APPENDIX A

HIGH RAD SAMPLE PANEL

Plant Specific and Vendor Procedures for Purging, Sampling and Analyzing

WISCONSIN PUBLIC SERVICE CORPORATION Kewaunee Nuclear Power Plant EMERGENCY PLAN IMPLEMENTATION PROCEDURE	NO. EP-RET-3C TITLE: Post Accident Operation of the High Radiation Sample Room DATE: JUN 18 1982 — PAGE 1 of 23
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1.0 PURPOSE

1.1 This procedure is to detail the requirements, considerations, and operation of the High Radiation Sample Room during a post LOCA condition.

2.0 APPLICABILITY

2.1 This is to detail the procedures to be utilized for obtaining:

a. Diluted liquid sample of primary coolant, for Boron Analysis and Isotopic Analysis (Sect 5.1).

b. An inline sample for pH, conductivity, oxygen, and chloride analysis (Sect 5.2).

c. An inline sample of primary coolant for Hydrogen Analysis, and a dilute sample of gases, contained in Primary Coolant, for Isotopic Analysis (Sect 5.3).

d. An undiluted sample of Primary Coolant for off-site analysis (Sect 5.4).

e. Containment Hydrogen Analyzer measurement (Sect 5.5).

f. Containment Air Sample Panel operation (Sect 5.6).

3.0 PRECAUTIONS

3.1 Process an Emergency Radiation Work Permit (see EP-AD-11).

3.2 Contact Health Physics Dept for:

a. Proper personnel dosimetry.
b. Proper radiation detection instrumentation.
c. Personnel for continuous HP coverage during sampling.
d. Remote area monitor readings in area of HRSR.

3.3 Utilize onsite communications with the Radiological Protection Director, as necessary, during sampling.

4.0 REFERENCES

4.1 Sentry HRSS Operating and Maintenance Manual

4.2 RC-C-82, Boron Analysis - Curcumin Method

4.3 RC-C-?, pH Analyzer Oper & Std

4.4 RC-C-?, Conductivity Oper & Std

4.5 RC-C-?, Oxygen Analyzer (YSI) Oper & Std

4.6 RC-C-?, Oxygen Analyzer (Rexnord) Oper & Std

4.7 RC-C-?, Ion Chromatograph Oper & Std

4.8 RC-C-?, Gas Chromatograph Oper & Std

5.0 PROCEDURE

5.1 Dilute Liquid Sample

5.1.1 Proceed to HRSR per HP/RPD recommendations.

5.1.2 Check ventilation on in "normal" position and High Vacuum Lights indicate "normal" for the LSP and CAP.

5.1.3 Check radiation levels in HRSR, and in maintenance area behind panels, if access is required.

5.1.4 Check the following Lab Equipment available and operational:

a. Drying oven on at 55°C to 60°C.
b. Fume hood ventilation normal.
c. Shielded aligoiter available.
d. DI water flush hoses connected to LSP and supply valve on.
e. New 24 ml diluted sample bottle.
f. Hand operated vacuum pump.
g. Lights on in Diluted Sample Port of LSP.
h. LSP Sample Cask available with diluted sample bottle piston installed.
i. Perform valve lineup per Attachment #1.
j. Reach Rod for remote valve operation.
k. All material required in section 4 of RC-C-82.
l. Multi-channel analyzer available for counting.
m. 2 - 1 liter poly bottles.

5.1.5 Evacuate the diluted sample bottle to 15 inches of vacuum or more. Install in sample cask and check cask for proper operation.

5.1.6 Install the sample cart under the diluted sample port and position the bottle up on the needles.

5.1.7 Check level in dilution water reservoirs. Fill to full mark as necessary.

5.1.8 Have Control Room Operator open RC-422 and RC-423 (not required for RHR sample).

5.1.9 At the Sample Acquisition Panel:

a. For RCHL Sample: Open CC-314
Open RC-423-1

b. For RHR Sample: Open CC-316
Open RHR-81-A (81-B)

c. For all Samples: Turn RC-437-1 (437-2) to DDT

5.1.10 At the Liquid Sample Panel: Open V-3
Open V-1.2 (V-1.1 for RHR)

5.1.11 Regulate Reactor Coolant (RHR) flow using RC-VREL-1 until flow indicator RC-FI-1 indicates between 35 to 40 inches of water. Maintain this purge for a minimum of 5 minutes.

NOTE: A D/P of 35 to 40 inches of water on RC-FI-1 is equal to approximately 1/2 gpm flow rate.

5.1.12 Upon completion of the purge: Shut V-3
Open V-8.2
Open V-8.1
Open V-2

5.1.13 Regulate Reactor Coolant (or RHR) flow using RC-VREL-2 until flow indicator RC-FI-2 indicates 18 to 22 inches of water. Maintain this purge for a minimum of 3 minutes.

NOTE: A D/P of 18 to 22 inches of water on RC-FI-2 is equal to approximately 200 cc/min flow rate.

5.1.14 Upon completion of the purge: Turn DV-1 to "Sample"
Shut V-1.2 (V-1.1 for RHR)

5.1.15 Throttle open V-21 and add 24 ml of DI water, from the graduated reservoir to the sample bottle, then close RC-V-21.

5.1.16 Turn DV-1 to "Bypass".

5.1.17 Open V-4. Observe Flush Water Flow Rate of 18-22 inches of water for a minimum of 3 minutes.

5.1.18 Upon completion of flush: Shut V-4
Shut V-2
Shut V-8.2
Shut V-8.1

5.1.19 Have Control Room Operator shut RC-422 and RC-423 (not required for RHR).

5.1.20 At the Sample Acquisition Panel:

For RCHL Sample: Open FPC-51
Open FPC-51-14

For RHR Sample: Shut RHR-81-A (81-B)
Open FPC-51
Open FPC-51-41

5.1.21 At the Liquid Sample Panel: Open V-1.2 (V-1.1 for RHR)
Open V-3

Observe Flush Water Flow Rate of 35 to 40 inches of water as indicated on RC-FI-1. Maintain flush for 5 minutes while performing step 5.1.22.

5.1.22 Lower the diluted sample bottle into the sample cask. Close the cask and install auxiliary shield. Place cask near fume hood.

5.1.23 Upon completion of flushing: Shut V-1.2 (V-1.1 for RHR)
Shut V-3

5.1.24 At the Sample Acquisition Panel:

For RCHL Sample: Shut RC-423-1
Shut FPC-51-14
Shut FPC-51
Shut CC-314

For RHR Sample: Shut RHR-81-A (81-B)
Shut FPC-51-41
Shut FPC-51
Shut CC-316

For all samples: Turn RC-437-1 (or 437-2) to VCT

5.1.25 Using the shielded liquid aliquoter, transfer a 1.0 ml sample from the sample cask into a VYCOR evaporating dish.

NOTE: For Boron analysis of less than 2000 ppm, use an appropriate larger amount of sample.

5.1.26 Continue the Boron analysis with step 6.2 of RC-C-82.

5.1.27 For Beta Gamma analysis, transfer 1.0 ml of coolant from the cask to a liter poly bottle using the shielded liquid aliquoter. Dilute to 1 liter.

5.1.28 From the diluted 1 liter bottle in step 5.1.27, transfer 10 ml to another empty liter bottle. Dilute to 1 liter. This sample may be transferred to the multi-channel analyzer for counting.

NOTE: Total dilution is (x 10^8)

5.2 Inline Sample for pH, Cond, O_2 and Cl

5.2.1 Proceed to HRSR per HP/RPD recommendations.

5.2.2 Verify ventilation is ON in "normal" position and high vacuum lights indicate "normal" for the LSP and CAP.

5.2.3 Check radiation levels in HRSR, and in maintenance area behind panels if access is necessary.

5.2.4 Verify the following lab equipment available and operational.

a. DI water flush hoses connected to LSP and CAP with supply valves open.
b. Verify valve lineup for SAP, LSP, and CAP, per Attachment #1.
c. Reach Rod for Remote Valve operation.
d. Main Power switch at CMP "on".
e. At the CMP, turn on the YSI chart recorder, pH meter, conductivity meter, and start IC unit for base line.
f. Check HRSS calibration log for verification of latest performances.
g. Check gas bottles (argon and air) for adequate supply.

5.2.5 At the CAP: Turn V-6 to Liquid Sample
Turn V-5 to Liquid Sample

5.2.6 Have the Control Room Operator open RC-422 and RC-423 (not required for RHR sample).

5.2.7 At the Sample Acquisition Panel:

For RCHL Sample: Open CC-314
Open RC-423-1

For RHR Sample: Open CC-316
RHR 81-A (81-B)

For all samples: Turn RC-437-1 (or 437-2) to DDT.

5.2.8 At the Liquid Sample Panel: Open V-3
Open V-1.2 (V-1.1 for RHR)

5.2.9 Regulate Reactor Coolant (or RHR) flow using RC-VREL-1 until flow indicator RC-FI-1 indicates between 35-40 inches of water. Maintain this purge for a minimum of 5 minutes.

NOTE: A D/P of 35 to 40 inches of water on RC-FI-1 is equal to approximately 1/2 gpm flow rate.

5.2.10 Upon completion of the purge: Shut V-3
Open V-2
Open V-7
Turn V-22 to CAP

5.2.11 Regulate Reactor Coolant (or RHR) flow using RC-VREL-2 until flow indicator RC-FI-2 indicates 18 to 22 inches of water. Maintain this purge for a minimum of 5 minutes.

NOTE: A D/P of 18 to 22 inches of water on RC-FI-2 is equal to approximately 200 cc/min flow rate.

5.2.12 Verify adequate flow rate to the CAP by observing the lights "on" for both O_2 flow and IC flow.

5.2.13 When the YSI O_2 meter chart reading has stabilized:

Record the conductivity reading
Record the temperature
Record the O_2 reading
Place the Load/Inject switch on the IC unit to "Inject"

5.2.14 At the Liquid Sample Panel: Turn V-22 to Waste
Shut V-1.2 (V-1.1 for RHR)
Open V-4

5.2.15 Observe DI Water Flush to Waste as indicated on Flow Indicator RC-FI-2. After 2 minutes:
Record pH reading
Place the Load/Inject switch on the IC unit to "Load"

5.2.16 Flush the CAP by turning V-22 to CAP position. Verify flush water flow by observing the lights "on" for both O_2 Flow and IC Flow. Continue flush for 2 minutes.

NOTE: Chloride results should read out 5 to 10 minutes after injection (step 5.2.13).

5.2.17 Upon completion of flush to CAP:

At the LSP: Turn V-22 to Waste
Shut V-7
Shut V-2
Shut V-4

At the CAP: Turn V-6 to O_2 Cal
Turn V-5 to Closed

5.2.18 Have Control Room Operator shut RC-422 and RC-423 (not required for RHR sample).

5.2.19 At the Sample Acquisition Panel:

For RCHL Sample: Open FPC-51
Open FPC-51-14

For RHR Sample: Shut RHR 81-A (81-B)
Open FPC-51
Open FPC-51-41

5.2.20 At the Liquid Sample Panel:

Open V-1.2 (V-1.1 for RHR)
Open V-3
Observe flush water flow rate of 35 to 40 inches of water as indicated on RC-FI-1. Maintain this flush for a minimum of 5 minutes.

5.2.21 Upon completion of flushing: Shut V-1.2 (V-1.1 for RHR)
Shut V-3

5.2.22 At the Sample Acquisition Panel:

For RCHL Sample: Shut RC-423-1
Shut FPC-51-14
Shut FPC-51
Shut CC-314

For RHR Sample: Shut RHR 81-A (81-B)
Shut FPC-51-41
Shut FPC-51
Shut CC-316

For all samples: Turn RC-437-1 (or 437-2) to VCT

5.3 Hydrogen and Gaseous Activity of Primary Coolant

5.3.1 Proceed to HRSR per HP/RPD recommendations.

5.3.2 Verify ventilation on in "normal" position and high vacuum lights indicate "normal" for the CAP and LSP.

5.3.3 Check radiation levels in HRSR, and in maintenance area behind panels, if access is necessary.

5.3.4 Verify the following lab equipment available and operational:

a. DI water flush hoses connected to LSP and CAP with supply valves open.
b. Verify valve lineup for SAP, LSP, and CAP per Attachment #1.
c. Reach Rod for remote valve operation.
d. Main power switch at the CMP "on".
e. Check the program in GC mini-computer and latest data in the HRSS Cal Log.
f. Check Argon and Air Pressure in lab and at the bottles for adequate supply.
g. 10 cc gas sample bottle, with septum, properly installed in face of LSP, using the special handling tool.
h. Verify multi-channel analyzer available for counting.

5.3.5 Dry the expansion vessel: Turn V-11 to "Argon in"
Open V-9
Open V-8.2
Open V-10

5.3.6 Adjust RC-VREL-2 as necessary to obtain 20 psi on RC-G-3 for 1 minute. Observe flow indication on RC-FI-2 also.

5.3.7 Upon completion of Drying Expansion Vessel:

Turn V-11 to "Vent" position
Shut V-9
Shut V-8.2

5.3.8 Have Control Room Operator open RC-422 and RC-423 (not required for sample from RHR).

5.3.9 At the Sample Acquisition Panel:

For RCHL Sample: Open CC-314
Open RC-423-1

For RHR Sample: Open CC-316
Open RHR 81-A (81-B)

For all samples: Turn RC-437-1 (or 437-2) to DDT

5.3.10 At the Liquid Sample Panel: Open V-3
Open V-1.2 (V-1.1 for RHR)

5.3.11 Regulate Reactor Coolant (RHR) flow using RC-VREL-1 until flow indicator RC-FI-1 indicates between 35 to 40 inches of water. Maintain this purge for a minimum of 5 minutes.

NOTE: A D/P of 35 to 40 inches of water on RC-FI-1 is equal to approximately 1/2 gpm flow rate.

5.3.12 Evacuate the Gas Expansion Vessel, sample bottle and tubing:

Open V-13
Open V-15
Turn DV-2 to 12 o'clock position
Open V-12

5.3.13 When vacuum on RC-G-2.2 reads 22 inches vacuum or greater, turn DV-2 to 9 o'clock position.

5.3.14 When vacuum on RC-G-2.1 reads 22 inches of vacuum or greatest:

Shut V-15
Shut V-13

Shut V-10
Turn V-11 to Closed
Shut V-12

NOTE: Observe vacuum reading on both gauges holding steady.

5.3.15 Open V-14 and observe about 1.0 psi on RC-G-2.2.

5.3.16 Upon completion of purge (from step 5.3.11):

Shut V-3
Open V-8.2
Open V-8.1
Open V-2

5.3.17 Regulate Reactor Coolant (RHR) flow using RC-VREL-2 until flow indicator RC-FI-2 indicates 18 to 22 inches of water. Maintain this purge for a minimum of 3 minutes.

NOTE: A D/P of 18 to 22 inches of water on RC-FI-2 is equal to approximately 200 cc/min flow rate.

5.3.18 Upon completion of sample purge:

Shut V-8.2
Shut V-8.1
Shut V-1.2 (V-1.1 for RHR)
Open V-9
Open V-16 (for 1 full minute)

5.3.19 Upon completion of gas stripping, commence LSP flush:

Shut V-16
Shut V-9
Open V-8.2
Open V-8.1
Open V-4
Turn V-11 to "vent" position

5.3.20 Obtain the diluted gas sample by turning DV-2 to 12 o'clock position.

5.3.21 Observe pressure gauge RC-G-2.2 stabilized at about 1 psi:

Turn DV-2 to 9 o'clock position
Shut V-14

5.3.22 Remove the diluted gas sample bottle from the LSP and place entire assembly in fume hood for later transport to multi-channel analyzer.

5.3.23 At the CMP, operate the GC mini-computer to draw a vacuum on all 4 sample loops.

5.3.24 At the LSP open V-15 and allow the gas sample to transfer to the GC.

5.3.25 Operate the GC unit to obtain 4 samples for hydrogen determination. By selective attenuation, starting with a high value, determine the hydrogen concentration.

5.3.26 Have Control Room Operator shut RC-422 and RC-423 (not required for RHR sample).

5.3.27 At the Sample Acquisition Panel:

For RCHL Sample: Open FPC-51
Open FPC-51-14

For RHR Sample: Shut RHR 81-A (81-B)
Open FPC-51
Open FPC-51-41

5.3.28 At the Liquid Sample Panel: Shut V-4
Shut V-2
Shut V-8.1
Shut V-8.2
Open V-3
Open V-1.2 (V-1.1 for RHR)

Observe flush water flow rate of 35 to 40 inches of water on RC-FI-1. Maintain this flush for a minimum of 5 minutes.

5.3.29 At the completion of flushing: Shut V-1.2 (V-1.1 for RHR)
Shut V-3

5.3.30 At the Sample Acquisition Panel:

For RCHL Samples: Shut RC-423-1
Shut FPC-51-14
Shut FPC-51
Shut CC-314

For RHR Sample: Shut RHR 81-A (81-B)
Shut FPC-51-41
Shut FPC-51
Shut CC-316

For all samples: Turn RC-437-1 (or 437-2) to VCT.

5.3.31 At the LSP flush the expansion vessel:

Open V-8.2
Open V-9
Turn V-11 to "DI Water" position

Allow system to flush for 2 minutes.

5.3.32 Upon completion of flush: Turn V-11 to "Argon" position and blow expansion vessel dry

5.3.33 Upon completion of drying expansion vessel:

Turn V-11 to Close
Shut V-9
Shut V-8.2

5.3.34 Remove radioactive gases from gas system:

Open V-10
Open V-13
Open V-15
Turn V-11 to "vent" position
Open V-12

Evacuate system for 1 full minute.

5.3.35 Upon evacuation of gas system:

Shut V-12
Turn V-11 to "closed" position
Shut V-15
Shut V-13
Shut V-10

5.3.36 Transport diluted gas bottle to multi-channel analyzer for analysis.

5.4 Undiluted Liquid Sample

5.4.1 Proceed to HRSR per HP/RPD recommendations.

5.4.2 Check ventilation on, in "normal" position and high vacuum lights indicate "normal" for the LSP and CAP.

5.4.3 Check radiation levels in HRSR, and in maintenance area behind panels, if access is necessary.

5.4.4 Check the following lab equipment available and operational:

a. DI water flush hoses connected to LSP and supply valve open.
b. Check valve lineup per Attachment #1.
c. Reach rod for remote valve operation.
d. New undiluted liquid sample bottle available.
e. New undiluted liquid flush bottle, with special tool, available.
f. Sample cask available with undiluted sample piston installed.
g. Light on in undiluted sample port of LSP.

5.4.5 Install undiluted sample bottle in cask and check for proper operation.

5.4.6 Install the sample cask under the undiluted sample port and position the bottle up on the needles.

5.4.7 Have Control Room Operator open RC-422 and RC-423 (not required for RHR sample).

5.4.8 At the Sample Acquisition Panel:

For RCHL Sample: Open CC 314
Open RC 423-1

For RHR Sample: Open CC 316
Open RHR 81-A (81-B)

For all samples: Turn RC-437-1 (or 437-2) to DDT.

5.4.9 At the Liquid Sample Panel: Open V-3
Open V-1.2 (V-1.1 for RHR)

5.4.10 Regulate Reactor Coolant (RHR) flow using RC-VREL-1 until flow indicator RC-FI-1 indicates between 35-40 inches of water. Maintain this purge for a minimum of 5 minutes.

NOTE: A D/P of 35-40 inches of water on RC-FI-1 is equal to approximately 1/2 gpm flow rate.

5.4.11 Upon completion of the purge: Shut V-3
Open V-2
Open V-7

5.4.12 Regulate Reactor Coolant (RHR) flow using RC-VREL-2 until flow indicator RC-FI-2 indicates 18 to 22 inches of water. Maintain this purge for a minimum of 3 minutes.

NOTE: A D/P of 18 to 22 inches of water on RC-FI-2 is equal to approximately 200 cc/min.

5.4.13 Upon completion of the purge: Turn V-19 to "sample".

Observe flow into/thru sample bottle to waste. Purge time required only to insure bottle is full.

5.4.14 Upon completion of sample fill: Turn V-19 to "bypass"
Shut V-1.2 (V-1.1 for RHR)
Open V-4

5.4.15 While system is in DI water flush, return undiluted sample to cask, close lead top, and remove cask from lab. Install auxiliary shield.

NOTE: DI water flush should be performed for a minimum of 3 minutes before going to step 5.4.16.

5.4.16 Place undiluted sample flush bottle, and special flush tool into position.
Turn V-19 to "sample"
Allow system to flush for an additional 3 minutes.

5.4.17 Upon completion of sample flush: Turn V-19 to "bypass"
Shut V-7
Shut V-2

5.4.18 Have Control Room shut RC-422 and RC-423 (not required for RHR sample).

5.4.19 At the Sample Acquisition Panel:

For RCHL Sample: Open FPC-51
Open FPC-51-14

For RHR Sample: Shut RHR 81-A (81-B)
Open FPC-51
Open FPC-51-41

5.4.20 At the Sample Acquisition Panel: Open V-1.2 (V-1.1 for RHR)
Open V-3

Observe flush water flow rate of 35 to 40 inches of water, as indicated on FI-1. Maintain this flush for a minimum of 5 minutes.

5.4.21 Upon completion of flushing: Shut V-1.2 (V-1.1 for RHR)
Shut V-3

5.4.22 At the Sample Acquisition Panel:

For RCHL Sample: Shut RC-423-1
Shut FPC-51-14
Shut FPC-51
Shut CC-314

For RHR Sample: Shut FPC-51-41
Shut FPC-51
Shut CC-316

For All Samples: Turn RC 437-1 (437-2) to VCT.

5.5 Containment Hydrogen Monitor 1A & 1B Operation Procedure

5.5.1 Proceed to HRSR per HP/RPD recommendations.

5.5.2 Check ventilation on in "normal" position.

5.5.3 Check radiation levels in HRSR and maintenance area behind panels, if access is necessary.

5.5.4 Check to make sure remote panels are in stand-by and have had 6 hours warmup time.

5.5.5 Insure heat tracing is energized and operational.

5.5.6 Check monitor selection at Sample Acquisition Panel to insure it is not sampling same loop as the CASP.

5.5.7 Call Control Room to open valves RBV-14-3 and RBV-16-1 and RBV-14-1, for H_2 Analyzer A.

5.5.8 Call Control Room to open valves RBV-14-4 and RBV-16-2 and RBV-14-2, for H_2 Analyzer B.

5.5.9 Push the "remote selector" pushbutton to gain access at the remote panel.

5.5.10 Switch analyzer to Sample Mode. Allow 10 minutes for sample purge time.

5.5.11 Read sample in percent hydrogen off remote panel meter.

NOTE: If problems are encountered with selected analyzer, go to SAP and after checking status of CASP switch to other analyzer, and repeat procedure.

5.6 Containment Air Sample Panel Operation

5.6.1 Proceed to HRSR per HP/RPD recommendations.

5.6.2 Check ventilation on and in "normal" position and high vacuum lights indicate "normal" for the LSP and CAP, and CASP.

5.6.3 Check radiation levels in HRSR and in maintenance area behind panels if access is required.

5.6.4 Insure that N_2 supply regualtor is set at 150 psi and bottle contains at least 500 psig N_2.

5.6.5 Insure that when selecting sample loop A or B that either hydrogen monitor is not operating or loop selected is opposite that being used by monitor.

5.6.6 Verify that CASP and CASP Control Panels are energized and operational.

5.6.7 Place the four sample carts in the four sample positions and lock in place. Check carts are properly locked in by trying to pull away.

NOTE: Only Sample Station 1 can be used for Iodine Analysis.

5.6.8 Call Control Room and verify Dome Fans 1A and 1B are operational.

5.6.9 Have Control Room Operator open 1 set of the following valves:

Loop A	Loop B
RBV-14-1	RBV-14-2
RBV-14-3	RBV-14-4
RBV-16-1	RBV-16-2

5.6.10 Connect local pressure transmitter to cart selected for sampling.

5.6.11 CASP two minute pre-sample back flush:

SV-10 Open
SV-6 Open
SV-5 Open

Insure flow monitor on CASP is indicating flow.

5.6.12 Three minute sample capture:

SV-5 Closed
AV-2 Open

For Sample Station 1 - AV-1 and SV-1.2 Open
For Sample Station 2 - SV-2.1 and SV-2.2 Open
For Sample Station 3 - SV-3.1 and SV-3.2 Open
For Sample Station 4 - SV-4.1 and SV-4.2 Open

Open manual inlet and outlet values and close manual bypass valve on sample cart selected. Check pressure transmitter for indication of negative press. Insure CASP Flow Meter is still indicating flow.

5.6.13 Fifteen second flask equilibration:

SV-6 Closed

Flow Monitor on CASP should go out. Pressure Transmitter should reach stability (NOTE: Equal to containment pressure).

5.6.14 Three Minute Residual Sample Gas Removal:

Close Manual inlet and outlet valves, open bypass valve and close corresponding solenoid valves for station selected in step 5.6.12. Flow Monitor on CASP should still be out. After 3 minutes open SV-6.

5.6.15 Initial fifteen second post sample back-flush: AV-2 Closed

Flow Monitor should indicate flow.

5.6.16 Second fifteen second post sample back-flush: SV-5 Open

Flow Monitor should indicate flow.

5.6.17 Three minute sample flask line flush: SV-5 Closed

Open corresponding solenoid valves for sample station selected in step 5.6.12 and flush for three minutes. Flow indicator should indicate flow.

5.6.18 After flush is completed, close the following valves in order solenoid valves for station selected in step 5.6.12:

SV-10 Closed
SV-6 Closed

5.6.19 Call Control Room and have containment isolation valves selected in step 5.6.12 closed.

CAUTION: Make sure correct set is closed to avoid damaging hydrogen monitors.

5.6.20 After cart is removed, reset "Active/Inactive" indicator lights to Inactive mode.

Attachment 1

VALVE LINEUP SHEET

Sample Acquisition Panel

FPC-51	Sample Flush Line Iso.	CLOSE
FPC-51-41	RHR Sample Flush	CLOSE
RHR 81-A	RHR SMPL Iso A Aux Cool	CLOSE
RHR 81-B	RHR Smpl Iso B Aux Cool	CLOSE
RPC 51-14	RCHL Smpl Flush	CLOSE
RC-423-1	RCHL Smpl	CLOSE
FPC-51-31	M/B Demin Inlet Flush	CLOSE
LD-71	M/B Demin Inlet Iso	CLOSE
LD-75	M/B Demin Inlet Smpl	CLOSE
FPC-51-21	M/B Demin Outlet Flush	CLOSE
LD-81	M/B Demin Outlet Iso	CLOSE
LD-85	M/B Demin Outlet Smpl	CLOSE
FPC-51-12	Pzr Stm Sp Smpl Flush	CLOSE
RC-403-1	Przr Stm Sp Smpl	CLOSE
FPC-51-13	Pzr Liq Sp Smpl Flush	CLOSE
RC-413-1	Pzr Liq Sp Smpl	CLOSE
CC-314	Rx Cool HRS Hx CC Flow	CLOSE
CC-316	RHR HRS Hx CC Flow	CLOSE
MGR-545	VCT Gas Sp Smpl Iso A	CLOSE
MGR-545-1	VCT Gas SP Smpl Iso B	CLOSE
RC-437-1	Smpl Purge Divert A	TO VCT
RC-437-2	Smpl Purge Divert B	TO VCT

Attachment 1 (cont'd)

Liquid Sample Panel

V-17	Open Grab Sample	SHUT
V-6.1	Rem Smpl Bomb Inlet	SHUT
V-6.2	Rem Smpl Bomb Outlet	SHUT
V-5.1	Rem Smpl Bomb Inlet Iso	SHUT
V-5.2	Rem Smpl Bomb Outlet Iso	SHUT
V-REL-1	RC Purge Throttle	THROTTLED
V-3	RC Purge Stop	SHUT
V-REL-2	RC Purge to Waste Th	THROTTLED
V-7	Smpl Bomb Bypass	SHUT
V-2	RC Purge to Waste Stop	SHUT
V-1.1	RHR Smpl Iso	SHUT
V-1.2	RCHL/Pzr Smpl Iso	SHUT
V-1.3	(Spare)	SHUT
V-1.4	(Spare)	SHUT
V-1.5	VCT Gas Sp Smpl Iso	SHUT
V-4	DI Water Flush Iso	SHUT
V-8.1	Press Smpl Bomb Inlet	SHUT
V-8.2	Press Smpl Bomb Outlet	SHUT
V-9	Expansion Vessel Inlet	SHUT
V-16	Argon Gas Strip Purge	SHUT
V-18	RC Purge/Backflush	PURGE
V-19	Undiluted Liq Smpl	BYPASS
V-22	RC Purge Waste/CAP	WASTE

Attachment 1 (cont'd)

Liquid Sample Panel (cont'd)

DV-1	Diluted Liquid Sample	BYPASS
V-11	Expansion Vessel Outlet	SHUT
DV-2	Diluted Gas Smpl	BYPASS
V-10	Expansion Vessel Vacuum	SHUT
V-13	Dil Gas Smpl Vac	SHUT
V-14	Argon Purge to Dil Gas Smpl	SHUT
V-15	Gas Smpl to GC	SHUT
V-12	Argon to Eductor	SHUT

Liquid Sample Panel (Demin Sect)

DV-1.1	CVCS Demin Inlet Iso	SHUT
DV-1.2	CVCS Demin Outlet Iso	SHUT
DV-1.3	(Spare)	SHUT
DV-3	DI Water Flush	SHUT
DV-2.1	CVCS Demin Inlet Smpl	SHUT
DV-2.2	CVCS Demin Outlet Smpl	SHUT
DV-2.3	(Spare)	SHUT

Attachment 1 (cont'd)

CASP Control Panel

AV-1/SV-1.2	Smpl Pos #1 Inlet/Outlet	CLOSE
SV-2.1/SV-2.2	Smpl Pos #2 Inlet/Outlet	CLOSE
SV-3.1/SV-3.2	Smpl Pos #3 Inlet/Outlet	CLOSE
SV-4.1/SV-4.2	Smpl Pos #4 Inlet/Outlet	CLOSE
SV-5	Smpl Bypass	CLOSE
SV-10	Nitrogen to Eductor	CLOSE
AV-2	Return to Containment	CLOSE
SV-6	Eductor Suction Iso	CLOSE

(At Sample Acquisition Panel)

RBV-27-2	Cont Air Smpl A Iso	CLOSE
RBV-27-3	Cont Air Smpl B Iso	CLOSE

Attachment 1 (cont'd)

Chemical Analytical Panel

V-2	IC Smpl Outlet	OPEN
V-5	IC Loop Select	SHUT
V-6	O_2 Loop Select	O_2 - Cal
V-7	O_2 Analyzer Select	YSI
V-8	O_2 Loop Outlet	OPEN
V-9	O_2 Anal Cal Supply	SHUT
V-10	Inst Air Supply	OPEN
V-11	DI Water Supply	OPEN
V-12	Nitrogen Supply	OPEN
V-14	Argon Supply to GC	OPEN
V-15	Cal-3 Supply	OPEN
V-17	O_2 Cal Tk Recirc	SHUT
V-18	O_2 Cal Tk Drain	SHUT
V-19	Cal-3 Drain	SHUT
V-20	pH Cal Tk 2 Drain	SHUT
V-13	IC Inject Port	SHUT
V-16	pH Cal Tk 2 Supply	SHUT
V-25	pH Cal Tk 1 Drain	SHUT
V-27	pH Cal Tk 1 N_2 Supply	VENT
V-28	pH Cal Tk 2 N_2 Supply	VENT
V-29	Cal-3 N_2 Supply	VENT
V-30	pH Cal Tk Select	CAL-1
V-26	pH Cal Tk 1 Supply	SHUT
V-24	O_2 Cal Tk Fill	SHUT

IV. FLOW PATHS AND SCHEMATICS

A. LIQUID SAMPLING PANEL - REACTOR COOLANT MODULE (FIGURE IV-1)

A flow schematic of the reactor coolant module of the LSP is shown in Figure IV-1. All lines and components are assigned an alpha numeric designation to describe the flow paths. A glossary of terms for the LSP is included in Table IV-1.

The letters CP-L indicate a reactor coolant sample panel line containing a radioactive liquid or gas sample. The letters G-L indicate a gas supply line used for flushing purposes or evacuation of a system to radioactive waste. The letters FS-L indicate fluid supply lines for flushing, decontaminating, or dilution purposes. Sample supply lines to the reactor coolant module are indicated by the letters RC-L and components are identified by the letters RC preceding the component designation.

Graphic flow paths are detailed on the front panel of the LSP in various colors which indicate the module line applications. The color coding is detailed in Table IV-4.

Section IV details flow rates in ml/min as indicated on differential pressure gauges (i.e., RC-FI-2). The operator will observe a corresponding reading in inches of water (e.g., 200 ml/min corresponds to 18-22 inches of water on RC-FI-2).

1. Purging Flow Path (Figure IV-2)

Reactor coolant is routed to the liquid sampling panel through lines RC-L-1, -2, -3, -4, and -5. By opening one of the valves in the series RC-V-1.1 through RC-V-1.5, reactor coolant enters the LSP to line CP-L-1. System pressure is measured on pressure gauge RC-PI-G-1, located immediately above valves V-1.1 through V-1.5 on the panel face.

Flow continues through line CP-L-15 to temperature switch, RC-TS-1, which automatically isolates flow if the sample temperature exceeds 160°F. Flow proceeds through air operated valve RC-AV-1, valve RC-V-3, and a variable rod-in-capillary device RC-VREL-1. By adjusting RC-VREL-1, the operator controls the purge flow rate to 1900 ml/min for approximately five minutes.

After five minutes, RC-VREL-1 is throttled to 1000 ml/min and purging continued for one minute. A flow rate reduction is specified to reduce sample stream temperature prior to routing reactor coolant to the sample panel. The 1900 ml/min flow rate minimizes operator time requirements and reduces operator exposure during high radiation conditions.

Determination of the flow rate is made by measuring the pressure drop across orifice RC-OR-1. The flow rate is indicated on RC-FI-1, located above RC-VREL-1 on the panel face. From RC-OR-1, flow is routed back to containment or waste through CP-L-16.

2. Open Grab Sampling Flow Path (Figure IV-3)

Reactor coolant flows through line CP-L-1 and enters line CP-L-2 through valve RC-V-2. Temperature switch, RC-TS-2, isolates flow if the sample temperature exceeds 120°F. Reactor coolant continues through air-operated valve, RC-AV-2, valve RC-V-7 in line CP-L-3, and enters line CP-L-7.

Flow rate and pressure are controlled by variable rod-in-capillary, RC-VREL-2. RC-VREL-2 is adjusted until a flow rate of approximately 200 ml/min is indicated on flow indicator RC-FI-2. RC-FI-2 is located to the left of the burette reservoir on the panel face.

The reactor coolant exits RC-VREL-2 to lines CP-L-17, CP-L-18, and CP-L-19, and passes through filter RC-FILT-1. Switching valve RC-

V-18 is positioned to direct flow through degasifier RC-DG-1 to remove excessive gas bubbles. Stripped gas is sent to waste through lines CP-L-26, CP-L-30, and CP-L-29.

From the degasifier, flow is routed through line CP-L-21 to switching valve RC-V-19 which is positioned to direct flow to CP-L-24. Switching valve RC-V-22 is positioned to route coolant to lines CP-L-30 and CP-L-29 to waste. RC-V-22 may also direct flow to the CAP through line CP-L-28.

After reactor coolant purges through the panel lines for three minutes, valve RC-V-17 is opened to collect the grab sample.

3. <u>Removable Pressurized Flask Sampling Flow Path (Figure IV-4)</u>

Reactor coolant flow originates from line CP-L-1 and enters line CP-L-2 through valve RC-V-2. Flow continues through temperature switch, RC-TS-2, and air-operated valve RC-AV-2 to lines CP-L-3 and CP-L-4. With valve RC-V-7 closed, coolant passes through valve RC-V-5.1, quick disconnect RC-D-2.1 and valve RC-V-6.1 into the sampling flask RC-SF-1.1.

As coolant exits RC-SF-1.1, it passes through valve RC-V-6.2 in line CP-L-5, quick disconnect RC-D-2.2, and valve RC-V-5.2 into line CP-L-3 and then line CP-L-7.

Flow rate and pressure are controlled by variable rod-in-capillary RC-VREL-2. RC-VREL-2 is adjusted until a flow rate of approximately 200 ml/min is indicated on flow indicator RC-FI-2. RC-FI-2 is located to the left of the burette reservoir on the panel face.

From RC-VREL-2, the flow path is from line CP-L-17 to line CP-L-18 to line CP-L-19. Coolant flows through filter RC-FILT-1 to switching valve, RC-V-18, which is positioned to direct the flow to

CP-L-20 through degasifier RC-DG-1. Flow proceeds through line CP-L-21 to switching valve RC-V-19, which is positioned to direct flow to line CP-L-24. Switching valve RC-V-22 routes flow to line CP-L-30 and line CP-L-29 to waste. RC-V-22 may be rotated to direct flow to the CAP through line CP-L-28.

4. Routing of Reactor Coolant to the CAP Flow Path (Figure IV-5)

Reactor coolant flows through line CP-L-1 and enters line CP-L-2 through valve RC-V-2. Flow continues through temperature switch, RC-TS-2, which isolates flow if the sample temperature exceeds 120°F. This temperature setting provides protection for the components in the chemical analysis panel (CAP). After exiting RC-TS-2, flow passes through air-operated valve RC-AV-2 to line CP-L-3 to line CP-L-7.

Flow rate to the CAP is set to approximately 200 ml/min by adjusting variable rod-in-capilliary RC-VREL-2. The flow rate is indicated on RC-FI-2.

Line pressure as indicated on RC-PI-G-3 must not exceed 100 psig to protect the CAP probes. Pressure is limited by LSP pressure relief valve RC-PRV-2 which is set at 65 psig. The pressure in the CAP is controlled also by pressure control valve PCV-1 located in the CAP inlet header in line AP-L-2.

