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Double Blind Post-Test Prediction for LOBI-MOD2 Small Break Experiment A2-81 Using RELAP5/MOD1/19 Computer Code as Contribution to International CSNI-Standardproblem No. 18

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ABSTRACT

The first small break experiment A2-81 performed in the LOBI-MOD2 test facility was the base of the 18th international CSNI standard problem (ISP 18). Taking part in this exercise, a blind post-test prediction was performed using the light water reactor transient analysis code RELAP5/MOD1. This paper describes the input model preparation and summarizes the findings of the pre-calculation comparing the calculational results with the experimental data. The results show that there was a good agreement between prediction and experiment in the initial stage (up to 250 sec) of the transient and an adequate prediction of the global behaviour (thermal response of the core), which is important for safety related considerations. However, the prediction confirmed some deficiencies of the models in the code concerning vertical and horizontal stratification resulting in a high break mass flow and an erroneous distribution of mass over the primary loops.

Doppeltblinde Posttest-Vorausrechnung des LOBI-MOD2 Kleinleck-Experimentes A2-81 mit Hilfe des Rechenprogramms RELAP5/MOD1/19 als Beitrag zum internationalen CSNI-Standardproblems Nr. 18

ZUSAMMENFASSUNG

Das erste Kleinleck-Experiment A2-81, welches an der LOBI-MOD2 Versuchsanlage gefahren wurde, war die Basis des 18-ten internationalen CSNI-Standardproblems (ISP18). Hierfür wurde eine blinde Vorhersage nach Versuch mit Hilfe des Leichtwasserreaktor-Transientenanalyse-Programms RELAP5/MOD1 durchgeführt. Dieses Papier beschreibt die Erstellung des Eingabemodells und faßt die Befunde der Vorausrechnung zusammen, indem die Rechenergebnisse mit den experimentellen Daten verglichen werden. Die Ergebnisse zeigen eine gute Übereinstimmung zwischen Vorhersage und Experiment in der Anfangsphase (bis 250 s) der Transiente und eine noch genügende Vorhersage des globalen Verhaltens (thermische Reaktion des Kerns), welches bedeutsam ist für sicherheitsbezogene Betrachtungen. Allerdings erhärtete die Vorhersage einige Modellschwächen des Programms hinsichtlich vertikaler und horizontaler Schichtung, die sich in einem zu hohen Leckmassenstrom und einer unrichtigen Massenverteilung über die Primärkreise auswirkte.

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1. INTRODUCTION

Since the occurrence of the TMI accident in 1979, the emphasis in light water reactor safety experiments such as Semiscale, LOFT and LOBI have shifted from large break loss-of-coolant experiments (LOCE) to consideration of small break LOCE phenomena. Several OECD member states showed their keen interest in the analysis of small break loss-of-coolant accidents. Based on their request the "OECD-CSNI Principal Working Group No. 2 on Transient and Breaks" during its meeting in October 1982, proposed one of the LOBI-MOD2 small break tests for the International Standard Problem No. 18 (ISP18). This proposal was approved by the CSNI during its plenary meeting in November 1982.

The objective of ISP18 was to perform LWR safety system computer code calculations for the post-test prediction of the results from a small break LOBI-MOD2 integral system loss-of-coolant experiment. The LOBI-MOD2 test facility is a 1:712 scaled model of a 1300 MWe pressurized water reactor of the KWU type.

The LOBI test A2-81 a 1 % cold leg break test, proposed for ISP18 was successfully performed in September 1984. The LOBI project is being executed in the Euratom Joint Research Centre, Ispra Establishment, Italy, in the framework of an R&D contract between the Commission of the European Communities, Brussels, Belgium and the Bundesminister für Forschung und Technologie, Bonn, F. R. Germany.

Using one of the first tests with the new LOBI-MOD2 facility for the ISP18 offered a rare opportunity to perform a "double-blind" exercise. For this purpose, not only the results of ISP18 test, but also the results of all LOBI-MOD2 tests preceding it, were withheld until after the completion of the prediction calculations. As a consequence, no particular code adaptation to the specific transient behaviour characteristics of the test facility could be performed by the ISP18 participants for this prediction calculation, which made ISP18 a "double-blind" exercise.

In order to further increase the challenge to the participants, the participants were provided with the original design drawings of the test facility components and systems instead of appropriately prepared excerpts

from those drawings. As a consequence, it was up to the code user to make his own excerpts as he considered most appropriate for the purpose of preparing the nodalization of the test facility and the input data set for the code calculations.

A total of 26 participants from 12 different countries took part in this exercise. 9 different computer codes were used for ISP18 predictions. The various participants used not only different codes, but even different versions of the same code. Table 1.1 shows the list of participants along with the code and computer facility used by them. The Karlsruhe Nuclear Research Centre as one of the participants completed in time the post-test prediction of the experiment using the RELAP5/MOD1/19 computer code. As proposed for ISP18, a total of 53 parameters of interest were predicted and results sent to LOBI project on transmittal tape in desired format.

This report describes the input model for RELAP5 used for ISP18 prediction and the steady state calculations and discusses the prediction results in comparison with experimental data. Furthermore, a summary of the LOBI-MOD2 facility description and a complete listing of input data cards are included.

2. FACILITY CONFIGURATION AND TEST SPECIFICATION

2.1 LOBI-MOD2 Test Facility

The LOBI facility /0/ is a high pressure integral system blowdown-refill test facility designed, constructed and operated in the Joint Research Centre of the European Communities, Ispra Establishment. It was commissioned in December 1979 and was operated until June 1982 in the MOD1 configuration. It was then extensively modified to accommodate new program requirements leading to the present MOD2 configuration.

Only a short description of the LOBI facility is given here. More details of the test facility are provided in Appendix A and can be found of course in the original LOBI publications /0/ to /15/.

The LOBI two loop test facility simulates the cooling system of a four loop 1300 MW(e) PWR of the Kraftwerk-Union design. One test loop, having three times the capacity in water volume and mass flow of the other, represents the three intact reactor loops. Pipe rupture of different sizes can be simulated at different locations within the broken loop.

Emergency core cooling water may be supplied by the high pressure injection system and the intermediate pressure accumulator injection. Provisions are made for cold leg or combined cold and hot leg ECC injection into both primary loops.

The power input, the primary circuit coolant mass flow and volume are scaled down from the reactor values by a factor of 712, leading to a 5.3 MW heating power and 28 kg/s core mass flow. All other most relevant quantities such as operating temperature, pressure and pressure drops along the flow paths have been maintained as closely as technically possible equal to the value of the reference plant. Also, the absolute heights and relative elevations of the individual system components have been kept at reactor values thus preserving the gravitational heads.

Both primary loops are active loops, each containing a main coolant pump and a steam generator (coolant mass flow rates are 21 kg/s and 7 kg/s for the intact and broken loop respectively resulting in 28 kg/s core mass

flow). An active secondary loop system contains two condensers simulating the reactor turbines, a cooler, the feedwater pump, and the auxiliary feedwater system. The normal operating conditions of the secondary cooling system are approximately 210 degree C feedwater temperature and 54 bar pressure (mass flow rates are 2.0 kg/s and 0.67 kg/s for the intact and broken loop respectively).

The MOD2 steam generators are designed especially to meet the requirements of small break tests and of special transients experiments. They contain major components such as inverted U-tubes, an annular downcomer and coarse and fine separators to model the geometry of the reference plant. The intact and broken loop steam generators contain 24 and 8 U-tubes respectively with corresponding 3.96 MW and 1.32 MW heat exchange power.

2.2 Test Configuration

For the small break test, designated as A2-81, the break position was located in the cold leg between main coolant pump and pressure vessel inlet. To simulate a 1 % break (equivalent to about 50 sq. cm rupture in the main coolant loop of the reference PWR), a break orifice of 3 mm dia was used. The break device installed at LOBI test facility consisted of a T-shaped insert connected across the main coolant pipe at the break location, a break orifice, a quick opening valve installed downstream of the break orifice and a discharge line which was heavily instrumented to provide the required information (e.g. density, velocity, etc.) for break flow calculations. The break was initiated by a quick opening, ball-type, valve flanged to the break insert on one side and to the discharge line on the other side.

In this test, the high pressure injection system was connected to intact loop cold leg simulating 2 out of 4 HPIS pumps. No accumulator was used. The pump seal water was continuously drained from upper plenum up to initiation of break. Thereafter the draining system was isolated. A pump locked rotor resistance in the broken loop was simulated by orifice plates inserted in a two-way valve located at the discharge side of the pump. The geometrical configuration for test A2-81 is shown in Fig. 2.1.

2.3 Initial Conditions

The test A2-81 was started from normal operation conditions. The initial conditions for the test were specified as follows /4/:

Primary side:

15.8 MPa	- pressure in the upper plenum
21.0/7.0 kg/	- coolant mass flow rates for the intact and broken loop respectively
294.0 C	- coolant temperature at the vessel inlet for the intact and broken loop respectively
5.28 MW	- core power
4.8 m	- collapsed liquid level in the pressurizer
346 C	- temperature of the pressurizer

Secondary side:

6.45 MPa	- pressure in the steam dome of both steam generators
2.0/0.67 kg/s	- feedwater mass flow rates for the intact and broken loop steam generator respectively
210 C	- feedwater temperature for both steam generators
3.6	- recirculation ratio (mass flow in downcomer / feedwater mass flow) for the intact and broken loop respectively

The instant of break opening start defined the test time "zero". The boundary conditions of the test were given by the sequence of events (see Table 2.1), and as functions of time

- the power drop, simulating the decay heat of the nuclear core (Table 2.2),
- the pump coast-down of the main coolant pumps (Table 2.3),
- the secondary pressure drop starting from 83 MPa according to the cooling down rate of 100 K/h.

Furthermore, as a function of primary pressure

- the mass flow of high pressure injection system (Table 2.4).

3. RELAP5 INPUT MODEL

3.1 RELAP5/MOD1 Computer Code

The light water reactor safety analysis computer code RELAP5/MOD1 is based on a one-dimensional, two-fluid, nonequilibrium hydrodynamic model. The major simplification of the two-phase flow model assumes the least massive phase within a control volume to be at saturation, which would be the case if that phase were just appearing or disappearing. This assumption allows the use of one overall energy equation. The overall energy equation contains a source term which couples the hydrodynamic model to the heat conduction model by convective heat transfer boundary conditions. The code contains special process models for choking, abrupt area changes, branching, pumps, accumulators, valves, annuli, and steam separators.

The code uses a one-dimensional finite difference formulation for both fluid path and heat path modelling. In the code, fluid paths are divided into a series of central control volumes connected by junctions. Mass and energy conservation relations are used over the central control volumes. The vector quantities such as liquid and vapor velocity are evaluated at the junctions or boundaries of the central control volumes. This discrete model is used to build up flow paths representative of the physical flow paths.

Heat conductors are divided axially into heat structures representative of the physical conductor geometry. Heat structures are then radially subdivided into mesh intervals according to the resolution required for the solution. The model uses a generalized one-dimensional conduction solution. The boundaries of the conductors can be adiabatic or coupled through convective heat transfer correlations to control volumes.

A comprehensive description of the computational models in the code and the input requirements as well as a users guide and checkout problems are included in the three volumes code manual /19,20,21/.

For the ISP18 prediction an IBM-version of cycle 19 of RELAP5/MOD1 was used. The IBM-version originated from a FACOM-version of RELAP5/MOD1 (cycle 1), which was introduced to KfK from the Japan Atomic Energy

Research Institute (JAERI) in 1982. Cycle 19 has been achieved as an update work consisting of conversion and application of the original update cards supplied by the code developers for the CYBER-176 version of RELAP5. More details of the code conversion work to IBM can be found in /28,29/.

3.2 General of Nodalization

A layout of the nodalization scheme for LOBI-MOD2 used for the ISP18 prediction is shown in Figure 3.1, on which the various component numbers are identified and the relative elevations approximately are maintained. The nodalization was based on the geometrical data compiled in Table 3.1, which were developed from as-built blueprints enclosed in /1/. The node numbers in columns 2A/2B of Table 3.1 refer to the schematic view of the facility in Figures 3.2 to 3.6, which are simplified excerpts from the as-built drawings. The volume-related and junction-related data of the nodalization can be found in Tables 3.2 and 3.3, which detail the correspondence between the nodalization and the geometrical setting-up of Table 3.1.

The input data were organized in several groups according to component numbers:

100 series: Reactor pressure vessel model (RPVM) and upper head simulator (UHS)
200 series: Intact loop pipework (IL) and main coolant pump (MCP)
300 series: Broken loop pipework (BL), main coolant pump, and break assembly
400 series: Pressurizer with surge line
500 series: Secondary side of steam generator of intact loop (SG I)
600 series: Secondary side of steam generator of steam generator of broken loop (SG II)
700 series: Steam line with steam header
800 series: Injection and drainage systems of primary loops

The model consisted of 263 volumes, 272 junctions, and 297 heat structures. The nodalization was straightforward, however as close as possible

to the geometrical configuration of the facility. Through this detailed nodalization we hoped to ensure reliable results, without being forced to perform lengthy sensitivity studies required to validate coarser nodalizations.

Because of the influence of environmental heat losses and structural heat exchange on slow transients, a rather large number of heat structures have been included in the input model.

RELAP5 trip logic and control variables were used extensively to simulate the required boundary conditions, and to achieve by the help of special controllers the specified initial conditions.

A complete listing of the input data deck is enclosed (Appendix B).

3.3 Modelling of Reactor Pressure Vessel Model

The reactor pressure vessel model (RPVM) together with the upper head simulator (UHS) was modelled with 49 volumes and 67 heat structures as shown in Fig. 3.7.

The downcomer upper inlet annulus, represented by a branch (#100), connects to the downcomer, modelled as an annulus (#110) with 12 stacked volumes. The lower plenum was represented by a branch (#120) and connects to a single volume (#130), which describes the lower part of the core inlet box. The upper part of the core inlet box, modelled by a branch (#140), connects to the core, modelled by a pipe comprising 8 stacked volumes (#150). The upper plenum was modelled in three parts. The lower is a branch (#170) connected to the core channel, and the middle is a pipe with three volumes (#180) reaching the elevation of the centerline of the hot legs. The uppermost part is a branch (#190) with junctions to the outlet nozzles of the loop pipework.

In Fig. 3.8 the various core bypass flow paths are identified with 1 to 5. The 1.5 mm gap between the inner surface of the core barrel and the ceramics filler segments was modelled by a pipe with 6 stacked volumes (1). The two 5 mm dia holes in the core barrel in the upper section of the

vessel (3) were represented by a junction connecting the top of the inlet annular (#100) and the top of the upper plenum (#190). The hot leg nozzle clearance gaps were represented by two junctions (4 & 5) connecting the inlet annulus (#100) with the hot legs (#200, #300). The bypass flow paths through the upper head simulator(2) were modelled as follows.

The upper head vessel, modelled with 4 stacked pipe volumes, connects through a pipe component with two volumes (#195) to the upper plenum. It also connects upstream of the shut-off valve, represented by a motor valve (#197), through two single volumes (#193 and #192) to the downcomer upper annulus. The tube between the shut-off valve and top of the vessel was represented by a pipe component comprising 6 volumes (#194).

The electrically heated tube bundle was modelled by 8 heat structures representing the 5-step axial power profile shown in Fig. 3.9. Additional 8 heat slabs were included to represent the upper and lower extensions of the heater rod bundle outside the core section, which produce 13.6 % of the total power.

To account for the mass of metal and ceramics in RPVM and UHS further 51 heat structures have been included for the pressure vessel, the ceramics filler blocks, the core barrel, the lower and upper current connection plates, the UHS vessel, and the tubing walls. To model properly the honeycomb structure of the core barrel a pseudo-material was introduced. The number of nodes in the heat structures varied from 3 to 10.

3.4 Nodalization of Loops

17 volumes were used to represent the intact loop piping with pump, and 24 volumes for the broken loop including pump and break assembly. The pressurizer system was modelled by 12 volumes for the vessel and 13 for the surge line.

The single-phase homologeous head and torque curves for the primary system coolant pumps, which are identical for both loops, and difference curves were taken from the LOBI-furnished data /14,15/ as well as the two-phase multiplier /5/. The locked rotor simulators in resistance position were

modelled by replacing the pump components by branch components (#250, #350) after the pumps have reached zero speed. The branch assumes smooth area change junctions with form loss coefficients of 20.0 for IL, and 55.0 for BL on each side, to account for the pump resistance and additionally the reduction of flow area to approximately 20 % due to orifice plates in the simulator of broken loop.

The break assembly was originally modelled by two junctions connecting the discharge volume to the volumes downstream and upstream of the break. Each junction was assigned one-half the total break flow area. A third junction with a flow area equal to that of the broken loop piping connected the upstream and downstream volumes, modelling the communicative nature of the break assembly. A motor valve, opening to full open position within 4 seconds as specified, connected the discharge volume to a time-dependent volume representing the boundary. This nodalization is identified by A in Figure 3.10. During steady state calculations nodalization A caused troubles due to heavy flow oscillations and unphysical conditions in the discharge volume. Therefore we used a simplified modelling identified by nodalization B in Figure 3.10. The only difference between the two nodalizations is that in nodalization B the break orifice is modelled by one junction having the full orifice flow area and connecting the volume downstream the break to the discharge volume. The discharge coefficients applied to the critical flow model at the break were chosen to be 1.0 for both, the discharge of subcooled water and two-phase mixture.

3.5 Steam Generator Nodalization

The steam generator nodalizations are shown in Figures 3.11 and 3.12. 32 volumes were used for the primary side lumping together all the U-tubes into a single flow path. 32 volumes also were used for the secondary side with a somewhat artificial nodalization in the upper riser and separator region. To model phase separation a separator component was used with junction assignments as recommended in /25/. Besides the 22 heat slabs modelling the U-tubes further 44 heat structures representing the tube sheet, the shroud, the filler tube, the separator housing, and the external wall are included in the model. The steam line connecting both steam generators and the steam header were modelled by 10 volumes.

3.6 System boundary

11 time-dependent volumes defined the boundary of the model representing the containment, main feedwater, condenser, pump seal water, seal water drainage, high pressure injection system (HPIS), atmosphere, and pressurizer.

The High Pressure Injection System (HPIS) was modelled by a time-dependent junction connected to the cold leg in the intact loop. The time-dependent junction used the upper plenum pressure as the independent search variable to model the flow versus pressure curve given earlier in Table 2.3.

The pump seal water injections into the main coolant pumps were modelled by time-dependent junctions connected to the discharge volumes of the pumps (#255, #355). The time-dependent junction used the primary pressure as the independent search variable to model the flow versus pressure curve given in Tab. 4.7. A time-dependent junction (#835) connects the upper plenum volume to a time-dependent volume (#840) to compensate for the pump seal water injection flow during steady state operation.

4. INITIALIZATION OF THE PROBLEM

4.1 General

The initial conditions for the test A2-81 were the normal operation conditions as for the reference plant. Specific RELAP5 calculations were performed to match these initial conditions, the measured pressure drops, environmental heat losses and bypass mass flows being a part of it. To achieve steady state conditions several "controllers" were used. They are not controllers in the sense of control theory; they are merely methods to control the values of specified parameters with the help of the RELAP5 control system capability.

First the initialization calculations were performed for the main components of the LOBI-MOD2 test facility separately, namely reactor pressure vessel model, the intact loop and broken loop steam generators. Subsequently, the intact loop and broken loop with main coolant pumps including steam generators and finally the complete system were initialized. It proved rather difficult to match simultaneously the primary and secondary side initial conditions. Because of lack of experience with RELAP5, a substantial effort was required to get the desired initial conditions measured during the test.

4.2 Pressure Differentials

In RELAP5 code, the pressure drop due to wall friction effects are computed from pipe roughness and hydraulic diameter data entered as input for each volume. These wall friction losses contribute significantly to system pressure drops.

Another significant contributor to the system pressure drops is the loss associated with pipe elbows, bends, obstructions (due to measurement inserts for instance) etc. The form loss coefficient is defined by the ratio of pressure drop (due to form loss) to the dynamic pressure in the flow area considered:

$$K = \Delta P / (\frac{\rho}{2} |v|^2)$$ v: average velocity, ρ: average fluid density

We estimated these form losses carefully from /16/ based on the geometrical shape information given in the as-built drawings of the test facility. We usually divided the estimated loss coefficients equally to the nearest two junctions.

The final portion of system drop is due to area changes (e.g. expansion, contractions, orifices etc.). Besides hydraulic diameter, roughness and user-input loss coefficient, any change in flow area are modelled explicitly by using the option for abrupt area change model. The code then automatically calculates additional form losses in the direction of flow at these junctions using expansion and contraction formulas. Changes in piping sizes are usually modelled as abrupt area changes if the change occurs over a relatively short distances. For example, we have used abrupt area change model at steam generator plena and U-tubes. Another example where we have used the option of abrupt area change model is at the junctions between the vessel and the hot and cold legs.

The abrupt area change model mentioned above has been reported /25/ to cause unphysical behaviour under two phase flow conditions for large contraction/expansion ratios (throat ratios of the order of 0.01 or smaller) and also for branched flows where large differences in the flow area are involved. The symptoms of this trouble are flow oscillations and/or excessive pressure drop across the junction. These problems have most often been experienced in the modelling of leak paths where the flows are small, but merge with large flows in branch volume. An example is the leakage from the downcomer to the hot legs fo the LOBI test facility. The recommended approach for such cases is to use the smooth option for the junction and let the junction area default (the minimum area of the adjoining volume areas). With this specification it is necessary to enter user inputted form loss coefficient to give the proper flow rate and pressure drop relationship. The user inputted loss factor in terms of the nominal pressure drop ΔP, fluid density ρ, junction area A, and nominal mass flow rate $\dot{m}$ is:

$$K = \Delta P/(\dot{m}^2/2\rho A^2)$$

The value computed for K in this way has been found to be very large because the reference area is much larger than the actual flow area. To

simulate the bypass flows between the downcomer and hot legs in LOBI facility, we have used the above recommended approach and found no problems like flow oscillations etc.

We attempted to model all the flow area changes and local flow resistances very carefully. However, during steady state calculations at many locations the numbers have been adjusted in order to achieve the measured pressure drops.

In spite of careful estimation of form losses, as mentioned before, it was not possible to match the measured pressure drops in all flow paths. Thus we had to adjust these form loss coefficients and in some cases the values for hydraulic diameter and roughness to get the measured pressure drops. After substantial effort, we were able to achieve reasonable values for pressure drops. Tables 4.1 through 4.3 show the measured and calculated pressure drops for the reactor pressure vessel model and for intact/broken loop including the primary side of steam generators. In Figures 4.1 to 4.4 the various measurement locations and sections are shown.

On the steam generator secondary side, we tried hard to match simultaneously the pressure differentials and recirculation ratio (mass flow rate of downcomer / mass flow rate of feedwater). We were unsuccessful in getting measured recirculation ratio for the two steam generators properly. Our calculated recirculation ratio is 7.2 and 7.1 for the intact loop and broken loop steam generator respectively. The corresponding measured recirculation ratio is 6.5 and 4.5. The secondary side measured and calculated pressure differentials at different locations is shown in Table 4.8. As may be seen from this table, it was not possible to match all pressure differentials on the secondary side exactly.

4.3 Environmental Heat Loss

For long transients such as in small break tests, the environmental heat loss is quite important. The heat losses for the LOBI test facility were determined by heat loss tests and the results were documented and supplied to all participants /3/. The data provided to us were mostly based on estimates with a high degree of uncertainty in measurements and in the assump-

tions in calculating the conduction losses. Due to the importance of environmental heat losses, we tried to match the heat losses for the complete system by adjusting the heat transfer coefficients with the assumed boundary temperature of transfer coefficients with the assumed boundary temperature of 22 degree C. Table 4.4 shows the measured/estimated and calculated heat losses of the complete system. As may be seen from this table, our calculated heat loss is in good agreement with data. Estimates of heat losses provided by LOBI /32/ after the prediction calculation were different from the values given in /3/.

4.4 Bypass Flow Rates

Specific measurements were undertaken merely for an estimation of the bypass flows through the two 5 mm diameter holes and the hot leg nozzle clearance gaps in downcomer. Based on these measurements, which were performed with air at nearly atmospheric pressure, this bypass portion was estimated to be 2.4 to 3.7 % of nominal total mass flow of 28 kg/s. For the other bypass flow paths no estimates were available. Therefore the assumptions on additional bypass flows were somewhat uncertain. Table 4.5 shows the final bypass flows assumed in the steady state calculation.

After completion of the prediction the LOBI-team provided some information on probable bypass flows. It was considered that random misalignments of the ceramics fillers in the core barrel probably had the effect of reducing any flow in the 1.5 mm gap in the core barrel to a negligible amount. Then it was stated that the penetration gaps through the hot nozzles into downcomer had a tendency to close during the transient. 1 % bypass flow was considered as a reasonable value for the bypass via upper head pipework after closing the shut off valve before starting the transient. Thus our calculated value of 9.5 % for total core bypass flow used in the prediction (steady state) seems to be too high.

4.5 Primary Side Steady State

A small number of standardized parameters are normally used to determine primary side steady state conditions. These variables may include:

- core power
- primary side pressure
- hot leg temperature(s)
- cold leg temperature(s)
- core ΔT
- core flow
- loop mass flow(s)
- bypass flows
- pressurizer level or inventory
- pump speed(s)

According to the ISP18 specifications, the following quantities were actually used:

- core power (power input of heater rod bundle)
- pressure in upper plenum
- vessel inlet temperature in both loops
- mass flow rates in both loops
- water level in pressurizer
- fluid temperature in pressurizer

4.5.1 Core Power

Because in the LOBI test facility, the power generated by an electrically heated tube bundle in RPVM is very well known and simple to input, we did not use the core power as an adjustable parameter. The power input was kept fixed as specified.

4.5.2 Pressure

The absolute value of primary pressure was controlled with the help of a liquid filled, time-dependent volume in place of the vapor region of the pressurizer. This time-dependent volume provides the pressurizer pressure and supplies or absorbs water from the primary system as needed. (However, this time-dependent volume has been replaced by the normal vapor volumes at the initiation of the transient). We experienced no difficulty in getting the measured value of absolute pressure at the upper plenum of reactor vessel model.

4.5.3 Mass Flow Rates

To achieve the actual mass flows in the intact and broken loop, the pump speed was controlled with an integral function of the offset from desired loop flow. This pump speed controller was of the form:

$$\text{new speed} = \text{initial speed} + \text{constant} * \int(\text{desired mass flow} - \text{actual mass flow})\, dt$$

The constant is an adjustable parameter chosen by trial and error to prevent the pump from overreacting to small system perturbations, but still allow convergence on the desired setpoint value in a reasonable length of time. The constant in our case has assumed the value of 20 and 60 for intact and broken loop respectively.

This pump speed controller worked smoothly and quickly. However, at the same time it was not possible to match exactly the pump speed measured during the test. Nevertheless, calculated values agreed very well with the measured pump speeds (Table 4.6).

4.5.4 Temperature

The absolute values of primary loop temperature is determined by the secondary side saturation temperature and by the temperature profile across the steam generator U-tube walls. Our first steady state calculations produced primary side temperatures that were significantly higher (5K) than specified (measured) values. These primary side temperatures were lowered somewhat by reducing the secondary side pressure from 6.54 MPa to 6.52 MPa.

However, the remaining discrepancy i.e. a high overall temperature difference between primary and secondary side was eliminated by increasing artificially the heat transfer area of the heat structure representing the steam generator tube bundle by approximately 10 % which is clearly unphysical. But the problem of matching primary and secondary side conditions simultaneously, encountered with RELAP5, is well known and has been addressed elsewhere /22/.

Regarding the temperature differentials between the hot and cold legs in both loops, there is small discrepancy which is probably within the experimental uncertainty (see Table 4.6).

4.6 Secondary Side Steady State

Just as in the primary system, discussed above, a small number of standardized parameters which are not all mutually independent normally determine secondary side steady state operating conditions. These variables may include:

- steam dome pressure
- saturation temperature
- feedwater temperature
- feedwater flow
- recirculation ratio
- liquid level
- liquid inventory

The variables we used for each steam generator included:

- steam dome pressure
- collapsed water level
- recirculation ratio
- feedwater flow
- feedwater temperature

We spent considerable time to get steady state and we were not able to satisfy all the specified conditions. The steady state controllers we have used for secondary side were:

- a steam flow controller to control the steam dome pressure; and
- a feedwater flow controller to control the liquid level/inventory

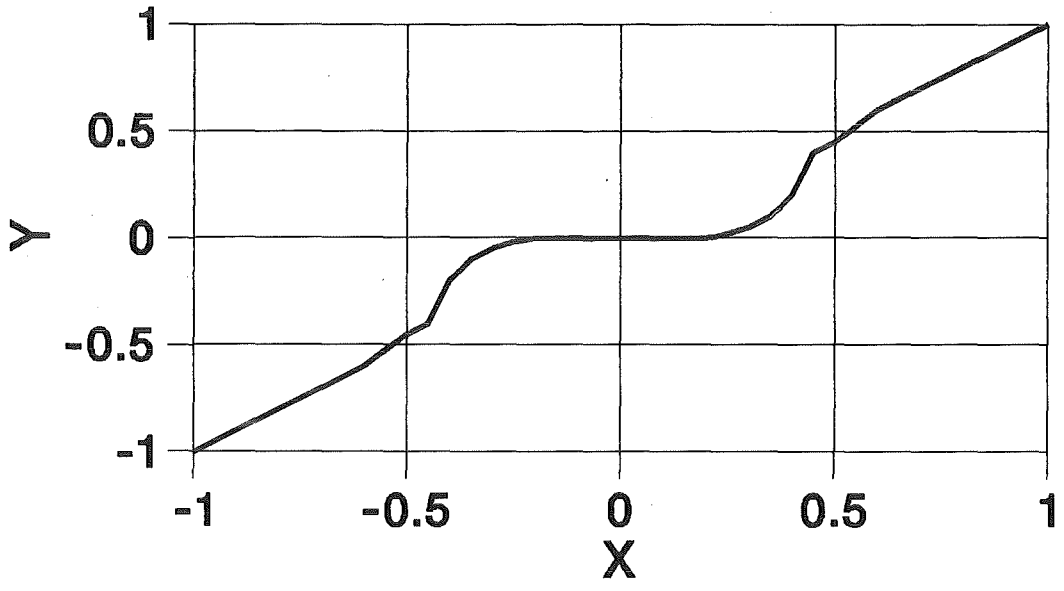
These two controllers helped us to control the values of specified parameters on the secondary side.

4.6.1 Secondary Pressure

As already mentioned, the secondary side pressure and associated saturation temperature directly determine the absolute value of the primary side temperature. The secondary side pressure may be controlled by adjusting the steam outflow, either by using a steam flow control valve or by connecting the steam dome to a large steam-filled time-dependent volume at the desired pressure and allowing the steam outlet junction mass flow to vary as required. We have used the latter controller for the two steam generators when initialized them separately as component and found this controller easy to use. However, we had to use the former controller when we tried to get steady state conditions for the complete system. This controller controls the stem position of the steam outlet valves (#705 & #715) according to the function (simplified):

stem position = init. val. + c1*f(ΔP)+c2* f(ΔP)dt

where ΔP is the deviation from desired steam pressure and f is a deadband function as shown in the Figure below:



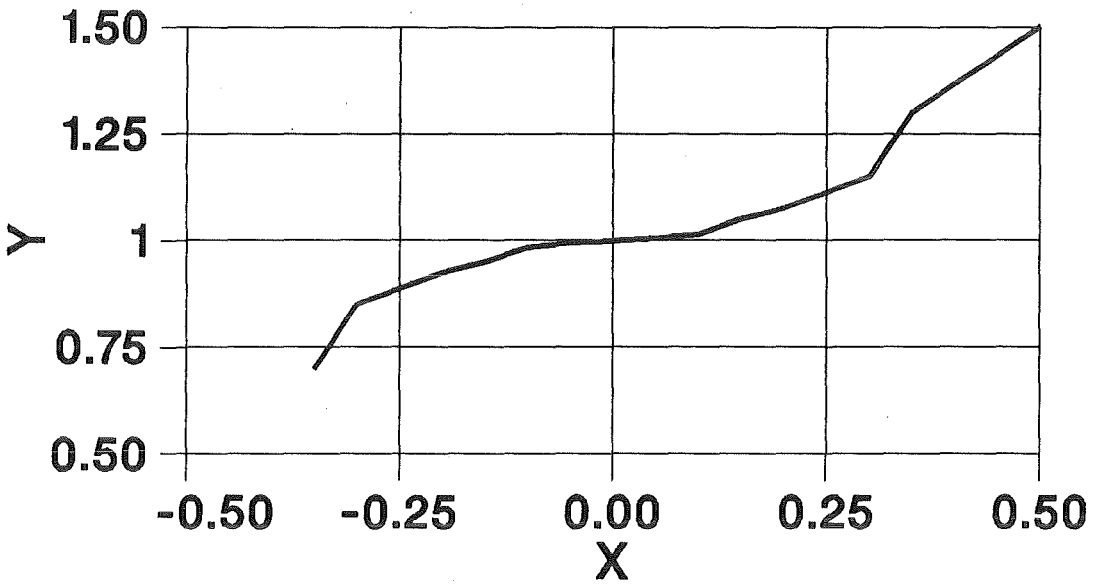
As constants the values c1 = 0.014 and c2 = 0.0015 have been chosen.

4.6.2 Liquid Level

The feedwater flow into the secondary side balances the steam outflow in normal steady state operation. In addition, during steady state the liquid level / liquid inventory remains constant. The liquid level/inventory can be increased or decreased by altering the feedwater flow relative to the steam outflow until the desired values are reached. In our steady state calculations, we have used a feed flow controller of the form:

$$\text{feed flow rate} = f(\Delta L) * \text{steam flow}$$

where f is an amplifier function as shown in the Figure below.



This controller worked very well to achieve the desired liquid level and hence the liquid inventory in the secondary side of steam generators. At the same time, however, it was not possible to match the measured feedwater mass flow / steam outflow in the steam generators. The result of the effort achieving the desired initial conditions of the test is documented in Table 4.8.

5. COMPARISON OF RESULTS

5.1 Performance of Calculation

The RELAP5-precalculation of the ISP18 transient was performed without major problems. The code applied an average time step size of 0.02 sec. Several times during calculation excessive errors occurred at minimum time step size (10^{-10} sec). However, the calculation proceeded in a reasonable way; so we abstained from any action (renodalization or reduction of minimum time step size). Another problem caused termination of the calculation due to temperature outside the range of a thermal property table. After a minor modification of the code we successfully restarted the problem at point of failure. After a prologue of 440 sec steady state the transient calculation was started with the renodalization of the pressurizer and deactivation of the steady state controllers. At the instant of zero speed of main coolant pumps the pump components were replaced by branch components (compare Table 5.1).

The ratio of computing time to problem time was 37 using the 15 MIPS machine Siemens 7890 (synonymous with FUJITSU FACOM M380). For this rather high consumption of computing time not only the fine nodalization was responsible but also the code itself. The used IBM-version of RELAP5 is at least three times slower than the original CDC-version because of downgraded speed efficiency due to code conversion from CDC- to IBM-compatibility.

For completeness all of the requested prediction quantities are presented in overlay plots compared with experimental data curves. However the discussion of results will be confined to the major points.

5.2 Thermal Response of the Core

To start with the most important question in small break investigations, as far as safety margins are concerned, is to ask, whether the core was covered or not. In the experiment the core remained covered, and the heater rod surface temperatures followed the fluid temperature, which were at saturation. The same behaviour was predicted by RELAP5 (see Figures 5.33 to 5.38).

The calculated saturation temperature was lower than in the experiment, since saturation pressure was predicted to be lower than data after 600 s (see section 5.3). In the calculation temporary dryout occurred in the uppermost section of the heater rods, which results from high void fraction in upper plenum (see section 5.5).

5.3 Depressurization in Primary System

Due to a slightly faster initial depressurization in the calculation as in the experiment (Figure 5.2a), the core heating power starts to drop and the HPIS starts to operate slightly earlier than in the test. However, after these events the calculated depressurization decreases slightly and results in excellent agreement with the primary system pressure measured during the test upto around 600 seconds into the transient. The code, therefore, calculated the timings of coastdown and stoppage of the main coolant pumps quite accurately. See Table 5.2 of chronology of significant events.

In the test the pressure in the primary system remained always above the pressure of the secondary system. After the initial phase of blowdown the primary pressure was controlled by the cooldown conditions (100 K/h) on the secondary side (see Figure 5.55). Up to about 600 seconds the RELAP5 calculation predicted the primary pressure very well, however after this time up to 1200 seconds into transient the code calculated a higher system depressurization rate as compared to data (Figures 5.1 & 5.2). The calculated primary system pressure dropped even below the secondary side pressure at about 850 transient time (Figure 5.56). The crossing of the pressure curves strongly affected the behaviour of the steam generators. From this instant on the steam generators changed from heat sinks to heat sources. In the case of broken loop steam generator this reversed behaviour led to a stagnant liquid level on secondary side (Fig. 5.47). After 1200 seconds transient time the calculated depressurization rate was in good agreement with data decreasing somewhat after 2500 seconds, and the calculated primary pressure remained approximately 5 bars below the data through the rest of the transient.

In the experiment the calculated lower pressure throughout the transient implies the end of test event (system pressure 10 bar) earlier than experiment (Table 5.1). The predicted HPIS flow is also higher as compared to data (Fig. 5.5) because of HPIS flow dependence on primary system pressure.

5.4 Primary Mass Inventory

The break mass flow (Fig. 5.57) is one of the key parameters of the prediction. Unfortunately just this quantity could not be compared with experimental data, because the flow measurement data in the discharge line did not represent an average flow velocity due to phase separation. In exchange for break flow data the LOBI team determined the mass inventory in the primary side on the base of density and differential pressure measurements /31/.

On the basis of Figure 5.58, which was taken from /31/, we have roughly estimated the total cumulative mass loss through the break in the test. We assumed average values of 0.012 kg/s, 0.013 kg/s, and 0.16 kg/s for net pump seal water flow in intact and broken loop as well as HPIS flow respectively, and gathered from Fig. 5.58 a mass inventory deficiency of approximately 122 kg at 4000 s. Hence follows a break mass loss of 862 kg upto 4000 s in the test. The prediction yielded an average break mass flow of 0.25 kg/s (Fig. 5.57) and hence a loss of 1000 kg, which is 16 % higher than the estimated value from experimental data. As can be seen from Fig. 5.58 the predicted mass inventory development in time considerably deviated from the experimentally obtained curves. The calculation overpredicted the break flow within the period from 300 sec to 900 sec, which led to an early mass inventory minimum of 175 kg at 900 sec against 250 kg at 2400 sec in the experiment.

With the LOBI two-beam γ-densitometer two different fluid densities in horizontal pipes were measured. The special beam geometry is illustrated in Fig. 5.61. The data identified by DIA were recorded using the diametrically penetrating beam and PER identifies the data obtained from the peripherically crossing beam.

Considering the beam geometry of the LOBI-MOD2 γ-densitometer (Fig. 5.60) from the two-beam fluid density data (Fig. 5.21) in measurement position 26 between vessel and break the assumption can be made that the flow in the cold leg became stratified early after the end of the forced convection period (120 s). After 250 s the leak was first uncovered. From this instant high quality steam was discharged through the break. In the calculation, on the other hand, strong density oscillations in this period indicated that the code did not recognize stratification. Therefore in the calculation a uniform two-phase mixture was discharged, leading to a larger mass loss after break uncovery than occurred in the experiment. Examination of the pressure responses in Figure 5.1 gives supporting evidence. The experiment showed a faster increase of depressurization rate starting at 100 seconds due to higher steam discharge. The calculation, on the other hand, showed an increase in depressurization rate from 750 up to 1200 seconds transient time corresponding to a temporary uncovery of the orifice during that period in the calculation.

5.5 Mass Distribution

There are several symptoms for an incorrect mass distribution in primary system predicted by the code, which can be derived from the plotted differential pressures and densities at different locations.

The U-tubes of the steam generator of intact loop were completely voided at about 1500 sec while the code calculated early (750 sec) complete voiding (Fig. 5.30). Similarly in steam generator II, the complete voiding occurred at about 2000 sec while the code calculated early (500 sec) complete voiding in the U-tubes (Fig. 5.31). Furthermore the differential pressure data indicate that both steam generators U-tubes started filling at about 3500 sec while the code predicted no refilling.

The hot leg densities for the two loops are shown in Figures 5.15 and 5.18. After 750 s in broken loop and 1000 s in the intact loop into transient time the code calculated completely draining of the hot legs and high densities in the cold legs (Fig. 5.17). The case is quite the reverse as the data show. Figure 5.29 indicates a calculated high vapor fraction in the upper plenum developing at a very early stage of the transient,

resulting in dryout or the heater rod surfaces at top levels above the heated section (Figure 5.37, 5.38), where still 8.4 % of total power is generated (compare Fig. 5.59).

A cause for the incorrectly calculated high densities in the cold legs especially in the broken loop might be a higher condensation rate of steam bypassed from the upper plenum to cold legs. The steam generated in the core and bypassed to upper downcomer was condensed to a large extent in inlet annulus.

Obviously in the calculation there was not enough steam flow via the broken loop cold leg directly to the break as in the experiment.

After the erroneously predicted loop seal clearance of the broken loop (Fig. 5.25 & 5.26) at 750 sec the steam accumulated in upper plenum could escape through hot leg of broken loop to the leak.

To understand why RELAP5 did not predict stratification in the cold leg of broken loop we consider Fig. 5.61, which is a schematic cross section of the vessel in the level of the hot and cold leg nozzles with identified azimutal locations of the bypass flow paths. One can imagine that the flow regime in the downcomer was two-dimensional and asymmetrical in nature. Subcooled water entering the downcomer via the cold leg of intact loop established a cold stream downward filling the downcomer with subcooled water (Fig. 5.14).

As can be seen from Fig. 5.61 the bypass connections to downcomer lay mainly on the broken loop side. Therefore it can be assumed that the amount of steam bypassed from upper plenum to upper downcomer and arrived at the cold leg nozzle of broken loop was rather high because of reduced mixing with subcooled water stemming from HPIS and consequently low condensation rate. Therefore a continual stratified flow was formed with steam flow area large enough to supply the leak with high quality steam.

In contrast to physical reality the modelling with RELAP5 was one-dimensional as illustrated in Fig. 3.8. The inlet annulus was represented by a single, vertical oriented volume (branch component #100). Considering the period after 250 s into the transient the mass flow in cold leg between

RPVM and Break was determined by the discharge rate through the break, which was 0.45 kg/s yielding a mass flux of 265 kg/m^2-s. Looking into the horizontal flow regime map (Fig. 5.62) RELAP5 marked the flow regime as bubbly or slug flow, in any case not as stratified flow.

As a consequence the corresponding modifications of the momentum equation and of the choked flow model to account for vapour pull through and entrainment under stratified flow conditions was not active. Thus subcooled water or a two-phase mixture flowed out through the leak interrupted by temporary steam escapes. Probably this was the main reason for high break mass flow in the period from 250 s to 850 s resulting in a significant deviation of the precalculated system behaviour from the experimental findings.

6. CONCLUSIONS

The participation in the double blind prediction ISP18 proved to be a very useful exercise for us. The understanding of computer simulation of small break transients and the experience in using the RELAP5 code have increased considerably.

The RELAP5 input model used for the prediction was based on a straightforward nodalization. The LOBI-MOD2 test facility geometry was modelled as closely as possible using a rather large number of control volumes and heat structures. The preparation of the input data set from the as-built drawings was very time consuming.

A substantial effort was needed in numerous steady state calculations to achieve acceptable initial conditions for the test. Various special controllers were used to bring it about. However we were not able to meet all the measured initial conditions simultaneously.

No specific major problems were encountered in performing the transient calculations, and with the handling of the code. However, excessive computer time was required to complete the ISP18 calculations.

The KfK prediction has predicted a covered core and corresponding heater rod surface temperatures following fluid saturation temperature throughout the transient similar as in experiment. In this respect, most important for safety related considerations, the prediction was acceptable. However, most of the local parameters like fluid densities were in good agreement with experimental data only up to 250 sec into the transient. Later on in the calculated transient the predicted mass distribution in the primary system drifted away from the experimental facts. Here and there the calculation just showed the opposite of the experimental behaviour.

The overall comparison of measured and predicted parameters clearly indicated that the code predicted a far too homogeneous system behaviour and that the gravity-dominated phase separation processes which are important in small break were not correctly modelled in the code. In most of the cases, the code has failed to predict properly the mass distribution during the transient.

There were several facts in the calculation which sharply contrasted with the experiment:

1) Drop of primary pressure below secondary pressure and resulting reversal of heat transfer in steam generators.

2) High break mass flow resulting in too low primary side mass inventory.

3) Complete draining of hot legs.

4) Clearance of broken loop seal.

5) Saturation conditions in pressure vessel downcomer and core entrance.

In our judgement all these discrepancies originated from the thermal-hydraulic phenomena in the upper region of the RPVM and cold leg nozzles, which RELAP5 could not properly conceive.

In the calculation the steam generated in the core section reached via various bypass flow paths the upper downcomer and was largely condensed there. The code was unable to develop a stable stratified flow in the broken loop cold leg between vessel and break with steam flow area large enough to supply the break orifice continuously with steam. As a consequence steam was accumulated in the upper plenum and could not escape before loop seal clearance of broken loop. As a consequence of the erroneously described flow regime upstream the leak the mass discharge was overpredicted.

To conclude, a one-dimensional modelling of an obvious two-dimensional flow behaviour in the downcomer was not adequate. The concerted acting of the following three special model features of RELAP5 was not satisfactory in the ISP18 prediction.

the flow regime maps, especially the limiting condition for stratified flow,

the condensation model, especially under phase separation and stratification conditions,

the choked flow model, especially under stratified flow conditions in front of the throat.

The above conclusions are supplemented by the fact that, for ISP18, LOBI Project has also found similar results when using the same, unmodified version of RELAP5 code with a different input deck than ours /30/.

On the other hand it cannot be ruled out that the model discrepancies of RELAP5, mentioned above, can be mitigated using a quasi two-dimensional nodalization (splitted downcomer) and/or by taking a hand in the models itself tuning some influential model parameters.

T A B L E S

Table 1.1: List of ISP18 Participants

COUNTRY	ORGANISATION	DIRECTORY DESCRIPTOR	CODE	ORIG. CODE	COMPUTER	POWER (MIPS)
Austria	IRS, Seibersdorf	IRSA	RELAP4/MOD6	no	IBM 3081	10
Canada	AECL, Whiteshell	AECL	ATHENA MOD0.1	no	VAX 11-750	0.7
Belgium	Univ. Louvain, Tractionel Brussels	LTB-	RELAP5/MOD1/19	yes	CYBER 176	15
Finland	TRC, Helsinki	TRCF	RELAP5/MOD2/36	yes	CYBER 173	2.0
France	CEA, Fontenay	CEAT	TRAC-PF1/MOD0/7	no	CRAY-XMP	30
	CEA, Grenoble	CEAC	CATHARE	yes	CRAY-XMP	30
	Framatome	FRAM	FRACAS		CRAY-XMP	30
Germany	GRS, Garching	GRS-	DRUFAN-M2A	yes	AMDAHL 470/V8	6.5
	KFK, Karlsruhe	KFK-	RELAP5/MOD1/19	yes	SIEMENS 7890	15
	Rhein. Westf. TÜV, IKE-Stuttgart	RWIK	RELAP5/MOD1/18	no	CRAY 1M	15
	TÜV Bayern, TÜV Hannover	TBYH	DRUFAN-M2	yes	AMDAHL 470/V8	6.5
	TÜV Nord-D, Baden, Stuttgart	TNBS	RELAP5/MOD1/18	no	CRAY 1M	15
	TÜV Rheinland	TRHL	DRUFAN-M2	yes	AMDAHL 470/V8	6.5
Italy	Università Pisa	PIS4	RELAP4/MOD6	yes	IBM 3081	10
	Università Pisa	PIS5	RELAP5/MOD1/19	no	IBM 3081	10
	Ansaldo-NIRA, Genova	NIRA	RELAP5/MOD1/19	yes	CYBER 170/845	5
Netherlands	ECN, Petten	ECN-	RELAP5/MOD2/21	yes	CYBER 855	8
Sweden	Studsvik, Nyköping	STUD	RELAP5/MOD2/36	yes	CYBER 180/835	3.8
Switzerland	EIR, Würenlingen	EIR-	RELAP5/MOD1/25	yes	CYBER 174	2.8

Table 1.1: List of ISP18 Participants (cont.)

COUNTRY	ORGANISATION	DIRECTORY DESCRIPTOR	CODE	ORIG. CODE	COMPUTER	POWER (MIPS)
United Kingdom	CEGB, Leatherhead	CEGB	RELAP5/MOD1/19	no	IBM 4341	1.2
	NII, Univ. Strathclyde	NII-	RELAP5/MOD1/19	yes	CDC 7600	15
	NNC, Whetstone	NNC-	NOTRUMP-ER	yes	CDC 7600	15
	UKAEA, Culcheth	UKC-	RELAP5/MOD1/19	no	CYBER 176	15
	UKAEA, Winfrith	UKW-	TRAC-PF1/MOD1	no	CRAY 1S	20
United States	INEL, Idaho Falls	INEL	RELAP5/MOD2/36	yes	CYBER 176	15
	LANL, Los Alamos	LANL	TRAC-PF1/MOD1	no		

Table 2.1 List of Most Important Trips/Events of LOBI-MOD2 Test A2-81 (ISP18)

No.	Time or Primary Pressure /other Trip Signal	Trip/Event
1	Sufficient time before time zero	Pressurizer cooling and pressurizer additional heating off (the loop is put in steady state conditions without both)
2	-240 sec	Start closure of shut-off valve in tube to top of upper head (closure time 8 sec)
3	-5 sec	Start closure of drain valve in upper plenum (closure time 8 sec)
4	0 sec	Normal pressurizer heating off
5	0 sec	Leak starts to open
6	4 sec	Leak is fully open
7	132 bar	Shut off valves in feed water lines and the shut-off valve in the steam line before the condenser starts to close (closure time 1.5 sec)
8	132 bar	Cooling down curve becomes active (at the rate of 100 K/hr)
9	132 bar + delay 0.5 s	Heating power starts to drop (Table 2.2)
10	117 bar + delay 35 s	HPIS starts (Table 2.4)
11	110 bar	Main coolant pumps (MCP) speed start to drop (Table 2.3)
12	Time at which MCP speed reaches zero	MCP speed zero
13	2 sec after 12	Mechanical brakes MCP in brake position
14	2 sec after 13	Locked rotor resistance simulator in broken loop in position "resistance"
15	10 bar	End of Test

Table 2.2 Heating Power of LOBI-MOD2 test A2-81 (ISP18)

After initiation of rupture, t=0 :
-power remains 100 % until power trip on low primary pressure (132 bar) , with a delay of 0.5 sec
-after this heating powers drop according to following

Trip time (sec)	Heating power (%)
0	100.0
1	90.0
2	73.0
3	65.0
5	51.0
7	40.0
9	32.0
13	20.0
15	16.1
16	15.0
17	14.0
18	13.0
20	12.0
24	10.0
30	8.0
40	6.5
68	4.8
110	4.0
170	3.5
270	2.8
470	2.3
870	2.0
1000	1.9
2000	1.6
4000	1.3
6000	1.1
10000	1.0

Table 2.3 Main Coolant Pump Speed for LOBI-MOD2 test A2-81 (ISP18)

After initiation of rupture, t=0
-speed for both pumps remains constant 100% until trip on low primary pressure (110 bar)
-thereafter both pumps coast down according to

Trip time (sec)	Normalized speed (%)
0	100
5	78
10	60
15	46
20	36
25	30
30	25
40	18
65	10
70	0

Table 2.4 HPIS Mass Flow as Function of Primary Pressure

Primary system Pressure (bar)	HPIS Flow [1] (kg/s)
117	0.0000
111	0.0218
101	0.0520
91	0.0770
81	0.0980
71	0.1164
61	0.1320
51	0.1470
41	0.1600
31	0.1720
21	0.1830
11	0.1920
1	0.2010

[1] corresponds to 2 out of 4 pumps,
temperature of HPIS water: 30° C

TABLE 3.1

GEOMETRICAL DATA FOR LOBI-MOD2 FACILITY
(DIMENSIONS IN m)

PIECE NO. 1	NODE NO. FROM 2A	TO 2B	DESCRIPTION 3	FLOW AREA ENTRY 4A	FLOW AREA EXIT 4B	FLOW LENGTH 5	VOLUME 6	ELEVATION ENTRY 7A	ELEVATION EXIT 7B	DIAMETER ENTRY 8A	DIAMETER EXIT 8B	DRAWING N COMMENTS 9
			PRIMARY COOLANT SYSTEM:									
			INTACT LOOP HOT LEG									
001	001	002	VESSEL OUTLET NOZZLE WITH ECC INJECTION POINT	0.004266		0.233	0.000994	+3.520		0.0737		440
002	002	003	MEASUREMENT INSERT 11H	0.004223		0.600	0.0025338	+3.520		0.0737		415 99% VOL.
003	003	004	HORIZ.PIPE BEND (30D,R=0.5) WITH SURGE LINE CONNECTION	0.004266		0.262	0.0011177	+3.520		0.0737		415
004	004	005	PIPE	0.004266		1.730	0.0073802	+3.520		0.0737		415
005	005	006	PIPE BEND(90D,R=.115)	0.004266		0.181	0.0007721	+3.520	+3.635	0.0737		415
006	006	007	MEASUREMENT INSERT 12V	0.004223		0.83	0.0035051	+3.635	+4.465	0.0737		373,415 99% VOL.
			STEAM GENERATOR I									
007	007	008	S.G.I INLET PIPE EXPANSION	0.004266	0.01088	0.082	0.0006010	+4.465	+4.547	0.0737	0.1177	373
008	008	009	S.G.I INLET PIPE	0.01088		1.334	0.0145139	+4.547	+5.881	0.1177		372,373, COMM.1,FIG
009	009	010	S.G.I INLET PIPE BEND (35D,R=0.4)	0.009852		0.244	0.0024039	+5.881	+6.1105	0.1120		372
010	010	011	S.G.I INLET CHAMBER			0.333	0.0095736	+6.1105	+6.415	0.112	0.156	372
011	011	012	S.G.I TUBE BUNDLE HOT SIDE (24 #)	0.007241		6.807	0.04929	+6.415	+13.222	0.0196		372
012	012	013	S.G.I TUBE BUNDLE TOP REGION	0.007241		0.5054	0.0036589	+13.222	+13.575	0.0196		372
013	013	014	S.G.I TUBE BUNDLE COLD SIDE	0.007241		6.807	0.04929	+13.215	+6.415	0.0196		372
014	014	015	S.G.I OUTLET CHAMBER			0.333	0.0095736	+6.415	+6.1105	0.156	0.112	372
015	015	016	S.G.I OUTLET PIPE BEND	0.009852		0.244	0.0024039	+6.1105	+5.881	0.1120		372
016	016	017	S.G.I OUTLET PIPE	0.01088		1.334	0.0145139	+5.881	+4.547	0.1177		372,373

TABLE 3.1 (CONTINUED) GEOMETRICAL DATA FOR LOBI-MOD2 FACILITY (DIMENSIONS IN m)

PIECE NO. 1	NODE NO. FROM 2A	TO 2B	DESCRIPTION 3	FLOW AREA ENTRY 4A	FLOW AREA EXIT 4B	FLOW LENGTH 5	VOLUME 6	ELEVATION ENTRY 7A	ELEVATION EXIT 7B	DIAMETER ENTRY 8A	DIAMETER EXIT 8B	DRAWING N COMMENTS 9
017	017	018	S.G.I OUTLET PIPE CONTRACTION	0.01088	0.004266	0.082	0.0006010	+4.547	+4.465	0.1177	0.0737	373
			INTACT LOOP COLD LEG									
018	018	019	MEASUREMENT INSERT 13V	0.004223		0.83	0.0035051	+4.465	+3.635	0.0737		373,415 99% VOL.
019	019	020	PIPE	0.004266		2.4125	0.0102917	+3.635	+1.120	0.0737		415
020	020	021	PIPE BEND(90D,R=0.115)	0.004266		0.1810	0.0007721	+1.120	+1.005	0.0737		415
021	021	022	PIPE	0.004266		0.6250	0.002666	+1.005		0.0737		415
022	022	023	PIPE BEND(90D,R=0.115)	0.004266		0.1810	0.0007721	+1.005	+1.120	0.0737		415
023	023	024	PIPE	0.004266		1.4310	0.0061046	+1.120	+2.551	0.0737		415
024	024	025	MEASUREMENT INSERT 14V WITH ADAPTOR	0.004223	0.003318	0.7690	0.0032201	+2.551	+3.320	0.0737	0.0650	415 99% VOL.
025	025	026	PUMP ONE	0.003318	0.003318	0.7142	0.00237	+3.320	+3.520	0.0650		415,COMM.1 (FIG.8)
026	026	027	MEASUREMENT INSERT 15H WITH ADAPTOR	0.003318	0.004223	0.7410	0.0031019	+3.520		0.0650	0.0737	415 99% VOL.
027	027	028	PIPE	0.004266		1.9670	0.0083912	+3.520		0.0737		415
028	028	029	HORIZ.BEND (48D24M,R=0.5) (ECC INJECTION POINT)	0.004266		0.4220	0.0018003	+3.520		0.0737		415
029	029	030	MEASUREMENT INSERT 16H	0.004223		0.6070	0.0025634	+3.520		0.0737		415 99% VOL.
			VESSEL SIMULATOR									
030	030	031	VESSEL INLET NOZZLE	0.004266		0.1660	0.0007082	+3.520		0.0737		415,440
031	031	032	INLET ANNULUS	0.011310		0.315	0.0035626	+3.520	+3.835	0.024		440
032	032A	041A	BYPASS BORES	0.000020				+3.835	+3.835	0.005		440
033	031	033	DOWNCOMER	0.011310		7.1170	0.08049	+3.520	-3.597	0.024		440

TABLE 3.1 (CONTINUED)

GEOMETRICAL DATA FOR LOBI-MOD2 FACILITY
(DIMENSIONS IN m)

PIECE NO. 1	NODE NO. FROM 2A	TO 2B	DESCRIPTION 3	FLOW AREA ENTRY 4A	FLOW AREA EXIT 4B	FLOW LENGTH 5	VOLUME 6	ELEVATION ENTRY 7A	ELEVATION EXIT 7B	DIAMETER ENTRY 8A	DIAMETER EXIT 8B	DRAWING N COMMENTS 9
034	033	034	LOWER PLENUM	0.06593		0.3730	0.0245926	-3.597	-3.970	0.3120		441
035	035	036	CORE BARREL TUBE UP TO CONNECTING PLATE	0.02946		0.5260	0.015614	-3.597	-3.063	0.1980		441
036	036	037	CORE BARREL TUBE UP TO HEATER RODS	0.02142		0.4760	0.0101122	-3.063	-2.595	0.1300		441
037	037	038	CORE	0.0081150		4.428	0.0359341	-2.595	+1.833	0.01347		441
038	037A	038A	CORE BYPASS	0.0009260		4.428	0.0041003	-2.595	+1.833	0.003		441
039	039	040	UPPER PLENUM LOWER VOLUME	0.025450		1.687	0.0557992	+1.833	+3.520	0.01347		441
040	040	041	UPPER PLENUM UPPER VOLUME	0.025450		0.315	0.0104189	+3.520	+3.835	0.01347		441
			UPPER HEAD SIMULATOR									
041	041	042	PIPING FROM UPPER PLENUM TO UPPER HEAD BOTTOM FLANGE	0.000314		1.5	0.000471	+3.835	+4.350	0.02		VOL.IV FIG.2,3,4
042	032	043	PIPING FROM INLET ANNULUS TO PIPING TEE	0.000314		0.8	0.000251	+3.835	+4.015	0.02		"
043	043	044	PIPING FROM TEE TO UPPER HEAD SIMULATOR WITH ORIFICE	0.000314		1.1	0.000220	+4.015	+4.350	0.02		"
044	043	045	PIPING FROM TEE TO UPPER HEAD WITH SHUT-OFF VALVE	0.000314		3.84	0.001178	+4.015	+7.056	0.02		"
045	044	045	UPPER HEAD SIMULATOR	0.011310		2.566	0.029021	+4.350	+7.056	0.120		460
			BROKEN LOOP HOT LEG									
051	051	052	VESSEL OUTLET NOZZLE WITH ECC INJECTION POINT	0.001669		0.208	0.0003472	+3.520		0.0461		440
052	052	053	MEASUREMENT INSERT 21H WITH SURGE LINE CONNECTION	0.001652		1.150	0.0019002	+3.520		0.0461		415 99% VOL.
053	053	054	HORIZ. PIPE BEND (75D,R=0.15)	0.001669		0.1964	0.0003278	+3.520		0.0461		415
054	054	055	PIPE	0.001669		0.5805	0.0009689	+3.520		0.0461		415

TABLE 3.1 (CONTINUED) GEOMETRICAL DATA FOR LOBI-MOD2 FACILITY
(DIMENSIONS IN m)

PIECE NO. 1	NODE NO. FROM 2A	NODE NO. TO 2B	DESCRIPTION 3	FLOW AREA ENTRY 4A	FLOW AREA EXIT 4B	FLOW LENGTH 5	VOLUME 6	ELEVATION ENTRY 7A	ELEVATION EXIT 7B	DIAMETER ENTRY 8A	DIAMETER EXIT 8B	DRAWING N COMMENTS 9
055	055	056	HORIZ. PIPE BEND (45D,R=0.15)	0.001669		0.1178	0.0001966	+3.520		0.0461		415
056	056	057	PIPE	0.001669		0.5008	0.0008358	+3.520		0.0461		415
057	057	058	PIPE BEND (90D,R=0.076)	0.001669		0.1194	0.0001993	0+3.52	0+3.596	0.0461		415
058	058	059	MEASUREMENT INSERT 22V	0.001652		0.8670	0.001423	+3.596	+4.4631	0.0461		370,415
			STEAM GENERATOR II									
059	059	060	S.G.II INLET PIPE EXPANSION	0.001669	0.003664	0.0415	0.0001078	+4.4631	+4.5045	0.0461	0.0683	99% VOL. 370,371
060	060	061	S.G.II INLET PIPE	0.003664		1.6045	0.0058789	+4.5045	+6.1095	0.0683		370
061	061	062	S.G.II INLET PIPE BEND (35D,R=0.242)	0.003675		0.148	0.0005439	+6.1090	+6.248	0.0684		370
062	062	063	S.G.II INLET CHAMBER			0.2160	0.0025784	+6.248	+6.4455	0.0684	0.102	370
063	063	064	S.G.II TUBE BUNDLE HOT SIDE	0.002414		6.831	0.016488	+6.4455	+13.277	0.0196		370
064	064	065	S.G.II TUBE BUNDLE (TOP REGION)	0.002414		0.483	0.001166	+13.277	+13.5755	0.0196		370
065	065	066	S.G.II TUBE BUNDLE COLD SIDE	0.002414		6.831	0.01646	+13.277	+6.4455	0.0196		370
066	066	067	S.G.II OUTLET CHAMBER			0.2165	0.0025784	+6.4455	+6.248	0.102	0.0684	370
067	067	068	S.G.II OUTLET PIPE BEND (35D,R=0.242)	0.00366		0.148	0.00061	+6.248	+6.1090	0.0684	0.0684	370
068	068	069	S.G.II OULET PIPE	0.00366		1.6045	0.00570	+6.1090	+4.5045	0.0684		370
069	069	070	S.G.II OUTLET PIPE CONTRACTION	0.00366	0.001652	0.0415	0.0001078	+4.5045	+4.4631	0.0684	0.0461	370,371

TABLE 3.1 (CONTINUED)

GEOMETRICAL DATA FOR LOBI-MOD2 FACILITY
(DIMENSIONS IN m)

PIECE NO. 1	NODE NO. FROM 2A	TO 2B	DESCRIPTION 3	FLOW AREA ENTRY 4A	FLOW AREA EXIT 4B	FLOW LENGTH 5	VOLUME 6	ELEVATION ENTRY 7A	ELEVATION EXIT 7B	DIAMETER ENTRY 8A	DIAMETER EXIT 8B	DRAWING N COMMENTS 9
			BROKEN LOOP COLD LEG									
070	070	071	MEASUREMENT INSERT 23V	0.001652		0.8670	0.0014323	+4.4631	+3.596	0.0461		370 99% VOL.
071	071	072	PIPE	0.001669		2.0040	0.0034248	+3.596	+1.544	0.0461		415
072	072	073	BEND(90D,R=0.076)	0.001669		0.1194	0.0001993	+1.544	+1.468	0.0461		415
073	073	074	PIPE	0.001669		0.7320	0.0012217	+1.468	+1.468	0.0461		415
074	074	075	BEND(90D,R=0.076)	0.001669		0.1194	0.0001993	+1.468	+1.544	0.0461		415
075	075	076	PIPE AND MEASUREMENT INSERT 24H WITH ADAPTOR	0.001652	0.003318	1.7280	0.002934	+1.544	+3.320	0.0461	0.0650	415 99% VOL.
076	076	077	PUMP TWO	0.003318		0.7142	0.00237	+3.320	+3.520	0.0650	0.0650	415,COMM.1 (FIG.8)
077	077	078	MEASUREMENT INSERT 25H WITH RESISTANCE SIMULATOR	0.003318	0.001652	1.2830	0.0021195	+3.520	+3.520	0.0650	0.0461	415 99% VOL.
078	078	079	PIPE BEND(90D,R=0.076)	0.001669		0.1194	0.0001993	+3.520	+3.520	0.0461		415
079	079	080	PIPE	0.001669		0.3580	0.0005975	+3.520	+3.520	0.0461		302,415
080	080	081	PIPE BEND(90D,R=0.076)	0.001669		0.1194	0.0001993	+3.520	+3.520	0.0461		302
081	081	082	LEAK ASSEMBLY	0.001669		0.4500	0.0007511	+3.520	+3.520	0.0461		302
082	082	083	PIPE BEND(30D,R=0.076)	0.001669		0.0398	0.000066	+3.520	+3.520	0.0461		302
083	083	084	MEASUREMENT INSERT 26H	0.001652		1.190	0.0019659	+3.520	+3.520	0.0461		415 99% VOL.
084	084	031	VESSEL INLET NOZZLE	0.001669		0.151	0.000252	+3.520	+3.520	0.0461		415
085	085	086	LEAK DISCHARGE LINE WITH MEASUREMENT INSERT 05H	0.001652		1.452		+3.52	+3.401	0.0461		433,434 99% VOL.

TABLE 3.1 (CONTINUED)

GEOMETRICAL DATA FOR LOBI-MOD2 FACILITY
(DIMENSIONS IN m)

PIECE NO. 1	NODE NO. FROM 2A	TO 2B	DESCRIPTION 3	FLOW AREA ENTRY 4A	FLOW AREA EXIT 4B	FLOW LENGTH 5	VOLUME 6	ELEVATION ENTRY 7A	ELEVATION EXIT 7B	DIAMETER ENTRY 8A	DIAMETER EXIT 8B	DRAWING N COMMENTS 9
			PRESSURIZATION SYSTEM									
090	090	092	SURGE LINE I.L. TO PIPING TEE	0.000137		2.7535	0.000377	+3.520	+1.020	0.0132		MINUT.,APP
091	091	092	SURGE LINE B.L. TO PIPING TEE	0.000137		5.196	0.000711	+3.520	+1.020	0.0132		MINUT.,APP
092	092	093	SURGE LINE FROM TEE TO PRESSURIZER	0.000137		4.2505	0.000582	+1.020	+3.790	0.0132		MINUT.,APP
093	093	094	PRESSURIZER VESSEL LOWER VOLUME	0.006346		0.790	0.0050131	+3.000	+3.790	0.0260		5521
094	094	095	PRESS.VESSEL VOLUME UP TO END OF HEATERS	0.008227		0.585	0.004813	+3.790	+4.375	0.032		5521
095	095	096	PRESS. VESSEL UPPER VOLUME	0.011962		6.355	0.0760237	+4.375	+10.730	0.124		5521
			SECONDARY COOLANT SYSTEM:									
			STEAM GENERATOR I (I.L.)									
100	100	101	FEEDWATER INLET ANNULUS	0.00275		2.0577	0.00565	+13.8565		0.0532		373
101	101	102A	DISTRIBUTION TUBES(32)	0.00161		0.2200	0.0003539	+13.8565	+13.907	0.008		373
102	102	103	DOWNCOMER NARROW REGION	0.01195		7.4020	0.088448	+6.505	+13.907	0.024		372
103	103	104	BOILER LOWER VOLUME	0.02946		6.720	0.19800	+6.505	+13.225	0.022		372
104	104	105	BOILER TUBE BEND REGION	0.049425		0.361	0.0178424	+13.225	+13.586	0.022		372
105	105	106	BOILER UP TO CONTRACTION	0.07116		0.562	0.0399919	+13.586	+14.148	0.301		372
106	106	107	TOP OF BOILER	0.07116	0.03398	0.172	0.00885	+14.148	+14.320	0.301	0.208	372
107	107	108	COARSE SEPARATOR	0.0387		1.290	0.05000	+14.320	+15.610			372

TABLE 3.1 (CONTINUED)

GEOMETRICAL DATA FOR LOBI-MOD2 FACILITY
(DIMENSIONS IN m)

PIECE NO. 1	NODE NO. FROM 2A	TO 2B	DESCRIPTION 3	FLOW AREA ENTRY 4A	FLOW AREA EXIT 4B	FLOW LENGTH 5	VOLUME 6	ELEVATION ENTRY 7A	ELEVATION EXIT 7B	DIAMETER ENTRY 8A	DIAMETER EXIT 8B	DRAWING N COMMENTS 9
108	108A	109	FINE SEPARATOR	0.05024		0.3	0.01507	+15.981	+16.281	0.02		372
109	102	110	DOWNCOMER	0.0589		0.241	0.01421	+13.907	+14.148	0.105		372
110	110	111	DOWNCOMER UPPER VOLUME	0.05896	0.09673	0.172	0.01339	+14.148	+14.320	0.410		372
111	111	112	ANNULAR VOLUME OUTSIDE COARSE SEPARATOR	0.115721		1.29	0.14928	+14.320	+15.610	0.237		372
112	112	113	VOLUME OUTSIDE FINE SEPARATOR	0.1387		0.671	0.09307	+15.610	+16.281	0.419		372
113	113	114	STEAM DOME LOWER VOLUME	0.17129		0.114	0.0195271	+16.281	+16.395	0.467		372
114	114	115	STEAM DOME UPPER VOLUME	0.147638		0.315	0.0465059	+16.395	+16.710	0.461		372
			STEAM GENERATOR II (B.L.)									
120	120	121	FEEDWATER INLET ANNULUS	0.001319		1.3352	0.0017612	+13.780		0.035		371
121	121	122	DISTRIBUTION TUBES(20)	0.00066		0.145	0.00010	+13.780	+13.810	0.0065		371
122	122	123	DOWNCOMER NARROW REGION	0.00396		7.304	0.0289122	+6.506	+13.810	0.0120		371
123	123	124	BOILER UP TO UPPER BORDER OF FILLER TUBE	0.009364		6.720	0.0629309	+6.506	+13.226			370
124	124	125	BOILER UP TO HIGHEST TUBE	0.025797		0.361	0.0092868	+13.226	+13.587			370
125	125	126	BOILER UP TO CONTRACTION	0.03173		0.424	0.0134835	+13.587	+14.011	0.201		370
126	126	127	TOP OF BOILER	0.03173	0.01287	0.137	0.00296	+14.011	+14.148	0.201	0.128	370
127	127	128	COARSE SEPARATOR	0.01441		1.388	0.02000	+14.148	+15.536			370
128	128	129	FINE SEPARATOR	0.01529		0.370	0.00565	+16.121	+16.491			370

TABLE 3.1 (CONTINUED)

GEOMETRICAL DATA FOR LOBI-MOD2 FACILITY
(DIMENSIONS IN m)

PIECE NO. 1	NODE NO. FROM 2A	NODE NO. TO 2B	DESCRIPTION 3	FLOW AREA ENTRY 4A	FLOW AREA EXIT 4B	FLOW LENGTH 5	VOLUME 6	ELEVATION ENTRY 7A	ELEVATION EXIT 7B	DIAMETER ENTRY 8A	DIAMETER EXIT 8B	DRAWING N COMMENTS 9
129	129	130	DOWNCOMER ABOVE NARROW REGION	0.01218		0.201	0.002448	+13.810	+14.011	0.035		370
130	131	132	DOWNCOMER UPPER VOLUME	0.01218	0.03138	0.137	0.00298	+14.011	+14.148	0.035		370
132	132	133	ANNULUS OUTSIDE COARSE SEPARATOR	0.03285		1.388	0.04560	+14.148	+15.536	0.130		370
133	133	134	VOLUME OUTSIDE FINE SEPARATOR	0.04145		0.955	0.039584	+15.536	+16.491	0.120		370
134	134	135	STEAM DOME LOWER VOLUME	0.0572		0.041	0.0023475	+16.491	+16.532	0.270		370
135	135	136	STEAM DOME UPPER VOLUME	0.051695		0.190	0.009822	+16.532	+16.722	0.270		370
			STEAM LINE WITH HEADER									
140	140	141	S.G.1 STEAM NOZZLE	0.003728		0.129	0.0004809	+16.395		0.0689		372
141	141	142	STRAIGHT PIPE	0.003728		0.645	0.0024096	+16.359		0.0689		407
142	142	143	PIPE BEND	0.003728		0.181	0.006748	+16.359	+16.398	0.0689		407
143	143	144	STRAIGHT PIPE WITH COMPENSATORS AND RELIEF LINE CONNECTION	0.003728		1.245	0.0046414	+16.398	+16.425	0.0689		407
144	144	145	PIPE BEND	0.003728		0.181	0.0006748	+16.425	+16.428	0.0689		407
145	145	146	STRAIGHT PIPE	0.003728		0.585	0.0021809	+16.428		0.0689		407
146	146	147	MEASUREMENT INSERT 65H	0.004560		2.684	0.0149158	+16.428		0.0762		407
147	147	147	VALVE	0.002290		0.420	0.0009618	+16.428		0.054		407
148	148	149	CURVED PIPE	0.003728		0.250	0.0009320	+16.425	+16.290	0.0689		407
150	150	151	S.G.11 STEAM NOZZLE	0.001459		0.117	0.0001707	+16.532		0.0431		370
151	151	152	STRAIGHT PIPE WITH COMPENSATORS AND RELIEF LINE CONNECTION	0.001459		1.578	0.0023023	+16.532	+16.556	0.0431		407
152	152	153	PIPE BEND	0.001459		0.113	0.0001649	+16.556	+16.558	0.0431		407

TABLE 3.1 (CONTINUED) GEOMETRICAL DATA FOR LOBI-MOD2 FACILITY
(DIMENSIONS IN m)

PIECE NO. 1	NODE NO. FROM 2A	TO 2B	DESCRIPTION 3	FLOW AREA ENTRY 4A	FLOW AREA EXIT 4B	FLOW LENGTH 5	VOLUME 6	ELEVATION ENTRY 7A	ELEVATION EXIT 7B	DIAMETER ENTRY 8A	DIAMETER EXIT 8B	DRAWING N COMMENTS 9
153	153	154	STRAIGHT PIPE	0.001459		0.356	0.0005194	+16.558		0.0431		407
154	154	155	PIPE BEND	0.001459		0.113	0.0001649	+16.558	+16.560	0.0431		407
155	155	156	STRAIGHT PIPE	0.001459		0.196	0.0002860	+16.560	+16.563	0.0431		407
156	156	157	PIPE BEND	0.001459		0.113	0.0001649	+16.563	+16.565	0.0431		407
157	157	158	STRAIGHT PIPE	0.001459		0.578	0.0008433	+16.565				
158	158	159	MEASUREMENT INSERT 66H	0.001787		1.977	0.0041941	+16.565		0.0477		407
159	159	160	VALVE	0.001439		0.370	0.0005324	+16.565		0.0428		407
160	160	161	PIPE BEND	0.001459		0.320	0.0004669	+16.565	+16.290	0.0431		407
170	170	171	HEADER	0.004608		1.660	0.0076493	+16.290		0.0766		428

TABLE 3.2 RELAP5/MOD1 VOLUME RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81.
(DIMENSIONS IN m)

COMPONENT NUMBER 1A	VOL. 1B	TYPE 2	DESCRIPTION 3	AREA 4	LENGTH 5	VOLUME 6	VERT. ANGLE 7	ELEVAT. CHANGE 8	HYDR. DIA. 9	PIECE NO. 10
			REACTOR PRESSURE VESSEL MODEL (RPVM)							
100		B	INLET ANNULUS		0.3150	0.0035626	+90.000	+0.3150	0.0240	031
110	01 TO 04	A	DOWNCOMER	0.011310	0.4218		-90.000	-0.4218		
	05			0.011310	0.7400		-90.000	-0.7400	0.0260	033
	06			0.011310	0.6630		-90.000	-0.6630		
	07 TO 08			0.011310	0.8750		-90.000	-0.8750		
	09			0.011310	0.6630		-90.000	-0.6630		
	10			0.011310	0.6120		-90.000	-0.6120		
	11			0.011310	0.4720		-90.000	-0.4720		
	12			0.011310	0.5300		-90.000	-0.5300		
120		B	LOWER PLENUM		0.3730	0.0245926	+90.000	+0.3730	0.3120	034
130		SV	CORE INLET(LOWER VOL)		0.5300	0.015614	+90.000	+0.5300	0.1980	035
140		B	CORE INLET(UPPER VOL)		0.4720	0.0101112	+90.000	+0.4720	0.1300	036
150	01	P	CORE (HEATED TUBE BUNDLES)	0.008115	0.6120		+90.000	+0.6120	0.0135	037
	02			0.008115	0.6630		+90.000	+0.6630	0.0135	037
	03 TO 06			0.008115	0.4375		+90.000	+0.4375	0.0135	037
	07			0.008115	0.6630		+90.000	+0.6630	0.0135	037
	08			0.008115	0.7400		+90.000	+0.7400	0.0135	037

TABLE 3.2 (CONTINUED) RELAP5/MOD1 VOLUME RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81.
(DIMENSIONS IN m)

NUMBER COMPONENT 1A	VOL. 1B	TYPE 2	DESCRIPTION 3	AREA 4	LENGTH 5	VOLUME 6	VERT. ANGLE 7	ELEVAT. CHANGE 8	HYDR. DIA. 9	PIECE NO. 10
160	01	P	CORE BYPASS	0.000926	0.6120		+90.000	+0.6120	0.0030	038
	02			0.000926	0.6630		+90.000	+0.6630	0.0030	038
	03 TO 04			0.000926	0.8750		+90.000	+0.8750	0.0030	038
	05			0.000926	0.6630		+90.000	+0.6630	0.0030	038
	06			0.000926	0.7400		+90.000	+0.7400	0.0030	038
170		B	UPPER PLENUM LOWER VOLUME	0.025450	0.4218		+90.000	+0.4218	0.0440	039
180	01 TO 03	P	UPPER PLENUM MIDDLE VOLUMES	0.025500	0.4218		+90.000	+0.4218	0.0350	039
190		B	UPPER PLENUM UPPER VOLUME	0.025450	0.3150		+90.000	+0.3150	0.0350	040
			UPER HEAD SIMULATOR WITH PIPEWORK							
192		SV	UPPER HEAD INLET TUBE UPTO TEE	0.000314	0.9554		+06.008	+0.1000	0.0200	
193		B	UPPER HEAD BYPASS WITH ORIFICE	0.000314	0.8600		-22.926	-0.3350	0.0200	
194	01 TO 05	P	UPPER HEAD INLET TUBE FROM TEE	0.000314	0.6400		+90.000	+0.6400	0.0200	044
	06			0.000314	0.9083		-10.082	-0.1590	0.0200	
195	01	P	PIPING FROM UPPER	0.000314	0.7013		-38.336	-0.4350	0.0200	041
	02		PLENUM TO UPPER HEAD	0.000314	0.7000		+00.000	+0.0000	0.0200	041
196	01	P	UPPER HEAD VESSEL	0.011310	0.7660		-90.000	-0.7660	0.1200	045
	02 TO 04				0.6466		-90.000	-0.6466	0.1200	045

TABLE 3.2 (CONTINUED) RELAP5/MOD1 VOLUME RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81.
(DIMENSIONS IN m)

NUMBER COMPONENT 1A	VOL. 1B	TYPE 2	DESCRIPTION 3	AREA 4	LENGTH 5	VOLUME 6	VERT. ANGLE 7	ELEVAT. CHANGE 8	HYDR. DIA. 9	PIECE NO. 10
			INTACT LOOP PIPEWORK							
200		B	VESSEL OUTLET NOZZLE		0.8330	0.0035278	+00.275	+0.0040	0.0737	001,002
210		B	CONNECTION WITH PRESSURISER	0.004266	1.9920		+00.201	+0.0070	0.0737	003,004
220		SV	PIPE INLET TO STEAM/G		1.0110	0.0042772	+67.494	+0.9340	0.0737	005,006
230	01 TO 03	P	STEAM GENERATOR		0.4150	0.0043797	+90.000	+0.4150	0.1120	007
	04				0.4150	0.0043797	+74.038	+0.3990	0.1120	009
	05				0.3330	0.0095736	+66.336	+0.3050	0.1560	010
	06 TO 15				0.6190	0.0044823	+90.000	+0.6190	0.0196	011
	16				0.8697	0.0062977	+90.000	+0.8697	0.0196	011,012
	17				0.8697	0.0062977	-90.000	-0.8697	0.0196	012,013
	18 TO 27				0.6190	0.0044823	-90.000	-0.6190	0.0196	013
	28				0.3330	0.0095736	-66.336	-0.3050	0.1560	014
	29				0.4150	0.0043797	-74.038	-0.3990	0.1120	015
	30 TO 32				0.4150	0.0043797	-90.000	-0.4150	0.1120	017

TABLE 3.2 (CONTINUED) RELAP5/MOD1 VOLUME RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81.
(DIMENSIONS IN m)

NUMBER COMPONENT 1A	VOL. 1B	TYPE 2	DESCRIPTION 3	AREA 4	LENGTH 5	VOLUME 6	VERT. ANGLE 7	ELEVAT. CHANGE 8	HYDR. DIA. 9	PIECE NO. 10
240	01	P	PIPE UPTO PUMP INLET		0.8300	0.0035051	-90.000	-0.8300	0.0737	018
	02 TO 03				0.8040	0.0034299	-90.000	-0.8040	0.0737	019
	04				1.0880	0.0046414	-69.941	-1.0220	0.0737	019,020
	05				0.6250	0.0026663	+00.000	+0.0000	0.0737	021
	06				0.8970	0.0038244	+67.884	+0.8310	0.0737	022
	07				0.7160	0.0030523	+90.000	+0.7160	0.0737	023
	08				0.7681	0.0032201	+90.000	+0.7681	0.0737	024
250		PP	PUMP	0.003318		0.0023700	+17.140	+0.2105	0.0650	025
255		B	PIPE		0.7410	0.0031019	-00.348	-0.0045	0.0737	026
260	01 TO 03	P	PIPE		0.7960	0.0033972	-00.048	-0.00067	0.0737	027,028
270		B	VESSEL INLET NOZZLE		0.7730	0.0032715	-00.297	-0.0040	0.0737	029,030

TABLE 3.2 (CONTINUED) RELAP5/MOD1 VOLUME RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81.
(DIMENSIONS IN m)

COMPONENT 1A	NUMBER VOL. 1B	TYPE 2	DESCRIPTION 3	AREA 4	LENGTH 5	VOLUME 6	VERT. ANGLE 7	ELEVAT. CHANGE 8	HYDR. DIA. 9	PIECE NO. 10
			BROKEN LOOP PIPEWORK WITH BREAK ASSEMBLY							
300	01 TO 02	P	VESSEL OUTLET		0.6790	0.0011237	-00.190	-0.0023	0.0461	|
	03		HOT LEG PIPING		0.7770	0.0012967	+00.369	+0.0050	0.0461	|051-058
	04				0.7380	0.0012207	+05.911	+0.0760		|
	05		PIPE INLET TO STEAM/G		0.8675	0.0014341	+90.000	+0.8675	0.0461	|
330	01 TO 03	P	STEAM GENERATOR		0.4490	0.0016057	+90.000	+0.4490	0.0684	|059
	04				0.4490	0.0016057	+77.291	+0.4380	0.0684	|061
	05				0.2160	0.0025784	+66.444	+0.1980	0.1020	062
	06 TO 15				0.6210	0.0014989	+90.000	+0.6210	0.0196	063
	16				0.8625	0.0020819	+90.000	+0.8625	0.0196	063,064
	17				0.8625	0.0020819	-90.000	-0.8625	0.0196	064,065
	18 TO 27				0.6210	0.0014989	-90.000	-0.6210	0.0196	065
	28				0.2160	0.0025784	-66.444	-0.1980	0.1020	066
	29				0.4490	0.0016057	-77.291	-0.4380	0.0684	|067
	30 TO 32				0.4490	0.0016057	-90.000	-0.4490	0.0684	|069

