B32A 055
7341 515 FORMAT(6X17HOUTPUT INTERVAL =F6.3,1X8HSEC FROMF7.3,1X20HSEC UNTIL B32A 056
7342 1 FINAL TIME/1M) B32A 057
7343 516 FORMAT(6X,19HMAXIMUM TIME STEP =,F4.2,8H SECONDS) B32A 058
7344 517 FORMAT(/29X16M---MODAL DATA---/1M) B32A 059
7345 518 FORMAT(6X74MNODE MATL TEMPERATURE RELATIVE THICKNESS MODAL DE B32A 060
7346 1PTH CONT.RESISTANCE) B32A 061
7347 519 FORMAT(7X73MNO. NO. (DEC.RANKINE) AREA (INCHES) (INCHES) B32A 062
7348 1 (SQFT-S-DEG/BTU)) B32A 063
7349 520 FORMAT(3X216,F12.2,E13.4,F9.5,F12.6,A1,E15.4) B32A 064
7350 521 FORMAT( 14X47HMINIMUM THICKNESS OF LAST ABLATOR MODE (INCHES)F B32A 065
7351 17.4/14X,10MTHERE ARE ,I2,40M MODELETS ASSIGNED TO EACH ABLATING NO B32A 066
7352 2DE) B32A 067
7353 522 FORMAT(/18X48M---HEAT OF FORMATION OF MATERIAL CONSTITUENTS---/7X B32A 068
7354 18H(BTU/LB)/21X7HPLASTIC11X4HCHAR17X3HGAS) B32A 069
7355 523 FORMAT(20XF9.2,7XF9.2,11XF9.2) B32A 070
7356 524 FORMAT(/7X28HENTHALPY DATUM TEMPERATURE =F9.3,1X11HDEC RANKINE) B32A 071
7357 525 FORMAT( /22X36M---MATERIAL THERMAL PROPERTY DATA---/6X14MATER B32A 072
7358 1IAL NO. 110X14MATERIAL NO. 210X26MATERIAL NOS. 3 THROUGH 18/6X14M B32A 073
7359 2NVIRGIN PLASTIC15X4HCHAR21X7HBACK-UP) B32A 074
7360 526 FORMAT(/6X12MATERIAL NO.12,38X8HNOENSITY =F8.3,1X8MLB/CU FT/ B32A 075
7361 1 7X11HTEMPERATURES11X5HSPECIFIC HEATS11X2HCONDUCTIVITY15X8H EN B32A 076
7362 2SIBLE4X18HEMISSIVITY/50X8HENTHALPY/9X7H(DEC R)7X12H(BTU/LB-DEC)4) B32A 077
7363 36H(BTU/FT-SEC-DEG)3X8H(BTU/LB)) B32A 078
7364 4 (8XF8.2,9XF7.4,9XF10.7,7XF9.2,4XF7.4)) B32A 079
7365 527 FORMAT(/6X12MATERIAL NO.12,38X8HNOENSITY =F8.3,1X8MLB/CU FT/ B32A 080
7366 1 7X11HTEMPERATURES11X5HSPECIFIC HEATS11X2HCONDUCTIVITY/9X7H( B32A 081

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7367	2EG R)7X12H(BTU/LB-DEG)4X16H(BTU/FT-SEC-DEG)/	
7368	3 (8XF8.2,8XF7.4,9XF10.7))	B32A 082
7369	528 FORMAT(39H BAD SURFACE STATE TABLE -- QUIT JOB)	B32A 083
7370	531 FORMAT (1H /6X19HTEMPERATURE (DEG R)5F11.2)	B32A 084
7371	532 FORMAT (//20X47H---RESIN DECOMPOSITION GAS SENSIBLE ENTHALPY---	B32A 085
7372	533 FORMAT (6X19HENTHALPY (BTU/LB)5F11.2)	B32A 086
7373	534 FORMAT (1H //23X40H---TIME DEPENDENT BOUNDARY CONDITIONS---/1H)	B32A 087
7374	535 FORMAT (9X,4HTIME,8X,4HPROB,3X,8HRECOVERY,3X,9HRADIATION,4X,4HHEAT	B32A 088
7375	15X,8HPPRESSURE,3X,7HBLLOWING/9X,5H(SEC),7X,4HOPTN,3X,8HENTHALPY,3X,	B32A 089
7376	29HHEAT RATE,4X,5HCOEFF,14X,9HREDUCTION/28X,8H(BTU/LB),2X,11H(ETU/S	B32A 090
7377	3Q FT-,1X,10H(LB/SQ FT-,3X,5H(ATM),3X,9HPARAMETER /40X,7HSECOND),	B32A 091
7378	44X,7HSECOND))	B32A 092
7379	536 FORMAT (6X,F8.2,8X,I2,4X,2(F8.2,3X),F8.4,3X,F8.5,3X,F8.3)	B32A 093
7380	537 FORMAT (1H /9X,69HCH/CHO = PHI/(EXP(PHI)-1.) WHERE PHI = 2.*BRP*M	B32A 094
7381	1DOT/CHO. BRP IN TABLE)	B32A 095
7382	538 FORMAT(//27X30H---SURFACE EQUILIBRIUM DATA---	B32A 096
7383	539 FORMAT (1H /6X12HM DOT G/CM =F7.4/1H)	B32A 097
7384	540 FORMAT(2(17X4HTEMP8X3HLOG7X9H(H WALL).3X)/2(6X7H(DEG R)3X10HM-DOT-C	B32A 098
7385	1/CM2X11H(1+B PRIME)2X)/2(29X8H(BTU/LB)4X))	B32A 099
7386	541 FORMAT (5XF8.2,4XF7.4,5XF9.2,8XF8.2,4XF7.4,5XF9.2)	B32A 100
7387	551 FORMAT(1H110X65HAEROTHERM CHARRING MATERIAL THERMAL RESPONSE AND A	B32A 101
7388	18LATION PROGRAM/73X4HPAGEI3/1H 67X2A6)	B32A 102
7389	552 FORMAT (9X,4HTIME,8X,4HPROB,3X,7HSURFACE,4X,7HSURFACE/9X,5H(SEC),	B32A 103
7390	17X,4HOPTN,5X,4HTEMP,5X,9HRECESSION/28X,7H(DEG R),6X,4HRAE/38X,	B32A 104
7391	210H(MILS/SEC))	B32A 105
7392	553 FORMAT(8X24H*INITIAL INTERNAL RADIUS,1X,F6.3,4X,21HAREA PRO%.TO RA	B32A 106
7393	1DIUS**F4.2)	B32A 107
7394	554 FORMAT(8X24H*INITIAL EXTERNAL RADIUS,1X,F6.3,4X,21HAREA PROP.TO RA	B32A 108
7395	1DIUS**F4.2)	B32A 109
7396	555 FORMAT(8X15H*PLANAR SURFACE)	B32A 110
7397	556 FORMAT (9X,4HTIME,8X,4HPROB,5X,4HVIEW,5X,9HRADIATION/9X,5H(SEC),	B32A 111
7398	17X,4HOPTN,4X,6HFACTOR,4X,9HHEAT RATE/38X,11H(BTU/SQ FT-/40X,	B32A 112
7399	27HSECOND))	B32A 113
7400	560 FORMAY(I2,5E10.0)	B32A 114
7401	561 FORMAT (I2,F8.4)	B32A 115
7402	563 FORMAT (I2,I3,I1,I2,I2,7F10.5/8F10.5)	B32A 116
7403	564 FORMAT (A1,9X2F10.5,E10.3,F10.5,E10.3,F10.5)	B32A 117
7404	571 FORMAT(I2,F10.5,F10.5,F10.8,F10.5)	B32A 118
7405	575 FORMAT(I1,F9.5,7F10.5/8F10.5)	B32A 119
7406	577 FORMAT(I1,F9.5,5F10.5)	B32A 120
7407	578 FORMAT(12X2E12.5,2E13.6,I1)	B32A 121
7408	5790 FORMAT (6X,26HNO RADIUS CORRECTION ON CH)	B32A 122
7409	5791 FORMAT (3F8.5,F9.4,F5.3,2F9.3,I2,A6)	B32A 123
7410	5792 FORMAT(//6X,3HP =,F9.4,4H ATM//6X,3(25HTEMPERATURE EDGE ENTH)/	B32A 124
7411	16X,3(25H (DEG R) AT T-WALL))	B32A 125
7412	5793 FORMAY(//6X,37HBAD SURFACE EQUILIBRIUM TABLE OF TYPE,I2)	B32A 126
7413	5794 FORMAT (//6X,74HEQUAL MASS AND HEAT TRANSFER COEFFICIENTS AND EQUA	B32A 127
7414	1L DIFFUSION COEFFICIENTS/6X,29HNMIONAL SURFACE VIEW FACTOR =,	B32A 128
7415	2F6.3)	B32A 129
7416	5789 FORMAY(//6X,14HM-DOT-GAS/CM =,F7.4,8X,10HPPRESSURE =,F9.4,4H ATM//	B32A 130
7417	17X,2(4HTEMP,5X,26HM-DOT- CHEM.PROD SURFACE,3X)/6X,2(36H(DEG R)	B32A 131
7418	2CHAR/CM (BTU/LB) SPECIES,2X))	B32A 132
7419	5795 FORMAT(5X,F8.2,2X,F7.4,2X,F8.2,4X,A6,1X,F8.2,2X,F7.4,2X,F8.2,4X,A6	B32A 133
7420	1)	B32A 134
7421	5796 FORMAT (2F10.0,9X,I1)	B32A 135
7422	5797 FORMAT(//6X,45HRAIO OF MASS TO HEAT TRANSFER COEFFICIENTS =,F6.3/	B32A 13
7423	1 6X,28HUNEQUAL DIFFUSION EXPONENT =,F6.3/6X,29HNMIONAL SURFACE VIE	B32A 137
7424	2W FACTOR =,F6.3,11H (OPTION 1))	B32A 138
		B32A 139

7425	5798 FORMAT	(6X,F9.2,4X,F9.2,3X,F9.2,4X,F9.2)	B32A 140
7426	22,3X,F9.2,4X,F9.2)		B32A 141
7427	5799 FORMAT (6X,66HHEAT TRANSFER COEFFICIENT MULTIPLIED BY (R INITIAL/R		B32A 142
7428	1 CURRENT)**1.8)		B32A 143
7429	580 FORMAT (8F10.5)		B32A 144
7430	581 FORMAT(/14X20HBACK WALL CONVECTION10X9HBACK WALL10X9HRESERVOIR/		B32A 145
7431	113X23HCOEF BTU/FTSQ-SEC-DEG R8X10HEMISSIVITY8X11HTEMPERATURE/		B32A 146
7432	217XF10.4,18XF6.3,10XF10.2)		B32A 147
7433	582 FORMAT(5F10.5,9X,I1)		B32A 148
7434	DATA BLANK,ASTER/ 1H ,1H*/		B32A 149
7435	KOUT=5		B32A 150
7436	INPUT=8		B32A 151
7437	NMG=0		B32A 152
7438	INCH=8		B32A 153
7439	WT=0.0		B32A 154
7440	C INPUT/OUTPUT		B32A 155
7441	C		B32A 156
7442	1 NPG=1		B32A 157
7443	WRITE (KOUT,551)NPG		B32A 158
7444	READ (INPUT,499)(RECORD(I),I=1,36)		B32A 159
7445	C	EUNITN	B32A 160
7446	C	FO	B32A 161
7447	C	8999,9999)TUPNI,FOE(	B32A 162
7448	WRITE (KOUT,502)(RECORD(I),I=1,36)		B32A 163
7449	WRITE (KOUT,503)		B32A 164
7450	WRITE (KOUT,504)		B32A 165
7451	WRITE (KOUT,505)		B32A 166
7452	WRITE (KOUT,506)		B32A 167
7453	READ (INPUT,564)A9,RH00A,RH0RA,BA,PSIA,EA,TRACA,B9,RH00B ,RH0RB,B		B32A 168
7454	1B,PSIB,EB,TRACB ,C9,RH00C,RH0RC,BC, PSIC,EC,TRACC		B32A 169
7455	WRITE (KOUT,507)A9,RH00A,RH0RA,BA,PSIA,EA,TRACA,B9,RH00B,RH0RB,BB,L32A		170
7456	1PSIB,EB,TRACB ,C9,RH00C,RH0RC,BC, PSIC,EC,TRACC		B32A 171
7457	READ (INPUT,563) JF,NUMN,YN,NO,MI,THZRO,THFIN,DTPRT,DTPR2,DTPR3,		B32A 172
7458	1DTHB,BRP,TPR2,TPR3,DELM,DH1,DH2,DELHG,GAMA,TZ		B32A 173
7459	IF(JF-1) 171,170,172		B32A 174
7460	170 JF=2		B32A 175
7461	GO TO 172		B32A 176
7462	171 JF=10		B32A 177
7463	172 JFH=JF/2		B32A 178
7464	JF=JFH+JFH		B32A 179
7465	JFHP=JFH+1		B32A 180
7466	FJFS=JF		B32A 181
7467	FJFH=FJFS/2.0		B32A 182
7468	NOI=NO+NI		B32A 183
7469	IF (NO) 181,181,182		B32A 184
7470	182 READ (INPUT,580)(SO(I),I=1,NO)		B32A 185
7471	181 CONTINUE		B32A 186
7472	IF (NI) 184,184,183		B32A 187
7473	183 NOP=NO+1		B32A 188
7474	READ (INPUT,580)(SO(I), I=NOP,NOI)		B32A 189
7475	184 IF(GAMA) 408,409,409		B32A 190
7476	408 GAMA=RH00C/(RH00C-(RH00A+RH00B)-(RH00A+RH00E)/GAMA)		B32A 191
7477	409 OMG=1.0-GAMA		B32A 192
7478	RHO(1)=GAMA*(RH00A+RH00B)+OMG*RH00C		B32A 193
7479	RHO(2)=GAMA*(RH0RA+RH0RB)+OMG*RH0RC		B32A 194
7480	GAMAM=GAMA/RHO(1)*(RH00A+RH00E)		B32A 195
7481	WRITE (KOUT,510)GAMA,GAMAM		B32A 196
7482	IF(DTHB) 412,410,412		B32A 197

7483	410 DTHB=5.	B32A 198
7484	412 DTHIN=.01	B32A 199
7485	413 IF (TPR2) 414,414,415	B32A 200
7486	414 TPR2=THFIN	B32A 201
7487	415 IF (TPR3) 416,416,417	B32A 202
7488	416 TPR3=THFIN	B32A 203
7489	IF (TPR2-THZRO) 418,418,417	B32A 204
7490	418 DTPRT=DTPR2	B32A 205
7491	DTPR2=DTPR3	B32A 206
7492	TPR2=TPR3	B32A 207
7493	GO TO 416	B32A 208
7494	417 WRITE (KOUT,511)	B32A 209
7495	THFIN=AMAX1(THFIN,TPR2,TPR3)	B32A 210
7496	WRITE (KOUT,512) THZRO,THFIN	B32A 211
7497	WRITE (KOUT,513) DTPRT,TPR2	B32A 212
7498	WRITE (KOUT,514) DTPR2,TPR2,TPR3	B32A 213
7499	WRITE (KOUT,515) DTPR3,TPR3	B32A 214
7500	WRITE (KOUT,516) DTHB	B32A 215
7501	C481	CCART,BCART,ACART(F1NIM=MCA
7502	TRACH=AMIN1(TRACA,TRACB,TRACC)	B32A 216
7503	PETE=RHO(1)/(RHO(1)-RHO(2))	B32A 217
7504	PET=PETE*RHO(2)	B32A 218
7505	C	----- NODAL PROPERTIES
7506	N=0	B32A 219
7507	J1=JFH	B32A 220
7508	CALL LCOUNT (-NUMN-8,LCT,NPG,RECORD(35))	B32A 221
7509	302 WRITE (KOUT,517)	B32A 222
7510	WRITE (KOUT,518)	B32A 223
7511	WRITE (KOUT,519)	B32A 224
7512	B=ASTER	B32A 225
7513	READ(INPUT,560) (MATL(I),TA(I),AREA(I),DEL(I),RA(I),RC(I),I=1,NUMN)	B32A 226
7514	AE=RA(2)	B32A 227
7515	RSV=RA(1)	B32A 228
7516	RA(1)=0.0	B32A 229
7517	DO 400 I=1,NUMN	B32A 230
7518	IF (I-2) 4541,452,453	B32A 231
7519	453 RA(I)=RA(I-1)+(DEL(I-1)+DEL(I))/2.0	B32A 232
7520	GO TO 461	B32A 233
7521	452 RA(2)=DEL(1)+DEL(2)/2.	B32A 234
7522	B=BLANK	B32A 235
7523	461 DEL(I-1)=DEL(I-1)/12.	B32A 236
7524	4541 RAV(I)=RA(I)	B32A 237
7525	IF (AE) 4542,4543,4542	B32A 238
7526	4542 AREA(I)=(ABS(RSV+RA(I)))*AE	B32A 239
7527	GO TO 454	B32A 240
7528	4543 IF (AREA(I)) 4544,4544,454	B32A 241
7529	4544 IF (RSV) 4545,4546,4545	B32A 242
7530	4545 AREA(I)=ABS(RSV+RA(I))	B32A 243
7531	AE=1.0	B32A 244
7532	GO TO 454	B32A 245
7533	4546 AREA(I)=1.	B32A 246
7534	454 WRITE(KOUT,520) I,MATL(I),TA(I),AREA(I),DEL(I),RA(I),B,RC(I)	B32A 247
7535	IF (MATL(I)-2) 401,405,400	B32A 248
7536	401 NL=I	B32A 249
7537	DO 404 J=1,J1	B32A 250
7538	N=N+1	B32A 251
7539	ROA(N)=RHOOA	B32A 252
7540	ROB(N)=RHOOB	B32A 253

7541	404	ROC(N)=RH00C	B32A	256
7542		J1=JF	B32A	257
7543		GO TO 400	B32A	258
7544	405	NL=I	B32A	259
7545		DO 406 J=1,J1	B32A	260
7546		N=N+1	B32A	261
7547		ROA(N)=RHORA	B32A	262
7548		ROB(N)=RHORB	B32A	263
7549	406	ROC(N)=RHORC	B32A	264
7550		J1=JF	B32A	265
7551	400	CONTINUE	B32A	266
7552	403	DEL(NUMN)=DEL(NUMN)/12.	B32A	267
7553		CALL SLOPC(NUMN,RA,AREA,EMA,EMA)	B32A	268
7554		NBM=NL+1	B32A	269
7555		IF(RSV) 4031,4032,4033	B32A	270
7556	4031	RSVN=-RSV	B32A	271
7557		WRITE(KOUT,554)RSVN,AE	B32A	272
7558		GO TO 304	B32A	273
7559	4032	WRITE(KOUT,555)	B32A	274
7560		GO TO 304	B32A	275
7561	4033	WRITE(KOUT,553)RSV,AE	B32A	276
7562	304	WRITE(KOUT,521)DELM,JF	B32A	277
7563		DELM=DELM/12.0	B32A	278
7564		READ(INPUT,582)HCONV,EPSh,TRES,CHCRI,PYCRI,NCON	B32A	279
7565		IF(CHCRI) 305,305,306	B32A	280
7566	305	CHCRI=0.02	B32A	281
7567	306	IF(PYCRI) 307,307,308	B32A	282
7568	307	PYCRI=0.98	B32A	283
7569	308	TA(NUMN+1)=TRES	B32A	284
7570		CALL LCOUNT(4, LCT,NPG,RECORD(35))	B32A	285
7571		WRITE(KOUT,581)HCONV,EPSh,TRES	B32A	286
7572		CALL LCOUNT(5, LCT,NPG,RECORD(35))	B32A	287
7573		WRITE(KOUT,522)	B32A	288
7574		WRITE(KOUT,523)DH1,DH2,DELMG	B32A	289
7575		CALL LCOUNT(2, LCT,NPG,RECORD(35))	B32A	290
7576		WRITE(KOUT,524)TZ	B32A	291
7577		----- MATERIAL PROPERTIES	B32A	292
7578		CALL LCOUNT(6, LCT,NPG,RECORD(35))	B32A	293
7579	310	WRITE(KOUT,525)	B32A	294
7580		IT=0	B32A	295
7581		ILO(3)=1	B32A	296
7582		ILO(4)=1	B32A	297
7583		KT=1	B32A	298
7584	350	IT=IT+1	B32A	299
7585		READ(INPUT,571)NC,TT2(IT,KT),TCP(IT,KT),TKP(IT,KT),TEP(IT,KT)	B32A	300
7586		IF(NC) 351,350,351	B32A	301
7587	351	IHI(KT+2)=ILO(KT+2)+IT-1	B32A	302
7588		IR(KT+2)=ILO(KT+2)	B32A	303
7589		THZ(1,KT)=0.	B32A	304
7590		IF(IT-2) 2357,1357,1357	B32A	305
7591	1357	DO 357 I=2,IT	B32A	306
7592	357	THZ(I,KT)=THZ(I-1,KT)+(TCP(I,KT)+TCP(I-1,KT))/2.*(TT2(I,KT)-TT2(I-1,KT))	B32A	307
7593		11,KT))	B32A	308
7594	2357	CONTINUE	B32A	309
7595		CALL LOOK(KT+2,TZ,TT2(1,KT),THZ(1,KT),0,0,0,MSH,0UM,1)	B32A	310
7596		DO 359 I=1,IT	B32A	311
7597	359	THZ(I,KT)=THZ(I,KT)-MSH	B32A	312
7598		CALL LCOUNT(6+IT, LCT,NPG,RECORD(35))	B32A	313

7599	312 IF (IT-1) 2312,1312,1312	B32A 314
7600	1312 WRITE (KOUT,526) KT,RHO(KT), (TT2(I,KT),TCP(I,KT),TKP(I,KT),THZ(I,KT)	B32A 315
7601	1,TEP(I,KT),I=1,IT)	B32A 316
7602	2312 CONTINUE	B32A 317
7603	KT=KT+1	B32A 318
7604	IT=0	B32A 319
7605	IF (NC) 356,353,353	B32A 320
7606	356 IF (KT-2) 350,350,411	B32A 321
7607	411 READ (INPUT,561) KT,RHO(KT)	B32A 322
7608	IF (RHO(KT)) 3550,3550,355	B32A 323
7609	3550 WT=1.0	B32A 324
7610	IX=0	B32A 325
7611	3551 IX=IX+1	B32A 326
7612	READ (INPUT,497) NC,IX(IX), F1(IX),F2(IX)	B32A 327
7613	IF (NC) 3552,3551,3552	B32A 328
7614	3552 ILO(11)=1	B32A 329
7615	IHI(11)=IX	B32A 330
7616	IR(11)=1	B32A 331
7617	CALL LCOUNT(8+IX,LCT,NPG,RECORD(35))	B32A 332
7618	IF (IX-1) 6001,6000,6000	B32A 333
7619	6000 WRITE (KOUT,498) (TX(I),F1(I),F2(I),I=1,IX)	B32A 334
7620	6001 CONTINUE	B32A 335
7621	IF (NC) 411,411,353	B32A 336
7622	355 IT=IT+1	B32A 337
7623	READ (INPUT,571) NC,TT2(IT,KT),TCP(IT,KT),TKP(IT,KT)	B32A 338
7624	IF (NC) 354,355,354	B32A 339
7625	354 ILO(KT+2)=1	B32A 340
7626	IHI(KT+2)=ILO(KT+2)+IT-1	B32A 341
7627	IR(KT+2)=ILO(KT+2)	B32A 342
7628	CALL LCOUNT(5+IT, LCT,NPG,RECORD(35))	B32A 343
7629	314 IF (IT-1) 2314,1314,1314	B32A 344
7630	1314 WRITE (KOUT,527) KT,RHO(KT), (TT2(I,KT),TCP(I,KT),TKP(I,KT),I=1,IT)	B32A 345
7631	2314 CONTINUE	B32A 346
7632	IT=0	B32A 347
7633	IF (NC) 411,411,353	B32A 348
7634	C ----- PYROLYSIS GAS ENTHALPY	B32A 349
7635	353 NT1=0	B32A 350
7636	361 IN=1+NT1	B32A 351
7637	NT1=8+NT1	B32A 352
7638	IF (NT1-IN) 6003,6002,6002	B32A 353
7639	6002 READ (INPUT,575) NC, (TT1(I),I=IN,NT1), (THG(I),I=IN,NT1)	B32A 354
7640	6003 CONTINUE	B32A 355
7641	IF (NC) 361,361,362	B32A 356
7642	364 NT1=NT1-1	B32A 357
7643	362 IF (TT1(NT1)) 364,364,365	B32A 358
7644	365 ILO(2)=1	B32A 359
7645	IR(2)=1	B32A 360
7646	IHI(2)=NT1	B32A 361
7647	CALL LCOUNT(3*((NT1+9)/5), LCT,NPG,RECORD(35))	B32A 362
7648	316 WRITE (KOUT,532)	B32A 363
7649	IFN=0	B32A 364
7650	368 IN=IFN+1	B32A 365
7651	IFN=MIN0(NT1,IFN+5)	B32A 366
7652	IF (IFN-IN) 6005,6004,6004	B32A 367
7653	6004 WRITE (KOUT,531) (TT1(I),I=IN,IFN)	B32A 368
7654	WRITE (KOUT,533) (THG(I),I=IN,IFN)	B32A 369
7655	6005 CONTINUE	B32A 370
7656	IF (NT1-IFN) 367,367,368	B32A 371

7657	367 K=1	832A 372
7658	2803 READ(INPUT,583) BPG,(TNRV(I),I=1,19)	832A 373
7659	IF(TNRV(1)) 2804,2804,2805	832A 374
7660	2805 TMG(K)=BPG	832A 375
7661	DO 2802 I=1,19	832A 376
7662	IF(TNRV(I)-99.) 2800,2800,2801	832A 377
7663	2801 TTS(I,K,1)=TNRV(I)	832A 378
7664	KHI(K)=I	832A 379
7665	NHI(K)=I	
7666	GO TO 2802	832A 380
7667	2800 IF(TNRV(I)) 2811,2811,2810	832A 381
7668	2810 TLNC(I,K,1) = TNRV(I)	832A 382
7669	NHI(K)=I	832A 383
7670	2802 CONTINUE	832A 384
7671	2811 K=K+1	832A 385
7672	GO TO 2803	832A 386
7673	2804 NMG=K-1	832A 387
7674	IHI(12)=NMG	832A 388
7675	ILO(12)=1	832A 389
7676	IR(12)=1	832A 390
7677	DO 2818 K=1,NMG	
7678	NLO(K)=KHI(K)+1	832A 392
7679	KHIK=KHI(K)	832A 393
7680	NLOK=NLO(K)	832A 394
7681	NHIK=NHI(K)	832A 395
7682	DO 2807 I=1,KHIK	832A 396
7683	2807 TTS(I,K,2)=TTS(I,K,1)	832A 397
7684	IF(NHIK-NLOK) 2810,2809,2809	
7685	2809 DO 2808 I=NLOK,NHIK	
7686	TLNC(I,K,1)=ALOG(AHAX1(TLNC(I,K,1),.00001))	832A 399
7687	2808 TLNC(I,K,2)=TLNC(I,K,1)	832A 400
7688	2818 CONTINUE	
7689	583 FORMAT(20F4.0)	832A 401
7690	VFZ=1.0	
7691	IF(BPG.GT.0.) VFZ=BPG	
7692	RETURN	
7693	END	
7694	CB33A	833A 001
7695	SUBROUTINE LOOK(II,XL,X,A,B,C,E,Y,D,ION)	833A 002
7696	COMMON/LOOCOM/KOUT,IEX,DEN,VR,IHI(23),ILO(23),IR(23)	833A 003
7697	DIMENSION X(1),Y(1),D(1)	833A 004
7698	DIMENSION A(1),B(1),C(1),E(1)	833A 005
7699	IM=IHI(II)	833A 006
7700	IL=ILO(II)	833A 007
7701	IFX=0	833A 008
7702	IF(X(IM)-X(IL)) 30,30,29	833A 009
7703	30 IEX=1	833A 010
7704	IF (XL-X(IM)) 3,2,31	833A 011
7705	31 IF (XL-X(IL)) 6,5,4	833A 012
7706	29 IF (XL-X(IM)) 1,2,3	833A 013
7707	1 IF (XL-X(IL)) 4,5,6	833A 014
7708	6 I=IR(II)	833A 015
7709	I=MIN0(I,IM)	833A 016
7710	I=MAX0(I,IL)	833A 017
7711	IS=1	833A 018
7712	IT=1	833A 019
7713	GO TO 8	833A 020
7714	11 I=I+1	833A 021

