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PLOTTING SYSTEM FOR THE MINCS CODE

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Tadashi WATANABE

日本原子力研究所
Japan Atomic Energy Research Institute

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Plotting System for the MINCS Code

Tadashi WATANABE

Department of Reactor Safety Research
Tokai Research Establishment
Japan Atomic Energy Research Institute
Tokai-mura, Naka-gun, Ibaraki-ken

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The plotting system for the MINCS code is described. The transient two-phase flow analysis code MINCS has been developed to provide a computational tool for analysing various two-phase flow phenomena in one-dimensional ducts. Two plotting systems, namely the SPLPLOT system and the SDPLOT system, can be used as the plotting functions. The SPLPLOT system is used for plotting time transients of varibles, while the SDPLOT system is for spatial distributions. The SPLPLOT system is based on the SPLPACK system, which is used as a general tool for plotting results of transient analysis codes or experiments. The SDPLOT is based on the GPLP program, which is also regarded as one of the general plotting programs. In the SPLPLOT and the SDPLOT systems, the standardized data format called the SPL format is used in reading data to be plotted. The output data format of MINCS is translated into the SPL format by using the conversion system called the MINTOSPL system. In this report, how to use the plotting functions is described.

Keywords: Plotting System, MINCS, SPL Format, Conversion, SPLPLOT, SPLPACK, SDPLOT, GPLP, MINTOSPL

MINCSコード用作図システム

日本原子力研究所東海研究所原子炉安全工学部
渡辺　正

（1990年7月10日受理）

MINCSコード用作図システムについて記述する。過渡二相流解析コードMINCSは，一次元流路に於ける様々な二相流現象を解析する為の数値計算の道具を提供する為に開発された。作図機能としては，二種類の作図システム，すなわちSPLPLOTシステムとSDPLOTシステムを使用することができる。SPLPLOTシステムは，変数の時間変化を作図する為に用いられ，一方SDPLOTシステムは，空間分布の作図に用いられる。SPLPLOTシステムは，過渡解析コードの計算結果や実験結果を作図する為の汎用プログラム，SPLPACKシステムを基にしている。SDPLOTは，同じく汎用プログラムの一つであるGPLPを基にしている。SPLPLOTシステム及びSDPLOTシステムでは，SPL形式と呼ばれる標準データ形式が作図用データの読み込みに使用される。MINCSの出力形式は，MINTOSPLシステムと呼ばれる変換システムによってSPL形式に変換される。本報告書では，これらの作図機能の使用法について解説する。

東海研究所：〒319－11　茨城県那珂郡東海村白方字白根2－4

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1. Introduction

The plotting system for the MINCS code [1] is described. The MINCS code is the transient two-phase flow analyzer, which has been developed to provide a computational tool for analyzing various two-phase flow phenomena in one-dimensional ducts. Two plotting systems, namely the SPLPLOT system and the SDPLOT system are used as plotting functions. The SPLPLOT system is used for plotting time transients of variables, while the SDPLOT system is for spatial distributions. The SPLPLOT system is based on the general plotting tool called the SPLPACK system [2] which is designed for plotting calculated results of transient analysis codes or experimental data. The SDPLOT system is based on GPLP [3] which is also regarded as one of the general plotting programs. In the SPLPLOT system and the SDPLOT system, the standardized data format called the SPL format is used in reading data to be plotted.

The output data format of MINCS is, however, not the SPL format. The reason why is that much more core storage is necessary if the file conversion function is included in the MINCS code itself. The output data of MINCS are, thus, translated into the SPL format by using the conversion system called the MINTOSPL system. The basic structure of plotting system is illustrated in Fig.1-1.

Each system is made up of some program units as shown in Fig.1-1. The MINTOSPL system is composed of the MINTOSPL and the SPLEDIT programs, and the SPLPLOT system is composed of the SPLEDIT and the SPLPLOT programs, while the SDPLOT system is composed of the SPLEDIT, the SDPLOT and the GPLP programs. In the three systems shown in Fig.1-1, the SPLEDIT program is always used for handling the SPL format data.

In this report, the detail about the data structure or each program is not described. The main objective is to explain how to use the plotting functions to the users of MINCS. The conversion of data file is described in Section 2. How to use the SPLPLOT system is, then described in Section 3, and the SDPLOT system in Section 4.

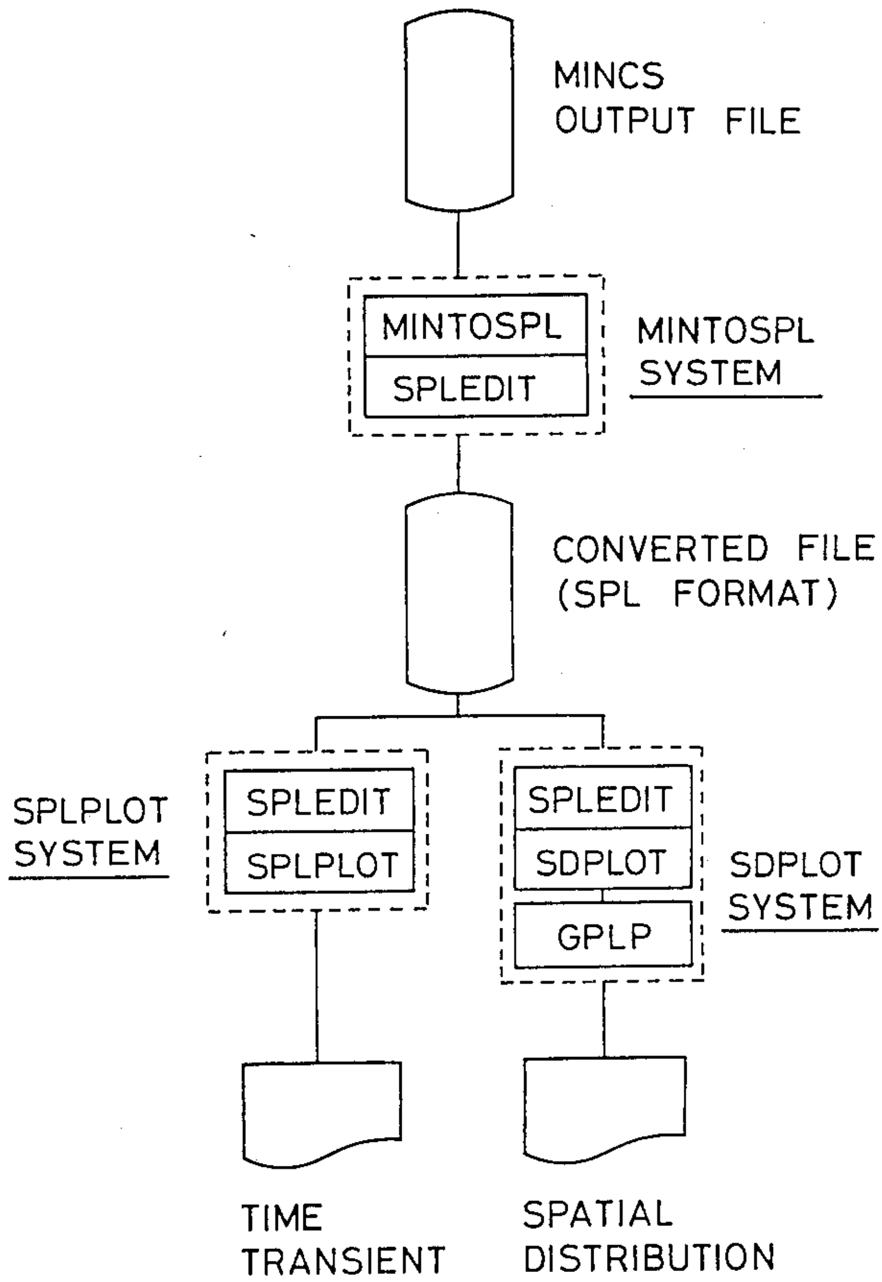


Fig. 1-1 Structure of Plotting System

2. Data Conversion into SPL Format: MINTOSPL

2.1 General Description

In the SPLPLOT and SDPLOT system, the SPL data format is used as the standardized data format in reading data to be plotted. The structure of SPL format is listed in Table 2-1. The detail is described in Ref.4. The output data format of MINCS is, however, not the SPL format. The reason why is that much more core storage is necessary if output data are converted into the SPL format within the framework of MINCS itself. Before using the plotting programs, thus, the output data of MINCS are converted into the SPL format by using the conversion program.

The relation of data files are shown in Fig.2-1. In converting the data, three data files are necessary as shown in Fig.2-1: the output data of MINCS, the control data for conversion program, and the label data used as the tag-ID for the variables. All the tag-ID built into MINCS is listed in Table 2-2.

2.2 Control Data for MINTOSPL

The control data for the conversion program are described here. The input deck (or control data file) is made up of some control data. One unit of control data is denoted as 'Card' in the following. It should be noted that each Card has several input data, and can consist of two or more lines in the input deck.

The control data file consists of 10 types of input Cards. The Cards 1, 3, 4, 5 and 6 are always needed. The meaning of each Card is described below. The names of input variables in one Card are listed after the Card number. The meanings of each variables are, then, described. The number of columns to be used for one variable, the FORTRAN format and the default value are denoted in the bracket.

o Card 1

```
# PROCES ,MAXFIL ,ITIME ,IOIN ,IOUT ,
  LBLFIL ,TMAX ,TLAG ,ISAME
```

PROCES (1-8 : A8 : 'MINSPL')

Function of file conversion.

MERGE : Combining several MINCS output files

MINSPL : Making a converted file from a MINCS output file

MAXFIL (9-12 : I4 : 1)

Number of MINCS output files to be used

ITIME (13-16 : I4 : 0)

Data pick up option

=0 : Data at all time steps are converted

>0 : Number of Card 2, data are converted according to the time tables defined by Card 2

IOIN (17-20 : I4 : 40)

Unit number of first input file

IOUT (21-24 : I4 : 20)

Unit number of output file

LBLFIL (25-28 : I4 : 8)

Unit number of label (Tag-ID) data file

TMAX (31-40 : F10.0 : 5000.)

End time of conversion (sec)

TLAG (41-50 : F10.0 : 0.0)

Time in input (MINCS output) file, which corresponds to 0.0 (sec) in the output (converted) file

ISAME (51-54 : I4 : 0)

File construction flag

0 : All input files have the same construction

1 : Some input files have the different construction

o Card 2 (This card must be inserted ITIME times)

TEND , TDELT

TEND (1-10 : F10.0 : -)
End time (sec) of use of the time step width TDELT

TDELT (11-20 : F10.0 : -)
Time step width of picking up data (sec)

o Card 3

```
# FILNAM ,PRGNAM ,DAY ,USYSP ,USYSF
```

FILNAM (1-8 : A8 : -)
File name of converted file (arbitrary)

PRGNAM (11-26 : A16 : 'BY MINCS-SPL')
Program name of converted file (arbitrary)

DAY (31-38 : A8 : date of MINCS output file)
Date of converted file

USYSP (41-44 : A4 : MKSA)
Unit system of MINCS output file

USYSF (46-49 : A4 : MKSA)
Unit system of converted file

o Card 4

\# TITLE

TITLE (1-72 : A72 : title of MINCS output file)
Title of converted file (arbitrary)

o Card 5

COMENT

COMENT (1-72 : A72 : -)
Comment for converted file (arbitrary)

o Card 6

COMENT

COMENT (1-32 : A32 : -)

Comment for converted file (continued)

o Card 7

```
# XTAG    ,MCONP   ,MMESH
```

XTAG (1-4 : A4 : *)
Tag name or 'ALL ' or '*   '

MCONP (9-12 : I4 or A4 : -)
Component number or 'ALL '

MMESH (13-16 : A4 : -)
'AVG', 'SUM', 'SYS', 'CMP', 'SLB', 'PMP' or 'ALL'

o Card 8 (* See Remarks)

```
# XTAG    ,NV      ,MODE    ,IJ      ,NEWLBL  ,
  NEWUID  ,NEWUNT  ,C       ,D
```

XTAG (1-4 : A4 : -)

Keyword 'C1 ' must be input

NV (9-12 : I4 or A4 : -)

Number of variables to be used for making a new specific variable, or '* ' for all mesh cells

MODE (13-16 : I4 : -)

Equation number for calculation

IJ (17-20 : I4 : -)

Dummy variable

NEWLBL (21-28 : A8 : -)

Label name for a new specific variable
(5-th and 6-th characters are sometimes used as the component number automatically by the system)

NEWUID (29-32 : A4 : -)

Unit system for a new specific variable

NEWUNT (33-52 : A20 : -)

Unit name for a new specific variable
This name must be in brackets ()

C (53-62 : F10.0 : -)
Constant used for calculation

D (63-72 : F10.0 : -)
Constant used for calculation

o Card 9 (* See Remarks)

NEWCPN

NEWCPN (1-28 : A28 : -)
Caption for a new specific variable

o Card 10 (* See Remarks)

```
# XTAG    ,MXCOMP  ,MXMESH  ,YTAG    ,MYCOMP  ,
  MYMESH  ,A       ,B
```

XTAG (1-4 : A4 : -)
Tag name for X(i) used for calculation

MXCOMP (9-12 : I4 or A4 : -)
Component number for the variable X(i), or 'ALL '

MXMESH (13-16 : I4 or A4 : -)
Mesh number for the variable X(i), or 'ALL '.
'*   ' is used only when NV='*   ' in Card 8

YTAG (21-24 : A4 : -)
Tag name for Y(i) used for calculation

MYCOMP (29-32 : I4 or A4 : -)
Component number for the variable Y(i), or 'ALL '
(if Y(i) is not used, MYCOMP must be blank)

MYMESH (33-36 : I4 or A4 : -)
Mesh number for the variable Y(i), or 'ALL '.
'*   ' is used only when NV='*   ' in Card 8
(if Y(i) is not used, MYMESH must be blank)

A (41-50 : F10.0 : -)
Constant value A(i) used for calculation

B (51-60 : F10.0 : -)

Constant value B(i) used for calculation

O Remarks

1. New specific variables can be created by calculations based on equations listed in Table 2-3. New specific variables are output in the converted file with other ordinary variables. In use of this function, Cards 8, 9 and 10 are inserted instead of Card 7. MODE in Card 8 defines the type of calculation.

2. Cards 7-10 are not needed if PROCES in Card 1 is 'MERGE'. Card 7 can be inserted any times, but the total number of Card 7-10 must be less than 200.

3. Card 8, Card 9 and several numbers of Card 10 make one set. This set can be inserted any times after Card 7.

4. Card 9 is inserted only one time after Card 8.

5. Card 10 is inserted NV times, but only one time is necessary if NV='*   '.

6. On Card 7

(i) If XTAG='*   ', time (TIME), pressure (PRES), enthalpy (HG and HL), velocity (UG and UL) and temperature (TG and TL) are converted, and MCONP and MMESH are ignored.

(ii) If XTAG='ALL ', all variables in one component (or system) are converted. In this case, MCONP must be component (or heat slub or pump) number or 'ALL '. If MCONP is 'ALL ', all the component number is specified. MMESH defines what is specified by MCONP, that is, if MMESH is 'CNP', then component is specified. 'SLB' means heat slub, 'PMP', 'SYS' and 'ALL' correspond to pump, system and all of them, respectively. Thus, if Card 7 is 'ALL ALL   ALL', all the data for all components are converted. As for the system variable, 'ALL ALL   SYS' could be used.

(iii) If XTAG is the system variable, MMESH is 'AVG' or 'SUM', or is not input. If MMESH is 'AVG' or 'SUM', the average value or the total value over the component is calculated.

(iv) If MMESH is 'AVG' or 'SUM', 'AV' or 'SM' is added to the end of SPL label, and such variables as 'UG 01AV' are created.

(v) The same label name cannot be appeared in converted file. For example, '* , , ' and 'ALL,ALL,ALL' can not be used at the same time since TIME, UG, UL ... are duplicated.