TABLE 3.2 (CONTINUED) RELAP5/MOD1 VOLUME RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81.
(DIMENSIONS IN m)

COMPONENT 1A	NUMBER VOL. 1B	TYPE 2	DESCRIPTION 3	AREA 4	LENGTH 5	VOLUME 6	VERT. ANGLE 7	ELEVAT. CHANGE 8	HYDR. DIA. 9	PIECE NO. 10
340	01 TO 03	P	PIPE UPTO PUMP INLET		0.7300	0.0012143	-90.000	-0.7300	0.0461	070,071
	04				0.8010	0.0014135	-71.147	-0.7580	0.0461	071,072
	05			0.001669	0.7320		+00.000	+0.0000	0.0461	073
	06				0.6630	0.0011773	+69.251	+0.6200	0.0461	074
	07 TO 08				0.5920	0.0009780	+90.000	+0.5920	0.0461	075
350		PP	PUMP	0.003318		0.0023700	+15.260	+0.1880	0.0650	076
355		B	PIPE	0.001669	0.6415		-00.134	-0.0015	0.0461	077-080
360	01	P	PIPE WITH MEASUREMENT INSERT & RESISTANCE SIMULATOR	0.001669	0.6415		-00.134	-0.0015	0.0461	
	02 TO 03				0.2984		+00.288	+0.0015		
370		B	LEAK ASSEMBLY I	0.001669	0.2250	0.0003755	+00.000	+0.0000	0.0461	081
*80	01 TO 04	P	LEAK DISHCHARGE LINE WITH MEASUREMENT INSERT		0.3400	0.0005617	-05.062	-0.0300	0.0461	085
390		B	LEAK ASSEMBLY II	0.001669	0.2250	0.0003755	+00.000	+0.0000	0.0461	081
395	01 TO 02	P	MEASUREMENT INSERT		0.3170	0.0005247	+00.499	+0.0028	0.0461	082-084
	03		VESSEL INLET		0.7467	0.0012350	+00.499	+0.0065	0.0461	

TABLE 3.2 (CONTINUED)

RELAP5/MOD1 VOLUME RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81.
(DIMENSIONS IN m)

NUMBER COMPONENT 1A	VOL. 1B	TYPE 2	DESCRIPTION 3	AREA 4	LENGTH 5	VOLUME 6	VERT. ANGLE 7	ELEVAT. CHANGE 8	HYDR. DIA. 9	PIECE NO. 10
			PRESSURIZER WITH SURGE LINE							
400	01	P	SURGE LINE	0.000137	0.7000		-45.585	-0.5000	0.0132	090
	02									
	TO				0.5000		-90.000	-0.5000		092
	04									
	05				0.6050		-55.735	-0.5000		
	06				0.5880		+55.228	+0.4830		
	07									
	TO				0.4870		+90.000	+0.4870		
	11									
	12				0.5830		+55.942	+0.4830		
	13				0.7300		-59.657	-0.6300		
410		B	PRESSURISER VESSEL LOWER VOLUME	0.006346	0.7900		+90.000	+0.7900	0.0260	093
420	01	P	PRESSURISER VESSEL UPTO END OF HEATERS	0.008227	0.5850		+90.000	+0.5850	0.0320	094
	02		PRESSURISER VESSEL							
	TO		UPTO WATER LEVEL	0.011962	0.6375		+90.000	+0.6375	0.1240	095
	07									
	08		PRESSURISER VESSEL							
	TO		UPPER VOLUME		0.6325		+90.000	+0.6325	0.1240	
	11		(STEAM REGION)							

TABLE 3.2 (CONTINUED)

RELAP5/MOD1 VOLUME RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81.
(DIMENSIONS IN m)

NUMBER COMPONENT 1A	VOL. 1B	TYPE 2	DESCRIPTION 3	AREA 4	LENGTH 5	VOLUME 6	VERT. ANGLE 7	ELEVAT. CHANGE 8	HYDR. DIA. 9	PIECE NO. 10
			STEAM GENERATOR I (I. L) SECONDARY SIDE							
505		SV	FEED WATER INLET RING	0.011698	0.5140	0.0060126	+00.000	+0.0000	0.0532	100,101
510	01	A	DOWNCOMER	0.011950	0.8697		-90.000	-0.8697	0.0240	102
	02 TO 10				0.6190		-90.000	-0.6190	0.0240	102
	11				0.5290		-90.000	-0.5290	0.0240	102
520	01	P	BOILER	0.029460	0.5290		+90.000	+0.5290	0.0220	103
	02 TO 10			0.029460	0.6190		+90.000	+0.6190	0.0220	
	11			0.0351860	0.8697		+90.000	+0.8697	0.0220	
	12				0.4327	0.0321193	+90.000	+0.4327	0.3010	
	13				0.8430	0.0388078	+90.000	+0.8430	0.2080	
	14			0.038760	0.8600		+90.000	+0.8600	0.3840	
	15			0.084842	0.6710		+90.000	+0.6710	0.1870	112
530		S	SEPARATOR	0.086445	0.6710		+90.000	+0.6710	0.0200	108,112
540	01	A	DOWNCOMER	0.115721	0.8600		-90.000	-0.8600	0.0830	
	02			0.091767	0.8430		-90.000	-0.8430	0.1050	
550		B	DOWNCOMER	0.011950	0.4327		-90.000	-0.4327	0.0240	102
560		B	STEAM DOME		0.4290	0.0660335	+90.000	+0.4290	0.4610	113,114

TABLE 3.2 (CONTINUED) RELAP5/MOD1 VOLUME RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81.
(DIMENSIONS IN m)

NUMBER COMPONENT 1A	VOL. 1B	TYPE 2	DESCRIPTION 3	AREA 4	LENGTH 5	VOLUME 6	VERT. ANGLE 7	ELEVAT. CHANGE 8	HYDR. DIA. 9	PIECE NO. 10
			STEAM GENERATOR II (B. L) SECONDARY SIDE							
605		SV	FEED WATER INLET RING	0.002788	0.6676	0.0018612	+00.000	+0.0000	0.0350	120,121
610	01	A	DOWNCOMER	0.003960	0.5773		-90.000	-0.5773	0.0120	122
	02 TO 10			0.003960	0.6210		-90.000	-0.6210	0.0120	122
	11			0.003960	0.5605		-90.000	-0.5605	0.0120	122
620	01	P	BOILER	0.009364	0.5605		+90.000	+0.5605	0.0220	123
	02 TO 10			0.009364	0.6210		+90.000	+0.6210	0.0220	123
	11 TO 12			0.0188043	0.5773		+90.000	+0.5773	0.0220	124
	13			0.0133512	0.8006		+90.000	+0.8006	0.1280	125,126
	14			0.0144080	0.9254	0.0133333	+90.000	+0.9254	0.2050	132
	15			0.0312170	0.9550		+90.000	+0.9550	0.1200	133
630		S	SEPARATOR	0.026020	0.9550		+90.000	+0.9550	0.0100	128
640	01	A	DOWNCOMER	0.032850	0.9254		-90.000	-0.9254	0.0650	133
	02			0.025761	0.8006		-90.000	-0.8006	0.0350	129,130
650		B	DOWNCOMER	0.003960	0.5773		-90.000	-0.5773		
660		B	STEAM DOME		0.2300	0.0121690	+90.000	+0.2300	0.2640	134,135

TABLE 3.2 (CONTINUED)

RELAP5/MOD1 VOLUME RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81.
(DIMENSIONS IN m)

COMPONENT 1A	NUMBER VOL. 1B	TYPE 2	DESCRIPTION 3	AREA 4	LENGTH 5	VOLUME 6	VERT. ANGLE 7	ELEVAT. CHANGE 8	HYDR. DIA. 9	PIECE NO. 10
			STEAM LINES AND HEADER							
700	01	P	S.G.I STEAMLINE	0.003728	1.4870		+00.000	+0.000	0.0689	|140,141
	02			0.003728	1.4790				0.0689	|142
	03			0.004778	1.2020				0.0780	|143
	04			0.004778	0.9770				0.0780	|146
701		B	HEADER INLET	0.0037286	1.1730		-09.016	-0.105	0.0689	147,148
710	01	P	S.G.II STEAM LINE	0.001459	1.6955		+00.000	+0.000	0.0431	|
	02			0.001459	1.4690		+00.000	+0.000	0.0431	|150-158
	03			0.001459	1.4970		+00.000	+0.000	0.0431	|
										154,155
711		B	HEADER INLET	0.001459	1.0130		-20.532	-0.242	0.0428	159,160
720		B	HEADER	0.004608	1.6600		+00.000	+0.000	0.0766	170

TABLE 3.3 RELAP5/MOD1 JUNCTION RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81 (ISP18). (DIMENSIONS IN m)

COMP NO. 1	COMP TYPE 2	JUN NO. 3	DESCRIPTION 4	VOLUME NUMBER FROM 5A	VOLUME NUMBER TO 5B	JUNCTION AREA 6	FORM LOSS FORWARD 7A	FORM LOSS REVERSE 7B	CONTROL CAHS 8	NODE NO. 9	REFERENCE 10
			REACTOR PRESSURE VESSEL MODEL								
100	B	01	INLET ANNULUS TO DOWNCOMER	10000	11000	0.009240	00.00	00.00	0100	031	
		02	INLET ANNULUS TO UPPER HEAD	10001	19200	0.0	01.93	02.43	0000	032	
		03	INTACT LOOP TO INLET ANNULUS	27001	10000	0.002253	00.00	00.00	0100	031	3-4,11-6,$
		04	BROKEN LOOP TO INLET ANNULUS	39501	10000	0.000796	00.00	00.00	0100	031	3-4,11-6,$
		05	INLET ANNULUS TO INTACT LOOP	10000	20000	0.0	20000.00		0000		
		06	INLET ANNULUS TO BROKEN LOOP	10000	30000	0.0	16000.00		0000		
110	A	01 TO 11	DOWNCOMER			0.0	00.00	00.00	0000		
120	B	01	DOWNCOMER TO LOWER PLENUM	11001	12001	0.0	01.24	00.65	0000	033	
		02	LOWER PLENUM TO CORE INLET	12001	13000	0.0	00.63	01.20	0000	035	
140	B	01	CORE INLET	13001	14000	0.0	05.52	05.50	0000	036	4-14
		02	CORE INLET TO CORE	14001	15000	0.0	05.52	05.50	0000	037	4-14
		03	CORE INLET TO BYPASS	14001	16000	0.0	50.00	50.00	0000	037A	
150	P	01 TO 07	CORE			0.007350	00.00	00.00	0100		
160	P	01 TO 05	CORE BYPASS			0.0	00.00	00.00	0000		
170	B	01	CORE TO UPPER PLENUM(LOWER VOL)	15001	17000	0.007350	00.00	00.00	0100	038	
		02	CORE BYPASS TO UPPER PLENUM (LOWER VOL)	16001	17000	0.0	50.00	50.00	0000	038A	
		03	UPPER PLENUM (LOWER VOL)	17001	18000	0.020000	00.00	00.00	0100		
180	P	01 TO 02	UPPER PLENUM (LOWER VOL)			0 020000	00.00	00.00	0100		

TABLE 3.3 (CONTINUED) RELAP5/MOD1 JUNCTION RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81 (ISP18). (DIMENSIONS IN m)

COMP NO. 1	COMP TYPE 2	JUN NO. 3	DESCRIPTION 4	VOLUME NUMBER FROM 5A	TO 5B	JUNCTION AREA 6	FORM LOSS FORWARD 7A	REVERSE 7B	CONTROL CAHS 8	NODE NO. 9	REFERENCE 10
190	B	01	INLET ANNULUS TO UPPER PLENUM (UPPER VOL)	10001	19001	0.0	3.00+5	3.00+5	0000	032-041	
		02	UPPER HEAD TO UPPER PLENUM	19501	19001	0.020000	02.43	01.93	0000	041	
		03	UPPER PLENUM (LOWER VOL) TO UPPER PLENUM (UPPER VOL)	18001	19000	0.0	00.00	00.00	0100	040	
		04	UPPER PLENUM (UPPER VOL) TO INTACT LOOP	19000	20000	0.003324	00.00	00.00	0100	001	
		05	UPPER PLENUM (UPPER VOL) TO BROKEN LOOP	19000	30000	0.001078	00.00	00.00	0100	051	
			UPPER HEAD SIMULATOR (UPS)								
193	B	01	UPPER HEAD TO U.H BYPASS	19601	19300	0.0	00.51	00.95	0000	044	
		02	U.H INLET TUBE U.H BYPASS	19201	19301	0.0	72.00	72.90	0000	043	
		03	U.H BYPASS TO U.H OUTLET TUBE	19300	19500	0.0	03.00	03.10	0000	042	6-7,7-21
194	P	01 TO 04	PIPE TO U.H. VESSEL UPPER FLANGE			0.0	00.00	00.00	0000		
		05				0.0	00.34	00.34	0000		
195	P	01	UPPER HEAD OUTLET TUBE			0.0	00.20	00.20	0000		
196		01 TO 03	U.H. VESSEL			0.0	00.00	00.00	0000		
197	V	01	FROM INLET ANNULUS TO TEE (U.H. PIPING)	19201	19400	0.0	00.86	00.86	0000	043A	
198	SJ		U.H. VESSEL UPPER CONNECTION	19401	19600	0.0	01.11	00.28	0000		

TABLE 3.3 (CONTINUED) RELAP5/MOD1 JUNCTION RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81 (ISP18).
(DIMENSIONS IN m)

COMP NO. 1	COMP TYPE 2	JUN NO. 3	DESCRIPTION 4	VOLUME NUMBER FROM 5A	TO 5B	JUNCTION AREA 6	FORM LOSS FORWARD 7A	REVERSE 7B	CONTROL CAHS 8	NODE NO. 9	REFERENCE 10
			INTACT LOOP PIPEWORK								
200	B	02	VESSEL OUTLET TO SURGE LINE	20001	40000	0.000068	00.00	00.00	0100	003	
210	B	01	SURGE LINE TO INTACT LOOP	40000	21000	0.000068	00.00	00.00	0100	003	
		02	PIPE TO INLET PIPE OF STEAM/G	21001	22000	0.0	00.27	00.27	0000	005	6-2,$
		03	PIPE	20001	21000	0.0	00.62	00.62	0000	005	6-2,$
225	SJ		PIPE TO STEAM GENERATOR (EXPANSION)	22001	23000	0.0	00.00	00.00	0000	007	6-2,$,5-2,3-7
		01									
230	P	TO 02	STEAM GENERATOR INLET PIPE			0.0	00.00	00.00	0000		
		03	STEAM GENERATOR INLET BEND			0.0	00.61	00.31	0000	009	6-2
230		04	STEAM GENERATOR BEND TO CHAMBER			0.0	00.00	00.00	0100	010	
		05	STEAM GENERATOR BUNDLE INLET			0.0	00.00	00.00	0000	011	
		06 TO 15	STEAM GENERATOR BUNDLE UPWARD			0.0	00.00	00.00	0000		
		16	STEAM GENERATOR BUNDLE BEND			0.0	00.00	00.00	0000	012,013	6-2
		17 TO 26	STEAM GENERATOR BUNDLE DOWNWARD			0.0	00.00	00.00	0000		
		27	BUNDLE OUTLET			0.0	00.00	00.00	0000	014	
		28	CHAMBER TO OUTLET			0.0	00.00	00.00	0100	015	
		29	STEAM GENERATOR OUTLET BEND			0.0	00.31	00.61	0000	016	6-2
		30 TO 31	STEAM GENERATOR OUTLET PIPE			0.0	00.00	00.00	0000		
235	SJ		STEAM/G OUTLET TO PIPING (REDUCTION & MEASUREMENT INSERT)	23001	24000	0.0	00.00	00.00	0000	018	6-2,$

TABLE 3.3 (CONTINUED) RELAP5/MOD1 JUNCTION RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81 (ISP18). (DIMENSIONS IN m)

COMP NO. 1	COMP TYPE 2	JUN NO. 3	DESCRIPTION 4	VOLUME FROM 5A	VOLUME TO 5B	JUNCTION AREA 6	FORM LOSS FORWARD 7A	FORM LOSS REVERSE 7B	CONTROL CAHS 8	NODE NO. 9	REFERENCE 10
240	P	01 02				0.0	00.10	00.10	0000	019	$
		TO 03	PIPE			0.0	00.00	00.00	0000		
		04 TO 05	PIPE BEND			0.0	00.17	00.17	0000		6-2
		06 TO 07	PIPE			0.0	00.00	00.00	0000	024	$
250	PP	01	PIPE TO PUMP INLET	24001	25000	0.0	00.13	00.13	0000	025	$,3-7,5-2
		02	PUMP TO INTACT LOOP (WITH ADAPTOR & M.I)	25001	26000	0.0	00.04	00.03	0000	026	3-7,5-2,$
255	B		OUTLET OF PUMP	25501	26000	0.0	00.20	00.20	0000		
260	P	01 TO 03				0.0	00.00	00.00	0000		
270	B	01	PIPE TO VESSEL INLET	26001	27000	0.0	00.15	00.15	0000	030	

TABLE 3.3 (CONTINUED) RELAP5/MOD1 JUNCTION RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81 (ISP18).
(DIMENSIONS IN m)

COMP NO. 1	COMP TYPE 2	JUN NO. 3	DESCRIPTION 4	VOLUME FROM 5A	VOLUME TO 5B	JUNCTION AREA 6	FORM LOSS FORWARD 7A	FORM LOSS REVERSE 7B	CONTROL CAHS 8	NODE NO. 9	REFERENCE 10
			BROKEN LOOP PIPEWORK								
300	P	01	VESSEL OUTLET TO BROKEN LOOP			0.0	00.05	00.05	0000	052	
		02	PIPE			0.0	00.11	00.11	0000	053	
		03				0.0	00.07	00.07	0000	054|	
		04				0.0	01.38	00.38	0000	059|	
315	SJ		PIPE TO S.G EXPANSION	30001	33000	0.0	00.19	00.05	0000	059	
330	P	01	EXPANSION TO INLET PIPE			0.0	00.00	00.00	0000	060	
		02	INLET PIPE			0.0	00.00	00.00	0000		
		03	STEAM GENERATOR PIPE TO BEND			0.0	00.01	00.01	0000	061	
		04	STEAM GENERATOR BEND TO CHAMBER			0.0	00.00	00.00	0100	062	
		05	STEAM GENERATOR BUNDLE INLET			0.0	00.00	00.00	0100	063	
		06 TO 11	STEAM GENERATOR BUNDLE UPWARD			0.0	00.00	00.00	0000		
		12 TO 15				0.0	00.15	00.15	0000		
		16	STEAM GENERATOR BUNDLE BEND			0.0	00.00	00.00	0000	064-	
		17 TO 26	STEAM GENERATOR BUNDLE DOWNWARD			0.0	00.00	00.00	0000	065	
		27	BUNDLE OUTLET			0.0	00.00	00.00	0100	066	
		28	CHAMBER TO OUTLET			0.0	00.00	00.00	0100	067	
		29	STEAM GENERATOR OUTLET BEND			0.0	00.00	00.00	0000	068	
		30 TO 31	STEAM GENERATOR OUTLET PIPE			0.0	00.00	00.00	0000	069	
335	J		STEAM GENERATOR TO PIPING (REDUCTION & MEASUREMENT INSERT)	33001	34000	0.0	00.05	00.19	0000	070	
340	P	01	PIPE			0.0	00.10	00.10	0000		
		02				0.0	00.00	00.00	0000		
		03				0.0	00.00	00.00	0000		
		04	PIPE BEND			0.0	00.75	00.75	0000	072-	
		05				0.0	00.07	00.07	0000	072-	
		06	PIPE			0.0	00.00	00.00	0000	074-	
		07				0.0	00.24	00.24	0000		

TABLE 3.3 (CONTINUED) RELAP5/MOD1 JUNCTION RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81 (ISP18).
(DIMENSIONS IN m)

COMP NO. 1	COMP TYPE 2	JUN NO. 3	DESCRIPTION 4	VOLUME NUMBER FROM 5A	TO 5B	JUNCTION AREA 6	FORM LOSS FORWARD 7A	REVERSE 7B	CONTROL CAHS 8	NODE NO. 9	REFERENCE 10
350	PP	01	PIPE TO PUMP INLET (WITH ADAPTOR & M.I)	34001	35000	0.0	00.15	00.15	0000	076	
		02	PUMP OUTLET TO PIPE (WITH ADAPTOR , M.I AND RESISTANCE SIMULATOR	35001	36000	0.0	00.85	00.85	0000	077	
355	B	01		35501	36000	0.00000	00.40	00.40	0000	07	
360	P	01	PIPE WITH M.I.			0.0	00.00	00.00	0000	077A	
		02				0.0	00.05	00.05	0000	077B-	
370	B	01		36001	37000	0.0	00.00	00.00	0000		
		02		37001	39000	0.0	00.00	00.00	0000		
390	B	01		39001	39500	0.0	00.00	00.00	0000	082	6-2
395	P	01				0.0	00.00	00.00	0000		
		02				0.0	00.05	00.05	0000		$

TABLE 3.3 (CONTINUED) RELAP5/MOD1 JUNCTION RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81 (ISP18). (DIMENSIONS IN m)

COMP NO. 1	COMP TYPE 2	JUN NO. 3	DESCRIPTION 4	VOLUME NUMBER FROM 5A	VOLUME NUMBER TO 5B	JUNCTION AREA 6	FORM LOSS FORWARD 7A	FORM LOSS REVERSE 7B	CONTROL CAHS 8	NODE NO. 9	REFERENCE 10
			PRESSURIZER WITH SURGE LINE								
400	P	01	SURGE LINE			0.0	00.16	00.16	0000		
		02									
		TO				0.0	00.00	00.00	0000		
		04									
		05				0.0	00.32	00.32	0000		
		06									
		TO				0.0	00.00	00.00	0000		
		11									
		12				0.0	00.32	00.32	0000		
410	B	01	CONNECTION TO PRESSURIZER	40001	41001	0.0	00.00	00.00	0100		
		02	FROM LOWER VOLUME TO UPPER VOLUMES	41000	42000	0.0	00.00	00.00	0000		
420	P	01	PRESURIZER			0.0	00.00	00.00	0000		
		TO									
		11									

TABLE 3.3 (CONTINUED) RELAP5/MOD1 JUNCTION RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81 (ISP18). (DIMENSIONS IN m)

COMP NO. 1	COMP TYPE 2	JUN NO. 3	DESCRIPTION 4	VOLUME FROM 5A	NUMBER TO 5B	JUNCTION AREA 6	FORM LOSS FORWARD 7A	FORM LOSS REVERSE 7B	CONTROL CAHS 8	NODE NO. 9	REFERENCE 10
			STEAM GENERATOR I (I.L) SECONDARY SIDE								
501	TDJ		FEED WATER INLET	50001	50500	0.001698	00.00	00.00	0100	101,102 A	
		01									
510	A	TO	DOWNCOMER			0.0	00.00	00.00	0000		
		11									
515	SJ		DOWNCOMER TO RISER	51001	52000	0.0	02.00	02.00	0000	103	
		01									
520	P	TO	RISER			0.018000	00.00	00.00	0100		
		10									
		11				0.018000	10.00	10.00	0000		
		12				0.0	00.00	00.00	0100	105	
		13									
		TO				0.0	00.00	00.00	0000	106	
		14								7	
530	S	01	SEPARATOR TO STEAM DOME	53001	56000	0.060000	00.00	00.00	0100	113	
		02	RISER TO SEPARATOR	52001	53000	0.040000	00.00	00.00	0100	113	
		03	SEPARATOR TO DOWNCOMER	53000	54000	0.0	00.00	00.00	0000	108A	
540	A	01	DOWNCOMER			0.0	00.00	00.00	0000		
550	B	01	FEEDWATER INLET TO DOWNCOMER	50501	55000	0.001608	00.00	00.00	0100	121,122 A	
		02	DOWNCOMER UPPER TO LOWER	54001	55000	0.0	00.00	00.00	0100	122	
		03	DOWNCOMER	55001	51000	0.0	00.00	00.00	0000	122	
560	B	01	STEAM DOME	56000	70000	0.0	00.00	00.00	0100		

TABLE 3.3 (CONTINUED) RELAP5/MOD1 JUNCTION RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81 (ISP18). (DIMENSIONS IN m)

COMP NO. 1	COMP TYPE 2	JUN NO. 3	DESCRIPTION 4	VOLUME NUMBER FROM 5A	TO 5B	JUNCTION AREA 6	FORM LOSS FORWARD 7A	REVERSE 7B	CONTROL CAHS 8	NODE NO. 9	REFERENCE 10
			STEAM GENERATOR II (B.L) SECONDARY SIDE								
601	TDJ		FEED WATER INLET	60001	60500	0.001698	00.00	00.00	0100	101,102 A	
610	A	01 TO 11	DOWNCOMER			0.0	00.00	00.00	0000		
615	SJ		DOWNCOMER TO RISER	61001	62000	0.0	05.00	05.00	0000		
620	P	01 TO 11	RISER			0.008000	00.00	00.00	0000		
		12				0.0	00.00	00.00	0100		
		13 TO 14				0.014408	00.00	00.00	0000		
630	S	01	SEPARATOR TO STEAM DOME	63001	66000	0.020000	00.00	00.00	0100		
		02	RISER TO SEPARATOR	62001	63001	0.013000	00.00	00.00	0100		
		03	SEPARATOR TO DOWNCOMER	63000	64000	0.0	00.00	00.00	0000		
650	B	01	FEEDWATER RING TO DOWNCOMER	60501	65000	0.000664	00.00	00.00	0100	121,122 A	
		02	DOWNCOMER UPPER TO LOWER SECT.	64001	65000	0.0	00.00	00.00	0100	122	
		03	DOWNCOMER	65001	61000	0.0	00.00	00.00	0000	122	
660	B		STEAM DOME TO STEAM LINE	66001	71000	0.0	00.00	00.00	0100		

TABLE 3.3 (CONTINUED) RELAP5/MOD1 JUNCTION RELATED INPUT DATA FOR LOBI-MOD2 TEST A2-81 (ISP18). (DIMENSIONS IN m)

COMP NO. 1	COMP TYPE 2	JUN NO. 3	DESCRIPTION 4	VOLUME NUMBER FROM 5A	TO 5B	JUNCTION AREA 6	FORM LOSS FORWARD 7A	REVERSE 7B	CONTROL CAHS 8	NODE NO. 9	REFERENCE 10
			STEAM LINES WITH HEADER								
700	P	01 02 TO 03	STEAM LINE INTACT LOOP			0.0 0.0	06.32 01.79	06.32 01.79	0000 0000		
701	B	01	HEADER INLET	70001	70100	0.0	00.00	00.00	0000		
705	V	01		70101	72000	0.003728	00.00	00.00	0100		
710	P	01 02	STEAM LINE BROKEN LOOP			0.0 0.0	06.80 06.96	06.80 06.96	0000 0000	9-21,6-2 ,$	
711	B	01	HEADER INLET	71001	71100	0.0	00.00	00.00	0000		
715	V	01	HEADER INLET TO HEADER	71101	72000	0.001459	00.00	00.00	0100		
725	V	01	MAIN STEAM VALVE	72001	73000	0.0	00.00	00.00	0000		

Table 4.1 Measured/Calculated Pressure Drop Data for the Reactor Pressure Vessel Model RPV, at nominal conditions of Test A2-81

Pressure Drop Section Component		Location see Fig. 4.2	Static Head H (mm)	Static Head PD(Static)* (kPa)	Pressure Difference (kPa) measured	Pressure Difference (kPa) calculated	PD-Identifier
RPV inlet	IL	L18	- 170	- 1.2	45.0 0.3	44.5	PD163DB3
	BL	L18	- 170	- 1.2	26.9 0.2	29.5	PD263DB7
Downcomer							
upper section		V1	- 5405	- 37.2	- 26.9 0.4	- 26.9	PD3DBT
medium	"	V2	- 600	- 4.1	- 3.1 0.2	- 3.2	PD3DTU02
lower	"	V3+V4+V5	0	0	9.4 0.4	9.4	PD3D3RUU
outlet	"						
Riser							
core entrance		V5	+ 1500	+ 10.2	17.8 0.3	17.7	PD3RYU21
heated length		V6	+ 4605	+ 31.7	117.5 0.5	116.5	PD3RUG11
upper plenum		V7	+ 1565	+ 10.8	10.0 0.4	11.3	PD3RGF12 PD3RFD24 PD3RDA44
RPV outlet	IL	L11	+ 5	0.1	35.7 0.4	35.0	PD3R11A4
	BL	L21	+ 5	0.1	34.1 0.7	33.5	PD3R21A3
RPV total	IL	L19 over RPV	0	0	188 1.0	186.6	-
	BL	L29 sections	0	0	168 1.3	173.8	-

*) evaluated with = 702 kg/m³

Table 4.2 Measured/Calculated Pressure Drop Data for the Intact/Broken Loop (IL/BL), at nominal conditions of Test A2-81

Pressure Drop Section			Static Head		Pressure Difference (kPa)		PD-Identifier
Component		Location see Fig. 4.1	H (mm)	PD(Static)* (kPa)	measured	calculated	
Hot Leg	IL	L12	+ 1205	+ 8.3	25.5 0.2	28.5	PD1190A
	BL	L22	+ 1055	+ 7.3	29.8 0.3	30.8	PD2180A
Steam Generator	IL	L13	0	0	58 1.2	59.9	PD9092AA
	BL	L23	0	0	64 1.2	63.5	PD8082AA
Pump seal entrance	IL	L14	- 3750	- 25.7	5.8 0.5	3.9	PD9217A
	BL	L24	- 3145	- 21.6	8 1.2	8.5	PD8227A
Pump seal outlet	IL	L15	+ 1735	+ 11.9	18.0 0.3	23.6	PD1714
	BL	L25	+ 1430	+ 9.8	20.0 0.3	21.3	PD2724
Cold leg	IL	L17	- 15	0.1	11 0.2	13.3	PD151653
	BL	L27	- 10	0.1	22 0.2	15.3	PD2526
RPV, total	IL	L19	0	0	186 3.1	186.6	PD161133
	BL	L29	0	0	170 1.3	173.8	PD262133
Pump head	IL	L16	- 805	- 5.5	307 4.3	315.9	PD151456
	BL	L26	- 670	- 4.6	314 8.0	313.1	PD252451

*) evaluated with = 702 kg/m³

Table 4.3 Measured/Calculated Pressure Drop Data for the Steam Generators SG1/SG2 at nominal conditions of Test A2-81

Pressure Drop Section			Static Head		Pressure Difference (kPa)		PD-Identifier
Component		Location see Fig. 4.3+4.4	H (mm)	PD(Static)* (kPa)	measured	calculated	
SG inlet	SG1	S91	+ 1760	+ 12.2	20.2 0.3	19.8	PD90AB46
	SG2	S81	+ 1905	+ 13.1	21.2 0.3	21.3	PD80AB42
U-tube hot leg	SG1	S92	+ 6900	+ 47.3	73.4 0.7	74.7	PD90BNX1
	SG2	S82	+ 6920	+ 47.5	76.6 0.7	74.6	PD80BNX1
cold leg	SG1	S95	- 6900	- 47.3	- 23.4 0.7	- 22.2	PD92NBX1
	SG2	S85	- 6920	- 47.5	- 22.2 0.7	- 21.9	PD82NBX1
SG outlet	SG1	S98	- 1760	- 12.2	- 12.3 0.3	- 12.4	PD92BA24
	SG2	S88	- 1905	- 13.1	- 11.9 0.3	- 10.5	PD82BA64
SG total	SG1	L13	0	0	57.7 1.2	59.9	PD9092AA
	SG2	L23	0	0	63.6 1.2	63.5	PD8082AA

*) evaluated with = 702 kg/m³

Table 4.4 Measured and Calculated Environmental Heat Losses for LOBI-MOD2 test A2-81 (ISP18)

Component	Heat loss (kW) measured/estimated	calculated
Vessel simulator	18.16	18.26
Intact loop piping	12.19	13.24
Broken loop piping	12.41	12.09
Pressurizer	*	2.26
Steam generator (I.L)	12.00	8.32
Steam generator (B.L)	8.00	5.34
Steam line and header	*	1.27
sub-total	64.52	60.78
Seal water[1]	30.48	30.22
total system	95.00	91.00

* data or estimate not available

[1] seal water temperature: 25° C

Table 4.5 Estimated and Calculated Bypass Flow Rates

Flow Path	Bypass flow (%) measured/estimated	calculated
- from downcomer to I.L hot leg	*	1.43
- from downcomer to B.L hot leg	*	0.65
- from upper downcomer to upprr plenum (through 2 holes of 5mm dia each)	*	0.82
sub-total	2.4 - 3.7	2.9
- from upper downcomer to upprr plenum (through upper head)	*	3.5
- Core bypass flow	*	3.1
total		9.5

* data or estimate not available

Table 4.6 Measured and Calculated Pump Speed and Core Heatup Values at Steady State

Parameter	Measured	Calculated
Pump speed (rev/min):		
-Intact loop	4820	4902
-broken loop	3830	3882
ΔT between vessel inlet and outlet (K):		
-Intact loop	32.8	32.6
-broken loop	34.7	32.7

Table 4.7 Seal Water Injection into Primary Coolant Pumps as Function of Primary Pressure

Primary Pressure (M Pa)	Total seal water flow (kg/s)
Intact Loop Pump:	
2.5	0.01444
3.0	0.01500
4.0	0.01583
5.0	0.01639
6.0	0.01722
7.0	0.01750
8.0	0.01778
9.0	0.01806
10.0	0.01806
11.0	0.01778
12.0	0.01750
13.0	0.01667
14.0	0.01528
15.0	0.01333
16.0	0.01111
17.0	0.00833
Splitting up ratio (suction/total) appr. 0.2	
Broken Loop Pump:	
2.5	0.00944
3.0	0.01000
4.0	0.01083
5.0	0.01167
6.0	0.01222
7.0	0.01278
8.0	0.01306
9.0	0.01333
10.0	0.01361
11.0	0.01361
12.0	0.01333
13.0	0.01278
14.0	0.01194
15.0	0.01028
16.0	0.00861
17.0	0.00639
Splitting up ratio (suction/total) appr. 0.7	

Table 4.8 Initial Conditions for LOBI-MOD2 Test A2-81 (ISP18)

	Specified [1])	Measured	Calculated
Primary system			
Mass flow: (kg/s)			
-Intact loop	21.0	21.0	21.0
-Broken loop	7.0	6.7	6.7
Pressure: (MPa)			
-Upper Plenum	15.8	15.8	15.8
Fluid temperatures: (C)			
- Vessel Inlet			
-Intact loop	294.0	293.7	293.9
-Broken loop	294.0	293.3	293.5
- Pressurizer	346.0	346.0	346.0
Core Power: (MW)	5.28	5.206	5.206
Pressurizer Water Level:(m)	4.8	5.2	5.2
Secondary system			
Feedwater mass flows: (kg/s)			
-Intact loop	2.0	2.0	2.09
-Broken loop	0.67	0.72	0.66
Pressure: (MPa)			
-Steam Dome	6.45	6.54	6.52
Main feedwater temperature (C):			
-Intact loop	210.0	212.9	212.9
-Broken loop	210.0	212.9	212.9
Recirculation ratio:			
-Intact loop	3.6	6.5	7.2
-Broken loop	3.6	4.5	7.1
Collapsed Liquid Level in Downcomer (m):			
-Intact Loop	8.3		8.3
-Broken Loop	9.1		9.1
Pressure Differential b/w Level: (MPa)			
-Intact loop			
B and S		0.05475	0.06037
R and S		0.00562	0.00072
S and T		0.00080	0.00237
F and B (Downcomer)		-0.01274	-0.01470
B and F (Riser)		0.01406	0.01328
-Broken loop			
B and S		0.04634	0.04901
R and S		0.01082	0.00865
S and T		0.00222	0.00042
F and B (Downcomer)		-0.01046	-0.00879
B and F (Riser)		0.01119	0.01110

[1] in Reference /4/

Table 5.1: LOBI-MOD2 Test A2-81 (ISP18) Post-Test Prediction Performance

Restart no.	Date	Job no.	Problem time(s) From	to	CPU time@1 (min)	Remarks
	13.03.85	3193	0.	440.	143.	Steady state
1	15.03.85	6908	440.	555.	194.	Start of transient
2	17.03.85	8863	555.	1600.	504.	Renod. of pumps
3	29.03.85	6460	1600.	1850.	684	
4	31.03.85	3092	1850.	2700.	1284.	
5	01.04.85	7985	2700.	3300.	1757.	
6	03.04.85	6020	3300.	3550.	1937.	
7	06.04.85	3562	3550.	4464.8	2516.(=42h)	End of prediction

@1 on Siemens maschine 7-890 (same as Fujitsu FACOM M380)

Table 5.2 LOBI-MOD2 Test A2-81 (ISP18): Post-Test Prediction, Sequence of Events

Event	Time(s) measured	calculated
- Leak starts to open	0	0
- Primary pressure reaches 132 bar Heating Power starts to drop; Cooling down curve becomes active; secondary shutoff valve starts to close;	32	24
- Primary pressure reaches 110 bar Main Coolant Pumps start to coastdown	45	41
- High Pressure Injection starts (117 bar + delay of 35 s)	74	65
- Main Coolant Pumps stop	117	115
- Locked Rotor Resistance Simulator for Broken Loop in position "resistance"	121	115
- Primary pressure reaches 10 bar (specified end of test)	4333	4025

F I G U R E S

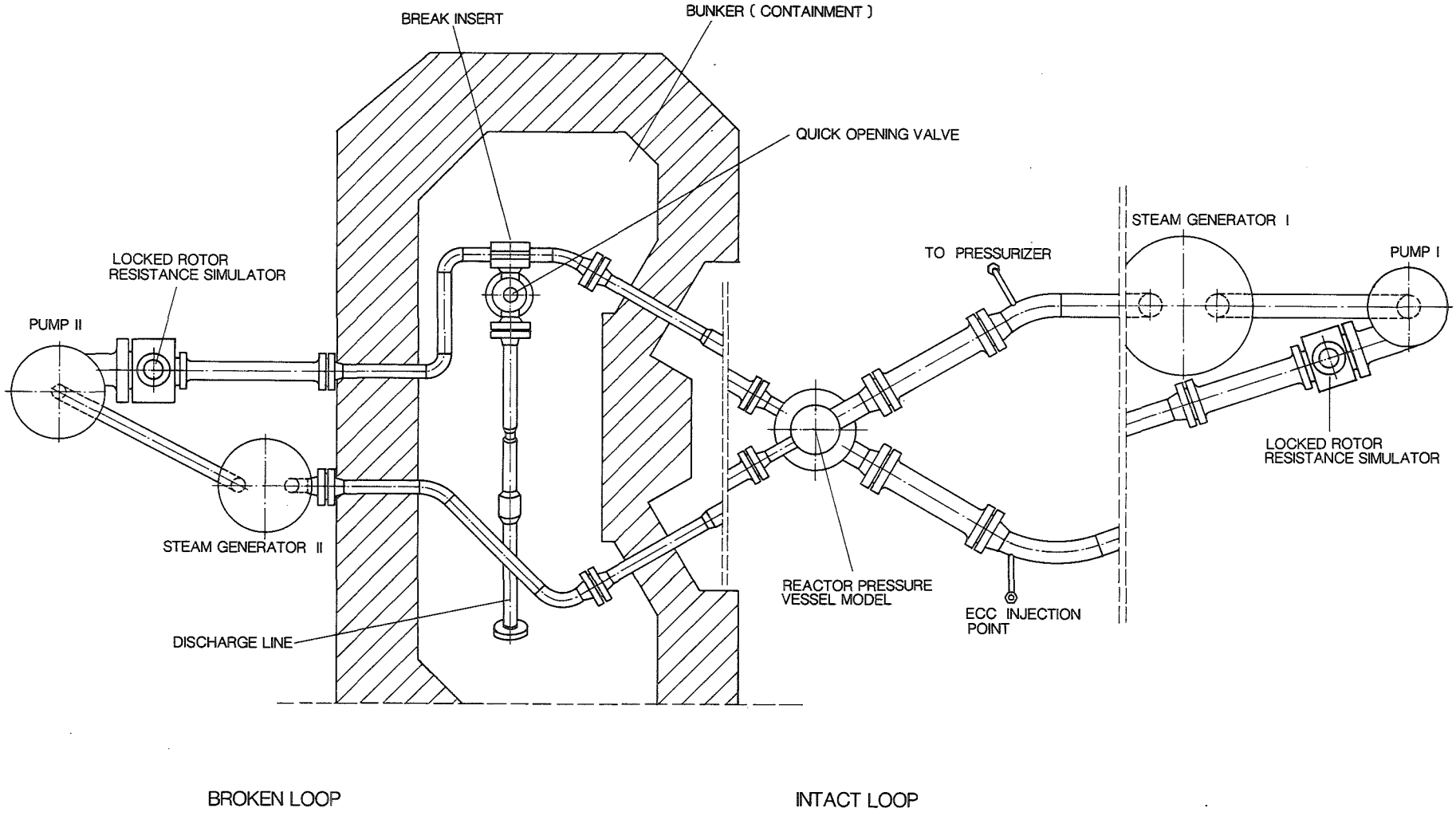


Figure 2.1 LOBI-MOD2 Configuration for Test A2-81

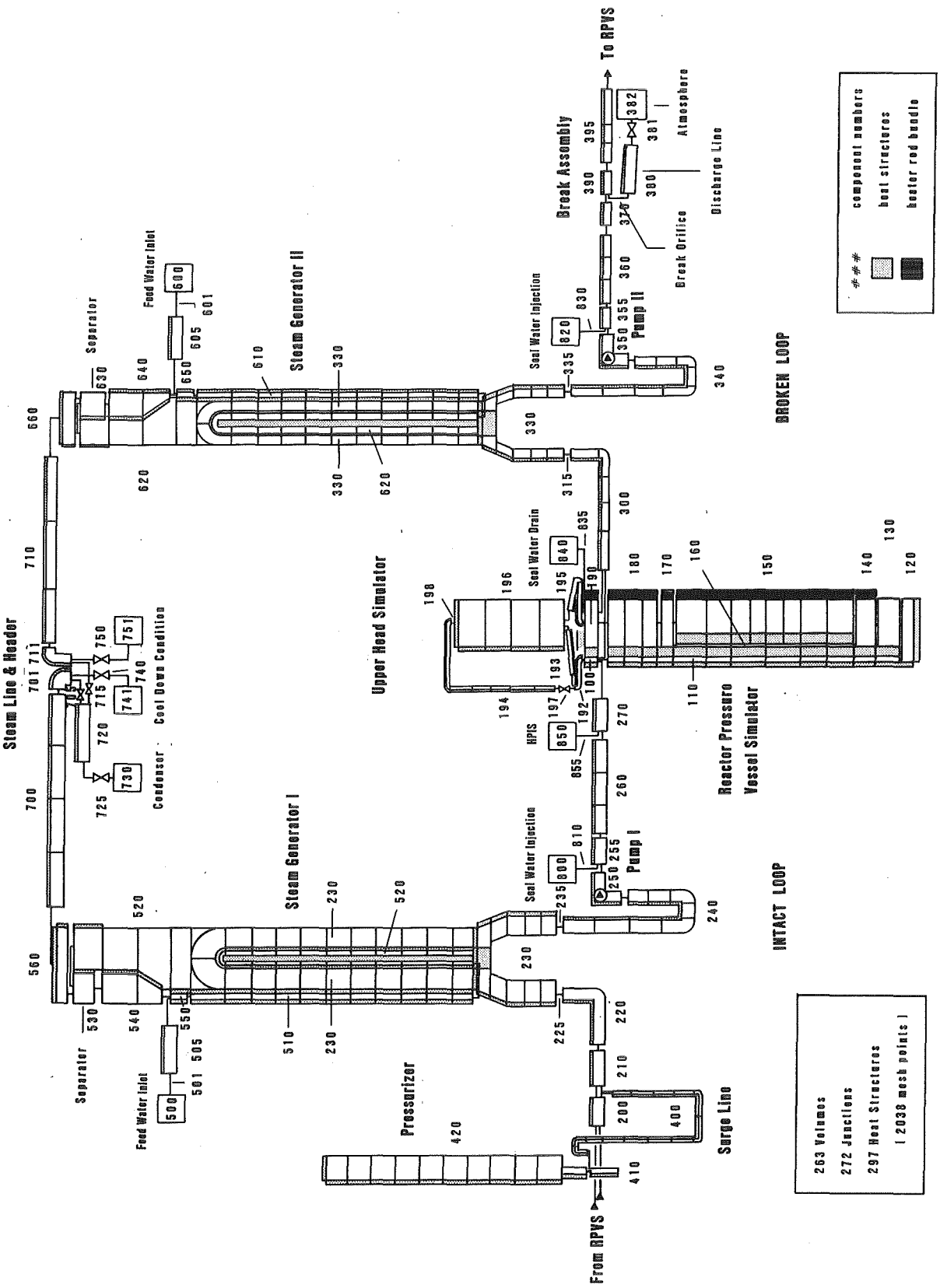


Figure 3.1 LOBI-MOD2 Nodalization for RELAP5/MOD1

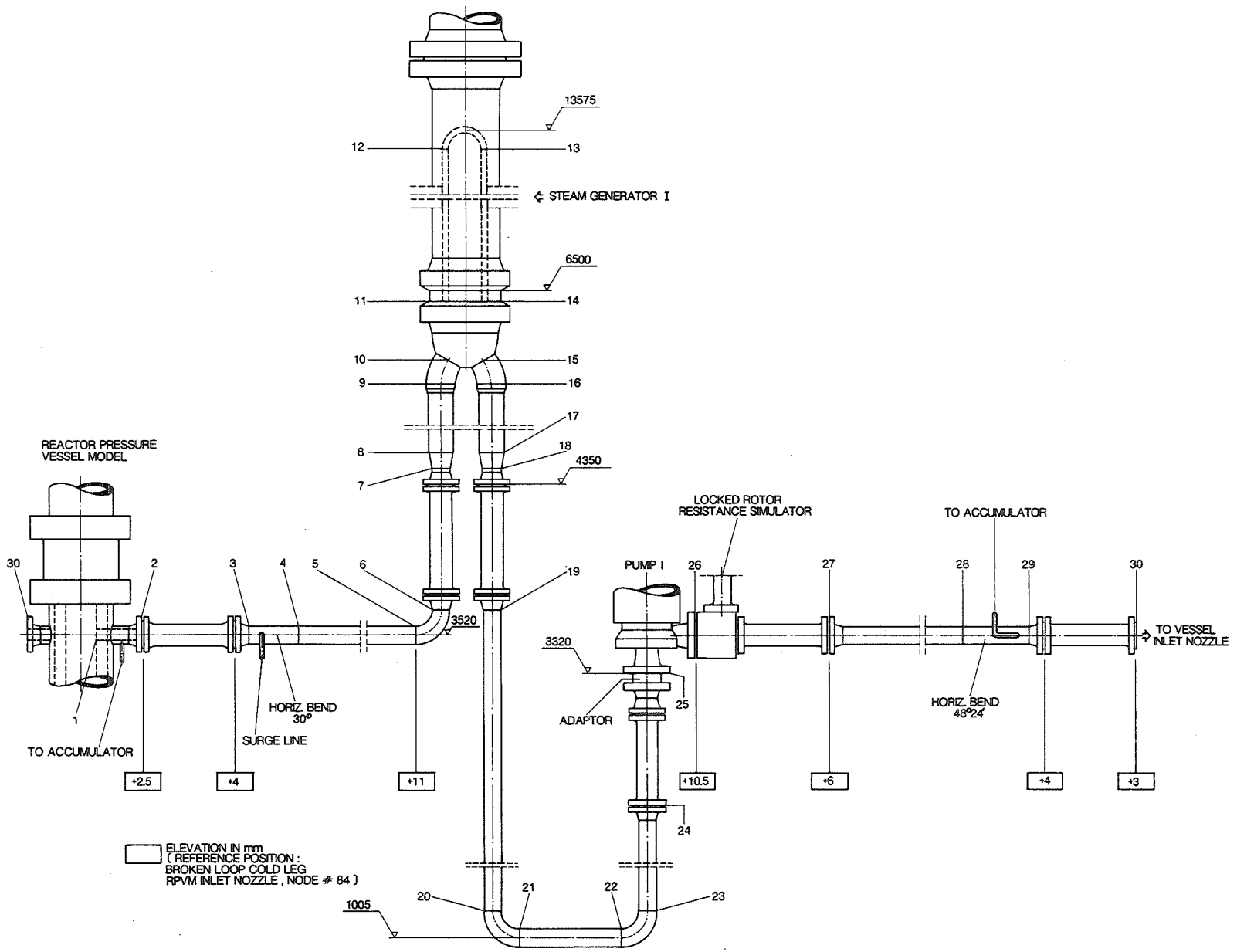


Figure 3.2 LOBI-MOD2 Intact Loop (Schematic)

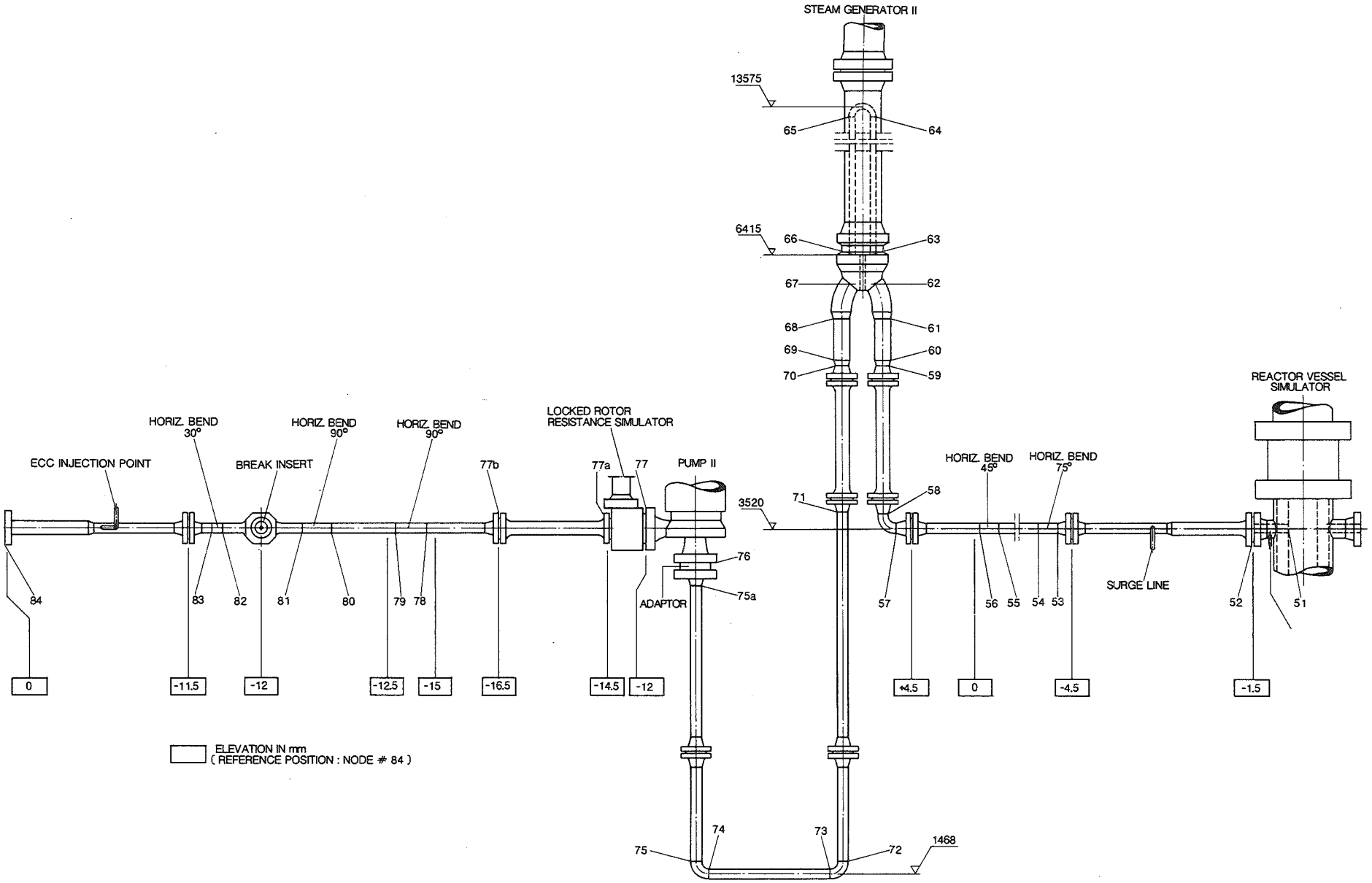


Figure 3.3 LOBI-MOD2 Broken Loop (Schematic)

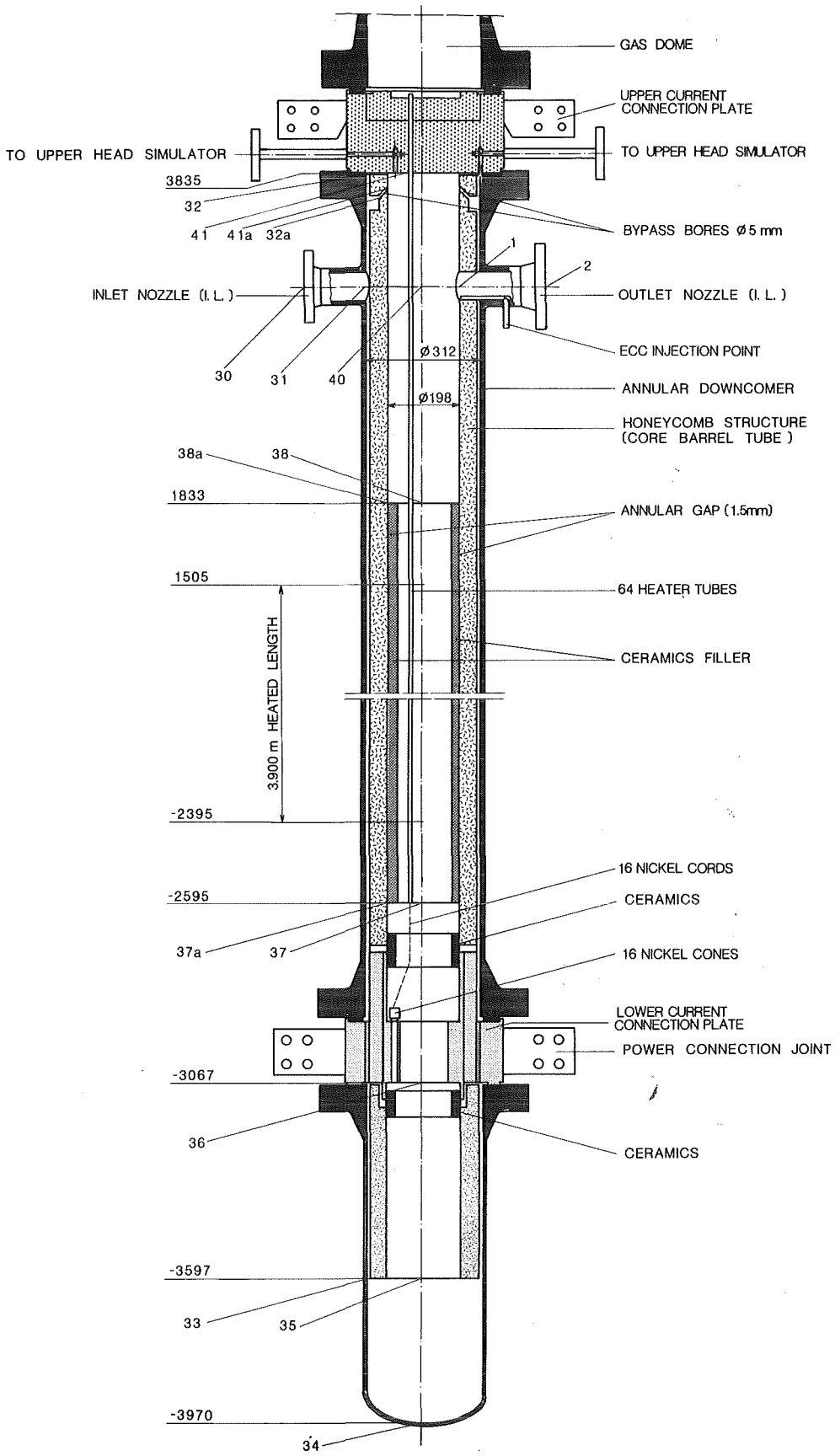


Figure 3.4 LOBI-MOD2 Reactor Pressure Vessel Model (Schematic)

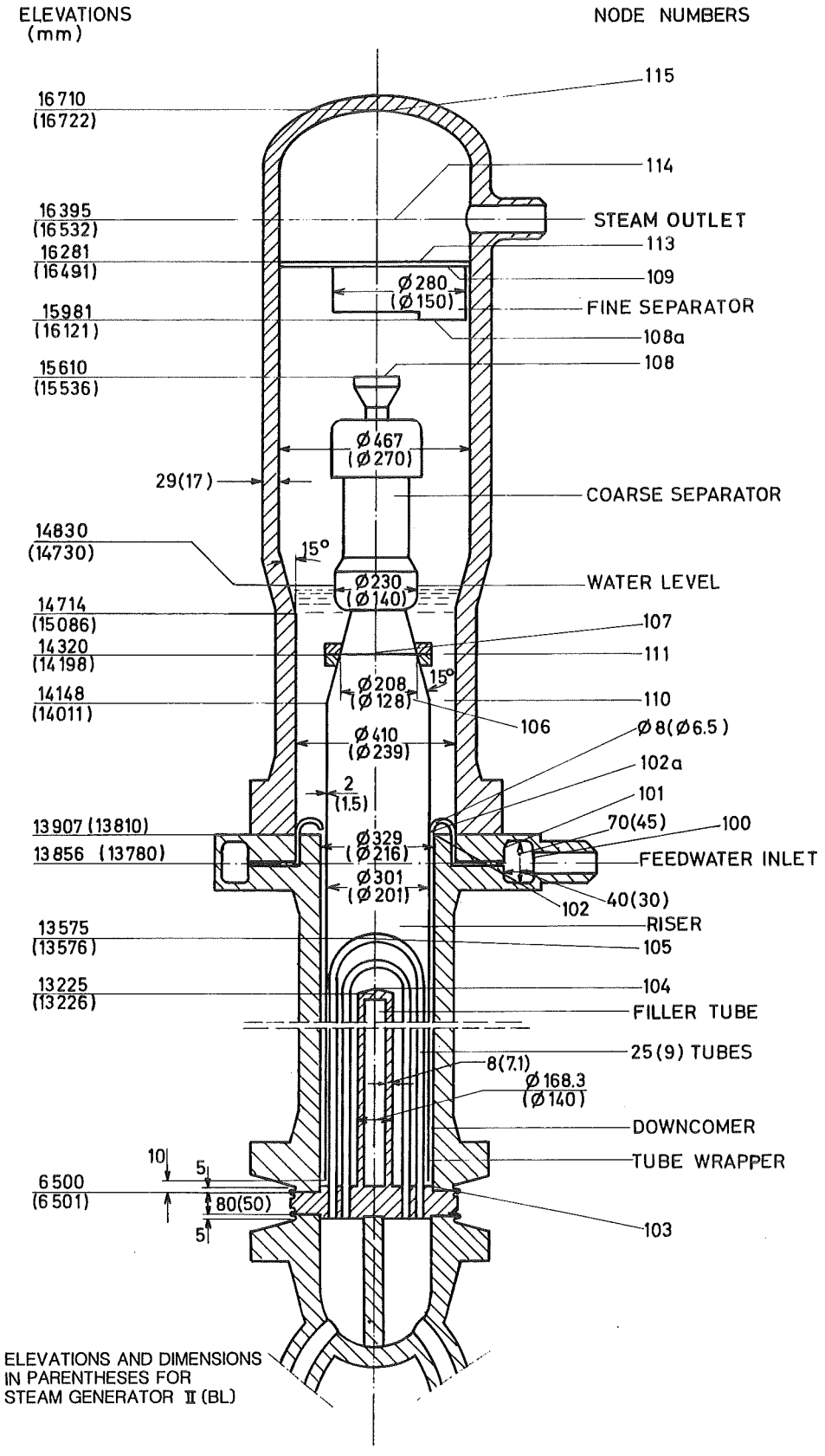


Figure 3.5 LOBI-MOD2 Steam Generator(s), Schematic

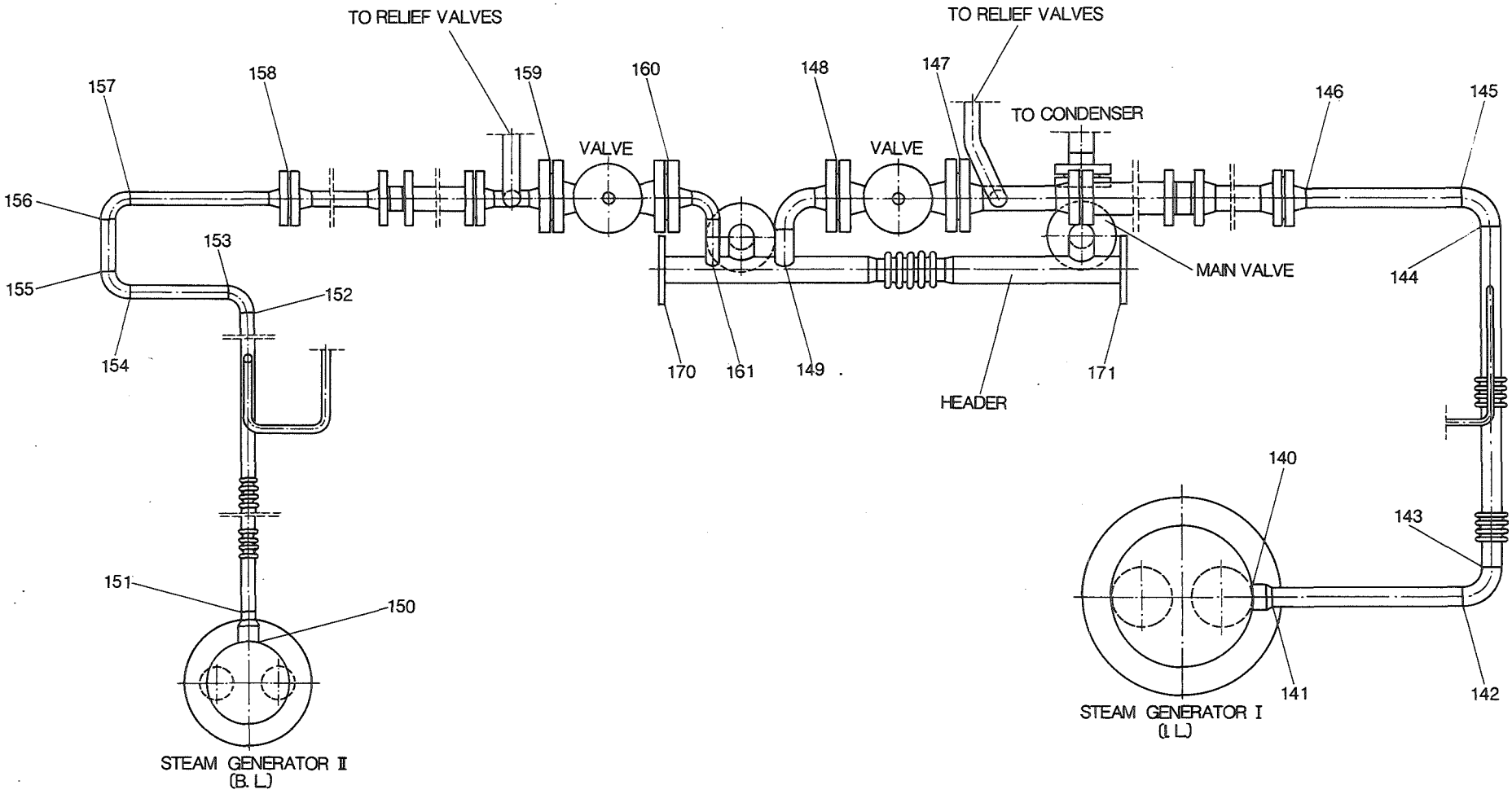


Figure 3.6 LOBI-MOD2 Steam Lines and Header (Schematic)

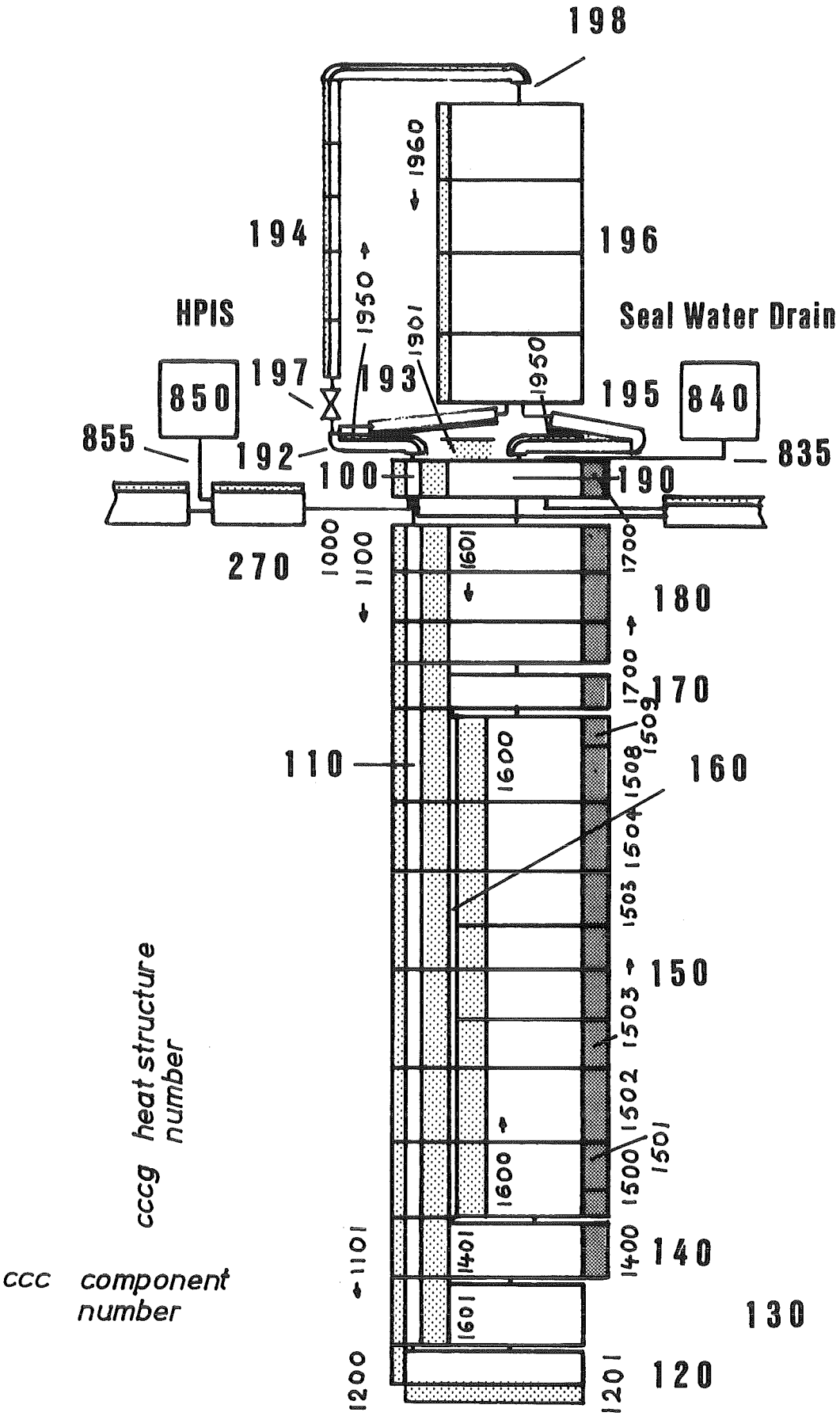


Figure 3.7 Nodalization of RPVM

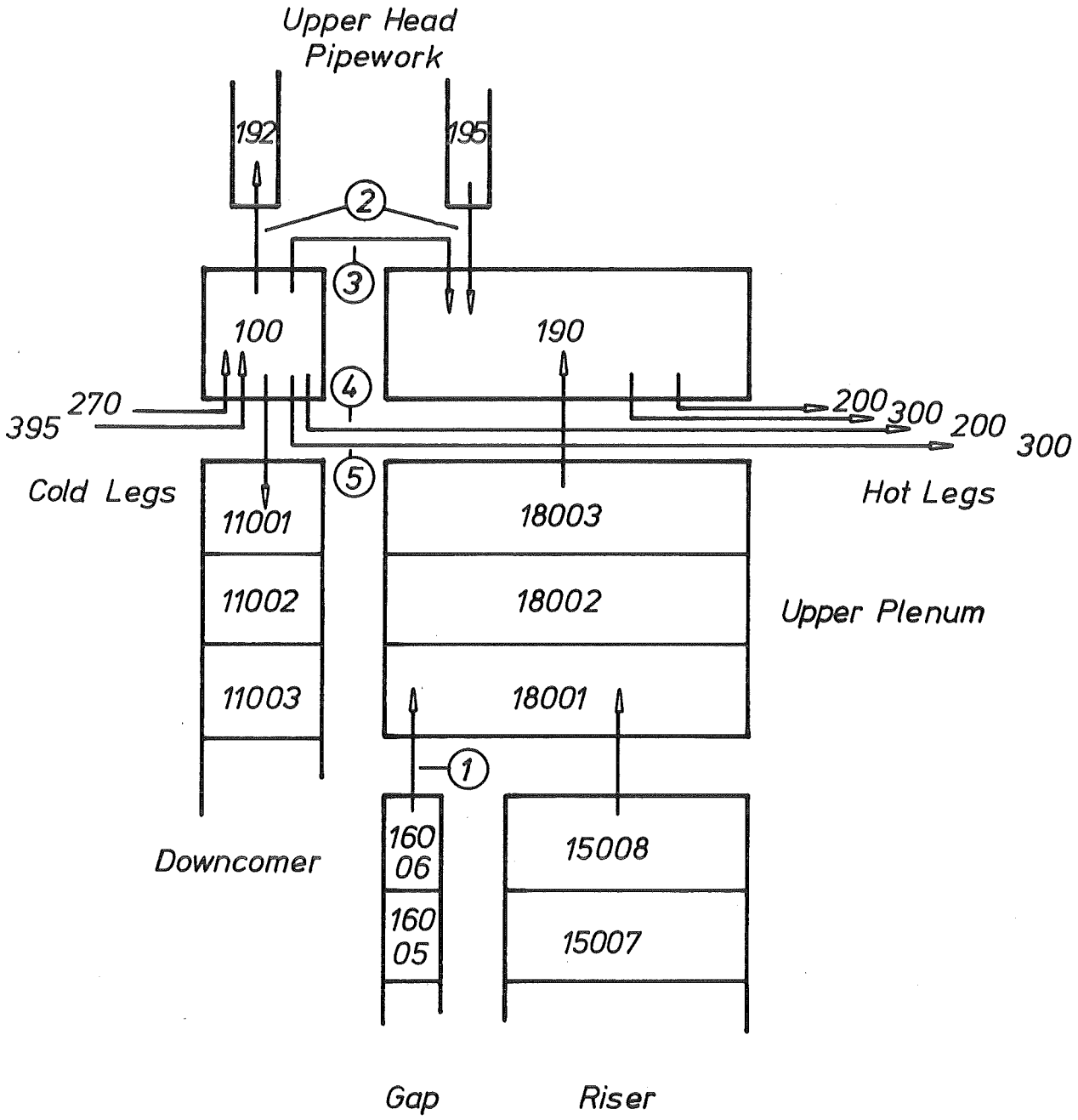
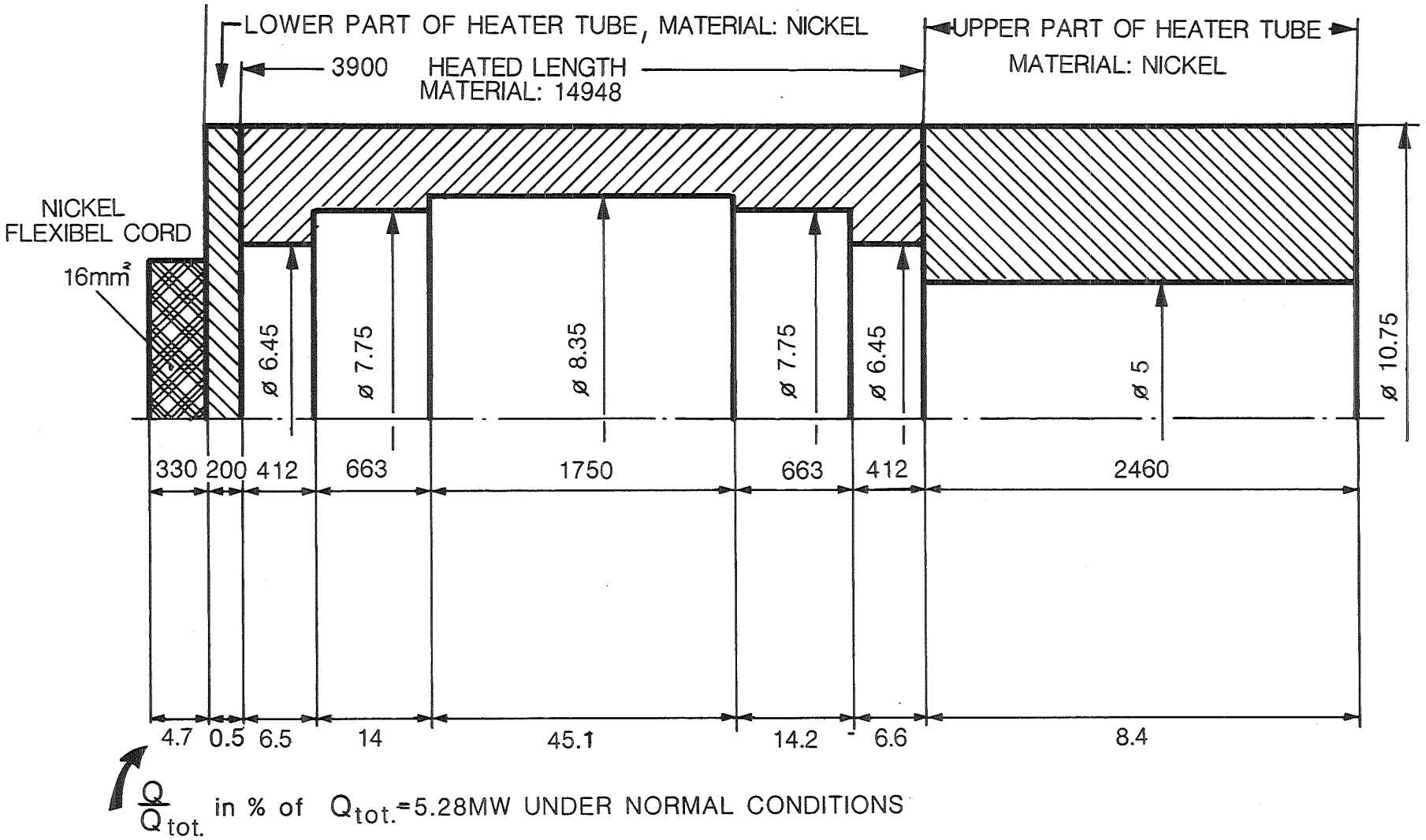


