RECEIVED

APR 18 1996

OSTI

DOE/METC-96/1029-Vol. 2

# METC/3M Cooperative Agreement CRADA 94-024 High Temperature High Pressure Filter Materials Exposure Test Program

**Final Report, Volume II**

June 1995

U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy Technology Center
3610 Collins Ferry Road
Morgantown, WV 26505

and
Minnesota Mining and Manufacturing Company
3M Ceramic Materials Department
3M Center Building 207-1S-23
St. Paul, MN 55144-1000

Contributors:
J.M. Rockey, J.R. Bird, E. Galloway, A.P. Lui,
D. Eckels, J. Rutten, M.S. Tucker, P.C. Yue,
R.L. Pineault, J.C. Pack, T. Thomson

DOE/METC-96/1029

# METC/3M Cooperative Agreement CRADA 94-024 High Temperature High Pressure Filter Materials Exposure Test Program

## Final Report, Volume II

June 1995

U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy Technology Center
3610 Collins Ferry Road
Morgantown, WV 26505

and

Minnesota Mining and Manufacturing Company
3M Ceramic Materials Department
3M Center Building 207-1S-23
St. Paul, MN 55144-1000

Contributors:
J.M. Rockey, J.R. Bird, E. Galloway, A.P. Lui,
D. Eckels, J. Rutten, M.S. Tucker, P.C. Yue,
R.L. Pineault, J.C. Pack, T. Thomson

## Table of Contents

# APPENDIX 1

## SUMMARY OF PARTICULATE MONITORING RESULTS

## Appendix 1: Summary of Particulate Monitoring Results

This report is a summary of the results of activities of the particulate monitoring group in support of the METC/3M CRADA 94-024. Online particulate monitoring began in June, 1994 and ended in October, 1994. The particulate monitoring group participated in four MGCR runs (#7 through #10). The instrument used in measuring the particle loadings (particle counts and size distribution) is the Particle Measuring Systems Classical Scattering Aerosol Spectrometer Probe High Temperature and High Pressure (PMS Model CSASP-100-HTHP). This PMS unit is rated to operate at temperatures up to 540°C and gage pressures up to 2.07 MPa.

Gas stream conditions, temperature at 540°C, gage pressure at 2.93 MPa, and gas flowrate at 0.0157 SCM per second, precluded the direct measurement of particulate loadings in the gas stream with the PMS unit. A side stream was extracted from the gas stream after it came over to the MGCR, Modular Gas Cleanup Rig, from the FBG, pressurized Fluidized-Bed Gasifier, but before it entered the filter testing vessel. A sampling probe of 0.635 cm O.D. thin wall stainless steel tubing was used for extracting the sample gas isokinetically based on the expected flowrate. The sample gas stream was further split into two streams; one was directed to the PMS unit and the other to the alkali monitor unit. The alkali monitor unit was not used during runs #7 through #10.

The gas flowrate to the PMS unit was controlled by a critical orifice to minimize particle loss. The actual sample gas flowrate was recorded continuously by the DDAS, Distributed Data Acquisition System.

The PMS unit was set to a measuring cycle of 90 seconds which resulted in about 40 measuring cycles per hour. At the end of each cycle it reported the total particle count and particle count in each size group. These were recorded by a PC. To obtain the particle loadings from measurements (i.e. particle number density and particle mass loading) it was necessary to perform post measurement calculations with flow data recorded by the DDAS which also recorded other operation parameters of the FBG and the MGCR.

Unfortunately, technical difficulties prohibited the DDAS recording of the flow data to the PMS unit for runs #7 and #10. All data were processed with flowrate values either actually recorded or a fixed value that was observed during the runs. In cases where actual flow information was available an average of 15 flow values was used to process each data set of 90 seconds (DDAS recorded flow data at a 6 second interval). Only data sets containing 6 or more hours of continuous records were processed in order to obtain a time history of the data trend.

In each data set presented, each data point represents a 15-minute ensemble average (an average of 10 measurements). Three plots of the ensemble averages were generated from each data set; mean particle diameter, mean number concentration, and mean mass loading. For mass loading calculations, a particle mass density value of 1.0 gram per cubic centimeter (1 gm/cc) was used, following the general practice used by some optical particle monitor vendors. The actual mass loading can be easily obtained by multiplying the mass loading with the appropriate particle mass density. For these FBG/MGCR runs the particle mass density varied from 2.2 to 2.5 gm/cc depending on the specific runs. A nominal value of 2.3 gm/cc has been suggested for use.

In the following, for each run presented is an example of an unprocessed particle size distribution of one 90 second measuring cycle and an example of a 15-minute averaged size distribution. Then for each data set, 3 plots are presented, one for the ensemble mean values of diameters, number concentration, and mass loading over each measuring period. In an ideal situation, when constant particle loadings and particle size distribution are present, a straight line curve for these last three plots is expected. But there are many factors that may contribute to the measured variations of particle loading and size; gasifier operations conditions, gas stream flow and pressure fluctuations, particle deposition on and re-entrainment from pipes and valves, etc.

PMS at MGCR Run #7

MGCR Run #7 took place in June, 1994. Nine hours of particulate data were collected. These data were processed with a constant flowrate of $1.18 \times 10^{-3}$ SCM/sec (150 scfh) because no flow data for the particulate measuring period were recorded by the DDAS. This flow value was the expected flowrate using the combined critical flow orifice and backpressure controlled valve. Figure 5a is the particle size distribution of unprocessed data from a measuring cycle and Figure 5b shows a 15-minute average size distribution. Here we see that the average distribution is very much the same as the distribution of a single measurement. The ensemble mean diameter of the particles for this run is shown in Figure 5c. Since a constant flowrate was used to calculate the particle number concentration (Figure 5d) and mass loading (Figure 5e) they may not represent the true particle loadings.

PMS at MGCR Run #8

MGCR Run #8 took place in July, 1994. Particulate measurements included 8 hours on 7/19/94, 10 hours and 30 minutes on 7/21/94, and 23 hours on 7/22/94. Again, comparing the particle size distributions between an unprocessed single measurement (Figure 6a) and that of a 15 minute average (Figure 6b), shows no significant difference. Figures 6c, 6d, and 6e are plots of the 15 minute ensemble mean particle diameters, number concentrations, and mass loadings for the 8 hour period taken on

7/19/94. The particle data collected on 7/21 and 7/22 showed large fluctuations in ensemble mean diameters (Figure 7a and 7b) and number concentrations (Figures 7b and 8b). Consequently, the mass loadings also show large fluctuations (Figures 7c and 8c).

PMS at MGCR Run #9

Two sets of particulate measurements were taken in this run. On 9/13/94, 7 hours of particulate data were collected. Again, the size distribution is consistent between a single measuring cycle (Figure 9a) and the 15-minute averaged sized distribution (Figure 9b). The ensemble mean particle diameters are relatively large, about 0.8 microns, as shown in Figure 9c. The number concentration plot (Figure 9d) and the mass loading plot (Figure 9e) showed relatively constant values except for a sharp drop at around 1300 hours. The data collected between 9/15 and 9/16 show that the ensemble mean diameters (Figure 10a) varied more than those taken on 9/13. The mean particle concentrations also show large variations (Figure 10b). The mass loadings (Figure 10c) seem to amplify the variations in number concentration.

PMS at MGCR Run #10

In the final run, MGCR Run #10, the DDAS recording bug struck again. The record showed zero values for the particulate sample flow during the measuring period. We again used a constant flowrate of $1.18\times10^{-3}$ SCM/sec (150 scfh) to process the data. The plots in Figures 10a through 10e for this set of data are the same as those for the previous sets of data. While the mean particle diameters remained between 0.85 to 0.7 micrometers (see Figure 10a) there was a big drop in particle number concentration occurring at 1245 hours, as shown in Figure 10b. This big drop in number concentration may be due to partial plugging of the sampling probe or flow valves. If DDAS flow data were available this loss of flow would be accounted for in the averaging.

Conclusion

Obviously the operating conditions of the FBG affected the particulate loading and size distributions in the gas stream. The ability to maintain size calibration of the PMS also affected the measured results. We tried to collect solid samples downstream of the PMS unit to compare loadings from optical measurements. However we found the mass loadings on the high temperature ceramic thimble filters were not consistent. We suspected that leakage at the seal of the thimble filter was the cause. For instance, solid catches under high temperature showed loadings varied from 0.09 to 0.13 gram per hour. It is suspected that thermal expansion may have contributed to the leakage problem.

Supplemental to the online particulate monitoring, the following table provides the hours of filtration and the pounds of solid filtered with respect to the filtration vessel.

| Run Number | Hours of Filtration per Run | Pounds of Solid Collected |
|---|---|---|
| 7 | 119 | 2.12 |
| 8 | 189 | 5.62 |
| 9 | 86 | 3.38 |
| 10 | 89 | 2.56 |

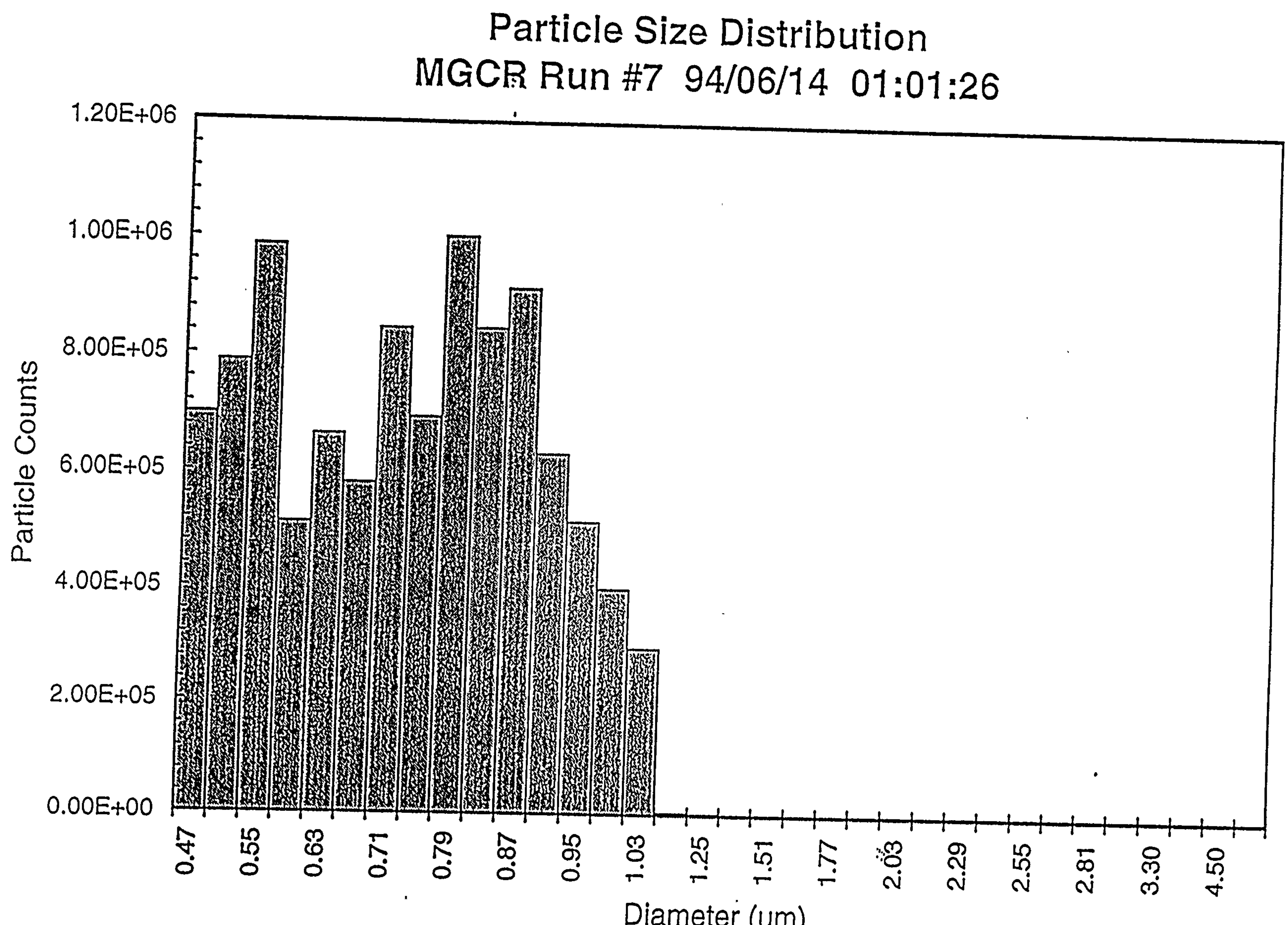



Figure 5a. Unprocessed particle size distribution from a single measurement.

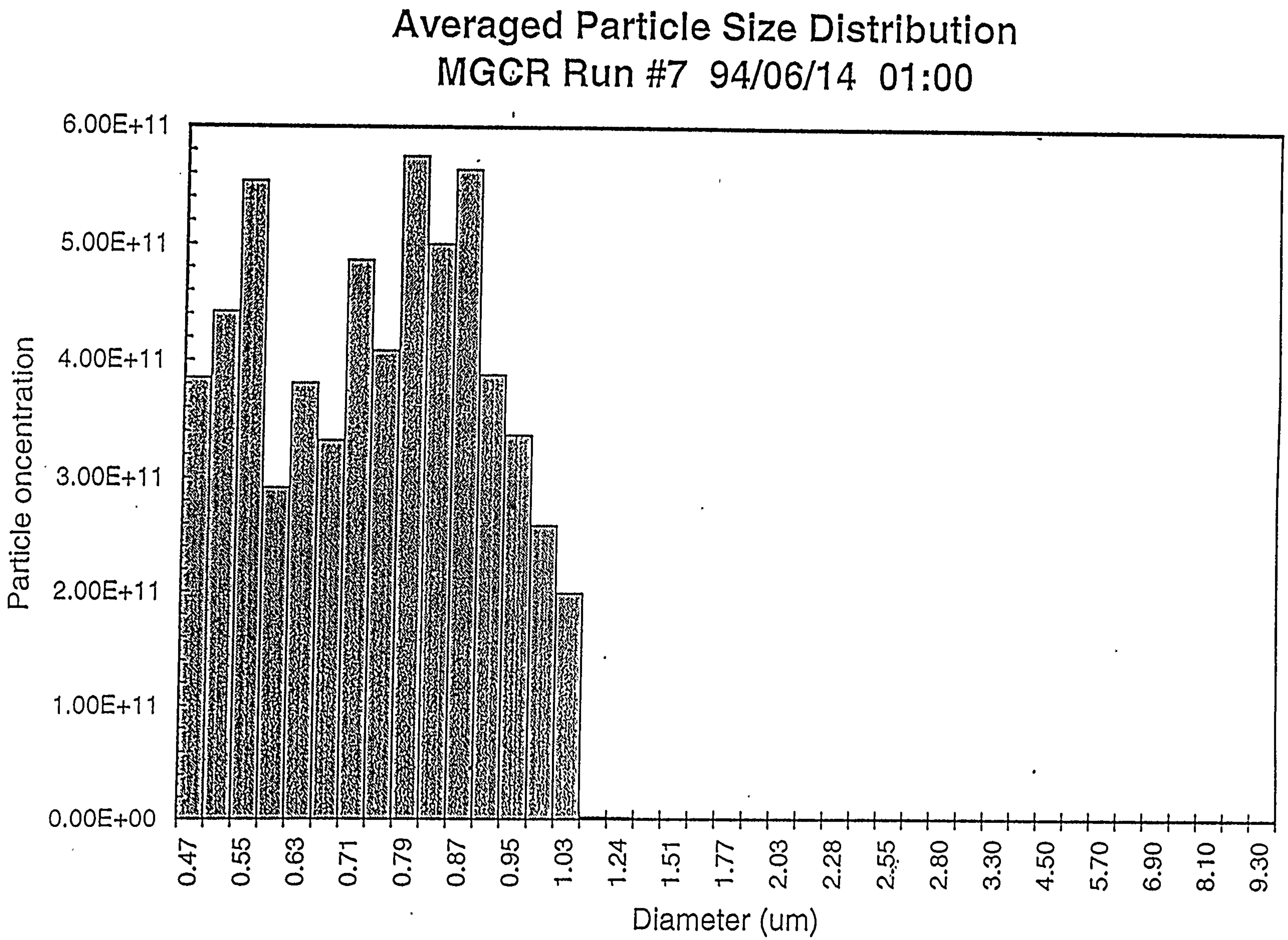



Figure 5b. A 15-minute averaged particle size distribution.

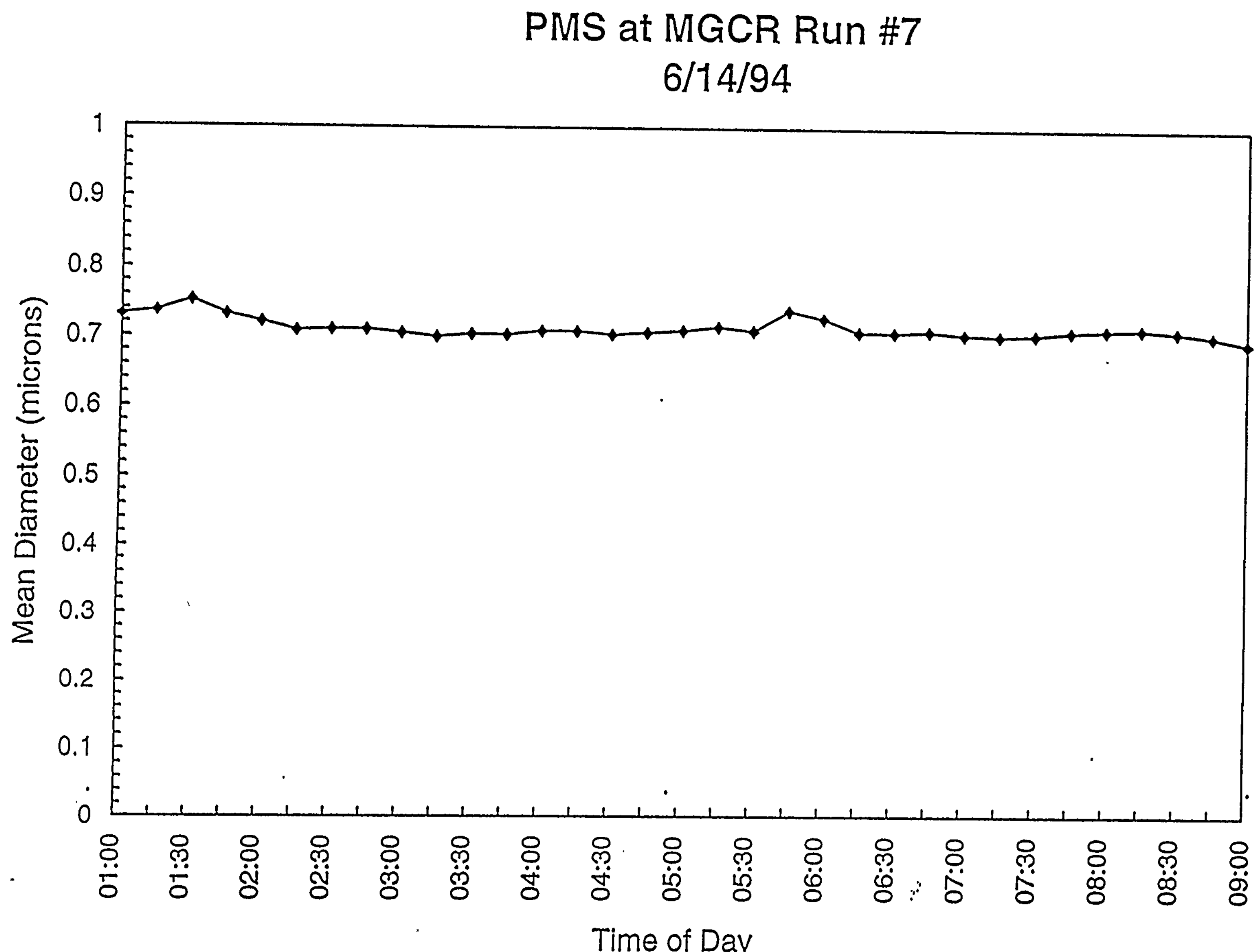



Figure 5c. Ensemble mean particle diameters.

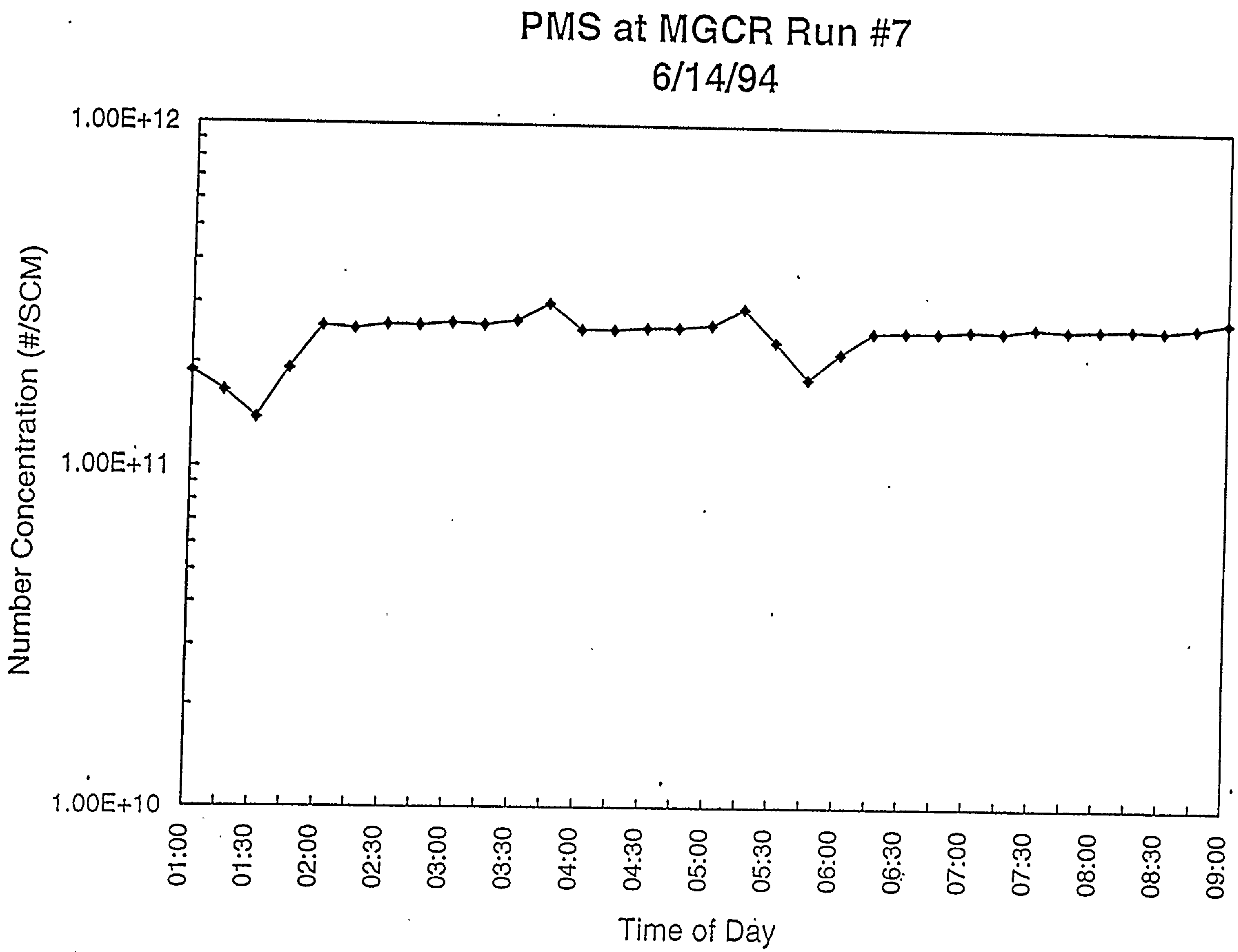



Figure 5d. Ensemble mean particle concentrations.

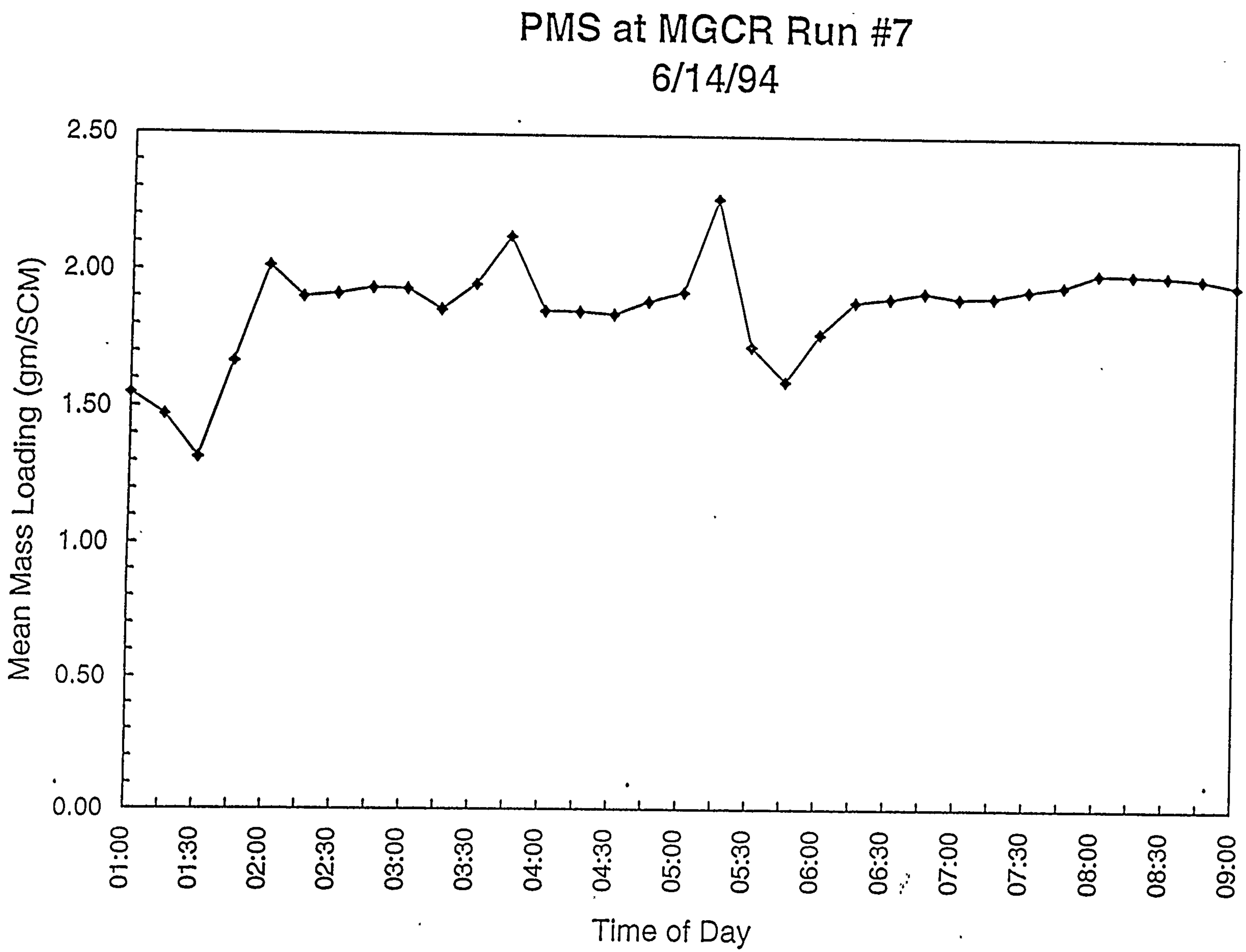



Figure 5e. Ensemble mean mass loadings.

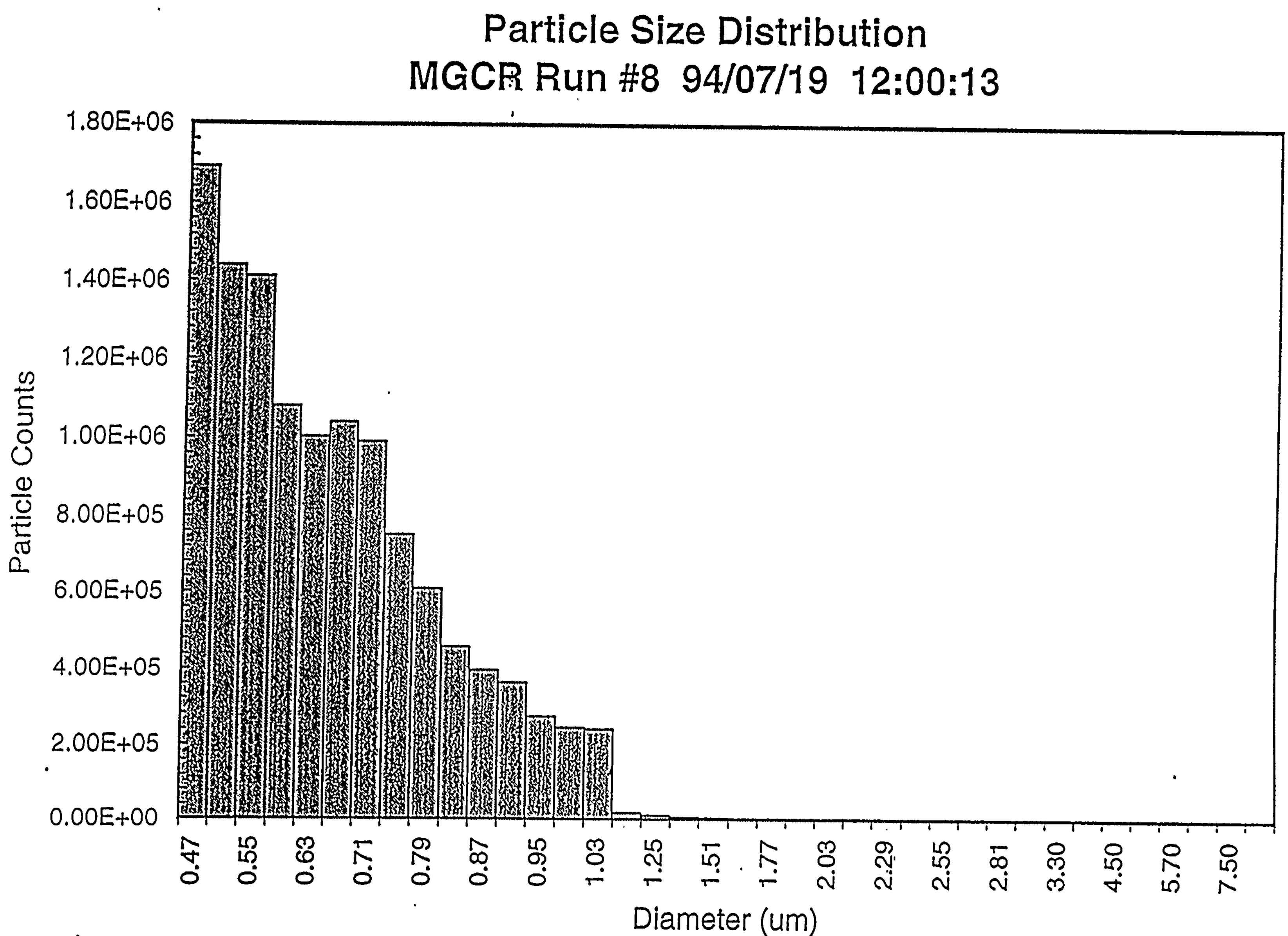



Figure 6a. Unprocessed particle size distribution from a single measurement.

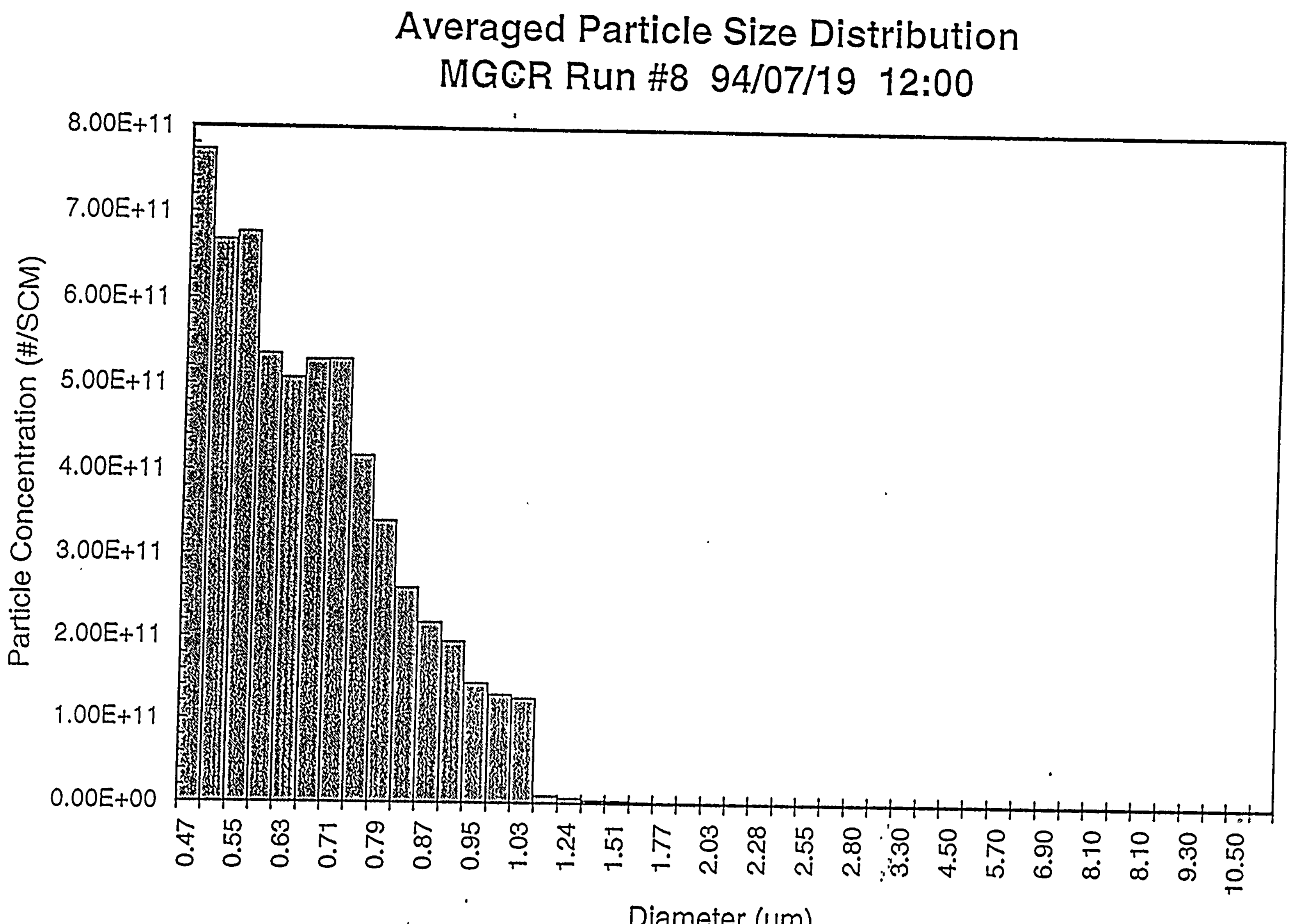



Figure 6b. A 15-minute averaged particle size distribution.

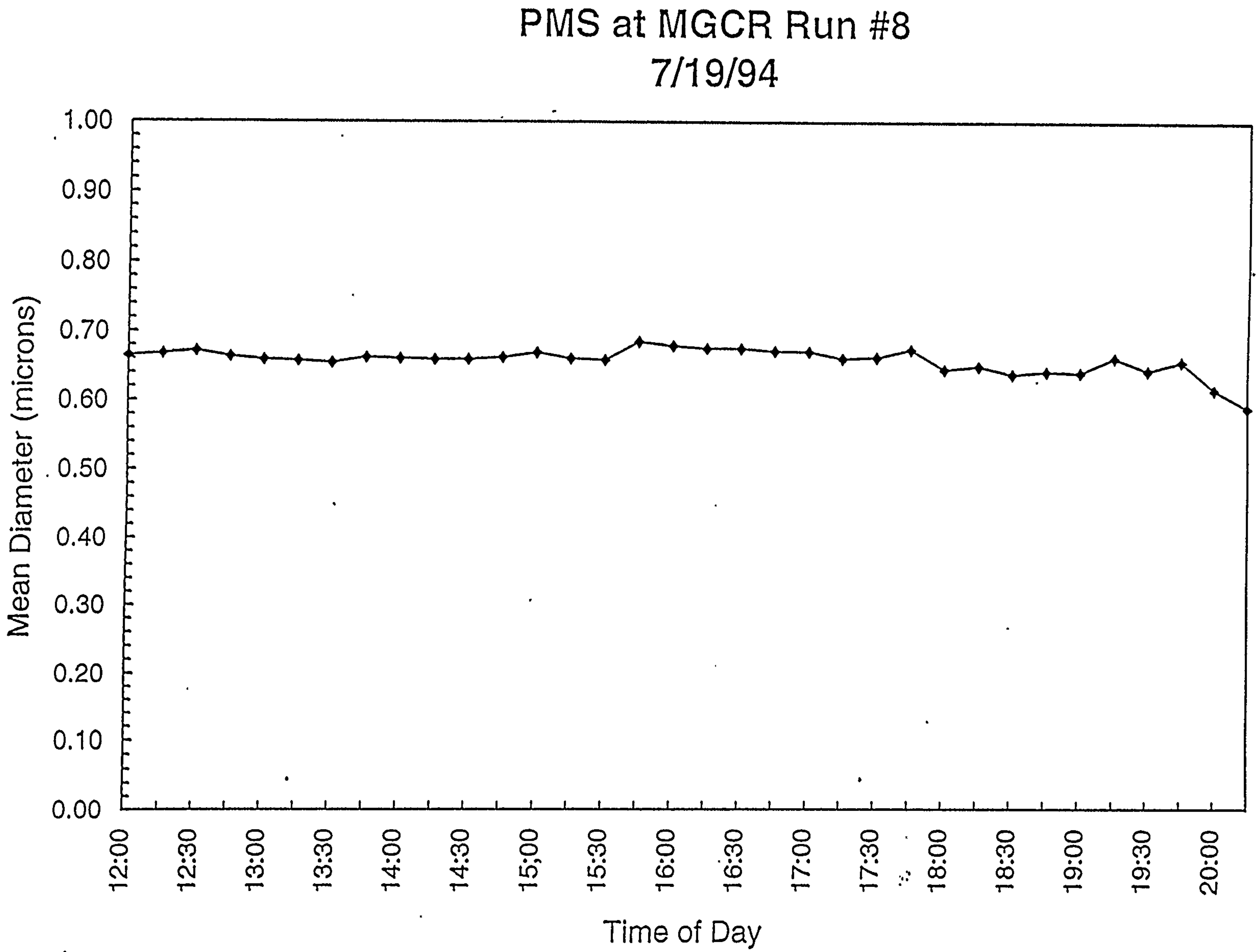



Figure 6c. Ensemble mean particle diameters.

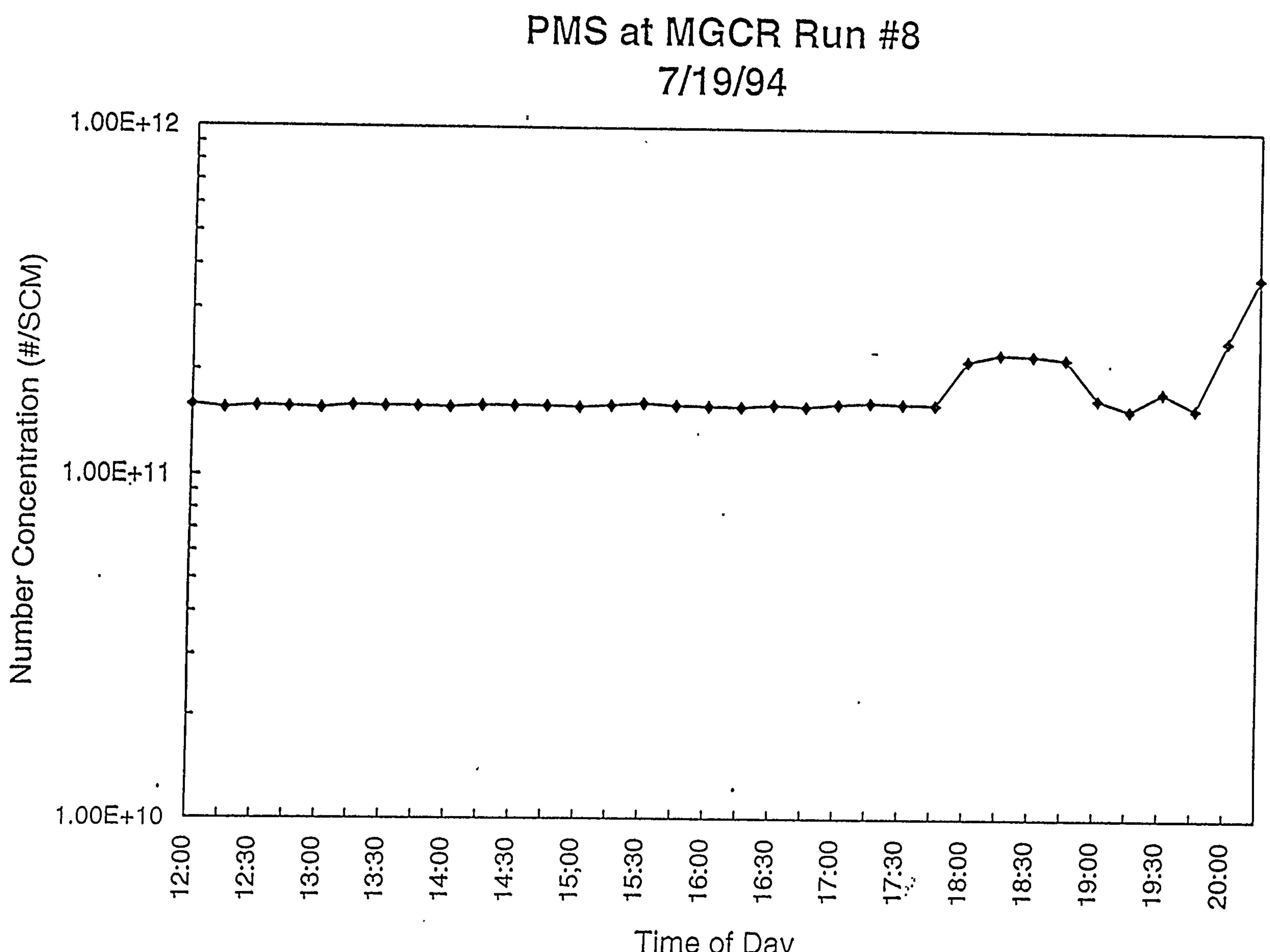


Figure 6d. Ensemble mean particle concentrations.

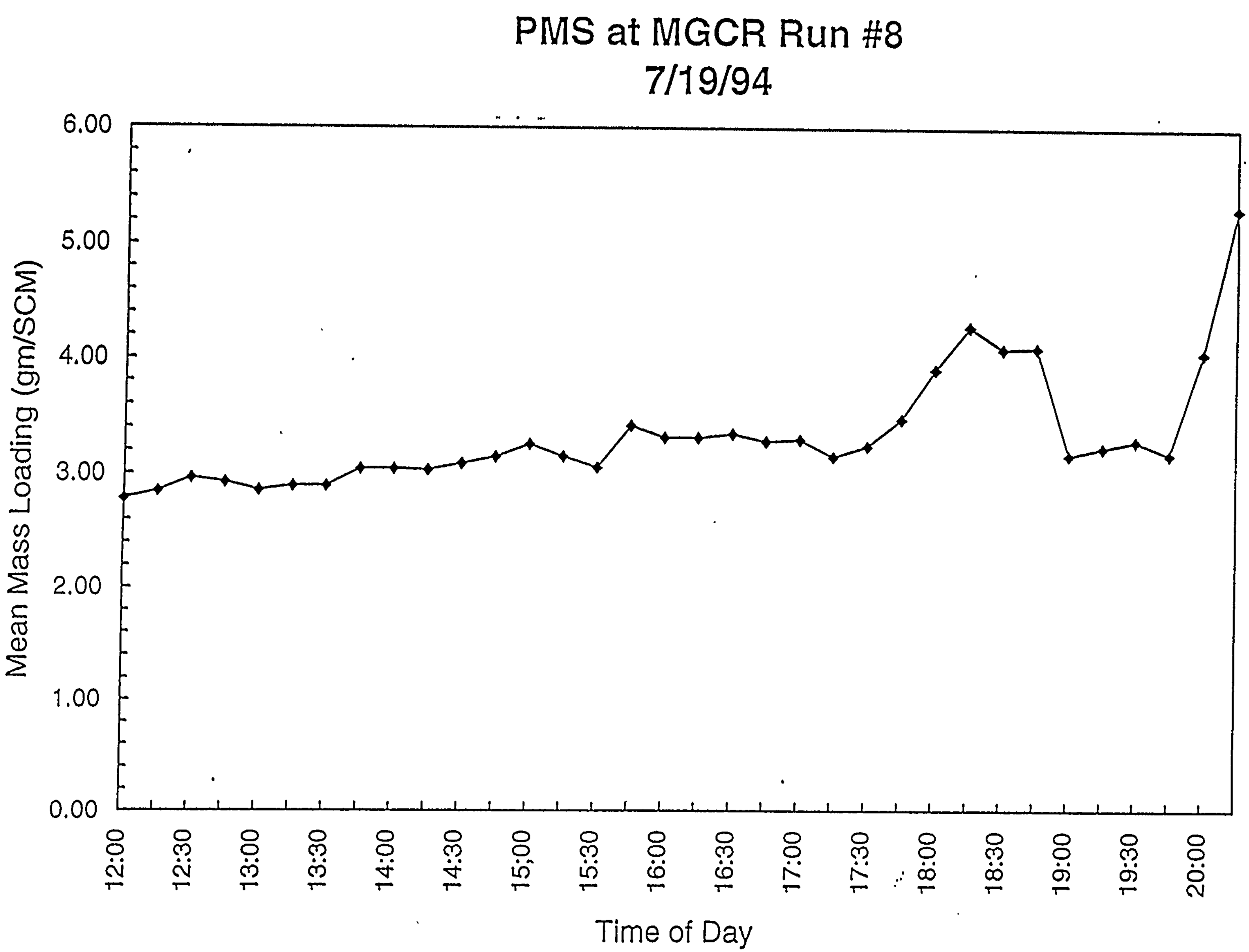



Figure 6e. Ensemble mean mass loadings.

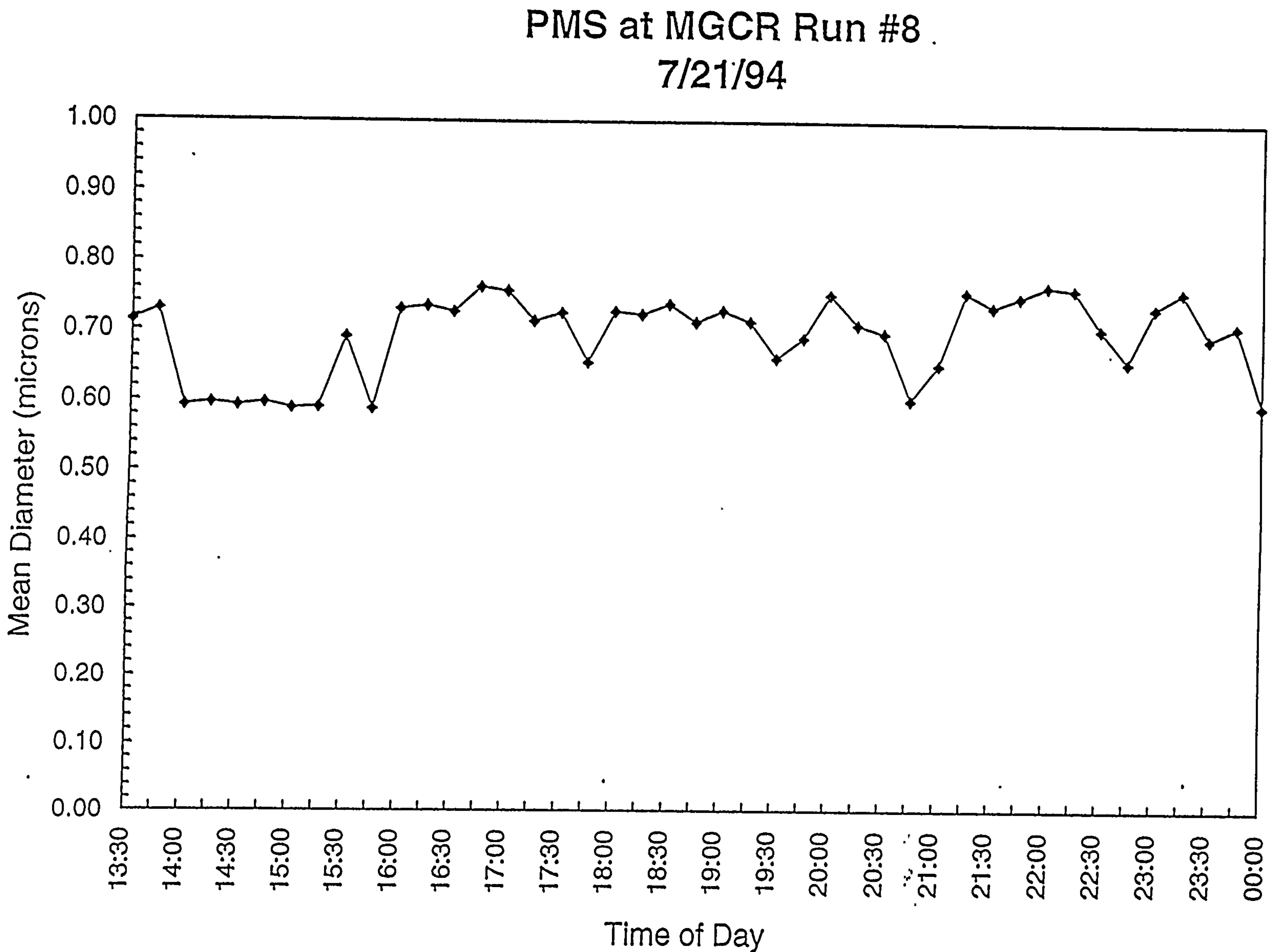



Figure 7a. Ensemble mean particle diameters.

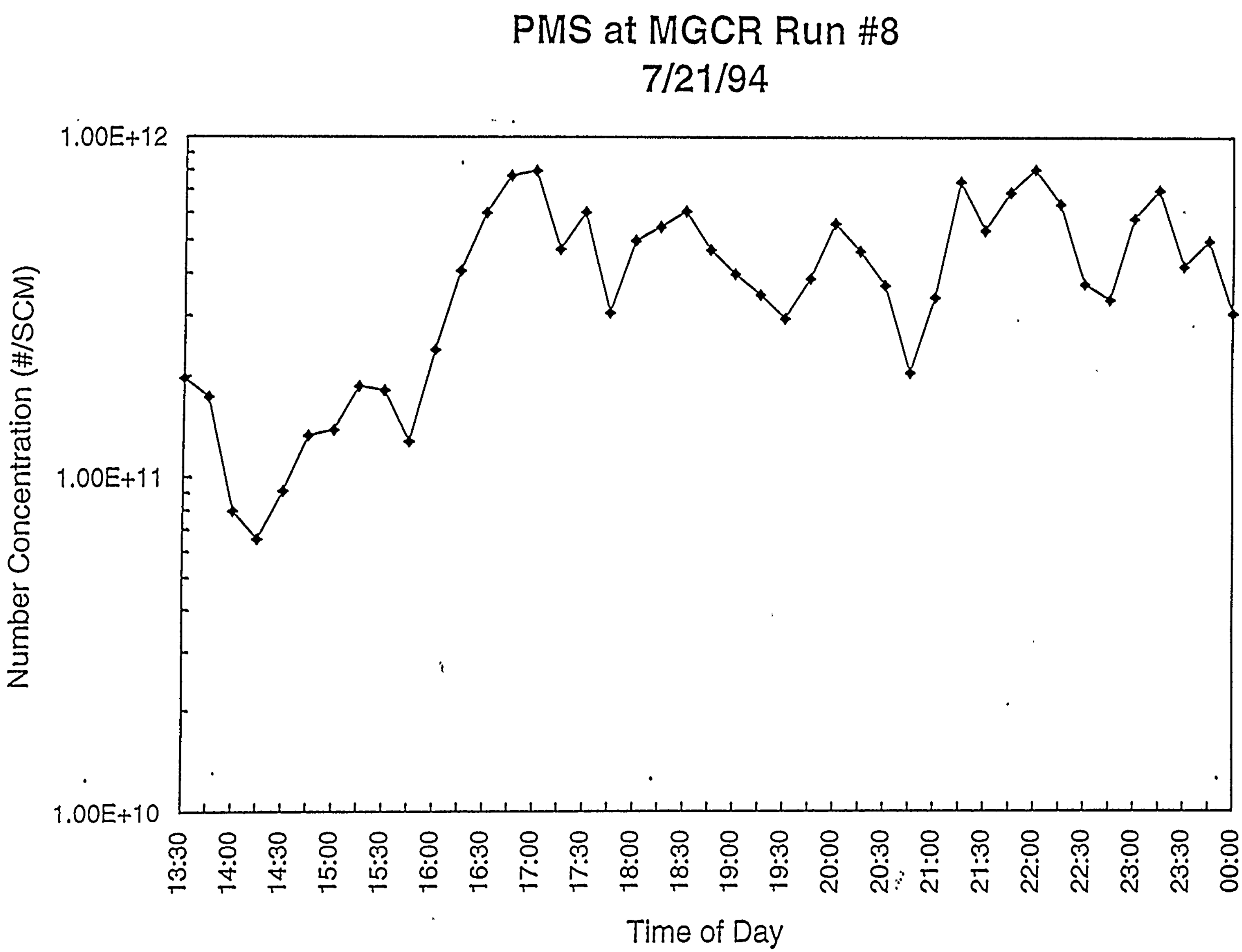



Figure 7b. Ensemble mean particle concentrations.

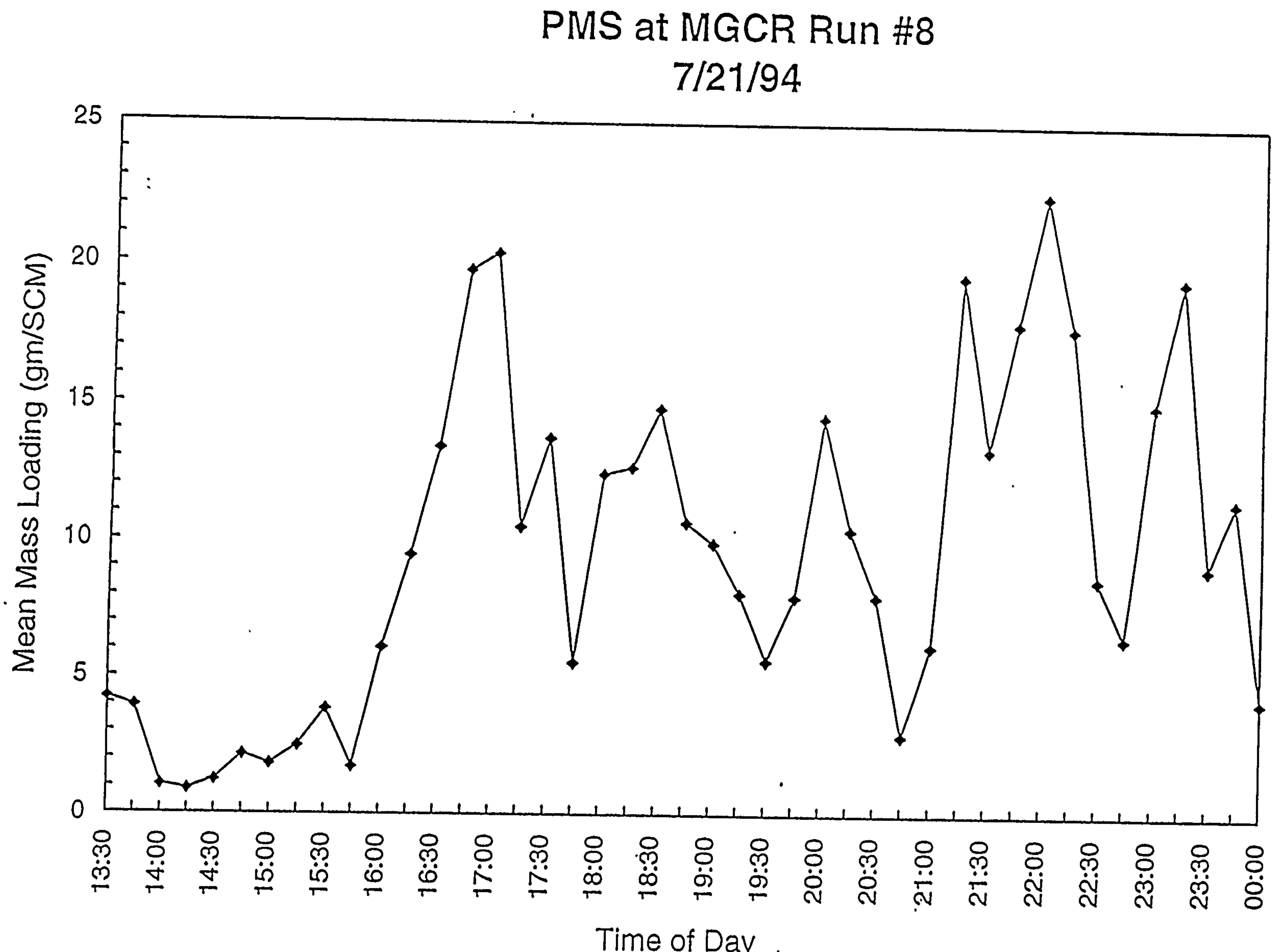



Figure 7c. Ensemble mean mass loadings.

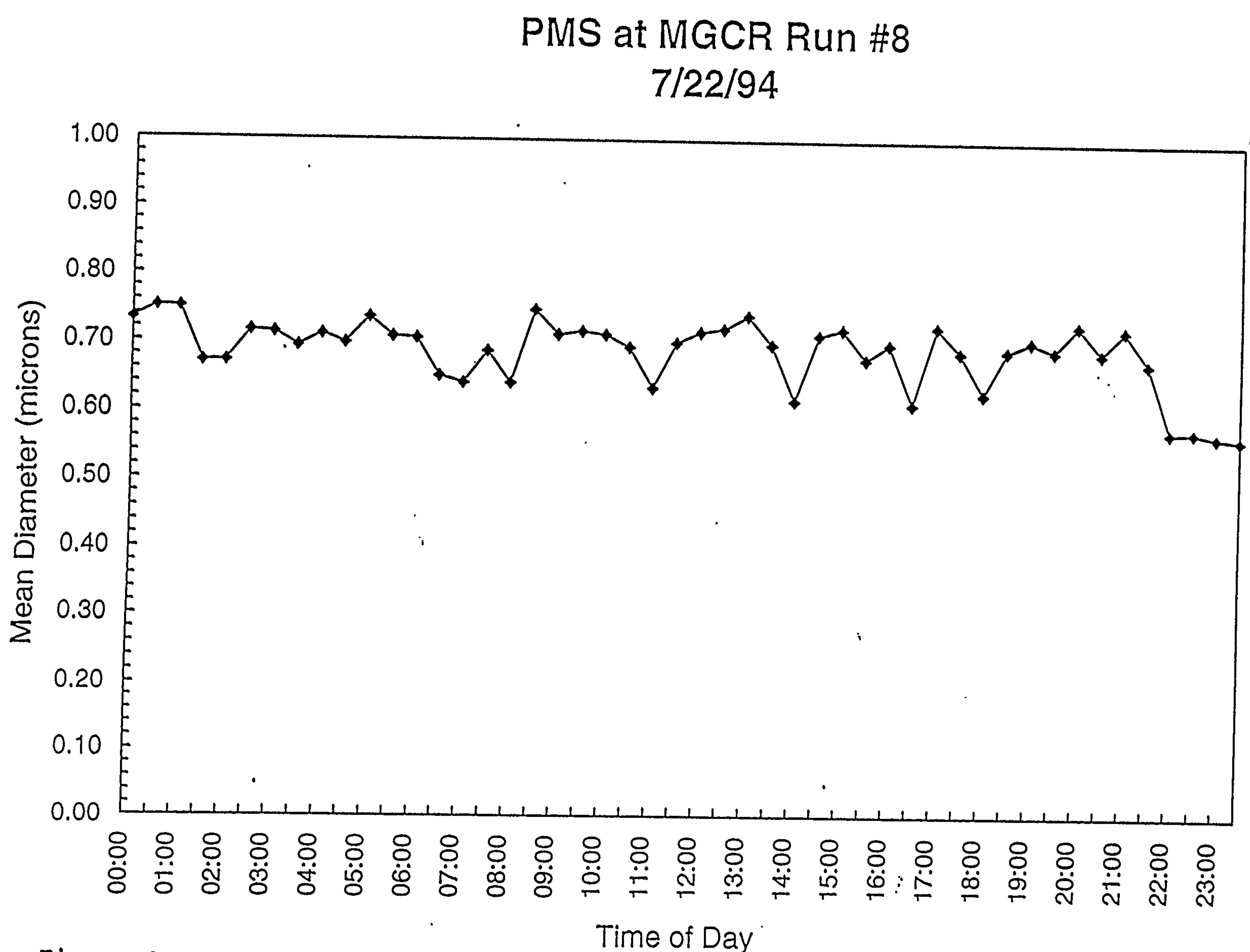



Figure 8a. Ensemble mean particle diameters.

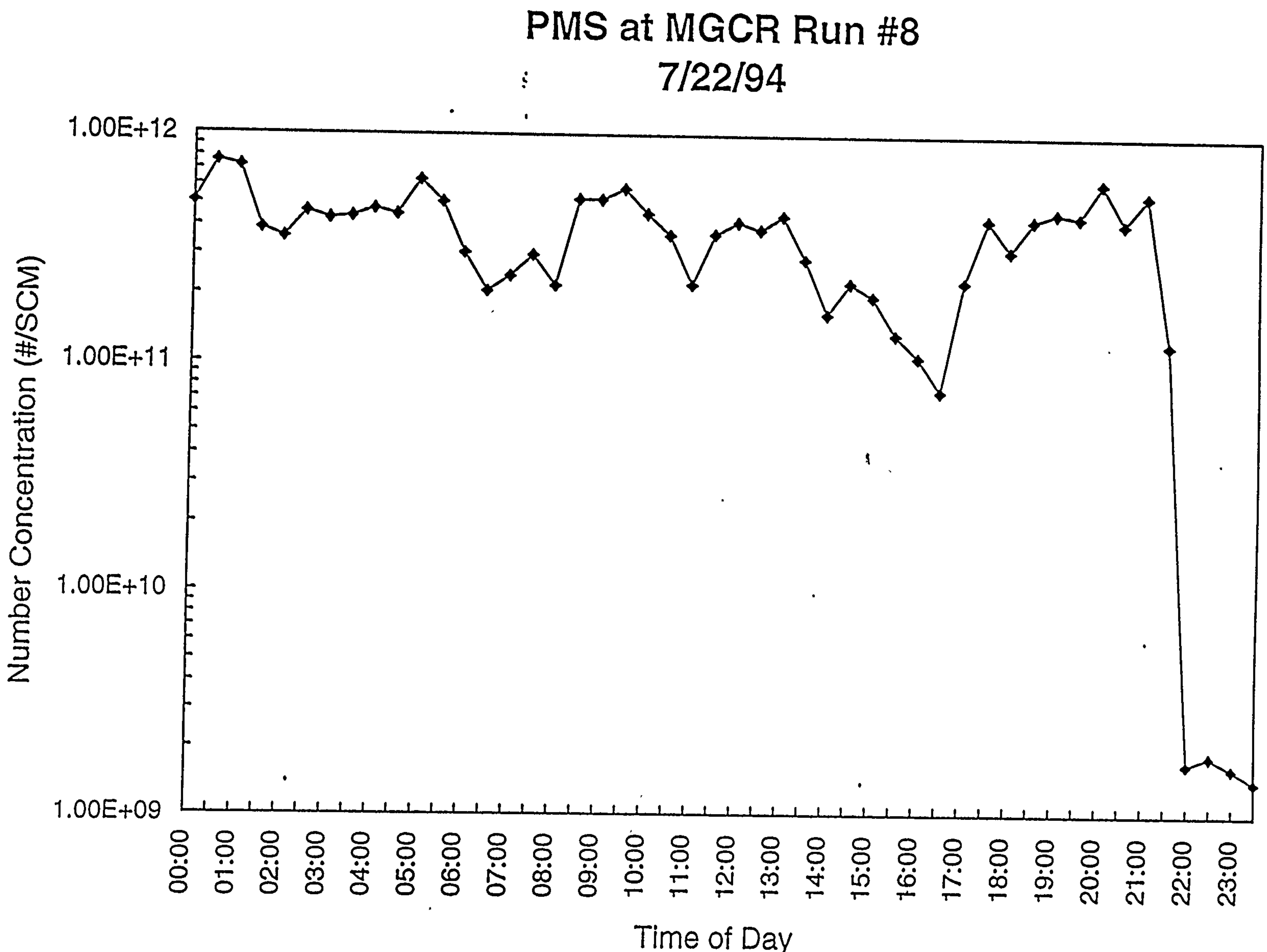



Figure 8b. Ensemble mean particle concentrations.