7. On Card 10

(i) If MXMESH='* ', NV in Card 8 must be '* '. If Y(i) is used in this case, MYMESH must be '* ' too. Only one Card 10 is necessary in this case. It is convenient to use this input when the number of mesh cells are different in each component.

(ii) The input MXCOMP='ALL' and MXMESH='ALL' are equivalent to call the subroutine CALC11 for all components and all mesh cells.

2.3 Example of MINTOSPL

2.3.1 Example of Control Data: 1

This example is one of the simplest input and it has Cards 1, 3, 4, 5, 6 and 7.

```
++++*++++1++++*++++2++++*++++3
(blank card)                          : Card 1
@STRAT                                : Card 3
STRATIFIED AIR-WATER                  : Card 4
BY USING MINCS-SLP                    : Card 5
TRANSIENT                             : Card 6
*                                     : Card 7
```

Card 1 : All values in Card 1 are default values.
Card 3 : The file name '@STRAT' is specified.
Card 4 : The title 'STRATIFIED AIR-WATER' is specified.
Card 5 : The comment 'BY USING MINCS-SLP' is specified.
Card 6 : The comment 'TRANSIENT' is specified.
Card 7 : TIME, PRES, HG, HL, UG, UL, TG and TL are converted for all components.

2.3.2 Example of Control Data: 2

This example has Cards 1, 3, 4, 5, 6, and 4 times of Card 7, and three sets of Cards 8-10. The calculation function is used in this example.

```
++++*++++1++++*++++2++++*++++3++++*++++4++++*++++5++++*
(blank card)                                                : Card 1
SPLFILE1                                                    : Card 3
** PLOT FILE : TEST RUN **                                  : Card 4
MINCS-SPL DEBUG                                             : Card 5
```

```
1990/3/12                                                  : Card 6
*          ALL ALL                                         : Card 7a
ALW           2SUM                                         : Card 7b
RHOL       ALL AVG                                         : Card 7c
ALL        ALL PMP                                         : Card 7d
C1             2    13      ARV1      FLUX(KGM/M2/S)   1.0 : Card 8a
QUAL*RHOM                                                  : Card 9a
QUAL           2     1       RHOM         2     1          : Card 10a
C1             2    13      ARV2      FLUX(KGM/M2/S)   1.0 : Card 8b
QUAL*RHOM                                                  : Card 9b
QUAL           2     2       RHOM         2     2          : Card 10b
C1             *    21      AINT        (M-1)              : Card 8c
AVERAGE INTERFACIAL AREA                                   : Card 9c
AGI        ALL *                                           : Card 10c
```

Card 1 : All values in Card 1 are default values.

Card 3 : The fill name 'SPLFILE1' is specified.

Card 4 : The title '** PLOT FILE : TEST RUN **' is specified.

Card 5 : The comment 'MINCS-SPL DEBUG' is specified.

Card 6 : The comment '1990/3/12' is specified.

Card 7a : TIME, PRES, HG, HL, UG, UL, TG and TL are converted for all components, two 'ALL's are ignored.

Card 7b : ALWs in component 2 are summed up and a new variable 'ALW 02SM' is created.

Card 7c : RHOLs in each component are averaged and new variables such as 'RHOL01AV' are created.

Card 7d : All variables in all pump components are converted.

Card 8a-10a : QUAL*RHOM is calculated at the first mesh of second component, and a new variable 'ARV102' is created.

Card 8b-10b : QUAL*RHOM is calculated at the second mesh of second component, and a new variable 'ARV202' is created.

Card 8c-10c : The average AGI is calculated for each component, and new variables 'AINT's are created.

Table 2-1 Structure of SPL Format

FILE NAME PART

Record 1 : Indicator of File Name Part (2)

MARK

MARK (2), A = '$STDDATA'

Record 2 : File Name and Format Description (25)

FILNM	CFMT	LFMT	DFMT	FNDMY

FILNH (2), A = file name
CFMT (1), A = comment format ID
LEMT (1), A = variable label format ID
DFMT (1), A = data format ID
FNDMY (20) = a dummy space

COMMENT PART

Record 3 : Indicator of Comment Part (2)

MARK

MARK (2), A = '$COMMENT'

Record 4 : Description of File (100)

PRGNM	DAY	TITLE	CMDMY

PRGNM (4), A = name of mother program
DAY (2), A = date of data set generation
TITLE (44), A = description of data set
CMDMY (50) = a dummy space

VARIABLE LABEL PART

Record 5 : Indicator of Variable Label Part (2)

MARK

MARK (2), A = '$LABEL

Record 6 : General Information (3)

USYS	IDBL	NVMAX

USYS (1), A = unit system ID
IDBL (1), 1 = data precision ID
(1 = single, 2 = double)
NVMAX (1), I= number of variables

Note :

All the records are written using Non-Formatted WRITE statements.

Record.7 : Label of Each Variable (50)

This Record is repeated NVMAX times.

VARID	CAPTN	UNTNM	UNID	IDIM	DMNM	JDBL	LAD	LDMY

VARID (2), A = variable name for identification
CAPTN (10), A = caption
UNTNM (10), A = physical unit
UNID (1), A = ID of physical dimension
NDIM (1), I = number of subscripts (NDIM<10)
IDIM (10), I = dimension of subscripted variable
DMNM (10), A = name of subscripts
JDBL (1), I = data precision ID
(1 = single, 2 = double)
LAD (1), I = location in the data record
LDMY (4) = a dummy space

Record 8 : Miscellaneous Information (20)

NEMAX	NDWRD	NSTP	STPID	INDVAR	LEDMY

NEMAX (1), I = total number of values in a data record
NDWRD (1), I = length of a data record in words
NSTP (1), I = number of data records in data set
STPID (1), A = name for counting the steps
(Default is 'STEP'.)
INDVAR (2), A = ID name of the independent variable
(Default is 'TIME'.)
LEDMY (14) = a dummy space

DATA PART

Record 9 : indicator of Data Part (2)

MARK

MARK (2), A = '$DATA'

Record 10 : Data of One Step (NDWRD)

If NSTP≠0 this record is repeated NST times.
If NSTP=0, it indicates that number of steps is not known.

DATA

DATA (NOWRD), R = values

Nomenclature :

'xxx' = a character string
(xxx) = length of an array in words
I, A, and R attached to array names indicate varible type.
I = integer
R = real number
A = character

Table 2-2 Built-in Tag-ID

NO.	ID	(*)	MEANING	(UNIT)
01	TIME	00	TIME	TIME (SEC)
02	DELT	10	TIME STEP WIDTH	TIME (SEC)
03	TM	10	TOTAL MASS	MASS (KGM)
04	TML	10	TOTAL LIQUID MASS	MASS (KGM)
05	TMG	10	TOTAL VAPOR MASS	MASS (KGM)
06	TMA	10	TOTAL MASS ADDED	MASS (KGM)
07	TMLA	10	TOTAL LIQUID MASS ADDED	MASS (KGM)
08	TMGA	10	TOTAL VAPOR MASS ADDED	MASS (KGM)
09	TE	10	TOTAL ENERGY	HEAT (J)
10	TEL	10	TOTAL LIQUID ENERG	HEAT (J)
11	TEG	10	TOTAL VAPOR ENERGY	HEAT (J)
12	TEA	10	TOTAL ENERGY ADDED	HEAT (J)
13	TELA	10	TOTAL LIQUID ENERGY ADDED	HEAT (J)
14	TEGA	10	TOTAL VAPOR ENERGY ADDED	HEAT (J)
15	TH	10	TOTAL HEAT ADDED	
16	NPOW	10	NORMALIZED POWER	
17	PERI	10	REACTOR PERIOD	
18	REAC	10	REACTIVITY ($)	
19	RV	10	VOID REACTIVITY ($)	
20	RTM	10	WATER TEMP. REACTIVITY ($)	
21	RTF	10	FUEL TEMP. REACTIVITY ($)	
22	RD	10	DOPPLAR REACTIVITY ($)	
23	RROD	10	CONTROL ROD REACTIVITY ($)	
24	RB	10	POISON REACTIVITY ($)	
25	ITER	10	ITERATION COUNT	
26	CPU	10	TOTAL CPU TIME	TIME (SEC)
27	SDM1	99	SYSTEM DUMMY 01	
28	SDM2	99	SYSTEM DUMMY 02	
29	SDM3	99	SYSTEM DUMMY 03	
30	ALP	01	VOID FRACTION	
31	PRES	01	PRESSURE	PRES (N/M2)
32	HG	01	ENTHALPY OF GAS	ENTH (J/KGM)
33	HL	01	ENTHALPY OF LIQUID	ENTH (J/KGM)
34	UG	01	VELOCITY OF GAS	VELC (M/SEC)

Table 2-2 (Continued)

35	UL	01 VELOCITY OF LIQUID	VELC (M/SEC)
36	RHOG	11 DENSITY OF GAS	DENS (KGM/M3)
37	RHOL	11 DENSITY OF LIQUID	DENS (KGM/M3)
38	TG	01 TEMPERATURE OF GAS	TEMP (DEGK)
39	TL	01 TEMPERATURE OF LIQUID	TEMP (DEGK)
40	TSAT	11 SATURATE TEMPERATURE	TEMP (DEGK)
41	HGS	11 SATURATE ENTHALPY OF GAS	ENTH (J/KGM)
42	HLS	11 SATURATE ENTHALPY OF LIQ.	ENTH (J/KGM)
43	AGW	11 AREA GAS-WALL	(M-1)
44	ALW	11 AREA LIQUID-WALL	(M-1)
45	FGW	11 FRICTION GAS-WALL	
46	FLW	11 FRICTION LIQUID-WALL	
47	HTGW	11 HTC GAS-WALL	HTRC (J/SEC.DEGK.M2)
48	HTLW	11 HTC LIQUID-WALL	HTRC (J/SEC.DEGK.M2)
49	TW	11 TEMPERATURE OF WALL	TEMP (DEGK)
50	AGI	11 AREA GAS-INTERFACE	(M-1)
51	ALI	11 AREA LIQUID-INTERFACE	(M-1)
52	FGI	11 FRICTION GAS-INTERFACE	
53	FLI	11 FRICTION LIQUID-INTERFACE	
54	HTGI	11 HTC GAS-INTERFACE	HTRC (J/SEC.DEGK.M2)
55	HTLI	11 HTC LIQUID-INTERFACE	HTRC (J/SEC.DEGK.M2)
56	GMGI	11 MASS TRANSFER RATE	MFPV (KGM/SEC.M3)
57	QUAL	11 QUALITY	
58	RHOM	11 DENSITY OF MIXTURE	DENS (KGM/M3)
59	HMIX	11 ENTHALPY OF MIXTURE	ENTH (J/KGM)
60	DYPG	11 DYNAMIC PRESSURE OF GAS	PRES (N/M2)
61	DYPL	11 DYNAMIC PRESSURE OF LIQUID	PRES (N/M2)
62	MINV	11 MASS INVENTRY OF SYSTEM	MASS (KGM)
63	EINV	11 ENERGY INVENTRY OF SYSTEM	HEAT (J)
64	MAC	11 MASS ACCUMULATION	MASS (KGM)
65	EAC	11 ENERGY ACCUMULATION	HEAT (J)
66	HTNW	11 HTC NUCLEATE	HTRC (J/SEC.DEGK.M2)
67	CDM2	99 COMPONENT DUMMY 01	
68	CDM3	99 COMPONENT DUMMY 02	
69	CDM4	99 COMPONENT DUMMY 03	
70	CDM5	99 COMPONENT DUMMY 04	

Table 2-2 (Continued)

71	HFL	12 LEFT HEAT FLUX	HFLX (W/M2.SEC)
72	HFR	12 RIGHT HEAT FLUX	HFLX (W/M2.SEC)
73	TBL	12 LEFT BULK TEMP	TEMP (K)
74	TBR	12 RIGHT BULK TEMP	TEMP (K)
75	HPOW	12 GENERATE TOTAL POWER	POWR (W)
76	TMP	12 MESH POINT TEMP.	TEMP (K)
77	HDM1	99 HEAT SLAB DUMMY 01	
78	HDM2	99 HEAT SLAB DUMMY 02	
79	HDM3	99 HEAT SLAB DUMMY 03	
80	HDM4	99 HEAT SLAB DUMMY 04	
81	HDM5	99 HEAT SLAB DUMMY 05	
82	POMG	13 PUMP SPEED	FREQ (SEC-1)
83	PTRT	13 PUMP TORQUE	HEAT (N.M)
84	PTRH	13 HYDLORIC TORQUE	HEAT (N.M)
85	PTRF	13 FRICTION TORQUE	HEAT (N.M)
86	PTRM	13 MOTOR TORQUE	HEAT (N.M)
87	PHED	13 PUMP HEAD	LNGT (M)
88	PDM1	99 PUMP DUMMY 01	
89	PDM2	99 PUMP DUMMY 02	
90	PDM3	99 PUMP DUMMY 03	
91	PDM4	99 PUMP DUMMY 04	
92	PDM5	99 PUMP DUMMY 05	
93	END		

* Meaning of two digits after Tag-ID

* first digit - 0 : main variable
1 : other variable
9 : dummy variable

* second digit - 0 : system variable
1 : variable in pipe module
2 : variable in heat slab
3 : variable in pump module
9 : dummy variable

Table 2-2 (Continued)

i) If XTAG in Card-7 is '*', main variables with the first digit of zero are converted.

ii) The variables for reactor physics have no meaning at present.

Table 2-3 Built-in Equations (MINTOSPL)

MODE	EQUATION
1.	$\sum_{i=1}^{NV} X(i)$
2.	$\prod_{i=1}^{NV} X(i)$
3.	$X(1)-X(2)$
4.	$X(1)/X(2)$
5.	$1.0/X(1)$
11.	$\sum_{i=1}^{NV} \{C*X(i)+D\}$
12.	$\sum_{i=1}^{NV} \{C/X(i)+D\}$
13.	$\sum_{i=1}^{NV} \{C*X(i)*Y(i)+D\}$
14.	$\sum_{i=1}^{NV} \{C*X(i)/Y(i)+D\}$
15.	$\sum_{i=1}^{NV} \{C*(X(i))^2+D\}$
16.	$\sum_{i=1}^{NV} \{A(i)*X(i)+B(i)\}$

Table 2-3 (Continued)

17.	$\sum_{i=1}^{NV}\{A(i)/X(i)+B(i)\}$
18.	$\sum_{i=1}^{NV}\{A(i)*X(i)*Y(i)+B(i)\}$
19.	$\sum_{i=1}^{NV}\{A(i)*X(i)/Y(i)+B(i)\}$
20.	$\sum_{i=1}^{NV}\{A(i)*(X(i))^2+B(i)\}$
21.	$\frac{1}{NV}\sum_{i=1}^{NV}X(i)$
22.	$\{\prod_{i=1}^{NV}X(i)\}^{(1/NV)}$
31.	$\frac{dX(1)}{dt}$
32.	$\int X(1)dt$

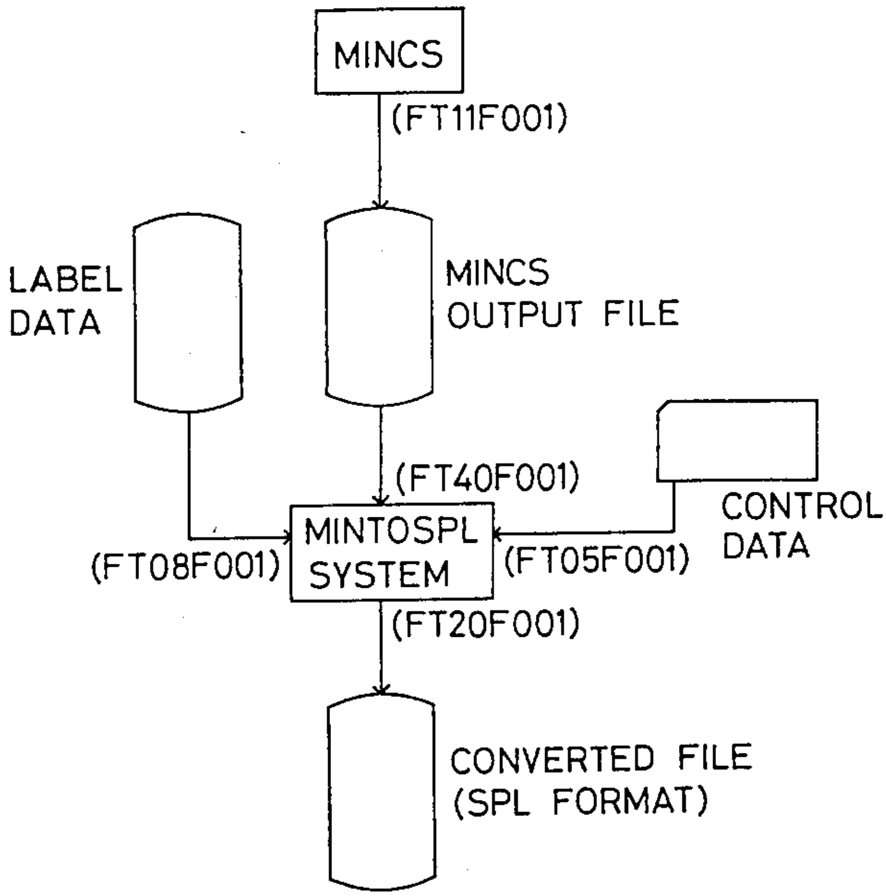


Fig. 2-1　Relation of Data Files for the MINTOSPL System

3. Plotting of Time Transient: SPLPLOT

3.1 General Description

The SPLPLOT system is based on the SPLPACK system which is a general tool for plotting calculated results or experimental data [2]. By using the SPLPACK system, we can save the cost for developing a new plotting program inherent to MINCS. The relation of data files are shown in Fig.3-1. The detail about the SPLPACK system is described in Refs.2 and 4, thus, it is omitted here.

