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PROJECT TECHNICAL REPORT

STEADY-STATE ATTITUDE CONTROL PROPULSION SYSTEMS
COMPUTER PROGRAM DOCUMENTATION AND USER'S MANUAL
VOLUME II
MSC/TRW TASK 705-1

NAS 9-8166

June, 1971

Prepared for
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

FACILITY FORM 602

N71-36574 (ACCESSION NUMBER)	
277 (PAGES)	G3 (THRU)
CR-115185 (NASA CR OR TMX OR AD NUMBER)	(CODE) 08 (CATEGORY)

OFFICE OF PRIME RESPONSIBILITY

EP4

CR-115185

17618-H204-RO-00

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1. INTRODUCTION

The purpose of this document is to provide the user with a listing of the Steady-State Attitude Control Propulsion System Computer Program (SSACPS). This document is to be used in conjunction with Volume 1, Reference 2, and as a supplement to the Engineer's Manual, Reference 1. Reference 1 contains detailed information on each component model. The SSACPS was developed as a general computer simulation model capable of modeling a large variety of attitude control propulsion systems (ACPS). This model has been developed under MSC/TRW Task 705-1 for use on MSC's Univac 1108 Computer along with the ACPS transient Computer Program.

The SSACPS was developed with the capability to simulate operation of ACPS components connected in a large variety of configurations. The components are connected within the program by the user using input data to define initial and operating conditions. The component models consist of gas generators, monopropellant and bipropellant combustors; lines including adiabatic, isothermal, and heat transfer with friction-liquid/gas; heat exchangers; junctions; regulators; pressure boundaries; and liquid and gas valves. The system model uses hydrogen and oxygen properties from detailed NBS property subroutines. The data are input through the numerical input subroutine TRWLOD and the system equations are solved by the nonlinear equation solver: TRW BEGS. The constraint equations for each component set of equations and the state variables are selected by the user. This allows a great deal of flexibility in solving for either fluid state points or component dimensions.

2. PROGRAM DESCRIPTION

2.1 Program Definition

The SSACPS is a flexible steady-state attitude control propulsion system simulation computer program. The program consists of engineering equations simulating the fluid states using properties of hydrogen and oxygen. The combustor products of combustion are modeled using curve fit data. ACPS components are available for combination in any type of ACPS simulation.

The SSACPS program is stored on a PCF tape which contains the entire program. The program includes subroutines which model individual components, thermodynamic property data, a nonlinear equation solver, and a set of driver subroutines.

The ACPS program main driver Subroutine, SSPIPE, is shown in figure 1. SSPIPE initializes the line calculations, reads input data and sets up the basic call sequences to exercise the entire program. SSPIPE calls subroutine BEGS (routine which solves a system of implicit equations) and BEGS in turn calls Subroutine GATHER, figure 2, which sets up the ACPS component models into the desired system configuration as input by the user. GATHER also sets up the state variables and the functional constraint equations and returns these values to subroutine BEGS where the state variables are varied in order to minimize the ACPS functional constraint equations. Control is then returned to SSPIPE and the output processor, OUTPRC, prints the ACPS case output. The time may be incremented at this point for integration purposes or the program terminated.

TRWLOD (card input) input is used to enter the component data and system configuration. TRWLOD is described in Reference 2 Section 4.8

and the description of the card inputs is presented in Reference 2

Section 3.1.3.

2.2 Method of Solution

The theory and mathematical derivations for this program are described in Reference 1.

Program Driver (SSPIPE)

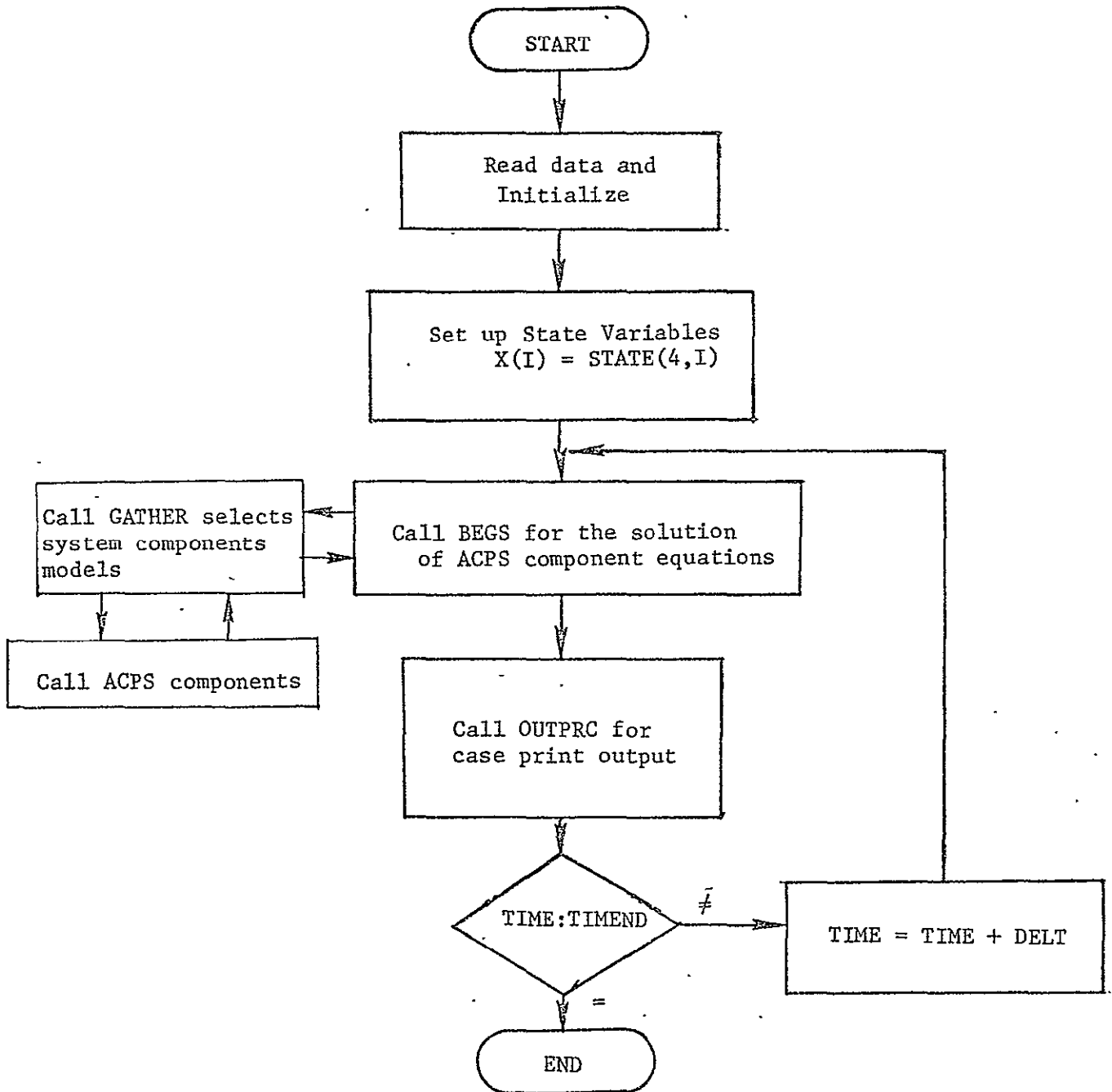


Figure 1. ACPS General Flowchart

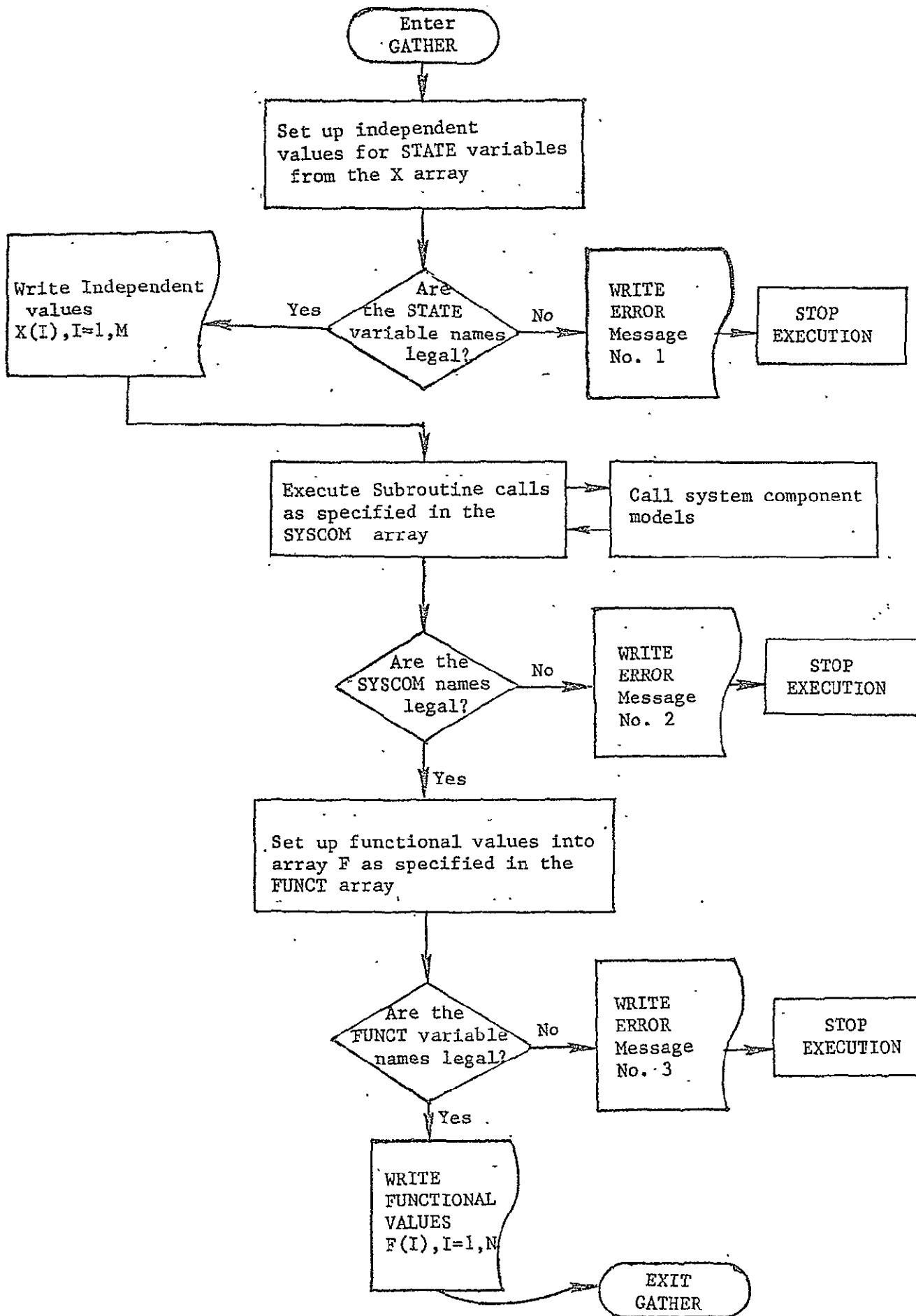


Figure 2. Flowchart for Subroutine GATHER

3. ATTITUDE CONTROL PROPULSION SYSTEM COMPUTER PROGRAM LISTING

This section contains a detailed listing of the steady-state attitude control propulsion system computer program including the element table, subroutine listings and program storage.

3.1 ELEMENT TABLE

TRACER	CODE	RELOCATABLE	15 JAN 68	17:12:25	1	02303300	24	1
QQPOS	VER2	RELOCATABLE	12 MAR 70	13:12:04	0	02303330	14	2
BCDINT		SYMBOLIC			1	02303364	24	1
BCDINT	CODE	RELOCATABLE	30 APR 71	11:18:48	0	02303414	14	8
			30 APR 71	11:18:48	0	02303574	14	32
BEGS		SYMBOLIC			1	02304474	24	1
BEGS	CODE	RELOCATABLE	30 APR 71	11:18:54	0	02304524	14	9
			30 APR 71	11:18:54	0	02304722	14	411
BINSER	CODE	RELOCATABLE	30 APR 71	11:18:57	1	02320114	24	1
CWALL		SYMBOLIC			0	02320144	14	123
CWALL	CODE	RELOCATABLE	30 APR 71	11:19:10	0	02323436	24	1
			30 APR 71	11:19:10	0	02323466	14	13
DP2R		SYMBOLIC			0	02323754	14	11
DP2R	CODE	RELOCATABLE	30 APR 71	11:19:11	1	02324206	24	1
			30 APR 71	11:19:11	0	02324236	14	3
HPTTC	CODE	RELOCATABLE	30 APR 71	11:19:11	0	02324310	14	8
			30 APR 71	11:19:11	1	02324470	24	1
HPTV	CODE	RELOCATABLE	30 APR 71	11:19:31	0	02324520	14	2
			30 APR 71	11:19:31	1	02324554	24	1
			30 APR 71	11:19:34	0	02324604	14	96
HYDRO		SYMBOLIC			1	02327304	24	1
HYDRO	CODE	RELOCATABLE	30 APR 71	11:19:35	0	02327334	14	100
			30 APR 71	11:19:35	0	02332124	14	81
INTEG		SYMBOLIC			1	02334302	24	1
INTEG	CODE	RELOCATABLE	30 APR 71	11:19:39	0	02334332	14	29
			30 APR 71	11:19:39	0	02335160	14	29
INTERP		SYMBOLIC			1	02336006	24	1
INTERP	CODE	RELOCATABLE	30 APR 71	11:19:40	0	02336036	14	7
			30 APR 71	11:19:40	0	02336200	14	35
INTER2		SYMBOLIC			1	02337152	24	1
INTER2	CODE	RELOCATABLE	30 APR 71	11:19:42	0	02337202	14	20
			30 APR 71	11:19:42	0	02337632	14	70
LEGS		SYMBOLIC			1	02341556	24	1
LEGS	CODE	RELOCATABLE	30 APR 71	11:19:50	0	02341606	14	30
			30 APR 71	11:19:50	0	02342452	14	371
OXYGEN		SYMBOLIC			1	02354564	24	1
OXYGEN	CODE	RELOCATABLE	30 APR 71	11:19:53	0	02354614	14	93
			30 APR 71	11:19:53	0	02357242	14	83
PACK		SYMBOLIC			0	02361504	14	36
PACK	CODE	RELOCATABLE	30 APR 71	11:19:55	0	02362474	14	61
			30 APR 71	11:19:55	1	02364222	24	1
PROPTY		SYMBOLIC			0	02364252	14	13
PROPTY	CODE	RELOCATABLE	30 APR 71	11:20:04	0	02364540	14	32
			30 APR 71	11:20:04	1	02365440	24	1
PHEAT	CODE	RELOCATABLE	30 APR 71	11:20:06	0	02365470	14	15
			30 APR 71	11:20:06	1	02366012	24	1
R2DP		SYMBOLIC			0	02366042	14	60
R2DP	CODE	RELOCATABLE	30 APR 71	11:20:07	0	02367552	14	8
			30 APR 71	11:20:07	1	02367732	24	1
SQZB		SYMBOLIC			0	02367762	14	2
SQZB	CODE	RELOCATABLE	30 APR 71	11:20:08	0	02370016	14	31
			30 APR 71	11:20:08	1	02370700	24	1
BLK2	CODE	RELOCATABLE	19 MAY 71	02:49:41	0	02370730	14	8
					1	02371110	24	1

HPTD	CODE	RELOCATABLE	19 MAY 71	02:50:07	0	02371140	14	119
					1	02374342	24	1
TEST	CODE	RELOCATABLE	19 MAY 71	02:50:27	0	02374372	14	141
					1	02400260	24	1
					0	02400310	14	4
BINSER		SYMBOLIC	01 MAR 71	18:47:30	0	02400400	14	101
BLK1		SYMBOLIC	01 MAR 71	18:49:05	0	02403206	14	166
BLK2		SYMBOLIC	01 MAR 71	18:49:07	0	02407632	14	183
HPTD		SYMBOLIC	10 MAY 71	12:52:01	0	02414634	14	275
HPTTC		SYMBOLIC	01 MAR 71	18:48:10	0	02424246	14	229
HPTV		SYMBOLIC	01 MAR 71	18:48:13	0	02432454	14	266
PTHEAT		SYMBOLIC	01 MAR 71	18:48:48	0	02441670	14	180
SAT		SYMBOLIC	14 JUN 71	15:04:53	0	02446620	14	24
SAT	CODE	RELOCATABLE	14 JUN 71	15:04:53	1	02447340	24	1
					0	02447370	14	13
LATENT		SYMBOLIC	14 JUN 71	15:04:54	0	02447656	14	30
LATENT	CODE	RELOCATABLE	14 JUN 71	15:04:54	1	02450522	24	1
					0	02450552	14	18
BPROPL		SYMBOLIC	14 JUN 71	15:04:55	0	02451146	14	36
BPROPL	CODE	RELOCATABLE	14 JUN 71	15:04:55	1	02452136	24	1
					0	02452166	14	25
BPROPG		SYMBOLIC	14 JUN 71	15:04:56	0	02452724	14	35
BPROPG	CODE	RELOCATABLE	14 JUN 71	15:04:56	1	02453676	24	1
					0	02453726	14	25
HPTCP		SYMBOLIC	14 JUN 71	15:04:57	0	02454464	14	39
HPTCP	CODE	RELOCATABLE	14 JUN 71	15:04:57	1	02455526	24	1
					0	02455556	14	3
HPTCV		SYMBOLIC	14 JUN 71	15:04:59	0	02455630	14	39
HPTCV	CODE	RELOCATABLE	14 JUN 71	15:04:59	1	02456672	24	1
					0	02456722	14	3
BETA		SYMBOLIC	14 JUN 71	15:05:17	0	02456774	14	16
BETA	CODE	RELOCATABLE	14 JUN 71	15:05:17	1	02457334	24	1
					0	02457364	14	12
WRITE		SYMBOLIC	14 JUN 71	15:05:19	0	02457634	14	86
WRITE	CODE	RELOCATABLE	14 JUN 71	15:05:19	1	02462120	24	1
					0	02462150	14	43
HEATEX		SYMBOLIC	14 JUN 71	15:05:32	0	02463302	14	358
HEATEX	CODE	RELOCATABLE	14 JUN 71	15:05:32	1	02475126	36	1
					0	02475172	14	132
TR#LOD		SYMBOLIC	14 JUN 71	15:05:35	0	02500662	14	348
TR#LOD	CODE	RELOCATABLE	14 JUN 71	15:05:35	1	02512272	36	1
					0	02512336	14	82
CDDATA		SYMBOLIC	14 JUN 71	15:05:38	0	02514532	14	432
CDDATA	CODE	RELOCATABLE	14 JUN 71	15:05:38	1	02530372	36	1
					0	02530436	14	109
NUSLET		SYMBOLIC	14 JUN 71	15:05:43	0	02533424	14	57
NUSLET	CODE	RELOCATABLE	14 JUN 71	15:05:43	1	02535062	24	1
					0	02535112	14	17
BDATA		SYMBOLIC	14 JUN 71	15:05:47	0	02535470	14	51
BDATA	CODE	RELOCATABLE	14 JUN 71	15:05:47	1	02537002	24	1
					0	02537032	14	4
H2OH2		SYMBOLIC	17 JUN 71	13:50:55	0	02537122	14	64
H2OH2	CODE	RELOCATABLE	17 JUN 71	13:50:55	1	02540722	24	1
					0	02540752	14	16
ADIAB		SYMBOLIC	23 JUN 71	21:25:16	0	02541312	14	100
ADIAB	CODE	RELOCATABLE	23 JUN 71	21:25:16	1	02544102	48	1
					0	02544162	14	35
CHOICE		SYMBOLIC	23 JUN 71	21:25:28	0	02545134	14	143
CHOICE	CODE	RELOCATABLE	23 JUN 71	21:25:28	1	02551056	24	1
					0	02551106	14	43

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INITIAL INITIAL	CODE	SYMBOLIC RELOCATABLE							
			23 JUN 71	21:25:47	0	02552240	14	23	
			23 JUN 71	21:25:47	1	02552742	24	1	
					0	02552772	14	8	
ISOTH		SYMBOLIC	23 JUN 71	21:25:51	0	02553152	14	95	
ISOTH	CODE	RELOCATABLE	23 JUN 71	21:25:51	1	02555634	48	1	
					0	02555714	14	33	
PERFOR		SYMBOLIC	23 JUN 71	21:26:12	0	02556632	14	125	
PERFOR	CODE	RELOCATABLE	23 JUN 71	21:26:12	1	02562160	36	1	
					0	02562224	14	54	
TANK		SYMBOLIC	23 JUN 71	21:26:25	0	02563610	14	60	
TANK	CODE	RELOCATABLE	23 JUN 71	21:26:25	1	02565500	36	1	
					0	02565544	14	27	
DRIVER		SYMBOLIC	26 JUN 71	22:03:52	0	02566336	14	23	
DRIVER	CODE	RELOCATABLE	26 JUN 71	22:03:52	1	02567040	24	1	
					0	02567070	14	17	
CMON		SYMBOLIC	30 JUN 71	20:46:25	0	02567446	14	147	
CMON	CODE	RELOCATABLE	30 JUN 71	20:46:25	1	02573460	36	1	
					0	02573524	14	60	
FEEDB		SYMBOLIC	30 JUN 71	20:46:28	0	02575414	14	40	
FEEDB	CODE	RELOCATABLE	30 JUN 71	20:46:28	1	02576474	24	1	
					0	02576524	14	7	
HEATX		SYMBOLIC	30 JUN 71	20:46:39	0	02576666	14	136	
HEATX	CODE	RELOCATABLE	30 JUN 71	20:46:39	1	02602446	36	1	
					0	02602512	14	30	
THERM		SYMBOLIC	02 JUL 71	17:51:21	0	02603356	14	402	
THERM	CODE	RELOCATABLE	02 JUL 71	17:51:21	1	02616352	72	1	
					0	02616462	14	81	
TPOCB1		SYMBOLIC	02 JUL 71	17:51:35	0	02620640	14	1650	
TPOCB1	CODE	RELOCATABLE	02 JUL 71	17:51:35	1	02676114	24	1	
					0	02676144	14	747	
TPOCB2		SYMBOLIC	02 JUL 71	17:51:39	0	02722476	14	386	
TPOCB2	CODE	RELOCATABLE	02 JUL 71	17:51:39	1	02735132	24	1	
					0	02735162	14	76	
SSPIPE		SYMBOLIC	31 JUL 71	23:31:17	0	02737232	14	84	
SSPIPE	CODE	RELOCATABLE	31 JUL 71	23:31:17	1	02741462	36	1	
					0	02741526	14	22	
TRHDAT		SYMBOLIC	31 JUL 71	23:32:00	0	02742212	14	101	
TRHDAT	CODE	RELOCATABLE	31 JUL 71	23:32:00	1	02745020	24	1	
					0	02745050	14	30	
CHAM		SYMBOLIC	31 AUG 71	09:25:01	0	02745714	14	254	
CHAM	CODE	RELOCATABLE	31 AUG 71	09:25:01	1	02754660	48	1	
					0	02754740	14	100	
FCOMP1		SYMBOLIC	31 AUG 71	09:25:02	0	02757530	14	42	
FCOMP1	CODE	RELOCATABLE	31 AUG 71	09:25:02	1	02760644	24	1	
					0	02760674	14	19	
FCOMP2		SYMBOLIC	31 AUG 71	09:25:03	0	02761306	14	42	
FCOMP2	CODE	RELOCATABLE	31 AUG 71	09:25:03	1	02762422	24	1	
					0	02762452	14	14	
FCOMP3		SYMBOLIC	31 AUG 71	09:25:05	0	02762756	14	37	
FCOMP3	CODE	RELOCATABLE	31 AUG 71	09:25:05	1	02763764	24	1	
					0	02764014	14	18	
GATHER		SYMBOLIC	31 AUG 71	09:25:09	0	02764410	14	275	
GATHER	CODE	RELOCATABLE	31 AUG 71	09:25:09	1	02774022	48	1	
					0	02774102	14	04	
JUNCL		SYMBOLIC	31 AUG 71	09:25:10	0	02776332	14	107	
JUNCL	CODE	RELOCATABLE	31 AUG 71	09:25:10	1	03001264	36	1	
					0	03001330	14	34	

OUTPRC		SYMBOLIC	31 AUG 71	09:25:16	0	03002264	14	305
OUTPRC	CODE	RELOCATABLE	31 AUG 71	09:25:16	1	03012542	36	1
					0	03012606	14	166
PBL		SYMBOLIC	31 AUG 71	09:25:18	0	03017232	14	95
PBL	CODE	RELOCATABLE	31 AUG 71	09:25:18	1	03021714	36	1
					0	03021760	14	37
PIPL		SYMBOLIC	31 AUG 71	09:25:21	0	03022766	14	198
PIPL	CODE	RELOCATABLE	31 AUG 71	09:25:21	1	03030312	48	1
					0	03030372	14	73
PREG		SYMBOLIC	31 AUG 71	09:25:23	0	03032370	14	62
PREG	CODE	RELOCATABLE	31 AUG 71	09:25:23	1	03034134	36	1
					0	03034200	14	15
TANKD		SYMBOLIC	31 AUG 71	09:25:25	0	03034522	14	153
TANKD	CODE	RELOCATABLE	31 AUG 71	09:25:25	1	03040660	48	1
					0	03040740	14	37
VALVG		SYMBOLIC	31 AUG 71	09:25:27	0	03041746	14	91
VALVG	CODE	RELOCATABLE	31 AUG 71	09:25:27	1	03044340	36	1
					0	03044404	14	33
VALVL		SYMBOLIC	31 AUG 71	09:25:29	0	03045322	14	49
VALVL	CODE	RELOCATABLE	31 AUG 71	09:25:29	1	03046600	36	1
					0	03046644	14	11

ENTRY POINT TABLE

ADJAB (ADJAB/CODE)	1	000427	BCDINT (BCDINT/CODE)	1	000065	BEGS (BEGS/CODE)	1	002076
BETA (BETA/CODE)	1	000127	BINSER (BINSER/CODE)	1	000137	BPROPG (BPROPG/CODE)	1	000146
BPROPL (BPROPL/CODE)	1	000146	CDDATA (CDDATA/CODE)	1	001774	CHAM (CHAM/CODE)	1	001565
CHOICE (CHOICE/CODE)	1	000445	CMON (CMON/CODE)	1	001101	CHALL (CHALL/CODE)	1	000012

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DP2R (DP2R/CODE)	1	000011	FCOMP1 (FCOMP1/CODE)	1	000214	FCOMP2 (FCOMP2/CODE)	1	000136
FCOMP3 (FCOMP3/CODE)	1	000177	FEEDB (FEEDB/CODE)	1	000054	GATHER (GATHER/CODE)	1	001251
HEATEX (HEATEX/CODE)	1	002212	HEATX (HEATX/CODE)	1	000404	HPTCP (HPTCP/CODE)	1	000016
HPTCV (HPTCV/CODE)	1	000016	HPTD (HPTD/CODE)	1	000544	HPTTC (HPTTC/CODE)	1	000504
HPTV (HPTV/CODE)	1	000461	HYDRO (HYDRO/CODE)	1	000102	H2OH2 (H2OH2/CODE)	1	000077
INITAL (INITAL/CODE)	1	000056	INTEG (INTEG/CODE)	1	000053	INTERP (INTERP/CODE)	1	000223
INTER2 (INTER2/CODE)	1	000365	ISOTH (ISOTH/CODE)	1	000403	JUNCL (JUNCL/CODE)	1	000404
KILLER (TRACER/CODE)	1	000000	LATENT (LATENT/CODE)	1	000056	LEGS (LEGS/CODE)	1	001521
NUSLET (NUSLET/CODE)	1	000130	OPDCP (THERM/CODE)	1	001227	OPDCV (THERM/CODE)	1	001151
OPDH (THERM/CODE)	1	001073	OPDIC (THERM/CODE)	1	001015	OPDIT (THERM/CODE)	1	000737
OPDT (THERM/CODE)	1	001305	OPTCP (THERM/CODE)	1	001253	OPTCV (THERM/CODE)	1	001175
OPTD (THERM/CODE)	1	000705	OPTH (THERM/CODE)	1	001117	OPTIC (THERM/CODE)	1	001041
OPTIT (THERM/CODE)	1	000763	OPTTC (THERM/CODE)	1	001363	OPTV (THERM/CODE)	1	001331
OUTPRC (OUTPRC/CODE)	1	002333	OXYGEN (OXYGEN/CODE)	1	000100	PACK (PACK/CODE)	1	000140
PBL (PBL/CODE)	1	000451	PERFOR (PERFOR/CODE)	1	000401	PIPL (PIPL/CODE)	1	001177
PIPLL (PIPL/CODE)	1	001204	PREG (PREG/CODE)	1	000153	PROPTY (PROPTY/CODE)	1	000136
PTHEAT (PTHEAT/CODE)	1	000617	QQFIL (QQPOS/VER2)	1	000002	QQREC (QQPOS/VER2)	1	000000
R2DP (R2DP/CODE)	1	000011	SAT (SAT/CODE)	1	000040	SQZB (SQZB/CODE)	1	000063
TANK (TANK/CODE)	1	000271	TANKC (TANKC/CODE)	1	000507	TANKD (TANKD/CODE)	1	000502
TEST (TEST/CODE)	1	000006	TRACER (TRACER/CODE)	1	000003	TRWLOD (TRWLOD/CODE)	1	001216
TURBOP (CHAM/CODE)	1	001572	VALVG (VALVG/CODE)	1	000405	VALVL (VALVL/CODE)	1	000114
WRITE (WRITE/CODE)	1	000527						

SPHEAT (BLK2/CODE) 34 BANK 2 DEPENDENT
CPNS (BDATA/CODE), 34 BANK 2 DEPENDENT
PCB (PCB2/CODE)

INDATA (BDATA/CODE) 34 BANK 2 DEPENDENT
IPCB (IPCB1/CODE) 34 BANK 2 DEPENDENT
STAB (TRWDAT/CODE) 34 BANK 2 DEPENDENT

COBOL LIBRARY TABLE EMPTY

PROCEDURE NAME TABLE EMPTY

END CUR LCC 1102-0038 L8

@ HDG @ FOR, @ SSPIPE,SSPIPE

UNIVAC J108 FORTRAN V LEVEL 2206 0018 F5018H
THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:26:16

MAIN PROGRAM

STORAGE USED (BLOCK, NAME, LENGTH)

```
0001 *CODE 000233
0000 *DATA 011367
0002 *BLANK 000000
0003 INDATA 011610
0004 CONS 000003
0005 COM 006525
```

EXTERNAL REFERENCES (BLOCK, NAME)

```
0006 GATHER
0007 TRWLOD
0010 ALOG
0011 BEGS
0012 OUTPRC
0013 NSTOPS
0014 NWDUS
0015 NIO2S
0016 NIO1S
```

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

```
0001 000000 10L      0001 000020 115G      0001 000107 136G      0001 000156 151G      0001 000170 160G
0000 011312 30F      0001 000102 40L      0001 000113 51L      0000 011324 60F      0000 011335 70F
0000 011345 80F      0010 R 000000 ALOG      0005 R 000000 AREA      0005 R 000074 AREAI      0005 R 000170 AREAK
0005 R 000132 AREAO      0000 R 000074 BLOCK      0003 R 000766 BOUNDS      0005 R 005060 CF      0005 R 006423 CGGC
0005 R 006436 CGTANK      0005 R 006431 CLTANK      0005 R 005014 CONCT      0005 R 006443 CPJU      0005 R 005006 CSTAR
0005 R 006355 CVEL      0003 R 000077 DELT      0005 R 000036 DELXL      0005 R 000226 DIALI      0003 R 000510 DIALO
0005 R 006277 DMVENT      0003 R 000765 EPSLN      0005 R 006360 ETAT      0000 R 000000 F      0004 R 000002 FB
0005 R 006370 FBPC      0005 R 006376 FBTC      0005 R 006362 FBWC      0000 R 011307 FNORM      0005 R 005111 FRL
0004 R 000001 GC      0003 R 000613 H      0005 R 003132 HI      0005 R 003036 HO      0005 R 003322 HRAD
0000 I 011305 I      0000 I 011311 IBLEW      0003 I 000675 IBNDS      0005 I 005110 ICMON      0003 I 000701 IDER
0003 I 000702 IFIN      0005 I 005052 ISPT      0000 I 011306 ITERS      0005 I 003606 JUN      0003 I 000703 JVECTR
0000 I 011304 K      0003 I 000676 M      0003 I 000700 MAXIT      0005 I 005066 MEX      0005 I 004756 MR
0005 I 005102 MWC      0003 I 000677 N      0005 I 002552 NGR      0003 I 000100 NODEL      0003 I 005713 NPIPL
0005 I 002646 NPR      0005 I 002742 NRE      0000 R 011310 P      0005 R 000264 PB      0005 R 004764 PC
0005 R 004772 PCN      0005 R 005074 PE      0005 R 000272 PG      0005 R 003620 PGT      0004 R 000000 PI
0005 R 005036 PMR      0005 R 006241 POWC      0005 R 006350 POWP      0005 R 006343 POWT      0005 R 006300 PPI
0005 R 006305 PPO      0005 R 006331 PTI      0005 R 006336 PTO      0005 R 006357 R      0003 R 005754 RFLAG
0005 R 001422 RHUG      0005 R 006312 RPMT      0003 R 000000 S      0003 R 007541 STATE      0005 R 005044 TC
0003 R 000451 TH      0005 R 006416 THOC      0003 R 000611 TIME      0003 R 000612 TIMEND      0005 R 006411 TPCG
0005 R 006404 TPCL      0005 R 006317 TTI      0005 R 006324 TTO      0005 R 003226 TWALL      0005 R 006356 U
0005 R 003416 UAO      0005 R 003512 VEL      0005 R 006265 WI      0005 R 004750 WNOZ      0005 R 006253 WO
0005 R 006361 WT      0005 R 006246 WTGC      0000 R 000036 X      0003 R 000413 XLENZ
```

```

00100 1. C
00101 2. EXTERNAL G
00101 3. C
00103 4. DIMENSION H(20),DIALO(30),XLENG(30),NODEL(20),TH(30)
00103 5. ,
00103 6. JVECTR(20),STATE(4,40),BOUNDS(20)
00104 7. C
00104 8. DIMENSION F(30),X(30),BLOCK(4744)
00104 9. C
00105 10. COMMON /INDATA/S(5000)
00106 11. C
00106 12. COMMON /CONS/PI,GC,FB
00107 13. C
00107 14. COMMON /COM/AREA(30),DELXL(30),AREA1(30),AREA0(30),AREAK(30)
00107 15. *,
00107 16. DIALI(30),PB(6),PG(30,20),RHOG(30,20),NGR(30,2)
00107 17. *,
00107 18. NPR(30,2),NRE(30,2),HO(30,2),HI(30,2),TWALL(30,2)
00107 19. *,
00107 20. HRAD(30,2),UAO(30,2),VEL(30,2),JUN(10),PGT(30,20)
00107 21. *,
00107 22. WNOZ(6),MR(6),PC(6),PCN(6,2),CSTAR(6),CONCT(3,6)
00107 23. *,
00107 24. PMR(6),TC(6),ISPT(6),CF(6),MEX(6),PE(6),MWC(6),ICMON
00107 25. *,
00107 26. FRL(30,20),POWC(5),WTGC(5),WO(10),WI(10),DMVENT,PPI(5)
00107 27. *,
00107 28. PPO(5),RPMT(5),TTI(5),TTO(5),PTI(5),PTO(5),POWT(5)
00107 29. *,
00107 30. POWP(5),CVEL,U,R,ETAT,WT,FBWC(6),FBPC(6)
00107 31. *,
00107 32. FBTC(6),TPCL(5),TPCG(5),THOC(5),CGGTC(6),CLTANK(5)
00107 33. *,
00107 34. CGTANK(5),CPJU(5,10)
00110 35. C
00110 36. EQUIVALENCE
00110 37. , (S(268),XLENG(1)), (S(298),TH(1)), (S(329),DIALO(1))
00110 38. , (S(65),NODEL(1)), (S(3020),NPIPL), (S(396),H(1))
00110 39. *, (S(446),IBNDS), (S(447),M), (S(448),N)
00110 40. *, (S(449),MAXIT), (S(450),IDER), (S(451),IFIN)
00110 41. *, (S(452),JVECTR(1)), (S(502),EPSLN), (S(503),BOUNDS(1))
00110 42. *, (S(3938),STATE(1,1))
00110 43. *, (S(64),DELT), (S(394),TIME), (S(395),TIMEND)
00110 44. *, (S(3053),RFLAG)
00110 45. C
00110 46. C
00110 47. READ INPUT
00110 48. C
00111 49. 10 CALL TRWLOD(5,6,K)
00112 50. IF (K.EQ.2) STOP
00112 51. C
00114 52. DO 20 I=1,NPIPL
00117 53. AREA(I) = 0.25*PI*DIALO(I)**2
00120 54. DELXL(I) = XLENG(I)/(NODEL(I)-1)
00121 55. DIALI(I) = DIALO(I) - 2.0*TH(I)
00122 56. AREA1(I) = PI*DIALI(I)*DELXL(I)/12.0
00123 57. AREA0(I) = PI*DIALO(I)*DELXL(I)/12.0
00124 58. AREAK(I) = ALOG(DIALO(I)/DIALI(I))/(2.*PI*DELXL(I))
00125 59. 20 CONTINUE
00125 60. C
00125 61. SOLUTION OF NON LINEAR EQUATIONS
00125 62. C
00127 63. IF (M.LE.30) GO TO 40
00131 64. WRITE (6,30)
00133 65. 30 FORMAT(4X52H*** MORE THAN 30 VARIABLES SPECIFIED - ABORT RUN ***)
00134 66. STOP
00135 67. 40 DO 50 I=1,M
00140 68. X(I) = STATE(4,I)

```

```

00141 57* 50 CONTINUE
00141 58* C
00143 59* ICMON = 0
00144 60* 51 CONTINUE
00144 61* C
00145 62* CALL BEGS (X,H,IBNDS,BOUNDS,M,N,MAXIT,IDER,IFIN,JVECTR,EPSLN,
00145 63* BLOCK,GATHER,ITERS,F,FNORM)
00145 64* C
00146 65* CALL GATHER (X,F,P,IBLEW)
00146 66* C
00147 67* WRITE (6,60)(X(I),I=1,M)
00155 68* 60 FORMAT(1H1//18X28HSSPIPE-INDEPENDENT VARIABLES/(7X1P6E17.7))
00156 69* WRITE (6,70)(F(I),I=1,N)
00164 70* 70 FORMAT(//19X22HSSPIPE-FUNCTION VALUES/(7X1P6E17.7))
00165 71* WRITE (6,80)ITERS,FNORM
00171 72* 80 FORMAT(//27X 6HSSPIPE/7X117.1P5E17.7)
00171 73* C
00172 74* CALL OUTPRC
00172 75* C
00173 76* IF (DELT .LE. 0.) DELT = 1.
00173 77* C PARTIAL MATRIX FIRST TIME ONLY
00175 78* IDER = 1
00176 79* RFLAG = 1.
00177 80* TIME = TIME + DELT
00200 81* IF (TIME .LE. TIMEND) GO TO 51
00202 82* GO TO 10
00202 83* C
00203 84* END
    
```

END OF UNIVAC 1108 FORTRAN V COMPILATION. 0 *DIAGNOSTIC* MESSAGE(S)

SSPIPE	SSPIPE	CODE	SYMBOLIC	RELOCATABLE	31 JUL 71	23:31:17	0	02737232	14	84.	(DELETED)
					31 JUL 71	23:31:17	1	02741462	36	1	(DELETED)
							0	02741526	14	22	

LD
 B HDG B FOR,* ADIAB,ADIAB

UNIVAC 1108 FORTRAN V LEVEL 2200018 F5018H
THIS COMPILATION WAS DONE ON 31 71 AT 09:26:29

SUBROUTINE ADIAB ENTRY POINT 000427

STORAGE USED (BLOCK, NAME, LENGTH)

0001	%CODE	000441
0000	%DATA	000065
0002	%BLANK	000000
0003	INDATA	011610
0004	CONS	000003
0005	COM	006525

EXTERNAL REFERENCES (BLOCK, NAME)

0006	OPTCP
0007	OPTCV
0010	OPTV
0011	HPTCP
0012	HPTCV
0013	HPTV
0014	FCOMP3
0015	NERR2\$
0016	SQRT
0017	NEXP6\$
0020	NWDU\$
0021	NIO1\$
0022	NIO2\$
0023	NERR3\$

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000021	IL	0000	000014	IOF	0001	000043	ZL	0001	000412	ZOL	0001	000064	SL					
0000	R	000011	ADIA	0005	R	000000	AREA	0005	R	000074	AREAI	0005	R	000170	AREAK	0005	R	000132	AREAO
0005	R	005060	CF	0005	R	006423	CGGTC	0005	R	006436	CGTANK	0005	R	006431	CLTANK	0005	R	005014	CONCT
0003	R	005714	CP	0005	R	006443	CPJU	0005	R	005006	CSTAR	0000	R	000010	CV	0005	R	006355	CVEL
0005	R	000036	DELXL	0005	R	000226	DIALI	0005	R	006277	DMVENT	0005	R	006360	ETAT	0004	R	000002	FB
0005	R	006370	FBPC	0005	R	006376	FBTC	0005	R	006362	FBWC	0005	R	005111	FRL	0004	R	000001	GC
0005	R	003132	HI	0005	R	003036	HO	0011	R	000000	HPTCP	0012	R	000000	HPTCV	0013	R	000000	HPTV
0005	R	003322	HRAD	0005	I	005110	ICMON	0003	I	000551	IPROP	0005	I	005052	ISPT	0000	I	000005	JJ
0005	I	003606	JUN	0003	R	003413	KA	0003	R	004561	MACH	0005	I	005066	MEX	0005	I	004756	MR
0005	I	005102	MWC	0005	I	002552	NGR	0003	I	000553	NPLINE	0005	I	002646	NPR	0005	R	002742	NRE
0006	R	000000	OPTCP	0007	R	000000	OPTCV	0010	R	000000	OPTV	0000	R	000006	P	0005	R	000264	PB
0005	R	004764	PC	0005	R	004772	PCN	0005	R	005074	PE	0005	R	000272	PG	0005	R	003620	PGT
0004	R	000000	PI	0005	R	005036	PMR	0005	R	006241	PONC	0005	R	006350	POWP	0005	R	006343	POWT
0005	R	006300	PP1	0005	R	006305	PP0	0005	R	006331	PTI	0005	R	006336	PTO	0005	R	006357	R
0003	R	005754	RFLAG	0003	R	005711	RGAS	0005	R	001422	RHOG	0005	R	006312	RPMT	0003	R	000000	S
0000	R	000007	T	0005	R	005044	TC	0005	R	006416	THOC	0005	R	006411	TPCG	0005	R	006404	TPCL
0003	R	001132	TTEMP	0005	R	006317	TTI	0005	R	006324	TTO	0003	R	002262	TTTEMP	0005	R	003226	TWALL
0005	R	006356	U	0005	R	003416	UA0	0005	R	003512	VEL	0003	R	000253	VISC	0000	R	000000	W
0003	R	003423	WDOTG	0005	R	006265	WI	0005	R	004750	WNOZ	0005	R	006253	WO	0005	R	006361	WT

0005 R 006246 WTGC

0000 R 000012 X

0003 R 000413 XLENGL

0000 R 000013 Y

```

00100 10 C
00100 20 C ADIABATIC LINE SUBROUTINE
00100 30 C
00101 40 SUBROUTINE ADIAB (II)
00101 50 C
00103 60 REAL KA, MACH, NRE
00103 70 C
00104 80 DIMENSION W(5)
00105 90 DIMENSION VISC(30), XLENGL(30), NPLINE(30), KA(2), RGAS(2)
00105 100 MACH(30,20), TTEMP(30,20), TTTEMP(30,20), CP(30)
00105 110 WDOTG(30,20)
00105 120 C
00106 130 COMMON /INDATA/S(5000)
00106 140 C
00107 150 COMMON /CONS/PI, GC, FB
00107 160 C
00110 170 COMMON /COM/AREA(30), DELXL(30), AREA1(30), AREA0(30), AREAK(30)
00110 180 DIALI(30), PB(6), PG(30,20), RHOG(30,20), NGR(30,2)
00110 190 NPR(30,2), NRE(30,2), HO(30,2), HI(30,2), TWALL(30,2)
00110 200 HRAD(30,2), UAO(30,2), VEL(30,2), JUN(10), PGT(30,20)
00110 210 WNOZ(6), MR(6), PC(6), PCN(6,2), CSTAR(6), CONCT(3,6)
00110 220 PMR(6), TC(6), ISPT(6), CF(6), MEX(6), PE(6), MAC(6), ICMON
00110 230 FRL(30,20), POWC(5), WTGC(5), HO(10), WI(10), DMVENT, PPI(5)
00110 240 PPO(5), RPMT(5), TTI(5), TTO(5), PTI(5), PTO(5), POWT(5)
00110 250 POWP(5), CVEL, U, R, ETAT, WT, FBWC(6), FBPC(6)
00110 260 FBTC(6), TPC(15), TPCG(5), THOC(5), CGGTC(6), CLTANK(5)
00110 270 CGTANK(5), CPJU(5,10)
00110 280 C
00111 290 EQUIVALENCE
00111 300 (S(172), VISC(1)) (S(268), XLENGL(1)) (S(3018), RGAS(1))
00111 310 (S(362), IPROP) (S(364), NPLINE(1)) (S(1804), KA(1))
00111 320 (S(2418), MACH(1,1)) (S(603), TTEMP(1,1)) (S(1203), TTTEMP(1,1))
00111 330 (S(3021), CP(1)) (S(1812), WDOTG(1,1))
00111 340 (S(3053), RFLAG)
00111 350 C
00112 360 JJ = 1
00112 370 C
00113 380 IPROP = NPLINE(II)
00114 390 P = PG(II,1)
00115 400 T = TTEMP(II,1)
00116 410 GO TO (1,2), IPROP
00116 420 C OXYGEN
00117 430 1 CP(II) = OPTCP(P,T)
00120 440 CV = OPTCV(P,T)
00121 450 VISC(II) = OPTV(P,T) * 32.2 * 3600.
00122 460 GO TO 5
00122 470 C
00122 480 C HYDROGEN
00123 490 2 CP(II) = HPTCP(P,T)
00124 500 CV = HPTCV(P,T)
00125 510 VISC(II) = HPTV(P,T) * 32.2 * 3600.
00126 520 5 CONTINUE
00127 530 RGAS(IPROP) = (CP(II) - CV) * 778.156
    
```

```

00130 54* KA(IPROP) = I1 / CV
00131 55* VEL(II,JJ) = MACH(II,JJ)*SQRT(KA(IPROP)*GC*RGAS(IPROP)*TTEMP(II,JJ
00131 56* 1))
00132 57* TTEMP(II,JJ) = TTEMP(II,JJ)+VEL(II,JJ)**2/(2*GC*FB*CP(II))
00132 58* C DENSITY OF GAS
00133 59* RHOG(II,JJ) = PG(II,JJ)/(RGAS(IPROP)*TTEMP(II,JJ))*144.0
00133 60* C REYNOLDS NUMBER
00134 61* NRE(II,JJ) = VEL(II,JJ)*DIALI(II)*RHOG(II,JJ)/(VISC(II)*12.0)
00134 62* C KOO FRICTION FACTOR FOR SMOOTH PIPES - PG.383 CHE. HANDBOOK EQ. 24
00135 63* FRL(II,JJ) = 1.4E-3 + 1.25E-1*(NRE(II,JJ))**(-0.32)
00135 64* C
00136 65* W(1) = MACH(II,1)
00137 66* W(2) = FRL(II,1)
00140 67* W(3) = XLENG(II)
00141 68* W(4) = DIALI(II)
00142 69* W(5) = KA(IPROP)
00142 70* C
00143 71* CALL FCOMP3 (W,MACH(II,2),ADIA)
00143 72* C
00143 73* C ADIABATIC FLOW CONTANT AREA DUCT INTEGRAL RELATIONSHIPS
00144 74* X = 1.0 + (KA(IPROP)-1.0)*0.5*MACH(II,JJ)**2
00145 75* Y = 1.0 + (KA(IPROP)-1.0)*0.5*MACH(II,JJ+1)**2
00145 76* C STATIC TEMP
00146 77* TTEMP(II,JJ+1) = TTEMP(II,JJ)*X/Y
00146 78* C TOTAL TEMP
00147 79* TTTEMP(II,2) = TTEMP(II,1)
00147 80* C STATIC PRESS
00150 81* PG(II,2) = PG(II,1)*MACH(II,1)/MACH(II,2)*SQRT(X/Y)
00150 82* C TOTAL PRESS
00151 83* PGT(II,JJ) = PG(II,JJ)*X**((KA(IPROP)/(KA(IPROP)-1.0))
00152 84* PGT(II,2) = PG(II,2)*Y**((KA(IPROP)/(KA(IPROP)-1.0))
00152 85* C DENSITY
00153 86* RHOG(II,JJ+1) = PG(II,JJ+1)/(RGAS(IPROP)*TTEMP(II,JJ+1))
00153 87* C
00153 88* C FLOWRATE
00154 89* WDOTG(II,2) = WDOTG(II,1)
00154 90* C
00155 91* IF (RFLAG),20,
00160 92* WRITE (6,10) II,JJ,II,JJ,IPROP,NPLINE(II),IPROP,IPROP,VEL(II,JJ),MA
00160 93* 2CH(II,JJ),KA(IPROP),GC,RGAS(IPROP),TTEMP(II,JJ),TTTEMP(II,JJ),VISC
00160 94* 3(II),CP(II),RHOG(II,JJ),NRE(II,JJ),DIALI(II),XLENG(II),FB,X,Y,PG(
00160 95* 4(II,JJ),PG(II,JJ+1),PGT(II,JJ),PGT(II,JJ+1),RHOG(II,JJ+1),TTEMP(II
00160 96* 5JJ+1),TTTEMP(II,JJ+1),W(1),WDOTG(II,1),WDOTG(II,2)
00224 97* 10 FORMAT(1H1//24X13HAD)AB=ROUTINE/7X4117/7X4117/(7X1P4E17.7)
00224 98* C
00225 99* 20 RETURN
00226 100* END
    
```

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END OF UNIVAC 1108 FORTRAN V COMPILATION.

0 *DIAGNOSTIC* MESSAGE(S)

ADIAB	SYMBOLIC	23 JUN 71	21:25:16	0	01674702	14	100	(DELETED)
ADIAB	CODE	23 JUN 71	21:25:16	1	01677472	48	1	(DELETED)
				0	01677552	14	35	

8 HDG 8 FOR, BCDINT,BCDINT

3.2.3 BCDINT

@ FOR, @ BCDINT,BCDINT
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5016H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:26:32

31 AUG 71

9:26:31.870

SUBROUTINE BCDINT ENTRY POINT 000065

STORAGE USED (BLOCK, NAME, LENGTH)

```

0001 *CODE 000110
0000 *DATA 000033
0002 *BLANK 000000
  
```

EXTERNAL REFERENCES (BLOCK, NAME)

```

0003 SQZ8
0004 NERR3s
  
```

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

```

0001 000017 113G      0001 000022 116G      0001 000037 3L      0001 000042 5L      0001 000046 900L
0001 000050 999L      0000 I 000012 1S      0000 I 000014 J      0000 I 000013 K      0000 I 000000 NUM
  
```

61

```

00101  1*      SUBROUTINE BCDINT(NCOL, INT, N)
00101  2*      C.....
00101  3*      C.....CONVERTS A BCD NUMBER TO A BINARY INTEGER AND RETURNS THE VALUE
00101  4*      C.....THROUGH THE ARGUMENT (INT).                                     9/01/68
00101  5*      C.....N IS THE NUMBER OF WORDS INPUT AND THE NUMBER OF NON-BLANK
00101  6*      C.....CHARACTERS OUTPUT. N IS NEGATIVE FOR AN ERROR WITH THE MAGNITUDE
00101  7*      C.....BEING THE SUBSCRIPT OF THE INCORRECT WORD.
00101  8*      C.....
00103  9*      DIMENSION
00103 10*      * NCOL(1) ,NUM(10)
00103 11*      C.....
00104 12*      DATA
00104 13*      * NUM / 1H0, 1H1, 1H2, 1H3, 1H4, 1H5, 1H6, 1H7, 1H8, 1H9 /
00104 14*      C.....
00106 15*      INT=0
00106 16*      C.....GET RID OF THE BLANKS
00107 17*      CALL SQZ8(NCOL(1), N)
00110 18*      IF(N.EQ.0) GO TO 999
00112 19*      DO 5 K=1,N
00115 20*      DO 3 J=1,10
00120 21*      IF(NCOL(K).NE.NUM(J)) GO TO 3
00122 22*      INT = INT*10 + IABS(J-1)
00123 23*      GO TO 5
00123 24*      C.....
00124 25*      3 CONTINUE
00126 26*      GO TO 900
00126 27*      C.....
00127 28*      5 CONTINUE
  
```


00131 29* GO TO 999
 00132 30* 900 N = -K
 00133 31* 999 RETURN
 00134 32* END

END OF UNIVAC 1108 FORTRAN V COMPILATION.
 BCDINT SYMBOLIC
 BCDINT CODE RELOCATABLE

D *DIAGNOSTIC* MESSAGE(S)

30 APR 71	11:18:48	0	01437164	14	32	(DELETED)
30 APR 71	11:18:48	1	01440064	24	1	(DELETED)
		0	01440114	14	9	

S HDG @ FOR, * BDATA,BDATA

3.2.4 BDATA

FOR, BDATA, BDATA
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:26:33

31 AUG 71

9:26:32.919

BLOCK DATA

STORAGE USED (BLOCK, NAME, LENGTH)

0003 INDATA 011610
 0004 CONS 000003

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0003 R 006466 Cp2	0003 R 006203 CS2	0004 R 000002 FB	0004 R 000001 GC	0000 I 000000 I
0003 R 006207 IS2	0003 R 006173 MW2	0004 R 000000 PI	0003 R 000741 POW0	0003 R 000746 POW1
0003 R 000753 POW2	0003 R 006663 POW3	0003 R 000651 POW0	0003 R 000656 POW1	0003 R 000663 POW2
0003 R 000000 S	0003 R 006177 TC2			

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00101	1*		BLOCK DATA
00101	2*	C	
00102	3*		REAL MW2, IS2
00102	4*	C	
00103	5*		DIMENSION MW2(4), TC2(4), CS2(4), IS2(4), CP2(5), POW(5), POW1(5), POW2(5)
00103	6*		, POW0(5), POW3(5), POW2(5), POW3(5)
00103	7*	C	
00104	8*		COMMON /INDATA/S(5000)
00104	9*	C	
00105	10*		COMMON /CONS/PI, GC, FB
00105	11*	C	
00106	12*		EQUIVALENCE
00106	13*		*, (S(3196), MW2(1)) , (S(3200), TC2(1)) , (S(3204), CS2(1))
00106	14*		*, (S(3208), IS2(1)) , (S(3383), CP2(1)) , (S(426), POW(1))
00106	15*		*, (S(431), POW1(1)) , (S(436), POW2(1)) , (S(482), POW0(1))
00106	16*		*, (S(487), POW1(1)) , (S(492), POW2(1)) , (S(3508), POW3(1))
00106	17*	C	
00107	18*		DATA
00107	19*		*, PI / 3.1415927 /, GC / 32.174049 /
00107	20*		*, FB / 777.9 /
00107	21*	C	
00113	22*		DATA (MW2(1), I=1, 4) /
00113	23*		1 0.19109966E1, 0.21066749E1, -0.44042913E-2, -0.60646600E-2 /
00113	24*	C	
00115	25*		DATA (TC2(1), I=1, 4) /
00115	26*		1 0.44354884E3, 0.21022635E4, -0.24057595E3, 0.81889125E1 /
00115	27*	C	
00117	28*		DATA (CS2(1), I=1, 4) /
00117	29*		1 0.70174506E4, 0.11752099E4, -0.30091700E3, 0.20546873E2 /
00117	30*	C	
00121	31*		DATA (IS2(1), I=1, 4) /
00121	32*		1 0.34833907E3, 0.75678814E2, -0.17121626E2, 0.11873112E1 /
00121	33*	C	
00123	34*		DATA (CP2(1), I=1, 4) /

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00123 35* 1 0.25917475 0.74177182E0,0.12549806E0,-0.82476042E-2 /
00123 36* C
00125 37* DATA PW0(1)/ 0.12503708E4/
00125 38* C
00127 39* DATA PW1(1)/ 0.24354174E2/
00127 40* C
00131 41* DATA PW2(1)/-0.50557429E1/
00131 42* C
00133 43* DATA POW0(1)/0.29375007E6/
00133 44* C
00135 45* DATA POW1(1)/0.21971513E5/
00135 46* C
00137 47* DATA POW2(1)/0.50103014E3/
00137 48* C
00141 49* DATA POW3(1)/0.78168831E1/
00141 50* C
00143 51* END

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END OF UNIVAC 1108 FORTRAN V COMPILATION.

0 *DIAGNOSTIC* MESSAGE(S)

BDATA	CODE	SYMBOLIC	RELOCATABLE

14 JUN 71	15:05:47	0	01671060	14	51 (DELETED)
14 JUN 71	15:05:47	1	01672372	24	1 (DELETED)
		0	01672422	14	4

@ HDG @ FOR, BEGS, BEGS

3.2.5 BEGS

FOR, BEGS, BEGS
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 FS018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:26:33

31 AUG 71

9:26:33.766

SUBROUTINE BEGS ENTRY POINT 002076

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 002204
 0000 *DATA 000224
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 LEGS
 0004 NWDUS
 0005 NIO1S
 0006 NIO2S
 0007 NERR3S

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000105	100L	0001	001674	1000G	0001	001730	1013G	0001	002024	1020L	0001	001743	1021G
0001	002033	1030L	0001	001766	1034G	0001	002040	1040L	0001	002002	1042G	0001	000111	110L
0001	000051	132G	0001	000122	140L	0001	000070	146G	0001	000124	150L	0001	000023	20L
0001	000213	200L	0001	000177	210G	0001	000230	223G	0001	000251	230L	0001	000253	240L
0001	000270	245L	0001	000304	255G	0001	000314	280L	0001	000320	290L	0001	000341	310L
0001	000403	313G	0001	000440	333G	0001	000357	340L	0001	000471	350G	0001	000372	360L
0001	000523	363G	0001	000526	366G	0001	000416	380L	0001	000554	402G	0001	000466	410L
0001	000650	417G	0001	000661	424G	0001	000503	430L	0001	000766	440G	0001	000510	440L
0001	000547	460L	0001	001024	461G	0001	001054	471G	0001	000601	490L	0001	001077	502G
0001	000713	510L	0001	001116	514G	0001	000755	520L	0001	001140	524G	0001	001010	540L
0001	001166	543G	0001	001240	566G	0001	001036	570L	0001	001252	577G	0001	001062	590L
0001	001067	600L	0001	001277	607G	0001	001110	620L	0001	001331	623G	0001	001332	626G
0001	001356	637G	0001	001127	640L	0001	001131	650L	0001	001406	654G	0001	001435	670G
0001	001143	670L	0001	001150	680L	0001	001160	700L	0001	001477	712G	0001	001212	720L
0001	001543	730G	0001	001217	730L	0001	001556	736G	0001	001632	755G	0001	001656	772G
0001	001350	820L	0001	001371	840L	0001	001375	847L	0001	001426	860L	0001	001471	880L
0000	000104	8995F	0001	001512	900L	0000	000127	9000F	0000	000052	9005F	0000	000057	9010F
0000	000064	9015F	0000	000071	9020F	0000	000076	9025F	0001	001576	930L	0001	001605	940L
0001	001643	970L	0000	R 000025	A1	0000	R 000006	BF	0000	R 000010	BST	0000	R 000002	EP5L
0000	I 000007	I	0000	I 000005	1BLEW	0000	I 000003	1DER	0000	I 000047	1FS	0000	I 000004	IP
0000	I 000035	1PF	0000	I 000050	1PR	0000	I 000034	1Q	0000	I 000040	1RV	0000	I 000037	1RX
0000	I 000046	1N	0000	I 000033	1X	0000	I 000045	1Y	0000	I 000044	1Z	0000	I 000027	J
0000	I 000021	JAR	0000	I 000020	JATA	0000	I 000015	JAZ	0000	I 000024	JD	0000	I 000011	JJ
0000	I 000032	JK	0000	I 000036	JON	0000	I 000012	JPF	0000	I 000013	JPX	0000	I 000017	JQ
0000	I 000022	JV	0000	I 000016	JW	0000	I 000014	JY	0000	I 000030	JZ	0000	I 000023	K
0000	I 000031	K1	0000	I 000000	M	0000	I 000001	N	0000	R 000026	P	0000	R 000051	SF
0000	R 000043	SUP	0000	R 000042	SUS	0000	R 000041	T						

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00100 1* C TRN BEGS=SOLUTION A SYSTEM OF NON=LINEAR EQUATIONS TR#BE
00101 2* SUBROUTINE BEGS,X,H,IBNDS,BNDS,MX,NY, BEGS0001
00101 3* 1 MAXIT,IDEV,IFIN,IV,EPS,S,FCALC,NIT,F,BSST) BEGS0002
00101 4* C MODIFIED FEB 1968 BEGS0003
00103 5* DIMENSION S(1),X(1),H(1),BNDS(1),IV(1),F(1) BEGS0004
00103 6* C BEGS0005
00104 7* AB(P)=ABS(P) BEGS0006
00105 8* 9005 FORMAT(20H ***SUM OF F(1)**2=E16.7) BEGS0007
00106 9* 9010 FORMAT(7H0 X=7E16.7/(7X,7E16.7)) BEGS0008
00107 10* 9015 FORMAT(7H F=7E16.7/(7X,7E16.7)) BEGS0009
00110 11* 9020 FORMAT(20H SUM OF F(1)**2=E16.7) BEGS0010
00111 12* 9025 FORMAT ( 4H0 X(12,15H) PERTURBED BY E11,4) BEGS0011
00111 13* C TO CONVERT TO DOUBLE PRECISION, REMOVE THE BEGS0012
00111 14* C ABOVE 4 CARDS AND REMOVE THE C FROM BEGS0013
00111 15* C COLUMN 1 OF THE FOLLOWING 8 CARDS BEGS0014
00111 16* C DOUBLE PRECISION X,H,BNDS,S,F,BSST,BST,BF, BEGS0015
00111 17* C 1 P,SF,A1,T,SUS,SUP BEGS0016
00111 18* C AB(P)=DABS(P) BEGS0017
00111 19* C9005 FORMAT(20H ***SUM OF F(1)**2=D27.16) BEGS0018
00111 20* C9010 FORMAT(7H0 X=3D27.16/(7X,3D27.16)) BEGS0019
00111 21* C9015 FORMAT(7H F=3D27.16/(7X,3D27.16)) BEGS0020
00111 22* C9020 FORMAT(20H SUM OF F(1)**2=D27.16) BEGS0021
00111 23* C9025 FORMAT(4H0 X(12,15H) PERTURBED BY D27.16) BEGS0022
00111 24* C BEGS0023
00111 25* C RENAME INPUT ITEMS MX,NY,IDEV. BEGS0024
00112 26* M=MX BEGS0025
00113 27* N=NY BEGS0026
00114 28* EPSL=ABS(EPS) BEGS0027
00115 29* IDEV=IDEV BEGS0028
00115 30* C TEST IF TOLERANCE, EPSL, IS ZERO. BEGS0029
00116 31* IF(EPSL)20,10,20 BEGS0030
00116 32* C SUBSTITUTE REASONABLE VALUE FOR EPSL, BEGS0031
00121 33* 10 EPSL=1.E-5 BEGS0032
00121 34* C INITIALIZE ITERATION COUNTER,NIT = 0. INITIALIZE NO. OF COMPONENTS BEGS0033
00121 35* C TO BE REGARDED IN PERTURBATION OPERATION, IP = 0. BEGS0034
00122 36* 20 NIT=0 BEGS0035
00123 37* IP=0 BEGS0036
00123 38* C EVALUATE FUNCTION OF GUESS POINT, F(X). BEGS0037
00124 39* CALL FCALC(X,F,S(1),IBLEW) BEGS0038
00124 40* C TEST IF GUESS POINT GOOD, BEGS0039
00125 41* IF(IBLEW)670,40,670 BEGS0040
00125 42* C COMPUTE NORM SQUARED,BF, OF FUNCTION AT GUESS POINT. BEGS0041
00130 43* 40 BF=0. BEGS0042
00131 44* DO 50 I=1,N BEGS0043
00134 45* 50 BF=BF+F(I)**2 BEGS0044
00134 46* C INITIALIZE BEST VALUE OF NORM SQUARED,BST. BEGS0045
00136 47* BST=BF BEGS0046
00136 48* C TEST IF FINISHING PROCEDURE ONLY IS TO BE USED. BEGS0047
00137 49* IF(IFIN)900,60,900 BEGS0048
00142 50* 60 IF (BST),670, BEGS0050
00142 51* C ESTABLISH CONSTRAINT AND PERTURBATION VECTORS ACCORDING TO VECTOR BEGS0051
00142 52* C INTEGER CODES ,IV(1). BEGS0052
00145 53* DO 150 I=1,M BEGS0053
00145 54* C TEST VECTOR OF INTEGERS FOR NON-ZERO COMPONENTS,I.E. DISREGARD BEGS0054
00145 55* C CORRESPONDING COMPONENTS OF X IN ITERATION PROCEDURE BEGS0055
00150 56* IF(IV(I))150,70,150 BEGS0056
00153 57* 70 IP=IP+1 BEGS0057
00153 58* C TEST VECTOR OF CONSTRAINTS FOR ZERO COMPONENTS.

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00154 59* IF(BNDS(I))100,90,100 BEGS0058
00154 60* C RESET I-TH COMPONENT IF INITIALLY ZERO. BEGS0059
00157 61* 90 BNDS(IP)=10,0 BEGS0060
00160 62* GO TO 110 BEGS0061
00161 63* 100 BNDS(IP)=BNDS(I) BEGS0062
00161 64* C TEST FOR NULL COORDINATE IN PERTURBATION VECTOR-IF ZERO THEN RESET BEGS0063
00162 65* 110 IF(H(I))150,120,150 BEGS0064
00165 66* 120 IF(X(I))130,140,130 BEGS0065
00170 67* 130 H(I)=.01*X(I) BEGS0066
00171 68* GO TO 150 BEGS0067
00172 69* 140 H(I)=.001 BEGS0068
00173 70* 150 CONTINUE BEGS0069
00173 71* C DEFINE INDEX VALUES FOR TEMPORARY STORAGE ARRAY S. BEGS0070
00175 72* JJ=IP*IP BEGS0071
00176 73* JPPF=N*IP BEGS0072
00177 74* JPX=JPPF*N BEGS0073
00200 75* JY=JPX*JJ BEGS0074
00201 76* JAZ=JY+IP BEGS0075
00202 77* JW=JAZ+IP BEGS0076
00203 78* JQ=JW+IP BEGS0077
00204 79* JATA=JQ*JJ BEGS0078
00205 80* JAR=JATA+((IP+1)*(IP+2))/2 BEGS0079
00206 81* JV=JAR+((IP+2)*(IP+3))/2 BEGS0080
00206 82* C INITIALIZE BEST F IN S ARRAY-- S(MN+1),...,S(MN+N) BEGS0081
00207 83* DO 170 I=1,N BEGS0082
00212 84* JJ=JPPF*I BEGS0083
25 00213 85* 170 S(JJ)=F(I) BEGS0084
00213 86* C TEST IF USING TANGENT OR SECANT METHOD. BEGS0085
00215 87* IF(IDER)510,200,510 BEGS0086
00215 88* C IF USING SECANT METHOD, THEN COMPUTE NECESSARY MATRICES APPROXIMATING BEGS0087
00215 89* C MATRIX OF PARTIALS, BY CONSTRUCTING M INDEPENDENT POINTS LOCALLY BEGS0088
00215 90* C SURROUNDING X AND USING THESE M+1 POINTS TO DEFINE A HYPERPLANE BEGS0089
00215 91* C APPROACHING THE ACTUAL TANGENT PLANE AT X --X IS UPDATED AS NEEDED. BEGS0090
00215 92* C PERTURB COMPONENTS OF X AND EVALUATE F SUCCESSIVELY. MAINTAIN BEST BEGS0091
00215 93* C POINT IN X. UPDATE MINIMAL VALUE, BST, AS REQUIRED. OUTCOME WILL BE BEGS0092
00215 94* C M PERTURBED POINTS IN S(NM+N+1),...,S(NM+N*M+2), AND CORRESPONDING BEGS0093
00215 95* C FUNCTION VALUES IN S(1),...,S(MN). BEST PT. IS X. BEST FUNCTION OF BEGS0094
00215 96* C THIS X IS IN S(MN+1),...,S(MN+N). BEGS0095
00220 97* 200 K=D BEGS0096
00221 98* JD=D BEGS0097
00222 99* DO 430 I=1,M BEGS0098
00222 100* C SHOULD I-TH COMPONENT OF X BE PERTURBED. BEGS0099
00225 101* IF(IV(I))430,210,430 BEGS0100
00230 102* 210 K=K+1 BEGS0101
00230 103* C PERTURB IT NO LESS THAN (10**(-6))* X(I). BEGS0102
00231 104* A1=1.E-6*AB(X(I)) BEGS0103
00232 105* IF(AB(H(I))-A1) 220,220,230 BEGS0104
00235 106* 220 H(I)=SIGN(A1,H(I)) BEGS0105
00235 107* C SAVE X(I) TEMPORARILY. BEGS0106
00236 108* 230 P=X(I) BEGS0107
00236 109* C PERTURB X(I) BY H(I). BEGS0108
00237 110* 240 X(I)=H(I)+P BEGS0109
00240 111* IF (X(I)-P)245,,245
00240 112* C ERROR EXIT BEGS0111
00243 113* IF(NIT.EQ.0) NIT=1 BEGS0112
00245 114* NIT=-NIT BEGS0113
00246 115* GO TO 650 BEGS0114
00246 116* C COMPUTE F FOR NEW POINT BEGS0115

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00247 117* 245 CALL FCALC(S,IBLEW) BEGS0116
00247 118* C TEST IF POINT IS GOOD. IF NOT, REVERSE H(I),HALVE, AND TRY AGAIN. BEGS0117
00250 119* IF(IBLEW)280,250,280 BEGS0118
00250 120* C COMPUTE NORM SQUARED FOR NEW POINT X. BEGS0119
00253 121* 250 BF=0. BEGS0120
00254 122* DO 260 J=1,N BEGS0121
00257 123* 260 BF=BF+F(J)**2 BEGS0122
00257 124* C IF F**2 TOO LARGE, HALVE STEP AND REPEAT. BEGS0123
00261 125* IF(BF-.E36)290,280,280 BEGS0124
00264 126* 280 H(I)=-H(I)/2.0 BEGS0125
00265 127* GO TO 240 BEGS0126
00265 128* C UPDATE STEP SIZE AND DIRECTION DEPENDING ON SIGNED CHANGE IN F**2. BEGS0127
00265 129* C UP STEP SIZE BY 5 IF RELATIVE CHANGE IN F**2 IS VERY SMALL. BEGS0128
00265 130* C DIRECTION OF THIS CHANGE IS TOWARD SMALLEST VALUE OF BF,BST. BEGS0129
00266 131* 290 IF(ABS(BF-BST)/BST)-1.E-7) 300,300,310 BEGS0130
00271 132* 300 H(I)=SIGN(5.0*H(I),(BST-BF)*H(I)) BEGS0131
00272 133* GO TO 360 BEGS0132
00272 134* C IS NEW F BETTER. BEGS0133
00273 135* 310 IF(BF-BST)320,320,340 BEGS0134
00273 136* C NEW F IS BETTER. IF RELATIVE CHANGE IN F**2 IS LESS THAN .5 BEGS0135
00273 137* C THEN UP STEP SIZE BY 5. BEGS0136
00276 138* 320 IF((BST-BF)/BST-.5)330,330,360 BEGS0137
00301 139* 330 H(I)=5.0*H(I) BEGS0138
00302 140* GO TO 360 BEGS0139
00302 141* C NEW NOT BETTER, REVERSE STEP DIRECTION. BEGS0140
00303 142* 340 H(I)=-H(I) BEGS0141
00303 143* C IF RELATIVE CHANGE IN F**2 IS GREATER THAN .5 THEN REDUCE STEP BEGS0142
00303 144* C SIZE BY 1/5. BEGS0143
00304 145* IF((BF-BST)/BST-.5)360,360,350 BEGS0144
00307 146* 350 H(I)=H(I)/5.0 BEGS0145
00307 147* C DEFINE START INDEX IN S ARRAY FOR STORAGE OF SUCCESSIVE COMPONENTS BEGS0146
00307 148* C OF X WHICH ARE CONSIDERED IN ITERATIVE PROCEDURE. BEGS0147
00310 149* 360 JZ=JPX+(K-1)*IP BEGS0148
00310 150* C SET APPROPRIATE ENTRIES IN S VECTOR TO ABOVE X COMPONENTS. BEGS0149
00311 151* K1=0 BEGS0150
00312 152* DO 380 J=1,M BEGS0151
00315 153* IF(S(J))380,370,380 BEGS0152
00320 154* 370 K1=K1+1 BEGS0153
00321 155* JJ=JZ+K1 BEGS0154
00322 156* S(JJ)=X(J) BEGS0155
00323 157* 380 CONTINUE BEGS0156
00323 158* C IS NEW F BETTER. THIS QUESTION IS ASKED TO DETERMINE WHETHER BEGS0157
00323 159* C LAST BEST POINT SHOULD BE UPDATED. BEGS0158
00325 160* IF(BF-BST)390,390,410 BEGS0159
00325 161* C NEW F IS BETTER. BEGS0160
00330 162* 390 JZ=JZ+K BEGS0161
00330 163* C PUT PREVIOUS X(I) IN S ARRAY. BEGS0162
00331 164* S(JZ)=P BEGS0163
00332 165* DO 400 J=1,N BEGS0164
00335 166* JD=JD+1 BEGS0165
00336 167* JK=JPFF+J BEGS0166
00336 168* C STORE PREVIOUS FUNCTION VALUE IN APPROPRIATE BEGS0167
00336 169* C SECTION OF S(1),...,S(MN). BEGS0168
00337 170* S(JD)=-S(JK) BEGS0169
00337 171* C STORE NEW FUNCTION VALUE IN S(MN+1),...,S(MN+N). BEGS0170
00340 172* 400 S(JK)=-F(J) BEGS0171
00342 173* BST=BF BEGS0172
00343 174* IF (BST),650,

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00346 175* GO TO 430 BEGS0174
00346 176* C NEWFNOT BETTER. SET APPROPRIATE SECTION OF S(1),...,S(MN) TO BEGS0175
00346 177* C NEW FUNCTION VALUE. BEGS0176
00347 178* 410 DO 420 J=1,N BEGS0177
00352 179* JD=JD+1 BEGS0178
00353 180* 420 S(JD)=F(J) BEGS0179
00355 181* X(I)=P BEGS0180
00355 182* C REPEAT FOR MORE COMPONENTS. BEGS0181
00356 183* 430 CONTINUE BEGS0182
00356 184* C HAVE SET OF PERTURBED POINTS, AND A BEST POINT. COMPUTE P,Q-MATRICES BEGS0183
00356 185* C USED IN SECANT METHOD. BEGS0184
00360 186* 440 K=0 BEGS0185
00361 187* K1=0 BEGS0186
00362 188* DO 480 I=1,IP BEGS0187
00362 189* C COMPUTE POINT DIFFERENCES FOR Q-MATRIX, BEGS0188
00362 190* C S(MN+N+1),...,S(MN+N+M+2). BEGS0189
00365 191* DO 460 J=1,M BEGS0190
00370 192* IF(IY(J))460,450,460 BEGS0191
00373 193* 450 K=K+1 BEGS0192
00374 194* IX=JPX+K BEGS0193
00375 195* IQ=JQ+K BEGS0194
00376 196* S(IQ)=S(IX)-X(J) BEGS0195
00377 197* 460 CONTINUE BEGS0196
00377 198* C COMPUTE FUNCTION DIFFERENCES IN P-MATRIX, S(1),...,S(MN) BEGS0197
00401 199* DO 470 J=1,N BEGS0198
00404 200* IPP=JPPF+J BEGS0199
00405 201* K1=K1+1 BEGS0200
00406 202* 470 S(K1)=S(K1)+S(IPP) BEGS0201
00410 203* 480 CONTINUE BEGS0202
00412 204* JON=0 BEGS0203
00413 205* IRX=0 BEGS0204
00414 206* IRV=JV BEGS0205
00414 207* C DETERMINE DX= ITERATIVE CHANGE IN X, FOR SECANT METHOD. BEGS0206
00414 208* C SOLVE PY = -F FOR Y. BEGS0207
00415 209* 490 CALL LEGS(S(1),S(JY+1),BNDS,N,IP,N,IP, BEGS0208
00415 210* IS(JATA+1),S(JAR+1),T,SUS,SUP,IBNDS,0,0,0,0) BEGS0209
00415 211* C COMPUTE DX = QY. STORE IN S(NM+N+M+2+M) SUBVECTOR. BEGS0210
00416 212* DO 500 I=1,IP BEGS0211
00421 213* IZ=JAZ+1 BEGS0212
00422 214* S(IZ)=0. BEGS0213
00423 215* DO 500 J=1,IP BEGS0214
00426 216* IQ=JQ+(J-1)*IP+1 BEGS0215
00427 217* IY=JY+J BEGS0216
00430 218* 500 S(IZ)=S(IZ)+S(IQ)*S(IY) BEGS0217
00430 219* C UPDATE MATRIX ITERATION COUNT FOR THESE P,Q BEGS0218
00433 220* JON=JON+1 BEGS0219
00434 221* GO TO 520 BEGS0220
00434 222* C DETERMINE DX DIRECTLY, IF USING TANGENT METHOD, FROM A(DX) = -F, BEGS0221
00434 223* C WHERE A IS MATRIX OF PARTIALS STORED IN S(1),...,S(MN) BY SUBROUTINE BEGS0222
00434 224* C FCALC. STORE DX IN S(NM+N+M+2+M) SUBVECTOR. BEGS0223
00435 225* 510 CALL LEGS(S(1),S(JAZ+1),BNDS,N,IP,N,IP, BEGS0224
00435 226* IS(JATA+1),S(JAR+1),T,SUS,SUP,IBNDS,0,0,0,0) BEGS0225
00436 227* 520 I=0 BEGS0226
00437 228* DO 540 K=1,M BEGS0227
00442 229* IF(IY(K))540,530,540 BEGS0228
00445 230* 530 I=I+1 BEGS0229
00446 231* IJ=JH+1 BEGS0230
00447 232* IZ=JAZ+1 BEGS0231

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00447 233* C SAVE PREVIOUS X VECTOR THIS LAST MATRIX ITERATION, IN S(NM+N*0*2+2M) SBE
00447 234* C SUBVECTOR. BEGS0233
00450 235* S(IW)=X(K) BEGS0234
00450 236* C COMPUTE NEW X FROM DX AND OLD X. BEGS0235
00451 237* X(K)=S(IW)+S(IZ) BEGS0236
00452 238* 540 CONTINUE BEGS0237
00452 239* C UP ITERATION COUNT BY 1. BEGS0238
00454 240* NIT=NIT+1 BEGS0239
00455 241* IF(IDER)550,570,550 BEGS0240
00455 242* C SAVE LAST POINT PARTIALS, IF USING TANGENT METHOD. NOTE--A SIMILAR THIN BEGS0241
00455 243* C WAS DONE FOR Q-MATRIX WHEN USING SECANT METHOD. BEGS0242
00460 244* 550 DO 560 K=1, JPF BEGS0243
00463 245* IQ=JV+K BEGS0244
00464 246* 560 S(IQ)=S(K) BEGS0245
00464 247* C COMPUTE NEW F AND F**2. BEGS0246
00466 248* 570 CALL FCALC(X,F,S(I),IBLW) BEGS0247
00467 249* BF=0. BEGS0248
00470 250* DO 580 I=1, N BEGS0249
00473 251* 580 BF=BF+F(I)**2 BEGS0250
00475 252* GO TO 680 BEGS0251
00475 253* C FINAL SEQUENCE OF STATEMENTS ENDING PROGRAM. BEGS0252
00475 254* C TEST IF PRESENT NORM SQUARED BETTER THAN LAST. BEGS0253
00476 255* 590 IF(BF-BST)640,640,600 BEGS0254
00476 256* C RESET BEST X. BEGS0255
00501 257* 600 DO 620 I=1, M BEGS0256
00504 258* IF(IY(I))620,610,620 BEGS0257
00507 259* 610 JW=JW+1 BEGS0258
00510 260* X(I)=S(JW) BEGS0259
00511 261* 620 CONTINUE BEGS0260
00511 262* C SET FUNCTION F TO LAST BEST VALUE. BEGS0261
00513 263* DO 630 I=1, N BEGS0262
00516 264* JPF=JPF+1 BEGS0263
00517 265* 630 F(I)=S(JPF) BEGS0264
00521 266* GO TO 650 BEGS0265
00521 267* C UPDATE BEST F**2. BEGS0266
00522 268* 640 BST=BF BEGS0267
00522 269* C NULL OUT CONSTRAINT VECTOR. BEGS0268
00523 270* 650 DO 660 J=1, M BEGS0269
00526 271* H(J)=0.0 BEGS0270
00527 272* 660 BNDJ(J)=0.0 BEGS0271
00531 273* 670 BSST=BST BEGS0272
00532 274* RETURN BEGS0273
00532 275* C BEGS0274
00532 276* C BEGS0275
00533 277* 680 K=0 BEGS0276
00533 278* C IS POINT GOOD. BEGS0277
00534 279* IF(IBLEW)690,700,690 BEGS0278
00534 280* C TEST NO. OF ITERATIONS. BEGS0279
00537 281* 690 IF(MAXIT-NIT)600,600,840 BEGS0280
00542 282* 700 DO 720 I=1, M BEGS0281
00545 283* IF(IY(I))720,710,720 BEGS0282
00550 284* 710 K=K+1 BEGS0283
00551 285* IZ=JAZ+K BEGS0284
00551 286* C PERFORM RELATIVE CONVERGENCE TEST. BEGS0285
00552 287* IF(ABS(S(IZ)).GT. ABS(X(I)*EPSL)) GO TO 730 BEGS0286
00554 288* 720 CONTINUE BEGS0287
00556 289* GO TO 590 BEGS0288
00557 290* 730 IF(MAXIT-NIT)590,590,740 BEGS0289

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00557 291* C IS NEW F BETTER. BEGS0290
00562 292* 740 IF(BF=BST)750,750,840 BEGS0291
00562 293* C NEW F IS BETTER, DOUBLE VALUES IN CONSTRAINT VECTOR. BEGS0292
00565 294* 750 DO 760 K=1,IP BEGS0293
00570 295* 760 BND5(K)=BND5(K)*2.0 BEGS0294
00570 296* C UPDATE BEST NORM SQUARED VALUE. BEGS0295
00572 297* BST=BF BEGS0296
00572 298* C IF USING TANGENT METHOD THEN UPDATE BEST F IN BEGS0297
00572 299* C S ARRAY, I.E., UPDATE CONSTANT MATRIX BEGS0298
00573 300* IF(IDER)820,770,820 BEGS0299
00573 301* C UPDATE LAST BEST X--FROM S(NM+N+M**2+2M) TO S(NM+N) SUBVECTOR SECTION. BEGS0300
00576 302* 770 DO 780 I=1,IP BEGS0301
00601 303* IRX=IRX+1 BEGS0302
00602 304* JJ=JPX+IRX BEGS0303
00603 305* IW=JW+I BEGS0304
00604 306* 780 S(JJ)=S(IW) BEGS0305
00606 307* DO 790 I=1,N BEGS0306
00611 308* IRV=IRV+I BEGS0307
00612 309* IFS=JPPF+I BEGS0308
00612 310* C SAVE LAST BEST F --FROM S(NM+1) TO OTHER HIGH INDEXED SECTION. BEGS0309
00613 311* S(IRV)=-S(IFS) BEGS0310
00613 312* C UPDATE BEST F -- TO S(NM+1) SUBVECTOR. BEGS0311
00614 313* 790 S(IFS)=-F(I) BEGS0312
00614 314* C TEST TO SEE IF P,Q NEED BE UPDATED. IF NO, THEN PERFORM ANOTHER SECANT BEGS0313
00614 315* C ITERATION. BEGS0314
00616 316* IF(JON-IP)490,800,800 BEGS0315
00616 317* C UPDATE S(I),...,S(MN) TO PAST BEST FUNCTION VALUES. TRANSFER TO SECTION BEGS0316
00616 318* C WHICH UPDATES P,Q MATRICES. BEGS0317
00621 319* 800 K=0 BEGS0318
00622 320* DO 810 I=1,N BEGS0319
00625 321* DO 810 J=1,IP BEGS0320
00630 322* K=K+1 BEGS0321
00631 323* IRV=JV+K BEGS0322
00632 324* 810 S(K)=S(IRV) BEGS0323
00635 325* GO TO 440 BEGS0324
00636 326* 820 DO 830 I=1,N BEGS0325
00641 327* J=JPPF+I BEGS0326
00642 328* 830 S(J)=-F(I) BEGS0327
00644 329* GO TO 510 BEGS0328
00644 330* C NEW F NOT BETTER. BEGS0329
00645 331* 840 IF(IDER) 845,847,845 BEGS0330
00650 332* 845 IF(IBND5.EQ.0) GO TO 510 BEGS0331
00652 333* 847 I=0 BEGS0332
00653 334* DO 860 K=1,M BEGS0333
00656 335* IF(IV(K))860,850,860 BEGS0334
00661 336* 850 I=I+1 BEGS0335
00661 337* C REDUCE CONSTRAINT VECTOR BY 1/5. BEGS0336
00662 338* BND5(I)=BND5(I)/5.0 BEGS0337
00663 339* IW=JW+I BEGS0338
00664 340* X(K)=S(IW) BEGS0339
00665 341* 860 CONTINUE BEGS0340
00665 342* C RESET FUNCTION F TO LAST BEST VALUES IN S(NM+1) SUBVECTOR. BEGS0341
00667 343* DO 870 K=1,N BEGS0342
00672 344* JJ=JPPF+K BEGS0343
00673 345* 870 F(K)=-S(JJ) BEGS0344
00675 346* BF=BST BEGS0345
00675 347* C TRANSFER TO SECTION FOR ANOTHER ATTEMPT AT COORDINATE STEPPING,IF BEGS0346

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00676 349* IF (IDER,880) 5 880
00701 350* 875 IF (EPS,GE,0) GO TO 200
00703 351* WRITE(6,8995) JON,NIT
00707 352* 8995 FORMAT(45H NORM SQUARED WORSE THAN PREVIOUS VALUE AFTER,
00707 353* 1 14,26H CONSTANT SLOPE ITERATIONS,10X,
00707 354* 2 17HTOTAL ITERATIONS=I3)
00710 355* GO TO 200
00710 356* C RESET COEF. MATRIX TO PREVIOUS VALUE, IF USING TANGENT METHOD.
00711 357* 880 DO 890 I=1,JPF
00714 358* IQ=JV+I
00715 359* 890 S(I)=S(IQ)
00715 360* C TRANSFER TO AREA FOR ANOTHER TANGENT ITERATION, WITH THE REDUCED
00715 361* C CONSTRAINT VECTOR.
00717 362* GO TO 510
00717 363* C START FINISHING PROCEDURE TO TEST WHETHER INPUT X IS MINIMAL.
00720 364* 900 JPF=M*N
00721 365* JW=JPF*N
00722 366* JZ=JW+M
00723 367* WRITE(6,9000)
00725 368* 9000 FORMAT(44H0 FINISHING PROCEDURE WITH FOLLOWING NOMINAL)
00726 369* WRITE(6,9010) (X(IPR),IPR=1,M)
00734 370* WRITE(6,9015) (F(IPR),IPR=1,N)
00742 371* IF (BF-BST)920,920,930
00745 372* 920 WRITE(6,9005) BF
00750 373* GO TO 940
00751 374* 930 WRITE(6,9020) BF
00754 375* 940 DO 1040 I=1,M
00757 376* IF (Y(I))1040,950,1040
00762 377* 950 IF (H(I))970,960,970
00765 378* 960 H(I)=EPSL*X(I)
00766 379* 970 P=X(I)
00766 380* C PERTURB I-TH COMPONENT, X(I), +H(I) AND -H(I), FOR EACH I. LOOK FOR
00766 381* C SMALLER VALUES IN F**2 AND SAVE ACCORDINGLY.
00766 382* C TRANSFER TO PROGRAM RETURN.
00767 383* JAR=JZ+1
00770 384* JATA=JZ+N
00771 385* DO 1030 J=1,2
00774 386* X(I)=P+H(I)
00775 387* CALL FCALC(X,S(JZ+1),S,IBLEN)
00776 388* SF=0.
00777 389* DO 980 K=1,N
01002 390* IZ=JZ+K
01003 391* 980 SF=SF+S(IZ)**2
01005 392* WRITE(6,9025) I,H(I)
01011 393* WRITE(6,9010) (X(K),K=1,M)
01017 394* WRITE(6,9015) (S(K),K=JAR,JATA)
01025 395* IF (BST-SF)1020,990,990
01030 396* 990 WRITE(6,9005) SF
01033 397* DO 1000 JJ=1,M
01036 398* IJ=JJ+JW
01037 399* 1000 S(IW)=X(IJ)
01041 400* DO 1010 JJ=1,N
01044 401* IZ=JZ+JJ
01045 402* IFF=JPF+JJ
01046 403* 1010 S(IPP)=S(IZ)
01050 404* BST=SF
01051 405* GO TO 1030
01052 406* 1020 WRITE(6,9020) SF

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BE 48
BEGS0349
BEGS0350
BEGS0351
BEGS0352
BEGS0353
BEGS0354
BEGS0355
BEGS0356
BEGS0357
BEGS0358
BEGS0359
BEGS0360
BEGS0361
BEGS0362
BEGS0363
BEGS0364
BEGS0365
BEGS0366
BEGS0367
BEGS0368
BEGS0369
BEGS0370
BEGS0371
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BEGS0374
BEGS0375
BEGS0376
BEGS0377
BEGS0378
BEGS0379
BEGS0380
BEGS0381
BEGS0382
BEGS0383
BEGS0384
BEGS0385
BEGS0386
BEGS0387
BEGS0388
BEGS0389
BEGS0390
BEGS0391
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BEGS0394
BEGS0395
BEGS0396
BEGS0397
BEGS0398
BEGS0399
BEGS0400
BEGS0401
BEGS0402
BEGS0403
BEGS0404
BEGS0405

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@ FOR,* BEGS,BEGS
 01055 407* 1030 H(I)=H(I)
 01057 408* X(I)=P
 01060 409* 1040 CONTINUE
 01062 410* GO TO 590
 01063 411* END

BEGS0406
 BEGS0407
 BEGS0408
 BEGS0409
 BEGS0410

END OF UNIVAC 1108 FORTRAN V COMPILATION.

0 *DIAGNOSTIC* MESSAGE(S)

BEGS	SYMBOLIC	30 APR 71	11:18:54	0	01440312	14	411	(DELETED)	
BEGS	CODE	RELOCATABLE		30 APR 71	11:18:54	1	01453504	24	1 (DELETED)
						0	01453534	14	123

B HDG @ FOR,* BETA,BETA

@ FOR,* BETA,BETA
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:26:39

FUNCTION BETA ENTRY POINT 000127

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000156
 0000 *DATA 000033
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

32 0001 000031 10L 0001 000052 116G 0001 000043 20L 0001 000063 40L 0000 R 000000 BETA
 0000 I 000002 I 0000 I 000001 M1

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00101 10 FUNCTION BETA (Y,X,XIN,M)
00103 20 DIMENSION X(20), Y(20)
00104 30 IF( XIN .GT. X(1) ) GO TO 10
00106 40 BETA = Y(1)
00107 50 RETURN
00110 60 10 IF( XIN .LT. X(M) ) GO TO 20
00112 70 BETA = Y(M)
00113 80 RETURN
00113 90 C
00113 100 C FIND I SUCH THAT X(I) .LE. XIN .LE. X(I+1)
00114 110 20 M1 = M-1
00115 120 DO 30 I=1,M1
00120 130 IF ( X(I+1) .GE. XIN ) GO TO 40
00123 140 BETA = Y(I) + (Y(I+1)-Y(I))*(( XIN-X(I))/(X(I+1)-X(I)) )
00124 150 RETURN
00125 160 END
    
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END OF UNIVAC 1108 FORTRAN V COMPILATION.

0 *DIAGNOSTIC* MESSAGE(S)

BETA	SYMBOLIC	14 JUN 71	15:05:17	0	01612364	14	16	(DELETED)
BETA	CODE	RELOCATABLE	14 JUN 71	15:05:17	1	01612724	24	1 (DELETED)
				0	01612754	14	12	

@ HDG @ FOR,* BINSER,BINSER

3.2.7 BINSER

@ FOR,* BINSER,BINSER
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:26:40

31 AUG'71

9:26:39.979

SUBROUTINE BINSER ENTRY POINT 0001J7

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000172
 0000 *DATA 000023
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 NERR3S

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001 000024 10L 0001 000027 20L 0001 000037 30L 0001 000057 50L 0001 000061 60L
 0001 000124 70L 0000 R 000002 DELTT 0000 I 000000 INDEX 0000 R 000001 SIGN

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00100	1*	CD	*****	BINS0010
00100	2*	CD		BINS0020
00100	3*	CD	PROGRAMMER AND DATE	BINS0030
00100	4*	CD	J. I. PREWITT	BINS0040
00100	5*	CD	DECEMBER 1970	BINS0050
00100	6*	CD		BINS0060
00100	7*	CD	PURPOSE	BINS0070
00100	8*	CD	PERFORMS A BINARY SEARCH TO OBTAIN ITS INDICE AND	BINS0080
00100	9*	CD	INTERPOLATION FUNCTION,	BINS0090
00100	10*	CD		BINS0100
00100	11*	CD	USAGE	BINS0110
00100	12*	CD	CALL BINSER (T,UB,JMAX,JJ,B)	BINS0120
00100	13*	CD		BINS0130
00100	14*	CD	DESCRIPTION OF PARAMETERS	BINS0140
00100	15*	CD		BINS0150
00100	16*	CD	INPUT	BINS0160
00100	17*	CD	CALLING SEQUENCE	BINS0170
00100	18*	CD	T - VALUE TO BE SEARCHED FOR	BINS0180
00100	19*	CD	UB - ARRAY TO BE SEARCHED	BINS0190
00100	20*	CD	JMAX - LENGTH OF UB	BINS0200
00100	21*	CD	COMMON	BINS0210
00100	22*	CD	NONE	BINS0220
00100	23*	CD	CARD	BINS0230
00100	24*	CD	NONE	BINS0240
00100	25*	CD	TAPE	BINS0250
00100	26*	CD	NONE	BINS0260
00100	27*	CD		BINS0270
00100	28*	CD		BINS0280
00100	29*	CD	OUTPUT	BINS0290

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00100 30* CD CALLING SEQUENCE BIN0300
00100 31* CD JJ = INDICE OF THE UB ARRAY, I.E. T .LE. UB(JJ) BIN0310
00100 32* CD B = INTERPOLATION FUNCTION BIN0320
00100 33* CD COMMON BIN0330
00100 34* CD NONE BIN0340
00100 35* CD CARD BIN0350
00100 36* CD NONE BIN0360
00100 37* CD PRINT BIN0370
00100 38* CD NONE BIN0380
00100 39* CD TAPE BIN0390
00100 40* CD NONE BIN0400
00100 41* CD BIN0410
00100 42* CD REMARKS AND RESTRICTIONS BIN0420
00100 43* CD TEST TO MAKE SURE T IS WITHIN THE RANGE UB(1) = UB(JMAX) BIN0430
00100 44* CD HAS TO BE MADE BEFORE ENTRY IN TO THIS ROUTINE. BIN0440
00100 45* CD BIN0450
00100 46* CD SUBPROGRAMS REQUIRED BIN0460
00100 47* CD NONE BIN0470
00100 48* CD BIN0480
00100 49* CD METHOD BIN0490
00100 50* CD T IS COMPARED TO THE UB ARRAY UNTIL T LIES BETWEEN TWO BIN0500
00100 51* CD VALUES IN THE UB ARRAY OR UNTIL T IS EQUAL TO A VALUE BIN0510
00100 52* CD IN THE UB ARRAY. THEN THE INTERPOLATION FUNCTION IS BIN0520
00100 53* CD COMPUTED. BIN0530
00100 54* CD BIN0540
00100 55* CD * * * * * BIN0550
00100 56* C BIN0560
00101 57* C SUBROUTINE BINSER (T,UB,JMAX,JJ,B) BIN0570
00101 58* C BIN0580
00103 59* C DIMENSION UB(1) BIN0590
00103 60* C BIN0600
00104 61* C JJ = (JMAX+1) / 2 BIN0610
00105 62* C INDEX = (JJ+1) / 2 BIN0620
00106 63* C SIGN = UB(JMAX) - UB(1) BIN0630
00106 64* C BIN0640
00107 65* C GO TO 30 BIN0650
00107 66* C BIN0660
00107 67* C INCREMENT BIN0670
00107 68* C BIN0680
00110 69* C 10 JJ = JJ + INDEX BIN0690
00110 70* C BIN0700
00110 71* C TEST END OF SEARCH BIN0710
00110 72* C BIN0720
00111 73* C 20 IF (INDEX.EQ.1) GO TO 60 BIN0730
00113 74* C INDEX = INDEX - INDEX/2 BIN0740
00113 75* C BIN0750
00113 76* C TEST RANGE BIN0760
00113 77* C BIN0770
00114 78* C 30 IF (SIGN(T,SIGN)*SIGN(UB(JJ),SIGN)) 40,50,10 BIN0780
00114 79* C BIN0790
00114 80* C DECREMENT BIN0800
00114 81* C BIN0810
00117 82* C 40 JJ = JJ - INDEX BIN0820
00120 83* C GO TO 20 BIN0830
00120 84* C BIN0840
00120 85* C T .EQ. UB(JJ) BIN0850
00120 86* C BIN0860
00121 87* C 50 CONTINUE BIN0870

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3/2

FOR,* BINSER,BINSER

DATE 310871 PAGE 94

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00122 88*      B = 0.                                BINS0880
00123 89*      GO TO 70                             BINS0890
00124 90*      60 CONTINUE                           BINS0900
00124 91*      C                                     BINS0910
00124 92*      C      INTERPOLATION FUNCTION         BINS0920
00124 93*      C                                     BINS0930
00125 94*      C      IF (SIGN(T,SIGN) .GT. SIGN(UB(JJ),SIGN)) JJ = JJ+1 BINS0940
00127 95*      DELTT = UB(JJ)-UB(JJ-1)              BINS0950
00130 96*      IF (ABS(DELT)) .LT. .00005) GO TO 50 BINS0960
00132 97*      B = (T-UB(JJ)) / DELTT                BINS0970
00132 98*      C                                     BINS0980
00133 99*      70 CONTINUE                           BINS0990
00134 100*     RETURN                                BINS1000
00135 101*     END                                  BINS1010

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END OF UNIVAC 1108 FORTRAN V COMPILATION.