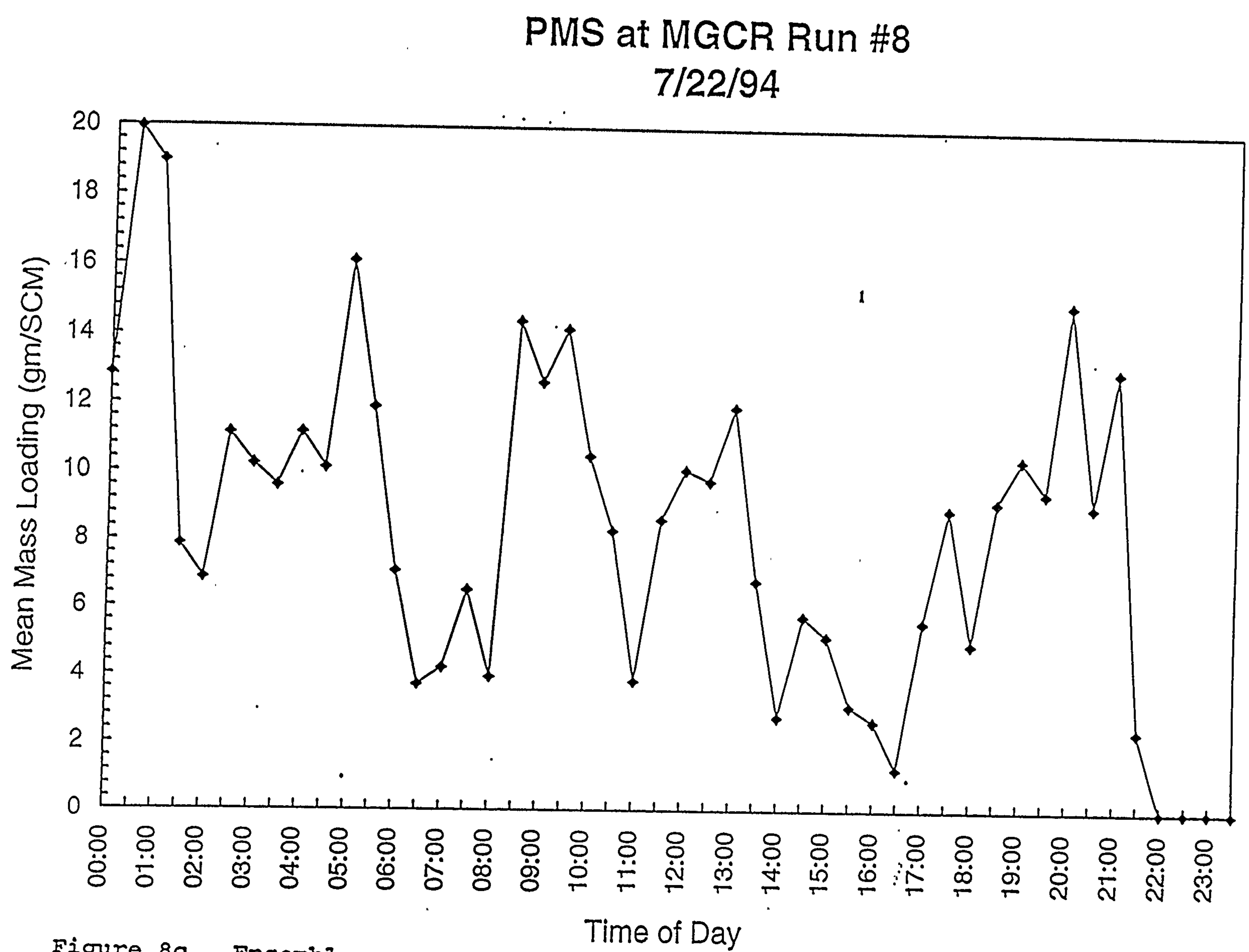



Figure 8c. Ensemble mean mass loadings.

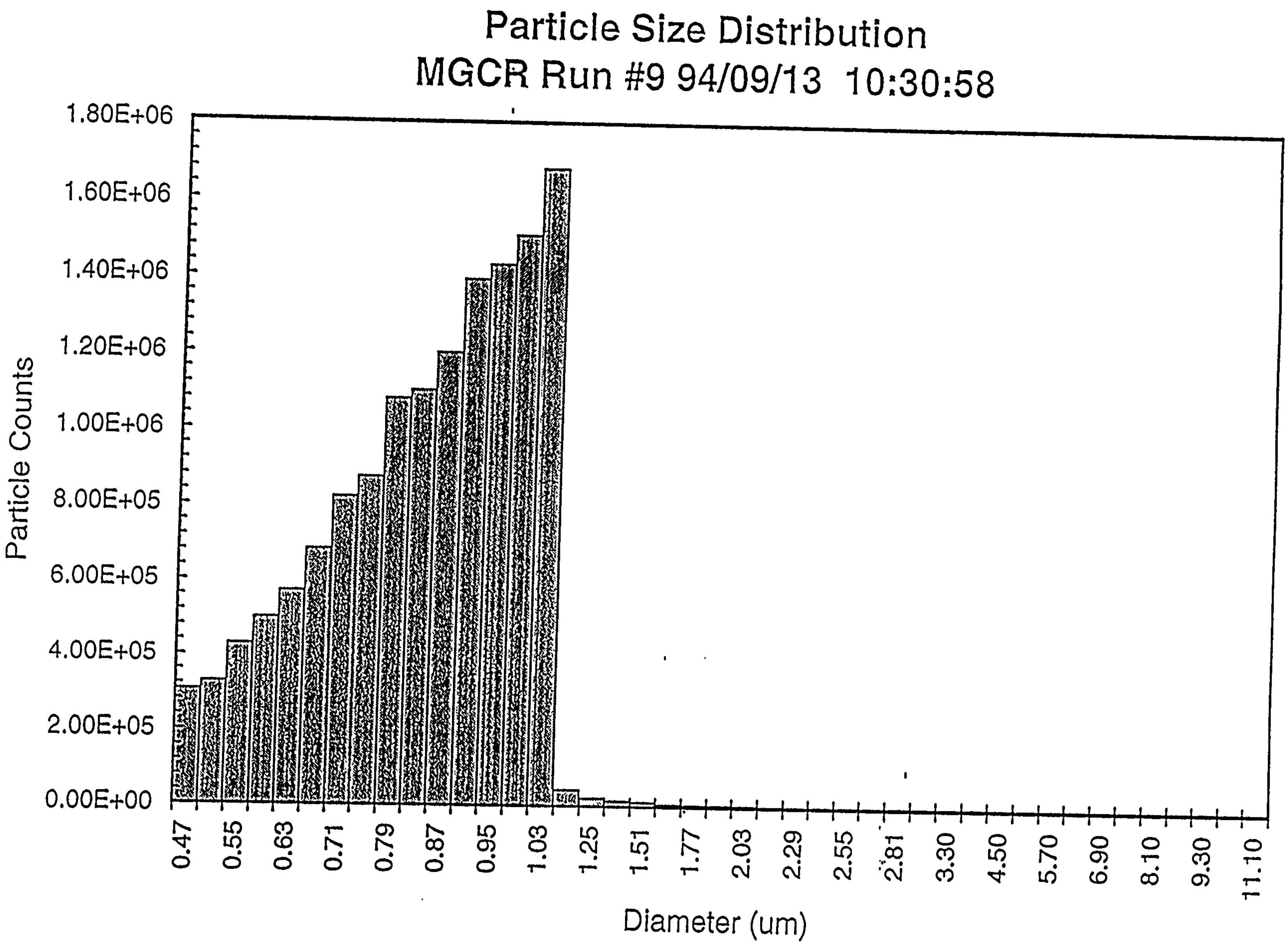



Figure 9a. Unprocessed particle size distribution from a single measurement.

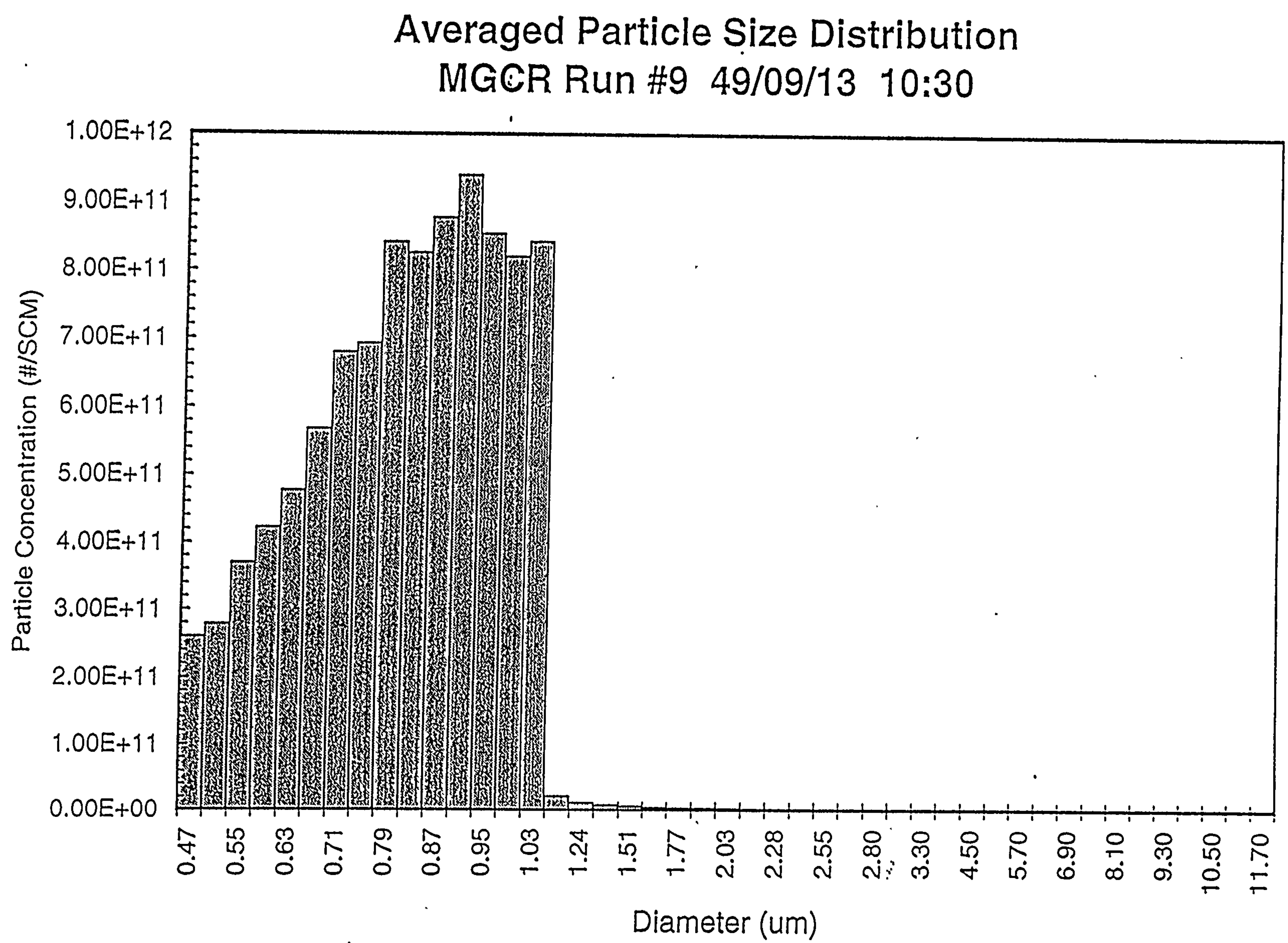



Figure 9b. A 15-minute averaged particle size distribution.

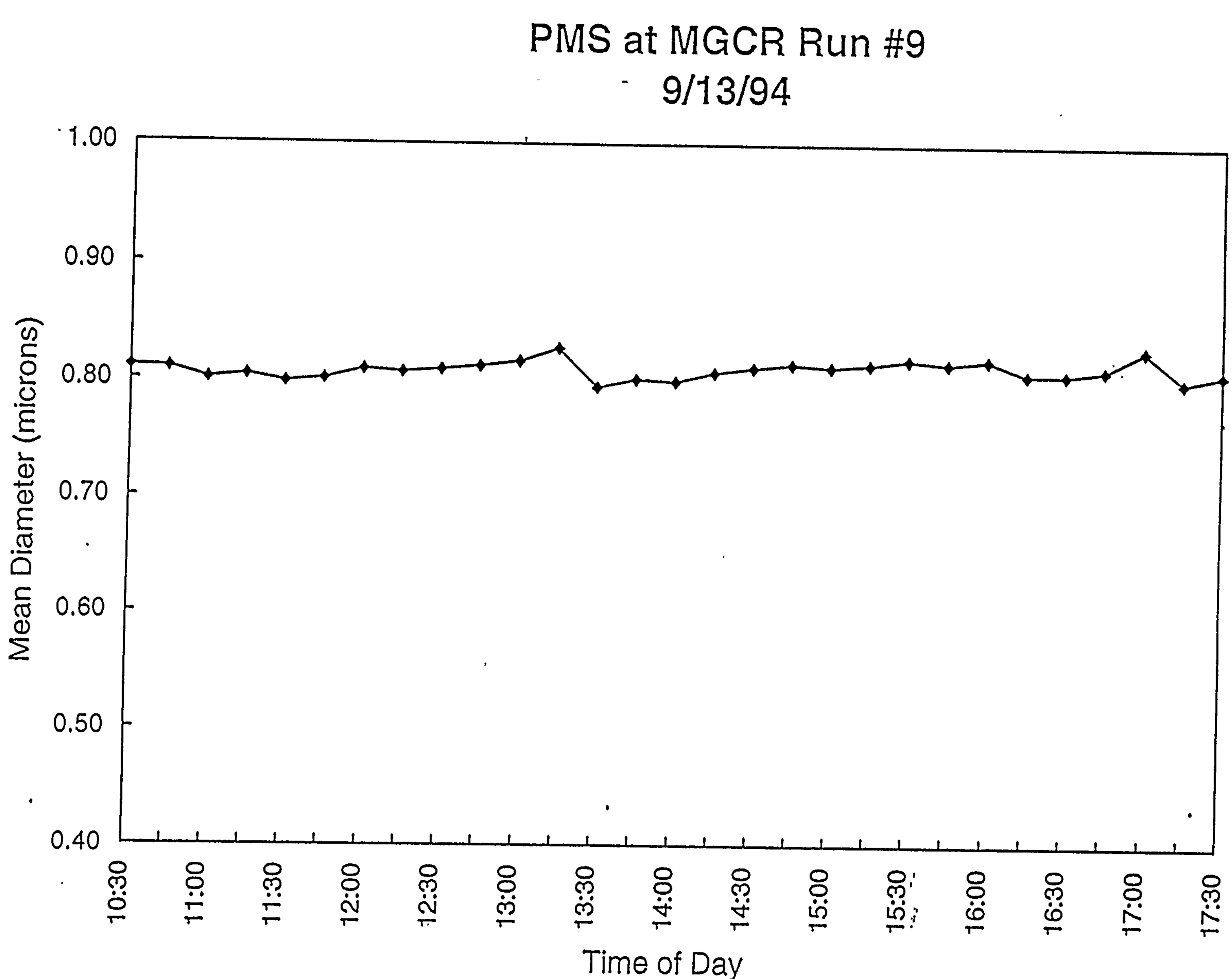



Figure 9c. Ensemble mean particle diameters.

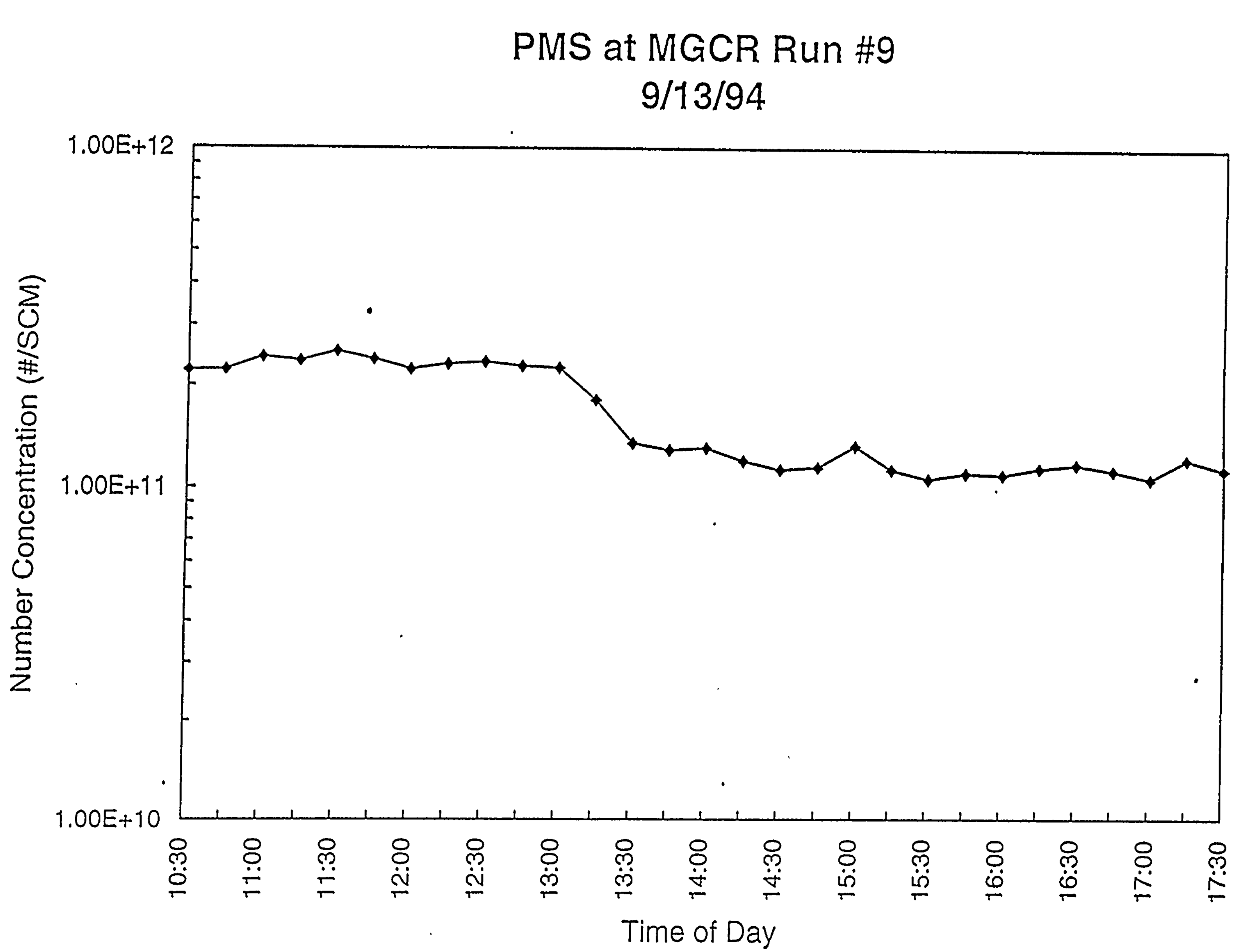



Figure 9d. Ensemble mean particle concentrations.

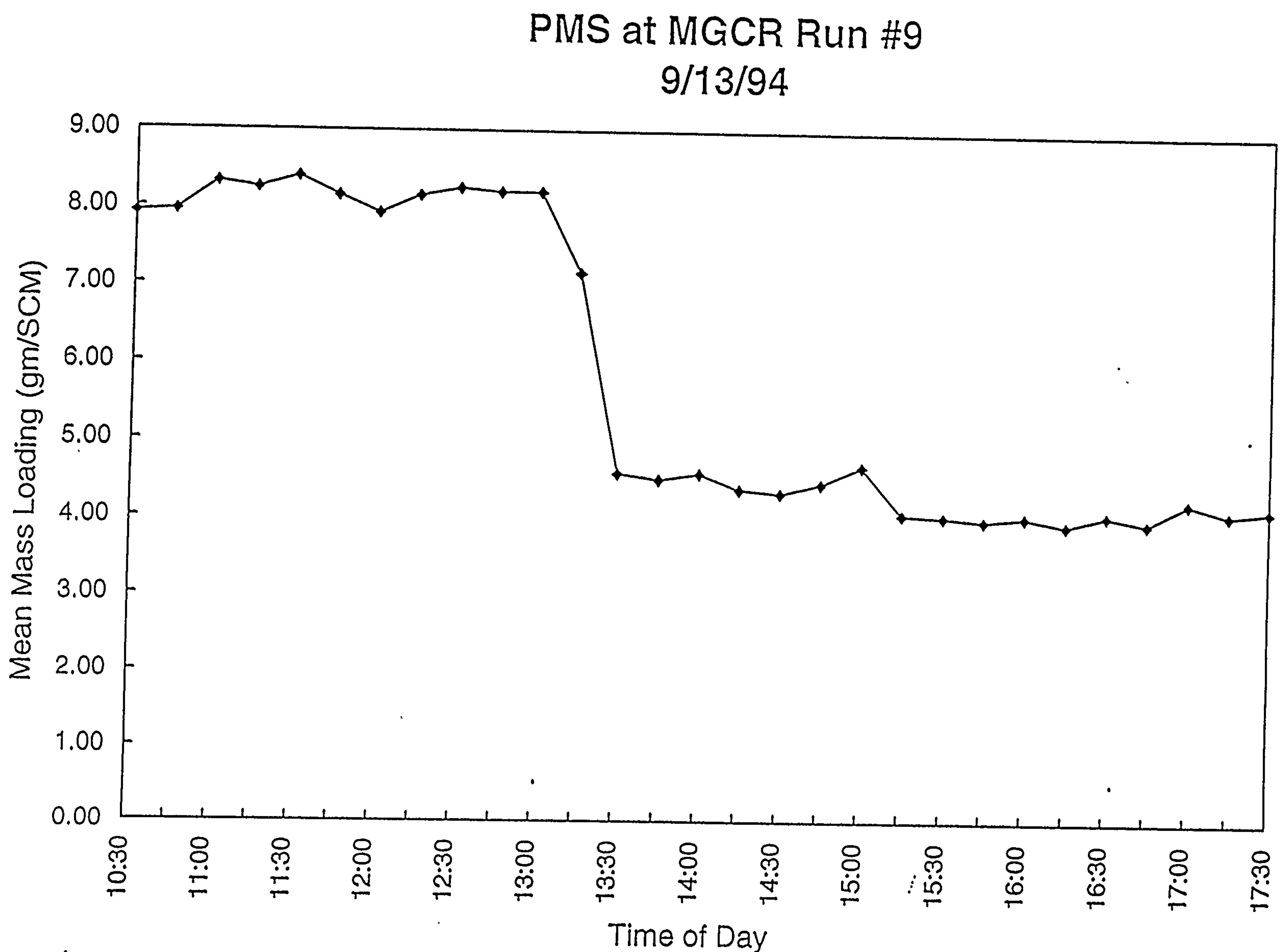



Figure 9e. Ensemble mean mass loadings.

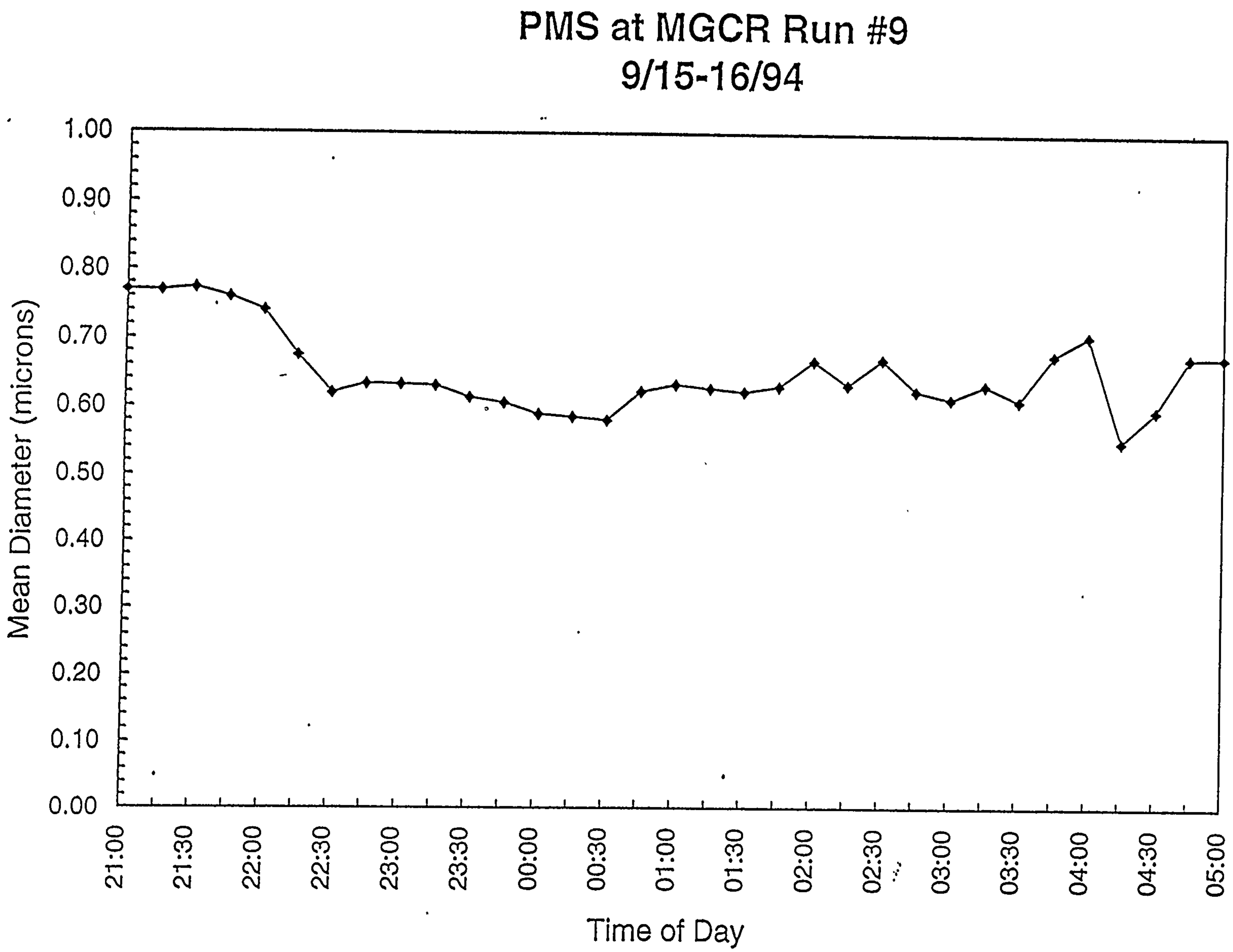



Figure 10a. Ensemble mean particle diameters.

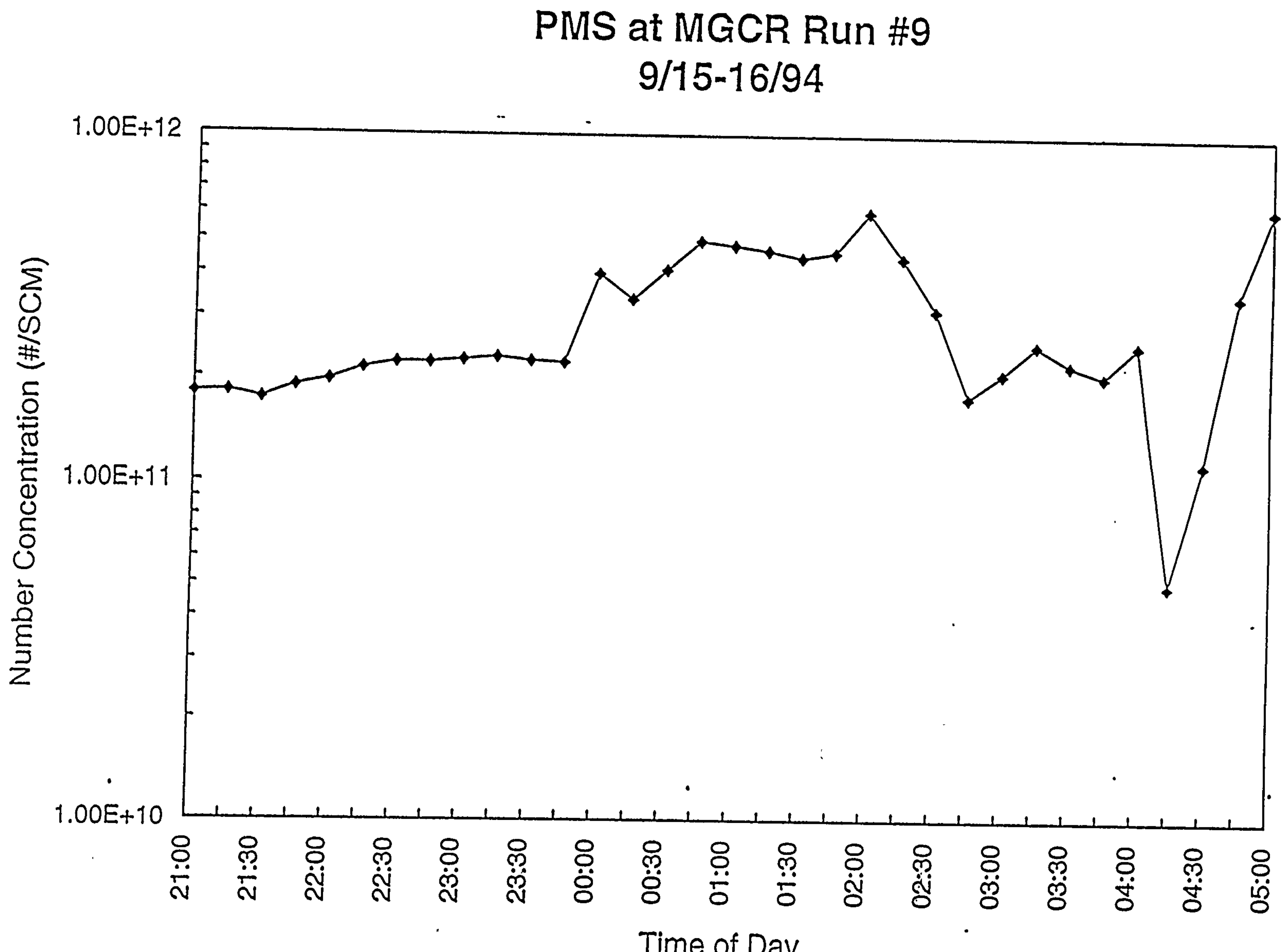



Figure 10b. Ensemble mean particle concentrations.

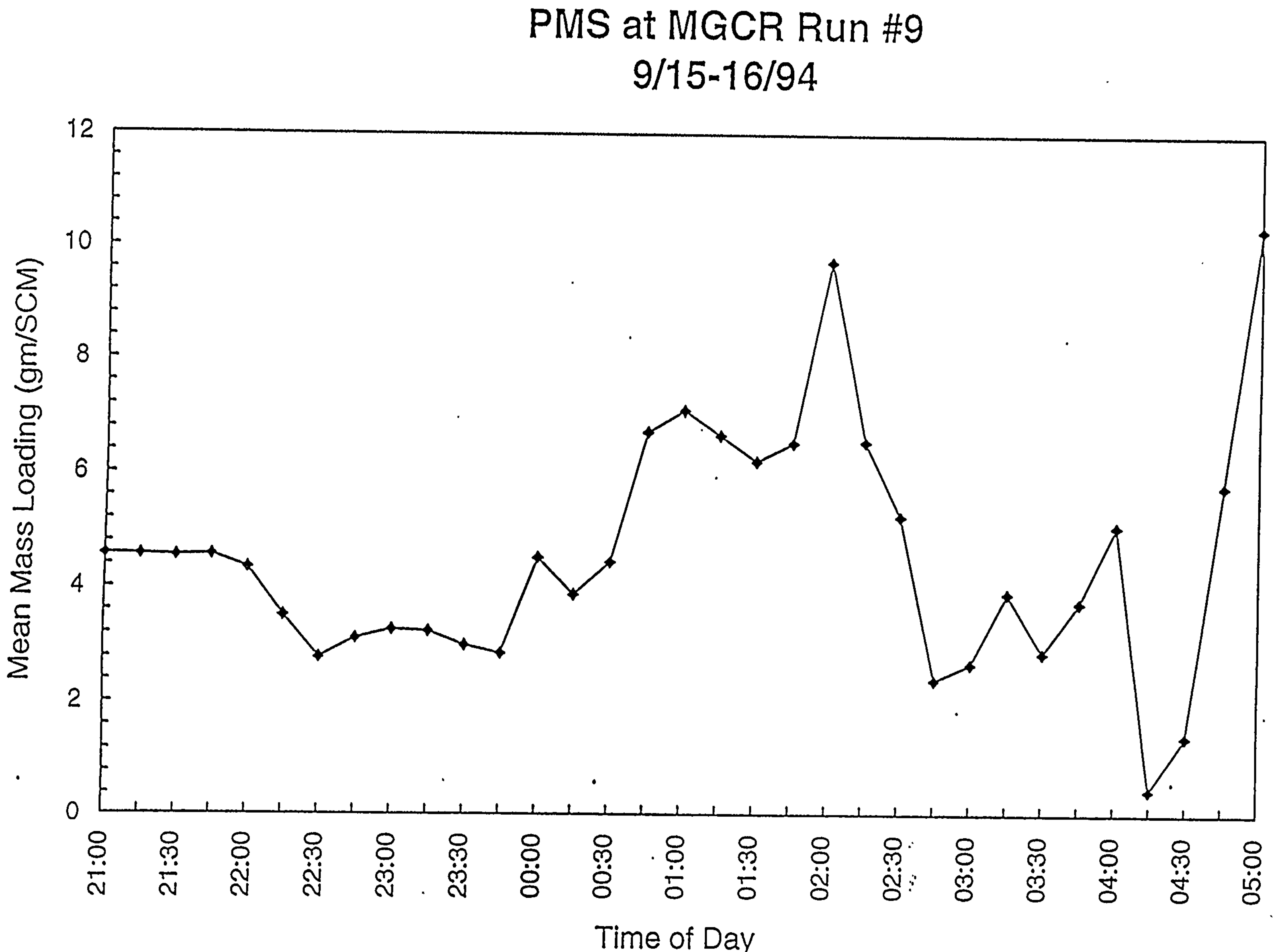



Figure 10c. Ensemble mean mass loadings.

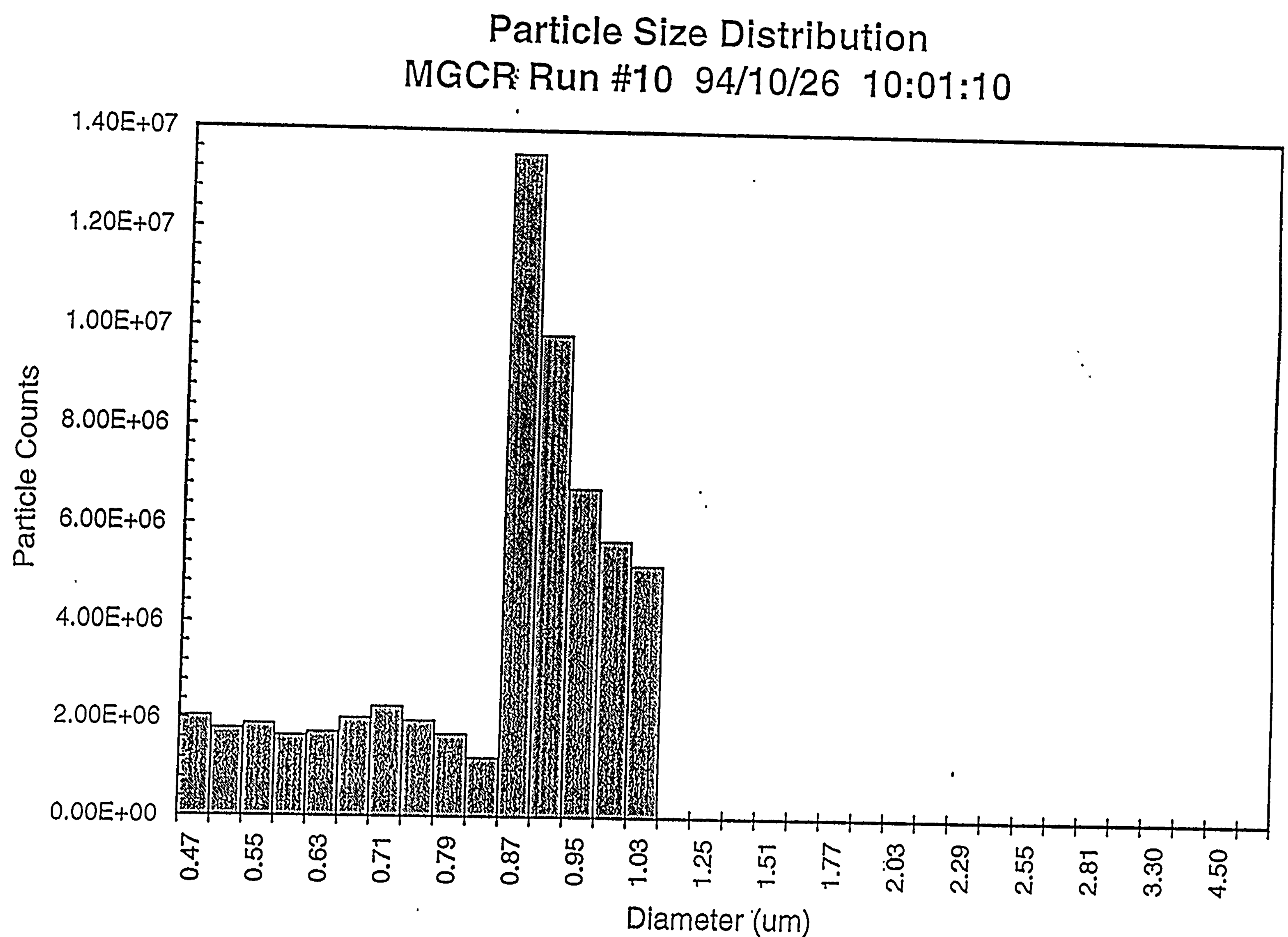



Figure 11a. Unprocessed particle size distribution from a single measurement.

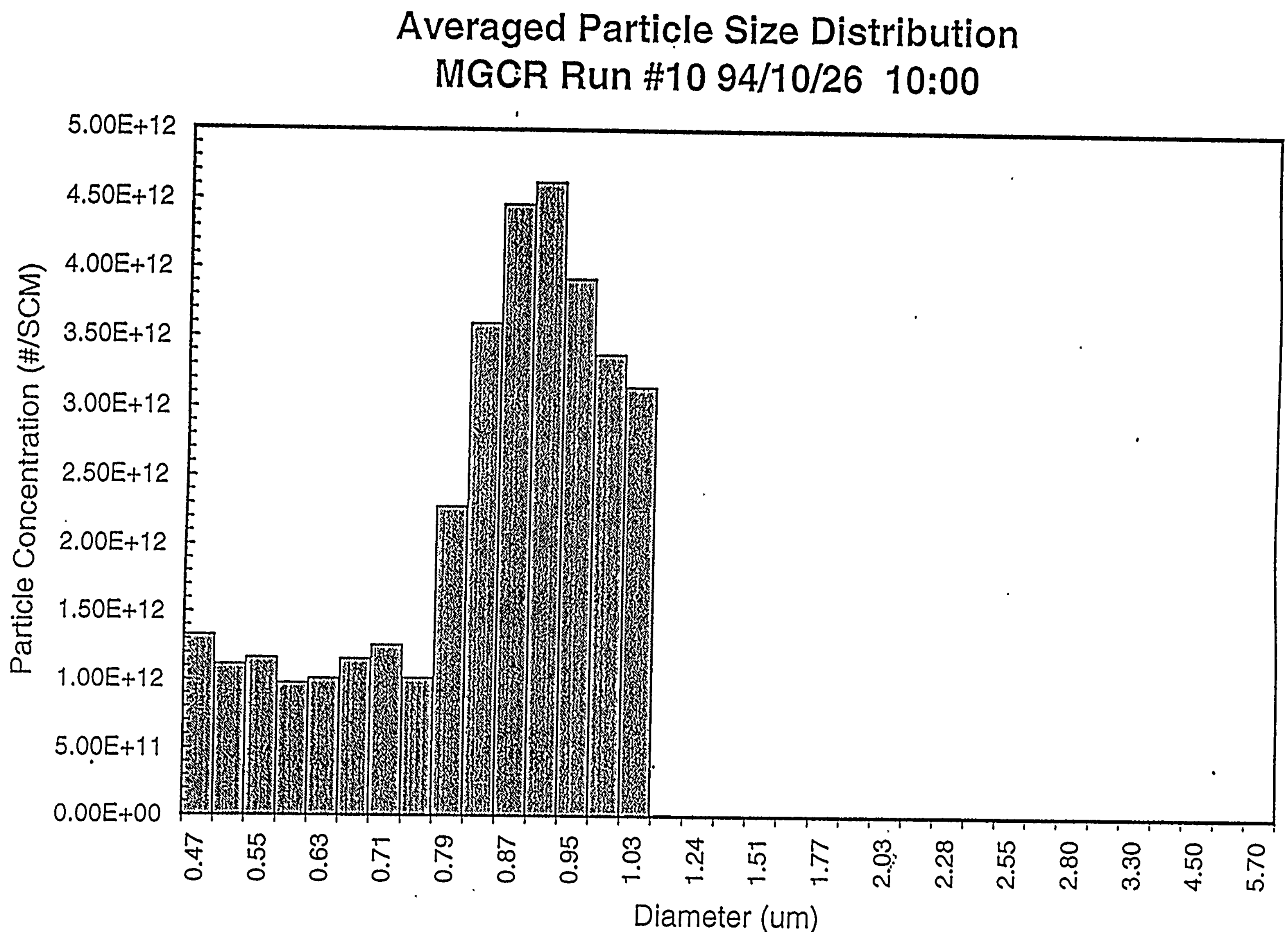



Figure 11b. A 15-minute averaged particle size distribution.

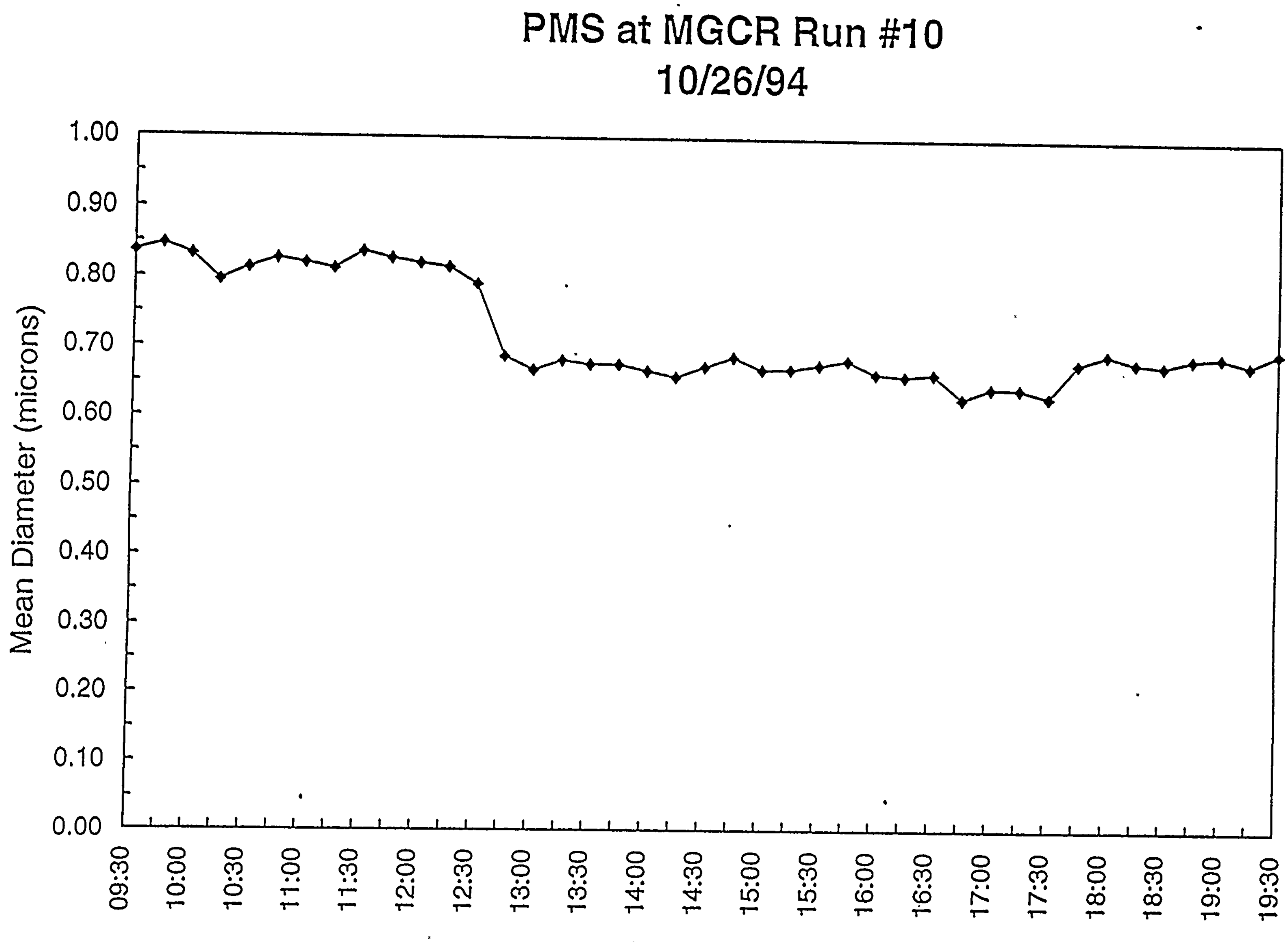



Figure 11c. Ensemble mean particle diameters.

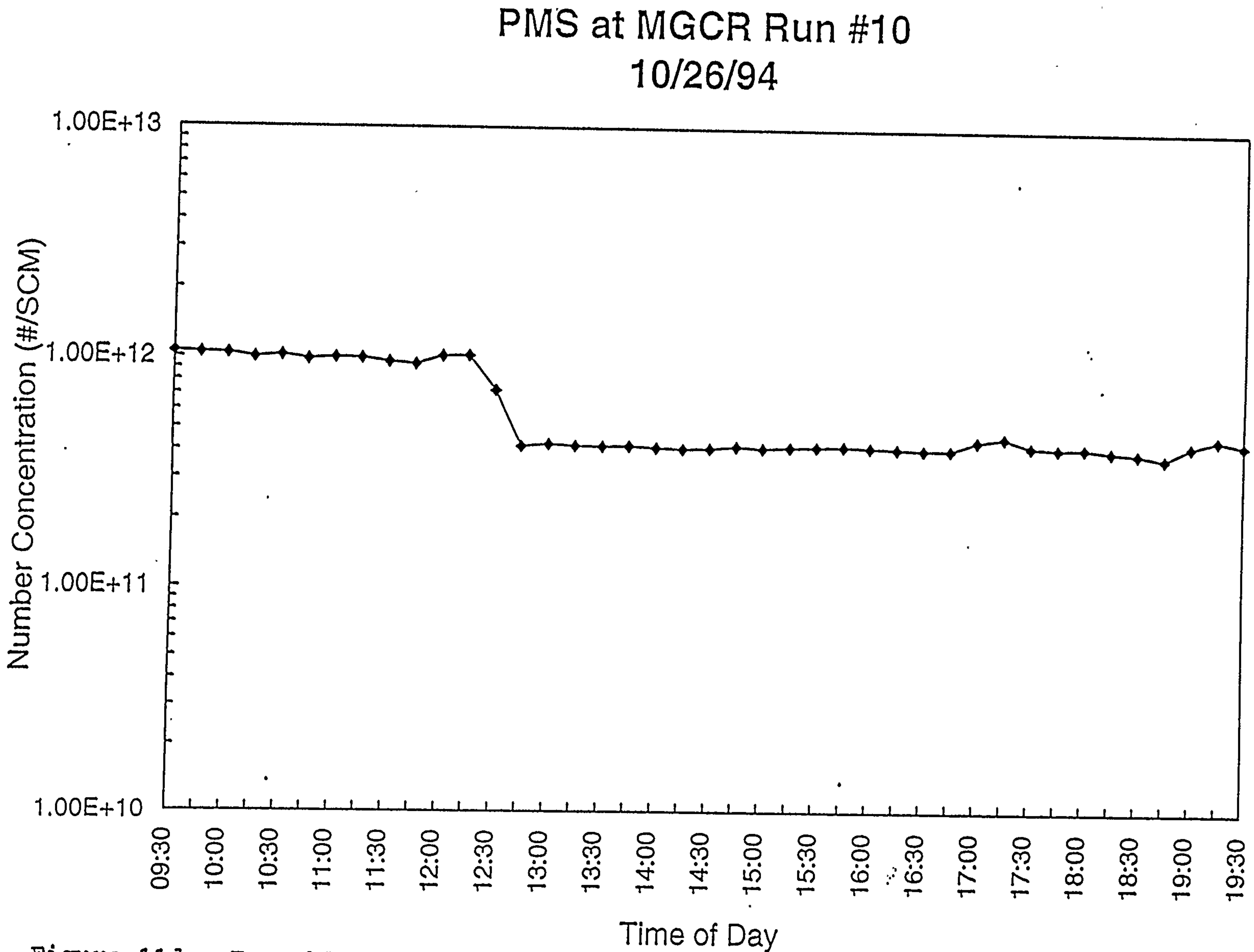



Figure 11d. Ensemble mean particle concentrations.

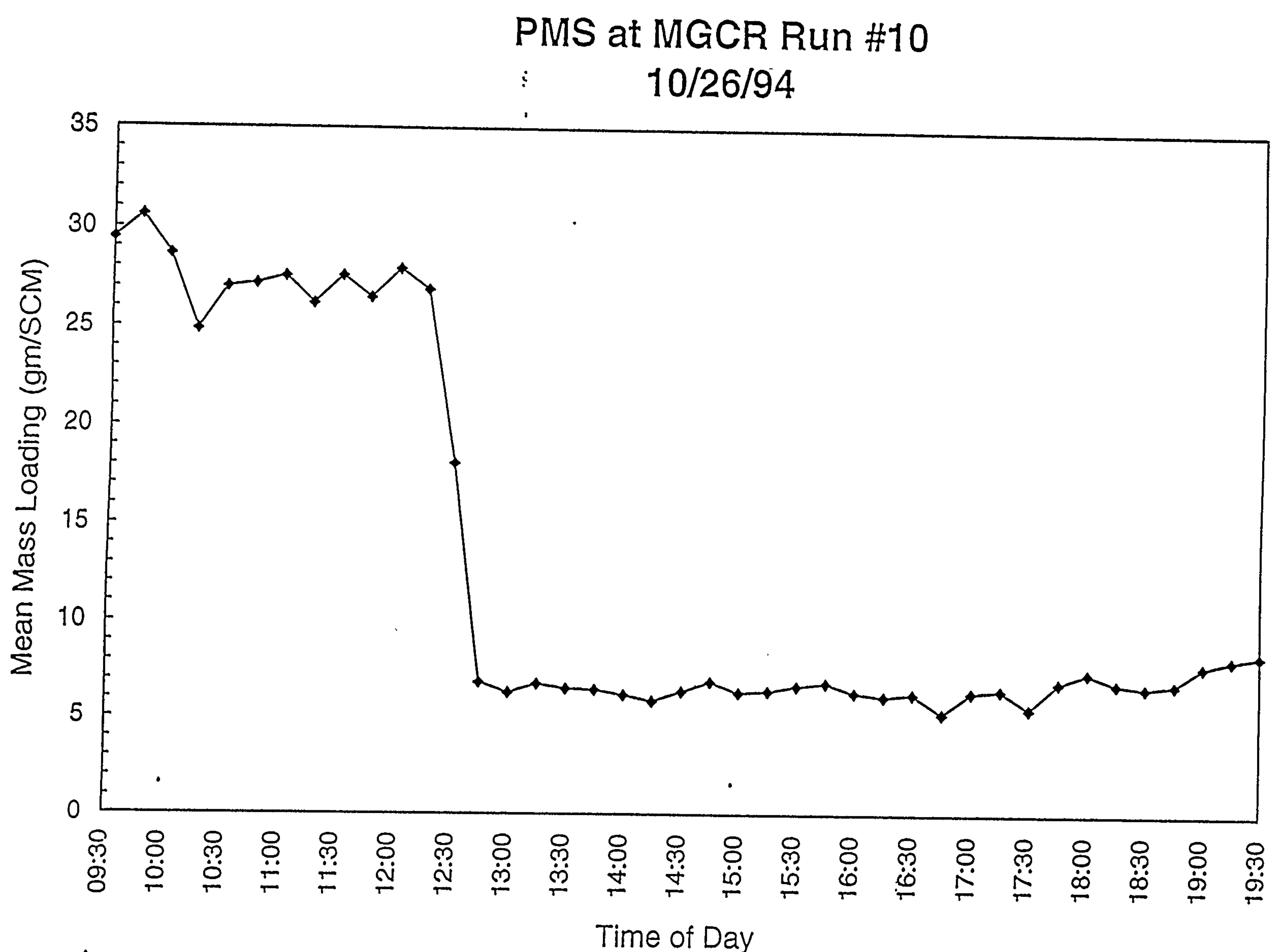



Figure 11e. Ensemble mean mass loadings.

# APPENDIX 2

# DETAILED CHRONOLOGY OF SIGNIFICANT RUN EVENTS

**Table 1. SUMMARY OF MAJOR EVENTS DURING TEST RUN**
(Test No. 94FBG07) June 6-15, 1994

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 6/6 (00:00) | | • Started <u>System Start-up</u> procedure.<br>• Reactor insert with steam side-jets was used. |
| 6/6 (02:57) - (14:01) | 11 hr 4 min. | • Air Preheater ignited. Heated up reactor to 800°F (TIR-700, -701, -707 & -733, whichever one reached first).<br>• FCV-113& 115 could not provide 7000 scfh. Opened HV-503 to obtain the required air flow.<br>• Repaired leaks around FV-221.<br>• DDAS on-line, changed logging rate from 2 to 4 sec. But crashed 4-5 times. |
| 6/6 (14:01) - (16:10) | 2 hr 9 min. | • Started <u>Combustion mode</u>. |
| 6/6 (16:10) - (16:46) | 36 min. | • Purged reactor to reduce $O_2$ conc. to < 3% by replacing reactor air with $N_2$. |
| 6/6 (16:46) - (18:30) | 1 hr 44 min. | • Started <u>Gasification mode</u>.<br>a. Convey air at 850 scfh, Reactor air at 1200 scfh, side steam at 33 lb/h out of total 55 lb/h, underflow $N_2$ reduced from 400 to 350 scfh, and coal feed at 70.4 lb/h.<br>b. Performed routine coal transfer from batch to feed hopper and from silo to batch hopper.<br>c. Performed routine dumping of solids from all lockhoppers every hour; and purging all vent valves and transmitters every 4 hours. |
| 6/6 (18:30) - 6/7 (05:38) | 11 hr 8 min. | • <u>Steady-State #1</u> (with Montana #6).<br>a. Change conditions many times to reduce the $H_2O$ in underflow dump: Increased convey air to 1,080 and reactor air to 1,500 scfh; reduced underflow $N_2$ to 200 scfh; increased set points in air preheater and superheater)<br>b. TIR-701 reached 1,770°F at 01:40 on 6/7. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| | | c. Reset the conditions to : Convey Air = 900 scfh, Reactor air = 1,300 scfh; underflow $N_2$ = 320 scfh; side steam of 33 lb/h with 50 lb/h total; and coal feed = 70 lbm/h.<br>d. DDAS crashed 2 times.<br>e. High temperature excursion to 1,900°F on TIR-701.<br>f. Loss of coal feed at 05:32. |
| 6/7 (05:38) - (15:45) | 10 hr 7 min. | • Controlled Shutdown due to loss of coal feed. Cooled reactor from 1,500 to 800°F.<br>• DDAS off-line at 10:25. |
| 6/7 (15:45) - 6/8 (00:30) | 8 hr 45 min. | • Used air chisel to remove clinker from the wall that held the reactor insert in place. The reactor insert dropped out of the reactor at 23:50.<br>• Removed TE-707 and plugged the hole of the housing. |
| 6/8 (00:30) - (05:02) | 4 hr 32 min. | • Started System Start-up procedure.<br>• Installed reactor insert with no side-jets. |
| 6/8 (05:02) - (10:40) | 5 hr 38 min. | • Ignited air Preheater and incinerator. Heated up reactor to 800°F (TIR-700, -701, -707 & -733, whichever reached first).<br>• DDAS back on-line at 08:00 but crashed once at approx. 09:40. |
| 6/8 (10:40) - (11:45) | 1 hr 5 min. | • Started Combustion mode. |
| 6/8 (11:45) - (14:00) | 2 hr 15 min. | • Dropped reactor pressure to fix coal plug in feed line. |
| 6/8 (14:00) - (16:20) | 1 hr 40 min. | • Restarted Combustion mode. |
| 6/8 (16:20) - (16:32) | 12 min. | • Purged reactor to reduce $O_2$ conc. to < 3% by replacing reactor air with $N_2$. TIR-700 at 1126°F. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 6/8 (16:32) - (21:38) | 5 hr 6 min. | • Started <u>Gasification mode</u>.<br>a. Convey air at 850 scfh, reactor air gradually raised from 500 to 1200 scfh, steam at 55 lb/h, underflow $N_2$ reduced from 400 to 0 scfh (to prevent steam condensation in the bed), and coal feed at 70.2 lb/h.<br>b. Performed routine coal transfer from batch to feed hopper and from silo to batch hopper.<br>c. Performed routine dumping of solids from all lockhoppers every hour; and purging all vent valves and transmitters every 4 hours. |
| 6/8 (21:38) - 6/12 (11:30) | 89 hr | • <u>Steady-State #2</u> (with Montana #6 coal).<br>a. No underflow dumping due to bad leaks in transition MoGas valve (FV-908). But it caused very low underflow $N_2$ even with FCV-311/313 wide open. Clinker might have been formed. We fixed the problem with 1200-psig $N_2$ purge through FV-908. Then, we were able to get underflow $N_2$ back to 450 scfh.<br>b. Reactor temperature crept up to 1,670°F (TIR-700). Had an excursion to 1,800 (TIR-733) at 02:50 of 6/9. To stop it, we increased steam from 50 to 55 lb/h, reduced reactor air from 1,200 to 1,100 scfh, switched convey air to $N_2$. At 03:50, all temperatures resumed uniform between 1,282 and 1,477°F.<br>c. From 08:59 to 13:35 of 6/9, increased reactor air gradually to increase bed temperature. At 16:07, TE-700, -701, -702, and -703 read 1,076, 1,514, 1,499, and 1,458.<br>d. At 21:39 of 6/10, another temperature creeping occurred at TE-701 (apprx. 1,816°F). We tuned down the reactor air and increased underflow $N_2$ flow to bring down TIR-701, but we overshot it to 862°F.<br>e. From 16:13 of 6/11 on, TIR-700 and -701 were very low (apprx. 300°F). We were very sure a clinker was formed in the bottom of the bed. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| | | f. At 16:36 of 6/11, another temperature creeping occurred at TE-702 (apprx. 1,740°F). We tuned down the reactor air and up the underflow $N_2$ flow to bring down TIR-702 to 1,576 at 21:29.<br>g. Loaded 540 more lbm of Montana #6 coal into silo at 04:38 of 6/12 in order to have a scheduled shut down at 11:30. |
| 6/12 (11:30) - 6/13 (04:21) | 16 hr 51 min. | • <u>Controlled Shutdown</u> for MGCR to load sorbent.<br>a. Found and fixed the leak in the gas grab sampling system by putting in a check valve in the exit line after the gas grab bottle.<br>b. Cooled off the reactor bottom and bed so that the workers could work on it). Cleaned out the clinker from the insert and bed (8'1" tall from the face of the bottom flange). Feed nozzle was brushed clean.<br>c. Installed TE-707 back for combustion zone temperature.<br>d. Purge all hand valves and push-button purge lines. We got a lot of dust out of the purge line.<br>e. Replaced the MoGas valve (FV-908) that had a groves on the bottom seat with a new one. |
| 6/13 (04:21) - (13:30) | 9 hr 9 min. | • Started <u>System Start-up</u> procedure.<br>a. At 07:40, MGCR decided to scratch their Dry Chloride Removal (DCR) test plan. At 10:15, all chloride doped coal was removed from silo and replaced with regular coal. |
| 6/13 (13:30) - (15:00) | 1 hr 30 min. | • Start <u>Combustion mode</u>.<br>a. Added underflow $N_2$ during this mode. |
| 6/13 (15:00) - (15:10) | 10 min. | • Purged reactor to reduce $O_2$ conc. to < 3% by replacing reactor air with $N_2$. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 6/13 (15:10) - (17:26) | 2 hr 16 min. | • Started Gasification mode.<br>a. At the start of this mode, the following condition was set: Convey air at 850 scfh, reactor air at 1105 scfh, steam at 63 lb/h, underflow $N_2$ at 478 scfh, and coal feed at 70.2 lb/h. |
| 6/13 (17:26) - 6/15 (12:40) | 43 hr 14 min. | • Steady-State #3 (with Montana #6 coal).<br>a. At 17:20, a different flow configuration was tried: Convey air at 1600 scfh, reactor air at 450 scfh, steam at 54 lb/h, underflow $N_2$ at 400 scfh and coal feed 70 lb/h.<br>b. Performed routine coal transfer from batch to feed hopper and from silo to batch hopper.<br>c. Performed routine dumping of solids from all lockhoppers every hour; and purging all vent valves and transmitters every 4 hours. |
| 6/15 (12:40) - (24:00) | 11 hr 20 min. | • Normal System Shutdown. |

Total Gasification Time = 151 hr 74 min.     Total Steady-State Time = 143 hr 22 min.
Total No. of Steady-State Periods = 3 (11.13; 89; and 43.23 hours).