3.2 Control Data for SPLPLOT

The control data for SPLPLOT are described here. The control data consists of 12 types of input Card. Mainly, however, 10 Cards are necessary, and Card 11 and 12 are used if some specific variables are needed. That is, new specific variables can be created by built-in equations not only in conversion stage but also in plotting stage. The meaning of each Card is described below. The names of input variables in one Card are listed after the Card number. The meaning of each variable is, then, described. The number of columns to be used for one variable, the FORTRAN format and the default value are denoted in the bracket. The terms used below are schematically explained in Fig.3-2.

o Card 1

```
# NTAPE   ,USYSP  ,NPMAX  ,IOPT3  ,IOPTFF ,
  IOPTFT  ,IOPTCT ,IOPTCD ,IOPTLM ,IOPTSN ,
  DX      ,NX     ,DY     ,NY     ,FACTR
```

NTAPE (1-2 : A4 : -)

Number of files or tapes to be used (maximum is 10)

(In the following, 'file' means a file or a tape)

USYSP (3-6 : A4 : system of unit used in the first file)

System of unit

MKSA : MKS Absolute

MKSC : MKS Conventional

CGSA : CGS Absolute

CGSC : CGS Conventional

FPSA : FPS Absolute

FPHA : FPH Absolute

FPHC : FPH Conventional

M=meters,	K=kilo-grams,
C=cneti-meters,	G=grams,
F=feet,	K=pounds,
S=seconds,	H=hours.

NPMAX (7-10 : I4 : 500)

Maximum number of data points to be plotted (0 means 500)

IOPT3 (11-12 : I2 : 0)

Selection of output form

0 : plotting only

1 : both plotting and print out

-1 : print out only

IOPTFF (13 : I1 : 0)

Drawing of outside frame

0 : no

1 : yes

IOPTFT (14 : I1 : 0)

Plotting of figure title

0 : no

1 : yes

IOPTCT (15 : I1 : 0)

File number to be used for plotting of title:

Title on the IOPTCT-th file is plotted

(0 : no title is plotted)

IOPTCD (16 : I1 : 0)

File number to be used for plotting of date:

Date on the IOPTCD-th file is plotted

(0 : no date is plotted)

IOPTLM (17 : I1 : 0)

Selection of identification symbol

0 : symbols are plotted on some data points

1 : numbers are plotted on some data points

IOPTSN (18 : I1 : 0)

Plotting of identification names for subscripts of array variables

0 : no

1 : yes

DX (19-24 : F6.0 : 10.0)
Grid width of X-axis (mm) (0.0 means 10.0)

NX (25-28 : I4 : 18)
Number of grid for X-axis (0 means 18)

DY (29-34 : F6.0 : 10.0)
Grid width of Y-axis (mm) (0.0 means 10.0)

NY (35-38 : I4 : 12)
Number of grid for Y-axis (0 means 12)

FACTR (39-44 : F6.0 : 1.0)
Multiplying factor of figure size (0.0 means 1.0)

o Card 2 (The data format on each input file is specified by the Card 2 and 3. The NTAPE pairs of Card 2 and 3 are required)

ITPFMT ,NTPID ,ITPTIT

ITPFMT (1-4 : A4 : STND)

Data format (only STND is available for MINCS)

STND : standard data format of SPL

NTPID (5-16 : 3A4 : -)

Title used for check whether or not the file is relevant, First 12 characters must be input. If these columns are blank, file check is not performed.

ITPTIT (17-36 : 5A4 : -)

File title. If these columns are blank, file title is not plotted.

o Card 3

\# (blank card)

This card is dummy, but is necessary because it is used as a pause signal in TSS operation.

o Card 4 (This card is required when IOPTCT is not zero)

\# ITITLE

ITITLE (1-72 : 18A4 : -)

Title. If these columns are blank, the title on the IOPTCT-th file is plotted.

o Card 5 (This card is required when IOPTFT is unity)

FTIT

FTIT (1-72 : 18A4 : -)

Figure title. If these columns are blank, figure title is not plotted.

o Card 6

```
# NOV(I),(I=1,10) ,NOV(11) ,DXF ,NXF ,
  DYF ,NYF
```

NOV(I) (1-20 : 10I2 : -)

Number of curves to be plotted from NOV(I)-th file in one figure

NOV(11) (21-22 : I2 : -)

(not available for MINCS)

DXF (23-28 : F6.0 : 0.0)

Grid width of X-axis (mm) (0.0 means DX)

NXF (29-32 : I4 : 0)

Number of grid of X-axis (mm) (0 means NX)

DYF (33-38 : F6.0 : 0.0)

Grid width of Y-axis (mm) (0.0 means DY)

NYF (39-42 : I4 : 0)

Number of grid of Y-axis (mm) (0 means NY)

o Card 7

LOGX ,XMIN ,XMAX ,XTIT ,XUNIT

LOGX (1 : I1 : 0)
Logarithmic scale flag
0 : linear scale
1 : logarithmic scale

XMIN (2-11 : E10.2 : -)
Minimum value of X-axis

XMAX (12-21 : E10.2 : -)
Maximum value of X-axis. If XMIN=XMAX, automatic scale control is performed.

XTIT (22-41 : 5A4 : -)
Caption of X-axis. If these columns are blank, the label on the first file is used.

XUNIT (42-61 : 5A4 : -)
Unit of X-axis. If these columns are blank, the unit specified by USYSP in Card 1 is used.

o Card 8 (* see bellow)

```
# VARID   ,SUF(I),(I=1,3)  ,COMMENT
```

VARID (1-8 : A8 : -)

Identification name of variable to be plotted.
Identification name (Tag-ID) is listed in Table 2-1.

SUF(I) (9-20 : 3I4 : -)

Subscripts of variable to be plotted.

COMMENT (21-44 : 6A4 : -)

Comment for variable. This is printed on the right side of the identification symbol.

o Card 9

\# KNDO

KNDO (1-2 : I2 : 0)

Number of Y-axis (maximum = 4). If KNDO=0, new Y-axis is created according to Card 10.

o Card 10

LOGY ,YMIN ,YMAX ,YTIT ,YUNIT

LOGY (1 : I1 : 0)

Logarithmic scale flag

0 : linear scale

1 : logarithmic scale

YMIN (2-11 : E10.2 : -)

Minimum value of Y-axis

YMAX (12-21 : E10.2 : -)

Maximum value of Y-axis. If YMIN=YMAX, automatic scale control is performed.

YTIT (22-41 : 5A4 : -)

Caption of Y-axis. If these columns are blank, the caption stored in the file is used.

YUNIT (42-61 : 5A4 : -)

Unit of Y-axis. If these columns are blank, the unit specified by USYSP in Card 1 is used.

o Card 11 (* see bellow)

```
# VARID    ,NODT1   ,ICALC1  ,IDUMMY  ,COMMNT  ,
  IL       ,CL(1)   ,CL(2)
```

VARID (1-8 : A8 : -)
Key word for calculation, 'C1   ' must be input.

NODT1 (9-12 : I4 : -)
Number of variables to be used for making new specific variable

ICALC1 (13-16 : I4 : -)
Equation number for calculation, see Table 3-1.
By putting other equations in the subroutine CALC11, new specific variables can be identified.

IDUMMY (17-20 : I4 : -)
Dummy variable, leave it blank.

COMMNT (21-44 : 6A4 : -)
Comment for variable

IL (45-50 : I6 : -)
Integer parameter to be used in calculation

CL(1) (51-60 : E10.2 : -)
Real parameter to be used in calculation

CL(2) (61-70 : E10.2 : -)

Real parameter to be used in calculation

o Card 12 (* See Remarks)

```
# VARID   ,SUF(I),(I=1,3)   ,IDUMMY  ,ID      ,
  CD(1)   ,CD(2)
```

VARID (1-8 : A8 : -)
Variable identification name (Tag-ID)

SUF(I) (9-20 : 3I4 : -)
Subscripts of variables to be plotted

IDUMMY (21-24 : I4 : -)
Dummy variable, leave it blank.

ID (25-30 : I6 : -)
Integer parameter to be used in calculation

CD(1) (31-40 : E10.2 : -)
Real parameter to be used in calculation

CD(2) (41-50 : E10.2 : -)
Real parameter to be used in calculation

o Remarks

New specific variables can be created by calculations based on equations listed in Table 3-1. New specific variables are output in the converted file with other ordinary variables.

In use of this function, Card 11 and 12 are inserted instead of Card 8. ICALC1 in Card 11 defines the type of calculation. Card 12 must be inserted NODT1 times.

3.3 Example of SPLPLOT

The SPLPACK system is a general plotting tool, and many examples are shown in Refs.2, 4 and 5, thus, only one example is shown here. Two figures can be plotted by using the following example, they are shown in Figs.3-3 and 3-4.

```
++++*++++1++++*++++2++++*++++3++++*++++4++++*++++5
 1           1111            10          10          : Card 1
(blank)                                              : Card 2
(blank)                                              : Card 3
SAMPLE 1: EVAPORAION 20MESH                          : Card 4
VOID FRACTION TRANSIENT                              : Card 5a
 3                                                   : Card 6a
    0.00E+00    5.00E+02 TIME                 (SEC)  : Card 7a
ALP 01      1          01-MESH OF 20                 : Card 8a
(blank)                                              : Card 9a
0  0.00E+00  1.00E+00 VOID FRACTION       ( - )      : Card 10a
ALP 01      5          05-MESH OF 20                 : Card 8a
 1                                                   : Card 9a
ALP 01      10          10-MESH OF 20                : Card 8a
 1                                                   : Card 9a
GAS VELOCITY TRANSIENT                               : Card 5b
 4                                                   : Card 6b
                         TIME                (SEC)   : Card 7b
UG    01      1          01-MESH OF 20               : Card 8b
(blank)                                              : Card 9b
    0.00E+00    0.20E+02 GAS VELOCITY         (M/S)  : Card 10b
UG    01      5          05-MESH OF 20               : Card 8b
 1                                                   : Card 9b
UG    01      10         10-MESH OF 20               : Card 8b
 1                                                   : Card 9b
UG    01      15         15-MESH OF 20               : Card 8b
 1                                                   : Card 9b
```

Card 1 : one file is used, figure title and date are printed, 10 grids
are used in X and Y directions.

Card 2 : standard format is used

Card 3 : dummy card is inserted

Card 4 : title 'SAMPLE 1: EVAPORATION 20MESH' is specified

Card 5a : figure title 'VOID FRACTION TRANSIENT' is specified

Card 6a : number of curves is 3

Card 7a : X-axis is specified

Card 8a : three variables to be plotted are specified

Card 9a : Y-axis is selected, the first (9a) means 'create a new axis',
the second and third mean 'same as before'.

Card 10a : Y-axis is specified

Card 5b : figure title 'GAS VELOCITY TRANSIENT' is specified

Card 6b : number of curves is 4

Card 7b : X-axis is specified

Card 8b : four variables to be plotted are specified

Card 9b : Y-axis is selected, the first (9b) means 'create a new axis',
the second to fourth mean 'same as before'.

Card 10b : Y-axis is specified

Table 3-1 Built-in Equations (SPLPLOT)

MODE	EQUATION
1.	$\sum_{i=1}^{NV} X(i)$
2.	$\prod_{i=1}^{NV} X(i)$
3.	$X(1)-X(2)$
4.	$X(1)/X(2)$
12.	$CL(1)*X(1)+CL(2)$
15.	$\sum_{i=1}^{NODT1} \{CD(1)_i*X(i)+CD(2)_i\}$

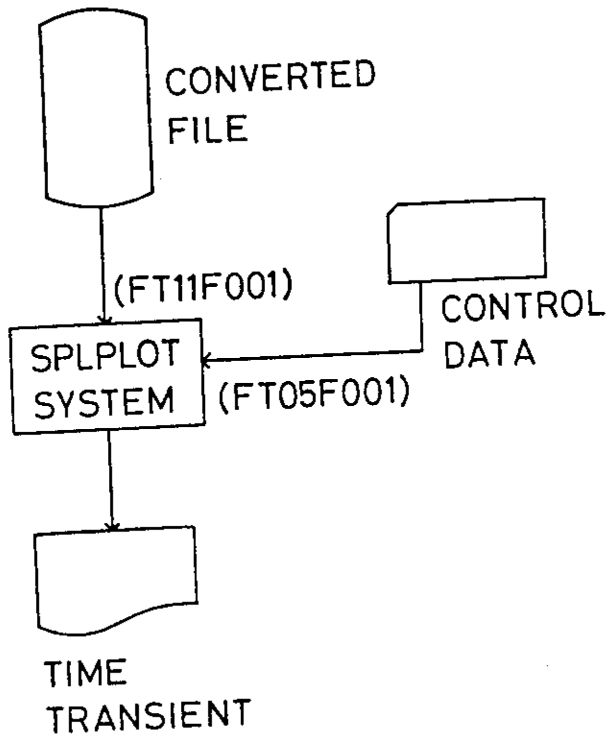


Fig. 3-1 Relation of Data Files (SPLPLOT)