D *DIAGNOSTIC* MESSAGE(S)

BINSER	SYMBOLIC	01 MAR 71	18:47:30	0	01533770	14	101	(DELETED)
BINSER	CODE	30 APR 71	11:18:57	1	01457026	24	1	(DELETED)
				0	01457056	14	13	

HDG # FOR,* BLK1,BLK1

FOR, BLK1, BLK1
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:26:41

31 AUG 71

9:26:41.420

BLOCK DATA

STORAGE USED (BLOCK, NAME, LENGTH)

0003 BLKPTH 002116

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0003 R 000000 AA	0003 R 000127 AB	0003 R 000220 AC	0003 R 000367 AD	0003 R 000404 AE
0003 R 000547 AF	0003 R 000571 AG	0003 R 000723 AH	0003 R 001055 AI	0003 R 001217 AJ
0003 R 001251 AK	0003 R 001417 AL	0003 R 001516 AM	0003 R 001573 AN	0003 R 001742 AO
0000 I 000000 IS				

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00100	1*	CD	BLK10010
00100	2*	CD		BLK10020
00100	3*	CD	PROGRAMMER AND DATE	BLK10030
00100	4*	CD	NATIONAL BUREAU OF STANDARDS	BLK10040
00100	5*	CD	1967	BLK10050
00100	6*	CD		BLK10060
00100	7*	CD	DOCUMENTATION AND DATE	BLK10070
00100	8*	CD	J. I. PREWITT	BLK10080
00100	9*	CD	DECEMBER 1970	BLK10090
00100	10*	CD		BLK10100
00100	11*	CD	PURPOSE	BLK10110
00100	12*	CD		BLK10120
00100	13*	CD	INITIALIZATION OF TABLES FOR HPTH (ENTHALPY OF HYDROGEN).	BLK10130
00100	14*	CD		BLK10140
00100	15*	CD	USAGE	BLK10150
00100	16*	CD	BLOCK DATA	BLK10160
00100	17*	CD		BLK10170
00100	18*	CD	DESCRIPTION OF PARAMETERS	BLK10180
00100	19*	CD		BLK10190
00100	20*	CD	INPUT	BLK10200
00100	21*	CD	NONE	BLK10210
00100	22*	CD		BLK10220
00100	23*	CD		BLK10230
00100	24*	CD	OUTPUT	BLK10240
00100	25*	CD	COMMON	BLK10250
00100	26*	CD	UNKNOWN	BLK10260
00100	27*	CD		BLK10270
00100	28*	CD	REMARKS AND RESTRICTIONS	BLK10280
00100	29*	CD	THIS BLOCK DATA ROUTINE IS LOADED INTO CORE EVERY TIME	BLK10290
00100	30*	CD	THE FUNCTION HPTH IS LOADED INTO CORE.	BLK10300
00100	31*	CD		BLK10310
00100	32*	CD	SUBPROGRAMS REQUIRED	BLK10320
00100	33*	CD	NONE	BLK10330
00100	34*	CD		BLK10340
00100	35*	CD	METHOD	BLK10350

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00100 36* CD BLK10360
00100 37* CD BLK10370
00100 38* CD THIS ROUTINE WAS OBTAINED FROM NASA/MSC AND IS PART OF BLK10380
00100 39* CD NBS COMPUTER PROGRAMS FOR THERMODYNAMIC AND TRANSPORT BLK10390
00100 40* CD PROPERTIES OF HYDROGEN FROM 1 TO 5000 PSIA AND FOR BLK10400
00100 41* CD TEMPERATURES FROM THE TRIPLE POINT (ABOUT 24.16 O R ) BLK10410
00100 42* CD TO 5000 O R . AUTHORS ARE A.J.HALL, R.D.MCCARTY AND BLK10420
00100 43* CD H.M.ROEDER , NBS REPORT NO 9288 , AUGUST 18, 1967, BLK10430
00100 44* CD PP 188 , NASA NO N67-35527 BLK10440
00100 45* CD . . . . . BLK10450
00101 46* BLOCK DATA BLK10460
00102 47* COMMON /BLKPTH/ AA(87),AB(57),AC(103),AD(13),AE(99),AF(18),AG(90), BLK10470
00102 48* IAH(90),AI(98),AJ(26),AK(102),AL(63),AM(45),AN(103),AO(108) BLK10480
00103 49* DATA AA /10718.,10748.,10777.,12691.,12720.,12754., BLK10490
00103 50* 114783.,14783.,14809.,17057.,16960.,16959.,19701.,19333.,19260., BLK10500
00103 51* 210716.,10722.,10728.,12714.,12699.,12701.,14922.,14807.,14783., BLK10510
00103 52* 317616.,17141.,17026.,21389.,19939.,19578.,10718.,10719.,10720., BLK10520
00103 53* 412730.,12714.,12705.,15023.,14907.,14853.,18003.,17547.,17331., BLK10530
00103 54* 522558.,21174.,20519.,10718.,10718.,10719.,11515.,11501., BLK10540
00103 55* 611496.,11519.,12356.,12322.,12309.,12318.,13258.,13180.,13152., BLK10550
00103 56* 713162.,14255.,14093.,14036.,14049.,15404.,15094.,14984.,14936., BLK10560
00103 57* 816783.,16223.,16026.,16026.,18497.,17539.,17201.,17116.,20676., BLK10570
00103 58* 919114.,18562.,18433.,23483.,21035.,20170.,19976.,27103.,23409./ AB /BLK10590
00105 59* DATA AB /BLK10590
00105 60* A22100.,21520.,10718.,10718.,10718.,10718.,10718.,11538.,11522., BLK10600
00105 61* B11515.,11511.,11508.,12414.,12374.,12357.,12346.,12339.,13386., BLK10610
00105 62* C13297.,13258.,13235.,13219.,14517.,14335.,14255.,14207.,14174., BLK10620
00105 63* D15904.,15557.,15403.,15311.,15249.,17684.,17059.,16781.,16616., BLK10630
00105 64* E16503.,20035.,18967.,18493.,18211.,18018.,23183.,21442.,20670., BLK10640
00105 65* F20209.,19895.,27393.,24679.,23472.,22751.,22259.,32955.,28899., BLK10650
00105 66* G27084.,25999.,25256./ BLK10660
00107 67* DATA AC /1663., 1748., 3407., 3524., 5151., 5272., BLK10670
00107 68* 1 6935., 7056., 8783., 8901.,10718.,10817.,419.7, 385.5, 377.1, BLK10680
00107 69* 2385.1,401.5,830.7,823.8,826.2,835.9,851.0,1261.,1270.,1282.,1297., BLK10690
00107 70* 31315.,1668.,1687.,1706.,1724.,1743.,102.2,129.1,159.0,159.9,182.2, BLK10700
00107 71* 4209.4,221.1,238.9,263.6,284.8,299.1,321.3,350.8,362.7,383.0,419.0, BLK10710
00107 72* 5429.4,446.8,88.34,86.30,87.94,91.61,96.51,102.2,162.4,155.2,152.9, BLK10720
00107 73* 6153.5,156.1,159.9,232.5,224.0,219.6,218.2,218.9,221.1,299.0,291.1, BLK10730
00107 74* 7286.2,284.0,283.7,284.8,364.3,357.6,353.2,350.8,350.1,350.8,431.8, BLK10740
00107 75* 8424.8,422.9,420.9,418.9,419.0,126.4,109.2,98.33,91.88,88.34,201.9, BLK10750
00107 76* 9188.4,177.2,168.7,162.4,265.3,255.1,246.2,238.6,232.5,325.1,317.4, BLK10760
00111 77* DATA AD/BLK10770
00111 78* A310.4,304.2,299.0,384.9,378.8,373.4,368.5,364.3,448.8,444.5,440.3, BLK10780
00111 79* B436.0,431.8/ BLK10790
00113 80* DATA AE /222.2,174.7,126.4,266.9,233.7,201.9,313.5, BLK10800
00113 81* 1288.4,265.3,362.4,342.7,325.1,414.5,398.7,384.9,465.8,457.3,448.8, BLK10810
00113 82* 236.57,-0.635,35.58,-24.27,11.37,46.52,-10.41,24.51,59.14,5.035, BLK10820
00113 83* 339.10,73.14,22.05,54.99,88.32,40.42,72.09,104.7,59.98,90.22,122.0, BLK10830
00113 84* 480.60,109.3,140.1,102.2,129.1,159.0,-85.55,-76.17,-66.88,-57.67, BLK10840
00113 85* 5-48.54,-39.65,-76.14,-67.02,-57.86,-48.74,-39.63,-30.42,-65.46, BLK10850
00113 86* 6-56.63,-47.73,-38.82,-29.88,-20.81,-53.51,-45.09,-36.51,-27.86, BLK10860
00113 87* 7-19.15,-10.41,-40.29,-32.38,-24.23,-15.89,-7.47,1.17,-25.74,-18.56, BLK10870
00113 88* 8-10.9,-2.96,5.14,13.54,-9.88,-3.58,3.41,10.88,18.6,26.64,7.34, BLK10880
00113 89* 912.46,18.68,25.57,32.85,40.42,25.89,29.54,34.63,41.04,47.82,54.09, BLK10890
00115 90* DATA AF/BLK10900
00115 91* A45.69,47.61,51.79,57.23,63.43,70.29,66.61,66.57,69.53,74.12,79.68, BLK10910
00115 92* B86.00,88.34,86.30,87.94,91.61,96.51,102.21/ BLK10920
00117 93* DATA AG /-129.36,-124.60,-119.83,-115.03,-110.26, BLK10930

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00117 94* 1-105.55,-100.08,-96.08,-91.37,-119.42,-114.92,-110.38,-105.79,-101.81, BLK10950

00117 95* 2-16,-96.51,-91.88,-87.21,-82.41,-107.45,-103.44,-99.26,-94.98, BLK10950

00117 96* 3-90.6,-86.19,-81.71,-77.23,-72.58,-92.77,-89.71,-86.23,-82.46,-78.8, BLK10970

00117 97* 447,-74.37,-70.19,-65.93,-61.48,-73.53,-72.8,-70.77,-67.93,-64.6,-68.6, BLK10970

00117 98* 51,-57.2,-53.28,-49.11,-41.28,-49.57,-51.87,-50.91,-48.74,-45.9, BLK10980

00117 99* 6-42.7,-39.24,-35.44,-39.9,-18.9,-26.49,-30.41,-30.39,-28.88,-26.55, BLK10990

00117 100* 723.74,-20.45,46.52,40.72,37.01,34.66,33.21,32.38,32.04,32.06,32.49, BLK11000

00117 101* 8,88,56,79,51,72,99,68,32,65,01,62,69,61,11,60,10,59,63,126,40,117, BLK11010

00117 102* 980,109.21,103.80,98.33,95.10,91.88,90.11,88.34/ BLK11020

00121 103* DATA AH /-30.39,-29.64,-28.88,-27.72,-26.55,-25.15,-28.6, BLK11030

00121 104* 13.74,-22.17,-20.45,-23.63,-23.33,-22.72,-21.84,-20.77,-19.57,-18.28, BLK11040

00121 105* 24,-16.82,-15.17,-16.47,-16.59,-16.27,-15.65,-14.8,-13.76,-12.58,-18.6, BLK11050

00121 106* 31.27,-9.88,-8.89,-9.51,-9.56,-9.23,-8.6,-7.75,-6.72,-5.57,-4.14, BLK11060

00121 107* 4-85,-2.07,-2.56,-2.55,-2.18,-1.55,-7.8,3,1.60,7.68,5.74,4.76,4.38, BLK11070

00121 108* 5,4,45,4.85,5.5,6.34,7.34,16.7,13.93,12.37,11.57,11.03,11.45,11.88, BLK11080

00121 109* 612.53,13.52,26.21,22.50,20.28,19.02,18.39,18.24,18.43,18.89,19.70, BLK11090

00121 110* 736.36,31.44,28.52,26.72,25.70,25.22,25.15,25.40,25.89,46.52,40.72, BLK11100

00121 111* 837.01,34.66,32.21,32.38,32.04,32.06,32.49/ BLK11110

00123 112* DATA AI/95.17,80.15,65.54,53.23,44.02,37.38,32.55,28.6, BLK11120

00123 113* 1.95,26.21,115.71,104.14,92.37,81.05,70.96,62.55,55.86,50.62,46.52, BLK11130

00123 114* 2132.56,123.21,113.55,103.98,94.83,86.45,79.09,72.87,67.54,147.68, BLK11140

00123 115* 3139.66,131.45,123.26,115.26,107.63,100.54,94.17,88.56,161.61,154.48, BLK11150

00123 116* 46,147.34,140.2,133.1,126.33,119.83,113.75,107.50,174.7,168.66,162.8, BLK11160

00123 117* 5.62,156.58,150.54,144.50,138.46,132.42,126.38,177.4,161.6,143.4, BLK11170

00123 118* 6121.8,95.2,186.3,171.7,155.4,136.8,115.7,195.1,181.6,166.8,150.5, BLK11180

00123 119* 7132.6,204.0,191.4,177.9,163.3,147.7,212.9,201.2,188.7,175.5,161.6, BLK11190

00123 120* 8222.2,210.3,198.5,186.6,174.7,-30.41,-30.63,-30.67,-30.59,-30.39, BLK11200

00123 121* 9-22.50,4,-23.09,-23.64,-23.63,-13.86,-14.96,-15.7,-16.18/ BLK11210

00125 122* DATA AJ /-16.47,-4.37,-6.14,-7.4,-8.28,-8.89,6.14, BLK11220

00125 123* 13.46,1.54,1.16,-0.85,17.79,13.93,11.18,9.17,7.68,30.52,25.28,21.52, BLK11230

00125 124* 218.77,16.7,44.02,37.38,32.55,28.95,26.21/ BLK11240

00127 125* DATA AK /-26.48,-27.26,-27.92,-28.45,-28.92,-29.30, BLK11250

00127 126* 1-29.62,-29.88,-30.1,-30.28,-30.41,-21.02,-22.11,-23.0,-23.75,-24.38, BLK11260

00127 127* 2-24.9,-25.36,-25.73,-26.06,-26.32,-26.46,-14.94,-16.45,-17.67,-18.6, BLK11270

00127 128* 3.68,-19.53,-20.25,-20.85,-21.37,-21.81,-22.19,-22.5,-8.03,-10.16, BLK11280

00127 129* 4-11.84,-13.21,-14.34,-15.28,-16.09,-16.77,-17.35,-17.85,-18.18,018, BLK11290

00127 130* 5-3.05,-5.37,-7.22,-8.72,-9.96,-11.01,-11.9,-12.66,-13.31,-13.86, BLK11300

00127 131* 69.41,5.12,1.87,-6.1,-2.6,-4.23,-5.58,-6.72,-7.69,-8.52,-9.12,20.7, BLK11310

00127 132* 7,14.43,10.1,6.72,4.1,1.99,-2.6,-1.19,-2.42,-3.47,-4.37,33.45,25.24, BLK11320

00127 133* 819.25,14.8,11.45,8.7,6.54,4.7,1.3,17.1,87.88,45.95,36.79,29.44, BLK11330

00127 134* 923.8,19.44,16.07,13.29,11.02,9.12,7.51,6.14,5.6,31.47,94.39,94/ BLK11340

00131 135* DATA AL / 33.38, BLK11350

00131 136* 15.28,09.23,89.20,51.17,74.15,44.13,49.11,96.66,66.58,21.50,23.43,18, BLK11360

00131 137* 24.37,17.32,25.28,21.24,89.22,11.19,78.17,79.74,56.67,32.59,73.52,68, BLK11370

00131 138* 32.46,26.40,81.36,2.32,35.29,11.26,37.24,15.82,45.75,41.68,34.61,5, BLK11380

00131 139* 455.11,49.35,44.34,40.03,36.35,33.21,30.52,88.81,82.65,76.12,69.66, BLK11390

00131 140* 563.44,57.66,52.40,47.78,43.74,40.24,37.27,95.17,89.16,83.15,77.23, BLK11400

00131 141* 671.38,65.54,60.61,55.69,51.39,47.70,44.02/ BLK11410

00133 142* DATA AM /104.94,98.01,90.23,81.37,71.12,59.16,45.59, BLK11420

00133 143* 131.88,20.95,113.25,107.27,100.76,93.63,85.67,76.79,66.95,56.39,45, BLK11430

00133 144* 295,120.40,115.79,110.19,104.17,97.75,90.73,83.18,75.10,66.66,127.68, BLK11440

00133 145* 30.123.62,118.65,113.4,107.84,102.07,95.85,89.29,82.45,134.75,130.48, BLK11450

00133 146* 42,126.09,121.76,116.44,111.12,105.81,100.49,95.17/ BLK11460

00135 147* DATA AN /65.16,51.82,-3.47,-10.85,-14.26,-16.57,-18.6, BLK11470

00135 148* 137,-19.82,-21.02,-22.04,-22.92,-23.69,-24.38,-24.99,-25.54,-26.04, BLK11480

00135 149* 2-26.48,74.13,67.69,57.36,39.09,5.99,-3.23,-7.63,-10.52,-12.65,-14.8, BLK11490

00135 150* 337,-15.78,-16.98,-18.0,-18.9,-19.69,-20.39,-21.02,83.09,77.17,70.3, BLK11500

00135 151* 461.77,50.17,31.98,12.48,3.55,-1.09,-4.43,-6.93,-8.9,-10.49,-11.86, BLK11510

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00135 152* 5-13.03,-14.04,-14.94,89.04,84.56,79.06,72.84,65.52,56.54,44.99,30.BLK11520
00135 153* 66.17,92.9,94.4,89.1,51,-1.24,-3.43,-5.22,-6.72,-8.03,94.98,90.77, BLK11530
00135 154* 786.16,81.07,75.42,69.01,61.59,52.84,42.58,31.64,22.32,15.46,10.57,BLK11540
00135 155* 86.94,4.28,1.95,.01, 99.84,96.27,92.24,87.87,83.15,77.97,72.25,65.8,BLK11550
00135 156* 96.58,68.50,67.42,06.33,59.26,31.20,44.15,88.12,29.9,41.10,4.7/ BLK11560
00137 157* DATA A0/101.28,97.67,93.82,89.72,85.3,80.54,75.38,69.76,63.63,56.9,BLK11570
00137 158* 18.49,93.42,76.35,94.29,96.24,89.20,71.10,9.09,105.87,102.64,99.07, BLK11580
00137 159* 295.49,91.50,87.5,82.95,78.39,73.16,67.98,62.13,56.27,50.20,44.14, BLK11590
00137 160* 338.79,33.45,71.,37.3,0.,0.,0.,84.3,57.3,0.,0.,0.,97.6,72.9,43.,0.,BLK11600
00137 161* 40.,110.9,89.8,62.,0.,0.,124.2,107.4,83.28,48.,0.,137.5,123.9,105.9,BLK11610
00137 162* 5,81.,0.,150.7,138.8,124.9,108.5,85.9,164.1,153.6,142.,128.9,113.3,BLK11620
00137 163* 6177.4,167.9,158.0,147.0,134.8,78.8,62.3,45.4,0.,0.,89.8,78.3,61., BLK11630
00137 164* 741.9,29.1,98.8,90.1,78.9,60.1,27.8,106.7,99.5,91.1,80.6,65.2,114.,BLK11640
00137 165* 8107.8,100.8,92.8,83.1,120.8,115.2,109.2,102.5,95./ BLK11650
00141 166* END BLK11660

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END OF UNIVAC 1108 FORTRAN V COMPILATION.

D *DIAGNOSTIC* MESSAGE(S)

@ HDG. @ BLK1 SYMBOLIC FOR,* BLK2,BLK2 01 MAR 71 18:49:05 0 01536576 14 166 (DELETED)

@ FOR, BLK2.BLK2
 UNIVAC 1106 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:26:43

31 AUG 71

9:26:43.277

BLOCK DATA

STORAGE USED (BLOCK, NAME, LENGTH)

0003 SPHEAT 002432

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0003 R 000000 AA	0003 R 000152 AB	0003 R 000160 AC	0003 R 000332 AD	0003 R 000343 AE
0003 R 000515 AF	0003 R 000533 AG	0003 R 000651 AH	0003 R 001017 AI	0003 R 001171 AJ
0003 R 001215 AK	0003 R 001367 AL	0003 R 001375 AM	0003 R 001547 AN	0003 R 001560 AO
0003 R 001732 AP	0003 R 001750 AQ	0003 R 002066 AR	0003 R 002234 AS	0003 R 002406 AT
0000 I 000000 IS				

40

00100	10	CD	*****	BLK20010
00100	20	CD		BLK20020
00100	30	CD	PROGRAMMER AND DATE	BLK20030
00100	40	CD	NATIONAL BUREAU OF STANDARDS	BLK20040
00100	50	CD	1967	BLK20050
00100	60	CD		BLK20060
00100	70	CD	DOCUMENTATION AND DATE	BLK20070
00100	80	CD	J. I. PREWITT	BLK20080
00100	90	CD	DECEMBER 1970	BLK20090
00100	100	CD		BLK20100
00100	110	CD	PURPOSE	BLK20110
00100	120	CD	INITIALIZATION OF TABLES FOR USE BY PTHEAT (SPECIFIC	BLK20120
00100	130	CD	HEAT FOR HYDROGEN).	BLK20130
00100	140	CD		BLK20140
00100	150	CD	USAGE	BLK20150
00100	160	CD	BLOCK DATA	BLK20160
00100	170	CD		BLK20170
00100	180	CD	DESCRIPTION OF PARAMETERS	BLK20180
00100	190	CD		BLK20190
00100	200	CD	INPUT	BLK20200
00100	210	CD	NONE	BLK20210
00100	220	CD		BLK20220
00100	230	CD		BLK20230
00100	240	CD	OUTPUT	BLK20240
00100	250	CD	COMMON	BLK20250
00100	260	CD	UNKNOWN	BLK20260
00100	270	CD		BLK20270
00100	280	CD	REMARKS AND RESTRICTIONS	BLK20280
00100	290	CD	THIS ROUTINE IS LOADED INTO CORE EVERY TIME PTHEAT IS	BLK20290
00100	300	CD	LOADED INTO CORE.	BLK20300
00100	310	CD	THIS ROUTINE WAS OBTAINED FROM NASA/MSC.	BLK20310
00100	320	CD		BLK20320
00100	330	CD	SUBPROGRAMS REQUIRED	BLK20330
00100	340	CD	NONE	BLK20340

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00100 35* CD                      BLK20350
00100 36* CD METHOD                      BLK20360
00100 37* CD THIS ROUTINE WAS OBTAINED FROM NASA/MSC AND IS PART OF   BLK20370
00100 38* CD NBS COMPUTER PROGRAMS FOR THERMODYNAMIC AND TRANSPORT   BLK20380
00100 39* CD PROPERTIES OF HYDROGEN FROM 1 TO 5000 PSIA AND FOR     BLK20390
00100 40* CD TEMPERATURES FROM THE TRIPLE POINT (ABOUT 24.16 O K )   BLK20400
00100 41* CD TO 5000. O R . AUTHORS ARE W.J.HALL, R.D.MCCARTY AND    BLK20410
00100 42* CD H.M.RODEK ; NBS REPORT NO 9288 , AUGUST 18, 1967, .    BLK20420
00100 43* CD PP 188 , NASA NO N67-35527                        BLK20430
00100 44* CD                      BLK20440
00100 45* CD. . . . . BLK20450
00101 46* BLOCK DATA                      BLK20460
00102 47* COMMON/SPHEAT/AA(106),AB(6),AC(106),AD(9),AE(106),AF(14),AG(78);   BLK20470
00102 48* 1AH(102),AI(106),AJ(20),AK(106),AL(6),AM(106),AN(9),AO(106),AP(14);   BLK20480
00102 49* 2AQ(78),AR(102),AS(106),AT(20)                      BLK20490
00103 50* DATA AA / 3.804,3.796,3.794,3.794,3.793,3.793,3.793,3.793,3.793,3.793;   BLK20500
00103 51* 14.025,3.951,3.937,3.931,3.927,3.924,3.922,4.665,4.259,4.184,4.150,   BLK20510
00103 52* 24.130,4.117,4.107,6.495,5.032,4.755,4.632,4.559,4.509,4.472,10.98,   BLK20520
00103 53* 36.839,6.054,5.706,5.498,5.356,5.252,20.06,10.48,8.646,7.834,7.350,   BLK20530
00103 54* 47.020,6.776,35.135,16.83,13.18,11.55,10.58,9.919,9.429,3.793,3.792,   BLK20540
00103 55* 53.792,3.924,3.917,3.913,4.117,4.076,4.059,4.510,4.359,4.298,5.360,   BLK20550
00103 56* 64.931,4.757,7.028,6.027,5.620,9.936,7.923,7.103,3.793,3.791,3.791,   BLK20560
00103 57* 73.791,3.791,3.790,3.916,3.910,3.908,3.907,3.906,3.905,4.075,4.043,   BLK20570
00103 58* 84.031,4.025,4.022,4.020,4.360,4.236,4.192,4.172,4.161,4.183,4.933,   BLK20580
00103 59* 94.581,4.457,4.401,4.369,4.346,6.030,5.210,4.920,4.791,4.715,4.759,   BLK20590
00105 60* DATA AB/BLK20600
00105 61* 17.930,6.276,5.692,5.433,5.279,5.173/ BLK20610
00107 62* DATA AC / 3.790,3.790,3.789,3.789,3.789,4.020,4.014,BLK20620
00107 63* 14.011,4.010,4.008,4.346,4.290,4.265,4.250,4.240,5.173,4.912,4.796,   BLK20630
00107 64* 24.726,4.679,3.470,3.511,3.504,3.507,3.624,3.622,3.792,3.789,3.744,   BLK20640
00107 65* 34.108,4.297,4.346,3.658,3.842,3.961,4.015,3.537,3.637,3.708,3.749,   BLK20650
00107 66* 43.479,3.535,3.579,3.608,3.461,3.495,3.523,3.542,3.461,3.478,3.494,   BLK20660
00107 67* 53.511,2.586,2.981,3.396,3.693,3.806,3.785,3.434,3.187,3.036,2.861,   BLK20670
00107 68* 63.089,3.309,3.498,3.628,3.693,3.640,3.501,3.379,3.200,3.342,3.474,   BLK20680
00107 69* 73.584,3.673,3.737,3.800,3.744,3.681,3.519,3.633,3.738,3.826,3.903,   BLK20690
00107 70* 83.957,4.030,4.041,4.015,3.744,3.838,3.921,3.994,4.060,4.111,4.223,   BLK20700
00107 71* 94.248,4.243,3.877,3.951,4.018,4.079,4.133,4.179,4.292,4.333,4.343,   BLK20710
00111 72* DATA AD / 3.926,3.980,4.033,4.087,4.125,4.152,4.263,4.317,4.346/ BLK20720
00113 73* DATA AE / 1.334,1.264,1.217,1.200,1.884,1.742,1.667,BLK20730
00113 74* 11.587,2.387,2.151,2.025,1.947,2.871,2.506,2.337,2.232,3.311,2.792,   BLK20740
00113 75* 22.584,2.461,3.668,3.035,2.789,2.652,3.846,3.230,2.968,2.821,3.840,   BLK20750
00113 76* 33.370,3.113,2.963,3.767,3.475,3.250,3.104,1.543,1.515,1.491,1.468,   BLK20760
00113 77* 41.447,1.428,1.414,2.003,1.960,1.922,1.890,1.862,1.835,1.812,2.510,   BLK20770
00113 78* 52.426,2.357,2.301,2.253,2.210,2.173,3.151,2.967,2.836,2.734,2.652,   BLK20780
00113 79* 62.585,2.529,4.070,3.651,3.383,3.198,3.063,2.956,2.871,5.417,4.486,   BLK20790
00113 80* 73.997,3.690,3.477,3.318,3.196,5.793,5.081,4.509,4.119,3.844,3.640,   BLK20800
00113 81* 83.484,4.855,4.893,4.637,4.339,4.084,3.879,3.714,4.140,4.370,4.391,   BLK20810
00113 82* 94.286,4.134,3.980,3.841,3.735,3.956,4.069,4.083,4.035,3.954,3.863,   BLK20820
00115 83* DATA AF/BLK20830
00115 84* A3.505,3.692,3.819,3.881,3.891,3.868,3.824,3.378,3.516,3.654,3.712,   BLK20840
00115 85* 83.770,3.769,3.767/ BLK20850
00117 86* DATA AG / 5.417,4.486,3.997,3.690,5.820,4.795,4.229,BLK20860
00117 87* 13.862,5.887,5.022,4.430,4.033,5.639,5.107,4.573,4.163,5.230,5.054,   BLK20870
00117 88* 24.643,4.251,4.855,4.893,4.637,4.339,2.470,2.730,3.077,3.551,4.192,   BLK20880
00117 89* 34.958,5.659,5.946,5.793,2.482,2.678,2.916,3.205,3.549,3.916,4.304,   BLK20890
00117 90* 44.637,4.855,2.503,2.656,2.833,3.033,3.255,3.496,3.725,3.949,4.140,   BLK20900
00117 91* 52.535,2.659,2.795,2.942,3.100,3.264,3.430,3.590,3.735,2.582,2.683,   BLK20910
00117 92* 62.792,2.907,3.026,3.140,3.270,3.391,3.505,2.641,2.731,2.822,2.913,   BLK20920

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00117 93* 73.003,3.097,1.791,3.284,3.378/ BLK21030
00121 94* DATA AM / 25.22,30.03,35.61,40.25,44.37,48.45,24.47,8LK20940
00121 95* 130.12,36.70,42.16,47.08,51.94,22.95,29.45,36.95,43.16,48.74,54.28,8LK20950
00121 96* 220.18,27.65,36.20,43.19,49.41,55.58,16.12,24.74,34.50,42.30,49.15,8LK20960
00121 97* 355.90,10.33,20.63,31.93,40.59,48.07,55.40,1.494,15.13,28.59,38.11,8LK20970
00121 98* 446.15,53.98,-19.29,10.62,24.91,35.04,3.50,51.78,00.00, 8.28,17.76,8LK20980
00121 99* 530.56,39.53,48.33, 0.,-55.0, 4.28,17.23,31.90,42.56, 0., 0.,8LK20990
00121 100* 6-9.11, 3.79,17.00,32.36,11.93,-5.256,1.590, 0., 0.11,16.88,15.48,8LK21000
00121 101* 711.00,4.18,-13.56, 0., 0.,23.81,18.76,13.42,-1.68,-17.82, 0.,8LK21010
00121 102* 831.05,25.95,27.70,16.41,3.20,-10.31,38.05,32.90,33.42,32.03,20.87,8LK21020
00121 103* 9 9.05,44.95,39.75,39.57,39.66,34.95,24.46/ 8LK21030
00123 104* DATA AI / 1027.,1143.,1238.,1311.,1362.,1407.,1445.,8LK21040
00123 105* 1962.3,1099.,1202.,1285.,1344.,1394.,1438., 869.,1026.,1142.,1235.,8LK21050
00123 106* 21301.,1357.,1405.,727.5,906.9,1040.,1145.,1219.,1282.,1335.,533.3,8LK21060
00123 107* 3742.1,895.5,1016.,1099.,1170.,1230.,333.8,512.8,696.3,838.4,934.9,8LK21070
00123 108* 41015.,1083., 91.2,290.2,434.2,603.4,720.3,814.5,893.8, 0., 0.,8LK21080
00123 109* 5153.4,302.5,433.2,558.1,653.3,343.4, 72.4,-162.0, 20.0,151.5,276.4,8LK21090
00123 110* 6378.8,929.7,692.1,477.8,288.3,134.0, 90.2,-120.,1489.,1269.,1082.,8LK21100
00123 111* 7907.6,759.5,607.4,444.7,2037.,1817.,1634.,1469.,1331.,1195.,1053.,8LK21110
00123 112* 82584.,2363.,2180.,2016.,1881.,1751.,1620.,3135.,2911.,2726.,2563.,8LK21120
00123 113* 92428.,2299.,2173.,1.566,1.557,1.780,1.770,2.059,2.037,2.377,2.333/8LK21130
00125 114* DATA AJ / 2.926,2.724,1.091,3.210,2.460,5.286,2.456,8LK21140
00125 115* 13.245,2.428,3.431,2.434,3.025,2.461,2.813,2.463,2.700,2.465,2.638,8LK21150
00125 116* 22.470,2.612/ 8LK21160
00127 117* DATA AK / 2.819,2.811,2.809,2.809,2.808,2.808,2.808,8LK21170
00127 118* 13.032,2.963,2.950,2.944,2.940,2.938,2.936,3.624,3.255,3.186,3.155,8LK21180
00127 119* 23.136,3.124,3.114,5.313,3.972,3.717,3.604,3.537,3.491,3.457,9.333,8LK21190
00127 120* 35.610,4.898,4.582,4.394,4.265,4.170,17.15,8.823,7.203,6.481,6.049,8LK21200
00127 121* 45.754,5.536,29.47,14.22,11.11,9.705,8.862,8.284,7.855,2.808,2.807,8LK21210
00127 122* 52.807,2.938,2.931,2.928,3.124,3.086,3.070,3.492,3.353,3.296,4.268,8LK21220
00127 123* 63.878,3.719,5.762,4.865,4.498,8.300,6.533,5.809,2.807,2.807,2.806,8LK21230
00127 124* 72.806,2.806,2.806,2.931,2.925,2.923,2.922,2.921,2.920,3.085,3.055,8LK21240
00127 125* 83.044,3.039,3.036,3.034,3.353,3.239,3.199,3.181,3.170,3.189,3.879,8LK21250
00127 126* 93.559,3.446,3.395,3.365,3.345,4.867,4.129,3.867,3.751,3.682,3.720/8LK21260
00131 127* DATA AL/8LK21270
00131 128* 16.541,5.077,4.557,4.327,4.189,4.095/ 8LK21280
00133 129* DATA AM / 2.806,2.806,2.805,2.804,2.803,3.034,3.029,8LK21290
00133 130* 13.026,3.024,3.022,3.345,3.294,3.271,3.257,3.247,4.095,3.861,3.757,8LK21300
00133 131* 23.694,3.652,2.485,2.509,2.519,2.520,2.639,2.637,2.807,2.803,2.884,8LK21310
00133 132* 32.996,3.078,3.134,2.728,2.802,2.860,2.900,2.578,2.626,2.663,2.689,8LK21320
00133 133* 42.506,2.538,2.562,2.578,2.482,2.504,2.520,2.530,2.480,2.489,2.500,8LK21330
00133 134* 52.509,1.602,1.634,1.665,1.682,1.694,1.706,1.758,1.800,1.838,1.876,8LK21340
00133 135* 61.893,1.911,1.929,1.947,1.961,2.005,2.046,2.084,2.215,2.216,2.217,8LK21350
00133 136* 72.219,2.229,2.238,2.271,2.304,2.338,2.533,2.543,2.552,2.560,2.571,8LK21360
00133 137* 82.580,2.617,2.653,2.684,2.759,2.776,2.791,2.806,2.820,2.833,2.882,8LK21370
00133 138* 92.920,2.951,2.892,2.910,2.926,2.943,2.958,2.972,3.023,3.062,3.093/8LK21380
00135 139* DATA AN / 2.940,2.956,2.973,2.989,3.003,3.015,3.063,3.101,3.134/ 8LK21390
00137 140* DATA AO / 1.113,1.083,1.060,1.050,1.353,1.335,1.325,8LK21400
00137 141* 11.312,1.496,1.498,1.494,1.491,1.572,1.591,1.601,1.603,1.595,1.630,8LK21410
00137 142* 21.655,1.672,1.617,1.662,1.696,1.724,1.651,1.699,1.738,1.771,1.693,8LK21420
00137 143* 31.741,1.782,1.819,1.757,1.807,1.850,1.888,1.173,1.171,1.168,1.165,8LK21430
00137 144* 41.160,1.156,1.149,1.1345,1.1341,1.1340,1.1338,1.1334,1.1332,1.1329,1.1456,8LK21440
00137 145* 51.455,1.454,1.453,1.452,1.449,1.517,1.519,1.521,1.523,1.525,8LK21450
00137 146* 61.526,1.527,1.551,1.552,1.556,1.561,1.564,1.569,1.572,1.583,1.571,8LK21460
00137 147* 71.571,1.575,1.581,1.587,1.591,1.610,1.591,1.584,1.584,1.589,1.594,8LK21470
00137 148* 81.600,1.610,1.610,1.608,1.608,1.610,1.615,1.621,1.616,1.623,1.627,8LK21480
00137 149* 91.632,1.635,1.641,1.646,1.632,1.640,1.646,1.653,1.659,1.665,1.671/8LK21490
00141 150* DATA AP / 1.665,1.673,1.680,1.687,1.693,1.700,1.707,8LK21500

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00141 151° 11.715,1.723,1.731,1.738,1.744,1.751,1.757/ BLK21510
00143 152° DATA AQ / 1.583,1.571,1.571,1.575,1.597,1.578,1.574,BLK21520
00143 153° 11.579,1.608,1.587,1.581,1.582,1.610,1.596,1.589,1.589,1.610,1.604,BLK21530
00143 154° 21.598,1.598,1.610,1.610,1.608,1.608,1.485,1.511,1.534,1.557,1.577,BLK21540
00143 155° 31.604,1.621,1.621,1.610,1.495,1.516,1.534,1.552,1.569,1.583,1.596,BLK21550
00143 156° 41.606,1.610,1.516,1.532,1.548,1.563,1.577,1.591,1.602,1.610,1.616,BLK21560
00143 157° 51.549,1.562,1.574,1.585,1.597,1.608,1.619,1.627,1.632,1.595,1.606,BLK21570
00143 158° 61.615,1.625,1.634,1.642,1.652,1.660,1.665,1.656,1.664,1.671,1.679,BLK21580
00143 159° 71.686,1.693,1.701,1.708,1.715/ BLK21590
00145 160° DATA AR / 1.131,1.132,1.133,1.133,1.133,1.131,1.240,BLK21600
00145 161° 11.239,1.238,1.237,1.236,1.235,1.342,1.338,1.335,1.332,1.330,1.328,BLK21610
00145 162° 21.417,1.412,1.409,1.406,1.404,1.402,1.464,1.462,1.460,1.459,1.457,BLK21620
00145 163° 31.456,1.501,1.497,1.495,1.495,1.495,1.495,1.565,1.535,1.523,1.520,BLK21630
00145 164° 41.520,1.522,1.754,1.780,1.544,1.546,1.541,1.541,1.943,2.300,1.710,BLK21640
00145 165° 51.585,1.564,1.557, 0.,2.400,1.808,1.653,1.594,1.573, 0., 0,BLK21650
00145 166° 61.620,1.683,1.624,1.591,1.583,2.300,3.100, 0.,1.632,1.608,1.330,BLK21660
00145 167° 71.976,2.608,1.560, 0., 0.,1.522,1.660,1.736,1.617,1.495, 0.,BLK21670
00145 168° 81.527,1.589,1.679,1.663,1.609,1.560,1.522,1.663,1.608,1.648,1.627,BLK21680
00145 169° 91.601,1.520,1.551,1.579,1.613,1.622,1.609/ BLK21690
00147 170° DATA AS / 1.151,1.152,1.152,1.152,1.153,1.153,1.153,BLK21700
00147 171° 11.243,1.242,1.241,1.241,1.240,1.240,1.240,1.327,1.326,1.325,1.324,BLK21710
00147 172° 21.323,1.322,1.321,1.393,1.392,1.391,1.390,1.389,1.388,1.387,1.440,BLK21720
00147 173° 31.439,1.438,1.438,1.437,1.436,1.436,1.478,1.474,1.473,1.472,1.471,BLK21730
00147 174° 41.471,1.470,1.508,1.503,1.506,1.504,1.501,1.500,1.498, 0., 0,BLK21740
00147 175° 51.547,1.546,1.548,1.539,1.533,1.646,1.780,1.938,1.602,1.615,1.628,BLK21750
00147 176° 61.641,1.544,1.607,1.690,1.805,1.978,2.346,2.652,1.517,1.544,1.578,BLK21760
00147 177° 71.623,1.687,1.787,1.962,1.504,1.518,1.534,1.551,1.570,1.592,1.618,BLK21770
00147 178° 81.498,1.508,1.517,1.526,1.536,1.546,1.556,1.499,1.506,1.512,1.519,BLK21780
00147 179° 91.526,1.532,1.539,1.129,1.130,1.220,1.220,1.310,1.307,1.380,1.378,BLK21790
00151 180° DATA AT / 1.432,1.430,1.477,1.469,1.477,1.700,1.475,BLK21800
00151 181° 11.671,1.476,1.619,1.477,1.544,1.478,1.517,1.478,1.504,1.481,1.498,BLK21810
00151 182° 21.485,1.499/ BLK21820
00153 183° END BLK21830

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END OF UNIVAC 1108 FORTRAN V COMPILATION.

0 *DIAGNOSTIC* MESSAGE(S)

BLK2	SYMBOLIC	01 MAR 71	18:49:07	0	01543222	14	183	(DELETED)
BLK2	CODE	RELOCATABLE	19 MAY 71	02:49:41	1	01524500	24	(DELETED)
					0	01524530	14	117

HDG # FOR,• BPROPG,BPROPG

© FOR, BPROG, BPROG
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:26:45

31 AUG 71

9:26:45.152

SUBROUTINE BPROG ENTRY POINT 000146

STORAGE USED (BLOCK, NAME, LENGTH)

```
0001 *CODE 000212
0000 *DATA 000166
0002 *BLANK 000000
```

EXTERNAL REFERENCES (BLOCK, NAME)

```
0003 BETA
0004 HPTCP
0005 HPTV
0006 HPTTC
0007 OPTV
0010 OPTTC
0011 NERR2S
0012 NERR3S
```

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

```
0001 000012 10L      0001 000067 20L      0003 R 000000 BETA      0000 R 000147 DTS      0000 R 000074 FCPO
0000 R 000000 FRH    0000 R 000050 FSVO    0004 R 000000 HPTCP    0006 R 000000 HPTTC    0005 R 000000 HPTV
0000 I 000144 IS     0000 I 000145 NPH     0000 I 000146 NPO     0010 R 000000 OPTTC    0007 R 000000 OPTV
0000 R 000024 PH     0000 R 000120 PO
```

```
00101 1° SUBROUTINE BPROG (IFLUID, PX, TSAT, SV, MU, K, CP, PR)
00103 2° REAL MU, K
00103 3° C
00103 4° C OBTAIN SATURATED GAS PROPERTIES AT INPUT PX
00103 5° C BY LINEAR INTERPOLATION OF FUNCTION-PRESSURE TABLES
00103 6° C
00104 7° DIMENSION FRH(20), PH(20), FSVO(20), FCPO(20), PO(20)
00105 8° DATA FRH / .0592, .0837, .1108, .1612, .2119, .2633, .3160,
00105 9° 1 .3703, .4264, .4848, .5456, .942, 8*0. /
00107 10° DATA NPH / 12/, PH / 10., 14.696, 20., 30., 40., 50., 60., 70.,
00107 11° 1 80., 90., 100., 150., 8*0. /
00112 12° DATA FSVO / 1.2396, 1.0144, .83781, .69771, .58529, .49415,
00112 13° 1 .41954, .35792, .30658, .26347, .22697, .19582, .16902, .14575,
00112 14° 2 .12531, .10711, .09051, .07465, .05852, .03675 /
00114 15° DATA FCPO / .249, .255, .262, .270, .280, .291, .304, .318, .336,
00114 16° 1 .357, .383, .416, .457, .514, .594, .719, .945, 1.497, 3.631, 99./
00116 17° DATA NPO / 20/, PO / 46.261, 57.286, 70.163, 85.040, 102.09,
00116 18° 1 121.51, 143.49, 168.20, 195.82, 226.59, 260.66, 298.26, 339.62,
00116 19° 2 384.96, 434.55, 488.66, 547.69, 612.08, 653.06, 737.06 /
00116 20° C
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@ FOR,* BPROPG,BPROPG

DATE 310871 PAGE 104

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00121 21*      DTS = .5
00122 22*      GO TO (10,20),IFLUID
00123 23*      10 SV = 1728. / BETA ( FRH, PH, PX, NPH )
00124 24*      CP = HPTCP ( PX, (SAT+DTS )
00125 25*      MU = HPTV ( PX, (SAT+DTS ) * 32.2 * 3600. / 12.
00126 26*      K = HPTC ( PX, (SAT+DTS ) / 3600. / 12.
00127 27*      PR = CP * MU / K
00130 28*      RETURN
00131 29*      20 SV = BETA ( FSVO, PO, PX, NPO ) * 1728.
00132 30*      CP = BETA ( FCPO, PO, PX, NPO )
00133 31*      MU = OPTV ( PX, (SAT+DTS ) * 32.2 * 3600. / 12.
00134 32*      K = OPTC ( PX, (SAT+DTS ) / 3600. / 12.
00135 33*      PR = CP * MU / K
00136 34*      RETURN
00137 35*      END

```

END OF UNIVAC 1108 FORTRAN V COMPILATION.
 BPROPG SYMBOLIC
 BPROPG CODE RELOCATABLE

0 *DIAGNOSTIC* MESSAGE(S)

14 JUN 71	15:04:56	0	01606314	14	35	(DELETED)
14 JUN 71	15:04:56	1	01607266	24	1	(DELETED)
		0	01607316	14	25	

@ HDG @ FOR,* BPROPL,BPROPL

R FOR, BPROPL,BPROPL
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09126:46

31 AUG 71

9:26:46.405

SUBROUTINE BPROPL ENTRY POINT 000146

STORAGE USED (BLOCK, NAME, LENGTH)

```
0001 *CODE 000212
0000 *DATA 000166
0002 *BLANK 000000
```

EXTERNAL REFERENCES (BLOCK, NAME)

```
0003 BETA
0004 HPTCP
0005 HPTV
0006 HPTTC
0007 OPTV
0010 OPTTC
0011 NERR2S
0012 NERR3S
```

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

```
0001 000012 10L      0001 000067 20L      0003 R 000000 BETA      0000 R 000147 DTS      0000 R 000074 FCPO
0000 R 000000 FRH    0000 R 000050 FSV0    0004 R 000000 HPTCP    0006 R 000000 HPTTC    0005 R 000000 HPTV
0000 I 000144 IS     0000 I 000145 NPH     0000 I 000146 NPO     0010 R 000000 OPTTC    0007 R 000000 OPTV
0000 R 000024 PH     0000 R 000120 PO
```

```
00101 1* SUBROUTINE BPROPL (IFLUID, PX, TSAT, SV, MU, K, CP, PR )
00103 2* REAL MU, K
00103 3* C
00103 4* C OBTAIN SATURATED LIQUID PROPERTIES AT INPUT PX
00103 5* C BY LINEAR INTERPOLATION OF FUNCTION-PRESSURE TABLES
00103 6* C
00104 7* DIMENSION FRH(20), PH(20), FSV0(20), FCPO(20), PO(20)
00105 8* DATA FRH / 4.5025, 4.418, 4.3384, 4.2123, 4.1034, 4.0032, 3.9078,
00105 9* 1 3.8168, 3.7272, 3.6377, 3.5486, 2.99 ,8*0./
00107 10* DATA NPH /12/, PH / 10., 14.696, 20., 30., 40., 50., 60., 70.,
00107 11* 1 80., 90., 100., 50. ,8*0./
00112 12* DATA FSV0 / .01489, .01510, .01533, .01557, .01582, .01609,
00112 13* 1 .01639, .01670, .01704, .01742, .01783, .01830, .01882, .01943,
00112 14* 2 .02014, .02101, .02213, .02371, .02645, .03675 /
00114 15* DATA FCPO / .417, .421, .426, .431, .438, .446, .455, .466,
00114 16* 1 .479, .495, .515, .548, .577, .624, .689, .787, .962, 1.335,
00114 17* 2 2.791, 100. /
00116 18* DATA NPO /20/, PO / 46.261, 57.286, 70.163, 85.040, 102.09,
00116 19* 1 121.51, 143.49, 168.20, 195.82, 226.59, 260.66, 298.26, 339.62,
00116 20* 2 384.96, 434.55, 488.66, 547.69, 612.08, 653.06, 737.06 /
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00116 21* C
00121 22*   DTS = .5
00122 23*   GO TO (10,20),IFLUID
00123 24* 10 SV = 1728. / BETA ( FRH, PH, PX, NPH )
00124 25*   CP = HPTCP ( PX, TSAT-DTS )
00125 26*   MU = HPTV ( PX, TSAT-DTS ) * 32.2 * 3600. / 12.
00126 27*   K = HPTTC ( PX, TSAT-DTS ) / 3600. / 12.
00127 28*   PR = CP * MU / K
00130 29*   RETURN
00131 30* 20 SV = BETA ( FSV0, PO, PX, NPO ) * 1728.
00132 31*   CP = BETA ( FCPO, PO, PX, NPO )
00133 32*   MU = OPTV ( PX, TSAT-DTS ) * 32.2 * 3600. / 12.
00134 33*   K = OPTTC ( PX, TSAT-DTS ) / 3600. / 12.
00135 34*   PR = CP * MU / K
00136 35*   RETURN
00137 36*   END
    
```

END OF UNIVAC 1108 FORTRAN V COMPILATION.	0 *DIAGNOSTIC* MESSAGE(S)				
BPROPL SYMBOLIC	14 JUN 71 15:04:55	0	01604536	14	36 (DELETED)
BPROPL CODE RELOCATABLE	14 JUN 71 15:04:55	1	01605526	24	1 (DELETED)
		0	01605556	14	25

HDG @ FOR,* CDDATA,CDDATA

FOR, * CDDATA, CDDATA
UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:26:47

SUBROUTINE CDDATA ENTRY POINT 001774

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 002005
0000 *DATA 000302
0002 *BLANK 000160
0003 STAB 000504

EXTERNAL REFERENCES (BLOCK, NAME)

0004 BCDINT
0005 SQZB
0006 PACK
0007 NRDU\$
0010 N101\$
0011 N102\$
0012 NNDU\$
0013 NERR2\$
0014 NEXP9\$
0015 NERR3\$

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STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000204	100F	0000	000206	110F	0001	000060	120L	0001	000067	130L	0001	000103	140L
0001	000014	144G	0001	000021	150G	0001	000167	156L	0001	000213	159L	0001	000035	160G
0001	000265	160L	0001	000045	164G	0001	000272	165L	0001	000302	180L	0001	000304	190L
0001	000307	200L	0001	000312	220L	0001	000135	223G	0001	000144	227G	0001	000157	236G
0001	000356	250L	0001	000364	260L	0001	000402	270L	0001	000405	280L	0001	000416	290L
0001	000417	300L	0001	000422	310L	0001	000346	312G	0001	000443	320L	0001	000460	330L
0001	000467	340L	0001	000427	346G	0001	000527	350L	0001	000552	360L	0001	000555	370L
0001	000576	380L	0001	000615	390L	0001	000626	400L	0001	000635	420L	0001	000646	450L
0001	000650	460L	0001	000703	462L	0001	000731	466L	0001	000751	470L	0001	000711	472G
0001	001031	485L	0001	001055	500L	0001	001061	510L	0001	001074	520L	0001	001106	530L
0001	001045	534G	0001	001115	540L	0001	001120	550L	0001	001121	552L	0001	001124	553L
0001	001174	558L	0001	001177	570L	0001	001216	580L	0001	001235	590L	0001	001244	600L
0001	001253	610L	0001	001271	620L	0001	001256	627G	0001	001311	630L	0001	001317	640L
0001	001322	650L	0001	001331	660L	0001	001405	664L	0001	001413	666L	0001	001443	670L
0001	001453	680L	0001	001456	690L	0001	001506	700L	0001	001547	720L	0001	001520	722G
0001	001562	740L	0001	001556	742G	0001	001577	750L	0001	001616	760L	0001	001627	770L
0001	001646	776L	0001	001651	780L	0001	001705	790L	0001	001710	800L	0001	001712	810L
0001	001717	820L	0001	001723	830L	0001	001727	840L	0001	001732	850L	0001	001734	860L
0000	000211	870F	0001	001752	880L	0001	001754	890L	0000	R 000226	AX	0000	I 000001	BCDTBL
0000	D 000223	DP	0000	I 000150	I	0003	I 000002	IADD	0000	I 000243	IAPTST	0000	I 000161	IBCD5
0000	I 000146	IBEG	0000	I 000230	IBTST	0000	I 000227	ICHTKS	0000	I 000013	ICOM	0003	I 000000	ICOUNT
0000	I 000227	ICTST	0000	I 000223	IDP	0000	I 000162	IDTEST	0000	I 000237	IDTST	0000	I 000152	IEND
0000	I 000231	IEG	0000	I 000233	IETST	0000	I 000173	IEXP	0000	I 000203	IFLAG	0000	I 000153	IH
0000	I 000200	IIDP	0000	I 000201	IJK	0000	I 000244	ILO	0000	I 000240	ILPAR	0000	I 000234	IHINTS
0000	I 000163	IMINUS	0000	I 000000	INT	0000	I 000154	IO	0000	I 000144	IOCTM	0000	I 000156	IPIR

0000 I 000235 IPLTS	0000 I 000236 IPTST	0000 I 000174 IPTSW	0000 I 000241 IREP	0000 I 000245 IRPAR
0000 I 000157 ISEP	0000 I 000123 ISEQ	0000 I 000225 ISP	0000 I 000232 ISTR	0000 I 000242 ISTST
0003 I 000001 ITYPE	0000 I 000226 IX	0000 I 000147 IS	0000 I 000151 J	0002 I 000000 JIN
0002 I 000001 JOUT	0002 I 000002 KOUT	0002 I 000003 KRBF	0003 I 000004 KSYMB	0000 I 000143 L
0003 I 000003 LADD	0000 I 000141 LE	0000 I 000171 LI	0000 I 000202 LL	0000 I 000164 MINUSX
0000 I 000165 N	0000 I 000160 NADR	0000 I 000125 NAME	0000 I 000172 NC	0000 I 000167 NCOL
0000 I 000145 NDCAS	0000 I 000175 NDECL	0000 I 000176 NDECR	0000 I 000155 NGP	0000 I 000166 NN
0000 I 000170 NR	0000 R 000225 SP	0000 R 000177 XX		

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00101 10 SUBROUTINE CDDATA
00101 20 C.....
00101 30 C.....CDDATA IS A VARIABLE FORMAT CARD INPUT ROUTINE WHICH WILL-
00101 40 C.....(1) READ A CARD,
00101 50 C.....(2) PRINT THE CARD IMAGE,
00101 60 C.....(3) PROCESS THE DATA FIELDS AS NECESSARY AND STORE THE PROCESSED
00101 70 C..... DATA IN A BUFFER (KRBF).
00101 80 C.....
00103 90 INTEGER
00103 100 * BCDTBL
00103 110 C.....
00104 120 DOUBLE PRECISION
00104 130 * DP
00104 140 C.....
00105 150 DIMENSION
00105 160 * ICOM(72) ,ISEQ(2)
00105 170 * ,NAME(12) ,BCDTBL(10)
00105 180 * ,IDP(2) ,LE(2)
00105 190 * ,ICHTRS(15)
00105 200 C.....
00105 210 C.....KRBF IS THE DATA STORAGE BUFFER
00106 220 COMMON JIN,JOUT,KOUT,KRBF(109)
00106 230 C.....
00106 240 C.....THE FOLLOWING COMMON BLOCK CONTAINS THE INPUT TABLE OF VARIABLE
00106 250 C.....NAMES AND STORAGE ADDRESSES.
00106 260 C
00106 270 C * * * * *
00106 280 C *
00106 290 C * INSERT PROGRAM SYMBOL COMMON BLOCK
00106 300 C *
00106 310 C COMMON /STAB/ ICOUNT, ITYPE, IADD, LADD, KSYMB( )
00107 320 COMMON /STAB/ ICOUNT, ITYPE, IADD, LADD, KSYMB( 320)
00107 330 C *
00107 340 C * * * * *
00107 350 C
00107 360 C.....
00107 370 C.....ICOUNT IS THE NUMBER OF VARIABLE NAMES (OR LOCATIONS ALLOTEO FOR
00107 380 C.....NAMES) IN THE SYMBOL TABLE (KSYMB).
00107 390 C.....KSYMB IS DIVIDED IN 2 EQUAL SECTIONS. THE FIRST HALF CONTAINS THE
00107 400 C.....BCD EQUIVALENT OF THE VARIABLE NAME. THE SECOND HALF CONTAINS THE
00107 410 C.....OCTAL STORAGE ADDRESSES OF THE VARIABLES.
00110 420 EQUIVALENCE
00110 430 * (DP ,IDP(1)) ,(SP ,ISP)
00110 440 * ,(IX ,AX)
00110 450 * ,(ICHTRS(1) ,ICTST) ,(ICHTRS(2) ,IBTST)
00110 460 * ,(ICHTRS(3) ,IEW) ,(ICHTRS(4) ,ISTR)
    
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00110 47*      *,(ICHTRS(5),IST)      ,(ICHTRS(6),IMINTS)
00110 48*      *,(ICHTRS(7),IPLTS)    ,(ICHTRS(8),IPTST)
00110 49*      *,(ICHTRS(9),IOTST)    ,(ICHTRS(10),ILPAR)
00110 50*      *,(ICHTRS(11),IREP)     ,(ICHTRS(12),ISTST)
00110 51*      *,(ICHTRS(13),IAPTST)  ,(ICHTRS(14),ILO)
00110 52*      *,(ICHTRS(15),IRPAR)
00110 53*      C.....
00111 54*      DATA      (BCDTBL(L),L=1,10) /
00111 55*      * IH0      ,IH1      ,IH2      ,IH3      ,IH4
00111 56*      * ,IH5      ,IH6      ,IH7      ,IH8      ,IH9      /
00113 57*      DATA
00113 58*      * ICTST / IH,      /      ,IBTST / IH      /
00113 59*      * ,IEQ / IH=      /      ,ISTR / IH=      /
00113 60*      * ,IETST / IHE      /      ,IMINTS / IH-      /
00113 61*      * ,IPLTS / IH+      /      ,IPTST / IH=      /
00113 62*      * ,IOTST / IHD      /      ,ILPAR / IH(      /
00113 63*      * ,IRPAR / IH)      /      ,ISTST / IH/      /
00113 64*      * ,IAPTST / IH'      /      ,ILO / IH0      /
00113 65*      * ,IREP / 6HR      /      ,IOCTM / 040000000000 /
00113 66*      * ,NDCAS / 6HENDCAS /      ,IBEG / 6HBEGIN /
00113 67*      * ,LE(1) / 38      /      ,LE(2) / 308      /
00113 68*      C.....
00113 69*      C.....ADJUST MAXIMUM EXPONENT OF DOUBLE PRECISION VALUE IF ON 7099
00140 70*      IF (IBTST.LT.0) LE(2) = LE(1)

00140 71*      C.....
00140 72*      C.....READ IN CARD IMAGE

00142 73*      READ (JIN,100)ICOM,ISEQ
00154 74*      100 FORMAT(72A1,A6,A2)

00154 75*      C.....
00154 76*      C.....WRITE OUT CARD IMAGE
00155 77*      IF (JOUT.NE.0) WRITE (JOUT,110)(ICOM(L),L=1,72),(ISEQ(L),L=1,2)
00170 78*      110 FORMAT(15X72A1,10XA6,A2)
00170 79*      C.....

00171 80*      I = 1
00172 81*      J = 1
00173 82*      IEND = 0

00173 83*      C.....
00173 84*      C.....SKIP AROUND ALL BLANKS (IBTST)
00174 85*      120 IF (ICOM(I).NE.IBTST) GO TO 140
00176 86*      130 IF (IEND.EQ.1) GO TO 880
00200 87*      I = I+1
00201 88*      IF (I.GT.72) GO TO 880
00203 89*      GO TO 120

00203 90*      C.....
00204 91*      140 IF (ICOM(I).EQ.ICTST) GO TO 130
00206 92*      IF (ICOM(I).EQ.ISTR) GO TO 880
00210 93*      IH = 0
00211 94*      IO = 0
00212 95*      NGP = 0
00213 96*      IPER = 0
00214 97*      ISEP = 0
00215 98*      NADR = 0
00216 99*      IBCDS = 0
00217 100*      IOTEST = 0
00220 101*      IMINUS = 0
00221 102*      MINUSX = 0

00221 103*      C.....
00221 104*      C.....BEGIN SCAN OF FIELD
    
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00222 105*      DO 460 N=1,72
00225 106*      NN = N
00225 107*      C.....CHECKING FOR A DIGIT 0-9
00226 108*      DO 150 L=1,10
00231 109*      IF (ICOM(N).EQ.BCDTBL(L)) GO TO 460
00233 110*      150 CONTINUE
00233 111*      C.....
00233 112*      C.....LOOK FOR KEY CHARACTERS
00235 113*      DO 153 L=1,14
00240 114*      IF (ICOM(N).EQ.ICHTRS(L)) GO TO 156
00242 115*      153 CONTINUE
00244 116*      GO TO 450
00245 117*      156 GO TO (420,460,220,200,380,165,160,390,370,280,159,270,462,400),L
00245 118*      C.....
00245 119*      C.....FOUND AN R, CHECK FOR REPEAT GROUP
00246 120*      159 IF(N.EQ.I) GO TO 450
00250 121*      IF (IH.EQ.1) GO TO 460
00252 122*      IF (IO.EQ.1) GO TO 450
00254 123*      NCOL * N = I
00255 124*      CALL BCDINT (ICOM(I), NR, NCOL)
00256 125*      IF (NCOL.LT.0) GO TO 810

00260 126*      KRBF(J) = 43
00261 127*      KRBF(J+1) = NR
00262 128*      J = J+2
00263 129*      I = N
00264 130*      GO TO 130
00264 131*      C.....
00264 132*      C.....TEST FOR SIGN OF NUMBER (N=I) OR SIGN OF EXPONENT (N.GT.I)
00265 133*      160 IF (N=I) 860,460,190
00270 134*      165 IF (N=I) 860,170,180
00273 135*      170 IMINUS = 1
00274 136*      GO TO 460
00275 137*      180 MINUSX = 1
00276 138*      190 NGP = 2
00277 139*      GO TO 550
00277 140*      C.....
00277 141*      C.....FOUND AN ASTERISK (END OF RECORD)
00300 142*      200 IEND = 1
00301 143*      GO TO 420
00301 144*      C.....
00301 145*      C.....HAVE JUST FOUND A SYMBOL
00302 146*      220 NCOL = N-I
00303 147*      IF (NCOL.EQ.0) GO TO 130
00305 148*      CALL SQZB(ICOM(I),NCOL)
00306 149*      IF (NCOL.EQ.0) GO TO 130
00310 150*      CALL PACK(ICOM(I), NAME, NCOL)
00310 151*      C.....
00310 152*      C.....THE CURRENT FIELD IS A SYMBOL (6 CHARACTERS OR LESS)
00311 153*      230 DO 240 L=1,ICOUNT
00314 154*      IF (NAME(L).EQ.KSYMB(L)) GO TO 250
00316 155*      240 CONTINUE
00320 156*      GO TO 260
00320 157*      C.....
00321 158*      250 L = L+ICOUNT
00322 159*      NADR = KSYMB(L)
00323 160*      260 KRBF(J) = 1
00324 161*      KRBF(J+1) = NAME(1)
00325 162*      KRBF(J+2) = NAOR

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00326 163*      J = J+3
00327 164*      IF (IBCOS.EQ.1) GO TO 290
00331 165*      GO TO 790
00331 166*      C.....
00331 167*      C.....DIMENSION GROUP
00332 168*      270 NGP = 20
00333 169*      GO TO 300
00333 170*      C.....
00333 171*      C.....SUBSCRIPT GROUP
00334 172*      280 NGP = 30
00335 173*      IF (IH.NE.1) GO TO 290
00337 174*      IBCOS = 1
00340 175*      GO TO 220
00341 176*      290 IBCOS = 0
00342 177*      300 LI = N
00343 178*      NCOL = 0
00344 179*      310 LI = LI+1
00345 180*      DO 320 L=1,10
00350 181*      IF (ICOM(LI).NE.BCDTBL(LI)) GO TO 320
00352 182*      NCOL = NCOL+1
00353 183*      GO TO 310
00354 184*      320 CONTINUE
00356 185*      IF (ICOM(LI).NE.IBTST) GO TO 330
00360 186*      NCOL = NCOL+1
00361 187*      GO TO 310
00361 188*      C.....
00362 189*      330 IF (ICOM(LI).NE.ICTST) GO TO 350
00364 190*      340 CALL BCDINT (ICOM(NN+1), INT, NCOL)
00365 191*      IF (NCOL.LT.0) GO TO 820
00367 192*      KRBF(J) = NGP+3
00370 193*      KRBF(J+1) = INT
00371 194*      J = J+2
00372 195*      NCOL = 0
00373 196*      I = LI
00374 197*      NN = LI
00375 198*      IF (ISEP.EQ.1) GO TO 130
00377 199*      GO TO 310
00377 200*      C.....
00400 201*      350 IF (ICOM(LI).EQ.1STST) IF (NGP=20) 840,360,840
00404 202*      IF (ICOM(LI).NE.IRPAR) GO TO 840
00406 203*      IF (NGP=30) 840,360,840
00411 204*      360 ISEP = 1
00412 205*      GO TO 340
00412 206*      C.....
00412 207*      C.....FOUND A D, CHECK FOR DOUBLE PRECISION
00413 208*      370 IF(N.EQ.1) GO TO 450
00415 209*      IF (IH.EQ.1) GO TO 460
00417 210*      IF (IO.EQ.1) GO TO 450
00421 211*      IOTEST = 1
00422 212*      NGP = 4
00423 213*      GO TO 520
00423 214*      C.....
00423 215*      C.....FOUND AN E, CHECK FOR REAL
00424 216*      380 IF(N.EQ.1) GO TO 450
00426 217*      IF (IH.EQ.1) GO TO 460
00430 218*      IF (IO.EQ.1) GO TO 450
00432 219*      NGP = 2
00433 220*      GO TO 520

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00433 221* C.....
00433 222* C.....FOUND A DECIMAL POINT
00434 223* 390 IF(IPER,EQ,1) GO TO 860
00436 224* IPER = 1
00437 225* NGP = 2
00440 226* GO TO 460
00440 227* C.....
00440 228* C.....FOUND AN O, CHECK FOR OCTAL
00441 229* 400 IF(N,NE,1) GO TO 450
00443 230* IO = 1
00444 231* GO TO 460
00444 232* C.....
00444 233* C.....END OF RECORD
00445 234* 420 IF (IH,EQ,1) GO TO 470
00447 235* IF (IO,NE,1) GO TO 770
00451 236* GO TO 690
00451 237* C.....
00451 238* C.....BCD DATA
00452 239* 450 IH = 1
00453 240* 460 CONTINUE
00455 241* NN = 73
00456 242* IF (IH,EQ,1) GO TO 470
00460 243* IF (IPER,EQ,1) GO TO 800
00462 244* IF (IO,EQ,1) GO TO 690
00464 245* IF(IMINUS,EQ,1) I=I+1
00466 246* NCOL = 72-I
00467 247* GO TO 780
00467 248* C.....
00467 249* C.....BCD STRING
00470 250* 462 L = NN+1
00471 251* DO 464 LI=L,72
00474 252* IF(ICOM(LI),EQ,1APTST) IF(LI-L) 840,840,466
00500 253* 464 CONTINUE
00502 254* LI=73
00503 255* IEND=1
00504 256* 466 NCOL = LI-L
00505 257* NGP = 6
00506 258* CALL PACK (ICOM(L), NAME, NCOL)
00507 259* NN = LI
00510 260* GO TO 485
00511 261* 470 IF (NN.GT.72) NN = 72
00513 262* IF (ICOM(NN),EQ,ICTST) GO TO 500
00515 263* IF (ICOM(NN),EQ,ISTR) GO TO 500
00517 264* IF (ICOM(NN),EQ,IBTST) GO TO 500
00521 265* NCOL = NN-I+1
00522 266* NGP = 6
00523 267* 480 CALL PACK(ICOM(I), NAME, NCOL)
00524 268* IF (NAME(I),EQ,IBEG) GO TO 510
00526 269* IF (NAME(I),EQ,NDCAS) GO TO 510
00530 270* 485 KRBF(J) = NGP
00531 271* KRBF(J+1) = NCOL
00532 272* J = J+2
00533 273* DO 490 L=1,NCOL
00536 274* KRBF(J) = NAME(L)
00537 275* 490 J = J+1
00541 276* GO TO 790
00541 277* C.....
00542 278* 500 NN = NN-1

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00543 279• GO TO 470
00543 280• C.....
00544 281• 510 KRBF(J) = 1
00545 282• KRBF(J+1) = NAME(1)
00546 283• KRBF(J+2) = NAOR
00547 284• J = J+3
00550 285• GO TO 790
00550 286• C.....
00551 287• 520 IF (ICOM(N+1).NE.IMINTS) GO TO 530
00553 288• MINUSX = 1
00554 289• GO TO 540
00554 290• C.....
00555 291• 530 IF (ICOM(N+1).NE.IPLTS) GO TO 550
00557 292• 540 N = N+1
00557 293• C.....
00557 294• C.....PICK UP EXPONENT
00560 295• 550 NCOL = 0
00561 296• 552 NCOL = NCOL + 1
00562 297• 553 NC = N + NCOL + 1
00563 298• IF(NC=73) 555,570,860
00566 299• 555 IF(ICOM(NC).EQ.ICTST) GO TO 570
00570 300• IF (ICOM(NC).EQ.ISTH) GO TO 570
00572 301• IF (ICOM(NC).EQ.IBTST) GO TO 552
00574 302• IF (NCOL.GT.1) GO TO 552
00576 303• IF (ICOM(NC).NE.IMINTS) IF (ICOM(NC)=IPLTS) 552, 558, 552
00602 304• MINUSX = 1
00603 305• 558 N = NC
00604 306• GO TO 553
00605 307• 570 CALL BCDINT (ICOM(N+1), IEXP, NCOL)
00606 308• IF (NCOL.LT.0) GO TO 830
00610 309• N = N + NCOL
00611 310• 580 IPTSW = 0
00612 311• DP = 0.000
00613 312• NDECL = 0
00614 313• NDECR = 0
00615 314• IF (ICOM(I).NE.IMINTS) GO TO 590
00617 315• IMINUS = 1
00620 316• GO TO 600
00620 317• C.....
00621 318• 590 IF (ICOM(I).NE.IPLTS) GO TO 610
00623 319• 600 I = I+1
00624 320• IF (I.GE.NN) GO TO 660
00626 321• 610 DO 620 L=1,10
00631 322• IF (ICOM(I).NE.BCDTAB(L)) GO TO 620
00633 323• XX = L-1
00634 324• GO TO 630
00634 325• C.....
00635 326• 620 CONTINUE
00637 327• IF (ICOM(I).EQ.IBTST) GO TO 600
00641 328• IF (ICOM(I).NE.IPTST) GO TO 850
00643 329• IPTSW = 1
00644 330• GO TO 600
00644 331• C.....
00645 332• 630 IF (IPTSW.NE.0) GO TO 640
00647 333• NDECL = NDECL+1
00650 334• GO TO 650
00650 335• C.....
00651 336• 640 NDECR = NDECR+1

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00652 337* 650 DP = DP*10.0 + XX
00653 338* GO TO 600
00653 339* C.....
00654 340* 660 IF (MINUSX.EQ.1) IEXP = -IEXP
00656 341* IEXP = IEXP - NDECX
00656 342* C.....
00656 343* C..... TEST FOR UNDERFLOW AND OVERFLOW
00657 344* IF (IEXP.LT.-LE(IDTEST+1)) DP = 0.00
00661 345* IF (IEXP.GT. LE(IDTEST+1)) DP = 10.00**LE(IDTEST+1)
00663 346* IF (IEXP) 662, 666, 664
00666 347* 662 DP = DP/(10.00**ABS(IEXP))
00667 348* GO TO 666
00670 349* 664 DP = DP*(10.00**IEXP)
00671 350* 666 IF (IMINUS.EQ.1) DP = -DP
00673 351* KRBF(J) = NGP
00674 352* IF (IDTEST.EQ.1) GO TO 670
00676 353* SP = DP
00677 354* KRBF(J+1) = ISP
00700 355* J = J+2
00701 356* GO TO 680
00701 357* C.....
00702 358* 670 KRBF(J+1) = IDP(1)
00703 359* KRBF(J+2) = IDP(2)
00704 360* J = J+3
00705 361* 680 I = N
00706 362* GO TO 130
00706 363* C.....
00706 364* C..... OCTAL INTEGER
00707 365* 690 IIDP = 0
00710 366* IX = 0
00711 367* IJK = I+1
00712 368* IF (NN.GT.72) NN = 72
00714 369* L = NN - I
00715 370* CALL SQZB (ICOM(IJK), L)
00716 371* 700 I = I+1
00717 372* IF (I.GT.72) GO TO 720
00721 373* DO 710 L=1,8
00724 374* LL = L
00725 375* IF (ICOM(I).EQ.8CDT8L(L)) GO TO 750
00727 376* 710 CONTINUE
00731 377* IF (ICOM(I).EQ.1BTST) GO TO 720
00733 378* IF (ICOM(I).NE.1CTST) IF (ICOM(I)=ISTR) 850,720,850
00737 379* 720 IF (IIDP.EQ.12) GO TO 740
00741 380* DO 730 L=IIDP,11
00744 381* 730 IX = IX*8
00746 382* 740 AX = OR(IX,IFLAG)
00747 383* KRBF(J) = 7
00750 384* KRBF(J+1) = IX
00751 385* J = J+2
00752 386* IO = 0
00753 387* GO TO 790
00753 388* C.....
00754 389* 750 IF (IJK.NE.I) GO TO 760
00756 390* IFLAG = 0
00757 391* IF (LL.LT.5) GO TO 760
00761 392* IFLAG = IOCTM
00762 393* LL = LL-4

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00764 395* IIDP = IIDP+
00765 396* GO TO 700
00765 397* C.....
00766 398* 770 IF (IPER.EQ.1) GO TO 800
00770 399* IF (IMINUS.EQ.0) IF (ICOM(I)-IPLTS) 776, 773, 776
00774 400* 773 I = I + 1
00775 401* 776 NCOL = N - I
00776 402* 780 CALL BCDINT(ICOM(I), INT, NCOL)
00777 403* IF (NCOL.LT.0) GO TO 810
01001 404* IF (IMINUS.EQ.1) INT = -INT
01003 405* KRBF(J) = 3
01004 406* KRBF(J+1) = INT
01005 407* J = J+2
01006 408* 790 I = NN
01007 409* GO TO 130
01007 410* C.....
01010 411* 800 IEXP = 0
01011 412* GO TO 580
01011 413* C.....
01011 414* C.....ERROR ON INPUT STREAM
01012 415* 810 N = I - 1 - NCOL
01013 416* GO TO 860
01014 417* 820 N = NN - NCOL
01015 418* GO TO 860
01016 419* 830 N = N - NCOL
01017 420* GO TO 860
01020 421* 840 N = LI
01021 422* GO TO 860
01022 423* 850 N = I
01023 424* 860 KRBF(J) = -1
01024 425* WRITE (KOUT,870)ICOM(N),N
01030 426* 870 FORMAT(26H ILLEGAL USE OF CHARACTER A1,19H IN OR AFTER COLUMN13)
01031 427* GO TO 890
01031 428* C.....STORE VALUE OF ZERO IN BUFFER TO INDICATE END OF CARD
01032 429* 880 KRBF(J) = 0
01033 430* 890 KRBF(109) = J
01034 431* RETURN
01035 432* END
    
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END OF UNIVAC 1108 FORTRAN V COMPILATION. 0 *DIAGNOSTIC* MESSAGE(S)

CDDATA	CODE	SYMBOLIC RELOCATABLE	14 JUN 71	15:05:38	0	01650122	14	432	(DELETED)
			14 JUN 71	15:05:38	1	01663762	36	1	(DELETED)
					0	01664026	14	109	

HDG R FOR, CHAM,CHAM

3.2.13 CHAM (BI - PROPELLANT THRUSTOR GAS GENERATOR AND TURBOPUMP)

FOR, CHAM,CHAM
 UNIVAC 1108 FORTRAN V LEVEL 2204 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:26:52

31 AUG 71

9:26:52.148

SUBROUTINE CHAM ENTRY POINT 001545

TURBOP ENTRY POINT 001572

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	001577
0000	*DATA	000126
0002	*BLANK	000000
0003	INDATA	011610
0004	COM	006525
0005	CONS	000003
0006	CCPCX	000007

EXTERNAL REFERENCES (BLOCK, NAME)

0007	OPTCP
0010	OPTCV
0011	HPTCP
0012	HPTCV
0013	OPTD
0014	HPTD
0015	NERR2S
0016	NEXP5S
0017	SQRT
0020	NEXP6S
0021	NWDUS
0022	NI01S
0023	NI02S
0024	NERR3S

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000036	IL	0001	000757	11L	0001	000775	12L	0001	000322	120L	0001	000013	123G					
0001	001012	15L	0001	000421	150L	0001	000503	160L	0001	000164	164G	0001	000604	170L					
0001	000210	177G	0000	000036	190F	0001	000004	191L	0001	000725	195L	0001	000051	2L					
0001	000122	20L	0001	001525	200L	0001	000277	222G	0001	000126	30L	0001	000715	350G					
0001	000152	42L	0001	000063	5L	0001	000236	55L	0001	000257	60L	0000	R	000026	A				
0003	I	006221	AJ	0004	R	000000	AREA	0003	006074	AREA	0004	R	000074	AREA1	0004	R	000170	AREAK	
0004	R	000132	AREAD	0003	R	006066	AREAT	0003	R	006121	ARINJ	0003	R	006625	ATD	0003	R	006613	ATI
0003	000760	ATD	0000	R	000027	B	0000	R	000030	C	0003	006157	CDC	0003	R	006644	CEF1		
0003	R	006651	CEF2	0004	R	005060	CF	0004	R	006423	CGGTC	0004	R	006436	CGTANK	0004	R	006431	CLTANK
0004	R	005014	CONCT	0003	R	005714	CP	0004	R	000000	CPCX	0000	R	000016	CPGAS	0004	R	006443	CPJU
0000	R	000021	CPX	0003	R	006466	CPZ	0004	R	005006	CSTAR	0003	R	006203	CS2	0003	I	006117	CTW
0003	R	006102	CV	0004	R	006355	CVEL	0000	R	000017	CVGAS	0000	R	000022	C6	0000	R	000023	C9
0000	R	000025	D	0004	R	000036	DELXL	0003	R	000727	DIAD	0004	R	000226	DIAL1	0003	R	000734	D1AP
0003	R	006675	D1AT	0004	R	006277	DMVENT	0000	R	000032	EP	0004	R	006360	ETAT	0005	R	000002	FB
0004	R	006370	FBPC	0004	R	006376	FBTC	0004	R	006362	F04C	0004	R	005111	FRL	0005	R	000001	GC
0003	R	006447	GR	0004	R	003132	H1	0004	R	003036	HU	0011	R	000000	HPTCP	0012	R	000000	HPTCV

	FOR,	CHAN,CHAN	DATE	310871	PAGE	117
0014	R	000000 HPTD	0003	003322 HRAD	0003	I 005763 ICHAM
0000	I	000012 II	0003	000551 IPRDP	0003	I 000637 IPUMI
0004	R	005052 ISPT	0003	R 006207 IS2	0000	I 000013 JJ
0003	R	003413 KA	0000	R 006000 KAY	0003	R 006632 KTD
0004	R	004756 MR	0004	R 005102 MWC	0003	R 006173 MW2
0003	I	006116 NCOEF	0000	I 000001 NGGTP	0004	I 002552 NGR
0004	I	002646 NPR	0004	I 002742 NRE	0007	R 000000 OPTCP
0000	R	000014 P	0003	G 006120 PATH	0004	R 000264 PB
0004	R	004772 PCN	0003	R 000644 PDELP	0003	R 006213 PDROP
0004	R	003620 PGT	0000	R 006024 PGTC	0005	R 000000 PI
0004	R	006350 POWP	0004	R 006343 POWT	0003	R 000741 POW0
0003	R	006663 POW3	0004	R 006300 PPI	0004	R 006305 PPO
0003	R	000651 POW0	0003	R 000656 PW1	0003	R 000663 PA2
0003	R	005711 RGAS	0004	R 001422 RHOG	0003	R 000546 RHOL
0004	R	006312 RPMT	0003	R 000000 S	0000	R 000615 T
0004	R	006416 THOC	0003	R 006135 THRT	0004	R 006411 TPCG
0003	R	001132 TTEMP	0004	R 006317 TTI	0004	R 006324 TTO
0000	R	000033 TX	0004	R 006356 U	0004	R 003416 UAO
0000	R	000002 W	0003	R 003423 WDOTG	0004	R 006265 WI
0003	R	006670 WP	0004	R 006361 WT	0004	R 006246 WTGC

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00101 10 SUBROUTINE CHAM(I)
00101 20 C
00103 30 REAL KA,MR,ISP,KAY,MW2,IS2,ISPT
00103 40 *, MWC,KTD,KTI
00104 50 C
00104 60 INTEGER AJ,NGGTP
00104 70 *, CTW
00104 80 C
00105 90 DIMENSION ICHAM(6,2),AREAT(6),AREAE(6),CV(6,2),TTEMP(30,20),W(2)
00105 100 *,
00105 110 *, ARINJ(6,2),RGAS(2),PCI(6),ISP(6)
00105 120 *, NODEL(20),NPLINE(30),KA(2),WDOTG(30,20),THRT(6)
00105 130 *, TC2(4),MW2(4),CS2(4),IS2(4),PDROP(6)
00105 140 *, IPUMI(5),PDELP(5),RPM(5),DIA(5),DIAP(5),POW0(5)
00105 150 *, POW1(5),POW2(5),POW3(5),GR(5),ATI(5),KTI(5),ATD(5)
00105 160 *, KTD(5),ATO(5),RPMP(5),CEF1(5),CEF2(5)
00105 170 *, PW0(5),PW1(5),PW2(5),DIAT(5),CP2(5),IPUMO(5),CP(30)
00105 180 *, TTEMP(30,20),RHOL(3),WP(5)
00105 190 C
00106 200 COMMON /INDATA/S(5000)
00106 210 C
00107 220 COMMON /COM/AREA(30),DELXL(30),AREAI(30),AREAO(30),AREAK(30)
00107 230 *, DIALI(30),PB(6),PG(30,20),RHOG(30,20),NGR(30,2)
00107 240 *, NPR(30,2),NRE(30,2),HO(30,2),HI(30,2),TWALL(30,2)
00107 250 *, HRAD(30,2),UAO(30,2),VEL(30,2),JUN(10),PGT(30,20)
00107 260 *, WNOZ(6),MR(6),PC(6),PCN(6,2),CSTAR(6),CONCT(3,6)
00107 270 *, PMR(6),TC(6),ISPT(6),CF(6),MEX(6),PE(6),MWC(6),ICMON
00107 280 *, FRL(30,20),POWC(5),WTGC(5),WO(10),WI(10),DMVENT,PPI(5)
00107 290 *, PPO(5),RPMT(5),TTI(5),TTO(5),PTI(5),PTO(5),POWT(5)
00107 300 *, POWP(5),CVEL,U,R,ETAT,WT,FBWC(6),FBPC(6)
00107 310 *, FBTC(6),TPCL(5),TPCG(5),THOC(5),CGGTC(6),CLTANK(5)
00107 320 C
00110 330 COMMON /CONS/PI,GC,FB
00111 340 COMMON /CCPCX/ CPCX(6), ICX

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00111 35* C
00112 36* EQUIVALENCE
00112 37*   ,(S(45),NODL(1)),(S(362),IPROP),(S(1804),KA(1))
00112 38*   ,(S(364),NPLINE(1)),(S(3018),RGAS(1)),(S(1203),TTEMP(1,1))
00112 39*   ,(S(3060),ICHAM(1,1)),(S(3127),AREAT(1)),(S(3154),ARINJ(1,1))
00112 40*   ,(S(3152),CTW)
00112 41*   ,(S(3139),CV(1,1)),(S(3151),NCOEF),(S(3053),RFLAG)
00112 42*   ,(S(3153),PATH),(S(3184),CDC),(S(3133),AREAE(1))
00112 43*   ,(S(3172),ISP(1)),(S(3166),THRT(1)),(S(3196),MW2(1))
00112 44*   ,(S(3178),PC1(1)),(S(103),NCHAM),(S(1812),WDOTG(1,1))
00112 45*   ,(S(3200),TC2(1)),(S(3204),CS2(1)),(S(3208),IS2(1))
00112 46*   ,(S(3212),PDROP(1)),(S(3218),AJ)
00112 47*   ,(S(416),IPUMI(1)),(S(421),POELP(1)),(S(426),PWD(1))
00112 48*   ,(S(431),PA1(1)),(S(436),PA2(1)),(S(441),RPMO(1))
00112 49*   ,(S(472),DIAP(1)),(S(477),DIAP(1)),(S(482),POAO(1))
00112 50*   ,(S(487),POW1(1)),(S(492),POW2(1)),(S(3508),POW3(1))
00112 51*   ,(S(3368),GR(1)),(S(3468),AT1(1)),(S(3473),KT1(1))
00112 52*   ,(S(3478),ATD(1)),(S(3483),KTD(1)),(S(497),ATO(1))
00112 53*   ,(S(3493),CEF1(1)),(S(3498),CEF2(1)),(S(3021),CP(1))
00112 54*   ,(S(3518),DIAT(1)),(S(3383),CP2(1)),(S(3488),IPUMO(1))
00112 55*   ,(S(603),TTEMP(1,1)),(S(359),RHOL(1)),(S(3513),WF(1))
00112 56* C
00113 57*   NGGTP = 0
00114 58*   GO TO 191
00115 59*   ENTRY TURBOP(1)
00117 60*   NGGTP = 1
00120 61* 191 CONTINUE
00121 62*   WNOZ(1) = 0.
00122 63*   DO 10 N=1,2
00125 64*     II = ICHAM(1,N)
00126 65*     JJ = NODL(11)
00127 66*     P = PG(II,JJ)
00130 67*     T = TTEMP(II,JJ)
00131 68*     IPROP = NPLINE(11)
00132 69*     GO TO (1,2), IPROP
00132 70* C QXYGEN
00133 71*   1 CPGAS = OPTCP(P,T)
00134 72*   CVGAS = OPTCV(P,T)
00135 73*   GO TO 5
00135 74* C HYDROGEN
00136 75*   2 CPGAS = HPTCP(P,T)
00137 76*   CVGAS = HPTCV(P,T)
00140 77*   5 CONTINUE
00141 78*   RGAS(IPROP) = (CPGAS - CVGAS) * 778.156
00142 79*   KA(IPROP) = CPGAS / CVGAS
00143 80*   W(N) = WDOTG(11,JJ)
00144 81*   WNOZ(1) = WNOZ(1) + W(N)
00145 82* 10 CONTINUE
00147 83*   IF (NPLINE(11).EQ.1) GO TO 20
00151 84*   MR(1) = W(1)/W(2)
00152 85*   GO TO 30
00153 86* 20 MR(1) = W(2)/W(1)
00154 87* 30 CONTINUE
00155 88*   IF (MR(1) .LE. 6.0) GO TO 42
00157 89*   ISPT(1) = 442.4919 - 1.46667*(MR(1) - 6.0)
00160 90*   CSTAR(1) = 7673.8046 - 220.*(MR(1) - 6.0)
00161 91*   GO TO 55
00162 92* 42 PMR(1) = 1.0

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00163 93* DO 40 K=2,N
00166 94* PMR(K) = MR(I)**(K-1)
00167 95* 40 CONTINUE
00171 96* MWC(I) = 0.
00172 97* TC(I) = 0.
00173 98* CPX = 0.
00174 99* CSTAR(I)=0.
00175 100* ISPT(I) = 0.0
00176 101* DO 50 K=1,NCOEF
00201 102* MWC(I) = MAC(I) + MW2(K)*PMR(K)
00202 103* TC(I) = TC(I) + TC2(K)*PMR(K)
00203 104* CSTAR(I) = CSTAR(I) + CS2(K)*PMR(K)
00204 105* ISPT(I) = ISPT(I) + IS2(K)*PMR(K)
00205 106* CPX = CPX + CP2(K) * PMR(K)
00206 107* 50 CONTINUE
00206 108* C STORE CPX FOR HEAT EXCHANGER H2OH2 - ROUTINE
00210 109* CPCX(I) = CPX
00211 110* 55 CONTINUE
00211 111* C CF = THRUST COEFFICIENT
00212 112* CF(I) = GC*ISPT(I)/CSTAR(I)
00213 113* IF (CTM .NE.4) GO TO 60
00215 114* PCI(I) = WNOZ(I) *CSTAR(I) / (AREAT(I) *GC)
00216 115* 60 CONTINUE
00216 116* C ISP IS COMPUTED INTERNALLY
00216 117* C INPUT 2 OF THE FOLLOWING AND THE THIRD AS A STATE VARIABLE -
00216 118* C PCI, AREAT, THRT
00217 119* ISP(I) = ISPT(I)
00220 120* 110 CONTINUE
00221 121* DO 170 N=1,2
00224 122* II = ICHAM(I,N)
00225 123* JJ = NODEL(II)
00226 124* IPROP = NPLINE(II)
00227 125* KAY = KA(IPROP)
00230 126* W(N) = ADOTG(II,JJ)
00231 127* IF (AJ.EQ.1) GO TO 150
00233 128* 120 C6 = ARINJ(II,N)*CV(I,N)*SQRT(GC*KAY/(RGAS(IPROP) *
00233 129* TTTEMP(II,JJ)**2.0/(KAY-1.0))
00234 130* IF (PCI(II) *GE. PGT(II,JJ)) PCI(II) = 0.9*PGT(II,JJ)
00236 131* 130 CONTINUE
00237 132* C9 = PCI(II)/PGT(II,JJ)
00237 133* C CV = INJECTOR DISCHARGE COEFFICIENT
00237 134* C FLOWRATE THRU INJECTOR
00240 135* CONCT(N,II) = 1. - PGT(II,JJ)*C6*SQRT(C9**2./KAY) -
00240 136* 1 C9**((KAY+1.)/KAY) / W(N)
00241 137* 140 CONTINUE
00242 138* GO TO 160
00243 139* 150 CONTINUE
00244 140* PGTC = PCI(II) * PDROP(II)
00245 141* C9 = PCI(II)/PGTC
00245 142* C
00245 143* C AREA INJECTOR (FLO)
00245 144* C
00246 145* ARINJ(II,N) = WDOTG(II,JJ)/(PGT(II,JJ)*CV(I,N)*SQRT(GC*KAY*2.0/
00246 146* 1 (RGAS(IPROP)*TTTEMP(II,JJ)*(KAY-1.))*C9**2./KAY)-C9**
00246 147* 2 ((KAY+1.)/KAY))
00247 148* GO TO 120
00250 149* 160 CONTINUE
00251 150* IF (RFLAG),170,

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00254 151* WRITE (6,190)I,II,JJ,IPROP,N,NAJ,NPLINE(II),N,KAY,W(N),WNOZ(II),C6,A
00254 152* *RINJ(1,N),CV(1,N),GC,RGAS(II),TTEMP(II,JJ),PGT(II,JJ),PCN(I,N),C9
00254 153* *,P0ROP(I),*DOTG(II,JJ),ISP(II),THRT(II),ISPT(II),PCI(II)
00310 154* 170 CONTINUE
00310 155* C CONSTRAINT EQ THRUST OR ISP
00312 156* 180 CONCT(3,1) = 1. - THRT(II)*CSTAR(II)/(ISP(II)*AREAT(II)*GC) / PCI(II)
00313 157* IF (RFLAG),195,
00316 158* WRITE(6,190)I,II,JJ,IPROP,N,N,NPLINE(II),WCOEF,KAY,WNOZ(II),C6,R
00316 159* 2GAS(II),MR(II),W(II),N(2),MWC(II),TC(II),CSTAR(II),ISP(II),CF(II),PC(II),T
00316 160* 3HRT(II),PCI(II),AREAT(II),(CONCT(N,II),N=1,3),GC,THRT(II)
00356 161* 190 FORMAT(//24X12HCHAM ROUTINE, 5X,8I6, // 4(I1PBE15,7//)
00357 162* 195 KAY = CPX/(CPX-1.9852/MWC(II))
00360 163* IF (NGGTP .EQ. 0) GO TO 200
00360 164* C IPUM1 = LINE CONNECTED TO PUMP INLET
00362 165* II = IPUM1(II)
00363 166* JJ = NODEL(II)
00364 167* IPROP = NPLINE (II)
00364 168* C COMPUTE FLUID DENSITY
00365 169* GO TO (11,12),IPROP
00365 170* 11 RHOL(IPROP) = OPTD (PG(II,JJ),TTEMP(II,JJ) )
00367 171* GO TO 15
00370 172* 12 RHOL(IPROP) = HPTD (PG(II,JJ),TTEMP(II,JJ) )
00371 173* 15 CONTINUE
00371 174* C PUMP CALCULATIONS
00371 175* C
00371 176* C PRESSURE PUMP INLET
00372 177* PPI(II) = PG(II,JJ)
00372 178* C PUMP FLOWRATE
00373 179* WP(II) = WDOTG(II,JJ)
00373 180* C PRESSURE OUT
00374 181* PPO(II) = PPI(II) + PDEL(II)
00374 182* C PDEL(II) = PUMP PRESSURE HEAD, PSIA
00374 183* C PUMP ACTUAL DIAMETER / PUMP DESIGN DIAMETER
00375 184* D = DIAP(II) / DIAD(II)
00375 185* C SPEED, S IS LABELED AS V
00375 186* C SPEED V IS POSITIVE ROOT OF QUADRATIC EQUATION
00376 187* A = D**2 * PA0(II)
00377 188* B = PA1(II) * WP(II) / D
00400 189* C = PA2(II) * WP(II)**2 / D**4 - PDEL(II)
00401 190* V = (-B + SQRT(B**2 - 4. *A*C) ) / (2.*A)
00401 191* C PUMP SPEED / PUMP DESIGN SPEED = F ( HEAD CURVE )
00402 192* RPMP(II) = RPM(II) * V
00402 193* C RPMP = PUMP SPEED, REV/SEC
00402 194* C RPM(II) = PUMP DESIGN SPEED, RPM
00402 195* C DIAD = PUMP DESIGN DIA. , INCHES
00402 196* C DIAP = PUMP DIA. , INCHES
00402 197* C PUMP POWER
00403 198* POWP(II) = V**3 *D**5 *POW0(II) + (V*D)**2 *POW1(II) *WP(II)
00403 199* + V *POW2(II) * WP(II)**2 / D + (WP(II)/D)**3 / D * POW3(II)
00403 200* C POW0 = COEFFICIENT IN PUMP DESIGN POWER CURVE FIT
00403 201* C POW1 = COEFFICIENT IN PUMP DESIGN POWER CURVE FIT
00403 202* C POW2 = COEFFICIENT IN PUMP DESIGN POWER CURVE FIT
00403 203* C POW3 = COEFFICIENT IN PUMP DESIGN POWER CURVE FIT
00404 204* EP = PDEL(II) * WP(II) * (44. / (RHOL(IPROP) * POWP(II) ) )
00405 205* TX = (1.-EP) * POWP(II) / (FB * WP(II) * CP(II) ) + TTEMP(II,JJ)
00405 206* C ... TURBINE EQUATIONS ...
00405 207* C SPEED, REV/SEC
00406 208* RPMT(II) = RPMP(II)*GR(II)

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00407 209. TT1(I) = TC(I)
00407 210. C TURBINE ISENTROPIC DISCHARGE TEMPERATURE (DEG-R)
00410 211. TTE1S = TT1(I)*(ATI(I)/ATD(I))*((2.+(KAY-1.)/(KAY+1.))
00411 212. PT1(I) = PCI(I)
00411 213. C PRESSURE DROP GG TO TURBINE INCLUDED IN KT, ADIABATIC LINE COULD BE
00411 214. C USED
00411 215. C PRESSURE TURBINE OUT BASED SONIC FLOW OUT OF DUCT TO ATM.
00411 216. C ISENTROPIC SPOUTING VELOCITY, FT/SEC
00412 217. CVEL = SQRT(2.0*CPX*(TC(I)-TTE1S)*778.26*GC)
00413 218. U = 3.14159*DIAT(I)/12.0*RPMT(I)/60.0
00414 219. R = U/CVEL
00414 220. C EFFICIENCY
00415 221. ETAT = CEF2(I)*R + CEF1(I)*R
00415 222. C TURBINE POWER , FT-LBF/SEC
00416 223. POWT(I) = ETAT*778.26*CPX*WNOZ(I)*(TC(I)-TTE1S)
00416 224. C TURBINE ACTUAL DISCHARGE TEMPERATURE (DEG-R)
00417 225. TTO(I) = TC(I)*(1. - ETAT)/(1. - TTE1S/TC(I))
00417 226. C TURBINE CHOKED FLOW RATE, FT/SEC
00420 227. WT = PT1(I)*ATI(I)*KT1(I)*SQRT(MWC(I)/1545./TT1(I)*GC*KAY*(2./
00420 228. *(KAY+1.))*((KAY+1.)/(KAY-1.)))
00421 229. PTD(I) = WT/(ATD(I)*KTD(I)*SQRT(MWC(I)/1545./TTO(I)*GC*KAY*(2./
00421 230. *(KAY+1.))*((KAY+1.)/(KAY-1.)))
00421 231. C TURBINE GG FLOW CONSTRAINT EQ
00422 232. WTGC(I) = 1. - WT / WNOZ(I)
00422 233. C CONSTRAINT PUMP-TURBINE POWER
00423 234. POWC(I) = 1. - POWT(I)/POWP(I)
00423 235. C IPUMO = LINE CONNECTED PUMP DISCHARGE
00424 236. II = IPUMO(I)
00425 237. JJ = 1
00426 238. IPROP = NPLINE(II)
00427 239. WDOTG(II, JJ) = WP(I)
00430 240. TTEMP(II, JJ) = TX
00431 241. PG(II, JJ) = PPO(I)
00432 242. IF (RFLAG), 200,
00435 243. WRITE(6, 190) I, II, JJ, IPROP, N, AJ, NPLINE(I), N
00435 244. *, PPI(I), PPO(I), PDELPI(I), PXO(I)
00435 245. *, PW1(I), PAZ(I), WP(I), RPMT(I)
00435 246. *, GR(I), TC(I), TT1(I), TTO(I)
00435 247. *, ATI(I), ATD(I), PCI(I), PT1(I)
00435 248. *, TC(I), CVEL, DIAT(I), U
00435 249. *, R, CEF2(I), CEF1(I), ETAT
00435 250. *, POWT(I), PT1(I), KT1(I), PTO(I)
00435 251. *, WT, WTGC(I), POWC(I), POWP(I)
00435 252. *, WP(I), CPX, KAY, CP2(I)
00513 253. 200 RETURN
00514 254. END
    
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END OF UNIVAC 1108 FORTRAN V COMPILATION. D *DIAGNOSTIC MESSAGE(S)

CHAM	CODE	SYMBOLIC RELOCATABLE	31 AUG 71	09:25:01	0	02076324	14	254	(DELETED)
			31 AUG 71	09:25:01	1	02105270	48	1	(DELETED)
					0	02105350	14	100	

R HDG R FOR, * CHOICE, CHOICE

FOR, CHOICE, CHOICE
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:26:56

SUBROUTINE CHOICE ENTRY POINT 000445

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	000660
0000	*DATA	000037
0002	*BLANK	000000
0003	INDATA	011610

EXTERNAL REFERENCES (BLOCK, NAME)

0004	HEATEX
0005	NWDUS
0006	NIO15
0007	NIO25
0010	NERR25
0011	NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000101	110L	0001	000121	140L	0001	000130	150L	0001	000161	160L	0001	000223	170L
0001	000237	190L	0001	000246	200L	0001	000277	210L	0001	000341	220L	0000	000015	230F
0001	000415	235L	0001	000427	240L	0001	000433	250L	0001	000016	40L	0001	000023	50L
0001	000034	70L	0001	000040	80L	0001	000051	90L	0000 R	000013	81	0000 R	000005	82
0000 I	000006	J	0000 I	000014	JOUT	0000 I	000001	KRET	0000 R	000011	PIN	0000 R	000000	POUT
0003 R	005754	RFLAG	0003	006316	RI	0003	006424	RO	0003 R	000000	S	0003 I	006311	TYPE
0000 R	000012	XT12	0000 R	000003	XT02	0000 R	000010	X1	0000 R	000004	X2	0000 R	000007	Y1
0000 R	000002	Y2												

00101 1* SUBROUTINE CHOICE (LN,LI,T11,T12,T01,T02,P11,P12,P01,P02,*D1,
 00101 2* 1 *DO,QT,LO,X1,X0)
 00101 3* CC THIS SUBROUTINE DETERMINES WHETHER THE HEAT EXCHANGER IS
 00101 4* CC OPERATING AS A PARALLEL OR A COUNTER FLOW DEVICE FROM THE
 00101 5* CC FLOWRATE SIGNS, AND THEN DETERMINES WHICH END TO START
 00101 6* CC INTO FOR INTEGRATION. FOR PARALLEL FLOW HEAT EXCHANGERS,
 00101 7* CC INTEGRATION IS IN THE DIRECTION OF FLOWRATE. FOR COUNTERFLOW
 00101 8* CC HEAT EXCHANGERS, AN ITERATION IS NEEDED TO CONVERGE.
 00101 9* CC T = TEMP (DEG,R) (SUBSCRIPT 1 = INSIDE)
 00101 10* CC P = PRESS (PSIA (0 = OUTSIDE)
 00101 11* CC *D= FLOWRATE FROM END 1 TO END 2 (POUNDS/SEC)
 00101 12* CC QT= TOTAL HEAT TRANSFER RATE (BTU/SEC IN DEG,R)
 00101 13* CC IS EITHER FLOWRATE ZERO
 00103 14* INTEGER TYPE
 00103 15* C
 00104 16* DIMENSION TYPE(5),RI(5),RO(5)
 00104 17* C

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00105 18* COMMON /INDATA/ 5(5000)
00105 19* C
00106 20* EQUIVALENCE
00106 21* * (S(3274),TYPE(1)) , (S(3279),RI(1)) , (S(3349),RO(1))
00106 22* * , (S(3053),RFLAG)
00106 23* C
00107 24* IF (W01) 10,50,10
00112 25* 10 IF (W00) 90,20,90
00115 26* 20 IF (W01) 30,80,40
00120 27* 30 T11=T12
00121 28* P11=P12
00122 29* GO TO 80
00123 30* 40 P12=P11
00124 31* T12=T11
00125 32* GO TO 80
00126 33* 50 IF (W00) 60,80,70
00131 34* 60 T01=T02
00132 35* P01=P02
00133 36* GO TO 80
00134 37* 70 T02=T01
00135 38* P02=P01
00136 39* 80 QT=0.0
00137 40* GO TO 250
00137 41* CC FLOWRATES ARE NON ZERO, IS IT PARALLEL OR COUNTER FLOW
00137 42* CC TYPE 3 CROSSFLOW
00140 43* IF (TYPE(LN).EQ.3) GO TO 110
00142 44* 90 IF (W01/W00) 110,110,100
00145 45* 100 CONTINUE
00145 46* CC PARALLEL FLOW, COMPUTE CONDITIONS AT END 2 GIVEN
00145 47* CC CONDITIONS AT END 1.
00146 48* CALL HEATEX (LN,LI,LO,T11,T01,T12,T02,P11,P01,P12,P02,W01,W00,QT,
00146 49* I X1,X0)
00147 50* GO TO 250
00147 51* CC
00147 52* CC COUNTER FLOW, WHICH IS POSITIVE
00150 53* 110 CONTINUE
00151 54* IF (W01) 170,170,120
00154 55* 120 CONTINUE
00154 56* CC INSIDE FLOW POSITIVE, ASSUME T01 AND ITERATE UNTIL THE
00154 57* CC PROPER VALUE OF T02 IS FOUND
00154 58* CC FIRST GUESS, USE T01 UNLESS HEAT FLUX HAS WRONG SIGN
00155 59* POUT=P02
00156 60* IF (T11-T02) 140,130,140
00156 61* CC NO TEMP DIFFERENCE, NO HEAT TRANSFER
00161 62* 130 T12=T11
00162 63* T01=T02
00163 64* QT=0.0
00164 65* GO TO 250
00165 66* 140 T01=0.5*(T11+T02)
00166 67* KRET=1
00167 68* GO TO 220
00170 69* 150 CONTINUE
00171 70* Y2=X*T02-T02
00172 71* X2=T01
00172 72* CC COMPUTE SECOND GUESS
00173 73* B2=(X*T02-T01)/(T01-T11)
00174 74* T01=(T02+B2*T11)/(1.0+B2)
00175 75* P01=P01+POUT-P02

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00176 76* J=1
00177 77* KRET=2
00200 78* GO TO 220
00201 79* 160 CONTINUE
00202 80* J=J+1
00202 81* CC USE REGULA FALSI FOR SUCCESSIVE GUESSES
00203 82* Y1=XT02-T02
00204 83* X1=T01
00205 84* IF (J.GT.10) GO TO 240
00207 85* IF (ABS(Y1/T02).LE.0.001) GO TO 240
00211 86* T01=X1-Y1*(X2-X1)/(Y2-Y1)
00212 87* P01=P01+POUT-P02
00213 88* X2=X1
00214 89* Y2=Y1
00215 90* GO TO 220
00215 91* CC OUTSIDE FLOW POSITIVE, ASSUME T11 AND ITERATE UNTIL THE
00215 92* CC CORRECT VALUE OF T12 IS FOUND
00215 93* CC FIRST GUESS, USE T11 UNLESS HEAT FLUX HAS WRONG SIGN
00216 94* 170 CONTINUE
00217 95* PIN=P12
00220 96* IF (T01-T12) 190,180,190
00220 97* CC NO TEMP DIFFERENCE OR HEAT TRANSFER
00223 98* 180 T02=T01
00224 99* T11=T12
00225 100* QT=0.0
00226 101* GO TO 250
00227 102* 190 T11=0.5*(T01+T12)
00230 103* KRET=3
00231 104* GO TO 220
00232 105* 200 CONTINUE
00233 106* Y2=X112-T12
00234 107* X2=T11
00234 108* CC COMPUTE SECOND GUESS
00235 109* B1=(XT12-T11)/(T11-T01)
00236 110* T11=(T12+B1*T01)/(1.0+B1)
00237 111* P11=P11+PIN-P12
00240 112* J=1
00241 113* KRET=4
00242 114* GO TO 220
00243 115* 210 CONTINUE
00243 116* CC USE REGULA FALSI FOR SUCCESSIVE GUESSES
00244 117* J=J+1
00245 118* IF (J.GT.10) GO TO 240
00247 119* Y1=XT12-T12
00250 120* X1=T11
00251 121* IF (ABS(Y1/T12).LE.0.001) GO TO 240
00253 122* P11=P11+PIN-P12
00254 123* T11=X1-Y1*(X2-X1)/(Y2-Y1)
00255 124* X2=X1
00256 125* Y2=Y1
00257 126* GO TO 220
00257 127* CC
00257 128* CC HEAT EXCHANGER CALL
00260 129* 220 CONTINUE
00261 130* CALL HEATEX (LN,LI,LO,T11,T01,XT12,XT02,P11,P01,P12,P02,PO1,
00261 131* 1 WDO,QT,XI,XO)
00262 132* IF (RFLAG),235,
00265 133* JOUT=6

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00266 134*
00300 135* 230 WRITE (JOUT,250) T11,XT12,T01,XT02,QT,PI2,PO1,PO2
00301 136* 235 FORMAT(8E13.6/)
00301 137* 235 GO TO (150,160,200,210),KRET
00301 138* CC
00301 138* CC CONVERGENCE OCCURRED, CLEANUP PROCESS
00302 139* 240 CONTINUE
00303 140* T12=XT12
00304 141* T02=XT02
00305 142* 250 RETURN
00306 143* END
    
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END OF UNIVAC 1108 FORTRAN V COMPILATION.