**Table 1 . SUMMARY OF MAJOR EVENTS DURING TEST RUN**
(Test No. 94FBG08) July 18-27, 1994

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 7/18 (00:00) | | • Started System Start-up procedure.<br>• Reactor insert without side-jets was used (from the last S.S. period of Test Run 94FBG07).<br>• Montana Rosebud #6 coal in silo. |
| 7/18 (00:40) - | 10 hr 41 min. | • Air Preheater ignited. Heated reactor to 800°F. (Based on TIR-700, -701, -707 & -733, whichever one reached first).<br>• Opened HV-503 and FCV-115 to obtain the high air flow (apprx. 7000 scfh).<br>• Repaired broken flexible coupling at VSL-906.<br>• Set all line heater temperatures to 500°F except Zone 6 & 7 to 1100°F (exits of both cyclones). |
| 7/18 (11:21) - (13:10) | 1 hr 49 min. | • Started Combustion mode. |
| 7/18 (13:10) - (13:55) | 45 min. | • Purged reactor to reduce $O_2$ conc. to < 3% by replacing reactor air with $N_2$. |
| 7/18 (13:55) - (16:30) | 2 hr 35 min. | • Started Gasification mode.<br>a. Convey air at 1600 scfh, Reactor air at 460 scfh, underflow $N_2$ at 402 scfh, steam at 55 lb/h and coal feed at 69.6 lb/h.<br>b. Performed routine coal transfer from batch to feed hopper and from silo to batch hopper.<br>c. Performed routine dumping of solids from all lockhoppers every hour; and purging all vent valves and transmitters every 4 hours. |
| 7/18 (16:30) - 7/20 (12:45) | 44 hr 15 min. | • Steady State #1 (with regular coal for METC-2 Sorbent Test and Filter Test).<br>a. Low sample loop flow (FIR-806) - 3.2 scfh - due to crystal -like material built up. Cleaned and flow resumed.<br>b. Sampling frequency: gas grab, detector tube, and condensate every hr., solids for every 4 hours. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| | | c. Mass spec. went off-line numerous times during the run. |
| 7/18 (2355) | | d. MGCR requested to postpone High $Cl^-$-coal run for 24 hours. |
| | | e. MGCR sorbent test had a breakthrough between 7/18 2330 and 7/19 0030. Thus, sampling freq. changed from every hour to every 4 hrs for gas grab, condensate, and filter fines. No more detector tube. Solids for every 12 hours. |
| 7/19 (0745) | | f. Primary cyclone plugged. Unplugged with purging (bypassed interlock). |
| 7/20 (1245) - | 16 hr | <u>Steady-State #2</u> (with high chloride coal for Dry Chloride Removal (DCR) Test). |
| 7/21 (0445) | | a. Continuous monitoring pH and $Cl^-$ content in condensate from 7/20 1130 to 7/21 0630: pH dropped from 9.3 to 8.6; and $Cl^-$ increased irregularly from < 10 ppm to 250 ppm. |
| 7/21 (0445) - 7/27 (0035) | 139 hr 50 min. | <u>Steady-State #3</u> (with regular coal to continue Filter Test). |
| | | a. Operating Conditions: Convey air 1600 scfh @66°F, Reactor air 530 scfh @940°F, steam 52 lb/h @950°F, underflow $N_2$ 400 scfh @495°F, coal @30 rpm (70 lb/h). |
| | | b. In the underflow dump, occasionally found small pieces of clinkers. |
| 7/21 (1155) | | c. Neotronics personal monitors lost $SO_2$ detecting capability. Need to use the Drager monitors along with the Neotronics. |
| 7/23 (0630) | | d. ES&H discovered gas leaked into B12 through the space around a pipe penetrating into the building. Did not know where was the source. Gas had 281 ppm CO and 9.5 ppm $H_2S$. The space was temporarily patch with insulation material. The source could be the baghouse, leaking from its top. |
| 7/25 (0655) | | e. Found a hole in the vent line above HV-950 and temporarily plug it with a screw. |
| 7/26 (2102) | | f. MGCR lost all flow from FBG through FT-501. Switched to FCV-755. For 15 min. from 2108, there was a large pressure fluctuation on the reactor and manifold. PCV-756 slammed open and shut real bad. Had instrumentation tech. change the programming of the valve. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 7/27 (00:35) - (15:00) | 14 hr 25 min. | • Normal System Shutdown due to loss of coal feed.<br>• Dropped the reactor bottom and found no clinkers adhered on the reactor wall and the insert.<br>• DDAS off-line at 13:30. |

Total Gasification Time = 202 hr 40 min. Total Steady State Time = 200 hr 5 min.
Total No. of Steady State Periods = 3 (44.25, 16, 139.83 hours).

**Table 1. SUMMARY OF MAJOR EVENTS DURING TEST RUN**
(Test No. 94FBG09) September 12-16, 1994

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 9/12 (00:00) | | • Started System Start-up procedure.<br>• Reactor insert without side-jets was used (from 94FBG08).<br>• Montana Rosebud #7 coal (1,950 lbm) loaded in silo. |
| 9/12 (00:10) - (14:56) | 14 hr 46 min. | • Air Preheater ignited. Heated reactor to 800°F. (Based on TIR-700, -701, -707 & -733, whichever one reached first).<br>• Opened HV-503 and FCV-115 to obtain the high air flow (apprx. 4500 scfh max. vs 7,000 scfh max. in 94FBG08).<br>• Set all line heater temperatures to 500°F except Zone 6 & 7 to 1100°F (exits of both cyclones). |
| 9/12 (14:56) - (16:08) | 1 hr 12 min. | • Started Combustion mode.<br>a. Raised the reactor temperature in 3 stages: 1,045 - 1,300 - 1,400 - 1,600°F). |
| 9/12 (16:08) - (16:22) | 14 min. | • Purged reactor to reduce $O_2$ conc. to < 3% by replacing reactor air with $N_2$. |
| 9/12 (16:22) - 9/12 (16:52) | 30 min. (assumed) | • Started Gasification mode.<br>a. Convey air at 1600 scfh, Reactor air at 525 scfh, underflow $N_2$ at 402 scfh, steam at 58 lb/h and Montana #7 coal fed at 70 lb/h (air/coal=2.32; steam/coal=0.83).<br>b. Performed routine coal transfer from batch to feed hopper and from silo to batch hopper.<br>c. Performed routine dumping of solids every hour except underflow every 30 min. and 2nd cyclone every 6 hours; and purging all vent valves and transmitters every 4 hours. |
| 9/12 (16:52) - 9/13 (06:15) | 13 hr 23 min. | • Steady State #1 (with Montana #7 coal for METC-2 Sorbent Test and Filter Test with an air/coal of 2.32).<br>a. Gas alarm went off twice (18:39 and 19:06) due to gas leak from the transition valve when dumping secondary cyclone.<br>b. Sampling frequency: gas grab, detector tube and condensate every hr. until MGCR sorbent breakthrough, then every 4 hours; solids every 2 hours except cyclone every 12 hours. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| | | c. At 18:29, switched mass spec. (707) from FBG to MGCR.<br>d. Moisture contents in product gas = 12.3, 10.3 and 10.7%wt. |
| 9/13 (06:15) - (18:00) | 11 hr 45 min. | • <u>Steady State #2</u> (with Montana #7 coal for METC-2 Sorbent Test, Filter Test and Gain Matrix Test with an increase of air/coal from 2.32 to 2.65).<br>a. At 06:15, started to increase reactor air from 525 to 825 scfh in 3 increments of 100 scfh.<br>b. Gas alarm in alley read 2ppm $SO_2$ and PEL light on at 12:25.<br>c. Mass spec. switched from MGCR to FBG at 12:42.<br>d. At 11:45, loaded 1,120 lbm of $Cl^-$ doped Montana #6 coal into silo.<br>e. From 11:45-11:47, took DDAS off line for mass spec. (707). |
| 9/13 (18:00) - 9/14 (10:22) | 16 hr 22 min. | • <u>Steady State #3</u> (with 3% chloride doped Montana Rosebud #6 coal for DCR Test, Filter Test and Gain Matrix Test with an air/coal of 2.87).<br>a. At 18:03, raised reactor air from 825 to 1,025 in 4 increments of 50, 50, 25 and 25 scfh. At 23:13, reactor air reached to 1,025.<br>b. Moisture Content in product gas during this period: 13.8, 12.7 and 10.4%wt.<br>c. At 02:00, loaded 520 lbm of Montana #7 coal into silo.<br>d. At 06:10, increased underflow $N_2$ from 400 to 500 scfh.<br>e. At 10:20, loaded 740 lbm of Montana #7 coal into silo.<br>f. Gas sample changed to every 4 hours; no detector tube.<br>g. Moisture contents in product gas = 13.8, 12.7, 10.4 and 8.7%wt. |
| 9/14 (10:22) - (19:27) | 9 hr 5 min. | • <u>Steady State #4</u> (with Montana #7 coal for Gain Matrix Test).<br>a. At 11:21 and 12:21, loaded a total of 1,440 lbm of Montana #7 coal into silo.<br>b. From 13:25-13:27, took DDAS off line to change strategy so that mass spec. signal goes to totalizer and an alarm.<br>c. At 16:10, lowered underflow $N_2$ from 500 to 400 scfh.<br>d. At 17:16, gas alarm activated by radio.<br>e. At 18:44, load 325 lbm of Montana #7 coal into silo. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| | | f. Moisture Contents of product gas = 8.7 and 8.3 %wt. |
| 9/14 (19:27) - 9/15 (06:10) | 10 hr 43 min. | • Steady State #5 (with Montana Rosebud #7 coal for Gain Matrix Test with an increase of coal feed rate from 70 to 80 lb/hr, resulting in a decrease of air/coal of 2.5).<br>a. At 00:29 and 05:40, loss of coal feed during coal transfer into feed hopper and recovered with emergency $N_2$ (FV-409).<br>b. Moisture Contents of product gas = 9, 10, 9.8 %wt. |
| 9/15 (06:10) - 9/15 (21:12) | 15 hr 2 min. | • Steady State #6 (with Montana Rosebud #7 coal for Gain Matrix Test with an increase of air/coal of 2.87).<br>a. At 06:10, started to increase reactor air from 1,025 to 1,400 scfh in 7 increments of 50 scfh and last increment of 25 scfh.. At 09:55, reactor air reached to 1,400 scfh.<br>b. From 09:43-09:45, took DDAS off line to update the mass spec. alarm.<br>c. At 16:06, decreased reactor air to 1,025 scfh and coal feed to 70 lb/h.<br>d. At 17:25, loaded silo with 810 lbm of coke breeze.<br>e. Moisture Contents of product gas = 9.1, 10.3 and 8.8 %wt. |
| 9/15 (21:12) - 9/16 (07:00) | 9 hr 48 min. | • Steady State #7 (with Coke Breeze at 70 lbm/hr and an air/coke of 2.87)<br>a. At 22:47, discovered old calibration curve for coke breeze, i.e., 30 rpm=72 lbm/hr of coke breeze.<br>b. At 00:53, loaded 600 lbm of Illinois #6 coal into silo.<br>c. At 01:05, reduced underflow $N_2$ from 500 to 475 scfh; at 01:10, reduce it further to 450 scfh.<br>d. At 01:25, turned off air preheater to prepare for cooler reactor air for running caking (bituminous) coal.<br>e. At 02:10, decreased reactor air from 1,025 to 1,000 scfh and increased underflow $N_2$ from 450 to 500 scfh.<br>f. At 04:59, increased reactor air from 1,000 to 1,025 scfh.<br>g. At 05:45, batch hopper is empty; then loaded Illinois #6 coal from silo to batch hopper.<br>h. From 05:50 to 06:16, increased reactor air from 1,025 to 1,200 scfh in an increments of 25 scfh and 3 increments of 50 scfh. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| | | i. At 06:01, reduce underflow $N_2$ from 500 to 475 scfh; at 06:11, reduce it to 460 scfh; and at 06:47, further reduced to 440 scfh.<br>j. Moisture Contents of product gas = 10.4 and 9.2 %wt. |
| 9/16 (07:00) - (14:00) | 7 hr | • Steady State #8 (with Illinois #6 coal)<br>a. From 07:02 to 07:25, reduced reactor air from 1,200 to 1,150 scfh, and underflow $N_2$ further down to 400 scfh.<br>b. Moisture Contents of product gas = 13, 9.5 and 8.9 %wt. |
| 9/16 (14:00) - (24:00) | 10 hr | • Normal System Shutdown as scheduled.<br>a. Changed convey and reactor air to $N_2$.<br>b. Turned of coal feeder and $N_2$ preheater.<br>c. Bypassed steam from reactor.<br>d. Weighed and secured all barrels of solids.<br>e. Shut off portable boiler.<br>f. Transferred all solids from silo through batch into feed hopper.<br>g. Blew out all vent lines with HV-950 for 10 sec.<br>h. Shut all $N_2$ and sir header valves.<br>i. Removed the center (3/4") feed nozzle from reactor bottom.<br>j. Calibrated coal feeder ("A") with Illinois #6 coal. |
| 9/19 Morning | | • Dropped the reactor bottom and found no clinkers adhered on the reactor wall and the insert. |

Total Gasification Time = 93 hr 38 min. Total Test Time = 93 hr 8 min.
Total No. of Test Periods = 8 (13.38, 11.75, 16.37, 9.08, 10.72, 15.03, 9.8, and 7 hours).

**Table 1. SUMMARY OF MAJOR EVENTS DURING TEST RUN**
(Test No. 94FBG10) October 24-28, 1994

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 10/24 (00:00) | 11 hr | • Test Period #1 (Heat-Up of the system)<br>a. Started System Start-up procedure.<br>b. Reactor insert with side-jets was used (Brand new design).<br>c. Montana #7 coal (3,500 lbm) loaded in silo on 10/18.<br>d. Air Preheater ignited. Heated reactor to 800°F. (Based on TIR-700, -701, -707 & -733, whichever one reached first).<br>e. Set cone $N_2$ to 50 scfh (FIR-311) and underflow $N_2$ (FIR-313) to 350 scfh with underflow $N_2$ preheater set at 350°F.<br>f. Heated up reactor faster at lower pressure (100 psig).<br>g. Set all line heater temperatures to 500°F except Zone 6 & 7 to 1100°F (exits of both cyclones).<br>h. At 07:45, reactor pressure was raised to 425 psig when the bottom temperatures reached to 750°F.<br>i. At 08:30, fixed steam leak at PCV-221 and reinsulated the line. Another small leak was found around TE-220 and was not fixed. |
| 10/24 (11:00) - (13:00) | 2 hr | • Started Combustion mode.<br>Raised the reactor temperature in 3 stages: 1,045 - 1,300 - 1,400 - 1,600°F). |
| 10/24 (13:00) - (13:46) | 46 min. | • Purged reactor to reduce $O_2$ conc. to < 3% by replacing reactor air with $N_2$. |
| 10/24 (13:46) - (15:00) | 1 hr 14 min. | • Started Gasification mode.<br>a. Convey air at 1600 scfh, Reactor air at 854 scfh, cone $N_2$ at 50 scfh and underflow $N_2$ at 350 scfh, steam at 60 lb/h and Montana #7 coal fed at 70 lb/h (Air/Coal (daf) = 3.3; Steam/Coal (daf) = 0.83).<br>b. Performed routine coal transfer from batch to feed hopper and from silo to batch hopper.<br>c. Performed routine dumping of solids every hour except underflow every 30 min. and 2nd cyclone every 6 hours; and purging all vent valves and transmitters every 4 hours. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 10/24 (15:00) - (23:00) | 8 hr | • Test Period #2 (Filled bed with an Air/Coal (daf) of 3.3 and Steam/Coal (daf) at 0.83).<br>a. At 15:20, mass spec. (707) was turned on for MGCR.<br>b. At 16:30, MGCR came on-line.<br>c. Rupture disk 753A was blown and replaced with ES&H personnel present (CO on 3rd floor of the cell = 9ppm).<br>d. Small fire around the overflow pipe on the 2nd level of cell was found and extinguished.<br>e. Sampling frequency: gas grab, detector tube and condensate every hr. until MGCR sorbent breakthrough, then every 4 hours; solids every 2 hours except cyclone at the end of each test period (6 or 12 hours).<br>f. Averaged Moisture Content in product gas = 9.4 %wt.<br>g. DDAS was down twice. |
| 10/24 (23:00) - 10/25 (05:00) | 6 hr | • Test Period #3 (Bed stabilization with Montana #7 coal for ZT-04 Sorbent Test, Filter Test and test matrix with an increase of reactor air to 1,000 scfh and cone $N_2$ to 100 scfh, and a decrease of steam to 55 lb/h and underflow $N_2$ to 300 scfh.<br>a. Needed to purge the overflow line frequently to unplug it.<br>b. Mass spec. (707) went off-line several times.<br>c. Between 00:00 and 01:00, there was a breakthrough on ZT-04.<br>d. Averaged Moisture Content in product gas = 8.9 %wt. |
| 10/25 (05:00) - (17:00) | 12 hr | • Test Period #4 (with Montana #7 coal for test matrix with an increase of cone $N_2$ to 150 scfh).<br>a. Needed to purge the overflow line frequently to unplug it.<br>b. Mass spec. (707) went off-line several times.<br>c. At 14:40, MGCR called to shut off mass spec. (707).<br>d. At 16:46, reactor temperatures were: 927 (TIR-700), 1242 (-701), 1,568 (-701), 903 (-703), and 1,010°F (-733).<br>e. Averaged Moisture Content in product gas = 7.4 %wt. |

| Date (Time) | Duration | Description of Events |
| --- | --- | --- |
| 10/25 (17:00) - 10/26 (05:00) | 12 hr | • Test Period #5 (with Montana #7 coal for test matrix with cone $N_2$ reset at 50 scfh).<br>a. At 18:20, ES&H personnel accompanied one technician and shift engineer to check the CO level at the 2nd level, which hit 35 ppm. Needed to insulate the overflow pipe.<br>b. Needed to purge the overflow line frequently to unplug it.<br>c. Averaged Moisture Contents of product gas = 7.0 %wt. |
| 10/26 (05:00) - (11:00) | 6 hr | • Test Period #6 (with Montana #7 coal for test matrix with an increase of cone $N_2$ to 100 scfh).<br>a. At 05:45, loaded 1,190 lbm of $Cl^-$ doped Montana #6 coal into silo.<br>b. Averaged Moisture Content of product gas = 7.2 %wt. |
| 10/26 (11:00) - 10/26 (23:00) | 12 hr | • Test Period #7 (with 3% chloride doped Montana #6 coal for DCR Test, Filter Test and test matrix with an Air/Coal (daf) of 3.82 and Steam/Coal (daf) of 0.83).<br>a. At 16:14, reactor temperatures were: 1,027 (TIR-700), 1,277 (-701), 1,630 (-702), 940 (-903) and 1,027°F (-733).<br>b. At 00:45, loaded 3,640 lb of Montana #7 coal into silo.<br>c. Averaged Moisture Content of product gas = 8.3 %wt. |
| 10/26 (23:00) - 10/27 (03:00) | 4 hr | • Test Period #8 (with 3% chloride doped Montana #6 coal for DCR Test, Filter Test and test matrix with an Air/Coal (daf) of 3.65 and Steam/Coal (daf) of 0.81).<br>a. Reduced the reactor air flow to 940 scfh according to the test matrix planned. |
| 10/27 (03:00) - (15:00) | 12 hr | • Test Period #9 (with Montana #7 coal for test matrix with a decrease of reactor air to 940 scfh. Air/Coal (daf) was 3.12 and steam/coal (daf) was 0.74)<br>a. CO gas alarm in cell at 40 ppm.<br>b. MGCR was off-line from 13:16 to 13:29.<br>c. Averaged Moisture Content of product gas = 8 %wt. |
| 10/27 (15:00) - (21:00) | 6 hr | • Test Period #10 (with Montana #7 coal for test matrix with an increase of reactor air to 1,000 scfh, Air/Coal (daf) = 3.17 and Steam/Coal (daf) of 0.85) |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| | | a. At 19:16, the Neotronics monitor carried by a technician detected 15 ppm CO and ES&H personnel was called in but detected no leak around the baghouse.<br>b. Averaged Moisture Content in product gas = 9 %wt. |
| 10/27 (21:00) -<br>10/28 (09:00) | 12 hr | • Test Period #11 (with Montana #7 coal for test matrix with an increase of reactor pressure (PIR-713) to 440 psig)<br>a. At 23:12, had problems with the steam flow and gas leak in cell (getting worse). Thus, reduced reactor pressure back to 425 psig.<br>b. At 00:10, increased cone $N_2$ from 100 to 200 scfh (an additional study in the Test Matrix).<br>c. At 07:20, discovered steam flow creeping up from 55 to 70 lb/h. Reduced to 55 lb/h, but it crept back up 60 lb/h within 10 min. Again reduced it to 58 lb/h but discovered TIR-702 creeping up to 1,698°F. Stopped reducing steam and watch TIR-702 closely.<br>d. Averaged Moisture Content of product gas = 7.2 %wt. |
| 10/28 (09:00) -<br>(13:30) | 4 hr 30 min. | • Test Period #12 (with Montana #7 coal for test matrix with a decrease of reactor pressure to 400 psig)<br>a. At 09:00, CO alarm on 3rd level in cell went off at 35 ppm.<br>b. At 09:03, reduced reactor pressure down to 400 psig and cone $N_2$ flow from 200 to 100 scfh, keeping underflow $N_2$ at 300 scfh, causing the reactor pressure to swing for about 10 min. before it stabilized at 400 psig.<br>c. At 09:05, the bed slumped (PDIR-706) which stopped the underflow $N_2$ about 15 min. The product gas flow also varied between 2,000 to 9,000 scfh during this 15 min.<br>d. At 09:30, steam flow declined from 62 to 30 lb/h in 35 min. and raised back to 58 lb/h afterward.<br>e. At 10:35, MGCR got off-line to remove sorbent and switch filter vessels and clean the plugged incinerator lines.<br>f. At 10:50, TIR-700 went up to 1,962°F. Reduced reactor air to 950 scfh and increase steam to 70 lb/h. Brought reactor pressure down to 425 psig to alleviate the overheating problem but failed.<br>g. Averaged Moisture Content of product gas = 9 %wt. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 10/28 (13:30) - 10/29 (08:00) | 18 hr 30 min. | • Quick Controlled Shutdown (due to clinker formation and completely plugging in overflow line)<br>a. Changed convey and reactor air to $N_2$.<br>b. Turned off coal feeder and $N_2$ preheater.<br>c. Bypassed steam from reactor.<br>d. Weighed and secured all barrels of solids.<br>e. Shut off portable boiler and incinerator.<br><br>f. Transferred all solids from silo through batch into feed hopper.<br>g. Blew out all vent lines with HV-950 for 10 sec.<br>h. Shut all $N_2$ and air header valves.<br>i. Removed the center (3/4") feed nozzle from reactor bottom.<br><br>j. Calibrated coal feeder ("A") with Montana #7 coal.<br>k. Dropped the reactor bottom and found a few clinkers adhered on the reactor wall and filled up the insert. |

Total Gasification Time = 95 hr 44 min. Test Matrix Time = 94 hr 30 min.
Entire Test Period = 128 hrs. No. of Test Periods = 11

# APPENDIX 3

# DAILY PROCESS VARIABLE PLOTS

The following trend charts were created for runs 94MGC07 through 94MGC10. Although the charts contain several process variables, only FIR-501, TIR-248, TIR-224, PIR-247, PIR-458 and, PDIR- (also shown as PDT- or PIR-)155 and 459 are relevant. The table below provides a description of each of these process variables.

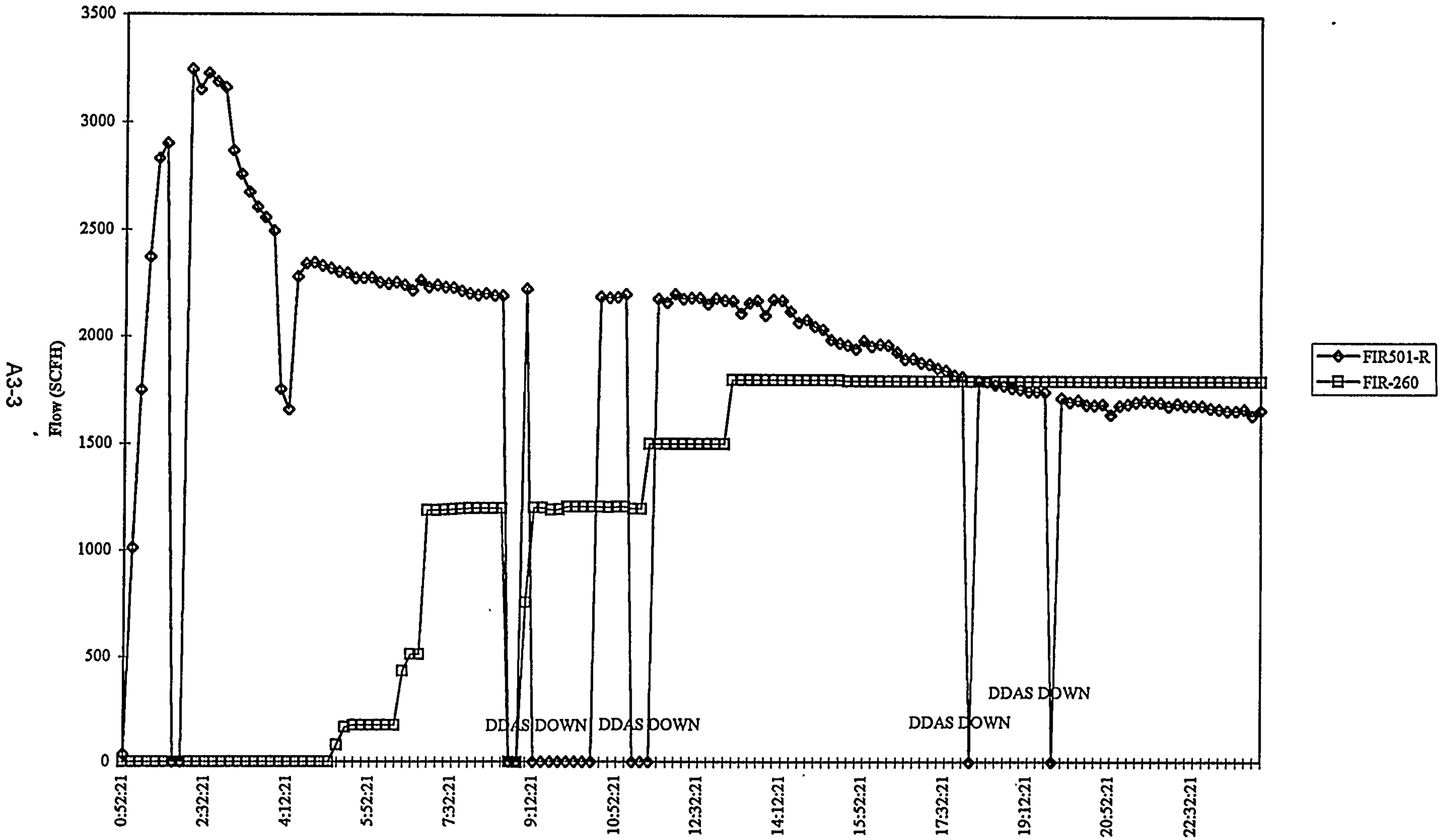
| Process Variable | Description |
|---|---|
| FIR-501 | Cumulative syngas volumetric flow rate to the filtration vessel and the particle measurement system |
| TIR-248 | Inlet gas temperature of the filtration vessel |
| TIR-224 | Outlet gas temperature of the filtration vessel |
| PIR-247 | Inlet gas pressure of the filtration vessel |
| PIR-458 | Filter blowback pressure |
| PDIR-155 | Differential pressure of the filtration vessel |
| PDIR-459 | Differential pressure of the filter |

All other process variables may be referenced through the process and instrumentation diagrams provided.

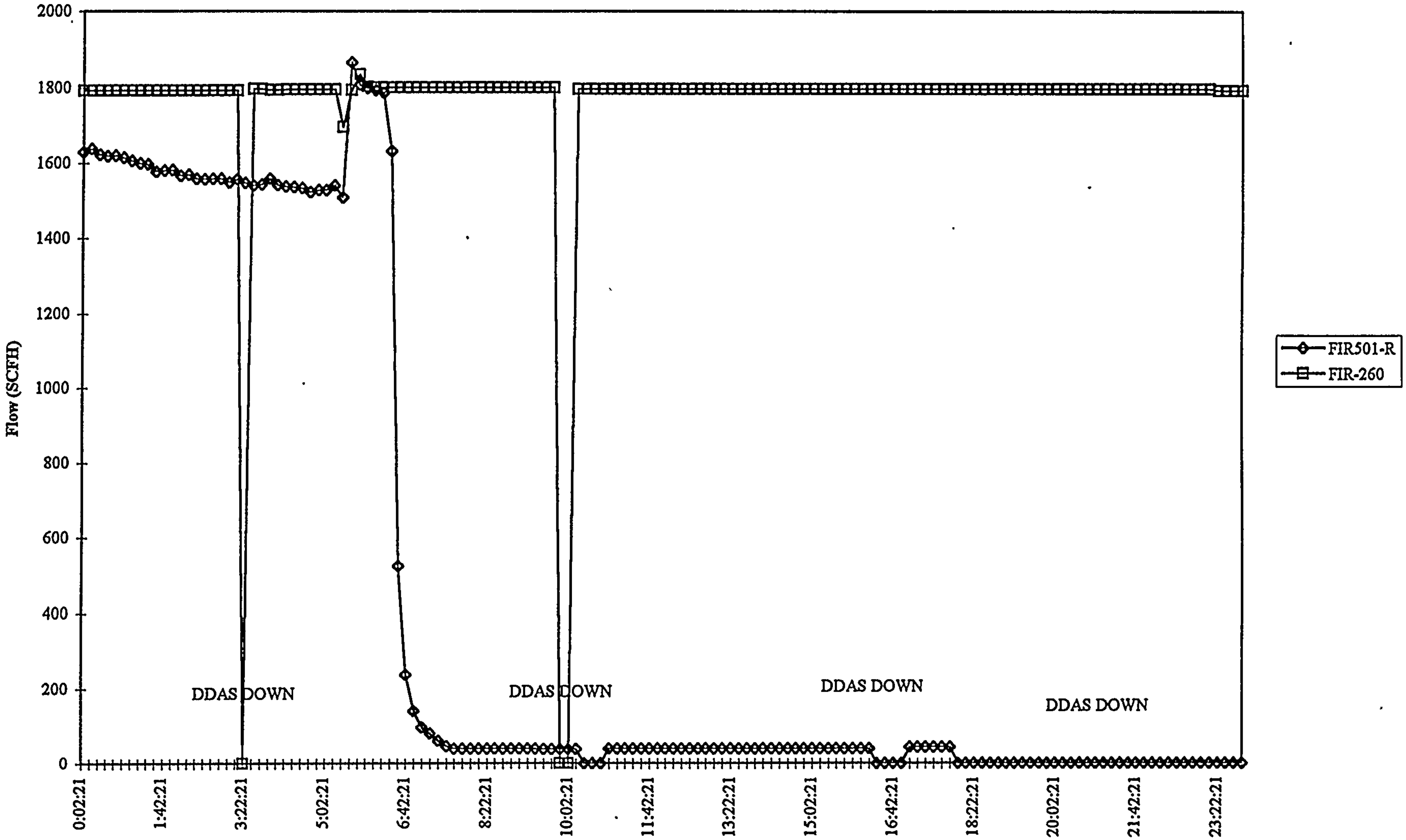
Since the needs of the project have changed somewhat from run to run, the trend charts have also changed somewhat. However, these changes are not major ones and the charts have been separated by run number and arranged in the order listed above for convenience.

# 94MGC07
# (06/06/94 - 06/15/94)

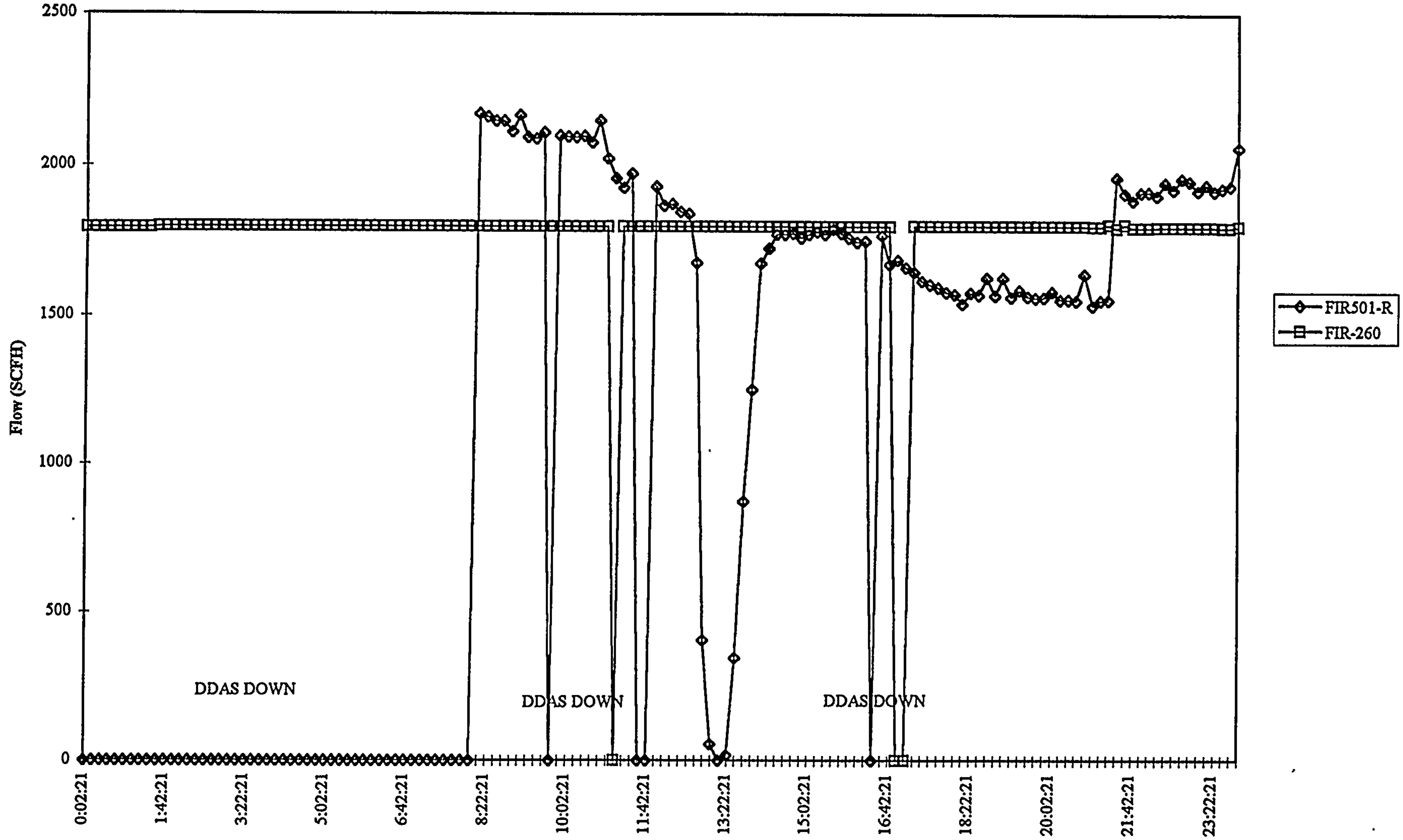
## MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/06/94



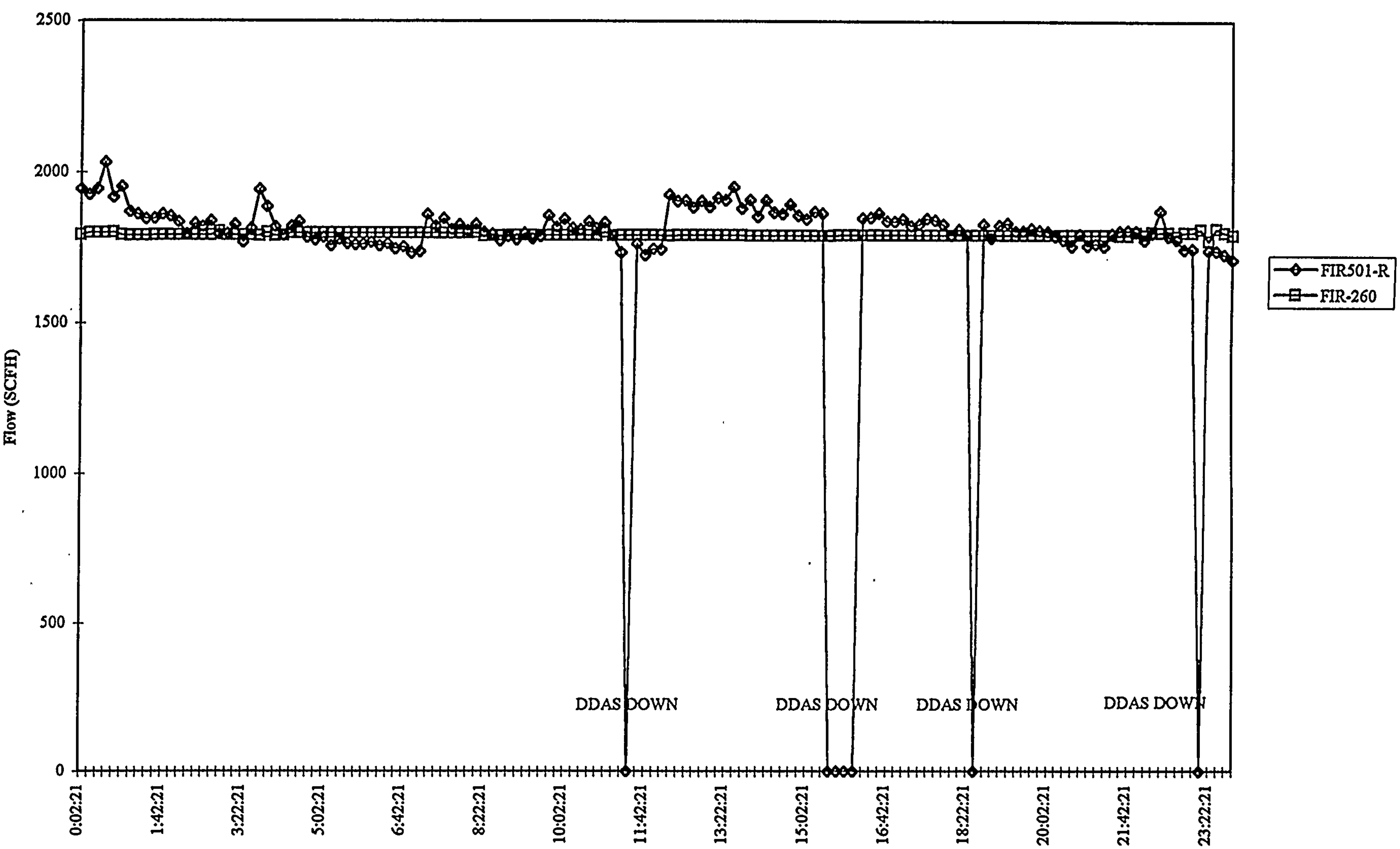
## MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/07/94



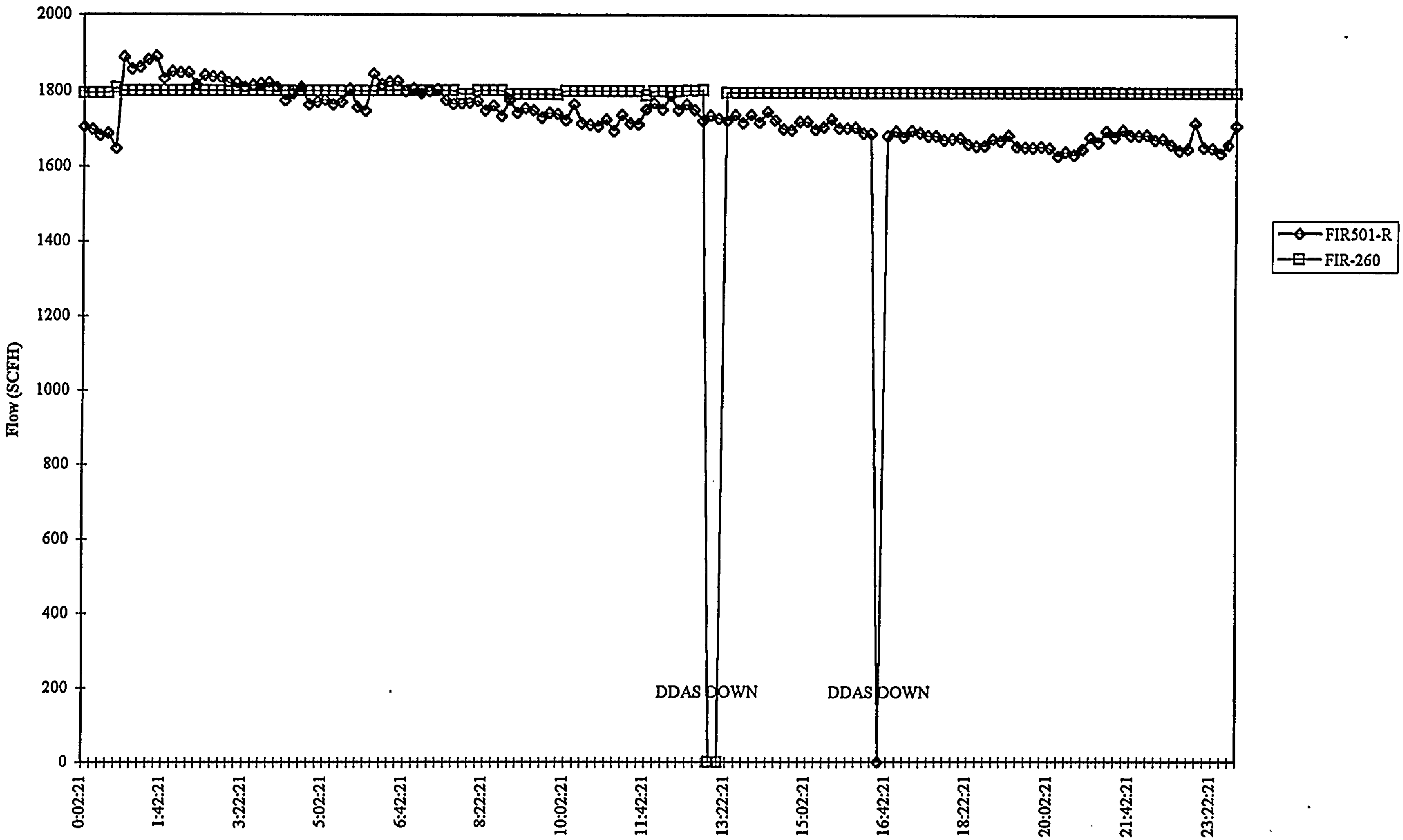
MGCR INLET AND EXIT FLOWS
94MGC07 - 06/08/94



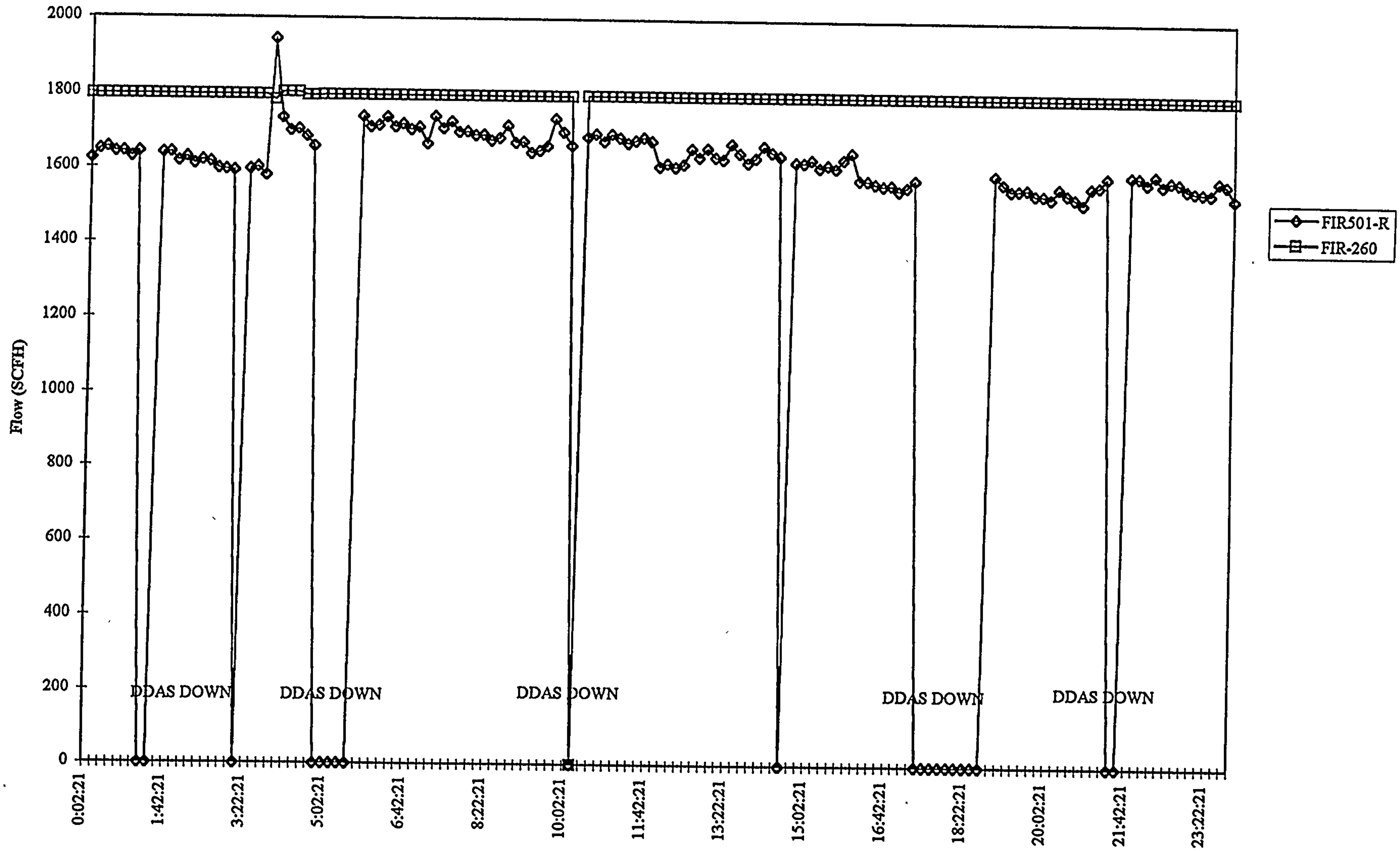
# MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/09/94



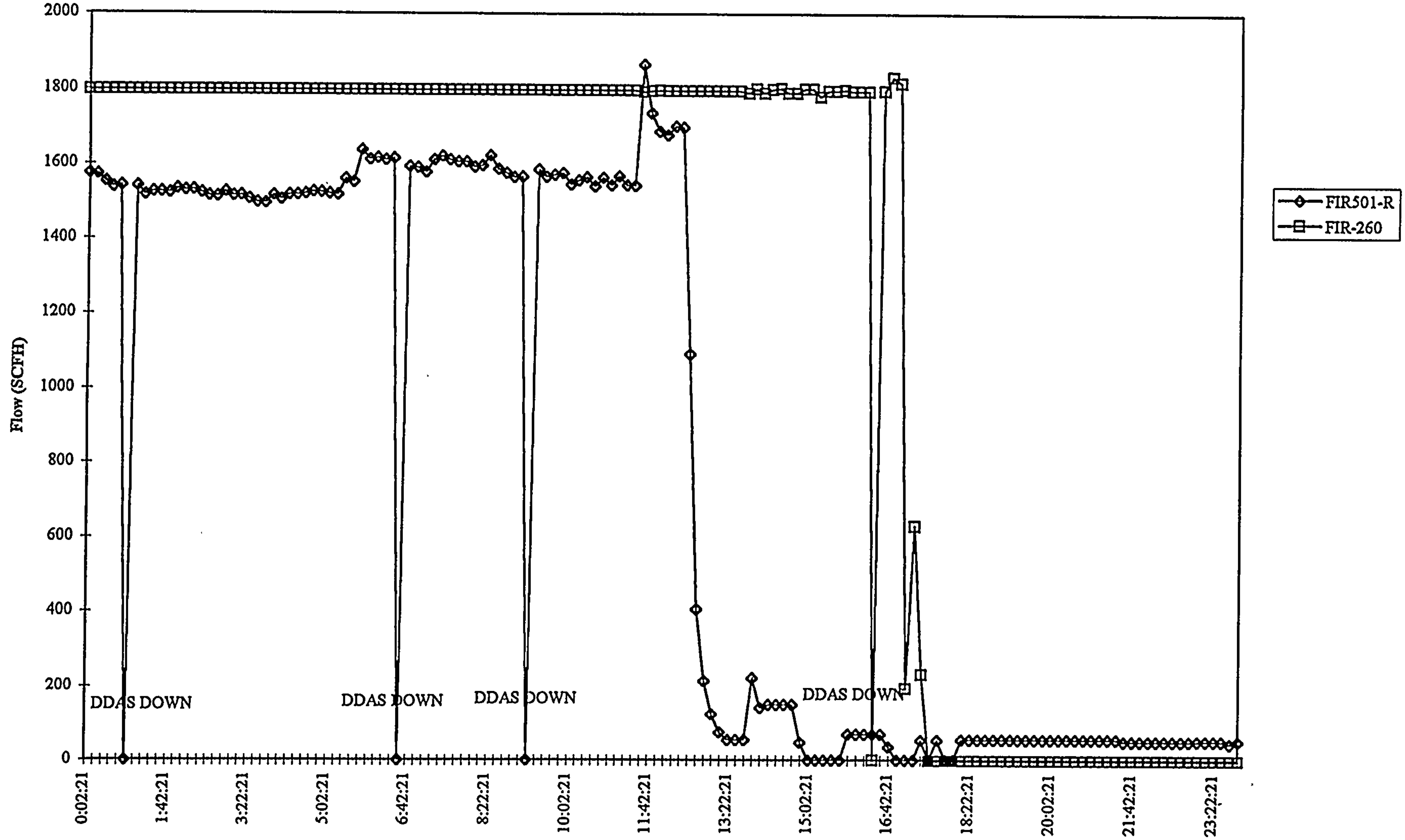
# MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/10/94



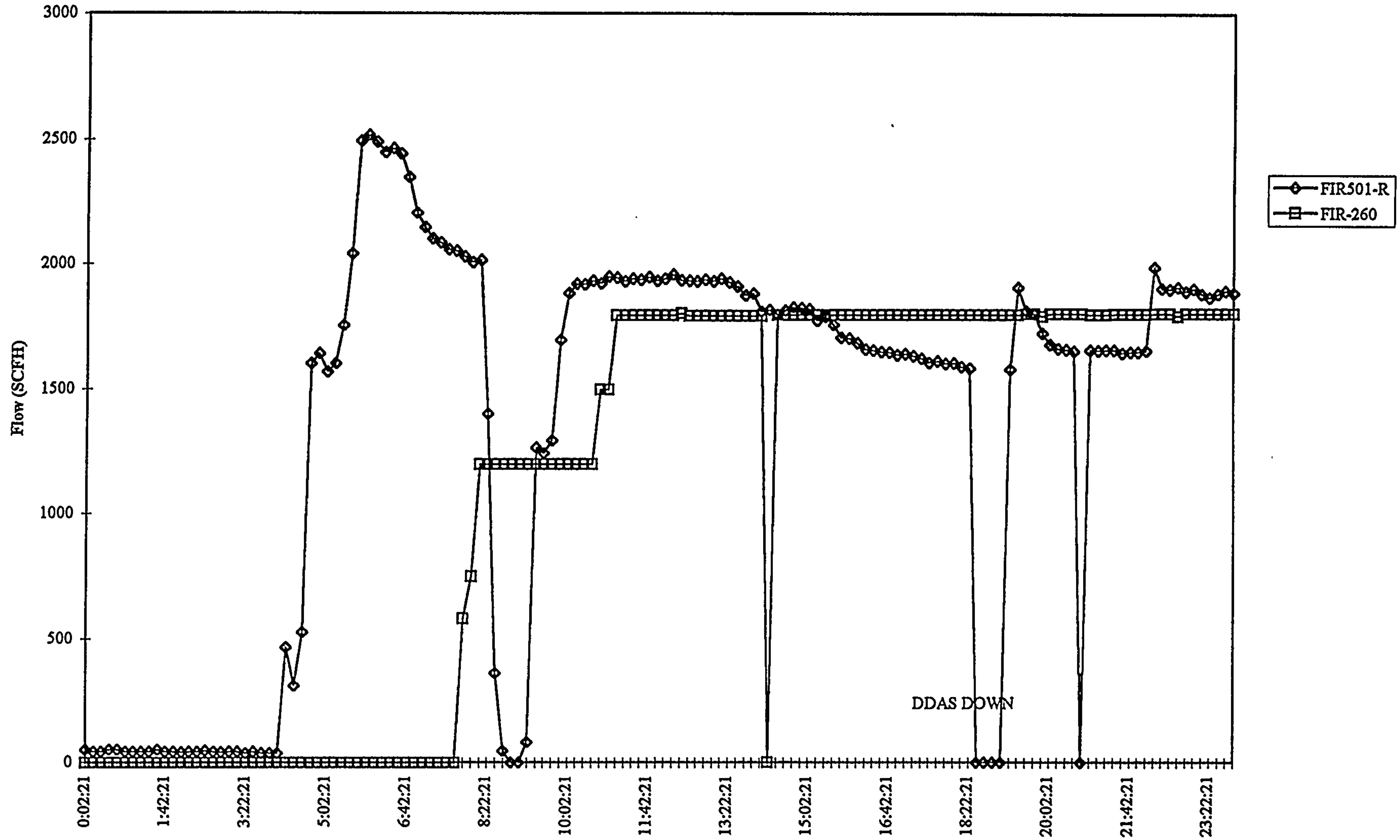
# MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/11/94



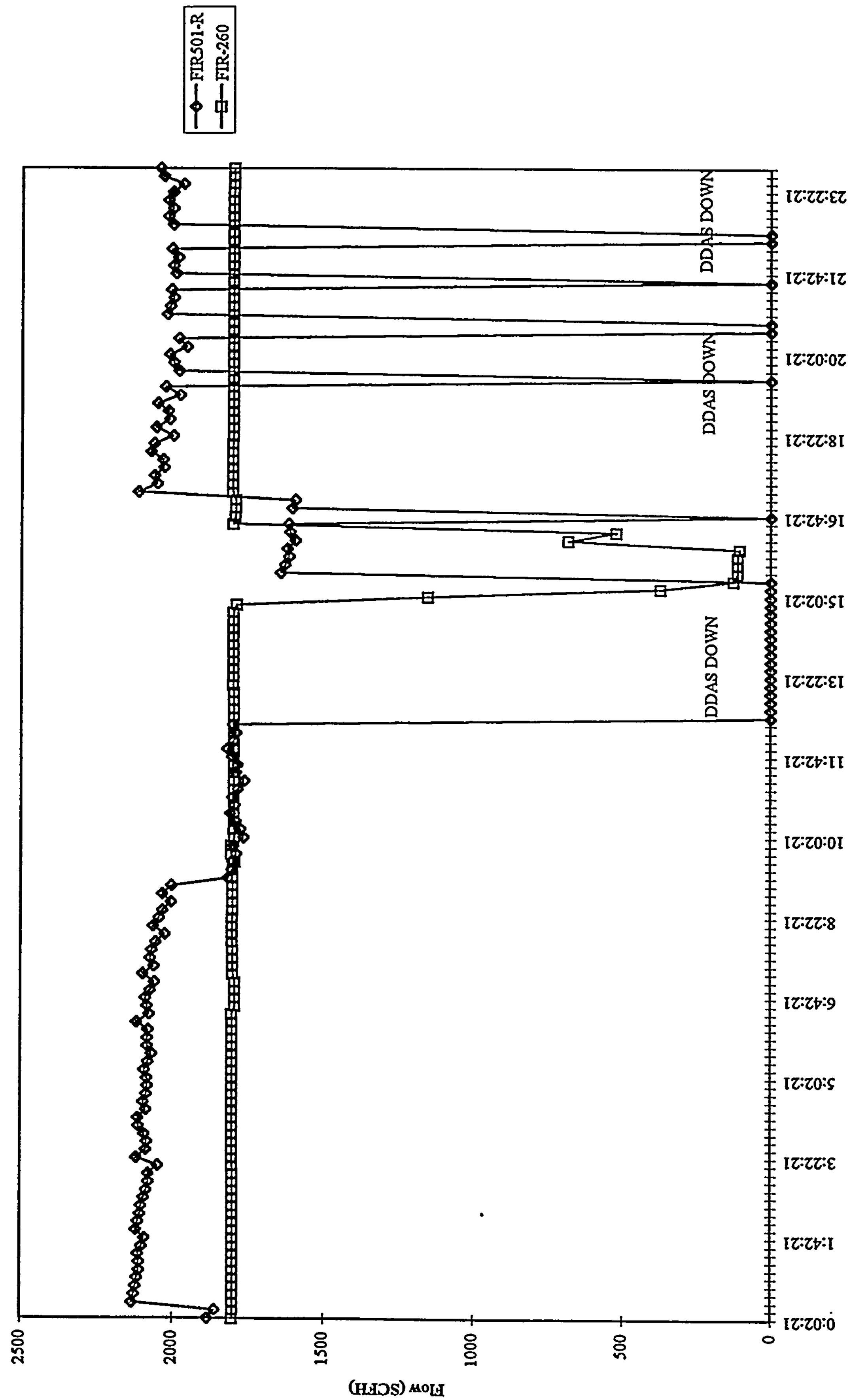
# MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/12/94



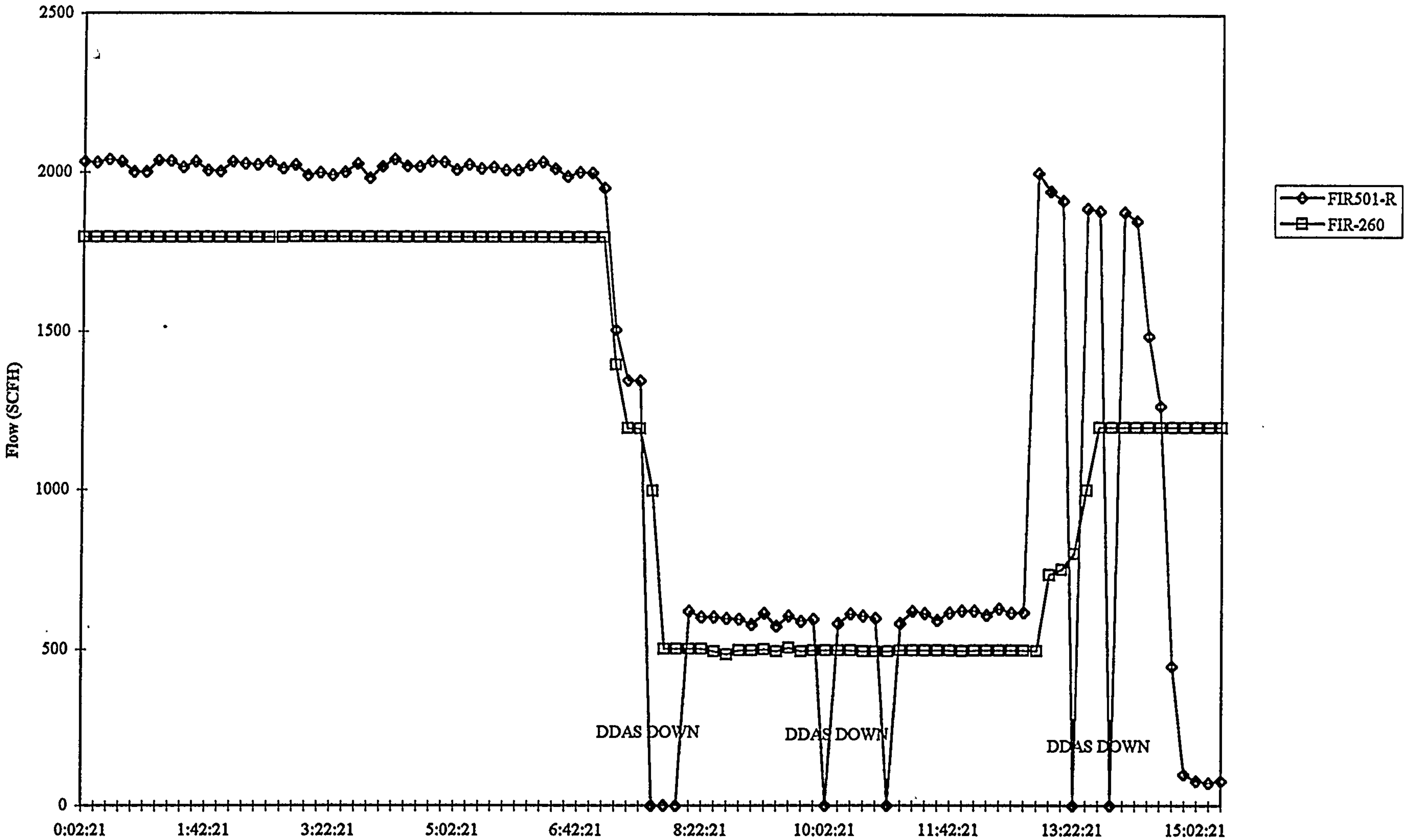
## MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/13/94



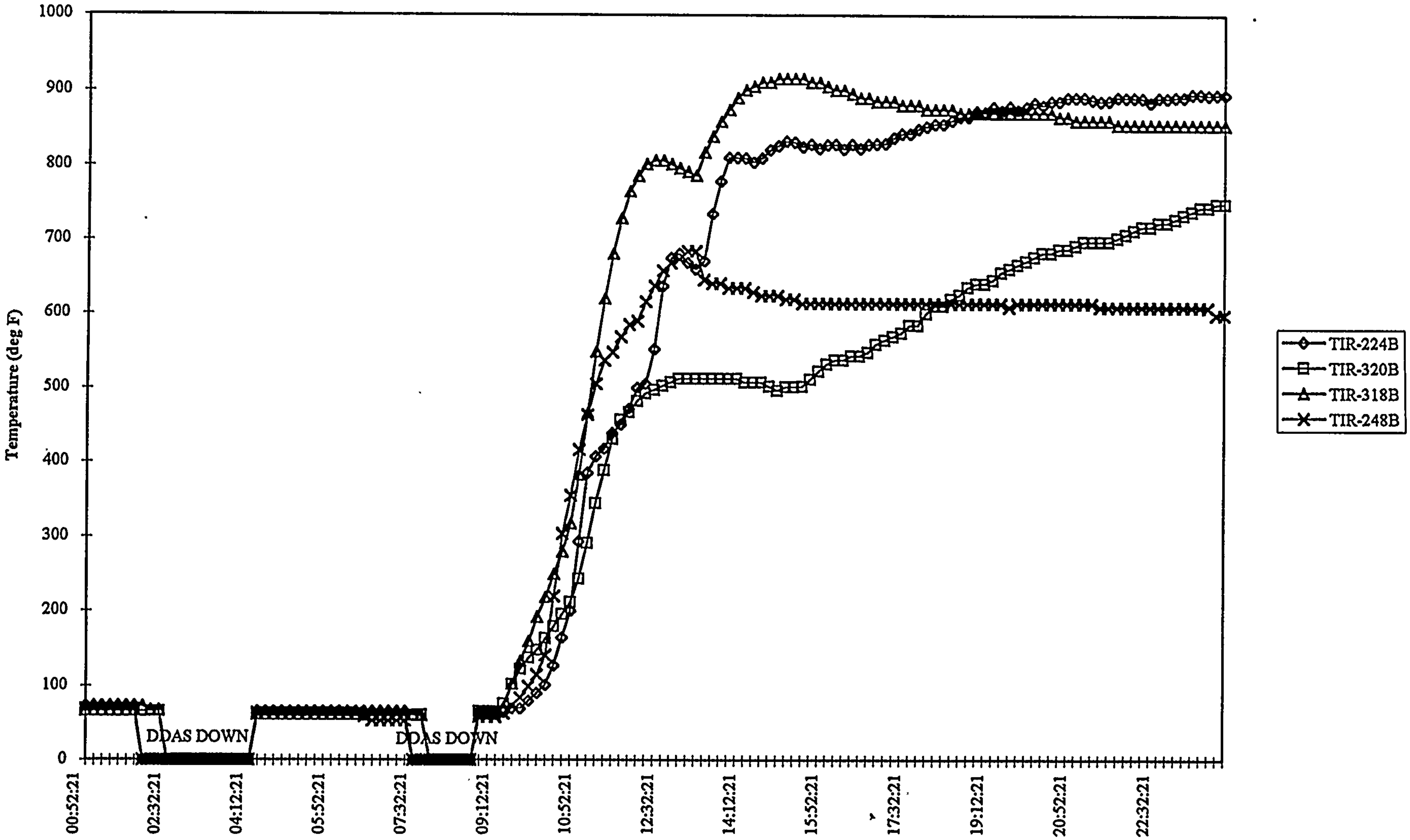
# MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/14/94



