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Report 6

MTRAC—A COMPUTER PROGRAM FOR ANALYSIS OF CIRCUITS INCLUDING MAGNETIC CORES

Volume II

Input Data and Program Listing

By: D. NITZAN and J. R. HERNDON

Prepared for:

**JET PROPULSION LABORATORY
4800 OAK GROVE DRIVE
PASADENA, CALIFORNIA 91103**

CONTRACT 951840 UNDER NAS7-100

**(Extension of work under Contracts 950095 under
NASw-6 and 950943 and 951383 under NAS7-100)**

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VOL. II - T-70-10033

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SRI Project 6408

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I MTRAC INPUT DATA

Instructions for the order and contents of MTRAC input-data cards are given as follows. The standard input-data cards are listed in Sec. I-A. In Sec. I-B are listed the cards for parameter deviations in a worst-case analysis.

A. MTRAC INPUT-DATA CARDS

Card 00000

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	A6,6X	CAT	Name (up to 6 characters) of circuit or circuit mode.	CKT51A
13-24	I12	LIMITT	Time limit (in seconds): 20 seconds before LIMITT is reached, results are plotted (if NPLTWT $\geq$ 1), continued-run cards are punched, and the run terminates.	120
25-36	I12	KONT	1 - continued run; 0 - otherwise.	1
37-48	F12.0	DMAX	Maximum deviation (in percent) of parameter values. If DMAX $>$ 0, then deviation signs must follow cards of variable sources and each circuit-element type.	5
49-60				
61-72				
73-80				00000

Card 00001: MONITOR WRITE specifications for debugging purposes.
 1 - WRITE statements to be executed in the corresponding subprogram(s) if $NDTMIN < NDELT \leq NDTMAX$;
 0 (or blank) - otherwise.
 Commas may be replaced by blanks.

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	6(A1,1X)	EMVALU(I) I=1,6	(1) Main program and RWRUNC, (2) AUX(K), (3) ELEM, (4) SEQSQL, (5) IVS, (6) RES,	1, 1, 1, 1, 1, 1,
13-24	6(A1,1X)	EMVALU(I) I=7,12	(7) CAP, (8) IND, (9) ZEN, (10) DIOD, (11) TRAN, (12) CORE.	1, 1, 1, 1, 1, 1,
25-36	I12	NDTMIN	Index number of Δt before beginning the MONITOR printout.	1
37-48	I12	NDTMAX	Index number of Δt before ending the MONITOR printout.	10
49-60				
61-72				
73-80				00001

Card 00002

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NSVVAR	1 - save the final values of the previous mode for initial values; 0 - otherwise. If NG = -1, NSVVAR = 1 is forbidden.	1
13-24	I12	NSVPHI	1 - save the final magnetic-core Ø values of the previous mode for initial values; 0 - otherwise.	1
25-36	I12	NSVIL	1 - save the inductor-current values of the previous mode for initial values; 0 - otherwise.	1
37-48				
49-60				
61-72				
73-80				00002

Card 00003

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	ITRTST	Number of iterations below which Δt is multiplied by 2 (if not exceeding the value specified in Cards 01200-01230) and above which Δt is divided by 2. If blank, then $ITRTST = 10 + KNL$, where KNL = number of nonlinear elements (diodes, transistor junctions, and core windings).	8
13-24	I12	MAXMIN	Initial (lowest) maximum number of iterations above which the variable values are reset and Δt is divided by 4. If blank, then $MAXMIN = 2(10+KNL)$.	20
25-36	I12	KFMAX	Maximum number of trials before $ITRMAX$ is changed (doubled for $KFMAX$ successive convergence failures; halved for $KFMAX$ successive convergence successes with less than $ITRTST$ iterations). If blank, then $KFMAX = 3$.	3
37-48	E12.8	RELER	Relative voltage error in the solution of initial conditions. If blank, then $RELER = 10^{-6}$.	1.0
49-60	E12.8	ABSER	Absolute voltage error in the solution of initial conditions. If blank, then $ABSER = 10^{-6}$ volt.	1.0
61-72	I12	N3B	Solution of initial conditions: -1 - no transient solution; 0 - if no convergence, terminate mode run; 1 - if no convergence, print errors and proceed with the transient solution.	1
73-80				00013

Card 01000

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NV	Number of unknown nodal voltages.	15
13-24	I12	NAUX	Number of auxiliary unknowns. (max. NV + NAUX = 70).	23
25-36	I12	NG	Initial conditions: - 1 - calculate; 0 - zero; 1 - read in.	1
37-48	I12	ND	Number of variable sources and grounded dc voltage sources (max.18).	2
49-60	I12	NB	Ratio of computed points to plotted points (NB ≥ 1).	1
61-72	I12	NBB	Ratio of plotted points to printed points (NBB ≥ 1).	1
73-80				01000

Card 01010

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NPLTVT	Number of variables to be plotted (max.10).	5
13-24	I12	N1B	1 - plot phase planes (V vs. V) of the variables that are plotted vs. time; 0 - otherwise.	
25-36	I12	NPLTVV	Number of variable-vs.-variable plots (max. 10).	1
37-48				
49-60				
61-72				
73-80				01010

Card 01011

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	KPLOT	1 - plot at the end of mode; 0 - otherwise. (To plot variables in succeeding modes, let KPLOT = 1 for the last mode only.)	1
13-24	I12	KPRPLT	1 - print-plot at the end of mode; 0 - otherwise. (To plot variables in succeeding modes, let KPRPLT = 1 for the last mode only.) If KPRPLT = 0 and NPLT > 0, then KPRPLT is set to 1 if the number of plot points exceeds IPX or if the run is about to be terminated due to either a run-time limit ($t > \text{LIMITT}-20$ seconds, Card 00000) or a failure to converge.	1
25-36	F12.0	SCALE	Plot scales; 1 - specified by the user; 0 - determined by the program on the basis of extreme values. (Scales for print-plots are determined by the program only.)	1
37-48	I12	IPX	Number of plotted points per frame (max, 350).	350
49-60	11X,A1	PRSYMB	A symbol to be used in print-plots (if blank, then *).	*
61-72	I12	KPFIT	Scales and frame boundaries of V-vs.-t print-plots (and plots if SCALE=0) if the number of plot points exceeds IPX; 0 - independent (among frames); 1 - X scale and boundaries independent; Y scale and boundaries fixed by first frame; 2 - X boundaries independent; X scale, Y scale, and Y boundaries fixed by first frame; 3 - fixed by first frame. Scales and boundaries for V-vs.-V and V-vs.-V plots are independent if KPFIT = 0, but fixed by first frame if KPFIT = 1, 2, or 3.	
73-80				01011

Cards 01020 and 01021 (0 to 2 cards): NPLTVT (max.10) variables to be plotted vs. time. Omit cards with no data (i.e., omit card 01021 if NPLTVT ≤ 0; omit both cards if NPLTVT ≤ 0, Card 01010).

Variables to be plotted vs. each other must be included in these cards. If any of these variables should not be plotted vs. time, add a minus sign to the left of its index number.

Card 01020

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	A6, I6	AAAA(1),NPP(1)	Name and index number of the 1st variable.	IAIPIA 18
13-24	A6, I6	AAAA(2),NPP(2)	Name and index number of the 2nd variable.	MMF 1 -25
25-36	A6, I6	AAAA(3),NPP(3)	Name and index number of the 3rd variable.	PHI 1 26
37-48	A6, I6	AAAA(4),NPP(4)	Name and index number of the 4th variable.	PHDQI 27
49-60	A6, I6	AAAA(5),NPP(5)	Name and index number of the 5th variable.	PHDTI 30
61-72	A6, I6	AAAA(6),NPP(6)	Name and index number of the 6th variable.	
73-80				01020

Card 01021

1-12	A6, I6	AAAA(7),NPP(7)	Name and index number of the 7th variable.	
13-24	A6, I6	AAAA(8),NPP(8)	Name and index number of the 8th variable.	
25-36	A6, I6	AAAA(9),NPP(9)	Name and index number of the 9th variable.	
37-48	A6, I6	AAAA(10),NPP(10)	Name and index number of the 10th variable.	
49-60				
61-72				
73-80				01021

Cards 01030-01033 (0 to 4 cards): NPLTVV (max.10) plots of Variable V_y vs. Variable V_x . Both variables must be listed in Cards 01020-01021. Omit cards with no data. Omit cards if NPLTVT $\leq$ 0 (Card 01010).

Card 01030

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NP1(1,1)	V_x index number of 1st plot.	
13-24	I12	NP1(1,2)	V_y index number of 1st plot.	
25-36	I12	NP1(2,1)	V_x index number of 2nd plot.	
37-48	I12	NP1(2,2)	V_y index number of 2nd plot.	
49-60	I12	NP1(3,1)	V_x index number of 3rd plot.	
61-72	I12	NP1(3,2)	V_y index number of 3rd plot.	
73-80				01030

Card 01031

1-12	I12	NP1(4,1)	V_x index number of 4th plot.	
13-24	I12	NP1(4,2)	V_y index number of 4th plot.	
25-36	I12	NP1(5,1)	V_x index number of 5th plot.	
37-48	I12	NP1(5,2)	V_y index number of 5th plot.	
49-60	I12	NP1(6,1)	V_x index number of 6th plot.	
61-72	I12	NP1(6,2)	V_y index number of 6th plot.	
73-80				01031

etc.

Cards 01040-01099 (0 to 60 cards): User's specifications for plot units, scales, and frames. Number of cards is twice the total number of plots, i.e., 2[NPLTWT(1+N1B) + NPLTWT]. Omit cards with no data. Omit all cards if SCALE = 0 (Card 01011) or if NPLTWT=0 (Card 01010). Plot No. (Columns 61-72) is not read in and may be deleted.

Card 01040

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	A6,6X	Q1	Name of X variable.	TIME
13-24	2R6	XUNIT(J,1)J=1,2	Units of X variable.	MICROSECONDS
25-36	E12.5	XSCALE(1)	Scale (in mks units/inch) of X variable.	2.54 -06
37-48	E12.5	XLEFT(1)	Left boundary of frame (in mks units).	-1.0 -06
49-60	E12.5	XRIGHT(1)	Right boundary of frame (in mks units).	12.0 -06
61-72			Plot No. 1.	PLOT NO. 1
73-80				01040

Card 01041

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	A6,6X	Q2	Name of Y variable.	ALPHA
13-24	2R6	YUNIT(J,1)J=1,2	Units of Y variable.	AMPERE
25-36	E12.6	YSCALE(1)	Scale (in mks units/inch) of Y variable.	1.27
37-48	E12.6	YBOTTM(1)	Bottom boundary of frame (in mks units).	-0.5
49-60	E12.6	YTOP(1)	Top boundary of frame (in mks units).	5.0
61-72			Plot No. 1.	PLOT NO. 1
73-80				01041

Card 01042

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	A6,6X	Q1	Name of X variable.	TIME
13-24	2R6	XUNIT(J,2)J=1,2	Units of X variable.	MICROSECONDS
25-36	E12.6	XSCALE(2)	Scale (in mks units/inch) of X variable.	2.54 -05
37-48	E12.6	XLEFT(2)	Left boundary of frame (in mks units).	-1.0 -05
49-60	E12.6	XRIGHT(2)	Right boundary of frame (in mks units).	12.0 -05
61-72			Plot No. 2.	PLOT NO. 2
73-80				01042

Card 01043

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	A6,6X	Q2	Name of Y variable.	MMF 1
13-24	2R6	YUNIT(J,2)J=1,2	Units of Y variable.	AMPERE TURN
25-36	E12.6	YSCALE(2)	Scale (in mks units/inch) of Y variable.	0.127
37-48	E12.6	YBOTTM(2)	Bottom boundary of frame (in mks units).	-0.05
49-60	E12.6	YTOP(2)	Top boundary of frame (in mks units).	0.5
61-72			Plot No. 2.	PLOT NO. 2
73-80				01043

Card 01044

1-12	A6,6X	Q1	Name of X variable.	TIME
13-24	2R6	XUNIT(J,3)J=1,2	Units of X variable.	MICROSECONDS
25-36	E12.5	XSCALE(3)	Scale (in mks units/inch) of X variable.	2.54
37-48	E12.5	XLEFT(3)	Left boundary of frame (in mks units).	-1.0
49-60	E12.5	XRIGHT(3)	Right boundary of frame (in mks units).	12.0
61-72			Plot No. 3.	PLOT NO. 3
73-80				01044

Card 01045

1-12	A6,6X	Q2	Name of Y variable.	PHI 1
13-24	2R6	YUNIT(J,3)J=1,2	Units of Y variable.	MAXWELLS
25-36	E12.6	YSCALE(3)	Scale (in mks units/inch) of Y variable.	20.0
37-48	E12.6	YBOTTM(3)	Bottom boundary of frame (in mks units).	-40.0
49-60	E12.6	YTOP(3)	Top boundary of frame (in mks units).	40.0
61-72			Plot No. 3.	PLOT NO. 3
73-80				01045

etc.

Card 01100

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	E12.5	ABTEMP	Absolute temperature (°K).	298.0
13-24	I12	NDTSPC	Number of Δt -specification periods (max. 10). If blank, NDTSPC = 1.	3
25-36				
37-48				
49-60				
61-72				
73-80				01100

Cards 01200-01203 (1 to 4 cards): Specification for maximum Δt in NDTSPC periods (max. 10). If a cycle of (NDTSPC-1) periods is to be repeated n times, let the last Δt be -n.0. Omit cards with no data.

Card 01200

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	E12.8	CT(1,1)	Maximum Δt during $0 < t \leq t_1$ (1st period).	1.0 -08
13-24	E12.8	CT(1,2)	t_1	2.5 -08
25-36	E12.8	CT(2,1)	Maximum Δt during $t_1 < t \leq t_2$ (2nd period).	1.0 -08
37-48	E12.8	CT(2,2)	t_2	23.0 -08
49-60	E12.8	CT(3,1)	Maximum Δt during $t_2 < t \leq t_3$ (3rd period).	1.0 -07
61-72	E12.8	CT(3,2)	t_3	24.0 -08
73-80				01200

Card 01201

1-12	E12.8	CT(4,1)	Maximum Δt during $t_3 < t \leq t_4$ (4th period).	
13-24	E12.8	CT(4,2)	t_4	
25-36	E12.8	CT(5,1)	Maximum Δt during $t_4 < t \leq t_5$ (5th period).	
37-48	E12.8	CT(5,2)	t_5	
49-60	E12.8	CT(6,1)	Maximum Δt during $t_5 < t \leq t_6$ (6th period).	
61-72	E12.8	CT(6,2)	t_6	
73-80				01201

etc.

Cards 02000, 02001, 02002, ... (0 to 10 cards): Enter only if NG=1 (i.e., if initial unknown voltages and auxiliary unknowns are to be read in). Number of cards = $\lfloor (NV+NAUX)/6 + \alpha \rfloor$, where $0 \leq \alpha \leq 5/6$.

Card 02000

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	E12.8	V1(1)	Initial value of unknown No. 1.	
13-24	E12.8	V1(2)	Initial value of unknown No. 2.	
25-36	E12.8	V1(3)	Initial value of unknown No. 3.	
37-48	E12.8	V1(4)	Initial value of unknown No. 4.	
49-60	E12.8	V1(5)	Initial value of unknown No. 5.	
61-72	E12.8	V1(6)	Initial value of unknown No. 6.	
73-80				02000

Card 02001

1-12	E12.8	V1(7)	Initial value of unknown No. 7.	
13-24	E12.8	V1(8)	Initial value of unknown No. 8.	
25-36	E12.8	V1(9)	Initial value of unknown No. 9.	
37-48	E12.8	V1(10)	Initial value of unknown No. 10.	
49-60	E12.8	V1(11)	Initial value of unknown No. 11.	
61-72	E12.8	V1(12)	Initial value of unknown No. 12.	
73-80				02001

Card 02002

1-12	E12.8	V1(13)	Initial value of unknown No. 13.	
13-24	E12.8	V1(14)	Initial value of unknown No. 14.	
25-36	E12.8	V1(15)	Initial value of unknown No. 15.	
37-48	E12.8	V1(16)	Initial value of unknown No. 16.	
49-60	E12.8	V1(17)	Initial value of unknown No. 17.	
61-72	E12.8	V1(18)	Initial value of unknown No. 18.	
73-80				02002

etc.

Cards 03000-03006 (1 to 7 cards): Data on Radiation photocurrent Ipp.
If there are no radiation runs, enter only the first card (blank).

Card 03000

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NI	Number of break points in Ipp waveform (2 to 16); NI=0 if no rad.run.	2
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				03000

Card 03001

1-12	E12.8	E(1,1,1)	Initial Ipp value (always zero).	0.0
13-24	E12.8	E(1,1,2)	Ipp scale factor.	0.0
25-36	E12.8	E(1,2,1)	Normalized Ipp value at 2nd point.	0.0
37-48	E12.8	E(1,2,2)	Time at 2nd point.	1.0
49-60	E12.8	E(1,3,1)	Normalized Ipp value at 3rd point.	
61-72	E12.8	E(1,3,2)	Time at 3rd point.	
73-80				03001

Card 03002

1-12	E12.8	E(1,4,1)	Normalized Ipp value at 4th point.	
13-24	E12.8	E(1,4,2)	Time at 4th point.	
25-36	E12.8	E(1,5,1)	Normalized Ipp value at 5th point.	
37-48	E12.8	E(1,5,2)	Time at 5th point.	
49-60	E12.8	E(1,6,1)	Normalized Ipp value at 6th point.	
61-72	E12.8	E(1,6,2)	Time at 6th point.	
73-80				03002

etc.

Cards 03010-03016 (2 to 7 cards): Data on 1st variable source (or grounded dc voltage source). If dc, enter first two cards only.

Card 03010

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NI	Number of break points (1 if dc; 2 to 16 if variable).	1
13-24	I12	NI2	-1 - dc; 0 - hold last value; 1 - cycle.	1
25-36				
37-48				
49-60				
61-72				
73-80				03010

Card 03011: If dc - Columns 13-73 are blank.

1-12	E12.8	E(2,1,1)	Initial source value at 1st point; dc value if dc.	28.0
13-24	E12.8	E(2,1,2)	Initial time at 1st point (usually zero).	
25-36	E12.8	E(2,2,1)	Source value at 2nd point.	
37-48	E12.8	E(2,2,2)	Time at 2nd point.	
49-60	E12.8	E(2,3,1)	Source value at 3rd point.	
61-72	E12.8	E(2,3,2)	Time at 3rd point.	
73-80				03011

Card 03012

1-12	E12.8	E(2,4,1)	Source value at 4th point.	
13-24	E12.8	E(2,4,2)	Time at 4th point.	
25-36	E12.8	E(2,5,1)	Source value at 5th point.	
37-48	E12.8	E(2,5,2)	Time at 5th point.	
49-60	E12.8	E(2,6,1)	Source value at 6th point.	
61-72	E12.8	E(2,6,2)	Time at 6th point.	
73-80				03012

etc.

Cards 03020-03026 (2 to 7 cards): Data on 2nd variable source (or grounded dc voltage source). If uc, enter first two cards only.

Card 03020

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NI	Number of break points (1 if dc; 2 to 16 if variable).	
13-24	I12	NI2	-1 - dc; 0 - hold last value; 1 - cycle.	
25-36				
37-48				
49-60				
61-72				
73-80				03020

Card 03021: If dc, Columns 13-72 are blank.

1-12	E12.8	E(3,1,1)	Initial source value at 1st point; dc value if dc.	
13-24	E12.8	E(3,1,2)	Initial time at 1st point (usually zero).	
25-36	E12.8	E(3,2,1)	Source value at 2nd point.	5.0
37-48	E12.8	E(3,2,2)	Time at 2nd point.	0.5
49-60	E12.8	E(3,3,1)	Source value at 3rd point.	5.0
61-72	E12.8	E(3,3,2)	Time at 3rd point.	23.0
73-80				03021

Card 03022

1-12	E12.8	E(3,4,1)	Source value at 4th point.	
13-24	E12.8	E(3,4,2)	Time at 4th point.	23.5
25-36	E12.8	E(3,5,1)	Source value at 5th point.	-06
37-48	E12.8	E(3,5,2)	Time at 5th point.	
49-60	E12.8	E(3,6,1)	Source value at 6th point.	
61-72	E12.8	E(3,6,2)	Time at 6th point.	
73-80				03022

etc.

Cards 03500, 03510, 03511, ... (1 or 3 to 31 cards): Normal-Termination conditions: 0 to 5 OR statements, each with 1 to 5 AND conditions. Omit cards with no data.
 Card 03500

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	IOC	Number of OR statements.	
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				03500

Card 03510

1-12	I12	IAC(1)	Number of AND conditions of 1st statement.	
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				03510

Card 03511: 1st condition of 1st statement.

1-12	A1, 8X, 13	A1, NOVAR(1, 1)	ABS (absolute value) or blank (otherwise); Unknown V No.	ABS
13-24	A1, 11X	A2	GT (1.e., >) or LE (1.e., ≤).	11X
25-36	E12.5	BVAL(1, 1)	Boundary value.	3.35
37-48				-04
49-60				
61-72				
73-80				03511

Card 03512; 2nd condition of 1st statement.

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	A1,8X,I3	A1,NOVAR(1,2)	ABS (absolute value) or blank (otherwise); Unknown v No.	
13-24	A1,11X	A2	GT (i.e., >) or LE (i.e., ≤).	GT
25-36	E12,5	BVAL(1,2)	Boundary value.	0.0
37-48				
49-60				
61-72				
73-80				03512

etc.

Card 03520

1-12	I12	IAC(2)	Number of AND conditions of 2nd statement.	2
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				03520

Card 03521; 1st condition of 2nd statement.

1-12	A1,8X,I3	A1,NOVAR(2,1)	ABS (absolute value) or blank (otherwise); Unknown v No.	
13-24	A1,11X	A2	GT (i.e., >) or LE (i.e., ≤).	LE
25-36	E12,5	BVAL(2,1)	Boundary value.	-6.55
37-48				03
49-60				
61-72				
73-80				03521

etc.

Cards 03600, 03610, 03611, ... (1 or 3 to 31 cards): Failure-termination conditions: 0 to 5 OR Statements, each with 1 to 5 AND conditions. Omit cards with no data.

Card 03600

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	IOCF	Number of OR statements.	1
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				03600

Card 03610

1-12	I12	IACF(1)	Number of AND conditions of 1st statement.	3
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				03610

Card 03611: 1st condition of 1st statement.

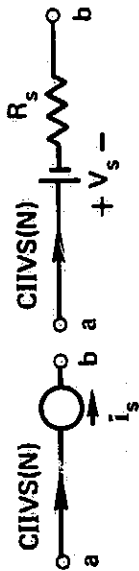
1-12	A1,8X,13A1,NOVARF(1,1)	A2	ABS (absolute value) or blank (otherwise); Unknown V No.	7
13-24	A1,11X	A2	GT (i.e., >) or LE (i.e., ≤).	31
25-36	E12.5	BVALF(1,1)	Boundary value.	140.0
37-48				
49-60				
61-72				
73-80				03611

etc.

Cards 10000, 10010, ..., (1 to 21 cards): Current sources and floating voltage sources (0 to 20).
 If any source varies with time, it must also be entered as a variable source (in Cards 03010, ...).
 Terminal-type designation: blank - floating; S - known voltage sources; G - ground.
 Enter the first card only, if there are no such sources.

Card 10000

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NIV	Number of current sources and floating voltage sources (max.20).	
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				10000



Card 10010: 1st current or floating voltage source.

1-12	I12	K4(1)	1 - current source; 0 - floating voltage source.	
13-24	I12	K3(1)	0 (if dc) or index no. of variable source (if variable).	
25-36	A6, I6	A1, K1(1)	Type (blank, S, or G) and index number of Terminal a.	S
37-48	A6, I6	A2, K2(1)	Type (blank, S, or G) and index number of Terminal b.	
49-60	E12.8	VI(1)	Magnitude of a dc source; blank if a variable source.	
61-72	E12.8	RVS (1)	R _s of voltage source (0.1 Ω if blank); blank if current source.	
73-80				10010

Card 10020: 2nd current or floating voltage source.

1-12	I12	K4(2)	1 - current source; 0 - floating voltage source.	
13-24	I12	K3(2)	0 (if dc) or index no. of variable source (if variable).	
25-36	A6, I6	A1, K1(2)	Type (blank, S, or G) and index number of Terminal a.	S
37-48	A6, I6	A2, K2(2)	Type (blank, S, or G) and index number of Terminal b.	
49-60	E12.8	VI(2)	Magnitude of a dc source; blank if a variable source.	5.0
61-72	E12.8	RVS(2)	R _s of voltage source (0.1 Ω if blank); blank if current source.	0.05
73-80				10020

etc.

Cards 20000, 20010, ... (1 to 61 cards): Resistors (0 to 40).

Terminal-type designation: blank - floating; S - known voltage source; G - ground.

Up to 5 resistors may vary with time - see next page.

Enter the first card only, if there are no resistors.

Card 20000

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NR	Number of resistors (max. 40).	
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				20000



Card 20010: 1st resistor, R1.

1-12	A6, I6	F1, K1(1)	Type (blank, S, or G) and index number of Terminal a.	
13-24	A6, I6	R2, K2(1)	Type (blank, S, or G) and index number of Terminal b.	
25-36	E12.8	R(1)	Resistance R (if blank, R = 0.001Ω).	104.7
37-48	I12	NRP(1)	No. of break points if R varies with time.	
49-60				
61-72				
73-80				20010

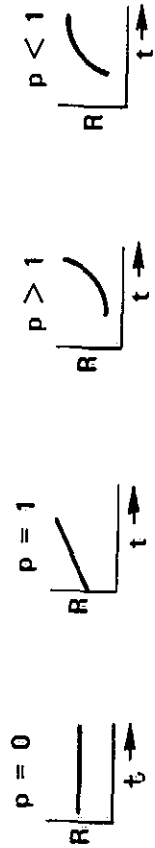
Card 20020: 2nd resistor, R2.

1-12	A6, I6	F1, K1(2)	Type (blank, S, or G) and index number of Terminal a.	
13-24	A6, I6	R2, K2(2)	Type (blank, S, or G) and index number of Terminal b.	
25-36	E12.8	R(2)	Resistance R (if blank, R = 0.001Ω).	3.9
37-48	I12	NRP(2)	No. of break points if R varies with time.	
49-60				
61-72				
73-80				20020

An Nth resistor may vary with time in up to 4 modes, in each of which $R(t) = R_0 + (R_f - R_0) \left(\frac{t - t_0}{t_f - t_0} \right)^p$.

In this case:

- (1) $NRP(N) \geq 2$, where $NRP(N)$ = No. of break points = 1 + No. of $R(t)$ modes;
- (2) Initial $R_0 = R$ (Columns 25-36) and initial $t_0 = t$;
- (3) $NRP(N) - 1$ cards must follow, each with the values of R_f , t_f , and p .



Card 20030: 3rd resistor, R3.

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	A6, I6	F1, K1(3)	Type (blank, S, or G) and index number of Terminal a.	14
13-24	A6, I6	R2, K2(3)	Type (blank, S, or G) and index number of Terminal b.	2
25-36	E12.8	R(3)	Resistance R (if blank, $R = 0.001 \Omega$).	0.5
37-48	I12	NRP(3)	No. of break points if R varies with time.	3
49-60				
61-72				
73-80				20030

Card 20031: 1st mode of R3(t).

1-12	E12.5	RF(1,2)	R_f (at 2nd break point).	1.0	+06
13-24	E12.5	TFR(1,2)	t_f (at 2nd break point).	2.0	-05
25-36	E12.5	XRES(1,2)	p value.	0.5	
37-48					
49-60					
61-72					
73-80					20031

Card 20032: 2nd mode of R3(t).

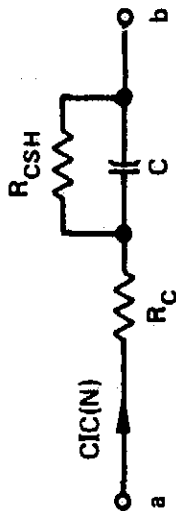
1-12	E12.5	RF(1,3)	R_f (at 3rd break point).	1.0	+06
13-24	E12.5	TFR(1,3)	t_f (at 3rd break point).	12.0	-06
25-36	E12.5	XRES(1,3)	p value.		
37-48					
49-60					
61-72					
73-80					20032

etc.

Cards 30000, 30010, ... (1 to 21 cards): Capacitors (0 to 20).
 Terminal-type designation: blank - floating; S - known voltage source; G - ground.
 Enter the first card only, if there are no capacitors.

Card 30000

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NC	Number of capacitors (max.20)	1
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				30000



Card 30010: 1st capacitor, C1.

1-12	A6, I6	F1, K1(1)	Type (blank, S, or G) and index number of Terminal a.	0
13-24	A6, I6	R2, K2(1)	Type (blank, S, or G) and index number of Terminal b.	6
25-36	E12.8	CAPC(1)	Capacitance C.	22.0
37-48	E12.8	RC(1)	Series resistance R_C (if blank, then $R_C = 0.1 \Omega$).	0.35
49-60	E12.8	RCSH(1)	Shunt resistance R_{CSH} (if blank, then $R_{CSH} = 10^9 \Omega$).	
61-72	E12.8	C10	Initial current.	
73-80				30010

Card 30020: 2nd capacitor, C2.

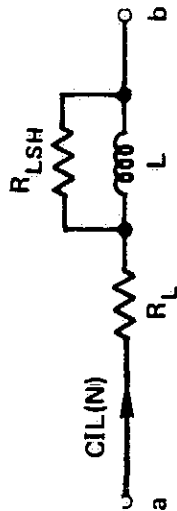
1-12	A6, I6	F1, K1(2)	Type (blank, S, or G) and index number of Terminal a.	
13-24	A6, I6	R2, K2(2)	Type (blank, S, or G) and index number of Terminal b.	
25-36	E12.8	CAPC(2)	Capacitance C.	
37-48	E12.8	RC(2)	Series resistance R_C (if blank, then $R_C = 0.1 \Omega$).	
49-60	E12.8	RCSH(2)	Shunt resistance R_{CSH} (if blank, then $R_{CSH} = 10^9 \Omega$).	
61-72	E12.8	C10	Initial current.	
73-80				30020

etc.

Cards 40000, 40010, ..., (1 to 41 cards): Linear and nonlinear inductors (0 to 20).
 Terminal-type designation: blank - floating; S - known voltage source; G - ground.
 For nonlinear inductors, $L = L_0 e^{-I/I_{con}}$.
 Enter the first card only, if there are no inductors.

Card 40000

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NL	Number of inductors (max, 20).	
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				40000



Cards 40010 and 40011: 1st inductor, L1.

Card 40010

1-12	A6, I6	F1, K1(1)	Type (blank, S, or G) and index number of Terminal a.		10
13-24	A6, I6	R2, K2(1)	Type (blank, S, or G) and index number of Terminal b.		2
25-36	E12, 8	INDL(1)	Inductance L (linear inductor) or L_0 (nonlinear inductor).	365.0	-06
37-48	E12, 8	RL(1)	Series resistance R_L (if blank, $R_L = 1.0 \Omega$).	0.5	
49-60	E12, 8	RLSH(1)	Shunt resistance R_{LSH} (if blank, $R_{LSH} = 10^6 \Omega$).		
61-72	E12, 8	VICON(1)	blank (linear inductor) or $1/I_{con}$ (nonlinear inductor).	7.24	
73-80					40010

Card 40011

1-12	E12, 5	CIL0	Initial current.	0.152	
13-24	I12	INCIL(1)	1 - Initial CIL(N) = CIL0 regardless of NSVAR or NSVIL; 0 - otherwise		1
25-36					
37-48					
49-60					
61-72					
73-80					40011

Cards 40020 and 40021: 2nd inductor, L2.

Card 40020

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	A6, I6	F1, K1(2)	Type (blank, S, or G) and index number of Terminal a.	15
13-24	A6, I6	R2, K2(2)	Type (blank, S, or G) and index number of Terminal b.	0
25-36	E12.8	INDL(2)	Inductance L (linear inductor) or I_0 (nonlinear inductor).	11.7 -06
37-48	E12.8	RL(2)	Series resistance R_L (if blank, $R_L = 1.0 \Omega$).	
49-60	E12.8	RLSH(2)	Shunt resistance R_{LSH} (if blank, $R_{LSH} = 10^6 \Omega$).	2.5 7
61-72	E12.8	VICON(2)	blank (linear inductor) or $1/I_{con}$ (nonlinear inductor).	
73-80				40020

Card 40021

1-12	E12.5	CIL0	Initial current.	
13-24	I12	INCIL(2)	1 - Initial CIL(N) = CIL0 regardless of NSVVAR or NSVIL; 0 otherwise.	
25-36				
37-48				
49-60				
61-72				
73-80				40021

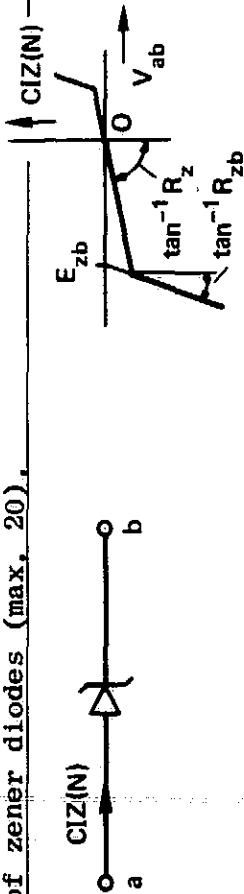
etc.

Cards 50000, 50010, ... (1 to 21 cards): Zener diodes (0 to 20).

Terminal-type designation: blank - floating; S - known voltage source; G - ground.
Enter the first card only, if there are no zener diodes.

Card 50000

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NZEN	Number of zener diodes (max, 20).	
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				50000



Card 50010: 1st zener diode, Z1.

1-12	A6, I6	F1, K1(1)	Type (blank, S, or G) and index number of Terminal a.	
13-24	A6, I6	R2, K2(1)	Type (blank, S, or G) and index number of Terminal b.	
25-36	E12, 8	RZ(1)	High zener resistance R_z .	0.18
37-48	E12, 8	RZB(1)	Low back zener resistance R_{zb} .	0.5
49-60	E12, 8	EZB(1)	Extrapolated back zener voltage E_{zb} (negative value).	-4.65
61-72				
73-80				50010

Card 50020: 2nd zener diode, Z2.

1-12	A6, I6	F1, K1(2)	Type (blank, S, or G) and index number of Terminal a.	
13-24	A6, I6	R2, K2(2)	Type (blank, S, or G) and index number of Terminal b.	
25-36	E12, 8	RZ(2)	High zener resistance R_z .	0.35
37-48	E12, 8	RZB(2)	Low back zener resistance R_{zb} .	0.55
49-60	E12, 8	EZB(2)	Extrapolated back zener voltage E_{zb} (negative value).	-4.68
61-72				
73-80				50020

etc.

Cards 60000, 60010, ... (1 to 41 cards): Diodes (0 to 20).

Terminal-type designation: blank - floating; S - known voltage source; G - ground.

Two cards per diode if the parameter values are specified; One card per diode if the parameter values are identical with those of another diode (of lower index number).

Enter the first card only, if there are no diodes.

Card 60000

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NDIODE	Number of diodes (max. 20).	
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				60000



Cards 60010 and 60011: 1st diode, D1.

Card 60010

1-12	A6, I6	F1, K1(1)	Type (blank, S, or G) and index number of Terminal a.	
13-24	A6, I6	R2, K2(1)	Type (blank, S, or G) and index number of Terminal b.	
25-36	I12	K3	Parameter values: 0 - specify; N - same as those of Nth diode.	
37-48	E12.8	QCR(1,6)	Photocurrent I _{pp} .	
49-60				
61-72				
73-80				60010

Card 60011: Parameter values of D1.

1-12	E12.8	QCR(1,1)	I _{sd}	9.747	-09
13-24	E12.8	QCR(1,2)	m _d	1.95	
25-36	E12.8	QCR(1,3)	R _d	6.00	+09
37-48	E12.8	QCR(1,4)	C _{10d}	1.0	-12
49-60	E12.8	QCR(1,5)	V _{φd}	0.8	
61-72	E12.8	QCR(1,7)	T _d	1.0	-08
73-80					60011

Cards 60020 and 60021: 2nd diode, D2.

Card 60020

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	A6, I6	F1, K1(2)	Type (blank, S, or G) and index number of Terminal a.	1
13-24	A6, I6	R2, K2(2)	Type (blank, S, or G) and index number of Terminal b.	2
25-36	I12	K3	Parameter values: 0 - specify; N - same as those of Nth diode.	1
37-48	E12.8	QCR(2,6)	Photocurrent I _{pp} .	
49-60				
61-72				
73-80				60020

Card 60021: Parameter values of D2. Omit this card if parameter values are identical with those of D1 (K3=1).

1-12	E12.8	QCR(2,1)	I _{sd}	
13-24	E12.8	QCR(2,2)	m _d	
25-36	E12.8	QCR(2,3)	R _{0d}	
37-48	E12.8	QCR(2,4)	C _{jd}	
49-60	E12.8	QCR(2,5)	V _{pd}	
61-72	E12.8	QCR(2,7)	T _d	
73-80				60021

etc.

Cards 70000, 70010, ... (1 to 81 cards): npn and pnp Transistors (0 to 20).

Terminal-type designation: blank - floating; S - known voltage source; G - Ground

Four cards per transistor if the parameter values are specified; one card per transistor if the parameter values are identical with those of another transistor (of lower index number).

Enter the first card only, if there are no transistors.

Card 70000

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NTRANS	Number of transistors (max. 20).	
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				

Cards 70010 through 70013: 1st transistor, T1.

Card 70010

1-12	I12	K1(1)	0 - npn; 1 - pnp.	
13-24	A6, I6	BASE, K2(1)	Type (blank, S, or G) and index number of Terminal B (Base).	
25-36	A6, I6	COLC, K3(1)	Type (blank, S, or G) and index number of Terminal C (Collector).	
37-48	A6, I6	EMTR, K4(1)	Type (blank, S, or G) and index number of Terminal E (Emitter).	
49-60	I12	K5	Parameter values: 0 - specify; N - same as those of Nth transistor.	
61-72				
73-80				

Cards 70011, 70012, and 70013: Parameter values of T1.

Card 70011

1-12	E12.8	QTAN(1,1)	β_n	
13-24	E12.8	QTAN(1,2)	β_i	
25-36	E12.8	QTAN(1,3)	T_e	
37-48	E12.8	QTAN(1,4)	T_c	
49-60	E12.8	QTAN(1,5)	I_{sc}	
61-72	E12.8	QTAN(1,6)	m_c	
73-80				

Card 70012

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	E12.8	QTAN(1,7)	C _{10c}	0.55 -12
13-24	E12.8	QTAN(1,8)	V _{pc}	0.7
25-36	E12.8	QTAN(1,9)	R _{1c}	0.3 -12
37-48	E12.8	QTAN(1,10)	I _{se}	54.01 -09
49-60	E12.8	QTAN(1,11)	m _e	2.12
61-72	E12.8	QTAN(1,12)	C _{10e}	57.0 -12
73-80				70012

Card 70013

1-12	E12.8	QTAN(1,13)	V _{ce}	0.6
13-24	E12.8	QTAN(1,14)	R _{1e}	0.2 -12
25-36	E12.8	QTAN(1,15)	Collector photocurrent I _{pc}	
37-48	E12.8	QTAN(1,16)	Emitter photocurrent I _{pe}	
49-60				
61-72				
73-80				70013

Cards 70020 through 70023: 2nd transistor, T2.

Card 70020

1-12	I12	K1(2)	0 - npn; 1 - pnp.	
13-24	A6, I6	BASE, K2(2)	Type (blank, S, or G) and index number of Terminal B (Base).	13
25-36	A6, I6	COLC, K3(2)	Type (blank, S, or G) and index number of Terminal C (Collector).	12
37-48	A6, I6	EMTR, K4(2)	Type (blank, S, or G) and index number of Terminal E (Emitter).	14
49-60	I12	K5	Parameter values: 0 - specify; N - same as those of Nth transistor.	1
61-72				
73-80				70020

Cards 70021, 70022, and 70023: Parameter values of T2. Omit these three cards if the parameter values are identical with those of T1 (K5 = 1).

Card 70021

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	E12.8	QTAN(2,1)	P_n	
13-24	E12.8	QTAN(2,2)	β_1	
25-36	E12.8	QTAN(2,3)	T_e	
37-48	E12.8	QTAN(2,4)	T_c	
49-60	E12.8	QTAN(2,5)	I_{sc}	
61-72	E12.8	QTAN(2,6)	m_c	
73-80				70021

Card 70022

1-12	E12.8	QTAN(2,7)	C_{jgc}	
13-24	E12.8	QTAN(2,8)	V_{qc}	
25-36	E12.8	QTAN(2,9)	R_{gc}	
37-48	E12.8	QTAN(2,10)	I_{ge}	
49-60	E12.8	QTAN(2,11)	m_e	
61-72	E12.8	QTAN(2,12)	C_{joe}	
73-80				70022

Card 70023

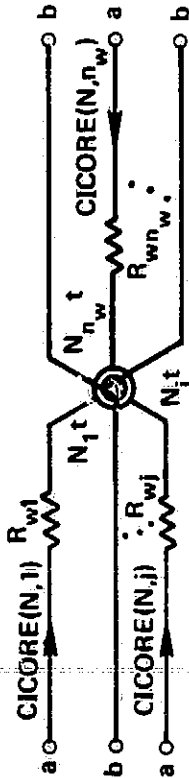
1-12	E12.8	QTAN(2,13)	V_{qe}	
13-24	E12.8	QTAN(2,14)	R_{qe}	
25-36	E12.8	QTAN(2,15)	Collector photocurrent I_{ppe}	
37-48	E12.8	QTAN(2,16)	Emitter photocurrent I_{ppe}	
49-60				
61-72				
73-80				70023

etc.

(1) $\phi_A(F)$ and $\phi_p(F)$ Input Core Parameters (PARIN = PHIF or blank).
 Cards 80000, 80001, ... (1 to 322 cards): Magnetic cores (0 to 20), each with n_w windings (1 to 10).
 Terminal-type designation: blank - floating; S - known voltage source; G - ground.
 Use 6 + n_w cards per core if the parameter values are specified; 1 + n_w cards per core if the parameter values are identical with those of another core (of lower index number). Since $1 \leq n_w \leq 10$, there may be 2 to 16 cards per core. Enter the first card only, if there are no cores.

Card 80000

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NCORE	Number of cores (max. 20).	
13-24	A6	PARIN	Parameter input-data kind: PHIF or blank - ϕF data; BH - BH data.	PHIF
25-36				
37-48				
49-60				
61-72				
73-80				80000



Card 80001

1-12	E12.5	RELERR	Relative error for convergence of winding currents (10^{-4} if blank).	0.00001
13-24	E12.5	ABSERR	Absolute error for convergence of winding currents (10^{-4} A if blank).	0.00001
25-36	E12.5	PSTEP	Weight of previous-iteration results on computed winding current, varying from PSTEP = 0 (no effect) to $ PSTEP = 1.0$ ($i = 1 \dots n_w$). If "1/2-factor" rather than Aitken formula is to be used, PSTEP is negative.	0.5
37-48	F12.0	STSWEX	1 - terminate mode run if flux switching of all cores is completed and $t > NUDT \cdot \Delta t$; 0 - otherwise.	1
49-60	I12	NUDT	Number of Δt 's above which STSWEX is effective.	10
61-72	I12	LASTIC	1 - elastic ϕ is included; 0 - elastic ϕ neglected.	1
73-80				80001

Cards 80100, 80101, ...: 1st magnetic core, Core 1.

Card 80100

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NW(1)	Number of windings.	
13-24	I12	KC1	Parameter values: 0 - specify; N - same as those of Nth core.	
25-36	E12.5	U0(1)	Initial current.	1.0
37-48				
49-60				
61-72				
73-80				80100

Card 80101: 1st winding of Core 1.

1-12	A6, I6	F1C,K1C(1,1)	Type (blank, S, or G) and index number of Terminal a (bottom).	
13-24	A6, I6	R2C,K2C(1,1)	Type (blank, S, or G) and index number of Terminal b (top).	
25-36	F12.0	XNT(1,1)	Number of turns.	
37-48	E12.5	RW(1,1)	Winding resistance (0.1Ω if blank).	0.015
49-60	I6, I6	NP(1,1);NS(1,1)	No. of identically switching cores in parallel; in series (1 if blank).	
61-72	E12.5	CI0	Initial current.	
73-80				80101

Card 80102: 2nd winding of Core 1.

1-12	A6, I6	F1C,K1C(1,2)	Type (blank, S, or G) and index number of Terminal a (bottom).	
13-24	A6, I6	R2C,K2C(1,2)	Type (blank, S, or G) and index number of Terminal b (top).	
25-36	F12.0	XNT(1,2)	Number of turns.	
37-48	E12.5	RW(1,2)	Winding resistance (0.1Ω if blank).	0.3
49-60	I6, I6	NP(1,2);NS(1,2)	No. of identically switching cores in parallel; in series (1 if blank).	
61-72	E12.5	CI0	Initial current.	
73-80				80102

etc.

Cards 80120 through 80124: Parameters of Core 1.

Use mks units (ϕ in weber, F in ampere-turn, H in ampere-turn/meter, etc.), except for core diameters.

Cards 80120, 80121, and 80122: Static $\phi_d(F)$ parameters.

Card 80120

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	E12.5	XOD(1)	Outside diameter (in inch).	0.147
13-24	E12.5	XID(1)	Inside diameter (in inch).	0.09
25-36	E12.5	PHIS(1)	ϕ_s - Saturation flux (if blank, then $\phi_s = 1.1 \phi_r$).	39.6
37-48	E12.5	PHIR(1)	ϕ_r - Maximum remanent flux.	36.0
49-60	11X, A1	TYPE (1)	$\phi_d(F)$ - curve type: G, A, B, C, D, E, or F (if blank, then B).	-08
61-72	A1	CORMAT(1)	Core material: F or blank - Ferrite; T - Tape-wound.	FERRITE
73-80				80120

Card 80121

1-12	E12.5	FD1(1)	F_{d1} - Threshold mmf; blank for Type D.	0.21
13-24	E12.5	FDZ(1)	F_{dz} - May be blank if $F_{dz} = F_{d1}$ or $F_{dz} = \frac{1}{2}(F_{d1} + F_{d2})$; blank for Types A, D, E.	
25-36	E12.5	FD2(1)	F_{d2} - May be blank if $F_{d2} = F_{d1}$; blank for Types A, D, and E.	
37-48	E12.5	FD3(1)	F_{d3} - Blank for Types B, D, and F.	
49-60	E12.5	PHID2(1)	ϕ_{d2} - ϕ_d @ $F = F_{d2}$; blank for Types A, D, E, and F.	-13.0
61-72				
73-80				80121

Card 80122

1-12	E12.5	HA(1)	H_a - Material saturation parameter.	147.1
13-24	E12.5	HQ(1)	H_q - Material nonsaturation parameter; blank for Types C, E, and F.	19.81
25-36	E12.5	HN(1)	H_n - Material nonsaturation parameter; blank for Types C, E, and F.	15.23
37-48				
49-60				
61-72				
73-80				80122

Cards 80123 and 80124: Dynamic $\phi_p(F)$ parameters. Values of parameters F_0 , F_B , F_0 and ρ_p must be entered.
Close values of the remaining parameters will be computed by the program if not entered.

Card 80123

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	E12.5	XLMAD(1)	λ_d (blank if not known).	2.0508
13-24	E12.5	XNUD(1)	ν_d (blank if not known).	1.8569
25-36	E12.5	FDB(1)	F_{dB} (blank if not known).	0.3290
37-48	E12.5	FOPP(1)	F_0''	0.2863
49-60	E12.5	XLAMDA(1)	λ (blank if not known).	1.8076
61-72	E12.5	XNU(1)	ν (blank if not known).	1.2423
73-80				80123

Card 80124

1-12	E12.5	FB(1)	F_B	1.7897
13-24	E12.5	F0(1)	F_0	0.5735
25-36	E12.5	ROP(1)	ρ_p	2.4788
37-48	E12.5	FB1(1)	F_{B1} (blank if no Region 5).	
49-60	E12.5	F01(1)	F_{01} (blank if F_{B1} is blank).	
61-72	E12.5	ROP1(1)	ρ_{p1} (blank if F_{B1} is blank).	
73-80				80124

Cards 80200, 80201, ...: 2nd magnetic core, Core 2.

Card 80200

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NW(2)	Number of windings.	
13-24	I12	KC1	Parameter values; 0 - specify; N - same as those of Nth core.	
25-36	E12.5	U0(2)	Initial ϕ/ϕ_r .	-1.0
37-48				
49-60				
61-72				
73-80				80200

Card 80201: 1st winding of Core 2.

1-12	A6, I6	F1C, K1C(2, 1)	Type (blank, S, or G) and index number of Terminal a (bottom).	
13-24	A6, I6	R2C, K2C(2, 1)	Type (blank, S, or G) and index number of Terminal b (top).	
25-36	F12.0	XNT(2, 1)	Number of turns.	
37-48	E12.5	RW(2, 1)	Winding resistance (0.1 Ω if blank).	0.3
49-60	I6, I6	NP(2, 1); NS(2, 1)	No. of identically switching cores in parallel; in series (1 if blank).	
61-72	E12.5	CI0	Initial current.	
73-80				80201

Card 80202: 2nd winding of Core 2.

1-12	A6, I6	F1C, K1C(2, 2)	Type (blank, S, or G) and index number of Terminal a (bottom).	
13-24	A6, I6	R2C, K2C(2, 2)	Type (blank, S, or G) and index number of Terminal b (top).	
25-36	F12.0	XNT(2, 2)	Number of turns.	
37-48	E12.5	RW(2, 2)	Winding resistance (0.1 Ω if blank).	0.06
49-60	I6, I6	NP(2, 2); NS(2, 2)	No. of identically switching cores in parallel; in series (1 if blank).	
61-72	E12.5	CI0	Initial current.	
73-80				80202

etc.

Cards 80220 through 80224: Parameters of Core 2. Omit these five cards if the parameter values are identical with those of Core 1 ($KCl = 1$).

Use mks units (ϕ in weber, F in ampere-turn, H in ampere-turn/meter, etc.), except for core diameters.

Cards 80220, 80221, and 80222: Static $\phi_d(F)$ parameters.

Card 80220

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	E12.5	XOD(2)	Outside diameter (in inch).	
13-24	E12.5	XID(2)	Inside diameter (in inch).	
25-36	E12.5	PHIS(2)	ϕ_s - Saturation flux (if blank, then $\phi_s = 1.1 \phi_r$).	
37-48	E12.5	PHIR(2)	ϕ_r - Maximum remanent flux.	
49-60	11X,A1	TYPE(2)	$\phi_d(F)$ - curve type: G, A, B, C, D, E, or F (if blank, then B).	
61-72	A1	CORMAT(2)	Core material: F or blank - Ferrite; T - tape-wound.	
73-80				80220

Card 80221

1-12	E12.5	FD1(2)	FD1 - Threshold mmf; blank for Type D.	
13-24	E12.5	FDZ(2)	FDZ - May be blank if $F_{dz} = F_{d1}$ or $F_{dz} = \frac{1}{2} (F_{d1} + F_{d2})$; blank for Types A, D, E.	
25-36	E12.5	FD2(2)	FD2 - May be blank if $F_{d2} = F_{d1}$; blank for Types A, D, and E.	
37-48	E12.5	FD3(2)	FD3 - Blank for Types B, D, and F.	
49-60	E12.5	PHID2(2)	ϕ_{d2} : ϕ_d @ $F = F_{d2}$; blank for Types A, D, E, and F.	
61-72				
73-80				80221

Card 80222

1-12	E12.5	HA(2)	H_a - Material saturation parameter.	
13-24	E12.5	HQ(2)	H_q - Material nonsaturation parameter; blank for Types C, E, and F.	
25-36	E12.5	HN(2)	H_n - Material nonsaturation parameter; blank for Types C, E, and F.	
37-48				
49-60				
61-72				
73-80				80222

Cards 80223 and 80224: Dynamic $\phi_p(F)$ parameters. Values of Parameters F_0'' , F_B , F_0 , and ρ_p must be entered.

Close values of the remaining parameters will be computed by the program if not entered.

Card 80223

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	E12.5	XLMDAD(2)	λ_d (blank if not known).	
13-24	E12.5	XNUD(2)	ν_d (blank if not known).	
25-36	E12.5	FDB(2)	F_{dB} (blank if not known).	
37-48	E12.5	FOPP(2)	F_0''	
49-60	E12.5	XLAMDA(2)	λ (blank if not known).	
61-72	E12.5	XNU(2)	ν (blank if not known).	
73-80				80223

Card 80224

1-12	E12.5	FB(2)	FB	
13-24	E12.5	F0(2)	F_0	
25-36	E12.5	ROP(2)	ρ_p	
37-48	E12.5	FB1(2)	FB1 (blank if no Region 5).	
49-60	E12.5	F01(2)	F01 (blank if FB1 is blank).	
61-72	E12.5	ROP1(2)	ρ_{p1} (blank if FB1 is blank).	
73-80				80224

etc.

(2) Static and Dynamic B(H)-Loop Input Core Parameters (PARIN = BH).

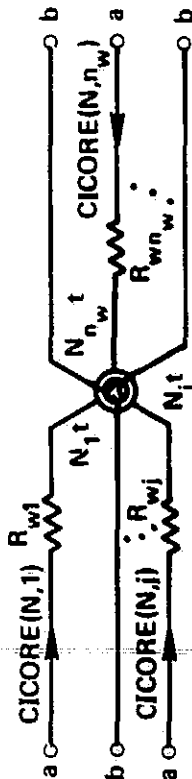
Cards 80000, 80001, ..., Magnetic cores (0 to 20), each with n_w windings (1 to 10).

Terminal-type designation: blank - floating; S - known voltage source; G - ground.

Enter the first card only, if there are no cores.

Card 80000

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NCORE	Number of cores (max. 20).	
13-24	A6	PARIN	Parameter input-data kind: PHIF or blank - $\emptyset$ F data; BH - BH data.	PHIF
25-36				
37-48				
49-60				
61-72				
73-80				80000



Card 80001

1-12	E12.5	RELERR	Relative error for convergence of winding currents (10^{-4} if blank).	0.00001
13-24	E12.5	ABSERR	Absolute error for convergence of winding currents (10^{-4} A if blank).	0.00001
25-36	E12.5	PSTEP	Weight of previous-iteration results on computed winding current, varying from PSTEP = 0 (no effect) to $ PSTEP = 1.0$ ($i = 1 \dots I$). If "1/2-factor" rather than Aitken formula is to be used, PSTEP is negative.	0.5
37-48	F12.0	STSWEX	1 - terminate mode run if flux switching of all cores is completed and $t > NUDT \cdot \Delta t$; 0 - otherwise.	1
49-60	I12	NUDT	Number of Δt 's above which STSWEX is effective.	10
61-72	I12	LASTIC	1 - elastic $\emptyset$ is included; 0 - elastic $\emptyset$ neglected.	1
73-80				80001

Cards 80100, 80101, ...: 1st magnetic core, Core 1.

Card 80100

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NW(1)	Number of windings.	
13-24	I12	KC1	Parameter values: 0 - specify; N - same as those of Nth core.	
25-36	E12.5	U0(1)	Initial B/Br.	1.0
37-48				
49-60				
61-72				
73-80				80100

Card 80101: 1st winding of Core 1.

1-12	A6, I6	F1C,K1C(1,1)	Type (blank, S, or G) and index number of Terminal a (bottom).	
13-24	A6, I6	R2C,K2C(1,1)	Type (blank, S, or G) and index number of Terminal b (top).	
25-36	F12.0	XNT(1,1)	Number of turns.	
37-48	E12.5	RW(1,1)	Winding resistance (0.1Ω if blank).	0.015
49-60	I6, I6	NP(1,1);NS(1,1)	No. of identically switching cores in parallel; in series (1 if blank).	
61-72	E12.5	C10	Initial current.	
73-80				80101

Card 80102: 2nd winding of Core 1.

1-12	A6, I6	F1C,K1C(1,2)	Type (blank, S, or G) and index number of Terminal a (bottom).	
13-24	A6, I6	R2C,K2C(1,2)	Type (blank, S, or G) and index number of Terminal b (top).	
25-36	F12.0	XNT(1,2)	Number of turns.	
37-48	E12.5	RW(1,2)	Winding resistance (0.1Ω if blank).	0.3
49-60	I6, I6	NP(1,2);NS(1,2)	No. of identically switching cores in parallel; in series (1 if blank).	
61-72	E12.5	C10	Initial current.	
73-80				80102

etc.

Cards 80120 through 80122, 80130, 80131, ... (4 + ndynp cards; Parameters of Core 1.