DIAGNOSTIC MESSAGE(S)

CHOICE	SYMBOLIC	23 JUN 71	21:25:28	0	01700524	14	143	(DELETED)
CHOICE CODE	RELOCATABLE	23 JUN 71	21:25:28	1	01704446	24	1	(DELETED)
				0	01704476	14	43	

HOG FOR, * CMON,CMON

3.2.15 CMON (MONOPROPELLANT THRUSTOR)

FOR, * CMON,CMON
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:26:58

31 AUG 71

9:26:58.394

SUBROUTINE CMON ENTRY POINT 001101

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	001137
0000	*DATA	000114
0002	*BLANK	000000
0003	INDATA	011610
0004	COM	006525
0005	CONS	000003

EXTERNAL REFERENCES (BLOCK, NAME)

0006	OPTCP
0007	OPTCV
0010	HPTCP
0011	HPTCV
0012	NERR2s
0013	NEXP6s
0014	SQRT
0015	NWDUs
0016	NIO1s
0017	NIO2s
0020	NERR3s

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000025	IL	0001	000671	100L	0001	000701	110L	0001	000711	120L	0001	000720	130L
0001	000123	135G	0000	000035	140F	0001	000155	144G	0001	001060	150L	0001	000040	2L
0001	000262	20L	0001	000271	40L	0001	000052	5L	0001	000335	50L	0001	000467	60L
0001	000470	70L	0001	000552	80L	0000	R 000025	A	0003	I 006221	AJ	0004	R 000000	AREA
0003	R 006074	AREAE	0004	R 000074	AREAI	0004	R 000170	AREAK	0004	R 000132	AREAO	0003	R 006066	AREAT
0003	R 006121	ARINJ	0000	R 000021	B	0000	R 000034	B8	0000	R 000022	C	0003	R 006157	CDC
0004	R 005060	CF	0004	R 006423	CGGTC	0004	R 006436	CGTANK	0004	R 006431	CLTANK	0004	R 005014	CONCT
0000	R 000015	CPGAS	0004	R 006443	CPJU	0004	R 005006	CSTAR	0003	I 006117	CT%	0003	R 006102	CV
0004	R 006355	CVEL	0000	R 000016	CVGAS	0000	R 000027	C6	0000	R 000031	C7	0000	R 000030	C9
0000	R 000024	D	0000	R 000026	DA	0000	R 000032	DCLP	0000	R 000033	DELX	0004	R 000036	DELXL
0004	R 000226	DIAL1	0004	R 006277	DMVENT	0000	R 000020	E	0004	R 006360	ETAT	0005	R 000002	FB
0004	R 006370	FBPC	0004	R 006376	FBTC	0004	R 006362	F8WC	0004	R 005111	FRL	0005	R 000001	GC
0004	R 003132	HI	0004	R 003036	HO	0010	R 000000	HPTCP	0011	R 000000	HPTCV	0004	R 003322	HRAD
0003	I 005763	ICHAM	0004	I 005110	ICMON	0000	I 000011	II	0003	I 000551	IPROP	0000	I 000017	ISAVE
0004	R 005052	ISP	0003	R 006143	ISPI	0000	I 000023	J	0000	I 000013	JJ	0004	I 003606	JUN
0003	R 003413	KA	0000	R 000000	KAY	0003	R 006165	LAMDA	0000	R 000001	KE	0004	R 005066	MEX
0004	R 004756	MR	0004	I 005102	MWC	0000	R 000002	MZE	0003	I 000146	NCHAM	0003	006116	NCOEF
0004	I 002552	NGR	0003	I 000100	NODEL	0003	I 000553	NPLINE	0004	I 002646	NPR	0004	I 002742	NRE
0006	R 000000	OPTCP	0007	R 000000	OPTCV	0000	R 000012	F	0003	R 006120	PATM	0004	R 000264	PB
0004	R 004764	PC	0003	R 006151	PCI	0004	R 004772	PCN	0003	R 006213	PDR0P	0004	R 005074	PE
0004	R 000272	PG	0004	R 003620	PGT	0005	R 000000	PI	0004	R 005036	PMR	0004	R 006241	POWC
0004	R 006350	PO&P	0004	R 006343	POWT	0004	R 006300	PPI	0004	R 006305	PP0	0004	R 006331	PT1


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0004 R 006336 PTO      0004 R 006357 R      0003 R 005754 RFLAG      0003 R 005754 RGAS      0004 R 001422 RHOG
0004 R 006312 RPMT     0003 R 000000 S      0000 R 000014 T      0004 R 005044 TC      0004 R 006416 THOC
0003 R 006135 THRT     0000 R 000003 THRT     0004 R 006411 TPCG      0004 R 006404 TPCL      0003 R 001132 TTEMP
0004 R 006317 TTI      0004 R 006324 TIO      0003 R 002262 TTEMP      0004 R 003226 TWALL      0004 R 006356 U
0004 R 003416 UAO      0004 R 003512 VEL      0003 R 003423 WDOTG      0004 R 006265 WI      0004 R 004750 WNOZ
0004 R 006253 W0      0004 R 006361 WT      0004 R 006246 WTGC

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00101 10 SUBROUTINE CMON (1)
00101 20 C
00103 30 REAL KA, MK, ISP, KAY, ME, MZE, MEX, LAMDA, ISPI
00103 40 C
00104 50 INTEGER CT%, AJ
00104 60 C
00105 70 DIMENSION ICHAM(6,2), AREAT(6), AREAE(6), CV(6,2), CDC(6), THRT(6)
00105 80 *, ARINJ(6,2), RGAS(2), THRI(6), ISPI(6), PCI(6), LAMDA(6)
00105 90 *, NDEL(20), NPLINE(30), KA(2), WDOTG(30,20), TTEMP(30,20)
00105 100 *, PDROP(6)
00105 110 *, TTEMP(30,20)
00105 120 C
00106 130 COMMON /INDATA/S(5000)
00106 140 C
00107 150 COMMON /COM/AREA(30), DELXL(30), AREA1(30), AREA0(30), AREAK(30)
00107 160 *, DIALI(30), PB(6), PG(30,20), RHOG(30,20), NGR(30,2)
00107 170 *, NPR(30,2), NRE(30,2), HO(30,2), HI(30,2), THALL(30,2)
00107 180 *, HRAD(30,2), UAO(30,2), VEL(30,2), JUN(10), PGT(30,20)
00107 190 *, WNOZ(6), HR(6), PC(6), PCN(6,2), CSTAR(6), CONCT(3,6)
00107 200 *, PMR(6), TC(6), ISP(6), CF(6), MEX(6), PE(6), MWC(6), ICMON
00107 210 *, FRL(30,20), POWC(5), WTGC(5), WO(10), WI(10), DMVENT, PPI(5)
00107 220 *, PPO(5), RPMT(5), TTI(5), TIO(5), PTI(5), PTO(5), POUT(5)
00107 230 *, POWP(5), CVEL, U, R, ETAT, WT, FBWC(6), FBPC(6)
00107 240 *, FBTC(6), TPCL(5), TPCG(5), THOC(5), CGGTC(6), CLTANK(5)
00107 250 *, CGTANK(5), CPJU(5,10)
00107 260 C
00110 270 COMMON /CONS/PI, GC, FB
00110 280 C
00111 290 EQUIVALENCE
00111 300 *, (S(65), NDEL(1)), (S(362), IPROP), (S(1804), KA(1))
00111 310 *, (S(364), NPLINE(1)), (S(3018), RGAS(1)), (S(1203), TTEMP(1,1))
00111 320 *, (S(3060), ICHAM(1,1)), (S(3127), AREAT(1)), (S(3154), ARINJ(1,1))
00111 330 *, (S(3139), CV(1,1)), (S(3151), NCOEF), (S(3152), CTW)
00111 340 *, (S(3153), PATH), (S(3190), LAMDA(1)), (S(103), NCHAM)
00111 350 *, (S(3172), ISPI), (S(3178), PCI(1)), (S(1812), WDOTG(1,1))
00111 360 *, (S(3133), AREAE(1)), (S(3166), THRI(1)), (S(3184), CDC(1))
00111 370 *, (S(3212), PDROP(1)), (S(3218), AJ)
00111 380 *, (S(3053), RFLAG)
00111 390 C
00111 400 *, (S(603), TTEMP)
00112 410 II = ICHAM(1,1)
00113 420 IPROP = NPLINE(11)
00114 430 P = PG(11, JJ)
00115 440 T = TTEMP(11, JJ)
00116 450 GO TO (1,2), IPROP
00116 460 C OXYGEN
00117 470 I CPGAS = OPTCP(P, T)
00120 480 CVGAS = OPTCV(P, T)

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00121 49* GO TO 5
00121 50* C HYDROGEN
00122 51* 2 CPGAS = HPTCP(P,T)
00123 52* CVGAS = HPTCV(P,T)
00124 53* 5 KA(IPROP) = CPGAS / CVGAS
00125 54* RGAS(IPROP) = ( CPGAS - CVGAS ) * 778.156
00126 55* JJ = NODEL(II)
00127 56* KAY = KA(IPROP)
00130 57* IF (ICMON.GE.1) GO TO 40
00132 58* ICMON = 1
00133 59* ISAVE = 1
00134 60* DO 30 I=1,NCHAM
00134 61* C THRUSTER EXIT MACH NUMBER BASED ON AERA RATIO
00137 62* E = (KA(IPROP)-1.)*.5
00140 63* B = (KA(IPROP)+1.0)/(2.0*(KA(IPROP)-1.0))
00141 64* C = E + 1.
00142 65* ME = 5.
00143 66* DO 10 J=1,10
00146 67* IF (I.GT. 1) ME = HEX(I)
00150 68* D = (1.+E*ME**2/C)
00151 69* A = AREAE(I)-AREAT(I)/ME*((1.0+E*ME**2)/C)**.5
00151 70* C EXIT MACH NUMBER EQ DERIVATIVE
00152 71* DA = -2.0*E*B*AREAT(I)/C*D**2 + AREAT(I)/ME**2*D**.5
00153 72* M2E = ME - A/DA
00154 73* IF (ABS(ME-M2E).LE.1.0E-8.OR.ABS(A).LE.1.0E-8) GO TO 20
00156 74* ME = M2E
00157 75* 10 CONTINUE
00161 76* 20 HEX(I) = ME
00162 77* 30 CONTINUE
00164 78* I = ISAVE
00165 79* 40 IF (AJ.EQ.1) GO TO 70
00167 80* C6 = ARINJ(I,1)*CV(I,1)*SQRT(GC*KAY/(RGAS(II)*TTTEMP(II,JJ)
00167 81* *2.0/(KAY - 1.0)))
00167 82* C FIRST GUESS CHAMBER PRESS
00170 83* PCN(I,1) = 0.9*PGT(II,JJ)
00171 84* 50 CONTINUE
00172 85* C9 = PCN(I,1)/PGT(II,JJ)
00172 86* C CV = INJECTOR DISCHARGE COEFFICIENT
00172 87* C FLOWRATE THRU INJECTOR
00173 88* C7 = WDOTG(II,JJ) - PGT(II,JJ)*C6*SQRT(C9**2.0/KAY) -
00173 89* 1 C9**((KAY+1.0)/KAY)
00174 90* DCLP = -C6/((2.0*KAY*SQRT(C9**2.0/KAY) - C9**((KAY+1.0)/KAY))
00174 91* * (2.0*C9**2.0/KAY-1.0) - (KAY+1.0)*C9**((1.0/KAY)))
00175 92* DELP = C7/DCLP
00176 93* PCN(I,1) = PCN(I,1) - DELP
00177 94* IF (ABS(DELP).LE.1.0E-6) GO TO 60
00201 95* GO TO 50
00202 96* 60 CONTINUE
00203 97* GO TO 80
00204 98* 70 CONTINUE
00205 99* PCN(I,1) = PGT(II,JJ) - PDROP(I)
00206 100* C9 = PCN(I,1)/PGT(II,JJ)
00207 101* ARINJ(I,1) = WDOTG(II,JJ)/(PGT(II,JJ)*CV(I,1)*SQRT(GC*KAY*2.0/
00207 102* (RGAS(II)*TTTEMP(II,JJ)*(KAY-1.0))*(C9**2.0/KAY)-C9**
00207 103* ((KAY+1.0)/KAY)))
00207 104* C AREA INJECTOR (FLOW)
00210 105* 80 CONTINUE
00210 106* C THRUSTER EXIT PRESSURE

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00211 107* PE(I) = PCN(I) / (1.0 + (KA(IPROP) - 1.0) * 0.5 * MEX(I) ** 2) ** (KA(IPROP)
00211 108* / (KA(IPROP) - 1.0))
00211 109* C PGT = TOTAL PRESSURE
00212 110* BB = CDC(I) * AREAT(I) * PCN(I,1) * SQRT(KA(IPROP) / (RGAS(IPROP) * TTTEMP
00212 111* (II, JJ)) * (2. / (KA(IPROP) + 1.)) ** ((KA(IPROP) + 1.)) / (KA(IPROP) - 1.))
00212 112* C CDC = CHAMBER FLOWRATE DISCHARGE COEFFICIENT
00212 113* C C = CONSTANT FOR THRUST EQ
00213 114* C = AREA(I) * (PE(I) * (1. + LAMDA(I) * KA(IPROP) * MEX(I) ** 2) - PATM)
00213 115* C LAMDA = DIVERGENCE COEFFICIENT NOZZLE
00213 116* C PATM = ATMOSPHERIC PRESSURE
00214 117* THRT(I) = C
00215 118* CONTINUE
00215 119* C *NOZ = THRUSTER NOZZLE FLOWRATE
00216 120* ANOZ(I) = BB
00217 121* ISP(I) = THRT(I) / ANOZ(I)
00217 122* C THRT = ENGINE THRUST
00220 123* GO TO (120, 110, 100), CTW
00220 124* C CTW CONSTRAINT EQUATION SWITCH COMBUSTOR (1 = ISP, 2 = PC, 3 = THRUST)
00220 125* C CONSTRAINT EQ THRUST
00221 126* 100 CONCT(I, I) = 1. - C / THRT(I)
00222 127* GO TO 130
00222 128* C CONSTRAINT EQ PC
00223 129* 110 CONCT(I, I) = 1. - PCN(I, I) / PCI(I)
00224 130* GO TO 130
00224 131* C CONSTRAINT EQ ISP
00225 132* 120 CONCT(I, I) = 1. - ISP(I) / ISPI(I)
00226 133* 130 IF (RFLAG), 150,
00231 134* WRITE(6, 140) I, II, JJ, CTW
00231 135* 1, NCHAM, IPROP, ICMON, ICMON
00231 136* 2, KAY, E, B, C
00231 137* 3, ME, O, AREA1(I), AREAT(I)
00231 138* 4, A, DA, C6, ARINJ(I, I)
00231 139* 5, CV(I, I), GC, RGAS(II), TTTEMP(II, JJ)
00231 140* 6, PCN(I, I), PGT(II, JJ), C9, C7
00231 141* 7, *DOTG(II, JJ), DCLP, DELP, PE(I)
00231 142* 8, BB, CDC(I), PATM, LAMDA(I)
00231 143* 9, MEX(I), THRT(I), *NOZ(I), ISP(I)
00231 144* 0, CONCT(I, I)
00304 145* 140 FORMAT(//24X12HCMON ROUTINE/7X4I17/7X4I17/(7X1P4E17.7))
00305 146* 150 RETURN
00306 147* END

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END OF UNIVAC 1108 FORTRAN V COMPILATION.

0 *DIAGNOSTIC* MESSAGE(S)

CMON	CODE	SYMBOLIC RELOCATABLE	30 JUN 71	20:46:25	0	01723036	14	147	(DELETED)
			30 JUN 71	20:46:25	1	01727050	36	1	(DELETED)
					0	01727114	14	68	

@ HDG @ FOR, * C*ALL, C*ALL

@ FOR,* C*ALL,C*ALL
UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:01

31 AUG 71

9:27: 1.109

SUBROUTINE C*ALL ENTRY POINT 000012

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000014
0000 *DATA 000010
0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

71

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00101 1* SUBROUTINE C*ALL(T,K)
00101 2* CC
00101 3* CC THIS SUBROUTINE COMPUTES THE THERMAL
00101 4* CC CONDUCTIVITY OF AISI 347 STAINLESS IN
00101 5* CC BTU/IN-SEC-DEG R
00101 6* CC
00101 7* C  $K = (0.0546 * T + 72.8) / 3600.0 / 144.0$ 
00103 8* REAL K
00104 9* K =  $1.05324074E-7 * T + 1.40432099E-4$ 
00105 10* RETURN
00106 11* END

```

END OF UNIVAC 1108 FORTRAN V COMPILATION.

0 *DIAGNOSTIC MESSAGE(S)

C*ALL	SYMBOLIC	30 APR 71	11:19:10	0	01457344	14	1	(DELETED)
C*ALL	RELOCATABLE	30 APR 71	11:19:10	1	01457576	24	1	(DELETED)
				0	01457626	14	3	

@ HDG @ FOR,* DP2R,DP2R

@ FOR, DP2R,DP2R
 UNIVAC 1108 FORTRAN V LEVEL 2206 GC18 FS018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:02

FUNCTION DP2R ENTRY POINT 000011

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000013
 0000 *DATA 000007
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 R 000000 DP2R

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00101 1* FUNCTION DP2R(X)
 00101 2* C.....
 00103 3* DOUBLE PRECISION
 00103 4* * X
 00103 5* C.....
 00104 6* DP2R = SNGL(X)
 00105 7* RETURN
 00106 8* END

END OF UNIVAC 1108 FORTRAN V COMPILATION.

0 *DIAGNOSTIC* MESSAGE(S)

DP2R	SYMBOLIC	30 APR 71	11:19:11	0	01457700	14	8	(DELETED)
DP2R	CODE RELOCATABLE	30 APR 71	11:19:11	1	01460060	24	1	(DELETED)
				0	01460110	14	2	

@ HDG @ FOR, DRIVER,DRIVER

3.2.17 DRIVER (OXYGEN PROPERTIES)

FOR, DRIVER, DRIVER
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018_F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:03

31 AUG 71

9:27: 3. 69

MAIN PROGRAM

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000206
 0000 *DATA 006071
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 OPTD
 0004 OPTCP
 0005 OPTCV
 0006 NWDUS
 0007 N1O1S
 0010 N1O2S
 0011 NSTOPS

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000002	104G	0001	000017	111G	0001	000027	115G	0001	000074	130G	0001	000103	135G	
0001	000112	142G	0001	000126	151G	0001	000135	156G	0001	000144	163G	0001	000160	172G	
0001	000167	177G	0001	000176	204G	0000	006051	900F	0000	006056	901F	0000	R	002126	CP
0000	R	004076	CV	0000	I	006050	I	0000	I	006047	IP	0000	I	006046	IT
0005	R	000000	OPTCV	0003	R	000000	OPTD	0000	R	000000	P	0000	R	000156	R
												0000	R	000144	T

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```

00101 1*      DIMENSION P(100), T(10), R(10,100), CP(10,100), CV(10,100)
00103 2*      DO 10 IT = 1,10
00106 3*      10 T(IT) = 50. * FLOAT(IT) + 50.001
00110 4*      DO 20 IP = 1,100
00113 5*      P(IP) = 10. * FLOAT(IP)
00114 6*      DO 30 IT = 1,10
00117 7*      R (IT,IP) = OPTD (P(IP),T(IT))
00120 8*      CP(IT,IP) = OPTCP(P(IP),T(IT))
00121 9*      CV(IT,IP) = OPTCV(P(IP),T(IT))
00122 10*     30 CONTINUE
00124 11*     20 CONTINUE
00126 12*     WRITE (6,900) (T(I),I=1,10)
00134 13*     DO 40 IP=1,100
00137 14*     40 WRITE(6,901) P(IP), (R (IT,IP), IT=1,10)
00147 15*     WRITE (6,900) (T(I),I=1,10)
00155 16*     DO 41 IP=1,100
00160 17*     41 WRITE(6,901) P(IP), (CP(IT,IP), IT=1,10)
00170 18*     WRITE (6,900) (T(I),I=1,10)
00176 19*     DO 42 IP=1,100
00201 20*     42 WRITE(6,901) P(IP), (CV(IT,IP), IT=1,10)
  
```

@ FOR, * DRIVER, DRIVER

DATE 310871 PAGE 133

00211 21* 900 FORMAT (I11,6,EMP =,4X,10F11.0/)
 00212 22* 901 FORMAT (1H,FD,0,4X,10E11.5)
 00213 23* END

END OF UNIVAC 1108 FORTRAN V COMPILATION.
 DRIVER CODE SYMBOLIC
 DRIVER CODE RLOCATABLE

U *DIAGNOSTIC* MESSAGE(S)

26 JUN 71	22:03:52	0	01721726	14	23	(DELETED)
26 JUN 71	22:03:52	1	01722430	24	1	(DELETED)
		0	01722460	14	17	

@ HDG @ FOR, * FCOMPL,FCOMPI

3.2.18 FCOMP 1 (GAS LINE WITH HEAT TRANSFER AND FRICTION
MACH NUMBER CALCULATIONS)

@ FOR, FCOMP1,FCOMP1
UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:04

31 AUG 71

9:27: 4.422

SUBROUTINE FCOMP1 ENTRY POINT 000214

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000240
0000 *DATA 000064
0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 NWDG\$
0004 NIO2\$
0005 NERR3\$

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000055	1256	0000	000021	30F	0000 R	000003	A	0000 R	000007	AVGM	0000 R	000015	B		
0000	R	000016	C	0000	R	000006	D	0000 R	000013	DELXL	0000 R	000014	DIALI	0000 R	000005	E
0000	R	000020	FPM2	0000	R	000012	FRL	0000 I	000017	J	0000 R	000002	KA	0000 R	000000	M1
0000	R	000001	M2P	0000	R	000010	T1	0000 R	000011	T2	0000 R	000004	Z			

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```

00100 1* C
00101 2* SUBROUTINE FCOMP1(Y,M2,FM2)
00101 3* C
00103 4* REAL M1,M2,M2P,KA
00103 5* C
00104 6* DIMENSION Y(7)
00104 7* C
00104 8* C BUILT IN FUNCTIONS FOR MACH NO. DIFFERENTIAL EQUATION
00105 9* F(ZM2) = M1**2 - ZM2**2 + (2.0*A*Z + Z**2*E + Z**3*D)/(1.0-Z)
00106 10* FP(ZM2) = -2.0*ZM2 + AVGM*((1.0-Z)*(2.0*A+2.0*Z*E+3.0*Z**2*D) +
00106 11* * 2.0*A*Z+Z**2*E+Z**3*D)/(1.0-Z)**2
00106 12* C
00107 13* M1 = Y(1)
00110 14* T1 = Y(2)
00111 15* T2 = Y(3)
00112 16* FRL = Y(4)
00113 17* DELXL = Y(5)
00114 18* DIALI = Y(6)
00115 19* KA = Y(7)
00115 20* C
00116 21* A = (T2-T1)/(T2+T1)
00117 22* B = (48.0*FRL*DELXL)/DIALI
00120 23* C = 0.5*(KA-1.0)
00121 24* D = KA*(2.0*A*C + B*C)
00122 25* E = 2.0*A*C + KA*(2.0*A + B)

```



```

      FOR,* FCOMP1,FCOMP1
00123 26*      M2      = M 5.0E-3
00123 27*      C
00124 28*      DO 20 J=1,10
00127 29*      AVGM    = 0.5*(M1 + M2)
00130 30*      Z        = AVGM**2
00131 31*      FM2     = F(M2)
00132 32*      FPM2    = FP(M2)
00133 33*      M2P     = M2 - FM2/FPM2
00134 34*      IF (ABS(M2-M2P).LE.1.0E-8.OR.ABS(FM2).LE.1.0E-8) RETURN
00136 35*      M2      = M2P
00137 36*      20 CONTINUE
00137 37*      C
00141 38*      WRITE (6,30)
00143 39*      30 FORMAT (//4X24HNO CONVERGENCE IN FCOMP1 )
00143 40*      C
00144 41*      RETURN
00145 42*      END
  
```

END OF UNIVAC 1108 FORTRAN V COMPILATION.

0 *DIAGNOSTIC* MESSAGE(S)

FCOMP1	SYMBOLIC	31 AUG 71	09:25:02	0	02110140	14	42	(DELETED)
FCOMP1	CODE	RELOCATABLE	31 AUG 71	09:25:02	1	02111254	24	1 (DELETED)
				0	02111304	14	19	

FOR,* FCOMP2,FCOMP2

3.2.19 FCOMP 2 (ADIATIC GAS LINE MACH NUMBER CALCULATIONS)

FOR, * FCOMP2, FCOMP2
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:06

31 AUG 71

9:27: 5.878

SUBROUTINE FCOMP2 ENTRY POINT 000136

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000163
 0000 *DATA 000051
 0002 *BLANK 000000
 0003 INDATA 011610

EXTERNAL REFERENCES (BLOCK, NAME)

0004 ALOG
 0005 NWDVS
 0006 N102\$
 0007 NERR3\$

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000040	1236	0000	000013	30F	0000	R	000001	A	0004	R	000000	ALOG	0000	R	000002	B			
0000	R	000006	DIAL1	0000	R	000011	FPG2	0000	R	000003	FRL	0003	I	000551	I	PROP	0000	I	000010	J
0003	R	006064	MW	0000	R	000000	PG1	0000	R	000012	PG2P	0003	R	000000	S		0000	R	000005	TTEMP
0000	R	000004	WDOTG	0000	R	000007	XLENG													

00100 1* C
 00100 2* C FUNCTION GENERATOR FOR 150TH USING NEWTON-RAPHSON TECHNIQUE
 00100 3* C
 00101 4* C SUBROUTINE FCOMP2 (X,PG2,FPG2)
 00101 5* C
 00103 6* C REAL MW
 00103 7* C
 00104 8* C DIMENSION X(6), MW(2)
 00104 9* C
 00105 10* C COMMON /INDATA/S(5000)
 00105 11* C
 00106 12* C EQUIVALENCE
 00106 13* C * (S(362), IPROP) ,(S(3125), MW(1))
 00106 14* C
 00106 15* C BUILT-IN FUNCTIONS FOR PRESSURE BOUNDARY DIFFERENTIAL EQUATION
 00107 16* C $F(ZPG2) = ZPG2^{**2} - PG1^{**2} + A*(B-ALOG(ZPG2/PG1))$
 00110 17* C $FP(ZPG2) = 2.0*ZPG2 - A/ZPG2$
 00110 18* C
 00111 19* C PG1 = X(1)
 00112 20* C FRL = X(2)
 00113 21* C WDOTG = X(3)
 00114 22* C TTEMP = X(4)
 00115 23* C DIAL1 = X(5)

```

00116 24* XLENGL =
00116 25*
00117 26* C A = 155.695*WDOTG**2*ITEMP/(MW(IPROP)*DIALI**4)
00120 27* a = 24.0*FRL*XLENGL/DIALI
00121 28* PG2 = PG1 - 1.0
00121 29* C
00122 30* DO 20 J=1,10
00125 31* FPGZ = F(PG2)
00126 32* FPPG2 = FP(PG2)
00127 33* PG2P = PG2 - FPGZ/FPPG2
00130 34* IF (ABS(PG2-PG2P).LE.1.0E-8.OR.ABS(FPGZ).LE.1.0E-8) RETURN
00132 35* PG2 = PG2P
00133 36* 20 CONTINUE
00133 37* C
00135 38* WRITE (6,30)
00137 39* 30 FORMAT (//4X24HNO CONVERGENCE IN FCOMP2 )
00137 40* C
00140 41* RETURN
00141 42* END
    
```

END OF UNIVAC 1108 FORTRAN V COMPILATION. 0 *DIAGNOSTIC* MESSAGE(5)

FCOMP2	SYMBOLIC	31 AUG 71	09:25:03	0	02111716	14	42	(DELETED)
FCOMP2	CODE	31 AUG 71	09:25:03	1	02113032	24	1	(DELETED)
	RELOCATABLE			0	02113062	14	14	

@ HDG @ FOR,0 FCOMP3,FCOMP3

3.2.20. FCOMP 3 (ISOTHERMAL GAS LINE MACH NUMBER CALCULATIONS)

R FOR, FCOMP3,FCOMP3
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:07

31 AUG 71

9:27: 7.333

SUBROUTINE FCOMP3 ENTRY POINT 000177

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000224
 0000 *DATA 000054
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 ALOG
 0004 NWDUS
 0005 NIOZS
 0006 NERR3S

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001 000062 117G 0000 000012 30F 0003 R 000000 ALOG 0000 R 000006 C 0000 R 000005 DIALI
 0000 R 000011 FPMZ 0000 R 000003 FRL 0000 R 000007 G 0000 I 000010 J 0000 R 000002 KA
 0000 R 000000 M1 0000 R 000001 M2P 0000 R 000004 XLENGL

00101 10 SUBROUTINE FCOMP3 (X,M2,FMZ)
 00101 20 C
 00103 30 REAL M1,M2,M2P,KA
 00103 40 C
 00104 50 DIMENSION X(5)
 00104 60 C
 00104 70 C BUILT-IN FUNCTIONS FOR ADIABATIC MACH NO. DIFFERENTIAL EQUATION
 00104 80 C
 00105 90 F(ZM2) = -48.0*FRL*XLENGL/DIALI + (1.0-M1*M1)/(KA*M1*M1) +
 00105 100 C * C*ALOG((M1*M1*(KA+1.0))/(2.0+M1*M1*(KA-1.0))) +
 00105 110 C * (ZM2**2-1.0)/(KA*ZM2**2) - C*ALOG((ZM2*ZM2*(KA+1.0))/
 00105 120 C * G)
 00106 130 FP(ZM2) = 2.0/(KA*ZM2**3) - 4.0*C/(ZM2+G)
 00106 140 C
 00107 150 M1 = X(1)
 00110 160 FRL = X(2)
 00111 170 XLENGL = X(3)
 00112 180 DIALI = X(4)
 00113 190 KA = X(5)
 00113 200 C
 00114 210 C = (KA+1.0)/(KA+KA)
 00115 220 M2 = M1 + 5.0E-3
 00115 230 C
 00116 240 DO 20 J=1,10
 00121 250 G = 2.0 + M2*M2*(KA-1.0)

```

00122 26* FM2 = 
00123 27* FPM2 = FPM2)
00124 28* M2P = M2 - FPM2/FPM2
00125 29* IF (ABS(M2-M2P).LE.1.0E-8.OR.ABS(FM2).LE.1.0E-8) RETURN
00127 30* M2 = M2P
00130 31* 20 CONTINUE
00130 32* C
00132 33* WRITE (6,30)
00134 34* 30 FORMAT (//4X24HND CONVERGENCE IN FCOMP3 )
00134 35* C
00135 36* RETURN
00136 37* END
    
```

END OF UNIVAC 1108 FORTRAN V COMPILATION.

DIAGNOSTIC MESSAGE(S)

FCOMP3	SYMBOLIC	31 AUG 71	09:25:05	0	02113366	14	37	(DELETED)
FCOMP3	CODE	RELOCATABLE	31 AUG 71	09:25:05	1	02114374	24	1 (DELETED)
				0	02114424	14	18	

HDF B FOR,* GATHER,GATHER

3.2.21 GATHER (SETS UP PROGRAM STATE VARIABLES, FUNCTION CONSTRAINT EQUATIONS AND CALLS SYSTEM COMPONENT MODELS)

UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:08

SUBROUTINE GATHER ENTRY POINT 001251

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	001267
0000	*DATA	000227
0002	*BLANK	000000
0003	INDATA	011610
0004	COM	006525

EXTERNAL REFERENCES (BLOCK, NAME)

0005	PBL
0006	PIPL
0007	ADIAB
0010	ISOTH
0011	JUNCL
0012	CHAM
0013	CHON
0014	HEATX
0015	TANKO
0016	TANKC
0017	PIPLL
0020	TURBOP
0021	PREG
0022	VALVG
0023	VALVL
0024	FEEDB
0025	NWDUS
0026	N1015
0027	N1025
0030	NSTOP5
0031	NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000064	10L	0001	000254	100L	0001	000270	102L	0001	000304	103L	0001	000320	104L
0001	000334	105L	0001	000350	106L	0001	000364	107L	0001	000400	108L	0001	000414	109L
0000	000101	110F	0001	000430	111L	0001	000443	120L	0000	000113	130F	0001	000042	131G
0001	000517	140L	0001	000527	150L	0001	000537	160L	0001	000547	170L	0001	000557	180L
0001	000567	190L	0001	000100	20L	0001	000577	200L	0001	000607	210L	0001	000617	220L
0001	000627	230L	0001	000637	240L	0001	000647	242L	0001	000657	243L	0001	000667	244L
0001	000677	249L	0000	000134	250F	0001	000707	251L	0001	000722	260L	0001	000750	270L
0001	000467	271G	0001	000762	280L	0001	000774	290L	0001	001006	292L	0001	001020	293L
0001	001032	294L	0001	001044	295L	0001	001056	296L	0001	001070	297L	0001	001102	298L
0001	001114	299L	0001	000114	30L	0000	000146	300F	0001	001126	301L	0001	000504	302G
0001	001140	302L	0001	001152	303L	0001	001164	304L	0001	001177	310L	0000	000160	320F
0001	000130	40L	0001	000733	417G	0001	000144	50L	0001	001224	534G	0001	000160	60L
0001	000174	70L	0001	000210	80L	0001	000224	90L	0001	000240	91L	0004	R 000000	AREA

0004 R 000074 AREAI	0004 R 000170 AREAK	0004 R 000132 AREA0	0003 R 006060 EAT	0003 R 006121 ARINJ
0004 R 005060 CF	0004 R 006423 CGGTC	0004 R 006436 CGTANK	0004 R 006437 CLTANK	0004 R 005014 CONCT
0004 R 006443 CPJU	0004 R 005006 CSTAR	0004 R 006355 CVEL	0004 R 000036 DELXL	0004 R 000226 DIALI
0003 R 000510 DIALO	0004 R 006277 DMVENT	0004 R 006360 ETAT	0004 R 006370 FBPC	0004 R 006376 FBTC
0004 R 006362 FBWC	0004 R 005111 FRL	0003 I 010001 FUNCT	0004 R 003132 HI	0004 R 003036 HO
0003 R 006562 HR	0004 R 003322 HRAD	0000 I 000074 I	0000 I 000024 ICALLS	0004 I 005110 ICMON
0000 I 000050 IFUNCT	0000 I 000000 INDV	0004 I 005052 ISPT	0000 I 000075 IT	0000 I 000077 J
0004 R 003606 JUN	0000 I 000100 K	0003 R 006304 LENGTH	0003 I 000676 M	0003 R 004561 MACH
0004 I 005066 MEX	0004 I 004736 MR	0004 I 005102 MWC	0003 I 000677 N	0004 I 002552 NGR
0004 I 002646 NPR	0004 I 002742 NRE	0003 I 004013 NSYS	0003 R 006366 P	0004 R 000264 PB
0004 R 004764 PC	0003 R 006151 PCI	0004 R 004772 PCN	0003 R 000644 PDELP	0004 R 005074 PE
0004 R 000272 PG	0003 R 004553 PGPBL	0004 R 003620 PGI	0004 R 005036 PNR	0004 R 006241 POWN
0004 R 006350 PQAP	0004 R 006343 POWT	0004 R 006300 PPI	0004 R 006305 PPO	0003 R 006721 PRE
0004 R 006331 PTI	0004 R 006336 PTO	0004 R 006357 R	0003 R 005754 RFLAG	0000 R 000076 RFLAG1
0004 R 001422 RHOQ	0003 R 006316 RI	0003 R 006424 RO	0004 R 006312 RPMT	0003 R 000000 S
0003 I 007541 STATE	0003 I 007065 SYSCOM	0004 R 005044 TC	0004 R 006416 THOC	0003 R 006135 THRT
0004 R 006411 TPCG	0004 R 006404 TPCL	0003 R 001132 TTEMP	0004 R 006317 TTI	0004 R 006324 TTO
0003 R 002262 TTEMP	0004 R 003226 TWALL	0004 R 006356 U	0004 R 003416 UAO	0004 R 003512 VEL
0003 R 003423 WDTG	0004 R 006265 XI	0004 R 004750 WNOZ	0004 R 006253 W0	0004 R 006361 WT
0004 R 006246 WTGC	0003 R 007003 XK			

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00101 10 SUBROUTINE GATHER (X,F,PP,IBLEW)
00101 20 C
00103 30 REAL MACH,JUN,LENGTH
00103 40 C
00104 50 INTEGER SYSCOM,STATE,FUNCT
00104 60 C
00105 70 DIMENSION X(30),F(30),INDV(20),ICALLS(20),IFUNCT(20)
00105 80 C
00106 90 DIMENSION STATE(4,40),FUNCT(2,40),SYSCOM(2,150)
00106 100 *, TTEMP(30,20),TTTEMP(30,20),WDTG(30,20),MACH(30,20)
00106 110 *, PGPBL(6),DIALO(30),ARINJ(6,2),PCI(6),AREAT(6)
00106 120 *, THRT(6),PDELP(5),XK(20),PRE(10),LENGTH(5),RI(5),RO(5)
00106 130 *, HR(5),P(5)
00106 140 C
00107 150 COMMON /INDATA/S(5000)
00107 160 C
00110 170 COMMON /COM/AREA(30),DELXL(30),AREAI(30),AREA0(30),AREAK(30)
00110 180 *, DIALI(30),PB(6),PG(30,20),RHOQ(30,20),NGR(30,2)
00110 190 *, NPR(30,2),NRE(30,2),HO(30,2),HI(30,2),TWALL(30,2)
00110 200 *, HRAD(30,2),UAO(30,2),VEL(30,2),JUN(10),PGT(30,20)
00110 210 *, WNOZ(6),MR(6),PC(6),PCN(6,2),CSTAR(6),CONCT(18)
00110 220 *, PMR(6),TC(6),ISPT(6),CF(6),MEX(6),PE(6),MWC(6),ICMON
00110 230 *, FRL(30,20),POW(5),WTGC(5),WO(10),NI(10),DMVENT,PPI(5)
00110 240 *, PPO(5),RPMT(5),TTI(5),TTO(5),PTI(5),PTO(5),POWT(5)
00110 250 *, PQAP(5),CVEL,U,R,ETAT,RT,FBWC(6),FBPC(6)
00110 260 *, FBTC(6),TPCL(5),TPCG(5),THOC(5),CGGTC(6),CLTANK(5)
00110 270 *, CGTANK(5),CPJU(50)
00110 280 C
00111 290 EQUIVALENCE
00111 300 *, (S(447),M), (S(448),N), (S(3938),STATE(1,1))
00111 310 *, (S(603),TTEMP(1,1)), (S(1812),WDTG(1,1)), (S(1203),TTTEMP(1,1))
00111 320 *, (S(3154),ARINJ(1,1)), (S(3178),PCI(1)), (S(3127),AREAT(1))
00111 330 *, (S(2410),MACH(1,1)), (S(3638),SYSCOM(1,1)), (S(3291),DIALO(1))
00111 340 *, (S(3084),NSYS), (S(4098),FUNCT(1,1)), (S(2412),PGPBL(1))
    
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00111 35°      °,(S(3166),THRT(1))      ,(S(421) ,PDELP(1))      ,(S(3584),XK(1))
00111 36°      °,(S(3538),PRE(1))      ,(S(3269),LENGTH(1))      ,(S(3279),RI(1))
00111 37°      °,(S(3349),RO(1))      ,(S(3443),HR(1))
00111 38°      °,(S(3053),RFLAG)
00111 39°      °,(S(3319),P(1))
00111 40°      C
00112 41°      DATA(INDV(I),I=1,20)      / 6HWDOTG      , 6HMACH
00112 42°      °,      6HPG      , 6HDIALO
00112 43°      °,      6HTTEMP      , 6HTTEMP
00112 44°      °,      6HPGPBL      , 6HARINJ
00112 45°      °,      6HPCI      , 6HAREAT
00112 46°      °,      6HTHRT      , 6HDIALI
00112 47°      °,      6HPDELP      , 6HXX
00112 48°      °,      6HPRE      , 6HLENGTH
00112 49°      °,      6HRI      , 6HRO
00112 50°      °,      6HHR      , 6hP
00112 51°      C
00114 52°      DATA (ICALLS(I),I=1,20)      / 6HPBL      , 6HPIPL
00114 53°      °,      6HADIAB      , 6HISOTH
00114 54°      °,      6HJUNCL      , 6HCHAM
00114 55°      °,      6HCMON      , 6HHEATX
00114 56°      °,      6HTANKD      , 6HTANKC
00114 57°      °,      6HPIPLL      , 6HTURBOP
00114 58°      °,      6HPREG      , 6HVALVG
00114 59°      °,      6HVALVL      , 6HFEEOB
00114 60°      °,      6H      , 6H
00114 61°      °,      6H      , 6H
00114 62°      C
00116 63°      DATA (IFUNCT(I),I=1,20)      / 6HPB      , 6HJUN
00116 64°      °,      6HCONCT      , 6HPDHC
00116 65°      °,      6HWTGC      , 6HFBWC
00116 66°      °,      6HFBPC      , 6HFBTC
00116 67°      °,      6HTPCL      , 6HTPCG
00116 68°      °,      6HTHOC      , 6HCGGTC
00116 69°      °,      6HCLTANK      , 6HCGTANK
00116 70°      °,      6HCPJU      , 6H
00116 71°      °,      6H      , 6H
00116 72°      °,      6H      , 6H
00116 73°      C
00120 74°      DATA IT/=1/
00120 75°      C
00122 76°      IT = IT+1
00123 77°      IF (IT.EQ.0) RFLAG1 = RFLAG
00125 78°      °DIAGNOSTIC° THE TEST FOR EQUALITY BETWEEN NON-INTEGERS MAY NOT BE MEANINGFUL.
00125 79°      ° IF ((IT.EQ.M+1).AND.(RFLAG1.GT.0.).AND.(RFLAG.EQ.0.)) RFLAG = 1.
00127 80°      C      IBLEW      = 0
00127 81°      C
00127 82°      C      SET UP INDEPENDENT VARIABLES
00127 83°      C
00130 84°      DO 120 I=1,M
00133 85°      J      = STATE(2,I)
00134 86°      K      = STATE(3,I)
00135 87°      IF (STATE(1,I).NE.INDV(1)) GO TO 10
00137 88°      WDOTG(J,K) = X(I)
00140 89°      GO TO 120
00141 90°      10 IF (STATE(1,I).NE.INDV(2)) GO TO 20
00143 91°      HACH(J,K) = X(I)

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00144 92* GO TO 120
00145 93* 20 IF (STATE(1,1).NE.INDV(3)) GO TO 30
00147 94* PG(J,K) = X(I)
00150 95* GO TO 120
00151 96* 30 IF (STATE(1,1).NE.INDV(4)) GO TO 40
00153 97* DIALO(J) = X(I)
00154 98* GO TO 120
00155 99* 40 IF (STATE(1,1).NE.INDV(5)) GO TO 50
00157 100* TTEMP(J,K) = X(I)
00160 101* GO TO 120
00161 102* 50 IF (STATE(1,1).NE.INDV(6)) GO TO 60
00163 103* TTEMP(J,K) = X(I)
00164 104* GO TO 120
00165 105* 60 IF (STATE(1,1).NE.INDV(7)) GO TO 70
00167 106* PGPBL(J) = X(I)
00170 107* GO TO 120
00171 108* 70 IF (STATE(1,1).NE.INDV(8)) GO TO 80
00173 109* ARINJ(J,K) = X(I)
00174 110* GO TO 120
00175 111* 80 IF (STATE(1,1).NE.INDV(9)) GO TO 90
00177 112* PCI(J) = X(I)
00200 113* GO TO 120
00201 114* 90 IF (STATE(1,1).NE.INDV(10)) GO TO 91
00203 115* AREAT(J) = X(I)
00204 116* GO TO 120
00205 117* 91 IF (STATE(1,1).NE.INDV(11)) GO TO 100
00207 118* THRT(J) = X(I)
00210 119* GO TO 120
00211 120* 100 IF (STATE(1,1).NE.INDV(12)) GO TO 102
00213 121* DIAL1(J) = X(I)
00214 122* GO TO 120
00215 123* 102 IF (STATE(1,1).NE.INDV(13)) GO TO 103
00217 124* PDERP(J) = X(I)
00220 125* GO TO 120
00221 126* 103 IF (STATE(1,1).NE.INDV(14)) GO TO 104
00223 127* XK(J) = X(I)
00224 128* GO TO 120
00225 129* 104 IF (STATE(1,1).NE.INDV(15)) GO TO 105
00227 130* PRE(J) = X(I)
00230 131* GO TO 120
00231 132* 105 IF (STATE(1,1).NE.INDV(16)) GO TO 106
00233 133* LENGTH(J) = X(I)
00234 134* GO TO 120
00235 135* 106 IF (STATE(1,1).NE.INDV(17)) GO TO 107
00237 136* RI(J) = X(I)
00240 137* GO TO 120
00241 138* 107 IF (STATE(1,1).NE.INDV(18)) GO TO 108
00243 139* RO(J) = X(I)
00244 140* GO TO 120
00245 141* 108 IF (STATE(1,1).NE.INDV(19)) GO TO 109
00247 142* HR(J) = X(I)
00250 143* GO TO 120
00251 144* 109 IF (STATE(1,1).NE.INDV(20)) GO TO 111
00253 145* P(J) = X(I)
00254 146* GO TO 120
00255 147* 111 CONTINUE
00256 148* WRITE(6,110)STATE(1,1),1
00262 149* 110 FORMAT(/'BX4H*** A6,3IHIS AN ILLEGAL NAME FOR STATE(1,12,1H)')

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00263 150* STOP
00264 151* 120 CONTINUE
00266 152* WRITE(6,130)IT,(STATE(1,1),STATE(2,1),STATE(3,1),X(1),I=1,M)
00300 153* 130 FORMAT (//T25,'ITERATION'14,
00300 154* * 5X,'GATHER-ROUTINE (INDEPENDENT VARIABLES)'/
00300 155* * 4(1XA6,1H(12,1H,12,3H) =1PE13,7) )
00300 156* C
00300 157* C SET UP MODEL CALLS
00300 158* C
00301 159* DO 260 I=1,NSYS
00304 160* J = SYSCOM(2,I)
00305 161* IF (SYSCOM(1,I).NE.ICALLS(1)) GO TO 140
00307 162* CALL PBL (J)
00310 163* GO TO 260
00311 164* 140 IF (SYSCOM(1,1).NE.ICALLS(2)) GO TO 150
00313 165* CALL PIPL (J)
00314 166* GO TO 260
00315 167* 150 IF (SYSCOM(1,1).NE.ICALLS(3)) GO TO 160
00317 168* CALL ADIAB (J)
00320 169* GO TO 260
00321 170* 160 IF (SYSCOM(1,1).NE.ICALLS(4)) GO TO 170
00323 171* CALL ISOTH (J)
00324 172* GO TO 260
00325 173* 170 IF (SYSCOM(1,1).NE.ICALLS(5)) GO TO 180
00327 174* CALL JUNCL (J)
00330 175* GO TO 260
00331 176* 180 IF (SYSCOM(1,1).NE.ICALLS(6)) GO TO 190
00333 177* CALL CHAM (J)
00334 178* GO TO 260
00335 179* 190 IF (SYSCOM(1,1).NE.ICALLS(7)) GO TO 200
00337 180* CALL CMON (J)
00340 181* GO TO 260
00341 182* 200 IF (SYSCOM(1,1).NE.ICALLS(8)) GO TO 210
00343 183* CALL HEATX (J)
00344 184* GO TO 260
00345 185* 210 IF (SYSCOM(1,1).NE.ICALLS(9)) GO TO 220
00347 186* CALL TANKD (J)
00350 187* GO TO 260
00351 188* 220 IF (SYSCOM(1,1).NE.ICALLS(10)) GO TO 230
00353 189* CALL TANKC (J)
00354 190* GO TO 260
00355 191* 230 IF (SYSCOM(1,1).NE.ICALLS(11)) GO TO 240
00357 192* CALL PIPLL (J)
00360 193* GO TO 260
00361 194* 240 IF (SYSCOM(1,1).NE.ICALLS(12)) GO TO 242
00363 195* CALL TURBOP (J)
00364 196* GO TO 260
00365 197* 242 IF (SYSCOM(1,1).NE.ICALLS(13)) GO TO 243
00367 198* CALL PREG (J)
00370 199* GO TO 260
00371 200* 243 IF (SYSCOM(1,1).NE.ICALLS(14)) GO TO 244
00373 201* CALL VALVG (J)
00374 202* GO TO 260
00375 203* 244 IF (SYSCOM(1,1).NE.ICALLS(15)) GO TO 249
00377 204* CALL VALVL (J)
00400 205* GO TO 260
00401 206* 249 IF (SYSCOM(1,1).NE.ICALLS(16)) GO TO 251
00403 207* CALL FEEDB (J)

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00404 208* GO TO 260
00405 209* 251 CONTINUE
00406 210* WRITE (6,250)SYSCOM(1,1),I
00412 211* 250 FORMAT(/8X4H*** A6,32HIS AN ILLEGAL NAME FOR SYSCOM(1,12,1H))
00413 212* STOP
00414 213* 260 CONTINUE
00414 214*
00414 215* C
C SET UP FUNCTIONAL VALUES
00414 216* C
00416 217* DO 310 I=1,N
00421 218* J = FUNCT(2,I)
00422 219* IF (FUNCT(1,I).NE.IFUNCT(1)) GO TO 270
00424 220* F(I) = PB(J)
00425 221* GO TO 310
00426 222* 270 IF (FUNCT(1,I).NE.IFUNCT(2)) GO TO 280
00430 223* F(I) = JUN(J)
00431 224* GO TO 310
00432 225* 280 IF (FUNCT(1,I).NE.IFUNCT(3)) GO TO 290
00434 226* F(I) = CONCT(J)
00435 227* GO TO 310
00436 228* 290 IF (FUNCT(1,I).NE.IFUNCT(4)) GO TO 292
00440 229* F(I) = POWC(J)
00441 230* GO TO 310
00442 231* 292 IF (FUNCT(1,I).NE.IFUNCT(5)) GO TO 293
00444 232* F(I) = HTGC(J)
00445 233* GO TO 310
00446 234* 293 IF (FUNCT(1,I).NE.IFUNCT(6)) GO TO 294
00450 235* F(I) = FBWC(J)
00451 236* GO TO 310
00452 237* 294 IF (FUNCT(1,I).NE.IFUNCT(7)) GO TO 295
00454 238* F(I) = FBPC(J)
00455 239* GO TO 310
00456 240* 295 IF (FUNCT(1,I).NE.IFUNCT(8)) GO TO 296
00460 241* F(I) = FBTC(J)
00461 242* GO TO 310
00462 243* 296 IF (FUNCT(1,I).NE.IFUNCT(9)) GO TO 297
00464 244* F(I) = TPCL(J)
00465 245* GO TO 310
00466 246* 297 IF (FUNCT(1,I).NE.IFUNCT(10)) GO TO 298
00470 247* F(I) = TPCG(J)
00471 248* GO TO 310
00472 249* 298 IF (FUNCT(1,I).NE.IFUNCT(11)) GO TO 299
00474 250* F(I) = THOC(J)
00475 251* GO TO 310
00476 252* 299 IF (FUNCT(1,I).NE.IFUNCT(12)) GO TO 301
00500 253* F(I) = CGGC(J)
00501 254* GO TO 310
00502 255* 301 IF (FUNCT(1,I).NE.IFUNCT(13)) GO TO 302
00504 256* F(I) = CLTANK(J)
00505 257* GO TO 310
00506 258* 302 IF (FUNCT(1,I).NE.IFUNCT(14)) GO TO 303
00510 259* F(I) = CGTANK(J)
00511 260* GO TO 310
00512 261* 303 IF (FUNCT(1,I).NE.IFUNCT(15)) GO TO 304
00514 262* F(I) = CPJU(J)
00515 263* GO TO 310
00516 264* 304 CONTINUE
00517 265* WRITE (6,300)FUNCT(1,1),I

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@ FOR,* GATHER,GATHER

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00523 266* 300 FORMAT(/11X4H*** A6,31H)IS AN ILLEGAL NAME FOR FUNCT(1,12,1H))
00524 267* STOP
00525 268* 310 CONTINUE
00527 269* RFLAG = RFLAG - 1.
00530 270* IF (RFLAG.LT.0.) RFLAG = 0.
00532 271* WRITE(6,320){FUNCT(1,1),FUNCT(2,1),F(I),I=1,N)
00542 272* 320 FORMAT(/40X34HGATHER.ROUTINE (FUNCTIONAL VALUES)/
00542 273* * 4(1XA6,1H(12,3H) =1PE13.7) )
00543 274* RETURN
00544 275* END

```

END OF UNIVAC 1108 FORTRAN V COMPILATION. 1 *DIAGNOSTIC* MESSAGE(S)

GATHER	SYMBOLIC	31 AUG 71	09:25:09	0	02115020	14	275	(DELETED)
GATHER	CODE	RELOCATABLE	31 AUG 71	09:25:09	1	02124432	48	1 (DELETED)
					0	02124512	14	84

@ HDG @ FOR,* HEATEX,HEATEX

FOR HEATEX, HEATEX
 UNIVAC 1108 FORTRAN V LEVEL 2204 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:12

31 AUG 71

9:27:12.492

SUBROUTINE HEATEX ENTRY POINT 002212

STORAGE USED (BLOCK, NAME, LENGTH)

```
0001 *CODE 002333
0000 *DATA 000212
0002 *BLANK 000000
0003 INDATA 011610
0004 HEAT 001074
```

EXTERNAL REFERENCES (BLOCK, NAME)

```
0005 PROPTY
0006 SAT
0007 LATENT
0010 BPROPL
0011 BPROPG
0012 NUSLET
0013 CWALL
0014 SQRT
0015 EXP
0016 NEXP6S
0017 NERR2S
0020 NERR3S
```

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000032	10L	0001	000661	100L	0001	000742	110L	0001	000763	120L	0001	000772	121L
0001	001040	150L	0001	001076	160L	0001	001142	170L	0001	001350	180L	0001	001403	190L
0001	000123	20L	0001	001434	200L	0001	000241	210G	0001	001500	210L	0001	001712	220L
0001	000330	230G	0001	001745	230L	0001	002107	240L	0001	000220	30L	0001	000227	40L
0001	001772	470G	0001	000334	50L	0001	000461	70L	0001	000520	80L	0001	000562	90L
0001	000577	95L	0003 R	006361	ARFL	0000 R	000017	A63662	0000 R	000022	BINR	0000 R	000023	BOUTR
0004 R	000002	CPI	0000 R	000055	CPIA	0000 R	000101	CPIG	0000 R	000075	CPIL	0004 R	000027	CPO
0000 R	000056	CPOA	0000 R	000110	CPOG	0000 R	000105	CPOL	0000 R	000050	CI	0000 R	000051	C2
0000 R	000052	C3	0000 R	000070	DELWT	0003 R	006412	DHYO	0004 R	000054	DIST	0000 R	000064	DPFI
0000 R	000066	OPFO	0000 R	000065	OPMI	0000 R	000067	OPMO	0003 R	006405	OSI	0003 R	006373	OTB
0000 R	000041	OX	0000 R	000073	ENTHG	0000 R	000034	ENTHI	0000 R	000072	ENTHL	0000 R	000035	ENTHO
0000 R	000077	ENTLI	0003 I	006354	FD	0000 R	000060	FFACTI	0000 R	000062	FFACTO	0003 I	006543	FN
0000 R	000021	GC	0004 R	000101	HE	0004 R	000720	HI	0004 R	000772	HO	0004 R	000745	HW
0000 I	000043	I	0000 I	000053	J	0000 I	000040	JB01L	0000 I	000112	JJ	0000 I	000031	JOUT
0000 I	000044	K	0004 R	000126	KI	0000 R	000013	KIG	0000 R	000011	KIL	0004 R	000153	KQ
0000 R	000014	KOG	0000 R	000012	KOL	0000 I	000045	KRET	0004 R	000200	KW	0000 R	000002	KI
0000 R	000004	K2	0003 R	006304	LENGTH	0000 I	000026	LS	0003 R	006400	LT	0000 R	000015	MARTI
0000 R	000016	MARTO	0000 R	000003	MUBAR	0004 R	000226	MUI	0000 R	000007	MUIG	0000 R	000005	MUIL
0004 R	000252	MUO	0000 R	000010	MUOG	0000 R	000006	MUOL	0000 I	000024	NSECT	0003 I	006417	NT
0000 R	000000	NUI	0000 R	000001	NUO	0003 R	006366	P	0000 R	000032	PCORI	0000 R	000033	PCORO
0004 R	001071	PHI1	0004 R	001072	PHI2	0004 R	001073	PHI3	0004 R	000277	PI	0000 R	000020	PIE
0004 R	000324	PO	0004 R	000351	PRI	0000 R	000102	PRIG	0000 R	000076	PRIL	0004 R	000376	PRO

0000 R 000111	PROG	0000 R 000106	PROL	0004 R 000423	Q	0000 R 000054	QA	0004 R 001017	QUALI
0004 R 001044	QUALO	0004 R 000450	REI	0000 R 000057	RENIN	0000 R 000061	RENOU	0004 R 000475	REO
0003 R 006316	RI	0003 R 006424	RO	0003 R 000000	S	0000 R 000063	SVBAR	0004 R 000522	SVI
0000 R 000100	SVIG	0000 R 000074	SVIL	0004 R 000547	SVO	0000 R 000107	SVOG	0000 R 000104	SVOL
0000 R 000025	TEMP	0003 R 006323	THICK	0004 R 000574	TI	0004 R 000621	TO	0000 R 000071	TSATI
0000 R 000103	TSATO	0000 R 000113	TALL	0004 R 000646	TWI	0004 R 000673	TWO	0003 I 006311	TYPE
0000 R 000046	WCI	0000 R 000047	WCO	0004 R 000000	WD	0000 R 000027	WGASI	0000 R 000030	WGASO
0000 R 000036	XI	0000 R 000037	XO	0000 R 000042	XREM				

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00101 1* SUBROUTINE HEATEX (LN,LI,LO,TI1,T01,TI2,T02,P11,P01,P12,P02,ND1,
00101 2* I WDO,QT,XI1,XO1 )
00101 3* CC THIS SUBROUTINE CALCULATES THE HEAT EXCHANGER OPPOSITE END
00101 4* CC CONDITIONS GIVEN THE FLUID CONDITIONS AT ONE END. FOR
00101 5* CC PARALLEL FLOW HEAT EXCHANGERS, THE OUTLET CONDITIONS ARE
00101 6* CC COMPUTED AS A FUNCTION OF INLET CONDITIONS. FOR COUNTER
00101 7* CC FLOW HEAT EXCHANGERS, THIS SUBROUTINE MUST BE USED IN AN
00101 8* CC ITERATION LOOP. THE HEAT EXCHANGER IS AUTOMATICALLY
00101 9* CC BROKEN 20 SECTIONS.
00101 10* CC LN = HEAT EXCHANGER NUMBER ( 1 = HYDROGEN )
00101 11* CC LO = OUT SIDE FLUID NUMBER ( 2 = OXYGEN )
00101 12* CC LI = IN SIDE FLUID NUMBER ( 3 = H2O-H2, MR=1.0 )
00101 13* CC WD = FLOWRATE (POUNDS/SEC)
00101 14* CC T = TEMPERATURE (DEG R)
00101 15* CC P = PRESSURE (PSIA)
00101 16* CC H = FILM OR WALL CONDUCTIVITY (BTU/5QIN SEC DEG R.)
00101 17* CC Q = HEAT TRANSFER FLUX INTO INSIDE FLUID (BTU/SEC IN**2)
00101 18* CC MU = VISCOSITY (POUNDS/IN SEC)
00101 19* CC SV = SPECIFIC VOLUME (CUIN/POUND)
00101 20* CC RE = REYNOLDS NUMBER
00101 21* CC PR = PRANDTL NUMBER
00101 22* CC NU = NUSSLET NUMBER
00101 23* CC TI = INSIDE TEMPERATURE (DEG R)
00101 24* CC TO = OUTSIDE TEMP (DEG R)
00101 25* CC XI = INSIDE QUALITY
00101 26* CC XO = OUTSIDE QUALITY
00101 27* CC FD = FLAG INPUT HYDRAULIC DIAMETER ( 1 = INPUT DHYO , 0 = CALCULATE
00101 28* CC NT = NUMBER TUBES IN HEAT XER CROSS FLOW
00101 29* CC DHYO = HYDRAULIC DIA FOR CROSS FLOW HELICOIL HEAT XER
00101 30* CC LS = HEAT XER SHELL LENGTH
00101 31* CC DSI = DIAMETER HEAT XER SHELL (INSIDE)
00101 32* CC ARFL = FLOW AREA CROSS SECTION HEAT EX OUTER TUBE
00101 33* CC NT = NUMBER TUBE WRAPS
00101 34* CC DTB = DIAMETER TUBE BUNDLE
00101 35* CC P = PITCH TUBE WRAPS
00101 36* CC LT = LENGTH INNER TUBE
00101 37* CC SUBSCRIPTS (* I = INSIDE (CIRCULAR TUBE) *)
00101 38* CC (* O = OUTSIDE (ANNULUS) *)
00101 39* CC THE PROGRAM ASSUMES A TUBE INSIDE A CONCENTRIC SHELL, THUS
00101 40* CC CYLINDRICAL PIPE CORRELATIONS ARE USED FOR THE INNER
00101 41* CC PASSAGE, AND ANNULUS CORRELATIONS ARE USED FOR THE OUTER
00101 42* CC PASSAGE WITH THE HYDRAULIC RADIUS BEING USED TO COMPUTE THE
00101 43* CC REYNOLDS NUMBER AND DARCY PRESSURE DROP.
00101 44* CC
00103 45* REAL LT
00103 46* C

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00104 47*      INTEGER TYPE,IN
00104 48*      C
00105 49*      DIMENSION TYPE(5),RI(5),RO(5),LENGTH(5),THICK(5),DHYO(5),NT(5)
00105 50*      *,      FD(5),P(5),DSI(5),DTB(5),ARFL(5),LT(5)
00105 51*      *,      FN(5)
00105 52*      C
00106 53*      REAL KI,KO,KH,MUI,MUO,LENGTH,NUI,MUO,K1,MUBAK,K2
00107 54*      REAL MUIL,MUOL,MUIG,MUOG,KIL,KOL,KIG,KOG
00110 55*      REAL MARTI,MARTO
00110 56*      C
00111 57*      COMMON /INDATA/ S(SOOO)
00111 58*      C
00112 59*      COMMON /HEAT/NO(2),CPI(21),CPO(21),DIST(21),HE(21),KI(21),KO(21)
00112 60*      1,      KN(21),MUI(21),MUO(21),PI(21),PO(21),PRI(21),PRO(21)
00112 61*      2,      GZ(1),REI(21),REO(21),SVI(21),SVO(21),TI(21),TO(21)
00112 62*      3,      TAL(21),TWO(21),HI(21),HW(21),HO(21)
00112 63*      4,      QUALI(21),QUALO(21),PHI1,PHI2,PHI3,
00112 64*      C
00113 65*      EQUIVALENCE
00113 66*      *,(S(3274),TYPE(1))      ,(S(3279),RI(1))      ,(S(3349),RO(1))
00113 67*      *,(S(3269),LENGTH(1))  ,(S(3284),THICK(1))  ,(S(3339),DHYO(1))
00113 68*      *,(S(3344),NT(1))      ,(S(3309),FD(1))      ,(S(3319),P(1))
00113 69*      *,(S(3334),DSI(1))      ,(S(3324),DTB(1))      ,(S(3314),ARFL(1))
00113 70*      *,(S(3329),LT(1))      ,(S(3428),FN(1))
00113 71*      CC
00114 72*      DATA A63662/0.63662/,PIE,GC/3.14159,386.088/
00114 73*      CC
00114 74*      CC      IMPLICIT REYNOLDS NUMBER FUNCTIONS OF VISCOSITY
00120 75*      RENI(AMU)= BINR/AMU
00121 76*      RENO(AMU)= BOUTR/AMU
00121 77*      C
00122 78*      NSECT      = 20
00122 79*      CC      COMPUTE REYNOLDS NUMBER CONSTANTS
00123 80*      BINR= A63662*ABS(WDI)/RI(LN)
00124 81*      TEMP= THICK(LN) + RO(LN)
00125 82*      IF (TYPE(LN).EQ.3) GO TO 10
00127 83*      BOUTR      = A63662*ABS(WDO)/(RI(LN)+TEMP)
00127 84*      CC      DHYO = OUTSIDE HYDRAULIC DIAMETER (INCHES)
00127 85*      CC      DHY      = 4.0*(FLOW AREA)/(WETTED PERIMETER)
00130 86*      DHYO(LN) = 2.0*(RO(LN)-THICK(LN)-RI(LN))
00131 87*      GO TO 20
00132 88*      10 BOUTR      = 2.0*RI(LN)*ABS(WDO)/(ARFL(LN)*NT(LN))
00133 89*      IF (FD(LN).EQ.1) GO TO 20
00135 90*      NT(LN)      = LT(LN)/(PIE*DTB(LN) + SQRT(DTB(LN)**2 + P(LN)**2))
00136 91*      LS          = NT(LN)*P(LN)
00137 92*      DHYO(LN) = (DSI(LN)**2 - DTB(LN)*8.0*RI(LN)*LT(LN) + DSI(LN)*LS)
00140 93*      20 CONTINUE
00140 94*      CC
00140 95*      CC      PRESSURE DRUP TERMS NOT VARYING ALONG TUBE LENGTH
00141 96*      W GAS1=(WDI/(PIE*RI(LN)**2))**2/GC
00142 97*      W GASO=(WDO/(PIE*(RO(LN)**2-(RI(LN)+THICK(LN)**2))**2)**2/GC
00143 98*      JOUT=6
00144 99*      PCORI = 0.
00145 100*      PCORO = 0.
00146 101*      ENTHI = 0.
00147 102*      ENTHO = 0.
00150 103*      XI = X11
00151 104*      XO = X01

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T6

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00152 105*   MARTO = 0.
00153 106*   JBOIL = 0
00154 107*   DIST(1)=0.0
00155 108*   QT=0.0
00156 109*   DX = LENGTH(LN)/FLUAT(NSECT)
00157 110*   XREM= LENGTH(LN)
00160 111*   T1(1)=T11
00161 112*   T0(1)=T01
00162 113*   P1(1)=P11
00163 114*   P0(1)=P01
00163 115*   CC      CHECK FLOWRATE AND COMPUTE REYNOLDS NUMBERS
00164 116*   IF (WDI*WDO) 30,,30
00167 117*   T12=T11
00170 118*   T02=T01
00171 119*   P12=P11
00172 120*   P02=P01
00173 121*   QT=0.0
00174 122*   RETURN
00175 123*   30 CONTINUE
00175 124*   CC      START PASS ONE
00176 125*   I=1
00177 126*   K=1
00177 127*   CC      COMPUTE FLUID PROPERTIES AT END ONE
00200 128*   QUAL1(I) = 0.
00201 129*   QUAL0(I) = 0.
00202 130*   KRET=1
00203 131*   GO TO 150
00204 132*   40 CONTINUE
00204 133*   CC
00209 134*   IF (TYPE(LN).EQ.3) NSECT = 1
00207 135*   DO 130 K=1,NSECT
00212 136*   J=K
00213 137*   QUAL1(K+1) = 0.
00214 138*   QUAL0(K+1) = 0.
00214 139*   CC      REGULA FALSI METHOD USED
00214 140*   CC      FIRST GUESS, ASSUMES CONSTANT COEFFICIENTS
00214 141*   CC      LOCAL HEAT TRANSFER FLUX HAS NOW BEEN ESTIMATED.
00214 142*   CC      USING THE INTEGRAL, ASSUMING THAT THE FLUX IS A FUNCTION OF
00214 143*   CC      INSIDE AND OUTSIDE TEMPERATURE DIFFERENCES ONLY, THE
00214 144*   CC      EXPONENTIAL TEMPERATURE COEF. MAY BE CALCULATED(K1,K2)
00215 145*   AC1=WD1*CP1(I)
00216 146*   WCO=WDO*CP0(I)
00217 147*   C1=AC1+WCO
00220 148*   C2=WC1+TI(I)*WCO*T0(I)
00221 149*   K1=HE(I)*[1.0/WC1+1.0/WCO]*2.0*3.14159*R1(LN)
00222 150*   K2=EXP(-K1*DX)
00222 151*   CC      COMPUTE SECTION OUTLET TEMPERATURES
00223 152*   C3=K2*(T0(1)-T1(I))
00224 153*   T1(I+1)=(C2-WCO*C3)/C1
00225 154*   T0(I+1)=T1(I+1)+C3
00226 155*   I=K+1
00227 156*   DO 60 J=1,7
00227 157*   CC      EVALUATE PROPERTIES AT END SECTION
00233 158*   KRET=2
00233 159*   GO TO 150
00234 160*   50 CONTINUE
00235 161*   WA=0.5*(Q(I)+Q(I-1))*R1(LN)*2.0*PI*DX
00236 162*   CP1A=0.5*(CP1(I)+CP1(I-1))

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00237 163* CPOA=0.5*(CPI(I)+CPI(I-1))
00240 164* TI(I)=TI(I-1)+GA/(NDI*CPIA)
00241 165* IF (MARTI.GT.0.) TI(I) = TI(I-1)
00243 166* TO(I)=TO(I-1)-GA/(VDO*CPOA)
00244 167* IF (MARTO.GT.0.) TO(I) = TO(I-1)
00246 168* 60 CONTINUE
00250 169* I=K

00250 170* CC
00250 171* CC COMPUTE OUTLET PROPERTIES AT INLET PRESSURE
00251 172* IF (MARTI.GT.0.) GO TO 70
00253 173* CALL PROPT (LI,PI(I),TI(I+1),SVI(I+1),MUI(I+1),KI(I+1),CPI(I+1),
00253 174* 1 PRI(I+1))
00254 175* 70 IF (MARTO.GT.0.) GO TO 80
00256 176* CALL PROPT (LO,PO(I),TO(I+1),SVO(I+1),MUO(I+1),KO(I+1),CPO(I+1),
00256 177* 1 PRO(I+1))
00257 178* 80 CONTINUE
00257 179* CC
00257 180* CC COMPUTE AVERAGE SECTION REYNOLDS NUMBERS, FRICTION
00257 181* CC FACTORS, FRICTION AND MOMENTUM DELTA P, AND OUTLET PRESSURE.
00257 182* CC 1212.93= PI*G (IN/SEC**2)=32.174*12.*3.1416
00260 183* MUBAR=0.5*(MUI(I+1)+MUI(I))
00261 184* RENIN =RENI (MUBAR)
00262 185* FFACTI=0.316/RENIN**0.25
00263 186* MUBAR=(MUO(I)+MUO(I+1))/2.0
00264 187* RENOUT=RENO(MUBAR)
00265 188* IF (TYPE(LN).EQ.3) GO TO 90
00267 189* FFACTO=0.316/RENOUT**0.25
00270 190* GO TO 95
00271 191* 90 FFACTO = 0.2*RENOUT**(-0.2)/(P(LN)/(2.0*RI(LN)) -1.0)
00272 192* 95 SVBAR =(SVI(I)+SVI(I+1))*0.5
00273 193* DPFI=WGASI*FFACTI*SVBAR*DX/(4.0*RI(LN))
00274 194* DPMI=WGASI*(SVI(I+1)-SVI(I))
00275 195* PI(I+1)=PI(I)-DPFI-DPMI
00276 196* IF (NDI.LT.0.0) PI(I+1)=PI(I)+DPFI-DPMI
00300 197* IF (PCORI.LE.0.) GO TO 100
00302 198* DPFI = 0.
00303 199* DPMI = DPMI*PCORI
00304 200* PI(I+1) = PI(I) - DPMI
00305 201* CALL SAT (LI,PI(I+1),TI(I+1))
00306 202* 100 CONTINUE
00306 203* CC
00306 204* CC FOR FRICTIONAL PRESSURE DROP IN THE ANNULUS, THE
00306 205* CC EQUIVALENT HYDRAULIC DIAMETER MUST BE USED IN THE
00306 206* CC DARCY EQUATION (DH=4.0*RH) WHERE RH= HYDRAULIC RADIUS
00307 207* SVBAR=SVO(I)+SVO(I+1)
00310 208* SVBAR=SVBAR*0.5
00311 209* DPFO = WGASO*FFACTO*SVBAR*DX/(2.0*DHYO(LN))
00312 210* DPMO=WGASO*(SVO(I+1)-SVO(I))
00313 211* PO(I+1)=PO(I)-DPFO-DPMO
00314 212* IF (VDO.LT.0.0) PO(I+1)=PO(I)+DPFO-DPMO
00316 213* IF (PCORO.LE.0.) GO TO 110
00320 214* DPFO = 0.
00321 215* PO(I+1) = PO(I) - DPMO
00322 216* CALL SAT (LO,PO(I+1),TO(I+1))
00323 217* 110 CONTINUE
00323 218* CC
00323 219* CC COMPUTE TOTAL HEAT TRANSFER RATE CONTRIBUTION
00324 220* IF (TYPE(LN).EQ.3) GO TO 120

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00326 221*      I=K+1
00327 222*      DELQT = (Q(I)+Q(I-1))*RI(LN)*DX*PIE
00330 223*      QT=QT+DELQT
00331 224*      GO TO 121
00331 225*      CC HEAT TRANSFER TOTAL FOR CROSS FLOW HEAT XER
00332 226*      120 QT      = (Q(I) + Q(I-1))*PIE*RI(LN)*LT(LN)
00333 227*      121 CONTINUE
00334 *DIAGNOSTIC* THE TEST FOR EQUALITY BETWEEN NON-INTEGERS MAY NOT BE MEANINGFUL.
00334 228*      IF (ENTHI .NE. 0.) ENTHI = ENTHI + DELQT/WDI
00336 *DIAGNOSTIC* THE TEST FOR EQUALITY BETWEEN NON-INTEGERS MAY NOT BE MEANINGFUL.
00336 229*      IF (ENTHO .NE. 0.) ENTHO = ENTHO + ABS(DELQT/WDO)
00340 230*      DIST(I)=DIST(I-1)+DX
00341 231*      130 CONTINUE
00343 232*      I=NSECT+1
00344 233*      T12=TI(I)
00345 234*      T02=TO(I)
00346 235*      P12=PI(I)
00347 236*      P02=PO(I)
00350 237*      140 RETURN
00350 238*      CC          THE FLUID PROPERTIES, WALL TEMPERATURES, AND
00350 239*      CC          LOCAL HEAT TRANSFER COEFFICIENTS ARE
00350 240*      CC          COMPUTED HERE AT POINT I.
00351 241*      150 CONTINUE
00352 242*      IF (XI.GT.0.95) GO TO 180
00354 243*      CALL SAT (LI,PI(I),TSATI)
00355 244*      IF (XI.GT.0.) GO TO 160
00357 245*      IF ( TSATI.GT.TI(I) ) GO TO 180
00361 246*      QUALI(K+1) = XI
00362 247*      160 CONTINUE
00363 248*      IF (JBOIL.EQ.1) GO TO 190
00363 249*      CC
00363 250*      CC          IN VAPOR DOME (INNER FLUID)
00365 251*      CALL LATENT ( LI, PI(I), ENTHL, ENTHG )
00366 252*      IF (XI.GT.0.) GO TO 170
00366 253*      CC
00366 254*      CC          COMPUTE FIRST ENTHALPY VALUE
00370 255*      CALL BPROPL ( LI,PI(I),TSATI,SVIL,MUIL,KIL,CPIL,PRIL )
00371 256*      ENTLI = ENTHL + CPIL * (TI(I)-TSATI )
00372 257*      170 CONTINUE
00372 258*      CC
00372 259*      CC          COMPUTE QUALITY
00373 260*      XI = (ENTHI - ENTHL)/(ENTHG - ENTHL)
00373 261*      CC
00374 262*      IF ( XI.GT. 1. ) XI = 1.
00376 263*      QUALI(K) = XI
00376 264*      CC
00376 265*      CC          COMPUTE PROPERTIES FOR SATURATED GAS AND
00376 266*      CC          SATURATED LIQUID
00377 267*      CALL BPROPL(LI,PI(I),TSATI,SVIL,MUIL,KIL,CPIL,PRIL)
00400 268*      CALL BPROPG(LI,PI(I),TSATI,SVIG,MUIG,KIG,CPIG,PRIG)
00401 269*      MARTI = (XI/(1.-XI))**.9*(MUIG/MUIL)**.1*(SVIG/SVIL)**.5
00402 270*      SVI(I) = XI*SVIG + (1.-XI)*SVIL
00403 271*      CPI(I) = XI*CPIG + (1.-XI)*CPIL
00404 272*      KI(I) = KIG
00405 273*      MUI(I) = MUIG
00406 274*      PRI(I) = PRIG
00407 275*      PCORI = (1.+MARTI)**.25*((1.-XI)/XI)**.75*(MUIL/MUIG)**.083
00407 276*      I      *(SVIL/SVIG)**.416)**.2.4

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00410 277*      JBOIL = 1
00411 278*      GO TO 190
00411 279*      CC      FLUID PROPERTIES OUTSIDE DOME
00412 280*      180 CALL PROPTY (LI,PI(I),TI(I),SVI(I),MUI(I),KI(I),CPI(I),PRI(I))
00413 281*      MARTI = 0.
00414 282*      PCORI = 0.
00415 283*      190 CONTINUE
00416 284*      IF (XO.GT.0.95) GO TO 220
00420 285*      CALL SAT(LO,PO(I),TSATO)
00421 286*      IF (XO.GT.0.) GO TO 200
00423 287*      IF (TSATO .GT. TO(I)) GO TO 220
00425 288*      200 CONTINUE
00426 289*      IF (JBOIL.EQ.1) GO TO 230
00426 290*      CC
00426 291*      CC      IN VAPOR DOME (OUTER FLUID)
00430 292*      CALL LATENT ( LO, PO(I), ENTHL, ENTHG )
00431 293*      IF (XO.GT.0.) GO TO 210
00431 294*      CC
00431 295*      CC      COMPUTE FIRST ENTHALPY VALUE
00433 296*      CALL BPROPL(LO,PO(I),TSATO,SVOL,MUOL,KOL,CPOL,PROL)
00434 297*      ENTHO = ENTHL + CPOL*(TO(I) - TSATO)
00435 298*      210 CONTINUE
00435 299*      CC
00435 300*      CC      COMPUTE QUALITY
00436 301*      XO      = (ENTHO - ENTHL)/(ENTHG - ENTHL)
00437 302*      IF ( XO.GT. 1. ) XO = 1.
00441 303*      QUALO(K+1) = XO
00441 304*      CC
00442 305*      IF (XO .GT. 0.99) GO TO 220
00442 306*      CC      COMPUTE PROPERTIES OF SATURATED GAS AND
00442 307*      CC      SATURATED LIQUID
00444 308*      CALL BPROPL(LO,PO(I),TSATO,SVOL,MUOL,KOL,CPOL,PROL)
00445 309*      CALL BPROPG(LO,PO(I),TSATO,SVOL,MUOL,KOL,CPOL,PROL)
00446 310*      MARTO = (XO/(1.-XO))*0.9*(MUOG/MUOL)*0.1*(SVOL/SVOL)*0.5
00447 311*      SVO(I) = XO*SVOL + (1.-XO)*SVOL
00450 312*      CPO(I) = XO*CPOG + (1.-XO)*CPOL
00451 313*      KO(I) = KOG
00452 314*      MUO(I) = MUOG
00453 315*      PRO(I) = PROG
00454 316*      PCORO = (1.+MARTO)*.25*((1.-XO)/XO)*.75*(MUOL/MUOG)*.083
00454 317*      I      *(SVOL/SVOL)*.416)*.2.4
00455 318*      JBOIL = 1
00456 319*      GO TO 230
00457 320*      220 CALL PROPTY (LO,PO(I),TO(I),SVO(I),MUO(I),KO(I),CPO(I),PRO(I))
00460 321*      MARTO = 0.
00461 322*      PCORO = 0.
00462 323*      230 CONTINUE
00462 324*      CC
00462 325*      CC      INSIDE REYNOLDS NUMBER
00463 326*      REI(I)=RENI (MUI(I))
00463 327*      CC      OUTSIDE REYNOLDS NUMBER (ANNULUS RI,RU)
00464 328*      REO(I)=RENO(MUO(I))
00464 329*      CC
00464 330*      CC      NUSSLET NUMBER AND EQUIVALENT HEAT TRANSFER COEF DO LOOP
00465 331*      TW(I)=0.5*(TI(I)+TO(I))
00466 332*      TWO(I)=TWI(I)
00466 333*      CC      ITERATE FOR CORRECT COEFFICIENTS
00467 334*      DO 250 JJ=1,3

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00467 335* CC      COMPUTE NUSSLET NUMBER INSIDE
00472 336*      CALL NUSLET (LI, PRI(I), REI(I), TWI(I), TI(I), MARTI, NUI)
00473 337*      HI(I)=NUI *KI(I)/(2.0*RI(LN))
00473 338* CC
00473 339* CC      COMPUTE OUTSIDE NUSSLET NUMBER
00474 340*      CALL NUSLET (LO, PRO(I), REQ(I), TWO(I), TO(I), MARTO, NUO)
00474 341*      IF (TYPE(LN), NE, 1) GO TO 240
00477 342*      NUO = 0.33*N(LN)*REU(I)*((WU*4)*CPO(I)*NDU*DRHO(LN)/KRO(I))
00477 343*      ASFL(LN)*REO(I)*(-8.8888887E-1)*
00477 344*      (TO(I)/TAO(I))*0.14*PHI1*PHI2*PHI3
00500 345*      240 HO(I) = NUO*KO(I)/DRHO(LN)
00500 346* CC
00500 347* CC      COMPUTE WALL CONDUCTIVITY
00501 348*      TWALL=(TWI(I)+TWO(I))/2.0
00502 349*      CALL CWALL (TWALL, KW(I))
00503 350*      HW(I)=KW(I)/THICK(LN)
00503 351* CC      COMPUTE EQUIVALENT HEAT TRANSFER COEF.
00504 352*      HE(I)=1.0/(1.0/HI(I)+1.0/HW(I)+1.0/HO(I))
00505 353*      Q(I)=(TO(I)-TI(I))*HE(I)
00506 354*      TWI(I)=TI(I)+Q(I)/HI(I)
00507 355*      TWO(I)=TWO(I)+Q(I)/HW(I)
00510 356*      250 CONTINUE
00512 357*      GO TO (40,50,50),KRET
00513 358*      END
    
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END OF UNIVAC 1108 FORTRAN V COMPILATION.	2 *DIAGNOSTIC* MESSAGE(S)				
HEATEX	SYMBOLIC	14 JUN 71	15:05:32	0	01616672 14 358 (DELETED)
HEATEX	CODE	14 JUN 71	15:05:32	1	01630516 36 (DELETED)
B HDG	B FOR, HEATX, HEATX			0	01630562 14 132

FOR, HEATX,HEATX
UNIVAC 1108 FORTRAN V LEVEL 220 18 FS018H
THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:17

31 AUG 71

7:2/11/705

SUBROUTINE HEATX ENTRY POINT 000404

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	000422
0000	*DATA	000042
0002	*BLANK	000000
0003	INDATA	011610
0004	CONS	000003
0005	CCPCX	000007
0006	COM	006525

EXTERNAL REFERENCES (BLOCK, NAME)

0007	PERFOR
0010	SQRT
0011	NEKR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000015	10L	0001	000022	20L	0001	000034	21L	0001	000046	22L	0001	000065	30L	
0001	000072	40L	0001	000104	41L	0001	000116	42L	0001	000271	43L	0001	000210	44L	
0001	000216	50L	0001	000223	60L	0001	000315	70L	0001	000322	80L	0001	000371	81L	
0006	R	000000	AREA	0006	R	000074	AREA1	0006	R	000170	AREAK	0006	R	000132	AREAO
0006	R	006423	CGGTC	0006	R	006436	CGTANK	0006	R	006431	CLTANK	0006	R	005014	CONCT
0006	R	006443	CPJU	0006	R	005006	CSTAR	0006	R	006355	CVEL	0006	R	000036	DELKL
0006	R	006277	DMVENT	0006	R	006360	ETAT	0004	R	000002	FB	0006	R	006370	FBPC
0006	R	006362	FBWC	0006	R	005111	FRL	0004	R	000001	GC	0003	I	006272	HE11
0003	I	006265	HE01	0003	I	006260	HE00	0003	I	007057	HG11	0003	I	007052	HG01
0006	R	003036	HO	0006	R	003322	HRAD	0006	I	005110	ICMON	0005	I	000006	ICK
0000	I	000021	IPROP	0006	I	005052	ISPT	0000	I	000006	JJ	0006	I	003606	JUN
0003	I	006330	L1	0003	I	006335	L0	0003	R	004561	MACH	0006	I	005066	MEX
0006	I	005102	MKC	0006	I	002552	NGR	0003	I	000100	NODEL	0003	I	000553	NPLINE
0006	I	002742	NRE	0006	R	000264	PB	0006	R	004764	PC	0003	R	006151	PCI
0006	R	005074	PE	0006	R	000272	PG	0006	R	003620	PGT	0004	R	000000	PI
0000	R	000017	PI2	0006	R	005036	PMR	0000	R	000011	PQUT	0006	R	006241	POWC
0006	R	006343	POWT	0000	R	000015	PQ2	0006	R	006300	PPI	0006	R	006305	PPO
0006	R	006331	PT1	0006	R	006336	PT0	0000	R	000000	QT	0006	R	006357	R
0006	R	001422	RKOG	0006	R	006312	RPMT	0003	R	000000	S	0006	R	005044	TC
0006	R	006416	THOC	0000	R	000013	TIN	0000	R	000020	T12	0000	R	000010	TOUT
0006	R	006411	TPCG	0006	R	006404	TPCL	0003	R	001132	TTEMP	0006	R	006317	TI1
0006	R	003226	TWALL	0003	I	006311	TYPE	0006	R	006356	U	0006	R	003416	UAO
0000	R	000012	W01	0000	R	000007	W00	0003	R	003423	W00TG	0006	R	006265	W1
0006	R	006253	W0	0006	R	006361	WT	0006	R	006246	WTGC				

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00101 20 C
00101 30 CC DRIVER SUBROUTINE FOR HEAT EXCHANGER MODEL - SETS UP LINE CONNECTS
00101 40 C HEO1 = NUMBER OF SYSTEM LIVE CONNECTED TO HEATXER OUTER LIVE INLET
00101 50 C HEO0 = NUMBER OF SYSTEM LIVE CONNECTED TO HEATXER OUTER LINE OUTLE
00101 60 C HEI1 = NUMBER OF SYSTEM LIVE CONNECTED TO HEATXER INNER LINE INLET
00101 70 C HEI0 = NUMBER OF SYSTEM LIVE CONNECTED TO HEATXER INNER LINE OUTLE
00101 80 C
00103 90 C INTEGER HEO0,HEO1,HEI1,HEI0,HG11,HG01
00103 100 C
00104 110 REAL MACH,KA
00104 120 C
00105 130 DIMENSION HEO0(5),HEO1(5),HEI1(5),HEI0(5),NODEL(20),WDOTG(30,20)
00105 140 *, TTEMP(30,20),LI(5),LO(5)
00105 150 *, KA(2),RGAS(2),NPLINE(30)
00105 160 *, MACH(30,20),HG11(5),HG01(5),PCI(5)
00105 170 *, THEC(5)
00105 180 C
00106 190 DIMENSION QT(5)
00106 200 C
00107 210 COMMON /INDATA/ S(5000)
00107 220 C
00110 230 COMMON /CONS/PI,GC,FB
00110 240 C
00111 250 COMMON /CCPCX/ CPCX(6), ICX
00112 260 C
00112 270 COMMON /COM/AREA(30),DELXL(30),AREA1(30),AREA0(30),AREAK(30)
00112 280 *, DIALI(30),FB(6),PG(30,20),RHOG(30,20),NGR(30,2)
00112 290 *, NPR(30,2),NRE(30,2),HO(30,2),HI(30,2),TWALL(30,2)
00112 300 *, HRAD(30,2),UA0(30,2),VEL(30,2),JUN(10),PGT(30,20)
00112 310 *, HNOZ(6),MR(6),PC(6),PCN(6,2),CSTAR(6),CONCT(3,6)
00112 320 *, PMR(6),TC(6),ISPT(6),CF(6),HEX(6),PE(6),MWC(6),ICMON
00112 330 *, FRL(30,20),POWC(5),WTGC(5),WO(10),WI(10),DMVENT,PPI(5)
00112 340 *, PPO(5),RPHT(5),TTI(5),TTO(5),PTI(5),PTO(5),POWT(5)
00112 350 *, POWP(5),CVEL,U,R,ETAT,WT,FBWC(6),FBPC(6)
00112 360 *, FBTC(6),TPCL(5),TPCG(5),THOC(5),CGGTC(6),CLTANK(5)
00112 370 *, CGTANK(5),CPJU(5,10)
00112 380 C
00113 390 INTEGER TYPE
00113 400 C
00114 410 EQUIVALENCE (S(3274),TYPE)
00115 420 EQUIVALENCE
00115 430 *, (S(65),NODEL(1)), (S(603),TTEMP(1,1)), (S(1812),WDOTG(1,1))
00115 440 *, (S(3249),HEO0(1)), (S(3254),HEO1(1)), (S(3259),HEI1(1))
00115 450 *, (S(3264),HEI0(1)), (S(3289),LI(1)), (S(3294),LO(1))
00115 460 *, (S(1804),KA(1)), (S(3018),RGAS(1)), (S(364),NPLINE(1))
00115 470 *, (S(2418),MACH(1,1)), (S(3627),HG01), (S(3632),HG11)
00115 480 *, (S(3178),PCI), (S(3503),THEC(1))
00115 490 C ICX = NUMBER OF COMBUSTOR CONNECTED TO HEAT EXCHANGER H2OH2 ROUTINE
00115 500 C HG11 = NUMBER OF COMBUSTOR CONNECTED TO ITH HEAT EXCHANGER INSIDE LINE
00115 510 C HG01 = NUMBER OF COMBUSTOR CONNECTED TO ITH HEAT EXCHANGER OUTSIDE LINE
00115 520 C
00116 530 I1 = HEO1(1)
00117 540 IF (HG01(1) .GT. 0) GO TO 21
00121 550 IF (I1.LE.0) GO TO 10
00123 560 GO TO 20
00124 570 10 I1 = - I1
00125 580 JJ = NODEL(I1)
00128 590 20 CONTINUE

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00127 60*      WDO = WDOTG(II,JJ)
00130 61*      TOUT = T(II,JJ)
00131 62*      POUT = P(II,JJ)
00132 63*      GO TO 22
00133 64*      21 CONTINUE
00134 65*      ICX = HG01(I)
00135 66*      WDO = WNOZ(ICX)
00136 67*      TOUT = TC(ICX)
00137 68*      POUT = PCI(ICX)
00140 69*      22 CONTINUE
00141 70*      II = HE11(I)
00142 71*      IF (HG11(I) .GT. 0) GO TO 41
00144 72*      IF (II.LE.0) GO TO 30
00146 73*      JJ = 1
00147 74*      GO TO 40
00150 75*      30 II = - II
00151 76*      JJ = NODEL(II)
00152 77*      40 CONTINUE
00153 78*      WDI = WDOTG(II,JJ)
00154 79*      TIN = TTEMP(II,JJ)
00155 80*      PIN = PG(II,JJ)
00156 81*      GO TO 42
00157 82*      41 CONTINUE
00160 83*      ICX = HG11(I)
00161 84*      WDI = WNOZ(ICX)
00162 85*      TIN = TC(ICX)
00163 86*      PIN = PCI(ICX)
00164 87*      42 CONTINUE
00164 88*      C
00165 89*      IF (TYPE .EQ. 1) WDI = -WDI
00167 90*      CALL PERFOR (TIN,PIN,WDI,WDO,TOUT,POUT,LI(I),LO(I),I
00167 91*      , P02,T02,PI2,TI2,GT(I))
00167 92*      C
00170 93*      IF (TYPE .EQ. 1) WDI = -WDI
00172 94*      II = HE00(I)
00173 95*      IF (HG01(I) .GT. 0) GO TO 43
00175 96*      IF (LO(I) .GE. 3) GO TO 44
00177 97*      THOC(I) = 1. - T02 / THEC(I)
00200 98*      44 CONTINUE
00201 99*      IF (II) 50,50,
00204 100*      JJ = 1
00205 101*      GO TO 60
00206 102*      50 II = -II
00207 103*      JJ = NODEL(II)
00210 104*      60 CONTINUE
00211 105*      IPROP = NPLINE(II)
00212 106*      WDOTG(II,JJ) = WDO
00213 107*      PG(II,JJ) = P02
00214 108*      TTEMP(II,JJ) = T02
00214 109*      C DENSITY OF GAS
00215 110*      RHOG(II,JJ) = PG(II,JJ)/(RGAS(IPROP)*TTEMP(II,JJ))*144.
00215 111*      C MACH NUMBER
00216 112*      MACH(II,JJ) = 4.*WDOTG(II,JJ)/(RHOG(II,JJ)*PI*DIALI(II)**2.*SQRT
00216 113*      *(KA(IPROP)*GC*RGAS(IPROP)*TTEMP(II,JJ)))
00217 114*      43 CONTINUE
00220 115*      II = HE10(II)
00221 116*      IF (HG11(I) .GT. 0) GO TO 81
00223 117*      THOC(II) = 1. - TI2 / THEC(I)

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00224 118*      IF (II.LE.0) GO TO 70
00226 119*      JJ = 1
00227 120*      GO TO 80
00230 121*      70 II = -II
00231 122*      JJ = NODEL(II)
00232 123*      80 CONTINUE
00233 124*      PROP = NPLINE(II)
00234 125*      WDOTG(II,JJ) = WDI
00235 126*      PG(II,JJ) = PIN
00236 127*      TTEMP(II,JJ) = TIN
00236 128*      C DENSITY OF GAS
00237 129*      RHOG(II,JJ) = PG(II,JJ)/(RGAS(IPROP)*TTEMP(II,JJ))*144.
00237 130*      C MACH NUMBER
00240 131*      MACH(II,JJ) = 4.*WDOTG(II,JJ)/(RHOG(II,JJ)*PI*DIALI(II)**2.**SQRT
00240 132*      * (KA(IPROP)*GC*RGAS(IPROP)*TTEMP(II,JJ))
00241 133*      81 CONTINUE
00242 134*      ICX = 0
00243 135*      RETURN
00244 136*      END
    
```

END OF UNIVAC 1108 FORTRAN V COMPILATION.
HEATX SYMBOLIC
HEATX CODE RELOCATABLE

0 *DIAGNOSTIC* MESSAGE(S)

30 JUN 71	20:46:39	0	01732256	14	136	{DELETED}
30 JUN 71	20:46:39	1	01736036	36	1	{DELETED}
		0	01736102	14	30	

@ HDG @ FOR,* HPTCP,HPTCP

FUNCTION HPTCP ENTRY POINT 000016

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE C00024
 0000 *DATA 000010
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 PTHEAT
 0004 NERR3

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 R 000000 HPTCP 0003 R 000000 PTHEAT

100

00100	1*	CD	* * * * *	HPTC0010
00100	2*	CD		HPTC0020
00100	3*	CD	PROGRAMMER AND DATE	HPTC0030
00100	4*	CD	J. I. PREWITT	HPTC0040
00100	5*	CD	DECEMBER 1970	HPTC0050
00100	6*	CD		HPTC0060
00100	7*	CD	PURPOSE	HPTC0070
00100	8*	CD	COMPUTES THE SPECIFIC HEAT OF HYDROGEN FOR CONSTANT	HPTC0080
00100	9*	CD	PRESSURE.	HPTC0090
00100	10*	CD		HPTC0100
00100	11*	CD	USAGE	HPTC0110
00100	12*	CD	CP = HPTCP (PRES,TEMP)	HPTC0120
00100	13*	CD		HPTC0130
00100	14*	CD	DESCRIPTION OF PARAMETERS	HPTC0140
00100	15*	CD		HPTC0150
00100	16*	CD	INPUT	HPTC0160
00100	17*	CD	CALLING SEQUENCE	HPTC0170
00100	18*	CD	PRES = PRESSURE = PSIA	HPTC0180
00100	19*	CD	TEMP = TEMPERATURE = O K	HPTC0190
00100	20*	CD		HPTC0200
00100	21*	CD	OUTPUT	HPTC0210
00100	22*	CD	CALLING SEQUENCE	HPTC0220
00100	23*	CD	HPTCP - SPECIFIC HEAT FOR CONSTANT PRESSURE - BTU/LBM/O	HPTC0230
00100	24*	CD		HPTC0240
00100	25*	CD	REMARKS AND RESTRICTIONS	HPTC0250
00100	26*	CD	NONE	HPTC0260
00100	27*	CD		HPTC0270
00100	28*	CD	SUBPROGRAMS REQUIRED	HPTC0280
00100	29*	CD	PTHEAT	HPTC0290

@ FOR, HPTCP,HPTCP

DATE 310871 PAGE 160

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00100 30* CD HPTC0300
00100 31* CD METHOD HPTC0310
00100 32* CD THE SPECIFIC HEAT FOR CONSTANT PRESSURE IS COMPUTED BY HPTC0320
00100 33* CD REFERENCING THE FUNCTION PTHEAT WITH KTRANS EQUAL TO 1. HPTC0330
00100 34* CD HPTC0340
00100 35* CD * * * * * HPTC0350
00101 36* FUNCTION HPTCP (PRES,TEMP) HPTC0360
00103 37* HPTCP = PTHEAT (PRES,TEMP,1) HPTC0370
00104 38* RETURN HPTC0380
00105 39* END HPTC0390

```

END OF UNIVAC 1108 FORTRAN V COMPILATION.