7715	IS=0	B33A 022
7716	8 IF(IEX) 28,28,38	B33A 023
7717	28 IF(XL-X(I)) 7,10,9	B33A 024
7718	38 IF(XL-X(I)) 9,10,7	B33A 025
7719	7 I=I-1	B33A 026
7720	IT=0	B33A 027
7721	IF(IS) 10,10,8	B33A 028
7722	9 IF(IT) 10,10,11	B33A 029
7723	3 IEX=3	B33A 030
7724	2 I=IH-1	B33A 031
7725	GO TO 10	B33A 032
7726	4 IEX=2	B33A 033
7727	5 I=IL	B33A 034
7728	10 DEN=X(I+1)-X(I)	B33A 035
7729	IR(Y)=I	B33A 036
7730	VR=XL-X(I)	B33A 037
7731	IF(IDN) 13,13,14	B33A 038
7732	14 GO TO (21,22,23,24),IDN	B33A 039
7733	24 Y(4)=E(I)	B33A 040
7734	D(4)=E(I+1)-E(I)	B33A 041
7735	23 Y(3)=C(I)	B33A 042
7736	D(3)=C(I+1)-C(I)	B33A 043
7737	22 Y(2)=B(I)	B33A 044
7738	D(2)=B(I+1)-B(I)	B33A 045
7739	21 Y(1)=A(I)	B33A 046
7740	D(1)=A(I+1)-A(I)	B33A 047
7741	DO 12 J=1,IDN	B33A 048
7742	20 D(J)=D(J)/DEN	B33A 049
7743	12 Y(J)=Y(J)+D(J)*VR	B33A 050
7744	13 VR=VR/DEN	B33A 051
7745	RETURN	B33A 052
7746	END	B33A 053
7747	C834A	B34A 001
7748	SUBROUTINE COMP(X,Y,VOID,IFLAG)	
7749	DIMENSION Y(20,10,2)	
7750	DIMENSION X(20,10,2)	B34A 003
7751	IFLAG=0	B34A 004
7752	DO 3 I=1,2	B34A 005
7753	DO 3 K=1,2	B34A 007
7754	IF(Y(I,1,K)-VOID) 1,2,1	
7755	1 IF(X(I,1,K)-VOID) 3,2,3	
7756	3 CONTINUE	B34A 009
7757	GO TO 4	B34A 010
7758	2 IFLAG=1	B34A 011
7759	4 RETURN	B34A 012
7760	END	B34A 013
7761	C836A	B36A 001
7762	SUBROUTINE OGLE(N,XAM,PRM,NUMX,X,P,EM)	B36A 002
7763	DIMENSION XAM(1),X(1),P(1),EM(1),PRM(1),OPDIN(1)	B36A 003
7764	XOIF=X(NUMX)-X(1)	B36A 004
7765	IS=1	B36A 005
7766	2 DO 600 J=1,N	B36A 006
7767	XA=XAM(J)	B36A 007
7768	59 IO=1	B36A 008
7769	IT=1	B36A 009
7770	61 IF(XOIF) 72,60,71	B36A 010
7771	71 IF(XA-X(IS)) 62,63,64	B36A 011
7772	72 IF(X:IS)-XA) 62,63,64	B36A 012

7773	62 IF (IS-1) 671, 671, 68	836A 013
7774	68 IS=IS-1	836A 014
7775	IT=2	836A 015
7776	GO TO (61, 66), IO	836A 016
7777	672 IS=NUMX	836A 017
7778	671 I=IS	836A 018
7779	H=0.	836A 019
7780	DPDI=EM(I)	836A 020
7781	GO TO 67	836A 021
7782	63 PR=P(IS)	836A 022
7783	DPDI=EM(IS)	836A 023
7784	GO TO 601	836A 024
7785	64 IS=IS+1	836A 025
7786	IF (IS-NUMX) 69, 69, 672	836A 026
7787	69 IO=2	836A 027
7788	GO TO (61, 65), IT	836A 028
7789	65 IS=IS-1	836A 029
7790	66 X=IS	836A 030
7791	G=((P(I+1)-P(I))/(X(I+1)-X(I)))-EM(I)/(X(I+1)-X(I))	836A 031
7792	F=((EM(I+1)-EM(I))/(X(I+1)-X(I)))-2.*G/(X(I+1)-X(I))	836A 032
7793	H=IF*(XA-X(I+1))+G*(XA-X(I))	836A 033
7794	DPDI=(H+H+EM(I)+F*(XA-X(I))*(XA-X(I)))	836A 034
7795	67 PR=(H+EM(I))*(XA-X(I))+P(I)	836A 035
7796	601 CONTINUE	836A 036
7797	PRM(J)=PR	836A 037
7798	600 CONTINUE	836A 038
7799	60 CONTINUE	836A 039
7800	4 RETURN	836A 040
7801	END	836A 041
7802	CR37A	837A 001
7803	SUBROUTINE LCOUNT (J, LCT, NPG, R)	837A 002
7804	COMMON/LOOCOM/KOUT, IEX, DEN, VR, IMI(23), ILO(23), IR(23)	837A 003
7805	I=J	837A 004
7806	DIMENSION R(2)	837A 005
7807	551 FORMAT(1H112X61HAEROTHERM COUPLED ABLATION BOUNDARY LAYER ENVIRONM	
7808	1ENT PROGRAM/73X4HPAGE13/68X2A6)	
7809	IF(I) 2, 2, 3	837A 008
7810	2 I=-I	837A 009
7811	GO TO 4	837A 010
7812	3 LCT=LCT-I	837A 011
7813	IF (LCT) 4, 5, 5	837A 012
7814	4 NPG=NPG+1	837A 013
7815	LCT=55-I	837A 014
7816	WRITE (KOUT, 551) NPG, R	837A 015
7817	5 RETURN	837A 016
7818	END	837A 017
7819	CR38A	838A 001
7820	SUBROUTINE SBOPKG	838A 002
7821	COMMON/CANCOM/TLNG(20, 10, 2), TNG(20), TTS(20, 10, 2), TCHEM(20, 10, 2),	838A 003
7822	1NLO(20), NHI(20), KHI(20), JCMA, INC, INC, NNG,	838A 004
7823	2TCH(2), TPR(2), TRAD(2), IAB	838A 005
7824	3, TT2(20, 2), THZ(20, 2), TT1(30), TNG(30), DH12(2), TA(39), DELHG, I1, I2, CH	838A 006
7825	4, CHD, BPRNG, KCH(10)	838A 007
7826	EQUIVALENCE (NCLASS, JCMA)	838A 008
7827	COMMON/LOOCOM/KOUT, IEX, DEN, VR, IMI(23), ILO(23), IR(23)	838A 009
7828	COMMON/CHACOM/TEP(20, 2), TCP(20, 2), TAP(20, 2)	838A 010
7829	3, RHO(2), NATL(30), DEL(39), SO(20), M(30), RC(30), RA(30), RECORD(36),	838A 011
7830	4AREA(30), EMA(30), RAV(30),	838A 012

7831	5ROA(152),ROB(152),ROC(152),	838A 013
7832	6 TPI(30),VFZ,CMH,NPR,	838A 014
7833	7LCT,NPG,II,NBH,NUMN,NL, DELM,RFT,RHORA,RHORB,RHORE,TRA	838A 015
7834	8CA,TRACB,TRACC,RHOOA,RHOOB,RHOOE,EA,EB,EC,8A,8B,8C,PSIA,PSIB,PSIC,	838A 016
7835	9TRACH,PET,PETE,RSV,ETA,OTPR1,OTPR2,OTPR3,TPR3,TPR2,THZRO,THFIN,WT	838A 017
7836	COMMON/CHACOM/EPST,TRES,	838A 018
7837	1THNT,GAMA,OMG,NO,FJFH,FJFS,JF,JFHP,JFH,INPUT, DTHIN,BRP,HCONV,	838A 019
7838	2INCH,CTHB,NN,NI,NOI,CHCRI,PYCRI,NCON, NR,TX(30),F1(30),F2(30)	838A 020
7839	COMMON/SBCP/BF,CHMA,CHMI,DERR,DMIV,EMIV,ERFX,ERRC,ERR,ERRS,I3,I4,	838A 021
7840	1VRH,VRP,TPR,IRA,IRB,IRC,IRD,ITL,PHI,QQ,TABC,TEMP,TSMA,YSMI,TSSQ	838A 022
7841	COMMON/SBCP/ TNXT, DNCP(3),CPE(3),TO(20),VITER(51),EITER(51)	838A 023
7842	COMMON/SBCP/ Y2(16),D2(16),Y3(8),D3(8),Y1(2),D1(2)	838A 024
7843	COMMON/SBCP/ CPC(50),CPV(50),CP(50),HP (50),HC(50),CN(50),	838A 025
7844	1RAT(50),ROT(50),RO(50),X(50),RON(50),DMOG(50),RR (50),	838A 026
7845	2CNC(50),A(50),B(50),C(50),D(50),EMO(50),CMO(50)	838A 027
7846	COMMON/SBCP/BR, CHZ, CMOL, DEOT,DEOTT,DSDTB,OTH,GSMS,HW,	838A 028
7847	1HE, ITS,PRES,QCHEM,QCHEMT,QCOND,QCONDY,QCONV,QCONVT,QRA,URP,	838A 029
7848	2QRPT,RAO,RAOT,RSU,S2G, TSAVE,VF,XP1,ASU	838A 030
7849	COMMON/MISC/ BPRH,CNT,COLD,CPI,CPGAS,CPNL,CZ,DCDT,DECOM,	838A 031
7850	1DECOM,DELCR,DELR,DENOLD,DIDT,DNS,DPOY,DRLCP,DRLC,DRLP,DRL,DRCAC,	838A 032
7851	2DROAT,DROBC,DROBT,DROCC,DROCT,DRODT,OSDT,DSI,DS,DSS,DTA,DTHC,DTHS	838A 033
7852	3,DTS,DVB,DZ,EGO,EZ,FACT1,FACT2,FA,FB,FC,FJF,FK,FZ,GSEGR,GSN,GSMT,	838A 034
7853	4GZ,H1,HAPHB,HBAR,HGAS,HRES,IE,INTA,I,IS,ISV,ITER,J1,J,K,K,KT,L,	838A 035
7854	5NDR,NLI,NLM,N,NZ,O,PGPU,PGPIT,POLO,POH,QLOSS,QLOSST,RO,RO1,ROOZ,SAB	838A 036
7855	6,SOEGR,TAS,TB,TERM1,TERM2,TERM3,THOS,TH,THPRT,TN,TOP1,TOP2,TOP3,T,	838A 037
7856	7TT,VOL,X1	838A 038
7857	EQUIVALENCE (DH1,DH12(1)),(DH2,DH12(2)),(TS,TA)	838A 039
7858	DATA VOID/4HVOID/	838A 040
7859	529 FORMAT(17H ITERATION STOP)	838A 041
7860	582 FORMAT(1P12E10.3)	838A 042
7861	IF(JCHA-2) 771,771,770	838A 043
7862	770 IF(JCHA-4) 2513,744,753	838A 044
7863	771 CONTINUE	838A 045
7864	XP1=X(1)	838A 046
7865	VF=VFZ	
7866	ITL=1	838A 047
7867	ITS=1	838A 048
7868	VRP=(TH-TPR(1))/(TPR(2)-TPR(1))	838A 049
7869	TNXT=AMAX1(TPR(2),TPR(1))	838A 050
7870	CH = TCH(1)+VRP*(TCH(2)-TCH(1))	838A 051
7871	QRA=TRAD(1)+VRP*(TRAD(2)-TRAD(1))	838A 052
7872	CHZ=CH	838A 053
7873	TPR=1	838A 054
7874	ERFX=D(1)	838A 055
7875	CALL LOOK(12,GSMS/CH,IMG,0,0,0,0,Y2,DZ,0)	838A 056
7876	IMG=IR(12)	838A 057
7877	VRM=VR	838A 058
7878	2510 ILO(14)=NLO(IMG)	838A 059
7879	IMI(14)=NMI(IMG)	838A 060
7880	ILO(15)=NLO(IMG+1)	838A 061
7881	IMI(15)=NMI(IMG+1)	838A 062
7882	I1=ILO(14)	838A 063
7883	I2=ILO(15)	838A 064
7884	L1=I1	
7885	L2=I2	
7886	ERRM=1.0	
7887	IF(IMI(14)-ILO(14)) 620,620,729	
7888	729 CONTINUE	

7889	IF(TCHEM(I2,IMG+1,1)-VOID) 730,731,730	838A 065
7890	730 IF(TCHEM(I1,IMG,1)-VOID) 732,731,732	838A 066
7891	732 IF(TCHEM(I2,IMG+1,2)-VOID) 733,731,733	838A 067
7892	733 IF(TCHEM(I1,IMG,2)-VOID) 2513,731,2513	838A 068
7893	731 JCMA=3	838A 069
7894	RETURN	838A 070
7895	2513 TABC=ITS(I1,IMG,1)+VRM*(TTS(I2,IMG+1,1)-TTS(I1,IMG,1))	838A 071
7896	2515 TABC=TABC+VRP*(TTS(I1,IMG,2)+VRM*(TTS(I2,IMG+1,2)-TTS(I1,IMG+1,2))	838A 072
7897	1-TABC)	838A 073
7898	2503 IF(TSAVE-TABC+.0001) 420,420,421	
7899	C ----- ABLATING SURFACE	838A 075
7900	421 IF(IAB) 422,422,423	838A 076
7901	422 CMDL=TLMC(I1,IMG,1)-VRM*(TLMC(I1,IMG,1)-TLMC(I2,IMG+1,1))	838A 077
7902	CHD=EXP(CMDL)*CH	838A 078
7903	IAB=1	838A 079
7904	423 CALL LOOK(14,CMDL,TLMC(1,IMG,1),0,0,0,0,0,0)	838A 080
7905	IRA=IR(14)	838A 081
7906	I1=IRA	838A 082
7907	CALL LOOK(15,CMDL,TLMC(1,IMG+1,1),0,0,0,0,0,0)	838A 083
7908	IRB=IR(15)	838A 084
7909	I2=IRB	838A 085
7910	CALL COMP(TCHEM(I1,IMG,1),TCHEM(I2,IMG+1,1),VOID,IFLAG)	
7911	IF(IFLAG-1) 740,741,740	838A 087
7912	741 JCMA=4	838A 088
7913	RETURN	838A 089
7914	740 CONTINUE	838A 090
7915	744 CALL LOOK(14,CMDL,TLMC(1,IMG,1),TTS(1,IMG,1),TCHEM(1,IMG,1),0,0,	838A 091
7916	Y2(1),Y2(3),2)	838A 092
7917	CALL LOOK(15,CMDL,TLMC(1,IMG+1,1),TTS(1,IMG+1,1),TCHEM(1,IMG+1,1),	838A 093
7918	10,0,Y2(5),Y2(7),2)	838A 094
7919	CALL LOOK(14,CMDL,TLMC(1,IMG,2),TTS(1,IMG,2),TCHEM(1,IMG,2),0,0,	838A 095
7920	Y2(9),Y2(11),2)	838A 096
7921	CALL LOOK(15,CMDL,TLMC(1,IMG+1,2),TTS(1,IMG+1,2),TCHEM(1,IMG+1,2),	838A 097
7922	10,0,Y2(13),Y2(15),2)	838A 098
7923	IIX=IEX-2	
7924	DO 4232 I=1,8	838A 099
7925	4232 Y2(I)=Y2(I)+VRP*(Y2(I+8)-Y2(I))	838A 100
7926	4233 DO 426 I=1,4	838A 101
7927	426 Y2(I)=Y2(I)+(Y2(I+4)-Y2(I))*VRM	838A 102
7928	IF(Y2(1)) 4260,4260,4261	838A 103
7929	4260 ITL=ITS	838A 104
7930	GO TO 4350	838A 105
7931	4261 CONTINUE	838A 106
7932	CALL LOOK(4,Y2(1),Y2(1,2),TEP(1,2),0,0,0,EMIV,DMIV,1)	838A 107
7933	IF(MATL(1)-2) 420,427,420	838A 108
7934	420 CALL LOOK(3,Y2(1),Y2(1,1),TEP(1,1),0,0,0,Y3,D3,1)	838A 109
7935	EMIV=EMIV*XP1*(Y3(1)-EMIV)	
7936	DMIV=DMIV*XP1*(D3(1)-DMIV)	
7937	427 TSSQ=Y2(1)*Y2(1)	838A 112
7938	TS=Y2(1)	838A 113
7939	RAD=SIG*EMIV*TSSQ*TSSQ*VF	838A 114
7940	436 ERR=CH*Y2(2)+EMIV*QRA-RAD-B(1)*TS+ERFX	838A 115
7941	ERRR=AMAX1(ABS(CH*Y2(2)),ABS(EMIV*QRA),ABS(RAD),ABS(B(1)*TS),	
7942	1 ABS(ERFX))	
7943	DERR=CH*Y2(4)+((QRA-RAD/EMIV)*DMIV-4./TS*RAD-B(1)*Y2(3)	838A 116
7944	IF(DERR) 4365,4365,4362	
7945	4362 IF(IIX) 4365,4360,4365	
7946	4360 ITL=ITS	

7947	GO TO 4356	
7948	4365 CONTINUE	
7949	ERRC=ERR/DERR	838A 117
7950	VITER(ITS)=CMOL	838A 118
7951	EITER(ITS)=ERR	838A 119
7952	CMOL=CMOL-ERRC	838A 120
7953	CMHI=-1.E+30	838A 121
7954	CMHA=+1.E+30	838A 122
7955	IF(ILO(14)-IRA) 4361,4363,4363	838A 123
7956	4361 IF(ILO(15)-IRB) 4270,4363,4363	838A 124
7957	4270 CMHI=AMAX1(CMHI, TLHC(IRA,IMG,IPR)+TLHC(IRA-1,IMG,IPR), TLHC(IRB,IMG	838A 125
7958	1+1,IPR)+TLHC(IRB-1,IMG+1,IPR))/2.	838A 126
7959	CMOL=AMAX1(CMOL,CMHI)	838A 127
7960	4363 IF(IMI(14)-IRA-1) 4369,4369,4364	
7961	4364 IF(IMI(15)-IRB-1) 4369,4369,4275	
7962	4369 IF(ITS-ITL) 4366,4366,4360	
7963	4360 IF(ERRS) 420,4367,4367	
7964	4275 CMHA=AMIN1(CMHA, TLHC(IRA+1,IMG,IPR)+TLHC(IRA+2,IMG,IPR), TLHC(IRB+1	838A 130
7965	1,IMG+1,IPR)+TLHC(IRB+2,IMG+1,IPR))/2.	838A 131
7966	CMOL=AMIN1(CMOL,CMHA)	838A 132
7967	IF(ITS-ITL-1) 4366,4351,4352	838A 133
7968	4351 ERRS=ERR	838A 134
7969	CMOL=CMHA	838A 135
7970	GO TO 4278	
7971	4352 IF(ERR*ERRS) 4354,4367,4353	838A 137
7972	4353 CMOL=CMHA	838A 138
7973	GO TO 4278	
7974	4354 ITL=55	836A 140
7975	IF(ERRC) 4355,4367,4367	838A 141
7976	4355 CMOL=CMHI	838A 142
7977	GO TO 4278	
7978	4366 IF(ITS-ITL) 4367,4356,4367	838A 144
7979	4356 CMOL=AMIN1(TLHC(L1,IMG,IPR), TLHC(L2,IMG+1,IPR))	
7980	4279 CMOL=AMIN1(CMOL, TLHC(L1,IMG,IPR+1), TLHC(L2,IMG+1,IPR+1))	
7981	4278 ERR=1.E+20	
7982	4367 CMOL=EXP(CMOL)*CM	838A 147
7983	IF(ITS-50) 440,440,998	838A 148
7984	440 ITS=ITS+1	838A 149
7985	IF(ABS(ERR/ERRM)-.01) 4372,4372,423	
7986	C ----- NON-ABLATING SURFACE	838A 151
7987	420 TS=TSAVE	838A 152
7988	IAB=0	838A 153
7989	CMO=0.0	838A 154
7990	4382 ILO(18)=1	838A 155
7991	IMI(18)=KMI(IMG)	838A 156
7992	ILO(19)=1	838A 157
7993	IMI(19)=KMI(IMG+1)	838A 158
7994	430 CONTINUE	838A 159
7995	CALL LOOK(18,TS, TTS(1,IMG,1),0,0,0,0,0,0,0)	838A 160
7996	CALL LOOK(19,TS, TTS(1,IMG+1,1),0,0,0,0,0,0,0)	838A 161
7997	IRA=IR(18)	838A 162
7998	I1=IRA	838A 163
7999	IRB=IR(19)	838A 164
8000	I2=IRB	838A 165
8001	CALL COMP (TCHEM(I1,IMG,1),TCHEM(I2,IMG+1,1),VOID,IFLAG)	
8002	IF(IFLAG-1) 742,743,742	838A 167
8003	743 JCMA=5	838A 168
8004	RETURN	838A 169

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0005      742 CONTINUE
0006      753 CALL LOOK(10,TS,TTS(1,ING ,1),TCHEM(1,ING ,1),TLNC(1,ING ,1),
0007          1 0,0,Y2(1),Y2(3),2)
0008          CALL LOOK(10,TS,TTS(1,ING+1,1),TCHEM(1,ING+1,1),TLNC(1,ING+1,1),
0009          1 0,0,Y2(5),Y2(7),2)
0010          CALL LOOK(10,TS,TTS(1,ING ,2),TCHEM(1,ING ,2),TLNC(1,ING ,2),
0011          1 0,0,Y2(9),Y2(11),2)
0012          CALL LOOK(10,TS,TTS(1,ING+1,2),TCHEM(1,ING+1,2),TLNC(1,ING+1,2),
0013          1 0,0,Y2(13),Y2(15),2)
0014          DO 4321 I=1,8
0015      4321 Y2(I)=Y2(I)+YRF*(Y2(I+8)-Y2(I))
0016      4322 DO 4323 I=1,4
0017      4323 Y2(I)=Y2(I)+VRN*(Y2(I+4)-Y2(I))
0018      433 CALL LOOK (4,TS,TT2(1,2),TEP(1,2),0,0,0,ENIV,DNIV,1)
0019          IF(MAYL(1)-2) 434,442,434
0020      434 CALL LOOK (3,TS,TT2(1,1),TEP(1,1),0,0,0,Y3,03,1)
0021          ENIV=ENIV+XP1*(Y3(1)-ENIV)
0022          DNIV=DNIV+XP1*(03(1)-DNIV)
0023      442 TSSC=TS*TS
0024      4422 RAD=SIC*ENIV*TSSQ*TSSQ*VF
0025      439 ERR=CM*Y2(1)+ENIV*QRA-RAD-B(1)*TS+ERFX
0026          ERRM=AMAX1(ABS(CM*Y2(1)),ABS(ENIV*QRA),ABS(RAD),ABS(B(1)*TS),
0027          1 ABS(ERFX))
0028          DERR=CM*Y2(3)+((QRA-RAD/ENIV)*DNIV-4./TS*RAD-B(1))
0029          ERRC=ERR/DERR
0030          VITER(ITS)=TS
0031          EITER(ITS)=ERR
0032          TS=TS-ERRC
0033      4391 TSMI=-1.E+30
0034          TSMA=+1.E+30
0035          IF(ILO(10)-IRA) 4509,4501,4501
0036      4500 IF(ILO(19)-IRB) 4503,4501,4501
0037      4503 TSMI=AMAX1(TSMI,TTS(IRB,ING+1,IPR)+TTS(IRB-1,ING+1,IPR),
0038          1 TTS(IRA,ING,IPR)+TTS(IRA-1,ING,IPR))/2.
0039          TS=AMAX1(TS,TSMI)
0040      4501 IF(INI(10)-IRA-1) 4507,4507,4500
0041      4500 IF(INI(19)-IRB-1) 4507,4507,4510
0042      4510 TSMA=AMIN1(TSMA,TTS(IRB+1,ING+1,IPR)+TTS(IRB+2,ING+1,IPR),
0043          1 TTS(IRA+1,ING,IPR)+TTS(IRA+2,ING,IPR))/2.
0044          TS=AMIN1(TS,TSMA)
0045      4507 CONTINUE
0046          IF(ITS-50) 441,441,990
0047      441 ITS=ITS+1
0048          IF(ABS(ERR/ERRM)-.01) 4390,4390,430
0049      990 WRITE (KOUT,529)
0050          WRITE(KOUT,502)(VITER(I),EITER(I),I=1,51)
0051          WRITE(KOUT,502) TM,DTM,VRN,ERFX,TABC,ENIV,DNIV,RAD,B(1),CM,PNI,
0052          1 0(1),ME,XP1,QRA,Y2(1),Y2(2),Y2(3),Y2(4)
0053          TM=TMFIN
0054          JCNA=0
0055          RETURN
0056      C ----- POST ITERATION
0057      4390 CONTINUE
0058          IF(IAR) 4371,4371,4372
0059      4371 CMO=EXP(Y2(2))*CM
0060          Y2(2)=Y2(1)
0061      4372 OCONV=CM*Y2(2)
0062          IF(XCM(4)) 4376,4375,4376

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030A 170

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030A 221

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8063 4376 WRITE(KOUT,582) (VITER(I),EITER(I),I=1,ITS)
8064 WRITE(KOUT,582) TH,DTH,VRM,ERFX,TABC,EMIV,DMIV,RAD,B(1),CH,PHI,
8065 1 D(1),HE,XPI,QRA,Y2,DERK,VRP
8066 4375 CONTINUE
8067 QCHEM=0. B38A 222
8068 QSDTB=CMD/RHO(2) B38A 223
8069 1437 RO(1)=RON(1) B38A 224
8070 BR=CH/CHZ B38A 225
8071 QRP=EMIV*QRA B38A 226
8072 QCONO=-D(1)+B(1)*TA(1) B38A 227
8073 QCONVT=QCONVT+QCONV*DTH/AREA(1)*ASU B38A 228
8074 QCHEMT=QCHEMT+QCHEM*DTH/AREA(1)*ASU B38A 229
8075 QCONDT=QCONDT+QCONO*DTH/AREA(1)*ASU B38A 230
8076 QRPT=QRPT+QRP*DTH/AREA(1)*ASU B38A 231
8077 RADT= RADT+RAD*DTH/AREA(1)*ASU B38A 232
8078 C B38A 233
8079 DEDT=RON(1)*CP(1)*(TS-TSAVE)*DEL(1)/DTH B38A 234
8080 DO 95 I=2,NL B38A 235
8081 RO(I) = RON(I) B38A 236
8082 TEMP =(D(I)-A(I)*TA(I-1))/B(I) B38A 237
8083 DEDT=DEDT+RON(I)*CP(I)*(TEMP-TA(I))*DEL(I)*RR(I)/DTH B38A 238
8084 95 TA(I)=TEMP B38A 239
8085 IF (NUMN-NBM) 97,96,96 B38A 240
8086 96 K=NL B38A 241
8087 TA(NBM-1) = TA(NL) B38A 242
8088 DO 98 I = NBM,NUMN B38A 243
8089 K = K+1 B38A 244
8090 98 TA(I) = (D(K)-A(K)*TA(I-1))/B(K) B38A 245
8091 97 DEDTT=DEDTT+DEDT*DTH/AREA(1)*ASU B38A 246
8092 JCMA=1 B38A 247
8093 RETURN B38A 248
8094 END B38A 249
8095 CC00A C00A 001
8096 DIMENSION FT(21)
8097 COMMON/CAMCON/TLHG(20,10,2),TMG(20),TTS(20,10,2),TCHEM(20,10,2), C00A 002
8098 1NLQ(20),NHI(20),KHI(20),JCMA,IMG,IMC,NMG, C00A 003
8099 2TCH(2),TPR(2),TRAD(2),IAB C00A 004
8100 3,T72(20,2),THZ(20,2),TT1(30),THG(30),DH12(2),TA(39),DELHG,I1,I2,CH C00A 005
8101 4,CMD,BPRMG,KCM(10) C00A 006
8102 COMMON/BLQCON/ MGA( 71), MOB( 71),NSPEC,FR( 71,15),W(3),LEF(10) C00A 7
8103 1,LEFS(10),PIEASE,LEFW(10) C00A 8
8104 COMMON/FLXCON/DELQK,DELJW( 8),DQNL(153),DJNL(153, 8),WALLQ C00A 9
8105 1,WALLJ( 8),QW,VJKW( 9),TPWALL C00A 10
8106 COMMON/HISCON/C1,C2,C3,C4,ALPHD,BFTA,ZH(4,14),ZG(4,14),ZSF(4,14, 8) C00A 11
8107 1),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HHUE,HFW,DLX2 C00A 12
8108 2,C3M(40),BETAN(40) C00A 13
8109 COMMON/INTCON/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NC C00A 14
8110 1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) C00A 15
8111 2,B(8), MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) C00A 16
8112 3,KAUXO,JTIME,JSPEC,MD(3) C00A 17
8113 COMMON/PRMCON/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) C00A 18
8114 1,RNOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO, C00A 19
8115 2CONE,RADFL( 50),RADR(40),RAD(40),IRAD C00A 20
8116 COMMON/PRPCON/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15) C00A 21
8117 1,CPBAR(15),VMW(15),PHIK(15, 8),DRHOH,DRHOK( 8),ZK( 8),DZKH( 8), DC00A 22
8118 2MU3K( 8),DMU4K( 8),DTK( 8),DPHIKH( 8),DPRK( 8),DSCK( 8),DCAPCK( 8) C00A 23
8119 3,DHTLK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8) C00A 24
8120 4,DPHIKK( 8, 8), DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,OPTIL,HTIL C00A 25