Use units that are common in core-manufacturer catalogs: B in gaussess, H in oersted, diameter in inch, and cross-sectional area in cm².

Cards 80120, 80121, and 80122: Static B_d(H) parameters.

Card 80120

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	E12.5	XOD(1)	Outside diameter (in inch).	0.147
13-24	E12.5	XID(1)	Inside diameter (in inch).	0.090
25-36	E12.5	AIN(1)	Effective cross-sectional area (in cm ²).	0.01452
37-48	E12.5	BRIN(1)	Br, in ⁻ Maximum remanent flux density (in gaussess).	6200.0
49-60	IX,A1	TYPE(1)	B _d (H) - curve type: G, A, B, C, D, E, or F (if blank, then G).	
61-72	A1	CORMAT(1)	Core material: F - Ferrite; T or blank - Tape-wound.	TAPE-WOUND
73-80				80120

Card 80121: Threshold and boundary H values (in oersted).

1-12	E12.5	HD1IN(1)	H _{d1} , in ⁻ H threshold; blank for Type D.	0.01
13-24	E12.5	HD2IN(1)	H _{d2} , in ⁻ May be blank if H _{d2} = H _{d1} or H _{d2} = 1/2(H _{d1} + H _{d2}); blank for Types A, D, and E.	0.018
25-36	E12.5	HD2IN(1)	H _{d2} , in ⁻ May be blank if H _{d2} = H _{d1} ; blank for Types A, D and E.	0.022
37-48	E12.5	HD3IN(1)	H _{d3} , in ⁻ Blank for Types B and F.	0.038
49-60	E12.5	HMIN(1)	H _m , in ⁻ Blank for Types C, E, and F.	0.16
61-72				
73-80				80121

Card 80122: Boundary B values (in gaussess).

1-12	E12.5	BD2IN(1)	B _{d2} , in ⁻ B _d @ H = H _{d2} ; blank for Types A, D, E, and F.	5000.0
13-24	E12.5	BD3IN(1)	B _{d3} , in ⁻ B _d @ H = H _{d3} ; blank for Types B, C, E, and F.	4000.0
25-36	E12.5	BMIN(1)	B _m , in ⁻ B _d @ H = H _m [B _m = 1/2(B _r + B _s)]; blank for Types C, E, and F.	7600.0
37-48				
49-60				
61-72				
73-80				80122

Cards 80130, 80131, 80132, ...: Dynamic B(H)-curve parameters.
 Card 80130

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NDYNP(1)	n _{dync} - Number of dynamic B(H) curves vs. frequency.	
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				80130

Card 80131

1-12	E12.5	FREQ(1,1)	Frequency (in Hz) of 1st point.	400.0
13-24	E12.5	HOBIN(1,1)	H @ B = 0 (in oersted) of 1st point.	0.036
25-36				
37-48				
49-60				
61-72				
73-80				80131

Card 80132

1-12	E12.5	FREQ(1,2)	Frequency (in Hz) of 2nd point.	1000.0
13-24	E12.5	HOBIN(1,2)	H @ B = 0 (in oersted) of 2nd point.	0.045
25-36				
37-48				
49-60				
61-72				
73-80				80132

etc.

Cards 80200, 80201, ...: 2nd magnetic core, Core 2.

Card 80200

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NW(2)	Number of windings.	
13-24	I12	KC1	Parameter values: 0 - specify; N - same as those of Nth core.	
25-36	E12.5	U0(2)	Initial B/Br.	-1.0
37-48				
49-60				
61-72				
73-80				80200

Card 80201: 1st winding of Core 2.

1-12	A6, I6	FLC,K1C(2,1)	Type (blank, S, or G) and index number of Terminal a (bottom).	
13-24	A6, I6	R2C,K2C(2,1)	Type (blank, S, or G) and index number of Terminal b (top).	
25-36	F12.0	XNT(2,1)	Number of turns.	
37-48	E12.5	RW(2,1)	Winding resistance (0.1Ω if blank).	0.3
49-60	I6, I6	NP(2,1);NS(2,1)	No. of identically switching cores in parallel; in series (1 if blank).	
61-72	E12.5	C10	Initial current.	
73-80				80201

Card 80202: 2nd winding of Core 2.

1-12	A6, I6	FLC,K1C(2,2)	Type (blank, S, or G) and index number of Terminal a (bottom).	
13-24	A6, I6	R2C,K2C(2,2)	Type (blank, S, or G) and index number of Terminal b (top).	
25-36	F12.0	XNT(2,2)	Number of turns.	
37-48	E12.5	RW(2,2)	Winding resistance (0.1Ω if blank).	0.05
49-60	I6, I6	NP(2,2);NS(2,2)	No. of identically switching cores in parallel; in series (1 if blank).	
61-72	E12.5	C10	Initial current.	
73-80				80202

etc.

Cards 80220 through 80222, 80230, 80231, ... [0 or (4 + ndynp) cards]: Parameters of Core 2.
 Omit these (4+ndynp) cards if the parameter values are identical with those of Core 1 (KCI=1).
 Use units that are common in core-manufacturer catalogs: B in gauss, H in oersted, diameter in inch, and cross-sectional area in cm².
 Cards 80220, 80221, and 80222: Static B_d(H) parameters.

Card 80220

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	E12.5	XOD(2)	Outside diameter (in inch).	
13-24	E12.5	XID(2)	Inside diameter (in inch).	
25-36	E12.5	AIN(2)	Effective cross-sectional area (in cm ²).	
37-48	E12.5	BRIN(2)	Br _r , in, Maximum remanent flux density (in gauss).	
49-60	11X,A1	TYPE(2)	B _d (H) - curve type: G, A, B, C, D, E, or F (if blank, then G).	
61-72	A1	CORMAT(2)	Core material: F - Ferrite; T or Blank - Tape-wound.	
73-80				80220

Card 80221: Threshold and boundary H values (in oersted).

1-12	E12.5	HD1IN(2)	H _{d1} , in, H threshold; blank for Type D.	
13-24	E12.5	HDZIN(2)	H _{dz} , in - May be blank if H _{dz} =H _{d1} or H _{d2} = $\frac{1}{2}(H_{d1}+H_{d2})$; blank for Types A, D, and E.	
25-36	E12.5	HD2IN(2)	H _{d2} , in - May be blank if H _{d2} =H _{d1} ; blank for Types A, D, and E.	
37-48	E12.5	HD3IN(2)	H _{d3} , in - Blank for Types B and F.	
49-60	E12.5	HMIN(2)	H _m , in - Blank for Types C, E, and F.	
61-72				
73-80				80221

Card 80222: Boundary B values (in gauss).

1-12	E12.5	BD2IN(2)	B _{d2} , in: B _d @ H = H _{d2} ; blank for Types A, D, E, and F.	
13-24	E12.5	BD3IN(2)	B _{d3} , in: B _d @ H = H _{d3} ; blank for Types B, C, E, and F.	
25-36	E12.5	BMIN(2)	B _m , in: B _d @ H = H _m ; $B_m \approx \frac{1}{2}(B_r+B_s)$; blank for Types C, E, and F.	
37-48				
49-60				
61-72				
73-80				80222

Cards 80230, 80231, 80232, ...: Dynamic B(H)-curve parameters.

Card 80230

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	I12	NDYNP(2)	ndynp- Number of dynamic B(H) curves vs. frequency.	
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				80230

Card 80231

1-12	E12.5	FREQ(2,1)	Frequency (in Hz) of 1st point.	
13-24	E12.5	HOBIN(2,1)	H @ B = 0 (in oersted) of 1st point.	
25-36				
37-48				
49-60				
61-72				
73-80				80231

Card 80232

1-12	E12.5	FREQ(2,2)	Frequency (in Hz) of 2nd point.	
13-24	E12.5	HOBIN(2,2)	H @ B = 0 (in oersted) of 2nd point.	
25-36				
37-48				
49-60				
61-72				
73-80				80232

etc.

B. PARAMETER DEVIATION CARDS

Cards S03001, S03011, ... S10010, S10020, ... etc. (1 to 300 cards): Signs of maximum deviation of parameter values.

Enter only if $DMAX > 0$.

Each group of cards follows the last parameter card of the corresponding circuit element. For variable sources and grounded dc voltage sources, the sign card follows the corresponding source data cards. Use 1 for a + sign, blank for no change, and -1 for a -sign. Use different values for deviations other than DMAX percent. Field location corresponds to the location of each parameter in the corresponding input-data card. Specified parameter values will be multiplied by $[1 + (S \cdot DMAX/100)]$ in the corresponding subprogram.

Cards S03001, S03011, S03021, ... (1 to 19 cards): Variable sources and grounded dc sources.

Card S03001: Follows photocurrent cards.

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	F12.0	S1	Sign S of photocurrent.	-1
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				S03001

Card S03011: Follows cards of 1st variable source.

1-12	F12.0	S1	Sign S of 1st variable source.	1
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				S03011

Card S03021: Follows cards of 2nd variable source.

1-12	F12.0	S1	Sign S of 2nd variable source.	
13-24				
25-36				
37-48				
49-60				
61-72				
73-80				S03021

etc.

Cards S10010, S10020, S10030, ... (1 to 20 cards): Current sources and floating voltage sources.
 These cards follow the last source card in the 10000 series.
 Card S10010: 1st current or floating-voltage source.

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	12X			
13-24	12X			
25-36	12X			
37-48	12X			
49-60	F12.0	S1	Sign S of magnitude of a dc source; blank if a variable source.	
61-72	F12.0	S2	Sign S of Rs of a voltage source; blank if current source.	
73-80				S10010

Card S10020: 2nd current or floating-voltage source.

1-12	12X			
13-24	12X			
25-36	12X			
37-48	12X			
49-60	F12.0	S1	Sign S of magnitude of a dc source; blank if a variable source.	
61-72	F12.0	S2	Sign S of Rs of a voltage source; blank if current source.	
73-80				S10020

Card S10030: 3rd current or floating-voltage source.

1-12	12X			
13-24	12X			
25-36	12X			
37-48	12X			
49-60	F12.0	S1	Sign S of magnitude of a dc source; blank if a variable source.	
61-72	F12.0	S2	Sign S of Rs of a voltage source; blank if current source.	
73-80				S10030

etc.

Cards S20010, S20020, S20030, ... (1 to 40 cards): Resistors.

These cards follow the last resistor card in the 20000 series.

Card S20010: 1st resistor, R1.

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	12X			
13-24	12X			
25-36	F12.0	S1	Sign S of resistance R (and R_f , if R varies with time).	-1
37-48				
49-60				
61-72				
73-80				S20010

Card S20020: 2nd resistor, R2.

1-12	12X			
13-24	12X			
25-36	F12.0	S1	Sign S of resistance R (and R_f , if R varies with time).	
37-48				
49-60				
61-72				
73-80				S20020

Card S20030: 3rd resistor, R3.

1-12	12X			
13-24	12X			
25-36	F12.0	S1	Sign S of resistance R (and R_f , if R varies with time).	1
37-48				
49-60				
61-72				
73-80				S20030

etc.

Cards S30010, S30020, S30030, ... (1 to 20 cards): Capacitors.
 These cards follow the last capacitor card in the 30000 series.
 Card S30010: 1st capacitor, C1.

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	12X			
13-24	12X			
25-36	F12.0	S1	Sign S of capacitance C.	
37-48	F12.0	S2	Sign S of series resistance R_C .	-1
49-60	F12.0	S3	Sign S of shunt resistance R_{CSH} .	1
61-72				
73-80				S30010

Card S30020: 2nd capacitor, C2.

1-12	12X			
13-24	12X			
25-36	F12.0	S1	Sign S of capacitance C.	1
37-48	F12.0	S2	Sign S of series resistance R_C .	1
49-60	F12.0	S3	Sign S of shunt resistance R_{CSH} .	-1
61-72				
73-80				S30020

Card S30030: 3rd capacitor, C3.

1-12	12X			
13-24	12X			
25-36	F12.0	S1	Sign S of capacitance C.	-1
37-48	F12.0	S2	Sign S of series resistance R_C .	-1
49-60	F12.0	S3	Sign S of shunt resistance R_{CSH} .	
61-72				
73-80				S30030

etc.

Cards S40010, S40020, S40030, ... (1 to 20 cards): Inductors.

These cards follow the last inductor card in the 40000 series.

Card S40010: 1st inductor, L1.

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	12X			
13-24	12X			
25-36	F12.0	S1	Sign S of Inductance L (or I_0 if L is nonlinear).	1
37-48	F12.0	S2	Sign S of series resistance R_L .	1
49-60	F12.0	S3	Sign S of shunt resistance R_{LSH} .	-1
61-72	F12.0	S4	Sign S of $1/I_{con}$; blank if L is linear.	-1
73-80				S40010

Card S40020: 2nd inductor, L2.

1-12	12X			
13-24	12X			
25-36	F12.0	S1	Sign S of Inductance L (or I_0 if L is nonlinear).	-1
37-48	F12.0	S2	Sign S of series resistance R_L .	-1
49-60	F12.0	S3	Sign S of shunt R_{LSH} .	1
61-72	F12.0	S4	Sign S of $1/I_{con}$; blank if L is linear.	1
73-80				S40020

Card S40030: 3rd inductor, L3.

1-12	12X			
13-24	12X			
25-36	F12.0	S1	Sign S of Inductance L (or I_0 if L is nonlinear).	
37-48	F12.0	S2	Sign S of series resistance R_L .	
49-60	F12.0	S3	Sign S of shunt resistance R_{LSH} .	
61-72	F12.0	S4	Sign S of $1/I_{con}$; blank if L is linear.	
73-80				S40030

etc.

Cards S50010, S50020, S50030, ... (1 to 20 cards): Zener diodes.
 These cards follow the last zener-diode card in the 50000 series.
 Card S50010: 1st zener diode, Z1.

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	12X			
13-24	12X			
25-36	F12.0	S1	Sign S of high zener resistance R_z .	1
37-48	F12.0	S2	Sign S of low back zener resistance R_{zb} .	-1
49-60	F12.0	S3	Sign S of back zener voltage E_{zb} .	-1
61-72				
73-80				S50010

Card S50020: 2nd zener diode, Z2.

1-12	12X			
13-24	12X			
25-36	F12.0	S1	Sign S of high zener resistance R_z .	-1
37-48	F12.0	S2	Sign S of low back zener resistance R_{zb} .	1
49-60	F12.0	S3	Sign S of back zener voltage E_{zb} .	1
61-72				
73-80				S50020

Card S50030: 3rd zener diode, Z3.

1-12	12X			
13-24	12X			
25-36	F12.0	S1	Sign S of high zener resistance R_z .	
37-48	F12.0	S2	Sign S of low back zener resistance R_{zb} .	
49-60	F12.0	S3	Sign S of back zener voltage E_{zb} .	
61-72				
73-80				S50030

etc.

Cards S60011, S60021, S60031, ... (1 to 20 cards): Diodes.
 These cards follow the last diode card in the 60000 series.
 Card S60011: 1st diode, D1.

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	F12.0	S1	Sign S of I _{sd} .	1
13-24	F12.0	S2	Sign S of m _d .	-1
25-36	F12.0	S3	Sign S of R _{ld} .	-1
37-48	F12.0	S4	Sign S of C _{j0d} .	-1
49-60	F12.0	S5	Sign S of V _{pd} .	1
61-72	F12.0	S7	Sign S of T _d .	-1
73-80				S60011

Card S60021: 2nd diode, D2.

1-12	F12.0	S1	Sign S of I _{sd} .	
13-24	F12.0	S2	Sign S of m _d .	
25-36	F12.0	S3	Sign S of R _{ld} .	
37-48	F12.0	S4	Sign S of C _{j0d} .	
49-60	F12.0	S5	Sign S of V _{pd} .	
61-72	F12.0	S7	Sign S of T _d .	
73-80				S60021

Card S60031: 3rd diode, D3.

1-12	F12.0	S1	Sign S of I _{sd} .	
13-24	F12.0	S2	Sign S of m _d .	
25-36	F12.0	S3	Sign S of R _{ld} .	
37-48	F12.0	S4	Sign S of C _{j0d} .	
49-60	F12.0	S5	Sign S of V _{pd} .	
61-72	F12.0	S7	Sign S of T _d .	
73-80				S60031

etc.

Cards S70011, S70012, S70013, S70021, ... (3 to 60 cards): Transistors.

These cards follow the last transistor card in the 70000 series.

Cards S70011, S70012, and S70013: 1st transistor, T1.

Card S70011

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	F12.0	ESSES(1)	Sign S of β_n .	1
13-24	F12.0	ESSES(2)	Sign S of β_i .	-1
25-36	F12.0	ESSES(3)	Sign S of T_e .	1
37-48	F12.0	ESSES(4)	Sign S of T_c .	-1
49-60	F12.0	ESSES(5)	Sign S of I_{sc} .	1
61-72	F12.0	ESSES(6)	Sign S of m_c .	-1
73-80				S70011

Card S70012

1-12	F12.0	ESSES(7)	Sign S of C_{j0c} .	-1
13-24	F12.0	ESSES(8)	Sign S of V_{gc} .	-1
25-36	F12.0	ESSES(9)	Sign S of R_{lc} .	-1
37-48	F12.0	ESSES(10)	Sign S of I_{se} .	-1
49-60	F12.0	ESSES(11)	Sign S of m_e .	1
61-72	F12.0	ESSES(12)	Sign S of C_{j0e} .	-1
73-80				S70012

Card S70013

1-12	F12.0	ESSES(13)	Sign S of V_{ge} .	1
13-24	F12.0	ESSES(14)	Sign S of R_{le} .	-1
25-36				
37-48				
49-60				
61-72				
73-80				S70013

Cards S70021, S70022, and S70023: 2nd transistor, T2.
 Card S70021

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	F12.0	ESSES(1)	Sign S of β_n .	
13-24	F12.0	ESSES(2)	Sign S of β_i .	
25-36	F12.0	ESSES(3)	Sign S of T_e .	
37-48	F12.0	ESSES(4)	Sign S of T_c .	
49-60	F12.0	ESSES(5)	Sign S of I_{sc} .	
61-72	F12.0	ESSES(6)	Sign S of m_c .	
73-80				S70021

Card S70022

1-12				
13-24	F12.0	ESSES(7)	Sign S of C_{j0c} .	
25-36	F12.0	ESSES(8)	Sign S of V_{gc} .	
37-48	F12.0	ESSES(9)	Sign S of R_{lc} .	
49-60	F12.0	ESSES(10)	Sign S of I_{se} .	
61-72	F12.0	ESSES(11)	Sign S of m_e .	
73-80		ESSES(12)	Sign S of C_{j0e} .	S70022

Card S70023

1-12	F12.0	ESSES(13)	Sign S of V_{ge} .	
13-24	F12.0	ESSES(14)	Sign S of R_{le} .	
25-36				
37-48				
49-60				
61-72				
73-80				S70023

etc.

(1) $\phi_d(F)$ and $\phi_p(F)$ Input Core Parameters (PARIN = PHIF or blank).

Cards S80120 through S80124, S80224, ... (5 to 100 cards): Magnetic cores.

These cards follow the last core card in the 80000 series.

Cards S80120 through S80124: 1st magnetic core, Core 1.

Card S80120

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	F12.0	ESSES(1)	Sign S of outside diameter.	
13-24	F12.0	ESSES(2)	Sign S of inside diameter.	
25-36	F12.0	ESSES(3)	Sign S of saturation flux ϕ_s .	
37-48	F12.0	ESSES(4)	Sign S of maximum remanent flux ϕ_r .	
49-60				
61-72				
73-80				S80120

Card S80121

1-12	F12.0	ESSES(5)	Sign S of threshold mmf F_{d1} ; blank for Type D.	
13-24	F12.0	ESSES(6)	Sign S of F_{dz} ; blank for Types A, D, and E.	
25-36	F12.0	ESSES(7)	Sign S of F_{d2} ; blank for Types A, D, and E.	
37-48	F12.0	ESSES(8)	Sign S of F_{d3} ; blank for Types B, D, and F.	
49-60	F12.0	ESSES(9)	Sign S of ϕ_{d2} ; blank for Types A, D, E, and F.	
61-72				
73-80				S80121

Card S80122

1-12	F12.0	ESSES(10)	Sign S of H_a .	
13-24	F12.0	ESSES(11)	Sign S of H_q ; blank for Types C, E, and F.	
25-36	F12.0	ESSES(12)	Sign S of H_n ; blank for Types C, E, and F.	
37-48				
49-60				
61-72				
73-80				S80122

Card S80123

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	F12.0	ESSES(13)	Sign S of λ_d .	-1
13-24	F12.0	ESSES(14)	Sign S of ν_d .	-1
25-36	F12.0	ESSES(15)	Sign S of F_{dB} .	1
37-48	F12.0	ESSES(16)	Sign S of F_0 .	1
49-60	F12.0	ESSES(17)	Sign S of λ .	-1
61-72	F12.0	ESSES(18)	Sign S of ν .	-1
73-80				S80123

Card S80124

1-12	F12.0	ESSES(19)	Sign S of F_B .	1
13-24	F12.0	ESSES(20)	Sign S of F_0 .	1
25-36	F12.0	ESSES(21)	Sign S of p .	-1
37-48	F12.0	ESSES(22)	Sign S of F_{B1} ; blank if no Region 5.	
49-60	F12.0	ESSES(23)	Sign S of F_{01} ; blank if no Region 5.	
61-72	F12.0	ESSES(24)	Sign S of λ_{p1} ; blank if no Region 5.	
73-80				S80124

Cards S80220 through S80224: 2nd magnetic core, Core 2.

Card S80220

1-12	F12.0	ESSES(1)	Sign S of outside diameter.	1
13-24	F12.0	ESSES(2)	Sign S of inside diameter.	1
25-36	F12.0	ESSES(3)	Sign S of saturation flux ϕ_s .	-1
37-48	F12.0	ESSES(4)	Sign S of maximum remanent flux ϕ_r .	-1
49-60				
61-72				
73-80				S80220

etc.

(2) Static and Dynamic B(H)-Loop Input Core Parameters (PARIN = BH)
 Cards S80120 through S80122, S80130, S80220 through S80222, S80230, ... : Magnetic cores.

These cards follow the last core card in the 80000 series.

Cards S80120 through S80122, S80130: 1st magnetic core, Core 1.

Card S80120

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	F12.0	ESSES(1)	Sign S of outside diameter.	
13-24	F12.0	ESSES(2)	Sign S of inside diameter.	
25-36	F12.0	ESSES(3)	Sign S of effective cross-sectional area.	
37-48	F12.0	ESSES(4)	Sign S of maximum remanent flux density B_r .	
49-60				
61-72				
73-80				S80120

Card S80121

1-12	F12.0	ESSES(5)	Sign S of threshold H_{d1} ; blank for Type D.	
13-24	F12.0	ESSES(6)	Sign S of H_{d2} ; blank for Types A, D, and E.	
25-36	F12.0	ESSES(7)	Sign S of H_{d3} ; blank for Types A, D, and E.	
37-48	F12.0	ESSES(8)	Sign S of H_{d3} ; blank for Types B and F.	
49-60	F12.0	ESSES(9)	Sign S of H_m ; blank for Types C, E, and F.	
61-72				
73-80				S80121

Card S80122

1-12	F12.0	ESSES(10)	Sign S of B_{d2} ; blank for Types A, D, E, and F.	
13-24	F12.0	ESSES(11)	Sign S of B_{d3} ; blank for Types B, C, E, and F.	
25-36	F12.0	ESSES(12)	Sign S of B_m ; blank for Types C, E, and F.	
37-48				
49-60				
61-72				
73-80				S80122

Card S80130

COLUMNS	FORMAT	PROGRAM NAME	DESCRIPTION	EXAMPLE
1-12	12X			
13-24	F12.0	ESSES(13)	Sign S of values of $H @ B = 0$ for all frequencies.	1
25-36				
37-48				
49-60				
61-72				
73-80				S80130

Cards S80220 through S80222, S80230: 2nd magnetic core, Core 2.

Card S80220

1-12	F12.0	ESSES(1)	Sign S of outside diameter.	1
13-24	F12.0	ESSES(2)	Sign S of inside diameter.	1
25-36	F12.0	ESSES(3)	Sign S of effective cross-sectional area.	1
37-48	F12.0	ESSES(4)	Sign S of maximum remanent flux density B_r .	1
49-60				
61-72				
73-80				S80220

Card S80221

1-12	F12.0	ESSES(5)	Sign S of threshold H_{d1} ; blank for Type D.	1
13-24	F12.0	ESSES(6)	Sign S of H_{d2} ; blank for Types A, D, and E.	1
25-36	F12.0	ESSES(7)	Sign S of H_{d2} ; blank for Types A, D, and E.	1
37-48	F12.0	ESSES(8)	Sign S of H_{d3} ; blank for Types B and F.	1
49-60	F12.0	ESSES(9)	Sign S of H_m ; blank for Types C, E, and F.	1
61-72				
73-80				S80221

etc.

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II GLOSSARY OF VARIABLES AND PROGRAM LISTING

A. Glossary of Variables

The glossary of the variables in the MTRAC program is divided into two parts, one listing the COMMON variables and the other listing the local variables. Each list is presented alphabetically. Array sizes are indicated by numbers in parentheses.

1. MTRAC's COMMON Variables

AAAA(10)	Alphanumeric names of unknowns to be plotted and/or print-plotted.
ABC	Convergence indicator: 0 - convergence achieved; 1 - convergence not achieved yet; -3 - convergence not achieved in ITHMAX iterations.
ABSER	Largest absolute error allowed in the solution of initial conditions.
ABSERR	Largest absolute error allowed in the transient solution of core-winding currents.
ABTEMP	Absolute temperature (degrees Kelvin).
AF(20)	α_n of a transistor.
AR(20)	α_i of a transistor.
BCDT	Name for X-axis in plot.
BCDT1	Name for Y-axis in plot.
BCI(20)	Base-collector current, $i_{fc<-1>}$.
BCR(20)	Slope of i_{fc} vs. V_c at the previous iteration, $(i_{fc<-1>} + I_{sc})/\theta_{mc}$.
BCV(20)	Base-collector voltage, $V_c<-1>$.
BEI(20)	Base-emitter current, $i_{fe<-1>}$.
BER(20)	Slope of i_{fe} vs. V_e at the previous iteration, $(i_{fe<-1>} + I_{se})/\theta_{me}$.
BEV(20)	Base-emitter voltage, $V_e<-1>$.
BVAL(6,6)	Boundary value specified for normal termination.

BVALF(6,6)	Boundary value specified for circuit-failure termination.
CAPC(20)	Capacitance of a capacitor.
CC1(20)	$c_{1c} = 0.9 V_{\phi c}$ of a transistor.
CC2(20)	$c_{2c} = 1/\theta_{mc} = 11,590/(T_{mc})$ of a transistor.
CC3(20)	$c_{3c} = 1/R_{\ell c}$ of a transistor.
CC4(20)	$c_{4c} = 1/V_{\phi c}$ of a transistor.
CDT1(20)	$d_{11c} = T_c/\Delta t$ of a transistor.
CDT2(20)	$d_{12c} = 1 + (T_c/\Delta t)$ of a transistor.
CDT3(20)	$d_{13c} = C_{j0c}/\Delta t$ of a transistor.
CIBASE(20)	Base current.
CIC(20)	Capacitor current.
CICOLC(20)	Collector current of a transistor.
CICORE(20,10)	Core-winding current.
CICOR1(20,10)	Core-winding current at the previous Δt .
CIDIOD(20)	Diode current.
CIEMTR(20)	Emitter current of a transistor.
CIIVS(20)	Current through a current source or a voltage source.
CIL(20)	Inductor current.
CIR(40)	Resistor current.
CIZ(20)	Zener-diode current.
CT(11,2)	CT(J,1)-maximum Δt for the Jth period; CT(J,2)-termination time of the Jth period.
C1(20)	$c_1 = 0.9 V_{\phi d}$ of a diode.
C2(20)	$c_2 = 1/\theta_{md} = 11,590/(T_{md})$ of a diode.
C3(20)	$c_3 = 1/R_{\ell d}$ of a diode.
C4(20)	$c_4 = 1/V_{\phi d}$ of a diode.
DELT	Time step, Δt .
D1(20)	Diode current, $i_{fd<-1>}$.
DMAX	Maximum deviation (in percent) of parameter values.
DR(20)	Slope of i_{fd} vs. V_d at the previous iteration, $(i_{fd<-1>} + I_{sd})/\theta_{md}$.
DTM1	$\Delta t_{(-1)}$.

DTM2	$\Delta t_{(-2)}$
DT1(20)	$d_{t1} = T_d/\Delta t$ of a diode.
DT2(20)	$d_{t2} = 1 + (T_d/\Delta t)$ of a diode.
DT3(20)	$d_{t3} = C_{j0d}/\Delta t$ of a diode.
DV(20)	$V_{d(-1)}$ of a diode.
E(19,16,2)	Data of the J th time-variable source at the L th break point; $E(J,L,1)$ = Source magnitude; $E(J,L,2)$ = Break-point time. $J = 1$ for photo current; $J = K + 1$ for K th source.
EC1(20)	$c_{1e} = 0.9 V_{\phi e}$ of a transistor.
EC2(20)	$c_{2e} = 1/\theta_{ne} = 11,590/(Tm_e)$ of a transistor.
EC3(20)	$c_{3e} = 1/R_{\chi e}$ of a transistor.
EC4(20)	$c_{4e} = 1/V_{\phi e}$ of a transistor.
EDT1(20)	$d_{t1e} = T_e/\Delta t$ of a transistor.
EDT2(20)	$d_{t2e} = 1 + (T_e/\Delta t)$ of a transistor.
EDT3(20)	$d_{t3e} = C_{j0e}/\Delta t$ of a transistor.
EI(20)	Present value of a time-variable source.
EP1(20)	Value of a time-variable source at the previous Δt .
EZB(20)	Extrapolated back zener voltage E_{zb} .
E2(19)	Present slope of a time-variable source.
F(20)	MMF of a core.
FB(20)	F_B of a core.
FB1(20)	F_{B1} of a core.
FDB(20)	F_{dB} of a core.
FDZ(20)	F_{dz} of a core.
FD1(20)	Threshold F_{d1} of a core.
FD2(20)	F_{d2} of a core.
FD3(20)	F_{d3} of a core.
FD4(20)	F_{d4} of a core.
FM1(20)	$F_{(-1)}$ of a core.
FM2(20)	$F_{(-2)}$ of a core.
FM3(20)	$F_{(-3)}$ of a core.

F0(20)	F_0 of a core.
F0PP(20)	F_0'' of a core.
F01(20)	F_{01} of a core.
H(60,60)	Conductance matrix of the circuit.
IAC(6)	Number of AND conditions of a normal-termination statement.
IACF(6)	Number of AND conditions of a circuit-failure-termination statement.
IBC	Control set in Subroutine ELEM: 0 - fill H and T arrays [Part (1)]; 1 - compute currents and test convergence [Part (2)].
ICS(6,6)	Indicator of normal-termination condition: 1 if $V() \leq$; 2 if $V() >$; -1 if $ V() \leq$; -2 if $ V() >$.
ICSF(6,6)	Indicator of circuit-failure-termination condition: 1 if $V() \leq$; 2 if $V() >$; -1 if $ V() \leq$; -2 if $ V() >$.
IGRAPH	Count of graphs plotted.
INCIL(20)	1 - initial inductor current $CIL(N) = CIL0$ regardless of NSVVAR or NSVIL; 0 - otherwise.
INDL(20)	Inductance of an inductor.
IOC	Number of OR statements describing normal-termination conditions.
IOCF	Number of OR statements describing circuit-failure-termination conditions.
IPX	Number of points to be plotted per frame.
ITRMAX	Maximum number of iterations above which variable values are reset and Δt is divided by 4.
ITRTST	Number of iterations below which Δt is multiplied by 2 (if not exceeding T1) and above which Δt is divided by 2.
IX(5)	Index number of a break point for a time-variable resistor.
JCAT	Index number of a period for which Δt_{max} is specified.
JG(19)	Index number of a variable-source mode.
JKKJ	Solution of initial conditions: 0 - converged; 1 - did not converge.
JKLJ	Number of initial-condition iterations.

JSJ Control indicator: 0 - initially; 1 - prior to call on Subroutine INTIAL; -1 - throughout the transient solution.

JV Present number of stored plot points.

KCAP(20) Capacitor nodal voltages indicator: 1 - unknown; 2 - $V_b = V_{sb}$; 3 - $V_a = V_{sa}$.

KCORE(20,10) Core-winding nodal voltages indicator: 1 - unknown; 2 - $V_b = V_{sb}$; 3 - $V_a = V_{sa}$.

KDIOD(20) Diode nodal voltages indicator: 1 - unknown; 2 - $V_b = V_{sb}$; 3 - $V_a = V_{sa}$.

KFAIL Number of variable resettings with no convergence before ITRMAX is changed.

KFMAX Maximum number of trials before ITRMAX is changed (doubled if KFAIL = KFMAX; halved if KONVRG = KFMAX).

KIND(20) Inductor nodal voltages indicator: 1 - unknown; 2 - $V_b = V_{sb}$; 3 - $V_a = V_{sa}$.

KIVS(20) Indicator of nodal voltages of current and voltage sources: 1 - unknown; 2 - $V_b = V_{sb}$; 3 - $V_a = V_{sa}$.

KONT 1 - continued run; 0 - otherwise.

KONVRG Count of successive time-step solutions (each with less than ITRTST iterations).

KPFIT Dependency of scales and boundaries of plot frames on those of first frame: 0 - independent; 1 - X independent; Y fixed by first frame; 2 - fixed by first frame except for independent X boundaries; 3 - fixed by first frame.

KPLOT 1 - plot at the end of present mode; 0 - otherwise.

KPRPLT 1 - print-plot at the end of present mode; 0 - otherwise (KPRPLT is set to 1 if $JV > IPX$ or $CPTIME > TLIMIT$ or $NAW > 5$).

KPUNCH Set to 1 when the processor time of a mode run exceeds the time limit, in order to punch cards for a continued run; 0 - otherwise.

KRES(40) Resistor nodal voltages indicator: 1 - unknown; 2 - $V_b = V_{sb}$; 3 - $V_a = V_{sa}$.

KTRAN(20) Transistor nodal voltages indicator: 1 - unknown; 2 - $V_b = V_{sb}$; 3 - $V_c = V_{sc}$; 4 - $V_e = V_{se}$.

KXT 1 - if PLAPR(KEND) has been called with KEND = 0; 0 - otherwise.

KZEN(20) Zener-diode nodal voltages indicator: 1 - unknown;
 2 - $V_b = V_{sb}$; 3 - $V_a = V_{sa}$.

K1CAP(20) Index number of Terminal a of a capacitor.

K1CORE(20,10) Index number of Terminal a of a core winding.

K1DIOD(20) Index number of Terminal a of a diode.

K1IND(20) Index number of Terminal a of an inductor.

K1IVS(20) Index number of Terminal a of a current or voltage source.

K1RES(40) Index number of Terminal a of a resistor.

K1TRAN(20) Transistor type: 0 - npn; 1 - pnp.

K1ZEN(20) Index number of Terminal a of a zener diode.

K2CAP(20) Index number of Terminal b of a capacitor.

K2CORE(20,10) Index number of Terminal b of a core winding.

K2DIOD(20) Index number of Terminal b of a diode.

K2IND(20) Index number of Terminal b of an inductor.

K2IVS(20) Index number of Terminal b of a current or voltage source.

K2RES(40) Index number of Terminal b of a resistor.

K2TRAN(20) Index number of Terminal B (Base) of a transistor.

K2ZEN(20) Index number of Terminal b of a zener diode.

K3IVS(20) Index number of a time-variable source (0 if dc).

K3TRAN(20) Index number of Terminal C (Collector) of a transistor.

K4IVS(20) Type of a variable source: 1 - current; 0 - voltage.

K4TRAN(20) Index number of Terminal E (Emitter) of a transistor.

LASTIC 1 - elastic ϕ is included; 0 - elastic ϕ is neglected.

MAXMIN Initial (lowest) maximum number of iterations above
 which the variable values are reset and Δt is divided
 by 4.

MONC Logical control of MONITOR print-out in Subroutine CAP.

MONCOR Logical control of MONITOR print-out in Subroutines
 RWCORF, RWCORH, and CORE.

MOND Logical control of MONITOR print-out in Subroutine DIODE.

MONELM Logical control of MONITOR print-out in Subroutine ELEM.

MONIV Logical control of MONITOR print-out in Subroutine IVS.

MONL	Logical control of MONITOR print-out in Subroutines RWIND and IND.
MONMA	Logical control of MONITOR print-out in the main program and Subroutines RWRUNC and INTIAL..
MONR	Logical control of MONITOR print-out in Subroutine RES.
MONS	Logical control of MONITOR print-out in Subroutine AUX(K).
MONT	Logical control of MONITOR print-out in Subroutines RWTRAN and TRAN.
MONTOR	Logical indicator of whether or not $NDTMIN < NEDEL \leq NDTMAX$.
MONZEN	Logical control of MONITOR print-out in Subroutine ZEN.
MVALUE(14)	Logical control values specifying in which subprograms MONITOR print-out will be executed if $NDTMIN < NDEL \leq NDTMAX$.
NAW	Number of times variables have been reset and Δt divided by 4 due to convergence failure. For each Δt , if $NAW = 0$ at the first iteration, then $NAW = 1$ in the following iterations until convergence is achieved.
NB	Ratio of computed points to plotted points.
NBB	Ratio of plotted points to printed points.
NC	Number of capacitors.
NCORE	Number of cores.
ND	Number of variable sources.
NDEL	Index number of the current time step, Δt .
NDIODE	Number of diodes.
NDTMAX	Value of NDEL beyond which MONITOR print-out stops.
NDTMIN	Value of NDEL before MONITOR print-out starts.
ND1	ND-1.
NG	Initial variable values: -1 - compute; 0 - zero; 1 - read in.
NITER	Iteration count during a given time step.
NITRSM	Total count of transient-solution iterations.
NIV	Number of current or voltage sources.
NL	Number of inductors.

NOEXIT	Control indicator: 1 - until inelastic flux switching begins, thus preventing stop-switching exit; 0 - otherwise.
NOVAR(6,6)	Index number of a variable whose value is tested in a condition for normal termination.
NOVARF(6,6)	Index number of a variable whose value is tested in a condition for circuit-failure termination.
NP(20,10)	Number of identically switching cores in parallel represented by a single core across a given winding.
NPLTVT	Number of variables to be plotted.
NPLTVV	Number of variable-vs.-variable plots.
NPP(10)	Index numbers of variables to be plotted (if negative, then no V-vs.-t plot).
NP1(10,2)	Index numbers of variables plotted vs. each other: NP1(J,1) for V_x ; NP1(J,2) for V_y .
NR	Number of resistors.
NRP(40)	Number of break points if R varies with time.
NS(20,10)	Number of identically switching cores in series represented by a single core across a given winding.
NSVIL	Indicates whether the present mode will initially retain the inductor currents of the previous mode: 1 - yes; 0 - no.
NSVPHI	Indicates whether the present mode will initially retain all magnetic flux values of the previous mode: 1 - yes; 0 - no.
NSVVAR	Indicates whether the present mode will initially retain all the final time variables of the previous mode: 1 - yes; 0 - no.
NTRANS	Number of transistors.
NV	Number of unknown nodal voltages in the circuit.
NW(20)	Number of windings of a core.
NZ	Total number of unknown nodal voltages and auxiliary unknowns.
NZEN	Number of zener diodes.
N1B	1 - include phase-plane plots; 0 - otherwise.
N3B	-1 - solve initial conditions only; 0 - halt if error in initial condition solution; 1 - print if error in initial condition solution but proceed with transient solution.

PDTEM1(20)	$\dot{\phi}_{\epsilon(-1)}$ of a core.
PHDTE(20)	$\dot{\phi}_{\epsilon}$ of a core.
PHDTM1(20)	$\dot{\phi}_{(-1)}$ of a core.
PHDTM2(20)	$\dot{\phi}_{(-2)}$ of a core.
PHI(20)	ϕ of a core.
PHID(20)	ϕ_d of a core.
PHIDOT(20)	$\dot{\phi}$ of a core.
PHIM1(20)	$\phi_{(-1)}$ of a core.
PHIM2(20)	$\phi_{(-2)}$ of a core.
PHIM3(20)	$\phi_{(-3)}$ of a core.
PHIR(20)	ϕ_r of a core.
PHIS(20)	ϕ_s of a core.
PHI0(20)	Initial ϕ of a core.
PPIC(20)	Collector-base photocurrent.
PPIC1(20)	Collector-base photocurrent at the previous time step.
PPID(20)	Diode photocurrent.
PPID1(20)	Diode photocurrent at the previous time step.
PPIE(20)	Emitter-base photocurrent.
PPIE1(20)	Emitter-base photocurrent at the previous time step.
PRSYMB	A printer symbol used to print-plot specified output.
PSTEP	Weight of previous-iteration results on computed winding current of a core.
PWCR(20)	Dissipated power in a diode.
PWTR(20)	Dissipated power in a transistor.
P1(20)	Auxiliary core parameter p_1 .
P2(20)	Auxiliary core parameter p_2 .
P3(20)	Auxiliary core parameter p_3 .
P4(20)	Auxiliary core parameter p_4 .
P5(20)	Auxiliary core parameter p_5 .
P6(20)	Auxiliary core parameter p_6 .
P7(20)	Auxiliary core parameter p_7 .

P8(20)	Auxiliary core parameter p_8 .
P9(20)	Auxiliary core parameter p_9 .
P10(20)	Auxiliary core parameter p_{10} .
P11(20)	Auxiliary core parameter p_{11} .
P12(20)	Auxiliary core parameter p_{12} .
P13(20)	Auxiliary core parameter p_{13} .
P14(20)	Auxiliary core parameter p_{14} .
P15(20)	Auxiliary core parameter p_{15} .
P16(20)	Auxiliary core parameter p_{16} .
P17(20)	Auxiliary core parameter p_{17} .
P18(20)	Auxiliary core parameter p_{18} .
P19(20)	Auxiliary core parameter p_{19} .
P20(20)	Auxiliary core parameter p_{20} .
QCR(20,7)	Diode parameters: I_{sd} , m_d , $R_{\ell d}$, C_{j0d} , $V_{\phi d}$, I_{pp} , T_d .
QTAN(20,16)	Transistor parameters: β_n , β_i , T_e , T_c , I_{sc} , m_c , C_{j0c} , $V_{\phi c}$, $R_{\ell c}$, I_{sc} , m_c , C_{j0c} , $V_{\phi c}$, $R_{\ell c}$, I_{ppc} , I_{ppe} .
R(40)	Resistance of a resistor.
RC(20)	Series resistance of a capacitor.
RCSH(20)	Shunt resistance of a capacitor.
RELER	Relative error allowed in a solution of initial conditions.
RELERR	Relative error allowed in a transient solution of core-winding currents.
RF(5,5)	R_f of a resistor whose resistance varies with time.
RL(20)	Series resistance of an inductor.
RLSH(20)	Shunt resistance of an inductor.
RMAG	I_{pp} scale factor = E(1,1,2).
RNUDT	Number of Δt 's above which STSWEX is effective.
ROP(20)	ρ_p of a core.
ROP1(20)	ρ_{p1} of a core.
RVS(20)	Series resistance of a voltage source.
RW(20,10)	Resistance of a core winding.

RZ(20)	High resistance R_z of a zener diode.
RZB(20)	Low back resistance R_{zb} of a zener diode.
S(20)	Inductance value of an inductor.
SAVEXL(10,3)	Values of XL in the previous call on plot routines.
SAVEXR(10,3)	Values of XR in the previous call on plot routines.
SAVEYB(10,3)	Values of YB in the previous call on plot routines.
SAVEYT(10,3)	Values of YT in the previous call on plot routines.
ST(19,2)	Variable-source data. ST(J,1) = NI = number of break points (1 if dc); ST(J,2) indicates type: -1 - dc; 0 - hold last value; 1 - cycle.
STARTS	Central processor time at the beginning of each mode run.
STSWEX	1 - terminate mode run if flux switching of all cores is completed and $t > \text{NUDT} \cdot \Delta t$; 0 - otherwise.
T(60)	Current matrix of a circuit.
TE	Time.
TF(354)	Storage of the X-axis values (usually time) for plotting.
TFR(5,5)	t_f of a resistor whose resistance varies with time.
TI	Maximum Δt , CT(JCAT,1).
TIMEIN	Time at the beginning of a mode (used to prevent stop-switching exit if $\text{TE} < \text{TIMEIN} + \text{NUDT} \cdot \text{DELT}$).
TITLE(12)	Circuit name, saved for plot labeling.
TLIMIT	Maximum central processor time of a mode run before results are print-plotted, continued-run cards are punched, and the run terminates.
TOO(19)	Overall time of previously completed cycles.
TOOLD	Value of Δt at the last time Δt -dependent diode terms were set.
TO1	Previous Δt ; controls tasks in Subroutine ELEM: > 0 - Part (1), to fill H and T arrays; < 0 - Part (2), to compute currents and test convergence.
TTOOLD	Value of Δt at the last time Δt -dependent transistor terms were set.
V(70)	Unknown nodal voltages and auxiliary unknowns.
VI(20)	Magnitude of a dc source in Subroutines RWIVS and IVS.

VICON(20)	$1/I_{con}$ of a nonlinear inductor (zero for a linear inductor).
VP(10,350)	Values of variables stored for plotting.
VZB(20)	Reverse boundary-value V_{zb} of a zener diode.
VZF(20)	Forward boundary-value V_{zf} of a zener diode.
V1(70)	$V_{(-1)}$.
V2(70)	$V_{(-2)}$.
WSQSOL	Logical control of MONITOR print-out in Subroutine SEQSOL.
XL	X value of the leftmost plotted point.
XLAMDA(20)	λ of a core.
XLEFT(20)	Left boundary of plot frame (in mks units).
XLMDAD(20)	λ_d of a core.
XNT(20,10)	Number of turns in a core winding.
XNU(20)	ν of a core.
XNUD(20)	ν_d of a core.
XP(713)	Y values for points to be plotted; set up in Subroutine PLAPR from Array VP(10,350).
XR	X value of the rightmost plotted point.
XRES(5,5)	Exponent p of a resistor whose resistance varies with time.
XRIGHT(20)	Right boundary of plot frame (in mks units).
XSCALE(20)	Scale of X variable (in mks units/inch).
XUNIT(2,20)	Units of the X variable.
YB	Y value of next to the bottom-most plot point.
YBOTTM(20)	Bottom boundary of plot frame (in mks units)
YSCALE(20)	Scale of Y variable (in mks units/inch).
YT	Y value of the next-to-the-topmost plot point.
YTOP(20)	Top boundary of plot frame (in mks units).
YUNIT(2,20)	Units of Y variable.
ZV(20)	Negligible ϕ value of a core.

2. MTRAC's Local Variables

The following local variables have the same meaning in several READ-WRITE and computation circuit-element subroutines:

CC	Carriage control character for printing: blank - single space; 0 - double space.
F1	Type of Terminal <i>a</i> : blank - floating; S - Source, G - Ground.
F3	Alphanumeric blank = 6Hbbbbbb, where b represents a blank.
KO	Temporary storage for K(N): 1 - V_a and V_b are unknown; 2 - $V_a = V_{sa}$; 3 - $V_b = V_{sb}$.
KO1	Temporary storage for the index number of Terminal <i>a</i> (also Terminal <i>B</i> of a transistor base).
KO2	Temporary storage for the index number of Terminal <i>b</i> (also Terminal <i>C</i> of a transistor collector).
N	Index number of a circuit element.
R2	Type of Terminal <i>b</i> : blank - floating; S - Source; G - Ground.

The glossary of local variables is given as follows for each sub-program separately.

(1) Main Program

DTIM	Length of a cycle of a mode time (value of CT(J-1,2) when CT(J,1) < 0).
ERR	Parameter of Subroutine SEQSQL which indicates a singular matrix if ERR ≠ 0.
FETCH(2)	Storage for name of MTRAC segment in memory.
GENDA1	Alphanumeric "PLOTS" (segment name).
GETOFF	Logical indicator which is set to TRUE if the run should terminate after plotting.
JH	Index number of the previous break point of a variable source [= JG(J)].
JJ	Index of inner loop during which one Δt solution is obtained. The loop will repeat NB times for each plot point.
JJJ	Index of outer loop during which NB plot values are stored. The loop will repeat NBB times for each print-out point.

KDTIM 0 - until end of first cycle; 1 - otherwise.

KNL Total number of nonlinear circuit elements = $2 \cdot \text{NTRANS} + \text{NDIODE} + \sum_{i=1}^{\text{NCORE}} \text{NW}(i)$.

LABEL A temporary storage value for monitoring.

NI Number of break points of a variable source.

RWCOR1 Alphanumeric "RWCORS" (Segment name).

RWELM1 Alphanumeric "RWDATA" (Segment name).

SOFAR A temporary storage logical variable.

SOLVE1 Alphanumeric "SOLVE" (Segment name).

TEMP Temporary storage.

TERMNT A temporary storage logical variable.

TE1 Difference between t and the next break-point time of a variable source (negative, except when starting a new mode).

TOK Difference between t and the beginning time of a Δt -specification period, used to adjust t and Δt before starting a new period.

T1 Difference between t and the next break-point time of a variable source.

(2) Subroutine HOLLER(,)

No special local variables.

(3) Subroutine RWRUNC

A1 Alphanumeric for termination conditions: A - Absolute value; otherwise - algebraic value.

A2 Alphanumeric for termination conditions: G - >; otherwise - ≤.

CKT Alphanumeric name (up to 6 characters) of a circuit or a circuit mode.

HOL Alphanumeric blank = 1Hb, where b represents a blank.

HOLABS Alphanumeric "ABC" = 3HABC.

HOLBLN Alphanumeric triple blank = 3Hbbb, where b represents a blank.

HOLGT Alphanumeric "GT" = 2HGT.

HOLLA Alphanumeric "A" = 1HA.
 HOLLE Alphanumeric "LE" = 2HLE.
 HOLLG Alphanumeric "G" = 1HG.
 HOLL0 Alphanumeric zero = 1H0.
 LIMITT Processor time limit (in seconds).
 NAUX Number of auxiliary variables ($NZ = NV + NAUX$).
 NDTSPC Number of Δt -specification periods.
 NI Number of break points of a variable source.
 NI2 Indicator for variable sources: -1 - dc; 0 - hold
 last value; 1 - cycle.
 Q1 Name of the X variable in plot.
 Q2 Name of the Y variable in plot.
 SCALE Plot scales: 1 - specified by the user; 0 - determined
 on the basis of extreme values.
 SOFAR Logical variable used to decide whether the user is
 using any monitoring.
 S1 Sign of worst-case deviation of values of a variable
 source.

(4) Subroutine PLAPR()

I1 Subscript number of V() plotted as the Y value in a
 V-vs.-V plot.
 I2 Subscript number of V() plotted as the X value in a
 V-vs.-V plot.
 JVV JV-2, the number of values in the phase-plane plot.
 JV1 Subscript number of the V value being plotted vs. time.
 KEND -1 means plotting only, +1 means punch continued-run
 cards and plot, 0 means do entire subroutine.
 SKIPFR Logical variable which is TRUE if SKIPIT is TRUE and
 KPFIT = 2.
 SKIPIT Logical variable which is TRUE if the number of plotted
 points exceeds IPX, KPFIT > 0, and KONT = 0.
 SKIPX Logical variable which is TRUE if SKIPIT is TRUE and
 KPFIT = 1.
 SKIPXY Logical variable which is TRUE if SKIPIT is TRUE and
 KPFIT = 3.

TFJV	Recent time stored, TF(JV).
XLP	Smallest X value of a set of plot points.
XRP	Largest X value of a set of plot points.
YBP	Smallest Y value of a set of plot points (YB is the next-to-the-smallest value).
YTP	Largest Y value of a set of plot points (YT is the next-to-the-largest value).

(5) Subroutine PRPLT(, , ,)

AASS	Symbol used for data points in print plot (set equal to PRSYMB).
ABLANK	Hollerith character blank - 1Hb, where b represents a blank.
ADOT	Hollerith character dot or period = 1H..
APLUS	Hollerith character "+" = 1H+; used in print-plot for those points which represent two or more data values.
C	Floating-point value corresponding to index of location in array G.
CSX	Scale for X-axis.
CSY	Scale for Y-axis.
DC	Value of a tic mark on the Y-axis.
G(81,4)	Storage for symbols to be print-plotted.
ID	Subscript number of the V value being plotted as the Y value.
II	Intermediate value in converting floating X value into column index.
IG	Index number of a value in the array X.
IL	Either zero or, in a V-vs.-V plot, the subscript number of the V value being plotted as the X value.
JI	Intermediate value in converting floating Y value into row index.
KI	Counter (0,1,2,3,4,5) used to indicate a line of the print-plot on which a Y-axis tic mark will occur and whose Y value will be printed.
NLC	-1 for V-vs.-t plot; 0 for phase-plane plot; +1 for V-vs.-V plot.
NN	Number of values to be plotted.

SX	Range of X values.
SY	Range of Y values.
TT	Inverse of scaling factor (temporary storage).
TX	$\text{Log}_{10} (SX/7) + 1000$, used to determine appropriate X -scaling.
TY	$\text{Log}_{10} (SY/7) + 1000$, used to determine appropriate Y -scaling.
X(14)	Array for storing the values represented by the tic marks on the X -axis.
Z	Fractional portion of TX or TY.

(6) Subroutine PLT(, , ,)*

BOTTOM	Y value of bottom of frame.
FIXX	Scale for X -axis.
FIXY	Scale for Y -axis.
IAR2(2)	Thirteen-character alphanumeric of plot unit and a right parenthesis.
IBUF(1024)	1024-word buffer storage, used for plot tape.
ICOUNT	Number of tic marks on an axis.
IPC	Alphanumeric "PIC" = 3RPIC; used for scaling ($\times 10^{12}$) if units are PICO--.
ITEM	Temporary storage for Hollerith of first three letters of unit.
JV1	Subscript number of the V value being plotted as the Y value.
JV2	Either zero, or, in a V -vs.- V plot, the subscript number of the V value being plotted as the X value.
J2	-1 for V -vs. t plot, 0 for phase-plane plot, +1 for V -vs.- V plot.
MAKS	Alphanumeric for "MAX" = 3RMAX; used for scaling ($\times 10^8$) if units are MAXWELLS.
MIC	Alphanumeric for "MIC" = 3RMIC; used for scaling ($\times 10^6$) if units are MICRO--.

* Applicable at SRI computation center.

MIL	Alphanumeric for "MIL" = 3RMIL; used for scaling ($\times 10^3$) if units are MILLI--.
N	Number of values to be plotted.
NAN	Alphanumeric for "NAN" = 3RNAN; used for scaling ($\times 10^9$) if units are NANO--.
ONE	Value = 1.0.
PAREN1	Hollerith character for plotting left parenthesis = 1H(.
RATIO	Scaling factor based upon units specified by the user.
RIGHT	X value of right side of frame.
TAR1(2)	Name of plotted variable.
TAR4(15)	Storage of values of tic marks encoded for plotting.
TAR5(32)	Storage of values of tic marks before encoding.
TEMP	Temporary storage (e.g., value of final tic mark).
TEMP2	Temporary storage for various locations in plot.
TIC1	Value in inches of a tic mark.
TIME	Alphanumeric "TIME" = 6HTIMEbb, where b represents a blank.
TMARK1	1 - if last plotted point is inside frame; 0 - otherwise.
TOP	Y value of top of frame.
VSPT	Hollerith 6HbbVS.b, where b represents a blank.
X	Temporary storage of numbers which will be used to label tic marks on X-axis.
XLEFT1	X value of left side of frame.
XMARK	Grid size (between tic marks) on the X-axis in specified units.
XTIC	Distance (in inch) between X-axis tic marks.
XVALUE	Equivalent inches of X value of a plot point.
XZERO	Equivalent inches of X = 0.0.
Y	Temporary storage of number which will be used to label tic marks on Y-axis.
YMARK	Grid size (between tic marks) on the Y-axis in specified units.
YTIC	Distance (in inch) between Y-axis tic marks.
YVALUE	Equivalent in inches of Y value of plot point.

YZERO Equivalent in inches of $Y = 0.0$.

ZERO Value = 0.0.

(7) Subroutine PAREN(,)*

A(10) Set of masks to pick out one character from a word.

I Output parameter giving the number of characters to be plotted.

IT Temporary storage for a portion of a string of characters.

ITEM(2) Array parameter in which string of characters is stored in order to put a parenthesis to the right of the right-most nonblank character.

II Storage for a single character out of a string; compared to see if character is blank.

PARENS A set of ten characters (all right-parentheses).

(8) Subroutine RWIVS

A1 Type of Terminal a: blank - floating; S - Source; G - Ground.

A2 Type of Terminal b: blank - floating; S - Source; G - Ground.

S1 Sign of worst-case deviation of magnitude of a dc source.

S2 Sign of worst-case deviation of R_s of a voltage source.