D *DIAGNOSTIC*/MESSAGE(S)

HPTCP	SYMBOLIC	14 JUN 71	15:04:57	0	01610054	14	39	(DELETED)
HPTCP	CODE	RELOCATABLE	14 JUN 71	15:04:57	1	01611116	24	1 (DELETED)
					0	01611146	14	3

@ HDG @ FOR, HPTCV,HPTCV

& FOR, HPTCV, HPTCV
 UNIVAC 1108 FORTRAN V LEVEL 22 018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:21

FUNCTION HPTCV ENTRY POINT 000016

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000024
 0000 *DATA 000010
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 PTHEAT
 0004 NERRJS

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 R 000000 HPTCV 0003 R 000000 PTHEAT

102

00100	1*	CD	* * * * *	HPTC0010
00100	2*	CD		HPTC0020
00100	3*	CD	PROGRAMMER AND DATE	HPTC0030
00100	4*	CD	J. I. PREWITT	HPTC0040
00100	5*	CD	DECEMBER 1970	HPTC0050
00100	6*	CD		HPTC0060
00100	7*	CD	PURPOSE	HPTC0070
00100	8*	CD	COMPUTES THE SPECIFIC HEAT OF HYDROGEN FOR CONSTANT	HPTC0080
00100	9*	CD	VOLUME.	HPTC0090
00100	10*	CD		HPTC0100
00100	11*	CD	USAGE	HPTC0110
00100	12*	CD	CV = HPTCV (PRES,TEMP)	HPTC0120
00100	13*	CD		HPTC0130
00100	14*	CD	DESCRIPTION OF PARAMETERS	HPTC0140
00100	15*	CD		HPTC0150
00100	16*	CD	INPUT	HPTC0160
00100	17*	CD	CALLING SEQUENCE	HPTC0170
00100	18*	CD	PRES = PRESSURE - PSIA	HPTC0180
00100	19*	CD	TEMP = TEMPERATURE - O R	HPTC0190
00100	20*	CD		HPTC0200
00100	21*	CD	OUTPUT	HPTC0210
00100	22*	CD	CALLING SEQUENCE	HPTC0220
00100	23*	CD	HPTCV = SPECIFIC HEAT FOR CONSTANT VOLUME - BTU/LBM/O R	HPTC0230
00100	24*	CD		HPTC0240
00100	25*	CD	REMARKS AND RESTRICTIONS	HPTC0250
00100	26*	CD	NONE	HPTC0260
00100	27*	CD		HPTC0270
00100	28*	CD	SUBPROGRAMS REQUIRED	HPTC0280
00100	29*	CD	PTHEAT	HPTC0290

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00100 30* CD HPTC0300
00100 31* CD METHOD HPTC0310
00100 32* CD THE SPECIFIC HEAT FOR CONSTANT VOLUME IS COMPUTED BY HPTC0320
00100 33* CD REFERENCING THE FUNCTION PTHEAT WITH KTRANS EQUAL TO 2. HPTC0330
00100 34* CD HPTC0340
00100 35* CD * * * * * HPTC0350
00101 36* FUNCTION HPTCV (PRES,TEMP) HPTC0360
00103 37* HPTCV = PTHEAT (PRES,TEMP,2) HPTC0370
00104 38* RETURN HPTC0380
00105 39* END HPTC0390
    
```

END OF UNIVAC 1108 FORTRAN V COMPILATION. 0 *DIAGNOSTIC* MESSAGE(S)

HPTCV	SYMBOLIC	14 JUN 71	15:04:59	0	01611220	14	39	{DELETED}
HPTCV	CODE	14 JUN 71	15:04:59	1	01612262	24	1	{DELETED}
	RELOCATABLE			0	01612312	14	3	

@ HPG @ FOR, HPTD,HPTD

FOR, * HPTD, HPTD
UNIVAC 1108 FORTRAN V LEVEL 228 010 F5018H
THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:22

31 AUG 71

9:27:22.94

FUNCTION HPTD ENTRY POINT 000544

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000551
0000 *DATA 002207
0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 NERR32

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000040	10L	0001	000157	100L	0001	000162	110L	0001	000212	130L	0001	000232	140L
0001	000247	150L	0001	000252	160L	0001	000262	170L	0001	000304	180L	0001	000314	190L
0001	000043	20L	0001	000317	200L	0001	000327	210L	0001	000337	220L	0001	000342	230L
0001	000352	240L	0001	000362	250L	0001	000200	252G	0001	000377	260L	0001	000402	270L
0001	000417	280L	0001	000422	290L	0001	000053	30L	0001	000424	300L	0001	000056	40L
0001	000073	50L	0001	000076	60L	0001	000115	70L	0001	000120	80L	0001	000147	90L
0000 R	000375	AA	0000 R	000545	AB	0000 R	000663	AC	0000 R	001007	AD	0000 R	001157	AE
0000 R	001165	AF	0000 R	001321	AG	0000 R	001467	AH	0000 R	001506	AI	0000 R	001646	AJ
0000 R	001754	AK	0000 R	000542	AZ	0000 R	000175	BP	0000 R	000265	BT	0000 R	000231	DP
0000 R	000321	DT	0000 R	000367	F	0000 R	000372	FF	0000 R	000366	FI	0000 R	000364	FP
0000 R	000370	FT	0000 R	000034	HPTD	0000 I	000362	I	0000 I	000365	IP	0000 I	000371	IT
0000 I	000355	IS	0000 I	000373	J	0000 I	000105	JP	0000 I	000000	LOC	0000 I	000141	MX
0000 I	000360	N	0000 R	000356	P	0000 R	000035	PS	0000 R	000374	PTDENS	0000 R	000375	R
0000 R	000357	T	0000 R	000363	TH	0000 R	000061	TS	0000 R	000361	TZ			

104

00100	1*	CD	* * * * *	HPTD0010
00100	2*	CD		HPTD0020
00100	3*	CD	PROGRAMMER AND DATE	HPTD0030
00100	4*	CD	NATIONAL BUREAU OF STANDARDS	HPTD0040
00100	5*	CD	1967	HPTD0050
00100	6*	CD		HPTD0060
00100	7*	CD	DOCUMENTATION AND DATE	HPTD0070
00100	8*	CD	J. I. PREWITT	HPTD0080
00100	9*	CD	DECEMBER 1970	HPTD0090
00100	10*	CD		HPTD0100
00100	11*	CD	PURPOSE	HPTD0110
00100	12*	CD	COMPUTES THE DENSITY OF HYDROGEN	HPTD0120
00100	13*	CU		HPTD0130
00100	14*	CU	USAGE	HPTD0140
00100	15*	CD	RHO = HPTD (PRES,TEMP)	HPTD0150
00100	16*	CD		HPTD0160
00100	17*	CD	DESCRIPTION OF PARAMETERS	HPTD0170

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00100 18* CD HPTD0180
00100 19* CD INPUT HPTD0190
00100 20* CD CALLING SEQUENCE HPTD0200
00100 21* CD PRES = PRESSURE = PSIA HPTD0210
00100 22* CD TEMP = TEMPERATURE = O R HPTD0220
00100 23* CD HPTD0230
00100 24* CD HPTD0240
00100 25* CD OUTPUT HPTD0250
00100 26* CD HPTD = DENSITY = LBM/FT**3 HPTD0260
00100 27* CD HPTD0270
00100 28* CD REMARKS AND RESTRICTIONS HPTD0280
00100 29* CD THIS ROUTINES WAS OBTAINED FROM NASA/MSC. HPTD0290
00100 30* CD HPTD0300
00100 31* CD SUBPROGRAMS REQUIRED HPTD0310
00100 32* CD NONE HPTD0320
00100 33* CD HPTD0330
00100 34* CD METHOD HPTD0340
00100 35* CD CHECKS ARE MADE ON PRESSURE AND TEMPERATURE TO OBTAIN HPTD0350
00100 36* CD POINTERS TO A DENSITY TABLE FOR INTERPOLATION. HPTD0360
00100 37* CD THIS ROUTINE WAS OBTAINED FROM NASA/MSC AND IS PART OF HPTD0370
00100 38* CD NBS COMPUTER PROGRAMS FOR THERMODYNAMIC AND TRANSPORT HPTD0380
00100 39* CD PROPERTIES OF HYDROGEN FROM 1 TO 5000 PSIA AND FOR HPTD0390
00100 40* CD TEMPERATURES FROM THE TRIPLE POINT (ABOUT 24.16 O R ) HPTD0400
00100 41* CD TO 5000. O R , AUTHORS ARE W.J.HALL, R.D.MCCARTY AND HPTD0410
00100 42* CD H.M.RODER , NBS REPORT NO 9288 , AUGUST 18, 1967, HPTD0420
00100 43* CD PP 188 , NASA NO N67-35527 HPTD0430
00100 44* CD HPTD0440
00100 45* CD. * * * * * HPTD0450
00101 46* FUNCTION HPTD (PRES,TEMP) HPTD0460
00103 47* DIMENSION PS(20),TS(20),JP(ZB),MX(28),LOC(28),BP(28),DP(28),BT(28) HPTD0470
00103 48* 1,DT(28),R(865),AA(101),AB(78),AC(84),AD(104),AE(61),AF(92),AG(102),
00103 49* ZAH(15),AI(96),AJ(70),AK(114),AZ(3) HPTD0490
00104 50* EQUIVALENCE (AA,R),(AB,R(105)),(AC,R(183)),(AD,R(267)),(AE,R(371)) HPTD0500
00104 51* 1),(AF,R(377)),(AG,R(469)),(AH,R(571)),(AI,R(586)),(AJ,R(682)),
00104 52* 2(AK,R(752)),(AZ,R(102)) HPTD0520
00105 53* DATA PS/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,165.0,176.0,
00105 54* 1182.0,185.0,186.5,187.25,187.46875,187.506,187.6385/ HPTD0530
00107 55* DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54.
00107 56* 179.56,72.57,80.58,87.58,99.59,18.59,29.59,34.59,353.59,356.59,4/ HPTD0550
00111 57* DATA LOC/1,23,78,105,141,155,183,201,225,240,267,321,341,377,401. HPTD0570
00111 58* 1 425,437,453,469,494,534,546,586,682,722,752,800,848/ HPTD0580
00113 59* DATA JP/2.5,3,4,2,4,3,4,3,3,4,4,4,3,3,4,4,5,8,4,5,12,5,3,6,6,6/ HPTD0590
00115 60* DATA MX/0,3,1,2,0,2,1,2,1,1,1,2,2,1,1,2,2,3,6,2,3,10,3,1,4,4,4/ HPTD0600
00117 61* DATA BP/0.0,200.0,-100.0,0.0,0.0,-4.0,0.0,2645.28,1469.6,881.76,0.0,0.
00117 62* 1-44.088,587.84,293.92,73.48,-14.696,293.92,36.74,-7.348,293.92, HPTD0620
00117 63* 2180.0,0.0,29.392,102.872,29.392/ HPTD0630
00121 64* DATA DP/800.0,1200.0,200.0,1000.0,100.0,1000.0,7.0,1000.0,1175.68, HPTD0640
00121 65* 1 587.84,293.92,293.92,293.92,58.784,146.96,146.96,73.48,29.392, HPTD0650
00121 66* 2 73.48,36.74,14.696,73.48,10.0,7.348,1.4696,1.4696,1.4696,29.392/ HPTD0660
00123 67* DATA BT/180.0,180.0,500.0,500.0,1300.0,1300.0,2500.0,2500.0,36.0, HPTD0670
00123 68* 1 36.0,27.0,27.0,108.0,108.0,57.6,86.4,86.4,86.4,72.0,72.0,72.0, HPTD0680
00123 69* 2 59.4,59.4,30.0,23.4,39.6,52.2,64.8/ HPTD0690
00125 70* DATA DT/30.0,30.0,100.0,100.0,200.0,200.0,500.0,500.0,36.0,18.0, HPTD0700
00125 71* 1 9.0,9.0,9.0,14.4,7.2,7.2,7.2,7.2,3.6,3.6,7.2,1.8,1.8,6.0,6.4,3.6, HPTD0710
00125 72* 2 1.8,3.6/ HPTD0720
00127 73* DATA AA / 0.0,8376.0,0.0,7052.0,0.0,6114.0,0.0,5412.0,0.0,4862. HPTD0730
00127 74* 1 0.0,4419.0,0.0,4053.0,0.0,3746.0,0.0,3483.0,0.0,3255.0,0.0,3056, HPTD0740
00127 75* 2.2652,1.410,2.315,2.924,3.396,2.2314,1.179,1.979,2.584,3.052,1998, HPTD0750

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00127 76° 31.023,1.739, .09,2.765,.1766,.09058,1.554,2.087,2.526,.1577,.08147,HPTD0780

00127 77° 41.407,1.905, .025,.1424,.7414,1.286,1.754,2.154,.1297,.6809,1.180,HPTD0780

00127 78° 51.626,2.008, .1172,.6300,1.102,1.516,1.881,.1101,.5865,1.029,1.421,HPTD0780

00127 79° 61.769,.1021,.5489,.9656,1.338,1.671,.0953,.5159,.9100,1.264,1.584,HPTD0790

00127 80° 7.03747,.03747,.11140,.03125,.03125,.09302,-.02679,.02679, HPTD0800

00127 81° 8.07985,-.02345,.02345,.06995,-.02085,.02085,.06224,-.01877, HPTD0810

00127 82° 9.01877,.05606,-.01706,.01706,.05099,-.01565,.01565,.04677/ HPTD0820

00131 83° DATA AZ /-.01445,.01445,.04282/ HPTD0830

00133 84° DATA AB /,00464,.3605,.6912,.9949,.00341,.3021,.5825,HPTD0840

00133 85° 1.8432,.00260,.2601,.5038,.7325,.00200,.2285,.4441,.6479, HPTD0850

00133 86° 2.00161,.2037,.3972,.5810,.00131,.1838,.3592,.5267,.00110, HPTD0860

00133 87° 3.1674,.3279,.4818,.00090,.15380,.3017,.4439,.00027,.1422,.2793,.41 HPTD0870

00133 88° 416.0,0,.01445,0,0,.01252,0,0,.01105,0,0,.009892,0,0,.008951,0,0, HPTD0880

00133 89° 5.008174,0,.007521,.000267,.1422,.2793,.4116,.000189,.1235,.2432,HPTD0890

00133 90° 6.3592,.000144,.1092,.2154,.3187,.000120,.09785,.1933,.2864,.000098,HPTD0900

00133 91° 7.08864,.1753,.2601,.000081,.08101,.1604,.2382,.000069,.07459,.147 HPTD0910

00133 92° 88,.2196/ HPTD0920

00135 93° DATA AC /-.0003009,.0002256,.0007521,-.0002510,.00018 HPTD0930

00135 94° 182,.0006272,-.0002150,.0001611,.0005373,-.0001878,.0001442,.000468 HPTD0940

00135 95° 26,-.0001656,.0001221,.0004119,-.0001452,.0001042,.0003599,.0000069 HPTD0950

00135 96° 3.07459,.1478,.2196,.000046,.06226,.1236,.1839,.0000031,.05342,.1 HPTD0960

00135 97° 4061,.1582,.0000009,.04677,.09301,.1387,-.0000036,.04155,.08272,.12 HPTD0970

00135 98° 535,-.0000132,.03730,.07436,.1111, 5.270, 5.489, 5.680, 4.501 HPTD0980

00135 99° 6.4845,5.107,3.616,4.126,4.483,2.857,3.466,3.895,2.319,2.935,3.395 HPTD0990

00135 100° 7.4794,5.143,5.270,4.533,4.743,4.886,3.958,4.270,4.501,3.307,3.752 HPTD1000

00135 101° 8.4059,2.698,3.243,3.616,2.226,2.796,3.236,1.886,2.435,2.857,1.639 HPTD1010

00135 102° 9,2.150,2.588,1.453,1.924,2.319/ HPTD1020

00137 103° DATA AD /5.033,5.112,5.183,4.816,4.910,4.994,4.558,4.0 HPTD1030

00137 104° 1676,4.764,4.248,4.405,4.533,3.880,4.094,4.246,3.442,3.743,3.958,2.0 HPTD1040

00137 105° 2953,3.361,3.633,2.481,2.975,3.307,2.093,2.616,3.002,1.804,2.309,2.0 HPTD1050

00137 106° 3698,1.588,2.059,2.462,1.423,1.856,2.226,1.293,1.691,2.056,1.187,1.0 HPTD1060

00137 107° 4555,1.886,1.100,1.441,1.754,1.026,1.344,1.639,.9627,1.262,1.546,.9 HPTD1070

00137 108° 5076,1.189,1.453, 4.742,4.853,4.946,5.031,4.430,4.584,4.709,4.816 HPTD1080

00137 109° 6.4024,4.279,4.417,4.558,3.165,3.778,4.050,4.248,1.430,2.988,3.595 HPTD1090

00137 110° 7.3880, -.0233,.5581,1.189,1.804,-.015,.5030,1.005,1.588,-.0099, HPTD1100

00137 111° 8459,1.945,1.423,-.0065,.4231,.8618,1.293,-.0042,.3928,.7943,1.187, HPTD1110

00137 112° 9.00025,.3669,.7379,1.1,-.0015,.3445,.6898,1.026,-.0007,.3249/ HPTD1120

00141 113° DATA AE /,6483,.9627,-.0001,.3075,.6120,.9076/ HPTD1130

00143 114° DATA AF /-.07704,.02568,.1307,.2384,-.06786,.02262,1 HPTD1140

00143 115° 1144,.2079,-.06066,.02022,.1018,-.1844,-.05484,.01828,.09179,.1659,-HPTD1150

00143 116° 2.05004,.01668,.0836,.1508,-.04602,.01534,.07677,.1383, 3.887,3.9 HPTD1160

00143 117° 386,4.105,3.447,3.046,3.792,2.910,3.226,3.442,2.323,2.760,3.051,1.8 HPTD1170

00143 118° 457,2.317,2.670,1.549,1.963,2.326,1.34,1.701,2.035,1.189,1.497,1.80 HPTD1180

00143 119° 54. .7859,1.309,1.857,.6864,1.106,1.549,.6141,.9689,1.34,.5581,.8 HPTD1190

00143 120° 6735,1.189, .1675,.3524,.5577,.7859,.1530,.3178,.4955,.6864,.1409, HPTD1200

00143 121° 7.2902,.4479,.6141,.1307,.2674,.4127,.5581, -.03228,.03224,.09858, HPTD1210

00143 122° 8.1675,-.029742,.02971,.09043,.153,-.027561,.02754,.08359,.1409,-.0 HPTD1220

00143 123° 925680,.02568,.07819,.1307/ HPTD1230

00145 124° DATA AG /1.226,1.807,2.329,2.674,2.91,1.052,1.481,1.9 HPTD1240

00145 125° 141,2.326,2.616,.9378,1.279,1.656,2.019,2.323,.8526,1.141,1.456,1.7 HPTD1250

00145 126° 274,2.089,.7859,1.047,1.309,1.583,1.857,.09975,.2084,.3279,.461,.6 HPTD1260

00145 127° 3115,.7847,.9864,1.226,.09478, .1962,.3063,.4264,.5585,.7052,.8693, HPTD1270

00145 128° 41.052,.08981,.1855,.2878,.3977,.5164,.6451,.7851,.9388,.08590,.176 HPTD1280

00145 129° 5.2717,.3734,.4817,.5972,.7207,.8526,.08199,.1675,.2599,.3524,.455 HPTD1290

00145 130° 60,.5577,.6718,.7859, -.019364,.01932,.05888,.09975,-.017558,.0175 HPTD1300

00145 131° 73,.05323,.08981,-.01615,.01611,.04882,.08199, 3.304,3.422,3.541, HPTD1310

00145 132° 83.659,3.777,3.044,3.290,3.450,3.572,3.667,2.740,3.042,3.304,3.449, HPTD1320

00145 133° 93.557,2.322,2.880,3.141,3.315,3.447,1.861,2.621,2.959,3.170,3.313/ HPTD1330

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00147 134* DATA AH /1.551,2.329,2.760,3.014,3.179,1.358,2.045, HPTD1340
00147 135* 12.546,2.848,3.044,1.226,1.807,2.329,2.674,2.910/ HPTD1350
00151 136* DATA AI /.6295,2.42,2.726,2.849,2.937,3.005,3.061,3.1 HPTD1360
00151 137* 11.3.153,3.191,3.227,3.259,1.9338,1.076,1.265,1.599,2.202,2.566,2.65 HPTD1370
00151 138* 29.2.768,2.85,2.918,2.976,3.026,1.8297,1.9234,1.03,1.159,1.322,1.542, HPTD1380
00151 139* 31.835,2.136,2.356,2.509,2.618,2.709,1.7590,1.8323,1.9121,1.00,1.103, HPTD1390
00151 140* 41.220,1.359,1.523,1.713,1.916,2.106,2.267,1.7053,1.7670,1.8326,1.9039, HPTD1400
00151 141* 5.9807,1.066,1.160,1.265,1.383,1.513,1.655,1.803,1.6621,1.7161,1.7728, HPTD1410
00151 142* 6.8331,1.8976,1.9656,1.040,1.120,1.206,1.299,1.400,1.507,1.6259,1.6745, HPTD1420
00151 143* 7.7250,1.7780,1.8337,1.8927,1.9537,1.019,1.089,1.163,1.242,1.325,1.5941, HPTD1430
00151 144* 8.6412,1.6883,1.7355,1.7824,1.8372,1.8921,1.9469,1.005,1.070,1.135,1.200/ HPTD1440
00153 145* DATA AJ /-.000743,0.04849,0.09854,0.0,0,0.000787,0.04023, HPTD1450
00153 146* 108466,1.1315,1.1915,1.000437,0.03393,0.07032,1.097,1.1534,1.000257,0.029 HPTD1460
00153 147* 241,1.06027,1.09278,1.1275,1.000177,1.02599,1.05289,1.0808,1.1098,1.000122 HPTD1470
00153 148* 3,1.0233,1.0472,1.07177,1.09714,1.000083,1.02112,1.04266,1.06465,1.08719, HPTD1480
00153 149* 4000065,1.01932,1.03810,1.05888,1.07931,1.0,1.01172,1.02363,1.000111,1.00 HPTD1490
00153 150* 59736,1.0198,1.000059,1.008154,1.01648,1.000036,1.007021,1.01414,1.00002 HPTD1500
00153 151* 64,1.006166,1.0124,1.000015,1.005498,1.01104,1.000011,1.004962,1.009954, HPTD1510
00153 152* 7.000009,1.004521,1.009063,1.000007,1.004153,1.008321,1.000022,1.003846, HPTD1520
00153 153* 8.007715/ HPTD1530
00155 154* DATA AK /1.1664,1.248,0.0,0.0,0.0,1.1469,1.2418,1.3397,0.0,0.0,0.0,1.1315, HPTD1540
00155 155* 1.2117,1.3091,1.4233,1.5318,0.0,1.195,1.1891,1.2684,1.3626,1.4811,1.6115, HPTD1550
00155 156* 2.1098,1.1717,1.2400,1.3166,1.4051,1.5124,1.1017,1.1578,1.2183,1.2841,1.3568, HPTD1560
00155 157* 3.4387,1.09486,1.1463,1.2009,1.2592,1.322,1.3903,1.08892,1.1377,1.1865,1.2407 HPTD1570
00155 158* 4,1.295,1.3565,1.5712,1.727,1.9725,0.0,0.0,1.5124,1.6559,1.8514,1.116,0.0, HPTD1580
00155 159* 50,1.4755,1.5827,1.7329,1.9604,1.252,1.718,1.4387,1.5333,1.6477,1.7994,1.0 HPTD1590
00155 160* 668,1.1534,1.4145,1.4956,1.5914,1.7060,1.8535,1.1082,1.3903,1.4653,1.5491,1.64 HPTD1600
00155 161* 747,1.7575,1.8985,1.3734,1.4399,1.5151,1.5986,1.6928,1.8020,1.3565,1.4161,1.48 HPTD1610
00155 162* 898,1.5616,1.6487,1.7358,1.08892,1.1865,1.295,1.4181,1.5616,1.7358,1.08373,1.1 HPTD1620
00155 163* 9743,1.2731,1.3822,1.5044,1.6439,1.07931,1.1649,1.2562,1.3545,1.4610,1.5814/ HPTD1630
00157 164* P=PRES HPTD1640
00160 165* IF (P.LT.1.0) P=1.0 HPTD1650
00162 166* T=TEMP HPTD1660
00163 167* IF (T.LT.180.0) GO TO 80 HPTD1670
00165 168* IF (T.GE.1300.0) GO TO 40 HPTD1680
00167 169* IF (T.GE.490.0) GO TO 20 HPTD1690
00171 170* IF (P.GE.800.0) GO TO 10 HPTD1700
00173 171* N=1 HPTD1710
00174 172* GO TO 300 HPTD1720
00175 173* 10 N=2 HPTD1730
00176 174* GO TO 300 HPTD1740
00177 175* 20 IF (P.GE.300.0) GO TO 30 HPTD1750
00201 176* N=3 HPTD1760
00202 177* GO TO 300 HPTD1770
00203 178* 30 N=4 HPTD1780
00204 179* GO TO 300 HPTD1790
00205 180* 40 IF (T.GE.2500.0) GO TO 60 HPTD1800
00207 181* IF (P.GE.100.0) GO TO 50 HPTD1810
00211 182* N=5 HPTD1820
00212 183* GO TO 300 HPTD1830
00213 184* 50 N=6 HPTD1840
00214 185* GO TO 300 HPTD1850
00215 186* 60 IF (T.GE.5000.0) T=4999.99999 HPTD1860
00217 187* IF (P.GE.10.0) GO TO 70 HPTD1870
00221 188* N=7 HPTD1880
00222 189* GO TO 300 HPTD1890
00223 190* 70 N=8 HPTD1900
00224 191* GO TO 300 HPTD1910

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00225	192*	80	TZ=24.84+0.017*P	HPTD1920
00226	193*		IF (T.LT.TZ)	HPTD1930
00230	194*		IF (P.LT.881.0) GO TO 110	HPTD1940
00232	195*		IF (P.LT.2645.28) GO TO 90	HPTD1950
00234	196*		N=9	HPTD1960
00235	197*		GO TO 300	HPTD1970
00236	198*	90	IF (P.LT.1469.6) GO TO 100	HPTD1980
00240	199*		N=10	HPTD1990
00241	200*		GO TO 300	HPTD2000
00242	201*	100	N=11	HPTD2010
00243	202*		GO TO 300	HPTD2020
00244	203*	110	IF (T.GE.59.4) GO TO 140	HPTD2030
00246	204*		N=12	HPTD2040
00247	205*		IF (P.GE.187.6385) GO TO 300	HPTD2050
00251	206*		DO 120 I=2,20	HPTD2060
00254	207*		IF (P-PS(I)).130,130,120	HPTD2070
00257	208*	120	CONTINUE	HPTD2080
00261	209*		I=20	HPTD2090
00262	210*	130	TM=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))	HPTD2100
00263	211*		IF (T.GE.TM) GO TO 240	HPTD2110
00265	212*		GO TO 300	HPTD2120
00266	213*	140	IF (T.LT.108.0) GO TO 160	HPTD2130
00270	214*		IF (P.LT.132.264) GO TO 150	HPTD2140
00272	215*		N=13	HPTD2150
00273	216*		GO TO 300	HPTD2160
00274	217*	150	N=14	HPTD2170
00275	218*		GO TO 300	HPTD2180
00276	219*	160	IF (P.LT.587.84) GO TO 170	HPTD2190
00300	220*		N=15	HPTD2200
00301	221*		GO TO 300	HPTD2210
00302	222*	170	IF (T.LT.72.0) GO TO 230	HPTD2220
00304	223*		IF (T.LT.86.4) GO TO 200	HPTD2230
00306	224*		IF (P.LT.293.92) GO TO 180	HPTD2240
00310	225*		N=16	HPTD2250
00311	226*		GO TO 300	HPTD2260
00312	227*	180	IF (P.LT.73.48) GO TO 190	HPTD2270
00314	228*		N=17	HPTD2280
00315	229*		GO TO 300	HPTD2290
00316	230*	190	N=18	HPTD2300
00317	231*		GO TO 300	HPTD2310
00320	232*	200	IF (P.LT.293.92) GO TO 210	HPTD2320
00322	233*		N=19	HPTD2330
00323	234*		GO TO 300	HPTD2340
00324	235*	210	IF (P.LT.36.74) GO TO 220	HPTD2350
00326	236*		N=20	HPTD2360
00327	237*		GO TO 300	HPTD2370
00330	238*	220	N=21	HPTD2380
00331	239*		GO TO 300	HPTD2390
00332	240*	230	IF (P.LT.293.92) GO TO 240	HPTD2400
00334	241*		N=22	HPTD2410
00335	242*		GO TO 300	HPTD2420
00336	243*	240	IF (P.LT.180.0) GO TO 250	HPTD2430
00340	244*		N=23	HPTD2440
00341	245*		GO TO 300	HPTD2450
00342	246*	250	IF (P.GE.29.0) GO TO 270	HPTD2460
00344	247*		IF (P.LT.2.9392) GO TO 260	HPTD2470
00346	248*		N=24	HPTD2480
00347	249*		GO TO 300	HPTD2490

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00350 250* 260 N=25 HPTD2500
00351 251* GO TO 300 HPTD2510
00352 252* 270 IF (T.GE.64.8) GO TO 290 HPTD2520
00354 253* IF (P.GE.102.0) GO TO 280 HPTD2530
00356 254* N=26 HPTD2540
00357 255* GO TO 300 HPTD2550
00360 256* 280 N=27 HPTD2560
00361 257* GO TO 300 HPTD2570
00362 258* 290 N=28 HPTD2580
00363 259* 300 FP=(P-BP(N))/DP(N) HPTD2590
00364 260* IP=FP HPTD2600
00365 261* IF (IP.GT.MX(N)) IP=MX(N) HPTD2610
00367 262* FI=IP HPTD2620
00370 263* F=FP-FI HPTD2630
00371 264* FP=1.0-F HPTD2640
00372 265* FT=(T-BT(N))/DT(N) HPTD2650
00373 266* IT=FT HPTD2660
00374 267* FI=IT HPTD2670
00375 268* FF=FT-FI HPTD2680
00376 269* FT=1.0-FF HPTD2690
00377 270* I=IT*JP(N)+IP+LOC(N) HPTD2700
00400 271* J=I+JP(N) HPTD2710
00401 272* PTDENS=FP*FT*R(I)+F*FT*R(I+1)+FP*FF*R(J)+F*FF*R(J+1) HPTD2720
00402 273* HPTD = PTDENS HPTD2730
00403 274* RETURN HPTD2740
00404 275* END HPTD2750
    
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END OF UNIVAC 1108 FORTRAN V COMPILATION.

0 *DIAGNOSTIC* MESSAGE(S)

HPTD	CODE	SYMBOLIC	RELOCATABLE	10 MAY 71	12:52:01	0	01550224	14	275	(DELETED)
HPTD				19 MAY 71	02:50:07	1	01527732	24	1	(DELETED)
						0	01527762	14	141	

FOR, HPTTC,HPTTC

FOR HPTTC HPTTC
UNIVAC 1108 FORTRAN V LEVEL 220 118 F5018H
THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:25

FUNCTION HPTTC ENTRY POINT 000504

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000511
0000 *DATA 001274
0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 NERR3s

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000033	10L	0001	000157	100L	0001	000171	110L	0001	000215	120L	0001	000225	130L
0001	000230	140L	0001	000240	150L	0001	000254	160L	0001	000266	180L	0001	000272	190L
0001	000036	20L	0001	000305	200L	0001	000315	210L	0001	000325	220L	0001	000342	230L
0001	000354	240L	0001	000363	250L	0001	000414	260L	0001	000446	30L	0001	000256	302G
0001	000067	40L	0001	000103	50L	0001	000111	60L	0001	000125	70L	0001	000141	80L
0001	000147	90L	0000 R	000237	AA	0000 R	000267	AB	0000 R	000325	AC	0000 R	000351	AD
0000 R	000375	AE	0000 R	000407	AF	0000 R	000452	AG	0000 R	000515	AH	0000 R	000533	AI
0000 R	000662	AJ	0000 R	000713	AK	0000 R	000747	AL	0000 R	001035	AM	0000 R	001057	AN
0000 R	001165	AO	0000 R	000124	BP	0000 R	000162	BT	0000 R	000237	C	0000 R	000143	DP
0000 R	000201	DT	0000 R	000225	F	0000 R	000234	FF	0000 R	000231	FI	0000 R	000230	FP
0000 R	000232	FT	0000 R	000017	HPTTC	0000 I	000226	I	0000 I	000224	IP	0000 I	000233	IT
0000 I	000220	IS	0000 I	000235	J	0000 I	000066	JP	0000 I	000000	LOC:	0000 I	000105	MX
0000 I	000223	N	0000 R	000221	P	0000 R	000020	PS	0000 R	000236	PTCOND	0000 R	000222	T
0000 R	000043	TS	0000 R	000227	TSAT									

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00100	1*	CD	HPTT0010
00100	2*	CD		HPTT0020
00100	3*	CD	PROGRAMMER AND DATE	HPTT0030
00100	4*	CD	NATIONAL BUREAU OF STANDARDS	HPTT0040
00100	5*	CD	1967	HPTT0050
00100	6*	CD		HPTT0060
00100	7*	CD	DOCUMENTATION AND DATE	HPTT0070
00100	8*	CD	J. I. PREWITT	HPTT0080
00100	9*	CD	DECEMBER 1970	HPTT0090
00100	10*	CD		HPTT0100
00100	11*	CD	PURPOSE	HPTT0110
00100	12*	CD	COMPUTES THE THERMAL CONDUCTIVITY OF HYDROGEN.	HPTT0120
00100	13*	CD		HPTT0130
00100	14*	CD	USAGE	HPTT0140
00100	15*	CD	TC = HPTIC (PRES.TEMP)	HPTT0150
00100	16*	CD		HPTT0160
00100	17*	CD	DESCRIPTION OF PARAMETERS	HPTT0170

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00100 18* CD HPTT0180
00100 19* CD INPUT HPTT0190
00100 20* CD CALLING SEQUENCE HPTT0200
00100 21* CD PRES - PRESSURE - PSIA HPTT0210
00100 22* CD TEMP - TEMPERATURE - O R HPTT0220
00100 23* CD HPTT0230
00100 24* CD OUTPUT HPTT0240
00100 25* CD HPTT0250
00100 26* CD CALLING SEQUENCE HPTT0260
00100 27* CD HPTTC - THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R HPTT0270
00100 28* CD REMARKS AND RESTRICTIONS HPTT0280
00100 29* CD THIS ROUTINE WAS OBTAINED FROM NASA/MSC. HPTT0290
00100 30* CD HPTT0300
00100 31* CD SUBPROGRAMS REQUIRED HPTT0310
00100 32* CD NONE HPTT0320
00100 33* CD HPTT0330
00100 34* CD METHOD HPTT0340
00100 35* CD CHECKS ARE MADE ON PRESSURE AND TEMPERATURE TO OBTAIN HPTT0350
00100 36* CD THE POINTERS TO A THERMAL CONDUCTIVITY TABLE FOR HPTT0360
00100 37* CD INTERPOLATION. HPTT0370
00100 38* CD THIS ROUTINE WAS OBTAINED FROM NASA/MSC AND IS PART OF HPTT0380
00100 39* CD NBS COMPUTER PROGRAMS FOR THERMODYNAMIC AND TRANSPORT HPTT0390
00100 40* CD PROPERTIES OF HYDROGEN FROM 1 TO 5000 PSIA AND FOR HPTT0400
00100 41* CD TEMPERATURES FROM THE TRIPLE POINT (ABOUT 24.16 O R ) HPTT0410
00100 42* CD TO 5000 O R . AUTHORS ARE W.J.HALL, R.D.MCCARTY AND HPTT0420
00100 43* CD H.M.RODER , NBS REPORT NO 9288 , AUGUST 18, 1967, HPTT0430
00100 44* CD PP 188 , NASA NO N67-35527 HPTT0440
00100 45* CD HPTT0450
00100 46* CD * * * * * HPTT0460
00101 47* CD FUNCTION HPTTC (PRES,TEMP) HPTT0470
00103 48* CD DIMENSION PS(19),TS(19),JP(15),MX(15),LOC(15),BP(15),DP(15),BT(15) HPTT0480
00103 49* CD 1,OT(15),C(502),AA(24),AB(30),AC(20),AD(20),AE(10),AF(35),AG(35), HPTT0490
00103 50* CD 2AH(14),AI(87),AJ(25),AK(28),AL(54),AM(18),AN(70),AO(32) HPTT0500
00104 51* CD EQUIVALENCE (AA,C),(AB,C(25)),(AC,C(55)),(AD,C(75)),(AE,C(95)),(AF,HPTT0510
00104 52* CD 1,C(105)),(AG,C(140)),(AH,C(175)),(AI,C(189)),(AJ,C(276)),(AK,C(301)HPTT0520
00104 53* CD 2),(AL,C(329)),(AM,C(383)),(AN,C(401)),(AO,C(471)) HPTT0530
00105 54* CD DATA JP/9.9,4.4,2.5,7.7,7.7,6.3,7.7,2/ HPTT0540
00107 55* CD DATA MX/4.2,2.2,0.3,5.5,5.5,4.1,5.5,0/ HPTT0550
00111 56* CD DATA LOC/ 1.6,55.75,95.05,140.175,189.301,329,383,401,471,499/ HPTT0560
00113 57* CD DATA BP/0.,1469.6,0.,1469.6,1028.72,440.88,0.,0.,0.,0.,293.92, HPTT0570
00113 58* CD 1 180.,180.,120./ HPTT0580
00115 59* CD DATA DP/293.92,1175.68,1000.,1175.68,440.88,146.96,73.48,0.,0., HPTT0590
00115 60* CD 1 73.48,36.74,73.48,20.,20.,40./ HPTT0600
00117 61* CD DATA BT/180.0,180.0,600.0,36.0,36.0,27.0,108.0,1278.0,2700.0,27.0, HPTT0610
00117 62* CD 127.0,54.0,54.0,72.0,54.0/ HPTT0620
00121 63* CD DATA DT/72.,72.,100.,36.,36.,27.,18.,1422.,180.,9.,9.,9.,1.8,9., HPTT0630
00121 64* CD 15.4/ HPTT0640
00123 65* CD DATA PS/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0, HPTT0650
00123 66* CD 1165.0,176.0,182.0,185.0,186.5,187.25,187.46875,187.506/ HPTT0660
00125 67* CD DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97, HPTT0670
00125 68* CD 154.79,56.72,57.80,58.57,58.99,59.18,59.29,59.34,59.353,59.356/ HPTT0680
00127 69* CD DATA AA /,04476.,05103.,05971.,06618.,07002.,07268, HPTT0690
00127 70* CD 1 ,08216.,08976.,09584.,06661.,07073.,07749.,08378.,08846.,09187, HPTT0700
00127 71* CD 2 ,09955.,10614.,11242.,08118.,08391.,08873.,09380.,09811.,10166/ HPTT0710
00131 72* CD DATA AB /,10974.,11446.,11924.,09099.,09289.,09636, HPTT0720
00131 73* CD 1 ,10028.,10389.,10712.,11542.,11959.,12306.,10290.,10435.,10705, HPTT0730
00131 74* CD 2 ,11024.,11335.,11628.,12469.,12906.,13204.,11286.,11403.,11614, HPTT0740
00131 75* CD 3 ,11874.,12142.,12400.,13217.,13699.,14023/ HPTT0750

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00133 76* DATA AC / .12000, .12607, .13342, .13802, .13189, .13648, HP110760
00133 77* 1 .14298, .14634, .15012, .15582, .16088, .16075, .16394, .16898, HP110770
00133 78* 2 .17374, .17765, .18212, .18656/ HP110780
00135 79* DATA AD / .08390, .10792, .14312, .19133, .07030, .07723, HP110790
00135 80* 1 .08549, .09975, .06381, .07448, .08030, .08500, .06449, .07597, .08326, HP110800
00135 81* 2 .08828, .07268, .08216, .08996, .09584/ HP110810
00137 82* DATA AE / .07788, .08390, .06616, .07030, .05634, .06381, HP110820
00137 83* 1 .05980, .06449, .06830, .07268/ HP110830
00141 84* DATA AF / .07723, .07929, .08125, .08326, .08727, .06569, HP110840
00141 85* 1 .06720, .06847, .06960, .07064, .04563, .05197, .05720, .06084, .06323, HP110850
00141 86* 2 .04431, .04837, .05114, .05383, .05634, .04662, .05100, .05409, .05637, HP110860
00141 87* 3 .05813, .05150, .05581, .05920, .06182, .06376, .05785, .06400, .06560, HP110870
00141 88* 4 .06853, .07073/ HP110880
00143 89* DATA AG / .02541, .02703, .03016, .03405, .03783, .04141, HP110890
00143 90* 1 .04431, .02960, .03087, .03331, .03638, .03956, .04268, .04544, .03432, HP110900
00143 91* 2 .03538, .03738, .03994, .04269, .04545, .04804, .03938, .04029, .04199, HP110910
00143 92* 3 .04418, .04661, .04909, .05150, .04476, .04633, .04789, .04946, .05103, HP110920
00143 93* 4 .05320, .05537/ HP110930
00145 94* DATA AH / .20567, .20466, .20390, .20380, .20451, .20597, HP110940
00145 95* 1 .20852, .36298, .35676, .35209, .35139, .35498, .35604, .35622/ HP110950
00147 96* DATA AI / .36286, .35682, .35196, .35150, .35488, .35609, HP110960
00147 97* 1 .35633, .38534, .38148, .37930, .37664, .37543, .37447, .37471, .41170, HP110970
00147 98* 2 .40783, .40734, .40275, .39671, .39381, .39356, .44602, .43708, .43781, HP110980
00147 99* 3 .43079, .41919, .41387, .41339, .49582, .47237, .47165, .46174, .44361, HP110990
00147 100* 4 .43539, .43418, .57270, .51734, .51154, .49752, .47092, .45859, .45642, HP111000
00147 101* 5 .69382, .57874, .56182, .54103, .50211, .48422, .48059, .88238, .66553, HP111010
00147 102* 6 .62782, .59567, .53910, .51299, .50670, .1.1669, .79003, .71775, .66723, HP111020
00147 103* 7 .58382, .54562, .53595, .57555, .96748, .84201, .76199, .63918, .58310, HP111030
00147 104* 8 .56859, .2.1303, .1.2148, .1.0124, .88043, .70784, .62686, .60582, .2.8357, HP111040
00147 105* 9 .54821, .1.2428, .1.0555, .79390, .67810, .64813, .3.6746, .1.9802, .1.5455/ HP111050
00151 106* DATA AJ / .1.2723, .90124, .7383, .69696, .4.5908, .2.5142, .1.9 HP111060
00151 107* 1301, .1.5474, .1.034, .80937, .75305, .5.5046, .3.1428, .2.3999, .1.8869, .1.1967, HP111070
00151 108* 2.89302, .81784, .6.3121, .3.839, .2.9494, .2.2923, .1.3925, .99093, .89254/ HP111080
00153 109* DATA AK / .07199, .07268, .07353, .07441, .07531, .07625, HP111090
00153 110* 1 .07723, .06733, .06845, .06909, .06973, .07037, .07103, .07170, .06447, HP111100
00153 111* 2 .06517, .06598, .06670, .06736, .06799, .06859, .06143, .06015, .06048, HP111110
00153 112* 3 .06236, .06371, .06478, .06569/ HP111120
00155 113* DATA AL / .00695, .00730, .00000, .00000, .00000, .00000, HP111130
00155 114* 1 .00906, .01179, .01806, .00000, .00000, .00000, .01115, .01385, .01972, HP111140
00155 115* 2 .03034, .00000, .00000, .01324, .01504, .01928, .02628, .03868, .04891, HP111150
00155 116* 3 .01531, .01666, .01961, .02378, .02870, .03405, .01736, .01842, .02064, HP111160
00155 117* 4 .02370, .02728, .03106, .01939, .02027, .02205, .02446, .02730, .03032, HP111170
00155 118* 5 .02142, .02216, .02362, .02566, .02796, .03054, .02342, .02406, .02529, HP111180
00155 119* 6 .02700, .02895, .03113/ HP111190
00157 120* DATA AM / .06371, .06478, .06569, .05421, .05850, .06083, HP111200
00157 121* 1 .04069, .04580, .05134, .03864, .04257, .04563, .03782, .04179, .04456, HP111210
00157 122* 2 .03760, .04137, .04422/ HP111220
00161 123* DATA AN / .06143, .06192, .06235, .06276, .06313, .06348, HP111230
00161 124* 1 .06380, .05956, .06027, .06088, .06141, .06189, .06233, .06273, .05656, HP111240
00161 125* 2 .05790, .05888, .05967, .06034, .06092, .06144, .02859, .05321, .05573, HP111250
00161 126* 3 .05719, .05826, .05912, .06011, .03472, .03859, .04741, .05282, .05811, HP111260
00161 127* 4 .05661, .05764, .03346, .03645, .03953, .04401, .04960, .05273, .05457, HP111270
00161 128* 5 .03257, .03522, .03775, .04027, .04330, .04718, .05016, .03190, .03433, HP111280
00161 129* 6 .03663, .03878, .04089, .04321, .04569, .03139, .03366, .03582, .03761, HP111290
00161 130* 7 .03967, .04145, .04328, .03098, .03313, .03517, .03707, .03882, .04043, HP111300
00161 131* 8 .04199/ HP111310
00163 132* DATA AO / .03070, .03277, .03466, .03655, .03818, .03975, HP111320
00163 133* 1 .04115, .03002, .03169, .03328, .03488, .03634, .03776, .03904, .03028, HP111330

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00163	134*	2	*03167,*03302,*03442,*03576,*03701,*03821,*03091,*03211,*03329,	HPTT1340
00163	135*	3	*03452,*03570,*03684,*03795,*05950,*06088,*05036,*05159/	HPTT1350
00165	136*		P=PRES	HPTT1360
00166	137*		IF (P.LT.1.0) P=1.0	HPTT1370
00170	138*		T=TEMP	HPTT1380
00171	139*		IF (T.LT.180.0) GO TO 110	HPTT1390
00173	140*		IF (T.GE.540.0) GO TO 20	HPTT1400
00175	141*		IF (P.GE.1469.6) GO TO 10	HPTT1410
00177	142*		N=1	HPTT1420
00200	143*		GO TO 250	HPTT1430
00201	144*	10	N=2	HPTT1440
00202	145*		GO TO 250	HPTT1450
00203	146*	20	IF (T.GE.1000.0) GO TO 30	HPTT1460
00205	147*		N=3	HPTT1470
00206	148*		GO TO 250	HPTT1480
00207	149*	30	IF (P.GE.29.392) GO TO 60	HPTT1490
00211	150*		IF (P.LT.14.696) GO TO 40	HPTT1500
00213	151*		IP=2	HPTT1510
00214	152*		F=P/14.696-1.0	HPTT1520
00215	153*		GO TO 90	HPTT1530
00216	154*	40	IF (P.LT.7.368) GO TO 50	HPTT1540
00220	155*		IP=1	HPTT1550
00221	156*		F=P/7.348-1.0	HPTT1560
00222	157*		GO TO 90	HPTT1570
00223	158*	50	IP=0	HPTT1580
00224	159*		F=(P-1.4696)/5.8784	HPTT1590
00225	160*		GO TO 90	HPTT1600
00226	161*	60	IF (P.GE.146.96) GO TO 70	HPTT1610
00230	162*		IP=3	HPTT1620
00231	163*		F=(P-29.392)/117.568	HPTT1630
00232	164*		GO TO 90	HPTT1640
00233	165*	70	IF (P.GE.734.8) GO TO 80	HPTT1650
00235	166*		IP=4	HPTT1660
00236	167*		F=(P-146.96)/587.84	HPTT1670
00237	168*		GO TO 90	HPTT1680
00240	169*	80	IP=5	HPTT1690
00241	170*		F=P/734.8-1.0	HPTT1700
00242	171*	90	IF (T.GT.2700.0) GO TO 100	HPTT1710
00244	172*		N=8	HPTT1720
00245	173*		GO TO 260	HPTT1730
00246	174*	100	N=9	HPTT1740
00247	175*		IF (T.GE.5400.0) T=5399.9999	HPTT1750
00251	176*		GO TO 260	HPTT1760
00252	177*	110	IF (T.LT.20.0) T=20.0	HPTT1770
00254	178*		IF (P.LT.440.88) GO TO 140	HPTT1780
00256	179*		IF (P.LT.1469.6) GO TO 120	HPTT1790
00260	180*		N=4	HPTT1800
00261	181*		GO TO 250	HPTT1810
00262	182*	120	IF (P.LT.1028.72) GO TO 130	HPTT1820
00264	183*		N=5	HPTT1830
00265	184*		GO TO 250	HPTT1840
00266	185*	130	N=6	HPTT1850
00267	186*		GO TO 250	HPTT1860
00270	187*	140	IF (T.LT.99.0) GO TO 150	HPTT1870
00272	188*		N=7	HPTT1880
00273	189*		GO TO 250	HPTT1890
00274	190*	150	IF (T.GE.54.0) GO TO 210	HPTT1900
00276	191*		N=10	HPTT1910

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00277 192* IF (P.GE.120) GO TO 250
00301 193* 160 DO 170 I=2,1
00304 194* IF (P-PS(I)) ,180,170
00307 195* 170 CONTINUE
00311 196* 180 TSAT=TS(I)
00312 197* GO TO 200
00313 198* 190 TSAT=TS(I-1)+(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1))
00314 199* 200 IF(T.GT.TSAT) N=11
00316 200* GO TO 250
00317 201* 210 IF (P.LT.300.0) GO TO 220
00321 202* N=12
00322 203* GO TO 250
00323 204* 220 IF (T.GE.59.356) GO TO 240
00325 205* IF (P.GE.180.0) GO TO 230
00327 206* N=15
00330 207* GO TO 160
00331 208* 230 N=13
00332 209* IF(T.GE.70.2) N=14
00334 210* GO TO 250
00335 211* 240 IF (P.GE.180.0) GO TO 230
00337 212* N=11
00340 213* 250 FP=(P-BP(N))/DP(N)
00341 214* IP=FP
00342 215* IF(IP.GT.MX(N)) IP=MX(N)
00344 216* FI=IP
00345 217* F=FP-FI
00346 218* 260 FP=1.0-F
00347 219* FT=(T-BT(N))/DT(N)
00350 220* IT=FT
00351 221* FI=IT
00352 222* FF=FT-FI
00353 223* FT=1.0-FF
00354 224* I=IT*JP(N)+IP+LOC(H)
00355 225* J=I+JP(N)
00356 226* PTCND=FP*FT*C(I)+F*FT*C(I+1)+FP*FF*C(J)+F*FF*C(J+1)
00357 227* HPTTC = PTCND
00360 228* RETURN
00361 229* END

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HPTT00
HPTT01
HPTT1740
HPTT1950
HPTT1960
HPTT1970
HPTT1980
HPTT1990
HPTT2000
HPTT2010
HPTT2020
HPTT2030
HPTT2040
HPTT2050
HPTT2060
HPTT2070
HPTT2080
HPTT2090
HPTT2100
HPTT2110
HPTT2120
HPTT2130
HPTT2140
HPTT2150
HPTT2160
HPTT2170
HPTT2180
HPTT2190
HPTT2200
HPTT2210
HPTT2220
HPTT2230
HPTT2240
HPTT2250
HPTT2260
HPTT2270
HPTT2280
HPTT2290

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END OF UNIVAC 1108 FORTRAN V COMPILATION.

0 *DIAGNOSTIC* MESSAGE(S)

HPTTC	Code	SYMBOLIC	RELOCATABLE	01 MAR 71	18:48:10	0	01557636	14	229	(DELETED)
HPTTC				30 APR 71	11:19:31	1	01460144	24	1	(DELETED)
						0	01460174	14	96	

6 HDG 3 FOR,* HPTV,HPTV

W
D

3.2.28 HPTV

FOR, HPTV,HPTV
UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:28

31 AUG 71

9:27:27.979

FUNCTION HPTV ENTRY POINT 000461

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000466
0000 *DATA 001404
0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 NERR3s

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000026	10L	0001	000147	100L	0001	000157	110L	0001	000162	120L	0001	000210	140L
0001	000214	150L	0001	000227	160L	0001	000237	170L	0001	000247	180L	0001	000257	190L
0001	000043	20L	0001	000267	200L	0001	000277	210L	0001	000307	220L	0001	000324	230L
0001	000327	240L	0001	000337	250L	0001	000341	260L	0001	000200	276G	0001	000053	30L
0001	000056	40L	0001	000075	50L	0001	000105	60L	0001	000110	70L	0001	000131	80L
0001	000144	90L	0000 R	000314	AA	0000 R	000340	AB	0000 R	000360	AC	0000 R	000366	AD
0000 R	000374	AE	0000 R	000444	AF	0000 R	000474	AG	0000 R	000514	AH	0000 R	000541	AI
0000 R	000566	AJ	0000 R	000622	AK	0000 R	000636	AL	0000 R	000730	AM	0000 R	000732	AN
0000 R	000756	AO	0000 R	001006	AP	0000 R	001052	AQ	0000 R	001076	AR	0000 R	001170	AS
0000 R	001172	AT	0000 R	001246	AU	0000 R	001304	AV	0000 R	000150	BP	0000 R	000222	BT
0000 R	000175	DP	0000 R	000247	DT	0000 R	000306	F	0000 R	000311	FF	0000 R	000305	FI
0000 R	000303	FP	0000 R	000307	FT	0000 R	000025	HPTV	0000 I	000301	I	0000 I	000304	IP
0000 I	000310	IT	0000 I	000274	IS	0000 I	000312	J	0000 I	000076	JP	0000 I	000000	LOC
0000 I	000123	MX	0000 I	000277	N	0000 R	000275	P	0000 R	000026	PS	0000 R	000313	PTVISC
0000 R	000276	T	0000 R	000302	TL	0000 R	000052	TS	0000 R	000300	TZ	0000 R	000314	V

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00100	1*	CD	*****	HPTV0010
00100	2*	CD		HPTV0020
00100	3*	CD	PROGRAMMER AND DATE	HPTV0030
00100	4*	CD	NATIONAL BUREAU OF STANDARDS	HPTV0040
00100	5*	CD	1967	HPTV0050
00100	6*	CD		HPTV0060
00100	7*	CD	DOCUMENTATION AND DATE	HPTV0070
00100	8*	CD	J. I. PREWITT	HPTV0080
00100	9*	CD	DECEMBER 1970	HPTV0090
00100	10*	CD		HPTV0100
00100	11*	CD	PURPOSE	HPTV0110
00100	12*	CD	COMPUTES THE VISCOSITY OF HYDROGEN	HPTV0120
00100	13*	CD		HPTV0130
00100	14*	CD	USAGE	HPTV0140
00100	15*	CD	V = HPTV (PRES,TEMP)	HPTV0150
00100	16*	CD		HPTV0160


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00100 17* CD DESCRIPTION OF PARAMETERS HPTV0180
00100 18* CV HPTV0180
00100 19* CD INPUT HPTV0190
00100 20* CD CALLING SEQUENCE HPTV0200
00100 21* CD PRES - PRESSURE - PSIA HPTV0210
00100 22* CD TEMP - TEMPERATURE - O R HPTV0220
00100 23* CD HPTV0230
00100 24* CD OUTPUT HPTV0240
00100 25* CD CALLING SEQUENCE HPTV0250
00100 26* CD HPTV - VISCOSITY - LBF HR/FT/FT HPTV0260
00100 27* CD HPTV0270
00100 28* CD REMARKS AND RESTRICTIONS HPTV0280
00100 29* CD THIS ROUTINE WAS OBTAINED FROM NASA/MSC. HPTV0290
00100 30* CD HPTV0300
00100 31* CD SUBPROGRAMS REQUIRED HPTV0310
00100 32* CD NONE HPTV0320
00100 33* CD HPTV0330
00100 34* CD METHOD HPTV0340
00100 35* CD CHECKS ARE MADE ON PRESSURE AND TEMPERATURE TO OBTAIN HPTV0350
00100 36* CD POINTERS TO A VISCOSITY TABLE FOR INTERPOLATION. HPTV0360
00100 37* CD THIS ROUTINE WAS OBTAINED FROM NASA/MSC AND IS PART OF HPTV0370
00100 38* CD NBS COMPUTER PROGRAMS FOR THERMODYNAMIC AND TRANSPORT HPTV0380
00100 39* CD PROPERTIES OF HYDROGEN FROM 1 TO 5000 PSIA AND FOR HPTV0390
00100 40* CD TEMPERATURES FROM THE TRIPLE POINT (ABOUT 24.16 O K ) HPTV0400
00100 41* CD TO 5000. O R . AUTHORS ARE W.J.HALL, K.D.MCCARTY AND HPTV0410
00100 42* CD H.M.RODER , NBS REPORT NU 9288 , AUGUST 18, 1967, HPTV0420
00100 43* CD PP 188 , NASA NO N67-35527 HPTV0430
00100 44* CD HPTV0440
00100 45* CD * * * * * HPTV0450
00101 46* FUNCTION HPTV (PRES,TEMP) HPTV0460
00103 47* DIMENSION PS(20),TS(20),JP(21),MX(21),LOC(21),BP(21),DP(21),BT(21) HPTV0470
00103 48* 1,DT(21),V(531),AA(20),AB(16),AC(6),AD(6),AE(40),AF(24),AG(16), HPTV0480
00103 49* 2AH(21),AI(21),AJ(28),AK(12),AL(58),AM(2),AN(20),AO(24),AP(36), HPTV0490
00103 50* 3AQ(20),AR(58),AS(2),AT(44),AU(30),AV(27) HPTV0500
00104 51* EQUIVALENCE(AA,V),(AB,V(21)),(AC,V(37)),(AD,V(43)),(AE,V(49)),(AF,HPTV0510
00104 52* 1V(89)),(AG,V(113)),(AH,V(129)),(AI,V(150)),(AJ,V(171)),(AK,V(199))HPTV0520
00104 53* 2,(AL,V(211)),(AM,V(269)),(AN,V(271)),(AO,V(291)),(AP,V(315)),(AQ,HPTV0530
00104 54* 3(351)),(AR,V(371)),(AS,V(429)),(AT,V(431)),(AU,V(475)),(AV,V(505))HPTV0540
00105 55* DATA PS/1.022,2.04,4.08,14.25,43.69,99.128,151.165,176. HPTV0550
00105 56* 1182.,185.,186.5,187.25,187.46875,187.506,187.6385/ HPTV0560
00107 57* DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,54. HPTV0570
00107 58* 179.56,72.57,80.58,57.58,99.59,18.59,29.59,34.59,353.59,356.59,4/ HPTV0580
00111 59* DATA LOC/1,21,37,43,49,89,113,129,150,171,199,211,271,291,315,351, HPTV0590
00111 60* 1371,431,475,505,523/ HPTV0600
00113 61* DATA JP/4,4,3,3,5,3,2,3,3,4,3,6,4,6,4,5,5,11,6,3,3/ HPTV0610
00115 62* DATA MX/2,2,1,1,3,1,0,1,1,2,1,4,2,4,2,3,3,9,4,1,1/ HPTV0620
00117 63* DATA BP/140.96,0.,-1.,-500.,1.,-10.,500.,1469.6,1469.6,1469.6, HPTV0630
00117 64* 16,0.,0.,0.,587.84,0.,293.92,190.,190.,190.,190./ HPTV0640
00121 65* DATA DP/440.88,1000.,3.,1000.,1.,20.,1000.,1763.52,1763.52,1175.68, HPTV0650
00121 66* 1,1763.52,293.92,73.48,293.92,293.92,146.96,73.48,10.,20.,50.,50./ HPTV0660
00123 67* DATA BT/180.,500.,2000.,2880.,2480.,2880.,30.6,41.4,63.,126. HPTV0670
00123 68* 1,27.,36.,126.,54.,99.,59.4,59.4,64.8,72.,81./ HPTV0680
00125 69* DATA DT/90.,500.,700.,700.,360.,360.,360.,1.8,3.6,9.,18.,3.6,18., HPTV0690
00125 70* 118.,9.,9.,3.6,1.8,1.8,1.8,9./ HPTV0700
00127 71* DATA AA / 2.484E-11,2.625E-11,2.804E-11,3.034E-11, HPTV0710
00127 72* 1 3.418E-11,3.459E-11,3.528E-11,3.618E-11,4.146E-11,4.172E-11, HPTV0720
00127 73* 2 4.214E-11,4.268E-11,4.786E-11,4.805E-11,4.833E-11,4.871E-11, HPTV0730
00127 74* 3 5.367E-11,5.381E-11,5.403E-11,5.430E-11/ HPTV0740

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00131 75° DATA AB / 5.135E-11, 5.174E-11, 5.240E-11, 5.306E-11, HPTV0750
 00131 76° 1 7.993E-11, 8.008E-11, 8.034E-11, 8.069E-11, 8.057E-10, 8.058E-10, HPTV0760
 00131 77° 2 1.059E-10, 1.061E-10, 1.266E-10, 1.267E-10, 1.267E-10, 1.269E-10/ HPTV0770
 00133 78° DATA AC / 1.266E-10, 1.266E-10, 1.266E-10, 1.476E-10, HPTV0780
 00133 79° 1 1.513E-10, 1.521E-10/ HPTV0790
 00135 80° DATA AD / 1.266E-10, 1.267E-10, 1.268E-10, 1.519E-10, HPTV0800
 00135 81° 1 1.529E-10, 1.535E-10/ HPTV0810
 00137 82° DATA AE / 1.587E-10, 1.602E-10, 1.608E-10, 1.610E-10, HPTV0820
 00137 83° 1 1.612E-10, 1.738E-10, 1.761E-10, 1.768E-10, 1.772E-10, 1.774E-10, HPTV0830
 00137 84° 2 1.865E-10, 1.894E-10, 1.904E-10, 1.909E-10, 1.912E-10, 1.969E-10, HPTV0840
 00137 85° 3 2.006E-10, 2.018E-10, 2.024E-10, 2.027E-10, 2.055E-10, 2.098E-10, HPTV0850
 00137 86° 4 2.112E-10, 2.119E-10, 2.124E-10, 2.124E-10, 2.174E-10, 2.190E-10, HPTV0860
 00137 87° 5 2.199E-10, 2.204E-10, 2.179E-10, 2.236E-10, 2.255E-10, 2.264E-10, HPTV0870
 00137 88° 6 2.270E-10, 2.223E-10, 2.287E-10, 2.308E-10, 2.319E-10, 2.325E-10/ HPTV0880
 00141 89° DATA AF / 1.603E-10, 1.615E-10, 1.616E-10, 1.762E-10, HPTV0890
 00141 90° 1 1.778E-10, 1.780E-10, 1.894E-10, 1.917E-10, 1.920E-10, 2.006E-10, HPTV0900
 00141 91° 2 2.034E-10, 2.038E-10, 2.100E-10, 2.132E-10, 2.137E-10, 2.174E-10, HPTV0910
 00141 92° 3 2.214E-10, 2.220E-10, 2.235E-10, 2.282E-10, 2.290E-10, 2.285E-10, HPTV0920
 00141 93° 4 2.339E-10, 2.349E-10/ HPTV0930
 00143 94° DATA AG / 1.610E-10, 1.593E-10, 1.760E-10, 1.713E-10, HPTV0940
 00143 95° 1 1.894E-10, 1.836E-10, 2.015E-10, 1.961E-10, 2.123E-10, 2.088E-10, HPTV0950
 00143 96° 2 2.221E-10, 2.215E-10, 2.308E-10, 2.339E-10, 2.387E-10, 2.461E-10/ HPTV0960
 00145 97° DATA AH / 1.838E-10, 2.745E-10, 0.000E-10, 1.645E-10, HPTV0970
 00145 98° 1 2.572E-10, 0.000E-10, 1.496E-10, 2.341E-10, 3.211E-10, 1.381E-10, HPTV0980
 00145 99° 2 2.145E-10, 2.940E-10, 1.266E-10, 1.958E-10, 2.659E-10, 1.182E-10, HPTV0990
 00145 100° 3 1.804E-10, 2.432E-10, 1.100E-10, 1.674E-10, 2.237E-10/ HPTV1000
 00147 101° DATA AI / 1.100E-10, 1.674E-10, 2.237E-10, 9.723E-11, HPTV1010
 00147 102° 1 1.467E-10, 1.938E-10, 8.717E-11, 1.308E-10, 1.717E-10, 7.898E-11, HPTV1020
 00147 103° 2 1.184E-10, 1.547E-10, 7.217E-11, 1.084E-10, 1.413E-10, 6.587E-11, HPTV1030
 00147 104° 3 9.780E-10, 1.297E-10, 6.091E-11, 9.124E-11, 1.209E-10/ HPTV1040
 00151 105° DATA AJ / 6.091E-11, 8.175E-11, 1.020E-10, 1.209E-10, HPTV1050
 00151 106° 1 5.159E-11, 7.068E-11, 8.807E-11, 1.043E-10, 4.432E-11, 6.179E-11, HPTV1060
 00151 107° 2 7.734E-11, 9.191E-11, 3.911E-11, 5.524E-11, 6.936E-11, 8.264E-11, HPTV1070
 00151 108° 3 3.553E-11, 5.021E-11, 6.317E-11, 7.540E-11, 3.280E-11, 4.627E-11, HPTV1080
 00151 109° 4 5.823E-11, 6.956E-11, 3.134E-11, 4.364E-11, 5.458E-11, 6.503E-11/ HPTV1090
 00153 110° DATA AK / 3.050E-11, 4.650E-11, 6.177E-11, 2.946E-11, HPTV1100
 00153 111° 1 4.211E-11, 5.525E-11, 2.962E-11, 4.035E-11, 5.165E-11, 3.034E-11, HPTV1110
 00153 112° 2 3.954E-11, 4.874E-11/ HPTV1120
 00155 113° DATA AL / 1.290E-10, 1.480E-10, 1.677E-10, 1.866E-10, HPTV1130
 00155 114° 1 2.058E-10, 2.250E-10, 1.033E-10, 1.183E-10, 1.335E-10, 1.493E-10, HPTV1140
 00155 115° 2 1.656E-10, 1.825E-10, 8.563E-11, 9.818E-11, 1.107E-10, 1.233E-10, HPTV1150
 00155 116° 3 1.363E-10, 1.496E-10, 7.246E-11, 8.358E-11, 9.433E-11, 1.050E-10, HPTV1160
 00155 117° 4 1.158E-10, 1.267E-10, 6.196E-11, 7.234E-11, 8.199E-11, 9.135E-11, HPTV1170
 00155 118° 5 1.006E-10, 1.100E-10, 5.305E-11, 6.324E-11, 7.223E-11, 8.073E-11, HPTV1180
 00155 119° 6 0.902E-11, 9.723E-11, 4.487E-11, 5.552E-11, 6.423E-11, 7.216E-11, HPTV1190
 00155 120° 7 7.974E-11, 8.717E-11, 3.647E-11, 4.869E-11, 5.747E-11, 6.505E-11, HPTV1200
 00155 121° 8 7.214E-11, 7.898E-11, 2.615E-11, 4.232E-11, 5.160E-11, 5.906E-11, HPTV1210
 00155 122° 9 6.576E-11, 7.217E-11, 0.656E-11, 3.651E-11, 4.645E-11, 5.353E-11/ HPTV1220
 00157 123° DATA AM / 6.013E-11, 6.587E-11/ HPTV1230
 00161 124° DATA AN / 0.630E-11, 0.749E-11, 0.580E-11, 0.000E-11, HPTV1240
 00161 125° 1 0.930E-11, 1.004E-11, 1.209E-11, 2.554E-11, 1.198E-11, 1.249E-11, HPTV1250
 00161 126° 2 1.318E-11, 1.434E-11, 1.442E-11, 1.483E-11, 1.530E-11, 1.587E-11, HPTV1260
 00161 127° 3 1.667E-11, 1.701E-11, 1.738E-11, 1.780E-11/ HPTV1270
 00163 128° DATA AO / 1.877E-11, 2.006E-11, 2.192E-11, 2.457E-11, HPTV1280
 00163 129° 1 2.739E-11, 3.019E-11, 2.075E-11, 2.185E-11, 2.325E-11, 2.513E-11, HPTV1290
 00163 130° 2 2.729E-11, 2.946E-11, 2.263E-11, 2.360E-11, 2.473E-11, 2.617E-11, HPTV1300
 00163 131° 3 2.785E-11, 2.962E-11, 2.428E-11, 2.532E-11, 2.625E-11, 2.744E-11, HPTV1310
 00163 132° 4 2.880E-11, 3.029E-11/ HPTV1320

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00165 133* DATA IP / 5.444E-11,6.191E-11,6.881E-11,7.543E-11,
00165 134* 1 4.154E-11,7.721E-11,5.559E-11,6.091E-11,3.164E-11,3.988E-11,
00165 135* 2 4.613E-11,5.159E-11,2.517E-11,3.308E-11,3.919E-11,4.432E-11,
00165 136* 3 2.234E-11,2.867E-11,3.427E-11,3.911E-11,2.131E-11,2.623E-11,
00165 137* 4 3.099E-11,3.553E-11,2.113E-11,2.509E-11,2.900E-11,3.280E-11,
00165 138* 5 2.141E-11,2.463E-11,2.792E-11,3.134E-11,2.192E-11,2.457E-11,
00165 139* 6 2.739E-11,3.019E-11/
00167 140* DATA AQ / 1.557E-11,1.635E-11,1.739E-11,1.901E-11,
00167 141* 1 2.131E-11,1.667E-11,1.738E-11,1.826E-11,1.948E-11,2.113E-11,
00167 142* 2 1.774E-11,1.839E-11,1.916E-11,2.014E-11,2.141E-11,1.877E-11,
00167 143* 3 1.941E-11,2.006E-11,2.099E-11,2.192E-11/
00171 144* DATA AR / 3.651E-11,3.900E-11,4.148E-11,4.397E-11,
00171 145* 1 4.645E-11,2.868E-11,3.350E-11,3.675E-11,3.938E-11,4.154E-11,
00171 146* 2 2.076E-11,2.766E-11,3.178E-11,3.483E-11,3.716E-11,1.740E-11,
00171 147* 3 2.262E-11,2.722E-11,3.068E-11,3.329E-11,1.649E-11,2.000E-11,
00171 148* 4 2.377E-11,2.712E-11,3.000E-11,1.614E-11,1.857E-11,2.156E-11,
00171 149* 5 2.448E-11,2.720E-11,1.612E-11,1.790E-11,2.025E-11,2.270E-11,
00171 150* 6 2.517E-11,1.625E-11,1.766E-11,1.950E-11,2.154E-11,2.370E-11,
00171 151* 7 1.649E-11,1.766E-11,1.913E-11,2.086E-11,2.268E-11,1.676E-11,
00171 152* 8 1.774E-11,1.896E-11,2.044E-11,2.202E-11,1.707E-11,1.790E-11,
00171 153* 9 1.892E-11,2.019E-11,2.157E-11,1.739E-11,1.820E-11,1.901E-11/
00173 154* DATA AS / 2.016E-11,2.317E-11/
00175 155* DATA AT / 2.484E-11,2.818E-11,2.970E-11,3.086E-11,
00175 156* 1 3.181E-11,3.261E-11,3.335E-11,3.401E-11,3.461E-11,3.520E-11,
00175 157* 2 3.573E-11,1.431E-11,1.560E-11,1.812E-11,2.297E-11,2.590E-11,
00175 158* 3 2.757E-11,2.885E-11,2.987E-11,3.076E-11,3.154E-11,3.225E-11,
00175 159* 4 1.368E-11,1.429E-11,1.511E-11,1.626E-11,1.791E-11,2.015E-11,
00175 160* 5 2.259E-11,2.458E-11,2.611E-11,2.728E-11,2.831E-11,1.350E-11,
00175 161* 6 1.394E-11,1.438E-11,1.508E-11,1.578E-11,1.689E-11,1.800E-11,
00175 162* 7 1.949E-11,2.099E-11,2.246E-11,2.394E-11/
00177 163* DATA AU / 1.350E-11,1.438E-11,1.578E-11,1.800E-11,
00177 164* 1 2.099E-11,2.394E-11,1.347E-11,1.412E-11,1.503E-11,1.634E-11,
00177 165* 2 1.815E-11,2.032E-11,1.353E-11,1.404E-11,1.471E-11,1.562E-11,
00177 166* 3 1.683E-11,1.833E-11,1.363E-11,1.405E-11,1.459E-11,1.526E-11,
00177 167* 4 1.615E-11,1.729E-11,1.377E-11,1.414E-11,1.458E-11,1.514E-11,
00177 168* 5 1.582E-11,1.664E-11/
00201 169* DATA AV / 1.377E-11,1.484E-11,1.664E-11,1.393E-11,
00201 170* 1 1.486E-11,1.635E-11,1.409E-11,1.489E-11,1.610E-11,1.427E-11,
00201 171* 2 1.499E-11,1.604E-11,1.445E-11,1.509E-11,1.600E-11,1.464E-11,
00201 172* 3 1.523E-11,1.604E-11,1.464E-11,1.523E-11,1.604E-11,1.563E-11,
00201 173* 4 1.606E-11,1.658E-11,1.662E-11,1.697E-11,1.736E-11/
00203 174* P=PRES
00204 175* IF (P.LT.1.0) P=1.0
00206 176* T=TEMP
00207 177* IF (T.LT.180.0) GO TO 70
00211 178* IF (T.GE.540.0) GO TO 10
00213 179* N=1
00214 180* GO TO 260
00215 181* 10 IF (T.GE.2700.0) GO TO 40
00217 182* IF (T.GE.2000.0) GO TO 20
00221 183* N=2
00222 184* GO TO 260
00223 185* 20 IF (P.GT.6.0) GO TO 30
00225 186* N=3
00226 187* GO TO 260
00227 188* 30 N=4
00230 189* GO TO 260
00231 190* 40 IF (T.GE.5400.0) T=5399.99999

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HPTV1330
HPTV1340
HPTV1350
HPTV1360
HPTV1370
HPTV1380
HPTV1390
HPTV1400
HPTV1410
HPTV1420
HPTV1430
HPTV1440
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HPTV1480
HPTV1490
HPTV1500
HPTV1510
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HPTV1800
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HPTV1830
HPTV1840
HPTV1850
HPTV1860
HPTV1870
HPTV1880
HPTV1890
HPTV1900

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00233	191*	IF (P.GE.5.0) GO TO 50	HPTV1910
00235	192*	N=5	HPTV1920
00236	193*	GO TO 260	HPTV1930
00237	194*	50 IF (P.GE.40.0) GO TO 60	HPTV1940
00241	195*	N=6	HPTV1950
00242	196*	GO TO 260	HPTV1960
00243	197*	60 N=7	HPTV1970
00244	198*	GO TO 260	HPTV1980
00245	199*	70 IF (P.LT.1469.6) GO TO 120	HPTV1990
00247	200*	IF (T.GE.63.0) GO TO 100	HPTV2000
00251	201*	IF (T.GE.41.4) GO TO 90	HPTV2010
00253	202*	N=8	HPTV2020
00254	203*	80 TZ=24.84*0.00317*P	HPTV2030
00255	204*	IF (T.LT.TZ) T=TZ	HPTV2040
00257	205*	GO TO 260	HPTV2050
00260	206*	90 N=9	HPTV2060
00261	207*	GO TO 260	HPTV2070
00262	208*	100 IF (T.GE.117.0) GO TO 110	HPTV2080
00264	209*	N=10	HPTV2090
00265	210*	GO TO 260	HPTV2100
00266	211*	110 N=11	HPTV2110
00267	212*	GO TO 260	HPTV2120
00270	213*	120 IF (T.GE.59.4) GO TO 170	HPTV2130
00272	214*	N=12	HPTV2140
00273	215*	IF (P.GE.107.6385) GO TO 80	HPTV2150
00275	216*	DO 130 I=2,20	HPTV2160
00300	217*	IF (P=PS(I)) 150,140,130	HPTV2170
00303	218*	130 CONTINUE	HPTV2180
00305	219*	140 TL=TS(I)	HPTV2190
00306	220*	GO TO 160	HPTV2200
00307	221*	150 TL=TS(I-1)*(TS(I)-TS(I-1))/(P-PS(I-1))/(PS(I)-PS(I-1))	HPTV2210
00310	222*	160 IF (T.LE.TL) GO TO 80	HPTV2220
00312	223*	N=13	HPTV2230
00313	224*	GO TO 260	HPTV2240
00314	225*	170 IF (T.LT.126.0) GO TO 180	HPTV2250
00316	226*	N=14	HPTV2260
00317	227*	GO TO 260	HPTV2270
00320	228*	180 IF (P.LT.587.84) GO TO 190	HPTV2280
00322	229*	N=15	HPTV2290
00323	230*	GO TO 260	HPTV2300
00324	231*	190 IF (T.LT.99.0) GO TO 200	HPTV2310
00326	232*	N=16	HPTV2320
00327	233*	GO TO 260	HPTV2330
00330	234*	200 IF (P.GE.190.0) GO TO 210	HPTV2340
00332	235*	N=13	HPTV2350
00333	236*	GO TO 260	HPTV2360
00334	237*	210 IF (P.LT.293.92) GO TO 220	HPTV2370
00336	238*	N=17	HPTV2380
00337	239*	GO TO 260	HPTV2390
00340	240*	220 IF (T.GE.72.0) GO TO 240	HPTV2400
00342	241*	IF (T.GE.64.8) GO TO 230	HPTV2410
00344	242*	N=18	HPTV2420
00345	243*	GO TO 260	HPTV2430
00346	244*	230 N=17	HPTV2440
00347	245*	GO TO 260	HPTV2450
00350	246*	240 IF (T.GE.81.0) GO TO 250	HPTV2460
00352	247*	N=20	HPTV2470
00353	248*	GO TO 260	HPTV2480

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00354 249* 250 N=21 HPTV2500
00355 250* 260 FP=(P-BP(N))/DT(N) HPTV2500
00356 251* IP=FP HPTV2510
00357 252* IF(IP.GT.MX(N)) IP=MX(N) HPTV2520
00361 253* FI=IP HPTV2530
00362 254* F=FP-FI HPTV2540
00363 255* FP=1.0-F HPTV2550
00364 256* FT=(T-BT(N))/DT(N) HPTV2560
00365 257* IT=FT HPTV2570
00366 258* FI=IT HPTV2580
00367 259* FF=FT-FI HPTV2590
00370 260* FT=1.0-FF HPTV2600
00371 261* I=IT*JP(N)+IP+LOC(N) HPTV2610
00372 262* J=I+JP(N) HPTV2620
00373 263* PTVISC=FF*FT*V(I)+F*FT*V(I+1)+FP*FF*V(J)+F*FF*V(J+1) HPTV2630
00374 264* HPTV = PTVISC HPTV2640
00375 265* RETURN HPTV2650
00376 266* END HPTV2660
    
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END OF UNIVAC 1108 FORTRAN V COMPILATION. 0 *DIAGNOSTIC* MESSAGE(S)

HPTV	CODE	SYMBOLIC	RELOCATABLE	01 MAR 71	18:48:13	0	01566044	14	266	(DELETED)
HPTV				30 APR 71	11:19:34	1	01462674	24	1	(DELETED)
							0	01462724	14	100

@ HDG @ FOR, HYDRO, HYDRO

3.2.29 HYDRO

31 AUG 71

9:27:30.906

@ FOR,* HYDRO, HYDRO
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:31

SUBROUTINE HYDRO ENTRY POINT 000102

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000137
 0000 *DATA 000323
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 INTER2
 0004 EXP
 0005 NEERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 R 000020 ADEN	0000 R 000000 AP	0000 R 000003 ATI	0000 R 000104 BC	0000 R 000101 BP
0000 R 000070 BT	0000 R 000152 CMU	0000 R 000137 CT	0000 R 000224 DCP	0000 R 000302 DEN
0000 R 000221 DP	0000 R 000202 DT	0000 R 000147 EP	0000 I 000067 IS	0000 R 000303 TI

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00101 1* SUBROUTINE HYDRO (P,T,SV,MU,K,CP,PR)
00101 2* CC
00101 3* CC THIS SUBROUTINE COMPUTES SUPERCRITICAL HYDROGEN PROPERTIES IN
00101 4* CC THE RANGE 1000 PSIA TO 2000 PSIA AND 40 DEG R TO 800 DEG R.
00101 5* CC INPUT P = PRESSURE (PSIA)
00101 6* CC T = TEMPERATURE (DEG R)
00101 7* CC OUTPUT SV= SPECIFIC VOLUME (CUIN/POUND)
00101 8* CC MU= VISCOSITY (POUNDS/IN-SEC)
00101 9* CC K = CONDUCTIVITY (BTU/IN-SEC-DEG R)
00101 10* CC CP= SPECIFIC HEAT, CONST PRESS (BTU/POUND-DEG R)
00101 11* CC PR= PRANDTL NUMBER (CP*MU/K), COMPUTED
00101 12* CC
00103 13* REAL MU,K
00103 14* CC
00103 15* CC DENSITY DATA VS. INVERSE TEMP AND PRESS
00103 16* CC SPECIFIC VOLUME COMPUTED
00104 17* DIMENSION AP( 3),ATI(13),ADEN(13,3)
00105 18* DATA AP/1000.0, 1500.0, 2000.0/
00107 19* DATA ATI/1.25, 1.667, 2.5, 3.333, 5.0, 6.667, 10.0, 11.1,
00107 20* 1 12.50, 14.28, 16.67, 20.0, 25.0/
00111 21* DATA ADEN/0.2280, 0.3018, 0.4479, 0.5958, 0.9084, 1.270, 2.290,
00111 22* 1 2.7080, 3.1920, 3.6670, 4.0860, 4.4510, 4.750,
00111 23* 2 0.3368, 0.4440, 0.6553, 0.8679, 1.3160, 1.823, 2.299,
00111 24* 3 3.3370, 3.6960, 4.0450, 4.3650, 4.6570, 4.911,
00111 25* 4 0.4421, 0.5804, 0.8519, 1.1220, 1.6810, 2.281, 3.424,
00111 26* 5 3.7170, 4.0130, 4.3020, 4.5720, 4.8220, 5.047/
    
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00111 27* CC
00111 28* CC
00113 29* CONDUCTIVITY DATA (*1.0E+6)
00114 30* DIMENSION BT( 9),UP( 3),BC(9,3)
00114 31* DATA BT/ 40.0, 60.0, 100.0, 130.0, 160.0, 200.0, 340.0, 600.0,
00116 32* 1 1000.0/
00120 33* DATA UP/ 1000.0, 1500.0, 2000.0/
00120 34* DATA BC/1.7267, 1.6296, 1.4460, 1.5602, 1.6990, 1.6991, 1.9606,
00120 35* 1 2.9236, 4.2847,
00120 36* 2 1.8889, 1.6075, 1.6782, 1.6921, 1.8056, 1.8079, 2.1290,
00120 37* 3 3.0069, 4.3171,
00120 38* 4 2.0278, 1.7662, 1.8218, 1.8542, 1.8727, 1.8889, 2.2037,
00120 39* 5 3.0926, 4.3495/
00120 39* CC
00120 40* CC
00122 41* VISCOSITY DATA (ALOG(MU*1.0E+7))
00123 42* DIMENSION CT(8),EP(3),CMU(8,3)
00125 43* DATA CT/ 40.0, 60.0, 100.0, 130.0, 160.0, 340.0, 600.0, 1000.0/
00127 44* DATA EP/ 1000.0, 1500.0, 2000.0/
00127 45* DATA CMU/ 2.520, 1.793, 0.8473, 0.8072, 0.8544, 1.337, 1.693,
00127 46* 1 2.015,
00127 47* 2 2.897, 2.008, 1.189, 0.9491, 0.9746, 1.359, 1.693, 2.015,
00127 48* 3 3.182, 2.195, 1.435, 1.1120, 1.0590, 1.382, 1.693, 2.015/
00127 48* CC
00127 49* CC
00131 50* SPECIFIC HEAT CAPACITY DATA (CONST PRES)
00132 51* DIMENSION DT(15),DP(3),DCP(15,3)
00132 52* DATA DT/ 45.0, 55.0, 65.0, 75.0, 85.0, 95.0, 125.0, 175.0, 225.0,
00134 53* 1 275.0, 350.0, 450.0, 550.0, 650.0, 750.0/
00136 54* DATA DP/ 1000.0, 1500.0, 2000.0/
00136 55* DATA DCP/2.336, 2.842, 3.583, 3.758, 4.080, 4.212, 3.812, 3.692,
00136 56* 1 3.862, 4.010, 3.989, 3.728, 3.587, 3.520, 3.490,
00136 57* 2 2.188, 2.614, 3.157, 3.135, 3.335, 3.607, 3.782, 3.826,
00136 58* 3 3.954, 4.074, 4.037, 3.746, 3.614, 3.520, 3.500,
00136 59* 4 2.088, 2.484, 2.935, 2.849, 2.992, 3.247, 3.636, 3.884,
00136 60* 5 4.016, 4.120, 4.058, 3.759, 3.725, 3.530, 3.510/
00136 60* CC
00136 61* CC
00136 62* CC
00140 63* PROGRAM COMPUTATION
00140 64* SPECIFIC HEAT
00140 65* CALL INTER2 (T,DT,P,DP,CP,DCP,15,3)
00141 66* CC
00142 67* COMPUTE VISCOSITY
00142 68* CALL INTER2 (T,CT,P,EP,MU,CMU,8,3)
00142 69* MU= EXP(MU)*1.0E-7
00142 70* CC
00142 71* CC
00142 72* COMPUTE CONDUCTIVITY
00143 73* CALL INTER2 (T,BT,P,BP,K,BC,9,3)
00144 74* K=K*1.0E-6
00144 75* CC
00144 76* CC
00144 77* COMPUTE PRANDTL NUMBER
00145 78* PR= CP*MU/K
00145 79* CC
00145 80* CC
00145 81* COMPUTE SPECIFIC VOLUME FROM DENSITY LOOKUP
00146 82* TI=1000.0/T
00147 83* CALL INTER2 (TI,AT1,P,AP,DEN,ADEN,13,3)
00150 84* SV=1.0/DEN*1728.0
00151 85* RETURN
00152 86* END

```

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HYDRO CODE RELOCATABLE
@ HnG . @ FOR, * H2OH2, H2OH2

DATE 310871 PAGE 182
30 APR 71 11:19:35 1 01467672 24 1 (DELETED)
0 01467722 14 29

FOR, H2OH2, H2OH2
 UNIVAC 1108 FORTRAN V LEVEL 2204 0015 P5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:32

SUBROUTINE H2OH2 ENTRY POINT 000077

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	000141
0000	*DATA	000103
0002	*BLANK	000000
0003	CCPCX	000007

EXTERNAL REFERENCES (BLOCK, NAME)

0004	INTERP
0005	INTER2
0006	NEHR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 R 000006 AP	0000 R 000000 AT	0000 R 000012 BCP	0000 R 000034 CK	0003 R 000000 CPCX
0000 R 000056 DMU	0003 I 000006 ICX	0000 I 000011 IS	0000 I 000064 KKK	

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```

00101 1* SUBROUTINE H2OH2 (P,T,SV,MU,K,CP,PR)
00101 2* CC
00101 3* CC THIS SUBROUTINE COMPUTES FLOW PROPERTIES OF THE
00101 4* CC COMBUSTION PRODUCTS OF AN OXYGEN-HYDROGEN GAS GENERATOR OPERATING
00101 5* CC AT A MIXTURE RATIO OF 1.0, THUS THE GAS OUTPUT CONSISTS OF 86.7
00101 6* CC PERCENT HYDROGEN AND 12.6 PERCENT STEAM ON A MOLE FRACTION BASIS.
00101 7* CC INPUTS P = PRESSURE (PSIA)
00101 8* CC T = TEMPERATURE (DEG R)
00101 9* CC OUTPUTS SV= SPECIFIC VOLUME (CUIN/POUND)
00101 10* CC MU= VISCOSITY (POUNDS/IN-SEC)
00101 11* CC K = CONDUCTIVITY (BTU/IN-SEC-DEGR)
00101 12* CC CP= SPECIFIC HEAT, CONST PRESS (BTU/POUND-DEG R)
00101 13* CC PR= PRANDTL NUMBER (CP*MU/K)
00101 14* CC
00103 15* REAL MU,K
00104 16* COMMON /CCPCX/ CPCX(6), ICX
00104 17* CC
00105 18* DIMENSION AT(6), AP(3)
00106 19* DATA AP/146.96,440.88,1496.60/
00110 20* DATA AT/600.0,1100.0,1600.0,2100.0,2600.0,3100.0/
00110 21* CC
00110 22* CC SPECIFIC HEAT DATA (AT SAME POINTS AS PRANDTL NO. DATA)
00112 23* DIMENSION BCP(6,3)
00113 24* DATA BCP/1.7906,1.9051,2.0569,2.2568,2.9375,5.0492,
00113 25* 1 1.7906,1.9051,2.0560,2.2234,2.6584,3.9052,
00113 26* 2 1.7906,1.9051,2.0554,2.2028,2.4860,3.2028/

```

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FOR,* H2OH2,H2OH2

DATE 310871 PAGE 184

```

00113 27* CC
00113 28* CC          CONDUCTIVITY DATA (AT SAME DATA POINTS AS PRANDTL NO.)
00113 29* CC          CONDUCTIVITY DATA *10**(+6)
00115 30*          DIMENSION CK(6,3)
00116 31*          DATA CK/3.421,5.527,7.734,10.511,18.240,41.833,
00116 32*          1      3.421,5.527,7.728,10.248,15.703,30.50,
00116 33*          2      3.421,5.527,7.723,10.091,14.123,23.35/
00116 34* CC
00116 35* CC          VISCOSITY DATA WAS NOT FOUND TO BE A FUNCTION OF PRESSURE
00116 36* CC          VISCOSITY DATA*1.0E+6
00120 37*          DIMENSION DMU(6)
00121 38*          DATA DMU/1.03, 1.59, 2.16, 2.48, 2.91, 3.32/
00121 39* CC
00121 40* CC          SPECIFIC VOLUME DATA
00121 41* CC          SINCE THIS DATA IS NOT AVAILABLE IT WILL BE APPROXIMATED
00121 42* CC          BY THE IDEAL GAS LAW ASSUMING 1.0 MIXTURE RATIO
00123 43*          SV=4616.50*T/P
00124 44*          T=T/1.8
00124 45* CC
00124 46* CC          VISCOSITY COMPUTATION
00125 47*          CALL INTERP (6,AT,DMU,T,MU,KKK)
00126 48*          MU=MU*1.0E-6
00126 49* CC
00126 50* CC          SPECIFIC HEAT COMPUTATION
00127 51*          CALL INTER2 (T,AT,P,AP,CP,BCP,6,3)
00127 52* C
00127 53* C IF GAS GENERATOR CONNECTED, USE PREVIOUSLY COMPUTED CP IN CHAM ROUTINE
00127 54* C ICX = COMBUSTOR NO. HOOKED TO HEAT EXCHANGER
00130 55*          IF ( ICX.NE.0) CP = CPCX(ICX)
00130 56* CC
00130 57* CC          CONDUCTIVITY COMPUTATION
00132 58*          CALL INTER2 (T,AT,P,AP,K,CK,6,3)
00133 59*          K*K*1.0E-6
00134 60*          T=1.8*T
00134 61* CC          PRANDTL NUMBER
00135 62*          PR = CP * MU / K
00136 63*          RETURN
00137 64*          END

```

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```

END OF UNIVAC 1108 FORTRAN V COMPILATION.      0 *DIAGNOSTIC* MESSAGE(S)
H2OH2          SYMBOLIC          17 JUN 71 13:50:55      0 01672512      14      64 (DELETED)
H2OH2 CODE     RELOCATABLE      17 JUN 71 13:50:55      1 01674312      24      1 (DELETED)
                                     0 01674342      14      16
@ HDG          @ FOR,* INITIAL,INITAL

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@ FOR: * INITIAL,INITAL
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:33

31 AUG 71

9:27:33.517

SUBROUTINE INITIAL ENTRY POINT 000056

STORAGE USED (BLOCK, NAME, LENGTH)

```

0001 *CODE 000062
0000 *DATA 000030
0002 *BLANK 000000
0003 ARRAY 000047

```

EXTERNAL REFERENCES (BLOCK, NAME)

```

0004 NWDUS
0005 NIOZS
0006 NERR3S

```

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

```

0001 000002 1G7G      0001 000017 2DL      0000 000001 900F      0003 R 000000 A      0003 R 000006 CPI
0003 R 000012 GAM      0000 I 000000 I      0003 R 000041 M1      0003 R 000001 P      0003 R 000004 RHOL
0003 R 000010 R1      0003 R 000002 T      0003 R 000044 U      0003 R 000005 VTANK      0003 R 000043 W
0003 R 000003 WOL

```

```

00101 1*      SUBROUTINE INITIAL
00101 2*      C
00101 3*      C INITIALIZE DATA AT TIME = 0
00101 4*      C
00103 5*      COMMON /ARRAY/ A(39)
00104 6*      EQUIVALENCE (A(7),CPI),(A(9),R1),(A(11),GAM)
00104 7*      1, (A(34),M1),(A(2),P),(A(3),T),(A(6),VTANK),(A(4),WOL),(A(5),RHOL)
00104 8*      2, (A(36),W),(A(37),U)
00105 9*      REAL M1
00105 10*     C
00106 11*     DO 10 I=22,37
00111 12*     10 A(I) = 0.
00113 13*     IF (RHOL.GT.0.) GO TO 20
00115 14*     RHOL = 65.
00116 15*     WRITE (6,900)
00120 16*     900 FORMAT (1H ,44HTANK-ROUTINE RHOL NOT INITIALIZED-SET TO 65. )
00121 17*     20 CONTINUE
00122 18*     GAM = CPI / (CPI-R1)
00123 19*     M1 = 144. * P*(VTANK = WOL/RHOL) / R1 / T / 778.156
00124 20*     W = WOL
00125 21*     U = M1 * (CPI-R1) * T
00126 22*     RETURN
00127 23*     END

```

@ FOR,* INITIAL,INITAL

DATE 310871 PAGE 186

END OF UNIVAC 1108 FORTRAN V COMPILATION.
INITAL SYMBOLIC
INITAL CODE RELOCATABLE

@ *DIAGNOSTIC* MESSAGE(S)

23 JUN 71	21:25:47	0	01705630	14	23	(DELETED)
23 JUN 71	21:25:47	1	01706332	24	1	(DELETED)
		0	01706362	14	8	

@ HDG @ FOR,* INTEG,INTEG

FOR, • INTEG,INTEG
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5Q18H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:34

SUBROUTINE INTEG ENTRY POINT 000053

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	000066
0000	*DATA	000016
0002	*BLANK	000000
0003	ARRAY	000047

EXTERNAL REFERENCES (BLOCK, NAME)

0004 NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000010 10L	0001	000041 100L	0001	000017 117G	0001	000030 30L	0003	R 000000 A
0000	I 000000 J	0003	R 000045 T0	0003	R 000046 T1	0003	R 000025 X	0003	R 000035 Y

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00101 1* SUBROUTINE INTEG (K, ZDOT, TIME )
00103 2* DIMENSION X( 4,2), Y( 4,2)
00104 3* COMMON /ARRAY/ A(39)
00105 4* EQUIVALENCE (A(22),X), (A(30),Y),(A(38),T0),(A(39),T1)
00105 5* C
00105 6* C X CONTAINS THE LAST 2 VALUES OF ZDOT FOR EACH VARIABLE BEING INTEGRATED
00105 7* C Y CONTAINS THE INTEGRALS OF THE VARIABLES AT THE LAST 2 TIMES. THE VALUES
00105 8* C ARE UPDATED AFTER THE CURRENT INTEGRATION,
00105 9* C K DESIGNATES THE VARIABLE BEING INTEGRATED
00105 10* C
00106 *DIAGNOSTIC* THE TEST FOR EQUALITY BETWEEN NON-INTEGERS MAY NOT BE MEANINGFUL,
00106 11* IF (TIME.NE.0. ) GO TO 10
00110 12* X(K,2) = ZDOT
00111 13* T1 = 0.
00112 14* GO TO 100
00113 15* 10 CONTINUE
00114 16* IF (TIME.LE.T1) GO TO 30
00114 17* C UPDATE TIME AND DATA ARRAYS
00116 18* DO 20 J=1,4
00121 19* X(J,1) = X(J,2)
00122 20* Y (J,1) = Y (J,2)
00124 21* T0 = T1
00125 22* T1 = TIME
00126 23* 30 CONTINUE
00126 24* C UPDATING COMPLETE. ENTER NEW DATA.
00127 25* X(K,2) = ZDOT
00130 26* Y (K,2) = Y (K,1) + (T1-T0) * (X(K,1)+X(K,2)) / 2.
00131 27* 100 CONTINUE

```

@ FOR,* INTEG,INTEG

DATE 310871 PAGE 188

00132 28* RETURN
00133 29* END

END OF UNIVAC 1108 FORTRAN V COMPILATION.
INTEG SYMBOLIC
INTEG CODE RELOCATABLE

1 *DIAGNOSTIC* MESSAGE(S)

30 APR 71	11:19:39	0	01470550	14	29	(DELETED)
30 APR 71	11:19:39	1	01471376	24	1	(DELETED)
		0	01471426	14	7	

@ HDG @ FOR,* INTERP,INTERP

FOR, INTERP
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:35

SUBROUTINE INTERP ENTRY POINT 000223

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000306
 0000 *DATA 000024
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000130	110L	0001	000154	130L	0001	000137	142G	0001	000167	150L	0001	000015	20L
0001	000023	40L	0001	000044	60L	0001	000071	70L	0001	000100	80L	0001	000111	90L
0000	R	000001	ERROR	0000	I	000000	J							

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```

00101 1* SUBROUTINE INTERP (IMAX,XI,YI,X,Y,K)
00103 2*
00103 3* DIMENSION XI(1),YI(1)
00104 4* IF (K) 10,10,20
00107 5* 10 K=2
00110 6* 20 IF (K-IMAX) 40,40,30
00113 7* 30 K=IMAX
00114 8* 40 CONTINUE
00115 9* J=K-1
00116 10* IF (X-XI(K)) 50,70,90
00121 11* 50 IF (X-XI(J)) 130,80,60
00124 12* 60 Y=YI(J)+((YI(K)-YI(J))*(X-XI(J))/(XI(K)-XI(J)))
00125 13* RETURN
00126 14* 70 Y=YI(K)
00127 15* RETURN
00130 16* 80 Y=YI(J)
00131 17* X=XI(J)
00132 18* RETURN
00133 19* 90 IF (X-XI(IMAX)) 110,100,100
00136 20* 100 Y=YI(IMAX)
00137 21* K=IMAX
00140 22* RETURN
00141 23* 110 DO 120 K=K,IMAX
00144 24* ERROR = X-XI(K)
00145 25* J=K-1
00146 26* IF (ERROR) 60,70,120
00151 27* 120 CONTINUE
00153 28* 130 IF (X-XI(1)) 140,140,150

```

@ FOR,• INTERP,INTERP

DATE 310871 PAGE 190

```

00156 29• 140 Y=YI(1)
00157 30• K=2
00160 31• RETURN
00161 32• 150 K=K-1
00162 33• J=K-1
00163 34• IF (X-XI(J)) 150,70,60
00166 35• END

```

END OF UNIVAC 1108 FORTRAN V COMPILATION.

0 •DIAGNOSTIC• MESSAGE(S)

```

INTERP SYMBOLIC
INTERP CODE RELOCATABLE

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```

30 APR 71 11:19:40 0 01471570 14 35 (DELETED)
30 APR 71 11:19:40 1 01472542 24 1 (DELETED)
0 01472572 14 20

```

@ HDG @ FOR,• INTER2,INTER2

FOR, INTER2, INTER2
 UNIVAC 1108 FORTRAN V LEVEL 2206 0014 15018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:37

SUBROUTINE INTER2 ENTRY POINT 000365

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000434
 0000 *DATA 000070
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000035	107G	0001	000064	124G	0001	000053	20L	0001	000061	30L	0001	000102	50L	
0001	000110	60L	0001	000227	70L	0001	000275	80L	0001	000330	90L	0001	000340	999L	
0000	I	000002	I	0000	I	000003	J	0000	I	000000	KX	0000	I	000001	KY
0000	R	000005	X2	0000	R	000006	Y1	0000	R	000007	Y2	0000	R	000004	X1

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```

00101 1*      SUBROUTINE INTER2 (X,XTAB,Y,YTAB,Z,ZTAB,N,M)
00103 2*      DIMENSION XTAB(N),YTAB(M),ZTAB(N,M)
00103 3*      CC
00103 4*      CC          THIS SUBROUTINE INTERPOLATES A FUNCTION Z OF TWO VARIABLES
00103 5*      CC          X AND Y, WHERE
00103 6*      CC          ZTAB(N,M) = TABLE OF Z(XTAB(N),YTAB(M)), DEPENDANT VAR.
00103 7*      CC          XTAB(N)  = TABLE OF INDEPENDENT X VALUES
00103 8*      CC          YTAB(M)  = TABLE OF INDEPENDENT Y VALUES
00103 9*      CC          X AND Y  = INDEPENDENT VARIABLE INPUTS
00103 10*     CC          Z        = DEPENDENT VARIABLE OUTPUT
00103 11*     CC          N AND M  = RANGE OF TABLES (SHOULD BE VARIABLE IN CALL)
00103 12*     CC
00104 13*     KX=0
00105 14*     KY=0
00105 15*     CC          FIND POSITION OF X IN XTAB(N)
00106 16*     DO 10 I=1,N
00111 17*     10 IF(X.LT,XTAB(I)) GO TO 20
00111 18*     CC          X EXCEEDS TABLE
00114 19*     KX=1
00115 20*     I=N
00116 21*     GO TO 30
00117 22*     20 CONTINUE
00117 23*     CC          IS X LESS THAN THE TABLE
00120 24*     IF(I.EQ,1) KX=1
00122 25*     30 CONTINUE
00122 26*     CC          FIND POSITION OF Y IN YTAB(M)
00123 27*     DO 40 J=1,M

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00126 28* 40 IF(Y.LT.YTAB(J)) GO TO 50
00126 29* CC Y EXCEEDS TABLE
00131 30* KY=1
00132 31* J=M
00133 32* GO TO 60
00134 33* 50 CONTINUE
00134 34* CC IS Y LESS THAN THE TABLE
00135 35* IF(J.EQ.1) KY=1
00137 36* 60 CONTINUE
00137 37* CC BOTH INPUT VARIABLE POSITIONS HAVE NOW BEEN FOUND
00137 38* CC CHECK TO SEE IF ONE OR TWO DIMENSION INTERPOLATION
00137 39* CC SHOULD BE USED.
00140 40* IF(KX.EQ.1) GO TO 70
00142 41* IF(KY.EQ.1) GO TO 80
00142 42* CC TWO DIMENSION INTERPOLATION NEEDED
00144 43* X1=(X-XTAB(I-1))/(XTAB(I)-XTAB(I-1))
00145 44* X2=1.0-X1
00146 45* Y1=(Y-YTAB(J-1))/(YTAB(J)-YTAB(J-1))
00147 46* Y2=1.0-Y1
00150 47* Z= X1*Y1*ZTAB(I,J)
00150 48* 1 +X1*Y2*ZTAB(I,J-1)
00150 49* 2 +X2*Y1*ZTAB(I-1,J)
00150 50* 3 +X2*Y2*ZTAB(I-1,J-1)
00151 51* GO TO 999
00152 52* 70 CONTINUE
00152 53* CC X OUT OF BOUNDS, IS Y OUT OF BOUNDS
00153 54* IF(KY.EQ.1) GO TO 90
00153 55* CC Y IS IN BOUNDS, USE ONE DIMENSION INTERPOLATION
00155 56* Y1=(Y-YTAB(J-1))/(YTAB(J)-YTAB(J-1))
00156 57* Y2=1.0-Y1
00157 58* Z= Y1*ZTAB(I,J)+Y2*ZTAB(I,J-1)
00160 59* GO TO 999
00161 60* 80 CONTINUE
00161 61* CC X IS IN BOUNDS, Y IS NOT, INTERPOLATE X
00162 62* X1=(X-XTAB(I-1))/(XTAB(I)-XTAB(I-1))
00163 63* X2=1.0-X1
00164 64* Z= X1*ZTAB(I,J)+ X2*ZTAB(I-1,J)
00165 65* GO TO 999
00166 66* 90 CONTINUE
00166 67* CC BOTH X AND Y OUT OF RANGE, USE CORNER VALUE OF Z
00167 68* Z=ZTAB(I,J)
00170 69* 999 RETURN
00171 70* END
    
```

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END OF UNIVAC 1108 FORTRAN V COMPILATION. 0 *DIAGNOSTIC* MESSAGE(S)

INTER2	SYMBOLIC	30 APR 71	11:19:42	0	01473222	14	70	(DELETED)
INTER2	RELOCATABLE	30 APR 71	11:19:42	1	01475146	24	1	(DELETED)
				0	01475176	14	30	

FOR, ISOTH, ISOTH

FOR, ISO TH, ISO TH
 UNIVAC 1108 FORTRAN V LEVEL 220 118 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:38

31 AUG 71

9:27:38.698

SUBROUTINE ISO TH ENTRY POINT 000403

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	000415
0000	*DATA	000067
0002	*BLANK	000000
0003	INDATA	011610
0004	CONS	000003
0005	COM	006525

EXTERNAL REFERENCES (BLOCK, NAME)

0006	OPTCP
0007	OPTCV
0010	OPTV
0011	HPTCP
0012	HPTCV
0013	HPTV
0014	FCOMP2
0015	NEHR2S
0016	SGRT
0017	NEXP6S
0020	NADUS
0021	NI01S
0022	NI02S
0023	NEHR3S

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000021	IL	0000	000015	10F	0001	000043	2L	0001	000366	2GL	0001	000064	5L	
0005	R	000000	AREA	0005	R	000074	AREA1	0005	R	000170	AREAK	0005	R	005060	CF
0005	R	006423	CGGTC	0005	R	006436	CGTANK	0005	R	006431	CLTANK	0005	R	005714	CP
0005	R	006443	CPJU	0005	R	005006	CSTAR	0005	R	006355	CVEL	0000	R	000036	DELXL
0005	R	000226	DIALI	0005	R	006277	DMVENT	0005	R	006360	ETAT	0004	R	000002	FB
0005	R	006376	FBTC	0005	R	006367	FABC	0005	R	005111	FRL	0004	R	000001	GC
0005	R	003132	HI	0005	R	003036	HO	0011	R	000000	HPTCP	0012	R	000000	HPTCV
0005	R	003322	HRAD	0005	I	005110	ICHON	0003	I	000551	IPROP	0005	I	005052	ISPT
0005	I	003606	JUN	0003	R	003413	KA	0003	R	004561	MACH	0005	I	005066	MEX
0005	I	005102	MKC	0005	I	002552	NGR	0003	I	000553	NPLINE	0005	I	002646	NPR
0006	R	000000	OPTCP	0007	R	000000	OPTCV	0010	R	000000	OPTV	0000	R	000007	P
0005	R	004764	PC	0005	R	004772	PCH	0005	R	005074	PE	0005	R	000272	PG
0004	R	000000	PI	0005	R	005036	PMR	0005	R	006241	POWC	0005	R	006350	POWP
0005	R	006300	PPI	0005	R	006305	PPO	0005	R	006331	PTI	0005	R	006336	PTO
0003	R	005754	RFLAG	0003	R	005711	RGAS	0005	R	001422	RHOG	0005	R	006312	RPMT
0000	R	000010	T	0005	R	005044	TC	0005	R	006416	THUC	0005	R	006411	TPCG
0003	R	001132	TEMP	0005	R	006317	TTI	0005	R	006324	TTO	0003	R	002262	TTEMP
0005	R	006356	U	0005	R	003416	UAO	0005	R	003512	VEL	0003	R	000253	VISC
0005	R	006265	VI	0005	R	004750	WNOZ	0005	R	006253	WQ	0005	R	006301	WT
												0005	R	006246	WTGC