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8121      5,VMU3,DTH,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15), RHOP C00A 26
8122      6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CR40(14),GMR(15) C00A 27
8123      COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH C00A 28
8124      COMMON/WALCOM/FW(40, 1),TW(40, 1),HW(40, 1),SPW( 8,40, 1) C00A 29
8125      1,RHOVH(40, 1),FLUXJ( 3,40, 1),IHW,ITW,IFW,ISPW,IRHOVH,IFLUXJ C00A 30
8126      COMMON/EQTCOM/SIP,HIP
8127      DATA VOID/4HVOID/ C00A 00
8128      DATA SEG1/6HSEG1 / C00A 024
8129      DATA SEG2/6HSEG2 / C00A 025
8130      DATA SEG3/6HSEG3 / C00A 026
8131      DATA SEG4/6HSEG4 / C00A 027
8132      7234 FORMAT(10I1,3I5,35X,20I1)
8133      C++N.B.++ALSO DEFINED IN INPOUT,INPUT,CRECT AND RERAY
8134      KIN=8
8135      KOUT=5
8136      READ(KIN,7234) KCM,ITEM,IS,NITEM,KR
8137      KR(12)=1
8138      KR(2)=2
8139      KR17=KR(17)
8140      C IF KCM(10) = 0, DO NOTHING
8141      C IF KCM(10) = 1, SAVE
8142      C IF KCM(10) = 2, RESTART -- NO SAVE
8143      C IF KCM(10) = 3, RESTART -- SAVE
8144      IF (KCM(10)) 90,90,93
8145      90 CONTINUE
8146      GO TO 95
8147      93 REWIND 12
8148      95 REWIND 13
8149      REWIND 14
8150      B(1)=.5
8151      B(2)=.333333333 C00A 031
8152      B(3)=.166666666 C00A 032
8153      B(4)=.125 C00A 033
8154      B(5)=.041666666 C00A 034
8155      B(6)=.033333333 C00A 035
8156      B(7)=.013888888 C00A 036
8157      B(8)=.003968254 C00A 037
8158      IF (KCM(10) - 2) 102,100,100 C00A 038
8159      C RESTART
8160      100 NBT=13
8161      DO 107 IRW=1,2
8162      LIM=((IS-IRW+2)/2-1)*NITEM+ITEM-MOD(IS-1+IRW,2)
8163      IF(LIM) 107,107,109
8164      109 DO 108 I=1,LIM
8165      108 READ(NBT) HSTEQV
8166      107 NBT=14
8167      LIM=((IS-1)*NITEM+ITEM-1)*2
8168      DO 103 I=1,LIM
8169      103 READ(12) DUMEQV
8170      CALL DUMCOM(101)
8171      CALL DN2COM(101)
8172      GO TO 147
8173      102 NS=1
8174      IT=1
8175      105 IS=0 C00A 041
8176      MWE=-1 C00A 042
8177      JCMA=1 C00A 043
8178      110 IS=IS+1 C00A 044
C00A 045

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8179	IF (IS-NS) 115,115,105	
8180	115 CONTINUE	
8181	C CALL LOAD(SEG3)	C00A 047
8182	CALL INPOUT	C00A 048
8183	ITEM=1	C00A 049
8184	120 J=MOD(ITEM,2)+1	C00A 050
8185	DO 129 IMG=1,NMG	C00A 051
8186	LIMC=NHI(IMG)	C00A 052
8187	DO 129 IMC=1,LIMC	C00A 053
8188	129 TCHEM(IMC,IMG,J)=VOID	C00A 054
8189	C CALL LOAD (SEG4)	C00A 055
8190	C REWIND 10	C00A 056
8191	CALL SETUP	C00A 057
8192	TPR(J)=TIME(ITEM)	C00A 058
8193	TCH(J)=-1./C3M(IS)	C00A 059
8194	TRAD(J)=RADS(IS)	
8195	IF(ITEM-1) 128,128,130	C00A 061
8196	128 TPR(1)=TIME(NITEM)	C00A 062
8197	130 CONTINUE	
8198	C CALL LOAD(SEG1)	C00A 063
8199	CALL CMA	C00A 064
8200	C CALL LOAD(SEG2)	C00A 065
8201	KR(11)=3+IAB	C00A 066
8202	LIM=8	C00A 067
8203	IF(JCMA-3) 140,150,160	C00A 068
8204	140 IF(JCMA) 141,141,142	C00A 069
8205	141 WRITE(NBT) KCM	C00A 070
8206	STOP	C00A 071
8207	142 FLUXJ(1,IS,IT)=0.	
8208	FLUXJ(2,IS,IT)=-BPRMG	
8209	FLUXJ(3,IS,IT)=-CMD/CH	
8210	TW(IS,IT)=TA(1)	C00A 075
8211	KR(11)=3	
8212	CALL BLIMP	C00A 076
8213	145 IF (IABS(KCM(10)-2)-1) 147,146,147	
8214	146 CALL DUNCOM(102)	
8215	CALL DM2COM(102)	
8216	147 ITEM = ITEM+1	
8217	IF(JCMA-1) 110,110,120	C00A 078
8218	150 LIM=4	C00A 079
8219	KR(11)=4	C00A 080
8220	160 II=I1	C00A 081
8221	C REWIND 10	C00A 082
8222	J=MOD(ITEM,2)+1	C00A 083
8223	DO 280 K=1,LIM	C00A 084
8224	IF(TCHEM(II,IMG,J)-VOID) 209,170,209	C00A 085
8225	170 FLUXJ(1,IS,IT)=0.	
8226	FLUXJ(2,IS,IT)=-TMG(IMG)	
8227	IF(JCMA-4) 180,180,190	C00A 088
8228	180 FLUXJ(3,IS,IT)=-EXP(TLMC(II,IMG,J))	
8229	GO TO 200	C00A 090
8230	190 FLUXJ(3,IS,IT)=0.	
8231	TW(IS,1)=TTS(II,IMG,J)	C00A 092
8232	200 CALL BLIMP	C00A 093
8233	CALL LOOK(2,T(1),TT1,TMG,0,0,0,HGA,CT1,1)	C00A 094
8234	HGA=HGA+DELHG	C00A 095
8235	CALL LOOK(4,T(1),TT2(1,2),THZ(1,2),0,0,0,HCH,CT2,1)	C00A 096
8236	HCH=HCH+DH12(2)	C00A 097

8237	IF(JCMA.GT.4) TLHC(II,IMG,J)=ALOG(AMAX1(-W(3),0.00001))	
8238	TCHEM(II,IMG,J)=(W(2)+W(3))*HIP*1.8+HALLO-W(2)*HGA-W(3)*HCH	
8239	TTS(II,IMG,J)=T(1)	C00A 099
8240	209 GO TO (210,220,260,250,210,230,260,250),K	C00A 100
8241	210 ITEM=ITEM-1	C00A 101
8242	GO TO 270	C00A 102
8243	220 II=I2	C00A 103
8244	GO TO 240	C00A 104
8245	230 II=I2+1	C00A 105
8246	240 IMG=IMG+1	C00A 106
8247	GO TO 280	C00A 107
8248	250 IMG=IMG-1	C00A 108
8249	II=I1+1	C00A 109
8250	GO TO 280	C00A 110
8251	260 ITEM=ITEM+1	C00A 111
8252	270 J=3-J	C00A 112
8253	280 CONTINUE	C00A 113
8254	GO TO 130	C00A 114
8255	END	C00A 115
8256	CC018	C01B 001
8257	SUBROUTINE DM2COM(ICK)	C01B 002
8258	COMMON/CANCOM/TLHC(20,10,2),TMG(20),TTS(20,10,2),TCHEM(20,10,2),	C01B 003
8259	1NLO(20),NHI(20),KHI(20),JCMA,IMG,IMC,NMG,	C01B 004
8260	2TCH(2),TPR(2),TRAD(2),IAB	C01B 005
8261	3,TT2(20,2),THZ(20,2),TT1(30),THG(30),DH12(2),TA(39),DELHG,I1,I2,CHC	C01B 006
8262	4,CMD,BPRMG,KCM(10)	C01B 007
8263	EQUIVALENCE (NCLASS,JCMA)	C01B 008
8264	COMMON/LOOCOM/KOUT,IEX,DEN,VR,IHI(23),ILO(23),IR(23)	C01B 009
8265	COMMON/CMACOM/TEP(20,2),TCP(20,2),TKP(20,2)	C01B 010
8266	3,RHO(2),MATL(38),DEL(39),SO(20),H(38),RC(38),RA(38),RECORD(36),	C01B 011
8267	4AREA(38),EMA(38),RAV(38),	C01B 012
8268	5ROA(152),ROB(152),ROC(152),	C01B 013
8269	6 TPI(30),VFZ,CMH,NPR,	C01B 014
8270	7LCT,NPG,II,NBM,NUMN,NL, DELH,RFT,RHORA,RHORB,RHORC,TRA	C01B 015
8271	8CA,TRACB,TRACC,RH00A,RH00B,RH00C,EA,EB,EC,BA,BB,BC,PSIA,PSIB,PSIC,	C01B 016
8272	9TRACH,PET,PETE,RSV,ETA,DTPR3,DTPR2,DTPRT,TPR3,TPR2,THZRO,THFIN,WT	C01B 017
8273	COMMON/CMACOM/EPST,TRES,	C01B 018
8274	1TMWT,GAMA,OMG,NO,FJFH,FJFS,JF,JFHP,JFH,INPUT, DTHIN,BRP,HCONV,	C01B 019
8275	2INCH,DTHB,NN,NI,NOI,CHCRI,PYCRI,NCON, NR,TX(30),F1(30),F2(30)	C01B 020
8276	COMMON/SBCP/BF,CHMA,CHMI,DERR,DMIV,EMIV,ERFX,ERRC,ERR,ERRS,I3,I4,	C01B 021
8277	1VRM,VRP,IPR,IRA,IRB,IRC,IRD,ITL,PHI,QQ,TAGC,TEMP,TSMA,TSMI,TSSQ	C01B 022
8278	COMMON/SBCP/ TNXT, DNCP(3),CPE(3),TO(20),VITER(51),EITER(51)	C01B 023
8279	COMMON/SBCP/ Y2(16),D2(16),Y3(8),D3(8),Y1(2),D1(2)	C01B 024
8280	COMMON/SBCP/ CPC(50),CPV(50),CP(50),HP (50),HC(50),CN(50),	C01B 025
8281	1RAT(50),ROT(50),RO(50),X(50),RON(50),DMDG(50),RR (50),	C01B 026
8282	2CNC(50),A(50),B(50),C(50),D(50),ENO(50),CNO(50)	C01B 027
8283	COMMON/SBCP/BR, CHZ, CMDL, DEOT,DEDIT,DSOTB,OTH,GSHS,HW,	C01B 028
8284	1HE, ITS,PRES,QCHEM,QCHEMT,QCOND,QCONDY,QCONV,QCONVT,QRA,QRP,	C01B 029
8285	2QRPT,RAD,RADT,RSU,SIG, TSAVE,VF,XP1,ASU	C01B 030
8286	COMMON/MISC/ BPRM,CMT,COLD,CP1,CPGAS,CFNL,CZ,DCOT,DECOM,	C01B 031
8287	1DECOMT,DELGR,DELR,DENOLD,DICT,ONS,DPOT,DRLCF,DRLC,DRLP,DRL,DROAC,	C01B 032
8288	2DROAT,DROBC,DROBT,DROCC,DROCT,DROOTD,DSOT,DSI,DS,DSS,DTA,DTHC,DTHSC	C01B 033
8289	3,DYS,DVB,DZ,EGO,EZ,FACT1,FACT2,FA,F8,FC,FJF,FK,FZ,GSEGR,GSN,GSMT,	C01B 034
8290	4GZ,H1,HAPHB,HBAR,HGAS,HRES,IE,IMIN,I,IS,ISV,ITER,J1,J,KK,K,KT,L,	C01B 035
8291	5NDR,NLI,NLM,N,NZ,O,PGPU,PGPUT,POLD,POM,QLOSS,QLOSSY,RO,RO1,ROOZ,SAC	C01B 036
8292	6,SOEGR,TAS,TB,TERM1,TERM2,TERM3,THDS,TH,THPRT,TN,TOP1,TOP2,TOP3,T,	C01B 037
8293	7TT,VOL,X1	C01B 038
8294	EQUIVALENCE (DH1,DH12(1)),(DH2,DH12(2)),(TS,TA)	C01B 039

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8295      DIMENSION CAMEQV(1478), LOOEQV( 73), CMAEQV(1125), SBCEQV(1237),
8296      1      MISEQV(101)
8297      EQUIVALENCE (CAMEQV, TLMC), (LOOEQV, KOUT), (CMAEQV, TEP),
8298      1      (SBCEQV, BF), (MISEQV, BPRM)
8299      IF (ICK - 101) 40, 10, 20
8300      10 READ ( 12 ) CAMEQV, LOOEQV, CMAEQV, SBCEQV, MISEQV
8301      GO TO 40
8302      20 WRITE( 12 ) CAMEQV, LOOEQV, CMAEQV, SBCEQV, MISEQV
8303      40 RETURN
8304      END
8305      CC02A
8306      SUBROUTINE BLIMP
8307      DIMENSION HIST1(605), HIST2(607), HIST3(511), VMAT(566), HIST4(600)
8308      COMMON/BLQCOM/ MOA( 71), MOB( 71), NSPEC, FR( 71, 15), W(3), LEF(10)
8309      1, LEFS(10), PIEASE, LEFW(10)
8310      COMMON/EDGCOM/      PE(40, 1), PTE(40, 1), SPE( 8, 40, 1), DUES,
8311      1UE(40), RHOE(40), VMUE(40), TE(40), UEDGE, DUEDGE, D2UEDG, VMWE, HE, C90
8312      2 , DSIP(40), IDSIP, TTVC, TVCC(40)
8313      COMMON/FLPCOM/TXI(2), TUE(2), TRHOE(2), TTE(2), TVMUE(2), TMT(566, 2)
8314      2, THF(15, 2), LEFT(10, 2), TPE(2), TRACS(2), TDSIP(2), KQT(2)
8315      COMMON/HISCOM/C1, C2, C3, C4, ALPHD, BETA, ZH(4, 14), ZG(4, 14), ZSP(4, 14),
8316      1), XI(40), HF(15, 5), HG(15, 3), HSP(15, 3, 8), HALPH, HUE, HHUE, HFW, DLX2
8317      2, C3M(40), BETAM(40)
8318      COMMON/INTCOM/ KR(20), KIN, KOUT, MAT1I, MAT2I, MAT1J, MAT2J, NETA, I, IS,
8319      1S, IT, NTIME, NSP, NSPM1, NAM, NLEQ, NNLEQ, NRNL, ITS, KAPPA, CBAR, CASE(15)
8320      2, B(8), MWE, NON, KQ(10), ITEM, NITEM, KR17, NBT, NBT2, IDENT, KR9(40)
8321      3, KAUX0, JTIME, JSPEC, MC(3)
8322      COMMON/PRMCOM/TIME( 50), PRE(40), PTET( 50), GE( 50), S(40), ROKAP(40)
8323      1, RNOSE, VKAP, NDISC, IDISC(40), NSD(10), MSD(10), ITF( 50), IPRE, RADNO,
8324      2GONE, RADFL( 50), RADR(40), RADS(40), IRAD
8325      COMMON/VARCOM/F(4, 15), G(3, 15), SP(3, 15, 9), ALPH
8326      COMMON/WALCOM/FW(40, 1), TH(40, 1), HW(40, 1), SPW( 8, 40, 1)
8327      1, RHOVW(40, 1), FLUXJ( 3, 40, 1), IHW, ITW, IFW, ISPW, IRHOVW, IFLUXJ
8328      EQUIVALENCE(HIST1, XI), (HIST2, PE), (HIST3, F), (VMAT, C1), (HIST4, FW)
8329      3 FORMAT(/1H17X4HTIMEE12.5, 35H SECONDS - - - STREAMWISE DIMENSICNE12
8330      1.5, 11H FEET - - - 3A6)
8331      CALL DATE(9, MD)
8332      CALL TOD(18, MD)
8333      WRITE(KOUT, 3) TIME(ITEM), S(1S), MD
8334      140 J=MOD(ITEM, 2)+1
8335      DO 142 I=1, NETA
8336      142 HF(I, 5)=THF(I, J)
8337      XI(1S)=TXI(J)
8338      RADS(1S)=TRAOS(J)
8339      DSIP(1S)=TDSIP(J)
8340      UE(1S)=TUE(J)
8341      RHOE(1S)=TRHOE(J)
8342      TE(1S)=TTE(J)
8343      VMUE(1S)=TVMUE(J)
8344      KQ(10)=KQT(J)
8345      DO 141 I=1, 566
8346      141 VMAT(I)=TMT(I, J)
8347      PTE(1S, 1)=PTET(ITEM)
8348      PE(1S, 1)=TPE(J)
8349      DUM1=(GE(ITEM)-G(1, 1))/(G(1, NETA)-G(1, 1))
8350      DO 113 I=1, NETA
8351      G(3, I)=G(3, I)*DUM1
8352      G(2, I)=G(2, I)*DUM1

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C01B 041
C02A 001
C02A 002
C02A 003
C02A 4
C02A 5
C02A 6
C02A 7
C02A 8
C02A 9
C02A 10
C02A 11
C02A 12
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C02A 21
C02A 22
C02A 23
C02A 008
C02A 023
C02A 027
C02A 028
C02A 029
C02A 030
C02A 031
C02A 032
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C02A 035
C02A 036
C02A 037
C02A 038
C02A 039
C02A 040
C02A 041
C02A 042

8353	113	$G(1,I) = G(1,1) + DUM1 * (G(1,I) - G(1,1))$	C02A 043
8354		ITS=0	C02A 044
8355		KR(17)=KR17	C02A 045
8356	43	CALL ITERAT	C02A 046
8357		CALL OUTPUT	C02A 047
8358		IF(NON) 43,40,41	
8359	41	STOP 5050	
8360	40	RETURN	C02A 049
8361		END	C02A 050

SECTION IV

CHECK CASES

Two check cases were run on the AFWL CDC 6600 computer using the modified BLIMP code with the entropy layer swallowing option. Check Case I was a rocket sled boundary layer which simulates a reentry plasma. Edge conditions for this case have in the past been difficult to obtain using mass balancing techniques external to BLIMP. Check Case II was the boundary layer on a typical reentry vehicle.

Definition, input, and output of Case I and of Case II follow. The complete output is not included due to its large volume. Only the first and last points of the boundary layer edge and shock thermodynamic state output are presented. The boundary layer solutions for the stagnation point and for one station on the after body are presented for each case.

1. CHECK CASE 1 - SPHERE-CONE ON ROCKET SLED

a. Vehicle Configuration

1) Geometry: Sphere-cone

- a) Nose Radius: 1/2-inch
- b) Cone half angle: 9 degrees
- c) Length (streamwise): 1.9639 feet

2) Heatshield:

- a) Location: Between streamwise distances of .10686 feet and 1.5520 feet.
- b) Material: Avcoat 8024 (epoxy urethane)-C₅₆₇H₉₅₀O₁₁₃N₃₅
- c) From 0 to .10686 feet (streamwise) and from 1.5520 to 1.9639 the cone is considered nonablating.
- d) Contamination: Heatshield contains 20 pct by weight CsNO₃.

b. Wall Boundary Conditions

- 1) Mass Ablation Rate: See Case I input cards.
- 2) Wall Temperature: See Case I input cards.

c. Free Stream Properties

- 1) Altitude: 4,000 feet
- 2) Velocity: 8,000 feet/second
- 3) Density: .06792 lb/ft³
- 4) Enthalpy: 120.435 Btu/lb (ref. to 0°K).
(static, -7.761 Btu/lb, ref. to 298°K)
- 5) Pressure: 0.86384 atm
- 6) Mach No.: 7.2661

d. Shock Data

- 1) Local Pressure Ratio: See Case I input cards
- 2) Stagnation Conditions (from inviscid flow solution):
 - a) Pressure: 59.114 atm
 - b) Enthalpy: 1270.5 Btu/lb (ref. to 298°K)
- 3) Froestream stream function position vs. shock angle:
See Case I input cards

e. Input cards

1020302020020000 1 CHECK CASE 1 - 8000 FPS ROCKET SLED

blank card

5

1

1.

30

0.

.058705

.36080

-1.5528

15

0.

.1

13 .08

2.0

-0.4144667

.041154

blank card

52.114

1270.5

0.44

1610.

6

1HYDROGEN

6 CARBON

7NITROGEN

8 OXYGEN

55 CESIUM

99ELECTRON

1 55

183100+5

183100+5

2 1 0

-

-

1 6 1

-264170+5

-264170+5

1 6 2

-240840+5

-240840+5

2 7 0

0+0

0+0

1 00

0

0

1 6 0

170896+5

170896+5

1 1 0

521020+5

521020+5

1 0 0

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595590+5	135220+5	497278+1	380768-5	154749+5	500960+2	500.	3000.1	0.0
595590+5	135220+5	657489+1	-224262-3	891732+7	500960+2	3000.	5000.1	0.0
1 7 0	0 0 0	0			JANAF 03/61			N
112965+6	134370+5	486244+1	383516-4	959450+5	430900+2	500.	3000.1	0.N
112965+6	134370+5	422057+1	240844-3	417273+6	490900+2	3000.	5000.1	0.N
3 6 0	0 0 0	0	*		JANAF 12/60			C3
189670+6	366220+5	146441+2	622536-4	168227+7	798410+2	500.	3000.1	0.C3
189670+6	366220+5	144782+2	792232-4	646077+6	798410+2	3000.	5000.1	0.C3
4 1 1	6 0 0	0 0 0	0	*	JANAF 03/61			CH4
-178950+5	530790+5	230748+2	677806-3	755061+7	825970+2	500.	3000.1	0.CH4
-178950+5	530790+5	236053+2	374323-3	368234+7	825970+2	3000.	5000.1	0.CH4
1 6 1	7 0 0	0 0 0	0	C	JANAF 12/62			CN
109000+6	222490+5	655906+1	115326-2	479517+6	669760+2	500.	3000.1	0.CN
109000+6	222490+5	988013+1	313855-3	649453+7	669760+2	3000.	5000.1	0.CN
1 1 1	6 0 0	0 0 0	0		JANAF 03/61			CH
142006+6	221300+5	826079+1	302211-3	100184+7	616120+2	500.	3000.1	0.CH
142006+6	221300+5	707091+1	463281-3	552860+7	616120+2	3000.	5000.1	0.CH
1 1 1	6 1 7	0 0 C	0	C	0	0	0	JANAF 03/61
312000+5	355920+5	127023+2	552243-3	228955+7	758620+2	500.	3000.1	0.CHN
312000+5	355920+5	178895+2	-295052-3	183671+8	758620+2	3000.	5000.1	0.CHN
1 1 1	6 1 8	0 0 0	0	0	0	0	0	JANAF 03/61
-290000+4	323670+5	128033+2	300638-3	201721+7	789830+2	500.	3000.1	0.CHO
-290000+4	323670+5	107028+2	633312-3	121615+8	789830+2	3000.	5000.1	0.CHO
2 6 0	0 0 0	0			JANAF 9/61			C2
193900+6	246990+5	776612+1	696081-3	185649+6	685519+2	500.	3000.1	0.C2
193900+6	246990+5	104162+2	566841-4	640205+7	685519+2	3000.	5000.1	0.C2
2 1 2	6 0 0	0 0 0	0		JANAF 03/61			C2H2
541900+5	482570+5	190960+2	769044-3	409039+7	849690+2	500.	3000.1	0.C2H2
541900+5	482570+5	202952+2	389062-3	645297+7	849690+2	3000.	5000.1	0.C2H2
2 55					JANAF 06/68			AFWL-JEF
253900+5	273409+5	794214+1	122378-2	220339+6	903289+2	500	3000.1	CS2
253900+5	273409+5	110929+2	827707-3	174425+	903289+2	3000	6000.1	CS2
1 1 1	6 1 55				ATLANTIC RESEARCH			AFWL-NV
-550900+5	369369+5	129799+2	539248-3	222031+6	913640+2	500	3000.1	CSOH
-550900+5	369369+5	140099+2	477010-4	341184+7	913640+2	3000	6000.1	CSOH
1 1 1	7 2 8	0 0 0	0	0	0	0	0	JANAF 06/63
-183400+5	468800+5	168879+2	915578-3	107976+7	962540+2	500	3000.1	AFWL - WRS
-183400+5	468800+5	133435+2	221282-3	386246+7	962540+2	3000	5000.1	AFWL - WRS
1 1 1	7 2 8	0 0 0	0	0	0	0	0	JANAF 06/63
-188400+5	468840+5	168223+2	926502-3	102717+7	962980+2	500	3000.1	AFWL - WRS
-188400+5	468840+5	122227+2	224085-3	378011+7	962980+2	3000	5000.1	AFWL - WRS
1 1 1	0 0 0	0 0 0	0	0				JANAF 12/60
933000+4	214040+5	772193+1	304286-3	973561+6	613820+2	500.	3000.1	0.HO
933000+4	214040+5	065144+1	442528-4	586115+7	613820+2	3000.	5000.1	0.HO
2 1 1	8 0 0	0 0 0	0	0				JANAF 03/61
-577900+5	302010+5	112254+2	811297-3	260800+7	684210+2	500.	3000.1	0.H2O
-577900+5	302010+5	157273+2	191543-3	173599+8	684210+2	3000.	5000.1	0.H2O
1 7 1	8 0 0	0 0 0	0	0				JANAF 06/63
215800+5	227000+5	877523+1	999031-4	789656+6	688490+2	500.	3000.1	0.NO
215800+5	227000+5	916260+1	557885-5	212519+7	688490+2	3000.	5000.1	0.NO
2 0 0	0 0 0	0			ABBETT LOW TEMP			O2
0+0	146500+5	8.1287	-00167		63228 +2	500.	1	-002
0+0	224459+5	802690+1	427028-3	242222+6	579729 2	3000.	1	-002
1 55 -1	00				JANAF 06/68			AFWL-JEF
133000+6	124229+5	406709+1	030000-9	215212-6	520350+2	500	3000.1	CS+1
108000+6	124229+5	406500+1	030000-9	623513-4	520350+2	3000	6000.1	CS+1

1 6 -1 00 0 0 0 0 0 0	CONVAIR ZPH-122 12/61	C+
+328925+6+150120+5+482657+1+130700-4+340000+5+484232+22000. 10000.1		C+
+428785+6+150120+5+482657+1+130700-4+340000+5+484232+22000. 10000.1		C+
1 1 -1 00	AFWL TDR 34-44 MOK TO 293 JEFH+1	
357151+6 104226+5 406703+1-506233-3-304069-6 374820+2 500 30001		H+1
367151+6 104226+5 406703+1-267224-5-113416-4 374820+2 3000 50001		H+1
1 7 -1 00 0 0 0 0 0 *	CONVAIR ZPH-122 12/61	N+
+445641+6+151310+5+501751+1+617100-4-184100+7+496847+22000. 10000.1		N+
+445641+6+151310+5+501751+1+617100-4-184100+7+496847+22000. 10000.1		N+
2 0 1 00 0 0 0 0 0	CONVAIR ZPH-122 12/61	O2-
-205250+5+267570+5+111480+2-656700-4-779100+7+699149+22000. 10000.1		O2-
-205250+5+267570+5+111480+2-656700-4-779100+7+699149+22000. 10000.1		O2-
1 6 1 0 -1 00 0 0 0 0 0 0 0 0	CCONVAIR ZPH-122 12/61	CO+
+224293+6+243330+5+292610+1+378000-4-150900+7+666595+22000. 10000.1		CO+
+224293+6+243330+5+292610+1+378000-4-150900+7+666595+22000. 10000.1		CO+
1 7 1 0 -1 00 0 0 0 0 0 0	CCONVAIR ZPH-122 12/61	NO+
+232910+6+241070+5+210216+1+277400-4-316500+7+654379+22000. 10000.1		NO+
+232910+6+241070+5+210216+1+277400-4-316500+7+654379+22000. 10000.1		NO+
1 8 -1 00 0 0 0 0 0 0	CONVAIR ZPH-122 12/61	O+
+271000+6+149220+5+336271+1+306710-3+590200+7+484849+22000. 10000.1		O+
+271000+6+149220+5+336271+1+306710-3+590200+7+484849+22000. 10000.1		O+

blank card

20.3000.	0.06792	-7.761	0.86384				
5 0.	.020022	.042044	.059622	.080267	.10229	.12122	.14190
.17047	.20533	.25116	.29886	.39531	.50475	.59883	.70431
.80563	1.0149	1.4004	1.8017				
2 0.	.3554	.6859	.9353	1.0980	1.1971	1.2483	1.2662
1.3196	1.3451	1.3587	1.3692	1.3809	1.3737	1.3631	1.3587
1.3566	1.3545	1.3537	1.3535				

blank card

1.0	.0803	.05703	.90543	.81312	.59897	.35254	.22746
.075363	.071960	.067962	.064438	.059230	.059126	.043652	.037947
.035854	.035302	.036110	.037829	.039577	.041609	.042712	.043350
.043353	.043601	.043828	.044029	.044211	.044487		

six blank cards

5400.	5200.	5000.	4700.	4400.	4000.	3700.	3200.
2800.	2600.	2400.	2000.	1600.	1522.	1513.	1506.
1501.	1499.	1498.	1502.	1505.	1509.	1510.	1510.
1500.	1500.	1500.	1500.	1500.	1500.		

nine blank cards

0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	.65	.585	.55
.52	.49	.482	.495	.518	.539	.549	.55

0. 0. 0. 0. 0. 0.
blank card
:
:
(end of file card)

f. Computer output

The first and last points of the boundary layer edge and shock thermodynamic state output are presented. The boundary layer solutions for the stagnation point and for one station on the afterbody are also included.