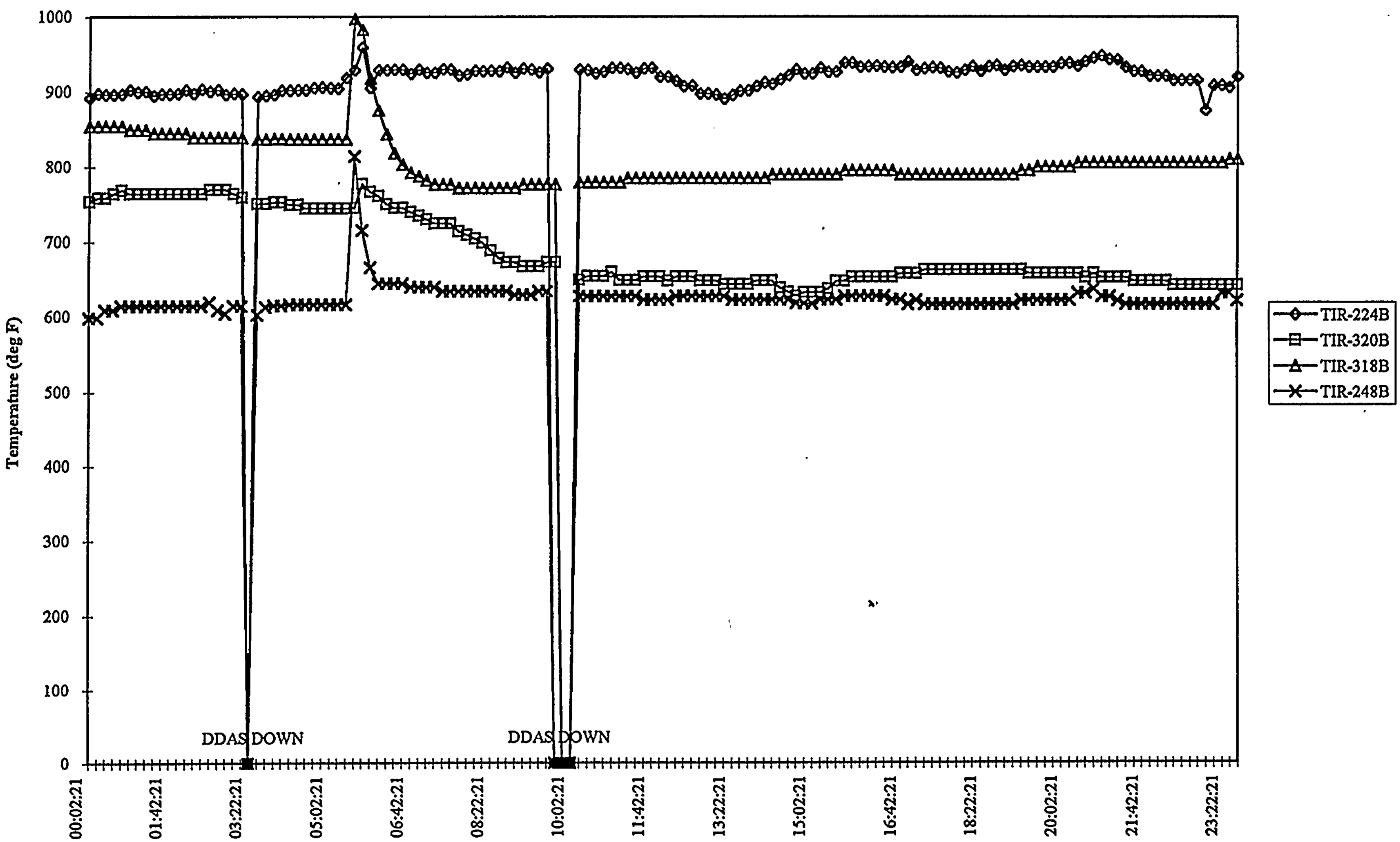
## MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/15/94



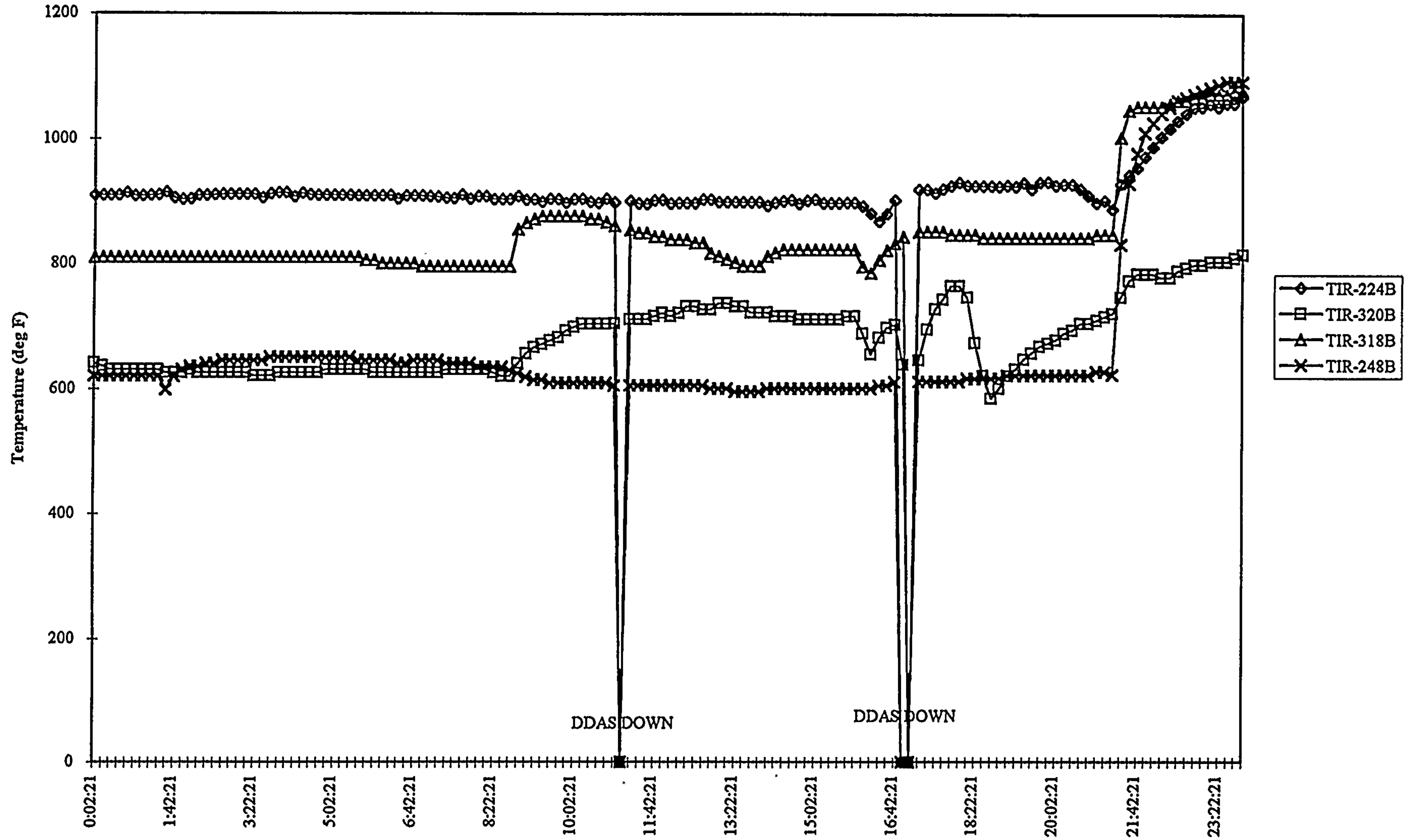
## MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/06/94

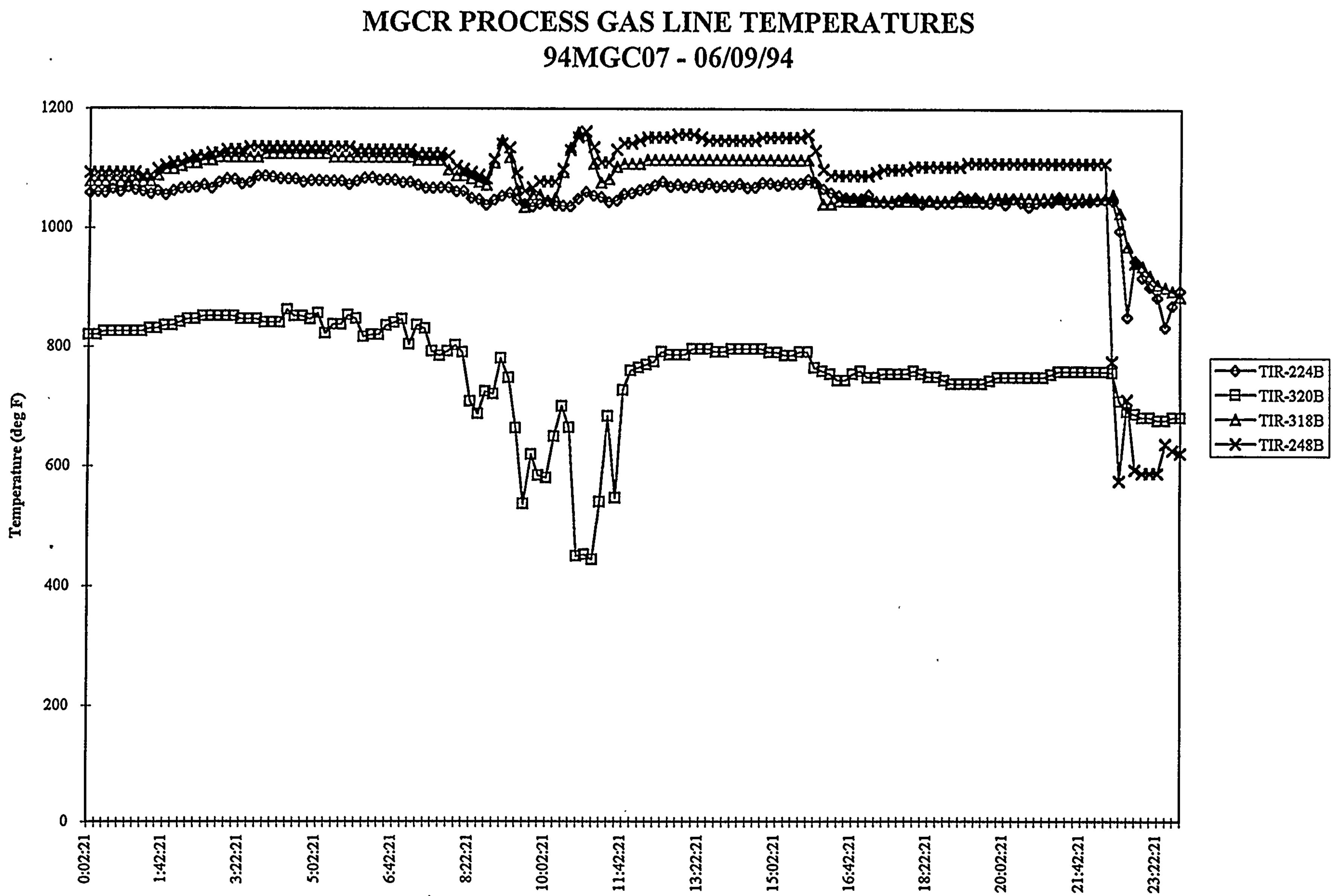


## MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/07/94

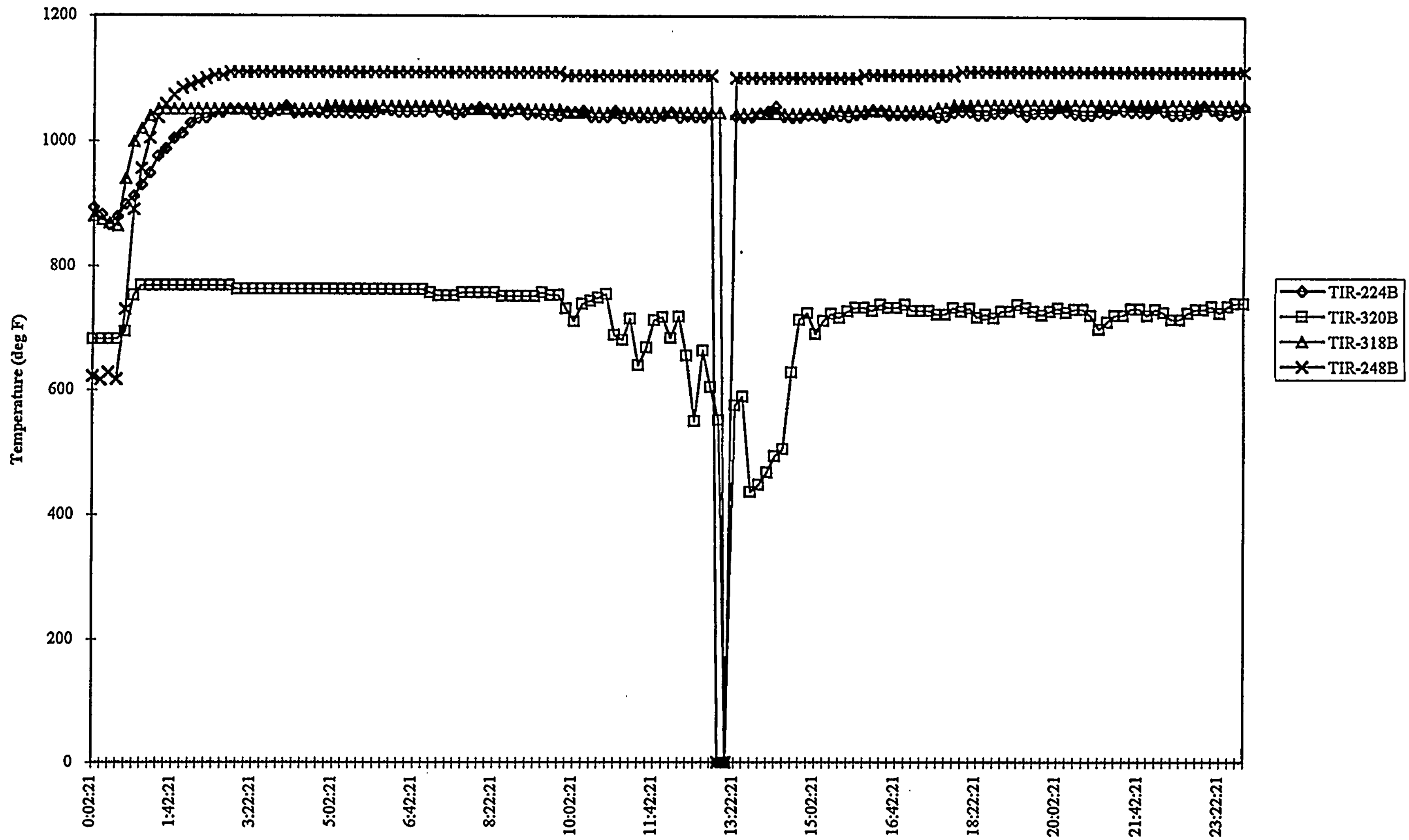


# MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/08/94

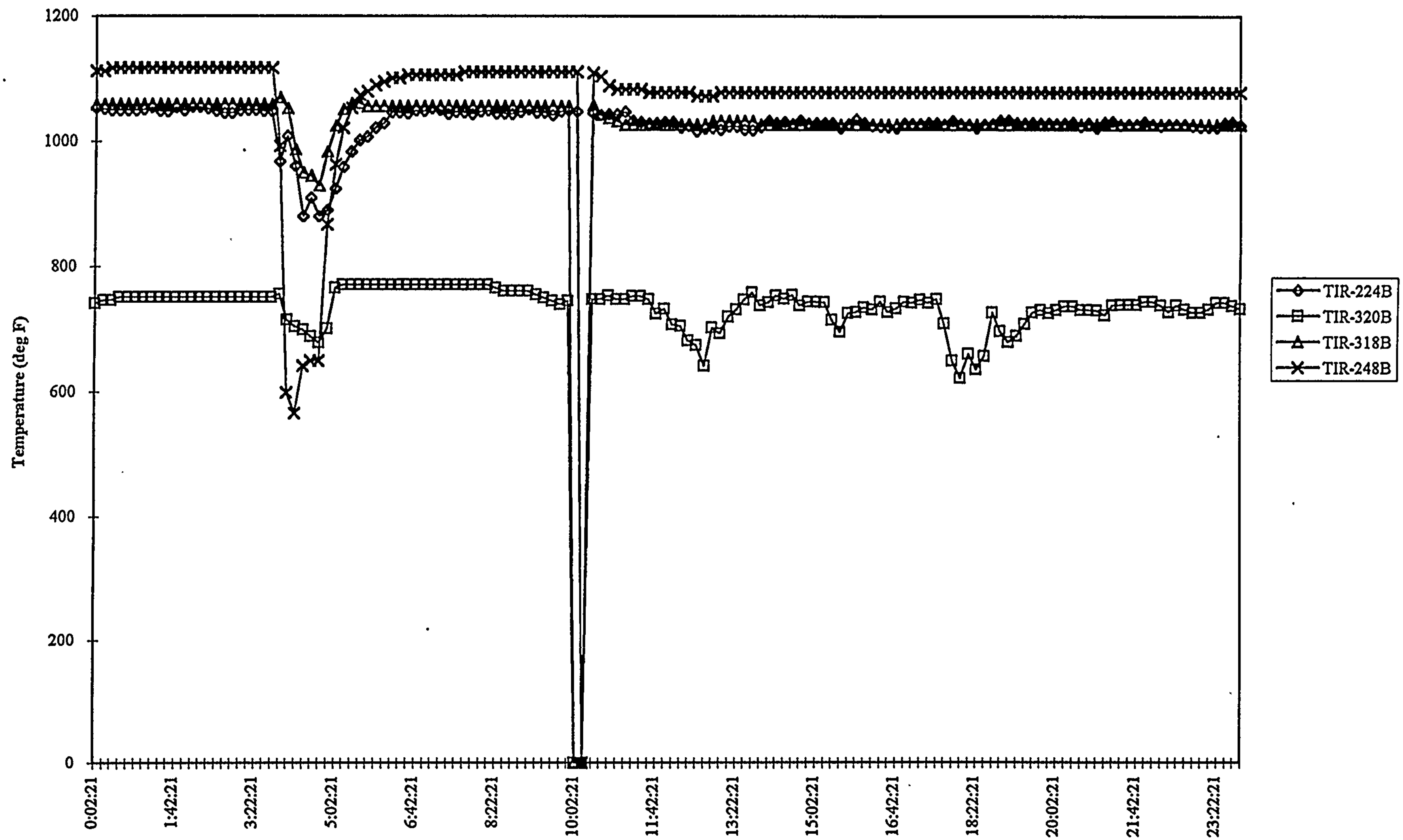



MGCR PROCESS GAS LINE TEMPERATURES
94MGC07 - 06/09/94
Temperature (deg F)
1200
1000
800
600
400
200
0
0:02:21
1:42:21
3:22:21
5:02:21
6:42:21
8:22:21
10:02:21
11:42:21
13:22:21
15:02:21
16:42:21
18:22:21
20:02:21
21:42:21
23:22:21
TIR-224B
TIR-320B
TIR-318B
TIR-248B

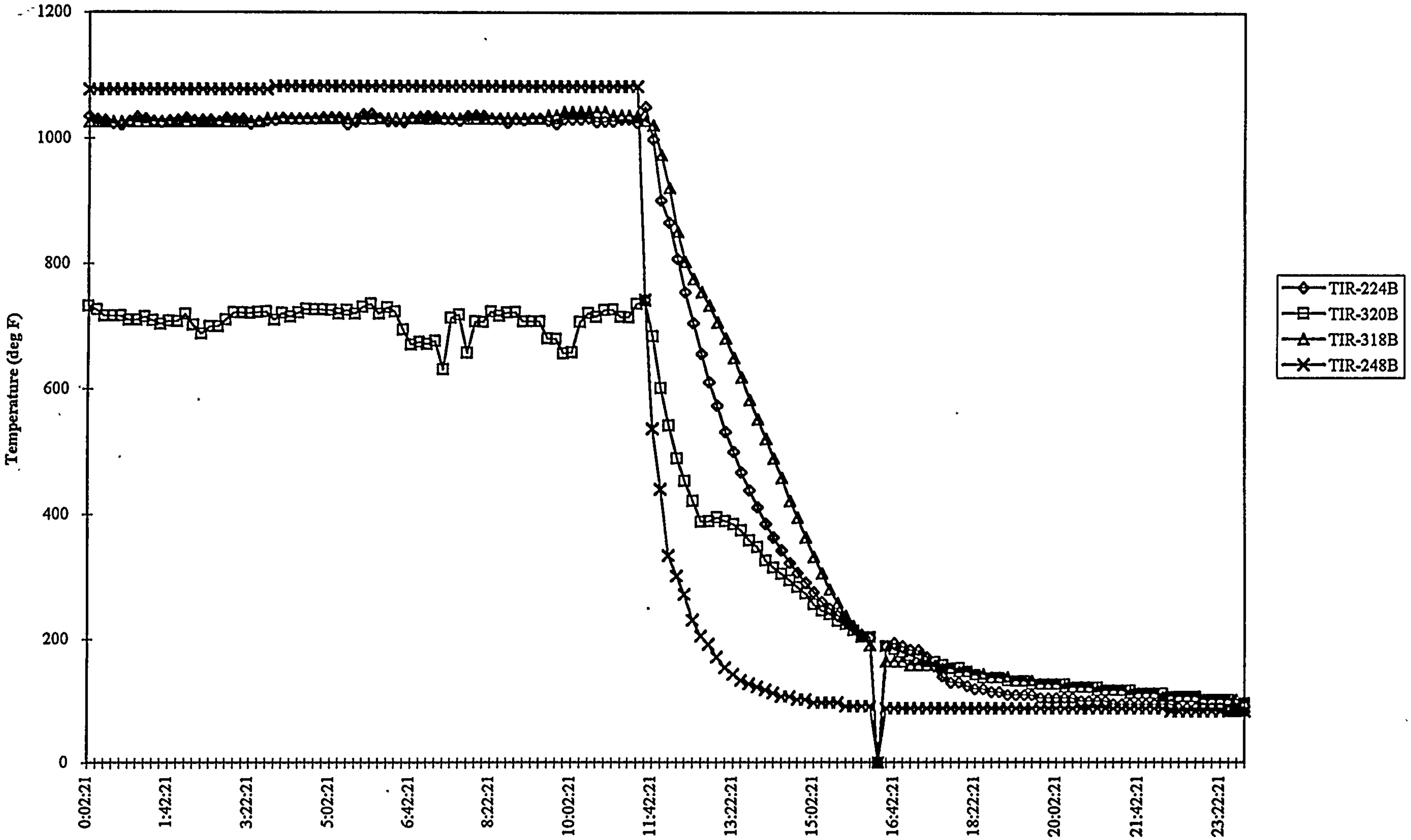
# MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/10/94



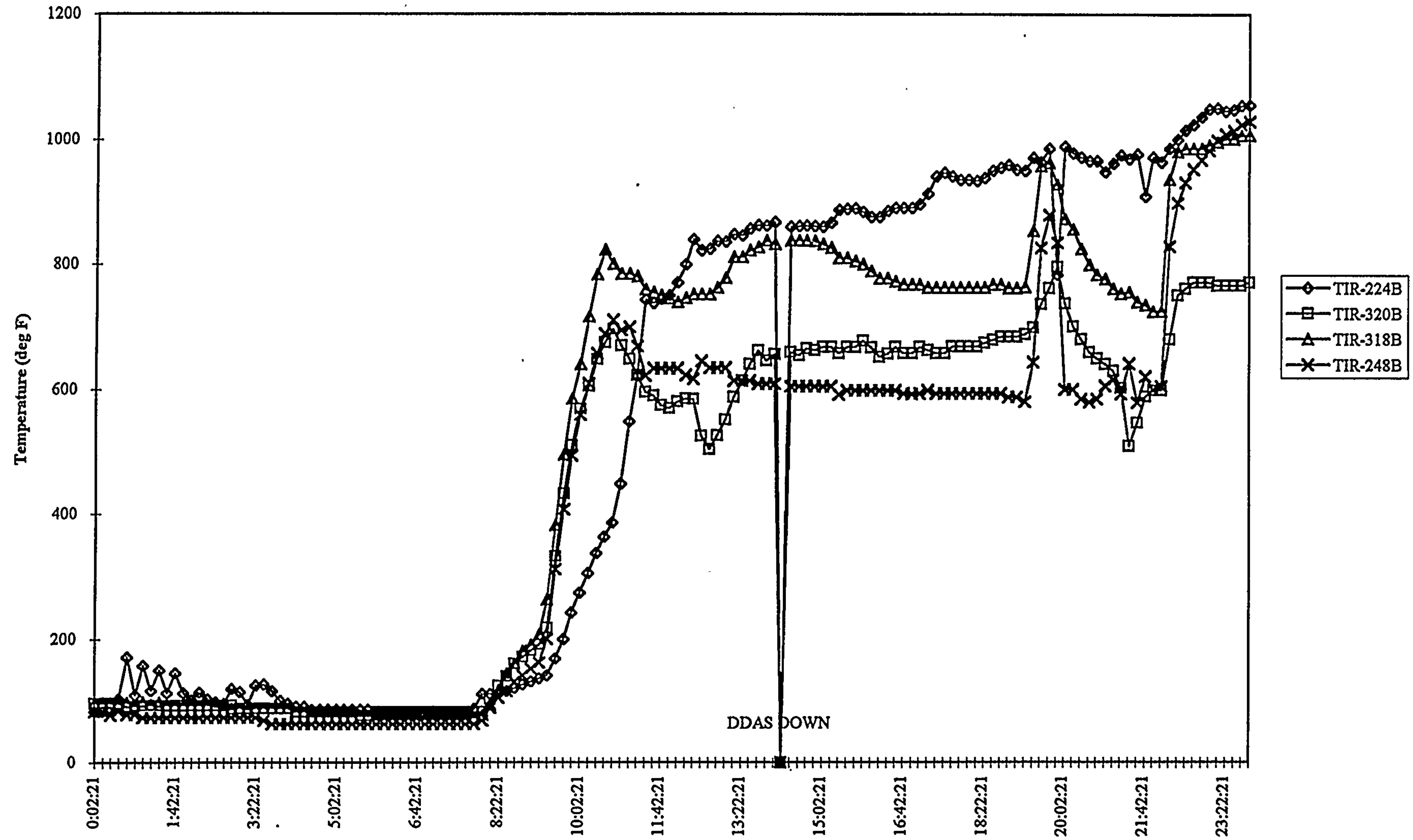
## MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/11/94



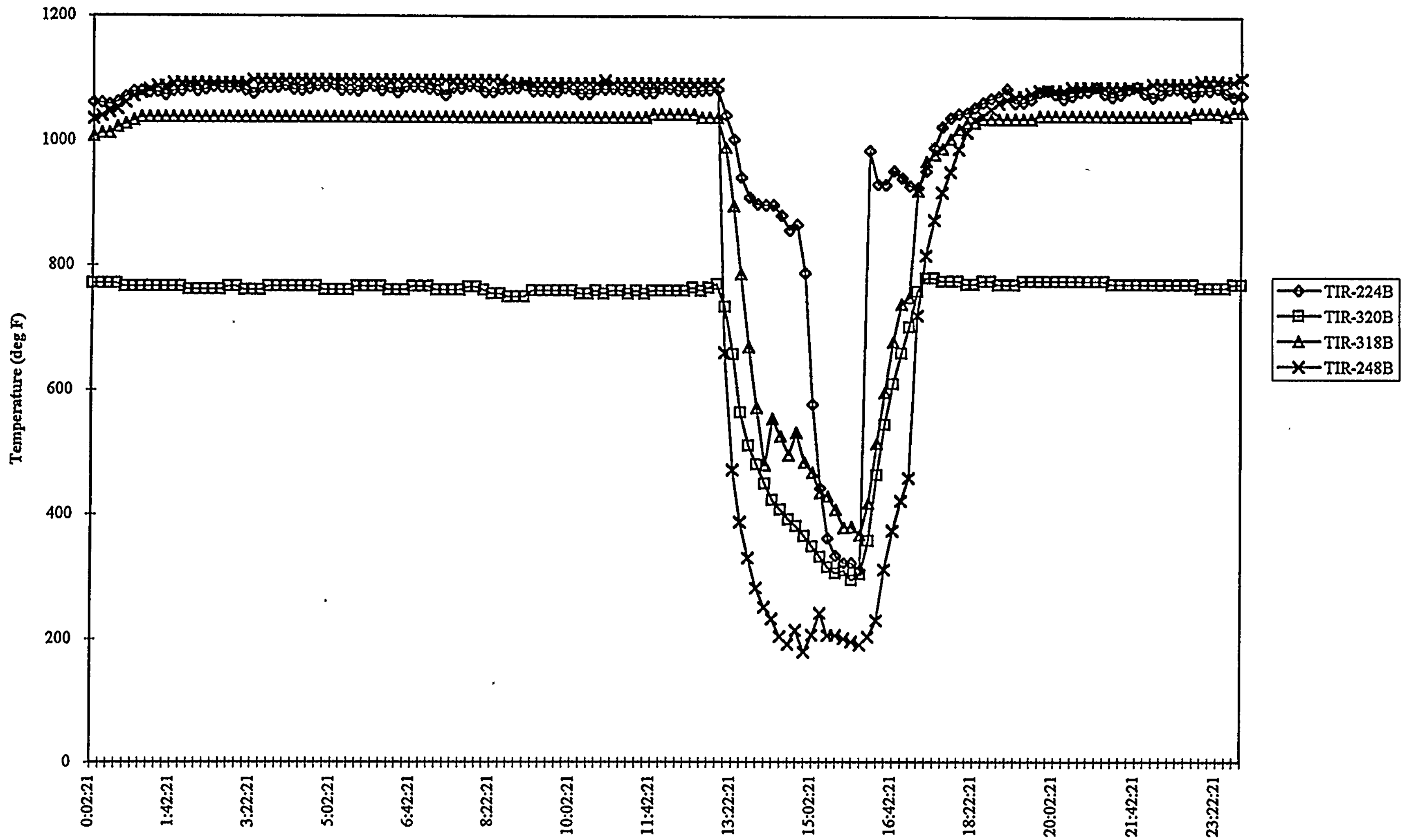
# MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/12/94



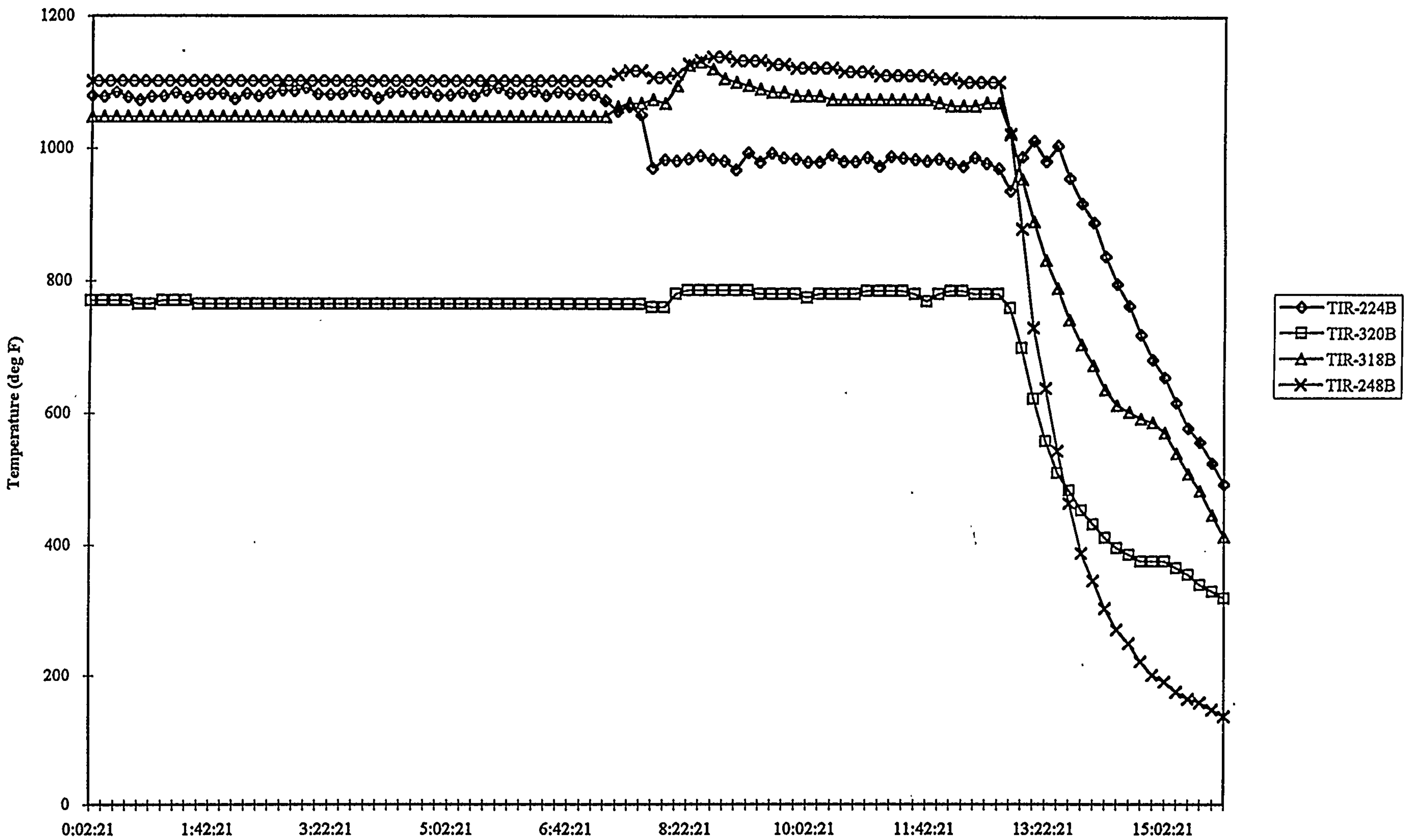
# MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/13/94



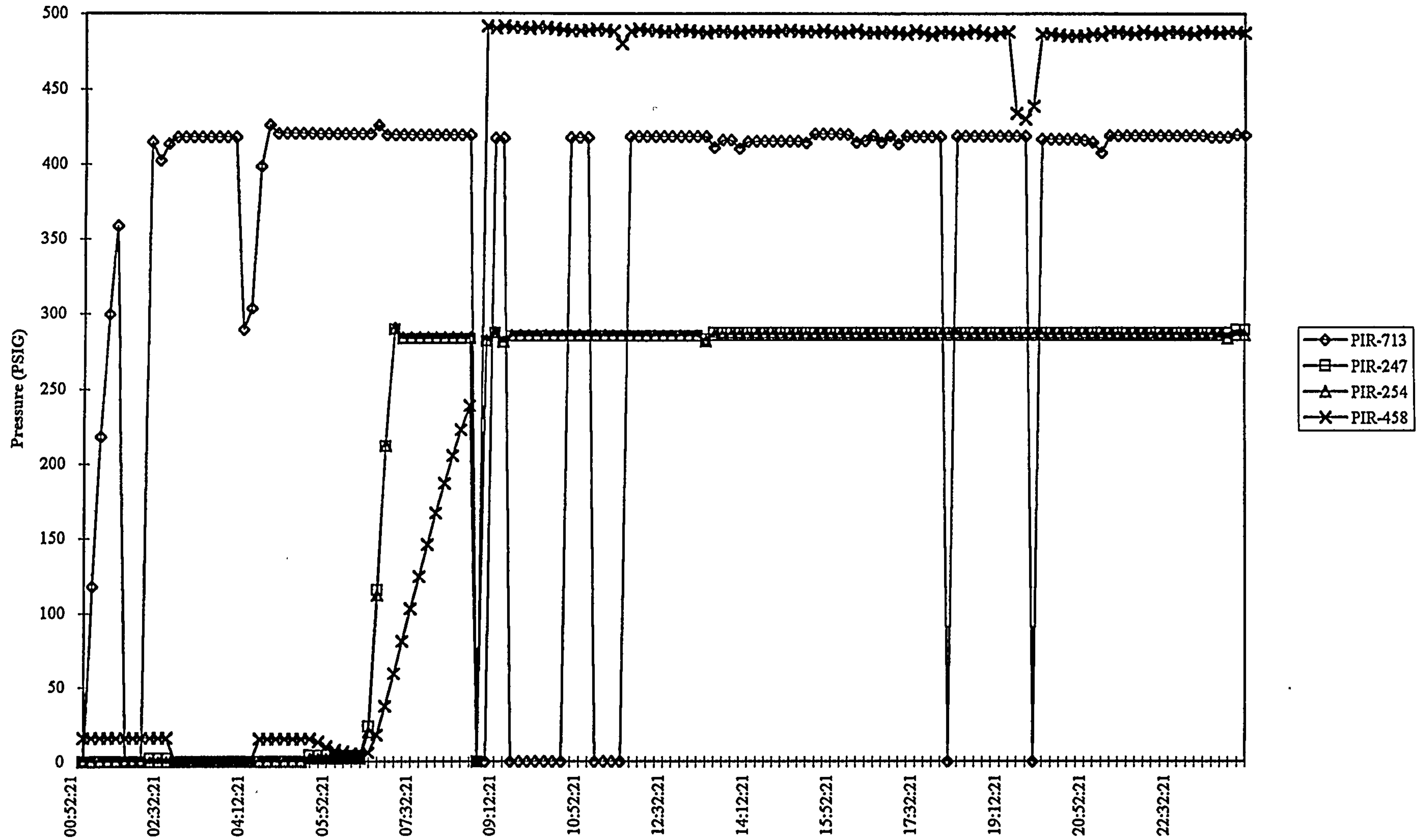
## MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/14/94

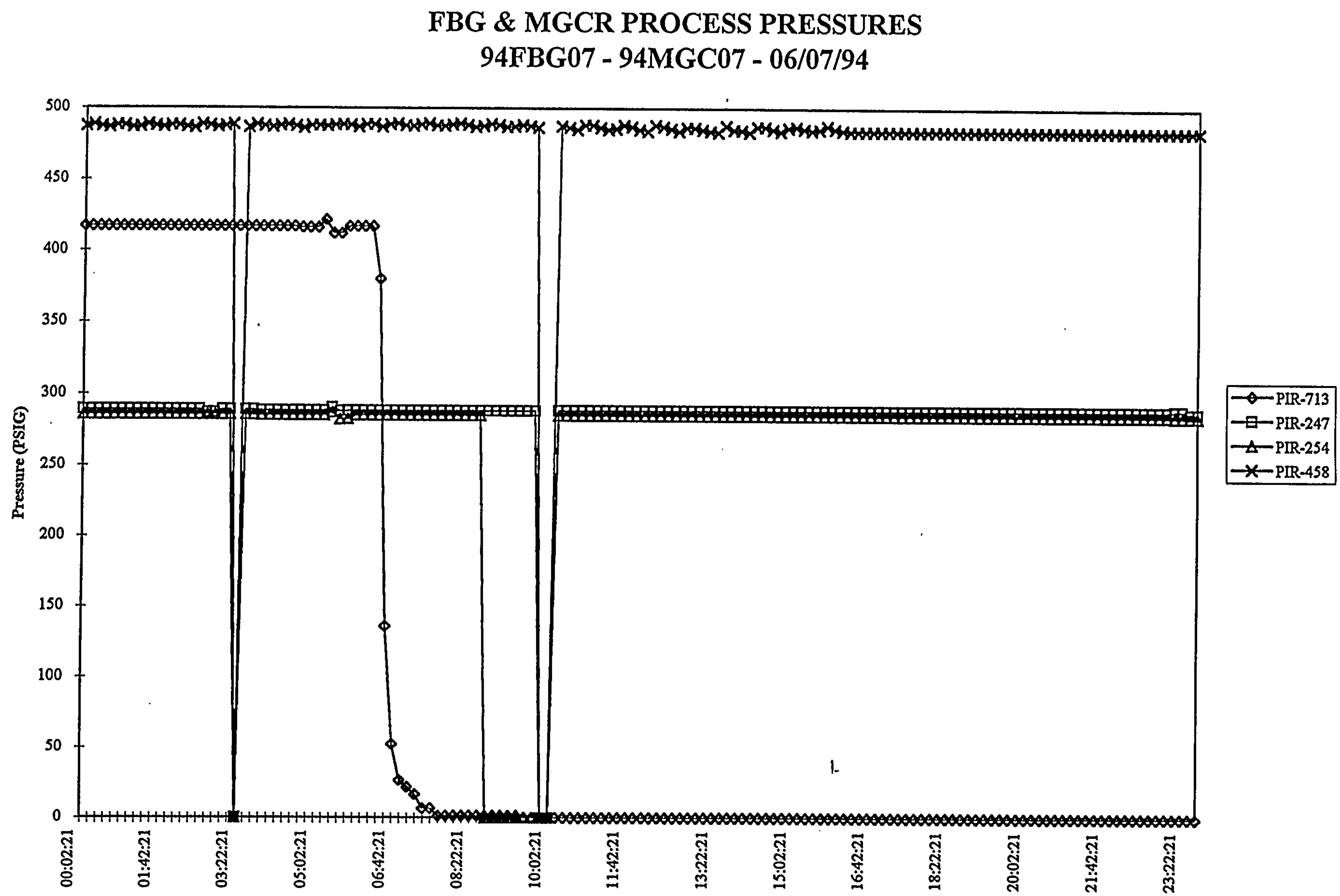


## MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/15/94

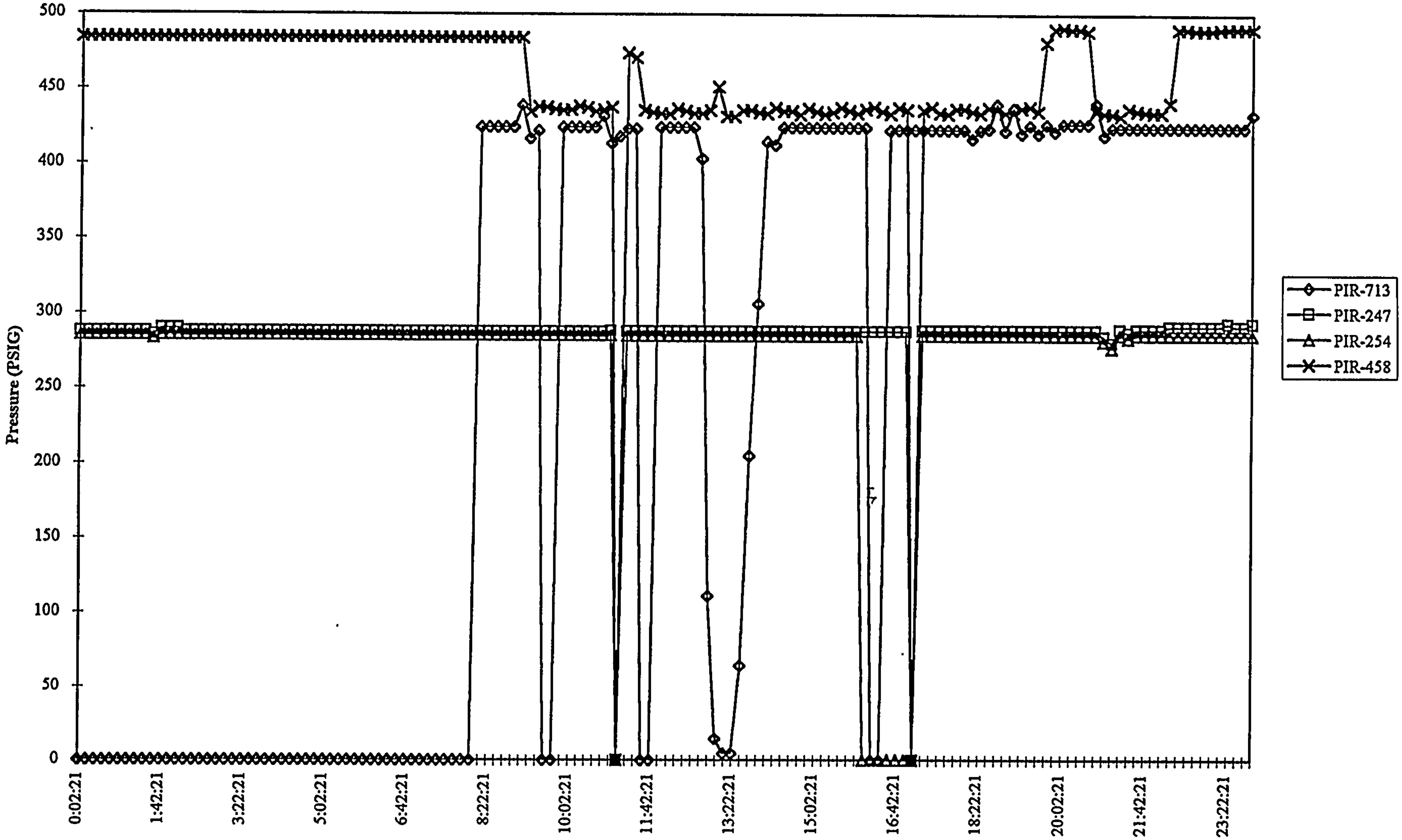


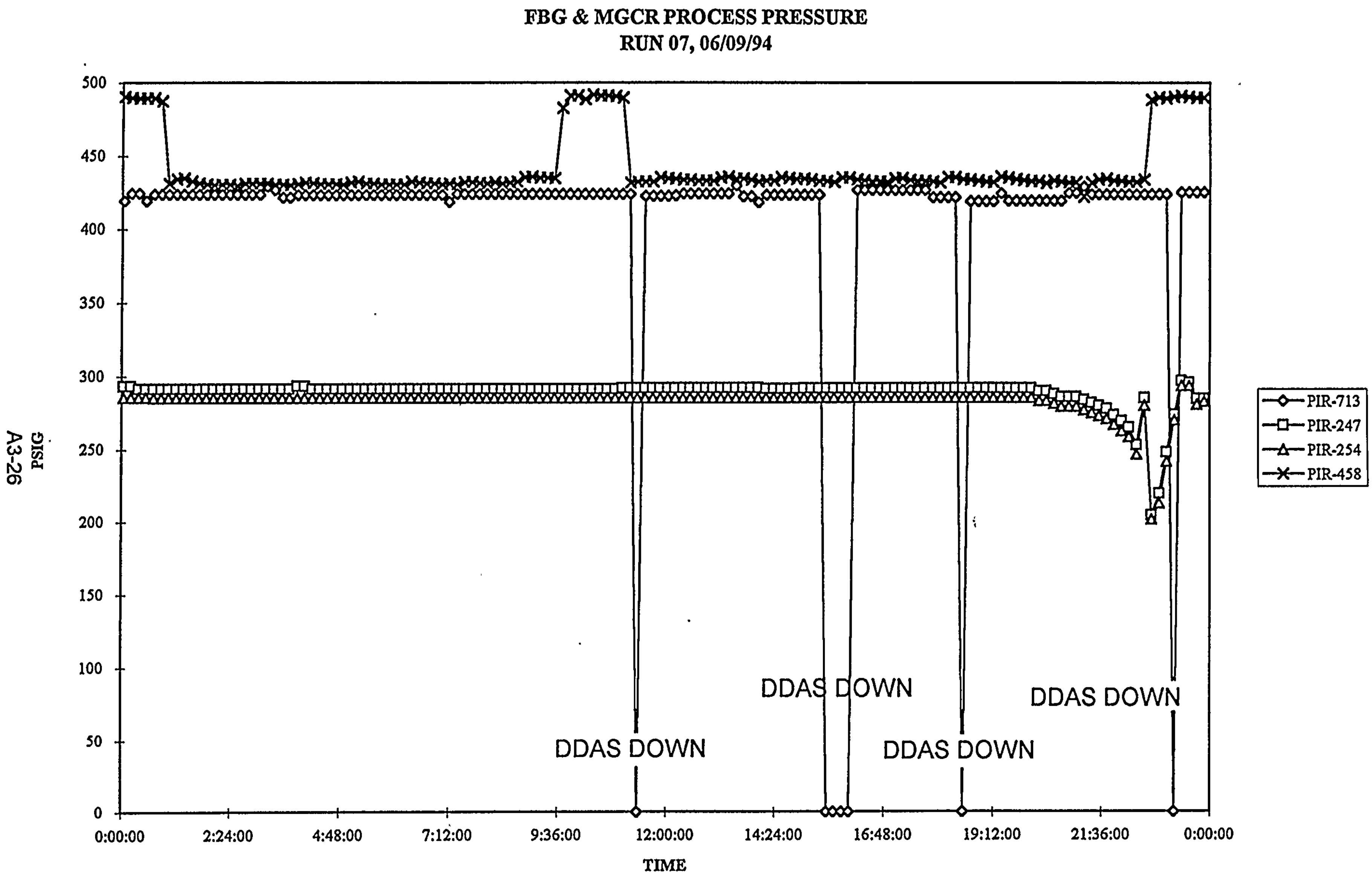
# FBG & MGCR PROCESS PRESSURES
# 94FBG07 - 94MGC07 - 06/06/94



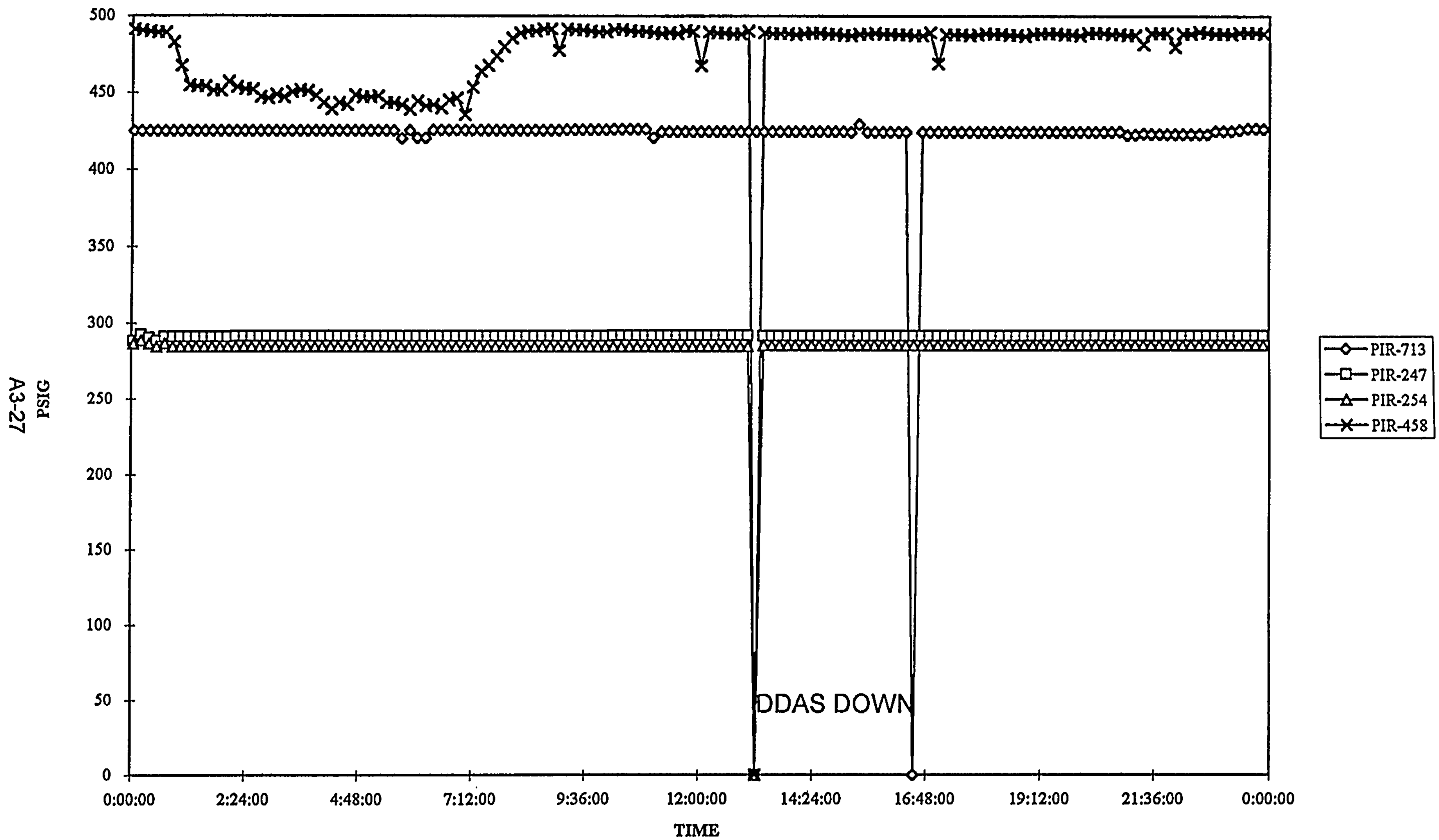

FBG & MGCR PROCESS PRESSURES
94FBG07 - 94MGC07 - 06/07/94
Pressure (PSIG)
500
450
400
350
300
250
200
150
100
50
0
00:02:21
01:42:21
03:22:21
05:02:21
06:42:21
08:22:21
10:02:21
11:42:21
13:22:21
15:02:21
16:42:21
18:22:21
20:02:21
21:42:21
23:22:21
PIR-713
PIR-247
PIR-254
PIR-458

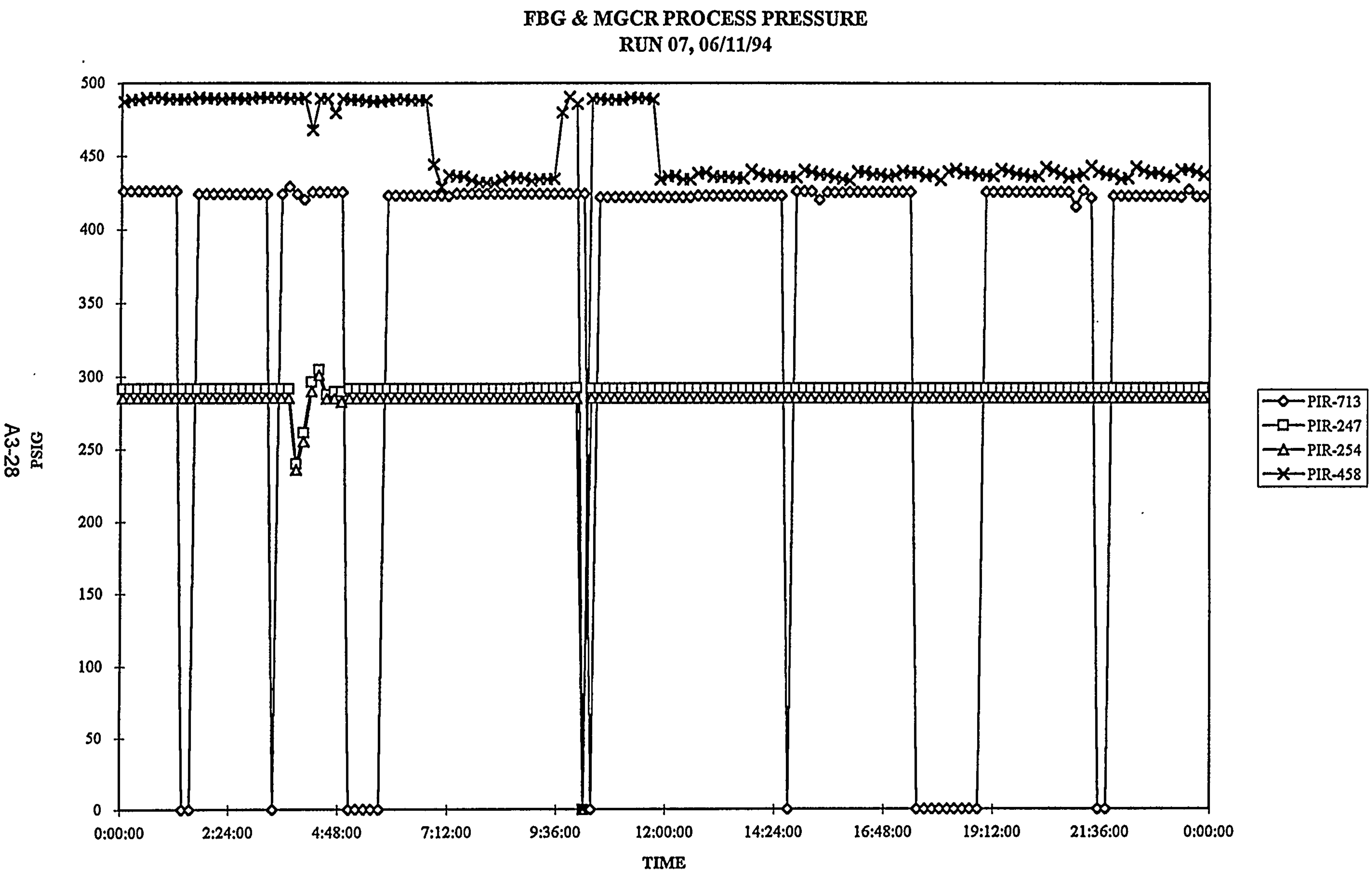
FBG & MGCR PROCESS PRESSURES
94FBG07 - 94MGC07 - 06/08/94




FBG & MGCR PROCESS PRESSURE
RUN 07, 06/09/94
PSIG
TIME
0:00:00
2:24:00
4:48:00
7:12:00
9:36:00
12:00:00
14:24:00
16:48:00
19:12:00
21:36:00
0:00:00
0
50
100
150
200
250
300
350
400
450
500
DDAS DOWN
DDAS DOWN
DDAS DOWN
DDAS DOWN
PIR-713
PIR-247
PIR-254
PIR-458

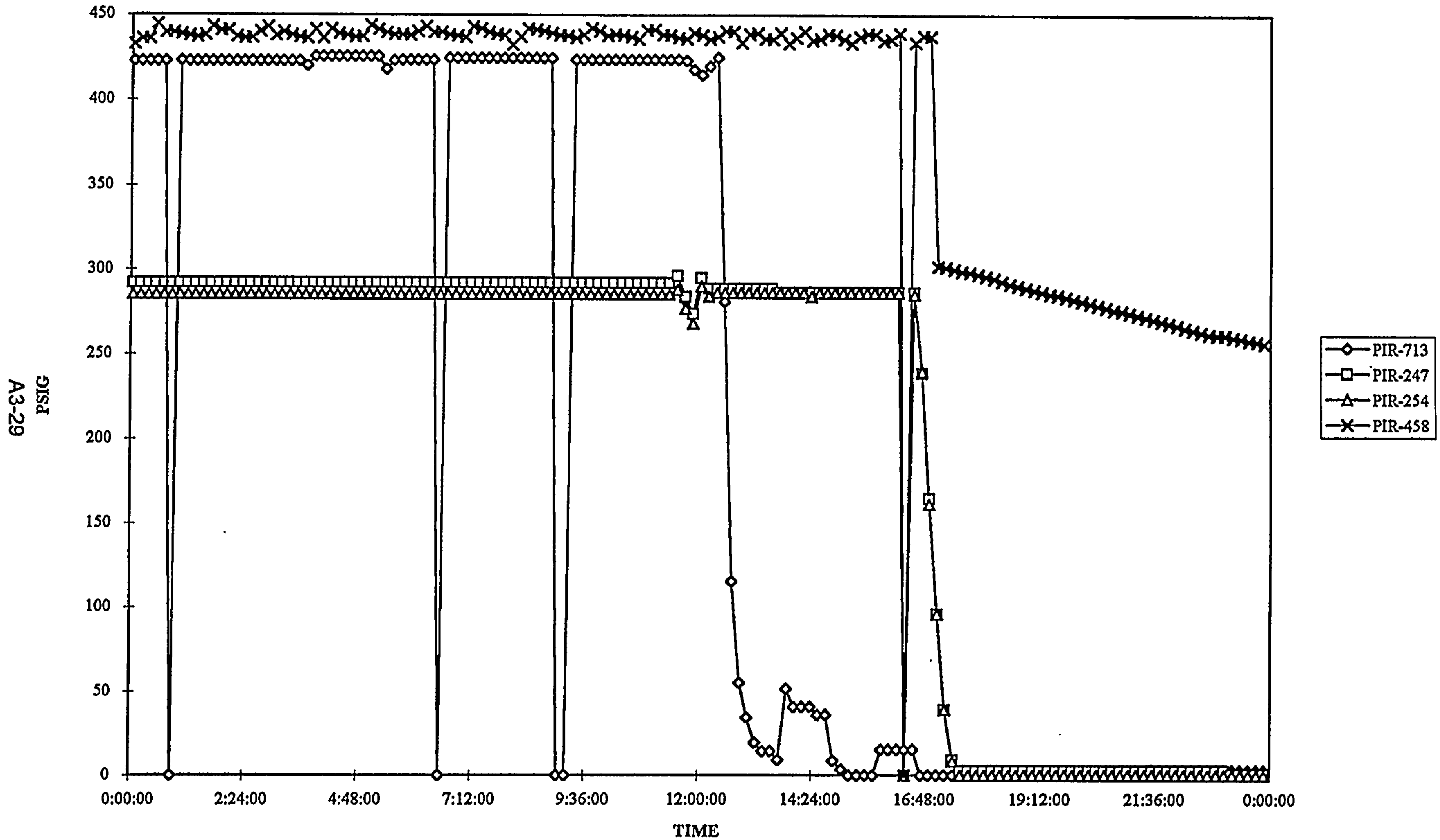
FBG & MGCR PROCESS PRESSURE
RUN 07, 06/10/94




FBG & MGCR PROCESS PRESSURE
RUN 07, 06/11/94
500
450
400
350
300
250
200
150
100
50
0
PSIG
0:00:00
2:24:00
4:48:00
7:12:00
9:36:00
12:00:00
14:24:00
16:48:00
19:12:00
21:36:00
0:00:00
TIME
PIR-713
PIR-247
PIR-254
PIR-458