Proper flow to the dissolved oxgen and I. C. lines is indicated by the red flow indicators on both the CAP and CMP. The flow switch for the dissolved oxygen line is set at 200 ml/min while the I. C. line flow switch is set at 15 ml/min.

Flow proceeds through lines CP-L-17, CP-L-18, and CP-L-19 through filter RC-FILT-1. Switching valve RC-V-18 directs flow through line CP-L-20 to degasifier, RC-DG-1. Flow continues through CP-L-21 to switching valve RC-V-19, which is positioned to direct flow to CP-L-24. Switching valve RC-V-22 routes flow through line CP-L-28 to the CAP.

5. In-Line Pressurized Flask Sampling Flow Path (Figure IV-6)

Reactor coolant flows through line CP-L-1 and enters line CP-L-2 through valve RC-V-2. Flow continues through temperature switch RC-TS-2, air-operated valve RC-AV-2, filter RC-FILT-2, diluter valve RC-DV-1, and valve RC-V-8.1 to sampling flask RC-SF-1.2 in line CP-L-6. After exiting the sampling flask, flow continues through valve RC-V-8.2 in line CP-L-7 to the variable rod-in-capillary RC-VREL-2.

Flow rate and pressure are controlled by adjusting RC-VREL-2. RC-VREL-2 is adjusted until a flow rate of approximately 200 ml/min is indicated on flow indicator RC-FI-2.

From RC-VREL-2, the flow continues through lines CP-L-17, CP-L-18, and CP-L-19. Coolant flows through filter RC-FILT-1 to switching valve RC-V-18, which is positioned to direct flow to CP-L-20 through degasifier RC-DG-1. Flow proceeds through line CP-L-21 to switching valve RC-V-19 which is positioned to direct flow to line CP-L-24. Switching valve RC-V-22 routes flow to line CP-L-30 and line CP-L-29 to waste. RC-V-22 may be rotated to direct flow to the CAP through line CP-L-28.

6. Undiluted Liquid Sampling Flow Path (Figure IV-7)

Reactor coolant flows through line CP-L-1 and enters line CP-L-2 through valve RC-V-2. Flow continues through temperature switch RC-TS-2 and air-operated valve RC-AV-2, valve RC-V-7 in line CP-L-3, and enters line CP-L-7.

Flow rate and pressure are controlled by variable rod-in-capillary RC-VREL-2. RC-VREL-2 is adjusted until a flow rate of approximately 200 ml/min is indicated on flow indicator RC-FI-2 and line pressure is 20 psig maximum as indicated on pressure gauge RC-PI-G-3. The reactor coolant exits RC-VREL-2 to lines CP-L-17, CP-L-18, and CP-L-19 and passes through filter RC-FILT-1. The filter provides assurance that the capillary tubing in the CAP and the hypodermic needles in the undiluted bottle will not become plugged.

Switching valve RC-V-18 is positioned to direct flow to line CP-L-20 through degasifier RC-DG-1. Flow proceeds through line CP-L-21 to switching valve RC-V-19, which is positioned to direct flow through needle line CP-L-22 into the septum sealed bottle. Flow exits the bottle through needle line CP-L-23 and through switching valve, RC-V-19 to line CP-L-24. Switching valve RC-V-22 routes flow to lines CP-L-30 and CP-L-29 to waste or to line CP-L-28 to the CAP.

7. <u>Diluted Liquid Sampling Flow Path (Figure IV-8)</u>

Reactor coolant flows through line CP-L-1 and enters line CP-L-2 through valve RC-V-2. Flow continues through temperature switch RC-TS-2, air-operated RC-AV-2, filter RC-FILT-2, diluter valve RC-DV-1, and valve RC-V-8.1. The filter provides assurance the hypodermic needle in the diluted sample bottle will not become plugged. From line CP-L-2, coolant flows through line CP-L-6, sampling flask RC-SF-1.2, and valve RC-V-8.2 in line CP-L-7.

Flow rate and pressure are controlled by variable rod-in-capillary RC-VREL-2. RC-VREL-2 is adjusted until a flow rate of approximately 200 ml/min is indicated on flow indicator RC-FI-2.

The reactor coolant exits RC-VREL-2 to lines CP-L-17, CP-L-18, and CP-L-19 and passes through filter, RC-FILT-1.

Switching valve RC-V-18 directs flow to line CP-L-20 through degasifier RC-DG-1. Flow proceeds through line CP-L-21 to switching valve RC-V-19, which is positioned to direct flow to line CP-L-24. RC-V-22 is positioned to direct flow through lines CP-L-30 and CP-L-29 to waste or through line CP-L-28 to the CAP.

After purging these lines for a few minutes, valve RC-V-8.1 is closed and diluter valve RC-DV-1 is rotated to align the port with flushing line FS-L-7. Valve RC-V-21 on the graduated cylinder RC-C-1 is opened to flush the aliquot of reactor coolant in the diluter valve through needle line CP-L-27 into the septum sealed bottle.

8. Gas Expansion Vessel Drying Flow Path (Figure IV-9)

With valves RC-V-9 and RC-V-8.2 open, valve RC-V-11 is turned to the three o'clock position (port 2). Argon enters the LSP through line G-L-3 to valve RC-V-11. The gas is routed through line CP-L-9 to the expansion vessel RC-EV-1. The liquid from RC-EV-1 and argon exit the bottom of the vessel through line CP-L-8, valve RC-V-9, and valve RC-V-8.2 in line CP-L-7.

Line CP-L-7 routes flow to variable rod-in-capillary RC-VREL-2. RC-VREL-2 is pulled open until a sharp increase in pressure is indicated on RC-PI-G-3. This indicates all liquid has been removed from the lines. RC-VREL-2 is released and adjusted until pressure gauge RC-PI-G-3 reads 20 psig. From RC-VREL-2, line CP-L-17 routes flow through lines CP-L-18 and CP-L-19. Flow continues through filter RC-FILT-1 to switching valve RC-V-18, which is positioned to direct flow through degasifier RC-DG-1 and line CP-L-21 to switching valve RC-V-19. RC-V-19 is positioned to route flow through line CP-L-24 to switching valve RC-V-22 which directs flow to waste through lines CP-L-30 and CP-L-29.

After purging with argon through the system for a minimum of one minute, valve RC-V-11 is turned to the nine o'clock position (port 4). This permits the gas to vent through lines CP-L-9 and CP-L-10 and line G-L-9 with valve RC-V-10 open.

9. <u>Gas Expansion Vessel and Gas Line Evacuation Flow Paths (Figure IV-10)</u>

After drying the expansion vessel and installing the diluted gas sample bottle on line CP-L-12, valves RC-V-13 and RC-V-12 are opened. Argon gas enters lines G-L-2 and G-L-5 to operate the eductor RC-VT-1 when valve RC-V-12 is opened.

The eductor RC-VT-1 evacuates line G-L-9, line G-L-8 and line G-L-7 to diluter valve RC-DV-2 which is aligned to line CP-L-11. Evacuation of these lines is continued until pressure indicator RC-PI-G-2.2 indicates 22 inches of mercury.

At the same time, evacuation of lines CP-L-10, CP-L-9 and CP-L-8 and expansion vessel RC-EV-1 is accomplished. Valve RC-V-10 is open and valve RC-V-11 is in the nine o'clock position (port 4) during this evacuation. The vacuum indicated on pressure gauge RC-PI-G-2.1 is observed and evacuation continued until the reading is 22 inches of mercury.

Diluter valve RC-DV-2 is turned to the six o'clock position (port 3). Evacuation of lines G-L-8 and G-L-7 and line CP-L-12 to the gas bottle is continued until RC-PI-G-2.1 and RC-PI-G-2.2 indicate the same reading. After closing valves RC-V-13, RC-V-10, and RC-V-12, the operator waits a minimum of two minutes to verify the vacuum is holding. RC-V-11 is then aligned to the CLOSED position and RC-DV-2 is aligned to the nine o'clock position. The system is now ready for degasification of a reactor coolant sample.

10. Gas Stripping and Sampling (Figure IV-11)

After capturing a reactor coolant sample in sampling flask RC-SF-1.2 by closing valves RC-V-8.1 and RC-V-8.2, an initial flushing of the module is performed to reduce radiation levels. Valves RC-V-9 is opened to release high pressure gases to RC-EV-1. Valve RC-V-16 is opened to route argon through line G-L-2, pressure control valve RC-PC-1, and line G-L-6 into the sampling flask RC-SF-1.2. Gases stripped by the argon pass through line CP-L-6, valve RC-V-9, and line CP-L-8 into expansion vessel RC-EV-1. Pressure control valve RC-PC-1 controls the pressure at approximately 10 psig.

Upon aligning valve RC-V-11 to the nine o'clock position, the stripped gas passes through line CP-L-10, line CP-L-11, and diluter valve RC-DV-2 to valve RC-V-15. The operator must verify at this time that the gas chromatograph of the CAP is ready to receive a gas sample.

Valve RC-V-15 is opened after line CP-L-13 has been evacuated to the CAP gas chromatograph. The pressure reading on RC-PI-G-2.1 is recorded after opening valve RC-V-15.

The diluted gas sampling is performed by rotating RC-DV-2 to the six o'clock position (port 3). Argon from line G-L-2 passes through pressure control valve RC-PC-2 in line G-L-4. With valve RC-V-14 open, argon enters line G-L-7 and forces the small "bite" of gas in diluter valve RC-DV-2 into the gas sample bottle through needle line CP-L-12. Pressure control valve RC-PC-2 limits the pressure to 1 psig as read on RC-PI-G-2.2.

11. Purge Line Flushing Flow Path (Figure IV-12)

Fluid from the attached flush line FS-L-1 flows through the quick disconnect RC-D-1, line FS-L-3, and valve RC-V-4 in line FS-L-5 to panel line CP-L-1. With valve RC-V-2 closed, flow proceeds through line CP-L-15 to temperature switch RC-TS-1, air-operated valve RC-AV-1, valve RC-V-3, to variable rod-in-capillary RC-VREL-1.

RC-VREL-1 is adjusted to a flow rate of approximately 1900 ml/min. Determination of the flow rate is made by measuring the pressure drop across orifice RC-OR-1. The flow rate is indicated on RC-FI-1. From RC-OR-1, flow is routed back to containment or waste through line CP-L-16.

12. <u>Module Flushing Flow Path (Figure IV-13)</u>

Fluid from the attached flush line FS-L-1 flows through the quick disconnect RC-D-1, line FS-L-3, and valve RC-V-4 in line FS-L-5 to panel line CP-L-1. With valve RC-V-3 closed, flow is routed through valve RC-V-2, temperature switch RC-TS-2, and air-operated valve RC-AV-2 in line CP-L-2.

With valves RC-V-8.1 and RC-V-8.2 closed, flow proceeds through line CP-L-2 into line CP-L-3 and flows through valve RC-V-7 to line CP-L-7. CP-L-7 carries fluid to variable rod-in-capillary RC-VREL-2.

Flushing fluid exits RC-VREL-2 to lines CP-L-17, CP-L-18, and CP-L-19 where is passes through filter RC-FILT-1. Switching valve RC-V-18 is positioned to route flow through degasifier RC-DG-1. From the degasifier, flow proceeds through line CP-L-21 to switching valve RC-V-19.

If the undiluted bottle lines are to be flushed, RC-V-19 is positioned to route flow through line CP-L-22 through the needle flush tool and back to RC-V-19 through line CP-L-23.

Flow continues through line CP-L-24 to switching valve RC-V-22. RC-V-22 is positioned to direct flow through lines CP-L-30 and CP-L-29 to waste or to line CP-L-28 to flush CAP lines.

To flush SF-1.1, valves RC-V-5.1, RC-V-6.1, RC-V-6.2, and RC-V-5.2 are opened and valve RC-V-7 is closed. This directs flow from line CP-L-2 to line CP-L-4 through the above valves, sampling flask RC-SF-1.1, and line CP-L-5 to CP-L-7. Flow continues through the sequence previously described.

To flush SF-1.2, valve RC-V-11 is aligned to the flush line FS-L-4 and flow proceeds from FS-L-1 to FS-L-3 and FS-L-4. From valve RC-V-11, flow is directed through line CP-L-9, vessel RC-EV-1, line CP-L-8, and valve RC-V-9 to sampling flask RC-SF-1.2. From line CP-L-6, flow is routed through line CP-L-2, valve RC-V-8.1, diluter valve RC-DV-1, filter FILT-2, and valve RC-V-7 in line CP-L-3. After flowing to waste for a few minutes, valves RC-V-9 and RC-V-7 are closed. Flow continues through line CP-L-2 to RC-SF-1.2 in line CP-L-6. From CP-L-6 flow continues through valve RC-V-8.2 in line CP-L-7 and ultimately to waste.

13. Supply Line Flushing Flow Path (Figure IV-14)

Sample supply line, RC-L-1, is prepared for flushing by closing the sample source isolation valve, valve RC-V-2 and valve RC-V-3, and opening the flush line isolation valve. Fluid flows from the attached supply line through the quick disconnect, line FS-L-3, and valve RC-V-4 in line FS-L-5 to panel line CP-L-1.

With valve RC-V-1.1 opened, fluid flows through supply line RC-L-1 and the remote flush line isolation valve and flush line.

B. LIQUID SAMPLING PANEL - RADWASTE MODULE (FIGURE IV-15)

A flow schematic of the radwaste module of the LSP is shown in Figure IV-15. All lines and components are assigned an alpha numeric designation to describe the flow paths. A glossary of terms for the LSP is included in Table IV-1.

The letters WP-L indicate a sample panel line containing a radwaste liquid sample. The letters FS-L indicate fluid supply lines for flushing and decontaminating purposes. Sample supply lines to the radwaste module are indicated by the letters RW-L while sample recirculation lines are indicated by the letters R-L. Radwaste module components are identified by the letters RW preceding the component designation.

Graphic flow paths are detailed on the front panel of the LSP in various colors which indicate the module line applications. The color coding is detailed in Table IV-4.

1. Recirculation Flow Path (Figure IV-16)

   Radwaste samples are routed to the LSP using supply lines in the series RW-L-1 through RW-L-10. By opening one of the valves in the series RW-V-1.1 through RW-V-1.10, radwaste liquid is routed through one of the recirculation lines R-L-1 through R-L-10. Recirculation is provided to obtain a representative sample of radwaste.

2. Purging and Open Grab Sampling Flow Paths (Figure IV-17)

   After recirculation for six minutes, the sample panel lines are purged. Using RW-L-1 as the sample source line, liquid enters line WP-L-1 and proceeds through valve RW-V-2.1 to panel line WP-L-11. A temperature switch RW-TS-1 in WP-L-11 isolates flow if the sample temperature exceeds 120°F during purging. Flow continues through solenoid valve RW-SV-1 and valve RW-V-4, which is used to control the flow rate. RW-V-4 is adjusted until flow indicator RW-FI-1 reads approximately 200 ml/min. RW-FI-1 is located to the right of the burette reservoir on the panel face.

   Flow proceeds through an in-line filter RW-FILT-1 in WP-L-14 to switching valve RW-V-5, which is positioned to direct flow to WP-L-15. Switching valve RW-V-7 is positioned to route flow through WP-

L-18 to switching valve RW-V-8. RW-V-8 is positioned to route flow through WP-L-21 to WP-L-23 to waste for a minimum of one minute.

An open grab sample is obtained by opening valve RW-V-6 to purge line WP-L-22.

3. <u>Undiluted Liquid Sampling Flow Path (Figure IV-18)</u>

Radwaste flows through line RW-L-1 to panel line WP-L-1. From WP-L-1, flow proceeds through valve RW-V-2.1 to WP-L-11. Flow continues through temperature switch RW-TS-1, solenoid valve RW-SV-1 and valve RW-V-4 to the in-line filter RW-FILT-1 in line WP-L-14. The filter provides assurance that the hypodermic needles will not be plugged when collecting an undiluted sample.

Flow rate and pressure are controlled by valve RW-V-4 until a flow rate of approximately 200 ml/min is indicated on flow indicator RW-FI-1 and line pressure is 20 psig maximum as indicated on pressure gauge RW-PI-G-1. Pressure relief valve RW-PRV-1 in line WP-L-13 is set to open at 25 psig and discharge water to waste line WP-L-23. The pressure relief valve prevents over-pressurization of the sample bottle.

The radwaste sample exits the filter to switching valve RW-V-5 which is positioned to direct flow through line WP-L-15 to switching valve RW-V-7. Switching valve RW-V-7 is positioned to route flow through needle line WP-L-16 into the septum sealed bottle. Radwaste liquid exits the bottle through needle line WP-L-17 and through switching valve RW-V-7 to line WP-L-18. Flow continues through switching valve RW-V-8, which is positioned to route flow through lines WP-L-21 and WP-L-23 to waste.

4. Diluted Liquid Sampling Path (Figure IV-19)

Radwaste flows through line RW-L-1 to panel line WP-L-1. From WP-L-1, flow proceeds through valve RW-V-2.1 to WP-L-11. Flow continues through temperature switch RW-TS-1, solenoid valve RW-SV-1, and valve RW-V-4 to the in-line filter RW-FILT-1 in line WP-L-14. The filter provides assurance that the hypodermic needle in the diluted bottle will not be plugged.

Flow rate and pressure are controlled by valve RW-V-4 until a flow rate of approximately 200 ml/min is indicated on flow indicator RW-FI-1.

The radwaste sample exits the filter to switching valve RW-V-5, which is positioned to direct flow through line WP-L-15 to switching valve, RW-V-7. RW-V-7 is positioned to direct flow through line WP-L-18 to switching valve RW-V-8. RW-V-8 is positioned to direct flow through line WP-L-19 and diluter valve RW-DV-1. Flow proceeds through line WP-L-20 to switching valve RW-V-8, which is positioned to route flow through line WP-L-21 and WP-L-23 to waste.

After purging these lines for a minute, diluter valve RW-DV-1 is rotated to align the port with flushing line FS-L-34. Valve RW-V-9 on the graduated cylinder, RW-C-1, is opened to flush the aliquot of radwaste in the diluter valve through needle line WP-L-24 into the septum sealed bottle.

5. Module Flushing Flow Path (Figure IV-20)

With valve RW-V-2.1 closed, fluid flows from the attached supply line through quick disconnect RW-D-1 and through valve RW-V-3 in flush line FS-L-20 to line FS-L-32. The flushing flow rate is controlled by throttling valve RW-V-3.

Flushing fluid continues through line WP-L-11, temperature switch RW-TS-1, solenoid valve RW-SV-1, valve RW-V-4, and filter RW-FILT-1 in line WP-L-14. Switching valve RW-V-5 is positioned to direct fluid through line WP-L-15 to switching valve RW-V-7.

If the undiluted bottle lines are to be flushed, RW-V-7 is positioned to direct flow through line WP-L-16, through the needle flush tool to line WP-L-17, and out through valve RW-V-7 to line WP-L-18. Line WP-L-18 carries the fluid to switching valve RW-V-8. If the diluter valve line is to be flushed, RW-V-8 is positioned to route flow through line WP-L-19 and diluter valve RW-DV-1. Flow proceeds through line WP-L-20 back to switching valve RW-V-8 to lines WP-L-21 and WP-L-23 to waste. Line WP-L-22 is flushed by opening valve RW-V-6 and flowing to the splash box.

With valve RW-V-2.1 open, fluid flows through line FS-L-20, valve RW-V-3, and line FS-L-21. Line FS-L-22 routes flow through check valve RW-CV-1.1 into line WP-L-1 and through check valve RW-CV-2.1 and valve RW-V-2.1 into line WP-L-11.

6. Supply and Recirculation Line Flushing Flow Paths (Figures IV-21)

Prior to flushing the recirculation line R-L-1, valves RW-V-4 and RW-V-2.1 and the remote sample source isolation valve are closed. When valves RW-V-3 and RW-V-1.1 are opened, demineralized water flows through flush lines FS-L-20, FS-L-21, and FS-L-22 into panel line WP-L-1. From WP-L-1, flow proceeds through valve RW-V-1.1 into recirculation line R-L-1. Flushing is continued for a minimum of six (6) minutes and then RW-V-1.1 is closed.

At completion of this flushing, valves RW-V-2.1 and RW-V-4 are opened. Flushing liquid flows through flushing lines FS-L-20, FS-L-21, and FS-L-22 and check valve RW-CV-1.1. Panel line WP-L-1 carries flow through check valve RW-CV-2.1 and valve RW-V-2.1 into panel line WP-L-11 to waste. Check valves RW-CV-1.1 and RW-CV-

2.1 have a 2 psi cracking pressure while relief valve RW-CV-4 opens at a pressure of 25 psi. These pressure settings permit panel line WP-L-1 to be flushed completely.

Sample supply line RW-L-1 is prepared for flushing by closing valves RW-V-2.1 and RW-V-4 and opening the remote flush line isolation valve. Fluid flows through flushing lines FS-L-20, FS-L-21, and FS-L-22, panel line WP-L-1, and sample supply line RW-L-1 to the Rad Waste Tank.

C. LIQUID SAMPLING PANEL - DEMINERALIZER MODULE (FIGURE IV-22)

A flow schematic of the demineralizer module of the LSP is shown in Figure IV-22. All lines and components are assigned an alpha numeric designation to describe the flow paths. A glossary of terms for the LSP is included in Table IV-1.

The letters DP-L indicate a sample panel line containing a demineralizer liquid sample. The letters FS-L indicate fluid supply lines for flushing and decontaminating purposes. Sample supply lines to the demineralizer module are indicated by the letters DM-L and components are identified by the letters DM preceeding the component designation.

Graphic flow paths are detailed on the front panel of the LSP in various colors which indicate the module line applications. The color coding is detailed in Table IV-4.

1. Purging and Open Grab Sampling Flow Paths (Figures IV-23)

Demineralizer samples are routed to the liquid sampling panel through lines DM-L-1, -2, and -3. By opening one of the valves in the series DM-V-1.1 through DM-V-1.3, a demineralizer sample enters the LSP.

Using sample line DM-L-1 as the source to the sampled, opening valve DM-V-1.1 permits flow to enter panel line DP-L-1. Variable rod-in-capillary DM-VREL-1.1 is opened to permit flow through panel lines DP-L-4 and DP-L-9 to flow orifice DM-OR-1. Determination of the flow rate is made by measuring the pressure drop across flow orifice DM-OR-1 through line DP-L-10 to waste.

The operator adjusts DM-VREL-1.1 to obtain a purge flow rate of 1900 ml/min. The flow rate is indicated on DM-FI-1 located to the left of the demineralizer variable rod-in-capillary device on the panel face.

After purging through the lines, valve DM-V-2.1 is opened to purge the open grab sampling line and to collect the grab sample.

2. Module Flushing Flow Path (Figure IV-24)

Fluid flows from the attached flush line FS-L-10 through quick disconnect DM-D-1 and valve DM-V-3 into line FS-L-11. Using DP-L-1 as the example panel line, flow proceeds from FS-L-11 to the variable rod-in-capillary DM-VREL-1.1 in line DP-L-1.

Flow rate is controlled by adjusting DM-VREL-1.1. The flow rate is indicated on flow indicator DM-FI-1. Flow continues from DM-VREL-1.1 through lines DP-L-4, DP-L-9, and DP-L-10 to waste.

Open grab sample line DP-L-4 is flushed by opening valve DM-V-2.1 and flowing to the splash box.

3. Supply Line Flushing Flow Path (Figure IV-25)

Sample supply line DM-L-1 is prepared for flushing by closing the sample source isolation valve and opening the flush line isolation valve. Fluid flows from the attached flush line FS-L-10 through quick disconnect DM-D-1 and valve DM-V-3 into line FS-L-11.

With variable rod-in-capillary DM-VREL-1.1 closed, fluid flows through line FS-L-11 into line DP-L-1. Flow continues through valve DM-V-1.1 into sample supply line DM-L-1 and through the remote flush valve and line.

D. CHEMICAL ANALYSIS PANEL

A flow schematic for the CAP is shown in Figure IV-26. All lines and components are assigned an alpha numeric designation to describe the flow paths.

The letter AP-L indicate a CAP reactor coolant panel line containing a radioactive liquid. The letters G-L indicate a gas supply line used of pressurizing calibration tanks, flushing to the LSP, or flowing reactor coolant stripped gas, carrier or calibration gas to the gas chromatograph. The letters FS-L indicate fluid supply lines for flushing with demineralized water or adding demineralized water to the oxygenated water tank.

A glossary of terms for the CAP is included in Table IV-2 and the color coding for the CAP graphic is detailed in Table IV-5.

1. Conductivity Calibration Flow Path (Figure IV-27)

To calibrate the conductivity probe, one of the calibration tanks must be drained and filled with a KCl solution of known concentration. The CAL-2 tank is presented as an example for the conductivity calibration.

Draining of CAL-2 is accomplished by opening valve V-20. The buffer tank is filled with demineralized water through the plug on level gauge LG-2 and allowed to drain. The tank should be flushed several times. Nitrogen entering line G-L-2, line G-L-4, valve V-28, and line G-L-5 is used to dry the CAL-2 tank after draining the demineralized water.

After filling CAL-2 with the KCl solution, the calibration tank is pressurized with nitrogen. The KCl solution enters lines CS-L-5 and CS-L-6 and then line CS-L-7 through valve V-16. Valve V-16 is used to control the flow rate to approximately 200 ml/min. Valve V-30 is positioned to CAL-2 and routes flow through line CS-L-9, filter F-2, and check valves CV-9 and CV-5 to switching valve V-6.

Valve V-6 directs flow through line AP-L-7 where it passes through the conductivity probe and holder CE-1 and temperature probe TE-2. Conductivity readout on the CMP is identified by CI-1.

Flow continues through line AP-L-7 to switching valve V-7. Flow is routed by V-7 through AP-L-8 and the Rexnord dissolved oxygen probe and holder AE-2 to line AP-L-10. The KCl solution continues through the pH probe and holder AE-5, flow sensor FE-2, valve V-8, and line AP-L-11 to AP-L-17. Line AP-L-17 carries the KCl to waste.

2. pH Calibration Flow Path (Figure IV-28)

Buffers of pH 7 and pH 4 or 10 are present in calibration tanks CAL-1 and CAL-2 respectively. The flow path from CAL-1 will be presented as an example.

Initially nitrogen is used to pressurize the calibration tank. Nitrogen from line G-L-1, regulated at approximately 60 psig by pressure control valve PCV-4, enters through line G-L-2, valve V-27, and line G-L-3 to the top of CAL-1.

With valve V-6 aligned to the pH calibration line CS-L-9 and valve V-30 aligned to CS-L-4, flow of buffer is from CAL-1 through line CS-L-1, line CS-L-3, valve V-26, and line CS-L-4 to valve V-30. Valve V-30 directs buffer through filter F-2, line CS-L-9 and check valves CV-9 and CV-5 to switching valve V-6.

Valve V-6 directs flow through line AP-L-7. Buffer solution passes the conductivity probe CE-1 and temperature probe TE-2 to switching valve V-7. Switching valve V-7 is positioned to direct flow through line AP-L-8 to the Rexnord dissolved oxygen probe AE-2 during normal operations or line AP-L-9 and the YSI dissolved oxygen probe AE-3 during accident conditions.

Buffer solution enters line AP-L-10 and the pH probe and holder AE-5. Flow proceeds through flow sensor FE-2, valve V-8, and line AP-L-11 to line AP-L-17 which carries it to waste. Valve V-26 is adjusted until proper flow is indicated by FS-2.

Readout of the buffer pH value on the CMP is indicated by AI-5. After terminating flow, the pH reading is permitted to stablize. The pH monitor AI-5 is adjusted to indicate the temperature corrected pH reading for the buffer solution.

3. Rexnord and YSI Dissolved Oxygen Calibration Flow Paths (Figure IV-29)

Prior to flowing air-saturated water to the dissolved oxygen probes, the water in calibration tank CAL-4 must be recirculated a minimum of one hour to saturate the water with air.

Recirculation is initiated by starting the recirculation pump PU-1 and opening valve V-17. The pump directs water through line CS-L-15, filter F-3 and lines CS-L-16, CS-L-17, and CS-L-18 back to the top of the tank through a spray nozzle.

If insufficient water is in the tank as observed through level gauge LG-4, demineralized water must be added to CAL-4 prior to recirculation. A demineralized water line is connected to quick disconnect coupling D-3. Valves V-11 and V-24 are opened to permit flow through lines FS-L-1 and FS-L-4 to the top of CAL-4 through valve V-24. The recirculation tank should be filled with demineralized water to a minimum distance of three inches from the spray nozzle.

After recirculation is completed, valve V-17 is closed, valve V-9 is opened, and valve V-6 is positioned to the oxygen calibrating line CS-L-21. Oxygenated water is pumped through line CS-L-16, valve V-9, line CS-L-21, and check valve CV-6 to switching valve V-6.

Switching valve V-6 directs flow through line AP-L-7 to the conductivity probe CE-1, temperature sensor TE-2, and valve V-7. For calibration of the Rexnord analyzer, valve V-7 is positioned to direct flow through probe AE-2 in line AP-L-8. For calibration of the YSI analyzer, valve V-7 is positioned to route flow through probe AE-3 in line AP-L-9.

Flow from either line enters line AP-L-10 and passes through the pH probe and holder AE-5 and flow sensor FE-2. After sufficent flow is indicated on the CAP or CMP by FS-2, the Rexnord AIT-2 or YSI AIR-3 analyzer is adjusted to indicate the dissolved oxygen content of the air-saturated water. Flow is controlled by V-17. Adjustment to the Rexnord analyzer AIT-2 is performed at the CAP. Readout is also available on the CMP edgewise meter AI-2. Adjustment to the YSI analyzer is performed only at the CMP.

After exiting V-8, the water enters line AP-L-11 and then AP-L-17 which carriers it to waste.

4. <u>Ion Chromatograph Calibration Flow Path (Figure IV-30)</u>

Calibration tank CAL-3 contains a low level chloride standard for routing to the ion chromatograph (I. C.) for calibration. A manual injection port on the rear of the panel is provided for calibration purposes also. This port may be used for injection of non-radioactive samples in addition to standards.

Nitrogen is used as the motive force to move the chloride standard to the I. C. from CAL-3. Nitrogen from line G-L-1 regulated by pressure control valve PCV-4 enters line G-L-2 and G-L-6. With valve V-29 directed to line G-L-6, nitrogen pressurizes tank CAL-3 through line G-L-7.

After pressurizing the tank, chloride standard proceeds through line CS-L-12 and valve V-15 which is normally in an open position. Filter F-1 remove particulates which could plug the small diameter lines in the ion chromatograph. Line CS-L-13 carries the chloride standard through check valves CV-8 and CV-4 to switching valve V-5. When aligned to the chloride calibration position, valve V-5 routes flow to the ion chromatograph through line AP-L-5 and AP-L-12.
Flow enters the I. C. AE-4 sample loop and then exits through line AP-L-15 when the INJECT/LOAD toggle switch is in the LOAD position. Flow is regulated by valve V-15 until flow sensor FE-1 and flow indicator FS-1 detect and indicate the proper flow rate of approximately 15 ml/min.

When proper flow is obtained, the INJECT/LOAD switch is placed in the INJECT position. The eluent carries the chloride standard through the separator and suppressor columns of the I. C. located in the rear of the CAP. The eluent and sample exit the I. C. through line AP-L-14 to lines AP-L-16 and AP-L-17 to waste.

Manual injections of standard to the I. C. are performed from the rear of the panel. Valve V-13 is opened and standard injected by syringe through a septum cap into lines CS-L-22 and CS-L-23 and line AP-L-12 to the ion chromatograph.

5. <u>Gas Chromatograph Calibration Flow Path (Figure IV-31)</u>

Verification of the gas chromatograph (G.C.) performance is accomplished by injection of either 2000 ppm or 10 percent hydrogen standard. The G.C. sample loop is loaded with one of the calibration standards after loop evacuation. Loop evacuation and loading of the sample loop with a gas standard are controlled from the G. C. controller AIR-1 at the CMP. Eductor VT-1 is activated by entering code 23 into the controller microprocessor which opens solenoid valve SV-1 in line G-L-12 and a G. C. analysis module valve in the vacuum line to the sample loop.

Calibration gas enters through either valve V-31 and line G-L-9 or valve V-32 and line G-L-10 to a manifold prior to being routed to the gas chromatograph internal valving and detection system. Chromatographic grade argon enters from line G-L-11 through valve V-14 and line G-L-13 to the G. C. and is regulated by pressure control valve PCV-2. The argon carrier gas pressure should remain constant at 40 psig during normal analytical use.

6. Conductivity, Dissolved Oxygen, and pH Sampling and Flushing Flow Paths (Figure IV-32)

Sample flow from LSP line CP-L-28 enters CAP line AP-L-1 to degasifier DG-1. Stripped gas is routed through line AP-L-3 and check valve CV-15 to waste through line AP-L-17.

Reactor coolant is directed by lines AP-L-2 and AP-L-6 to switching valve V-6 when valve V-5 is aligned to the CLOSED position. Valve V-6 routes coolant to the conductivity probe CE-1 and temperature probe TE-2 in line AP-L-7.

Valve V-7 is positioned to direct coolant to the Rexnord probe AE-2 in line AP-L-8 during normal operations. During accident conditions, valve V-7 is positioned to route flow through the YSI dissolved oxygen and temperature probe in line AP-L-9.

Flow from these probes enters line AP-L-10 containing the pH probe AE-5 and flow sensor FE-2. Flow rate is controlled by RC-VREL-2 in the LSP. Line AP-L-11 directs flow to line AP-L-17 to waste.

After determining the pH, temperature, dissolved oxygen content, and conductivity of the reactor coolant, flushing is initiated immediately during accident conditions. Initial flushing consists of flowing demineralized water through the LSP to CAP lines AP-L-1, AP-L-2 and AP-L-6. With valve V-6 aligned to the reactor coolant line AP-L-6, flush water is routed through the sample path previously described.

Final flusing involves flowing demineralized water from the LSP through CAP lines AP-L-1, AP-L-2 and AP-L-4 to complete flushing of the I.C. lines.

7. <u>Ion Chromatograph Sampling and Flushing Flow Paths (Figure IV-33)</u>

Sample flow from LSP line CP-L-28 enters CAP line AP-L-1 to degasifier DG-1. Stripped gas is routed through line AP-L-3 and check valve CV-15 to waste through line AP-L-17.

With valve V-6 directed to the oxygen calibration line CS-L-21 and valve V-5 aligned to the reactor coolant line AP-L-6, reactor coolant flows through lines AP-L-2 and AP-L-4 to switching valve V-5. From V-5, coolant flows through lines AP-L-5 and AP-L-12 to the ion chromatograph AE-4.

Flow enters the ion chromatograph sample loop and exits through line AP-L-15 to line AP-L-16 when the I. C. INJECT/LOAD toggle switch is in the LOAD position. Flow rate is controlled by RC-VREL-2 in the LSP and pressure control valve PCV-1 in line AP-L-2. Flow sensor FE-1 and flow indicator FS-1 detect and indicate the proper flow rate of 15 ml/min. Since RC-VREL-2 in the LSP is throttled to indicate 200 ml/min on RC-FI-2, the majority of the water is routed through CAP pressure control valve PC-V-1 in line AP-L-2 to maintain the 15 ml/min flow rate through the I. C. loop.

When proper flow is obtained and purging is completed, the INJECT/LOAD toggle is placed in the INJECT position. The eluent carries the chloride standard through the separator and suppressor columns of the I. C. located in the rear of the CAP. The eluent and sample exit the I. C. through line AP-L-14 to line AP-L-17 which routes flow to waste.

After sample analysis under accident conditions, the CAP is flushed immediately. Initial flushing is accomplished by routing demineralized water through a flush line connected at quick disconnect D-3. Valve V-5 is aligned to to demineralized water line FS-L-3 and flow proceeds through line FS-L-1, valve V-11, line FS-L-2, and line FS-L-3 to valve V-5. Valve V-5 routes flow through lines AP-L-5 and AP-L-12 to the I. C. to waste. Final flushing involves flowing demineralized water through the LSP to flush CAP lines AP-L-1, AP-L-2, AP-L-4 and AP-L-6 to waste. The ion chromatographic columns must be regenerated under accident conditions to flush radioactive anions and cations from the system.

8. Gas Chromatographic Evacuation, Sampling, and Flushing Flow Paths (Figure IV-34)

Evacuation of the gas chromatograph (G. C.) is accomplished prior to routing reactor coolant stripped-gas to the G. C. Eductor VT-1 is used for system evacuation and is activated by the G. C. controller at the CMP. Argon for operating the eductor enters through line G-L-11, valve V-14, and solenoid valve SV-1 in line G-L-12 to the eductor VT-1. The eductor is used to evacuate the internal four-loop sample valve, line G-L-8, and line CP-L-13 to valve RC-V-15 in the LSP. Evacuation is completed when the G. C. red HI vacuum indicator lights.

When RC-V-15 at the LSP is opened, gas flows through LSP line CP-L-13 to the CAP. Gas enters the CAP line G-L-8, valve V-1, and filter F-4 prior to entering the G. C. The four-loop sample valve is loaded with stripped-gas.

Upon sampling initiation from the CMP G.C. controller, sample flows through the G. C. columns and detector and is exhausted to the plenum.

After sampling is completed, the eductor VT-1 is activated from the G. C. controller to evacuate the four-loop sample valve, line G-L-8 and line CP-L-13 to valve RC-V-15.

Coincident with evacuation, an argon purge is initiated through CAP line G-L-11, pressure regulator PCV-2, and line G-L-13. From G-L-13, argon is routed to the LSP and enters through LSP line G-L-1. Line CP-L-13 routes argon to the G. C. and is exhausted to the plenum through the eductor VT-1.

E. CONTAINMENT AIR SAMPLING PANEL

A flow schematic for the CASP is shown in Figure IV-35. All lines and components are assigned an alpha numeric designation to describe the flow paths. A glossary of terms for the CASP is included in Table IV-3.