(9) Subroutine RWRES

L Index number of an $R(t)$ mode.

S1 Sign of worst-case deviation of resistance R (or R_f).

(10) Subroutine RWCAP

CI0 Initial capacitor current.

S1 Sign of worst-case deviation of capacitance C .

S2 Sign of worst-case deviation of series resistance R_C .

S3 Sign of worst-case deviation of shunt resistance R_{CSH} .

* Applicable at SRI computation center.

(11) Subroutine RWIND

CIL0 Initial inductor current.
S1 Sign of worst-case deviation of inductance L .
S2 Sign of worst-case deviation of series resistance R_L .
S3 Sign of worst-case deviation of shunt resistance R_{Lsh} .
S4 Sign of worst-case deviation of $1/I_{con}$.

(12) Subroutine RWZEN

S1 Sign of worst-case deviation of R_z .
S2 Sign of worst-case deviation of R_{zb} .
S3 Sign of worst-case deviation of E_{zb} .

(13) Subroutine RWDIOD

K3 Diode parameters: 0 - specified; N - same as those of Nth diode.
QT $11,590/T^\circ K$.
S1 Sign of worst-case deviation of I_{sd} .
S2 Sign of worst-case deviation of m_d .
S3 Sign of worst-case deviation of R_{ld} .
S4 Sign of worst-case deviation of C_{j0d} .
S5 Sign of worst-case deviation of $V_{\phi d}$.
S7 Sign of worst-case deviation of T_d .

(14) Subroutine RWTRAN

BASE Type of Terminal B (Base): blank - floating;
S - Source; G - Ground.
COLC Type of Terminal C (Collector): blank - floating;
S - Source; G - Ground.
EMTR Type of Terminal E (Emitter): blank - floating;
S - Source; G - Ground.
ESSES(14) Signs of worst-case deviations of transistor parameters.
K5 Transistor parameters: 0 - specified; N - same as those of Nth transistor.

NT01 Counter (4,7,10,13...) used to print data of only three transistors per page.

QT 11,590/ $T^{\circ}K$.

(15) Subroutine RWCORE

PARBH Alphanumeric "BH" = 6HBHbbbb, where b represents a blank.

PARIN Parameter input-data indicator: PHIF of blank - ϕF data (Call Subroutine RWCORF); BH - BH data (Call Subroutine RWCORH).

(16) Subroutine RWCORF

CI0 Initial current of a core winding.

CORMAT(20) Core material; T - Tape-wound; otherwise - Ferrite.

ESSES (24) Signs of worst-case deviations of core parameters.

F1C Type of Terminal a (bottom): blank - floating;
 S Source; G - Ground.

HA(20) H_a .

HAD H_a (temporary storage).

HDMIN $H_d^{\min}$.

HN(20) H_n .

HND H_n (temporary storage).

HOL Alphanumeric blank = 1Hb, where b represents a blank.

HOLA Alphanumeric "A" = 1HA.

HOLB Alphanumeric "B" = 1HB.

HOLC Alphanumeric "C" = 1HC.

HOLD Alphanumeric "D" = 1HD.

HOLE Alphanumeric "E" = 1HE.

HOLF Alphanumeric "F" = 1HF.

HOLG Alphanumeric "G" = 1HG.

HQ(20) H_q .

HQD H_q (temporary storage).

HS H_s .

IXNT Number of turns of a winding (temporary storage).

KC1 Parameter values: 0 - specified; N - same as those of the Nth core.

M Index number of a winding.

NUDT Number of time steps above which the run is terminated if SWSTEX = 1 and flux switching is completed.

NWSUBN Number of windings (temporary storage).

PHID1S $\phi_{d1s} = \phi_d @ F = F_{d1}$ in Region 1.

PHID2(20) ϕ_{d2} .

PHID2D ϕ_{d2} (temporary storage).

PHID3 ϕ_{d3} .

P0 $p_0 = (\phi_s + \phi_r)H_q / [(l_o - l_i)H_n]$

Q1 $p_1 \ln[(F_{d1} - p_2)/(F_{d1} - p_3)]$.

R2C Type of Terminal b (top): blank - floating; S - Source; G - Ground.

TYPE(20) $\phi_d(F)$ - curve type: G, A, B, C, D, E, or F.

T1 Alphanumeric "NEGLEC" = 6HNEGLEC or "INCLUD" = 6HINCLUD.

T2 Alphanumeric "TED" = 6HTEDbbb or "ED" = 6HEDbbbb, where b represents a blank.

U0(20) Initial value of ϕ/ϕ_r .

XID(20) Inside core diameter (in inch).

XLI Inside core circumference (in meter).

XLO Outside core circumference (in meter).

XOD(20) Outside core diameter (in inch).

(17) Subroutine RWCORH

A Cross-sectional area of a core (in meter²).

AIN(20) Cross-sectional areas of a core (in cm²)

BD2 B_{d2} (in weber/meter²).

BD2IN(20) B_{d2} (in gaussess).

BD3 B_{d3} (in weber/meter²).

BD3IN(20) B_{d3} (in gaussess).

BM B_m (in weber/meter²).

BMIN(20) B_m (in gaussess).

BR	B_r (in weber/meter ²).
BRIN(20)	B_r (in gaussess).
BS	B_s (in weber/meter ²).
CI0	Initial current of a core winding.
CORMAT(20)	Core material: F - Ferrite; otherwise - Tape-wound.
EL	Average core circumference, $l = (l_i + l_o)/2$.
ESSES(12)	Signs of worst-case deviations of core parameters.
FREQ(20,10)	Frequency (in Hz) of a dynamic $B(H)$ curve.
F1C	Type of Terminal a (bottom): blank - floating; S - Source; G - Ground.
HAD	H_a (in ampere-turns/meter).
HDMIN	H_d^{min} (in ampere-turns/meter).
HDZ	H_{dz} (in ampere-turns/meter).
HDZIN(20)	H_{dz} (in oersted).
HD1	H_{d1} (in ampere-turns/meter).
HD1IN(20)	H_{d1} (in oersted).
HD2	H_{d2} (in ampere-turns/meter).
HD2IN(20)	H_{d2} (in oersted).
HD3	H_{d3} (in ampere-turns/meter).
HD3IN(20)	H_{d3} (in oersted).
HM	H_m (in ampere-turns/meter).
HMIN(20)	H_m (in oersted).
HND	H_n (in ampere-turns/meter).
HOL	Alphanumeric blank = 1Hb, where b represents a blank.
HOLA	Alphanumeric "A" = 1HA.
HOLB	Alphanumeric "B" = 1HB.
HOLC	Alphanumeric "C" = 1HC.
HOLD	Alphanumeric "D" = 1HD.
HOLE	Alphanumeric "E" = 1HE.
HOLF	Alphanumeric "F" = 1HF.
HOLG	Alphanumeric "G" = 1HG.
HOLT	Alphanumeric "T" = 1HT.

HQD	H_q (in ampere-turns/meter).
HS	H_s (in ampere-turns/meter).
HQB	H_{0B} (in ampere-turns/meter).
HOBIN(20,10)	H_{0B} (in oersted).
IXNT	Number of turns of a winding (temporary storage).
KC1	Parameter values: 0 - specified; N - same as those of the Nth core.
M	Index number of a winding.
NDYNP(20)	Number of dynamic $B(H)$ curves of different frequencies.
NDYNPT	Temporary storage of NDYNP(N).
NUDT	Number of time steps above which the run is terminated if STSWEX = 1 and flux switching is completed.
NWSUBN	Number of windings (temporary storage).
PHID1S	$\phi_{d1s} = \phi_d @ F = F_{d1}$ in Region 1.
PHID2D	ϕ_{d2} .
PHID3	ϕ_{d3} .
P0	$p_0 = (\phi_s + \phi_r)H_q / [(l_o - l_i)H_n]$.
Q1	$q_1 = p_1 \ln[(F_{d1} - p_2)/(F_{d1} - p_3)]$.
R2C	Type of Terminal b (top): blank - floating; S - Source; G - Ground.
TYPE(20)	$B_d(H)$ - curve type: G, A, B, C, D, E, or F.
T1	Alphanumeric "NEGLEC" = 6HNEGLEC or "INCLUD" = 6HINCLUD.
T2	Alphanumeric "TED" = 6HTEDbbb or "ED" = 6HEDbbbb, where b represents a blank.
U0(20)	Initial value of B/B_r .
XID(20)	Inside core diameter (in inch).
XLI	Inside core circumference (in meter).
XLO	Outside core circumference (in meter).
XOD(20)	Outside core diameter (in inch).
Z1	$z_1 = \sum_j f(j)$.
Z2	$z_2 = \sum_j H_{0B}(j)$.
Z3	$z_3 = \sum_j f(j)H_{0B}(j)$.

$$Z4 \quad z_4 = \sum_j H_{0B(j)}^2$$

$$Z5 \quad z_5 = (n_{dynp} z_3 - z_1 z_2) / (n_{dynp} z_4 - z_2^2)$$

(18) Subroutine RWCND

No special local variables.

(19) Subroutine SEQSOL()

ID Size of an array column.

NX Column pointer, indicating which column is being processed
[H(NX) $\equiv$ H(1,N*ID)].

Q Ratio of two matrix elements of the same column, e.g.,
H(3,5)/H(1,5).

(20) Subroutine INTIAL

ERR Parameter of Subroutine SEQSOL which indicates a singular
matrix if ERR $\neq$ 0.

(21) Subroutine ELEM

No special local variables.

(22) Subroutine IVS

B Temporary storage for VI(N) or EI(K5) or 1/RVS(N).

C Temporary storage for VI(N)/RVS(N) or EI(K5)/RVS(N).

K5 Index number of a variable source.

(23) Subroutine RES

B $\Delta H = 1/R$.

L Index number of an R(t) mode.

(24) Subroutine CAP

A1 $a_1 = \Delta t / R_{CSH}$.

A2 $a_2 = 2C + a_1$.

A3 $a_3 = 2C - a_1$.

A4 $a_4 = 1 / (\Delta t + R_C a_2)$.

B1(20) $b_1 = a_3 a_4.$
 B2(20) $b_2 = [(\Delta t/a_3) - R_C] i_{ab}(-1).$
 HAA(20) $\Delta H = h_{aa} = a_2 a_4.$
 HAAJ $\Delta H = h_{aa}$ (temporary storage).
 TA(20) $\Delta T.$

(25) Subroutine IND

B $b = 1/[2L + R_L(\Delta t + c)];$ in solution of initial conditions,
 $B = 1/R_L.$
 B1(20) $b_1 = b(c - \Delta t).$
 B2(20) $b_2 = \{[2L/(\Delta t - c)] - R_L\} i_{ab}(-1).$
 C $c = 2L/R_{LSH}.$
 HAA(20) $\Delta H = h_{aa} = b(c + \Delta t).$
 HAAJ $\Delta H = h_{aa}$ (temporary storage).
 TA(20) $\Delta T.$

(26) Subroutine ZEN

GZ(20) $\Delta H.$
 GZD ΔH (temporary storage).
 VZ $V_{ab}.$
 ZI $\Delta T.$

(27) Subroutine DIOD

B $s[1 + (T_d/\Delta t)] + 1/R_{ld},$ where $s = DR(N) =$ slope of
 i_{fd} vs. $V_d.$
 BV $V_d(-1).$
 C $V_{d<-1>} \cdot s[1 + (T_d/\Delta t)] - i_{fd<-1>} + PPID - (T_d/\Delta t)$
 $[i_{fd<-1>} - i_{fd(-1)}],$ where $s = DR(N) =$ slope of
 i_{fd} vs. $V_d.$
 CI $i_{fd}.$
 D $C_{jd}/\Delta t = (C_{j0d}/\Delta t) \cdot [1 - (DV_2/V_{\phi d})]^{-0.5}.$
 DDI $i_{fd<-1>} - i_{fd(-1)}.$
 DEXP $V_{d(-1)}/\theta_{nd}.$

DIP(20) $i_{fd(-1)}$
 DV2 $\min(V_{d<-1>}, 0.9 V_{\varphi d})$
 HACH $\Delta H = G$
 LOOP Count of a possible looping in Part (1) at first iteration.
 SI1 I_{sd}
 TACH $\Delta T = A$

(28) Subroutine TRAN

BC $V_{c(-1)}$
 BCC(20) $(C_{j0c}/\Delta t)\{1 - [\min(V_{c<-1>}, 0.9 V_{\varphi c})/V_{\varphi c}]\}^{-0.5}$
 BCIP(20) $i_{fc(-1)}$
 BCV2 $\min(V_{c<-1>}, 0.9 V_{\varphi c})$
 BE $V_{e(-1)}$
 BEC(20) $(C_{j0e}/\Delta t)\{1 - [\min(V_{e<-1>}, 0.9 V_{\varphi e})/V_{\varphi e}]\}^{-0.5}$
 BEIP(20) $i_{fe(-1)}$
 BEV2 $\min(V_{e<-1>}, 0.9 V_{\varphi e})$
 CI i_{fc}
 CIO1 I_{sc}
 CO $c_{2c} = 1/\theta_{nc} = 11,590/(Tm_c)$
 DBCI(20) $[i_{fc<-1>} - i_{fc(-1)}]d_{t1c} = [i_{fc<-1>} - i_{fc(-1)}]T_c/\Delta t$
 DBEI(20) $[i_{fe<-1>} - i_{fe(-1)}]d_{t1e} = [i_{fe<-1>} - i_{fe(-1)}]T_e/\Delta t$
 DEXP $V_{c(-1)}/\theta_{nc}; V_{e(-1)}/\theta_{ne}$
 EIO1 I_{se}
 EO $c_{2e} = 1/\theta_{ne} = 11,590/(Tm_e)$
 EZ i_{fe}
 HACH22 $\Delta H_{(cc)} = G_c$
 HACH23 $\Delta H_{ce} = S_c$
 HACH32 $\Delta H_{ec} = S_e$
 HACH33 $\Delta H_{(ee)} = G_e$
 KO3 Temporary storage of the index number of Terminal E (Emitter).

LOOP Count of a possible looping in Part (1) at first iteration.
 TACH2 $\Delta T_{(c)} = A_c$.
 TACH3 $\Delta T_{(e)} = A_e$.
 TCR $d_{t2c}(i_{fc<-1>} + I_{sc})c_{2c} = [1 + (T_c/\Delta t)](i_{fc<-1>} + I_{sc})/\theta_{nc}$.
 TER $d_{t2e}(i_{fe<-1>} + I_{se})c_{2e} = [1 + (T_e/\Delta t)](i_{fe<-1>} + I_{se})/\theta_{ne}$.

(29) Subroutine CORE

AITKEN Boolean variable: *FALSE* every odd iteration; *TRUE* every even iteration.
 BV $V_a - V_b$.
 CIJM1(20,10) $i_{j<-1>}$.
 CIJM2(20,10) $i_{j<-2>}$.
 CIW $i_{ab} = G_c(V_a - V_b - V_c)$.
 DELTAV $S_t/3 = -[3\Delta t + 2\Delta t_{(-1)} + \Delta t_{(-2)}]/3$, if $\Delta t < 10^{-10}$ second;
 DELTAV = $-TE/NDEL$ T, otherwise.
 DLPDTE $\delta\phi_e$.
 EPS ϵ .
 EPSP ϵ' .
 ETA $\eta = 1 - [(2s\phi + \phi_s - \phi_d)/(\phi_s + \phi_d)]^2$.
 FDOTAV $\bar{F}$.
 FLXSW 0 - All cores have terminated flux switching; 1 - otherwise ($|\phi_i| > ZV$ for at least one core).
 FMM MMF (temporary storage).
 GC(20,10) $\Delta H = G_c = (N^2\phi'_{<-1>} + R_v)^{-1}$.
 GCNM G_c (temporary storage).
 GCVC $G_c V_c$.
 GW $1/R_v$.
 M Index number of a core winding.
 NWSUBN Number of windings (temporary storage)-
 PHDTEP(20) ϕ'_e .
 PHDTI ϕ_i .
 PHDTIP ϕ'_i .

PHDTP	$\dot{\phi}_p$
PHDTPP	$\dot{\phi}_p'$
PHDTPR	$\dot{\phi}'$
PHIDP	ϕ_d'
PHIDS	ϕ_{ds}
Q	Limiting boundary on $\dot{\phi}_e$
Q1	q_1
Q2	q_2
Q3	q_3
Q4	q_4
Q5	q_5
Q6	q_6
SF	$s \cdot F = F $, where $s = \text{sign}(F)$.
SIGNF	1 if $F > 0$; -1 if $F \leq 0$.
SMFTN	$S_{Ftn} = S_F S_t - 3S_{Ft}$
SMTSMT	S_t^2
SPHI	$s \cdot \phi$, where $s = \text{sign}(F)$.
SUMF	$S_F = F_{(-1)} + F_{(-2)} + F_{(-3)}$
SUMFT	$S_{Ft} = -[F_{(-1)}\Delta t_{(-1)} + F_{(-2)}t_{(-2)} + F_{(-3)}t_{(-3)}]$
SUMT	$S_t = -[3\Delta t + 2\Delta t_{(-1)} + \Delta t_{(-2)}]$
SUMTSQ	$S_{tsq} = S_t^2 - 3S_{tq}$
SUMTT	$\Delta t^2 + [\Delta t + \Delta t_{(-1)}]^2 + [\Delta t + \Delta t_{(-1)} + \Delta t_{(-2)}]^2$
S2	$1/(F + p_2)$
S3	$1/(F + p_3)$
TM1	$t_{(-1)} = -\Delta t$
TM2	$t_{(-2)} = -\Delta t - \Delta t_{(-1)}$
TM3	$t_{(-3)} = -\Delta t - \Delta t_{(-1)} - \Delta t_{(-2)}$
VC(20,10)	$V_c = N\phi_{<-1>} - N^2\phi'_{<-1>}i_{ab<-1>}$
VCNM	V_c (temporary storage).

(30) Subroutine AUX()

K Control indicator: ≤ 0 - computes functions for Part (1)
 in Subroutine ELEM; 1 - computes auxiliary variables for
 Part (2) in Subroutine ELEM.

B. MTRAC Program Listing

The listing of the MTRAC program is given next. Comments are scattered throughout the program in order to explain the functions of different program sections.

The main program is listed on pp. 91-99. The subroutines are listed in the following order:

<u>Subroutine</u>	<u>Pages</u>
HOLLER(SOFTLY, SWEET)	100
RWRUNC	101-107
PLAPR(KEND)	108-111
PRPLT(NV, NLC, ID, IL)	112-114
PLT(N, J2, JVI, JV2)	115-119
PAREN(ITEM, I)	120
RWIVS	121-122
RWBES	123-124
RWCAP	125-126
RWIND	127-128
RWZEN	129-130
RWDIOD	131-132
RWTRAN	133-135
RWCORE	136
RWCORF	137-143
RWCORH	144-151
RWCND	152-153
SEQSOL(ERROR)	154-155
INTIAL	156-157
ELEM	158-159
IVS	160-161
RES	162
CAP	163
IND	164-165
ZEN	166
DIOD	167-169
TRAN	170-175
CORE	176-182

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C      MTRAC - MAIN PROGRAM
COMMON AAAA(10),ABC,ABSER,ABSERR,ABTEMP,AF(20),AR(20),BCDT,BCDT1,
2     BCI(20),BCR(20),BCV(20),BEI(20),BER(20),BEV(20),BVAL(6,6),
3     BVALF(6,6),CAPC(20),CC1(20),CC2(20),CC3(20),CC4(20),CDT1(20),
4     CDT2(20),CDT3(20),CIBASE(20),CIC(20),CICOLC(20),CICORE(20,10),
5     CICOR1(20,10),CIDIOD(20),CIEMTR(20),CIIVS(20),CIL(20),CIR(40),
6     CIZ(20),CT(11,2),C1(20),C2(20),C3(20),C4(20),DELT,DI(20),DMAX,
7     DR(20),DTM1,DTM2,DT1(20),DT2(20),DT3(20),DV(20),
X     E(19,16,2),EC1(20),EC2(20),EC3(20),EC4(20),EDT1(20),EDT2(20),
8     EDT3(20),EI(20),EP1(20),
9     EZB(20),E2(19),F(20),FB(20),FB1(20),FDB(20),FDZ(20),FD1(20)
COMMON FD2(20),FD3(20),FD4(20),FM1(20),FM2(20),FM3(20),
2     FO(20),FOPP(20),FOI(20),H(60,60),IAC(6),IACF(6),IBC,ICS(6,6),
3     ICSF(6,6),IGRAPH,INCIL(20),INCL(20),IOC,IOCF,IPX
4     ,ITRMAX,ITRST,IX(5),JCAT,JG(19),JKKJ,JKLJ,JSJ,
5     JV,KCAP(20),KCORE(20,10),KDIOD(20),KFAIL,KFMAX,KIND(20),KIVS(20),
6     KONT,KONVRG,KPFIT,KPLOT,KPRPLT,KPUNCH,KRES(40),KTRAN(20),KXT,
7     KZEN(20),K1CAP(20),K1CORE(20,10),K1DIOD(20),K1IND(20),K1IVS(20)
8     ,K1RES(40),K1TRAN(20),K1ZEN(20),K2CAP(20),K2CORE(20,10),
9     K2DIOD(20),K2IND(20),K2IVS(20),K2RES(40),K2TRAN(20),K2ZEN(20)
COMMON K3IVS(20),K3TRAN(20),K4IVS(20),K4TRAN(20),LASTIC,
2     MAXMIN,MONC,MONCOR,PCAD,MONELM,MONIV,MONL,MONMA,
3     MONR,MONS,MONT,MONTOR,MONZEN,MVALUE(14),NAW,NB,NBB,NC,NCORE,ND,
4     NDELT,NDIODE,NDTMAX,NDTMIN,ND1,NG,NITER,NITRSM,NIV,NL,NDEXIT,
5     NOVAR(6,6),NOVARF(6,6),NP(20,10),NPLTVT,NPLTVV,NPP(10),
6     NPI(10,2),NR,NRP(40),NS(20,10),NSVIL,NSVPHI,NSVVAR,NTRANS,NV,
7     NW(20),NZ,NZEN,N1B,N3B,POTEM1(20),PHDTE(20),PHDTM1(20),
8     PHDTM2(20),PHI(20),PHID(20),PHIDCT(20),PHIM1(20),PHIM2(20),
9     PHIM3(20),PHIR(20),PHIS(20),PHIO(20),PPIC(20),PPIC1(20)
COMMON PPID(20),PPID1(20),PIE1(20),PIE11(20),PRSYM8,PSTEP,
2     PWCR(20),PWTR(20),P1(20),P2(20),P3(20),P4(20),P5(20),P6(20),
3     P7(20),P8(20),P9(20),P10(20),P11(20),P12(20),P13(20),P14(20),
4     P15(20),P16(20),P17(20),P18(20),P19(20),P20(20),QCR(20,7),
5     QTAN(20,16),R(40),RC(20),RCSH(20),RELER,RELERR,RF(5,5),RL(20),
6     RLSH(20),RMAG,RNUDT,ROP(20),ROP1(20),RVS(20),RW(20,10),PZ(20),
7     RZB(20),S(20),SAVEXL(10,3),SAVEXR(10,3),SAVEYB(10,3),SAVEYT(10,3),
8     ST(19,2),STARTS,STSWEX,T(60),TE,TF(354),TFR(5,5),TI,
9     TIMEIN,TITLE(12),TLIMIT,TOO(19),TOOLD,TO1,TTOOLD,V(70),VI(20)
COMMON VICON(20),VP(10,350),VZR(20),VZF(20),V1(70),V2(70),WSQSOL,
2     XL,XLAMDA(20),XLEFT(20),XLMDAD(20),XNT(20,10),XNU(20),XNUD(20)
3     ,XP(713),XR,XRES(5,5),XRIGHT(20),XSCALE(20),XUNIT(2,20),YB,
4     YBOTTM(20),YSCALE(20),YT,YTOP(20),YUNIT(2,20),ZV(20)
LOGICAL TERMNT,SOFAR,MONTOR,MONST,PCNPAT,MONELT,WSQSLT,MONIVT,
2     MONRT,MONCT,MONLT,MONDT,MONTT,MONCRT,MONZNT,
3     MONS,MONMA,MONELM,WSQSC,MCNIV,MONR,MONC,MONL,MOND,MONT,
4     MONCOR,MONZEN,GETOFF
DIMENSION      FETCH(2)
EQUIVALENCE(MVALUE(1),MONMAT),(MVALUE(2),MONST),(MVALUE(3),MONELT)
2     ,(MVALUE(4),WSQSLT),(MVALUE(5),MCNIVT),(MVALUE(6),MONRT)
3     ,(MVALUE(7),MONCT),(MVALUE(8),MONLT),(MVALUE(9),MONZNT)
4     ,(MVALUE(10),MONDT),(MVALUE(11),MONTT),(MVALUE(12),MONCRT)
C      . . . . .
GETOFF = .FALSE.
959 IF (FETCH(1) .EQ. GENDA1) GO TO 7722
    FETCH(1) = GENDA1
C      . . . . .
C      READ IN AND PRINT OUT RUN-CONTROL DATA
C      . . . . .
7722 CALL RWRUNC
    FETCH(1) = RWFLM1

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0030
0040
0050
0060
0070
0080
0090
0100
0110
0120
0130
0140
0150
0160

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C	-----	
C	READ IN AND PRINT OUT CIRCUIT-ELEMENT DATA	
C	-----	
	CALL RWIVS	0170
	CALL RWRES	0180
	CALL RWCAP	0190
	CALL RWIND	0200
	CALL RWZEN	0210
	CALL RWDIOD	0220
	CALL RWTRAN	0230
	FETCH(1) = RWCOR1	0240
	CALL RWCORE	0250
	WRITE (6,33)	0260
C	-----	
C	INITIAL CONDITIONS	
C	-----	
	KNL = NTRANS + NTRANS + NDIODE	0270
	IF (NCORE .EQ. 0) GO TO 1115	0280
	DO 1116 I = 1,NCORE	0290
	1116 KNL = KNL + NW(I)	0300
	1115 IF ((ITRTST .NE. 0) .AND. (MAXMIN .NE. 0) .AND. (KFMAX .NE. 0))	0310
	2GO TO 1114	0320
	IF (ITRTST .EQ. 0) ITRTST = 10 + KNL	0330
	IF (MAXMIN .EQ. 0) MAXMIN = 2*(10 + KNL)	0340
	ITRMAX = MAXMIN	0350
	IF (KFMAX .EQ. 0) KFMAX = 3	0360
	WRITE(6,7777) ITRTST,MAXMIN,KFMAX	0370
	1114 IF (KONT .EQ. 1) GO TO 2102	0380
	FETCH(1) = SOLVE1	0390
	IF (NSVVAR .EQ. 1) GO TO 2102	0400
	NAW = 0	0410
	IBC = 0	0420
	JSJ = 0	0430
	CALL DIOD	0440
	CALL TRAN	0450
	IF (NG .NE. -1) CALL CORE	0460
	2102 JSJ = 1	0470
	KDTIM = 0	0480
	IF (NG) 2330,1701,2101	0490
	2330 IF (KONT .EQ. 1) GO TO 2101	0500
	CALL INTIAL	0510
	1701 K = NV + 1	0520
	IF (NG .EQ. 0) CALL AUX (1)	0530
C	-----	
C	PRINT INITIAL VALUES	
C	-----	
	DO 1702 J = K,NZ	0540
	1702 V1(J) = V(J)	0550
	2101 NG=0	0560
	152 NDI=ND-1	0570
	IF (JKLJ .GT. 0) WRITE (6,7414) JKLJ,ABC	0580
	WRITE (6,34) (J,EI(J),J=1,ND1)	0590
	WRITE (6,3434) (J,V1(J),J=1,NZ)	0600
	WRITE (6,8556) RMAG	0610
	WRITE (6,32) TI,TE,CT(1,2)	0620
	CALL SECOND(TEMP)	0630
	WRITE (6,7975) TEMP	0640
	IF (N38) 959,2601,2600	0650
	2601 IF (JKKJ .GT. 0) CALL EXIT	0660
C	-----	
C	READ IN AND PRINT OUT CONTINUED-RUN DATA	
C	-----	
	2600 IF (KONT .NE. 1) GO TO 2301	0670
	CALL RWCND	0680
	FETCH(1) = SOLVE1	0690
	GO TO 2602	0700

C	- - - - -		
C	INITIALIZE DELT AND T. STORE INITIAL PLOTTED VARIABLES IN PLOT ARRAY		
C	- - - - -		
	2301 DELT = T1		0710
	IF (NSVVAR .NE. 0) GO TO 2602		0720
	TD1=DELT		0730
	DTM1= DELT		0740
	DTM2= DELT		0750
	2602 DO 1003 I=1,NPLTVT		0760
	JJ = IABS(NPP(I))		0770
	1003 VP(I,JV) = V1(JJ)		0780
	TF(JV)= TE		0790
	TE = TE + DELT		0800
	WRITE (6,33)		0810
	JSJ = -1		0820
	108 IF (MONMA) WRITE (6,6662) ND1, NC, ABC,TD1,DELT,		0830
	2 TE		0840
C	- - - - -		
C	START OF TRANSIENT LOOP		
C	- - - - -		
	DO 76 JJJ=1,NBR		0850
C	- - - - -		
C	EACH NEW JJJ LOOP GIVES A NEW SET OF PRINT VALUES		
C	- - - - -		
	JV=JV+1		0860
	DO 131 JJ=1,NB		0870
C	- - - - -		
C	EACH NEW JJ LOOP GIVES A NEW SET OF PLOT VALUES		
C	- - - - -		
	NAW = 0		0880
	TD1 = DELT		0890
	2222 NITER = 1		0900
	IF (MONMA) WRITE (6,6663) JJJ,JV,JJ,JSJ,TD1		0910
C	- - - - -		
C	COMPUTE VARIABLE-SOURCE VALUES		
C	- - - - -		
	IF(ND .LE. 0) GO TO 119		0920
	TE1=0.0		0930
	DO 121 J=1,ND		0940
	TF(ST(J,2) .LT.0.0)GO TO 121		0950
	JH=JG(J)		0960
	T1=TE-E(J,JH+1,2)-TOD(J)		0970
	IF(TE1 .GE. T1) GO TO 121		0980
	IF(T1 .GE. 0.999*DELT) GO TO 121		0990
	TE1 = T1		1000
	121 CONTINUE		1010
	IF(TE1 .LE.0.0)GO TO 3000		1020
	TE=TE-TE1		1030
	DELT = DELT - TE1		1040
	3000 DO 3124 J=1,ND		1050
	IF(ST(J,2) .LT.0.0)GO TO 124		1060
	JH=JG(J)		1070
	IF(J .GT. 1) GO TO 8504		1080
	K=19		1090
	GO TO 8505		1100
	8504 K = J-1		1110
	8505 TE1=TE-E(J,JH+1,2)-TOD(J)		1120
	IF(TE1 .LE. 0.01*DELT) GO TO 1071		1130
	JG(J)=JG(J)+1		1140
	NI =ST(J,1)		1150
	IF(JG(J) .GE. NI) GO TO 1074		1160
	E2(J)=(E(J,JH+2,1)-E(J,JH+1,1))/(E(J,JH+2,2)-E(J,JH+1,2))		1170
	1071 EI(K)=E(J,JH+1,1)+E2(J)*TE1		1180
	GO TO 124		1190
	1074 IF(ST(J,2) .GT.0.0)GO TO 1081		1200
	ST(J,2)=-1.0		1210

	EI(K) =E(J,NI,1)	1220
	GO TO 124	1230
1081	JG (J)=1	1240
	TOO(J)=TOO(J)+E(J,NI,2)	1250
	E2 (J)=(E(J,2,1)-E(J,NI,1))/E(J,2,2)	1260
	EI (K)=E(J,NI,1)	1270
124	IF (MONMA)WRITE(6,6665)J,JH,K,JG(J),NI,TE1,E2(J),EI(J),EI(K),TOO(J)	1280
3124	CONTINUE	1290
C	- - - - -	
C	CHECK MONITOR SFT UP	
C	- - - - -	
119	SOFAR = MONMA	1300
	IF (NDELT .LT. NDTMIN) GO TO 7726	1310
	IF (NDTMAX .LT. NDELT) GO TO 7726	1320
	IF (MONTOR) GO TO 701	1330
	MONTOR = .TRUE.	1340
	MONMA = MONMAT	1350
	MONS = MONST	1360
	MONELM = MONELT	1370
	WSQSOL = WSQSLT	1380
	MONIV = MONIVT	1390
	MONR = MONRT	1400
	MONC = MONCT	1410
	MONL = MONLT	1420
	MOND = MONDT	1430
	MONT = MONTT	1440
	MONCOR = MONCRT	1450
	MONZEN = MONZNT	1460
	IF (MONMA) GO TO 3333	1470
	IF (MONS) GO TO 3333	1480
	IF (MONELM) GO TO 3333	1490
	IF (WSQSOL) GO TO 3333	1500
	IF (MONIV) GO TO 3333	1510
	IF (MONR) GO TO 3333	1520
	IF (MONC) GO TO 3333	1530
	IF (MONL) GO TO 3333	1540
	IF (MOND) GO TO 3333	1550
	IF (MONT) GO TO 3333	1560
	IF (MONCOR) GO TO 3333	1570
	IF (MONZEN) GO TO 3333	1580
	GO TO 701	1590
3333	WRITE (6,6671) (MVALUE (I),I=1,12)	1600
	GO TO 701	1610
7726	IF (.NOT. MONTOR) GO TO 701	1620
	IF (MONMA) WRITE (6,6673)	1630
	MONTOR = .FALSE.	1640
	MONMA = .FALSE.	1650
	MONS = .FALSE.	1660
	MONELM = .FALSE.	1670
	WSQSOL = .FALSE.	1680
	MONIV = .FALSE.	1690
	MONR = .FALSE.	1700
	MONC = .FALSE.	1710
	MONL = .FALSE.	1720
	MOND = .FALSE.	1730
	MONT = .FALSE.	1740
	MONCOR = .FALSE.	1750
	MONZEN = .FALSE.	1760
C	- - - - -	
C	BEGINNING OF ITERATION LOOP	
C	- - - - -	
701	IF (SOFAR,OR.MONMA)WRITE(6,6666)NITER,TE,DELT	1770
	CALL ELEM	1780
	IF (.NOT. WSQSOL) GO TO 9992	1790
	WRITE (6,9999)	1800
	DO 9993 J = 1,NV	1810

9993	WRITE (6,9997) (H(J,K),K=1,NV)	1820
	WRITE (6,9996) (T(J),J=1,NV)	1830
9992	CALL SEQSQL (ERR)	1840
	IF (ERR .EQ. 0.0) GO TO 8100	1850
	IF (.NOT. WSQSOL) GO TO 9979	1860
	DO 9978 J=1,NV	1870
9978	WRITE (6,9997) (H(J,K),K=1,NV)	1880
9979	CALL ELEM	1890
	WRITE (6,2002) ((JACK,JILL,H(JACK,JILL),JILL=1,NV),JACK=1,NV)	1900
	CALL EXIT	1910
8100	IF (.NOT. WSQSOL) GO TO 2008	1920
	CALL AUX(1)	1930
	WRITE (6,9970) (V(J),J=1,NZ)	1940
2008	T01 = -T01	1950
	CALL ELEM	1960
	NITER = NITER + 1	1970
	NITRSM = NITRSM + 1	1980
	IF(ABC .LE. 0.0) GO TO 5000	1990
	IF(NAW .NE. 0) GO TO 701	2000
	NAW = -1	2010
	GO TO 701	2020
C	- - - - -	
C	END OF ITERATION LOOP	
C	- - - - -	
5000	IF (MONMA) WRITE (6,7500) JCAT,DELT,ABC, CT(JCAT,2)	2030
	NITER = NITER - 1	2040
	IF (ABC .NE. -3.0) GO TO 5001	2050
C	- - - - -	
C	DID NOT CONVERGE IN ITRMAX ITERATIONS	
C	- - - - -	
	IF (NAW .LT. 0) NAW = 0	2060
	NAW = NAW + 1	2070
	IF (NAW .LT. 6) GO TO 2222	2080
	WRITE (6,5003)	2090
	GO TO 1000	2100
C	- - - - -	
C	CHECK FOR NORMAL-TERMINATION CONDITIONS	
C	- - - - -	
5001	TERMNT = .FALSE.	2110
	IF (IOC .LE. 0) GO TO 7503	2120
	DO 7729 I = 1, IOC	2130
	SOFAR = .TRUE.	2140
	J3 = IAC(I)	2150
	DO 7730 J1 = 1,J3	2160
	J4 = NOVAR(I,J1)	2170
	TEMP = V(J4)	2180
	I1 = ICS(I,J1)	2190
	IF (I1 .LT. 0) TEMP = ABS(TEMP)	2200
	IF (IABS(I1) .NE. 2) GO TO 7731	2210
	IF (TEMP-BVAL(I,J1)) 7733,7733,7730	2220
7731	IF (TEMP-BVAL(I,J1)) 7730,7733,7733	2230
7733	SOFAR = .FALSE.	2240
7730	CONTINUE	2250
	TERMNT = TERMNT .OR. SOFAR	2260
7729	CONTINUE	2270
	IF (TERMNT) JCAT = 10	2280
	TERMNT = .FALSE.	2290
C	- - - - -	
C	CHECK FOR FAILURE-TERMINATION CONDITIONS	
C	- - - - -	
7503	IF (IOCF .LE. 0) GO TO 7505	2300
	DO 7734 I = 1,IOCF	2310
	SOFAR = .TRUE.	2320
	J3 = IACF(I)	2330
	DO 7735 J1 = 1,J3	2340
	J4 = NOVARF(I,J1)	2350

	TEMP = V(J4)	2360
	I1 = ICSF(I,J1)	2370
	IF (I1 .LT. 0) TEMP = ABS(TEMP)	2380
	IF (IABS(I1) .NE. 2) GO TO 7736	2390
	IF (TEMP-BVALF(I,J1)) 7738,7738, 7735	2400
7736	IF (TEMP-BVALF(I,J1)) 7735,7738,7738	2410
7738	SOFAR = .FALSE.	2420
7735	CONTINUE	2430
	TERMNT = TERMNT .OR. SOFAR	2440
7734	CONTINUE	2450
	IF (TERMNT) JCAT = 10	2460
C	-----	
C	UPDATE VARIABLES FOR THE NEXT TIME STEP	
C	-----	
7505	TE=TE + DELT	2470
	DO 3015 J=1,NZ	2480
3015	V1(J)=V(J)	2490
	IF(ND .LE. 0) GO TO 131	2500
	DO 1253 J = 1, ND1	2510
1253	EP1(J) = EI(J)	2520
C	-----	
C	CHECK FOR END OF DELT MODE	
C	-----	
	IF (TE .LT. CT (JCAT,2)) GO TO 131	2530
	IF (TE .LT. (CT(JCAT,2)+0.999* DELT))GO TO 8561	2540
	JCAT=JCAT+1	2550
	IF (CT(JCAT,1)) 82,1200,84	2560
82	CT(JCAT,1)= CT(JCAT,1)+1.0	2570
	JCAT = JCAT - 1	2580
	IF (KDTIM .GT. 0) GO TO 4360	2590
	DTIM =CT(JCAT,2)	2600
	KDTIM= 1	2610
4360	DO 83 J=1,JCAT	2620
83	CT(J,2)= CT(J,2)+DTIM	2630
	JCAT = 1	2640
84	TI = CT(JCAT,1)	2650
	TE=TE-DELT	2660
	IF (TI .GT. (DELT+DELT)) GO TO 9234	2670
	TE=TE+TI	2680
	DELT = TI	2690
	GO TO 321	2700
9234	DELT = DELT + DELT	2710
	TE=TE+DELT	2720
321	WRITE (6,32)TI,CT(JCAT-1,2),CT(JCAT,2)	2730
	GO TO 131	2740
8561	TOK=TE-CT(JCAT,2)	2750
	TE=TE-TOK	2760
	DELT = DELT - TOK	2770
131	CONTINUE	2780
C	-----	
C	END OF JJ LOOP	
C	STORE PLOT DATA IN ARRAYS	
C	-----	
	TE=TE-DELT	2790
	DO 205 I=1,NPLTVT	D 2800
	JJ =IABS(NPP(I))	A 2810
205	VP(I,JV)=V(JJ)	T 2820
7107	IF (RMAG .NE.0.0)GO TO 8765	A 2830
	XP(JV+IPX) = 1.0	2840
	GO TO 8766	F 2850
8765	XP(JV+IPX)=EI(19)/RMAG	O 2860
8766	TF(JV)=TE	R 2870
	TE =TE+DELT	2880
	IF (JV .LT. IPX) GO TO 76	P 2890
	IF (NPLTVT .EQ. 0) GO TO 75	L 2900
	KPRPLT = 1	O 2910

	GO TO 1200		T	2920
75	JV = 1			2930
76	CONTINUE			2940
C	-----			
C	END OF JJJ LOOP			
C	PRINT SOURCE MAGNITUDES AND RESULTING NODAL VOLTAGES			
C	AND AUXILIARY VARIABLES			
C	-----			
	IF (ND .LE. 0) GO TO 653			2950
	IF (EI(19) .NE. 0.0) WRITE (6,69) EI(19)			2960
	WRITE (6,70) (L,EI(L),L=1,ND1)			2970
653	TE = TE-DELT	P		2980
	LABEL = 653	R		2990
	IF (MONMA) WRITE (6,7501) LABEL	I		3000
	WRITE (6,50) TE, (1,V(1),I=1,NZ)	N		3010
	WRITE (6,7727) DELT,NITER,NDELT,NITRSM	T		3020
	TE=TE+DELT			3030
C	-----			
C	CHECK FOR COMPUTER PROCESSOR TIME			
C	-----			
	CALL SECOND(TEMP)			3040
	IF (TEMP-STARTS .LE. TLIMIT) GO TO 108			3050
	WRITE (6,7767)			3060
C	-----			
C	ERROR - EITHER 6 ITRMAX FAILURES OR COMPLETION OF ALLOTTED			
C	COMPUTER PROCESSOR TIME			
C	-----			
1000	JCAT = 11			3070
	GETOFF = .TRUE.			3080
	IF (NAW .LT. 6) KPUNCH = 1			3090
	IF (NPLVT .GT. 0) KPRPLT = 1			3100
	GO TO 109			3110
C	-----			
C	PRINT SOLUTION VALUES FOR FINAL DELT			
C	-----			
1200	IF (ND .LE. 0) GO TO 7000			3120
	IF (EI(19) .NE. 0.0) WRITE (6,69) EI(19)			3130
	WRITE (6,70) (L,EI(L),L=1,ND1)			3140
7000	TE = TE-DELT			3150
	TF(JV)=TE			3160
	LABEL = 7000			3170
	IF (MONMA) WRITE (6,7501) LABEL			3180
	WRITE (6,50) TE, (11,V(11),I=1,NZ)			3190
	WRITE (6,7727) DELT,NITER,NDELT,NITRSM			3200
C	-----			
C	CHECK AND PRINT IF TERMINATION CONDITIONS WERE FULFILLED			
C	-----			
	IF (IOC .LE. 0) GO TO 7507			3210
	TERMNT = .FALSE.			3220
	DO 7739 I = 1,IOC			3230
	SO FAR = .TRUE.			3240
	J3 = IAC(I)			3250
	DO 7740 J1 = 1,J3			3260
	J4 = NOVAR(I,J1)			3270
	TEMP = V(J4)			3280
	I1 = ICS(I,J1)			3290
	IF (I1 .LT. 0) TEMP = ABS(TEMP)			3300
	IF (IABS(I1) .NE. 2) GO TO 7741			3310
	IF (TEMP-BVAL(I,J1)) 7743,7743,7740			3320
7741	IF (TEMP-BVAL(I,J1)) 7740,7743,7743			3330
7743	SO FAR = .FALSE.			3340
7740	CONTINUE			3350
	IF (SO FAR) WRITE(6,7749) I			3360
	TERMNT = TERMNT .OR. SO FAR			3370
7739	CONTINUE			3380
	IF (TERMNT) WRITE(6,7750)			3390

7507 IF (IOCF .LE. 0) GO TO 7002	3400
TERMNT = .FALSE.	3410
DO 7744 I = 1,IOCF	3420
SOFAR = .TRUE.	3430
J3 = IACF(I)	3440
DO 7745 J1 = 1,J3	3450
J4 = NOVAF(I,J1)	3460
TEMP = V(J4)	3470
I1 = ICSF(I,J1)	3480
IF (I1 .LT. 0) TEMP = ABS(TEMP)	3490
IF (IABS(I1) .NE. 2) GO TO 7746	3500
IF (TEMP-BVALF(I,J1)) 7748,7748,7745	3510
IF (TEMP-BVALF(I,J1)) 7745,7748,7748	3520
7746 SOFAR = .FALSE.	3530
7748	3540
7745 CONTINUE	3550
IF (SOFAR) WRITE(6,7749) I	3560
TERMNT = TERMNT .OR. SOFAR	3570
7744 CONTINUE	3580
IF (TERMNT) WRITE (6,7977)	
C - - - - -	
C CALL PLOT ROUTINES	
C - - - - -	
7002 TE=TE+DELT	3590
109 FETCH(1) = GENDAI	3600
IF (CT(JCAT, 1) .GT.0.0)GO TO 85	3610
IF (KPLOT .EQ. 1.OR.KPUNCH .EQ. 1.CR.KPRPLT .EQ. 1) CALL PLAPR(1)	3620
CALL SECOND(TEMP)	P 3630
WRITE (6,7975) TEMP	L 3640
IF (GETOFF) CALL EXIT	D 3650
GO TO 959	T 3660
85 CALL PLAPR (-1)	3670
FETCH(1) = SOLVE1	3680
GO TO 108	3690
C	
32 FORMAT (/12HDELTA TIME=E12.5,3X,12H START TIME=E12.5,3X,10H E	3700
2ND TIME=E12.5)	3710
33 FORMAT (1H1)	3720
34 FORMAT (15H0 INITIAL VALUES /7H SOURCE /6(I4,E13.5))	3730
50 FORMAT (6H0 TIME=,E12.5,/,9H UNKNOWNNS, /16(I4,E13.5))	3740
69 FORMAT (17H0 IONIZING PULSE =,E13.5)	3750
70 FORMAT (7H SOURCE,/(6(I4,E13.5))	3760
2002 FORMAT(26H SINGULAR MATRIX EQUATION ,/,1H0,/, 20H H MATRIX	3770
1ELEMENTS/(I4,I4,E13.5))	3780
3434 FORMAT (9H0 UNKNOWNNS,/(6(I4,E13.5)))	3790
5003 FORMAT (21H CONVERGENCE FAILURE)	3800
6662 FORMAT (34H ND1, NG, ABC,TO1,DELT, TE ,2I7,	3810
2 5(/,1H ,E22.15,E22.15,E22.15,E22.15,E22.15))	3820
6663 FORMAT (33H JJJ,JV,JJ,JSJ, TO1 ,4I7,	3830
2 5(/,1H ,E22.15,E22.15,E22.15,E22.15,E22.15))	3840
6665 FORMAT(42H J,JH,K,JG(),NI,TE1,E2(),EI(),EI(K),TOO() , 5I7,/,1H ,	3850
2 10E12.5)	3860
6666 FORMAT(50(2H *),10H ITERATION ,15, /	3870
2 23H TE,DELT ,/,5E24.15)	3880
6671 FORMAT (15H MONITORS ON..,12L4)	3890
6673 FORMAT (29H MONITORS TURNED OFF AT 7726)	3900
7414 FORMAT (1H ,15, 30H INITIAL CONDITION ITERATIONS	3910
2 ,/, 5H ABC= ,F5.0)	3920
7500 FORMAT (27H JCAT,DELT,ABC,CT(,2) ,1I6,3E12.5)	3930
7501 FORMAT (7H LABEL ,15)	3940
7727 FORMAT (8HDELT = ,E12.5,15X,I4,14H ITERATION(S) ,15X,8HNDDELT =	3950
2 ,15,15X,13H ITER. SUM = ,16,/))	3960
7749 FORMAT (15H0 CONDITION NO. ,12,13H IS SATISFIED)	3970
7750 FORMAT (20H0 NORMAL TERMINATION)	3980
7767 FORMAT (24H TIME-LIMIT TERMINATION)	3990
7777 FORMAT(44H0 CONVERGENCE DATA DETERMINED BY THE PROGRAM ,/,	4000
1 110H ITRTST =,13,102H (NUMBER CF TEST ITERATIONS BELOW WHI	4010

2CH DELT IS MULTIPLIED BY 2 AND ABOVE WHICH DELT IS DIVIDED BY 2)	4020
3 ,/,10H MAXMIN = ,I3,99H (INITIAL MAXIMUM NUMBER OF ITERATIONS B	4030
4EFORE VARIABLE VALUES ARE RESET AND DELT IS DIVIDED BY 4) ,/,	4040
5 10H KFMAY = ,I3,54H (MAXIMUM NUMBER OF TRIALS BEFORE ITRMAX IS C	4050
6HANGED))	4060
7975 FORMAT (I3HOPRO. TIME = ,E12.3)	4070
7977 FORMAT (I21HOFailure TERMINATION)	4080
8556 FORMAT (30H0IONIZING PULSE SCALE FACTOR =E14.5)	4090
9970 FORMAT (I6H SEQSQL RESULTS ,I/,1H ,5E24.15))	4100
9996 FORMAT (I2H T ,I/,1H ,10E12.5))	4110
9997 FORMAT (I2H H ,I 1H ,10E12.5))	4120
9999 FORMAT (I8H SEQSQL)	4130
END	4140