0000 R 000000 X

0003 R 000413 XLENGL

0000 R 000013 XX

0000 R 000014 YY

```

00100 10 C
00100 20 C ISOTHERMAL LINE SUBROUTINE
00100 30 C
00101 40 C SUBROUTINE ISOTH (II)
00101 50 C
00101 60 C
00103 70 C REAL NRE, MACH, KA
00103 80 C
00104 90 C DIMENSION X(6)
00104 100 C
00105 110 C DIMENSION VISC(30), XLENGL(30), NPLINE(30), TTEMP(30,20), RGAS(2)
00105 120 C , TTTEMP(30,20), MACH(30,20), CP(30), KA(2), WDOTG(30,20)
00105 130 C
00106 140 C COMMON /INDATA/S(5000)
00106 150 C
00107 160 C COMMON /CONS/P1, GC, FB
00107 170 C
00110 180 C COMMON /COM/AREA(30), DELXL(30), AREA1(30), AREA0(30), AREAK(30)
00110 190 C , DIALI(30), PB(6), PG(30,20), RHOG(30,20), NGR(30,2)
00110 200 C , NPR(30,2), NRE(30,2), HO(30,2), HI(30,2), THALL(30,2)
00110 210 C , HRAD(30,2), UA0(30,2), VEL(30,2), JUN(10), PGT(30,20)
00110 220 C , WNOZ(6), MR(6), PC(6), PCN(6,2), CSTAR(6), CONCT(3,6)
00110 230 C , PMR(6), TC(6), ISPT(6), CF(6), MEX(6), PE(6), MAC(6), ICMON
00110 240 C , FRL(30,20), POWC(5), WTGC(5), WO(10), WI(10), DIVENT, PPI(5)
00110 250 C , PPO(5), RPMT(5), TTI(5), TTO(5), PTI(5), PTO(5), POWT(5)
00110 260 C , POWP(5), CVEL, U, R, ETAT, WT, FBWC(6), FBPC(6)
00110 270 C , FBTC(6), TPCG(5), TPCG(5), THOC(5), CGGTC(6), CLTANK(5)
00110 280 C , CGTANK(5), CPJU(5,10)
00110 290 C
00111 300 C EQUIVALENCE
00111 310 C , (S(172), VISC(1)) , (S(268), XLENGL(1)) , (S(362), IPROP)
00111 320 C , (S(364), NPLINE(1)) , (S(603), TTEMP(1,1)) , (S(1203), TTTEMP(1,1))
00111 330 C , (S(1812), WDOTG(1,1)) , (S(2418), MACH(1,1)) , (S(3018), RGAS(1))
00111 340 C , (S(3021), CP(1)) , (S(1804), KA(1))
00111 350 C , (S(3053), RFLAG)
00111 360 C
00112 370 C JJ = 1
00112 380 C
00113 390 C IPROP = NPLINE(II)
00114 400 C P = PG(II,1)
00115 410 C T = TTEMP(II,1)
00116 420 C GO TO (1,2), IPROP
00116 430 C OXYGEN
00117 440 C 1 CP(1) = OPTCP(P,T)
00120 450 C CVGAS = OPTCV(P,T)
00121 460 C VISC(1) = OPTV(P,T) * 32.2 * 3600.
00122 470 C GO TO 5
00122 480 C HYDROGEN
00123 490 C 2 CP(1) = HPTCP(P,T)
00124 500 C CVGAS = HPTCV(P,T)
00125 510 C VISC(1) = HPTV(P,T) * 32.2 * 3600.
00126 520 C 5 KA(IPROP) = CP(1) / CVGAS
00127 530 C RGAS(IPROP) = ( CP(1) * CVGAS ) * 778.156
    
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00130 54*   VEL(II,JJ) = MACH(II,JJ)*SQRT(KA(IPROP)*GC*RGAS(IPROP)*TEMP(II,JJ)
00130 55*   )
00131 56*   TTTEMP(II,JJ) = TEMP(II,JJ)+VEL(II,JJ)**2/(2*GC*FB*CP(II))
00131 57* C   DENSITY OF GAS
00132 58*   RHOG(II,JJ) = PG(II,JJ)/(KGAS(IPROP)*TEMP(II,JJ))*194.0
00132 59* C   REYNOLDS NUMBER
00133 60*   NRE(II,JJ) = VEL(II,JJ)*DIALI(II)*RHOG(II,JJ)/(VISC(II)*12.0)
00133 61* C   KOD FRICTION FACTOR FOR SMOOTH PIPES = PG.383 CHE. HANDBOOK EQ. 24
00134 62*   FRL(II,JJ) = 1.4E-3 + 1.25E-1*(NRE(II,JJ))**(-0.32)
00134 63* C
00135 64*   X(1) = PG(II,JJ)
00136 65*   X(2) = FRL(II,JJ)
00137 66*   X(3) = WDOTG(II,JJ)
00140 67*   X(4) = TTTEMP(II,JJ)
00141 68*   X(5) = DIALI(II)
00142 69*   X(6) = XLENG(II)
00142 70* C
00143 71*   CALL FCOMP2 (X,PG(II,2),GISU)
00143 72* C
00144 73*   MACH(II,2) = MACH(II,1)*PG(II,1)/PG(II,2)
00145 74*   TEMP(II,2) = TEMP(II,1)
00146 75*   TTTEMP(II,2) = TTTEMP(II,2)*(1.0 + (KA(IPROP)-1)*0.5*MACH(II,2)**2)
00146 76* C   FLOWRATE
00147 77*   WDOTG(II,2) = WDOTG(II,1)
00147 78* C   TOTAL PRESSURE
00150 79*   XX = (1.0 + (KA(IPROP)-1.0)*0.5*MACH(II,JJ)**2) **
00150 80*   (KA(IPROP)/(KA(IPROP)-1.0))
00151 81*   YY = (1.0 + (KA(IPROP)-1.0)*0.5*MACH(II,JJ+1)**2) **
00151 82*   (KA(IPROP)/(KA(IPROP)-1.0))
00152 83*   PGT(II,JJ) = PG(II,JJ)*XX
00153 84*   PGT(II,2) = PG(II,2)*YY
00153 85* C
00154 86*   IF (RFLAG).20,
00154 87* C
00157 88*   WRITE (6,10) II,JJ,II,JJ,IPROP,NPLINE(II),IPROP,IPROP,VEL(II,JJ),MA
00157 89*   ZCH(II,JJ),KA(IPROP),GC,KGAS(IPROP),TEMP(II,JJ),TTTEMP(II,JJ),VISC
00157 90*   3(II),CP(II),RHOG(II,JJ),PG(II,JJ),NRE(II,JJ),WDOTG(II,1),WDOTG(II,
00157 91*   42),DIALI(II),XLENG(II),FB,X(1)
00213 92* 10 FORMAT(1H1//24X13HISOTH=ROUTINE/7X4I17/7X4I17/(7X1P4E17.7))
00213 93* C
00214 94* 20 RETURN
00215 95*   END
    
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END OF UNIVAC 1108 FORTRAN V COMPILATION. 0 *DIAGNOSTIC* MESSAGE(S)

ISOTH	SYMBOLIC	23 JUN 71	21:25:51	0	01706542	14	95	(DELETED)
ISOTH	CODE	RELOCATABLE	23 JUN 71	21:25:51	1	01711224	48	1 (DELETED)
					0	01711304	14	33

6 HDG 6 FOR, * JUNCL, JUNCL

3.2.36 JUNCL (10 WAY JUNCTION)

FOR, JUNCL, JUNCL
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:40

31 AUG 71

9:27:40,765

SUBROUTINE JUNCL ENTRY POINT 000404

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	000422
0000	*DATA	000107
0002	*BLANK	000000
0003	INDATA	011610
0004	CONS	000003
0005	COM	006525

EXTERNAL REFERENCES (BLOCK, NAME)

0006	OPTCP
0007	HPTCP
0010	NWDUS
0011	N101S
0012	N102S
0013	NERR2S
0014	SQRT
0015	NERR3S

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000104	IL	0001	000051	11L	0001	000040	132G	0001	000057	143G	0001	000113	2L	
0001	000174	20L	0001	000220	206G	0001	000323	236G	0001	000357	253G	0001	000307	30L	
0001	000363	41L	0001	000121	5L	0001	000032	9L	0000	000021	9DDF	0000	000030	901F	
0000	000036	902F	0005	R	000000	AREA	0005	R	000074	AREAI	0005	R	000170	AREAK	
0005	R	005060	CF	0005	R	006423	CGGTC	0005	R	006436	CGTANK	0005	R	006431	CLTANK
0003	R	005714	CP	0005	R	006443	CPJU	0005	R	005006	CSTAR	0005	R	006355	CVEL
0005	R	000226	DIALI	0005	R	006277	DMVENT	0005	R	006360	ETAT	0004	R	000002	FB
0005	R	006376	FBTC	0005	R	006362	FBWC	0005	R	005111	FRL	0004	R	000001	GC
0005	R	003036	HO	0007	R	000000	HPTCP	0005	R	003322	HRAD	0005	I	005110	ICHON
0003	I	000153	IJUNC	0000	I	000000	IO	0003	I	000551	IPROP	0005	I	005052	ISPT
0000	I	000007	J	0000	I	000012	JJ	0000	I	000011	JL	0000	I	000020	JLI
0005	R	003606	JUN	0003	R	003413	KA	0003	R	004561	MACH	0005	I	005066	MEK
0005	I	005102	KWC	0000	I	000006	N	0005	I	002552	NGR	0003	I	010121	NLINJU
0003	I	000553	NPLINE	0005	J	002646	NPR	0005	J	002742	NRE	0006	R	000000	OPTCP
0005	R	000264	PB	0005	R	004764	PC	0005	R	004772	PCN	0005	R	005074	PE
0005	R	003620	PBT	0004	R	000000	PI	0000	R	000015	PJ	0005	R	005036	PHR
0005	R	006350	POWP	0005	R	006343	POWT	0005	R	006300	PPI	0005	R	006305	PPO
0005	R	006331	PTI	0005	R	006336	PTO	0005	R	006357	R	0003	R	005754	RFLAG
0005	R	001422	RHOG	0005	R	006312	RPMT	0003	R	000000	S	0000	R	000014	T
0005	R	006416	THOC	0000	R	000016	TJ	0005	R	006411	TPCG	0005	R	006404	TPCL
0005	R	006317	TTI	0005	R	006324	TTO	0005	R	003226	TWALL	0005	R	006356	U
0005	R	003512	VEL	0003	R	003423	WDOTG	0005	R	006265	WI	0000	R	000003	WM
0005	R	004750	WNOZ	0005	R	006253	WO	0005	R	006361	WT	0005	R	006246	WTGC

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00101 1. SUBROUTINE JUNCL(1)
00101 2. C
00103 3. REAL JUN,MACH,KA
00103 4. C
00104 5. DIMENSION NLINJU(10),IJUNC(10,6),NPLINE(30),WDOTG(30,20)
00104 6. *, NODEL(20),TTEMP(30,20),MACH(30,20),RGAS(2)
00104 7. *, KA(2),CP(30)
00104 8. C
00104 9. C
00105 10. COMMON /INDATA/S(5000)
00105 11. C
00106 12. COMMON /CONS/PI,GC,FB
00106 13. C
00107 14. COMMON /COM/AREA(30),DELXL(30),AREAI(30),AREAO(30),AREAK(30)
00107 15. *, DIALI(30),PB(6),PG(30,20),RHOG(30,20),NGR(30,2)
00107 16. *, NPR(30,2),NRE(30,2),HO(30,2),HI(30,2),TWALL(30,2)
00107 17. *, HRAD(30,2),UAD(30,2),VEL(30,2),JUN(10),PGT(30,20)
00107 18. *, ANOZ(6),MR(6),PC(6),PCN(6,2),CSTAK(6),CONCT(3,6)
00107 19. *, PMR(6),TC(6),ISPT(6),CF(6),HEX(6),PE(6),MWC(6),ICNON
00107 20. *, FRL(30,20),POW(5),WTGC(5),WO(10),WI(10),OMVENT,PPI(5)
00107 21. *, PPO(5),RPMT(5),TTI(5),TTO(5),PTI(5),PTO(5),PONT(5)
00107 22. *, POAP(5),CVEL,U,R,ETAT,#T,FBHC(6),FBPC(6)
00107 23. *, FBTC(6),TPCL(5),TPCG(5),THOC(5),CGGTC(6),CLTANK(5)
00107 24. *, CGTANK(5),CPJU(5,10)
00107 25. C
00107 26. EQUIVALENCE
00110 27. *,(S(4178),NLINJU(1)),(S(108),IJUNC(1)),(S(364),NPLINE(1))
00110 28. *,(S(1812),WDOTG(1,1)),(S(65),NODEL(1)),(S(362),IPROP)
00110 29. *,(S(603),TTEMP(1,1)),(S(2418),MACH(1,1)),(S(3018),RGAS(1))
00110 30. *,(S(1804),KA(1)),(S(3021),CP(1))
00110 31. *,(S(3053),RFLAG)
00111 32. DIMENSION IO(2)
00112 33. DATA IO / 6H IN ,6H OUT /
00112 34. C
00112 35. C INITIALIZE
00114 36. W(1) = 0.0
00115 37. W0(1) = 0.0
00116 38. WM = 0.
00117 39. WMT = 0.
00120 40. PSUM = 0.
00121 41. IF (RFLAG),9,
00121 42. C HEADING
00124 43. WRITE (6,900) I
00127 44. 900 FORMAT (1H0,20X,24HJUNCL-ROUTINE JUNCTION,13 )
00127 45. C
00127 46. C FIND J1 INLET LINES
00130 47. 9 N = NLINJU(I)
00131 48. DO 10 J=1,N
00134 49. I1 = IJUNC(I,J)
00135 50. IF (I1,LT,0) GO TO 11
00137 51. 10 CONTINUE
00141 52. I1 JL = J-1
00141 53. C
00141 54. C INLET LINES
00142 55. DO 20 J=1,JL
00145 56. I1 = IJUNC(I,J)

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00146 57*   JJ = NODEL(II)
00147 58*   P = PG(II,JJ)
00150 59*   T = TTEMP(II,JJ)
00151 60*   IPROP = NPLINE(II)
00152 61*   GO TO (1,2), IPROP
00153 62*   1 CP(II) = OPTCP(P,T)
00154 63*   GO TO 5
00155 64*   2 CP(II) = HPTCP(P,T)
00156 65*   5 CONTINUE
00157 66*   PSUM = PSUM + PG(II,JJ)
00160 67*   WI(II) = WI(II) + WDOTG(II,JJ)
00161 68*   WM = WM + WDOTG(II,JJ) * CP(II)
00162 69*   WMT = WMT + WDOTG(II,JJ) * CP(II) * TTEMP(II,JJ)
00163 70*   IF (RFLAG),20,
00166 71*   WRITE (6,901) II,IO(1),WDOTG(II,JJ),PG(II,JJ),TTEMP(II,JJ),
00166 72*   1 CP(II), MACH(II,JJ)
00177 73*   901 FORMAT (1H,15X,4HLINE,13,A6,3E12.6,2F10.5)
00200 74*   20 CONTINUE
00200 75*   C
00202 76*   PJ = PSUM / FLOAT(JL)
00203 77*   TJ = WMT / WM
00203 78*   C OUTLET LINES
00204 79*   JS = JL + 1
00205 80*   DO 30 J=JS,N
00210 81*   II = -IJUNC(I,J)
00211 82*   JJ = 1
00212 83*   WO(II) = WO(II) + WDOTG(II,JJ)
00213 84*   PG(II,JJ) = PJ
00214 85*   TTEMP(II,JJ) = TJ
00215 86*   MACH(II,1) = WDOTG(II,1)/(DIALI(II)**2*PG(II,1))*SQRT(1RGAS
00215 87*   (IPROP)*TTEMP(II,1)/(6.1685029E-10GC*KA(IPROP)))
00216 88*   IF (RFLAG),30,
00221 89*   WRITE (6,901) II,IO(2),WDOTG(II,JJ),PG(II,JJ),TTEMP(II,JJ),
00221 90*   1 CP(II),MACH(II,JJ)
00232 91*   30 CONTINUE
00232 92*   C
00232 93*   C INLET PIPE PRESSURE CONSTRAINT EQUATIONS
00234 94*   JL1 = JL - 1
00235 95*   DO 40 J=1,JL1
00240 96*   II = IJUNC(I,J)
00241 97*   JJ = NODEL(II)
00242 98*   40 CPJU(I,J) = 1. - PG(II,JJ)/PJ
00242 99*   C
00242 100*   C NET FLOWRATE CONSTRAINT EQUATION
00244 101*   JUN(I) = 1. - WO(II)/WI(II)
00245 102*   IF (RFLAG),41,
00250 103*   WRITE (6,902) JUN(I),(CPJU(J,I),J=1,JL1)
00257 104*   902 FORMAT (1H,28HJUNCTION-ROUTINE CONSTRAINTS / 4X,6E10.4)
00260 105*   41 CONTINUE
00261 106*   RETURN
00262 107*   END

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END OF UNIVAC 1109 FORTRAN V COMPILATION. 0 *DIAGNOSTIC* MESSAGE(S)

JUNCL	CODE	SYMBOLIC	RELOCATABLE	31 AUG 71	09:25:10	0	02126742	14	107	(DELETED)
JUNCL				31 AUG 71	09:25:10	1	02131674	36	1	(DELETED)
						0	02131740	14	34	

FOR, LATENT, LATENT
 UNIVAC 1108 FORTRAN V LEVEL 22US 0018 F5G18H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:43

31 AUG 71

9:27:42.901

SUBROUTINE LATENT ENTRY POINT 000056

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000075
 0000 *DATA 000202
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 BETA
 0004 NERR2S
 0005 NERR3S

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME).

0001	000010	10L	0001	000031	20L	0003	R	000000	BETA	0000	R	000024	HGH	0000	R	000120	HGO		
0000	R	000000	HLH	0000	R	000074	HLO	0000	I	000170	IS	0000	I	000171	NPH	0000	I	000172	NPO
0000	R	000050	PH	0000	R	000144	PO												

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00101 1*      SUBROUTINE LATENT ( IFLUID, PX, ENTHL, ENTHG )
00101 2*      C
00101 3*      C OBTAIN SATURATED LIQ AND SAT. GAS ENTHALPIES AT INPUT PX
00101 4*      C BY LINEAR INTERPOLATION IN SAT. ENTHALPY-PRESSURE TABLES
00101 5*      C
00103 6*      DIMENSION HLH(20), HGH(20), PH(20), HLO(20), HGO(20), PO(20)
00104 7*      DATA HLH / -115.02, -109.91, -106.06, -97.32, -90.61, -84.51,
00104 8*      1 -78.80, -73.35, -68.06, -62.86, -57.71, -30.35, 8.00 /
00106 9*      DATA HGH / 78.51, 81.78, 84.17, 86.78, 87.97, 88.30, 88.04,
00106 10*     1 87.34, 86.26, 84.88, 83.21, 70.59, 8.00 /
00110 11*     DATA NPH / 12, PH / 10., 14.696, 20., 30., 40., 50., 60., 70.,
00110 12*     1 80., 90., 100., 150., 8.00 /
00113 13*     DATA HLO / -48.022, -45.913, -43.781, -41.623, -39.434, -37.211,
00113 14*     1 -34.947, -32.636, -30.270, -27.840, -25.313, -22.697, -19.975,
00113 15*     2 -17.124, -14.099, -10.836, -7.226, -3.032, 2.462, 14.030 /
00115 16*     DATA HGO / 37.508, 38.097, 38.622, 39.079, 39.464, 39.769,
00115 17*     1 39.990, 40.117, 40.143, 40.056, 39.840, 39.479, 38.945, 38.203,
00115 18*     2 37.197, 35.836, 33.951, 31.136, 26.465, 14.030 /
00117 19*     DATA NPO / 20, PO / 46.261, 57.286, 70.163, 85.040, 102.09,
00117 20*     1 121.51, 143.49, 168.20, 195.82, 226.59, 260.66, 298.26, 339.62,
00117 21*     2 384.96, 434.55, 488.66, 547.69, 612.08, 683.06, 737.06 /
00117 22*     C
00122 23*     GO TO (10, 20), IFLUID
00123 24*     10 ENTHL = BETA ( HLH, PH, PX, NPH )
00124 25*     ENTHG = BETA ( HGH, PH, PX, NPH )
00125 26*     RETURN

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FOR,* LATENT,LATENT

DATE 310871 PAGE 200

00126 27* 20 ENTHL = BETA (HLO, PO, PX, NPO)
 00127 28* ENTHG = BETA (HGO, PO, PX, NPO)
 00130 29* RETURN
 00131 30* END

END OF UNIVAC 110B FORTRAN V COMPILATION.

DIAGNOSTIC MESSAGE(S)

LATENT SYMBOLIC
 LATENT CODE RELOCATABLE

14 JUN 71	15:04:54	0	01603246	14	30	(DELETED)
14 JUN 71	15:04:54	1	01604112	24	1	(DELETED)
		0	01604142	14	10	

FOR,* LEGS,LEGS

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FOR, LEGS,LEGS
UNIVAC 1108 FORTRAN V LEVEL 2200 0018 FSG18H
THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:44

SUBROUTINE LEGS ENTRY POINT 001521

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 001603
0000 *DATA 000155
0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 NERR2\$
0004 NERR3\$

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000033	1L	0001	000144	10L	0001	000100	127G	0001	000211	13L	0001	000111	134G
0001	000216	14L	0001	000122	142G	0001	000152	160G	0001	000165	164G	0001	000235	17L
0001	000247	20L	0001	000227	205G	0001	000265	21L	0001	000244	217G	0001	000273	22L
0001	000312	246G	0001	000350	25L	0001	000357	27L	0001	000454	3L	0001	000376	30L
0001	000405	31L	0001	000413	32L	0001	000417	33L	0001	000432	35L	0001	000444	36L
0001	000452	37L	0001	000480	38L	0001	000471	39L	0001	000501	40L	0001	000525	402L
0001	000540	404L	0001	000553	406L	0001	000566	42L	0001	000645	420G	0001	000571	43L
0001	000676	435G	0001	000710	443G	0001	000607	46L	0001	000760	465G	0001	000614	47L
0001	000772	472G	0001	000633	49L	0001	000640	50L	0001	001036	510G	0001	000665	53L
0001	001146	536G	0001	000753	55L	0001	001172	551G	0001	001244	571G	0001	000102	6L
0001	001261	602G	0001	001111	61L	0001	001307	610G	0001	001137	63L	0001	001366	637G
0001	001403	645G	0001	001423	654G	0001	001205	67L	0001	000116	7L	0001	001230	71L
0001	001276	74L	0001	001361	79L	0001	001451	792L	0001	001473	82L	0001	000142	9L
0000 R	000042	D	0000 R	000040	D1	0000 R	000041	D2	0000 R	000017	E1	0000 R	000020	E2
0000 R	000025	H	0000 R	000030	HAL	0000 I	000006	I	0000 I	000022	ICT	0000 I	000023	IF
0000 I	000021	IMAX	0000 I	000061	IN	0000 I	000005	IP	0000 I	000004	IQ	0000 I	000060	IR
0000 I	000055	IRS	0000 I	000054	IRSS	0000 I	000010	IS	0000 I	000057	IT	0000 I	000056	ITS
0000 I	000001	J	0000 I	000007	K	0000 I	000053	KK	0000 I	000027	KL	0000 I	000050	KL1
0000 I	000045	KM	0000 I	000026	KT	0000 I	000044	K1	0000 I	000047	K2	0000 I	000011	L
0000 I	000012	LI	0000 I	000013	LJ	0000 I	000002	N	0000 I	000000	NIDLE	0000 I	000003	N2
0000 R	000016	RH1	0000 R	000015	RHV	0000 R	000046	S	0000 R	000051	SS	0000 R	000052	S1
0000 R	000043	TP	0000 R	000014	X	0000 R	000031	X1	0000 R	000032	X1AL	0000 R	000034	X2
0000 R	000036	X3	0000 R	000024	Y	0000 R	000033	Y1	0000 R	000035	Y2	0000 R	000037	Y3

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00101	1*	SUBROUTINE LEGS(AB,OPAR,BNDS,M,N1,MD,NO,ATA,R,Z,	LEGS0001
00101	2*	XSUS,SUSP,11,12,13,14,15,IDLE)	LEGS0002
00101	3*	C MODIFIED MAY 1968	LEGS0003
00103	4*	DIMENSION AB(2),OPAR(2),BNDS(2),ATA(2),R(2),IDLE(2)	LEGS0004
00104	5*	ABC(D)=ABS(D)	LEGS0005
00104	6*	C TO CONVERT TO DOUBLE PRECISION DELETE THE PRECEEDING CARD	LEGS0006
00104	7*	C AND REMOVE THE COLUMN 1 C FROM THE NEXT 3 CARDS	LEGS0007

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00104 8* C DOUBLE PRECISION AB,DPAR,BNDS,ATA,R,Z,SUS,SUSP,D1,D2,D LEGS0008
00104 9* C 1,E1,E2,H,HAL,RHI,RHV,S1,S,SS,X1,X2,X3,X,Y1,Y2,Y3,Y,XIAL,TP LEGS0009
00104 10* C ABC(D)=DABS(D) LEGS0010
00105 11* LEGS0011
00105 12* C COUNT THE NUMBER OF DELETIONS LEGS0012
00105 13* LEGS0013
00105 14* NIDLE=0 LEGS0014
00106 15* J=1 LEGS0015
00107 16* 1 IF(IDLE(J))3,3,2 LEGS0016
00112 17* 2 NIDLE=NIDLE+1 LEGS0017
00113 18* J=J+2 LEGS0018
00114 19* IF(J=2*M)1,1,3 LEGS0019
00117 20* LEGS0020
00117 21* C SET UP COUNTERS LEGS0021
00117 22* LEGS0022
00117 23* 3 N=N1 LEGS0023
00120 24* N2=N+1 LEGS0024
00121 25* IQ=(N*N2)/2 LEGS0025
00122 26* IP=(N2*(N2+1))/2 LEGS0026
00123 27* LEGS0027
00123 28* LEGS0028
00123 29* C BRANCH ON I3 LEGS0029
00123 30* LEGS0030
00123 31* C I3 LESS THAN ZERO -- COMPUTE ATA AND ADD IT TO CONTENTS OF ATA LEGS0031
00123 32* C I3 EQUAL TO ZERO -- COMPUTE ATA AND PUT IN CLEARED ATA LEGS0032
00123 33* C I3 GREATER THAN ZERO -- ATA CALCULATED BEFORE ENTRY LEGS0033
00123 34* LEGS0034
00123 35* LEGS0035
00123 36* IF(I3)6,4,14 LEGS0036
00126 37* 4 DO 5 I=1,IP LEGS0037
00131 38* 5 ATA(I)=0 LEGS0038
00133 39* 6 DO 13 K=1,M LEGS0039
00134 40* IF(NIDLE)10,10,7 LEGS0040
00141 41* LEGS0041
00141 42* C ROW DELETOR SECTION LEGS0042
00141 43* LEGS0043
00141 44* 7 DO 9 J=1,NIDLE LEGS0044
00144 45* IS=2*J LEGS0045
00145 46* IF(K-IDLE(IS-1))9,13,8 LEGS0046
00150 47* 8 IF(K-IDLE(IS))13,13,9 LEGS0047
00153 48* 9 CONTINUE LEGS0048
00155 49* LEGS0049
00155 50* C COMPUTE ATA LEGS0050
00155 51* LEGS0051
00155 52* 10 L=1 LEGS0052
00156 53* LI=L LEGS0053
00157 54* DO 12 I=L,N2 LEGS0054
00162 55* LJ=L1 LEGS0055
00163 56* DO 11 J=L,N2 LEGS0056
00166 57* ATA(L)=ATA(L)+AB(LI)*AB(LJ) LEGS0057
00167 58* L=L+1 LEGS0058
00170 59* 11 LJ=LJ+MD LEGS0059
00172 60* 12 LI=LI+MD LEGS0060
00174 61* 13 CONTINUE LEGS0061
00176 62* LEGS0062
00176 63* LEGS0063
00176 64* C BRANCH ON I5 LEGS0064
00176 65* LEGS0065

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00176	66°	C	15 EQUAL TO ZERO -- CONTINUE	LEGS0068
00176	67°	C	15 NOT EQUAL TO ZERO -- EXIT	LEGS0069
00176	68°			LEGS0070
00176	69°			LEGS0071
00176	70°		IF (15)82,14,82	LEGS0072
00201	71°			LEGS0073
00201	72°			LEGS0074
00201	73°	C	BRANCH ON 12	LEGS0075
00201	74°			LEGS0076
00201	75°	C	12 EQUAL TO ZERO -- SOLVE FOR X	LEGS0077
00201	76°	C	12 NOT EQUAL TO ZERO -- DO NOT SOLVE FOR X	LEGS0078
00201	77°			LEGS0079
00201	78°			LEGS0080
00201	79°		14 IF (12)15,17,15	LEGS0081
00204	80°		15 DO 16 I=1,N	LEGS0082
00207	81°		16 SPAR(I)=BND5(I)	LEGS0083
00211	82°		X=1.	LEGS0084
00212	83°		GO TO 71	LEGS0085
00213	84°			LEGS0086
00213	85°			LEGS0087
00213	86°	C	BRANCH ON 11	LEGS0088
00213	87°			LEGS0089
00213	88°	C	11 EQUAL TO ZERO -- NO BOUNDS IN SOLVING FOR X	LEGS0090
00213	89°	C	11 NOT EQUAL TO ZERO -- BOUNDS USED IN SOLVING FOR X	LEGS0091
00213	90°			LEGS0092
00213	91°		17 IF (11)20,18,20	LEGS0093
00216	92°		18 DO 19 I=1,N	LEGS0094
00221	93°		19 BND5(I)=-1.	LEGS0095
00223	94°			LEGS0096
00223	95°	C	INITIALIZING FOR ITERATION	LEGS0097
00223	96°			LEGS0098
00223	97°		20 RHM=.0001	LEGS0099
00224	98°		RH1=.2	LEGS0100
00225	99°		E1=.1	LEGS0101
00226	100°		E2=.2	LEGS0102
00227	101°		IMAX=20	LEGS0103
00230	102°		ICT=0	LEGS0104
00231	103°		A=0.	LEGS0105
00232	104°		IF=1	LEGS0106
00233	105°			LEGS0107
00233	106°	C	FIND UNBOUNDED SOLUTION	LEGS0108
00233	107°			LEGS0109
00233	108°		GO TO 47	LEGS0110
00234	109°			LEGS0111
00234	110°	C	IF CONSTRAINTS SATISFIED,EXIT ITERATION	LEGS0112
00234	111°			LEGS0113
00234	112°		21 IF (Y-E1)71,71,22	LEGS0114
00237	113°			LEGS0115
00237	114°	C	GET FIRST ESTIMATE FOR ITERATION	LEGS0116
00237	115°			LEGS0117
00237	116°		22 H=0.	LEGS0118
00240	117°		KT=1	LEGS0119
00241	118°		KL=N2	LEGS0120
00242	119°		IF=2	LEGS0121
00243	120°		K=KT+KL-1	LEGS0122
00244	121°		HAL=0.0	LEGS0123
00245	122°		DO 28 I=1,N	
00250	123°		IF (BND5(I)) 27,27,23	

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00253	124*	23	X1=ABC(ATA(K))	LEGS0124
00254	125*		X1=BND5(I)*2*(X1/BND5(I)-ATA(KT))	LEGS0125
00255	126*		X1AL=ATA(KT)*BND5(I)*2*RHV	LEGS0126
00256	127*		IF(X1AL-HAL)25,25,24	LEGS0127
00261	128*	24	HAL=X1AL	LEGS0128
00262	129*	25	IF(X1-H)27,27,26	LEGS0129
00265	130*	26	H=X1	LEGS0130
00266	131*	27	KT=KT+KL	LEGS0131
00267	132*		KL=KL-1	LEGS0132
00270	133*	28	K=K+KL	LEGS0133
00272	134*		IF(H)29,29,30	LEGS0134
00275	135*	29	H=HAL	LEGS0135
00276	136*			LEGS0136
00276	137*	C	SET X1=FIRST ESTIMATE	LEGS0137
00276	138*			LEGS0138
00276	139*	30	X1=X	LEGS0139
00277	140*		Y1=Y	LEGS0140
00300	141*		X=X+H	LEGS0141
00301	142*		GO TO 47	LEGS0142
00302	143*	31	IF(Y-E1)33,33,32	LEGS0143
00305	144*			LEGS0144
00305	145*	C	X IS TOO SMALL INCREASE AND TRY AGAIN	LEGS0145
00305	146*			LEGS0146
00305	147*	32	H=10.*H	LEGS0147
00306	148*		GO TO 30	LEGS0148
00307	149*			LEGS0149
00307	150*	C	SOLUTION IS BETWEEN X1 AND X.	LEGS0150
00307	151*	C	IF X IS GOOD ENOUGH, EXIT ITERATION	LEGS0151
00307	152*			LEGS0152
00307	153*	33	IF(Y+E2)34,71,71	LEGS0153
00312	154*	34	X2=X	LEGS0154
00313	155*		Y2=Y	LEGS0155
00314	156*		IF=3	LEGS0156
00315	157*			LEGS0157
00315	158*	C	SOLUTION IS BETWEEN X1 AND X2. TRY A POINT IN BETWEEN.	LEGS0158
00315	159*			LEGS0159
00315	160*	35	X=(1.-RHI)*X1+RHI*X2	LEGS0160
00316	161*		IF=3	LEGS0161
00317	162*		GO TO 47	LEGS0162
00320	163*	36	IF(Y-E1)37,37,39	LEGS0163
00323	164*			LEGS0164
00323	165*	C	IF X IS GOOD ENOUGH, EXIT ITERATION	LEGS0165
00323	166*			LEGS0166
00323	167*	37	IF(Y+E1)38,71,71	LEGS0167
00326	168*			LEGS0168
00326	169*	C	SOLUTION IS BETWEEN X1 AND X.	LEGS0169
00326	170*			LEGS0170
00326	171*	38	X3=X2	LEGS0171
00327	172*		Y3=Y2	LEGS0172
00330	173*		X2=X	LEGS0173
00331	174*		Y2=Y	LEGS0174
00332	175*			LEGS0175
00332	176*	C	SOLUTION IS BETWEEN X1 AND X2. X3 BIGGER THAN X2	LEGS0176
00332	177*			LEGS0177
00332	178*		GO TO 40	LEGS0178
00333	179*			LEGS0179
00333	180*	C	SOLUTION IS BETWEEN X AND X2	LEGS0180
00333	181*			LEGS0181

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00333 182* 39 X3=X1 LEGS0182
00334 183* Y3=Y1 LEGS0183
00335 184* X1=X LEGS0184
00336 185* Y1=Y LEGS0185
00337 186* LEGS0186
00337 187* C SOLUTION IS BETWEEN X1 AND X2. X3 LESS THAN X1 LEGS0187
00337 188* LEGS0188
00337 189* 40 O1=Y2-Y1 LEGS0189
00340 190* LEGS0190
00340 191* C DO INVERSE QUADRATIC INTERPOLATION TO GET NEXT POINT LEGS0191
00340 192* LEGS0192
00340 193* O2=Y3-Y2 LEGS0193
00341 194* O=Y3-Y1 LEGS0194
00342 195* X=O LEGS0195
00343 196* TP=O1*O LEGS0196
00344 197* IF(TP)401,402,401 LEGS0197
00347 198* 401 X=X+(X1*Y2+Y3)/TP LEGS0198
00350 199* 402 TP=O1*O2 LEGS0199
00351 200* IF(TP)403,404,403 LEGS0200
00354 201* 403 X=X-(X2*Y1*Y3)/TP LEGS0201
00355 202* 404 TP=O*O2 LEGS0202
00356 203* IF(TP)405,406,405 LEGS0203
00361 204* 405 X=X+(X3*Y1*Y2)/TP LEGS0204
00362 205* 406 CONTINUE LEGS0205
00363 206* LEGS0206
00363 207* C IF INTERPOLATED POINT IS OUTSIDE RANGE (X1,X2), LEGS0207
00363 208* C TRY A NEW POINT BETWEEN X1 AND X2 LEGS0208
00363 209* LEGS0209
00363 210* IF(X-X2)41,35,35 LEGS0210
00366 211* 41 IF(X-X1)35,35,42 LEGS0211
00371 212* LEGS0212
00371 213* C INTERPOLATED POINT IS WITHIN RANGE (X1,X2) LEGS0213
00371 214* LEGS0214
00371 215* 42 IF=4 LEGS0215
00372 216* GO TO 47 LEGS0216
00373 217* LEGS0217
00373 218* C IF X IS GOOD ENOUGH, EXIT ITERATION LEGS0218
00373 219* LEGS0219
00373 220* 43 IF(Y-E1)44,44,46 LEGS0220
00376 221* 44 IF(Y+E2)45,71,71 LEGS0221
00401 222* 45 X2=X LEGS0222
00402 223* LEGS0223
00402 224* C SOLUTION IS BETWEEN X1 AND NEW X2 LEGS0224
00402 225* LEGS0225
00402 226* Y2=Y LEGS0226
00403 227* GO TO 35 LEGS0227
00404 228* 46 X1=X LEGS0228
00405 229* Y1=Y LEGS0229
00406 230* LEGS0230
00406 231* C SOLUTION IS BETWEEN NEW X1 AND X2 LEGS0231
00406 232* LEGS0232
00406 233* GO TO 35 LEGS0233
00407 234* LEGS0234
00407 235* C SOLVING THE LINEAR SYSTEM LEGS0235
00407 236* C DECOMPOSE X SUBMATRIX LEGS0236
00407 237* LEGS0237
00407 238* 47 K(I)=-1. LEGS0238
00410 239* R(IP+1)=0. LEGS0239

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00411	240*	L=1	LEGS0240
00412	241*	IF(BNDS(1))49,50,48	LEGS0241
00415	242*	48 R(IP+1)=X/BNDS(1)**2	LEGS0242
00416	243*		LEGS0243
00416	244*	C COMPUTE FIRST ELEMENT OF D.	LEGS0244
00416	245*		LEGS0245
00416	246*	49 R(IP+1)=ATA(1)+R(IP+1)	LEGS0246
00417	247*	50 DO 62 K=1,N	LEGS0247
00422	248*		LEGS0248
00422	249*	C DECOMPOSE (K+1)X(K+1) SUBMATRIX	LEGS0249
00422	250*		LEGS0250
00422	251*	IF(K=N)51,53,53	LEGS0251
00425	252*	51 IF(BNDS(K+1))53,52,53	LEGS0252
00430	253*	52 K1=IP+K+1	LEGS0253
00431	254*	R(K1)=0.	LEGS0254
00432	255*	GO TO 61	LEGS0255
00433	256*	53 KL=1	LEGS0256
00434	257*	DO 55 J=1,K	LEGS0257
00437	258*	KM=K+1	LEGS0258
00440	259*	KT=N	LEGS0259
00441	260*	S=0.	LEGS0260
00442	261*	DO 54 I=1,J	LEGS0261
00445	262*	S=S+R(KL)*ATA(KM)	LEGS0262
00446	263*	KM=KM+KT	LEGS0263
00447	264*	KT=KT-1	LEGS0264
00450	265*	54 KL=KL+1	LEGS0265
00452	266*	K1=L+J	LEGS0266
00453	267*	K2=IP+J	LEGS0267
00454	268*	R(K1)=0.	LEGS0268
00455	269*	IF(R(K2))541,55,541	LEGS0269
00460	270*	541 R(K1)=S/R(K2)	LEGS0270
00461	271*	55 CONTINUE	LEGS0271
00463	272*	KL=0	LEGS0272
00464	273*	DO 57 J=1,K	LEGS0273
00467	274*	KL1=KL+J	LEGS0274
00470	275*	S=0.	LEGS0275
00471	276*	DO 56 I=J,K	LEGS0276
00474	277*	K1=L+1	LEGS0277
00475	278*	S=S+R(KL1)*R(K1)	LEGS0278
00476	279*	56 KL1=KL1+1	LEGS0279
00500	280*	K1=L+J	LEGS0280
00501	281*	KL=KL+J	LEGS0281
00502	282*	57 R(K1)=S	LEGS0282
00504	283*	KL=K+1	LEGS0283
00505	284*	KT=N	LEGS0284
00506	285*	S=0.	LEGS0285
00507	286*	DO 58 J=1,K	LEGS0286
00512	287*	K1=L+J	LEGS0287
00513	288*	S=S+R(K1)*ATA(KL)	LEGS0288
00514	289*	KL=KL+KT	LEGS0289
00515	290*	58 KT=KT-1	LEGS0290
00517	291*	K1=IP+K+1	LEGS0291
00520	292*	R(K1)=ATA(KL)-S	LEGS0292
00521	293*	IF(K=N)59,61,61	LEGS0293
00524	294*	59 IF(BNDS(K+1))61,61,60	LEGS0294
00527	295*	60 R(K1)=R(K1)+X/(BNDS(K+1))**2	LEGS0295
00530	296*	61 L=L+K+1	LEGS0296
00531	297*	R(L)=-1.	LEGS0297

00532	298*	62	CONTINUE	LEGS0278
00534	299*		GO TO(63,63,63,63,79),IF	LEGS0279
00535	300*	63	DO 64 I=1,N	LEGS0300
00540	301*		K1=IQ+I	LEGS0301
00541	302*	64	OPAR(I)=R(K1)	LEGS0302
00543	303*		ICT=ICT+I	LEGS0303
00544	304*		IF(ICT-IMAX)65,71,71	LEGS0304
00547	305*	65	S=0.	LEGS0305
00550	306*		DO 67 I=1,N	LEGS0306
00553	307*		IF(BNDS(I))67,67,66	LEGS0307
00556	308*	66	S=S+(OPAR(I)/BNDS(I))*2	LEGS0308
00557	309*	67	CONTINUE	LEGS0309
00561	310*	68	Y=S-1.	LEGS0310
00562	311*	69	Z=X	LEGS0311
00563	312*	70	GO TO(21,31,36,43,79),IF	LEGS0312
00564	313*			LEGS0313
00564	314*	C	FIND LENGTH OF RESIDUAL VECTOR	LEGS0314
00564	315*			LEGS0315
00564	316*	71	SS=0.	LEGS0316
00565	317*		S1=0.	LEGS0317
00566	318*		K1=N2	LEGS0318
00567	319*		K2=N	LEGS0319
00570	320*		DO 76 J=1,N	LEGS0320
00573	321*		L=J	LEGS0321
00574	322*		S=0.	LEGS0322
00575	323*		KK=J+1	LEGS0323
00576	324*		IF(KK)74,74,72	LEGS0324
00601	325*	72	DO 73 I=1,KK	LEGS0325
00604	326*		S=S+ATA(L)*OPAR(I)	LEGS0326
00605	327*	73	L=L+N2-I	LEGS0327
00607	328*	74	DO 75 I=J,N	LEGS0328
00612	329*		S=S+ATA(L)*OPAR(I)	LEGS0329
00613	330*	75	L=L+1	LEGS0330
00615	331*		SS=SS+S*OPAR(J)	LEGS0331
00616	332*		S1=S1+ATA(K1)*OPAR(J)	LEGS0332
00617	333*		K1=K1+K2	LEGS0333
00620	334*	76	K2=K2-1	LEGS0334
00622	335*		SUS=ATA(K1)	LEGS0335
00623	336*		SUSP=SS-2.*S1+SUS	LEGS0336
00624	337*			LEGS0337
00624	338*			LEGS0338
00624	339*	C	BRANCH ON I4	LEGS0339
00624	340*			LEGS0340
00624	341*	C	I4 EQUAL TO ZERO -- INVERT NORMAL MATRIX	LEGS0341
00624	342*	C	I4 NOT EQUAL TO ZERO -- DO NOT INVERT NORMAL MATRIX,EXIT	LEGS0342
00624	343*			LEGS0343
00624	344*		IF(I4)82,77,82	LEGS0344
00627	345*	77	IF(X)78,79,78	LEGS0345
00632	346*	78	X=0.	LEGS0346
00633	347*		IF=5	LEGS0347
00634	348*		GO TO 47	LEGS0348
00635	349*			LEGS0349
00635	350*	C	FIND THE INVERSE OF (A TRANSPOSE)*A	LEGS0350
00635	351*			LEGS0351
00635	352*	79	IRSS=0	LEGS0352
00636	353*		DO 81 K=1,N	LEGS0353
00641	354*		IRSS=IRSS+K	LEGS0354
00642	355*		IRNS=IRSS-K	LEGS0355

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FOR,° LEGS,LEGS
00643 356° ITS=IRSS
00644 357° DO 81 J=K,N
00647 358° IRS=IRS+J
00650 359° IT=ITS
00651 360° IR=IRS
00652 361° S=0.
00653 362° DO 80 I=J,N
00656 363° IN=IP+I
00657 364° IF(R(IN))791,792,791
00662 365° 791 S=S+(R(IT)*R(IR))/R(IN)
00663 366° 792 IT=IT+I
00664 367° 80 IR=IR+I
00666 368° R(ITS)=S
00667 369° 81 ITS=ITS+J
00672 370° 82 RETURN
00673 371° END
    
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LEGS0356
LEGS0357
LEGS0358
LEGS0359
LEGS0360
LEGS0361
LEGS0362
LEGS0363
LEGS0364
LEGS0365
LEGS0366
LEGS0367
LEGS0368
LEGS0369
LEGS0370
LEGS0371
    
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END OF UNIVAC 1108 FORTRAN V COMPILATION.

D *DIAGNOSTIC* MESSAGE(S)

LEGS	CODE	SYMBOLIC	RELOCATABLE	30 APR 71	11:19:50	0	01476042	14	371	(DELETED)
				30 APR 71	11:19:50	1	01510154	24	1	(DELETED)
						0	01510204	14	93	

⊗ HDG ⊗ FOR,° NUSLET,NUSLET

6 FOR, NUSLET,NUSLET
 UNIVAC 1108 FORTRAN V LEVEL 2200 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:48

SUBROUTINE NUSLET ENTRY POINT 000130

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000156
 0000 *DATA 000105
 0002 *BLANK 000000
 0003 HEAT 001074

EXTERNAL REFERENCES (BLOCK, NAME)

0004 INTERP
 0005 INTER2
 0006 NERR25
 0007 NEAP05
 0010 NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000024	100L	0001	000041	200L	0001	000060	300L	0000	R	000011	APHI1	0000	R	000000	ATB			
0000	R	000033	BPH13	0000	R	000023	BTB	0000	R	000030	ATA	0003	R	000002	CPI	0003	R	000027	CPO
0000	R	000052	C1	0000	R	000053	C2	0003	R	000054	DIST	0003	R	000101	HE	0003	R	000720	HI
0003	R	000772	H0	0003	R	000745	HW	0000	I	000022	IS	0003	I	000126	KI	0000	I	000054	KKK
0003	I	000153	K0	0003	I	000200	KW	0003	I	000225	MUI	0003	I	000252	MUO	0003	R	001071	PHI1
0003	R	001072	PHI2	0003	R	001073	PHI3	0003	R	000277	PI	0003	R	000324	PO	0003	R	000351	PRI
0003	R	000376	PRO	0003	R	000423	Q	0003	R	001017	QUALI	0003	R	001044	QUALO	0003	R	000450	REI
0003	R	000475	REO	0003	R	000522	SVI	0003	R	000547	SVO	0003	R	000574	TI	0003	R	000621	TO
0003	R	000646	TAI	0003	R	000673	TW0	0003	R	000000	WD								

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00101 1* SUBROUTINE NUSLET (N,PR,RE,TA,TB,MART,NU)
00103 2* REAL NU,MART
00103 3* CC N=FLUID NUMBER, N=1 FOR HYDROGEN
00103 4* CC N=2 FOR OXYGEN
00103 5* CC N=3 FOR H2O-H2, MK=1.0
00103 6* CC INPUT RE = REYNOLDS NUMBER BULK
00103 7* CC PR = BULK PRANDTL NUMBER
00103 8* CC TA = WALL TEMP (DEG R)
00103 9* CC TB = BULK TEMP (DEG R)
00103 10* CC OUTPUT NU = NUSLET NUMBER
00103 11* CC
00103 12* CC PH11 CORRELATION DATA FOR HYDROGEN (PH11 VS. TB)
00104 13* DIMENSION ATB(9),APHI1(9)
00104 14* C
00105 15* COMMON /HEAT/AD(2),CPI(21),CPU(21),DIST(21),HE(21),KI(21),KU(21)
00105 16* 1, KA(21),MUI(21),MUO(21),PI(21),PO(21),PRI(21),PRO(21)
00105 17* 2, Q(21),REI(21),REU(21),SVI(21),SVO(21),TI(21),TV(21)

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00105 18@ 3, TWI(21),TWO(21),HI(21),HW(21),HO(21)
00105 19@ 4, QUALI(21),QUALO(21)
00105 20@ 4, PHI1,PHI2,PHI3
00105 21@ C
00106 22@ DATA ATB/40.0,50.0,60.0,70.0,80.0,90.0,100.0,110.0,120.0/
00110 23@ DATA APHI1/1.0, 1.0, 0.38, 0.51, 0.70, 0.80, 0.92, 0.96, 1.0/
00110 24@ CC
00110 25@ CC PHI3 VS. TW AND TB CORRECTION DATA FOR OXYGEN
00112 26@ DIMENSION BTB(5),BTW(3),BPHI3(5,3)
00113 27@ DATA BTB/200.0, 278.0, 300.0, 350.0, 400.0/
00115 28@ DATA BTW/600.0, 1000.0, 1800.0/
00117 29@ DATA BPHI3/1.30, 0.58, 0.68, 0.836, 1.0,
00117 30@ 10.95, 0.42, 0.556, 0.764, 1.0,
00117 31@ 20.75, 0.32, 0.434, 0.655, 1.0/
00121 32@ PHI1=1.0
00122 33@ PHI2=1.0
00123 34@ PHI3=1.0
00124 35@ C1 = 0.023
00125 36@ C2 = 0.
00126 37@ IF (MART .GT. 0.) GO TO 300
00130 38@ GO TO (100,200,100),N
00131 39@ 100 CONTINUE
00131 40@ CC CORRELATION FOR HYDROGEN
00131 41@ CC CORRELATION FOR H2O-H2 AT LOW MIXTURE RATIOS
00132 42@ C1=0.025
00133 43@ C2=-0.55
00133 44@ C IF(RE.GT.5.0E+5) PHI2=0.9
00134 45@ CALL INTERP (9,ATB,APHI1,TB,PHI1,KKK)
00135 46@ GO TO 300
00136 47@ 200 CONTINUE
00136 48@ CC CORRELATION FOR OXYGEN
00137 49@ C1=0.023
00140 50@ C2=-0.34
00141 51@ CALL INTER2 (TB,BTB,TN,BTW,PHI3,BPHI3,5,3)
00142 52@ GO TO 300
00143 53@ 300 CONTINUE
00144 54@ NU=C1*RE**0.8*PR**0.4*(TW/TB)**C2*PHI1*PHI2*PHI3
00145 55@ IF (MART .GT. 0.) NU =NU/(.611+1.93*MART)
00147 56@ RETURN
00150 57@ END
    
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END OF UNIVAC 1108 FORTRAN V COMPILATION. 0 *DIAGNOSTIC* MESSAGE(S)
NUSLET SYMBOLIC 14 JUN 71 15:05:43 0 01667014 14 57 (DELETED)
NUSLET CODE RELOCATABLE 14 JUN 71 15:05:43 1 01670452 24 1 (DELETED)
0 01670502 14 17
    
```

FOR, * OUTPRC, OUTPRC
UNIVAC 1108 FORTRAN V LEVEL 2206 0518 F5018H
THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:49

31 AUG 71

9:27:49.521

SUBROUTINE OUTPRC ENTRY POINT 002333

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 002343
0000 *DATA 000532
0002 *BLANK 000000
0003 INDATA 011610
0004 COM 006525
0005 TKOUT 000074

EXTERNAL REFERENCES (BLOCK, NAME)

0006 WRITE
0007 NADUS
0010 NIO1S
0011 NIO2S
0012 NERR3S

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001 000103 10L 0001 001505 100L 0000 000171 1000F 0000 000202 1010F 0001 001552 102L
0000 000216 1020F 0000 000233 1030F 0000 000236 1040F 0000 000247 1060F 0000 000260 1080F
0000 000274 1090F 0001 001714 110L 0000 000306 1100F 0000 000316 1110F 0000 000340 1120F
0000 000352 1125F 0000 000355 1130F 0000 000372 1140F 0000 000410 1160F 0000 000432 1170F
0000 000452 1180F 0000 000471 1190F 0001 000154 12L 0001 002076 120L 0001 002147 130L
0001 002232 140L 0001 000034 1466 0001 002314 150L 0001 000325 20L 0001 000406 22L
0001 000466 30L 0001 000547 32L 0001 000627 40L 0001 000702 50L 0001 000775 52L
0001 001064 60L 0001 001224 70L 0001 001233 80L 0001 001362 90L 0001 001406 91L
0001 001415 92L 0001 001421 93L 0001 001425 94L 0000 I 000000 A 0004 R 000000 AREA
0004 R 000074 AREAI 0004 R 000170 AREAK 0004 R 000132 AREAO 0003 R 000066 AREAT 0003 R 000121 AKINJ
0003 R 000625 ATD 0003 R 000613 ATI 0003 R 0006157 CDC 0004 R 0005060 CF 0004 R 0006423 CGGTC
0004 R 0006436 CGTANK 0004 R 0006431 CLTANK 0004 R 0005014 CONCT 0003 R 0005714 CP 0004 R 0006443 CPJU
0004 R 0005006 CSTAR 0003 R 0006102 CV 0004 R 0006355 CVEL 0004 R 000036 DELXL 0004 R 000226 DIALI
0003 R 0006675 DIAT 0004 R 0006277 DMVENT 0003 R 0006550 DGIN 0004 R 0006360 ETAT 0004 R 0006370 F6PC
0004 R 0006376 FBTC 0004 R 0006362 FBAC 0004 R 0005111 FKL 0003 R 0006447 GR 0004 R 0003132 HI
0004 R 0003036 HO 0004 R 0003322 HRAO 0000 I 000160 I 0000 I 000134 ICALLS 0003 I 000132 ICHAM
0004 I 0005110 ICHUN 0003 I 0006323 IEND 0000 I 000164 II 0003 I 000153 IJUNC 0003 I 0003415 IPB
0000 I 000170 IPROP 0003 I 0006637 IPUMI 0003 I 0006637 IPUM0 0003 R 0006143 ISP 0004 R 0005052 ISPT
0000 I 000161 J 0000 I 000162 JJ 0004 I 0003606 JUN 0003 R 0006222 KATHER 0003 R 0006656 KTI
0003 R 0006165 LAMDA 0003 I 0006431 LDMI 0003 I 0006536 LDM0 0003 I 0006517 LDWI 0003 I 0006524 LDMO
0003 R 0006561 NACH 0004 R 0006066 MEX 0000 I 000165 MM 0004 R 0004756 MK 0004 R 0005102 MHC
0000 I 000166 N 0003 I 0006146 NCHAM 0004 I 0002552 NGR 0003 I 000252 NLINJU 0000 I 000163 NN
0003 I 000100 NODEL 0003 I 0006553 NPLINE 0004 R 0002446 NPR 0004 R 0002742 NRE 0003 I 0006013 NSYS
0003 R 0006366 P 0004 R 000264 PB 0004 R 0004764 PC 0004 R 0006151 PCI 0004 R 0004772 PCN
0003 R 0006444 PDLLP 0003 R 0006713 PDROP 0004 R 0006074 PE 0004 R 000272 PG 0003 R 0006553 PGFBL
0004 R 000620 PGT 0004 R 0006036 PMK 0004 R 0006241 POWC 0004 R 0006350 POWP 0004 R 0006343 POWT
0004 R 0006300 PPI 0004 R 0006305 PPO 0003 I 0006707 PRIN 0003 I 0006601 PROU 0004 R 0006331 PTI
0004 R 0006336 PTO 0003 R 0006651 PWO 0004 R 0006357 R 0004 R 001422 RHOG 0003 R 000546 RHOL

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0004 R 006312 RPMT	0003 R 000000 S	0003 I 007065 SYSCOM	0004 R 005044 TC	0004 R 006416 THOC
0003 R 006135 THRT	0000 R 000167 THRUST	0003 R 000611 TIME	0005 R 000012 TKGAM	0005 R 000000 TKMTOT
0005 R 000024 TKMYNT	0005 R 000062 TKP	0005 R 000017 TKRGAS	0005 R 000005 TKRHOL	0005 R 000067 TKT
0005 R 000055 TKTIME	0004 R 006411 TPCG	0004 R 006404 TPCL	0003 R 006574 TTANK	0003 R 001132 TTEMP
0004 R 006317 TTI	0004 R 006324 TTO	0003 R 002242 TTTEMP	0004 R 003226 TWALL	0004 R 006356 U
0004 R 003416 UAO	0003 I 006757 VAD	0003 I 006733 VAI	0004 R 003512 VEL	0003 R 000253 VISC
0003 R 003423 WDOTG	0005 R 000031 WGASI	0005 R 000036 WGASO	0004 R 006265 WJ	0005 R 000043 WLIQI
0005 R 000050 WLIQO	0004 R 004750 WNOZ	0004 R 006253 WO	0003 R 006442 WOL	0003 R 006670 WP
0004 R 006361 WT	0004 R 006246 WTGC	0003 R 000041 WTHCON	0003 R 007003 XK	0003 R 000413 XLENGL

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00100 10 C
00101 20 SUBROUTINE OUTPRC
00101 30 C
00103 40 REAL MACH,NPR,NRE,KTHER,ISP,MR,MWC,MEX,LAMDA,KTI
00103 50 , ISPT
00103 60 C
00104 70 INTEGER SYSCOM,A,PRIN,PROU,VAI,VAD
00104 80 C
00105 90 DIMENSION ICALLS(20), A(92)
00105 100 C
00106 110 DIMENSION NODEL(20),VISC(30),IEND(6),XLENGL(30),IPB(6)
00106 120 , WDOTG(30,20),PGPBL(6),MACH(30,20),CP(20),SYSCOM(2,150)
00106 130 , KTHER(30),WTHCON(30),PDROP(6),ISP(6),THRT(6),CV(6,2)
00106 140 , ARINJ(6,2),AREAT(6),CDC(6),LAMDA(6),LDM(5),LDM0(5)
00106 150 , LWI(5),LDWO(5),P(5),TTANK(5),RHOL(3),DWIN(5)
00106 160 , PDELP(5),GR(5),ATI(5),ATD(5),DIAT(5),XK(20)
00106 170 , KTI(5),IJUNC(10,6),ICHAM(6,2),NPLINE(30),IPUMI(5)
00106 180 , IPUM0(5),PRIN(10),PROU(10),VAI(20),VAD(20)
00106 190 , TTEMP(30,20),TTTEMP(30,20),WLINJU(10),PWO(5),WP(5)
00106 200 , PCI(6)
00106 210 C
00107 220 COMMON /INDATA/ S(5000)
00107 230 C
00110 240 COMMON /COM/AREA(30),DELXL(30),AREAI(30),AREAO(30),AREAK(30)
00110 250 , DIALI(30),PB(6),PG(30,20),RHOG(30,20),NGR(30,2)
00110 260 , NPR(30,2),NRE(30,2),HO(30,2),HI(30,2),TWALL(30,2)
00110 270 , HRAO(30,2),UAO(30,2),VEL(30,2),JUN(10),PGT(30,20)
00110 280 , WNOZ(6),MR(6),PC(6),PCN(6,2),CSTAR(6),CONCT(3,6)
00110 290 , PMR(6),TC(6),ISPT(6),CF(6),MEX(6),PE(6),MWC(6),ICMON
00110 300 , FRL(30,20),PORC(5),WTGC(5),WO(10),WI(10),DMVENT,PPI(5)
00110 310 , PPO(5),RPMT(5),TTI(5),TTO(5),PTI(5),PTO(5),POWT(5)
00110 320 , POWP(5),CVEL,U,R,ETAT,WT,FBWC(6),FBPC(6)
00110 330 , FBTC(6),TPCL(5),TPCG(5),THOC(5),CGGTC(6),CLTANK(5)
00110 340 , CGTANK(5),CPJU(5,10)
00110 350 C
00111 360 COMMON /TKOUT/ TKMTOT(5),TKRHOL(5),TKGAM(5),TKRGAS(5),TKMYNT(5),
00111 370 , WGASI(5),WGASO(5),WLIQI(5),WLIQO(5),TKTIME(5),TKP(5)
00111 380 , TKT(5)
00112 390 EQUIVALENCE
00112 400 , (S(65),NODEL(1)), (S(172),VISC(1)), (S(212),IEND(1))
00112 410 , (S(268),XLENGL(1)), (S(1806),IPB(1)), (S(1812),WDOTG(1,1))
00112 420 , (S(2412),PGPBL(1)), (S(2418),MACH(1,1)), (S(3021),CP(1))
00112 430 , (S(3638),SYSCOM(1,1)), (S(3084),NSYS), (S(3219),KTHER(1))
00112 440 , (S(3568),VAD(1)), (S(3212),PDROP(1)), (S(3172),ISP(1))
00112 450 , (S(3166),THRT(1)), (S(3154),ARINJ(1,1)), (S(3139),CV(1,1))
    
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00112	46°	*,(S(3127),A	*,(S(3184),CDC(1))	*,(S(3190),LAMDA(1))
00112	47°	*,(S(3354),LD	*,(S(3423),LDMO(1))	*,(S(3408),LDWI(1))
00112	48°	*,(S(3413),LDHCT(1))	*,(S(3319),P(1))	*,(S(3453),TTANK(1))
00112	49°	*,(S(3363),DOL(1))	*,(S(359),RHOL(1))	*,(S(3433),DWIN(1))
00112	50°	*,(S(421),POELP(1))	*,(S(3513),WP(1))	*,(S(3368),GK(1))
00112	51°	*,(S(3468),ATI(1))	*,(S(3478),ATD(1))	*,(S(3516),DIAT(1))
00112	52°	*,(S(3588),XK(1))	*,(S(3503),KT1(1))	*,(S(171),NLINJU(1))
00112	53°	*,(S(108),IJUNC(1,1))	*,(S(91),ICHAM(1,1))	*,(S(103),NCHAM)
00112	54°	*,(S(394),TIME)	*,(S(364),NPLINE(1))	*,(S(416),IPUMI(1))
00112	55°	*,(S(3488),IPUMO(1))	*,(S(3528),PRIN(1))	*,(S(3458),PROU(1))
00112	56°	*,(S(3548),VAL(1))	*,(S(603),TTEMP(1,1))	*,(S(1203),TTTEMP(1,1))
00112	57°	*,(S(34),WTHCON(1))	*,(S(426),PNO(1))	
00112	58°	*,(S(3178),PCI(1))		
00112	59°	C		
00113	60°	DATA (ICALLS(I),I=1,20) /	6HPBL	, 6HPIPL
00113	61°	*,	6HADIA8	, 6HISQTH
00113	62°	*,	6HJUNCL	, 6HCHAM
00113	63°	*,	6HCHON	, 6HHEATX
00113	64°	*,	6HTANKD	, 6HTANKC
00113	65°	*,	6HPIPLL	, 6HTURBOP
00113	66°	*,	6HPREG	, 6HVALVG
00113	67°	*,	6HVALVL	, 6H
00113	68°	*,	6H	, 6H
00113	69°	*,	6H	, 6H
00113	70°	C		
00115	71°	DATA (A(I),I=1,40)	6HWDOTG	, 6HTTEMP
00115	72°	*,	6HTTTEMP	, 6HPGPBL
00115	73°	*,	6HVEL	, 6HMACH
00115	74°	*,	6HDIALI	, 6HVISC
00115	75°	*,	6HCP	, 6HWTCON
00115	76°	*,	6HKTHER	, 6HPG
00115	77°	*,	6HPGT	, 6HRHOG
00115	78°	*,	6HNPR	, 6KNRE
00115	79°	*,	6HRO	, 6HHI
00115	80°	*,	6HFRL	, 6HUAD
00115	81°	*,	6HHRAD	, 6HTHALL
00115	82°	*,	6HXLNGL	, 6HWI
00115	83°	*,	6HWO	, 6HPJI
00115	84°	*,	6HTEM	, 6HWNOZ
00115	85°	*,	6HPDROF	, 6HPCI
00115	86°	*,	6HISP	, 6HTHRT
00115	87°	*,	6HCF	, 6HMR
00115	88°	*,	6HTC	, 6HWR
00115	89°	*,	6HCSTAR	, 6HARINJ
00115	90°	*,	6HCY	, 6HMEK
00115	91°	C		
00117	92°	DATA (A(I),I=41,80) /	6HAREAI	, 6HAREAT
00117	93°	*,	6HPCN	, 6HPE
00117	94°	*,	6HCDC	, 6HLAMDA
00117	95°	*,	6HLDMI	, 6HLDMO
00117	96°	*,	6HLDMI	, 6HLDMO
00117	97°	*,	6HP	, 6HTTANK
00117	98°	*,	6HWOL	, 6HRHOL
00117	99°	*,	6HDMVENT	, 6HDQIN
00117	100°	*,	6HPPI	, 6HPFO
00117	101°	*,	6HPDEL	, 6HPHU
00117	102°	*,	6HWP	, 6HRPMT
00117	103°	*,	6HGR	, 6HTTI

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00117 104°      °,          6HTTO          , 6HATI
00117 105°      °,          6HATO          , 6HPTI
00117 106°      °,          6HPTO          , 6HCVEL
00117 107°      °,          6HDIAT         , 6HU
00117 108°      °,          6HR           , 6HETAT
00117 109°      °,          6HPOWT         , 6HPOAP
00117 110°      °,          6HWT           , 6HXX
00117 111°      °,          6HKT I         , 6H
00117 112°      C
00121 113°      DATA (A(1),I=81,92) / 6HTIME      , 6HPRESS
00121 114°      °,          6HTEMP      , 6HMTOT
00121 115°      °,          6HRHOL      , 6HRHOG
00121 116°      °,          6HGAM       , 6HVENT
00121 117°      °,          6HWGASI     , 6HWGASO
00121 118°      °,          6HWLIQI     , 6HWLIQO
00121 119°      C
00123 120°      1000 FORMAT(1H0, //7X,30H** PBL - PRESSURE BOUNDARY NO.13,3H **)
00124 121°      1010 FORMAT( //7XA6,1PE14.7,2X,A6,1PE14.7,2X,A6,1PE14.7,2X,A6,1PE14.7,
00124 122°      ° 2XA6,1PE14.7) )
00125 123°      1020 FORMAT(1H0//7X22H** PIPL - GAS LINE NO.13,35H WITH HEAT TRANSFER
00125 124°      °AND FRICTION **)
00126 125°      1030 FORMAT( //7X8HNODE NO.13)
00127 126°      1040 FORMAT(1H0//7X,29H** ADIAB - ADIABATIC LINE NO.13,3H **)
00130 127°      1060 FORMAT(1H0//7X,30H** ISOTH - ISOTHERMAL LINE NO.13,3H **)
00131 128°      1080 FORMAT(1H0//7X23H** JUNCL - JUNCTION NO.13,11H CONNECTING I3, 9H L
00131 129°      °INES **)
00132 130°      1090 FORMAT(1H0//7X36H** CHAM - BIPROPELLANT COMBUSTOR NO.13,3H **)
00133 131°      1100 FORMAT( //7X 8HLINE NO.13,23H CONNECTED TO INLET NO.13)
00134 132°      1110 FORMAT(1H0//7X38H** CMON - MONOPROPELLANT COMBUSTOR NO.13,22H CON
00134 133°      °NECTED TO LINE NO. 13, 5H WITH I3,12H CHAMBERS **)
00135 134°      1120 FORMAT(1H0//7X39H** TANKD - ACCUMULATOR/STORAGE TANK NO.13,3H **)
00136 135°      1125 FORMAT( //7X, 4(A6,14,11X) )
00137 136°      1130 FORMAT(1H0//7X39H** TANKC - ACCUMULATOR/STORAGE TANK NO.13,7H TIM
00137 137°      °E = 1PE14.7,3H **)
00140 138°      1140 FORMAT(1H0//7X26H** PIPLL - LIQUID LINE NO.13,35H WITH HEAT TRANS
00140 139°      °FER AND FRICTION **)
00141 140°      1160 FORMAT(1H0//7X39H** TURBOP - TURBOPUMP/GAS GENERATOR NO.13,15H IN
00141 141°      °LET LINE NO.13,16H OUTLET LINE NO.13,3H **)
00142 142°      1170 FORMAT(1H0//7X32H** PREG - PRESSURE REGULATOR NO.13,15H INLET LIN
00142 143°      °E NO.13,16H OUTLET LINE NO.13,3H **)
00143 144°      1180 FORMAT(1H1//7X24H** VALVG - GAS VALVE NO.13,15H INLET LINE NO.13,
00143 145°      °16H OUTLET LINE NO.13,3H **)
00144 146°      1190 FORMAT(1H0//7X27H** VALVL - LIQUID VALVE NO.13,15H INLET LINE NO.
00144 147°      °13,16H OUTLET LINE NO.13,3H **)
00144 148°      C
00145 149°      DO 150 I=1,NSYS
00150 150°      J      = SYSCOM(2,I)
00151 151°      JJ     = 1
00152 152°      NN     = 1
00153 153°      IF (SYSCOM(1,I).NE.ICALLS(1)) GO TO 10
00155 154°      II     = IPB(J)
00156 155°      IF (IEND(J),EQ,2) JJ=NODEL(II)
00160 156°      *WRITE(6,1000)J
00163 157°      *WRITE(6,1010)A(1),WDOTG(II,JJ),A(2),TTEMP(II,JJ),A(3)
00163 158°      °,          TTEMP(II,JJ),A(4),PGPBL(J),A(6),NACH(II,JJ)
00177 159°      GO TO 150
00200 160°      10 IF (SYSCOM(1,I).NE.ICALLS(2)) GO TO 20
00202 161°      KM     = 1

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00203 162* WRITE(6,1020)
00206 163* WRITE(6,1010)A(7),DIALI(J),A(8),VISC(J),A(9),CP(J),A(10),WTHCON(J)
00206 164* *, A(11),KTHER(J)
00222 165* 12 WRITE(6,1030)JJ
00225 166* WRITE(6,1010)A(5),VEL(J,NN),A(6),MACH(J,JJ),A(2),TTEMP(J,JJ)
00225 167* *, A(3),TTTEMP(J,JJ),A(12),PG(J,JJ),A(13),PGT(J,JJ)
00225 168* *, A(1),WDOTG(J,JJ),A(14),RHOG(J,MM),A(15),NPR(J,NN)
00225 169* *, A(16),NRE(J,NN),A(17),HO(J,NN),A(18),HI(J,NN)
00225 170* *, A(19),FRL(J,NN),A(20),UAD(J,NN),A(21),HRAD(J,NN)
00225 171* *, A(22),TWALL(J,NN)
00267 172* IF (JJ.NE.1) GO TO 150
00271 173* JJ = NODEL(J)
00272 174* NN = 2
00273 175* MM = JJ - 1
00274 176* GO TO 12
00275 177* 20 IF (SYSCOM(1,1).NE.ICALLS(3)) GO TO 30
00277 178* WRITE(6,1040)J
00302 179* WRITE(6,1010)A(7),DIALI(J),A(23),XLENG(J),A(9),CP(J),A(8),VISC(J)
00302 180* *, A(19),FRL(J,1),A(16),NRE(J,1),A(5),VEL(J,1),A(14)
00302 181* *, RHOG(J,1)
00324 182* 22 WRITE(6,1030)JJ
00327 183* WRITE(6,1010)A(6),MACH(J,JJ),A(2),TTEMP(J,JJ),A(3),TTTEMP(J,JJ)
00327 184* *, A(12),PG(J,JJ),A(13),PGT(J,JJ),A(1),WDOTG(J,JJ)
00345 185* IF (JJ.NE.1) GO TO 150
00347 186* JJ = 2
00350 187* GO TO 22
00351 188* 30 IF (SYSCOM(1,1).NE.ICALLS(4)) GO TO 40
00352 189* WRITE(6,1040)J
00355 190* WRITE(6,1010)A(7),DIALI(J),A(23),XLENG(J),A(9),CP(J),A(8),VISC(J)
00356 191* *, A(19),FRL(J,1),A(16),NRE(J,1),A(5),VEL(J,1),A(14)
00356 192* *, RHOG(J,1)
00400 193* 32 WRITE(6,1030)JJ
00403 194* WRITE(6,1010)A(6),MACH(J,JJ),A(2),TTEMP(J,JJ),A(3),TTTEMP(J,JJ)
00403 195* *, A(12),PG(J,JJ),A(13),PGT(J,JJ),A(1),WDOTG(J,JJ)
00421 196* IF (JJ.NE.1) GO TO 150
00423 197* JJ = 2
00424 198* GO TO 32
00425 199* 40 IF (SYSCOM(1,1).NE.ICALLS(5)) GO TO 50
00427 200* WRITE(6,1040)J,NLINJU(J)
00433 201* II = ABS(IJUNC(1,J))
00434 202* WRITE(6,1010)A(24),W1(J),A(25),W0(J),A(12),PG(II,1),A(2)
00434 203* *, TTEMP(II,1)
00446 204* GO TO 150
00447 205* 50 IF (SYSCOM(1,1).NE.ICALLS(6)) GO TO 60
00451 206* WRITE(6,1090)J
00454 207* WRITE(6,1010)A(28),W0Z(J),A(29),PDR0P(J),A(30),PCI(J),A(31)
00454 208* *, ISP(J),A(32),THRT(J),A(33),CF(J),A(34),MR(J),A(35)
00454 209* *, TC(J),A(36),MWC(J),A(37),CSTAR(J)
00502 210* N = 1
00503 211* 52 WRITE(6,100)ICHAM(J,N),N
00507 212* II = ICHAM(J,N)
00510 213* JJ = NODEL(II)
00511 214* WRITE(6,1010)A(38),ARINJ(J,N),A(39),CV(J,N),A(3),TTTEMP(II,JJ)
00511 215* *, A(13),PGT(II,JJ),A(1),WDOTG(II,JJ)
00525 216* IF (N.EQ.2) GO TO 150
00527 217* N = 2
00530 218* GO TO 52
00531 219* 60 IF (SYSCOM(1,1).NE.ICALLS(7)) GO TO 70

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00533 220*      II      = ICHAM(J,1)
00534 221*      WRITE(6,1110)J,II,NCHAM
00541 222*      JJ      = NODEL(II)
00542 223*      THRUST   = ISPT(J)*WNOZ(J)
00543 224*      WRITE(6,1010)A(40),MEX(J),A(41),AREAI(J),A(42),AREAT(J),A(38)
00543 225*      * ,      ARINJ(J,1),A(39),CV(J,1),A(3),TTTEMP(II,JJ),A(43)
00543 226*      * ,      PCN(J,1),A(13),PGT(II,JJ),A(1),WDOTG(II,JJ),A(44)
00543 227*      * ,      PE(J),A(45),CDC(J),A(46),LAMDA(J),A(32),THRUST
00543 228*      * ,      A(28),WNOZ(J),A(31),ISPT(J)
00603 229*      GO TO 150
00604 230*      70 IF (SYSCOM(1,1).NE.ICALLS(8)) GO TO 80
00606 231*      CALL WRITE
00607 232*      GO TO 150
00610 233*      80 IF (SYSCOM(1,1).NE.ICALLS(9)) GO TO 90
00612 234*      WRITE(6,1120)J
00615 235*      WRITE(6,1125)A(47),LDMI(J),A(48),LDMO(J),A(49),LDWI(J),A(50)
00615 236*      * ,      LDWO(J)
00627 237*      WRITE(6,1010)A(81),TKTIME(J),A(82),TKP(J),A(83),TKT(J),
00627 238*      * ,      A(84),TKMTOT(J),A(85),TKRHOL(J),A(86),TKRGAS(J),A(87),TKGAM(J),
00627 239*      * ,      A(88),TKMVT(J),A(89),HGASI(J),A(90),HGASO(J),A(91),WLIQI(J),
00627 240*      * ,      A(92),WLIQO(J)
00661 241*      GO TO 150
00662 242*      90 IF (SYSCOM(1,1).NE.ICALLS(10)) GO TO 100
00664 243*      WRITE(6,1130)J,TIME
00670 244*      IF (LDMI(J)),91,
00673 245*      II      = LDMI(J)
00674 246*      JJ      = NODEL(II)
00675 247*      91 IF (LDWI(J)),92,
00700 248*      II      = LDWI(J)
00701 249*      JJ      = NODEL(II)
00702 250*      92 IF (LDMO(J)),93,
00705 251*      II      = LDMO(J)
00706 252*      93 IF (LDWO(J)),94,
00711 253*      II      = LDWO(J)
00712 254*      94 IPROP   = NPLINE(II)
00713 255*      WRITE(6,1010)A(51),P(J),A(52),TTANK(J),A(53),WOL(J),A(54)
00713 256*      * ,      RHOL(IPROP),A(2),TTEMP(II,JJ),A(1),WDOTG(II,JJ)
00713 257*      * ,      A(55),DMVENT,A(56),DQIN(J)
00735 258*      GO TO 150
00736 259*      100 IF (SYSCOM(1,1).NE.ICALLS(11)) GO TO 110
00740 260*      WRITE(6,1140)J
00743 261*      WRITE(6,1010)A(7),DIALI(J),A(8),VISC(J),A(9),CP(J),A(10),WTHCON(J)
00743 262*      * ,      A(11),KTHEI(J)
00757 263*      102 WRITE(6,1030)JJ
00762 264*      WRITE(6,1010)A(5),VEL(J,NN),A(6),MACH(J,JJ),A(2),TTEMP(J,JJ)
00762 265*      * ,      A(3),TTEMP(J,JJ),A(12),PG(J,JJ),A(13),PGT(J,JJ)
00762 266*      * ,      A(1),WDOTG(J,JJ),A(14),RHOG(J,JJ),A(15),NPK(J,NN)
00762 267*      * ,      A(16),NRE(J,NN),A(17),MO(J,NN),A(18),HI(J,NN)
00762 268*      * ,      A(19),FRL(J,NN),A(20),UAO(J,NN),A(21),HRAD(J,NN)
00762 269*      * ,      A(22),TWALL(J,NN)
01024 270*      IF (JJ.NE.1) GO TO 150
01026 271*      JJ      = NODEL(J)
01027 272*      NN      = 2
01030 273*      GO TO 102
01031 274*      110 IF (SYSCOM(1,1).NE.ICALLS(12)) GO TO 120
01033 275*      WRITE(6,1160)J,IPUMI(J),IPUMO(J)
01040 276*      WRITE(6,1010)A(57),PPI(J),A(58),PPO(J),A(59),PDEL(J),A(60),PHO(J)
01040 277*      * ,      A(61),AP(J),A(62),RPMT(J),A(63),GR(J),A(35),TC(J)

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01040 278* 0, A(64),TTI(J),A(65),TTO(J),A(66),ATI(J),A(67),ATD(J)
01040 279* 0, A(68),PTI(J),A(69),PTO(J),A(70),CVEL,A(71),DIAT(J)
01040 280* 0, A(72),U,A(73),R,A(74),ETA,T,A(75),PONT(J),A(76)
01040 281* 0, POWP(J),A(77),WT,A(79),KTI(J)
01120 282* GO TO 150
01121 283* 120 IF (SYSCOM(1,I).NE.ICALLS(13)) GO TO 130
01123 284* WRITE(6,1170)J,PRIN(J),PROU(J)
01130 285* I1 = PROU(J)
01131 286* WRITE(6,1010)A(12),PG(11,1),A(1),WDOTG(11,1),A(14),RHOG(11,1),A(6)
01131 287* 0, MACH(11,1)
01143 288* GO TO 150
01144 289* 130 IF (SYSCOM(1,I).NE.ICALLS(14)) GO TO 140
01146 290* WRITE(6,1180)J,VAI(J),VAD(J)
01153 291* I1 = VAD(J)
01154 292* JJ = NODEL(11)
01155 293* WRITE(6,1010)A(1),WDOTG(11,1),A(12),PG(11,JJ),A(78),XK(J),A(14)
01155 294* 0, RHOG(11,1),A(6),MACH(11,1)
01171 295* GO TO 150
01172 296* 140 IF (SYSCOM(1,I).NE.ICALLS(15)) GO TO 150
01174 297* WRITE(6,1190)J,VAI(J),VAD(J)
01201 298* I1 = VAD(J)
01202 299* JJ = NODEL(11)
01203 300* WRITE(6,1010)A(1),WDOTG(11,1),A(12),PG(11,JJ),A(78),XK(J),A(14)
01203 301* 0, RHOG(11,1),A(6),MACH(11,1)
01217 302* 150 CONTINUE
01217 303* C
01221 304* RETURN
01222 305* END
    
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END OF UNIVAC 1108 FORTRAN V COMPILATION. D *DIAGNOSTIC* MESSAGE(S)

OUTPRC	CODE	SYMBOLIC RELOCATABLE	31 AUG 71	09:25:16	0	02132674	14	305	{DELETED}
OUTPRC			31 AUG 71	09:25:16	1	02143152	36	1	{DELETED}
@ HDG	@	FOR, OXYGEN, OXYGEN			0	02143216	14	166	

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3.2.41 OXYGEN

FOR, OXYGEN,OXYGEN
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:54

31 AUG 71

9:27:54.683

SUBROUTINE OXYGEN ENTRY POINT 000100

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000135
 0000 *DATA 000446
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 INTER2
 0004 EXP
 0005 NERR15

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 R 000013 AK	0000 R 000000 AP	0000 R 000003 AT	0000 R 000057 BMU	0000 R 000044 BP
0000 R 000047 BT	0000 R 000137 CCCP	0000 R 000107 CCP	0000 R 000114 CCT	0000 R 000276 DP
0000 R 000321 DSV	0000 R 000303 DT	0000 I 000043 IS	0000 R 000427 PI	

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00101 1* SUBROUTINE OXYGEN (P,T,SV,MU,K,CP,PR)
00101 2* CC
00101 3* CC THIS SUBROUTINE COMPUTES SUPER CRITICAL OXYGEN PROPERTIES
00101 4* CC IN THE RANGE OF 160 R. TO 540 R. AND 1000 PSIA TO 2000 PSIA
00101 5* CC P = PRESSURE (PSIA), INPUT
00101 6* CC T = TEMPERATURE (DEG R), INPUT
00101 7* CC SV= SPECIFIC VOLUME (IN*3/POUND), COMPUTED
00101 8* CC MU= VISCOSITY (POUNDS/IN-SEC), COMPUTED
00101 9* CC K = CONDUCTIVITY (BTU/IN-SEC-DEG R), COMPUTED
00101 10* CC CP= SPECIFIC HEAT CONSTANT PRESSURE (BTU/POUND-DEGR)
00101 11* CC PR= PRANDTL NUMBER (CP*MU/K), COMPUTED
00101 12* CC
00103 13* REAL MU,K
00103 14* CC CONDUCTIVITY DATA (P,T VS. LOG (K*10**7))
00104 15* DIMENSION AP( 3),AT( 8),AK( 8, 3)
00105 16* DATA AP/1000.0,1500.0,2000.0/
00107 17* DATA AT/180.0,260.0,280.0,300.0,320.0,400.0,480.0,600.0/
00111 18* DATA AK/2.90,2.39,2.07,1.641,1.322,1.215,1.297,1.477,
00111 19* 1 2.90,2.44,2.28,2.050,1.770,1.411,1.411,1.526,
00111 20* 2 2.90,2.48,2.33,2.180,2.010,1.609,1.552,1.575/
00111 21* CC
00111 22* CC VISCOSITY DATA (P,T VS. LOG(MU*10**6))
00113 23* DIMENSION BP( 3),BT( 8),BMU( 8, 3)
00114 24* DATA BP/1000.0,1500.0,2000.0/
00116 25* DATA BT/180.0,260.0,280.0,300.0,320.0,400.0,480.0,600.0/
00120 26* DATA BMU/2.70,1.359,0.9295,0.1613,0.00912,0.0653,0.1398,0.2920,
    
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00120 27* 1 1.47,1.171,0.7538,0.4447,0.1620,0.2084,0.3353,
00120 28* 2 2.71,1.56,1.297,1.0084,0.7459,0.2920,0.2770,0.3790/
00120 29* CC
00120 30* CC
00122 31* DIMENSION CCP(5),CCT(19),CCCP(19,5)
00123 32* DATA CCP/955.24,1175.68,1469.60,1763.52,2057.44/
00125 33* DATA CCT/160.0,200.0,240.0,250.0,260.0,270.0,280.0,285.0,290.0,
00125 34* 1 295.0,300.0,310.0,320.0,330.0,340.0,350.0,360.0,400.0,540.0/
00127 35* DATA CCCP/0.398,0.413,0.473,0.505,0.555,0.650,0.901,1.283,2.201,
00127 36* 1 1.743,1.075,0.654,0.510,0.434,0.389,0.359,0.338,0.290,0.244,
00127 37* 2 0.396,0.410,0.461,0.484,0.518,0.575,0.678,0.766,0.898,1.058,
00127 38* 3 1.241,1.037,0.724,0.564,0.477,0.423,0.386,0.313,0.250,
00127 39* 4 0.395,0.405,0.448,0.464,0.487,0.520,0.569,0.606,0.652,
00127 40* 5 0.695,0.757,0.853,0.836,0.714,0.598,0.516,0.459,0.345,0.258,
00127 41* 6 0.393,0.402,0.436,0.449,0.466,0.487,0.513,0.537,0.563,
00127 42* 7 0.583,0.612,0.664,0.698,0.689,0.636,0.573,0.514,0.376,0.265,
00127 43* 8 0.392,0.398,0.426,0.437,0.452,0.465,0.479,0.498,0.514,
00127 44* 9 0.527,0.543,0.574,0.600,0.610,0.599,0.571,0.533,0.402,0.272/
00127 45* CC
00127 46* CC
00127 47* CC
00131 48* DIMENSION DPI(5),DT(14),DSV(14,5)
00132 49* DATA DPI/4.8604E-4,5.6705E-4,6.8046E-4,8.5057E-4,10.469E-4/
00132 50* CC CORRESPONDING TO 140,120,100,80, AND 65 ATMOSPHERES
00132 51* CC NOTE 14.696 PSIA = 1 ATMOSPHERE
00134 52* DATA DT/160.0,200.0,240.0,260.0,280.0,290.0,300.0,310.0,320.0,
00134 53* 1 DATA DSV/340.0,370.0,400.0,470.0,540.0/
00136 54* 2 DATA DSV/23.55,25.76,28.86,31.00,33.87,35.72,37.98,40.78,44.23,
00136 55* 3 53.29,69.62,85.31,116.69,143.87,
00136 56* 4 23.62,25.92,29.17,31.52,34.87,37.11,40.07,44.01,49.18,
00136 57* 5 62.67,83.69,101.92,137.48,168.32,
00136 58* 6 23.70,26.06,29.51,32.14,36.13,39.21,43.70,50.54,59.98,
00136 59* 7 80.46,105.74,126.52,167.24,202.94,
00136 60* 8 23.78,24.21,29.91,32.92,36.15,43.38,53.97,71.71,87.99,
00136 61* 9 112.75,141.06,164.78,212.56,255.35,
00136 62* 23.85,26.33,30.26,33.64,40.97,55.85,90.13,111.11,126.87,
00136 63* 152.03,182.81,209.69,265.33,316.17/
00136 64* CC
00136 65* CC
00140 66* COMPUTE CONDUCTIVITY, AK(T,P)
00141 67* CALL INTER2 (T,AT,P,AP,K,AK,8,3)
00141 68* K=EXP(K)*1.0E-7
00142 69* CC COMPUTE VISCOSITY, BMU(T,P)
00142 70* CALL INTER2 (T,HT,P,BP,MU,BMU,8,3)
00143 71* MU=EXP(HU)*1.0E-6
00143 72* CC
00143 73* CC COMPUTE SPECIFIC HEAT, CCCP(T,P)
00144 74* CALL INTER2 (T,CCT,P,CCP,CP,CCCP,19,5)
00144 75* CC
00144 76* CC COMPUTE SPECIFIC VOLUME, DSV(T,PI)
00145 77* PI=1.0/P
00144 78* CALL INTER2 (T,DT,PI,DP,SV,DSV,14,5)
00146 79* CC
00146 80* CC COMPUTE PRANDTL NUMBER
00147 81* PR=CP*MU/K
00150 82* RETURN
00151 83* END

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@ FOR, OXYGEN, OXYGEN

DATE 310871 PAGE 220

END OF UNIVAC 1108 FORTRAN V COMPILATION.

D *DIAGNOSTIC* MESSAGE(S)

OXYGEN SYMBOLIC
OXYGEN CODE RELOCATABLE

30 APR 71	11:19:53	0	01512632	14	83	{DELETED}
30 APR 71	11:19:53	1	01515044	24	1	{DELETED}
		0	01515074	14	36	

@ HDG @ FOR, PACK, PACK

FOR, * PACK,PACK
 UNIVAC 1108 FORTRAN V LEVEL 220 0010 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:56

SUBROUTINE PACK ENTRY POINT 000140

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000162
 0000 *DATA 000045
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000027	120G	0001	000047	131G	0001	000064	137G	0001	000103	150G	0001	000015	3L
0001	000052	4L	0001	000121	999L	0000	R 000014	ACHAR	0000	R 000013	BSIN	0000	I 000010	I
0000	I 000001	10CTM	0000	I 000002	10CT31	0000	I 000013	ISIN	0000	I 000012	IWORD	0000	I 000011	J
0000	I 000005	K	0000	I 000004	KWORD	0000	I 000007	K1	0000	I 000006	K2	0000	I 000000	NBLNK1
0000	I 000003	NBLNK2	0000	I 000014	NCHAR	0000	R 000012	WORD						

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00101 10 SUBROUTINE PACK(NCARD, LWORD, N)
00101 20 C.....
00101 30 C.....SUBROUTINE PACK TAKES N WORDS (SINGLE CHARACTER PER WORD) OF
00101 40 C.....NCARD AND PACKS THE ARRAY NCARD INTO LWORD (SIX CHARACTERS PER
00101 50 C.....WORD). 4/1/68
00101 60 C.....
00103 70 DIMENSION
00103 80 * NCARD(1) ,LWORD(1)
00103 90 * ,NCHAR(6)
00103 100 C.....
00104 110 EQUIVALENCE
00104 120 * (IWORD ,WORD) ,(BSIN ,ISIN)
00104 130 * ,(ACHAR ,NCHAR(1))
00104 140 C.....
00105 150 DATA
00105 160 * NBLNK1 / 1H /, 10CTM / 040000000000 /
00105 170 * , 10CT31 / 0000000000037 /
00105 180 C.....
00111 190 NBLNK2 = FLD(0,6,NBLNK1)
00112 200 IF(N.GT.0) GO TO 3
00114 210 LWORD(1) = NBLNK1
00115 220 GO TO 999
00115 230 C.....
00115 240 C.....KWORD IS THE NUMBER OF IWORD WORDS NEEDED TO PACK N CHARACTERS.
00116 250 3 KWORD = (N+5)/6
00116 260 C.....

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00117 27*      DO 10 K=1,KWORD
00122 28*      IWORD = 0
00122 29*      C.....
00122 30*      C.....FIGURE OUT THE RANGE IN NCARD
00123 31*      K2 = 6*K
00124 32*      K1 = K2-5
00125 33*      IF(K2.LE.N) GO TO 6
00125 34*      C.....
00125 35*      C.....SETUP TO FILL LAST WORD WITH BLANKS
00127 36*      K2 = N
00130 37*      DO 5 I=1,6
00133 38*      5 NCHAR(I) = NBLNK2
00133 39*      C.....
00133 40*      C.....SHIFT TO END OF WORD
00135 41*      6 J = 0
00136 42*      DO 7 I=K1,K2
00141 43*      J = J+1
00142 44*      NCHAR(J) = FLD(0,6,NCARD(I))
00143 45*      7 CONTINUE
00143 46*      C.....
00145 47*      BSIN = AND(NCARD(K1),IOCTM)
00146 48*      ACHAR = AND(NCHAR(I),IOCT31)
00146 49*      C.....
00146 50*      C.....PACK SIX CHARACTERS
00147 51*      DO 35 J=1,6
00152 52*      IWORD = IWORD*64 + NCHAR(J)
00153 53*      35 CONTINUE
00153 54*      C.....
00155 55*      WORD = OR(IWORD,ISIN)
00156 56*      LWORD(K) = IWORD
00156 57*      C.....
00157 58*      10 CONTINUE
00161 59*      N = KWORD
00162 60*      999 RETURN
00163 61*      END
    
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END OF UNIVAC 1108 FORTRAN V COMPILATION.