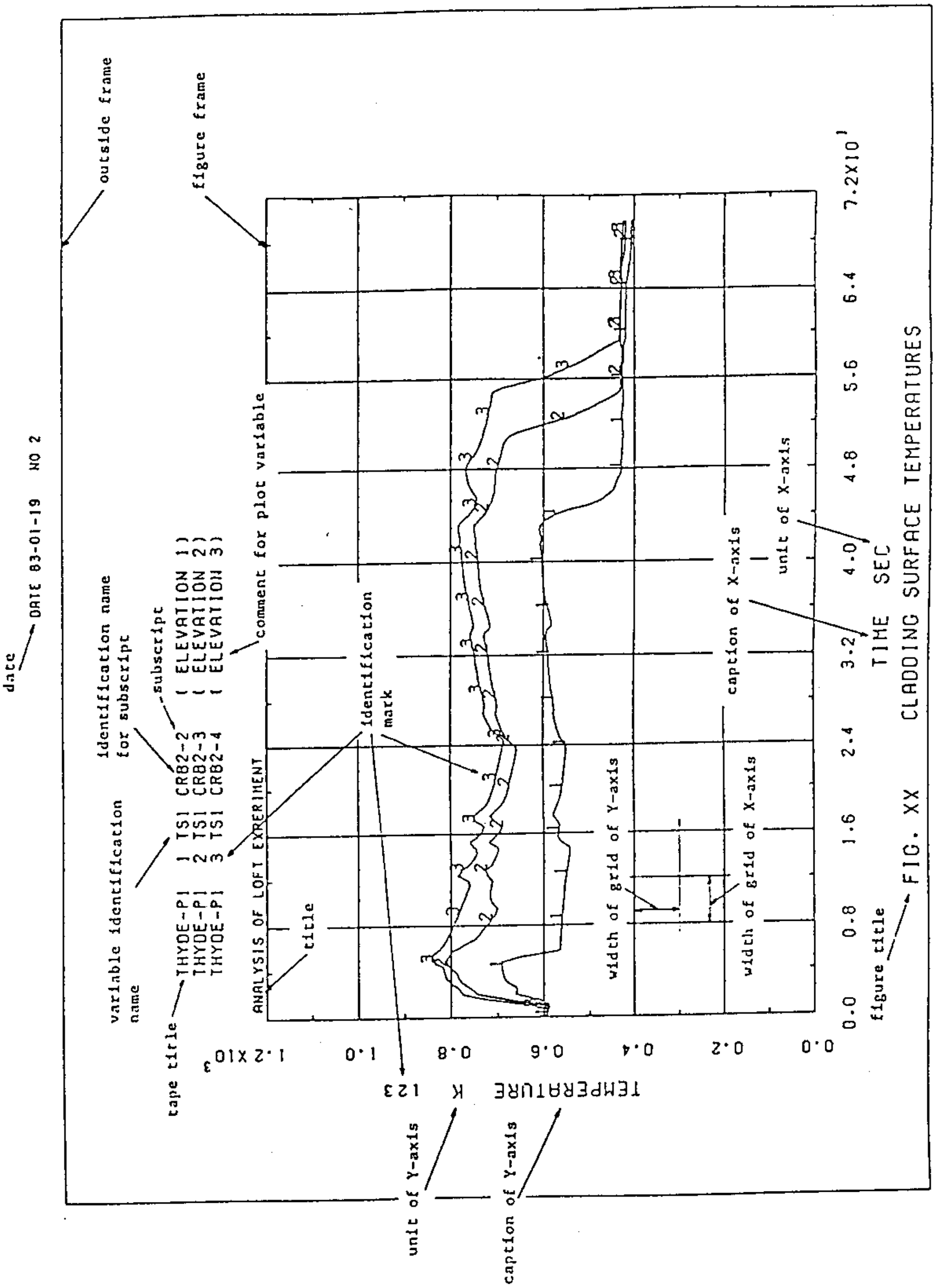


Fig. 3-2 Explanation of Terms Used in SPLPLOT

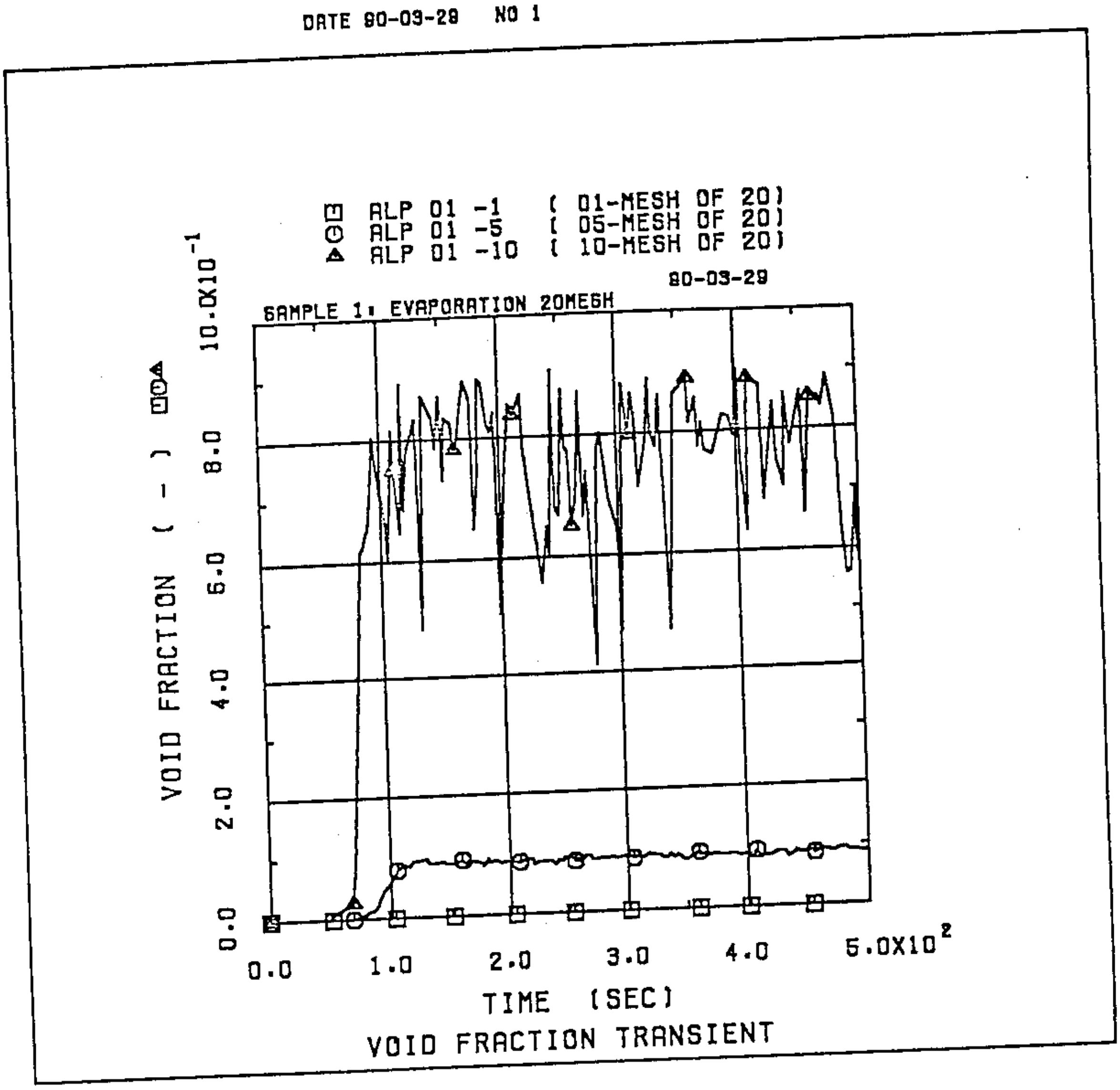


Fig. 3-3 Example of SPLPLOT (first part)

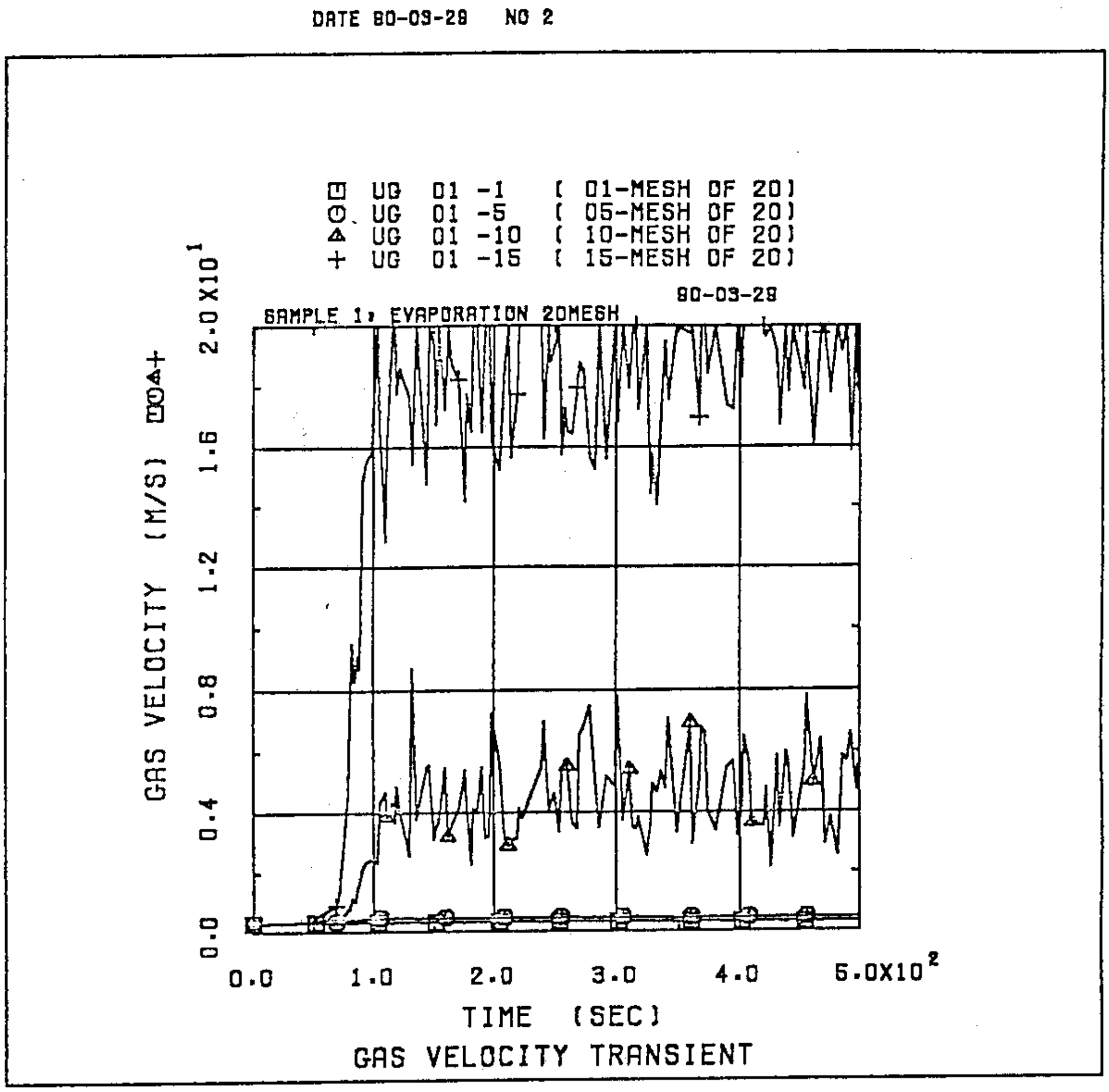


Fig. 3-4 Example of SPLPLOT (second part)

4. Plotting of Spatial Distribution: SDPLOT

4.1 General Description

The SDPLOT system is based on the general plotting tool called GPLP [3]. The SPL file and the control data are converted into one file which is suitable for GPLP, and then, the GPLP functions are used for plotting. By using the GPLP functions, we can save the cost for developing a new plotting program. The relation of data files are shown in Fig.4-1. The detail about GPLP is described in Refs.3.

4.2 Control Data for SDPLOT

The control data for the SDPLOT system are described here. The control data consist of 13 types of input Cards. Cards 1, 6, 8, 11 and 12 are always needed. The meaning of each Card is described below. Each Card has a label in the first four columns. Operands are described in the columns 5 to 72 by using a free format. In the following, the names of input variables in one Card are listed after the Card label. The data type and the default value are denoted in the bracket after the variable name. The meaning of each variable is, then, described. If the first column is '*', such Card is regarded as a comment card and ignored. The terms used below are schematically explained in Fig.4-2.

o Card 1: Input data control card

(this card must be inserted at the top of control data only once)

```
# HEAD    ,USYSP   ,NPRT    ,IP(I),(I=1,3)
```

HEAD (A4 : -)

'HEAD' is the label of this card (1-4 columns)

USYSP (integer : -)

System of unit

0 : Unit of input (converted) file is used
1 : MKS absolute
2 : MKS (kgf and kcal)
3 : MKH (kgf, kcal and hour)
4 : CGS absolute
5 : CGS (gf and cal)
6 : FPS absolute
7 : FPS (lbf and Btu)
8 : FPH (lbf, Btu and hour)

NPRT (integer : 0)

Print out option for input data

0 : no print out
1 : print of input data
2 : print of input data and (x,y) data

IP (integer : 2, 2, 1)

Line thickness

0 : thin
1 : medium
2 : thick

IP(1) : axis caption, line title and line
IP(2) : frame and scale value
IP(3) : scale, grid and frame of line title

o Card 2: Number of figures on one page

(if this card is omitted, one figure is plotted)

```
# FLOC    ,INLP    ,(RX(I)  ,RY(I)   ,RAN(I)   ,
  FX(I)   ,FY(I)),(I=1,INLP)
```

FLOC (A4 : -)

'FLOC' is the label of this card (1-4 columns)

INLP (integer : 1)

INLP>0 : Number of figures on one page (maximum=20)

INLP<0 : -1 or -2 (RX,RY,RAN,FX and FY are not needed)

INLP=-1 : two figures are plotted on one page

INLP=-2 : four figures are plotted on one page

RX (real : 0.0)

x coordinate of center point for revolution (cm)

RY (real : 0.0)

y coordinate of center point for revolution (cm)

RAN (real : 0.0)

angle of revolution (rad: counterclockwise)

FX (real : 0.0)

x coordinate of origin (cm)

FY (real : 0.0)

y coordinate of origin (cm)

o Card 3: Title card

(if this card is omitted, figure has no title)

```
# FT      ,TITL
```

FT (A4 : -)

'FT ' is the label of this card (1-4 columns)

TITL (character : -)

Figure title (5-72 columns, maximum=68 characters) o Card 4: X-axis title card

(if this card is omitted, x-axis title is 'DISTANCE (M)')

```
# XT      ,XTITL
```

XT (A4 : -)

'XT ' is the label of this card (1-4 columns)

XTITL (character : -)

X-axis title (5-44 columns, maximum=40 characters) o Card 5: Y-axis title card

(if this card is omitted, y-axis title is set to the caption of first y-data)

```
# YT      ,YTITL
```

YT (A4 : -)

'YT ' is the label of this card (1-4 columns)

YTITL (character : -)

Y-axis title (5-44 columns, maximum=40 characters) o Card 6: Figure control card

```
# LINE    ,INC    ,ITX    ,ITY    ,XMI    ,
  XMA     ,YMI    ,YMA    ,IPR
    (if this card has only the label 'LINE',
    former defined values are used)
```

LINE (A4 : -)
'LINE' is the label of this card (1-4 columns)

INC (integer : -)
number of lines in one figure (maximum=12)

ITX (integer : 0)
scale of X-axis
0 : linear
1 : log

ITY (integer : 0)
scale of Y-axis
0 : linear
1 : log

XMI (real : 0.0)
minimum value of X-axis

XMA (real : 0.0)
maximum value of X-axis
(if XMI=0.0 and XMA=0.0, automatic scale function is used)

YMI (real : 0.0)
  minimum value of Y-axis

YMA (real : 0.0)
  maximum value of Y-axis
  (if YMI=0.0 and YMA=0.0, automatic scale function is used)

IPR (integer : 0)
  scale value option
    0 : real number
    1 : integer number for X-axis
    2 : integer number for Y-axis
    3 : integer number for X- and Y-axis

o Card 7: Format control card

```
# FORM    ,NFX    ,NFY    ,XY1    ,XY2    ,
  SX      ,SY     ,SX0    ,SY0    ,SIM    ,
  SIX     ,SIY    ,SIS    ,SXS    ,SYS    ,
  SFA
```

FORM (A4 : -)

'FORM' is the label of this card (1-4 columns)