BOUNDARY LAYER INTEGRAL MATRIX PROGRAM (BLIMP)
AEROTHERM CORPORATION, PALO ALTO, CALIF (RMK, EPB)

CASE CHECK CASE 1 - 8000 FPS POCKET SLED

CONTROL NUMBERS 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
1 0 2 0 3 0 2 0 2 0 0 2 0 0 0 0 0 0 1 0 -0

PUNCH CONTROL
IDENT JSPEC
-0

U/UE TO NORM. ETA	NODAL PT. AT WHICH ETA NORM.	ETA VALUES
9.500E-01	13	0.E+00 2.000E-03 4.000E-03 7.000E-03 1.200E-02 2.000E-02 3.000E-02 5.000E-02 1.000E-01 2.000E-01 3.500E-01 5.000E-01 1.000E+00 1.600E+00 2.500E+00
NOSE RADIUS, FT	4.16667E-02	CONE HALF ANGLE 9.00000E+00 DEGREES

CASE 1.00000E+00

TOTAL ENTHALPY, BTU/LB 1.27050E+03

TOTAL PRESSURE, ATM 5.91140E+01

INCIDENT RAD FLUX, B/SF2 0.E+00

MIXING LENGTH CONSTANT = 4.4000E-01
SUBLAYER CONSTANT, YA+ = 1.1823E+01
CLAUSER NUMBER = 1.8000E-02
TURBULENT SCHMIDT NUMBER = 9.0000E-01
TURBULENT PRANDTL NUMBER = 3.0000E-01
TRANSITION MOM. THICK. RE = 3.0000E+02

CASE 1

RELATIVE ELEMENTAL COMPOSITIONS, ATOMIC WTS/UNIT MASS									
AT.NO.	ELEMENT	ATOMIC WT	EDGE GAS	P/PO	GAS 1	CHAR 1	PYRO.GAS 2	CHAR 2	PYRO.GAS 3
1	HYDROGEN	1.00400	0.000000	-0.000000	0.000000	0.000000	-0.000000	-0.000000	-0.000000
6	CARBON	12.01100	0.000000	-0.000000	0.000000	0.000000	-0.000000	-0.000000	-0.000000
7	NITROGEN	14.00800	0.000000	-0.000000	0.000000	0.000000	-0.000000	-0.000000	-0.000000
8	OXYGEN	16.00000	0.000000	-0.000000	0.000000	0.000000	-0.000000	-0.000000	-0.000000
55	CESIUM	132.91300	0.000000	-0.000000	0.000000	0.000000	-0.000000	-0.000000	-0.000000
99	ELECTRON	0.00055	0.000000	-0.000000	0.000000	0.000000	-0.000000	-0.000000	-0.000000

THERMODYNAMIC PROPERTY CURVE-FIT DATA (SEE MANUAL FOR FORMAT)

THERMODYNAMIC PROPERTY CURVE-FIT DATA (SEE MANUAL FOR FORMAT)									
1.	55-0.	-0-0.	-0-0.	-0-0.	-0-0.	-0-0.	-0-0.	-0-0.	-0-0.
0.18320E+05	0.14043E+05	0.36812E+01	0.95347E-03	0.36387E+06	0.53653E+02	500.0000	3000.0000	1	0.000000
0.18320E+05	0.14043E+05	0.17745E+02	0.62187E-02	0.48342E+08	0.53653E+02	3000.0000	6000.0000	1	0.000000
2.	1 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.
0.E+00	0.21210E+05	0.71196E+01	0.62195E-03	0.71259E+06	0.48465E+02	500.0000	3000.0000	1	0.000000
0.E+00	0.21210E+05	0.68179E+01	0.58985E-03	0.26511E+07	0.48465E+02	3000.0000	5000.0000	1	0.000000
1.	6 1.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.
-0.26417E+05	0.22357E+05	0.86504E+01	0.11702E-03	0.89821E+06	0.65370E+02	500.0000	3000.0000	1	0.000000
-0.26417E+05	0.22357E+05	0.11550E+02	0.42414E-03	0.13156E+08	0.65370E+02	3000.0000	5000.0000	1	0.000000
1.	6 2.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.
-0.94054E+05	0.36535E+05	0.14456E+02	0.21039E-03	0.18239E+07	0.79848E+02	500.0000	3000.0000	1	0.000000
-0.94054E+05	0.36535E+05	0.15645E+02	0.38156E-04	0.60277E+07	0.79848E+02	3000.0000	5000.0000	1	0.000000
2.	7 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.
0.E+00	0.28172E+05	0.52936E+01	0.30800E-02	0.54400	0.66552E+02	-0.0000	500.0000	1	0.000000
0.E+00	0.22165E+05	0.79310E+01	0.31955E-03	0.31429E+06	0.63765E+02	-0.0000	3000.0000	1	0.000000
1.	99-0.	-0-0.	-0-0.	-0-0.	-0-0.	-0-0.	-0-0.	-0-0.	-0-0.
0.E+00	0.13423E+05	0.49680E+01	0.21533E-05	0.26284E+06	0.16459E+02	500.0000	3000.0000	1	0.000000
0.E+00	0.13423E+05	0.49680E+01	0.23377E-06	0.98622E+06	0.16459E+02	3000.0000	5000.0000	1	0.000000
1.	6 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.
0.17089E+06	0.13550E+05	0.44443E+01	0.22813E-03	0.48983E+06	0.49287E+02	500.0000	3000.0000	1	0.000000
0.17089E+06	0.13550E+05	0.41221E+01	0.26191E-03	0.26289E+07	0.49287E+02	3000.0000	5000.0000	1	0.000000
1.	1 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.
0.52102E+05	0.13423E+05	0.48922E+01	0.55547E-04	0.17310E+06	0.38862E+02	500.0000	3000.0000	1	0.000000
0.52102E+05	0.13423E+05	0.3175E+01	0.31533E-03	0.92974E+07	0.38862E+02	3000.0000	5000.0000	1	0.000000
1.	8 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.
0.59559E+05	0.13522E+05	0.49723E+01	0.38077E-05	0.15475E+05	0.50096E+02	500.0000	3000.0000	1	0.000000
0.59559E+05	0.13522E+05	0.65749E+01	0.22427E-03	0.89174E+07	0.50096E+02	3000.0000	5000.0000	1	0.000000
1.	7 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.
0.11297E+06	0.13437E+05	0.48694E+01	0.38352E-04	0.95846E+05	0.48090E+02	500.0000	3000.0000	1	0.000000
0.11297E+06	0.13437E+05	0.42896E+01	0.24084E-03	0.41727E+06	0.48090E+02	3000.0000	5000.0000	1	0.000000
3.	6 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.
0.18967E+06	0.36622E+05	0.14644E+02	0.62254E-04	0.16823E+07	0.79841E+02	500.0000	3000.0000	1	0.000000
0.18967E+06	0.36622E+05	0.14779E+02	0.79223E-04	0.64509E+06	0.79841E+02	3000.0000	5000.0000	1	0.000000
4.	1 1.	6 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.
-0.17895E+05	0.53079E+05	0.23795E+02	0.67790E-03	0.75506E+07	0.82597E+02	500.0000	3000.0000	1	0.000000
-0.17895E+05	0.53079E+05	0.23605E+02	0.37432E-03	0.36823E+07	0.82597E+02	3000.0000	5000.0000	1	0.000000
1.	6 1.	7 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.
0.10900E+06	0.23249E+05	0.65591E+01	0.11533E-02	0.47952E+06	0.66976E+02	500.0000	3000.0000	1	0.000000
0.10900E+06	0.23249E+05	0.98901E+01	0.31386E-03	0.64945E+07	0.66976E+02	3000.0000	5000.0000	1	0.000000
1.	1 1.	6 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.
0.14201E+06	0.22130E+05	0.92608E+01	0.30221E-03	0.10018E+07	0.61612E+02	500.0000	3000.0000	1	0.000000
0.14201E+06	0.22130E+05	0.70703E+01	0.46328E-03	0.55286E+07	0.61612E+02	3000.0000	5000.0000	1	0.000000
1.	1 1.	6 1.	7 0.	0 0.	0 0.	0 0.	0 0.	0 0.	0 0.
0.31202E+05	0.35593E+05	0.13712E+02	0.55224E-03	0.22895E+07	0.75862E+02	500.0000	3000.0000	1	0.000000
0.31202E+05	0.35593E+05	0.17489E+02	0.29505E-03	0.19367E+08	0.75862E+02	3000.0000	5000.0000	1	0.000000

[illegible]

ELEMENT BASE SP	HYDROGEN H2	CARBON CO	NITROGEN N2	OXYGEN CO2	DESIGN CS	ELECTRON E-
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MOLECULAR TRANSPORT PROPERTIES

VISCOSITY BUDDENBERG - WILKE MIXTURE FORMULA WITH MU(I) CALCULATED ON THE BASIS OF O(I,I) = DBAR/G(I)**2

THERMAL CONDUCTIVITY MASON - SAKENA MIXTURE FORMULA WITH EUCKEN CORRECTION

DIFFUSION COEFFICIENTS O(I,J) = DBAR/(F(I)*F(J)) WITH DBAR BASED ON SIGMA = 3.4670, EPOVRK = 106.7000, AND MREF = 32.0000

METHODS EMPLOYED

1 CONDENSED PHASE, VALUES FOR F(I) AND G(I) SET EQUAL TO 1.E+10

1 VALUES FOR F(I) (OR G(I)) INPUT DIRECTLY

2 VALUES FOR F(I) (OR G(I)) CALCULATED BY F(I) = (M(I)/FITMOL)**FFA AND G(I) = (M(I)/FITGMW)**GGA WHERE M(I) IS SPECIES MOLECULAR WEIGHT, FITMOL = 26.7000, AND FFA = 0.4890, FITGMW = 24.3000, AND GGA = 0.4500

3 VALUES FOR G(I) CALCULATED BY G(I) = SQRT(DBAR/J(I,I)) = (SIGMA(I)/SIGMA) * (EPS(I)/EPOVRK) **0.0795 * (M(I)/MREF) **0.25 WHERE SIGMA(I) AND EPS(I) ARE GIVEN WITH THERMODYNAMIC DATA

SPECIES	F(I) METHOD	G(I) METHOD	SPECIES	F(I) METHOD	G(I) METHOD
CS	2.192	2	H2	0.283	2
CO	1.024	2	CO2	1.277	2
N2	1.024	2	E-	0.005	2
C	0.677	2	H	0.201	2
O	0.778	2	N	0.729	2
CJ	1.158	2	CH4	0.780	2
CM	0.987	2	CH	0.704	2
CMH	1.085	2	CHO	1.042	2
C2	0.950	2	C2H2	0.988	2
CS2	3.877	2	CSOH	2.325	2
MMO2	1.319	2	MMO2	1.319	2
M3	0.502	2	H2O	0.525	2
NO	1.059	2	O2	1.093	2
CS+1	2.192	2	C+	0.677	2
H+1	0.201	2	N+	0.729	2
C2-	1.093	2	CO+	1.024	2
NO+	1.059	2	O+	0.778	2

STAGNATION SOLUTION FOLLOWED BY BOUNDARY-LAYER EDGE EXPANSION

STREAM FUNCTION, L/SEC	O.E+01	0.10891E+00	0.43554E+00	0.96576E+00	0.17504E+01	0.28427E+01	0.39921E+01	0.54704E+01
	0.74937E+01	0.11510E+02	0.17130E+02	0.24266E+02	0.42455E+02	0.69217E+02	0.97424E+02	0.13477E+03
	3.1733E+03	0.27994E+03	0.53967E+03	0.86191E+03				

SHOCK ANGLE, RADIANS	O.E+01	0.35540E+00	0.68590E+00	0.93530E+00	0.10980E+01	0.11971E+01	0.12488E+01	0.12962E+01
	0.13126E+01	0.13451E+01	0.13587E+01	0.13692E+01	0.13809E+01	0.13737E+01	0.13631E+01	0.13587E+01
	0.13556E+01	0.13545E+01	0.13537E+01	0.13535E+01				

CP-FROZEN CP-EQUIL DLNM/DLNT DLNM/DLNP GAMMA
 0.3J75E+00 0.3575E+00-0.1078E-01 0.4749E-03 0.1244E+01
 TEMP = 2681.4493 DEG-K PRES = 59.1140 ATM MDL WT = 20.8329163
 RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00 0.E+00
 ENTHALPY = 0.705933E+03 CAL/GM ENTROPY = 0.19727E+01 CAL/GM-DEG K
 DENSITY = 0.483521E+00 LB/CUFT
 VEL = 0.E+00 FT/SEC WACH = 0.E+00 AREA = 0.E+00 SQFT/LB/SEC

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
CS	0.E+00	H2	0.E+00	CO	0.E+00
CO2	0.E+00	H2	0.77186E+00	E-	0.19994E-09
C	0.E+00	H	0.E+00	O	0.19032E-02
N	0.15888E-06	C3	0.E+00	CH4	0.E+00
CN	0.E+00	CH	0.E+00	CHN	0.E+00
CHO	0.E+00	C2	0.E+00	C2H2	0.E+00
CS2	0.E+00	CSOH	0.E+00	HN02 CIS	0.E+00
HN02 TRA	0.E+00	H0	0.E+00	H2O	0.E+00
NO	0.30584E-01	O2	0.19535E+00	CS+1	0.E+00
C+	0.E+00	H+1	0.E+00	V+	0.44648E-23
O2-	0.48007E-09	CO+	0.E+00	NO+	0.68000E-09
O+	0.50525E-18				

TEMP = 374.3826 DEG-K PRES = 2.3974 ATM MOL WT = 28.8603826
 RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00
 ENTHALPY = 0.2099507E+02 CAL/GM ENTROPY = 0.16422E+01 CAL/GM-DEG K
 DENSITY = 0.140584E+00 LB/CUFT

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
CS	0.E+00	H2	0.E+00	CO	0.E+00
CO2	0.E+00	N2	0.78806E+00	E-	0.E+00
C	0.E+00	H	0.E+00	O	0.57611E-32
N	0.71343E-63	C3	0.E+00	CH4	0.E+00
CN	0.E+00	CH	0.E+00	C2H2	0.E+00
CHO	0.E+00	C2	0.E+00	C2H4	0.E+00
CS2	0.E+00	CSOH	0.E+00	HNO2	0.E+00
HNO2	0.E+00	-O	0.E+00	H2O	0.E+00
NO	0.40173E-12	O2	0.21194E+00	CS+1	0.E+00
C+	0.E+00	H+1	0.E+00	N+	0.E+00
O2-	0.E+00	CO+	0.E+00	NO+	0.E+00
O+	0.E+00				

TEMP = 2637.8300 DEG-K PRES = 55.2652 ATM MOL WT = 28.8366324
 RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00 0.E+00
 ENTHALPY = 0.6904347E+03 CAL/GM ENTROPY = 0.19715E+01 CAL/GM-DEG K
 DENSITY = 3.459577E+00 LB/CUFT

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
CS	0.E+00	H2	0.E+00	CO	0.E+00
CO2	0.E+00	H2	0.77292E+00	E-	0.13934E-09
C	0.E+00	H	0.E+00	O	3.16321E-02
N	3.11503E-06	C3	0.E+00	CH4	0.E+00
CN	0.E+00	CH	0.E+00	CHN	0.E+00
CHC	0.E+00	C2	0.E+00	C2H2	0.E+00
CS2	0.E+00	CSOH	0.E+00	HNO2	0.E+00
HNO2	0.E+00	HO	0.E+00	CIS	0.E+00
NO	0.20939E-01	O2	0.13646E+00	H2O	0.E+00
C+	0.E+00	H+1	0.E+00	CS+1	0.E+00
O2-	3.34581E-09	CO+	0.E+00	N+	0.16821E-23
O+	3.28874E-18			NO+	3.48575E-09

CP-FROZEN CP-EQUIL OLNM/DLNT OLNM/DLNP G441A
 0.20712E+30 0.20907E+00-0.14991E-05 0.33329E-07 0.13115E+01
 TEMP = 1357.0166 DEG-K PRES = 2.6290 ATM MOL WT = 20.0603007
 RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00 0.E+00
 ENTHALPY = 0.2043751E+33 CAL/GM ENTROPY = 0.19727E+01 CAL/GM-DEG K
 DENSITY = 0.425440E-11 LB/CUFT
 VEL = 0.616E+04 FT/SEC MACH = 0.262E+01 AREA = 0.301E-02 SQFT/LB/SEC

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
CS	0.E+00	N2	0.E+00	CO	0.E+00
CO2	0.E+00	N2	0.70774E+30	E-	0.E+00
C	0.E+00	H	0.E+00	O	0.11214E-10
N	3.50E-15	C3	0.E+00	CH4	0.E+00
CH	0.E+00	CH	0.E+00	CHN	0.E+00
CH2	0.E+00	C2	0.E+00	C2H2	0.E+00
CS2	0.E+00	CSOM	0.E+00	HN02	0.E+00
HN02 TRA	1.E+00	NO	0.E+00	M20	0.E+00
C+	0.E+00	O2	0.2116E+00	CS+1	0.E+00
O2-	0.13359E-17	H+1	0.E+00	N+	0.31599E-40
O+	0.46106E-37	CO+	0.E+00	NO+	0.14601E-17

[illegible]

0.39939E+02 0.79839E+02 0.11835E+01 0.16535E+01 0.25150E+01 0.32907E+01 0.30740E+01
0.42733E+01 0.44542E+01 0.46810E+01 0.48595E+01 0.50656E+01 0.61904E+01 0.75102E+01
0.10150E+00 0.12790E+00 0.13438E+00 0.10072E+00 0.22036E+00 0.25995E+00 0.21472E+00
0.28590E+00 0.29727E+00 0.30048E+00 0.31907E+00 0.33916E+00

6.14929E-09 8.25435E-08 0.11027E-07 0.42918E-07 0.21806E-06 0.50324E-06 6.40298E-06
3.14618E-05 0.17307E-05 0.15840E-05 0.23183E-05 0.23300E-05 0.40040E-05 0.70149E-05
0.16391E-04 0.31191E-04 0.54259E-04 0.07992E-04 0.16352E-03 0.24630E-03 0.32760E-03
0.37137E-03 0.41977E-03 0.47146E-03 0.52716E-03 0.67435E-03

0.9930E+00	0.9570E+00	0.3054E+00	0.0101E+00	0.5907E+00	0.3325E+00	0.2274E+00
0.7196E-01	0.6796E-01	0.6443E-01	0.5923E-01	0.5912E-01	0.4365E-01	0.3794E-01
0.3530E-01	0.3610E-01	0.3702E-01	0.3957E-01	0.4160E-01	0.4271E-01	0.4350E-01
0.4360E-01	0.4302E-01	0.4402E-01	0.4421E-01	0.4440E-01		

[illegible]

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030																																																																																																																																																																														
1990	0.42289E+03	0.52705E+03	0.63000E+04	0.73777E+04	0.84696E+04	0.95801E+04	0.10721E+05	0.11879E+05	0.13083E+05	0.14343E+05	0.15659E+05	0.17032E+05	0.18463E+05	0.19952E+05	0.21499E+05	0.23104E+05	0.24768E+05	0.26490E+05	0.28271E+05	0.30111E+05	0.32011E+05	0.33971E+05	0.35991E+05	0.38071E+05	0.40211E+05	0.42411E+05	0.44671E+05	0.46991E+05	0.49371E+05	0.51811E+05	0.54311E+05	0.56871E+05	0.59491E+05	0.62171E+05	0.64911E+05	0.67711E+05	0.70571E+05	0.73491E+05	0.76471E+05	0.79511E+05	0.82611E+05	0.85771E+05	0.88991E+05	0.92271E+05	0.95611E+05	0.99011E+05	0.10247E+06	0.10599E+06	0.10957E+06	0.11321E+06	0.11691E+06	0.12067E+06	0.12449E+06	0.12837E+06	0.13231E+06	0.13631E+06	0.14037E+06	0.14449E+06	0.14867E+06	0.15291E+06	0.15721E+06	0.16157E+06	0.16599E+06	0.17047E+06	0.17499E+06	0.17957E+06	0.18421E+06	0.18891E+06	0.19367E+06	0.19849E+06	0.20337E+06	0.20831E+06	0.21331E+06	0.21837E+06	0.22349E+06	0.22867E+06	0.23391E+06	0.23921E+06	0.24457E+06	0.24999E+06	0.25547E+06	0.26099E+06	0.26657E+06	0.27221E+06	0.27791E+06	0.28367E+06	0.28949E+06	0.29537E+06	0.30131E+06	0.30731E+06	0.31337E+06	0.31949E+06	0.32567E+06	0.33191E+06	0.33821E+06	0.34457E+06	0.35099E+06	0.35747E+06	0.36399E+06	0.37057E+06	0.37721E+06	0.38391E+06	0.39067E+06	0.39749E+06	0.40437E+06	0.41131E+06	0.41831E+06	0.42537E+06	0.43249E+06	0.43967E+06	0.44691E+06	0.45421E+06	0.46157E+06	0.46899E+06	0.47647E+06	0.48399E+06	0.49157E+06	0.49921E+06	0.50691E+06	0.51467E+06	0.52249E+06	0.53037E+06	0.53831E+06	0.54631E+06	0.55437E+06	0.56249E+06	0.57067E+06	0.57891E+06	0.58721E+06	0.59557E+06	0.60399E+06	0.61247E+06	0.62099E+06	0.62957E+06	0.63821E+06	0.64691E+06	0.65567E+06	0.66449E+06	0.67337E+06	0.68231E+06	0.69131E+06	0.70037E+06	0.70949E+06	0.71867E+06	0.72791E+06	0.73721E+06	0.74657E+06	0.75599E+06	0.76547E+06	0.77501E+06	0.78461E+06	0.79427E+06	0.80399E+06	0.81377E+06	0.82361E+06	0.83351E+06	0.84347E+06	0.85349E+06	0.86357E+06	0.87371E+06	0.88391E+06	0.89417E+06	0.90449E+06	0.91487E+06	0.92531E+06	0.93581E+06	0.94637E+06	0.95699E+06	0.96767E+06	0.97841E+06	0.98921E+06	1.00007E+06	1.01099E+06	1.02197E+06	1.03301E+06	1.04411E+06	1.05527E+06	1.06649E+06	1.07777E+06	1.08911E+06	1.10051E+06	1.11197E+06	1.12349E+06	1.13507E+06	1.14671E+06	1.15841E+06	1.17017E+06	1.18199E+06	1.19387E+06	1.20581E+06	1.21781E+06	1.22987E+06	1.24199E+06	1.25417E+06	1.26641E+06	1.27871E+06	1.29107E+06	1.30349E+06	1.31597E+06	1.32851E+06	1.34111E+06	1.35377E+06	1.36649E+06	1.37927E+06	1.39211E+06	1.40501E+06	1.41797E+06	1.43099E+06	1.44407E+06	1.45721E+06	1.47041E+06	1.48367E+06	1.49699E+06	1.51037E+06	1.5

0.5003E+00	0.4929E+00	0.5316E+00	0.4000E+00	0.5299E+00	0.6077E+00	0.7672E+00	0.1023E+01
0.0113E+00	-0.1037E+00	0.1146E+00	0.1216E+00	0.1244E+00	0.1226E+00	0.0074E-01	0.3797E-01
0.1421E-01	0.3529E+00	0.1404E-01	-0.1993E-01	0.1912E-01	0.1825E-01	0.1217E-01	0.1007E-01
-0.7404E-03	-0.1515E-01	0.0706E-02	-0.0196E-02	-0.7400E-02	-0.6914E-02		

[illegible][illegible]

0.4738E+00-0.4950E+00-0.4767E+00-0.4679E+00-0.5132E+00-0.6432E+00-0.9510E+00-0.1327E+01
0.1146E+01-0.3738E+01-0.3782E+01-0.4023E+01-0.4443E+01-0.4452E+01-0.6257E+01-0.7383E+01
0.1146E+01-0.8564E+01-0.9204E+01-0.9609E+01-0.1036E+02-0.1090E+02-0.115...-0.1191E+02

[illegible]

300376 NCISNARK ID 351m4V j.m.l.

1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000-1001-1002-1003-1004-1005-1006-1007-1008-1009-1010-1011-1012-1013-1014-1015-1016-1017-1018-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039-1040-1

DATE WHEN MINIMUM SAVINGS IN CONSERVATION COS.

[illegible]

QUANTITY FROM WELL (PT)	DENSITY, ρ G/CM ³	VISCOSITY, η POISE	WOUND RATIO, C/G	SPECIFIC HEAT (BTU/LB R)	THERMAL CONDUCTIVITY (BTU/IN R) (SEC FT R)	PRANGL NUMBER	MODIFIED SCHMIDT NUMBER	MOLECULAR WEIGHT	POSSIBLE POLYMER NUMBER
1	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
2	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
3	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
4	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
5	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
6	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
7	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
8	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
9	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
10	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
11	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
12	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
13	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
14	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
15	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
16	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
17	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
18	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
19	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
20	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
21	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
22	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
23	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
24	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
25	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
26	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
27	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
28	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
29	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
30	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
31	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
32	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
33	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
34	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
35	1.02	0.015	0.001	0.2	0.001	0.001	0.001	1000	1000
36	1.02	0.015	0.001	0.2	0.001	0.001	0.0		

[illegible]

ALGEBRAIC FRACTIONS AND THEIR FIRST AND SECOND DERIVATIVES WITH RESPECT TO ETA

[illegible]

MOLECULAR FRACTIONS

[illegible]