Graphic flow paths are detailed on the front panel of the CASP Control Panel (CCP) in color to indicate the flow paths for containment air and nitrogen through the CASP. Indicator lights for all air and solenoid valves are included on the graphic to assist the operator in recognizing the exact flow paths for each exercise being performed.

Containment air flow paths through the CASP are designated by red 5/16-inch lines while containment air returning to containment are illustrated by red 5/32-inch lines. Nitrogen supply lines are designated by brown 5/16-inch lines. After passing through the eductor EV-1, nitrogen flow paths are illustrated by brown 5/32-inch lines.

1. Two-Minute Pre-Sample Back Flush (Figure IV-36)

Nitrogen is purged through the CASP prior to sampling. Nitrogen passes through the pressure regulator by customer piping to line L-40. With valve V-2 and solenoid valve SV-10 open, flow proceeds through lines L-41 and L-42 to the eductor. Nitrogen pressure is read on pressure gauge G-1 on the CCP.

With air-operated valve AV-2 closed, nitrogen passes through line L-12 where the flow rate is monitored by flow monitor FM-1. The pressure regulator is adjusted until the red indicator for FM-1 lights. From FM-1, flow proceeds through line L-11, solenoid valve SV-5, and line L-10. Nitrogen enters line L-1 and is purged back to containment through valve V-1. Ths pre-sample back flush continues for a period of two minutes.

2. Three-Minute Sample Capture (Figure (IV-37)

During this three-minute exercise, containment air enters the CASP through valve V-1 to line L-1. Air-operated valve AV-1 opens to permit flow through line L-2, quick disconnect D-1.1, and line L-3. With the inlet and outlet CASK isolation valves V-4 and V-6 open and bypass valve V-5 closed, containment air enters the CASK through line L-4 and exits through line L-6. After passing through quick disconnect D-1.2, flow continues through line L-7, solenoid valve SV-1.2 in line L-8, to line L-9. From line L-9, containment air is directed through line L-11, flow monitor FM-1, line L-12 and eductor

EV-1. The eductor routes flow through line L-13, air-operated valve AV-2, line L-14, valve V-3, and back to containment through line L-15.

3. Fifteen-Second Equilibrate Flask Pressure (Figure IV-38)

After the three minute sample capture exercise is complete, solenoid valve SV-1.2 closes to equilibrate sample pressure in flask SF-1. Flow proceeds from containment through valve V-1, line L-1, air-operated valve AV-1, and line L-2. After the fifteen second timer elapses, air-operated valve AV-1 closes.

4. Three-Minute Residual Sample Gas Removal (Figure IV-39)

For three minutes, air-operated valve AV-2 and solenoid valve SV-10 remain open. During this period, lines L-8, L-9, L-11, and L-12 are evacuated to remove the residual containment air from these lines. Lines L-23, L-31 and L-39 will also be evacuated during this sequence.

5. Initial Fifteen-Second Post-Sample Back Flush (Figure IV-40)

This initial back flush starts with the closing of air-operated valve AV-2. With solenoid valve SV-5 closed, flow proceeds from the nitrogen source through line L-40, valve V-2, line L-41, solenoid valve SV-10, and line L-42 to the eductor EV-1. Nitrogen from the eductor flows through flow monitor FM- 1 in line L-12 to line L-11. From line L-11, flow is directed through line L-9, check valve CV-1 in line L-8, line L-10, and back to containment through line L-1 and valve V-1.

6. Second Fifteen-Second Post-Sample Back Flush (Figure IV-41)

After completing the initial back flush, solenoid valve SV-5 opens. Nitrogen flow proceeds from the nitrogen source through line L-40, valve V-2, line L-41, solenoid valve SV-10, and line L-42 to the eductor EV-1. Nitrogen from the eductor flows through flow monitor FM-1 in line L-12 to line L-11. With solenoid valve SV-5 open, flow continues through line L-10, line L-1, and valve V-1 back to containment.

7. Three-Minute Sample Flask Line Flush (Figure IV-42)

After completion of the second back flush, the pause timer lights and the anunciator "isolate sample flask" will flash on and off. The operator, upon observing the anunciator, should move to the CASP and close the inlet and outlet isolation valves V-4 and V-6 and open the bypass valve V-5. The pause timer is set for three minutes during this exercise.

After performing the CASK valve manipulations, the operator, upon activating the "start" exercise pushbutton at the CCP, initiates the sample flask line flush.

Nitrogen for line flushing flows from the nitrogen source through line L-40, valve V-2, line L-41, solenoid valve SV-10, and line L-42 to the eductor EV-1. With air operated valve AV-2 closed, nitrogen is directed through line L-12, flow monitor FM-1, and line L-11. Solenoid valve SV-5 remains closed routing nitrogen to line L-9.

Activation of the sample flask line flush opens solenoid valve SV-1.2 and air-operated valve AV-1, permitting a flush through line L-8, SV-1.2, quick disconnect D-1.2, line L-6, and valve V-5 in bypass line L-5. Flow continues through line L-3, quick disconnect D-1.1, line L-2, AV-1, line L-1, and valve V- 1 back to containment.

8. Two-Minute GGD Back Flush (Figure IV-43)

Nitrogen is flushed back through the CASP for two minutes and a background reading of the GGD is recorded. With valve V-2 and solenoid valve SV-10 open, flow is routed through line L-40, line L-41, and line L-42 to the eductor EV-1. From EV-1, nitrogen flows through line L-12, flow monitor FM-1, and line L-11. With solenoid valve SV-5 open, flow continues through line L-10, line L-1, and valve V-1 back through the GGD to containment.

9. Three-Minute GGD Sampling (Figure IV-44)

During this exercise, air-operated valve AV-2 opens and containment air is passed by the GGD for a period of three minutes. Containment air enters the CASP through valve V-1 to line L-1. With air-operated valve AV-1 closed, flow is routed through line L-10, solenoid valve SV-5, line L-11, and flow monitor FM-1 to the eductor EV-1. From EV-1, containment air flows through line L-13 through air-operated valve AV-2, line L-14, valve V-3 and to the containment building through line L-15.

10. Fifteen-Second GGD Residual Sample Gas Removal (Figure IV-45)

After the three-minute sampling exercise is complete, solenoid valve SV-5 closes. Air operated valve AV-2 remains open. Eductor EV-1 operates to evacuate lines L-8, L-9, L-11, and L-12 for a period of fifteen seconds.

11. Three-Minute GGD Residual Sample Gas Removal (Figure IV-46)

After the fifteen-second line evacuation, a three-minute timer controls evacuation of lines L-8, L-9, L-11, and L-12 as described in section 10 above.

12. Initial Fifteen-Second Post-GGD Back Flush (Figure IV-47)

Upon initiation of this cycle, air-operated valve AV-2 and solenoid valve SV-5 close. This valve operation routes nitrogen through line L-40, valve V-2, line L-41, solenoid valve SV-10, and line L-42 to eductor EV-1. From EV-1, flow is directed through line L-12, flow monitor FM-1, line L-11, line L-9, and check valve CV-1 in line L-8. Nitrogen enters line L-10 and then is directed to containment through valve V-1 in line L-1.

13. Second Fifteen-Second Post-GGD Back Flush (Figure IV-48)

Upon completion of the initial back flush, solenoid valve SV-5 opens. This sequence routes nitrogen through line L-40, valve V-2, line L-41, solenoid valve SV-10, and line L-42 to eductor EV-1. From EV-1, nitrogen flows through line L-12, flow monitor FM-1, line L-11, solenoid valve SV-5, and line L-10 to line L-1. Nitrogen is purged through valve V-1 back to containment. After completion of this back purge, the CCP returns to the home position to await GGD exercises.

TABLE IV-1

GLOSSARY OF TERMS FOR LIQUID SAMPLING PANEL

Term	Nomenclature	Applicable LSP Module: Reactor Coolant	Demin	Radwaste
C	Graduated cylinder	X	-	X
DG	Degasifier	X	-	-
D	Quick disconnect	X	X	X
EV	Expansion vessel	X	-	-
FI	Flow indicator	X	X	X
FILT	Filter	X	-	X
GS	Gauge protector	X	X	X
NB	Needle block assembly	X	-	X
OR	Flow orifice	X	X	-
PI-G	Pressure indicator-gauge	X	-	X
PPS	Plenum static pressure switch	X	-	-
PC	Pressure controller	X	-	-
R	Burette reservoir	X	-	X
SF	Sample flask	X	-	-
TS	Temperature switch	X	-	X
AV	Valve, air-operated	X	-	-
CV	Valve, check	X	X	X
DV	Valve, diluter	X	-	X
PCV	Valve, pressure control	X	-	-
PRV	Valve, pressure relief	X	-	X
SV	Valve, solenoid	X	-	X
V	Valve, globe, ball, or plug	X	X	X
VT	Eductor	X	-	-
VREL	Variable pressure reducing element	X	X	-
RC	Reactor coolant module	X	-	-
DM	Demineralizer module	-	X	-
RW	Radwaste module	-	-	X
CP-L	Reactor coolant panel line	X	-	-
DP-L	Demineralizer panel line	-	X	-
WP-L	Radwaste panel line	-	-	X
G-L	Gas line	X	-	-
FS-L	Flush supply line	X	X	X
R-L	Recirculation line	-	-	X

TABLE IV-2

GLOSSARY OF TERMS FOR THE CHEMICAL ANALYSIS AND MONITOR PANELS

Term	Nomenclature
AE-1/AT-1	Baseline gas chromatograph
AIR-1	Gas chromatograph control section (CMP)
AIT-2	Rexnord dissolved oxygen analyzer
AE-2	Rexnord dissolved oxygen probe and flow assembly
AI-2	Dissolved oxygen indicating meter (CMP)
AIR-3	YSI oxygen and temperature recorder (CMP)
AE-3	YSI oxygen and temperature probe
AR-4	L&N Speedomax M two-pen recorder (CMP)
AE-4, AIT-4	Dionex ion chromatograph
AI-5	Beckman pH monitor (CMP)
AE-5,AT-5	Cole-Parmer pH probe, pre-amp
CI-1	L&N Conductivity monitor (CMP)
CE-1	Beckman conductivity probe
CAL	Calibration solution cylinder
D	Quick disconnect plug coupling
DG	Degasifier
F	Filter
FE	Flow switch, sensorhead
FT, FS	Electrical assembly for FE
HS-1	Dissolved oxygen pump switch
I	Solid state relay
PI	Pressure indicator, gauge
PIT-1	MBIS pressure monitor
PI-1	Pressure indicating meter (CMP)
PE	Pressure transducer
PU	Pump
TI, TE	Temperature indicator, probe
CV	Valve, check
PCV	Valve, pressure control
SV	Valve, solenoid
V	Valve
VT	Eductor
AP-L	Chemical analysis panel line
CS-L	Calibration solution line
G-L	Gas line
FS-L	Flush water line

TABLE IV-3

GLOSSARY OF TERMS FOR THE
CONTAINMENT AIR SAMPLING AND CONTROL PANELS

Term	Nomenclature
AV	Valve, air operated
SV	Valve, solenoid
V	Valve, manual isolation
CV	Value, check
D	Quick disconnect coupling
EV	Eductor
FM	Flow monitor
G	Pressure gauge
PE	Pressure transducer
PI	Pressure indicator
PC	Pressure regulator

TABLE IV-4

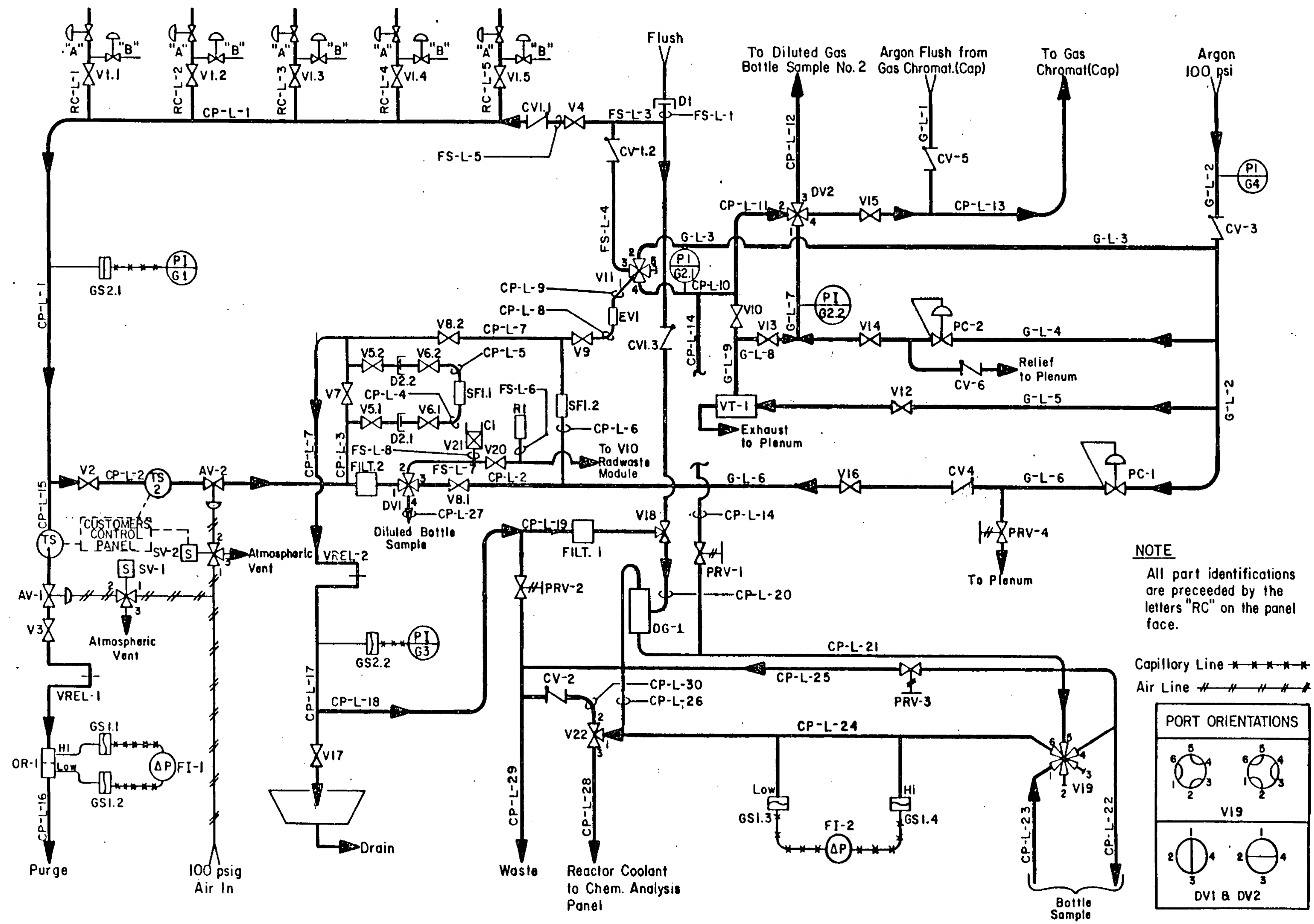
LSP GRAPHIC LINE CODES

Lines	Color	Line Width, Inches
Reactor coolant liquid sample	Red	5/16
Reactor coolant purge	Red	3/16
Radwaste sample	Yellow	5/16
Radwaste recirculation	Yellow	3/16
Demineralizer liquid	Green	5/16
Reactor coolant stripped gas	Orange	5/16
Flushing	Grey	5/16
Argon	Light Blue	5/16

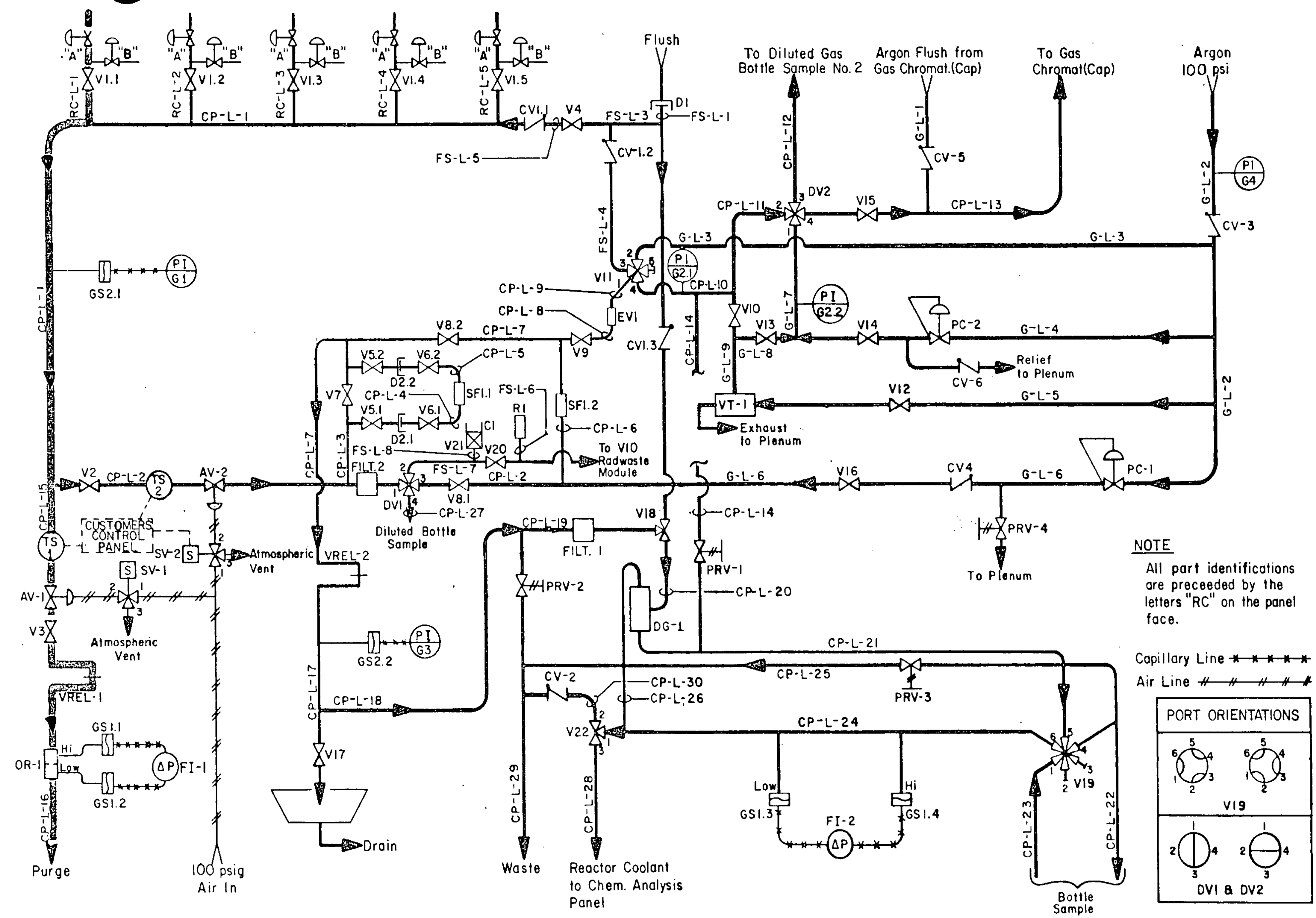
TABLE IV-5

CAP GRAPHIC LINE CODES

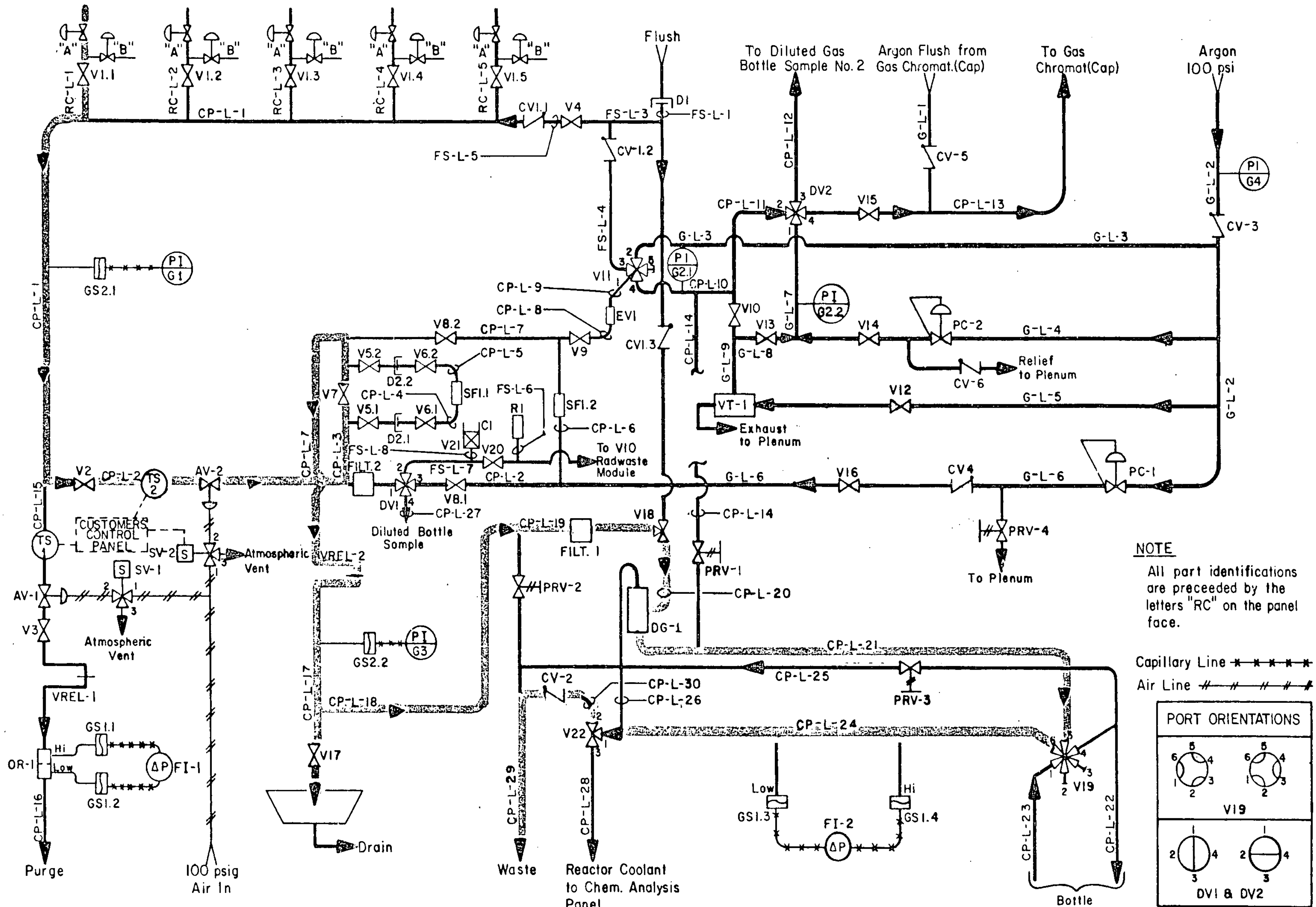
Lines	Color	Line Width, Inches
Reactor coolant liquid sample	Red	5/16
Reactor coolant stripped gas	Orange	5/16
Flushing	Grey	5/16
Oxygenated water	Green	5/16
pH buffers	Yellow	5/16
Chloride standards	Tan	5/16



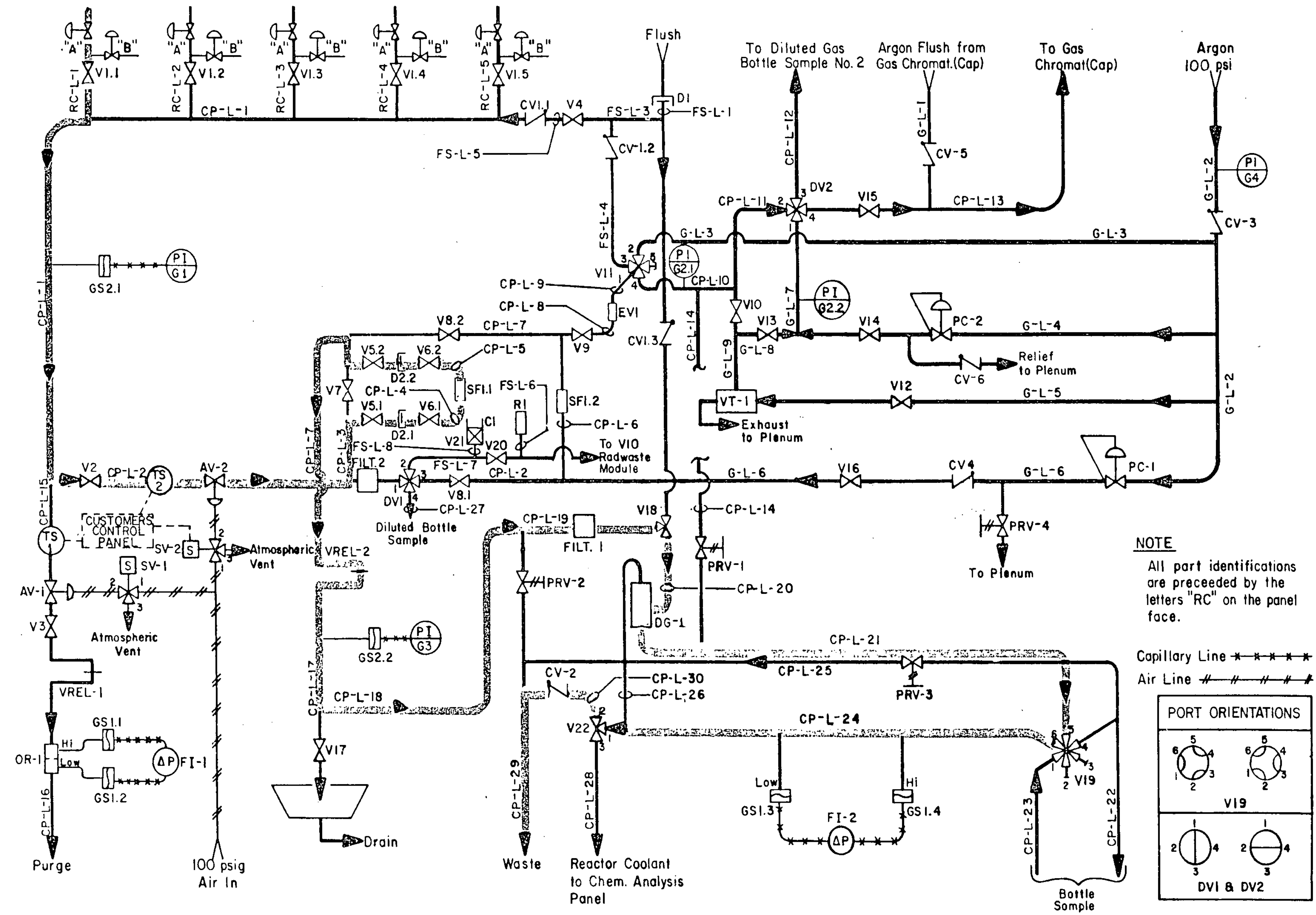
LIQUID SAMPLING PANEL
REACTOR COOLANT MODULE
FIGURE IV-1



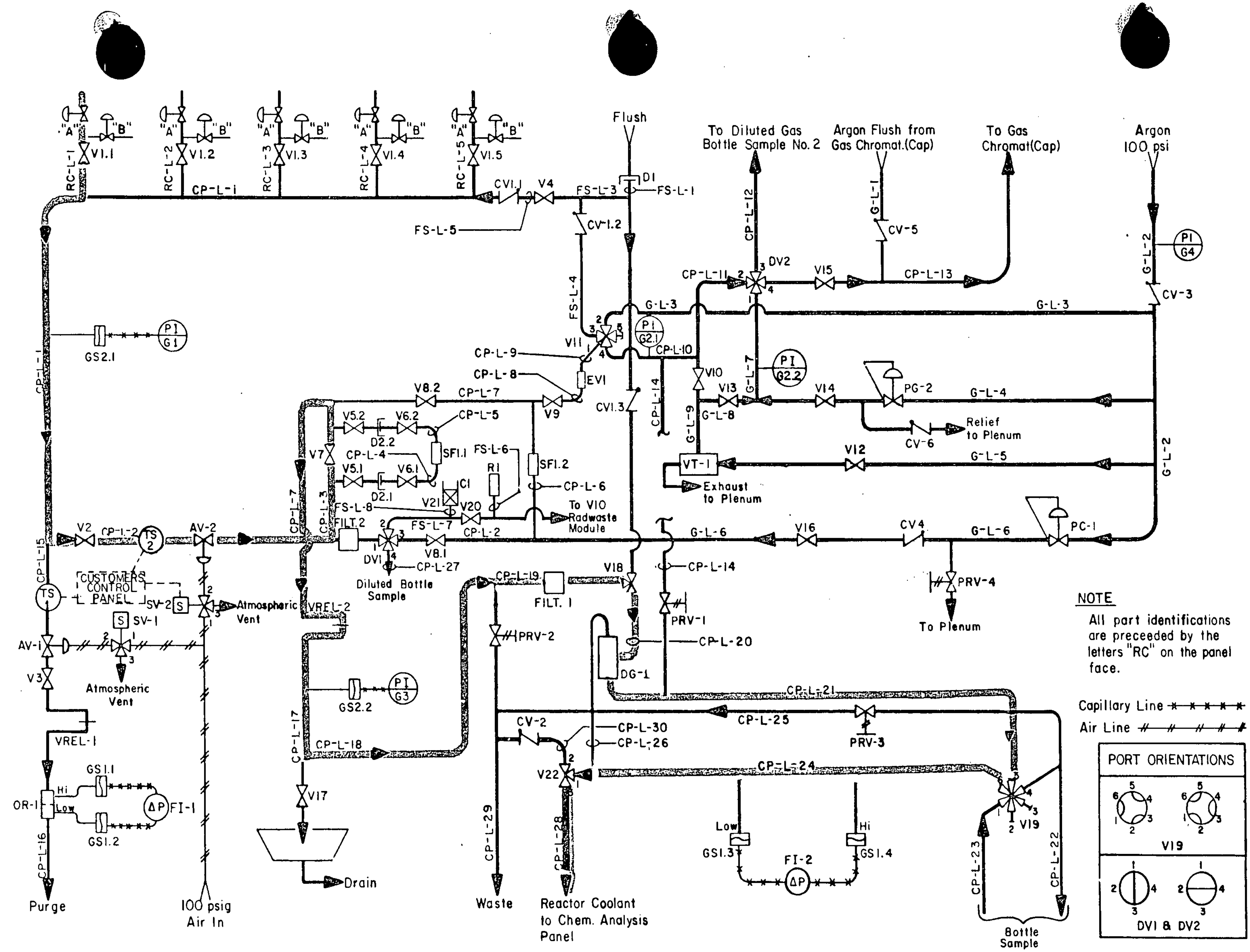
LIQUID SAMPLING PANEL
REACTOR COOLANT MODULE
FIGURE IV-2
PURGING



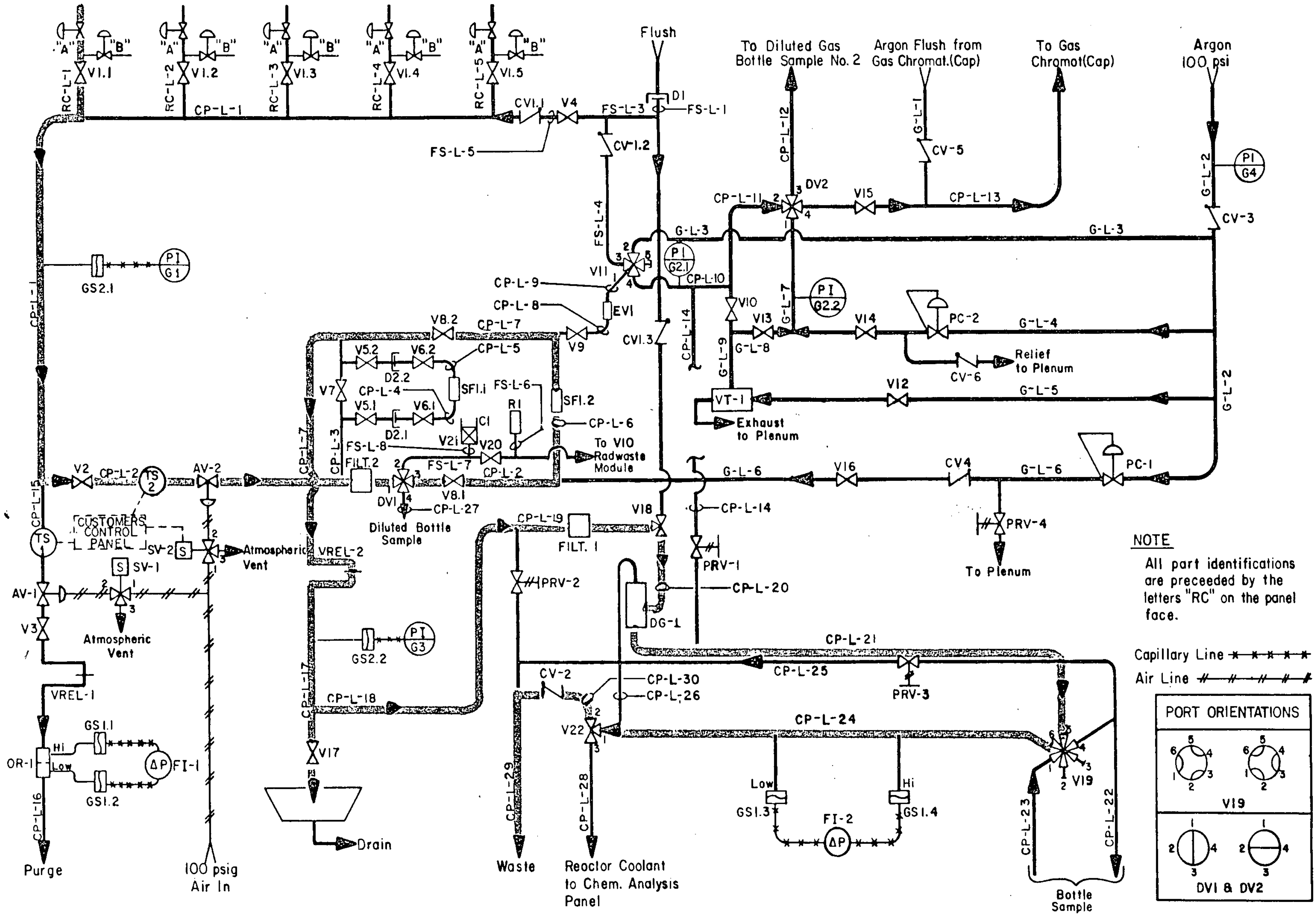
LIQUID SAMPLING PANEL
REACTOR COOLANT MODULE
FIGURE IV-3
OPEN GRAB SAMPLING



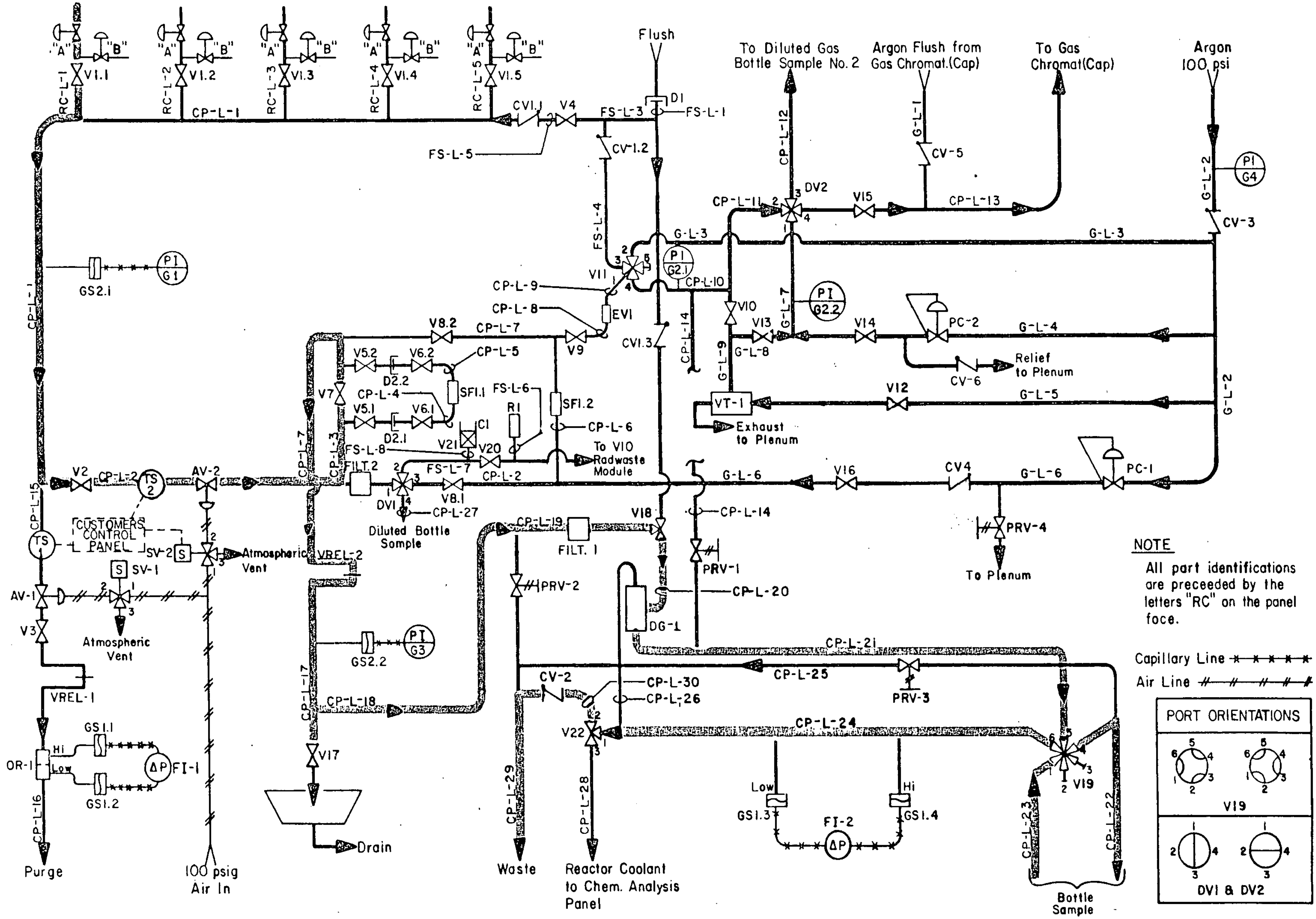
LIQUID SAMPLING PANEL
REACTOR COOLANT MODULE
FIGURE IV-4
REMOVABLE PRESSURIZED
FLASK SAMPLING