NFX (integer : 0)

grid option for X-axis

- 0 : coarse grid (broken line) with small scale
- 1 : coarse grid (solid line) without small scale
- 2 : coarse grid (solid line) with small scale
- 3 : fine grid (solid line)
- -1 : coarse grid (broken line) without small scale
- -2 : fine grid (broken line)
- -3 : no grid line

NFY (integer : 0)

grid option for Y-axis

- 0 : coarse grid (broken line) with small scale
- 1 : coarse grid (solid line) without small scale
- 2 : coarse grid (solid line) with small scale
- 3 : fine grid (solid line)
- -1 : coarse grid (broken line) without small scale
- -2 : fine grid (broken line)
- -3 : no grid line

XY1 (real : 0.0)

x coordinate of lower left side of line title block (cm)

XY2 (real : 0.0)
y coordinate of lower left side of line titile block (cm)
(if XY1=0.0 and XY2=0.0, line title block is located at
the upper left side of the figure)

SX (real : 15.0)
length of X-axis (cm)
(if SX=0.0, X-axis is set to 15.0 cm)

SY (real : 10.0)
length of Y-axis (cm)
(if SY=0.0, Y-axis is set to 10.0 cm)

SX0 (real : 0.0)
length of outer frame in X direction (cm)
(if SX0=0.0, outer frame is omitted but its size is SX+6.0cm)

SY0 (real : 0.0)
length of outer frame in Y direction (cm)
(if SY0=0.0, outer frame is omitted but its size is SY+5.0cm)

SIM (real : 0.3)
character size of figure title (cm)
(if SIM=0.0, SIM=0.3 cm)

SIX (real : 0.375)
character size of X-axis (cm)
(if SIX=0.0, SIX=0.375 cm)

SIY (real : 0.375)
  character size of Y-axis (cm)
  (if SIY=0.0, SIY=0.375 cm)

SIS (real : 0.25)
  character size of line title (cm)
  (if SIS=0.0, SIS=0.25 cm)

SXS (real : 0.3125)
  character size of X-axis scale (cm)
  (if SXS=0.0, SXS=0.3125 cm)

SYS (real : 0.3125)
  character size of Y-axis scale (cm)
  (if SYS=0.0, SYS=0.3125 cm)

SFA (real : 1.0)
  scaling factor of the figure
  (if SFA=0.0, SFA=1.0)

o Card 8: Data control card

```
# LC      ,IU      ,TIME    ,ND      ,LI      ,
  NS
    (if this card has only the label 'LC  ',
    former defined values are used)
```

LC (A4 : -)
'LC ' is the label of this card (1-4 columns)

IU (integer : -)
unit number for input file (11-20)
(if IU=0, input file is not used and data must be directly input)

TIME (real : -)
time for plotting (data at closest time step are plotted)
(if time repeat function is used, TIME is ignored)

ND (integer : -)
number of data (maximum=1000)

LI (integer : 0)
line type

0 : straight solid ling
1 : straight broken line
2 : straight dotted line
3 : straight chained line
4 : straight solid (thick) line
5 : straight broken (thick) line
6 : straight dotted (thick) line
7 : straight chained (thick) line
-1 : smooth interpolation by 3rd order spline function

-2 : no line

NS (integer : 0)

interval of symbol

0 : at every data point

n : at every n data point

(if n is negative, no symbol is put)

o Card 9: Calculation function card

```
# CALC    ,ICALC   ,NODT1   ,(CL1(I),CL2(I)),(I=1,NODT1)
```

CALC (A4 : -)
'CALC' is the label of this card (1-4 columns)

ICALC (integer : -)
Equation number for calculation, see Table 4-1

NODT1 (real : -)
number of input variables (ICALC=1,2,6) (maximum=100)
(if ICALC=4, NODT1 is a dummy input)

CL1(I) (real : -)
value of CL(1) for ICALC=4, CD1(I) for ICALC=6

CL2(I) (real : -)
value of CL(2) for ICALC=4, CD2(I) for ICALC=6

necessary number of Card 12 according to equation number is:

1 : NODT1 times
2 : NODT1 times
3 : 2 times
4 : 1 time
6 : NODT1 times
7 : 1 time
8 : 2 times, and Card 11 is omitted

o Card 10: Line title card

(if this card is omitted, the time step value of input file is used as the line title: 'TIME = (time step value) S')

```
# LT      ,LTITL
```

LT (A4 : -)

'LT ' is the label of this card (1-4 columns)

LTITL (character : -)

line title (5-44 columns, maximum=40 characters) o Card 11: X data card

```
# XD       ,XDATA(I),(I=1,ND)
```

XD (A4 : -)

'XD ' is the label of this card (1-4 columns)

XDATA (real : -)

data value for X coordinate

if X data are in the same interval, the following increment format can be used:

nRd	n(integer)	number of interval
	R	key word
	d(real)	value of increment

for example, if Card 11 is 'XD 1.0 5.0 6.0 3R0.5 9.0',
X data are XDATA(1)=1.0, XDATA(2)=5.0, XDATA(3)=6.0,
XDATA(4)=6.5, XDATA(5)=7.0, XDATA(6)=7.5, XDATA(7)=9.0.

o Card 12: Y data card

```
# YD     ,(DVAR(I),ID1(I),ID2(I),ID3(I)),(I=1,ND)
```

YD (A4 : -)

'YD ' is the label of this card (1-4 columns)

DVAR (character : -)

variable name to be read from input file

ID1(I) (integer : -)

first element number for array type variable
(discriminated by ',' from DVAR)

ID2(I) (integer : -)

second element number for array type variable
(discriminated by ',' from ID1)

ID3(I) (integer : -)

third element number for array type variable
(discriminated by ',' from ID2)

if element number is in the same interval,
the following increment format can be used:

nRd	n(integer)	number of interval
	R	key word
	d(real)	value of increment

for example, if Card 12 is 'YD ALP,1 ALP,2R4 PRES,1,1,2R1'
Y data are YDATA(1)=ALP(1), YDATA(2)=ALP(5), YDATA(3)=ALP(9),
YDATA(4)=PRES(1,1,1), YDATA(5)=PRES(1,1,2).

if variable name has blank, '#' must be inserted as blank:
'ALP 01' is input as 'ALP#01'.

if IU=0 in Card 8, Card 12 is

```
 # YD       ,YDATA(I),(I=1,ND)
```

YDATA (real : -)
Y data: how to input YDATA is the same as XDATA in Card 11

o Card 13: Error bar control card

```
# EBAR    ,IBAR    ,EDATA(I),(I=1,ND)
```

EBAR (A4 : -)
'EBAR' is the label of this card (1-4 columns)

IBAR (integer : -)
option for error flag
0 : relative error (to YDATA in Card 12)
1 : absolute error

EDATA (real : -)
error data

if error data are the same value,
the following iterative format can be used:

nCd	n(integer)	number of interval
	C	key word
	d(real)	error data

for example, if Card 13 is 'EBAR 0 5.0 3C10.0 15.0 20.0'
error data are EDATA(1)=5.0, EDATA(2)=10.0, EDATA(3)=10.0,
EDATA(4)=10.0, EDATA(5)=15.0, EDATA(6)=20.0,

and each error bar is in the range of +-5%, +-10%, +-10%,
+-10%, +-15%, +-20% of YDATA(1) to YDATA(6).

o Card 14: Time repeat card

```
# REPT    ,IFIG    ,ILIN    ,
  (TIMER(I,J),(I=1,ILIN)),(J=1,IFIG)


# REND
```

('REPT' card and 'REND' card are one set)

REPT (A4 : -)
'REPT' is the label of this card (1-4 columns)

IFIG (integer : -)
repeat times for figure (maximum=100)

ILIN (integer : -)
repeat times for line in one figure
(maximum number of INC(in Card 8) times ILIN is 12)

TIMER (real : -)
time for plotting (maximum number is IFIG times ILIN)

if time data are in the same interval,
the following increment format can be used:

nRd	n(integer)	number of interval
	R	key word
	d(real)	increment value

for example, if the control data are as follows,

```
HEAD 1 2
HEAD REPT 2 2 3R1.0
LINE 2
LC 11 0.0 10
XD 10R0.3
YD ALP1,10R1
LC
XD
YD ALP2,10R1
REND
```

ALP1 and ALP2 at the time of 1 (sec) and 2 (sec) are plotted on the first figure, and ALP1 and ALP2 at the time of 3 (sec) are plotted on the second figure.

4.3 Example of SDPLOT

4.3.1 Comparison of 9 Cases

In this example, 9 calculated results in 9 files are plotted on one figure. The control data are listed below, and the figure is shown in Fig.4-3.

```
++++*++++1++++*++++2++++*++++3++++*++++4++++*++++5++++*
                                                       : Card 1
HEAD 1 2                                               : Comment
**** Fig.1 ****                                        : Card 3
FT   Fig.1  The pressure distribution along the nozzle : Card 4
XT   Distance  X ( M )                                 : Card 5
YT   Pressure  P  ( N/M2 )                             : Card 6
LINE 9                                                 : Card 8a
LC   11 120.0 50                                       : Card 10a
LT   Case-1                                            : Card 11a
XD   0.01 49R0.02                                      : Card 12a
YD   PRES01,2 PRES01,49R4                              : Card 8b
LC   12 120.0 50                                       : Card 10b
LT   Case-2                                            : Card 11b
XD                                                     : Card 12b
YD                                                     : Card 8c
LC   13 120.0 50                                       : Card 10c
LT   Case-3                                            : Card 11c
XD                                                     : Card 12c
YD                                                     : Card 8d
LC   14 120.0 50                                       : Card 10d
LT   Case-4                                            : Card 11d
XD                                                     : Card 12d
YD                                                     : Card 8e
LC   15 120.0 50                                       : Card 10e
LT   Case-5                                            : Card 11e
XD                                                     : Card 12e
YD                                                     : Card 8f
LC   16 120.0 50
```

```
LT   Case-6                                  : Card 10f
XD                                           : Card 11f
YD                                           : Card 12f
LC   17 120.0 50                             : Card 8g
LT   Case-7                                  : Card 10g
XD                                           : Card 11g
YD                                           : Card 12g
LC   18 120.0 50                             : Card 8h
LT   Case-8                                  : Card 10h
XD                                           : Card 11h
YD                                           : Card 12h
LC   19 120.0 50                             : Card 8i
LT   Case-9                                  : Card 10i
XD                                           : Card 11i
YD                                           : Card 12i
```

Card 1 : MKS unit system is selected, and the input data and (x,y) data are printed out.
Card 3 : Figure title is specified.
Card 4 : X-axis title is specified.
Card 5 : Y-axis title is specified.
Card 6 : 9 lines are drawn on a figure
Card 8a : The first line is taken from unit 11, the time is 120.0 (sec), and the number of point is 50.
Card 10a: Line title is specified.
Card 11a: X-data points are defined.
Card 12a: Y-data (variable) are defined.
Card 8b-8i: Unit number is varied for each data file.
Card 10b-10i: Line title is varied for each line.
Card 11b-11i: X-data are all the same.
Card 12b-12i: Y-data variables are all the same.

4.3.2 Use of time repeat function

In this example, the time repeat function is used. The control data are listed below, and the figure is shown in Fig.4-4.

```
++++*++++1++++*++++2++++*++++3++++*++++4++++*++++5++++*++++
HEAD 0 0 2 2 1                                               : Card 1
REPT 2 5 0.0 9R50                                            : Card 14
FT  SAMPLE PROBLEM 1 (EVAPORATION 20MESH): VOID PROFILE      : Card 3
YT  VOID FRACTION                                            : Card 5
LINE 1 0 0 0.0 2.4 0.0 1.0 0                                 : Card 6
LC   11 0.0 20 0 0                                           : Card 8
XD   0.06095 19R0.1219                                       : Card 11
YD   ALP#01,1  ALP#01,19R1                                   : Card 12
REND                                                         : Card 14
```

Card 1 : MKS unit system is selected, the input data are not printed out, and the thickness of lines are specified.

Card 14 : Two figures are plotted, and 5 lines are drawn in each figure. That is, 10 lines are drawn. The time for first line is 0.0 (sec), and then lines at every 50 (sec) are drawn.

Card 5 : Y-axis title is specified.

Card 6 : One line is drawn, both axis have linear scale, X-axis is from 0.0 to 2.4, Y-axis is from 0.0 to 1.0, and the scale value is a real number.

Card 8 : The first line is taken from unit 11. The plotting time of 0.0 (sec) has no meaning because the time repeat function is used. The number of X-data is 20, data points are connected by the straight solid line, and some symbols are put on every data point.

Card 11 : X-data points are defined.

Card 12 : Y-data (variable) are defined.

Card 14 : The time repeat function is terminated.

4.3.3 Comparison with experimental data

In this example, experimental data are plotted along with the calculated result. The error bar is also used. The control data are listed below, and the figure is shown in Fig.4-5.

```
++++*++++1++++*++++2++++*++++3++++*++++4++++*++++5++++*
HEAD 1 2                                               : Card 1
FT  FIG.1  ERROR BAR                                   : Card 3
LINE 2                                                 : Card 6
FORM -3                                                : Card 7
LC   11 10.0 50                                        : Card 8a
LT   CALCLATION                                        : Card 10a
XD   0.01 49R0.02                                      : Card 11a
YD   PRES01,2  PRES01,49R4                             : Card 12a
LC   0 0.0 3 -2                                        : Card 8b
LT   EXPERIMENT                                        : Card 10b
XD   0.3 0.5 0.8                                       : Card 11b
YD   5.5 3.0 1.0                                       : Card 12b
EBAR 0 5.0 2C10.0                                      : Card 13
```

Card 1 : MKS unit system is selected, the input data and (x,y) data are printed out.

Card 3 : Figure title is specified.

Card 6 : Two lines (one is experimental data) are drawn.

Card 7 : No grid lines are drawn in the X direction.

Card 8a : The first line is taken from unit 11, the time for plotting is 10.0 (sec), and the number of data points is 50.

Card 10a: The title for the first line is specified.

Card 11a: X-data points for the first line are defined.

Card 12a: Y-data (variable) for the first line are defined.

Card 8b : The data of second line are directly input. The time for plotting is 0.0 (sec), the number of data points is 3, and no lines are drawn in between the data.

Card 10b: The title for the experimental data is specified.

Card 11b: X-data points are input.

Card 12a: Y-data points are input.

Card 13 : Relative error is indicated by the error bar, and the range is +-5%, +-10% and +-10% of each Y-value.

4.3.4 Pressure vs. velocity

In this example, the liquid velocity is plotted against the pressure. The calculation function is used. The control data are listed below, and the figure is shown in Fig.4-6.

```
++++*++++1++++*++++2++++*++++3++++*++++4++++*++++5++++*
                                                        : Card 1
HEAD 1 0                                                : Card 2
FLOC -2                                                 : Comment
**** FIG.1 ****                                         : Card 3a
FT  FIG.1  PRESSURE                                     : Card 6a
LINE 1                                                  : Card 8a
LC   11 30.0 50                                         : Card 10a
LT   TIME = 30.0                                        : Card 11a
XD   0.01 49R0.02                                       : Card 12a
YD   PRES01,2 PRES01,49R4                               : Comment
**** FIG.2 ****                                         : Card 3b
FT  FIG.2  VELOCITY OF LIQUID                           : Card 6b
LINE 1                                                  : Card 8b
LC   11 30.0 50                                         : Card 10b
LT   TIME = 30.0                                        : Card 11b
XD   0.01 49R0.02                                       : Card 12b
YD   UL##01,2 UL##01,49R4                               : Comment
**** FIG.3 ****                                         : Card 3c
FT  FIG.3  CALUCULATION ( ICALC = 8 )                   : Card 4c
XT  PRESSURE (N/M2)                                     : Card 5c
YT  VELOCITY OF LIQUID (M/S)                            : Card 6c
LINE 1                                                  : Card 8c
LC   11 30.0 50                                         : Card 9c
CALC 8                                                  : Card 10c
LT   TIME = 30.0                                        : Card 12c
YD   PRES01,2 PRES01,49R4                               : Card 12c
YD   UL##01,2 UL##01,49R4
```

Card 1 : MKS unit system is selected, the input data are not printed out.

