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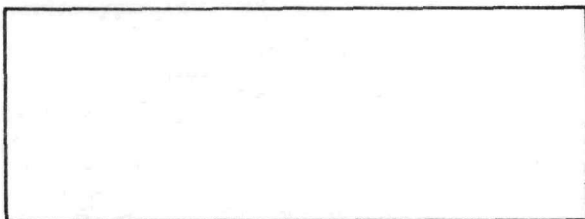
NAA-SR-MEMO 9664

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ATOMICS INTERNATIONAL A Division of North American Aviation, Inc.		NAA-SR- TDR NO. 9664	APPROVALS <i>W. Brown</i>
TECHNICAL DATA RECORD		PAGE 1 OF 49	
AUTHOR <i>RAB</i> R. A. Blaine and <i>RFB</i> R. F. Berland (2)	DEPT. & GROUP NO. 795-50 795-50	DATE 3/27/64	
TITLE 500 - THGC A 500 Node Transient Heat Transfer Code.		S/A NO. 1210	TWR 52693
		SECURITY CLASSIFICATION	
		(CHECK ONE BOX ONLY)	
PROGRAM SUBACCOUNT TITLE SNAP 10 A- Flight Test Performance Evaluation.		UNCL. <input checked="" type="checkbox"/> AEC <input type="checkbox"/> DOD <input type="checkbox"/> CONF. <input type="checkbox"/> SECRET <input type="checkbox"/>	(CHECK ONE BOX ONLY) RESTRICTED DATA <input type="checkbox"/> DEFENSE INFO. <input type="checkbox"/>
DISTRIBUTION		AUTHORIZED CLASSIFIER SIGNATURE _____ DATE _____	
STATEMENT OF PROBLEM Develop a nodal Heat Transfer Code incorporating conduction, convection, radiation, variable mass heat transfer, effective space temperatures, and special start-up features.			
ABSTRACT: 500-THGC is a generalized transient one, two, or three dimensional Heat Transfer Code, an outgrowth of 30-THGC ¹ , with special options for handling SNAP circular orbit pre-start-up and start-up problems. Provision is made for mass transfer, dropping the heat shield and simulating environmental conditions by means of effective temperatures. Use of FAP coding and special treatment of matrix multiplication are used to minimize machine time.			

I. INTRODUCTION

500-THGC is a generalized transient one, two, or three-dimensional Heat Transfer Code, an outgrowth of 30-THGC¹, with special options for handling SNAP circular orbit pre-start-up start-up problems. Provision is made for mass transfer, dropping the heat shield and simulating environmental conditions by means of effective temperatures. Use of FAP coding and special treatment of matrix multiplication are used to minimize machine time.

This document is not meant to be a complete detailed discussion of the many types of problems this code will handle, it is rather a users manual for one who is familiar with such problems as discussed in references 2 and 3. The authors will be happy to discuss any features of this code and provide assistance in its use.

II. THEORY

Let us divide the region of interest into small volumes in which the temperature is defined at the center. We write the heat balance equation for node i,

$$(\rho C_p V)_i \frac{dT_i(\theta)}{d\theta} = \sum_j \left(\frac{KA}{L} \right)_{ij} [T_j(\theta) - T_i(\theta)] + \sum_j (\sigma FA)_{ij} [T_j^4(\theta) - T_i^4(\theta)] ; i=1, N \quad (1)$$

where

- θ = the time (hour, minute, second, etc.)
- T_i = the temperature at node i at time
 (If there is radiation, T must be the absolute temperature in °K or °R).
- σ = the Stephan-Boltzman constant
- ρ_i = the density of node i
- C_{pi} = the specific heat of node i
- K_{ij} = the conductivity between nodes i and j

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F_{ij}	=	form factor of node i as seen by node j
l_{ij}	=	length between nodes i and j
A_{ij}	=	area between nodes i and j
V_i	=	volume of node i
N	=	the number of nodes

and the sums are over all nodes j which can exchange heat with node i.

We make the following definitions:

$$C_{ij} = \frac{(KA/l)_{ij}}{(\rho C_p V)_i} \quad , \quad \text{the conduction coefficient,}$$

$$R_{ij} = \frac{(\sigma FA)_{ij}}{(\rho C_p V)_i} \quad , \quad \text{the radiation coefficient}$$

With the above definitions, equation (1) becomes

$$\frac{dT_i(\theta)}{d\theta} = \sum_j C_{ij} [T_j(\theta) - T_i(\theta)] + \sum_j R_{ij} [T_j^4(\theta) - T_i^4(\theta)] \quad (2)$$

; $i=1, N$

Note that if we also define

$$C_{ii} = - \sum_j C_{ij} \quad ,$$

and

$$R_{ii} = - \sum_j R_{ij} \quad ,$$

Equation (2) can be written in the form

$$\frac{dT_i(\theta)}{d\theta} = \sum_j C_{ij} T_j(\theta) + \sum_j R_{ij} T_j^4(\theta) \quad ; \quad i=1, N \quad (3)$$

where the sums include the $j = i$ term.

The time derivative is represented by the first forward difference:

$$\frac{dT_i(\theta)}{d\theta} \approx \frac{T_i(\theta+h) - T_i(\theta)}{h} \quad (4)$$

Substituting equation 4 in equation 3, multiplying through by h, and putting $T_i(\theta)$ on the right hand side, we have

$$T_i(\theta+h) = T_i(\theta) + h \sum_j C_{ij} T_j(\theta) + h \sum_j R_{ij} T_j^4(\theta) \quad (5)$$

Thus given the temperature of all nodes which exchange heat with the i^{th} , at time θ , we can predict the temperature of node i at time $\theta+h$.

Let us redefine the coefficients to simplify the equations.

Let $TN_i = T_i(\theta+h)$ (6)

$$TO_i = T_i(\theta) \quad (7)$$

$$D_{ij} = \begin{cases} h C_{ij}, & i \neq j \\ 1 + h C_{ii}, & i = j \end{cases} \quad (8)$$

$$S_{ij} = \begin{cases} h R_{ij}, & i \neq j \\ h R_{ii}, & i = j \end{cases} \quad (9)$$

With these new definitions, equation (5) becomes

$$TN_i = \sum_j D_{ij} TO_j + \sum_j S_{ij} TO_j^4 \quad ; \quad i=1, N \quad (10)$$

Finally, the system of equations (10) can be written in matrix notation

$$\begin{bmatrix} TN \end{bmatrix} = \begin{bmatrix} D \end{bmatrix} \begin{bmatrix} TO \end{bmatrix} + \begin{bmatrix} S \end{bmatrix} \begin{bmatrix} TO^4 \end{bmatrix} \quad (11)$$

where TN and TO are N X 1 column vectors, D and S are N X N square matrices which are in general sparse.

D and S contain N^2 elements, however in real physical problems a given node, in general, has no more than six adjacent nodes. Thus $6N$ is a good

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estimate of the number of non-zero elements in D and probably 2N or 3N non-zero elements in S. Assuming a typical problem of 300 nodes then, D and S contain 90,000 elements each, of which only some 1800 elements in D and 600-900 elements in S are non-zero.

Looking at equation 10, we see that if we could store the matrices D and S as square arrays that we would perform 600 multiplications and additions for each of the 300 nodes or a total of 180,000 multiplications and additions of which most operations are wasted.

The procedure actually used is to number the non-zero elements in D and S consecutively in an arbitrary order, so we have for each non-zero d_{ij} and s_{ij} , d_l , $l=1, M$ and s_l , $l=1, MR$. In addition we record the row and column indications i and j for each l as (i_{dl}, j_{dl}) $l=1, M$ and (i_{sl}, j_{sl}) $l=1, MR$ where the subscript d refers to the elements of D and s refers to the elements of S. Thus given an l , we know that $d_l = d_{ij}$ where $i = i_{dl}$ and $j = j_{dl}$.

This procedure represents a transformation (a mapping) of the two dimensional index set, (i, j) on to a one dimensional index set, l .

Mathematically we can reduce equation (11) to the form:

$$TN_i = \sum_{l=1}^M [d_l \delta_i, i_s(l)] T O_{j_D(l)} + \sum_{l=1}^{MR} [s_l \delta_i, i_s(l)] T O_{j_S(l)} \quad (12)$$

Stated in words, for each l we form the products of d_l and $T O_j$ where j is found from $j_D(l)$ and add the product to $T N_i$ where i is given by $i_D(l)$ and similarly for the second series.

To clarify this still further let us see how this transformation simplifies the operation in the fortran language:

Letting $l \rightarrow L$

$$i = i_D(L) \rightarrow ID(L)$$

$$j = j_D(L) \rightarrow JD(L)$$

$$d_{ij} = d(L) \rightarrow D(L)$$

$$L = 1, M$$

$$i = i_S(L) = IS(L)$$

$$j = j_S(L) = JS(L)$$

$$s_{ij} = s(L) = S(L)$$

$$L = 1, MR$$

Then we have

$$\begin{aligned}
 & D\phi \quad 1 \quad L = 1, M \\
 & \begin{aligned} I &= ID(L) \\ J &= JD(L) \end{aligned} \\
 1 \quad TN(I) &= TN(I) + D(L) * TO(J) \\
 & D\phi \quad 2 \quad L = 1, MR \\
 & \begin{aligned} I &= IS(L) \\ J &= JS(L) \end{aligned} \\
 2 \quad TN(I) &= TN(I) + S(L) * TO(J) ** 4
 \end{aligned}$$

Because of the importance of these manipulations, this portion of the code is optimized and coded in FAP (machine language). The reduction in running time was approximately a factor of ten.

The condition for the stability of (11) can be stated in the following way:

$$h \leq \left\{ \text{Max}_i \left[-C_{ii} + \sum_j R_{ij} \left| \frac{T_j^y - T_i^y}{T_j - T_i} \right| \right] \right\}^{-1} \quad (13)$$

where the maximum temperature difference expected is used.

III. SPECIAL FEATURES

A. Effective Space Temperatures

These nodes are made to represent the variation of the outside temperature due to variation of the position of the vehicle with respect to the earth-sun relation.

1. A maximum of 200 nodes can be used as effective temperature nodes. Each of these has three regions of orbit dependence.

For the first,

$$\begin{aligned}
 T_{A_1}(\theta) &= A_2 \sin [A_3 \varphi(\theta) + A_4] + A_7, \quad 0 \leq \varphi(\theta) \leq A_{10} \\
 \varphi(\theta) &= A_8 [T_3(N + A_9) - \theta] \\
 N &= \text{integer part of } \theta/T_3
 \end{aligned} \quad (14)$$

For the second,

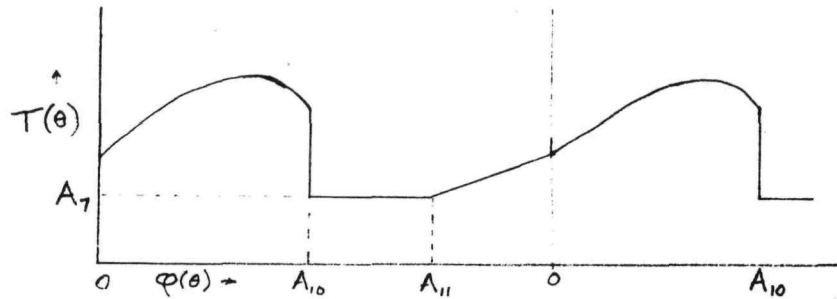
$$T_{A_1}(\theta) = A_7, \quad A_{10} < \varphi(\theta) \leq A_{11} \quad (15)$$

For the third,

$$T_{A_1}(\theta) = A_5 \varphi(\theta) - A_6 + A_7, \quad \varphi(\theta) > A_{11} \quad (16)$$

Figure 1 is an example which should clarify the orbit dependence of the effective temperature nodes.

Figure 1



Since $\varphi(\theta)$ is periodic with period T_3 , the orbit time, the effective temperatures are similarly periodic in θ with period T_3 .