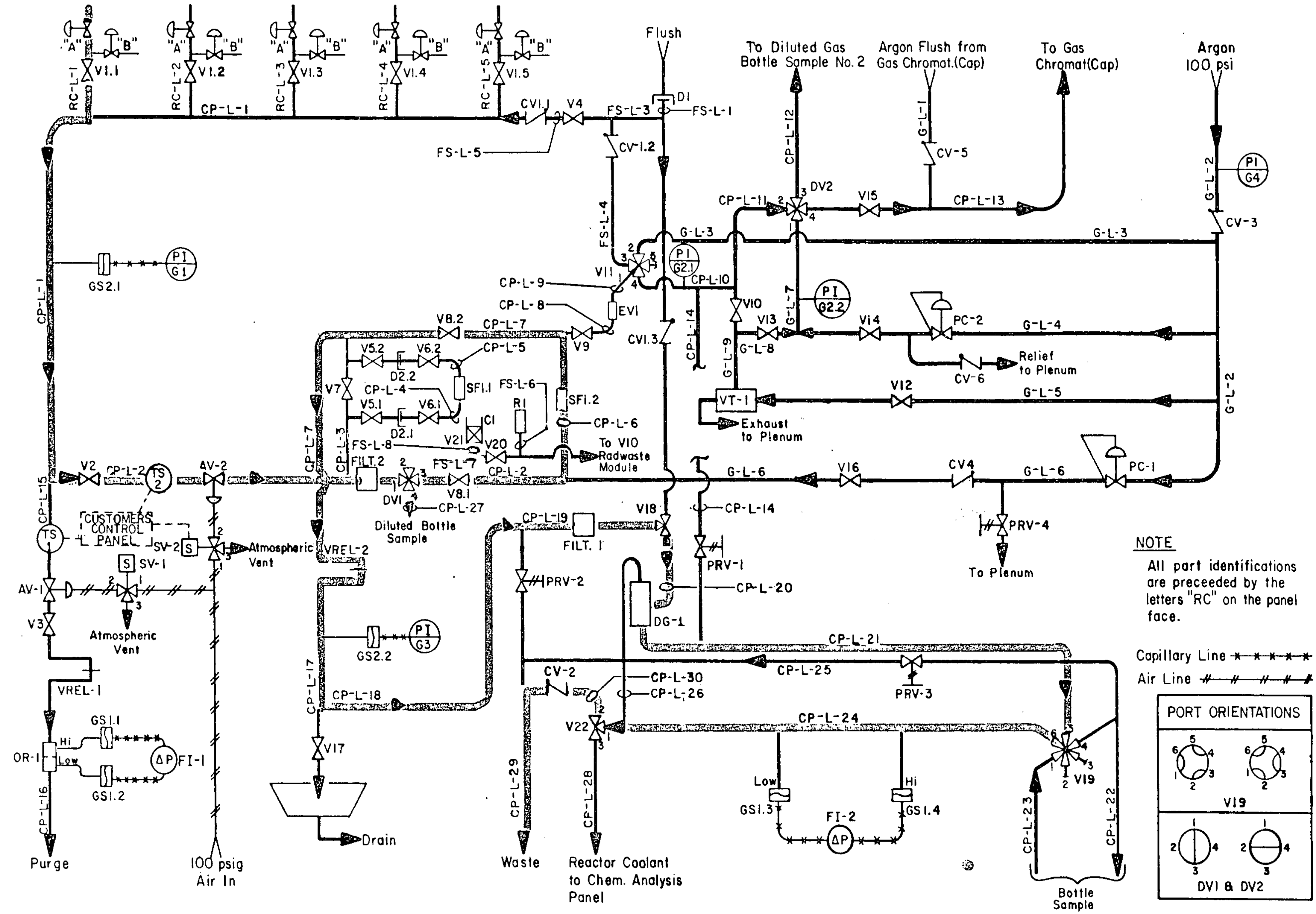
LIQUID SAMPLING PANEL
REACTOR COOLANT MODULE
FIGURE IV-5
ROUTING TO THE CAP



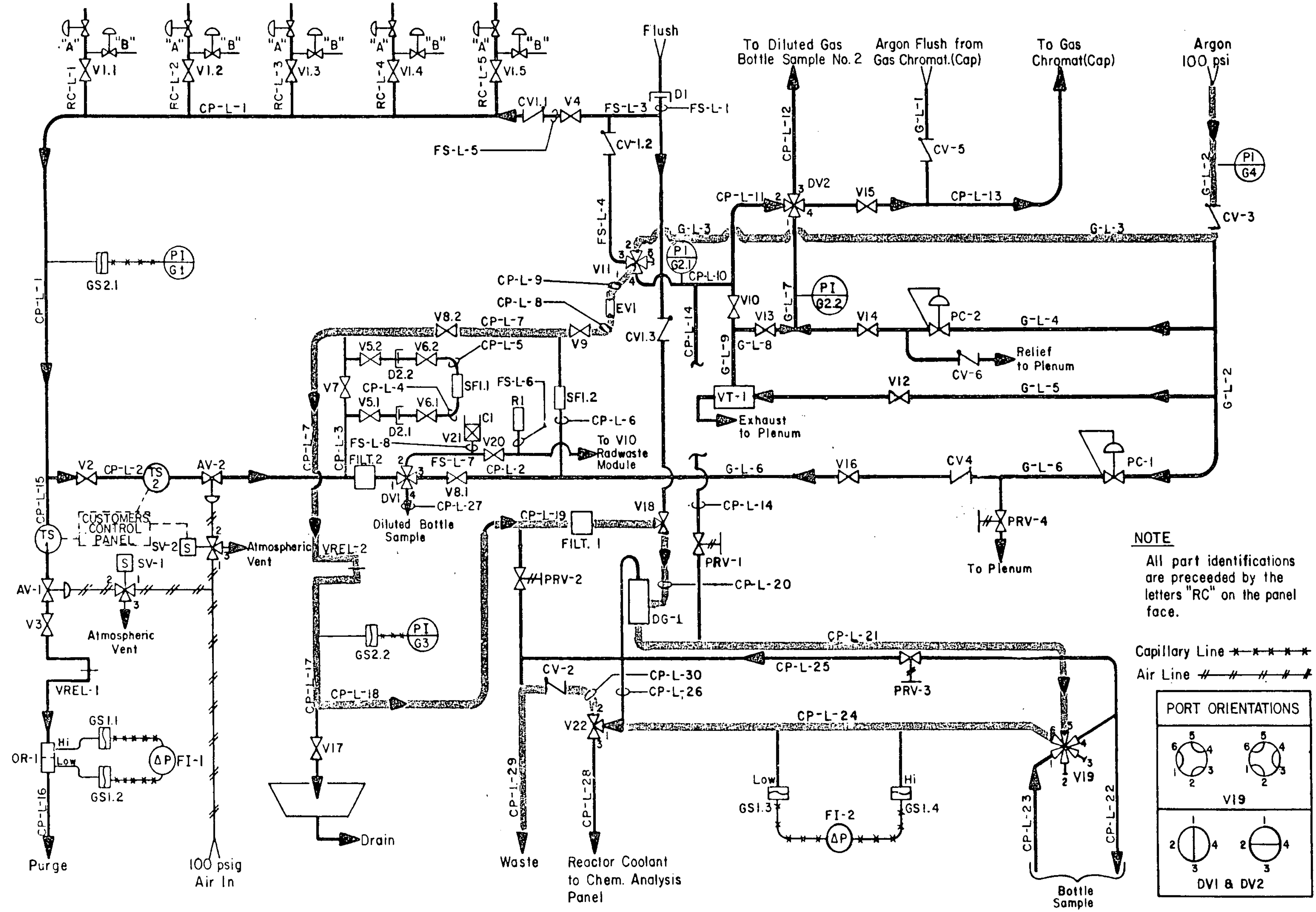
LIQUID SAMPLING PANEL
REACTOR COOLANT MODULE
FIGURE IV-6
IN-LINE PRESSURIZED
FLASK SAMPLING



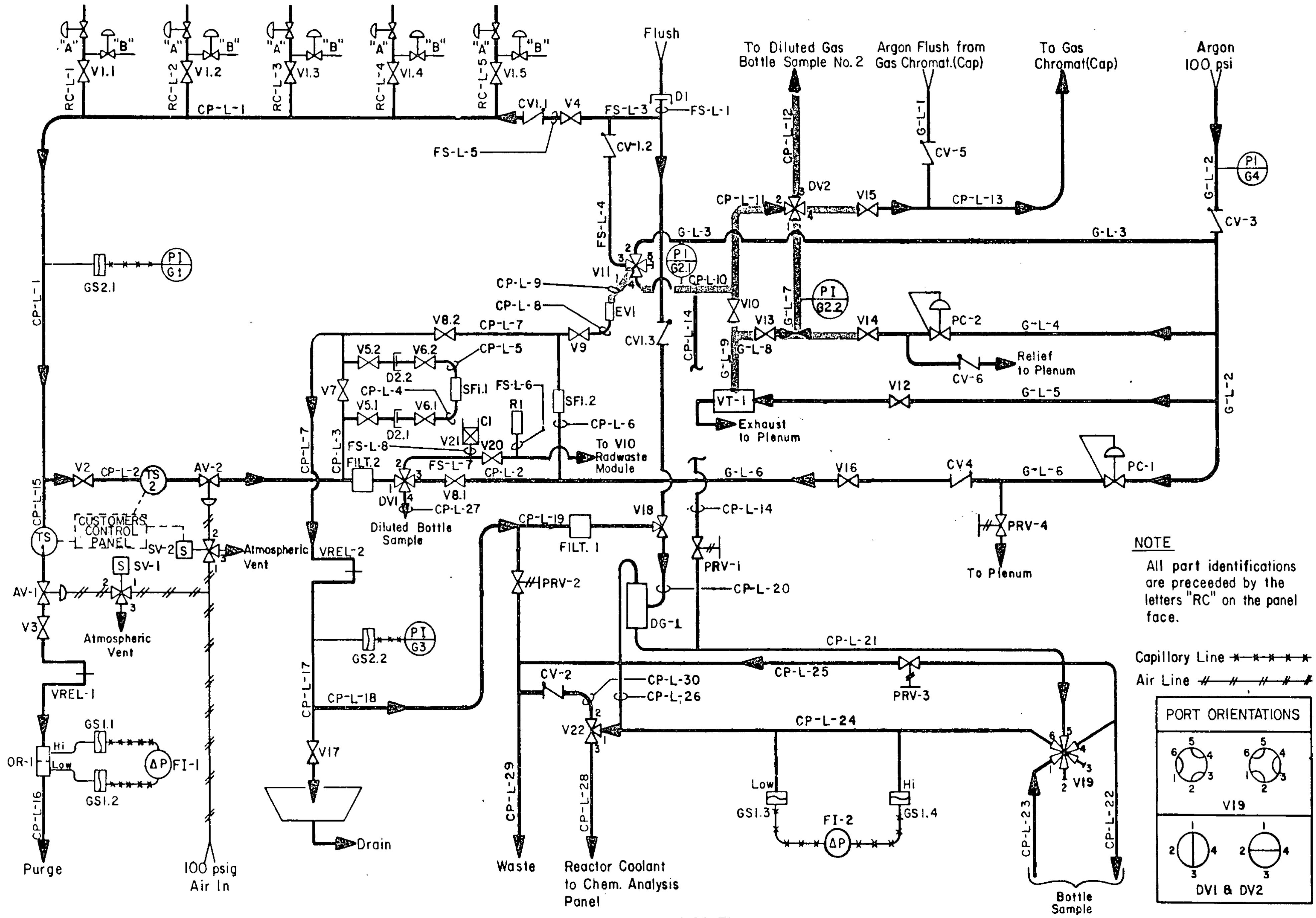
LIQUID SAMPLING PANEL
REACTOR COOLANT MODULE
FIGURE IV-7
UNDILUTED LIQUID SAMPLING



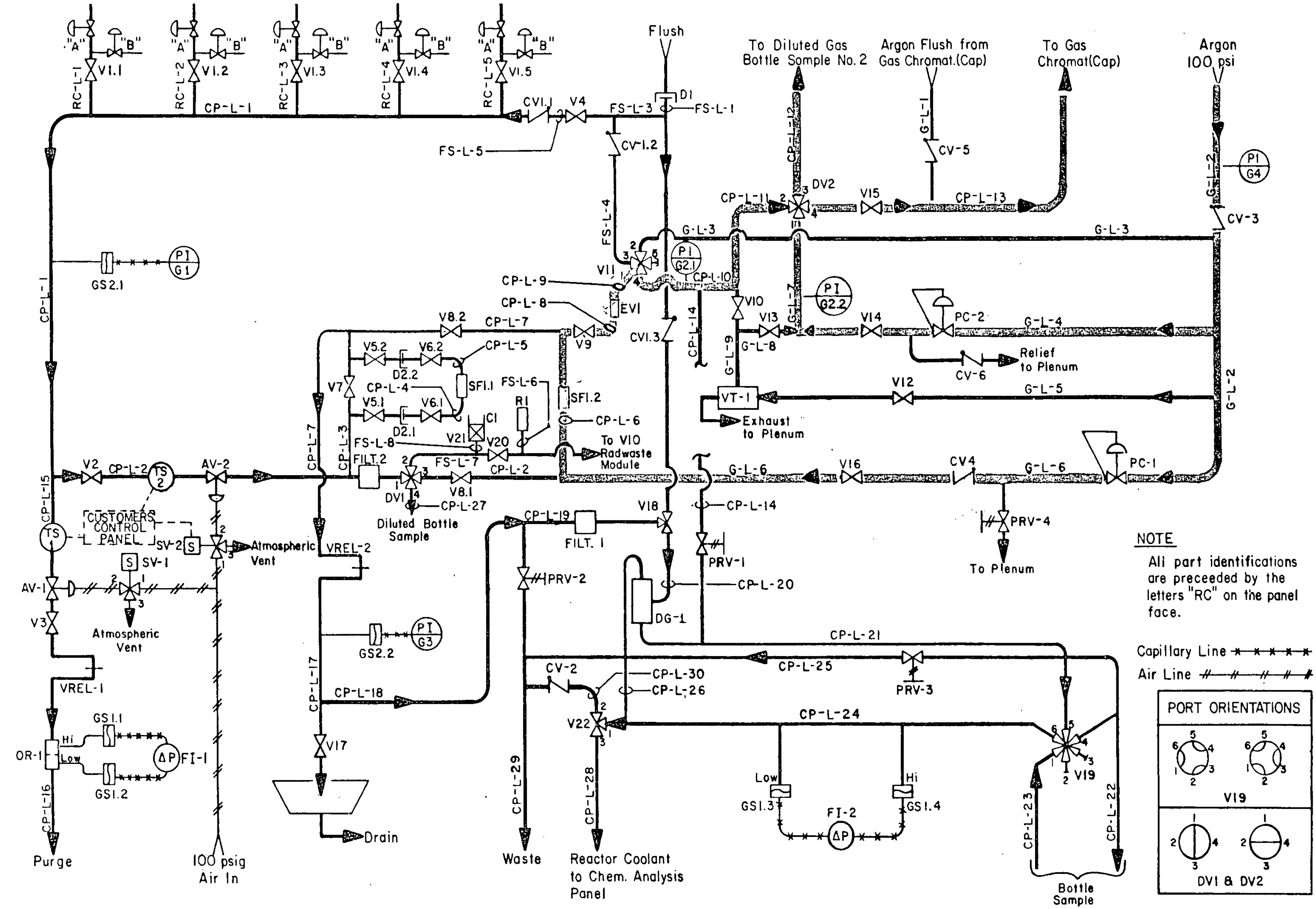
LIQUID SAMPLING PANEL
REACTOR COOLANT MODULE
FIGURE IV-8
DILUTED LIQUID SAMPLING



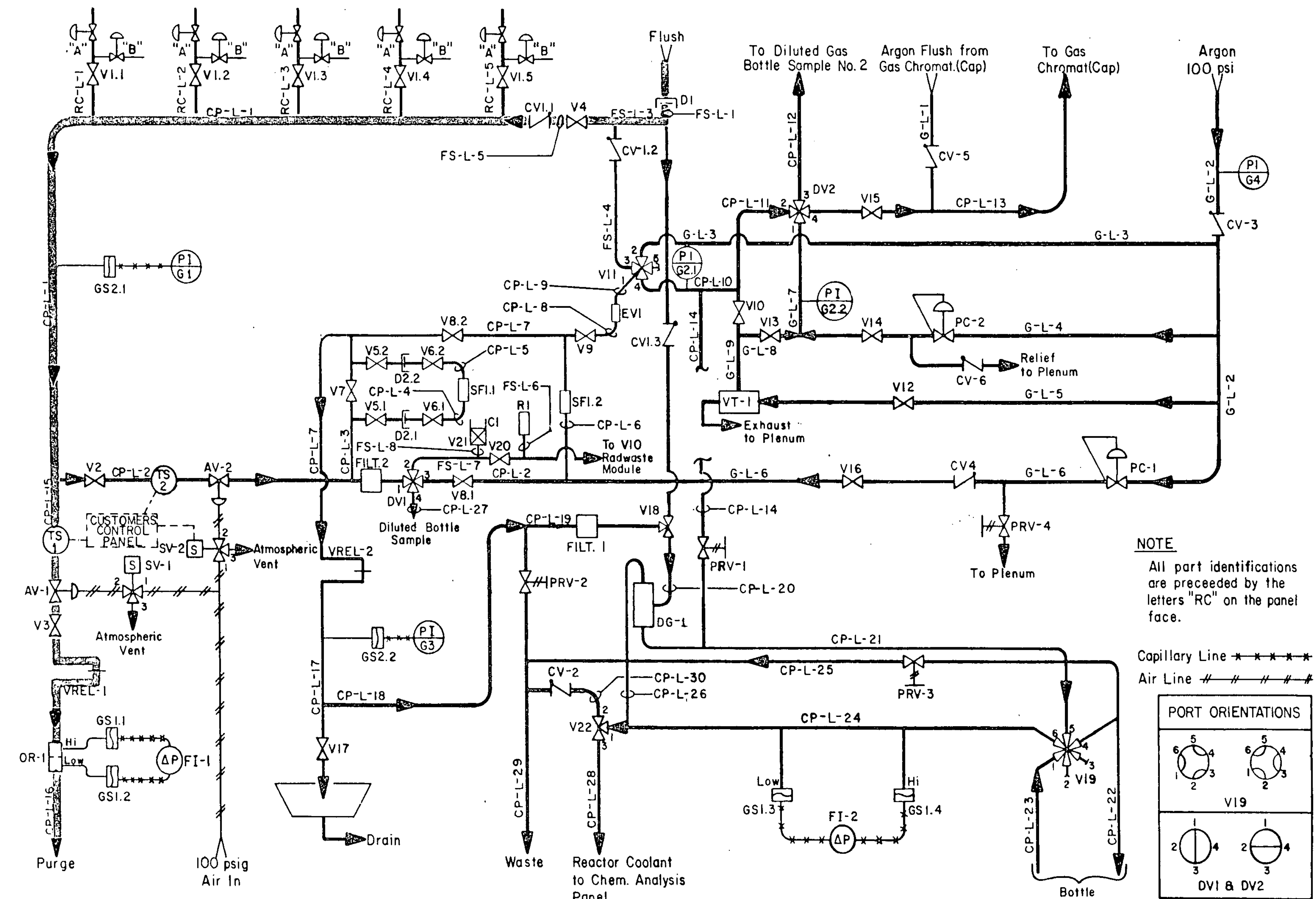
LIQUID SAMPLING PANEL
REACTOR COOLANT MODULE
FIGURE IV-9
GAS EXPANSION VESSEL DRYING



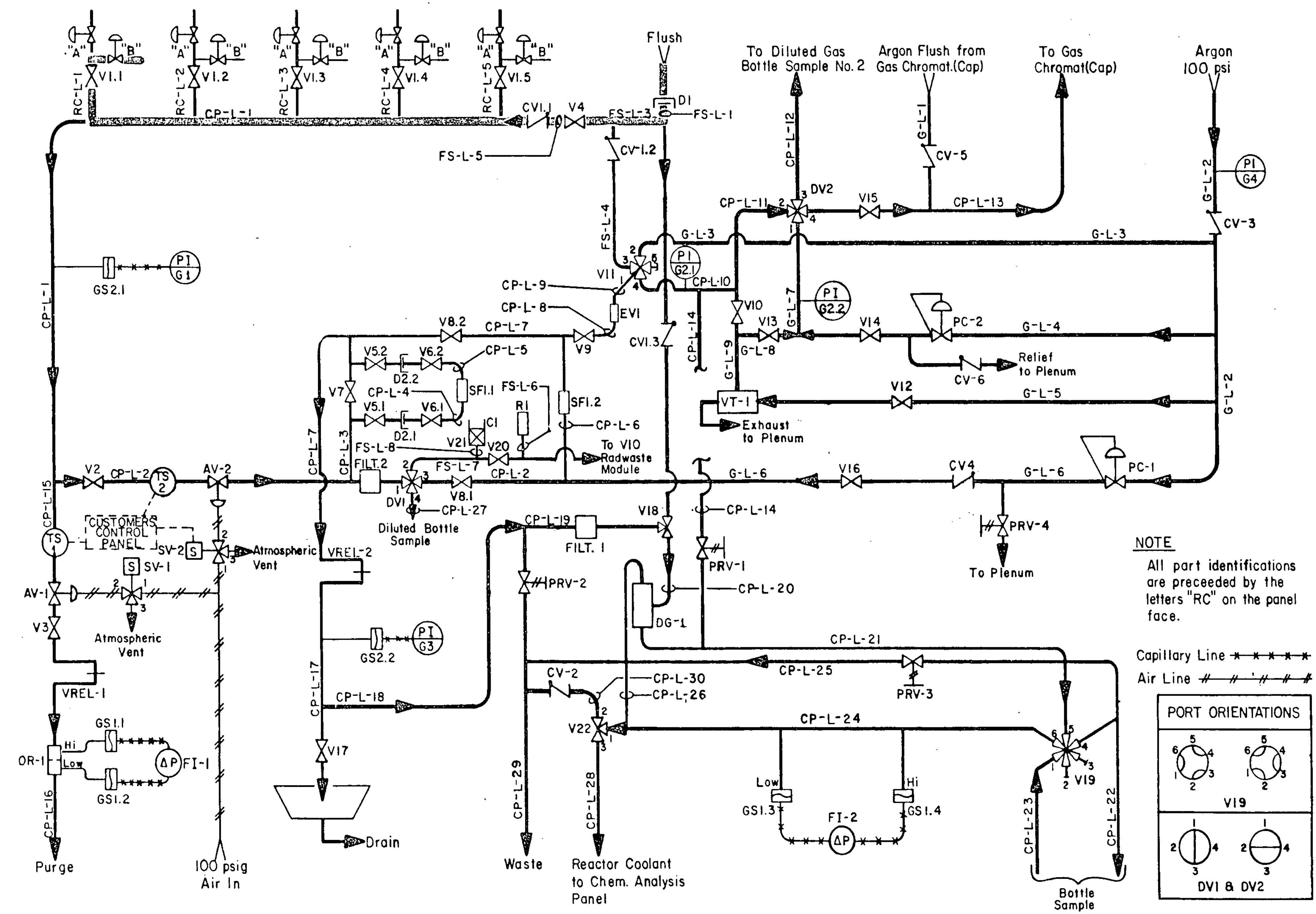
LIQUID SAMPLING PANEL
REACTOR COOLANT MODULE
FIGURE IV-10
GAS EXPANSION VESSEL
AND GAS LINE EVACUATION



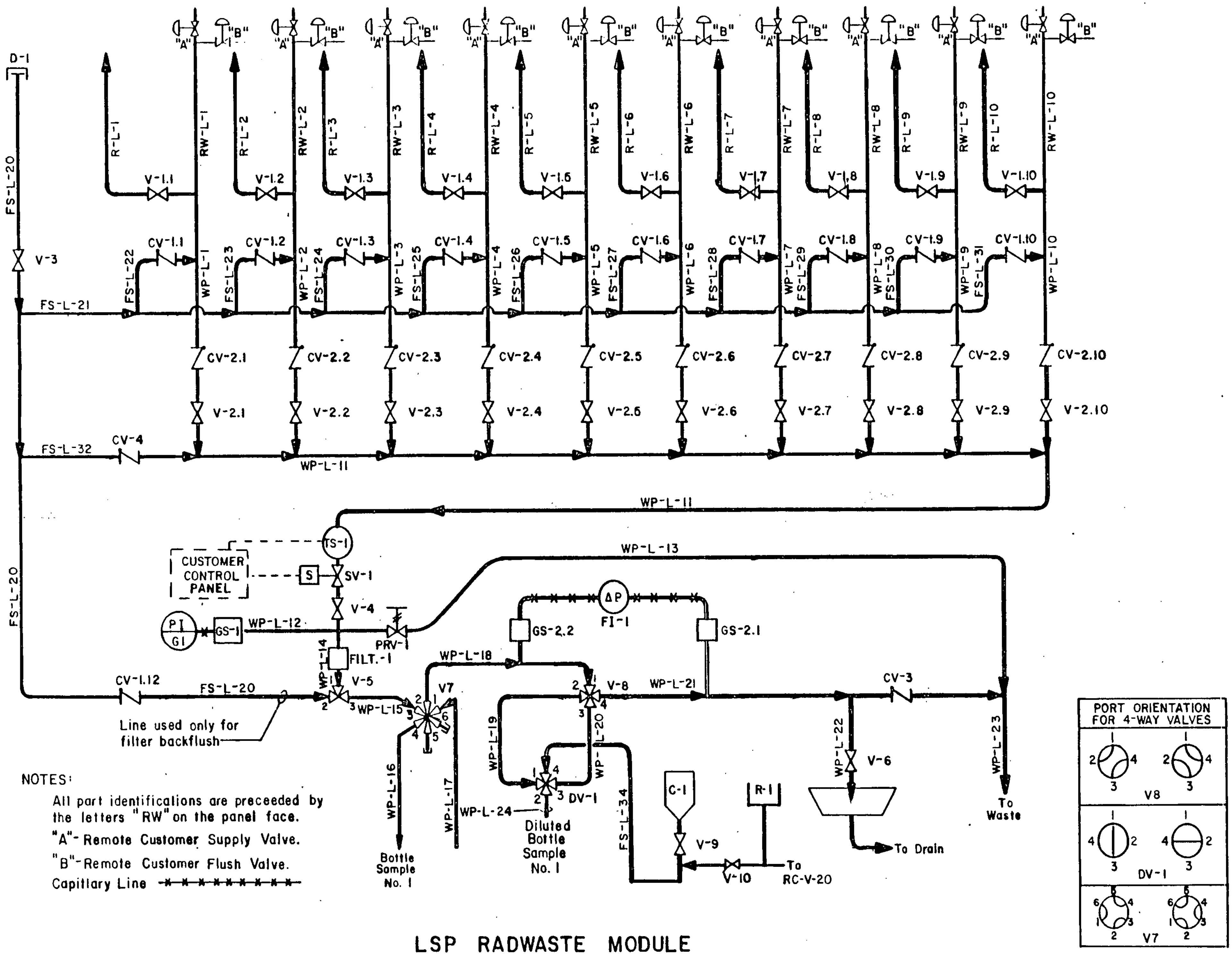
LIQUID SAMPLING PANEL
REACTOR COOLANT MODULE
FIGURE IV-11
GAS STRIPPING AND SAMPLING



LIQUID SAMPLING PANEL
REACTOR COOLANT MODULE
FIGURE IV-12
PURGE LINE FLUSHING



LIQUID SAMPLING PANEL
REACTOR COOLANT MODULE
FIGURE IV-14
SUPPLY LINE FLUSHING



NOTES:

All part identifications are preceeded by the letters "RW" on the panel face.

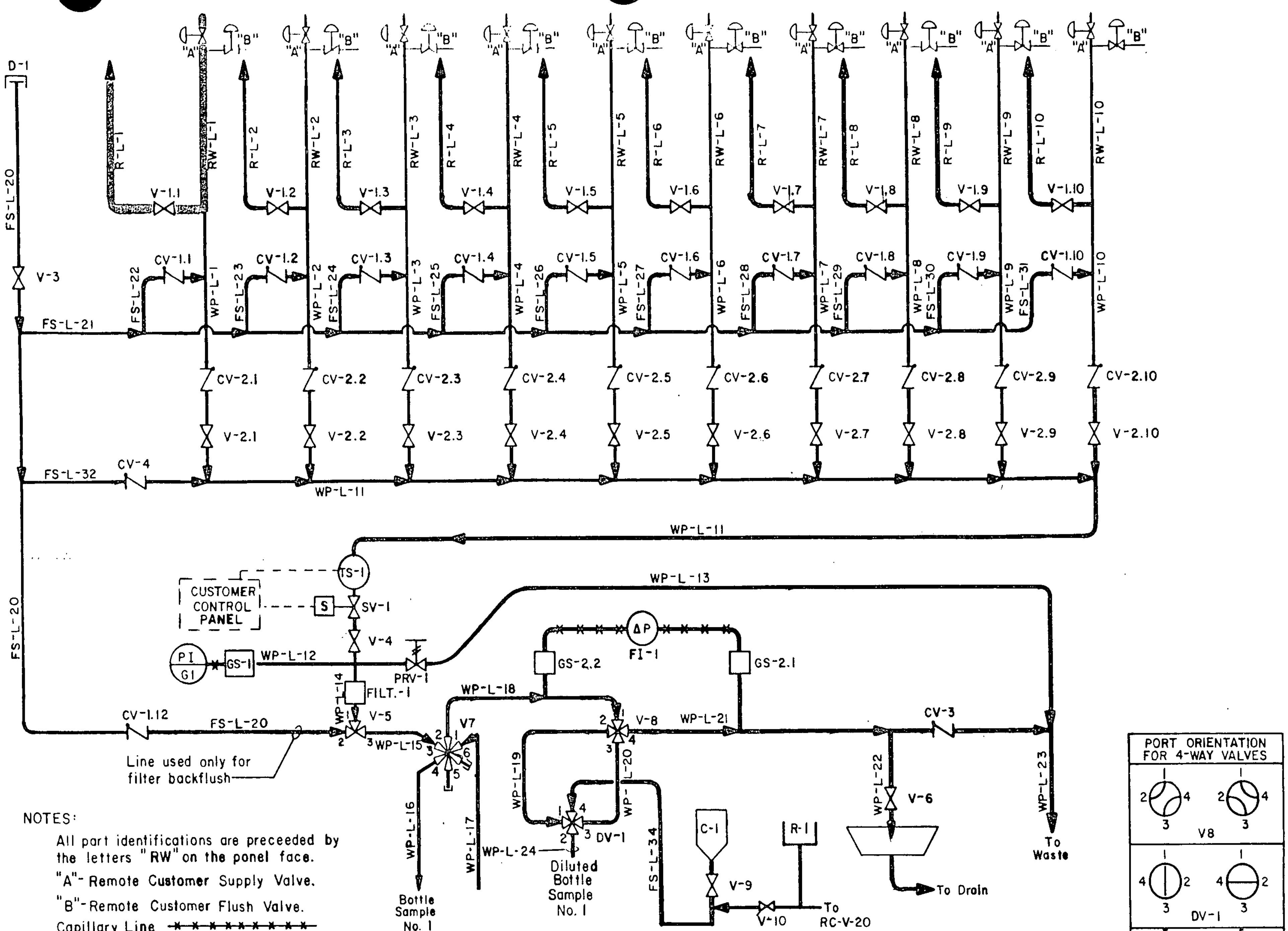
"A"- Remote Customer Supply Valve.

"B"- Remote Customer Flush Valve.

Capillary Line -x-x-x-x-x-x-x-x-

LSP RADWASTE MODULE

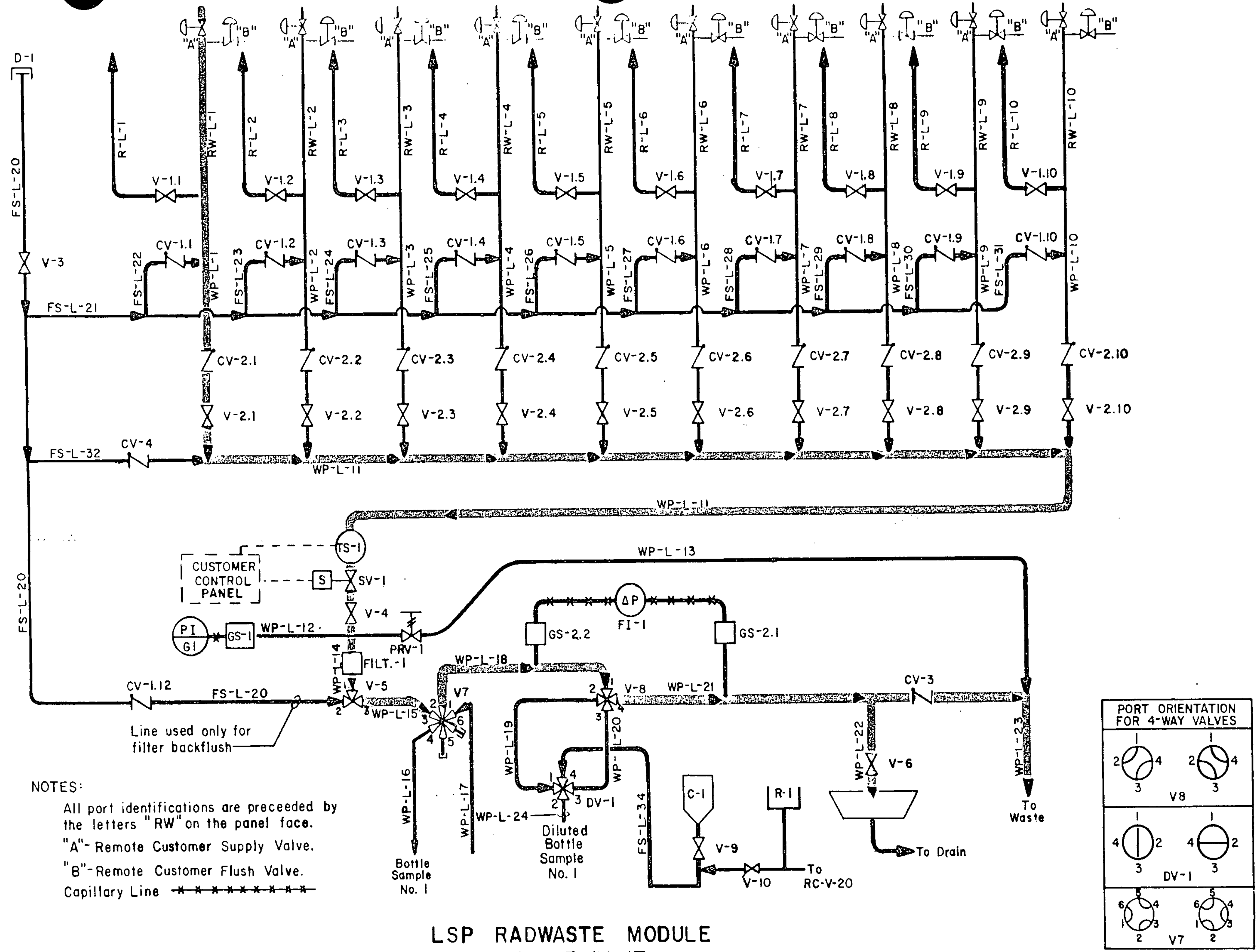
FIGURE IV-15



LSP RADWASTE MODULE

FIGURE IV-16

RECIRCULATION



NOTES:

All port identifications are preceeded by the letters "RW" on the panel face.

"A"- Remote Customer Supply Valve.