Card 2 : Four figures are plotted on one page.

Card 3a : The title of FIG.1 is specified.

Card 6a : One line is drawn.

Card 8a : Data are taken from unit 11. The plotting time is 30.0 (sec), and the number of data is 50.

Card 10a: The lint title is specified.

Card 11a: X-data points are defined.

Card 12a: Y-data (variable) are defined.

Card 3b : The title of FIG.2 is specified.

Card 6b : One line is drawn.

Card 8b : Data are taken from unit 11. The plotting time is 30.0 (sec), and the number of data is 50.

Card 10b: The lint title is specified.

Card 11b: X-data points are defined.

Card 12b: Y-data (variable) are defined.

Card 3c : The title of FIG.3 is specified.

Card 4c : The title of X-axis is specified.

Card 5c : The title of Y-axis is specified.

Card 6c : One line is drawn.

Card 8c : Data are taken from unit 11. The plotting time is 30.0 (sec), and the number of data is 50.

Card 9c : The equation 8 is selected.

Card 10c: The lint title is specified.

Card 12c: X- and Y-data are defined.

4.3.5 Use of grid option

In this example, the fine grid system is used and Y-axis is longer than X-axis. The control data are listed below, and the figure is shown in Fig.4-7.

```
++++*++++1++++*++++2++++*++++3++++*++++4++++*++++5++++*
                                                         : Card 1
HEAD 1 0                                                 : Card 3
FT  FIG.1  The Velocity Distribution of Phase 2          : Card 6
LINE 1 0 0 0.0 1.0 0.4 1.6                               : Card 7
FORM -2 -2 0.0 0.0 10.0 15.0                             : Card 8
LC   13 120.0 50                                         : Card 11
XD   0.01 49R0.02                                        : Card 12
YD   UL##01,2 UL##01,49R4
```

Card 1 : MKS unit system is selected, the input data are not printed out.

Card 3 : The figure title is specified.

Card 6 : One line is drawn. The minimum and the maximum values are defined for both axis.

Card 7 : Fine grid of broken line is used and the length of axis is specified.

Card 8 : Data are taken from unit 13. The plotting time is 120.0 (sec) and the number of data is 50.

Card 11 : X-data points are defined.

Card 12 : Y-data (variable) are defined.

4.3.6 Change of line title block location

In this example, the location of line title block is changed. The control data are listed below, and the figure is shown in Fig.4-8.

```
++++*++++1++++*++++2++++*++++3++++*++++4++++*++++5++++*
                                                         : Card 1
HEAD 1 0                                                 : Card 3
FT  FIG.1  The Velocity Distribution of Phase 2          : Card 6
LINE 1 0 0 0.0 1.0 0.4 1.6                               : Card 7
FORM 0 0 0.0 16.5 10.0 15.0                              : Card 8
LC   13 120.0 50                                         : Card 11
XD   0.01 49R0.02                                        : Card 12
YD   UL##01,2 UL##01,49R4
```

Card 1 : MKS unit system is selected, the input data are not printed out.

Card 3 : The figure title is specified.

Card 6 : One line is drawn. The minimum and the maximum values are defined for both axis.

Card 7 : The location of line title block and the length of axis are specified.

Card 8 : Data are taken from unit 13. The plotting time is 120.0 (sec) and the number of data is 50.

Card 11 : X-data points are defined.

Card 12 : Y-data (variable) are defined.

Table 4-1 Built-in Equations (SDPLOT)

MODE	EQUATION
1.	$\sum_{i=1}^{NODT1} X(i)$
2.	$\prod_{i=1}^{NODT1} X(i)$
3.	$X(1)-X(2)$
4.	$CL(1)*X(1)+CL(2)$
6.	$\sum_{i=1}^{NODT1} \{CD(1)_i*X(i)+CD(2)_i\}$
7.	$\frac{dX(1)}{dt}$
8.	$(X,Y) = (X(1),X(2))$

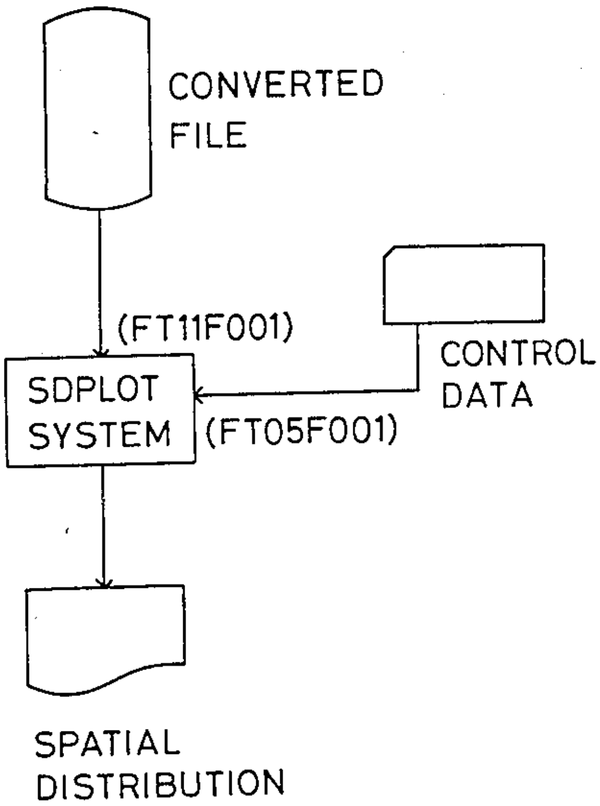


Fig. 4-1 Relation of Data Files (SDPLOT)

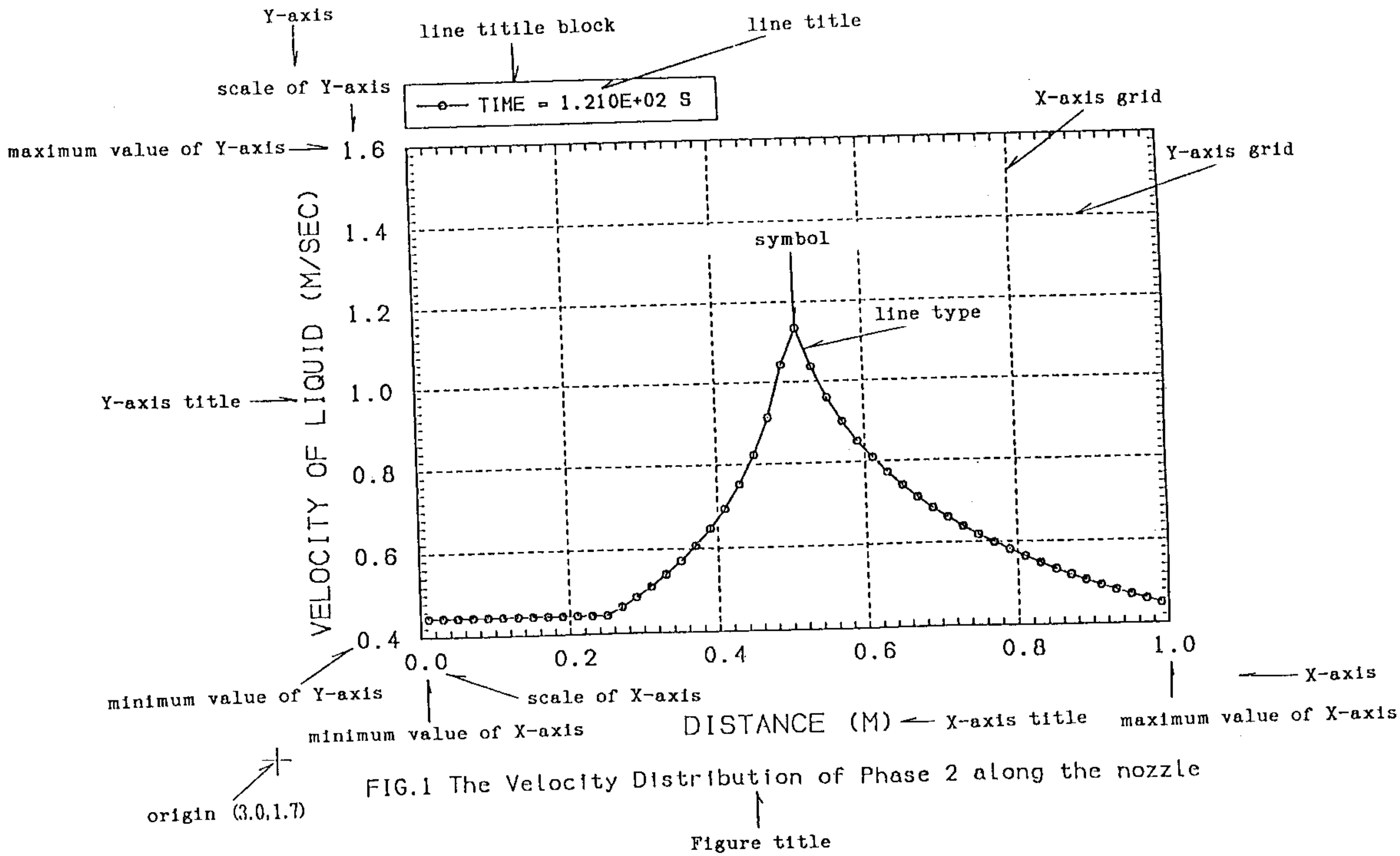


Fig. 4-2 Explanation of Terms Used in SDPLOT

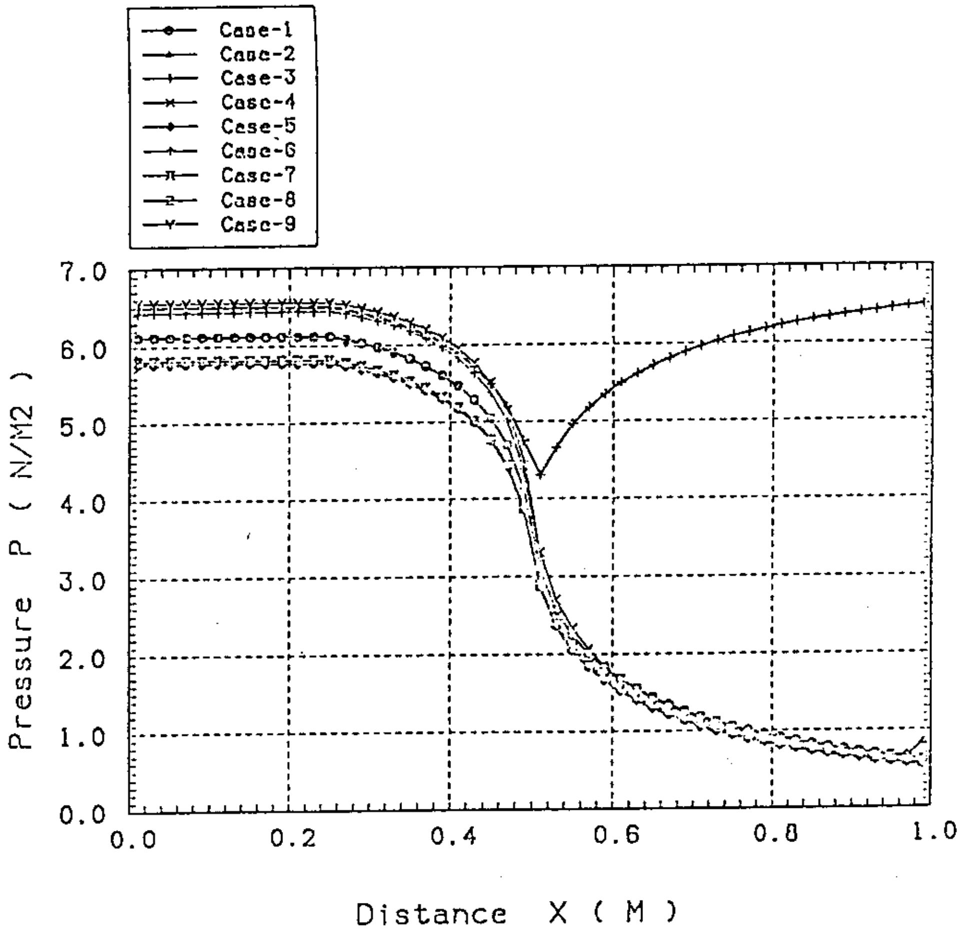
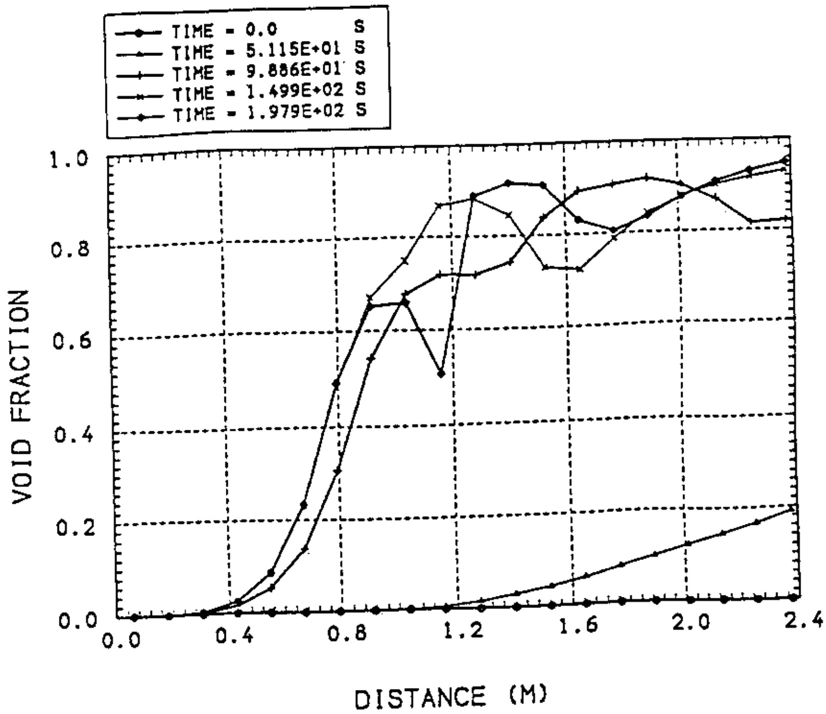
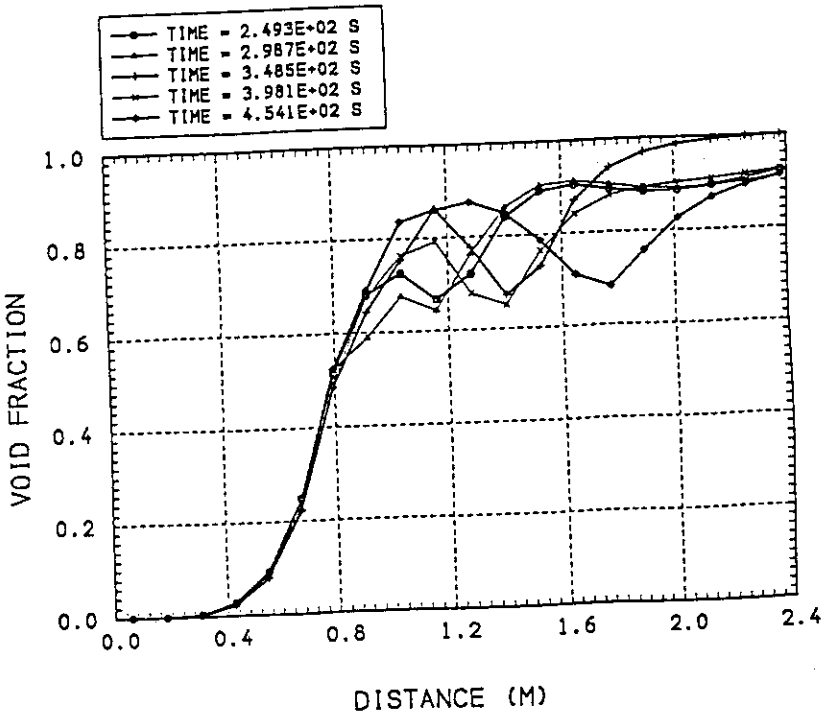