2. Node 296 (reactor node) has a special form with four regions of time dependence.

For the first,

$$T_{296}(\theta) = \left[\frac{A_2 - T_{su}}{A_{10} - A_9} \right] (\theta - A_9) + T_{su} \quad , \quad A_9 \leq \theta \leq A_{10} \quad (17)$$

where T_{su} = temperature of node 296 at $\theta = A_9$

For the second,

$$T_{296}(\theta) = A_2 \quad , \quad A_{10} < \theta \leq A_{11} \quad (18)$$

For the third,

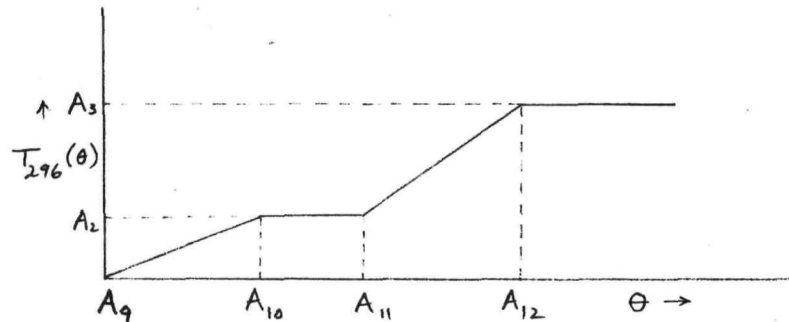
$$T_{296}(\theta) = A_4 (\theta - A_{11}) + A_2 \quad , \quad A_{11} < \theta \leq A_{12} \quad (19)$$

For the fourth,

$$T_{296}(\theta) = A_3 \quad , \quad \theta > A_{12} \quad (20)$$

Figure 2 gives an example which should clarify the time dependence of node 296.

Figure 2



3. Node 308 (space temperature as seen by reactor top) has a special form with three regions of orbit dependence.

For the first,

$$T_{308}(\theta) = A_2 \sqrt{1 - \left(\frac{FT(\theta)}{A_3}\right)^2}, \quad 0 \leq FT(\theta) \leq A_{10} \quad (21)$$

where $FT(\theta) = \theta - T_3 \cdot N$

$N = \text{integer part of } \theta/T_3$

For the second,

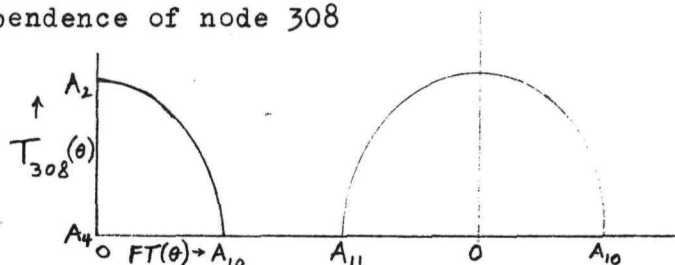
$$T_{308}(\theta) = A_4, \quad A_{10} < FT(\theta) \leq A_{11} \quad (22)$$

For the third,

$$T_{308}(\theta) = A_2 \sqrt{1 - \left(\frac{FT(\theta) - A_5}{A_3}\right)^2}, \quad FT(\theta) > A_{11} \quad (23)$$

Figure 3 gives an example which should clarify the orbit dependence of node 308

Figure 3



Since $FT(\theta)$ is periodic with period T_3 the orbit time, T_{308} is similarly periodic in θ with period T_3 .

B. Reactor Startup

1. When $\theta > T_2$ (see input) a new calculation interval and a new print out interval are used. The D_{ij} and S_{ij} are changed accordingly. Variable mass transfer coefficients are read in and the coefficients are computed at each subsequent time step. When the condition $T_{296} \geq T_{296IN}$ (see input) is satisfied the heat shield, which must consist of consecutive node numbers, is dropped. This is accomplished by deleting all transfer coefficients involving the heat shield and reading in new transfer coefficients between space and the radiator. As of the time of writing, this option has not been tested completely.

2. Variable Mass Transfer Coefficient Equations

Up to 6 variable mass transfer coefficient equations may be used with a maximum of 100 C_{ij} being calculated by each one. Each of these equations has six regions of time dependence.

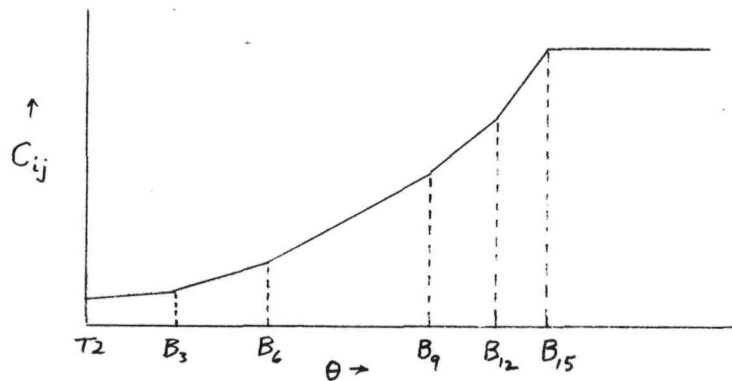
$$C_{ij} = B_{lk} \theta + B_{lk+1} \quad , \quad B_{lk-1} \leq \theta < B_{lk+2} \quad (24)$$

where $k=1, \dots, 6$ the equation number, and $l=1, \dots, 16$

$$B_{l0} = T_2 \text{ and } B_{l18} = \infty$$

Figure 4 gives an example which should clarify the time dependence.

Figure 4



C. Pre-Startup Only

Set $T2 > TMAX$ and omit the cards that are special for startup.

IV. LIMITATIONS

500 nodes of which 200 may be effective temperatures.

2500 Radiation terms

2500 Conduction terms

6 variable mass transfer coefficient equations where each may be used with a maximum of 100 C_{ij} 's being calculated by each one.

Multiple cases can not be run.

V. RUNNING TIME

The sample case took 2 minutes with an output of 700 lines of printing.

VI. USE OF CODE

500 - THGC is filed at Department 792 as Deck Number 3W543 .
Submit a short form and place data behind deck.

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VII. REFERENCES

1. R. A. Blaine, "30-THGC - A 30 Node Transient or Steady State Heat Generation Code", Applied Mathematics Technical Document 169 (AMTD-169), September, 1962.
2. T. J. Boyle, G. S. Drucker, "SNAP 10A Orbital Pre-startup and Startup Analysis" -(to be published).
3. L. F. Baumeister, F. J. Boyle, J. H. Van Osdol, "SNAP 10A System Pre-startup Thermal Analysis", (to be published).

INPUT

<u>DATA BLOCK 1</u>	(12A6)	Title Card - all 72 columns may be used.
<u>DATA BLOCK 2</u>	(6I12)	
NC	-	Number of conduction cards
N	-	Number of nodes ≤ 500
L10	1	All nodes have same initial temperature
	2	Some initial temps specified, all the rest have same temp- erature.
	3	All initial temperatures are specified.
IH	-	Heat shield initial node* number
IHL	-	Heat shield final node number
NCT	-	Number of initial temperatures specified for L10 = 2 or 3.
<u>DATA BLOCK 3</u>	(6I12)	
NETS	-	Number of effective temper- atures
NC2	-	Number of radiation cards
NC3	-	Number of Variable Mass Trans- fer Coefficient Equations ≤ 6
NC4	-	Number of radiation cards specified after the heat shield drops off.
IW	1	Normal printout.
	2	Special printout.
<u>DATA BLOCK 4</u>	(6F12.8)	
TMAX	-	Maximum system time
THEAT	-	Not used at present
DELTA	-	Calculation interval
TØØ	-	Temperature of unspecified nodes for L10 = 1 or 2
TTØ	-	Print interval
EE	-	Not used at present

* Note that heat shield nodes must be numbered consecutively.

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DATA BLOCK 5 (6F12.8)

T1	-	New calculation interval for startup.
T2	-	Time for starting Variable Mass Transfer Coefficient Equations.
T3	-	Orbit time
TIME	-	Initial time ≥ 0
T4	-	New print interval for start-up.
T296IN	-	Temperature of node 296 at which heat shield is dropped

DATA BLOCK 6 (6(I3,F9.5)

Initial temperatures
NCT pairs (I,TO(I)) must be specified, 6 per card. Omit if
L10 = 1

I, TO(I)

DATA BLOCK 7 (F9.5, 2I13)

Conduction coefficients C_{ij} .
NC cards must be included, 1 C per card, and NP (IC, JC)
pairs where $NP \leq 10$.
Omit if $NC = 0$.

C, NP,
IC(1), JC(1), IC(2), JC(2)

.

.

.

IC (NP), JC(NP)

IC = i , JC = j

DATA BLOCK 8 (F9.5, 2I13)

Radiation coefficients R_{ij} .
NC2 cards must be included, 1 R per card, and NP (IR, JR)
pairs where $NP \leq 10$.
Omit if $NC2 = 0$.

R, NP,
IR (1), JR(1), IR(2), JR(2)

.

.

.

IR(NP), JR(NP)

IR = i , JR = j

DATA BLOCK 9 (6F12.8)

Effective temperature coefficients A.2 : NETS cards must be included, 2 cards for each effective temperature equation. Nodes 296 and 308 must be specified, if 296 and 308 are not needed, set A(1) = node number and A(2) through A(12) = 0. Omit if NETS = 0.

A(1) = node number

A(2)

.

See equations 14, 15, 16, 17, 18, 19, 20, 21, 22, and 23.

A(12)

DATA BLOCK 10 (6I12)

Omit if $T_2 > T_{MAX}$ i.e. Variable Mass Transfer Coefficients are not used.

L11 (1)

Number of (I, J) pairs using Variable Mass Transfer Equation 1, . . . , NC3
 L11 (K) < 101, NC 3 < 7

.

L11 (NC3)

DATA BLOCK 11 (24I3)

Omit if $T_2 > T_{MAX}$ variable mass transfer coefficients are not used.

L 11 (K) pairs of (I,J) must be included, 12 per card
 K = 1, . . . , NC3

I1(1), J1(1), I1(2), J1(2)

.

I1 = i, J1 = J

I1(L), J1(L)

L = L11 (K)

DATA BLOCK 12 (6F12.8)

Omit if $T_2 > T_{MAX}$
 3*NC3 cards must be included, 3 cards for each variable mass transfer equation.

B(1)

.

See equation 24

B(17)

DATA BLOCK 13

DATA BLOCK 13 (F9.5, 2113)

Omit if $T2 > TMAX$

Radiation coefficients R_{ij}

NC4 cards must be included, 1 R per card, and NP (IR, JR) pairs where $NP \leq 10$.

R , NP

IR(1), JR(1), IR(2), JR(2)

.

.

.