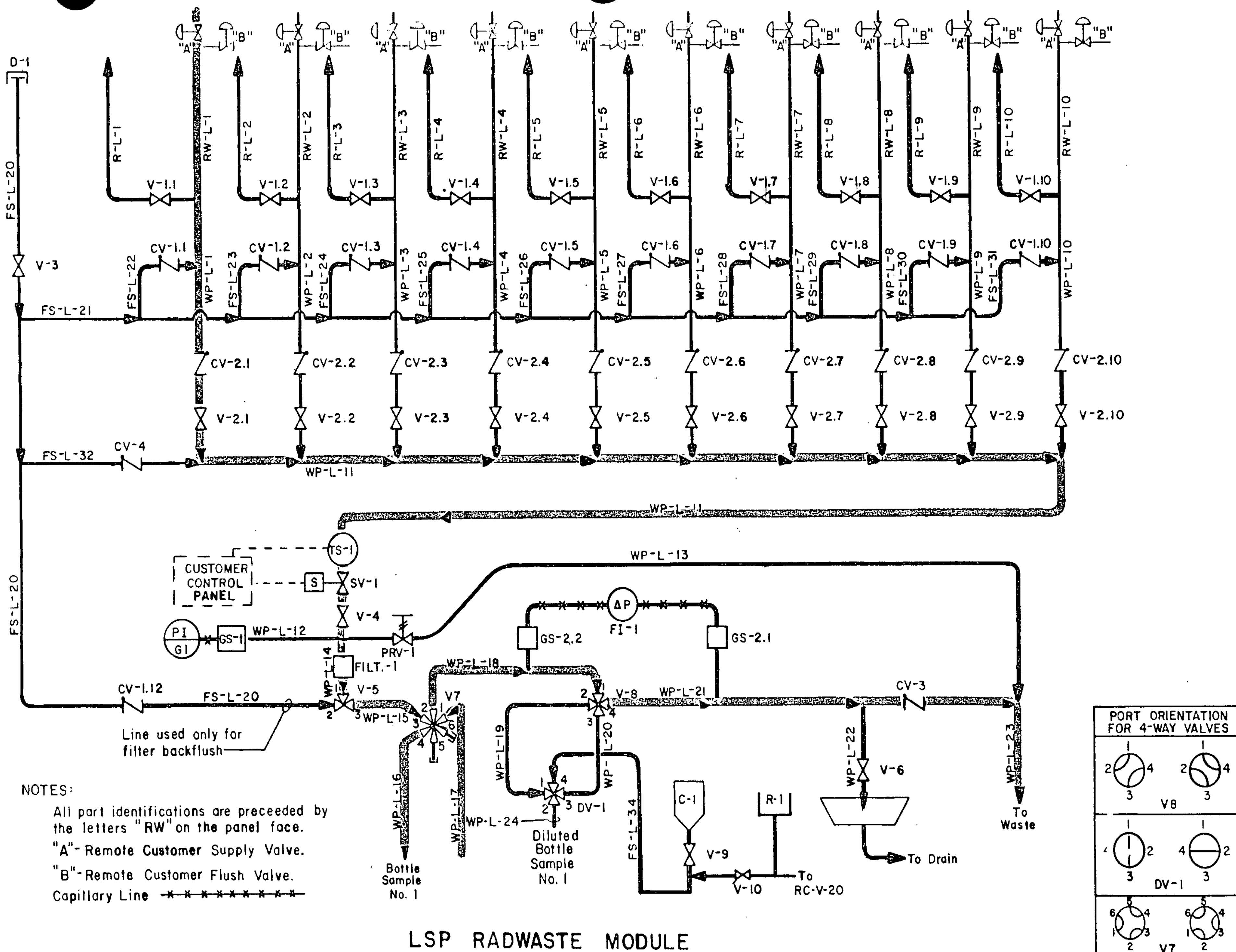
"B"-Remote Customer Flush Valve.

Capillary Line

LSP RADWASTE MODULE

FIGURE IV-17

PURGING AND OPEN GRAB SAMPLING



NOTES:

All part identifications are preceeded by the letters "RW" on the panel face.

"A"- Remote Customer Supply Valve.

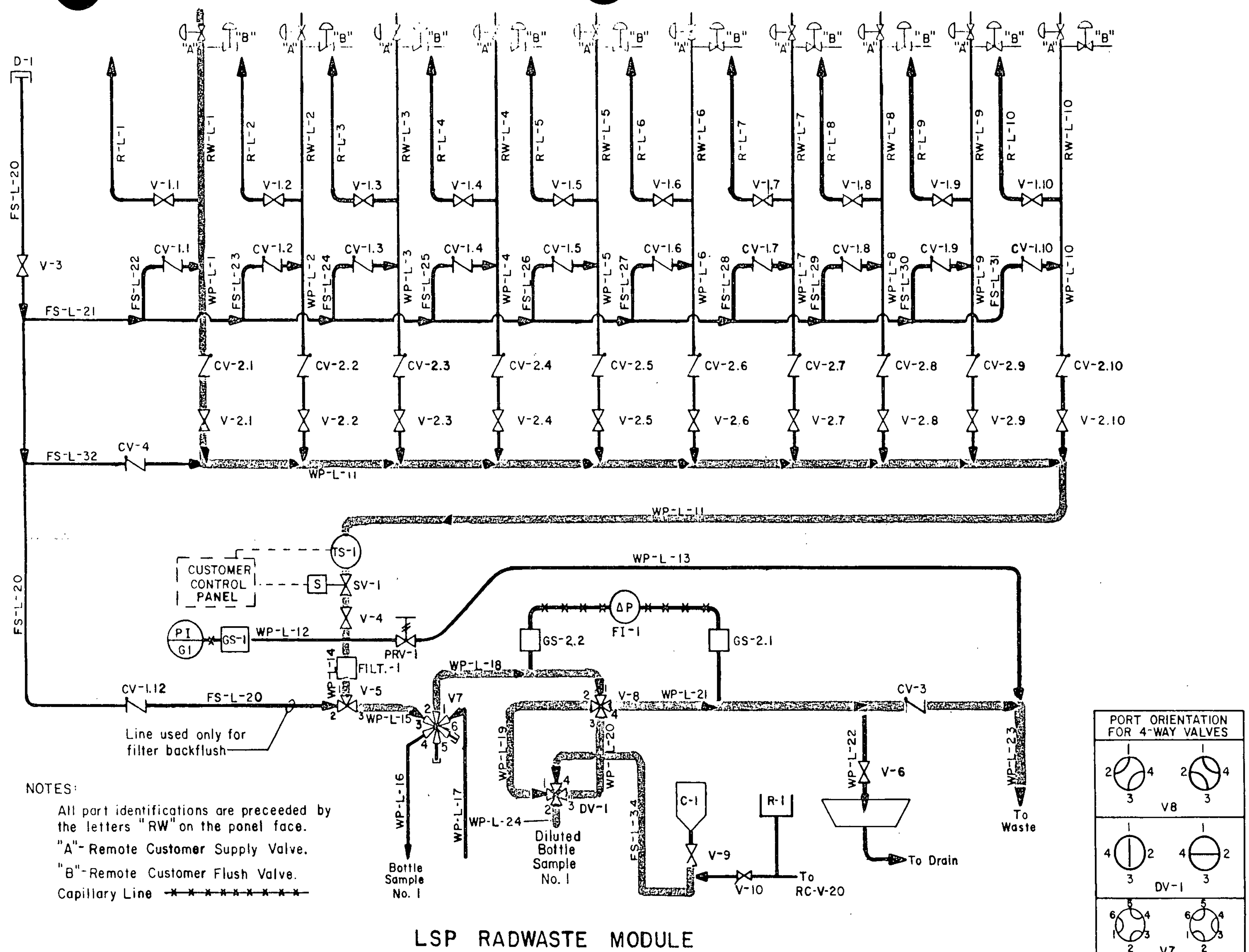
"B"- Remote Customer Flush Valve.

Capillary Line -x-x-x-x-x-x-x-x-x-

LSP RADWASTE MODULE

FIGURE IV-18

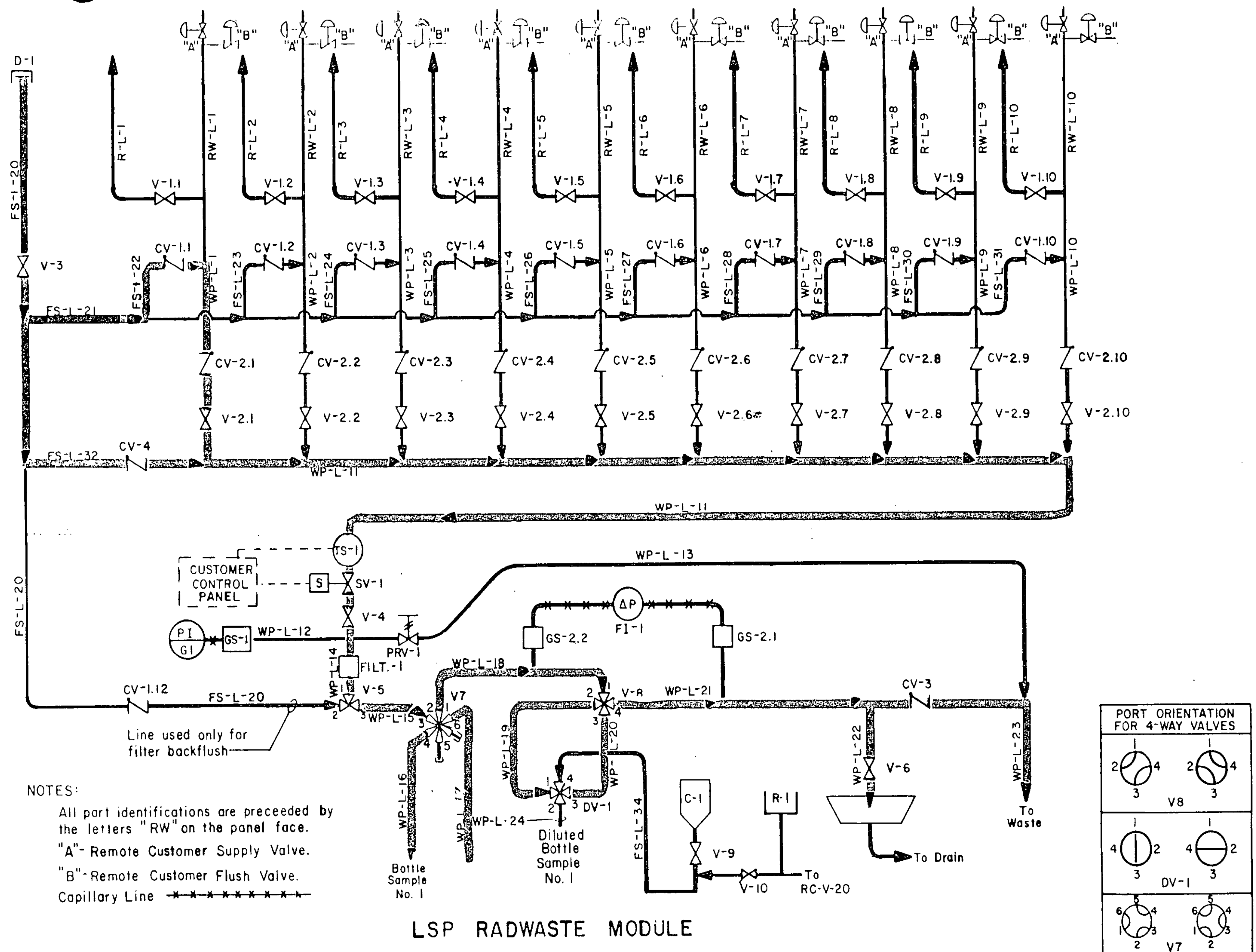
UNDILUTED LIQUID SAMPLING



LSP RADWASTE MODULE

FIGURE IV-19

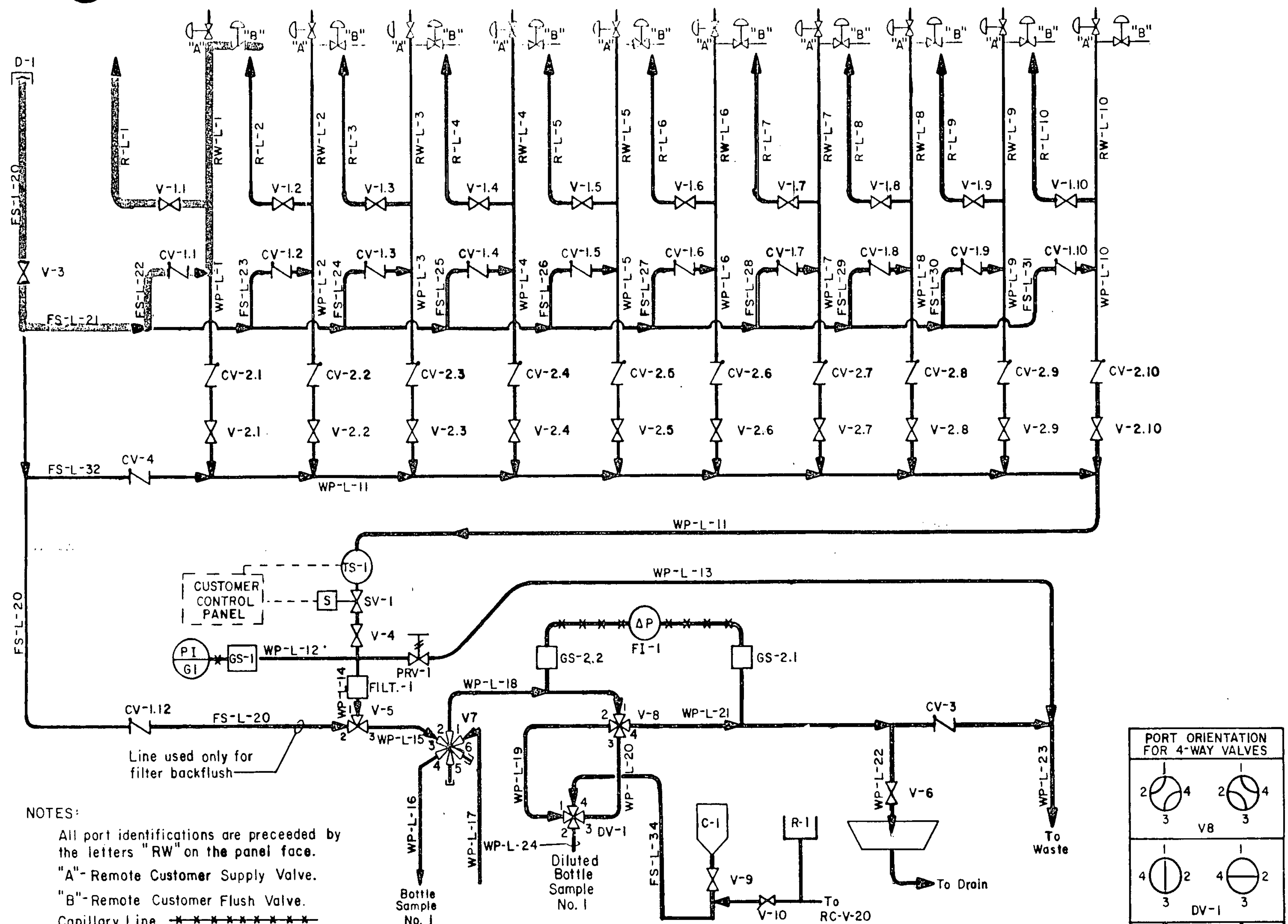
DILUTED LIQUID SAMPLING



LSP RADWASTE MODULE

FIGURE IV-20

MODULE FLUSHING



NOTES:

All port identifications are preceeded by the letters "RW" on the panel face.

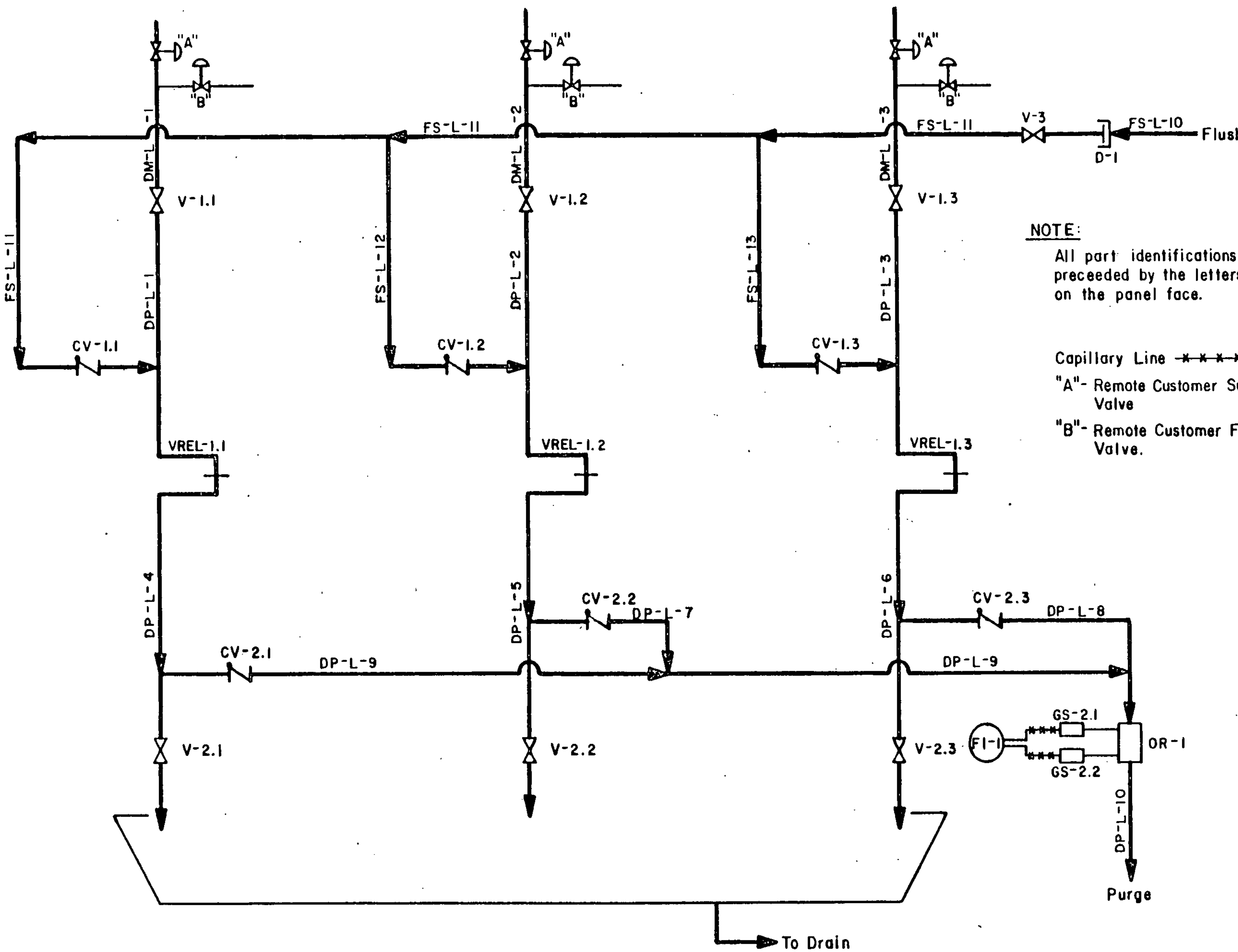
"A"- Remote Customer Supply Valve.

"B"- Remote Customer Flush Valve.

Capillary Line -x-x-x-x-x-x-x-x-

LSP RADWASTE MODULE
FIGURE IV-21

SUPPLY AND RECIRCULATION LINE FLUSHING



NOTE:

All part identifications are preceeded by the letters "DM" on the panel face.

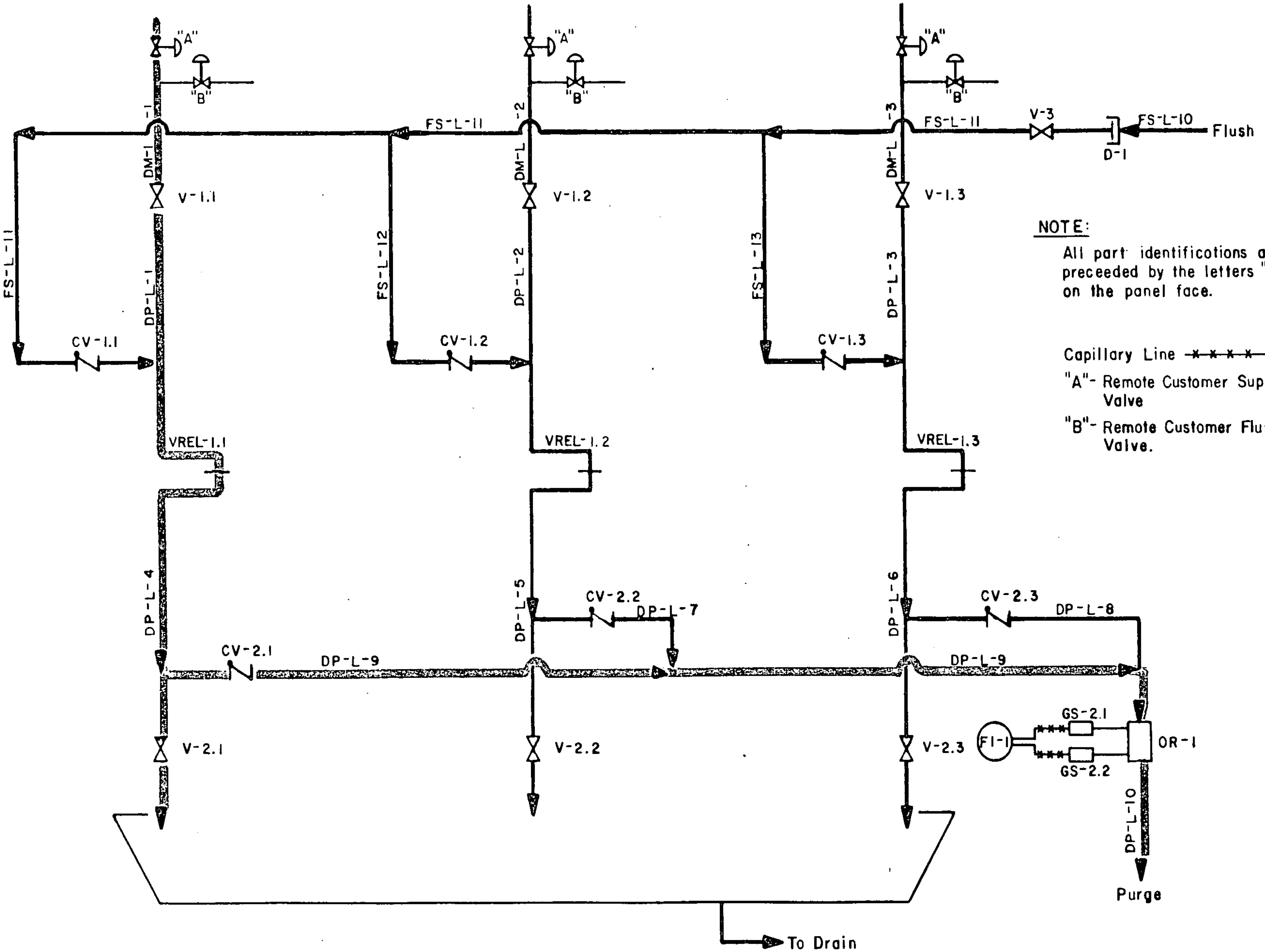
Capillary Line -x-x-x-x-x-

"A"- Remote Customer Supply Valve

"B"- Remote Customer Flush Valve.

LSP DEMINERALIZER MODULE

FIGURE IV-22



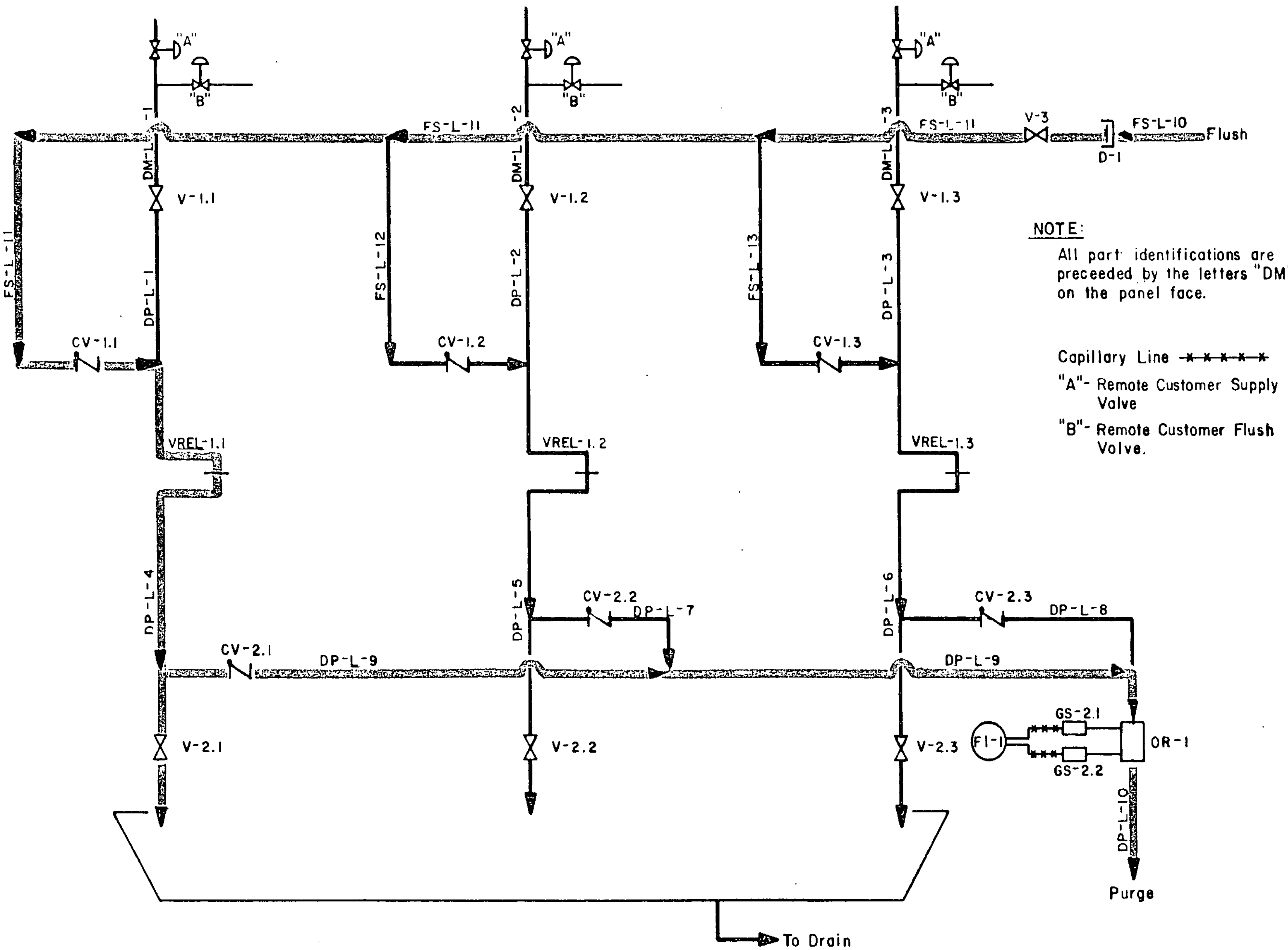
NOTE:
All part identifications are preceeded by the letters "DM" on the panel face.

Capillary Line —x—x—x—x—

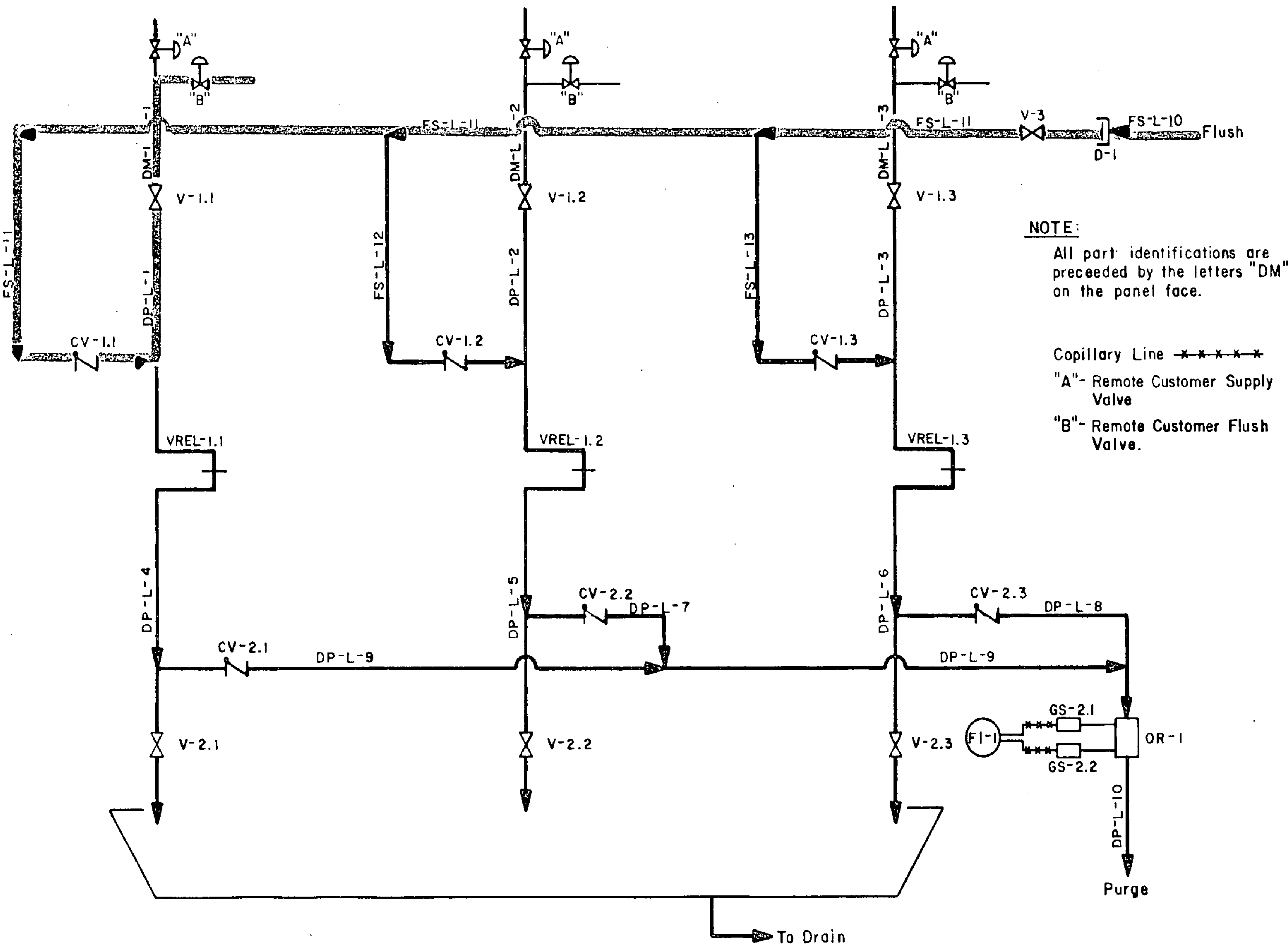
"A"- Remote Customer Supply Valve

"B"- Remote Customer Flush Valve.