Fig.1 The pressure distribution along the nozzule

Fig. 4-3 Comparison of 9 Cases



SAMPLE PROBLEM 1 (EVAPORATION 20MESH): VOID PROFILE



SAMPLE PROBLEM 1 (EVAPORATION 20MESH): VOID PROFILE

Fig. 4-4 Use of Time Repeat Function

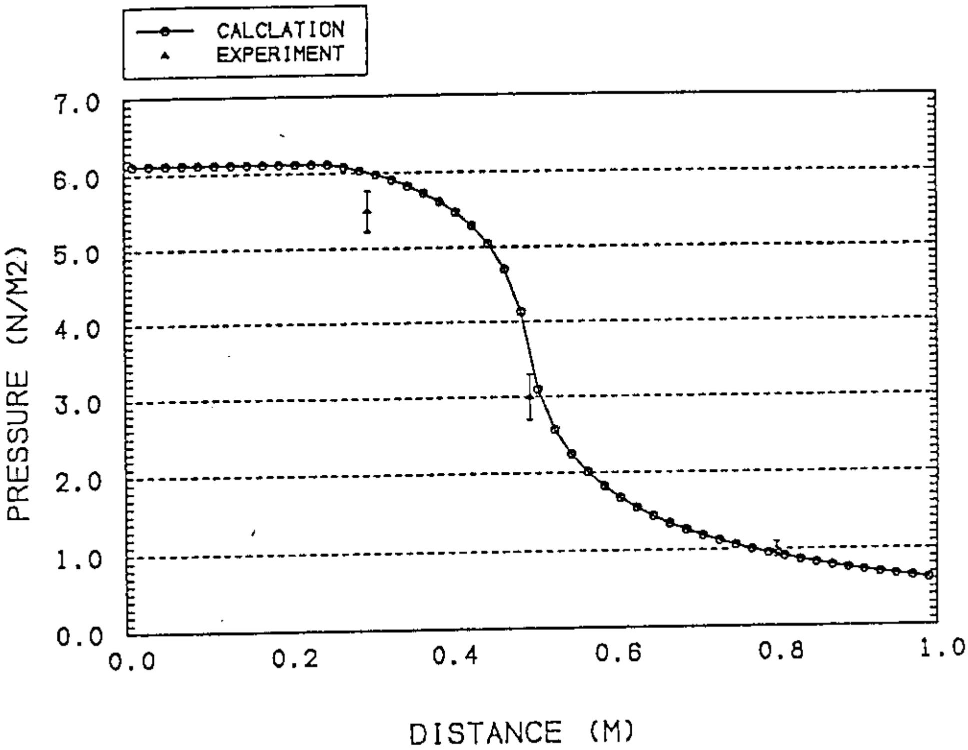


FIG.1 ERROR BAR

Fig. 4-5 Comparison with Experimental Data

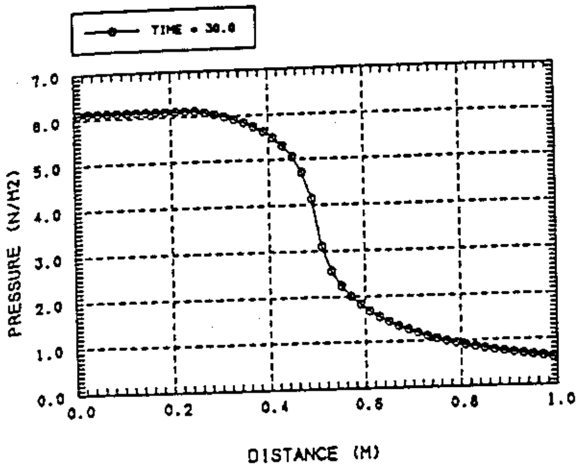


FIG.1 PRESSURE

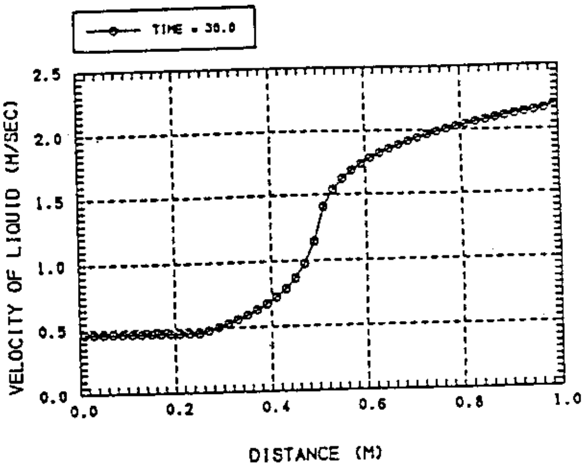


FIG.2 VELOCITY OF LIQUID

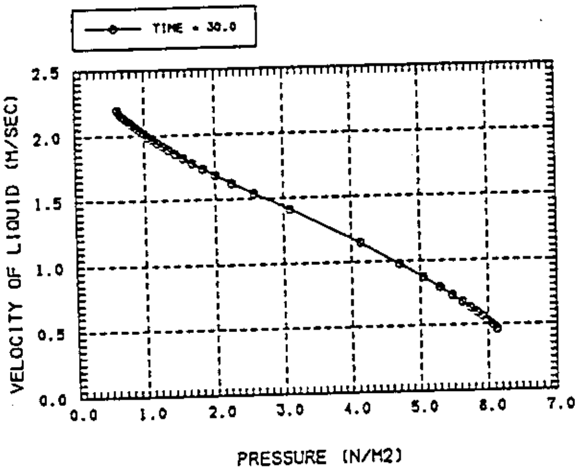


FIG.3 CALUCULATION (ICALC = 8)

Fig. 4-6 Pressure vs. Velocity

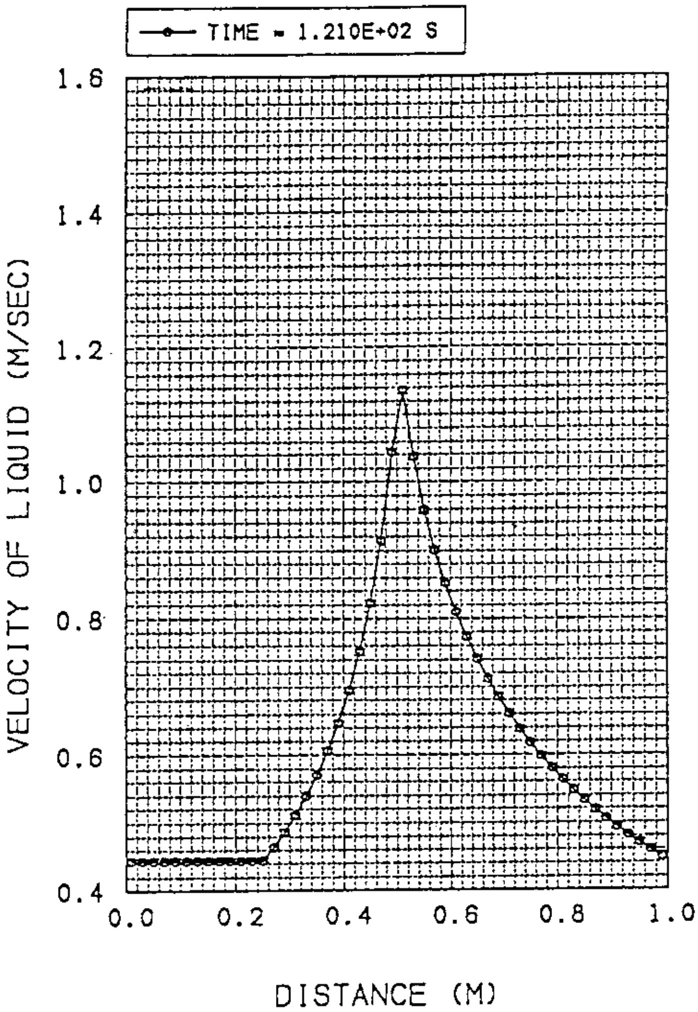


FIG.1 The Velocity Distribution of Phase 2

Fig. 4-7 Use of Grid Option

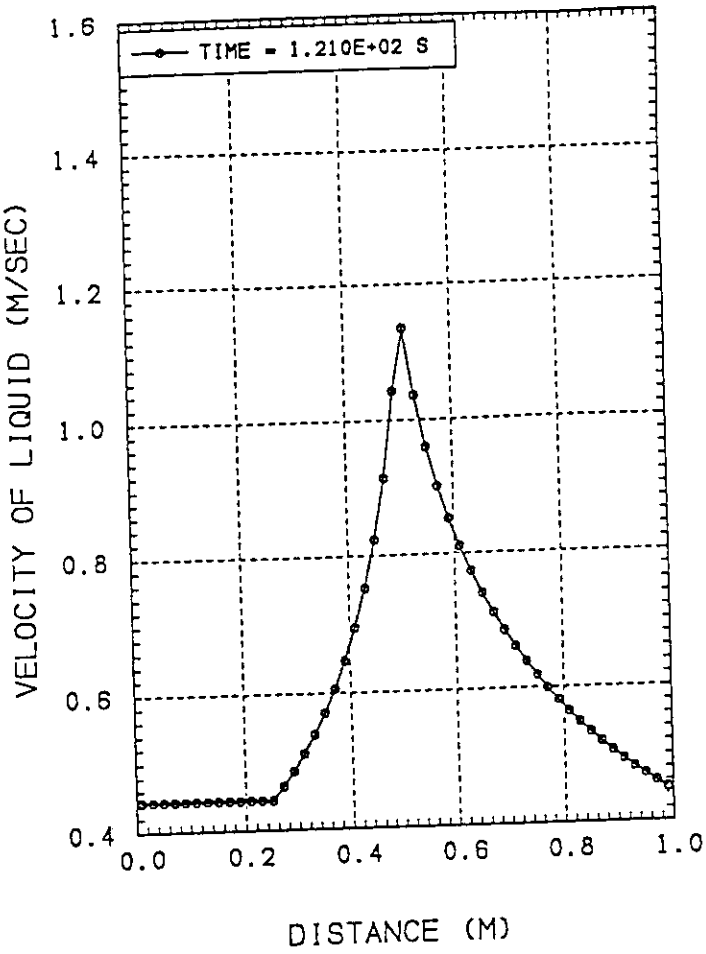


FIG.1 The Velocity Distribution of Phase 2

Fig. 4-8 Change of Line Title Block Location

References

[1] T.WATANABE, et al., "Transient Two-Phase Flow Analysis Code: MINCS", JAERI report to be published.

[2] K.MURAMATSU, et al., "Users Manual for SPLPACK-1", JAERI-M 83-166(1983).

[3] H.IHARA, "GPLP: General Purpose Line Plotting Programme", JAERI-M 82-197(1982).

[4] M.HIRANO, et al., "Conversion Program from THYDE-P1 Output Data to SPL Format Data Base", JAERI-M 83-045(1983).

[5] S.SASAKI and F.ARAYA, "A Blowdown Analysis on LPWR LOCA by ALARM-P1", JAERI-M 82-161(1982).

Appendix JCL for the plotting system

JCL (Job Control Language) related to the plotting system is described here. JCL for the MINTOSPL system is in Section 1, the SPLPLOT system in Section 2 and the SDPLOT system in Section 3. All the JCL listed in Appendix is for the FACOM computer system used in JAERI.

1. JCL for the MINTOSPL system

1.1 JCL for making the load module

Two FORTRAN programs and ASSEMBLAR program are necessary for making the load module of MINTOSPL system.

```
//FORT77  EXEC PGM=JZK@FORT,REGION=1024K,COND=(4,LT),
//         PARM='OPTIMIZE(2),LINECOUNT(0),NOS,NOSOURCE,ELM(*),NOMAP'
//SUBSYS    DD SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//SYSUT2    DD DSN=&&OUTSRC,DISP=(NEW,DELETE),UNIT=WK10
//             SPACE=(TRK,(30,10)),DCB=BLKSIZE=3200
//SYSPRINT  DD SYSOUT=*,
//          DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//SYSTERM   DD SYSOUT=*,
//          DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//SYSLIN    DD DSN=&&OBJF,DISP=(NEW,PASS),UNIT=WK10,
//          SPACE=(TRK,(39,10)),DCB=BLKSIZE=3200
//SYSIN     DD DSN=J4042.$MINSPL.FORT77,DISP=MOD
//          DD DSN=J4042.$SPLEDIT.FORT77'',DISP=MOD
//ASM  EXEC    PGM=JLAX00,REGION=512K,COND=(4,LT),
//             PARM='LIST,BATCH,NODECK,OBJ'
//SUBSYS       DD   SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//SYSLIB       DD   DSN=SYS1.MACLIB,DISP=SHR
//SYSPRINT     DD   SYSOUT=*
//SYSUT1       DD   UNIT=WK10,SPACE=(TRK,(30,10))
```

```
//SYSUT2        DD   UNIT=WK10,SPACE=(TRK,(30,10))
//SYSUT3        DD   UNIT=WK10,SPACE=(TRK,(30,10))
//SYSGO         DD   DSN=&&OBJA,DISP=(NEW<PASS),UNIT=WK10,
//              SPACE=(TRK,(30,10))
//SYSIN         DD   DSN=J4042.$SPLLIB.ASM,DISP=(MOD,PASS)
//LINK  EXEC PGM=JQAL,REGION=1024K,COND=(4,LT),PARM='NOMAP,LIST,LET'
//SUBSYS     DD SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//SYSLIB        DD   DSN=SYS9.GGS.LOAD,DISP=SHR
//              DD   DSN=SYS2.FORTLIB,DISP=SHR
//SYSPRINT      DD   SYSOUT=*,DCB=(BLKSIZE=4840)
//SYSTERM       DD   SYSOUT=*
//SYSUT1        DD   UNIT=VIO,SPACE=(TRK,(30,10))
//SYSLIN        DD   DSN=&&OBJA,DISP=(OLD,DELETE)
//              DD   DSN=&&OBJF,DISP=(OLD,DELETE)
//              DD   DDNAME=SYSIN
//SYSLMOD DD DISP=(,CATLG,DELETE),UNIT=TSSWK,SPACE=(TRK,(30,10,5)),
//         DSN=J4042.$MINSPL.LOAD
//SYSIN     DD *
          ENTRY    MAIN
          NAME     TEMPNAME(R)
/*
```

In the above JCL, 'J4042.$MINSPL.FORT77' and 'J4042.$SPLEDIT.FORT77' are the FORTRAN programs, while 'J4042.$SPLLIB.ASM' is the ASSEMBLER program. Two lines after SYSIN DD statement are the control data for the linkage editot, and 'J4042.$MINSPL.LOAD' is the load module to be created.

1.2 JCL for making a converted file

This example is for making a converted file by using the load module of MINTOSPL system created above.

```
//      EXEC PGM=TEMPNAME,COND=(4,LT),PARM='FLIB(ERRCUT=0)',
//           REGION=1024K
//SUBSYS     DD  SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//STEPLIB    DD  DSN=J4042.$MINSPL.LOAD,DISP=SHR
//SYSPRINT   DD  SYSOUT=*,
//           DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//FT05F001   DD  DDNAME=SYSIN
//FT06F001   DD  SYSOUT=*,
//           DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//FT08F001 DD DSN=J4042.$MINCSLB.DATA,DISP=SHR
//FT20F001 DD UNIT=TSSWK,DISP=(,CATLG),SPACE=(TRK,(10,5),RLSE),
//             DCB=(RECFM=VBS,LRECL=6208,BLKSIZE=6212),
//             DSN=J4042.OUTSPL.DATA
//FT40F001 DD DISP=SHR,DSN=J4042.OUTMIN.DATA
//SYSIN DD *

@TEST
BENCHMARK 12-2 MOD
BY USING MINCS-SLP
TRANSIENT
ALL     ALL ALL
/*
```

In the above JCL, 'J4042.$MINSPL.LOAD' is the load module for file conversion, and 'J4042.$MINCSLB.DATA' is the label data listed in Table 2.1. 'J4042.OUTMIN.DATA' is the output file of MINCS, and 'J4042.OUTSPL.DATA' is the converted file for plotting. Six lines after SYSIN DD statement are control data for making a converted file.