IR(NP), JR(NP)

IR = i, JR = j

FORTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO. DATA PROGRAMMER _____ DATE _____ PAGE 1 of 5 JOB NO. _____

NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
1	T. BOYLE, SNA		Title
13	P 1.0A. PRESTAR		
25	T THERMAL SI		
37	M, 4. PERCENT		
49	FLØW, TRANSIE	73	80
61	NT. HEATING		10
1		208	NC
13		3.49	N
25		2	L10
37		1	IH
49		72	IHI
61		1	20 NCT
1		78	NETS
13		1.81	NC2
25		0	NC3
37		0	NC4
49		1	IW
61			30
1		3.15	TMAX
13		0.0	THEAT
25		0.005	DELTA
37		5.3	TØØ
49		0.2	TTØ
61		0.0	40 EE

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DECK NO. DATA PROGRAMMER _____ DATE _____ PAGE 2 of 5 JOB NO. _____

NUMBER	IDENTIFICATION	DESCRIPTION DO NOT KEY PUNCH
0.0		T1
5.50.		T2
1.8		T3
.45		TIME
0.0		T4
5500.	50	T296IN
1 5.3		I, TO(I)
5.44	2	C, NP
1 2 6 5		IC(1), IC(1.), IC(2), IC(2)
3.97	2	'
1 7 6 12		208 conduction cards
		'
		'
		'
		'
	80	'

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NUMBER	IDENTIFICATION	DESCRIPTION DO NOT KEY PUNCH
1 20.9	2	<i>Last conduction card</i>
13 27.1268272269		
25		
37		
49	73 80	
61	2140	
1 .0010769	2	R, NP IR(1), JR(1), IR(2), JR(2)
13 1.127 6132		
25		
37		
49	73 80	
61	2150	
1 .0010801	2	. 181 radiation cards . . .
13 2128 5131		
25		
37		
49	73 80	
61	2160	
1 8. -06	4	<i>Last radiation card</i>
13 296260296261		
25 296262296263		
37		
49	73 80	
61	3950	

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	NUMBER	IDENTIFICATION	DESCRIPTION DO NOT KEY PUNCH	
1	278.		A(1)	
13	5.1		A(2)	
25	2.6		A(3)	
37	.533		A(4)	
49	5.182		A(5)	
61	6.737		3960	A(6)
1	2.53		A(7)	
13	- 1.		A(8)	
25	0.		A(9)	
37	.7		A(10)	
49	1.3		A(11)	
61	0.0		3970	A(12)
1	279.		78 sets of effective temperature cards	
13	4.7			'
25	2.6			'
37	.533			'
49	4.776			'
61	6.209			3980
1	2.53		78 sets of effective temperature cards	
13	- 1.			'
25	0.			'
37	.7			'
49	1.3			'
61	0.0			3990

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DECK NO. DATA PROGRAMMER _____ DATE _____ PAGE 5 of 5 JOB NO. _____

NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
1 296.		'	
13 0.0		'	
25 0.0		'	
37 0.0		'	
49 0.0	73. 80.	'	
61 0.0	4320	'	
1 0.0		'	
13 0.0		'	
25 1.00.		'	
37 0.0		'	
49 0.0	73. 80.	'	
61 0.0	4330		
1 308.		<i>Last set of effective temperature cards</i>	
13 7.5			
25 .45			
37 0.0			
49 1.8	73. 80.		
61 0.0	5500		
1 0.0			
13 0.0			
25 0.0			
37 .45			
49 1.35	73. 80.		
61 0.0	5510		

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T. BOYLE, SNAP10A PRESTART THERMAL SIM, 4 PERCENT FLOW, TRANSIENT HEATING 00000010

	208	349	2	1	72	
	78	181			1	100000020
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Listing of Data Deck
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3.86	2	37	38	42	41														
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2.53	1.	1.	.7	1.3		00004070
284.	6.15	2.51	.568	6.616	8.602	00004080
2.53	-1.	0.	.7	1.3		00004090
285.	5.75	2.51	.568	6.186	8.042	00004100
2.53	-1.	0.	.7	1.3		00004110
286.	4.05	2.42	.603	4.593	5.971	00004120
2.53	-1.	0.	.7	1.3		00004130
287.	4.05	2.42	.603	4.593	5.971	00004140
2.53	1.	1.	.7	1.3		00004150
288.	5.75	2.51	.568	6.186	8.042	00004160
2.53	1.	1.	.7	1.3		00004170
289.	6.15	2.51	.568	6.616	8.601	00004180
2.53	1.	1.	.7	1.3		00004190
290.	5.9	2.55	.552	6.198	8.058	00004200
2.53	-1.	0.	.7	1.3		00004210
291.	5.5	2.51	.568	5.917	7.692	00004220
2.53	-1.	0.	.7	1.3		00004230
292.	3.9	2.42	.603	4.423	5.750	00004240
2.53	-1.	0.	.7	1.3		00004250
293.	3.9	2.42	.603	4.423	5.750	00004260
2.53	1.	1.	.7	1.3		00004270
294.	5.5	2.51	.568	5.917	7.692	00004280
2.53	1.	1.	.7	1.3		00004290
295.	5.9	2.55	.552	6.198	8.058	00004300
2.53	1.	1.	.7	1.3		00004310
296.		100.				00004320
		2.37	.624	7.420	9.646	00004330
266.	6.35	2.37	.624	7.420	9.646	00004340
2.53	-1.	0.	.7	1.3		00004350
297.	6.0	2.50	.573	6.505	8.457	00004360

2.53	-1.	0.	.7	1.3		00004370
298.	4.3	2.37	.624	5.025	6.532	00004380
2.53	-1.	0.	.7	1.3		00004390
299.	4.3	2.37	.624	5.024	6.532	00004400
2.53	1.	1.	.7	1.3		00004410
300.	6.0	2.50	.573	6.505	8.457	00004420
2.53	1.	1.	.7	1.3		00004430
301.	6.35	2.37	.624	7.420	9.646	00004440
2.53	1.	1.	.7	1.3		00004450
302.	5.75	2.55	.552	6.030	7.839	00004460
2.53	-1.	0.	.7	1.3		00004470
303.	5.40	2.53	.559	5.727	7.445	00004480
2.53	-1.	0.	.7	1.3		00004490
304.	3.75	2.36	.629	4.412	5.736	00004500
2.53	-1.	0.	.7	1.3		00004510
305.	3.75	2.36	.629	4.412	5.736	00004520
2.53	1.	1.	.7	1.3		00004530
306.	5.40	2.53	.559	5.727	7.445	00004540
2.53	1.	1.	.7	1.3		00004550
307.	5.75	2.55	.552	6.030	7.839	00004560
2.53	1.	1.	.7	1.3		00004570
277.	6.35	2.51	.568	6.831	8.881	00004580
2.53	-1.	0.	.7	1.3		00004590
309.	5.95	2.50	.573	6.451	8.387	00004600
2.53	-1.	0.	.7	1.3		00004610
310.	4.20	2.42	.603	4.763	6.192	00004620
2.53	-1.	0.	.7	1.3		00004630
311.	4.20	2.42	.603	4.763	6.192	00004640
2.53	1.	1.	.7	1.3		00004650
312.	5.95	2.50	.573	6.451	8.387	00004660
2.53	1.	1.	.7	1.3		00004670
313.	6.35	2.51	.568	6.831	8.881	00004680
2.53	1.	1.	.7	1.3		00004690
314.	5.9	2.50	.573	6.397	8.316	00004700
2.53	-1.	0.	.7	1.3		00004710
315.	5.55	2.51	.566	5.952	7.738	00004720
2.53	-1.	0.	.7	1.3		00004730
316.	3.9	2.42	.603	4.423	5.750	00004740
2.53	-1.	0.	.7	1.3		00004750
317.	3.9	2.42	.603	4.423	5.750	00004760
2.53	1.	1.	.7	1.3		00004770
318.	5.55	2.51	.566	5.952	7.738	00004780
2.53	1.	1.	.7	1.3		00004790
319.	5.9	2.50	.573	6.397	8.316	00004800

2.53	1.	1.	.7	1.3		00004810
320.	6.1	2.51	.566	6.542	8.505	00004820
2.53	-1.	0.	.7	1.3		00004830
321.	5.7	2.51	.566	6.113	7.947	00004840
2.53	-1.	0.	.7	1.3		00004850
322.	4.05	2.42	.603	4.593	5.971	00004860
2.53	-1.	0.	.7	1.3		00004870
323.	4.05	2.42	.603	4.593	5.971	00004880
2.53	1.	1.	.7	1.3		00004890
324.	5.7	2.51	.566	6.113	7.947	00004900
2.53	1.	1.	.7	1.3		00004910
325.	6.1	2.51	.566	6.542	8.505	00004920
2.53	1.	1.	.7	1.3		00004930
326.	6.2	2.51	.566	6.649	8.644	00004940
2.53	-1.	0.	.7	1.3		00004950
327.	5.8	2.51	.566	6.220	8.086	00004960
2.53	-1.	0.	.7	1.3		00004970
328.	4.1	2.43	.601	4.636	6.027	00004980
2.53	-1.	0.	.7	1.3		00004990
329.	4.1	2.43	.601	4.636	6.027	00005000
2.53	1.	1.	.7	1.3		00005010
330.	5.8	2.51	.566	6.220	8.086	00005020
2.53	1.	1.	.7	1.3		00005030
331.	6.2	2.51	.566	6.649	8.644	00005040
2.53	1.	1.	.7	1.3		00005050
332.	5.75	2.51	.568	6.186	8.042	00005060
2.53	-1.	0.	.7	1.3		00005070
333.	5.50	2.53	.559	5.833	7.583	00005080
2.53	-1.	0.	.7	1.3		00005090
334.	3.9	2.42	.603	3.433	4.463	00005100
2.53	-1.	0.	.7	1.3		00005110
335.	3.9	2.42	.603	3.433	4.463	00005120
2.53	1.	1.	.7	1.3		00005130
336.	5.50	2.53	.559	5.833	7.583	00005140
2.53	1.	1.	.7	1.3		00005150
337.	5.75	2.51	.568	6.186	8.042	00005160
2.53	1.	1.	.7	1.3		00005170
338.	5.65	2.51	.566	6.059	7.877	00005180
2.53	-1.	0.	.7	1.3		00005190
339.	5.30	2.54	.557	5.603	7.284	00005200
2.53	-1.	0.	.7	1.3		00005210
340.	3.70	2.42	.603	4.196	5.455	00005220
2.53	-1.	0.	.7	1.3		00005230
341.	3.70	2.42	.603	4.196	5.455	00005240

2.53	1.	1.	.7	1.3		00005250
342.	5.30	2.54	.557	5.603	7.284	00005260
2.53	1.	1.	.7	1.3		00005270
343.	5.65	2.51	.566	6.059	7.877	00005280
2.53	1.	1.	.7	1.3		00005290
344.	2.95	2.78	.460	2.619	3.405	00005300
2.53	-1.	0.	.7	1.3		00005310
345.	2.70	2.78	.461	2.402	3.122	00005320
2.53	-1.	0.	.7	1.3		00005330
346.	1.75	2.74	.477	1.606	2.088	00005340
2.53	-1.	0.	.7	1.3		00005350
347.	1.75	2.74	.477	1.606	2.088	00005360
2.53	1.	1.	.7	1.3		00005370
348.	2.70	2.78	.461	2.402	3.122	00005380
2.53	1.	1.	.7	1.3		00005390
349.	2.95	2.78	.460	2.619	3.405	00005400
2.53	1.	1.	.7	1.3		00005410
273.	1.91	2.82	.446	1.647	2.142	00005420
2.90	-1.	0.	.7	1.3		00005430
274.	1.91	2.82	.446	1.647	2.142	00005440
2.90	1.	1.	.7	1.3		00005450
275.	3.96	3.02	.365	2.827	3.675	00005460
2.90	-1.0	0.	.7	1.3		00005470
276.	3.96	3.02	.365	2.827	3.675	00005480
2.90	1.	1.	.7	1.3		00005490
308.	7.5	.45	0.0	1.8		00005500
			.45	1.35		00005510

HEAT GENERATION PROGRAM
WRITTEN FOR R.M. GALANTINE BY R.A. BLAINE 2/62.