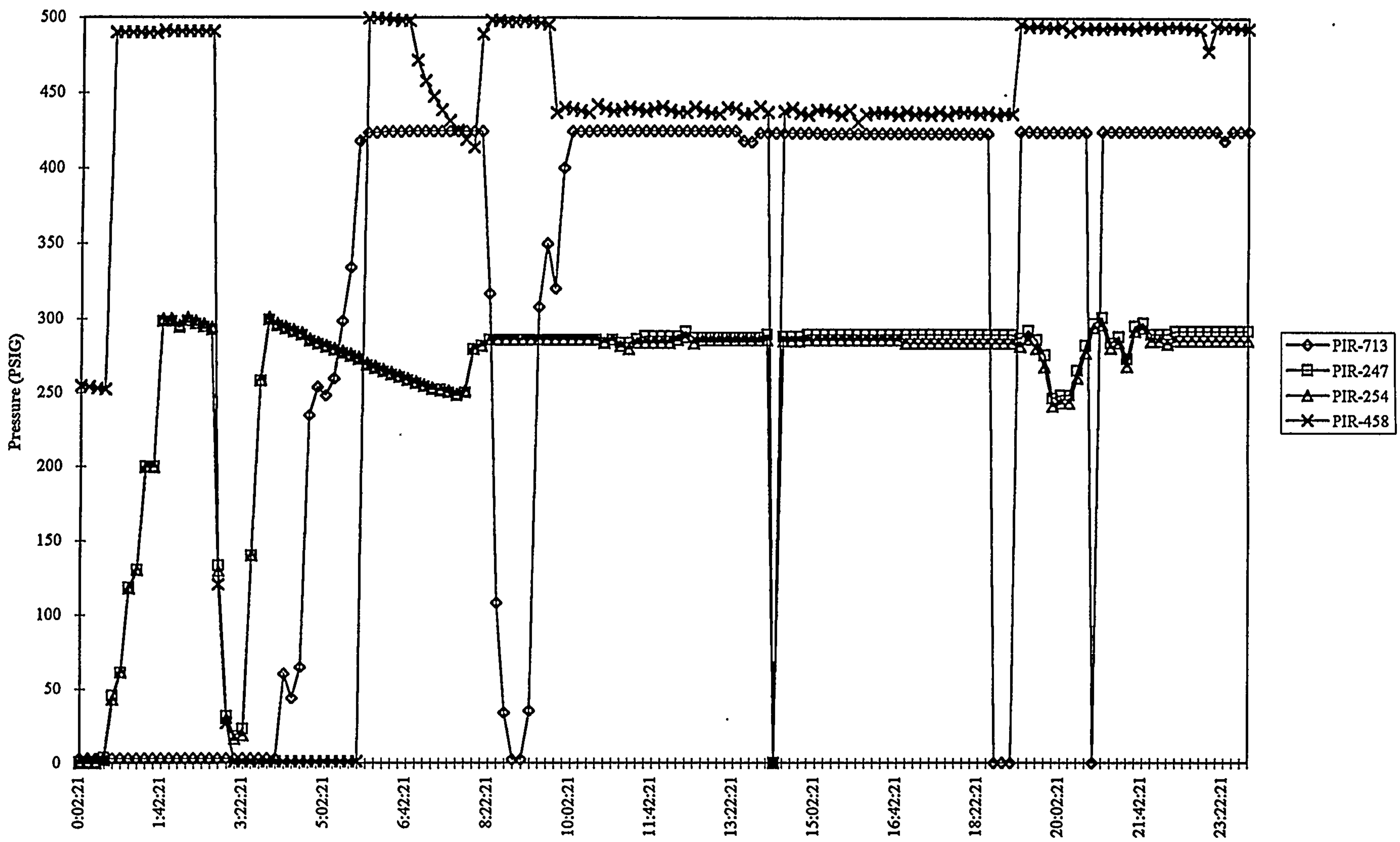
A3-28

FBG & MGCR PROCESS PRESSURE
RUN 07, 06/12/94

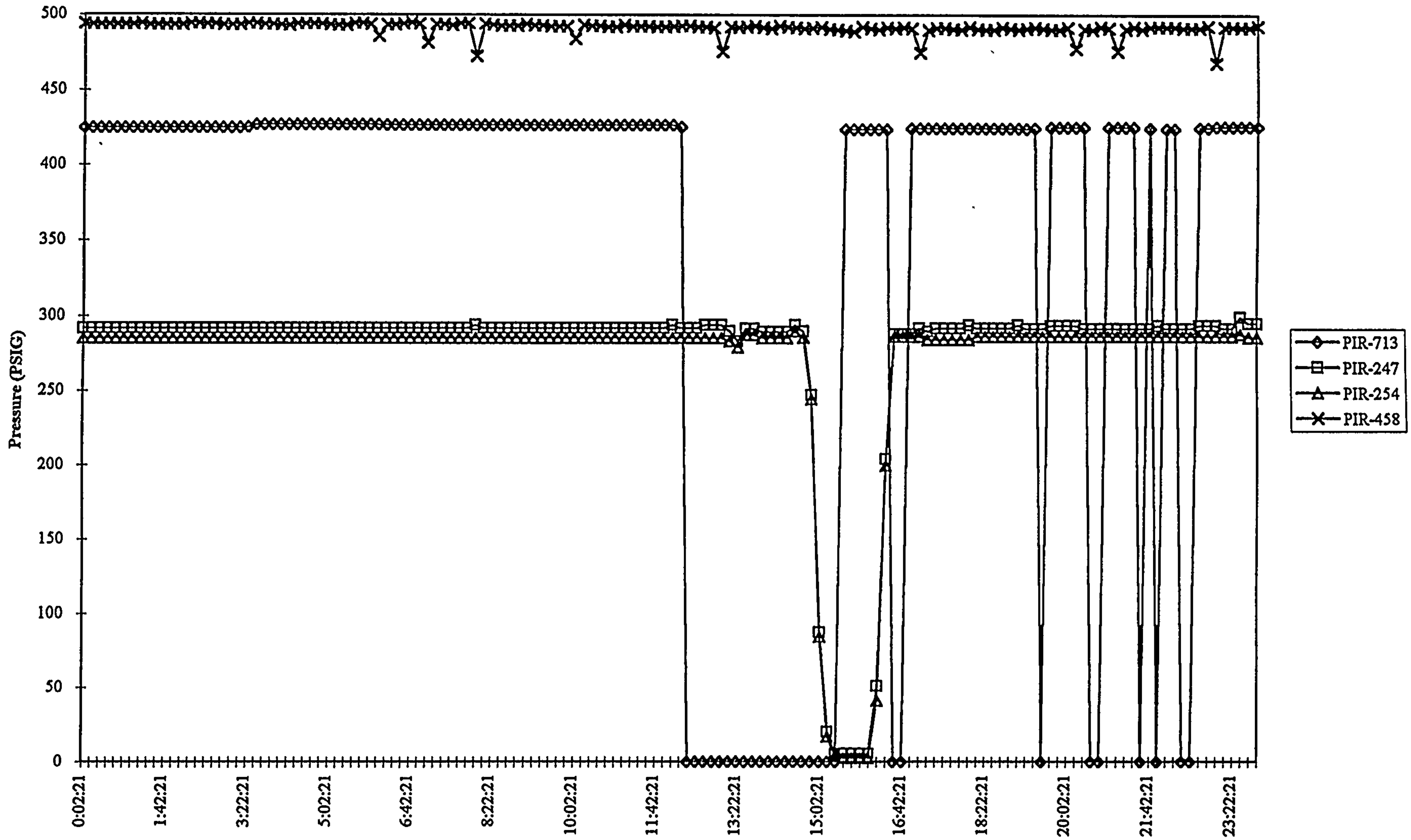



A3-29

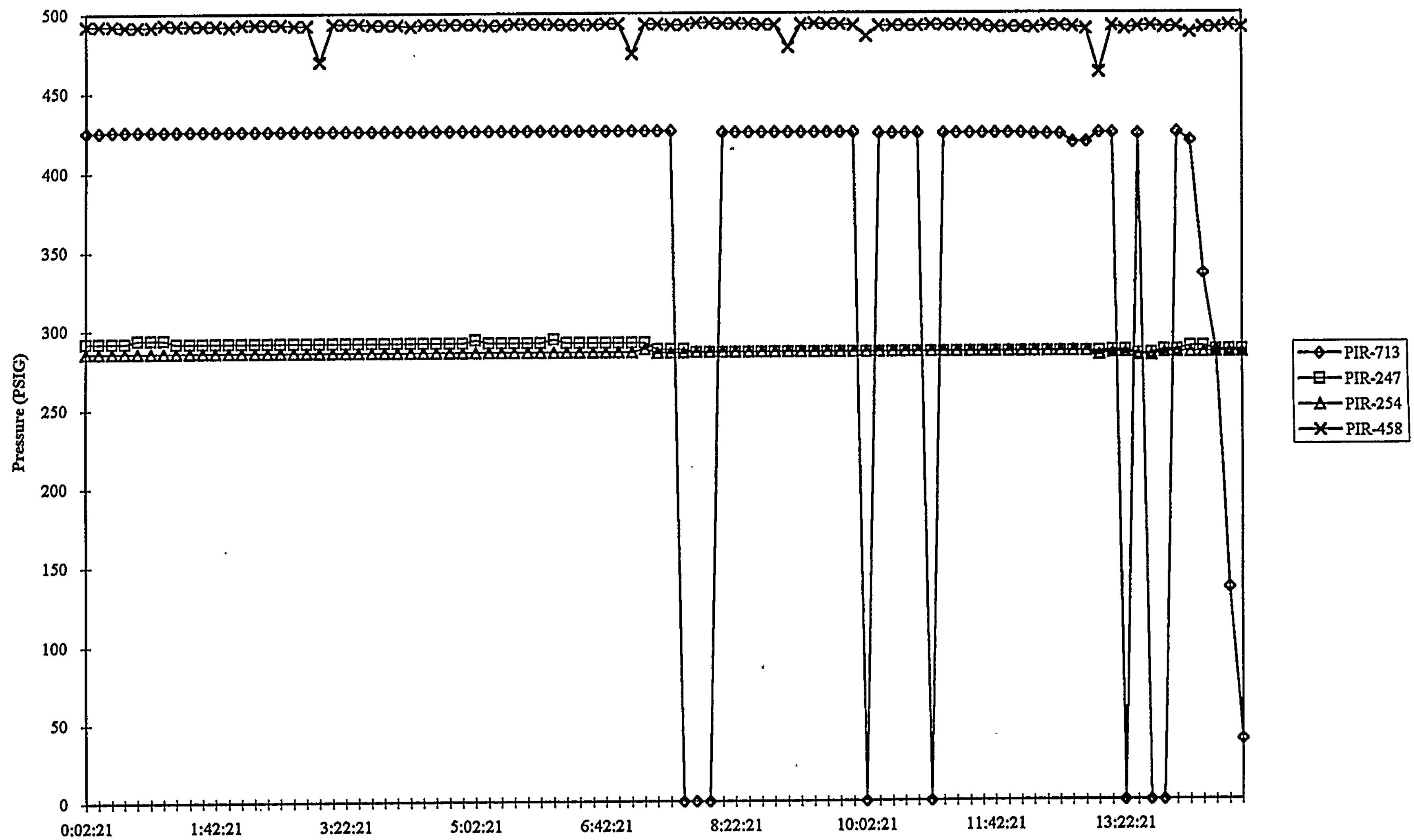
# FBG & MGCR PROCESS PRESSURES
## 94FBG07 - 94MGC07 - 06/13/94



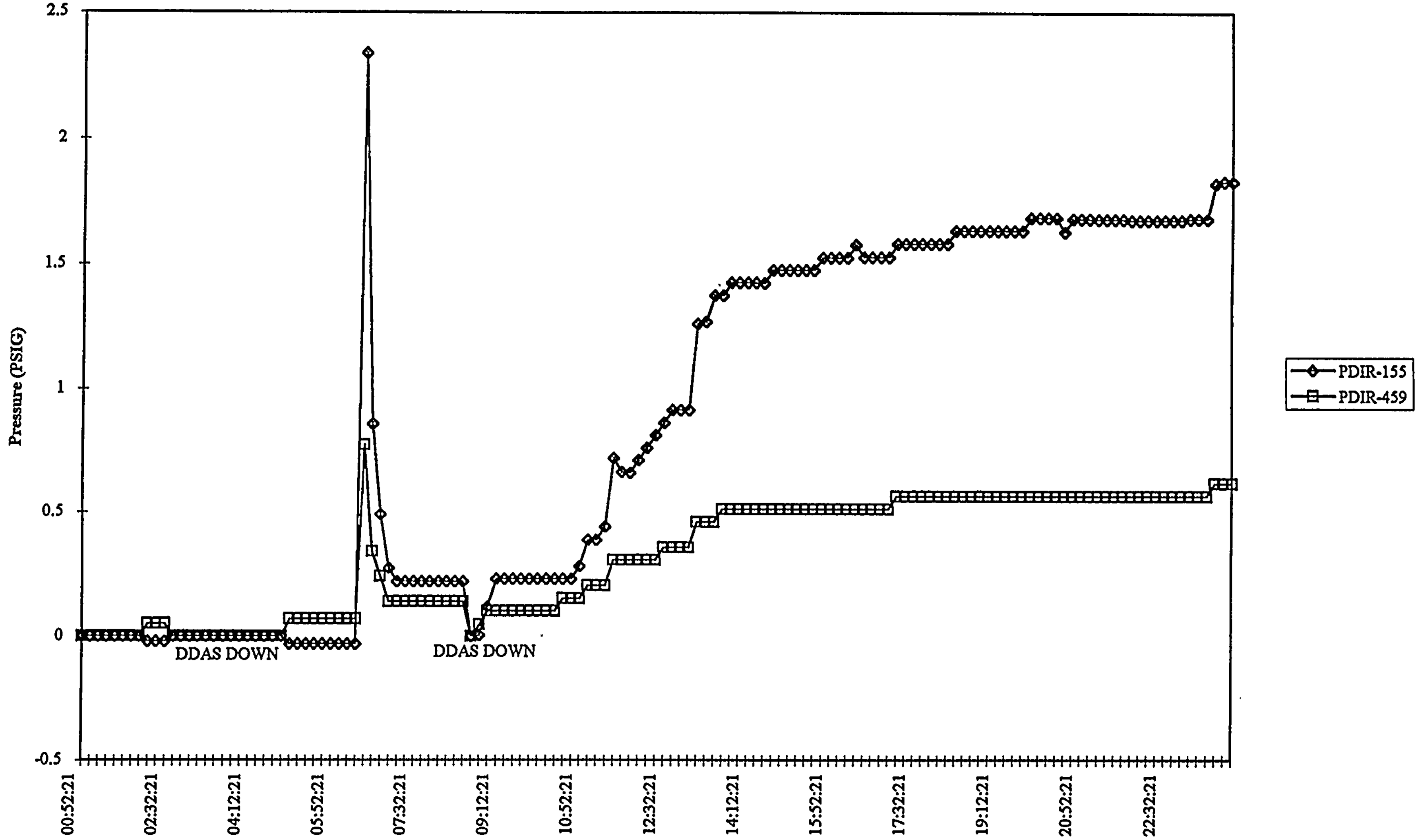
# FBG & MGCR PROCESS PRESSURES
## 94FBG07 - 94MGC07 - 06/14/94



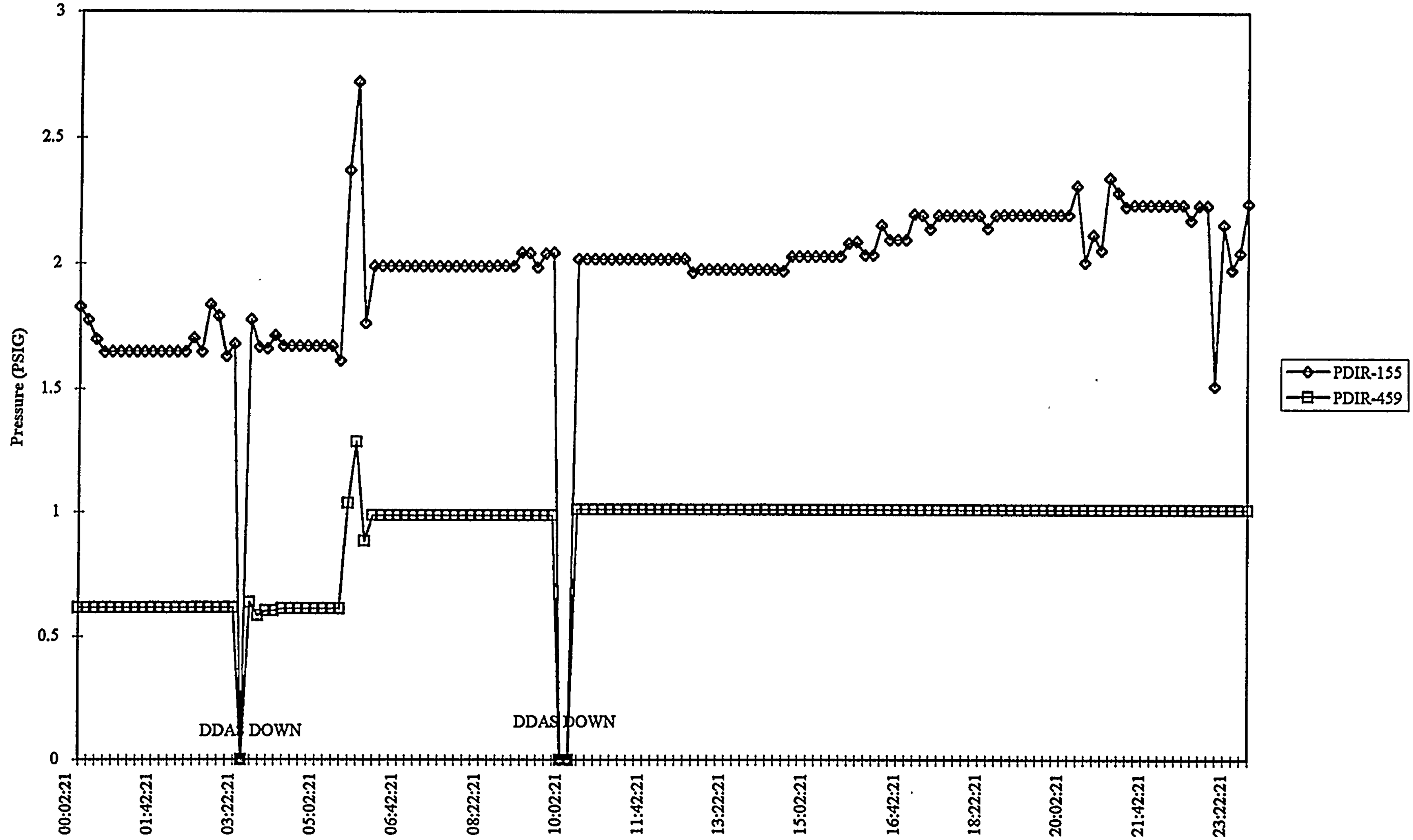
# FBG & MGCR PROCESS PRESSURES
## 94FBG07 - 94MGC07 - 06/15/94

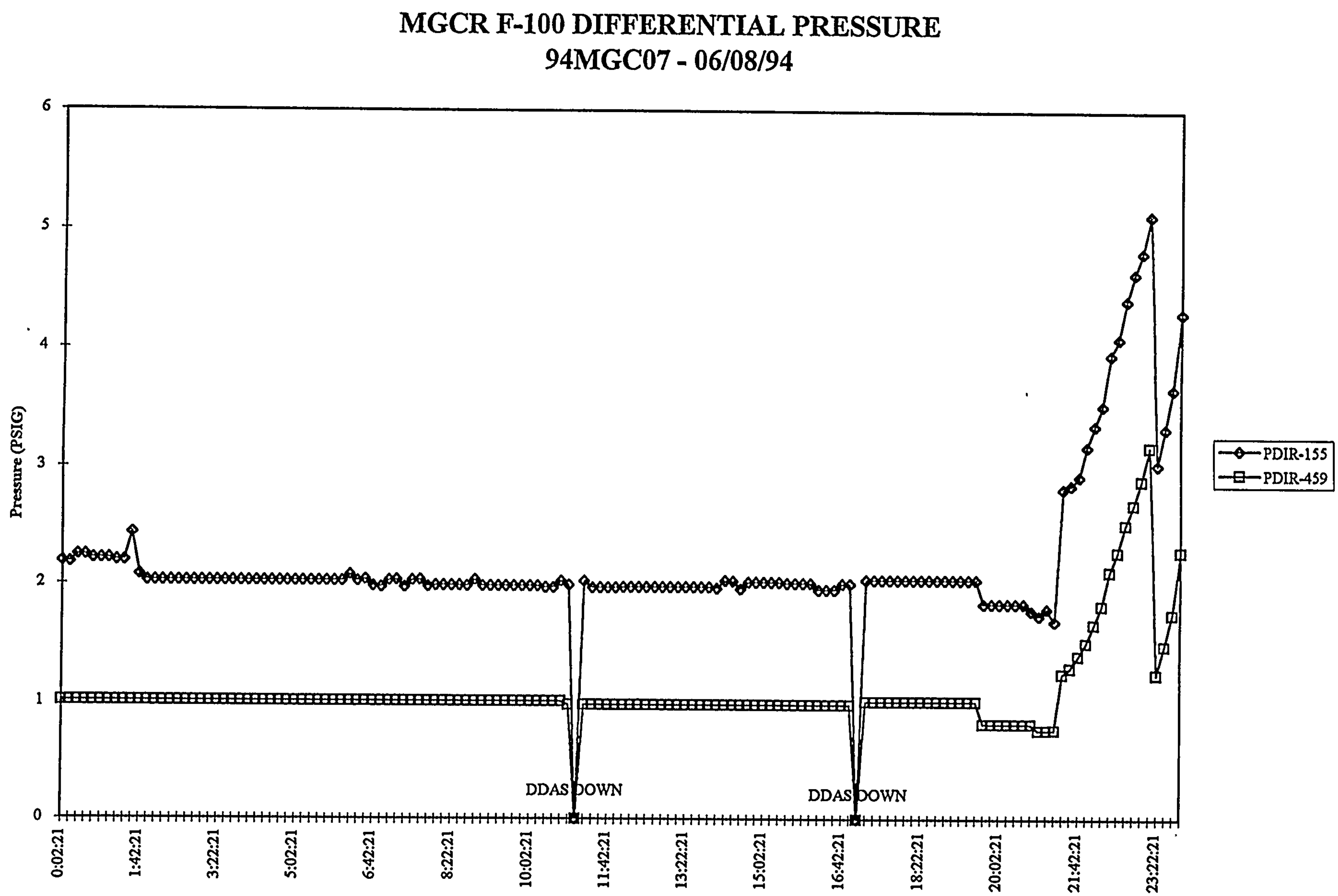


# MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/06/94



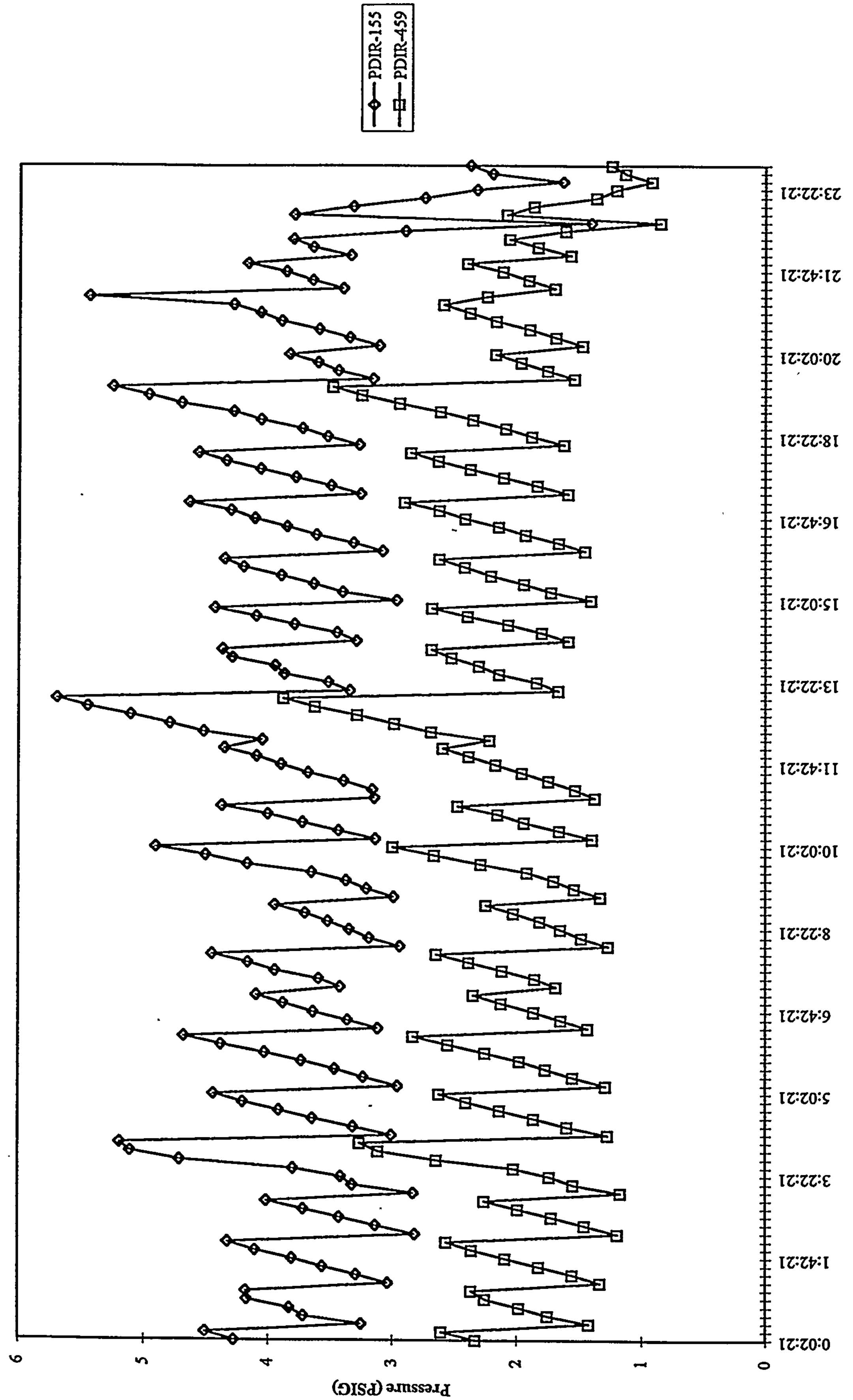
# MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/07/94



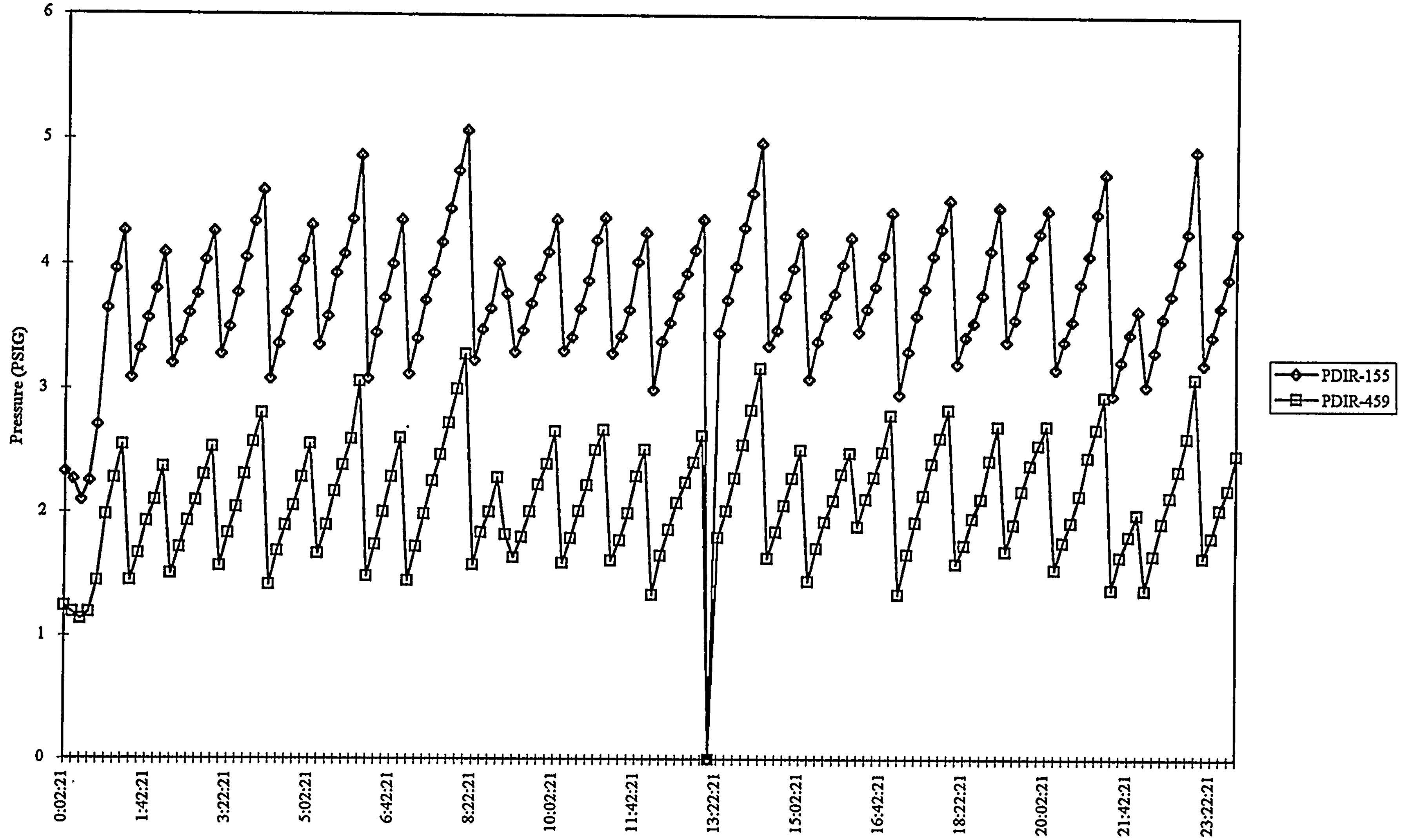


MGCR F-100 DIFFERENTIAL PRESSURE
94MGC07 - 06/08/94
Pressure (PSIG)
0
1
2
3
4
5
6
0:02:21
1:42:21
3:22:21
5:02:21
6:42:21
8:22:21
10:02:21
11:42:21
13:22:21
15:02:21
16:42:21
18:22:21
20:02:21
21:42:21
23:22:21
DDAS DOWN
DDAS DOWN
PDIR-155
PDIR-459

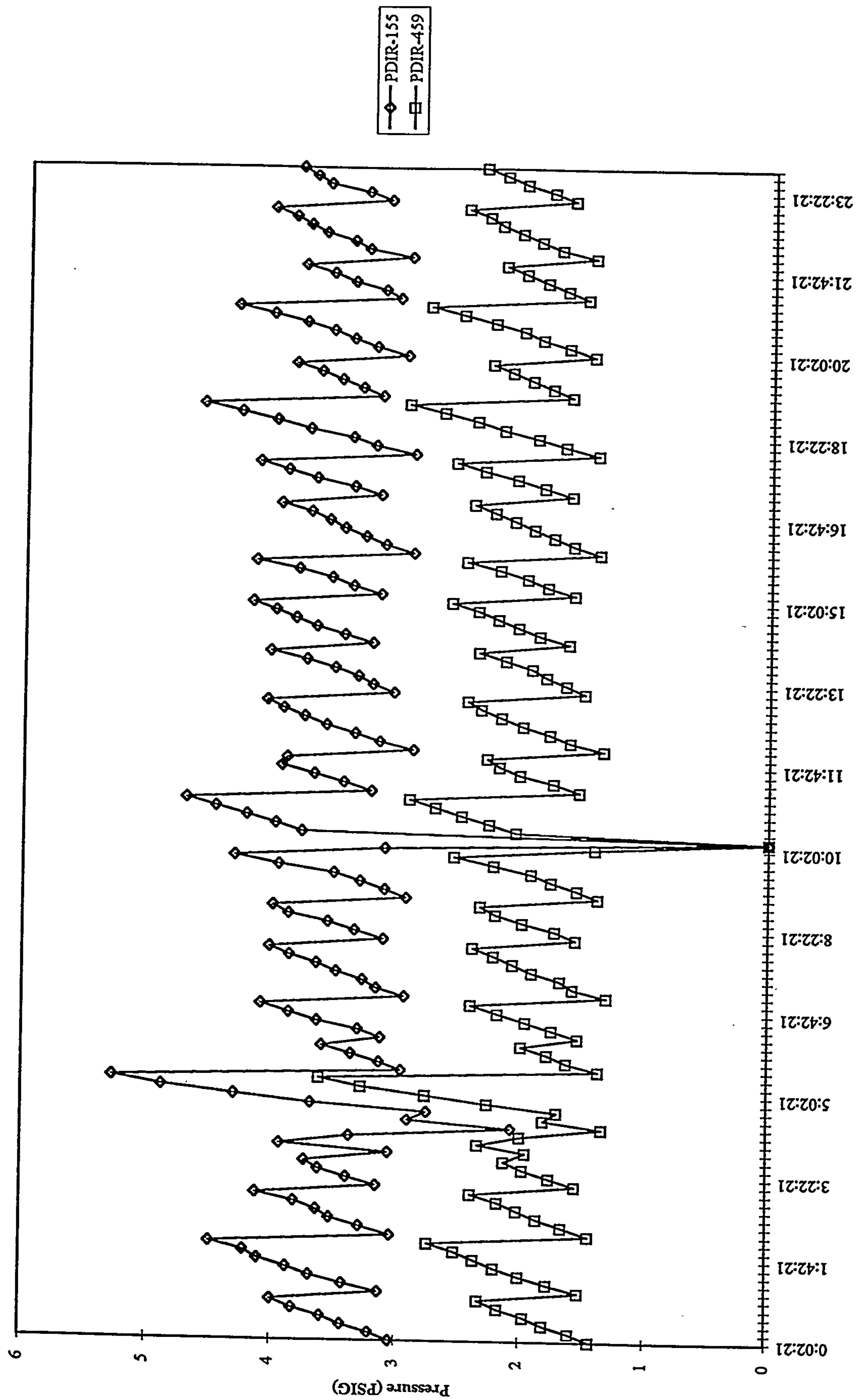
# MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/09/94



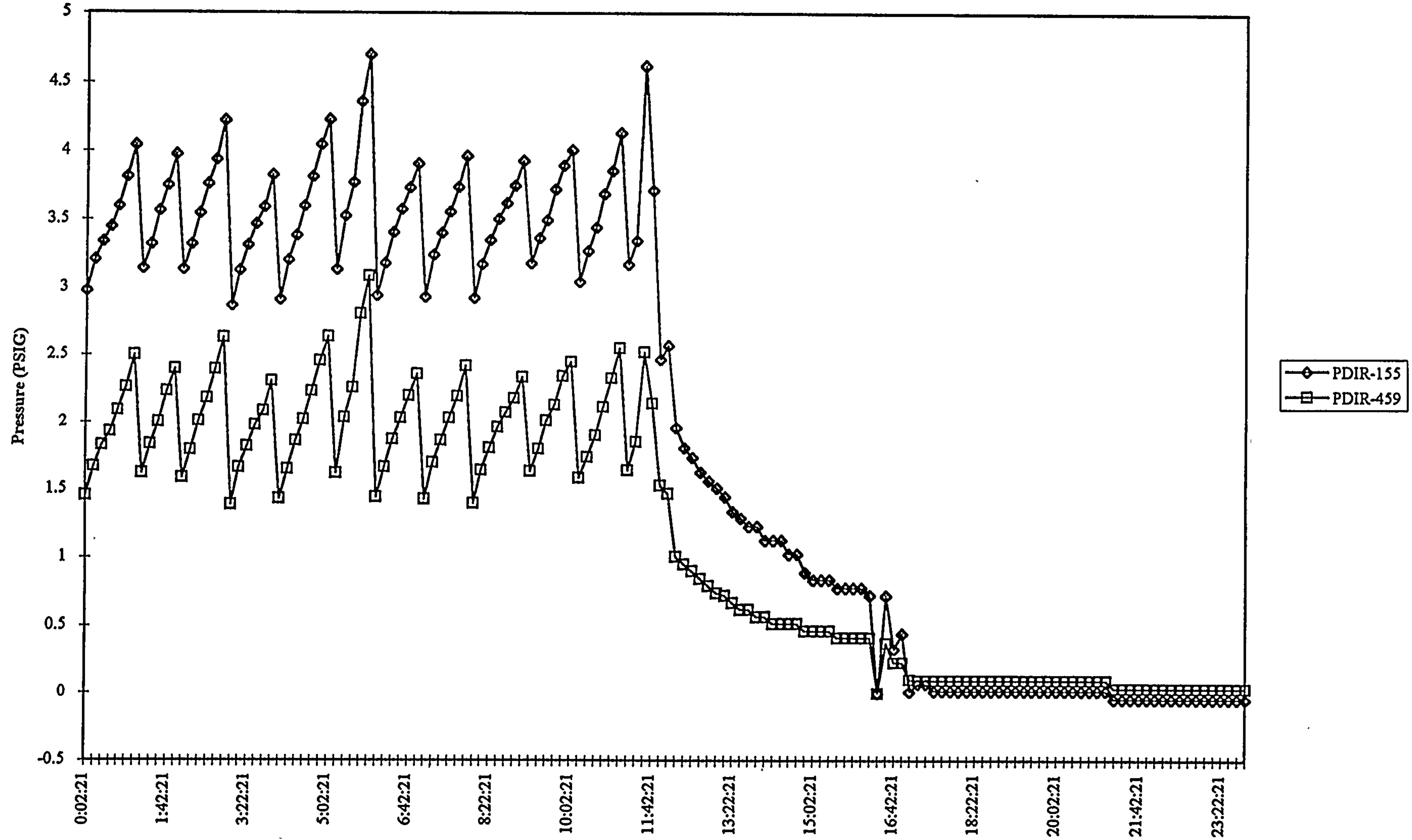
# MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/10/94



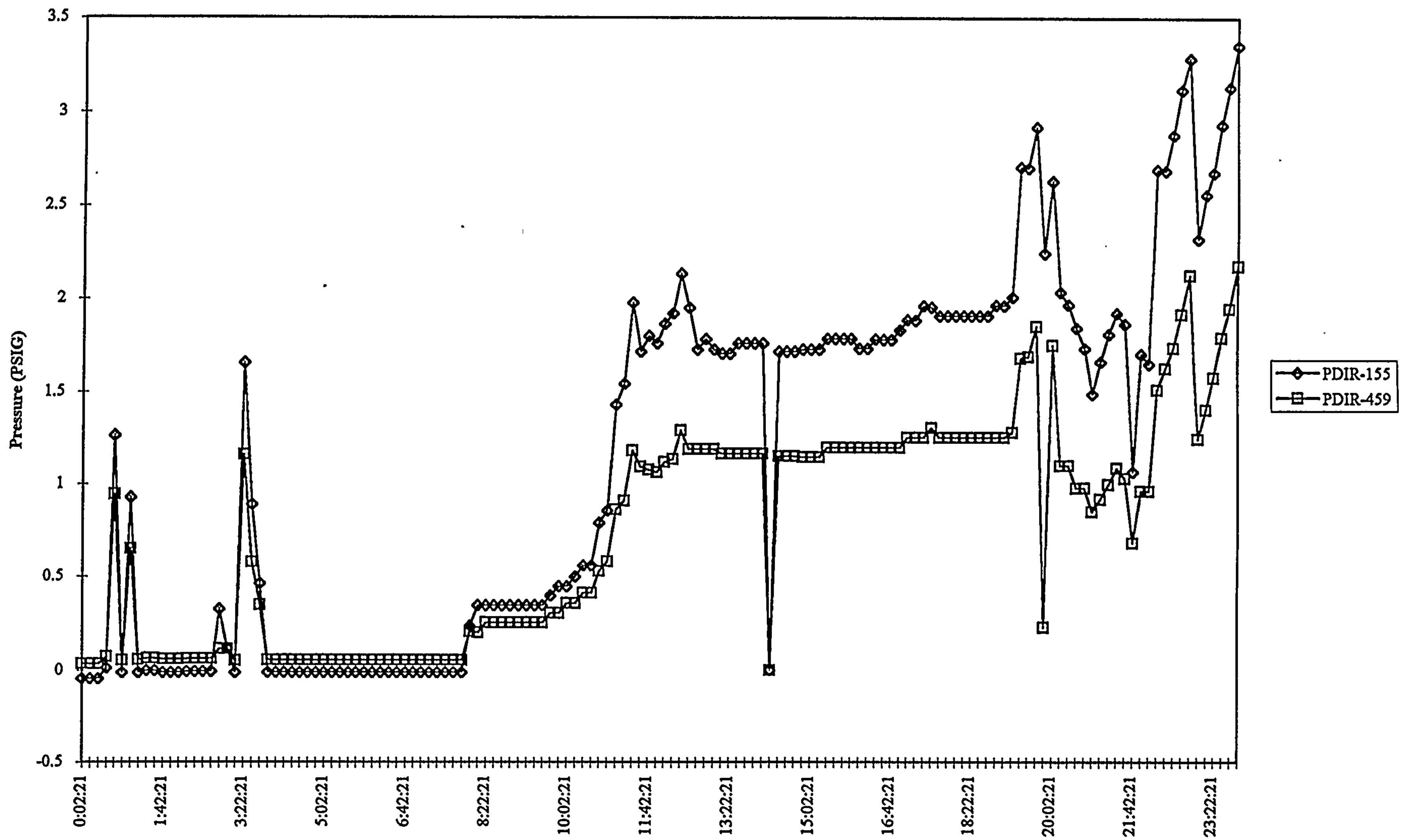
# MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/11/94



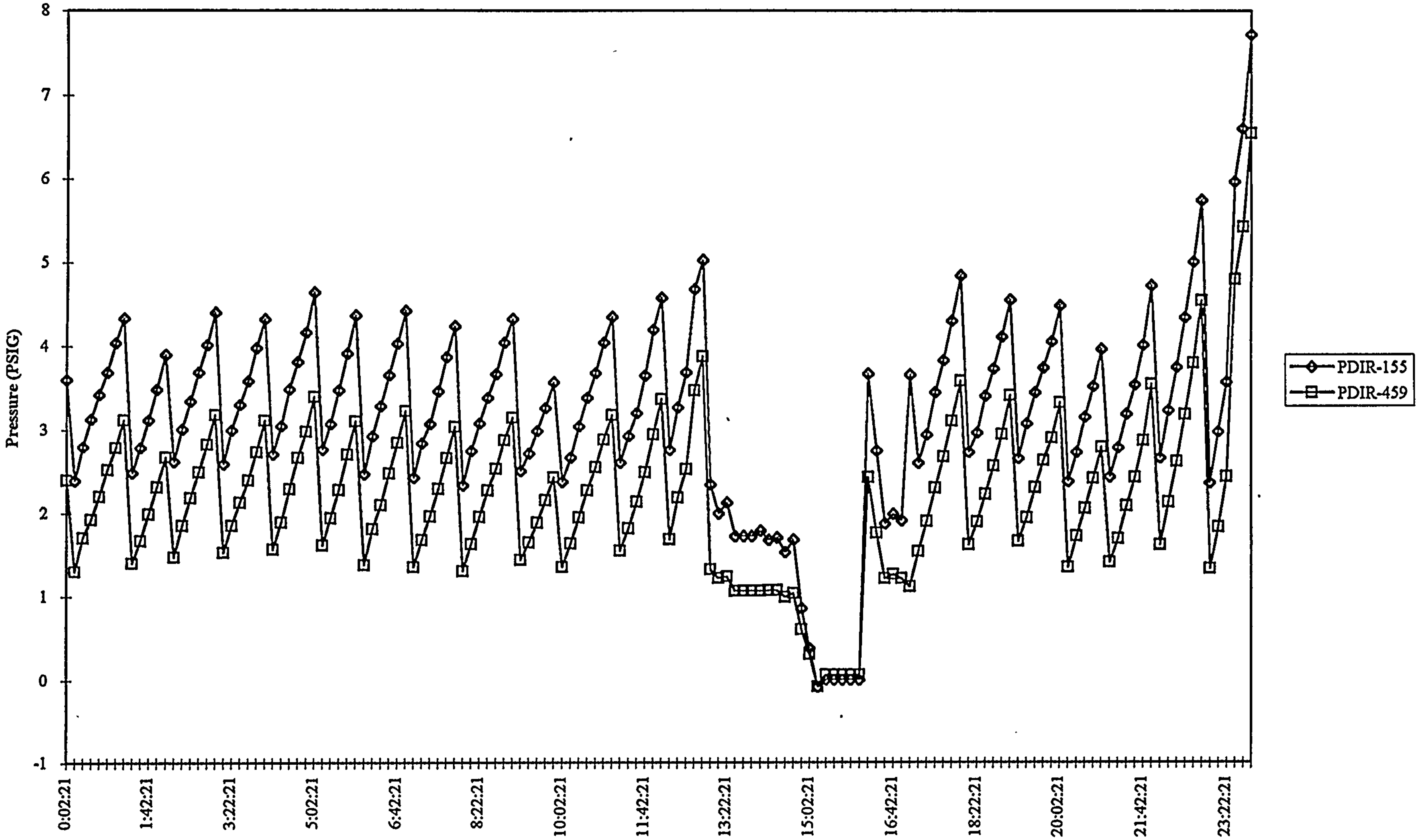
# MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/12/94



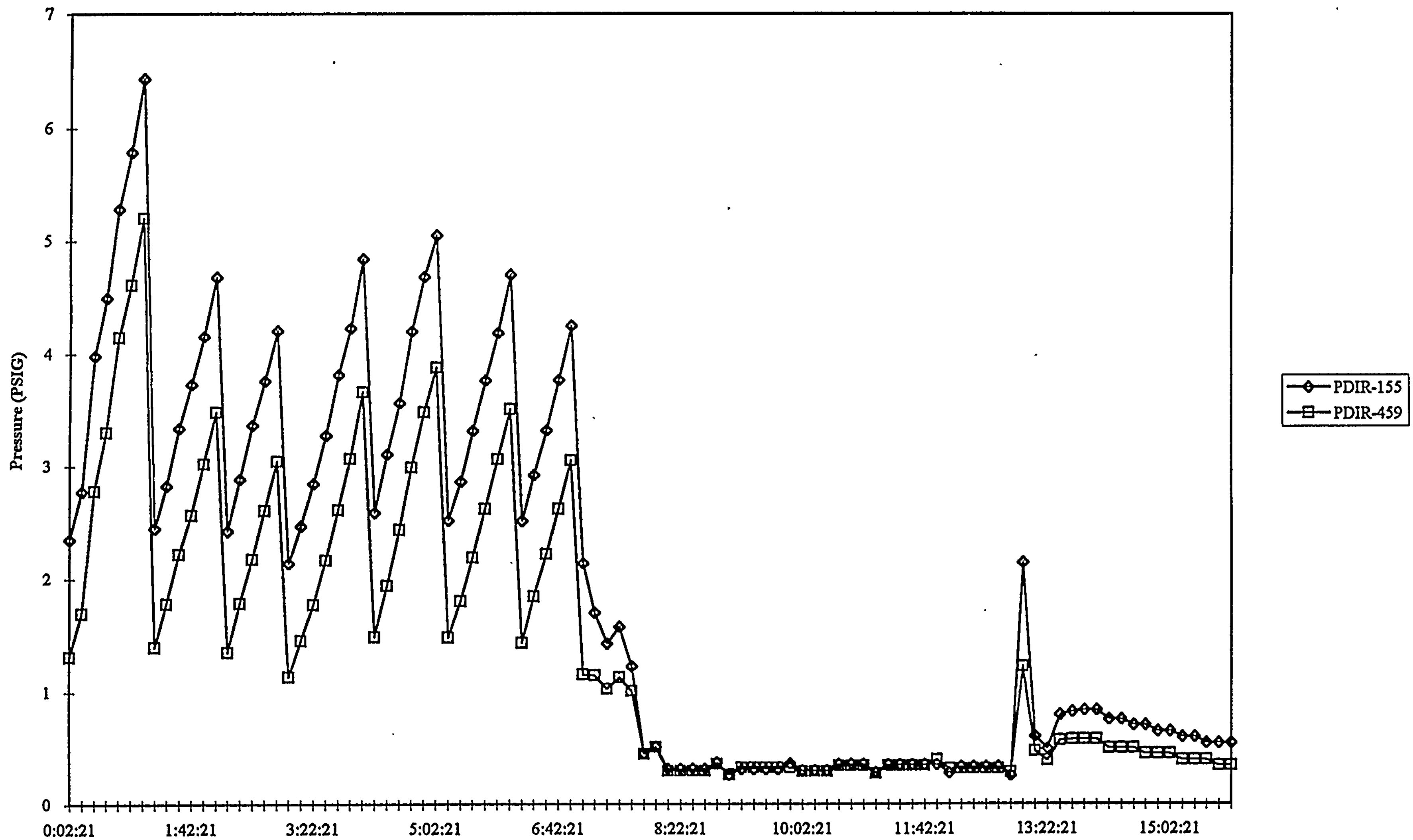
MGCR F-100 DIFFERENTIAL PRESSURE
94MGC07 - 06/13/94



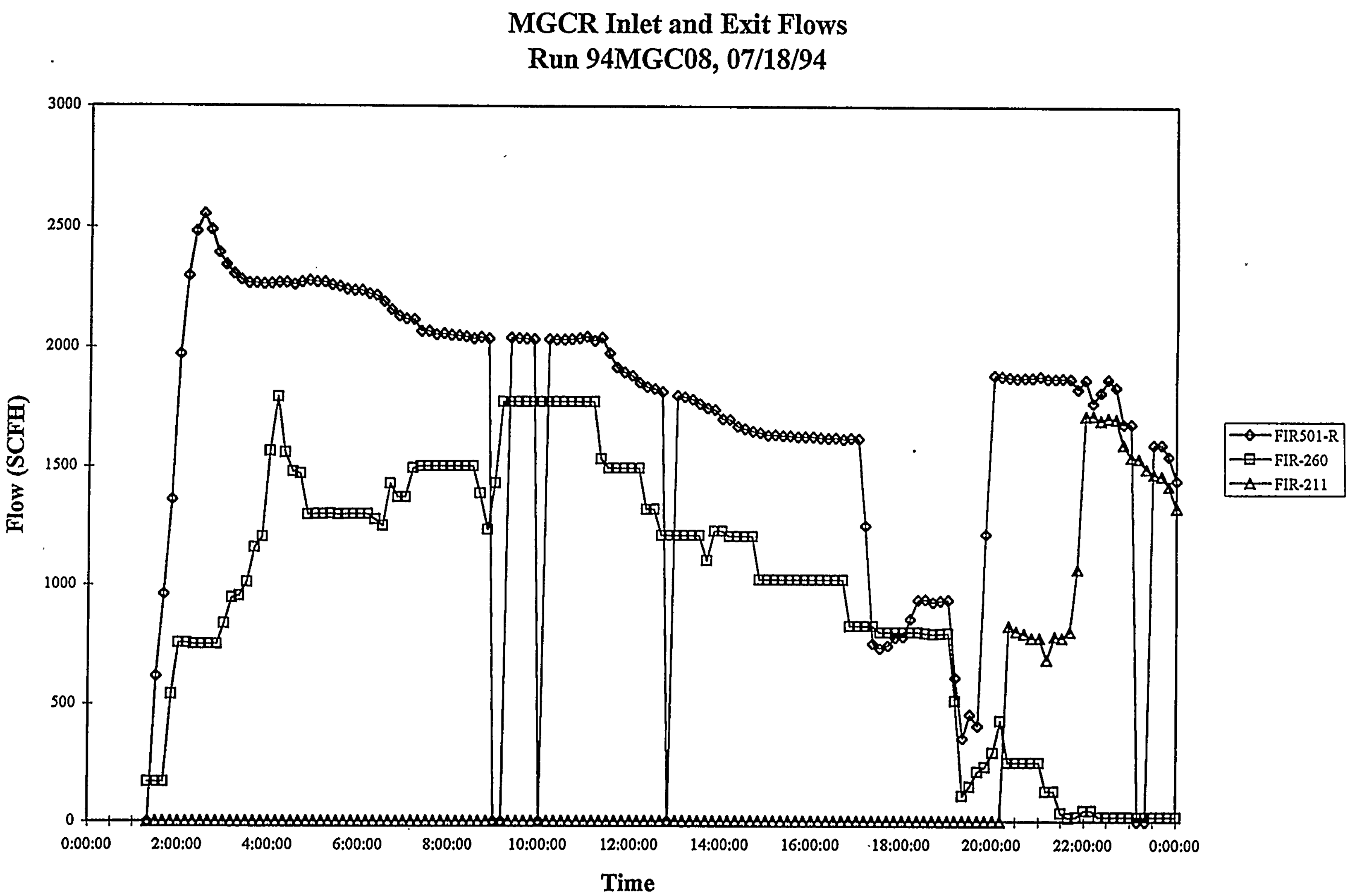
# MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/14/94



## MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/15/94

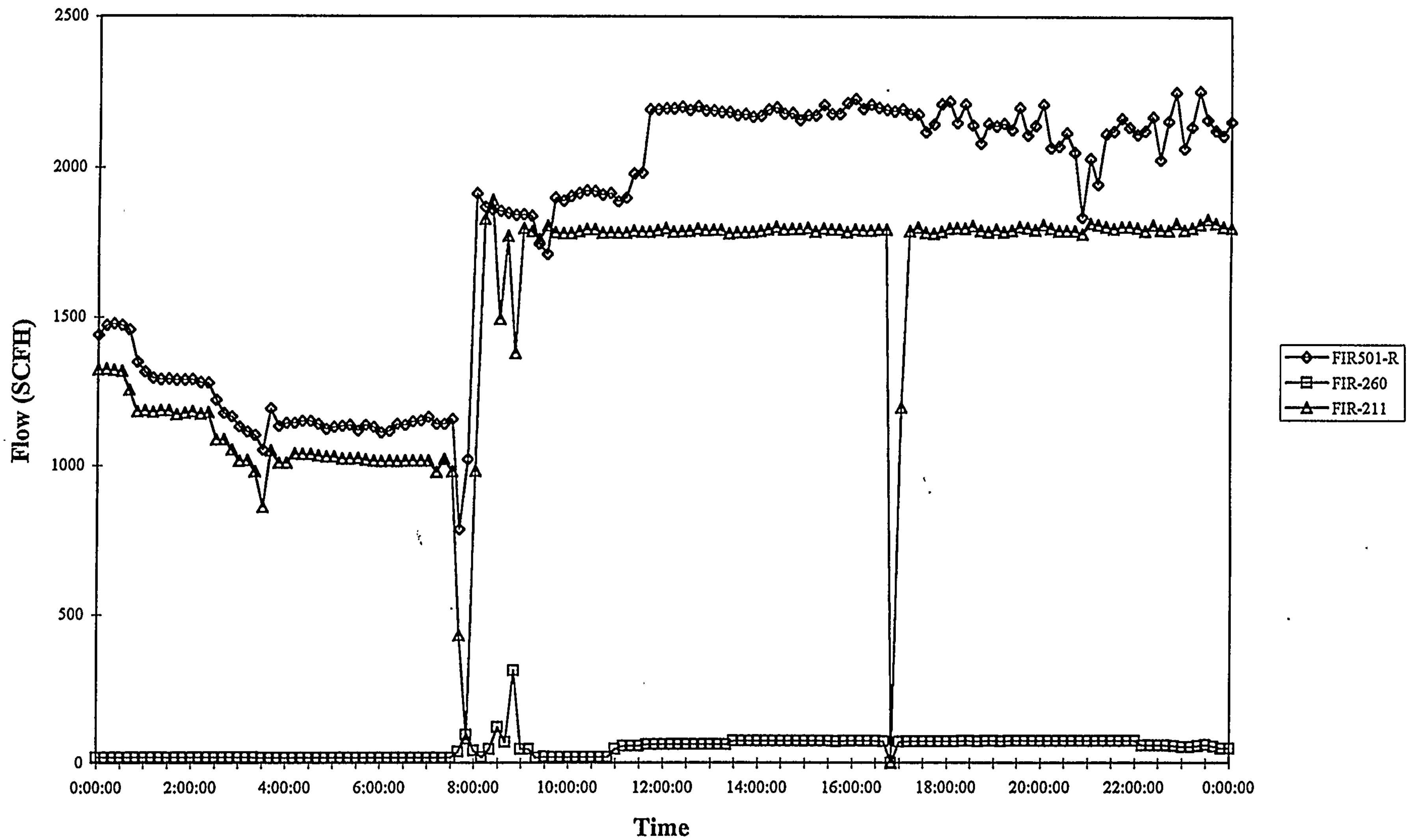


# 94MGC08
# (07/18/94 - 07/27/94)

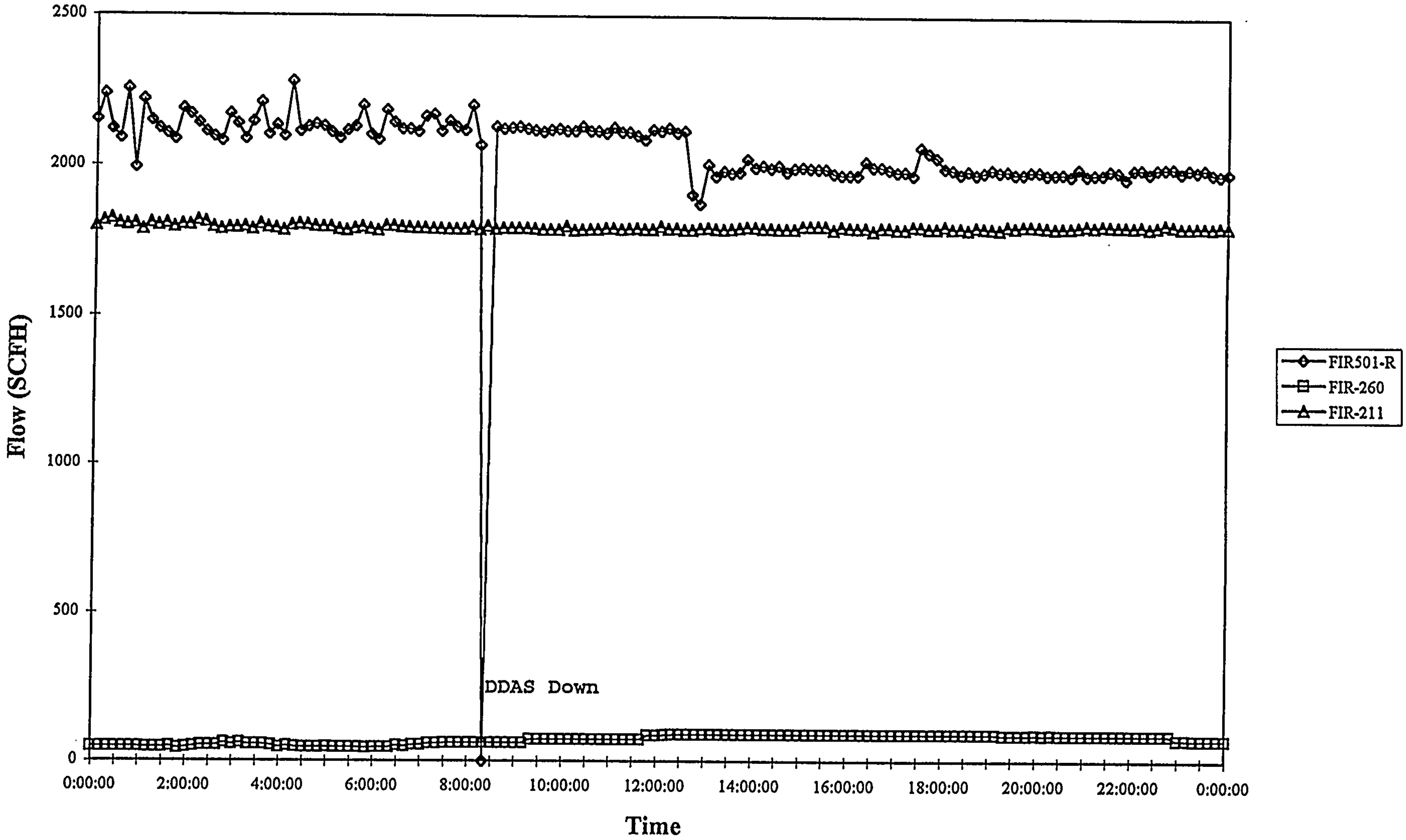


MGCR Inlet and Exit Flows
Run 94MGC08, 07/18/94
Flow (SCFH)
3000
2500
2000
1500
1000
500
0
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
16:00:00
18:00:00
20:00:00
22:00:00
0:00:00
Time
FIR501-R
FIR-260
FIR-211

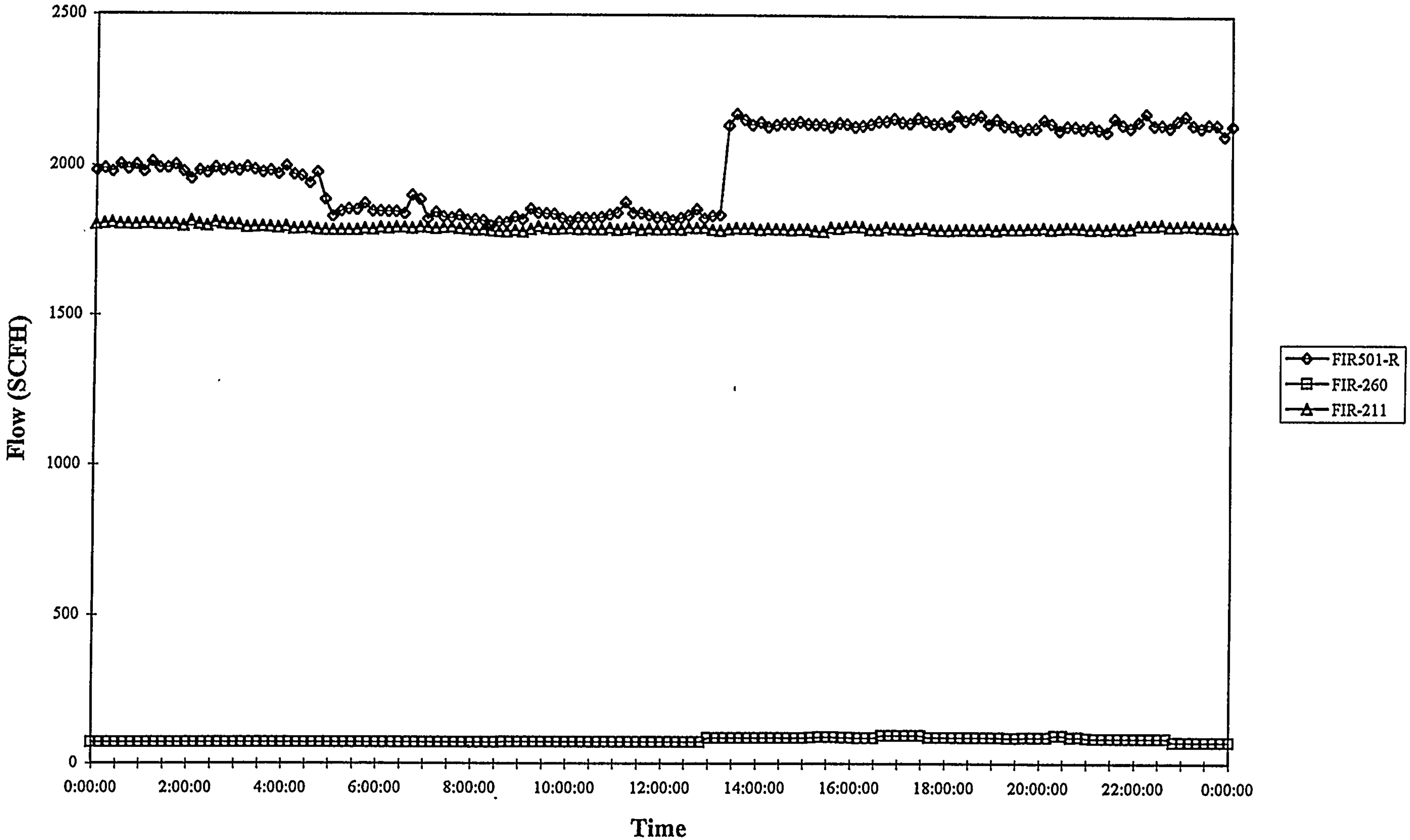
MGCR Inlet and Exit Flows
Run 94MGC08, 07/19/94