LSP DEMINERALIZER MODULE
FIGURE IV - 23
PURGING AND OPEN GRAB SAMPLING



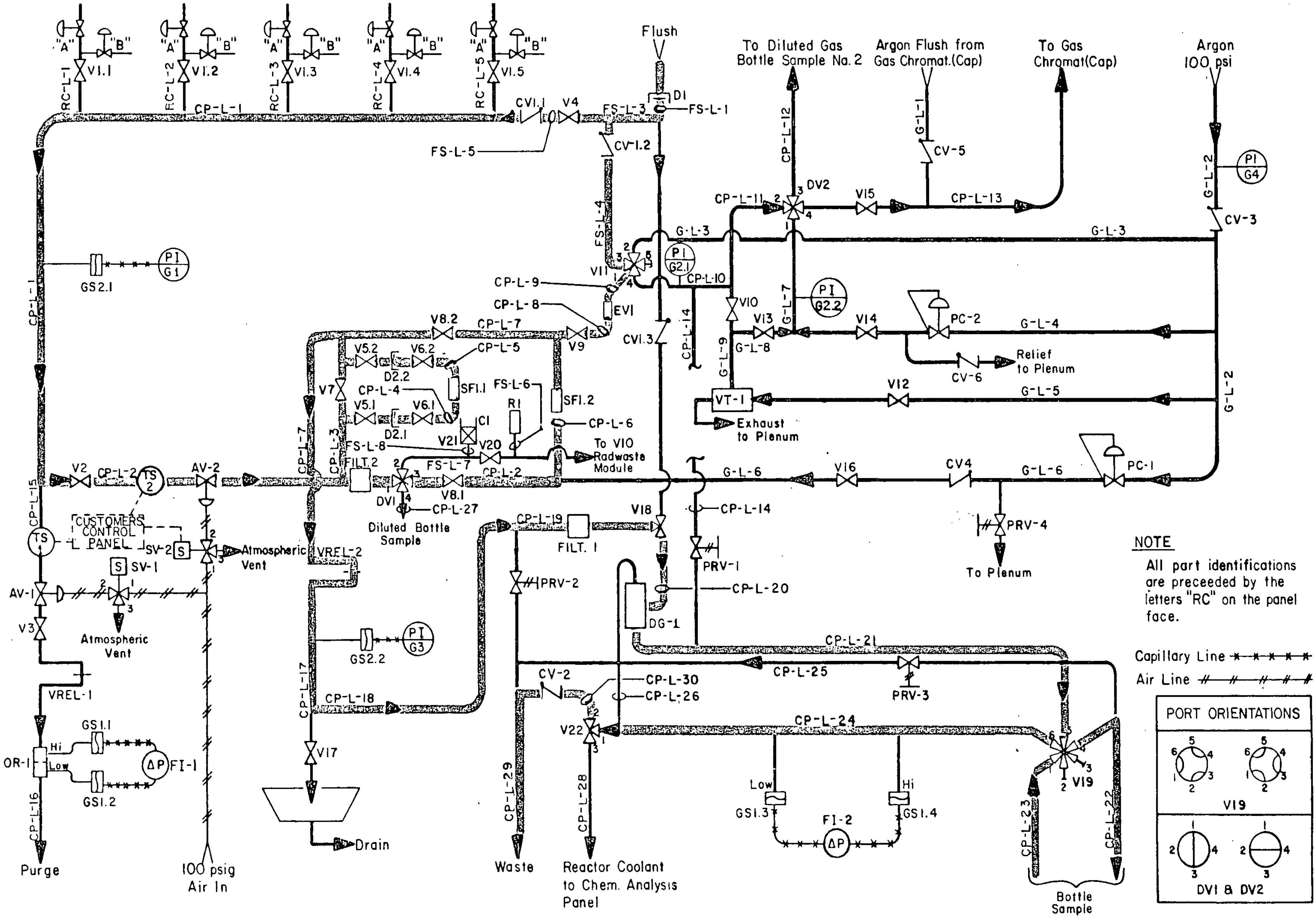
LSP DEMINERALIZER MODULE
FIGURE IV-24
MODULE FLUSHING



LSP DEMINERALIZER MODULE

FIGURE IV-25

SUPPLY LINE FLUSHING



LIQUID SAMPLING PANEL
REACTOR COOLANT MODULE
FIGURE IV-13
MODULE FLUSHING

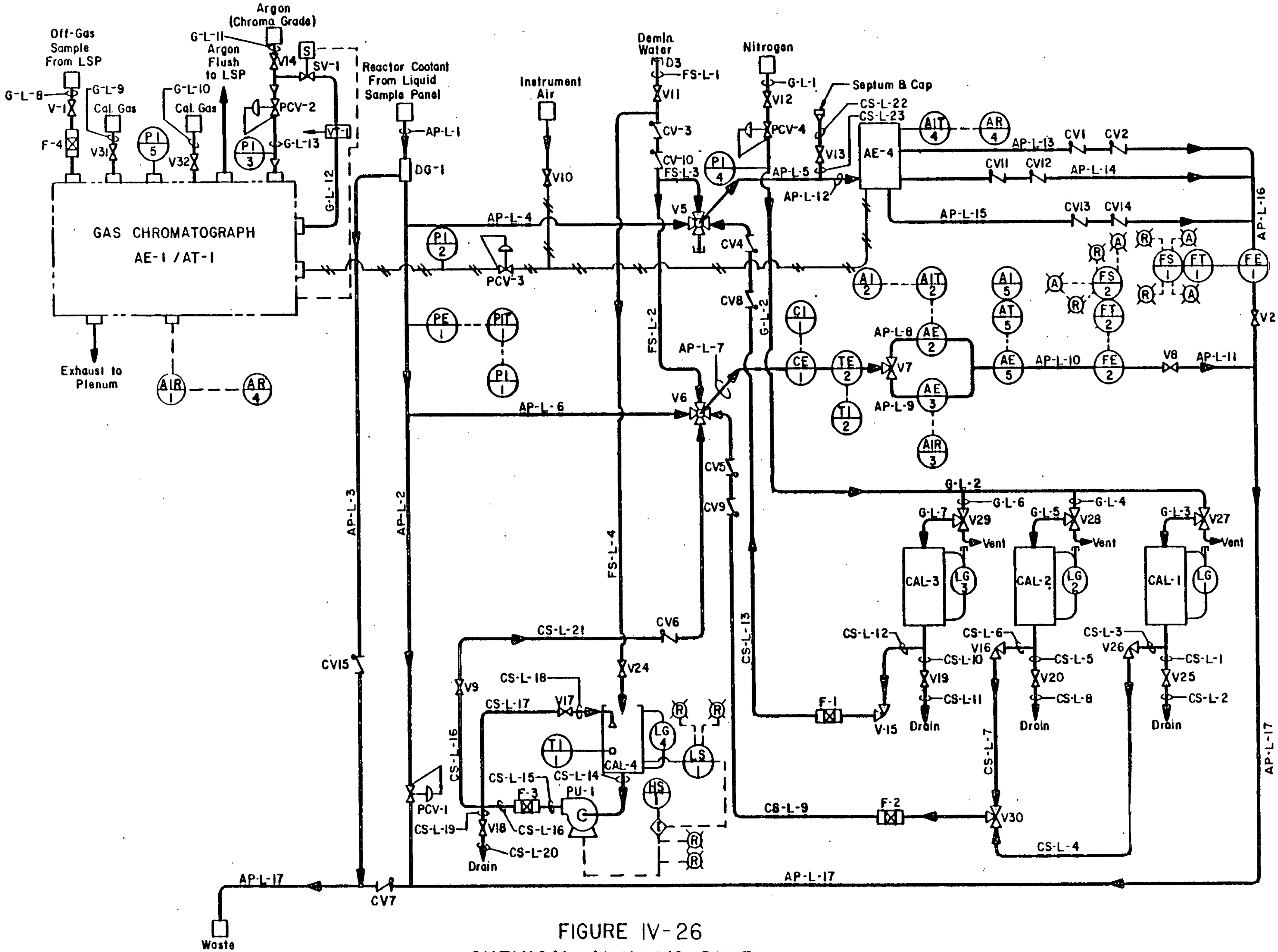


FIGURE IV-26
CHEMICAL ANALYSIS PANEL

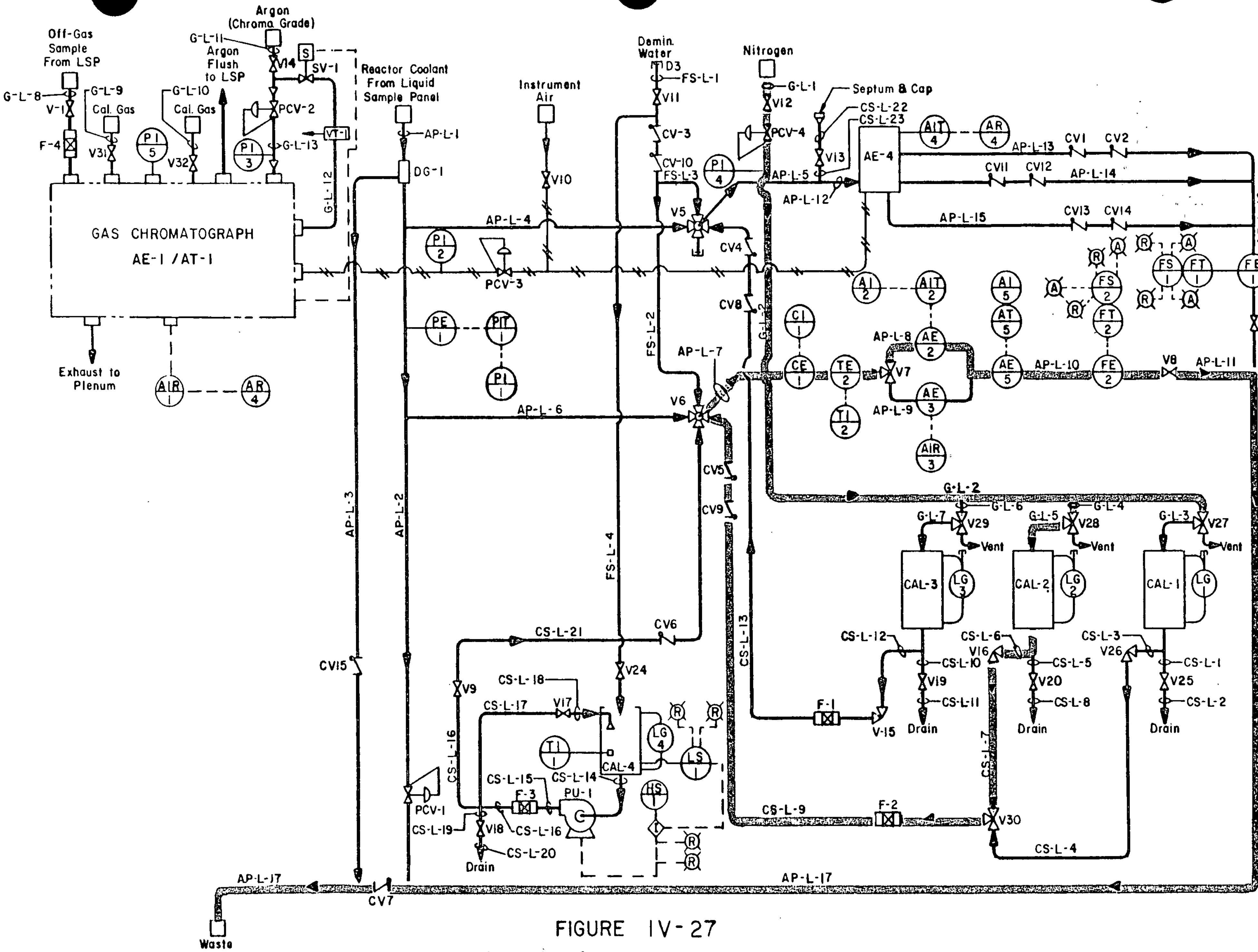


FIGURE IV-27
CHEMICAL ANALYSIS PANEL
CONDUCTIVITY CALIBRATION

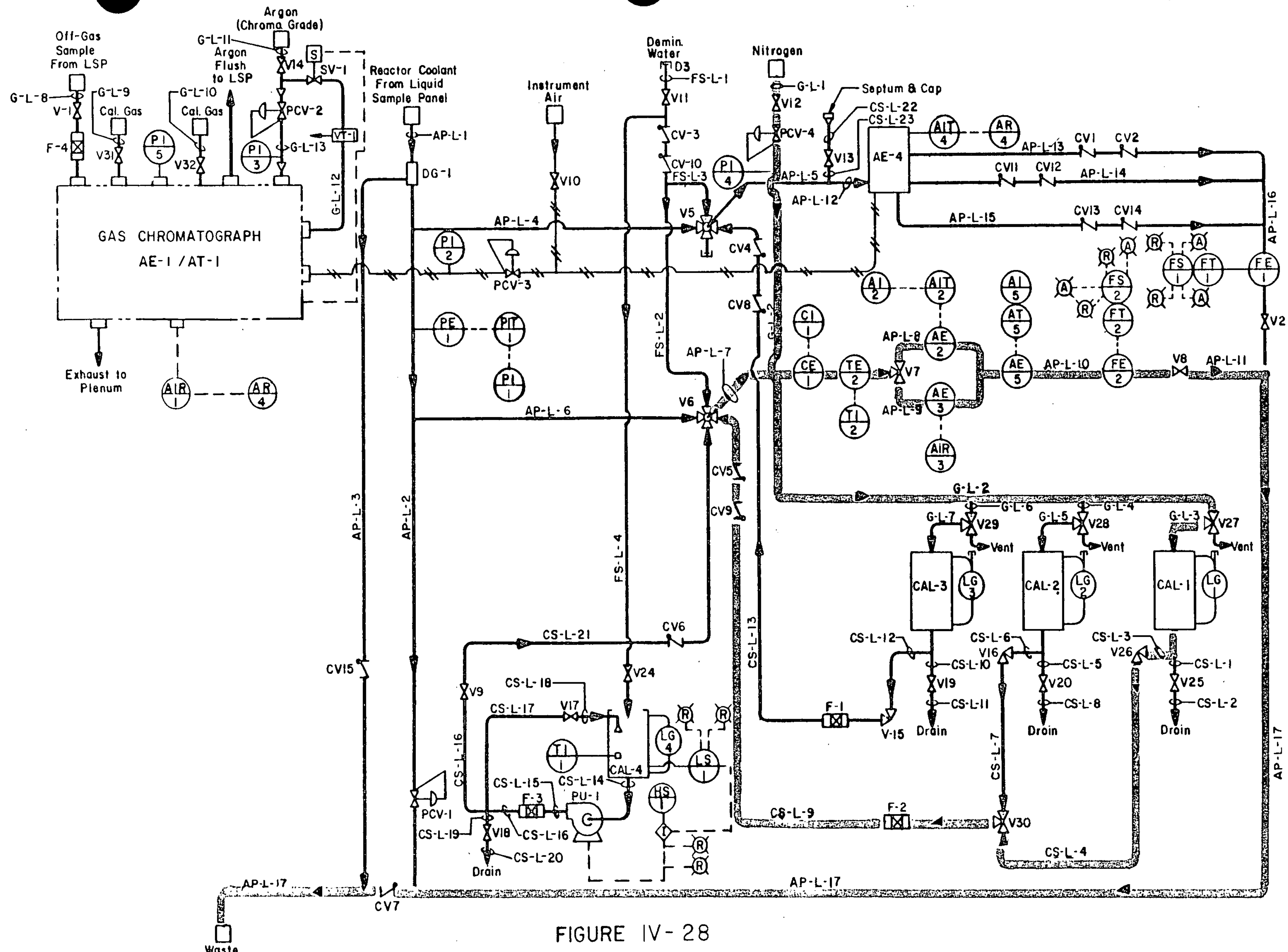


FIGURE IV- 28
CHEMICAL ANALYSIS PANEL
pH CALIBRATION

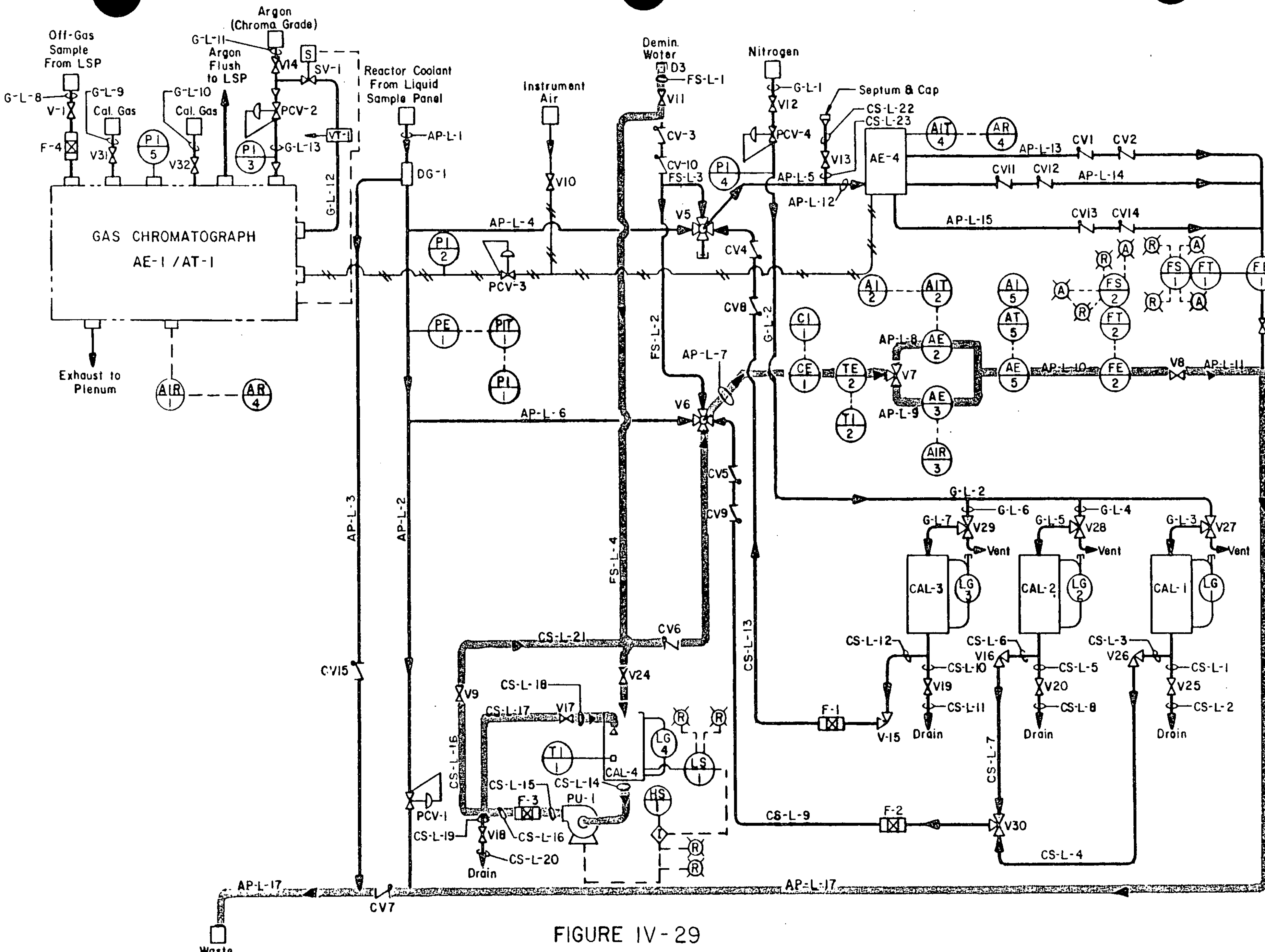


FIGURE IV-29
CHEMICAL ANALYSIS PANEL
REXNORD AND YSI DISSOLVED OXYGEN CALIBRATION

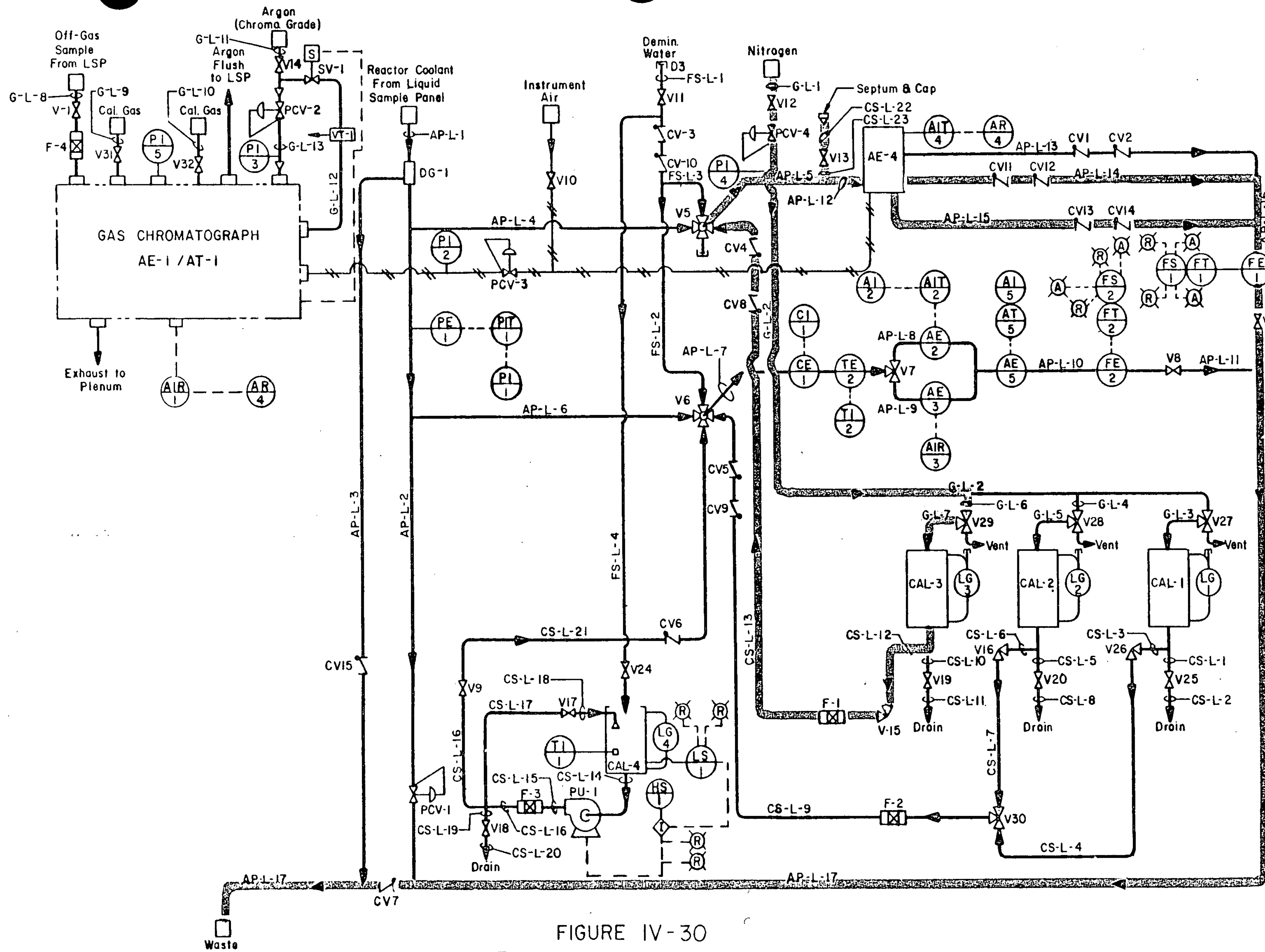


FIGURE IV-30
CHEMICAL ANALYSIS PANEL
ION CHROMATOGRAPH CALIBRATION

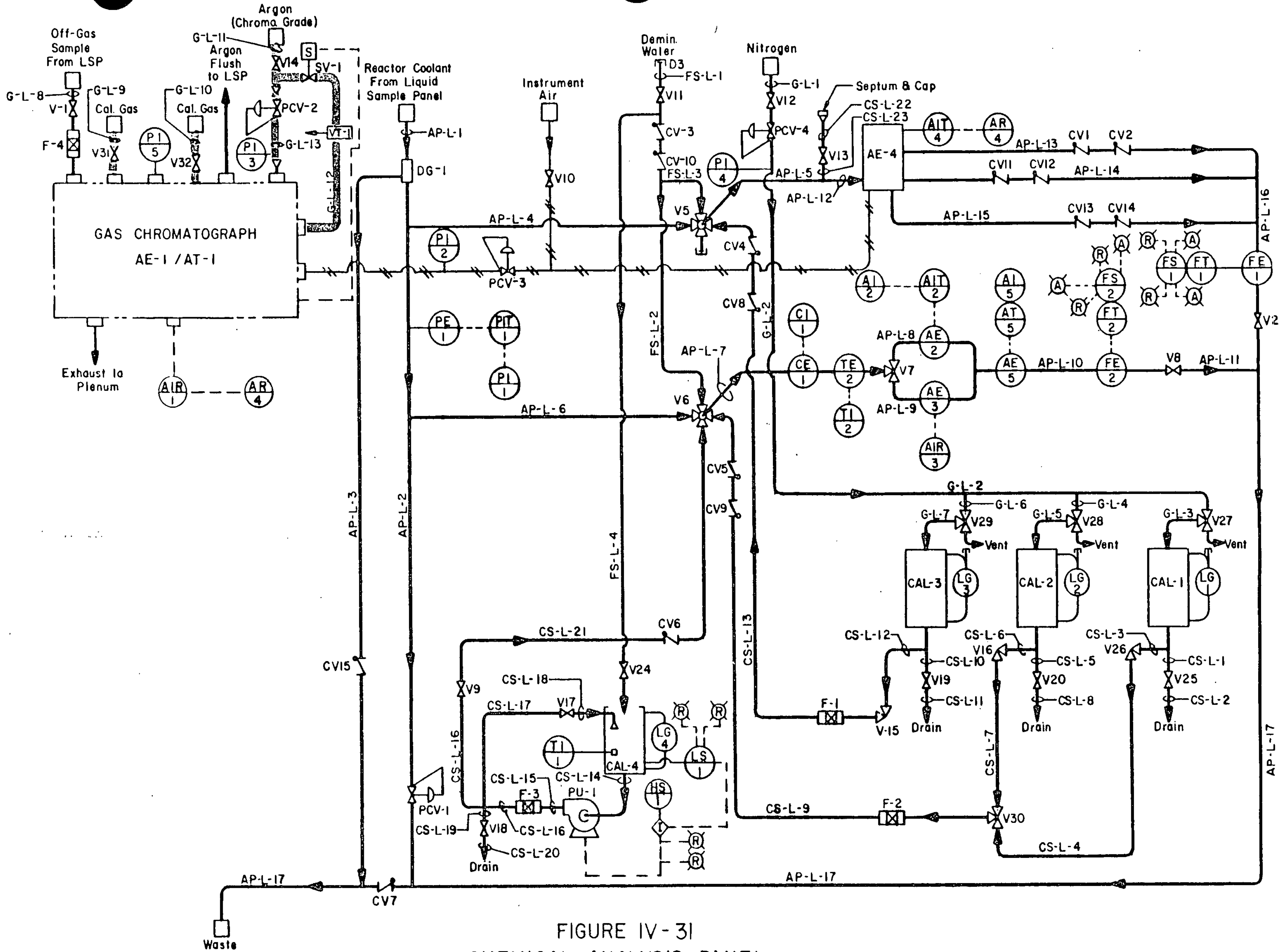


FIGURE IV-31
CHEMICAL ANALYSIS PANEL
GAS CHROMATOGRAPH CALIBRATION

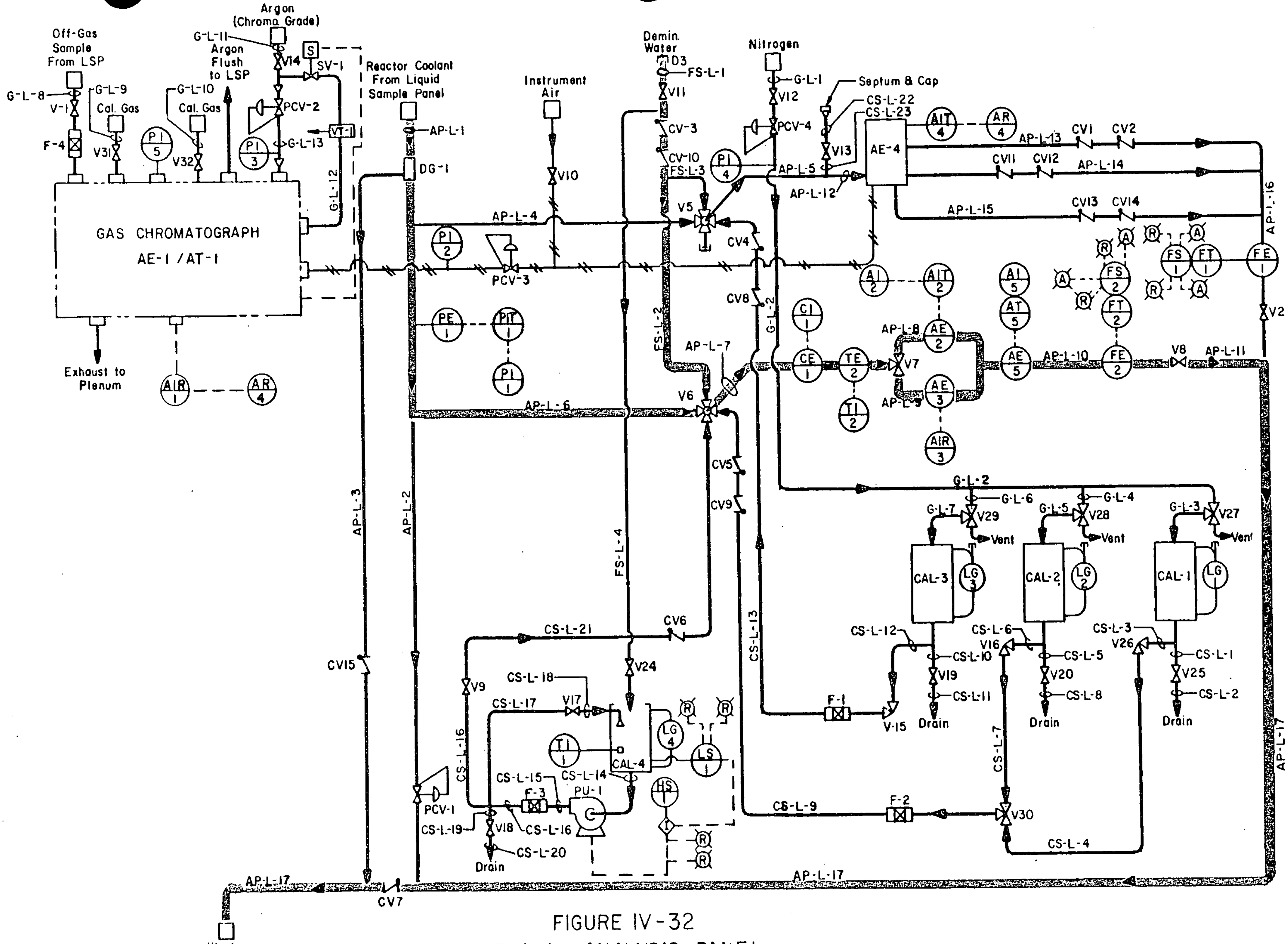


FIGURE IV-32
CHEMICAL ANALYSIS PANEL
CONDUCTIVITY, DISSOLVED OXYGEN, AND
pH SAMPLING AND FLUSHING

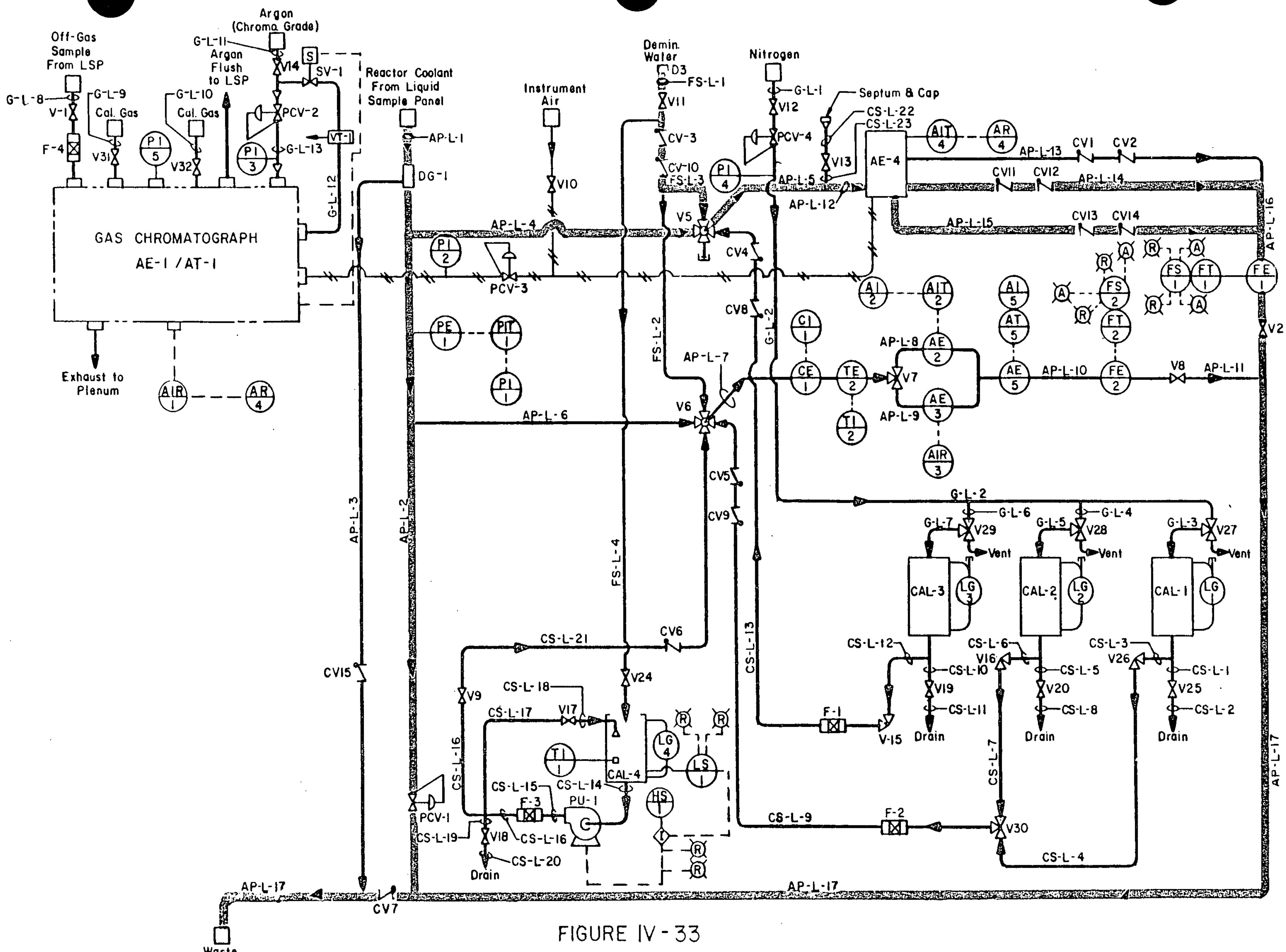


FIGURE IV-33
CHEMICAL ANALYSIS PANEL
ION CHROMATOGRAPH SAMPLING AND FLUSHING

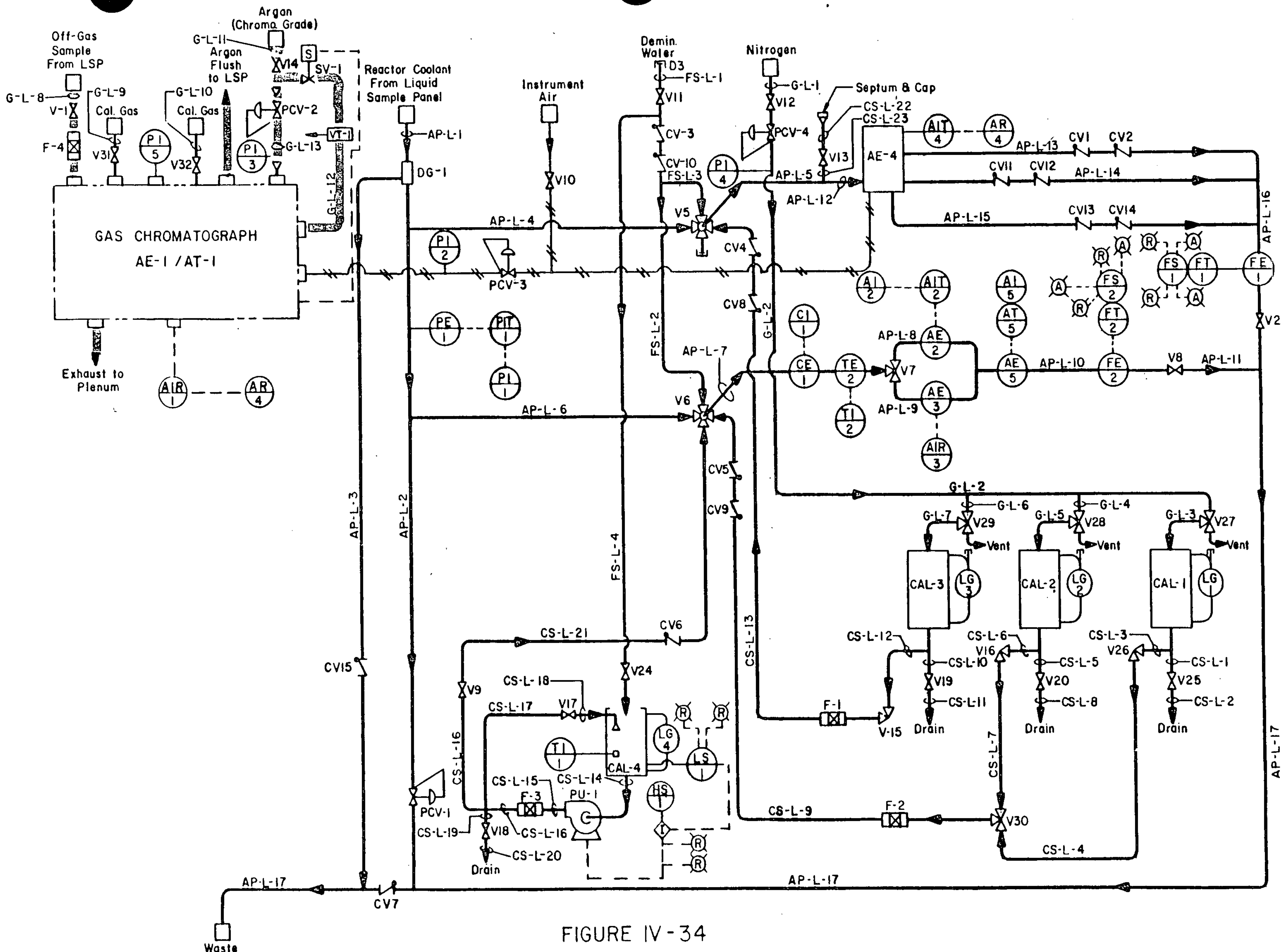


FIGURE IV-34
CHEMICAL ANALYSIS PANEL
G.C. EVACUATION, SAMPLING, AND FLUSHING

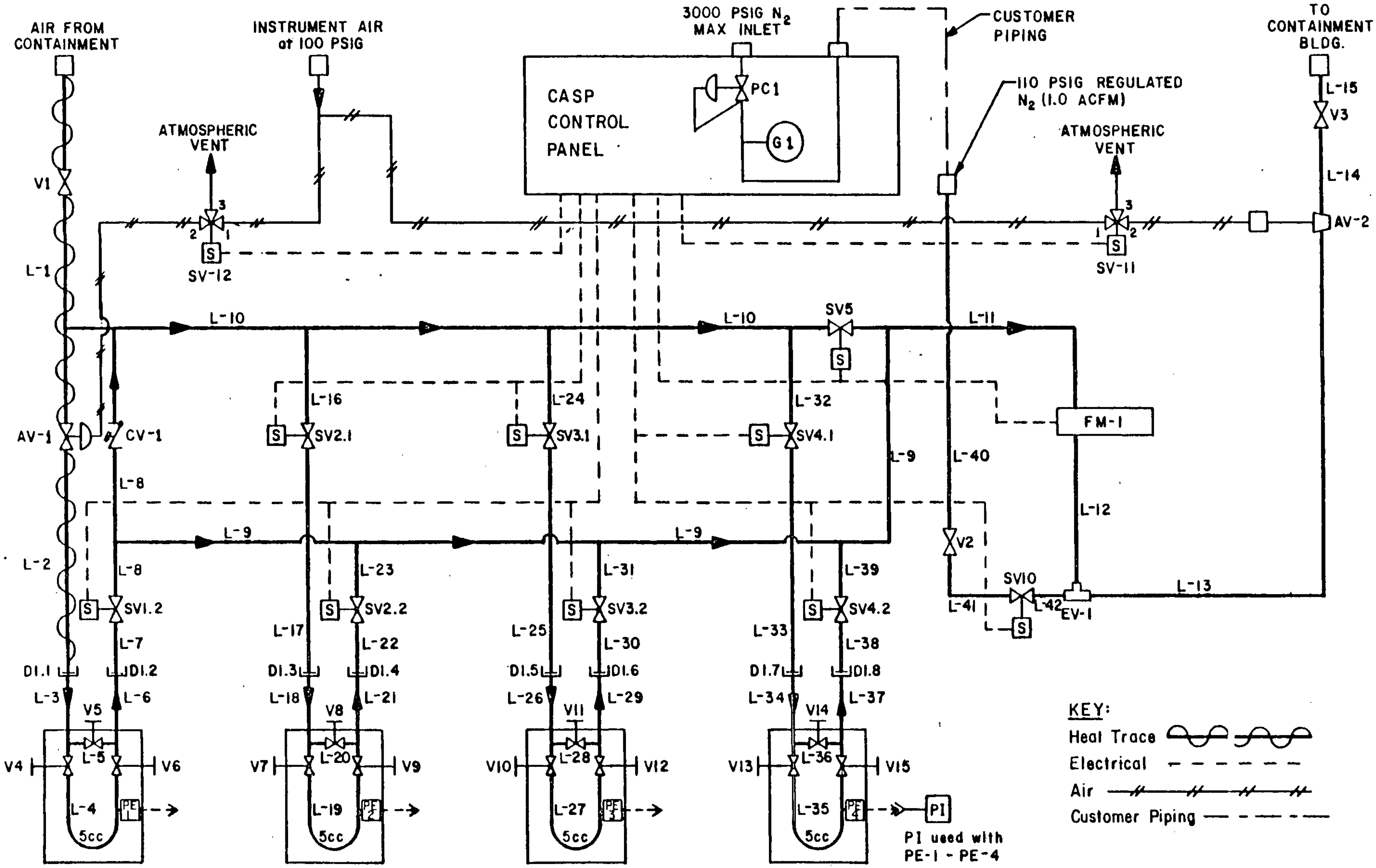


FIGURE IV-35
CONTAINMENT AIR SAMPLING PANEL

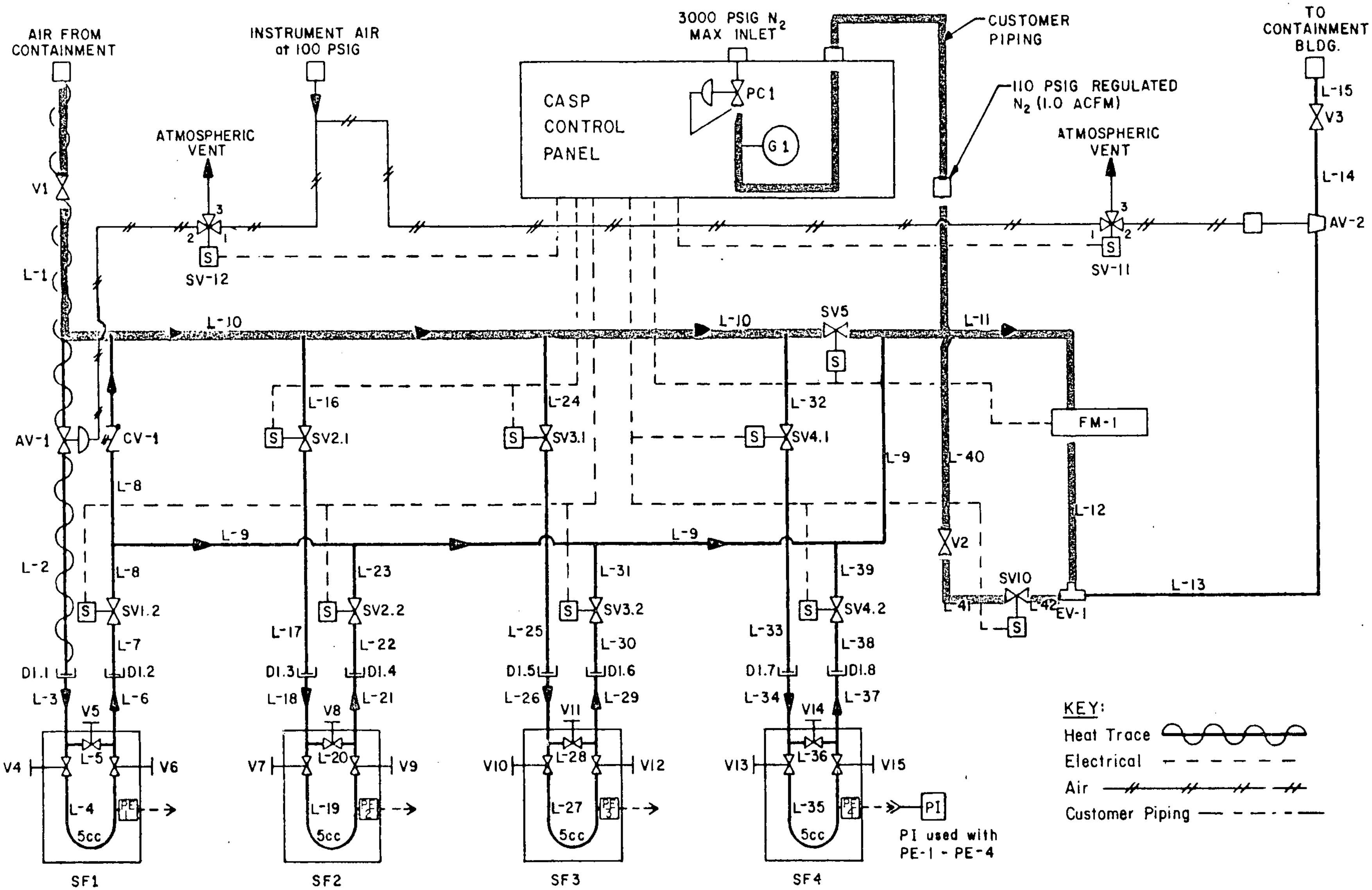


FIGURE IV-36
CONTAINMENT AIR SAMPLING PANEL
TWO - MINUTE PRE - SAMPLE BACK FLUSH

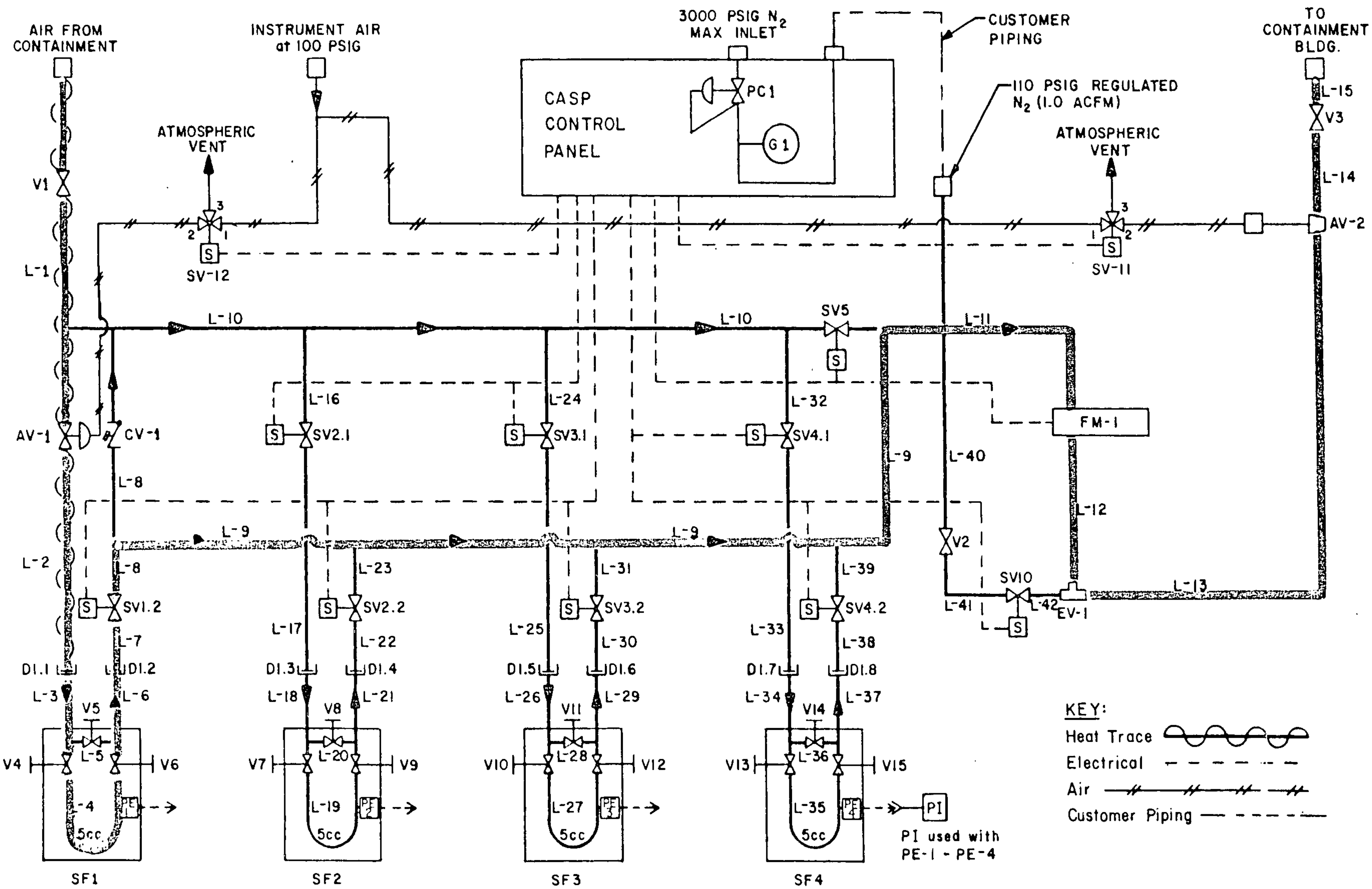


FIGURE IV-37
CONTAINMENT AIR SAMPLING PANEL
THREE - MINUTE SAMPLE CAPTURE

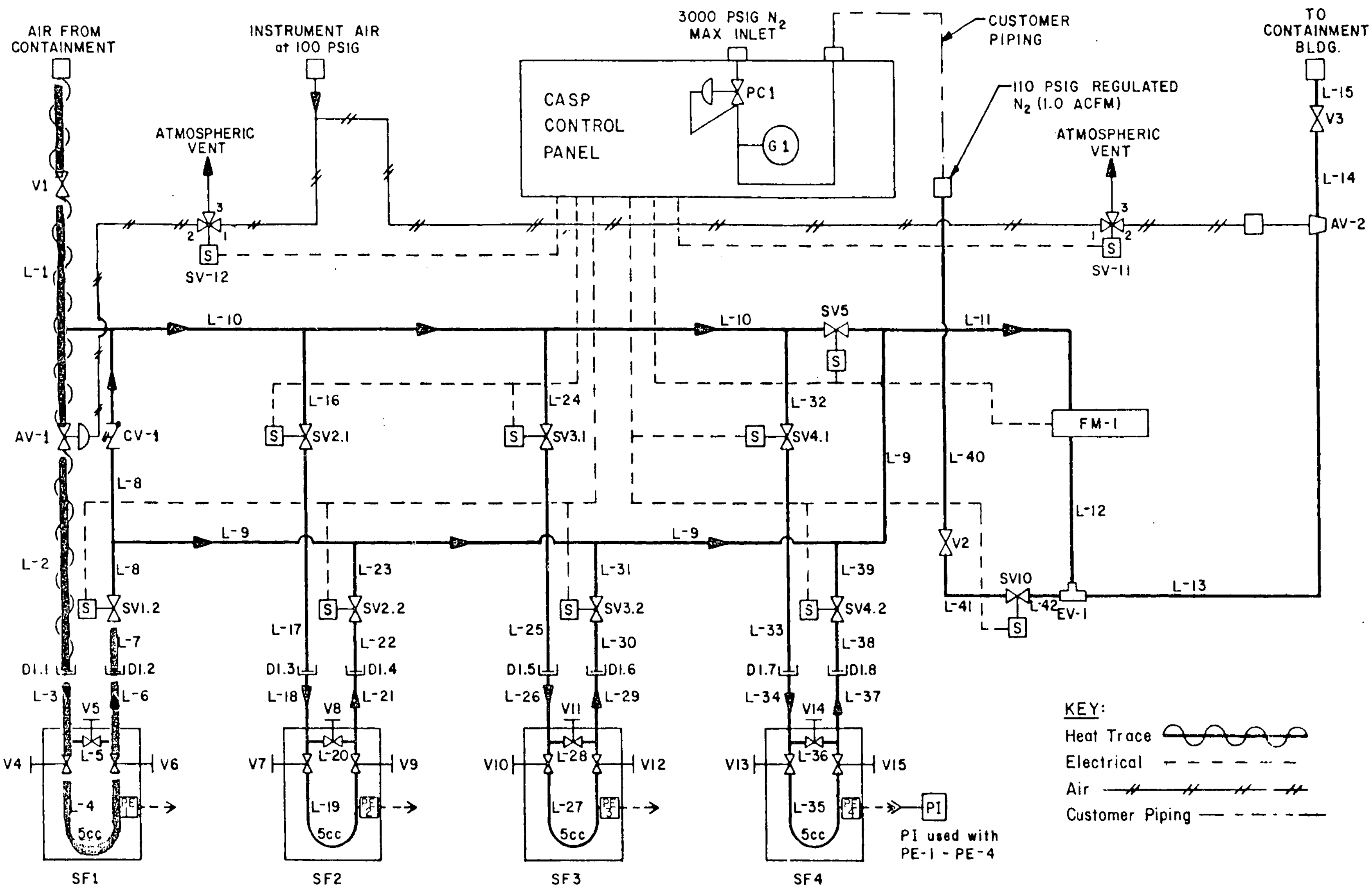


FIGURE IV-38
CONTAINMENT AIR SAMPLING PANEL
FIFTEEN - SECOND EQUILIBRATE FLASK PRESSURE

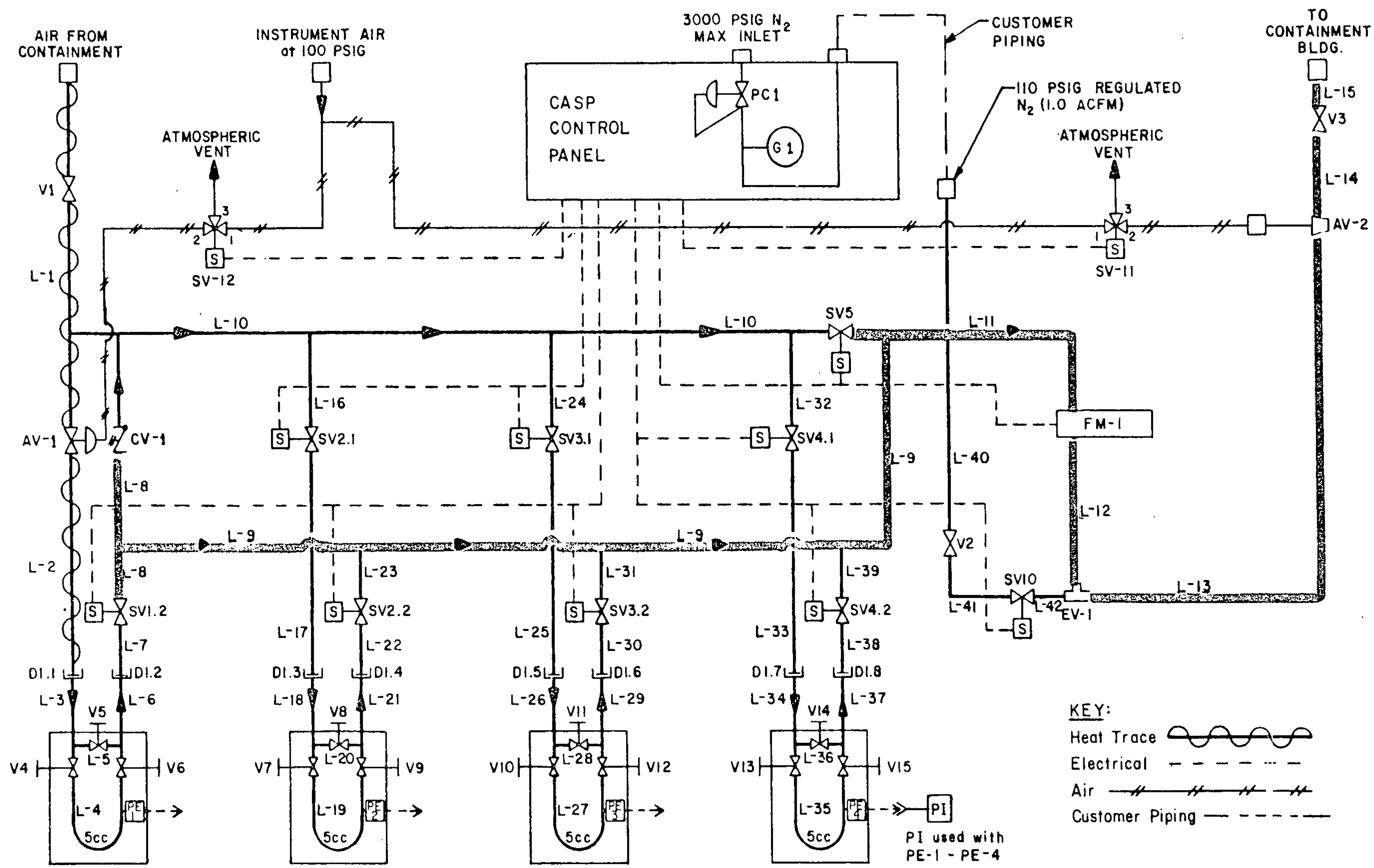


FIGURE IV-39
CONTAINMENT AIR SAMPLING PANEL
THREE-MINUTE RESIDUAL SAMPLE GAS REMOVAL

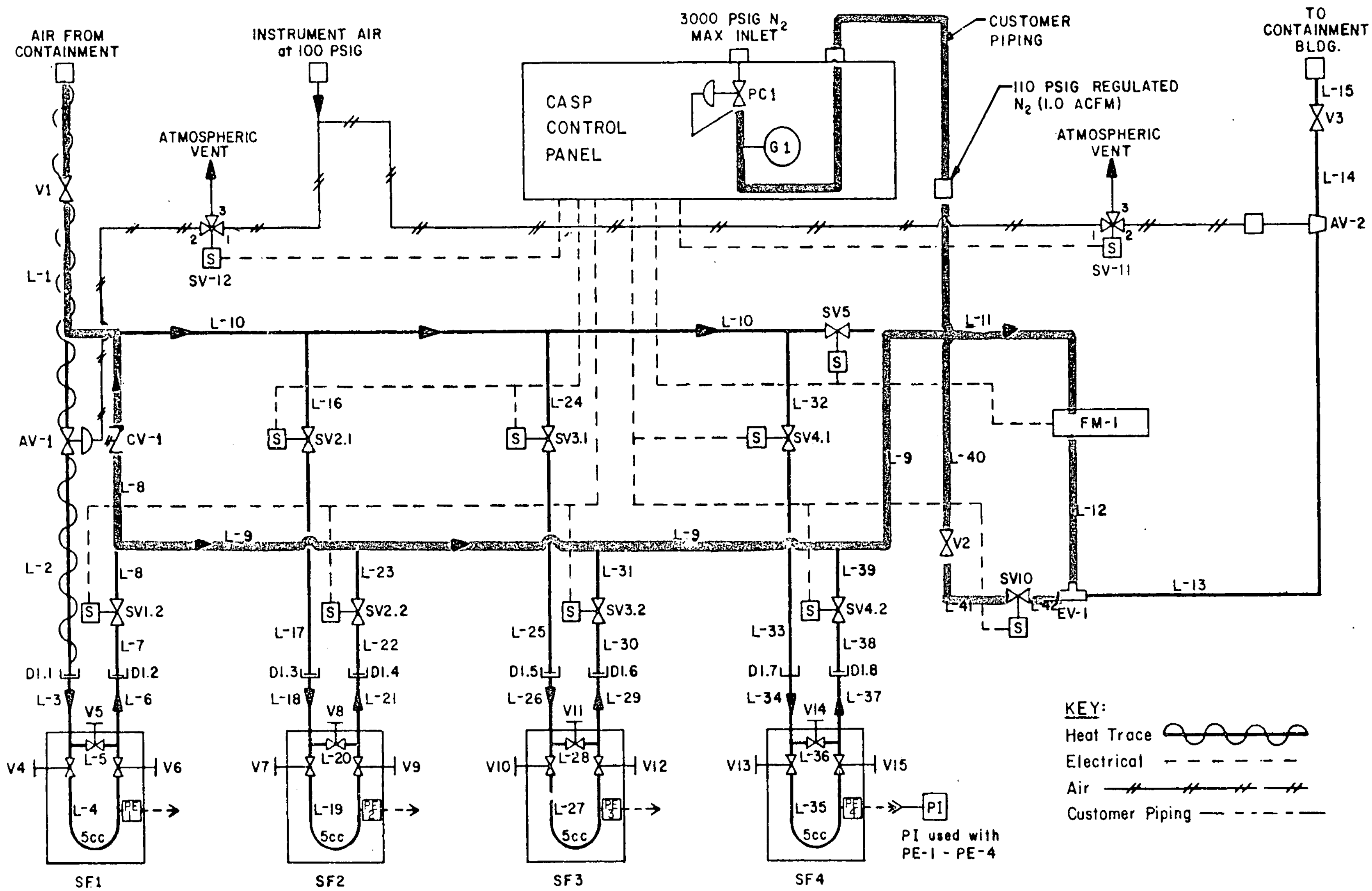


FIGURE IV-40
CONTAINMENT AIR SAMPLING PANEL
INITIAL FIFTEEN-SECOND
POST-SAMPLE BACK FLUSH

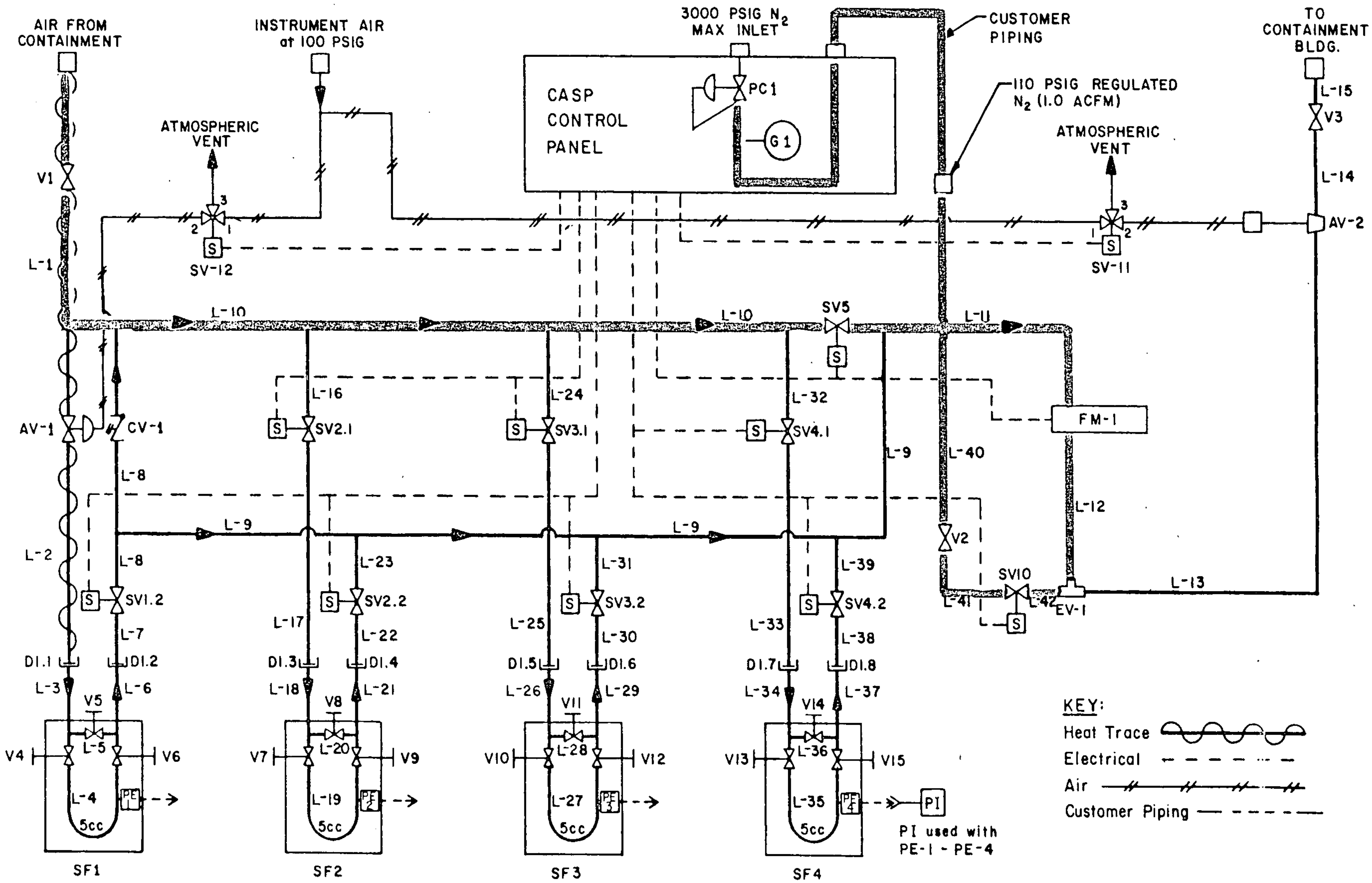


FIGURE IV-41
CONTAINMENT AIR SAMPLING PANEL
SECOND FIFTEEN-SECOND POST-SAMPLE BACK FLUSH

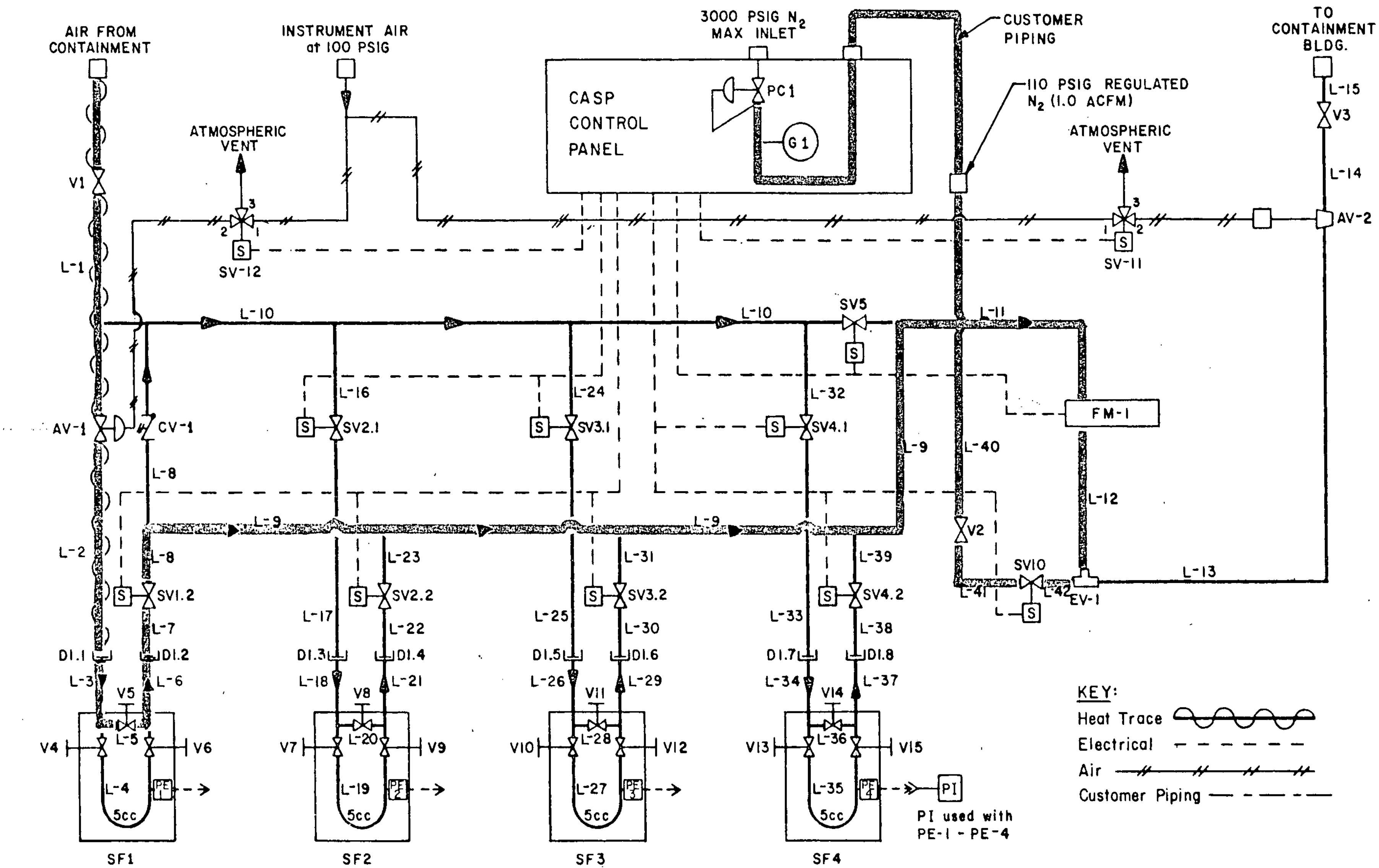


FIGURE IV-42
CONTAINMENT AIR SAMPLING PANEL
THREE-MINUTE SAMPLE FLASK LINE FLUSH

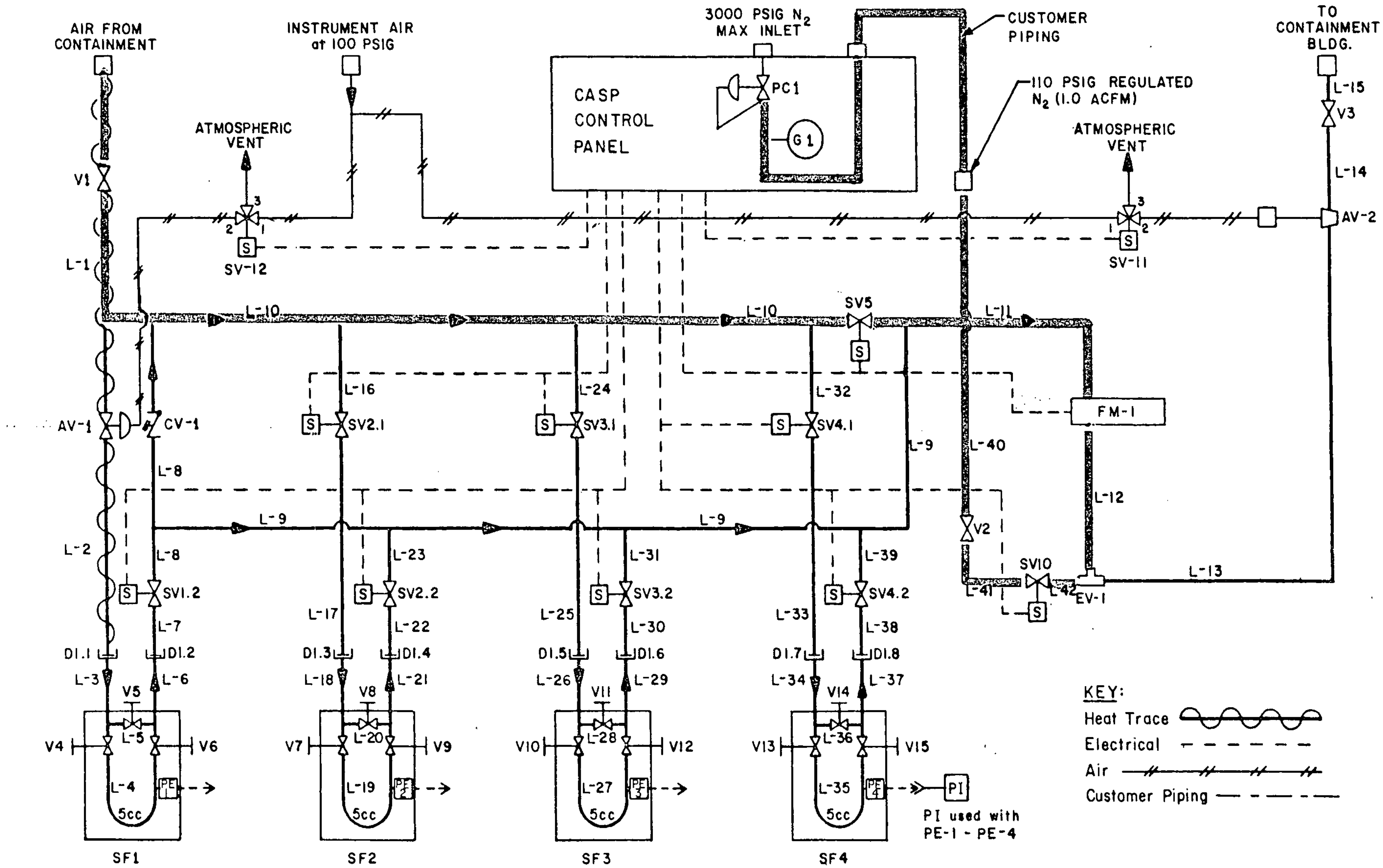


FIGURE IV-43
CONTAINMENT AIR SAMPLING PANEL
TWO-MINUTE GGD BACK FLUSH

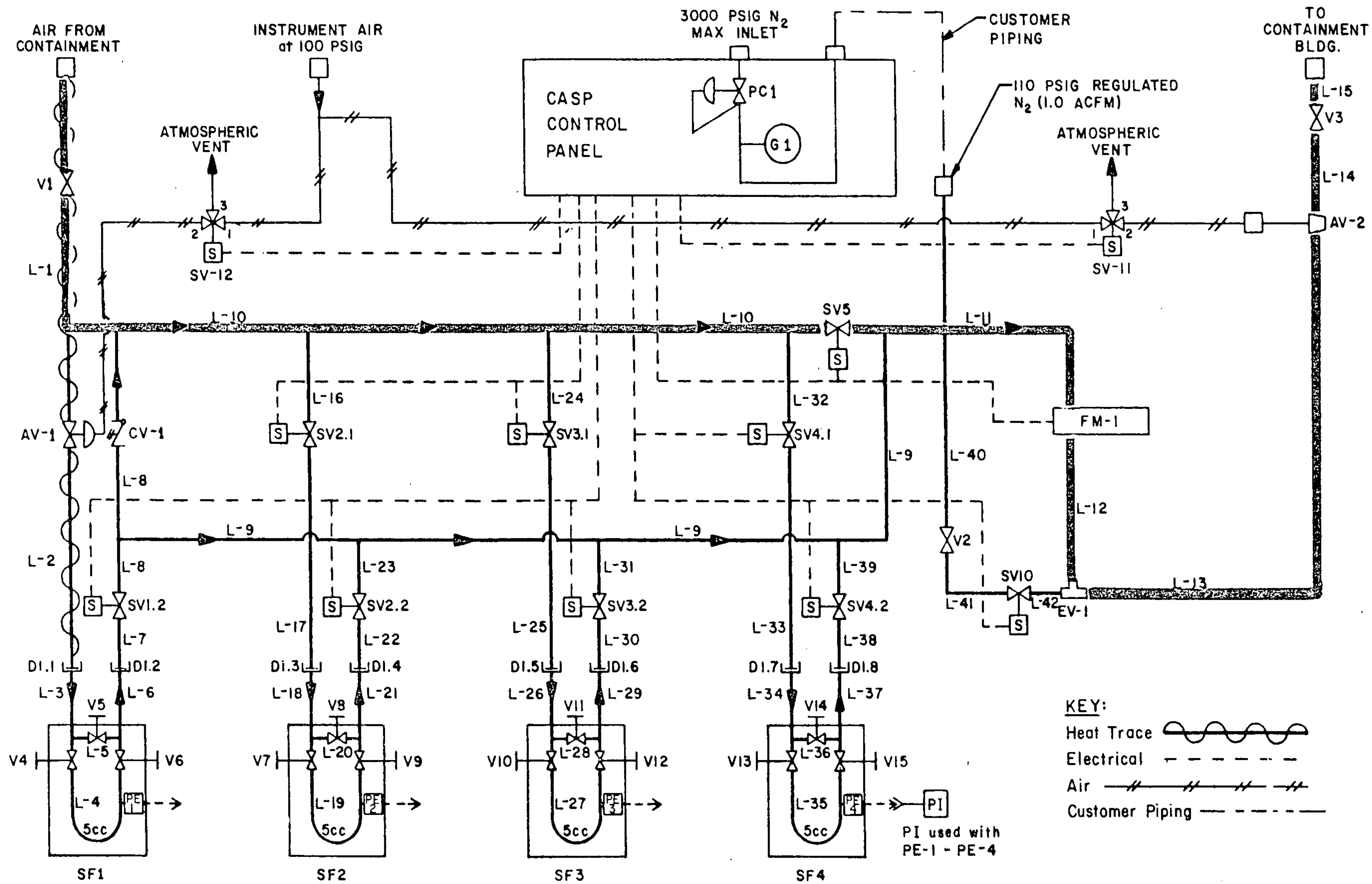


FIGURE IV-44
CONTAINMENT AIR SAMPLING PANEL
THREE-MINUTE GGD SAMPLING

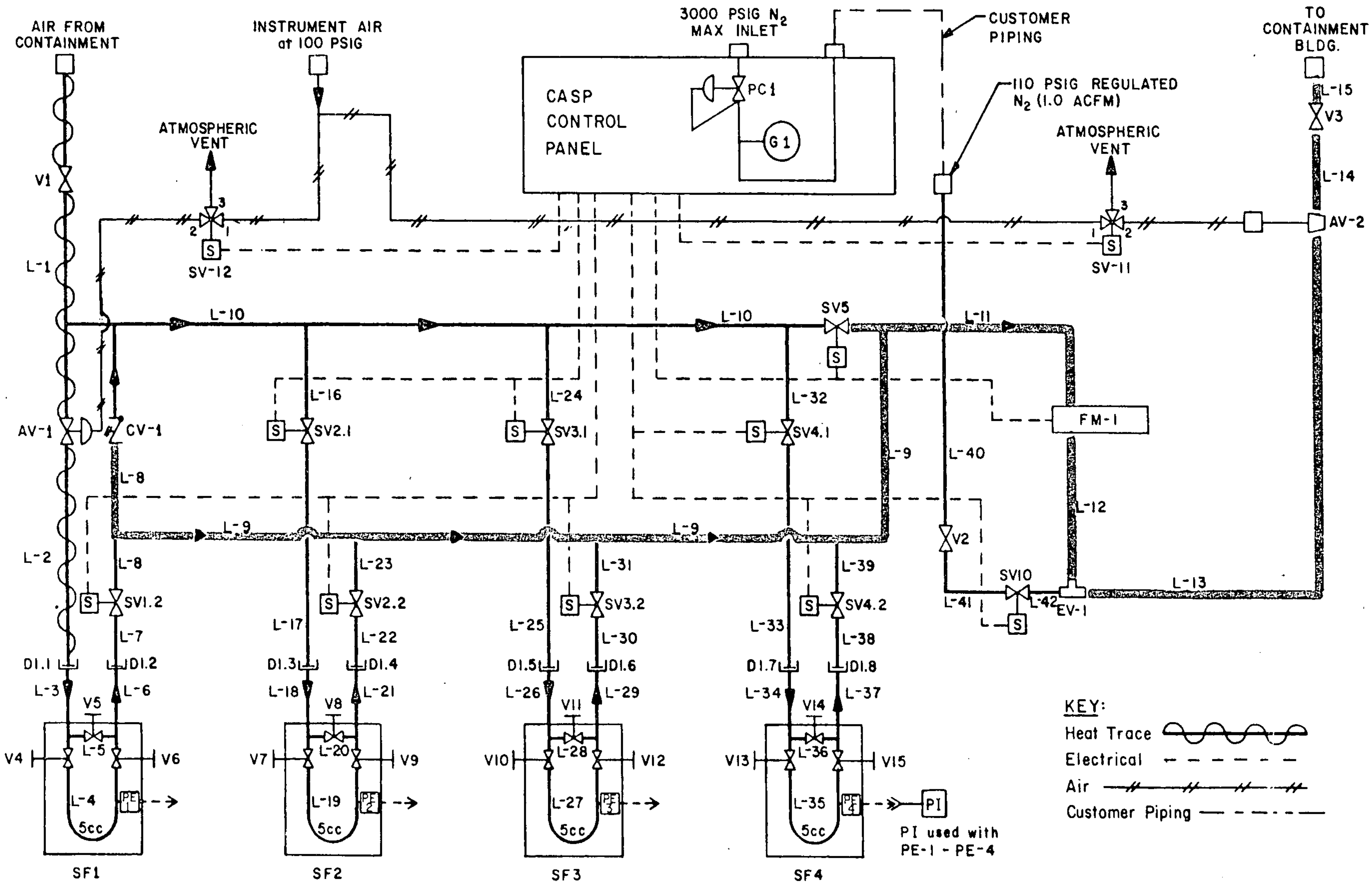


FIGURE IV-45
CONTAINMENT AIR SAMPLING PANEL
FIFTEEN -SECOND GGD RESIDUAL SAMPLE GAS REMOVAL

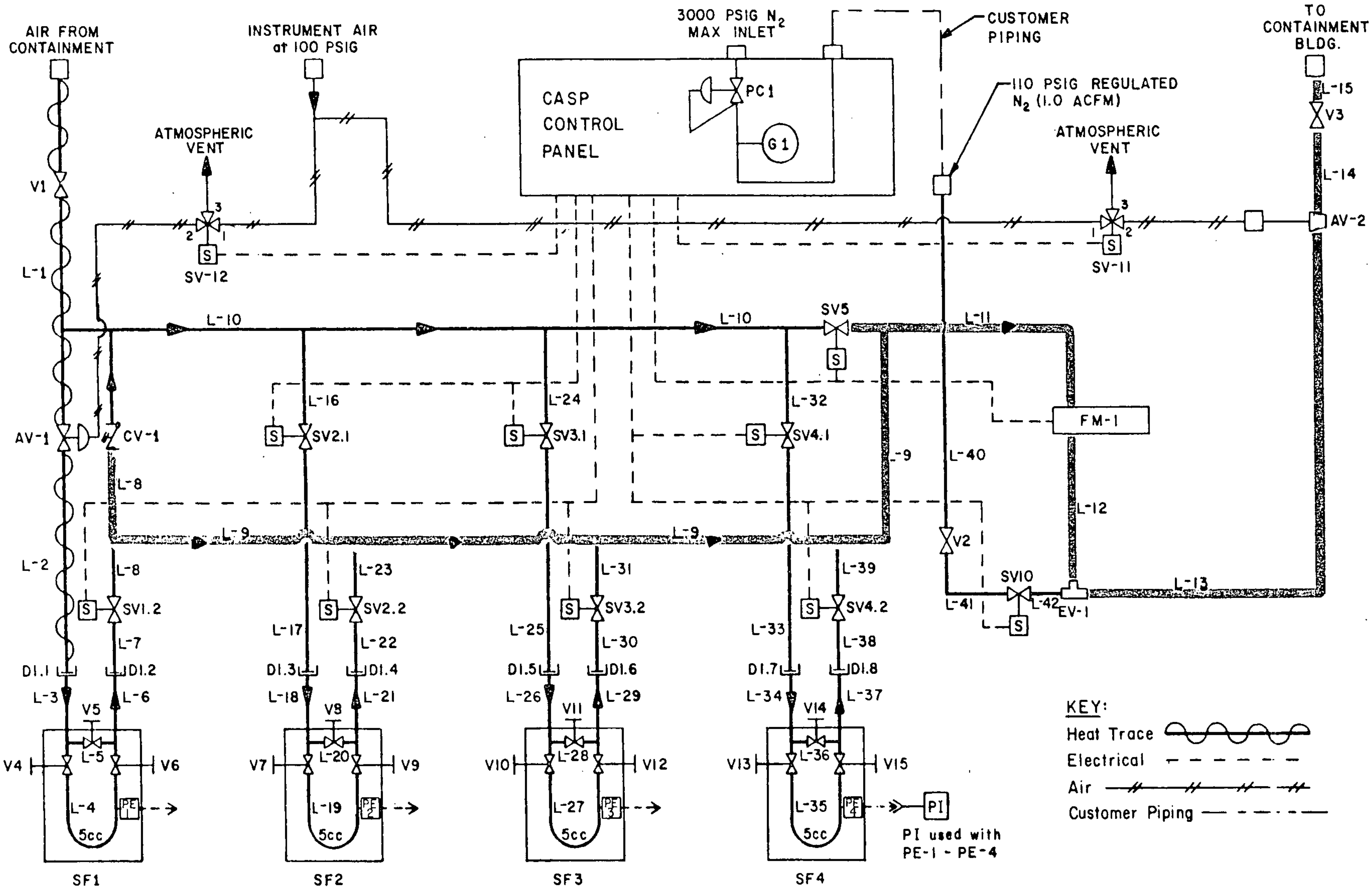


FIGURE IV-46
CONTAINMENT AIR SAMPLING PANEL
THREE-MINUTE GGD RESIDUAL SAMPLE GAS REMOVAL

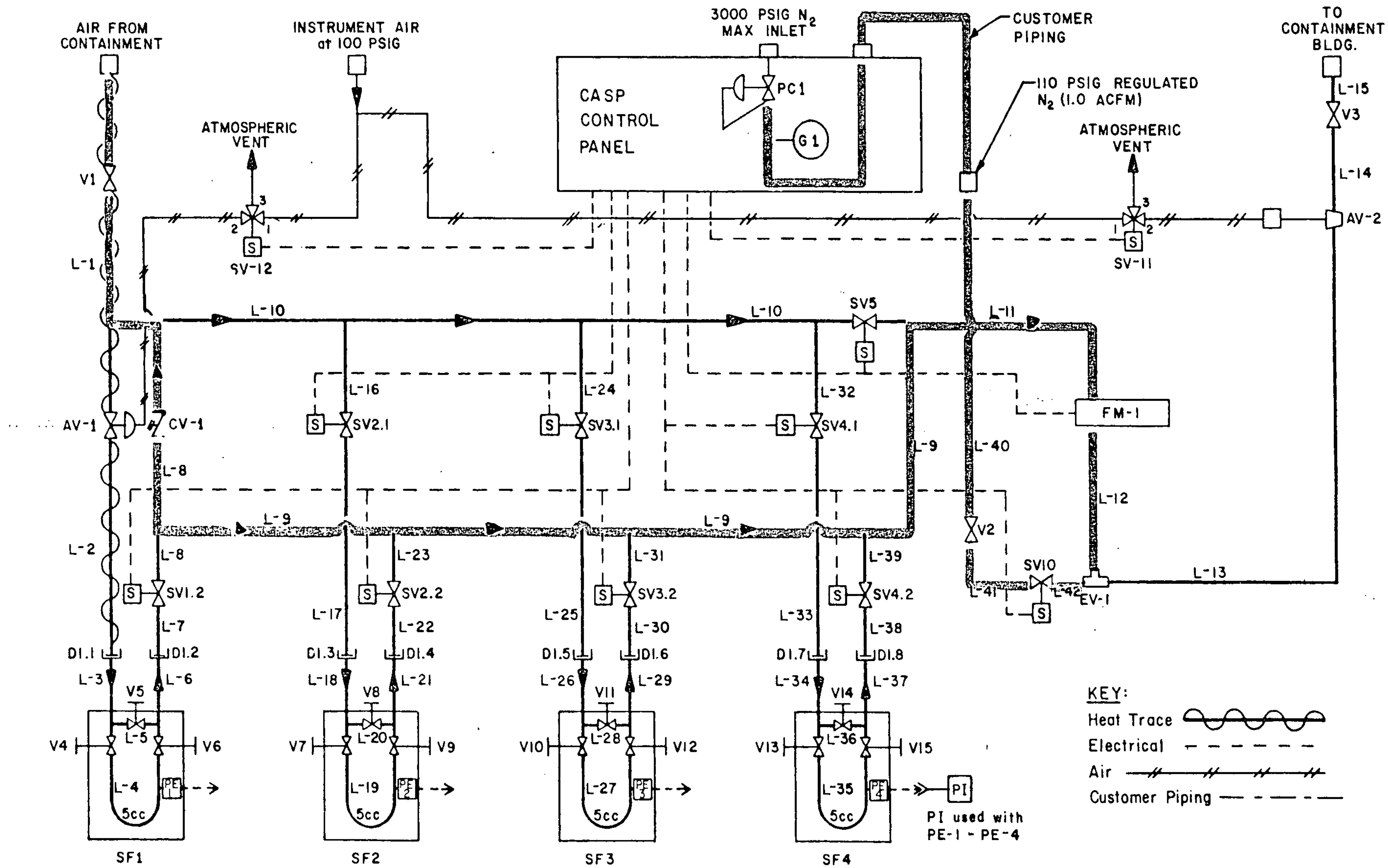


FIGURE IV-47
CONTAINMENT AIR SAMPLING PANEL
INITIAL FIFTEEN-SECOND POST-GGD BACK FLUSH

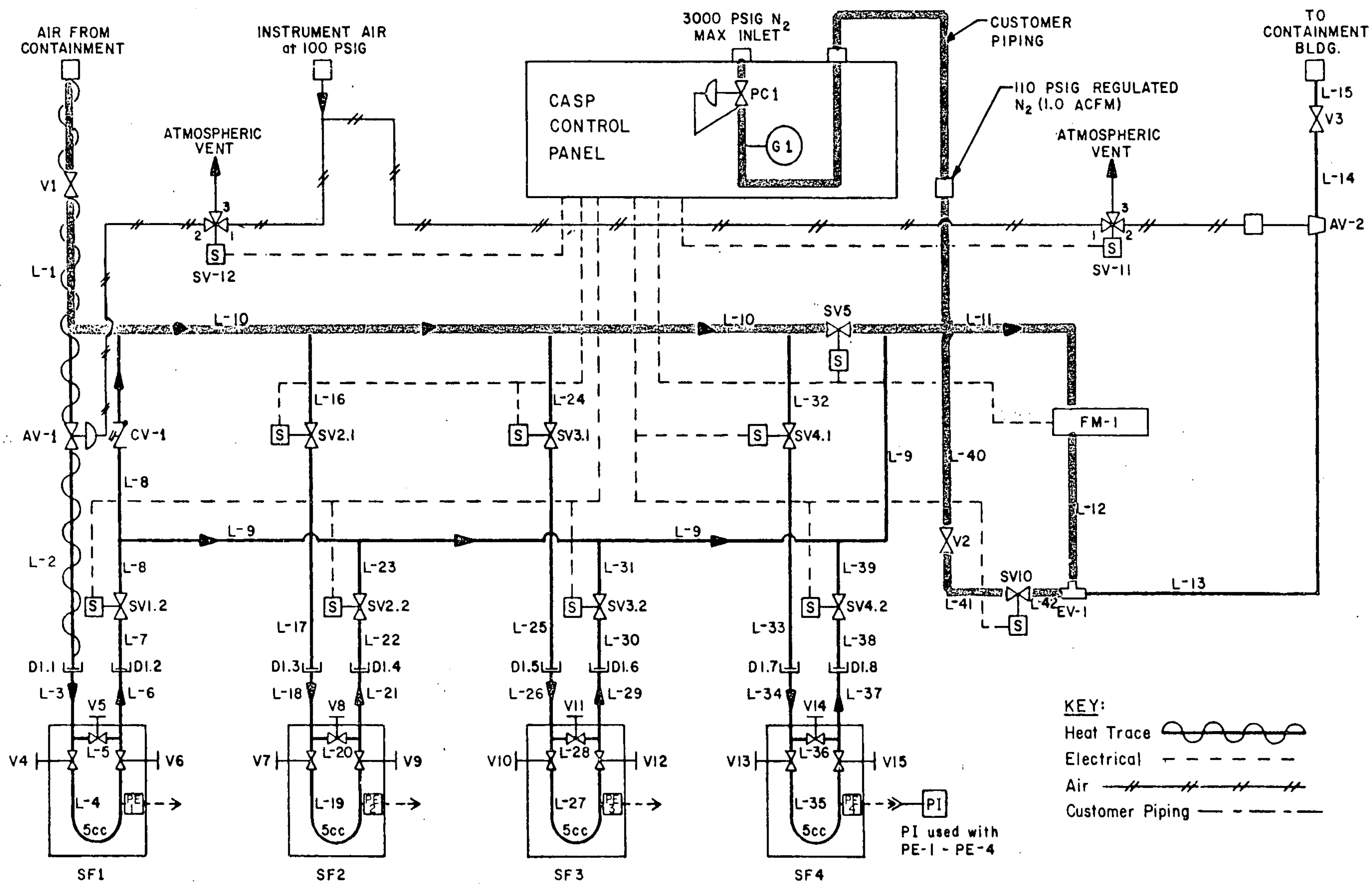


FIGURE IV-48
CONTAINMENT AIR SAMPLING PANEL
SECOND FIFTEEN - SECOND POST- GGD BACK FLUSH

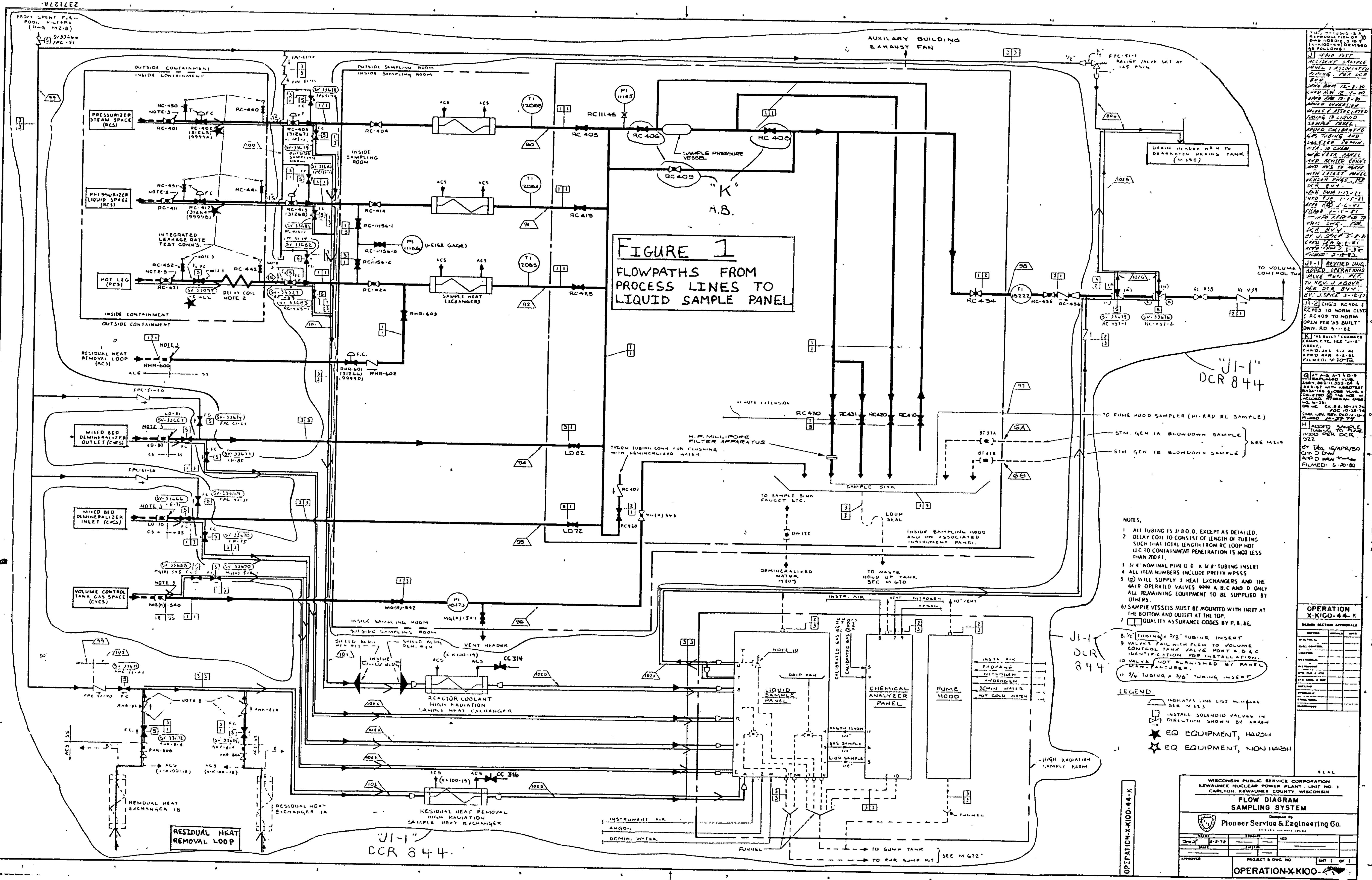


FIGURE 1
FLOWPATHS FROM PROCESS LINES TO LIQUID SAMPLE PANEL
AUXILARY BUILDING EXHAUST FAN
OUTSIDE CONTAINMENT
INSIDE CONTAINMENT
OUTSIDE SAMPLING ROOM
INSIDE SAMPLING ROOM
PRESSURIZER STEAM SPACE (RCS)
PRESSURIZER LIQUID SPACE (RCS)
HOT LEG (RCS)
INTEGRATED LEAKAGE RATE TEST CONN'S.
DELAY COIL NOTE 2