T. BOYLE, SNAP10A PRESTART THERMAL SIM, 4 PERCENT FLOW, TRANSIENT HEATING

TIME = 0.6500

TEMPERATURES

	1	2	3	4	5	6	7	8	9	10
0	6.3312	6.1356	5.5754	4.9104	4.8969	4.9031	6.8510	6.5802	5.7017	4.8850
1	4.8699	4.8721	6.8276	6.6008	5.7310	4.8600	4.8435	4.8645	7.0188	6.7286
2	5.8171	4.8918	4.8834	4.8859	6.8343	6.5851	5.7335	4.8316	4.8238	4.8235
3	6.9783	6.7044	5.8070	4.8934	4.8792	4.8778	6.8615	6.6106	5.7789	4.8649
4	4.8435	4.8413	6.9005	6.6354	5.8267	4.8788	4.8587	4.8560	6.8972	6.6418
5	5.8534	4.8840	4.8659	4.8632	6.7079	6.5092	5.8074	4.8430	4.8223	4.8190
6	6.4722	6.2673	5.6559	4.7611	4.7394	4.7346	5.3873	5.3167	5.1464	4.5416
7	4.4907	4.4792	5.4023	5.3788	5.3192	5.2862	5.2857	5.2858	5.3991	5.3786
8	5.3199	5.2861	5.2856	5.2860	5.4015	5.3786	5.3207	5.2874	5.2870	5.2871
9	5.3914	5.3711	5.3182	5.2869	5.2865	5.2865	5.3897	5.3695	5.3185	5.2888
10	5.2883	5.2883	5.3775	5.3604	5.3166	5.2894	5.2888	5.2888	5.3684	5.3532
11	5.3156	5.2909	5.2904	5.2904	5.3547	5.3429	5.3132	5.2927	5.2924	5.2923
12	5.3355	5.3288	5.3095	5.2945	5.2942	5.2942	5.3064	5.3049	5.3012	5.2985
13	5.2984	5.2984	5.3866	5.3673	5.3167	5.2885	5.2880	5.2882	5.3843	5.3662
14	5.3169	5.2887	5.2883	5.2885	5.3823	5.3638	5.3166	5.2895	5.2891	5.2891
15	5.3752	5.3584	5.3152	5.2898	5.2895	5.2894	5.3696	5.3540	5.3146	5.2912
16	5.2907	5.2907	5.3590	5.3460	5.3129	5.2921	5.2917	5.2917	5.3481	5.3376
17	5.3112	5.2937	5.2934	5.2934	5.3338	5.3268	5.3084	5.2957	5.2954	5.2954
18	5.3171	5.3140	5.3049	5.2980	5.2979	5.2979	5.3158	5.3122	5.3030	5.2980
19	5.2978	5.2979	5.3219	5.3174	5.3044	5.2971	5.2969	5.2970	5.3229	5.3178
20	5.3046	5.2972	5.2971	5.2971	5.3214	5.3166	5.3042	5.2971	5.2970	5.2970
21	5.3209	5.3162	5.3042	5.2975	5.2973	5.2973	5.3186	5.3145	5.3039	5.2976
22	5.2974	5.2974	5.3158	5.3126	5.3035	5.2980	5.2978	5.2978	5.3127	5.3100
23	5.3029	5.2984	5.2983	5.2983	5.3048	5.3039	5.3012	5.2993	5.2993	5.2993
24	5.3019	5.3014	5.3004	5.2998	5.2997	5.2997	5.3029	5.3023	5.3006	5.2995
25	5.2994	5.2994	5.4169	5.3918	5.3263	5.2754	5.2720	5.2717	5.3019	5.3010
26	5.2988	5.2953	5.2948	5.2947	5.3000	7.7934	5.3029	5.2432	5.1846	5.3000
27	5.2273	5.1576	4.3507	2.9000	5.7780	2.9000	7.6658	6.5832	6.2653	5.1757
28	2.5300	2.5300	2.5300	7.5041	7.1805	5.8607	2.5300	2.5300	2.5300	7.2669
29	6.9783	5.7373	2.5300	2.5300	2.5300	5.3013	7.3880	6.0942	2.5300	2.5300
30	2.5300	7.1465	6.8847	5.6414	2.5300	2.5300	2.5300	0.	7.3475	5.9840
31	2.5300	2.5300	2.5300	7.3071	7.0253	5.7373	2.5300	2.5300	2.5300	7.4708
32	7.1468	5.8607	2.5300	2.5300	2.5300	7.5518	7.2278	5.8913	2.5300	2.5300
33	2.5300	7.1805	6.9654	5.7373	2.5300	2.5300	2.5300	7.1063	6.7899	5.5728
34	2.5300	2.5300	2.5300	4.7935	4.5999	3.8828	2.5300	2.5300	2.5300	0.

TIME = 0.8500

TEMPERATURES

	1	2	3	4	5	6	7	8	9	10
0	5.6521	5.5518	5.3043	4.6402	4.6269	4.6319	5.6752	5.5717	5.2562	4.6271
1	4.6119	4.6151	5.7063	5.5706	5.2524	4.6036	4.5868	4.6065	5.7790	5.6669
2	5.3268	4.6285	4.6212	4.6245	5.6374	5.5436	5.2475	4.5746	4.5653	4.5646
3	5.7391	5.6432	5.3502	4.6297	4.6167	4.6146	5.6468	5.5622	5.3212	4.6066
4	4.5855	4.5822	5.6607	5.5808	5.3637	4.6178	4.5989	4.5949	5.6458	5.5745
5	5.3834	4.6160	4.6011	4.5978	5.4996	5.4439	5.3001	4.5563	4.5408	4.5373
6	5.2473	5.2088	5.1150	4.4320	4.4162	4.4118	4.7408	4.7408	4.7669	4.2098
7	4.1712	4.1621	5.4464	5.4140	5.3291	5.2618	5.2608	5.2610	5.4381	5.4073
8	5.3286	5.2634	5.2624	5.2628	5.4269	5.3996	5.3285	5.2668	5.2660	5.2660
9	5.4046	5.3825	5.3239	5.2692	5.2684	5.2684	5.3893	5.3711	5.3231	5.2742
0	5.2734	5.2733	5.3673	5.3540	5.3190	5.2784	5.2776	5.2775	5.3485	5.3395
1	5.3159	5.2838	5.2833	5.2832	5.3321	5.3266	5.3125	5.2893	5.2889	5.2889
2	5.3177	5.3151	5.3085	5.2943	5.2941	5.2940	5.3149	5.3114	5.3030	5.2946
3	5.2945	5.2946	5.4343	5.4048	5.3281	5.2668	5.2659	5.2660	5.4237	5.3968
4	5.3272	5.2689	5.2681	5.2683	5.4089	5.3859	5.3256	5.2722	5.2714	5.2714
5	5.3896	5.3711	5.3223	5.2755	5.2748	5.2747	5.3725	5.3581	5.3200	5.2801
6	5.2794	5.2793	5.3533	5.3431	5.3164	5.2846	5.2840	5.2839	5.3367	5.3302
7	5.3132	5.2898	5.2894	5.2893	5.3228	5.3193	5.3101	5.2951	5.2948	5.2948
8	5.3122	5.3109	5.3074	5.3004	5.3003	5.3002	5.3670	5.3523	5.3138	5.2885
9	5.2879	5.2880	5.3839	5.3659	5.3181	5.2853	5.2845	5.2847	5.3810	5.3636
0	5.3182	5.2862	5.2853	5.2853	5.3709	5.3559	5.3164	5.2872	5.2863	5.2863
1	5.3626	5.3496	5.3156	5.2892	5.2882	5.2882	5.3501	5.3401	5.3134	5.2910
2	5.2901	5.2901	5.3360	5.3303	5.3111	5.2936	5.2928	5.2931	5.3253	5.3209
3	5.3085	5.2962	5.2956	5.2956	5.3116	5.3097	5.3044	5.2990	5.2987	5.2986
4	5.3118	5.3095	5.3033	5.2987	5.2980	5.2980	5.3097	5.3079	5.3026	5.2976
5	5.2969	5.2969	5.4064	5.3846	5.3227	5.2386	5.2291	5.2283	5.2986	5.2981
6	5.2969	5.2926	5.2920	5.2919	5.2999	2.5300	5.2849	5.1477	5.1040	5.3000
7	5.1166	5.0708	2.9000	2.9000	2.9000	2.9000	2.5300	2.5300	2.5300	2.5300
8	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
9	2.5300	2.5300	2.5300	2.5300	2.5300	5.3062	2.5300	2.5300	2.5300	2.5300
0	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	0.	2.5300	2.5300
1	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
2	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
3	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
4	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	0.

TIME = 1.0500

TEMPERATURES

	1	2	3	4	5	6	7	8	9	10
0	5.0685	5.0227	4.9315	4.4576	4.4462	4.4504	5.0524	5.0031	4.8900	4.4556
1	4.4437	4.4471	5.0551	4.9805	4.8645	4.4383	4.4249	4.4423	5.0878	5.0370
2	4.9091	4.4594	4.4545	4.4577	4.9909	4.9519	4.8482	4.4130	4.4058	4.4052
3	5.0544	5.0190	4.9283	4.4610	4.4512	4.4492	4.9928	4.9652	4.9056	4.4420
4	4.4252	4.4220	4.9978	4.9756	4.9289	4.4499	4.4358	4.4321	4.9817	4.9643
5	4.9280	4.4415	4.4321	4.4296	4.8666	4.8558	4.8375	4.3726	4.3634	4.3610
6	4.6704	4.6661	4.6622	4.2339	4.2231	4.2198	4.3385	4.3468	4.3872	4.0256
7	3.9944	3.9872	5.3773	5.3570	5.3045	5.2416	5.2404	5.2404	5.3641	5.3466
8	5.3028	5.2460	5.2448	5.2451	5.3508	5.3374	5.3024	5.2523	5.2514	5.2514
9	5.3337	5.3243	5.2994	5.2580	5.2571	5.2570	5.3231	5.3166	5.2996	5.2654
0	5.2646	5.2645	5.3123	5.3083	5.2980	5.2718	5.2711	5.2710	5.3053	5.3032
1	5.2975	5.2785	5.2780	5.2780	5.3012	5.3000	5.2972	5.2844	5.2841	5.2841
2	5.2980	5.2976	5.2966	5.2891	5.2890	5.2889	5.3157	5.3116	5.3016	5.2895
3	5.2893	5.2894	5.3690	5.3512	5.3056	5.2493	5.2482	5.2482	5.3559	5.3413
4	5.3042	5.2542	5.2532	5.2533	5.3422	5.3314	5.3030	5.2602	5.2593	5.2593
5	5.3285	5.3210	5.3011	5.2663	5.2655	5.2654	5.3185	5.3136	5.3005	5.2729
6	5.2723	5.2722	5.3100	5.3071	5.2994	5.2790	5.2785	5.2785	5.3045	5.3030
7	5.2989	5.2850	5.2846	5.2846	5.3013	5.3005	5.2986	5.2902	5.2900	5.2900
8	5.2994	5.2992	5.2986	5.2948	5.2947	5.2947	5.3801	5.3621	5.3150	5.2747
9	5.2734	5.2735	5.3837	5.3651	5.3161	5.2706	5.2690	5.2692	5.3735	5.3577
0	5.3152	5.2734	5.2718	5.2718	5.3588	5.3464	5.3127	5.2768	5.2752	5.2752
1	5.3464	5.3370	5.3112	5.2812	5.2797	5.2796	5.3330	5.3266	5.3088	5.2854
2	5.2841	5.2841	5.3208	5.3179	5.3067	5.2901	5.2890	5.2894	5.3136	5.3114
3	5.3048	5.2941	5.2934	5.2933	5.3087	5.3074	5.3036	5.2980	5.2975	5.2974
4	5.3152	5.3128	5.3048	5.2971	5.2956	5.2955	5.3096	5.3077	5.3021	5.2951
5	5.2938	5.2936	5.3105	5.3008	5.2693	5.2060	5.1951	5.1939	5.2940	5.2939
6	5.2934	5.2908	5.2903	5.2903	5.2998	2.5300	5.2636	5.0741	5.0506	5.3000
7	5.0388	5.0141	2.9000	2.9000	2.9000	2.9000	2.5300	2.5300	2.5300	2.5300
8	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
9	2.5300	2.5300	2.5300	2.5300	2.5300	5.2993	2.5300	2.5300	2.5300	2.5300
0	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	0.	2.5300	2.5300
1	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
2	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
3	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
4	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	0.