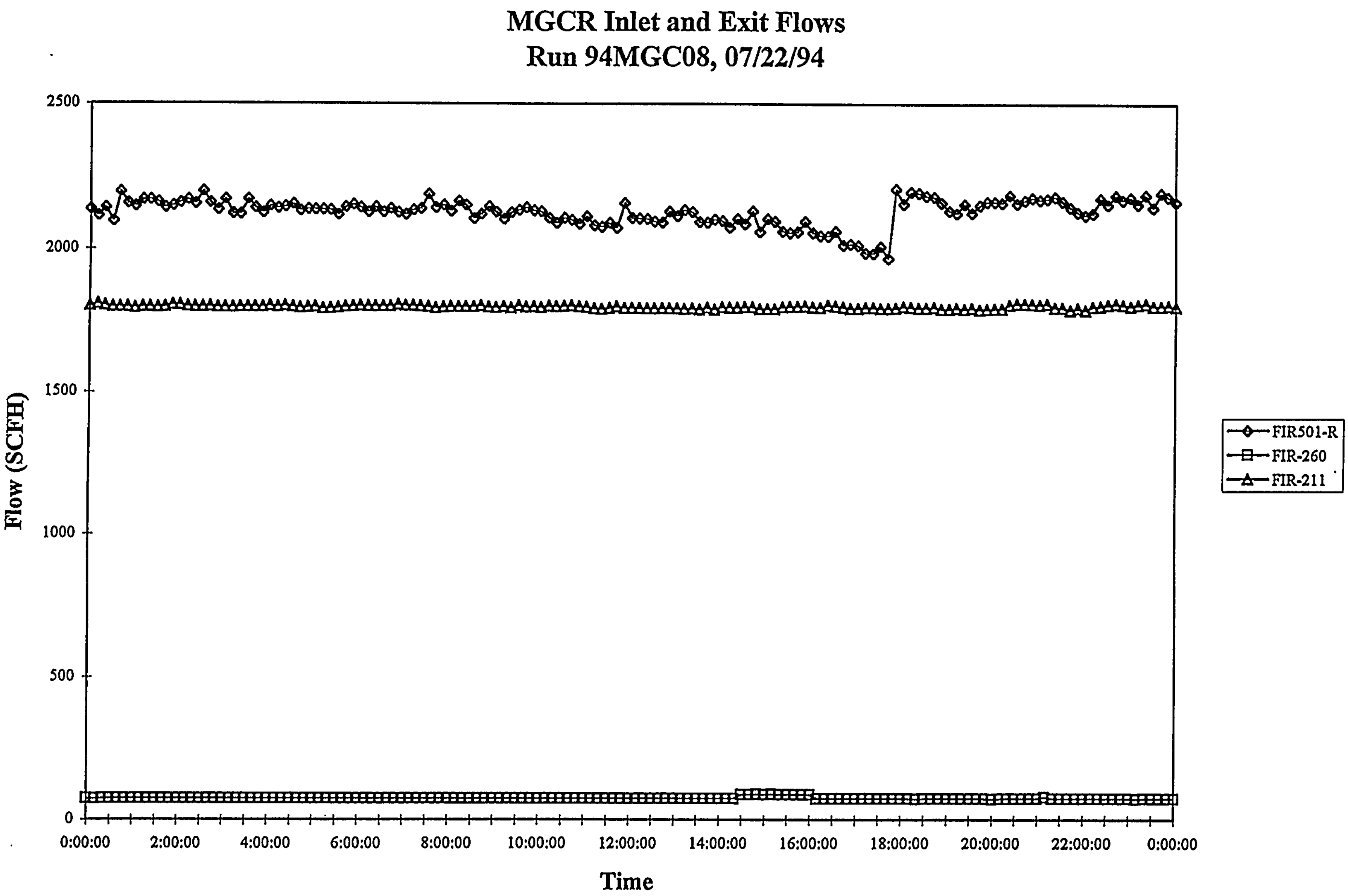


## MGCR Inlet and Exit Flows
## Run 94MGC08, 07/20/94

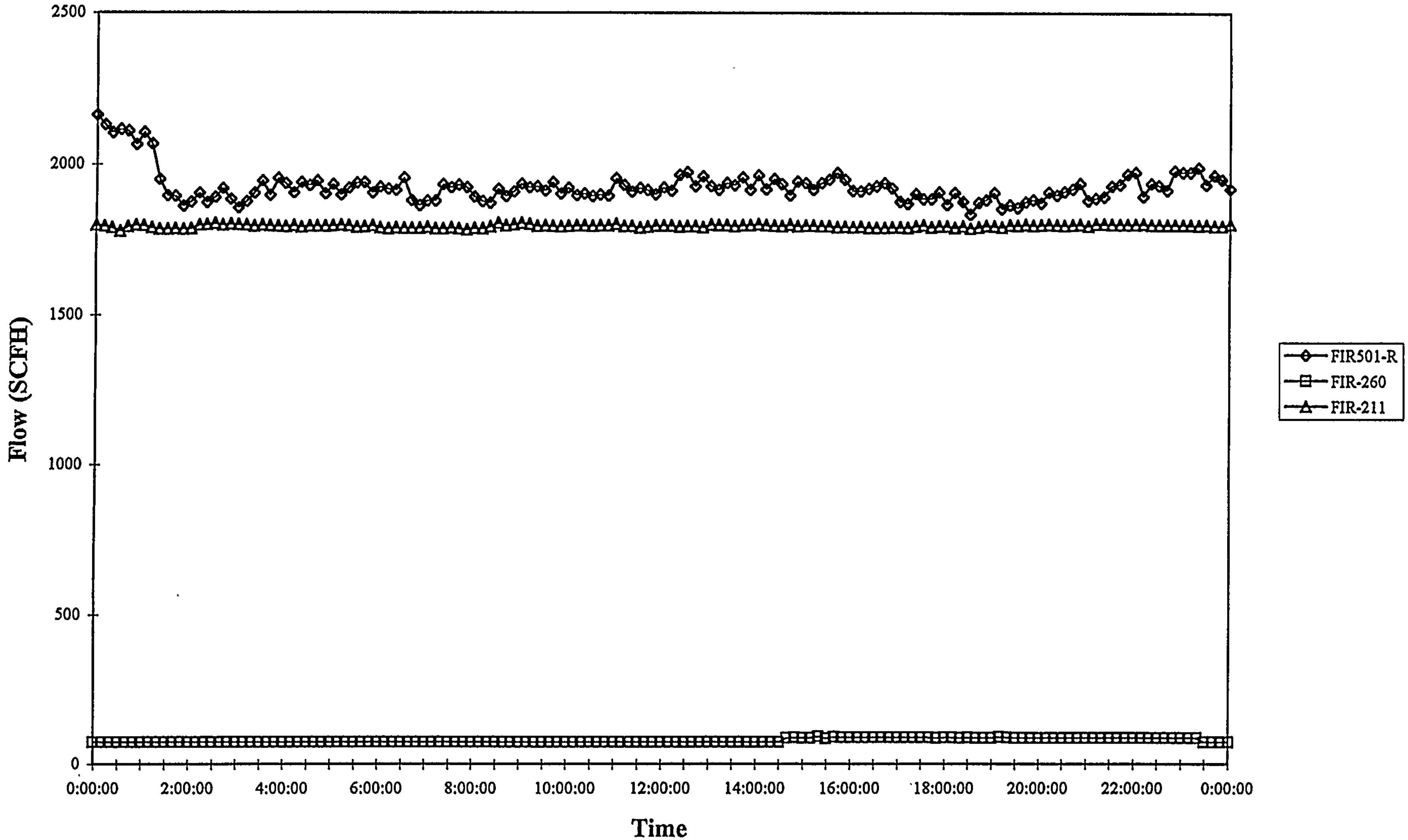


MGCR Inlet and Exit Flows
Run 94MGC08, 07/21/94

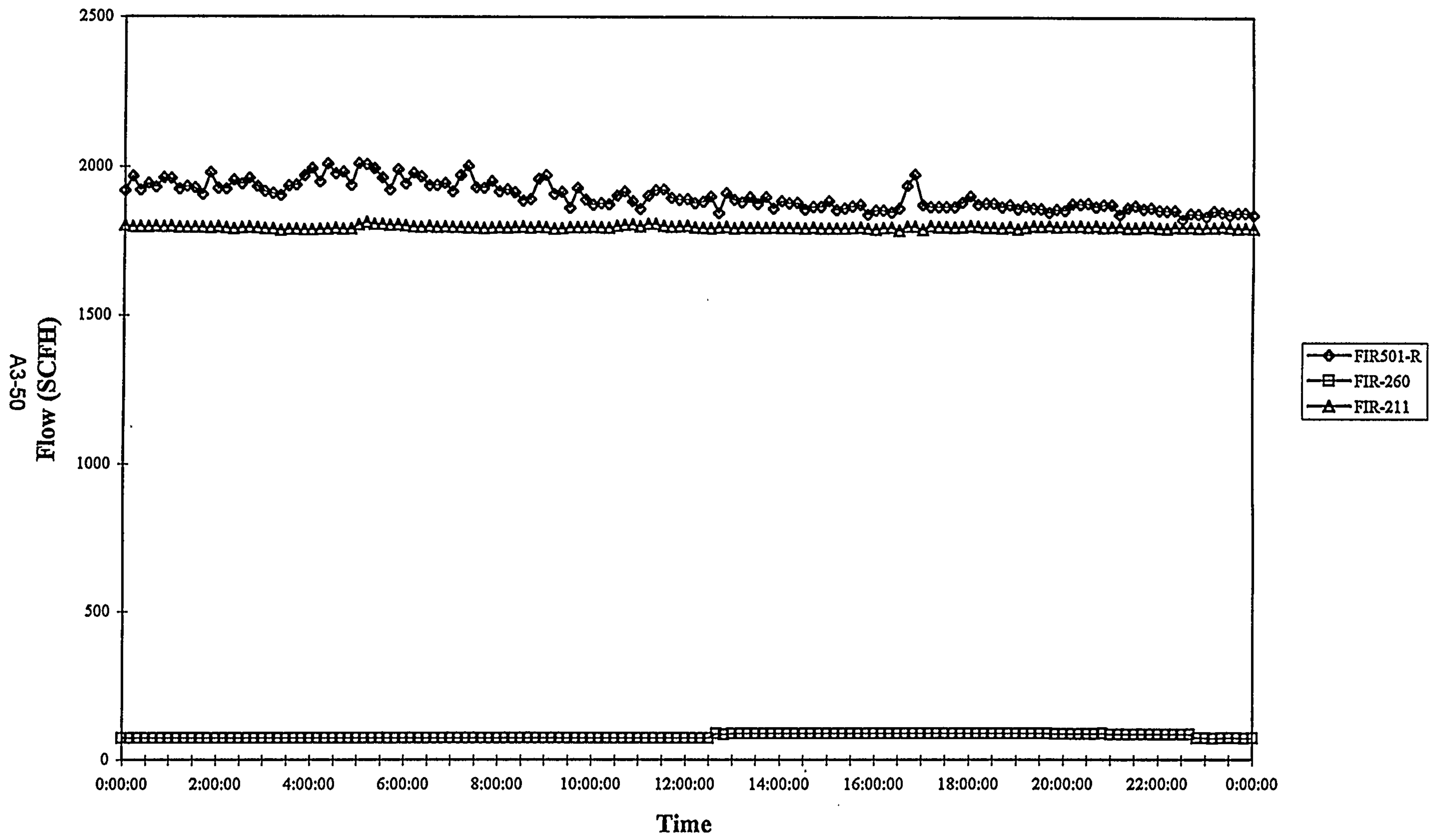


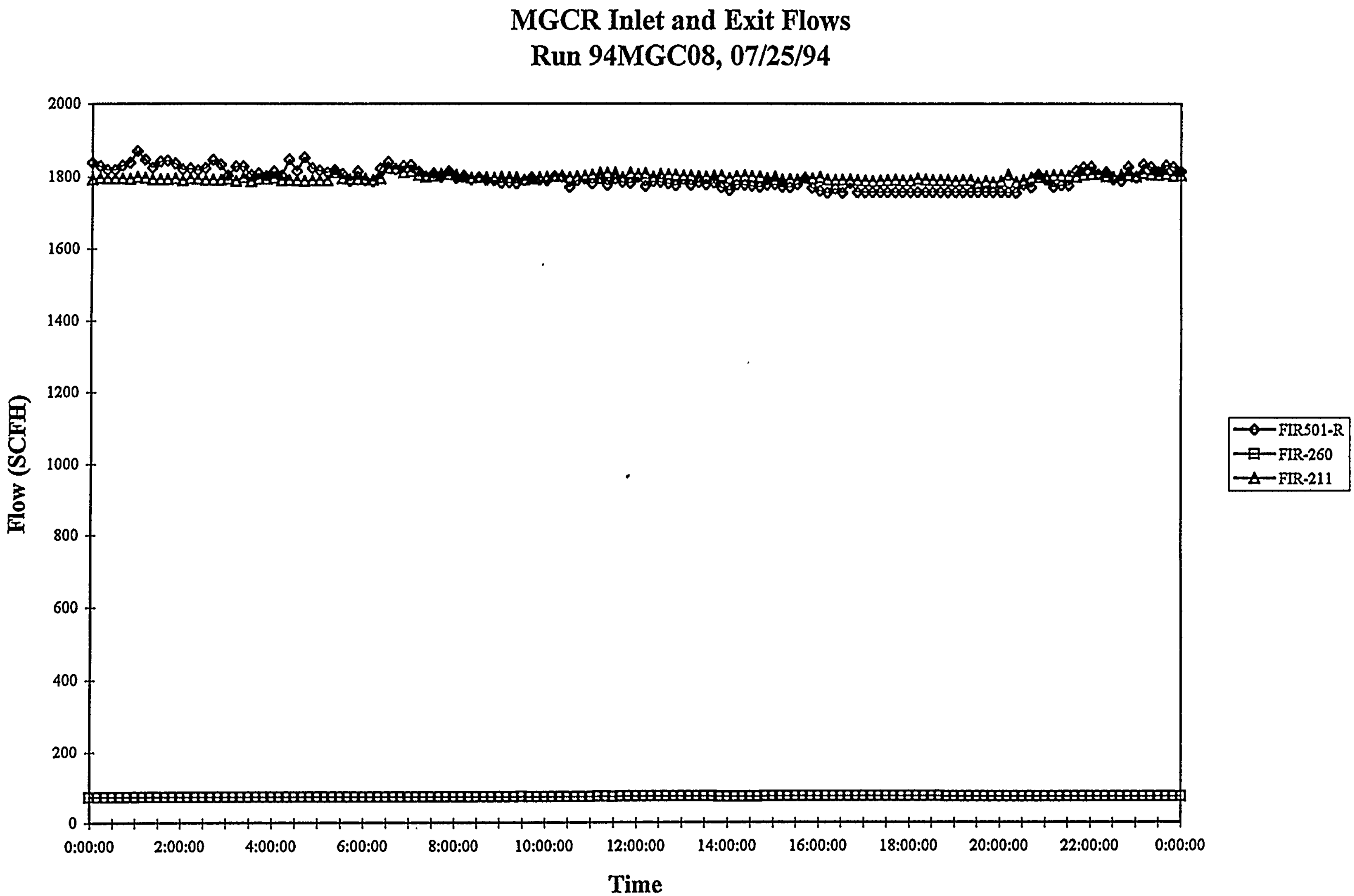

MGCR Inlet and Exit Flows
Run 94MGC08, 07/22/94
Flow (SCFH)
2500
2000
1500
1000
500
0
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
16:00:00
18:00:00
20:00:00
22:00:00
0:00:00
Time
FIR501-R
FIR-260
FIR-211

# MGCR Inlet and Exit Flows
## Run 94MGC08, 07/23/94



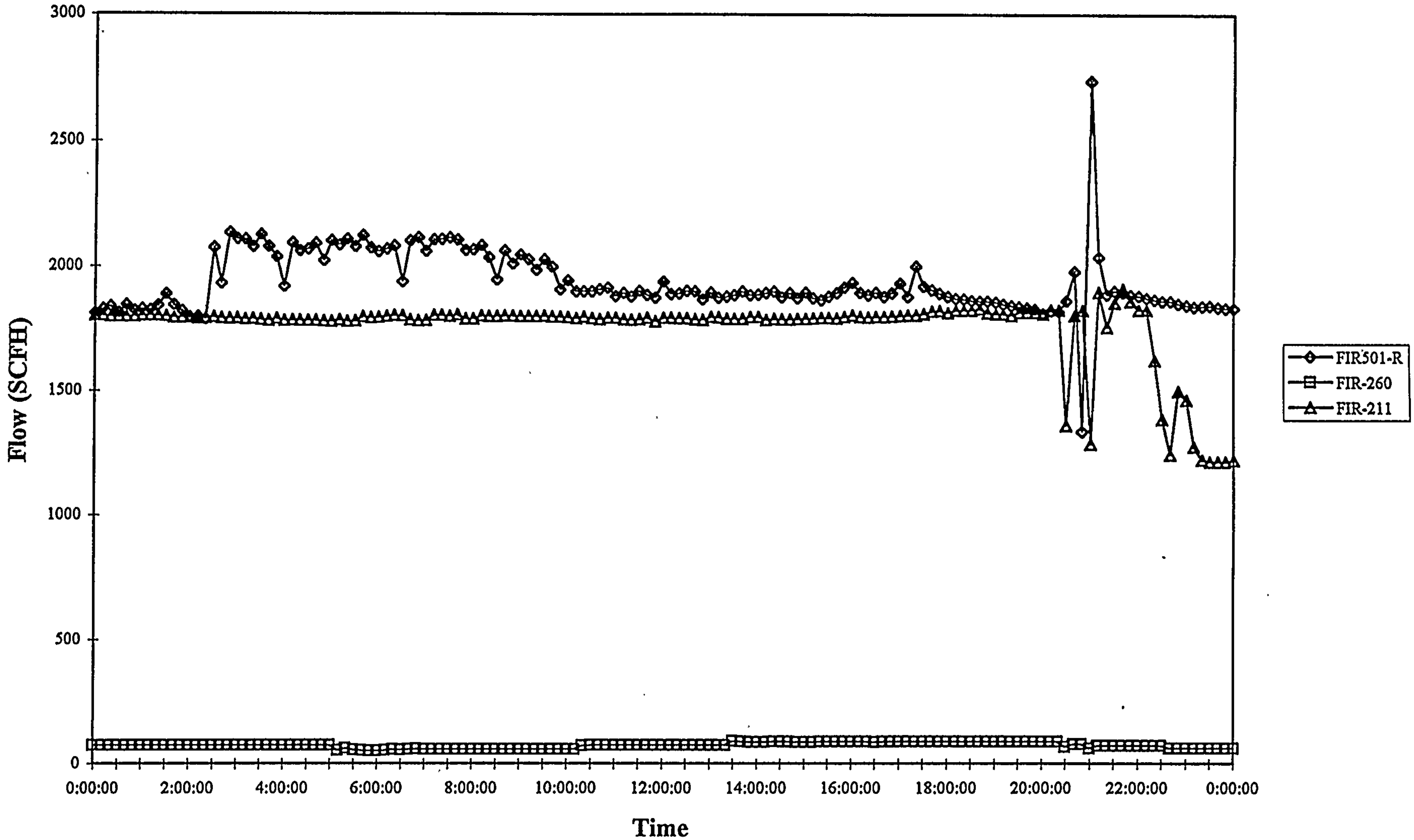
# MGCR Inlet and Exit Flows
## Run 94MGC08, 07/24/94

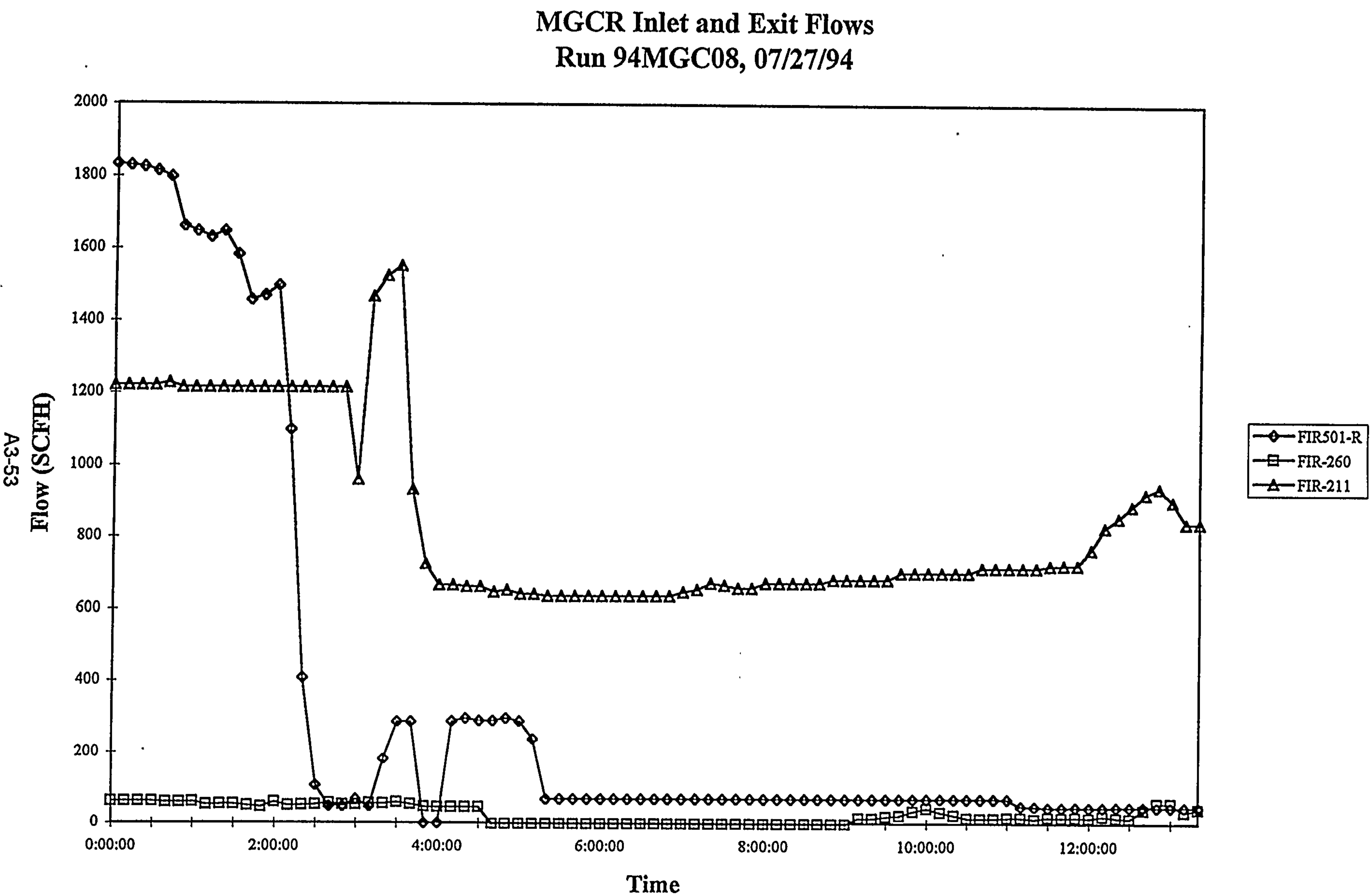




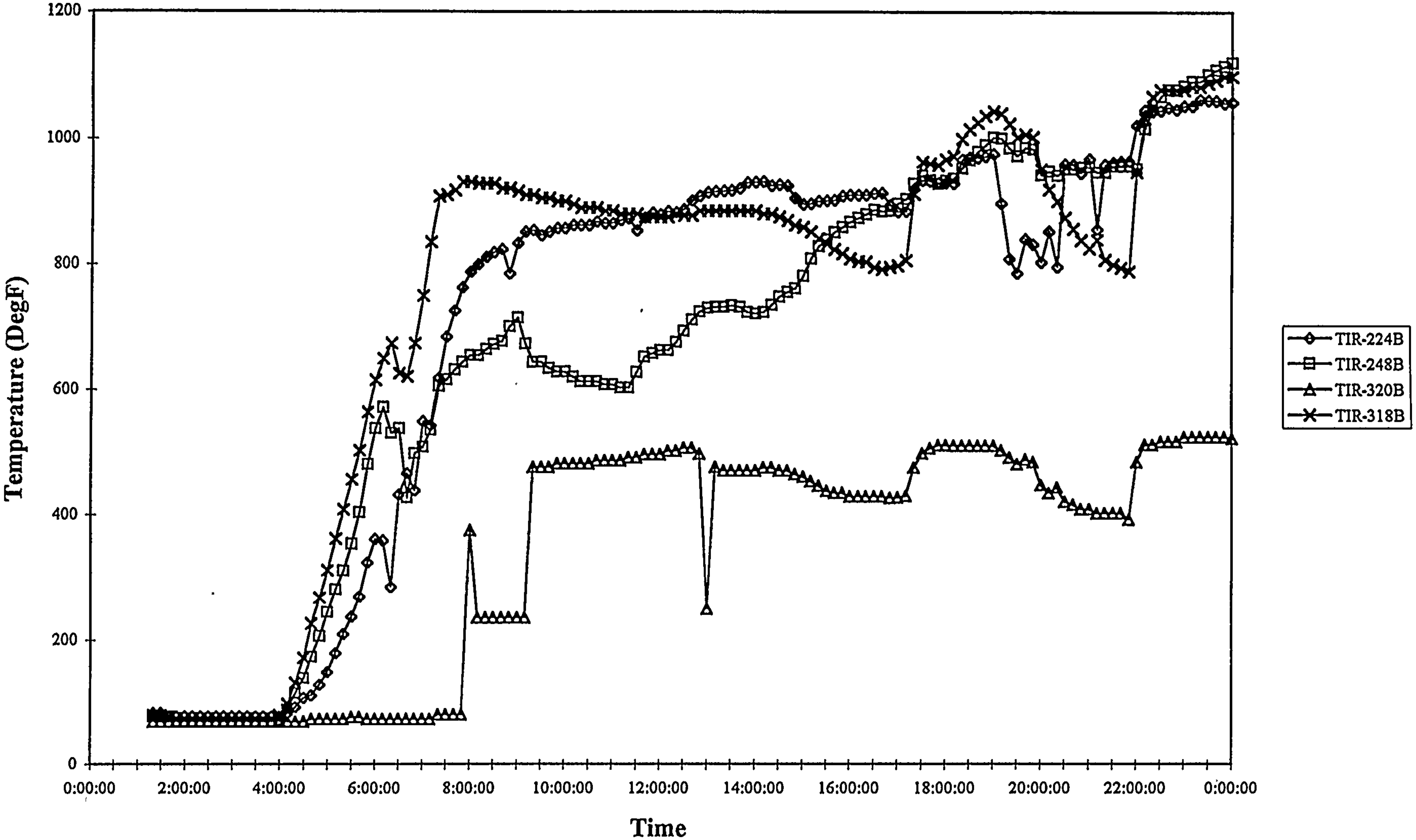
MGCR Inlet and Exit Flows
Run 94MGC08, 07/25/94
Flow (SCFH)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
16:00:00
18:00:00
20:00:00
22:00:00
0:00:00
Time
FIR501-R
FIR-260
FIR-211

## MGCR Inlet and Exit Flows
## Run 94MGC08, 07/26/94

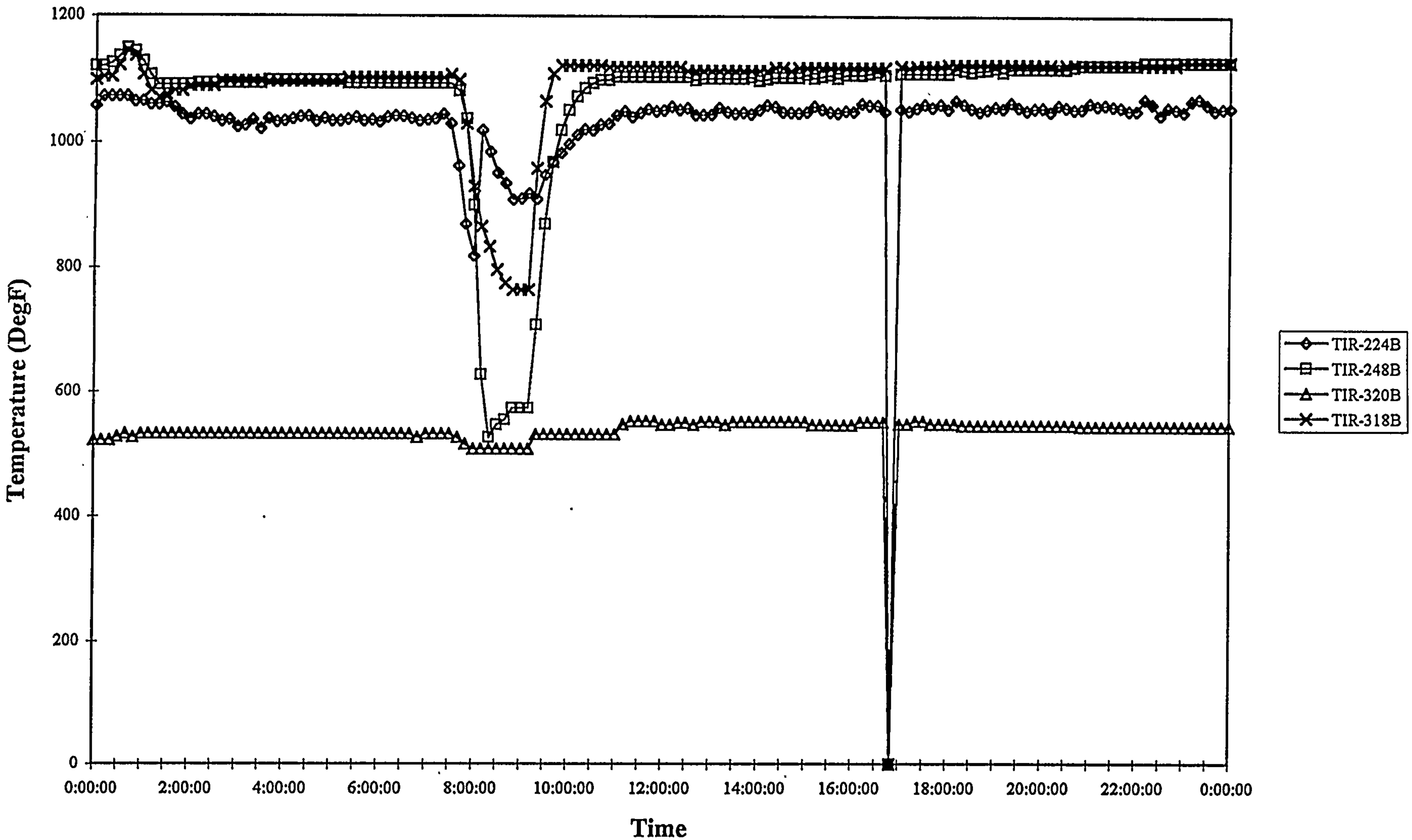



MGCR Inlet and Exit Flows
Run 94MGC08, 07/27/94
Flow (SCFH)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
Time
FIR501-R
FIR-260
FIR-211

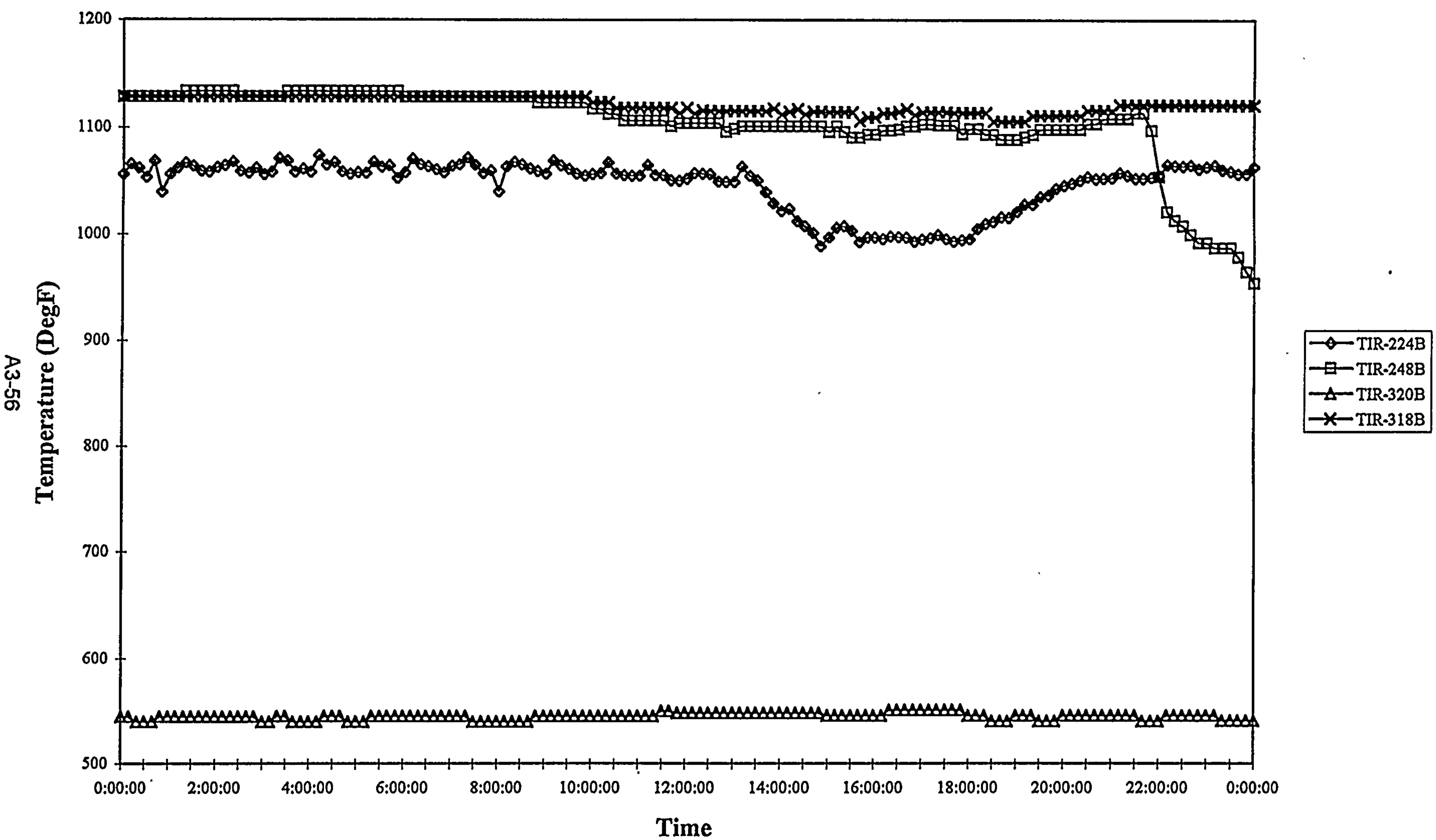
## MGCR Process Gas Line Temperatures
## Run 94MGC08, 07/18/94



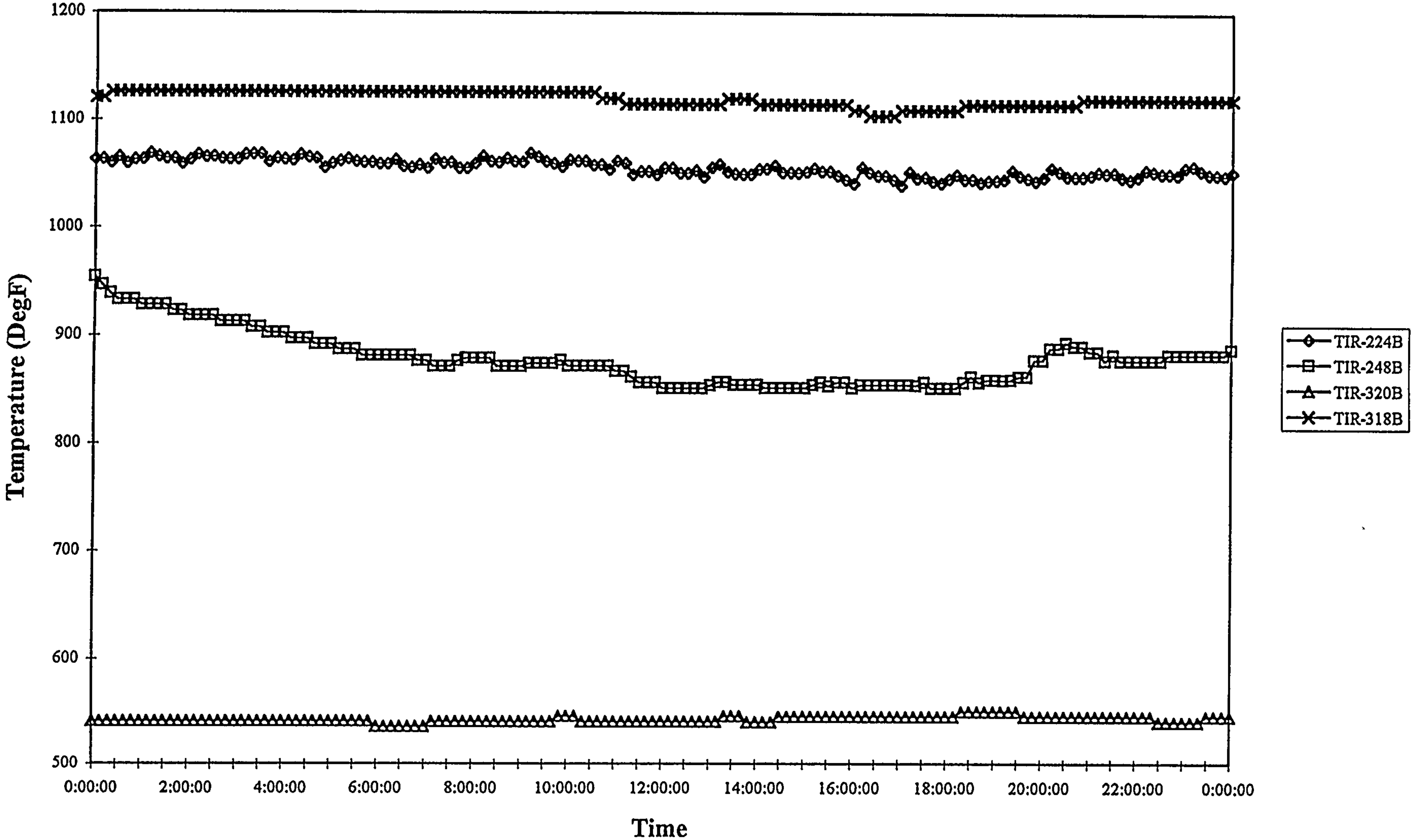
MGCR Process Gas Line Temperatures
Run 94MGC08, 07/19/94

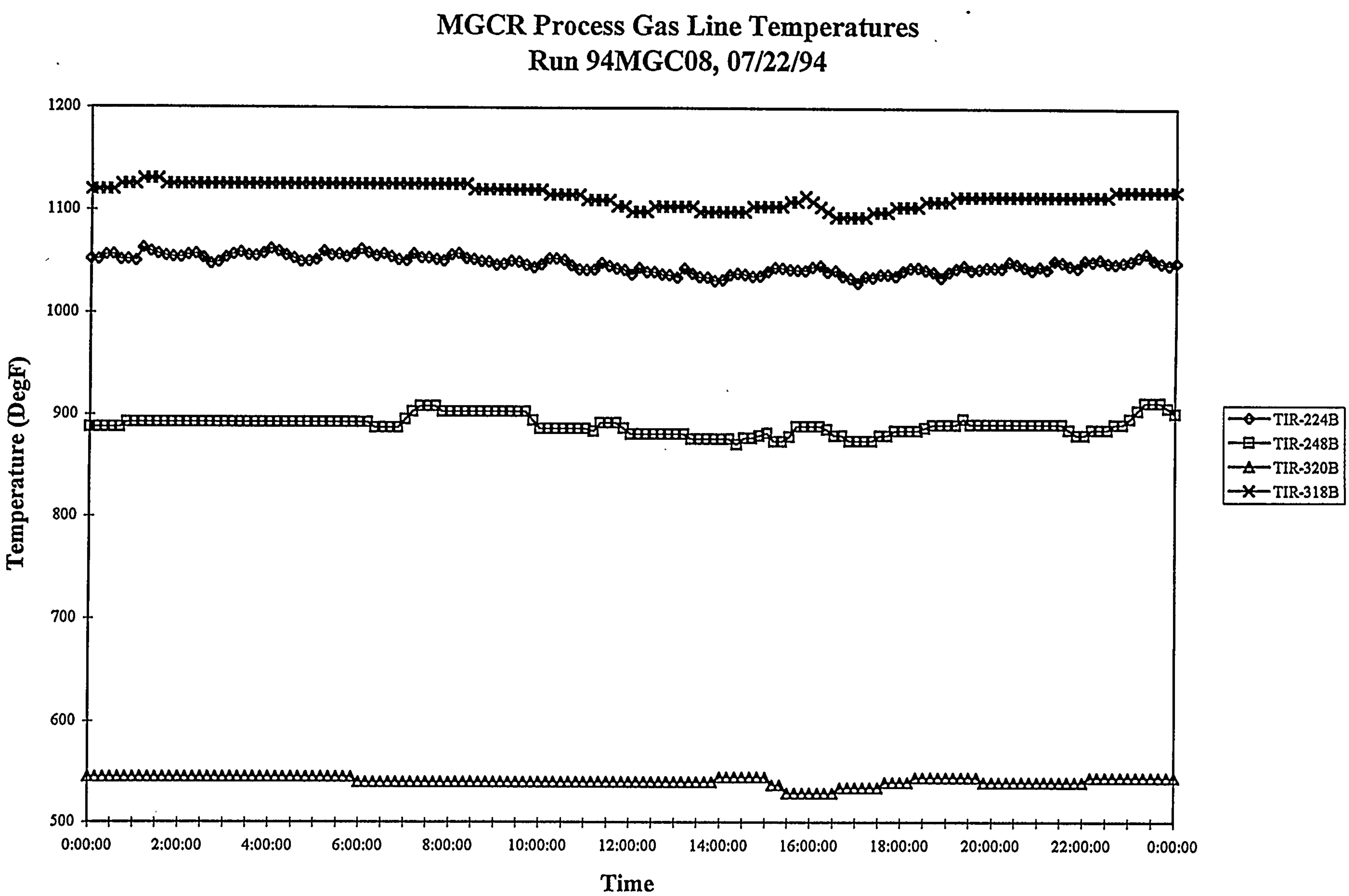


MGCR Process Gas Line Temperatures
Run 94MGC08, 07/20/94

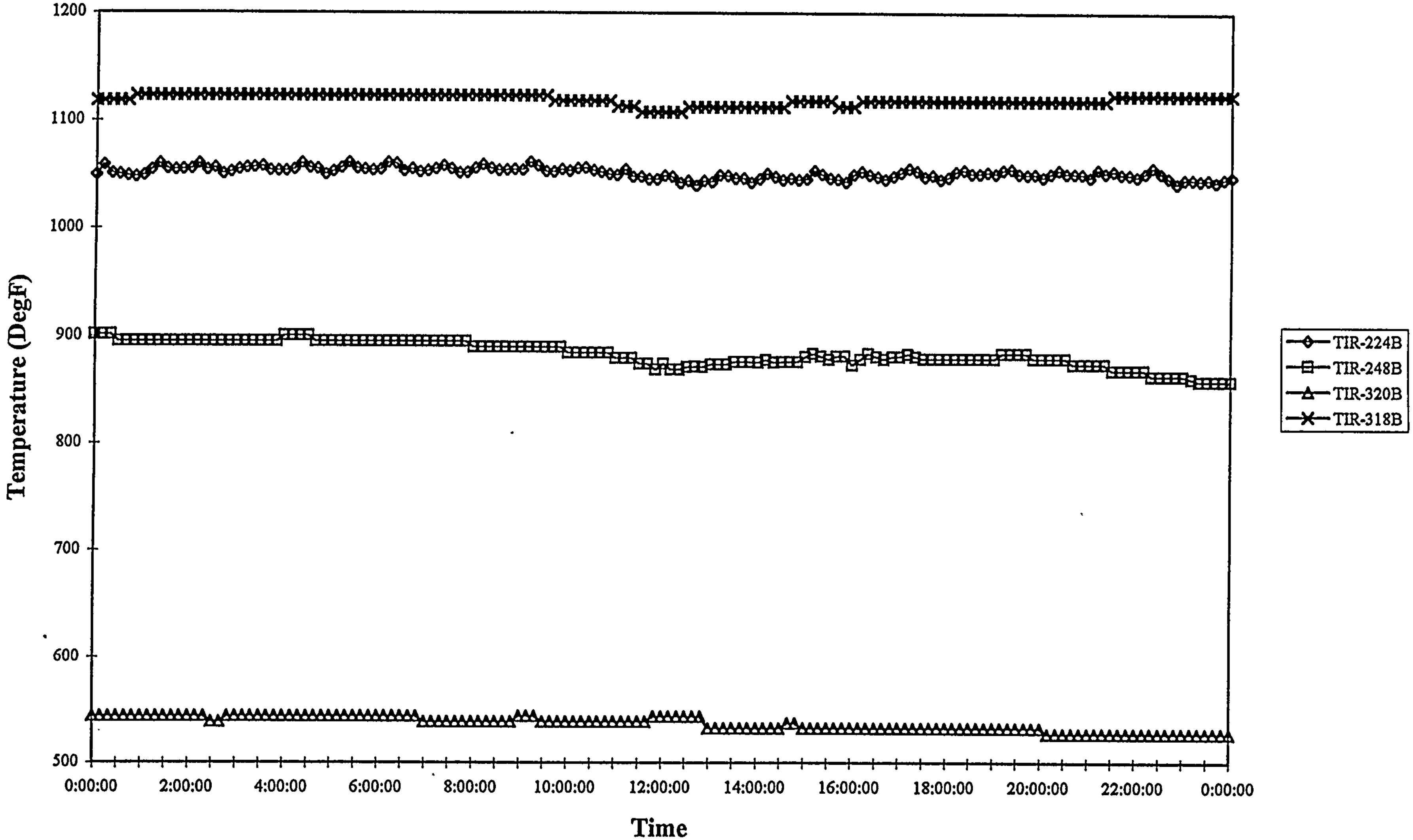


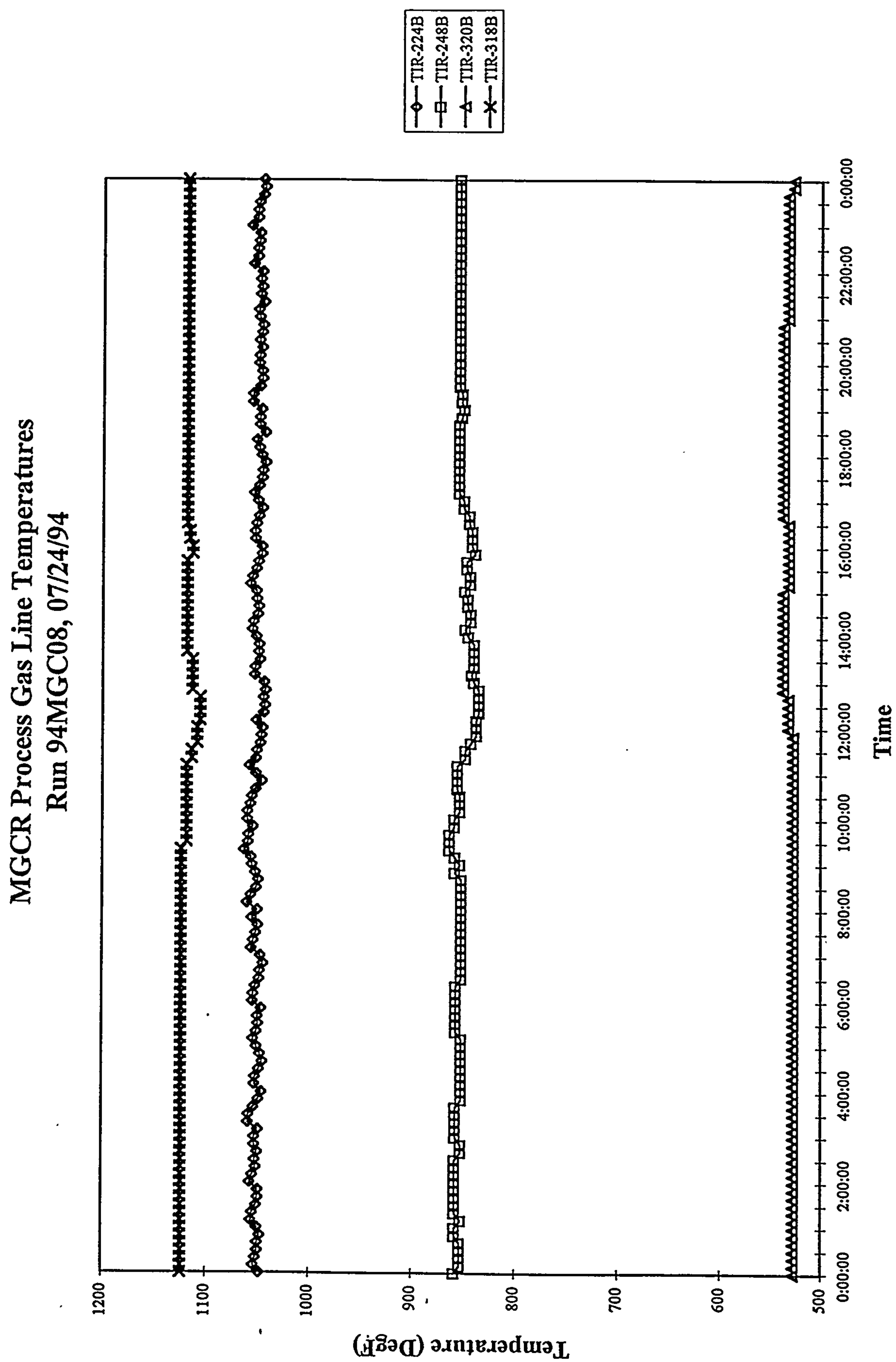
## MGCR Process Gas Line Temperatures
## Run 94MGC08, 07/21/94




MGCR Process Gas Line Temperatures
Run 94MGC08, 07/22/94
Temperature (DegF)
1200
1100
1000
900
800
700
600
500
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
16:00:00
18:00:00
20:00:00
22:00:00
0:00:00
Time
TIR-224B
TIR-248B
TIR-320B
TIR-318B

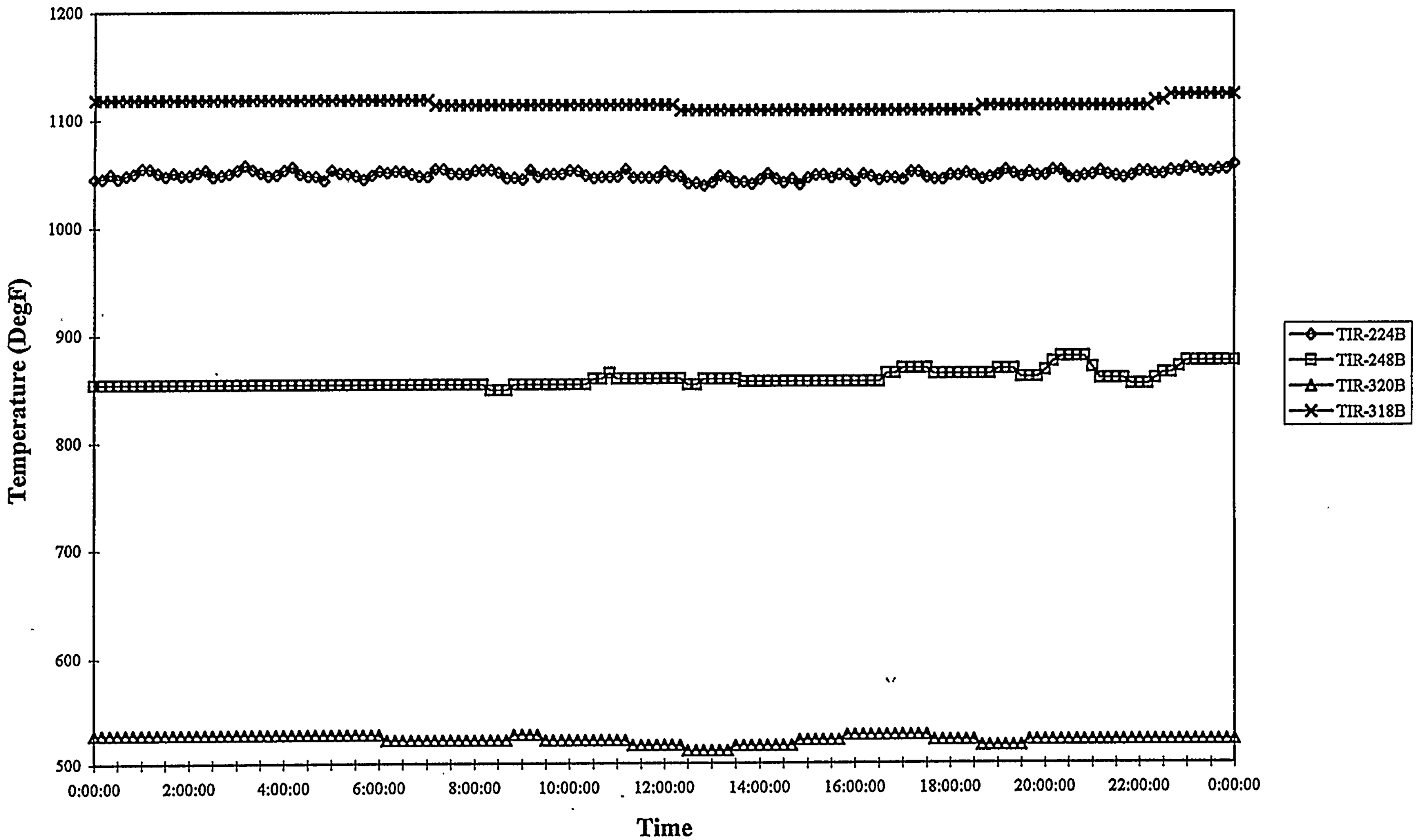
## MGCR Process Gas Line Temperatures
## Run 94MGC08, 07/23/94

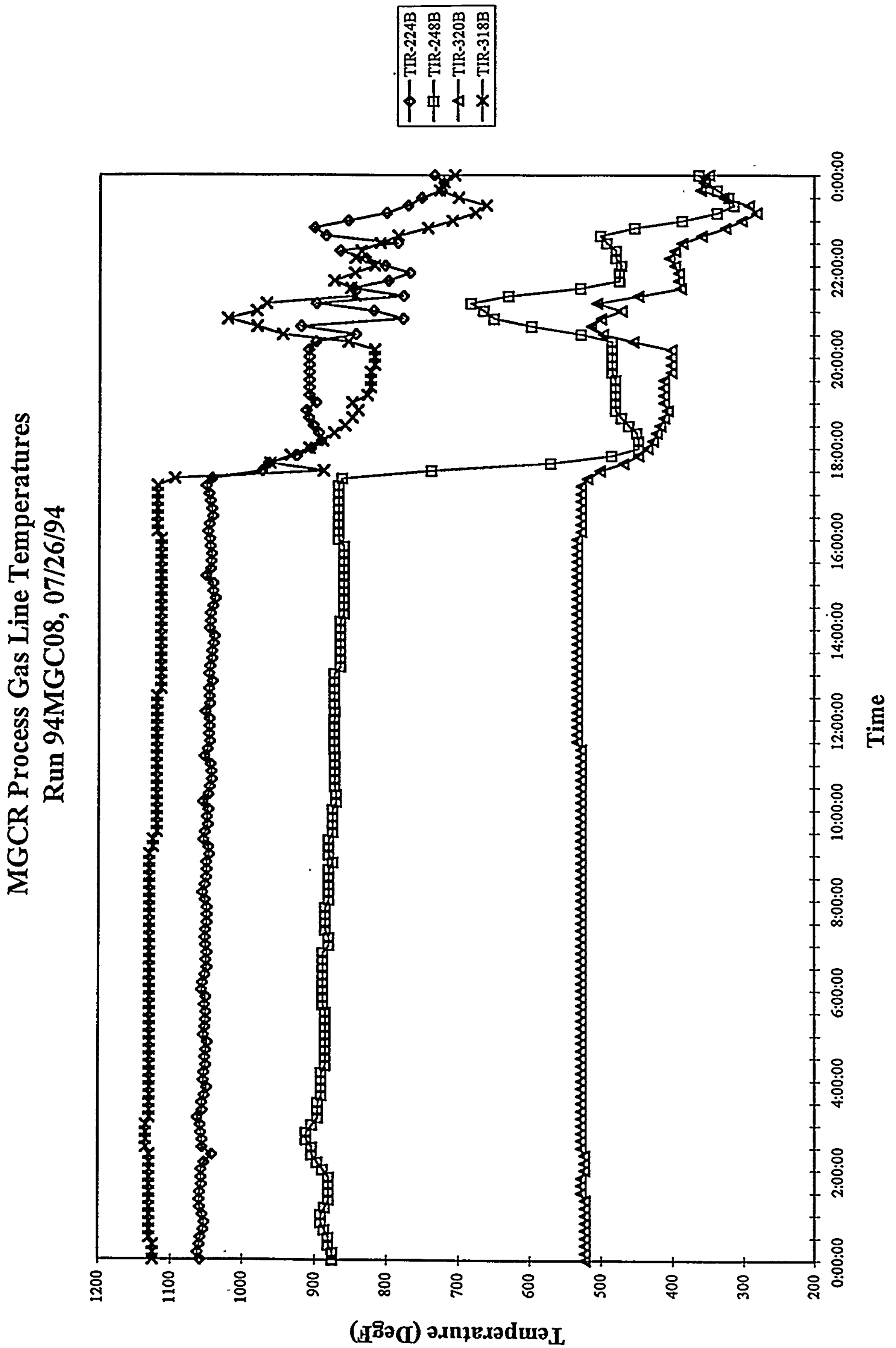




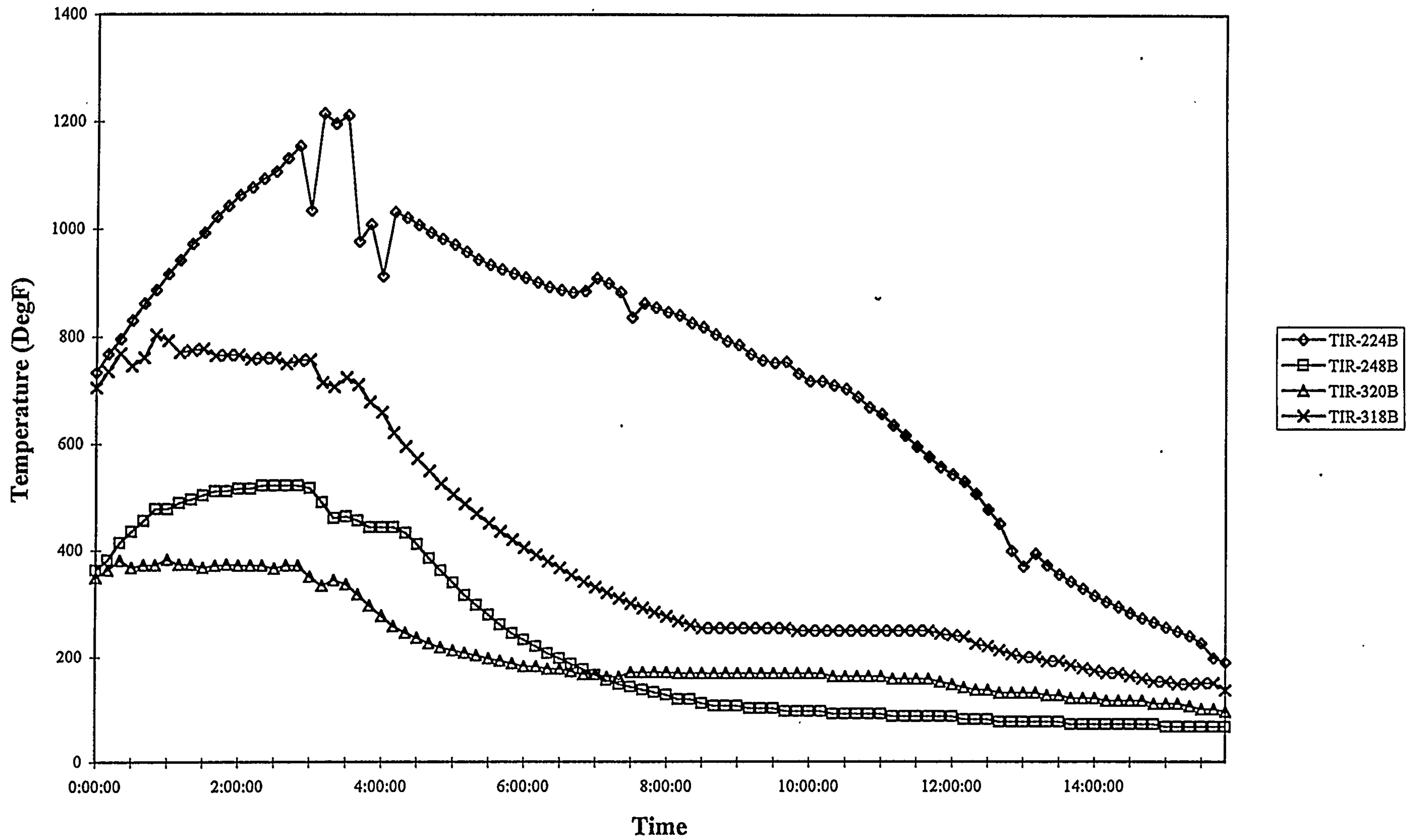
MGCR Process Gas Line Temperatures
Run 94MGC08, 07/24/94
TIR-224B
TIR-248B
TIR-320B
TIR-318B
Temperature (DegF)
1200
1100
1000
900
800
700
600
500
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
16:00:00
18:00:00
20:00:00
22:00:00
0:00:00
Time

MGCR Process Gas Line Temperatures
Run 94MGC08, 07/25/94

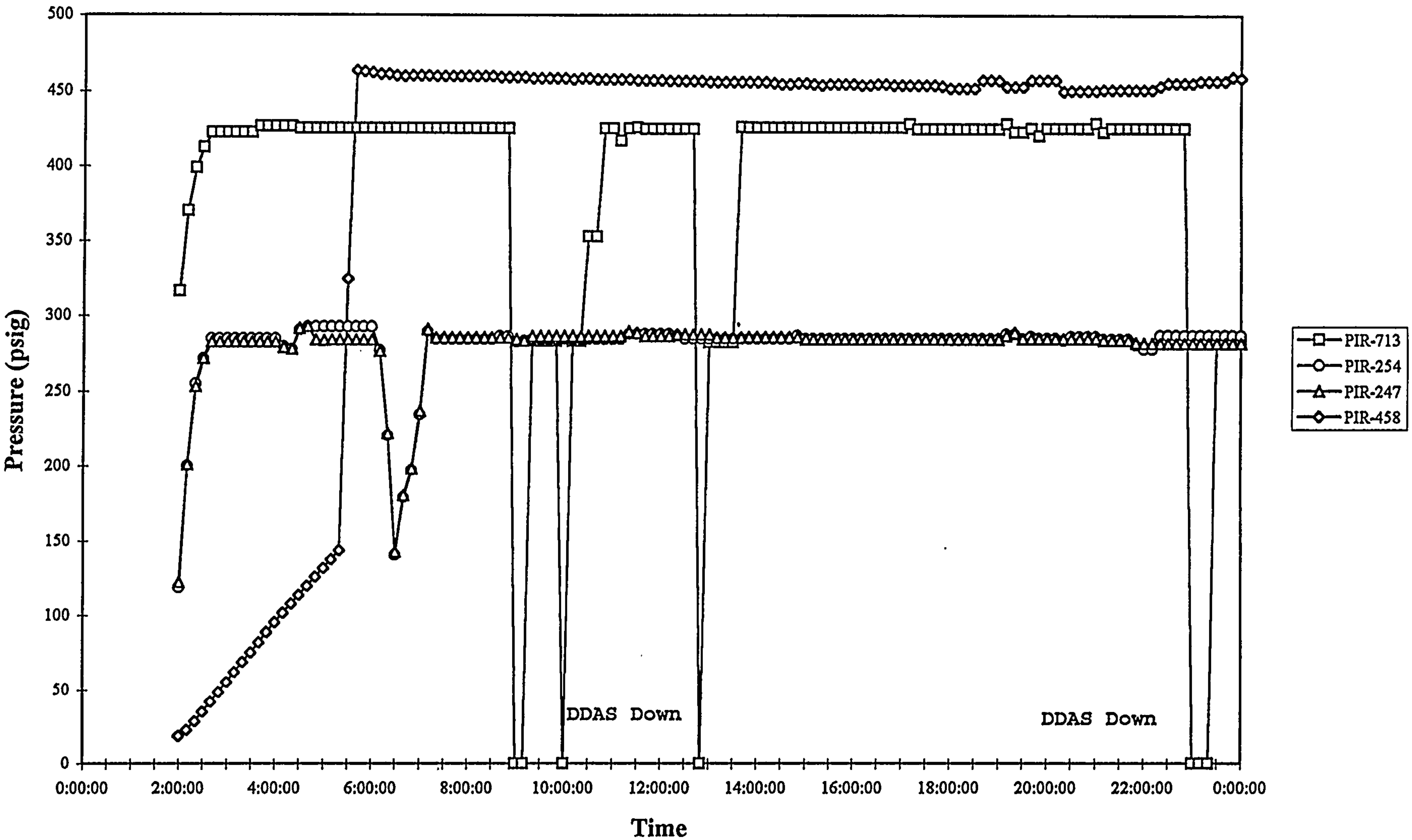



MGCR Process Gas Line Temperatures
Run 94MGC08, 07/26/94
Temperature (DegF)
Time
TIR-224B
TIR-248B
TIR-320B
TIR-318B
1200
1100
1000
900
800
700
600
500
400
300
200
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
16:00:00
18:00:00
20:00:00
22:00:00
0:00:00