0 *DIAGNOSTIC* MESSAGE(S)

PACK	CODE	SYMBOLIC	RELOCATABLE	30 APR 71	11:19:55	0	01516064	14	61	(DELETED)
				30 APR 71	11:19:55	1	01517612	24	1	(DELETED)
						0	01517642	14	13	

@ HDG @ FOR, * PBL,PBL

@ FOR, PBL,PBL
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:57

31 AUG 71

9:27:57.451

SUBROUTINE PBL ENTRY POINT 000451

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	000463
0000	*DATA	000077
0002	*BLANK	000000
0003	INDATA	011610
0004	CCNS	000003
0005	COM	006525

EXTERNAL REFERENCES (BLOCK, NAME)

0006	OPTCP
0007	OPTCV
0010	HPTCP
0011	HPTCV
0012	NERR25
0013	SGRT
0014	NWDUS
0015	N1025
0016	N1015
0017	NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000034	IL	0001	000143	14IG	0001	000047	2L	0000	000015	30F	0001	000265	40L
0001	000061	5L	0001	000277	50L	0001	000327	60L	0000	000027	70F	0001	000432	80L
0000	R 000006	A	0005	R 000000	AREA	0005	R 000074	AREA1	0005	R 000170	AREAK	0005	R 000132	AREAO
0000	R 000007	B	0000	R 000010	C	0005	R 005060	CF	0005	R 006423	CGGTC	0005	R 006436	CGTANK
0005	R 006431	CLTANK	0005	R 005014	CONCT	0000	R 000004	CPGAS	0005	R 006443	CPJU	0005	R 005006	CSTAR
0005	R 006355	CVEL	0000	R 000005	CYGAS	0005	R 000036	DELXL	0005	R 000226	DIALI	0003	000510	DIALO
0005	R 006277	DMVENT	0005	R 006360	ETAT	0004	R 000002	FB	0005	R 006370	FBPC	0005	R 006376	FBTC
0005	R 006362	FB4C	0000	R 000012	FH2	0000	R 000013	FPM2	0005	R 005111	FRL	0004	R 000001	GC
0005	R 003132	HI	0005	R 003036	HO	0010	R 000000	HPTCP	0011	R 000000	HPTCV	0005	R 003322	HRAD
0005	I 005110	ICHON	0003	I 000323	IEND	0000	I 000000	II	0003	I 003415	IPB	0003	I 000551	IPROP
0005	I 005052	ISPT	0000	I 000011	J	0000	I 000001	JJ	0005	I 003606	JUN	0003	R 003413	KA
0003	R 004561	MACH	0005	I 005066	MEX	0005	I 004756	MR	0005	I 005102	M4C	0000	I 000014	M2P
0005	I 002552	NGR	0003	I 000100	NODEL	0003	I 000553	NPLINE	0005	I 002646	NPR	0005	I 002742	NRE
0006	R 000000	OPTCP	0007	R 000000	OPTCV	0000	R 000002	P	0005	R 000264	PB	0005	R 004764	PC
0005	R 004772	PCN	0005	R 005074	PE	0005	R 000272	PG	0003	R 004553	PGPBL	0005	R 003620	PGT
0004	R 000000	PI	0005	R 005036	PMR	0005	R 006241	POWC	0005	R 006350	POWP	0005	R 006343	PORT
0005	R 006300	PPI	0005	R 006305	PPO	0005	R 006331	PTI	0005	R 006336	PTO	0005	R 006357	R
0003	R 005754	RFLAG	0003	R 005711	RGAS	0005	R 001422	RHUG	0005	R 006312	RPMT	0003	R 000000	S
0000	R 000003	T	0005	R 005044	TC	0003	000451	TH	0005	R 006416	THOC	0005	R 006411	TPCG
0005	R 006404	TPCL	0003	I 003412	TT	0003	R 001132	TTEMP	0005	R 006317	TTI	0005	R 006324	TTO
0003	R 002262	TTTEMP	0005	R 003226	TWALL	0005	R 006356	U	0005	R 003416	UAO	0005	R 003512	VEL
0003	R 003423	WDOTG	0005	R 006265	WI	0005	R 004750	WNOZ	0005	R 006253	WO	0005	R 006361	WT
0005	R 006246	WTGC												

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00101 10 SUBROUTINE PBL(I)
00101 20 C CONSTANT PRESSURE BOUNDARY SUBROUTINE
00103 30 REAL MACH,KA
00104 40 INTEGER TT
00104 50 C
00105 60 DIMENSION NODEL(20),TH(30),DIALO(30),RGAS(2),TTEMP(30,20)
00105 70 , TTTEMP(30,20),IEND(6),WDOTG(30,20),KA(2),PGPBL(6)
00105 80 , MACH(30,20),IPB(6),NPLINE(30)
00105 90 C
00106 100 COMMON /INDATA/5(5000)
00107 110 COMMON /CONS/FI,GC,FB
00107 120 C
00110 130 COMMON /COM/AREA(30),DELXL(30),AREA1(30),AREA0(30),AREAK(30)
00110 140 , DIALI(30),PB(6),PG(30,20),RHOG(30,20),NGR(30,2)
00110 150 , NPR(30,2),NRE(30,2),HO(30,2),HI(30,2),TWALL(30,2)
00110 160 , HRAO(30,2),UAO(30,2),VEL(30,2),JUN(10),PGT(30,20)
00110 170 , RNQZ(6),MR(6),PC(6),PCN(6,2),CSTAR(6),CONCT(3,6)
00110 180 , PMR(6),TC(6),ISPT(6),CF(6),MEX(6),PE(6),MAC(6),ICMON
00110 190 , FRL(30,20),POK(5),WTGC(5),WO(10),WI(10),DMVENT,PPI(5)
00110 200 , PPO(5),RPMT(5),TTI(5),TTO(5),PTI(5),PTO(5),PORT(5)
00110 210 , POWP(5),CYEL,U,R,ETAT,WT,FBWC(6),FBPC(6)
00110 220 , FBTC(6),YPCL(5),TPCG(5),THOC(5),CGGTC(6),CLTANK(5)
00110 230 , CGTANK(5),CPJU(5,10)
00110 240 C
00111 250 EQUIVALENCE
00111 260 , (S(65),NODEL(1)),(S(212),IEND(1)),(S(298),TH(1))
00111 270 , (S(329),DIALO(1)),(S(362),IPROP), (S(364),NPLINE(1))
00111 280 , (S(3018),RGAS(1)),(S(603),TTEMP(1,1)),(S(1203),TTTEMP(1,1))
00111 290 , (S(1812),WDOTG(1,1)),(S(1804),KA(1)),(S(2412),PGPBL(1))
00111 300 , (S(2418),MACH(1,1)),(S(1806),IPB(1)),(S(1803),TT)
00111 310 , (S(3053),RFLAG)
00111 320 C
00112 330 II = IPB(1)
00113 340 IF (IEND(1))EQ.2) GO TO 40
00115 350 JJ = 1
00116 360 IPROP = NPLINE(II)
00117 370 P = PGPBL(I)
00120 380 T = TTEMP(II,JJ)
00121 390 GO TO (1,2), IPROP
00121 400 C OXYGEN
00122 410 1 CPGAS = OPTCP(P,T)
00123 420 CVGAS = OPTCV(P,T)
00124 430 GO TO 5
00125 440 2 CPGAS = HPTCP(P,T)
00126 450 CVGAS = HPTCV(P,T)
00127 460 5 CONTINUE
00130 470 KA(IPROP) = CPGAS / CVGAS
00131 480 RGAS(IPROP) = ( CPGAS - CVGAS ) * 778.156
00132 490 IF (TI.LT.1) GO TO 50
00132 500 C
00132 510 C FLOW VERSUS TOTAL TEMPERATURE
00132 520 C
00134 530 A = KA(IPROP) - 1.0
00135 540 B = SQRT(KA(IPROP)*GC/(RGAS(IPROP)*TTTEMP(1,JJ))*PGPBL(1))

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00136 55* C      1.0*WDOTG(II,JJ)/(PI*DIALI(II)**2)
00136 56* C
00137 57* MACH(II,JJ) = 1.0E-1
00137 58* C
00140 59* DO 20 J=1,10
00143 60* FM2 = C + B*MACH(II,JJ)*SQRT(1.0+A*.5*MACH(II,JJ)**2)
00144 61* FM2 = C + B*MACH(II,JJ)**2 * SQRT(1.0+A*.5*MACH(II,JJ)**2)
00145 62* FPM2 = B * SQRT(2.0/(2.0+A*MACH(II,JJ)**2)) *
00145 63* (1.0 + A*MACH(II,JJ)**2)
00146 64* M2P = MACH(II,JJ) - FM2/FPM2
00147 65* IF (ABS(M2P-MACH(II,JJ)).LE.1.0E-8.OR.ABS(FM2).LE.1.0E-8) GO TO 60
00151 66* MACH(II,JJ) = M2P
00152 67* 20 CONTINUE
00154 68* WRITE (6,30)
00156 69* 30 FORMAT(/,4X46HPBL=NO CONVERGENCE IN NEWTON-RAPHSON ITERATION)
00157 70* GO TO 60
00157 71* C
00160 72* 40 CONTINUE
00161 73* JJ = NODEL(II)
00161 74* C
00161 75* C PRESSURE BOUNDARY CONSTRAINT EQUATION
00161 76* C
00162 77* PB(1) = 1. - PG(II,JJ) / PGPBL(1)
00163 78* GO TO 60
00163 79* C
00164 80* 50 MACH(II,JJ) = WDOTG(II,JJ)/(DIALI(II)**2*PGPBL(1)) *
00164 81* SQRT(RGAS(IPROP)*TTEMP(II,JJ)/(6.1685029E*10*GC*KA
00164 82* (IPROP)))
00164 83* C
00165 84* 60 PG(II,JJ) = PGPBL(1)
00166 85* IF (RFLAG),80,
00171 86* WRITE(6,70) II,JJ,IPROP,TT
00171 87* 1, WDOTG(II,JJ),PI,DIALI(II),KA(IPROP)
00171 88* 2, GC, RGAS(IPROP), TTEMP(II,JJ), MACH(II,JJ)
00171 89* 3, TTEMP(II,JJ), PGPBL(1), PB(1)
00171 90* 4, PG(II,JJ), A, B, C
00171 91* 5, FM2, FPM2, P, T
00171 92* 6, CPGAS, CVGAS
00224 93* 70 FORMAT (1H0//,25X11HPBL-ROUTINE,5X,4I7,/,3(1PBE15,7/))
00225 94* 80 RETURN
00226 95* END

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END OF UNIVAC 1108 FORTRAN V COMPILATION, O *DIAGNOSTIC* MESSAGE(S)

PBL	CODE	SYMBOLIC RELOCATABLE	31 AUG 71	09:25:18	0	02147642	14	95	(DELETED)
PBL			31 AUG 71	09:25:18	1	02152324	36	1	(DELETED)
					0	02152370	14	37	

@ HnG 6 FOR, PERFOR,PERFOR

3.2.44 PERFOR

FOR, PERFOR,PERFOR
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:27:59

31 AUG 71

9:27:59.497

SUBROUTINE PERFOR ENTRY POINT 000401

STORAGE USED (BLOCK, NAME, LENGTH)

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0001 *CODE 000476
0000 *DATA 000372
0002 *BLANK 000000
0003 INDATA 011610
0004 HEAT 001074
    
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EXTERNAL REFERENCES (BLOCK, NAME)

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0005 CHOICE
0006 WRITE
0007 NWDUS
0010 NI025
0011 NI015
0012 NERR35
    
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STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000002	124G	0001	000017	15L	0001	000130	170G	0001	000033	20L	0001	000037	30L
0001	000223	40L	0001	000361	50L	0000	000043	9901F	0000	000052	9902F	0000	000134	9903F
0000	000317	9904F	0000	000042	9906F	0000	000175	9907F	0000	000241	9908F	0000 R	000015	AAA
0000 R	000023	AAB	0000 R	000024	AAC	0000 R	000025	AAD	0000 R	000021	AFI	0000 R	000026	AFO
0000 R	000016	AHI	0000 R	000017	AHO	0000 R	000020	AHOW	0000 I	000000	ANAM2	0000 I	000004	ANAM3
0004 R	000002	CPI	0004 R	000027	CPO	0004 R	000054	DIST	0000 R	000036	DPI	0000 R	000037	DPO
0000 R	000040	DTI	0000 R	000041	DTO	0004 R	000101	HE	0004 R	000720	HI	0004 R	000772	HO
0004 R	000745	H#	0000 I	000031	I	0000 I	000011	IS	0000 I	000007	JOUT	0000 I	000012	K
0004 R	000126	KI	0004 R	000153	KO	0004 R	000200	K#	0003 R	006304	LENGTH	0004 R	000225	MUI
0004 R	000252	HUO	0000 I	000013	NI	0000 I	000014	N2	0004 R	001071	PHI1	0004 R	001072	PHI2
0004 R	001073	PHI3	0004 R	000277	PI	0000 R	000010	PIE	0000 R	000033	PJI	0004 R	000324	PO
0000 R	000034	POI	0004 R	000351	PRI	0004 R	000376	PRO	0004 R	000423	Q	0004 R	001017	QUAL1
0004 R	001044	QUAL0	0004 R	000450	REI	0004 R	000475	REQ	0003 R	005754	RFLAG	0003 R	006316	RI
0003 R	006424	RO	0003 R	000000	S	0004 R	000522	SVI	0004 R	000547	SVO	0003 R	006323	THICK
0004 R	000574	TI	0000 R	000032	TII	0004 R	000621	TO	0000 R	000035	TOL	0004 R	000646	THI
0004 R	000673	TWO	0003 I	006311	TYPE	0004	000002	VAR	0000 R	000022	VOLIN	0000 R	000027	VOLOUT
0000 R	000030	VOLVAL	0004 R	000000	WD	0003 R	006342	XI	0003 R	006347	XO			

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00101 1* SUBROUTINE PERFOR (TIN,PIN,WDI,WDO,TOUT,POUT,LI,LO,LN
00101 2* P02,T02,P12,T12,QT)
00101 3*
00101 4* CC THIS ROUTINE IS USED TO COMPUTE HEAT EXCHANGER PERFORMANCE
00101 5* CC WHEN INLET CONDITIONS ARE KNOWN FOR BOTH COUNTERFLOW AND
00101 6* CC PARALLEL FLOW DESIGNS. THE CONCENTRIC TUBE CONFIGURATION IS
00101 7* CC ASSUMED, WITH THE OUTER FLUID FLOWING IN AN ANNULUS
    
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00103  8*      INTEGER ANAM3
00103  9*      C
00104  10*     INTEGER TYPE
00104  11*     C
00105  12*     REAL      LENGTH,KI,KC,KW,MUI,MUO
00105  13*     C
00106  14*     DIMENSION VAR(21,22),ANAM2(4),ANAM3(3)
00106  15*     C
00107  16*     DIMENSION LENGTH(S),RI(S),RO(S),THICK(S),TYPE(S),XI(S),XO(S)
00107  17*     C
00110  18*     COMMON /INDATA/S(5000)
00110  19*     C
00111  20*     COMMON /HEAT/HD(2),CPI(21),CPO(21),DIST(21),HE(21),KI(21),KO(21)
00111  21*     1,      K*(21),MUI(21),MUO(21),PI(21),PU(21),PRI(21),PRO(21)
00111  22*     2,      Q(21),REI(21),REO(21),SVI(21),SVO(21),TI(21),TO(21)
00111  23*     3,      TH(21),TWO(21),HI(21),HW(21),HO(21)
00111  24*     4,      QUALI(21),QUALO(21)
00111  25*     4,      PHI1,PHI2,PHI3
00111  26*     C
00112  27*     EQUIVALENCE
00112  28*     * (S(3279),RI(1))      ,(S(3349),RO(1))      ,(S(3269),LENGTH(1))
00112  29*     * ,(S(3274),TYPE(1))  ,(S(3284),THICK(1))  ,(S(3299),XI(1))
00112  30*     * ,(S(3304),XO(1))
00112  31*     * ,(S(3053),RFLAG)
00112  32*     C
00113  33*     EQUIVALENCE (VAR(1,1),CPI(1))
00113  34*     C
00114  35*     DATA JOUT /6/ , PIE / 3.1415927 /
00117  36*     DATA ANAM2/6HCOUNTE,6HR FLOW ,6HPARALL,6HEL FLO/
00121  37*     DATA ANAM3/2HH2,2HO2,6HH2+H2O/
00121  38*     C
00123  39*     DO 60 K = 1,21
00126  40*     PI(K) = PIN
00127  41*     PO(K) = POUT
00131  42*     IF (RFLAG),15,
00134  43*     WRITE(JOUT,9906)
00136  44*     9906 FORMAT(1H1)
00137  45*     15 IF (TYPE(LN).EQ.2) GO TO 20
00141  46*     N1=1
00142  47*     N2=2
00143  48*     GO TO 30
00144  49*     20 N1=3
00145  50*     N2=4
00146  51*     30 CONTINUE
00147  52*     AAA=PIE*2.0*LENGTH(LN)
00150  53*     AH1=AAA*RI(LN)
00151  54*     AH0=AAA*THICK(LN)+AH1
00152  55*     AH00=AAA*RO(LN)
00153  56*     AFI=PIE*RI(LN)**2
00154  57*     VOLIN=AFI*LENGTH(LN)
00155  58*     AAB=PIE* RO(LN)**2
00156  59*     AAC=PIE*(RI(LN)+THICK(LN))**2
00157  60*     AAD=PIE*(RO(LN)+THICK(LN))**2
00160  61*     AFO =AAB-AAC
00161  62*     VOLOUT=AFO*LENGTH(LN)
00162  63*     VOL*AL=LENGTH(LN)*(AAD-AAB+AAC-AFI)
00163  64*
00163  65*     IF (RFLAG),40,

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00166 660 WRITE(JOUT,9901) (ANAM2(I),I=N1,N2)
00174 670 9901 FORMAT(1H1/10X,2A6,23HHEAT EXCHANGER ANALYSIS//)
00175 680
00175 690 WRITE(JOUT,9902) LENGTH(LN),VOLIN ,RI(LN),VOLOUT ,RO(LN),
00175 700 1 VOLWAL ,THICK(LN)
00206 710 9902 FORMAT(10X,2SHHEAT EXCHANGER DIMENSIONS//10X, 7HVOLUMES,33X,
00206 720 1 8HLENGTH =F14.3,7H INCHES/10X,13HINNER FLUID =F10.3,5H CUI,12X,
00206 730 2 14HINNER RADIUS =,F8.3,7H INCHES/10X,13HOUTER FLUID =F10.3,
00206 740 3 5H CUI,12X,14HOUTER RADIUS =,F8.3,7H INCHES/10X, 9H%ALL (IN+,
00206 750 4 6HOUT) =,F8.3,5H CUI,12X,12HWALL THICK =F10.3,7H INCHES/)
00207 760
00207 770 WRITE(JOUT,9903) ANAM3(LI),WDI,TIN,PIN,
00207 780 1 ANAM3(LO),WDO,TOUT,POUT
00221 790 9903 FORMAT(1H0,9X, 8HENTRANCE,8X,5HFLUID,12X,8HFLOWRATE,7X,
00221 800 1 12HTEMP (DEG R),3X,15HPRESSURE (PSIA)/10X,10HCONDITIONS/10X,
00221 810 2 6HINSIDE,10X,A6,11X,F8.4,7X,F8.2,7X,F8.2/10X,7HOUTSIDE,9X,A6,
00221 820 3 11X,F8.4,7X,F8.2,7X,F8.2//)
00222 830
00222 840 WRITE(JOUT,9907) AHI,AFI,AHO,AFO,AHOW
00231 850 9907 FORMAT(1H0,9X,19HHEAT TRANSFER AREAS,26X,16HFLUID FLOW AREAS/
00231 860 1 10X,10HINNER TUBE,F15.2,5H SQIN,10X,10HINNER FLOW,F15.2,5H SQIN/
00231 870 2 10X,10HOUTER TUBE,F15.2,5H SQIN,10X,10HOUTER FLOW,F15.2,5H SQIN/
00231 880 3 10X,10HOUTER WALL,F15.2,5H SQIN/)
00231 890 CC
00231 900 CC COMPUTE PERFORMANCE
00231 910 CC COUNTER FLOW
00232 920 40 T11 = TIN
00233 930 T12=TIN
00234 940 P11=PIN
00235 950 P12=PIN
00236 960 P02=POUT
00237 970 T02=TOUT
00237 980 CC PARALLEL FLOW
00240 990 P01=POUT
00241 1000 T01=TOUT
00241 1010 CC COMPUTE HEAT TRANSFER
00242 1020 CALL CHOICE (LN,LI,T11,T12,T01,T02 ,P11,P12,P01,P02 ,WDI,WDO,
00242 1030 1 QT,LO,XI(LN),XO(LN))
00243 1040 DPI=P11-P12
00244 1050 DPO=P01-P02
00245 1060 DTI=T11-T12
00246 1070 DTO=T01-T02
00247 1080
00247 1090 IF (RFLAG),50,
00252 1100 WRITE(JOUT,9908) ANAM3(LI),ANAM3(LO),T11,P11,T01,P01,
00252 1110 1 T12,P12,T02,P02,
00252 1120 2 DTI,DPI,DTO,DPO
00272 1130 9908 FORMAT(/ 33X,45HSUMMARY OF CALCULATION RESULTS AT EACH END OF,
00272 1140 1 19H THE HEAT EXCHANGER//27X,14HINSIDE FLUID (,A6,1H),19X,
00272 1150 2 15HOUTSIDE FLUID ( ,A6,1H)//20X,2(4X,12HTEMP (DEG R), 8X,
00272 1160 3 12HPRESS (PSIA),4X)//10X,7HEND ONE,F17.2,3F20.2//10X,
00272 1170 4 7HEND TWO,F17.2,3F20.2//10X,10HDIFFERENCE,F14.2,3F20.2/)
00273 1180
00273 1190 WRITE(JOUT,9904) QT
00276 1200 9904 FORMAT(10X,27HTOTAL HEAT TRANSFER RATE = ,F10.2,10H (BTU/SEC),
00276 1210 1 23H FROM OUTSIDE TO INSIDE//)
00276 1220 CC
00277 1230 CALL WRITE

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00300 124* 50 RETURN
00301 125* END

END OF UNIVAC 1108 FORTRAN COMPILATION.
PERFOR SYMBOLIC
PERFOR CODE RELOCATABLE

0 *DIAGNOSTIC* MESSAGE(S)

23 JUN 71	21:26:12	0	01712222	14	125	(DELETED)
23 JUN 71	21:26:12	1	01715550	36	1	(DELETED)
		0	01715614	14	54	

HDG B FOR,* P1PL,P1PL

FOR, PIPL,PIPL
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:01

SUBROUTINE PIPL ENTRY POINT 001177

PIPLL ENTRY POINT 001204

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	001211
0000	*DATA	000170
0002	*BLANK	000000
0003	INDATA	011610
0004	COM	006525
0005	CONS	000003

EXTERNAL REFERENCES (BLOCK, NAME)

0006	OPTCP
0007	OPTCV
0010	OPTTC
0011	OPTV
0012	HPTCP
0013	HPTCV
0014	HPTTC
0015	HPTV
0016	OPTD
0017	HPTD
0020	FCOMP1
0021	NERR2s
0022	COS
0023	SQRT
0024	NEXP6s
0025	EXP
0026	NWDUS
0027	NIO1s
0030	NIO2s
0031	NERR3s

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000024	1L	0001	000011	10L	0001	000253	11L	0001	000245	12L	0001	000242	145G
0001	000276	15L	0001	000074	2L	0001	000332	20L	0001	000461	202G	0001	000344	30L
0001	000400	35L	0001	000143	5L	0001	000673	50L	0001	000736	60L	0001	000767	70L
0000	000062	80F	0001	001122	85L	0000	R 000057	A	0003	R 000355	ALPHA	0004	R 000000	AREA
0004	R 000074	AREAI	0004	R 000170	AREAK	0004	R 000132	AREAO	0000	R 000060	B	0004	R 005060	CF
0004	R 006423	CGGTC	0004	R 006436	CGTANK	0004	R 006431	CLTANK	0004	R 005014	CONCT	0003	R 005714	CP
0004	R 006443	CPJU	0004	R 005006	CSTAR	0000	R 000000	CV	0004	R 006355	CVEL	0000	R 000061	D
0003	R 006436	OE	0004	R 000036	DELXL	0004	R 000226	DIALI	0003	R 000510	DIALO	0004	R 006277	DMVENT
0003	R 000003	EMIS	0004	R 006360	ETAT	0005	R 000002	FB	0004	R 006370	FBPC	0004	R 006376	FBTC
0004	R 006362	FBWC	0004	R 005111	FRL	0005	R 000001	GC	0003	R 005752	GEE	0000	R 000054	GF3
0004	R 003132	HI	0003	R 000002	HNPR	0003	R 000001	HNRE	0004	R 003036	HO	0003	R 000000	HOEX

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0012 R 000000 HPTCP	0013 R 000000 HPTCV	0017 R 000000 HPTD	0014 R 000000 HPTTC	0015 R 000000 HPTV
0003 R 001050 HR	0000 R 003322 HRAD	0003 I 001012 HRS	0004 I 005000 ICMON	0003 I 000551 IPROP
0004 I 005052 ISPT	0000 R 000050 JJ	0004 I 003606 JUN	0003 R 003000 KA	0003 R 006014 KLT
0003 R 006222 KHER	0000 I 000046 LL	0003 R 004561 MACH	0004 I 005066 MEX	0004 I 004756 MR
0004 I 005102 MAC	0000 I 000052 N	0004 R 002552 NGR	0000 I 000047 NN	0000 I 000045 NNODEL
0003 I 000100 NODEL	0003 I 000553 NPLINE	0004 R 002646 NPR	0004 R 002742 NRE	0006 R 000000 OPTCP
0007 R 000000 OPTCV	0016 R 000000 OPTD	0010 R 000000 OPTTC	0011 R 000000 OPTV	0004 R 000264 PB
0004 R 004764 PC	0004 R 004772 PCN	0004 R 005074 PE	0004 R 000272 PG	0004 R 003620 PGT
0005 R 000000 PI	0004 R 005036 PMR	0004 R 004241 POWC	0004 R 006350 POWP	0004 R 006343 POWT
0004 R 006300 PPI	0004 R 006305 PPO	0004 R 006331 PTI	0004 R 006336 PTO	0004 R 006357 R
0000 R 000053 RAD	0003 R 005754 RFLAG	0003 R 005711 RGAS	0000 R 000051 RHO	0004 R 001422 RHOG
0003 R 000546 RHOL	0004 R 006312 RPMT	0003 R 000000 S	0004 R 005044 TC	0003 R 005753 TENV
0004 R 006416 THOC	0004 R 006411 TPCG	0004 R 006404 TPCL	0003 R 001132 TTEMP	0004 R 006317 TTI
0004 R 006324 TTO	0003 R 002262 TTEMP	0004 R 003226 TWALL	0004 R 006356 U	0004 R 003416 UAO
0004 R 003512 VEL	0003 R 000253 VISC	0003 R 006437 VISE	0003 R 003423 WDOTG	0004 R 006265 WJ
0004 R 004750 WNOZ	0004 R 006253 WO	0004 R 006361 WT	0004 R 006246 WTGC	0003 R 000041 WTHCON
0000 R 000036 X	0003 R 006413 XLENGL	0000 R 000055 XX	0000 R 000056 YY	

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00101 1* SUBROUTINE PIPL (I)
00101 2* C PIPE WITH CONTANT TEMPERATURE EVIRONMENT HEAT TRANSFER INTO LINE
00101 3* C
00103 4* REAL KA,MACH,NGR,NPR,NRE,KHER
00103 5* * KLT
00103 6* C
00103 7* C
00104 8* INTEGER HRS
00104 9* C
00105 10* DIMENSION EMIS(30),WTHCON(30),NODEL(20),VISC(30),NPLINE(30)
00105 11* *, TTEMP(30,20),TTEMP(30,20),KA(2),WDOTG(30,20)
00105 12* *, MACH(30,20),RGAS(2),CP(30),DIALO(30)
00105 13* *, HRS(30),HR(30),KLT(30),KHER(30),CV(30),XLENGL(30)
00105 14* *, ALPHA(30),RHOL(3)
00105 15* C
00106 16* DIMENSION X(7)
00106 17* C
00107 18* COMMON /INDATA/S(5000)
00107 19* C
00110 20* COMMON /COM/AREA(30),DELXL(30),AREAI(30),AREAO(30),AREAK(30)
00110 21* *, DIALI(30),PB(6),PG(30,20),RHOG(30,20),NGR(30,2)
00110 22* *, NPR(30,2),NRE(30,2),HO(30,2),HI(30,2),TWALL(30,2)
00110 23* *, HRAD(30,2),UAO(30,2),VEL(30,2),JUN(10),PGT(30,20)
00110 24* *, WNOZ(6),MR(6),PC(6),PCN(6,2),CSTAR(6),CONCT(3,6)
00110 25* *, PMR(6),TC(6),ISPT(6),CF(6),MEX(6),PE(6),MAC(6),ICMON
00110 26* *, FRL(30,20),POWC(5),WTGC(5),WO(10),WI(10),UMVENT,PPI(5)
00110 27* *, PPO(5),RPMT(5),TTI(5),TTO(5),PTI(5),PTO(5),POWT(5)
00110 28* *, POWP(5),CVEL,U,R,ETAT,WT,FBWC(6),FBPC(6)
00110 29* *, FBTC(6),TPCL(5),TPCG(5),THOC(5),CGGTC(6),CLTANK(5)
00110 30* *, CGTANK(5),CPJU(5,10)
00110 31* C
00111 32* COMMON /CONS/PI,GC,FB
00111 33* C
00112 34* EQUIVALENCE
00112 35* *(S(2),HNRE),(S(3),HNPR),(S(4),EMIS(1))
00112 36* *(S(34),WTHCON(1)),(S(65),NODEL(1)),(S(172),VISC(1))
00112 37* *(S(329),DIALO(1)),(S(362),IPROP),(S(364),NPLINE(1))

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00112 38* *,(S(603),TTEMP(1,1)),(S(1804),KA(1)),(S(1203),TTTEMP(1,1))
00112 39* *,(S(1812),WDOTG(1,1)),(S(2418),MACH(1,1)),(S(3018),RGAS(1))
00112 40* *,(S(3021),CP(1)),(S(3051),GEE),(S(3052),TENY)
00112 41* *,(S(3219),KTHEP(1)),(S(1),HOEX)
00112 42* *,(S(523),HRS(1)),(S(553),HR(1)),(S(3085),KLT(1))
00112 43* *,(S(268),XLENG), (S(238),ALPHA), (S(359),RHOL)
00112 44* *,(S(3053),RFLAG), (S(3359),DE), (S(3360),VISE)
00112 45* C
00112 46* C
00113 47* NNODEL = NODEL(II) - 1
00114 48* LL = 0
00115 49* GO TO 10
00116 50* ENTRY PIPL(II)
00120 51* LL = 1
00121 52* NNODEL = 1
00122 53* 10 CONTINUE
00123 54* IPROP = NPLINE(II)
00124 55* GO TO (1,2), IPROP
00125 56* 1 CONTINUE
00125 57* C OXYGEN PROPERTIES
00126 58* CP(II) = OPTCP(PG(II,1),TTEMP(II,1))
00127 59* CV(II) = OPTCV(PG(II,1),TTEMP(II,1))
00130 60* KTHEP(II) = OPTTC ( PG(II,1),TTEMP(II,1) )
00131 61* VISC(II) = OPTV (PG(II,1),TTEMP(II,1) ) * 32.2 * 3600.
00132 62* 2 GO TO 5
00133 63* C 2 CONTINUE
00133 64* C HYDROGEN PROPERTIES
00134 65* CP(II) = HPTCP(PG(II,1),TTEMP(II,1))
00135 66* CV(II) = HPTCV(PG(II,1),TTEMP(II,1))
00136 67* KTHEP(II) = HPTTC ( PG(II,1),TTEMP(II,1) )
00137 68* VISC(II) = HPTV (PG(II,1),TTEMP(II,1) ) * 32.2 * 3600.
00140 69* 5 CONTINUE
00141 70* RGAS(IPROP) = (CP(II)-CV(II)) * 778.156
00142 71* KA(IPROP) = CP(II) / CV(II)
00142 72* C
00142 73* C LOOP OVER ALL NODES IN LINE
00143 74* NN = 1
00144 75* DO 90 JJ=1,NNODEL
00144 76* C
00144 77* C COMPUTE FLUID DENSITY
00147 78* GO TO (11,12), IPROP
00150 79* 11 RHO = OPTD ( PG(II,JJ), TTEMP(II,JJ) )
00151 80* GO TO 15
00152 81* 12 RHO = HPTD ( PG(II,JJ), TTEMP(II,JJ) )
00153 82* 15 CONTINUE
00153 83* C
00154 84* IF (LL) ,,20
00154 85* C VELOCITY IN LINE = FT/SEC
00157 86* VEL(II,NN) = 576 * WDOTG(II,JJ) / (PI * RHO * DIALI(II) ** 2 )
00157 87* C MACH NUMBER IN LINE
00160 88* MACH(II,JJ) = VEL(II,NN) / SQRT (KA(IPROP) * RGAS(IPROP) * GC *
00160 89* 1 TTEMP(II,JJ) )
00160 90* C DENSITY OF GAS
00161 91* RHOG(II,JJ) = RHO
00162 92* GO TO 30
00163 93* 20 CONTINUE
00163 94* CC PIPL = LIQUID PIPE LINE SUBROUTINE
00163 95* CC PIPL

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00164 96* RHOL(IPROP) * RHO
00165 97* VEL(II,1) * WDOTG(II,1) / (RHOL(IPROP) * PI * DIALI(II) ** 2)
00166 98* 30 CONTINUE
00167 99* TTTEMP(II, JJ) = TTEMP(II, JJ) + VEL(II, NN) ** 2 / (2.0 * GC * FB * CP(II))
00170 100* IF (GEE, LE, 0.) GO TO 35
00170 101* C GRASHOF NUMBER
00172 102* NGR(II, NN) = (GEE * (TENV - TTTEMP(II, JJ)) * DE ** 2 * DIALO(II) ** 3) /
00172 103* (TENV * VISE ** 2 * 1728.)
00173 104* 35 CONTINUE
00173 105* C PRANDTL NUMBER
00174 106* NPR(II, NN) = (CP(II) * VISC(II)) / KHER(II) * 3600.0
00174 107* C REYNOLDS NUMBER
00175 108* NRE(II, NN) = WDOTG(II, JJ) / (PI * DIALI(II) * VISC(II) * 3.0) * 144.
00175 109* C KOO FRICTION FACTOR FOR SMOOTH PIPES - PG.383 CHE. HANDBOOK EQ. 24
00176 110* FRL(II, NN) = 1.4E-3 + 1.25E-1 * (NRE(II, NN)) ** (-0.32)
00176 111* C FILM COEFFICIENT INNER WALL
00177 112* HO(II, NN) = KHER(II) * 0.53 / DIALO(II) * (NGR(II, NN) * NPR(II, NN))
00177 113* * HOEX * 12.0
00177 114* C FILM COEFFICIENT INNER WALL
00200 115* HI(II, NN) = KHER(II) * 0.023 / DIALI(II) * (NRE(II, NN) * HNRE *
00200 116* NPR(II, NN) * HNPR) * 12.0
00200 117* C ESTIMATE INNER WALL TEMPERATURE
00201 118* DO 40 N=1,2
00201 119* C ESTIMATE WALL TEMP
00204 120* TWALL(II, NN) = ((HO(II, NN) * RAD) * TENV + HI(II, NN) * TTTEMP(II, JJ)) /
00204 121* ((HO(II, NN) * RAD + HI(II, NN))
00204 122* C RADIATION EQUIVALENT HEAT TRANSFER COEFFICIENT
00205 123* RAD = 0.1714E-8 * EMIS(II) * (TENV + TWALL(II, NN)) *
00205 124* (TENV ** 2 + TWALL(II, NN) ** 2)
00206 125* 40 CONTINUE
00210 126* HRAD(II, NN) = RAD
00210 127* C OVERALL HEAT TRANSFER COEFFICIENT
00211 128* UAO(II, NN) = 1. / (1. / ((HO(II, NN) + HRAD(II, NN)) * AREA0(II)) + (1. / (HI(II,
00211 129* NN) * AREA1(II))) * (AREAK(II) / WTHCON(II)))
00211 130* CC . PIPL
00212 131* IF (LL.EQ, 1) GO TO 50
00212 132* C TOTAL LINE STAGNATION TEMPERATURE AT EACH NODE IN LINE
00214 133* TTTEMP(II, JJ+1) = TENV - (TENV - TTTEMP(II, JJ)) / (EXP(UAO(II, NN) * 0.16 /
00214 134* (PI * RHOG(II, JJ) * DIALI(II) ** 2 * VEL(II, JJ) * CP(II))))
00214 135* C FRICTION FACTOR LINE
00214 136* C STATIC PRESSURE IN LINE
00214 137* C
00215 138* X(1) = MACH(II, JJ)
00216 139* X(2) = TTTEMP(II, JJ)
00217 140* X(3) = TTTEMP(II, JJ+1)
00220 141* X(4) = FRL(II, NN)
00221 142* X(5) = DELXL(II)
00222 143* X(6) = DIALI(II)
00223 144* X(7) = KA(IPROP)
00223 145* C
00224 146* CALL FCOMP1 (X, MACH(II, JJ+1), GF3)
00224 147* C
00224 148* C MACH NUMBER DIFFERENTIAL EQ
00225 149* PG(II, JJ+1) = (PG(II, JJ) * MACH(II, JJ)) / MACH(II, JJ+1) * SQRT((1 + (KA(
00225 150* IPROP) - 1) * 5 * MACH(II, JJ) ** 2) / (1 + (KA(IPROP) - 1) * 5 * MACH(II, JJ+1) ** 2
00225 151* ) * TTTEMP(II, JJ+1) / TTTEMP(II, JJ))
00225 152* C STATIC TEMPERATURE
00226 153* TTTEMP(II, JJ+1) = TTTEMP(II, JJ) * TTTEMP(II, JJ+1) / TTTEMP(II, JJ) *

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00226 154*      *      (1.0 + 0.5*(KA(IPROP)-1.0)*MACH(II,JJ)**2)/
00226 155*      *      (1.0 + 0.5*(KA(IPROP)-1.0)*MACH(II,JJ+1)**2)
00226 156*      C FLOWRATE
00227 157*      WDOTG(II,JJ+1) = WDOTG(II,JJ)
00227 158*      C TOTAL PRESSURE
00230 159*      XX = (1.0 + (KA(IPROP)-1.0)*0.5*MACH(II,JJ)**2) *
00230 160*      *      (KA(IPROP)/(KA(IPROP)-1.0))
00231 161*      YY = (1.0 + (KA(IPROP)-1.0)*0.5*MACH(II,JJ+1)**2) *
00231 162*      *      (KA(IPROP)/(KA(IPROP)-1.0))
00232 163*      PGT(II,JJ) = PG(II,JJ)*XX
00233 164*      PGT(II,JJ+1) = PG(II,JJ+1)*YY
00234 165*      GO TO 70
00234 166*      CC PIPL
00235 167*      50 CONTINUE
00236 168*      CV(II) = CP(II)/KA(IPROP)
00237 169*      A = (PI*DIALI(II)**2)/4.1**2
00240 170*      B = WDOTG(II,1)**2/(RHOL(IPROP)**2)*D*GC*A**2*FB*CV(II)
00241 171*      D = FRL(II,1) * XLENG(II) / DIALI(II)
00242 172*      IF (HRS(II).EQ.1) GO TO 40
00244 173*      HR(II) = (D + KLT(II))/(2.*GC*A)
00245 174*      WDOTG(II,2) = WDOTG(II,1)
00246 175*      60 CONTINUE
00247 176*      PG(II,2) = PG(II,1)+RHOL(IPROP)*GEE*XLENG(II)*COS(ALPHA(II))/GC *
00247 177*      *      144.0 * HR(II)*WDOTG(II,1)**2/RHOL(IPROP)
00250 178*      TTEMP(II,2) = TTEMP(II,1) + UAO(II,1)*(TENV + TTEMP(II,1))/(WDOTG
00250 179*      *      (II,1)*CV(II)) + D*B
00251 180*      LL = 0
00252 181*      70 CONTINUE
00252 182*      C
00253 183*      IF (RFLAG),85)
00256 184*      WRITE(6,80)II,JJ,NNODEL,IPROP
00256 185*      *      VEL(II,NN),MACH(II,JJ),KA(IPROP),GC
00256 186*      *      RGAS(IPROP),TTEMP(II,JJ),TTTEMP(II,JJ),PG(II,JJ)
00256 187*      *      RHOG(II,JJ),NGR(II,NN),GEE,TENV,DIALO(II)
00256 188*      *      VISC(II),NPR(II,NN),CP(II),NRE(II,NN)
00256 189*      *      DIALI(II),HO(II,NN),KTHER(II),H(II,NN)
00256 190*      *      TWALL(II,NN),HRAD(II,NN),UAO(II,NN),AREAD(II)
00256 191*      *      AREAI(II),AREAK(II),WTHCON(II),RAD
00256 192*      *      PI,FRL(II,NN),MACH(II,JJ+1),PG(II,JJ+1)
00256 193*      *      TTEMP(II,JJ+1),WDOTG(II,JJ+1)
00327 194*      80 FORMAT(10//24X)2HP(PL~ROUTINE, 5X)17, // 5(1P8E15.7//)
00330 195*      85 NN = 2
00331 196*      90 CONTINUE
00333 197*      RETURN
00334 198*      END

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1.75

END OF UNIVAC 110B FORTRAN V COMPILATION. 0 *DIAGNOSTIC* MESSAGE(S)

PIPL	SYMBOLIC	31 AUG 71	09:25:21	0	02153376	14	198	(DELETED)
PIPL	CODE	RELOCATABLE	31 AUG 71	09:25:21	1	02160722	48	1 (DELETED)
					0	02161002	14	73

@ HDG @ FOR, PREG,PREG

S FOR, PREG,PREG
UNIVAC 1108 FORTRAN V LEVEL 2 2018 FS018H
THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:05

31 AUG 71

9:28: 5.434

SUBROUTINE PREG ENTRY POINT 000153

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	000166
0000	*DATA	000044
0002	*BLANK	000000
0003	CONS	000003
0004	INDATA	011610
0005	COM	006525

EXTERNAL REFERENCES (BLOCK, NAME)

0006	SQRT
0007	NWDUS
0010	NIO15
0011	NIO25
0012	NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000005	IOF	0001	000135	ZOL	0005	R	000000	AREA	0005	R	000074	AREA1	0005	R	000170	AREAK		
0005	R	000132	AREAO	0005	R	005060	CF	0005	R	006423	CGGTC	0005	R	006436	CGTANK	0005	R	006431	CLTANK
0005	R	005014	CONCT	0005	R	006443	CPJU	0005	R	005006	CSTAR	0005	R	006355	CVEL	0005	R	000036	DELXL
0005	R	000226	DIALI	0005	R	006277	DMVENT	0005	R	006360	ETAT	0003	R	000002	FB	0005	R	006370	F0PC
0005	R	006376	FBTC	0005	R	006362	FBWC	0005	R	005111	FRL	0003	R	000001	GC	0005	R	003132	HI
0005	R	003036	HO	0005	R	003322	HRAD	0005	I	005110	ICMON	0000	I	000000	II	0000	I	000001	IPROP
0005	I	005052	ISPT	0000	I	000002	JJ	0005	I	003606	JUN	0004	R	003413	KA	0004	I	004561	MACH
0005	I	005066	MEX	0005	I	004756	MR	0005	I	005102	MWC	0005	I	002552	NGR	0004	I	000100	NODEL
0004	I	000553	NPLINE	0005	I	002646	NPR	0005	I	002742	NRE	0005	R	000264	P0	0005	R	004764	PC
0005	R	004772	PCN	0005	R	005074	PE	0005	R	000272	PG	0005	R	003620	PGT	0003	R	000000	PI
0005	R	005036	PMR	0005	R	006241	POWC	0005	R	006350	POWP	0005	R	006343	PQWT	0005	R	006300	PP1
0005	R	006305	PPO	0004	R	006721	PRE	0004	I	006707	PRIN	0004	I	006601	PROU	0005	R	006331	PT1
0005	R	006336	PTO	0005	R	006357	R	0004	R	005754	RFLAG	0004	R	005711	RGAS	0005	R	001422	RHOG
0005	R	006312	RPMT	0004	R	000000	S	0000	R	000004	T	0005	R	005044	TC	0005	R	006416	THOC
0005	R	006411	TPCG	0005	R	006404	TPCL	0004	R	001132	TTEMP	0005	R	006317	TT1	0005	R	006324	TYQ
0005	R	003224	TWALL	0005	R	006356	U	0005	R	003416	UAO	0005	R	003512	VEL	0000	R	000003	W
0004	R	003423	WDOTG	0005	R	006265	WI	0005	R	004750	WNOZ	0005	R	006253	W0	0005	R	006361	WT
0005	R	006246	WTGC																

00100	1*	C	
00101	2*	C	SUBROUTINE PREG(I)
00101	3*	C	
00101	4*	C	
00103	5*	C	INTEGER PRIN,PROU
00103	6*	C	

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00104 7* REAL KA, MACH
00104 8* C
00105 9* DIMENSION KA(2), RGAS(2), NPLINE(30), MACH(30,20), PRIN(10), PROU(10)
00105 10* , WDOTG(30,20), TTEMP(30,20), PRE(10), NODEL(20)
00105 11* C
00106 12* COMMON /CONS/PI, GC, FB
00107 13* COMMON /INDATA/S(5000)
00107 14* C
00110 15* COMMON /COM/AREA(30), DELXL(30), AREAI(30), AREA0(30), AREAK(30)
00110 16* , DIALI(30), PB(6), PG(30,20), RHOG(30,20), NGK(30,2)
00110 17* , NPR(30,2), NRE(30,2), HO(30,2), HI(30,2), TWALL(30,2)
00110 18* , HRAD(30,2), UAO(30,2), VEL(30,2), JUN(10), PGT(30,20)
00110 19* , WNOZ(6), MR(6), PC(6), PCN(6,2), CSTAR(6), CONCT(3,6)
00110 20* , PMR(6), TC(6), ISPT(6), CF(6), MEX(6), PE(6), MDC(6), ICMON
00110 21* , FRL(30,20), POWC(5), WTGC(5), WO(10), WI(10), DNVENT, PPI(5)
00110 22* , PPO(5), RPMT(5), TTI(5), TTO(5), PTI(5), PTO(5), POWT(5)
00110 23* , POWP(5), CVEL, U, R, ETAT, WT, FBWC(6), FBPC(6)
00110 24* , FBTC(6), TPCL(5), TPCG(5), THOC(5), CGGTC(6), CLTANK(5)
00110 25* , CGTANK(5), CPJU(5,10)
00110 26* C
00111 27* EQUIVALENCE
00111 28* , (S(1804), KA(1)) , (S(3018), RGAS(1)) , (S(364), NPLINE(1))
00111 29* , (S(2418), MACH(1,1)) , (S(3528), PRIN(1)) , (S(3458), PROU(1))
00111 30* , (S(1812), WDOTG(1,1)) , (S(603), TTEMP(1,1)) , (S(3538), PRE(1))
00111 31* , (S(65), NODEL(1))
00111 32* , (S(3053), RFLAG)
00111 33* C
00111 34* C PRESSURE REGULATOR
00111 35* C
00111 36* C PRIN = LINE CONNECTED TO PRESS REGULATOR INLET
00111 37* C PRIN = LINE CONNECTED TO PRESS REGULATOR INLET
00111 38* C PROU = LINE CONNECTED TO PRESS REGULATOR OUTLET
00112 39* , II = PRIN(1)
00113 40* , IPROP = NPLINE(II)
00114 41* , JJ = NODEL(II)
00115 42* , W = WDOTG(II, JJ)
00116 43* , T = TTEMP(II, JJ)
00117 44* , II = PROU(1)
00120 45* , IPROP = NPLINE(II)
00121 46* , JJ = 1
00121 47* C DENSITY OF GAS
00122 48* , RHOG(II, JJ) = PRE(1) / (RGAS(IPROP) * T) * 144.
00122 49* C MACH NUMBER
00123 50* , MACH(II, JJ) = 4. * W / (RHOG(II, JJ) * PI * DIALI(II)) * 2 * SQRT
00123 51* , ( KA(IPROP) * GC * RGAS(IPROP) * T ) * 144.
00124 52* , PG(II, JJ) = PRE(1)
00125 53* , TTEMP(II, JJ) = T
00126 54* , WDOTG(II, JJ) = W
00127 55* , IF (RFLAG), 20,
00132 56* , WRITE(6,10) I, II, JJ, PRIN(I)
00132 57* , WDOTG(II, JJ), TTEMP(II, JJ), PRE(1), RGAS(IPROP)
00132 58* , W, T, RHOG(II, JJ), PI
00132 59* , DIALI(II), KA(IPROP), GC
00153 60* 10 FORMAT(//24X12HPREG-ROUTINE,5X417, //2(1P8E15.7//))
00154 61* 20 RETURN
00155 62* END

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	FOR, *	PREG, PREG
PREG	SYMBOLIC	
PREG	RELOCATABLE	
@ HDG	@	FOR, * PROPTY, PROPTY

31 AUG 71	09:25:23	02163000	14	62	(DELETED)
31 AUG 71	09:25:23	02164544	36	1	(DELETED)
		02164610	14	15	

@ FOR,* PROPTY,PROPTY
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:07

SUBROUTINE PROPTY ENTRY POINT 000136

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000216
 0000 *DATA 000015
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 HPTD
 0004 HPTV
 0005 HPTTC
 0006 PTHEAT
 0007 OPTD
 0010 OPTV
 0011 OPTTC
 0012 OPTCP
 0013 H2OH2
 0014 NERR2s
 0015 NERR3s

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001 000011 10L 0001 000054 20L 0001 000116 30L 0003 R 000000 HPTD 0005 R 000000 HPTTC
 0004 R 000000 HPTV 0012 R 000000 OPTCP 0007 R 000000 OPTD 0011 R 000000 OPTTC 0010 R 000000 OPTV
 0006 R 000000 PTHEAT

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00101 1* SUBROUTINE PROPTY (N,P,T,SV,MU,K,CP,PR)
 00103 2* REAL MU,K
 00103 3* CC THIS SUBROUTINE DOES PROPERTY LOOKUPS FOR
 00103 4* CC VARIOUS MATERIALS
 00104 5* GO TO (10,20,30),N
 00105 6* 10 CONTINUE
 00105 7* CC LOCKUP HYDROGEN DATA, N=1
 00105 8* C FUNCTION UNITS = HPTD = LBM / FT3
 00105 9* C = HPTV = LBF-HR / FT2
 00105 10* C = HPTTC = B / FT-HR-R
 00105 11* C = HPTCP = B / LBM-R
 00105 12* C SAME FOR OXYGEN
 00105 13* C
 00106 14* SV = 1. / HPTD(P,T) * 1728.
 00107 15* MU = HPTV(P,T) * 32.2 * 3600. / 12.
 00110 16* K = HPTTC(P,T) / 12. / 3600.
 00111 17* CP = PTHEAT(P,T,1)
 00112 18* PR = CP * MU / K


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00113 19* RETURN
00114 20* 20 CONTINUE
00114 21* CC LOOKUP OXYGEN DATA, N=2
00115 22* SV = 1./ OPTD(P,T) * 1728.
00116 23* MU = OPTV(P,T) * 32.2 * 3600. / 12.
00117 24* K = OPTIC(P,T) / 12. / 3600.
00120 25* CP = OPTCP(P,T)
00121 26* PR = CP * MU / K
00122 27* RETURN
00123 28* 30 . CONTINUE
00123 29* CC LOOKUP H2O-H2 FOR MR=1.0, N=3
00124 30* CALL H2OH2 (P,T,SV,MU,K,CP,PR)
00125 31* RETURN
00126 32* END
    
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END OF UNIVAC 1108 FORTRAN V COMPILATION. 0 *DIAGNOSTIC* MESSAGE(S)
PROPTY SYMBOLIC 30 APR 71 11:20:04 0 01520130 14 32 (DELETED)
PROPTY CODE RELOCATABLE 30 APR 71 11:20:04 1 01521030 24 1 (DELETED)
0 01521060 14 15
@ HDG @ FOR,* PTHEAT,PTHEAT
    
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6 FOR, * PTHEAT,PTHEAT
UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:08

31 AUG 71

9:28: 8.278

FUNCTION PTHEAT ENTRY POINT 000617

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000626
0000 *DATA 000334
0002 *BLANK 000000
0003 SPHEAT 002432

EXTERNAL REFERENCES (BLOCK, NAME)

0004 NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000137	100L	0001	000170	110L	0001	000173	120L	0001	000203	130L	0001	000227	140L					
0001	000232	150L	0001	000246	170L	0001	000277	180L	0001	000311	190L	0001	000351	20L					
0001	000353	200L	0001	000524	210L	0001	000540	220L	0001	000550	230L	0001	000234	232G					
0001	000602	240L	0001	000054	30L	0001	000064	40L	0001	000067	50L	0001	000104	60L					
0001	000107	70L	0001	000117	80L	0001	000122	90L	0000	R	000067	8P	0000	R	000133	BT			
0003	R	000000	CP	0000	R	000261	CTCP	0003	R	001215	CV	0000	R	000111	0P	0000	R	000155	DT
0000	R	000250	F	0000	R	000257	FF	0000	R	000251	FI	0000	R	000253	FP	0000	R	000255	FT
0000	I	000247	I	0000	I	000254	IF	0000	I	000256	IT	0000	I	000241	IS	0000	I	000260	J
0000	I	000023	JP	0000	I	000244	KTR	0000	I	000000	LOC	0000	I	000045	HX	0000	I	000245	N
0000	R	000242	P	0000	R	000177	PS	0000	R	000022	PTHEAT	0000	R	000243	T	0000	R	000227	TL
0000	R	000246	TH	0000	R	000252	TQ	0000	R	000213	TS								

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00100	1*	CD	PROGRAMMER AND DATE	PTHE0010
00100	2*	CD		PTHE0020
00100	3*	CD		PTHE0030
00100	4*	CD	NATIONAL BUREAU OF STANDARDS	PTHE0040
00100	5*	CD	1967	PTHE0050
00100	6*	CD		PTHE0060
00100	7*	CD	DOCUMENTATION AND DATE	PTHE0070
00100	8*	CD	J. I. PREWITT	PTHE0080
00100	9*	CD	DECEMBER 1970	PTHE0090
00100	10*	CD		PTHE0100
00100	11*	CD	PURPOSE	PTHE0110
00100	12*	CD	COMPUTES THE SPECIFIC HEAT OF HYDROGEN FOR EITHER	PTHE0120
00100	13*	CD	CONSTANT PRESSURE OR CONSTANT VOLUME.	PTHE0130
00100	14*	CD		PTHE0140
00100	15*	CD	USAGE	PTHE0150
00100	16*	CD	SH = PTHEAT (PRES,TEMP,KTRANS)	PTHE0160
00100	17*	CD		PTHE0170
00100	18*	CD	DESCRIPTION OF PARAMETERS	PTHE0180
00100	19*	CD		PTHE0190

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00100 20* CD INPUT
00100 21* CD CALL SEQUENCE
00100 22* CD PRES - PRESSURE - PSIA
00100 23* CD TEMP - TEMPERATURE - O R
00100 24* CD KTRANS - KEY
00100 25* CD = 1 - CONSTANT PRESSURE
00100 26* CD = 2 - CONSTANT VOLUME
00100 27* CD = 3 - CP/CV
00100 28* CD COMMON
00100 29* CD UNKNOWN
00100 30* CD
00100 31* CD OUTPUT
00100 32* CD CALLING SEQUENCE
00100 33* CD PTHEAT - SPECIFIC HEAT OF HYDROGEN
00100 34* CD
00100 35* CD REMARKS AND RESTRICTIONS
00100 36* CD THE BLOCK DATA ROUTINE BLK2 MUST BE USED WITH THIS
00100 37* CD PROGRAM.
00100 38* CD THIS ROUTINE WAS OBTAINED FROM NASA/MSC.
00100 39* CD
00100 40* CD SUBPROGRAMS REQUIRED
00100 41* CD NONE
00100 42* CD
00100 43* CD METHOD
00100 44* CD VARIOUS CHECKS ARE MADE ON PRESSURE AND TEMPERATURE TO
00100 45* CD OBTAIN POINTERS FOR THE INTERPOLATION OF SPECIFIC HEAT.
00100 46* CD THIS ROUTINE WAS OBTAINED FROM NASA/MSC AND IS PART OF
00100 47* CD NBS COMPUTER PROGRAMS FOR THERMODYNAMIC AND TRANSPORT
00100 48* CD PROPERTIES OF HYDROGEN FROM 1 TO 5000 PSIA AND FOR
00100 49* CD TEMPERATURES FROM THE TRIPLE POINT (ABOUT 24.16 O R )
00100 50* CD TO 5000. O R . AUTHORS ARE W.J.HALL, R.D.MCCARTY AND
00100 51* CD H.M.RODER , NBS REPORT NO 9288 , AUGUST 18, 1967,
00100 52* CD PP 188 , NASA NO N67-35527
00100 53* CD
00100 54* CD * * * * *
00101 55* FUNCTION PTHEAT(PRES,TEMP,KTRANS)
00103 56* COMMON/SPHEAT/CP(653),CV(653)
00104 57* DIMENSION LOC(18),JP(18),MX(18),BP(18),DP(18),BT(18),DT(18),PS(12)
00104 58* I,TS(12),TL(10)
00105 59* DATA PS/1.022,2.0,4.0,8.0,14.0,25.0,43.0,69.0,99.0,128.0,151.0,160./
00107 60* DATA TS/24.845,27.07,29.81,33.07,36.18,39.96,44.12,48.33,51.97,
00107 61* 154.79,56.72,57.46/
00111 62* DATA LOC/1.50,71.113,133,141.170,165,228,264,348,372,426,492,528,
00111 63* 1584,626,638/
00113 64* DATA JP/7.3,6.5,2.4,9.9,4.7,4.9,6.6,7.7,2,2/
00115 65* DATA MX/5.1,4.3,0.2,2.4,2.5,2.7,4.4,5.5,0,0/
00117 66* DATA BP/0.20,0.1000,1.00,1.00,1.00,1.469,6.0,1.469,6.587,84.587,84
00117 67* 1.0,100.,100.,40.,40.,0.,0./
00121 68* DATA BT/2600.,2600.,2600.,2600.,800.,300.,120.,120.,25.2,27.,72.,
00121 69* 181.,25.,56.,26.,41.,25.,25./
00123 70* DATA DP/5.40,200,1000,4900,2000,1175.68,293.92,1175.68,
00123 71* 1146.96,146.96,73.48,100,100,20,20,40,40./
00125 72* DATA DT/400.,400.,800.,600.,100.,30.,30.,12.6,9.,3.6,9.,5.,
00125 73* 15.,4.,8.,4.,8./
00127 74* DATA TL/24.846,27.175,29.310,31.299,33.176,34.962,36.672,38.317,
00127 75* 139.904,41.456/
00131 76* 10 P=PRES
00132 77* IF(P.LT.1.0) P=1.0

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00134 78* T=TEMP PTHE0780
00135 79* KTR=KTRANS PTHE0790
00136 80* IF (T.LT.126.) GO TO 90 PTHE0800
00140 81* IF (T.LT.2600.) GO TO 50 PTHE0810
00142 82* IF(T.GE.5000.) T=4999.99999 PTHE0820
00144 83* IF (P.GE.100.) GO TO 30 PTHE0830
00146 84* IF (P.GE.30.) GO TO 20 PTHE0840
00150 85* N=1 PTHE0850
00151 86* GO TO 200 PTHE0860
00152 87* 20 N=2 PTHE0870
00153 88* GO TO 200 PTHE0880
00154 89* 30 IF (P.GE.1000.) GO TO 40 PTHE0890
00156 90* N=3 PTHE0900
00157 91* GO TO 200 PTHE0910
00160 92* 40 N=4 PTHE0920
00161 93* GO TO 200 PTHE0930
00162 94* 50 IF (T.LT.300.) GO TO 70 PTHE0940
00164 95* IF (T.LT.800.) GO TO 60 PTHE0950
00166 96* N=5 PTHE0960
00167 97* GO TO 200 PTHE0970
00170 98* 60 N=6 PTHE0980
00171 99* GO TO 200 PTHE0990
00172 100* 70 IF (P.LT.1469.6) GO TO 80 PTHE1000
00174 101* N=7 PTHE1010
00175 102* GO TO 200 PTHE1020
00176 103* 80 N=8 PTHE1030
00177 104* GO TO 200 PTHE1040
00200 105* 90 IF (P.LT.587.84) GO TO 120 PTHE1050
00202 106* IF (P.LT.1469.6) GO TO 100 PTHE1060
00204 107* N=9 PTHE1070
00205 108* GO TO 190 PTHE1080
00206 109* 100 IF (P.LT.1028.72*AND.T.GE.72.0*AND.T.LT.90.0) GO TO 110 PTHE1090
00210 110* N=10 PTHE1100
00211 111* GO TO 190 PTHE1110
00212 112* 110 N=11 PTHE1120
00213 113* GO TO 200 PTHE1130
00214 114* 120 IF (T.LT.81.) GO TO 130 PTHE1140
00216 115* N=12 PTHE1150
00217 116* GO TO 200 PTHE1160
00220 117* 130 IF (P.LT.160.) GO TO 150 PTHE1170
00222 118* TM=((.86867647E-7*P+.12613701E-3)*P+.10353383)*P+43.8056878 PTHE1180
00223 119* IF (T.GT.TM) GO TO 140 PTHE1190
00225 120* N=13 PTHE1200
00226 121* GO TO 190 PTHE1210
00227 122* 140 N=14 PTHE1220
00230 123* GO TO 200 PTHE1230
00231 124* 150 GO 160 I=2,12 PTHE1240
00234 125* IF (P=PS(I)) 170,170,160 PTHE1250
00237 126* 160 CONTINUE PTHE1260
00241 127* I=12 PTHE1270
00242 128* 170 TM=TS(I-1)*(TS(I)-TS(I-1))*(P-PS(I-1))/(PS(I)-PS(I-1)) PTHE1280
00243 129* IF (T.GE.TM) GO TO 180 PTHE1290
00245 130* N=15 PTHE1300
00246 131* IF(P.LT.40.) N=17 PTHE1310
00250 132* GO TO 190 PTHE1320
00251 133* 180 N=16 PTHE1330
00252 134* IF(P.LT.40.) N=18 PTHE1340
00254 135* GO TO 200 PTHE1350

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00255 136* 190 F=P/587.84
00256 137* I=F
00257 138* IF(I.GT.8)
00261 139* F1=I
00262 140* F=F-F1
00263 141* TQ=(1.0-F)*TL(1+1)+F*TL(1+2)
00264 142* IF(T.LT.TQ) T=TQ
00266 143* 200 FP=(P-BP(N))/DP(N)
00267 144* IP=FP
00270 145* IF(IP.GT.MX(N)) IP=MX(N)
00272 146* F1=IP
00273 147* F=FP-F1
00274 148* FP=1.0-F
00275 149* FT=(T-BT(N))/DT(N)
00276 150* IT=FT
00277 151* F1=IT
00300 152* FF=FT-F1
00301 153* FT=1.0-FF
00302 154* I=IT*JP(N)+IP+LOC(N)
00303 155* J=1+JP(N)
00304 156* IF (KTR.EQ.2) GO TO 230
00306 157* CTCF=FP*FT*CP(I)+F*FT*CP(I+1)+FP*FF*CP(J)+F*FF*CP(J+1)
00307 158* IF (N.LT.13.OR.N.GE.17) GO TO 220
00311 159* IF (N.LT.15) GO TO 210
00313 160* CTCF=CTCF/(187.506-P+ABS (T-TM)*28.13)
00314 161* GO TO 220
00315 162* 210 CTCF=CTCF/(ABS (T-TM)/1.8+ABS (P-187.506)*.008008982)
00316 163* 220 IF (KTR.GE.2) GO TO 230
00320 164* PTHEAT=CTCF
00321 165* GO TO 240
00322 166* 230 PTHEAT=FP*FT*CV(I)+F*FT*CV(I+1)+FP*FF*CV(J)+F*FF*CV(J+1)
00323 167* IF (KTR.LT.3) GO TO 240
00325 168* PTHEAT=CTCF/PTHEAT
00326 169* 240 CONTINUE
00327 170* RETURN
00330 171* END

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PTHE1360
PTHE1370
PTHE1380
PTHE1390
PTHE1400
PTHE1410
PTHE1420
PTHE1430
PTHE1440
PTHE1450
PTHE1460
PTHE1470
PTHE1480
PTHE1490
PTHE1500
PTHE1510
PTHE1520
PTHE1530
PTHE1540
PTHE1550
PTHE1560
PTHE1570
PTHE1580
PTHE1590
PTHE1600
PTHE1610
PTHE1620
PTHE1630
PTHE1640
PTHE1650
PTHE1660
PTHE1670
PTHE1680
PTHE1690
PTHE1700
PTHE1710

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END OF UNIVAC 1108 FORTRAN V COMPILATION.

0 *DIAGNOSTIC* MESSAGE(S)

PTHEAT	SYMBOLIC	01 MAR 71	18:48:48	0	01575260	14	180	(DELETED)
PTHEAT	RELOCATABLE	30 APR 71	11:20:06	1	01521402	24	1	(DELETED)
				0	01521432	14	60	

@ HDG @ FOR, R2DP,R2DP

@ FOR, R2DP,R2DP
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:10

SUBROUTINE R2DP ENTRY POINT 000011

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000015
 0000 *DATA 000006
 0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

00101 1* SUBROUTINE R2DP (R, D)
 00101 2* C*****
 00103 3* DOUBLE PRECISION
 00103 4* *D
 00103 5* C*****
 00104 6* D = R
 00105 7* RETURN
 00106 8* END

END OF UNIVAC 1108 FORTRAN V COMPILATION.

0 *DIAGNOSTIC* MESSAGE(S)

R2DP	SYMBOLIC	30 APR 71	11:20:07	0	01523142	14	8	(DELETED)
R2DP	CODE	RELOCATABLE	30 APR 71	11:20:07	0	01523322	24	1 (DELETED)
					0	01523352	14	2

@ HDG @ FOR, SAT,SAT

6 FOR, SAT, SAT
 UNIVAC 1108 FORTRAN V LEVEL 22 018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:11

31 AUG 71

9:28:11.602

SUBROUTINE SAT ENTRY POINT 000040

STORAGE-USED (BLOCK, NAME, LENGTH)

0001 *CODE 000052
 0000 *DATA 000132
 0002 *BLANK 000060

EXTERNAL REFERENCES (BLOCK, NAME)

0003 BETA
 0004 NERR2S
 0005 NERR3S

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000010 10L	0001	000022 20L	0003 R	000000 BETA	0000	000120 1S	0000	000121 NPH
0000	000122 NPO	0000 R	000024 PH	0000 R	000074 PO	0000 R	000000 TH	0000 R	000050 TO

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00101 10 SUBROUTINE SAT ( IFLUID, PX, TSAT )
00101 20 C
00101 30 C OBTAIN SATURATION TEMPERATURE AT INPUT PRESSURE PX
00101 40 C IFLUID = 1=HYDROGEN, 2=OXYGEN
00101 50 C USE LINEAR INTERPOLATION OF SATURATION P-T TABLES
00101 60 C
00103 70 DIMENSION TH(20), PH(20), TO(20), PO(20)
00104 80 DATA TH / 34.26, 36.49, 38.436, 41.291, 43.529, 45.40, 47.022,
00104 90 1 48.464, 49.768, 50.962, 52.067, 56.6, 8*0./
00106 100 DATA NPH / 12/, PH / 10., 14.696, 20., 30., 40., 50., 60., 70.,
00106 110 1 80., 90., 100., 150., 8*0./
00111 120 DATA TO / 185., 190., 195., 200., 205., 210., 215., 220., 225.,
00111 130 1 230., 235., 240., 245., 250., 255., 260., 265., 270., 275.,
00111 140 2 278.586 /
00113 150 DATA NPO / 20/, PO / 46.261, 57.286, 70.163, 85.040, 102.09,
00113 160 1 121.51, 143.49, 168.20, 195.82, 226.59, 260.66, 298.26, 339.62,
00113 170 2 384.96, 434.55, 488.66, 547.69, 612.08, 653.06, 737.06 /
00113 180 C
00116 190 GO TO (10,20), IFLUID
00117 200 10 TSAT = BETA (TH, PH, PX, NPH)
00120 210 RETURN
00121 220 20 TSAT = BETA (TO, PO, PX, NPO)
00122 230 RETURN
00123 240 END

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END OF UNIVAC 1108 FORTRAN V COMPILATION. 0 *DIAGNOSTIC* MESSAGE(S)
 SAT SYMBOLIC 14 JUN 71 15:04:53 0 01602210 14 24 (DELETED)

FOR,* SAT,SAT

DATE 310871 PAGE 246

SAT CODE RELOCATABLE

14 JUN 71 15:04:53 1 01602730 24 1 (DELETED)
0 01602760 14 13

HDG FOR,* SQZB,SQZB .

6 F0H, SQZB, SQZB
UNIVAC 1108 FORTRAN V LEVEL 22 018 F5018H
THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:13

31 AUG 71

9:28:12.955

SUBROUTINE SQZB ENTRY POINT 000063

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000077
0000 *DATA 000020
0002 *BLANK 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 NERR3S

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001 000023 1L 0001 000010 110G 0001 000044 126G 0001 000047 3L 0000 000002 1
0000 000003 K 0000 000000 NBLNK 0000 000001 NCHAR

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00101 10 SUBROUTINE SQZB(NCOL, N)
00101 20 C.....
00101 30 C.....TRNSQZ SQUEEZES BLANKS FROM AN UNPACKED PHRASE
00101 40 C.....
00101 50 C.....NCOL = PHRASE ARRAY (ONE CHARACTER PER WORD)
00101 60 C.....N = NUMBER OF COLUMNS ENTERING AND NUMBER OF NON-BLANK COLUMNS
00101 70 C..... EXITING WITH.
00101 80 C.....
00103 90 DIMENSION
00103 100 NCOL(1)
00103 110 C.....
00104 120 DATA
00104 130 * NBLNK / 1H /
00104 140 C.....
00104 150 C.....LEFT ADJUST NON-BLANK WORDS IN NCOL
00106 160 NCHAR = 0
00107 170 DO 1 I=1,N
00112 180 IF(NCOL(I).EQ.NBLNK) GO TO 1
00114 190 NCHAR = NCHAR + 1
00115 200 NCOL(NCHAR) = NCOL(I)
00116 210 1 CONTINUE
00116 220 C.....
00116 230 C.....
00120 240 IF(NCHAR.EQ.0) GO TO 3
00122 250 IF(NCHAR.EQ.N) GO TO 3
00124 260 K = NCHAR + 1
00125 270 DO 2 I=K,N
00130 280 2 NCOL(I) = NBLNK
00132 290 3 N = NCHAR

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@ FOR,* SQZB,SQZB

DATE 310871 PAGE 248

00133 30* RETURN
00134 31* END

END OF UNIVAC 1108 FORTRAN V COMPILATION.

@ *DIAGNOSTIC* MESSAGE(S)

SQZB SYMBOLIC
SQZB CODE RELOCATABLE

30 APR 71	11:20:08	0	01523406	14	31	(DELETED)
30 APR 71	11:20:08	1	01524270	24	1	(DELETED)
		0	01524320	14	8	

@ HDG @ FOR,* TANK,TANK

SUBROUTINE TANK ENTRY POINT 000271

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	000302
0000	*DATA	000066
0002	*BLANK	000000
0003	ARRAY	000047
0004	GAMMA	000025
0005	INDATA	011610

EXTERNAL REFERENCES (BLOCK, NAME)

0006	INITAL
0007	BETA
0010	INTEG
0011	SQRT
0012	NWDUS
0013	NIDIS
0014	NID25
0015	NEARR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000004	1216	0001	000246	15L	0001	000242	1716	0001	000252	1776	0000	000017	900F	
0000	000027	901F	0003	R	000000	A	0000	R	000003	ALPHA	0003	R	000016	AVENT	
0000	R	000010	CP	0003	R	000006	CP1	0003	R	000007	CP2	0000	R	000011	CV
0000	R	000013	DMOUT	0000	R	000014	DMVENT	0003	R	000021	DMIN	0003	R	000022	DMOUT
0000	R	000004	DM1	0000	R	000005	DM2	0003	R	000024	DMIN	0000	R	000016	DU
0000	R	000006	DMNET	0000	R	000015	DWORK	0003	R	000020	DMOUT	0004	R	000012	FG
0003	R	000012	GAM	0000	I	000002	I	0000	I	000000	IS	0000	R	000001	MTOT
0003	R	000042	MZ	0004	I	000024	NG	0003	R	000001	P	0003	R	000015	PVENT
0005	R	005754	RFLAG	0003	R	000004	RHOL	0003	R	000010	R1	0003	R	000011	R2
0003	R	000002	T	0003	R	000000	TIME	0003	R	000014	TIN	0003	R	000044	V
0003	R	000005	VTANK	0003	R	000043	W	0003	R	000003	WOL	0000	R	000007	YGAS

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00101 10 SUBROUTINE TANK (B)
00101 20 C
00101 30 C THIS SUBROUTINE COMPUTES THE TANK PRESSURE AND TEMPERATURE
00101 40 C THE GAS MIXTURE IS ASSUMED THERMODYNAMICALLY AND CALORICALLY PERFECT
00101 50 C GAS AND LIQUID FLOWRATES INTO AND OUT OF TANK ARE REQUIRED
00101 60 C HEATING RATE INTO TANK IS INPUT
00101 70 C THE STATE OF THE TANK IS OBTAINED FROM ENERGY AND MASS BALANCES
00101 80 C PROGRAM WRITTEN FEBRUARY 23, 1971 P.J.HEINMILLER
00101 90 C
00103 100 COMMON /ARRAY/ A
  
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00104 11*   DIMENSION A(39), B(39)
00105 12*   EQUIVALENCE (A(1),TIME), (A(2),P), (A(3),T),
00105 13*   1 (A( 4),WOL ), (A( 5),RHOL ), (A( 6),VTANK ), (A( 7),CP1 ),
00105 14*   2 (A( 8),CP2 ), (A( 9),R1 ), (A(10),R2 ), (A(11),GAM ),
00105 15*   3 (A(12),R ), (A(13),TIN ), (A(14),PVENT ), (A(15),AVENT ),
00105 16*   4 (A(16),DWIN ), (A(17),DMOUT ), (A(18),DMIN ), (A(19),DMOUT ),
00105 17*   5 (A(20),DMVENT ), (A(21),DQIN ), (A(34),M1 ), (A(35),M2 ),
00105 18*   6 (A(36),W ), (A(37),U )
00106 19*   COMMON /GAMMA/ G(10), FG(10), NG
00106 20*   C
00107 21*   COMMON /INDATA/ S(S000)
00107 22*   C
00110 23*   EQUIVALENCE
00110 24*   * (S(3053),RFLAG)
00110 25*   C
00111 26*   DATA G / 1.10, 1.15, 1.20, 1.25, 1.30, 1.36, 1.40, 1.50, 1.60,0. /
00113 27*   DATA FG/.6590,.6848,.7104,.7356,.7608,.7906,.8102,.8586,.9062,0. /
00115 28*   DATA NG/ 9. /
00117 29*   REAL M1, M2, MTOT
00120 30*   DO 10 I=1,39
00123 31*   10 A(I)=B(I)
00125 32*   IF (TIME .LT. 0.) RETURN
00127 32*   *DIAGNOSTIC* THE TEST FOR EQUALITY BETWEEN NON-INTEGERS MAY NOT BE MEANINGFUL.
00127 33*   IF (TIME .EQ. 0.) CALL INITAL
00127 34*   C INITIALIZE DATA
00131 35*   ALPHA = M2 / (M1+M2)
00132 36*   IF (P.GT.PVENT) DMVENT = AVENT *P* BETA (FG,G,GAM,NG) /
00132 37*   1 SQRT ( 32*2 * GAM * R * T * 778.156 )
00132 38*   C COMPUTE SPECIE FLOWRATES
00134 39*   DM1 = (ALPHA - 1.) * (DMOUT + DMVENT)
00135 40*   DM2 = DMIN - ALPHA * (DMOUT + DMVENT)
00136 41*   CALL INTEG ( 1,DM1,TIME )
00137 42*   CALL INTEG ( 2,DM2,TIME )
00140 43*   MTOT = M1 + M2
00141 44*   DWNET = DWIN - DMOUT
00142 45*   CALL INTEG (3,DWNET,TIME )
00143 46*   VGAS = VTANK * W / RHOL
00144 47*   CP = (CP1 * M1 + CP2 * M2) / MTOT
00145 48*   R = ( R1 * M1 + R2 * M2) / MTOT
00146 49*   CV = CP * R
00147 50*   GAM = CP / CV
00147 51*   C PERFORM ENERGY BALANCE
00150 52*   DHIN = DMIN * CP1 * TIN
00151 53*   DHOUT = DMOUT * CP * T
00152 54*   DMVENT = DMVENT * CP * T
00153 55*   DWORK = P * DWNET / RHOL * 144. / 778.156
00154 56*   DU = DQIN + DHIN - DHOUT - DMVENT + DWORK
00155 57*   CALL INTEG (4,DU,TIME )
00156 58*   T = U / (MTOT * CV)
00157 59*   F = MTOT * R * T / VGAS * 778.156 / 144
00160 60*   IF (RFLAG),15,
00163 61*   WRITE (6,900) TIME
00166 62*   900 FORMAT ( 1H0,1CX,25HSUBROUTINE TANK AT TIME =, F10.1 / )
00167 63*   WRITE (6,901) A
00175 64*   901 FORMAT ( 5X, 10E11.4 )
00176 65*   15 DO 20 I=1,39
00201 66*   20 B(I) = A(I)
00203 67*   RETURN

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00204 68* END

END OF UNIVAC 1108 FORTRAN COMPILATION.
TANK SYMBOLIC
TANK CODE RELOCATABLE

1 *DIAGNOSTIC* MESSAGE(S)

23 JUN 71	21:26:25	0	01717200	14	68	(DELETED)
23 JUN 71	21:26:25	1	01721070	36	1	(DELETED)
		0	01721134	14	27	

@ HDG @ FOR,* TANKD,TANKD

3.2.53 TANKD (TANK INTERFACE ROUTINE)

© FOR, TANKD,TANKD
 UNIVAC 1106 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:15

31 AUG 71

9:28:15.563

SUBROUTINE TANKD ENTRY POINT 000502

TANKC ENTRY POINT 000507

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 000514
 0000 *DATA 000346
 0002 *BLANK 000000
 0003 CONS 000003
 0004 INDATA 011610
 0005 COM 0006525
 0006 TKOUT 000074

EXTERNAL REFERENCES (BLOCK, NAME)

0007 OPTD
 0010 HPTD
 0011 TANK
 0012 NERR2\$
 0013 SQRT
 0014 NERR3\$

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000202	11L	0001	000007	116G	0001	000215	12L	0001	000227	15L	0001	000234	16L	
0001	000241	17L	0001	000037	20L	0001	000067	30L	0001	000114	40L	0001	000135	50L	
0001	000161	60L	0001	000330	61L	0001	000350	62L	0001	000430	63L	0001	000450	64L	
0000	R	000001	A	0005	R	000000	AREA	0005	R	000074	AREAI	0005	R	000170	AREAK
0005	R	005060	CF	0005	R	006423	CGGTC	0005	R	006436	CGTANK	0005	R	006431	CLTANK
0005	R	006443	CPJU	0005	R	005006	CSTAR	0004	R	006531	CTANK	0005	R	006355	CVEL
0005	R	000226	DIALI	0005	R	006277	DMVENT	0004	R	006550	DQIN	0005	R	006360	ETAT
0005	R	006370	FBPC	0005	R	006376	FBTC	0005	R	006362	FBC	0005	R	005111	FRL
0005	R	003132	HI	0005	R	003036	HO	0010	R	000000	HPTD	0005	R	003322	HRAD
0000	I	000305	II	0000	I	000310	IPROP	0005	I	005052	ISPT	0000	I	000306	JJ
0000	I	000304	K	0004	R	003413	KA	0004	I	006431	LDMI	0004	I	006536	LDMQ
0004	I	006524	LDW0	0004	R	004561	MACH	0005	I	005066	MEX	0005	I	004756	MR
0005	I	002552	NGR	0004	I	000100	NODEL	0004	I	000553	NPLINE	0005	I	002646	NPR
0007	R	000000	OPTD	0004	R	006366	P	0005	R	000264	PB	0005	R	004764	PC
0005	R	005074	PE	0005	R	000272	PG	0005	R	003620	PGT	0003	R	000000	PI
0005	R	006241	POWC	0005	R	006350	POWP	0005	R	006343	POWT	0005	R	006300	PPI
0005	R	006331	PTI	0005	R	006336	PTO	0005	R	006357	R	0004	R	005711	RGAS
0005	R	001422	RHOG	0004	R	000546	RHOL	0005	R	006312	RPMT	0004	R	000000	S
0005	R	006416	THOC	0004	R	000611	TIME	0000	R	000307	TIN	0006	R	000012	TKGAM
0006	R	000024	TKHYNT	0004	R	000062	TKP	0006	R	000017	TKRGAS	0006	R	000005	TKRHOL
0006	R	000055	TKTIME	0004	R	010133	TLIQ	0005	R	006411	TPCG	0005	R	006404	TPCL
0004	R	001132	TTEMP	0005	R	006317	TTI	0005	R	006324	TTO	0004	R	002262	TTTEMP
0005	R	006356	U	0005	R	003416	UA0	0005	R	003512	VEL	0004	R	003423	WDOTG
0006	R	000036	WGAS0	0005	R	006265	WI	0006	R	000043	WLIQI	0006	R	000050	WLIQU
												0005	R	000311	WGASI
												0005	R	004750	WU02

0005 R 006253 #0

0005 006361 #T

0005 R 006246 #TGC

0000 I .0000 #

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00101 1* SUBROUTINE TANKD(I)
00101 2* C
00101 3* CC SUBROUTINE TANK DRIVER
00101 4* CC LDM1 = NUMBER OF LINE CONNECTED TO INLET GAS TANK I
00101 5* CC LDMO = NUMBER OF LINE CONNECTED TO OUTLET GAS TANK I
00101 6* CC LDWO = NUMBER OF LINE CONNECTED TO OUTLET LIQUID TANK I
00101 7* CC LDWI = NUMBER OF LINE CONNECTED TO INLET LIQUID TANK I
00103 8* COMMON/CONS/PI,GC,FB
00104 9* REAL MACH,KA
00104 10* C
00105 11* INTEGER Z
00105 12* C
00106 13* DIMENSION A(39,5),P(5),NODEL(20),WDOTG(30,20),TTTEMP(30,20)
00106 14* *, LDM1(5),LDMO(5),LDWI(5),LDWO(5)
00106 15* *, CTANK(5),TTEMP(30,20),DQIN(5)
00106 16* *, KA(2),RGAS(2),NPLINE(30)
00106 17* *, TTANK(5),MACH(30,20)
00106 18* *, TLIQ(5)
00106 19* C
00107 20* COMMON /INDATA/ S(5000)
00107 21* C
00110 22* COMMON /COM/AREA(30),DELXL(30),AREAI(30),AREAO(30),AREAK(30)
00110 23* *, DIALI(30),PB(6),PG(30,20),RHOG(30,20),NGR(30,2)
00110 24* *, NPR(30,2),NRE(30,2),HO(30,2),HI(30,2),TWALL(30,2)
00110 25* *, HRAD(30,2),UAD(30,2),VEL(30,2),JUN(10),PGT(30,20)
00110 26* *, XNOZ(6),MR(6),PC(6),PCN(6,2),CSTAR(6),CONCT(3,6)
00110 27* *, PHR(6),TC(6),ISPT(6),CF(6),HEX(6),PE(6),MHC(6),ICMON
00110 28* *, FRL(30,20),POWC(5),WTGC(5),WO(10),WI(10),OHVENT,PPI(5)
00110 29* *, PPO(5),RPMT(5),TTI(5),TTO(5),PTI(5),PTO(5),POWT(5)
00110 30* *, POWP(5),CVEL,U,R,ETAT,WT,FBWC(6),FBPC(6)
00110 31* *, FBTC(6),TPCL(5),TPCG(5),THOC(5),CGGTC(6),CLTANK(5)
00110 32* *, CGTANK(5),CPJU(5,10)
00110 33* C
00111 34* COMMON /TKOUT/ TKMTOT(5),TKRHOL(5),TKGAM(5),TKRGAS(5),TKMVNT(5),
00111 35* *, WGASI(5),AGASO(5),WLIQI(5),WLIQO(5),TKTIME(5),TKP(5)
00111 36* *,TKT(5)
00112 37* EQUIVALENCE
00112 38* *,(S(3413),LDWO(1)),(S(3418),CTANK(1)),(S(3423),LDMO(1))
00112 39* *,(S(603),TTEMP(1,1)),(S(3354),LDHI(1)),(S(3408),LDWI(1))
00112 40* *,(S(3433),DQIN(1)),(S(3319),P(1)),(S(65),NODEL(1))
00112 41* *,(S(1812),WDOTG(1,1)),(S(1203),TTTEMP(1,1))
00112 42* *,(S(359),RHOL(1))
00112 43* *,(S(3453),TTANK(1))
00112 44* *,(S(1804),KA(1)),(S(3018),RGAS(1)),(S(364),NPLINE(1))
00112 45* *,(S(2418),MACH(1))
00112 46* *,(S(394),TIME)
00112 47* *,(S(4188),TLIQ)
00112 48* C
00113 49* IF (Z.EQ.1) GO TO 20
00115 50* DO 10 K=1,5
00120 51* A( 2,K) = S(K+3318)
00121 52* A( 3,K) = S(K+3452)
00122 53* A( 4,K) = S(K+3362)

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00123 54* A( 6,K) = S(K+3372)
00124 55* A( 7,K) = S(K+3377)
00125 56* A( 8,K) = S(K+3382)
00126 57* A( 9,K) = S(K+3387)
00127 58* A(10,K) = S(K+3392)
00130 59* A(14,K) = S(K+3397)
00131 60* A(15,K) = S(K+3402)
00132 61* 10 CONTINUE
00132 62* C SET CONSTANTS FOR TANK ROUTINE
00134 63* Z = Z + 1
00135 64* 20 CONTINUE
00136 65* A(18,1) = 0.
00137 66* IF (LDMI(1),EQ.0) GO TO 30
00141 67* I1 = LDMI(1)
00142 68* JJ = NODEL(I1)
00143 69* A(18,1) = WDOTG(I1,JJ)
00144 70* TIN = TTEMP(I1,JJ)
00145 71* A(13,1) = TTEMP(I1,JJ)
00146 72* 30 CONTINUE
00147 73* IPROP = 0
00150 74* A(16,1) = 0.
00151 75* IF (LDWI(1),EQ.0) GO TO 40
00153 76* I1 = LDWI(1)
00154 77* JJ = NODEL(I1)
00155 78* A(16,1) = WDOTG(I1,JJ)
00156 79* IPROP = NPLINE(I1)
00157 80* 40 CONTINUE
00160 81* A(19,1) = 0.
00161 82* IF (LDMO(1),EQ.0) GO TO 50
00163 83* I1 = LDMO(1)
00164 84* JJ = 1
00165 85* A(19,1) = WDOTG(I1,JJ)
00166 86* 50 CONTINUE
00167 87* A(17,1) = 0.
00170 88* IF (LDAO(1),EQ.0) GO TO 60
00172 89* I1 = LDAO(1)
00173 90* JJ = 1
00174 91* A(17,1) = WDOTG(I1,JJ)
00175 92* IPROP = NPLINE(I1)
00176 93* 60 CONTINUE
00177 94* A(1,1) = TIME
00200 95* A(21,1) = DGIN(1)
00201 96* IF (IPROP,EQ.0) GO TO 16
00201 97* C COMPUTE FLUID DENSITY
00203 98* GO TO (1),12), IPROP
00204 99* 11 RHOL = OPTD (P(1),TLIQ(I))
00205 100* GO TO 15
00206 101* 12 RHOL = HPTD (P(1),TLIQ(I))
00207 102* 15 CONTINUE
00210 103* A(5,1) = RHOL
00211 104* GO TO 17
00212 105* 16 A(4,1) = 0.
00213 106* A(5,1) = 1.
00214 107* 17 CONTINUE
00215 108* CALL TANK(A(1,1))
00216 109* P(1) = A(2,1)
00217 110* TTANK(1) = A(3,1)
00220 111* TKTIME(1) = A(1,1)

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00221 112* TKP (I) = A(1,I)
00222 113* TKT(I) = A(1,I)
00223 114* TKMTOT(I) = A(14,I) + A(35,I)
00224 115* TKRHOL(I) = A(4,I)
00225 116* TKGAM(I) = A(11,I)
00226 117* TKRGAS(I) = A(12,I)
00227 118* TKMVRT(I) = A(20,I)
00230 119* WLIQ(I) = A(16,I)
00231 120* WLIQO(I) = A(17,I)
00232 121* WGAS(I) = A(18,I)
00233 122* WGASO(I) = A(19,I)
00234 123* II = LDH1(I)
00235 124* JJ = NODEL(II)
00236 125* IF (II.EQ.0) GO TO 61
00240 126* CGTANK(I) = 1. - PG(II,JJ) / P(I)
00241 127* 61 CONTINUE
00242 128* II = LDW1(I)
00243 129* JJ = NODEL(II)
00244 130* IF (II.EQ.0) GO TO 62
00246 131* CLTANK(I) = 1. - PG(II,JJ) / P(I)
00247 132* 62 CONTINUE
00250 133* JJ = 1
00251 134* II = LDH0(I)
00252 135* IF (II.EQ.0) GO TO 63
00254 136* TTEMP(II,JJ) = A(3,I)
00255 137* PG(II,JJ) = A(2,I)
00255 138* C DENSITY OF GAS
00256 139* RGAST = A(12,I) * 778.2
00257 140* RHOG(II,JJ) = PG(II,JJ) / (RGAST * TTEMP(II,JJ)) * 144.
00260 141* IPROP = NPLINE(II)
00260 142* C MACH NUMBER
00261 143* MACH(II,JJ) = 4. * WDOTG(II,JJ) / (RHOG(II,JJ) * PI * DIALI(II) * 2. * SQRT
00261 144* * (KA(IPROP) * GC * RGAST * TTEMP(II,JJ))) * 144.
00262 145* 63 CONTINUE
00263 146* II = LDW0(I)
00264 147* IF (II.EQ.0) GO TO 64
00266 148* PG(II,JJ) = A(2,I)
00267 149* TTEMP(II,JJ) = TLIQ(I)
00270 150* 64 CONTINUE
00271 151* ENTRY TANKC(I)
00273 152* RETURN
00274 153* END

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END OF UNIVAC 1108 FORTRAN V COMPILATION.

D *DIAGNOSTIC* MESSAGE(S)

TANKD	CODE	SYMBOLIC	RELOCATABLE	31 AUG 71	09:25:25	0	02165132	14	153	(DELETED)
TANKD	CODE	SYMBOLIC	RELOCATABLE	31 AUG 71	09:25:25	1	02171270	48	1	(DELETED)
0 HDG	@	FOR, * TEST, TEST				0	02171350	14	37	.

FOR, TEST,TEST

DATE 310871 PAGE 256

FOR, TEST,TEST
INPUT SOURCE LANGUAGE ELEMENT NOT AVAILABLE
HDC FOR, THERM,THERM

31 AUG 71

9128:18.142

FOR, * THERM, THERM
 UNIVAC 1108 FORTRAN V LEVEL 2 2016 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:18

31 AUG 71

9:28:18.185

FUNCTION OPTD ENTRY POINT 000705
 OPDIT ENTRY POINT 000737
 OPTIT ENTRY POINT 000763
 OPDIC ENTRY POINT 001015
 OPTIC ENTRY POINT 001041
 OPDH ENTRY POINT 001073
 OPTH ENTRY POINT 001117
 OPDCV ENTRY POINT 001151
 OPTCV ENTRY POINT 001175
 OPDCP ENTRY POINT 001227
 OPTCP ENTRY POINT 001253
 OPDT ENTRY POINT 001305
 DPTV ENTRY POINT 001331

 OPTTC ENTRY POINT 001363

STORAGE USED (BLOCK, NAME, LENGTH)

0001 *CODE 001415
 0000 *DATA 000116
 0002 *BLANK 000000
 0003 TPCB 021661

EXTERNAL REFERENCES (BLOCK, NAME)

0004 BINSER
 0005 NADUS
 0006 N1015
 0007 N1025
 0010 NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000117	10L	0001	000325	100L	0001	000353	105L	0001	000407	106L	0001	000405	107L
0001	000417	110L	0001	000516	120L	0001	000522	130L	0001	000530	150L	0001	000560	170L
0001	000602	180L	0001	000614	190L	0001	000123	20L	0001	000636	200L	0001	000640	210L
0001	000641	220L	0001	000646	245L	0001	000650	250L	0001	000166	255G	0000	000026	260F

0000	000035	270F	0000	000044	280F	0000	000052	290F	0001	000127	30L	0000	000060	300F					
0001	000131	40L	0001	000045	5L	0001	000164	50L	0001	000223	69L	0001	000225	70L					
0001	000265	95L	0001	000315	96L	0001	000313	97L	0000	R	000011	A	0000	R	000020	AB			
0000	R	000017	AC	0000	R	000019	B	0000	R	000016	_C	0003	I	000167	IOFLAG	0000	I	000003	IERR
0000	I	000004	IP	0000	I	000002	16	0000	I	000013	JJ	0000	I	000015	JK	0000	I	000001	JMAX
0000	I	000006	JTYPE	0000	I	000010	K	0003	I	000166	KEY	0000	I	000005	KTYPE	0000	R	000000	OPTD
0000	R	000007	P1	0000	R	000025	TEMP	0000	R	000021	TEMP1	0000	R	000022	TEMP2	0000	R	000023	TEMP3
0000	R	000024	TEMP4	0003	R	000000	TPCB	0000	R	000012	T1	0003	R	000360	UA	0003	R	000400	UB
0003	R	000523	UU	0003	R	000523	UI	0003	R	020177	VB	0003	R	020230	VV				

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00100 1* CD* * * * * THER0010
00100 2* CD THER0020
00100 3* CD PROGRAMMER AND DATE THER0030
00100 4* CD J. I. PREWITT THER0040
00100 5* CD DECEMBER 1970 THER0050
00100 6* CD THER0060
00100 7* CD PURPOSE THER0070
00100 8* CD INTERPOLATES A VALUE FOR ONE OF THE THERMODYNAMIC THER0080
00100 9* CD PROPERTIES OF OXYGEN. THER0090
00100 10* CD THER0100
00100 11* CD USAGE THER0110
00100 12* CD D = OPTD (P,T) THER0120
00100 13* CD IT = OPTIT (P,T) THER0130
00100 14* CD IC = OPTIC (P,T) THER0140
00100 15* CD H = OPTH (P,T) THER0150
00100 16* CD CV = OPTCV (P,T) THER0160
00100 17* CD CP = OPTCP (P,T) THER0170
00100 18* CD IT = OPDIT (P,D) THER0180
00100 19* CD IC = OPDIC (P,D) THER0190
00100 20* CD H = OPDH (P,D) THER0200
00100 21* CD CV = OPDCV (P,D) THER0210
00100 22* CD CP = OPDCP (P,D) THER0220
00100 23* CD T = OPDT (P,D) THER0230
00100 24* CD V = OPTV (P,T) THER0240
00100 25* CD TC = OPTTC (P,T) THER0250
00100 26* CD THER0260
00100 27* CD DESCRIPTION OF PARAMETERS THER0270
00100 28* CD THER0280
00100 29* CD INPUT THER0290
00100 30* CD CALLING SEQUENCE THER0300
00100 31* CD P = PRESSURE = PSIA THER0310
00100 32* CD T = TEMPERATURE = O R THER0320
00100 33* CD D = DENSITY = LBM/FT**3 THER0330
00100 34* CD COMMON THER0340
00100 35* CD KEY = REDUNDANT SEARCH TRIGGER THER0350
00100 36* CD UA = PRESSURE ARRAY THER0360
00100 37* CD UB = TEMPERATURE ARRAY CORRESPONDING TO THE UU ARRAY THER0370
00100 38* CD UU = THERMODYNAMIC PROPERTY ARRAY THER0380
00100 39* CD VB = TEMPERATURE ARRAY THER0390
00100 40* CD VV = THERMODYNAMIC PROPERTY ARRAY THER0400
00100 41* CD CARD THER0410
00100 42* CD NONE THER0420
00100 43* CD TAPE THER0430
00100 44* CD NONE THER0440
00100 45* CD OUTPUT THER0450
    
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00100	46	CD	CALLING SEQUENCE		THE0460
00100	47	CD	OP - DENSITY	- LBM/FT**3	THE0470
00100	48	CD	OP - ISOTHERM DERIVATIVE	- PSIA/LBM FT**3	THE0480
00100	49	CD	OPTIC - ISOCHORE DERIVATIVE	- PSIA/O R	THE0490
00100	50	CD	OPH - ENTHALPY	- BTU/LBM	THE0500
00100	51	CD	OPTCV - SPECIFIC HEAT AT CONSTANT VOLUME	- BTU/LBM/O R	THE0510
00100	52	CD	OPTCP - SPECIFIC HEAT AT CONSTANT PRESSURE	- BTU/LBM/O R	THE0520
00100	53	CD	OPDIT - ISOTHERM DERIVATIVE	- PSIA/LBM FT**3	THE0530
00100	54	CD	OPDIC - ISOCHORE DERIVATIVE	- PSIA/O R	THE0540
00100	55	CD	OPDH - ENTHALPY	- BTU/LBM	THE0550
00100	56	CD	OPDCV - SPECIFIC HEAT AT CONSTANT VOLUME	- BTU/LBM/O R	THE0560
00100	57	CD	OPDCP - SPECIFIC HEAT AT CONSTANT PRESSURE	- BTU/LBM/O R	THE0570
00100	58	CD	OPTV - VISCOSITY	- LBF HR/FT/FT	THE0580
00100	59	CD	OPTTC - THERMAL CONDUCTIVITY	- BTU FT/HR/FT/FT/O R	THE0590
00100	60	CD	COMMON		THE0600
00100	61	CD	NONE		THE0610
00100	62	CD	CARD		THE0620
00100	63	CD	NONE		THE0630
00100	64	CD	PRINT		THE0640
00100	65	CD	IF ONE OF THE INPUT VARIABLES IS OUT OF RANGE THEN AN		THE0650
00100	66	CD	ERROR MESSAGE IS PRINTED WITH ITS VALUE.		THE0660
00100	67	CD	PRESURE IS OUT OF RANGE		THE0670
00100	68	CD	TEMPERATURE IS OUT OF RANGE		THE0680
00100	69	CD	DENSITY IS OUT OF RANGE		THE0690
00100	70	CD	TAPE		THE0700
00100	71	CD			THE0710
00100	72	CD	REMARKS AND RESTRICTIONS		THE0720
00100	73	CD	THIS SUBPROGRAM NEEDS THE TWO BLOCK DATA ROUTINES		THE0730
00100	74	CD	TPOCB1 AND TPOCB2.		THE0740
00100	75	CD	IF THIS SUBPROGRAM IS EVER OVERLAYED THE COMMON BLOCK		THE0750
00100	76	CD	TPOCB SHOULD BE PLACED IN THE MAIN LINK AND THE INTERNAL		THE0760
00100	77	CD	VARIABLES JJ, JK, K, A, B, AB, AC, AND IERR SHOULD BE		THE0770
00100	78	CD	PLACED IN A COMMON BLOCK IN THE MAIN LINK.		THE0780
00100	79	CD	THE TEMPERATURE ARRAY FOR VISCOSITY AND THERMAL		THE0790
00100	80	CD	CONDUCTIVITY IS DIFFERENT THEN THE ONE FOR THE OTHER		THE0800
00100	81	CD	PROPERTIES AND THEREFORE KEY SHOULD BE SET TO ZERO		THE0810
00100	82	CD	BEFORE REFERENCING OPTV OR OPTTC.		THE0820
00100	83	CD			THE0830
00100	84	CD			THE0840
00100	85	CD	SUBPROGRAMS REQUIRED		THE0850
00100	86	CD	BINSER		THE0860
00100	87	CD			THE0870
00100	88	CD	METHOD		THE0880
00100	89	CD	THIS ROUTINE PREFORMS A TABLE LOOK UP TO OBTAIN A VALUE		THE0890
00100	90	CD	FOR ONE OF THE THERMODYNAMIC PROPERTIES OF OXYGEN		THE0900
00100	91	CD	DESCRIBED IN THE OUTPUT SECTION. IT USES EITHER		THE0910
00100	92	CD	PRESSURE AND TEMPERATURE OR PRESSURE AND DENSITY AS		THE0920
00100	93	CD	INPUT TO FIND THE INDICES FOR THE PROPER RANGES. THEN		THE0930
00100	94	CD	IT INTERPOLATES FOR THE DESIRED THERMODYNAMIC PROPERTY		THE0940
00100	95	CD	AND RETURNS. IF KEY IS SET TO ZERO THE ABOVE IS		THE0950
00100	96	CD	PERFORMED. IF KEY IS SET TO NON-ZERO THEN THE SEARCH		THE0960
00100	97	CD	FOR THE INDICES IS SKIPPED AND THE VALUES OBTAIN FROM		THE0970
00100	98	CD	THE PREVIOUS CALL ARE USED. THIS CAPABILITY ALLOWS		THE0980
00100	99	CD	THE USER TO BY PASS REDUDANT CALCULATIONS WHEN THE		THE0990
00100	100	CD	INPUT PARAMETERS REMAIN THE SAME BETWTEEN SUCESSIVE		THE1000
00100	101	CD	CALLS.		THE1010
00100	102	CD			THE1020
00100	103	CD			THE1030

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00100 104* C THER1040
00100 105* C REFERENCES 1. NBS REPORT 9710A THERMODYNAMIC AND RELATED THER1050
00100 106* C PROPERTIES OF OXYGEN FROM THE TRIPLE POINT THER1060
00100 107* C TO 300 O K AT PRESSURES TO 330 ATMOSPHERES, THER1070
00100 108* C BY L. A. WEBER, 29 AUGUST 1968. THER1080
00100 109* C THER1090
00100 110* C 2. NBS LETTER ON VISCOSITY AND THERMAL CONDUCTIVITY THER1100
00100 111* C OF OXYGEN, BY H. M. ROGER TO J. SMITHSON, NASA/MSC, THER1110
00100 112* C 10 SEPTEMBER 1970. THER1120
00100 113* C THER1130
00101 114* C FUNCTION OPTD (P,T) THER1140
00101 115* C THER1150
00101 116* C
00103 117* C DIMENSION UA(16), UB(83), VB(24)
00103 118* C *, U1(83,16), U2(83,16,6), VV(24,16,2)
00103 119* C
00104 120* C COMMON / TPCB / TPCB(9137)
00104 121* C
00105 122* C EQUIVALENCE ( TPCB ( 119 ) , KEY )
00106 123* C EQUIVALENCE ( TPCB ( 120 ) , IDFLAG )
00107 124* C EQUIVALENCE ( TPCB ( 241 ) , UA )
00110 125* C EQUIVALENCE ( TPCB ( 257 ) , UB )
00111 126* C EQUIVALENCE ( TPCB ( 340 ) , UU )
00112 127* C EQUIVALENCE ( TPCB ( 340 ) , U1 )
00113 128* C EQUIVALENCE ( TPCB ( 8320 ) , VB )
00114 129* C EQUIVALENCE ( TPCB ( 8345 ) , VV )
00114 130* C
00115 131* C DATA JMAX / 83 /
00115 132* C THER1270
00117 133* C DATA 16 / 6 / THER1280
00117 134* C THER1290
00117 135* C THIS ROUTINE INTERPOLATES A VALUE FOR DENSITY THER1300
00117 136* C THER1310
00121 137* C IF (P.GT.UA(1).AND.T.LT.UB(JMAX)) GO TO 5
00121 138* C OUT OF RANGE - USE IDEAL GAS EQUATION FOR DENSITY
00123 139* C OPTD = 2.983 * P/T
00124 140* C IERR = 1
00125 141* C WRITE (16,300) P,T,OPTD
00132 142* C RETURN
00132 143* C
00133 144* C 5 CONTINUE
00134 145* C IP = 1 THER1320
00135 146* C GO TO 30 THER1330
00135 147* C THER1340
00135 148* C THIS ROUTINE INTERPOLATES A VALUE FOR THE ISOTHERM DERIVATIVE THER1350
00135 149* C THER1360
00136 150* C ENTRY OPDIT (P,D) THER1370
00140 151* C IP = 2 THER1380
00141 152* C GO TO 20 THER1390
00141 153* C THER1400
00142 154* C ENTRY OPTIT (P,T) THER1410
00142 155* C THER1420
00144 156* C IP = 2 THER1430
00145 157* C GO TO 30 THER1440
00145 158* C THER1450
00145 159* C THIS ROUTINE INTERPOLATES A VALUE FOR THE ISOCHORE DERIVATIVE THER1460
00145 160* C THER1470
00146 161* C ENTRY OPDIC (P,D) THER1480

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00146	162*	C		1490
00150	163*		IP = 3	1500
00151	164*		GO TO 20	THER1510
00151	165*	C		THER1520
00152	166*		ENTRY OPTIC (P,T)	THER1530
00152	167*	C		THER1540
00154	168*		IP = 3	THER1550
00155	169*		GO TO 30	THER1560
00155	170*	C		THER1570
00155	171*	C	THIS ROUTINE INTERPOLATES A VALUE FOR ENTHALPY	THER1580
00155	172*	C		THER1590
00156	173*		ENTRY OPDH (P,D)	THER1600
00156	174*	C		THER1610
00160	175*		IP = 4	THER1620
00161	176*		GO TO 20	THER1630
00161	177*	C		THER1640
00162	178*		ENTRY OPTH (P,T)	THER1650
00162	179*	C		THER1660
00164	180*		IP = 4	THER1670
00165	181*		GO TO 30	THER1680
00165	182*	C		THER1690
00165	183*	C	THIS ROUTINE INTERPOLATES A VALUE FOR SPECIFIC HEAT	THER1700
00165	184*	C	FOR A CONSTANT VOLUME	THER1710
00165	185*	C		THER1720
00166	186*		ENTRY OPDCV (P,D)	THER1730
00166	187*	C		THER1740
00170	188*		IP = 5	THER1750
00171	189*		GO TO 20	THER1760
00171	190*	C		THER1770
00172	191*		ENTRY OPTCV (P,T)	THER1780
00174	192*		IP = 5	THER1790
00175	193*		GO TO 30	THER1800
00175	194*	C		THER1810
00175	195*	C	THIS ROUTINE INTERPOLATES A VALUE FOR SPECIFIC HEAT	THER1820
00175	196*	C	FOR A CONSTANT PRESSURE	THER1830
00175	197*	C		THER1840
00176	198*		ENTRY OPDCP (P,D)	THER1850
00176	199*	C		THER1860
00200	200*		IP = 6	THER1870
00201	201*		GO TO 20	THER1880
00201	202*	C		THER1890
00202	203*		ENTRY OPTCP (P,T)	THER1900
00202	204*	C		THER1910
00204	205*		IP = 6	THER1920
00205	206*		GO TO 30	THER1930
00205	207*	C		THER1940
00205	208*	C	THIS ROUTINE INTERPOLATES A VALUE FOR TEMPERATURE	THER1950
00205	209*	C		THER1960
00206	210*		ENTRY OPDT (P,D)	THER1970
00206	211*	C		THER1980
00210	212*		KTYPE = 1	THER1990
00211	213*		JTYPE = 1	THER2000
00212	214*		GO TO 40	THER2010
00212	215*	C		THER2020
00212	216*	C	THIS ROUTINE INTERPOLATES A VALUE FOR VISCOSITY	THER2030
00212	217*	C		THER2040
00213	218*		ENTRY OPTV (P,T)	THER2050
00213	219*	C		THER2060

00215	220*		IP = 1		THER2070
00216	221*		GO TO 10		THER2080
00216	222*	C			THER2090
00216	223*	C	THIS ROUTINE INTERPOLATES A VALUE FOR THERMAL CONDUCTIVITY		THER2100
00216	224*	C			THER2110
00217	225*		ENTRY OPTTC (P,T)		THER2120
00217	226*	C			THER2130
00221	227*		IP = 2		THER2140
00222	228*	10	CONTINUE		THER2150
00223	229*		JTYPE = -1		THER2160
00224	230*		KTYPE = -1		THER2170
00225	231*		GO TO 40		THER2180
00225	232*	C			THER2190
00226	233*	20	CONTINUE		THER2200
00227	234*		KTYPE = 0		THER2210
00230	235*		JTYPE = 1		THER2220
00231	236*		GO TO 40		THER2230
00231	237*	C			THER2240
00232	238*	30	CONTINUE		THER2250
00233	239*		JTYPE = 0		THER2260
00234	240*		KTYPE = 0		THER2270
00234	241*	C			THER2280
00235	242*	40	CONTINUE		THER2290
00236	243*		IF (KEY.NE.0) GO TO 150		THER2300
00240	244*		IERR = 0		THER2310
00240	245*	C			THER2320
00240	246*	C	FIND THE PROPER RANGE FOR PRESSURE		THER2330
00240	247*	C			THER2340
00241	248*		IF (P.GT.UA(1)) GO TO 50		
00241	249*	C	PRESSURE OUT OF RANGE - LOW		
00243	250*		P1 = UA(1)		
00244	251*		K = 1		
00245	252*		WRITE (16,260) P		
00250	253*		WRITE (16,290) P1		
00253	254*		GO TO 70		
00253	255*	C			
00254	256*	50	DO 60 K=1,16		
00257	257*		IF (UA(K).GT.P) GO TO 69		
00261	258*	60	CONTINUE		
00261	259*	C	PRESSURE OUT OF RANGE - HIGH		
00263	260*		K = K-1		
00264	261*		P1 = UA(K)		
00265	262*		WRITE (16,260) P		
00270	263*		WRITE (16,290) P1		
00270	264*	C			
00273	265*		GO TO 70		
00274	266*	69	P1 = P		
00275	267*	70	A = (P1-UA(K)) / (UA(K)-UA(K-1))		
00275	268*	C			THER2580
00275	269*	C	TEST FOR TEMPERATURE OR DENSITY		THER2590
00275	270*	C			THER2600
00276	271*		IF (JTYPE) 90,100,110		THER2610
00276	272*	C			THER2620
00276	273*	C	FIND THE PROPER RANGE FOR TEMPERATURE		THER2630
00276	274*	C			THER2640
00301	275*	90	CONTINUE		THER2650
00301	276*	C			THER2660
00301	277*	C	VB IS THE TEMPERATURE ARRAY FOR VISCOSITY AND		THER2670


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00301 278* C THERMAL CONDUCTIVITY,
00301 279* C
00302 280* IF (T.GT.VB(1)) GO TO 95
00302 281* C TEMPERATURE OUT OF RANGE - LOW
00304 282* T1 = VB(1)
00305 283* WRITE (16,270) T
00310 284* WRITE (16,290) T1
00313 285* GO TO 96
00313 286* C
00314 287* 95 IF (T.LT.VB(24)) GO TO 97
00314 288* C TEMPERATURE OUT OF RANGE - HIGH
00316 289* T1 = VB(24)
00317 290* WRITE (16,270) T
00322 291* WRITE (16,290) T1
00325 292* GO TO 96
00325 293* C
00326 294* 97 T1 = T
00327 295* 96 CALL BINSER (T1,VB,24,JJ,B)
00330 296* GO TO 120
00330 297* C
00331 298* 100 CONTINUE
00332 299* IF (T.GT.VB(1)) GO TO 105
00332 300* C TEMPERATURE OUT OF RANGE - LOW
00334 301* T1 = VB(1)
00335 302* WRITE (16,270) T
00340 303* WRITE (16,290) T1
00343 304* GO TO 106
00343 305* C
00344 306* 105 IF (T.LT.VB(JMAX)) GO TO 107
00344 307* C TEMPERATURE OUT OF RANGE - HIGH
00346 308* T1 = VB(JMAX)
00347 309* WRITE (16,270) T
00352 310* WRITE (16,290) T1
00355 311* GO TO 106
00355 312* C
00356 313* 107 T1 = T
00357 314* 106 CALL BINSER (T1,VB,JMAX,JJ,B)
00360 315* GO TO 120
00360 316* C
00360 317* C
00360 318* C FIND THE PROPER RANGE FOR DENSITY
00360 319* C
00361 320* 110 CONTINUE
00362 321* IF (D.GT.U1(1,K)) GO TO 250
00364 322* IF (D.LT.U1(JMAX,K)) GO TO 245
00366 323* CALL BINSER (D,U1(1,K),JMAX,JJ,B)
00366 324* C
00367 325* IF (X.EQ.1) GO TO 120
00371 326* IF (D.GT.U1(1,K-1)) GO TO 250
00373 327* IF (D.LT.U1(JMAX,K-1)) GO TO 245
00375 328* CALL BINSER (D,U1(1,K-1),JMAX,JK,C)
00376 329* GO TO 130
00376 330* C
00377 331* 120 CONTINUE
00400 332* JK = JJ
00401 333* C = B
00402 334* 130 CONTINUE
00403 335* AC = A*C

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THER2680
THER2690

THER2800
THER2810
THER2820
THER2830
THER2840

THER2870
THER2880
THER2890

THER2920
THER2930
THER2940
THER2950
THER2960
THER2970
THER2980

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00403 336* C THER2990
00404 337* 140 CONTINUE THER3000
00405 338* AB = A*B THER3010
00406 339* 150 CONTINUE THER3020
00407 340* IF (IERR.EQ.1) GO TO 210 THER3030
00411 341* IF (KTYPE) 160,170,180 THER3040
00411 342* C THER3050
00411 343* C INTERPOLATE AS A FUNCTION OF PRESSURE AND TEMPERATURE THER3060
00411 344* C THER3070
00414 345* 160 CONTINUE THER3080
00415 346* TEMP1 = VV(JJ, K, IP)
00416 347* TEMP2 = VV(JJ-1, K, IP)
00417 348* TEMP3 = VV(JJ, K-1, IP)
00420 349* TEMP4 = VV(JJ-1, K-1, IP)
00421 350* GO TO 190
00421 351* C THER3130
00422 352* 170 CONTINUE THER3140
00423 353* TEMP1 = UU(JJ,K,IP) THER3150
00424 354* TEMP2 = UU(JJ-1,K,IP) THER3160
00425 355* TEMP3 = UU(JK,K-1,IP) THER3170
00426 356* TEMP4 = UU(JK-1,K-1,IP) THER3180
00427 357* GO TO 190 THER3190
00427 358* C THER3200
00430 359* 180 CONTINUE THER3210
00430 360* C THER3220
00430 361* C INTERPOLATE TEMPERATURE AS A FUNCTION OF PRESSURE AND THER3230
00430 362* C DENSITY THER3240
00430 363* C THER3250
00431 364* TEMP1 = UB(JJ) THER3260
00432 365* TEMP2 = UB(JJ-1) THER3270
00433 366* TEMP3 = UB(JK) THER3280
00434 367* TEMP4 = UB(JK-1) THER3290
00434 368* C THER3300
00435 369* 190 CONTINUE THER3310
00435 370* C THER3320
00435 371* C GENERAL INTERPOLATION BETWEEN PRESSURE AND TEMPERATURE OR THER3330
00435 372* C PRESSURE AND DENSITY THER3340
00435 373* C THER3350
00436 374* TEMP = TEMP1 * (1.+A+U+AB) * TEMP2 * (B+AB) - TEMP3 * (A+AC) THER3360
00436 375* + TEMP4 * AC THER3370
00437 376* GO TO 220 THER3380
00437 377* C THER3390
00440 378* 200 CONTINUE THER3400
00441 379* IERR = 1 THER3410
00442 380* 210 CONTINUE THER3420
00443 381* TEMP = 0. THER3430
00443 382* C THER3440
00444 383* 220 CONTINUE THER3450
00444 384* C THER3460
00445 385* OPTD = TEMP THER3470
00445 386* C THER3480
00446 387* RETURN THER3490
00446 388* C THER3500
00446 389* C DENSITY IS OUT OF RANGE THER3510
00446 390* C THER3620
00447 391* 245 IDFLAG = 1 THER3630
00450 392* 250 WRITE (16,280)D
00453 393* GO TO 200 THER3640
THER3650

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00453 394* C
00454 395* 260 FORMAT (' PRESSURE IS OUT OF RANGE',E15.8)
00455 396* 270 FORMAT (' TEMPERATURE IS OUT OF RANGE',E15.6)
00456 397* 280 FORMAT (' DENSITY IS OUT OF RANGE',E15.8)
00457 398* 290 FORMAT ('H+,T47,12HEVALUATE AT ,E15.8)
00460 399* 300 FORMAT ('H ,46HDENSITY COMPUTED FROM IDEAL GAS EQUATION PTD = ,
00460 400* 1 3E15.8 )
00460 401* C
00461 402* END

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THER3690
THER3690
THER3690
THER3690
THER3700
THER3710

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END OF UNIVAC 1108 FORTRAN V COMPILATION.
THERM SYMBOLIC
THERM CODE RELOCATABLE
FOR,= TPOCB1,TPOCB1

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D *DIAGNOSTIC* MESSAGE(S)

02 JUL 71	17:51:21	0	01736746	14	402	(DELETED)
02 JUL 71	17:51:21	1	01751742	72	1	(DELETED)
		0	01752052	14	81	

3.2.55 TPOCB 1

FOR, TPOCB1,TPOCB1
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:21

31 AUG 71

9:28:21.414

BLOCK DATA

STORAGE USED (BLOCK, NAME, LENGTH)

0003 TPCB 021661

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 I 000000 I5	0000 I 000001 J	0003 R 000000 TPCB	0003 R 000360 UA	0003 R 000400 UB
0003 R 000523 U1	0003 R 003203 U2	0003 R 005663 U3	0003 R 010343 U4	0003 R 013023 U5
0003 R 015503 U6				