SAMPLE HEAT EXCHANGERS
RESIDUAL HEAT REMOVAL LOOP (ACS)
MIXED BED DEMINERALIZER OUTLET (CVCS)
MIXED BED DEMINERALIZER INLET (CVCS)
VOLUME CONTROL TANK GAS SPACE (CVCS)
SAMPLE PRESSURE VESSEL
"K"
H.B.
H. P. MILLIPORE FILTER APPARATUS
TYGON TUBING CONN FOR FLUSHING WITH DEMINERALIZED WATER
SAMPLE SINK
TO SAMPLE SINK FAUCET ETC.
LOOP SEAL
INSIDE SAMPLING HOOD AND ON ASSOCIATED INSTRUMENT PANEL
DEMINERALIZED WATER M209
TO WASTE HOLD UP TANK SEE M 670
TO FUME HOOD SAMPLER (HI-RAD RC SAMPLE)
STM GEN 1A BLOWDOWN SAMPLE
STM GEN 1B BLOWDOWN SAMPLE
SEE M219
TO VOLUME CONTROL TANK
DRAIN HEADER NEW TO DEAERATED DRAINS TANK (M 390)
RELIEF VALVE SET AT 125 PSIG
REACTOR COOLANT HIGH RADIATION SAMPLE HEAT EXCHANGER
RESIDUAL HEAT REMOVAL SAMPLE HEAT EXCHANGER
RESIDUAL HEAT EXCHANGER 1B
RESIDUAL HEAT EXCHANGER 1A
RESIDUAL HEAT REMOVAL LOOP
LIQUID SAMPLE PANEL
CHEMICAL ANALYZER PANEL
FUME HOOD
HIGH RADIATION SAMPLE ROOM
INSTRUMENT AIR
ARGON
DEMIN. WATER
TO SUMP TANK
TO RHR SUMP PIT
SEE M672
"J1-1" DCR 844
NOTES,
1 ALL TUBING IS 3/8 O.D. EXCEPT AS DETAILED.
2 DELAY COIL TO CONSIST OF LENGTH OF TUBING SUCH THAT TOTAL LENGTH FROM RC LOOP HOT LEG TO CONTAINMENT PENETRATION IS NOT LESS THAN 200 FT.
3 3/4" NOMINAL PIPE O.D. x 3/8" TUBING INSERT
4 ALL ITEM NUMBERS INCLUDE PREFIX WPSSS
5 (W) WILL SUPPLY 3 HEAT EXCHANGERS AND THE 4 AIR OPERATED VALVES 9999 A, B, C AND D ONLY ALL REMAINING EQUIPMENT TO BE SUPPLIED BY OTHERS.
6 SAMPLE VESSELS MUST BE MOUNTED WITH INLET AT THE BOTTOM AND OUTLET AT THE TOP.
7 QUALITY ASSURANCE CODES BY P. S. & E.
8 1/2" TUBING x 3/8" TUBING INSERT
9 VALVES FAIL WITH FLOW TO VOLUME CONTROL TANK. VALVE PORT A, B & C IDENTIFICATION FOR INSTALLATION.
10 VALVE NOT FURNISHED BY PANEL MANUFACTURER.
11 3/4 TUBING x 3/8" TUBING INSERT
LEGEND.
INDICATES LINE LIST NUMBERS SEE M 323
INSTALL SOLENOID VALVES IN DIRECTION SHOWN BY ARROW
EQ EQUIPMENT, HARSH
EQ EQUIPMENT, NON HARSH
WISCONSIN PUBLIC SERVICE CORPORATION
KEWAUNEE NUCLEAR POWER PLANT - UNIT NO. 1
CARLTON, KEWAUNEE COUNTY, WISCONSIN
FLOW DIAGRAM
SAMPLING SYSTEM
Pioneer Service & Engineering Co.
5-8-78
SHT 1 OF 1
OPERATION-X-KIOO-44-K

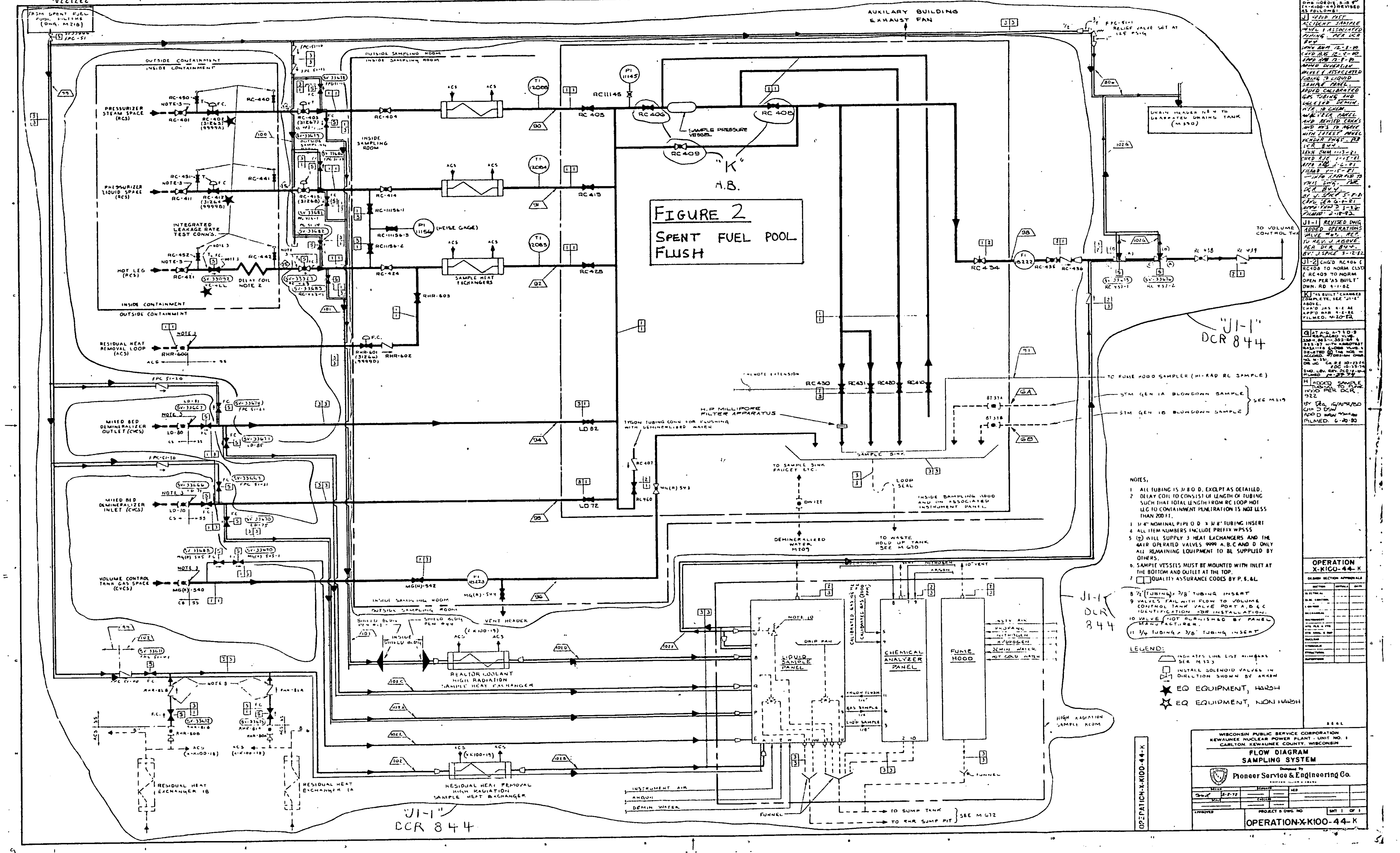
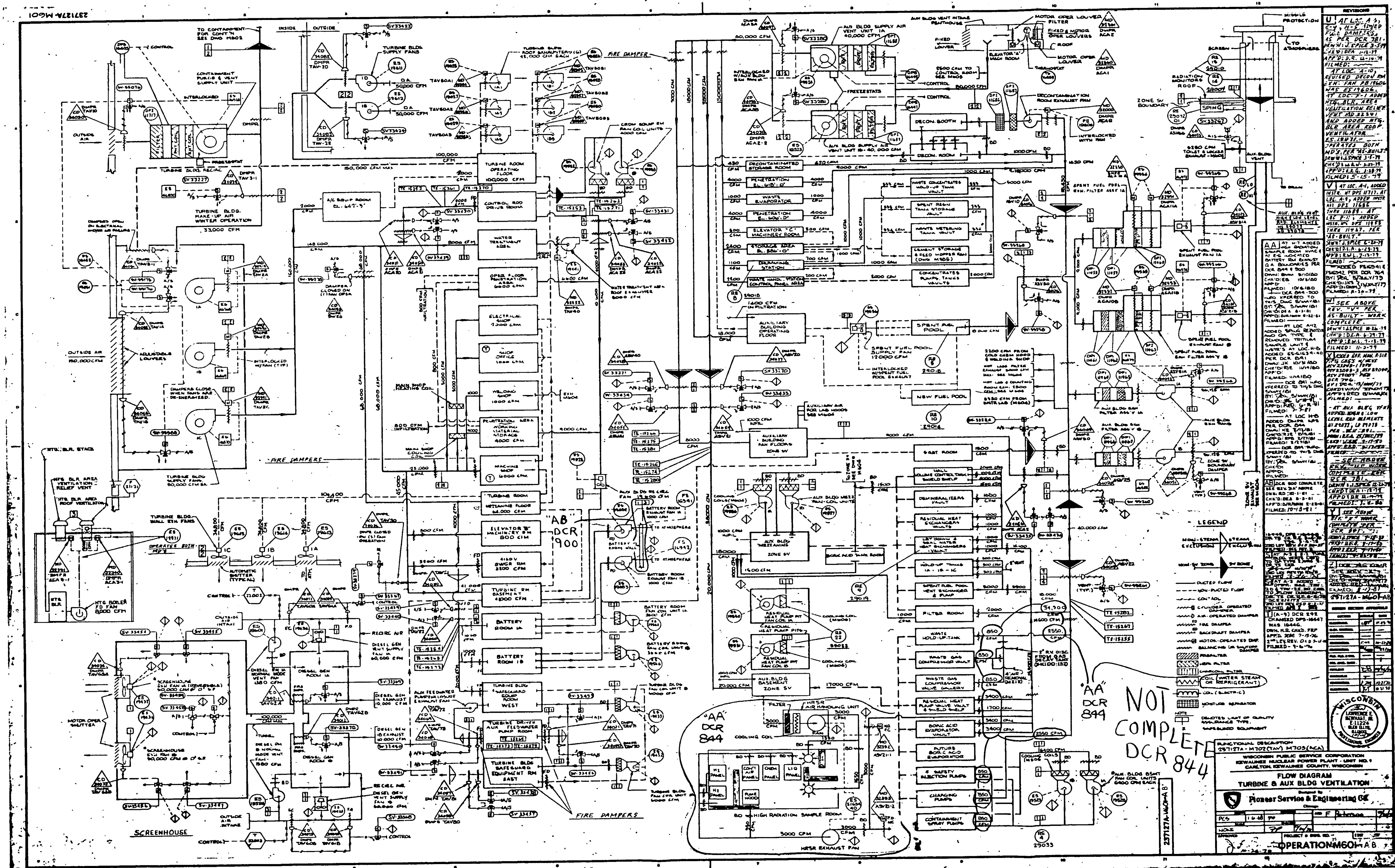
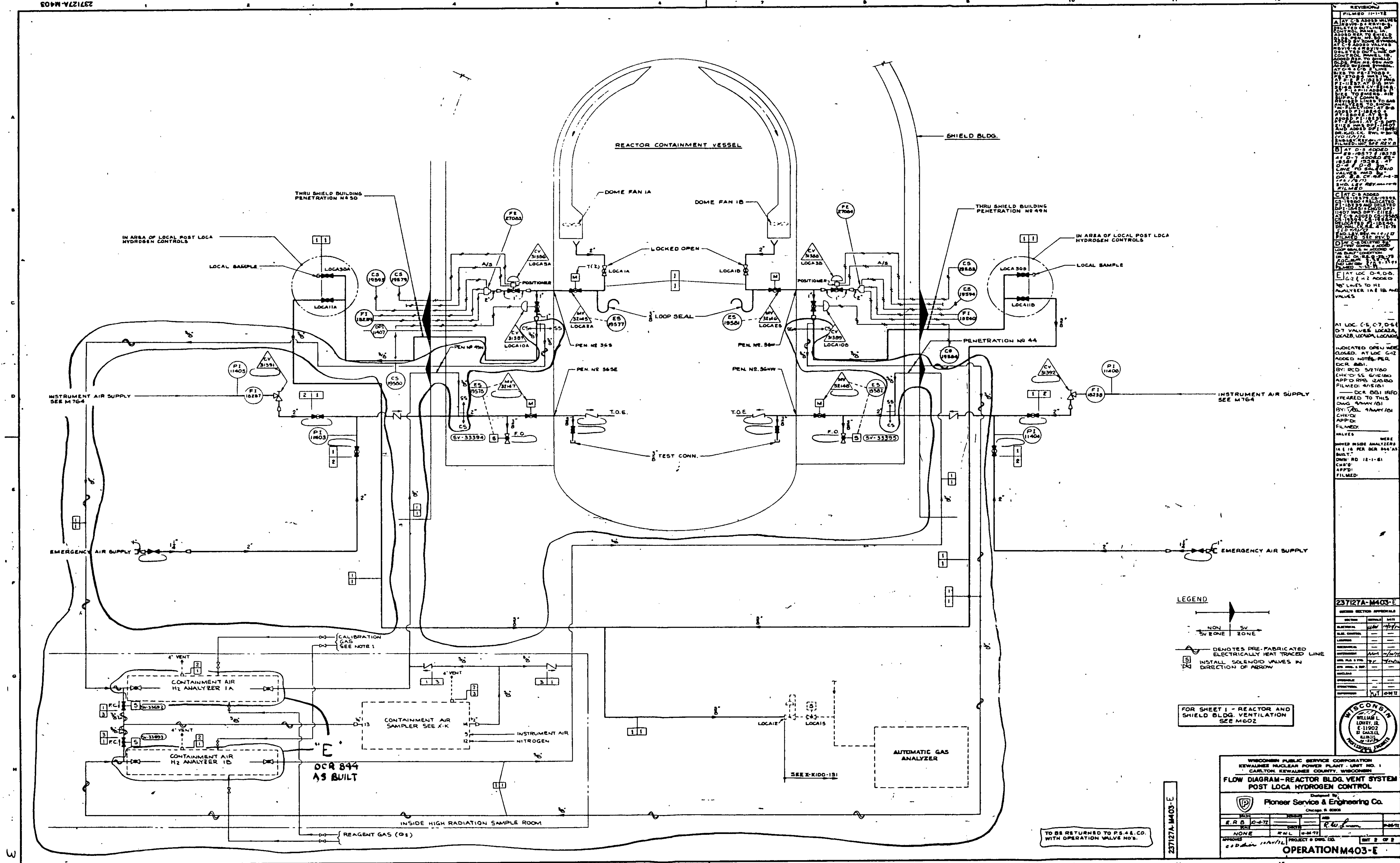


FIGURE 2
SPENT FUEL POOL FLUSH
AUXILARY BUILDING EXHAUST FAN
OUTSIDE CONTAINMENT
INSIDE CONTAINMENT
PRESSURIZER STEAM SPACE (RCS)
PRESSURIZER LIQUID SPACE (RCS)
INTEGRATED LEAKAGE RATE TEST CONN'S.
HOT LEG (RCS)
DELAY COIL NOTE 2
RESIDUAL HEAT REMOVAL LOOP (RCS)
MIXED BED DEMINERALIZER OUTLET (CVCS)
MIXED BED DEMINERALIZER INLET (CVCS)
VOLUME CONTROL TANK GAS SPACE (CVCS)
OUTSIDE SAMPLING ROOM
INSIDE SAMPLING ROOM
SAMPLE HEAT EXCHANGERS
SAMPLE PRESSURE VESSEL
(HEISE GAGE)
SAMPLE SINK
H.P. MILLIPORE FILTER APPARATUS
TYGON TUBING CONN FOR FLUSHING WITH DEMINERALIZED WATER
TO SAMPLE SINK FAUCET ETC.
LOOP SEAL
INSIDE SAMPLING HOOD AND ON ASSOCIATED INSTRUMENT PANEL
DEMINERALIZED WATER M209
TO WASTE HOLD UP TANK SEE M 670
TO FUME HOOD SAMPLER (HI-RAD RC SAMPLE)
STM GEN 1A BLOWDOWN SAMPLE
STM GEN 1B BLOWDOWN SAMPLE
SEE M219
DRAIN HEADER NO. 4 TO DEAERATED DRAINS TANK (M330)
TO VOLUME CONTROL TANK
"JI-1" DCR 844
VENT HEADER
REACTOR COOLANT HIGH RADIATION SAMPLE HEAT EXCHANGER
RESIDUAL HEAT REMOVAL HIGH RADIATION SAMPLE HEAT EXCHANGER
RESIDUAL HEAT EXCHANGER 1B
RESIDUAL HEAT EXCHANGER 1A
LIQUID SAMPLE PANEL
CHEMICAL ANALYZER PANEL
FUME HOOD
DRIP PAN
HIGH RADIATION SAMPLE ROOM