C02	0.E+00	0.E+01	0.E+02	0.E+03	0.E+04	0.E+05	0.E+06	0.E+07	0.E+08	0.E+09	0.E+10	0.E+11	0.E+12	0.E+13	0.E+14	0.E+15	0.E+16	0.E+17	0.E+18	0.E+19	0.E+20	0.E+21	0.E+22	0.E+23	0.E+24	0.E+25	0.E+26	0.E+27	0.E+28	0.E+29	0.E+30	0.E+31	0.E+32	0.E+33	0.E+34	0.E+35	0.E+36	0.E+37	0.E+38	0.E+39	0.E+40	0.E+41	0.E+42	0.E+43	0.E+44	0.E+45	0.E+46	0.E+47	0.E+48	0.E+49	0.E+50	0.E+51	0.E+52	0.E+53	0.E+54	0.E+55	0.E+56	0.E+57	0.E+58	0.E+59	0.E+60	0.E+61	0.E+62	0.E+63	0.E+64	0.E+65	0.E+66	0.E+67	0.E+68	0.E+69	0.E+70	0.E+71	0.E+72	0.E+73	0.E+74	0.E+75	0.E+76	0.E+77	0.E+78	0.E+79	0.E+80	0.E+81	0.E+82	0.E+83	0.E+84	0.E+85	0.E+86	0.E+87	0.E+88	0.E+89	0.E+90	0.E+91	0.E+92	0.E+93	0.E+94	0.E+95	0.E+96	0.E+97	0.E+98	0.E+99	0.E+100	0.E+101	0.E+102	0.E+103	0.E+104	0.E+105	0.E+106	0.E+107	0.E+108	0.E+109	0.E+110	0.E+111	0.E+112	0.E+113	0.E+114	0.E+115	0.E+116	0.E+117	0.E+118	0.E+119	0.E+120	0.E+121	0.E+122	0.E+123	0.E+124	0.E+125	0.E+126	0.E+127	0.E+128	0.E+129	0.E+130	0.E+131	0.E+132	0.E+133	0.E+134	0.E+135	0.E+136	0.E+137	0.E+138	0.E+139	0.E+140	0.E+141	0.E+142	0.E+143	0.E+144	0.E+145	0.E+146	0.E+147	0.E+148	0.E+149	0.E+150	0.E+151	0.E+152	0.E+153	0.E+154	0.E+155	0.E+156	0.E+157	0.E+158	0.E+159	0.E+160	0.E+161	0.E+162	0.E+163	0.E+164	0.E+165	0.E+166	0.E+167	0.E+168	0.E+169	0.E+170	0.E+171	0.E+172	0.E+173	0.E+174	0.E+175	0.E+176	0.E+177	0.E+178	0.E+179	0.E+180	0.E+181	0.E+182	0.E+183	0.E+184	0.E+185	0.E+186	0.E+187	0.E+188	0.E+189	0.E+190	0.E+191	0.E+192	0.E+193	0.E+194	0.E+195	0.E+196	0.E+197	0.E+198	0.E+199	0.E+200	0.E+201	0.E+202	0.E+203	0.E+204	0.E+205	0.E+206	0.E+207	0.E+208	0.E+209	0.E+210	0.E+211	0.E+212	0.E+213	0.E+214	0.E+215	0.E+216	0.E+217	0.E+218	0.E+219	0.E+220	0.E+221	0.E+222	0.E+223	0.E+224	0.E+225	0.E+226	0.E+227	0.E+228	0.E+229	0.E+230	0.E+231	0.E+232	0.E+233	0.E+234	0.E+235	0.E+236	0.E+237	0.E+238	0.E+239	0.E+240	0.E+241	0.E+242	0.E+243	0.E+244	0.E+245	0.E+246	0.E+247	0.E+248	0.E+249	0.E+250	0.E+251	0.E+252	0.E+253	0.E+254	0.E+255	0.E+256	0.E+257	0.E+258	0.E+259	0.E+260	0.E+261	0.E+262	0.E+263	0.E+264	0.E+265	0.E+266	0.E+267	0.E+268	0.E+269	0.E+270	0.E+271	0.E+272	0.E+273	0.E+274	0.E+275	0.E+276	0.E+277	0.E+278	0.E+279	0.E+280	0.E+281	0.E+282	0.E+283	0.E+284	0.E+285	0.E+286	0.E+287	0.E+288	0.E+289	0.E+290	0.E+291	0.E+292	0.E+293	0.E+294	0.E+295	0.E+296	0.E+297	0.E+298	0.E+299	0.E+300	0.E+301	0.E+302	0.E+303	0.E+304	0.E+305	0.E+306	0.E+307	0.E+308	0.E+309	0.E+310	0.E+311	0.E+312	0.E+313	0.E+314	0.E+315	0.E+316	0.E+317	0.E+318	0.E+319	0.E+320	0.E+321	0.E+322	0.E+323	0.E+324	0.E+325	0.E+326	0.E+327	0.E+328	0.E+329	0.E+330	0.E+331	0.E+332	0.E+333	0.E+334	0.E+335	0.E+336	0.E+337	0.E+338	0.E+339	0.E+340	0.E+341	0.E+342	0.E+343	0.E+344	0.E+345	0.E+346	0.E+347	0.E+348	0.E+349	0.E+350	0.E+351	0.E+352	0.E+353	0.E+354	0.E+355	0.E+356	0.E+357	0.E+358	0.E+359	0.E+360	0.E+361	0.E+362	0.E+363	0.E+364	0.E+365	0.E+366	0.E+367	0.E+368	0.E+369	0.E+370	0.E+371	0.E+372	0.E+373	0.E+374	0.E+375	0.E+376	0.E+377	0.E+378	0.E+379	0.E+380	0.E+381	0.E+382	0.E+383	0.E+384	0.E+385	0.E+386	0.E+387	0.E+388	0.E+389	0.E+390	0.E+391	0.E+392	0.E+393	0.E+394	0.E+395	0.E+396	0.E+397	0.E+398	0.E+399	0.E+400	0.E+401	0.E+402	0.E+403	0.E+404	0.E+405	0.E+406	0.E+407	0.E+408	0.E+409	0.E+410	0.E+411	0.E+412	0.E+413	0.E+414	0.E+415	0.E+416	0.E+417	0.E+418	0.E+419	0.E+420	0.E+421	0.E+422	0.E+423	0.E+424	0.E+425	0.E+426	0.E+427	0.E+428	0.E+429	0.E+430	0.E+431	0.E+432	0.E+433	0.E+434	0.E+435	0.E+436	0.E+437	0.E+438	0.E+439	0.E+440	0.E+441	0.E+442	0.E+443	0.E+444	0.E+445	0.E+446	0.E+447	0.E+448	0.E+449	0.E+450	0.E+451	0.E+452	0.E+453	0.E+454	0.E+455	0.E+456	0.E+457	0.E+458	0.E+459	0.E+460	0.E+461	0.E+462	0.E+463	0.E+464	0.E+465	0.E+466	0.E+467	0.E+468	0.E+469	0.E+470	0.E+471	0.E+472	0.E+473	0.E+474	0.E+475	0.E+476	0.E+477	0.E+478	0.E+479	0.E+480	0.E+481	0.E+482	0.E+483	0.E+484	0.E+485	0.E+486	0.E+487	0.E+488	0.E+489	0.E+490	0.E+491	0.E+492	0.E+493	0.E+494	0.E+495	0.E+496	0.E+497	0.E+498	0.E+499	0.E+500	0.E+501	0.E+502	0.E+503	0.E+504	0.E+505	0.E+506	0.E+507	0.E+508	0.E+509	0.E+510	0.E+511	0.E+512	0.E+513	0.E+514	0.E+515	0.E+516	0.E+517	0.E+518	0.E+519	0.E+520	0.E+521	0.E+522	0.E+523	0.E+524	0.E+525	0.E+526	0.E+527	0.E+528	0.E+529	0.E+530	0.E+531	0.E+532	0.E+533	0.E+534	0.E+535	0.E+536	0.E+537	0.E+538	0.E+539	0.E+540	0.E+541	0.E+542	0.E+543	0.E+544	0.E+545	0.E+546	0.E+547	0.E+548	0.E+549	0.E+550	0.E+551	0.E+552	0.E+553	0.E+554	0.E+555	0.E+556	0.E+557	0.E+558	0.E+559	0.E+560	0.E+561	0.E+562	0.E+563	0.E+564	0.E+565	0.E+566	0.E+567	0.E+568	0.E+569	0.E+570	0.E+571	0.E+572	0.E+573	0.E+574	0.E+575	0.E+576	0.E+577	0.E+578	0.E+579	0.E+580	0.E+581	0.E+582	0.E+583	0.E+584	0.E+585	0.E+586	0.E+587	0.E+588	0.E+589	0.E+590	0.E+591	0.E+592	0.E+593	0.E+594	0.E+595	0.E+596	0.E+597	0.E+598	0.E+599	0.E+600	0.E+601	0.E+602	0.E+603	0.E+604	0.E+605	0.E+606	0.E+607	0.E+608	0.E+609	0.E+610	0.E+611	0.E+612	0.E+613	0.E+614	0.E+615	0.E+616	0.E+617	0.E+618	0.E+619	0.E+620	0.E+621	0.E+622	0.E+623	0.E+624	0.E+625	0.E+626	0.E+627	0.E+628	0.E+629	0.E+630	0.E+631	0.E+632	0.E+633	0.E+634	0.E+635	0.E+636	0.E+637	0.E+638	0.E+639	0.E+640	0.E+641	0.E+642	0.E+643	0.E+644	0.E+645	0.E+646	0.E+647	0.E+648	0.E+649	0.E+650	0.E+651	0.E+652	0.E+653	0.E+654	0.E+655	0.E+656	0.E+657	0.E+658	0.E+659	0.E+660	0.E+661	0.E+662	0.E+663	0.E+664	0.E+665	0.E+666	0.E+667	0.E+668	0.E+669	0.E+670	0.E+671	0.E+672	0.E+673	0.E+674	0.E+675	0.E+676	0.E+677	0.E+678	0.E+679	0.E+680	0.E+681	0.E+682	0.E+683	0.E+684	0.E+685	0.E+686	0.E+687	0.E+688	0.E+689	0.E+690	0.E+691	0.E+692	0.E+693	0.E+694	0.E+695	0.E+696	0.E+697	0.E+698	0.E+699	0.E+700	0.E+701	0.E+702	0.E+703	0.E+704	0.E+705	0.E+706	0.E+707	0.E+708	0.E+709	0.E+710	0.E+711	0.E+712	0.E+713	0.E+714	0.E+715	0.E+716	0.E+717	0.E+718	0.E+719	0.E+720	0.E+721	0.E+722	0.E+723	0.E+724	0.E+725	0.E+726	0.E+727	0.E+728	0.E+729	0.E+730	0.E+731	0.E+732	0.E+733	0.E+734	0.E+735	0.E+736	0.E+737	0.E+738	0.E+739	0.E+740	0.E+741	0.E+742	0.E+743	0.E+744	0.E+745	0.E+746	0.E+747	0.E+748	0.E+749	0.E+750	0.E+751	0.E+752	0.E+753	0.E+754	0.E+755	0.E+756	0.E+757	0.E+758	0.E+759	0.E+760	0.E+761	0.E+762	0.E+763	0.E+764	0.E+765	0.E+766	0.E+767	0.E+768	0.E+769	0.E+770	0.E+771	0.E+772	0.E+773	0.E+774	0.E+775	0.E+776	0.E+777	0.E+778	0.E+779	0.E+780	0.E+781	0.E+782	0.E+783	0.E+784	0.E+785	0.E+786	0.E+787	0.E+788	0.E+789	0.E+790	0.E+791	0.E+792	0.E+793	0.E+794	0.E+795	0.E+796	0.E+797	0.E+798	0.E+799	0.E+800	0.E+801	0.E+802	0.E+803	0.E+804	0.E+805	0.E+806	0.E+807	0.E+808	0.E+809	0.E+810	0.E+811	0.E+812	0.E+813	0.E+814	0.E+815	0.E+816	0.E+817	0.E+818	0.E+819	0.E+820	0.E+821	0.E+822	0.E+823	0.E+824	0.E+825	0.E+826	0.E+827	0.E+828	0.E+829	0.E+830	0.E+831	0.E+832	0.E+833	0.E+834	0.E+835	0.E+836	0.E+837	0.E+838	0.E+839	0.E+840	0.E+841	0.E+842	0.E+843	0.E+844	0.E+845	0.E+846	0.E+847	0.E+848	0.E+849	0.E+850	0.E+851	0.E+852	0.E+853	0.E+854	0.E+855	0.E+856	0.E+857	0.E+858	0.E+859	0.E+860	0.E+861	0.E+862	0.E+863	0.E+864	0.E+865	0.E+866	0.E+867	0.E+868	0.E+869	0.E+870	0.E+871	0.E+872	0.E+873	0.E+874	0.E+875	0.E+876	0.E+877	0.E+878	0.E+879	0.E+880	0.E+881	0.E+882	0.E+883	0.E+884	0.E+885	0.E+886	0.E+887	0.E+888	0.E+889	0.E+890	0.E+891	0.E+892	0.E+893	0.E+894	0.E+895	0.E+896	0.E+897	0.E+898	0.E+899	0.E+900	0.E+901	0.E+902	0.E+903	0.E+904	0.E+905	0.E+906	0.E+907	0.E+908	0.E+909	0.E+910	0.E+911	0.E+912	0.E+913	0.E+914	0.E+915	0.E+916	0.E+917	0.E+918	0.E+919	0.E+920	0.E+921	0.E+922	0.E+923	0.E+924	0.E+925	0.E+926	0.E+927	0.E+928	0.E+929	0.E+930	0.E+931	0.E+932	0.E+933	0.E+934	0.E+935	0.E+936	0.E+937	0.E+938	0.E+939	0.E+940	0.E+941	0.E+942	0.E+943	0.E+944	0.E+945	0.E+946	0.E+947	0.E+948	0.E+949	0.E+950	0.E+951	0.E+952	0.E+953	0.E+954	0.E+955	0.E+956	0.E+957	0.E+958	0.E+959	0.E+960	0.E+961	0.E+962	0.E+963	0.E+964	0.E+965	0.E+966	0.E+967	0.E+968	0.E+969	0.E+970	0.E+971	0.E+972	0.E+973	0.E+974	0.E+975	0.E+976	0.E+977	0.E+978	0.E+979	0.E+980	0.E+981	0.E+982	0.E+983	0.E+984	0.E+985	0.E+986	0.E+987	0.E+988	0.E+989	0.E+990	0.E+991	0.E+992	0.E+993	0.E+994	0.E+995	0.E+996	0.E+997	0.E+998	0.E+999	0.E+1000	0.E+1001	0.E+1002	0.E+1003	0.E+1004	0.E+1005	0.E+1006	0.E+1007	0.E+1008	0.E+1009	0.E+1010	0.E+1011	0.E+1012	0.E+1013	0.E+1014	0.E+1015	0.E+1016	0.E+1017	0.E+1018	0.E+1019	0.E+1020	0.E+1021	0.E+1022	0.E+1023	0.E+1024	0.E+1025	0.E+1026	0.E+1027	0.E+1028	0.E+1029	0.E+1030	0.E+1031	0.E+1032	0.E+1033	0.E+1034	0.E+1035	0.E+1036	0.E+1037	0.E+1038	0.E+1039	0.E+1040	0.E+1041	0.E+1042	0.E+1043	0.E+1044	0.E+1045	0.E+1046	0.E+1047	0.E+1048	0.E+1049	0.E+1050	0.E+1051	0.E+1052	0.E+1053	0.E+1054	0.E+1055	0.E+1056	0.E+1057	0.E+1058	0.E+1059	0.E+1060	0.E+1061	0.E+1062	0.E+1063	0.E+1064	0.E+1065	0.E+1066	0.E+1067	0.E+1068	0.E+1069	0.E+1070	0.E+1071	0.E+1072	0.E+1073	0.E+1074	0.E+1075	0.E+1076	0.E+1077	0.E+1078	0.E+1079	0.E+1080	0.E+1081	0.E+1082	0.E+1083	0.E+1084	0.E+1085	0.E+1086	0.E+1087	0.E+1088	0.E+1089	0.E+1090	0.E+1091	0.E+1092	0.E+1093	0.E+1094	0.E+1095	0.E+1096	0.E+1097	0.E+1098	0.E+1099	0.E+1100	0.E+1101	0.E+1102	0.E+1103	0.E+1104	0.E+1105	0.E+1106	0.E+1107	0.E+1108	0.E+1109	0.E+1110	0.E+1111	0.E+1112	0.E+1113	0.E+1114	0.E+1115	0.E+1116	0.E+1117	0.E+1118	0.E+1119	0.E+1120	0.E+1121	0.E+1122
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CASE 1 - - - - - STREAMWISE DIMENSION 0.18393E+01 FEET - - - - -

APWL-IR-09-114, VOL 1, (C) 2011

ITERATED VALUES

ITS

TIME

ALPH

FPPH

DAMP

MAX.LIN

MAX.ERRORS IN CONSERVATION EQS.

ENERGY

CS

H2

CO

CO2

1

7.25431E-211

3.84000E-4999

5E-02

17-2.9E+01

2 1.6E+03

11 1.2E-01

11 1.2E-01

11 4.2E+00

11-3.4E+00

0

0

2

15.75523E-998

3.77561E-000

2E-02

17-2.9E+01

2 1.3E+03

11 1.1E-01

11 1.1E-01

11 3.7E+00

11-1.7E+00

0

0

3

24.09829E-984

3.65081E-000

5E-03

6-3.6E+00

3-8.5E+02

3 1.4E-02

3 1.4E-02

3 1.9E-01

3-7.2E-02

0

0

4

32.33629E-957

3.67021E-000

1E-03

5 9.1E+00

3-3.8E+02

3 9.4E-03

3 9.4E-03

2-9.9E-02

2 1.4E-01

0

0

5

39.67629E-948

3.66701E-000

1E-03

6 1.1E+00

2-3.1E+02

3 3.3E-03

3 3.3E-03

2-6.6E-02

2 8.4E-02

0

0

6

47.18729E-943

3.67051E-000

5E-04

6 4.5E-01

2-1.7E+02

2 2.2E-03

2 2.2E-03

2-4.9E-02

2 6.5E-02

0

0

7

54.32429E-943

3.67301E-000

2E-04

6 1.0E-01

2-5.9E+01

2 1.4E-03

2 1.4E-03

2-2.2E-02

2 2.9E-02

0

0

8

61.42629E-942

3.67381E-000

8E-05

18-3.9E-02

2-8.9E+00

2 5.1E-04

2 5.1E-04

2-6.3E-03

2 7.9E-03

0

0

9

68.52929E-942

3.67391E-000

3E-05

18-1.6E-02

2 2.8E+00

2 9.4E-05

2 9.4E-05

2-5.9E-04

2 5.5E-04

0

0

10

75.63129E-942

3.67391E-000

1E-05

18-6.4E-03

2 2.5E+00

2-1.4E-05

2-1.4E-05

2 3.6E-05

2-7.1E-04

0

0

11

82.69829E-942

3.67381E-000

6E-06

18-2.6E-03

2 9.7E-01

2-1.8E-05

2-1.8E-05

2 3.3E-04

2-4.4E-04

0

0

12

89.72729E-942

3.67381E-000

2E-06

18-1.1E-03

2 2.1E-01

2-7.9E-06

2-7.9E-06

2 1.1E-04

2-1.4E-04

0

0

13

96.79329E-942

3.67381E-000

9E-07

18-4.3E-04

3-8.2E-03

2-2.0E-06

2-2.0E-06

2 1.9E-05

2-2.3E-05

0

0

14

103.82329E-942

3.67381E-000

4E-07

18-1.7E-04

2-2.8E-02

3 1.4E-07

3 1.4E-07

2-3.0E-06

2 4.9E-06

0

0

ALPHA

(LB /SEC)**2

2.394E+01

5.272E-04

3.137E-01

2.613E+00

6.167E+00

7.782E-02

7.993E+02

7.993E+02

0.0E+00

1.985E+02

MECH REM

PYROL GAS

CHAR

(LB/SEC SQ FT)

6.522E+01

0.0E+00

0.0E+00

0.0E+00

0.0E+00

0.0E+00

0.0E+00

0.0E+00

0.0E+00

HEAT TRANS

HEAT TRANS

COEFF,

(BASED ON CH) FOR

RHO*UE*CF/2

RHO*UE*CH

PYROL GAS

CHAR

3.403E-01

3.554E-01

0.0E+00

0.0E+00

0.0E+00

0.0E+00

0.0E+00

0.0E+00

0.0E+00

MOM TRANS

HEAT TRANS

BLOWING PARAMETERS

ELEMENTAL MASS TRANSFER COEFFICIENTS,

(LB/SEC SQ FT) FOR

RHO*UE*CF/2

RHO*UE*CH

PYROL GAS

CHAR

3.403E-01

3.554E-01

0.0E+00

0.0E+00

0.0E+00

0.0E+00

0.0E+00

0.0E+00

0.0E+00

MOMENTUM DISPLACEMENTAL ENTHALPY REYNOLDS MASS THICKNESSES (FT) FOR

THICKNESS, THICKNESS, BODY THICKNESS, NUMBER

THEIA DELSTAR DISPLACEMENTAL ENTHALPY REYNOLDS MASS THICKNESSES (FT) FOR

TEMP

STATIC ENTHALPY (BTU/LB)

GPP

GP

ENTHALPY (BTU/LB)

TEMP

ELECTRON COLL FREQ (1/SEC)

-4.561E-03

-1.609E-03

-1.277E-04

1.971E-03

8.626E+06

8.435E-03

7.137E-03

6.309E-03

-9.166E-03

5.840E-03

NODAL INFORMATION

DISTANCE, ETA

FROM WALL

(FT)

0.0E+00

0.0E+00

-3.803E+00

0.0E+00

2.067E-01

3.674E+00

5.522E+01

9.783E+02

6.021E+03

5.301E+04

-9.783E+02

1.500E+03

5.264E+11

1.670E-05

5.988E-02

3.83E+00

2.067E-01

3.674E+00

5.522E+01

9.783E+02

6.021E+03

5.301E+04

-9.783E+02

1.500E+03

5.264E+11

3.905E-05

1.198E-01

3.786E+00

3.227E-01

1.336E+00

6.522E+01

5.960E+02

5.524E+03

6.959E+04

-6.284E+02

1.865E+03

4.721E+11

7.931E-05

2.098E-01

3.733E+00

4.067E-01

6.594E-01

6.522E+01

3.622E+02

2.745E+03

2.322E+04

-4.413E+02

2.306E+03

4.245E+11

1.551E-04

3.593E-01

3.686E+00

4.772E-01

3.421E-01

6.522E+01

1.873E+02

1.396E+03

6.917E+03

-3.129E+02

2.648E+03

3.962E+11

2.379E-04

5.949E-01

3.564E+00

5.283E-01

1.930E-01

6.522E+01

3.631E+02

7.383E+02

1.973E+03

-2.095E+02

2.935E+03

3.763E+11

4.655E-04

8.983E-01

3.355E+00

5.847E-01

1.260E-01

6.522E+01

9.608E+01

4.205E+02

6.901E+02

-1.240E+02

3.180E+03

3.615E+11

8.409E-04

1.497E+00

3.027E+00

6.423E-01

7.551E-02

6.522E+01

3.229E+02

1.642E+02

8.309E+01

9.613E+01

3.363E+03

3.519E+11

1.850E-03

2.394E+00

1.938E+00

7.232E-01

3.385E-02

6.522E+01

4.929E+01

8.153E+01

2.742E+01

9.929E+01

3.908E+03

3.281E+11

4.011E-03

5.988E+00

3.91E-01

9.034E-01

2.055E-02

7.551E-02

6.522E+01

3.890E+01

1.061E+01

1.669E+02

4.244E+03

3.189E+11

7.931E-03

1.044E+01

4.413E+01

8.973E-01

2.230E-02

8.197E+01

6.571E+02

3.590E+01

2.728E+01

2.122E+02

4.646E+03

2.991E+11

1.089E-02

1.497E+01

8.379E+00

9.086E-01

2.062E-02

8.240E+01

9.741E+02

2.923E+01

2.701E+01

2.168E+02

4.676E+03

2.981E+11

1.945E-02

2.994E+01

2.43E+01

1.162E+00

5.019E-03

6.638E+01

1.189E+03

4.818E+00

5.597E-01

1.642E+02

2.588E+03

4.007E+11

2.341E-02

4.791E+01

4.637E+01

1.219E+00

1.80E-03

5.302E+01

1.225E+03

1.367E+00

1.755E-01

9.698E+01

1.765E+03

4.853E+11

3.084E-02

7.485E+01

7.961E+01

1.247E+00

5.479E-04

4.459E+01

1.273E+03

0.0E+00

-2.770E-01

8.894E+01

8.906E+02

6.831E+11

DISTANCE FROM WALL (FT)	DENSITY, RHO (LB/CU FT)	VISCOSITY, MU (LB/SEC FT)	RHO*MU /RHOE*WUE, C	SPECIFIC HEAT (BTU/LB R)	THERMAL CONDUCTIVITY (BTU/SEC FT R)	PRANDTL NUMBER	MODIFIED SCHMIDT NUMBER	MOLECULAR WEIGHT	PHOSOPHS /RHOE*WUE	MACH NUMBER
0.00	6.846E-02	2.22E-05	1.13E+00	2.978E-01	1.11E-05	5.94E-01	7.037E-01	2.870E+01	3.5E+00	0.000
1.670E-05	5.948E-02	2.26E-05	1.01E+00	3.181E-01	1.49E-05	5.45E-01	7.032E-01	2.630E+01	5.571E-01	0.042E-01
3.905E-05	3.999E-02	2.94E-05	9.20E-01	3.327E-01	1.80E-05	5.45E-01	7.030E-01	2.577E+01	2.353E+00	0.324E-01
7.931E-05	3.456E-02	3.23E-05	8.70E-01	3.406E-01	2.01E-05	5.46E-01	7.030E-01	2.557E+01	5.763E+00	9.752E-01
1.551E-04	3.109E-02	3.46E-05	8.39E-01	3.455E-01	2.18E-05	5.47E-01	7.029E-01	2.551E+01	1.197E+01	1.086E+00
2.179E-04	2.469E-02	3.64E-05	8.15E-01	3.489E-01	2.31E-05	5.50E-01	7.029E-01	2.550E+01	2.197E+01	1.178E+00
4.650E-04	2.716E-02	3.73E-05	8.07E-01	3.510E-01	2.40E-05	5.52E-01	7.029E-01	2.552E+01	3.420E+01	1.246E+00
8.409E-04	2.553E-02	3.94E-05	7.85E-01	3.532E-01	2.50E-05	5.56E-01	7.028E-01	2.559E+01	5.853E+01	1.329E+00
1.950E-03	2.366E-02	4.17E-05	7.70E-01	3.549E-01	2.61E-05	5.67E-01	7.026E-01	2.584E+01	1.189E+02	1.446E+00
4.511E-03	2.224E-02	4.40E-05	7.62E-01	3.564E-01	2.65E-05	5.85E-01	7.023E-01	2.637E+01	2.439E+02	1.568E+00
7.431E-03	2.113E-02	4.67E-05	7.52E-01	3.514E-01	2.60E-05	6.29E-01	7.014E-01	2.751E+01	2.457E+02	1.742E+00
1.089E-02	2.209E-02	4.68E-05	8.077E-01	3.411E-01	2.40E-05	6.66E-01	6.997E-01	2.887E+01	2.671E+02	2.619E+00
1.945E-02	4.021E-02	3.15E-05	9.60E-01	2.983E-01	1.37E-05	6.83E-01	6.962E-01	2.908E+01	8.847E+02	2.995E+00
2.541E-02	5.877E-02	2.45E-05	1.123E+00	2.910E-01	1.00E-05	6.84E-01	6.953E-01	2.898E+01	1.890E+03	3.755E+00
3.084E-02	1.160E-01	1.55E-05	1.410E+00	2.403E-01	5.47E-06	6.84E-01	6.940E-01	2.886E+01	5.450E+03	5.245E+00
DISTANCE FROM WALL, FT										
0.00	1.670E-05	3.90E-05	7.93E-05	1.551E-04	2.879E-04	4.650E-04	8.409E-04	1.850E-03	4.011E-03	
	7.431E-03	1.089E-02	1.94E-02	2.541E-02	3.084E-02					
ELEMENTAL FRACTIONS AND THEIR FIRST AND SECOND DERIVATIVES WITH RESPECT TO ETA										
CS	3.483E-02	3.044E-02	2.897E-02	2.858E-02	2.841E-02	2.826E-02	2.819E-02	2.775E-02	2.677E-02	2.481E-02
	2.076E-02	1.493E-02	4.72E-03	2.646E-03	0.0E+00					
	-7.544E-02	-5.241E-02	-9.563E-03	-1.904E-03	-7.59E-04	-5.660E-04	-5.551E-04	-5.927E-04	-6.645E-04	-6.997E-04
	-1.161E-01	-1.256E-03	-2.760E-04	-8.021E-05	0.0E+00					
	-5.610E-01	1.330E+00	1.374E-01	1.373E-02	1.550E-03	6.122E-05	1.111E-05	-1.363E-04	4.033E-05	-6.383E-05
H2	-1.415E-04	9.916E-05	3.175E-05	9.953E-06	1.591E-05					
	1.346E-02	1.346E-02	1.468E-02	1.523E-02	1.544E-02	1.549E-02	1.545E-02	1.532E-02	1.483E-02	1.377E-02
	1.156E-02	8.338E-03	2.654E-03	1.491E-03	0.0E+00					
	-7.326E-02	3.195E-02	1.190E-02	2.774E-03	5.377E-04	-1.844E-05	-1.772E-04	-2.745E-04	-3.487E-04	-3.867E-04
	-6.374E-04	-6.966E-04	-1.545E-04	-4.509E-05	0.0E+00					
CO	4.166E-00	-4.891E-01	-1.772E-01	-2.608E-02	-3.797E-03	-8.472E-04	-2.134E-04	-1.113E-04	1.205E-05	-3.339E-05
	-8.094E-05	5.460E-05	1.781E-05	-5.625E-06	8.971E-06					
	1.034E-01	1.241E-01	1.276E-01	1.277E-01	1.269E-01	1.248E-01	1.220E-01	1.159E-01	9.766E-02	6.351E-02
	-1.619E-02	-1.270E-01	-1.323E-01	-3.609E-01	-4.114E-01					
	5.838E-01	1.439E-01	1.097E-02	4.423E-03	-7.417E-03	-8.759E-03	-9.720E-03	-1.095E-02	-1.252E-02	-1.325E-02
CO2	-2.202E-02	-2.387E-02	-5.263E-03	-1.531E-03	0.0E+00					
	-1.049E+01	-4.10E+00	-3.689E-01	-3.394E-02	-6.057E-03	-5.142E-03	-1.282E-03	-2.0E-03	7.095E-04	-1.202E-03
	-2.704E-03	1.880E-03	6.057E-04	-1.902E-04	3.039E-04					
	2.508E-01	2.203E-01	2.126E-01	2.113E-01	2.110E-01	2.132E-01	2.155E-01	2.204E-01	2.351E-01	2.051E-01
	3.271E-01	4.166E-01	5.736E-01	6.056E-01	6.464E-01					
N2	-7.025E-01	-2.939E-01	-3.647E-02	-9.124E-04	5.143E-03	6.871E-03	7.779E-03	8.810E-03	1.011E-02	1.071E-02
	1.780E-02	1.929E-02	4.252E-03	1.237E-03	0.0E+00					
	5.765E+00	7.879E+00	7.203E-01	7.134E-02	9.553E-03	4.878E-03	1.183E-03	2.289E-03	5.697E-04	9.707E-04
	2.127E-03	-1.520E-03	-4.893E-04	1.537E-04	-2.455E-04					
	5.961E-01	6.117E-01	6.162E-01	6.171E-01	6.176E-01	6.192E-01	6.190E-01	6.207E-01	6.256E-01	6.358E-01
MOLE FRACTIONS	2.724E-01	1.696E-01	2.215E-02	4.465E-03	2.496E-03	2.472E-03	2.674E-03	2.994E-03	3.424E-03	3.628E-03
	6.025E-03	6.531E-03	1.442E-03	4.197E-04	0.0E+00					
	1.124E+00	4.556E+00	3.688E-01	-2.505E-02	1.255E-03	1.049E-03	3.011E-04	7.673E-04	-1.922E-04	3.286E-04
	7.399E-01	5.138E-04	1.660E-04	5.217E-05	-8.333E-05					
CS	1.977E-04	9.570E-04	1.792E-03	2.475E-03	2.952E-03	3.270E-03	3.440E-03	3.599E-03	3.636E-03	3.404E-03
	2.679E-03	1.413E-03	9.20E-07	5.030E-10	0.0E+00					