TIME = 1.2500

TEMPERATURES

	1	2	3	4	5	6	7	8	9	10
0	4.7287	4.7046	4.6686	4.7519	5.1703	5.3114	4.7203	4.6936	4.6476	4.9304
1	5.6711	5.9155	4.7148	4.6692	4.6227	4.9610	5.6980	5.8670	4.7333	4.7068
2	4.6518	5.0120	5.7758	6.0409	4.6590	4.6411	4.6003	4.9671	5.6962	5.9224
3	4.7067	4.6927	4.6623	4.9924	5.7598	6.0030	4.6619	4.6531	4.6420	4.9814
4	5.7150	5.9402	4.6649	4.6595	4.6538	5.0033	5.7234	5.9647	4.6492	4.6456
5	4.6418	4.9989	5.7162	5.9522	4.5512	4.5501	4.5529	4.9335	5.5994	5.7799
6	4.3798	4.3811	4.3883	4.7532	5.3650	5.5675	4.1090	4.1169	4.1518	4.3194
7	4.5294	4.6085	5.3091	5.2988	5.2729	5.2355	5.2500	5.2563	5.3001	5.2920
8	5.2723	5.2420	5.2566	5.2614	5.2934	5.2878	5.2735	5.2495	5.2639	5.2706
9	5.2857	5.2821	5.2730	5.2557	5.2693	5.2747	5.2826	5.2805	5.2749	5.2625
10	5.2762	5.2817	5.2797	5.2785	5.2756	5.2680	5.2805	5.2853	5.2788	5.2782
11	5.2767	5.2732	5.2847	5.2894	5.2787	5.2785	5.2778	5.2769	5.2868	5.2907
12	5.2786	5.2785	5.2783	5.2791	5.2862	5.2885	5.3130	5.3086	5.2980	5.2842
13	5.2847	5.2852	5.3071	5.2983	5.2763	5.2426	5.2534	5.2579	5.2991	5.2926
14	5.2762	5.2490	5.2597	5.2637	5.2926	5.2882	5.2768	5.2557	5.2662	5.2708
15	5.2871	5.2843	5.2771	5.2618	5.2718	5.2758	5.2842	5.2825	5.2783	5.2677
16	5.2773	5.2812	5.2821	5.2812	5.2789	5.2726	5.2813	5.2846	5.2815	5.2810
17	5.2799	5.2768	5.2842	5.2872	5.2814	5.2812	5.2807	5.2797	5.2854	5.2875
18	5.2818	5.2817	5.2815	5.2816	5.2846	5.2856	5.3563	5.3416	5.3030	5.2616
19	5.2611	5.2617	5.3450	5.3324	5.2989	5.2584	5.2583	5.2591	5.3341	5.3244
20	5.2978	5.2629	5.2630	5.2638	5.3229	5.3159	5.2963	5.2681	5.2682	5.2689
21	5.3142	5.3094	5.2957	5.2737	5.2740	5.2747	5.3064	5.3034	5.2947	5.2788
22	5.2792	5.2798	5.3013	5.2995	5.2942	5.2837	5.2843	5.2854	5.2980	5.2969
23	5.2937	5.2873	5.2879	5.2883	5.2997	5.2989	5.2964	5.2922	5.2921	5.2922
24	5.3096	5.3080	5.3017	5.2944	5.2927	5.2926	5.3041	5.3027	5.2981	5.2918
25	5.2904	5.2903	5.2420	5.2376	5.2217	5.1938	5.2033	5.2095	5.2909	5.2908
26	5.2906	5.2901	5.2907	5.2910	5.2996	2.5300	5.2559	5.0255	5.0501	5.3000
27	4.9886	5.0248	2.9000	4.6391	2.9000	6.4568	2.5300	2.5300	2.5300	2.5300
28	5.5569	6.8731	7.2427	2.5300	2.5300	2.5300	6.3158	7.8747	8.2465	2.5300
29	2.5300	2.5300	6.1756	7.6423	8.0010	5.2826	2.5300	2.5300	6.5593	8.1082
30	8.4803	2.5300	2.5300	2.5300	6.0446	7.5454	7.8619	0.	2.5300	2.5300
31	6.4560	8.0617	8.4324	2.5300	2.5300	2.5300	6.1756	7.6929	8.0152	2.5300
32	2.5300	2.5300	6.3158	7.8324	8.2045	2.5300	2.5300	2.5300	6.3574	7.9254
33	8.2975	2.5300	2.5300	2.5300	6.1756	7.6383	7.8747	2.5300	2.5300	2.5300
34	5.9886	7.4456	7.7859	2.5300	2.5300	2.5300	4.1327	4.9962	5.2258	0.

TIME = 1.4500

TEMPERATURES

	1	2	3	4	5	6	7	8	9	10
0	4.5288	4.5136	4.4951	5.4919	6.3976	6.6949	4.5364	4.5188	4.4920	5.6973
1	7.0474	7.4354	4.5308	4.5000	4.4739	5.7718	7.0928	7.4195	4.5472	4.5284
2	4.4961	5.8833	7.2620	7.6229	4.4858	4.4754	4.4519	5.8043	7.0839	7.4364
3	4.5246	4.5172	4.5000	5.8862	7.2295	7.6149	4.4909	4.4864	4.4815	5.8684
4	7.1040	7.4547	4.4922	4.4899	4.4865	5.9326	7.1301	7.5006	4.4762	4.4740
5	4.4687	5.9628	7.1280	7.4869	4.3879	4.3865	4.3810	5.8846	6.9397	7.2180
6	4.2292	4.2287	4.2280	5.6470	6.5893	6.8811	3.9824	3.9875	4.0115	5.0329
7	5.3432	5.4606	5.2604	5.2554	5.2431	5.2717	5.3874	5.4357	5.2564	5.2527
8	5.2439	5.2794	5.3930	5.4364	5.2551	5.2527	5.2467	5.2857	5.3963	5.4409
9	5.2532	5.2518	5.2482	5.2876	5.3861	5.4264	5.2545	5.2537	5.2516	5.2912
10	5.3838	5.4226	5.2556	5.2551	5.2541	5.2915	5.3686	5.4004	5.2581	5.2578
11	5.2573	5.2918	5.3558	5.3830	5.2609	5.2608	5.2605	5.2892	5.3383	5.3587
12	5.2637	5.2637	5.2635	5.2842	5.3154	5.3267	5.3085	5.3039	5.2931	5.2828
13	5.2900	5.2934	5.2629	5.2587	5.2483	5.2736	5.3730	5.4135	5.2598	5.2568
14	5.2496	5.2795	5.3755	5.4133	5.2585	5.2566	5.2518	5.2839	5.3738	5.4106
15	5.2579	5.2567	5.2539	5.2861	5.3662	5.3994	5.2590	5.2584	5.2568	5.2880
16	5.3591	5.3888	5.2606	5.2602	5.2594	5.2879	5.3455	5.3695	5.2631	5.2629
17	5.2624	5.2867	5.3313	5.3500	5.2660	5.2659	5.2657	5.2834	5.3135	5.3257
18	5.2695	5.2694	5.2693	5.2787	5.2933	5.2986	5.3205	5.3104	5.2837	5.2604
19	5.2833	5.2934	5.3027	5.2953	5.2759	5.2623	5.2942	5.3072	5.2949	5.2897
20	5.2755	5.2676	5.2994	5.3132	5.2889	5.2854	5.2755	5.2722	5.3014	5.3139
21	5.2850	5.2827	5.2763	5.2769	5.3041	5.3159	5.2822	5.2808	5.2769	5.2803
22	5.3035	5.3134	5.2824	5.2807	5.2783	5.2831	5.3019	5.3097	5.2817	5.2810
23	5.2795	5.2841	5.2978	5.3034	5.2874	5.2869	5.2854	5.2859	5.2908	5.2927
24	5.3004	5.2994	5.2955	5.2919	5.2935	5.2948	5.2961	5.2952	5.2921	5.2897
25	5.2919	5.2931	5.1985	5.1966	5.1924	5.2531	5.3574	5.4000	5.2888	5.2888
26	5.2891	5.2938	5.2972	5.2985	5.2993	3.6430	5.2656	4.9965	5.0826	5.3000
27	4.9597	5.0622	3.1461	4.7919	3.3241	6.8162	3.5539	3.3069	3.2462	3.0680
28	5.7561	7.1917	7.5884	3.5212	3.4577	3.2188	6.5505	8.2356	8.6326	3.4591
29	3.4176	3.1933	6.4016	7.9876	8.3830	5.2737	3.5052	3.2842	6.8005	8.4848
30	8.8364	3.4345	3.3891	3.1914	6.2549	7.8870	8.2342	4.7140	3.4969	3.2443
31	6.6994	8.4352	8.8310	3.4896	3.4224	3.1933	6.4016	8.0358	8.3856	3.5109
32	3.4468	3.2188	6.5505	8.1846	8.5814	3.5270	3.4630	3.2252	6.6009	8.2838
33	8.6806	3.4577	3.4048	3.0448	6.4016	7.9862	8.2356	3.4385	3.3703	3.1592
34	6.2030	7.7888	8.1350	2.9225	2.8909	2.7707	4.2641	5.2048	5.4520	0.

TIME = 1.6500

TEMPERATURES

	1	2	3	4	5	6	7	8	9	10
0	4.4965	4.4759	4.4334	5.8472	6.6022	6.8545	4.5631	4.5330	4.4583	5.9353
1	6.9900	7.2852	4.5585	4.5275	4.4529	5.9803	6.9997	7.2690	4.6014	4.5551
2	4.4770	6.1070	7.1670	7.4711	4.5321	4.5086	4.4407	6.0090	6.9656	7.2255
3	4.5667	4.5448	4.4738	6.1241	7.1296	7.4123	4.5416	4.5190	4.4578	6.0937
4	6.9918	7.2554	4.5393	4.5192	4.4600	6.1646	7.0210	7.2909	4.5217	4.5013
5	4.4381	6.2004	7.0208	7.2792	4.4356	4.4158	4.3408	6.1064	6.8336	7.0399
6	4.2782	4.2596	4.2069	5.8644	6.5079	6.7170	3.9840	3.9808	3.9800	5.2666
7	5.4425	5.5156	5.2294	5.2265	5.2194	5.3317	5.5408	5.6223	5.2297	5.2275
8	5.2225	5.3358	5.5309	5.6047	5.2329	5.2312	5.2276	5.3381	5.5183	5.5878
9	5.2357	5.2347	5.2322	5.3328	5.4840	5.5421	5.2412	5.2405	5.2388	5.3315
10	5.4631	5.5144	5.2467	5.2462	5.2450	5.3246	5.4262	5.4658	5.2538	5.2534
11	5.2524	5.3187	5.3951	5.4252	5.2609	5.2607	5.2599	5.3105	5.3635	5.3841
12	5.2679	5.2677	5.2671	5.3002	5.3306	5.3414	5.3030	5.2984	5.2874	5.2868
13	5.3058	5.3141	5.2348	5.2323	5.2264	5.3280	5.5130	5.5846	5.2359	5.2341
14	5.2300	5.3301	5.4997	5.5646	5.2391	5.2378	5.2350	5.3294	5.4798	5.5380
15	5.2429	5.2421	5.2402	5.3252	5.4508	5.4995	5.2484	5.2478	5.2465	5.3215
16	5.4248	5.4652	5.2544	5.2540	5.2531	5.3150	5.3924	5.4226	5.2613	5.2610
17	5.2603	5.3082	5.3628	5.3841	5.2685	5.2683	5.2678	5.3000	5.3337	5.3466
18	5.2762	5.2761	5.2758	5.2916	5.3065	5.3118	5.2860	5.2795	5.2626	5.2816
19	5.3633	5.3966	5.2679	5.2637	5.2535	5.2920	5.3933	5.4328	5.2642	5.2614
20	5.2546	5.2963	5.3923	5.4305	5.2630	5.2611	5.2569	5.2973	5.3806	5.4138
21	5.2636	5.2624	5.2600	5.2988	5.3710	5.4000	5.2654	5.2645	5.2634	5.2977
22	5.3545	5.3771	5.2705	5.2685	5.2678	5.2958	5.3376	5.3521	5.2732	5.2726
23	5.2722	5.2924	5.3202	5.3308	5.2802	5.2799	5.2791	5.2870	5.2984	5.3026
24	5.2914	5.2908	5.2894	5.2942	5.3059	5.3108	5.2882	5.2876	5.2864	5.2920
25	5.3016	5.3053	5.1754	5.1747	5.1831	5.3400	5.5013	5.5605	5.2884	5.2884
26	5.2891	5.2980	5.3023	5.3038	5.2992	5.1270	5.2710	4.9889	5.0937	5.3000
27	4.9523	5.0688	3.4755	4.3586	3.8895	5.7899	4.9201	4.3433	4.2014	3.7858
28	5.1840	6.2779	6.5968	4.8444	4.6949	4.1374	5.8616	7.1887	7.5128	4.6987
29	4.6010	4.0779	5.7382	6.9861	7.2754	5.2847	4.8062	4.2892	6.0999	7.4035
30	7.8019	4.6405	4.5345	4.0738	5.6506	6.8860	7.1547	7.0711	4.7871	4.1969
31	5.9850	7.3629	7.6748	4.7690	4.6128	4.0779	5.7382	7.0201	7.3223	4.8193
32	4.6694	4.1374	5.8616	7.1415	7.4651	4.8568	4.7070	4.1524	5.9016	7.2224
33	7.5460	4.6949	4.5714	3.7314	5.7382	6.9667	7.1887	4.6503	4.4909	3.9984
34	5.5737	6.8038	7.1010	3.4463	3.3713	3.0919	3.8877	4.6076	4.7980	0.