INSTRUMENT AIR
ARGON
DEMIN WATER
TO SUMP TANK
TO RHR SUMP PIT
SEE M 672
FUNNEL
NOTES:
1 ALL TUBING IS 3/8 O.D. EXCEPT AS DETAILED.
2 DELAY COIL TO CONSIST OF LENGTH OF TUBING SUCH THAT TOTAL LENGTH FROM RC LOOP HOT LEG TO CONTAINMENT PENETRATION IS NOT LESS THAN 200 FT.
3 3/4" NOMINAL PIPE O.D. x 3/8" TUBING INSERT
4 ALL ITEM NUMBERS INCLUDE PREFIX WPSSS
5 (W) WILL SUPPLY 3 HEAT EXCHANGERS AND THE 4 AIR OPERATED VALVES 9999 A, B, C AND D ONLY. ALL REMAINING EQUIPMENT TO BE SUPPLIED BY OTHERS.
6. SAMPLE VESSELS MUST BE MOUNTED WITH INLET AT THE BOTTOM AND OUTLET AT THE TOP.
7 QUALITY ASSURANCE CODES BY P. S. & L.
8 1/2" (TUBING) x 3/8" TUBING INSERT
9 VALVES FAIL WITH FLOW TO VOLUME CONTROL TANK VALVE PORT A, B & C IDENTIFICATION FOR INSTALLATION.
10 VALVE NOT FURNISHED BY PANEL MANUFACTURER.
11 3/4 TUBING x 3/8" TUBING INSERT
LEGEND:
INDICATES LINE LIST NUMBERS SEE M 323
INSTALL SOLENOID VALVES IN DIRECTION SHOWN BY ARROW
EQ EQUIPMENT, HARSH
EQ EQUIPMENT, NON HARSH
OPERATION X-K100-44-K
WISCONSIN PUBLIC SERVICE CORPORATION
KEWAUNEE NUCLEAR POWER PLANT - UNIT NO. 1
CARLTON, KEWAUNEE COUNTY, WISCONSIN
FLOW DIAGRAM
SAMPLING SYSTEM
Designed by
Pioneer Service & Engineering Co.
APPROVED
PROJECT & DWG. NO.
SHT 1 OF 1
OPERATION-X-K100-44-K



237127A M601
FIRE DAMPER
FIRE DAMPERS
SCREENHOUSE
TURBINE BLDG. MAKE-UP AIR WINTER OPERATION
33,000 CFM
OUTSIDE AIR 150,000 CFM
TURBINE BLDG WALL EXH FANS
TURBINE ROOM OPERATING FLOOR 100,000 CFM
CONTROL ROD DRIVE ROOM
WATER TREATMENT AREA
ELECTRICAL SHOP
MACHINE SHOP
TURBINE ROOM MEZZANINE FLOOR
TURBINE RM BASEMENT 41000 CFM
BATTERY ROOM 1A
BATTERY ROOM 1B
SPENT FUEL POOL
NEW FUEL POOL
DECON. BOOTH
DECON. ROOM
AUXILIARY BUILDING OPERATING FLOOR
AUX BLDG MEZZANINE ZONE SV
AUX. BLDG BASEMENT ZONE SV
HIGH RADIATION SAMPLE ROOM
HRSR EXHAUST FAN
"AB" DCR 900
"AA" DCR 844
NOT COMPLETE DCR 844
LEGEND
REVISIONS
FUNCTIONAL DESCRIPTION 237127A-M702(TAV) M703(ACA)
WISCONSIN PUBLIC SERVICE CORPORATION
KEWAUNEE NUCLEAR POWER PLANT - UNIT NO. 1
CARLTON, KEWAUNEE COUNTY, WISCONSIN
FLOW DIAGRAM
TURBINE & AUX BLDG VENTILATION
Pioneer Service & Engineering Co.
OPERATION M601-AB


237127A-M403
REACTOR CONTAINMENT VESSEL
SHIELD BLDG.
DOME FAN 1A
DOME FAN 1B
THRU SHIELD BUILDING PENETRATION NO 43D
THRU SHIELD BUILDING PENETRATION NO 49N
IN AREA OF LOCAL POST LOCA HYDROGEN CONTROLS
LOCAL SAMPLE
LOCKED OPEN
LOOP SEAL
POSITIONER
PENETRATION NO 44
PEN. NO 36S
PEN. NO 36SE
PEN. NO 36W
PEN. NO 36NW
INSTRUMENT AIR SUPPLY SEE M764
EMERGENCY AIR SUPPLY
T.O.E.
TEST CONN.
CALIBRATION GAS SEE NOTE 1
4" VENT
CONTAINMENT AIR H2 ANALYZER 1A
CONTAINMENT AIR H2 ANALYZER 1B
CONTAINMENT AIR SAMPLER SEE X-K
INSTRUMENT AIR
NITROGEN
"E"
DCR 844
AS BUILT
AUTOMATIC GAS ANALYZER
SEE X-K100-131
INSIDE HIGH RADIATION SAMPLE ROOM
REAGENT GAS (O2)
LEGEND
NON SV ZONE
SV ZONE
DENOTES PRE-FABRICATED ELECTRICALLY HEAT TRACED LINE
INSTALL SOLENOID VALVES IN DIRECTION OF ARROW
FOR SHEET 1 - REACTOR AND SHIELD BLDG. VENTILATION SEE M602
TO BE RETURNED TO P.S.&E.CO. WITH OPERATION VALVE NO'S.
REVISIONS
237127A-M403-E
WISCONSIN
WILLIAM L. LOWRY, JR.
E-11902
ST. CHARLES ILLINOIS
PROFESSIONAL ENGINEER
WISCONSIN PUBLIC SERVICE CORPORATION
KEWAUNEE NUCLEAR POWER PLANT - UNIT NO. 1
CARLTON, KEWAUNEE COUNTY, WISCONSIN
FLOW DIAGRAM-REACTOR BLDG. VENT SYSTEM
POST LOCA HYDROGEN CONTROL
Designed By
Pioneer Service & Engineering Co.
Chicago, Ill. 60603
E.R.B. 10-4-72
NONE
R.W.L.
SHT 2 OF 2
OPERATION M403-E