Figure 3.8 Modelling of Core Bypass Flow Paths in RPVM



dimensions in mm

Figure 3.9 LOBI-MOD2 Heater Rods, Sections and Power Distribution

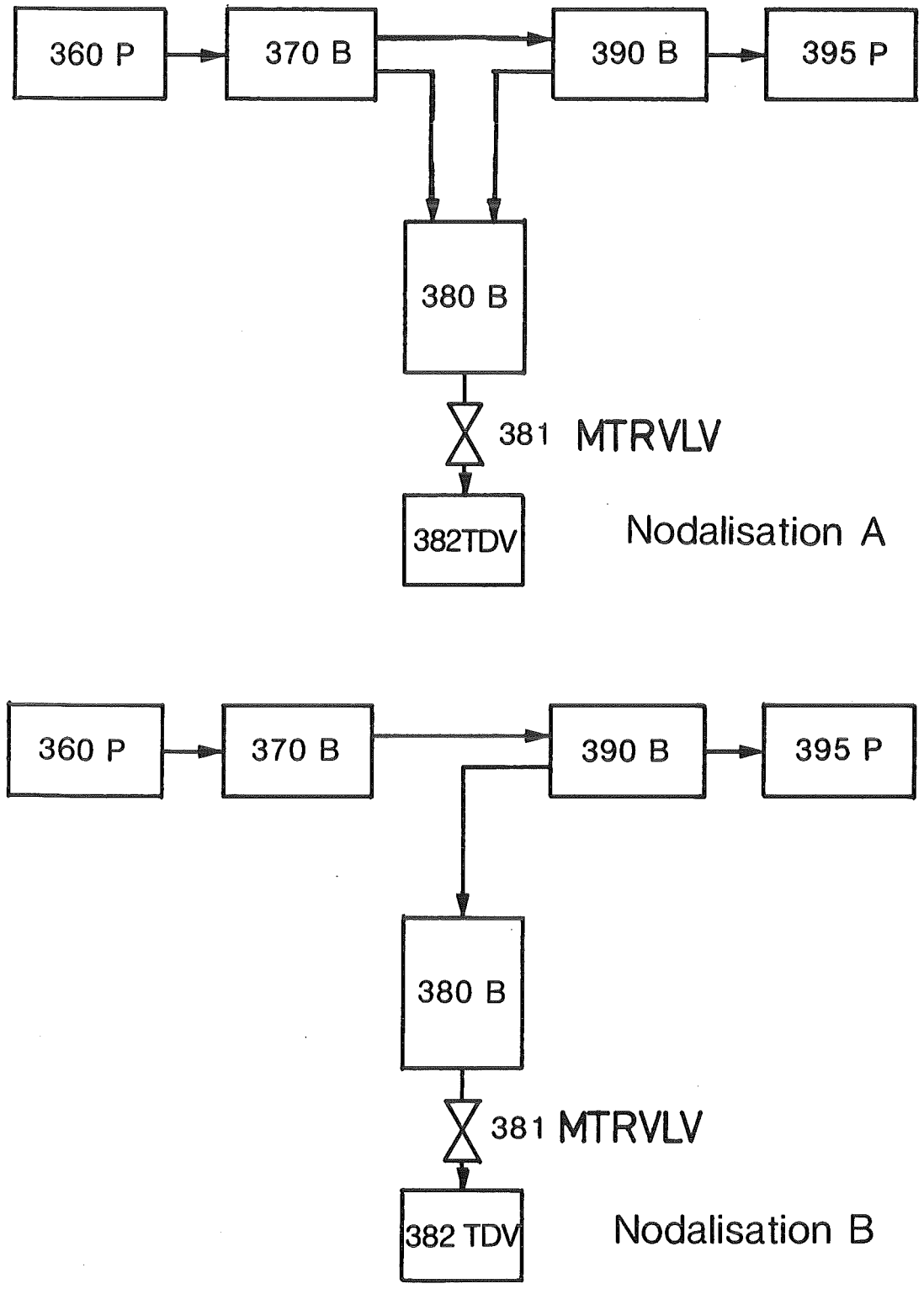


Figure 3.10 Modelling of Break

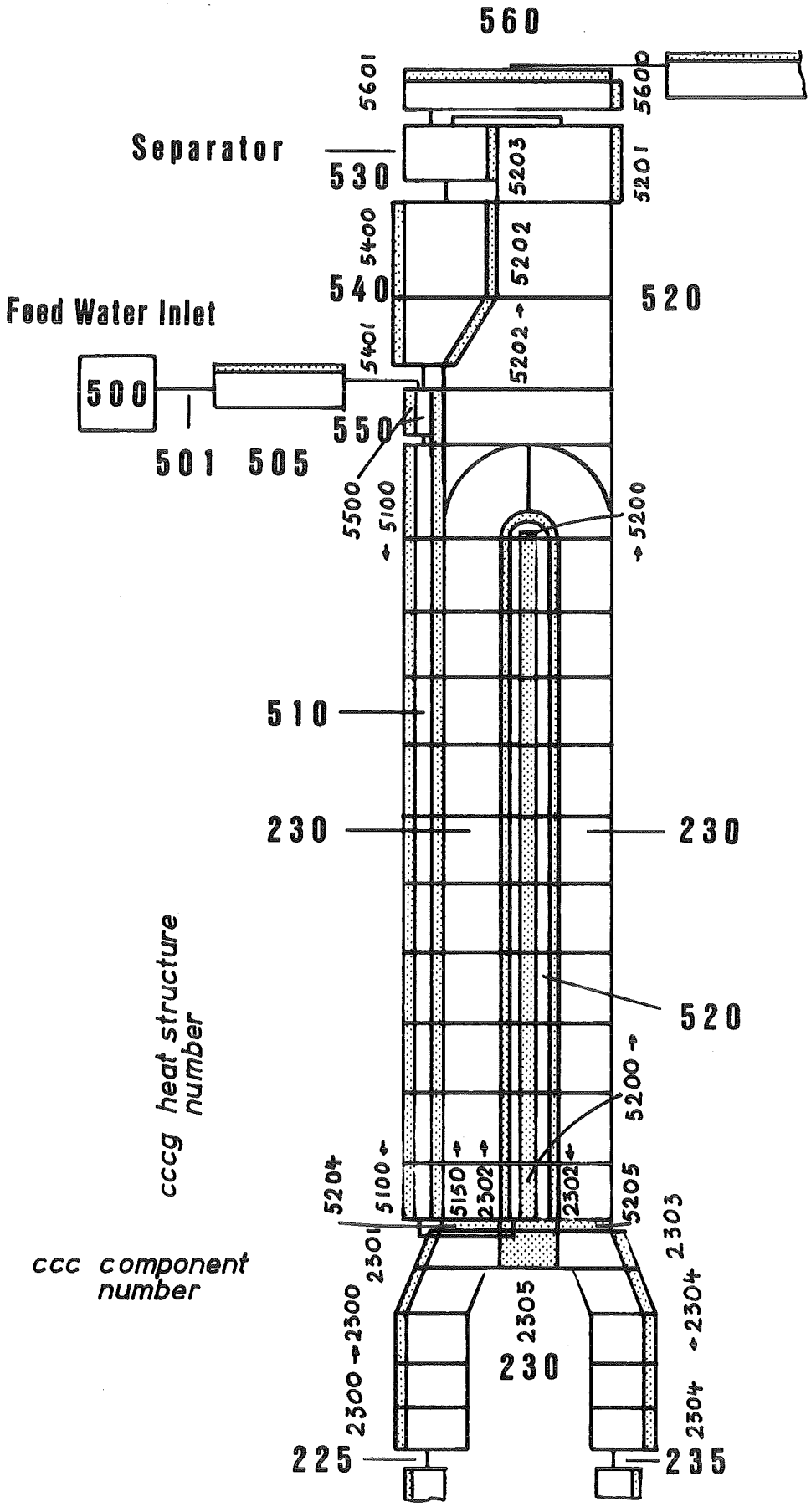


Figure 3.11 Nodalization of Steam Generator I

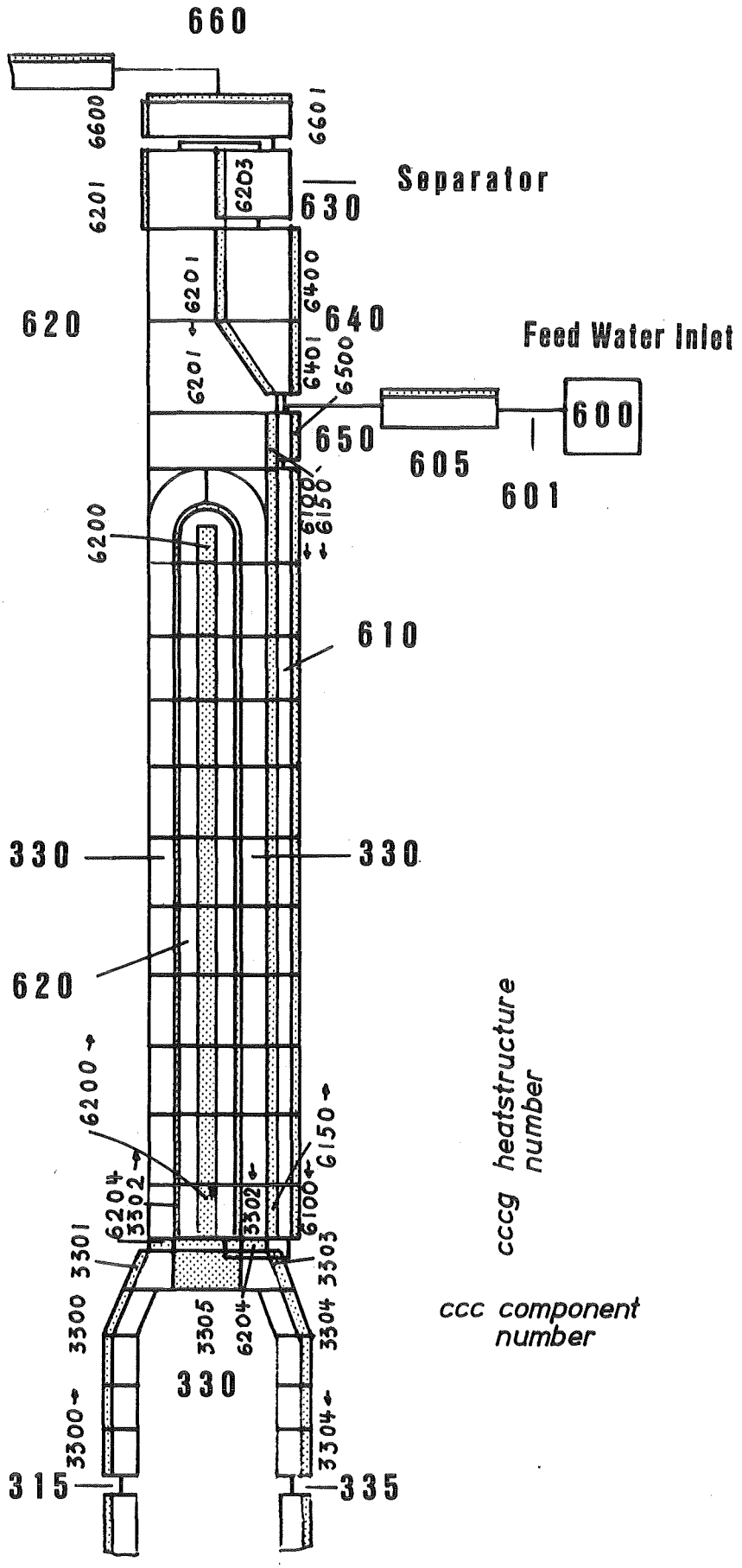


Figure 3.12 Nodalization of Steam Generator II

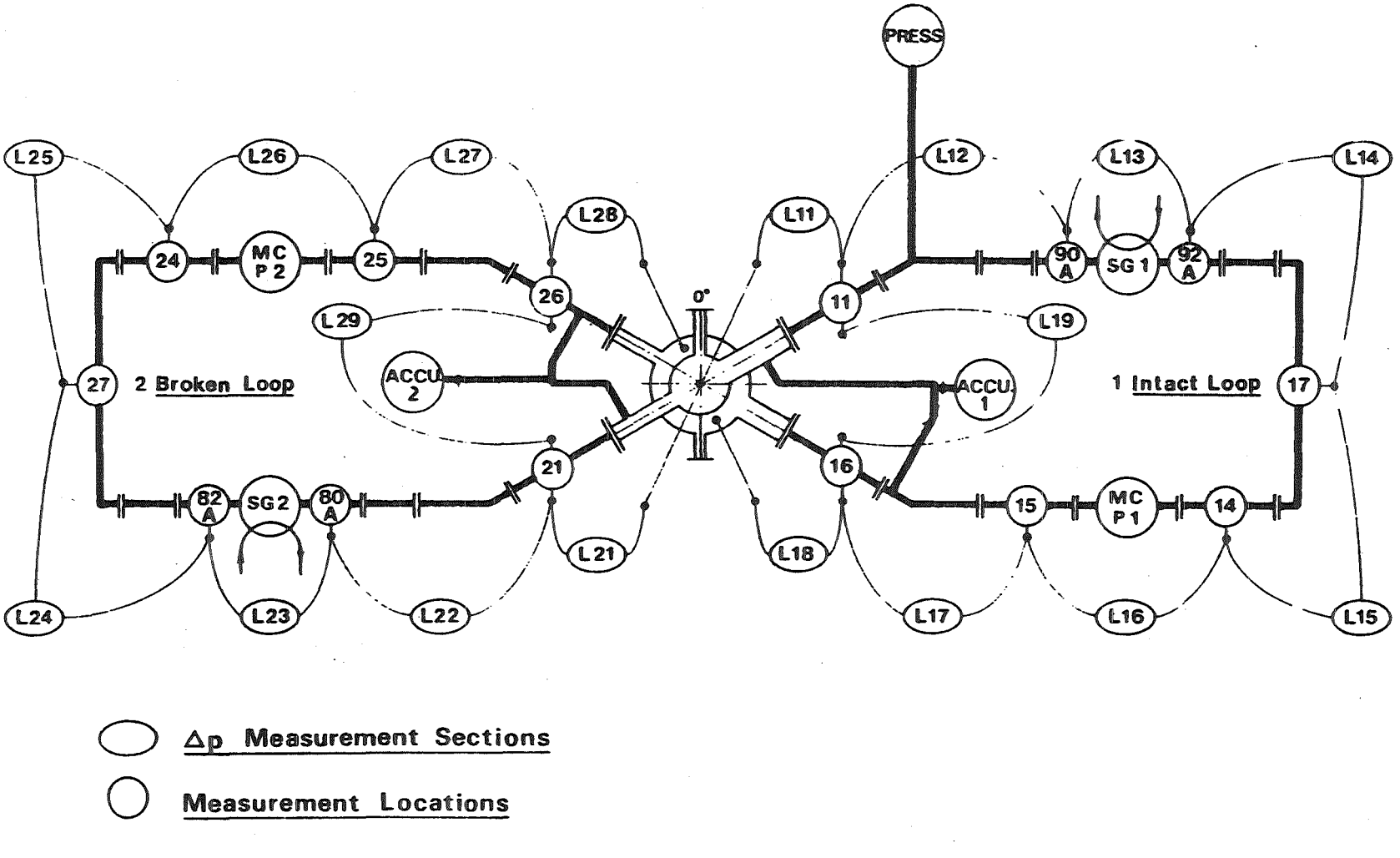


Figure 4.1: Differential Pressure Measurement Sections for Loops

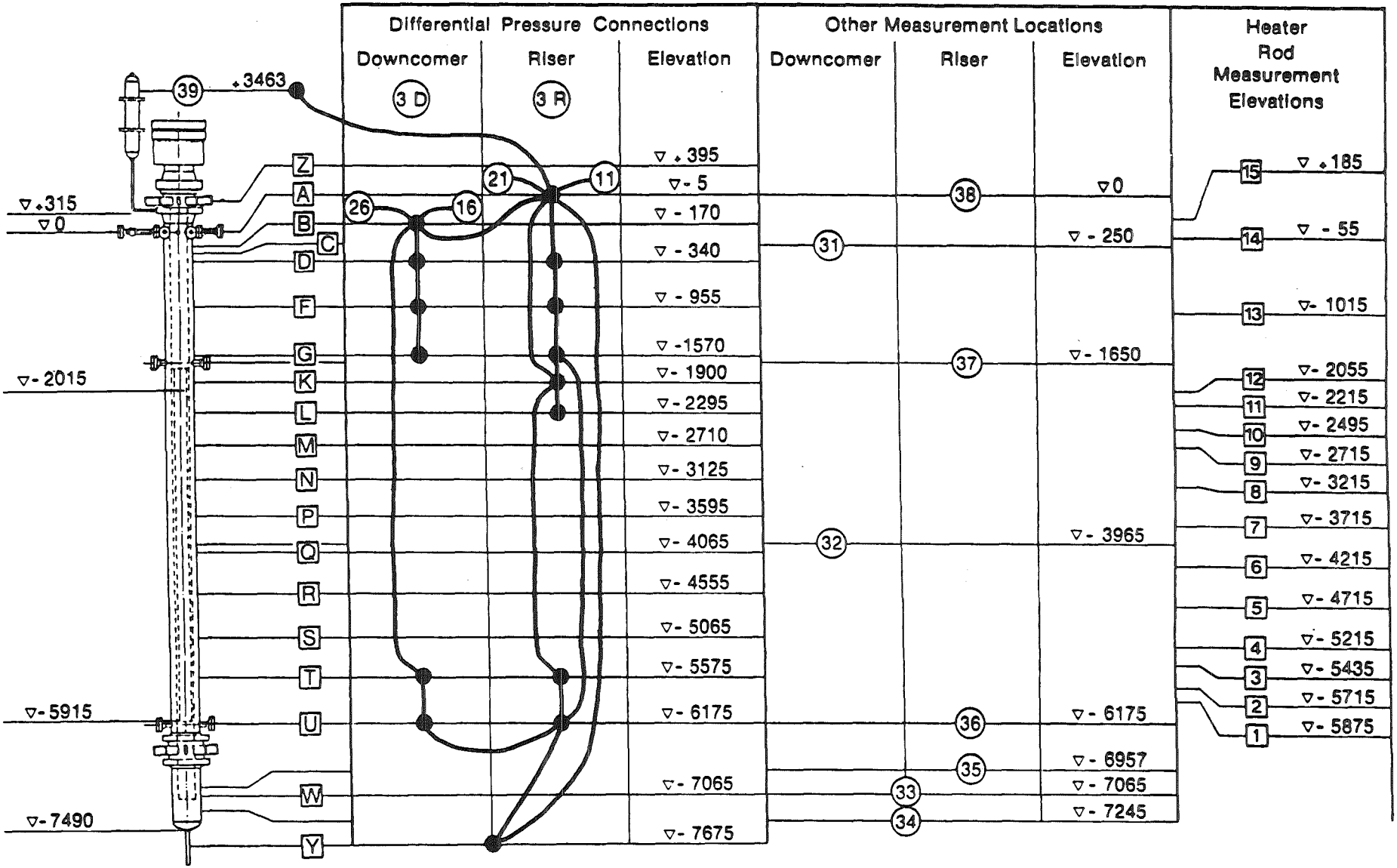


Figure 4.2: Differential Pressure Measurement Sections for RPVM

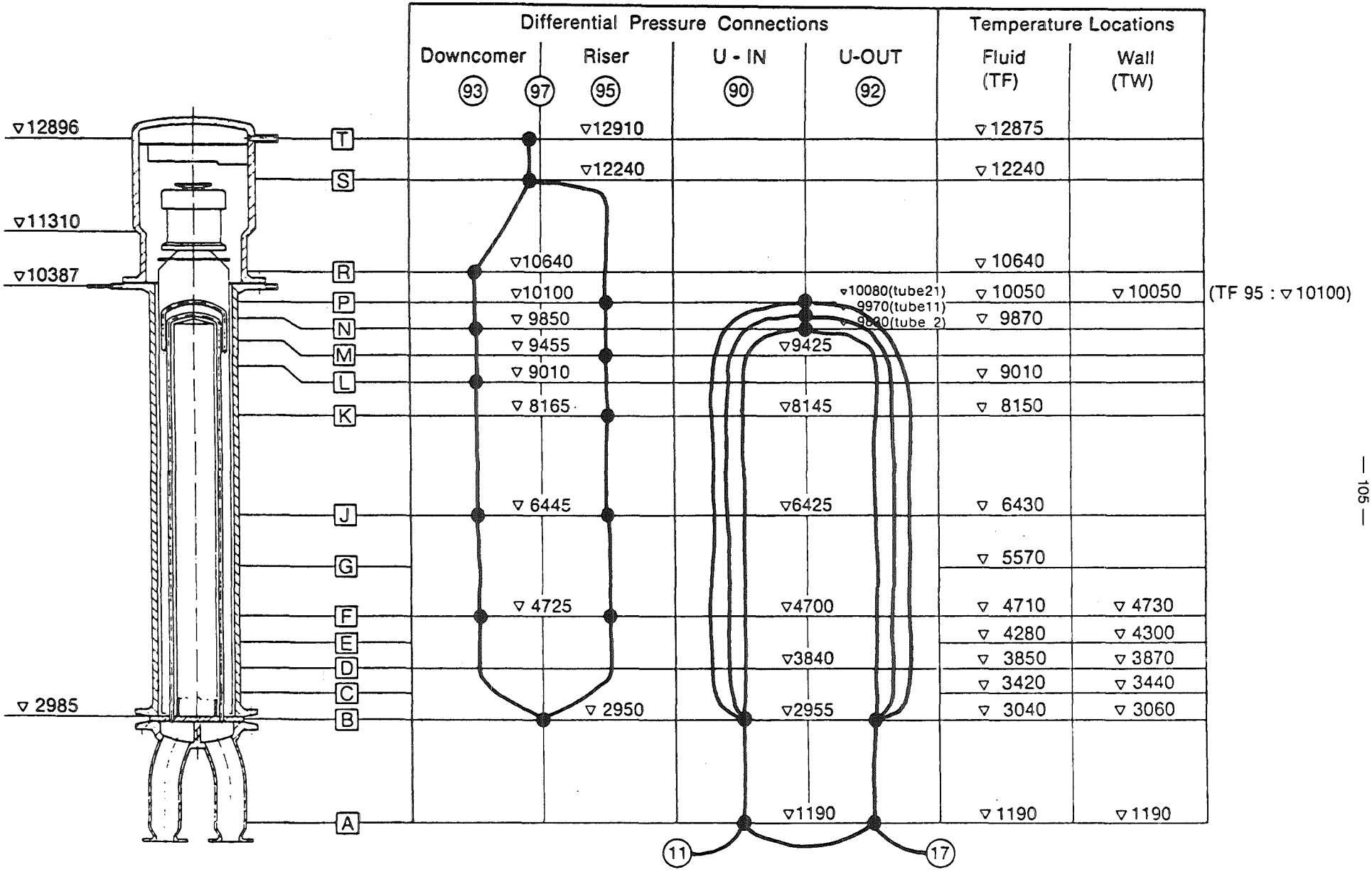


Figure 4.3: Differential Pressure Measurement Sections for SG I

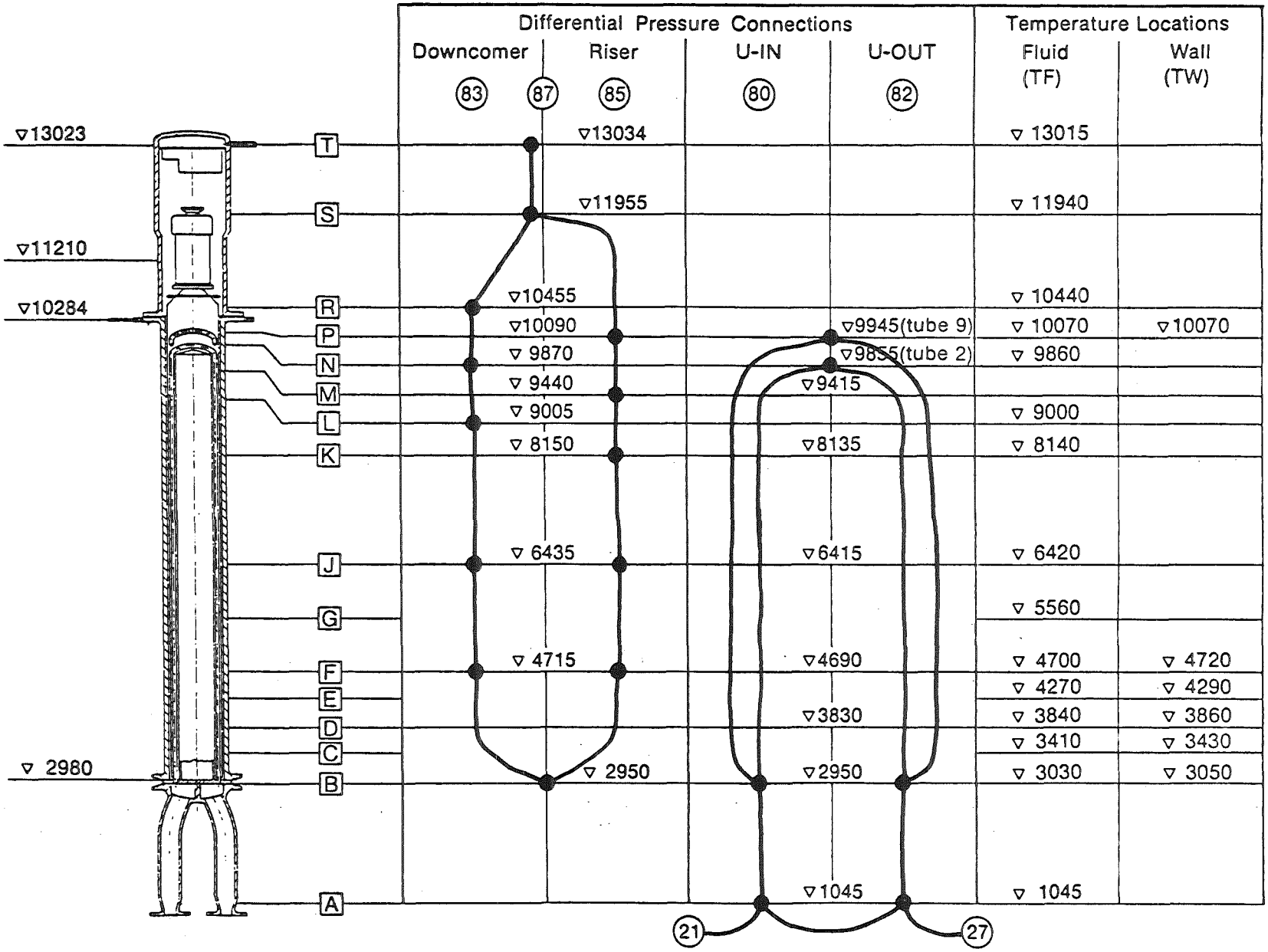


Figure 4.4: Differential Pressure Measurement Sections for SG II

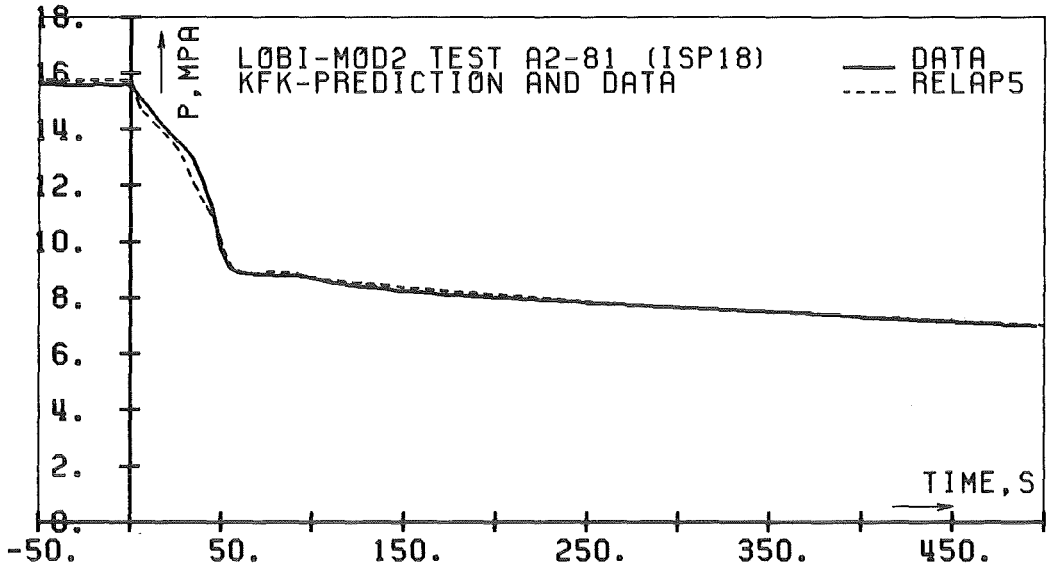


FIG. 5.2A PRESSURE IN PRESSURIZER, PA40 (MPA)

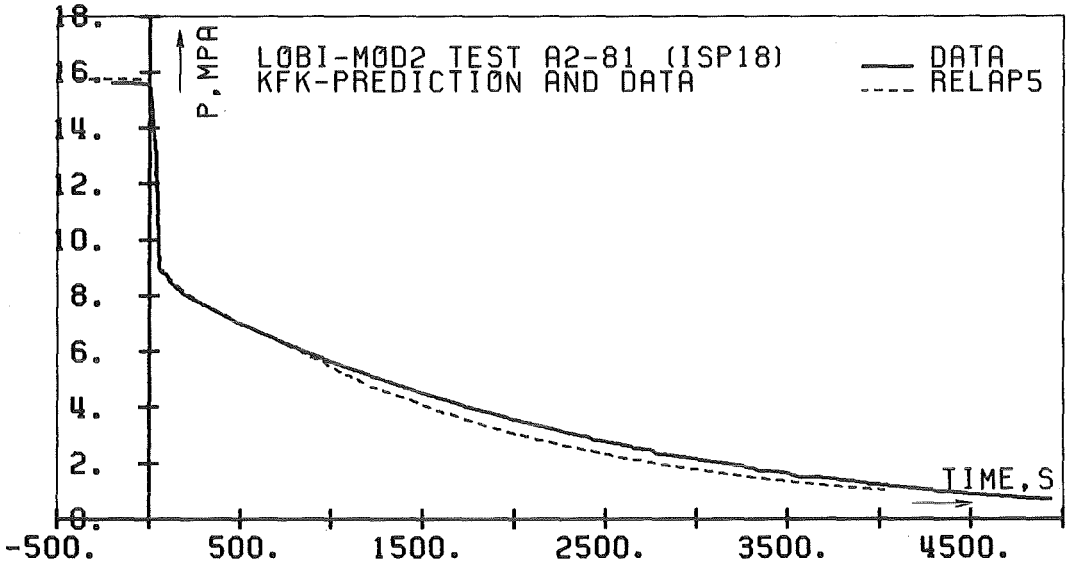


FIG. 5.2 PRESSURE IN PRESSURIZER, PA40 (MPA)

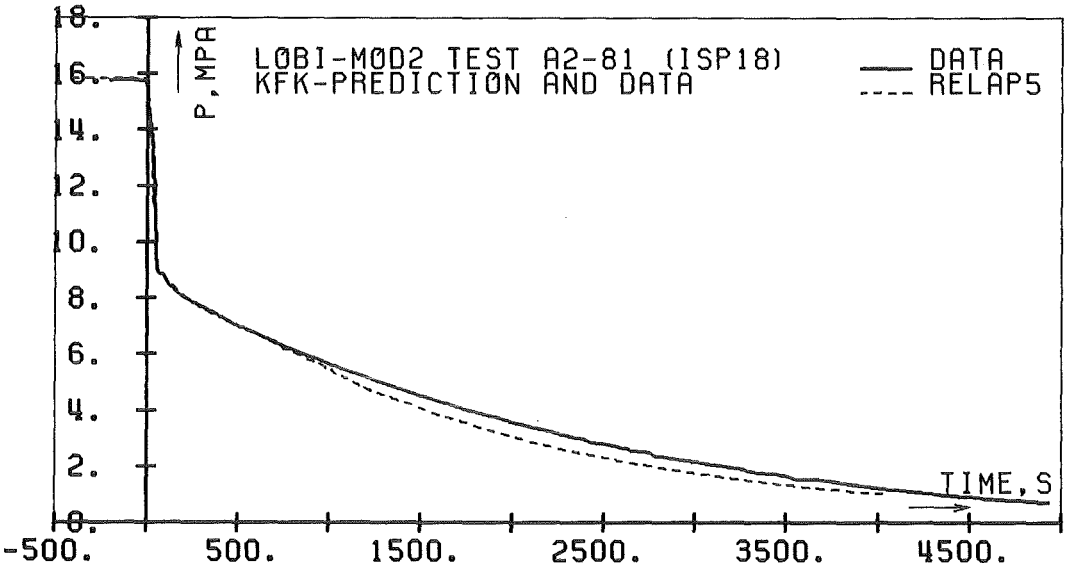


FIG. 5.1 PRESSURE IN UPPER PLENUM, PA38 (MPA)

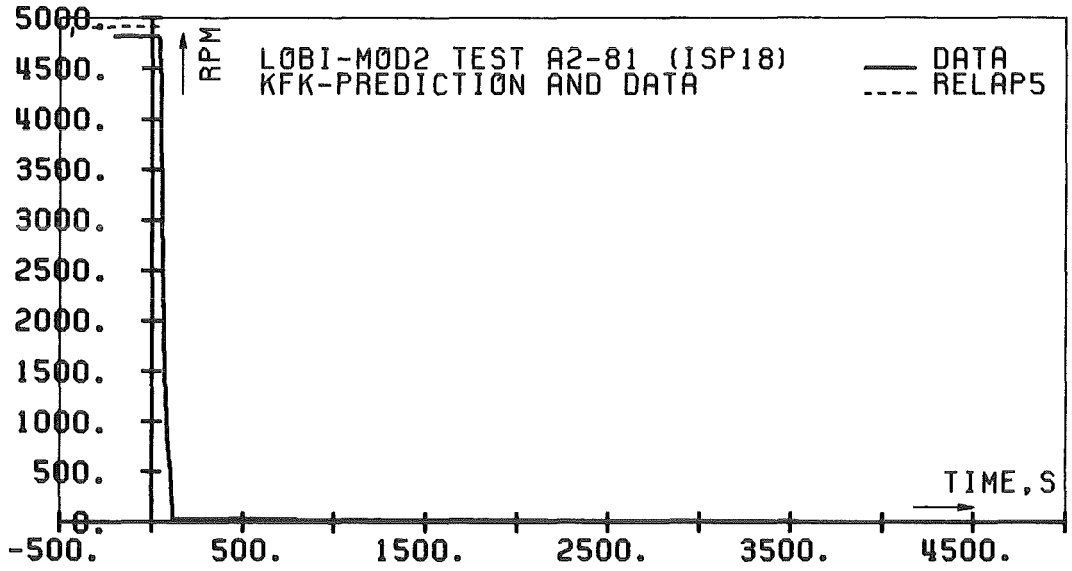


FIG. 5.4 INTACT LOOP PUMP SPEED, RP71 (RPM)

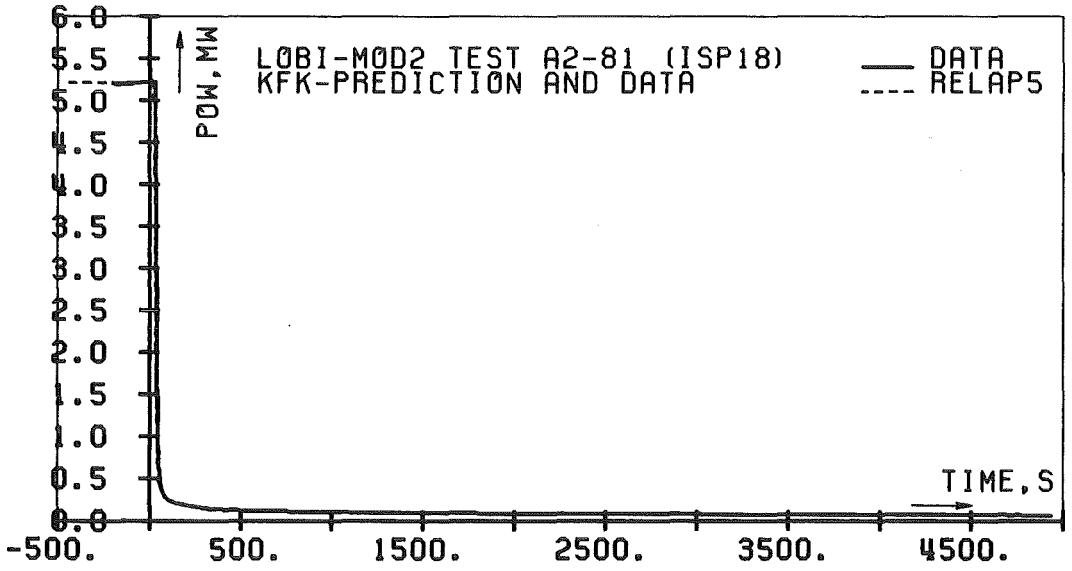


FIG. 5.3 POWER INPUT, WH-POWER (MW)

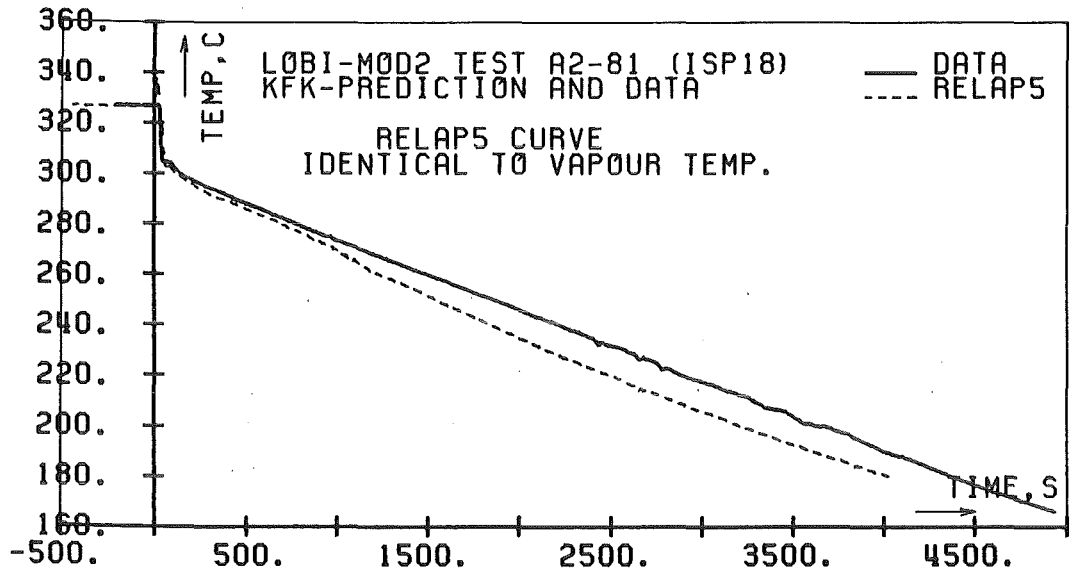


FIG. 5.6 FLUID TEMP. INTACT L. VESSEL OUTLET AT TOP, TF11T (C)

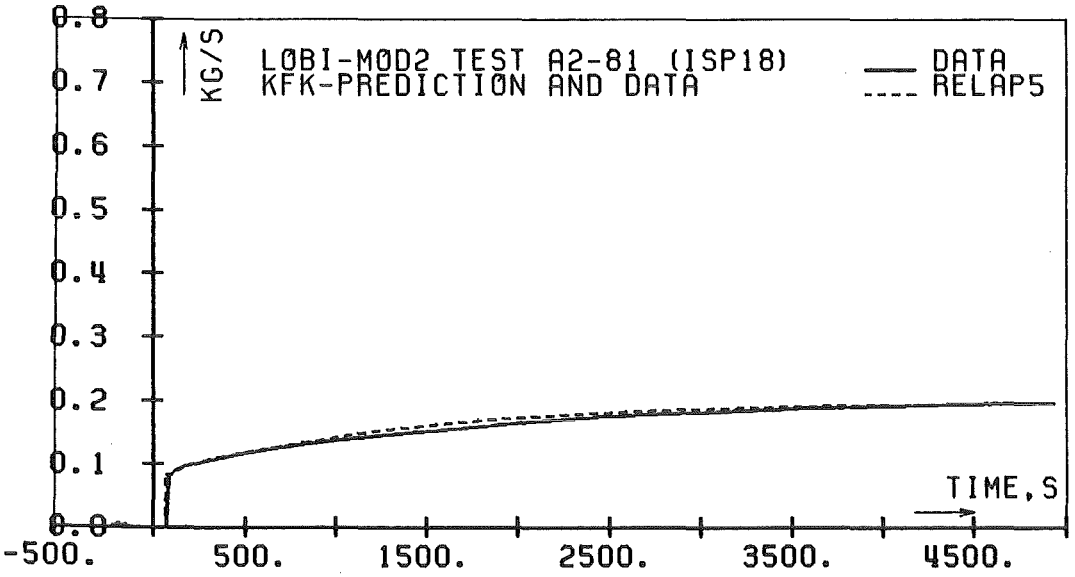


FIG. 5.5 HIGH PRESSURE INJECTION FLOW, QM55 (KG/S)

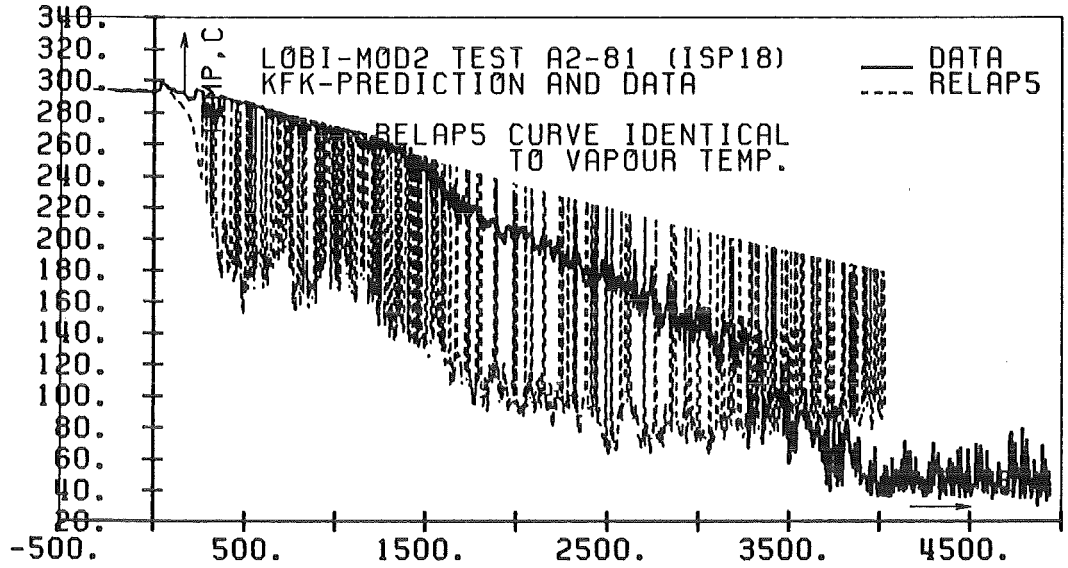


FIG. 5.8 FLUID TEMP. INTACT LØØP VESSEL INLET AT TØP, TF16T (C)

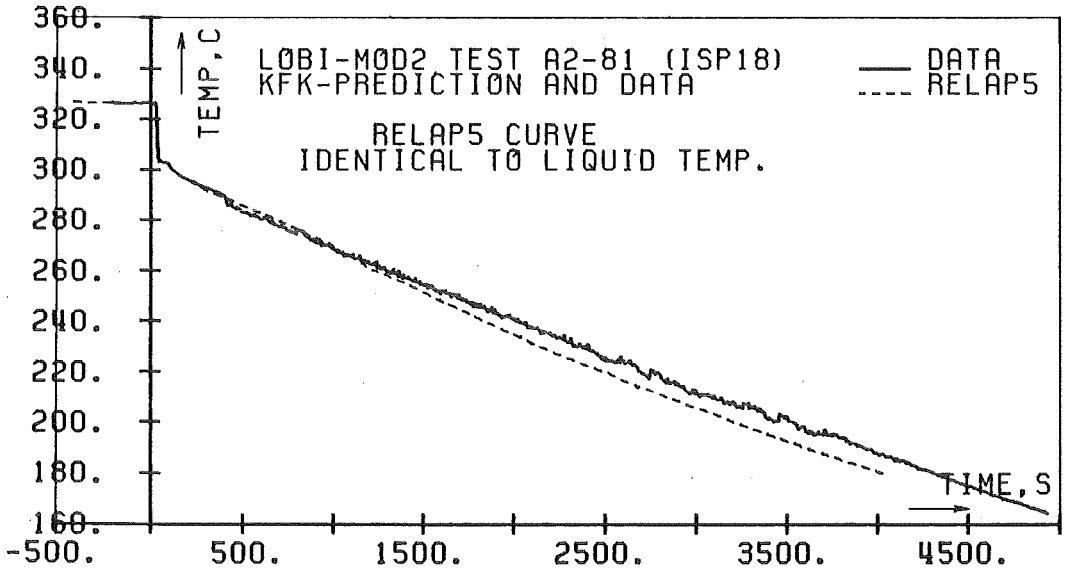


FIG. 5.7 FLUID TEMP. INTACT L. VESSEL OUTLET AT BØTTØM, TF11B (C)

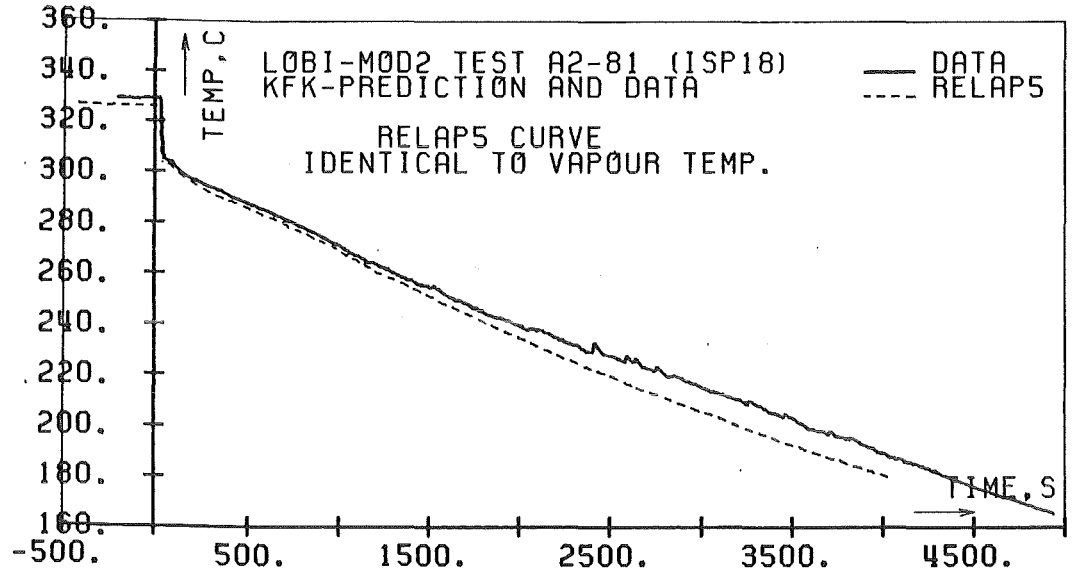


FIG. 5.10 FLUID TEMP. BRØKEN LØØP VESSEL ØUTLET AT TØP, TF21T (C)

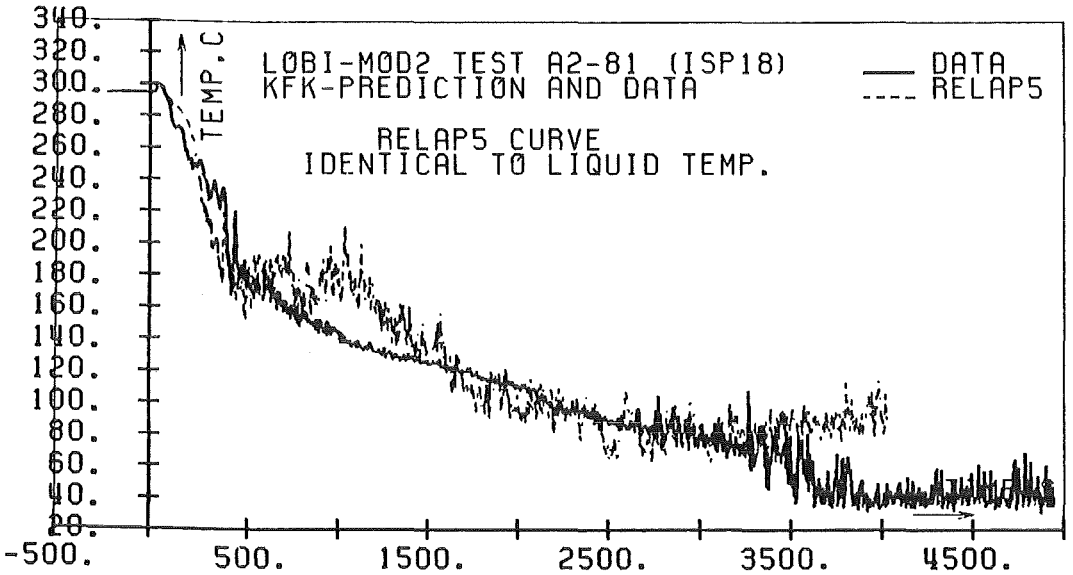


FIG. 5.9 FLUID TEMP. INTACT LØØP VESSEL INLET AT BØTTØM, TF16B (C)

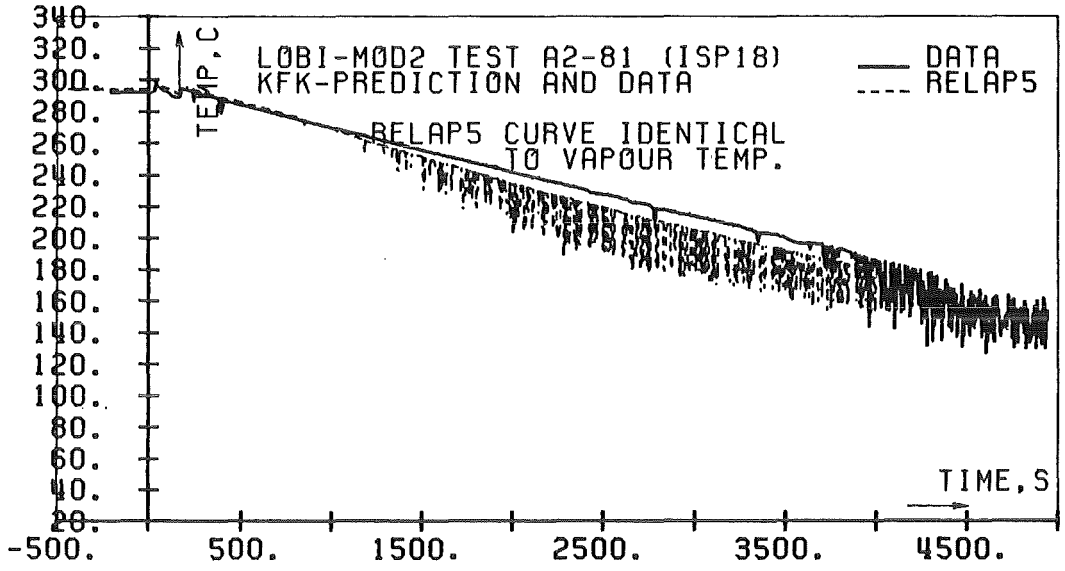


FIG. 5.12 FLUID TEMP. BROKEN LOOP VESSEL INLET AT TOP, TF26T (C)

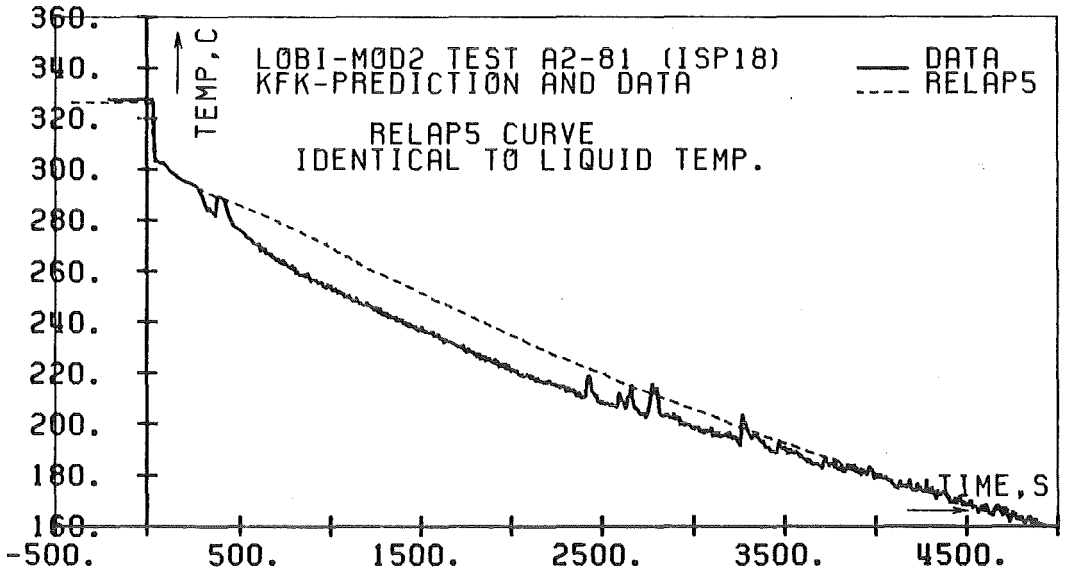


FIG. 5.11 FLUID TEMP. BROKEN LOOP VESSEL OUTLET AT BOTTOM, TF21B (C)

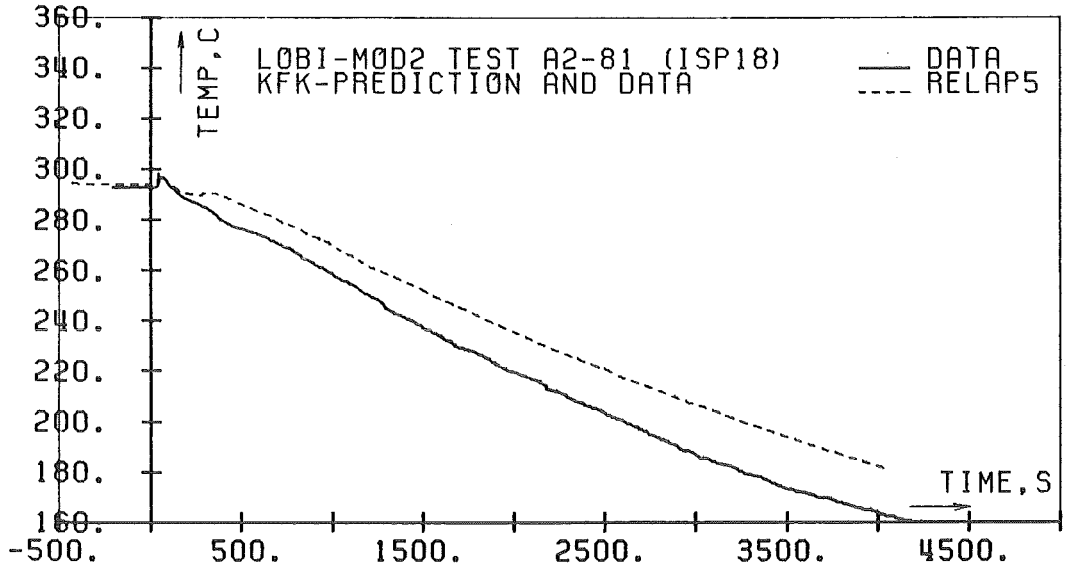


FIG. 5.14 FLUID TEMP. CORE INLET, TF35 (C)

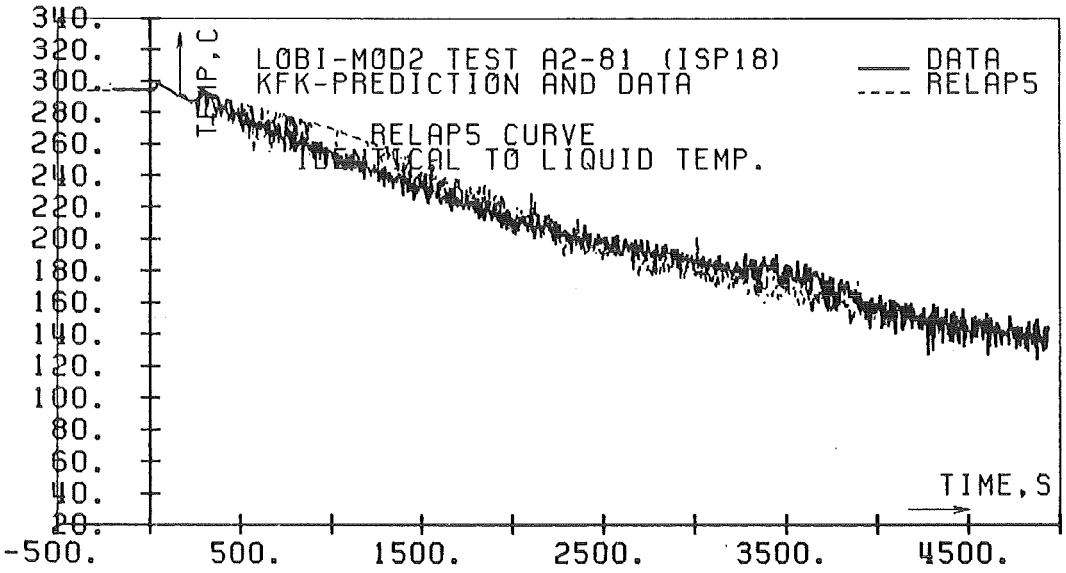


FIG. 5.13 FLUID TEMP. BROKEN LOOP VESSEL INLET AT BOTTOM, TF26B (C)

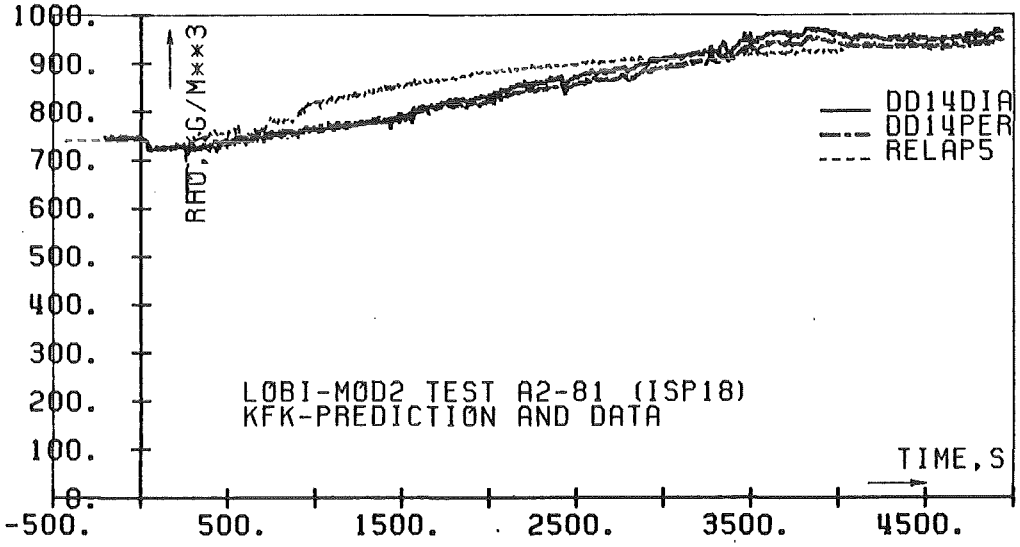


FIG. 5.16 FLUID DENSITY IN INTACT LOOP SEAL PUMP INLET, DD14 (KG/M**3)

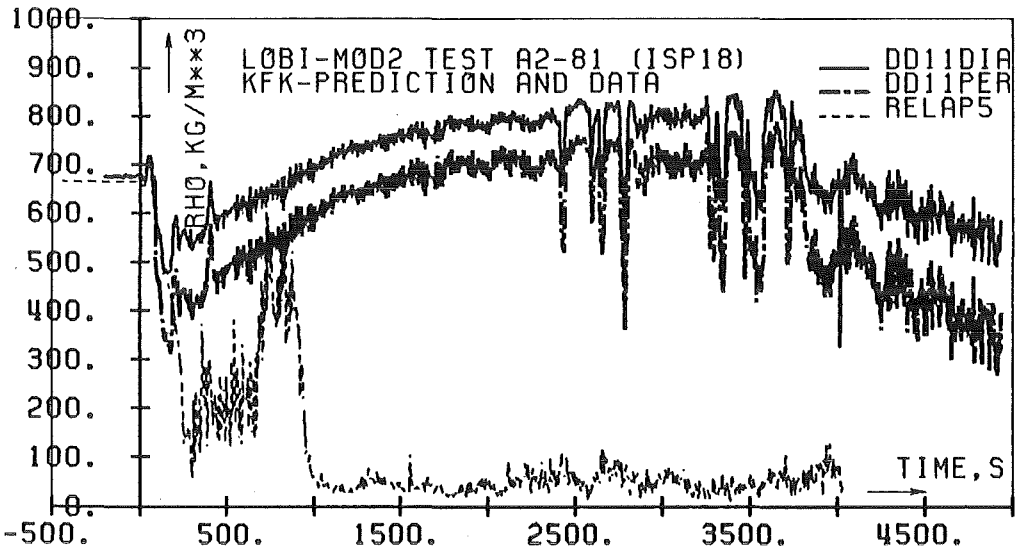


FIG. 5.15 FLUID DENSITY INTACT. L. VESSEL OUTLET, DD11 (KG/M**3)

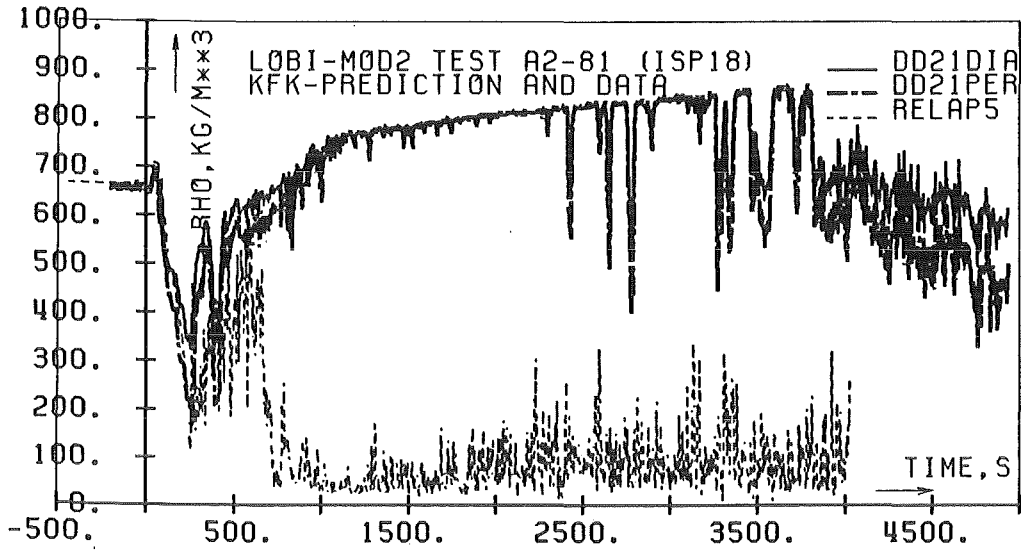


FIG. 5.18 FL.DENSITY BRØKEN L. HØT LEG VESSEL ØUTLET, DD21 (KG/M**3

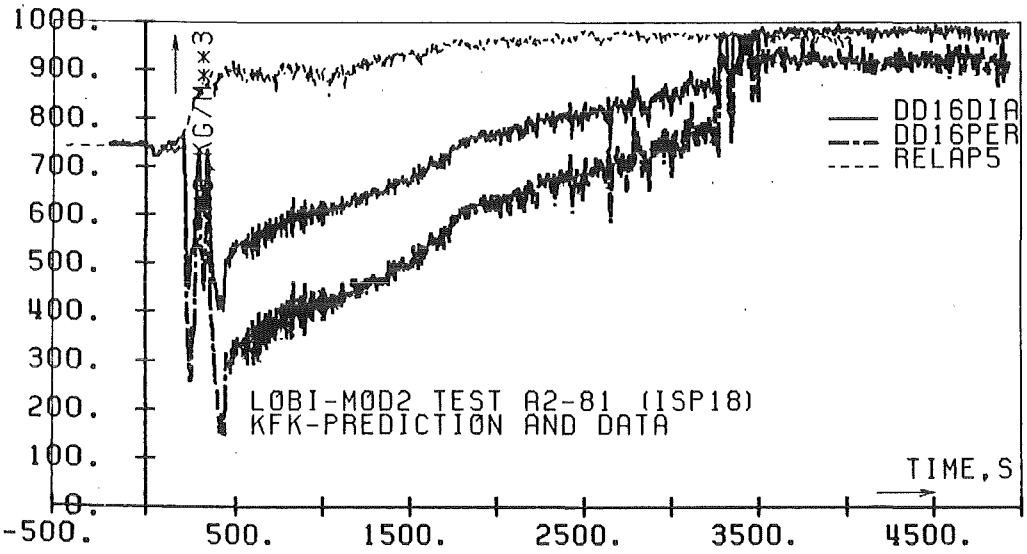


FIG. 5.17 FLUID DENSITY INTACT L. CØLD LEG VESSEL INLET,DD16 (KG/M**

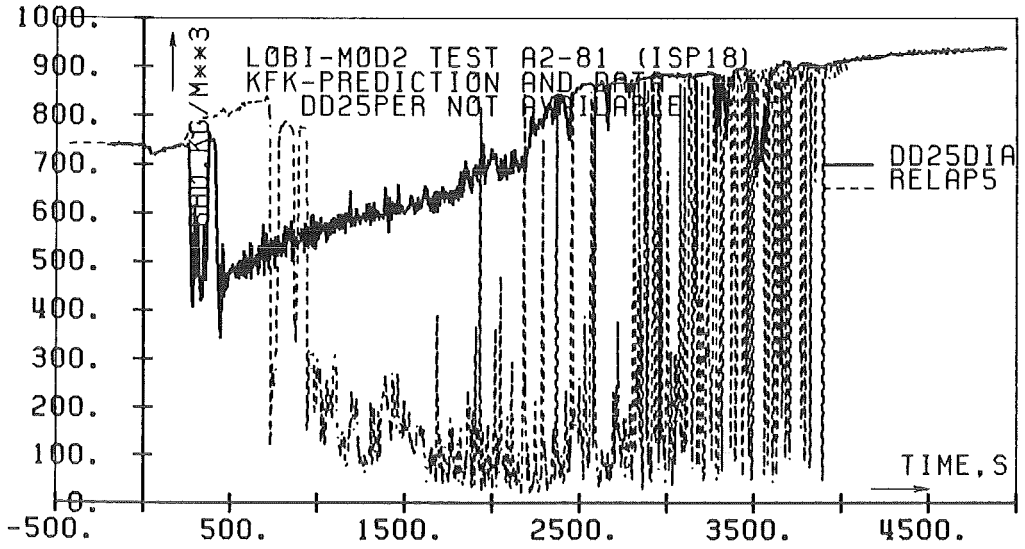


FIG. 5.20 FL.DENSITY BROKEN L. B/W PUMP & BREAK, DD25 (KG/M**3)

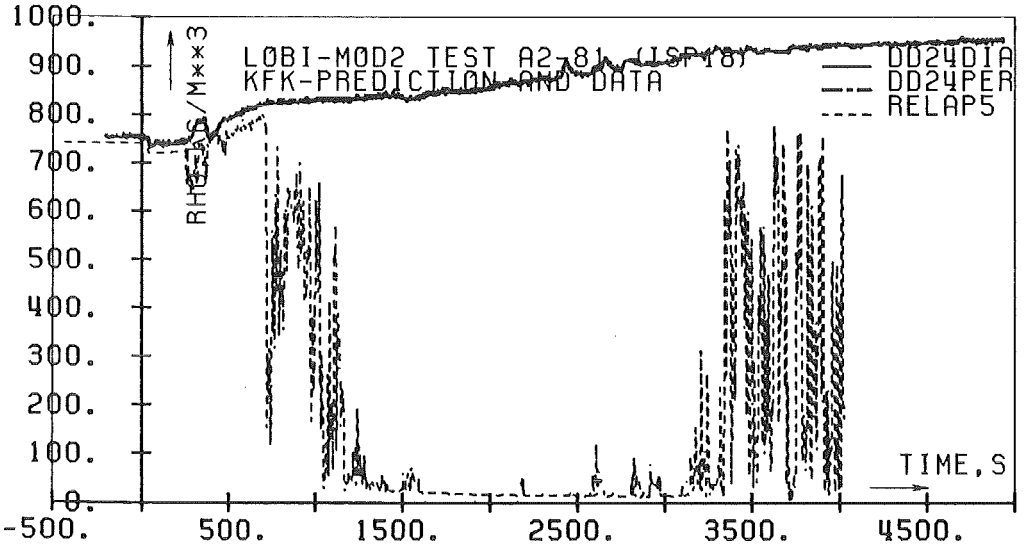


FIG. 5.19 FL.DENSITY BROKEN LOOP SEAL PUMP INLET, DD24 (KG/M**3)

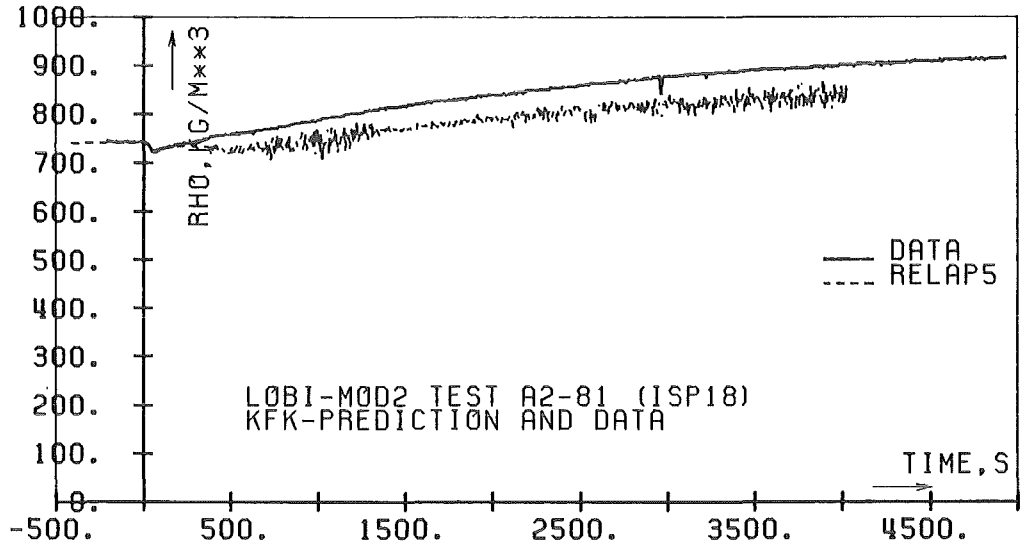


FIG. 5.22 FL.DENSITY NEAR CORE INLET, DS35 (KG/M**3)

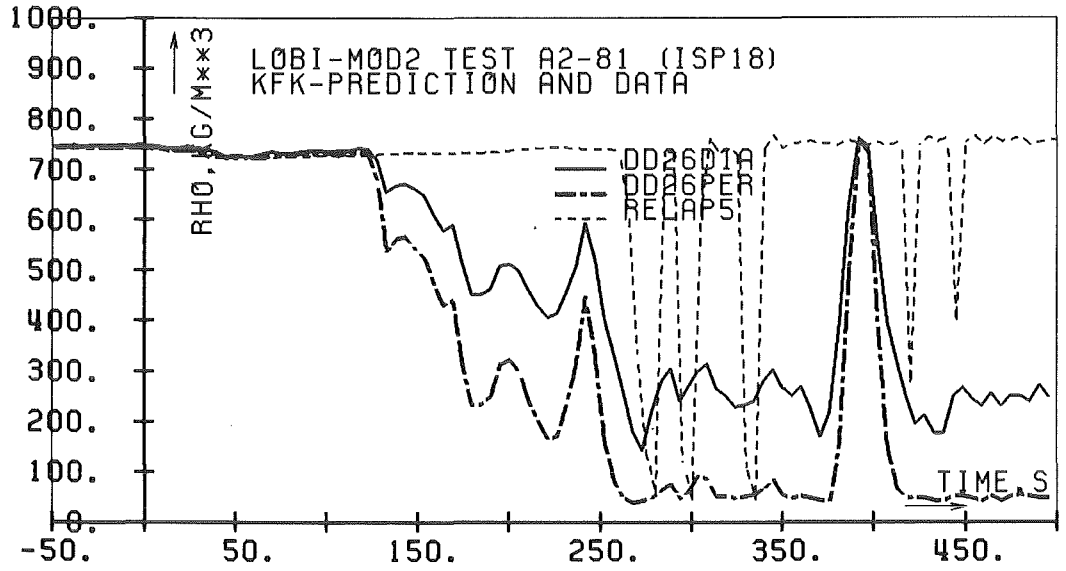


FIG. 5.21 A FL.DENSITY BROKEN L. B/W BREAK & VESSEL, DD26 (KG/M**3)

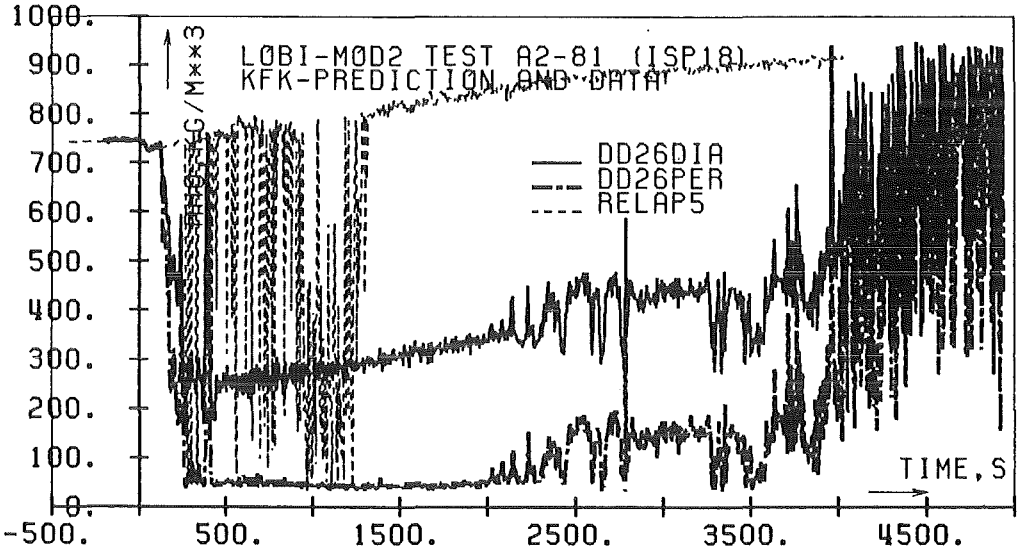


FIG. 5.21 FL.DENSITY BROKEN L. B/W BREAK & VESSEL, DD26 (KG/M**3)

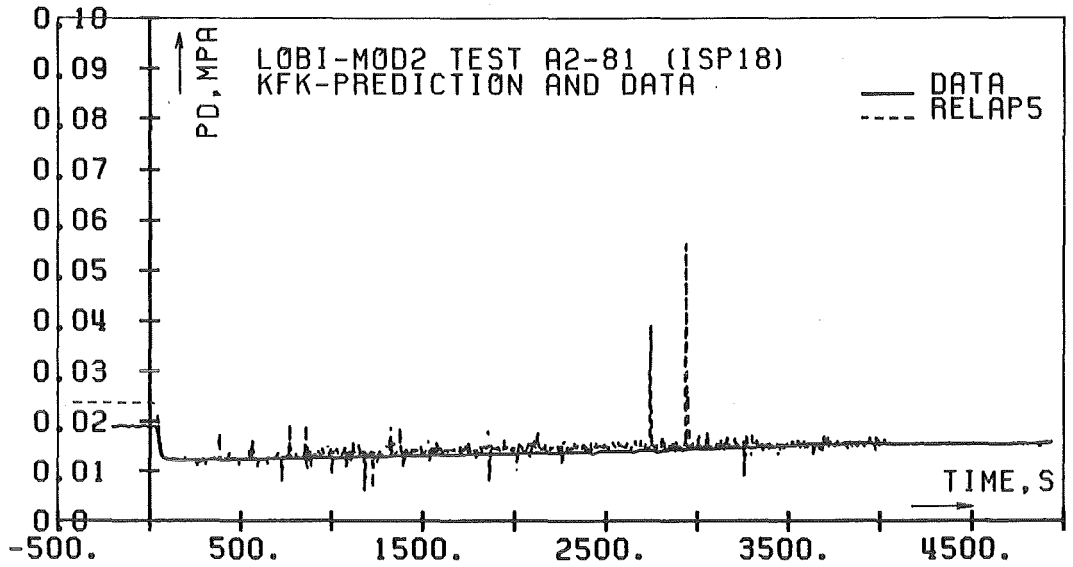


FIG. 5.24 DIFF.PRESSURE I.LOOP SEAL ASC.LEG, PD1714 (MPA)

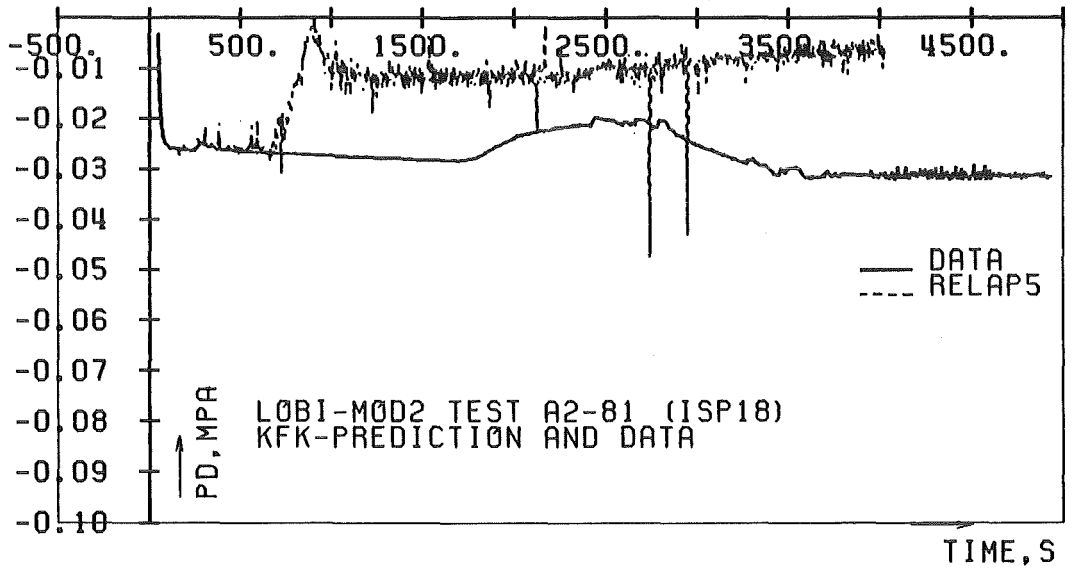


FIG. 5.23 DIFF.PRESSURE I.LOOP SEAL DESC.LEG, PD9217 (MPA)

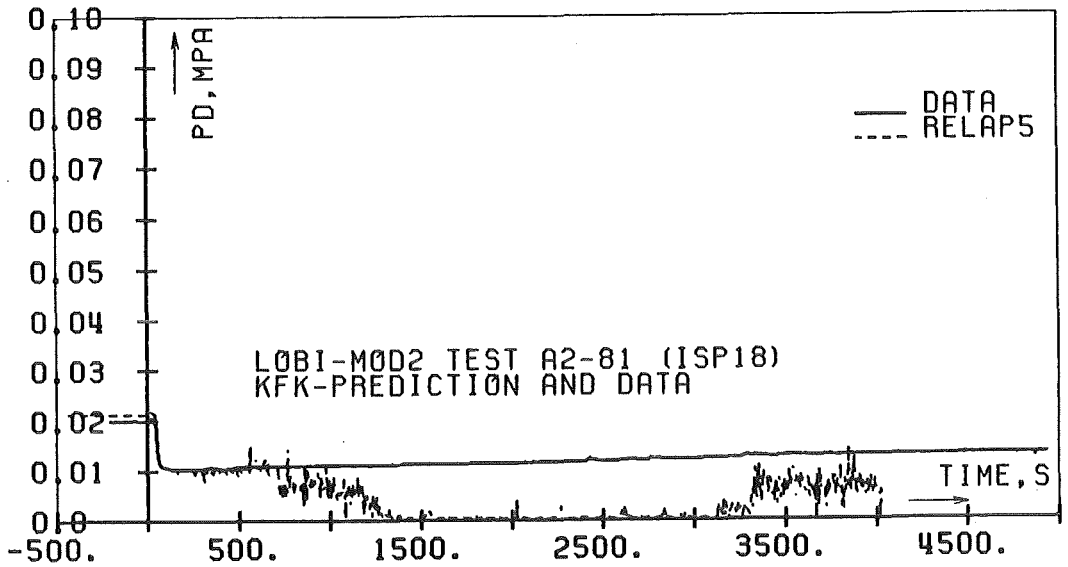


FIG. 5.26 DIFF.PRESS.BROK.LOOP SEAL ASC.LEG, PD2724 (MPA)

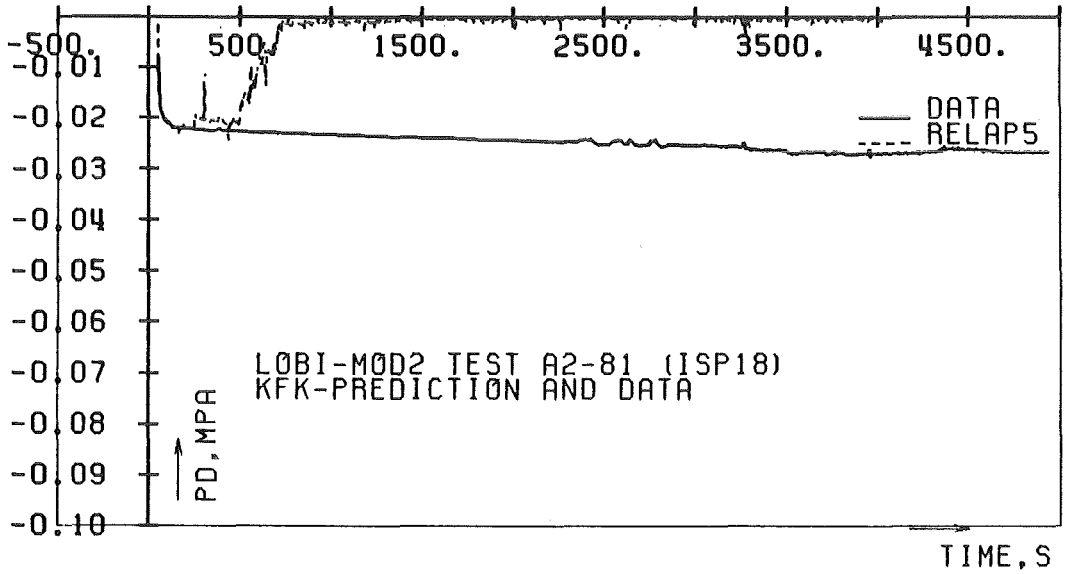


FIG. 5.25 DIFF.PRESS.BROK.LOOP SEAL DESC.LEG, PD8227 (MPA)

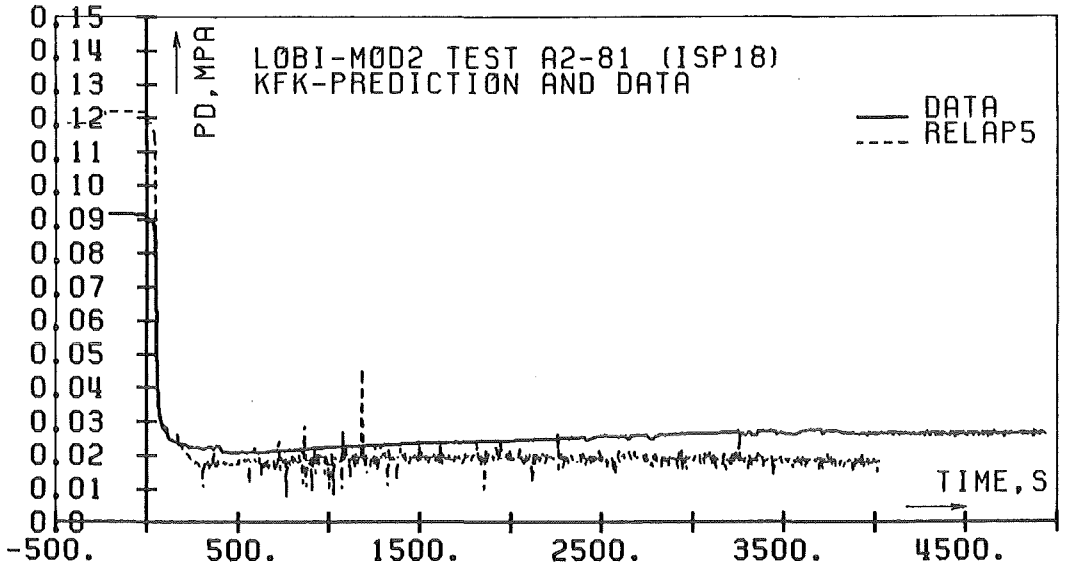


FIG. 5.28 DIFF.PRESS.CORE HEATED LENGTH, PD3RTK (MPA)

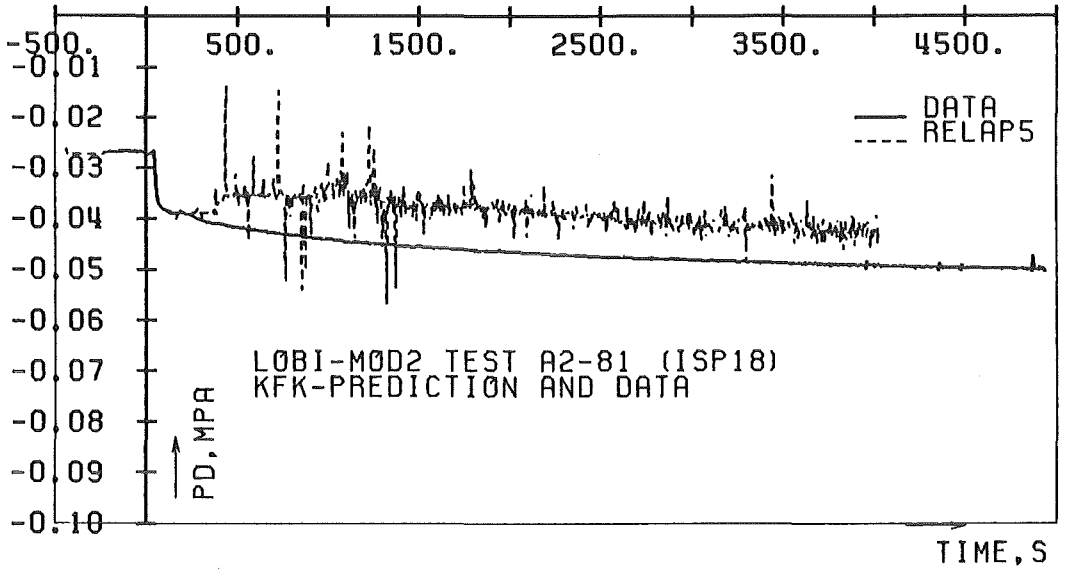


FIG. 5.27 DIFF.PRESS.VESSEL DOWNCOMER, PD3DBT (MPA)

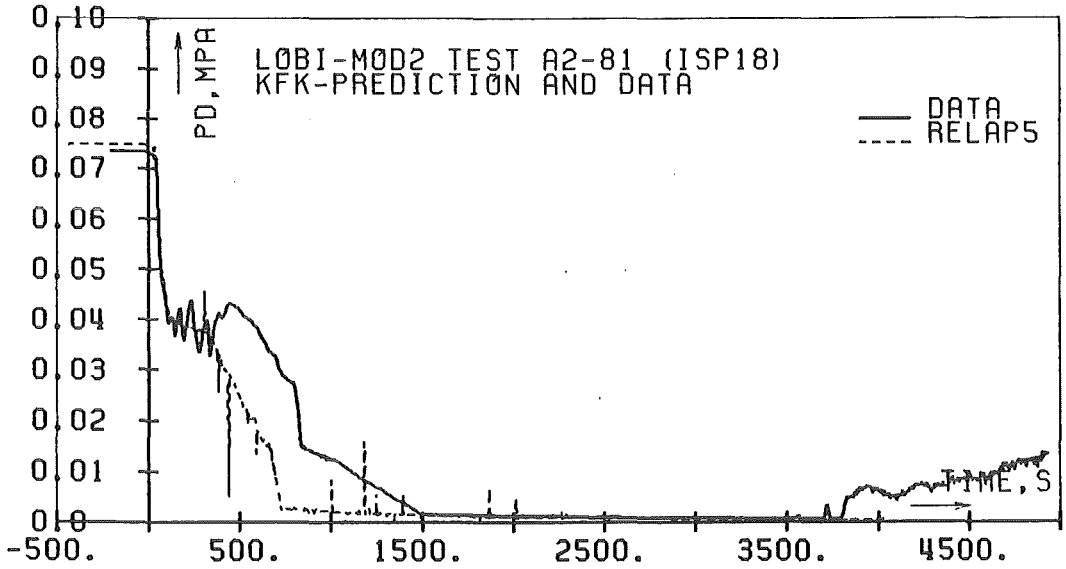


FIG. 5.30 DIFF.PRESS. I.L. U-TUBES ASC.LEG, PD90BN (MPA)

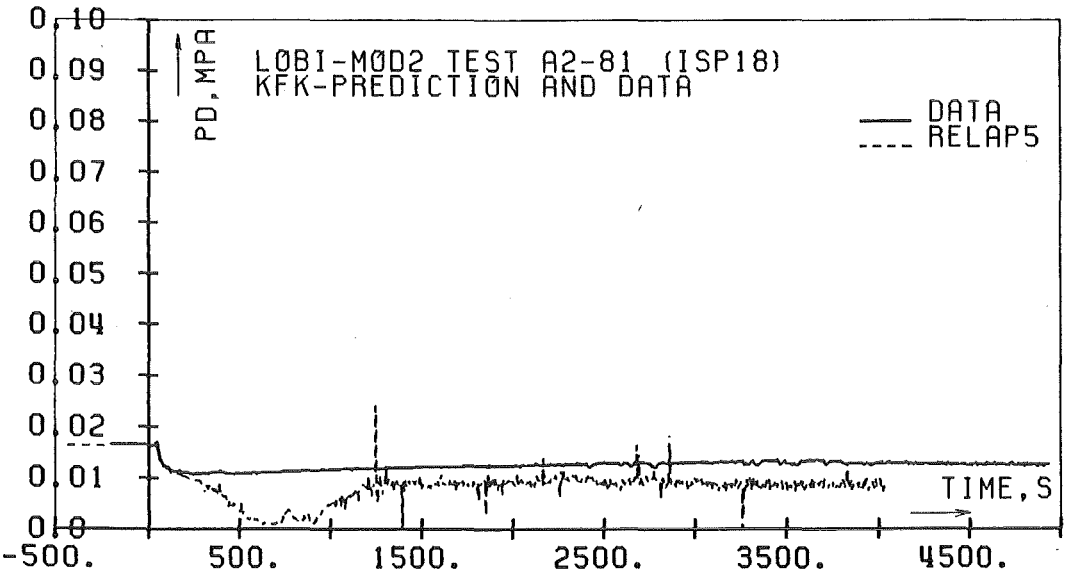


FIG. 5.29 DIFF.PRESS. UPPER PLENUM, PD3RKA (MPA)