SUBROUTINE HOLLER(SOFTLY, SWEET)
SWEET = SOFTLY
RETURN
END

00010
00020
00030
00040

C SUBROUTINE RWRUNC
RWRUNC READS IN AND PRINTS OUT RUN-CONTROL DATA

RRU 0010

COMMON VARIABLES

```

LOGICAL          MONTOR,MONST,MONPAT,MONELT,WSQSLT,MONIVT      RRU 0020
LOGICAL MONRT,MONCT,MONLT,MONDT,MONTT,MONCRT,MONZNT          RRU 0030
LOGICAL MONS,MONMA,MONELM,WSQSOL,PCNIV,MONR,MONC,MONL,MOND,MONT RRU 0040
LOGICAL MONCOR,MONZEN,MONEY(14),SCFAR                         RRU 0050
DIMENSION EMVALU(14)                                          RRU 0060
EQUIVALENCE(MVALUE(1),MONMAT),(MVALUE(2),MONST),(MVALUE(3),MONELT) RRU 0070
2      , (MVALUE(4),WSQSLT),(MVALUE(5),PCNIVT),(MVALUE(6),MONRT) RRU 0080
3      , (MVALUE(7),MONCT),(MVALUE(8),MONLT),(MVALUE(9),MONZNT) RRU 0090
4      , (MVALUE(10),MONDT),(MVALUE(11),MONTT),(MVALUE(12),MONCRT) RRU 0100
5      , (MVALUE,FMVALU,MONEY)                                RRU 0110

C      . . . . .
CALL HOLLER(IH,HOL)                                           RRU 0120
CALL HOLLER(IHO,HOLO)                                         RRU 0130
CALL SECOND(STARTS)                                           RRU 0140
WRITE(6,7975) STARTS                                         RRU 0150

C      - - - - -
C      READ-WRITE OVERALL-RUN DATA
C      - - - - -

READ (5,7751) CKT,LIMITT,KONT,DMAX                            RRU 0160
IF (EOF,5) 5551,5552
5551 WRITE(6,5553)
IF (KPLOT.NE.1) CALL EXIT
CALL PLOT(0,0,999)
CALL EXIT
5552 WRITE(6,7755) CKT                                         RRU 0170
TITLE(4) = CKT                                               RRU 0180
WRITE(6,7753) LIMITT,KONT                                     RRU 0190
TLIMIT = LIMITT - 20                                         RRU 0200
IF (DMAX.GT.0.0)WRITE(6,4446) DMAX                            RRU 0210

C      READ-WRITE MONITOR SPECIFICATIONS
READ (5,7752) (EMVALU(I),I=1,12),NDTMIN,NDTMAX              RRU 0220
MONTOR = .FALSE.                                             RRU 0230
SOFAR = .FALSE.                                              RRU 0240
DO 5550 I = 1,12                                             RRU 0250
MONEY(I) = .NOT. ((EMVALU(I).EQ.HOL) .OR. (EMVALU(I).EQ.HOLO)) RRU 0260
5550 SOFAR = SOFAR .OR. MONEY(I)                             RRU 0270
IF (SOFAR) WRITE(6,1111) NDTMIN,NDTMAX                      RRU 0280
MDLT = 0                                                     RRU 0290
NITRSM = 0                                                    RRU 0300
JCAT = 1                                                      RRU 0310
JKKJ = 0                                                      RRU 0320

C      - - - - -
C      READ-WRITE INSTRUCTIONS FOR SAVING FINAL VARIABLE VALUES FROM A
C      PREVIOUS MODE TO BE USED AS INITIAL VALUES
C      - - - - -

READ (5,10) NSVVAR,NSVPHI,NSVIL                              RRU 0330
IF (NSVVAR.EQ.1) NSVPHI = 1                                   RRU 0340
IF (NSVVAR.EQ.1) NSVIL = 1                                   RRU 0350
WRITE(6,7756) NSVVAR,NSVPHI,NSVIL                            RRU 0360

C      - - - - -
C      READ-WRITE CONVERGENCE CONTROL DATA
C      - - - - -

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READ (5,11) ITRTST,MAXMIN,KFMAX,RELEP,ABSER,N38	RRU 0370
WRITE(6,7777) ITRTST,MAXMIN,KFMAX	RRU 0380
ITRMAX = MAXMIN	RRU 0390
IF(RELER .LE.0.0)RELER=1.0E-6	RRU 0400
IF(ABSER .LE.0.0)ABSER=1.0E-6	RRU 0410
WRITE(6,800) RELER,ABSER	RRU 0420
IF ((NSVVAR .EQ. 1) .OR. (KONT .EQ. 1)) GO TO 7718	RRU 0430
DO 5117 I = 1,19	RRU 0440
5117 TOT(I)=0.0	RRU 0450
TE = 0.0	RRU 0460
JV = 1	RRU 0470
GO TO 7720	RRU 0480
7718 TE = TE - DELT	RRU 0490
7720 TIMEIN = TE	RRU 0500
JKLJ = 0	RRU 0510

C CHECK MONITOR SET UP	

IF (NOELT .LT. NOTMIN) GO TO 7426	RRU 0520
IF (NOTMAX .LT. NOELT) GO TO 7426	RRU 0530
IF (MONTOR) GO TO 1112	RRU 0540
MONTOR = .TRUE.	RRU 0550
MONMA = MONMAT	RRU 0560
MONS = MONST	RRU 0570
MONELM = MONELT	RRU 0580
WSQSOL = WSQSLT	RRU 0590
MONIV = MONIVT	RRU 0600
MONR = MONRT	RRU 0610
MONC = MONCT	RRU 0620
MONL = MONLT	RRU 0630
MOND = MONDT	RRU 0640
MONT = MONTT	RRU 0650
MONCOR = MONCRT	RRU 0660
MONZEN = MONZNT	RRU 0670
IF (MONMA) GO TO 3333	RRU 0680
IF (MONS) GO TO 3333	RRU 0690
IF (MONELM) GO TO 3333	RRU 0700
IF (WSQSOL) GO TO 3333	RRU 0710
IF (MONIV) GO TO 3333	RRU 0720
IF (MONR) GO TO 3333	RRU 0730
IF (MONC) GO TO 3333	RRU 0740
IF (MONL) GO TO 3333	RRU 0750
IF (MOND) GO TO 3333	RRU 0760
IF (MONT) GO TO 3333	RRU 0770
IF (MONCOR) GO TO 3333	RRU 0780
IF (MONZEN) GO TO 3333	RRU 0790
GO TO 1112	RRU 0800
3333 WRITE (6,6672) (MVALUE (I),I=1,12)	RRU 0810
GO TO 1112	RRU 0820
7426 IF (.NOT. MONTOR) GO TO 1112	RRU 0830
IF (MONMA) WRITE (6,6672)	RRU 0840
MONTOR = .FALSE.	RRU 0850
MONMA = .FALSE.	RRU 0860
MONS = .FALSE.	RRU 0870
MONELM = .FALSE.	RRU 0880
WSQSOL = .FALSE.	RRU 0890
MONIV = .FALSE.	RRU 0900
MONR = .FALSE.	RRU 0910
MONC = .FALSE.	RRU 0920
MONL = .FALSE.	RRU 0930
MOND = .FALSE.	RRU 0940
MONT = .FALSE.	RRU 0950
MONCOR = .FALSE.	RRU 0960
MONZEN = .FALSE.	RRU 0970

C READ-WRITE GENERAL RUN CONTROLS	
C	

C	1112	READ (5,10) NV,NAUX,NG,ND,NR,NBB	RRU 0980
		WRITE (6,31) NV,NAUX,NG,N3R,ND,NB,NBB	RRU 0990
		NZ = NV + NAUX	RRU 1000
C		-----	
C		READ-WRITE PLOT AND PRINT-PLOT SPECIFICATIONS	
C		-----	
		READ (5,10) NPLTVT,N1R,NPLTVV	RRU 1010
		IF (NPLTVT .EQ. 0) GO TO 8990	RRU 1020
		READ (5,836) KPLDT,KPRPLT,SCALE,IPX,PRSYMB,KPFIT	RRU 1030
		IF (KPRPLT .EQ. 1) GO TO 1113	RRU 1040
		IF (KPLDT .NE. 1) GO TO 1113	RRU 1050
		IF (SCALE .NE. 0.0) GO TO 1113	RRU 1060
		KPRPLT = 1	RRU 1070
	1113	WRITE (6,34) SCALE , NPLTVT,NPLTVV,N1R,KPRPLT,KPLDT,IPX,KPFIT	RRU 1080
C		-----	
C		PLOTS OF VARIABLE VS. TIME. A VARIABLE NUMBER IS ENTERED NEGATIVE	
C		IF IT IS TO BE PLOTTED ONLY VS. ANOTHER VARIABLE(S)	
C		-----	
		READ (5,5) (AAAA(J),NPP(J),J=1,NPLTVT)	RRU 1090
		IF (N1R .GT. 0) GO TO 37	RRU 1100
		WRITE (6,30) (AAAA(J),NPP(J),J=1,NPLTVT)	RRU 1110
		GO TO 38	RRU 1120
	37	WRITE (6,35) (AAAA(J),NPP(J),J=1,NPLTVT)	RRU 1130
	38	WRITE (6,33)	RRU 1140
		IF (NPLTVV .EQ. 0) GO TO 39	RRU 1150
		READ (5,10) (NP1(J,1),NP1(J,2),J=1,NPLTVV)	RRU 1160
		WRITE (6,41) (NP1(J,1),NP1(J,2),J=1,NPLTVV)	RRU 1170
		DO 2230 J=1,2	RRU 1180
		DO 2230 K=1,NPLTVV	RRU 1190
		DO 2231 L=1,NPLTVT	RRU 1200
		IF (IABS(NPP(L)) .EQ. NP1(K,J)) GO TO 2230	RRU 1210
	2231	CONTINUE	RRU 1220
		WRITE (6,2232) K	RRU 1230
		CALL EXIT	RRU 1240
	2230	NP1(K,J)=L	RRU 1250
	39	K = NPLTVT* (N1R+1) + NPLTVV	RRU 1260
		IF (K .LE. 0) GO TO 8990	RRU 1270
		IF (SCALE .FO. 0.0) GO TO 8989	RRU 1280
		XSCALE(20) = 0.0	RRU 1290
		WRITE (6,7900)	RRU 1300
		DO 7902 I = 1 , K	RRU 1310
		READ (5,7903) Q1,XUNIT(1,1),XUNIT(2,1),XSCALE(1),XLEFT(1),	RRU 1320
	2	XRIGHT(1),Q2,YUNIT(1,1),YUNIT(2,1),YSCALE(1),YBOTTM(1),	RRU 1330
	3	YTOP(1)	RRU 1340
		WRITE(6,7904) I,Q1,XUNIT(1,1),XUNIT(2,1),XSCALE(1),XLEFT(1),	RRU 1350
	2	XRIGHT(1),Q2,YUNIT(1,1),YUNIT(2,1),YSCALE(1),YBOTTM(1),	RRU 1360
	3	YTOP(1)	RRU 1370
	7902	CONTINUE	RRU 1380
		GO TO 8990	RRU 1390
	8989	XSCALE(20) = -1.0	RRU 1400
C		-----	
C		CHECK IF UPPER LIMITS OF NUMBER OF VARIABLES AND VARIABLE SOURCES	
C		ARE EXCEEDED	
C		-----	
	8990	IF (NV .LE. 60) GO TO 3407	RRU 1410
		WRITE (6,3409)	RRU 1420
		CALL EXIT	RRU 1430
	3407	IF (NZ .LE. 70) GO TO 3414	RRU 1440
		WRITE (6,3413)	RRU 1450
		CALL EXIT	RRU 1460
	3414	IF (ND .LE. 18) GO TO 3417	RRU 1470
		WRITE (6,3419)	RRU 1480
		CALL EXIT	RRU 1490
	3417	IF (INSVVAR .NE. 0) GO TO 7722	RRU 1500
		DO 81 J = 1,NZ	RRU 1510

	V (J)=0.0	RRU 1520
81	V1(J)=0.0	RRU 1530
C	- - - - -	
C	READ-WRITE TEMPERATURE AND DELT-MODE SPECIFICATIONS	
C	- - - - -	
7722	READ (5,25) ABTEMP,NDTSPC	RRU 1540
	WRITE (6,61) ABTEMP	RRU 1550
	IF (NDTSPC .EQ. 0) NDTSPC = 1	RRU 1560
	READ (5,20) (CT(J,1),CT(J,2),J=1,NDTSPC)	RRU 1570
	WRITE (6,5112)(J,CT(J,1),CT(J,2),J=1,NDTSPC)	RRU 1580
	IF (NG .NE. 1) GO TO 134	RRU 1590
	READ (5,20)(V1(J),J=1,NZ)	RRU 1600
134	TI =CT(1,1)	RRU 1610
	DELT = TI	RRU 1620
	IF (NG .EQ. -1) DELT = 1.0E+20	RRU 1630
	T01=TI	RRU 1640
C	- - - - -	
C	READ-WRITE VARIABLE-SOURCE DATA	
C	- - - - -	
	ND =ND+1	RRU 1650
	CALL HOLLER(1H0,CC)	RRU 1660
	IF (DMAX .NE. 0.0) CALL HOLLER (1H ,CC)	RRU 1670
	WRITE (6,33)	RRU 1680
	DO 118 J=1,ND	RRU 1690
	JG(J) = 1	RRU 1700
	READ (5,10)NI,N12	RRU 1710
	IF (NI .NE. 0) GO TO 500	RRU 1720
	IF (J .GT. 1) GO TO 500	RRU 1730
	NI = 2	RRU 1740
	ST(1,1) = NI	RRU 1750
	ST(1,2) = NI2	RRU 1760
	E(1,1,1) = 0.0	RRU 1770
	E(1,1,2) = 0.0	RRU 1780
	E(1,2,1) = 0.0	RRU 1790
	E(1,2,2) = 1.0E+10	RRU 1800
	K = 19	RRU 1810
	RMAG = 0	RRU 1820
	GO TO 5122	RRU 1830
500	ST(J,1)=NI	RRU 1840
	ST(J,2)=NI2	RRU 1850
	READ (5,20)(E(J,L,1),E(J,L,2),L=1,NI)	RRU 1860
	IF (DMAX .EQ.0.0)GO TO 4444	RRU 1870
C	- - - - -	
C	MODIFY NOMINAL SOURCE VALUES BY DMAX PERCENT	
C	- - - - -	
	READ (5,4445) S1	RRU 1880
	S1 = S1 * DMAX	RRU 1890
	WRITE (6,4449) S1	RRU 1900
	DO 4447 L=1,NI	RRU 1910
4447	E(J,L,1) = E(J,L,1) * (1.0 + S1 / 100.0)	RRU 1920
4444	IF(J .GT. 1) GO TO 8501	RRU 1930
501	K=19	RRU 1940
	DO 8555 L=1,NI	RRU 1950
8555	E(1,L,1)=E(1,L,1)*E(1,1,2)	RRU 1960
	RMAG =E(1,1,2)	RRU 1970
	E(1,1,2)=0.0	RRU 1980
	WRITE (6,5116)RMAG,(E(1,L,1),E(1,L,2),L=1,NI)	RRU 1990
	GO TO 5122	RRU 2000
8501	K=J-1	RRU 2010
	IF(NI2)5118,5119,5120	RRU 2020
5118	WRITE (6,5121) CC,K,E(J,1,1)	RRU 2030
	GO TO 5122	RRU 2040
5119	WRITE (6,5123) CC,K,(E(J,L,1),E(J,L,2),L=1,NI)	RRU 2050
	GO TO 5122	RRU 2060
5120	WRITE (6,5124) CC,K,(E(J,L,1),E(J,L,2),L=1,NI)	RRU 2070
5122	IF (E(J,2,2) .NE.0.0)E2(J) = (E(J,2,1)-E(J,1,1)) / E(J,2,2)	RRU 2080

	ET (K)=E(J,1,1)	RRU 2090
	EP1(K)=ET(K)	RRU 2100
	IF (MONMA) WRITE (6,1125) J,K,NI,NI2,ST(J,1),ST(J,2),RMAG,ET(J)	RRU 2110
118	CONTINUE	RRU 2120
	IF (MONMA) WRITE (6,6661) JCAT,TE,TIMEIN,TI,DELT,RMAG	RRU 2130
C	-----	
C	READ-WRITE NORMAL-TERMINATION CONDITIONS	
C	-----	
	CALL HOLLER(1HA,HOLLA)	RRU 2140
	CALL HOLLER(1HG,HOLLG)	RRU 2150
	CALL HOLLER(3HABS,HOLABS)	RRU 2160
	CALL HOLLER(3H,HOLBLN)	RRU 2170
	CALL HOLLER(2HLE,HOLLE)	RRU 2180
	CALL HOLLER(2HGT,HOLGT)	RRU 2190
	READ (5, 10) IOC	RRU 2200
	IF (IOC .LE. 0) GO TO 7926	RRU 2210
	WRITE (6,7928) IOC	RRU 2220
	DO 7932 I=1,IOC	RRU 2230
	READ (5, 10) JACK	RRU 2240
	IAC(I) = JACK	RRU 2250
	WRITE (6,7930) I,JACK	RRU 2260
	DO 7931 J = 1,JACK	RRU 2270
	READ (5,7933) A1,NOVAR(I,J),A2,BVAL(I,J)	RRU 2280
	IF (A1 .EQ. HOLLA) GO TC 7938	RRU 2290
	A1 = HOLBLN	RRU 2300
	IF (A2 .EQ. HOLLG) GO TC 7937	RRU 2310
	ICS(I,J) = 1	RRU 2320
	A2 = HOLLE	RRU 2330
	GO TO 7941	RRU 2340
7937	ICS(I,J) = 2	RRU 2350
	GO TO 7841	RRU 2360
7938	A1 = HOLABS	RRU 2370
	IF (A2 .EQ. HOLLG) GO TC 7940	RRU 2380
	ICS(I,J) = -1	RRU 2390
	A2 = HOLLE	RRU 2400
	GO TO 7941	RRU 2410
7940	ICS(I,J) = -2	RRU 2420
7841	A2 = HOLGT	RRU 2430
7941	WRITE (6,7934) A1,NOVAR(I,J),A2,BVAL(I,J)	RRU 2440
7931	CONTINUE	RRU 2450
7932	CONTINUE	RRU 2460
C	-----	
C	READ-WRITE FAILURE-TERMINATION CONDITIONS	
C	-----	
7926	READ (5, 10) IOCF	RRU 2470
	IF (IOCF .LE. 0) RETURN	RRU 2480
	WRITE (6,7948) IOCF	RRU 2490
	DO 7952 I = 1,IOCF	RRU 2500
	READ (5, 10) JACK	RRU 2510
	IACF(I) = JACK	RRU 2520
	WRITE (6,7950) I,JACK	RRU 2530
	DO 7951 J = 1,JACK	RRU 2540
	READ (5,7933) A1,NOVARF(I,J),A2,BVALF(I,J)	RRU 2550
	IF (A1 .EQ. HOLLA) GO TC 7958	RRU 2560
	A1 = HOLBLN	RRU 2570
	IF (A2 .EQ. HOLLG) GO TO 7957	RRU 2580
	ICSF(I,J) = 1	RRU 2590
	A2 = HOLLE	RRU 2600
	GO TO 7961	RRU 2610
7957	ICSF(I,J) = 2	RRU 2620
	GO TO 7861	RRU 2630
7958	A1 = (+HOLABS)	RRU 2640
	IF (A2 .EQ. HOLLG) GO TC 7960	RRU 2650
	ICSF(I,J) = -1	RRU 2660
	A2 = HOLLE	RRU 2670
	GO TO 7961	RRU 2680

7960	ICSF(I,J) = -2	RRU 2690
7861	A2 = HOLGT	RRU 2700
7961	WRITE (6,7934) A1,NOVARF(I,J),A2,BVALF(I,J)	RRU 2710
7951	CONTINUE	RRU 2720
7952	CONTINUE	RRU 2730
	RETURN	RRU 2740
C		
5	FORMAT (6(A6,I6))	RRU 2750
10	FORMAT (6I12)	RRU 2760
11	FORMAT (3I12,2F12.8,I12)	RRU 2770
20	FORMAT (6F12.8)	RRU 2780
25	FORMAT (E12.5,I12)	RRU 2790
30	FORMAT (32HO PLOTS OF VARIABLE VS. TIME ,/,52H (SAVED BUT NOT PLOTTED IF VARIABLE NO. IS NEGATIVE) ,/10H VARIABLE ,/,	RRU 2800
3	13H NAME NO. ,/,(1H,A6,I4))	RRU 2810
31	FORMAT (14H GENERAL DATA	RRU 2820
2	,/ 6H NV =,I3,38H (NUMBER OF UNKNOWN NODAL VOLTAGES) ,	RRU 2830
3	/ 6H NAUX=,I3,33H (NUMBER OF AUXILIARY UNKNOWNNS) ,	RRU 2840
4	/ 5H NG =I4,54H (-1=CALCULATE VALUES, 0=ZERO VALUES, 1=READ VARRU 2850	RRU 2860
	SLUES)	RRU 2870
8	/,5H N3B=,I4,3X,43H(-1 = INITIAL CONDITIONS ONLY, 0 = HALT IF	RRU 2880
9	, 54H ERROR IN I.C., 1 = PRINT IF ERROR IN I.C. BUT PROCEED),RRU 2890	RRU 2900
5/5H	ND =I4,31H (NUMBER OF VARIABLE SOURCES)/5H NB =I4,49H (RATRRU 2910	RRU 2920
6/0	OF COMPUTED POINTS TO PLOTTED POINTS) /5H NBB=I4,46H (RATIO	RRU 2930
7/0	PLOTTED POINTS TO PRINTED POINTS))	RRU 2940
33	FORMAT (1H1)	RRU 2950
34	FORMAT (25HO PLOT AND PRINT-PLOT DATA ,/,	RRU 2960
1	(9H SCALE =,F3.0,34H (1 = READ SCALE FROM CARDS, 0 =	RRU 2970
2	11H OTHERWISE) ,/,9H NPLTVT = ,I3,38H (NUMBER OF VARIABLES TO	RRU 2980
	BE PLOTTED)	RRU 2990
3	,/,9H NPLTVV = ,I3,28H (NUMBER OF V-VS.-V PLOTS) ,/, 9H N1R	RRU 3000
4	= ,I3,2X,50H(1 = PLOT VDOT VS. V PHASE PLANES, 0 = OTHERWISE) /RRU 3010	RRU 3020
5	9H KPRPLT = ,I3,41H (1 = PRINT PLOT, 0 = DO NOT PRINT PLOT	RRU 3030
X	16H AT NORMAL EXIT) ,/,	RRU 3040
6	9H KPLT = ,I3,31H (1 = PLOT, 0 = DO NOT PLOT) ,/,	RRU 3050
7	9H IPX = ,I3,39H (NUMBER OF PLOTTED POINTS PER FRAME) ,/,RRU 3060	RRU 3070
8	9H KPFIT = ,I3,84H (0=INDEPENDENT SCALES AND BOUNDARIES FORRRU 3080	RRU 3090
9	FRAMES, 1=SAVE Y SCALES AND Y BOUNDARIES, ,/,15X,79H 2=SAVE X SCARRU 3100	RRU 3110
	XLES, Y SCALES, AND Y BOUNDARIES, 3=SAVE ALL SCALES AND BOUNDARIES)RRU 3120	RRU 3130
	X)	RRU 3140
35	FORMAT (66HO PLOTS OF VARIABLE VS. TIME AND VARIABLE DERIVITIVERRU 3150	RRU 3160
2	VS. VARIABLE ,/,52H (SAVED BUT NOT PLOTTED IF VARIABLE NO. IS NERRU 3170	RRU 3180
	3GATIVE) , /9H VARIABLE/12H NAME NO. /(X,A6,I4))	RRU 3190
41	FORMAT (32HO PLOTS OF VARIABLE VS. VARIABLE /26H VARIABLE X	RRU 3200
	2VARIABLE Y /(I7,6X,I7))	RRU 3210
61	FORMAT(1H0,/23HO ABSOLUTE TEMPERATURE= ,E13.5)	RRU 3220
600	FORMAT (67HO*** THE PLOT ROUTINE IS CALLED FOR BUT NO PLOTS ARE SPRRU 3230	RRU 3240
	2ECIFIED ***)	RRU 3250
800	FORMAT (7H RELER=,E12.5,9H ABSER = ,E12.5,RRU 3260	RRU 3270
2	24H FOR INITIAL CONDITIONS)	RRU 3280
836	FORMAT (2I12,F12.0,I12,11X,A1,I12)	RRU 3290
1111	FORMAT (35H MONITORING SPECIFIED FROM NDELT = ,I4,12H TO NDELT =	RRU 3300
2	,I4)	RRU 3310
1125	FORMAT (38H J,K,N1,N12,ST(I,J,1),ST(I,J,2),RMAG,EI(I) ,4I10,/,4E24.15)RRU 3320	RRU 3330
2232	FORMAT (41H DATA MISSING FOR UNKNOWN VS UNKNOWN PLOT 13)	RRU 3340
3409	FORMAT (28H NO OF NODES GREATER THAN 60)	RRU 3350
3413	FORMAT (31H NO OF UNKNOWNNS GREATER THAN 70)	RRU 3360
3419	FORMAT (30H NO OF SOURCES GREATER THAN 18)	RRU 3370
4445	FORMAT (F12.0)	RRU 3380
4446	FORMAT (31H O R S T C A S E F O R ,F2.0, 10H PERCENT	RRU 3390
2	58H D E V I A T I O N O F P A R A M E T E R V A L U E S /RRU 3400	RRU 3410
4449	FORMAT (1H0,F3.0,24H PERCENT DEVIATION FOR)	RRU 3420
5112	FORMAT (1H0/26H NO. DELT END TIME /(I3,2E12.4))	RRU 3430
5116	FORMAT (12H IPP SOURCE /15H SCALE FACTOR = E12.4 /20H MAGNITURRU 3440	RRU 3450
	2DE TIME /(2E12.4))	RRU 3460
5121	FORMAT (A1, 13H DC SOURCE NO. ,I3,/,12H MAGNITUDE = ,E12.4)	RRU 3470

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5123 FORMAT (A1, 19HVARIABLE SOURCE NO. ,I3,/,20H LAST MAGNITUDE HELD RRU 3340
2 ,/,21H MAGNITUDE TIME ,/,12E12.4)) RRU 3350
5124 FORMAT (A1, 19HVARIABLE SOURCE NO. I3 / 6H CYCLE /20H MAGNITUDE RRU 3360
2 TIME /12E12.4)) RRU 3370
5553 FORMAT (17HOEND OF FILE READ) RRU 3380
6661 FORMAT (48H JCAT, TE, TIMEIN, TI, DELT, RMAG , 17, RRU 3390
2 /5E24.15) RRU 3400
6671 FORMAT (15H MONITORS ON.. ,12L4) RRU 3410
6672 FORMAT (29H MONITORS TURNED OFF AT 7426 ) RRU 3420
7751 FORMAT (A6,6X,2I12,F12.0) RRU 3430
7752 FORMAT (12(A1,1X),2I12) RRU 3440
7753 FORMAT ( 1X,17HOVERALL-RUN DATA ,/,8H LIMITT= ,I3, RRU 3450
2 50H (COMPUTER-RUN PROCESS TIME = LIMITT-20 SECONDS) ,/, RRU 3460
3 7H KONT = ,I3,36H (1 = CONTINUED RUN, 0 = OTHERWISE) ) RRU 3470
7755 FORMAT (1H1,35X,16H C I R C U I T ,A6,/) RRU 3480
7756 FORMAT ( 20H SAVE-VARIABLE DATA ,/, 11H NSVVAR = ,I3, RRU 3490
2 53H (1 = SAVE ALL TIME VARIABLES FOR THE FOLLOWING MODE,, RRU 3500
3 16H 0 = OTHERWISE) ,/, 11H NSVPHI = ,I3, RRU 3510
4 50H (1 = SAVE ALL FLUX VALUES FOR THE FOLLOWING MODE,, RRU 3520
5 16H 0 = OTHERWISE) ,/, 11H NSVIL = ,I3, RRU 3530
6 58H (1 = SAVE INDUCTOR-CURRENT VALUES FOR THE FOLLOWING MORRU 3540
7DE, 16H 0 = OTHERWISE) ) RRU 3550
7777 FORMAT(17HOCONVERGENCE DATA ,/, RRU 3560
1 (10H ITRTST =,I3,102H (NUMBER OF TEST ITERATIONS BELOW WHIRRU 3570
2CH DELT IS MULTIPLIED BY 2 AND ABOVE WHICH DELT IS DIVIDED BY 2) RRU 3580
3 ,/,10H MAXMIN = ,I3,99H (INITIAL MAXIMUM NUMBER OF ITERATIONS BRRU 3590
4EFORE VARIABLE VALUES ARE RESET AND DELT IS DIVIDED BY 4) ,/RRU 3600
5 10H KFMAX =,I3,54H (MAXIMUM NUMBER OF TRIALS BEFORE ITRMAX IS CRRU 3610
6HANGED) ) RRU 3620
7900 FORMAT ( 1H0, 52X,18HP L O T D A T A ,/,1H0, RRU 3630
2 ,/,121H PLOT NO. X X-UNITS X-SCALE LERRU 3640
3FT RIGHT Y Y-UNITS Y-SCALE BOTTOM RRU 3650
4 TOP ,/) RRU 3660
C7903 FORMAT (A6,6X,2A6,3E12.5) RRU 3670
7903 FORMAT (A6,6X,2R6,3E12.5) RRU 3670
7904 FORMAT (1X,14,4X,A6,2X,2R6,E12.3,2E11.2,3X,A6,2X,2R6,E12.3,2E11.2)RRU 3680
C7904 FORMAT (1X,14,4X,A6,2X,2A6,E12.3,2E11.2,3X,A6,2X,2A6,E12.3,2E11.2)RRU 3680
7928 FORMAT ( 35HINORMAL-TERMINATION SPECIFICATIONS //, RRU 3690
2 5HOIOC= ,I2,/) RRU 3700
7930 FORMAT (4HOACI ,I2,3H)= ,I2) RRU 3710
7933 FORMAT (A1,8X,I3,A1,11X,E12.5) RRU 3720
7934 FORMAT (1H ,A3,1X,I2,1X,A2,E12.5) RRU 3730
7948 FORMAT (/ 36HOFILURE-TERMINATION SPECIFICATIONS /, RRU 3740
2 6HOIOCF= ,I2,/) RRU 3750
7950 FORMAT (5HOACF( ,I2,3H)= ,I2) RRU 3760
7975 FORMAT (13HOPRO. TIME = ,E12.3) RRU 3770
END RRU 3780

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C SURROUTINE PLAPR (KEND)
 C PLAPR CONTROLS PLOTTING (CALLS SURROUTINE PLT),
 C PRINT-PLOTTING (CALLS PRPLT), AND CARD PUNCHING

PLA 0010

COMMON VARIABLES

C	LOGICAL MONMA, SKIPIT, SKIPX, SKIPFR, SKIPXY	
C	IF (MONMA) WRITE (6,9999)	PLA 0020
	IGRAPH = 0	PLA 0030
	IF (KEND) 310,150,30	PLA 0040
150	IF (KXT .NE. 0) RETURN	PLA 0050
	KXT = 1	PLA 0060
	JV = JV - 1	PLA 0070
	WRITE (6,5)JV,T01	PLA 0080
	IF (ND .LE. 0) GO TO 700	PLA 0090
	ND1=ND-1	PLA 0100
	WRITE (6,70)EP1(19),(I,EP1(I),I=1,ND1)	PLA 0110
700	TE= TE-DELT	PLA 0120
	WRITE (6,50)TE,(I,V1(I),I=1,NZ)	PLA 0130
30	IF (KPUNCH .NE. 1) GO TO 310	PLA 0140
	TE = TE - DELT	PLA 0150
C	-----	
C	PUNCH CARDS FOR CONTINUED RUN	
C	-----	
	WRITE (6,11) NDELT,TE,DELT,DTM1,DTM2,NITRSM	PLA 0160
	PUNCH 11, NDELT,TE,DELT,DTM1,DTM2,NITRSM	PLA 0170
	TE = TE + DELT	PLA 0180
	WRITE (6,10) (TOO(I),I = 1, 19)	PLA 0190
	PUNCH 10 , (TOO(I),I = 1, 19)	PLA 0200
	WRITE (6,10) (EP1(I),I = 1,ND1)	PLA 0210
	PUNCH 10 , (EP1(I),I = 1,ND1)	PLA 0220
	WRITE (6,10) (V1(I),I=1,NZ)	PLA 0230
	PUNCH 10,(V1(I),I=1,NZ)	PLA 0240
	IF (NC .LE. 0) GO TO 330	PLA 0250
	DO 51 I=1,NC	PLA 0260
	WRITE (6,10) CIC(I)	PLA 0270
51	PUNCH 10 , CIC(I)	PLA 0280
330	IF (NL .LE. 0) GO TO 170	PLA 0290
	DO 52 I=1,NL	PLA 0300
	WRITE (6,10) CIL(I)	PLA 0310
52	PUNCH 10 ,CIL(I)	PLA 0320
170	IF (NDIODE .LE. 0) GO TO 171	PLA 0330
	DO 177 I=1,NDIODE	PLA 0340
	WRITE (6,10) DV(I),DR(I),DI(I)	PLA 0350
177	PUNCH 10 ,DV(I),DR(I),DI(I)	PLA 0360
171	IF (NTRANS .LE. 0) GO TO 173	PLA 0370
	DO 179 I=1,NTRANS	PLA 0380
	WRITE (6,10) BCV(I),BCR(I),BCI(I),BEV(I),BER(I),BEI(I)	PLA 0390
179	PUNCH 10 ,BCV(I),BCR(I),BCI(I),BEV(I),BER(I),BEI(I)	PLA 0400
173	IF (NCORE .LE. 0) GO TO 310	PLA 0410
	DO 181 I=1,NCORE	PLA 0420
	WRITE(6, 10) FM3(I),FM2(I),FM1(I),PHIM3(I),PHIM2(I),PHIM1(I),	PLA 0430
2	PDTEM1(I),PHDTM2(I),PHDTM1(I)	PLA 0440
	PUNCH 10 , FM3(I),FM2(I),FM1(I),PHIM3(I),PHIM2(I),PHIM1(I),	PLA 0450
2	PDTEM1(I),PHDTM2(I),PHDTM1(I)	PLA 0460
	K = NW(I)	PLA 0470
	DO 182 J = 1,K	PLA 0480
	WRITE (6,10) ,CICORE(I,J)	PLA 0490
182	PUNCH 10 ,CICORE(I,J)	PLA 0500
181	CONTINUE	PLA 0510
310	CALL AUX (-3)	PLA 0520
	IF (KPRPLT .EQ. 1) GO TO 555	PLA 0530
	IF (KPLOT .NE. 1) RETURN	PLA 0540
555	IF (JV .LT. 2) RETURN	PLA 0550

C	-----	
C	PLOTTING AND PRINT PLOTTING	
C	-----	
	TFJV = TF(JV)	PLA 0560
	SKIPIT = (NDELT .GT. IPX*NB) .AND. (KPFIT .GT. 0) .AND. (KONT.EQ.0)	PLA 0570
	SKIPX = SKIPIT .AND. (KPFIT .EQ. 1)	PLA 0580
	SKIPFR = SKIPIT .AND. (KPFIT .EQ. 2)	PLA 0590
	SKIPXY = SKIPIT .AND. (KPFIT .EQ. 3)	PLA 0600
	IF (NPLTVT .EQ. 0) GO TO 206	PLA 0610
C	-----	
C	V-VS.-T PLOTS	
C	-----	
	CALL HOLLER(3H ,TITLE(2))	PLA 0620
109	DO 306 I=1,NPLTVT	PLA 0630
	JV1=NPP(I)	PLA 0640
	K = IABS(JV1)	PLA 0650
	VP(I,JV)=V(K)	PLA 0660
	IF (JV1 .LT. 0) GO TO 306	PLA 0670
	BCDT=AAAA(I)	PLA 0680
	TITLE(1) = BCDT	PLA 0690
	IF (SKIPXY) GO TO 71	PLA 0700
	XL = +1.0E30	PLA 0710
	XR = -1.0E30	PLA 0720
	YT = -1.0E30	PLA 0730
	YTP= -1.0E30	PLA 0740
	YB = +1.0E30	PLA 0750
	YBP= +1.0E30	PLA 0760
71	DO 307 K=1,JV	PLA 0770
	XP(K)=VP(I,K)	PLA 0780
	IF (SKIPXY) GO TO 307	PLA 0790
	XL=AMIN1(XL,TF(K))	PLA 0800
	XR=AMAX1(XR,TF(K))	PLA 0810
	IF (XP(K) .GT. YB) GO TO 716	PLA 0820
	IF (XP(K) .LT. YBP) GO TO 715	PLA 0830
	YB = XP(K)	PLA 0840
	GO TO 716	PLA 0850
715	YB = YBP	PLA 0860
	YBP = XP(K)	PLA 0870
716	IF (XP(K) .LT. YT) GO TO 307	PLA 0880
	IF (XP(K) .GT. YTP) GO TO 717	PLA 0890
	YT = XP(K)	PLA 0900
	GO TO 307	PLA 0910
717	YT = YTP	PLA 0920
	YTP = XP(K)	PLA 0930
307	CONTINUE	PLA 0940
	IF (SKIPXY) GO TO 718	PLA 0950
	IF (SKIPFR) GO TO 817	PLA 0960
	IF (SKIPX) GO TO 818	PLA 0970
	SAVEXL(I,1) = XL	PLA 0980
	SAVEXR(I,1) = XR	PLA 0990
	SAVEYB(I,1) = YB	PLA 1000
	SAVEYT(I,1) = YT	PLA 1010
	GO TO 719	PLA 1020
817	IF (XR .LE. SAVEXR(I,1)) GO TO 718	PLA 1030
	XRP = (SAVEXR(I,1) - SAVEXL(I,1)) / 8.0	PLA 1040
	XLP = XRP * AMIN1(7.0, AINT((XR-SAVEXR(I,1))/XRP)) + XRP	PLA 1050
	XL = SAVEXL(I,1) + XLP	PLA 1060
	XR = SAVEXR(I,1) + XLP	PLA 1070
	GO TO 818	PLA 1080
718	XL = SAVEXL(I,1)	PLA 1090
	XR = SAVEXR(I,1)	PLA 1100
818	YB = SAVEYB(I,1)	PLA 1110
	YT = SAVEYT(I,1)	PLA 1120
719	IF (KPRPLT .EQ. 1) CALL PRPLT (JV,-1,JV1,0)	PLA 1130
	IF (KPLOT .EQ. 1) CALL PLT (JV,-1,JV1,0)	PLA 1140
306	CONTINUE	PLA 1150
	IF(N1B .LE. 0) GO TO 2202	PLA 1160
C	-----	
C	VDDT-VS.-V (PHASE PLANE) PLOTS	

C	JVV=JV-2	PLA 1170
	CALL HOLLER(3HDDOT ,TITLE(2))	PLA 1180
	M = 0	PLA 1190
	DO 2201 I=1,NPLTVT	PLA 1200
	JV1=NPP(I)	PLA 1210
	IF (JV1 .LT. 0) GO TO 2201	PLA 1220
	BCDT=AAAA(I)	PLA 1230
	BCDT1 = BCDT	PLA 1240
	TITLE(1) = BCDT	PLA 1250
	IF (SKIPIT) GO TO 72	PLA 1260
	YT = -1.0E30	PLA 1270
	YTP = -1.0E30	PLA 1280
	YB = +1.0E30	PLA 1290
	YBP = +1.0E30	PLA 1300
72	DO 2200 K=1,JVV	PLA 1310
	IF (M .GT. 0) GO TO 3406	PLA 1320
	XP(K)=(VP(I,K+2)-VP(I,K))/(TF(K+2)-TF(K))	PLA 1330
	GO TO 3407	PLA 1340
3406	XP(K)=(VP(I,K+2)-VP(I,K))*XP(K)/(VP(M,K+2)-VP(M,K))	PLA 1350
3407	TF(K)=VP(I,K+1)	PLA 1360
	IF (SKIPIT) GO TO 2200	PLA 1370
	IF (XP(K) .GT. YB) GO TO 726	PLA 1380
	IF (XP(K) .LT. YBP) GO TO 725	PLA 1390
	YB = XP(K)	PLA 1400
	GO TO 726	PLA 1410
725	YB = YBP	PLA 1420
	YBP = XP(K)	PLA 1430
726	IF (XP(K) .LT. YT) GO TO 2200	PLA 1440
	IF (XP(K) .GT. YTP) GO TO 727	PLA 1450
	YT = XP(K)	PLA 1460
	GO TO 2200	PLA 1470
727	YT = YTP	PLA 1480
	YTP = XP(K)	PLA 1490
2200	CONTINUE	PLA 1500
	IF (SKIPIT) GO TO 728	PLA 1510
	XL = SAVEYB(I,1)	PLA 1520
	SAVEXL(I,2) = XL	PLA 1530
	XR = SAVEYT(I,1)	PLA 1540
	SAVEXR(I,2) = XR	PLA 1550
	SAVEYB(I,2) = YB	PLA 1560
	SAVEYT(I,2) = YT	PLA 1570
	GO TO 729	PLA 1580
728	XL = SAVEXL(I,2)	PLA 1590
	XR = SAVEXR(I,2)	PLA 1600
	YB = SAVEYB(I,2)	PLA 1610
	YT = SAVEYT(I,2)	PLA 1620
729	IF (KPRPLT .EQ. 1) CALL PRPLT(JVV,0, JV1,0)	PLA 1630
	IF (KPLDT .EQ. 1) CALL PLT (JVV,0, JV1,C)	PLA 1640
	M = I	PLA 1650
2201	CONTINUE	PLA 1660
2202	IF (NPLTVV .LE. 0) GO TO 206	PLA 1670
C	-----	
C	V-VS.-V PLOTS	
C	-----	
	CALL HOLLER(3H ,TITLE(2))	PLA 1680
	DO 2205 I=1,NPLTVV	PLA 1690
	I1=NP1(I,1)	PLA 1700
	I2=NP1(I,2)	PLA 1710
	BCDT=AAAA(I1)	PLA 1720
	BCDT1=AAAA(I2)	PLA 1730
	TITLE(1) = BCDT1	PLA 1740
	IF (SKIPIT) GO TO 73	PLA 1750
	XL = +1.0E30	PLA 1760
	XLP = +1.0E30	PLA 1770
	XR = -1.0E30	PLA 1780
	XRP = -1.0E30	PLA 1790
	YT = -1.0E30	PLA 1800
	YTP = -1.0E30	PLA 1810
	YB = +1.0E30	PLA 1820
	YBP = +1.0E30	PLA 1830

73 DO 2206 K=1,JV	PLA 1840
TF(K)=VP(I1,K)	PLA 1850
XP(K)=VP(I2,K)	PLA 1860
IF (SKIPIT) GO TO 2206	PLA 1870
IF (TF(K) .GT. XL) GO TO 732	PLA 1880
IF (TF(K) .LT. XLP) GO TO 731	PLA 1890
XL = TF(K)	PLA 1900
GO TO 732	PLA 1910
731 XL = XLP	PLA 1920
XLP = TF(K)	PLA 1930
732 IF (TF(K) .LT. XR) GO TO 734	PLA 1940
IF (TF(K) .GT. XRP) GO TO 733	PLA 1950
XR = TF(K)	PLA 1960
GO TO 734	PLA 1970
733 XR = XRP	PLA 1980
XRP = TF(K)	PLA 1990
734 IF (XP(K) .GT. YB) GO TO 736	PLA 2000
IF (XP(K) .LT. YBP) GO TO 735	PLA 2010
YB = XP(K)	PLA 2020
GO TO 736	PLA 2030
735 YB = YBP	PLA 2040
YBP = XP(K)	PLA 2050
736 IF (XP(K) .LT. YT) GO TO 2206	PLA 2060
IF (XP(K) .GT. YTP) GO TO 737	PLA 2070
YT = XP(K)	PLA 2080
GO TO 2206	PLA 2090
737 YT = YTP	PLA 2100
YTP = XP(K)	PLA 2110
2206 CONTINUE	PLA 2120
IF (SKIPIT) GO TO 738	PLA 2130
SAVEXL(I,3) = XL	PLA 2140
SAVEXR(I,3) = XR	PLA 2150
SAVEYB(I,3) = YB	PLA 2160
SAVEYT(I,3) = YT	PLA 2170
GO TO 739	PLA 2180
738 XL = SAVEXL(I,3)	PLA 2190
XR = SAVEXR(I,3)	PLA 2200
YB = SAVEYB(I,3)	PLA 2210
YT = SAVEYT(I,3)	PLA 2220
739 I1=NPP(I1)	PLA 2230
I2=NPP(I2)	PLA 2240
IF (KPRPLT .EQ. 1) CALL PRPLT(JV, 1, I1,I2)	PLA 2250
IF (KPLOT .EQ. 1) CALL PLT (JV, 1, I1,I2)	PLA 2260
2205 CONTINUE	PLA 2270
206 WRITE (6,5)	PLA 2280
IF (JV .LT. IPX) GO TO 1206	PLA 2290
DO 1205 I = 1,NPLTVT	PLA 2300
VP(I,1) = VP(1,JV)	PLA 2310
1205 CONTINUE	PLA 2320
TF(1) = TFJV	PLA 2330
JV = 1	PLA 2340
RETURN	PLA 2350
1206 JV = 0	PLA 2360
RETURN	PLA 2370
C	
5 FORMAT (1H1/I6,E13.5)	PLA 2380
10 FORMAT (6E12.5)	PLA 2390
11 FORMAT (1I2,4E12.5,I12)	PLA 2400
50 FORMAT (1H /6H TIME=E12.5/9H UNKNOWN6(I4,E13.5))	PLA 2410
70 FORMAT (1H /17H IONIZING PULSE = E13.5/7H SOURCE/6(I4,E13.5))	PLA 2420
9999 FORMAT (8H PLAPR)	PLA 2430
END	PLA 2440

C SUBROUTINE PRPLT
PRPLT HANDLES PRINT PLOTTING

(NN,NLC,ID,IL)

PRP 0010

COMMON VARIABLES

	EQUIVALENCE (H,G)	PRP 0020
	DIMENSION G(81,41)	PRP 0030
	DIMENSION X(14)	PRP 0040
C	• • • • •	
C	CHECK PLOT RANGE	
C	-----	
	SX = XR - XL	PRP 0050
	IF (SX .LE. 0.0) GO TO 31	PRP 0060
	SY = YT - YB	PRP 0070
	IF (SY .GT. 0.0) GO TO 33	PRP 0080
	31 WRITE (6,32) TITLE(1),TITLE(2)	PRP 0090
	GO TO 35	PRP 0100
	33 CALL HOLLER(1H,ABLANK)	PRP 0110
	CALL HOLLER(1H,ADOT)	PRP 0120
	IF (PRSYMB .EQ. ABLANK) CALL HOLLER(1H*,PRSYMB)	PRP 0130
	AASS = PRSYMB	PRP 0140
	CALL HOLLER(1H*,APLUS)	PRP 0150
C	-----	
C	BLANK ARRAY AND FILL IN VERTICAL AND HCRIZONTAL GRID LINES	
C	-----	
	DO 50 J = 1,41	PRP 0160
	DO 50 I = 1,81	PRP 0170
	G(I,J) = ABLANK	PRP 0180
	IF (I .EQ. 81) GO TO 160	PRP 0190
	IF (I .EQ. 1) GO TO 160	PRP 0200
	IF (J .EQ. 41) GO TO 160	PRP 0210
	IF (J .EQ. 1) GO TO 160	PRP 0220
	IF (MOD(I,10) .NE. 1) GO TO 159	PRP 0230
	IF (J .EQ. 2) GO TO 160	PRP 0240
	IF (J .EQ. 40) GO TO 160	PRP 0250
	159 IF (MOD(J,5) .NE. 1) GO TO 50	PRP 0260
	IF (I .EQ. 2) GO TO 160	PRP 0270
	IF (I .LT. 80) GO TO 50	PRP 0280
	160 G(I,J) = ADOT	PRP 0290
	50 CONTINUE	PRP 0300
	WRITE (6,401)	PRP 0310
C	-----	
C	DETERMINE BOUNDS AND TIC SPACING FOR GRAPH	
C	-----	
	TX = ALOG10(SX/7.0) + 1000.0	PRP 0320
	Z = TX - AINT(TX)	PRP 0330
	IF (Z .EQ. 0.0) GO TO 89	PRP 0340
	IF (Z .GT. 0.30103) GO TO 81	PRP 0350
	TX = AINT(TX) + 1.0299956E-3 + 0.3	PRP 0360
	GO TO 89	PRP 0370
	81 IF (Z .GT. 0.69898) GO TO 82	PRP 0380
	TX = AINT(TX) - 1.0299956E-3 + 0.7	PRP 0390
	GO TO 89	PRP 0400
	82 TX = AINT(TX+1.0)	PRP 0410
	89 SX = 10.0 ** (1001.0-TX)	PRP 0420
	TT = 10.0 / SX	PRP 0430
	TX = AINT(XL/TT) * TT	PRP 0440
	IF (XL .LT. TX) TX = TX - TT	PRP 0450
	XL = TX	PRP 0460
	TY = ALOG10(SY/7.0) + 1000.0	PRP 0470
		PRP 0480

IF (Z .EQ. 0.0) GO TO 79	PRP 0490
IF (Z .GT. 0.30103) GO TO 71	PRP 0500
TY = AINT(TY) + 1.0299956E-3 + 0.3	PRP 0510
GO TO 79	PRP 0520
71 IF (Z .GT. 0.69898) GO TO 72	PRP 0530
TY = AINT(TY) - 1.0299956E-3 + 0.7	PRP 0540
GO TO 79	PRP 0550
72 TY = AINT(TY+1.0)	PRP 0560
79 SY = 10.0 * (1000.7 - TY - 1.0299956E-3)	PRP 0570
TT = 5.0 / SY	PRP 0580
TY = AINT(YB/TT) * TT	PRP 0590
IF (YB .LT. TY) TY = TY - TT	PRP 0600
YB = TY	PRP 0610
IF (KPLOT .EQ. 0) GO TO 106	PRP 0620
IF (XSCALE(20) .GT. -0.5) GO TO 106	PRP 0630

C SET SCALES AND FRAME FOR PLT SUBROUTINE (IF SCALE = 1)	
C	
C	
K = IGRAPH + 1	PRP 0640
XLEFT(K) = XL	PRP 0650
XRIGHT(K) = XL + 80.0 / SX	PRP 0660
XSCALE(K) = (XRIGHT(K) - XL) / 8.0	PRP 0670
IF (NLC .NE. -1) GO TO 90	PRP 0680
CALL HOLLER(6RSECOND, XUNIT(1,K))	PRP 0690
CALL HOLLER(6RS, XUNIT(2,K))	PRP 0700
GO TO 92	PRP 0710
90 CALL HOLLER(6RMKS UN, XUNIT(1,K))	PRP 0720
CALL HOLLER(6RITS, XUNIT(2,K))	PRP 0730
92 YBOTTM(K) = YB	PRP 0740
YTOP(K) = YB + 40.0 / SY	PRP 0750
YSCALE(K) = (YTOP(K) - YB) / 8.0	PRP 0760
CALL HOLLER(6RMKS UN, YUNIT(1,K))	PRP 0770
CALL HOLLER(6RITS, YUNIT(2,K))	PRP 0780
106 CSX = SX * 10.0	PRP 0790
CSY = SY * 20.0	PRP 0800

C TRANSFORM X AND Y DATA FROM TF(K) AND XP(K) ARRAYS INTO	
C G(I,J) SYMBOL ARRAY.	
C	
C	
DO 206 K = 1, NN	PRP 0810
II = (TF(K) - XL) * CSX + .5	PRP 0820
J1 = (XP(K) - YB) * CSY + .5	PRP 0830
I = 1 + (II + .5) / 10	PRP 0840
J = 1 + (J1 + .5) / 20	PRP 0850
IF (I .LT. 1) I = 1	PRP 0860
IF (I .GT. 81) I = 81	PRP 0870
IF (J .GT. 41) J = 41	PRP 0880
J = 42 - J	PRP 0890
IF (J .GT. 41) J = 41	PRP 0900
IF (G(I,J) .EQ. APLUS) GO TO 206	PRP 0910
IF (G(I,J) .NE. AASS) GO TO 180	PRP 0920
G(I,J) = APLUS	PRP 0930
GO TO 206	PRP 0940
180 G(I,J) = AASS	PRP 0950
206 CONTINUE	PRP 0960

C PRINT-PLOT SYMBOL ARRAY G(I,J)	
C	
C	
KI = 1	PRP 0970
DO 407 I = 1, 40	PRP 0980
IF (KI .NE. 1) GO TO 307	PRP 0990
C = 41 - I	PRP 1000

	DC = YB + C / SY	PRP 1010
	IF (ABS(DC) .LE. 1.0E-4*ABS(YB)) DC = 0.0	PRP 1020
C	-----	
C	LABEL Y AXIS IN LINES 21(VARIABLE), 23(UNITS), AND 26(V.NO.)	
C	-----	
	IF (I .NE. 21) GO TO 306	PRP 1030
	WRITE (6,20) TITLE(1),TITLE(2),CC,(G(L,I),L=1,81)	PRP 1040
	GO TO 207	PRP 1050
306	IF (I .NE. 26) GO TO 406	PRP 1060
	IF (NLC .EQ. 0) GO TO 406	PRP 1070
	IF (NLC .EQ. -1) GO TO 404	PRP 1080
	J = IABS(IL)	PRP 1090
	GO TO 405	PRP 1100
404	J = IABS(ID)	PRP 1110
405	WRITE (6,21) J ,DC,(G(L,I),L=1,81)	PRP 1120
	GO TO 207	PRP 1130
406	WRITE (6, 20) DC,(G(L,I),L=1,81)	PRP 1140
	GO TO 207	PRP 1150
307	IF (I .NE. 23) GO TO 308	PRP 1160
	WRITE (6, 23) (G(L,I),L=1,81)	PRP 1170
	GO TO 207	PRP 1180
308	WRITE (6, 22) (G(L,I),L=1,81)	PRP 1190
	IF (KI .LT. 5) GO TO 207	PRP 1200
	KI= 0	PRP 1210
207	KI=KI+1	PRP 1220
407	CONTINUE	PRP 1230
C	-----	
C	LABEL X-AXIS	
C	-----	
	WRITE (6,20) YB,(G(L,41),L=1,81)	PRP 1240
	IG = 0	PRP 1250
	DO 208 I = 1,81, 10	PRP 1260
	IG = IG + 1	PRP 1270
	C = I - 1	PRP 1280
	X(IG) = XL + C / SX	PRP 1290
	IF (ABS(X(IG)) .LE. 1.0E-4*ABS(XL)) X(IG)= 0.0	PRP 1300
208	CONTINUE	PRP 1310
	WRITE (6, 21) (X(L), L = 1, IG)	PRP 1320
35	IF (NLC) 3,4,4	PRP 1330
3	WRITE(6,96)	PRP 1340
	WRITE(6, 6) TITLE(4)	PRP 1350
	RETURN	PRP 1360
4	J = IABS(ID)	PRP 1370
	WRITE(6,98) BCDT,J	PRP 1380
	WRITE(6, 6) TITLE(4)	PRP 1390
	RETURN	PRP 1400
C	-----	
	6 FORMAT (1H0,52X,8HCIRCUIT ,A6)	PRP 1410
20	FORMAT (4X, E15.2, 2X, 81A1)	PRP 1420
21	FORMAT (15X, 9E10.2)	PRP 1430
22	FORMAT (21X81A1)	PRP 1440
23	FORMAT (13H (MKS UNITS) ,7X,81A1)	PRP 1450
32	FORMAT (16H-NO PRINTER PLOT,5X,A6,A3)	PRP 1460
96	FORMAT (1H0,54X, ,10H TIME (SEC) ,/1H0)	PRP 1470
98	FORMAT (1H0,46X,A6,20H (MKS UNITS), 2HV(, 12, 1H),/,1H0)	PRP 1480
120	FORMAT (1H , A6,A3 , E9.2,2X,81A1)	PRP 1490
121	FORMAT (3H V(, 12,1H),E14.2,2X,81A1)	PRP 1500
401	FORMAT(1H1/1H ,30X12A6)	PRP 1510
	END	PRP 1520

SUBROUTINE PLT (N,J2,JV1,JV2)
 C PLT HANDLES PLOTTING

PLT 0010

COMMON VARIABLES

INTEGER XUNIT,YUNIT
 LOGICAL RULL
 DIMENSION TAR1(2),TAR4(15),TAR5(32),TAR2(2)
 DIMENSION IBUF(1024)
 DATA DOT /3HDDT/
 DATA PAREN1/6H(/
 DATA TIME /6HTIME /
 DATA VSPT /6H VS. /
 DATA MIC/3RMIC/
 DATA MIL/3RMIL/
 DATA MAKS/3RMAX/
 DATA NAN/3RNAN/
 DATA IPC/3RPIC/

PLT 0020
 PLT 0030
 PLT 0040
 PLT 0050
 PLT 0060
 PLT 0070
 PLT 0080
 PLT 0090
 PLT 0100
 PLT 0110
 PLT 0120
 PLT 0130
 PLT 0140

C
 IGRAPH = IGRAPH + 1
 IF (CT(11,2) .NE. 123.456) CALL PLCTSI (IBUF,1024,7)
 CT(11,2) = 123.456
 ZERO = 0.0
 ONE = 1.0
 XLEFT1 = XLFFT(IGRAPH)
 RIGHT = XRIGHT(IGRAPH)
 TOP = YTOP(IGRAPH)
 BOTTOM = YBOTTM(IGRAPH)
 FIXX = 1.0 / XSCALE(IGRAPH)
 FIXY = 1.0 / YSCALE(IGRAPH)
 XZERO = -XLEFT1 * FIXX
 YZERO = ONE - BOTTOM * FIXY

PLT 0150
 PLT 0160
 PLT 0170
 PLT 0180
 PLT 0190
 PLT 0200
 PLT 0210
 PLT 0220
 PLT 0230
 PLT 0240
 PLT 0250
 PLT 0260
 PLT 0270

C
 C DRAW FRAME
 C

CALL PLOT (ZERO,ONE,3)
 XTIC = RIGHT * FIXX + XZERO
 CALL PLOT (XTIC,ONE,2)
 YTIC = TOP * FIXY + YZERO
 CALL PLOT (XTIC,YTIC,2)
 CALL PLOT (ZERO,YTIC,2)
 CALL PLOT (ZERO,ONE,2)

PLT 0280
 PLT 0290
 PLT 0300
 PLT 0310
 PLT 0320
 PLT 0330
 PLT 0340

C
 C DETERMINE SCALE OF X-AXIS
 C

ITEM = XUNIT(1,IGRAPH) / 10000000
 IF (ITEM - MIC) 10, 9, 10
 9 RATIO = 1.0E6
 GO TO 30
 10 IF (ITEM - MIL) 12,11,12
 11 RATIO = 1.0E3
 GO TO 30
 12 IF (ITEM - MAKS) 14,13,14
 13 RATIO = 1.0E8
 GO TO 30
 14 IF (ITEM - NAN) 16,15,16
 15 RATIO = 1.0E9

PLT 0350
 PLT 0360
 PLT 0370
 PLT 0380
 PLT 0390
 PLT 0400
 PLT 0410
 PLT 0420
 PLT 0430
 PLT 0440
 PLT 0450
 PLT 0460

	GO TO 30	PLT 0470
	16 IF (ITEM - IPC) 18,17,18	PLT 0480
	17 RATIO = 1.0E12	PLT 0490
	GO TO 30	PLT 0500
	18 RATIO = 1.0	PLT 0510
	30 TEMP = XSCALE(IGRAPH) * RATIO	PLT 0520
C	- - - - -	
C	DETERMINE TIC SPACING FOR X-AXIS	
C	- - - - -	
	XMARK=ALOG10(TEMP)	PLT 0530
	IF (INT(XMARK) .EQ. XMARK) GO TO 21	PLT 0540
	IF (XMARK) 19,29,21	PLT 0550
	19 XMARK = 10.0 ** (INT(XMARK) - 1.0)	PLT 0560
	GO TO 20	PLT 0570
	21 XMARK = 10.0 ** INT(XMARK)	PLT 0580
	20 XTIC = ABS(XMARK/TEMP)	PLT 0590
	IF (XTIC - 0.282842712475) 22,23,23	PLT 0600
	22 IF (XTIC - 0.141421356237) 24,25,25	PLT 0610
	24 XTIC = 10.0 * XTIC	PLT 0620
	XMARK = 10.0 * XMARK	PLT 0630
	GO TO 29	PLT 0640
	25 XTIC = 5.0 * XTIC	PLT 0650
	XMARK = 5.0 * XMARK	PLT 0660
	23 IF (XTIC - 0.70710678119) 26,29,29	PLT 0670
	26 XTIC = XTIC + XTIC	PLT 0680
	XMARK = XMARK + XMARK	PLT 0690
	29 ICOUNT = (RIGHT - XLEFT) * FIXX / XTIC + 2.00000001	PLT 0700
	TEMP = XLEFT * FIXX / XTIC + 0.999999999	PLT 0710
	IF (INT(TEMP) .EQ. TEMP) GO TO 28	PLT 0720
	IF (TEMP) 27,28,28	PLT 0730
	27 TEMP = TEMP - 1.0	PLT 0740
	28 TEMP = INT(TEMP)	PLT 0750
	YTIC = TEMP * XTIC - XTIC + XZERO	PLT 0760
	TIC1 = YTIC	PLT 0770
	TMARK1 = TEMP * XMARK	PLT 0780
	X = TMARK1	PLT 0790
	DO 31 I = 1,ICOUNT	PLT 0800
	IF (ABS(10000.0*X) .LT. XMARK) X = 0.0	PLT 0810
	TAR5(I) = X	PLT 0820
	31 X = X + XMARK	PLT 0830
	DO 110 J = 1,ICOUNT,2	PLT 0840
	110 ENCODE 20,32,TAR4(J),TAR5(J),TAR5(J+1)	PLT 0850
C	- - - - -	
C	WRITE NUMBERS ON X-AXIS	
C	- - - - -	
	TEMP = RIGHT * FIXX + XZERO + 0.010	PLT 0860
	TIC1 = XTIC + TIC1	PLT 0870
	BULL = .TRUE.	PLT 0880
	DO 35 I = 1,1000	PLT 0890
	TAR4(I) = TAR4(I)	PLT 0900
	BULL = .NOT. BULL	PLT 0910
	IF (BULL) GO TO 34	PLT 0920
	TEMP2 = TIC1-0.48	PLT 0930
	CALL SYMBOL(TEMP2,0.73,0.14,TAR4,0.0,8)	PLT 0940
	34 CALL PLOT(TIC1,ONE,3)	PLT 0950
	CALL PLOT(TIC1,1.1,2)	PLT 0960
	TIC1 = TIC1 + XTIC	PLT 0970
	IF (TIC1 - TEMP) 35,36,36	PLT 0980
	35 CONTINUE	PLT 0990
C	- - - - -	
C	PLOT TICS ON TOP AND BOTTOM FRAME	
C	- - - - -	
	36 TIC1 = YTIC	PLT 1000
	YTIC = TOP * FIXY + YZERO	PLT 1010
	DO 37 I = 1,1000	PLT 1020
	TIC1 = XTIC + TIC1	PLT 1030

CALL PLOT (TIC1, YTIC, 3)	PLT 1040
TEMP2 = YTIC - 0.1	PLT 1050
CALL PLOT (TIC1, TEMP2, 2)	PLT 1060
IF (TIC1 + XTIC - TEMP) 37, 38, 38	PLT 1070
37 CONTINUE	PLT 1080
38 TEMP = (XLEFT1 + RIGHT) * 0.5 * FIXX + XZERO	PLT 1090
IF (J2) 41, 40, 40	PLT 1100
40 TARI(1) = BCDT	PLT 1110
GO TO 42	PLT 1120
41 TARI(1) = TIME	PLT 1130
42 TEMP2 = TEMP - 1.34	PLT 1140

C WRITE TITLES AND DIMENSIONS	
C	
C	