H2	7.324E-02	1.242E-01	1.222E-01	1.194E-01	1.162E-01	1.128E-01	1.096E-01	1.064E-01	1.032E-01	1.000E-01	9.678E-02	9.356E-02	9.034E-02	8.712E-02	8.390E-02	8.068E-02
C0	3.031E-02	4.857E-03	4.791E-03	1.483E-02	1.483E-02	1.483E-02	1.483E-02	1.483E-02	1.483E-02	1.483E-02	1.483E-02	1.483E-02	1.483E-02	1.483E-02	1.483E-02	1.483E-02
C02	7.780E-02	1.676E-01	1.847E-01	1.319E-01	1.958E-01	1.978E-01	1.981E-01	1.981E-01	1.981E-01	1.981E-01	1.981E-01	1.981E-01	1.981E-01	1.981E-01	1.981E-01	1.981E-01
N2	1.543E-01	7.946E-02	5.719E-02	4.744E-02	4.231E-02	3.938E-02	3.799E-02	3.730E-02	3.661E-02	3.592E-02	3.523E-02	3.454E-02	3.385E-02	3.316E-02	3.247E-02	3.178E-02
E-	6.113E-01	5.747E-01	5.688E-01	5.634E-01	5.623E-01	5.628E-01	5.638E-01	5.658E-01	5.678E-01	5.698E-01	5.718E-01	5.738E-01	5.758E-01	5.778E-01	5.798E-01	5.818E-01
C	0.0E+00	2.847E-11	3.596E-09	4.345E-08	5.094E-07	5.843E-06	6.592E-05	7.341E-04	8.090E-03	8.839E-02	9.588E-01	1.033E-00	1.108E-01	1.183E-02	1.258E-03	1.333E-04
K	2.771E-37	1.236E-29	4.171E-24	4.252E-21	4.133E-19	1.047E-17	8.463E-17	7.945E-16	1.104E-14	9.444E-14	8.000E-13	6.555E-12	5.111E-11	3.666E-10	2.222E-09	7.777E-08
O	1.745E-12	1.239E-09	1.755E-07	2.621E-05	1.568E-05	5.564E-05	1.266E-04	3.076E-04	8.897E-04	2.089E-03	5.000E-03	1.250E-02	3.125E-02	7.812E-02	2.000E-01	5.000E-01
N	3.804E-33	1.631E-03	3.939E-07	2.200E-11	1.723E-24	2.982E-07	3.595E-07	6.230E-15	5.162E-23	7.840E-48	1.535E-27	1.014E-21	4.077E-17	1.321E-14	6.088E-13	9.228E-12
C3	6.683E-39	1.275E-32	3.412E-29	2.461E-27	4.075E-26	2.866E-25	9.721E-25	3.305E-24	1.014E-23	1.230E-23	3.948E-02	7.054E-04	3.551E-06	1.319E-07	2.702E-08	6.539E-09
CH	1.171E-24	1.628E-28	1.015E-64	6.048E-99	0.0E+00	3.953E-13	4.742E-16	2.539E-32	8.016E-47	0.0E+00	9.848E-24	2.587E-19	2.486E-16	1.035E-14	1.210E-13	6.824E-13
CHN	3.125E-07	1.096E-06	7.418E-07	5.965E-07	5.121E-07	4.535E-07	4.112E-07	3.549E-07	2.536E-07	1.307E-07	1.657E-10	6.995E-09	6.339E-08	2.058E-07	4.434E-07	7.570E-07
CHO	1.766E-05	1.997E-07	7.560E-17	8.763E-26	0.0E+00	1.895E-02	3.452E-34	6.121E-29	4.333E-26	3.268E-24	6.809E-23	4.762E-22	3.632E-21	3.535E-20	1.446E-19	5.897E-12
C2	1.226E-19	3.600E-22	4.263E-51	2.798E-79	0.0E+00	1.126E-15	4.439E-19	3.499E-43	1.601E-65	0.0E+00	1.933E-08	1.362E-07	1.588E-07	1.713E-07	1.668E-07	1.565E-07
C2M2	5.897E-12	2.963E-11	6.502E-12	2.791E-12	1.562E-12	1.004E-12	7.231E-13	4.647E-13	1.953E-13	4.269E-14	7.334E-03	5.155E-03	3.826E-03	3.024E-03	2.499E-03	2.149E-03
CS2	3.758E-09	1.031E-08	2.586E-14	4.870E-20	0.0E+00	1.558E-03	1.792E-03	1.033E-03	5.769E-04	0.0E+00	1.344E-28	9.376E-24	1.952E-19	4.376E-17	1.592E-15	2.075E-14
CSOH	1.197E-03	7.627E-03	8.039E-04	2.619E-05	5.242E-10	6.565E-27	3.264E-21	3.887E-16	2.241E-13	1.521E-11	3.087E-10	2.253E-09	2.071E-08	3.886E-07	8.801E-06	3.0E+00
HN02 CIS	4.816E-04	1.695E-02	1.469E-01	1.758E-01	2.119E-01	2.847E-11	3.296E-09	4.345E-08	2.383E-07	7.940E-07	1.736E-06	4.052E-06	1.136E-05	2.739E-05	6.150E-05	4.781E-05
HA02 TRA	1.812E-28	1.133E-23	2.395E-19	5.249E-17	1.881E-15	2.426E-14	1.316E-13	8.699E-13	1.061E-11	1.307E-10	5.166E-16	1.433E-12	1.141E-09	4.267E-08	4.675E-07	2.562E-06
HC	3.636E-03	8.727E-03	2.038E-05	2.827E-08	0.0E+00	4.071E-02	4.736E-02	6.347E-02	7.231E-02	7.793E-02	8.203E-02	8.499E-02	8.908E-02	9.714E-02	1.094E-01	1.230E-01
H20	1.230E-01	1.085E-01	3.775E-02	2.114E-02	0.0E+00	6.363E-19	5.548E-15	1.414E-11	1.009E-09	1.711E-08	1.287E-07	4.863E-07	2.126E-06	1.455E-05	9.984E-05	1.197E-03
HO	1.197E-03	7.627E-03	8.039E-04	2.619E-05	5.242E-10	6.565E-27	3.264E-21	3.887E-16	2.241E-13	1.521E-11	3.087E-10	2.253E-09	2.071E-08	3.886E-07	8.801E-06	3.0E+00
O2	4.816E-04	1.695E-02	1.469E-01	1.758E-01	2.119E-01	2.847E-11	3.296E-09	4.345E-08	2.383E-07	7.940E-07	1.736E-06	4.052E-06	1.136E-05	2.739E-05	6.150E-05	4.781E-05
CS+1	6.150E-05	4.781E-05	1.417E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
C+	0.0E+00	9.161E-73	1.113E-58	5.931E-51	7.665E-46	3.290E-42	7.590E-40	2.778E-37	3.638E-34	1.601E-31	3.706E-23	3.996E-20	2.360E-16	0.0E+00	0.0E+00	0.0E+00
H+1	0.0E+00	1.275E-64	1.264E-51	1.601E-44	8.281E-40	1.849E-36	2.839E-34	6.830E-32	5.865E-29	2.200E-26	7.360E-24	6.141E-24	9.755E-47	0.0E+00	0.0E+00	0.0E+00
N+	0.0E+00	2.172E-80	4.304E-64	3.384E-55	2.690E-49	4.178E-45	2.280E-42	2.202E-39	1.090E-35	2.115E-32	4.939E-29	1.182E-28	1.994E-28	0.0E+00	0.0E+00	0.0E+00
O2-	0.0E+00	5.995E-29	1.165E-22	2.328E-19	4.769E-17	1.812E-15	1.951E-14	2.712E-13	9.243E-12	2.480E-10	1.388E-03	5.193E-07	1.186E-09	0.0E+00	0.0E+00	0.0E+00

CO+	0.E+00	1.581E-57	2.500E-46	3.259E-40	3.720E-36	2.837E-33	2.150E-31	2.415E-29	8.073E-27	1.325E-24
	1.906E-22	1.029E-22	3.136E-45	0.E+00	0.E+00					
NO+	1.E+10	6.555E-49	9.347E-39	3.292E-33	1.595E-29	6.717E-27	3.523E-25	2.746E-23	6.706E-21	1.132E-18
	3.773E-16	4.125E-15	8.657E-26	0.E+00	0.E+00					
Q+	0.E+00	3.216E-75	1.693E-59	6.726E-51	3.465E-45	4.017E-41	1.837E-38	1.505E-35	6.689E-32	1.453E-28
	6.266E-25	7.801E-24	5.029E-44	0.E+00	0.E+00					

2. CHECK CASE 2 - CONVENTIONAL REENTRY VEHICLE ANALYSIS

a. Vehicle Configuration

1) Geometry: Sphere-cone

- a) Nose Radius: 1/2-inch
- b) Cone half angle: 8 degrees
- c) Length (streamwise): 7.0922 feet

2) Heatshield

- a) ATJ graphite from nose tip to .864 feet streamwise distance
- b) Phenolic carbon (composition as specified in NASA CR-72301, Aerotherm Report No. 67-15) between streamwise distances of .865 feet and 7.0922 feet
- c) Contamination: 100 PPM by weight sodium Na in graphite and phenolic carbon

b. Wall Boundary Conditions

- 1) Mass Ablation Rate: See Case II input cards
- 2) Wall Temperature: See Case II input cards

c. Free Stream Properties

- 1) Altitude: 10,000 feet
- 2) Velocity: 14,000 feet/second
- 3) Density: .05648 lb/ft³
- 4) Enthalpy: 115.364 Btu/lb (ref. to 0°K)
(static, -12.832 Btu/lb, ref. to 298°K)
- 5) Pressure: .6880 atm
- 6) Mach No.: 12.994

d. Shock Data

- 1) Local Pressure Ratio: See Case II input cards
- 2) Stagnation Conditions (from inviscid flow solution):
 - a) Pressure: 149.91 atm
 - b) Enthalpy: 3903.3 Btu/lb (ref. to 298°K)
- 3) Freestream stream function position vs. shock angle:
See Case II input cards

e. Input Cards

-279000+5	461930+5	179701+2	469024-3	-200934+7	928990+2	500.	3000.1	0.CHND
-279000+5	461930+5	217167+2	-229915-3	-105569+8	928990+2	3000.	5000.1	0.CHND
1001 01 06	01 09	JANAF 03/61						CHC
-290000+4	323670+5	128033+2	300638-3	-201721+7	769830+2	500.	3000.1	0.CHO
-290000+4	323670+5	103029+2	633312-3	121615+8	789830+2	3000.	5000.1	0.CHO
2001 01 06	JANAF 12/62							CH2
950000+5	329960+5	132894+2	413822-3	-290273+7	684940+2	500.	3000.1	0.CH2
950000+5	329960+5	140728+2	132150-3	-239493+7	584740+2	3000.	5000.1	0.CH2
2001 01 06	01 08	JANAF 03/61						CH20
-277000+5	437910+5	184022+2	379921-3	-431982+7	848830+2	500.	3000.1	0.CH20
-277000+5	437910+5	139629+2	161963-3	-372770+7	948880+2	3000.	5000.1	0.CH20
4001 01 06	JANAF 03/61							CH4
-176550+5	570790+5	230943+2	677826-3	-755061+7	925970+2	500.	3000.1	0.CH4
-176550+5	570790+5	236012+2	374222-3	-368234+7	925970+2	3000.	5000.1	0.CH4
1006 01 07	JANAF 12/62							CN
109000+6	272490+5	555906+1	115326-2	479517+6	660760+2	500.	3000.1	0.CN
109000+6	272490+5	989013+1	313855-3	-647453+7	669760+2	3000.	5000.1	0.CN
1 6 1 7 1 11	0 0 0 0 0 *	0 JANAF 03/66				AFWL - WRS		CNNA
225300+5	330100+5	138204+2	331050-3	-381026+6	994600+2	500	3000.1	CNNA
225300+5	330100+5	143601+2	778244-4	167248+7	994600+2	3000	5000.1	CNNA
1006 01 08	JANAF 03/61							CO
-264170+5	223570+5	865040+1	117021-3	-898211+6	653700+2	500.	3000.1	0.CO
-264170+5	223570+5	115496+2	-424139-3	-131563+8	653700+2	3000.	5000.1	0.CO
1006 02 08	JANAF 03/61							CO2
-940540+5	365350+5	144559+2	210386-3	-182392+7	798480+2	500.	3000.1	0.CO2
-940540+5	365350+5	155451+2	-381561-4	-602769+7	798480+2	3000.	5000.1	0.CO2
602006	JANAF 9/61							C2
198979+6	246920+5	776612+1	696081-3	185647+6	685519+2	500.	3000.1	0.C2
198979+6	246920+5	104162+2	566841-4	-640205+7	695519+2	3000.	5000.1	0.C2
10 1 2 6	DUFF BAUER 6/61							C2H
117395+6	349620+5	134210+2	469100-3	-187509+7	781140+2	500.	3000.1	0.C2H
117395+6	349620+5	142516+2	109402-3	-503862+7	781140+2	3000.	5000.1	0.C2H
2001 02 06	JANAF 03/61							C2H2
541700+5	482570+5	189960+2	769044-3	-409039+7	849690+2	500.	3000.1	0.C2H2
541700+5	482570+5	203952+2	287062-3	-645297+7	349690+2	3000.	5000.1	0.C2H2
4001 02 06	JANAF 12/60							C2H4
124960+5	676830+5	294887+2	526568-3	-865313+7	101790+3	500.	3000.1	0.C2H4
124960+5	676830+5	313872+2	616238-4	-131058+8	101790+3	3000.	5000.1	0.C2H4
12006002-07	JANAF 3/61							C2H2
708079+5	511070+5	108740+2	559856-3	-896773+6	985479+2	500.	3000.1	0.C2H2
738699+5	511070+5	208204+2	630229-5	-346865+7	985479+2	3000.	5000.1	0.C2H2
3006	JANAF 12/60							C3
189670+6	366220+5	146441+2	622536-4	-169227+7	799410+2	500.	3000.1	0.C3
139670+6	366220+5	144782+2	792232-4	-646877+6	799410+2	3000.	5000.1	0.C3
1001 01 07	JANAF 12/60							HN
792000+5	217660+5	827133+1	281555-3	-126696+7	609290+2	500.	3000.1	0.HN
792000+5	217660+5	765457+1	359353-3	180777+7	609290+2	3000.	5000.1	0.HN
1 1 1 11 0 0 0 0 0 *	JANAF 03/63				AFWL - WRS			HN
777000+5	242590+5	874435+1	298020-3	-260114+6	648020+2	500	3000.1	HN
297000+5	242590+5	949472+1	275912-3	234538+7	648020+2	3000	5000.1	HN
1 1 1 8 1 11 0 0 0 0 *	0 JANAF 03/66				AFWL - WRS			HN
-504000+5	371100+5	114447+2	722555-3	-407755+6	830870+2	500	3000.1	HN
-504000+5	371100+5	127321+2	169800-3	257273+7	830870+2	3000	5000.1	HN
1001 01 17 01 08	JANAF 12/60							HN
238000+5	327550+5	133320+2	122061-3	-232403+7	783850+2	500.	3000.1	0.HN
238000+5	327550+5	141521+2	-470424-4	-469135+7	783850+2	3000.	5000.1	0.HN

1001 01 08	JANAF 12/60	HC
933030+4 214040+5 773193+1 394385-3-973561+6 613920+2	500. 3000.1	0.HC
933030+4 214040+5 965144+1-443528-4-686115+7 613920+2	3000. 5000.1	0.HC
2001	JANAF 03/61	H2
- 212100+5 711963+1 621950-3-712694+6 484650+2	500. 3000.1	0.H2
- 212100+5 681794+1 585854-3 265106+7 494650+2	3000. 5000.1	0.H2
002001001007	JANAF 12/65	H2N
400999+5 305799+5 975862+1 114401-2-518970+6 701550+2	500. 3000.1	0.H2N
400999+5 305799+5 137417+2 220493-4-610024+7 7 1580+2	3000. 5000.1	0.H2N
2 1 2 7 0 0 0 0 0 *	T666 LIBRARY	H2N2
509000+5 437709+5 173547+2 582286-3-325379+7 851033+2	500 3000.1	H2N2
509000+5 437709+5 186269+2 195007-3-154736+7 851033+2	3000 5000.1	H2N2
2001 01 08	JANAF 03/61	H2D
-577980+5 302010+5 112254+2 811397-3-260900+7 684210+2	500. 3000.1	0.H2D
-577980+5 302010+5 157278+2-191548-3-173599+8 694210+2	3000. 5000.1	0.H2D
003001001007	JANAF 09/65	H3N
-109700+5 416309+5 125186+2 219670-2-978531+6 769080+2	500. 3000.1	0.H3N
-109700+5 416309+5 166320+2 923148-3-361337+7 769080+2	2000. 5000.1	0.H3N
004001002007	JANAF 12/65	H4N2
227899+5 685059+5 229856+2 241733-2-195931+7 108099+3	500. 3000.1	0.H4N2
227899+5 685059+5 314319+2 437245-4-139705+9 108099+3	3000. 5000.1	0.H4N2
1 8 1 11 0 0 0 0 0	JANAF 12/60	AFWL - WRS NA0
132000+5 243470+5 891391+1 138113-3-123218+6 743320+2	500 3000.1	NA0
132000+5 243470+5 873051+1 159255-3 116133+7 743320+2	3000 5000.1	NA0
2 11 0 0 0 0 0	JANAF 06/62	AFWL - WRS NA2
549980+5 258510+5 894240+1 385123-3-845826+4 766340+2	500 3000.1	NA2
549980+5 258510+5 840237+1 464003-3 334031+7 766340+2	3000 5000.1	NA2
1007	JANAF 03/61	N
112965+6 174370+5 486944+1 363516-4 958460+5 480900+2	500. 3000.1	0.N
112965+6 174370+5 428957+1 240844-3-417273+6 480900+2	3000. 5000.1	0.N
1007 01 08	JANAF 06/63	NO
215800+5 227000+5 877623+1 099031-4-789656+6 689490+2	500. 3000.1	0.NO
215800+5 227000+5 916260+1 657885-5-212519+7 689490+2	3000. 5000.1	0.NO
1007 02 08	JANAF 06/63	NO2
801100+4 345800+5 137819+2 315611-4-133765+7 848890+2	500. 3000.1	0.NO2
801100+4 345800+5 130154+2 172580-3 175340+7 848890+2	3000. 5000.1	0.NO2
001007003008	JANAF 12/64	NO3
170000+5 498219+5 192301+2 191161-3-112129+7 998970+2	500. 3000.1	0.NO3
170000+5 498219+5 198709+2 577142-7-172913+7 998970+2	3000. 5000.1	0.NO3
2007 01 08	JANAF 12/60	N2D
195000+5 365450+5 144686+2 120480-3-153478+7 815900+2	500. 3000.1	0.N2D
195000+5 365450+5 123036+2 459018-3 942382+7 815900+2	3000. 5000.1	0.N2D
002007003008	JANAF 12/64	N2D3
197999+5 617799+5 232121+2 477530-3-124103+7 123217+3	500. 3000.1	0.N2D3
197999+5 617799+5 248304+2 102872-5-293892+7 123217+3	3000. 5000.1	0.N2D3
002007004008	JANAF 9/64	N2D4
216999+4 785969+5 297734+2 594431-3-178832+7 134908+3	500. 3000.1	0.N2D4
216999+4 785969+5 317915+2 175630-5-385969+7 134908+3	3000. 5000.1	0.N2D4
002007005008	JANAF 12/64	N2D5
216999+4 215759+5 353051+2 147295-3-163850+7 156719+3	500. 3000.1	0.N2D5
216999+4 215759+5 357365+2 624544-5-171267+7 156719+3	3000. 5000.1	0.N2D5
1008	JANAF 06/62	D
595590+5 175220+5 497228+1 380769-5 154749+5 500760+7	500. 3000.1	0.D
595590+5 175220+5 657489+1-224268-3-891782+7 500960+2	3000. 5000.1	0.D
1 99	JANAF 05/65	AFWL - JEF
0 174230+5 496800+1 215333-5 262840-6 164590+2	300 3000.1	-

0	134230+5	496800+1	-232368-6	-986224-5	164590+2	3000	50001	E-
1	6 -1 99	C 0 0 0 0	0	0	0	0	0	AFWL TDR 64-44 NORM TO 278 JEFH+1
432426+6	134352+5	496355+1	-130999-6	334973+4	484318+2	500	30001	C+1
432426+6	134352+5	495164+1	323814-5	646115+5	484318+2	3000	50001	C+1
01 11 -1 99								NA+
+14383	+6+134231+5+49681	+1				+468068+2	00500	060001 NA+
+14383	+6+134231+5+49681	+1				+468068+2	00500	060001 NA+
1	7 1 8 -1 99					JANAF 06/66		AFWL - WRS NO+
236660+6	221500+5	774520+1	418330-3	-269762+6	653320+2	500	30001	NO+
236660+6	221500+5	820583+1	130026-3	214001+7	553320+2	3000	50001	NO+
1	8 1 99					JANAF 06/65		AFWL - WRS 0-
243000+5	134820+5	496695+1	691566-6	198781+5	492850+2	500	30001	0-
243000+5	134820+5	496947+1	-180037-6	138583+5	492850+2	3000	50001	0-
1	6 1 99	0 -0	0 -0	0 -0	0 -0	- JANAF 09-65		AFWL-NV C-
140500+6	134370+5	491212+1	321368-4	132546+5	476310+2	500	30001	C-
140500+6	134370+5	244233+1	573167-3	763348+7	476310+2	3000	60001	C-
1	1 -1 99	0 -0	0 -0	0 -0	0 -0	- AFWL TDR 64-44 NORM TO 278 JEFH+1		
367161+6	134226+5	496793+1	-596238-5	-304069-6	374820+2	500	30001	H+1
367161+6	134226+5	496793+1	-267224-5	-113416-4	374820+2	3000	50001	H+1
1	1 1 8 1 99	0 -0	0 -0	0 -0	0 -0	- CJANAF 3-56		AFWL-NV NO-1
-344000+5	213240+5	674082+1	719851-2	-638922+5	585820+2	500	30001	NO-1
-344000+5	213240+5	781605+1	250452-3	287562+7	585820+2	3000	50001	NO-1
3	1 1 8 -1 99	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	- CJANAF 06/66		AFWL - WRS H30+1
138900+6	402930+5	118547+2	235311-2	-918440+6	759010+2	500	30001	H30+1
138900+6	402930+5	161099+2	505835-3	773556+7	759010+2	3000	60001	H30+1
1	7 -1 99	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	- AFWL TDR 64-44 NORM TO 278 JEFH+1		
449589+6	134721+5	439332+1	338126-4	563287+5	497019+2	500	30001	N+1
449589+6	134721+5	451805+1	137668-3	629693+6	497019+2	3000	50001	N+1
1	7 2 8 1 99	0 -0	0 -0	0 -0	0 -0	- CJANAF 12-65		AFWL-NV NO2-
-859000+5	350150+5	133480+2	190394-3	-710004+6	845930+2	500	30001	NO2-
-859000+5	350150+5	135346+2	548795-4	105301+7	845930+2	3000	60001	NO2-
2	7 -1 99	0 -0	0 -0	0 -0	0 -0	- BROWNE EPTM-3		SAAG AFWL-NV N2+1
359306+6	252240+5	656358+1	103235-2	-983877+5	656860+2	500	30001	N2+1
359306+6	252240+5	106439+2	903548-4	-519734+7	656860+2	3000	50001	N2+1
1	8 -1 99	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	- AFWL TDR 64-44 NORM TO 278 JEFH+1		
375070+6	134238+5	496452+1	154755-3	240532+4	484312+2	500	30001	C+1
375070+6	134238+5	426730+1	146410-3	236516+7	484312+2	3000	50001	C+1
2	8 -1 99					BROWNE EPTM-3		AFWL-NV 02+1
231480+6	227199+5	821253+1	295407-3	-317505+6	677520+2	500	30001	02+1
231480+6	227199+5	759256+1	307050-3	439516+7	677520+2	3000	50001	02+1
2	8 1 99					JANAF 12/66		AFWL - WRS 02-
-113900+5	255850+5	874295+1	147731-3	-260657+6	693050+2	500	30001	15 02-
-113900+5	255850+5	844640+1	160340-3	168458+7	693050+2	3000	60001	15 02-
blank card								
13 14300.	.05648	-12.532	.6380					
F 0.	.010571	.039142	.059170	.030039	.10147	.12165	.11736	
.17072	.20123	.24552	.30143	.39947	.47975	.60781	.80271	
.99424	1.4552							
R 0.	.1563	.6931	.9471	1.1387	1.2418	1.3012	1.3370	
1.3768	1.3933	1.4109	1.4249	1.4323	1.4166	1.4065	1.4011	
1.4009	1.4011							
blank card								
1.00	.9591	.95637	.85795	.81501	.63932	.40627	.21037	
.020156	.060578	.063805	.061807	.059205	.055102	.051021	.044704	
.038409	.030425	.021932	.020536	.019076	.019064	.019045	.019011	
.021154	.022557	.023850	.024026	.027384	.027966	.027981	.02788	

.027754 .027659 .027633 .027647 .027649 .027652 .027656

7 blank cards

7986.	7999.	7974.	7956.	7913.	7798.	7766.	7552.
7251.	7083.	7055.	7028.	6905.	6956.	6919.	6836.
6748.	6595.	6362.	6255.	6176.	6155.	5994.	5755.
5990.	6031.	6066.	6106.	6085.	6102.	6109.	6071.
6076.	6083.	6089.	6040.	6041.	6043.	6046.	

11 blank cards

.4759	.5058	.4733	.4896	.4399	.3586	.8041	.5501
.2908	.1919	.1789	.1711	.1621	.1510	.1420	.1245
.1085	.08643	.06598	.05764	.05383	.05393	.06729	.07112
.07794	.08571	.09429	.1110	.1161	.1218	.1226	.1157
.1160	.1157	.1148	.1071	.1074	.1078	.1082	

blank card

:

(end-of-file card)

f. Computer Output

The first and last points of the boundary layer edge and shock thermodynamic state output are presented. The boundary layer solutions for the stagnation point and for one station on the afterbody are also included.

BOUNDARY LAYER INTEGRAL MATRIX PROGRAM (BLIMP)

AEROTHERM CORPORATION, PALO ALTO, CALIF (RMK, EP8)

CASE CHECK CASE 2 - REENTRY VEHICLE

CONTROL NUMBERS 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
1 0 2 0 3 0 2 0 2 1 0 2 0 2 -0 -0 -0 -0 -0 -0

PUNCH CONTROL
IDENT JSPEC
-0

U/UE TO NORM. ETA	NODAL PT. AT WHICH ETA NORM.	ETA VALUES
9.500E-01	13	0.E+00 2.000E-03 4.000E-03 7.000E-03 1.200E-02 2.000E-02 3.000E-02 5.000E-02 1.000E-01
		2.000E-01 3.500E-01 5.000E-01 1.000E+00 1.600E+00 2.500E+00
NOSE RADIUS, FT	4.16667E-02	CONE HALF ANGLE 8.00000E+00 DEGREES

CASE 2.00000E+00

TOTAL ENTHALPY, BTU/LB 3.90330E+03

TOTAL PRESSURE, ATM 1.49910E+02

INCIDENT RAC FLUX, 3/SF2 0.E+00

MIXING LENGTH CONSTANT = 4.4000E-01
 SUBLAYER CONSTANT, YA+ = 1.1823E+01
 CLAUER NUMBER = 1.8000E-02
 TURBULENT SCHMIDT NUMBER = 9.0000E-01
 TURBULENT PRANDTL NUMBER = 9.0000E-01
 TRANSITION MOM. THICK. RE = 3.0000E+02

CASE 2

RELATIVE ELEMENTAL COMPOSITIONS, ATOMIC HTS/UNIT MASS

AT.NO.	ELEMENT	ATOMIC WT	EDGE GAS	PRO.GAS 1	CHAR 1	PYRO.GAS 2	CHAR 2	PYRO.GAS 3	CHAR 7
1	HYDROGEN	1.00800	0.0000000	-0.0000000	0.0000000	-0.0000000	00.0727362	-0.0000000	-0.0000000
6	CARBON	12.01100	0.0000000	-0.0000000	00.0832559	-0.0000000	00.0769038	-0.0000000	-0.0000000
7	NITROGEN	14.00800	0.0546117	-0.0000000	0.0000000	-0.0000000	0.0000000	-0.0000000	-0.0000000
8	OXYGEN	16.00000	0.0146875	-0.0000000	0.0000000	-0.0000000	00.0034622	-0.0000000	-0.0000000
11	SODIUM	22.99000	0.0000000	-0.0000000	0.0000000	-0.0000000	00.0000000	-0.0000000	-0.0000000
99	ELECTRON	00.00055	0.0000000	-0.0000000	0.0000000	-0.0000000	0.0000000	-0.0000000	-0.0000000

THERMOOYNAMIC PROPERTY CURVE-FIT DATA (SEE MANUAL FOR FORMAT)

1.	1-0	-0-0	-0-0	-0-0	-0-0	-0-0	-0-0	-0-JANAF	12/60	H
	0.52102E+05	0.13423E+05	0.48022E+01	0.55947E-04	0.17310E+06	0.38862E+02	500.0000			
	0.52102E+05	0.13423E+05	0.30875E+01	0.31503E-03	0.92974E+07	0.38862E+02	3000.0000			
1.	6-0	-0-0	-0-0	-0-0	-0-0	-0-JANAF	03/61	C		
	0.17089E+06	0.13550E+05	0.44443E+01	0.22813E-03	0.40987E+06	0.49287E+02	500.0000			
	0.17089E+06	0.13550E+05	0.44443E+01	0.42121E+01	0.26391E-03	0.26289E+07	0.49287E+02	3000.0000		
1.	11 0	0 0	0 0	0 0	0 JUANAF	06/62	AFWL - WRS NA			
	0.25735E+05	0.13467E+05	0.48100E+01	0.31614E-04	0.37231E+05	0.48200E+02	500.0000			
	0.25735E+05	0.13467E+05	0.12284E+02	0.34422E-02	0.46314E+08	0.48200E+02	3000.0000			
2.	8-0	-0-0	-0-0	-0-0	-0-0	-JUANAF	03/61	O2		
	0.E+C0	0.23446E+05	0.80437E+01	0.51087E-03	0.15272E+06	0.67973E+02	500.0000			
	0.E+C0	0.23446E+05	0.10307E+02	0.29099E-04	0.78308E+07	0.67973E+02	3000.0000			
2.	7-0	-0-0	-0-0	-0-0	-0-0	-JUANAF	03/61	N2		
	0.E+C0	0.22165E+05	0.86270E+01	0.11609E-03	0.10371E+07	0.63765E+02	500.0000			
	0.E+C0	0.22165E+05	0.98417E+01	0.11623E-03	0.61273E+07	0.63765E+02	3000.0000			
1.	1 1	6-0	-0-0	-0-0	-0-0	-JUANAF	03/61	CH		
	0.14201E+06	0.221130E+05	0.82608E+01	0.30221E-03	0.10018E+07	0.61612E+02	500.0000			
	0.14201E+06	0.221130E+05	0.70709E+01	0.46328E-03	0.45528E+07	0.61612E+02	3000.0000			
1.	1 1	6 1	7-0	-0-0	-0-0	-JUANAF	03/61	CHN		
	0.31202E+05	0.335593E+05	0.13702E+02	0.55224E-03	0.22935E+07	0.75862E+02	500.0000			
	0.31202E+05	0.335593E+05	0.17889E+02	0.29505E-03	0.18367E+08	0.75862E+02	3000.0000			
1.	1 1	6 1	7 1	8-0	-0-0	-JUANAF	12/60	CHNO		
	0.27902E+05	0.46193E+05	0.17970E+02	0.46902E-03	0.20090E+07	0.92899E+02	500.0000			
	0.27902E+05	0.46193E+05	0.21117E+02	0.22991E-03	0.10557E+08	0.92899E+02	3000.0000			
1.	1 1	6 1	8-0	-0-0	-0-0	-JUANAF	03/61	CHO		
	0.29009E+04	0.32367E+05	0.12803E+02	0.30064E-03	0.20172E+07	0.78983E+02	500.0000			
	0.29001E+04	0.32367E+05	0.10303E+02	0.63331E-03	0.12161E+08	0.78983E+02	3000.0000			
2.	1 1	6-0	-0-0	-0-0	-0-0	-JUANAF	12/62	CH2		
	0.95003E+05	0.32996E+05	0.13289E+02	0.4382E-03	0.29027E+07	0.58494E+02	500.0000			
	0.95003E+05	0.32996E+05	0.14073E+02	0.13215E-03	0.23949E+07	0.58494E+02	3000.0000			
2.	1 1	6 1	8-0	-0-0	-0-0	-JUANAF	03/61	CH2O		
	0.27702E+05	0.43791E+05	0.18402E+02	0.37992E-03	0.43194E+07	0.84888E+02	500.0000			
	0.27702E+05	0.43791E+05	0.11363E+02	0.16396E-03	0.37277E+07	0.84888E+02	3000.0000			
4.	1 1	6-0	-0-0	-0-0	-0-0	-JUANAF	03/61	CH4		
	0.17895E+05	0.53079E+05	0.23195E+02	0.67790E-03	0.75506E+07	0.82597E+02	500.0000			
	0.17895E+05	0.53079E+05	0.23609E+02	0.37432E-03	0.36823E+07	0.82597E+02	3000.0000			