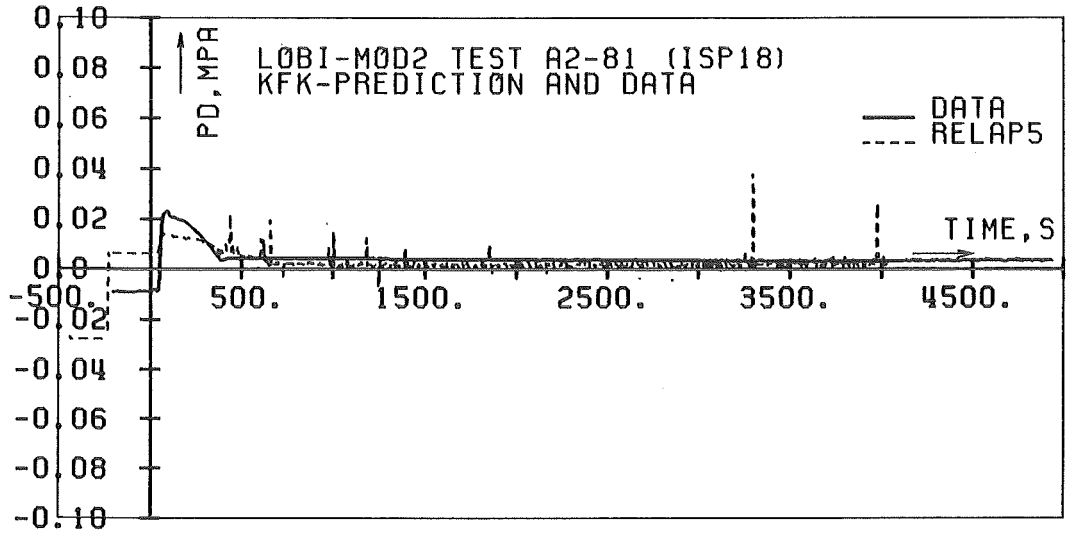


FIG. 5.32 DIFF.PRESS.VESSEL U.HEAD TO U.PLENUM, PD3R39 (MPA)

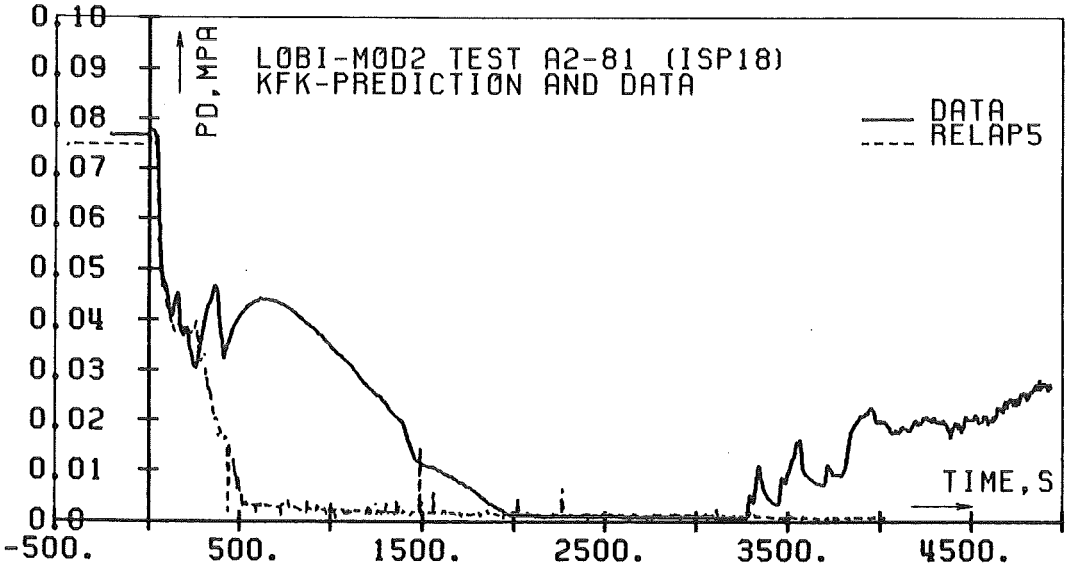


FIG. 5.31 DIFF.PRESS. B.L. U-TUBES ASC.LEG, PD80BN (MPA)

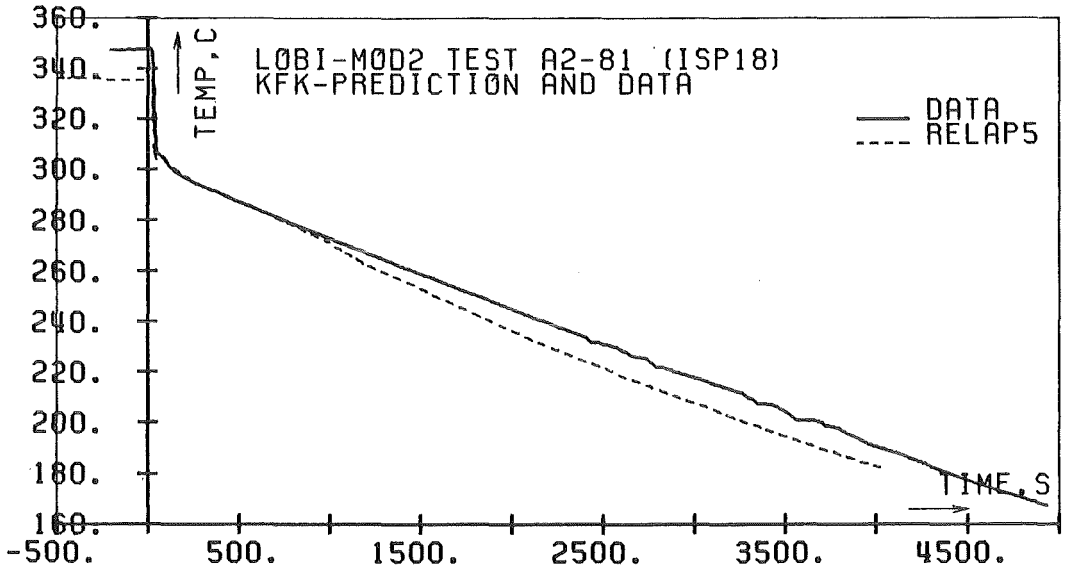


FIG. 5.34 HEATER ROD SURFACE TEMP.LEVEL 7, TH07 (C)

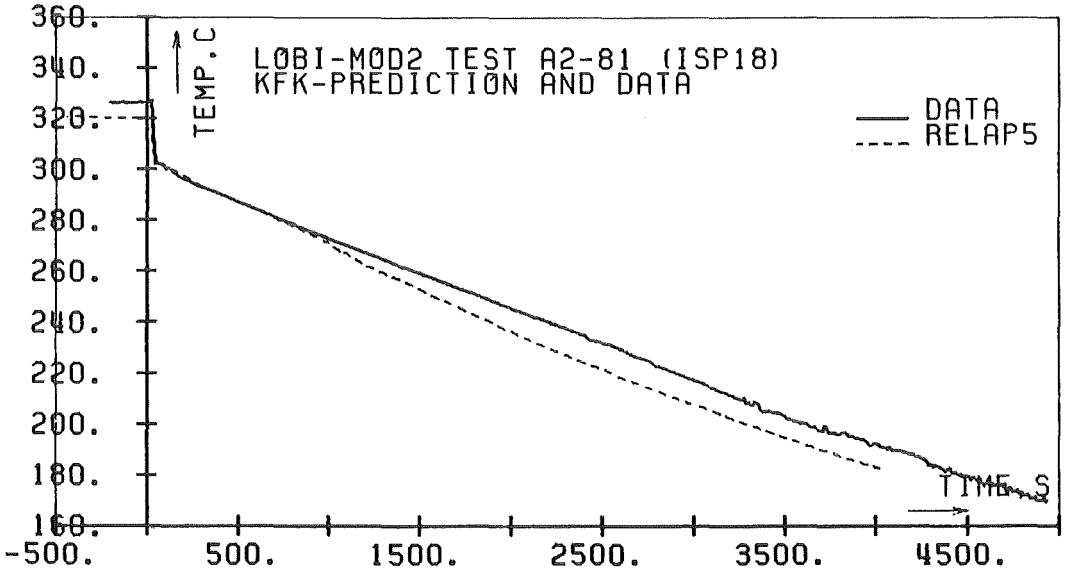


FIG. 5.33 HEATER ROD SURFACE TEMP.LEVEL 4, TH04 (C)

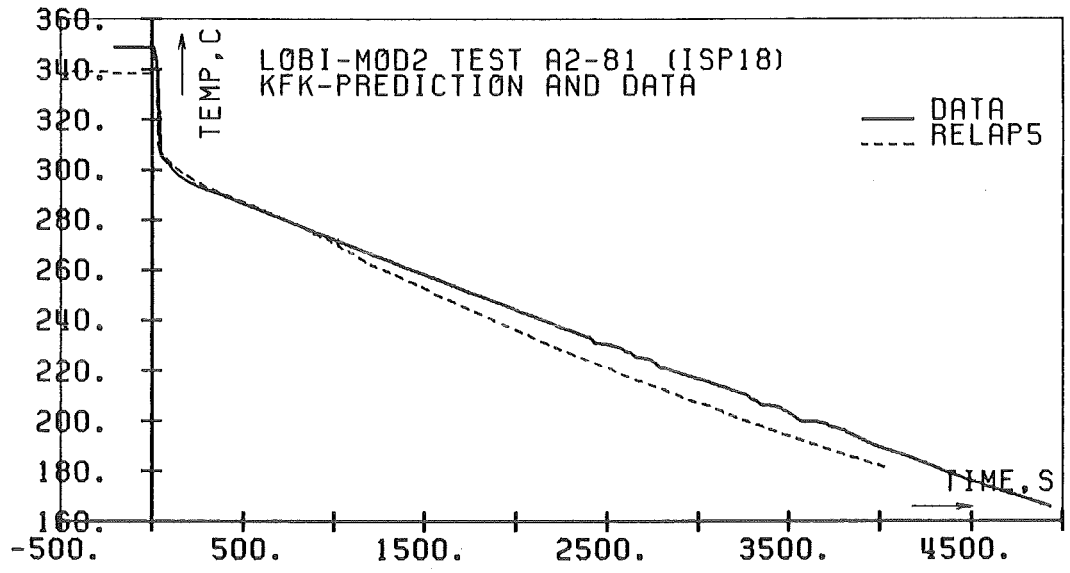


FIG. 5.36 HEATER ROD SURFACE TEMP.LEVEL 11, TH11 (C)

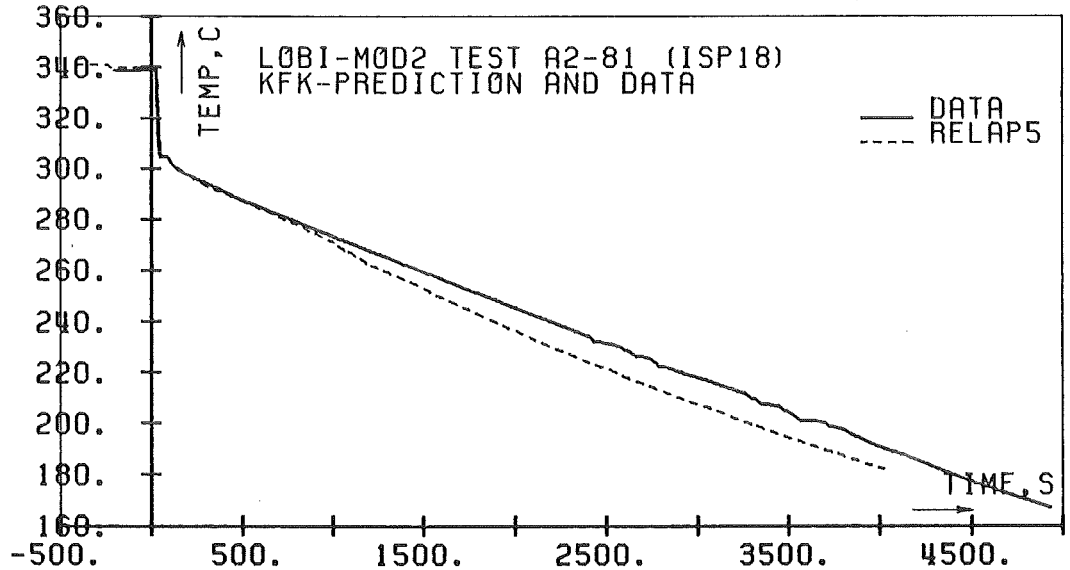


FIG. 5.35 HEATER ROD SURFACE TEMP.LEVEL 9, TH09 (C)

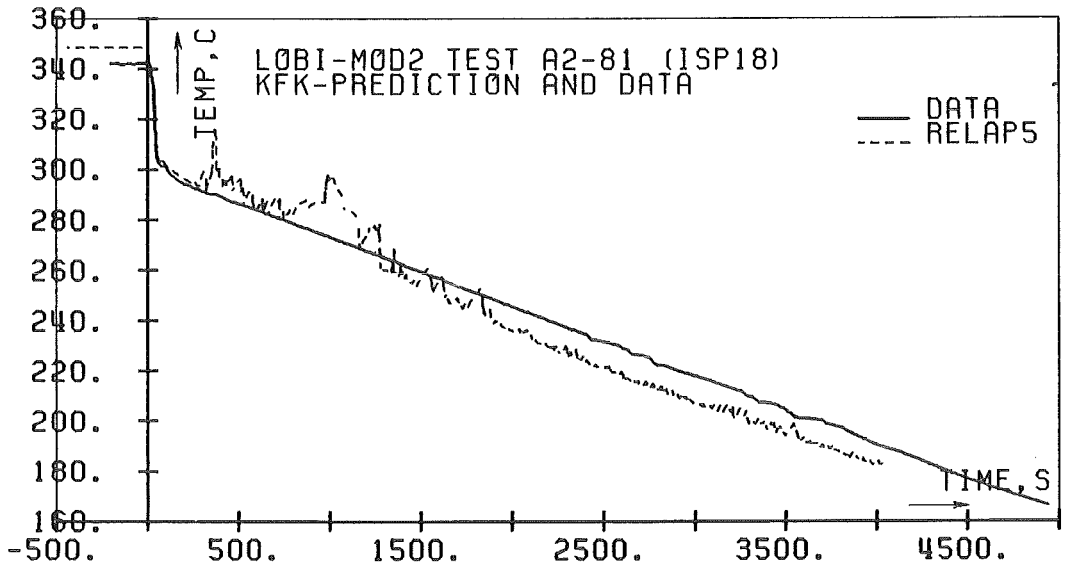


FIG. 5.38 HEATER ROD SURFACE TEMP.LEVEL 14, TH14 (C)

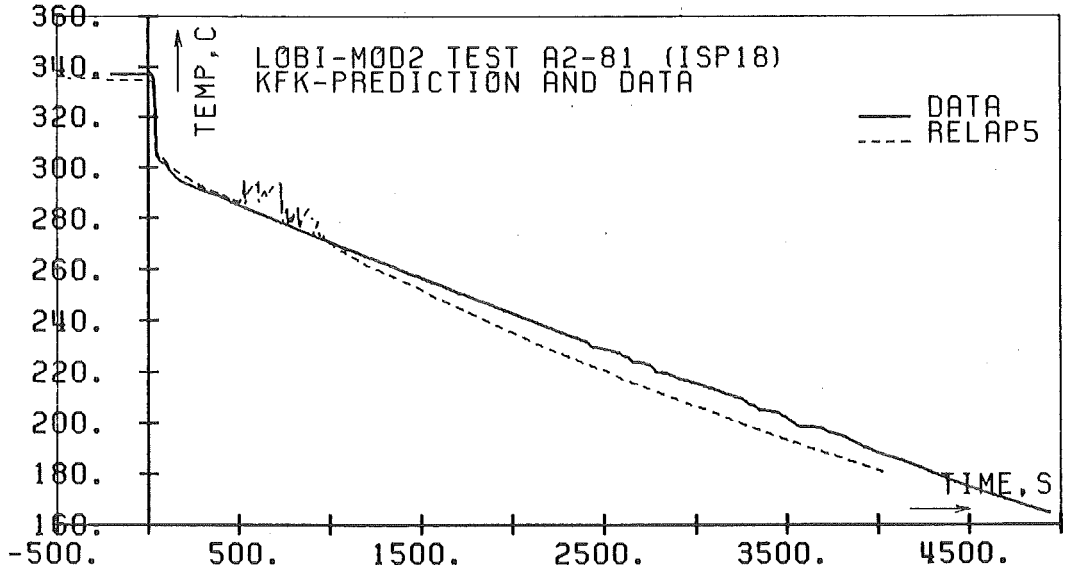


FIG. 5.37 HEATER ROD SURFACE TEMP.LEVEL 13, TH13 (C)

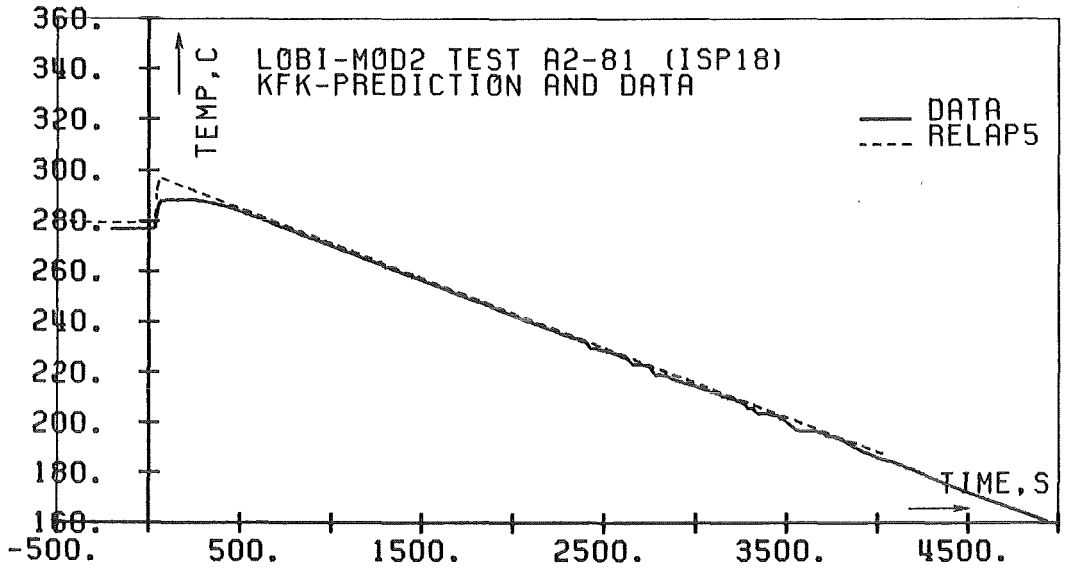


FIG. 5.40 STEAM GEN. I TEMP. BØTTØM ØF RISER, TF95B (C)

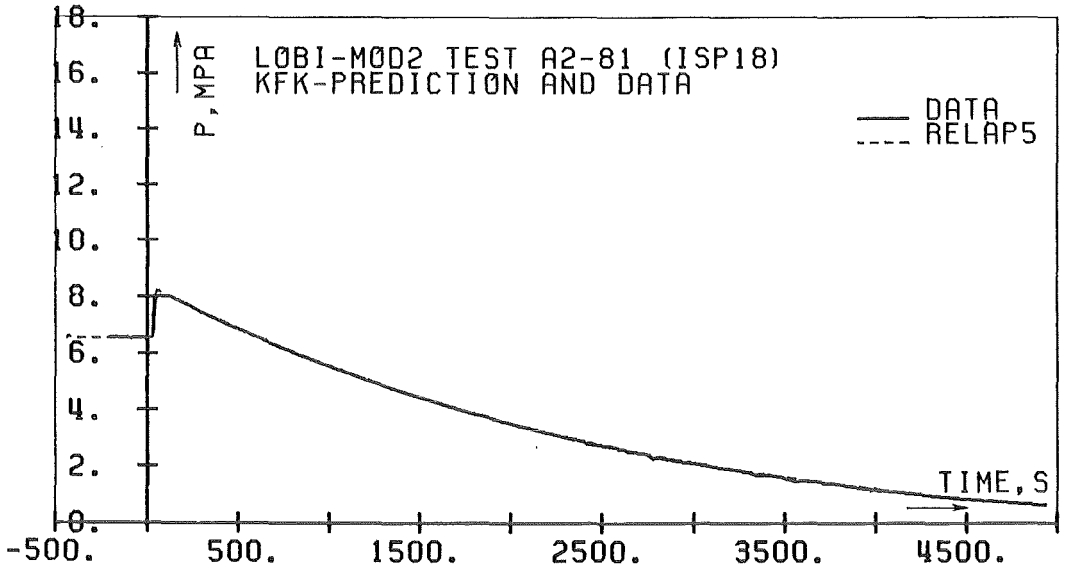


FIG. 5.39 STEAM GEN. I PRESS. IN STEAM DØME, PA97S (MPA)

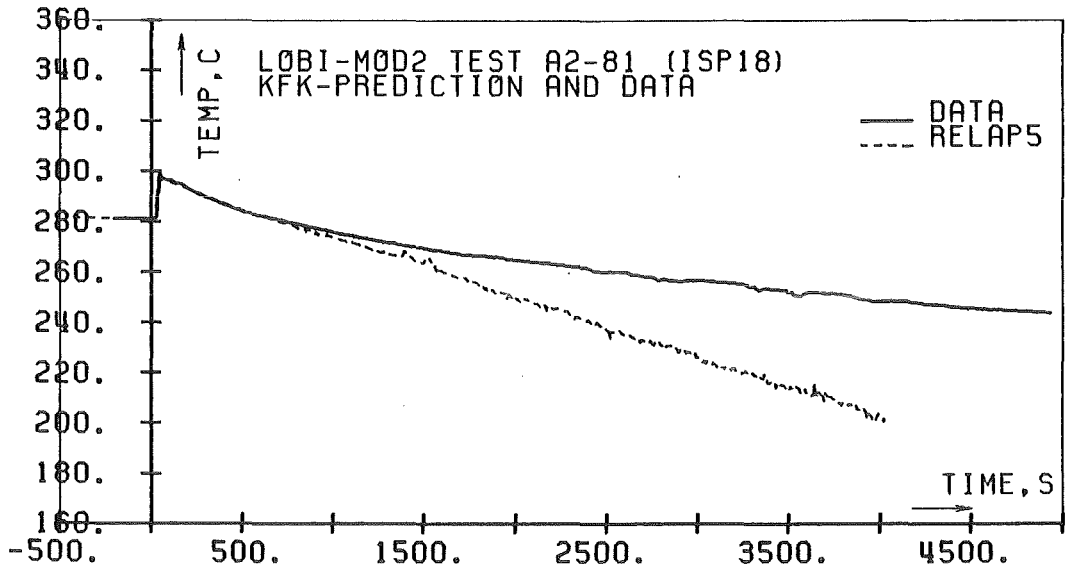


FIG. 5.42 STEAM GEN. I TEMP. STEAM DØME, TF97T (C) C))

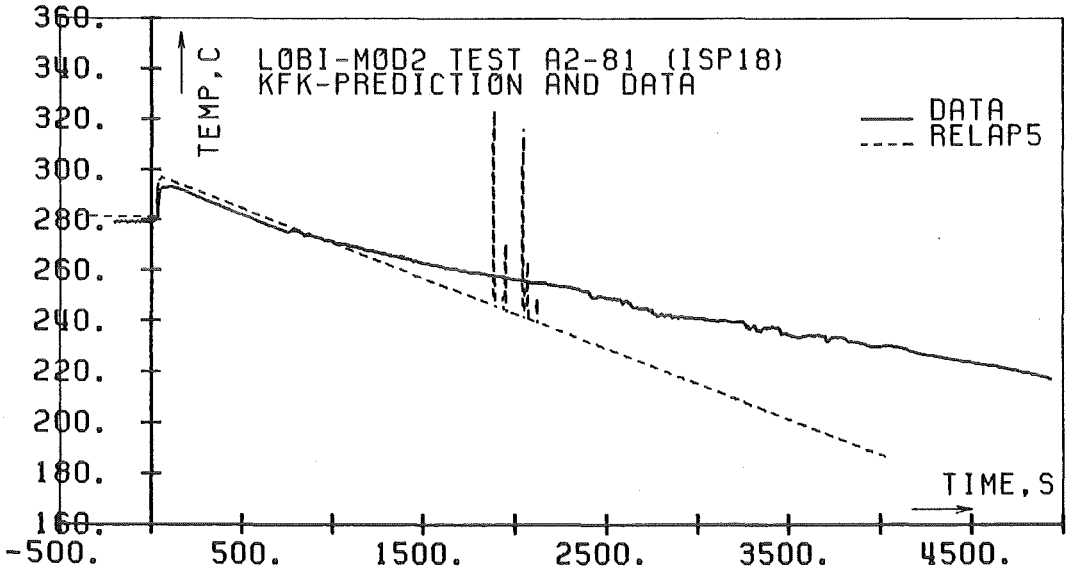


FIG. 5.41 STEAM GEN. I TEMP. TØP ØF RISER, TF95N (C))

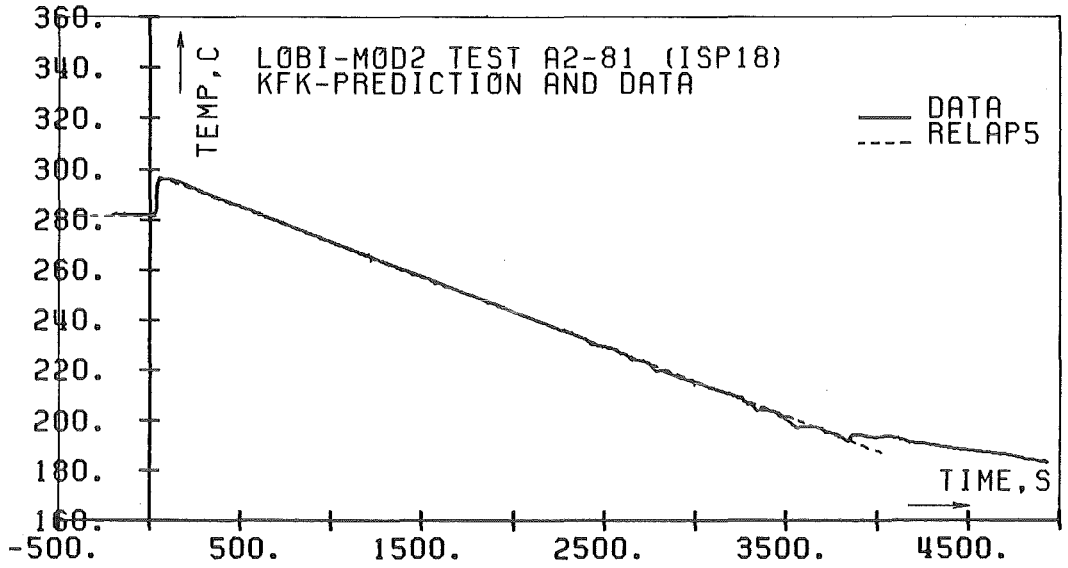


FIG. 5.44 STEAM GEN.II TEMP. TØP ØF RISER, TF85K (C)

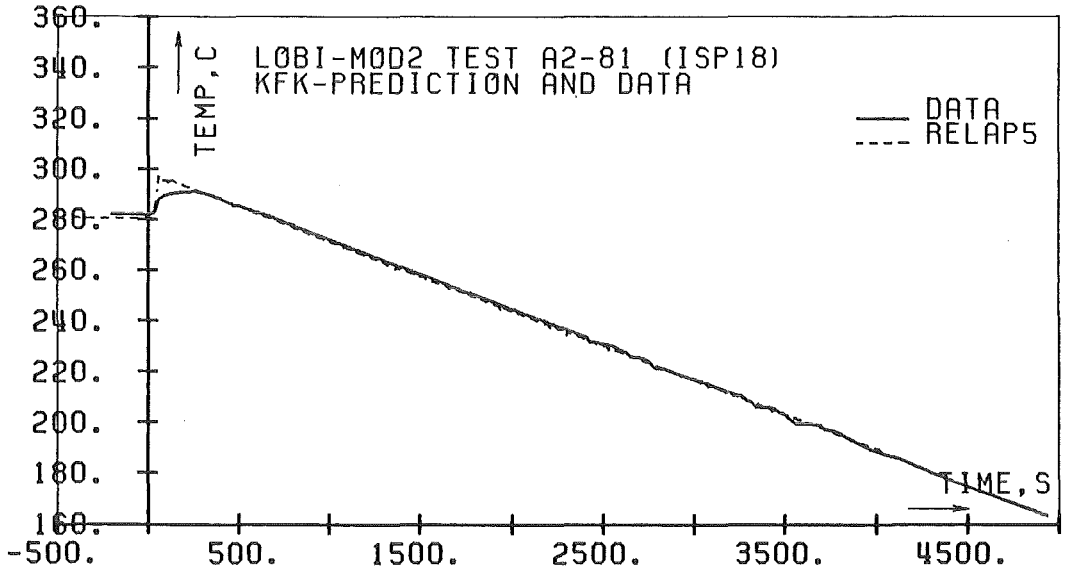


FIG. 5.43 STEAM GEN.II TEMP. BØTTØM ØF RISER, TF85B (C)

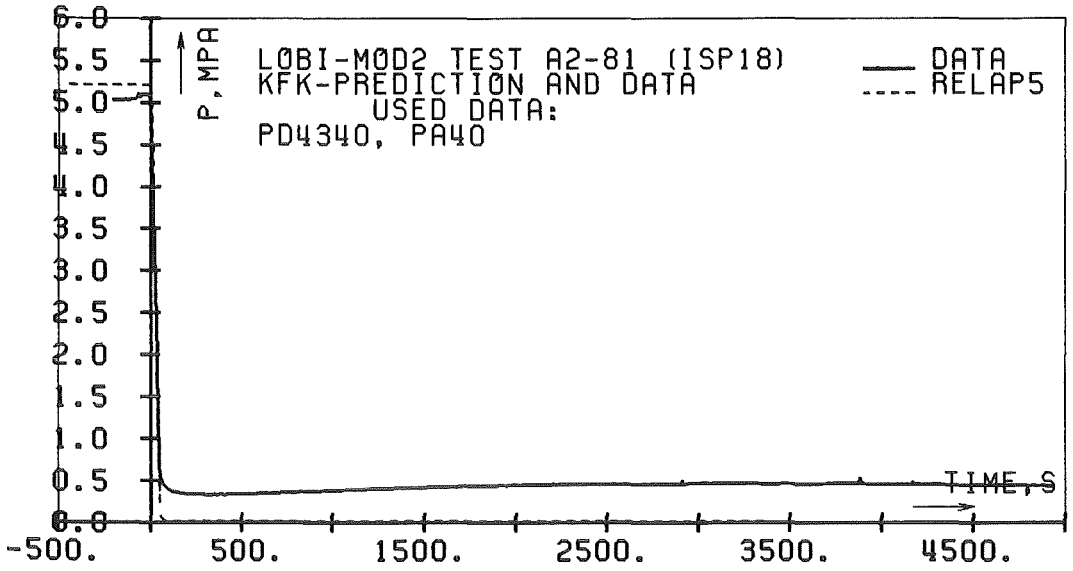


FIG. 5.46 COLL. WATER LEVEL IN PRESSURIZER, CL4340 (M)

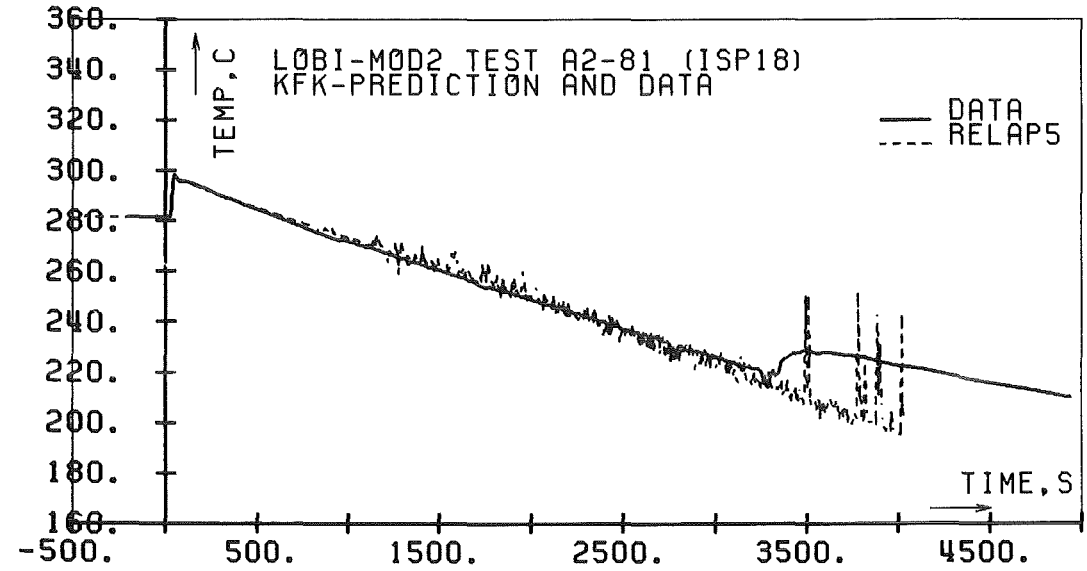


FIG. 5.45 STEAM GEN.II TEMP. STEAM DOME, TF87T (C)

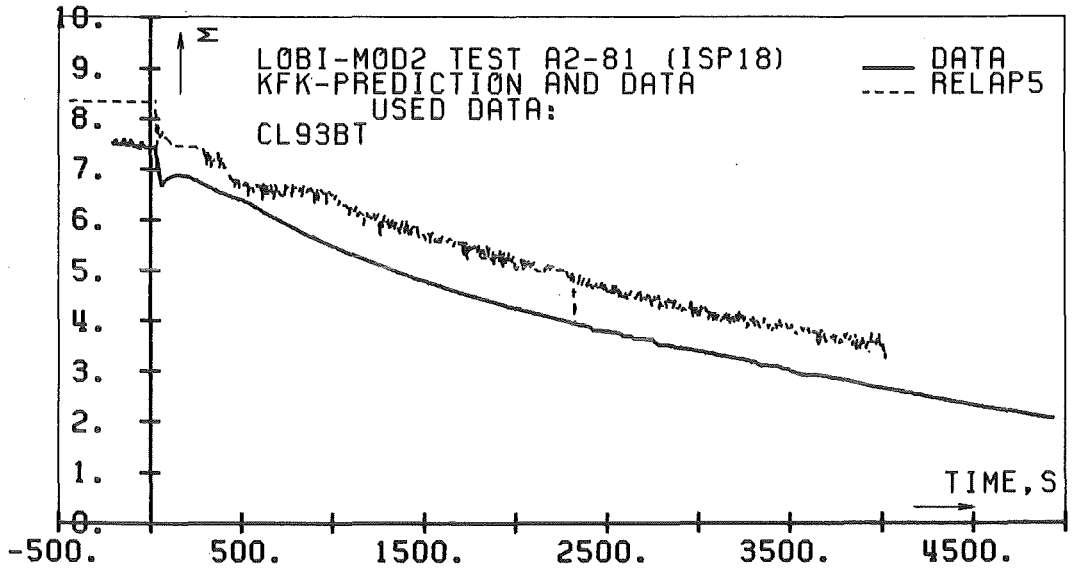


FIG. 5.48 COLL. WATER LEVEL IN SG I DOWNCOMER, CL93BT (M)

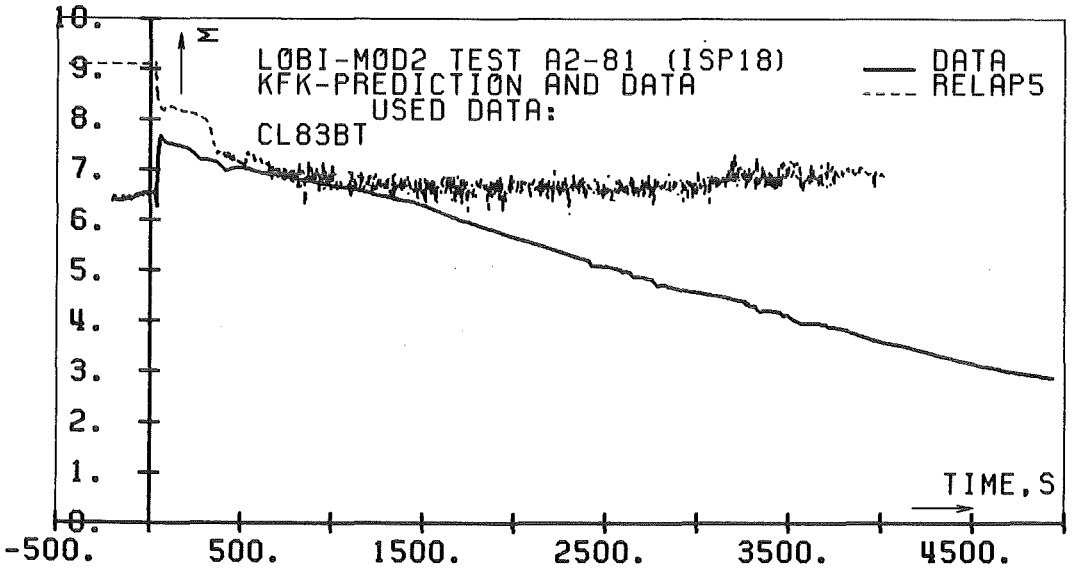


FIG. 5.47 COLL. WATER LEVEL IN SG II DOWNCOMER, CL83BT (M)

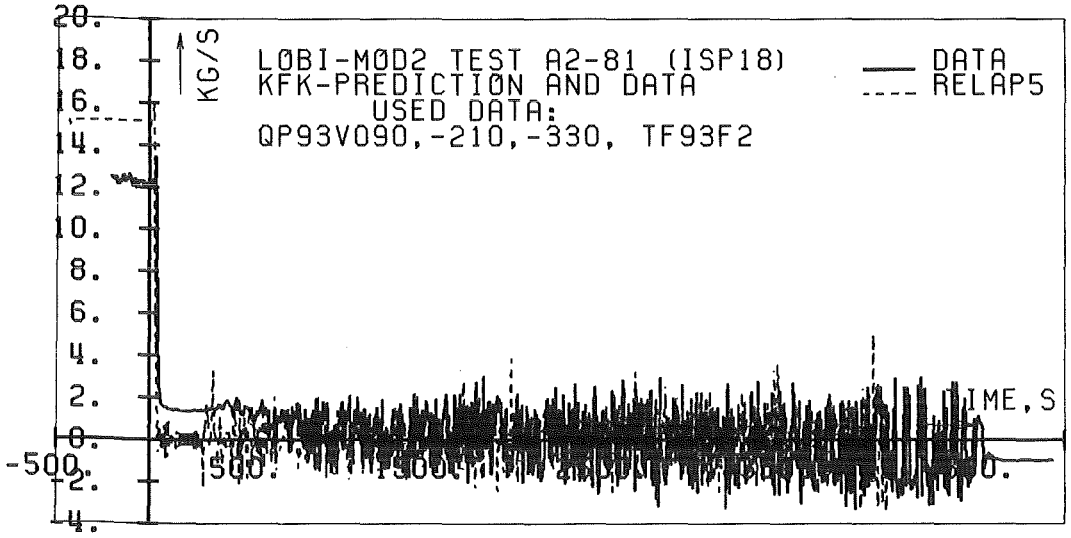


FIG. 5.50 MASS FLOW SG I DOWNCOMER LOW SECTION, CM93G (KG/S)

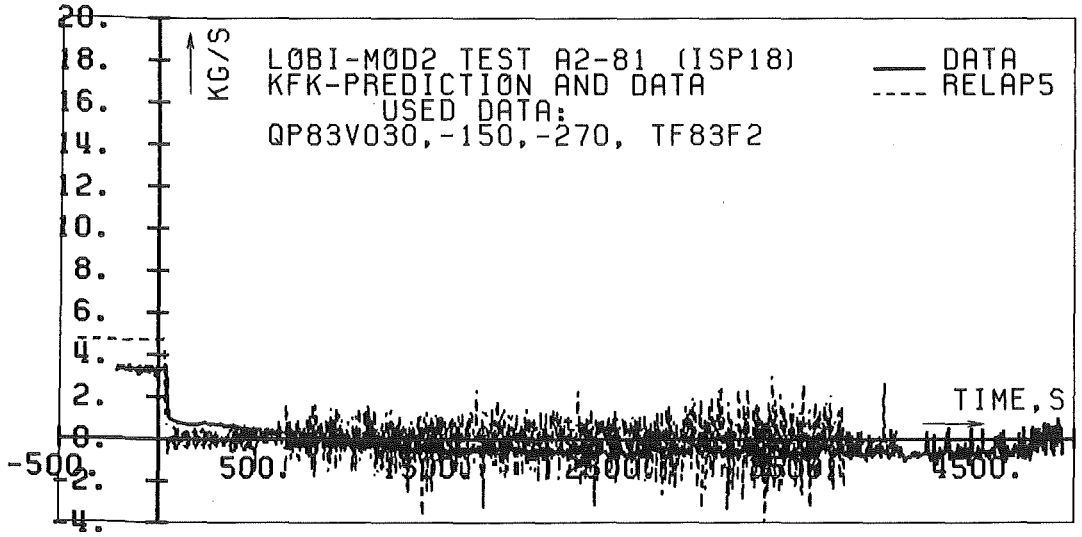


FIG. 5.49 MASS FLOW SG II DOWNCOMER LOW SECTION, CM83G (KG/S)

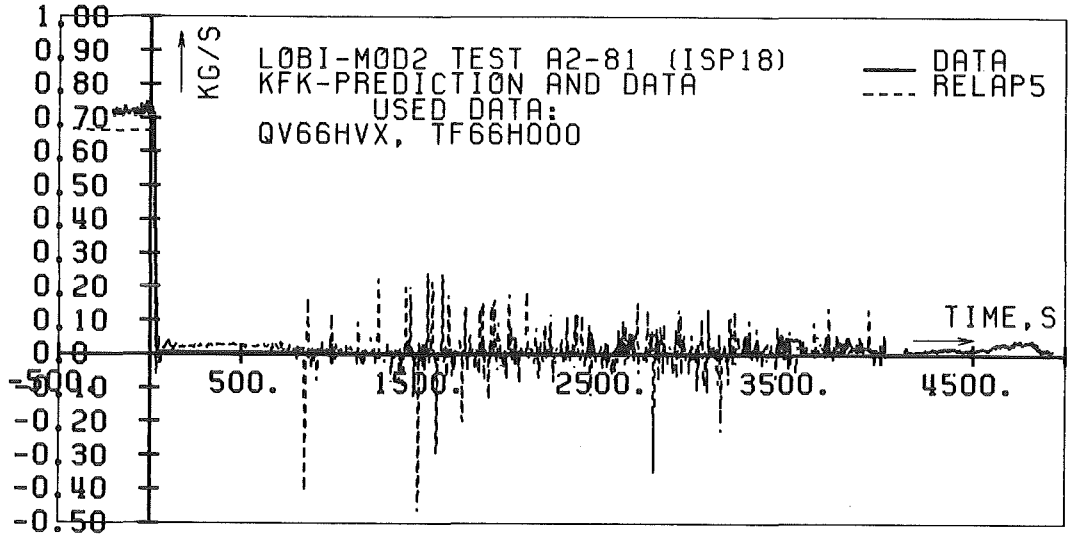


FIG. 5.52 MASS FLOW SG II STEAM LINE, CM66 (KG/S)

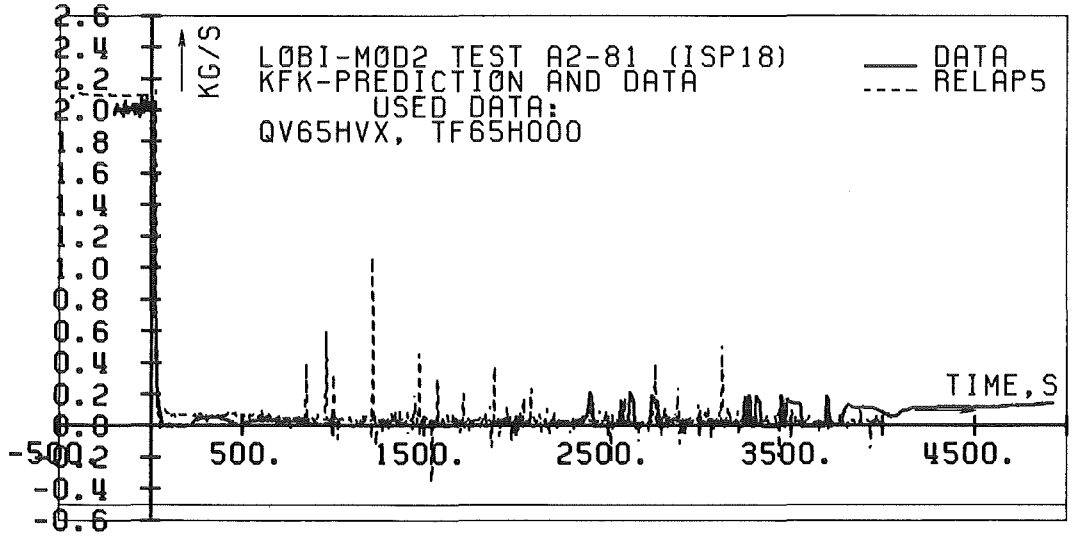


FIG. 5.51 MASS FLOW SG I STEAM LINE, CM65 (KG/S)

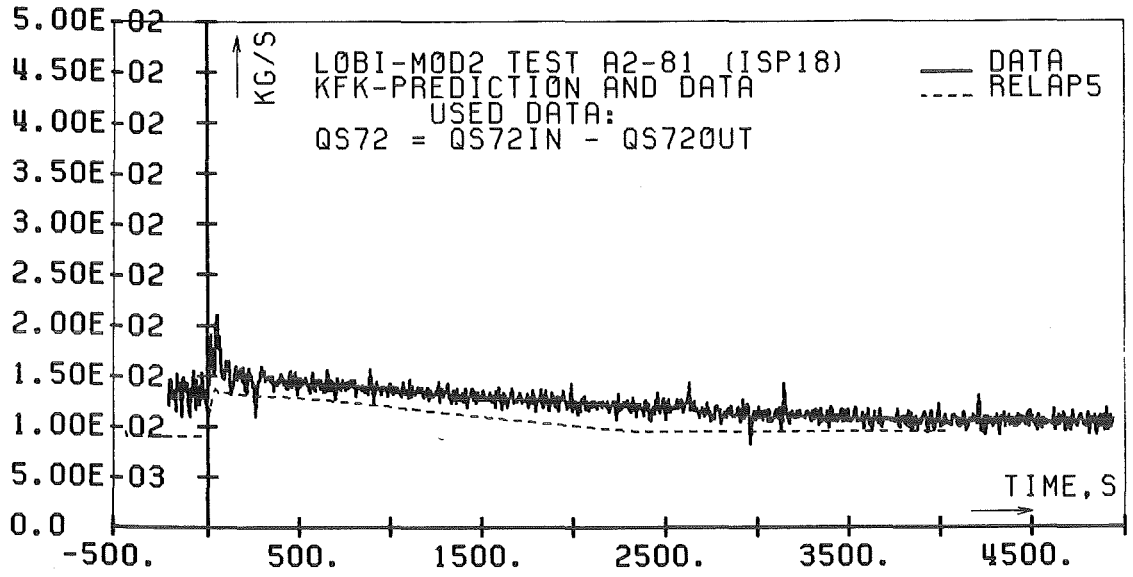


FIG. 5.54 NET PUMP SEAL WATER INJECTION BROKEN L., QS72 (KG/S)

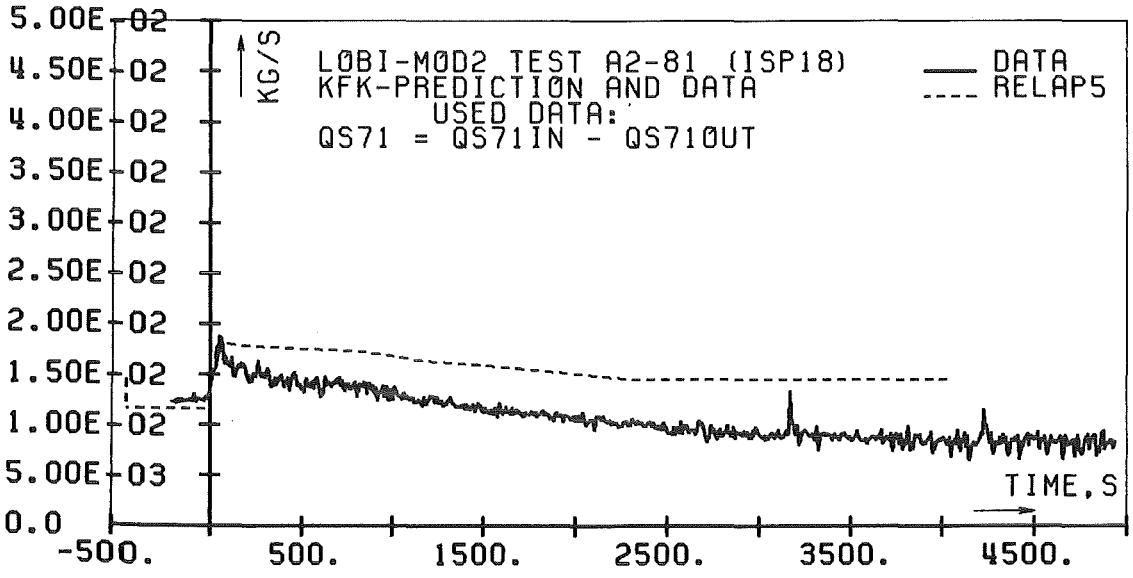


FIG. 5.53 NET PUMP SEAL WATER INJECTION INTACT L., QS71 (KG/S)

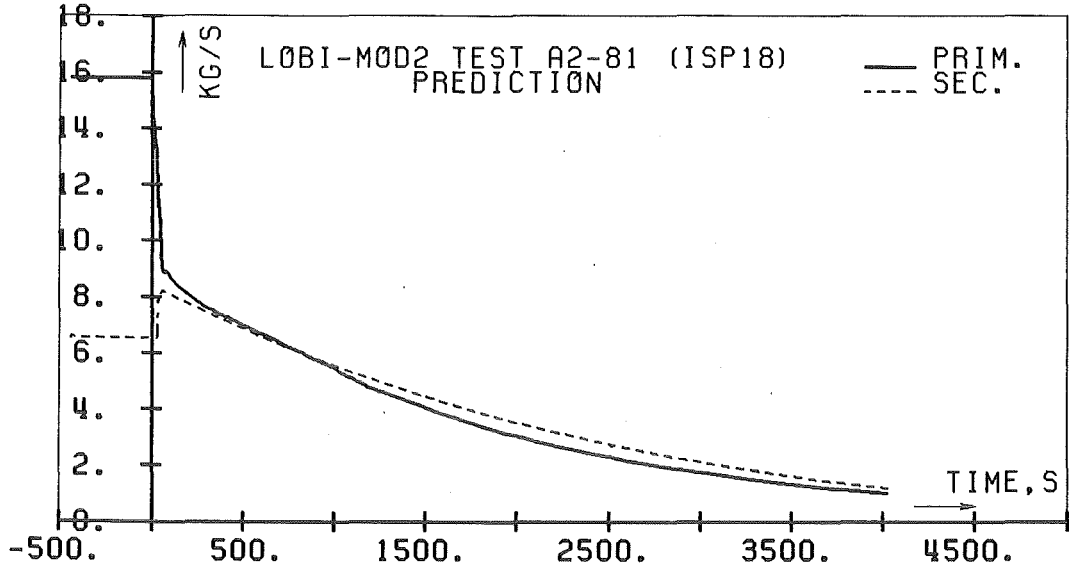


FIG. 5.56 PRIMARY & SECONDARY PRESSURE, PA38 & PA97S (MPA)

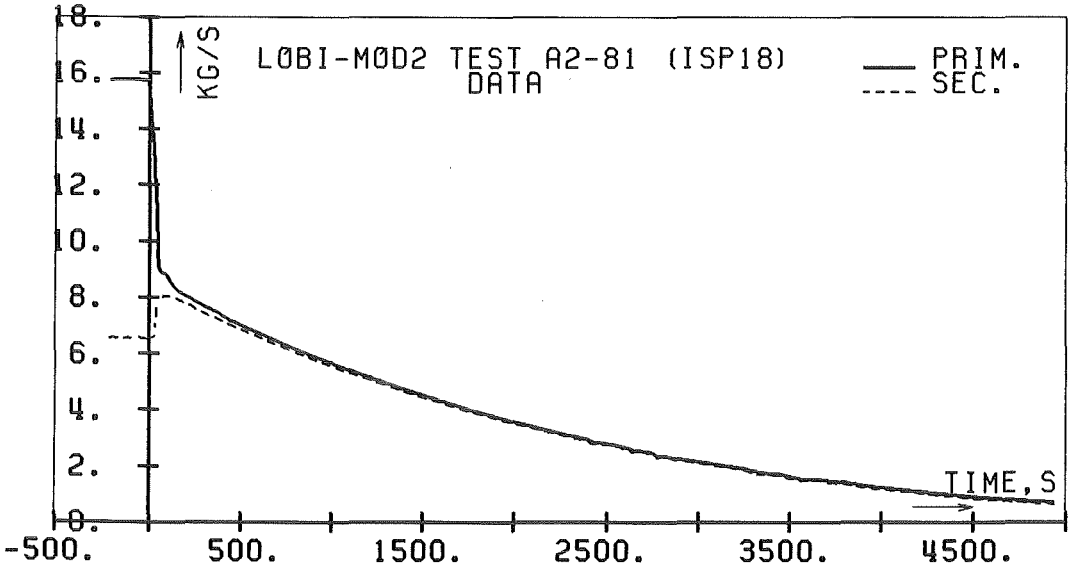


FIG. 5.55 PRIMARY & SECONDARY PRESSURE, PA38 & PA97S (MPA)

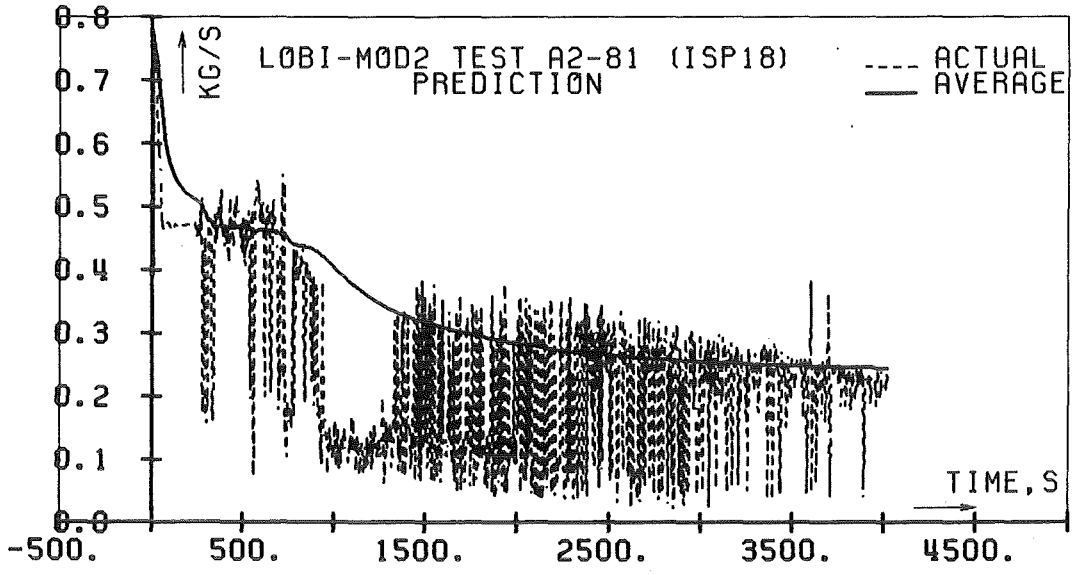


FIG. 5.57 BREAK MASS FLOW, CMOS (KG/S)

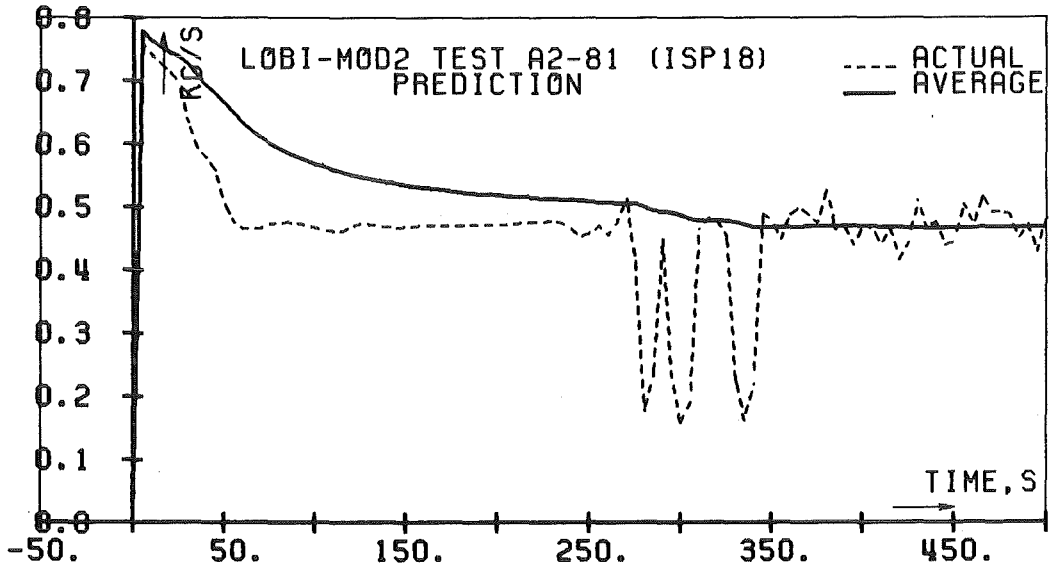


FIG. 5.57 A BREAK MASS FLOW, CMOS (KG/S)

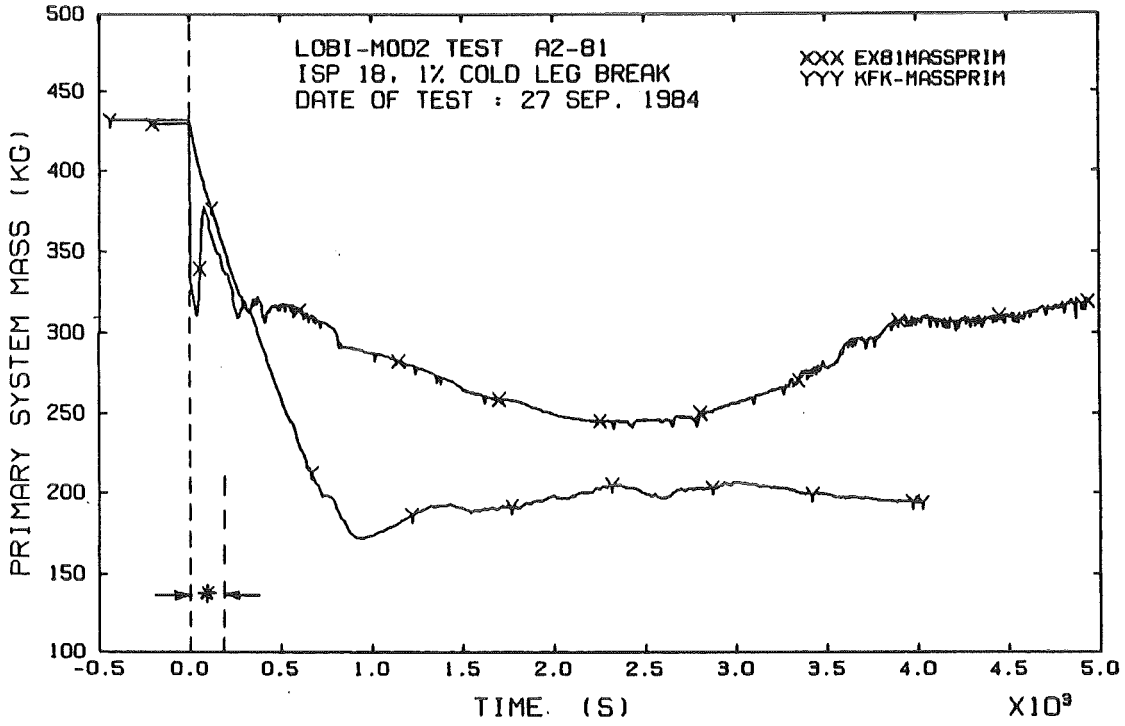


FIG. 5.58 PRIMARY SYSTEM MASS INVENTORY

* Interval of exp. curve not representative

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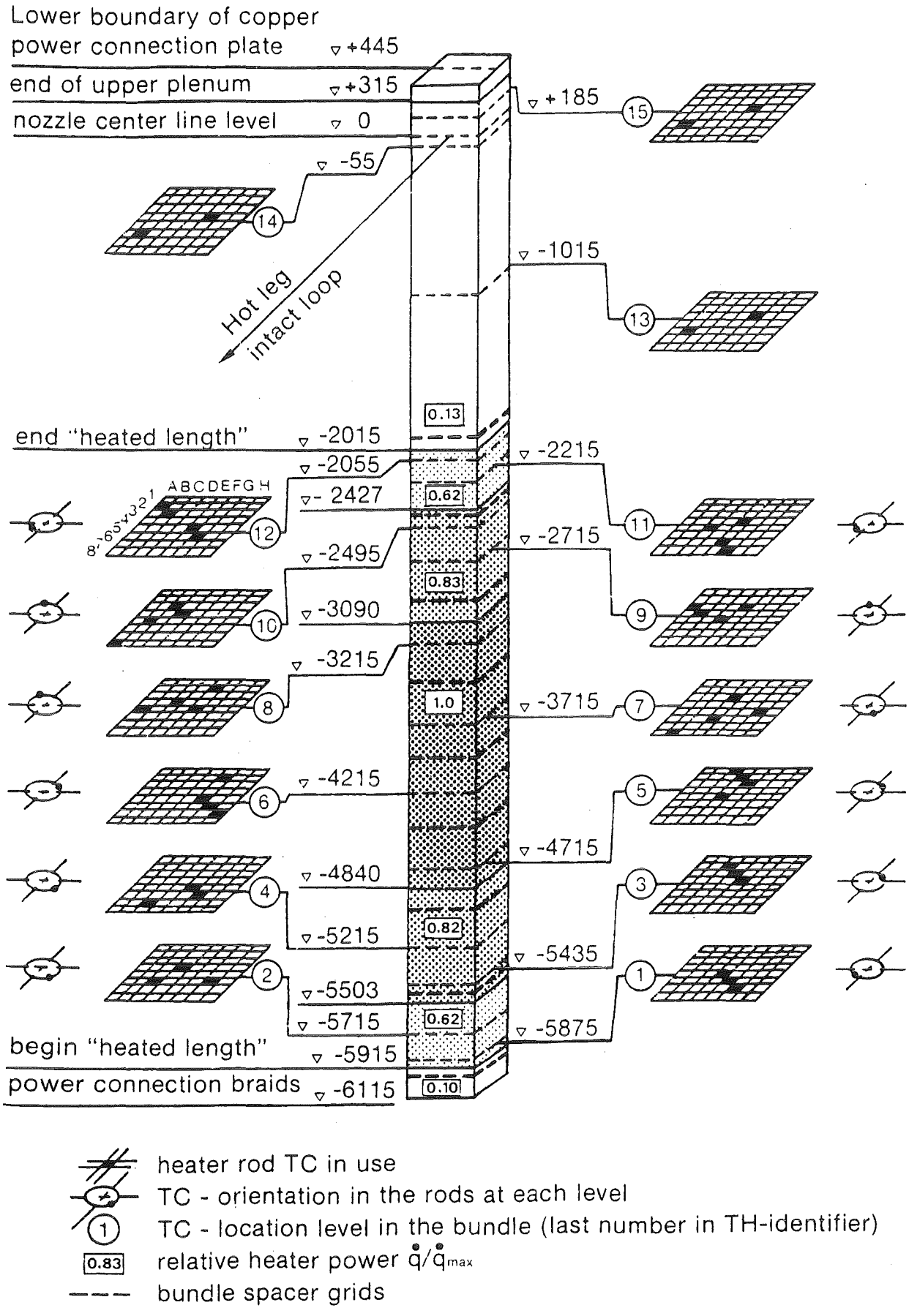

Figure 5.59 Location of Heater Rod Thermocouples in Test A2-81

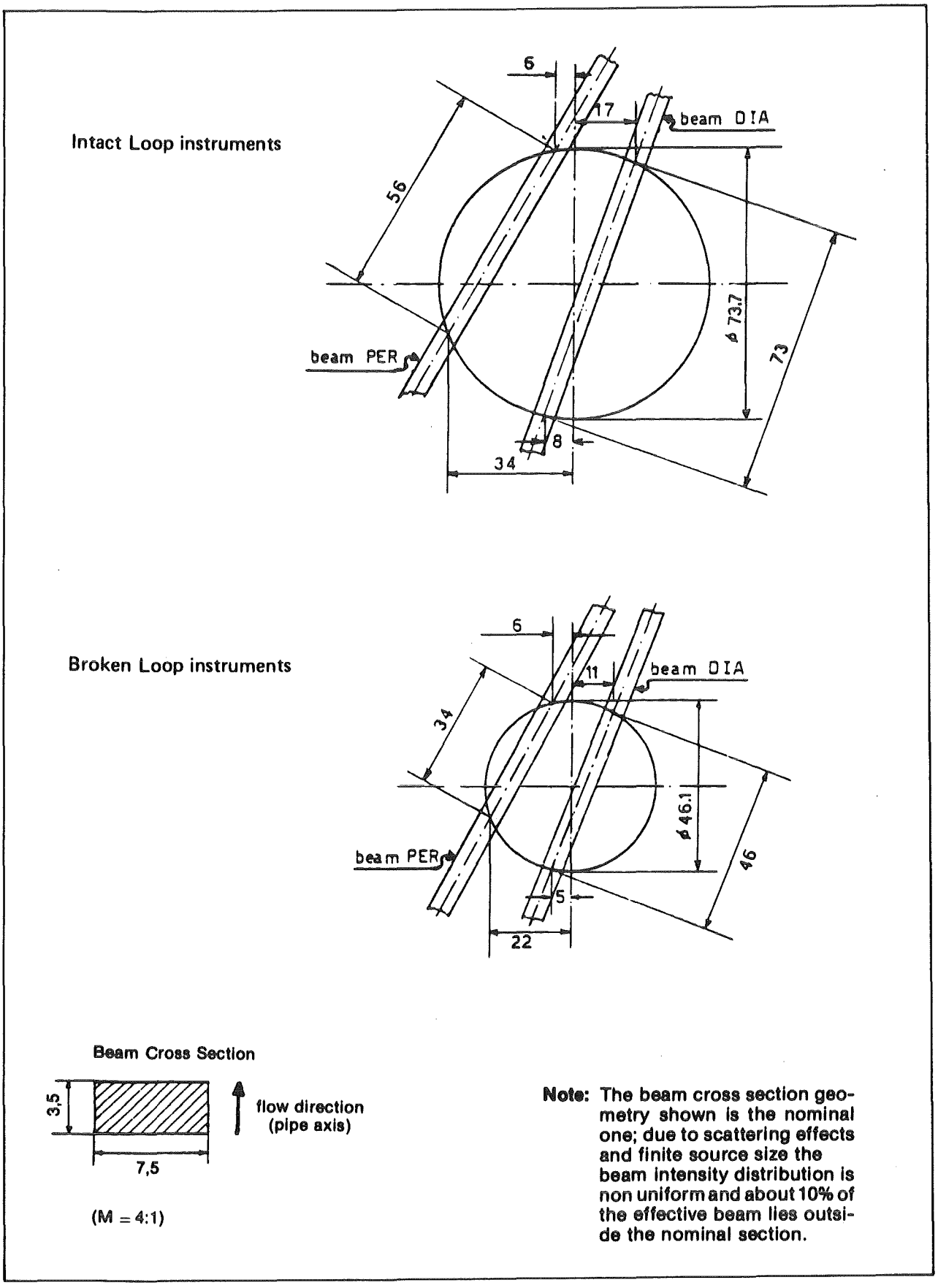

Figure 5.60 Beam Geometry of LOBI-MOD2 γ-Densitometer

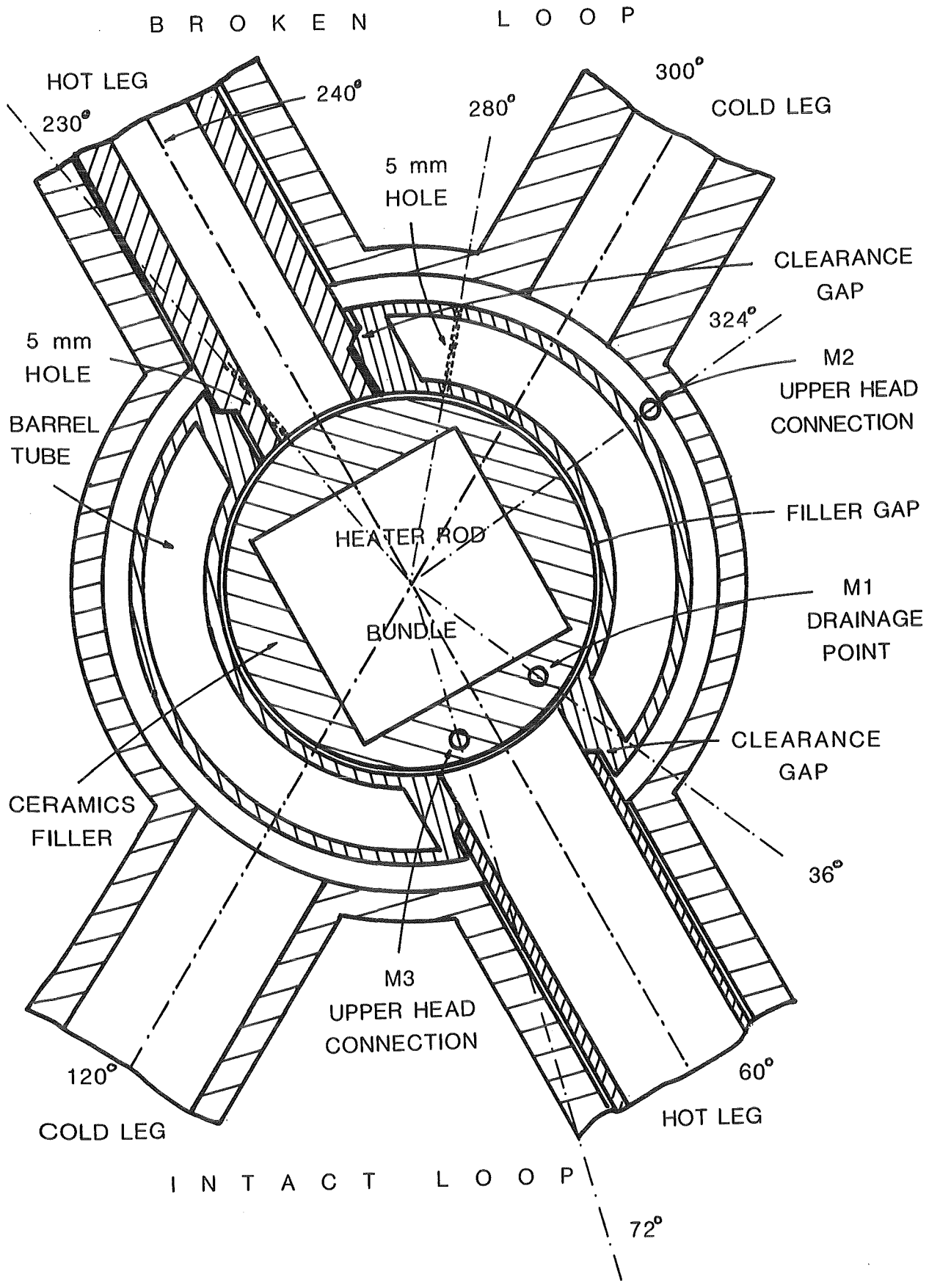

Figure 5.61: Azimutal Locations of Bypass Flow Paths in RPVM

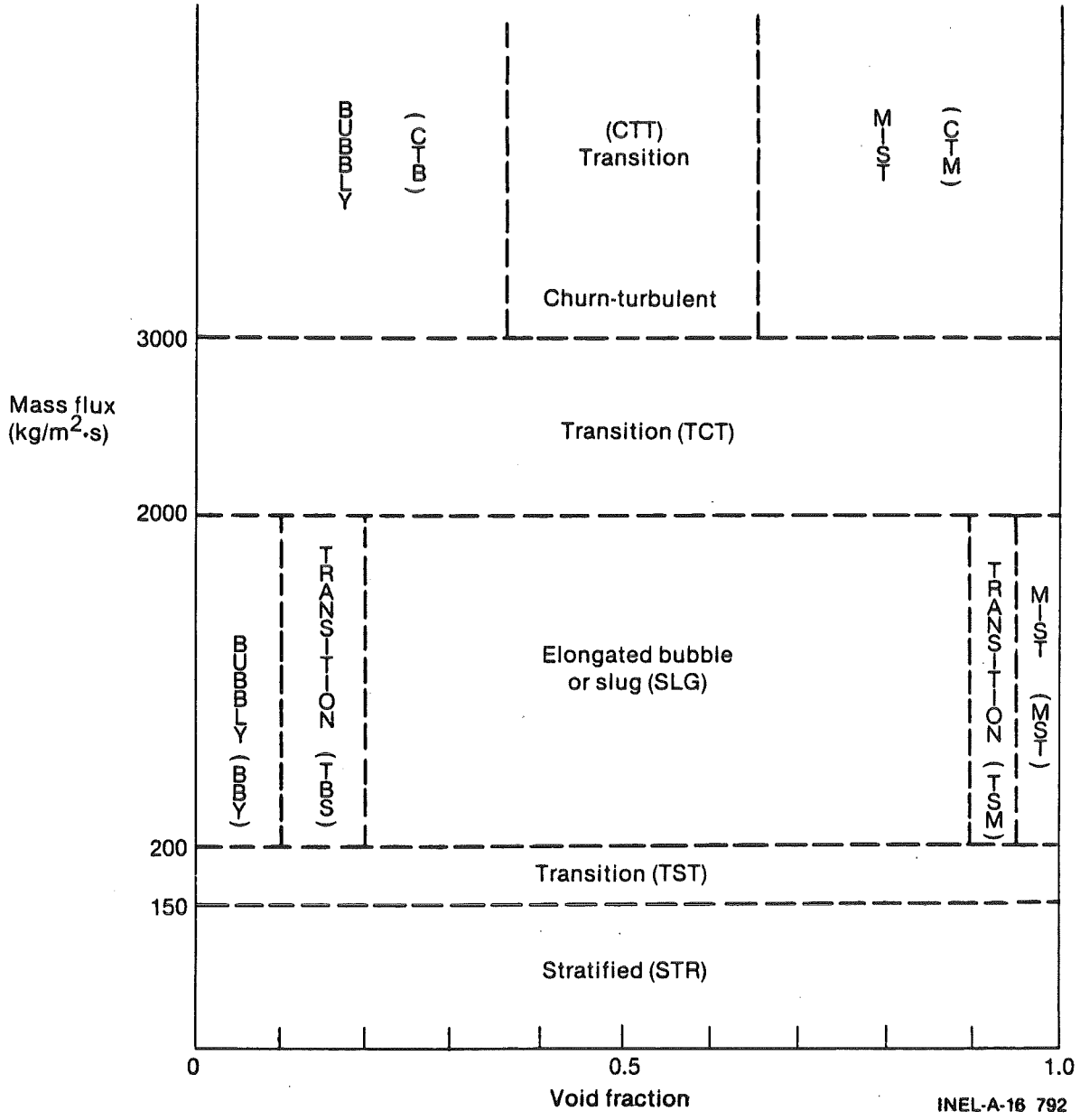

Figure 5.62 Horizontal Flow Regime Map Used in RELAP5 Code

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Appendix A

LOBI-MOD2, Description of Test Facility

1. General Description

The LOBI facility is a high pressure integral system blowdown-refill test facility designed, constructed and operated in the Joint Research Centre of the European Communities, Ispra Establishment, Italy. It was commissioned in December 1979 and was operated until June 1982 in the MOD1 configuration. It was then extensively modified to accommodate new programme requirements leading to the present MOD2 configuration.

The LOBI test facility is an approximately 1:712 scale model of a four-loop 1300 MWe PWR and has two primary loops, the intact loop representing three loops, and the broken loop representing one loop of the reference PWR. Both primary loops are active loops, each containing a coolant circulation pump and a steam generator. The simulated core consists of an electrically heated 64 rod bundle (5.3 MW) housed in the pressure vessel model. Lower plenum, upper plenum and an annular downcomer are additional major components of the reactor model assembly. Pipe ruptures of various sizes, ranging from double-ended breaks to single-ended small leaks, may be simulated at various locations within the primary cooling system. The primary cooling system which is shown schematically in Figures A.1 operates at normal PWR conditions: approximately 155 bar and 290/320°C pressure and temperature.

In the MOD2 system configuration emergency-core-cooling (ECC) water can be supplied by the high pressure injection system (HPIS) and by the accumulator injection system (AIS); for the time being the low pressure injection system (LPIS) is not represented. Provisions are made for cold leg or combined cold and hot leg ECC injection into both primary loops.

Heat is transferred from the primary loops by the secondary cooling circuit containing two condensers and a cooler (simulating the heat sink represented by the turbines and condensers in the real plant), the main feedwater pump, and the auxiliary feedwater system. The normal operating conditions of the secondary cooling circuit are approximately 210°C feedwater temperature and 54 bar pressure. The secondary cooling circuit is, however, designed to withstand pressures and temperatures of up to 100 bar and 310°C respectively. A schematic drawing of the secondary cooling circuit is shown in Fig. A.2.

2. General Design Rationale

The objectives of the LOBI project require a test facility with a thermo-hydraulic behaviour during blowdown which is as closely as possible a reactor typical one.

The scaling factor of 712 has been applied to the power input, coolant mass flow and coolant volume of the primary cooling system leading to the following values:

- 5.3 MW electrical power supplied to the 64 (8 x 8) heater rod bundle of a 1 : 1 PWR design

- 21 kg/s and 7 kg/s coolant mass flow for the intact and broken loop respectively, resulting in 28 kg/s core mass flow

- about 0.6 m^3 coolant volume within the primary loop system including the pressurizer.

The design of the experimental primary loops and the individual components was performed such that (1) the ratio of power to volume, (2) the ratio of the volumes of various components and pipework sections to each other and (3) the ratio of the rupture size to primary coolant system volume, as well as (4) the pressure drop and temperature distribution along the flow paths was maintained as closely as technically possible equal to the value of the reference plant.

The height, and relative heights (elevation) of components are scaled 1 : 1, thus preserving gravitational heads. The heat transfer surfaces (core rod bundle, steam generators) are full length.

An exception to these scaling criteria is the annular shaped downcomer. Since no general scaling concept for the downcomer gap size is available at present, the LOBI-MOD2 system is configured with a downcomer of 12 mm gap width (which is a compromise between the volume scaled downcomer, 7 mm gap width, and a pressure drop scaled downcomer, 25 mm gap width).

3. Mechanical Components

In this subsection an introductive description of each major mechanical component of the test facility is presented. Geometrical shape and dimensions and all relevant characteristics of the various components of the test facility are detailed in the as-built drawings.

3.1 Reactor Pressure Vessel Model (RPVM)

The reactor model consists of the pressure vessel (PV), the core barrel tube (CBT) and the heater rod bundle, thus simulating the internal annular downcomer, the core and the lower and upper plenum (Fig. A.3).

The pressure vessel is closed at its upper end by the upper power connecting plate and at its lower end by the lower plenum container.

The annular downcomer formed by both the PV and the CBT together has a downcomer gap width of 12 mm. A honeycomb structure is arranged along the outer wall of the CBT in order to form the 12 mm downcomer gap width. The honeycomb design was adopted to reduce the stored heat in the downcomer inner wall. Two holes of 5 mm diameter in the upper end of the core barrel tube simulate the upper downcomer to hot leg bypass flow path.

The reactor core is simulated by a 64 heater rod bundle (8 x 8) of hollow tubes, uniformly heated over the bundle cross section, with the following dimensions:

- total length	6890 mm
- heated length	3900 mm
- outer tube diameter	10.75 mm
- pitch	14.3 mm
- tube wall thickness (5 steps)	1.2, 1.5, 2.15 mm

The tubes are electrically heated; the tube wall thickness within the heated length is varied in 5 steps such as to allow the simulation of a cosine-shaped axial heat flux distribution.

The upper "unheated" part of the rod bundle is formed by hollow nickel tubes, the lower "unheated" part by nickel rods and flexible nickel strings through which the heater rods are connected to the lower power connecting ring. The heat dissipated within these "unheated" regions amounts to about 14 %.

Nine grid spacers are equidistantly placed throughout the heated length; five further spacers are arranged in the upper "unheated" part of the rod bundle; these are supplied with additional distancing devices to support the rod bundle against the core barrel tube.

Ceramic segments are arranged along the inner wall of the CBT forming a quadratic flow shroud extending for 4428 mm over the heated length of the rod bundle. A core bypass flow is caused by the annular gap of 1.5 mm width remaining between these ceramic fillers and the CBT.

The upper "unheated" part of the heater rod bundle extends entirely in the upper plenum and represents the internal structure of the LOBI upper plenum.

The upper head of the RPVM is simulated by a small container of 1 : 1 height and scaled volume, and is arranged separately to the RPVM at 1 : 1 elevation. It is connected to the upper plenum on one hand and to the upper downcomer region on the other hand.

3.2 Steam Generators

The geometrical configuration of the MOD2 steam generators is, in general, similar to that of the steam generators in the reference plant. They are of the inverted U-tube type. The capacity ratio between the broken loop and the intact loop steam generators is 1:3 with respect to coolant volume and mass flow, to heat transfer surface and, hence, to heat exchanger power.

The general form of the design consists of a single cylindrical pressure vessel with an annular downcomer separated from the riser region by a skirt tube. This tube is supported above the tube plate, and carries the coarse separator at its upper end. The U-tubes are arranged in a circle

within the riser region, around an axially mounted filler tube, with the U-bends crossing over one another above it. This design permits cross flow between co-current and counter current legs of the U-tubes over their entire length, heat transfer between riser and downcomer, and extremely precise volume scaling; at the same time extraneous thermal capacity in the filler elements is minimised. The actual elevation and the dimensions of various components within the two steam generators are shown in Figure A.4.

3.3 Main Coolant Pumps (MCP)

The MCP of both loops are centrifugal type pumps and are equal in size. Therefore, special cross section adapters at the pump inlet and outlet are required for connecting the pump to the different inner tube diameters of the intact and broken loop. The two pumps are operated at two different speeds such as to yield the two different steady-state mass flows of 21 kg/s and 7 kg/s for the intact and the broken loop respectively at the same pressure head. A special control and drive system allows the control of the pump speed during blowdown in forward and backward direction over a range of about 8500 rpm.

3.4 Pressurizer

The LOBI pressurizer design is geometrically similar to that of the reference plant. It is scaled in total and water volume, the height and the elevation are preserved 1:1.

The 20 kW heat source to generate the system pressure is formed by 8 heater rods; the heat sink to regulate the system pressure is represented by 3 cooling tubes placed within the steam region.

The pressurizer normal operating conditions are 155 bar and 345°C pressure and temperature, respectively. The pressurizer is normally connected to the intact loop hot leg. The surge line rises within the pressurizer and leaves it radially. A full flow turbine flow meter installed within the surge line allows the measurement of the surge line fluid flow during blowdown.

3.5 ECC Injection System

The LOBI-MOD2 ECC injection system comprises the high pressure injection system (HPIS) and the accumulator injection system (AIS). The low pressure injection system (LPIS), for the time being, is not represented.

The HPIS and the AIS have common injection points. Each HPIS and the corresponding AIS feed line are piped together at a certain distance from the common connection to the main coolant pipe of the primary circuit. This arrangement enables a variety of HPIS-ECC injection modes; e.g. cold leg, hot leg or combined cold and hot leg ECC injection (KWU design) can be provided. The HPIS water is supplied by a positive displacement pump driven by a variable speed motor. The pump is rated for a maximum flow of 0.39 kg/s at a total head of 200 bars when operated at 150 rpm. A special speed control system provides appropriate head and delivery variation to match the expected performance of the HPIS in the reference plant. Properly designed and calibrated throttling devices are installed in the main injection line to provide the required proportioning (depending on specific simulation needs) of the injection rate between the broken and the intact loop.

The AIS is composed of two accumulators, one for each loop. The accumulator of the intact loop has three times the volume and water capacity of that for the broken loop. The total volume of each accumulator is scaled to that of the reference plant having one accumulator per primary loop. Height and elevation are scaled 1:1.