CALL SYMBOL (TEMP-2.01, 0.11, 0.21, TARI, 0.0, 6)	PLT 1150
CALL SYMBOL (TEMP-0.75, 0.11, 0.21, PAREN1, 0.0, 1)	PLT 1160
IAR2(1) = XUNIT(1, IGRAPH)	PLT 1170
IAR2(2) = XUNIT(2, IGRAPH)	PLT 1180
CALL PAREN(IAR2, 1)	PLT 1190
CALL SYMBOL (TEMP-0.54, 0.11, 0.21, IAR2, 0.0, 1)	PLT 1200
CALL SYMBOL (TEMP-0.72, -0.46, 0.28, VSPT, 0.0, 6)	PLT 1210
CALL SYMBOL (TEMP+1.00, -0.46, 0.28, TARI, 0.0, 6)	PLT 1220
IF (J2) 44, 45, 43	PLT 1230
43 BCDT = BCDT1	PLT 1240
44 TARI(1) = BCDT	PLT 1250
CALL SYMBOL (TEMP-2.12, -0.46, 0.28, TARI, 0.0, 6)	PLT 1260
TEMP = (TOP + BOTTOM) * 0.5 * FIXY + YZERO	PLT 1270
CALL SYMBOL (-1.50, TEMP-2.01, 0.21, TARI, 90.0, 6)	PLT 1280
GO TO 46	PLT 1290
45 TARI(1) = BCDT	PLT 1300
CALL SYMBOL (TEMP-3.08, -0.46, 0.28, TARI, 0.0, 6)	PLT 1310
CALL SYMBOL (TEMP-1.40, -0.46, 0.28, DOT, 0.0, 3)	PLT 1320
TEMP = (TOP + BOTTOM) * 0.5 * FIXY + YZERO	PLT 1330
CALL SYMBOL (-1.50, TEMP-2.73, 0.21, TARI, 90.0, 6)	PLT 1340
CALL SYMBOL (-1.50, TEMP-1.47, 0.21, DOT, 90.0, 3)	PLT 1350
46 CALL SYMBOL (-1.50, TEMP-0.75, 0.21, PAREN1, 90.0, 1)	PLT 1360
IAR2(1) = YUNIT(1, IGRAPH)	PLT 1370
IAR2(2) = YUNIT(2, IGRAPH)	PLT 1380
CALL PAREN(IAR2, 1)	PLT 1390
CALL SYMBOL (-1.50, TEMP-0.54, 0.21, IAR2, 90.0, 1)	PLT 1400

C DETERMINE SCALE OF Y-AXIS	
C	
C	
ITEM = YUNIT(1, IGRAPH) / 10000008	PLT 1410
IF (ITEM - MIC) 50, 49, 50	PLT 1420
49 RATIO = 1.0E6	PLT 1430
GO TO 60	PLT 1440
50 IF (ITEM - MIL) 52, 51, 52	PLT 1450
51 RATIO = 1.0E3	PLT 1460
GO TO 60	PLT 1470
52 IF (ITEM - MAKSI) 54, 53, 54	PLT 1480
53 RATIO = 1.0E8	PLT 1490
GO TO 60	PLT 1500
54 IF (ITEM - NAN) 56, 55, 56	PLT 1510
55 RATIO = 1.0E9	PLT 1520
GO TO 60	PLT 1530
56 IF (ITEM - IPC) 58, 57, 58	PLT 1540
57 RATIO = 1.0E12	PLT 1550
GO TO 60	PLT 1560
58 RATIO = 1.0	PLT 1570
60 TEMP = YSCALE(IGRAPH) * RATIO	PLT 1580

C DETERMINE TIC SPACING FOR Y-AXIS	
C	
C	
YMARK = ALOG10(TEMP)	PLT 1590
IF (INT(YMARK) .EQ. YMARK) GO TO 61	PLT 1600

IF (YMARK.LT.0.0) YMARK = YMARK - 1.0	PLT 1610
61 YMARK = 10.0 ** INT(YMARK)	PLT 1620
YTIC = ABS(YMARK / TEMP)	PLT 1630
IF (YTIC - 0.282842712475) 62,63,63	PLT 1640
62 IF (YTIC - 0.141421356237) 64,65,65	PLT 1650
64 YTIC = 10.0 * YTIC	PLT 1660
YMARK = 10.0 * YMARK	PLT 1670
GO TO 69	PLT 1680
65 YTIC = 5.0 * YTIC	PLT 1690
YMARK = 5.0 * YMARK	PLT 1700
63 IF (YTIC - 0.70710678119) 66,69,69	PLT 1710
66 YTIC = YTIC + YTIC	PLT 1720
YMARK = YMARK + YMARK	PLT 1730
69 ICOUNT = (TOP - BOTTOM) * FIXY / YTIC + 2.000000001	PLT 1740
TEMP = BOTTOM * FIXY / YTIC + 0.999999999	PLT 1750
IF (TEMP .EQ. INT(TEMP)) GO TO 200	PLT 1760
IF (TEMP .LT. 0.0) TEMP = TEMP - 1.0	PLT 1770
TEMP = INT(TEMP)	PLT 1780
200 XTIC = TEMP * YTIC - YTIC + YZERO	PLT 1790
TIC1 = XTIC	PLT 1800
TMARK1 = TEMP * YMARK	PLT 1810
Y = TMARK1	PLT 1820
DO 70 I = 1, ICOUNT	PLT 1830
IF (ABS(10000.0*Y) .LT. YMARK) Y = 0.0	PLT 1840
TAR5(I) = Y	PLT 1850
70 Y = Y + YMARK	PLT 1860
DO 111 J = 1, ICOUNT, 2	PLT 1870
111 ENCODE(20,32,TAR4(J)) TAR5(J),TAR5(J+1)	PLT 1880
C - - - - -	
C WRITE NUMBERS ON Y-AXIS	
C - - - - -	
TEMP = TOP * FIXY + YZERO + 0.010	PLT 1890
DO 71 I = 1, 1000	PLT 1900
TIC1 = YTIC + TIC1	PLT 1910
TAR4(I) = TAR4(I)	PLT 1920
TEMP2 = TIC1 - 0.07	PLT 1930
CALL SYMBOL(-1.25,TEMP2,0.14,TAR4,0.0,8)	PLT 1940
CALL PLOT(0.0,TIC1,3)	PLT 1950
CALL PLOT(0.1,TIC1,2)	PLT 1960
IF (TIC1 + YTIC - TEMP) 71,72,72	PLT 1970
71 CONTINUE	PLT 1980
C - - - - -	
C PLOT TICS ON RIGHT AND LEFT FRAME	
C - - - - -	
72 TIC1 = XTIC	PLT 1990
XTIC = RIGHT * FIXX + XZERO	PLT 2000
TEMP2 = XTIC - 0.1	PLT 2010
DO 73 I = 1, 1000	PLT 2020
TIC1 = YTIC + TIC1	PLT 2030
CALL PLOT (XTIC,TIC1, 3)	PLT 2040
CALL PLOT (TEMP2,TIC1, 2)	PLT 2050
IF (TIC1+YTIC-TEMP) 73,733,733	PLT 2060
73 CONTINUE	PLT 2070
733 TMARK1 = 0	PLT 2080
C - - - - -	
C PLOT DATA POINTS	
C - - - - -	
DO 1100 I = 1,N	PLT 2090
IF (TF(I)-XLEFT) 74,77,75	PLT 2100
74 TMARK1 = 0	PLT 2110
GO TO 100	PLT 2120
75 IF (TF(I)-RIGHT) 77,77,76	PLT 2130
C - - - - -	
C HANDLE DATA POINTS THAT ARE OUT OF FRAME AT RIGHT	
C - - - - -	
76 IF (TMARK1) 78,100,78	PLT 2140

78	YVALUE = (XP(I) - XP(I-1))*(RIGHT - TF(I-1))	PLT 2150
2	/ (TF(I) - TF(I-1)) + XP(I-1)	PLT 2160
	IF (YVALUE - BOTTOM) 80,81,81	PLT 2170
80	XVALUE = ((RIGHT - TF(I-1)) * (BOTTOM - XP(I-1))	PLT 2180
2	/ (YVALUE - XP(I-1)) + TF(I-1)) * FIXX + XZERO	PLT 2190
	YVALUE = BOTTOM	PLT 2200
	GO TO 85	PLT 2210
81	IF (YVALUE - TOP) 83,83,82	PLT 2220
82	XVALUE = ((RIGHT - TF(I-1)) * (TOP - XP(I-1))	PLT 2230
2	/ (YVALUE - XP(I-1)) + TF(I-1)) * FIXX + XZERO	PLT 2240
	YVALUE = TOP	PLT 2250
	GO TO 85	PLT 2260
83	XVALUE = RIGHT * FIXX + XZERO	PLT 2270
85	YVALUE = YVALUE * FIXY + YZERO	PLT 2280
	TMARK1 = 0	PLT 2290
	GO TO 99	PLT 2300
77	IF (XP(I) - BOTTOM) 86,91,87	PLT 2310
C	-----	
C	HANDLE DATA POINTS THAT ARE OUT OF FRAME AT BOTTOM	
C	-----	
86	IF (TMARK1) 88,100,88	PLT 2320
88	XVALUE = ((TF(I) - TF(I-1)) * (BOTTOM - XP(I-1))	PLT 2330
2	/ (XP(I) - XP(I-1)) + TF(I-1)) * FIXX + XZERO	PLT 2340
	YVALUE = BOTTOM * FIXY + YZERO	PLT 2350
	TMARK1 = 0	PLT 2360
	GO TO 99	PLT 2370
87	IF (XP(I) - TOP) 91,91,90	PLT 2380
C	-----	
C	HANDLE DATA POINTS THAT ARE OUT OF FRAME AT TOP	
C	-----	
90	IF (TMARK1) 92,100,92	PLT 2390
92	XVALUE = ((TF(I) - TF(I-1)) * (TOP - XP(I-1))	PLT 2400
2	/ (XP(I) - XP(I-1)) + TF(I-1)) * FIXX + XZERO	PLT 2410
	YVALUE = TOP * FIXY + YZERO	PLT 2420
	TMARK1 = 0	PLT 2430
	GO TO 99	PLT 2440
91	IF (TMARK1) 98,94,98	PLT 2450
C	-----	
C	FIRST IN-FRAME VALUE	
C	-----	
94	TMARK1 = 1	PLT 2460
	IF (I - 1) 102,102,103	PLT 2470
103	IF (XP(I-1) - BOTTOM) 95,102,96	PLT 2480
95	XVALUE = ((TF(I) - TF(I-1)) * (BOTTOM - XP(I-1))	PLT 2490
2	/ (XP(I) - XP(I-1)) + TF(I-1)) * FIXX + XZERO	PLT 2500
	YVALUE = BOTTOM * FIXY + YZERO	PLT 2510
	GO TO 101	PLT 2520
96	IF (XP(I-1) - TOP) 102,102,97	PLT 2530
97	XVALUE = ((TF(I) - TF(I-1)) * (TOP - XP(I-1))	PLT 2540
2	/ (XP(I) - XP(I-1)) + TF(I-1)) * FIXX + XZERO	PLT 2550
	YVALUE = TOP * FIXY + YZERO	PLT 2560
101	CALL PLOT (XVALUE,YVALUE, 3)	PLT 2570
	GO TO 98	PLT 2580
102	YVALUE = XP(I) * FIXY + YZERO	PLT 2590
	XVALUE = TF(I) * FIXX + XZERO	PLT 2600
	CALL PLOT (XVALUE,YVALUE, 3)	PLT 2610
	GO TO 100	PLT 2620
C	-----	
C	PLOT IN-FRAME DATA POINTS	
C	-----	
98	XVALUE = TF(I) * FIXX + XZERO	PLT 2630
	YVALUE = XP(I) * FIXY + YZERO	PLT 2640
99	CALL PLOT (XVALUE,YVALUE, 2)	PLT 2650
100	CONTINUE	PLT 2660
1100	CONTINUE	PLT 2670
	XVALUE = RIGHT * FIXX + XZERO + 7.0	PLT 2680
	CALL PLOT (XVALUE,0.0,-3)	PLT 2690
	RETURN	PLT 2700
C	-----	
32	FORMAT(15(E8.1,2H))	PLT 2710
	END	PLT 2720

	SUBROUTINE PAREN(ITEM,I)	PAR 0010
C	PAREN HANDLES PLOTTING PARENTHESES AROUND VARIABLE UNITS	
	DIMENSION ITEM(3) ,A(10)	PAR 0020
	DATA (A(J),J=1,10)/77000000000000000000B,770000000000000000B,	PAR 0030
2	770000000000000000B,7700000000000000B,77000000000000B,770000000000B,	PAR 0040
3	77000000B,770000B,7700B,77B/	PAR 0050
	DATA PARENS/(OH)))))))))//	PAR 0060
C		PAR 0070
	I = 13	PAR 0070
	IT = ITEM(2)	PAR 0080
C	- - - - -	
C	CHECK FOR NON-BLANK IN SECOND SIX CHARACTERS	
C	- - - - -	
	DO 15 J = 1,6	PAR 0090
	I1 = IT .AND. 77B	PAR 0100
	IF (I1 .NE. 1R) GO TO 30	PAR 0110
	I = I - 1	PAR 0120
	IT = IT / 100B	PAR 0130
15	CONTINUE	PAR 0140
	IT = ITEM(1)	PAR 0150
C	- - - - -	
C	CHECK FOR NON-BLANK IN FIRST SIX CHARACTERS	
C	- - - - -	
	DO 25 J = 1,5	PAR 0160
	I1 = IT .AND. 77B	PAR 0170
	IF (I1 .NE. 1R) GO TO 30	PAR 0180
	I = I - 1	PAR 0190
	IT = IT / 100B	PAR 0200
25	CONTINUE	PAR 0210
C	- - - - -	
C	CHANGE 2R6 FORMAT TO A10,A4 FORMAT	
C	- - - - -	
30	ENCODE(13, 32, ITEM(1)) ITEM(1), ITEM(2)	PAR 0220
C	- - - - -	
C	DELETE A BLANK AND INSERT A RIGHT PARENTHESIS	
C	- - - - -	
	IF (I .GT. 10)GO TO 40	PAR 0230
	IT= ITEM(1) .AND. .NOT. A(I)	PAR 0240
	ITEM(1)= IT .OR. (PARENS .AND. A(I))	PAR 0250
	I = I + 1	PAR 0260
	RETURN	PAR 0270
40	IT= ITEM(2) .AND. .NOT. A(I-10)	PAR 0280
	ITEM(2)= IT .OR. (PARENS .AND. A(I-10))	PAR 0290
	RETURN	PAR 0300
C		
32	FORMAT(2R6, 1H)	PAR 0310
	END	PAR 0320

C SUBROUTINE RWIVS RIV 0010
RWIVS READS IN AND PRINTS OUT DATA OF CURRENT AND VOLTAGE SOURCES

COMMON VARIABLES

	EQUIVALENCE (KIVS,K1),(K1IVS,K1),(K2IVS,K2),(K3IVS,K3),(K4IVS,K4)	RIV 0020
	DIMENSION K(20), K1(20), K2(20), K3(20), K4(20)	RIV 0030
C	READ (5,10)NIV	RIV 0040
	IF(NIV.LE. 0) RETURN	RIV 0050
	IF(NIV.LE. 20) GO TO 2101	RIV 0060
	WRITE (6,2103)	RIV 0070
	CALL EXIT	RIV 0080
2101	CALL HOLLER (6H ,F3)	RIV 0090
	CALL HOLLER(1H0,CC)	RIV 0100
	IF (DMAX .NE. 0.0) CALL HOLLER (1H ,CC)	RIV 0110
	WRITE (6,2100)	RIV 0120
	DO 2202 N = 1,NIV	RIV 0130
	READ(5,20)K4(N),K3(N),A1,K1(N),A2,K2(N),VI(N),RVS(N)	RIV 0140
	IF (RVS(N) .EQ. 0.0) RVS(N) = 0.1	RIV 0150
C	-----	
C	DETERMINE TYPE OF TERMINALS	
C	-----	
	IF(A1 .NE. F3) GO TO 2112	RIV 0160
	IF(A2 .NE. F3) GO TO 2114	RIV 0170
	K (N)=1	RIV 0180
	GO TO 2202	RIV 0190
2112	K (N)=2	RIV 0200
	GO TO 2202	RIV 0210
2114	K (N)=3	RIV 0220
2202	CONTINUE	RIV 0230
	DO 5 N=1,NIV	RIV 0240
	A1 = VI(N)	RIV 0250
	A2 = RVS(N)	RIV 0260
	IF (DMAX .EQ.0.0)GO TO 4444	RIV 0270
C	-----	
C	MODIFY NOMINAL PARAMETER VALUES BY DMAX PERCENT	
C	-----	
	READ (5,4445) S1,S2	RIV 0280
	S1 = S1 * DMAX	RIV 0290
	S2 = S2 * DMAX	RIV 0300
	A1 = A1 * (1.0 + S1 / 100.0)	RIV 0310
	A2 = A2 * (1.0 + S2 / 100.0)	RIV 0320
	VI(N) = A1	RIV 0330
	RVS(N) = A2	RIV 0340
4444	KO = K (N)	RIV 0350
	IF(K4(N) .LE. 0) GO TO 2200	RIV 0360
C	-----	
C	PRINT CURRENT-SOURCES DATA	
C	-----	
	WRITE (6,29)N	RIV 0370
2221	GO TO (9,2117,2118),KO	RIV 0380
2117	IF(K1(N) .GT. 0) GO TO 2119	RIV 0390
	WRITE (6,32)K2(N)	RIV 0400
	K1(N)=20	RIV 0410
	GO TO 11	RIV 0420
2119	WRITE (6,34)K1(N),K2(N)	RIV 0430

GO TO 11	RIV 0440
2118 IF(K2(N) .GT. 0) GO TO 2220	RIV 0450
WRITE (6,33)K1(N)	RIV 0460
K2(N)=20	RIV 0470
GO TO 11	RIV 0480
9 WRITE (6,31)K1(N),K2(N)	RIV 0490
GO TO 11	RIV 0500
C - - - - -	
C PRINT VOLTAGE-SOURCES DATA	
C - - - - -	
2220 WRITE (6,35)K1(N),K2(N)	RIV 0510
11 IF(K4(N) .LE. 0) GO TO 16	RIV 0520
IF(K3(N) .LE. 0) GO TO 100	RIV 0530
WRITE (6,53)K3(N)	RIV 0540
GO TO 5	RIV 0550
100 WRITE (6,40)	RIV 0560
IF (DMAX .GT. 0.0) WRITE (6,4446) S1	RIV 0570
WRITE (6,50) CC,A1	RIV 0580
GO TO 5	RIV 0590
2200 WRITE (6,30)N	RIV 0600
GO TO 2221	RIV 0610
16 IF(K3(N) .LE. 0) GO TO 102	RIV 0620
WRITE (6,53)K3(N)	RIV 0630
GO TO 104	RIV 0640
102 WRITE (6,40)	RIV 0650
IF (DMAX .GT. 0.0) WRITE (6,4446) S1	RIV 0660
WRITE (6,51) CC,A1	RIV 0670
104 IF (DMAX .GT. 0.0) WRITE (6,4446) S2	RIV 0680
WRITE (6,52) CC,A2	RIV 0690
5 CONTINUE	RIV 0700
RETURN	RIV 0710
C	
10 FORMAT (6I12)	RIV 0720
20 FORMAT (2I12,A6,I6,A6,I6,2E12.8)	RIV 0730
29 FORMAT (1H /15H CURRENT SOURCE/4H NO=13/15H NODE A NODE B)	RIV 0740
30 FORMAT (1H /15H VOLTAGE SOURCE/4H NO=13/15H NODE A NODE B)	RIV 0750
31 FORMAT (2X,I3,5X,I3)	RIV 0760
32 FORMAT (7H GROUND,3X,I3)	RIV 0770
33 FORMAT (2X,I3,3X,7H GROUND)	RIV 0780
34 FORMAT (3H S12,5X,I3)	RIV 0790
35 FORMAT (2X,I3,3X,3H S,12)	RIV 0800
40 FORMAT (24H0 NOMINAL)	RIV 0810
50 FORMAT (A1,10HCURRENT ,3X,E12.4)	RIV 0820
51 FORMAT (A1,10HVOLTAGE ,3X,E12.4)	RIV 0830
52 FORMAT (A1,10HRESISTANCE,3X,E12.4)	RIV 0840
53 FORMAT (7HOSOURCE I3)	RIV 0850
2100 FORMAT (1H1)	RIV 0860
2103 FORMAT (21HOMORE THAN 20 SOURCES)	RIV 0870
4445 FORMAT (48X,2F12.0)	RIV 0880
4446 FORMAT (14X,F3.0,8H PERCENT)	RIV 0890
END	RIV 0900

C SUBROUTINE RWRES
RWRES READS IN AND PRINTS OUT DATA OF RESISTORS

RRE 0010

COMMON VARIABLES

	EQUIVALENCE (KRES,K),(K1RES,K1),(K2RES,K2)	RRE 0020
	DIMENSION K(40), K1(40), K2(40)	RRE 0030
C		
	READ (5,10)NR	RRE 0040
	IF(NR .LE. 0) RETURN	RRE 0050
	IF(NR .LE. 40) GO TO 2101	RRE 0060
	WRITE (6,2103)	RRE 0070
	CALL EXIT	RRE 0080
2101	WRITE (6,2100)	RRE 0090
	L = 0	RRE 0100
	CALL HOLLER (6H ,F3)	RRE 0110
	CALL HOLLER(1H0,CC)	RRE 0120
	IF (DMAX .NE. 0.0) CALL HOLLER (1H ,CC)	RRE 0130
	DO 2202 N=1,NR	RRE 0140
	READ (5,20) F1,K1 (N),R2,K2 (N),R(N) ,NRP(N)	RRE 0150
	IF (R(N) .EQ. 0.0) R(N) = 0.001	RRE 0160
	IF (NRP(N) .LE. 1) GO TO 3002	RRE 0170
C	-----	
C	VARIABLE R-VS.-T DATA	
C	-----	
	L = L + 1	RRE 0180
	RF(L,1) = R(N)	RRE 0190
	TFR(L,1) = TE	RRE 0200
	IX(L) = 2	RRE 0210
	KO = NRP(N)	RRE 0220
	READ (5,3004) (RF(L,J),TFR(L,J),XRES(L,J),J=2,KO)	RRE 0230
C	-----	
C	DETERMINE TYPE OF TERMINALS	
C	-----	
3002	IF(F1 .EQ. F3) GO TO 2201	RRE 0240
	K(N)=3	RRE 0250
	GO TO 2202	RRE 0260
2201	IF(R2 .EQ. F3) GO TO 2204	RRE 0270
	K(N)=2	RRE 0280
	GO TO 2202	RRE 0290
2204	K(N)=1	RRE 0300
2202	CONTINUE	RRE 0310
	L = 0	RRE 0320
	DO 115 N=1,NR	RRE 0330
	IF (NRP(N) .LE. 1) GO TO 4449	RRE 0340
	L = L + 1	RRE 0350
4449	IF (DMAX .EQ.0.0)GO TO 4444	RRE 0360
C	-----	
C	MODIFY NOMINAL PARAMETER VALUES BY DMAX PERCENT	
C	-----	
	READ (5,4445) S1	RRE 0370
	S1 = S1 * DMAX	RRE 0380
	WRITE (6,4446) S1	RRE 0390
	R(N) = R(N) * (1.0 + S1/ 100.0)	RRE 0400
	KO = NRP(N)	RRE 0410
	DO 4447 J = 1,KO	RRE 0420
4447	RF(L,J) = RF(L,J) * (1.0 + S1 / 100.0)	RRE 0430

C	- - - - -	
C	PRINT RESISTORS DATA	
C	- - - - -	
	4444 KO=K(N)	RRE 0440
	GO TO (6,7,8),KO	RRE 0450
	6 WRITE (6,31) CC,N,K1(N),K2(N),R(N)	RRE 0460
	GO TO 5	RRE 0470
	7 IF(K2(N).GT.0) GO TO 23	RRE 0480
	K2(N)=20	RRE 0490
	WRITE (6,35) CC,N,K1(N),R(N)	RRE 0500
	GO TO 5	RRE 0510
	23 WRITE (6,33) CC,N,K1(N),K2(N),R(N)	RRE 0520
	GO TO 5	RRE 0530
	8 IF(K1(N).GT.0) GO TO 12	RRE 0540
	K1(N)=20	RRE 0550
	WRITE (6,34) CC,N,K2(N),R(N)	RRE 0560
	GO TO 5	RRE 0570
	12 WRITE (6,32) CC,N,K1(N),K2(N),R(N)	RRE 0580
	5 IF (NRP(N).LT.2) GO TO 115	RRE 0590
	KD = NRP(N)	RRE 0600
	WRITE (6,3040) (J,RF(L,J),TFR(L,J),XRES(L,J),J=1,KD)	RRE 0610
	115 CONTINUE	RRE 0620
	RETURN	RRE 0630
C		
	10 FORMAT (6I12)	RRE 0640
	20 FORMAT (A6,I6,A6,I6,E12.8,I12)	RRE 0650
	31 FORMAT (A1,I3,3X,I3,5X,I3,6X,8X,E13.5)	RRE 0660
	32 FORMAT (A1,I3,3H S,I3,5X,I3,6X,8X,E13.5)	RRE 0670
	33 FORMAT (A1,I3,3X,I3,2X,3H S,I3,6X,8X,E13.5)	RRE 0680
	34 FORMAT (A1,I3,7H GROUND,3X,I3,6X,8X,E13.5)	RRE 0690
	35 FORMAT (A1,I3,3X,I3,3X,7H GROUND,4X,8X,E13.5)	RRE 0700
	2100 FORMAT (1H1/10H RESISTORS/32H PART	/44HRRE 0710
	1 NO NODE A NODE B RESISTANCE)	RRE 0720
	2103 FORMAT (23HOMORE THAN 40 RESISTORS)	RRE 0730
	3004 FORMAT (3E12.5)	RRE 0740
	3040 FORMAT (20H WITH TIME STATES.. ,/,	RRE 0750
	2 43H POINT RESISTANCE TIME EXPONENT ,/,	RRE 0760
	3 5(1H ,15,3E13.4,/))	RRE 0770
	4445 FORMAT (24X,E12.0)	RRE 0780
	4446 FORMAT (1H0,31X,F3.0,8H PERCENT)	RRE 0790
	END.	RRE 0800

C SUBROUTINE RWCAP
RWCAP READS IN AND PRINTS OUT DATA OF CAPACITORS

RCA 0010

COMMON VARIABLES

	EQUIVALENCE (KCAP,K),(K1CAP,K1),(K2CAP,K2)	RCA 0020
	DIMENSION K(20), K1(20), K2(20)	RCA 0030
C		
	READ (5,10) NC	RCA 0040
	IF (NC .LE. 0) RETURN	RCA 0050
	IF (NC .LE. 20) GO TO 2101	RCA 0060
	WRITE (6,2103)	RCA 0070
	CALL EXIT	RCA 0080
2101	WRITE (6,2100)	RCA 0090
	CALL HOLLER (6H ,F3)	RCA 0100
	CALL HOLLER (1H0,CC)	RCA 0110
	IF (DMAX .NE. 0.0) CALL HOLLER (1H ,CC)	RCA 0120
	DO 2202 N = 1,NC	RCA 0130
	READ (5,20) F1,K1(N),R2,K2(N),CAPC(N),RC(N),RCSH(N),CIC	RCA 0140
	IF (NSVVAR .EQ. 0) CIC(N) = CIC	RCA 0150
	IF (RC(N) .LE. 0.0) RC(N) = 0.1	RCA 0160
	IF (RCSH(N) .LE. 0.0) RCSH(N) = 1.0E+9	RCA 0170
C	-----	
C	DETERMINE TYPE OF TERMINALS	
C	-----	
	IF (F1 .EQ. F3) GO TO 2201	RCA 0180
	K(N)=3	RCA 0190
	GO TO 2202	RCA 0200
2201	IF (R2 .EQ. F3) GO TO 2204	RCA 0210
	K(N)=2	RCA 0220
	GO TO 2202	RCA 0230
2204	K(N)=1	RCA 0240
2202	CONTINUE	RCA 0250
	DO 5 N=1,NC	RCA 0260
	IF (DMAX .EQ. 0.0) GO TO 4444	RCA 0270
C	-----	
C	MODIFY NOMINAL PARAMETER VALUES BY DMAX PERCENT	
C	-----	
	READ (5,4445) S1,S2,S3	RCA 0280
	S1 = S1 * DMAX	RCA 0290
	S2 = S2 * DMAX	RCA 0300
	S3 = S3 * DMAX	RCA 0310
	WRITE (6,4446) S1,S2,S3	RCA 0320
	CAPC(N)=CAPC(N)*(1.0+S1 / 100.0)	RCA 0330
	RC(N)=RC(N) * (1.0 + S2 / 100.0)	RCA 0340
	RCSH(N)=RCSH(N)*(1.0+S3 / 100.0)	RCA 0350
C	-----	
C	PRINT CAPACITORS DATA	
C	-----	
4444	KO=K(N)	RCA 0360
	GO TO (6,7,8),KO	RCA 0370
6	WRITE (6,31) CC,N,K1(N),K2(N),CAPC(N),RC(N),RCSH(N),CIC(N)	RCA 0380
	GO TO 5	RCA 0390
7	IF (K2(N) .GT. 0) GO TO 23	RCA 0400
	K2(N)=20	RCA 0410
	WRITE (6,35) CC,N,K1(N), CAPC(N),RC(N),RCSH(N),CIC(N)	RCA 0420
	GO TO 5	RCA 0430

23	WRITE (6,33) CC,N,K1(N),K2(N),CAPC(N),RC(N),RCSH(N),CIC(N)	RCA 0440
	GO TO 5	RCA 0450
8	IF(K1(N).GT. 0) GO TO 12	RCA 0460
	K1(N)=20	RCA 0470
	WRITE (6,34) CC,N, K2(N),CAPC(N),RC(N),RCSH(N),CIC(N)	RCA 0480
	GO TO 5	RCA 0490
12	WRITE (6,32) CC,N,K1(N),K2(N),CAPC(N),RC(N),RCSH(N),CIC(N)	RCA 0500
5	CONTINUE	RCA 0510
	RETURN	RCA 0520
C		
10	FORMAT (6I12)	RCA 0530
20	FORMAT (A6,I6,A6,I6,4E12.8)	RCA 0540
31	FORMAT (A1 ,I4,3X,I3,5X,I3,6X, 8X,4E14.5)	RCA 0550
32	FORMAT (A1 ,I4,3H S,I3,5X,I3,6X, 8X,4E14.5)	RCA 0560
33	FORMAT (A1 ,I4,3X,I3,2X, 3H S I3,6X, 8X,4E14.5)	RCA 0570
34	FORMAT (A1 ,I4,8H GROUND,3X,I3,6X, 8X,4E14.5)	RCA 0580
35	FORMAT (A1 ,I4,3X,I3,3X,7H GROUND,4X, 8X,4E14.5)	RCA 0590
2100	FORMAT (11H1/14H CAPACITORS /7H PART	RCA 0600
1	45X,21H SERIES SHUNT ,/,	101RCA 0610
2	H NO NODE A NODE B CAPACITANCE RESISTANCE	RCA 0620
3	RESISTANCE CURRENT)	RCA 0630
2103	FORMAT (24H MORE THAN 20 CAPACITERS)	RCA 0640
4445	FORMAT (24X,3F12.0)	RCA 0650
4446	FORMAT (140,33X,4(F3.0,11H PERCENT)	RCA 0660
	END	RCA 0670

C SUBROUTINE RWIND
RWIND READS IN AND PRINTS OUT DATA OF INDUCTORS

RIN 0010

COMMON VARIABLES

REAL INDL	RIN 0020
LOGICAL MONL	RIN 0030
EQUIVALENCE (KIND,K),(K1IND,K1),(K2IND,K2)	RIN 0040
DIMENSION K(20), K1(20), K2(20)	RIN 0050
C	
READ (5,10)NL	RIN 0060
IF(NL .LE. 0) RETURN	RIN 0070
IF(NL .LE. 20) GO TO 1000	RIN 0080
WRITE (6,1002)	RIN 0090
CALL EXIT	RIN 0100
1000 WRITE (6,201)	RIN 0110
CALL HOLLER (6H ,F3)	RIN 0120
CALL HOLLER (1H0,CC)	RIN 0130
IF (DMAX .NE. 0.0) CALL HOLLER (1H ,CC)	RIN 0140
DO 2202 N = 1,NL	RIN 0150
READ (5,20) F1,K1(N),R2,K2(N),INDL(N),RL(N),RLSH(N),VICON(N)	RIN 0160
READ (5,1903) CIL0, INCIL(N)	RIN 0170
IF (RL(N) .LE. 0.0) RL(N) = 1.0	RIN 0180
IF (RLSH(N) .LE. 0.0) RLSH(N) = 1.0E+9	RIN 0190
IF (INCIL(N).EQ. 1) GO TO 1901	RIN 0200
IF (NSVIL .EQ. 1) GO TO 1902	RIN 0210
IF (NSVVAR .EQ. 1) GO TO 1902	RIN 0220
1901 CIL(N) = CIL0	RIN 0230
1902 IF (VICON(N).EQ.0.0) S(N) = INDL(N)	RIN 0240
C - - - - -	
C DETERMINE TYPE OF TERMINALS	
C - - - - -	
IF (F1 .EQ. F3) GO TO 2201	RIN 0250
K(N)=3	RIN 0260
GO TO 2202	RIN 0270
2201 IF (R2 .EQ. F3) GO TO 2204	RIN 0280
K(N)=2	RIN 0290
GO TO 2202	RIN 0300
2204 K(N)=1	RIN 0310
2202 CONTINUE	RIN 0320
DO 115 N = 1,NL	RIN 0330
IF (DMAX .EQ. 0.0) GO TO 4444	RIN 0340
C - - - - -	
C MODIFY NOMINAL PARAMETER VALUES BY DMAX PERCENT	
C - - - - -	
READ (5,4445) S1,S2,S3,S4	RIN 0350
S1 = S1 * DMAX	RIN 0360
S2 = S2 * DMAX	RIN 0370
S3 = S3 * DMAX	RIN 0380
S4 = S4 * DMAX	RIN 0390
WRITE (6,4446) S1,S2,S3,S4	RIN 0400
INDL(N)=INDL(N)*(1.0+S1 / 100.0)	RIN 0410
RL(N) = RL(N) * (1.0 + S2 / 100.0)	RIN 0420
RLSH(N) = RLSH(N) * (1.0 + S3 / 100.0)	RIN 0430
VICON(N)=VICON(N)* (1.0 + S4 / 100.0)	RIN 0440
C - - - - -	
C PRINT INDUCTORS DATA	
C - - - - -	

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C  - - - - -
4444 KO=K(N) RIN 0450
GO TO (6,7,8),KO RIN 0460
6 WRITE (6,31)CC,N,K1(N),K2(N),INDL(N),RL(N),RLSH(N),VICON(N),CIL(N) RIN 0470
GO TO 5 RIN 0480
7 IF(K2(N).GT. 0) GO TO 23 RIN 0490
K2(N)=20 RIN 0500
WRITE (6,35)CC,N,K1(N), INDL(N),RL(N),RLSH(N),VICON(N),CIL(N) RIN 0510
GO TO 5 RIN 0520
23 WRITE (6,33)CC,N,K1(N),K2(N),INDL(N),RL(N),RLSH(N),VICON(N),CIL(N) RIN 0530
GO TO 5 RIN 0540
8 IF(K1(N).GT. 0) GO TO 12 RIN 0550
K1(N)=20 RIN 0560
WRITE (6,34)CC,N, K2(N),INDL(N),RL(N),RLSH(N),VICON(N),CIL(N) RIN 0570
GO TO 5 RIN 0580
12 WRITE (6,32)CC,N,K1(N),K2(N),INDL(N),RL(N),RLSH(N),VICON(N),CIL(N) RIN 0590
5 IF (MODL) WRITE (6,1950) S(N),C1LO,INCIL(N) RIN 0600
115 CONTINUE RIN 0610
RETURN RIN 0620

C . . . . .
10 FORMAT (112) RIN 0630
20 FORMAT (A6,16,A6,16,4E12.8) RIN 0640
31 FORMAT (A1,14,3X,13,5X,13,6X, 8X,5E14.5) RIN 0650
32 FORMAT (A1,14,3H S,13,5X,13,6X, 8X,5E14.5) RIN 0660
33 FORMAT (A1,14,3X,13,2X,3H S,13,6X, 8X,5E14.5) RIN 0670
34 FORMAT (A1,14,8H GROUND,3X,13,6X, 8X,5E14.5) RIN 0680
35 FORMAT (A1,14,3X,13,3X,7H GROUND,4X, 8X,5E14.5) RIN 0690
201 FORMAT (1H1/12H INDUCTORS /7H PART RIN 0700
1 45X,21H SERIES SHUNT ,/, 101R IN 0710
2 H NO NODE A NODE B INDUCTANCE RESISTANCE RIN 0720
3 RESISTANCE INVICON CURRENT ) RIN 0730
1002 FORMAT (1H /23H MORE THAN 20 INDUCTORS) RIN 0740
1903 FORMAT (E12.5,112) RIN 0750
1950 FORMAT (16H S(),C1LO,INCIL ,2E12.5,112) RIN 0760
4445 FORMAT (24X,4F12.0) RIN 0770
4446 FORMAT (1H0,33X,4(F3.0,11H PERCENT 1) RIN 0780
END RIN 0790

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C SUBROUTINE RWZEN
RWZEN READS IN AND PRINTS OUT DATA OF ZENER DIODES

RZE 0010

COMMON VARIABLES

	EQUIVALENCE (KZEN,K), (K1ZEN,K1), (K2ZEN,K2)	RZE 0020
	DIMENSION K(20), K1(20), K2(20)	RZE 0030
C		
	READ (5,10) NZEN	RZE 0040
	IF (NZEN .LE. 0) RETURN	RZE 0050
	IF (NZEN .LE. 20) GO TO 2101	RZE 0060
	WRITE (6,2103)	RZE 0070
	CALL EXIT	RZE 0080
2101	WRITE (6,2100)	RZE 0090
	CALL HOLLER (6H ,F3)	RZE 0100
	CALL HOLLER (1H0,CC)	RZE 0110
	IF (DMAX .NE. 0.0) CALL HOLLER (1H ,CC)	RZE 0120
	DO 2202 N=1,NZEN	RZE 0130
	READ (5,20) F1,K1(N),R2,K2(N),RZ(N),RZB(N),EZB(N)	RZE 0140
C	-----	
C	DETERMINE TYPE OF TERMINALS	
C	-----	
	IF (F1 .EQ. F3) GO TO 2201	RZE 0150
	K(N)=3	RZE 0160
	GO TO 2202	RZE 0170
2201	IF (R2 .EQ. F3) GO TO 2204	RZE 0180
	K(N)=2	RZE 0190
	GO TO 2202	RZE 0200
2204	K(N)=1	RZE 0210
2202	CONTINUE	RZE 0220
	DO 5 N=1,NZEN	RZE 0230
	IF (DMAX .EQ. 0.0) GO TO 4444	RZE 0240
C	-----	
C	MODIFY NOMINAL PARAMETER VALUES BY DMAX PERCENT	
C	-----	
	READ (5,4445) S1,S2,S3	RZE 0250
	S1 = S1 * DMAX	RZE 0260
	S2 = S2 * DMAX	RZE 0270
	S3 = S3 * DMAX	RZE 0280
	WRITE (6,4446) S1,S2,S3	RZE 0290
	RZ(N) = RZ(N) * (1.0 + S1 / 100.0)	RZE 0300
	RZB(N) = RZB(N) * (1.0 + S2 / 100.0)	RZE 0310
	EZB(N) = EZB(N) * (1.0 + S3 / 100.0)	RZE 0320
C	-----	
C	PRINT ZENER-DIODES DATA	
C	-----	
4444	KD=K(N)	RZE 0330
	VZB(N) = EZB(N) * RZ(N) / (RZ(N) - RZB(N))	RZE 0340
	VZF(N) = 0.7 * RZ(N) / (RZ(N) - 1.0)	RZE 0350
	GO TO (6,7,8),KD	RZE 0360
6	WRITE (6,31) CC,N,K1(N),K2(N),RZ(N),RZB(N),EZB(N),VZB(N)	RZE 0370
	GO TO 5	RZE 0380
7	IF (K2(N) .GT. 0) GO TO 23	RZE 0390
	K2(N)=20	RZE 0400
	WRITE (6,35) CC,N,K1(N), RZ(N),RZB(N),EZB(N),VZB(N)	RZE 0410
	GO TO 5	RZE 0420
23	WRITE (6,33) CC,N,K1(N),K2(N),RZ(N),RZB(N),EZB(N),VZB(N)	RZE 0430

GO TO 5	RZE 0440
8 IF(K1(N) .GT. 0) GO TO 12	RZE 0450
K1(N)=20	RZE 0460
WRITE (6,34) CC,N, K2(N),RZ(N),RZB(N),EZB(N),VZB(N)	RZE 0470
GO TO 5	RZE 0480
12 WRITE (6,32) CC,N,K1(N),K2(N),RZ(N),RZB(N),EZB(N),VZB(N)	RZE 0490
5 CONTINUE	RZE 0500
RETURN	RZE 0510
C	
10 FORMAT (6I12)	RZE 0520
20 FORMAT (A6,I6,A6,I6,4E12.8)	RZE 0530
31 FORMAT (A1 ,I3,3X,I3,5X,I3, 13X , 4E14.5)	RZE 0540
32 FORMAT (A1 ,I3,3H S13,5X,I3,13X, 4E14.5)	RZE 0550
33 FORMAT (A1 ,I3,3X,I3,2X,3H S,I3,13X, 4E14.5)	RZE 0560
34 FORMAT (A1 ,I3,8H GROUND,3X,I3,13X, 4E14.5)	RZE 0570
35 FORMAT (A1 ,I3,3X,I3,3X,7H GROUND,11X, 4E14.5)	RZE 0580
2100 FORMAT (1H1/14H ZENER DIODES	RZE 0590
2 /32H PART	/21HRZE 0600
3 NO NODE A NODE B ,I6X,2HRZ,12X,3HRZB,11X,3HEZB,11X,3HVZB)	RZE 0610
2103 FORMAT (27HOMORE THAN 20 ZENER DIODES)	RZE 0620
4445 FORMAT (24X,3F12.0)	RZE 0630
4446 FORMAT (1H0,31X,3F3.0,11H PERCENT)	RZE 0640
END	RZE 0650

SUBROUTINE RWDIOD
RWDIOD READS IN AND PRINTS OUT DATA OF DIODES

RDI 0010

COMMON VARIABLES

	EQUIVALENCE (KD10D,K1),(K1D10D,K1),(K2D10D,K2)	RDI 0020
	DIMENSION K(20), K1(20), K2(20)	RDI 0030
C	READ (5,10)NDIODE	RDI 0040
	IF(NDIODE .LE. 0) RETURN	RDI 0050
	IF(NDIODE .LE. 20) GO TO 8601	RDI 0060
	WRITE (6,8600)	RDI 0070
	CALL EXIT	RDI 0080
8601	WRITE (6,30)	RDI 0090
	QT = 1.159E+4 / ABTEMP	RDI 0100
	TOOLD=-7777777.777	RDI 0110
	CALL HOLLER (6H ,F3)	RDI 0120
	CALL HOLLER (1H0,CC)	RDI 0130
	IF (DMAX .NE. 0.0) CALL HOLLER (1H ,CC)	RDI 0140
	DO 8503 N=1,NDIODE	RDI 0150
	READ (5,2199) F1,K1(N),R2,K2(N),K3,QCR(N,6)	RDI 0160
C	-----	
C	DETERMINE TYPE OF TERMINALS	
C	-----	
	IF(F1 .EQ. F3) GO TO 2201	RDI 0170
	K(N)=3	RDI 0180
	GO TO 2202	RDI 0190
2201	IF(R2 .EQ. F3) GO TO 2204	RDI 0200
	K(N)=2	RDI 0210
	GO TO 2202	RDI 0220
2204	K(N)=1	RDI 0230
2202	IF(K3 .LE. 0) GO TO 8500	RDI 0240
C	-----	
C	COPY THE PARAMETER VALUES OF DIODE NO. K3	
C	-----	
	DO 8502 I=1,7	RDI 0250
8502	QCR(N,I) = QCR(K3,I)	RDI 0260
	GO TO 8503	RDI 0270
8500	READ (5,20) QCR(N,1),QCR(N,2),QCR(N,3),QCR(N,4),QCR(N,5),QCR(N,7)	RDI 0280
8503	CONTINUE	RDI 0290
	DO 5 N=1,NDIODE	RDI 0300
	IF (DMAX .EQ.0.0)GO TO 4444	RDI 0310
C	-----	
C	MODIFY NOMINAL PARAMETER VALUES BY DMAX PERCENT	
C	-----	
	READ (5,4445) S1,S2,S3,S4,S5,S7	RDI 0320
	S1 = S1 * DMAX	RDI 0330
	S2 = S2 * DMAX	RDI 0340
	S3 = S3 * DMAX	RDI 0350
	S4 = S4 * DMAX	RDI 0360
	S5 = S5 * DMAX	RDI 0370
	S7 = S7 * DMAX	RDI 0380
	WRITE (6,4446) S1,S2,S3,S4,S5,S7	RDI 0390
	QCR(N,1) = QCR(N,1) * (1.0 + S1 / 100.0)	RDI 0400
	QCR(N,2) = QCR(N,2) * (1.0 + S2 / 100.0)	RDI 0410
	QCR(N,3) = QCR(N,3) * (1.0 + S3 / 100.0)	RDI 0420
	QCR(N,4) = QCR(N,4) * (1.0 + S4 / 100.0)	RDI 0430

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      QCR(N,5) = QCR(N,5) * (1.0 + S5 / 100.0)      RDI 0440
      QCR(N,7) = QCR(N,7) * (1.0 + S7 / 100.0)      RDI 0450
C
C
C
      PRINT DIODES DATA
C
4444 C1(N) = 0.9 * QCR(N,5)      RDI 0460
      C2(N) = QT / QCR(N,2)      RDI 0470
      C3(N) = 1.0 / QCR(N,3)      RDI 0480
      C4(N) = 1.0 / QCR(N,5)      RDI 0490
      KO=K(N)      RDI 0500
      GO TO (6,7,8),KO      RDI 0510
      6 WRITE (6,31) CC,N,K1(N),K2(N), (QCR(N,1), I=1,5),QCR(N,7),QCR(N,6) RDI 0520
      GO TO 5      RDI 0530
      7 IF(K2(N) .GT. 0) GO TO 23      RDI 0540
      K2(N)=20      RDI 0550
      WRITE (6,35) CC,N,K1(N), (QCR(N,1), I=1,5),QCR(N,7),QCR(N,6) RDI 0560
      GO TO 5      RDI 0570
      23 WRITE (6,33) CC,N,K1(N),K2(N), (QCR(N,1), I=1,5),QCR(N,7),QCR(N,6) RDI 0580
      GO TO 5      RDI 0590
      8 IF(K1(N) .GT. 0) GO TO 12      RDI 0600
      K1(N)=20      RDI 0610
      WRITE (6,34) CC,N,K2(N), (QCR(N,1), I=1,5),QCR(N,7),QCR(N,6) RDI 0620
      GO TO 5      RDI 0630
      12 WRITE (6,32) CC,N,K1(N),K2(N), (QCR(N,1), I=1,5),QCR(N,7),QCR(N,6) RDI 0640
      5 CONTINUE      RDI 0650
      RETURN      RDI 0660
C
      . . . . .
10 FORMAT (6I12)      RDI 0670
20 FORMAT(6F12.8)      RDI 0680
30 FORMAT(11H1/7H DIODES/99H NO  NODE P  NODE N      ISD      MD      RDI 0690
      1      RLD      COD      VPOTD      T D      IPP)      RDI 0700
31 FORMAT (A1 ,12,3X,13,5X,13,E13.3,6E12.3)      RDI 0710
32 FORMAT (A1 ,12,3H S13,5X,13,E13.3,6E12.3)      RDI 0720
33 FORMAT (A1 ,12,3X,13,2X,3H S13,E13.3,6E12.3)      RDI 0730
34 FORMAT (A1 ,12,8H GROUND,3X,13,E13.3,6E12.3)      RDI 0740
35 FORMAT (A1 ,12,3X,13,4X,6HGROUND,E11.3,6E12.3)      RDI 0750
2199 FORMAT (A6,16,A6,16,112,3E12.8)      RDI 0760
4445 FORMAT (6F12.0)      RDI 0770
4446 FORMAT (1H0,18X,6IF3.0, 9H PERCENT 1)      RDI 0780
8600 FORMAT ( 20HMORE THAN 20 DIODES)      RDI 0790
      END      RDI 0800

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C SUBROUTINE RWTRAN
RWTRAN READS IN AND PRINTS OUT DATA OF TRANSISTORS

RTR 0010

COMMON VARIABLES

LOGICAL MONT	RTR 0020
EQUIVALENCE (KTRAN,K1),(K1TRAN,K1),(K2TRAN,K2),(K3TRAN,K3),	RTR 0030
2 (K4TRAN,K4)	RTR 0040
DIMENSION K(20), K1(20), K2(20), K3(20), K4(20)	RTR 0050
DIMENSION ESSES(14)	RTR 0060
C	
READ (5,10)NTRANS	RTR 0070
IF(NTRANS .LE. 0) RETURN	RTR 0080
IF(NTRANS .LE. 20) GO TO 8601	RTR 0090
WRITE (6,8600)	RTR 0100
CALL EXIT	RTR 0110
8601 QT = 1.159E+4/ABTEMP	RTR 0120
TTDOLD=-7777777.777	RTR 0130
CALL HOLLER (6H ,F3)	RTR 0140
CALL HOLLER (1H0,CC)	RTR 0150
IF (DMAX .NE. 0.0) CALL HOLLER (1H ,CC)	RTR 0160
DO 8003 N=1,NTRANS	RTR 0170
READ (5,2199)K1(N),BASE,K2(N),COLC,K3(N),EMTR,K4(N),K5	RTR 0180
C - - - - -	
C DETERMINE TYPE OF TERMINALS	
C - - - - -	
IF (BASE .EQ. F3) GO TO 2201	RTR 0190
K (N)=2	RTR 0200
GO TO 2202	RTR 0210
2201 IF (COLC .EQ. F3) GO TO 2204	RTR 0220
K (N)=3	RTR 0230
GO TO 2202	RTR 0240
2204 IF (EMTR .EQ. F3) GO TO 2206	RTR 0250
K (N)=4	RTR 0260
GO TO 2202	RTR 0270
2206 K (N)=1	RTR 0280
2202 IF (K5 .LE. 0) GO TO 8500	RTR 0290
C - - - - -	
C COPY THE PARAMETER VALUES OF TRANSISTOR NO. K5	
C - - - - -	
DO 8502 I=1,16	RTR 0300
8502 QTAN(N,I) = QTAN(K5,I)	RTR 0310
GO TO 8003	RTR 0320
8500 READ (5,20) (QTAN(N,I),I = 1,16)	RTR 0330
8003 CONTINUE	RTR 0340
NT01=4	RTR 0350
WRITE (6,2500)	RTR 0360
DO 3 N=1,NTRANS	RTR 0370
IF(N .NE. NT01) GO TO 2501	RTR 0380
WRITE (6,2500)	RTR 0390
NT01=NT01+3	RTR 0400
2501 IF(K1(N).GT. 0) GO TO 5	RTR 0410
WRITE (6,30)N	RTR 0420
GO TO 6	RTR 0430
5 WRITE (6,31)N	RTR 0440
6 KD=K (N)	RTR 0450
WRITE (6,75)	RTR 0460

GO TO (100,101,102,103),K0	RTR 0470
100 WRITE (6,35)K2(N),K3(N),K4(N)	RTR 0480
GO TO 11	RTR 0490
101 IF(K2(N) .GT. 0) GO TO 108	RTR 0500
K2(N)=20	RTR 0510
WRITE (6,36)K3(N),K4(N)	RTR 0520
GO TO 11	RTP 0530
108 WRITE (6,37)K2(N),K3(N),K4(N)	RTR 0540
GO TO 11	RTR 0550
102 IF(K3(N) .GT. 0) GO TO 110	RTR 0560
K3(N)=20	RTR 0570
WRITE (6,38)K2(N),K4(N)	RTR 0580
GO TO 11	RTR 0590
110 WRITE (6,39)K2(N),K3(N),K4(N)	RTR 0600
GO TO 11	RTR 0610
103 IF(K4(N) .GT. 0) GO TO 112	RTR 0620
K4(N)=20	RTR 0630
WRITE (6,40)K2(N),K3(N)	RTR 0640
GO TO 11	RTR 0650
112 WRITE (6,41)K2(N),K3(N),K4(N)	RTR 0660
11 IF (DMAX .EQ.0.0)GO TO 4444	RTR 0670
C	
C	
C	
C	
MODIFY NOMINAL PARAMETER VALUES BY DMAX PERCENT	
READ (5,4445) (ESSES(I), I=1,14)	RTR 0680
DO 4447 I = 1,14	RTR 0690
ESSES(I) = ESSES(I) * DMAX	RTR 0700
4447 QTAN (N,I) = QTAN(N,I) * (1.0 + ESSES(I) / 100.0)	RTR 0710
C	
C	
C	
C	
PRINT TRANSISTORS DATA	
WRITE (6,4446) (ESSES(I), I=1,4)	RTR 0720
4444 WRITE (6,32) CC, (QTAN (N,I), I = 1, 4)	RTR 0730
IF (DMAX .GT.0.0)WRITE (6,4446) (ESSES(I), I=5,9)	RTR 0740
WRITE (6,4448) (QTAN(N,I), I = 5, 9)	RTR 0750
IF (DMAX .GT.0.0)WRITE (6,4446) (ESSES(I), I=10,14)	RTR 0760
WRITE (6,4449) (QTAN(N,I), I = 10,14)	RTR 0770
CC1(N) = 0.9 * QTAN(N,8)	RTR 0780
CC2(N) = QT / QTAN(N,6)	RTR 0790
CC3(N) = 1.0 / QTAN(N,9)	RTR 0800
CC4(N) = 1.0 / QTAN(N,8)	RTR 0810
EC1(N) = 0.9 * QTAN(N,13)	RTR 0820
EC2(N) = QT / QTAN (N,11)	RTR 0830
EC3(N) = 1.0 / QTAN(N,14)	RTR 0840
EC4(N) = 1.0 / QTAN(N,13)	RTR 0850
AF(N) = QTAN(N,1) / (1.0+QTAN(N,1))	RTR 0860
AR(N) = QTAN(N,2) / (1.0+QTAN(N,2))	RTR 0870
IF (MONT) WRITE (6,865) CC1(N),CC2(N),CC3(N),CC4(N),AF(N),	RTR 0880
2 EC1(N),EC2(N),EC3(N),EC4(N),AR(N)	RTR 0890
IF(QTAN(N,15) .EQ. -QTAN(N,16)) GO TO 3	RTR 0900
WRITE (6,58)QTAN(N,15),QTAN(N,16)	RTR 0910
IF(K1(N).GT. 0) GO TO 3	RTR 0920
QTAN(N,16) = -QTAN(N,16)	RTR 0930
QTAN(N,15) = -QTAN(N,15)	RTR 0940
3 CONTINUE	RTR 0950
RETURN	RTR 0960
C	
10 FORMAT (6I12)	RTR 0970
20 FORMAT (6E12.8)	RTR 0980
30 FORMAT (1H0/15H NPN TRANSISTOR/4H NO=13)	RTR 0990
31 FORMAT (1H0/15H PNP TRANSISTOR/4H NO=13)	RTR 1000
32 FORMAT (A1,7H BETAIE11.4,7H BETAIE11.4,7H TE E11.4,7H TC	RTR 1010
1E11.4)	RTR 1020
35 FORMAT (2X,13,5X,13,5X,13)	RTR 1030
36 FORMAT (7H GROUND,3X,13,5X,13)	RTR 1040
37 FORMAT (3H SI2,5X,13,5X,13)	RTR 1050

38	FORMAT (2X,13,3X,7H GROUND,3X,13)	RTR 1060
39	FORMAT (2X,13,3X,3H SI2,5X,13)	RTR 1070
40	FORMAT (2X,13,5X,13,3X,7H GROUND)	RTR 1080
41	FORMAT (2X,13,5X,13,3X,3H SI2)	RTR 1090
58	FORMAT (7H IPPCE11.4,7H IPPEE11.4)	RTR 1100
75	FORMAT (23HONODE B NODE C NODE E)	RTR 1110
865	FORMAT (60H CC1(),CC2(),CC3(),CC4(),AF(),EC1(),EC2(),EC3(),EC4(),ARTR 1120	
	2R() ,2(/,5F24.15))	RTR 1130
2199	FORMAT (112,A6,16,A6,16,A6,16,2112)	RTR 1140
2500	FORMAT (1H1)	RTR 1150
4445	FORMAT (6F12.0)	RTR 1160
4446	FORMAT (/6X,5(F3.0,8H PERCENT ,7X))	RTR 1170
4448	FORMAT	RTR 1180
	1 (6H ISCE11.4, 6H MCE11.4,7X, 3HCOCE11.4,7H VPOTEE11.4,	RTR 1190
	27H RLCE11.4)	RTR 1200
4449	FORMAT (6H ISEE11.4, 6H MEE11.4,7X, 3HCOEE11.4,7H VPRTR 1210	
	30TEE11.4,7H RLEE11.4)	RTR 1220
8600	FORMAT (25HOMORE THAN 20 TRANSISTORS)	RTR 1230
	END	RTR 1240

C SUBROUTINE RWCORE
 C RWCORE CALLS SUBROUTINE RWCORF FOR PHI-F DATA
 C OR SUBROUTINE RWCORH FOR B-H DATA

RCE 0010

COMMON VARIABLES

C	READ (5,500) NCORE, PARIN	RCE 0020
	IF (NCORE .LE. 0) RETURN	RCE 0030
	IF (NCORE .LE. 20) GO TO 5	RCE 0040
	WRITE (6,502)	RCE 0050
	CALL EXIT	RCE 0060
	5 CALL HOLLER(6H8H ,PARBH)	RCE 0070
C	-----	
C	CHOOSE BETWEEN SUBROUTINES RWCORF AND RWCORH WHICH READ	
C	PHI-F AND B-H DATA	
C	-----	
	IF (PARIN .EQ. PARBH) GO TO 7	RCE 0080
	CALL RWCORF	RCE 0090
	RETURN	RCE 0100
	7 CALL RWCORH	RCE 0110
	RETURN	RCE 0120
C	502 FORMAT(20X,39HTHE MAXIMUM NUMBER OF CORES IS EXCEEDED//)	RCE 0130
	500 FORMAT (I12,A6)	RCE 0140
	END	RCE 0150

SUBROUTINE RWCORF
RWCORF READS IN AND PRINTS OUT PHI-F DATA OF CORES

RCF 0010

COMMON VARIABLES

C	LOGICAL MONCOR	RCF 0020
C	REAL NS,NP	RCF 0030
C	INTEGER STSWEX	RCF 0040
C	EQUIVALENCE (KCORE,KC),(K1CORE,K1C),(K2CORE,K2C)	RCF 0050
C	DIMENSION KC(20,10), K1C(20,10), K2C(20,10)	RCF 0060
C	DIMENSION ESSES(24), HA(20), HN(20), HQ(20), XID(20),	RCF 0070
C	2 XOD(20), TYPE(20), PHID2(20), CORMAT(20), UO(20)	RCF 0080
C	READ IN DATA COMMON TO ALL CORES.	
C	SET HOLLERITH CONSTANTS FOR PHID(F) TYPES, BLANKS,	
C	AND CARRIAGE CONTROL.	
C	-----	
C	READ (5,531) RELERR,ABSERR,PSTEP,STSWEX,NUDT,LASTIC	RCF 0090
C	IF (RELERR.EQ. 0.0) RELERR = 0.0001	RCF 0100
C	IF (ABSERR.EQ. 0.0) ABSERR = 0.0001	RCF 0110
C	CALL HOLLER(1H,HOL)	RCF 0120
C	CALL HOLLER(1HA,HOLA)	RCF 0130
C	CALL HOLLER(1HB,HOLB)	RCF 0140
C	CALL HOLLER(1HC,HOLC)	RCF 0150
C	CALL HOLLER(1HD,HOLD)	RCF 0160
C	CALL HOLLER(1HE,HOLE)	RCF 0170
C	CALL HOLLER(1HF,HOLF)	RCF 0180
C	CALL HOLLER(1HG,HOLG)	RCF 0190
C	CALL HOLLER(16H,F3)	RCF 0200
C	CALL HOLLER(1HO,CC)	RCF 0210
C	IF (DMAX.NE. 0.0) CALL HOLLER(1H,CC)	RCF 0220
C	IF (NSVPHI.NE. 1) GO TO 7757	RCF 0230
C	IF (NSVVAR.EQ. 1) GO TO 7757	RCF 0240
C	IF (KONT.EQ. 1) GO TO 7757	RCF 0250
C	-----	
C	SUBTRACT ELASTIC FLUX CHANGE FROM PHI OF PREVIOUS MODE,	
C	UNLESS NSVVAR=1 OR KONT=1.	
C	-----	
C	DO 7759 N = 1, NCORE	RCF 0260
C	PHI(N)=PHI(N)-P1(N)*F(N)*ALOG((ABS(F(N))+P2(N))/(ABS(F(N))+P3(N)))	RCF 0270
C	2 N)))	RCF 0280
C	IF (ABS(PHI(N)).LE. PHIR(N)) GO TO 7759	RCF 0290
C	IF (PHI(N)) 7761,7759,7762	RCF 0300
C	7761 PHI(N) = -PHIR(N)	RCF 0310
C	GO TO 7759	RCF 0320
C	7762 PHI(N) = PHIR(N)	RCF 0330
C	7759 CONTINUE	RCF 0340
C	7757 WRITE (6,9789)	RCF 0350
C	-----	
C	CHECK AND WRITE	
C	(1) WHETHER ELASTIC SWITCHING IS INCLUDED.	
C	(2) WHETHER TO TERMINATE MODE RUN WHEN SWITCHING	
C	OF ALL CORES IS COMPLETED.	
C	-----	
C	IF (LASTIC.GE. 1) GO TO 477	RCF 0360
C	CALL HOLLER(16HNEGLEC,T1)	RCF 0370
C	CALL HOLLER(16HTED,T2)	RCF 0380

GO TO 478	RCF 0390
477 CALL HOLLER(6MINCLUD,T1)	RCF 0400
CALL HOLLER(6HED ,T2)	RCF 0410
478 WRITE (6,150) T1,T2	RCF 0420
RNUDT = NUDT	RCF 0430
IF (ISTWEX .NE. 0.0) GO TO 8	RCF 0440
WRITE (6,528)	RCF 0450
GO TO 9	RCF 0460
8 WRITE (6,529)NUDT	RCF 0470
9 NOEXIT = 1	RCF 0480
WRITE (6, 533) RELERR, ABSERR	RCF 0490
WRITE(6,7778) PSTEP	RCF 0500
DO 2202 N=1,NCORE	RCF 0510
READ (5,503) NWSUBN, KC1, UO(N)	RCF 0520
NW(N) = NWSUBN	RCF 0530
IF (NWSUBN .GT. 0) GO TO 6	RCF 0540
WRITE (6,524) N	RCF 0550
CALL EXIT	RCF 0560
6 IF (NWSUBN .LE. 10) GO TO 7	RCF 0570
WRITE (6,523)N	RCF 0580
CALL EXIT	RCF 0590

C READ IN WINDING DATA	
C	
C	
7 DO 13 M = 1,NWSUBN	RCF 0600
READ (5,504) F1C,K1C(N,M),R2C,K2C(N,M),XNT(N,M),RW(N,M),I,J,C10	RCF 0610
IF (I .LE. 0) I = 1	RCF 0620
IF (J .LE. 0) J = 1	RCF 0630
NP(N,M) = I	RCF 0640
NS(N,M) = J	RCF 0650
IF ((NSVVAR .NE. 1) .AND. (KONT .NE. 1)) C1CORE(N,M) = C10	RCF 0660
IF (RW(N,M) .LE. 0.0) RW(N,M) = 0.1	RCF 0670

C DETERMINE TYPE OF TERMINALS	
C	
C	
IF (F1C .NE. F3) GO TO 12	RCF 0680
IF (R2C .NE. F3) GO TO 11	RCF 0690
KC(N,M)=1	RCF 0700
GO TO 13	RCF 0710
11 KC(N,M)=2	RCF 0720
GO TO 13	RCF 0730
12 KC(N,M)=3	RCF 0740
13 CONTINUE	RCF 0750
IF (KC1 .GT. 0) GO TO 15	RCF 0760

C UP TO THIS POINT, SUBROUTINES RWCORF AND RWCORH ARE IDENTICAL.	
C READ IN CORE-PARAMETER DATA	
C	
C	
READ (5,501) XOD(N),XID(N),PHIS(N),PHIR(N),TYPE(N),CORMAT(N)	RCF 0770
IF (TYPE(N) .EQ. HOL) TYPE(N) = HOLB	RCF 0780
IF (CORMAT(N) .EQ. HOL) CORMAT(N) = HOLF	RCF 0790
IF (PHIS(N) .EQ. 0.0) PHIS(N) = 1.1 * PHIR(N)	RCF 0800