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ELEMENT BASE SP	HYDROGEN H	CARBON C	NITROGEN N2	OXYGEN O2	SODIUM NA	ELECTRON E-
1	1	1	1	1	1	1

MOLECULAR TRANSPORT PROPERTIES

VISCOSITY/ BUDDENBERG - WILKE MIXTURE FORMULA WITH MU(I) CALCULATED ON
 THE BASIS OF D(I,I) = DBAR/G(I)**2

THERMAL CONDUCTIVITY MASON - SAXENA MIXTURE FORMULA WITH EUCKEN CORRECTION

DIFFUSION COEFFICIENTS $D(I,J) = DBAR/(F(I)*F(J))$ WITH DBAR BASED ON
SIGMA = 3.4670, EPOVRK = 106.7000, AND HREF = 32.0000

METHODS EMPLOYED

0 CONDENSED PHASE, VALUES FOR F(I) AND G(I) SET EQUAL TO 1.E+10

1 VALUES FOR F(I) (OR G(I)) INPUT DIRECTLY

2 VALUES FOR F(I) (OR G(I)) CALCULATED BY F(I) = (M(I)/FITMOL)**FFA AND G(I) = (M(I)/FITGMW)**GGA WHERE M(I) IS SPECIES MOLECULAR WEIGHT, FITMOL = 26.7000, AND FFA = 0.4890, FITGMW = 24.3000, AND GGA = 0.4540

VALUES FOR G(I) CALCULATED BY $G(I) = \sqrt{RT(OBAR/D(I,I))} = (\text{SIGMA}(I)/\text{SIGMA})$
 * $(\text{EPS}(I)/\text{EPOVRX})^{**0.0795} * (M(I)/MREF)^{**0.25}$ WHERE SIGMA(I) AND EPS(I)
 ARE GIVEN WITH THERMODYNAMIC DATA

SPECIES	F (I)	METHOD	G (I)	METHOD	SPECIES	F (I)	METHOD	G (I)	METHOD
H	0.201	2	0.236	2	C	0.677	2	0.726	2
HA	0.929	2	0.975	2	O2	1.093	2	1.133	2
N2	1.024	2	1.167	2	E-	0.005	2	0.008	2
C-	0.704	2	0.753	2	CHN	1.006	2	1.045	2
CHNO	1.263	2	1.296	2	CHO	1.042	2	1.084	2
C4C2	0.730	2	0.779	2	CH2O	1.059	2	1.101	2
CH4	0.780	2	0.828	2	CN	0.987	2	1.032	2
CNNA	1.346	2	1.375	2	CO	1.024	2	1.067	2
C02	1.277	2	1.310	2	C2	0.950	2	0.995	2
C2H	0.965	2	1.014	2	C2H2	0.989	2	1.032	2
C2H4	1.572	2	1.067	2	C2N2	1.386	2	1.413	2
C3	1.158	2	1.196	2	HN	0.755	2	0.804	2
C4NA	0.949	2	0.994	2	HN4O	1.219	2	1.254	2
NO	1.076	2	1.117	2	HO	0.802	2	0.850	2
N2	0.253	2	0.323	2	H2N	0.779	2	0.828	2

H2N2	1.059	2	1.131	2	H2O	0.825	2	0.873	2
H2N	0.903	2	0.951	2	H4N2	1.093	2	1.134	2
NAO	1.203	2	1.239	2	NA2	1.304	2	1.336	2
N	0.729	2	0.779	2	NO	1.059	2	1.101	2
NO2	1.305	2	1.336	2	NO3	1.513	2	1.530	2
H2O	1.277	2	1.310	2	N2O3	1.668	2	1.678	2
N2O4	1.831	2	1.830	2	N2O5	1.981	2	1.969	2
O	0.778	2	0.827	2	C+1	0.677	2	0.726	2
NA+	0.929	2	0.975	2	NO+	1.059	2	1.101	2
O-	0.778	2	0.827	2	C-	0.677	2	0.726	2
H+1	0.201	2	0.236	2	HO-1	0.802	2	0.850	2
H3O+1	0.947	2	0.995	2	N+1	0.729	2	0.779	2
NO2-	1.335	2	1.336	2	N2+1	1.024	2	1.067	2
O+1	0.778	2	0.827	2	O2+1	1.093	2	1.133	2
O2-	1.093	2	1.133	2					

STAGNATION SOLUTION FOLLOWED BY BOUNDARY-LAYER EDGE EXPANSION

STREAM FUNCTION, LB/SEC 0.E+00 0.15143E+00 0.60573E+00 0.13842E+01 0.25360E+01 0.40707E+01 0.50508E+01 0.77336E+01
 0.11523E+02 0.16010E+02 0.23832E+02 0.35922E+02 0.63090E+02 0.98741E+02 0.14606E+03 0.25475E+03
 0.39137E+03 0.63722E+03

SHOCK ANGLE, RADIAN 0.E+00 0.35630E+00 0.69310E+00 0.94710E+00 0.11387E+01 0.12418E+01 0.13012E+01 0.13370E+01
 0.13768E+01 0.13933E+01 0.14109E+01 0.14249E+01 0.14323E+01 0.14466E+01 0.14606E+01 0.14611E+01
 0.14609E+01 0.14611E+01

CP-FROZEN CP-EQUIL OLNH/OLNT OLNH/OLNP GAMMA
 0.31871E+00 0.60967E+00-0.32204E+00 0.30799E-01 0.12339E+01

TEMP = 5518.0909 DEG-K PRES = 149.9100 ATM MOL WT = 25.8520972
 RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00 0.E+00
 ENTHALPY = 0.2168500E+04 CAL/GM ENTROPY = 0.22662E+01 CAL/GM-DEG K
 DENSITY = 0.534249E+00 LB/CUFT
 VEL = 0.E+00 FT/SEC YACH = 0.E+00 AREA = 0.E+00 SQFT/LB/SEC

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
H	0.E+00	C	0.E+00	NA	0.E+00
O2	0.39381E-01	N2	0.65319E+00	E-	0.25528E-04
CH	0.E+00	CHN	0.E+00	CHNO	0.E+00
CHO	0.E+00	CH2	0.E+00	CH2O	0.E+00
CH4	0.E+00	CN	0.E+00	CNNA	0.E+00
CO	0.E+00	CO2	0.E+00	C2	0.E+00
C2H	0.E+00	C2H2	0.E+00	C2H4	0.E+00
C2N2	0.E+00	C2	0.E+00	HN	0.E+00
HNA	0.E+00	HNAO	0.E+00	HNO	0.E+00
HO	0.E+00	H2	0.E+00	H2N	0.E+00
H2N2	0.E+00	H2O	0.E+00	H3N	0.E+00
H4N2	0.E+00	NAO	0.E+00	NA2	0.E+00
N	0.5671E-02	NO	0.98618E-01	NO2	0.96218E-04
NO3	0.57493E-08	N2O	0.66560E-14	N2O3	0.56400E-09
N2O+	0.66399E-13	N2O5	0.29821E-15	O	0.20201E+00
C+1	0.E+00	N4+	0.E+00	NO+	0.23661E-04
O-	0.74536E-05	C-	0.E+00	+1	0.E+00
HO-1	0.E+00	H3O+1	0.E+00	N+1	0.30253E-09
H02-	0.13940E-06	H2+1	0.39510E-08	O+1	0.12753E-07
H2+1	0.10733E-04	H2-	0.45972E-06		

CP-FROZEN CP-EQUIL DLNH/DLNT DLNH/DLNP GAMMA
 0.31370E+00 0.6532E+00 0.23399E+00 0.12891E-01 0.11794E+01

TEMP = 3303.3513 DEG-K PRES = 4.1459 ATM MOL WT = 28.0658265
 RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00 0.E+00
 ENTHALPY = 0.1035973E+04 CAL/GH ENTROPY = 0.22652E+01 CAL/GH-DEG K
 DENSITY = 0.267947E-01 LB/CUFT
 VEL = 0.101E+05 FT/SEC WACH = 0.287E+01 AREA = 0.369E-02 SQFT/LB/SEC

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
H	0.E+00	C	0.E+00	NA	0.E+00
O2	0.15024E+00	N2	0.73803E+00	E-	9.10515E-06
CH	0.E+00	CHN	0.E+00	CHNO	0.E+00
CHO	0.E+00	CH2	0.E+00	CH2O	0.E+00
CH4	0.E+00	CN	0.E+00	CNNA	0.E+00
CO	0.E+00	CO2	0.E+00	C2	0.E+00
C2H	0.E+00	C2H2	0.E+00	C2H4	0.E+00
C2H2	0.E+00	C3	0.E+00	HN	0.E+00
HNA	0.E+00	HNAO	0.E+00	HNO	0.E+00
HO	0.E+00	H2	0.E+00	H2N	0.E+00
H2N	0.E+00	H2O	0.E+00	H3N	0.E+00
H4N2	0.E+00	HAO	0.E+00	NA2	0.E+00
N	0.34502E-04	N0	0.56573E-01	N02	0.41164E-04
N03	0.34430E-09	N20	0.58569E-05	N203	0.46282E-11
N204	0.33175E-15	N205	0.47099E-18	O	0.55074E-01
C+1	0.E+00	NA+	0.E+00	NO+	0.73026E-07
O-	0.66765E-08	C-	0.E+00	H+1	0.E+00
HO-1	0.E+00	H3O+1	0.E+00	N+1	0.48831E-17
HO2-	0.45736E-07	N2+1	0.24381E-14	O+1	0.39116E-13
O2+1	0.85910E-07	O2-	0.13713E-08		

TEMP = 5469.8950 DEG-K PRES = 145.7704 ATM MOL WT = 25.9031093
 RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00 0.E+00
 ENTHALPY = 0.214287E+04 CAL/GH ENTROPY = 0.22637E+01 CAL/GH-DEG K
 DENSITY = 0.525108E+00 LB/CUFT

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
H	0.E+00	C	0.E+00	NA	0.E+00
O2	0.41021E-01	N2	0.65459E+00	E-	0.23602E-04
CH	0.E+00	CHN	0.E+00	CHNO	0.E+00
CHO	0.E+00	CH2	0.E+00	CH2O	0.E+00
CH4	0.E+00	CN	0.E+00	CNNA	0.E+00
CO	0.E+00	CO2	0.E+00	C2	0.E+00
C2H	0.E+00	C2H2	0.E+00	C2H4	0.E+00
C2H2	0.E+00	C3	0.E+00	HN	0.E+00
HNA	0.E+00	HNAO	0.E+00	HNO	0.E+00
HO	0.E+00	H2	0.E+00	H2N	0.E+00
H2N	0.E+00	H2O	0.E+00	H3N	0.E+00
H4N2	0.E+00	HAO	0.E+00	NA2	0.E+00
N	0.60670E-02	N0	0.99115E-01	N02	0.98416E-04
N03	0.58482E-08	N20	0.65337E-04	N203	0.58421E-09
N204	0.67975E-13	N205	0.30428E-15	O	0.19898E+00
C+1	0.E+00	NA+	0.E+00	NO+	0.21809E-04
O-	0.99620E-05	C-	0.E+00	H+1	0.E+00
HO-1	0.E+00	H3O+1	0.E+00	N+1	0.23239E-09
HO2-	0.95076E-06	N2+1	0.3131E-19	O+1	0.10522E-07
O2+1	0.10136E-04	O2-	0.44413E-06		

TEMP = 441.2483 DEG-K PRES = 4.0131 ATM MOL WT = 26.8603830
 RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00 0.E+00
 ENTHALPY = 0.4994597E+02 CAL/GM ENTROPY = 0.16717E+01 CAL/GM-DEG K
 DENSITY = 0.199666E+00 LB/CUFT

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
H	0.E+00	C	0.E+00	NA	0.E+00
O2	0.21194E+00	N2	0.78806E+00	E-	0.E+00
CH	0.E+00	CHN	0.E+00	CHNO	0.E+00
CHO	0.E+00	CH2	0.E+00	CH2O	0.E+00
CH4	0.E+00	CN	0.E+00	CNNA	0.E+00
CO	0.E+00	CO2	0.E+00	C2	0.E+00
C2H	0.E+00	C2H2	0.E+00	C2H4	0.E+00
C2H2	0.E+00	C3	0.E+00	HN	0.E+00
HNA	0.E+00	HNAO	0.E+00	HNO	0.E+00
HO	0.E+00	H2	0.E+00	H2N	0.E+00
H2H2	0.E+00	H2O	0.E+00	H3N	0.E+00
H4N2	0.E+00	NAO	0.E+00	NA2	0.E+00
N	0.56837E-53	NO	0.36064E-10	NO2	0.23792E-07
NOJ	0.14241E-16	N2O	0.20801E-13	N2O3	0.95752E-20
N2O4	0.10479E-16	N2O5	0.86286E-20	O	0.83928E-27
C+1	0.E+00	NA+	0.E+00	NO+	0.E+00
O-	0.E+00	C-	0.E+00	H+1	0.E+00
HO-1	0.E+00	H3O+1	0.E+00	N+1	0.E+00
MO2-	0.E+00	N2+1	0.E+00	O+1	0.E+00
O2+1	0.E+00	O2-	0.E+00		

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0.0.E+01	0.40556E-09	0.69828E-08	0.38212E-07	0.11378E-06	0.45553E-06	0.12687E-05	0.22956E-05
0.0.E+01	0.34325E-05	0.36018E-05	0.38591E-05	0.42209E-05	0.47944E-05	0.54295E-05	0.60097E-05
0.0.E+01	0.12113E-04	0.23830E-04	0.52418E-04	0.84509E-04	0.16956E-03	0.16982E-03	0.20890E-03
0.0.E+01	0.46405E-03	0.63764E-03	0.11548E-02	0.19357E-02	0.30219E-02	0.44451E-02	6.6237E-02
0.0.E+01	0.14217E-01	0.22147E-01	0.32492E-01	0.33196E-01	0.33995E-01	0.37517E-01	

DECEASED RATIO

0.1000E+01	0.90910E+00	0.95637E+00	0.00799E+00	0.81501E+00	0.63932E+00	0.44027E+00	0.21039E+00
0.99156E-01	0.65570E-01	0.53805E-01	0.61907E-01	0.59050E-01	0.55102E-01	0.51021E-01	0.44784E-01
0.34285E-01	0.23982E-01	0.23982E-01	0.27536E-01	0.19076E-01	0.19066E-01	0.19068E-01	0.19511E-01
0.25828E-01	0.23890E-01	0.26026E-01	0.26026E-01	0.27384E-01	0.27966E-01	0.27971E-01	0.27840E-01
0.27589E-01	0.27659E-01	0.27659E-01	0.27659E-01	0.27649E-01	0.27652E-01	0.27656E-01	
0.27754E-01							

STATIC PRESSURE, ATM

0.14391E+03	0.14208E+03	0.14337E+03	0.1331E+03	0.12218E+03	0.95840E+02	0.66904E+02	0.32739E+02
0.14864E+02	0.98308E+01	0.95650E+01	0.92805E+01	0.86754E+01	0.82603E+01	0.76486E+01	0.67136E+01
0.57572E+01	0.45610E+01	0.35951E+01	0.30786E+01	0.28597E+01	0.25882E+01	0.28585E+01	0.29249E+01
0.31712E+01	0.37853E+01	0.35813E+01	0.30916E+01	0.41051E+01	0.41921E+01	0.41931E+01	0.41747E+01
0.43916E+01	0.44634E+01	0.41425E+01	0.41446E+01	0.41449E+01	0.41453E+01	0.41459E+01	

035/11' / 110074A 3003

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100																																																														
0.64682E+03	0.90880E+04	0.91249E+04	0.91643E+04	0.92220E+04	0.92791E+04	0.93332E+04	0.93888E+04	0.94408E+04	0.94888E+04	0.95361E+04	0.95861E+04	0.96361E+04	0.96861E+04	0.97361E+04	0.97861E+04	0.98361E+04	0.98861E+04	0.99361E+04	0.99861E+04	1.00361E+05	1.00861E+05	1.01361E+05	1.01861E+05	1.02361E+05	1.02861E+05	1.03361E+05	1.03861E+05	1.04361E+05	1.04861E+05	1.05361E+05	1.05861E+05	1.06361E+05	1.06861E+05	1.07361E+05	1.07861E+05	1.08361E+05	1.08861E+05	1.09361E+05	1.09861E+05	1.10361E+05	1.10861E+05	1.11361E+05	1.11861E+05	1.12361E+05	1.12861E+05	1.13361E+05	1.13861E+05	1.14361E+05	1.14861E+05	1.15361E+05	1.15861E+05	1.16361E+05	1.16861E+05	1.17361E+05	1.17861E+05	1.18361E+05	1.18861E+05	1.19361E+05	1.19861E+05	1.20361E+05	1.20861E+05	1.21361E+05	1.21861E+05	1.22361E+05	1.22861E+05	1.23361E+05	1.23861E+05	1.24361E+05	1.24861E+05	1.25361E+05	1.25861E+05	1.26361E+05	1.26861E+05	1.27361E+05	1.27861E+05	1.28361E+05	1.28861E+05	1.29361E+05	1.29861E+05	1.30361E+05	1.30861E+05	1.31361E+05	1.31861E+05	1.32361E+05	1.32861E+05	1.33361E+05	1.33861E+05	1.34361E+05	1.34861E+05	1.35361E+05	1.35861E+05	1.36361E+05	1.36861E+05	1.37361E+05	1.37861E+05	1.38361E+05	1.38861E+05	1.39361E+05	1.39861E+05	1.40361E+05	1.40861E+05	1.41361E+05	1.41861E+05	1.42361E+05	1.42861E+05	1.43361E+05	1.43861E+05	1.44361E+05	1.44861E+05	1.45361E+05	1.45861E+05	1.46361E+05	1.46861E+05	1.47361E+05	1.47861E+05	1.48361E+05	1.48861E+05	1.49361E+05	1.49861E+05	1.50361E+05	1.50861E+05	1.51361E+05	1.51861E+05	1.52361E+05	1.52861E+05	1.53361E+05	1.53861E+05	1.54361E+05	1.54861E+05	1.55361E+05	1.55861E+05	1.56361E+05	1.56861E+05	1.57361E+05	1.57861E+05	1.58361E+05	1.58861E+05	1.59361E+05	1.59861E+05	1.60361E+05	1.60861E+05	1.61361E+05	1.61861E+05	1.62361E+05	1.62861E+05	1.63361E+05	1.63861E+05	1.64361E+05	1.64861E+05	1.65361E+05	1.65861E+05	1.66361E+05	1.66861E+05	1.67361E+05	1.67861E+05	1.68361E+05	1.68861E+05	1.69361E+05	1.69861E+05	1.70361E+05	1.70861E+05	1.71361E+05	1.71861E+05	1.72361E+05	1.72861E+05	1.73361E+05	1.73861E+05	1.74361E+05	1.74861E+05	1.75361E+05	1.75861E+05	1.76361E+05	1.76861E+0

234

0.50800E+00	0.48990E+00	0.54247E+00	0.46119E+00	0.51659E+00	0.50045E+00	0.72065E+00	0.96311E+00
0.16197E+01	0.93771E+00	0.42260E-01	0.12493E+00	0.14732E+00	0.16109E+00	0.16755E+00	0.16806E+00
0.15828E+00	0.13105E+00	0.10135E+00	0.66422E-01	0.18494E-01	0.35234E-01	0.12705E+01	0.27670E-01
0.37119E-01	0.36228E-01	0.32725E-01	0.24483E-01	0.14694E-01	0.35530E-02	0.27564E-02	0.29995E-02
0.19611E-02	0.74165E-03	0.34900E-04	0.70439E-04	0.59604E-03	0.30025E-03	0.42701E-03	0.42701E-03

INCIDENT PACIFICATION FLUX

[illegible]

CLYDE, OROP, JY/LB R

[illegible]

-1/6 LUX VCRM. 2A AMETER

0.24673E+00-0.27160E+00-0.28967E+00-0.27749E+00-0.30677E+00-0.36887E+00-0.451006E+00-0.81299E+00
C.15446E+01-0.21266E+01-0.22011E+01-0.22953E+01-0.24311E+01-0.26502E+01-0.28923E+01-0.33272E+01
0.19776E+01-0.19409E+01-0.63073E+01-0.94081E+01-0.10313E+02-0.11106E+02-0.11103E+02-0.10760E+02
C.1.266E+02-0.10094E+02-0.10087E+02-0.1386E+02-0.10939E+02-0.11669E+02-0.12508E+02-0.1323E+02
0.14773E+02-0.15422E+02-0.16627E+02-0.17733E+02-0.17786E+02-0.17941E+02-0.18150E+02

WALL TEMPERATURE, DEG F	0.79860E+04	0.79990E+04	0.79740E+04	0.79560E+04	0.79130E+04	0.77980E+04	0.77660E+04	0.75520E+04
	0.72910E+04	0.70830E+04	0.70550E+04	0.70280E+04	0.69950E+04	0.69560E+04	0.69190E+04	0.68360E+04
	0.67480E+04	0.65950E+04	0.63630E+04	0.62550E+04	0.61760E+04	0.61550E+04	0.59940E+04	0.59550E+04
	0.59930E+04	0.60310E+04	0.60660E+04	0.61880E+04	0.63850E+04	0.61020E+04	0.61090E+04	0.60710E+04
	0.60760E+04	0.60830E+04	0.60890E+04	0.60400E+04	0.60410E+04	0.60430E+04	0.60460E+04	
COMP FLUX, LB/SEC FT**2	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
COMP FLUX, LB/SEC FT**2	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
COMP FLUX, LB/SEC FT**2	0.47510E+00	0.50580E+00	0.47330E+00	0.48960E+00	0.43990E+00	0.35860E+00	0.80410E+00	0.55010E+00
	0.29080E+00	0.19190E+00	0.17890E+00	0.17110E+00	0.16210E+00	0.15190E+00	0.14200E+00	0.12450E+00
	0.10850E+00	0.86430E-01	0.65980E-01	0.57640E-01	0.53830E-01	0.53930E-01	0.67290E-01	0.71120E-01
	0.77940E-01	0.85710E-01	0.94290E-01	0.11180E+00	0.11610E+00	0.12180E+00	0.12260E+00	0.11570E+00
	0.11530E+00	0.11570E+00	0.11480E+00	0.10710E+00	0.10740E+00	0.10780E+00	0.10620E+00	

[illegible]

DISTANCE FROM WALL (FT)	DENSITY, G/CM ³	VISCOSITY, G/CM ² SEC	WJ /CM ² SEC	WJ /CM ² SEC	SPECIFIC HEAT (BTU/LB R)	THERMAL COND (BTU /SEC FT R)	GRANOTL NUMBER	MODIFIED SCHWIDT NUMBER	MOLECULAR WEIGHT	SHOSQEPS /PMOE ² WUE	MACH NUMBER
0.200	7.297E-01	6.441E-05	1.187E+00	3.240E-01	3.151E-05	6.956E-01	7.013E-01	2.035E+01	0.000	0.000	0.000
7.132E-04	7.272E-01	6.440E-05	1.186E+00	3.240E-01	3.154E-05	6.956E-01	7.013E-01	2.034E+01	0.000	0.000	0.000
1.464E-07	7.256E-01	6.436E-05	1.185E+00	3.240E-01	3.154E-05	6.955E-01	7.013E-01	2.033E+01	0.000	0.000	0.000
2.973E-07	7.233E-01	6.430E-05	1.183E+00	3.237E-01	3.163E-05	6.954E-01	7.013E-01	2.032E+01	0.000	0.000	0.000
6.673E-07	7.196E-01	6.427E-05	1.180E+00	3.237E-01	3.171E-05	6.953E-01	7.012E-01	2.029E+01	0.000	0.000	0.000
7.403E-07	7.133E-01	6.424E-05	1.176E+00	3.236E-01	3.185E-05	6.951E-01	7.011E-01	2.025E+01	0.000	0.000	0.000
1.116E-06	7.059E-01	6.420E-05	1.172E+00	3.235E-01	3.201E-05	6.948E-01	7.010E-01	2.021E+01	0.000	0.000	0.000
1.001E-06	6.901E-01	6.402E-05	1.158E+00	3.228E-01	3.239E-05	6.943E-01	7.010E-01	2.012E+01	0.000	0.000	0.000
3.072E-06	6.507E-01	7.115E-05	1.129E+00	3.222E-01	3.330E-05	6.931E-01	7.013E-01	2.794E+01	0.000	0.000	0.000
8.258E-06	5.724E-01	7.727E-05	1.075E+00	3.198E-01	3.573E-05	6.915E-01	6.990E-01	2.703E+01	0.000	0.000	0.000
1.551E-05	5.635E-01	7.663E-05	1.054E+00	3.182E-01	3.613E-05	6.924E-01	6.997E-01	2.749E+01	0.000	0.000	0.000
2.261E-05	5.671E-01	7.401E-05	1.043E+00	3.165E-01	3.591E-05	6.933E-01	7.016E-01	2.711E+01	0.000	0.000	0.000
5.736E-05	5.302E-01	7.721E-05	1.015E+00	3.148E-01	3.550E-05	6.933E-01	7.014E-01	2.624E+01	0.000	0.000	0.000
7.773E-05	5.366E-01	7.678E-05	1.001E+00	3.107E-01	3.535E-05	6.922E-01	6.993E-01	2.508E+01	0.000	0.000	0.000
1.222E-04	5.362E-01	7.675E-05	1.000E+00	3.107E-01	3.534E-05	6.921E-01	6.992E-01	2.505E+01	0.000	0.000	0.000

DISTANCE FROM WALL, FT

0.000 7.332E-04 1.668E-07 2.973E-07 4.823E-07 7.403E-07 1.116E-06 1.001E-06 3.072E-06 8.258E-06 1.551E-05 2.261E-05 5.736E-05 7.773E-05 1.222E-04

ELEMENTAL FRACTIONS AND THEIR FIRST AND SECOND DERIVATIVES WITH RESPECT TO ETA

M	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NA	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
O2	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N2	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

WOLF FRACTIONS

C	2.937E-03	2.893E-03	2.932E-03	3.005E-03	3.123E-03	3.334E-03	3.610E-03	4.161E-03	5.558E-03	3.409E-03
NA	1.481E-04	4.513E-05	4.619E-06	2.092E-07	0.E+00					
O2	7.910E-09	7.758E-09	7.607E-09	7.386E-09	7.026E-09	6.483E-09	5.863E-09	4.841E-09	3.440E-09	3.391E-09
N2	1.293E-10	1.357E-10	1.425E-10	1.533E-10	1.734E-10	2.122E-10	2.753E-10	4.782E-10	2.520E-09	1.328E-06
E-	5.994E-01	5.997E-01	5.999E-01	6.003E-01	6.010E-01	6.020E-01	6.033E-01	6.060E-01	6.136E-01	6.349E-01
CH	2.056E-07	2.077E-07	2.079E-07	2.097E-07	2.127E-07	2.181E-07	2.259E-07	2.479E-07	3.876E-07	2.365E-06
CHN	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
CHNO	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
CHC	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
CH2	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
CH2O	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
CH4	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
CN	2.849E-02	2.860E-02	2.872E-02	2.890E-02	2.917E-02	2.958E-02	3.001E-02	3.057E-02	2.921E-02	8.563E-03
CNNA	3.260E-04	1.048E-04	1.187E-05	5.565E-07	0.E+00					
CC	2.305E-08	2.215E-08	2.132E-08	2.013E-08	1.827E-08	1.550E-08	1.275E-08	8.481E-09	3.081E-09	2.154E-10
C02	2.188E-11	8.814E-12	5.876E-13	2.049E-15	0.E+00					
C2	3.390E-01	3.390E-01	3.391E-01	3.391E-01	3.391E-01	3.391E-01	3.392E-01	3.394E-01	3.404E-01	3.441E-01
C2H	2.911E-01	2.279E-01	7.468E-02	4.712E-03	0.E+00					
C2H2	4.350E-06	4.407E-06	4.529E-06	4.665E-06	4.902E-06	5.233E-06	6.050E-06	9.831E-06	9.280E-05	
C2H4	2.106E-03	3.743E-03	3.135E-03	2.565E-04	0.E+00					
C2N2	4.625E-03	4.642E-03	4.659E-03	4.682E-03	4.715E-03	4.754E-03	4.775E-03	4.711E-03	3.755E-03	2.327E-04
C3	3.155E-07	3.330E-08	4.401E-10	9.727E-13	0.E+00					
HN	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
HNA	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
HNAO	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
HNO	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
HO	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
H2	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
H2N	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
H2N2	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00

[illegible]