TIME = 1.8500

TEMPERATURES

	1	2	3	4	5	6	7	8	9	10
0	4.7324	4.6774	4.5307	5.6375	6.0195	6.1639	4.9593	4.8690	4.6072	5.6255
1	6.1506	6.3129	4.9551	4.8889	4.6247	5.6311	6.1457	6.3156	5.0889	4.9377
2	4.6678	5.7312	6.2633	6.4730	4.9590	4.8764	4.6352	5.6452	6.1028	6.2433
3	5.0055	4.9220	4.6547	5.7474	6.2251	6.3706	4.9779	4.8892	4.6398	5.7147
4	6.1229	6.2621	4.9711	4.8868	4.6455	5.7649	6.1405	6.2730	4.9488	4.8660
5	4.6213	5.7833	6.1323	6.2547	4.8397	4.7646	4.5197	5.6630	5.9766	6.0793
6	4.6536	4.5816	4.3813	5.4652	5.7099	5.8023	4.1611	4.1391	4.0867	5.0015
7	5.0279	5.0477	5.2240	5.2202	5.2106	5.3564	5.5377	5.6066	5.2288	5.2256
8	5.2173	5.3545	5.5136	5.5743	5.2371	5.2333	5.2260	5.3519	5.4881	5.5414
9	5.2430	5.2406	5.2346	5.3426	5.4485	5.4880	5.2522	5.2501	5.2445	5.3377
10	5.4211	5.4523	5.2607	5.2587	5.2541	5.3288	5.3876	5.4100	5.2700	5.2684
11	5.2645	5.3217	5.3609	5.3758	5.2782	5.2770	5.2739	5.3145	5.3387	5.3479
12	5.2851	5.2843	5.2820	5.3067	5.3191	5.3237	5.2978	5.2930	5.2818	5.2916
13	5.3184	5.3299	5.2307	5.2274	5.2195	5.3511	5.5110	5.5719	5.2362	5.2333
14	5.2266	5.3482	5.4858	5.5384	5.2436	5.2409	5.2352	5.3433	5.4565	5.5001
15	5.2508	5.2489	5.2441	5.3357	5.4229	5.4556	5.2595	5.2578	5.2536	5.3294
16	5.3948	5.4194	5.2679	5.2665	5.2631	5.3215	5.3662	5.3832	5.2765	5.2754
17	5.2727	5.3147	5.3430	5.3536	5.2843	5.2836	5.2817	5.3081	5.3239	5.3299
18	5.2916	5.2913	5.2902	5.3024	5.3088	5.3112	5.2610	5.2565	5.2456	5.3114
19	5.4351	5.4836	5.2476	5.2446	5.2388	5.3247	5.4593	5.5106	5.2487	5.2464
20	5.2429	5.3257	5.4456	5.4917	5.2519	5.2504	5.2483	5.3220	5.4201	5.4572
21	5.2571	5.2559	5.2549	5.3192	5.3981	5.4279	5.2631	5.2621	5.2617	5.3138
22	5.3715	5.3931	5.2718	5.2697	5.2695	5.3083	5.3473	5.3590	5.2774	5.2768
23	5.2767	5.3027	5.3268	5.3354	5.2824	5.2821	5.2819	5.2941	5.3058	5.3100
24	5.2860	5.2857	5.2868	5.3008	5.3205	5.3275	5.2832	5.2830	5.2838	5.2967
25	5.3107	5.3155	5.1753	5.1740	5.1870	5.3545	5.4744	5.5148	5.2893	5.2892
26	5.2898	5.2975	5.3002	5.3010	5.2992	6.8234	5.2619	4.9980	5.0688	5.3000
27	4.9628	5.0358	3.9579	3.6403	4.8539	4.1723	6.5891	5.6690	5.4228	4.6448
28	4.1448	4.6626	4.8615	6.4613	6.2056	5.2127	4.5968	5.3135	5.5070	6.2376
29	6.0458	5.1133	4.5203	5.1928	5.3185	5.2992	6.3861	5.4374	4.7900	5.4568
30	5.8690	6.1433	5.9485	5.0779	4.5150	5.1073	5.2435	7.4536	6.3540	5.3120
31	4.6733	5.4323	5.6033	6.3218	6.0692	5.1133	4.5203	5.2080	5.4088	6.4199
32	6.1648	5.2127	4.5968	5.2808	5.4735	6.4837	6.2286	5.2412	4.6160	5.3290
33	5.5218	6.2056	6.0118	5.1133	4.0748	5.1548	5.3135	6.1330	5.8790	4.9808
34	4.4180	5.0513	5.2563	4.1933	4.0545	3.5382	3.2525	3.6115	3.7083	0.

TIME = 2.0500

TEMPERATURES

	1	2	3	4	5	6	7	8	9	10
0	5.7092	5.5226	4.9738	5.2692	5.4493	5.5277	6.3393	6.0524	5.1514	5.2362
1	5.4825	5.5714	6.3292	6.1070	5.2085	5.2204	5.4670	5.5763	6.5373	6.2217
2	5.2902	5.2850	5.5417	5.6531	6.3785	6.1084	5.2418	5.2143	5.4280	5.5036
3	6.4790	6.1941	5.2780	5.2988	5.5087	5.5808	6.3902	6.1192	5.2624	5.2697
4	5.4388	5.5043	6.4012	6.1237	5.2926	5.2984	5.4484	5.5073	6.3761	6.1078
5	5.2925	5.2953	5.4341	5.4869	6.1743	5.9635	5.2138	5.1763	5.3048	5.3500
6	5.8977	5.6802	5.0085	5.0016	5.0900	5.1250	4.8365	4.7522	4.5292	4.6557
7	4.6401	4.6421	5.2852	5.2685	5.2286	5.3383	5.4484	5.4908	5.2921	5.2776
8	5.2389	5.3336	5.4238	5.4591	5.3036	5.2867	5.2498	5.3297	5.4010	5.4289
9	5.3054	5.2919	5.2591	5.3219	5.3728	5.3919	5.3128	5.3001	5.2690	5.3181
10	5.3545	5.3680	5.3147	5.3038	5.2775	5.3125	5.3360	5.3449	5.3175	5.3081
11	5.2859	5.3086	5.3230	5.3284	5.3169	5.3096	5.2921	5.3054	5.3137	5.3169
12	5.3122	5.3079	5.2961	5.3021	5.3064	5.3079	5.2963	5.2907	5.2775	5.2934
13	5.3235	5.3364	5.2834	5.2698	5.2367	5.3349	5.4303	5.4671	5.2905	5.2778
14	5.2466	5.3303	5.4068	5.4365	5.2982	5.2854	5.2565	5.3253	5.3836	5.4060
15	5.3020	5.2914	5.2657	5.3191	5.3605	5.3759	5.3072	5.2977	5.2746	5.3148
16	5.3433	5.3539	5.3095	5.3015	5.2825	5.3101	5.3281	5.3348	5.3108	5.3046
17	5.2896	5.3068	5.3174	5.3213	5.3096	5.3054	5.2949	5.3042	5.3098	5.3119
18	5.3063	5.3044	5.2991	5.3025	5.3048	5.3057	5.2575	5.2518	5.2394	5.3265
19	5.4463	5.4923	5.2551	5.2498	5.2389	5.3340	5.4467	5.4892	5.2608	5.2555
20	5.2461	5.3316	5.4254	5.4606	5.2660	5.2619	5.2542	5.3256	5.3979	5.4243
21	5.2732	5.2696	5.2629	5.3209	5.3748	5.3945	5.2798	5.2767	5.2713	5.3148
22	5.3518	5.3650	5.2870	5.2839	5.2796	5.3095	5.3331	5.3397	5.2913	5.2895
23	5.2865	5.3052	5.3195	5.3243	5.2899	5.2893	5.2883	5.2990	5.3078	5.3108
24	5.2865	5.2860	5.2881	5.3052	5.3244	5.3303	5.2834	5.2831	5.2846	5.2992
25	5.3125	5.3168	5.2396	5.2271	5.2107	5.3108	5.3783	5.3992	5.2927	5.2923
26	5.2916	5.2949	5.2961	5.2964	5.2991	8.4856	5.2594	5.0335	5.0381	5.3000
27	5.0059	5.0017	4.6442	3.3109	6.4644	3.6069	8.4380	7.2513	6.8810	5.5621
28	3.4270	3.7092	3.8251	8.2519	7.8798	6.3164	3.6782	4.0763	4.1838	8.0063
29	7.6472	6.1761	3.6357	4.0094	4.0789	5.3029	8.1179	6.5629	3.7852	4.1558
30	4.3850	7.8670	7.5462	6.0503	3.6326	3.9619	4.0375	6.2361	8.0713	6.4566
31	3.7207	4.1421	4.2371	8.0247	7.6896	6.1761	3.6357	4.0176	4.1294	8.2009
32	7.8291	6.3164	3.6782	4.0582	4.1651	8.2939	7.9220	6.3638	3.6888	4.0850
33	4.1920	7.8798	7.6391	6.1761	3.3882	3.9882	4.0763	7.7826	7.4543	5.9892
34	3.5788	3.9307	4.0445	5.2286	5.0010	4.1358	2.9313	3.1311	3.1845	0.