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00100	1*	CD	*****	TP010010
00100	2*	CD		TP010020
00100	3*	CD		TP010030
00100	4*	CD	PROGRAMMER AND DATE	TP010040
00100	5*	CD	J. I. PREWITT	TP010050
00100	6*	CD	DECEMBER 1970	TP010060
00100	7*	CD		TP010070
00100	8*	CD	PURPOSE	TP010080
00100	9*	CD	INITIALIZATION OF WEBER'S THERMODYNAMIC PROPERTIES OF	TP010090
00100	10*	CD	OXYGEN.	TP010100
00100	11*	CD		TP010110
00100	12*	CD	USAGE	TP010120
00100	13*	CD	BLOCK DATA	TP010130
00100	14*	CD		TP010140
00100	15*	CD	DESCRIPTION OF PARAMETERS	TP010150
00100	16*	CD		TP010160
00100	17*	CD	INPUT	TP010170
00100	18*	CD	NONE	TP010180
00100	19*	CD		TP010190
00100	20*	CD		TP010200
00100	21*	CD	OUTPUT	TP010210
00100	22*	CD	CALLING SEQUENCE	TP010220
00100	23*	CD	NONE	TP010230
00100	24*	CD	COMMON	TP010240
00100	25*	CD	UA - PRESSURE ARRAY - PSIA	TP010250
00100	26*	CD	UB - TEMPERATURE ARRAY - O R	TP010260
00100	27*	CD	U1 - DENSITY ARRAY - LBM/FT**3	TP010270
00100	28*	CD	U2 - ISOTHERM DERIVATIVE ARRAY - PSIA/LBM/FT**3	TP010280
00100	29*	CD	U3 - ISOCHORE DERIVATIVE ARRAY - PSIA/O R	TP010290
00100	30*	CD	U4 - ENTHALPHY ARRAY - BTU/LBM	TP010300
00100	31*	CD	U5 - SPECIFIC HEAT FOR CONSTANT VOLUME - BTU/LBM/O R	TP010310
00100	32*	CD	U6 - SPECIFIC HEAT FOR CONSTANT PRESSURE - BTU/LBM/O R	TP010320
00100	33*	CD		TP010330
00100	34*	CD	REMARKS AND RESTRICTIONS	TP010340
00100	35*	CD	THIS BLOCK DATA ROUTINE IS INITIALIZED EVERY TIME THE	TP010350
00100	36*	CD	SUBPROGAM THERM IS LOADED INTO CORE.	TP010360

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00100 37* CD TP010400
00100 38* CD SUBPROGRAMS INDEXED TP010410
00100 39* CD NONE TP010420
00100 40* CD TP010400
00100 41* CD METHOD TP010410
00100 42* CD REFERENCE TP010420
00100 43* CD NBS REPORT 9710A, THERMODYNAMIC AND RELATED TP010430
00100 44* CD PROPERTIES OF OXYGEN FROM THE TRIPLE POINT TP010440
00100 45* CD TO 300 O K AT PRESSURES TO 300 ATMOSPHERES, TP010450
00100 46* CD BY L. A. WEBER, 29 AUGUST 1968. TP010460
00100 47* CD TP010470
00100 48* CD TP010480
00101 49* BLOCK DATA TP010490
00101 50* C TP010500
00102 51* DIMENSION UA(16), UB(83)
00103 52* DIMENSION U1(83,16), U2(83,16), U3(83,16)
00103 53* , U4(83,16), U5(83,16), U6(83,16)
00103 54* C
00104 55* COMMON / TPCB / TPCB(9137)
00104 56* C
00105 57* EQUIVALENCE ( TPCB( 241) , UA )
00106 58* EQUIVALENCE ( TPCB( 257) , UB )
00107 59* EQUIVALENCE ( TPCB( 340) , U1 )
00110 60* EQUIVALENCE ( TPCB(1668) , U2 )
00111 61* EQUIVALENCE ( TPCB(2996) , U3 )
00112 62* EQUIVALENCE ( TPCB(4324) , U4 )
00113 63* EQUIVALENCE ( TPCB(5652) , U5 )
00114 64* EQUIVALENCE ( TPCB(6980) , U6 )
00114 65* C TP010620
00114 66* C TP010630
00114 67* C TP010640
00114 68* C TP010650
00114 69* C TEMPERATURE RANGE FOR DENSITY, ISOTHERM DERIVATIVE, TP010660
00114 70* C ISOCHORE DERIVATIVE, ENTHALPHY, SPECIFIC HEAT FOR TP010670
00114 71* C CONSTANT VOLUME AND CONSTANT PRESSURE TP010680
00114 72* C TP010690
00115 73* DATA UB / TP010700
00115 74* * 100.00000, 105.00000, 110.00000, 115.00000, 120.00000, TP010710
00115 75* * 125.00000, 130.00000, 135.00000, 140.00000, 145.00000, TP010720
00115 76* * 150., 155., 160., 0210504513615, 0210504513616, 165., 170.,
00115 77* * 175.00000, 180.00000, 185.00000, 190.00000, 195.00000, TP010740
00115 78* * 200.00000, 205.00000, 210.00000, 215.00000, 220.00000, TP010750
00115 79* * 225., 0210712065176, 0210712065177, 230., 235.,
00115 80* * 0210736722743, 0210736722743, 240., 245.,
00115 81* * 0210760202030, 0210760202031, 250.00000, 255.00000,
00115 82* * 0210777172702, 0210777172703, 260.00000, 0211406173716,
00115 83* * 0211406173717, 265.00000, 0211414134530,
00115 84* * 0211414134531, 270., 0211421435544, 0211421435545, 275., TP010780
00115 85* * 0211426350754, 0211426350755, 280., 285.00, 290.00000, TP010790
00115 86* * 295.00000, 300.00000, 310.00000, 320.00000, 330.00000, TP010800
00115 87* * 340.00000, 350.00000, 360.00000, 370.00000, 380.00000, TP010810
00115 88* * 390.00000, 400.00000, 410.00000, 420.00000, 430.00000, TP010820
00115 89* * 440.00000, 450.00000, 460.00000, 470.00000, 480.00000, TP010830
00115 90* * 490.00000, 500.00000, 510.00000, 520.00000, 530.00000, TP010840
00115 91* * 540.00000/ TP010850
00115 92* C TP010860
00115 93* C TP010870
00115 94* C

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00115 95° C
00115 96° C PRESSURE - PSIA
00115 97° C
00117 98° DATA UA(1) / 14.696 /
00117 99° C
00117 100° C DENSITY - LB/CU FT - FOR 14.696 PSIA
00117 101° C
00121 102° DATA (U1(J, 1), J=1, 83) /
00121 103° * 81.23477, 80.45052, 79.68127, 78.92660, 78.18608,
00121 104° * 77.39938, 76.56968, 75.75758, 74.96252, 74.12898,
00121 105° * 73.31378, 72.46377, 71.63324, 71.22507, 27938,
00121 106° * .27439, .26555, .25732, .24961, .24238,
00121 107° * .23558, .22918, .22313, .21740, .21197,
00121 108° * .20682, .20193, .19726, .19673, .19673,
00121 109° * .19282, .18858, .18495, .18495, .18452,
00121 110° * .18064, .17830, .17830, .17692, .17336,
00121 111° * .17293, .17293, .16994, .16845, .16845,
00121 112° * .16666, .16464, .16464, .16350, .16133,
00121 113° * .16133, .16047, .15843, .15843, .15754,
00121 114° * .15472, .15201, .14938, .14685, .14204,
00121 115° * .13754, .13332, .12935, .12561, .12209,
00121 116° * .11876, .11561, .11262, .10978, .10708,
00121 117° * .10452, .10207, .09974, .09751, .09538,
00121 118° * .09334, .09139, .08951, .08772, .08599,
00121 119° * .08433, .08273, .08120/
00121 120° C
00121 121° C ISOTHERM DERIVATIVE - ALL VALUES SET TO ZERO
00121 122° C
00123 123° DATA (U2(J, 1), J=1, 83) / 83.0. /
00123 124° C
00123 125° C ISOCHORE DERIVATIVE - ALL VALUES SET TO ZERO
00123 126° C
00125 127° DATA (U3(J, 1), J=1, 83) / 83.0. /
00125 128° C
00125 129° C ENTHALPY - BTU/LB - FOR 14.696 PSIA
00125 130° C
00127 131° DATA (U4(J, 1), J=1, 83) /
00127 132° * -82.272, -80.285, -78.298, -76.310, -74.321,
00127 133° * -72.332, -70.341, -68.347, -66.350, -64.350,
00127 134° * -62.344, -60.333, -58.315, -57.374, 34.153,
00127 135° * 34.767, 35.909, 37.046, 38.179, 39.307,
00127 136° * 40.432, 41.554, 42.673, 43.790, 44.904,
00127 137° * 46.017, 47.128, 48.237, 49.134, 49.134,
00127 138° * 49.344, 50.451, 51.436, 51.436, 51.556,
00127 139° * 52.660, 53.349, 53.349, 53.762, 54.864,
00127 140° * 55.000, 55.000, 55.965, 56.459, 56.459,
00127 141° * 57.066, 57.765, 57.765, 58.165, 58.947,
00127 142° * 58.947, 59.264, 60.023, 60.023, 60.362,
00127 143° * 61.460, 62.557, 63.654, 64.750, 66.941,
00127 144° * 69.130, 71.318, 73.505, 75.691, 77.877,
00127 145° * 80.062, 82.246, 84.430, 86.614, 88.798,
00127 146° * 90.982, 93.166, 95.351, 97.536, 99.722,
00127 147° * 101.909, 104.096, 106.285, 108.475, 110.666,
00127 148° * 112.859, 115.053, 117.249 /
00127 149° C
00127 150° C SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 14.696 PSIA
00127 151° C
00131 152° DATA (U5(J, 1), J=1, 83) /

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00131	153*	0.264	0.260	0.256	0.252	0.248
00131	154*	0.244	0.241	0.237	0.234	0.231
00131	155*	0.228	0.225	0.222	0.221	0.159
00131	156*	0.159	0.158	0.158	0.158	0.158
00131	157*	0.157	0.157	0.157	0.157	0.157
00131	158*	0.157	0.157	0.156	0.156	0.156
00131	159*	0.156	0.156	0.156	0.156	0.156
00131	160*	0.156	0.156	0.156	0.156	0.156
00131	161*	0.156	0.156	0.156	0.156	0.156
00131	162*	0.156	0.156	0.156	0.156	0.156
00131	163*	0.156	0.156	0.156	0.156	0.156
00131	164*	0.156	0.156	0.156	0.156	0.156
00131	165*	0.156	0.156	0.156	0.156	0.156
00131	166*	0.156	0.156	0.156	0.156	0.156
00131	167*	0.156	0.156	0.156	0.156	0.156
00131	168*	0.156	0.156	0.156	0.157	0.157
00131	169*	0.157	0.157	0.157 /		

C
C

SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM O R - 14.696 PSIA

00133	172*	DATA (U6(J,1),J=1,83) /				
00133	173*	0.398	0.397	0.397	0.398	0.398
00133	174*	0.398	0.398	0.399	0.400	0.400
00133	175*	0.402	0.403	0.404	0.405	0.230
00133	176*	0.229	0.228	0.227	0.226	0.225
00133	177*	0.225	0.224	0.224	0.223	0.223
00133	178*	0.222	0.222	0.222	0.221	0.221
00133	179*	0.221	0.221	0.221	0.221	0.221
00133	180*	0.221	0.221	0.221	0.220	0.220
00133	181*	0.220	0.220	0.220	0.220	0.220
00133	182*	0.220	0.220	0.220	0.220	0.220
00133	183*	0.220	0.220	0.220	0.220	0.220
00133	184*	0.219	0.219	0.219	0.219	0.219
00133	185*	0.219	0.219	0.219	0.219	0.219
00133	186*	0.218	0.218	0.218	0.218	0.218
00133	187*	0.218	0.218	0.218	0.219	0.219
00133	188*	0.219	0.219	0.219	0.219	0.219
00133	189*	0.219	0.220	0.220 /		

C
C

.....
PRESSURE - PSIA

C
C

DATA UA(2) / 220.440 /

C
C

DENSITY - LB/CU FT - FOR 220.440 PSIA

00137	198*	DATA (U1(J, 2),J=1,83) /				
00137	199*	81.36696	80.58018	79.80846	79.05138	78.30853
00137	200*	77.51938	76.68712	75.93014	75.13148	74.29420
00137	201*	73.47538	72.67442	71.83908	71.47963	71.47963
00137	202*	70.97232	70.07709	69.20415	68.30601	67.38544
00137	203*	66.44518	65.48788	64.47453	63.41154	62.34414
00137	204*	61.19951	60.02401	58.75441	57.67013	56.68881
00137	205*	3.65591	3.49711	3.37302	3.37302	3.35841
00137	206*	3.23530	3.16526	3.16526	3.12471	3.02435
00137	207*	3.01268	3.01268	2.93255	2.89402	2.89402
00137	208*	2.84795	2.79754	2.79759	2.76962	2.71739
00137	209*	2.71739	2.69673	2.64936	2.64936	2.62867
00137	210*	2.56476	2.50470	2.44798	2.39435	2.29516

210

00137 211* * 2.20527, 2.12323, 2.04801, 1.97859, 1.91435,
 00137 212* * 1.85460, 1.79885, 1.74669, 1.69774, 1.65169,
 00137 213* * 1.60829, 1.56725, 1.52842, 1.49160, 1.45662,
 00137 214* * 1.42335, 1.39163, 1.36138, 1.33248, 1.30484,
 00137 215* * 1.27838, 1.25301, 1.22867/

C
C
C

ISOTHERM DERIVATIVE - ALL VALUES SET TO ZERO

DATA (U2(J, 2),J=1,83) / 83*0. /

C
C

ISOCHORE DERIVATIVE - ALL VALUES SET TO ZERO

DATA (U3(J, 2),J=1,83) / 83*0. /

C
C
C

ENTHALPY - BTU/LB - FOR 220.440 PSIA

DATA (U4(J,2),J=1,83) /

00145 227* *
 00145 228* * -81.892, -79.906, -77.921, -75.936, -73.951,
 00145 229* * -71.965, -69.977, -67.988, -65.996, -64.001,
 00145 230* * -62.001, -59.997, -57.986, -57.048, -57.048,
 00145 231* * -55.968, -53.942, -51.905, -49.856, -47.792,
 00145 232* * -45.711, -43.609, -41.483, -39.328, -37.138,
 00145 233* * -34.906, -32.621, -30.271, -28.306, 40.081,
 00145 234* * 40.414, 42.109, 43.545, 43.545, 43.720,
 00145 235* * 45.267, 46.201, 46.201, 46.762, 48.215,
 00145 236* * 48.391, 48.391, 49.632, 50.254, 50.254,
 00145 237* * 51.019, 51.886, 51.886, 52.381, 53.334,
 00145 238* * 53.334, 53.721, 54.633, 54.633, 55.041,
 00145 239* * 56.344, 57.632, 58.907, 60.170, 62.664,
 00145 240* * 65.123, 67.552, 69.955, 72.337, 74.701,
 00145 241* * 77.048, 79.382, 81.703, 84.014, 86.315,
 00145 242* * 88.609, 90.894, 93.174, 95.448, 97.716,
 00145 243* * 99.981, 102.242, 104.500, 106.755, 109.008,
 00145 244* * 111.259, 113.509, 115.758/

C
C
C

SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 220.440 PSIA

DATA (U5(J,2),J=1,83) /

00147 248* *
 00147 249* * 0.264, 0.260, 0.256, 0.252, 0.248,
 00147 250* * 0.244, 0.241, 0.238, 0.235, 0.231,
 00147 251* * 0.229, 0.226, 0.223, 0.222, 0.222,
 00147 252* * 0.221, 0.218, 0.216, 0.213, 0.211,
 00147 253* * 0.209, 0.207, 0.205, 0.203, 0.201,
 00147 254* * 0.200, 0.198, 0.197, 0.195, 0.185,
 00147 255* * 0.185, 0.181, 0.178, 0.178, 0.178,
 00147 256* * 0.175, 0.173, 0.173, 0.173, 0.172,
 00147 257* * 0.172, 0.172, 0.170, 0.169, 0.169,
 00147 258* * 0.169, 0.168, 0.168, 0.168, 0.167,
 00147 259* * 0.167, 0.167, 0.166, 0.166, 0.166,
 00147 260* * 0.165, 0.164, 0.163, 0.163, 0.162,
 00147 261* * 0.161, 0.160, 0.160, 0.159, 0.159,
 00147 262* * 0.159, 0.158, 0.158, 0.158, 0.158,
 00147 263* * 0.158, 0.158, 0.157, 0.157, 0.157,
 00147 264* * 0.157, 0.157, 0.157, 0.157, 0.158,
 00147 265* * 0.158, 0.158, 0.158/

C
C
C

SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM O R - 220.440 PSIA

00147 268* C


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00151 269* DATA (U6(J,2),J=1,83) /
00151 270* * 0.397, 0.397, 0.397, 0.397, 0.397,
00151 271* * 0.397, 0.398, 0.398, 0.399, 0.399,
00151 272* * 0.400, 0.401, 0.403, 0.403, 0.403,
00151 273* * 0.404, 0.406, 0.409, 0.411, 0.414,
00151 274* * 0.418, 0.423, 0.428, 0.434, 0.442,
00151 275* * 0.451, 0.463, 0.477, 0.492, 0.353,
00151 276* * 0.349, 0.330, 0.317, 0.317, 0.315,
00151 277* * 0.304, 0.298, 0.298, 0.298, 0.287,
00151 278* * 0.286, 0.286, 0.280, 0.278, 0.278,
00151 279* * 0.275, 0.272, 0.272, 0.270, 0.267,
00151 280* * 0.267, 0.266, 0.263, 0.263, 0.262,
00151 281* * 0.259, 0.256, 0.254, 0.251, 0.248,
00151 282* * 0.244, 0.242, 0.239, 0.237, 0.236,
00151 283* * 0.234, 0.233, 0.232, 0.231, 0.230,
00151 284* * 0.229, 0.228, 0.228, 0.227, 0.227,
00151 285* * 0.226, 0.226, 0.226, 0.225, 0.225,
00151 286* * 0.225, 0.225, 0.225/
00151 287*

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C
00151 288* C*****
00151 289* C PRESSURE - PSIA
00151 290* C

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00153 291* DATA UA(3) / 293.920 /
00153 292* C
00153 293* C DENSITY - LB/CU FT - FOR 293.920 PSIA

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00153 294* C
00155 295* DATA (U1(J,3),J=1,83) /
00155 296* * 81.36696, 80.64516, 79.87220, 79.11392, 78.30853,
00155 297* * 77.51938, 76.74597, 75.98784, 75.18797, 74.34944,
00155 298* * 73.52941, 72.72727, 71.89073, 71.53076, 71.53076,
00155 299* * 71.02273, 70.17544, 69.30007, 68.39945, 67.47638,
00155 300* * 66.53360, 65.57377, 64.59948, 63.57279, 62.50000,
00155 301* * 61.38735, 60.20470, 58.96226, 57.90388, 57.90388,
00155 302* * 57.63689, 56.21135, 54.82456, 5.02563, 4.99476,
00155 303* * 4.74046, 4.60405, 4.60405, 4.52591, 4.34047,
00155 304* * 4.31947, 4.31947, 4.17728, 4.11049, 4.11049,
00155 305* * 4.03128, 3.94649, 3.94649, 3.89955, 3.84438,
00155 306* * 3.84438, 3.77958, 3.70274, 3.70274, 3.66946,
00155 307* * 3.56773, 3.47331, 3.38535, 3.30284, 3.15259,
00155 308* * 3.01832, 2.89746, 2.78769, 2.68738, 2.59518,
00155 309* * 2.51004, 2.43108, 2.35760, 2.28891, 2.22460,
00155 310* * 2.16413, 2.10722, 2.05351, 2.00268, 1.95454,
00155 311* * 1.90840, 1.86532, 1.82395, 1.78447, 1.74676,
00155 312* * 1.71072, 1.67622, 1.64314/

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00155 313* C
00155 314* C ISOTHERM DERIVATIVE - ALL VALUES SET TO ZERO
00155 315* C

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00157 316* DATA (U2(J,3),J=1,83) / 83.00 /
00157 317* C
00157 318* C ISOCHORE DERIVATIVE - ALL VALUES SET TO ZERO
00157 319* C

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00161 320* DATA (U3(J,3),J=1,83) / 83.00 /
00161 321* C
00161 322* C ENTHALPY - BTU/LB - FOR 293.920 PSIA
00161 323* C

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00163 324* DATA (U4(J,3),J=1,83) /
00163 325* * -81.756, -79.771, -77.787, -75.803, -73.819,
00163 326* * -71.834, -69.848, -67.860, -65.869, -63.876,

```

00163	327*	*	-61.878,	-59.876,	-57.868,	-56.931,	-56.931,
00163	328*	*	-55.853,	-53.830,	-51.797,	-49.752,	-47.693,
00163	329*	*	-45.618,	-43.523,	-41.405,	-39.260,	-37.082,
00163	330*	*	-34.863,	-32.596,	-30.268,	-28.319,	-26.319,
00163	331*	*	-27.864,	-25.340,	-22.986,	39.526,	39.749,
00163	332*	*	41.699,	42.832,	42.832,	43.511,	45.221,
00163	333*	*	45.423,	45.423,	46.854,	47.558,	47.558,
00163	334*	*	48.424,	49.390,	49.390,	49.943,	50.995,
00163	335*	*	50.995,	51.421,	52.417,	52.417,	52.863,
00163	336*	*	54.276,	55.662,	57.026,	58.370,	61.007,
00163	337*	*	63.587,	66.122,	68.619,	71.083,	73.520,
00163	338*	*	75.934,	78.328,	80.704,	83.064,	85.412,
00163	339*	*	87.747,	90.072,	92.387,	94.695,	96.995,
00163	340*	*	99.289,	101.577,	103.861,	106.140,	108.416,
00163	341*	*	110.689,	112.959,	115.227/		

C
C
C

SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 293.920 PSIA

00165	345*		DATA (U6(J,3),J=1,83)	/			
00165	346*	*	0.265,	0.260,	0.256,	0.252,	0.248,
00165	347*	*	0.245,	0.241,	0.238,	0.235,	0.232,
00165	348*	*	0.229,	0.226,	0.223,	0.222,	0.222,
00165	349*	*	0.221,	0.218,	0.216,	0.214,	0.211,
00165	350*	*	0.209,	0.207,	0.205,	0.203,	0.202,
00165	351*	*	0.200,	0.198,	0.197,	0.195,	0.195,
00165	352*	*	0.195,	0.198,	0.197,	0.193,	0.192,
00165	353*	*	0.187,	0.187,	0.187,	0.183,	0.180,
00165	354*	*	0.179,	0.179,	0.177,	0.176,	0.176,
00165	355*	*	0.175,	0.174,	0.174,	0.173,	0.172,
00165	356*	*	0.172,	0.171,	0.170,	0.170,	0.170,
00165	357*	*	0.169,	0.168,	0.167,	0.166,	0.164,
00165	358*	*	0.163,	0.162,	0.162,	0.161,	0.160,
00165	359*	*	0.160,	0.159,	0.159,	0.159,	0.158,
00165	360*	*	0.158,	0.158,	0.158,	0.158,	0.158,
00165	361*	*	0.158,	0.158,	0.158,	0.158,	0.158,
00165	362*	*	0.158,	0.158,	0.158/		

C
C
C

SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM O R - 293.920 PSIA

00167	366*		DATA (U6(J,3),J=1,83)	/			
00167	367*	*	0.397,	0.397,	0.397,	0.397,	0.397,
00167	368*	*	0.397,	0.397,	0.398,	0.398,	0.399,
00167	369*	*	0.400,	0.401,	0.402,	0.403,	0.403,
00167	370*	*	0.404,	0.406,	0.408,	0.410,	0.413,
00167	371*	*	0.417,	0.421,	0.426,	0.432,	0.439,
00167	372*	*	0.448,	0.459,	0.472,	0.485,	0.485,
00167	373*	*	0.489,	0.519,	0.545,	0.412,	0.407,
00167	374*	*	0.375,	0.360,	0.360,	0.351,	0.334,
00167	375*	*	0.332,	0.332,	0.320,	0.315,	0.315,
00167	376*	*	0.309,	0.302,	0.302,	0.299,	0.294,
00167	377*	*	0.294,	0.292,	0.287,	0.287,	0.285,
00167	378*	*	0.280,	0.275,	0.271,	0.267,	0.261,
00167	379*	*	0.256,	0.251,	0.248,	0.245,	0.242,
00167	380*	*	0.240,	0.238,	0.237,	0.235,	0.234,
00167	381*	*	0.233,	0.232,	0.231,	0.230,	0.230,
00167	382*	*	0.229,	0.229,	0.228,	0.228,	0.227,
00167	383*	*	0.227,	0.227,	0.227/		
00167	384*	*					

C

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00167 385* C .....
00167 386* C PRESSURE PSIA
00167 387* C
00171 388* DATA UA(4) / 367.400 /
00171 389* C
00171 390* C DENSITY - LB/CU FT - FOR 367.400 PSIA
00171 391* C
00173 392* DATA (U1(J, 4), J=1, 83) /
00173 393* * 81.43322, 80.64516, 79.87220, 79.11392, 78.36991,
00173 394* * 77.57952, 76.80491, 76.04553, 75.24454, 74.40476,
00173 395* * 73.63770, 72.78020, 71.94245, 71.56192, 71.56192,
00173 396* * 71.12375, 70.27407, 69.39625, 68.49315, 67.56757,
00173 397* * 66.66667, 65.70302, 64.72492, 63.69427, 62.61741,
00173 398* * 61.53846, 60.38647, 59.17160, 58.11708, 58.11708,
00173 399* * 57.87037, 56.46527, 55.13737, 55.13737, 54.97526,
00173 400* * 53.27650, 52.11047, 6.48971, 6.32831, 5.96338,
00173 401* * 5.92487, 5.92487, 5.66572, 5.55001, 5.55001,
00173 402* * 5.41389, 5.27315, 5.27315, 5.19588, 5.05740,
00173 403* * 5.05740, 5.00350, 4.88329, 4.88329, 4.83138,
00173 404* * 4.67574, 4.53412, 4.40393, 4.28357, 4.06785,
00173 405* * 3.87883, 3.71085, 3.56024, 3.42395, 3.29979,
00173 406* * 3.19091, 3.08090, 2.98374, 2.89335, 2.80907,
00173 407* * 2.73015, 2.65611, 2.58645, 2.52073, 2.45857,
00173 408* * 2.39969, 2.34384, 2.29079, 2.24024, 2.19202,
00173 409* * 2.14601, 2.10203, 2.05994/
00173 410* C
00173 411* C ISOTHERM DERIVATIVE - ALL VALUES SET TO ZERO
00173 412* C
00175 413* C DATA (U2(J, 4), J=1, 83) / 83*0. /
00175 414* C
00175 415* C ISOCHORE DERIVATIVE - ALL VALUES SET TO ZERO
00175 416* C
00177 417* C DATA (U3(J, 4), J=1, 83) / 83*0. /
00177 418* C
00177 419* C ENTHALPY - BTU/LB - FOR 367.400 PSIA
00177 420* C
00201 421* DATA (U4(J, 4), J=1, 83) /
00201 422* * -81.619, -79.636, -77.653, -75.670, -73.686,
00201 423* * -71.702, -69.718, -67.731, -65.742, -63.751,
00201 424* * -61.755, -59.755, -57.750, -56.815, -56.815,
00201 425* * -55.738, -53.718, -51.683, -49.648, -47.594,
00201 426* * -45.524, -43.436, -41.326, -39.190, -37.022,
00201 427* * -34.817, -32.567, -30.260, -28.334, -28.334,
00201 428* * -27.883, -25.392, -23.078, -23.078, -22.796,
00201 429* * -20.040, -18.209, 38.508, 39.402, 41.597,
00201 430* * 41.797, 41.797, 43.592, 43.792, 43.792,
00201 431* * 43.447, 45.561, 46.561, 47.199, 47.399,
00201 432* * 47.399, 48.870, 49.980, 49.980, 50.477,
00201 433* * 52.033, 53.543, 55.017, 56.459, 59.266,
00201 434* * 61.988, 64.642, 67.242, 69.797, 72.314,
00201 435* * 74.799, 77.257, 79.691, 82.104, 84.499,
00201 436* * 86.879, 89.244, 91.597, 93.939, 96.272,
00201 437* * 98.596, 100.912, 103.222, 105.526, 107.825,
00201 438* * 110.119, 112.410, 114.697/
00201 439* C
00201 440* C SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 367.400 PSIA
00201 441* C
00203 442* C DATA (U5(J, 4), J=1, 83)

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214

00203	443*	°	.265,	.260,	.256,	.252,	.248,
00203	444*	°	.245,	.241,	.238,	.235,	.232,
00203	445*	°	.229,	.226,	.224,	.223,	.223,
00203	446*	°	.221,	.219,	.216,	.214,	.212,
00203	447*	°	.210,	.208,	.206,	.204,	.202,
00203	448*	°	.200,	.198,	.197,	.195,	.195,
00203	449*	°	.195,	.198,	.197,	.197,	.197,
00203	450*	°	.196,	.196,	.201,	.198,	.191,
00203	451*	°	.190,	.190,	.187,	.185,	.185,
00203	452*	°	.183,	.181,	.181,	.180,	.178,
00203	453*	°	.178,	.177,	.176,	.176,	.175,
00203	454*	°	.173,	.172,	.170,	.169,	.167,
00203	455*	°	.165,	.164,	.163,	.162,	.162,
00203	456*	°	.161,	.160,	.160,	.160,	.159,
00203	457*	°	.159,	.159,	.159,	.158,	.158,
00203	458*	°	.158,	.158,	.158,	.158,	.158,
00203	459*	°	.158,	.158,	.158/		

C
C
C

SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM O R - 367.400 PSIA

00205	463*	°	DATA (U6(J, 4), J=1,83) /				
00205	464*	°	.397,	.397,	.397,	.397,	.397,
00205	465*	°	.397,	.397,	.397,	.398,	.399,
00205	466*	°	.399,	.400,	.402,	.402,	.402,
00205	467*	°	.403,	.405,	.407,	.409,	.412,
00205	468*	°	.416,	.420,	.424,	.430,	.437,
00205	469*	°	.445,	.455,	.467,	.561,	.561,
00205	470*	°	.583,	.509,	.529,	.529,	.532,
00205	471*	°	.571,	.603,	.490,	.465,	.416,
00205	472*	°	.412,	.412,	.384,	.373,	.373,
00205	473*	°	.360,	.349,	.349,	.342,	.331,
00205	474*	°	.331,	.327,	.319,	.319,	.316,
00205	475*	°	.306,	.298,	.292,	.286,	.276,
00205	476*	°	.279,	.263,	.258,	.253,	.250,
00205	477*	°	.247,	.245,	.242,	.240,	.239,
00205	478*	°	.237,	.236,	.235,	.234,	.233,
00205	479*	°	.232,	.231,	.231,	.230,	.230,
00205	480*	°	.229,	.229,	.229/		

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C

PRESSURE - PSIA

00205	485*	°	DATA UA(5) / 440.880 /				
00207	486*	°	DENSITY - LB/CU FT - FOR 440.880 PSIA				
00207	487*	°	DENSITY - LB/CU FT - FOR 440.880 PSIA				
00207	488*	°	DENSITY - LB/CU FT - FOR 440.880 PSIA				
00207	489*	°	DENSITY - LB/CU FT - FOR 440.880 PSIA				

C

00211	490*	°	DATA (U1(J, 5), J=1,83) /				
00211	491*	°	81.43322,	80.71025,	79.93605,	79.17656,	78.43137,
00211	492*	°	77.63975,	76.86395,	76.04563,	75.30120,	74.46016,
00211	493*	°	73.69197,	72.83321,	72.04611,	71.64093,	71.64093,
00211	494*	°	71.17438,	70.32349,	69.44444,	68.96552,	67.65900,
00211	495*	°	66.75567,	65.78947,	64.80881,	63.81621,	62.77464,
00211	496*	°	61.69031,	60.56935,	59.38242,	58.34781,	58.34781,
00211	497*	°	58.10575,	56.75369,	55.46683,	55.46683,	55.30973,
00211	498*	°	53.67686,	52.52101,	52.52101,	51.92108,	49.70179,
00211	499*	°	49.40711,	8.13387,	7.58956,	7.37786,	7.37786,
00211	500*	°	7.11744,	6.87783,	6.87783,	6.74082,	6.51702,

FORM 100B1, 100C1

00211	501*	°	6.51702,	6.42632,	6.24014,	6.24014,	6.15688,
00211	502*	°	5.92101,	5.81135,	5.52303,	5.35160,	5.05102,
00211	503*	°	4.79294,	4.6788,	4.36872,	4.19041,	4.02950,
00211	504*	°	3.88304,	3.74897,	3.62555,	3.51148,	3.40541,
00211	505*	°	3.30655,	3.21409,	3.12735,	3.04572,	2.96877,
00211	506*	°	2.89603,	2.82717,	2.76182,	2.69971,	2.65463,
00211	507*	°	2.56418,	2.53036,	2.47893/		

C
C

ISOTHERM DERIVATIVE - ALL VALUES SET TO ZERO

00211	510*						
00213	511*	DATA	(U2(J, 5), J=1, 83)	/	83*0.	/	

C
C

ISOCHORE DERIVATIVE - ALL VALUES SET TO ZERO

00213	512*						
00213	513*						
00213	514*						
00215	515*	DATA	(U3(J, 5), J=1, 83)	/	83*0.	/	

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C

ENTHALPY - BTU/LB - FOR 440.880 PSIA

00215	516*						
00215	517*						
00215	518*						
00217	519*	DATA	(U4(J, 5), J=1, 83)	/		/	
00217	520*	°	-81.483,	-79.500,	-77.513,	-75.536,	-73.554,
00217	521*	°	-71.571,	-69.587,	-67.602,	-65.615,	-63.625,
00217	522*	°	-61.632,	-59.634,	-57.631,	-56.697,	-56.697,
00217	523*	°	-55.622,	-53.605,	-51.579,	-49.543,	-47.494,
00217	524*	°	-45.429,	-43.348,	-41.245,	-39.117,	-36.961,
00217	525*	°	-34.768,	-32.533,	-30.246,	-28.339,	-28.339,
00217	526*	°	-27.893,	-25.434,	-23.090,	-23.090,	-22.804,
00217	527*	°	-20.192,	-18.395,	-18.395,	-17.313,	-14.134,
00217	528*	°	-13.709,	27.050,	39.477,	39.677,	39.677,
00217	529*	°	41.565,	43.115,	43.115,	44.002,	44.202,
00217	530*	°	44.202,	45.968,	47.242,	47.242,	47.812,
00217	531*	°	49.562,	51.237,	52.852,	54.418,	57.429,
00217	532*	°	60.316,	63.107,	65.882,	68.447,	71.081,
00217	533*	°	73.643,	76.169,	78.664,	81.132,	83.578,
00217	534*	°	86.003,	88.411,	90.803,	93.181,	95.546,
00217	535*	°	97.001,	100.246,	102.503,	104.912,	107.234,
00217	536*	°	109.551,	111.862,	114.169/		

C
C

SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 440.880 PSIA

00217	539*						
00221	540*	DATA	(U5(J, 5), J=1, 83)	/		/	
00221	541*	°	.265,	.260,	.256,	.252,	.249,
00221	542*	°	.245,	.242,	.238,	.235,	.232,
00221	543*	°	.229,	.226,	.224,	.223,	.223,
00221	544*	°	.221,	.219,	.216,	.214,	.212,
00221	545*	°	.210,	.208,	.206,	.204,	.202,
00221	546*	°	.200,	.198,	.197,	.195,	.195,
00221	547*	°	.195,	.193,	.197,	.197,	.197,
00221	548*	°	.196,	.196,	.196,	.196,	.198,
00221	549*	°	.198,	.200,	.200,	.197,	.197,
00221	550*	°	.193,	.190,	.190,	.188,	.185,
00221	551*	°	.185,	.184,	.182,	.182,	.181,
00221	552*	°	.178,	.176,	.174,	.172,	.170,
00221	553*	°	.169,	.166,	.165,	.164,	.163,
00221	554*	°	.162,	.161,	.161,	.160,	.160,
00221	555*	°	.160,	.159,	.159,	.159,	.159,
00221	556*	°	.159,	.158,	.158,	.158,	.158,
00221	557*	°	.158,	.158,	.158/		
00221	558*						

C

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00221 559° C SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM D R - 440.880 PSIA
 00221 560° C
 00223 561° DATA (U6(J, 5), J=1, 83) /
 00223 562° ° .397, .397, .396, .396, .396,
 00223 563° ° .397, .397, .397, .398, .398,
 00223 564° ° .399, .400, .401, .401, .401,
 00223 565° ° .402, .404, .406, .408, .411,
 00223 566° ° .414, .418, .423, .428, .435,
 00223 567° ° .442, .452, .463, .474, .474,
 00223 568° ° .477, .501, .520, .520, .522,
 00223 569° ° .555, .583, .583, .600, .676,
 00223 570° ° .700, .605, .511, .483, .483,
 00223 571° ° .449, .423, .423, .408, .381,
 00223 572° ° .381, .380, .365, .365, .359,
 00223 573° ° .342, .329, .318, .309, .294,
 00223 574° ° .283, .275, .268, .263, .258,
 00223 575° ° .254, .251, .240, .246, .243,
 00223 576° ° .242, .240, .238, .237, .236,
 00223 577° ° .235, .234, .233, .233, .232,
 00223 578° ° .231, .231, .230/

00223 579° C
 00223 580° C
 00223 581° C

00223 582° C PRESSURE - PSIA
 00223 583° C
 00225 584° DATA UA(6) / 514.360 /
 00225 585° C
 00225 586° C DENSITY - LB/CU FT - FOR 514.360 PSIA
 00225 587° C

00227 588° DATA (U1(J, 6), J=1, 83) /
 00227 589° ° 81.49959, 80.71025, 80.00000, 79.23930, 78.43137,
 00227 590° ° 77.70008, 76.92308, 76.10350, 75.35795, 74.51565,
 00227 591° ° 73.74631, 72.93946, 72.09805, 71.71589, 71.71589,
 00227 592° ° 71.27584, 70.42253, 69.54103, 68.68132, 67.75068,
 00227 593° ° 66.84492, 65.91958, 64.93506, 63.93862, 62.93266,
 00227 594° ° 61.84292, 60.71645, 59.55926, 58.54608, 58.54608,
 00227 595° ° 58.30904, 56.98006, 55.73807, 55.73807, 55.58644,
 00227 596° ° 54.02485, 52.93806, 52.93806, 52.30125, 50.32713,
 00227 597° ° 50.02501, 50.02501, 47.89272, 46.55493, 10.04924,
 00227 598° ° 9.46880, 8.97424, 8.97424, 8.71384, 8.51354,
 00227 599° ° 8.51354, 8.15927, 7.85053, 7.85053, 7.71962,
 00227 600° ° 7.35402, 7.04176, 6.76956, 6.52784, 6.11396,
 00227 601° ° 5.76901, 5.47375, 5.21648, 4.98927, 4.78606,
 00227 602° ° 4.60278, 4.43616, 4.28376, 4.14336, 4.01381,
 00227 603° ° 3.89332, 3.78100, 3.67607, 3.57756, 3.48493,
 00227 604° ° 3.39766, 3.31510, 3.23698, 3.16276, 3.09234,
 00227 605° ° 3.02517, 2.94121, 2.90006/

00227 606° C
 00227 607° C ISOTHERM DERIVATIVE - ALL VALUES SET TO ZERO

00231 608° C DATA (U2(J, 6), J=1, 83) / 83.0. /

00231 610° C
 00231 611° C ISOCORE DERIVATIVE - ALL VALUES SET TO ZERO

00231 612° C
 00233 613° DATA (U3(J, 6), J=1, 83) / 83.0. /

00233 614° C
 00233 615° C ENTHALPY - BTU/LB - FOR 514.360 PSIA
 00233 616° C

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		DATA (U4(J, 6), J=1, 83) /					
00235	617*	°	-81.347,	-79.365,	-77.384,	-75.402,	-73.421,
00235	618*	°	-71.440,	-69.457,	-67.474,	-65.488,	-63.500,
00235	619*	°	-61.508,	-59.513,	-57.512,	-55.580,	-53.580,
00235	620*	°	-55.506,	-53.492,	-51.470,	-49.437,	-47.393,
00235	621*	°	-45.334,	-43.258,	-41.163,	-39.044,	-36.897,
00235	622*	°	-34.717,	-32.496,	-30.228,	-28.341,	-26.391,
00235	623*	°	-27.900,	-25.467,	-23.229,	-21.229,	-19.956,
00235	624*	°	-20.321,	-18.573,	-16.573,	-14.526,	-12.493,
00235	625*	°	-14.065,	-11.065,	-11.044,	-9.270,	-7.071,
00235	626*	°	37.072,	37.272,	37.272,	40.033,	40.233,
00235	627*	°	40.223,	42.529,	42.729,	42.729,	44.750,
00235	628*	°	46.787,	48.691,	50.494,	52.217,	55.481,
00235	629*	°	58.563,	61.511,	64.357,	67.121,	69.820,
00235	630*	°	72.464,	75.063,	77.623,	80.150,	82.649,
00235	631*	°	85.122,	87.573,	90.005,	92.420,	94.819,
00235	632*	°	97.206,	99.580,	101.944,	104.298,	106.644,
00235	633*	°	108.983,	111.316,	113.642,		

C
C
C
SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 514.360 PSIA

		DATA (U5(J, 6), J=1, 83) /					
00237	638*	°	.265,	.261,	.256,	.253,	.249,
00237	639*	°	.245,	.242,	.238,	.235,	.232,
00237	640*	°	.229,	.227,	.224,	.223,	.223,
00237	641*	°	.221,	.219,	.217,	.214,	.212,
00237	642*	°	.210,	.208,	.206,	.204,	.202,
00237	643*	°	.200,	.199,	.197,	.195,	.195,
00237	644*	°	.195,	.199,	.197,	.197,	.197,
00237	645*	°	.196,	.196,	.196,	.196,	.197,
00237	646*	°	.197,	.197,	.199,	.202,	.217,
00237	647*	°	.209,	.202,	.202,	.200,	.195,
00237	648*	°	.195,	.193,	.190,	.190,	.188,
00237	649*	°	.184,	.181,	.179,	.176,	.173,
00237	650*	°	.170,	.168,	.167,	.165,	.164,
00237	651*	°	.163,	.162,	.162,	.161,	.161,
00237	652*	°	.160,	.160,	.160,	.159,	.159,
00237	653*	°	.159,	.159,	.159,	.159,	.159,
00237	654*	°	.159,	.159,	.159,		

C
C
C
SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM O R - 514.360 PSIA

		DATA (U6(J, 6), J=1, 83) /					
00241	656*	°	.397,	.396,	.396,	.396,	.396,
00241	657*	°	.396,	.397,	.397,	.397,	.398,
00241	658*	°	.399,	.399,	.401,	.401,	.401,
00241	659*	°	.402,	.404,	.405,	.408,	.410,
00241	660*	°	.413,	.417,	.421,	.426,	.432,
00241	661*	°	.440,	.448,	.459,	.470,	.470,
00241	662*	°	.472,	.494,	.509,	.509,	.511,
00241	663*	°	.542,	.565,	.565,	.579,	.636,
00241	664*	°	.651,	.651,	.759,	.840,	.799,
00241	665*	°	.664,	.583,	.583,	.536,	.488,
00241	666*	°	.488,	.468,	.438,	.438,	.424,
00241	667*	°	.393,	.370,	.352,	.338,	.316,
00241	668*	°	.301,	.289,	.280,	.273,	.267,
00241	669*	°	.262,	.258,	.254,	.251,	.249,
00241	670*	°	.246,	.244,	.242,	.241,	.239,

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00241 675.0 * .238, .237, .236, .235, .234,
00241 676.0 * .234, .233, .232/
00241 677.0 C
00241 678.0 C*****
00241 679.0 C
00241 680.0 C PRESSURE - PSIA
00241 681.0 C
00243 682.0 DATA UA(7) / 587.840 /
00243 683.0 C
00243 684.0 C DENSITY - LB/CU FT - FOR 587.840 PSIA
00243 685.0 C
00245 686.0 DATA (U1(J, 7),J=1,83) /
00245 687.0 * 81.49959, 80.77544, 80.00000, 79.23930, 78.49294,
00245 688.0 * 77.70008, 76.92308, 76.16146, 75.35795, 74.57121,
00245 689.0 * 73.80074, 72.99270, 72.15007, 71.76736, 71.76736,
00245 690.0 * 71.32668, 70.47216, 69.63788, 68.72852, 67.84260,
00245 691.0 * 66.93440, 66.00660, 65.06181, 64.06150, 63.05170,
00245 692.0 * 61.99628, 60.90134, 59.73716, 58.77347, 58.77347,
00245 693.0 * 58.54801, 57.24098, 56.01553, 56.01553, 55.86592,
00245 694.0 * 54.37738, 53.35500, 53.35500, 52.74202, 50.86470,
00245 695.0 * 50.59448, 50.59448, 48.68549, 47.42373, 47.42373,
00245 696.0 * 45.87156, 43.36513, 42.43472, 41.71097, 40.79765,
00245 697.0 * 40.79765, 40.46682, 9.89839, 9.89839, 9.66370,
00245 698.0 * 9.06454, 8.58443, 8.18398, 7.84006, 7.27326,
00245 699.0 * 6.81570, 6.43418, 6.10762, 5.82276, 5.57103,
00245 700.0 * 5.34616, 5.14324, 4.95860, 4.78973, 4.63435,
00245 701.0 * 4.49055, 4.35711, 4.23263, 4.11641, 4.00721,
00245 702.0 * 3.90442, 3.80764, 3.71609, 3.62937, 3.54711,
00245 703.0 * 3.46885, 3.39432, 3.32325/
00245 704.0 C
00245 705.0 C ISOTHERM DERIVATIVE - ALL VALUES SET TO ZERO
00245 706.0 C
00247 707.0 DATA (U2(J, 7),J=1,83) / 83.00 /
00247 708.0 C
00247 709.0 C ISOCHORE DERIVATIVE - ALL VALUES SET TO ZERO
00247 710.0 C
00251 711.0 DATA (U3(J, 7),J=1,83) / 83.00 /
00251 712.0 C
00251 713.0 C ENTHALPY - BTU/LB - FOR 587.840 PSIA
00251 714.0 C
00253 715.0 DATA (U4(J, 7),J=1,83) /
00253 716.0 * -81.211, -79.230, -77.249, -75.269, -73.289,
00253 717.0 * -71.308, -69.327, -67.345, -65.361, -63.374,
00253 718.0 * -61.385, -59.391, -57.393, -56.462, -56.462,
00253 719.0 * -55.389, -53.379, -51.360, -49.331, -47.291,
00253 720.0 * -45.237, -43.167, -41.079, -38.968, -36.831,
00253 721.0 * -34.662, -32.456, -30.205, -28.335, -28.335,
00253 722.0 * -27.898, -25.492, -23.285, -23.285, -23.016,
00253 723.0 * -20.430, -18.726, -18.726, -17.706, -14.784,
00253 724.0 * -14.385, -14.385, -11.551, -9.844, -9.844,
00253 725.0 * -7.744, -4.650, 32.316, 34.251, 36.995,
00253 726.0 * 36.995, 38.107, 40.145, 40.145, 41.057,
00253 727.0 * 43.571, 45.818, 47.885, 49.819, 53.402,
00253 728.0 * 56.719, 59.849, 62.842, 65.728, 68.530,
00253 729.0 * 71.264, 73.941, 76.570, 79.158, 81.711,
00253 730.0 * 84.234, 86.731, 89.204, 91.656, 94.091,
00253 731.0 * 96.510, 98.914, 101.305, 103.684, 106.056,
00253 732.0 * 108.417, 110.771, 113.118/

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00253 733° C
 00253 734° C
 00253 735° C
 00255 736°
 00255 737°
 00255 738°
 00255 739°
 00255 740°
 00255 741°
 00255 742°
 00255 743°
 00255 744°
 00255 745°
 00255 746°
 00255 747°
 00255 748°
 00255 749°
 00255 750°
 00255 751°
 00255 752°
 00255 753°
 00255 754° C
 00255 755° C
 00255 756° C
 00257 757°
 00257 758°
 00257 759°
 00257 760°
 00257 761°
 00257 762°
 00257 763°
 00257 764°
 00257 765°
 00257 766°
 00257 767°
 00257 768°
 00257 769°
 00257 770°
 00257 771°
 00257 772°
 00257 773°
 00257 774°
 00257 775° C
 00257 776° C
 00257 777° C
 00257 778° C
 00257 779° C
 00261 780°
 00261 781° C
 00261 782° C
 00261 783° C
 00263 784°
 00263 785°
 00263 786°
 00263 787°
 00263 788°
 00263 789°
 00263 790°

SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 587.840 PSIA

DATA (U5(J, 7), J=1,83)

0.265,	0.261,	0.257,	0.253,	0.249,
0.245,	0.242,	0.239,	0.235,	0.232,
0.230,	0.227,	0.224,	0.223,	0.223,
0.222,	0.219,	0.217,	0.215,	0.212,
0.210,	0.208,	0.206,	0.204,	0.202,
0.200,	0.199,	0.197,	0.195,	0.195,
0.195,	0.199,	0.197,	0.197,	0.197,
0.196,	0.195,	0.195,	0.195,	0.196,
0.196,	0.196,	0.198,	0.200,	0.200,
0.202,	0.208,	0.227,	0.220,	0.210,
0.210,	0.206,	0.200,	0.200,	0.198,
0.192,	0.167,	0.184,	0.181,	0.176,
0.173,	0.170,	0.168,	0.167,	0.165,
0.164,	0.163,	0.163,	0.162,	0.161,
0.161,	0.161,	0.160,	0.160,	0.160,
0.159,	0.159,	0.159,	0.159,	0.159,
0.159,	0.159,	0.159,		

SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM O R - 587.840 PSIA

DATA (U6(J, 7), J=1,83) /

0.396,	0.396,	0.396,	0.396,	0.396,
0.396,	0.396,	0.397,	0.397,	0.398,
0.398,	0.399,	0.400,	0.400,	0.400,
0.401,	0.403,	0.405,	0.407,	0.409,
0.412,	0.416,	0.420,	0.425,	0.430,
0.437,	0.445,	0.455,	0.465,	0.465,
0.467,	0.488,	0.501,	0.501,	0.503,
0.530,	0.550,	0.550,	0.562,	0.607,
0.618,	0.618,	0.697,	0.766,	0.766,
0.850,	1.168,	1.214,	0.943,	0.738,
0.738,	0.655,	0.574,	0.574,	0.538,
0.472,	0.429,	0.399,	0.376,	0.343,
0.321,	0.306,	0.294,	0.284,	0.277,
0.270,	0.265,	0.261,	0.257,	0.254,
0.251,	0.248,	0.246,	0.244,	0.243,
0.241,	0.240,	0.239,	0.238,	0.237,
0.236,	0.235,	0.234,		

PRESSURE - PSIA

DATA UA(8) / 661.320 /

DENSITY - LB/CU FT - FOR 661.320 PSIA

DATA (U1(J, 8), J=1,83) /

81.56607,	80.77544,	80.06405,	79.30214,	78.55459,
77.76050,	76.98229,	76.21951,	75.41478,	74.62686,
73.85524,	73.04602,	72.20217,	71.81890,	71.81890,
71.37759,	70.57163,	69.68841,	68.82312,	67.93478,
67.02413,	66.09385,	65.14658,	64.18485,	63.17119,
62.15040,	61.05006,	59.91612,	58.97467,	58.97467,

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00263	791*	°	58.75441,	57.47124,	56.26409,	56.26409,	56.11672,	
00263	792*	°	54.70460,	53.70530,	53.70530,	53.10674,	51.36107,	
00263	793*	°	51.11273,	51.11273,	49.35834,	48.25795,	48.25795,	
00263	794*	°	46.90431,	44.71598,	44.71598,	43.55401,	39.30818,	
00263	795*	°	15.77536,	14.45923,	12.94703,	12.94703,	12.36858,	
00263	796*	°	11.23343,	10.44059,	9.82994,	9.33184,	8.54920,	
00263	797*	°	7.94534,	7.45601,	7.04573,	6.69389,	6.38610,	
00263	798*	°	6.11396,	5.87061,	5.65068,	5.45048,	5.26704,	
00263	799*	°	5.09840,	4.94218,	4.79708,	4.66179,	4.53535,	
00263	800*	°	4.41638,	4.30459,	4.19903,	4.09937,	4.00481,	
00263	801*	°	3.91497,	3.82966,	3.74841,			
00263	802*	C						
00263	803*	C	ISOTHERM DERIVATIVE - ALL VALUES SET TO ZERO					
00263	804*	C						
00265	805*		DATA (U2(J, 8), J=1, 83) / 83*0. /					
00265	806*	C						
00265	807*	C	ISOCORE DERIVATIVE - ALL VALUES SET TO ZERO					
00265	808*	C						
00267	809*		DATA (U3(J, 8), J=1, 83) / 83*0. /					
00267	810*	C						
00267	811*	C	ENTHALPY - BTU/LB - FOR 661.320 PSIA					
00267	812*	C						
00271	813*	C	DATA (U4(J, 8), J=1, 83) /					
00271	814*	°	-81.075,	-79.094,	-77.114,	-75.135,	-73.156,	
00271	815*	°	-71.177,	-69.197,	-67.216,	-65.233,	-63.248,	
00271	816*	°	-61.261,	-59.269,	-57.274,	-56.344,	-56.344,	
00271	817*	°	-55.273,	-53.265,	-51.249,	-49.224,	-47.189,	
00271	818*	°	-45.140,	-43.076,	-40.994,	-38.891,	-36.763,	
00271	819*	°	-34.605,	-32.412,	-30.177,	-28.324,	-28.324,	
00271	820*	°	-27.890,	-25.510,	-23.330,	-23.330,	-23.064,	
00271	821*	°	-20.523,	-18.858,	-18.858,	-17.860,	-15.032,	
00271	822*	°	-14.650,	-14.650,	-11.953,	-10.389,	-10.389,	
00271	823*	°	-8.464,	-5.716,	-5.716,	-4.145,	.635,	
00271	824*	°	28.133,	30.890,	34.518,	34.518,	36.141,	
00271	825*	°	39.640,	42.472,	44.938,	47.167,	51.168,	
00271	826*	°	54.771,	58.115,	61.274,	64.296,	67.211,	
00271	827*	°	70.041,	72.801,	75.503,	78.156,	80.766,	
00271	828*	°	83.341,	85.884,	88.400,	90.892,	93.362,	
00271	829*	°	95.813,	98.248,	100.668,	103.074,	105.469,	
00271	830*	°	107.853,	110.228,	112.595,			
00271	831*	C						
00271	832*	C	SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 661.320 PSIA					
00271	833*	C						
00273	834*		DATA (U5(J, 8), J=1, 83) /					
00273	835*	°	.265,	.261,	.257,	.253,	.249,	
00273	836*	°	.245,	.242,	.239,	.236,	.233,	
00273	837*	°	.230,	.227,	.224,	.223,	.223,	
00273	838*	°	.222,	.219,	.217,	.215,	.213,	
00273	839*	°	.211,	.208,	.206,	.204,	.203,	
00273	840*	°	.201,	.199,	.197,	.195,	.195,	
00273	841*	°	.195,	.199,	.197,	.197,	.197,	
00273	842*	°	.196,	.195,	.195,	.195,	.196,	
00273	843*	°	.196,	.196,	.197,	.198,	.198,	
00273	844*	°	.200,	.204,	.204,	.206,	.223,	
00273	845*	°	.249,	.233,	.218,	.218,	.212,	
00273	846*	°	.202,	.195,	.190,	.185,	.180,	
00273	847*	°	.175,	.172,	.170,	.168,	.167,	
00273	848*	°	.165,	.164,	.164,	.163,	.162,	

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00273 849* * .162, .161, .161, .160, .160,
00273 850* * .160, .160, .159, .159, .159,
00273 851* * .159, .159, .159/
00273 852* C
00273 853* C SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM O R - 661.320 PSIA
00273 854* C
00275 855* DATA (U6(J, 8), J=1, 83) /
00275 856* * .396, .396, .396, .396, .396,
00275 857* * .396, .396, .396, .397, .397,
00275 858* * .398, .399, .400, .400, .400,
00275 859* * .401, .402, .404, .406, .408,
00275 860* * .411, .414, .418, .423, .428,
00275 861* * .435, .442, .451, .460, .460,
00275 862* * .462, .482, .494, .494, .495,
00275 863* * .519, .537, .537, .547, .586,
00275 864* * .594, .594, .653, .697, .697,
00275 865* * .751, .913, .913, 1.006, 2.072,
00275 866* * 2.673, 1.480, 1.016, 1.016, .809,
00275 867* * .618, .524, .467, .427, .377,
00275 868* * .346, .324, .308, .296, .287,
00275 869* * .279, .273, .268, .263, .259,
00275 870* * .256, .253, .250, .248, .246,
00275 871* * .244, .243, .241, .240, .239,
00275 872* * .238, .237, .236/
00275 873* C
00275 874* C .....
00275 875* C
00275 876* C PRESSURE - PSIA
00275 877* C
00277 878* DATA UA(9) / 734.800 /
00277 879* C
00277 880* C DENSITY - LB/CU FT - FOR 734.800 PSIA
00277 881* C
00301 882* DATA (U1(J, 9), J=1, 83) /
00301 883* * 81.56607, 80.84074, 80.06405, 79.36508, 78.55459,
00301 884* * 77.82101, 77.04160, 76.27765, 75.47170, 74.68260,
00301 885* * 73.90983, 73.09941, 72.30658, 71.92221, 71.92221,
00301 886* * 71.47963, 70.62147, 69.78367, 68.91799, 68.02721,
00301 887* * 67.11409, 66.22517, 65.27415, 64.30868, 63.33122,
00301 888* * 62.30530, 61.23699, 60.09615, 59.14909, 59.14909,
00301 889* * 58.92752, 57.70340, 56.54322, 56.54322, 56.40158,
00301 890* * 55.00550, 54.04891, 54.04891, 53.47594, 51.81347,
00301 891* * 51.57931, 51.57931, 49.92511, 48.93182, 48.93182,
00301 892* * 47.70992, 45.91221, 45.91221, 44.94382, 41.88929,
00301 893* * 41.88929, 40.76641, 30.24803, 24.18380, 17.71793,
00301 894* * 14.33075, 12.82051, 11.81754, 11.06807, 9.97009,
00301 895* * 9.17179, 8.54701, 8.03600, 7.60514, 7.23327,
00301 896* * 6.90799, 6.61901, 6.36011, 6.12595, 5.91226,
00301 897* * 5.71657, 5.53649, 5.36942, 5.21404, 5.06919,
00301 898* * 4.93340, 4.80584, 4.68582, 4.57247, 4.46528,
00301 899* * 4.36357, 4.26712, 4.17519/
00301 900* C
00301 901* C ISOTHERM DERIVATIVE - ALL VALUES SET TO ZERO
00301 902* C
00303 903* DATA (UZ(J, 9), J=1, 83) / 83.00 /
00303 904* C
00303 905* C ISOCHORE DERIVATIVE - ALL VALUES SET TO ZERO
00303 906* C

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00305 907* DATA (U3(J, 9), J=1, 83) / 83*0. /

00305 908* C

00305 909* C ENTHALPY - BTU/LB - FOR 734.800 PSIA

00305 910* C

00307 911* DATA (U4(J, 9), J=1, 83) /

00307 912* * -80.939, -78.959, -76.980, -75.001, -73.023,

00307 913* * -71.045, -69.066, -67.087, -65.105, -63.122,

00307 914* * -61.137, -59.147, -57.154, -56.225, -56.225,

00307 915* * -55.155, -53.151, -51.138, -49.117, -47.086,

00307 916* * -45.042, -42.983, -40.908, -38.812, -36.693,

00307 917* * -34.546, -32.365, -30.145, -28.308, -28.308,

00307 918* * -27.878, -25.521, -23.367, -23.367, -23.104,

00307 919* * -20.602, -18.970, -18.970, -17.992, -15.239,

00307 920* * -14.872, -14.872, -12.283, -10.820, -10.820,

00307 921* * -9.021, -6.594, -6.594, -5.212, -1.564,

00307 922* * -1.564, -.065, 10.621, 17.558, 27.239,

00307 923* * 34.325, 38.364, 41.508, 44.182, 48.747,

00307 924* * 52.707, 56.302, 59.652, 62.824, 65.863,

00307 925* * 68.796, 71.645, 74.423, 77.144, 79.815,

00307 926* * 82.443, 85.035, 87.594, 90.126, 92.633,

00307 927* * 95.118, 97.583, 100.032, 102.465, 104.844,

00307 928* * 107.291, 109.688, 112.075/

00307 929* C

00307 930* C SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 734.800 PSIA

00307 931* C

00311 932* DATA (U5(J, 9), J=1, 83) /

00311 933* * .265, .261, .257, .253, .249,

00311 934* * .246, .242, .239, .236, .233,

00311 935* * .230, .227, .225, .224, .224,

00311 936* * .222, .220, .217, .215, .213,

00311 937* * .211, .209, .207, .205, .203,

00311 938* * .201, .199, .197, .195, .195,

00311 939* * .195, .199, .197, .197, .197,

00311 940* * .196, .195, .195, .195, .195,

00311 941* * .195, .195, .196, .197, .197,

00311 942* * .198, .200, .200, .202, .210,

00311 943* * .210, .213, .267, .288, .247,

00311 944* * .217, .205, .197, .191, .183,

00311 945* * .178, .175, .172, .170, .168,

00311 946* * .167, .165, .164, .164, .163,

00311 947* * .162, .162, .161, .161, .160,

00311 948* * .160, .160, .160, .159, .159,

00311 949* * .159, .159, .159/

00311 950* C

00311 951* C SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM O R - 734.800 PSIA

00311 952* C

00313 953* DATA (U6(J, 9), J=1, 83) /

00313 954* * .396, .396, .396, .396, .396,

00313 955* * .396, .396, .396, .396, .397,

00313 956* * .397, .398, .399, .399, .399,

00313 957* * .400, .402, .403, .405, .407,

00313 958* * .410, .413, .417, .421, .426,

00313 959* * .432, .440, .448, .456, .456,

00313 960* * .458, .477, .488, .488, .489,

00313 961* * .510, .525, .525, .534, .568,

00313 962* * .574, .574, .620, .652, .652,

00313 963* * .692, .782, .782, .834, 1.180,

00313 964* * 1.180, 1.325, 87.267, 131.184, 2.514,

00313	965*	°	.960	.698,	.573,	.502,	.420,
00313	966*	°	.37	.346,	.325,	.310,	.298,
00313	967*	°	.28	.281,	.275,	.269,	.265,
00313	968*	°	.261,	.257,	.254,	.252,	.250,
00313	969*	°	.247,	.246,	.244,	.243,	.241,
00313	970*	°	.240,	.239,	.238/		

00313 971* C
 00313 972* C
 00313 973* C

00313 974* C PRESSURE - PSIA

00313 975* C
 00315 976* DATA UAL(10) / 808.280 /

00315 977* C
 00315 978* C DENSITY - LB/CU FT - FOR 808.280 PSIA

00315 979* C
 00317 980* DATA (U1(J,10),J=1,83) /
 00317 981* ° 81.63265, 80.90615, 80.12820, 79.36508, 78.61635,
 00317 982* ° 77.88162, 77.10100, 76.33588, 75.52870, 74.73841,
 00317 983* ° 73.96450, 73.15289, 72.35890, 71.97398, 71.97398,
 00317 984* ° 71.53076, 70.67138, 69.83240, 69.01311, 68.11989,
 00317 985* ° 67.24949, 66.31300, 65.40222, 64.43299, 63.45178,
 00317 986* ° 62.42197, 61.38735, 60.27728, 59.35288, 59.35288,
 00317 987* ° 59.13661, 57.90388, 56.76427, 56.76427, 56.62514,
 00317 988* ° 55.27916, 54.36742, 54.36742, 53.82131, 52.21932,
 00317 989* ° 52.00043, 52.00043, 50.45409, 49.54476, 49.54476,
 00317 990* ° 48.42615, 46.83880, 46.83880, 45.97701, 43.66280,
 00317 991* ° 43.66280, 42.78990, 38.93346, 38.93346, 37.42515,
 00317 992* ° 20.56344, 16.22060, 14.35544, 13.15270, 11.57407,
 00317 993* ° 10.51193, 9.71628, 9.08265, 8.55871, 8.11359,
 00317 994* ° 7.72857, 7.38934, 7.08717, 6.81617, 6.56987,
 00317 995* ° 6.34558, 6.13949, 5.94919, 5.77267, 5.60852,
 00317 996* ° 5.45524, 5.31124, 5.17625, 5.04872, 4.92854,
 00317 997* ° 4.81464, 4.70655, 4.60384/

00317 998* C ISOTHERM DERIVATIVE - ALL VALUES SET TO ZERO

00317 1000* C
 00321 1001* DATA (U2(J,10),J=1,83) / 83.0. /

00321 1002* C
 00321 1003* C ISOCHORE DERIVATIVE - ALL VALUES SET TO ZERO

00321 1004* C
 00323 1005* C DATA (U3(J,10),J=1,83) / 83.0. /

00323 1006* C
 00323 1007* C ENTHALPY - BTU/LB - FOR 808.280 PSIA

00323 1008* C
 00325 1009* DATA (U4(J,10),J=1,83) /
 00325 1010* ° -80.803, -78.823, -76.845, -74.867, -72.890,
 00325 1011* ° -70.913, -68.936, -66.957, -64.978, -62.996,
 00325 1012* ° -61.012, -59.025, -57.034, -56.106, -56.106,
 00325 1013* ° -55.038, -53.036, -51.027, -49.009, -46.982,
 00325 1014* ° -44.943, -42.890, -40.820, -38.732, -36.621,
 00325 1015* ° -34.484, -32.316, -30.110, -28.287, -28.287,
 00325 1016* ° -27.860, -25.525, -23.395, -23.395, -23.135,
 00325 1017* ° -20.668, -19.065, -19.065, -18.105, -15.417,
 00325 1018* ° -15.063, -15.063, -12.559, -11.165, -11.165,
 00325 1019* ° -9.450, -7.231, -7.231, -5.962, -2.952,
 00325 1020* ° -2.952, -1.732, 2.632, 2.632, 4.584,
 00325 1021* ° 24.812, 32.874, 37.341, 40.739, 46.101,
 00325 1022* ° 50.510, 54.404, 57.971, 61.311, 64.485,

00325	1023*	•	67.530,	70.472,	73.332,	76.123,	78.856,
00325	1024*	•	81.540,	84.182,	86.786,	89.359,	91.903,
00325	1025*	•	94.422,	96.919,	99.397,	101.857,	104.301,
00325	1026*	•	106.732,	109.150,	111.557/		

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C

SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 808.280 PSIA

00327	1030*		DATA (U5(J,10),J=1,83) /				
00327	1031*	•	.265,	.261,	.257,	.253,	.249,
00327	1032*	•	.246,	.242,	.239,	.236,	.233,
00327	1033*	•	.230,	.227,	.225,	.224,	.224,
00327	1034*	•	.222,	.220,	.218,	.215,	.213,
00327	1035*	•	.211,	.209,	.207,	.205,	.203,
00327	1036*	•	.201,	.199,	.197,	.195,	.195,
00327	1037*	•	.195,	.199,	.197,	.197,	.197,
00327	1038*	•	.196,	.195,	.195,	.195,	.195,
00327	1039*	•	.195,	.195,	.195,	.196,	.196,
00327	1040*	•	.197,	.198,	.198,	.199,	.203,
00327	1041*	•	.203,	.205,	.217,	.217,	.223,
00327	1042*	•	.249,	.219,	.206,	.198,	.188,
00327	1043*	•	.181,	.177,	.174,	.171,	.169,
00327	1044*	•	.168,	.166,	.165,	.164,	.164,
00327	1045*	•	.163,	.162,	.162,	.161,	.161,
00327	1046*	•	.161,	.160,	.160,	.160,	.160,
00327	1047*	•	.159,	.159,	.159/		

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SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM O R - 808.280 PSIA

00331	1051*		DATA (U6(J,10),J=1,83) /				
00331	1052*	•	.396,	.396,	.396,	.395,	.395,
00331	1053*	•	.395,	.396,	.396,	.396,	.396,
00331	1054*	•	.397,	.398,	.399,	.399,	.399,
00331	1055*	•	.400,	.401,	.403,	.404,	.407,
00331	1056*	•	.409,	.412,	.416,	.420,	.425,
00331	1057*	•	.430,	.437,	.445,	.452,	.452,
00331	1058*	•	.454,	.472,	.482,	.482,	.483,
00331	1059*	•	.502,	.516,	.516,	.524,	.553,
00331	1060*	•	.558,	.558,	.594,	.620,	.620,
00331	1061*	•	.651,	.712,	.712,	.747,	.906,
00331	1062*	•	.906,	.971,	1.549,	1.549,	1.808,
00331	1063*	•	2.731,	1.075,	.763,	.615,	.477,
00331	1064*	•	.411,	.371,	.344,	.325,	.310,
00331	1065*	•	.299,	.290,	.282,	.276,	.271,
00331	1066*	•	.266,	.262,	.259,	.256,	.253,
00331	1067*	•	.251,	.249,	.247,	.245,	.244,
00331	1068*	•	.242,	.241,	.240/		

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C

PRESSURE - PSIA

C

DATA UA(11) / 881.760 /

C

DENSITY - LB/CU FT - FOR 881.760 PSIA

C

00335	1078*		DATA (U1(J,11),J=1,83) /				
00335	1079*	•	81.63265,	80.90615,	80.19246,	79.42812,	78.67821,
00335	1080*	•	77.88162,	77.16049,	76.33588,	75.50579,	74.79431,

00335 1081° * 74.01925, 73.20644, 72.41130, 72.02582, 72.02582,
 00335 1082° * 71.58196, 71.77141, 69.93007, 69.06077, 68.21282,
 00335 1083° * 67.34007, 67.40106, 65.48788, 64.55778, 63.57279,
 00335 1084° * 62.57822, 61.53846, 60.45949, 59.52955, 59.52955,
 00335 1085° * 59.31198, 58.13953, 57.01955, 57.01955, 56.88282,
 00335 1086° * 55.55554, 54.67143, 54.67143, 54.14185, 52.60389,
 00335 1087° * 52.39465, 52.39465, 50.91650, 50.06594, 50.06594,
 00335 1088° * 49.01941, 47.60910, 47.60910, 46.83841, 44.87888,
 00335 1089° * 44.87888, 44.13063, 41.51036, 41.51036, 40.43672,
 00335 1090° * 33.78378, 22.22716, 17.86033, 15.76541, 13.41562,
 00335 1091° * 11.98610, 10.97333, 10.19160, 9.55840, 9.02935,
 00335 1092° * 8.57633, 8.18130, 7.83269, 7.52106, 7.24008,
 00335 1093° * 6.98470, 6.75128, 6.53637, 6.33794, 6.15347,
 00335 1094° * 5.98158, 5.82072, 5.66990, 5.52822, 5.39433,
 00335 1095° * 5.26759, 5.14774, 5.03398/

C
 C . ISOTHERM DERIVATIVE - ALL VALUES SET TO ZERO
 C

00337 1099° DATA (U2(J,11),J=1,83) / 83°0. /

C
 C ISOCHORE DERIVATIVE - ALL VALUES SET TO ZERO
 C

00341 1103° DATA (U3(J,11),J=1,83) / 83°0. /

C
 C ENTHALPY - BTU/LB - FOR 881.760 PSIA
 C

00341 1106° DATA (U4(J,11),J=1,83) /
 00343 1107°

00343 1108° * -80.666, -78.688, -76.710, -74.734, -72.757,
 00343 1109° * -70.781, -68.805, -66.828, -64.850, -62.870,
 00343 1110° * -60.888, -58.903, -56.914, -55.987, -55.987,
 00343 1111° * -54.920, -52.921, -50.915, -48.901, -46.878,
 00343 1112° * -44.843, -42.795, -40.732, -38.651, -36.548,
 00343 1113° * -34.420, -32.263, -30.071, -28.261, -28.261,
 00343 1114° * -27.838, -25.524, -23.415, -23.415, -23.158,
 00343 1115° * -20.723, -19.146, -19.146, -18.202, -15.570,
 00343 1116° * -15.226, -15.226, -12.793, -11.456, -11.456,
 00343 1117° * -9.811, -7.729, -7.729, -6.539, -3.857,
 00343 1118° * -3.857, -2.770, .504, .504, 1.968,
 00343 1119° * 9.714, 24.318, 32.001, 36.652, 43.172,
 00343 1120° * 48.166, 52.415, 56.230, 59.757, 63.077,
 00343 1121° * 66.242, 69.285, 72.230, 75.095, 77.893,
 00343 1122° * 80.634, 83.327, 85.978, 88.592, 91.174,
 00343 1123° * 93.728, 96.257, 98.764, 101.251, 103.720,
 00343 1124° * 106.174, 108.614, 111.042/

C
 C SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 881.760 PSIA
 C

00345 1128° DATA (U5(J,11),J=1,83) /
 00345 1129°

00345 1130° * .266, .261, .257, .253, .249,
 00345 1131° * .246, .243, .239, .236, .233,
 00345 1132° * .230, .228, .225, .224, .224,
 00345 1133° * .223, .220, .218, .216, .213,
 00345 1134° * .211, .209, .207, .205, .203,
 00345 1135° * .201, .199, .197, .196, .196,
 00345 1136° * .196, .196, .196, .196, .196,
 00345 1137° * .195, .195, .195, .195, .195,
 00345 1138° * .196, .197, .197, .198, .200,

00345	1139°	*	.200,	.201,	.207,	.207,	.210,
00345	1140°	*	.231,	.240,	.218,	.206,	.193,
00345	1141°	*	.185,	.179,	.176,	.173,	.171,
00345	1142°	*	.169,	.167,	.166,	.165,	.164,
00345	1143°	*	.164,	.163,	.162,	.162,	.161,
00345	1144°	*	.161,	.161,	.160,	.160,	.160,
00345	1145°	*	.160,	.159,	.159,		

C
C
C

SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM D R - 881.760 PSIA

00347	1149°		DATA (U6(J,11),J=1,83) /				
00347	1150°	*	.396,	.396,	.395,	.395,	.395,
00347	1151°	*	.395,	.395,	.395,	.396,	.396,
00347	1152°	*	.397,	.397,	.398,	.398,	.398,
00347	1153°	*	.399,	.400,	.402,	.404,	.406,
00347	1154°	*	.408,	.411,	.414,	.418,	.423,
00347	1155°	*	.428,	.434,	.442,	.449,	.449,
00347	1156°	*	.451,	.467,	.477,	.477,	.478,
00347	1157°	*	.495,	.507,	.507,	.514,	.540,
00347	1158°	*	.544,	.544,	.573,	.595,	.595,
00347	1159°	*	.621,	.665,	.665,	.691,	.788,
00347	1160°	*	.788,	.827,	1.021,	1.021,	1.108,
00347	1161°	*	2.337,	2.209,	1.127,	.789,	.554,
00347	1162°	*	.454,	.400,	.365,	.341,	.324,
00347	1163°	*	.310,	.299,	.290,	.283,	.277,
00347	1164°	*	.272,	.267,	.263,	.260,	.257,
00347	1165°	*	.254,	.252,	.250,	.248,	.246,
00347	1166°	*	.245,	.243,	.242,		

C
C
C

PRESSURE - PSIA

00347	1168°		DATA U6(12) / 955.240 /				
00347	1169°						
00347	1170°						
00347	1171°						
00351	1172°						

C
C
C

DENSITY - LB/CU FT - FOR 955.240 PSIA

00351	1173°		DATA (U1(J,12),J=1,83) /				
00351	1174°	*	81.69935,	80.97166,	80.19246,	79.42812,	78.67821,
00353	1176°	*	77.94232,	77.16049,	76.39419,	75.64297,	74.85030,
00353	1177°	*	74.07407,	73.26007,	72.46377,	72.10161,	72.10161,
00353	1178°	*	71.68459,	70.82153,	69.97901,	69.15629,	68.30601,
00353	1179°	*	67.43088,	66.53360,	65.61680,	64.64124,	63.69427,
00353	1180°	*	62.69592,	61.69031,	60.60606,	59.70031,	59.70031,
00353	1181°	*	59.48840,	58.34306,	57.24435,	57.24435,	57.11022,
00353	1182°	*	55.63473,	54.96033,	54.96033,	54.43658,	52.96610,
00353	1183°	*	52.76708,	52.76708,	51.36107,	50.56180,	50.56180,
00353	1184°	*	49.57858,	48.26923,	48.26923,	47.55112,	45.82977,
00353	1185°	*	45.82977,	45.16712,	43.05729,	43.05729,	42.17630,
00353	1186°	*	37.96507,	30.94059,	23.08936,	19.17178,	15.55210,
00353	1187°	*	13.62027,	12.32742,	11.36622,	10.60670,	9.98104,
00353	1188°	*	9.45269,	8.99604,	8.59623,	8.24063,	7.92205,
00353	1189°	*	7.63417,	7.37137,	7.13063,	6.90894,	6.70331,
00353	1190°	*	6.51254,	6.33392,	6.16713,	6.00998,	5.86235,
00353	1191°	*	5.72279,	5.59065,	5.46538,		

C
C
C

ISOTHERM DERIVATIVE - ALL VALUES SET TO ZERO

00353	1196°						
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00355 1197*
00355 1198* C
00355 1199* C
00355 1200* C
00357 1201* DATA (U2(J,12),J=1,83) / 83*0. /
00357 1202* C
00357 1203* C
00357 1204* C
00361 1205* DATA (U4(J,12),J=1,83) /
00361 1206* * -80.530, -78.552, -76.576, -74.600, -72.625,
00361 1207* * -70.649, -68.674, -66.699, -64.722, -62.744,
00361 1208* * -60.763, -58.780, -56.793, -55.868, -55.868,
00361 1209* * -54.802, -52.806, -50.803, -48.792, -46.773,
00361 1210* * -44.742, -42.700, -40.642, -38.568, -36.473,
00361 1211* * -34.355, -32.209, -30.030, -28.233, -28.233,
00361 1212* * -27.812, -25.518, -23.429, -23.429, -23.174,
00361 1213* * -20.768, -19.215, -19.215, -18.284, -15.702,
00361 1214* * -15.366, -15.366, -12.995, -11.704, -11.704,
00361 1215* * -10.115, -8.135, -8.135, -7.003, -4.530,
00361 1216* * -4.530, -3.528, .711, .711, .548,
00361 1217* * 5.849, 14.291, 24.920, 31.718, 39.925,
00361 1218* * 45.651, 50.332, 54.430, 58.163, 61.642,
00361 1219* * 64.934, 68.083, 71.110, 74.059, 76.925,
00361 1220* * 79.725, 82.471, 85.169, 87.825, 90.446,
00361 1221* * 93.035, 95.597, 98.133, 100.647, 103.142,
00361 1222* * 105.620, 108.081, 110.529/
00361 1223* C
00361 1224* C
00361 1225* C
00363 1226* DATA (U5(J,12),J=1,83) /
00363 1227* * .266, .261, .257, .253, .250,
00363 1228* * .246, .243, .239, .236, .233,
00363 1229* * .231, .228, .225, .224, .224,
00363 1230* * .223, .220, .218, .216, .214,
00363 1231* * .211, .209, .207, .205, .203,
00363 1232* * .201, .199, .197, .196, .196,
00363 1233* * .196, .199, .198, .198, .198,
00363 1234* * .196, .195, .195, .195, .195,
00363 1235* * .195, .195, .195, .195, .195,
00363 1236* * .195, .196, .196, .196, .198,
00363 1237* * .198, .199, .202, .202, .204,
00363 1238* * .213, .234, .230, .215, .197,
00363 1239* * .188, .182, .177, .174, .172,
00363 1240* * .170, .168, .167, .166, .165,
00363 1241* * .164, .163, .163, .162, .162,
00363 1242* * .161, .161, .161, .160, .160,
00363 1243* * .160, .160, .159/
00363 1244* C
00363 1245* C
00363 1246* C
00365 1247* DATA (U6(J,12),J=1,83) /
00365 1248* * .396, .395, .395, .395, .395,
00365 1249* * .395, .395, .395, .395, .396,
00365 1250* * .396, .397, .398, .398, .398,
00365 1251* * .399, .400, .401, .403, .405,
00365 1252* * .407, .410, .413, .417, .421,
00365 1253* * .426, .432, .439, .445, .445,
00365 1254* * .447, .463, .472, .472, .473,

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DATA (U2(J,12),J=1,83) / 83*0. /

ISOCHORIC DERIVATIVE - ALL VALUES SET TO ZERO

DATA (U3(J,12),J=1,83) / 83*0. /

ENTHALPY - BTU/LB - FOR 955.240 PSIA

DATA (U4(J,12),J=1,83) /

* -80.530,	-78.552,	-76.576,	-74.600,	-72.625,
* -70.649,	-68.674,	-66.699,	-64.722,	-62.744,
* -60.763,	-58.780,	-56.793,	-55.868,	-55.868,
* -54.802,	-52.806,	-50.803,	-48.792,	-46.773,
* -44.742,	-42.700,	-40.642,	-38.568,	-36.473,
* -34.355,	-32.209,	-30.030,	-28.233,	-28.233,
* -27.812,	-25.518,	-23.429,	-23.429,	-23.174,
* -20.768,	-19.215,	-19.215,	-18.284,	-15.702,
* -15.366,	-15.366,	-12.995,	-11.704,	-11.704,
* -10.115,	-8.135,	-8.135,	-7.003,	-4.530,
* -4.530,	-3.528,	.711,	.711,	.548,
* 5.849,	14.291,	24.920,	31.718,	39.925,
* 45.651,	50.332,	54.430,	58.163,	61.642,
* 64.934,	68.083,	71.110,	74.059,	76.925,
* 79.725,	82.471,	85.169,	87.825,	90.446,
* 93.035,	95.597,	98.133,	100.647,	103.142,
* 105.620,	108.081,	110.529/		

SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 955.240 PSIA

DATA (U5(J,12),J=1,83) /

* .266,	.261,	.257,	.253,	.250,
* .246,	.243,	.239,	.236,	.233,
* .231,	.228,	.225,	.224,	.224,
* .223,	.220,	.218,	.216,	.214,
* .211,	.209,	.207,	.205,	.203,
* .201,	.199,	.197,	.196,	.196,
* .196,	.199,	.198,	.198,	.198,
* .196,	.195,	.195,	.195,	.195,
* .195,	.195,	.195,	.195,	.195,
* .195,	.196,	.196,	.196,	.198,
* .198,	.199,	.202,	.202,	.204,
* .213,	.234,	.230,	.215,	.197,
* .188,	.182,	.177,	.174,	.172,
* .170,	.168,	.167,	.166,	.165,
* .164,	.163,	.163,	.162,	.162,
* .161,	.161,	.161,	.160,	.160,
* .160,	.160,	.159/		

SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM O R - 955.240 PSIA

DATA (U6(J,12),J=1,83) /

* .396,	.395,	.395,	.395,	.395,
* .395,	.395,	.395,	.395,	.396,
* .396,	.397,	.398,	.398,	.398,
* .399,	.400,	.401,	.403,	.405,
* .407,	.410,	.413,	.417,	.421,
* .426,	.432,	.439,	.445,	.445,
* .447,	.463,	.472,	.472,	.473,

00365 1255° * .488, .499, .499, .505, .528,
 00365 1256° * .531, .531, .555, .574, .574,
 00365 1257° * .597, .631, .631, .650, .718,
 00365 1258° * .718, .745, .853, .853, .901,
 00365 1259° * 1.283, 2.201, 1.743, 1.075, .654,
 00365 1260° * .510, .434, .389, .359, .338,
 00365 1261° * .321, .309, .299, .290, .283,
 00365 1262° * .277, .272, .268, .264, .260,
 00365 1263° * .257, .255, .252, .250, .249,
 00365 1264° * .247, .245, .244/

00365 1265° C
 00365 1266° C*****

PRESSURE - PSIA

00367 1270° DATA UA(13) / 1028.720 /

DENSITY - LB/CU FT - FOR 1028.720 PSIA

00371 1274° DATA (U1(J,13),J=1,83) /

00371 1275° * 81.69935, 80.97166, 80.25682, 79.49126, 78.74016,
 00371 1276° * 78.00312, 77.22008, 76.45260, 75.70023, 74.90637,
 00371 1277° * 74.12898, 73.31378, 72.51632, 72.15363, 72.15363,
 00371 1278° * 71.73601, 70.92199, 70.07708, 69.25208, 68.35270,
 00371 1279° * 67.52194, 66.62225, 65.70302, 64.76684, 63.81621,
 00371 1280° * 62.85355, 61.80470, 60.79027, 59.87906, 59.87906,
 00371 1281° * 59.66587, 58.51375, 57.46721, 57.46721, 57.33945,
 00371 1282° * 56.00525, 55.24052, 55.24052, 54.73454, 53.30490,
 00371 1283° * 53.11331, 53.11331, 51.75983, 51.00440, 51.00440,
 00371 1284° * 50.07511, 48.86096, 48.86096, 48.19277, 46.62577,
 00371 1285° * 46.62577, 46.01933, 44.20595, 44.20595, 43.44049,
 00371 1286° * 40.16064, 35.58719, 29.26544, 23.57934, 18.05380,
 00371 1287° * 15.43448, 13.78930, 12.61193, 11.70412, 10.96972,
 00371 1288° * 10.35733, 9.83284, 9.37734, 8.97505, 8.61623,
 00371 1289° * 8.29325, 8.00000, 7.73216, 7.48615, 7.25847,
 00371 1290° * 7.04771, 6.85072, 6.66711, 6.49477, 6.33272,
 00371 1291° * 6.17971, 6.03537, 5.89831/

ISOTHERM DERIVATIVE - ALL VALUES SET TO ZERO

00373 1295° DATA (U2(J,13),J=1,83) / 83°0. /

ISOCHERE DERIVATIVE - ALL VALUES SET TO ZERO

00375 1299° DATA (U3(J,13),J=1,83) / 83°0. /

ENTHALPY - BTU/LB - FOR 1028.720 PSIA

00377 1303° DATA (U4(J,13),J=1,83) /

00377 1304° * -80.394, -78.417, -76.441, -74.466, -72.492,
 00377 1305° * -70.518, -68.544, -66.569, -64.594, -62.617,
 00377 1306° * -60.638, -58.667, -56.672, -55.748, -55.748,
 00377 1307° * -54.684, -52.690, -50.690, -48.683, -46.667,
 00377 1308° * -44.641, -42.603, -40.552, -38.484, -36.396,
 00377 1309° * -34.287, -32.151, -29.984, -28.199, -28.199,
 00377 1310° * -27.781, -25.566, -23.436, -23.436, -23.183,
 00377 1311° * -20.804, -19.272, -19.272, -18.354, -15.816,
 00377 1312° * -15.488, -15.488, -13.168, -11.915, -11.915,

00377	1313*	°	-10.374,	-8.474,	-8.474,	-7.388,	-5.064,
00377	1314*	°	-5.064,	-4.122,	-1.573,	-1.573,	-1.433,
00377	1315*	°	3.966,	9.751,	17.774,	25.967,	36.336,
00377	1316*	°	42.967,	48.149,	52.571,	56.530,	60.180,
00377	1317*	°	63.609,	66.869,	69.997,	73.018,	75.953,
00377	1318*	°	78.814,	81.613,	84.360,	87.060,	89.720,
00377	1319*	°	92.345,	94.939,	97.505,	100.047,	102.567,
00377	1320*	°	105.068,	107.552,	110.020/		

00377 1321*
00377 1322*

C
C

SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 1028.720 PSIA

00377 1323*

C

DATA (U5(J,13),J=1,83) /

00401	1324*	°	.266,	.262,	.257,	.254,	.250,
00401	1325*	°	.246,	.243,	.240,	.237,	.234,
00401	1326*	°	.231,	.228,	.225,	.224,	.224,
00401	1327*	°	.223,	.221,	.218,	.216,	.214,
00401	1328*	°	.212,	.210,	.208,	.206,	.204,
00401	1329*	°	.202,	.200,	.198,	.196,	.196,
00401	1330*	°	.196,	.199,	.198,	.198,	.198,
00401	1331*	°	.196,	.195,	.195,	.195,	.194,
00401	1332*	°	.194,	.194,	.194,	.194,	.194,
00401	1333*	°	.195,	.195,	.195,	.195,	.196,
00401	1334*	°	.196,	.197,	.199,	.199,	.200,
00401	1335*	°	.206,	.219,	.227,	.221,	.202,
00401	1336*	°	.191,	.184,	.179,	.176,	.173,
00401	1337*	°	.171,	.169,	.168,	.167,	.166,
00401	1338*	°	.165,	.164,	.163,	.163,	.162,
00401	1339*	°	.162,	.161,	.161,	.160,	.160,
00401	1340*	°	.160,	.160,	.160/		

00401 1341*

C

00401 1342*

C

SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM O R - 1028.720 PSIA

00401 1343*

C

DATA (U6(J,13),J=1,83) /

00403	1344*	°	.396,	.395,	.395,	.395,	.395,
00403	1345*	°	.395,	.395,	.395,	.395,	.395,
00403	1346*	°	.396,	.396,	.397,	.397,	.397,
00403	1347*	°	.398,	.399,	.401,	.402,	.404,
00403	1348*	°	.406,	.409,	.412,	.415,	.419,
00403	1349*	°	.424,	.430,	.436,	.442,	.442,
00403	1350*	°	.444,	.458,	.468,	.468,	.469,
00403	1351*	°	.482,	.492,	.492,	.498,	.518,
00403	1352*	°	.521,	.521,	.541,	.558,	.558,
00403	1353*	°	.578,	.604,	.604,	.619,	.669,
00403	1354*	°	.669,	.690,	.762,	.762,	.794,
00403	1355*	°	.992,	1.381,	1.761,	1.411,	.783,
00403	1356*	°	.574,	.474,	.415,	.379,	.353,
00403	1357*	°	.334,	.319,	.307,	.298,	.290,
00403	1358*	°	.283,	.277,	.272,	.268,	.264,
00403	1359*	°	.261,	.258,	.255,	.253,	.251,
00403	1360*	°	.249,	.248,	.246/		

00403 1361*

C

00403 1362*

C

00403 1363*

C

PRESSURE - PSIA

00403 1364*

C

00403 1365*

C

DATA UA(14) / 1102.200 /

00403 1366*

C

00403 1367*

C

DENSITY - LB/ CU FT - FOR 1102.200 PSIA

00405 1368*

C

00405 1369*

C

00405 1370*

C

00405 1371° C
 00407 1372°
 00407 1373° DATA (U1(J,14),J=1,83) /
 00407 1374° * 81.76615, 81.03728, 80.25682, 79.55449, 78.80221,
 00407 1375° * 78.00312, 77.27975, 76.51109, 75.75758, 74.96252,
 00407 1376° * 74.18398, 73.36757, 72.62164, 72.23394, 72.23394,
 00407 1377° * 71.78751, 70.97232, 70.12623, 69.30007, 68.44627,
 00407 1378° * 67.61325, 66.71114, 65.78947, 64.89293, 63.93862,
 00407 1379° * 64.18485, 61.95787, 61.95787, 60.24511, 60.24511,
 00407 1380° * 59.84440, 58.71991, 57.66606, 57.66606, 57.53740,
 00407 1381° * 56.30631, 55.49390, 55.49390, 55.06608, 53.61930,
 00407 1382° * 53.41880, 53.41880, 52.13764, 51.41388, 51.41388,
 00407 1383° * 50.53057, 49.40711, 49.40711, 48.75670, 47.30369,
 00407 1384° * 47.30369, 46.75082, 45.06534, 45.06534, 44.44444,
 00407 1385° * 41.66667, 38.15338, 33.57958, 28.27255, 20.93602,
 00407 1386° * 17.44287, 15.36570, 13.93146, 12.85347, 11.99616,
 00407 1387° * 11.29050, 10.69176, 10.17605, 9.72384, 9.32227,
 00407 1388° * 8.96218, 8.63707, 8.34028, 8.06907, 7.81861,
 00407 1389° * 7.58668, 7.37137, 7.17000, 6.98178, 6.80504,
 00407 1390° * 6.63834, 6.48130, 6.33232/

00407 1390° C
 00407 1391° C ISOTHERM DERIVATIVE - ALL VALUES SET TO ZERO

00407 1392° C
 00411 1393° C DATA (U2(J,14),J=1,83) / 83°0. /

00411 1394° C
 00411 1395° C ISOCHORE DERIVATIVE - ALL VALUES SET TO ZERO

00411 1396° C
 00413 1397° C DATA (U3(J,14),J=1,83) / 83°0. /

00413 1398° C
 00413 1399° C ENTHALPY - BTU/LB - FOR 1102.200 PSIA

00413 1400° C
 00415 1401° C DATA (U4(J,14),J=1,83) /
 00415 1402° * -80.258, -78.281, -76.306, -74.332, -72.358,
 00415 1403° * -70.386, -68.413, -66.439, -64.465, -62.490,
 00415 1404° * -60.513, -58.534, -56.551, -55.628, -55.628,
 00415 1405° * -54.565, -52.574, -50.577, -48.573, -46.561,
 00415 1406° * -44.539, -42.506, -40.460, -38.398, -36.318,
 00415 1407° * -34.217, -32.091, -29.937, -28.162, -28.162,
 00415 1408° * -27.747, -25.469, -23.437, -23.437, -23.187,
 00415 1409° * -20.832, -19.981, -19.981, -18.413, -15.915,
 00415 1410° * -15.593, -15.593, -13.319, -12.098, -12.098,
 00415 1411° * -10.597, -8.756, -8.756, -7.713, -5.501,
 00415 1412° * -5.501, -4.605, -2.237, -2.237, -1.178,
 00415 1413° * 2.725, 7.433, 13.385, 20.528, 32.464,
 00415 1414° * 40.127, 45.872, 50.654, 54.863, 58.696,
 00415 1415° * 62.267, 65.644, 68.869, 71.973, 74.979,
 00415 1416° * 77.902, 80.756, 83.552, 86.296, 88.996,
 00415 1417° * 91.656, 94.283, 96.880, 99.449, 101.995,
 00415 1418° * 104.520, 107.025, 109.514/

00415 1419° C
 00415 1420° C SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 1102.200 PSIA

00415 1421° C
 00417 1422° C DATA (U5(J,14),J=1,83) /
 00417 1423° * .266, .262, .258, .254, .250,
 00417 1424° * .246, .243, .240, .237, .234,
 00417 1425° * .231, .228, .226, .225, .225,
 00417 1426° * .223, .221, .218, .216, .214,
 00417 1427° * .212, .210, .208, .206, .204,
 00417 1428° * .202, .200, .198, .196, .196,

00417	1429°	°	.196,	.199,	.198,	.196,	.198,
00417	1430°	*	.196,	.195,	.195,	.195,	.194,
00417	1431°	°	.194,	.194,	.194,	.194,	.194,
00417	1432°	°	.194,	.195,	.195,	.195,	.196,
00417	1433°	*	.196,	.196,	.197,	.197,	.198,
00417	1434°	°	.202,	.211,	.217,	.219,	.206,
00417	1435°	*	.194,	.187,	.181,	.177,	.175,
00417	1436°	*	.172,	.170,	.169,	.168,	.166,
00417	1437°	*	.165,	.165,	.164,	.163,	.163,
00417	1438°	*	.162,	.162,	.161,	.161,	.160,
00417	1439°	°	.160,	.160,	.160/		

C
C
C

SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM O R - 1102.200 PSIA

00421	1443°		DATA (U6(J,14),J=1,83) /				
00421	1444°	°	.395,	.395,	.395,	.395,	.395,
00421	1445°	*	.395,	.395,	.395,	.395,	.395,
00421	1446°	°	.396,	.396,	.397,	.397,	.397,
00421	1447°	°	.398,	.399,	.400,	.402,	.403,
00421	1448°	°	.405,	.408,	.411,	.414,	.418,
00421	1449°	°	.422,	.428,	.434,	.440,	.440,
00421	1450°	°	.441,	.455,	.464,	.464,	.465,
00421	1451°	°	.476,	.485,	.485,	.491,	.510,
00421	1452°	*	.512,	.512,	.529,	.543,	.543,
00421	1453°	°	.561,	.563,	.583,	.595,	.634,
00421	1454°	*	.634,	.650,	.703,	.703,	.726,
00421	1455°	*	.851,	1.040,	1.325,	1.453,	.927,
00421	1456°	°	.647,	.518,	.446,	.399,	.369,
00421	1457°	°	.347,	.329,	.316,	.305,	.296,
00421	1458°	*	.289,	.282,	.277,	.272,	.268,
00421	1459°	°	.264,	.261,	.258,	.256,	.253,
00421	1460°	°	.251,	.250,	.248/		

C

C*****

C

PRESSURE - PSIA

C

DATA UA(15) / 1175.680 /

C

DENSITY - LB/CU FT - FOR 1175.680 PSIA

C

00425	1470°		DATA (U1(J,15),J=1,83) /				
00425	1471°	°	81.76615,	81.03728,	80.32128,	79.55449,	78.80221,
00425	1472°	°	78.06401,	77.33952,	76.56968,	75.81501,	75.01875,
00425	1473°	°	74.23905,	73.47538,	72.67442,	72.28615,	72.28615,
00425	1474°	°	71.83908,	71.02273,	70.22472,	69.39625,	68.54010,
00425	1475°	°	67.65900,	66.80027,	65.91958,	64.97726,	64.06150,
00425	1476°	°	63.09148,	62.11180,	61.08736,	60.22562,	60.22562,
00425	1477°	°	60.02401,	58.92752,	57.89600,	57.89600,	57.77007,
00425	1478°	°	56.56109,	55.74136,	55.74136,	55.27916,	53.93743,
00425	1479°	°	53.76344,	53.76344,	52.49344,	51.78664,	51.78664,
00425	1480°	*	50.96840,	49.87531,	49.87531,	49.28536,	47.93864,
00425	1481°	°	47.93864,	47.41584,	45.94685,	45.94685,	45.28986,
00425	1482°	°	42.84490,	39.90423,	36.31082,	32.02049,	24.09639,
00425	1483°	°	19.63865,	17.05611,	15.32567,	14.05284,	13.05995,
00425	1484°	°	12.25054,	11.57273,	10.99263,	10.48658,	10.03915,
00425	1485°	°	9.64041,	9.28074,	8.95496,	8.65651,	8.38293,
00425	1486°	°	8.12942,	7.89453,	7.67578,	7.47105,	7.27908,

5
A

6 FOR,* TPOCB1,TPOCB1

DATE 310871 PAGE 292

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00425 1487*  * 7.09874, 6.92857, 6.76727/
00425 1488*  C
00425 1489*  C      ISOTHERM DERIVATIVE - ALL VALUES SET TO ZERO
00425 1490*  C
00427 1491*  DATA (U2(J,15),J=1,83) / 83*0. /
00427 1492*  C
00427 1493*  C      ISOCORE DERIVATIVE - ALL VALUES SET TO ZERO
00427 1494*  C
00431 1495*  DATA (U3(J,15),J=1,83) / 83*0. /
00431 1496*  C
00431 1497*  C      ENTHALPY - BTU/LB - FOR 1175.680 PSIA
00431 1498*  C
00433 1499*  DATA (U4(J,15),J=1,83) /
00433 1500*  * -80.121, -78.146, -76.171, -74.198, -72.225,
00433 1501*  * -70.253, -68.282, -66.310, -64.337, -62.363,
00433 1502*  * -60.388, -58.411, -56.430, -55.508, -55.508,
00433 1503*  * -54.446, -52.457, -50.463, -48.463, -46.454,
00433 1504*  * -44.437, -42.408, -40.367, -38.312, -36.239,
00433 1505*  * -34.146, -32.030, -29.886, -28.123, -28.123,
00433 1506*  * -27.710, -25.468, -23.433, -23.433, -23.185,
00433 1507*  * -20.853, -19.957, -19.957, -18.462, -15.999,
00433 1508*  * -15.683, -15.683, -13.450, -12.257, -12.257,
00433 1509*  * -10.790, -9.009, -9.009, -7.991, -5.885,
00433 1510*  * -5.885, -5.008, -2.773, -2.773, -1.774,
00433 1511*  * 1.808, 5.930, 10.813, 16.613, 28.540,
00433 1512*  * 37.175, 43.521, 48.686, 53.163, 57.193,
00433 1513*  * 60.914, 64.411, 67.736, 70.925, 74.003,
00433 1514*  * 76.990, 79.900, 82.745, 85.534, 88.274,
00433 1515*  * 90.971, 93.631, 96.238, 98.855, 101.427,
00433 1516*  * 103.975, 106.502, 109.011/
00433 1517*  C
00433 1518*  C      SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 1175.680 PSIA
00433 1519*  C
00435 1520*  DATA (U5(J,15),J=1,83) /
00435 1521*  * .266, .262, .258, .254, .250,
00435 1522*  * .247, .243, .240, .237, .234,
00435 1523*  * .231, .228, .226, .225, .225,
00435 1524*  * .223, .221, .219, .216, .214,
00435 1525*  * .212, .210, .208, .206, .204,
00435 1526*  * .202, .200, .198, .196, .196,
00435 1527*  * .196, .199, .198, .198, .198,
00435 1528*  * .196, .195, .195, .195, .194,
00435 1529*  * .194, .194, .194, .194, .194,
00435 1530*  * .194, .194, .194, .194, .195,
00435 1531*  * .195, .195, .196, .196, .196,
00435 1532*  * .199, .206, .210, .214, .208,
00435 1533*  * .197, .189, .183, .179, .176,
00435 1534*  * .173, .171, .176, .168, .167,
00435 1535*  * .166, .165, .164, .164, .163,
00435 1536*  * .162, .162, .161, .161, .161,
00435 1537*  * .160, .160, .160/
00435 1538*  C
00435 1539*  C      SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM O R - 1175.680 PSIA
00435 1540*  C
00437 1541*  DATA (U6(J,15),J=1,83) /
00437 1542*  * .395, .395, .395, .395, .394,
00437 1543*  * .394, .394, .394, .395, .395,
00437 1544*  * .395, .396, .396, .396, .396,

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00437	1545	*	.397,	.398,	.399,	.401,	.403,
00437	1546	*	.405,	.407,	.410,	.413,	.416,
00437	1547	*	.421,	.426,	.431,	.437,	.437,
00437	1548	*	.438,	.451,	.460,	.460,	.461,
00437	1549	*	.471,	.479,	.479,	.484,	.501,
00437	1550	*	.503,	.503,	.518,	.531,	.531,
00437	1551	*	.547,	.565,	.565,	.575,	.607,
00437	1552	*	.607,	.620,	.660,	.660,	.678,
00437	1553	*	.766,	.899,	1.058,	1.241,	1.037,
00437	1554	*	.724,	.564,	.477,	.423,	.386,
00437	1555	*	.360,	.340,	.325,	.313,	.303,
00437	1556	*	.295,	.288,	.282,	.276,	.272,
00437	1557	*	.268,	.264,	.261,	.258,	.256,
00437	1558	*	.254,	.252,	.250/		

C
C*****

C
C PRESSURE = PSIA

C
C DATA UA(16) / 1249.160 /

C
C DENSITY = LB/CU FT = FOR 1249.160 PSIA

00443	1568		DATA (U1(J,16),J=1,83) /				
00443	1569	*	81.83306,	81.10300,	80.38585,	79.61783,	78.86435,
00443	1570	*	78.12500,	77.33952,	76.62835,	75.81501,	75.07507,
00443	1571	*	74.29420,	73.52941,	72.72727,	72.36248,	72.36248,
00443	1572	*	71.94245,	71.12375,	70.27407,	69.44444,	68.63418,
00443	1573	*	67.75068,	66.88963,	66.00660,	65.10417,	64.18485,
00443	1574	*	63.21113,	62.22775,	61.23699,	60.40042,	60.40042,
00443	1575	*	60.20470,	59.10166,	58.09402,	58.09402,	57.97101,
00443	1576	*	56.78592,	55.99104,	55.99104,	55.52471,	54.22993,
00443	1577	*	54.05405,	54.05405,	52.85412,	52.16484,	52.16484,
00443	1578	*	51.36107,	50.32713,	50.32713,	49.75124,	48.47310,
00443	1579	*	48.47310,	47.98464,	46.62005,	46.62005,	46.04052,
00443	1580	*	43.82121,	41.25413,	38.24092,	34.71017,	27.21829,
00443	1581	*	21.97802,	18.84659,	16.78979,	15.30222,	14.15829,
00443	1582	*	13.23802,	12.47349,	11.82452,	11.26126,	10.76658,
00443	1583	*	10.32738,	9.93246,	9.57488,	9.24984,	8.95095,
00443	1584	*	8.67604,	8.42105,	8.18398,	7.96242,	7.75494,
00443	1585	*	7.56029,	7.37681,	7.20305/		

C
C ISOTHERM DERIVATIVE = ALL VALUES SET TO ZERO

C
C DATA (U2(J,16),J=1,83) / 83.0. /

C
C ISOCHORE DERIVATIVE = ALL VALUES SET TO ZERO

C
C DATA (U3(J,16),J=1,83) / 83.0. /

C
C ENTHALPY = BTU/LB = FOR 1249.160 PSIA

00451	1597		DATA (U4(J,16),J=1,83) /				
00451	1598	*	-79.985,	-78.010,	-76.036,	-74.064,	-72.092,
00451	1599	*	-70.121,	-68.151,	-66.180,	-64.209,	-62.236,
00451	1600	*	-60.263,	-58.287,	-56.309,	-55.388,	-55.388,
00451	1601	*	-54.327,	-52.341,	-50.349,	-48.352,	-46.347,
00451	1602	*	-44.333,	-42.310,	-40.274,	-38.224,	-36.158,

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00451	1603*	*	-34.073,	-31.966,	-29.833,	-28.079,	-28.079,
00451	1604*	*	-27.669,	-25.443,	-23.424,	-23.424,	-23.178,
00451	1605*	*	-20.867,	-19.981,	-19.981,	-18.502,	-16.072,
00451	1606*	*	-15.637,	-15.637,	-13.564,	-12.395,	-12.395,
00451	1607*	*	-10.958,	-9.224,	-9.224,	-8.232,	-6.181,
00451	1608*	*	-6.181,	-5.350,	-3.219,	-3.219,	-2.266,
00451	1609*	*	1.090,	4.835,	9.100,	14.000,	24.950,
00451	1610*	*	34.198,	41.125,	46.684,	51.437,	55.674,
00451	1611*	*	59.552,	63.173,	66.600,	69.876,	73.028,
00451	1612*	*	76.080,	79.047,	81.942,	84.775,	87.555,
00451	1613*	*	90.289,	92.982,	95.640,	98.265,	100.862,
00451	1614*	*	103.434,	105.983,	108.512/		

C
C
C

SPECIFIC HEAT CONSTANT VOLUME - BTU/LBM O R FOR 1249.160 PSIA

00453	1618*		DATA (U5(J,16),J=1,83) /				
00453	1619*	*	.266,	.262,	.258,	.254,	.250,
00453	1620*	*	.247,	.243,	.240,	.237,	.234,
00453	1621*	*	.231,	.229,	.226,	.225,	.225,
00453	1622*	*	.224,	.221,	.219,	.217,	.215,
00453	1623*	*	.212,	.210,	.208,	.206,	.204,
00453	1624*	*	.202,	.200,	.198,	.196,	.196,
00453	1625*	*	.196,	.199,	.198,	.198,	.198,
00453	1626*	*	.197,	.196,	.196,	.195,	.194,
00453	1627*	*	.194,	.194,	.194,	.194,	.194,
00453	1628*	*	.194,	.194,	.194,	.194,	.194,
00453	1629*	*	.194,	.194,	.195,	.195,	.195,
00453	1630*	*	.197,	.203,	.205,	.208,	.207,
00453	1631*	*	.199,	.191,	.185,	.180,	.177,
00453	1632*	*	.174,	.172,	.171,	.169,	.168,
00453	1633*	*	.167,	.166,	.165,	.164,	.163,
00453	1634*	*	.163,	.162,	.162,	.161,	.161,
00453	1635*	*	.160,	.160,	.160/		

C
C
C

SPECIFIC HEAT CONSTANT PRESSURE - BTU/LBM O R - 1249.160 PSIA

00453	1638*		DATA (U6(J,16),J=1,83) /				
00455	1640*	*	.395,	.395,	.395,	.394,	.394,
00455	1641*	*	.394,	.394,	.394,	.394,	.395,
00455	1642*	*	.395,	.395,	.396,	.396,	.396,
00455	1643*	*	.397,	.398,	.399,	.400,	.402,
00455	1644*	*	.404,	.406,	.408,	.411,	.415,
00455	1645*	*	.419,	.424,	.429,	.434,	.434,
00455	1646*	*	.435,	.448,	.456,	.456,	.457,
00455	1647*	*	.466,	.474,	.474,	.479,	.494,
00455	1648*	*	.496,	.496,	.509,	.521,	.521,
00455	1649*	*	.535,	.550,	.550,	.558,	.585,
00455	1650*	*	.585,	.596,	.628,	.628,	.642,
00455	1651*	*	.708,	.802,	.906,	1.048,	1.059,
00455	1652*	*	.793,	.612,	.510,	.447,	.405,
00455	1653*	*	.374,	.352,	.335,	.321,	.310,
00455	1654*	*	.301,	.293,	.286,	.281,	.276,
00455	1655*	*	.271,	.267,	.264,	.261,	.258,
00455	1656*	*	.256,	.254,	.252/		

C

END

TP019260
TP019270

TPOCB1
 TPOCB1 CODE SYMBOLIC
 RELOCATABLE
 @ HDG 6 FOR,* TPOCB2,TPOCB2

DATE 310871 PAGE 295
 02 JUL 71 17:51:35 01754230 14 1658 (DELETED)
 02 JUL 71 17:51:35 02031504 24 1 (DELETED)
 02031534 14 747

3.2.56 TPOCB 2

FOR: TPOCB2,TPOCB2
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:29

31 AUG 71

9:28:29.657

BLOCK DATA

STORAGE USED (BLOCK, NAME, LENGTH)

0003 TPCB 021661

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 I 000000 IS 0000 I 000001 J 0003 R 000000 TPCB 0003 R 020177 VB 0003 R 020230 V1
 0003 R 021030 V2

00100	1*	CD	*****	TP020010
00100	2*	CD		TP020020
00100	3*	CD	PROGRAMMER AND DATE	TP020030
00100	4*	CD	J. I. PREATT	TP020040
00100	5*	CD	DECEMBER 1970	TP020050
00100	6*	CD		TP020060
00100	7*	CD	PURPOSE	TP020070
00100	8*	CD	INITIALIZATION OF RODER'S THERMODYNAMIC PROPERTIES OF	TP020080
00100	9*	CD	OXYGEN	TP020090
00100	10*	CD		TP020100
00100	11*	CD	USAGE	TP020110
00100	12*	CD	BLOCK DATA	TP020120
00100	13*	CD		TP020130
00100	14*	CD	DESCRIPTION OF PARAMETERS	TP020140
00100	15*	CD		TP020150
00100	16*	CD	INPUT	TP020160
00100	17*	CD	NONE	TP020170
00100	18*	CD		TP020180
00100	19*	CD		TP020190
00100	20*	CD	OUTPUT	TP020200
00100	21*	CD	CALLING SEQUENCE	TP020210
00100	22*	CD	NONE	TP020220
00100	23*	CD	COMMON	TP020230
00100	24*	CD	VB - TEMPERATURE ARRAY - O R	TP020240
00100	25*	CD	V1 - VISCOSITY ARRAY - LBF HR/FT/FT	TP020250
00100	26*	CD	V2 - THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R	TP020260
00100	27*	CD		TP020270
00100	28*	CD	REMARKS AND RESTRICTIONS	TP020280
00100	29*	CD	THIS BLOCK DATA ROUTINE IS INITIALIZED EVERY TIME THE	TP020290
00100	30*	CD	SUBPROGRAM THERM IS LOADED INTO CORE.	TP020300
00100	31*	CD		TP020310
00100	32*	CD	SUBPROGRAMS REQUIRED	TP020320
00100	33*	CD	NONE	TP020330
00100	34*	CD		TP020340
00100	35*	CD	METHOD	TP020350
00100	36*	CD	REFERENCE	TP020360
00100	37*	CD	NBS LETTER ON VISCOSITY AND THERMAL CONDUCTIVITY OF	TP020370

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00100 38* CD OXYGEN, BY H. M. ROPER TO J. SMITHSON, NASA/MSC, TPO20380
00100 39* CD 20 SEPTEMBER 1970. TPO20390
00100 40* CD TPO20400
00100 41* CD ..... TPO20410
00101 42* BLOCK DATA TPO20420
00101 43* C TPO20430
00101 44* C TPO20440
00102 45* DIMENSION VB(24), V1(24,16), V2(24,16)
00102 46* C
00103 47* COMMON / TPCB / TPCB(9137)
00103 48* C
00104 49* EQUIVALENCE ( TPCB (8320) , VB )
00105 50* EQUIVALENCE ( TPCB (8345) , V1 )
00106 51* EQUIVALENCE ( TPCB (8729) , V2 )
00106 52* C TPO20520
00106 53* C TPO20530
00106 54* C..... TPO20540
00106 55* C TPO20550
00106 56* TEMPERATURE ARRAY FOR VISCOSITY AND THERMAL CONDUCTIVITY TPO20560
00106 57* C TPO20570
00107 58* DATA VB / TPO20580
00107 59* * 144.0000, 162.0000, 180.0000, 198.0000, 216.0000, TPO20590
00107 60* * 234.0000, 252.0000, 270.0000, 282.6000, 288.0000, TPO20600
00107 61* * 306.0000, 324.0000, 342.0000, 360.0000, 378.0000, TPO20610
00107 62* * 396.0000, 414.0000, 432.0000, 450.0000, 463.0000, TPO20620
00107 63* * 486.0000, 504.0000, 522.0000, 540.0000/ TPO20630
00107 64* C
00107 65* C.....
00107 66* C
00107 67* C VISCOSITY - LBF HR/FT/FT - FOR 14.696 PSIA
00107 68* C
00111 69* DATA (V1(J,1),J=1,24) /
00111 70* *1.577718E-9,1.147072E-9, .044207E-9, .048558E-9, .053432E-9,
00111 71* * .057203E-9, .061496E-9, .065673E-9, .069597E-9, .069850E-9,
00111 72* * .073911E-9, .077856E-9, .081801E-9, .085630E-9, .089343E-9,
00111 73* * .093056E-9, .096711E-9, .100250E-9, .103731E-9, .107212E-9,
00111 74* * .110576E-9, .113883E-9, .117132E-9, .120381E-9/
00111 75* C
00111 76* C THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R -FOR 14.696 PSIA
00111 77* C
00113 78* DATA (V2(J,1),J=1,24) /
00113 79* * .948019E-1, .874743E-1, .054783E-1, .040216E-1, .065648E-1,
00113 80* * .071080E-1, .076454E-1, .081770E-1, .085412E-1, .086972E-1,
00113 81* * .092115E-1, .097142E-1, .102112E-1, .106966E-1, .111763E-1,
00113 82* * .116501E-1, .121124E-1, .125690E-1, .130140E-1, .134589E-1,
00113 83* * .138981E-1, .143257E-1, .147534E-1, .151695E-1/
00113 84* C
00113 85* C.....
00113 86* C
00113 87* C VISCOSITY - LBF HR/FT/FT - FOR 220.440 PSIA
00113 88* C
00115 89* DATA (V1(J,2),J=1,24) /
00115 90* *1.592454E-9,1.167262E-9, .902887E-9, .728726E-9, .589722E-9,
00115 91* * .071532E-9, .074897E-9, .077856E-9, .080049E-9, .080989E-9,
00115 92* * .084238E-9, .087545E-9, .090851E-9, .094158E-9, .097465E-9,
00115 93* * .100772E-9, .104021E-9, .107270E-9, .110460E-9, .113651E-9,
00115 94* * .116784E-9, .119859E-9, .122934E-9, .125950E-9/
00115 95* C

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00115 96* C THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R -FOR 220.440 PSIA
00115 97* C
00117 98* DATA (V2(J,2),J=1,24) /
00117 99* * .952238E-1, .879455E-1, .807593E-1, .728654E-1, .637291E-1,
00117 100* * .090439E-1, .093675E-1, .097258E-1, .099968E-1, .101130E-1,
00117 101* * .105175E-1, .109278E-1, .113439E-1, .117657E-1, .121818E-1,
00117 102* * .126036E-1, .130197E-1, .134300E-1, .138403E-1, .142506E-1,
00117 103* * .146551E-1, .150597E-1, .154584E-1, .158514E-1/
00117 104* C
00117 105* C*****
00117 106* C
00117 107* C VISCOSITY - LBF HR/FT/FT - FOR 293.920 PSIA
00117 108* C
00121 109* DATA (V1(J,3),J=1,24) /
00121 110* *1.602200E-9,1.174456E-9, .908109E-9, .734006E-9, .594944E-9,
00121 111* * .480306E-9, .078668E-9, .081105E-9, .083745E-9, .084876E-9,
00121 112* * .087951E-9, .091026E-9, .094100E-9, .097233E-9, .100366E-9,
00121 113* * .103499E-9, .106631E-9, .109764E-9, .112839E-9, .115914E-9,
00121 114* * .118989E-9, .121948E-9, .124906E-9, .127865E-9/
00121 115* C
00121 116* C THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R -FOR 293.920 PSIA
00121 117* C
00123 118* DATA (V2(J,3),J=1,24) /
00123 119* * .953740E-1, .811389E-1, .809673E-1, .731717E-1, .640931E-1,
00123 120* * .555115E-1, .100609E-1, .103210E-1, .105516E-1, .106504E-1,
00123 121* * .110145E-1, .113959E-1, .117773E-1, .121702E-1, .125632E-1,
00123 122* * .129619E-1, .133607E-1, .137594E-1, .141524E-1, .145453E-1,
00123 123* * .149383E-1, .153255E-1, .157127E-1, .160940E-1/
00123 124* C
00123 125* C*****
00123 126* C
00123 127* C VISCOSITY - LBF.HR/FT/FT - FOR 367.400 PSIA
00123 128* C
00125 129* DATA (V1(J, 4),J=1,24) /
00125 130* *1.611974E-9,1.181669E-9, .913346E-9, .739298E-9, .600117E-9,
00125 131* * .486232E-9, .086385E-9, .086038E-9, .087198E-9, .087720E-9,
00125 132* * .090215E-9, .093174E-9, .096422E-9, .100078E-9, .103210E-9,
00125 133* * .106169E-9, .109186E-9, .112203E-9, .115162E-9, .118178E-9,
00125 134* * .121079E-9, .124038E-9, .126939E-9, .129782E-9/
00125 135* C
00125 136* C THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R - FOR 367.400 PSIA
00127 137* DATA (V2(J, 4),J=1,24) /
00127 138* * .955269E-1, .883089E-1, .811718E-1, .734684E-1, .644589E-1,
00127 139* * .560158E-1, .107685E-1, .109859E-1, .111303E-1, .111997E-1,
00127 140* * .114944E-1, .118296E-1, .121879E-1, .125635E-1, .129449E-1,
00127 141* * .133206E-1, .137020E-1, .140776E-1, .144590E-1, .148405E-1,
00127 142* * .152219E-1, .155975E-1, .159789E-1, .163488E-1/
00127 143* C
00127 144* C*****
00127 145* C
00127 146* C VISCOSITY - LBF.HR/FT/FT - FOR 440.880 PSIA
00127 147* C
00131 148* DATA (V1(J, 5),J=1,24) /
00131 149* *1.621721E-9,1.188864E-9, .918509E-9, .744519E-9, .605281E-9,
00131 150* * .491976E-9, .377104E-9, .093464E-9, .093348E-9, .093289E-9,
00131 151* * .094218E-9, .096248E-9, .098801E-9, .101644E-9, .104719E-9,
00131 152* * .107852E-9, .111449E-9, .114523E-9, .117424E-9, .120325E-9,
00131 153* * .123168E-9, .126018E-9, .128854E-9, .131696E-9/

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00131 154* C
 00131 155* C THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R - FOR 440.880 PSIA
 00131 156* C
 00133 157* DATA (V2(J, 5), J=1, 24) /
 00133 158* ° .956771E-1; .884823E-1; .813741E-1; .737631E-1; .648115E-1;
 00133 159* ° .565013E-1; .456830E-1; .118181E-1; .118238E-1; .118296E-1;
 00133 160* ° .120145E-1; .122862E-1; .125924E-1; .129334E-1; .132859E-1;
 00133 161* ° .136499E-1; .140198E-1; .143955E-1; .147653E-1; .151352E-1;
 00133 162* ° .154993E-1; .158691E-1; .162332E-1; .165973E-1/

00133 163* C
 00133 164* C*****
 00133 165* C
 00133 166* C VISCOSITY - LBF.HR/FT/FT - FOR 514.360 PSIA

00133 167* C
 00135 168* DATA (V1(J, 6), J=1, 24) /
 00135 169* ° 1.631526E-9; 1.196058E-9; .923673E-9; .749683E-9; .610386E-9;
 00135 170* ° .497603E-9; .376756E-9; .102688E-9; .100658E-9; .099729E-9;
 00135 171* ° .099381E-9; .100832E-9; .102166E-9; .104429E-9; .106981E-9;
 00135 172* ° .109708E-9; .112809E-9; .115626E-9; .118643E-9; .122181E-9;
 00135 173* ° .125082E-9; .127983E-9; .130768E-9; .133495E-9/

00135 174* C
 00135 175* C THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R - FOR 514.360 PSIA
 00135 176* C
 00137 177* C

DATA (V2(J, 6), J=1, 24) /
 00137 178* ° .958274E-1; .886499E-1; .815706E-1; .740463E-1; .651640E-1;
 00137 179* ° .569694E-1; .462667E-1; .129161E-1; .126791E-1; .125809E-1;
 00137 180* ° .126040E-1; .127774E-1; .130259E-1; .133206E-1; .136384E-1;
 00137 181* ° .139736E-1; .143204E-1; .146787E-1; .150370E-1; .154010E-1;
 00137 182* ° .157651E-1; .161292E-1; .164875E-1; .168458E-1/

00137 183* C
 00137 184* C TP020640
 00137 185* C***** TP020650
 00137 186* C TP020660
 00137 187* C VISCOSITY - LBF.HR/FT/FT - FOR 587.840 PSIA TP020670
 00137 188* C TP020680

00141 189* DATA (V1(J, 7), J=1, 24) /
 00141 190* ° 1.641273E-9; 1.203194E-9; .930809E-9; .754846E-9; .615434E-9; TP020700
 00141 191* ° .503173E-9; .380121E-9; .113189E-9; .108896E-9; .107098E-9; TP020710
 00141 192* ° .106749E-9; .105357E-9; .106401E-9; .108142E-9; .109882E-9; TP020720
 00141 193* ° .112203E-9; .114756E-9; .117424E-9; .120209E-9; .123052E-9; TP020730
 00141 194* ° .125953E-9; .128854E-9; .132334E-9; .135119E-9/ TP020740

00141 195* C
 00141 196* C THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R - FOR 587.840 PSIA TP020750
 00141 197* C TP020760
 00143 198* C TP020770

DATA (V2(J, 7), J=1, 24) /
 00143 199* ° .959690E-1; .888690E-1; .817762E-1; .743273E-1; .655088E-1; TP020790
 00143 200* ° .574184E-1; .469125E-1; .145800E-1; .136323E-1; .134705E-1; TP020800
 00143 201* ° .132740E-1; .133260E-1; .134936E-1; .137305E-1; .140079E-1; TP020810
 00143 202* ° .143142E-1; .146378E-1; .149672E-1; .153081E-1; .156606E-1; TP020820
 00143 203* ° .160074E-1; .163599E-1; .167182E-1; .170707E-1/ TP020830

00143 204* C TP020840
 00143 205* C***** TP020850
 00143 206* C TP020860
 00143 207* C VISCOSITY - LBF.HR/FT/FT - FOR 661.320 PSIA TP020870
 00143 208* C TP020880

DATA (V1(J, 8), J=1, 24) /
 00145 209* ° 1.650961E-9; 1.212941E-9; .935740E-9; .760010E-9; .620481E-9; TP020900
 00145 210* ° .508568E-9; .385632E-9; .132367E-9; .175672E-9; .112261E-9; TP020910
 00145 211*

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00145 212* * .111507E-9, .111913E-9, .110869E-9, .111797E-9, .113537E-9, TPO20920
00145 213* * .115510E-9, .117366E-9, .119687E-9, .122182E-9, .124792E-9, TPO20930
00145 214* * .127461E-9, .130188E-9, .132973E-9, .135757E-9/ TPO20940
00145 215* C THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R - FOR 661.320 PSIA TPO20950
00145 216* C THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R - FOR 661.320 PSIA TPO20960
00145 217* C DATA (V2(J, 8),J=1,24) / TPO20970
00147 218* * .961019E-1, .889882E-1, .819842E-1, .746047E-1, .658498E-1, TPO20990
00147 219* * .578576E-1, .475887E-1, .378860E-1, .264523E-1, .149325E-1, TPO21000
00147 220* * .140252E-1, .139270E-1, .140021E-1, .141697E-1, .144008E-1, TPO21010
00147 221* * .146667E-1, .149614E-1, .152677E-1, .155913E-1, .159207E-1, TPO21020
00147 222* * .162616E-1, .165968E-1, .169435E-1, .172845E-1/ TPO21030
00147 223* C TPO21040
00147 224* C TPO21040
00147 225* C TPO21050
00147 226* C TPO21060
00147 227* C VISCOSITY - LBF.HR/FT/FT - FOR 734.800 PSIA TPO21070
00147 228* C TPO21080
00151 229* C DATA (V1(J, 9),J=1,24) /
00151 230* * .1660708E-9, .219380E-9, .941890E-9, .765695E-9, .625470E-9, TPO21100
00151 231* * .513906E-9, .394683E-9, .338755E-9, .191279E-9, .128099E-9, TPO21110
00151 232* * .115104E-9, .115800E-9, .116728E-9, .117366E-9, .117076E-9, TPO21120
00151 233* * .118469E-9, .120557E-9, .122508E-9, .124502E-9, .126881E-9, TPO21130
00151 234* * .129318E-9, .131870E-9, .134423E-9, .137092E-9/ TPO21140
00151 235* C TPO21150
00151 236* C THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R - FOR 734.800 PSIA TPO21160
00151 237* C TPO21170
00153 238* C DATA (V2(J, 9),J=1,24) /
00153 239* * .974195E-1, .891616E-1, .821885E-1, .748647E-1, .661907E-1, TPO21190
00153 240* * .582853E-1, .484324E-1, .394521E-1, .216937E-1, .166141E-1, TPO21200
00153 241* * .148747E-1, .145742E-1, .145395E-1, .146378E-1, .148111E-1, TPO21210
00153 242* * .150307E-1, .152966E-1, .155797E-1, .158802E-1, .161923E-1, TPO21220
00153 243* * .165159E-1, .168395E-1, .171689E-1, .175041E-1/ TPO21230
00153 244* C TPO21240
00153 245* C TPO21250
00153 246* C TPO21260
00153 247* C VISCOSITY - LBF.HR/FT/FT - FOR 808.280 PSIA TPO21270
00153 248* C TPO21280
00155 249* C DATA (V1(J,10),J=1,24) /
00155 250* * .1670455E-9, .1227561E-9, .948039E-9, .770220E-9, .630460E-9, TPO21300
00155 251* * .519127E-9, .401123E-9, .350591E-9, .205899E-9, .143938E-9, TPO21310
00155 252* * .123690E-9, .118643E-9, .120035E-9, .120093E-9, .122240E-9, TPO21320
00155 253* * .122008E-9, .123458E-9, .125257E-9, .127403E-9, .129492E-9, TPO21330
00155 254* * .131464E-9, .133785E-9, .136164E-9, .138658E-9/ TPO21340
00155 255* C TPO21350
00155 256* C THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R - FOR 808.280 PSIA TPO21360
00155 257* C TPO21370
00157 258* C DATA (V2(J,10),J=1,24) /
00157 259* * .964082E-1, .893349E-1, .823772E-1, .751248E-1, .665259E-1, TPO21390
00157 260* * .587013E-1, .490507E-1, .406252E-1, .381923E-1, .216070E-1, TPO21400
00157 261* * .158455E-1, .152908E-1, .151116E-1, .151290E-1, .152446E-1, TPO21410
00157 262* * .154237E-1, .156433E-1, .158976E-1, .161172E-1, .164697E-1, TPO21420
00157 263* * .167702E-1, .170622E-1, .174001E-1, .177237E-1/ TPO21430
00157 264* C TPO21440
00157 265* C TPO21450
00157 266* C TPO21460
00157 267* C VISCOSITY - LBF.HR/FT/FT - FOR 861.760 PSIA TPO21470
00157 268* C TPO21480
00161 269* C DATA (V1(J,11),J=1,24) /

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00161 270* 01.680201E-9, 0.235799E-9, 0.954247E-9, 0.775268E-9, 0.635391E-9, TP021500
00161 271* 0.524291E-9, 0.408201E-9, 0.360395E-9, 0.241347E-9, 0.190350E-9, TP021510
00161 272* 0.137034E-9, 0.124038E-9, 0.122298E-9, 0.124154E-9, 0.124560E-9, TP021520
00161 273* 0.126823E-9, 0.126707E-9, 0.128157E-9, 0.129840E-9, 0.131870E-9, TP021530
00161 274* 0.134133E-9, 0.136164E-9, 0.138136E-9, 0.140399E-9/ TP021540
00161 275* C TP021550
00161 276* C THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R - FOR 881.760 PSIA TP021560
00161 277* C TP021570
00163 278* DATA (V2(J,11),J=1,24) /
00163 279* 0.965527E-1, 0.895083E-1, 0.825795E-1, 0.754022E-1, 0.668553E-1, TP021590
00163 280* 0.591059E-1, 0.496748E-1, 0.416769E-1, 0.375219E-1, 0.312577E-1, TP021600
00163 281* 0.170013E-1, 0.160363E-1, 0.157126E-1, 0.156317E-1, 0.156895E-1, TP021610
00163 282* 0.158224E-1, 0.160074E-1, 0.162327E-1, 0.164754E-1, 0.167470E-1, TP021620
00163 283* 0.170360E-1, 0.173307E-1, 0.176370E-1, 0.179490E-1/ TP021630
00163 284* C TP021640
00163 285* C TP021650
00163 286* C***** TP021660
00163 287* C TP021670
00163 288* C VISCOSITY - LBF.HR/FT/FT - FOR 955.240 PSIA TP021680
00163 289* C TP021690
00165 290* DATA (V1(J,12),J=1,24) /
00165 291* 01.689484E-9, 0.244095E-9, 0.960455E-9, 0.780373E-9, 0.640265E-9, TP021710
00165 292* 0.529396E-9, 0.417019E-9, 0.371186E-9, 0.284859E-9, 0.247844E-9, TP021720
00165 293* 0.145446E-9, 0.132915E-9, 0.126301E-9, 0.126069E-9, 0.128157E-9, TP021730
00165 294* 0.128854E-9, 0.131232E-9, 0.132567E-9, 0.132683E-9, 0.134365E-9, TP021740
00165 295* 0.136164E-9, 0.138310E-9, 0.140573E-9, 0.142661E-9/ TP021750
00165 296* C TP021760
00165 297* C THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R - FOR 955.240 PSIA TP021770
00165 298* C TP021780
00167 299* DATA (V2(J,12),J=1,24) /
00167 300* 0.966914E-1, 0.896816E-1, 0.827759E-1, 0.756622E-1, 0.671847E-1, TP021800
00167 301* 0.595046E-1, 0.504261E-1, 0.425380E-1, 0.377069E-1, 0.335750E-1, TP021810
00167 302* 0.186078E-1, 0.168742E-1, 0.163483E-1, 0.161634E-1, 0.161460E-1, TP021820
00167 303* 0.162327E-1, 0.163772E-1, 0.165737E-1, 0.167933E-1, 0.170418E-1, TP021830
00167 304* 0.173018E-1, 0.175850E-1, 0.178739E-1, 0.181744E-1/ TP021840
00167 305* C TP021850
00167 306* C***** TP021860
00167 307* C TP021870
00167 308* C VISCOSITY - LBF.HR/FT/FT - FOR 1028.720 PSIA TP021880
00167 309* C TP021890
00171 310* DATA (V1(J,13),J=1,24) /
00171 311* 01.697432E-9, 0.252333E-9, 0.966663E-9, 0.785363E-9, 0.645370E-9, TP021910
00171 312* 0.534385E-9, 0.425605E-9, 0.379657E-9, 0.304410E-9, 0.272211E-9, TP021920
00171 313* 0.159486E-9, 0.142255E-9, 0.132915E-9, 0.129144E-9, 0.129782E-9, TP021930
00171 314* 0.132102E-9, 0.132973E-9, 0.135409E-9, 0.136860E-9, 0.137034E-9, TP021940
00171 315* 0.138716E-9, 0.140457E-9, 0.142429E-9, 0.144634E-9/ TP021950
00171 316* C TP021960
00171 317* C THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R - FOR 1028.720 PSIA TP021970
00171 318* C TP021980
00173 319* DATA (V2(J,13),J=1,24) /
00173 320* 0.968012E-1, 0.898146E-1, 0.829724E-1, 0.759165E-1, 0.675198E-1, TP022000
00173 321* 0.598918E-1, 0.511426E-1, 0.433008E-1, 0.384581E-1, 0.345285E-1, TP022010
00173 322* 0.206940E-1, 0.177872E-1, 0.170187E-1, 0.167124E-1, 0.166199E-1, TP022020
00173 323* 0.166488E-1, 0.167586E-1, 0.169146E-1, 0.171111E-1, 0.173423E-1, TP022030
00173 324* 0.175850E-1, 0.178450E-1, 0.181166E-1, 0.184056E-1/ TP022040
00173 325* C TP022050
00173 326* C
00173 327* C*****

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00173 328* C
00173 329* C      VISCOSITY - LBF.HR/FT/FT - FOR 1102.20 PSIA
00173 330* C
00175 331* DATA (V1(J,14),J=1,24) /
00175 332* *1.705322E-9,1.263937E-9, .971130E-9, .790352E-9, .649895E-9,
00175 333* * .539317E-9, .433496E-9, .385864E-9, .322047E-9, .294663E-9,
00175 334* * .179153E-9, .149507E-9, .140398E-9, .134945E-9, .133379E-9,
00175 335* * .133785E-9, .135583E-9, .137556E-9, .138832E-9, .139586E-9,
00175 336* * .141849E-9, .143532E-9, .144692E-9, .146664E-9/
00175 337* C
00175 338* C      THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R - FOR 1102.20 PSIA
00175 339* C
00177 340* DATA (V2(J,14),J=1,24) /
00177 341* * .969196E-1, .899790E-1, .831656E-1, .761672E-1, .679090E-1,
00177 342* * .602692E-1, .517972E-1, .439724E-1, .389794E-1, .355640E-1,
00177 343* * .234974E-1, .190302E-1, .177473E-1, .172908E-1, .171174E-1,
00177 344* * .170769E-1, .171405E-1, .172676E-1, .180131E-1, .176433E-1,
00177 345* * .178687E-1, .181114E-1, .183714E-1, .186430E-1/
00177 346* C
00177 347* C*****
00177 348* C
00177 349* C      VISCOSITY - LBF.HR/FT/FT - FOR 1175.68 PSIA
00177 350* C
00201 351* DATA (V1(J,15),J=1,24) /
00201 352* *1.713212E-9,1.275540E-9, .975655E-9, .795341E-9, .654420E-9,
00201 353* * .544248E-9, .441385E-9, .392014E-9, .334810E-9, .305870E-9,
00201 354* * .198820E-9, .156d17E-9, .147940E-9, .140747E-9, .137034E-9,
00201 355* * .135525E-9, .138252E-9, .139702E-9, .140805E-9, .142139E-9,
00201 356* * .144982E-9, .146606E-9, .146897E-9, .148695E-9/
00201 357* C
00201 358* C      THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R - FOR 1175.68 PSIA
00201 359* C
00203 360* DATA (V2(J,15),J=1,24) /
00203 361* * .970294E-1, .901466E-1, .833563E-1, .764157E-1, .682442E-1,
00203 362* * .606390E-1, .524560E-1, .446428E-1, .395168E-1, .365926E-1,
00203 363* * .263927E-1, .203594E-1, .184812E-1, .178687E-1, .175970E-1,
00203 364* * .175104E-1, .175277E-1, .176202E-1, .177646E-1, .179438E-1,
00203 365* * .181518E-1, .183772E-1, .186257E-1, .188800E-1/
00203 366* C
00203 367* C*****
00203 368* C
00203 369* C      VISCOSITY - LBF.HR/FT/FT - FOR 1249.16 PSIA
00203 370* C
00205 371* DATA (V1(J,16),J=1,24) /
00205 372* *1.721045E-9,1.284648E-9, .981573E-9, .800273E-9, .659062E-9,
00205 373* * .549295E-9, .448464E-9, .395670E-9, .339510E-9, .315375E-9,
00205 374* * .219822E-9, .168710E-9, .153162E-9, .146897E-9, .143067E-9,
00205 375* * .139644E-9, .140051E-9, .140921E-9, .143010E-9, .144576E-9,
00205 376* * .146664E-9, .148115E-9, .149681E-9, .151480E-9/
00205 377* C
00205 378* C      THERMAL CONDUCTIVITY - BTU FT/HR/FT/FT/O R - FOR 1249.16 PSIA
00205 379* C
00207 380* DATA (V2(J,16),J=1,24) /
00207 381* * .971392E-1, .903084E-1, .835470E-1, .766526E-1, .685852E-1,
00207 382* * .610031E-1, .530397E-1, .452207E-1, .401120E-1, .374421E-1,
00207 383* * .284905E-1, .219197E-1, .192440E-1, .184870E-1, .181113E-1,
00207 384* * .179554E-1, .179264E-1, .179785E-1, .180940E-1, .182500E-1,
00207 385* * .184350E-1, .186488E-1, .188800E-1, .191227E-1/

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00211 386* END

T 060

END OF UNIVAC 1108 FORTRAN COMPILATION.
TPOCB2 SYMBOLIC
TPOCB2 CODE RELOCATABLE

O *DIAGNOSTIC* MESSAGE(S)

02 JUL 71	17:51:39	0	02056066	14	386	(DELETED)
02 JUL 71	17:51:39	1	02070522	24	1	(DELETED)
		0	02070552	14	76	

@ HDG @ FOR,* TRWDAT,TRWDAT

© FOR, TRWDAT, TRWDAT
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:43

31 AUG 71

9:28:43.489

BLOCK DATA

STORAGE USED (BLOCK, NAME, LENGTH)

0003 STAB 000504

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 I 000000 I 0003 I 000002 IADD 0003 I 000000 ICOUNT 0003 I 000001 ITYPE 0003 I 000004 KSYMB
 0003 I 000003 LAOD

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00101 1* BLOCK DATA
00102 2* COMMON /STAB/ ICOUNT, ITYPE, IADD, LADD, KSYMB( 160, 2)
00103 3* DATA
00103 4* * ICOUNT / 160 /, ITYPE / 18 /, IADD / 21 /, LADD / 15 /
00110 5* DATA (KSYMB(I,1), I= 1, 40)/
00110 6* * 6HMOEX ,6HNRRE ,6HNNPR ,6HEMIS
00110 7* * ,6HATHCON ,6HDELT ,6HNODEL ,6HNLC
00110 8* * ,6HICHAM ,6HNCHAM ,6HNPBL ,6HNPBL
00110 9* * ,6HNVALL ,6HNJUNCL ,6HIJUNC ,6HZO
00110 10* * ,6HNPBLF ,6HIPBF ,6HNLINJU ,6HVISC
00110 11* * ,6HIFB ,6HIEND ,6HLVDN ,6HLVUP
00110 12* * ,6HALPHA ,6HXLLENG ,6HTH ,6HPZOO
00110 13* * ,6HOIALO ,6HRHOL ,6HIPROP ,6HNPLINE
00110 14* * ,6HTIME ,6HTIMEND ,6HH ,6HIPUMI
00110 15* * ,6HPDELP ,6HPAO ,6HPWI ,6HPQ2
00110 16* */
00112 17* DATA (KSYMB(I,2), I= 1, 40)/
00112 18* * 0000000200001 ,0000000200002 ,0000000200003 ,0000000200004
00112 19* * ,0000000200042 ,0000000200100 ,0000000300101 ,0000000305756
00112 20* * ,0000000305764 ,0000000300147 ,0000000300150 ,0000000300151
00112 21* * ,0000000300152 ,0000000300153 ,0000000300154 ,0000000200250
00112 22* * ,0000000300251 ,0000000300252 ,0000000310122 ,0000000200254
00112 23* * ,0000000300312 ,0000000300324 ,0000000300332 ,0000000300344
00112 24* * ,0000000200356 ,0000000200414 ,0000000200452 ,0000000200510
00112 25* * ,0000000200511 ,0000000200547 ,0000000300552 ,0000000300554
00112 26* * ,0000000200612 ,0000000200613 ,0000000200614 ,0000000300640
00112 27* * ,0000000200645 ,0000000200652 ,0000000200657 ,0000000200664
00112 28* */
00114 29* DATA (KSYMB(I,1), I= 41, 80)/
00114 30* * 6HRPHD ,6HIBNDS ,6HM ,6HN
00114 31* * ,6HMAXIT ,6HIDER ,6HIFIN ,6HJVECTR
00114 32* * ,6HDIAD ,6HDIAP ,6HPORD ,6HPORD
00114 33* * ,6HPORD2 ,6HATO ,6HEPSLN ,6HBOUND
00114 34* * ,6HTTEMP ,6HTTEMP ,6HTT ,6HKA
00114 35* * ,6HIPB ,6HWDOTG ,6HPGPBL ,6HMACH
00114 36* * ,6HRGAS ,6HNPIPL ,6HCP ,6HGEE
00114 37* * ,6HTENV ,6HRFLAG ,6HNSYS ,6HWW

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00114	38*	*,6HAREAT	,6HAREAE	,6HCV	,6HNCQEF
00114	39*	*,6HCTA	,6HPATM	,6HARINJ	,6HTHRT
00114	40*	*/			
00116	41*	DATA (KSYMB(I,2),I= 41, 80)/			
00116	42*	*,0000000200671	,0000000300676	,0000000300677	,0000000300700
00116	43*	*,0000000300701	,0000000300702	,0000000300703	,0000000300704
00116	44*	*,0000000200730	,0000000200735	,0000000200742	,0000000200747
00116	45*	*,0000000200754	,0000000200761	,0000000200766	,0000000200767
00116	46*	*,0000000201133	,0000000202263	,0000000303413	,0000000203414
00116	47*	*,0000000303416	,0000000203424	,0000000204554	,0000000204562
00116	48*	*,0000000205712	,0000000305714	,0000000205715	,0000000205753
00116	49*	*,0000000205754	,0000000205755	,0000000306014	,0000000206065
00116	50*	*,0000000206067	,0000000206075	,0000000206103	,0000000306117
00116	51*	*,0000000306120	,0000000206121	,0000000206122	,0000000206136
00116	52*	*/			
00120	53*	DATA (KSYMB(I,1),I= 81, 120)/			
00120	54*	*,6HISP	,6HPCI	,6HCDC	,6HLAMDA
00120	55*	*,6HM#2	,6HTC2	,6HCS2	,6HIS2
00120	56*	*,6HPDROP	,6HAJ	,6HKTHER	,6HHE00
00120	57*	*,6HHEOI	,6HHEII	,6HHEIO	,6HLENGTH
00120	58*	*,6HTYPE	,6HRI	,6HTHICK	,6HLI
00120	59*	*,6HLO	,6HXI	,6HXO	,6HFD
00120	60*	*,6HARFL	,6HP	,6HDT8	,6HLT
00120	61*	*,6HDSI	,6HDHYO	,6HNT	,6HRO
00120	62*	*,6HLDMI	,6H#OL	,6HGR	,6HVTANK
00120	63*	*,6HCP1	,6HCP2	,6HRI	,6HR2
00120	64*	*/			
00122	65*	DATA (KSYMB(I,2),I= 81, 120)/			
00122	66*	*,0000000206144	,0000000206152	,0000000206160	,0000000206166
00122	67*	*,0000000206174	,0000000206200	,0000000206204	,0000000206210
00122	68*	*,0000000206214	,0000000306222	,0000000206223	,0000000306261
00122	69*	*,0000000306266	,0000000306273	,0000000306300	,0000000206305
00122	70*	*,0000000306312	,0000000206317	,0000000206324	,0000000306331
00122	71*	*,0000000306336	,0000000206343	,0000000206350	,0000000306355
00122	72*	*,0000000206362	,0000000206367	,0000000206374	,0000000206401
00122	73*	*,0000000206406	,0000000206413	,0000000306420	,0000000206425
00122	74*	*,0000000306432	,0000000206443	,0000000206450	,0000000206455
00122	75*	*,0000000206462	,0000000206467	,0000000206474	,0000000206501
00122	76*	*/			
00124	77*	DATA (KSYMB(I,1),I= 121,159)/			
00124	78*	*,6HPVENT	,6HAVENT	,6HLDWI	,6HLDWO
00124	79*	*,6HCTANK	,6HLDMD	,6HFN	,6HDQIN
00124	80*	*,6HHR5	,6HHR	,6HKL7	,6HTTANK
00124	81*	*,6HPROU	,6HATI	,6HKT1	,6HATD
00124	82*	*,6HKTD	,6HIPUMO	,6HCEF1	,6HCEF2
00124	83*	*,6HTEC	,6HPW3	,6H#P	,6HDIAT
00124	84*	*,6HPRIN	,6HPRE	,6HVA1	,6HVAD
00124	85*	*,6HXX	,6HFB0	,6HFB1	,6HPFB
00124	86*	*,6HTFB	,6HHGOI	,6HHGII	,6HSYSCOM
00124	87*	*,6HSTATE	,6HFUNCT	,6HTLIQ	
00124	88*	*/			
00126	89*	DATA (KSYMB(I,2),I= 121,159)/			
00126	90*	*,0000000206506	,0000000206513	,0000000306520	,0000000306525
00126	91*	*,0000000206532	,0000000306537	,0000000306544	,0000000206551
00126	92*	*,0000000301013	,0000000201051	,0000000206015	,0000000206575
00126	93*	*,0000000306602	,0000000206614	,0000000206621	,0000000206626
00126	94*	*,0000000206633	,0000000306640	,0000000206645	,0000000206652
00126	95*	*,0000000206657	,0000000206664	,0000000206671	,0000000206676

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00126 96* *.0000000306710 ,0000000206722 ,0000000306734 ,0000000306760
00126 97* *.0000000207004 ,0000000307030 ,0000000307036 ,0000000207037
00126 98* *.0000000207045 ,0000000307053 ,0000000307060 ,0000000007066
00126 99* *.0000000007542 ,0000000010002 ,0000000210134
00126 100* */
00130 101* END

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END OF UNIVAC 1108 FORTRAN V COMPILATION.

D *DIAGNOSTIC* MESSAGE(S)

TR#DAT	CODE	SYMBOLIC	RELOCATABLE	DATE	TIME	STATUS	MSG#	PAGE	REMARKS
				31 JUL 71	23:32:00	0	01460074	14	101 (DELETED)
				31 JUL 71	23:32:00	1	01462702	24	1 (DELETED)
						0	01462732	14	30

@ HDG @ FOR,* TR#LOD,TR#LOD

FOR: TRWLOD,TRWLOD
 UNIVAC 1108 FORTRAN V LEVEL 220 18 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:44

SUBROUTINE TRWLOD ENTRY POINT 001216

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	001231
0000	*DATA	000260
0002	*BLANK	000160
0003	STAB	000504
0004	INDATA	011610

EXTERNAL REFERENCES (BLOCK, NAME)

0005	CPDATA
0006	DP2R
0007	R20P
0010	NWDUS
0011	NI02S
0012	NI01S
0013	NERR2S
0014	NERR3S

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000036	10F	0001	000077	130L	0001	000126	133G	0001	000111	150L	0001	000117	160L
0001	000135	190L	0001	000161	200L	0001	000214	210L	0000	000037	220F	0001	000224	230L
0001	000226	235L	0001	000232	240L	0000	000015	250F	0001	000272	260L	0001	000311	270L
0000	000055	290F	0001	000353	300L	0000	000015	310F	0001	000367	320L	0001	000410	330L
0001	000435	340L	0001	000441	350L	0001	000460	355L	0000	000075	360F	0001	000477	370L
0001	000510	380L	0001	000527	390L	0000	000105	395F	0001	000024	40L	0001	000560	400L
0000	000114	405F	0001	000600	410L	0001	000622	420L	0001	000653	430L	0001	000736	440G
0001	000665	440L	0001	000673	450L	0001	000701	460L	0001	000720	470L	0001	000757	490L
0001	001012	500L	0001	001064	510L	0001	001067	520L	0000	000127	530F	0001	001144	534G
0001	001151	540G	0001	001077	540L	0000	000143	550F	0001	001107	560L	0000	000153	570F
0001	001130	580L	0000	000177	590F	0001	000042	60L	0001	001137	600L	0000	000212	620F
0000	000217	630F	0001	001174	640L	0001	001201	650L	0001	000052	80L	0002	R 000003	BUFF
0006	R 000000	DP2R	0000	I 000011	I	0003	I 000002	IAPP	0000	I 000007	18EG	0000	I 000025	IC
0003	I 000000	ICOUNT	0000	I 000034	IDX	0000	I 000031	IPAR	0000	I 000024	IR	0000	I 000014	IREP
0000	I 000016	ISAVE	0000	I 000032	ISLSH	0000	I 000230	ITEMP2	0003	I 000001	ITYPE	0000	I 000026	Ix
0000	I 000027	IY	0000	I 000030	IZ	0000	I 000012	J	0002	I 000000	JIN	0000	I 000035	JJ
0000	I 000021	JJJ	0002	I 000001	JOUT	0000	I 000023	J1	0000	I 000015	KKK	0002	I 000002	KOUT
0002	I 000003	KRBF	0000	I 000017	KRBF1	0003	I 000004	KSYMB	0003	I 000003	LA0D	0000	I 000020	LL
0000	I 000013	NA0R	0000	I 000022	NAME	0000	I 000000	NAMTYP	0000	I 000010	NDCAS	0000	I 000033	NDX
0004	R 000000	ORIGIN	0000	R 000230	TEMP	0000	R 000230	TEMP2						

00101 1* SUBROUTINE TRWLOD (IIN,IOUT,K)
 00101 2* C.....

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00101 30 C.....TRWLOD IS A MACHINE INDEPENDENT INPUT CONTROL ROUTINE WHICH WILL
00101 40 C.....TAKE DATA (PROCESSED BY CDDATA AND STORED IN AN INPUT BUFFER) AND
00101 50 C.....STORE IT DIRECTLY INTO CORE IN THE SPECIFIED LOCATIONS.
00101 60 C.....
00103 70 DIMENSION
00103 80 * BUFF(107) ,NAMTYP(7)
00103 90 * ,TEMP2(2) * ,ITEMP2(2)
00103 100 C.....
00103 110 C.....KRBF IS THE DATA STORAGE BUFFER FILLED BY CDDATA
00104 120 COMMON JIN,JOUT,KOUT,KRBF(109)
00104 130 C.....
00105 140 EQUIVALENCE
00105 150 * (KRBF,BUFF)
00105 160 C
00105 170 C * * * * *
00105 180 C *
00105 190 C * INSERT PROGRAM SYMBOL TABLE COMMON BLOCK AND INPUT COMMON BLOCK
00105 200 C *
00105 210 C COMMON /STAB/ ICOUNT, ITYPE, IADD, LADD, KSYMB( )
00106 220 COMMON /STAB/ ICOUNT,ITYPE,IADD,LADD,KSYMB( 320)
00106 230 C *
00106 240 C COMMON / / ORIGIN( )
00107 250 COMMON /INDATA/ ORIGIN(5000)
00107 260 C *
00107 270 C * * * * *
00107 280 C
00107 290 C.....
00110 300 EQUIVALENCE
00110 310 * (TEMP2(1),ITEMP2(1),TEMP)
00110 320 C.....
00111 330 DATA
00111 340 * IBEG / 6HBEGIN / ,NDCAS / 6HENOCAS /
00111 350 * ,(NAMTYP(I),I=1,7) / 6HSYMBOL
00111 360 * ,6H REAL ,6H FIXED
00111 370 * ,6HDOUBLE ,6HTYPE 5
00111 380 * ,6H BCD ,6H OCTAL
00111 390 C.....
00111 400 C.....ESTABLISH I/O UNITS
00111 410 C.....JIN = INPUT UNIT
00111 420 C.....JOUT= NORMAL OUTPUT UNIT
00111 430 C.....KOUT= ERROR MESSAGE OUTPUT UNIT = JOUT UNLESS JOUT = 0
00115 440 JIN = IIN
00116 450 JOUT= IOUT
00117 460 KOUT= JOUT
00120 470 IF(JOUT.EQ.0) KOUT = 6
00120 480 C.....
00120 490 C.....SKIP TO HEAD OF PAGE
00122 500 IF (JOUT.NE.0) WRITE (JOUT,10)
00125 510 10 FORMAT(1H1)
00125 520 C.....
00125 530 C.....INITIALIZATION
00125 540 C.....J IS FLAG SET AFTER FIRST LEGAL SYMBOL IS RECOGNIZED
00125 550 C.....K IS ILLEGAL INPUT FLAG
00125 560 C.....NADR IS A INFORMATION CELL CONTAINING TYPE AND SUBSCRITP OF THE
00125 570 C.....VARIABLE, IF ZERO THE SYMBOL IS BEGIN, ENOCAS, OR AN ILLEGAL
00125 580 C.....SYMBOL.
00125 590 C.....IREP IS THE NUMBER OF REPITITIONS TO BE PERFORMED
00126 600 J = 0

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00127 61*      K = 0
00130 62*      NADR = 0
00131 63*      IREP = 0
00131 64*      C.....
00131 65*      C.....ZERO OUT THE INPUT BUFFER
00132 66*      40 DO 50 KKK=1,109
00135 67*      50 KRBF(KKK)= 0
00135 68*      C.....
00135 69*      C.....CALL CDDATA TO PROCESS ONE DATA CARD AND FILL THE INPUT BUFFER
00137 70*      CALL CDDATA
00137 71*      C.....
00137 72*      C.....IF NOT A CONTINUE CARD AND THE FIRST BUFFER CELL NOT A SYMBOL TYPE
00137 73*      C.....FLAG THERE IS AN ILLEGAL DATA CARD CONTAINED IN THE INPUT BUFFER.
00140 74*      I=1
00141 75*      IF (KRBF(1).GT.1) IF (J) 60,580,60
00141 76*      C.....
00141 77*      C.....IF REPEATING, BACK BUFFER POINTER UP TO FIELD BEING REPEATED
00145 78*      60 IF (IREP) 520,80,70
00150 79*      70 IREP = IREP-1
00151 80*      I = ISAVE
00152 81*      GO TO 130
00153 82*      80 IF (KRBF(1)) 640,40,90
00153 83*      C.....
00153 84*      C.....IF KRBF(1) EQUAL 23 A DIMENSION INTEGER FOLLOWS DESIGNATING NUMBE
00153 85*      C.....OF ROWS OR COLUMNS, FOR EXAMPLE X=/3,4/ DIMENSION X(3,4,N)
00156 86*      90 IF (KRBF(1)-23) 150,490,100
00156 87*      C.....
00156 88*      C.....IF KRBF(1) IS EQUAL TO 33 A SUBSCRIPT INTEGER FOLLOWS DESIGNATING
00156 89*      C.....SUBSCRIPT LOCATION FOR EXAMPLE X=/3,4/,(1,2,2),10,6
00161 90*      100 IF (KRBF(1)-33) 580,500,110
00161 91*      C.....
00161 92*      C.....IF KRBF(1) IS EQUAL TO 43 A REPEAT INTEGER FOLLOWS DESIGNATING THE
00161 93*      C.....NUMBER OF TIMES THE NEXT FIELD IS TO BE REPEATED, FOR EXAMPLE
00161 94*      C.....X=/3,4/,(1,2,2),10,6,2R0.
00164 95*      110 IF (KRBF(1)-43) 580,120,580
00167 96*      120 IREP = KRBF(1+1)-1
00170 97*      I = I+2
00171 98*      ISAVE = I
00171 99*      C.....
00171 100*      C.....TEST FOR KRBF(1) EQUAL 1(SYMBOL), 2(REAL), 3 OR LARGER
00172 101*      130 IF (KRBF(1)-2) 520,260,140
00175 102*      140 IF (KRBF(1)-7) 160,240,520
00200 103*      150 KRBF1 = KRBF(1)
00201 104*      IF (KRBF(1)-2) 190, 260, 160
00201 105*      C.....
00201 106*      C.....TEST FOR KRBF(1) EQUAL 3(INTEGER), 4(DOUBLE PRECISION), 5 OR LARGE
00204 107*      160 IF (KRBF(1)-4) 350,380,170
00204 108*      C.....
00204 109*      C.....TEST FOR KRBF(1) EQUAL TO 6 (BCD STRING)
00207 110*      170 IF (KRBF(1)-6) 580,440,180
00207 111*      C.....
00207 112*      C.....TEST FOR KRBF(1) EQUAL 7(OCTAL INTEGER)
00212 113*      180 IF (KRBF(1)-8) 240,580,580
00212 114*      C.....
00212 115*      C.....BREAK OUT THE TYPE FROM THE INFORMATION CELL (NADR)
00215 116*      190 LL = FLD(ITYPE,3,NADR)
00216 117*      IF (LL.NE.1) GO TO 200
00220 118*      IF (J.EQ.0) GO TO 200

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00222 119*      IF (KRBF(I+2),NE,0) GO TO 200
00224 120*      I = I+1
00225 121*      JJJ = 1
00226 122*      GO TO 460
00226 123*      C.....
00226 124*      C.....NAME IS THE BCD SYMBOL READ OFF THE DATA CARD
00227 125*      200 NAME = KRBF(I+1)
00227 126*      C.....
00227 127*      C.....INITIALIZATION
00227 128*      C.....J1 IS THE SUBSCRIPT OF THE VARIABLE
00227 129*      C.....IR IS THE NUMBER OF ROW FOR A DIMENSION VARIABLE
00227 130*      C.....IC IS THE NUMBER OF COLUMNS FOR A DIMENSION VARIABLE
00227 131*      C.....IX IS THE X SUBSCRIPT
00227 132*      C.....IY IS THE Y SUBSCRIPT
00227 133*      C.....IZ IS THE Z SUBSCRIPT
00227 134*      C.....IPAR IS THE SUBSCRIPT FLAG
00227 135*      C.....ISLSH IS THE DIMENSION FLAG
00230 136*      J1 = 0
00231 137*      IR = 0
00232 138*      IC = 0
00233 139*      IX = 0
00234 140*      IY = 0
00235 141*      IZ = 0
00236 142*      IPAR = 0
00237 143*      ISLSH = 0
00237 144*      C.....
00240 145*      NADR = KRBF(I+2)
00241 146*      LL = FLD(ITYPE,3,NADR)
00241 147*      C.....
00241 148*      C.....CHECK FOR ILLEGAL INPUT SYMBOL
00242 149*      IF (NADR,NE,0) GO TO 230
00242 150*      C.....
00242 151*      C.....THE SYMBOL IS ILLEGAL
00242 152*      C.....CHECK SYMBOL FOR BEGINNING OF CASE (BEGIN)
00244 153*      IF(NAME,EQ,1BEG) GO TO 235
00244 154*      C.....
00244 155*      C.....CHECK SYMBOL FOR END OF CASE (ENDCAS)
00246 156*      IF (NAME,NE,NDCAS) GO TO 210
00250 157*      GO TO 650
00250 158*      C.....
00251 159*      210 WRITE (KOUT,220)NAME
00254 160*      220 FORMAT(5X,A6,23H IS AN ILLEGAL SYMBOL )
00255 161*      GO TO 640
00255 162*      C.....
00255 163*      C.....LEGAL SYMBOL, BEGIN PROCESSING VALUES
00256 164*      230 J = 1
00257 165*      235 I = I+3
00260 166*      GO TO 60
00260 167*      C.....
00260 168*      C.....OCTAL INTEGER, TYPE 7
00261 169*      240 IF (LL,EQ,0) GO TO 320
00263 170*      IF (LL,EQ,7) GO TO 320
00265 171*      IF (LL,EQ,3) GO TO 320
00267 172*      IF (LL,NE,2) GO TO 560
00271 173*      TEMP = KRBF(I+1)
00272 174*      KRBF(I) = 2
00273 175*      WRITE (KOUT,250)KRBF(I+1),TEMP
00277 176*      250 FORMAT(5X,I3HINPUT VALUE 0012,I3H CONVERTED TO1PE15,7)

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00300 177* GO TO 370
00300 178* C.....
00300 179* C.....REAL, TYPE 2
00300 180* C.....IF EXPECTING DOUBLE PRECISION (LL=4) WILL EXPAND REAL VALUE TO D,P
00301 181* 260 IF(LL.EQ.0) GO TO 320
00303 182* GO TO (560,320,270,400,560,560,270),LL
00303 183* C.....
00303 184* C.....IF EXPECTING AN INTEGER (LL=3 OR 7) AND THE VALUE IS A WHOLE
00303 185* C.....NUMBER CONVERT TO INTEGER, IF FRACTION AN ERROR EXIST.
00304 186* 270 IF (AMOD(BUFF(I+1),1.)) 560,280,560
00307 187* 280 TEMP = BUFF(I+1)
00310 188* KRBF(I+1) = BUFF(I+1)
00311 189* IF (LL.EQ.7) GO TO 300
00313 190* KRBF(I) = 3
00314 191* WRITE (KOUT,290)TEMP,KRBF(I+1)
00320 192* 290 FORMAT(5X11HINPUT VALUEIPE15.7,13H CONVERTED TOI12)
00321 193* GO TO 320
00322 194* 300 KRBF(I) = 7
00323 195* WRITE (KOUT,310) TEMP, KRBF(I+1)
00327 196* 310 FORMAT(5X11HINPUT VALUEIPE15.7,15H CONVERTED TO 0012)
00330 197* 320 J1 = J1+1
00330 198* C.....
00330 199* C.....IF SUBSCRIPT FLAG IS SET = 1 COMPUTE SUBSCRIPT OF THE VARIABLE.
00331 200* IF (IPAR.EQ.0) GO TO 330
00333 201* J1 = (IY-1)* IR + IR*IC(IZ-1) + IX
00334 202* IPAR = 0
00334 203* C.....
00334 204* C.....NDX IS THE SUBSCRIPT OF THE INPUT COMMON BLOCK
00335 205* 330 NDX = FLD(IADD,LADD,NADR) + J1-1
00336 206* ORIGIN(NDX)= BUFF(I+1)
00337 207* IF (KRBF1.EQ.4) I = 1 + 1
00341 208* 340 I = I+2
00342 209* GO TO 60
00342 210* C.....
00342 211* C.....INTEGER, TYPE 3
00343 212* 350 IF (LL.EQ.0) GO TO 320
00345 213* GO TO (580,355,320,355,560,560,320),LL
00346 214* 355 TEMP = KRBF(I+1)
00347 215* KRBF(I) = 2
00350 216* WRITE (KOUT,360)KRBF(I+1),TEMP
00354 217* 360 FQRMAT(5X11HINPUT VALUEI12.13H CONVERTED TOIPE15.7)
00355 218* 370 BUFF(I+1) = KRBF(I+1)
00356 219* IF (LL.EQ.4) GO TO 400
00360 220* GO TO 320
00360 221* C.....
00360 222* C.....DOUBLE PRECISION, TYPE 4
00361 223* 380 IF (LL.EQ.0) GO TO 410
00363 224* GO TO (580,390,390,410,560,560,390),LL
00364 225* 390 TEMP = DP2R(BUFF(I+1))
00365 226* KRBF(I) = 2
00366 227* WRITE(KOUT,395) KRBF(I+1),TEMP
00372 228* 395 FORMAT(5X11HINPUT VALUEIPD24.16.13H CONVERTED TOIPE15.7)
00373 229* BUFF(I+1) = TEMP
00374 230* IF (LL.EQ.2) GO TO 320
00376 231* GO TO 270
00376 232* C.....
00376 233* C.....STORE DOUBLE PRECISION VALUE
00377 234* 400 CALL R2OP (BUFF(I+1), TEMP2)

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00400 235*      *WRITE (KOUT,405) KRBF(I+1), ITEMP2(I)
00404 236*      405 FORMAT(5X11HINPUT VALUEIPEIS.7,13H CONVERTED TOIFDZ4.16I)
00405 237*      410 J1 = J1+2
00406 238*      IF (IPAR.EQ.0) GO TO 420
00410 239*      J1 = ((IY-1)*IR + IR*IC*(IZ-1) + IX)*2
00411 240*      IPAR = 0
00412 241*      420 NDX = FLD(IADD,LADD,NADR) + J1-2
00413 242*      IF (KRBF(I).EQ.4) GO TO 430
00415 243*      ORIGIN(NDX) = TEMP2(I)
00416 244*      ORIGIN(NDX+1) = TEMP2(2)
00417 245*      GO TO 340
00420 246*      430 ORIGIN(NDX) = BUFF(I+1)
00421 247*      ORIGIN(NDX+1) = BUFF(I+2)
00422 248*      I = I+3
00423 249*      GO TO 60
00423 250*      C.....
00423 251*      C.....BCD, TYPE 6
00424 252*      440 IF (LL.EQ.0) GO TO 450
00426 253*      IF (LL.NE.6) GO TO 560
00426 254*      C.....
00426 255*      C.....JJJ IS THE NUMBER OF BCD WORDS
00430 256*      450 I = I + 2
00431 257*      JJJ = KRBF(I-1)
00431 258*      C.....
00432 259*      460 IF (IPAR.EQ.0) GO TO 470
00434 260*      J1 = (IY-1)*IR + IR*IC*(IZ-1) + IX-1
00435 261*      IPAR = 0
00435 262*      C.....
00436 263*      470 NDX = FLD(IADD,LADD,NADR) + J1-1
00437 264*      DO 480 KKK=1,JJJ
00442 265*      IX = NDX + KKK
00443 266*      ORIGIN(IDX)=BUFF(I)
00444 267*      480 I=I+1
00446 268*      J1 = J1 + JJJ
00447 269*      GO TO 60
00447 270*      C.....
00447 271*      C.....DIMENSION INTEGER, TYPE 23
00447 272*      C.....IF A TWO DIMENSION VARIABLE ONLY THE NUMBER OF ROWS NEED TO BE
00447 273*      C.....INPUT, BUT FOR A THREE DIMENSIONAL VARIABLE BOTH THE NUMBER OF
00447 274*      C.....ROWS AND COLUMNS HAVE TO BE INPUT, WILL NOT WORK WITHOUT SOME
00447 275*      C.....CHANGES FOR A VARIABLE DIMENSIONED GREATER THAN THREE.
00447 276*      C.....IF DIMENSION FLAG IS ON THE DIMENSION HAS ALREADY BEEN DEFINED.
00450 277*      490 IF (ISLSH.EQ.1) GO TO 540
00450 278*      C.....
00450 279*      C.....THE NUMBER OF ROWS = KRBF(I+1)
00452 280*      IR = KRBF(I+1)
00453 281*      I = I+2
00454 282*      ISLSH = 1
00455 283*      IF (KRBF(I).NE.23) GO TO 60
00455 284*      C.....
00455 285*      C.....THE NUMBER OF COLUMNS = KRBF(I+1)
00457 286*      IC = KRBF(I+1)
00460 287*      I = I+2
00461 288*      GO TO 60
00461 289*      C.....
00461 290*      C.....SUBSCRIPT INTEGER, TYPE 33
00461 291*      C.....THIS ROUTINE CHECKS ONLY TO A MAXIMUM OF THREE DIMENSIONAL, THAT
00461 292*      C.....IS ONLY X, Y, AND Z.

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00461 293* C.....IF SUBSCRIPT FLAG IS ON THE SUBSCRIPTS HAVE ALREADY BEEN DEFINED;
00462 294* 500 IF (IPAR.EQ.0) GO TO 540
00464 295* IX = KRBF(I)
00465 296* I = I+2
00466 297* IF (KRBF(I).NE.33) GO TO 510
00466 298* C.....
00466 299* C.....THIS IS THE Y SUBSCRIPT,HAS THE NUMBER OF ROWS BEEN DEFINED
00470 300* IF (ISLH.NE.1) GO TO 540
00472 301* IY = KRBF(I+1)
00473 302* I = I+2
00474 303* IF (KRBF(I).NE.33) GO TO 510
00474 304* C.....
00474 305* C.....THIS IS THE Z SUBSCRIPT,HAS THE NUMBER OF COLUMNS BEEN DEFINED
00476 306* IF (IC.EQ.0) GO TO 540
00500 307* IZ = KRBF(I+1)
00501 308* I = I+2
00502 309* 510 IPAR = 1
00503 310* GO TO 60
00503 311* C.....
00503 312* C.....ERROR MESSAGES
00503 313* C.....
00504 314* 520 WRITE (KOUT,530) I
00507 315* 530 FORMAT(5X57HERROR INVOLVING REPITITION OF DATA FIELD (SEE BUFFER W
00507 316* *ORD13,1H))
00510 317* GO TO 600
00510 318* C.....
00511 319* 540 WRITE (KOUT,550) I
00514 320* 550 FORMAT(5X35HERROR IN SUBSCRIPT (SEE BUFFER WORD13,1H))
00515 321* GO TO 600
00515 322* C.....
00516 323* 560 IJX = KRBF(I)
00517 324* WRITE (KOUT,570)NAMTYP(ILL),NAMTYP(IJX),I
00524 325* 570 FORMAT(5X45HINCORRECT DATA TYPE. NO CONVERSION POSSIBLE./A11,14H
00524 326* *HAS EXPECTED,A7,31H FOUND ON CARD (SEE BUFFER WORD13,2H),)
00525 327* GO TO 600
00525 328* C.....
00526 329* 580 WRITE (KOUT,590) I
00531 330* 590 FORMAT(5X,47HILLEGAL DATA CARD CONTAINED IN BUFFER (SEE WORD13,1H)
00531 331* *)
00532 332* 600 JJ = KRBF(109)
00533 333* DO 610 KKK=1,JJ
00536 334* 610 WRITE (KOUT,620)((KRBF(KKK),IDX=1,5)
00545 335* 620 FORMAT(A11,1PE19.7,115,1PD19.7,019)
00546 336* IF (JJ.EQ.108) GO TO 640
00550 337* WRITE (KOUT,630)JJ,KRBF(108)
00554 338* 630 FORMAT(12H KRBF CELLS ,13,25H THROUGH 108 ALL CONTAIN , 13 )
00554 339* C.....
00554 340* C.....SET INPUT ERROR FLAG EQUAL 2 AND RETURN TO STATEMENT 2 TO PROCESS
00554 341* C.....THE NEXT DATA CARD.
00555 342* 640 K = 2
00556 343* IPAR = 0
00557 344* IREP = 0
00560 345* GO TO 40
00560 346* C.....
00561 347* 650 RETURN
00562 348* END

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END OF UNIVAC 1108 FORTRAN V COMPILATION. 0 *DIAGNOSTIC* MESSAGE(S)

6 FOR,* TRWLOD,TRWLOD

DATE .310871 PAGE 314

TRWLOD SYMBOLIC
TRWLOD CODE RELOCATABLE

14 JUN 71	15:05:35	0	01442752	14	348	(DELETED)
14 JUN 71	15:05:35	1	01454362	36	1	(DELETED)
		0	01454426	14	82	.

HOG. 5 FOR,* VALVG,VALVG

FOR, VALVG, VALVG
 UNIVAC 1108 FORTRAN V LEVEL 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:48

31 AUG 71

9:28:47.975

SUBROUTINE VALVG ENTRY POINT 000405

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	000423
0000	*DATA	000104
0002	*BLANK	000000
0003	COM	006525
0004	INDATA	011610
0005	CONS	000003

EXTERNAL REFERENCES (BLOCK, NAME)

0006	SQRT
0007	NEXP65
0010	NWDUS
0011	NIO15
0012	NIO25
0013	NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000070	127G	0001	000232	21L	0000	000015	30F	0000	000023	40F	0001	000364	50L	
0000	R	000000	A	0003	R	000000	AREA	0003	R	000074	AREAI	0003	R	000132	AREAO
0000	R	000001	B	0000	R	000002	C	0003	R	005060	CF	0003	R	006436	CGTANK
0003	R	006431	CLTANK	0003	R	005014	CONCT	0003	R	006443	CPJU	0003	R	006355	CVEL
0000	R	000003	D	0003	R	000036	DELXL	0003	R	000226	DIALI	0003	R	006277	DMVENT
0005	R	000002	FB	0003	R	006370	FBPC	0003	R	006376	FBTC	0003	R	006362	F8WC
0003	R	005111	FRL	0005	R	000001	GC	0003	R	003132	HI	0003	R	003036	HO
0003	I	005110	ICMON	0000	I	000005	II	0000	I	000006	IPROP	0003	I	005052	ISPT
0000	I	000007	JJ	0003	I	003606	JUN	0004	R	003413	KA	0004	R	004561	MACH
0003	I	004756	KR	0003	I	005102	MHC	0003	I	002552	NGR	0004	I	000100	NODEL
0003	I	002646	NPR	0003	I	002742	NRE	0003	R	000264	PB	0003	R	004764	PC
0003	R	005074	PE	0003	R	000272	PG	0003	R	003620	PGT	0000	R	000011	PGZ
0005	R	000000	PI	0003	R	005036	PMR	0003	R	006241	POWC	0003	R	006350	POWP
0003	R	006300	PFI	0003	R	006305	PPO	0003	R	006331	PTI	0003	R	006336	PTO
0004	R	005754	RFLAG	0004	R	005711	RGAS	0003	R	001422	RHOG	0004	R	000546	RHOL
0004	R	000000	S	0000	R	000010	T	0003	R	005044	TC	0003	R	006416	THOC
0003	R	006404	TPCL	0004	R	001132	TTEMP	0003	R	006317	TTI	0003	R	006324	TTO
0003	R	003226	TRALL	0003	R	006356	U	0003	R	003416	UAO	0004	I	006757	VAD
0003	R	003512	VEL	0000	R	000004	WD	0004	R	003423	WDGTG	0003	R	006265	WI
0003	R	006253	WO	0003	R	006361	WT	0003	R	006246	WTGC	0004	R	007003	XK

00101	1*		SUBROUTINE	VALVG(1)
00101	2*	C		
00103	3*		INTEGER	VAI, VAO

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00103 4* C
00104 5* REAL KA, MACH
00104 6* C
00105 7* DIMENSION XK(20),WDOTG(30,20),TTTEMP(30,20),KA(2),RGAS(2),VAI(20)
00105 8* , VAD(20),NPLINE(30),NODEL(20),RHOL(3),MACH(30,20)
00105 9* , TTEMP(30,20)
00105 10* C
00106 11* COMMON /COM/AREA(30),DELXL(30),AREA1(30),AREA0(30),AREAK(30)
00106 12* , DIALI(30),PB(6),PG(30,20),RHOG(30,20),NGR(30,2)
00106 13* , NPR(30,2),NRE(30,2),HO(30,2),HI(30,2),TWALL(30,2)
00106 14* , HRAD(30,2),UAD(30,2),VEL(30,2),JUN(10),PGT(30,20)
00106 15* , WNOZ(6),MR(6),PC(6),PCN(6,2),CSTAR(6),CONCT(3,6)
00106 16* , PMR(6),TC(6),ISPT(6),CF(6),MEX(6),PE(6),MNC(6),ICHON
00106 17* , FRL(30,20),PORC(5),WTGC(5),WO(10),WI(10),DMVENT,PPI(5)
00106 18* , PPO(5),RPMT(5),TT1(5),TTO(5),PTI(5),PTO(5),POWT(5)
00106 19* , POWP(5),CVEL,U,R,ETAT,WT,FBWC(6),FBPC(6)
00106 20* , FBTC(6),TPCL(5),TPCG(5),THOC(5),CGGTC(6),CLTANK(5)
00106 21* , CGTANK(5),CPJU(5,10)
00106 22* C
00107 23* COMMON /INDATA/S(5000)
00107 24* C
00110 25* COMMON /CONS/PI,GC,FB
00110 26* C
00111 27* EQUIVALENCE
00111 28* , (S(3568),XK(1)) , (S(1812),WDOTG(1,1)) , (S( 603),TTEMP(1,1))
00111 29* , (S(1804),KA(1)) , (S(3018),RGAS(1)) , (S( 364),NPLINE(1))
00111 30* , (S( 65),NODEL(1)) , (S( 359),RHOL(1)) , (S(2418),MACH(1,1))
00111 31* , (S(3548),VAI(1)) , (S(3568),VAD(1))
00111 32* , (S(1203),TTTEMP(1,1))
00111 33* , (S(3053),RFLAG)
00111 34* C
00111 35* C GAS VALVES,ORIFICES,PIPEBENDS,MANIFOLDS,INJECTORS
00111 36* C
00111 37* C BUILT-IN FUNCTIONS FOR PRESSURE EQUATION + DERIVATIVE
00112 38* F(R) = 1 - (A*B*SQRT(R**C - R**D)) / WD
00113 39* FP(R) = -.5*A*B*(C**R**C - 1) + D**R**D / SQRT(R**C - R**D) / WD
00113 40* C
00113 41* C GAS VALVES,MANIFOLDS
00114 42* II = VAI(I)
00114 43* C VAI = LINE CONNECTED TO INLET VALVE (I)
00115 44* IPROP = NPLINE(II)
00116 45* JJ = NODEL(II)
00117 46* WD = WDOTG(II,JJ)
00120 47* T = TTEMP(II,JJ)
00120 48* C PRESSURE DOWNSTREAM,PSIA
00121 49* A = XK(I) * PGT(II,JJ)
00122 50* B = SQRT(2 * GC * KA(IPROP) / (RGAS(IPROP) * TTTEMP(II,JJ) * (KA(IPROP) - 1)))
00123 51* C = 2. / KA(IPROP)
00124 52* D = (KA(IPROP) + 1) / KA(IPROP)
00125 53* PG2 = .8 * PG(II,JJ)
00125 54* C
00126 55* DO 20 J=1,10
00131 56* R = PG2 / PGT(II,JJ)
00132 57* IF (R.GT.1.) R = .99
00134 58* IF (R.LT.0.) R = .1
00136 59* PG2 = R * PGT(II,JJ)
00137 60* PG2P = PG2 - F(R) / FP(R) * PGT(II,JJ)
00140 61* FPG2 = F(R)

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00141 62* IF ( ABS(1 - 2P/PG2) .LT. 1.E-6 ) GO TO 21
00143 63* PG2 = 2P
00144 64* 20 CONTINUE
00144 65* C
00146 66* WRITE (6,30) 1
00151 67* 30 FORMAT (//4X23HNO CONVERGENCE IN VALVG ,14)
00151 68* C
00152 69* 21 CONTINUE
00153 70* II = VAD(1)
00153 71* C VAD = LINE CONNECTED VALVE DISCHARGE
00154 72* JJ = 1
00155 73* PG(II,JJ) = PG2
00156 74* WDOTG(II,JJ) = WD
00157 75* TTEMP(II,JJ) = T
00157 76* C DENSITY OF GAS
00160 77* RHOG(II,JJ) = PG(II,JJ)/(RGAS(IPROP)*TTEMP(II,JJ))*144.
00160 78* C MACH NUMBER
00161 79* MACH(II,JJ) = 4.*WDOTG(II,JJ)/(RHOG(II,JJ)*PI*DIALI(II))*2.*SQRT
00161 80* (KA(IPROP) *GC *RGAS(IPROP) *TTEMP(II,JJ) )
00161 81* *144.
00162 82* IF (RFLAG),50,
00165 83* WRITE(6,40)I,IPROP,II,JJ
00165 84* , WDOTG(II,JJ),PG(II,JJ),XK(1),KA(IPROP)
00165 85* , RGAS(IPROP),TTEMP(II,JJ),PG2,FPG2
00165 86* , WDOTG(II,JJ),PI,DIALI(II)
00165 87* , GC,MACH(II,JJ), PGT(II,JJ), TTEMP(II,JJ); R
00214 88* 40 FORMAT (///24X13HVALVG=ROUTINE,5X,417,// 3(1P8E15.7))
00215 89* 50 CONTINUE
00216 90* RETURN
00217 91* END