The accumulators' over-pressure is generated by a nitrogen gas atmosphere. They are both designed for operation at a maximum of 60 bar and 50°C. Each accumulator is connected to both cold and hot leg of the respective primary loop. Depending on specific simulation requirements, cold leg, hot leg or combined cold and hot leg ECC injection can be provided.

The AIS-ECC injection is started by the automatic opening of check valves when the loop pressure has decreased below the accumulator set pressure. The injection mass flow is measured by full flow turbines in each individual branch of the injection lines.

3.6 Connecting Pipes

The main coolant pipes connecting the major individual components of the intact loop and of the broken loop have inner diameters of 73.7 mm and 46.1 mm respectively. Measurement inserts are installed at the inlet and outlet of each major component. Special cross section adapters at the pump inlet and outlet are required for connecting each pump to the main coolant pipes which have a different inner tube diameter.

3.7 Break Device

The break device installed in the LOBI-MOD2 test facility for the small break test series consists of a T-shaped insert connected across the main coolant pipe at the selected break location, a break orifice, a quick-opening valve installed downstream of the break orifice and a discharge line which is heavily instrumented to provide the required information for break flow calculation.

The break orifice is housed in a recess machined in the branch of the insert. Breaks of different size are simulated with break orifices of different diameters. The break is initiated by a quick opening, ball-type, valve flanged to the break insert on one side and to the discharge line on the other side. The discharge line is essentially an instrumented spool piece mounted downstream of the break valve (Fig. A.5).

3.8 Containment

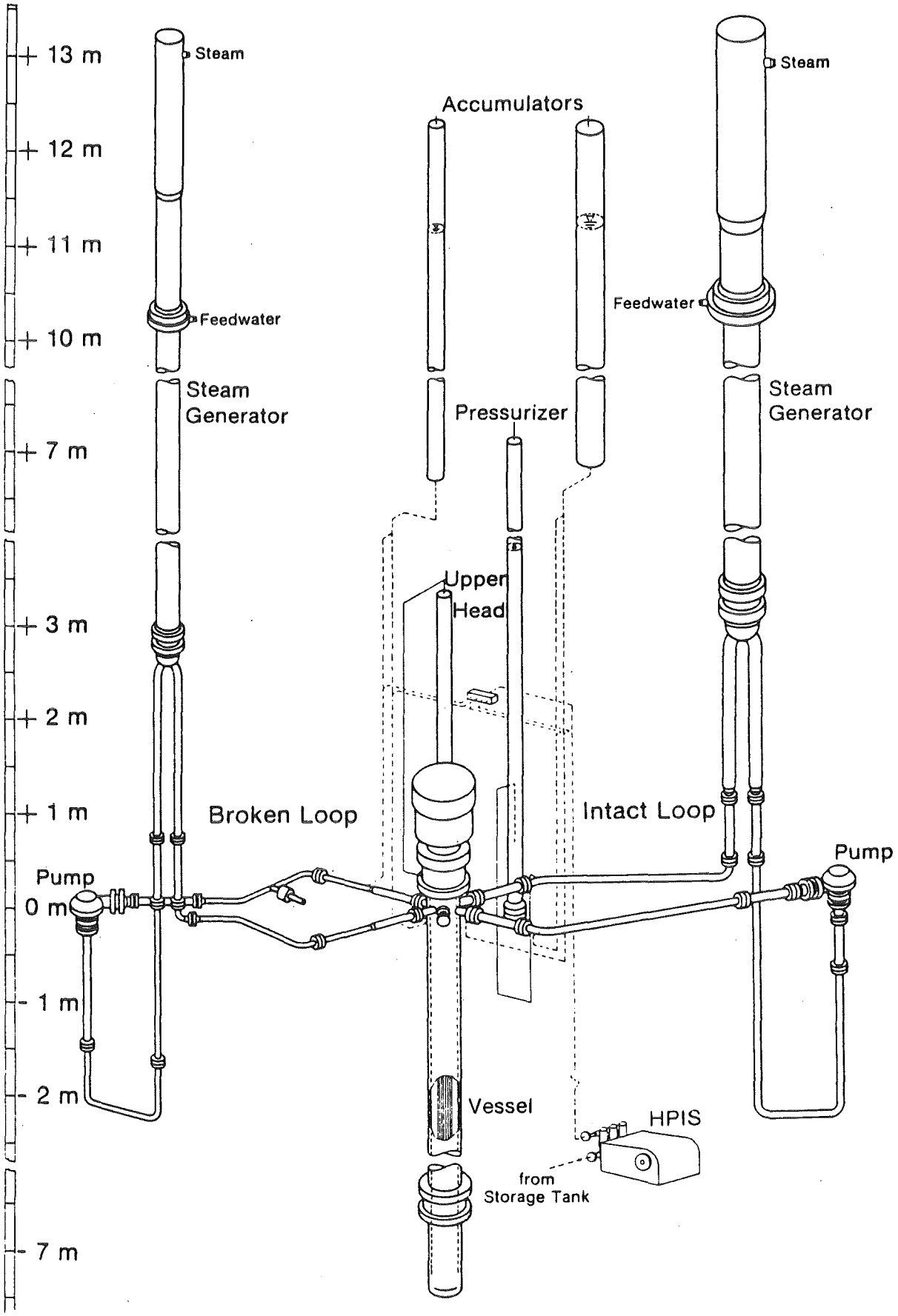
The LOBI break device is situated within a concrete bunker, which encloses the vessel side sections of the cold leg and of the hot leg as well as the bottom part of the loop seal of the broken loop. All these locations are provided with the necessary hardware for simulation of a break. The break device and the main coolant pipe near the break are supported against the hydraulic reaction forces during blowdown by shock arrestors fixed at the bunker wall. The bunker chambers are closed by steel covers and are vented through two open steel pipes of 400 mm inner diameter, 6 mm wall thickness and about 3900 mm length, ending outside the laboratory hall. A condensed water drain pipe of about 4500 mm length, 153 mm inner diameter and 6 mm

wall thickness connects the lower bunker chamber to the atmosphere also outside the laboratory hall.

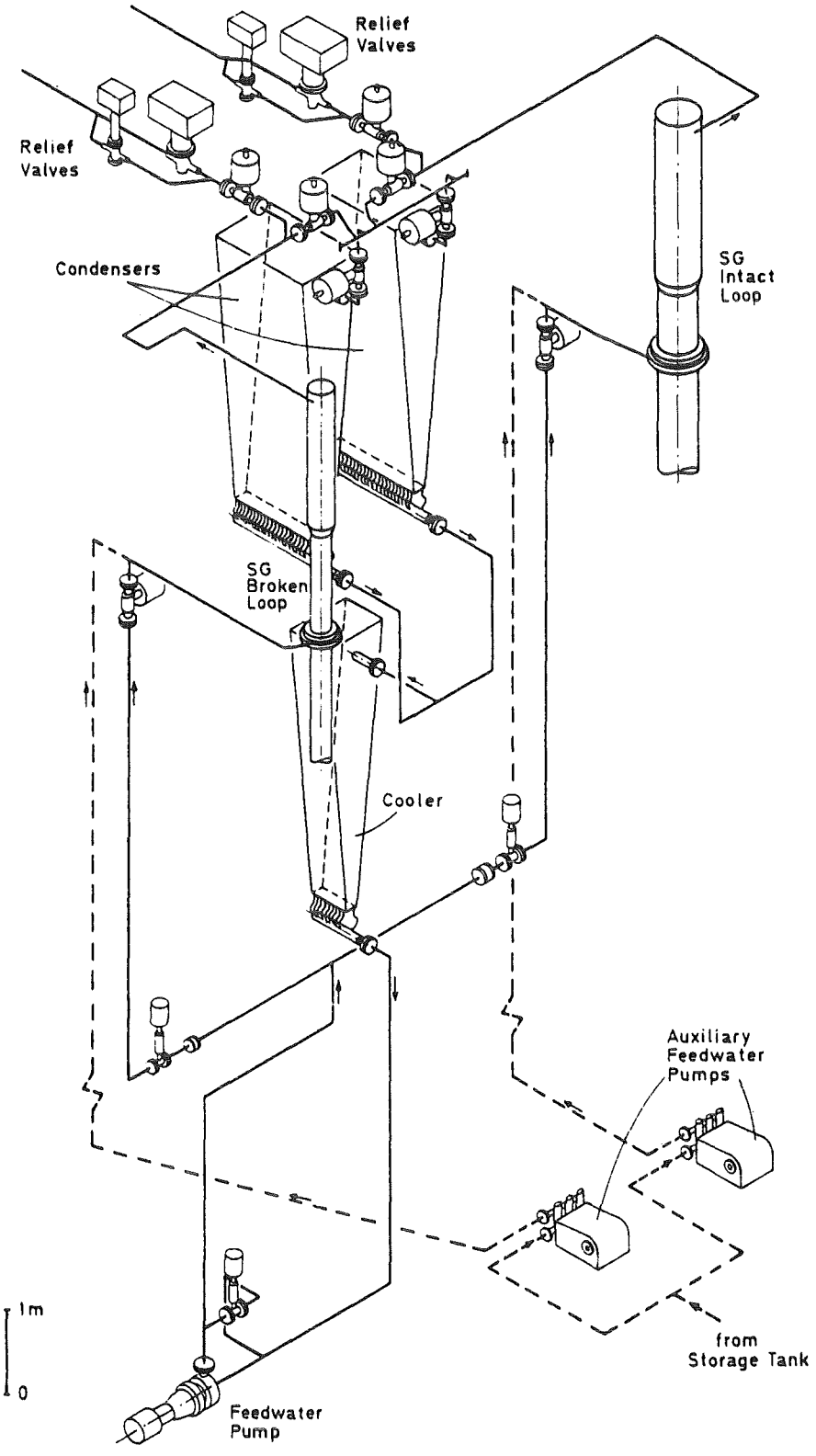
3.9 Secondary Circuit

The circuit consists of a condenser, a cooler, a feedwater circulation pump and an auxiliary feedwater system comprising two auxiliary feedwater pumps, one for each loop, and a water storage tank. Connecting pipes, valves and control systems are other major functional components of the circuit.

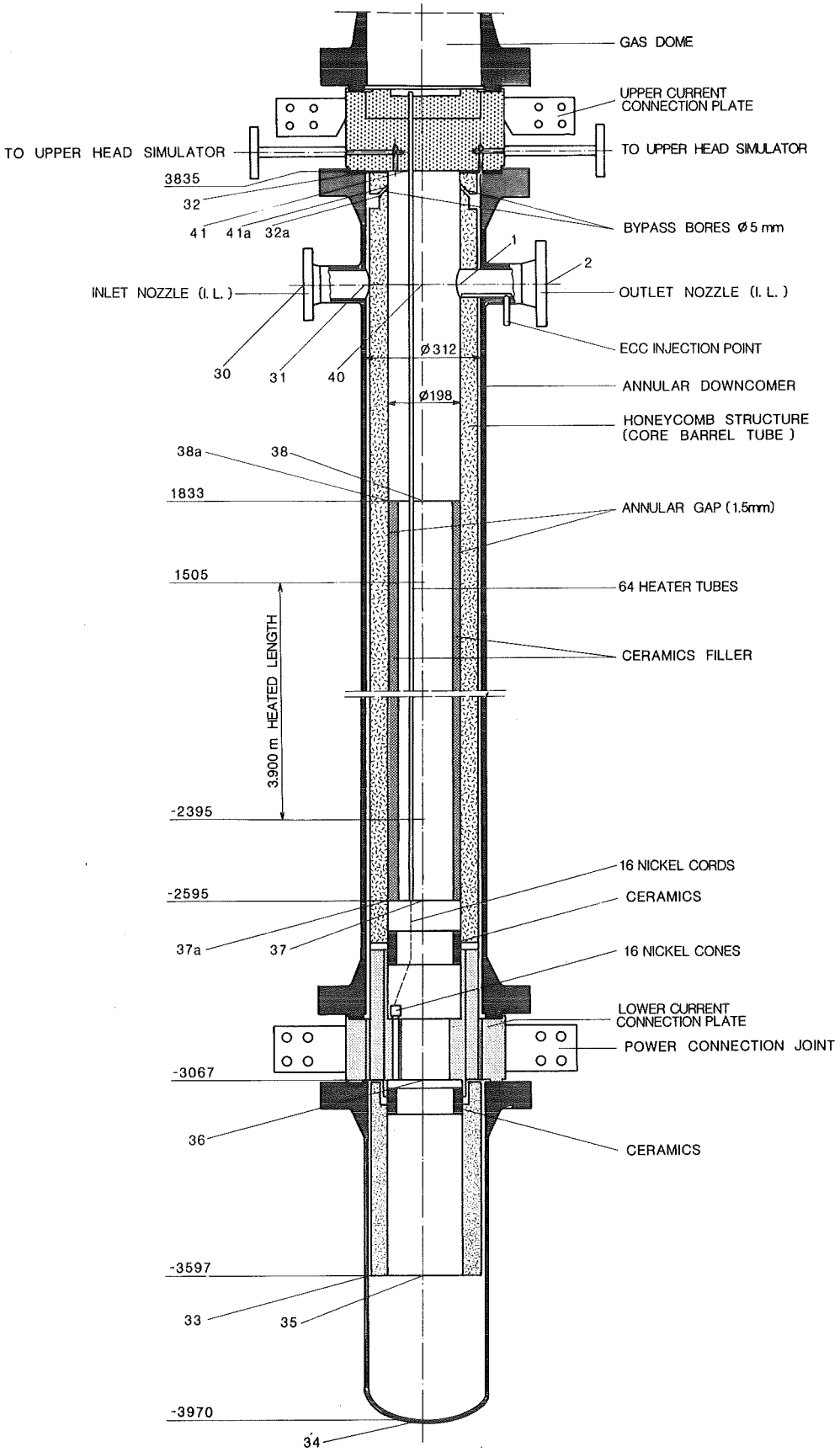
The main feedwater circulation pump is a centrifugal type pump. The intact loop and broken loop auxiliary feedwater pumps are positive displacement type pumps and are rated for respectively 0.208 kg/s and 0.069 kg/s at a delivery pressure of 100 bar when operated at 100 rpm. A speed control device allows variation of delivery head and rate in the corresponding injection lines. The auxiliary feedwater storage tank capacity is sufficient for a period typical of a very small break transient. Isolation valves are installed in both the steam and feedwater lines. Pressure relief valves are installed upstream of the steam line isolation valves. The secondary system can be thus operated to simulate a variety of special transients such as a turbine trip with and without the turbine bypass opening.



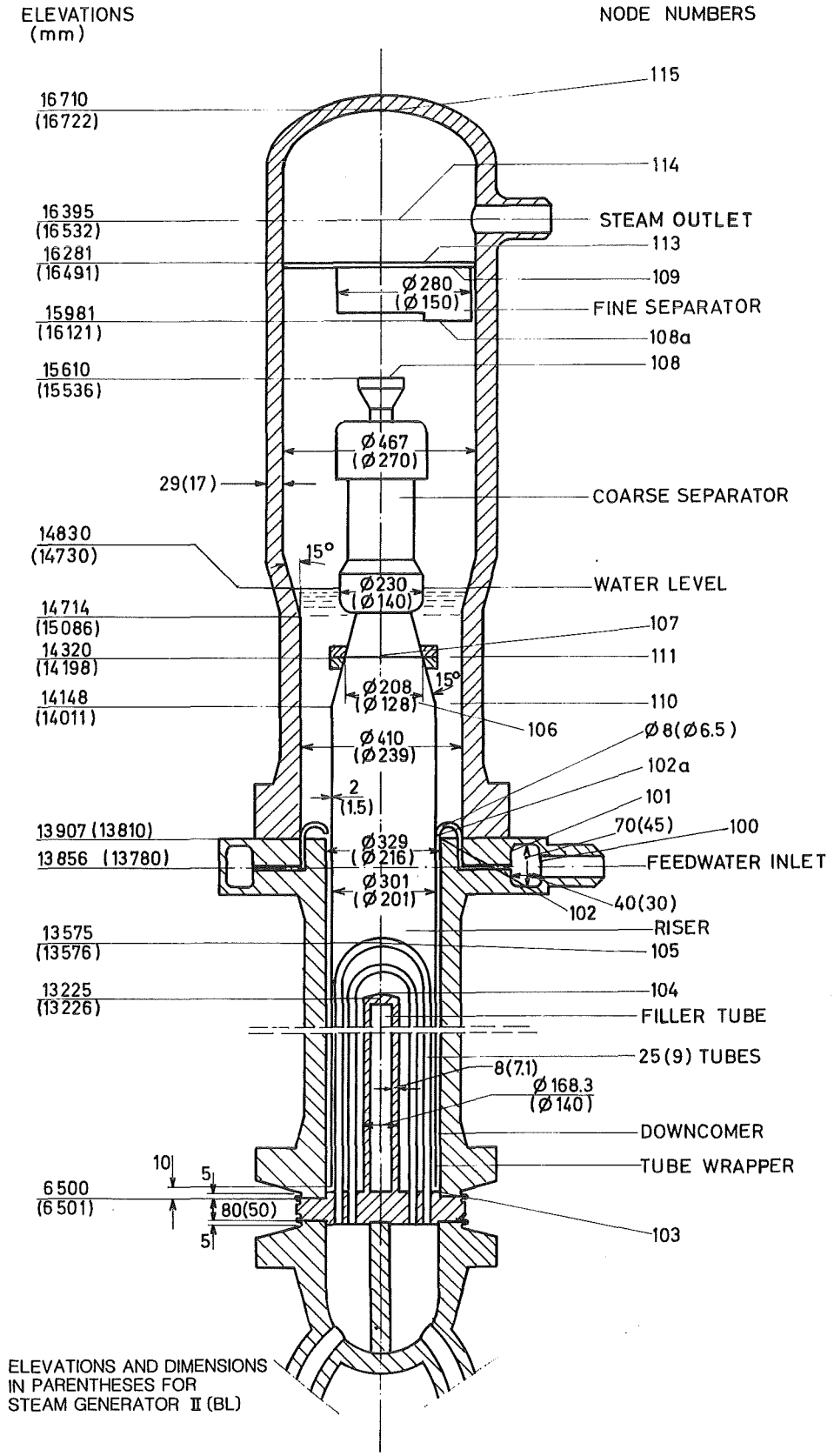
A.1 LOBI-MOD2 Primary Cooling Circuits (Schematic)



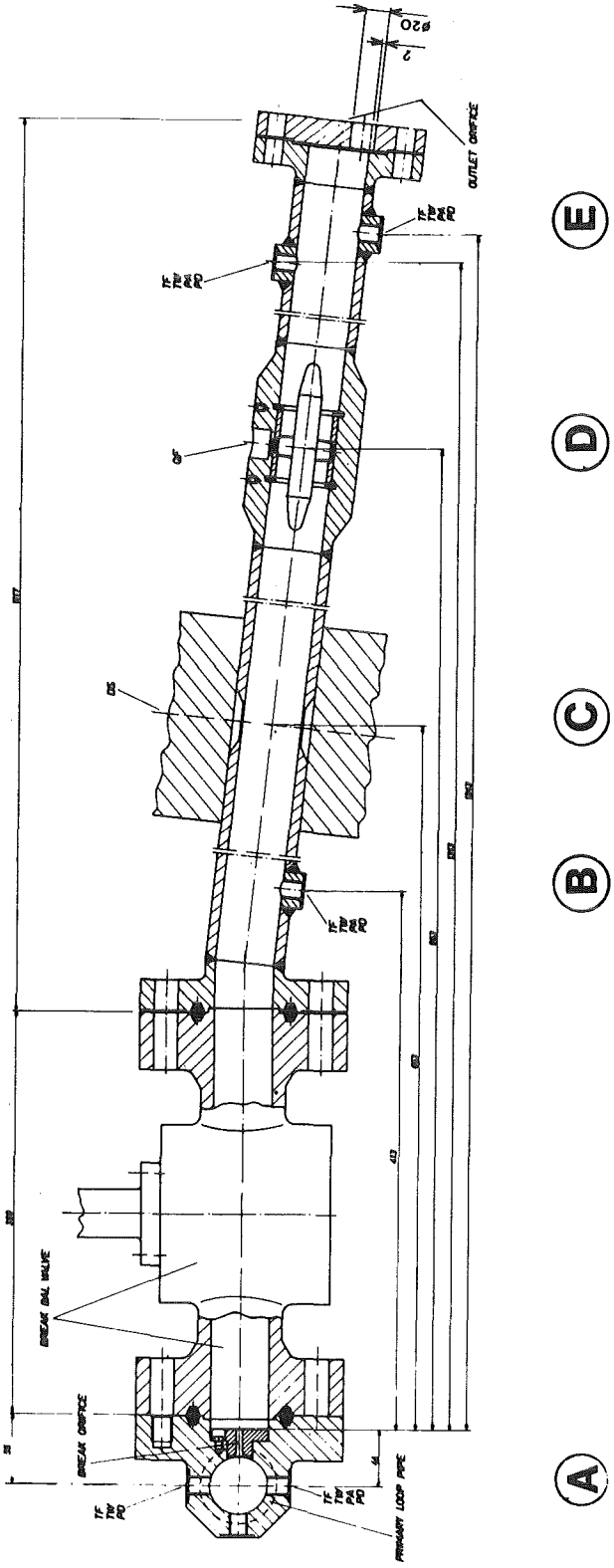
A.2 LOBI-MOD2 Secondary Cooling Circuit (Schematic)



A.3 LOBI-MOD2 Reactor Pressure Vessel Model (Schematic)



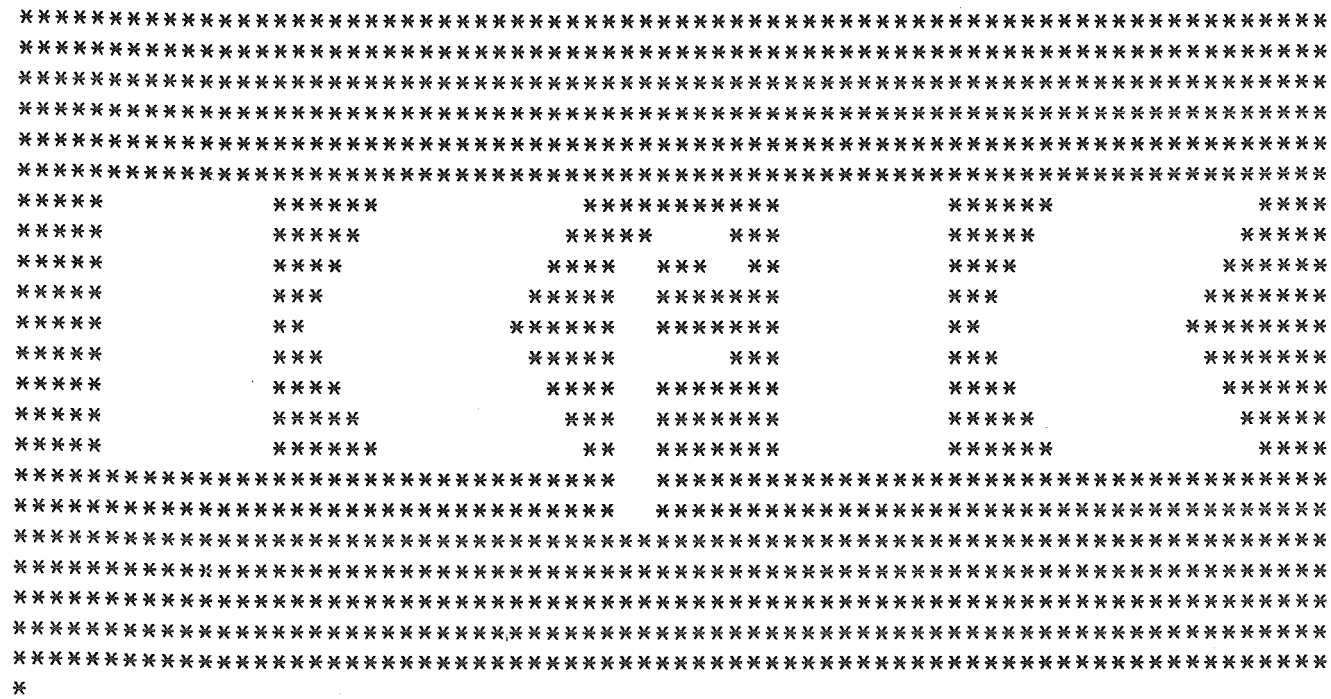
A.4 LOBI-MOD2 Steam Generators (Schematic)



A.5 LOBI-MOD2 Break Insert and Discharge Line

Appendix B

Complete Listing of Input Data for ISP18



```
*
*TIMESTEPS    *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
*
=LOBI-MOD2 TEST A2-81(ISP18)          85/03/12
100 NEW TRANSNT *
101 RUN
*04   NONE
201      440. 1.0E-6  .05  00001  100    2000  2000*
*02      600. 1.0E-10 .025 00001  200    2000  2000*
*03     5000. 1.0E-10 .05  00001  100    2000  2000*
*
*TRIPS     *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
*
*
501 TIME      0          GE NULL      0          0       L*ALWAYS TRUE
502 TIME      0          LT NULL      0          0       L*ALWAYS FALSE
503 TIME      0          GE NULL      0          200.    L*CLOSE U.H. VALVE *
504 TIME      0          GE NULL      0          435.    L*CLOSE DRAIN VALVE
505 TIME      0          GE NULL      0          440.    L*OPEN LEAK
* RESTART
506 CNTRLVAR 198         LE NULL      0          13.2    L*CLOSE FEED VALVE *
507 TIME      0          GE TIMEOF    506        .5      L*START POWER DOWN
508 CNTRLVAR 198         LE NULL      0          11.7    L*HPIS TRIP SIGNAL
509 TIME      0          GE TIMEOF    508        35.     L*START HPIS
510 CNTRLVAR 198         LE NULL      0          11.0    L*MCP COASTDOWN
511 TIME      0          GE TIMEOF    510        74.     L*PMPS IN RESISTANCE
* RESTART                                                  POSITION
512 CNTRLVAR 198         LE NULL      0          1.0     L*END OF TEST
*
513 P         560010000  GE P         741010000  0.0     L*START COOLDOWN
514 P         660010000  GE P         751010000  0.0     L*START COOLDOWN
*
515 TIME      0          LE NULL      0          440.    N*
*
600 512
*
*** TTTT OOO TTTT L*
```

```
601 -505 AND  501 L*
602  506 AND  513 L*
603  506 AND  514 L*
*
*
*MINOREDITS  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
*
*PARAMETERS TO BE PREDICTED
*
301      CNTRLVAR  198*          *   PA38
302      CNTRLVAR  401*          *   PA40
303      CNTRLVAR  199*          *   WH-POWER
304      CNTRLVAR  207*          *   RP71
305      CNTRLVAR  301*          *   CM05
306      CNTRLVAR  801*          *   QM55
307      CNTRLVAR  204*          *   TF11T
308      CNTRLVAR  203*          *   TF11B
309      CNTRLVAR  206*          *   TF16T
310      CNTRLVAR  205*          *   TF16B
311      CNTRLVAR  351*          *   TF21T
312      CNTRLVAR  350*          *   TF21B
313      CNTRLVAR  353*          *   TF26T
314      CNTRLVAR  352*          *   TF26B
315      CNTRLVAR  189*          *   TF35
316      CNTRLVAR  201*          *   DD11
317      CNTRLVAR  208*          *   DD14
318      CNTRLVAR  202*          *   DD16
319      CNTRLVAR  354*          *   DD21
320      CNTRLVAR  355*          *   DD24
321      CNTRLVAR  356*          *   DD25
322      CNTRLVAR  357*          *   DD26
323      CNTRLVAR  184*          *   DS35
324      CNTRLVAR  286*          *   PD9217
325      CNTRLVAR  287*          *   PD1714
326      CNTRLVAR  317*          *   PD8227
327      CNTRLVAR  318*          *   PD2724
328      CNTRLVAR  179*          *   PD3DBT
329      CNTRLVAR  178*          *   PD3RTK
330      CNTRLVAR  177*          *   PD3RKA
331      CNTRLVAR  281*          *   PD90BN
332      CNTRLVAR  312*          *   PD80BN
333      CNTRLVAR  176*          *   PD3R39
334      CNTRLVAR  405*          *   CL4340
335      CNTRLVAR  175*          *   TH04
336      CNTRLVAR  174*          *   TH07
337      CNTRLVAR  173*          *   TH09
338      CNTRLVAR  172*          *   TH11
339      CNTRLVAR  171*          *   TH13
340      CNTRLVAR  170*          *   TH14
341      CNTRLVAR  544*          *   PA97S
342      CNTRLVAR  545*          *   TF95B
343      CNTRLVAR  546*          *   TF95N
344      CNTRLVAR  547*          *   TF97T
345      CNTRLVAR  672*          *   TF85B
346      CNTRLVAR  673*          *   TF85K
347      CNTRLVAR  674*          *   TF87T
348      CNTRLVAR  548*          *   CM93G
349      CNTRLVAR  675*          *   CM83G
350      CNTRLVAR  549*          *   CM65
```

```
351      CNTRLVAR  676*          *    CM66
352      CNTRLVAR  552*          *    CL93BN
353      CNTRLVAR  635*          *    CL83BN
*
*OTHER MINOR EDIT VARIABLES
*
*  LIQUID MASS INVENTORY
354      CNTRLVAR  534 * SGI
355      CNTRLVAR  634 * SGII
356      CNTRLVAR  190 * WH-POW ALT. DEF.
357      CNTRLVAR  001 * TOT. HEAT LOSS
358      CNTRLVAR  031 * VESSEL COLL. LIQUID LEVEL
359      CNTRLVAR  222 * THTSG1
360      CNTRLVAR  332 * THTSG2
361      CNTRLVAR  308 * LEAK MASS LOSS
362      CNTRLVAR  310 * LEAK HEAT REMOVAL
*
*
* SYSTEM CONTROL VARIABLES
20500100  LOSS-SY     SUM      1.         0.        1
20500101  0.  1.  CNTRLVAR  124      1.     CNTRLVAR     212
+             1.  CNTRLVAR  345      1.     CNTRLVAR     404
+             1.  CNTRLVAR  543      1.     CNTRLVAR     663
+             1.  CNTRLVAR  701
*
*VESSEL
*
*
*VS CONTROL VARIABLES
*
20503100     VSLL       SUM  1.000      0        1* VESSEL LIQUID LEVELE
*          A0      LENGTH       VAR.  CODE       LENGTH      VAR.      CODE
20503101  0.0     0.3730      VOIDF 120010000   0.5300    VOIDF  130010000
+                 0.4720      VOIDF 140010000   0.6120    VOIDF  150010000
+                 0.6630      VOIDF 150020000   0.4375    VOIDF  150030000
+                 0.4375      VOIDF 150040000   0.4375    VOIDF  150050000
+                 0.4375      VOIDF 150060000   0.6630    VOIDF  150070000
+                 0.7400      VOIDF 150080000   0.4218    VOIDF  170010000
+                 0.4218      VOIDF 180010000   0.4218    VOIDF  180020000
+                 0.4218      VOIDF 180030000   0.3150    VOIDF  190010000
*
*
20510000  DUMMY      SUM    1.     0.             1
20510001  0.      1.0     CPUTIME     0
*
*
* PRESSURE DROPS
20510100    PD163DB3    SUM    1.-6  0.    1* L18
20510200    PD263DB7    SUM    1.-6  0.    1* L28
20510300    PD3DBT      SUM    1.-6  0.    1* V1
20510400    PD3DTUO2    SUM    1.-6  0.    1* V2
20510500    PD3D3RUU    SUM    1.-6  0.    1* V3+V4+V5
20510700    PD3RYU21    SUM    1.-6  0.    1* V5
20510800    PD3RUG11    SUM    1.-6  0.    1* V6
20510900    PD3RGF12    SUM    1.-6  0.    1* V7
20511000    PD3R11A4    SUM    1.-6  0.    1* L11
20511100    PD3R21A3    SUM    1.-6  0.    1* L21
20511200    PD161133    SUM    1.-6  0.    1* L19
20511300    PD262133    SUM    1.-6  0.    1* L29
```

```
*
*
20510101    0.        1.0    P 270010000 -1.0   P 110010000 *L18
+                                 .40207    RHO    110010000
20510201    0.        1.0    P 395010000 -1.0   P 110010000 *L28
+                                 .40207    RHO    110010000
20510301    0.        1.0    P 110010000 -1.0   P 110100000 *V1
+      -.40207    RHO    110010000      2.29472    RHO    110100000
20510401    0.        1.0    P 110100000 -1.0   P 110110000 *V2
+     -2.29472    RHO    110100000      1.72594    RHO    110110000
20510501    0.        1.0    P 110110000 -1.0   P 140010000 *V3+V4+V5
+     -1.72594    RHO    110110000      1.72594    RHO    140010000
20510701    0.        1.0    P 120010000 -1.0   P 140010000 *V5
+      3.64802    RHO    120010000      1.72594    RHO    140010000
20510801    0.        1.0    P 140010000 -1.0   P 170010000 *V6
+     -1.72592    RHO    140010000      -.92181    RHO    170010000
20510901    0.        1.0    P 170010000 -1.0   P 180030000 *V7
+       .92181    RHO    170010000      2.02014    RHO    180030000
20511001    0.        1.0    P 180030000 -1.0   P 200010000 *L11
+     -2.02014    RHO    200010000
20511101    0.        1.0    P 180030000 -1.0   P 300010000 *L21
+     -2.02014    RHO    300010000
20511201      0.0     1.0    P 270010000 -1.0   P 200010000 *L19
20511301      0.0     1.0    P 395010000 -1.0   P 300010000 *L29
*
* HEAT LOSSES
*
20511600    L1901     SUM    1.    0.    1* UPPER TUBE SHEET
20511700    L1000     SUM    1.    0.    1* UPPER DOWNCOMER
20511800    L1100     SUM    1.    0.    1* DOWNCOMER
20511900    L1101     SUM    1.    0.    1* LOWER DOWNCOMER
20512000    L1200     SUM    1.    0.    1* LOWER PLENUM
20512100    L1201     SUM    1.    0.    1* BOTTOM
20512200    L1950     SUM    1.    0.    1* UPPER HEAD TUBING
20512300    L1960     SUM    1.    0.    1* UPPER HEAD VESSEL
20512400    LOSS-VS     SUM    1.-3 0.    1* RPVM TOTAL
*
*
*
20511601  0.  0.030000 HTRNR  190100101
20511701  0.  0.418520 HTRNR  100000101
20511801  0.  0.600550 HTRNR  110000101  0.600550  HTRNR  110000201
+             0.600550 HTRNR  110000301  0.600550  HTRNR  110000401
+             1.053600 HTRNR  110000501  0.943960  HTRNR  110000601
+             1.245800 HTRNR  110000701  1.245800  HTRNR  110000801
+             0.943960 HTRNR  110000901  0.871350  HTRNR  110001001
20511901  0.  0.621990 HTRNR  110100101  0.698420  HTRNR  110100201
20512001  0.  0.458440 HTRNR  120000101
20512101  0.  0.072880 HTRNR  120100101
20512201  0.  0.258020 HTRNR  195000101  0.232350  HTRNR  195000201
+             0.172910 HTRNR  195000301  0.172910  HTRNR  195000401
+             0.172910 HTRNR  195000501  0.172910  HTRNR  195000601
+             0.172910 HTRNR  195000701  0.245320  HTRNR  195000801
+             0.189390 HTRNR  195000901  0.189120  HTRNR  195001001
20512301  0.  0.770070 HTRNR  196000101  0.650440  HTRNR  196000201
+             0.650440 HTRNR  196000301  0.650440  HTRNR  196000401
20512401  0.  1.       CNTRLVAR 116       1.       CNTRLVAR 117
+             1.       CNTRLVAR 118       1.       CNTRLVAR 119
+             1.       CNTRLVAR 120       1.       CNTRLVAR 121
```

```
+              1.        CNTRLVAR 122        1.        CNTRLVAR 123
*
20515000  BYPASS  SUM 1.0  0.   1*
20515100  ILFLOW  SUM 1.0  0.   1*
20515200  BLFLOW  SUM 1.0  0.   1*
*         A0      A       VAR     CODE      A      VAR     CODE
20515001   0.     1.    MFLOWJ 190010000   1.   MFLOWJ 100050000 *
+                 1.    MFLOWJ 100060000
20515101   0.     1.    MFLOWJ 190040000   1.   MFLOWJ 100050000 * I.L
20515201   0.     1.    MFLOWJ 190050000   1.   MFLOWJ 100060000 * B.L
*
* QUANTITIES TO BE PREDICTED
*
20517000   TH14       SUM      1.0      0.      1
20517001  -273.16     1.    HTTEMP  170000505
20517100   TH13       SUM      1.0      0.      1
20517101  -273.16     1.    HTTEMP  170000205
20517200   TH11       SUM      1.0      0.      1
20517201  -273.16     1.    HTTEMP  150800105
20517300   TH09       SUM      1.0      0.      1
20517301  -273.16     1.    HTTEMP  150400105
20517400   TH07       SUM      1.0      0.      1
20517401  -273.16     1.    HTTEMP  150300305
20517500   TH04       SUM      1.0      0.      1
20517501  -273.16     1.    HTTEMP  150200105
20517600  PD3R39      SUM     1.-6      0.      1
20517601  0.    1.    CNTRLVAR  180
20517602        0.5   P     180030000     0.5   P       190010000
20517603     -0.5     P     194060000    -0.5     P     195010000
20517700  PD3RKA      SUM     1.-6      0.      1
20517701  0.    1.    CNTRLVAR  181
20517702        1.    P     150080000
20517703     -0.5     P     180030000    -0.5     P     190010000
20517800  PD3RTK      SUM     1.-6      0.      1
20517801  0.    1.    CNTRLVAR  182
20517802      0.5     P     110090000     0.5     P     110100000
20517803       -1.    P     150080000
20517900  PD3DBT      SUM     1.-6      0.      1
20517901  0.    1.    CNTRLVAR  183
20517902        1.    P     110010000
20517903     -0.5     P     110090000    -0.5     P     110100000
20518000  D4          SUM      9.81     0.      1
20518001  0.     .0025  RHO    180030000     .0025   RHO    190010000
20518002        -.0365  RHO    194060000    -.0365   RHO    195010000
20518100  D3          SUM      9.81     0.      1
20518101  0.    -.157    RHO    150080000
20518102        -.0025  RHO    180030000    -.0025   RHO    190010000
20518200  D2          SUM      9.81     0.      1
20518201  0.    .036     RHO    110090000      .036     RHO   110100000
20518202        .157     RHO    150080000
20518300  D1          SUM      9.81              0.            1
20518301  0.      -.041    RHO    110010000
20518302          -.036    RHO    110090000     -.036    RHO   110100000
20518400  DS35        SUM      1.                0.            1
20518401  0.       1.  RHO      130010000
20518500  DD26        SUM      1.                0.            1
20518501  0.       1.  RHO      395010000
20518600  DD21        SUM      1.                0.            1
20518601  0.       1.  RHO      300010000
```

```
20518900  TF35       SUM      1.                0.            1
20518901  -273.16 1. TEMPF    130010000
**********
20519000      WH-POWE     SUM            1.-6      0.        0
20519001  0. .31848       HTRNR      140000101 .43228    HTRNR    150000101
20519002      .89023       HTRNR      150100101 1.4330    HTRNR    150200101
20519003      .94562       HTRNR      150300101  .94562   HTRNR    150300201
20519004      .94562       HTRNR      150300301  .94562   HTRNR    150300401
20519005     1.4330        HTRNR      150400101
20519006      .89057       HTRNR      150800101  .70888   HTRNR    150900101
20519007      .91168       HTRNR      170000101  .91168   HTRNR    170000201
20519008      .91168       HTRNR      170000301  .91168   HTRNR    170000401
20519009      .68085       HTRNR      170000501
20519100      TRIPCOND TRIPUNIT         1.        0.        0
20519101      507
20519200      TRIPTIME TRIPDLAY         1.        0.        1
20519201      507
20519300      ARGUM     SUM             1.        0.        1
20519301      0. 1. TIME      0      -1.     CNTRLVAR      192
20519400      MULTP     MULT            1.        1.        0
20519401      CNTRLVAR        191         CNTRLVAR     193
20519900      WH-POWER FUNCTION         1.-6      0.        0
20519901      CNTRLVAR   194          900
**********
20519800  PA38       SUM     .5-6              0.             1
20519801  0.       1.       P     180030000     1. P  190010000
*
*VS VOLUMES
*
1000000 '03-12-84' BRANCH * UPPER DOWNCOMER (INLET ANNULUS)
*         NO.J    CONTROL
1000001    06       0          *
*         AREA    LENGTH    VOLUME  H.A. V.ANGLE  ELEVAT.  ROUGH  DIAM. FE
1000101 .000000 0.3150  .0035626  0.0 +90.000  +0.3150  8.0-5 .0240 00*
*  CONTROL PRESSURE    ENERGY      QUALITY
1000200  0 15.909+6    1.2826+6       0.     *
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS
1001101   100000000   110000000  .009240   00.00   00.00 0100    *
1002101   100010000   192000000  .000000    1.93    2.43 0000    *
1003101   270010000   100000000  .002253   00.00   00.00 0100    *
1004101   395010000   100000000  .000796   00.00   00.00 0100    *
1005101   100000000   200000000  .000000   20000. 20000. 0000    *
1006101   100000000   300000000  .000000   16000. 16000. 0000    *
*        LIQUID VEL. VAPOR VEL. INTERFACE VEL
1001201    3.0976      3.0976    0.0*
1002201    4.2399      4.2399    0.0*
1003201    6.7069      6.7069    0.0*
1004201    5.4772      5.4772    0.0*
1005201    0.12689     0.12689   0.0*
1006201    0.14484     0.14484   0.0*
*
*
1100000  '03-12-84' ANNULUS * DOWNCOMER
*      VOLUMES
1100001    12 *
*          AREA     VOL.NO.
1100101  .011310     12      *
*          J.AREA   JUN.NO.
1100201  .000000     11      *
```

```
*         LENGTH    VOL.NO.
1100301   0.4218      4       *
1100302   0.7400      5       *
1100303   0.6630      6       *
1100304   0.8750      8       *
1100305   0.6630      9       *
1100306   0.6120      10      *
1100307   0.4720      11      *
1100308   0.5300      12      *
*          VOLUME   V.NO.
1100401   .0000000    12      *
*          H.A   V.NO.
1100501    0.0      12        *
*         V.ANGLE V.NO.
1100601   -90.000     12      *
*          ROUGH.   DIAM.   V.NO.
1100801    8.00-6 .0260     12     * 27/11/84
*           K(FORD)  K(REV)    J.NO.
1100901      00.00    00.00    11 *
*           FE    V.NO
1101001     00      12        *
*           CAHS J.NO.
1101101     0000    11        *
*           CONTROL  PRESSURE    ENERGY      QUALITY      VOL NO.
1101201        0       15.907+6    1.2827+6  0.     0.        1 *
1101202        0       15.909+6    1.2828+6  0.     0.        2 *
1101203        0       15.911+6    1.2829+6  0.     0.        3 *
1101204        0       15.913+6    1.2830+6  0.     0.        4 *
1101205        0       15.916+6    1.2830+6  0.     0.        5 *
1101206        0       15.920+6    1.2830+6  0.     0.        6 *
1101207        0       15.924+6    1.2830+6  0.     0.        7 *
1101208        0       15.928+6    1.2831+6  0.     0.        8 *
1101209        0       15.932+6    1.2831+6  0.     0.        9 *
1101210        0       15.935+6    1.2831+6  0.     0.        10 *
1101211        0       15.938+6    1.2829+6  0.     0.        11 *
1101212        0       15.940+6    1.2827+6  0.     0.        12 *
*         CONTROL
1101300      0
*         LIQUID VEL.     VAPOR VEL.      0        JUN NO.
1101301     3.0977          3.0977          0.          1
1101302     3.0978          3.0978          0.          2
1101303     3.0980          3.0980          0.          3
1101304     3.0981          3.0981          0.          4
1101305     3.0981          3.0981          0.          5
1101306     3.0981          3.0981          0.          6
1101307     3.0982          3.0982          0.          7
1101308     3.0982          3.0982          0.          8
1101309     3.0981          3.0981          0.          9
1101310     3.0981          3.0981          0.         10
1101311     3.0979          3.0979          0.         11
*
1200000 '03-12-84' BRANCH * LOWER PLENUM
*         NO.J   CONTROL
1200001    02      0          *
*         AREA    LENGTH    VOLUME   H.A. V.ANGLE   ELEVAT.   ROUGH   DIAM. FE
1200101 .000000 0.3730   .0245926   0.0 +90.000   +0.3730   8.0-5  .3120 00*
*   CONTROL PRESSURE    ENERGY      QUALITY
1200200   0 15.942+6  1.2827+6        0.    *
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS
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1201101  110010000   120010000  .000000  01.24  00.65 0000   *27/11/84
1202101  120010000   130000000  .000000  00.63  01.20 0000   *27/11/84
*         LIQUID VEL. VAPOR VEL. INTERFACE VEL
1201201   3.0976      3.0976      0.0             *
1202201   1.1856      1.1856      0.0             *
*
1300000  '03-12-84' SNGLVOL *  CORE INLET LOWER VOLUME
*        AREA    LENGTH    VOLUME   H.A. V.ANGLE  ELEVAT.  ROUGH  DIAM. FE
1300101 .000000 0.5300   .0156614   0.0 +90.000  +0.5300  8.0-5 .198 00*
*  CONTROL PRESSURE    ENERGY      QUALITY
1300200  0 15.938+6    1.2827+6      0.      *
*
1400000 '03-12-84' BRANCH * CORE INLET UPPER VOLUME
*        NO.J   CONTROL
1400001   03      0          *
*        AREA    LENGTH    VOLUME   H.A. V.ANGLE  ELEVAT.  ROUGH  DIAM. FE
1400101 .000000 0.4720   .0101112   0.0 +90.000  +0.4720  8.0-5 .1300 00*
*  CONTROL PRESSURE    ENERGY      QUALITY
1400200  0 15.928+6   1.2921+6        0.    *
*         CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS
1401101  130010000   140000000  .000000  05.52  05.50 0000   *29/11/84
1402101  140010000   150000000  .000000  05.52  05.50 0000   *29/11/84
1403101  140010000   160000000  .000000  50.00  50.00 0000   *29/11/84
*
*         LIQUID VEL. VAPOR VEL. INTERFACE VEL
1401201   1.6354      1.6354      0.0             *
1402201   4.1935      4.1935      0.0             *
1403201   1.2648      1.2648      0.0             *
*
1500000  '03-12-84' PIPE *  CORE (HEATED TUBES BUNDLE)
*     VOLUMES
1500001  08  *
*         AREA     VOL.NO.
1500101  .008115      8      *
*         J.AREA   JUN.NO.
1500201  .007350     07      *
*        LENGTH    VOL.NO.
1500301  0.6120      1       *
1500302  0.6630      2       *
1500303  0.4375      6       *
1500304  0.6630      7       *
1500305  0.7400      8       *
*         VOLUME   V.NO.
1500401  .0000000    8       *
*         H.A   V.NO.
1500501   0.0      8          *
*        V.ANGLE V.NO.
1500601  +90.000    8         *
*         ROUGH.   DIAM.   V.NO.
1500801    8.0-6 .0135      8     *27/11/84
*          K(FORD)  K(REV)    J.NO.
1500901     00.00    00.00    07 *
*          FE    V.NO
1501001    00     8          *
*          CAHS J.NO.
1501101    0100 07           *
*          CONTROL     PRESSURE      ENERGY        QUALITY      VOL NO.
1501201       0         15.881+6      1.3065+6    0.     0.       1  *
1501202       0         15.870+6      1.3352+6    0.     0.       2  *
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1501203        0          15.861+6       1.3582+6      0.      0.        3  *
1501204        0          15.853+6       1.3813+6      0.      0.        4  *
1501205        0          15.846+6       1.4044+6      0.      0.        5  *
1501206        0          15.838+6       1.4273+6      0.      0.        6  *
1501207        0          15.829+6       1.4560+6      0.      0.        7  *
1501208        0          15.817+6       1.4716+6      0.      0.        8  *
*         CONTROL
1501300      0
*         LIQUID VEL.    VAPOR VEL.        0         JUN NO.
1501301      4.2248         4.2248          0.          1                  *
1501302      4.2894         4.2894          0.          2                  *
1501303      4.3449         4.3449          0.          3                  *
1501304      4.4021         4.4021          0.          4                  *
1501305      4.4640         4.4640          0.          5                  *
1501306      4.5284         4.5284          0.          6                  *
1501307      4.6139         4.6139          0.          7                  *
*
1600000  '03-12-84' PIPE *  CORE BYPASS
*      VOLUMES
1600001  06  *
*          AREA     VOL.NO.
1600101  .0009263     6      *
*          J.AREA   JUN.NO.
1600201  .000000      05     *
*         LENGTH    VOL.NO.
1600301  0.6120      1        *
1600302  0.6630      2        *
1600303  0.8750      4        *
1600304  0.6630      5        *
1600305  0.7400      6        *
*          VOLUME   V.NO.
1600401  .0000000    6        *
*          H.A   V.NO.
1600501   0.0     6           *
*         V.ANGLE V.NO.
1600601  +90.000    6         *
*          ROUGH.   DIAM.   V.NO.
1600801    5.0-6  .0030      6     *
*          K(FORD)  K(REV)    J.NO.
1600901     00.00     00.00    05 *
*          FE    V.NO
1601001    00     6           *
*          CAHS J.NO.
1601101    0000 05            *
*          CONTROL      PRESSURE        ENERGY        QUALITY     VOL NO.
1601201       0         15.893+6       1.2926+6      0.    0.        1 *
1601202       0         15.885+6       1.2946+6      0.    0.        2 *
1601203       0         15.876+6       1.2992+6      0.    0.        3 *
1601204       0         15.865+6       1.3075+6      0.    0.        4 *
1601205       0         15.855+6       1.3140+6      0.    0.        5 *
1601206       0         15.846+6       1.3214+6      0.    0.        6 *
*         CONTROL
1601300      0
*         LIQUID VEL.        VAPOR VEL.          0              JUN NO.
1601301      1.2652             1.2652            0.               1          *
1601302      1.2665             1.2665            0.               2          *
1601303      1.2696             1.2696            0.               3          *
1601304      1.2750             1.2750            0.               4          *
1601305      1.2793             1.2793            0.               5          *
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*
1700000 '03-12-84' BRANCH * UPPER PLENUM LOWER VOLUME
*         NO.J    CONTROL
1700001    03       0          *
*         AREA    LENGTH    VOLUME  H.A. V.ANGLE  ELEVAT.  ROUGH  DIAM. FE
1700101 .025450 0.4218   .00000  0.0 +90.000 +0.4218 1.0-6 .0350 00*27/11
*  CONTROL PRESSURE    ENERGY      QUALITY
1700200   0 15.810+6  1.4696+6       0.     *
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS
1701101   150010000    170000000  .007350   00.00   00.00 0100    *29/11/84
1702101   160010000    170000000  .000000   50.00   50.00 0000    *29/11/84
1703101   170010000    180000000  .020000    0.0     0.0  0100    *29/11/84
*        LIQUID VEL VAPOR VEL.     INTERFACE VEL
1701201    4.6641      4.6641       0.0              *
1702201    1.2842      1.2842       0.0              *
1703201    1.5362      1.5362       0.0              *
*
1800000   '03-12-84' PIPE *  UPPER PLENUM MIDDLE VOLUMES
*      VOLUMES
1800001   03  *
*          AREA     VOL.NO.
1800101   .025500      3      *
*          J.AREA   JUN.NO.
1800201   .020000     02      *
*         LENGTH    VOL.NO.
1800301   0.4218      3        *
*          VOLUME   V.NO.
1800401   .0000000    3       *
*          H.A   V.NO.
1800501    0.0      3          *
*         V.ANGLE V.NO.
1800601   +90.000    3         *
*          ROUGH.   DIAM.   V.NO.
1800801     1.0-6 .0400      3     *27/11/84
*           K(FORD)  K(REV)    J.NO.
1800901      00.00    00.00    02 *
*           FE    V.NO
1801001     00      3          *
*           CAHS J.NO.
1801101     0100 02            *
*       CONTROL    PRESSURE     ENERGY        QUALITY       VOL NO.
1801201    0          15.807+6    1.4725+6     0.     0.         1*
1801202    0          15.804+6    1.4754+6     0.     0.         2*
1801203    0          15.801+6    1.4783+6     0.     0.         3*
*         CONTROL
1801300    0
*          LIQUID VEL.      VAPOR VEL.      0           JUN NO.
1801301    1.5363           1.5363           0.            1      *
1801302    1.5394           1.5394           0.            2      *
*
1900000 '03-12-84' BRANCH * UPPER PLENUM UPPER VOLUME
*         NO.J    CONTROL
1900001    05       0          *
*         AREA    LENGTH    VOLUME  H.A. V.ANGLE  ELEVAT.  ROUGH  DIAM. FE
1900101 .025450 0.315    .0000000  0.0 +90.000  +0.315   1.4-6 .0440 00*
*  CONTROL PRESSURE    ENERGY      QUALITY
1900200   0 15.799+6  1.4716+6       0.     *
*
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS
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1901101  100010000   190010000  .000000  3.00+5 3.00+5 0000  *
1902101  195010000   190010000  .000000  02.43  01.93  0000  *
1903101  180010000   190000000  .000000  00.00  00.00  0100  *27/11/84
1904101  190000000   200000000  .003324  00.00  00.00  0100  *27/11/84
1905101  190000000   300000000  .001078  00.00  00.00  0100  *27/11/84
*       LIQUID VEL VAPOR VEL.    INTERFACE VEL
1901201  2.6848-2    2.6848-2    0.0            *
1902201  4.2388      4.2388      0.0            *
1903201  1.5455      1.5455      0.0            *
1904201  7.3430      7.3430      0.0            *
1905201  5.9527      5.9527      0.0            *
*
1920000 '03-12-84' SNGLVOL *  UPPER HEAD INLET TUBE UPTO TEE
*        AREA   LENGTH   VOLUME  H.A. V.ANGLE  ELEVAT.  ROUGH  DIAM. FE
1920101 .000314 0.9554  .0000000  0.0  +6.008  +0.1000  8.0-5 .0200 00*
*  CONTROL PRESSURE   ENERGY     QUALITY
1920200  0 15.883+6  1.2825+6   0.     0. *
*
*
1930000  '03-12-84' BRANCH *  UPPER HEAD BYPASS WITH ORIFICE
*        JUNCTIONS     CNTL
1930001  3             0*
*       FROM      TO        AREA  FORWARD REVERSE CAHS
1931101 196010000 193000000 0.0   0.51    0.95    0000*
1932101 192010000 193010000 0.0   72.0   72.90    0000*
1933101 193000000 195000000 0.0   3.0     3.1    0000*
*       LIQUID      VAPOR       0
1931201   3.0985    3.0985      0.0 *
1932201   1.1403    1.1403      0.0 *
1933201   4.2388    4.2388      0.0 *
*        AREA   LENGTH   VOLUME  H.A. V.ANGLE  ELEVAT.  ROUGH  DIAM. FE
1930101 .000314 0.8600    0.0    0.0 -22.926  -0.335  8.0-5  .0200 00*
*  CONTROL PRESSURE   ENERGY     QUALITY
1930200  0 15.851+6   1.2820+6      0.    *
*
*
1940000  '03-12-84' PIPE *  UPPER HEAD INLET TUBE FROM TEE
*     VOLUMES
1940001   6  *
*         AREA    VOL.NO.
1940101  .000314     6     *
*         J.AREA  JUN.NO.
1940201  .000000     5     *
*         LENGTH   VOL.NO.
1940301  0.6400     5       *
1940302  0.9083     6       *
*         VOLUME  V.NO.
1940401  .0000000   6       *
*        V.ANGLE V.NO.
1940601  +90.000    5       *
1940602  -10.082   6        *
*         ROUGH.  DIAM.  V.NO.
1940801    8.0-5 .0200     6    *
*          K(FORD)  K(REV)   J.NO.
1940901     00.00    00.00   04 *
1940902      0.34     0.34   05 *
*          FE   V.NO
1941001    00    6          *
*          CAHS J.NO.
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1941101     0000 05          *
*       CONTROL    PRESSURE     ENERGY        QUALITY        VOL NO.
1941201    0          15.876+6    1.2825+6     0.      0.        1 *
1941202    0          15.868+6    1.2824+6     0.      0.        2 *
1941203    0          15.860+6    1.2823+6     0.      0.        3 *
1941204    0          15.852+6    1.2822+6     0.      0.        4 *
1941205    0          15.844+6    1.2822+6     0.      0.        5 *
1941206    0          15.837+6    1.2820+6     0.      0.        6 *
*         CONTROL
1941300    0
*          LIQUID VEL.     VAPOR VEL.      0            JUN NO.
1941301    3.0995           3.0995          0.             1
1941302    3.0994           3.0994          0.             2
1941303    3.0993           3.0993          0.             3
1941304    3.0992           3.0992          0.             4
1941305    3.0991           3.0991          0.             5
*
*        'NAME'      TYPE
1950000 '03-12-84' PIPE *   UPPER HEAD OUTLET TUBE
*        VOLUMES
1950001 02
*        VOL AREA      VOL NO.
1950101 0.000314       02*
*        JUN AREA      JUN NO.
1950201 0.0            01*
*        LENGTH        VOL NO.
1950301 0.7013         01*
1950302 0.7000         02*
*        ANGLE         VOL NO.
1950601 -38.336        01
1950602  00.00         02
*        ROUGHNESS   DIAM     VOL NO.
1950801 8.0-5        0.02     02
*         FORWARD   REVERSE   JUN NO.
1950901  00.2        0.2      01
*         FE-FLAG      VOL NO.
1951001  00            02
*         CAHS-FLAG    JUN NO.
1951101  0000          01
*        CNTL PRESSURE    ENERGY      QUALITY     VOL NO.
1951201    0  15.817+6    1.2820+6  0.       0.   01*
1951202    0  15.811+6    1.2819+6  0.       0.   02*
*        CNTL
1951300    0*
*          LIQUID      VAPOR       0                JUN NO.
1951301    4.2389      4.2389      0.0              01*
*
1960000  '03-12-84' PIPE *  UPPER HEAD VESSEL
*      VOLUMES
1960001    4  *
*          AREA     VOL.NO.
1960101   .011310      4      *
*          J.AREA   JUN.NO.
1960201   .000000       3     *
*         LENGTH    VOL.NO.
1960301   0.7660     1        *
1960302   0.6466     4
*          VOLUME   V.NO.
1960401   .0000000    4       *
```

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*         V.ANGLE V.NO.
1960601   -90.000   4        *
*          ROUGH.   DIAM.   V.NO.
1960801     8.0-5 .1200      4     *
*           K(FORD)  K(REV)    J.NO.
1960901      00.00     00.00     3 *
*           FE    V.NO
1961001     00     4          *
*           CAHS J.NO.
1961101     0000   3          *
*       CONTROL    PRESSURE     ENERGY         QUALITY        VOL NO.
1961201    0          15.838+6    1.2819+6     0.     0.          1 *
1961202    0          15.843+6    1.2819+6     0.     0.          2 *
1961203    0          15.848+6    1.2818+6     0.     0.          3 *
1961204    0          15.852+6    1.2819+6     0.     0.          4 *
*          CONTROL
1961300    0
*           LIQUID VEL.      VAPOR VEL.       0            JUN NO.
1961301    8.6031-2          8.6031-2         0.             1       *
1961302    8.6028-2          8.6028-2         0.             2       *
1961303    8.6024-2          8.6024-2         0.             3       *
*
*         'NAME'      TYPE
1970000  '03-12-84' VALVE *
*         FROM        TO           AREA       FORWARD  REVERSE  CAHS
1970101  192010000 194000000  0.000314    0.86     0.86     0100*
*         CNTL  LIQUID V.   VAPOR V.    0
1970201    0     3.0996     3.0996      0.*
*           VALVE * TYPE
1970300    MTRVLV *
*          TRIP NO
1970301   502  503  0.125  1.0
*
*         'NAME'      TYPE
1980000  '03-12-84' SNGLJUN *
*         FROM        TO          AREA      FORWARD REVERSE CAHS
1980101  194010000 196000000 0.0         1.11     0.28    0000  *
*        CNTL LIQUID V. VAPOR V.   0
1980201   0    3.0990     3.0990    0.0*
*
*VS STRUCTURES
*
*************************************************************************
* VESSEL SIMULATOR WALL UPPER DOWNCOMER
*************************************************************************
11000000 1          7          2          1          .156
11000100 0          1
11000101 6          0.21146
11000201 1          6
11000301  0.0       6
11000400  -1
11000401  559.08,549.79,540.89,532.34,524.10,516.14,508.43
11000501  100010000 0          1          1          0.3150     1
11000601  -919       0          3929       1          0.315      1
11000701  0          0.0        0.0        0.0        1
11000801  0          .024       0.0        0.0        1
*************************************************************************
* VESSEL SIMULATOR WALL FROM TOP TO TO LOWER DOWNCOMER
*************************************************************************
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```
11100000  10         10         2          1          .156
11100100  0          1
11100101  6          .1766
11100102  3          .2266
11100201  1          6
11100202  9          9
11100301  0.0        9
11100400  -1
11100401  566.91 566.82 566.74 566.65 566.56 566.46 566.36 474.46
+         389.56 311.56
11100402  566.93 566.84 566.76 566.67 566.58 566.48 566.38 474.47
+         389.57 311.04
11100403  566.95 566.86 566.77 566.69 566.59 566.50 566.40 474.48
+         389.57 311.05
11100404  566.97 566.88 566.79 566.70 566.61 566.52 566.42 474.50
+         389.58 311.05
11100405  566.97 566.89 566.80 566.71 566.62 566.53 566.43 474.50
+         389.58 311.05
11100406  566.98 566.89 566.81 566.72 566.63 566.53 566.44 474.50
+         389.58 311.05
11100407  566.98 566.90 566.81 566.72 566.63 566.54 566.44 474.50
+         389.58 311.05
11100408  566.99 566.90 566.82 566.73 566.64 566.55 566.45 474.51
+         389.58 311.05
11100409  566.99 566.91 566.82 566.73 566.64 566.55 566.45 474.51
+         389.58 311.05
11100410  566.99 566.91 566.82 566.74 566.65 566.55 566.45 474.51
+         389.59 311.05
11100501  110010000 10000      1          1          .4218      4
11100502  110050000 0          1          1          .740       5
11100503  110060000 0          1          1          .663       6
11100504  110070000 10000      1          1          .875       8
11100505  110090000 0          1          1          .663       9
11100506  110100000 0          1          1          .612       10
11100601  -919      0          3949       1          .4218      4
11100602  -919      0          3949       1          .740       5
11100603  -919      0          3949       1          .663       6
11100604  -919      0          3949       1          .875       8
11100605  -919      0          3949       1          .663       9
11100606  -919      0          3949       1          .612       10
11100701  0         0.0        0.0        0.0        10
11100801  0         .024       0.0        0.0        10
**************************************************************
* REACTOR VESSEL WALL-LOWER DOWNCOMER
**************************************************************
11101000 2          7          2          1          .156
11101100 0          1
11101101 6          0.20973
11101201 1          6
11101301  0.0       6
11101400  -1
11101401  566.54 560.67 555.06 549.67 544.46 539.43 534.54
11101402  566.50 560.64 555.04 549.65 544.44 539.41 534.52
11101501  110110000 0          1          1          0.4720     1
11101502  110120000 0          1          1          0.5300     2
11101601  -919      0          3939       1          0.472      1
11101602  -919      0          3939       1          0.530      2
11101701  0         0.0        0.0        0.0        2
11101801  0         .024       0.0        0.0        2
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*****************************************************************
* REACTOR VESSEL WALL-LOWER PLENUM
*****************************************************************
11200000  1          10         2          1          .156
11200100  0          1
11200101  6          .17043
11200102  3          .22043
11200201  1          6
11200202  9          9
11200301  0.0        9
11200400  -1
11200401  566.47 566.42 566.37 566.31 566.25 566.18 566.11 473.98
+         389.18 310.97
11200501  120010000 0          1          1          .331       1
11200601  -919       0          3949       1          .331       1
11200701  0          0.0        0.0        0.0        1
11200801  0          .312       0.0        0.0        1
*****************************************************************
* REACTOR VESSEL WALL-BOTTOM
*****************************************************************
11201000  1          7          1          1          0.0
11201100  0          1
11201101  3          .019
11201102  3          .069
11201201  1          3
11201202  9          6
11201301  0.0        6
11201400  -1
11201401  566.66 566.58 566.46 566.32 482.20 397.60 312.94
11201501  120010000 0          1          1          .07288     1
11201601  -919       0          3949       1          .07288     1
11201701  0          0.0        0.0        0.0        1
11201801  0          0.0        0.0        0.0        1
*****************************************************************
* NICKEL CORD CONNECTION
*****************************************************************
11400000  1          3          2          1          0.0
11400100  0          1
11400101  2          .0024
11400201  4          2
11400301  1.0        2
11400400  -1
11400401  644.49 640.70 629.34
11400501  0          0          0          1          21.12      1
11400601  140010000 0          1          1          21.12      1
11400701  900        .047       0.0        0.0        1
11400901  0          .072       .0789      .330       1
*****************************************************************
* LOWER POWER CONNECTING RING
*****************************************************************
11401000  1          8          2          1          .075
11401100  0          1
11401101  7          .144
11401201  1          7
11401301  0.0        7
11401400  -1
11401401  568.72 568.62 568.48 568.29 568.04 567.73 567.37 567.00
11401501  140010000 0          1          1          .472       1
11401601  110110000 0          1          1          .472       1
```

```
11401701  0          0.0        0.0        0.0        1
11401801  0          .130       0.0        0.0        1
11401901  0          .024       0.0        0.0        1
*************************************************************
* NICKEL ROD
*************************************************************
11500000  1          5          2          1          0.0
11500100  0          1
11500101  4          .005375
11500201  4          4
11500301  1.0        4
11500400  -1
11500401  576.07 575.90 575.41 574.59 573.44
11500501  0          0          0          1          12.8       1
11500601  150010000 0          1          1          12.8       1
11500701  900        .005       0.0        0.0        1
11500901  0          .0135      0.         .200       1
*************************************************************
* ACTIVE CORE (VOLUME 15001)     ******************************
*************************************************************
11501000  1          5          2          1          .003225
11501100  0          1
11501101  4          .005375
11501201  3          4
11501301  1.0        4
11501400  -1
11501401  605.88 604.36 600.08 593.29 584.16
11501501  0          0          0          1          26.36      1
11501601  150010000 0          1          1          26.36      1
11501701  900        .065       0.0        0.0        1
11501901  0          .0135      0.         .412       1
*************************************************************
* ACTIVE CORE  (VOLUME 15002)
*************************************************************
11502000  1          5          2          1          .003875
11502100  0          1
11502101  4          .005375
11502201  3          4
11502301  1.0        4
11502400  -1
11502401  613.47 612.13 608.28 602.07 593.64
11502501  0          0          0          1          42.432     1
11502601  150020000 0          1          1          42.432     1
11502701  900        .140       0.0        0.0        1
11502901  0          .0135      0.0        .663       1
*************************************************************
* ACTIVE CORE  (VOLUMES 15003 AND 15006)
*************************************************************
11503000 4          5          2          1          .004175
11503100 0          1
11503101 4          .005375
11503201 3          4
11503301 1.0        4
11503400 -1
11503401 620.49 619.23 615.54 609.56 601.38
11503402 624.28 623.01 619.33 613.37 605.20
11503403 628.09 626.82 623.15 617.20 609.05
11503404 631.77 630.51 626.85 620.91 612.77
11503501 0          0          0          1          28.00      4
```

```
11503601 150030000 10000      1           1           28.00      4
11503701 900       .11275     0.0         0.0         4
11503901 0         .0135      0.0         .4375       4
*****************************************************************
* ACTIVE CORE   (VOLUME 15007)
*****************************************************************
11504000  1          5          2          1          .003875
11504100  0          1
11504101  4          .005375
11504201  3          4
11504301  1.0        4
11504400  -1
11504401  633.79 632.45 628.59 622.37 613.90
11504501  0          0          0          1          42.432     1
11504601  150070000 0           1          1          42.432     1
11504701  900        .142       0.0        0.0        1
11504901  0          .0135      0.0        .663       1
*****************************************************************
* ACTIVE CORE   (VOLUME 15008)
*****************************************************************
11508000 1          5          2          1          .003225
11508100  0          1
11508101  4          .005375
11508201  3          4
11508301  1.0        4
11508400  -1
11508401  633.83 632.31 628.03 621.25 612.12
11508501  0          0          0          1          26.37      1
11508601  150080000 0           1          1          26.37      1
11508701  900        .066       0.0        0.0        1
11508901  0          .0135      0.0        .412       1
*****************************************************************
* NICKEL TUBE  (VOLUME 15008)
*****************************************************************
11509000  1          5          2          1          .0025
11509100  0          1
11509101  4          .005375
11509201  4          4
11509301  1.0        4
11509400  -1
11509401  604.95 604.79 604.34 603.64 602.71
11509501  0          0          0          1          20.99      1
11509601  150080000 0           1          1          20.99      1
11509701  900        .012       0.0        0.0        1
11509901  0          .0135      0.0        .328       1
*****************************************************************
* CERAMIC FILLER (IN CORE REGION)
*****************************************************************
11600000  8          10         2          1          .0684
11600100  0          1
11600101  9          .0975
11600201  6          9
11600301  0.0        9
11600400  -1
11600401  571.34 571.02 570.72 570.44 570.16 569.90 569.64 569.40
+         569.16 568.94
11600402  576.46 575.55 574.68 573.85 573.05 572.29 571.56 570.85
+         570.17 569.52
11600403  580.55 579.23 577.97 576.77 575.62 574.52 573.46 572.44
```

```
+          571.46 570.52
11600404   584.45 582.63 580.90 579.25 577.67 576.16 574.71 573.31
+          571.97 570.68
11600405   592.17 589.55 587.06 584.69 582.43 580.26 578.20 576.21
+          574.30 572.47
11600406   596.69 593.48 590.43 587.53 584.77 582.14 579.62 577.20
+          574.88 572.66
11600407   596.73 593.66 590.76 587.99 585.36 582.85 580.44 578.13
+          575.92 573.79
11600408   599.19 595.98 592.94 590.04 587.29 584.65 582.14 579.72
+          577.41 575.18
11600501   150010000 0          1          1          .612       1
11600502   150020000 0          1          1          .663       2
11600503   150030000 10000      1          1          .4375      4
11600504   150060000 10000      1          1          .4375      6
11600505   150070000 0          1          1          .663       7
11600506   150080000 0          1          1          .740       8
11600601   160010000 0          1          1          .612       1
11600602   160020000 0          1          1          .663       2
11600603   160030000 0          1          1          .4375      4
11600604   160040000 0          1          1          .4375      6
11600605   160050000 0          1          1          .663       7
11600606   160060000 0          1          1          .740       8
11600701   0         0.0        0.0        0.0        8
11600801   0         0.0135     0.         0.         8
11600901   0         0.003      0.         0.         8
************************************************************************
* HONEYCOMB STRUCTURE = CORE BARREL TUBE
************************************************************************
11601000 12        5          2          1          .099
11601100 0         1
11601101 4         .144
11601201 8         4
11601301 0.0       4
11601400 -1
11601401 596.72 589.12 582.19 575.82 569.92
11601402 600.38 590.98 582.41 574.54 567.25
11601403 599.95 590.67 582.22 574.45 567.26
11601404 599.52 590.36 582.03 574.37 567.28
11601405 599.06 590.04 581.83 574.28 567.29
11601406 574.02 572.06 570.26 568.60 567.06
11601407 572.69 571.11 569.66 568.31 567.05
11601408 571.52 570.27 569.12 568.05 567.04
11601409 570.02 569.19 568.43 567.71 567.03
11601410 569.17 568.59 568.04 567.52 567.03
11601411 568.80 568.32 567.87 567.44 567.03
11601412 566.95 566.98 566.99 566.98 566.95
11601501 190010000 0          1          1          .315       1
11601502 180030000 -10000     1          1          .4218      4
11601503 170010000 0          1          1          .4218      5
11601504 160060000 0          1          1          .740       6
11601505 160050000 0          1          1          .663       7
11601506 160040000 -10000     1          1          .875       9
11601507 160020000 0          1          1          .663       10
11601508 160010000 0          1          1          .612       11
11601509 130010000 0          1          1          .530       12
11601601 100010000 0          1          1          .315       1
11601602 110010000 10000      1          1          .4218      5
11601603 110050000 0          1          1          .740       6
```

```
11601604 110060000 0          1          1          .663       7
11601605 110070000 10000      1          1          .875       9
11601606 110090000 0          1          1          .663       10
11601607 110100000 0          1          1          .612       11
11601608 110120000 0          1          1          .530       12
11601701 0          0.0       0.0       0.0       12
11601801 0          0.003     0.        0.        12
11601901 0          0.024     0.        0.        12
*************************************************************
* HEATER TUBES IN UPPER PLENUM
*************************************************************
11700000  5          5          2          1          .0025
11700100  0          1
11700101  4          .005375
11700201  4          4
11700301  1.0        4
11700400  -1
11700401  610.24 610.08 609.63 608.94 608.03
11700402  610.68 610.52 610.07 609.39 608.47
11700403  611.11 610.95 610.50 609.81 608.90
11700404  611.54 611.37 610.93 610.24 609.32
11700405  623.60 623.44 623.00 622.32 621.41
11700501  0          0          0          1          26.995     4
11700502  0          0          0          1          20.16      5
11700601  170010000 0          1          1          26.995     1
11700602  180010000 10000      1          1          26.995     4
11700603  190010000 0          1          1          20.16      5
11700701  900        .0152     0.0        0.0        4
11700702  900        .0112     0.0        0.0        5
11700901  0          .044      0.0        .4218      4
11700902  0          .044      0.0        .315       5
*
*************************************************************
*        UPPER TUBE SHEET
*************************************************************
*         NH   NP   TYPE FLAG  LEFT BOUNDARY
11901000  1   6    1       1       0.0     *
*         FLAG   FLAG
11901100  0       1    *
*         NO INTERV.,RIGHT COORD.  OR  MESH INTERV.,MESH NO
11901101  5           0.195
*         COMPOS. NO   INTERV. NO
11901201  5              5
*         SOURCE  INTERV. NO
11901301  0.0       5
11901400  -1
*         TEMP. ,  POINT NO           OR       TEMPS.
11901401  594.21 573.97 553.02 531.58 509.74 487.51
*         VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
11901501  190010000  0          1           1         0.03       1
*         VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
11901601  -919       0         3929        1         0.03       1
*         SOURCE TYPE  MULTI    DIRECT HEAT LEFT   DIRECT HEAT RIGHT  NO
11901701   0             0.       0.                  0.                 1
*         CHF FLAG    HYDR.DIAM  HEAT. DIAM    CHANN.LENGTH     STRUCT NO
11901801    0           0.044       0.             0.               1
*
*************************************************************
********        UPPER HEAD CONNECTION TUBES                 ************
```

```
**************************************************************************
*          NH    NP    TYPE FLAG   LEFT BOUNDARY
11950000  10    7     2       1       0.0100 *
*          FLAG    FLAG
11950100  0       1     *
*          NO INTERV.,RIGHT COORD.   OR   MESH INTERV.,MESH NO
11950101  3               0.013
11950102  3               0.043
*          COMPOS. NO    INTERV. NO
11950201  5                   3
11950202  9                   6
*          SOURCE   INTERV. NO
11950301  0.                  6
11950400  -1
*          TEMP. ,   POINT NO            OR       TEMPS.
11950401  566.84 566.76 566.68 566.61 446.89 369.74 312.78
11950402  566.62 566.54 566.47 566.40 446.79 369.69 312.77
11950403  566.80 566.72 566.65 566.58 446.88 369.73 312.78
11950404  566.79 566.70 566.63 566.56 446.87 369.73 312.78
11950405  566.77 566.69 566.61 566.55 446.85 369.72 312.78
11950406  566.75 566.67 566.60 566.53 446.85 369.72 312.78
11950407  566.73 566.65 566.58 566.51 446.84 369.72 312.78
11950408  566.71 566.63 566.55 566.49 446.82 369.71 312.77
11950409  566.70 566.62 566.55 566.48 446.84 369.71 312.77
11950410  566.69 566.61 566.53 566.47 446.83 369.71 312.77
*          VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
11950501  192010000  0          1              1        0.955          1
11950502  193010000  0          1              1        0.860          2
11950503  194010000  10000      1              1        0.640          7
11950504  194060000  0          1              1        0.908          8
11950505  195010000  0          1              1        0.701          9
11950506  195020000  0          1              1        0.700         10
*          VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
11950601  -919           0      3949           1        0.955          1
11950602  -919           0      3949           1        0.860          2
11950603  -919           0      3949           1        0.640          7
11950604  -919           0      3949           1        0.908          8
11950605  -919           0      3949           1        0.701          9
11950606  -919           0      3949           1        0.700         10
*          SOURCE TYPE   MULTI    DIRECT HEAT LEFT    DIRECT HEAT RIGHT   NO
11950701    0.             0.                0.                  0.      10*
*          CHF FLAG    HYDR.DIAM   HEAT. DIAM    CHANN.LENGTH     STRUCT NO
11950801      0         0.020          0.              0.              10*
*
**************************************************************************
*************      UPPER HEAD VESSEL      ***************************
**************************************************************************
*          NH    NP    TYPE FLAG   LEFT BOUNDARY
11960000  4     10    2       1       0.0600 *
*          FLAG    FLAG
11960100  0       1     *
*          NO INTERV.,RIGHT COORD.   OR   MESH INTERV.,MESH NO
11960101  6               0.080
11960102  3               0.160
*          COMPOS. NO    INTERV. NO
11960201  5                   6
11960202  9                   9
*          SOURCE   INTERV. NO
11960301  0.                  9
```

```
11960400  -1
*         TEMP. ,  POINT NO          OR       TEMPS.
11960401  566.52 566.48 566.44 566.39 566.34 566.29 566.23 457.71
+         372.91 303.51
11960402  566.52 566.48 566.44 566.39 566.34 566.29 566.23 457.71
+         372.91 303.51
11960403  566.52 566.48 566.44 566.40 566.35 566.29 566.23 457.69
+         372.90 303.51
11960404  566.53 566.49 566.45 566.41 566.36 566.30 566.24 457.69
+         372.90 303.51
*         VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
11960501  196010000  0          1              1       0.766          1
11960502  196010000  10000      1              1       0.647          4
*         VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
11960601  -919          0      3949           1       0.766          1
11960602  -919          0      3949           1       0.647          4
*         SOURCE TYPE  MULTI    DIRECT HEAT LEFT    DIRECT HEAT RIGHT  NO
11960701    0.           0.              0.                 0.           4
*         CHF FLAG   HYDR.DIAM  HEAT. DIAM    CHANN.LENGTH     STRUCT NO
11960801     0         0.120          0.             0.             4
*
*
*INTACT LOOP
*
*
*IL CONTROLVARIABLES
*
20520000  DUMMY      SUM      1.                0.            1
20520001  0.       1.   CPUTIME      0
*
*
20520100  DD11       SUM      1.                0.            1
20520101  0.       1.  RHO      200010000
20520200  DD16       SUM      1.                0.            1
20520201  0.       1.  RHO      270010000
20520300  TF11B      SUM      1.              0.              1
20520301  -273.16 1. TEMPF     200010000
20520400  TF11T      SUM      1.              0.              1
20520401  -273.16 1. TEMPG     200010000
20520500  TF16B      SUM      1.              0.              1
20520501  -273.16 1. TEMPF     270010000
20520600  TF16T      SUM      1.              0.              1
20520601  -273.16 1. TEMPG     270010000
20520700  RP71       SUM      9.549297        4820.        0
20520701  0.            1.        PMPVEL      250
20520800  DD14       SUM      1.                0.            1
20520801  0.       1.  RHO      240080000
* HEAT LOSSES
20521000   L1        SUM      1.-3        0.        1*HEAT LOSS IL
20521001   0.  0.52376   HTRNR  200000101   0.93182  HTRNR   210000101
+              0.58369   HTRNR  220000101   0.25943  HTRNR   230000101
+              0.25943   HTRNR  230000201   0.25943  HTRNR   230000301
+              0.25943   HTRNR  230000401   0.48782  HTRNR   230100101
+              0.48782   HTRNR  230300101   0.25943  HTRNR   230400101
+              0.25943   HTRNR  230400201   0.25943  HTRNR   230400301
+              0.25943   HTRNR  230400401   0.49580  HTRNR   240000101
+              0.38008   HTRNR  240100101   0.38008  HTRNR   240100201
+              0.46564   HTRNR  240100301   0.29546  HTRNR   240100401
20521100   L2        SUM      1.-3        0.        1*HEAT LOSS IL
```

```
20521101  0.    0.42404    HTRNR  240100501   0.33848  HTRNR   240100601
+               0.50982    HTRNR  240200101   0.65840  HTRNR   250000101
+               0.48773    HTRNR  260000101   0.37883  HTRNR   260100101
+               0.37883    HTRNR  260100201   0.37883  HTRNR   260100301
+               0.47781    HTRNR  270000101
20521200   LOSS-IL  SUM      1.          0.       1*HEAT LOSS IL
20521201  0.    1.     CNTRLVAR 210       1.     CNTRLVAR  211
*
* HEAT TRANSFER TO/FROM SG1 (MW)
20522000  PHTSG1    SUM    1.    0.    1*
20522100  PHTSG1    SUM    1.    0.    1*
20522200  THTSG1    SUM    1.-6  0.    1* HEAT TRANSFER TO/FROM SG1
*
*
20522001  0.   1.129500 HTRNR  230200101  1.129500  HTRNR  230200201
+              1.129500 HTRNR  230200301  1.129500  HTRNR  230200401
+              1.129500 HTRNR  230200501  1.129500  HTRNR  230200601
+              1.129500 HTRNR  230200701  1.129500  HTRNR  230200801
+              1.129500 HTRNR  230200901  1.129500  HTRNR  230201001
20522101  0.   1.586900 HTRNR  230201101  1.586900  HTRNR  230201201
+              1.129500 HTRNR  230201301  1.129500  HTRNR  230201401
+              1.129500 HTRNR  230201501  1.129500  HTRNR  230201601
+              1.129500 HTRNR  230201701  1.129500  HTRNR  230201801
+              1.129500 HTRNR  230201901  1.129500  HTRNR  230202001
+              1.129500 HTRNR  230202101  1.129500  HTRNR  230202201
20522201  0.   1.0    CNTRLVAR 220        1.0   CNTRLVAR   221
*
* PUMP SPEED CONTROLLER
*
20526100   SPDCNTLR       SUM        1.0   0.0   1
20526101   21.0           -1.0      MFLOWJ   270010000
*
20526200  DEADBAND   STDFNCTN  1.0    0.0     1
20526201  ABS    CNTRLVAR   261
*
*
20526300  PMPSPEED  INTEGRAL  20.0  513.27 1 *
20526301   CNTRLVAR  261                    *
*
*
20528000    PD90AB46  SUM  1.-6      0       1* S91
20528100    PD90BNX1  SUM  1.-6      0       1* S92
20528200    PD92NBX1  SUM  1.-6      0       1* S95
20528300    PD92BA24  SUM  1.-6      0       1* S98
20528400    PD9092AA  SUM  1.-6      0       1* L13
20528500    PD1190A   SUM  1.-6      0       1* L12
20528600    PD9217A   SUM  1.-6      0       1* L14
20528700    PD1714    SUM  1.-6      0       1* L15
20528800    PD151456  SUM  1.-6      0       1* L16(PUMP HEAD)
20528900    PD251653  SUM  1.-6      0       1* L17
20529000    PD161133  SUM  1.-6      0       1* L19
*
20528001    0.0     1.0  P  230010000 -0.363   RHO 230010000
+                  -1.0  P  230060000 -2.452   RHO 230060000
20528101    0.0     1.0  P  230060000  2.452   RHO 230060000
+                  -0.5  P  230160000  1.520   RHO 230160000
+                  -0.5  P  230170000  1.520   RHO 230170000
20528201    0.0     0.5  P  230160000 -1.520   RHO 230160000
+                   0.5  P  230170000 -1.520   RHO 230170000
```