READ (5,505) FD1(N),FDZ(N),FD2(N),FD3(N),PHID2(N)	RCF 0810
READ (5,505) HA(N),HQ(N),HN(N)	RCF 0820
READ (5,505) XLMDAD(N),XNUD(N),FDB(N),FOPP(N),XLAMDA(N),XNU(N),	RCF 0830
2 FB(N),FO(N),ROP(N),FBI(N),FOI(N),ROI(N)	RCF 0840
IF (FBI(N) .EQ. 0.0) FBI(N) = 1.0E30	RCF 0850
IF (FOPP(N) .LT. FD1(N)) FOPP(N) = FD1(N)	RCF 0860
IF (XNU(N) .EQ. 0.0) XNU(N) = (FB(N)-FOPP(N)) / (FB(N)-FO(N))	RCF 0870
IF (XLAMDA(N) .EQ. 0.0) XLAMDA(N)=RCP(N)/(XNU(N)*(FB(N)-FOPP(N))	RCF 0880
2 ** (XNU(N)-1.0))	RCF 0890
IF (FDB(N) .EQ. 0.0) FDB(N) = 1.15 * FOPP(N)	RCF 0900
IF (XNUD(N) .EQ. 0.0) XNUD(N) = XNU(N)*(FDB(N)-FD1(N))	RCF 0910
2 / (FDB(N)-FOPP(N))	RCF 0920
IF (XLMDAD(N) .EQ. 0.0) XLMDAD(N)=XLAMDA(N)*(XNU(N)/XNUD(N))**	RCF 0930
2 XNU(N) / (FDB(N)-FD1(N))**(XNUD(N)-XNU(N))	RCF 0940

C	GO TO 2202	RCF 0950
C	-----	
C	COPY THE PARAMETER VALUES OF CORE NO. KC1.	
C	-----	
15	XOD (N)= XOD (KC1)	RCF 0960
	XID (N)= XID (KC1)	RCF 0970
	PHIS (N)= PHIS (KC1)	RCF 0980
	PHIR (N)= PHIR (KC1)	RCF 0990
	CORMAT(N)= CORMAT(KC1)	RCF 1000
	TYPE (N)= TYPE (KC1)	RCF 1010
	FD1 (N)= FD1 (KC1)	RCF 1020
	FDZ (N)= FDZ (KC1)	RCF 1030
	FD2 (N)= FD2 (KC1)	RCF 1040
	FD3 (N)= FD3 (KC1)	RCF 1050
	PHID2 (N)= PHID2 (KC1)	RCF 1060
	HA (N)= HA (KC1)	RCF 1070
	HQ (N)= HQ (KC1)	RCF 1080
	HN (N)= HN (KC1)	RCF 1090
	XLMDAD(N)= XLMDAD(KC1)	RCF 1100
	XNUD (N)= XNUD (KC1)	RCF 1110
	FDB (N)= FDB (KC1)	RCF 1120
	FOPP (N)= FOPP (KC1)	RCF 1130
	XLAMDA(N)= XLAMDA(KC1)	RCF 1140
	XNU (N)= XNU (KC1)	RCF 1150
	FB (N)= FB (KC1)	RCF 1160
	FO (N)= FO (KC1)	RCF 1170
	ROP (N)= ROP (KC1)	RCF 1180
	FB1 (N)= FB1 (KC1)	RCF 1190
	FO1 (N)= FO1 (KC1)	RCF 1200
	ROP1 (N)= ROP1 (KC1)	RCF 1210
2202	CONTINUE	RCF 1220
	DO 25 N = 1, NCORE	RCF 1230
	IF (DMAX .EQ. 0.0) GO TO 4444	RCF 1240
C	-----	
C	MODIFY NOMINAL PARAMETER VALUES BY DMAX PERCENT	
C	-----	
	READ (5, 4445) (ESSES(I), I=1, 24)	RCF 1250
	DO 4447 I = 1, 24	RCF 1260
4447	ESSES(I) = ESSES(I) * DMAX	RCF 1270
	XOD (N)= XOD (N) * (1.0 + ESSES(1) / 100.0)	RCF 1280
	XID (N)= XID (N) * (1.0 + ESSES(2) / 100.0)	RCF 1290
	PHIS (N)= PHIS (N) * (1.0 + ESSES(3) / 100.0)	RCF 1300
	PHIR (N)= PHIR (N) * (1.0 + ESSES(4) / 100.0)	RCF 1310
	FD1 (N)= FD1 (N) * (1.0 + ESSES(5) / 100.0)	RCF 1320
	FDZ (N)= FDZ (N) * (1.0 + ESSES(6) / 100.0)	RCF 1330
	FD2 (N)= FD2 (N) * (1.0 + ESSES(7) / 100.0)	RCF 1340
	FD3 (N)= FD3 (N) * (1.0 + ESSES(8) / 100.0)	RCF 1350
	PHID2 (N)= PHID2 (N) * (1.0 + ESSES(9) / 100.0)	RCF 1360
	HA (N)= HA (N) * (1.0 + ESSES(10) / 100.0)	RCF 1370
	HQ (N)= HQ (N) * (1.0 + ESSES(11) / 100.0)	RCF 1380
	HN (N)= HN (N) * (1.0 + ESSES(12) / 100.0)	RCF 1390
	XLMDAD(N)= XLMDAD(N) * (1.0 + ESSES(13) / 100.0)	RCF 1400
	XNUD (N)= XNUD (N) * (1.0 + ESSES(14) / 100.0)	RCF 1410
	FDB (N)= FDB (N) * (1.0 + ESSES(15) / 100.0)	RCF 1420
	FOPP (N)= FOPP (N) * (1.0 + ESSES(16) / 100.0)	RCF 1430
	XLAMDA(N)= XLAMDA(N) * (1.0 + ESSES(17) / 100.0)	RCF 1440
	XNU (N)= XNU (N) * (1.0 + ESSES(18) / 100.0)	RCF 1450
	FB (N)= FB (N) * (1.0 + ESSES(19) / 100.0)	RCF 1460
	FO (N)= FO (N) * (1.0 + ESSES(20) / 100.0)	RCF 1470
	ROP (N)= ROP (N) * (1.0 + ESSES(21) / 100.0)	RCF 1480
	FB1 (N)= FB1 (N) * (1.0 + ESSES(22) / 100.0)	RCF 1490
	FO1 (N)= FO1 (N) * (1.0 + ESSES(23) / 100.0)	RCF 1500
	ROP1 (N)= ROP1 (N) * (1.0 + ESSES(24) / 100.0)	RCF 1510
4444	CONTINUE	RCF 1520
C	-----	
C	PRELIMINARY COMPUTATION OF CERTAIN PARAMETERS.	

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C      - - - - -
      PHIG(N) = UO(N) * PHIR(N)                                RCF 1530
      PHID2D = PHID2(N)                                         RCF 1540
      HAD = HA(N)                                               RCF 1550
      HQD = HQ(N)                                               RCF 1560
      HND = HN(N)                                               RCF 1570
      XLO = 3.1415927 * 0.0254 * XOD(N)                       RCF 1580
      XLI = 3.1415927 * 0.0254 * XID(N)                       RCF 1590
C      - - - - -
C      COMPUTATION OF AUXILIARY STATIC PARAMETERS P1(N) THROUGH P20(N).
C      FROM HERE UNTIL THE END OF COMPUTATION OF AUXILIARY STATIC-
C      PARAMETERS, SUBROUTINES RWCORF AND RWCORH ARE IDENTICAL.
C      - - - - -
      P1(N) = (PHIS(N) - PHIR(N))/((XLO - XLI) * HAD )          RCF 1600
      P2(N) = HAD * XLO                                         RCF 1610
      P3(N) = HAD * XLI                                         RCF 1620
      P4(N) = P1(N) * (P2(N)-P3(N))                             RCF 1630
      IF (TYPE(N) .NE. HOLF) GO TO 200                          RCF 1640
      IF (FD2(N) .EQ. 0.0) FD2(N) = FD1(N)                      RCF 1650
      PHID2D = P1(N) * ALOG((FD2(N)+P2(N))/(FD2(N)+P3(N))) *   RCF 1660
      2      FD2(N) + PHIR(N)                                    RCF 1670
      GO TO 201                                                  RCF 1680
200  IF (TYPE(N) .EQ. HOLG) GO TO 201                          RCF 1690
      IF (TYPE(N) .EQ. HOLR) GO TO 201                          RCF 1700
      IF (TYPE(N) .NE. HOLC) GO TO 206                          RCF 1710
201  IF (FDZ(N) .EQ. 0.0 ) GO TO 202                          RCF 1720
      IF (FDZ(N) .EQ. FD1(N)) GO TO 202                        RCF 1730
      IF (FDZ(N)*2.0 .NE. FD1(N)+FD2(N)) GO TO 205             RCF 1740
202  IF (FD2(N) .EQ. 0.0 ) GO TO 203                          RCF 1750
      IF (FD2(N) .NE. FD1(N)) GO TO 204                        RCF 1760
203  FD2(N) = FD1(N)                                           RCF 1770
      FD1(N) = 0.95 * FD1(N)                                    RCF 1780
204  FDZ(N) = 0.5 * (FD1(N) + FD2(N))                          RCF 1790
      P5(N) = P1(N) * ALOG((FD1(N)-P2(N))/(FD1(N)-P3(N))) *   RCF 1800
      2      - PHIR(N)                                           RCF 1810
      P6(N) = (PHID2D - P5(N)) / (FD2(N) - FD1(N))            RCF 1820
      P7(N) = 1.0                                              RCF 1830
      P8(N) = 0.0                                              RCF 1840
      P9(N) = 0.0                                              RCF 1850
      GO TO 206                                                  RCF 1860
205  Q1 = P1(N) * ALOG((FD1(N) - P2(N)) / (FD1(N) - P3(N)))   RCF 1870
      P5(N) = Q1 * FD1(N) - PHIR(N)                            RCF 1880
      P6(N) = Q1 + P4(N)*FD1(N)/((FD1(N)-P2(N))*(FD1(N)-P3(N))) RCF 1890
      P7(N) = ALOG((PHID2D - P5(N)-P6(N)*(FD2(N)-FD1(N)))/(0.5*(PHID2D - RCF 1900
      2P5(N))-P6(N)*(FDZ(N)-FD1(N))))                          RCF 1910
      3      / ALOG((FD2(N)-FD1(N))/(FDZ(N)-FD1(N)))          RCF 1920
      P8(N) = (PHID2D-P5(N)-P6(N)*(FD2(N)-FD1(N)))/(FD2(N)-FD1(N))*P7(N) RCF 1930
      P9(N) = P7(N) - 1.0                                       RCF 1940
206  IF (TYPE(N) .EQ. HOLG) GO TO 207                          RCF 1950
      IF (TYPE(N) .EQ. HOLR) GO TO 207                          RCF 1960
      IF (TYPE(N) .EQ. HOLB) GO TO 207                          RCF 1970
      IF (TYPE(N) .NE. HOLD) GO TO 208                          RCF 1980
207  HS = HAD + HQD + HND + PHIR(N)*(HAC +HQD -HND )/PHIS(N)  RCF 1990
      HDMIN = 0.25 * (HS -SQRT(HS**2-8.0*HAD *HQD)            RCF 2000
      2      *(1.0+PHIR(N)/PHIS(N)))                            RCF 2010
      PO = (PHIS(N)+PHIR(N))*HQD /((XLO-XLI)*HND )           RCF 2020
      P12(N) = PO / HDMIN                                       RCF 2030
      P13(N) = PO * (1.0/HND -1.0/HQD )                       RCF 2040
      P14(N) = 1.0 - HND /HDMIN                                RCF 2050
      P15(N) = HND * XLI                                       RCF 2060
      P16(N) = PHIR(N) + PO*XLI                                RCF 2070
      P17(N) = HND * XLO                                       RCF 2080
      P18(N) = P16(N) - PO*XLO                                  RCF 2090
      P19(N) = P13(N) * P15(N)                                 RCF 2100
      P20(N) = P13(N) * (P17(N)-P15(N))                       RCF 2110
      IF (TYPE(N) .EQ. HOLD) FD1(N) = HDMIN * XLI            RCF 2120

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FD4(N) = HDMIN * XLD	RCF 2130
GO TO 289	RCF 2140
208 P13(N) = P1(N)	RCF 2150
P15(N) = -P3(N)	RCF 2160
P17(N) = -P2(N)	RCF 2170
P18(N) = -PHIR(N)	RCF 2180
P20(N) = -P4(N)	RCF 2190
289 IF (TYPE(N) .EQ. HOLA) GO TO 210	RCF 2200
IF (TYPE(N) .EQ. HOLG) GO TO 210	RCF 2210
IF (TYPE(N) .EQ. HOLC) GO TO 209	RCF 2220
IF (TYPE(N) .NE. HDLE) GO TO 216	RCF 2230
209 PHID3 = P1(N)*ALOG((FD3(N)+P2(N))/(FD3(N)+P3(N))) + PHIR(N)	RCF 2240
GO TO 212	RCF 2250
210 IF (FD3(N) .LT. FD4(N)) GO TO 211	RCF 2260
PHID3 = P13(N)*ALOG((FD3(N)-P17(N))/(FD3(N)-P15(N)))*FD3(N)-P18(N)	RCF 2270
GO TO 212	RCF 2280
211 PHID3 = (P12(N) + P13(N)*ALOG(P14(N)*FD3(N)/(FD3(N)-P15(N)))	RCF 2290
2 * FD3(N) - P16(N)	RCF 2300
212 IF (TYPE(N) .EQ. HOLC) GO TO 213	RCF 2310
IF (TYPE(N) .NE. HOLG) GO TO 214	RCF 2320
213 P10(N) = (PHID3 - PHID2D) / (FD3(N) - FD2(N))	RCF 2330
GO TO 215	RCF 2340
214 PHID1S = P1(N)*ALOG((FD1(N)-P2(N))/(FD1(N)-P3(N)))*FD1(N) - PHIR(N)	RCF 2350
P10(N) = (PHID3 - PHID1S) / (FD3(N) - FD1(N))	RCF 2360
215 P11(N) = P10(N) * FD3(N) - PHID3	RCF 2370
C - - - - -	
C END OF COMPUTATION OF AUXILIARY STATIC PARAMETERS.	
C - - - - -	
216 ZV(N) = 0.003* XLAMDA(N) * (0.3*FOPP(N))*XNU(N)	RCF 2380
C - - - - -	
C WRITE CORE-WINDINGS DATA.	
C - - - - -	
C	
WRITE (6,506) N	RCF 2390
WRITE (6,507)	RCF 2400
WRITE (6,508)	RCF 2410
NWSUBN = NW(N)	RCF 2420
DO 31 M = 1,NWSUBN	RCF 2430
KO = KC(N,M)	RCF 2440
IXNT = XNT(N,M)	RCF 2450
GO TO (17,18,21),KO	RCF 2460
17 WRITE (6,509) M,K1C(N,M),K2C(N,M),IXNT,RW(N,M),CICORE(N,M)	RCF 2470
GO TO 24	RCF 2480
18 IF (K2C(N,M) .LE. 0) GO TO 20	RCF 2490
WRITE (6,510) M,K1C(N,M),K2C(N,M),IXNT,RW(N,M),CICORE(N,M)	RCF 2500
GO TO 24	RCF 2510
20 K2C(N,M) = 20	RCF 2520
WRITE (6,511) M,K1C(N,M), IXNT,RW(N,M),CICORE(N,M)	RCF 2530
GO TO 24	RCF 2540
21 IF (K1C(N,M) .LE. 0) GO TO 23	RCF 2550
WRITE (6,512) M,K1C(N,M),K2C(N,M),IXNT,RW(N,M),CICORE(N,M)	RCF 2560
GO TO 24	RCF 2570
23 K1C(N,M) = 20	RCF 2580
WRITE (6,513) M, K2C(N,M),IXNT,RW(N,M),CICORE(N,M)	RCF 2590
24 I = NS(N,M)	RCF 2600
IF (I .GT. 1) WRITE (6,7906) I	RCF 2610
J = NP(N,M)	RCF 2620
IF (J .GT. 1) WRITE (6,7905) J	RCF 2630
31 CONTINUE	RCF 2640
C - - - - -	
C WRITE CORE PARAMETERS	
C - - - - -	
C	
WRITE (6,514)	RCF 2650
CALL HOLLER(6HFERRIT,T1)	RCF 2660
CALL HOLLER(6HE ,T2)	RCF 2670
IF (CORMAT(N) .EQ. HOLF) GO TO 1111	RCF 2680
CALL HOLLER(6HTAPE-W,T1)	RCF 2690

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CALL HOLLER(6HOUND ,T2)
1111 IF (DMAX .GT.0.0)WRITE (6,4446) ESSES(1),ESSES(2)
WRITE (6,515)CC,XOD(N),XID(N),TYPE(N),T1,T2
IF (DMAX .GT.0.0)WRITE (6,4446) (ESSES(1),I=3,7)
WRITE (6,516)CC,PHIS(N),PHIR(N),F01(N),FDZ(N),FD2(N)
IF (DMAX .GT.0.0)WRITE (6,4446) (ESSES(1),I=8,12)
WRITE (6,517)CC,FD3(N),PHID2D ,HAD ,HQD ,HND
IF (DMAX .GT. 0) WRITE (6,4446) (ESSES(1),I=13,17)
WRITE (6,518)CC,XLMDAD(N),XNUD(N),FDB(N),FOPP(N),XLAMDA(N)
IF (DMAX .GT.0.0)WRITE (6,4446) (ESSES(1),I=18,21)
WRITE (6,519)CC,XNU(N),F8(N),F0(N),ROP(N)
IF (DMAX .GT.0.0)WRITE (6,4446) (ESSES(1),I=22,24)
WRITE (6,520)CC,FB1(N),F01(N),ROP1(N)
WRITE (6,525)
IF (MONCOR) WRITE (6,3167) XLO,XLI,HS,HDMIN,PO,PHID3,PHID15
WRITE (6,527) P1(N), P2(N), P3(N), P4 (N), P5 (N),
2 P6(N), P7(N), P8(N), P9(N), P10(N), P11(N), P12(N) ,
3 P13(N), P14(N), P15(N),P16(N),P17(N),P18(N),P19(N),P20(N),ZV(N)
IF (NSVVAR .NE. 0) GO TO 404
IF (NSVPHI .NE. 0) GO TO 404
WRITE (6, 532) PHIO(N)
GO TO 25
404 WRITE (6, 532) PHI(N)
25 CONTINUE
RETURN
C . . . . .
150 FORMAT (16HOELASTIC PHIDOT ,2A6)
501 FORMAT (4E12.5,11X,2A1)
503 FORMAT (2I12,E12.5)
504 FORMAT(A6,I6,A6,I6,F12.0,E12.5,2I6,E12.5)
505 FORMAT(6E12.5)
506 FORMAT(1H1,/,43X,14HC O R E N O. ,12,/)
507 FORMAT(47X,15HW I N D I N G S,/)
508 FORMAT(7X,11HWINDING NO.,8X,6HNODE B,11X,6HNODE T,10X,5HTURNS,8X,
11OHRESISTANCE,9X,15HINITIAL CURRENT,/)
509 FORMAT(1H0,5X,I6,11X, I6,11X, I6,5X, 112,2(8X,E12.5))
510 FORMAT(1H0,5X,I6,11X, I6,10X,1HS, I6,5X, 112,2(8X,E12.5))
511 FORMAT(1H0,5X,I6,11X, I6,14X,6HGROUND,2X, 112,2(8X,E12.5))
512 FORMAT(1H0,5X,I6,10X,1HS, I6,11X, I6,5X, 112,2(8X,E12.5))
513 FORMAT(1H0,5X,I6,14X,6HGROUND, 8X, I6,5X, 112,2(8X,E12.5))
514 FORMAT(//,43X,29HC O R E P A R A M E T E R S, )
515 FORMAT(A1 ,4X,3HOD=,E12.5,8X,3HID=,E12.5,6X,5HTYPE- ,A1,13X,
2 10HMATERIAL- ,2A6)
516 FORMAT(A1 ,2X,5HPHIS=,E12.5,6X,5HPIR=,E12.5,7X,4HFD1=,E12.5,7X,
2 4HFDZ=,E12.5,7X,4HFD2=,E12.5)
517 FORMAT(A1 ,3X,4HFD3=,E12.5,5X,6HPID2=,E12.5,8X,3HHA=,E12.5,8X,3HMR
1Q=,E12.5, 8X,3HHN=,E12.5)
518 FORMAT(A1,
2 7HLAMDAD=,E12.5,7X,4HNUD=,E12.5,7X,4HFDB=,E12.5,6X,5HFOPP=
1,E12.5,5X,6HLAMDA=,E12.5)
519 FORMAT(A1 ,4X,3HNU=,E12.5,8X,3HF8=,E12.5,8X,3HF0=,E12.5,7X,4HROP=,
1E12.5)
520 FORMAT(A1 ,3X,4HFB1=,E12.5,7X,4HF01=,E12.5,6X,5HROP1=,E12.5)
523 FORMAT(16X,39HTHE MAXIMUM NUMBER OF WINDINGS FOR CORE,13,11HIS EXC
1EDED)
524 FORMAT(16X,4HCORE,13,16H HAS NO WINDINGS)
525 FORMAT(//22X,57HC O M P U T E D A U X I L I A R Y P A R A M E
1T E R S)
527 FORMAT(16X,3HP1=,E12.5,8X,3HP2=,E12.5,7X,3HP3=,E12.5,7X,4H P4=,
1 E12.5,7X,4H P5=,E12.5//6X,3HP6=,E12.5,8X,3HP7=,E12.5,7X,3HP8=,
2 E12.5,8X,3HP9=,E12.5,7X,4HP10=,E12.5//5X,4HP11=,E12.5,7X,4HP12=,
3 E12.5,6X,4HP13=,E12.5,7X,4HP14=,E12.5,7X,4HP15=,E12.5,/,5X,
4 4HP16=,E12.5,7X,4HP17=,E12.5,6X,4HP18=,E12.5,7X,4HP19=,E12.5,
5 7X,4HP20=,E12.5,/,5X,4HZV = ,E12.5)
528 FORMAT(//38H DO NOT EXIT WHEN FLUX SWITCHING STOPS)
529 FORMAT(//49H EXIT WHEN FLUX SWITCHING STOPS IF T GREATER THAN,14,

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RCF 2700
RCF 2710
RCF 2720
RCF 2730
RCF 2740
RCF 2750
RCF 2760
RCF 2770
RCF 2780
RCF 2790
RCF 2800
RCF 2810
RCF 2820
RCF 2830
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RCF 2880
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RCF 2970
RCF 2980
RCF 2990
RCF 3000
RCF 3010
RCF 3020
RCF 3030
RCF 3040
RCF 3050
RCF 3060
RCF 3070
RCF 3080
RCF 3090
RCF 3100
RCF 3110
RCF 3120
RCF 3130
RCF 3140
RCF 3150
RCF 3160
RCF 3170
RCF 3180
RCF 3190
RCF 3200
RCF 3210
RCF 3220
RCF 3230
RCF 3240
RCF 3250
RCF 3260
RCF 3270
RCF 3280
RCF 3290
RCF 3300
RCF 3310
RCF 3320
RCF 3330
RCF 3340

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15H*DELT)	RCF 3350
531 FORMAT (3E12.5,F12.0,2I12)	RCF 3360
532 FORMAT(///6X,16H INITIAL FLUX = ,E12.5)	RCF 3370
533 FORMAT (// 10H RELERR = ,E10.3, 8X, 9HABSERR = ,E10.3//)	RCF 3380
770 FORMAT (7H HS,PO ,2E22.15)	RCF 3390
4445 FORMAT (4F12.0,/,5F12.0,/,3F12.0,2(/,6F12.0))	RCF 3400
4446 FORMAT (1H0,6X,51F3.0,8H PERCENT ,12X))	RCF 3410
7778 FORMAT (10HOPSTEP = ,E12.5)	RCF 3420
7905 FORMAT (14H REPRESENTING ,12,32H IDENTICALLY SWITCHING CORES IN	RCF 3430
2 ,9HPARALLEL)	RCF 3440
7906 FORMAT (14H REPRESENTING ,12,32H IDENTICALLY SWITCHING CORES IN	RCF 3450
2 ,7HSERIES)	RCF 3460
3167 FORMAT (34H XLO,XLI,HS,HDMIN,PO,PHID3,PHID15 ,2(/,5E24.15))	RCF 3470
9789 FORMAT (16HIMAGNETIC CORES ///)	RCF 3480
END	RCF 3490

RCH 6010

COMMON VARIABLES

LOGICAL MONCOR	RCH 0020
REAL NS,NP	RCH 0030
INTEGER STSWEX	RCH 0040
EQUIVALENCE (KCORE,KC),(K1CORE,K1C),(K2CORE,K2C)	RCH 0050
DIMENSION AIN(20), BD2IN(20),BD3IN(20), BMIN(20), BRIN(20),	RCH 0060
2 CORMAT(20),ESSES(12),FREQ(20,10), HD1IN(20), HD2IN(20),	RCH 0070
3 HD3IN(20),HDZIN(20),HMIN(20),HOBIN(20,10),NDYNP(20), TYPE(20),	RCH 0080
4 UO(20), XID(20), XOD(20)	RCH 0090
DIMENSION KC(20,10), K1C(20,10), K2C(20,10)	RCH 0100
.	
READ IN DATA COMMON TO ALL CORES.	
SET HOLLERITH CONSTANTS FOR PHID(F) TYPES, BLANKS,	
AND CARRIAGE CONTROL.	
- - - - -	
READ (5,531) RELERR,ABSERR,PSTEP ,STSWEX,NUDT,LASTIC	RCH 0110
IF (RELERR .EQ. 0.0) RELERR = 0.0001	RCH 0120
IF (ABSERR .EQ. 0.0) ABSERR = 0.0001	RCH 0130
CALL HOLLER(1H ,HOL)	RCH 0140
CALL HOLLER(1HA,HOLA)	RCH 0150
CALL HOLLER(1HB,HOLB)	RCH 0160
CALL HOLLER(1HC,HOLC)	RCH 0170
CALL HOLLER(1HD,HOLD)	RCH 0180
CALL HOLLER(1HE,HOLE)	RCH 0190
CALL HOLLER(1HF,HOLF)	RCH 0200
CALL HOLLER(1HG,HOLG)	RCH 0210
CALL HOLLER(1HT,HOLT)	RCH 0220
CALL HOLLER (6H ,F3)	RCH 0230
CALL HOLLER(1HO,CC)	RCH 0240
IF (DMAX .NE. 0.0) CALL HOLLER (1H ,CC)	RCH 0250
IF (NSVPHI .NE. 1) GO TO 7757	RCH 0260
IF (NSVVAR .EQ. 1) GO TO 7757	RCH 0270
IF (KONT .EQ. 1) GO TO 7757	RCH 0280
- - - - -	
SUBTRACT ELASTIC FLUX CHANGE FROM PHI OF PREVIOUS MODE,	
UNLESS NSVVAR=1 OR KONT=1.	
- - - - -	
DO 7759 N = 1, NCORE	RCH 0290
PHI(N)=PHI(N)-P1(N)*F(N)*ALOG((ABS(F(N))+P2(N))/(ABS(F(N))+P3(N)))	RCH 0300
2 IF (ABS(PHI(N)) .LE. PHIR(N)) GO TO 7759	RCH 0310
IF (PHI(N)) 7761,7759,7762	RCH 0320
7761 PHI(N) = -PHIR(N)	RCH 0330
GO TO 7759	RCH 0340
7762 PHI(N) = PHIR(N)	RCH 0350
7759 CONTINUE	RCH 0360
7757 WRITE (6,9789)	RCH 0370
- - - - -	
CHECK AND WRITE	
(1) WHETHER ELASTIC SWITCHING IS INCLUDED.	
(2) WHETHER TO TERMINATE MODE RUN WHEN SWITCHING	
OF ALL CORES IS COMPLETED.	
- - - - -	

IF (LASTIC .GE. 1) GO TO 477	RCH 0390
CALL HOLLER(6HNEGLEC,T1)	RCH 0400
CALL HOLLER(6HTEO ,T2)	RCH 0410
GO TO 478	RCH 0420
477 CALL HOLLER(6HINCLUD,T1)	RCH 0430
CALL HOLLER(6HED ,T2)	RCH 0440
478 WRITE (6,150) T1,T2	RCH 0450
RNUDT = NUOT	RCH 0460
IF (STSWEX .NE.0.0)GO TO 8	RCH 0470
WRITE (6,528)	RCH 0480
GO TO 9	RCH 0490
8 WRITE (6,529)NUOT	RCH 0500
9 NOEXIT = 1	RCH 0510
WRITE (6, 533) RELERR, ABSERR	RCH 0520
WRITE(6,7778) PSTEP	RCH 0530
DO 2202 N=1,NCORE	RCH 0540
READ (5,503) NWSUBN, KC1, UO(N)	RCH 0550
NW(N) = NWSUBN	RCH 0560
IF (NWSUBN .GT. 0) GO TO 6	RCH 0570
WRITE (6,524) N	RCH 0580
CALL EXIT	RCH 0590
6 IF (NWSUBN .LE. 10) GO TO 7	RCH 0600
WRITE (6,523)N	RCH 0610
CALL EXIT	RCH 0620

C READ IN WINDING DATA	
C -----	
C	
7 DO 13 M = 1,NWSUBN	RCH 0630
READ (5,504) F1C,K1C(N,M),R2C,K2C(N,M),XNT(N,M),RW(N,M),I,J,C10	RCH 0640
IF (I .LE. 0) I = 1	RCH 0650
IF (J .LE. 0) J = 1	RCH 0660
NP(N,M) = I	RCH 0670
NS(N,M) = J	RCH 0680
IF ((NSVVAR .NE. 1) .AND. (KONT .NE. 1)) C1CORE(N,M) = C10	RCH 0690
IF (RW(N,M) .LE.0.0) RW(N,M) = 0.1	RCH 0700
C -----	
C DETERMINE TYPE OF TERMINALS	
C -----	
C	
IF (F1C .NE. F3) GO TO 12	RCH 0710
IF (R2C .NE. F3)GO TO 11	RCH 0720
KC(N,M)=1	RCH 0730
GO TO 13	RCH 0740
11 KC(N,M)=2	RCH 0750
GO TO 13	RCH 0760
12 KC(N,M)=3	RCH 0770
13 CONTINUE	RCH 0780
IF (KC1 .GT.0) GO TO 15	RCH 0790
C -----	
C UP TO THIS POINT, SUBROUTINES RWCORF AND RWCORH ARE IDENTICAL.	
C READ IN CORE-PARAMETER DATA	
C -----	
C	
READ (5,501) XND(N),XID(N),AIN(N),BRIN(N),TYPE(N),CORMAT(N)	RCH 0800
IF (TYPE(N) .EQ. HOL) TYPE(N) = HCLC	RCH 0810
IF (CORMAT(N) .EQ. HOL) CORMAT(N) = HCLT	RCH 0820
READ (5,505) HD1IN(N),HD2IN(N),HD3IN(N),HMIN(N)	RCH 0830
READ (5,505) BD2IN(N),BD3IN(N),BMIN(N)	RCH 0840
READ (5,503) NDYNPT	RCH 0850
NDYNP(N)=NDYNPT	RCH 0860
DO 14 J=1,NDYNPT	RCH 0870
14 READ (5,505) FRED(N,J),HOBIN(N,J)	RCH 0880
GO TO 2202	RCH 0890
C -----	
C COPY THE PARAMETER VALUES OF CORE NC. KC1.	
C -----	
C	
15 XND (N) = XND (KC1)	RCH 0900
XID (N) = XID (KC1)	RCH 0910

AIN (N) = AIN (KC1)	RCH 0920
BRIN (N) = BRIN (KC1)	RCH 0930
TYPE (N) = TYPE (KC1)	RCH 0940
CORMAT(N) = CORMAT(KC1)	RCH 0950
HD1IN (N) = HD1IN (KC1)	RCH 0960
HDZIN (N) = HDZIN (KC1)	RCH 0970
HD2IN (N) = HD2IN (KC1)	RCH 0980
HD3IN (N) = HD3IN (KC1)	RCH 0990
HMIN (N) = HMIN (KC1)	RCH 1000
BD2IN (N) = BD2IN (KC1)	RCH 1010
BD3IN (N) = BD3IN (KC1)	RCH 1020
BMIN (N) = BMIN (KC1)	RCH 1030
NDYNPT = NDYNP (KC1)	RCH 1040
NDYNP (N) = NDYNPT	RCH 1050
DO 650 J = 1,NDYNPT	RCH 1060
FREQ(N,J)=FREQ(KC1,J)	RCH 1070
650 HOBIN(N,J)=HOBIN(KC1,J)	RCH 1080
2202 CONTINUE	RCH 1090
DO 25 N=1,NCORE	RCH 1100
NDYNPT=NDYNP(N)	RCH 1110
IF (DMAX .EQ.0.0)GO TO 4444	RCH 1120

C	
C	
C	
MODIFY NOMINAL PARAMETER VALUES BY DMAX PERCENT	

READ (5,4445)(ESSES(I),I=1,13)	RCH 1130
DO 4447 I = 1,13	RCH 1140
4447 ESSES(I) = ESSES(I) * DMAX	RCH 1150
XOD (N)=XOD (N)*(1.0 + ESSES(1) / 100.0)	RCH 1160
XID (N)=XID (N)*(1.0 + ESSES(2) / 100.0)	RCH 1170
AIN (N)=AIN (N)*(1.0 + ESSES(3) / 100.0)	RCH 1180
BRIN (N)=BRIN (N)*(1.0 + ESSES(4) / 100.0)	RCH 1190
HD1IN (N)=HD1IN (N)*(1.0 + ESSES(5) / 100.0)	RCH 1200
HDZIN (N)=HDZIN (N)*(1.0 + ESSES(6) / 100.0)	RCH 1210
HD2IN (N)=HD2IN (N)*(1.0 + ESSES(7) / 100.0)	RCH 1220
HD3IN (N)=HD3IN (N)*(1.0 + ESSES(8) / 100.0)	RCH 1230
HMIN (N)=HMIN (N)*(1.0 + ESSES(9) / 100.0)	RCH 1240
BD2IN (N)=BD2IN (N)*(1.0 + ESSES(10) / 100.0)	RCH 1250
BD3IN (N)=BD3IN (N)*(1.0 + ESSES(11) / 100.0)	RCH 1260
BMIN (N)=BMIN (N)*(1.0 + ESSES(12) / 100.0)	RCH 1270
DO 651 I=1,NDYNPT	RCH 1280
651 HOBIN(N,I)=HOBIN(N,I)*(1.0+ ESSES(13) / 100.0)	RCH 1290
4444 CONTINUE	RCH 1300

C	
C	
C	
C	
CONVERT INPUT CORE-PARAMETER VALUES TO MKS UNITS.	
COMPUTE STATIC PHI(F) PARAMETERS	

XLO = 3.1415927 * 0.0254 * XOD(N)	RCH 1310
XLI = 3.1415927 * 0.0254 * XID(N)	RCH 1320
A = AIN (N) * 1.0E-4	RCH 1330
BR = BRIN (N) * 1.0E-4	RCH 1340
HD1 = HD1IN(N) * 79.577	RCH 1350
HDZ = HDZIN(N) * 79.577	RCH 1360
HD2 = HD2IN(N) * 79.577	RCH 1370
HD3 = HD3IN(N) * 79.577	RCH 1380
HM = HMIN (N) * 79.577	RCH 1390
BD2 = BD2IN(N) * 1.0E-4	RCH 1400
BD3 = BD3IN(N) * 1.0E-4	RCH 1410
BM = BMIN (N) * 1.0E-4	RCH 1420
IF (TYPE(N) .EQ. HOLE) GO TO 1625	RCH 1430
IF (TYPE(N) .EQ. HOLE) GO TO 1625	RCH 1440
IF (TYPE(N) .EQ. HOLE) GO TO 1625	RCH 1450
BS = BM + BM - BR	RCH 1460
GO TO 1630	RCH 1470
1625 BS = 1.1 * BR	RCH 1480
1630 PHIS(N)=BS * A	RCH 1490
PHIR(N)=BR * A	RCH 1500

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C  -----
C  PRELIMINARY COMPUTATION OF CERTAIN PARAMETERS
C  IN ORDER TO MATCH WITH SUBROUTINE RWCORF.
C  -----
      PH10(N) = U0(N) * PHIR(N)
      PH1020 = B02 * A
      FD1(N) = HD1 * XLI
      FDZ(N) = HDZ * XLI
      FD2(N) = HD2 * XLI
      FD3(N) = HD3 * XLO
      IF (TYPE(N) .NE. HOLF) GO TO 171
      FDZ(N) = 0.5 * HDZ * (XLO+XLI)
      FD2(N) = HD2 * XLO
      HD3 = HD2
171  HAD = HM
      IF (TYPE(N) .EQ. HOLC) GO TO 172
      IF (TYPE(N) .EQ. HOLB) GO TO 172
      IF (TYPE(N) .NE. HOLF) GO TO 173
172  HAD = 4.0 * HD3
      GO TO 175
173  IF (TYPE(N) .NE. HOLB) GO TO 174
      HD3 = HD2
      BD3 = B02
174  HND = (HD3 * (BS-BD3) - HM * (BM-BR)) / (BM-BD3)
      HQD = HD3 - (BD3+BR) * (HD3-HND) / (BM+BM)
C  -----
C  COMPUTATION OF AUXILIARY STATIC PARAMETERS P1(N) THROUGH P20(N).
C  FROM HERE UNTIL THE END OF COMPUTATION OF AUXILIARY STATIC-
C  PARAMETERS, SUBROUTINES RWCORF AND RWCORH ARE IDENTICAL.
C  -----
175  P1(N) = (PH1S(N) - PHIR(N)) / ((XLO - XLI) * HAD )
      P2(N) = HAD * XLO
      P3(N) = HAD * XLI
      P4(N) = P1(N) * (P2(N) - P3(N))
      IF (TYPE(N) .NE. HOLF) GO TO 200
      IF (FD2(N) .EQ. 0.0) FD2(N) = FD1(N)
      PH1D20 = P1(N) * ALOG((FD2(N)+P2(N)) / (FD2(N)+P3(N))) *
2    FD2(N) + PHIR(N)
      GO TO 201
200  IF (TYPE(N) .EQ. HOLG) GO TO 201
      IF (TYPE(N) .EQ. HOLB) GO TO 201
      IF (TYPE(N) .NE. HOLC) GO TO 206
201  IF (FDZ(N) .EQ. 0.0) GO TO 202
      IF (FDZ(N) .EQ. FD1(N)) GO TO 202
      IF (FDZ(N)*2.0 .NE. FD1(N)+FD2(N)) GO TO 205
202  IF (FD2(N) .EQ. 0.0) GO TO 203
      IF (FD2(N) .NE. FD1(N)) GO TO 204
203  FD2(N) = FD1(N)
      FD1(N) = 0.95 * FD1(N)
204  FDZ(N) = 0.5 * (FD1(N) + FD2(N))
      P5(N) = P1(N) * ALOG((FD1(N)-P2(N)) / (FD1(N)-P3(N))) * FD1(N)
2    - PHIR(N)
      P6(N) = (PH1D20 - P5(N)) / (FD2(N) - FD1(N))
      P7(N) = 1.0
      P8(N) = 0.0
      P9(N) = 0.0
      GO TO 206
205  Q1 = P1(N) * ALOG((FD1(N) - P2(N)) / (FD1(N) - P3(N)))
      P5(N) = Q1 * FD1(N) - PHIR(N)
      P6(N) = Q1 + P4(N)*FD1(N) / ((FD1(N)-P2(N))*(FD1(N)-P3(N)))
      P7(N) = ALOG((PH1D20 - P5(N) - P6(N)*(FD2(N)-FD1(N))) / (0.5*(PH1D20 -
2    P5(N)) - P6(N)*(FDZ(N)-FD1(N))))
3    / ALOG((FD2(N)-FD1(N)) / (FDZ(N)-FD1(N)))
      P8(N) = (PH1D20 - P5(N) - P6(N)*(FD2(N)-FD1(N))) / (FD2(N)-FD1(N)) * P7(N)
      P9(N) = P7(N) - 1.0
206  IF (TYPE(N) .EQ. HOLG) GO TO 207

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RCH 1510
RCH 1520
RCH 1530
RCH 1540
RCH 1550
RCH 1560
RCH 1570
RCH 1580
RCH 1590
RCH 1600
RCH 1610
RCH 1620
RCH 1630
RCH 1640
RCH 1650
RCH 1660
RCH 1670
RCH 1680
RCH 1690
RCH 1700
RCH 1710
RCH 1720
RCH 1730
RCH 1740
RCH 1750
RCH 1760
RCH 1770
RCH 1780
RCH 1790
RCH 1800
RCH 1810
RCH 1820
RCH 1830
RCH 1840
RCH 1850
RCH 1860
RCH 1870
RCH 1880
RCH 1890
RCH 1900
RCH 1910
RCH 1920
RCH 1930
RCH 1940
RCH 1950
RCH 1960
RCH 1970
RCH 1980
RCH 1990
RCH 2000
RCH 2010
RCH 2020
RCH 2030
RCH 2040
RCH 2050
RCH 2060
RCH 2070

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IF (TYPE(N) .EQ. HOLA) GO TO 207	RCH 2080
IF (TYPE(N) .EQ. HOLB) GO TO 207	RCH 2090
IF (TYPE(N) .NE. HOLD) GO TO 208	RCH 2100
207 HS = HAD + HQD + HND + PHIR(N)*(HAD +HQD -HND)/PHIS(N)	RCH 2110
HDMIN = 0.25 * (HS -SQRT(HS**2-8.0*HAC *HQD	RCH 2120
2 * (1.0+PHIR(N)/PHIS(N)))	RCH 2130
PO = (PHIS(N)+PHIR(N))*HQD /((XLO-XLI)*HND)	RCH 2140
P12(N)= PO / HDMIN	RCH 2150
P13(N)= PO * (1.0/HND -1.0/HQD)	RCH 2160
P14(N)= 1.0 - HND /HDMIN	RCH 2170
P15(N)= HND * XLI	RCH 2180
P16(N)= PHIR(N) + PO*XLI	RCH 2190
P17(N)= HND * XLO	RCH 2200
P18(N)= P16(N) - PO*XLO	RCH 2210
P19(N)= P13(N) * P15(N)	RCH 2220
P20(N)= P13(N) * (P17(N)-P15(N))	RCH 2230
IF (TYPE(N) .EQ. HOLD) FD1(N) = HDMIN * XLI	RCH 2240
FD4(N) = HDMIN * XLO	RCH 2250
GO TO 289	RCH 2260
208 P13(N)= P1(N)	RCH 2270
P15(N)= -P3(N)	RCH 2280
P17(N)= -P2(N)	RCH 2290
P18(N)= -PHIR(N)	RCH 2300
P20(N)= -P4(N)	RCH 2310
289 IF (TYPE(N) .EQ. HOLA) GO TO 210	RCH 2320
IF (TYPE(N) .EQ. HOLG) GO TO 210	RCH 2330
IF (TYPE(N) .EQ. HOLC) GO TO 209	RCH 2340
IF (TYPE(N) .NE. HOLE) GO TO 216	RCH 2350
209 PHID3 = P1(N)*ALOG((FD3(N)+P2(N))/(FD3(N)+P3(N))) + PHIR(N)	RCH 2360
GO TO 212	RCH 2370
210 IF (FD3(N) .LT. FD4(N)) GO TO 211	RCH 2380
PHID3 = P13(N)*ALOG((FD3(N)-P17(N))/(FD3(N)-P15(N)))*FD3(N)-P18(N)	RCH 2390
GO TO 212	RCH 2400
211 PHID3 = (P12(N) + P13(N)*ALOG(P14(N)*FD3(N)/(FD3(N)-P15(N))))	RCH 2410
2 * FD3(N) - P16(N)	RCH 2420
212 IF (TYPE(N) .EQ. HOLC) GO TO 213	RCH 2430
IF (TYPE(N) .NE. HOLG) GO TO 214	RCH 2440
213 P10(N)= (PHID3 - PHID2D) / (FD3(N) - FD2(N))	RCH 2450
GO TO 215	RCH 2460
214 PHID15= P1(N)*ALOG((FD1(N)-P2(N))/(FD1(N)-P3(N)))*FD1(N) - PHIR(N)	RCH 2470
P10(N)= (PHID3 - PHID15) / (FD3(N) - FD1(N))	RCH 2480
215 P11(N)= P10(N) * FD3(N) - PHID3	RCH 2490
C	
C	
C	
C	
END OF COMPUTATION OF AUXILIARY STATIC PARAMETERS.	
COMPUTATION OF DYNAMIC PARAMETERS.	
216 Z1=0.0	RCH 2500
Z2=0.0	RCH 2510
Z3=0.0	RCH 2520
Z4=0.0	RCH 2530
DO 603 J=1, NDYNPT	RCH 2540
HOB =HOB IN(N,J)*79.577	RCH 2550
Z1=Z1+FRFQ(N,J)	RCH 2560
Z2=Z2+HOB	RCH 2570
Z3=Z3+FREQ(N,J)*HOB	RCH 2580
Z4=Z4+HOB **2	RCH 2590
603 CONTINUE	RCH 2600
T1 = NDYNPT	RCH 2610
Z5=(T1 *Z3-Z1*Z2)/(T1 *Z4-Z2**2)	RCH 2620
EL=0.5*(XLI+XLO)	RCH 2630
ROP(N)=Z5*3.1415927*(PHIR(N)+PHIS(N))/EL	RCH 2640
F0(N)=EL*(Z2-Z1/Z5)/T1	RCH 2650
IF (CORMAT(N) .EQ. HOLF) GO TO 831	RCH 2660
F8(N)=F0(N)*(1.33-0.0007*(ABTEMP - 298.0))	RCH 2670
GO TO 832	RCH 2680
831 F8(N)=F0(N)*(2.0+0.008*(ABTEMP - 298.0))	RCH 2690

832	XNU(N)=(FB(N)-FD1(N))/(FB(N)-FO(N))	RCH 2700
	XLAMDA(N)=ROP(N)/(XNU(N)*(FB(N)-FD1(N))*XNU(N)-1.0))	RCH 2710
	FDB(N) = 0.99 * FD1(N)	RCH 2720
	FOPP(N) = FD1(N)	RCH 2730
	FB1(N) = 1.0F+30	RCH 2740
	ZV(N) = 0.003* XLAMDA(N) * (0.3*FOPP(N))*XNU(N)	RCH 2750
C	-----	
C	WRITE CORE-WINDINGS DATA.	
C	-----	
	WRITE (6,506) N	RCH 2760
	IF (MONCOR) WRITE (6,770) Q1,P0,EL,Z1,Z2,Z3,Z4,Z5	RCH 2770
	WRITE (6,507)	RCH 2780
	WRITE (6,508)	RCH 2790
	NWSURN = NW(N)	RCH 2800
	DO 31 M = 1,NWSUBN	RCH 2810
	KD = KC(N,M)	RCH 2820
	IXNT = XNT(N,M)	RCH 2830
	GO TO (17,18,21),KD	RCH 2840
17	WRITE (6,509) M,K1C(N,M),K2C(N,M),IXNT,RW(N,M),CICORE(N,M)	RCH 2850
	GO TO 24	RCH 2860
18	IF(K2C(N,M) .LE. 0) GO TO 20	RCH 2870
	WRITE (6,510) M,K1C(N,M),K2C(N,M),IXNT,RW(N,M),CICORE(N,M)	RCH 2880
	GO TO 24	RCH 2890
20	K2C(N,M) = 20	RCH 2900
	WRITE (6,511) M,K1C(N,M), IXNT,RW(N,M),CICORE(N,M)	RCH 2910
	GO TO 24	RCH 2920
21	IF (K1C(N,M) .LE. 0) GO TO 23	RCH 2930
	WRITE (6,512) M,K1C(N,M),K2C(N,M),IXNT,RW(N,M),CICORE(N,M)	RCH 2940
	GO TO 24	RCH 2950
23	K1C(N,M) = 20	RCH 2960
	WRITE (6,513) M, K2C(N,M),IXNT,RW(N,M),CICORE(N,M)	RCH 2970
24	I = NS(N,M)	RCH 2980
	IF (I .GT. 1) WRITE (6,7906) I	RCH 2990
	J = NP(N,M)	RCH 3000
	IF (J .GT. 1) WRITE (6,7905) J	RCH 3010
31	CONTINUE	RCH 3020
C	-----	
C	WRITE CORE PARAMETERS	
C	-----	
	WRITE(6,799)	RCH 3030
	WRITE(6,901)	RCH 3040
	CALL HOLLER(6HFERRIT,T1)	RCH 3050
	CALL HOLLER(6HE ,T2)	RCH 3060
	IF (CORMAT(N) .EQ. HOLF) GO TO 1111	RCH 3070
	CALL HOLLER(6HTAPE-W,T1)	RCH 3080
	CALL HOLLER(6HOUND ,T2)	RCH 3090
1111	IF (DMAX .GT. 0.0) WRITE (6,4446) ESSES(1),ESSES(2),ESSES(3)	RCH 3100
	WRITE (6,902) CC,XOD(N),XID(N),AIN(N)	RCH 3110
	WRITE(6,803)	RCH 3120
	IF (DMAX .GT. 0.0) WRITE (6,4466) ESSES(4),ESSES(5)	RCH 3130
	WRITE (6,900) CC,BRIN(N),TYPE(N),T1,T2,HD1IN(N)	RCH 3140
	IF (DMAX .GT. 0.0) WRITE (6,4446) (ESSES(I),I=6,9)	RCH 3150
	WRITE (6,804) CC, HDZIN(N),FD2IN(N),HD3IN(N),HMIN(N)	RCH 3160
	IF (DMAX .GT. 0.0) WRITE (6,4449) (ESSES(I),I=10,12)	RCH 3170
	WRITE (6,820) CC,BD2IN(N),BD3IN(N),BMIN(N)	RCH 3180
	WRITE(6,805)	RCH 3190
	IF(DMAX.GT.0.0)WRITE(6,821) ESSFS(13)	RCH 3200
	DO 807 J=1,NDYNPT	RCH 3210
	WRITE(6,806) J,FREQ(N,J),HOBIN(N,J)	RCH 3220
807	CONTINUE	RCH 3230
	WRITE (6,526)	RCH 3240
	WRITE (6,808) A,XLI,XLO,BR,BS,BD2,BD3,BM,FM,HS,HDMIN,HD1,HDZ,HD2,	RCH 3250
2	HD3,FD4(N),PHID1S,PHID3	RCH 3260
	WRITE (6,514)	RCH 3270
	WRITE (6,515) XOD(N),XID(N),TYPE(N),T1,T2	RCH 3280
	WRITE (6,516) PHIS(N),PHIR(N),FD1(N),FDZ(N),FD2(N)	RCH 3290

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WRITE      (6,517)  FD3(N),PHID2D ,HAD ,HQD ,HND          RCH 3300
WRITE      (6,518)  XLMDAD(N),XAUD(N),FDB(N),FOPP(N),XLAMDA(N) RCH 3310
WRITE      (6,519)  XNU(N),FB(N),FO(N),ROP(N)             RCH 3320
WRITE      (6,520)  FB1(N),FO1(N),ROP1(N)                 RCH 3330
WRITE      (6,525)                                     RCH 3340
WRITE      (6,527)  P1(N), P2(N), P3(N), P4 (N), P5 (N),   RCH 3350
2          P6(N), P7(N), P8(N), P9(N), P10(N), P11(N), P12(N) , RCH 3360
3          P13(N), P14(N), P15(N),P16(N),P17(N),P18(N),P19(N),P20(N),ZV(N) RCH 3370
IF (NSVVAR .NE. 0) GO TO 404                               RCH 3380
IF (NSVPHI .NE. 0) GO TO 404                               RCH 3390
WRITE      (6, 532) PH10(N)                                RCH 3400
GO TO 25                                                    RCH 3410
404 WRITE      (6, 532) PHI(N)                              RCH 3420
25 CONTINUE                                                RCH 3430
RETURN                                                    RCH 3440

C . . . . .
150 FORMAT (16H0ELASTIC PHIDOT ,2A6)                      RCH 3450
501 FORMAT (4E12.5,11X,2A1)                               RCH 3460
503 FORMAT (2I12,E12.5)                                    RCH 3470
504 FORMAT(A6,I6,A6,I6,F12.0,E12.5,2I6,E12.5)             RCH 3480
505 FORMAT(6E12.5)                                         RCH 3490
506 FORMAT(1H1,/,51X,14HC O R E N O. ,I2,/)              RCH 3500
507 FORMAT(47X,15HW I N D I N G S,/)                      RCH 3510
508 FORMAT(7X,11HWINDING NO.,8X,6HNODE B,11X,6HNODE T,10X,5HTURNS,8X, RCH 3520
110HRESISTANCE,9X,15HINITIAL CURRENT,/)                  RCH 3530
509 FORMAT(1H0,5X,I6,11X,      I6,11X,      I6,5X,      I12,2(8X,E12.5)) RCH 3540
510 FORMAT(1H0,5X,I6,11X,      I6,10X,1HS,      I6,5X,      I12,2(8X,E12.5)) RCH 3550
511 FORMAT(1H0,5X,I6,11X,      I6,14X,6HGRCUND,2X,      I12,2(8X,E12.5)) RCH 3560
512 FORMAT(1H0,5X,I6,10X,1HS,      I6,11X,      I6,5X,      I12,2(8X,E12.5)) RCH 3570
513 FORMAT(1H0,5X,I6,14X,6HGROUND, 8X,      I6,5X,      I12,2(8X,E12.5)) RCH 3580
514 FORMAT(1H1,25X,47HC O M P U T E D C C R E P A R A M E T E R S) RCH 3590
515 FORMAT(1H0,4X,3HQD=,E12.5,8X,3HID=,E12.5,5X,5HTYPE= ,A1,18X, RCH 3600
2          10HMATERIAL= ,2A6)                              RCH 3610
516 FORMAT(1H0,2X,5HPHIS=,E12.5,6X,5HPHIR=,E12.5,6X,4HFD1=,E12.5,8X, RCH 3620
2          4HFD2=,E12.5,9X,4HFD2=,E12.5)                  RCH 3630
517 FORMAT(1H0,3X,4HFD3=,E12.5,5X,6HPHIC2=,E12.5,7X,3HHA=,E12.5,9X,3HHRCH RCH 3640
1Q=,E12.5,10X,3HNN=,E12.5)                                RCH 3650
518 FORMAT(8HOLAMDAD=,E12.5,7X,4HNUD=,E12.5,6X,4HFDB=,E12.5,7X,5HFOPP= RCH 3660
1,E12.5,7X,6HLAMDA=,E12.5)                                RCH 3670
519 FORMAT(1H0,4X,3HNU=,E12.5,8X,3HFB=,E12.5,7X,3HFO=,E12.5,8X,4HROP=, RCH 3680
1E12.5)                                                     RCH 3690
520 FORMAT(1H0,3X,4HFB1=,E12.5,7X,4HFO1=,E12.5,5X,5HROP1=,E12.5) RCH 3700
523 FORMAT(16X,39HTHE MAXIMUM NUMBER OF WINDINGS FOR CORE,I3,11HIS EXCRCH RCH 3710
1EDED)                                                      RCH 3720
524 FORMAT(16X,4HCORE,I3,16H HAS NO WINDINGS)              RCH 3730
525 FORMAT(//22X,57HC O M P U T E D A U X I L I A R Y P A R A M E RCH 3740
1T E R S)                                                    RCH 3750
526 FORMAT (15H0CONVERSION TO MKS UNITS AND PRELIMINARY COMPUTATION )RCH 3760
527 FORMAT(//6X,3HP1=,E12.5,8X,3HP2=,E12.5,7X,3HP3=,E12.5,7X,4H P4=, RCH 3770
1 E12.5,7X,4H P5=,E12.5//6X,3HP6=,E12.5,8X,3HP7=,E12.5,7X,3HP8=, RCH 3780
2 E12.5,8X,3HP9=,E12.5,7X,4HP10=,E12.5//5X,4HP11=,E12.5,7X,4HP12=,RCH 3790
3 E12.5,6X,4HP13=,E12.5,7X,4HP14=,E12.5,7X,4HP15=,E12.5,/,5X, RCH 3800
4 4HP16=,E12.5,7X,4HP17=,E12.5,6X,4HP18=,E12.5,7X,4HP19=,E12.5, RCH 3810
5 7X,4HP20=,E12.5,/,5X,4HZV = ,E12.5)                    RCH 3820
528 FORMAT(//38H DO NOT EXIT WHEN FLUX SWITCHING STOPS)    RCH 3830
529 FORMAT(//49H EXIT WHEN FLUX SWITCHING STOPS IF T GREATER THAN,I4, RCH 3840
15H*DELT)                                                    RCH 3850
531 FORMAT (3E12.5,F12.0,2I12)                              RCH 3860
532 FORMAT(///6X,16H INITIAL FLUX = ,E12.5)                RCH 3870
533 FORMAT (// 10H RELERR = ,E10.3, 8X, 9HABSERR = ,E10.3//) RCH 3880
770 FORMAT (25H Q1,P0,EL,21,22,23,24,25 ,3E24.15,/,1H ,5E24.15) RCH 3890
799 FORMAT(//,20X,48H S T A T I C A N D D Y N A M I C I N P U T RCH 3900
2 ,34H C O R E P A R A M E T E R S )                        RCH 3910
803 FORMAT(//9X,22HSTATIC B(H)-CURVE DATA)                RCH 3920
804 FORMAT (A1,13HHDZ(OERSTED)= ,E12.5,5X,13HHD2(OERSTED)= ,E12.5,5X, RCH 3930
2 13HHD3(OERSTED)= ,E12.5,5X,13HHD(OERSTED)= ,E12.5)    RCH 3940

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805 FORMAT(/9X,23HDYNAMIC B(H)-CURVE DATA,/10X,30HFREQUENCY HIDERSTERCH 3950
1DS) AT B=0/) RCH 3960
806 FORMAT(5X,13,2E14.5) RCH 3970
808 FORMAT(/6X,2HA=,E12.5,5X,3HLI=,E12.5,5X,3HLO=,E12.5,5X,3HBR=,E12.5,RCH 3980
2,5X,3HRS=,E12.5/4X,4HBD2=,E12.5,4X,4HBD3=,E12.5,5X,3HBM=,E12.5,5X,RCH 3990
33HBM=,E12.5,5X,3HMS=,E12.5,2X,6HHDMIN=,E12.5/4X,4HHD1=,E12.5,4X, RCH 4000
44HHD2=,E12.5,4X,4HHD2=,E12.5,4X,4HHD3=,E12.5,4X,4HFD4=,E12.5, RCH 4010
5 /1X,7HPHID1S=,E12.5,2X,6HPHID3=,E12.5) RCH 4020
820 FORMAT (A1,30X,13HBD2(GAUSSSES)= ,E12.5,5X,13HBD3(GAUSSSES)= ,E12.5,RCH 4030
2 5X,13HBM (GAUSSES)= ,E12.5) RCH 4040
821 FORMAT(23X,F3.0,8H PERCENT) RCH 4050
900 FORMAT (A1,13HBR (GAUSSES)= ,E12.5,13X, RCH 4060
2 6HTYPE- ,A1,15X,14HCORE MATERIAL- ,2A6,4X,13HHD1(DERSTED)= ,RCH 4070
3 E12.5) RCH 4080
901 FORMAT(/9X,10HDIMENSIONS) RCH 4090
902 FORMAT (A1,3X,10HOD (INCH)= ,E12.5,8X,10HID (INCH)= ,E12.5,7X, RCH 4100
2 11HA (CM.SQ.)= ,E12.5) RCH 4110
4445 FORMAT (4F12.0/5F12.0/3F12.0/12X,F12.0) RCH 4120
4446 FORMAT (1H0,12X,4(F3.0,8H PERCENT ,19X)) RCH 4130
4449 FORMAT (1H0,42X,F3.0,8H PERCENT ,2(19X,F3.0,8H PERCENT )) RCH 4140
4466 FORMAT (1H0,12X,F3.0,8H PERCENT ,79X,F3.0,8H PERCENT ) RCH 4150
7778 FORMAT (10HOPSTEP = ,E12.5) RCH 4160
7905 FORMAT (14H REPRESENTING ,12,32H IDENTICALLY SWITCHING CORES IN RCH 4170
2 ,9HPARALLEL ) RCH 4180
7906 FORMAT (14H REPRESENTING ,12,32H IDENTICALLY SWITCHING CORES IN RCH 4190
2 ,7HSERIES ) RCH 4200
9789 FORMAT (16H1MAGNETIC CORES ////) RCH 4210
END RCH 4220