2. JCL for the SPLPLOT system

2.1 JCL for making the load module

Two FORTRAN programs and ASSEMBLAR program are necessary for making a SPLPLOT load module.

```
//FORT77 EXEC PGM=JZK@FORT,REGION=1024K,COND=(4,LT),
//        PARM='OPTIMIZE(2),LINECOUNT(0),NOS,NOSOURCE,ELM(*),NOMAP'
//SUBSYS    DD SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//SYSUT2    DD DSN=&&OUTSRC,DISP=(NEW,DELETE),UNIT=WK10
//             SPACE=(TRK,(30,10)),DCB=BLKSIZE=3200
//SYSPRINT DD SYSOUT=*,
//          DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//SYSTERM   DD SYSOUT=*,
//          DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//SYSLIN    DD DSN=&&OBJF,DISP=(NEW,PASS),UNIT=WK10,
//          SPACE=(TRK,(39,10)),DCB=BLKSIZE=3200
//SYSIN     DD DSN=J4042.$SPLPLOT.FORT77,DISP=MOD
//          DD DSN=J4042.$SPLEDIT.FORT'',DISP=MOD
//ASM  EXEC   PGM=JLAX00,REGION=512K,COND=(4,LT),
//            PARM='LIST,BATCH,NODECK,OBJ'
//SUBSYS      DD   SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//SYSLIB      DD   DSN=SYS1.MACLIB,DISP=SHR
//SYSPRINT    DD   SYSOUT=*
//SYSUT1      DD   UNIT=WK10,SPACE=(TRK,(30,10))
//SYSUT2      DD   UNIT=WK10,SPACE=(TRK,(30,10))
//SYSUT3      DD   UNIT=WK10,SPACE=(TRK,(30,10))
//SYSGO       DD   DSN=&&OBJA,DISP=(NEW<PASS),UNIT=WK10,
//            SPACE=(TRK,(30,10))
//SYSIN       DD   DSN=J4042.$SPLLIB.ASM,DISP=(MOD,PASS)
//LINK  EXEC PGM=JQAL,REGION=1024K,COND=(4,LT),PARM='NOMAP,LIST,LET'
//SUBSYS    DD SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//SYSLIB      DD   DSN=SYS9.GGS.LOAD,DISP=SHR
//            DD   DSN=SYS9.PNL.LOAD,DISP=SHR
//            DD   DSN=SYS2.FORTLIB,DISP=SHR
//SYSPRINT    DD   SYSOUT=*,DCB=(BLKSIZE=4840)
//SYSTERM     DD   SYSOUT=*
//SYSUT1      DD   UNIT=VIO,SPACE=(TRK,(30,10))
//SYSLIN      DD   DSN=&&OBJA,DISP=(OLD,DELETE)
//            DD   DSN=&&OBJF,DISP=(OLD,DELETE)
```

```
//            DD   DDNAME=SYSIN
//SYSLMOD DD DISP=(,CATLG,DELETE),UNIT=TSSWK,SPACE=(TRK,(30,10,5)),
//         DSN=J4042.$SPLPLOT.LOAD
//SYSIN    DD *
           ENTRY     MAIN
           NAME      TEMPNAME(R)
/*
```

In the above JCL, 'J4042.$SPLPLOT.FORT77 and 'J4042.$SPLEDIT.FORT77' are the FORTRAN programs, while 'J4042.$SPLLIB.ASM' is the ASSEMBLER program. Two lines after SYSIN DD statement are the control data for the linkage editor, and 'J4042.$SPLPLOT.LOAD' is the load module to be created.

2.2 JCL for plotting a time transient

This example is for plotting a time transient by using the SPLPLOT load module created above.

```
//       EXEC PGM=TEMPNAME,COND=(4,LT),PARM='FLIB(ERRCUT=0)',
//SUBSYS     DD  SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//STEPLIB    DD  DSN=J4042.$SPLPLOT.LOAD,DISP=SHR
//SYSPRINT   DD  SYSOUT=*,
//           DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//FT01F001   DD  UNIT=TSSWK,SPACE=(TRK,(200,50)),DISP=(,PASS)
//FT05F001   DD  DDNAME=SYSIN
//FT06F001   DD  SYSOUT=*,
//           DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//FT09F001   DD UNIT=TSSWK,SPACE=(TRK,(200,50)),DISP=(,PASS)
//FT11F001   DD DISP=SHR,DSN=J4042.OUTSPL.DATA
// EXPAND GRNLP,SYSOUT=G
//SYSIN DD *
  1          1111          10          10
```

```
SAMPLE 1: EVAPORATION 20MESH
VOID FRACTION TRANSIENT
  3
    0.00E+00    5.00E+02 TIME                    (SEC)
ALP 01        1           01-MESH OF 20

0    0.00E+00    1.00E+00 VOID FRACTION         ( - )
ALP 01        5           05-MESH OF 20
  1
ALP 01       10           10-MESH OF 20
  1
GAS VELOCITY TRANSIENT
  4
                         TIME                    (SEC)
UG     01        1           01-MESH OF 20

    0.00E+00    0.20E+02 GAS VELOCITY         (M/S)
UG     01        5           05-MESH OF 20
01
UG     01       10           10-MESH OF 20
01
UG     01       15           15-MESH OF 20
01
/*
```

In the above JCL, 'J4042.$SPLPLOT.LOAD' is the load module for plotting a time transient. '4042.OUTSPL.DATA' is the converted file. The input data after JCL is the same as listed in Section 3.3.

3. JCL for the SDPLOT system

3.1 JCL for making the load module

Two load modules are necessary for the SDPLOT system: one is SDPLOT and the other is GPLP.

3.1.1 SDPLOT

Two FORTRAN programs and ASSEMBLAR program are necessary for making the SDPLOT load module.

```
//FORT77 EXEC PGM=JZK@FORT,REGION=1024K,COND=(4,LT),
//          PARM='OPTIMIZE(2),LINECOUNT(0),NOS,NOSOURCE,ELM(*),NOMAP'
//SUBSYS    DD SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//SYSUT2    DD DSN=&&OUTSRC,DISP=(NEW,DELETE),UNIT=WK10
//             SPACE=(TRK,(30,10)),DCB=BLKSIZE=3200
//SYSPRINT DD SYSOUT=*,
//          DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//SYSTERM   DD SYSOUT=*,
//          DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//SYSLIN    DD DSN=&&OBJF,DISP=(NEW,PASS),UNIT=WK10,
//          SPACE=(TRK,(39,10)),DCB=BLKSIZE=3200
//SYSIN     DD DSN=J4042.$SDPLOT.FORT77,DISP=MOD
//          DD DSN=J4042.$SPLEDIT.FORT'',DISP=MOD
//ASM  EXEC    PGM=JLAX00,REGION=512K,COND=(4,LT),
//             PARM='LIST,BATCH,NODECK,OBJ'
//SUBSYS       DD    SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//SYSLIB       DD    DSN=SYS1.MACLIB,DISP=SHR
//SYSPRINT     DD    SYSOUT=*
//SYSUT1       DD    UNIT=WK10,SPACE=(TRK,(30,10))
//SYSUT2       DD    UNIT=WK10,SPACE=(TRK,(30,10))
//SYSUT3       DD    UNIT=WK10,SPACE=(TRK,(30,10))
//SYSGO        DD    DSN=&&OBJA,DISP=(NEW<PASS),UNIT=WK10,
//             SPACE=(TRK,(30,10))
//SYSIN        DD    DSN=J4042.$SPLLIB.ASM,DISP=(MOD,PASS)
//LINK  EXEC PGM=JQAL,REGION=1024K,COND=(4,LT),PARM='NOMAP,LIST,LET'
//SUBSYS    DD SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//SYSLIB       DD    DSN=SYS9.GGS.LOAD,DISP=SHR
//             DD    DSN=SYS9.PNL.LOAD,DISP=SHR
```

```
//              DD   DSN=SYS2.FORTLIB,DISP=SHR
//SYSPRINT      DD   SYSOUT=*,DCB=(BLKSIZE=4840)
//SYSTERM       DD   SYSOUT=*
//SYSUT1        DD   UNIT=VIO,SPACE=(TRK,(30,10))
//SYSLIN        DD   DSN=&&OBJA,DISP=(OLD,DELETE)
//              DD   DSN=&&OBJF,DISP=(OLD,DELETE)
//              DD   DDNAME=SYSIN
//SYSLMOD DD DISP=(,CATLG,DELETE),UNIT=TSSWK,SPACE=(TRK,(30,10,5)),
//        DSN=J4042.$SDPLOT.LOAD
//SYSIN    DD *
           ENTRY     MAIN
           NAME      TEMPNAME(R)
/*
```

In the above JCL, 'J4042.$SDPLOT.FORT77 and 'J4042.$SPLEDIT.FORT77' are the FORTRAN programs, while 'J4042.$SPLLIB.ASM' is the ASSEMBLER program. Two lines after SYSIN DD statement are the control data for the linkage editor, and 'J4042.$SPLPLOT.LOAD' is the load module to be created.

3.1.2 GPLP

One FORTRAN program and ASSEMBLAR program are necessary for making the GPLP load module.

```
//FORT77  EXEC PGM=JZK@FORT,REGION=1024K,COND=(4,LT),
//        PARM='OPTIMIZE(2),LINECOUNT(0),NOS,NOSOURCE,ELM(*),NOMAP'
//SUBSYS    DD SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//SYSUT2    DD DSN=&&OUTSRC,DISP=(NEW,DELETE),UNIT=WK10
//             SPACE=(TRK,(30,10)),DCB=BLKSIZE=3200
//SYSPRINT DD SYSOUT=*,
//          DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//SYSTERM   DD SYSOUT=*,
//          DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//SYSLIN    DD DSN=&&OBJF,DISP=(NEW,PASS),UNIT=WK10,
```

```
//          SPACE=(TRK,(39,10)),DCB=BLKSIZE=3200
//SYSIN     DD DSN=J4042.$GPLP.FORT77,DISP=MOD
//ASM  EXEC    PGM=JLAX00,REGION=512K,COND=(4,LT),
//             PARM='LIST,BATCH,NODECK,OBJ'
//SUBSYS       DD    SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//SYSLIB       DD    DSN=SYS1.MACLIB,DISP=SHR
//SYSPRINT     DD    SYSOUT=*
//SYSUT1       DD    UNIT=WK10,SPACE=(TRK,(30,10))
//SYSUT2       DD    UNIT=WK10,SPACE=(TRK,(30,10))
//SYSUT3       DD    UNIT=WK10,SPACE=(TRK,(30,10))
//SYSGO        DD    DSN=&&OBJA,DISP=(NEW<PASS),UNIT=WK10,
//             SPACE=(TRK,(30,10))
//SYSIN        DD    DSN=J4042.$GPLPLIB.ASM(FRECORFV),DISP=(MOD,PASS)
               DD    DSN=J4042.$GPLPLIB.ASM(GETCORFV),DISP=(MOD,PASS)
//LINK  EXEC PGM=JQAL,REGION=1024K,COND=(4,LT),PARM='NOMAP,LIST,LET'
//SUBSYS    DD SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//SYSLIB       DD    DSN=SYS9.GGS.LOAD,DISP=SHR
//             DD    DSN=SYS9.PNL.LOAD,DISP=SHR
//             DD    DSN=SYS2.FORTLIB,DISP=SHR
//SYSPRINT     DD    SYSOUT=*,DCB=(BLKSIZE=4840)
//SYSTERM      DD    SYSOUT=*
//SYSUT1       DD    UNIT=VIO,SPACE=(TRK,(30,10))
//SYSLIN       DD    DSN=&&OBJA,DISP=(OLD,DELETE)
//             DD    DSN=&&OBJF,DISP=(OLD,DELETE)
//             DD    DDNAME=SYSIN
//SYSLMOD DD DISP=(,CATLG,DELETE),UNIT=TSSWK,SPACE=(TRK,(30,10,5)),
//         DSN=J4042.$GPLP.LOAD
//SYSIN    DD *
           ENTRY    MAIN
           NAME     TEMPNAME(R)
/*
```

In the above JCL, 'J4042.$GPLP.FORT77 is the FORTRAN programs, while 'J4042.$GPLPLIB.ASM' is the ASSEMBLER program. Two lines after SYSIN DD statement are the control data for the linkage editor, and 'J4042.$GPLP.LOAD' is the load module to be created.

3.2 JCL for plotting a spatial distribution

This example is for plotting a spatial distribution by using the SDPLOT and GPLP load modules created above.

```
//       EXEC PGM=TEMPNAME,COND=(4,LT),PARM='FLIB(ERRCUT=0)',
//SUBSYS      DD  SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//STEPLIB     DD  DSN=J4042.$SDPLOT.LOAD,DISP=SHR
//FT01F001    DD  DSN=&&SPLEDIT,
              UNIT=TSSWK,SPACE=(TRK,(50,10),RLSE),DISP=(NEW,PASS),
              DCB=(DSORG=PS)
//FT02F001    DD  DSN=&&WORK1,
              UNIT=TSSWK,SPACE=(TRK,(50,10),RLSE),DISP=(NEW,PASS)
              DCB=(DSORG=PS)
//FT03F001    DD  DSN=&&WORK2,
              UNIT=TSSWK,SPACE=(TRK,(50,10),RLSE),DISP=(NEW,PASS)
              DCB=(DSORG=PS)
//FT05F001    DD  DDNAME=SYSIN
//FT06F001    DD  SYSOUT=*,
//            DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//FT10F001    DD  DSN=&&GPLPD,
              UNIT=TSSWK,SPACE=(TRK,(50,10),RLSE),DISP=(NEW,PASS)
              DCB=(LRECL=80,BLKSIZE=3200,RECFM=FB,DSORG=PS)
//FT11F001    DD DISP=SHR,DSN=J4042.OUTSPL.DATA
//SYSIN DD *
HEAD 0 0 2 2 1
REPT 2 5 0.0 9R50.
FT SAMPLE PROBLEM 1 (EVAPORATION 20MESH): VOID PROFILE
YT VOID FRACTION
LINE 1 0 0 0.0 2.4 0.0 1.0 0
LC 11 0.0 20 0 0
XD 0.06095 19R0.1219
YD ALP 01,1 ALP 01,19R1
```

```
REND
  1
/*
//       EXEC PGM=TEMPNAME,COND=(4,LT),PARM='FLIB(ERRCUT=0)',
//SUBSYS      DD  SUBSYS=(VPCS,'SIZE=(00000K,00M)')
//STEPLIB     DD  DSN=J4042.$GPLP.LOAD,DISP=SHR
//FT04F001    DD  DSN=&&GPLP1,
              UNIT=TSSWK,SPACE=(TRK,(50,10),RLSE),DISP=(NEW,PASS),
              DCB=(DSORG=PS)
//FT05F001    DD  DSN=&&GPLPD,DISP=(OLD,PASS)
//FT06F001    DD  DUMMY
//FT10F001    DD  DSN=&&GPLP2,
              UNIT=TSSWK,SPACE=(TRK,(50,10),RLSE),DISP=(NEW,PASS)
              DCB=(DSORG=PS)
//GDFILE      DD  SYSOUT=G,OUTLIM=0
```

In the above JCL, 'J4042.$SDPLOT.LOAD' and 'J4042.$GPLP.LOAD' are the load modules for plotting a time transient. '4042.OUTSPL.DATA' is the converted file. The input data after JCL is the same as listed in Section 4.3.