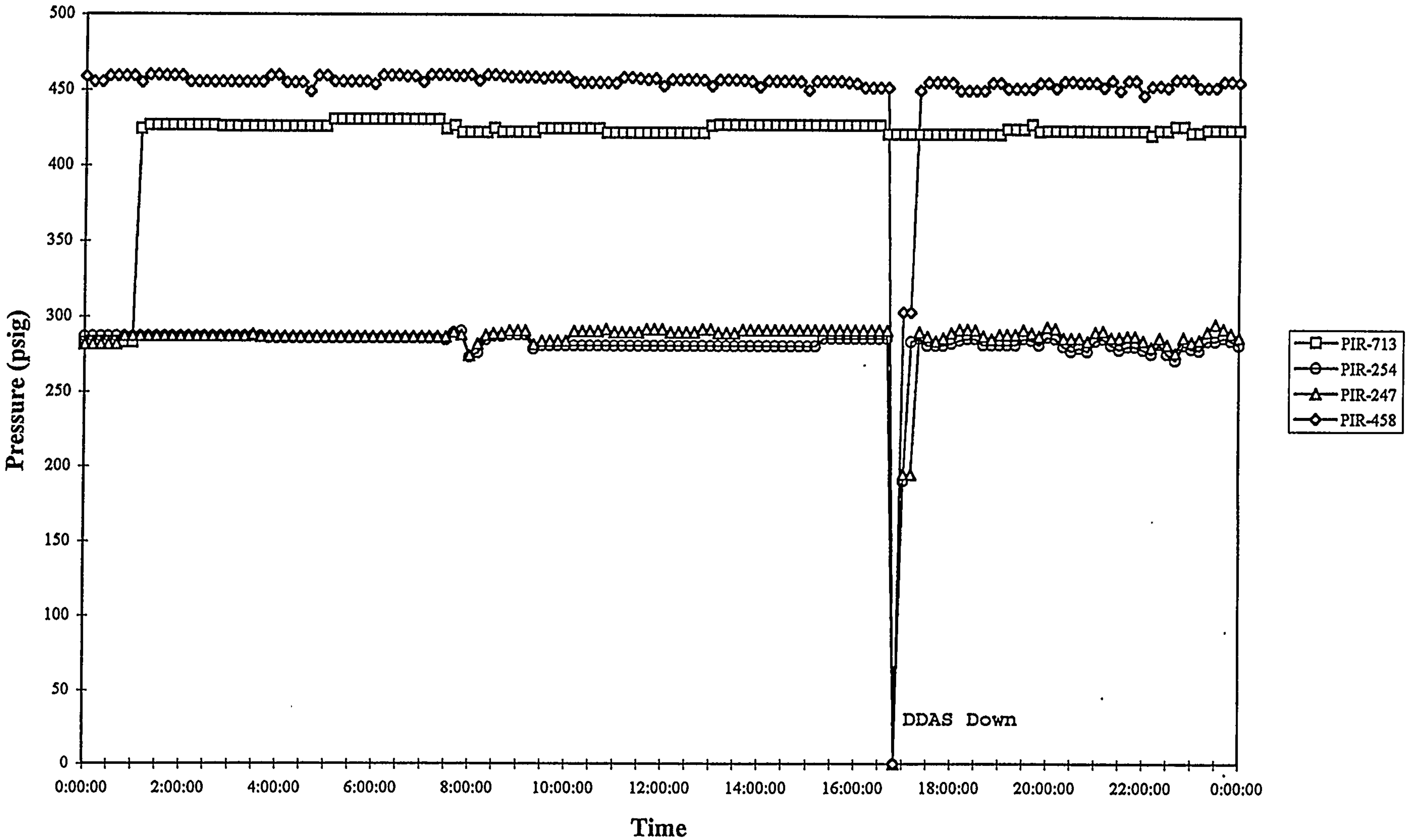
## MGCR Process Gas Line Temperatures
## Run 94MGC08, 07/27/94

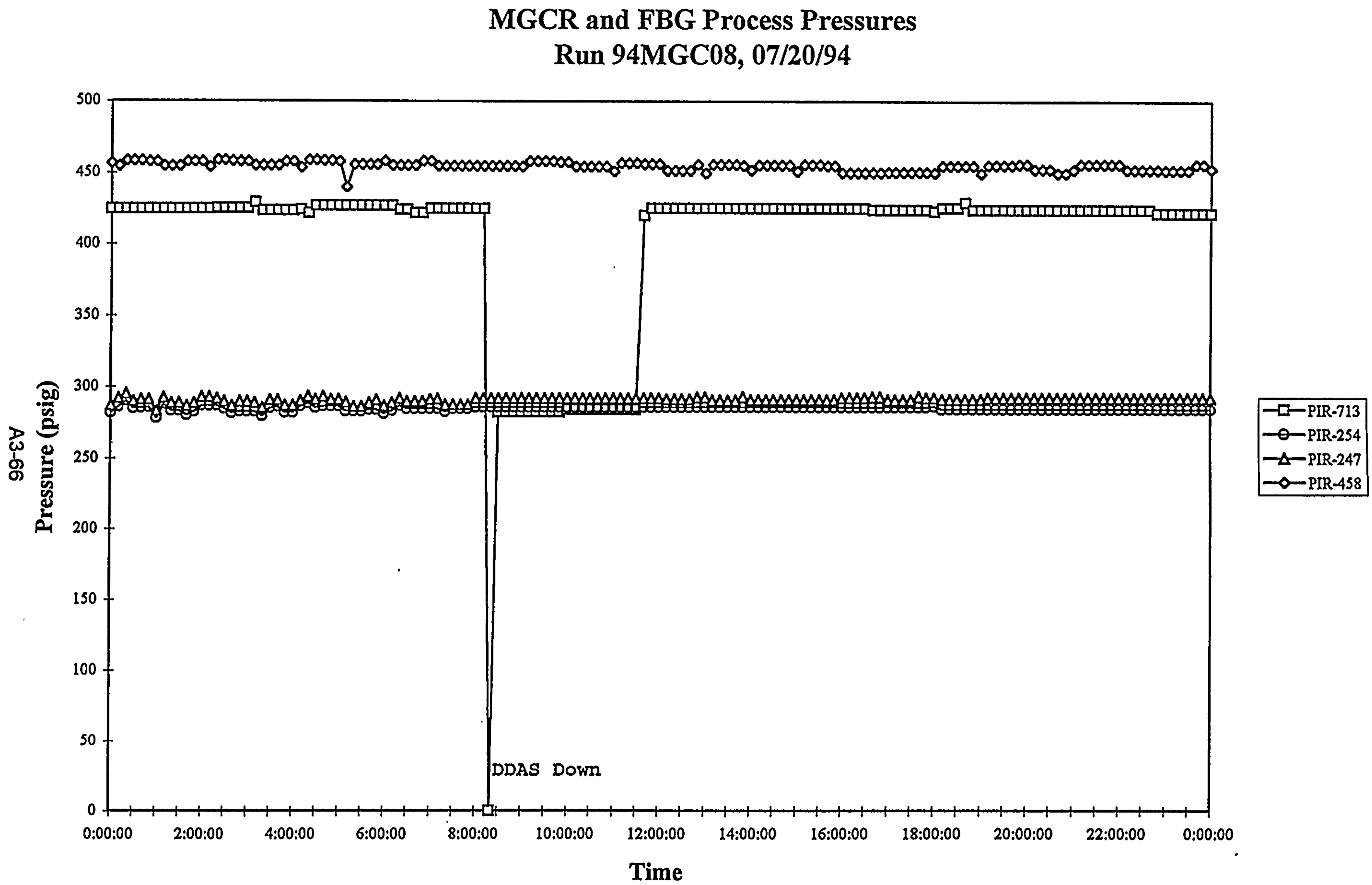


## MGCR and FBG Process Pressures
## Run 94MGC08, 07/18/94

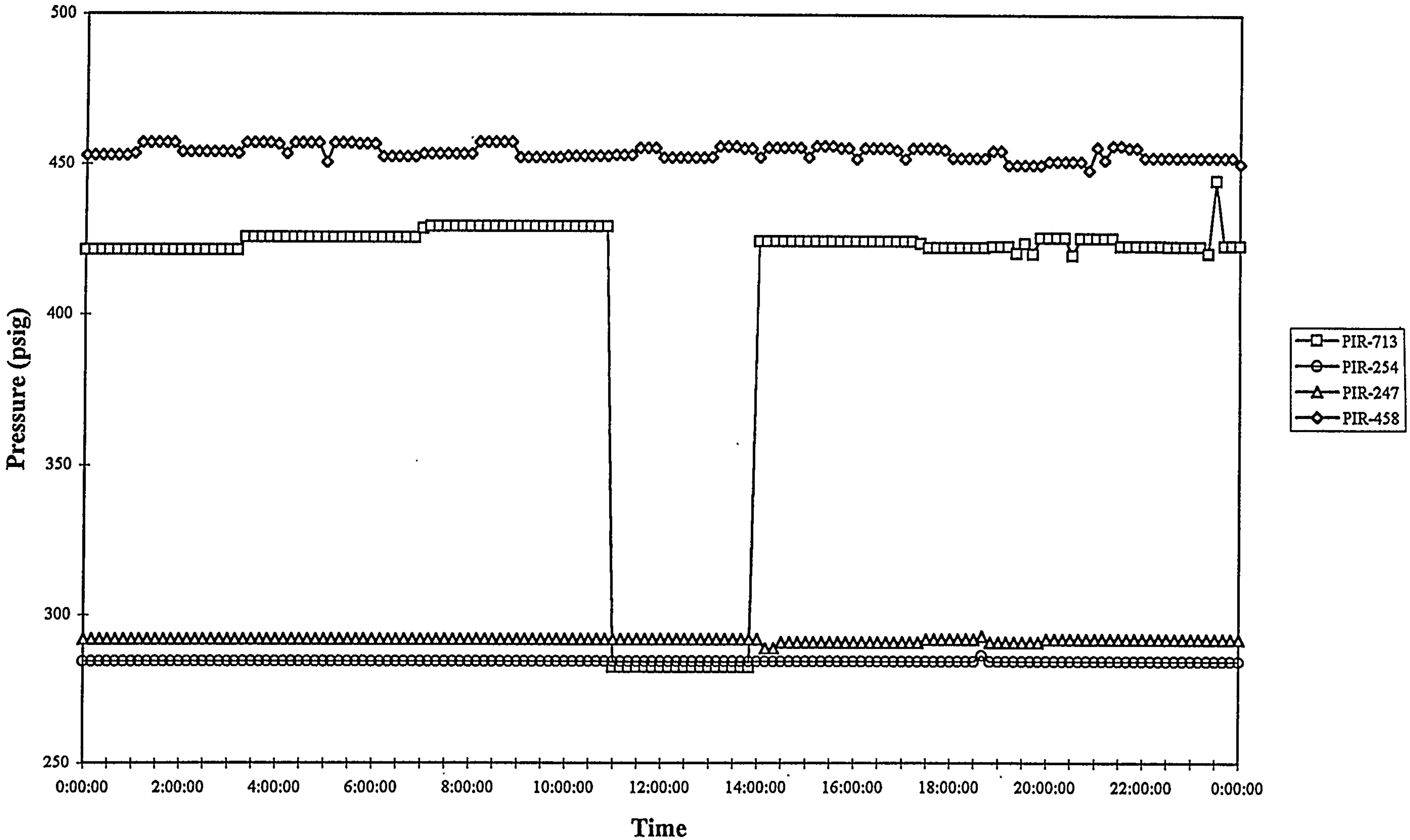


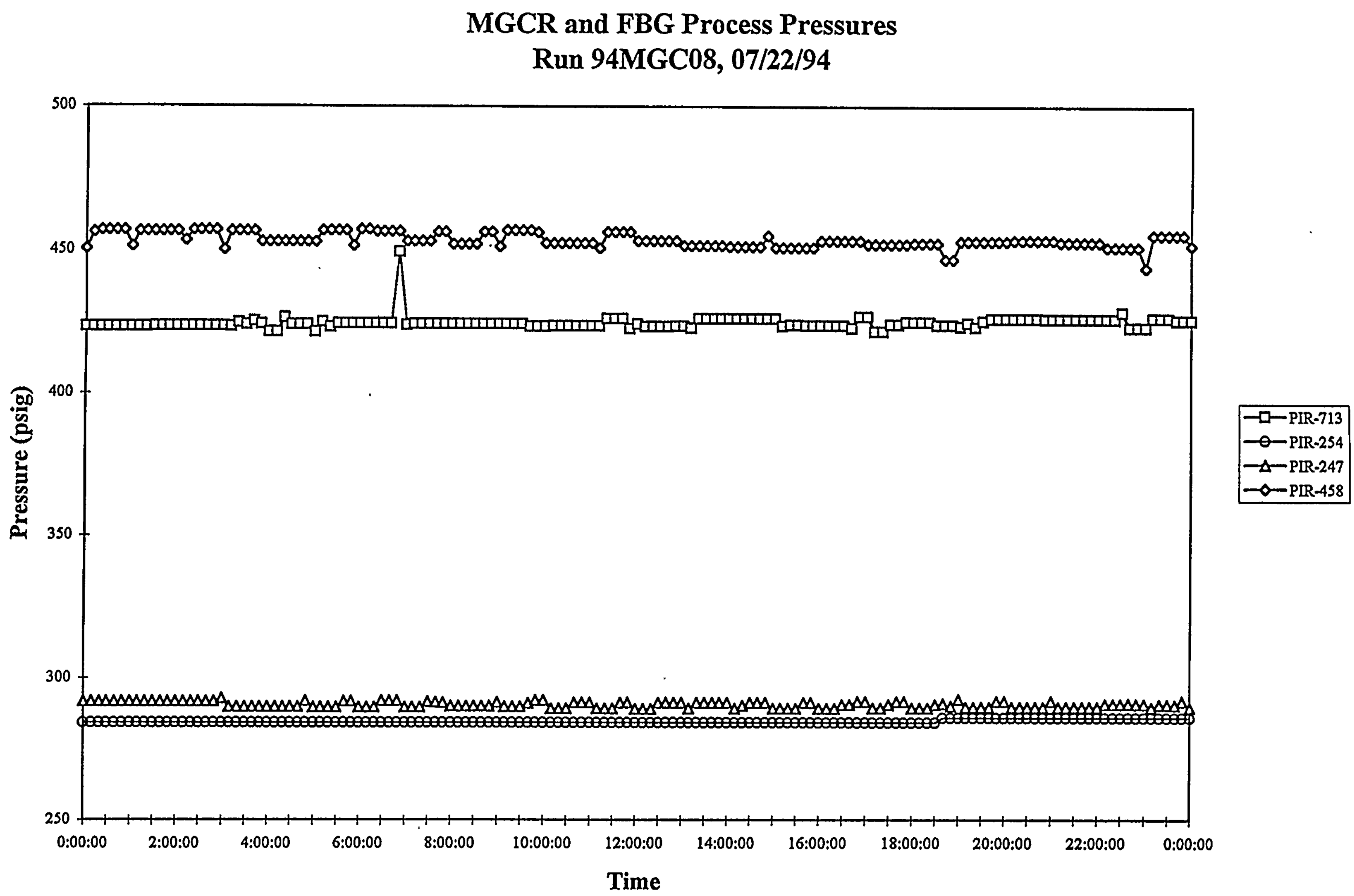
# MGCR and FBG Process Pressures
## Run 94MGC08, 07/19/94



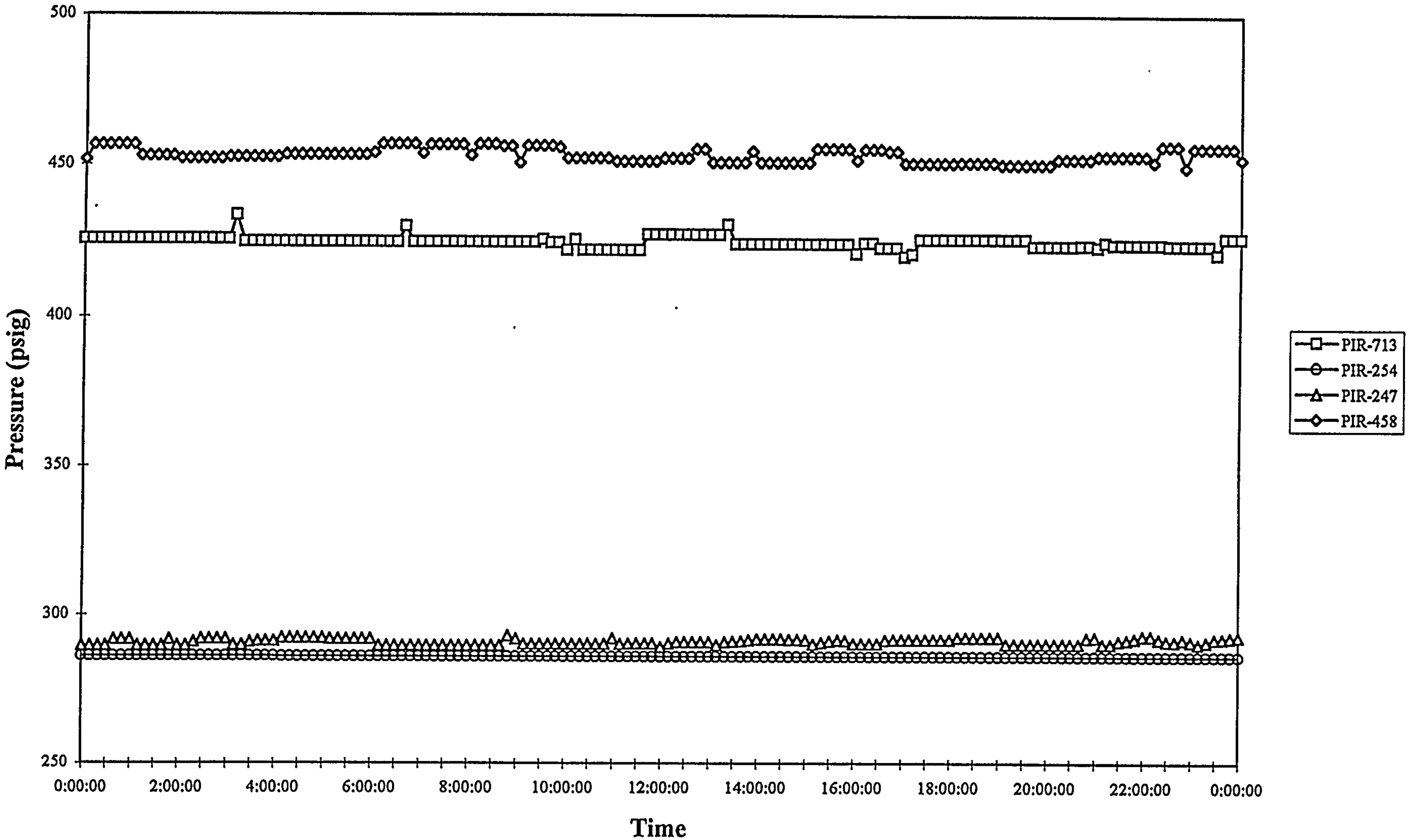

MGCR and FBG Process Pressures
Run 94MGC08, 07/20/94
Pressure (psig)
500
450
400
350
300
250
200
150
100
50
0
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
16:00:00
18:00:00
20:00:00
22:00:00
0:00:00
Time
DDAS Down
PIR-713
PIR-254
PIR-247
PIR-458

## MGCR and FBG Process Pressures
## Run 94MGC08, 07/21/94

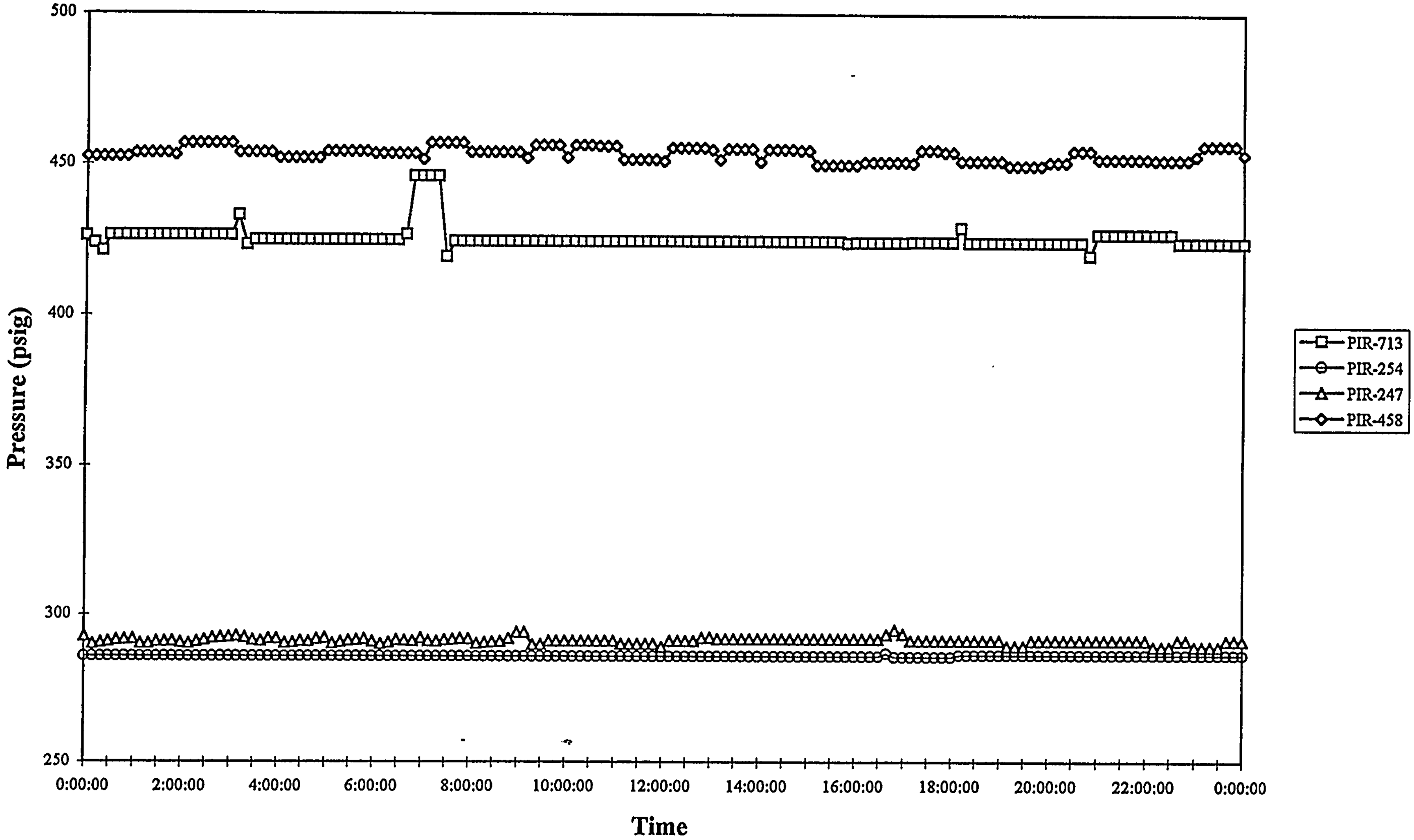



MGCR and FBG Process Pressures
Run 94MGC08, 07/22/94
500
450
400
350
300
250
Pressure (psig)
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
16:00:00
18:00:00
20:00:00
22:00:00
0:00:00
Time
PIR-713
PIR-254
PIR-247
PIR-458

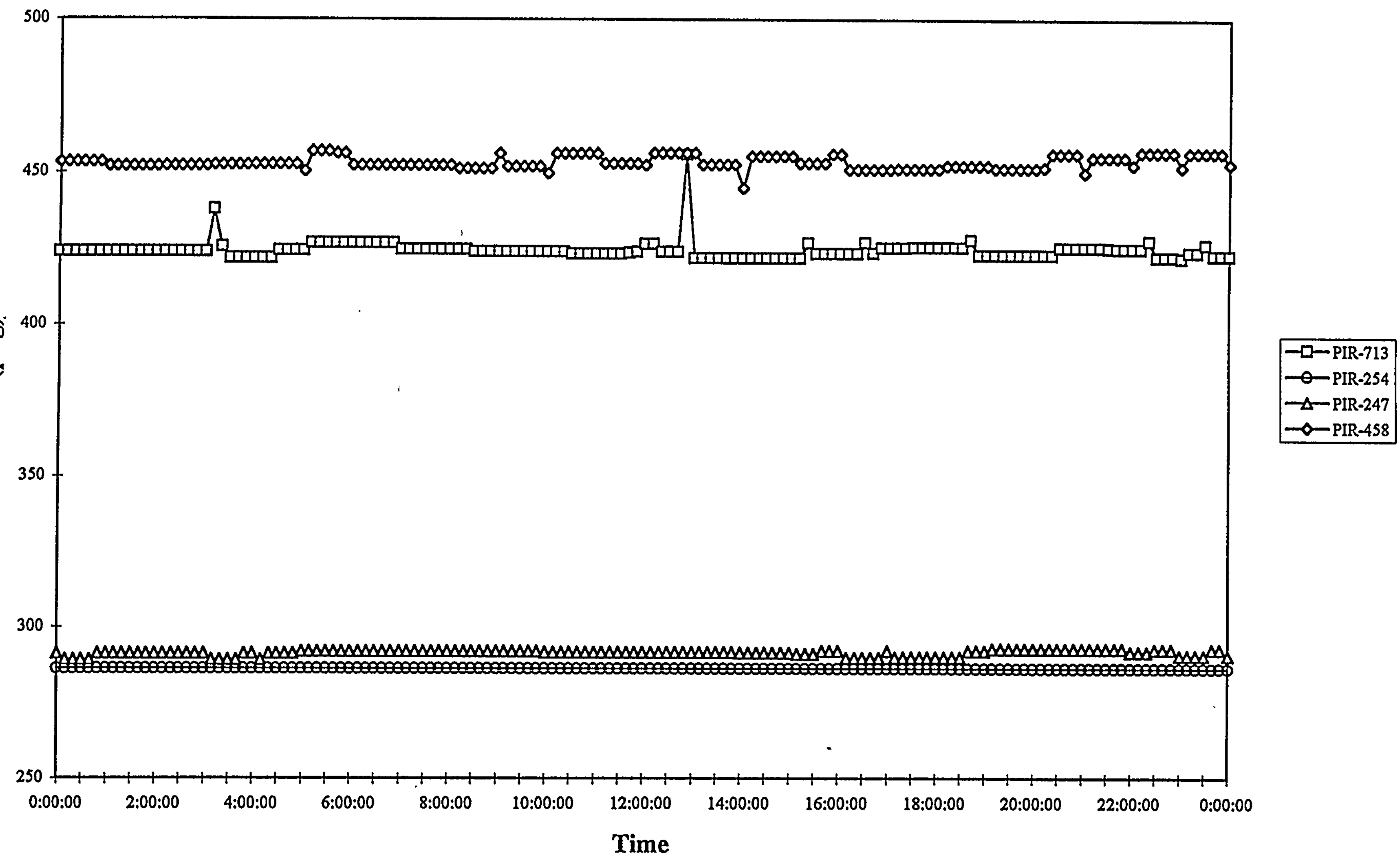
MGCR and FBG Process Pressures
Run 94MGC08, 07/23/94



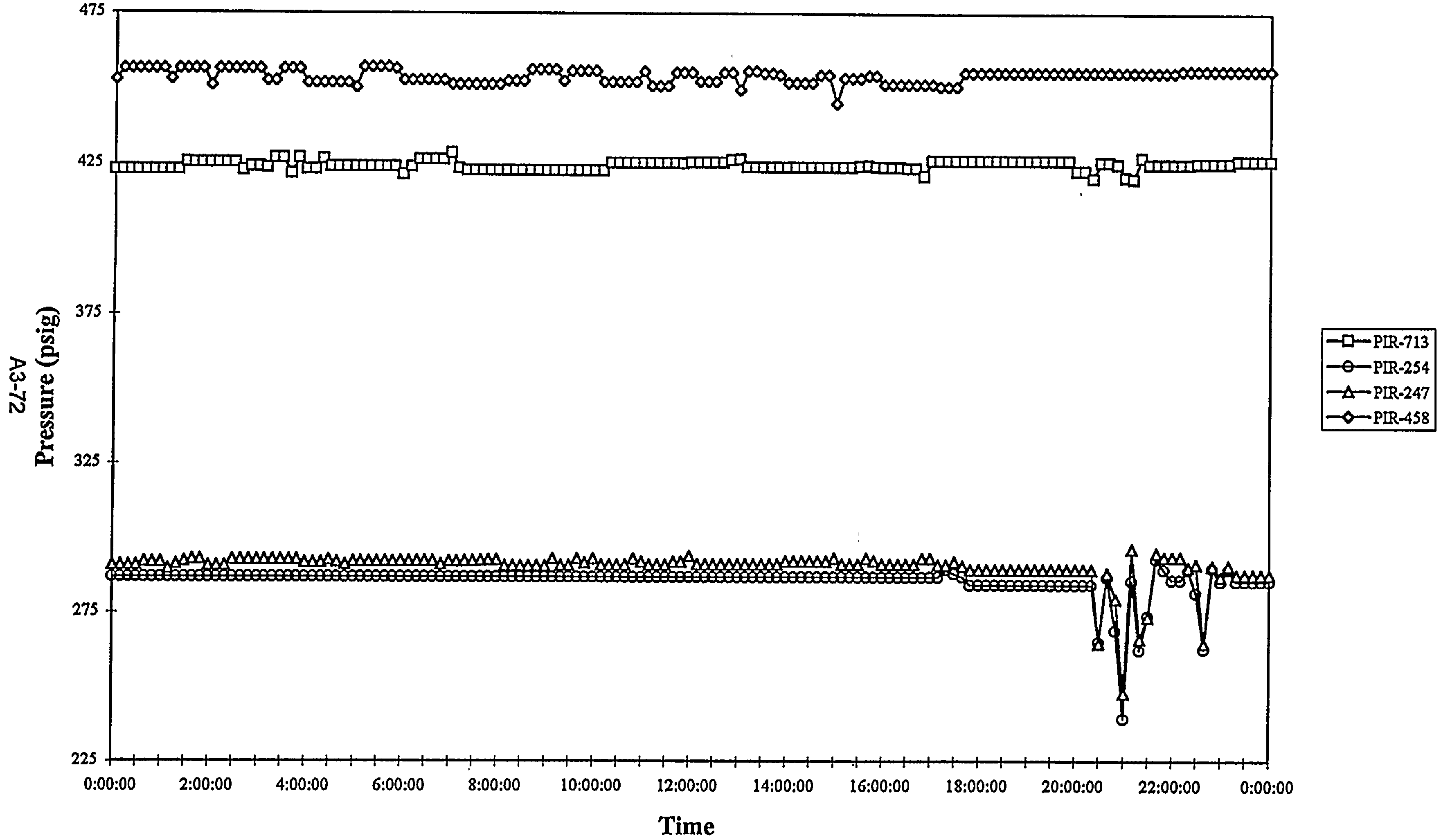
## MGCR and FBG Process Pressures
## Run 94MGC08, 07/24/94

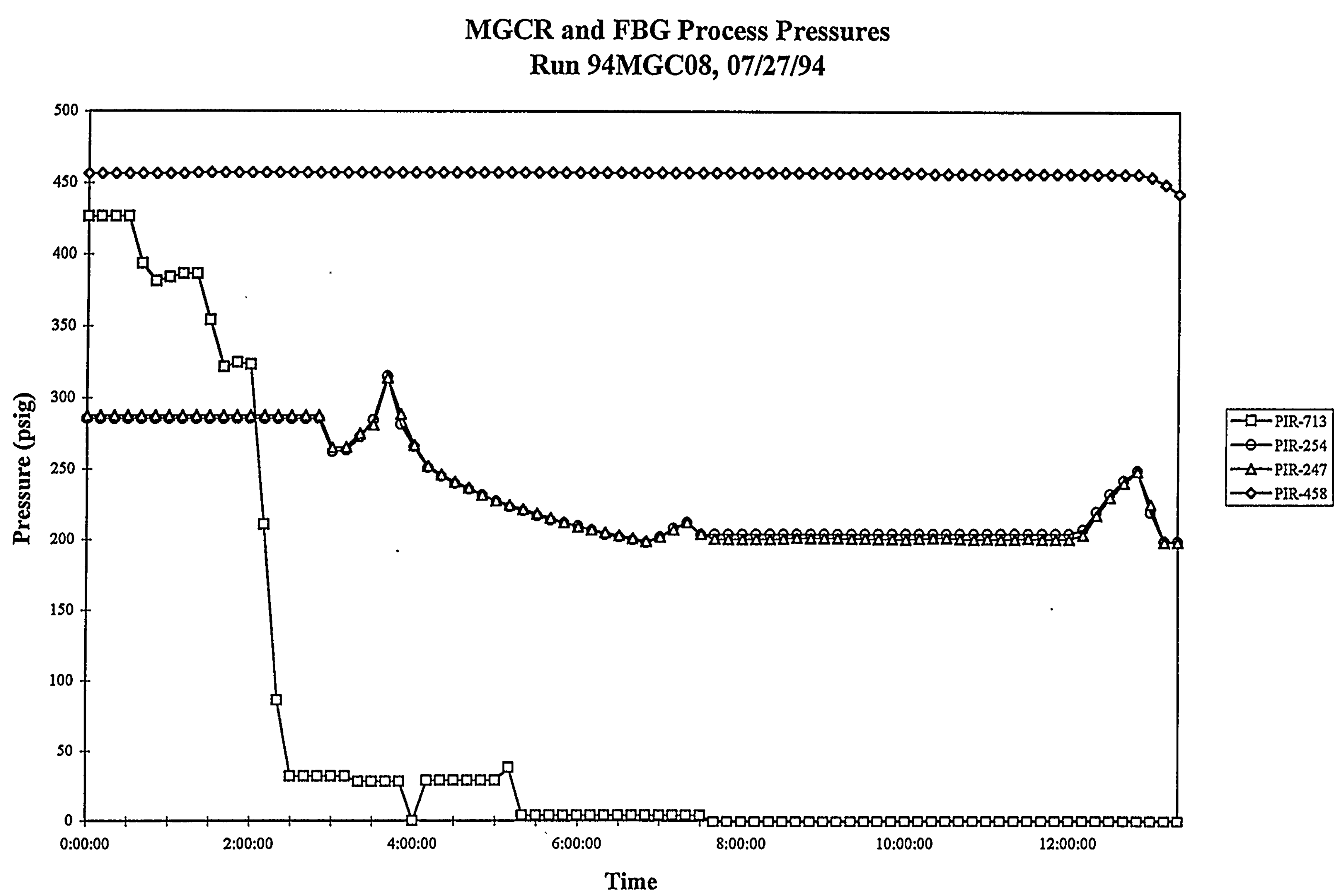


MGCR and FBG Process Pressures
Run 94MGC08, 07/25/94

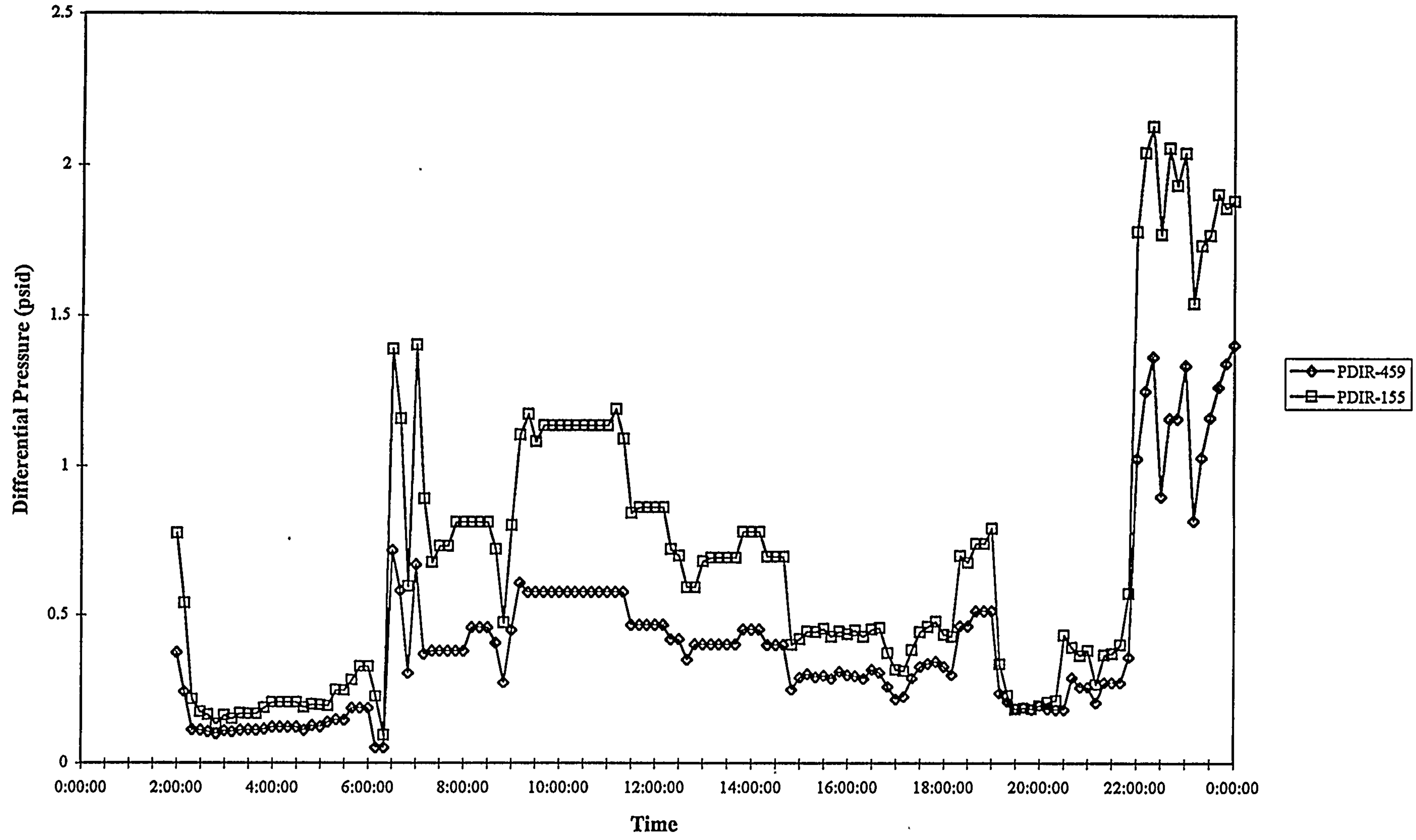


MGCR and FBG Process Pressures
Run 94MGC08, 07/26/94

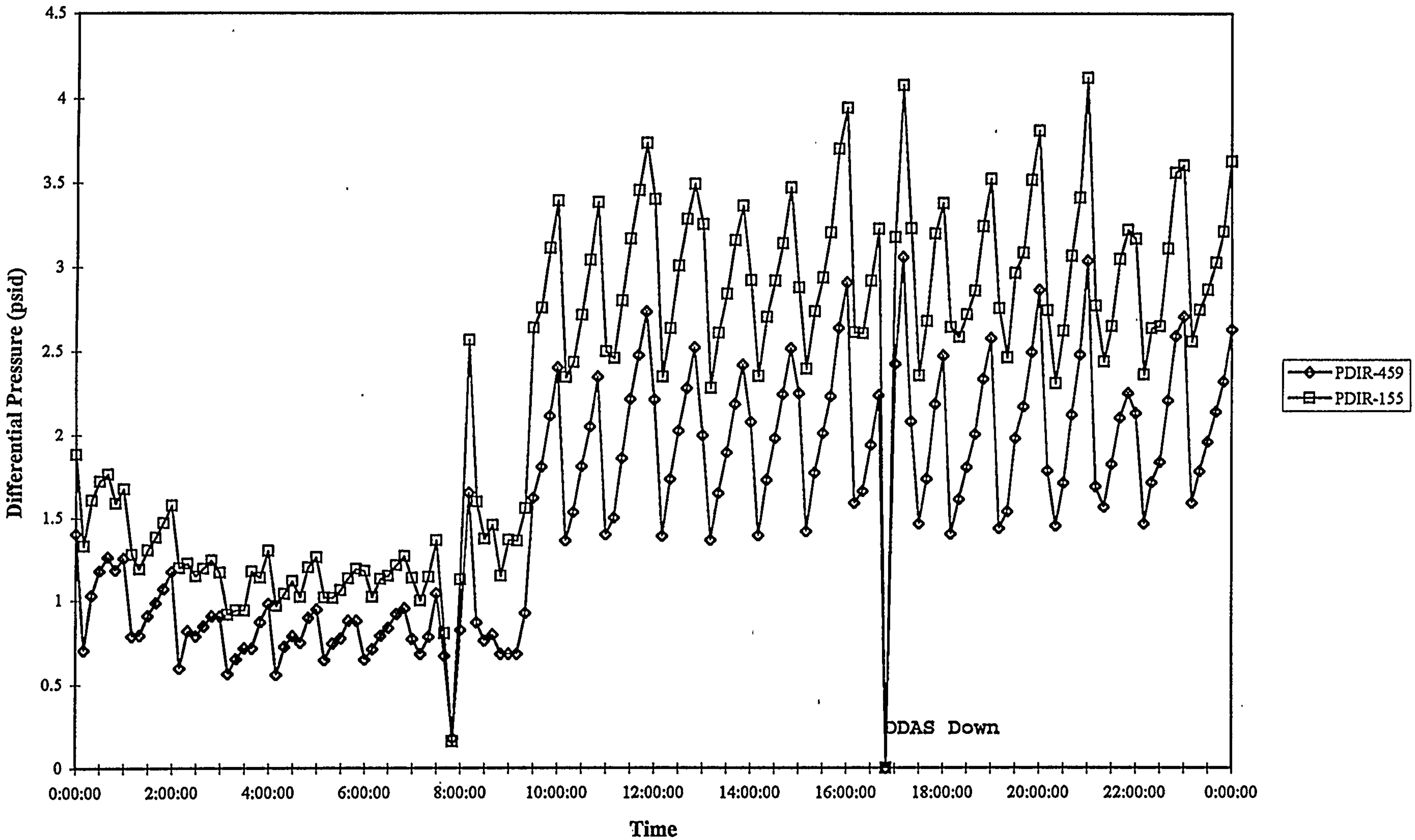



MGCR and FBG Process Pressures
Run 94MGC08, 07/27/94
Pressure (psig)
500
450
400
350
300
250
200
150
100
50
0
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
Time
PIR-713
PIR-254
PIR-247
PIR-458

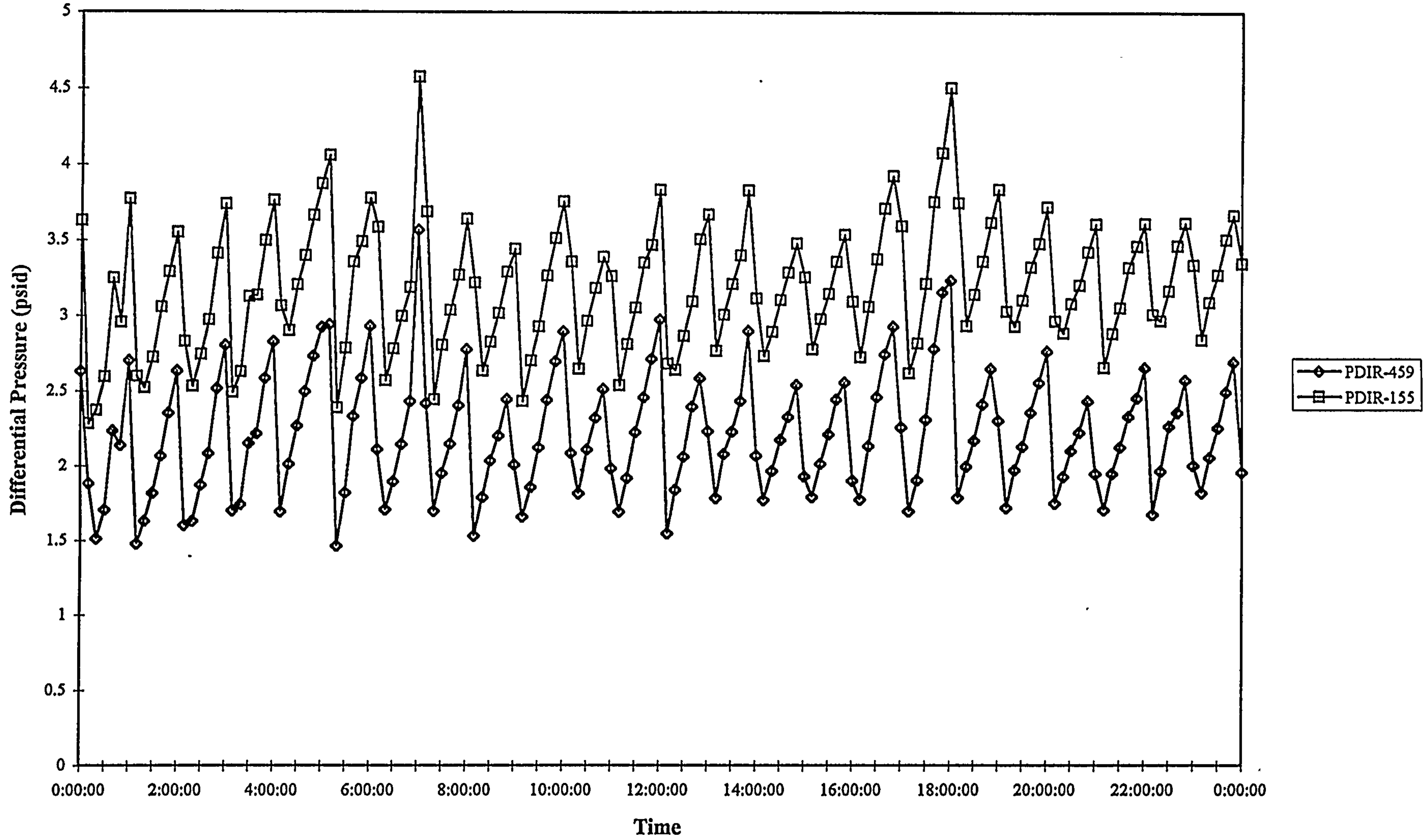
## F-100 Differential Pressure
## Run 94MGC08, 07/18/94



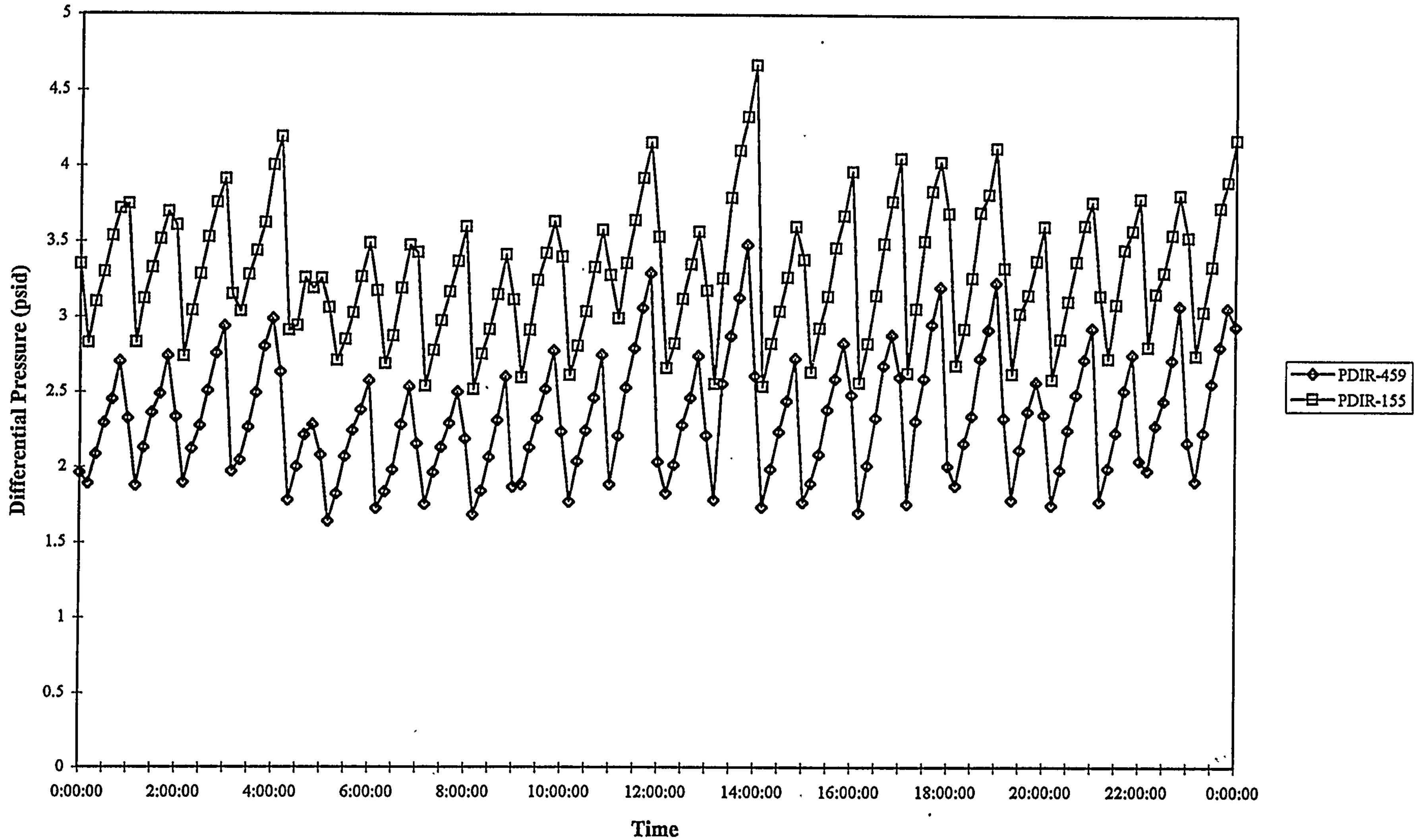
# F-100 Differential Pressure
## Run 94MGC08, 07/19/94



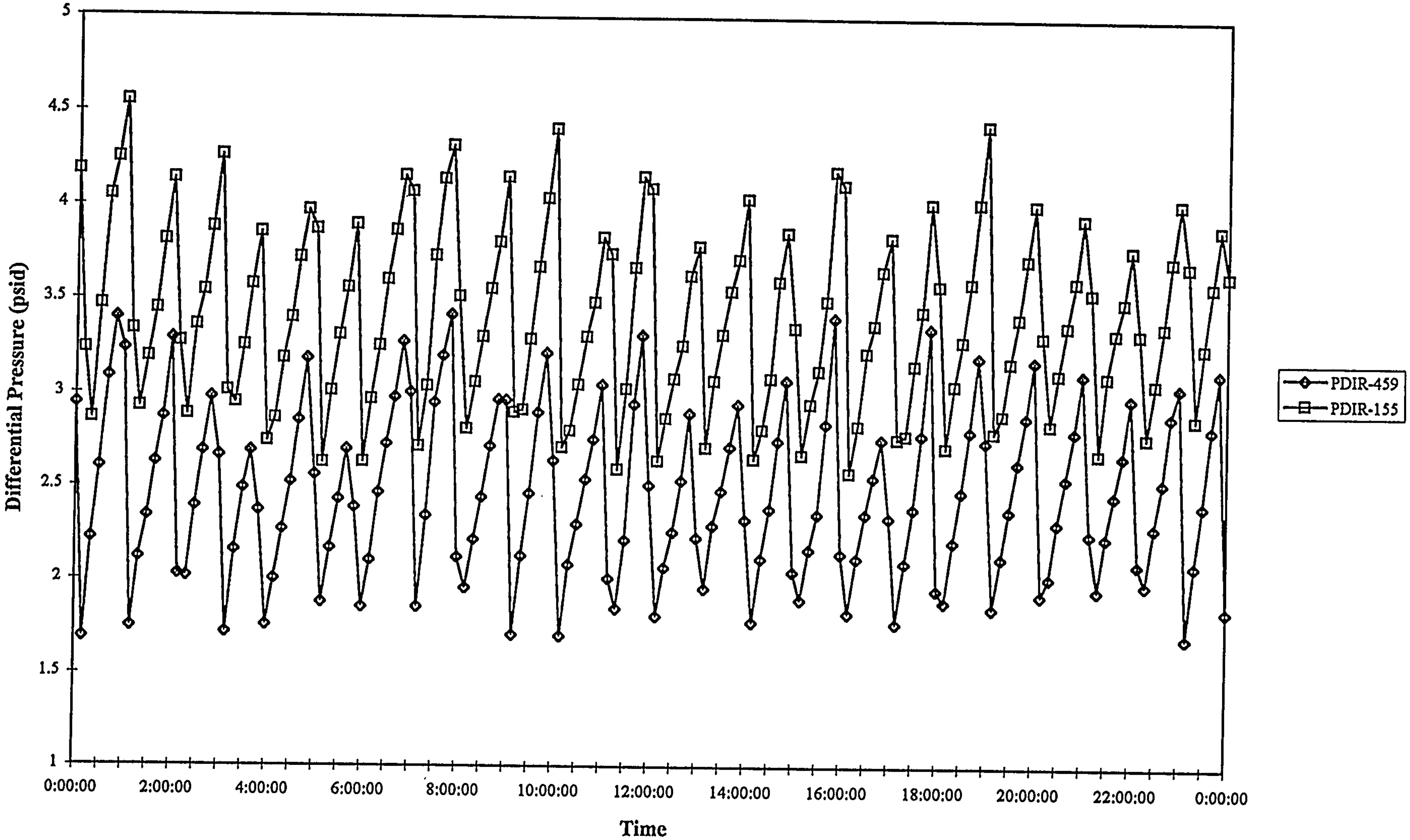
# F-100 Differential Pressure
## Run 94MGC08, 07/20/94



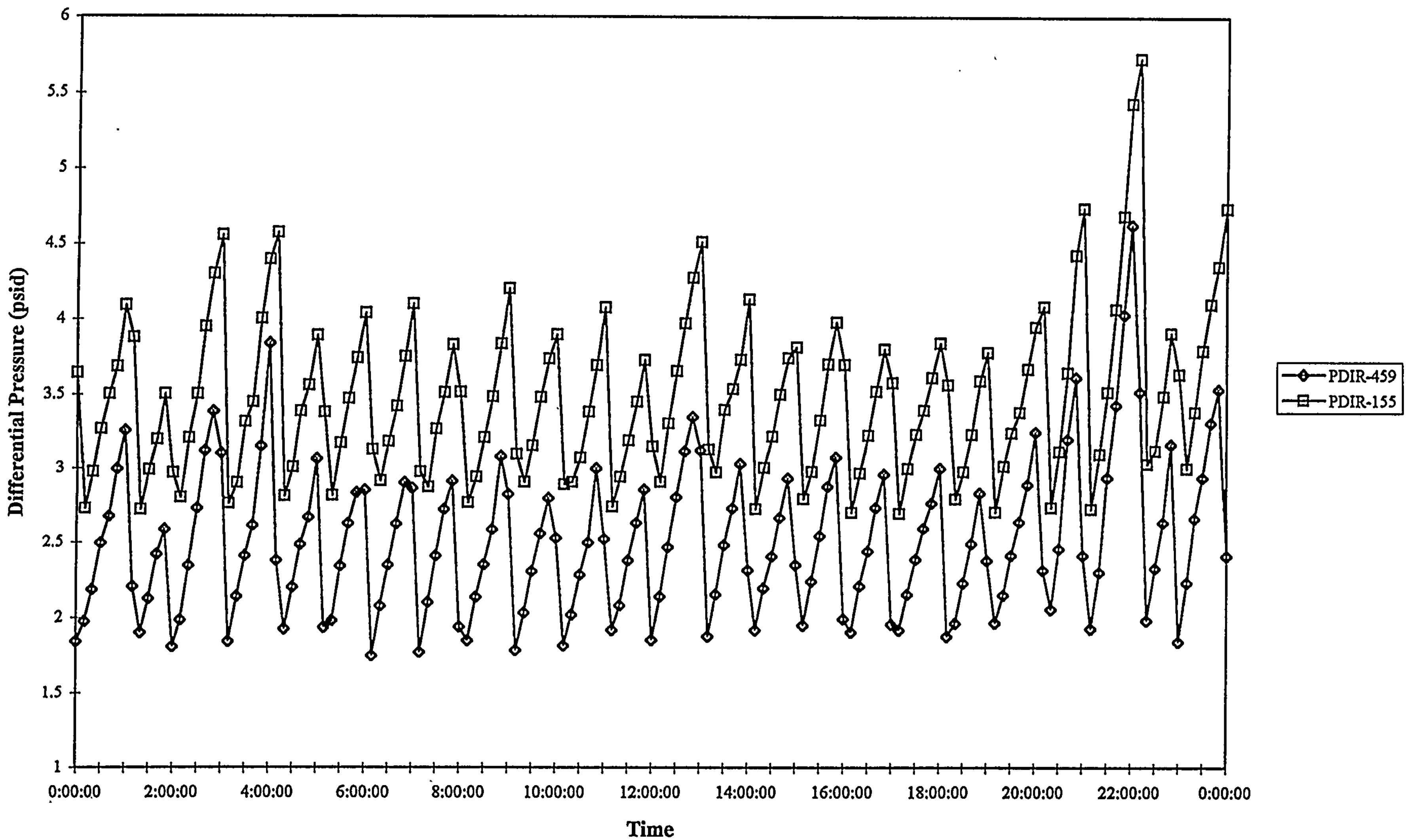
## F-100 Differential Pressure
## Run 94MGC08, 07/21/94



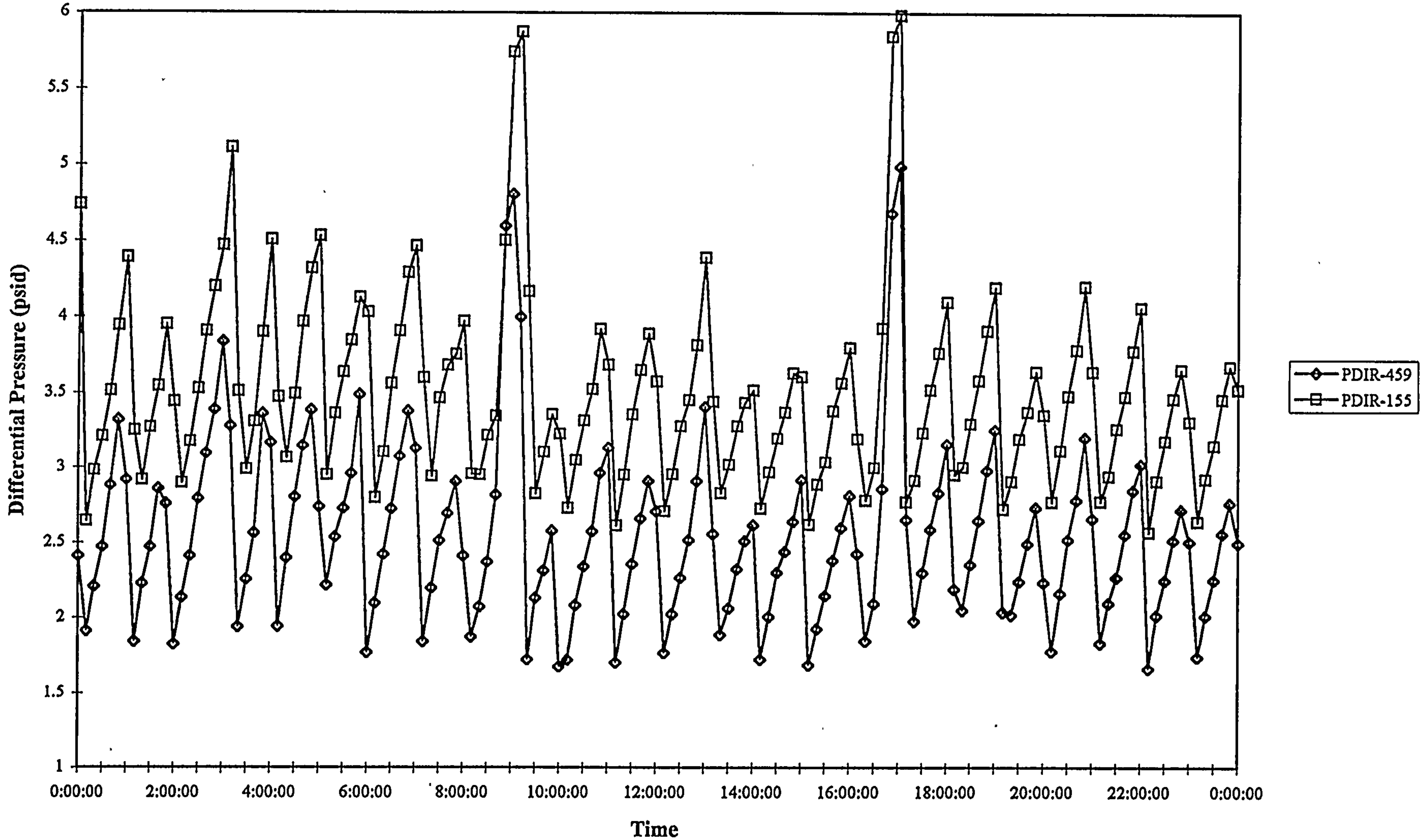
# F-100 Differential Pressure
## Run 94MGC08, 07/22/94