TIME = 2.2500

TEMPERATURES

	1	2	3	4	5	6	7	8	9	10
0	6.8399	6.5417	5.6337	4.9375	5.0190	5.0616	7.5334	7.1526	5.8193	4.9067
1	5.0144	5.0618	7.5136	7.1884	5.8906	4.8831	4.9920	5.0614	7.7183	7.3660
2	6.0135	4.9244	5.0415	5.0939	7.5188	7.1765	5.9280	4.8634	4.9567	4.9937
3	7.7061	7.3318	6.0232	4.9345	5.0167	5.0490	7.5377	7.1979	5.9998	4.9086
4	4.9650	4.9911	7.5848	7.2255	6.0665	4.9244	4.9713	4.9929	7.5719	7.2242
5	6.0972	4.9127	4.9552	4.9738	7.2993	7.0305	6.0106	4.8123	4.8462	4.8608
6	6.9608	6.6768	5.7633	4.6408	4.6600	4.6690	5.5408	5.4280	5.1335	4.3672
7	4.3356	4.3302	5.4883	5.4292	5.2866	5.3049	5.3631	5.3857	5.4879	5.4349
8	5.2978	5.3014	5.3459	5.3636	5.4908	5.4383	5.3072	5.2996	5.3326	5.3453
9	5.4720	5.4257	5.3115	5.2958	5.3179	5.3262	5.4664	5.4228	5.3177	5.2957
10	5.3103	5.3157	5.4404	5.4053	5.3197	5.2947	5.3035	5.3068	5.4206	5.3914
11	5.3218	5.2954	5.3005	5.3024	5.3945	5.3730	5.3206	5.2969	5.2997	5.3008
12	5.3609	5.3492	5.3164	5.2985	5.2999	5.3004	5.3077	5.2987	5.2775	5.2922
13	5.3237	5.3372	5.4626	5.4125	5.2894	5.3050	5.3548	5.3742	5.4611	5.4150
14	5.2986	5.3021	5.3395	5.3541	5.4561	5.4127	5.3057	5.2999	5.3267	5.3369
15	5.4416	5.4034	5.3103	5.2976	5.3155	5.3221	5.4287	5.3952	5.3144	5.2972
16	5.3087	5.3130	5.4066	5.3802	5.3159	5.2970	5.3039	5.3064	5.3852	5.3650
17	5.3163	5.2981	5.3020	5.3034	5.3596	5.3467	5.3144	5.3001	5.3021	5.3028
18	5.3319	5.3264	5.3110	5.3030	5.3039	5.3042	5.3104	5.2928	5.2525	5.3223
19	5.4147	5.4497	5.3312	5.3108	5.2619	5.3219	5.3967	5.4246	5.3380	5.3175
20	5.2708	5.3184	5.3767	5.3980	5.3373	5.3194	5.2783	5.3134	5.3560	5.3711
21	5.3389	5.3228	5.2861	5.3099	5.3397	5.3503	5.3353	5.3222	5.2922	5.3062
22	5.3256	5.3323	5.3295	5.3204	5.2972	5.3038	5.3159	5.3196	5.3231	5.3163
23	5.3000	5.3024	5.3100	5.3126	5.3046	5.3021	5.2961	5.3003	5.3062	5.3082
24	5.2967	5.2946	5.2927	5.3050	5.3190	5.3228	5.2927	5.2911	5.2890	5.2988
25	5.3089	5.3121	5.4399	5.3936	5.2846	5.2636	5.2946	5.3046	5.3009	5.2995
26	5.2961	5.2928	5.2930	5.2931	5.2990	8.8346	5.2697	5.0821	5.0152	5.3000
27	5.0590	4.9764	4.7902	2.9815	6.8136	3.0415	8.8291	7.5855	7.1890	5.7544
28	2.7092	2.7559	2.7887	8.6307	8.2339	6.5503	2.7596	2.8391	2.8606	8.3812
29	7.9859	6.4014	2.7511	2.8260	2.8393	5.3078	8.4815	6.7992	2.7804	2.8548
30	2.9010	8.2324	7.8867	6.2529	2.7502	2.8165	2.8315	0.0206	8.4319	6.6992
31	2.7681	2.8519	2.8709	8.3823	8.0369	6.4014	2.7511	2.8272	2.8500	8.5826
32	8.1857	6.5503	2.7596	2.8356	2.8567	8.6819	8.2850	6.5987	2.7616	2.8410
33	2.8622	8.2339	7.9859	6.4014	2.7016	2.8216	2.8391	8.1361	7.7858	6.2029
34	2.7396	2.8101	2.8327	5.4511	5.2031	4.2631	2.6101	2.6507	2.6607	0.

TIME = 2.4500

TEMPERATURES

	1	2	3	4	5	6	7	8	9	10
0	6.8868	6.6395	5.9054	4.6755	4.7096	4.7332	7.3039	7.0139	5.9864	4.6565
1	4.7003	4.7261	7.2836	7.0177	6.0253	4.6329	4.6762	4.7207	7.4844	7.1834
2	6.1519	4.6614	4.7123	4.7380	7.2373	6.9841	6.0494	4.6079	4.6449	4.6618
3	7.4245	7.1464	6.1708	4.6674	4.6947	4.7077	7.2662	7.0139	6.1381	4.6445
4	4.6545	4.6629	7.3099	7.0454	6.2086	4.6530	4.6595	4.6649	7.2996	7.0460
5	6.2419	4.6374	4.6437	4.6481	7.0560	6.8556	6.1458	4.5462	4.5473	4.5497
6	6.7370	6.5273	5.9000	4.3803	4.3757	4.3755	5.5354	5.4639	5.2953	4.1446
7	4.1110	4.1036	5.6658	5.5798	5.3586	5.2735	5.3025	5.3139	5.6463	5.5691
8	5.3651	5.2734	5.2940	5.3025	5.6276	5.5558	5.3695	5.2756	5.2901	5.2957
9	5.5799	5.5208	5.3656	5.2773	5.2864	5.2899	5.5514	5.4996	5.3660	5.2823
10	5.2878	5.2899	5.5022	5.4628	5.3602	5.2870	5.2900	5.2912	5.4621	5.4321
11	5.3554	5.2935	5.2951	5.2958	5.4216	5.4012	5.3481	5.3004	5.3013	5.3017
12	5.3796	5.3690	5.3387	5.3073	5.3077	5.3079	5.3299	5.3158	5.2827	5.2890
13	5.3209	5.3346	5.6263	5.5509	5.3557	5.2776	5.3022	5.3119	5.6048	5.5371
14	5.3601	5.2784	5.2957	5.3025	5.5766	5.5167	5.3612	5.2808	5.2924	5.2969
15	5.5367	5.4872	5.3586	5.2838	5.2910	5.2938	5.5019	5.4612	5.3563	5.2886
16	5.2929	5.2946	5.4592	5.4290	5.3508	5.2939	5.2963	5.2973	5.4211	5.3999
17	5.3451	5.3005	5.3018	5.3023	5.3844	5.3716	5.3379	5.3077	5.3083	5.3086
18	5.3505	5.3453	5.3305	5.3156	5.3159	5.3160	5.4269	5.3866	5.2886	5.3068
19	5.3696	5.3933	5.4687	5.4233	5.3082	5.3015	5.3450	5.3614	5.4658	5.4229
20	5.3158	5.2996	5.3312	5.3428	5.4469	5.4104	5.3191	5.2980	5.3197	5.3275
21	5.4319	5.4006	5.3228	5.2981	5.3122	5.3173	5.4075	5.3836	5.3232	5.2985
22	5.3071	5.3103	5.3798	5.3659	5.3222	5.3005	5.3057	5.3079	5.3589	5.3482
23	5.3194	5.3032	5.3066	5.3079	5.3247	5.3202	5.3084	5.3038	5.3073	5.3085
24	5.3198	5.3142	5.3020	5.3031	5.3109	5.3131	5.3109	5.3069	5.2976	5.2975
25	5.3037	5.3057	5.5849	5.5249	5.3659	5.2315	5.2349	5.2389	5.3058	5.3043
26	5.3001	5.2920	5.2914	5.2914	5.2990	7.7934	5.2736	5.1043	5.0026	5.3000
27	5.0768	4.9616	4.3507	2.9000	5.7780	2.9000	7.6658	6.5832	6.2653	5.1757
28	2.5300	2.5300	2.5300	7.5041	7.1806	5.8607	2.5300	2.5300	2.5300	7.2669
29	6.9784	5.7373	2.5300	2.5300	2.5300	5.3251	7.3880	6.0942	2.5300	2.5300
30	2.5300	7.1465	6.8847	5.6414	2.5300	2.5300	2.5300	0.	7.3476	5.9840
31	2.5300	2.5300	2.5300	7.3071	7.0253	5.7373	2.5300	2.5300	2.5300	7.4708
32	7.1468	5.8607	2.5300	2.5300	2.5300	7.5518	7.2278	5.8913	2.5300	2.5300
33	2.5300	7.1806	6.9654	5.7373	2.5300	2.5300	2.5300	7.1063	6.7900	5.5728
34	2.5300	2.5300	2.5300	4.7935	4.5999	3.8828	2.5300	2.5300	2.5300	0.

TIME = 2.6500

TEMPERATURES

	1	2	3	4	5	6	7	8	9	10
0	5.8445	5.7382	5.4757	4.4898	4.5040	4.5185	5.8404	5.7339	5.4065	4.4838
1	4.5023	4.5178	5.8543	5.7132	5.3922	4.4654	4.4825	4.5129	5.9215	5.8118
2	5.4747	4.4881	4.5119	4.5264	5.7607	5.6717	5.3874	4.4417	4.4569	4.4649
3	5.8689	5.7799	5.5061	4.4920	4.5006	4.5057	5.7654	5.6886	5.4732	4.4721
4	4.4688	4.4708	5.7794	5.7078	5.5184	4.4768	4.4731	4.4733	5.7624	5.6992
5	5.5343	4.4589	4.4576	4.4580	5.6032	5.5537	5.4307	4.3722	4.3688	4.3684
6	5.3407	5.3044	5.2191	4.2110	4.2030	4.2010	4.8080	4.8099	4.8432	3.9964
7	3.9668	3.9600	5.6122	5.5479	5.3780	5.2533	5.2673	5.2730	5.5805	5.5242
8	5.3776	5.2580	5.2672	5.2713	5.5454	5.4992	5.3763	5.2653	5.2713	5.2738
9	5.4968	5.4622	5.3686	5.2726	5.2761	5.2776	5.4622	5.4360	5.3655	5.2824
10	5.2842	5.2851	5.4235	5.4058	5.3581	5.2917	5.2925	5.2930	5.3930	5.3820
11	5.3523	5.3021	5.3025	5.3027	5.3698	5.3635	5.3469	5.3118	5.3121	5.3122
12	5.3515	5.3487	5.3413	5.3205	5.3206	5.3207	5.3439	5.3271	5.2874	5.2843
13	5.3162	5.3299	5.5822	5.5252	5.3751	5.2616	5.2733	5.2781	5.5491	5.5008
14	5.3738	5.2672	5.2747	5.2780	5.5111	5.4728	5.3703	5.2745	5.2793	5.2813
15	5.4697	5.4412	5.3642	5.2826	5.2853	5.2865	5.4356	5.4150	5.3595	5.2919
16	5.2934	5.2941	5.4028	5.3894	5.3531	5.3013	5.3020	5.3023	5.3772	5.3693
17	5.3477	5.3110	5.3113	5.3115	5.3583	5.3541	5.3430	5.3202	5.3204	5.3205
18	5.3450	5.3435	5.3394	5.3291	5.3292	5.3293	5.5127	5.4604	5.3280	5.2892
19	5.3285	5.3436	5.5408	5.4877	5.3491	5.2840	5.3067	5.3157	5.5208	5.4743
20	5.3526	5.2858	5.3006	5.3066	5.4860	5.4489	5.3504	5.2888	5.2980	5.3019
21	5.4564	5.4270	5.3491	5.2936	5.2987	5.3011	5.4215	5.4008	5.3446	5.2987
22	5.3012	5.3027	5.3860	5.3765	5.3392	5.3048	5.3061	5.3071	5.3641	5.3564
23	5.3338	5.3109	5.3118	5.3123	5.3368	5.3327	5.3216	5.3118	5.3135	5.3141
24	5.3402	5.3331	5.3133	5.3029	5.3053	5.3064	5.3246	5.3197	5.3066	5.2976
25	5.2999	5.3010	5.4921	5.4576	5.3555	5.2092	5.1964	5.1969	5.3009	5.3003
26	5.2983	5.2916	5.2908	5.2907	5.2990	2.5300	5.2563	5.0668	4.9987	5.3000
27	5.0274	4.9558	2.9000	2.9000	2.9000	2.9000	2.5300	2.5300	2.5300	2.5300
28	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
29	2.5300	2.5300	2.5300	2.5300	2.5300	5.3385	2.5300	2.5300	2.5300	2.5300
30	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	0.	2.5300	2.5300
31	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
32	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
33	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
34	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	0.