```
+                  -1.0   P  230270000 -2.452    RHO 230270000
20528301     0.0    1.0   P  230270000  2.452    RHO 230270000
+                  -1.0   P  230320000  0.363    RHO 230320000
20528401     0.0    1.0   P  230010000 -0.363    RHO 230010000
+                  -1.0   P  230320000  0.363    RHO 230320000
20528501     0.0    1.0   P  200010000  0.186    RHO 200010000
+                  -1.0   P  230010000  0.363    RHO  230010000
20528601     0.0    1.0   P  230320000  -0.363   RHO  230320000
+                  -1.0   P  240050000  -0.2450 RHO  240050000
20528701     0.0    1.0   P  240050000  0.2450   RHO  240050000
+                  -1.0   P  240080000 -2.1770   RHO  240080000
20528801     0.0    1.0   P  240080000 +2.1770   RHO  240080000
+                  -1.0   P  260010000  -0.098   RHO  260010000
20528901     0.0    1.0   P  260010000  0.098    RHO  260010000
+                  -1.0   P  270010000  -0.186   RHO  270010000
20529001     0.0    1.0   P  270010000  0.186    RHO  270010000
+                  -1.0   P  200010000  -0.186   RHO  200010000
*
*IL VOLUMES
*
2000000 '84-12-12' BRANCH  *  VESSEL OULET NOZZLE
*         NO.J   CONTROL
2000001    01     0         *
*       AREA      LENGTH  VOLUME        0  ANGLE    0  ROUGHN DIAM    FE
2000101 0.0       0.8330  0.0035278     0. 00.275 .004 8.0-5  0.0737  00*
*         CODE(FROM)  CODE(TO)   AREA   K(FORD) K(REV)CAHS   COEFFICIENT
2001101  200010000   400000000  .000068  00.00  00.00 0100  *
*       CNTL PRESSURE   ENERGY      QUALITY
2000200   0  15.764+6   1.4681+6     0.    *
*
*       LIQUID VEL VAPOR VEL.    INTERFACE VEL
2001201   -3.3555   -3.3555      0.0             *
*
2100000 '20-08-84' BRANCH * CONNECTION WITH PRESSURISER
*         NO.J   CONTROL
2100001    03     0         *
*        AREA   LENGTH   VOLUME  H.A. V.ANGLE  ELEVAT.  ROUGH  DIAM. FE
2100101 .004266 1.9920  .0000000  0.0 +00.201  +0.0070  8.0-5 .0737 00*
*  CONTROL PRESSURE   ENERGY     QUALITY
2100200  0 15.744+6   1.4681+6     0.     *
*         CODE(FROM)  CODE(TO)   AREA   K(FORD) K(REV)CAHS   COEFFICIENT
2101101  400000000   210000000  .000068  00.00  00.00 0100  *
2102101  210010000   220000000  .000000  00.27  00.27 0000  *
2103101  200010000   210000000  .000000  00.62  00.62 0000  * 0.52
*       LIQUID VEL VAPOR VEL.    INTERFACE VEL
2101201   -3.3519   -3.3519      0.0             *
2102201    7.4751    7.4751      0.0             *
2103201    7.5754    7.5754      0.0             *
*
2200000 '20-08-84' SNGLVOL *
*        AREA   LENGTH   VOLUME  H.A. V.ANGLE  ELEVAT.  ROUGH  DIAM. FE
2200101 .000000 1.0110  .0042772  0.0 +67.494  +0.9340  8.0-5 .0737 00*
*  CONTROL PRESSURE   ENERGY     QUALITY
2200200  0 15.728+6   1.4681+6     0.  *
*
*       'NAME'     TYPE
2250000 '84-12-12' SNGLJUN * S. G. INLET
*       FROM      TO         AREA
2250101 220010000 230000000 0.0  0.0 0.0  0000 *
```

```
*          CONTROL        LIQUID V.     VAPOR V.   0
2250201     0             7.4753        7.4753      0.0   *
*
*
2300000 '84-12-15' PIPE *
*     VOLUMES
2300001  32  *
*          AREA     VOL.NO.
2300101  .000000      32 *
*          J.AREA   JUN.NO.
2300201  .000000      04 * .01088
2300202  .000000      05 * .007241
2300203  .000000      26 *
2300204  .000000      27 * .007241
2300205  .000000      31 * .01088
*          LENGTH   VOL.NO.
2300301  0.4150       4    *
2300302  0.3330       5    *
2300303  0.6190      15    *
2300304  0.8697      17    *
2300305  0.6190      27    *
2300306  0.3330      28    *
2300307  0.4150      32    *
*          VOLUME   V.NO.
2300401  .0043797     4   *
2300402  .0095736     5   *
2300403  .0044823    15   *
2300404  .0062977    17   *
2300405  .0044823    27   *
2300406  .0095736    28   *
2300407  .0043797    32   *
*          H.A   V.NO.
2300501    0.0    32       *
*         V.ANGLE  V.NO.
2300601  +90.000     3    *
2300602  +74.038     4    *
2300603  +66.336     5    *
2300604  +90.000    16    *
2300605  -90.000    27    *
2300606  -66.336    28    *
2300607  -74.038    29    *
2300608  -90.000    32    *
*         ELEVAT.  V.NO.
2300701  +0.4150     3    *
2300702  +0.3990     4    *
2300703  +0.3050     5    *
2300704  +0.6190    15    *
2300705  +0.8697    16    *
2300706  -0.8697    17    *
2300707  -0.6190    27    *
2300708  -0.3050    28    *
2300709  -0.3990    29    *
2300710  -0.4150    32    *
*          ROUGH.   DIAM.   V.NO.
2300801     2.0-5  .1120      4    *
2300802     2.0-5  .1560      5    *
2300803    1.50-6  .0196     27    *
2300804     2.0-5  .1560     28    *
2300805     2.0-5  .1120     32    *
```

```
*           K(FORD)  K(REV)    J.NO.
2300901      00.00     00.00     02*
2300902      00.61     00.31     03*  .06
2300903      00.00     00.00     15*
2300904      00.00     00.00     16*  .12
2300905      00.00     00.00     28*
2300906      00.31     00.61     29*  .06
2300907      00.00     00.00     31*
*           FE    V.NO
2301001     00    32      *
*           CAHS  J.NO.
2301101     0000   03     *
2301102     0100   04     *
2301103     0000   05     *
2301104     0000   26     *
2301105     0000   27     *
2301106     0100   28     *
2301107     0000   31     *
*         CONTROL   PRESSURE   ENERGY/TEMP   QUALITY      VOL NO.
2301201     0       15.736+6    1.4681+6      0.     0.     01    *
2301202     0       15.733+6    1.4681+6      0.     0.     02    *
2301203     0       15.731+6    1.4681+6      0.     0.     03    *
2301204     0       15.726+6    1.4681+6      0.     0.     04    *
2301205     0       15.725+6    1.4675+6      0.     0.     05    *
2301206     0       15.715+6    1.4526+6      0.     0.     06    *
2301207     0       15.708+6    1.4386+6      0.     0.     07    *
2301208     0       15.701+6    1.4255+6      0.     0.     08    *
2301209     0       15.694+6    1.4133+6      0.     0.     09    *
2301210     0       15.688+6    1.4018+6      0.     0.     10    *
2301211     0       15.681+6    1.3910+6      0.     0.     11    *
2301212     0       15.674+6    1.3810+6      0.     0.     12    *
2301213     0       15.667+6    1.3716+6      0.     0.     13    *
2301214     0       15.661+6    1.3628+6      0.     0.     14    *
2301215     0       15.654+6    1.3545+6      0.     0.     15    *
2301216     0       15.645+6    1.3438+6      0.     0.     16    *
2301217     0       15.642+6    1.3339+6      0.     0.     17    *
2301218     0       15.644+6    1.3275+6      0.     0.     18    *
2301219     0       15.646+6    1.3214+6      0.     0.     19    *
2301220     0       15.648+6    1.3156+6      0.     0.     20    *
2301221     0       15.650+6    1.3102+6      0.     0.     21    *
2301222     0       15.652+6    1.3052+6      0.     0.     22    *
2301223     0       15.654+6    1.3004+6      0.     0.     23    *
2301224     0       15.656+6    1.2960+6      0.     0.     24    *
2301225     0       15.658+6    1.2918+6      0.     0.     25    *
2301226     0       15.660+6    1.2879+6      0.     0.     26    *
2301227     0       15.662+6    1.2840+6      0.     0.     27    *
2301228     0       15.669+6    1.2840+6      0.     0.     28    *
2301229     0       15.669+6    1.2840+6      0.     0.     29    *
2301230     0       15.671+6    1.2840+6      0.     0.     30    *
2301231     0       15.673+6    1.2840+6      0.     0.     31    *
2301232     0       15.676+6    1.2840+6      0.     0.     32    *
*         CONTROL
2301300     0
*         LIQUID VEL          VAPOUR VEL   INTERFACE VEL.   JUN NO.
2301301    2.9966               2.9966          0.0          01    *
2301302    2.9966               2.9966          0.0          02    *
2301303    2.9966               2.9966          0.0          03    *
2301304    2.9967               2.9967          0.0          04    *
2301305    4.3658               4.3658          0.0          05    *
```

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2301306   4.3217            4.3217            0.0          06   *
2301307   4.2826            4.2826            0.0          07   *
2301308   4.2465            4.2465            0.0          08   *
2301309   4.2143            4.2143            0.0          09   *
2301310   4.1842            4.1842            0.0          10   *
2301311   4.1569            4.1569            0.0          11   *
2301312   4.1322            4.1322            0.0          12   *
2301313   4.1099            4.1099            0.0          13   *
2301314   4.0895            4.0895            0.0          14   *
2301315   4.0710            4.0710            0.0          15   *
2301316   4.0464            4.0464            0.0          16   *
2301317   4.0245            4.0245            0.0          17   *
2301318   4.0104            4.0104            0.0          18   *
2301319   3.9974            3.9974            0.0          19   *
2301320   3.9853            3.9853            0.0          20   *
2301321   3.9742            3.9742            0.0          21   *
2301322   3.9639            3.9639            0.0          22   *
2301323   3.9543            3.9543            0.0          23   *
2301324   3.9452            3.9452            0.0          24   *
2301325   3.9367            3.9367            0.0          25   *
2301326   3.9288            3.9288            0.0          26   *
2301327   3.9211            3.9211            0.0          27   *
2301328   2.6903            2.6903            0.0          28   *
2301329   2.6903            2.6903            0.0          29   *
2301330   2.6903            2.6903            0.0          30   *
2301331   2.6903            2.6903            0.0          31   *
*
*
*       'NAME'     TYPE
2350000 '84-12-12' SNGLJUN * S. G. INLET
*       FROM       TO         AREA
2350101 230010000  240000000  0.0  0.0 0.0  0000 *
*         CONTROL       LIQUID V.     VAPOR V.   0
2350201    0             6.7232        6.7232      0.0   *
*
*
*
2400000 '84-12-12' PIPE *
*     VOLUMES
2400001  08  *
*         AREA     VOL.NO.
2400101  .000000      8   *
*         J.AREA   JUN.NO.
2400201  .000000     07   *
*         LENGTH   VOL.NO.
2400301  0.8300      1     *
2400302  0.8040      3     *
2400303  1.0880      4     *
2400304  0.6250      5     *
2400305  0.8970      6     *
2400306  0.7160      7     *
2400307  0.7681      8     *
*         VOLUME   V.NO.
2400401  .0035051     1    *
2400402  .0034299     3    *
2400403  .0046414     4    *
2400404  .0026663     5    *
2400405  .0038244     6    *
2400406  .0030523     7    *
```

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2400407  .0032201    8    *
*         H.A  V.NO.
2400501   0.0      8      *
*        V.ANGLE V.NO.
2400601  -90.000    3     *
2400602  -69.941    4     *
2400603  +00.000    5     *
2400604  +67.884    6     *
2400605  +90.000    8     *
*        ELEVAT. V.NO.
2400701  -0.8300    1     *
2400702  -0.8040    3     *
2400703  -1.0220    4     *
2400704  +0.0000    5     *
2400705  +0.8310    6     *
2400706  +0.7160    7     *
2400707  +0.7681    8     *
*         ROUGH.   DIAM.   V.NO.
2400801    2.0-5 .0737      8     *
*          K(FORD)  K(REV)    J.NO.
2400901     00.10     00.10    01 *  0.1
2400902     00.00     00.00    03 *
2400903     00.17     00.17    05 *
2400904     00.00     00.00    06 *
2400905     00.00     00.00    07 *  0.22
*          FE    V.NO
2401001    00     8       *
*          CAHS J.NO.
2401101    0000   07      *
*       CONTROL   PRESSURE   ENERGY/TEMP   QUALITY     VOL NO.
2401201    0       15.665+6    1.2840+6      0.     0.     01    *
2401202    0       15.667+6    1.2840+6      0.     0.     02    *
2401203    0       15.670+6    1.2840+6      0.     0.     03    *
2401204    0       15.674+6    1.2840+6      0.     0.     04    *
2401205    0       15.672+6    1.2840+6      0.     0.     05    *
2401206    0       15.664+6    1.2840+6      0.     0.     06    *
2401207    0       15.655+6    1.2840+6      0.     0.     07    *
2401208    0       15.647+6    1.2840+6      0.     0.     08    *
*         CONTROL
2401300    0
*       LIQUID VEL          VAPOUR VEL   INTERFACE VEL.   JUN NO.
2401301   6.7233              6.7233           0.0           1    *
2401302   6.6554              6.6554           0.0           2    *
2401303   6.6555              6.6555           0.0           3    *
2401304   6.6554              6.6554           0.0           4    *
2401305   6.6593              6.6593           0.0           5    *
2401306   6.6602              6.6602           0.0           6    *
2401307   6.7726              6.7726           0.0           7    *
*
*
2500000 '84-12-12' PUMP *
*         FLOWAREA   LENGTH VOLUME    H.A   VER.ANGL   ELEVAT.   CNTLFLAG
2500101   0.0033183 0.0000 0.002370 0.0 +17.140    +0.2105       0      *
*         CODENO.   J.AREA     K(FORWARD) K(REVERSE)    CAHS
2500108   240010000 0.0         0.13        0.13         0000 *0.23 *
*         CODENO.   J.AREA     K(FORWARD) K(REVERSE)    CAHS
2500109   255000000 0.0         0.04        0.03         0000       *
*
*       CONTROL   PRESSURE   ENERGY        QUALITY
```

```
2500200     0      15.796+6   1.2838+6        0.      0.       *
*
*         CNTLW   INIT L VEL   INIT V VEL   INTERFACE VEL
2500201     0       8.5565       8.5565      0.0                      *
*         CNTLW   INIT L VEL   INIT V VEL   INTERFACE VEL
2500202     0       8.5541       8.5541      0.0                      *
*
2500301   0      0      0          -1      0        0          0       *
*
2500302  745.605 0.6884          .02787 139.9    45.47 1.444 747.3 *
2500303     0.     0.    0.    0. 0.                                   *
*
2500310     0.     0.    0.*
2506100     501    CNTRLVAR 263
2506101     0.      0.0
2506102   745.605 745.605*
*PUMP DATA
*********************************************************************************
*****************           PUMP  DATA       ******************************
***************** SINGLE  PHASE HEAD CURVE DATA ****************************
*********************************************************************************
*
*********************************************************************************
*  HEAD CURVE 1  ************************************************************
*********************************************************************************
2501100   1           1          *
2501101  0.0000     1.0550       *
2501102  0.0500     1.0640       *
2501103  0.1000     1.0790       *
2501104  0.2000     1.1020       *
2501105  0.3000     1.1200       *
2501106  0.4000     1.1310       *
2501107  0.5000     1.1310       *
2501108  0.6000     1.1230       *
2501109  0.7000     1.1040       *
2501110  0.8000     1.0785       *
2501111  0.9000     1.0430       *
2501112  1.0000     1.0000       *
*********************************************************************************
*  HEAD CURVE 2  ************************************************************
*********************************************************************************
2501200   1           2          *
2501201  0.0000    -0.7800       *
2501202  0.1000    -0.6285       *
2501203  0.2000    -0.4780       *
2501204  0.3000    -0.3230       *
2501205  0.3100    -0.3080       *
2501206  0.3500    -0.2480       *
2501207  0.4000    -0.1690       *
2501208  0.4500    -0.0840       *
2501209  0.5015     0.0000       *
2501210  0.5500     0.0820       *
2501211  0.6000     0.1730       *
2501212  0.7000     0.3650       *
2501213  0.7500     0.4610       *
2501214  0.8000     0.5560       *
2501215  0.9000     0.7680       *
2501216  0.9500     0.8810       *
*********************************************************************************
```

```
*  HEAD CURVE 3  ************************************************************
************************************************************************
2501300    1           3          *
2501301  -1.000     2.1100        *
2501302  -0.900     1.9270        *
2501303  -0.800     1.7590        *
2501304  -0.700     1.6105        *
2501305  -0.600     1.4890        *
2501306  -0.500     1.3800        *
2501307  -0.400     1.2820        *
2501308  -0.300     1.2000        *
2501309  -0.200     1.1330        *
2501310  -0.100     1.0805        *
2501311  -0.050     1.0615        *
2501312   0.000     1.0550        *
************************************************************************
*  HEAD CURVE 4  ************************************************************
************************************************************************
2501400    1           4          *
2501401  -0.900     1.8620        *
2501402  -0.800     1.6500        *
2501403  -0.700     1.4740        *
2501404  -0.600     1.3320        *
2501405  -0.500     1.2120        *
2501406  -0.400     1.1050        *
2501407  -0.300     1.0020        *
2501408  -0.200     0.9110        *
2501409  -0.100     0.8300        *
2501410   0.000     0.7610        *
************************************************************************
*  HEAD CURVE 5  ************************************************************
************************************************************************
2501500    1           5          *
2501501  0.0000     0.4240        *
2501502  0.0500     0.4580        *
2501503  0.1000     0.4890        *
2501504  0.1500     0.5175        *
2501505  0.2000     0.5430        *
2501506  0.2500     0.5730        *
2501507  0.3000     0.6030        *
2501508  0.3500     0.6310        *
2501509  0.4000     0.6600        *
2501510  0.4870     0.7020        *
2501511  0.5000     0.7095        *
2501512  0.5500     0.7305        *
2501513  0.6000     0.7495        *
2501514  0.6500     0.7620        *
2501515  0.7000     0.7770        *
2501516  0.7500     0.7890        *
2501517  0.8000     0.8040        *
2501518  0.8500     0.8280        *
2501519  0.9000     0.8610        *
2501520  0.9500     0.9010        *
************************************************************************
*  HEAD CURVE 6  ************************************************************
************************************************************************
2501600    1           6          *
2501601  0.0000     0.7610        *
2501602  0.1000     0.7100        *
```

```
2501603   0.2000     0.6640       *
2501604   0.3000     0.6440       *
2501605   0.3500     0.6460       *
2501606   0.4000     0.6530       *
2501607   0.5000     0.6795       *
2501608   0.6000     0.7070       *
2501609   0.7000     0.7460       *
2501610   0.8000     0.7990       *
2501611   0.9000     0.8610       *
2501612   0.9500     0.9010       *
2501613   1.0000     0.9480       *
**************************************************************************
*  HEAD CURVE 7  *********************************************************
**************************************************************************
2501700    1           7          *
2501701  -0.600    -0.2830        *
2501702  -0.500    -0.1470        *
2501703  -0.450    -0.0810        *
2501704  -0.384     0.0000        *
2501705  -0.350     0.0410        *
2501706  -0.300     0.1060        *
2501707  -0.250     0.1700        *
2501708  -0.200     0.2330        *
2501709  -0.150     0.2900        *
2501710  -0.100     0.3395        *
2501711  -0.050     0.3840        *
2501712   0.000     0.4240        *
**************************************************************************
*TORQUE CURVE 1  *******************************************************
**************************************************************************
2501800    2           1          *
2501801   0.0000     0.4390       *
2501802   0.0500     0.4420       *
2501803   0.1000     0.4600       *
2501804   0.2000     0.5150       *
2501805   0.3000     0.5825       *
2501806   0.4000     0.6470       *
2501807   0.5000     0.7060       *
2501808   0.6000     0.7640       *
2501809   0.7000     0.8230       *
2501810   0.8000     0.8820       *
2501811   0.9000     0.9415       *
2501812   1.0000     1.0000       *
**************************************************************************
*TORQUE CURVE 2  *******************************************************
**************************************************************************
2501900    2           2          *
2501901   0.0000    -0.5180       *
2501902   0.1000    -0.3500       *
2501903   0.2000    -0.1840       *
2501904   0.3000    -0.0184       *
2501905   0.3100     0.0000       *
2501906   0.3500     0.0660       *
2501907   0.4000     0.1510       *
2501908   0.4500     0.2380       *
2501909   0.5015     0.3200       *
2501910   0.5500     0.3960       *
2501911   0.6000     0.4640       *
2501912   0.7000     0.5985       *
```

```
2501913   0.7500     0.6660       *
2501914   0.8000     0.7310       *
2501915   0.9000     0.8640       *
2501916   0.9500     0.9305       *
*********************************************************************
*TORQUE CURVE 3  ***************************************************
*********************************************************************
2502000    2           3          *
2502001  -1.000     1.1820       *
2502002  -0.900     1.0370       *
2502003  -0.800     0.9110       *
2502004  -0.700     0.8040       *
2502005  -0.600     0.7120       *
2502006  -0.500     0.6320       *
2502007  -0.400     0.5670       *
2502008  -0.300     0.5130       *
2502009  -0.200     0.4730       *
2502010  -0.100     0.4495       *
2502011  -0.050     0.4410       *
2502012   0.000     0.4390       *
*********************************************************************
*TORQUE CURVE 4  ***************************************************
*********************************************************************
2502100    2           4          *
2502101  -0.900     1.1200       *
2502102  -0.800     1.0930       *
2502103  -0.700     1.1040       *
2502104  -0.600     1.2400       *
2502105  -0.500     1.3230       *
2502106  -0.400     1.3400       *
2502107  -0.300     1.2560       *
2502108  -0.200     1.1220       *
2502109  -0.100     1.0410       *
2502110   0.000     0.9840       *
*********************************************************************
*TORQUE CURVE 5  ***************************************************
*********************************************************************
2502200    2           5          *
2502201  0.0000    -0.5690       *
2502202  0.0500    -0.5010       *
2502203  0.1000    -0.4390       *
2502204  0.1500    -0.3780       *
2502205  0.2000    -0.3180       *
2502206  0.2500    -0.2595       *
2502207  0.3000    -0.2020       *
2502208  0.3500    -0.1500       *
2502209  0.4000    -0.0980       *
2502210  0.4870     0.0000       *
2502211  0.5000     0.0130       *
2502212  0.5500     0.0695       *
2502213  0.6000     0.1210       *
2502214  0.6500     0.1730       *
2502215  0.7000     0.2290       *
2502216  0.7500     0.2840       *
2502217  0.8000     0.3450       *
2502218  0.8500     0.4090       *
2502219  0.9000     0.4740       *
2502220  0.9500     0.5490       *
*********************************************************************
```

```
*TORQUE CURVE 6  ************************************************************
************************************************************************
2502300    2           6          *
2502301   0.0000     0.9840       *
2502302   0.1000     0.9505       *
2502303   0.2000     0.9290       *
2502304   0.3000     0.9050       *
2502305   0.3500     0.8900       *
2502306   0.4000     0.8730       *
2502307   0.5000     0.8400       *
2502308   0.6000     0.8020       *
2502309   0.7000     0.7610       *
2502310   0.8000     0.7205       *
2502311   0.9000     0.6780       *
2502312   0.9500     0.6530       *
2502313   1.0000     0.6300       *
************************************************************************
*TORQUE CURVE 7  ************************************************************
************************************************************************
2502400    2           7          *
2502401   -0.600    -1.5900       *
2502402   -0.500    -1.3900       *
2502403   -0.450    -1.2970       *
2502404   -0.384    -1.1800       *
2502405   -0.350    -1.1205       *
2502406   -0.300    -1.0400       *
2502407   -0.250    -0.9560       *
2502408   -0.200    -0.8700       *
2502409   -0.150    -0.7905       *
2502410   -0.100    -0.7160       *
2502411   -0.050    -0.6400       *
2502412    0.000    -0.5690       *
************************************************************************
* TWO PHASE MULTIPLIER DATA
************************************************************************
*  HEAD CURVE
************************************************************************
*        CNTLNO.   VOIDF   MULTPR
2503000     0      0.00      0.0  *
2503001            0.20      0.0  *
2503002            0.43      1.0  *
2503003            0.86      1.0  *
2503004            1.00      0.0  *
************************************************************************
*TORQUE CURVE
************************************************************************
*        CNTLNO.   VOIDF   MULTPR
2503100     0      0.00      0.00 *
2503101            0.15      0.00 *
2503102            0.24      0.56 *
2503103            0.80      0.56 *
2503104            0.96      0.45 *
2503105            1.00      0.00 *
************************************************************************
* PUMP I_ PHASE DIFFERENCE DATA
************************************************************************
*  HEAD CURVE 1  ************************************************************
************************************************************************
2504100    1           1          *
```

```
2504101   0.0000     0.1650       *
2504102   0.0500     0.7740       *
2504103   0.1000     0.8100       *
2504104   0.3000     0.7730       *
2504105   0.5000     0.8040       *
2504106   0.7000     0.8280       *
2504107   1.0000     0.8160       *
**************************************************************************
*  HEAD CURVE 2  ********************************************************
**************************************************************************
2504200    1           2          *
2504201   0.0000     0.2200       *
2504202   0.1000     0.2285       *
2504203   0.3000     0.2480       *
2504204   0.5015     0.3310       *
2504205   0.7000     0.4770       *
**************************************************************************
*  HEAD CURVE 3  ********************************************************
**************************************************************************
2504300    1           3          *
2504301  -1.000    -0.8200       *
2504302  -0.800    -1.4910       *
2504303  -0.700    -1.6695       *
2504304  -0.500    -1.7800       *
2504305  -0.300    -1.5000       *
2504306  -0.200    -1.1370       *
2504307  -0.100    -0.5895       *
2504308   0.000     0.1650       *
**************************************************************************
*  HEAD CURVE 4  ********************************************************
**************************************************************************
2504400    1           4          *
2504401  -0.900    -0.5380       *
2504402  -0.800    -0.3300       *
2504403  -0.600    -0.0980       *
2504404  -0.400    -0.0450       *
2504405  -0.200    -0.0390       *
2504406   0.000    -0.0390       *
**************************************************************************
*  HEAD CURVE 5  ********************************************************
**************************************************************************
2504500    1           5          *
2504501   0.0000    -0.0460       *
2504502   0.2000    -0.3660       *
2504503   0.4000    -0.5800       *
2504504   0.6000    -0.6805       *
2504505   0.8000    -0.6760       *
**************************************************************************
*  HEAD CURVE 6  ********************************************************
**************************************************************************
2504600    1           6          *
2504601   0.0000    -0.0390       *
2504602   0.2000    -0.0660       *
2504603   0.4000    -0.0970       *
2504604   0.6000    -0.1730       *
2504605   0.8000    -0.3310       *
2504606   1.0000    -0.4820       *
**************************************************************************
*  HEAD CURVE 7  ********************************************************
```

```
**********************************************************************
2504700    1            7          *
2504701   -0.600      0.7970       *
2504702   -0.400      0.5092       *
2504703   -0.200      0.2330       *
**********************************************************************
*TORQUE CURVE 1  ****************************************************
**********************************************************************
2504800    2            1          *
2504801   0.0000      0.5400       *
2504802   0.2000      0.5900       *
2504803   0.4000      0.6500       *
2504804   0.6000      0.7700       *
2504805   0.8000      0.9500       *
2504806   0.9000      0.9800       *
2504807   0.9500      0.9600       *
2504808   1.0000      0.8700       *
**********************************************************************
*TORQUE CURVE 2  ****************************************************
**********************************************************************
2504900    2            2          *
2504901   0.0000     -0.1500       *
2504902   0.2000      0.0200       *
2504903   0.4000      0.2200       *
2504904   0.6000      0.4600       *
2504905   0.8000      0.7100       *
2504906   0.9000      0.8100       *
2504907   0.9500      0.8500       *
2504908   1.0000      0.8700       *
**********************************************************************
*TORQUE CURVE 3  ****************************************************
**********************************************************************
2505000    2            3          *
2505001   -1.000      0.6200       *
2505002   -0.800      0.6800       *
2505003   -0.600      0.5300       *
2505004   -0.400      0.4600       *
2505005   -0.200      0.4900       *
2505006    0.000      0.5400       *
**********************************************************************
*TORQUE CURVE 4  ****************************************************
**********************************************************************
2505100    2            4          *
2505101   -1.000      0.6200       *
2505102   -0.800      0.5300       *
2505103   -0.600      0.4600       *
2505104   -0.400      0.4200       *
2505105   -0.200      0.3900       *
2505106    0.000      0.3600       *
**********************************************************************
*TORQUE CURVE 5  ****************************************************
**********************************************************************
2505200    2            5          *
2505201   0.0000     -0.6300       *
2505202   0.2000     -0.5100       *
2505203   0.4000     -0.3900       *
2505204   0.6000     -0.2900       *
2505205   0.8000     -0.2000       *
2505206   0.9000     -0.1600       *
```

```
2505207  1.0000    -0.1300       *
*************************************************************************
*TORQUE CURVE 6  ********************************************************
*************************************************************************
2505300    2            6          *
2505301   0.0000     0.3600       *
2505302   0.2000     0.3200       *
2505303   0.4000     0.2700       *
2505304   0.6000     0.1800       *
2505305   0.8000     0.0500       *
2505306   1.0000    -0.1300       *
*************************************************************************
*TORQUE CURVE 7  ********************************************************
*************************************************************************
2505400    2            7          *
2505401   -1.000    -1.4400       *
2505402   -0.800    -1.2500       *
2505403   -0.600    -1.0800       *
2505404   -0.400    -0.9200       *
2505405   -0.200    -0.7700       *
2505406    0.000    -0.6300       *
*************************************************************************
*
2550000 '20-08-84' BRANCH * SEAL WATER CONNECTION
*          NO.J    CONTROL
2550001     01       0          *
*         AREA    LENGTH    VOLUME   H.A. V.ANGLE   ELEVAT.   ROUGH   DIAM. FE
2550101 .000000 0.7410   .0031019   0.0 -00.348   -0.0045   8.0-5 .0737 00*
*  CONTROL PRESSURE    ENERGY      QUALITY
2550200  0 15.972+6    1.2832+6     0.       *
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS    COEFFICIENT
2551101   255010000    260000000  .000000   00.20   00.20 0000   *
*        LIQUID VEL VAPOR VEL.     INTERFACE VEL
2551201     6.7807    6.7807       0.0               *
*
2600000 '05-09-84' PIPE *
*      VOLUMES
2600001   03  *
*          AREA     VOL.NO.
2600101   .000000      3  *
*          J.AREA   JUN.NO.
2600201   .000000     02  *
*         LENGTH    VOL.NO.
2600301   0.7960      3     *
*          VOLUME   V.NO.
2600401   .0033972    3    *
*          H.A   V.NO.
2600501    0.0      3       *
*         V.ANGLE V.NO.
2600601   -00.0480   3     *
*         ELEVAT. V.NO.
2600701   -0.0007    3     *
*          ROUGH.   DIAM.   V.NO.
2600801     8.0-5 .0737      3     *
*          K(FORD)  K(REV)    J.NO.
2600901      00.00    00.00    02 *
*          FE    V.NO
2601001     00     3       *
*          CAHS J.NO.
```

```
2601101     0000  02      *
*
*        CONTROL   PRESSURE   ENERGY/TEMP   QUALITY      VOL NO.
2601201     0       15.964+6    1.2832+6       0.     0.     01    *
2601202     0       15.961+6    1.2832+6       0.     0.     02    *
2601203     0       15.957+6    1.2831+6       0.     0.     03    *
*         CONTROL
2601300     0
*        LIQUID VEL           VAPOUR VEL   INTERFACE VEL.   JUN NO.
2601301     6.6509             6.6509             0.0           1    *
2601302     6.6509             6.6509             0.0           2    *
*
*
*
2700000 '85-01-29' BRANCH * I.L. VESSEL INLET NOZZLE
*         NO.J    CONTROL
2700001    01       0          *
*         AREA    LENGTH    VOLUME   H.A. V.ANGLE   ELEVAT.   ROUGH   DIAM. FE
2700101 .000     0.7730   .0032715   0.0 -00.2965 -0.004    8.0-5  .0737 00*
*   CONTROL PRESSURE    ENERGY      QUALITY
2700200   0 15.951+6    1.2831+6       0.     *
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS
2701101   260010000    270000000  .000       00.15   00.15 0000    *
*        LIQUID VEL. VAPOR VEL. INTERFACE VEL
2701201    6.7068      6.7068    0.0*
*
*IL STRUCTURES
*
*************************************************************************
*VESSEL OUTLET
*************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
12000000   01    8     2      1      0.03685     *
*          FLAG     FLAG
12000100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
12000101      4              0.07007      *
12000102      3              0.10007      *
*         COMPOSITION NO. INTERVAL NO.
12000201       5               4      *
12000202       9               7      *
*        SOURCE VALUE INTERVAL NO.
12000301       0.0           7     *
*         TEMP   POINT NO
12000401   526.98    8   *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
12000501    200010000    00000    1        1       0.8330      1   *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
12000601       -919         0    3980       1       0.8330      1   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
12000701      0             0           0                    0              1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
12000801    0      0.0737      0.0          0.0             1     *
*
*************************************************************************
*PIPE
*************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
12100000   01    7     2      1      0.03685     *
```

```
*          FLAG     FLAG
12100100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
12100101       3              0.04445      *
12100102       3              0.07445      *
*         COMPOSITION NO.  INTERVAL NO.
12100201        5                3      *
12100202        9                6      *
*        SOURCE VALUE INTERVAL NO.
12100301        0.0          6     *
*         TEMP   POINT NO
12100401   488.85    7   *
*          BOUND.VOLUME  INCRE  TYPE  S.AREA  CODE  VALUE   H.STR.NO
12100501    210010000    00000    1        1       1.9920      1   *
*          BOUND.VOLUME  INCRE  TYPE  S.AREA  CODE  VALUE   H.STR.NO
12100601       -919         0    3980       1       1.9920      1   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
12100701        0             0          0                    0              1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
12100801    0      0.0737      0.0         0.0             1     *
*
*************************************************************************
*PIPE INLET TO STEAM GENERATOR
*************************************************************************
*          NH   NP   G.TYPE  FLAG  LEFT BOUNDARY
12200000   01    8     2      1      0.03685     *
*          FLAG     FLAG
12200100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
12200101       4              0.061887     *
12200102       3              0.091887     *
*         COMPOSITION NO.  INTERVAL NO.
12200201        5                7      *
*        SOURCE VALUE INTERVAL NO.
12200301        0.0          7     *
*         TEMP   POINT NO
12200401   595.29    8   *
*          BOUND.VOLUME  INCRE  TYPE  S.AREA  CODE  VALUE   H.STR.NO
12200501    220010000    00000    1        1       1.0110      1   *
*          BOUND.VOLUME  INCRE  TYPE  S.AREA  CODE  VALUE   H.STR.NO
12200601       -919         0    3980       1       1.0110      1   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
12200701        0             0          0                    0              1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
12200801    0      0.0737      0.0         0.0             1     *
*************************************************************************
*          NH   NP   G.TYPE  FLAG  LEFT BOUNDARY
12300000   04   8     2      1      0.05600     *
*          FLAG     FLAG
12300100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
12300101       4              0.069494     *
12300102       3              0.099494     *
*         COMPOSITION NO.  INTERVAL NO.
12300201        5                4      *
12300202        9                7      *
*        SOURCE VALUE INTERVAL NO.
12300301        0.0          7     *
*         TEMP   POINT NO
```

```
12300401  507.89  8   *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12300501   230010000   10000   1        1      0.4150     4  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12300601       -919       0   3980       1      0.4150     4  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
12300701     0           0          0                  0            4  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
12300801   0     0.1120     0.0        0.0            4    *
*
**********************************************************************
*STEAM GENERATOR PRIMARY SIDE (INLET CHAMBER)
**********************************************************************
*         NH  NP  G.TYPE FLAG LEFT BOUNDARY
12301000  01  10    2      1     0.07800    *
*         FLAG    FLAG
12301100    0       1   *
*         NO INTERVAL  RIGHT COORDINATE
12301101     4             0.1331515   *
12301102     5             0.2331515   *
*        COMPOSITION NO. INTERVAL NO.
12301201      5              4     *
12301202      9              9     *
*       SOURCE VALUE INTERVAL NO.
12301301      0.0          9    *
*        TEMP  POINT NO
12301401  476.06  10  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12301501   230050000     0     1        1      0.3330     1  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12301601       -919       0   3980       1      0.3330     1  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
12301701     0           0          0                  0            1  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
12301801   0     0.1560     0.0        0.0            1    *
*
**********************************************************************
*STEAM GENERATOR (TUBES)
**********************************************************************
*         NH  NP  G.TYPE FLAG LEFT BOUNDARY
12302000  22   6    2      1     0.00980    *
*         FLAG    FLAG
12302100    0       1   *
*         NO INTERVAL  RIGHT COORDINATE
12302101     5             0.011       *
*        COMPOSITION NO. INTERVAL NO.
12302201      7             5        *
*       SOURCE VALUE INTERVAL NO.
12302301      0.0          5    *
*        TEMP  POINT NO
12302401  566.30  6   *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12302501   230060000   10000   1        1      16.342    10  * 14.856
12302502   230160000   10000   1        1      22.960    12  * 20.873
12302503   230180000   10000   1        1      16.342    22  * 14.856
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12302601   520010000   10000   1        1      16.342    10  *
12302602   520110000    0000   1        1      22.960    11  *
12302603   520110000    0000   1        1      22.960    12  *
```

```
12302604   520100000  -10000   1        1       16.342     22  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
12302701      0           0          0                  0            22  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
12302801    0       0.0196     0.0         0.0           22     *
12302901    0       0.0220     0.0         0.0           22     *
*
*****************************************************************************
*STEAM GENERATOR (OUTLET CHAMBER)
*****************************************************************************
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
12303000   01  10     2     1      0.07800     *
*          FLAG    FLAG
12303100     0       1   *
*          NO INTERVAL  RIGHT COORDINATE
12303101       4              0.133151     *
12303102       5              0.233151     *
*         COMPOSITION NO. INTERVAL NO.
12303201       5               4      *
12303202       9               9      *
*        SOURCE VALUE INTERVAL NO.
12303301       0.0          9     *
*         TEMP  POINT NO
12303401   457.14 10    *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12303501    230280000      0     1        1       0.3330      1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12303601       -919        0   3980       1       0.3330      1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
12303701      0           0          0                  0            1  *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
12303801    0      0.1560      0.0         0.0           1     *
*
*****************************************************************************
*STEAM GENERATOR (PRIMARY SIDE)_ AFTER OUTLET CHAMBER
*****************************************************************************
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
12304000   04  8      2     1      0.05600     *
*          FLAG    FLAG
12304100     0       1   *
*          NO INTERVAL  RIGHT COORDINATE
12304101       4              0.069494     *
12304102       3              0.099494     *
*         COMPOSITION NO. INTERVAL NO.
12304201       5               4      *
12304202       9               7      *
*        SOURCE VALUE INTERVAL NO.
12304301       0.0          7     *
*         TEMP  POINT NO
12304401   485.44  8    *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12304501    230290000   10000   1        1       0.4150      4  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12304601       -919        0   3980       1       0.4150      4  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
12304701      0           0          0                  0            4  *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
12304801    0      0.1120      0.0         0.0           4     *
*
```

```
*****************************************************************************
*INLET/OUTLET CHAMBER PARTITIONING DISC
*****************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
12305000   01    6     1      1      0.0          *
*          FLAG     FLAG
12305100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
12305101       5              0.025        *
*         COMPOSITION NO. INTERVAL NO.
12305201       5                5      *
*        SOURCE VALUE INTERVAL NO.
12305301       0.0            5     *
*         CONTROL WORD
12305400       -1
12305401   596.18 591.05 585.91 580.47 575.55 570.33
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
12305501    230050000      0      1        1       0.0936      1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
12305601    230280000      0      1        1       0.0936      1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
12305701       0            0           0                    0            1  *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
12305801    0      0.1560      0.0         0.0            1     *
12305901    0      0.1560      0.0         0.0            1     *
*
*****************************************************************************
*VERTICAL MEASUREMENT INSERT
*****************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
12400000   01    8     2      1      0.03685     *
*          FLAG     FLAG
12400100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
12400101       4              0.065071     *
12400102       3              0.095071     *
*         COMPOSITION NO. INTERVAL NO.
12400201       5                4      *
12400202       9                7      *
*        SOURCE VALUE INTERVAL NO.
12400301       0.0            7     *
*         TEMP   POINT NO
12400401   498.07    8   *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
12400501    240010000    00000    1        1       0.8300      1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
12400601       -919         0    3980     1       0.8300      1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
12400701       0            0           0                    0            1  *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
12400801    0      0.0737      0.0         0.0            1     *
*
*PIPING
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
12401000   06    7     2      1      0.03685     *
*          FLAG     FLAG
12401100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
12401101       3              0.045238     *
```

```
12401102      3              0.075238     *
*         COMPOSITION NO.  INTERVAL NO.
12401201       5                3      *
12401202       9                6      *
*        SOURCE VALUE INTERVAL NO.
12401301       0.0           6     *
*         TEMP   POINT NO
12401401   470.09    7   *
*          BOUND.VOLUME  INCRE  TYPE  S.AREA  CODE  VALUE   H.STR.NO
12401501    240020000    10000    1        1       0.8040       2   *
12401502    240040000    00000    1        1       0.9850       3   *
12401503    240050000    00000    1        1       0.6250       4   *
12401504    240060000    00000    1        1       0.8970       5   *
12401505    240070000    00000    1        1       0.7160       6   *
*          BOUND.VOLUME  INCRE  TYPE  S.AREA  CODE  VALUE   H.STR.NO
12401601       -919         0    3980       1       0.8040       2   *
12401602       -919         0    3980       1       0.9850       3   *
12401603       -919         0    3980       1       0.6250       4   *
12401604       -919         0    3980       1       0.8970       5   *
12401605       -919         0    3980       1       0.7160       6   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
12401701      0             0           0                    0              6   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
12401801    0      0.0737      0.0         0.0             6     *
*
*
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
12402000   01    9     2      1      0.03685     *
*          FLAG      FLAG
12402100     0         1    *
*          NO INTERVAL   RIGHT COORDINATE
12402101       5               0.075515     *
12402102       3               0.105515     *
*         COMPOSITION NO.  INTERVAL NO.
12402201       5                5      *
12402202       9                8      *
*        SOURCE VALUE INTERVAL NO.
12402301       0.0           8     *
*         TEMP   POINT NO
12402401   506.68   9    *
*          BOUND.VOLUME  INCRE  TYPE  S.AREA  CODE  VALUE   H.STR.NO
12402501    240080000    00000    1        1       0.7690       1   *
*          BOUND.VOLUME  INCRE  TYPE  S.AREA  CODE  VALUE   H.STR.NO
12402601       -919         0    3980       1       0.7690       1   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
12402701      0             0           0                    0              1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
12402801    0      0.0737      0.0         0.0             1     *
*************************************************************************
*PUMP
*************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
12500000   01   10     2      1      0.03250     *
*          FLAG      FLAG
12500100     0         1    *
*          NO INTERVAL   RIGHT COORDINATE
12500101       9               0.1467212    *
*         COMPOSITION NO.  INTERVAL NO.
12500201       5                9      *
```

```
*       SOURCE VALUE INTERVAL NO.
12500301      0.0          9    *
*        TEMP  POINT NO
12500401  457.27  10  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12500501   250010000   00000   1        1       0.7142      1  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12500601      -919        0   3981       1       0.7142      1  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
12500701     0            0          0                   0            1  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
12500801   0     0.0650     0.0         0.0            1    *
*
*
*************************************************************************
*PIPE WITH MEASUREMENT INSERT & ECC  INJECTION POINT
*************************************************************************
*         NH  NP  G.TYPE FLAG LEFT BOUNDARY
12600000  01   9    2      1      0.03685    *
*         FLAG    FLAG
12600100    0       1   *
*         NO INTERVAL  RIGHT COORDINATE
12600101     5             0.074756    *
12600102     3             0.104756    *
*        COMPOSITION NO. INTERVAL NO.
12600201      5              5     *
12600202      9              8     *
*       SOURCE VALUE INTERVAL NO.
12600301      0.0          8    *
*         TEMP  POINT NO
12600401  506.12   9  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12600501   255010000   00000   1        1       0.7410      1  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12600601      -919        0   3980       1       0.7410      1  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
12600701     0            0          0                   0            1  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
12600801   0     0.0737     0.0         0.0            1    *
*
*
*         NH  NP  G.TYPE FLAG LEFT BOUNDARY
12601000  03   7    2      1      0.03685    *
*         FLAG    FLAG
12601100    0       1   *
*         NO INTERVAL  RIGHT COORDINATE
12601101     3             0.0457453   *
12601102     3             0.0757453   *
*        COMPOSITION NO. INTERVAL NO.
12601201      5              6     *
*       SOURCE VALUE INTERVAL NO.
12601301      0.0          6    *
*         TEMP  POINT NO
12601401  564.86   7  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12601501   260010000   10000   1        1       0.7960      3  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12601601      -919        0   3980       1       0.7960      3  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
```

```
12601701      0            0          0                    0              3  *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
12601801    0      0.0737      0.0         0.0            3     *
*
*************************************************************************
*VESSEL INLET
*************************************************************************
*          NH   NP   G.TYPE  FLAG LEFT BOUNDARY
12700000   01    8     2      1      0.03685     *
*          FLAG     FLAG
12700100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
12700101      4              0.068377     *
12700102      3              0.098377     *
*         COMPOSITION NO. INTERVAL NO.
12700201       5               4      *
12700202       9               7      *
*        SOURCE VALUE INTERVAL NO.
12700301       0.0          7     *
*         TEMP  POINT NO
12700401   501.05    8  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12700501    270010000   00000   1        1       0.7730      1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
12700601       -919        0   3980       1       0.7730      1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
12700701      0            0          0                    0              1  *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
12700801    0      0.0737      0.0         0.0            1     *
*
*
*BROKEN LOOP
*
*
*BL CONTROL VARIABLES
*
20530000     TRIPCOND TRIPUNIT          1.        1.         0
20530001     515
20530100     CM05      SUM     1.0    0.   1*
20530101     0.     1.0  MFLOWJ     390010000
20530200     BREAKM  INTEGRAL 1.0   0.   1*
20530201     CNTRLVAR 301
20530300     TRIPCOND TRIPUNIT          1.        0.         0
20530301     505
20530400     TRIPT   TRIPDLAY    1.0   0.0    1
20530401     505
20530500     ARGUM   SUM          1.0   0.0    1
20530501     0.    1.     TIME 0     -1.    CNTRLVAR     304
20530600     TIME    MULT         1.0   0.0    1
20530601     CNTRLVAR 303     CNTRLVAR 305
20530700     ACTIME    SUM       1.0        0.        1
20530701       0.      1.   CNTRLVAR 300    1.0   CNTRLVAR 306
20530800     BREAKF    DIV     1.0    0.   1*
20530801     CNTRLVAR 307      CNTRLVAR 302
*
*  HEAT CARRIED AWAY BY LEAK FLOW (MW,MJ)
20530900    LEAKPOW    MULT     1.-6       0.        1
20530901    CNTRLVAR 301      U   390010000
20531000    LEAKENG    INTEGRAL  1.0      0.        1
```

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20531001   CNTRLVAR  309
**************************************************
*PRESSURE DROPS
**************************************************
*PRIMARY SIDE
20531100     PD80AB42  SUM  1.-6       0        1* S81
20531200     PD80BNX1  SUM  1.-6       0        1* S82
20531300     PD82NBX1  SUM  1.-6       0        1* S85
20531400     PD82BA64  SUM  1.-6       0        1* S88
20531500     PD8082AA  SUM  1.-6       0        1* L23
20531600     PD2180A   SUM  1.-6       0        1* L22
20531700     PD8227    SUM  1.-6       0        1* L24
20531800     PD2724    SUM  1.-6       0        1* L25
20531900     PD252451  SUM  1.-6       0        1* L26(PUMP HEAD)
20532000     PD2526    SUM  1.-6       0        1* L27
20532100     PD262133  SUM  1.-6       0        1* L29
*
*
20531101     0.0      1.0   P  330010000  1.2027   RHO 330010000
+                    -1.0   P  330060000 -2.8057   RHO 330060000
20531201     0.0      1.0   P  330060000  2.8057   RHO 330060000
+                    -0.5   P  330160000 -0.5      P   330170000
20531301     0.0      0.5   P  330160000  0.5      P   330170000
+                    -1.0   P  330270000 -2.8057   RHO 330270000
20531401     0.0      1.0   P  330270000  2.8057   RHO 330270000
+                    -1.0   P  330320000 -1.2027   RHO 330320000
20531501     0.0      1.0   P  330010000  1.2027   RHO 330010000
+                    -1.0   P  330320000 -1.2027   RHO 330320000
20531601      0.0     1.0   P  300020000
+                    -1.0   P  330010000  -1.2027  RHO  330010000
20531701      0.0     1.0   P  330320000  +1.2027  RHO  330320000
+                    -1.0   P  340050000  -0.9320  RHO  340050000
20531801      0.0     1.0   P  340050000  +0.9320  RHO  340050000
+                    -1.0   P  340080000  -1.7070  RHO  340080000
20531901      0.0    -1.0   P  340080000  -1.7070  RHO  340080000
+                     1.0   P  360010000
20532001      0.0     1.0   P  360010000  -1.0   P 395020000
20532101      0.0     1.0   P  395020000  -1.0   P 300020000
*
* HEAT TRANSFER TO/FROM SG2 (MW)
20533000  PHTSG2    SUM    1.    0.    1*
20533100  PHTSG2    SUM    1.    0.    1*
20533200  THTSG2    SUM    1.-6  0.    1* HEAT TRANSFER TO/FROM SG2
*
*
20533001  0.   0.360500 HTRNR  330200101  0.360500  HTRNR  330200201
+              0.360500 HTRNR  330200301  0.360500  HTRNR  330200401
+              0.360500 HTRNR  330200501  0.360500  HTRNR  330200601
+              0.360500 HTRNR  330200701  0.360500  HTRNR  330200801
+              0.360500 HTRNR  330200901  0.360500  HTRNR  330201001
20533101  0.   0.500740 HTRNR  330201101  0.500740  HTRNR  330201201
+              0.360500 HTRNR  330201301  0.360500  HTRNR  330201401
+              0.360500 HTRNR  330201501  0.360500  HTRNR  330201601
+              0.360500 HTRNR  330201701  0.360500  HTRNR  330201801
+              0.360500 HTRNR  330201901  0.360500  HTRNR  330202001
+              0.360500 HTRNR  330202101  0.360500  HTRNR  330202201
20533201  0.   1.0    CNTRLVAR 330         1.0    CNTRLVAR   331
**************************************************
*  HEAT LOSSES (KW)
```

```
*****************************************************
20534300     L       SUM   1.-3   0.  1*
20534400     L       SUM   1.-3   0.  1*
20534500     LOSS-BL  SUM   1.0    0.  1* SUM IN BL
*
*          AO    SURFACE AREA  VAR.   CODE     SURFACE AREA VAR.      CODE
20534301   0     0.345390      HTRNR  300000101 0.345390   HTRNR   300000201
+                0.325210      HTRNR  300200101 0.382060   HTRNR   300200201
+                0.202740      HTRNR  330000101 0.202740   HTRNR   330000201
+                0.202740      HTRNR  330000301 0.202740   HTRNR   330000401
+                0.202740      HTRNR  330400101 0.202740   HTRNR   330400201
+                0.202740      HTRNR  330400301 0.202740   HTRNR   330400401
+                0.329110      HTRNR  340000101 0.329110   HTRNR   340000201
+                0.329110      HTRNR  340000301 0.382760   HTRNR   340000401
+                0.330010      HTRNR  340000501 0.320720   HTRNR   340000601
+                0.266890      HTRNR  340000701 0.266890   HTRNR   340000801
20534401   0     0.658400      HTRNR  350000101
+                0.352550      HTRNR  360000101 0.352550   HTRNR   360100101
+                0.112640      HTRNR  360200101 0.112640   HTRNR   360200201
+                0.042635      HTRNR  370000101 0.042635   HTRNR   390000101
+                0.190580      HTRNR  395000101 0.190580   HTRNR   395000201
+                0.448910      HTRNR  395100101
+                0.221440      HTRNR  330100101
+                0.221440      HTRNR  330300101
+                0.342400      HTRNR  300100101
20534501     0.   1.0    CNTRLVAR 343   1.0   CNTRLVAR 344
20535000   TF21B     SUM       1.          0.        1
20535001   -273.15       1.      TEMPF     300010000
20535100   TF21T     SUM       1.          0.        1
20535101   -273.15       1.      TEMPG     300010000
20535200   TF26B     SUM       1.          0.        1
20535201   -273.15       1.      TEMPF     395030000
20535300   TF26T     SUM       1.          0.        1
20535301   -273.15       1.      TEMPG     395030000
20535400   DD21      SUM       1.          0.        1
20535401   0.            1.      RHO       300010000
20535500   DD24      SUM       1.          0.        1
20535501   0.            1.      RHO       340010000
20535600   DD25      SUM       1.          0.        1
20535601   0.            1.      RHO       360010000
20535700   DD26      SUM       1.          0.        1
20535701   0.            1.      RHO       395030000
*
* PUMP SPEED CONTROLLER
*
20536100    SPDCNTLR       SUM        1.0    0.0    1
20536101     6.7           -1.0      MFLOWJ    300010000
*
20536200   DEADBAND    STDFNCTN  1.0    0.0     1
20536201   ABS     CNTRLVAR    361
*
20536300   PMPSPEED   INTEGRAL   60.0   406.49 1 *
20536301    CNTRLVAR  361                        *
20539000   TF26T      SUM      1.                 0.              1
20539001   -273.16 1. TEMPG     395010000
20539100   TF26B      SUM      1.                 0.              1
20539101   -273.16 1. TEMPF     395010000
20539200   TF21T      SUM      1.                 0.              1
20539201   -273.16 1. TEMPG     300010000
```

```
20539300  TF21B      SUM      1.                0.              1
20539301  -273.16 1. TEMPF     300010000
*
*
*BL VOLUMES
*
*
3000000 '05-09-84' PIPE *
*      VOLUMES
3000001    5  *
*          AREA     VOL.NO.
3000101   .000000      5 *
*          J.AREA   JUN.NO.
3000201   .000000     04 *
*         LENGTH    VOL.NO.
3000301   0.6790      2    *
3000302   0.7700      3    *
3000303   0.7380      4    *
3000304   0.8675      5    *
*          VOLUME   V.NO.
3000401   .0011237    2   *
3000402   .0012967    3   *
3000403   .0012207    4   *
3000404   .0014341    5   *
*          H.A   V.NO.
*000501    0.0     5       *
*         V.ANGLE V.NO.
3000601   -00.190    2    *
3000602   +00.369    3    *
3000603    +5.91086  4    *
3000604   +90.000    5    *
*         ELEVAT.  V.NO.
3000701   -0.0023    2    *
3000702   +0.0050    3    *
3000703   +0.0760    4    *
3000704   +0.8675    5    *
*          ROUGH.   DIAM.   V.NO.
3000801     2.0-5  .0461      5    *
*          K(FORD)   K(REV)    J.NO.
3000901      00.05     00.05     01*
3000902      00.11     00.11     02*  .41  .41    (.21,.21)
3000903      00.07     00.07     03*  .07   .07
3000904      01.38     00.38     04*   1.30  .30 L
*          FE    V.NO
3001001      00     5       *
*          CAHS  J.NO.
3001101      0000   04      *
*        CONTROL   PRESSURE   ENERGY/TEMP   QUALITY     VOL NO.
3001201      0       15.766+6    1.4667+6      0.      0.      01    *
3001202      0       15.761+6    1.4666+6      0.      0.      02    *
3001203      0       15.757+6    1.4666+6      0.      0.      03    *
3001204      0       15.752+6    1.4666+6      0.      0.      04    *
3001205      0       15.728+6    1.4666+6      0.      0.      05    *
*         CONTROL
3001300      0
*        LIQUID VEL          VAPOUR VEL   INTERFACE VEL.   JUN NO.
3001301      6.0937           6.0937            0.0            1    *
3001302      6.0937           6.0937            0.0            2    *
3001303      6.0969           6.0969            0.0            3    *
```

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3001304      6.1003           6.1003            0.0           4    *
*
* SINGLE JUNCTION
3150000 '05-09-84' SNGLJUN *PIPE TO S.G EXPANSION
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS    COEFFICIENT
3150101   300010000    330000000  .000000  00.19  00.05 0000   *.41 .27
*       C.WORD    INIT L FLO INIT V FLO  INTERFACE VEL           (.19,.05)
3150201    0          6.1006    6.1006        0.0    *
*
*
3300000 '05-09-84' PIPE *
*      VOLUMES
3300001   32  *
*          AREA     VOL.NO.
3300101   .000000     32 *
*          J.AREA   JUN.NO.
3300201   .000000     04 *
3300202   .000000     05 *
3300203   .000000     26 *
3300204   .000000     27 *
3300205   .000000     31 *
*          LENGTH    VOL.NO.
3300301   0.4490      4    *
3300302   0.2160      5    *
3300303   0.6210     15    *
3300304   0.8625     17    *
3300305   0.6210     27    *
3300306   0.2160     28    *
3300307   0.4490     32    *
*          VOLUME   V.NO.
3300401   .0016057    4   *
3300402   .0025784    5   *
3300403   .0014989   15   *
3300404   .0020819   17   *
3300405   .0014989   27   *
3300406   .0025784   28   *
3300407   .0016057   32   *
*          V.ANGLE V.NO.
3300601   +90.000     3    *
3300602   +77.291     4    *
3300603   +66.444     5    *
3300604   +90.000    16    *
3300605   -90.000    27    *
3300606   -66.444    28    *
3300607   -77.291    29    *
3300608   -90.000    32    *
*          ELEVAT.  V.NO.
3300701   +0.4490     3    *
3300702   +0.4380     4    *
3300703   +0.1980     5    *
3300704   +0.6210    15    *
3300705   +0.8625    16    *
3300706   -0.8625    17    *
3300707   -0.6210    27    *
3300708   -0.1980    28    *
3300709   -0.4380    29    *
3300710   -0.4490    32    *
*          ROUGH.   DIAM.   V.NO.
3300801     2.0-5  .0684      4    *
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3300802     2.0-5 .1020      5    * .102
3300803     0.2-5 .0196     27    * .2-5
3300804     2.0-5 .1020     28    *
3300805     2.0-5 .0684     32    *
*           K(FORD)  K(REV)    J.NO.
3300901      00.00     00.00     02*
3300902      00.01     00.01     03* .02 .02
3300903      00.00     00.00     11*
3300904      00.15     00.15     15*
3300905      00.00     00.00     16* .55 TOTAL
3300906      00.00     00.00     28*
3300907      00.00     00.00     29* .02  .02
3300908      00.00     00.00     31*
*           FE   V.NO
3301001     00   32      *
*           CAHS J.NO.
3301101     0000  03     *
3301102     0100  04     * 0000
3301103     0100  05     *
3301104     0000  26     *
3301105     0100  27     * 0000
3301106     0100  28     *
3301107     0000  31     *
*         CONTROL   PRESSURE   ENERGY        QUALITY     VOL NO.
3301201     0       15.729+6    1.4666+6      0.     0.     01    *
3301202     0       15.726+6    1.4666+6      0.     0.     02    *
3301203     0       15.723+6    1.4666+6      0.     0.     03    *
3301204     0       15.720+6    1.4666+6      0.     0.     04    *
3301205     0       15.719+6    1.4666+6      0.     0.     05    *
3301206     0       15.707+6    1.4515+6      0.     0.     06    *
3301207     0       15.700+6    1.4377+6      0.     0.     07    *
3301208     0       15.694+6    1.4247+6      0.     0.     08    *
3301209     0       15.687+6    1.4125+6      0.     0.     09    *
3301210     0       15.681+6    1.4012+6      0.     0.     10    *
3301211     0       15.674+6    1.3905+6      0.     0.     11    *
3301212     0       15.667+6    1.3805+6      0.     0.     12    *
3301213     0       15.660+6    1.3712+6      0.     0.     13    *
3301214     0       15.652+6    1.3624+6      0.     0.     14    *
3301215     0       15.645+6    1.3541+6      0.     0.     15    *
3301216     0       15.636+6    1.3433+6      0.     0.     16    *
3301217     0       15.633+6    1.3334+6      0.     0.     17    *
3301218     0       15.635+6    1.3270+6      0.     0.     18    *
3301219     0       15.637+6    1.3209+6      0.     0.     19    *
3301220     0       15.639+6    1.3152+6      0.     0.     20    *
3301221     0       15.641+6    1.3099+6      0.     0.     21    *
3301222     0       15.643+6    1.3048+6      0.     0.     22    *
3301223     0       15.646+6    1.3001+6      0.     0.     23    *
3301224     0       15.648+6    1.2956+6      0.     0.     24    *
3301225     0       15.650+6    1.2915+6      0.     0.     25    *
3301226     0       15.652+6    1.2876+6      0.     0.     26    *
3301227     0       15.654+6    1.2839+6      0.     0.     27    *
3301228     0       15.658+6    1.2839+6      0.     0.     28    *
3301229     0       15.657+6    1.2839+6      0.     0.     29    *
3301230     0       15.660+6    1.2839+6      0.     0.     30    *
3301231     0       15.663+6    1.2839+6      0.     0.     31    *
3301232     0       15.666+6    1.2839+6      0.     0.     32    *
*         CONTROL
3301300     0
*         LIQUID VEL  VAPOUR VEL INTERFACE VEL. JUN NO.
```

```
3301301    2.8201      2.8201      0.0          1    *
3301302    2.8201      2.8201      0.0          2    *
3301303    2.8201      2.8201      0.0          3    *
3301304    2.8201      2.8201      0.0          4    *
3301305    4.1773      4.1773      0.0          5    *
3301306    4.1359      4.1359      0.0          6    *
3301307    4.0988      4.0988      0.0          7    *
3301308    4.0647      4.0647      0.0          8    *
3301309    4.0342      4.0342      0.0          9    *
3301310    4.0056      4.0056      0.0         10    *
3301311    3.9797      3.9797      0.0         11    *
3301312    3.9563      3.9563      0.0         12    *
3301313    3.9351      3.9351      0.0         13    *
3301314    3.9157      3.9157      0.0         14    *
3301315    3.8980      3.8980      0.0         15    *
3301316    3.8741      3.8741      0.0         16    *
3301317    3.8532      3.8532      0.0         17    *
3301318    3.8397      3.8397      0.0         18    *
3301319    3.8273      3.8273      0.0         19    *
3301320    3.8159      3.8159      0.0         20    *
3301321    3.8053      3.8053      0.0         21    *
3301322    3.7955      3.7955      0.0         22    *
3301323    3.7864      3.7864      0.0         23    *
3301324    3.7777      3.7777      0.0         24    *
3301325    3.7695      3.7695      0.0         25    *
3301326    3.7620      3.7620      0.0         26    *
3301327    3.7548      3.7548      0.0         27    *
3301328    2.5344      2.5344      0.0         28    *
3301329    2.5343      2.5343      0.0         29    *
3301330    2.5343      2.5343      0.0         30    *
3301331    2.5343      2.5343      0.0         31    *
*
*
3350000 '05-09-84' SNGLJUN *STEAM GENERATOR TO PIPING
*          CODE(FROM)  CODE(TO)   AREA   K(FORD) K(REV)CAHS   COEFFICIENT
3350101  330010000   340000000  .000000  00.05  00.19 0000  *.27 .41
*       C.WORD   INIT L FLO INIT V FLO  INTERFACE VEL          (.15,.29)
3350201   0             5.4484     5.4484     0.0
*
3400000 '05-09-84' PIPE *
*      VOLUMES
3400001   8  *
*          AREA     VOL.NO.
3400101  .000000      4 *
3400102  .001669      5 *
3400103  .000000      8 *
*          J.AREA   JUN.NO.
3400201  .000000     07 *
*         LENGTH    VOL.NO.
3400301  0.7300      3    *
3400302  0.8010      4    *
3400303  0.7320      5    *
3400304  0.6630      6    *
3400305  0.5920      8    *
*          VOLUME   V.NO.
3400401  .0012143    3  *
3400402  .0014135    4  *
3400403  .0000000    5  *
3400404  .0011773    6  *
```

```
3400405  .0009780    8  *
*         H.A   V.NO.
*400501   0.0      8     *
*        V.ANGLE V.NO.
3400601  -90.000    3    *
3400602  -71.147    4    *
3400603  +00.000    5    *
3400604  +69.251    6    *
3400605  +90.000    8    *
*        ELEVAT. V.NO.
3400701  -0.7300    3    *
3400702  -0.7580    4    *
3400703  +0.0000    5    *
3400704  +0.6200    6    *
3400705  +0.5920    8    *
*         ROUGH.   DIAM.   V.NO.
3400801    2.0-5 .0461      8    *
*          K(FORD)  K(REV)    J.NO.
3400901     00.10     00.10     01* .22
3400902     00.00     00.00     03*
3400903     00.75     00.75     04* .8 .8 L
3400904     00.07     00.07     05* .07 .07 L
3400905     00.00     00.00     06*
3400906     00.24     00.24     07* .34 L
*          FE    V.NO
3401001    00     8      *
*          CAHS J.NO.
3401101    0000   07     *
*        CONTROL   PRESSURE   ENERGY/TEMP   QUALITY     VOL NO.
3401201    0       15.659+6    1.2838+6      0.     0.     01    *
3401202    0       15.661+6    1.2838+6      0.     0.     02    *
3401203    0       15.663+6    1.2838+6      0.     0.     03    *
3401204    0       15.667+6    1.2838+6      0.     0.     04    *
3401205    0       15.658+6    1.2838+6      0.     0.     05    *
3401206    0       15.653+6    1.2838+6      0.     0.     06    *
3401207    0       15.645+6    1.2838+6      0.     0.     07    *
3401208    0       15.636+6    1.2837+6      0.     0.     08    *
*         CONTROL
3401300    0
*        LIQUID VEL./FLOW    VAPOUR VEL   INTERFACE VEL.   JUN NO.
3401301      5.4484            5.4484           0.0           1    *
3401302      5.4483            5.4483           0.0           2    *
3401303      5.4482            5.4482           0.0           3    *
3401304      5.4300            5.4300           0.0           4    *
3401305      5.4300            5.4300           0.0           5    *
3401306      5.4858            5.4858           0.0           6    *
3401307      5.4858            5.4858           0.0           7    *
*
3500000 '05-09-84' PUMP *
*         FLOWAREA  LENGTH VOLUME    H.A  VER.ANGL  ELEVAT.   CNTLFLAG
3500101   0.0033183 0.0000 0.002370 0.0 +15.260   +0.1880       0      *
*         CODENO.   J.AREA    K(FORWARD) K(REVERSE)   CAHS
3500108   340010000 0.0000     0.15       0.15         0000        * .001669
*         CODENO.   J.AREA    K(FORWARD) K(REVERSE)   CAHS
3500109   355000000 0.0000     0.85       0.85         0000        * .001669
*        CONTROL   PRESSURE   ENERGY       QUALITY
3500200    0       15.808+6    1.2828+6      0.     0.      *
*
*         CNTLW   INIT L VEL   INIT V VEL   INTERFACE VEL
```

```
3500201     0        5.4858      5.4858      0.0                        *
*         CNTLW   INIT L VEL   INIT V VEL   INTERFACE VEL
3500202     0        5.4556      5.4556      0.0                        *
*
3500301      0      0      0       -1        0        0          0      * W5 -1
*
3500302  745.605 0.5452          .02787 139.9    45.47 1.444 747.3 *.6048845
3500303      0.     0.    0.    0. 0.                                  * .55  L
*
3500310      0.     0.    0.*
3506100     501     CNTRLVAR  363
3506101      0.0       0.0 *
3506102   745.605   745.605 *
*
*PUMP DATA
*************************************************************************
****************           PUMP  DATA       ******************************
*************** SINGLE  PHASE HEAD CURVE DATA ***************************
*************************************************************************
*
*************************************************************************
*  HEAD CURVE 1  ********************************************************
*************************************************************************
3501100    1           1          *
3501101   0.0000     1.0550       *
3501102   0.0500     1.0640       *
3501103   0.1000     1.0790       *
3501104   0.2000     1.1020       *
3501105   0.3000     1.1200       *
3501106   0.4000     1.1310       *
3501107   0.5000     1.1310       *
3501108   0.6000     1.1230       *
3501109   0.7000     1.1040       *
3501110   0.8000     1.0785       *
3501111   0.9000     1.0430       *
3501112   1.0000     1.0000       *
*************************************************************************
*  HEAD CURVE 2  ********************************************************
*************************************************************************
3501200    1           2          *
3501201   0.0000    -0.7800       *
3501202   0.1000    -0.6285       *
3501203   0.2000    -0.4780       *
3501204   0.3000    -0.3230       *
3501205   0.3100    -0.3080       *
3501206   0.3500    -0.2480       *
3501207   0.4000    -0.1690       *
3501208   0.4500    -0.0840       *
3501209   0.5015     0.0000       *
3501210   0.5500     0.0820       *
3501211   0.6000     0.1730       *
3501212   0.7000     0.3650       *
3501213   0.7500     0.4610       *
3501214   0.8000     0.5560       *
3501215   0.9000     0.7680       *
3501216   0.9500     0.8810       *
*************************************************************************
*  HEAD CURVE 3  ********************************************************
*************************************************************************
```

```
3501300   1           3          *
3501301  -1.000     2.1100       *
3501302  -0.900     1.9270       *
3501303  -0.800     1.7590       *
3501304  -0.700     1.6105       *
3501305  -0.600     1.4890       *
3501306  -0.500     1.3800       *
3501307  -0.400     1.2820       *
3501308  -0.300     1.2000       *
3501309  -0.200     1.1330       *
3501310  -0.100     1.0805       *
3501311  -0.050     1.0615       *
3501312   0.000     1.0550       *
**************************************************************************
*  HEAD CURVE 4  ********************************************************
**************************************************************************
3501400   1           4          *
3501401  -0.900     1.8620       *
3501402  -0.800     1.6500       *
3501403  -0.700     1.4740       *
3501404  -0.600     1.3320       *
3501405  -0.500     1.2120       *
3501406  -0.400     1.1050       *
3501407  -0.300     1.0020       *
3501408  -0.200     0.9110       *
3501409  -0.100     0.8300       *
3501410   0.000     0.7610       *
**************************************************************************
*  HEAD CURVE 5  ********************************************************
**************************************************************************
3501500   1           5          *
3501501  0.0000     0.4240       *
3501502  0.0500     0.4580       *
3501503  0.1000     0.4890       *
3501504  0.1500     0.5175       *
3501505  0.2000     0.5430       *
3501506  0.2500     0.5730       *
3501507  0.3000     0.6030       *
3501508  0.3500     0.6310       *
3501509  0.4000     0.6600       *
3501510  0.4870     0.7020       *
3501511  0.5000     0.7095       *
3501512  0.5500     0.7305       *
3501513  0.6000     0.7495       *
3501514  0.6500     0.7620       *
3501515  0.7000     0.7770       *
3501516  0.7500     0.7890       *
3501517  0.8000     0.8040       *
3501518  0.8500     0.8280       *
3501519  0.9000     0.8610       *
3501520  0.9500     0.9010       *
**************************************************************************
*  HEAD CURVE 6  ********************************************************
**************************************************************************
3501600   1           6          *
3501601  0.0000     0.7610       *
3501602  0.1000     0.7100       *
3501603  0.2000     0.6640       *
3501604  0.3000     0.6440       *
```

```
3501605   0.3500     0.6460       *
3501606   0.4000     0.6530       *
3501607   0.5000     0.6795       *
3501608   0.6000     0.7070       *
3501609   0.7000     0.7460       *
3501610   0.8000     0.7990       *
3501611   0.9000     0.8610       *
3501612   0.9500     0.9010       *
3501613   1.0000     0.9480       *
*********************************************************************
*  HEAD CURVE 7  ****************************************************
*********************************************************************
3501700    1           7          *
3501701  -0.600    -0.2830        *
3501702  -0.500    -0.1470        *
3501703  -0.450    -0.0810        *
3501704  -0.384     0.0000        *
3501705  -0.350     0.0410        *
3501706  -0.300     0.1060        *
3501707  -0.250     0.1700        *
3501708  -0.200     0.2330        *
3501709  -0.150     0.2900        *
3501710  -0.100     0.3395        *
3501711  -0.050     0.3840        *
3501712   0.000     0.4240        *
*********************************************************************
*TORQUE CURVE 1  ****************************************************
*********************************************************************
3501800    2           1          *
3501801   0.0000     0.4390       *
3501802   0.0500     0.4420       *
3501803   0.1000     0.4600       *
3501804   0.2000     0.5150       *
3501805   0.3000     0.5825       *
3501806   0.4000     0.6470       *
3501807   0.5000     0.7060       *
3501808   0.6000     0.7640       *
3501809   0.7000     0.8230       *
3501810   0.8000     0.8820       *
3501811   0.9000     0.9415       *
3501812   1.0000     1.0000       *
*********************************************************************
*TORQUE CURVE 2  ****************************************************
*********************************************************************
3501900    2           2          *
3501901   0.0000    -0.5180       *
3501902   0.1000    -0.3500       *
3501903   0.2000    -0.1840       *
3501904   0.3000    -0.0184       *
3501905   0.3100     0.0000       *
3501906   0.3500     0.0660       *
3501907   0.4000     0.1510       *
3501908   0.4500     0.2380       *
3501909   0.5015     0.3200       *
3501910   0.5500     0.3960       *
3501911   0.6000     0.4640       *
3501912   0.7000     0.5985       *
3501913   0.7500     0.6660       *
3501914   0.8000     0.7310       *
```

```
3501915   0.9000     0.8640       *
3501916   0.9500     0.9305       *
*********************************************************************
*TORQUE CURVE 3  ***************************************************
*********************************************************************
3502000    2           3          *
3502001  -1.000     1.1820       *
3502002  -0.900     1.0370       *
3502003  -0.800     0.9110       *
3502004  -0.700     0.8040       *
3502005  -0.600     0.7120       *
3502006  -0.500     0.6320       *
3502007  -0.400     0.5670       *
3502008  -0.300     0.5130       *
3502009  -0.200     0.4730       *
3502010  -0.100     0.4495       *
3502011  -0.050     0.4410       *
3502012   0.000     0.4390       *
*********************************************************************
*TORQUE CURVE 4  ***************************************************
*********************************************************************
3502100    2           4          *
3502101  -0.900     1.1200       *
3502102  -0.800     1.0930       *
3502103  -0.700     1.1040       *
3502104  -0.600     1.2400       *
3502105  -0.500     1.3230       *
3502106  -0.400     1.3400       *
3502107  -0.300     1.2560       *
3502108  -0.200     1.1220       *
3502109  -0.100     1.0410       *
3502110   0.000     0.9840       *
*********************************************************************
*TORQUE CURVE 5  ***************************************************
*********************************************************************
3502200    2           5          *
3502201  0.0000    -0.5690       *
3502202  0.0500    -0.5010       *
3502203  0.1000    -0.4390       *
3502204  0.1500    -0.3780       *
3502205  0.2000    -0.3180       *
3502206  0.2500    -0.2595       *
3502207  0.3000    -0.2020       *
3502208  0.3500    -0.1500       *
3502209  0.4000    -0.0980       *
3502210  0.4870     0.0000       *
3502211  0.5000     0.0130       *
3502212  0.5500     0.0695       *
3502213  0.6000     0.1210       *
3502214  0.6500     0.1730       *
3502215  0.7000     0.2290       *
3502216  0.7500     0.2840       *
3502217  0.8000     0.3450       *
3502218  0.8500     0.4090       *
3502219  0.9000     0.4740       *
3502220  0.9500     0.5490       *
*********************************************************************
*TORQUE CURVE 6  ***************************************************
*********************************************************************
```

```
3502300   2           6          *
3502301  0.0000     0.9840       *
3502302  0.1000     0.9505       *
3502303  0.2000     0.9290       *
3502304  0.3000     0.9050       *
3502305  0.3500     0.8900       *
3502306  0.4000     0.8730       *
3502307  0.5000     0.8400       *
3502308  0.6000     0.8020       *
3502309  0.7000     0.7610       *
3502310  0.8000     0.7205       *
3502311  0.9000     0.6780       *
3502312  0.9500     0.6530       *
3502313  1.0000     0.6300       *
*************************************************************************
*TORQUE CURVE 7  ********************************************************
*************************************************************************
3502400   2           7          *
3502401  -0.600    -1.5900       *
3502402  -0.500    -1.3900       *
3502403  -0.450    -1.2970       *
3502404  -0.384    -1.1800       *
3502405  -0.350    -1.1205       *
3502406  -0.300    -1.0400       *
3502407  -0.250    -0.9560       *
3502408  -0.200    -0.8700       *
3502409  -0.150    -0.7905       *
3502410  -0.100    -0.7160       *
3502411  -0.050    -0.6400       *
3502412   0.000    -0.5690       *
*************************************************************************
* TWO PHASE MULTIPLIER DATA
*************************************************************************
*  HEAD CURVE
*************************************************************************
*        CNTLNO.   VOIDF   MULTPR
3503000     0      0.00       0.0  *
3503001            0.20       0.0  *
3503002            0.43       1.0  *
3503003            0.86       1.0  *
3503004            1.00       0.0  *
*************************************************************************
*TORQUE CURVE
*************************************************************************
*        CNTLNO.   VOIDF   MULTPR
3503100     0      0.00       0.00 *
3503101            0.15       0.00 *
3503102            0.24       0.56 *
3503103            0.80       0.56 *
3503104            0.96       0.45 *
3503105            1.00       0.00 *
*************************************************************************
* PUMP I_ PHASE DIFFERENCE DATA
*************************************************************************
*  HEAD CURVE 1  ********************************************************
*************************************************************************
3504100   1           1          *
3504101  0.0000     0.1650       *
3504102  0.0500     0.7740       *
```

```
3504103   0.1000     0.8100       *
3504104   0.3000     0.7730       *
3504105   0.5000     0.8040       *
3504106   0.7000     0.8280       *
3504107   1.0000     0.8160       *
**************************************************************************
*  HEAD CURVE 2  *********************************************************
**************************************************************************
3504200    1           2          *
3504201   0.0000     0.2200       *
3504202   0.1000     0.2285       *
3504203   0.3000     0.2480       *
3504204   0.5015     0.3310       *
3504205   0.7000     0.4770       *
**************************************************************************
*  HEAD CURVE 3  *********************************************************
**************************************************************************
3504300    1           3          *
3504301   -1.000    -0.8200       *
3504302   -0.800    -1.4910       *
3504303   -0.700    -1.6695       *
3504304   -0.500    -1.7800       *
3504305   -0.300    -1.5000       *
3504306   -0.200    -1.1370       *
3504307   -0.100    -0.5895       *
3504308    0.000     0.1650       *
**************************************************************************
*  HEAD CURVE 4  *********************************************************
**************************************************************************
3504400    1           4          *
3504401   -0.900    -0.5380       *
3504402   -0.800    -0.3300       *
3504403   -0.600    -0.0980       *
3504404   -0.400    -0.0450       *
3504405   -0.200    -0.0390       *
3504406    0.000    -0.0390       *
**************************************************************************
*  HEAD CURVE 5  *********************************************************
**************************************************************************
3504500    1           5          *
3504501   0.0000    -0.0460       *
3504502   0.2000    -0.3660       *
3504503   0.4000    -0.5800       *
3504504   0.6000    -0.6805       *
3504505   0.8000    -0.6760       *
**************************************************************************
*  HEAD CURVE 6  *********************************************************
**************************************************************************
3504600    1           6          *
3504601   0.0000    -0.0390       *
3504602   0.2000    -0.0660       *
3504603   0.4000    -0.0970       *
3504604   0.6000    -0.1730       *
3504605   0.8000    -0.3310       *
3504606   1.0000    -0.4820       *
**************************************************************************
*  HEAD CURVE 7  *********************************************************
**************************************************************************
3504700    1           7          *
```

```
3504701  -0.600     0.7970       *
3504702  -0.400     0.5092       *
3504703  -0.200     0.2330       *
*************************************************************************
*TORQUE CURVE 1  ********************************************************
*************************************************************************
3504800    2           1          *
3504801  0.0000     0.5400       *
3504802  0.2000     0.5900       *
3504803  0.4000     0.6500       *
3504804  0.6000     0.7700       *
3504805  0.8000     0.9500       *
3504806  0.9000     0.9800       *
3504807  0.9500     0.9600       *
3504808  1.0000     0.8700       *
*************************************************************************
*TORQUE CURVE 2  ********************************************************
*************************************************************************
3504900    2           2          *
3504901  0.0000    -0.1500       *
3504902  0.2000     0.0200       *
3504903  0.4000     0.2200       *
3504904  0.6000     0.4600       *
3504905  0.8000     0.7100       *
3504906  0.9000     0.8100       *
3504907  0.9500     0.8500       *
3504908  1.0000     0.8700       *
*************************************************************************
*TORQUE CURVE 3  ********************************************************
*************************************************************************
3505000    2           3          *
3505001  -1.000     0.6200       *
3505002  -0.800     0.6800       *
3505003  -0.600     0.5300       *
3505004  -0.400     0.4600       *
3505005  -0.200     0.4900       *
3505006   0.000     0.5400       *
*************************************************************************
*TORQUE CURVE 4  ********************************************************
*************************************************************************
3505100    2           4          *
3505101  -1.000     0.6200       *
3505102  -0.800     0.5300       *
3505103  -0.600     0.4600       *
3505104  -0.400     0.4200       *
3505105  -0.200     0.3900       *
3505106   0.000     0.3600       *
*************************************************************************
*TORQUE CURVE 5  ********************************************************
*************************************************************************
3505200    2           5          *
3505201  0.0000    -0.6300       *
3505202  0.2000    -0.5100       *
3505203  0.4000    -0.3900       *
3505204  0.6000    -0.2900       *
3505205  0.8000    -0.2000       *
3505206  0.9000    -0.1600       *
3505207  1.0000    -0.1300       *
*************************************************************************
```

```
*TORQUE CURVE 6  ************************************************************
************************************************************************
3505300    2            6           *
3505301   0.0000      0.3600        *
3505302   0.2000      0.3200        *
3505303   0.4000      0.2700        *
3505304   0.6000      0.1800        *
3505305   0.8000      0.0500        *
3505306   1.0000     -0.1300        *
************************************************************************
*TORQUE CURVE 7  ************************************************************
************************************************************************
3505400    2            7           *
3505401   -1.000     -1.4400        *
3505402   -0.800     -1.2500        *
3505403   -0.600     -1.0800        *
3505404   -0.400     -0.9200        *
3505405   -0.200     -0.7700        *
3505406    0.000     -0.6300        *
************************************************************************
*
3550000 '20-08-84' BRANCH * SEAL WATER CONNECTION
*          NO.J    CONTROL
3550001     01       0          *
*         AREA     LENGTH     VOLUME   H.A. V.ANGLE   ELEVAT.   ROUGH   DIAM. FE
3550101 .001660 0.6415   .0000000   0.0 -00.134   -0.0015   8.0-5 .0461 00*
*  CONTROL PRESSURE     ENERGY      QUALITY
3550200   0 15.959+6     1.2812+6     0.        *
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS    COEFFICIENT
3551101   355010000    360000000  .000000   00.40   00.40 0000   *
*        LIQUID VEL VAPOR VEL.     INTERFACE VEL
3551201     5.4575    5.4575       0.0               *
*
3600000 '05-09-84' PIPE *
*      VOLUMES
3600001    3  *
*          AREA     VOL.NO.
3600101   .001669       3 *
*          J.AREA   JUN.NO.
3600201   .000000      02 *
*         LENGTH    VOL.NO.
3600301   0.6415      1    *
3600302   0.2984      3    *
*          VOLUME   V.NO.
3600401   .0000000    3   *
*          H.A   V.NO.
3600501    0.0      3      *
*         V.ANGLE V.NO.
3600601   -00.134     1    *
3600602   +00.288     3    *
*         ELEVAT. V.NO.
3600701   -0.0015     1    *
3600702   +0.0015     3    *
*          ROUGH.   DIAM.   V.NO.
3600801     2.0-5 .0461       3    *
*           K(FORD)   K(REV)    J.NO.
3600901      00.50     00.50     01*    .40   .40
3600902      00.22     00.22     02*    .20   .20 L
*           FE    V.NO
```