```

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END OF UNIVAC 1108 FORTRAN V COMPILATION. 0 *DIAGNOSTIC* MESSAGE(5)

VALVG	CODE	SYMBOLIC	RELOCATABLE	31 AUG 71	09:25:27	0	01463576	14	91	(DELETED)
VALVG				31 AUG 71	09:25:27	1	01466170	36	1	(DELETED)
Ø HDG	Ø	FOR,*	VALVL,VALYL			0	01466234	14	33	

3.2-60 VALVL (LIQUID VALVES)

© FOR, VALVL, VALVL
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:50

31 AUG 71

9:28:50 39

SUBROUTINE VALVL ENTRY POINT 000114

STORAGE USED (BLOCK, NAME, LENGTH)

0001	*CODE	000125
0000	*DATA	000037
0002	*BLANK	000000
0003	COM	006525
0004	INDATA	011610
0005	CONS	000003

EXTERNAL REFERENCES (BLOCK, NAME)

0006	NWDUS
0007	N1015
0010	N1025
0011	NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000006	4OF	0003	R	000000	AREA	0003	R	000074	AREAI	0003	R	000170	AREAK	0003	R	000132	AREAO	
0003	R	005060	CF	0003	R	006423	CGGTC	0003	R	006436	CGTANK	0003	R	006431	CLTANK	0003	R	005014	CONCT
0003	R	006443	CPJU	0003	R	005006	CSTAR	0003	R	006355	CVEL	0003	R	000036	DELXL	0003	R	000226	DIALI
0003	R	006277	DMVENT	0003	R	006340	ETAT	0005	R	000002	FB	0003	R	006370	FBPC	0003	R	006376	FBTC
0003	R	006362	FBWC	0003	R	005111	FRL	0005	R	000001	GC	0003	R	003132	HI	0003	R	003036	HO
0003	R	003322	HRAD	0003	I	005110	ICHON	0000	I	000000	II	0000	I	000001	IPROP	0003	I	005052	ISPT
0000	I	000002	JJ	0003	I	003606	JUN	0003	I	005066	MEX	0003	I	004756	MR	0003	I	005102	MWC
0003	I	002552	NGR	0004	I	000553	NPLINE	0003	I	002646	NPR	0003	I	002742	NRE	0003	R	000264	PB
0003	R	004764	PC	0003	R	004772	PCN	0003	R	005074	PE	0003	R	000272	PG	0003	R	003620	PGT
0000	R	000005	PG2	0005	R	000000	PI	0003	R	005036	PMR	0003	R	006241	POWC	0003	R	006350	POAP
0003	R	006343	POWT	0003	R	006300	PPJ	0003	R	006305	PPQ	0003	R	006331	PTJ	0003	R	006336	PTO
0003	R	006357	R	0003	R	001422	RHOG	0004	R	000546	RHUL	0003	R	006312	RFMT	0004	R	000000	S
0000	R	000004	T	0003	R	005044	TC	0003	R	006416	THOC	0003	R	006411	TPCG	0003	R	006404	TPCL
0004	R	001132	TTEMP	0003	R	006317	TTI	0003	R	006324	TTO	0003	R	003226	TWALL	0003	R	006356	U
0003	R	003416	UAO	0004	I	006757	VAD	0004	I	006733	VAI	0003	R	003512	VEL	0000	R	000003	WD
0004	R	003423	WDOTG	0003	R	006265	WI	0003	R	004750	WNQZ	0003	R	006253	WO	0003	R	006361	WT
0003	R	006246	WTGC	0004	R	007003	XK												

00101	1*		SUBROUTINE VALVL(I)
00101	2*	C	
00103	3*		INTEGER VAI, VAD
00103	4*	C	
00104	5*		DIMENSION XK(20), WDOTG(30,20), VAI(20), VAD(20), NPLINE(30), RHOL(3)
00104	6*		, TTEMP(30,20)
00104	7*	C	
00105	8*		COMMON /COM/ AREA(30), DELXL(30), AREAI(30), AREAO(30), AREAK(30)


```

      @      FOR,* VALVL,VALVL                                DATE  AUG 71  09:25:29
00105      9*      *,      LI(30),PB(6),PG(30,20),RHOG(30,20),NGR(30,2)
00105      10*     *,      (30,2),NRE(30,2),HO(30,2),HI(30,2),TWALL(30,2)
00105      11*     *,      INRD(30,2),UAO(30,2),VEL(30,2),JUN(10),PGT(30,20)
00105      12*     *,      WNOZ(6),MR(6),PC(6),PCN(6,2),CSTAR(6),CONCT(3,6)
00105      13*     *,      PMR(6),TC(6),ISPT(6),CF(6),MEX(6),PE(6),MnC(6),ICMON
00105      14*     *,      FRL(30,20),POWC(5),WTGC(5),WO(10),WI(10),DMVENT,PI(5)
00105      15*     *,      PPO(5),RPMT(5),TTI(5),TTO(5),PTI(5),PTO(5),POWT(5)
00105      16*     *,      POWP(5),CYEL,U,R,ETAT,WT,FBWC(6),FBPC(6)
00105      17*     *,      FBTC(6),TPCL(5),TPCG(5),THOC(5),CGGTC(6),CLTANK(5)
00105      18*     *,      CGTANK(5),CPJU(5,10)
00105      19*     C
00106      20*     COMMON /INDATA/S(5000)
00106      21*     C
00107      22*     COMMON /CONS/PI,GC,FB
00107      23*     C
00110      24*     EQUIVALENCE
00110      25*     * (S(3588),XK(1))      ,(S(1812),WDOTG(1,1)) ,(S( 603),TTEMP(1,1))
00110      26*     * ,(S( 364),NPLINE(1)) ,(S( 359),RHQL(1))      ,(S(3548),VAI(1))
00110      27*     * ,(S(3568),VAD(1))
00110      28*     C
00110      29*     C LIQUID VALVES,ORIFICES,PIPEBENDS,MANIFOLDS,INJECTORS
00111      30*     II = VAI(1)
00111      31*     C VAI = LINE CONNECTED TO INLET VALVE (I)
00112      32*     IPROP = NPLINE(II)
00113      33*     JJ = 2
00114      34*     WD = WDOTG(II,JJ)
00115      35*     T = TTEMP(II,JJ)
00115      36*     C PRESSURE DOWNSTREAM,PSIA
00116      37*     PG2 = PG(II,JJ) - (WDOTG(II,JJ)/XK(1))*2./(288.*GC*RHQL(IPROP))
00117      38*     II = VAD(1)
00117      39*     C VAD = LINE CONNECTED VALVE DISCHARGE
00120      40*     JJ = 1
00121      41*     PG(II,JJ) = PG2
00122      42*     WDOTG(II,JJ) = WD
00123      43*     TTEMP(II,JJ) = T
00124      44*     WRITE(6,40)I,IPROP,II,JJ
00124      45*     *      WDOTG(II,JJ),PG(II,JJ),XK(1),TTEMP(II,JJ)
00124      46*     *      WD,PI,DIALI(II)
00141      47*     40 FORMAT (//24X13HVALVL=ROUTINE,5X,4I7,// 3(1P8E15,7//)
00142      48*     RETURN
00143      49*     END

```

END OF UNIVAC 1100 FORTRAN V COMPILATION. O *DIAGNOSTIC* MESSAGE(S)

VALVL	CODE	SYMBOLIC	RELOCATABLE	31 AUG 71	09:25:29	0	01467152	14	49	(DELETED)
VALVL				31 AUG 71	09:25:29	1	01470430	36	1	(DELETED)
						0	01470474	14	11	

@ HDG @ FOR,* WRITE,WRITE

3.2.61 WRITE (HEAT EXCHANGER OUTPUT PROCESSOR)

FOR, WRITE,WRITE
 UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
 THIS COMPILATION WAS DONE ON 31 AUG 71 AT 09:28:51

31 AUG 71

9:28:51.396

SUBROUTINE WRITE ENTRY POINT 000527

STORAGE USED (BLOCK, NAME, LENGTH)

```

0001 *CODE 000547
0000 *DATA 000140
0002 *BLANK 000000
0003 HEAT 001074
    
```

EXTERNAL REFERENCES (BLOCK, NAME)

```

0004 NWDUS
0005 NI01S
0006 NI02S
0007 NERR2S
0010 NERR3S
    
```

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000023	110L	0001	000142	120L	0001	000145	125L	0001	000166	130L	0001	000101	131G	
0001	000171	135L	0001	000212	140L	0001	000270	212G	0001	000401	231G	0001	000433	300L	
0001	000313	400L	0000	000066	9904F	0000	000052	9905F	0000	000061	9906F	0000	000077	9907F	
0000	I	000000	ANAM	0003	R	000002	CPI	0003	R	000027	CPO	0003	R	000054	DIST
0003	R	000720	HI	0003	R	000772	HO	0003	R	000745	HW	0000	I	000050	I
0000	I	000035	JIN	0000	I	000036	JOUT	0003	I	000126	KI	0003	I	000153	KO
0000	I	000051	KRET1	0003	I	000200	KW	0000	I	000037	LI	0000	I	000040	L2
0000	I	000042	L4	0000	I	000043	L5	0000	I	000044	L6	0000	I	000045	L7
0003	I	000225	MUI	0003	I	000252	MUO	0003	R	001071	PH11	0003	R	001072	PH12
0003	R	000277	PI	0003	R	000324	PO	0003	R	000351	PR1	0003	R	000376	PRO
0003	R	001017	QUALI	0003	R	001044	QUALO	0003	R	000450	REI	0003	R	000475	REO
0003	R	000547	SVO	0003	R	000574	TI	0003	R	000621	TO	0003	R	000646	THI
0003	R	000002	VAR	0003	R	000000	WD					0003	R	000673	TR0

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```

00101 1* SUBROUTINE WRITE
00101 2* CC
00101 3* CC WRITE ARRAY OUTPUTS
00103 4* INTEGER ANAM
00103 5* C
00104 6* DIMENSION ANAM(28), VAR(21,27)
00104 7* C
00105 8* COMMON /HEAT/WD(2),CPI(21),CPO(21),DIST(21),HE(21),KI(21),KO(21)
00105 9* 1, KN(21),MUI(21),MUO(21),PI(21),PO(21),PRI(21),PRO(21)
00105 10* 2, W(21),REI(21),REO(21),SVI(21),SVO(21),TI(21),TO(21)
00105 11* 3, TAI(21),TWO(21),HI(21),HW(21),HO(21)
00105 12* 4, QUALI(21), QUALO(21)
00105 13* 4, PH11,PH12,PH13
    
```

```

00105 14* C
00106 15* DATA ANAM/ INS,6HCP OUT,6HDIST ,6HEQ HE ,6HCOND 1,6HCOND 0
00106 16* ,6HCOND 1,6HISC 1,6HVISC 0,6HPRES 1,6HPRES 0,6HPR. IN,6HPR OU
00106 17* ,6HQ-IN ,6HRE. IN,6HRE. OU,6HSVOL 1,6HSVOL 0
00106 18* ,6HTENP 1,6HTEMP 0,6HTWALL1,6HTWALLO,6HHIFILM,6HWALL H,6HHOFILM,
00106 19* ,6HQUAL 1,6HQUAL 0, 6H
00110 20* DATA JIN,JOUT/5,6/
00113 21* EQUIVALENCE (VAR(1,1),CPI(1))
00114 22* L1=3
00115 23* L2=19
00116 24* L3=20
00117 25* L4= 4
00120 26* L5=14
00121 27* L6=10
00122 28* L7=11
00123 29* L8 = 28
00124 30* KRET=1
00125 31* GO TO 300
00126 32* 110 CONTINUE
00127 33* WRITE(JOUT,9905) (VAR(I,L1),VAR(I,L2),VAR(I,L3),VAR(I,L4),
00127 34* 1 VAR(I,L5),VAR(I,L6),VAR(I,L7),I=1,21)
00143 35* 9905 FORMAT(F14.2,F15.2,F15.2,E15.6,E15.6,2F15.2)
00144 36* L2=1
00145 37* L3=8
00146 38* L4=5
00147 39* L5=17
00150 40* L6=12
00151 41* L7=15
00152 42* L8 = 26
00153 43* KRET=2
00154 44* GO TO 300
00155 45* 120 CONTINUE
00156 46* KRET1=1
00157 47* GO TO 400
00160 48* 125 CONTINUE
00161 49* L2=2
00162 50* L3=9
00163 51* L4=6
00164 52* L5=18
00165 53* L6=13
00166 54* L7=16
00167 55* L8 = 27
00170 56* KRET=3
00171 57* GO TO 300
00172 58* 130 CONTINUE
00173 59* KRET1=2
00174 60* GO TO 400
00175 61* 135 CONTINUE
00176 62* L2=7
00177 63* L3=21
00200 64* L4=22
00201 65* L5=23
00202 66* L6=24
00203 67* L7=25
00204 68* L8 = 28
00205 69* KRET=4
00206 70* GO TO 300
00207 71* 140 CUNTINUE

```

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@ FOR, @ WRITE, @WRITE

DATE 310871 PAGE 322

```

00210 72@ WRITE(JOUT,9906) (VAR(I,L1),VAR(I,L2),VAR(I,L3),VAR(I,L4),
00210 73@ 1 VAR(I,L5),VAR(I,L6),VAR(I,L7),I=1,21)
00224 74@ 9906 FORMAT(F14.2,E15.6,2F15.2,3E15.6)
00225 75@ 999 RETURN
00226 76@ 400 CONTINUE
00227 77@ WRITE(JOUT,9904) (VAR(I,L1),VAR(I,L2),VAR(I,L3),VAR(I,L4),
00227 78@ 1 VAR(I,L5),VAR(I,L6),VAR(I,L7),VAR(I,L8),I=1,21)
00244 79@ 9904 FORMAT (F14.2,F15.4,E15.6,E15.6, F15.3,F15.4,E15.6,F15.4)
00245 80@ GO TO (125,135),KRET1
00246 81@ 300 CONTINUE
00247 82@ WRITE(JOUT,9907) ANAM(L1),ANAM(L2),ANAM(L3),ANAM(L4),ANAM(L5),
00247 83@ 1 ANAM(L6),ANAM(L7),ANAM(L8)
00261 84@ 9907 FORMAT (1H1,8(SX,A6,4X)/)
00262 85@ GO TO (110,120,130,140),KRET
00263 86@ END

```

END OF UNIVAC 1108 FORTRAN V COMPILATION.

@ *DIAGNOSTIC* MESSAGE(S)

WRITE	SYMBOLIC	14 JUN 71	15:05:19	0	01437304	14	86	{DELETED}
WRITE	CODE	14 JUN 71	15:05:19	1	01441570	24	1	{DELETED}
	RELOCATABLE			0	01441620	14	43	

@N HDG

BLANK COMMON 163620 163777
 STARTING ADDRESS 014000
 CORE LIMITS 014000 063617 064671 163611 163612 163617

SSPIPE/CODE
 0 064671-076257
 1 014000-014232

NIERS /CODE
 0 076260-076260
 1 014233-014533
 2 076261-076352

NFMTs /CODE
 1 014534-015417
 2 076353-076366

NFTVs /CODE
 1 015420-015442

NCNVTs/CODE
 1 015443-015652
 2 076367-076452

NOTINs/CODE
 1 015653-016261
 2 076453-076515

FPACKs/CODE
 1 016262-016325

DEPTH /*****
 0 076516-076523

NERRs /CODE
 0 076524-076664
 1 016326-016734

NI0INs/CODE
 1 016735-017003

2 076665-076715

NQUTS /CODE

0 076716-076722
1 017004-017675
2 076723-076740

NTABS /CODE

0 076741-077074

QMSFIL/CODE

0 077075-077114
1 017676-020001

FMERR /CODE

0 077115-077116
1 020002-020012

NBDCVS/CODE

0 077117-077303

NSTOPs/CODE

1 020013-020030

OUTPRC/CODE

0 077304-100035
1 020031-022373

WRITE /CODE

0 100036-100175
1 022374-023142

HEAT /*****

0 100176-101271

TKOUT /*****

0 101272-101365

BEGS /CODE

0 101366-101611
1 023143-025346

LEGS /CODE

0 101612-101766
1 025347-027151

ALOG /CODE

1 027152-027233
2 101767-102035

TRVL00/CODE

0 102036-102315
1 027234-030464

R2DP /CODE

0 102316-102323
1 030465-030501

DP2R /CODE
0 102324-102332
1 030502-030514

CODATA/CODE
0 102333-102634
1 030515-032521

NEXP95/CODE
1 032522-032607
2 102635-102637

NXPDS/CODE
1 032610-032752
2 102640-102656

DEXP /CODE
1 032753-033040
2 102657-102733

DLOG /CODE
1 033041-033102
2 102734-103017

MSG3 /CODE
2 103020-103027

NXPDS/CODE
1 033103-033123
2 103030-103034

MSG12/CODE
2 103035-103054

NINPTS/CODE
0 103055-103056
1 033124-034043
2 103057-103111

NININS/CODE
1 034044-034211
2 103112-103142

PACK /CODE
0 103143-103207
1 034212-034373

SQZ6 /CODE
0 103210-103227
1 034374-034472

BCDINT/CODE
0 103230-103262
1 034473-034602

STAB /*****
0 103263-103766

GATHER /CODE

0 103767-104215
1 034603-036071

FEEDB /CODE

0 104216-104243
1 036072-036155

VALVL /CODE

0 104244-104302
1 036156-036302

VALVG /CODE

0 104303-104406
1 036303-036725

NEXP6S /CODE

1 036726-036737
2 104407-104407

NXPAF5 /CODE

1 036740-037062
2 104410-104414

NXPAXS /CODE

1 037063-037105
2 104415-104415

EXP /CODE

1 037106-037176
2 104416-104435

SQRT /CODE

0 104436-104472
2 104473-104534

PREG /CODE

0 104535-104600
1 037177-037364

TANKD /CODE

0 104601-105146
1 037365-040100

TANK /CODE

0 105147-105234
1 040101-040402

INTEG /CODE

0 105235-105252
1 040403-040470

BETA /CODE

0 105253-105305
1 040471-040646

INITAL /CODE

0 105306-105335

1 040647-040730

GAMMA /*****
0 105336-105362

ARRAY /*****
0 105363-105431

HPTD /CODE
0 105432-107640
1 040731-041501

THERM /CODE
0 107641-107756
1 041502-043116

BINSER/CODE
0 107757-110001
1 043117-043310

TPCB /*****
0 110002-131662

HEATX /CODE
0 131663-131724
1 043311-043732

PERFOR/CODE
0 131725-132316
1 043733-044430

CHOICE/CODE
0 132317-132355
1 044431-045310

HEATEX/CODE
0 132356-132567
1 045311-047643

CALL /CODE
0 132570-132577
1 047644-047661

NUSLET/CODE
0 132600-132704
1 047662-050037

INTER2/CODE
0 132705-132774
1 050040-050473

INTERP/CODE
0 132775-133020
1 050474-051001

BPROP6/CODE
0 133021-133206
1 051002-051213

HPTTC /CODE

0 133207-134502
1 051214-051724

HPTV /CODE

0 134503-136106
1 051725-052412

HPTCP /CODE

0 136107-136116
1 052413-052436

PTHEAT/CODE

0 136117-136452
1 052437-053264

SPHEAT/*****

0 136453-141104

BPROPL/CODE

0 141105-141272
1 053265-053476

LATENT/CODE

0 141273-141474
1 053477-053573

SAT /CODE

0 141475-141626
1 053574-053645

PROPTY/CODE

0 141627-141643
1 053646-054063

H2OH2 /CODE

0 141644-141746
1 054064-054224

CHON /CODE

0 141747-142062
1 054225-055363

HPTCV /CODE

0 142063-142072
1 055364-055407

CHAM /CODE

0 142073-142220
1 055410-057206

NEXPSS/CODE

1 057207-057264
2 142221-142223

CCPCX /*****

0 142224-142232

JUNCL /CODE
0 142233-142341
1 057265-057706

ISOTH /CODE
0 142342-142430
1 057707-060323

FCOMP2/CODE
0 142431-142501
1 060324-060506

ADIAB /CODE
0 142502-142566
1 060507-061147

FCOMP3/CODE
0 142567-142642
1 061150-061373

PIPL /CODE
0 142643-143032
1 061374-062604

SINCOS/CODE
1 062605-062674
2 143033-143066

FCOMP1/CODE
0 143067-143152
1 062675-063134

PBL /CODE
0 143153-143251
1 063135-063617

COM /*****
0 143252-151776

CONS /*****
0 151777-152001

INDATA/*****

3.6.62 FEEDB (FEED BACK CONSTRAINTS)

UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
THIS COMPILATION WAS DONE ON-08 SEP 71 AT 14:22:44

SUBROUTINE FEEDB ENTRY POINT 000054

STORAGE USED (BLOCK, NAME, LENGTH)

```
0001 *CODE 000064
0000 *DATA 000026
0002 *BLANK 000000
0003 INDATA 011610
0004 COM 006525
```

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NERR3\$

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0004 R 000000 AREA	0004 R 000074 AREA1	0004 R 000170 AREAK	0004 R 000132 AREA0	0004 R 005060 CF
0004 R 006423 CGGTC	0004 R 006436 CGTANK	0004 R 006431 CLTANK	0004 R 005014 CONCT	0004 R 006443 CPJU
0004 R 005006 CSTAR	0004 R 006356 CVEL	0004 R 000036 DELXL	0004 R 000226 DIALI	0004 R 006277 DMVENT
0004 R 006360 EYAT	0003 I 007027 FBD	0003 I 007035 FBI	0004 R 006370 FBPC	0004 R 006376 FBTC
0004 R 006362 FBWC	0004 R 005111 FRL	0004 R 003132 HI	0004 R 003036 HO	0004 R 003322 HRAD
0004 I 005110 ICMON	0000 I 000000 II	0004 I 005052 ISPT	0000 I 000001 JJ	0004 I 003606 JUN
0004 I 005066 MEX	0004 I 004756 MR	0004 I 005102 MWC	0004 I 002552 NGR	0003 I 000100 NODEL
0004 I 002646 NPR	0004 I 002742 NRE	0000 R 000003 P	0004 R 000264 PB	0004 R 004764 PC
0004 R 004772 PCN	0004 R 005074 PE	0004 R 000272 PG	0004 R 003620 PGT	0004 R 005036 PMR
0004 R 006241 POWC	0004 R 006350 POWP	0004 R 006343 POWT	0004 R 006300 PPI	0004 R 006305 PPO
0004 R 006331 PTI	0004 R 006336 PTO	0004 R 006357 R	0004 R 001422 RHOG	0004 R 006312 RPMT
0003 R 000000 S	0000 R 000004 T	0004 R 005044 TC	0004 R 006416 THOC	0004 R 006411 TPCG
0004 R 006404 TPCL	0003 R 001132 TTEMP	0004 R 006317 TTI	0004 R 006324 TTD	0004 R 003226 TWALL
0004 R 006356 U	0004 R 003416 UAO	0004 R 003512 VEL	0000 R 000002 W	0003 R 003423 WDOTG
0004 R 006265 WI	0004 R 004750 WNOZ	0004 R 006253 WO	0004 R 006361 WT	0004 R 006246 WTGC

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```
00101 1* SUBROUTINE FEEDB(I)
00103 2* INTEGER FBU, FBI
00103 3* C FEEDBACK SUBROUTINE ACCOUNTS FOR DOWNSTREAM COMPONENTS CONNECTED
00103 4* C TO UPSTREAM COMPONENTS - DEFINES CONNECTIONS/CONSTRAINTS
00104 5* DIMENSION FBI(6),NODEL(30),WDOTG(30,20),FBD(6), TTEMP(30,20)
00105 6* EQUIVALENCE
00105 7* * (S( 65),NODEL) ,(S(1812),WDOTG(1,1)) ,(S(3608),FBD)
00105 8* *,(S(603),TTEMP(1,1)), (S(3614),FBI)
00105 9* C
00106 10* COMMON /INDATA/S(5000)
00106 11* C
00107 12* COMMON /COM/AREA(30),DELXL(30),AREA1(30),AREA0(30),AREAK(30)
00107 13* *, DIALI(30),PB(6),PG(30,20),RHOG(30,20),NGR(30,2)
00107 14* *, NPR(30,2),NRE(30,2),HO(30,2),HI(30,2),TWALL(30,2)
```

3.6.62 FEEDB (FEED BACK CONSTRAINTS)

UNIVAC 1108 FORTRAN V LEVEL 2206 0018 F5018H
THIS COMPILATION WAS DONE ON 08 SEP 71 AT 14:22:44

SUBROUTINE FEEDB ENTRY POINT 000054

STORAGE USED (BLOCK, NAME, LENGTH)

```
0001 *CODE 000064
0000 *DATA 000026
0002 *BLANK 000000
0003 INDATA 011610
0004 COM 006525
```

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NERR35

STORAGE ASSIGNMENT FOR VARIABLES (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0004 R 000000 AREA	0004 R 000074 AREA1	0004 R 000170 AREAR	0004 R 000132 AREA0	0004 R 005060 CP
0004 R 006423 CGGTC	0004 R 006436 CGTANK	0004 R 006431 CLTANK	0004 R 005014 CONCT	0004 R 006443 CPJU
0004 R 005006 CSTAR	0004 R 006355 CVEL	0004 R 000036 DELXL	0004 R 000226 DIALI	0004 R 006277 DMVENT
0004 R 006360 ETAT	0003 I 007027 FBD	0003 I 007035 FBI	0004 R 006370 FBPC	0004 R 006376 FBTC
0004 R 006362 FBWC	0004 R 005111 FRL	0004 R 003132 HI	0004 R 003036 HO	0004 R 003322 HRAD
0004 I 005110 ICMON	0000 I 000000 II	0004 I 005052 ISPT	0000 I 000001 JJ	0004 I 003606 JUN
0004 I 005066 MEX	0004 I 004756 MR	0004 I 005102 MWC	0004 I 002552 NGR	0003 I 000100 NODEL
0004 I 002646 NPR	0004 I 002742 NRE	0000 R 000003 P	0004 R 000264 PB	0004 R 004764 PC
0004 R 004772 PCN	0004 R 005074 PE	0004 R 000272 PG	0004 R 003620 PGT	0004 R 005036 PMR
0004 R 006241 POWC	0004 R 006350 POWP	0004 R 006343 POWT	0004 R 006300 PPI	0004 R 006305 PPO
0004 R 006331 PTI	0004 R 006336 PTO	0004 R 006357 R	0004 R 001422 RHOG	0004 R 006312 RPMT
0003 R 000000 S	0000 R 000004 T	0004 R 005044 TC	0004 R 006416 THOC	0004 R 006411 TPCG
0004 R 006404 TPCL	0003 R 001132 TTEMP	0004 R 006317 TTI	0004 R 006324 TTO	0004 R 003226 TWALL
0004 R 006356 U	0004 R 003416 UAO	0004 R 003512 VEL	0000 R 000002 W	0003 R 003423 WDOTG
0004 R 006265 WI	0004 R 004750 WNOZ	0004 R 006253 WO	0004 R 006361 WT	0004 R 006246 WTGC

```
00101 1* SUBROUTINE FEEDB(I)
00103 2* INTEGER FBD, FBI
00103 3* C FEEDBACK SUBROUTINE ACCOUNTS FOR DOWNSTREAM COMPONENTS CONNECTED
00103 4* C TO UPSTREAM COMPONENTS - DEFINES CONNECTIONS/CONSTRAINTS
00104 5* DIMENSION FBI(6),NDDL(30),WDOTG(30,20),FBD(6), TTEMP(30,20)
00105 6* EQUIVALENCE
00105 7* * (S(65),NODEL) ,(S(1812),WDOTG(1,1)) ,(S(3608),FBD)
00105 8* *,(S(603),TTEMP(1,1)), (S(3614),FBI)
00105 9* C
00106 10* COMMON /INDATA/S(5000)
00106 11* C
00107 12* COMMON /COM/AREA(30),DELXL(30),AREA1(30),AREA0(30),AREAR(30)
00107 13* *, DIALI(30),PB(6),PG(30,20),RHOG(30,20),NGR(30,2)
00107 14* *, NPR(30,2),NRE(30,2),HO(30,2),HI(30,2),TWALL(30,2)
```


4. REFERENCE INFORMATION

1. P. F. Thompson, T. J. Walsh, "Characterization of Attitude Control Propulsion Systems, MSC/TRW Task 705-1," TRW Technical Report 1761B - H179-RO-00, June 1971.
2. P. F. Thompson, R. C. Turley, "Steady-State Attitude Control Propulsion Systems Computer Program Documentation and User's Manual," TRW Technical Report 1761B-H179-RO-00, Volume I.

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