```

C SUBROUTINE RWCND
RWCND READS IN AND PRINTS OUT CONTINUED-RUN DATA

RCN 0010

COMMON VARIABLES

C	WRITE(6,2303)	RCN 0020
	READ (5,2304) NDELT,TE,DELT,DTM1,DTM2,NITRSM	RCN 0030
	WRITE(6,2305) NDELT,TE,DELT,DTM1,DTM2,NITRSM	RCN 0040
	WRITE(6,2349)	RCN 0050
	READ (5,2300) (TON(I),I=1, 19)	RCN 0060
	WRITE(6,2350) (I,TON(I),I=1, 19)	RCN 0070
	READ (5,2300) (EP1(I),I=1,ND1)	RCN 0080
	WRITE(6,2350) (I,EP1(I),I=1,ND1)	RCN 0090
	WRITE(6,2306)	RCN 0100
	READ (5,2300) (V1(J),J=1,NZ)	RCN 0110
	WRITE(6,2344) (J,V1(J),J=1,NZ)	RCN 0120
	IF (NC.LE.0) GO TO 2308	RCN 0130
	WRITE(6,2307)	RCN 0140
	DO 2309 I=1,NC	RCN 0150
	READ (5,2300) CIC(I)	RCN 0160
2309	WRITE(6,2310) I,CIC(I)	RCN 0170
2308	CONTINUE	RCN 0180
	IF (NL.LE.0) GO TO 2312	RCN 0190
	WRITE(6,2311)	RCN 0200
	DO 2313 I=1,NL	RCN 0210
	READ (5,2300) CIL(I)	RCN 0220
2313	WRITE(6,2310) I,CIL(I)	RCN 0230
2312	CONTINUE	RCN 0240
	IF (NDIODE.LE.0) GO TO 2315	RCN 0250
	WRITE(6,2314)	RCN 0260
	DO 2316 I=1,NDIODE	RCN 0270
	READ (5,2300) DV(I),DR(I),DI(I)	RCN 0280
2316	WRITE(6,2310) I,DV(I),DR(I),DI(I)	RCN 0290
2315	CONTINUE	RCN 0300
	IF (NTRANS.LE.0) GO TO 2318	RCN 0310
	WRITE(6,2317)	RCN 0320
	DO 2319 I=1,NTRANS	RCN 0330
	READ (5,2300) BCV(I),BCR(I),BCI(I),BEV(I),BER(I),BEI(I)	RCN 0340
2319	WRITE(6,2310) I,BCV(I),BCR(I),BCI(I),BEV(I),BER(I),BEI(I)	RCN 0350
2318	CONTINUE	RCN 0360
	IF (NCORE.LE.0) RETURN	RCN 0370
	WRITE(6,2320)	RCN 0380
	DO 2322 I=1,NCORE	RCN 0390
	WRITE(6,2323) I	RCN 0400
	READ (5,2300) FM3(I),FM2(I),FM1(I),PHIM3(I),PHIM2(I),PHIM1(I),	RCN 0410
2	PDTFM1(I),PHDTM2(I),PHDTM1(I)	RCN 0420
	WRITE(6,2324) FM3(I),FM2(I),FM1(I),PHIM3(I),PHIM2(I),PHIM1(I),	RCN 0430
2	PDTFM1(I),PHDTM2(I),PHDTM1(I)	RCN 0440
	K = NW(I)	RCN 0450
	WRITE(6,2325)	RCN 0460
	DO 2326 J=1,K	RCN 0470
	READ (5,2300) CICOR1(I,J)	RCN 0480
2326	WRITE(6,2310) J,CICOR1(I,J)	RCN 0490
2322	CONTINUE	RCN 0500
	RETURN	RCN 0510
C		


```

C      SUBROUTINE SEQSQL (ERROR)                                SEQ 0010
C      SEQSQL SOLVES MATRIX EQUATIONS BY GAUSSIAN ELIMINATION
C      AND BACK SUBSTITUTION

```

COMMON VARIABLES

```

C      EQUIVALENCE (H,G)                                        SEQ 0020
C      DIMENSION G(3600)                                       SEQ 0030
C      DATA ID/60/                                             SEQ 0040
C      * * * * *
C      ERROR = 0.0                                              SEQ 0050
C      NM1 = NV- 1                                              SEQ 0060
C      NX = 0                                                  SEQ 0070
C      DO 19 I4 = 1,NM1                                         SEQ 0080
C          I3 = NX + I4                                         SEQ 0090
C          T1 = G(I3)                                           SEQ 0100
C      - - - - -
C      CHECK IF DIAGONAL FLEMENT H(I4,I4) IS ZERO
C      - - - - -
C      IF (T1 .NE.0.0)GO TO 7
C      ERROR = -1.0
C      RETURN
C      7  I4P1 = I4 + 1
C      DO 18 I1 = I4P1,NV
C          I3 = NX + I1
C          T2 = G(I3)
C      - - - - -
C      COMPUTE THE RATIO H(I1,I4)/H(I4,I4)
C      - - - - -
C      IF (T2 .EQ.0.0)GO TO 18
C      Q = -T2 / T1
C      I3 = NX + ID + I4
C      I5 = I3 + I1 - I4
C      DO 16 I2 = I4P1,NV
C      - - - - -
C      ASSUME THAT THE FIRST I4 ELEMENTS (LEFT OF THE DIAGONAL) OF
C      ROW I1 ARE ZERO
C      - - - - -
C      T3 = G(I3)
C      IF (T3 .NE.0.0) G(I5) = G(I5) + Q * T3
C      - - - - -
C      SURTRACT (H(I1,I4)/H(I4,I4)) * ROW I4 FROM ROW I1
C      - - - - -
C      I3 = I3 + ID
C      I5 = I5 + ID
C      16  CONTINUE
C      T(I1) = T(I1) + Q * T(I4)
C      - - - - -
C      REPLACE T(I1) BY T(I1) - T(I4)*H(I1,I4)/H(I4,I4)
C      - - - - -
C      18  CONTINUE
C      NX = NX + ID
C      19  CONTINUE
C      - - - - -
C      BACK SUBSTITUTE IN TRIANGULARIZED MATRIX
C      - - - - -
C      DO 33 I2 = 1,NV

```

```

SEQ 0110
SEQ 0120
SEQ 0130
SEQ 0140
SEQ 0150
SEQ 0160
SEQ 0170
SEQ 0180
SEQ 0190
SEQ 0200
SEQ 0210
SEQ 0220
SEQ 0230
SEQ 0240
SEQ 0250
SEQ 0260
SEQ 0270
SEQ 0280
SEQ 0290
SEQ 0300
SEQ 0310
SEQ 0320

```

	I4 = NV+ 1 - I2	SEQ 0330
	I3 = NX + I4	SEQ 0340
	T1 = G(I3)	SEQ 0350
C	- - - - -	
C	CHECK IF DIAGONAL ELEMENT H(I4,I4) OF TRIANGULARIZED MATRIX IS	
C	ZERO	
C	- - - - -	
	IF (T1 .NE.0.0) GO TO 26	SEQ 0360
	ERROR = 1.0	SEQ 0370
	RETURN	SEQ 0380
C	- - - - -	
C	SOLVE FOR V ARRAY	
C	- - - - -	
26	Q = -T(I4) / T1	SEQ 0390
	IF (Q .EQ.0.0) GO TO 32	SEQ 0400
	IF (I4 .LE. 1) GO TO 32	SEQ 0410
	I4M1=I4 - 1	SEQ 0420
	DO 31 I1 = 1,I4M1	SEQ 0430
C	- - - - -	
C	SUBSTITUTE VALUE V(I4) INTO ROWS 1 TO (I4-1)	
C	- - - - -	
	I5 = NX + I1	SEQ 0440
	T2 = G(I5)	SEQ 0450
	IF (T2 .NE.0.0) T(I1) = T(I1) + Q * T2	SEQ 0460
31	CONTINUE	SEQ 0470
32	V(I4) = -Q	SEQ 0480
	NX = NX - I4	SEQ 0490
33	CONTINUE	SEQ 0500
	RETURN	SEQ 0510
C		
	END	SEQ 0520

C SUBROUTINE INTIAL INTIAL SOLVES INITIAL CONDITIONS INT 0010

COMMON VARIABLES

LOGICAL MONMA,WSQSOL INT 0020

C . IF (NSVVAR.EQ. 0) GO TO 400 INT 0030

WRITE (6,9237) INT 0040

CALL EXIT INT 0050

C - - - - -

C START OF ITERATION LOOP

C FILL H AND T ARRAYS

C - - - - -

400 CALL ELEM INT 0060

IF (.NOT. WSQSOL) GO TO 8872 INT 0070

WRITE (6,9999) INT 0080

DO 9995 J = 1,NV INT 0090

9995 WRITE (6,9997) (H(J,K),K=1,NV) INT 0100

WRITE (6,9996) (T(J),J=1,NV) INT 0110

C - - - - -

C SOLVE MATRIX EQUATION

C - - - - -

8872 CALL SEQSQL (ERR) INT 0120

IF(ERR.EQ.0.0)GO TO 2001 INT 0130

C - - - - -

C PRINT OUT THE CONTENTS OF A SINGULAR MATRIX AND EXIT

C - - - - -

IF (.NOT. WSQSOL) GO TO 9980 INT 0140

DO 9981 J = 1,NV INT 0150

9981 WRITE (6,9997) (H(J,K),K=1,NV) INT 0160

9980 CALL ELEM INT 0170

WRITE (6,2002) ((JACK,JILL,H(JACK,JILL),JILL=1,NV),JACK=1,NV) INT 0180

CALL EXIT INT 0190

2001 IF (.NOT. WSQSOL) GO TO 9982 INT 0200

CALL AUX(1) INT 0210

WRITE (6,9970) (V(J),J=1,NZ) INT 0220

9982 TOI = -TOI INT 0230

C - - - - -

C TEST CONVERGENCE OF VOLTAGES

C - - - - -

DO 173 J = 1,NV INT 0240

IF(ABS(V1(J)-V(J)) .LE. (RELER*ABS(V1(J))+ABSER)) GO TO 173 INT 0250

JKKJ = 1 INT 0260

GO TO 174 INT 0270

173 CONTINUE INT 0280

C - - - - -

C COMPUTE CURRENTS AND TEST FOR CONVERGENCE

C - - - - -

174 CALL ELEM INT 0290

DO 175 J=1,NV INT 0300

175 V1(J)=V(J) INT 0310

IF (MONMA) WRITE (6,9994) JKKJ INT 0320

IF(JKKJ.GT. 0) GO TO 6011 INT 0330

IF(ABC.LE.0.0) RETURN INT 0340

6011 JKKJ=0 INT 0350

JKLJ=JKLJ+1 INT 0360

	IF(JKLJ-200)400,410,411	INT 0370
410	DO 412 J=1,NZ	INT 0380
412	V2(J)=V1(J)	INT 0390
	GO TO 400	INT 0400
C	-----	
C	END OF ITERATION LOOP	
C	-----	
411	DO 413 J=1,NZ	INT 0410
	IF (V1(J) .NE.0.0)GO TO 7413	INT 0420
	V2(J) = V2(J) * 1.0E10	INT 0430
	GO TO 413	INT 0440
7413	V2(J)={(V1(J)-V2(J))/V1(J)}*100.0	INT 0450
413	CONTINUE	INT 0460
	WRITE (6,414)	INT 0470
	WRITE (6,415)(J,V2(J),J=1,NZ)	INT 0480
	JKKJ=1	INT 0490
	RETURN	INT 0500
C	-----	
414	FORMAT (' 42H1PERCENT ERROR FOR NODE VALUE CALCULATION ')	INT 0510
415	FORMAT(1H 6(I4,F10.5))	INT 0520
2002	FORMAT(26HSINGULAR MATRIX EQUATION ,/,1H0/, 20H H MATRIX	INT 0530
	1ELEMENTS/(I4,I4,E13.5))	INT 0540
9237	FORMAT (49H INCONSISTENT SPECIFICATION OF SAVE-VARIABLE AND	INT 0550
2	32HINITIAL-CONDITION SOLUTION (NG))	INT 0560
9970	FORMAT (16H SEQ SOL RESULTS ,/(1H ,5E24.15))	INT 0570
9994	FORMAT (6H JKKJ ,I4)	INT 0580
9996	FORMAT (2H T ,(1H ,10E12.5))	INT 0590
9997	FORMAT (2H H ,(1H ,10E12.5))	INT 0600
9999	FORMAT (8H SEQ SOL)	INT 0610
	END	INT 0620

SUBROUTINE ELEM
 C ELEM CALLS PARTS (1) AND (2) OF EACH ELEMENT SUBROUTINE
 C AND CONTROLS CONVERGENCE MEANS

ELE 0010

COMMON VARIABLES

LOGICAL MONELM
 C
 C IF (MONELM) WRITE (6,9999)
 C IF(ABC .LT. 0.0) ABC = 0.0
 C IF(TOI .LE.0.0)GO TO 2
 C - - - - -
 C PART (1) - FILL H AND T ARRAYS
 C - - - - -
 C DO 1 J=1,NV
 C T(J)=0.0
 C DO 1 K=1,NV
 C 1 H(J,K)=0.0
 C IBC=0
 C CALL AUX(0)
 C CALL IVS
 C CALL RES
 C CALL CAP
 C CALL IND
 C CALL ZEN
 C CALL DIOD
 C CALL TRAN
 C CALL CORE
 C IF (MONELM) WRITE (6,7900) ABC,DELT,IBC
 C RETURN
 C - - - - -
 C PART (2) - COMPUTE CURRENTS AND TEST FOR CONVERGENCE
 C - - - - -
 C 2 TOI=-TOI
 C ABC=-1.0
 C IBC=1
 C CALL DIOD
 C CALL TRAN
 C CALL CORE
 C IF (ABC .LE. 0.0) GO TO 5
 C - - - - -
 C CONVERGENCE NOT ACHIEVED
 C - - - - -
 C IF(TE .LE. TIMEIN) GO TO 100
 C IF (NITER .LT. ITRMAX) GO TO 100
 C - - - - -
 C FAILED TO CONVERGE WITHIN ITRMAX ITERATIONS
 C - - - - -
 C KONVRG = 0
 C KFAIL = KFAIL + 1
 C IF (KFAIL .LT. KFMAX) GO TO 200
 C KFAIL = 0
 C ITRMAX = ITRMAX + ITRMAX
 C GO TO 100
 C - - - - -
 C RESET VARIABLES AND DIVIDE DELT BY 4
 C - - - - -

ELE 0020

ELE 0030

ELE 0040

ELE 0050

ELE 0060

ELE 0070

ELE 0080

ELE 0090

ELE 0100

ELE 0110

ELE 0120

ELE 0130

ELE 0140

ELE 0150

ELE 0160

ELE 0170

ELE 0180

ELE 0190

ELE 0200

ELE 0210

ELE 0220

ELE 0230

ELE 0240

ELE 0250

ELE 0260

ELE 0270

ELE 0280

ELE 0290

ELE 0300

ELE 0310

ELE 0320

ELE 0330

ELE 0340

ELE 0350

ELE 0360

200	TE = TE - DELT	ELE 0370
	DELT = 0.25*DELT	ELE 0380
	TE=TE+DELT	ELE 0390
	WRITE (6,775) DELT,NITER	ELE 0400
	DO 104 J=1,NV	ELE 0410
104	V(J)=V1(J)	ELE 0420
	ABC = -3.0	ELE 0430
100	IF (MONELM) WRITE (6,9180) TE,ABC,DELT,ITRMAX,KFAIL,KONVRG	ELE 0440
	RETURN	ELE 0450
5	IF (ING .NE. -1) GO TO 6	ELE 0460
	IF (JKKJ.LE. 0) GO TO 6	ELE 0470
	IF (JKLJ.LE.200) RETURN	ELE 0480
C	-----	
C	CONVERGENCE ACHIEVED. COMPUTE CURRENTS OF LINEAR ELEMENTS	
C	-----	
6	CALL IVS	ELE 0490
	CALL RES	ELE 0500
	CALL CAP	ELE 0510
	CALL IND	ELE 0520
	CALL ZEN	ELE 0530
	CALL AUX(1)	ELE 0540
	IF (ITE .LE. TIMEIN) GO TO 180	ELE 0550
	DTM2 = DTM1	ELE 0560
	DTM1 = DELT	ELE 0570
	NDELT = NDELT + 1	ELE 0580
C	-----	
C	ADJUST DELT	
C	-----	
	IF (NITER-ITRTST) 201,180,140	ELE 0590
201	IF (TI .GT. (DELT+DELT)) GO TO 9236	ELE 0600
	DELT = TI	ELE 0610
	GO TO 1016	ELE 0620
9236	DELT = DELT+DELT	ELE 0630
1016	KFAIL = 0	ELE 0640
	KONVRG = KONVRG + 1	ELE 0650
	IF (KONVRG .LT. KFMAX) GO TO 180	ELE 0660
	KONVRG = 0	ELE 0670
	IF (ITRMAX .GT. MAXMIN) ITRMAX = ITRMAX / 2	ELE 0680
	GO TO 180	ELE 0690
140	DELT = 0.5 * DELT	ELE 0700
180	IF (MONELM) WRITE (6,9180) TE,ABC,DELT,ITRMAX,KFAIL,KONVRG	ELE 0710
	RETURN	ELE 0720
C	-----	
775	FORMAT (8HODELT = ,E12.5,18X,I4,13H ITERATION(S))	ELE 0730
7900	FORMAT (14H ABC,DELT,I8C ,2E24.15,112)	ELE 0740
9180	FORMAT (34H TE,ABC,DELT,ITRMAX,KFAIL,KONVRG ,	ELE 0750
2	/3E24.15,3I12)	ELE 0760
9999	FORMAT (8H ELMTS)	ELE 0770
	END	ELE 0780

C SUBROUTINE IVS
C IVS COMPUTES CONTRIBUTIONS TO H AND T ARRAYS AND CURRENTS
C OF CURRENT AND VOLTAGE SOURCES

IVS 0010

COMMON VARIABLES

	LOGICAL MONIV	IVS 0020
	EQUIVALENCE (KIVS,K),(K1IVS,K1),(K2IVS,K2),(K3IVS,K3),(K4IVS,K4)	IVS 0030
	DIMENSION K(20), K1(20), K2(20), K3(20), K4(20)	IVS 0040
C	IF (NIV .LE. 0) RETURN	IVS 0050
	IF (MONIV) WRITE (6,9999)	IVS 0060
	DO 117 N = 1,NIV	IVS 0070
	K01=K1(N)	IVS 0080
	K02=K2(N)	IVS 0090
	K0=K(N)	IVS 0100
	IF(K4(N).LE. 0) GO TO 18	IVS 0110
C	-----	
C	CURRENT SOURCE	
C	-----	
	IF(K3(N) .GT. 0) GO TO 106	IVS 0120
	B=VI(N)	IVS 0130
	GO TO 107	IVS 0140
106	K5=K3(N)	IVS 0150
	B=EI(K5)	IVS 0160
107	CIIVS(N) = B	IVS 0170
C	-----	
C	COMPUTE CONTRIBUTION TO T ARRAY OF A CURRENT SOURCE	
C	-----	
	GO TO (24,21,23),K0	IVS 0180
24	T(K01)=T(K01)-B	IVS 0190
21	T(K02)=T(K02)+B	IVS 0200
	GO TO 17	IVS 0210
23	T(K01)=T(K01)-B	IVS 0220
	GO TO 17	IVS 0230
C	-----	
C	VOLTAGE SOURCE	
C	-----	
	18 B=1.0/RVS(N)	IVS 0240
	IF(K3(N) .LE. 0) GO TO 108	IVS 0250
	K5=K3(N)	IVS 0260
	C=EI(K5)*B	IVS 0270
	GO TO 110	IVS 0280
108	C=VI(N) *B	IVS 0290
C	-----	
C	COMPUTE CONTRIBUTION TO H AND T ARRAYS OF A VOLTAGE SOURCE	
C	-----	
110	IF (IBC .GT. 0) GO TO 3333	IVS 0300
	GO TO (28,26,27),K0	IVS 0310
28	H(K01,K01)=H(K01,K01)+B	IVS 0320
	H(K01,K02)=H(K01,K02)-B	IVS 0330
	T(K01)=T(K01)+C	IVS 0340
	H(K02,K01)=H(K02,K01)-B	IVS 0350
	H(K02,K02)=H(K02,K02)+B	IVS 0360
	T(K02)=T(K02)-C	IVS 0370
	GO TO 17	IVS 0380
26	H(K02,K02)=H(K02,K02)+B	IVS 0390

	T(K02)=T(K02)-C+B*EI(K01)	IVS 0400
	GO TO 17	IVS 0410
27	H(K01,K01)=H(K01,K01)+B	IVS 0420
	T(K01)=T(K01)+C+B*EI(K02)	IVS 0430
	GO TO 17	IVS 0440
C	- - - - -	
C	COMPUTE VOLTAGE-SOURCE CURRENTS (AFTER CONVERGENCE HAS BEEN	
C	ACHIEVED)	
C	- - - - -	
3333	GO TO (300,301,302),K0	IVS 0450
300	CIIVS(N) = (V (K01) - V (K02)) * B - C	IVS 0460
	GO TO 17	IVS 0470
301	CIIVS(N) = (V (K01) - EI(K02)) * B - C	IVS 0480
	GO TO 17	IVS 0490
302	CIIVS(N) = (EI(K01) - V (K02)) * B - C	IVS 0500
17	IF (MONIV) WRITE (6,9117) K5,K0,B,C,T(K01),T(K02),H(K01,K01),	IVS 0510
2	H(K02,K02),H(K01,K02)	IVS 0520
117	CONTINUE	IVS 0530
	RETURN	IVS 0540
C	- - - - -	
9117	FORMAT (46H K3(),K4(),B,C,T(1),T(2),H(1,1),H(2,2),H(1,2) ,2I6,/,	IVS 0550
1	5(/, 1H ,5E24.15))	IVS 0560
9999	FORMAT (13H IV SOURCES)	IVS 0570
	END	IVS 0580

C	SUBROUTINE RES	RES 0010
C	RES COMPUTES CONTRIBUTIONS TO H AND T ARRAYS AND CURRENTS	
C	OF RESISTORS	
	COMMON VARIABLES	
	LOGICAL MONR	RES 0020
	EQUIVALENCE (KRES,K),(K1RES,K1),(K2RES,K2)	RES 0030
	DIMENSION K(40), K1(40), K2(40)	RES 0040
C	IF (NR .LE. 0) RETURN	RES 0050
	IF (MONR) WRITE (6,9999)	RES 0060
	IF (IBC .GT. 0) GO TO 3333	RES 0070
	L = 0	RES 0080
	DO 114 N = 1,NR	RES 0090
	IF (NRPN) .LE. 1) GO TO 3005	RES 0100
C	R VARIES WITH TIME	
C	L = L + 1	RES 0110
	J1 = IX(L)	RES 0120
	IF (TE .LE. TFR(L,J1)) GO TO 3007	RES 0130
	J1 = J1 + 1	RES 0140
	IX(L) = J1	RES 0150
	R(N) = RF(L,J1-1)	RES 0160
	3007 IF (XRES(L,J1) .NE. 0.0)	RES 0170
	2R(N) = (RF(L,J1) - RF(L,J1-1)) * ((TE - TFR(L,J1-1))	RES 0180
	3 / (TFR(L,J1) - TFR(L,J1-1))) ** XRES(L,J1) + RF(L,J1-1)	RES 0190
C	COMPUTE CONTRIBUTION TO H AND T ARRAYS	
C	3005 B = 1.0/R(N)	RES 0200
	K0 = K(N)	RES 0210
	K01 = K1(N)	RES 0220
	K02 = K2(N)	RES 0230
	GO TO (100,101,102),K0	RES 0240
	100 H(K01,K01) = H(K01,K01) + B	RES 0250
	H(K01,K02) = H(K01,K02) - B	RES 0260
	H(K02,K01) = H(K02,K01) - B	RES 0270
	H(K02,K02) = H(K02,K02) + B	RES 0280
	GO TO 14	RES 0290
	101 H(K01,K01) = H(K01,K01) + B	RES 0300
	T(K01) = T(K01) + B * EI(K02)	RES 0310
	GO TO 14	RES 0320
	102 H(K02,K02) = H(K02,K02) + B	RES 0330
	T(K02) = T(K02) + B * EI(K01)	RES 0340
	14 IF (MONR) WRITE (6,9114) B, T(K01), T(K02), H(K01,K01), H(K02,K02),	RES 0350
	2 H(K01,K02)	RES 0360
	114 CONTINUE	RES 0370
	RETURN	RES 0380
C	COMPUTE RESISTOR CURRENTS (AFTER CONVERGENCE HAS BEEN ACHIEVED)	
C	3333 DO 303 N = 1,NR	RES 0390
	K0 = K(N)	RES 0400
	K01 = K1(N)	RES 0410
	K02 = K2(N)	RES 0420
	GO TO (300,301,302),K0	RES 0430
	300 CIR(N) = (V(K01) - V(K02)) / R(N)	RES 0440
	GO TO 303	RES 0450
	301 CIR(N) = (V(K01) - EI(K02)) / R(N)	RES 0460
	GO TO 303	RES 0470
	302 CIR(N) = (EI(K01) - V(K02)) / R(N)	RES 0480
	303 CONTINUE	RES 0490
	RETURN	RES 0500
C	9114 FORMAT (36H B, T(1), T(2), H(1,1), H(2,2), H(1,2),	RES 0510
	1 5I/, 1H, E22.15, E22.15, E22.15, E22.15)	RES 0520
	9999 FORMAT (13H RESISTORS)	RES 0530
	END	RES 0540

C SUBROUTINE CAP CAP 0010
C CAP COMPUTES CONTRIBUTIONS TO H AND T ARRAYS AND CURRENTS
C OF CAPACITORS

COMMON VARIABLES

LOGICAL MONC CAP 0020
EQUIVALENCE (KCAP,K),(K1CAP,K1),(K2CAP,K2) CAP 0030
DIMENSION K(20), K1(20), K2(20) CAP 0040
DIMENSION B1(20), B2(20), HAA(20), TA(20) CAP 0050
C
C IF (NC .LE. 0) RETURN CAP 0060
C IF (MONC) WRITE (6,9999) CAP 0070
C DO 114 N = 1,NC CAP 0080
C KO=K(N) CAP 0090
C K01=K1(N) CAP 0100
C K02=K2(N) CAP 0110
C IF (IBC .GT. 0) GO TO 105 CAP 0120
C IF (ABC .GT. 0.0) GO TO 53 CAP 0130
C
C AT THE FIRST ITERATION, COMPUTE VALUES THAT ARE CONSTANT FOR A
C GIVEN DELT
C
C A1=DELT/RCSH(N) CAP 0140
C A2=2.0*CAPC(N)+A1 CAP 0150
C A3=2.0*CAPC(N)-A1 CAP 0160
C A4=1.0/(DELT+RC(N)*A2) CAP 0170
C HAA(N)=A2*A4 CAP 0180
C B1(N)=A3*A4 CAP 0190
C B2(N)=CIC(N)*(DELT/A3-RC(N)) CAP 0200
C GO TO (61,62,63),KO CAP 0210
C 61 TA(N)=B1(N)*(V1(K01)-V1(K02)+B2(N)) CAP 0220
C GO TO 53 CAP 0230
C 62 TA(N)=B1(N)*(V1(K01)-EP1(K02)+B2(N))+HAA(N)*EI(K02) CAP 0240
C GO TO 53 CAP 0250
C 63 TA(N)=-B1(N)*(EP1(K01)-V1(K02)+B2(N))+HAA(N)*EI(K01) CAP 0260
C 53 HAAJ = HAA(N) CAP 0270
C
C ADD THE CONTRIBUTIONS TO THE H AND T ARRAYS (AT EVERY ITERATION)
C
C GO TO (100,101,102),KO CAP 0280
C 100 H(K01,K01)=H(K01,K01)+HAAJ CAP 0290
C H(K01,K02)=H(K01,K02)+HAAJ CAP 0300
C T(K01)=T(K01)+TA(N) CAP 0310
C H(K02,K01)=H(K02,K01)+HAAJ CAP 0320
C H(K02,K02)=H(K02,K02)+HAAJ CAP 0330
C T(K02)=T(K02)+TA(N) CAP 0340
C GO TO 14 CAP 0350
C 101 H(K01,K01)=H(K01,K01)+HAAJ CAP 0360
C T(K01)=T(K01)+TA(N) CAP 0370
C GO TO 14 CAP 0380
C 102 H(K02,K02)=H(K02,K02)+HAAJ CAP 0390
C T(K02)=T(K02)+TA(N) CAP 0400
C GO TO 14 CAP 0410
C
C COMPUTE CAPACITOR CURRENTS (AFTER CONVERGENCE HAS BEEN ACHIEVED)
C
C 105 GO TO (103,106,108), KO CAP 0420
C 103 CIC(N)=HAA(N)*(V(K01)-V(K02))-B1(N)*(V1(K01)-V1(K02)+B2(N)) CAP 0430
C GO TO 14 CAP 0440
C 106 CIC(N)=HAA(N)*(V(K01)-EI(K02))-B1(N)*(V1(K01)-EP1(K02)+B2(N)) CAP 0450
C GO TO 14 CAP 0460
C 108 CIC(N)=HAA(N)*(EI(K01)-V(K02))-B1(N)*(EP1(K01)-V1(K02)+B2(N)) CAP 0470
C 14 IF (MONC) WRITE (6,3899) K01,K02,A1,A2,A3,A4,HAA(N),B1(N),B2(N), CAP 0480
C 2 TA(N),CIC(N),T(K01),T(K02),H(K01,K01),H(K02,K02),H(K01,K02) CAP 0490
C 114 CONTINUE CAP 0500
C RETURN CAP 0510
C
C 3899 FORMAT (83H K01,K02,A1,A2,A3,A4,HAA(),B1(),B2(),TA(),CIC(),T(1CAP 0520
C 2),T(2),H(1,1),H(2,2),H(1,2) ,2I3,/,5E24.15,/,5E24.15,/,5E24.15) CAP 0530
C 9999 FORMAT (13H CAPACITORS) CAP 0540
C END CAP 0550

C SUBROUTINE IND
C IND COMPUTES CONTRIBUTIONS TO H AND T ARRAYS AND CURRENTS
C OF INDUCTORS

IND 0010

COMMON VARIABLES

REAL INDL	IND 0020
LOGICAL MONL	IND 0030
EQUIVALENCE (KIND,K),(K1IND,K1),(K2IND,K2)	IND 0040
DIMENSION K(20), K1(20), K2(20)	IND 0050
DIMENSION B1(20), B2(20), HAA(20), TA(20)	IND 0060
C	
IF (NL .LE. 0) RETURN	IND 0070
IF (MONL)WRITE (6,9999)	IND 0080
IF (NG .LT. 0) GO TO 202	IND 0090
DO 114 N=1,NL	IND 0100
KO=K(N)	IND 0110
KO1=K1(N)	IND 0120
KO2=K2(N)	IND 0130
IF (IBC .GT. 0) GO TO 105	IND 0140
IF (ABC .GT. 0.0) GO TO 53	IND 0150
C - - - - -	
C AT THE FIRST ITERATION, COMPUTE VALUES THAT ARE CONSTANT FOR A	
C GIVEN DELT	
C - - - - -	
IF (VICON(N) .GT. 0.0) S(N)=INDL(N)*EXP(-ABS(	IND 0160
2 CIL(N)*(RLSH(N)+RL(N)) - (V(KO1)-V(KO2))/RLSH(N)) * VICON(N))	IND 0170
C = 2.0*S(N)/RLSH(N)	IND 0180
B=1.0/(2.0*S(N)+RL(N)*(DELT+C))	IND 0190
HAA(N)=B*(DELT+C)	IND 0200
B1(N)=B*(C-DELT)	IND 0210
B2(N)=CIL(N)*(2.0*S(N)/(DELT-C)-RL(N))	IND 0220
GO TO (61,62,63),KO	IND 0230
61 TA(N)=B1(N)*(V1(KO1)-V1(KO2)+B2(N))	IND 0240
GO TO 53	IND 0250
62 TA(N)=B1(N)*(V1(KO1)-E1(KO2)+B2(N))+HAA(N)*E1(KO2)	IND 0260
GO TO 53	IND 0270
63 TA(N)=-B1(N)*(E1(KO1)-V1(KO2)+B2(N))+HAA(N)*E1(KO1)	IND 0280
C - - - - -	
C ADD THE CONTRIBUTIONS TO THE H AND T ARRAYS (AT EVERY ITERATION)	
C - - - - -	
53 HAAJ = HAA(N)	IND 0290
GO TO (100,101,102),KO	IND 0300
100 H(KO1,KO1)=H(KO1,KO1)+HAAJ	IND 0310
H(KO1,KO2)=H(KO1,KO2)+HAAJ	IND 0320
T(KO1)=T(KO1)+TA(N)	IND 0330
H(KO2,KO1)=H(KO2,KO1)+HAAJ	IND 0340
H(KO2,KO2)=H(KO2,KO2)+HAAJ	IND 0350
T(KO2)=T(KO2)+TA(N)	IND 0360
GO TO 14	IND 0370
101 H(KO1,KO1)=H(KO1,KO1)+HAAJ	IND 0380
T(KO1)=T(KO1)+TA(N)	IND 0390
GO TO 14	IND 0400
102 H(KO2,KO2)=H(KO2,KO2)+HAAJ	IND 0410
T(KO2)=T(KO2)+TA(N)	IND 0420
GO TO 14	IND 0430
C - - - - -	
C COMPUTE INDUCTOR CURRENTS (AFTER CONVERGENCE HAS BEEN ACHIEVED)	
C - - - - -	
105 GO TO (103,106,108), KO	IND 0440
103 CIL(N)=HAA(N)*(V(KO1)-V(KO2))-B1(N)*(V1(KO1)-V1(KO2)+B2(N))	IND 0450
GO TO 14	IND 0460
106 CIL(N)=HAA(N)*(V(KO1)-E1(KO2))-B1(N)*(V1(KO1)-E1(KO2)+B2(N))	IND 0470
GO TO 14	IND 0480

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108 CIL(N)=HAA(N)*(EI(KO1)-V(KO2))-B1(N)*(EP1(KO1)-V1(KO2)+B2(N))      IND 0490
14 IF (MONL) WRITE (6,3914) CIL(N),S(N),C,B,HAA(N),B1(N),B2(N),TA(N), IND 0500
    IT(KO1),T(KO2),H(KO1,KO1),H(KO2,KO2),H(KO1,KO2)                     IND 0510
114 CONTINUE                                                             IND 0520
    RETURN                                                                IND 0530

C -----
C   COMPUTATION OF INITIAL CONDITIONS
C -----
202 DO 203 N=1,NL                                                       IND 0540
    KO=K(N)                                                             IND 0550
    KO1=K1(N)                                                           IND 0560
    KO2=K2(N)                                                           IND 0570
    IF (IBC .GT. 0) GO TO 4007                                         IND 0580

C -----
C   COMPUTE CONTRIBUTIONS TO H AND T ARRAYS (INITIAL CONDITIONS, EVERY
C   ITERATION)
C -----
    IF (NSVIL .GT. 0) GO TO 4015                                         IND 0590
    IF (INCIL(N) .LE. 0) GO TO 2213                                     IND 0600

C -----
C   EQUIVALENT CIRCUIT FOR INITIAL CONDITIONS IS A CURRENT SOURCE OF
C   FIXED VALUE
C -----
4015 GO TO (4004,4005,4006),KO                                         IND 0610
4005 T(KO1) = T(KO1) - CIL(N)                                           IND 0620
    GO TO 1203                                                         IND 0630
4004 T(KO1) = T(KO1) - CIL(N)                                           IND 0640
4006 T(KO2) = T(KO2) + CIL(N)                                           IND 0650
    GO TO 1203                                                         IND 0660

C -----
C   EQUIVALENT CIRCUIT FOR INITIAL CONDITIONS IS A RESISTANCE RL
C -----
2213 B=1.0/RL(N)                                                       IND 0670
    GO TO (204,205,206),KO                                             IND 0680
204 H(KO1,KO1)=H(KO1,KO1)+B                                           IND 0690
    H(KO1,KO2)=H(KO1,KO2)-B                                           IND 0700
    H(KO2,KO1)=H(KO2,KO1)-B                                           IND 0710
    H(KO2,KO2)=H(KO2,KO2)+B                                           IND 0720
    GO TO 1203                                                         IND 0730
205 H(KO1,KO1)=H(KO1,KO1)+B                                           IND 0740
    T(KO1)=T(KO1)+B*EI(KO2)                                           IND 0750
    GO TO 1203                                                         IND 0760
206 H(KO2,KO2)=H(KO2,KO2)+B                                           IND 0770
    T(KO2)=T(KO2)+B*EI(KO1)                                           IND 0780
    GO TO 1203                                                         IND 0790

C -----
C   COMPUTE INDUCTOR CURRENTS (INITIAL CONDITIONS, AFTER ACHIEVING
C   CONVERGENCE)
C -----
4007 IF (NSVIL .GT. 0) GO TO 1203                                       IND 0800
    IF (INCIL(N) .GT. 0) GO TO 1203                                   IND 0810
    GO TO(208,209,210),KO                                             IND 0820
208 CIL(N)=(V (KO1)-V (KO2))/RL(N)                                     IND 0830
    GO TO 1203                                                         IND 0840
209 CIL(N)=(V (KO1)-EI(KO2))/RL(N)                                     IND 0850
    GO TO 1203                                                         IND 0860
210 CIL(N)=(EI(KO1)-V (KO2))/RL(N)                                     IND 0870
1203 IF (MONL) WRITE (6,1990) B,T(KO1),T(KO2),H(KO1,KO1),H(KO2,KO2), IND 0880
    2 H(KO1,KO2)                                                       IND 0890
203 CONTINUE                                                            IND 0900
    RETURN                                                            IND 0910

C -----
C   . . . . .
1990 FORMAT (34H B,T(1),T(2),H(1,1),H(2,2),H(1,2) ,                IND 0920
1 5(/,1H ,E22.15,E22.15,E22.15,E22.15,E22.15) )                   IND 0930
3914 FORMAT(41HCIL( ),S( ),C,B,HAA( ),B1( ),B2( ),TA( ),          IND 0940
1 31HT(1),T(2),H(1,1),H(2,2),H(1,2) , /,                          IND 0950
2 4(1H ,5E24.15,/))                                                 IND 0960
9999 FORMAT (13H INDUCTORS )                                         IND 0970
    END                                                                IND 0980

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C SUBROUTINE ZEN ZEN 0010
C ZEN COMPUTES CONTRIBUTIONS TO H AND T ARRAYS AND CURRENTS
C OF ZENER DIODES

COMMON VARIABLES

LOGICAL MONZEN ZEN 0020
EQUIVALENCE (KZEN,K1),(K1ZEN,K1),(K2ZEN,K2) ZEN 0030
DIMENSION K(20), K1(20), K2(20), GZ(20), ZI(20) ZEN 0040
C
IF (NZEN .LE. 0) RETURN ZEN 0050
IF (MONZEN) WRITE (6,9999) ZEN 0060
DO 114 N = 1,NZEN ZEN 0070
KO=K(N) ZEN 0080
K01=K1(N) ZEN 0090
K02=K2(N) ZEN 0100
IF (IBC .GT. 0) GO TO 502 ZEN 0110
IF (ABC .GT. 0.0) GO TO 208 ZEN 0120
C
C AT THE FIRST ITERATION, COMPUTE THE ZENER-DIODE VOLTAGE VZ AND
C DETERMINE THE EFFECTIVE REGION. COMPUTE TERMS THAT WILL REMAIN
C CONSTANT FOR A GIVEN DELT
C
GO TO (200,201,202),KO ZEN 0130
200 VZ = V(K01) - V(K02) ZEN 0140
GO TO 203 ZEN 0150
201 VZ = V(K01) - EI(K02) ZEN 0160
GO TO 203 ZEN 0170
202 VZ = EI(K01) - V(K02) ZEN 0180
203 IF (VZ .GT. VZB(N)) GO TO 205 ZEN 0190
GZ(N) = 1.0 / RZB(N) ZEN 0200
ZI(N) = EZB(N) * GZ(N) ZEN 0210
GO TO 208 ZEN 0220
205 IF (VZ .GT. VZF(N)) GO TO 207 ZEN 0230
GZ(N) = 1.0 / RZ(N) ZEN 0240
ZI(N) = 0.0 ZEN 0250
GO TO 208 ZEN 0260
207 GZ(N) = 1.0 ZEN 0270
ZI(N) = 0.7 ZEN 0280
C
C ADD CONTRIBUTIONS TO H AND T ARRAYS
C
208 GZD = GZ(N) ZEN 0290
GO TO (100,101,102),KO ZEN 0300
100 H(K01,K01)=H(K01,K01)+GZD ZEN 0310
H(K01,K02)=H(K01,K02)+GZD ZEN 0320
T(K01) = T(K01) + ZI(N) ZEN 0330
H(K02,K01)=H(K02,K01)+GZD ZEN 0340
H(K02,K02)=H(K02,K02)+GZD ZEN 0350
T(K02) = T(K02) - ZI(N) ZEN 0360
GO TO 14 ZEN 0370
101 H(K01,K01)=H(K01,K01)+GZD ZEN 0380
T(K01) = T(K01) +ZI(N) + GZD * EI(K02) ZEN 0390
GO TO 14 ZEN 0400
102 H(K02,K02)=H(K02,K02)+GZD ZEN 0410
T(K02) = T(K02) -ZI(N)+ GZD * EI(K01) ZEN 0420
GO TO 14 ZEN 0430
C
C COMPUTE ZENER-DIODE CURRENTS (AFTER CONVERGENCE HAS BEEN ACHIEVED)
C
502 GO TO (504,506,508),KO ZEN 0440
504 CIZ(N) = (V(K01)-V(K02)) * GZ(N) - ZI(N) ZEN 0450
GO TO 14 ZEN 0460
506 CIZ(N) = (V(K01)-EI(K02)) * GZ(N) - ZI(N) ZEN 0470
GO TO 14 ZEN 0480
508 CIZ(N) = (EI(K01) - V(K02)) * GZ(N) - ZI(N) ZEN 0490
14 IF (MONZEN)WRITE (6,9114) GZ(N),ZI(N),CIZ(N), ZEN 0500
2 T(K01),T(K02),H(K01,K01),H(K02,K02),H(K01,K02) ZEN 0510
114 CONTINUE ZEN 0520
RETURN ZEN 0530
C
9114 FORMAT (21H GZ(),ZI(),CIZ(), ZEN 0540
2 32HT(1),Z(27),H(1,1),H(2,2),H(1,2) , ZEN 0550
1 5(/,1H ,E22.15 ,E22.15,E22.15,E22.15)) ZEN 0560
9999 FORMAT (13H ZENER) ZEN 0570
END ZEN 0580

C SUBROUTINE DIOD DIO 0010
C DIOD COMPUTES CONTRIBUTIONS TO H AND T ARRAYS AND CURRENTS
C OF DIODES

COMMON VARIABLES

LOGICAL MOND DIO 0020
EQUIVALENCE (KDIOD,K),(K1DIOD,K1),(K2DIOD,K2) DIO 0030
DIMENSION K(20), K1(20), K2(20) DIO 0040
DIMENSION DIP(20) DIO 0050
C
C IF (NDIODE .LE. 0) RETURN DIO 0060
C IF (MOND) WRITE (6,9999) DIO 0070
C IF (IBC .GT. 0) GO TO 3000 DIO 0080
C - - - - -
C * * * P A R T (1) - COMPUTE CONTRIBUTIONS TO H AND T ARRAYS * * *
C - - - - -
C IF (DELT.EQ.TOOLD) GO TO 7950 DIO 0090
C - - - - -
C COMPUTE DELT-DEPENDENT TERMS (AT FIRST ITERATION,IF DELT VALUE HAS
C CHANGED)
C - - - - -
C TOOLD=DELT DIO 0100
C DO 2212 N=1,NDIODE DIO 0110
C DT1(N)=QCR(N,7)/DELT DIO 0120
C DT2(N)= 1.+DT1(N) DIO 0130
C DT3(N)= QCR(N,4) / DELT DIO 0140
C IF (MOND) WRITE (6,2272) TOOLD,C1(N),C2(N),C3(N),C4(N),
2 DT1(N),DT2(N),DT3(N) DIO 0150
2212 CONTINUE DIO 0160
7950 DO 116 N = 1,NDIODE DIO 0170
KO=K(N) DIO 0180
KO1=K1(N) DIO 0190
KO2=K2(N) DIO 0200
SI1=QCR(N,1) DIO 0210
C - - - - -
C COMPUTE DIODE VOLTAGE BV AT THE PREVIOUS DELT
C - - - - -
C GO TO (100,101,102),KO DIO 0230
100 BV=V1(KO1)-V1(KO2) DIO 0240
GO TO 1000 DIO 0250
101 BV=V1(KO1)-EP1(KO2) DIO 0260
GO TO 1000 DIO 0270
102 BV=EP1(KO1)-V1(KO2) DIO 0280
1000 IF (ABC .GT. 0.0) GO TO 8002 DIO 0290
C - - - - -
C AT THE FIRST ITERATION ONLY (UNTIL 8002)
C - - - - -
C LOOP = 0 DIO 0300
C IF (JSJ .LE. 0) GO TO 1001 DIO 0310
C - - - - -
C FOR INITIAL CONDITIONS (UNTIL 1001)
C - - - - -
C IF (BV .GT. -1.0) GO TO 9001 DIO 0320
C DI(N)=-SI1 DIO 0330
C DV(N)=BV DIO 0340
C GO TO 1003 DIO 0350