CASE 2 - - - - - STP WISE DIMENSION 0.42310E+01 FEET - - - - -

ITERATED VALUES									
ITS	TIME	ALPH	FPPM	DAMP	MAX. LIN ERROR	MAX. MOMENTUM	ENERGY	H	C
1	8.36232E-173	7.88400E-4999	5E-02	18	4.1E+01	13	1.8E+03	13-4.8E-03	13-1.8E-01
2	17.28232E-173	8.07551E-003	3E-02	18	1.8E+01	13	8.8E+02	13-2.4E-03	13-9.1E-02
3	26.08632E-173	8.07401E-003	3E-02	18	4.1E+01	15	1.6E+02	15-6.6E-05	15-2.1E-03
4	34.18832E-173	8.07381E-003	5E-03	18	1.4E+00	15	1.4E+00	15-1.4E-06	15-6.4E-05
5	42.18132E-173	8.07381E-000	5E-04	18	2.1E-01	15	1.5E+00	3-1.9E-07	3-9.1E-11
6	50.12032E-173	8.07381E-000	5E-05	18	6.4E-03	15	3.8E-01	3-5.0E-08	3-2.4E-12
7	57.53832E-173	8.07381E-000	2E-05	18	3.9E-03	15	1.2E-01	11-1.1E-07	11-5.1E-12
8	64.95732E-173	8.07381E-000	4E-06	18	1.0E-03	15	1.6E-02	10-8.5E-09	10-4.1E-13
9	72.37532E-173	8.07381E-000	2E-07	18	1.2E-04	11	1.4E-03	11-2.6E-09	11-1.3E-13
FLUX MOR- HEAT FLUXES									
ALPHA	XI	ROKAP	PRESSURE	EDGE	BETA	FLUX MOR- PARAMETER	FLUX MOR- TOT ENTH	RETRAD	QCOND
3.273E+01	8.432E-03	6.218E-01	4.161E+00	1.010E+04	1.960E-03	7.106E-02	1.081E+03	9.188E+02	0.E+00
ELEMENTAL MASS DIFFUSIVE FLUXES (LB/SEC SQ FT) FOR SODIUM									
WALL	MECH REM	PYROL GAS	CHAR	TOTAL GAS	HYDROGEN	CARBON	NITROGEN	OXYGEN	SODIUM
1.713E+02	0.E+00	0.E+00	1.160E-01	1.160E-01	1.97E-03	8.69E-02	7.20E-02	1.690E+02	9.414E-08
ELEMENTAL MASS TRANSFER COEFFICIENTS, RHO*UE*CF/2									
COEFF, RHO*UE*CF/2	COEFF, RHO*UE*CF/2	COEFF, RHO*UE*CF/2	COEFF, RHO*UE*CF/2	COEFF, RHO*UE*CF/2	COEFF, RHO*UE*CF/2	COEFF, RHO*UE*CF/2	COEFF, RHO*UE*CF/2	COEFF, RHO*UE*CF/2	COEFF, RHO*UE*CF/2
5.457E-01	4.309E-01	3.E+00	2.692E-01	2.692E-01	5.021E-01	4.990E-01	4.992E-01	4.983E-01	4.992E-01
MOMENTUM DISPLACE, EFFECTIVE ENTHALPY REYNOLDS									
THICKNESS, THICKNESS, BODY THICKNESS, PER FOOT	THICKNESS, THICKNESS, BODY THICKNESS, PER FOOT	THICKNESS, THICKNESS, BODY THICKNESS, PER FOOT	THICKNESS, THICKNESS, BODY THICKNESS, PER FOOT	THICKNESS, THICKNESS, BODY THICKNESS, PER FOOT	THICKNESS, THICKNESS, BODY THICKNESS, PER FOOT	THICKNESS, THICKNESS, BODY THICKNESS, PER FOOT	THICKNESS, THICKNESS, BODY THICKNESS, PER FOOT	THICKNESS, THICKNESS, BODY THICKNESS, PER FOOT	THICKNESS, THICKNESS, BODY THICKNESS, PER FOOT
-2.224E-02	-5.340E-02	-5.249E-02	4.698E-03	4.963E+06	4.642E-03	4.851E-03	4.835E-03	4.894E-03	4.835E-03
LOCAL INFORMATION									
DISTANCE, FROM WALL	ETA	F	FP	FPP	SHEAR	TOTAL ENTH- HALPY, G	CP	GPP	TEMP
6.2E+00	0.E+00	-1.189E+00	0.E+00	8.374E+00	1.713E+02	1.395E+03	0.91E+03	4.340E+04	6.076E+03
5.94E-05	0.547E-02	-1.17E+00	3.874E-01	3.762E+00	1.853E+02	1.951E+03	7.00E+03	6.406E+04	6.753E+11
1.194E-04	1.309E-01	-1.143E+00	5.577E-01	1.439E+00	1.915E+02	2.275E+03	2.866E+03	1.535E+04	1.642E+03
2.157E-04	2.291E-01	-1.083E+00	6.612E-01	6.685E-01	1.951E+02	2.483E+03	1.359E+03	4.011E+03	1.593E+03
3.445E-04	3.928E-01	-9.665E-01	7.438E-01	3.406E-01	1.973E+02	2.652E+03	7.021E+02	1.179E+03	1.525E+03
5.585E-04	6.547E-01	-7.618E-01	8.130E-01	1.886E-01	1.999E+02	2.795E+03	3.924E+02	4.288E+02	1.449E+03
8.174E-04	9.420E-01	-4.807E-01	8.636E-01	1.203E-01	2.012E+02	2.901E+03	2.530E+02	1.625E+02	1.382E+03
1.316E-03	1.637E+00	1.003E-01	9.258E-01	6.908E-02	2.023E+02	3.032E+03	1.466E+02	4.686E+01	5.847E+03
2.492E-03	3.277E+00	1.692E+00	1.009E+00	3.270E-02	2.020E+02	3.209E+03	6.991E+01	1.088E+01	1.136E+03
4.657E-03	6.547E+00	5.143E+00	1.189E+00	1.612E-02	1.977E+02	3.379E+03	3.431E+01	1.978E+00	9.652E+02
7.571E-03	1.146E+01	1.066E+00	1.157E+00	1.178E-02	1.877E+02	3.524E+03	2.459E+01	1.632E+00	7.965E+02
1.010E-02	1.637E+01	1.67E+01	1.206E+00	8.157E-03	1.742E+02	3.625E+03	1.658E+01	7.419E-01	6.619E+02
1.635E-02	3.273E+01	3.793E+00	1.293E+00	2.459E-03	1.265E+02	3.797E+03	4.437E+00	1.496E-01	3.910E+02
2.155E-02	5.238E+01	6.214E+01	1.327E+00	9.828E-04	9.672E+01	3.859E+03	1.498E+00	1.280E-01	2.681E+02
2.144E-02	8.184E+01	1.025E+02	1.366E+00	9.757E-05	1.303E+01	3.903E+03	0.E+00	-2.297E-01	1.054E+02
									8.896E+02
									1.088E+12

DISTANCE FROM WALL (FT)	DENSITY, RHO (LB/CU FT)	VISCOSITY, MU (LB/SEC FT)	RHO*MU /RHOE*MUE, C	SPECIFIC HEAT (BTU/LB R)	THERMAL COND (BTU /SEC FT R)	PRANDTL NUMBER	MODIFIED SCHMIDT NUMBER	MOLECULAR WEIGHT	RHO*SQ*EPS /RHOE*MUE	MACH NUMBER
0.E+00	2.509E-02	5.572E-05	9.512E-01	3.396E-01	3.003E-05	6.305E-01	7.010E-01	2.676E+01	0.E+00	0.E+00
5.964E-05	2.224E-02	5.965E-05	9.028E-01	3.335E-01	3.210E-05	6.196E-01	7.002E-01	2.637E+01	1.306E+00	1.900E+00
1.194E-04	2.308E-02	5.885E-05	9.243E-01	3.306E-01	3.037E-05	6.406E-01	7.016E-01	2.677E+01	5.041E+00	1.479E+00
2.057E-04	2.392E-02	5.739E-05	9.441E-01	3.285E-01	2.916E-05	6.534E-01	7.006E-01	2.713E+01	1.214E+01	1.792E+00
3.445E-04	2.481E-02	5.710E-05	9.641E-01	3.268E-01	2.814E-05	6.631E-01	7.005E-01	2.748E+01	2.508E+01	2.259E+00
5.585E-04	2.574E-02	5.619E-05	9.839E-01	3.252E-01	2.725E-05	6.705E-01	7.002E-01	2.782E+01	4.656E+01	2.297E+00
8.174E-04	2.653E-02	5.543E-05	1.000E+00	3.240E-01	2.658E-05	6.753E-01	6.999E-01	2.808E+01	7.402E+01	2.480E+00
1.316E-03	2.770E-02	5.427E-05	1.023E+00	3.223E-01	2.570E-05	6.803E-01	6.994E-01	2.843E+01	1.303E+02	2.710E+00
2.467E-03	2.975E-02	5.229E-05	1.059E+00	3.193E-01	2.436E-05	6.854E-01	6.986E-01	2.891E+01	2.759E+02	3.067E+00
4.657E-03	3.274E-02	4.947E-05	1.102E+00	3.174E-01	2.281E-05	6.882E-01	6.975E-01	2.930E+01	5.490E+02	3.448E+00
7.571E-03	3.731E-02	4.545E-05	1.154E+00	3.127E-01	2.064E-05	6.886E-01	6.965E-01	2.942E+01	7.131E+02	3.845E+00
1.013E-02	4.321E-02	4.113E-05	1.210E+00	3.074E-01	1.838E-05	6.880E-01	6.957E-01	2.934E+01	9.565E+02	4.247E+00
1.536E-02	6.695E-02	3.059E-05	1.393E+00	2.902E-01	1.293E-05	6.865E-01	6.946E-01	2.907E+01	2.296E+03	5.559E+00
2.155E-02	8.987E-02	2.512E-05	1.536E+00	2.741E-01	1.004E-05	6.860E-01	6.943E-01	2.897E+01	4.137E+03	6.538E+00
2.544E-02	1.048E-01	1.557E-05	1.956E+00	1.775E-01	4.035E-06	6.852E-01	6.940E-01	2.886E+01	6.654E+03	8.715E+00

DISTANCE FROM WALL, FT

0.E+00	5.964E-05	1.194E-04	2.057E-04	3.445E-04	5.545E-04	8.174E-04	1.316E-03	2.467E-03	4.657E-03
7.571E-03	1.010E-02	1.636E-02	2.155E-02	2.644E-02					

ELEMENTAL FRACTIONS AND THEIR FIRST AND SECOND DERIVATIVES WITH RESPECT TO ETA

H	3.923E-03	2.904E-03	2.410E-03	2.095E-03	1.839E-03	1.623E-03	1.466E-03	1.273E-03	1.014E-03	7.683E-04
	5.618E-04	4.181E-04	1.732E-04	8.963E-05	0.E+00					
	-2.043E-02	-1.072E-02	-4.358E-03	-2.065E-03	-1.359E-03	-5.879E-04	-3.750E-04	-2.149E-04	-1.011E-04	-4.910E-05
	-3.449E-05	-2.356E-05	-6.366E-06	-2.143E-06	0.E+00					
	1.484E-01	9.712E-02	2.335E-02	6.141E-03	1.801E-03	6.505E-04	2.444E-04	6.955E-05	1.588E-05	2.874E-06
C	2.328E-06	1.050E-06	2.151E-07	7.287E-07	4.741E-07					
	1.742E-01	1.292E-01	1.075E-01	8.354E-02	6.225E-02	7.273E-02	6.577E-02	5.724E-02	4.580E-02	3.492E-02
	2.573E-02	1.931E-02	8.278E-03	4.398E-03	0.E+00					
	-9.017E-01	-4.730E-01	-1.923E-01	-9.114E-02	-4.677E-02	-2.596E-02	-1.656E-02	-9.497E-03	-4.473E-03	-2.179E-03
	-1.561E-03	-1.056E-03	-2.923E-04	-1.021E-04	0.E+00					
	0.548E+00	4.297E+00	1.031E+00	2.711E-01	7.949E-02	2.871E-02	1.079E-02	3.070E-03	7.007E-04	1.260E-04
NA	1.027E-04	4.669E-05	9.684E-06	1.654E-05	2.347E-05					
	1.886E-07	1.398E-07	1.163E-07	1.012E-07	8.897E-08	7.866E-08	7.112E-08	6.189E-08	4.951E-08	3.772E-08
	2.779E-08	2.084E-08	8.904E-09	4.726E-09	0.E+00					
	-9.764E-07	-5.122E-07	-2.083E-07	-9.869E-08	-5.065E-08	-2.811E-08	-1.793E-08	-1.028E-08	-4.843E-09	-2.359E-09
	-1.689E-09	-1.143E-09	-3.156E-10	-1.099E-10	0.E+00					
	7.091E-06	4.642E-06	2.116E-06	2.335E-07	8.607E-08	3.109E-08	1.168E-08	3.324E-09	7.588E-10	1.365E-10
O2	1.112E-10	5.053E-11	1.047E-11	1.774E-11	2.520E-11					
	2.011E-01	2.094E-01	2.141E-01	2.168E-01	2.190E-01	2.208E-01	2.222E-01	2.238E-01	2.261E-01	2.282E-01
	2.300E-01	2.312E-01	2.334E-01	2.341E-01	2.350E-01					
	1.753E-07	9.195E-07	3.739E-07	1.772E-07	9.095E-08	5.043E-08	3.219E-08	1.847E-08	8.699E-09	4.241E-09
	3.040E-04	2.060E-04	5.728E-05	2.015E-05	0.E+00					
	-1.273E+00	-8.333E-01	-2.003E-01	-5.269E-02	-1.545E-02	-5.531E-03	-2.097E-03	-5.967E-04	-1.362E-04	-2.445E-05
	-1.996E-05	-9.049E-06	-1.890E-06	-3.297E-06	-4.665E-06					
N2	6.208E-01	6.590E-01	6.761E-01	6.876E-01	6.969E-01	7.048E-01	7.106E-01	7.177E-01	7.271E-01	7.361E-01
	7.437E-01	7.491E-01	7.542E-01	7.614E-01	7.650E-01					
	7.469E-01	3.918E-01	1.593E-01	7.549E-02	3.874E-02	2.150E-02	1.372E-02	7.866E-03	3.704E-03	1.804E-03
	1.292E-03	9.740E-04	2.414E-04	8.419E-05	0.E+00					
	-5.424E+00	-3.551E+00	-9.536E-01	-2.245E-01	-6.584E-02	-2.370E-02	-8.926E-03	-2.543E-03	-5.804E-04	-1.044E-04
	-8.506E-05	-3.865E-05	-8.009E-06	-1.357E-05	-1.928E-05					

HOLE FRACTIONS

H	2.842E-02	4.532E-02	3.153E-02	2.305E-02	1.677E-02	1.207E-02	9.059E-03	5.885E-03	2.648E-03	7.462E-04
	8.927E-05	4.946E-06	4.777E-11	8.808E-16	0.E+00					

C	2.152E-04	4.365E-08	9.998E-09	3.319E-09	1.160E-09	4.073E-10	1.662E-10	4.417E-11	3.825E-12	7.541E-14
NA	9.188E-17	1.087E-20	2.181E-36	2.340E-51	3.5E+00					
	2.318E-08	5.896E-09	7.113E-09	7.704E-09	8.101E-09	8.391E-09	8.585E-09	8.817E-09	9.056E-09	8.563E-09
O2	6.677E-09	3.535E-09	9.155E-12	1.578E-14	0.E+00					
	4.664E-13	3.023E-03	1.147E-02	2.353E-02	3.041E-02	4.074E-02	4.955E-02	6.197E-02	8.206E-02	1.057E-01
N2	1.334E-01	1.565E-01	1.904E-01	2.007E-01	2.119E-01					
	5.734E-01	6.137E-01	6.359E-01	6.530E-01	6.689E-01	6.839E-01	6.958E-01	7.114E-01	7.339E-01	7.557E-01
E-	7.716E-01	7.794E-01	7.864E-01	7.874E-01	7.881E-01					
	1.847E-07	4.178E-07	4.094E-07	3.336E-07	2.547E-07	1.868E-07	1.403E-07	8.991E-08	3.761E-08	7.941E-09
CH	4.429E-10	7.901E-12	2.087E-19	1.152E-26	0.E+00					
	1.449E-05	1.289E-07	2.644E-10	8.430E-11	2.866E-11	9.828E-12	3.923E-12	1.017E-12	6.411E-14	1.558E-15
CHN	1.739E-14	1.834E-22	2.388E-38	1.853E-53	0.E+00					
	3.304E-02	5.034E-07	1.744E-07	7.904E-08	3.903E-08	1.979E-08	1.118E-08	4.847E-09	1.048E-09	9.037E-11
CMO	1.387E-12	5.181E-15	1.426E-24	1.444E-33	0.E+00					
	7.193E-08	4.315E-08	2.873E-08	2.111E-08	1.555E-08	1.130E-08	8.497E-09	5.470E-09	2.308E-09	5.261E-10
CHO	3.630E-11	1.080E-12	8.598E-19	1.730E-24	0.E+00					
	1.419E-05	6.978E-06	4.728E-06	3.201E-06	2.0.E+00					
CP2	2.008E-03	2.659E-11	9.053E-19	8.093E-26	0.E+00					
	6.714E-07	2.087E-11	4.013E-12	1.288E-12	4.482E-13	1.584E-13	6.522E-14	1.765E-14	1.598E-15	3.475E-17
CM20	5.248E-20	8.489E-24	7.138E-39	3.935E-53	0.E+00					
	1.352E-08	5.335E-09	2.870E-09	1.421E-09	1.168E-09	7.390E-10	4.931E-10	2.663E-10	8.178E-11	1.151E-11
CH4	3.775E-13	3.689E-15	4.309E-23	1.659E-30	0.E+00					
	3.651E-08	1.019E-13	1.826E-14	6.345E-15	2.478E-15	1.000E-15	4.648E-16	1.516E-16	1.969E-17	7.877E-19
CN	3.555E-21	2.623E-24	1.308E-36	4.466E-40	0.E+00					
	3.289E-03	2.695E-07	7.553E-08	3.098E-08	1.354E-08	6.004E-09	3.016E-09	1.086E-09	1.664E-10	8.073E-12
CNNA	4.538E-14	4.247E-17	3.599E-29	1.137E-40	0.E+00					
CO	1.560E-17	2.851E-19	1.475E-27	1.153E-35	0.E+00					
	3.363E-01	2.731E-01	2.195E-01	1.837E-01	1.534E-01	1.267E-01	1.065E-01	8.098E-02	4.656E-02	1.739E-02
C02	2.858E-03	2.410E-04	1.380E-08	1.366E-12	0.E+00					
	4.256E-07	1.061E-02	2.005E-02	2.753E-02	3.475E-02	4.173E-02	4.731E-02	5.451E-02	6.368E-02	6.777E-02
C2	6.018E-02	4.693E-02	2.002E-02	1.061E-02	0.E+00					
	1.326E-04	6.210E-13	4.988E-14	8.696E-15	1.731E-15	3.567E-16	9.334E-17	1.303E-17	3.480E-19	1.038E-21
C2H	4.971E-26	7.737E-32	5.842E-55	5.718E-77	0.E+00					
	4.498E-03	4.337E-12	3.520E-13	7.109E-14	1.631E-14	3.925E-15	1.180E-15	2.033E-16	8.093E-18	4.645E-20
C2H2	6.977E-20	5.201E-29	2.560E-49	1.508E-68	0.E+00					
	1.609E-03	4.457E-13	3.619E-14	7.456E-15	1.830E-15	4.755E-16	1.533E-16	2.943E-17	1.444E-18	1.182E-20
C2H4	3.370E-24	6.167E-29	1.414E-47	4.129E-65	0.E+00					
	9.261E-09	6.56E-19	4.146E-20	7.236E-21	1.576E-21	3.650E-22	1.058E-22	1.778E-23	6.761E-25	3.778E-27
C2N2	5.902E-31	4.892E-36	5.521E-56	1.182E-74	0.E+00					
	8.900E-04	7.425E-13	8.775E-14	2.293E-14	6.996E-15	2.253E-15	8.721E-16	2.187E-16	1.731E-17	2.904E-19
C3	2.610E-22	2.182E-26	1.963E-42	1.409E-57	0.E+00					
	3.492E-04	2.182E-17	6.845E-19	7.038E-20	3.026E-21	1.242E-21	2.338E-22	2.035E-23	2.310E-25	1.744E-28
HN	7.923E-34	5.395E-41	2.172E-69	2.453E-96	0.E+00					
	8.301E-06	1.963E-05	1.296E-05	8.894E-06	6.041E-06	4.037E-06	2.832E-06	1.662E-06	6.142E-07	1.247E-07
HNA	8.281E-03	2.084E-10	7.218E-17	5.015E-23	0.E+00					
	7.231E-11	1.371E-11	1.336E-11	1.242E-11	1.127E-11	1.006E-11	9.043E-12	7.661E-12	5.523E-12	3.000E-12
HNAO	9.302E-13	1.422E-13	2.598E-18	4.481E-23	0.E+00					
	8.760E-15	3.834E-11	9.304E-11	1.507E-10	2.204E-10	3.056E-10	3.928E-10	5.496E-10	9.433E-10	1.072E-09
HNO	4.722E-09	1.136E-08	1.116E-08	5.954E-09	0.E+00					
	1.214E-11	9.971E-07	1.511E-06	1.658E-06	1.656E-06	1.563E-06	1.440E-06	1.230E-06	8.549E-07	4.354E-07
HO	1.243E-07	2.092E-08	1.314E-11	1.168E-14	0.E+00					
	1.264E-07	3.033E-03	1.250E-02	1.418E-02	1.471E-02	1.447E-02	1.385E-02	1.253E-02	9.761E-03	6.023E-03
H2	2.417E-03	6.487E-04	2.655E-06	1.396E-08	0.E+00					
	1.746E-02	8.530E-03	5.705E-03	4.320E-03	3.314E-03	2.535E-03	2.009E-03	1.422E-03	7.538E-04	2.796E-04
H2H	5.384E-05	5.857E-06	8.396E-10	2.204E-13	0.E+00					
	5.221E-07	4.675E-07	2.845E-07	1.935E-07	1.321E-07	8.926E-08	6.333E-08	3.786E-08	1.458E-08	3.201E-09
H2H2	2.477E-10	7.718E-12	6.468E-18	1.153E-23	0.E+00					
	2.349E-11	2.669E-11	1.588E-11	1.047E-11	6.913E-12	4.502E-12	3.090E-12	1.755E-12	6.117E-13	1.138E-13
	6.615E-15	1.408E-16	2.048E-23	1.414E-29	0.E+00					

M20	1.730E-07	2.747E-03	4.275E-03	5.246E-03	6.007E-03	6.590E-03	6.958E-03	7.317E-03	7.582E-03	7.749E-03
M3N	6.893E-03	5.752E-03	2.496E-03	1.288E-03	0.0E+00					
M4N2	4.049E-08	1.205E-08	6.933E-09	4.797E-09	3.391E-09	2.390E-09	1.744E-09	1.123E-09	4.890E-10	1.332E-10
M4O	1.537E-11	8.405E-13	7.892E-18	1.671E-22	0.0E+00					
M4O	1.811E-16	7.097E-17	3.121E-17	1.623E-17	8.890E-18	4.812E-18	2.819E-18	1.268E-18	2.894E-19	2.823E-20
M4O	5.781E-22	3.096E-24	2.979E-33	1.219E-41	0.0E+00					
M4O	4.664E-15	7.794E-11	1.906E-10	2.884E-10	3.864E-10	4.859E-10	5.719E-10	6.997E-10	9.302E-10	1.210E-09
M4O	1.453E-09	1.269E-09	1.961E-11	1.750E-13	3.8E+00					
M4O	7.429E-20	5.000E-21	7.219E-21	8.399E-21	9.205E-21	9.784E-21	1.016E-20	1.059E-20	1.093E-20	9.446E-21
M	5.412E-21	1.396E-21	6.453E-27	1.332E-32	0.0E+00					
M	4.425E-05	2.577E-04	1.869E-04	1.315E-04	3.023E-05	6.066E-05	4.270E-05	2.513E-05	9.303E-06	1.971E-06
M	1.199E-07	2.865E-09	7.821E-16	3.982E-22	5.499E-48					
M0	9.423E-08	1.079E-02	2.010E-02	2.548E-02	2.922E-02	3.171E-02	3.300E-02	3.376E-02	3.272E-02	2.800E-02
M0	1.895E-02	1.018E-12	6.483E-04	4.270E-05	5.114E-10					
M0	1.158E-16	8.732E-07	3.295E-06	5.433E-06	8.518E-06	1.122E-05	1.343E-05	1.636E-05	2.051E-05	2.418E-05
M0	2.532E-05	2.274E-05	5.645E-06	3.749E-06	6.458E-08					
M0	1.783E-27	1.317E-12	9.311E-12	2.115E-11	3.598E-11	5.238E-11	6.641E-11	8.519E-11	1.100E-10	1.241E-10
M0	1.092E-10	7.235E-11	8.057E-12	8.885E-13	1.201E-16					
M0	8.648E-12	1.045E-06	1.973E-06	2.523E-06	2.915E-06	3.185E-06	3.321E-06	3.429E-06	3.348E-06	2.883E-06
M0	1.960E-06	1.064E-06	7.732E-08	6.249E-09	2.273E-13					
M0	2.144E-29	1.736E-14	1.235E-13	2.807E-13	4.770E-13	6.927E-13	8.753E-13	1.115E-12	1.416E-12	1.540E-12
M0	1.257E-12	7.484E-13	5.408E-14	3.972E-15	1.109E-19					
M0	2.610E-39	1.434E-19	2.053E-18	6.471E-18	1.391E-17	2.435E-17	3.520E-17	5.305E-17	8.620E-17	1.277E-16
M0	1.607E-16	1.627E-16	9.756E-17	5.900E-17	1.454E-17					
M0	6.502E-48	2.942E-23	8.183E-22	3.442E-21	8.977E-21	1.813E-20	2.803E-20	4.832E-20	8.944E-20	1.484E-19
M0	2.026E-19	2.110E-19	1.166E-19	6.326E-20	1.235E-20					
C	1.103E-07	2.386E-02	3.882E-02	4.278E-02	4.236E-02	3.947E-02	3.595E-02	3.016E-02	2.028E-02	9.779E-03
C	2.528E-03	3.729E-14	1.331E-07	6.243E-11	1.247E-24					
C	1.168E-12	6.617E-15	6.849E-16	1.161E-16	2.094E-17	3.770E-18	8.654E-19	9.840E-20	1.820E-21	3.612E-24
C	1.134E-28	1.095E-34	3.323E-58	1.374E-80	0.0E+00					
NA	1.847E-07	1.543E-07	1.280E-07	1.112E-07	9.762E-08	8.598E-08	7.732E-08	6.646E-08	5.132E-08	3.642E-08
NA	2.271E-03	1.043E-08	6.802E-11	3.721E-13	0.0E+00					
NA	1.459E-13	2.318E-07	2.238E-07	1.680E-07	1.163E-07	7.633E-08	5.171E-08	2.818E-08	8.828E-09	1.464E-09
NA	7.853E-11	1.585E-12	7.381E-19	7.033E-25	0.0E+00					
O	2.145E-14	4.533E-09	8.421E-09	8.908E-09	8.006E-09	6.549E-09	5.245E-09	3.568E-09	1.548E-09	3.111E-10
O	1.384E-11	1.590E-13	3.974E-22	1.586E-30	0.0E+00					
O	1.246E-11	2.841E-15	7.330E-16	2.301E-16	7.183E-17	2.178E-17	7.699E-18	1.623E-18	8.694E-20	6.681E-22
O	1.247E-25	9.813E-31	7.241E-52	3.555E-72	0.0E+00					
M+1	3.989E-14	3.97E-12	1.065E-12	3.357E-13	1.052E-13	3.212E-14	1.147E-14	2.479E-15	1.497E-16	1.993E-18
M+1	1.681E-21	1.346E-25	1.675E-41	1.324E-56	0.0E+00					
M+1	2.986E-14	1.759E-09	3.202E-09	3.582E-09	3.473E-09	3.087E-09	2.667E-09	2.037E-09	1.102E-09	3.196E-10
M+1	2.707E-11	7.469E-13	6.558E-21	8.580E-27	0.0E+00					
M30+1	1.428E-15	1.693E-10	1.170E-10	7.21E-11	5.028E-11	3.110E-11	2.013E-11	1.032E-11	2.953E-12	4.460E-13
M+1	2.229E-14	4.255E-16	1.990E-22	2.728E-28	0.0E+00					
M+1	1.118E-17	5.689E-15	4.174E-15	4.175E-16	1.48E-16	3.032E-17	9.497E-18	1.681E-18	6.909E-20	4.849E-22
M+1	1.320E-25	2.234E-30	4.550E-49	6.408E-67	0.0E+00					
M2	1.592E-19	5.27E-10	2.697E-09	5.503E-09	8.868E-09	1.259E-08	1.580E-08	2.060E-08	2.771E-08	3.081E-08
M2	2.240E-08	1.042E-08	6.802E-11	3.721E-13	0.0E+00					
M2+1	3.686E-15	5.352E-13	1.755E-13	6.665E-14	2.501E-14	9.154E-15	3.818E-15	1.038E-15	9.481E-17	2.376E-18
M2+1	5.617E-21	1.775E-24	5.013E-38	5.955E-51	0.0E+00					
O+1	1.400E-19	1.770E-12	1.110E-12	5.270E-13	2.245E-13	8.859E-14	3.837E-14	1.069E-14	9.615E-16	2.179E-17
O+1	3.983E-20	8.300E-24	3.640E-38	6.994E-52	0.0E+00					
O2+1	3.370E-19	3.044E-08	7.214E-08	7.274E-08	5.167E-08	4.723E-08	3.558E-08	2.199E-08	8.173E-09	1.640E-09
O2+1	1.106E-10	2.831E-12	2.854E-18	5.374E-24	0.0E+00					
O2-	6.882E-21	6.669E-11	2.695E-10	4.298E-10	5.333E-10	5.767E-10	5.725E-10	5.191E-10	3.595E-10	1.391E-10
O2-	1.689E-11	6.960E-13	2.413E-19	1.001E-25	0.0E+00					