TIME = 2.8500

TEMPERATURES

	1	2	3	4	5	6	7	8	9	10
0	5.1724	5.1242	5.0300	4.3579	4.3632	4.3731	5.1517	5.0998	4.9822	4.3618
1	4.3698	4.3800	5.1437	5.0661	4.9497	4.3498	4.3561	4.3791	5.1702	5.1197
2	4.9948	4.3711	4.3836	4.3927	5.0621	5.0251	4.9284	4.3303	4.3370	4.3411
3	5.1264	5.0942	5.0138	4.3753	4.3775	4.3795	5.0594	5.0356	4.9881	4.3574
4	4.3511	4.3510	5.0640	5.0455	5.0108	4.3600	4.3550	4.3537	5.0469	5.0328
5	5.0067	4.3406	4.3392	4.3388	4.9265	4.9180	4.9071	4.2563	4.2540	4.2534
6	4.7253	4.7217	4.7199	4.0978	4.0906	4.0885	4.3795	4.3885	4.4318	3.8966
7	3.8705	3.8644	5.4700	5.4360	5.3473	5.2447	5.2512	5.2541	5.4411	5.4141
8	5.3445	5.2533	5.2570	5.2590	5.4144	5.3948	5.3425	5.2637	5.2659	5.2670
9	5.3853	5.3724	5.3373	5.2737	5.2748	5.2754	5.3670	5.3586	5.3360	5.2849
10	5.2853	5.2856	5.3507	5.3459	5.3329	5.2946	5.2946	5.2948	5.3405	5.3381
11	5.3313	5.3041	5.3041	5.3042	5.3347	5.3335	5.3302	5.3121	5.3122	5.3122
12	5.3307	5.3302	5.3289	5.3185	5.3186	5.3185	5.3466	5.3291	5.2876	5.2788
13	5.3103	5.3239	5.4521	5.4230	5.3468	5.2556	5.2610	5.2634	5.4251	5.4028
14	5.3443	5.2646	5.2676	5.2691	5.3995	5.3838	5.3414	5.2746	5.2763	5.2772
15	5.3761	5.3658	5.3378	5.2846	5.2853	5.2858	5.3598	5.3533	5.3358	5.2946
16	5.2949	5.2951	5.3469	5.3433	5.3334	5.3037	5.3037	5.3038	5.3388	5.3370
17	5.3319	5.3120	5.3120	5.3121	5.3343	5.3334	5.3310	5.3192	5.3192	5.3192
18	5.3317	5.3314	5.3306	5.3253	5.3253	5.3253	5.5040	5.4592	5.3426	5.2757
19	5.2987	5.3081	5.4969	5.4580	5.3542	5.2740	5.2843	5.2892	5.4690	5.4380
20	5.3537	5.2797	5.2853	5.2883	5.4360	5.4130	5.3495	5.2866	5.2894	5.2912
21	5.4086	5.3921	5.3462	5.2947	5.2954	5.2964	5.3823	5.3718	5.3415	5.3023
22	5.3021	5.3027	5.3592	5.3553	5.3368	5.3098	5.3093	5.3094	5.3474	5.3440
23	5.3330	5.3160	5.3157	5.3157	5.3361	5.3336	5.3263	5.3172	5.3176	5.3179
24	5.3415	5.3362	5.3185	5.3040	5.3030	5.3033	5.3258	5.3219	5.3104	5.2985
25	5.2981	5.2985	5.3522	5.3375	5.2879	5.1879	5.1718	5.1707	5.2954	5.2952
26	5.2944	5.2905	5.2899	5.2898	5.2990	2.5300	5.2357	5.0308	4.9935	5.3000
27	4.9896	4.9505	2.9000	2.9000	2.9000	2.9000	2.5300	2.5300	2.5300	2.5300
28	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
29	2.5300	2.5300	2.5300	2.5300	2.5300	5.3313	2.5300	2.5300	2.5300	2.5300
30	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	0.	2.5300	2.5300
31	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
32	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
33	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300
34	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	2.5300	0.

TIME = 3.0500

TEMPERATURES

	1	2	3	4	5	6	7	8	9	10
0	4.7974	4.7714	4.7328	4.6866	5.1176	5.2627	4.7878	4.7593	4.7103	4.8718
1	5.6280	5.8772	4.7763	4.7287	4.6816	4.9077	5.6597	5.8319	4.7902	4.7636
2	4.7100	4.9599	5.7370	6.0063	4.7086	4.6916	4.6541	4.9193	5.6600	5.8895
3	4.7560	4.7435	4.7181	4.9425	5.7205	5.9669	4.7080	4.7009	4.6954	4.9321
4	5.6757	5.9037	4.7106	4.7068	4.7062	4.9502	5.6797	5.9236	4.6942	4.6919
5	4.6921	4.9387	5.6653	5.9039	4.5929	4.5926	4.5981	4.8645	5.5395	5.7225
6	4.4161	4.4175	4.4254	4.6717	5.2909	5.4958	4.1368	4.1450	4.1813	4.2418
7	4.4573	4.5380	5.3678	5.3517	5.3101	5.2479	5.2661	5.2738	5.3503	5.3385
8	5.3086	5.2579	5.2745	5.2800	5.3370	5.3293	5.3085	5.2683	5.2838	5.2909
9	5.3241	5.3194	5.3067	5.2772	5.2914	5.2970	5.3179	5.3152	5.3077	5.2861
10	5.3000	5.3056	5.3128	5.3113	5.3074	5.2933	5.3058	5.3106	5.3105	5.3098
11	5.3079	5.2998	5.3112	5.3158	5.3097	5.3093	5.3084	5.3045	5.3141	5.3180
12	5.3090	5.3088	5.3085	5.3074	5.3144	5.3167	5.3449	5.3271	5.2852	5.2734
13	5.3052	5.3189	5.3614	5.3478	5.3126	5.2575	5.2713	5.2769	5.3460	5.3364
14	5.3116	5.2670	5.2793	5.2840	5.3338	5.3277	5.3110	5.2764	5.2877	5.2926
15	5.3240	5.3203	5.3102	5.2848	5.2952	5.2993	5.3184	5.3163	5.3105	5.2925
16	5.3023	5.3062	5.3145	5.3134	5.3103	5.2989	5.3075	5.3109	5.3127	5.3122
17	5.3106	5.3042	5.3115	5.3144	5.3120	5.3118	5.3110	5.3080	5.3135	5.3156
18	5.3119	5.3118	5.3115	5.3106	5.3136	5.3146	5.4489	5.4175	5.3344	5.2672
19	5.2814	5.2878	5.4213	5.3982	5.3359	5.2692	5.2750	5.2782	5.3977	5.3811
20	5.3342	5.2770	5.2802	5.2824	5.3757	5.3642	5.3311	5.2853	5.2871	5.2886
21	5.3587	5.3511	5.3289	5.2938	5.2947	5.2958	5.3445	5.3400	5.3261	5.3011
22	5.3017	5.3024	5.3338	5.3321	5.3237	5.3073	5.3078	5.3080	5.3287	5.3272
23	5.3218	5.3116	5.3121	5.3125	5.3271	5.3256	5.3210	5.3143	5.3144	5.3147
24	5.3310	5.3281	5.3161	5.3036	5.3015	5.3015	5.3198	5.3172	5.3087	5.2982
25	5.2967	5.2968	5.2634	5.2568	5.2318	5.1818	5.1862	5.1917	5.2918	5.2917
26	5.2914	5.2901	5.2905	5.2907	5.2988	2.5300	5.2287	5.0057	5.0227	5.3000
27	4.9648	4.9932	2.9000	4.6391	2.9000	6.4567	2.5300	2.5300	2.5300	2.5300
28	5.5569	6.8731	7.2427	2.5300	2.5300	2.5300	6.3158	7.8747	8.2465	2.5300
29	2.5300	2.5300	6.1756	7.6423	8.0010	5.3125	2.5300	2.5300	6.5593	8.1082
30	8.4803	2.5300	2.5300	2.5300	6.0446	7.5454	7.8619	0.	2.5300	2.5300
31	6.4560	8.0617	8.4324	2.5300	2.5300	2.5300	6.1756	7.6929	8.0152	2.5300
32	2.5300	2.5300	6.3158	7.8324	8.2045	2.5300	2.5300	2.5300	6.3574	7.9254
33	8.2975	2.5300	2.5300	2.5300	6.1756	7.6382	7.8747	2.5300	2.5300	2.5300
34	5.9886	7.4456	7.7859	2.5300	2.5300	2.5300	4.1327	4.9962	5.2258	0.

TIME = 3.2500

TEMPERATURES

	1	2	3	4	5	6	7	8	9	10
0	4.5788	4.5619	4.5409	5.4585	6.3770	6.6779	4.5859	4.5670	4.5380	5.6704
1	7.0355	7.4269	4.5768	4.5446	4.5178	5.7499	7.0845	7.4134	4.5901	4.5712
2	4.5394	5.8629	7.2540	7.6175	4.5238	4.5138	4.4918	5.7868	7.0771	7.4320
3	4.5622	4.5555	4.5407	5.8676	7.2217	7.6095	4.5263	4.5225	4.5203	5.8504
4	7.0963	7.4493	4.5271	4.5255	4.5245	5.9132	7.1209	7.4938	4.5105	4.5088
5	4.5053	5.9406	7.1164	7.4781	4.4194	4.4183	4.4139	5.8590	6.9250	7.2061
6	4.2547	4.2543	4.2540	5.6141	6.5662	6.8609	4.0022	4.0075	4.0325	5.0014
7	5.3172	5.4363	5.3036	5.2959	5.2762	5.2888	5.4059	5.4549	5.2948	5.2895
8	5.2763	5.2988	5.4130	5.4567	5.2901	5.2869	5.2782	5.3070	5.4177	5.4624
9	5.2857	5.2838	5.2788	5.3105	5.4089	5.4492	5.2854	5.2844	5.2815	5.3152
10	5.4075	5.4463	5.2853	5.2848	5.2834	5.3164	5.3933	5.4250	5.2870	5.2868
11	5.2860	5.3174	5.3812	5.4084	5.2894	5.2893	5.2889	5.3154	5.3643	5.3847
12	5.2919	5.2918	5.2916	5.3109	5.3420	5.3533	5.3408	5.3230	5.2811	5.2720
13	5.3099	5.3262	5.3039	5.2974	5.2808	5.2923	5.3928	5.4338	5.2966	5.2923
14	5.2814	5.3004	5.3966	5.4346	5.2923	5.2898	5.2828	5.3063	5.3963	5.4331
15	5.2896	5.2882	5.2841	5.3099	5.3898	5.4230	5.2894	5.2886	5.2863	5.3128
16	5.3836	5.4133	5.2900	5.2896	5.2884	5.3134	5.3709	5.3948	5.2918	5.2916
17	5.2909	5.3128	5.3573	5.3759	5.2944	5.2942	5.2939	5.3101	5.3401	5.3523
18	5.2975	5.2975	5.2973	5.3060	5.3205	5.3258	5.3887	5.3686	5.3147	5.2710
19	5.3027	5.3165	5.3566	5.3441	5.3100	5.2785	5.3131	5.3273	5.3408	5.3326
20	5.3088	5.2865	5.3194	5.3338	5.3289	5.3235	5.3075	5.2933	5.3228	5.3356
21	5.3206	5.3172	5.3071	5.2997	5.3268	5.3387	5.3144	5.3125	5.3064	5.3043
22	5.3272	5.3370	5.3112	5.3100	5.3062	5.3073	5.3258	5.3325	5.3097	5.3089
23	5.3062	5.3083	5.3217	5.3272	5.3138	5.3129	5.3100	5.3086	5.3134	5.3154
24	5.3179	5.3164	5.3093	5.3023	5.3034	5.3046	5.3107	5.3091	5.3034	5.2979
25	5.2995	5.3008	5.2102	5.2071	5.1979	5.2440	5.3438	5.3857	5.2895	5.2895
26	5.2896	5.2938	5.2971	5.2984	5.2986	3.6430	5.2391	4.9913	5.0735	5.3000
27	4.9517	5.0501	3.1461	4.7919	3.3241	6.8162	3.5539	3.3069	3.2462	3.0680
28	5.7561	7.1917	7.5884	3.5212	3.4577	3.2188	6.5505	8.2356	8.6326	3.4591
29	3.4176	3.1933	6.4016	7.9876	8.3830	5.3016	3.5052	3.2842	6.8005	8.4848
30	8.8364	3.4345	3.3891	3.1914	6.2549	7.8870	8.2342	4.7140	3.4969	3.2443
31	6.6994	8.4352	8.8310	3.4896	3.4224	3.1933	6.4016	8.0358	8.3856	3.5109
32	3.4468	3.2188	6.5505	8.1846	8.5814	3.5270	3.4630	3.2252	6.6009	8.2838
33	8.6806	3.4577	3.4048	3.0448	6.4016	7.9862	8.2356	3.4385	3.3703	3.1592
34	6.2030	7.7888	8.1350	2.9225	2.8909	2.7707	4.2641	5.2048	5.4520	0.

CONGRATULATIONS-ANOTHER SUCCESSFUL RUN