```
3601001     00     3      *
*           CAHS J.NO.
3601101     0000   02     *
*        CONTROL   PRESSURE   ENERGY/TEMP   QUALITY     VOL NO.
3601201     0       15.950+6    1.2812+6      0.     0.     01    *
3601202     0       15.943+6    1.2812+6      0.     0.     02    *
3601203     0       15.939+6    1.2812+6      0.     0.     03    *
*         CONTROL
3601300     0
*        LIQUID VEL./FLOW    VAPOUR VEL   INTERFACE VEL.   JUN NO.
3601301      5.4281           5.4281            0.0           1    *
3601302      5.4281           5.4281            0.0           2    *
*
*
3700000 '20-08-84' BRANCH * LEAK ASSEMBLY VOL I
*          NO.J    CONTROL
3700001     2          0 *
*         AREA    LENGTH    VOLUME   H.A. V.ANGLE   ELEVAT.   ROUGH   DIAM. FE
3700101 .001669 0.225    .0000000   0.0    0.        0.       2.0-5  .0461 00*
*   CONTROL PRESSURE    ENERGY      QUALITY
3700200   0 15.938+6    1.2812+6     0.       *
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS    COEFFICIENT
3701101   360010000    370000000  .000000   00.00   00.00 0000   *
3702101   370010000    390000000  .000000   00.00   00.00 0000   *
*703101   370010000    380000000  .000003534      01.00   00.50 0000   *
*        LIQUID VEL VAPOR VEL.     INTERFACE VEL
3701201     5.4282    5.4282        0.0              *
3702201     5.4280    5.4280        0.0              *
*
3800000 '20-08-84' BRANCH * LEAK DISCHARGE LINE
*          NO.J    CONTROL
3800001     0        0          *
*         AREA    LENGTH    VOLUME   H.A. V.ANGLE   ELEVAT.   ROUGH   DIAM. FE
3800101 .001652 1.452    .0000000   0.0   -5.0   -0.1266     8.0-5  .0461 00*
*   CONTROL PRESSURE    ENERGY      QUALITY
3800200   0 15.949+6    1.2846+6     0.       *
*
3810000 '20-08-84' VALVE ** BREAK DISCHARGE
*          FROM                TO     AREA      FORW       REV      CAHS
3810101    380010000    382000000  0.0003142  0.   0.    1100*  0.0003142
*         CNTL  LIQU VEL    VAP  VEL      0
3810201     0      0.0         0.0          0.*
*          VALVE * TYPE
3810300       MTRVLV*
*          OPEN TRIP NO.      CLOSE TRIP NO.   CHANGE RATE    INITIAL POS.
3810301       505              502               0.25           0.0
*
*        'NAME'      TYPE
3820000 '84-12-15' TMDPVOL * BUNKER
*        AREA        LENGTH   VOLUME        0   ANGLE ELEV. ROUGHN DIAM     FE
3820101 1.           1.         0.0         0.    0.0  0.0    8.-5  1.       00*
*        CNTL TRIP   VARIABLE    CODE
3820200    3  501    TIME         0          *
*          SEARCH VAR.    FLUID COND. (2 QUANTITIES)
3820201    0.   0.1+6     568.15   *
*
3900000 '20-08-84' BRANCH * LEAK ASSEMBLY VOL II
*          NO.J    CONTROL
3900001     02      0          *
```

```
*         AREA    LENGTH    VOLUME  H.A. V.ANGLE  ELEVAT.  ROUGH  DIAM. FE
3900101 .001669 0.225    .0000000  0.0   0.       0.       2.0-5 .0461 00*
*  CONTROL PRESSURE    ENERGY      QUALITY
3900200   0 15.937+6    1.2811+6     0.       *
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS   COEFFICIENT
3901101   390000000    380000000  .000007069      01.00  00.50 0000  *
3902101   390010000    395000000  .000000  00.00  00.00 0000  *
*        LIQUID VEL VAPOR VEL.     INTERFACE VEL
3901201     0.0       0.0          0.0              *
3902201     5.4731    5.4731       0.0              *
*
*
3950000 '05-09-84' PIPE *
*      VOLUMES
3950001    3  *
*          AREA     VOL.NO.
3950101   .000000      3 *
*          J.AREA   JUN.NO.
3950201   .000000     02 *
*          LENGTH    VOL.NO.
3950301   0.3170      2    *
3950302   0.7467      3    *
*          VOLUME   V.NO.
3950401   .0005247    2   *
3950402   .0012350    3   *
*          H.A  V.NO.
*950501    0.0     3      *
*          V.ANGLE V.NO.
3950601   +00.499    3    *
*          ELEVAT. V.NO.
3950701   +0.0028    2    *
3950702   +0.0065    3    *
*          ROUGH.   DIAM.   V.NO.
3950801     2.0-5 .0461      3    *
*           K(FORD)  K(REV)    J.NO.
3950901      00.00    00.00     01*
3950902      00.05    00.05     02* .31 .31(.05,.05)
*           FE    V.NO
3951001     00     3      *
*           CAHS J.NO.
3951101     0000   02     *
*        CONTROL   PRESSURE  ENERGY        QUALITY     VOL NO.
3951201     0       15.936+6   1.2811+6      0.     0.     01    *
3951202     0       15.935+6   1.2811+6      0.     0.     02    *
3951203     0       15.932+6   1.2811+6      0.     0.     03    *
*          CONTROL
3951300     0
*        LIQUID VEL          VAPOUR VEL   INTERFACE VEL.   JUN NO.
3951301      5.4824           5.4824            0.0           1    *
3951302      5.4865           5.4865            0.0           2    *
*
*BL STRUCTURES
*
*************************************************************************
*VESSEL OUTLET
*************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
13000000   02    8     2     1      0.02305     *
*          FLAG     FLAG
```

```
13000100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
13000101      4              0.050957     *
13000102      3              0.080957     *
*         COMPOSITION NO. INTERVAL NO.
13000201       5               4      *
13000202       9               7      *
*        SOURCE VALUE INTERVAL NO.
13000301       0.0          7     *
*          TEMP   POINT NO
13000401   490.46    8   *
*          BOUND.VOLUME  INCRE  TYPE S.AREA CODE VALUE   H.STR.NO
13000501    300010000    10000    1        1       0.6790      2   *
*          BOUND.VOLUME  INCRE  TYPE S.AREA CODE VALUE   H.STR.NO
13000601       -919         0    3982       1       0.6790      2   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13000701      0              0          0                    0              2   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
13000801    0      0.0461      0.0         0.0             2     *
*
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
13001000   01    8     2      1      0.02305     *
*          FLAG     FLAG
13001100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
13001101      4              0.0401349    *
13001102      3              0.0701349    *
*         COMPOSITION NO. INTERVAL NO.
13001201       5               4      *
13001202       9               7      *
*        SOURCE VALUE INTERVAL NO.
13001301       0.0          7     *
*          TEMP   POINT NO
13001401   471.45    8   *
*          BOUND.VOLUME  INCRE  TYPE S.AREA CODE VALUE   H.STR.NO
13001501    300030000    00000    1        1       0.7770      1   *
*          BOUND.VOLUME  INCRE  TYPE S.AREA CODE VALUE   H.STR.NO
13001601       -919         0    3982       1       0.7770      1   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13001701      0              0          0                    0              1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
13001801    0      0.0461      0.0         0.0             1     *
*
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
13002000   02    8     2      1      0.02305     *
*          FLAG     FLAG
13002100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
13002101      4              0.0401345    *
13002102      3              0.0701345    *
*         COMPOSITION NO. INTERVAL NO.
13002201       5               4      *
13002202       9               7      *
*        SOURCE VALUE INTERVAL NO.
13002301       0.0          7     *
*          TEMP   POINT NO
13002401   471.45    8   *
*          BOUND.VOLUME  INCRE  TYPE S.AREA CODE VALUE   H.STR.NO
13002501    300040000    0000    1        1       0.738       1   *
```

```
13002502   300050000   0000   1        1       0.867       2  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13002601       -919        0   3982       1       0.738       1  *
13002602       -919        0   3982       1       0.867       2  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13002701      0            0          0                    0             2  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
13002801    0      0.0461      0.0         0.0            2     *
*
*****************************************************************************
*STEAM GENERATOR (PRIMARY SIDE) _ BEFORE INLET CHAMBER
*****************************************************************************
*         NH  NP  G.TYPE FLAG LEFT BOUNDARY
13300000  04  10     2     1      0.03420     *
*         FLAG    FLAG
13300100    0       1   *
*         NO INTERVAL  RIGHT COORDINATE
13300101      4              0.041866     *
13300102      5              0.071866     *
*        COMPOSITION NO. INTERVAL NO.
13300201       5               4      *
13300202       9               9      *
*       SOURCE VALUE INTERVAL NO.
13300301       0.0          9    *
*
13300400      -1*
*        TEMP  POINT NO
13300401  599.00  598.89  598.78  598.68  598.59  527.85
+         465.38  409.41  358.72  312.42
13300402  598.99  598.88  598.78  598.68  598.59  527.85
+         465.38  409.41  358.72  312.42
13300403  598.99  598.88  598.78  598.68  598.58  527.85
+         465.37  409.40  358.72  312.42
13300404  598.98  598.87  598.77  598.67  598.58  527.85
+         465.37  409.40  358.72  312.42
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13300501   330010000   10000   1        1       0.4490      4  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13300601       -919        0   3982       1       0.4490      4  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13300701      0            0          0                    0             4  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
13300801    0      0.0684      0.0         0.0            4     *
*
*****************************************************************************
*STEAM GENERATOR PRIMARY SIDE (INLET CHAMBER)
*****************************************************************************
*         NH  NP  G.TYPE FLAG LEFT BOUNDARY
13301000  01  10     2     1      0.051       *
*         FLAG    FLAG
13301100    0       1   *
*         NO INTERVAL  RIGHT COORDINATE
13301101      4              0.063161     *
13301102      5              0.163161     *
*        COMPOSITION NO. INTERVAL NO.
13301201       5               4      *
13301202       9               9      *
*       SOURCE VALUE INTERVAL NO.
13301301       0.0          9    *
```

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*
13301400       -1
*         TEMP  POINT NO
13301401  598.92  598.86  598.80  598.74  598.68  512.74
+         444.76  388.73  341.10  299.69
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13301501   330050000      0     1       1      0.2160      1  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13301601       -919       0   3982       1      0.2160      1  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13301701      0            0          0                  0            1  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
13301801    0      0.102       0.0         0.0            1     *
*
*****************************************************************************
*STEAM GENERATOR (TUBES)
*****************************************************************************
*         NH  NP  G.TYPE FLAG LEFT BOUNDARY
13302000  22   6     2     1      0.00980     *
*         FLAG     FLAG
13302100    0        1    *
*         NO INTERVAL  RIGHT COORDINATE
13302101      5              0.011        *
*         COMPOSITION NO. INTERVAL NO.
13302201       7                5      *
*       SOURCE VALUE INTERVAL NO.
13302301       0.0          5     *
*
13302400       -1
*         TEMP  POINT NO
13302401  585.07   580.58  576.17  571.85  567.61  563.45
13302402  583.50   579.29  575.15  571.10  567.12  563.22
13302403  581.98   578.02  574.14  570.33  566.59  562.93
13302404  580.57   576.86  573.22  569.65  566.16  562.72
13302405  579.19   575.71  572.30  568.96  565.69  562.47
13302406  577.87   574.61  571.42  568.29  565.22  562.21
13302407  576.64   573.59  570.59  567.66  564.78  561.97
13302408  575.48   572.61  569.80  567.05  564.35  561.71
13302409  574.39   571.69  569.05  566.47  563.94  561.46
13302410  573.37   570.84  568.36  565.94  563.56  561.24
13302411  571.72   569.32  566.97  564.68  562.43  560.22
13302412  570.44   568.24  566.10  564.00  561.95  559.93
13302413  569.78   567.80  565.85  563.95  562.09  560.27
13302414  568.98   567.11  565.28  563.49  561.47  560.02
13302415  568.23   566.47  564.75  563.07  561.42  559.81
13302416  567.52   565.87  564.25  562.67  561.13  559.61
13302417  566.86   565.30  563.78  562.30  560.84  559.42
13302418  566.23   564.77  563.35  561.95  560.58  559.24
13302419  565.63   564.26  562.92  561.61  560.33  559.07
13302420  565.06   563.77  562.51  561.28  560.08  558.90
13302421  564.53   563.32  562.14  560.99  559.86  558.76
13302422  563.95   562.80  561.67  560.57  559.49  558.43
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13302501   330060000   10000   1       1       5.216     10  *  4.968
13302502   330160000   10000   1       1       7.245     12  *  6.900
13302503   330180000   10000   1       1       5.216     22  *  4.968
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13302601   620010000   10000   1       1       5.216     10  *
13302602   620110000    0000   1       1       7.245     11  *
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13302603   620110000     0000   1        1        7.245     12  *
13302604   620100000  -10000   1        1        5.216     22  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13302701      0           0         0                  0            22  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
13302801   0       0.0196     0.0         0.0          22     *
13302901   0       0.0220     0.0         0.0          22     *
*
*****************************************************************************
*STEAM GENERATOR (OUTLET CHAMBER)
*****************************************************************************
*         NH  NP  G.TYPE FLAG LEFT BOUNDARY
13303000  01  10    2      1      0.051       *
*         FLAG    FLAG
13303100    0       1   *
*         NO INTERVAL  RIGHT COORDINATE
13303101      4              0.063161     *
13303102      5              0.163161     *
*        COMPOSITION NO. INTERVAL NO.
13303201       5               4      *
13303202       9               9      *
*        SOURCE VALUE INTERVAL NO.
13303301       0.0         9      *
*
13303400       -1
*         TEMP  POINT NO
13303401  567.00  566.93  566.88  566.82  566.77  489.66  428.86
+         378.78  336.22  299.21
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13303501   330280000      0     1        1       0.2160      1  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13303601       -919        0   3982       1       0.2160      1  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13303701      0           0         0                  0            1  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
13303801   0      0.1020     0.0         0.0          1      *
*
*****************************************************************************
*STEAM GENERATOR (PRIMARY SIDE)_ AFTER OUTLET CHAMBER
*****************************************************************************
*         NH  NP  G.TYPE FLAG LEFT BOUNDARY
13304000  04  10    2      1      0.0342      *
*         FLAG    FLAG
13304100    0       1   *
*         NO INTERVAL  RIGHT COORDINATE
13304101      4              0.041866     *
13304102      5              0.071866     *
*        COMPOSITION NO. INTERVAL NO.
13304201       5               4      *
13304202       9               9      *
*        SOURCE VALUE INTERVAL NO.
13304301       0.0         9     *
13304400       -1
*         TEMP  POINT NO
13304401  567.00  566.90  566.80  566.71  566.62  503.27  447.35
+         397.29  351.97  310.58
13304402  567.00  566.90  566.80  566.71  566.62  503.27  447.35
+         397.29  351.97  310.58
13304403  567.00  566.89  566.80  566.71  566.62  503.27  447.35
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+          397.29   351.97   310.58
13304404   566.99   566.89   566.80   566.71   566.62   503.27   447.35
+          397.29   351.97   310.58
*          BOUND.VOLUME  INCRE  TYPE  S.AREA  CODE  VALUE   H.STR.NO
13304501    330290000    10000    1        1       0.4490      4   *
*          BOUND.VOLUME  INCRE  TYPE  S.AREA  CODE  VALUE   H.STR.NO
13304601       -919         0    3982      1       0.4490      4   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13304701      0             0           0                    0              4   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
13304801    0      0.0684      0.0         0.0             4     *
*
*****************************************************************************
*INLET/OUTLET CHAMBER PARTITIONING DISC
*****************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
13305000   01    6     1      1      0.0          *
*          FLAG     FLAG
13305100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
13305101      5               0.02          *
*         COMPOSITION NO.  INTERVAL NO.
13305201       5                5      *
*        SOURCE VALUE INTERVAL NO.
13305301       0.0          5     *
*         CONTROL WORD
13305400       -1
13305401   595.04 590.33 585.60 580.85 576.08 571.29
*          BOUND.VOLUME  INCRE  TYPE  S.AREA  CODE  VALUE   H.STR.NO
13305501    330050000      0      1        1       0.04        1   *
*          BOUND.VOLUME  INCRE  TYPE  S.AREA  CODE  VALUE   H.STR.NO
13305601    330280000      0      1        1       0.04        1   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13305701      0             0           0                    0              1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
13305801    0      0.102       0.0         0.0             1     *
13305901    0      0.102       0.0         0.0             1     *
*
*****************************************************************************
*PIPE UPTO PUMP INLET
*****************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
13400000   08    8     2      1      0.02305      *
*          FLAG     FLAG
13400100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
13400101      4               0.041752      *
13400102      3               0.071752      *
*         COMPOSITION NO.  INTERVAL NO.
13400201       5                4      *
13400202       9                7      *
*        SOURCE VALUE INTERVAL NO.
13400301       0.0          7     *
*          TEMP   POINT NO
13400401   455.76    8   *
*          BOUND.VOLUME  INCRE  TYPE  S.AREA  CODE  VALUE   H.STR.NO
13400501    340010000    10000    1        1       0.7300      3   *
13400502    340040000    00000    1        1       0.8490      4   *
13400503    340050000    00000    1        1       0.7320      5   *
```

```
13400504    340060000    00000    1        1       0.7114      6  *
13400505    340070000    10000    1        1       0.5920      8  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
13400601       -919        0    3982       1       0.7300      3  *
13400602       -919        0    3982       1       0.8490      4  *
13400603       -919        0    3982       1       0.7320      5  *
13400604       -919        0    3982       1       0.7114      6  *
13400605       -919        0    3982       1       0.5920      8  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13400701      0            0          0                   0            8  *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
13400801    0      0.0461      0.0         0.0            8     *
*
*************************************************************************
*PUMP
*************************************************************************
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
13500000   01  10     2      1      0.03250     *
*          FLAG     FLAG
13500100     0        1    *
*          NO INTERVAL  RIGHT COORDINATE
13500101      9              0.1467212    *
*         COMPOSITION NO. INTERVAL NO.
13500201       5                9      *
*        SOURCE VALUE INTERVAL NO.
13500301       0.0            9     *
*         TEMP  POINT NO
13500401   455.60   10   *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
13500501    350010000    00000    1        1       0.7142      1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
13500601       -919        0    3983       1       0.7142      1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13500701      0            0          0                   0            1  *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
13500801    0      0.0650      0.0         0.0            1     *
*
*
*************************************************************************
*PIPE WITH MEASUREMENT INSERT & RESISTANCE SIMULATOR
*************************************************************************
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
13600000   01   8     2      1      0.02305     *
*          FLAG     FLAG
13600100     0        1    *
*          NO INTERVAL  RIGHT COORDINATE
13600101      4              0.057466     *
13600102      3              0.087466     *
*         COMPOSITION NO. INTERVAL NO.
13600201       5                4      *
13600202       9                7      *
*        SOURCE VALUE INTERVAL NO.
13600301       0.0            7     *
*         TEMP  POINT NO
13600401   477.25    8   *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
13600501    355010000    00000    1        1       0.6415      1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
13600601       -919        0    3982       1       0.6415      1  *
```

```
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13600701      0           0          0                  0             1  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
13600801    0      0.0461      0.0         0.0            1     *
********
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
13601000   01   8     2     1      0.02305     *
*          FLAG     FLAG
13601100     0        1   *
*          NO INTERVAL  RIGHT COORDINATE
13601101      4             0.057466     *
13601102      3             0.087466     *
*         COMPOSITION NO. INTERVAL NO.
13601201       5               4      *
13601202       9               7      *
*        SOURCE VALUE INTERVAL NO.
13601301       0.0          7     *
*         TEMP  POINT NO
13601401   477.25   8  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13601501    360010000   00000   1        1       0.6415      1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13601601       -919        0   3982       1       0.6415      1  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13601701      0           0          0                  0             1  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
13601801    0      0.0461      0.0         0.0            1     *
********
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
13602000   02   8     2     1      0.02305     *
*          FLAG     FLAG
13602100     0        1   *
*          NO INTERVAL  RIGHT COORDINATE
13602101      4             0.030158     *
13602102      3             0.060158     *
*         COMPOSITION NO. INTERVAL NO.
13602201       5               4      *
13602202       9               7      *
*        SOURCE VALUE INTERVAL NO.
13602301       0.0          7     *
*         TEMP  POINT NO
13602401   429.43   8  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13602501    360020000   10000   1        1       0.2980      2  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13602601       -919        0   3982       1       0.2980      2  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13602701      0           0          0                  0             2  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
13602801    0      0.0461      0.0         0.0            2     *
*
*************************************************************************
*LEAK ASSEMBLY I
*************************************************************************
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
13700000   01   5     2     1      0.02305     *
*          FLAG     FLAG
13700100     0        1   *
*          NO INTERVAL  RIGHT COORDINATE
```

```
13700101      4                0.030158     *
*         COMPOSITION NO. INTERVAL NO.
13700201       5                 4      *
*        SOURCE VALUE INTERVAL NO.
13700301       0.0           4     *
*         TEMP  POINT NO
13700401  564.30    5  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13700501   370010000   00000   1        1       0.2250      1  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13700601       -919        0   3982       1       0.2250      1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13700701      0            0          0                    0              1  *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
13700801   0      0.0461      0.0         0.0             1     *
*
*********************************************************************
*LEAK DISCHARGE LINE WITH MEASUREMENT INSERT
*********************************************************************
* *          NH  NP  G.TYPE FLAG LEFT BOUNDARY
* 13800000  04   5    2      1      0.02305     *
* *          FLAG    FLAG
* 13800100    0       1   *
* *          NO INTERVAL  RIGHT COORDINATE
* 13800101      4               0.047802     *
* *         COMPOSITION NO. INTERVAL NO.
* 13800201       5                 4      *
* *        SOURCE VALUE INTERVAL NO.
* 13800301       0.0           4     *
* *         TEMP  POINT NO
* 13800401  567.2     5  *
* *          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
* 13800501   380010000   10000   1        1       0.3630      4  *
* *          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
* 13800601       -919        0   3982       1       0.3630      4  *
* *        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
* 13800701      0            0          0                    0              4  *
* *        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
* 13800801   0      0.0461      0.0         0.0             4     *
* *
*********************************************************************
*LEAK ASSEMBLY II
*********************************************************************
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
13900000  01   5    2      1      0.02305     *
*          FLAG    FLAG
13900100    0       1   *
*          NO INTERVAL  RIGHT COORDINATE
13900101      4               0.030158     *
*         COMPOSITION NO. INTERVAL NO.
13900201       5                 4      *
*        SOURCE VALUE INTERVAL NO.
13900301       0.0           4     *
*         TEMP  POINT NO
13900401  564.29    5  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13900501   390010000   00000   1        1       0.2250      1  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
13900601       -919        0   3982       1       0.2250      1  *
```

```
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13900701      0            0          0                   0            1  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
13900801    0      0.0461      0.0         0.0            1     *
*
*************************************************************************
*PIPE WITH MEASUREMENT INSERT & VESSEL INLET
*************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
13950000   02    8     2      1      0.02305     *
*          FLAG     FLAG
13950100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
13950101       4              0.065682     *
13950102       3              0.095682     *
*         COMPOSITION NO. INTERVAL NO.
13950201        5               4      *
13950202        9               7      *
*        SOURCE VALUE INTERVAL NO.
13950301        0.0          7     *
*         TEMP   POINT NO
13950401   485.15    8   *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
13950501    395010000   10000    1        1       0.3170      2  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
13950601        -919        0    3982       1       0.3170      2  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13950701      0            0          0                   0            2  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
13950801    0      0.0461      0.0         0.0            2     *
*
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
13951000   01    8     2      1      0.02305     *
*          FLAG     FLAG
13951100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
13951101       4              0.065682     *
13951102       3              0.095682     *
*         COMPOSITION NO. INTERVAL NO.
13951201        5               4      *
13951202        9               7      *
*        SOURCE VALUE INTERVAL NO.
13951301        0.0          7     *
*         TEMP   POINT NO
13951401   485.15    8   *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
13951501    395030000   00000    1        1       0.7467      1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
13951601        -919        0    3982       1       0.7467      1  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
13951701      0            0          0                   0            1  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
13951801    0      0.0461      0.0         0.0            1     *
*
*
*PRESSURIZER
*
*
*PR CONTROL VARIABLES
```

```
*
20540000  DUMMY      SUM      1.          0.      1
20540001  0.    1.   CPUTIME 0
*
20540100  PA40       SUM      1.-6        0.      1
20540101  0.    1.     P      420070000
*
20540200  L1         SUM     1.-3         0.      1
20540201  0. .16977     HTRNR  400000101    .12127      HTRNR  400000201
+            .12127     HTRNR  400000301    .12127      HTRNR  400000401
+            .14673     HTRNR  400000501    .14261      HTRNR  400000601
+            .11714     HTRNR  400000701    .11714      HTRNR  400000801
+            .11714     HTRNR  400000901    .11714      HTRNR  400001001
+            .11714     HTRNR  400001101    .14140      HTRNR  400001201
+            .17705     HTRNR  400001301    .69492      HTRNR  410000101
+            .51459     HTRNR  420000101    .93172      HTRNR  420000201
+            .93172     HTRNR  420000301    .93172      HTRNR  420000401
+            .93172     HTRNR  420000501    .93172      HTRNR  420000601
20540300  L2         SUM        1.-3        0.      1
20540301 0.   .56077     HTRNR  420000701
*
20540400  LOSS-PR    SUM        1.       0.    1
20540401  0.     1.     CNTRLVAR  402        1.       CNTRLVAR   403
*
20540500  CL4340     SUM      1.        0.       1
20540501   0.    0.7900   VOIDF  410010000  0.5850   VOIDF   420010000
+              0.6375   VOIDF  420020000  0.6375   VOIDF   420030000
+              0.6375   VOIDF  420040000  0.6375   VOIDF   420050000
+              0.6375   VOIDF  420060000  0.6375   VOIDF   420070000
*              0.6325   VOIDF  420080000  0.6325   VOIDF   420090000
*              0.6325   VOIDF  420100000  0.6325   VOIDF   420110000
*
*PR VOLUMES
*
4000000 '84-12-12' PIPE * SURGE LINE
*     VOLUMES
4000001  13  *
*         AREA     VOL.NO.
4000101  .000137     13  *
*         J.AREA   JUN.NO.
4000201  .000000     12  *
*        LENGTH    VOL.NO.
4000301  0.7000      1     *
4000302  0.5000      4     *
4000303  0.6050      5     *
4000304  0.5880      6     *
4000305  0.4870     11     *
4000306  0.5830     12     *
4000307  0.7300     13     *
*         VOLUME   V.NO.
4000401  .0000000   13    *
*         H.A   V.NO.
4000501   0.0    13       *
*        V.ANGLE V.NO.
4000601  -45.585   01     *
4000602  -90.000   04     *
4000603  -55.735   05     *
4000604  +55.228   06     *
4000605  +90.000   11     *
```

```
4000606  +55.942  12     *
4000607  -59.657  13     *
*          ROUGH.   DIAM.   V.NO.
4000801     8.0-5 .0132     13     *
*          K(FORD)  K(REV)    J.NO.
4000901      00.16    00.16    01 *
4000902      00.00    00.00    04 *
4000903      00.32    00.32    05 *
4000904      00.00    00.00    11 *
4000905      00.32    00.32    12 *
*          FE    V.NO
4001001     00    13       *
*          CAHS J.NO.
4001101     0000 12       *
*        CONTROL   PRESSURE   ENERGY/TEMP   QUALITY     VOL NO.
4001201     0     15.758+6    1.4677+6        0. 0.     01   *
4001202     0     15.761+6    1.3172+6        0. 0.     02   *
4001203     0     15.765+6    1.3544+6        0. 0.     03   *
4001204     0     15.768+6    1.3888+6        0. 0.     04   *
4001205     0     15.772+6    1.4179+6        0. 0.     05   *
4001206     0     15.772+6    1.4461+6        0. 0.     06   *
4001207     0     15.769+6    1.4659+6        0. 0.     07   *
4001208     0     15.766+6    1.4774+6        0. 0.     08   *
4001209     0     15.762+6    1.4868+6        0. 0.     09   *
4001210     0     15.759+6    1.4954+6        0. 0.     10   *
4001211     0     15.756+6    1.5048+6        0. 0.     11   *
4001212     0     15.753+6    1.5168+6        0. 0.     12   *
4001213     0     15.754+6    1.5377+6        0. 0.     13   *
*         CONTROL
4001300     0
*        LIQUID VEL          VAPOUR VEL   INTERFACE VEL.   JUN NO.
4001301    -4.2163-3        -4.2163-3          0.0           1     *
4001302    -4.3702-3        -4.3702-3          0.0           2     *
4001303    -4.5401-3        -4.5401-3          0.0           3     *
4001304    -4.7224-3        -4.7224-3          0.0           4     *
4001305    -4.9558-3        -4.9558-3          0.0           5     *
4001306    -5.1932-3        -5.1932-3          0.0           6     *
4001307    -5.3930-3        -5.3930-3          0.0           7     *
4001308    -5.5989-3        -5.5989-3          0.0           8     *
4001309    -5.8092-3        -5.8092-3          0.0           9     *
4001310    -6.0271-3        -6.0271-3          0.0          10     *
4001311    -6.2579-3        -6.2597-3          0.0          11     *
4001312    -6.5609-3        -6.5609-3          0.0          12     *
*
*
4100000 '84-12-12' BRANCH * LOWER VOLUME
*          NO.J    CONTROL
4100001     02      0          *
*         AREA    LENGTH    VOLUME   H.A. V.ANGLE   ELEVAT.   ROUGH   DIAM. FE
4100101 .006346 0.7900   .0000000   0.0 +90.000   +0.7900   8.0-5 .0260 00*
*  CONTROL PRESSURE    ENERGY         QUALITY
4100200  0  15.758+6   1.5845+6         0.0   *
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS
4101101   400010000    410010000  .000000   00.00   00.00 0100    *
4102101   410010000    420000000  .000000   00.00   00.00 0000    *
*        LIQUID VEL VAPOR VEL.     INTERFACE VEL
4101201   -7.0196-3  -7.0196-3     0.0              *
4102201   -1.7430-4  -1.7430-4     0.0              *
*
```

```
*
4200000 '84-12-12' PIPE * UPPER VOLUME
*     VOLUMES
4200001  07  *
*         AREA     VOL.NO.
4200101  .008227     1    *
4200102  .011962    07    *
*         J.AREA   JUN.NO.
4200201  .000000     06   *
*        LENGTH    VOL.NO.
4200301  0.5850     1     *
4200302  0.6375    07     *
*200303  0.6325    11     *
*         VOLUME   V.NO.
4200401  .0000000   07    *
*         H.A   V.NO.
4200501   0.0    07       *
*        V.ANGLE V.NO.
4200601  +90.000   07     *
*         ROUGH.   DIAM.   V.NO.
4200801    8.0-5 .0320     1     *
4200802    8.0-5 .1240    07     *
*          K(FORD)  K(REV)    J.NO.
4200901     00.00     00.00    06 *
*          FE    V.NO
4201001    00    07       *
*          CAHS J.NO.
4201101    0000   06      *
*       CONTROL   PRESSURE   ENERGY/TEMP   QUALITY     VOL NO.
4201201    0      15.754+6   1.5948+6      0. 0.       01    *
4201202    0      15.750+6   1.5971+6      0. 0.       02    *
4201203    0      15.746+6   1.5972+6      0. 0.       03    *
4201204    0      15.743+6   1.5972+6      0. 0.       04    *
4201205    0      15.739+6   1.5972+6      0. 0.       05    *
4201206    0      15.735+6   1.5974+6      0. 0.       06    *
4201207    0      15.731+6   1.5992+6      0. 0.       07    *
*        CONTROL
4201300    0
*       LIQUID VEL          VAPOUR VEL   INTERFACE VEL.   JUN NO.
4201301  -1.4880-4          -1.4880-4          0.0           01    *
4201302  -1.1877-4          -1.1877-4          0.0           02    *
4201303  -1.3520-4          -1.3520-4          0.0           03    *
4201304  -1.5163-4          -1.5163-4          0.0           04    *
4201305  -1.6809-4          -1.6809-4          0.0           05    *
4201306  -1.8478-4          -1.8478-4          0.0           06    *
*
*       'NAME'      TYPE
4210000 '84-12-12' SNGLJUN * PRESSURISER
*       FROM       TO          AREA
4210101 422000000 420010000 0.0  0.0  0.0  0000*
*         CONTROL       LIQUID V.     VAPOR V.   0
4210201     0           2.0339-4      2.0339-4     0.0 *
*       'NAME'      TYPE
4220000 '84-12-12' TMDPVOL * PRESSURISER (STEAM REGION)
*       AREA       LENGTH  VOLUME        0  ANGLE ELEV. ROUGHN DIAM     FE
4220101 0.011962    2.5300  0.0           0.  90.0 2.5300 8.-5  0.124    00*
*       CNTL TRIP  VARIABLE    CODE
4220200   1  501   TIME         0          *
*        SEARCH VAR.    FLUID COND. (2 QUANTITIES)
```

```
4220201   0.              619.10        0. *  619.16
*
*PR STRUCTURES
*
*************************************************************************
*PRESSURISER  - SURGE LINE
*************************************************************************
*         NH  NP  G.TYPE FLAG LEFT BOUNDARY
14000000  13   7    2     1     0.0066     *
*         FLAG    FLAG
14000100    0       1   *
*         NO INTERVAL  RIGHT COORDINATE
14000101     3             0.0086      *
14000102     3             0.0386      *
*        COMPOSITION NO. INTERVAL NO.
14000201      5               3     *
14000202      9               6     *
*       SOURCE VALUE INTERVAL NO.
14000301      0.0          6    *
*        TEMP  POINT NO
14000401  405.00   7  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
14000501   400010000   00000   1        1      0.7000      1  *
14000502   400020000   10000   1        1      0.5000      4  *
14000503   400050000   00000   1        1      0.6050      5  *
14000504   400060000   00000   1        1      0.5880      6  *
14000505   400070000   10000   1        1      0.4830     11  *
14000506   400120000   00000   1        1      0.5830     12  *
14000507   400130000   00000   1        1      0.7300     13  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
14000601      -919        0   3959       1      0.7000      1  *
14000602      -919        0   3959       1      0.5000      4  *
14000603      -919        0   3959       1      0.6050      5  *
14000604      -919        0   3959       1      0.5880      6  *
14000605      -919        0   3959       1      0.4830     11  *
14000606      -919        0   3959       1      0.5830     12  *
14000607      -919        0   3959       1      0.7300     13  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
14000701     0            0          0                   0           13  *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
14000801   0     0.0132     0.0         0.0          13    *
*
*************************************************************************
*PRESSURISER  - LOWER VOLUME
*************************************************************************
*         NH  NP  G.TYPE FLAG LEFT BOUNDARY
14100000   1   9    2     1     0.062      *
*         FLAG    FLAG
14100100    0       1   *
*         NO INTERVAL  RIGHT COORDINATE
14100101     5             0.0800      *
14100102     3             0.1400      *
*        COMPOSITION NO. INTERVAL NO.
14100201      5               5     *
14100202      9               8     *
*       SOURCE VALUE INTERVAL NO.
14100301      0.0          8   *
*        TEMP  POINT NO
14100401  470.35  9   *
```

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*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
14100501    410010000      0     1        1       0.7900      1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
14100601       -919        0    3959      1       0.7900      1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
14100701      0            0          0                   0           1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
14100801    0      0.0260      0.0         0.0            1    *
*
*
*********************************************************************
*PRESSURISER  - UPPER VOLUME
*********************************************************************
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
14200000   07   9     2     1      0.062       *
*          FLAG    FLAG
14200100     0       1   *
*          NO INTERVAL  RIGHT COORDINATE
14200101      5              0.0800      *
14200102      3              0.1400      *
*         COMPOSITION NO.. INTERVAL NO.
14200201       5               5     *
14200202       9               8     *
*        SOURCE VALUE INTERVAL NO.
14200301       0.0           8   *
*         TEMP  POINT NO
14200401   471.21  9   *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
14200501    420010000    00000  1        1       0.5850      1  *
14200502    420020000    10000  1        1       1.0592     07  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
14200601       -919        0    3959      1       0.5850      1  *
14200602       -919        0    3959      1       1.0592     07  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
14200701      0            0          0                   0           07   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
14200801    0      0.0320      0.0         0.0            07   *
*
*
*STEAM GENERATOR I
*
*
*SG1 CONTROL VARIABLES
*
20550000     DUMMY     SUM       1.        0.       1
20550001     0.        1.        CPUTIME       0
*  LIQUID MASS INVENTORY
20550100     V50501     MULT   0.0060126    0     1*F.W INLET RING (50501)
20550200     V51001     MULT   0.0103929    0     1*DOWNCOMER      (51001)
20550300     V51002     MULT   0.0073971    0     1*DOWNCOMER      (51002)
20550400     V51003     MULT   0.0073971    0     1*DOWNCOMER      (51003)
20550500     V51004     MULT   0.0073971    0     1*DOWNCOMER      (51004)
20550600     V51005     MULT   0.0073971    0     1*DOWNCOMER      (51005)
20550700     V51006     MULT   0.0073971    0     1*DOWNCOMER      (51006)
20550800     V51007     MULT   0.0073971    0     1*DOWNCOMER      (51007)
20550900     V51008     MULT   0.0073971    0     1*DOWNCOMER      (51008)
20551000     V51009     MULT   0.0073971    0     1*DOWNCOMER      (51009)
20551100     V51010     MULT   0.0073971    0     1*DOWNCOMER      (51010)
20551200     V51011     MULT   0.0063216    0     1*DOWNCOMER      (51011)
```

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20551400    V52001     MULT   0.0155843    0     1*RISER/BOILER    (52001)
20551500    V52002     MULT   0.0182357    0     1*RISER/BOILER    (52002)
20551600    V52003     MULT   0.0182357    0     1*RISER/BOILER    (52003)
20551700    V52004     MULT   0.0182357    0     1*RISER/BOILER    (52004)
20551800    V52005     MULT   0.0182357    0     1*RISER/BOILER    (52005)
20551900    V52006     MULT   0.0182357    0     1*RISER/BOILER    (52006)
20552000    V52007     MULT   0.0182357    0     1*RISER/BOILER    (52007)
20552100    V52008     MULT   0.0182357    0     1*RISER/BOILER    (52008)
20552200    V52009     MULT   0.0182357    0     1*RISER/BOILER    (52009)
20552300    V52010     MULT   0.0182357    0     1*RISER/BOILER    (52010)
20552400    V52011     MULT   0.0306013    0     1*RISER/BOILER    (52011)
20552500    V52012     MULT   0.0321193    0     1*RISER/BOILER    (52012)
20552600    V52013     MULT   0.0388078    0     1*RISER/BOILER    (52013)
20552700    V52014     MULT   0.0333336    0     1*RISER/BOILER    (52014)
20552800    V52015     MULT   0.0729641    0     1*RISER/BOILER    (52015)
20552900    V53001     MULT   0.0580046    0     1*SEPERATOR       (53001)
20553000    V54001     MULT   0.0995201    0     1*DOWNCOMER       (54001)
20553100    V54002     MULT   0.0773596    0     1*DOWNCOMER       (54002)
20553200    M1         SUM    1.0          0     1* MASS INVENTORY
20553300    T2         SUM    1.0          0     1* MASS INVENTORY
20553400    INVENT1    SUM    1.0          0     1*TOTAL MASS INVENTORY SG1
**********
20553500    V50501     MULT   0.0517077    0     1*DOWNCOMER       (55001)
**********
20550101    RHOF    505010000    VOIDF    505010000
20550201    RHOF    510010000    VOIDF    510010000
20550301    RHOF    510020000    VOIDF    510020000
20550401    RHOF    510030000    VOIDF    510030000
20550501    RHOF    510040000    VOIDF    510040000
20550601    RHOF    510050000    VOIDF    510050000
20550701    RHOF    510060000    VOIDF    510060000
20550801    RHOF    510070000    VOIDF    510070000
20550901    RHOF    510080000    VOIDF    510080000
20551001    RHOF    510090000    VOIDF    510090000
20551101    RHOF    510100000    VOIDF    510100000
20551201    RHOF    510110000    VOIDF    510110000
****
20551401    RHOF    520010000    VOIDF    520010000
20551501    RHOF    520020000    VOIDF    520020000
20551601    RHOF    520030000    VOIDF    520030000
20551701    RHOF    520040000    VOIDF    520040000
20551801    RHOF    520050000    VOIDF    520050000
20551901    RHOF    520060000    VOIDF    520060000
20552001    RHOF    520070000    VOIDF    520070000
20552101    RHOF    520080000    VOIDF    520080000
20552201    RHOF    520090000    VOIDF    520090000
20552301    RHOF    520100000    VOIDF    520100000
20552401    RHOF    520110000    VOIDF    520110000
20552501    RHOF    520120000    VOIDF    520120000
20552601    RHOF    520130000    VOIDF    520130000
20552701    RHOF    520140000    VOIDF    520140000
20552801    RHOF    520150000    VOIDF    520150000
****
20552901    RHOF    530010000    VOIDF    530010000
****
20553001    RHOF    540010000    VOIDF    540010000
20553101    RHOF    540020000    VOIDF    540020000
****
20553201    0.  1.0   CNTRLVAR 501 1.0   CNTRLVAR 502
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+                1.0    CNTRLVAR 503   1.0   CNTRLVAR 504
+                1.0    CNTRLVAR 505   1.0   CNTRLVAR 506
+                1.0    CNTRLVAR 507   1.0   CNTRLVAR 508
+                1.0    CNTRLVAR 509   1.0   CNTRLVAR 510
+                1.0    CNTRLVAR 511   1.0   CNTRLVAR 512
+                1.0    CNTRLVAR 514   1.0   CNTRLVAR 515
+                1.0    CNTRLVAR 516   1.0   CNTRLVAR 517
20553301    0.  1.0    CNTRLVAR 518   1.0   CNTRLVAR 519
+                1.0    CNTRLVAR 520   1.0   CNTRLVAR 521
+                1.0    CNTRLVAR 522   1.0   CNTRLVAR 523
+                1.0    CNTRLVAR 524   1.0   CNTRLVAR 525
+                1.0    CNTRLVAR 526   1.0   CNTRLVAR 527
+                1.0    CNTRLVAR 528   1.0   CNTRLVAR 529
+                1.0    CNTRLVAR 530   1.0   CNTRLVAR 531
+                1.0    CNTRLVAR 535
20553401    0.  1.0    CNTRLVAR 532   1.0   CNTRLVAR 533
********
20553501    RHOF    550010000    VOIDF    550010000
*  HEAT LOSSES
20554300  LOSS-S1  SUM   1.-3  0.       1
*         A0   SURFACE AREA  VAR.  CODE    SURFACE AREA VAR.     CODE
20554301  0    0.59223       HTRNR 550000101
+              1.1903        HTRNR 510000101  0.84721   HTRNR  510000201
+              0.84721       HTRNR 510000301  0.84721   HTRNR  510000401
+              0.84721       HTRNR 510000501  0.84721   HTRNR  510000601
+              0.84721       HTRNR 510000701  0.84721   HTRNR  510000801
+              0.84721       HTRNR 510000901  0.84721   HTRNR  510001001
+              0.72403       HTRNR 510001101
+              1.5886        HTRNR 540000101
+              1.3909        HTRNR 540100101
+              1.2332        HTRNR 520100101
+              0.79247       HTRNR 560000101
+              0.20284       HTRNR 560100101
20554400     PA97S   SUM     1.-6     0.       1
20554401      0.     1.      P      560010000
20554500     TF95B   SUM     1.       0.       1
20554501     -273.15 1.    TEMP     520010000
20554600     TF95N   SUM     1.       0.       1
20554601     -273.15 1.    TEMP     520110000
20554700     TF97T   SUM     1.       0.       1
20554701     -273.15 1.    TEMP     560010000
20554800     CM93G   SUM     1.       0.       1
20554801      0.     1.    MFLOWJ   510070000
20554900     CM65    SUM     1.       0.       1
20554901      0.     1.    MFLOWJ   560010000
*  EXIT POWER (MW), ENERGY MJ
20555000   DELTAU    SUM     1.       0.       1
20555001      0.     1.  U  560010000   -1.   U  500010000
20555100   POWSGI    MULT    1.-6     0.       1
20555101      CNTRLVAR    550     MFLOWJ      560010000
20555300   HTSGI  INTEGRAL  1.0      0.       1
20555301   CNTRLVAR  551
*
*LIQUID LEVEL
20555200    CL93BN    SUM  1.000     0       1* STEAM GEN. SEC. SIDE
*         A0     LENGTH      VAR.  CODE      LENGTH     VAR.     CODE
20555201 0.0     0.671      VOIDF 520150000   0.860    VOIDF  540010000
+              0.843      VOIDF 540020000   0.433    VOIDF  550010000
+              0.870      VOIDF 510010000   0.619    VOIDF  510020000
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+                0.619       VOIDF 510030000   0.619     VOIDF  510040000
+                0.619       VOIDF 510050000   0.619     VOIDF  510060000
+                0.619       VOIDF 510070000   0.619     VOIDF  510080000
+                0.619       VOIDF 510090000   0.619     VOIDF  510100000
+                0.529       VOIDF 510110000
*
*SG1 CONTROLLER
*
*  STEAM FLOW CONTROL
*
20556800  DT       SUM  1.     0.  1
20556801  652.00     -1.-4    P     560010000
*0556801  566.86    -1. TEMPF     270010000
20556900  DEADBAND    FUNCTION    1.0     0.    1
20556901  CNTRLVAR  568    502
*
*
20557000  INTDELT  INTEGRAL  1.  0.  1
20557001  CNTRLVAR  569
20557100  STEMPOS  SUM  1.  0.0666  0  3  0.  1.     *0.0666
20557101  0.0666 -.0144  CNTRLVAR  569  -.0015  CNTRLVAR  570  *0.0666
*
20557200  LVLERR  SUM  1.0   0.  1
*INPUT LIQUID LEVEL
20557201  8.33         -1.  CNTRLVAR     552
20557300  FEEDMULT  FUNCTION  1.  1.  1
20557301  CNTRLVAR 572    503
*
*
20557400  FEEDFLOW  MULT  1.  2.0  0
20557401  CNTRLVAR  573      MFLOWJ    560010000    CNTRLVAR    575
20557500  CLOSE  FUNCTION    1.0    1.0    0 *
20557501  CNTRLVAR     576     576
20557600  ARGUM  MULT         1.0  0.0   0
20557601  CNTRLVAR      578          CNTRLVAR      579
20557700  TRIPT  TRIPDLAY    1.0  0.0   1
20557701  506
20557800  ARGUM  SUM          1.0  0.0   1
20557801  0.   1.     TIME 0     -1.    CNTRLVAR     577
20557900  ONOFF      TRIPUNIT     1.      0.      0
20557901  506
* PRESSURE DROPS
*
20559100     PD-BS      SUM  1.-6       0        1* B & S (DOWNCOMER)
20559200     PD-RS      SUM  1.-6       0        1* R & S (DOWNCOMER)
20559300     PD-ST      SUM  1.-6       0        1* S & T
20559400     PD93FB10   SUM  1.-6       0        1* PD93FB10
20559500     PD95BF06   SUM  1.-6       0        1* PD95BF06
*
20559101     0.0      0.5  P  510110000  0.5      P    520010000
+                1.471 RHO  510110000  1.471 RHO    520010000
+                  -1.0  P  520150000 -1.814    RHO 520150000
20559201     0.0      1.0  P  540020000  1.647    RHO 540020000
+                  -1.0  P  520150000 -1.814    RHO 520150000
20559301     0.0      1.0  P  520150000  1.814    RHO 520150000
+                  -1.0  P  560010000  1.765    RHO 560010000
20559401     0.0      1.0  P  510090000 -2.765    RHO 510090000
+                  -0.5  P  510110000  -0.5  P      520010000
+                -1.471 RHO 510110000  -1.471 RHO   520010000
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20559501     0.0       0.5   P  510110000   0.5        P  520010000
+                    1.471 RHO 510110000   1.471    RHO 520010000
+                     -1.0   P  520030000   2.765    RHO 520030000
*
*
*SG1 VOLUMES
*
*        'NAME'      TYPE
5000000 '84-12-15' TMDPVOL * FEED WATER INLET
*        AREA        LENGTH   VOLUME        0   ANGLE ELEV. ROUGHN DIAM     FE
5000101 0.011698     0.5140    0.0          0.    0.0   0.0    8.-5  0.0532   00*
*        CNTL TRIP   VARIABLE    CODE
5000200    3  501    TIME         0           *
*         SEARCH VAR.    FLUID COND. (2 QUANTITIES)
5000201    0.   5.2395+6   486.06             * 54K SUBCOOLING
*
*        'NAME'      TYPE
5010000 '84-12-15' TMDPJUN * FEED WATER
*        FROM        TO          AREA
5010101 500000000 505000000 0.0   *
*          CNTL    TRIP NO. VARIABLE    CODE
5010200     1      501         CNTRLVAR   574
*          SEARCH VAR.   LIQUID V.     VAPOR V.   0
5010201     0.             0.0             0.0      0.0 *
5010202     3.0            3.0             0.0      0.0 *
*
5050000 '84-12-15' SNGLVOL * FEED WATER INLET RING
*         AREA    LENGTH    VOLUME   H.A. V.ANGLE   ELEVAT.   ROUGH   DIAM. FE
5050101 .000000 0.5140   .0060126   0.0 +00.000   +0.0000   8.0-5 .0532 00*
*  CONTROL PRESSURE    ENERGY      QUALITY
5050200  0    6.5380+6  9.5603+5  0.0        *
*
5100000 '84-12-15' ANNULUS * DOWNCOMER NARROW REGION
*      VOLUMES
5100001  11  *
*          AREA     VOL.NO.
5100101  .011950      11   *
*          J.AREA   JUN.NO.
5100201  .000000      10   *
*         LENGTH    VOL.NO.
5100301  0.8697       1    *
5100302  0.6190      10    *
5100303  0.5290      11    *
*          VOLUME   V.NO.
5100401  .0000000   11    *
*          H.A   V.NO.
5100501    0.0    11       *
*         V.ANGLE V.NO.
5100601  -90.000   11     *
*         ELEVAT. V.NO.
5100701 -0.8697       1    *
5100702 -0.6190      10    *
5100703 -0.5290      11    *
*          ROUGH.   DIAM.   V.NO.
5100801     2.0-5 .0240     11     *
*          K(FORD)  K(REV)    J.NO.
5100901      00.00    00.00    10 *
*          FE    V.NO
5101001     00     11      *
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*          CAHS J.NO.
5101101    0000 10      *
*        CONTROL   PRESSURE   ENERGY/TEMP   QUALITY     VOL NO.
5101201    0       6.5427+6   1.1903+6    1.-7  0.      1    *
5101202    0       6.5477+6   1.1912+6    0.    0.      2    *
5101203    0       6.5518+6   1.1921+6    0.    0.      3    *
5101204    0       6.5559+6   1.1929+6    0.    0.      4    *
5101205    0       6.5600+6   1.1937+6    0.    0.      5    *
5101206    0       6.5641+6   1.1944+6    0.    0.      6    *
5101207    0       6.5682+6   1.1950+6    0.    0.      7    *
5101208    0       6.5722+6   1.1956+6    0.    0.      8    *
5101209    0       6.5763+6   1.1961+6    0.    0.      9    *
5101210    0       6.5804+6   1.1965+6    0.    0.     10    *
5101211    0       6.5842+6   1.1970+6    0.    0.     11    *
*         CONTROL
5101300    0
*        LIQUID VEL./FLOW    VAPOUR VEL   INTERFACE VEL.   JUN NO.
5101301    1.6534            1.6534              0.0          01    *
5101302    1.6541            1.6541              0.0          02    *
5101303    1.6547            1.6547              0.0          03    *
5101304    1.6553            1.6553              0.0          04    *
5101305    1.6559            1.6559              0.0          05    *
5101306    1.6565            1.6565              0.0          06    *
5101307    1.6570            1.6570              0.0          07    *
5101308    1.6574            1.6574              0.0          08    *
5101309    1.6578            1.6578              0.0          09    *
5101310    1.6581            1.6581              0.0          10    *
*
* SINGLE JUNCTION
5150000 '84-12-15' SNGLJUN *DOWNCOMER TO RISER
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS   COEFFICIENT
5150101  510010000   520000000  .000000  02.00  02.00 0000 *  0.0
*       C.WORD    INIT L VEL INIT V VEL  INTERFACE VEL
5150201   0          1.6585       1.6585         0.0
*
5200000 '84-12-15' PIPE * BOILER
*      VOLUMES
5200001  15  *
*          AREA     VOL.NO.
5200101  .029460     10   *
5200102  .035186     11   *
5200103  .000000     13   *
5200104  .038760     14   *
5200105  .084842     15   *
*          J.AREA   JUN.NO.
5200201  .018000     11   *
5200202  .000000     12   *
5200203  .000000     14   *
*          LENGTH    VOL.NO.
5200301  0.5290      1     *
5200302  0.6190     10     *
5200303  0.8697     11     *
5200304  0.4327     12     *
5200305  0.8430     13     *
5200306  0.8600     14     *
5200307  0.6710     15     *
*          VOLUME   V.NO.
5200401  .0000000   11    *
5200402  .0321193   12    *
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5200403  .0388078  13    *
5200404  .0000000  15    *
*         H.A  V.NO.
5200501   0.0    15     *
*        V.ANGLE V.NO.
5200601  +90.000  15     *
*         ROUGH.   DIAM.   V.NO.
5200801    8.0-5 .0220     11     *
5200802    8.0-5 .3010     12     *
5200803    8.0-5 .2080     13     *
5200804    8.0-5 .3840     14     *
5200805    8.0-5 .1870     15     *
*          K(FORD)  K(REV)    J.NO.
5200901     00.00    00.00    10 *
5200902     10.00    10.00    11 *
5200903     00.00    00.00    14 *
*          FE    V.NO
5201001    00    15       *
*          CAHS J.NO.
5201101    0100 10        *
5201102    0000 11        *
5201103    0100 12        *
5201104    0000 14        *
*        CONTROL   PRESSURE   ENERGY/TEMP   QUALITY     VOL NO.
5201201    0       6.5827+6   1.2229+6   0.            0.        1    *
5201202    0       6.5783+6   1.2445+6   5.6428-3      0.        2    *
5201203    0       6.5740+6   1.2573+6   1.5323-2      0.        3    *
5201204    0       6.5702+6   1.2675+6   2.3110-2      0.        4    *
5201205    0       6.5666+6   1.2766+6   2.9969-2      0.        5    *
5201206    0       6.5633+6   1.2850+6   3.6336-2      0.        6    *
5201207    0       6.5600+6   1.2934+6   4.2730-2      0.        7    *
5201208    0       6.5568+6   1.3014+6   4.8766-2      0.        8    *
5201209    0       6.5536+6   1.3102+6   5.5392-2      0.        9    *
5201210    0       6.5506+6   1.3367+6   7.5149-2      0.       10    *
5201211    0       6.5465+6   1.2779+6   3.1683-2      0.       11    *
5201212    0       6.5332+6   1.3356+6   7.4957-2      0.       12    *
5201213    0       6.5307+6   1.2912+6   4.2206-2      0.       13    *
5201214    0       6.5275+6   1.2934+6   4.3933-2      0.       14    *
5201215    0       6.5245+6   1.2768+6   3.1757-2      0.       15    *
*         CONTROL
5201300    0
*        LIQUID VEL          VAPOUR VEL   INTERFACE VEL.   JUN NO.
5201301    0.68114             0.71749          0.0          01    *
5201302    0.76573             0.95481          0.0          02    *
5201303    0.89898             1.34450          0.0          03    *
5201304    1.00240             1.66780          0.0          04    *
5201305    1.09070             1.95450          0.0          05    *
5201306    1.17040             2.21450          0.0          06    *
5201307    1.24960             2.44540          0.0          07    *
5201308    1.32230             2.66880          0.0          08    *
5201309    1.40280             2.86540          0.0          09    *
5201310    1.68330             2.82440          0.0          10    *
5201311    1.66350             8.17690          0.0          11    *
5201312    1.05440             2.09390          0.0          12    *
5201313    0.88569             3.23600          0.0          13    *
5201314    0.90457             3.17130          0.0          14    *
*
5300000 '84-12-15' SEPARATR*
*         NO.J   CONTROL
```

```
5300001   03      0 *
*         AREA    LENGTH    VOLUME   H.A. V.ANGLE   ELEVAT.   ROUGH   DIAM. FE
5300101 .086445 0.6710   .0000000   0.0 +90.000   +0.6710   8.0-5 .0200 00*
*  CONTROL PRESSURE    ENERGY      QUALITY
5300200  0     6.5235+6    1.6642+6    0.31833  *
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS
5301101   530010000    560000000  .060000   00.00   00.00 0100    *
5302101   520010000    530010000  .040000   00.00   00.00 0100    *
5303101   530000000    540000000  .000000   00.00   00.00 0000    *
*        LIQUID VEL  VAPOR VEL.     INTERFACE VEL
5301201     0.20739     0.71729     0.0               *
5302201     0.35357     1.73770     0.0               *
5303201     2.30790    -2.9635-3    0.0               *
*
*
5400000 '84-12-15' ANNULUS * DOWNCOMER
*      VOLUMES
5400001    2  *
*          AREA     VOL.NO.
5400101   .115721      1  *
5400102   .091767      2  *
*          J.AREA   JUN.NO.
5400201   .000000     01  *
*         LENGTH    VOL.NO.
5400301   0.8600       1    *
5400302   0.8430       2    *
*          VOLUME   V.NO.
5400401   .0000000    2    *
*          H.A   V.NO.
5400501    0.0     2       *
*         V.ANGLE V.NO.
5400601   -90.000    2     *
*         ELEVAT. V.NO.
5400701   -0.8600    1     *
5400702   -0.8430    2     *
*          ROUGH.   DIAM.   V.NO.
5400801     8.0-5 .0830      1      *
5400802     8.0-5 .1050      2      *
*           K(FORD)  K(REV)    J.NO.
5400901      00.00    00.00    01  *
*           FE    V.NO
5401001     00      2       *
*           CAHS J.NO.
5401101     0000 01         *
*        CONTROL  PRESSURE  ENERGY/TEMP  QUALITY     VOL NO.
5401201     0     6.5239+6   1.8044+6    .42201  0.     1     *
5401202     0     6.5253+6   1.2769+6    .03176  0.     2     *
*         CONTROL
5401300     0
*        LIQUID VEL          VAPOUR VEL   INTERFACE VEL.   JUN NO.
5401301       3.2547           5.8826-4          0.0            1   *
*
5500000 '84-12-15' BRANCH *
*          NO.J    CONTROL
5500001     03      0         *
*         AREA    LENGTH    VOLUME   H.A. V.ANGLE   ELEVAT.   ROUGH   DIAM. FE
5500101 .011950 0.4327   .0000000   0.0 -90.000   -0.4327   8.0-5 .0240 00*
*  CONTROL PRESSURE    ENERGY      QUALITY
5500200  0    6.5380+6   1.1890+6   0.0      *
```

```
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS
5501101   505010000    550000000  .001608   00.00   00.00 0100    *
5502101   540010000    550000000  .000000   00.00   00.00 0100    *
5503101   550010000    510000000  .000000   00.00   00.00 0000    *
*        LIQUID VEL VAPOR VEL.     INTERFACE VEL
5501201      0.21351  0.21351      0.0              *
5502201      2.5109  -1.6108       0.0              *
5503201      1.6524   1.6524       0.0              *
*
5600000 '84-12-15' BRANCH * STEAM DOME
*         NO.J   CONTROL
5600001    01      0 *
*         AREA    LENGTH    VOLUME  H.A. V.ANGLE  ELEVAT.  ROUGH  DIAM. FE
5600101 .000000 0.4290   .0660335  0.0 +90.000   0.4290   8.0-5 .4610 00*
*   CONTROL PRESSURE    ENERGY      QUALITY
5600200   0    6.5230+6    2.5856+6   1.0   *
*
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS
5601101   560010000    700000000  .000000   00.00   00.00 0100    *
*        LIQUID VEL VAPOR VEL.     INTERFACE VEL
5601201   16.628      16.628       0.0              *
*
*SG1 SEC STRUCTURES
*
*************************************************************************
*STEAM GENERATOR(SECONDARY SIDE)_FEED WATER INLET
*************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
15000000    1   7      2      1      0.0350      *
*          FLAG     FLAG
15000100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
15000101      6               0.045        *
*         COMPOSITION NO. INTERVAL NO.
15000201       5                6      *
*        SOURCE VALUE INTERVAL NO.
15000301       0.0            6     *
*         TEMP   POINT NO
15000401   532.05 7     *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
15000501   505010000       0      1        1       10.104      1   *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
15000601   550010000       0      1        1       10.104      1   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
15000701      0             0          0                    0            1    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
15000801      0      0.0532     0      10.104              1    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
15000901      0      0.024      0      10.104              1    *
*
*************************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_ DOWNCOMER NARROW REGION_OUTER WALL
*************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
15100000   11   10     2      1      0.16450     *
*          FLAG     FLAG
15100100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
15100101      4               0.187832     *
```

```
15100102      5                0.217832     *
*         COMPOSITION NO.  INTERVAL NO.
15100201       5                 4      *
15100202       9                 9      *
*        SOURCE VALUE INTERVAL NO.
15100301       0.0           9     *
*         TEMP   POINT NO
15100401   468.50 10    *
*          BOUND.VOLUME  INCRE  TYPE S.AREA CODE  VALUE   H.STR.NO
15100501    510010000      0      1        1       0.8697      1   *
15100502    510020000    10000    1        1       0.6190     10   *
15100503    510110000      0      1        1       0.5290     11   *
*          BOUND.VOLUME  INCRE  TYPE S.AREA CODE  VALUE   H.STR.NO
15100601       -919         0    3969       1       0.8697      1   *
15100602       -919         0    3969       1       0.6190     10   *
15100603       -919         0    3969       1       0.5290     11   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
15100701      0              0          0                    0            11   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
15100801    0      0.0240      0.0         0.0             11    *
*
*****************************************************************************
******          TUBE WRAPPER          ***************************************
*****************************************************************************
*          NH    NP    TYPE FLAG   LEFT BOUNDARY
15150000 12    3     2       1        0.1505 *
*          FLAG    FLAG
15150100    0     1     *
*          NO INTERV.,RIGHT COORD.   OR   MESH INTERV.,MESH NO
15150101     2            0.1525    *
*          COMPOS. NO    INTERV. NO
15150201     5         2             *
*          SOURCE   INTERV. NO
15150301   0.0         2             *
*          TEMP. ,   POINT NO             OR       TEMPS.
15150401   549.        3             *
*          VOLUME      INCRE     TYPE     AREA CODE    VALUE      STRUCT. NO
15150501   520010000    0000     1            1          0.529        1
15150502   520020000   10000     1            1          0.619       10
15150503   520110000    0000     1            1          0.8697      11
15150504   520120000    0000     1            1          0.4327      12
*          VOLUME      INCRE     TYPE     AREA CODE    VALUE      STRUCT. NO
15150601   510110000    0000     1            1          0.529        1
15150602   510100000  -10000     1            1          0.619       10
15150603   510010000    0000     1            1          0.8697      11
15150604   550010000    0000     1            1          0.4327      12
*          SOURCE TYPE   MULTI    DIRECT HEAT LEFT    DIRECT HEAT RIGHT   NO
15150701    0.            0.              0.                  0.          12
*          CHF FLAG    HYDR.DIAM   HEAT. DIAM    CHANN.LENGTH      STRUCT NO
15150801     0          0.022           0.             0.               12
*          CHF FLAG    HYDR.DIAM   HEAT. DIAM    CHANN.LENGTH      STRUCT NO
15150901     0          0.024           0.             0.               12
*
*****************************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_ FILLER TUBE
*****************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
15200000   11   4      2      1      0.07615     *
*          FLAG     FLAG
```

```
15200100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
15200101      3               0.08415      *
*         COMPOSITION NO. INTERVAL NO.
15200201       5                3      *
*        SOURCE VALUE INTERVAL NO.
15200301       0.0           3     *
*          TEMP   POINT NO
15200401   554.50   4    *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
15200501         0          0      0        1       0.5290      1   *
15200502         0          0      0        1       0.6190     10   *
15200503         0          0      0        1       0.6200     11   *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
15200601   520010000        0      1        1       0.5290      1   *
15200602   520020000    10000      1        1       0.6190     10   *
15200603   520110000        0      1        1       0.6200     11   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
15200701      0             0           0                    0            11    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
15200901      0      0.022      0          0.5290          1    *
15200902      0      0.022      0          0.6190         10    *
15200903      0      0.022      0          0.6200         11    *
*
*****************************************************************************
******      RISER TOP VOLUME OUTER WALL    ********************************
*****************************************************************************
*          NH    NP    TYPE FLAG  LEFT BOUNDARY
15201000   1     10    2       1       0.2335 *
*          FLAG    FLAG
15201100      0     1     *
*          NO INTERV.,RIGHT COORD.   OR   MESH INTERV.,MESH NO
15201101      6         0.2625 *
15201102      3         0.2925 *
*          COMPOS. NO    INTERV. NO
15201201      5             6  *
15201202      9             9  *
*          SOURCE   INTERV. NO
15201301    0.0             9  *
*          TEMP.     POINT NO           OR       TEMPS.
15201401    482.71        10  *
*          VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
15201501   520150000    0         1           1        0.671        1 *
*          VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
15201601    -919         0         3969        1        0.671        1 *
*          SOURCE TYPE   MULTI    DIRECT HEAT LEFT    DIRECT HEAT RIGHT   NO
15201701      0.            0.              0.                    0.          1 *
*          CHF FLAG    HYDR.DIAM   HEAT. DIAM    CHANN.LENGTH     STRUCT NO
15201801       0          0.187          0.              0.                    1 *
*
*****************************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_ COARSE SEPERATOR
*****************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
15202000    2   3      2      1      0.114       *
*          FLAG     FLAG
15202100      0        1    *
*          NO INTERVAL   RIGHT COORDINATE
15202101      2              0.115        *
```

```
*         COMPOSITION NO. INTERVAL NO.
15202201       5              2        *
*        SOURCE VALUE INTERVAL NO.
15202301       0.0            2    *
*         TEMP  POINT NO
15202401   554.26 3     *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
15202501   520140000       0     1        1       3.8450      1   *
15202502   520130000       0     1        1       1.9230      2   *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
15202601   540010000       0     1        1       3.8450      1   * I
15202602   540020000       0     1        1       1.9230      2   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
15202701      0            0          0                    0            2    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
15202801      0      0.384      0         3.8450          1    *
15202802      0      0.208      0         1.9230          2    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
15202901      0      0.083      0         3.8450          1    *
15202902      0      0.105      0         1.9230          2    *
*
*****************************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_ FINE SEPERATOR
*****************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
15203000    1  3      1      1      0.0          *
*          FLAG     FLAG
15203100     0         1    *
*          NO INTERVAL   RIGHT COORDINATE
15203101       2              0.001         *
*         COMPOSITION NO. INTERVAL NO.
15203201       5              2      *
*        SOURCE VALUE INTERVAL NO.
15203301       0.0            2     *
*         TEMP   POINT NO
15203401   554.21   3    *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
15203501   520150000       0     1        1       3.4         1   *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
15203601   530010000       0     1        1       3.4         1   * I
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
15203701      0            0          0                    0            1    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
15203801      0      0.187      0         0.3             1    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
15203901      0      0.020      0         0.3             1    *
*
*****************************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_TUBE SHEET1(ADJACENT TO INLET CHAMBER)
*****************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
15204000    1  5      2      1      0.0098      *
*          FLAG     FLAG
15204100     0         1    *
*          NO INTERVAL   RIGHT COORDINATE
15204101       4              0.0218        *
*         COMPOSITION NO. INTERVAL NO.
15204201       5              4      *
*        SOURCE VALUE INTERVAL NO.
```

```
15204301       0.0          4     *
*         TEMP  POINT NO
15204401   568.45 5     *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
15204501   230050000       0     1        1       2.16        1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
15204601   520110000       0     1        1       2.16        1  * I
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
15204701      0            0          0                  0            1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
15204801      0      0.156      0       2.16              1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
15204901      0      0.022      0       2.16              1   *
*
**************************************************************************
*STEAM GENERATOR(SECONDARY SIDE)_TUBE SHEET2(ADJACENT TO OUTLET CHAMBER)
**************************************************************************
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
15205000    1  5      2      1      0.0098      *
*          FLAG     FLAG
15205100     0        1   *
*          NO INTERVAL  RIGHT COORDINATE
15205101      4              0.0218       *
*         COMPOSITION NO. INTERVAL NO.
15205201       5               4     *
*        SOURCE VALUE INTERVAL NO.
15205301       0.0          4     *
*         TEMP  POINT NO
15205401   558.49 5     *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
15205501   230280000       0     1        1       2.16        1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
15205601   520110000       0     1        1       2.16        1  * I
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
15205701      0            0          0                  0            1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
15205801      0      0.156      0       2.16              1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
15205901      0      0.022      0       2.16              1   *
*
**************************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_ DOWNCOMER (VOLUME 54001)_OUTER WALL
**************************************************************************
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
15400000    1  10     2      1      0.2335      *
*          FLAG     FLAG
15400100     0        1   *
*          NO INTERVAL  RIGHT COORDINATE
15400101      6              0.2640       *
15400102      3              0.2940       *
*         COMPOSITION NO. INTERVAL NO.
15400201       5               6     *
15400202       9               9     *
*        SOURCE VALUE INTERVAL NO.
15400301       0.0          9     *
*         TEMP  POINT NO
15400401   484.15 10    *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
15400501    540010000      0     1        1       0.8600      1  *
```

```
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
15400601       -919        0   3969       1       0.8600      1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
15400701      0            0          0                   0            1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
15400801    0      0.0830      0.0         0.0            1     *
*
*************************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_ DOWNCOMER (VOLUME 54002)_OUTER WALL
*************************************************************************
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
15401000    1  10     2      1      0.2050      *
*          FLAG     FLAG
15401100     0        1    *
*          NO INTERVAL  RIGHT COORDINATE
15401101      6              0.2326       *
15401102      3              0.2626       *
*         COMPOSITION NO. INTERVAL NO.
15401201       5               6      *
15401202       9               9      *
*        SOURCE VALUE INTERVAL NO.
15401301       0.0          9     *
*         TEMP  POINT NO
15401401  479.97 10    *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
15401501    540020000      0      1        1       0.8430      1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
15401601       -919        0   3969       1       0.8430      1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
15401701      0            0          0                   0            1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
15401801    0      0.1050      0.0         0.0            1     *
*
*************************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_ DOWNCOMER NARROW REGION _OUTER WALL
*************************************************************************
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
15500000  01  10     2      1      0.16450     *
*          FLAG     FLAG
15500100     0        1    *
*          NO INTERVAL  RIGHT COORDINATE
15500101      4              0.187832     *
15500102      5              0.217832     *
*         COMPOSITION NO. INTERVAL NO.
15500201       5               4      *
15500202       9               9      *
*        SOURCE VALUE INTERVAL NO.
15500301       0.0          9     *
*         TEMP  POINT NO
15500401  468.11 10    *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
15500501    550010000      0      1        1       0.4327      1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
15500601       -919        0   3969       1       0.4327      1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
15500701      0            0          0                   0            1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
15500801    0      0.0240      0.0         0.0            1     *
*
```

```
*****************************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_ STEAM DOME_OUTER WALL
*****************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
15600000    1   10     2      1      0.2305      *
*          FLAG     FLAG
15600100     0         1    *
*          NO INTERVAL   RIGHT COORDINATE
15600101       5              0.2640       *
15600102       4              0.2940       *
*         COMPOSITION NO. INTERVAL NO.
15600201       5                5      *
15600202       9                9      *
*        SOURCE VALUE INTERVAL NO.
15600301       0.0            9    *
*         TEMP   POINT NO
15600401   468.93 10    *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
15600501    560010000      0      1        1       0.4290      1   *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
15600601       -919        0    3969       1       0.4290      1   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
15600701       0             0          0                  0            1    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
15600801    0      0.4610      0.0          0.0             1     *
*
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
15601000    1   10     1      1      0.0         *
*          FLAG     FLAG
15601100     0         1    *
*          NO INTERVAL   RIGHT COORDINATE
15601101       5              0.0320       *
15601102       4              0.0620       *
*         COMPOSITION NO. INTERVAL NO.
15601201       5                5      *
15601202       9                9      *
*        SOURCE VALUE INTERVAL NO.
15601301       0.0            9    *
*         TEMP   POINT NO
15601401   491.79 10    *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
15601501    560010000      0      1        1       0.202841    1   *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
15601601       -919        0    3969       1       0.202841    1   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
15601701       0             0          0                  0            1    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
15601801    0      0.4610      0.0          0.0             1     *
*
*
*STEAM GENERATOR II
*
*
*SG2 CONTROL VARIABLES
*
20560000     DUMMY     SUM       1.        0.       1
20560001     0.        1.        CPUTIME       0
*
*  LIQUID MASS INVENTORY
```

```
*
20560100    F          MULT   0.0018612    0     1*F.W INLET RING (60001)
20560200    D          MULT   0.0022861    0     1*DOWNCOMER      (61001)
20560300    D          MULT   0.0024592    0     1*DOWNCOMER      (61002)
20560400    D          MULT   0.0024592    0     1*DOWNCOMER      (61003)
20560500    D          MULT   0.0024592    0     1*DOWNCOMER      (61004)
20560600    D          MULT   0.0024592    0     1*DOWNCOMER      (61005)
20560700    D          MULT   0.0024592    0     1*DOWNCOMER      (61006)
20560800    D          MULT   0.0024592    0     1*DOWNCOMER      (61007)
20560900    D          MULT   0.0024592    0     1*DOWNCOMER      (61008)
20561000    D          MULT   0.0024592    0     1*DOWNCOMER      (61009)
20561100    D          MULT   0.0024592    0     1*DOWNCOMER      (61010)
20561200    D          MULT   0.0022196    0     1*DOWNCOMER      (61011)
20561300    D          MULT   0.0022861    0     1*DOWNCOMER      (65001)
20561400    R          MULT   0.0052485    0     1*RISER/BOILER   (62001)
20561500    R          MULT   0.0058150    0     1*RISER/BOILER   (62002)
20561600    R          MULT   0.0058150    0     1*RISER/BOILER   (62003)
20561700    R          MULT   0.0058150    0     1*RISER/BOILER   (62004)
20561800    R          MULT   0.0058150    0     1*RISER/BOILER   (62005)
20561900    R          MULT   0.0058150    0     1*RISER/BOILER   (62006)
20562000    R          MULT   0.0058150    0     1*RISER/BOILER   (62007)
20562100    R          MULT   0.0058150    0     1*RISER/BOILER   (62008)
20562200    R          MULT   0.0058150    0     1*RISER/BOILER   (62009)
20562300    R          MULT   0.0058150    0     1*RISER/BOILER   (62010)
20562400    R          MULT   0.0108557    0     1*RISER/BOILER   (62011)
20562500    R          MULT   0.0108557    0     1*RISER/BOILER   (62012)
20562600    R          MULT   0.0106890    0     1*RISER/BOILER   (62013)
20562700    R          MULT   0.0133332    0     1*RISER/BOILER   (62014)
20562800    R          MULT   0.0298122    0     1*RISER/BOILER   (62015)
20562900    S          MULT   0.0248491    0     1*SEPERATOR      (63001)
20563000    D          MULT   0.0303994    0     1*DOWNCOMER      (64001)
20563100    D          MULT   0.0206243    0     1*DOWNCOMER      (64002)
20563200    M1         SUM    1.0          0     1* MASS INVENTORY
20563300    M2         SUM    1.0          0     1* MASS INVENTORY
20563400    INVENT2    SUM    1.0          0     1*TOTAL MASS INVENTORY
*
20563500    CL83BN     SUM    1.000        0     1* STEAM GEN. SEC. SIDE
*
20560101    RHOF    605010000    VOIDF    605010000
20560201    RHOF    610010000    VOIDF    610010000
20560301    RHOF    610020000    VOIDF    610020000
20560401    RHOF    610030000    VOIDF    610030000
20560501    RHOF    610040000    VOIDF    610040000
20560601    RHOF    610050000    VOIDF    610050000
20560701    RHOF    610060000    VOIDF    610060000
20560801    RHOF    610070000    VOIDF    610070000
20560901    RHOF    610080000    VOIDF    610080000
20561001    RHOF    610090000    VOIDF    610090000
20561101    RHOF    610100000    VOIDF    610100000
20561201    RHOF    610110000    VOIDF    610110000
20561301    RHOF    650010000    VOIDF    650010000
*
*  EXIT POWER (MW),ENERGY (MJ)
20563600   DELTAU    SUM      1.          0.        1
20563601      0.     1.  U   660010000   -1.    U  600010000
20563700   POWSGII   MULT     1.-6        0.        1
20563701      CNTRLVAR    636      MFLOWJ       660010000
20563800   HWSGII    INTEGRAL  1.0     0.        1
20563801   CNTRLVAR 637
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*
****
20561401     RHOF     620010000     VOIDF     620010000
20561501     RHOF     620020000     VOIDF     620020000
20561601     RHOF     620030000     VOIDF     620030000
20561701     RHOF     620040000     VOIDF     620040000
20561801     RHOF     620050000     VOIDF     620050000
20561901     RHOF     620060000     VOIDF     620060000
20562001     RHOF     620070000     VOIDF     620070000
20562101     RHOF     620080000     VOIDF     620080000
20562201     RHOF     620090000     VOIDF     620090000
20562301     RHOF     620100000     VOIDF     620100000
20562401     RHOF     620110000     VOIDF     620110000
20562501     RHOF     620120000     VOIDF     620120000
20562601     RHOF     620130000     VOIDF     620130000
20562701     RHOF     620140000     VOIDF     620140000
20562801     RHOF     620150000     VOIDF     620150000
****
20562901     RHOF     630010000     VOIDF     630010000
****
20563001     RHOF     640010000     VOIDF     640010000
20563101     RHOF     640020000     VOIDF     640020000
****
20563201     0.   1.0    CNTRLVAR 601   1.0   CNTRLVAR 602
+                1.0    CNTRLVAR 603   1.0   CNTRLVAR 604
+                1.0    CNTRLVAR 605   1.0   CNTRLVAR 606
+                1.0    CNTRLVAR 607   1.0   CNTRLVAR 608
+                1.0    CNTRLVAR 609   1.0   CNTRLVAR 610
+                1.0    CNTRLVAR 611   1.0   CNTRLVAR 612
+                1.0    CNTRLVAR 613   1.0   CNTRLVAR 614
+                1.0    CNTRLVAR 615   1.0   CNTRLVAR 616
+                1.0    CNTRLVAR 617   1.0   CNTRLVAR 618
20563301     0.   1.0    CNTRLVAR 619   1.0   CNTRLVAR 620
+                1.0    CNTRLVAR 621   1.0   CNTRLVAR 622
+                1.0    CNTRLVAR 623   1.0   CNTRLVAR 624
+                1.0    CNTRLVAR 625   1.0   CNTRLVAR 626
+                1.0    CNTRLVAR 627   1.0   CNTRLVAR 628
+                1.0    CNTRLVAR 629   1.0   CNTRLVAR 630
+                1.0    CNTRLVAR 631
20563401     0.   1.0    CNTRLVAR 632   1.0   CNTRLVAR 633
*
*          A0      LENGTH      VAR.   CODE       LENGTH     VAR.     CODE
20563501   0.0     0.9254      VOIDF  640010000   0.8006   VOIDF   640020000
+                  0.5773      VOIDF  610010000   0.6210   VOIDF   610020000
+                  0.6210      VOIDF  610030000   0.6210   VOIDF   610040000
+                  0.6210      VOIDF  610050000   0.6210   VOIDF   610060000
+                  0.6210      VOIDF  610070000   0.6210   VOIDF   610080000
+                  0.6210      VOIDF  610090000   0.6210   VOIDF   610100000
+                  0.5605      VOIDF  610110000   0.5773   VOIDF   650010000
+                  0.9550      VOIDF  620150000
*
* PRESSURE DROPS
*
20564300     DNCOMBS    SUM   1.-6       0        1* B & S (DOWNCOMER)
20564400     DNCOMRS    SUM   1.-6       0        1* R & S (DOWNCOMER)
20564500     DNCSDOM    SUM   1.-6       0        1* S & T
20564600     PD83FB     SUM   1.-6       0        1* PD83FB76
20564700     PD85BF     SUM   1.-6       0        1* PD85BF62
*
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20564301     0.0      0.5   P   610110000   1.5512   RHO 610110000
+                     0.5   P   620010000   1.5512   RHO 620010000
+                    -1.0   P   640010000   3.9407   RHO 640010000
20564401     0.0      1.0   P   640020000   2.3083   RHO 640020000
+                    -1.0   P   640010000   3.9407   RHO 640010000
20564501     0.0      1.0   P   640010000  -3.9407   RHO 640010000
+                    -1.0   P   660010000  -0.5101   RHO 660010000
20564601     0.0      1.0   P   610090000  -2.3544   RHO 610090000
+                    -0.5   P   610110000  -1.5512   RHO 610110000
+                    -0.5   P   620010000  -1.5512   RHO 620010000
20564701     0.0      0.5   P   610110000   1.5512   RHO 610110000
+                     0.5   P   620010000   1.5512   RHO 620010000
+                    -1.0   P   620030000  -2.3544   RHO 620030000
*
* HEAT LOSSES
*
20566300     LOSS-S2    SUM   1.-3   0. 1*HEAT LOSS IN S.G
20566301  0     0.55370        HTRNR 650000101
+               0.55370        HTRNR 610000101   0.59562   HTRNR  610000201
+               0.59562        HTRNR 610000301   0.59562   HTRNR  610000401
+               0.59562        HTRNR 610000501   0.59562   HTRNR  610000601
+               0.59562        HTRNR 610000701   0.59562   HTRNR  610000801
+               0.59562        HTRNR 610000901   0.59562   HTRNR  610001001
+               0.53759        HTRNR 610001101
+               1.0089         HTRNR 640000101
+               0.78906        HTRNR 640100101
+               1.0921         HTRNR 620100101
+               0.25839        HTRNR 660000101
+               0.070910       HTRNR 660100101
*
*SG2 CONTROLLER
*
*STEAM FLOW CONTROLLER
*
20565100  DELTA-T     SUM         1.0    0.0     1
20565101  652.00   -1.-4    P      660010000
*0565101  566.46   -1.0     TEMP   395030000
*
20565200  DEADBAND    FUNCTION  1.0    0.0     1
20565201  CNTRLVAR   651       609
*
20565300   INTDELT         INTEGRAL  1.0    0.0    1
20565301   CNTRLVAR     652
*
*0565400   TCONTROL        SUM         1.0    0.0362  0  3  0.0  1.0 *.0362
*0565401   0.0362         -0.00469   CNTRLVAR 652    *.0362
*0565402                  -0.00047   CNTRLVAR 653
20565400  STEMPOS  SUM  1.  0.0666  0  3  0.  1.     *0.0666
20565401  0.0666 -.0144  CNTRLVAR  652  -.0015  CNTRLVAR  653  *0.0666
*
*LIQUID LEVEL CONTROLLER
*
20566400   SGLVLERR       SUM         1.0    0.0    1
20566401   9.10           -1.0      CNTRLVAR   635
*
20566500  FEEDMULT    FUNCTION  1.0    0.0     1
20566501  CNTRLVAR    664        604
*
20566600  FEEDFLOW    MULT   1.0    0.72    0
```