9001	IF (DV(N)-BV)1002,1001,1001	DIO 0360
C	-----	
C	COMPUTE DC CURRENT AND VOLTAGE (AT FIRST ITERATION)	
C	-----	
1001	DEXP=BV*C2(N)	DIO 0370
	IF (DEXP .LT. 50.0) GO TO 1008	DIO 0380
	LOOP = LOOP + 1	DIO 0390
	IF (LOOP .LE. 100) GO TO 1002	DIO 0400
	WRITE (6,9500) N	DIO 0410
	CALL EXIT	DIO 0420
1002	DI(N)=(BV-DV(N))*DR(N)+DI(N)	DIO 0430
	IF (DI(N) .LE. -SI1) GO TO 1001	DIO 0440
	DV(N)= ALOG(DI(N)/SI1+1.0)/C2(N)	DIO 0450
	GO TO 1003	DIO 0460
1008	DI(N)=SI1*(EXP(DEXP)-1.0)	DIO 0470
	DV(N)=BV	DIO 0480
1003	DR(N)=(DI(N)+SI1)*C2(N)	DIO 0490
C	-----	
C	UPDATE PREVIOUS DC CURRENT DIP IF PRESENT VARIABLES ARE NOT RESET	
C	DUE TO CONVERGENCE FAILURE	
C	-----	
	IF (NAW .EQ. 0) DIP(N) = DI(N)	DIO 0500
C	-----	
C	COMPUTE EFFECT OF JUNCTION CAPACITANCE	
C	-----	
8002	DV2 = AMIN1(DV(N),C1(N))	DIO 0510
	D = DT3(N) / SQRT(1.0 - DV2 * C4(N))	DIO 0520
	DDI =DI(N)-DIP(N)	DIO 0530
	IF (DR(N) .GT. 10000.0) DR(N) = 10000.0	DIO 0540
	B=DR(N)*DT2(N)+C3(N)	DIO 0550
C	-----	
C	SET PHOTO CURRENT AT PRESENT AND PREVIOUS DELT	
C	-----	
	IF (NAW)3050,3150,3151	DIO 0560
3150	PPID1(N)=PPID(N)	DIO 0570
	GO TO 3051	DIO 0580
3151	PPID(N)=PPID1(N)	DIO 0590
3051	PPID(N)=(EI(19)*QCR(N,6)+DT1(N)*PPID(N))/DT2(N)	DIO 0600
C	-----	
C	COMPUTE CONTRIBUTIONS TO H AND T ARRAYS	
C	-----	
3050	C=DV(N)*DR(N)*DT2(N)-DI(N)+PPID(N)-DT1(N)*DDI	DIO 0610
	HACH=B+D	DIO 0620
	TACH=C+BV*D	DIO 0630
	GO TO (300,301,302),KO	DIO 0640
300	H(KO1,KO1)=H(KO1,KO1)+HACH	DIO 0650
	H(KO1,KO2)=H(KO1,KO2)-HACH	DIO 0660
	T(KO1)=T(KO1)+TACH	DIO 0670
	H(KO2,KO1)=H(KO2,KO1)-HACH	DIO 0680
	H(KO2,KO2)=H(KO2,KO2)+HACH	DIO 0690
	T(KO2)=T(KO2)-TACH	DIO 0700
	GO TO 16	DIO 0710
301	H(KO1,KO1)=H(KO1,KO1)+HACH	DIO 0720
	T(KO1)=T(KO1)+TACH+HACH*EI(KO2)	DIO 0730
	GO TO 16	DIO 0740
302	H(KO2,KO2)=H(KO2,KO2)+HACH	DIO 0750
	T(KO2)=T(KO2)-TACH+HACH*EI(KO1)	DIO 0760
C	-----	
C	COMPUTE TOTAL DIODE CURRENT	
C	-----	
16	CIDIOD(N) = HACH * DV(N) - TACH	DIO 0770
	IF (MOND) WRITE (6,9116) BV,DV(N),DV2,D,DI(N),DDI ,DR(N),PPID(N)	DIO 0780
2	,B,C,T(KO1),T(KO2),H(KO1,KO1),H(KO2,KO2),H(KO1,KO2),CIDIOD(N)	DIO 0790
116	CONTINUE	DIO 0800
	RETURN	DIO 0810
C	-----	

```

C      * * * P A R T ( 2 ) - COMPUTE DC DIODE CURRENTS AND TEST FOR
C      CONVERGENCE * * *
C      - - - - -
3000 DO 9102 N = 1,NDIODE                                DIO 0820
      KO=K(N)                                              DIO 0830
      KO1=K1(N)                                           DIO 0840
      KO2=K2(N)                                           DIO 0850
      SI1=QCR(N,1)                                        DIO 0860
      GO TO (3003,3004,3005),KO                          DIO 0870
C      - - - - -
C      COMPUTE DIODE VOLTAGE BV AT PRESENT DELT
C      - - - - -
3003 BV=V(KO1)-V(KO2)                                    DIO 0880
      GO TO 3006                                          DIO 0890
3004 BV=V(KO1)-EI(KO2)                                    DIO 0900
      GO TO 3006                                          DIO 0910
3005 BV=EI(KO1)-V(KO2)                                    DIO 0920
C      - - - - -
C      COMPUTE NEW DC DIODE CURRENT
C      - - - - -
3006 CI=(BV-DV(N))*DR(N)+DI(N)                            DIO 0930
      IF (BV*CI .GE. -1.0E-20) GO TO 3008                DIO 0940
      DR(N)=DI(N)/DV(N)                                  DIO 0950
      ABC=1.0                                             DIO 0960
      IF (MOND ) WRITE (6,9998)                          DIO 0970
      GO TO 3002                                          DIO 0980
3008 IF (CI .GT. (-SI1-SI1)) GO TO 3010                  DIO 0990
      ABC=1.0                                             DIO 1000
      IF (MOND ) WRITE (6,9998)                          DIO 1010
      DI(N)=-SI1                                         DIO 1020
      DV(N)=BV                                           DIO 1030
      DR(N)=0.0                                           DIO 1040
      GO TO 3002                                          DIO 1050
3010 IF (BV*C2(N) .LT. 1.0) GO TO 3002                  DIO 1060
C      - - - - -
C      TEST FOR CONVERGENCE OF DC CURRENT
C      - - - - -
      DEXP=BV*C2(N)                                       DIO 1070
      IF (DEXP .GT. 60.0) GO TO 3009                     DIO 1080
      DEXP=SI1*(FXP(DEXP)-1.0)                           DIO 1090
      IF (ABS(CI-DEXP) .LT. 0.1*DEXP) GO TO 3002         DIO 1100
3009 ABC=1.0                                             DIO 1110
      IF (MOND ) WRITE (6,9998)                          DIO 1120
      DI(N)=CI                                           DIO 1130
C      - - - - -
C      COMPUTE NEW DIODE VOLTAGE AND I/V SLCPE
C      - - - - -
      DV(N)= ALOG(DI(N)/SI1+1.0)/C2(N)                  DIO 1140
      DR(N)=(DI(N)+SI1)*C2(N)                            DIO 1150
3002 PWCR(N)=DI(N)*DV(N)+BV**2*C3(N)                    DIO 1160
      IF (MOND) WRITE (6,9112) BV,CI,DR(N),DI(N),DV(N),DEXP,PWCR(N) DIO 1170
9102 CONTINUE                                           DIO 1180
      RETURN                                              DIO 1190
C      - - - - -
2272 FORMAT (45H TOOLD,C1(),C2(),C3(),C4(),DT1(),DT2(),DT3() , DIO 1200
      2      2(/,5E24.15))                             DIO 1210
9112 FORMAT (34H BV,CI,DR(),DI(),DV(),DEXP,PWCR() ,      DIO 1220
      1      5(/,1H ,E22.15,E22.15,E22.15,E22.15,E22.15) ) DIO 1230
9500 FORMAT (18H LOOPING IN DIODE ,15)                  DIO 1240
9116 FORMAT (42H BV,DV(),DV2,D,DI(),DDI(),DR(),PPID(),B,C , DIO 1250
      2      41H,T(1),T(2),H(1,1),H(2,2),F(1,2),C1D10D() ) DIO 1260
      3      5(/,1H ,E22.15,E22.15,E22.15,E22.15,E22.15) ) DIO 1270
9998 FORMAT (18H DID NOT CONVERGE )                     DIO 1280
9999 FORMAT (13H DIODES )                               DIO 1290
      END                                              DIO 1300

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C SUBROUTINE TRAN
C TRAN COMPUTES CONTRIBUTIONS TO H AND T ARRAYS AND CURRENTS
C OF TRANSISTORS

TRA 0010

COMMON VARIABLES

	LOGICAL MONT	TRA 0020
	EQUIVALENCE (KTRAN,K),(K1TRAN,K1),(K2TRAN,K2),(K3TRAN,K3),	TRA 0030
	2 (K4TRAN,K4)	TRA 0040
	DIMENSION K(20), K1(20), K2(20), K3(20), K4(20)	TRA 0050
	DIMENSION BCC(20), BCIP(20), BEC(20), BEIP(20),	TRA 0060
	2 DRCI(20), DBEI(20)	TRA 0070
C	IF(NTRANS.LE. 0) RETURN	TRA 0080
	IF (MONT)WRITE (6,9999)	TRA 0090
	IF(IBC.GT. 0) GO TO 9200	TRA 0100
C	-----	
C	* * * P A R T (1)- COMPUTE CONTRIBUTIONS TO H AND T ARRAYS * * *	
C	-----	
	IF (DELT.EQ. TTOOLD) GO TO 2213	TRA 0110
C	-----	
C	COMPUTE DELT-DEPENDENT TERMS (AT FIRST ITERATION,IF DELT VALUE HAS	
C	CHANGED)	
C	-----	
	TTOOLD=DELT	TRA 0120
	DO 2212 N=1,NTRANS	TRA 0130
	CDT1(N)=QTAN(N,4)/DELT	TRA 0140
	CDT2(N)=1.0+CDT1(N)	TRA 0150
	CDT3(N)= QTAN(N,7) / DELT	TRA 0160
	EDT1(N)=QTAN(N,3)/DELT	TRA 0170
	EDT2(N)=1.0+EDT1(N)	TRA 0180
	EDT3(N)= QTAN(N,12) / DELT	TRA 0190
	IF (MONT) WRITE (6,2272) TTOOLD,CDT1(N),CDT2(N),CDT3(N),	TRA 0200
	2 EDT1(N),EDT2(N),EDT3(N)	TRA 0210
	2212 CONTINUE	TRA 0220
	2213 DO 909 N = 1,NTRANS	TRA 0230
	K0=K (N)	TRA 0240
	K01=K2(N)	TRA 0250
	K02=K3(N)	TRA 0260
	K03=K4(N)	TRA 0270
C	-----	
C	COMPUTE BASE-COLLECTOR VOLTAGE BC AND BASE-EMITTER VOLTAGE BE AT	
C	PREVIOUS DELT	
C	-----	
	GO TO (201,202,203,204),K0	TRA 0280
201	BC=V1(K01)-V1(K02)	TRA 0290
	BE=V1(K01)-V1(K03)	TRA 0300
	GO TO 300	TRA 0310
202	BC=EP1(K01)-V1(K02)	TRA 0320
	BE=EP1(K01)-V1(K03)	TRA 0330
	GO TO 300	TRA 0340
203	BC=V1(K01)-EP1(K02)	TRA 0350
	BE=V1(K01)-V1(K03)	TRA 0360
	GO TO 300	TRA 0370
204	BC=V1(K01)-V1(K02)	TRA 0380
	BE=V1(K01)-EP1(K03)	TRA 0390
300	IF(K1(N).LE. 0) GO TO 301	TRA 0400

C	-----	
C	PNP TRANSISTOR ONLY (UNTIL 301)	
C	-----	
	BE=-BE	TRA 0410
	BC=-BC	TRA 0420
	BCV(N)=-BCV(N)	TRA 0430
	BEV(N)=-BEV(N)	TRA 0440
	BCI(N)=-BCI(N)	TRA 0450
	BEI(N)=-BEI(N)	TRA 0460
	BCIP(N)=-BCIP(N)	TRA 0470
	BEIP(N)=-BEIP(N)	TRA 0480
301	CO=CC2(N)	TRA 0490
	EO=EC2(N)	TRA 0500
	CIO1=QTAN(N,5)	TRA 0510
	EIO1=QTAN(N,10)	TRA 0520
	IF(ABC .GT. 0.0) GO TO 8002	TRA 0530
C	-----	
C	AT THE FIRST ITERATION ONLY (UNTIL 8002)	
C	-----	
	IF (DELT .LE. 0.0) GO TO 8002	TRA 0540
	LOOP = 0	TRA 0550
	IF (JSJ .LE. 0) GO TO 307	TRA 0560
C	-----	
C	FOR INITIAL CONDITIONS (UNTIL 307)	
C	-----	
	IF(BC .GT. -1.0) GO TO 9317	TRA 0570
	BCI(N)=-CIO1	TRA 0580
	BCV(N)=BC	TRA 0590
	GO TO 601	TRA 0600
9317	IF(BCV(N) .LT. BC) GO TO 308	TRA 0610
C	-----	
C	COMPUTE DC CURRENT AND VOLTAGE (AT FIRST ITERATION)	
C	-----	
307	DEXP=BC*CO	TRA 0620
	IF(DEXP .LT. 50.0) GO TO 2308	TRA 0630
	LOOP = LOOP + 1	TRA 0640
	IF (LOOP .LE. 100) GO TO 308	TRA 0650
	WRITE (6,9501) N	TRA 0660
	CALL EXIT	TRA 0670
2308	BCI(N)=CIO1*(EXP(DEXP)-1.0)	TRA 0680
	BCV(N)=BC	TRA 0690
	GO TO 601	TRA 0700
308	BCI(N)=(BC-BCV(N))*BCR(N)+BCI(N)	TRA 0710
	IF(BCI(N) .LE. -CIO1) GO TO 307	TRA 0720
	BCV(N)=ALOG(BCI(N)/CIO1+1.0)/CO	TRA 0730
601	BCR(N)=(BCI(N)+CIO1)*CO	TRA 0740
	BCV2=AMIN1(BCV(N),CC1(N))	TRA 0750
	IF (MONT) WRITE (6,9751) BC,BE,AF(N),AR(N),CO,EO,CIO1,EIO1,BCI(N),	TRA 0760
2	BCV2,BCR(N),BCV(N),DEXP	TRA 0770
	BCC(N) = COT3(N) / SQRT(1.0 - BCV2 * CC4(N))	TRA 0780
	LOOP = 0	TRA 0790
	IF (BER(N)*QTAN(N,14) .LE. 0.1) GO TO 313	TRA 0800
	IF (JSJ .LE. 0) GO TO 313	TRA 0810
	IF(BC .GT. -1.0) GO TO 9313	TRA 0820
	BEI(N)=-EIO1	TRA 0830
	BEV(N)=BE	TRA 0840
	GO TO 602	TRA 0850
9313	IF (BEV(N) .LT. BE) GO TO 314	TRA 0860
313	DEXP=BE*EO	TRA 0870
	IF(DEXP .LT. 50.0) GO TO 2314	TRA 0880
	LOOP = LOOP + 1	TRA 0890
	IF (LOOP .LE. 100) GO TO 314	TRA 0900
	WRITE (6,9502) N	TRA 0910
	CALL EXIT	TRA 0920
2314	BEI(N)=EIO1*(EXP(DEXP)-1.0)	TRA 0930
	BEV(N)=BE	TRA 0940

GO TO 602	TRA 0950
314 BEI(N)=(BE-BEV(N))*BER(N)+BEI(N)	TRA 0960
IF(BEI(N).LE.-EIO1) GO TO 313	TRA 0970
BEV(N)=ALOG(BEI(N)/EIO1+1.0)/EC	TRA 0980
602 BER(N)=EO*(BEI(N)+EIO1)	TRA 0990
BEV2=AMIN1(BEV(N),EC1(N))	TRA 1000
BEC(N)=EDT3(N)/SQRT(1.0-BEV2*EC4(N))	TRA 1010
IF(NAW.NE.0) GO TO 8002	TRA 1020

C UPDATE PREVIOUS DC CURRENTS, BCIP AND BEIP, IF PRESENT VARIABLES	
C ARE NOT RESET DUE TO CONVERGENCE FAILURE	
C -----	
BCIP(N)=BCI(N)	TRA 1030
BEIP(N)=BEI(N)	TRA 1040
8002 IF(K1(N).LE.0) GO TO 208	TRA 1050
C -----	
C PNP TRANSISTOR ONLY (UNTIL 208)	
C -----	
BC=-BC	TRA 1060
BE=-BE	TRA 1070
BCV(N)=-BCV(N)	TRA 1080
BEV(N)=-BEV(N)	TRA 1090
BCI(N)=-BCI(N)	TRA 1100
BEI(N)=-BEI(N)	TRA 1110
BCIP(N)=-BCIP(N)	TRA 1120
BEIP(N)=-BEIP(N)	TRA 1130
C -----	
C COMPUTE EFFECTS OF JUNCTION CAPACITANCES	
C -----	
208 BCR(N)=AMIN1(BCR(N),100.0)	TRA 1140
BER(N)=AMIN1(BER(N),100.0)	TRA 1150
DBC1(N)=(BCI(N)-BCIP(N))*CDT1(N)	TRA 1160
DBEI(N)=(BEI(N)-BEIP(N))*EDT1(N)	TRA 1170
TCR=BCR(N)*CDT2(N)	TRA 1180
TER=BER(N)*EDT2(N)	TRA 1190
IF (MONT) WRITE (6,9752) BCR(N),BCC(N),BEI(N),BEV(N),BER(N),BEC(N),	TRA 1200
2 DBC1(N),DBEI(N),TCR,TER,DEXP,BEV2	TRA 1210
C -----	
C SET PHOTO CURRENTS AT PRESENT AND PREVIOUS DELT	
C -----	
IF(NAW)3050,3150,3151	TRA 1220
3150 PP1E1(N)=PP1E(N)	TRA 1230
PP1C1(N)=PP1C(N)	TRA 1240
GO TO 3051	TRA 1250
3151 PP1E(N)=PP1E1(N)	TRA 1260
PP1C(N)=PP1C1(N)	TRA 1270
3051 PP1E(N)=(EI(19)*QTAN(N,16)+EDT1(N)*PP1E(N))/EDT2(N)	TRA 1280
PP1C(N)=(EI(19)*QTAN(N,15)+CDT1(N)*PP1C(N))/CDT2(N)	TRA 1290
C -----	
C COMPUTE CONTRIBUTIONS TO H AND T ARRAYS	
C -----	
3050 HACH22=TCR+CC3(N)+BCC(N)	TRA 1300
HACH33=TER+EC3(N)+BEC(N)	TRA 1310
HACH23=-AF(N)*BER(N)	TRA 1320
HACH32=-AR(N)*BCR(N)	TRA 1330
TACH2=BCV(N)*TCR-BCI(N)-AF(N)*(BEV(N)*BER(N)-BEI(N))	TRA 1340
1 -DBC1(N)+BCC(N)*BC -PP1C(N)	TRA 1350
TACH3=BEV(N)*TER-BEI(N)-AR(N)*(BCV(N)*BCR(N)-BCI(N))	TRA 1360
1 -DBEI(N)+BEC(N)*BE -PP1E(N)	TRA 1370
IF (MONT) WRITE (6,9757) PP1E(N),PP1C(N),HACH22,HACH33,HACH23,	TRA 1380
2 HACH32,TACH2,TACH3	TRA 1390
GO TO (401,402,403,404),K0	TRA 1400
401 H(K01,K01)=H(K01,K01)+HACH22+HACH33+HACH23+HACH32	TRA 1410
H(K01,K02)=H(K01,K02)-HACH22-HACH32	TRA 1420
H(K01,K03)=H(K01,K03)-HACH23-HACH33	TRA 1430
T(K01)=T(K01)+TACH2+TACH3	TRA 1440

H(K02,K01)=H(K02,K01)-HACH22-HACH23	TRA 1450
H(K02,K02)=H(K02,K02)+HACH22	TRA 1460
H(K02,K03)=H(K02,K03)+HACH23	TRA 1470
T(K02)=T(K02)-TACH2	TRA 1480
H(K03,K01)=H(K03,K01)-HACH32-HACH33	TRA 1490
H(K03,K02)=H(K03,K02)+HACH32	TRA 1500
H(K03,K03)=H(K03,K03)+HACH33	TRA 1510
T(K03)=T(K03)-TACH3	TRA 1520
GO TO 200	TRA 1530
402 H(K02,K02)=H(K02,K02)+HACH22	TRA 1540
H(K02,K03)=H(K02,K03)+HACH23	TRA 1550
T(K02)=T(K02)-TACH2	TRA 1560
H(K03,K02)=H(K03,K02)+HACH32	TRA 1570
H(K03,K03)=H(K03,K03)+HACH33	TRA 1580
T(K03)=T(K03)-TACH3	TRA 1590
GO TO 200	TRA 1600
403 H(K01,K01)=H(K01,K01)+HACH22+HACH33+HACH23+HACH32	TRA 1610
H(K01,K03)=H(K01,K03)-HACH23-HACH33	TRA 1620
T(K01)=T(K01)+TACH2+TACH3	TRA 1630
H(K03,K01)=H(K03,K01)-HACH32-HACH33	TRA 1640
H(K03,K03)=H(K03,K03)+HACH33	TRA 1650
T(K03)=T(K03)-TACH3	TRA 1660
GO TO 200	TRA 1670
404 H(K01,K01)=H(K01,K01)+HACH22+HACH33+HACH23+HACH32	TRA 1680
H(K01,K02)=H(K01,K02)-HACH22-HACH32	TRA 1690
T(K01)=T(K01)+TACH2+TACH3	TRA 1700
H(K02,K01)=H(K02,K01)-HACH22-HACH23	TRA 1710
H(K02,K02)=H(K02,K02)+HACH22	TRA 1720
T(K02)=T(K02)-TACH2	TRA 1730

C COMPUTE TOTAL COLLECTOR, EMITTER, AND BASE CURRENTS	
C -----	
C	
200 C1COLC(N) = TACH2 - HACH22*BCV(N) - HACH23*BEV(N)	TRA 1740
C1EMTR(N) = HACH32*BCV(N) + HACH33*BEV(N) - TACH3	TRA 1750
C1BASE(N) = C1EMTR(N) - C1COLC(N)	TRA 1760
IF (MONT) WRITE(6,9753) T(K01),T(K02),T(K03),H(K01,K01),	TRA 1770
2 H(K02,K02),H(K03,K03),H(K01,K02),H(K02,K01),H(K01,K03),	TRA 1780
3 H(K03,K01),H(K02,K03),H(K03,K02),C1COLC(N),C1EMTR(N),C1BASE(N)	TRA 1790
909 CONTINUE	TRA 1800
RETURN	TRA 1810
C -----	
C * * * P A R T (2) - COMPUTE DC JUNCTION CURRENTS AND TEST FOR	
C CONVERGENCE * * *	
C -----	
9200 DO 9997 N=1,NTRANS	TRA 1820
K0=K(N)	TRA 1830
K01=K2(N)	TRA 1840
K02=K3(N)	TRA 1850
K03=K4(N)	TRA 1860
C -----	
C COMPUTE BASE-COLLECTOR VOLTAGE BC AND BASE-EMITTER VOLTAGE BE AT	
C PRESENT DELT	
C -----	
GO TO (9001,9002,9003,9004),K0	TRA 1870
9001 BC=V(K01)-V(K02)	TRA 1880
BE=V(K01)-V(K03)	TRA 1890
GO TO 9100	TRA 1900
9002 BC=EI(K01)-V(K02)	TRA 1910
BE=EI(K01)-V(K03)	TRA 1920
GO TO 9100	TRA 1930
9003 BC=V(K01)-EI(K02)	TRA 1940
BE=V(K01)-V(K03)	TRA 1950
GO TO 9100	TRA 1960
9004 BC=V(K01)-V(K02)	TRA 1970
BE=V(K01)-EI(K03)	TRA 1980
9100 CO=CC2(N)	TRA 1990

	EO=EC2(N)	TRA 2000
	CIO1=QTAN(N,5)	TRA 2010
	EIO1=QTAN(N,10)	TRA 2020
C	- - - - -	
C	COMPUTE NEW DC JUNCTION CURRENTS	
C	- - - - -	
	CI=(BC-BCV(N))*BCR(N)+BCI(N)	TRA 2030
	EZ=(BE-BEV(N))*BFR(N)+BEI(N)	TRA 2040
	IF(K1(N).LE. 0) GO TO 9101	TRA 2050
C	- - - - -	
C	PNP TRANSISTOR ONLY (UNTIL 9101)	
C	- - - - -	
	BC=-BC	TRA 2060
	CI=-CI	TRA 2070
	BE=-BE	TRA 2080
	EZ=-EZ	TRA 2090
9101	IF (MONT) WRITE (6,9754) BC,BE,CC,EO,CIO1,EIO1,CI,EZ	TRA 2100
	IF(RC*CI .GE. -1.0E-20) GO TO 9104	TRA 2110
	ABC=1.0	TRA 2120
	IF (MONT) WRITE (6,9998)	TRA 2130
	BCR(N)=BCI(N)/BCV(N)	TRA 2140
	GO TO 9108	TRA 2150
9104	IF(CI .GT. (-CIO1-CIO1)) GO TO 9107	TRA 2160
	ABC=1.0	TRA 2170
	IF (MONT) WRITE (6,9998)	TRA 2180
	BCI(N)=-CIO1	TRA 2190
	BCV(N)=RC	TRA 2200
	GO TO 9302	TRA 2210
9107	IF(RC*CO .LT. 1.0) GO TO 9108	TRA 2220
C	- - - - -	
C	TEST FOR CONVERGENCE OF BASE-COLLECTOR DC CURRENT	
C	- - - - -	
	DEXP=BC*CO	TRA 2230
	IF(DEXP .GT. 60.0) GO TO 9106	TRA 2240
	DEXP=CIO1*(EXP(DEXP)-1.0)	TRA 2250
	IF(ABS(CI-DEXP) .LT. 0.1*DEXP) GO TO 9108	TRA 2260
9106	ABC=1.0	TRA 2270
	IF (MONT) WRITE (6,9998)	TRA 2280
9105	BCI(N)=CI	TRA 2290
C	- - - - -	
C	COMPUTE NEW BASE-COLLECTOR VOLTAGE AND I/V SLOPE	
C	- - - - -	
	BCV(N)=A LOG(CI/CIO1+1.0)/CO	TRA 2300
9302	BCR(N)=(BCI(N)+CIO1)*CO	TRA 2310
C	- - - - -	
C	COMPUTE EFFECT OF BASE-COLLECTOR JUNCTION CAPACITANCE	
C	- - - - -	
	BCV2=AMIN1(BCV(N),CC1(N))	TRA 2320
	BCC(N) = CDT3(N) / SQRT(1.0 - BCCV2 * CC4(N))	TRA 2330
	IF(K1(N).LE. 0) GO TO 9108	TRA 2340
C	- - - - -	
C	PNP TRANSISTOR ONLY (UNTIL 9108)	
C	- - - - -	
	BCI(N)=-BCI(N)	TRA 2350
	BCV(N)=-BCV(N)	TRA 2360
9108	IF (MONT) WRITE (6,9755) ABC,BCV2,DEXP,BCI(N),BCV(N),BCR(N)	TRA 2370
	IF(BE*EZ .GE. -1.0E-20) GO TO 9115	TRA 2380
	ABC=1.0	TRA 2390
	IF (MONT) WRITE (6,9998)	TRA 2400
	BER(N)=BEI(N)/BEV(N)	TRA 2410
	GO TO 9000	TRA 2420
9115	IF(EZ .GT. (-EIO1-EIO1)) GO TO 9118	TRA 2430
	ABC=1.0	TRA 2440
	IF (MONT) WRITE (6,9998)	TRA 2450
	BEI(N)=-EIO1	TRA 2460
	BEV(N)=BE	TRA 2470

GO TO 9306	TRA 2480
9118 IF(BE*EO .LT. 1.0) GO TO 9000	TRA 2490
C	
C TEST FOR CONVERGENCE OF BASE-EMITTER CURRENT	
C	
DEXP=BE*EO	TRA 2500
IF(DEXP .GT. 60.0) GO TO 9117	TRA 2510
DEXP=EIO1*(EXP(DEXP)-1.0)	TRA 2520
IF(ABS(EZ-DEXP) .LT. 0.1*DEXP) GO TO 9000	TRA 2530
9117 ABC = 1.0	TRA 2540
IF (MONT) WRITE (6,9998)	TRA 2550
9119 BEI(N)=EZ	TRA 2560
C	
C COMPUTE NEW BASE-EMITTER VOLTAGE AND I/V SLOPE	
C	
BEV(N)=ALOG(EZ/EIO1 +1.0)/EO	TRA 2570
9306 BER(N)=(BEI(N)+EIO1)*EO	TRA 2580
C	
C COMPUTE EFFECT OF BASE-EMITTER JUNCTION CAPACITANCE	
C	
BEV2=AMIN1(BEV(N),EC1(N))	TRA 2590
BEC(N) = EDT3(N) / SQRT(1.0 - BEV2 * EC4(N))	TRA 2600
IF(K1(N).LE. 0) GO TO 9000	TRA 2610
C	
C PNP TRANSISTOR ONLY (UNTIL 9000)	
C	
BEI(N)=-BEI(N)	TRA 2620
BEV(N)=-BEV(N)	TRA 2630
9000 PWTR(N)=BEV(N)*(BEI(N)-BCI(N)*AR(N))+BCV(N)*(BCI(N)	TRA 2640
1 - BEI(N)*AF(N)) +BC**2*CC3(N)+BE**2*EC3(N)	TRA 2650
IF (MONT) WRITE (6,9756) BER(N),BEV2,BEC(N),BEI(N),BEV(N),DEXP,	TRA 2660
2 PWTR(N)	TRA 2670
9997 CONTINUE	TRA 2680
RETURN	TRA 2690
C	
2272 FORMAT (56H TTOOLS,CDT1(),CDT2(),CDT3(),EDT1(),EDT2(),EDT3()	TRA 2700
2 ,2(/,5E24.15))	TRA 2710
9501 FORMAT (38H LOOPING IN COLLECTOR OF TRANSISTOR ,15)	TRA 2720
9502 FORMAT (36H LOOPING IN EMITTER OF TRANSISTOR ,15)	TRA 2730
9751 FORMAT (58H BC,BE,AF,AR,CO,EO,C161,E161,BCI(),BCV2,BCR(),BCV(),DEXTRA	TRA 2740
2P 4(/,5E24.15))	TRA 2750
9752 FORMAT (68H BCV2,BCC(),BEI(),BEV(),BER(),BEC(),DBC1(),DBEI(),TCR,TTRA	TRA 2760
2ER,DEXP,BEV2 ,4(/,5E24.15))	TRA 2770
1 5(/,1H ,E22.15,E22.15,E22.15,E22.15,E22.15)	TRA 2780
9753 FORMAT (36H T(1),T(2),T(3),H(1,1),H(2,2),H(3,3)	TRA 2790
2 , 43H,H(1,2),H(2,1),H(1,3),H(3,1),H(2,3),H(3,2) ,	TRA 2800
3 30H,CICQLC(),CIEMTR(),CIBASE()	TRA 2810
4 5(/,1H ,E22.15,E22.15,E22.15,E22.15,E22.15)	TRA 2820
9754 FORMAT (29H BC,BE,CO,EO,CIO1,EIC1,C1,EZ ,	TRA 2830
1 5(/,1H ,E22.15,E22.15,E22.15,E22.15,E22.15)	TRA 2840
9755 FORMAT (33H ABC,BCV2,DEXP,BCI(),BCV(),BCR() ,	TRA 2850
1 5(/,1H ,E22.15,E22.15,E22.15,E22.15,E22.15)	TRA 2860
9756 FORMAT (42H BER(),BEV2,BEC(),BEI(),BEV(),DEXP,PWTR() ,/,	TRA 2870
1 5(/,1H ,E22.15,E22.15,E22.15,E22.15,E22.15)	TRA 2880
9757 FORMAT (55H PP1E(),PP1C(),HACH22,HACH33,HACH23,HACH32,TACH2,TACH3	TRA 2890
2 ,2(/,5E24.15))	TRA 2900
9998 FORMAT (18H DID NOT CONVERGE)	TRA 2910
9999 FORMAT (13H TRANSISTORS)	TRA 2920
END	TRA 2930

C SUBROUTINE CORE
C CORE COMPUTES CONTRIBUTIONS TO H AND T ARRAYS AND CURRENTS
C OF MAGNETIC CORES

COR 0010

COMMON VARIABLES

	LOGICAL MONCOR , AITKEN	COR 0020
	REAL NS,NP	COR 0030
	INTEGER STSWEX	COR 0040
	EQUIVALENCE (KCORE,KC),(K1CORE,K1C),(K2CORE,K2C)	COR 0050
	DIMENSION CIJM1(20,10), CIJM2(20,10), GC(20,10),	COR 0060
	2 KC(20,10), K1C(20,10), K2C(20,10), PHDTEP(20), VC(20,10)	COR 0070
C	IF (NCORE .LE. 0) RETURN	COR 0080
	IF (MONCOR) WRITE (6,9999)	COR 0090
	IF (NG .NE. -1) GO TO 65	COR 0100
C	-----	
C	*** INITIAL CONDITIONS ***	
C	-----	
	IF (IBC .GT. 0) GO TO 35	COR 0110
	DO 44 N = 1,NCORE	COR 0120
	NWSUBN = NW(N)	COR 0130
	DO 43 M = 1,NWSUBN	COR 0140
	K0 = KC(N,M)	COR 0150
	K01 = K1C(N,M)	COR 0160
	K02 = K2C(N,M)	COR 0170
C	-----	
C	COMPUTE CONTRIBUTIONS TO H AND T ARRAYS (INITIAL CONDITIONS, EVERY	
C	ITERATION)	
C	-----	
	GW = 1.0/RW(N,M)	COR 0180
	IF (NS(N,M).GT.1.0) GW = GW / NS(N,M)	COR 0190
	IF (NP(N,M).GT.1.0) GW = GW * NP(N,M)	COR 0200
	GO TO (40,41,42), K0	COR 0210
40	H(K01,K01) = H(K01,K01) + GW	COR 0220
	H(K01,K02) = H(K01,K02) - GW	COR 0230
	H(K02,K01) = H(K02,K01) - GW	COR 0240
	H(K02,K02) = H(K02,K02) + GW	COR 0250
	GO TO 743	COR 0260
41	H(K01,K01) = H(K01,K01) + GW	COR 0270
	T(K01) = T(K01) + EI(K02) * GW	COR 0280
	GO TO 743	COR 0290
42	H(K02,K02) = H(K02,K02) + GW	COR 0300
	T(K02) = T(K02) + EI(K01) * GW	COR 0310
743	IF (MONCOR) WRITE (6,776) H(K01,K01),H(K01,K02),H(K02,K01),	COR 0320
	2 H(K02,K02),T(K01),T(K02)	COR 0330
43	CONTINUE	COR 0340
44	CONTINUE	COR 0350
	RETURN	COR 0360
35	IF (ABC .GT. 0.0) RETURN	COR 0370
	IF (JKKJ .GT. 0) RETURN	COR 0380
C	-----	
C	COMPUTE WINDING CURRENTS (INITIAL CONDITIONS, AFTER ACHIEVING	
C	CONVERGENCE)	
C	-----	
	DO 55 N = 1,NCORE	COR 0390
	NWSUBN = NW(N)	COR 0400

DO 54 M = 1,NWSUBN	COR 0410
K0 = KC(N,M)	COR 0420
K01 = K1C(N,M)	COR 0430
K02 = K2C(N,M)	COR 0440
GO TO (46,47,48) ,K0	COR 0450
46 C1CORE(N,M)=(V(K01) - V(K02))/RW(N,M)	COR 0460
GO TO 49	COR 0470
47 C1CORE(N,M)=(V(K01)-E1(K02)) / RW(N,M)	COR 0480
GO TO 49	COR 0490
48 C1CORE(N,M) = (E1(K01) - V(K02)) / RW(N,M)	COR 0500
49 IF (NP(N,M).GT.1.0) C1CORE(N,M) = C1CORE(N,M) / NP(N,M)	COR 0510
IF (MONCOR) WRITE (6,777) C1CORE(N,M)	COR 0520
54 CONTINUE	COR 0530
55 CONTINUE	COR 0540

C COMPUTE AND SET INITIAL VALUES OF F, PHIDCT, AND PHI AT PRESENT	
C AND PREVIOUS DELTS. THIS PORTION (26 TO 30) IS ALSO ENTERED	
C INITIALLY FROM THE MAIN PROGRAM IF NG = 0 OR NG = 1	
C -----	
26 DO 30 N = 1,NCORE	COR 0550
FMM = 0.0	COR 0560
NWSUBN = NW(N)	COR 0570
DO 28 M = 1,NWSUBN	COR 0580
CIJMI(N,M) = C1CORE(N,M)	COR 0590
FMM = FMM + XNT(N,M) * C1CORE(N,M)	COR 0600
IF (MONCOR) WRITE (6,774) CIJMI(N,M),FMM	COR 0610
28 CONTINUE	COR 0620
IF (NWSUBN .GT. 9) GO TO 29	COR 0630
J = NWSUBN + 1	COR 0640
DO 407 M = J, 10	COR 0650
CIJMI(N,M) = 0.0	COR 0660
C1CORE(N,M) = 0.0	COR 0670
407 CONTINUE	COR 0680
29 F(N) = FMM	COR 0690
FM1(N) = FMM	COR 0700
FM2(N) = FMM	COR 0710
PHIDOT(N) = 0.0	COR 0720
PHDTMI(N) = 0.0	COR 0730
IF (NSVPHI .EQ. 0) PHI(N) = PHIO(N)	COR 0740
PHI(N) = PHI(N)+P1(N)*FMM*ALOG((ABS(FMM)+ P2(N))	COR 0750
2 / (ABS(FMM)+ P3(N))	COR 0760
PHIM1(N) = PHI(N)	COR 0770
PHIM2(N) = PHI(N)	COR 0780
IF (MONCOR) WRITE (6,775) NWSUBN,PHI(N)	COR 0790
30 CONTINUE	COR 0800
RETURN	COR 0810
65 IF (IRC .GT. 0) GO TO 85	COR 0820
IF (JSJ .EQ. 0) GO TO 26	COR 0830

C * * PART (1) - COMPUTE CONTRIBUTIONS TO H AND T ARRAYS * *	
C -----	
FLXSW = 0.0	COR 0840
IF (ABC .GT.0.0)GO TO R009	COR 0850

C COMPUTE DELT-DEPENDENT TERMS AT THE FIRST ITERATION	
C -----	
AITKEN = .TRUE.	COR 0860
TM1 = -DELT	COR 0870
TM2 = TM1 - DTM1	COR 0880
TM3 = TM2 - DTM2	COR 0890
SUMT = TM1 + TM2 + TM3	COR 0900
DELTAV = SUMT / 3.0	COR 0910
IF (DELT .LT. 1.0E-10) DELTAV = -TE/NDELT	COR 0920
SUMTT = TM1**2 + TM2**2 + TM3**2	COR 0930
SMTSMT = SUMT**2	COR 0940
SUMTSQ = -3.0*SUMTT + SMTSMT	COR 0950

IF (PHDTE(N)-Q) 8005,8008,8007	COR 1470
8005 Q = PDTEM1(N) - DLPDTE	COR 1480
IF (PHDTE(N)-Q) 8007,8008,8008	COR 1490
8007 PHDTE(N) = Q	COR 1500
GO TO 8010	COR 1510
8008 PHDTEP(N)=EPSP*FDOTAV - EPS/DELTAV	COR 1520
8010 IF (MONCOR) WRITE (6,8006) EPS,EPSP,FDOTAV ,PHDTEP(N),PHDTE(N)	COR 1530
C -----	
C COMPUTE STATIC PHI(F) AND PHIDPRIME(F)	
C -----	
311 IF (SF .GT. FD1(N)) GO TO 312	COR 1540
Q1 = P1(N)*ALOG((SF - P2(N))/(SF - P3(N)))	COR 1550
PHID(N) = Q1*SF - PHIR(N)	COR 1560
PHIDP = Q1 + P4 (N) * SF / ((SF-P2(N))*(SF-P3(N)))	COR 1570
GO TO 316	COR 1580
312 IF (SF .GT. FD2(N)) GO TO 313	COR 1590
Q2 = P8(N) * (SF-FD1(N)) ** P9(N)	COR 1600
PHID(N) = (P6(N)+Q2) * (SF-FD1(N)) + P5(N)	COR 1610
PHIDP = P6(N) + P7(N) * Q2	COR 1620
GO TO 316	COR 1630
313 IF (SF .GT. FD3(N)) GO TO 314	COR 1640
PHID(N) = P10(N)*SF - P11(N)	COR 1650
PHIDP = P10(N)	COR 1660
GO TO 316	COR 1670
314 IF (SF .GT. FD4(N)) GO TO 315	COR 1680
Q4 = P13(N) * ALOG(P14(N)* SF / (SF-P15(N)))	COR 1690
PHID(N) = (P12(N)+Q4) * SF - P16(N)	COR 1700
PHIDP = P12(N)+ Q4 - P19(N) / (SF-P15(N))	COR 1710
GO TO 316	COR 1720
315 Q5 = P13(N)*ALOG((SF -P17(N))/(SF - P15(N)))	COR 1730
PHID(N) = Q5*SF - P18(N)	COR 1740
PHIDP = Q5 + P20(N) * SF / ((SF-P15(N))*(SF-P17(N)))	COR 1750
316 IF (MONCOR)WRITE(6,791) Q1,Q2,Q4,Q5,Q6,PHID(N),PHIDP	COR 1760
IF (SPHI .GE. PHID(N)) GO TO 324	COR 1770
C -----	
C COMPUTE PHDTP (PEAK INELASTIC PHIDOT) AND PHDTPP (PHDTP PRIME)	
C -----	
401 IF(SF .GT. FD1(N)) GO TO 402	COR 1780
PHDTP = 0.0	COR 1790
PHDTPP = 0.0	COR 1800
GO TO 322	COR 1810
402 IF (SF .GT. FDB(N)) GO TO 403	COR 1820
PHDTP = XLMDAD(N) * (SF-FD1(N)) **XNUD(N)	COR 1830
PHDTPP = PHDTP * XNUD(N) / (SF-FD1(N))	COR 1840
GO TO 322	COR 1850
403 IF(SF .GT. FB(N)) GO TO 404	COR 1860
PHDTP = XLAMDA(N)*(SF-FOPP(N))**XNU(N)	COR 1870
PHDTPP = PHDTP * XNU(N) / (SF - FOPP(N))	COR 1880
GO TO 322	COR 1890
404 IF (SF .GT. FB1(N)) GO TO 405	COR 1900
PHDTP = ROP(N)*(SF - FO(N))	COR 1910
PHDTPP = ROP(N)	COR 1920
GO TO 322	COR 1930
405 PHDTP = ROP1(N) * (SF-FO1(N))	COR 1940
PHDTPP = ROP1(N)	COR 1950
C -----	
C COMPUTE PHDTI(INELASTIC PHIDOT) AND PHDTIP(INELASTIC PHIDOTPRIME)	
C -----	
322 ETA = 1.0 - ((SPHI+SPHI+PHIS(N)-PHID(N)) / (PHIS(N)+PHID(N))) ** 2	COR 1960
PHDTI = SIGNF * PHDTP * ETA	COR 1970
PHDTIP = ETA*PHDTPP+4.0*PHDTP*(SPHI+SPHI+PHIS(N)-PHID(N))*(SPHI+	COR 1980
2 PHIS(N))*PHIDP/(PHIS(N)+PHID(N))*3	COR 1990
GO TO 325	COR 2000
324 PHDTI = 0.0	COR 2010
PHDTIP = 0.0	COR 2020
C -----	

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C   COMPUTE PHIDOT, PHDTPR, AND PHI
C   -----
325 PHIDOT(N)=PHDTE(N)+ PHDTI COR 2030
    PHDTPR = PHDTEP(N) + PHDTIP COR 2040
    SPH=[SIGNF*(PHIM1(N)+0.5*DELT*(PHDTM1(N)+PHIDOT(N))) COR 2050
    IF(SPHI .LE. PHID(N)) GO TO 415 COR 2060
    IF (LASTIC .LE. 0) Q6 = P1(N) * ALOG((SF+P2(N))/(SF+P3(N))) COR 2070
    PHIDS=PHIR(N) + SF*Q6 COR 2080
    IF (PHIDS .LT. PHID(N)) PHIDS = PHID(N) COR 2090
    IF (SPHI .GT. PHIDS) SPHI = PHIDS COR 2100
415 PHI(N) = SIGNF*SPHI COR 2110
    IF (MONCOR) WRITE (6,790) PHDTP,PHDTPP,ETA,PHDTI,PHDTIP,PHIDOT(N), COR 2120
    2 PHDTPR,SPHI,PHIDS,PHI(N) COR 2130
C   -----
C   COMPUTE CONTRIBUTIONS TO H AND T ARRAYS OF EACH WINDING
C   -----
DO 76 M = 1,NWSUBN COR 2140
  GCNM = 1.0/(XNT(N,M)**2 *PHDTPR + RW(N,M)) COR 2150
  VCNM = XNT(N,M)*PHIDOT(N) - XNT(N,M)**2 * PHDTPR * CIJMI(N,M) COR 2160
  IF (NS(N,M) .LE. 1.0) GO TO 7750 COR 2170
  GCNM = GCNM / NS(N,M) COR 2180
  VCNM = VCNM * NS(N,M) COR 2190
7750 IF (NP(N,M) .GT. 1.0) GCNM = GCNM * NP(N,M) COR 2200
    KO = KC(N,M) COR 2210
    KO1 = K1C(N,M) COR 2220
    KO2 = K2C(N,M) COR 2230
    IF (MONCOR) WRITE (6,779) GCNM,VCNM,KO,KO1,KO2 COR 2240
    GC(N,M) = GCNM COR 2250
    VC(N,M) = VCNM COR 2260
    GO TO (72,73,74) ,KO COR 2270
72 H(KO1,KO1) = H(KO1,KO1) + GCNM COR 2280
  H(KO1,KO2) = H(KO1,KO2) - GCNM COR 2290
  GCVC = GCNM * VCNM COR 2300
  T(KO1) = T(KO1) + GCVC COR 2310
  H(KO2,KO1) = H(KO2,KO1) - GCNM COR 2320
  H(KO2,KO2) = H(KO2,KO2) + GCNM COR 2330
  T(KO2) = T(KO2) - GCVC COR 2340
  GO TO 769 COR 2350
73 H(KO1,KO1) = H(KO1,KO1) + GCNM COR 2360
  T(KO1) = T(KO1) + GCNM *(VCNM + EI(KO2)) COR 2370
  GO TO 769 COR 2380
74 H(KO2,KO2) = H(KO2,KO2) + GCNM COR 2390
  T(KO2) = T(KO2) + GCNM *(-VCNM + EI(KO1)) COR 2400
769 IF (MONCOR) WRITE (6,776) H(KO1,KO1),H(KO1,KO2),H(KO2,KO1), COR 2410
    2 H(KO2,KO2),T(KO1),T(KO2) COR 2420
76 CONTINUE COR 2430
  IF (ABS (PHDTI) .GT. ZV(N)) FLXSW = 1.0 COR 2440
80 CONTINUE COR 2450
  RETURN COR 2460
C   -----
C   * * PART (2) - COMPUTE WINDING CURRENTS AND TEST FOR CONVERGENCE *
C   -----
85 AITKEN = .NOT. AITKEN COR 2470
  DO 100 N=1,NCORE COR 2480
    IF (MONCOR) WRITE (6,1001) N COR 2490
    NWSUBN = NW(N) COR 2500
    F(N) = 0.0 COR 2510
    DO 98 M = 1,NWSUBN COR 2520
      KO = KC(N,M) COR 2530
      KO1 = K1C(N,M) COR 2540
      KO2 = K2C(N,M) COR 2550
      GO TO (87,88,89),KO COR 2560
    
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87 BV = V(K01) - V(K02) COR 2570
GO TO 90 COR 2580
88 RV = V(K01) - EI(K02) COR 2590
GO TO 90 COR 2600
89 RV = EI(K01) - V(K02) COR 2610
C
C COMPUTE WINDING CURRENT CIW AND MODIFY ACCORDING TO AITKIN FORMULA
C EVERY OTHER ITERATION (OR HALF-FACTOR FORMULA EVERY ITERATION)
C IF CIW IS OSCILLATORY
C
90 CIW = GC(N,M) * (BV - VC(N,M)) COR 2620
IF (NP(N,M).GT.1.0) CIW = CIW / NP(N,M) COR 2630
IF (MONCOR) WRITE(6,795) BV,CIW,CIJM1(N,M),CIJM2(N,M) COR 2640
IF (CIJM1(N,M).EQ.CIJM2(N,M)) GC TC 95 COR 2650
IF (PSTEP.LT.0.0) GO TO 93 COR 2660
IF (AITKEN) GO TO 95 COR 2670
IF ((CIW-CIJM1(N,M))*(CIJM1(N,M)-CIJM2(N,M)).LT.0.0) CIW = CIW COR 2680
2 - (CIW-CIJM1(N,M))*2 / (CIW-2.0*CIJM1(N,M)+CIJM2(N,M)) COR 2690
GO TO 94 COR 2700
93 IF ((CIW-CIJM1(N,M))*(CIJM1(N,M)-CIJM2(N,M)).LT.0.0) CIW = COR 2710
10.5 * (CIJM1(N,M) + CIW) COR 2720
94 IF (MONCOR) WRITE(6,796) CIW COR 2730
C
C TEST FOR CONVERGENCE OF EACH WINDING CURRENT
C
95 IF (CIW.EQ.0.0) GO TO 110 COR 2740
IF (ABS(1.0-CIJM1(N,M)/CIW).GT.(RELERR+ABSERR/ABS(CIW)))GO TO 97 COR 2750
CICORE(N,M) = ABS(PSTEP)*CICORE(N,M) + (1.0-ABS(PSTEP))*CIW COR 2760
GO TO 114 COR 2770
110 IF ((CIJM1(N,M).EQ.0.0).AND.(CIJM2(N,M).EQ.0.0)) GO TO 112 COR 2780
97 ABC = 1.0 COR 2790
IF (MONCOR) WRITE(6,9998) COR 2800
112 CICORE(N,M) = CIW COR 2810
C
C COMPUTE MMF FOR THE NEXT ITERATION
C
114 F(N) = F(N) + XNT(N,M) * CICORE(N,M) COR 2820
IF (MONCOR) WRITE(6,797)N,M,K01,K02,CIW,CICORE(N,M),F(N),ABC COR 2830
98 CONTINUE COR 2840
C
C PREVENT STOP- SWITCHING EXIT BEFORE INELASTIC SWITCHING STARTS
C
IF (ABS(F(N)).GT.FD1(N)) NOEXIT = 0 COR 2850
100 CONTINUE COR 2860
IF (ABC.GT.0.0) RETURN COR 2870
C
C AFTER CONVERGENCE IS ACHIEVED, UPDATE THE VALUES OF F,PHIDOT, PHI,
C AND WINDING CURRENTS OF PREVIOUS DELTS
C
DO 772 N = 1,NCORE COR 2880
FM3(N) = FM2(N) COR 2890
FM2(N) = FM1(N) COR 2900
FM1(N) = F(N) COR 2910
PHDTM2(N) = PHDTM1(N) COR 2920
PHDTM1(N) = PHIDOT(N) COR 2930
PDTFM1(N) = PHOTE(N) COR 2940
PHIM3(N) = PHIM2(N) COR 2950
PHIM2(N) = PHIM1(N) COR 2960
PHIM1(N) = PHI(N) COR 2970
NWSUBN = NW(N) COR 2980
DO 2326 M=1,NWSUBN COR 2990
2326 CICOR1(N,M) = CICORE(N,M) COR 3000
772 CONTINUE COR 3010

```

```

C      - - - - -
C      CHECK IF THE RUN SHOULD TERMINATE DUE TO STOP-SWITCHING EXIT
C      - - - - -
      IF(STSWEX      .LE. 0.0) RETURN          COR 3020
      IF(FLXSW      .NE. 0.0) RETURN          COR 3030
      IF (TE .LE. (TIMEIN+RNUDT*DELT)) RETURN  COR 3040
      IF (NOEXIT      .EQ. 1) RETURN          COR 3050
      WRITE          (6,530)                  COR 3060
      JCAT = 10                                COR 3070
      RETURN                                      COR 3080
C      . . . . .
530  FORMAT(1H0,10X,19HSTOP-SWITCHING EXIT)  COR 3090
774  FORMAT (16H CIJM1(N,M),FMM ,2E22.15)    COR 3100
775  FORMAT (16H NWSUBN,PHI(N) ,112,2E22.15)  COR 3110
776  FORMAT (39H H(1,1),H(1,2),H(2,1),H(2,2),T(1),T(2)
1    5(/,1H ,E22.15,E22.15,E22.15,E22.15,F22.15) ) COR 3120
777  FORMAT (13H CICORE(N,M) ,E22.15)        COR 3140
779  FORMAT (22H GCNM,VCNM,KO,KO1,KO2 ,2E24.15,3I12) COR 3150
790  FORMAT (75H PHOTP,PHOTPP,ETA,PHDTI,PHDTIP,PHIDOT(N),PHOTPR,SPHI,PHCOR 3160
      2IDS,PHI(N)
3    ,/,1H ,5E22.15,/,1H ,5E22.15,/,1H ,112) COR 3170
791  FORMAT (30H Q1,Q2,Q4,Q5,Q6,PHID,PHIDP , COR 3180
1    5(/,1H ,E22.15,E22.15,E22.15,E22.15,E22.15) ) COR 3190
792  FORMAT (40H NITER,SIGNF,SF,SPHI ,114, COR 3200
1    5(/,1H ,E22.15,E22.15,E22.15,E22.15,E22.15) ) COR 3210
795  FORMAT(32H BV,CIW,CIJM1(N,M),CIJM2(N,M) /5E24.15) COR 3220
796  FORMAT (13H CIW(AITKEN) , E24.15)        COR 3230
797  FORMAT (38H N,M,KO1,KO2,CIW,CICORE(N,M),F(N),ABC ,4I6, COR 3240
1    5(/,1H ,E22.15,E22.15,E22.15,E22.15,E22.15) ) COR 3250
800  FORMAT ( 42H FM3(N),FM2(N),FM1(N),PHDTM2(N),PHDTM1(N) COR 3260
2    39H,PHIM3(N),PHIM2(N),PHIM1(N),PDTEM1(N), COR 3270
3    25H(CICOR1(N,J),J=1,N,SUBN) ,4(/5E24.15) ) COR 3280
801  FORMAT ( 41H SUMF,SUMFT,SMFTN,FDOTAV(N),F(N),PHI(N) COR 3290
2    ,2(/,5E24.15)) COR 3300
1001 FORMAT (35(3H . ),4HCORE ,13)            COR 3310
8001 FORMAT (53H ELASTIC PHIDOT SET TO ZERO AFTER THREE CONVERGENCE COR 3320
2    ,10HFAILURES ) COR 3330
8006 FORMAT (36H EPS,EPSP,FDOTAV(N),PHDTEP,PHOTE(N) ,/,5E24.15) COR 3340
8765 FORMAT (39H TM1,TM2,TM3,SUMT,SUMTT,SMTSMT,SUMTSQ COR 3350
1    5(/,1H ,E22.15,E22.15,E22.15,E22.15,E22.15) ) COR 3360
9998 FORMAT (18H DID NOT CONVERGE )           COR 3370
9999 FORMAT (13H CNRES )                     COR 3380
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