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20566601  CNTRLVAR   665  MFLOWJ  660010000   CNTRLVAR   667
20566700  CLOSE  FUNCTION   1.0   1.0   0 *
20566701  CNTRLVAR     668     576
20566800  ARGUM  MULT        1.0  0.0   0
20566801  CNTRLVAR     670       CNTRLVAR        671
20566900  TRIPT  TRIPDLAY   1.0  0.0   1
20566901  506
20567000  ARGUM  SUM         1.0  0.0   1
20567001  0.   1.    TIME 0   -1.    CNTRLVAR   669
20567100  ONOFF  TRIPUNIT   1.0  0.0   1
20567101  506
*  QUANTITIES TO BE PREDICTED
*
20567200      TF85B   SUM      1.        0.       1
20567201      -273.15 1.    TEMP      620010000
20567300      TF95K   SUM      1.        0.       1
20567301      -273.15 1.    TEMP      620110000
20567400      TF87T   SUM      1.        0.       1
20567401      -273.15 1.    TEMP      660010000
20567500      CM83G   SUM      1.        0.       1
20567501       0.     1.    MFLOWJ    610070000
20567600      CM66    SUM      1.        0.       1
20567601       0.     1.    MFLOWJ    660010000
*
*
*SGII VOLUMES
*
*       'NAME'      TYPE
6000000  '5-09-84' TMDPVOL * FEED WATER INLET
*       AREA       LENGTH  VOLUME        0  ANGLE ELEV. ROUGHN DIAM     FE
6000101 0.002788    0.6676   0.0          0.    0.0  0.0  2.0-5  0.0350  00*
*       CNTL TRIP  VARIABLE   CODE
6000200   0  501   TIME       0          *
*        SEARCH VAR. PRESSU   ENERGY  QUALITY
6000201   0.        6.0000+6  9.0559+5  0.      *
*
*       'NAME'      TYPE
6010000 '05-09-84' TMDPJUN * FEED WATER
*       FROM       TO         AREA
6010101 600000000 605000000 0.0  *
*         CNTL   TRIP NO. VARIABLE   CODE
6010200    1     501        CNTRLVAR 666 *
*         SEARCH VAR.  LIQUID V.    VAPOR V.  0
6010201    0.            0.0           0.0     0.0
6010202    1.5           1.5           0.0     0.0
*
6050000 '05-09-84' SNGLVOL * FEED WATER INLET RING
*        AREA   LENGTH   VOLUME  H.A. V.ANGLE  ELEVAT.  ROUGH  DIAM. FE
6050101 .000000 0.6676  .0018612  0.0 +00.000  +0.0000  2.0-5 .0350 00*
*  CONTROL PRESSURE   ENERGY     QUALITY
6050200  0  6.5331+6 9.7572+5     0.0     *
*
6100000 '05-09-84' ANNULUS * DOWNCOMER NARROW REGION
*     VOLUMES
6100001  11  *
*         AREA    VOL.NO.
6100101  .003960    11  *
*         J.AREA  JUN.NO.
6100201  .000000    10  *
```

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*          LENGTH    VOL.NO.
6100301   0.5773       1    *
6100302   0.6210      10    *
6100303   0.5605      11    *
*           VOLUME   V.NO.
6100401   .0000000   11    *
*           H.A   V.NO.
6100501    0.0    11        *
*          V.ANGLE V.NO.
6100601   -90.000   11     *
*          ELEVAT.  V.NO.
6100701  -0.5773       1    *
6100702  -0.6210      10    *
6100703  -0.5605      11    *
*           ROUGH.   DIAM.   V.NO.
6100801     2.0-5  .0120     11     *
*           K(FORD)  K(REV)    J.NO.
6100901      00.00     00.00    10 *
*           FE    V.NO
6101001     00     11       *
*           CAHS J.NO.
6101101     0000 10        *
*        CONTROL   PRESSURE   ENERGY/TEMP   QUALITY      VOL NO.
6101201     0       6.5375+6   1.1904+6    0.     0.       1    *
6101202     0       6.5410+6   1.1924+6    0.     0.       2    *
6101203     0       6.5445+6   1.1943+6    0.     0.       3    *
6101204     0       6.5480+6   1.1961+6    0.     0.       4    *
6101205     0       6.5516+6   1.1977+6    0.     0.       5    *
6101206     0       6.5551+6   1.1992+6    0.     0.       6    *
6101207     0       6.5586+6   1.2005+6    0.     0.       7    *
6101208     0       6.5621+6   1.2016+6    0.     0.       8    *
6101209     0       6.5656+6   1.2026+6    0.     0.       9    *
6101210     0       6.5691+6   1.2034+6    0.     0.      10    *
6101211     0       6.5725+6   1.2045+6    0.     0.      11    *
*          CONTROL
6101300     0
*        LIQUID VEL  VAPOUR VEL  INTERFACE VEL.   JUN NO.
6101301      1.5385   1.5385       0.               1    *
6101302      1.5400   1.5400       0.               2    *
6101303      1.5414   1.5414       0.               3    *
6101304      1.5426   1.5426       0.               4    *
6101305      1.5438   1.5438       0.               5    *
6101306      1.5449   1.5449       0.               6    *
6101307      1.5458   1.5458       0.               7    *
6101308      1.5467   1.5467       0.               8    *
6101309      1.5474   1.5474       0.               9    *
6101310      1.5479   1.5479       0.              10    *
*
* SINGLE JUNCTION
6150000 '05-09-84' SNGLJUN *DOWNCOMER TO RISER
*           CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS    COEFFICIENT
6150101   610010000    620000000  .000000  05.00  05.00 0000 *    4.0
*        C.WORD    INIT L VEL INIT V VEL   INTERFACE VEL          (4.20,4.20)
6150201    0      1.5487       1.5487     0.0 *
*
6200000 '05-09-84' PIPE * BOILER
*      VOLUMES
6200001   15  *
*           AREA     VOL.NO.
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```
6200101  .0093640    10   *
6200102  .0188043    12   *
6200103  .0133512    13   *
6200104  .0144080    14   *
6200105  .0312170    15   *
*         J.AREA   JUN.NO.
6200201  .008000     11   *
6200202  .000000     12   *
6200203  .014408     14   *
*        LENGTH    VOL.NO.
6200301  0.5605      1     *
6200302  0.6210     10     *
6200303  0.5773     12     *
6200304  0.8006     13     *
6200305  0.9254     14     *
6200306  0.9550     15     *
*         VOLUME   V.NO.
6200401  .0000000   15    *
*         H.A   V.NO.
6200501   0.0    15       *
*        V.ANGLE V.NO.
6200601  +90.000   15     *
*         ROUGH.   DIAM.   V.NO.
6200801    2.0-5 .0220     12     *
6200802    2.0-5 .1280     13     *
6200803    2.0-5 .2050     14     *
6200804    2.0-5 .1200     15     *
*          K(FORD)  K(REV)    J.NO.
6200901     00.00     00.00    14 *
*          FE    V.NO
6201001    00    15       *
*          CAHS J.NO.
6201101    0000 11        *
6201102    0100 12        *
6201103    0000 14        *
*        CONTROL  PRESSURE  ENERGY      QUALITY VOL NO.
6201201    0      6.5681+6  1.2301+6  0.       0.  1     *
6201202    0      6.5641+6  1.2485+6  9.18-3   0.  2     *
6201203    0      6.5603+6  1.2595+6  1.75-2   0.  3     *
6201204    0      6.5568+6  1.2695+6  2.51-2   0.  4     *
6201205    0      6.5536+6  1.2772+6  3.09-2   0.  5     *
6201206    0      6.5506+6  1.2839+6  3.60-2   0.  6     *
6201207    0      6.5476+6  1.2892+6  4.00-2   0.  7     *
6201208    0      6.5447+6  1.2944+6  4.40-2   0.  8     *
6201209    0      6.5419+6  1.3002+6  4.84-2   0.  9     *
6201210    0      6.5392+6  1.3136+6  5.84-2   0. 10     *
6201211    0      6.5369+6  1.2927+6  4.31-2   0. 11     *
6201212    0      6.5349+6  1.3379+6  7.66-2   0. 12     *
6201213    0      6.5323+6  1.2989+6  4.78-2   0. 13     *
6201214    0      6.5291+6  1.2911+6  4.22-2   0. 14     *
6201215    0      6.5253+6  1.2763+6  3.14-2   0. 15     *
*         CONTROL
6201300    0
*        LIQUID VEL VAPOUR VEL INTE. VEL. JUN NO.
6201301     0.77618  0.84912      0.0        1   *
6201302     0.92592  1.2529       0.0        2   *
6201303     1.05380  1.7128       0.0        3   *
6201304     1.16750  2.0506       0.0        4   *
6201305     1.24970  2.4014       0.0        5   *
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6201306      1.31920   2.7255        0.0         6    *
6201307      1.36870   3.0554        0.0         7    *
6201308      1.41640   3.3557        0.0         8    *
6201309      1.46960   3.6182        0.0         9    *
6201310      1.61820   3.6865        0.0        10    *
6201311      1.33400   4.8920        0.0        11    *
6201312      1.33390   2.2615        0.0        12    *
6201313      0.78444   2.5778        0.0        13    *
6201314      0.74125   2.7428        0.0        14    *
*
6300000 '05-09-84' SEPARATR*
*         NO.J    CONTROL
6300001    03       0 *
*         AREA    LENGTH     VOLUME   H.A. V.ANGLE   ELEVAT.   ROUGH   DIAM. FE
6300101 .026020 0.9550   .0000000    0.0 +90.000   +0.9550   2.0-5 .0100 00*
*   CONTROL PRESSURE    ENERGY      QUALITY
6300200   0  6.5236+6    1.6699+6    0.32253 *
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS
6301101   630010000   660000000  .020000   00.00   00.00 0100    *
6302101   620010000   630010000  .013000   00.00   00.00 0100    *
6303101   630000000   640000000  .000000   00.00   00.00 0000    *
*        LIQUID VEL VAPOR VEL.     INTERFACE VEL
6301201    -0.77395     0.75293     0.0              *
6302201     0.35417     1.79930     0.0              *
6303201     2.35840     1.6676-3    0.0              *
*
*
6400000 '05-09-84' ANNULUS * DOWNCOMER
*      VOLUMES
6400001    2  *
*          AREA     VOL.NO.
6400101   .032850      1  *
6400102   .025761      2  *
*          J.AREA   JUN.NO.
6400201   .000000     01  *
*         LENGTH    VOL.NO.
6400301   0.9254       1   *
6400302   0.8006       2   *
*          VOLUME   V.NO.
6400401   .0000000    2   *
*          H.A   V.NO.
6400501    0.0     2       *
*         V.ANGLE V.NO.
6400601   -90.000    2     *
*         ELEVAT.  V.NO.
6400701   -0.9254    1     *
6400702   -0.8006    2     *
*          ROUGH.   DIAM.   V.NO.
6400801     2.0-5 .0650      1      *
6400802     2.0-5 .0350      2      *
*          K(FORD)  K(REV)    J.NO.
6400901     00.00    00.00    01  *
*          FE    V.NO
6401001     00      2       *
*          CAHS J.NO.
6401101     0000 01         *
*        CONTROL   PRESSURE   ENERGY/TEMP   QUALITY     VOL NO.
6401201     0       6.5251+6   1.3019+6      5.03-2    0. 01    *
6401202     0       6.5305+6   1.2338+6      0.        0. 02    *
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*         CONTROL
6401300     0
*        LIQUID VEL          VAPOUR VEL   INTERFACE VEL JUN NO.
6401301       0.45005       -2.11600        0.0           1    *
*
6500000 '05-09-84' BRANCH *
*          NO.J    CONTROL
6500001     03      0          *
*         AREA    LENGTH    VOLUME   H.A. V.ANGLE   ELEVAT.   ROUGH   DIAM. FE
6500101 .003960 0.5773   .0000000   0.0 -90.000   -0.5773   2.0-5 .0120 00*
*  CONTROL PRESSURE    ENERGY      QUALITY
6500200  0 6.5343+6    1.1888+6   0.          *
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS
6501101   605010000    650000000  .000664   00.00   00.00 0100    *
6502101   640010000    650000000  .000000   00.00   00.00 0100    *
6503101   650010000    610000000  .000000   00.00   00.00 0000    *
*        LIQUID VEL VAPOR VEL.     INTERFACE VEL
6501201      0.28534  0.28534      0.0              *
6502201      1.34740  1.34740      0.0              *
6503201      1.53740  1.53740      0.0              *
*
6600000 '05-09-84' BRANCH * STEAM DOME
*          NO.J    CONTROL
6600001    01      0 *
*         AREA    LENGTH    VOLUME   H.A. V.ANGLE   ELEVAT.   ROUGH   DIAM. FE
6600101 .000000 0.2300   .0121690   0.0 +90.000   0.2300    2.0-5 .2640 00*
*  CONTROL PRESSURE    ENERGY      QUALITY
6600200  0 6.5232+6    2.5857+6    1.0    *
*          CODE(FROM)  CODE(TO)    AREA    K(FORD) K(REV)CAHS
6601101   660010000    710000000  .000000   00.00   00.00 0100    *
*        LIQUID VEL VAPOR VEL.     INTERFACE VEL
6601201     14.318     14.318       0.0              *
*
*
*************************************************************************
*STEAM GENERATOR(SECONDARY SIDE)_FEED WATER INLET
*************************************************************************
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
16000000    1  7      2      1      0.024       *
*          FLAG     FLAG
16000100     0        1    *
*          NO INTERVAL  RIGHT COORDINATE
16000101      6              0.031        *
*         COMPOSITION NO. INTERVAL NO.
16000201       5                6      *
*        SOURCE VALUE INTERVAL NO.
16000301       0.0            6     *
16000400       -1
*         TEMP  POINT NO
16000401  521.46  525.35  529.06  532.59  535.96  539.20  542.29
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
16000501  605010000       0     1        1       5.255       1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
16000601  650010000       0     1        1       5.255       1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
16000701      0             0           0                    0            1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
16000801       0      0.035      0       5.255             1    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
```

```
16000901      0      0.012      0       5.255              1    *
*
*STEAM GENERATOR (SECONDARY SIDE)_ DOWNCOMER NARROW REGION_OUTER WALL
*************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
16100000   11   10     2      1      0.108       *
*          FLAG     FLAG
16100100     0        1    *
*          NO INTERVAL   RIGHT COORDINATE
16100101      4              0.12265      *
16100102      5              0.15265      *
*         COMPOSITION NO.  INTERVAL NO.
16100201       5                4      *
16100202       9                9      *
*        SOURCE VALUE INTERVAL NO.
16100301       0.0           9     *
16100400       -1
*         TEMP   POINT NO
16100401   545.80   545.65   545.50   545.36   545.23   491.49   440.24
+          391.28   344.41   299.45
16100402   546.20   546.05   545.91   545.77   545.63   491.80   440.47
+          391.43   344.49   299.45
16100403   546.58   546.43   546.28   546.14   546.00   492.10   440.69
+          391.57   344.56   299.46
16100404   546.92   546.77   546.63   546.49   546.35   492.37   440.89
+          391.71   344.63   299.46
16100405   547.24   547.09   546.95   546.80   546.67   492.62   441.07
+          391.83   344.69   299.47
16100406   547.53   547.38   547.23   547.09   546.95   492.84   441.24
+          391.94   344.75   299.47
16100407   547.79   546.64   547.49   547.35   547.21   493.05   441.39
+          392.04   344.80   299.48
16100408   548.01   547.86   547.72   547.58   547.44   493.22   441.52
+          392.12   344.84   299.48
16100409   548.21   548.06   547.91   547.77   547.63   493.37   441.63
+          392.20   344.88   299.49
16100410   548.35   548.20   548.06   547.91   547.78   493.49   441.71
+          392.25   344.91   299.49
16100411   548.57   548.42   548.27   548.13   547.99   493.66   441.84
+          392.34   344.95   299.49
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
16100501    610010000      0     1       1      0.5773      1   *
16100502    610020000   10000    1       1      0.6210     10   *
16100503    610110000      0     1       1      0.5605     11   *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
16100601       -919        0   3979       1      0.5773      1   *
16100602       -919        0   3979       1      0.6210     10   *
16100603       -919        0   3979       1      0.5605     11   *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
16100701      0            0          0                   0            11   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
16100801    0      0.0120      0.0         0.0            11    *
*
*************************************************************************
******          TUBE WRAPPER        ***************************************
*************************************************************************
*          NH    NP    TYPE FLAG  LEFT BOUNDARY
16150000 13    3     2       1       0.1005 *
*          FLAG    FLAG
```

```
16150100    0     1     *
*           NO INTERV.,RIGHT COORD.   OR   MESH INTERV.,MESH NO
16150101      2            0.102     *
*           COMPOS. NO    INTERV. NO
16150201      5         2             *
*           SOURCE   INTERV. NO
16150301  0.0         2             *
16150400  -1
*           TEMP. ,   POINT NO              OR        TEMPS.
16150401  551.12   550.47   549.83*
16150402  549.99   549.58   549.18*
16150403  550.30   549.77   549.25*
16150404  550.47   549.85   549.23*
16150405  550.54   549.85   549.15*
16150406  550.59   549.81   549.04*
16150407  550.60   549.74   548.90*
16150408  550.58   549.65   548.73*
16150409  550.53   549.53   548.53*
16150410  550.41   549.34   548.28*
16150411  549.22   548.35   547.49*
16150412  549.05   548.15   547.26*
16150413  554.36   554.38   554.40*
*           VOLUME      INCRE     TYPE     AREA CODE    VALUE      STRUCT. NO
16150501  620010000     0000    1            1          0.5605       1
16150502  620020000    10000    1            1          0.6210       10
16150503  620110000     0000    1            1          0.5773       12
16150504  620130000     0000    1            1          0.2010       13
*           VOLUME      INCRE     TYPE     AREA CODE    VALUE      STRUCT. NO
16150601  610110000     0000    1            1          0.5605       1
16150602  610100000   -10000    1            1          0.6210       10
16150603  610010000     0000    1            1          0.5773       11
16150604  650010000     0000    1            1          0.5773       12
16150605  620020000     0000    1            1          0.2010       13
*           SOURCE TYPE   MULTI    DIRECT HEAT LEFT    DIRECT HEAT RIGHT   NO
16150701    0.            0.              0.                  0.          13
*           CHF FLAG    HYDR.DIAM   HEAT. DIAM    CHANN.LENGTH     STRUCT NO
16150801      0          0.022          0.             0.              13
*           CHF FLAG    HYDR.DIAM   HEAT. DIAM    CHANN.LENGTH     STRUCT NO
16150901      0          0.024          0.             0.              13
*
*************************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_ FILLER TUBE
*************************************************************************
*           NH   NP   G.TYPE FLAG LEFT BOUNDARY
16200000  11   4      2      1      0.0629     *
*           FLAG     FLAG
16200100     0         1    *
*           NO INTERVAL   RIGHT COORDINATE
16200101       3              0.070         *
*         COMPOSITION NO.  INTERVAL NO.
16200201       5                3      *
*        SOURCE VALUE INTERVAL NO.
16200301       0.0            3     *
16200400      -1
*          TEMP   POINT NO
16200401   553.52   553.52   553.52   553.52 *
16200402   554.62   554.62   554.62   554.62 *
16200403   554.59   554.59   554.58   554.58 *
16200404   554.55   554.55   554.55   554.55 *
```

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16200405  554.52   554.52   554.52   554.52 *
16200406  554.49   554.49   554.49   554.49 *
16200407  554.46   554.46   554.46   554.46 *
16200408  554.43   554.43   554.43   554.43 *
16200409  554.40   554.40   554.40   554.40 *
16200410  554.37   554.37   554.37   554.37 *
16200411  554.35   554.35   554.35   554.35 *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
16200501        0          0     0       1      0.5605     1  *
16200502        0          0     0       1      0.6210    10  *
16200503        0          0     0       1      0.5705    11  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
16200601  620010000        0     1       1      0.5605     1  *
16200602  620020000    10000     1       1      0.6210    10  *
16200603  620110000        0     1       1      0.5705    11  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
16200701      0           0          0                  0          11   *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
16200901      0     0.022      0        0.5605        1   *
16200902      0     0.022      0        0.6210       10   *
16200903      0     0.022      0        0.5705       11   *
*
**********************************************************************
******     RISER TOP VOLUME OUTER WALL   ******************************
**********************************************************************
*         NH   NP   TYPE FLAG  LEFT BOUNDARY
16201000  1    10   2      1      0.135  *
*         FLAG   FLAG
16201100    0    1    *
*         NO INTERV.,RIGHT COORD.  OR  MESH INTERV.,MESH NO
16201101    6        0.152  *
16201102    3        0.182  *
*         COMPOS. NO   INTERV. NO
16201201    5            6  *
16201202    9            9  *
*         SOURCE  INTERV. NO
16201301   0.0           9  *
16201400   -1
*         TEMP. ,  POINT NO          OR      TEMPS.
16201401   553.94  553.82  553.71  553.59  553.48  553.38  553.27
+          463.38  379.08  299.66
*         VOLUME    INCRE    TYPE    AREA CODE   VALUE    STRUCT. NO
16201501  620150000   0       1          1       0.955       1 *
*         VOLUME    INCRE    TYPE    AREA CODE   VALUE    STRUCT. NO
16201601   -919       0       3979       1       0.955       1 *
*         SOURCE TYPE  MULTI   DIRECT HEAT LEFT   DIRECT HEAT RIGHT  NO
16201701    0.          0.             0.                  0.        1 *
*         CHF FLAG   HYDR.DIAM  HEAT. DIAM   CHANN.LENGTH    STRUCT NO
16201801     0         0.120         0.            0.                 1 *
*
**********************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_ COURSE SEPERATOR
**********************************************************************
*         NH  NP  G.TYPE FLAG LEFT BOUNDARY
16202000   2  3     2     1     0.069      *
*         FLAG    FLAG
16202100    0       1   *
*         NO INTERVAL  RIGHT COORDINATE
16202101    2             0.070       *
```

```
*         COMPOSITION NO. INTERVAL NO.
16202201       5                2      *
*        SOURCE VALUE INTERVAL NO.
16202301       0.0          2     *
16202400       -1
*         TEMP   POINT NO
16202401   554.25   554.24   554.24 *
16202402   554.27   554.26   554.26 *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
16202501   620140000       0      1        1       2.9930      1  *
16202502   620130000       0      1        1       1.3350      2  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
16202601   640010000       0      1        1       2.9930      1  *
16202602   640020000       0      1        1       1.3350      2  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
16202701       0            0          0                    0            2    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
16202801       0      0.205      0         2.9930          1    *
16202802       0      0.128      0         1.3350          2    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
16202901       0      0.065      0         2.9930          1    *
16202902       0      0.035      0         1.3350          2    *
*
*****************************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_ FINE SEPERATOR
*****************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
16203000    1   3      1      1      0.0          *
*          FLAG     FLAG
16203100     0         1    *
*          NO INTERVAL   RIGHT COORDINATE
16203101       2               0.001        *
*         COMPOSITION NO. INTERVAL NO.
16203201       5                2      *
*        SOURCE VALUE INTERVAL NO.
16203301       0.0          2     *
16203400      -1
*         TEMP   POINT NO
16203401   554.22   554.22   554.22 *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
16203501   620150000       0      1        1       0.805       1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
16203601   630010000       0      1        1       0.805       1  * I
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
16203701       0            0          0                    0            1    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
16203801       0      0.120      0         0.3             1    *  CHANNEL L ?
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
16203901       0      0.010      0         0.37            1    *
*
*****************************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_TUBE SHEET1(ADJACENT TO INLET CHAMBER)
*****************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
16204000    1   5      2      1      0.0098       *
*          FLAG     FLAG
16204100     0         1    *
*          NO INTERVAL   RIGHT COORDINATE
16204101       4               0.0335       *
```

```
*         COMPOSITION NO. INTERVAL NO.
16204201       5               4      *
*        SOURCE VALUE INTERVAL NO.
16204301       0.0             4     *
*
16204400       -1
*         TEMP   POINT NO
16204401   589.62   576.83   568.02   561.29   555.84 *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
16204501   330050000       0      1        1       0.48        1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
16204601   620110000       0      1        1       0.48        1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
16204701       0             0          0                    0            1    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
16204801       0      0.102      0       0.48              1    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
16204901       0      0.022      0       0.48              1    *
*
*************************************************************************
*STEAM GENERATOR(SECONDARY SIDE)_TUBE SHEET2(ADJACENT TO OUTLET CHAMBER)
*************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
16205000    1   5      2      1      0.0098      *
*          FLAG     FLAG
16205100      0        1    *
*          NO INTERVAL   RIGHT COORDINATE
16205101       4               0.0335       *
*         COMPOSITION NO. INTERVAL NO.
16205201       5               4      *
*        SOURCE VALUE INTERVAL NO.
16205301       0.0             4     *
16205400       -1
*         TEMP   POINT NO
16205401   564.32   560.75   558.30   556.44   554.94 *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
16205501   330280000       0      1        1       0.48        1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE   H.STR.NO
16205601   620110000       0      1        1       0.48        1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
16205701       0             0          0                    0            1    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
16205801       0      0.102      0       0.48              1    *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH   H.STR.NO.
16205901       0      0.022      0       0.48              1    *
*
*************************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_ DOWNCOMER (VOLUME 64001)_OUTER WALL
*************************************************************************
*          NH   NP   G.TYPE FLAG LEFT BOUNDARY
16400000    1   10     2      1      0.1350      *
*          FLAG     FLAG
16400100      0        1    *
*          NO INTERVAL   RIGHT COORDINATE
16400101       6               0.143522     *
16400102       3               0.173522     *
*         COMPOSITION NO. INTERVAL NO.
16400201       5               6      *
16400202       9               9      *
```

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*       SOURCE VALUE INTERVAL NO.
16400301      0.0          9    *
16400400      -1
*        TEMP  POINT NO
16400401  553.70  553.64  553.59  553.53  553.48  553.43  553.37
+         463.18  378.85  299.65
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
16400501   640010000     0     1       1      0.9254     1  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
16400601      -919       0   3979      1      0.9254     1  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
16400701     0           0          0                  0          1   *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
16400801   0     0.0650     0.0         0.0           1    *
*
*****************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_ DOWNCOMER (VOLUME 64002)_OUTER WALL
*****************************************************************
*         NH  NP  G.TYPE FLAG LEFT BOUNDARY
16401000   1  10    2     1     0.1195     *
*         FLAG    FLAG
16401100    0       1   *
*         NO INTERVAL  RIGHT COORDINATE
16401101     6             0.12686     *
16401102     3             0.15686     *
*        COMPOSITION NO. INTERVAL NO.
16401201      5              6     *
16401202      9              9     *
*       SOURCE VALUE INTERVAL NO.
16401301      0.0          9    *
16401400      -1
*        TEMP  POINT NO
16401401  554.00  553.95  553.90  553.86  553.81  553.76  553.72
+         462.76  378.34  299.61
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
16401501   640020000     0     1       1      0.8006     1  *
*         BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
16401601      -919       0   3979      1      0.8006     1  *
*       SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
16401701     0           0          0                  0          1   *
*       CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
16401801   0     0.0350     0.0         0.0           1    *
*
*****************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_ DOWNCOMER NARROW REGION _OUTER WALL
*****************************************************************
*         NH  NP  G.TYPE FLAG LEFT BOUNDARY
16500000  01  10    2     1     0.108      *
*         FLAG    FLAG
16500100    0       1   *
*         NO INTERVAL  RIGHT COORDINATE
16500101     4             0.12265     *
16500102     5             0.15265     *
*        COMPOSITION NO. INTERVAL NO.
16500201      5              4     *
16500202      9              9     *
*       SOURCE VALUE INTERVAL NO.
16500301      0.0          9    *
16500400      -1
```

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*         TEMP  POINT NO
16500401   545.50  545.35  545.20  545.06  544.93  491.26  440.07
+          391.17  344.36  299.44
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
16500501    650010000     0     1       1      0.5773     1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
16500601       -919       0   3979      1      0.5773     1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
16500701      0            0          0                  0            1  *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
16500801    0     0.0120     0.0        0.0           1     *
*
*****************************************************************************
*****************************************************************************
*STEAM GENERATOR (SECONDARY SIDE)_ STEAM DOME_OUTER WALL
*****************************************************************************
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
16600000    1  10     2     1      0.132       *
*          FLAG    FLAG
16600100     0       1   *
*          NO INTERVAL  RIGHT COORDINATE
16600101      5              0.1488       *
16600102      4              0.1788       *
*         COMPOSITION NO. INTERVAL NO.
16600201       5               5     *
16600202       9               9     *
*        SOURCE VALUE INTERVAL NO.
16600301       0.0          9    *
16600400       -1
*         TEMP  POINT NO
16600401   553.92  553.78  553.65  553.52  553.39  553.26  485.20
+          420.45  358.70  299.66
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
16600501    660010000     0     1       1      0.2300     1  *
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
16600601       -919       0   3979      1      0.2300     1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
16600701      0            0          0                  0            1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
16600801    0     0.2640     0.0        0.0           1     *
*
*          NH  NP  G.TYPE FLAG LEFT BOUNDARY
16601000    1  10     1     1      0.0         *
*          FLAG    FLAG
16601100     0       1   *
*          NO INTERVAL  RIGHT COORDINATE
16601101      5              0.02         *
16601102      4              0.12         *
*         COMPOSITION NO. INTERVAL NO.
16601201       5               5     *
16601202       9               9     *
*        SOURCE VALUE INTERVAL NO.
16601301       0.0          9    *
16601400       -1
*         TEMP  POINT NO
16601401   554.13  554.08  554.04  553.99  553.95  553.91  489.10
+          424.90  360.78  296.66
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
16601501    660010000     0     1       1      0.07091    1  *
```

```
*          BOUND.VOLUME INCRE TYPE S.AREA CODE VALUE  H.STR.NO
16601601       -919        0   3979       1      0.07091     1  *
*        SOURCE TYPE MULTIP DIRECT HEAT LEFT DIRECT HEAT RIGHT H.STR.NO
16601701      0            0          0                   0            1   *
*        CHF FLAG HYD.DIA HEAT.DIA CHANNEL LENGTH  H.STR.NO.
16601801    0      0.264       0.0         0.0            1     *
*
*
*STEAM LINE
*
*
*SL CONTROL VARIABLES
*
20570000     DUMMY     SUM       1.        0.       1
20570001     0.        1.        CPUTIME       0
*
20570100     LOSS-SH   SUM      1.-3      0.    1
20570101    0.   1.2903    HTRNR 700000101    1.2833  HTRNR    700000201
+                1.1359    HTRNR 700100101    0.9914  HTRNR    700200101
+                1.1800    HTRNR 700300101    1.3231  HTRNR    710000101
+                1.1464    HTRNR 710000201    1.3551  HTRNR    710200101
+                0.90127   HTRNR 715000101    1.6094  HTRNR    720000101
*
7000000 '84-12-15' PIPE * STEAM LINE FROM S.G. I
*      VOLUMES
7000001   04  *
*          AREA     VOL.NO.
7000101   .003728     02  *
7000102   .004778     04  *
*          J.AREA   JUN.NO.
7000201   .000000     03  *
*         LENGTH    VOL.NO.
7000301   1.4870     01     *
7000302   1.4790     02     *
7000303   1.2020     03     *
7000304   0.9770     04     *
*         V.A.
7000601   +00.000    04     *
*         ELEVAT.  V.NO.
7000701   0.0000     04     *
*          ROUGH.   DIAM.   V.NO.
7000801     2.0-5  .0689      02     *
7000802     2.0-5  .0780      04     *
*           K(FORD)  K(REV)    J.NO.
7000901       6.32      6.32    01 * 12.32  6.32
7000902      01.79     01.79    03 *  3.79  1.79
*           FE    V.NO
7001001     00    04       *
*           CAHS J.NO.
7001101     0000 03        *
*         CONTROL   PRESSURE   ENERGY/TEMP   QUALITY     VOL NO.
7001201     0        6.5158+6    2.5855+6   1.0000    0.     01    *
7001202     0        6.4847+6    2.5854+6   1.0000    0.     02    *
7001203     0        6.4769+6    2.5854+6   1.0000    0.     03    *
7001204     0        6.4712+6    2.5853+6   1.0000    0.     04    *
*          CONTROL
7001300     0
*         LIQUID V             VAPOUR VEL   INTERFACE VEL.   JUN NO.
7001301    16.644               16.644             0.0            1    *
```

```
7001302   16.724              16.724              0.0            2    *
7001303   13.064              13.064              0.0            3    *
*
7010000 '20-08-84' BRANCH *  HEADER INLET
*         NO.J    CONTROL
7010001     01      0          *
*        AREA    LENGTH    VOLUME  H.A. V.ANGLE  ELEVAT.  ROUGH  DIAM. FE
7010101 .003728 1.1730   .0000000  0.0  -9.016  -0.105   2.0-5 .0689 00*
*  CONTROL PRESSURE    ENERGY      QUALITY
7010200  0  6.4685+6  2.5852+6     1.0      *
*         CODE(FROM)  CODE(TO)    AREA   K(FORD) K(REV)CAHS
7011101  700010000   701000000  .000000  00.00  00.00 0000    *
*         INIT L VEL INIT V VEL  INTERFACE VEL
7011201   16.758     16.758      0.0 *
*
*
7050000 '20-08-84' VALVE ** S.G. I ISOL. VALVE * AND HEADER INLET
*         FROM                TO     AREA      FORW       REV      CAHS
7050101   701010000   720000000  0.003728     0.0     0.0      0100*
*        CNTL  LIQU VEL    VAP  VEL      0
7050201    0      16.763     16.763       0.*
*         VALVE * TYPE
7050300       SRVVLV*
*         CNTRLVAR          TABLE
7050301       571               501*
*
*
7100000 '05-09-84' PIPE * STEAM LINE EXIT
*     VOLUMES
7100001  03  *
*         AREA     VOL.NO.
7100101  .001368     02   * .001459
7100102  .001698     03   * .001787
*         J.AREA   JUN.NO.
7100201  .000000     02   *
*        LENGTH    VOL.NO.
7100301  1.6955    01     *
7100302  1.4690    02     *
7100303  1.4970    03     *
*         VOLUME   V.NO.
7100401  .0000000  03    *
*         H.A  V.NO.
7100501   0.0    03       *
*        V.ANGLE V.NO.
7100601  +00.000  03     *
*        ELEVAT. V.NO.
7100701  0.0000    03     *
*         ROUGH.   DIAM.   V.NO.
7100801    2.0-5 .0431     02     *
7100802    2.0-5 .0477     03     *
*          K(FORD)  K(REV)    J.NO.
7100901      6.80      6.80    01 *     6.8
7100902      6.96      6.96    02 *     6.96
*          FE    V.NO
7101001    00    03       *
*          CAHS J.NO.
7101101    0000  2        *
*       CONTROL  PRESSURE  ENERGY/TEMP  QUALITY     VOL NO.
7101201    0       6.5173+6 2.5855+6       1.     0.     01    *
```

```
7101202     0       6.4915+6 2.5853+6       1.     0.     02    *
7101203     0       6.4669+6 2.5852+6       1.     0.     03    *
*         CONTROL
7101300     0
*        LIQUID VEL          VAPOUR VEL  INTERFACE VEL.  JUN NO.
7101301   14.327              14.327          0.0          01    *
7101302   14.382              14.382          0.0          02    *
*
7110000 '20-08-84' BRANCH *  HEADER INLET
*          NO.J   CONTROL
7110001     01      0         *
*         AREA    LENGTH    VOLUME  H.A. V.ANGLE  ELEVAT.  ROUGH  DIAM. FE
7110101 .001459 1.0130  .0000000  0.0  -20.532 -0.242   2.0-5 .0431 00*
*  CONTROL PRESSURE   ENERGY      QUALITY
7110200  0  6.4649+6  2.5850+6     1.0      *
*          CODE(FROM)  CODE(TO)   AREA   K(FORD) K(REV)CAHS
7111101  710010000   711000000  .000000  00.00  00.00 0000    *
*          INIT L VEL INIT V VEL  INTERFACE VEL
7111201   13.534     13.534      0.0 *
*
*
7150000 '20-08-84' VALVE ** S.G.II ISOL. VALVE * AND HEADER INLET
*          FROM               TO     AREA      FORW       REV      CAHS
7150101    711010000   720000000  0.001459     0.0     0.0      0100*
*         CNTL  LIQU VEL   VAP  VEL      0
7150201     0     13.536     13.536       0.*
*          VALVE * TYPE
7150300       SRVVLV*
*          CNTRLVAR         TABLE
7150301       654             602*
*
7200000 '20-08-84' BRANCH *  HEADER
*          NO.J   CONTROL
7200001     00      0         *
*         AREA    LENGTH    VOLUME  H.A. V.ANGLE  ELEVAT.  ROUGH  DIAM. FE
7200101 .004608 1.6600  .0000000  0.0     0.      0.       8.0-5 .0766 00*
*  CONTROL PRESSURE   ENERGY      QUALITY
7200200  0  6.4511+6  2.5851+6     1.0      *
*
7250000 '20-08-84' VALVE ** MAIN STEAM VALVE *
*          FROM               TO     AREA      FORW       REV      CAHS
7250101    720010000   730000000  0.004608     0.0     0.0      0100*
*         CNTL  LIQU VEL   VAP  VEL      0
7250201     0     17.892     17.892       0.*
*          VALVE * TYPE
7250300       MTRVLV*
*          TRIP NO
7250301       502      506      0.6667     1.0
*
7300000   '84-12-21' TMDPVOL *  PIPING TO CONDENSER
7300101   1.    1.    0.      0.    0.    0.    0.      0.    00*
7300200   2     501      TIME    0*
7300201   0.    6.45+6    1.
*
7400000 '20-08-84' VALVE ** S.G.I RELIEF VALVE
*          FROM               TO     AREA      FORW       REV      CAHS
7400101    701010000   741000000  0.003728     0.0     0.0      0000*
*         CNTL  LIQU VEL   VAP  VEL      0
7400201     0     0.0        0.0          0.*
```

```
*          VALVE * TYPE
7400300       CHKVLV*
*
7400301       0       0        0.          0.
*
*
7410000   '84-12-21' TMDPVOL *     COOL DOWN CONDITIONS
7410101   1.    1.    0.      0.    0.    0.    0.      0.    00*
*410200   1     506    *
*410201   0.          570.773   1.
*410202   5400.       420.773   1.
7410200   3     506    *
7410201   -14.        8.3445+6      573.
7410202   166.        7.7686+6      568.
7410203   346.        7.2237+6      563.
7410204   526.        6.7085+6      558.
7410205   706.        6.2219+6      553.
7410206   886.        5.7627+6      548.
7410207  1066.        5.3298+6      543.
7410208  1246.        4.9223+6      538.
7410209  1426.        4.5390+6      533.
7410210  1606.        4.1789+6      528.
7410211  1786.        3.8412+6      523.
7410212  1966.        3.5247+6      518.
7410213  2146.        3.2286+6      513.
7410214  2326.        2.9521+6      508.
7410215  2506.        2.6941+6      503.
7410216  2686.        2.4538+6      498.
7410217  2866.        2.2305+6      493.
7410218  3046.        2.0232+6      488.
7410219  3226.        1.8311+6      483.
7410220  3406.        1.6536+6      478.
7410221  3586.        1.4897+6      473.
7410222  3766.        1.3388+6      468.
7410223  3946.        1.2001+6      463.
7410224  4126.        1.0730+6      458.
7410225  4306.        9.5666+5      453.
7410226  4486.        8.5053+5      448.
7410227  4666.        7.5394+5      443.
7410228  4846.        6.6625+5      438.
7410229  5026.        5.8687+5      433.
7410230  5206.        5.1523+5      428.
7410231  5386.        4.5075+5      423.
*
7500000 '20-08-84' VALVE ** S.G.II RELIEF VALVE
*          FROM              TO     AREA      FORW       REV      CAHS
7500101    711010000    751000000  0.001459     0.0      0.0      0000*
*         CNTL  LIQU VEL   VAP  VEL      0
7500201     0      0.0        0.0          0.*
*          VALVE * TYPE
7500300       CHKVLV*
*
7500301      0        0        0.       0.
*
*
7510000   '84-12-21' TMDPVOL *   COOL DOWN CONDITIONS
7510101   1.    1.    0.      0.    0.    0.    0.      0.    00*
*510200   1     506   *
*510201   0.          570.773   1.
```

```
*510202  5400.      420.773  1.
7510200  3    506    *
7510201  -14.       8.3445+6     573.
7510202  166.       7.7686+6     568.
7510203  346.       7.2237+6     563.
7510204  526.       6.7085+6     558.
7510205  706.       6.2219+6     553.
7510206  886.       5.7627+6     548.
7510207 1066.       5.3298+6     543.
7510208 1246.       4.9223+6     538.
7510209 1426.       4.5390+6     533.
7510210 1606.       4.1789+6     528.
7510211 1786.       3.8412+6     523.
7510212 1966.       3.5247+6     518.
7510213 2146.       3.2286+6     513.
7510214 2326.       2.9521+6     508.
7510215 2506.       2.6941+6     503.
7510216 2686.       2.4538+6     498.
7510217 2866.       2.2305+6     493.
7510218 3046.       2.0232+6     488.
7510219 3226.       1.8311+6     483.
7510220 3406.       1.6536+6     478.
7510221 3586.       1.4897+6     473.
7510222 3766.       1.3388+6     468.
7510223 3946.       1.2001+6     463.
7510224 4126.       1.0730+6     458.
7510225 4306.       9.5666+5     453.
7510226 4486.       8.5053+5     448.
7510227 4666.       7.5394+5     443.
7510228 4846.       6.6625+5     438.
7510229 5026.       5.8687+5     433.
7510230 5206.       5.1523+5     428.
7510231 5386.       4.5075+5     423.
*
*************************************************************************
******  STEAM LINE  FROM S.G. TO MEASUREMENT INSERT   ******************
*************************************************************************
*          NH    NP    TYPE FLAG  LEFT BOUNDARY
17000000    2    7     2       1       0.0345 *
*          FLAG   FLAG
17000100     0     1                          *
*          NO INTERV.,RIGHT COORD.  OR  MESH INTERV.,MESH NO
17000101     3          0.0381                *
17000102     3          0.1381                *
*          COMPOS. NO    INTERV. NO
17000201     5               3                *
17000202     9               6                *
*          SOURCE  INTERV. NO
17000301     0.0             6                *
*          TEMP. ,  POINT NO            OR       TEMPS.
17000401     382.26          7                *
*          VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
17000501   700010000    00000    1            1         1.487        1          *
17000502   700020000    00000    1            1         1.479        2          *
*          VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
17000601   -919          0        3949         1         1.487        1          *
17000602   -919          0        3949         1         1.479        2          *
*          SOURCE TYPE  MULTI    DIRECT HEAT LEFT    DIRECT HEAT RIGHT   NO
17000701     0.           0.              0.                  0.          2 *
```

```
*          CHF FLAG    HYDR.DIAM   HEAT. DIAM    CHANN.LENGTH     STRUCT NO
17000801      0          0.0689         0.              0.               2
*
*****************************************************************************
******  STEAM LINE MEASUREMENT INSERT SECTION I      ********************
*****************************************************************************
*          NH    NP    TYPE FLAG   LEFT BOUNDARY
17001000    1     7    2        1        0.0390 *
*          FLAG    FLAG
17001100     0     1                          *
*          NO INTERV.,RIGHT COORD.   OR   MESH INTERV.,MESH NO
17001101     3              0.0504           *
17001102     3              0.1504           *
*          COMPOS. NO    INTERV. NO
17001201     5               3               *
17001202     9               6               *
*          SOURCE   INTERV. NO
17001301    0.0              6               *
*          TEMP. ,   POINT NO            OR       TEMPS.
17001401    393.81          7                *
*          VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
17001501   700030000    0         1           1         1.202        1        *
*          VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
17001601   -919          0        3949        1         1.202        1        *
*          SOURCE TYPE   MULTI    DIR. HEAT LEFT    DIR. HEAT RIGHT   ST.NO
17001701     0.            0.                0.                0.       1   *
*          CHF FLAG    HYDR.DIAM   HEAT. DIAM    CHANN.LENGTH     STRUCT NO
17001801      0          0.078          0.              0.               1    *
*
*****************************************************************************
******  STEAM LINE MEASUREMENT INSERT SECTION II     ********************
*****************************************************************************
*          NH    NP    TYPE FLAG   LEFT BOUNDARY
17002000    1     7    2        1        0.0390 *
*          FLAG    FLAG
17002100     0     1                          *
*          NO INTERV.,RIGHT COORD.   OR   MESH INTERV.,MESH NO
17002101     3              0.0615           *
17002102     3              0.1615           *
*          COMPOS. NO    INTERV. NO
17002201     5               3               *
17002202     9               6               *
*          SOURCE   INTERV. NO
17002301    0.0              6               *
*          TEMP. ,   POINT NO            OR       TEMPS.
17002401    404.96          7                *
*          VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
17002501   700040000    0         1           1         0.977        1        *
*          VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
17002601   -919          0        3949        1         0.977        1        *
*          SOURCE TYPE   MULTI    DIR. HEAT LEFT    DIR. HEAT RIGHT   ST.NO
17002701     0.            0.                0.                0.       1   *
*          CHF FLAG    HYDR.DIAM   HEAT. DIAM    CHANN.LENGTH     STRUCT NO
17002801      0          0.078          0.              0.               1    *
*
*****************************************************************************
******  STEAM LINE HEADER INLET FROM S.G. I          ********************
*****************************************************************************
*          NH    NP    TYPE FLAG   LEFT BOUNDARY
```

```
17003000   1    7   2       1       0.0381 *
*          FLAG   FLAG
17003100     0    1                       *
*          NO INTERV.,RIGHT COORD.  OR  MESH INTERV.,MESH NO
17003101     3            0.0601          *
17003102     3            0.1601          *
*          COMPOS. NO   INTERV. NO
17003201     5             3              *
17003202     9             6              *
*          SOURCE  INTERV. NO
17003301    0.0            6              *
*          TEMP. ,  POINT NO          OR      TEMPS.
17003401    404.04        7               *
*          VOLUME     INCRE     TYPE     AREA CODE   VALUE     STRUCT. NO
17003501   701010000    0         1          1        1.173        1        *
*          VOLUME     INCRE     TYPE     AREA CODE   VALUE     STRUCT. NO
17003601   -919          0        3949       1        1.173        1        *
*          SOURCE TYPE  MULTI    DIR. HEAT LEFT   DIR. HEAT RIGHT  ST.NO
17003701     0.           0.              0.                0.       1   *
*          CHF FLAG   HYDR.DIAM  HEAT. DIAM   CHANN.LENGTH     STRUCT NO
17003801      0         0.078         0.            0.              1    *
*************************************************************************
******  STEAM LINE  FROM S.G. TILL VOL 71003          ******************
*************************************************************************
*          NH   NP   TYPE FLAG  LEFT BOUNDARY
17100000    2    7   2       1       0.0216 *
*          FLAG   FLAG
17100100     0    1                       *
*          NO INTERV.,RIGHT COORD.  OR  MESH INTERV.,MESH NO
17100101     3           0.0242           *
17100102     3           0.1242           *
*          COMPOS. NO   INTERV. NO
17100201     5             3              *
17100202     9             6              *
*          SOURCE  INTERV. NO
17100301    0.0            6              *
*          TEMP. ,  POINT NO          OR      TEMPS.
17100401    371.70     7**
*          VOLUME     INCRE     TYPE     AREA CODE   VALUE     STRUCT. NO
17100501   710010000    00000    1          1        1.6955       1        *
17100502   710020000    00000    1          1        1.4690       2        *
*          VOLUME     INCRE     TYPE     AREA CODE   VALUE     STRUCT. NO
17100601   -919          0        3949       1        1.6955       1        *
17100602   -919          0        3949       1        1.4690       2        *
*          SOURCE TYPE  MULTI    DIRECT HEAT LEFT   DIRECT HEAT RIGHT  NO
17100701     0.           0.              0.                0.       2 *
*          CHF FLAG   HYDR.DIAM  HEAT. DIAM   CHANN.LENGTH     STRUCT NO
17100801      0         0.0431        0.            0.              2
*
*************************************************************************
******  STEAM LINE MEASUREMENT INSERT SECTION       ********************
*************************************************************************
*          NH   NP   TYPE FLAG  LEFT BOUNDARY
17102000    1    7   2       1       0.02385*
*          FLAG   FLAG
17102100     0    1                       *
*          NO INTERV.,RIGHT COORD.  OR  MESH INTERV.,MESH NO
17102101     3           0.04407          *
17102102     3           0.14407          *
```

```
*          COMPOS. NO    INTERV. NO
17102201     5              3                *
17102202     9              6                *
*          SOURCE   INTERV. NO
17102301    0.0             6                *
*          TEMP. ,   POINT NO            OR       TEMPS.
17102401    394.23         7*
*          VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
17102501   710030000      0      1           1        1.4970       1        *
*          VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
17102601   -919           0        3949        1       1.4970       1        *
*          SOURCE TYPE   MULTI    DIR. HEAT LEFT    DIR. HEAT RIGHT   ST.NO
17102701     0.            0.                0.              0.       1  *
*          CHF FLAG    HYDR.DIAM   HEAT. DIAM    CHANN.LENGTH     STRUCT NO
17102801      0          0.0477          0.            0.             1   *
*
**********************************************************************
******  STEAM LINE HEADER INLET FROM S.G. II          ********************
**********************************************************************
*          NH    NP    TYPE FLAG   LEFT BOUNDARY
17150000    1     7    2       1       0.0216 *
*          FLAG    FLAG
17150100     0     1                          *
*          NO INTERV.,RIGHT COORD.   OR   MESH INTERV.,MESH NO
17150101     3              0.0416 *
17150102     3              0.1416 *
*          COMPOS. NO    INTERV. NO
17150201     5              3                *
17150202     9              6                *
*          SOURCE   INTERV. NO
17150301    0.0             6                *
*          TEMP. ,   POINT NO            OR       TEMPS.
17150401    392.42         7                *
*          VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
17150501   711010000    0        1           1        1.013        1        *
*          VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
17150601   -919           0        3949        1       1.013        1        *
*          SOURCE TYPE   MULTI    DIR. HEAT LEFT    DIR. HEAT RIGHT   ST.NO
17150701     0.            0.                0.              0.       1  *
*          CHF FLAG    HYDR.DIAM   HEAT. DIAM    CHANN.LENGTH     STRUCT NO
17150801      0          0.0431          0.            0.             1   *
**********************************************************************
******  HEADER                                          ********************
**********************************************************************
*          NH    NP    TYPE FLAG   LEFT BOUNDARY
17200000    1     7    2       1       0.0388 *
*          FLAG    FLAG
17200100     0     1                          *
*          NO INTERV.,RIGHT COORD.   OR   MESH INTERV.,MESH NO
17200101     3              0.0543 *
17200102     3              0.1543 *
*          COMPOS. NO    INTERV. NO
17200201     5              3                *
17200202     9              6                *
*          SOURCE   INTERV. NO
17200301    0.0             6                *
*          TEMP. ,   POINT NO            OR       TEMPS.
17200401    397.94         7                *
*          VOLUME     INCRE     TYPE     AREA CODE    VALUE     STRUCT. NO
```

```
17200501  720010000    0        1          1        1.660        1        *
*         VOLUME     INCRE     TYPE     AREA CODE   VALUE     STRUCT. NO
17200601  -919          0        3949       1        1.660        1        *
*       SOURCE TYPE  MULTI    DIR. HEAT LEFT    DIR. HEAT RIGHT  ST.NO
17200701      0         0.              0.             0.          1        *
*         CHF FLAG   HYDR.DIAM  HEAT. DIAM    CHANN.LENGTH     STRUCT NO
17200801      0         0.0766        0.             0.          1        *
*
*
*INJECTION SYSTEMS
*
*
*IS CONTROL VARIABLES
*
20580000  DUMMY  SUM  1.0  0  1*
20580001  0.   1.    CPUTIME  0*
*
20580100  QM55   SUM  1.0  0  1*
20580101  0.   1.    MFLOWJ     855000000
*
20580500  SLFLOW  SUM 1.0  0.   1*
20580501   0.    1.   MFLOWJ 810000000  1.  MFLOWJ 830000000 *
20580600  CHANGE FUNCTION   1.0   1.0   1 *
20580601  CNTRLVAR      807    807
20580700  ARGUM  MULT        1.0  1.0   0
20580701  CNTRLVAR     810       CNTRLVAR     811
20580800  CLOSE  MULT   1.    1.       1
20580801  CNTRLVAR  805     CNTRLVAR    806
20580900  TRIPT  TRIPDLAY   1.0  0.0   1
20580901  504
20581000  ARGUM  SUM         1.0  0.0   1
20581001  0.   1.      TIME   0     -1.     CNTRLVAR    809
20581100  ONOFF  TRIPUNIT   1.0  0.0   0
20581101  504
*
*
*IS VOLUMES
*
*PUMP SEAL WATER
*
*PS INTACT LOOP
*       'NAME'     TYPE
8000000 '84-12-15' TMDPVOL * SEAL WATER TANK
*       AREA       LENGTH  VOLUME       0  ANGLE ELEV. ROUGHN DIAM    FE
8000101 0.011698   0.5140   0.0          0.   0.0  0.0   8.-5  0.0532  00*
*       CNTL TRIP  VARIABLE   CODE
8000200   3  501   TIME       0          *
*        SEARCH VAR.   FLUID COND. (2 QUANTITIES)
8000201   0.  19.4+6  298.16           *
*
*       'NAME'     TYPE
8100000 '84-12-15' TMDPJUN * SEAL WATER
*       FROM       TO         AREA
8100101 800000000 255000000 0.0005*
*         CNTL   TRIP NO. VARIABLE   CODE
8100200    1     501       CNTRLVAR   198
*       SEARCH VAR(P)  LIQUID F     VAPOR F.  0
8100201     2.5          0.01444        0.0     0.0 *
8100202     3.0          0.01500        0.0     0.0 *
```

```
8100203      4.0          0.01583          0.0      0.0 *
8100204      5.0          0.01639          0.0      0.0 *
8100205      6.0          0.01722          0.0      0.0 *
8100206      7.0          0.01750          0.0      0.0 *
8100207      8.0          0.01778          0.0      0.0 *
8100208      9.0          0.01806          0.0      0.0 *
8100209     10.0          0.01806          0.0      0.0 *
8100210     11.0          0.01778          0.0      0.0 *
8100211     12.0          0.01750          0.0      0.0 *
8100212     13.0          0.01667          0.0      0.0 *
8100213     14.0          0.01528          0.0      0.0 *
8100214     15.0          0.01333          0.0      0.0 *
8100215     16.0          0.01111          0.0      0.0 *
8100216     17.0          0.00833          0.0      0.0 *
*
*PS  BROKEN LOOP
*        'NAME'      TYPE
8200000 '84-12-15' TMDPVOL * SEAL WATER TANK
*        AREA       LENGTH  VOLUME        0  ANGLE ELEV. ROUGHN DIAM     FE
8200101 0.011698    0.5140   0.0           0.    0.0  0.0   8.-5  0.0532   00*
*        CNTL TRIP  VARIABLE   CODE
8200200    3  501   TIME        0          *
*         SEARCH VAR.    FLUID COND. (2 QUANTITIES)
8200201    0.   19.4+6  298.16            *
*
*        'NAME'      TYPE
8300000 '84-12-15' TMDPJUN * SEAL WATER
*        FROM       TO          AREA
8300101 820000000 355000000 0.0005*
*          CNTL    TRIP NO. VARIABLE    CODE
8300200     1      501        CNTRLVAR    198
*        SEARCH VAR(P)  LIQUID F      VAPOR F.  0
8300201      2.5           0.00944         0.0      0.0 *
8300202      3.0           0.01000         0.0      0.0 *
8300203      4.0           0.01083         0.0      0.0 *
8300204      5.0           0.01167         0.0      0.0 *
8300205      6.0           0.01222         0.0      0.0 *
8300206      7.0           0.01278         0.0      0.0 *
8300207      8.0           0.01306         0.0      0.0 *
8300208      9.0           0.01333         0.0      0.0 *
8300209     10.0           0.01361         0.0      0.0 *
8300210     11.0           0.01361         0.0      0.0 *
8300211     12.0           0.01333         0.0      0.0 *
8300212     13.0           0.01278         0.0      0.0 *
8300213     14.0           0.01194         0.0      0.0 *
8300214     15.0           0.01028         0.0      0.0 *
8300215     16.0           0.00861         0.0      0.0 *
8300216     17.0           0.00639         0.0      0.0 *
*
*PS UPPER PLENUM DRAINAGE
*
*        'NAME'      TYPE
8350000 '84-12-15' TMDPJUN * SEAL WATER DRAINAGE
*        FROM       TO          AREA
8350101 190010000 840000000 0.001*
*          CNTL    TRIP NO. VARIABLE    CODE
8350200     1      501        CNTRLVAR    808
*        SEARCH VAR(F)  LIQUID F      VAPOR F.  0
8350201        0.0          0.0             0.0      0.0 *
```

```
8350202        1.0         1.0              0.0      0.0 *
*        'NAME'      TYPE
8400000 '84-12-15' TMDPVOL *
*        AREA        LENGTH   VOLUME         0   ANGLE ELEV. ROUGHN DIAM     FE
8400101 0.011698    0.5140    0.0            0.    0.0  0.0    8.-5  0.0532   00*
*        CNTL TRIP   VARIABLE    CODE
8400200    3  501    TIME         0           *
*         SEARCH VAR.    FLUID COND. (2 QUANTITIES)
8400201    0.   15.7+6   600.00              *
*
*HIGH PRESSURE INJECTION SYSTEM
*
*        'NAME'      TYPE
8500000 '85-01-29' TMDPVOL *
*        AREA        LENGTH   VOLUME         0   ANGLE ELEV. ROUGHN DIAM     FE
8500101 0.000113    0.0       0.1           0.    0.0  0.0    2.-5  0.012    00*
*        CNTL TRIP   VARIABLE    CODE
8500200    3  501    TIME         0           *
*         SEARCH VAR.    FLUID COND. (2 QUANTITIES)
8500201    0.   11.7+6   303.15              *
*
*        'NAME'      TYPE
8550000 '85-01-29' TMDPJUN *
*        FROM        TO          AREA
8550101 850000000 270000000 0.001*
*          CNTL    TRIP NO. VARIABLE    CODE
8550200     1       509         CNTRLVAR    198
*        SEARCH VAR(P)   LIQUID F      VAPOR F.   0
8550201      0.0            0.000          0.0       0.0 *
8550202      0.1            0.201          0.0       0.0
8550203      1.1            0.192          0.0       0.0 *
8550204      2.1            0.183          0.0       0.0 *
8550205      3.1            0.172          0.0       0.0 *
8550206      4.1            0.160          0.0       0.0 *
8550207      5.1            0.147          0.0       0.0 *
8550208      6.1            0.132          0.0       0.0 *
8550209      7.1            0.1164         0.0       0.0 *
8550210      8.1            0.098          0.0       0.0 *
8550211      9.1            0.077          0.0       0.0 *
8550212     10.1            0.0520         0.0       0.0 *
8550213     11.1            0.0218         0.0       0.0 *
8550214     11.7            0.000          0.0       0.0 *
*
*
*TABLES
*
*
*******************************************************************************
*********** HEAT STRUCTURE THERMAL PROPERTY DATA  ***********************
*******************************************************************************
*
*
*             CNTL WORD    FLAG    FLAG
20100100       TBL/FCTN      1       1    *INCOLNEL 625
20100200       TBL/FCTN      1       1    *INCOLNEL 718
20100300       TBL/FCTN      1       1    *1.4948
20100400       TBL/FCTN      1       1    *NI 201
20100500       TBL/FCTN      1       1    *1.4571
20100600       TBL/FCTN      1       1    *AL203
```

```
20100700      TBL/FCTN      1       1    *INCOLOY  800
20100800      TBL/FCTN      1       1    *HONEYCOMB
20100900      TBL/FCTN      1       1    *ROCKWOOL
*****************************************************************************
* INCONEL 625 _ THERMAL CONDUCTIVITY
*****************************************************************************
*             TEMP(K)       (WATT/M-K)
20100101       293.0            12.5     *
20100102       473.0            12.5     *
20100103       573.0            13.9     *
20100104       673.0            15.3     *
*****************************************************************************
* INCONEL 625 _ VOLUMETRIC HEAT CAPACITY
*****************************************************************************
*             TEMP(K)       (JOULE/M3-K)
20100151       293.0            3.460E6  *
20100152       373.0            3.671E6  *
20100153       473.0            3.866E6  *
20100154       573.0            4.051E6  *
20100155       673.0            4.262E6  *
*****************************************************************************
* INCONEL 718 _ THERMAL CONDUCTIVITY
*****************************************************************************
*             TEMP(K)       (WATT/M-K)
20100201       293.0            11.1     *
20100202       373.0            12.4     *
20100203       473.0            14.0     *
20100204       573.0            15.7     *
20100205       673.0            17.4     *
*****************************************************************************
* INCONEL 718 _ VOLUMETRIC HEAT CAPACITY
*****************************************************************************
*             TEMP(K)       (JOULE/M3-K)
20100251                     3.522E6  *
*****************************************************************************
*       1.4948 _ THERMAL CONDUCTIVITY
*****************************************************************************
*             TEMP(K)       (WATT/M-K)
20100301       293.0            16.9     *
20100302       300.0            17.0     *
20100303       400.0            18.3     *
20100304       500.0            18.9     *
20100305       600.0            20.1     *
20100306       700.0            21.2     *
20100307       800.0            22.4     *
20100308       900.0            23.5     *
20100309      1000.0            24.7     *
20100310      1050.0            25.3     *
*****************************************************************************
*       1.4948 _ VOLUMETRIC HEAT CAPACITY
*****************************************************************************
*             TEMP(K)       (JOULE/M3-K)
20100351       293.0            3.966E6  *
20100352       300.0            3.988E6  *
20100353       400.0            4.125E6  *
20100354       500.0            4.261E6  *
20100355       600.0            4.401E6  *
20100356       700.0            4.535E6  *
20100357       800.0            4.669E6  *
```

```
20100358       900.0            4.792E6 *
20100359      1000.0            4.968E6 *
20100360      1050.0            5.066E6 *
*****************************************************************************
*       NI 201 _ THERMAL CONDUCTIVITY
*****************************************************************************
*             TEMP(K)       (WATT/M-K)
20100401       293.0            79.2     *
20100402       533.0            61.9     *
20100403       813.0            59.0     *
20100404      1088.0            64.8     *
*****************************************************************************
*       NI 201 _ VOLUMETRIC HEAT CAPACITY
*****************************************************************************
*             TEMP(K)       (JOULE/M3-K)
20100451                        4.054E6 *
*****************************************************************************
*       1.4571 _ THERMAL CONDUCTIVITY
*****************************************************************************
*             TEMP(K)       (WATT/M-K)
20100501       293.0            14.0     *
20100502       623.0            18.6     *
*****************************************************************************
*       1.4571 _ VOLUMETRIC HEAT CAPACITY
*****************************************************************************
*             TEMP(K)       (JOULE/M3-K)
20100551       293.0            3.620E6 *
20100552       623.0            4.210E6 *
*****************************************************************************
*       AL203  _ THERMAL CONDUCTIVITY
*****************************************************************************
*             TEMP(K)       (WATT/M-K)
20100601       293.0            41.9     *
20100602       373.0            35.6     *
20100603       773.0            12.6     *
20100604      1073.0             8.4     *
*****************************************************************************
*       AL203  _ VOLUMETRIC HEAT CAPACITY
*****************************************************************************
*             TEMP(K)       (JOULE/M3-K)
20100651                        4042.5  *
*****************************************************************************
* INCOLOY 800 _ THERMAL CONDUCTIVITY
*****************************************************************************
*             TEMP(K)       (WATT/M-K)
20100701       294.0            11.5     *
20100702       533.0            15.7     *
20100703       811.0            20.1     *
20100704      1089.0            25.1     *
*****************************************************************************
* INCOLOY 800 _ VOLUMETRIC HEAT CAPACITY
*****************************************************************************
*             TEMP(K)       (JOULE/M3-K)
20100751                        4.030E6 *
*****************************************************************************
* HONEYCOMB   _ THERMAL CONDUCTIVITY
*****************************************************************************
*             TEMP(K)       (WATT/M-K)
20100801       293.0             8.4     *
```

```
20100802       623.0            11.16    *
*************************************************************************
* HONEYCOMB    _ VOLUMETRIC HEAT CAPACITY
*************************************************************************
*              TEMP(K)       (JOULE/M3-K)
20100851       293.0            1.540E6 *
20100852       623.0            1.790E6 *
*************************************************************************
* ROCKWOOL     _ THERMAL CONDUCTIVITY
*************************************************************************
*              TEMP(K)       (WATT/M-K)
20100901                        0.07    *
*************************************************************************
* ROCKWOOL     _ VOLUMETRIC HEAT CAPACITY
*************************************************************************
20100951                        0.140E6 *
*************************************************************************
*
*
*************************************************************************
**********      POWER       AND    HEAT  STRUCTURE      **********************
***************       BOUNDARY  CONDITIONS     ****************************
*************************************************************************
*
* CONTROLLER TABLES
*
20226200    REAC-T          * PUMP COASTDOWN
20226201    0.      1.0
20226202    5.      0.78
20226203    10.     0.60
20226204    15.     0.46
20226205    20.     0.36
20226206    25.     0.30
20226207    30.     0.25
20226208    40.     0.18
20226209    65.     0.10
20226210    70.     0.0
*
20250100   NORMAREA          * STEAM EXIT VALVE CHARACTERISTICS
20250101   0.0       0.05
20250102   0.0001    0.05
20250103   1.0       1.0
*
20250200   REAC-T            * DEADBAND FUNCTION
20250201   -100.      -100.
20250202     -0.6       -0.6
20250203     -0.5       -0.45
20250204     -0.45      -0.4
20250205     -0.4       -0.2
20250206     -0.35      -0.1
20250207     -0.3       -0.05
20250208     -0.25      -0.02
20250209     -0.2        0.0
20250210      0.2        0.0
20250211      0.25       0.02
20250212      0.3        0.05
20250213      0.35       0.1
20250214      0.4        0.2
20250215      0.45       0.4
```

```
20250216       .5         0.45
20250217       .6          .6
20250218    100.        100.
*
20250300   REAC-T        *       FEEDMULT FUNCTION
20250301   -0.20          0.5
20250302   -0.15          0.7
20250303   -0.10          0.85
20250304   -0.07          0.90
20250305   -0.04          0.95
20250306   -0.02          0.985
20250307    0.0           1.0
20250308    0.02          1.005
20250309    0.04          1.015
20250310    0.07          1.05
20250311    0.10          1.075
20250312    0.15          1.15
20250313    0.20          1.3
20250314    1.0           3.0
*
20257600   REAC-T     * CLOSING STEAM VALVES
20257601   0.      1.0
20257602   1.5     0.0
*
20260200   NORMAREA       * STEAM EXIT VALVE CHARACTERISTICS
20260201   0.0       0.05
20260202   0.0001    0.05
20260203   1.0       1.00
*
20260900   REAC-T             * DEADBAND FUNCTION
20260901   -100.0     -100.0
20260902     -0.6       -0.6
20260903     -0.5       -0.45
20260904     -0.45      -0.4
20260905     -0.4       -0.2
20260906     -0.35      -0.1
20260907     -0.3       -0.05
20260908     -0.25      -0.02
20260909     -0.2        0.0
20260910      0.2        0.0
20260911      0.25       0.02
20260912      0.3        0.05
20260913      0.35       0.1
20260914      0.4        0.2
20260915      0.45       0.4
20260916       .5        0.45
20260917       .6         .6
20260918    100.        100.
*
20260400   REAC-T        * FEEDMULT FUNCTION
20260401   -0.35           0.700
20260402   -0.30           0.850
20260403   -0.20           0.925
20260404   -0.15           0.950
20260405   -0.10           0.985
20260406   -0.05           0.995
20260407    0.00           1.000
20260408    0.05           1.005
20260409    0.10           1.015
```

```
20260410    0.15          1.050
20260411    0.20          1.075
20260412    0.30          1.150
20260413    0.35          1.300
20260414    0.50          1.5
*
20280700  REAC-T     *    DRAIN VALVE  CHARACTERISTICS
20280701  0.      1.0
20280702  8.      0.0
*
* HEATING POWER
20290000  POWER    507    1.0    5.206+6*
20290001        -1.0         1.00
20290002         0.0         1.00        *POWER DOWN
20290003         1.0         0.90
20290004         2.0         0.73
20290005         3.0         0.65
20290006         5.0         0.51
20290007         7.0         0.40
20290008         9.0         0.32
20290009        13.0         0.20
20290010        15.0         0.161
20290011        16.0         0.15
20290012        17.0         0.14
20290013        18.0         0.13
20290014        20.0         0.12
20290015        24.0         0.10
20290016        30.0         0.08
20290017        40.0         0.065
20290018        68.0         0.048
20290019       110.0         0.04
20290020       170.0         0.035
20290021       270.0         0.028
20290022       470.0         0.023
20290023       870.0         0.02
20290024      1000.0         0.019
20290025      2000.0         0.016
20290026      4000.0         0.013
20290027      6000.0         0.011
20290028     10000.0         0.01
*
*    ENVIRONMENTAL HEAT LOSS BOUNDARY TEMPERATURE
20291900  TEMP *
20291901  0.0  295.16 *
*    ENVIRONMENTAL HEAT LOSS TRANSFER COEFFICIENTS
20292900  HTC-T * VESSEL SIM. UPPER DOWNCOMER
20292901  0.0   50.     *  51.
*
20293900  HTC-T * VESSEL SIM. LOWER DOWNCOMER
20293901  0.0   30.     *  20.
*
20294900  HTC-T * VESSEL SIM. DOWNCOMER,LOW. PLENUM, UPPER HEAD&STEAM L.
20294901  0.0   20.     *
*PR
20295900  HTC-T *
20295901  0.0   10.     *
*SG1
20296900  HTC-T * SG I SEC. SIDE
20296901  0.0  120.     *
```

```
*SG2
20297900  HTC-T * SG II SEC. SIDE
20297901  0.0   120.     *
*IL
20298000  HTC-T *
20298001  0.0    05.     *
*PUMP I
20298100  HTC-T *
20298101  0.0    100.    *
*BL
20298200  HTC-T *
20298201  0.0    30.     *
*PUMP II
20298300  HTC-T *
20298301  0.0    100.    *
.END
```

```
*
=LOBI-MOD2 TEST A2-81(ISP18)       85/03/14
100 RESTART TRANSNT *
103  17600
*04   NONE
201     440. 1.0E-6  .05  00001  100   2000  2000*
202     700. 1.0E-10 .025 00001  200   2000  2000*
*03    5000. 1.0E-10 .05  00001  100   2000  2000*
*
600   511
*
*PARAMETERS TO BE PREDICTED
*
301      CNTRLVAR  198*          *   PA38
302      CNTRLVAR  401*          *   PA40
303      CNTRLVAR  199*          *   WH-POWER
304      CNTRLVAR  207*          *   RP71
305      CNTRLVAR  301*          *   CM05
306      CNTRLVAR  801*          *   QM55
307      CNTRLVAR  204*          *   TF11T
308      CNTRLVAR  203*          *   TF11B
309      CNTRLVAR  206*          *   TF16T
310      CNTRLVAR  205*          *   TF16B
311      CNTRLVAR  351*          *   TF21T
312      CNTRLVAR  350*          *   TF21B
313      CNTRLVAR  353*          *   TF26T
314      CNTRLVAR  352*          *   TF26B
315      CNTRLVAR  189*          *   TF35
316      CNTRLVAR  201*          *   DD11
317      CNTRLVAR  208*          *   DD14
318      CNTRLVAR  202*          *   DD16
319      CNTRLVAR  354*          *   DD21
320      CNTRLVAR  355*          *   DD24
321      CNTRLVAR  356*          *   DD25
322      CNTRLVAR  357*          *   DD26
323      CNTRLVAR  184*          *   DS35
324      CNTRLVAR  286*          *   PD9217
325      CNTRLVAR  287*          *   PD1714
326      CNTRLVAR  317*          *   PD8227
327      CNTRLVAR  318*          *   PD2724
328      CNTRLVAR  179*          *   PD3DBT
329      CNTRLVAR  178*          *   PD3RTK
330      CNTRLVAR  177*          *   PD3RKA
331      CNTRLVAR  281*          *   PD90BN
332      CNTRLVAR  312*          *   PD80BN
333      CNTRLVAR  176*          *   PD3R39
334      CNTRLVAR  405*          *   CL4340
335      CNTRLVAR  175*          *   TH04
336      CNTRLVAR  174*          *   TH07
337      CNTRLVAR  173*          *   TH09
338      CNTRLVAR  172*          *   TH11
339      CNTRLVAR  171*          *   TH13
340      CNTRLVAR  170*          *   TH14
341      CNTRLVAR  544*          *   PA97S
342      CNTRLVAR  545*          *   TF95B
343      CNTRLVAR  546*          *   TF95N
344      CNTRLVAR  547*          *   TF97T
345      CNTRLVAR  672*          *   TF85B
346      CNTRLVAR  673*          *   TF85K
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347      CNTRLVAR  674*          *    TF87T
348      CNTRLVAR  548*          *    CM93G
349      CNTRLVAR  675*          *    CM83G
350      CNTRLVAR  549*          *    CM65
351      CNTRLVAR  676*          *    CM66
352      CNTRLVAR  552*          *    CL93BN
353      CNTRLVAR  635*          *    CL83BN
*
*OTHER MINOR EDIT VARIABLES
*
*  LIQUID MASS INVENTORY
354      CNTRLVAR  534 * SGI
355      CNTRLVAR  634 * SGII
356      CNTRLVAR  190 * WH-POW ALT. DEF.
357      CNTRLVAR  001 * TOT. HEAT LOSS
358      CNTRLVAR  031 * VESSEL COLL. LIQUID LEVEL
359      CNTRLVAR  222 * THTSG1
360      CNTRLVAR  332 * THTSG2
361      CNTRLVAR  308 * LEAK MASS LOSS
362      CNTRLVAR  310 * LEAK HEAT REMOVAL
363      PMPVEL    250
364      PMPVEL    350
365      MFLOWJ    210020000
366      MFLOWJ    300010000
367      MFLOWJ    395020000
368      MFLOWJ    390010000
* *
* * PUMP I COAST DOWN
* *
20526100   TRIPCOND   TRIPUNIT     1.0       1.0     0
20526101   510
20526200   TRIPTIME   TRIPDLAY     1.0      -1.      1
20526201   510
20526400   ARGUMENT   SUM          1.0      0.       0
20526401   0.  1. TIME  0   -1. CNTRLVAR  262
20526800   MULTIP     MULT         1.0       0.      0
20526801   CNTRLVAR  261  CNTRLVAR 264
20526300  TABLE     FUNCTION  514.73  514.73 0
20526301  CNTRLVAR 268      262              *
* *
* * PUMP II COAST DOWN
* *
20536100   TRIPCOND   TRIPUNIT     1.0       1.0     0
20536101   510
20536200   TRIPTIME   TRIPDLAY     1.0      -1.      1
20536201   510
20536400   ARGUMENT   SUM          1.0      0.       0
20536401   0.  1. TIME  0   -1. CNTRLVAR  362
20536800   MULTIP     MULT         1.0       0.      0
20536801   CNTRLVAR  361  CNTRLVAR 364
20536300  TABLE     FUNCTION  408.52  408.52 0
20536301  CNTRLVAR 368      262              *
*
*  PRESURIZER UPPER VOLUMES
20540500  CL4340    SUM      1.       0.       1
20540501   0.    0.790    VOIDF  410010000  0.585    VOIDF    420010000
+              0.6375   VOIDF  420020000  0.6375   VOIDF    420030000
+              0.6375   VOIDF  420040000  0.6375   VOIDF    420050000
+              0.6375   VOIDF  420060000  0.6375   VOIDF    420070000
```

```
+                0.6325  VOIDF  420080000  0.6325  VOIDF   420090000
+                0.6325  VOIDF  420100000  0.6325  VOIDF   420110000
*
4200000 '84-12-12' PIPE * UPPER VOLUME
*     VOLUMES
4200001  11  *
*         AREA     VOL.NO.
4200101  .008227     1    *
4200102  .011962    11    *
*         J.AREA   JUN.NO.
4200201  .000000     10   *
*        LENGTH    VOL.NO.
4200301  0.5850      1     *
4200302  0.6375     07     *
4200303  0.6325     11     *
*         VOLUME   V.NO.
4200401  .0000000   11    *
*         H.A   V.NO.
4200501   0.0    11       *
*        V.ANGLE V.NO.
4200601  +90.000   11     *
*         ROUGH.   DIAM.   V.NO.
4200801    8.0-5 .0320     1     *
4200802    8.0-5 .1240    11     *
*         K(FORD)  K(REV)    J.NO.
4200901     00.00    00.00    10 *
*         FE    V.NO
4201001    00    11       *
*         CAHS J.NO.
4201101    0000  10       *
*       CONTROL  PRESSURE  ENERGY/TEMP  QUALITY     VOL NO.
4201201    0      15.754+6  1.5818+6     0. 0.       01    *
4201202    0      15.750+6  1.5837+6     0. 0.       02    *
4201203    0      15.747+6  1.5839+6     0. 0.       03    *
4201204    0      15.743+6  1.5839+6     0. 0.       04    *
4201205    0      15.739+6  1.5839+6     0. 0.       05    *
4201206    0      15.735+6  1.5844+6     0. 0.       06    *
4201207    0      15.731+6  1.5879+6     0. 0.       07    *
4201208    0      15.731+6  2.4580+6     1. 0.       11    *
*        CONTROL
4201300    0
*       LIQUID VEL          VAPOUR VEL  INTERFACE VEL.  JUN NO.
4201301  -5.0480-5          -5.0480-5         0.0          01    *
4201302  -4.6966-5          -4.6966-5         0.0          02    *
4201303  -5.9220-5          -5.9220-5         0.0          03    *
4201304  -7.1478-5          -7.1478-5         0.0          04    *
4201305  -8.3739-5          -8.3739-5         0.0          05    *
4201306  -9.6012-5          -9.6012-5         0.0          06    *
4201307  -9.6012-5          -9.6012-5         0.0          10    *
*
4210000   '84-12-12'    DELETE
4220000   '84-12-12'    DELETE
*
.END
```

```
*
=LOBI-MOD2 TEST A2-81(ISP18)       85/03/19
100 RESTART TRANSNT *   SECOND RESTART WITH PUMP LOCKED ROTOR
103  22819
*04   NONE
201      440. 1.0E-6  .05  00001  100   2000  2000*
202      600. 1.0E-10 .025 00001  200   2000  2000*
203     5000. 1.0E-10 .05  00001  100   2000  2000*
*
600 512
*
*PARAMETERS TO BE PREDICTED
*
301      CNTRLVAR  198*          *   PA38
302      CNTRLVAR  401*          *   PA40
303      CNTRLVAR  199*          *   WH-POWER
304      CNTRLVAR  207*          *   RP71
305      CNTRLVAR  301*          *   CM05
306      CNTRLVAR  801*          *   QM55
307      CNTRLVAR  204*          *   TF11T
308      CNTRLVAR  203*          *   TF11B
309      CNTRLVAR  206*          *   TF16T
310      CNTRLVAR  205*          *   TF16B
311      CNTRLVAR  351*          *   TF21T
312      CNTRLVAR  350*          *   TF21B
313      CNTRLVAR  353*          *   TF26T
314      CNTRLVAR  352*          *   TF26B
315      CNTRLVAR  189*          *   TF35
316      CNTRLVAR  201*          *   DD11
317      CNTRLVAR  208*          *   DD14
318      CNTRLVAR  202*          *   DD16
319      CNTRLVAR  354*          *   DD21
320      CNTRLVAR  355*          *   DD24
321      CNTRLVAR  356*          *   DD25
322      CNTRLVAR  357*          *   DD26
323      CNTRLVAR  184*          *   DS35
324      CNTRLVAR  286*          *   PD9217
325      CNTRLVAR  287*          *   PD1714
326      CNTRLVAR  317*          *   PD8227
327      CNTRLVAR  318*          *   PD2724
328      CNTRLVAR  179*          *   PD3DBT
329      CNTRLVAR  178*          *   PD3RTK
330      CNTRLVAR  177*          *   PD3RKA
331      CNTRLVAR  281*          *   PD90BN
332      CNTRLVAR  312*          *   PD80BN
333      CNTRLVAR  176*          *   PD3R39
334      CNTRLVAR  405*          *   CL4340
335      CNTRLVAR  175*          *   TH04
336      CNTRLVAR  174*          *   TH07
337      CNTRLVAR  173*          *   TH09
338      CNTRLVAR  172*          *   TH11
339      CNTRLVAR  171*          *   TH13
340      CNTRLVAR  170*          *   TH14
341      CNTRLVAR  544*          *   PA97S
342      CNTRLVAR  545*          *   TF95B
343      CNTRLVAR  546*          *   TF95N
344      CNTRLVAR  547*          *   TF97T
345      CNTRLVAR  672*          *   TF85B
346      CNTRLVAR  673*          *   TF85K
```

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347      CNTRLVAR   674*          *    TF87T
348      CNTRLVAR   548*          *    CM93G
349      CNTRLVAR   675*          *    CM83G
350      CNTRLVAR   549*          *    CM65
351      CNTRLVAR   676*          *    CM66
352      CNTRLVAR   552*          *    CL93BN
353      CNTRLVAR   635*          *    CL83BN
*
*OTHER MINOR EDIT VARIABLES
*
*  LIQUID MASS INVENTORY
354      CNTRLVAR   534 * SGI
355      CNTRLVAR   634 * SGII
356      CNTRLVAR   190 * WH-POW ALT. DEF.
357      CNTRLVAR   001 * TOT. HEAT LOSS
358      CNTRLVAR   031 * VESSEL COLL. LIQUID LEVEL
359      CNTRLVAR   222 * THTSG1
360      CNTRLVAR   332 * THTSG2
361      CNTRLVAR   308 * LEAK MASS LOSS
362      CNTRLVAR   310 * LEAK HEAT REMOVAL
*63      PMPVEL     250
*64      PMPVEL     350
365      MFLOWJ     210020000
366      MFLOWJ     300010000
367      MFLOWJ     395020000
368      MFLOWJ     390010000
*
20520700     RP71     TRIPDLAY      1.0      0.     0
20520701     501

2500000 '20-01-85' BRANCH * PUMP I
*          NO.J    CONTROL
2500001      2       0          *
*         AREA    LENGTH    VOLUME   H.A. V.ANGLE   ELEVAT.   ROUGH   DIAM. FE
2500101 .0033183    0.0   .002370    0.0  17.14     .2105   1.0-4  .01    00*
*   CONTROL PRESSURE    ENERGY      QUALITY
2500200   0  8.5675+6   1.3119+6     0.        *
*          CODE(FROM)   CODE(TO)    AREA    K(FORD) K(REV)CAHS    COEFFICIENT
2501101   240010000    250000000   .0         20.      20.   0000   *
2502101   250010000    255000000   .0         20.      20.   0000   *
*         LIQUID VEL VAPOR VEL.     INTERFACE VEL
2501201     0.92478   0.92478       0.0               *
2502201     0.92327   0.92327       0.0               *
**
*
3500000 '20-01-85' BRANCH * PUMP II
*          NO.J    CONTROL
3500001      2       0          *
*         AREA    LENGTH    VOLUME   H.A. V.ANGLE   ELEVAT.   ROUGH   DIAM. FE
3500101 .0033183    0.0   .002370    0.0  17.14     .2105   1.0-4  .01    00*
*   CONTROL PRESSURE    ENERGY      QUALITY
3500200   0  8.5654+6   1.3114+6     0.        *
*          CODE(FROM)   CODE(TO)    AREA    K(FORD) K(REV)CAHS    COEFFICIENT
3501101   340010000    350000000   .0         55.      55.   0000   *
3502101   350010000    355000000   .0         55.      55.   0000   *
*         LIQUID VEL VAPOR VEL.     INTERFACE VEL
3501201     1.0324    1.0324        0.0               *
3502201     1.0244    1.0244        0.0               *
*
*
.END
```

```
********** DATE:  1985/03/27     **************************
=LOBI-MOD2 TEST A2-81(ISP18)       POST TEST PREDICTION II
100 RESTART TRANSNT *   SECOND RESTART WITH PUMP LOCKED ROTOR
103  55309
*04   NONE
201     440. 1.0E-6  .05  00002  100   2000  2000*
202     600. 1.0E-10 .025 00002  200   2000  2000*
203    5000. 1.0E-10 .025 00002  200   2000  2000*
*
600 512
*
20556800  DT        DELETE      0.  0.  0
20556900  DEADBAND  DELETE      0.  0.  0
20557000  INTDELT   DELETE      0.  0.  0
20557100  STEMPOS   TRIPUNIT    1.  1.  0
20557101  501
*
*
20565100  DELTA-T   DELETE     0.  0.   0
20565200  DEADBAND  DELETE     0.  0.   0
20565300  INTDELT   DELETE     0.  0.   0
20565400  STEMPOS   TRIPUNIT   1.  1.   0
20565401  501
.END
```

```
********** DATE:  1985/04/06      **************************
=LOBI-MOD2 TEST A2-81(ISP18)       POST TEST PREDICTION II
100 RESTART TRANSNT *
103 274523
*04   NONE
201      440. 1.0E-6  .05  00002  100   2000  2000*
202      600. 1.0E-10 .025 00002  200   2000  2000*
203     5001. 1.0E-10 .025 00002  200   2000  2000*
*
600 502
*
.END
```