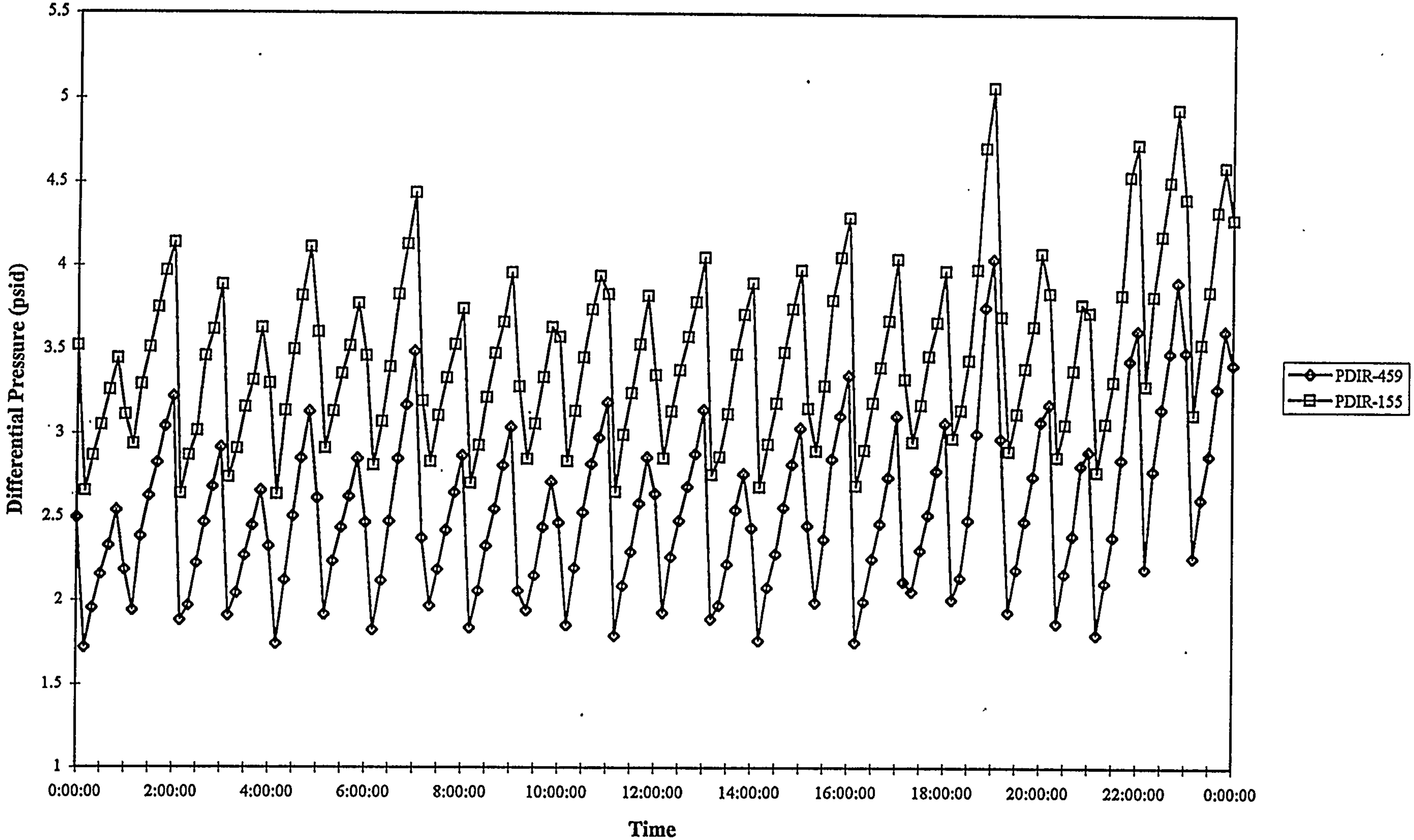
## F-100 Differential Pressure
## Run 94MGC08, 07/23/94



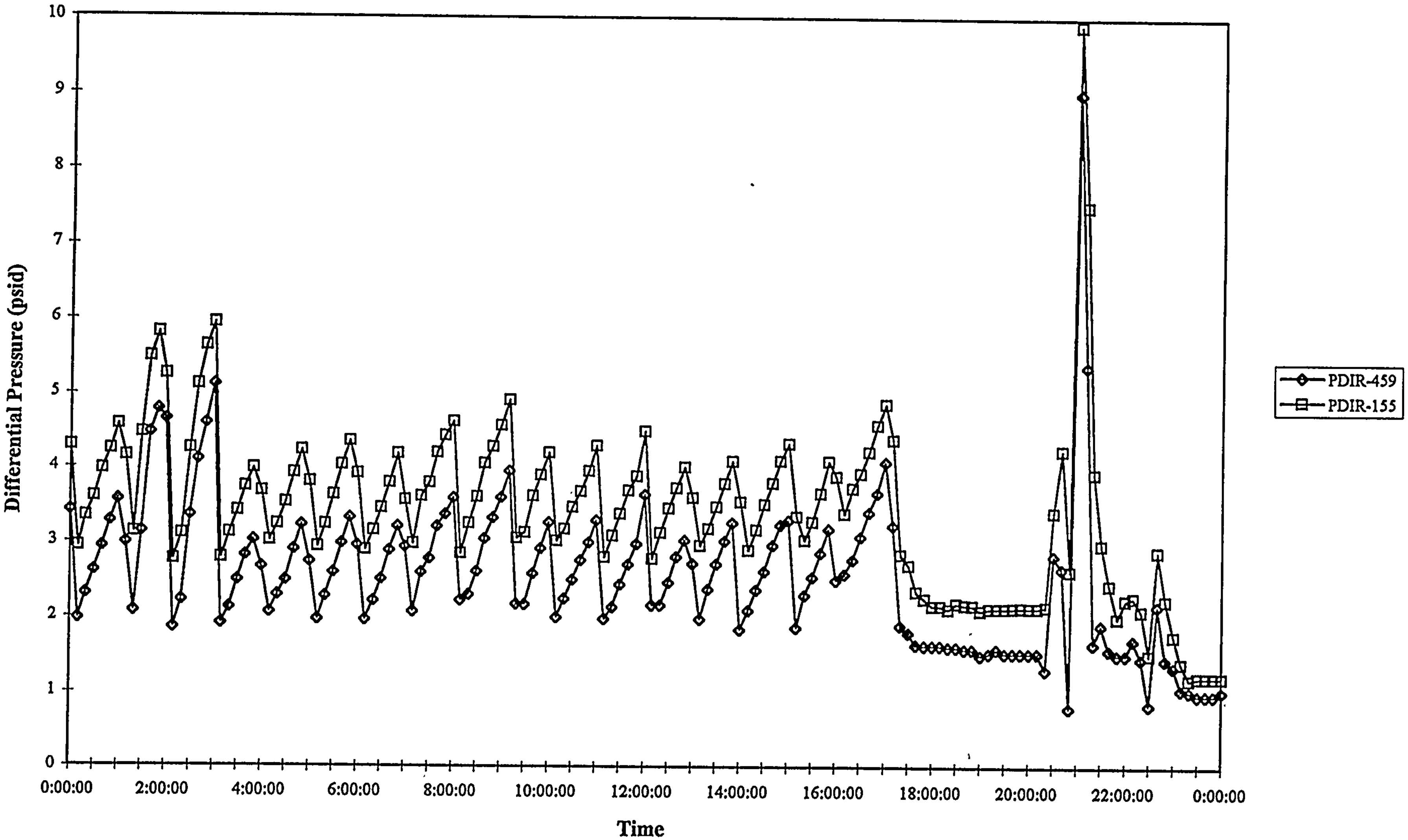
# F-100 Differential Pressure
Run 94MGC08, 07/24/94

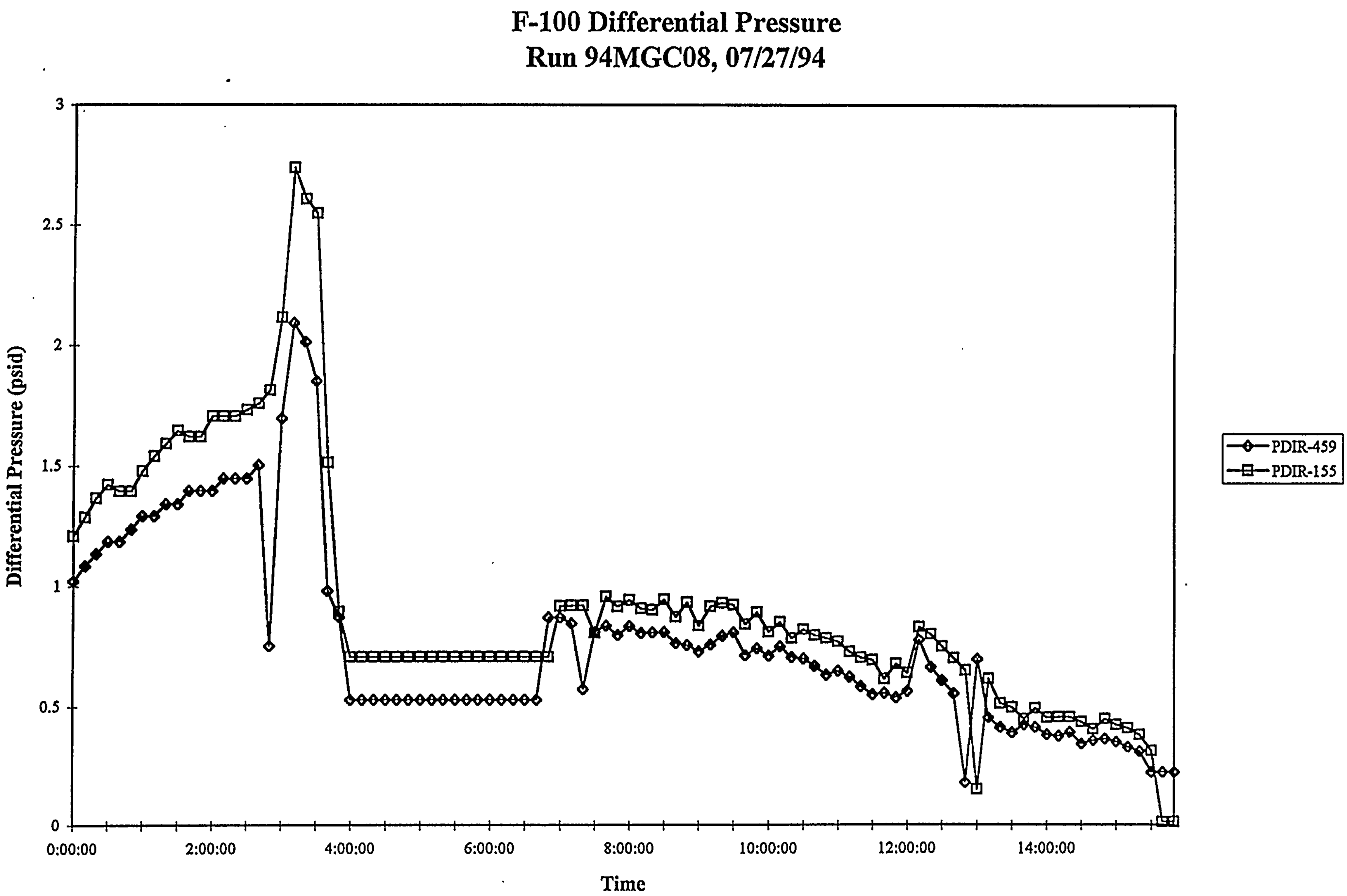


## F-100 Differential Pressure
## Run 94MGC08, 07/25/94



# F-100 Differential Pressure
## Run 94MGC08, 07/26/94

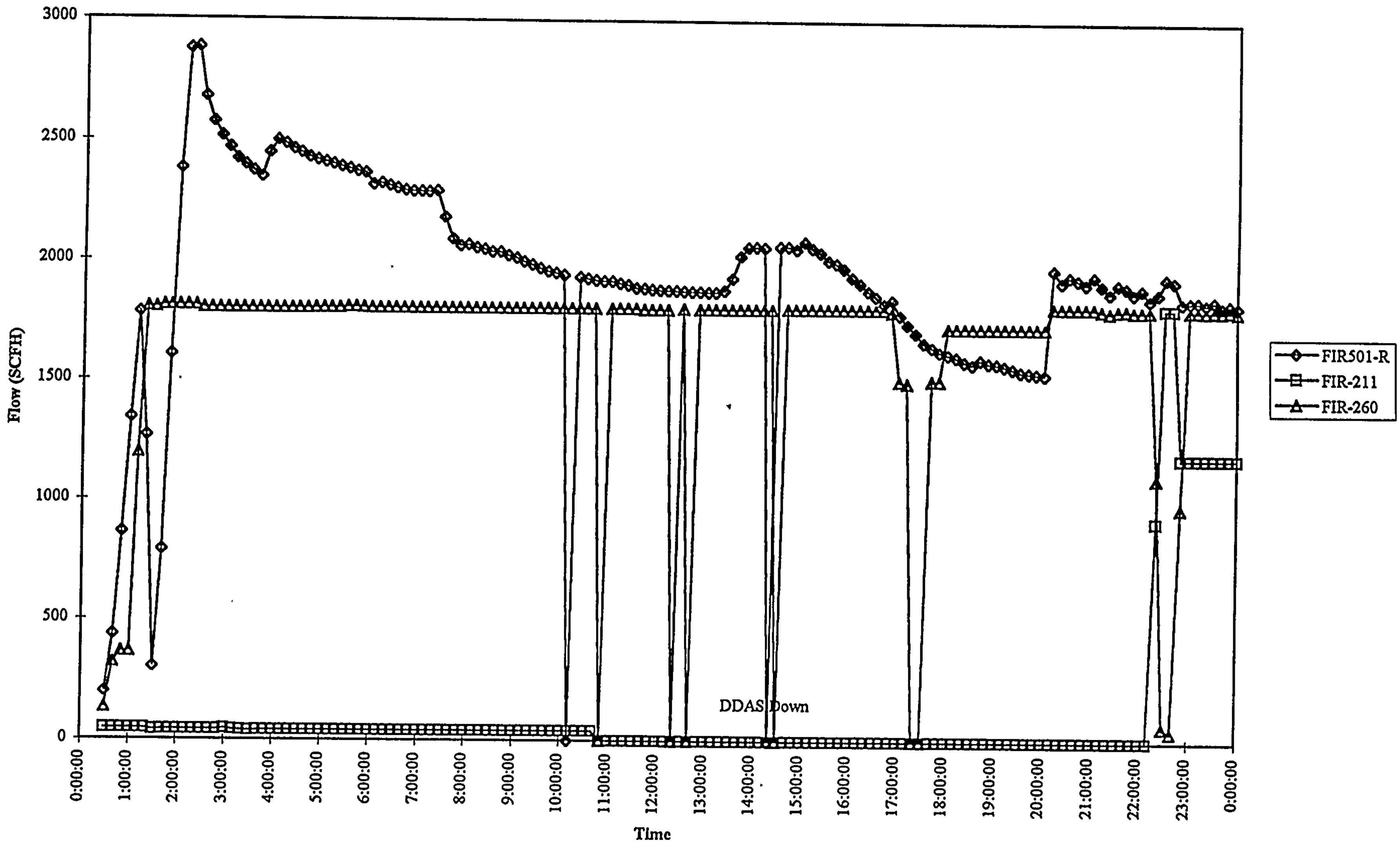




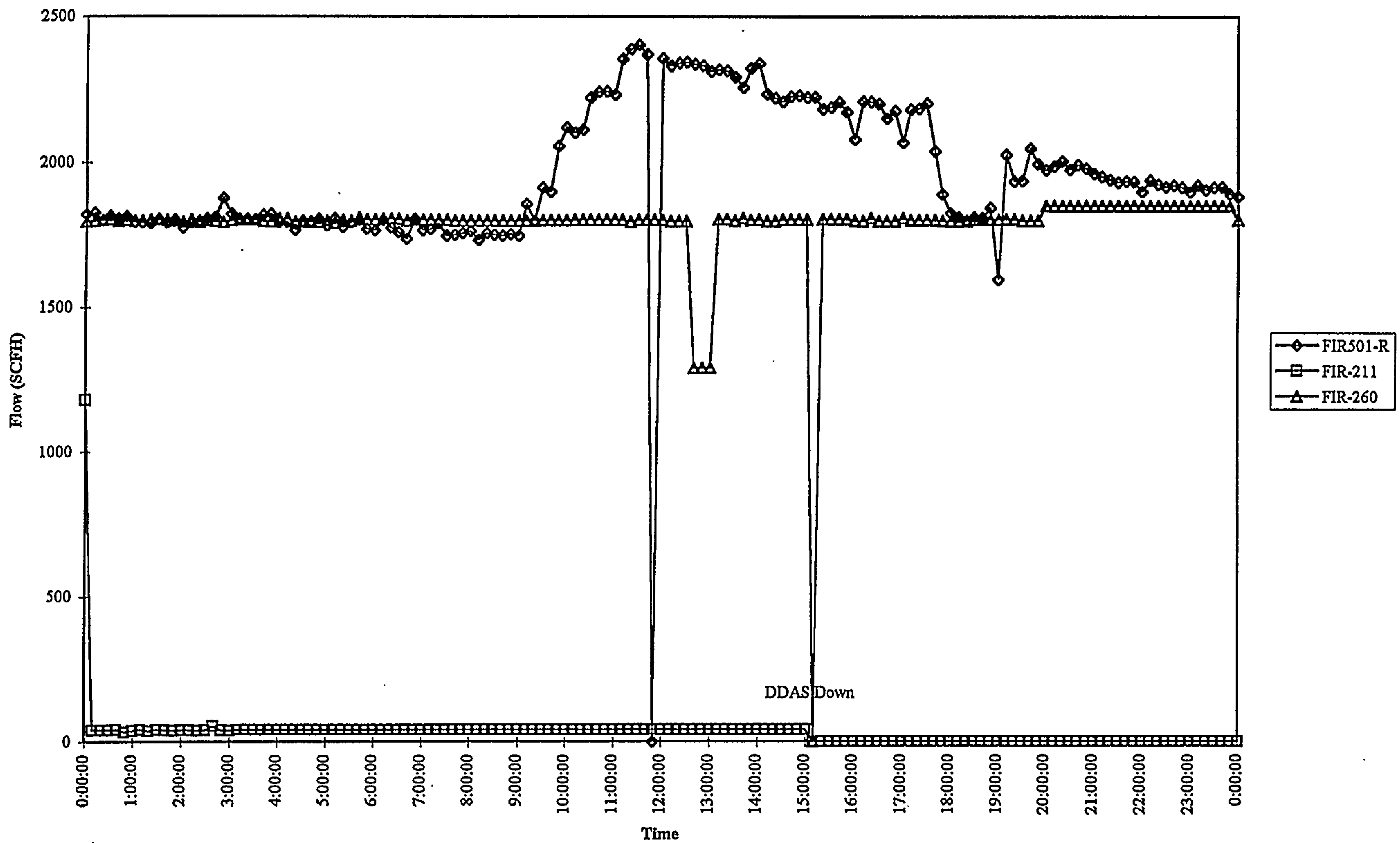
F-100 Differential Pressure
Run 94MGC08, 07/27/94
Differential Pressure (psid)
3
2.5
2
1.5
1
0.5
0
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
Time
PDIR-459
PDIR-155

# 94MGC09
# (09/12/94 - 09/16/94)

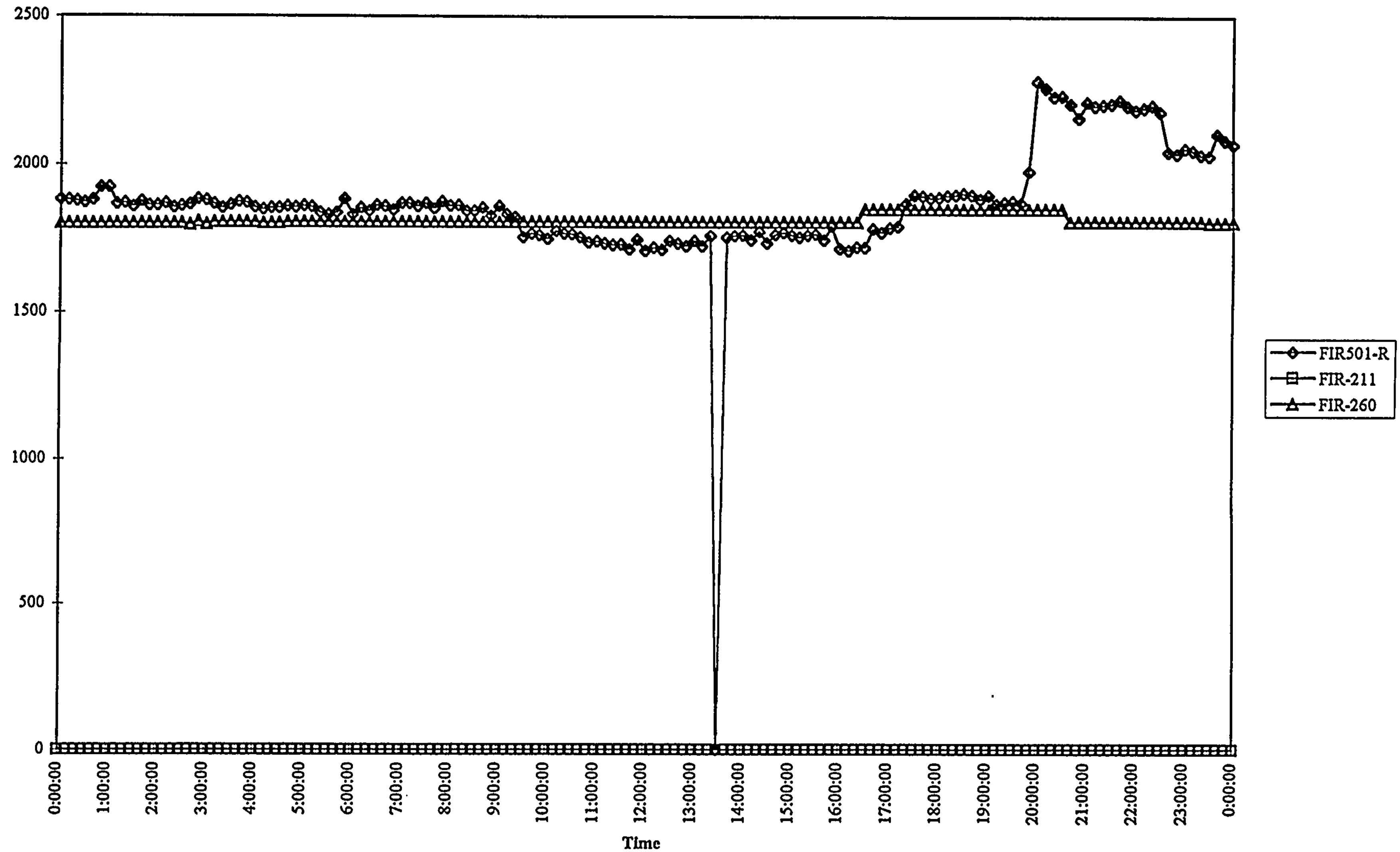
## MGCR Inlet and Exit Flows
## Run 94MGC09, 09/12/94



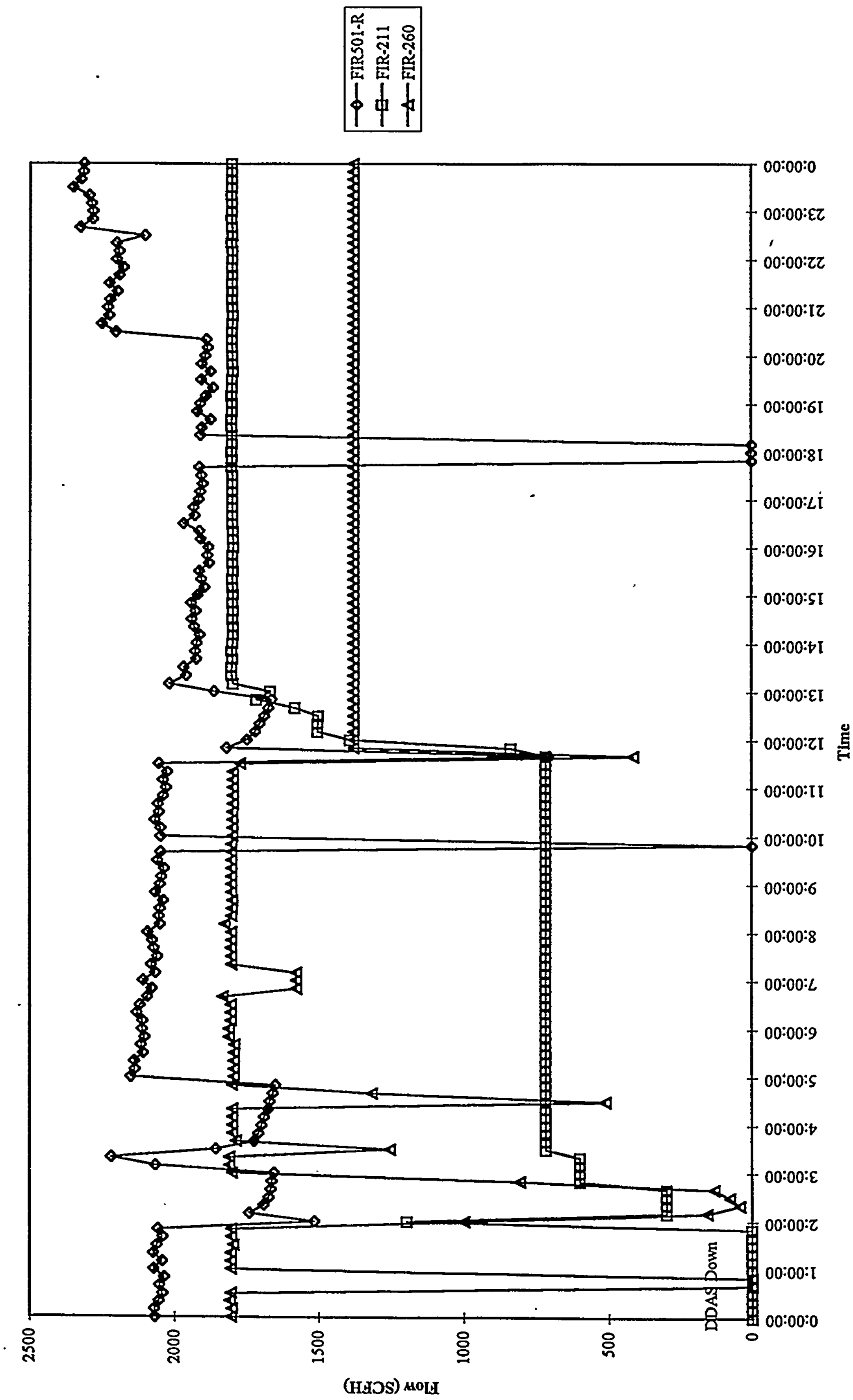
# MGCR Inlet and Exit Flows
## Run 94MGC09, 09/13/94



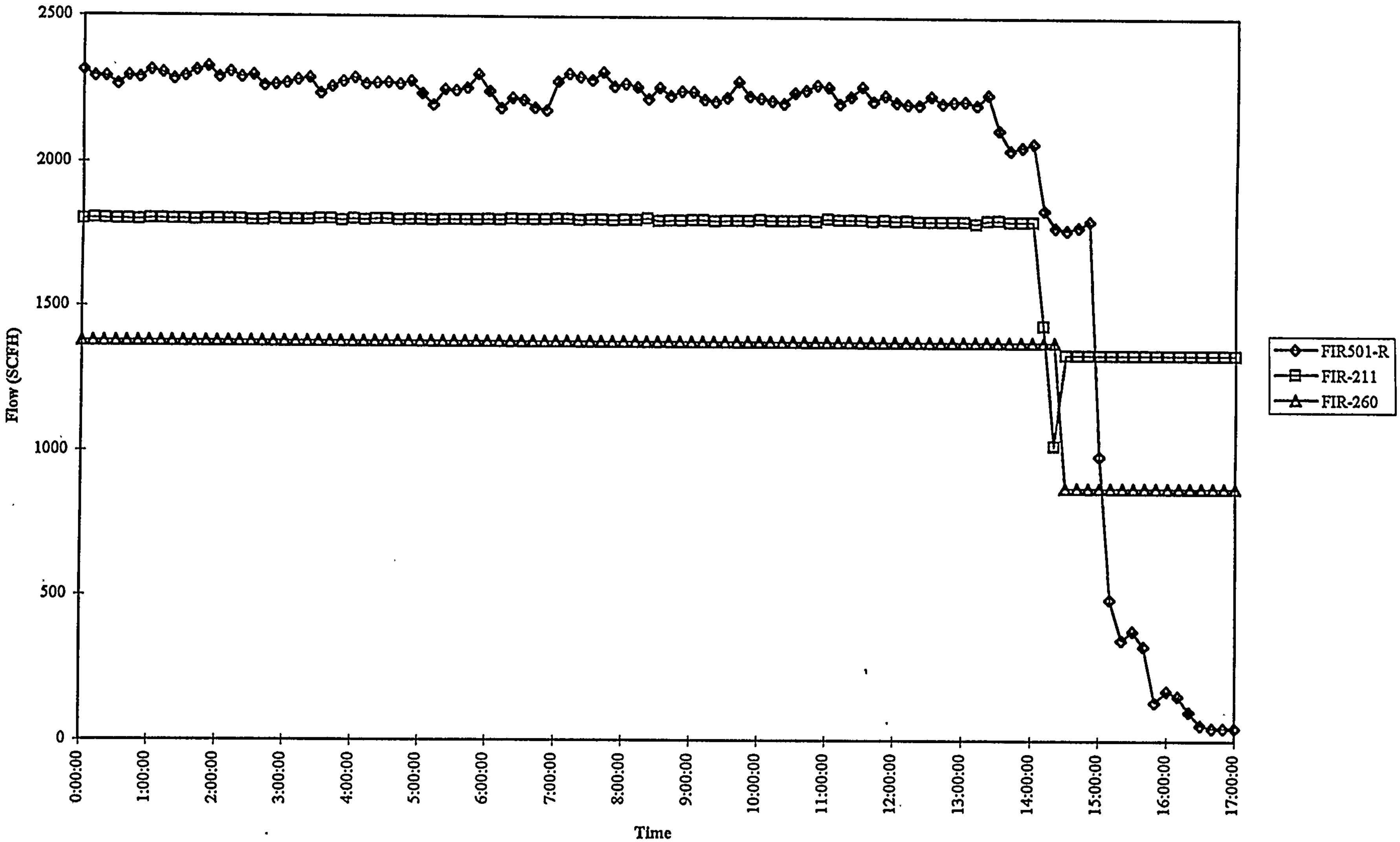
# MGCR Inlet and Exit Flows
## Run 94MGC09, 09/14/94



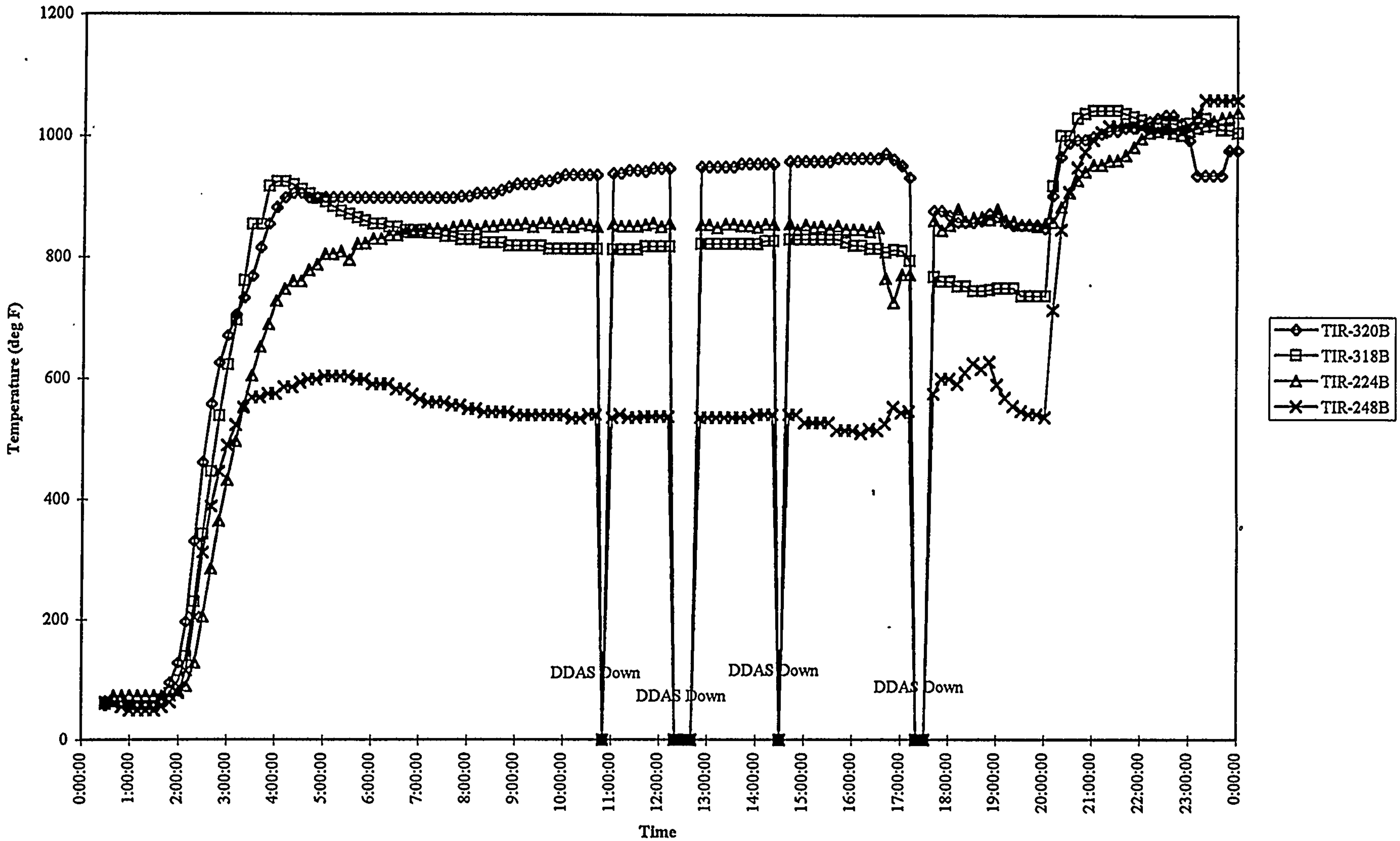
## MGCR Inlet and Exit Flows
## Run 94MGC09, 09/15/94



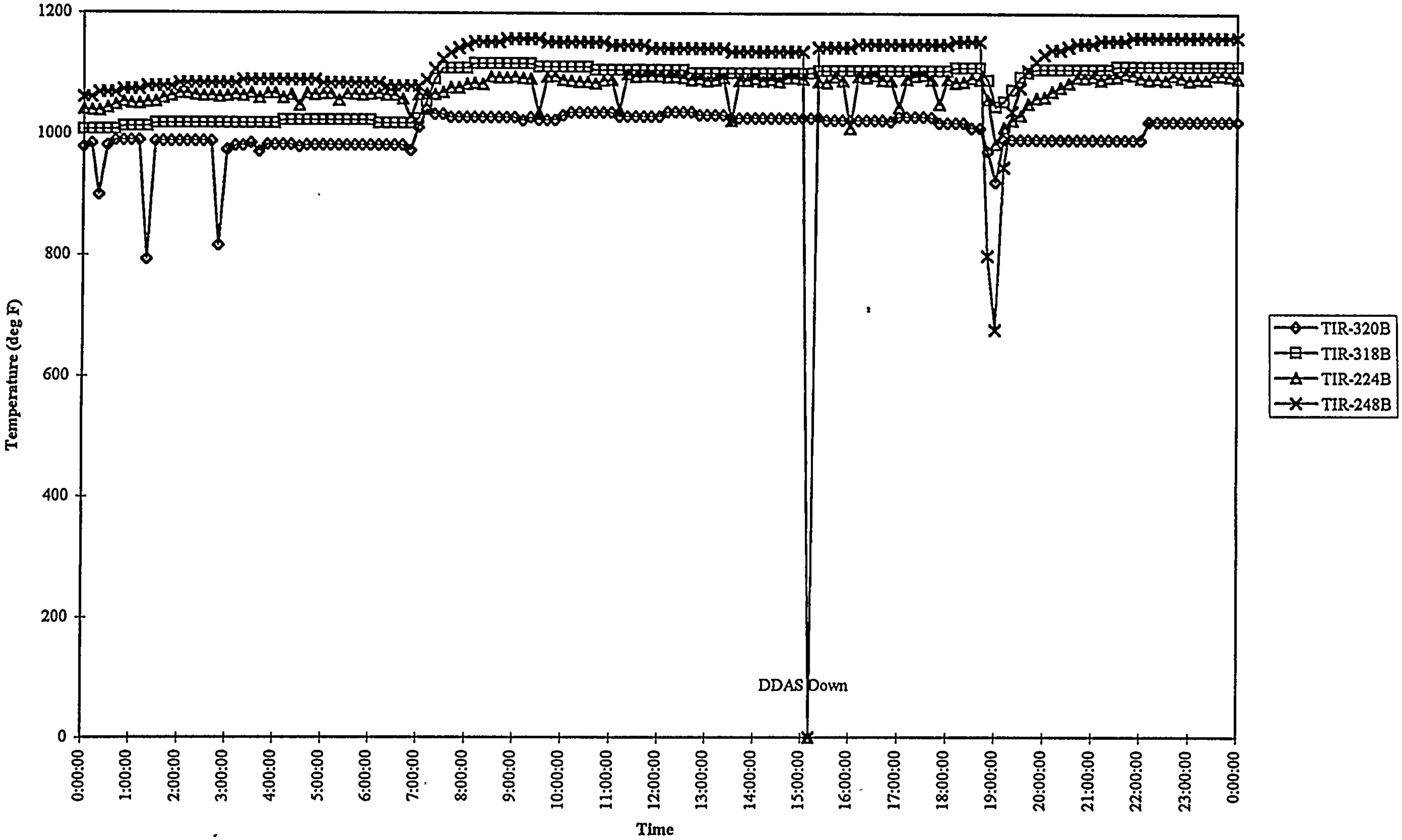
MGCR Inlet and Exit Flows
Run 94MGC09, 09/16/94



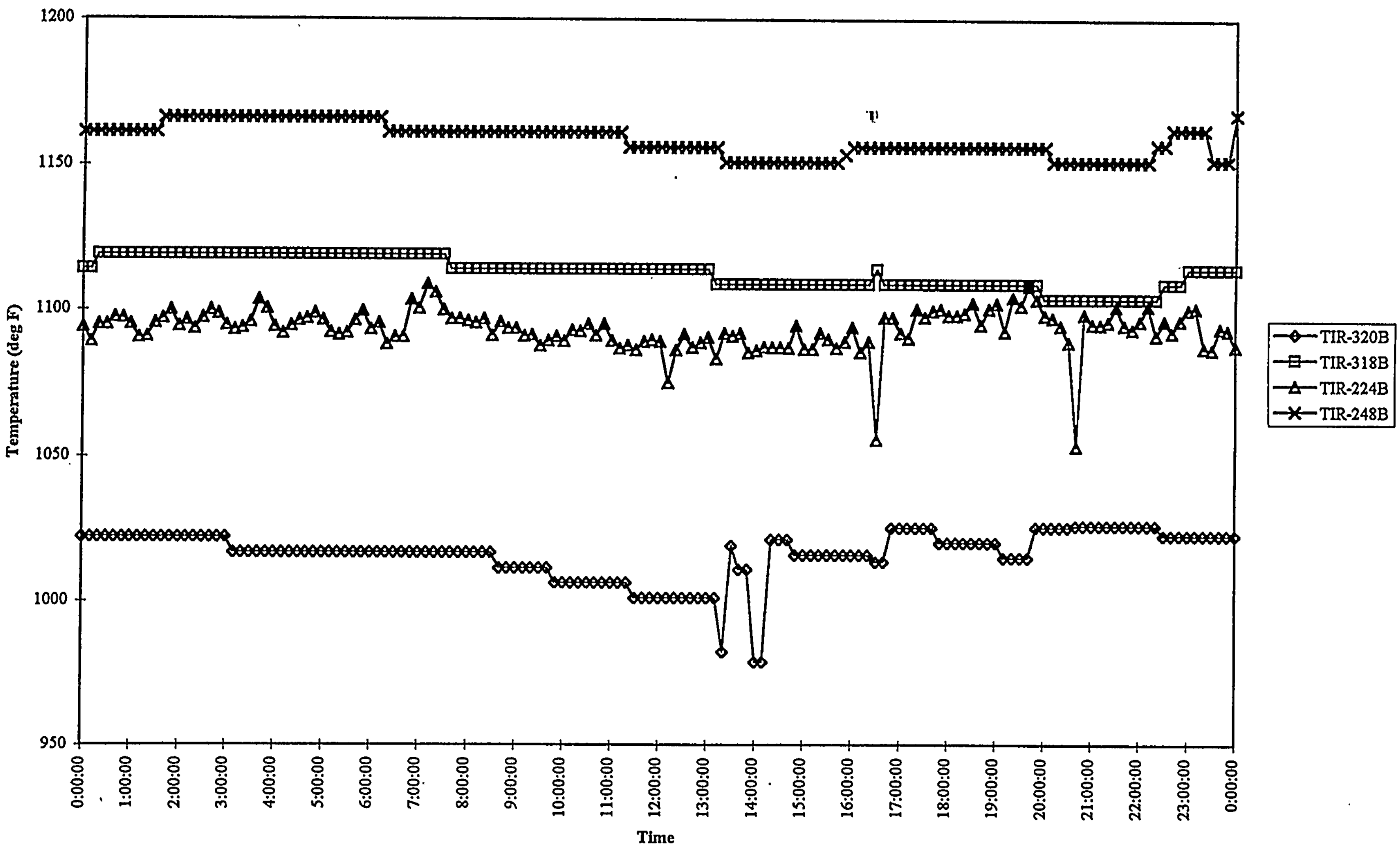
## MGCR Process Gas Line Temperatures
## Run 94MGC09, 09/12/94



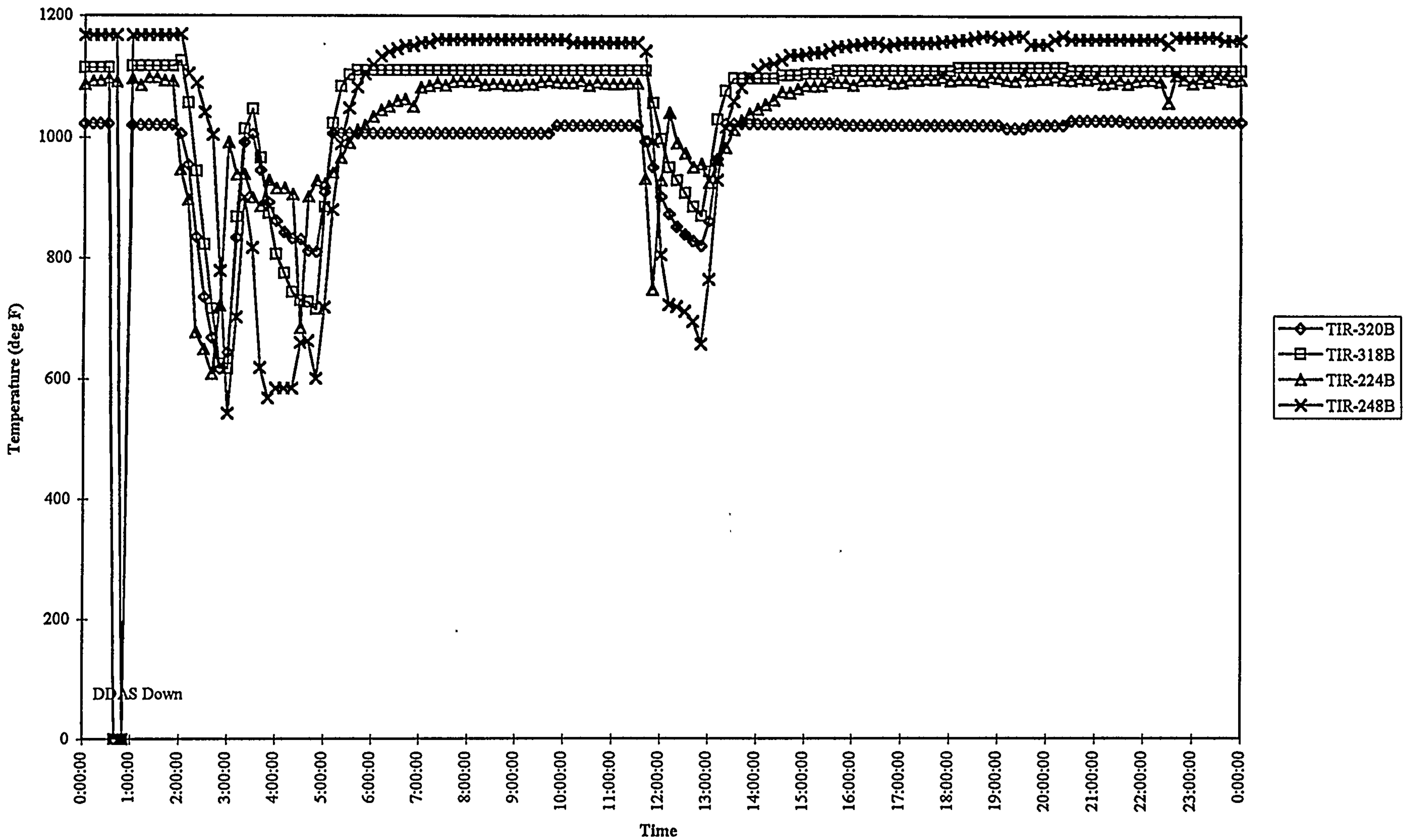
## MGCR Process Gas Line Temperatures
## Run 94MGC09, 09/13/94



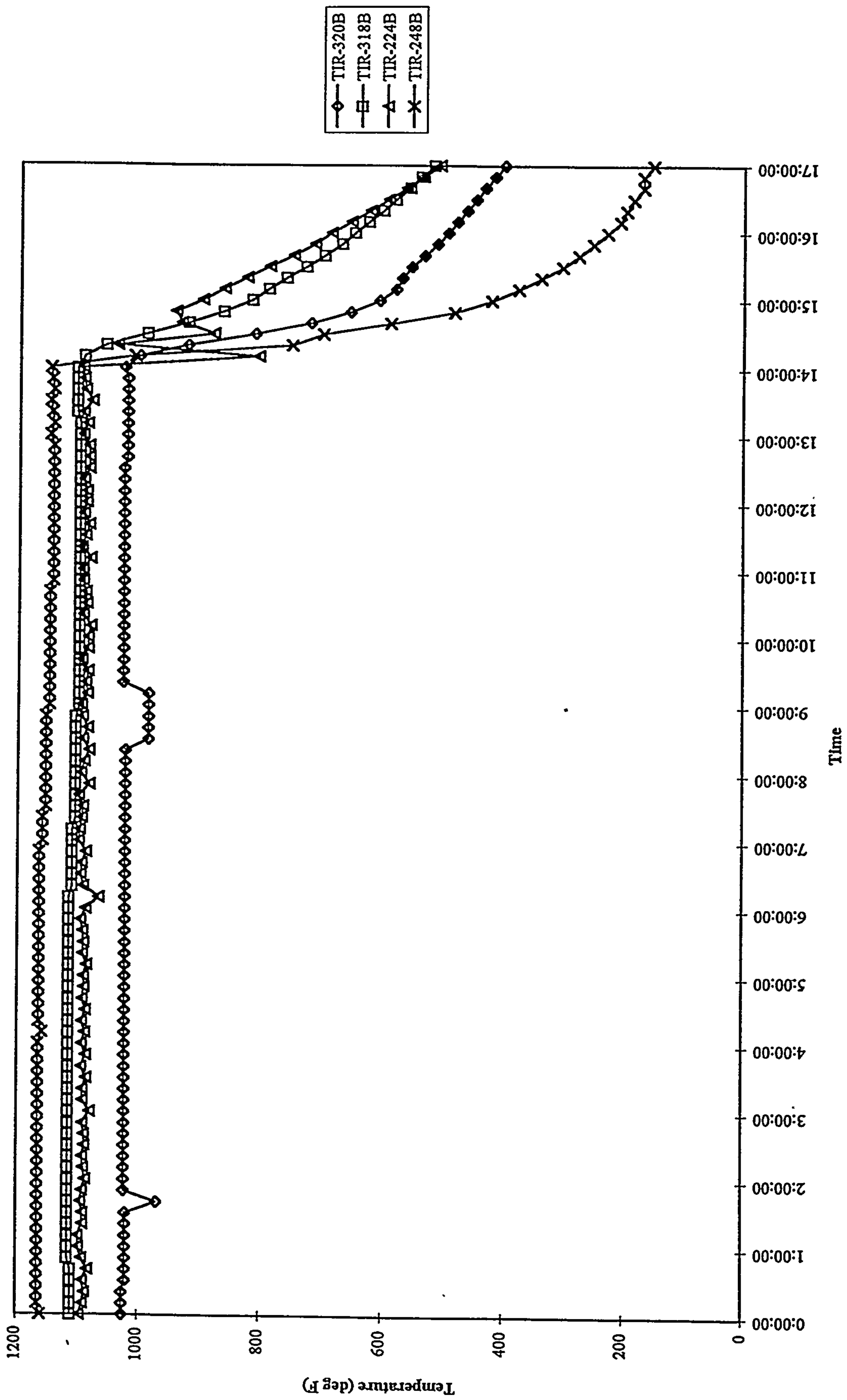
## MGCR Process Gas Line Temperatures
## Run 94MGC09, 09/14/94



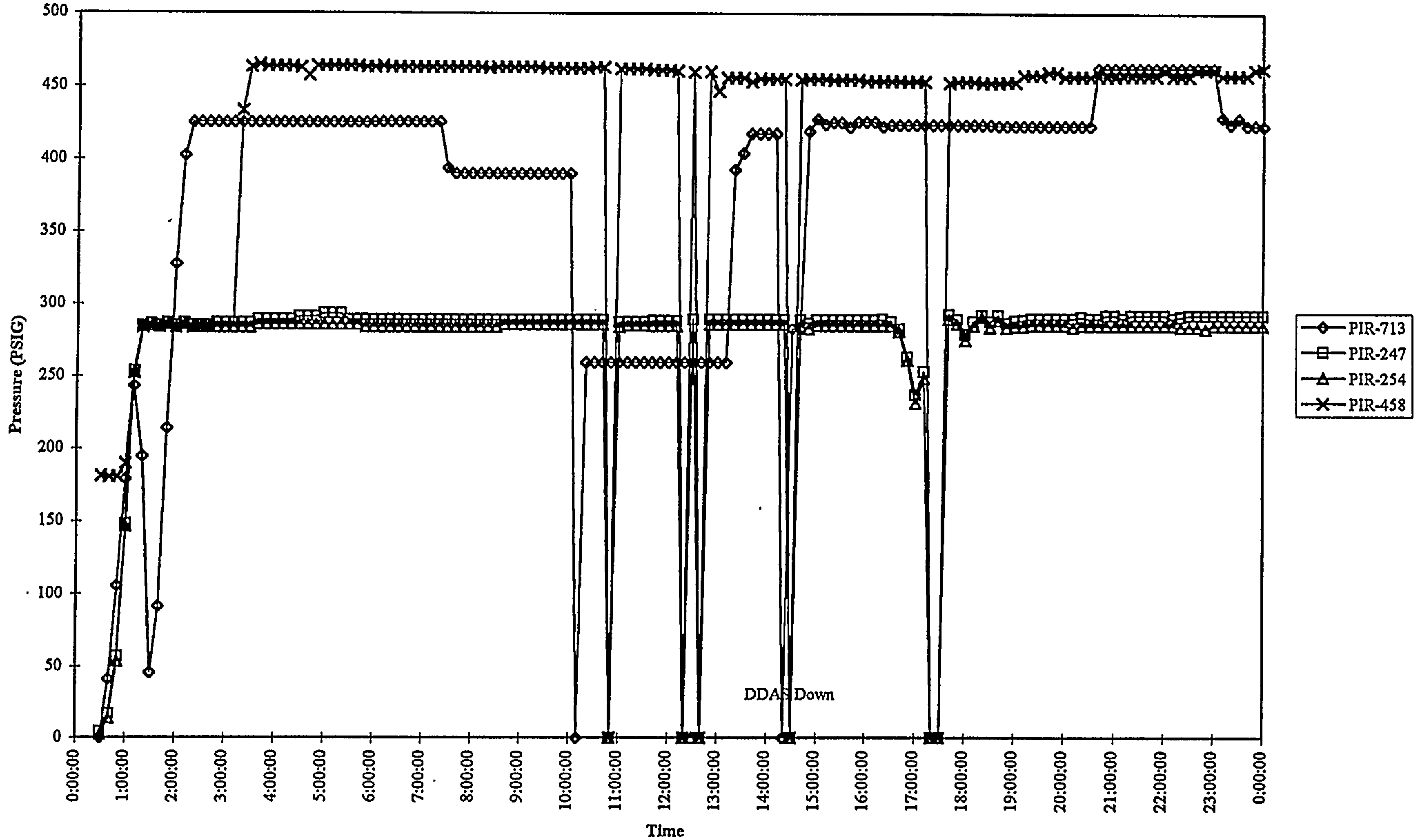
## MGCR Process Gas Line Temperatures
## Run 94MGC09, 09/15/94



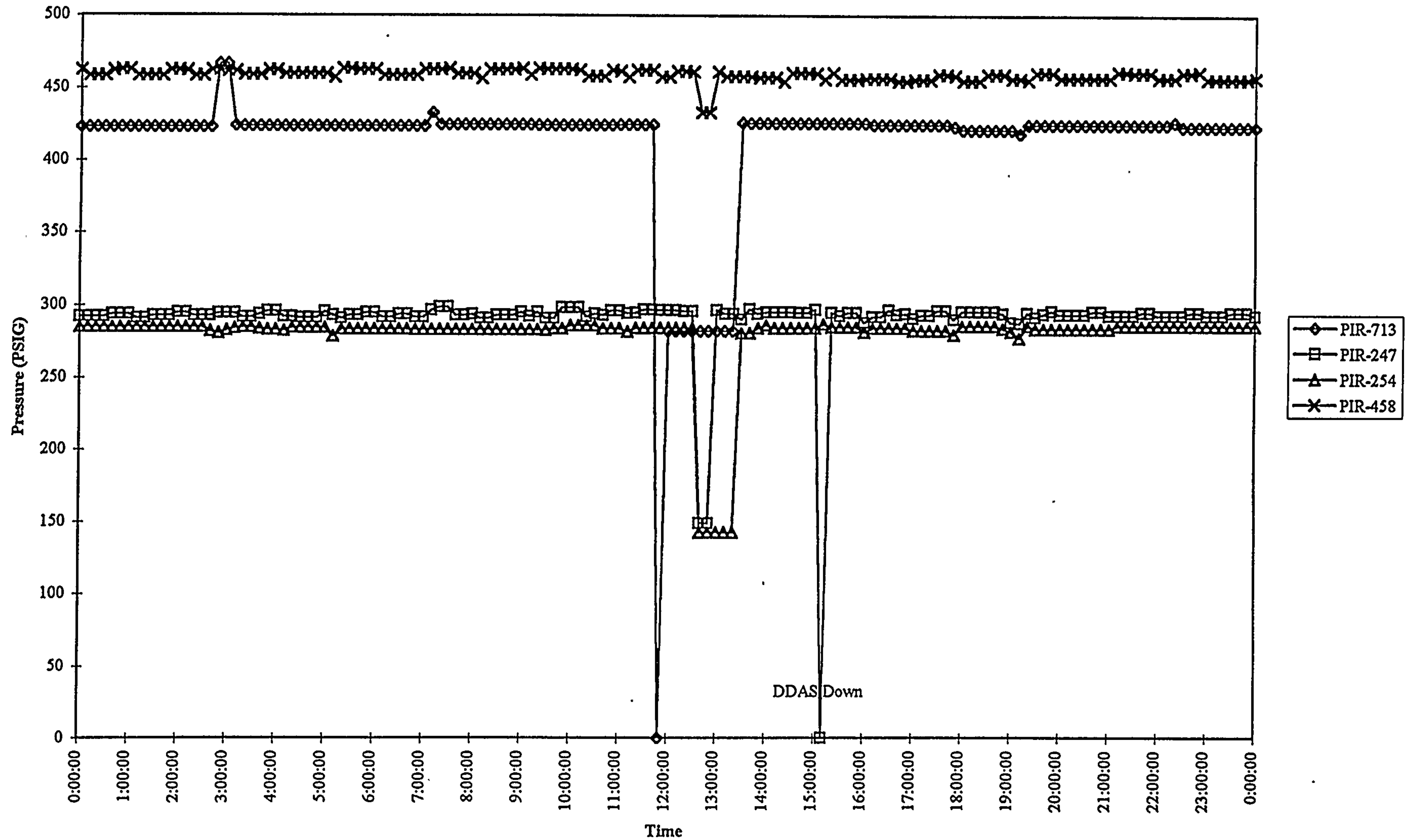
MGCR Process Gas Line Temperatures
Run 94MGC09, 09/16/94



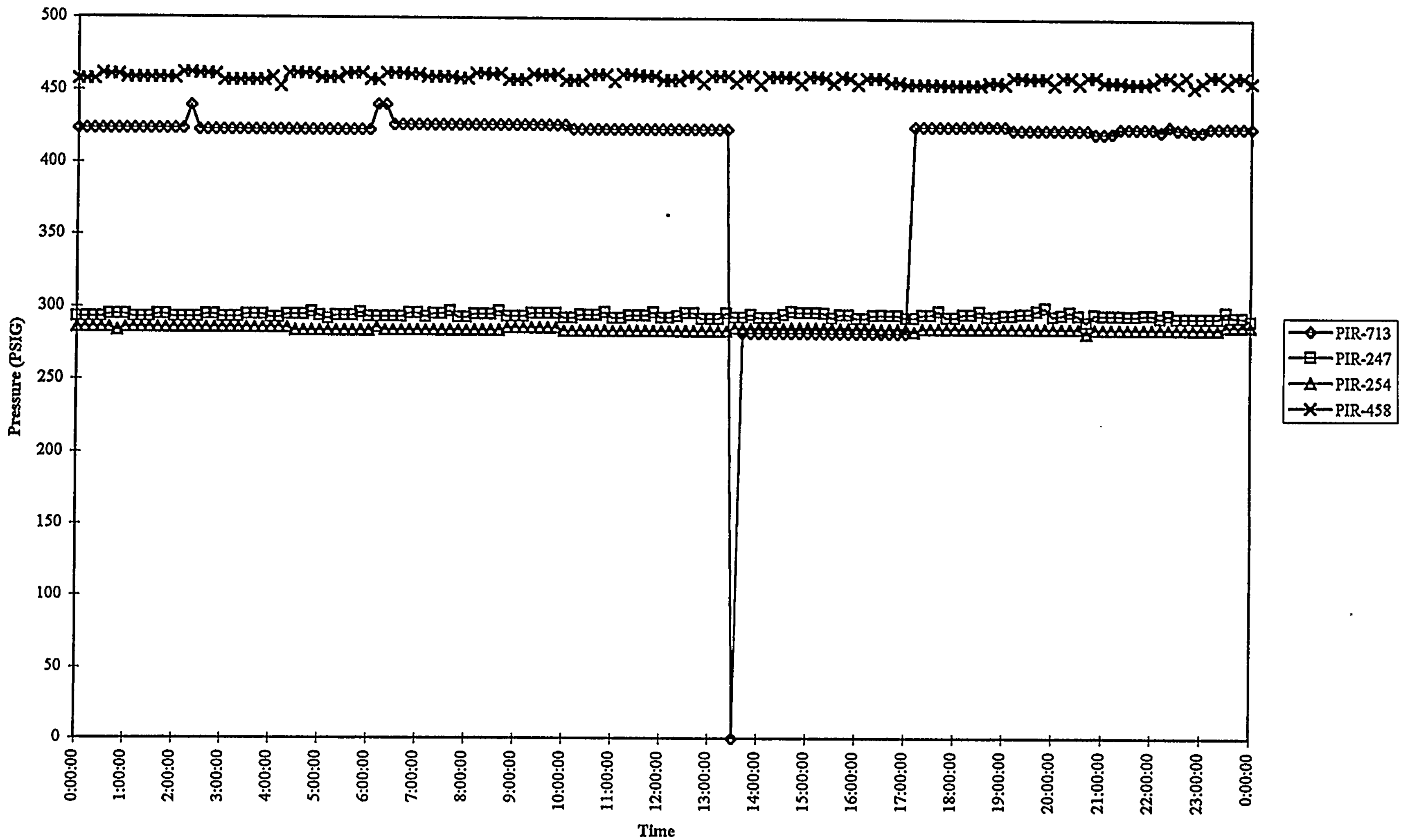
# FBG and MGCR Process Pressures
## Run 94FBG09, 09/12/94



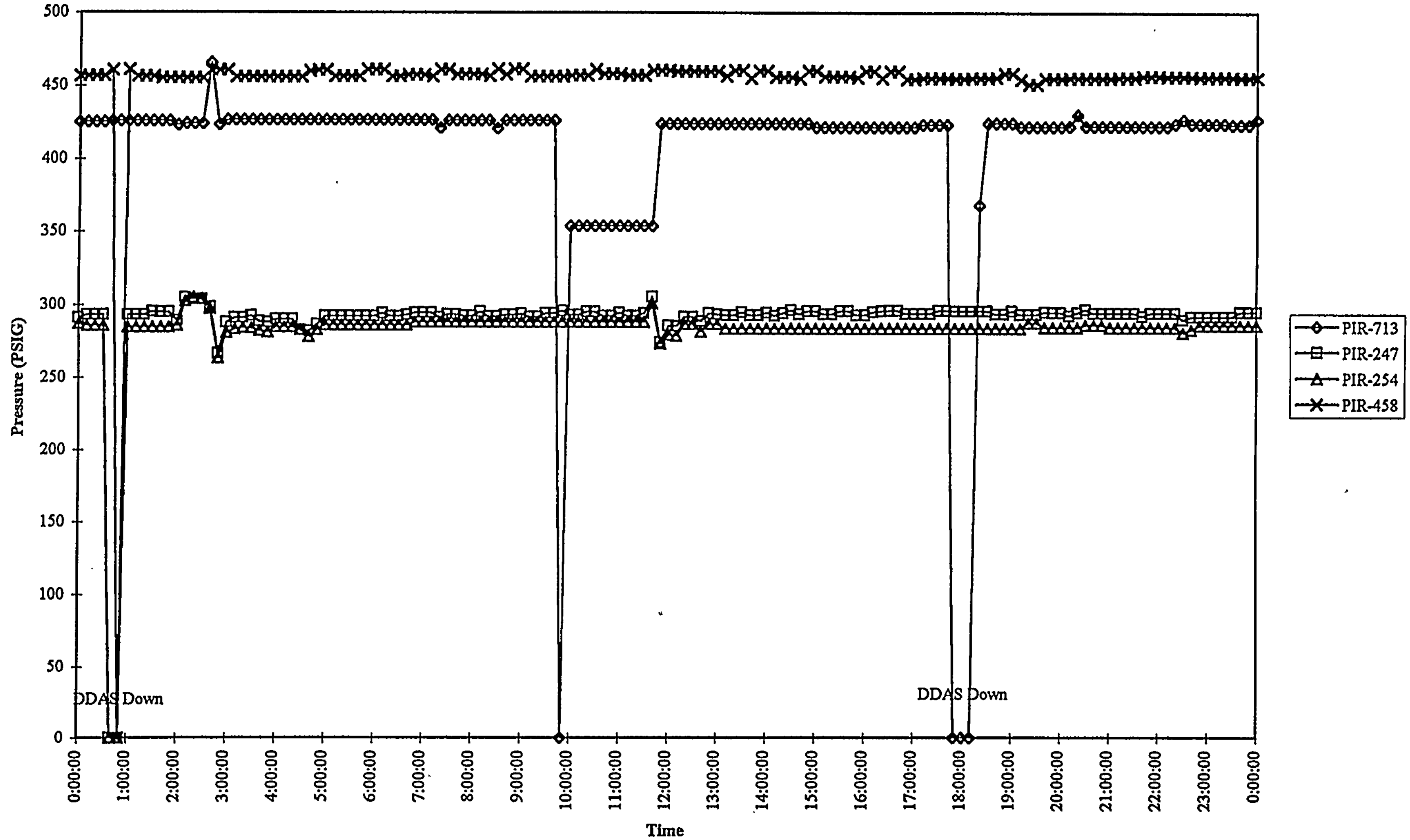
# FBG and MGCR Process Pressures
Run 94FBG09, 09/13/94



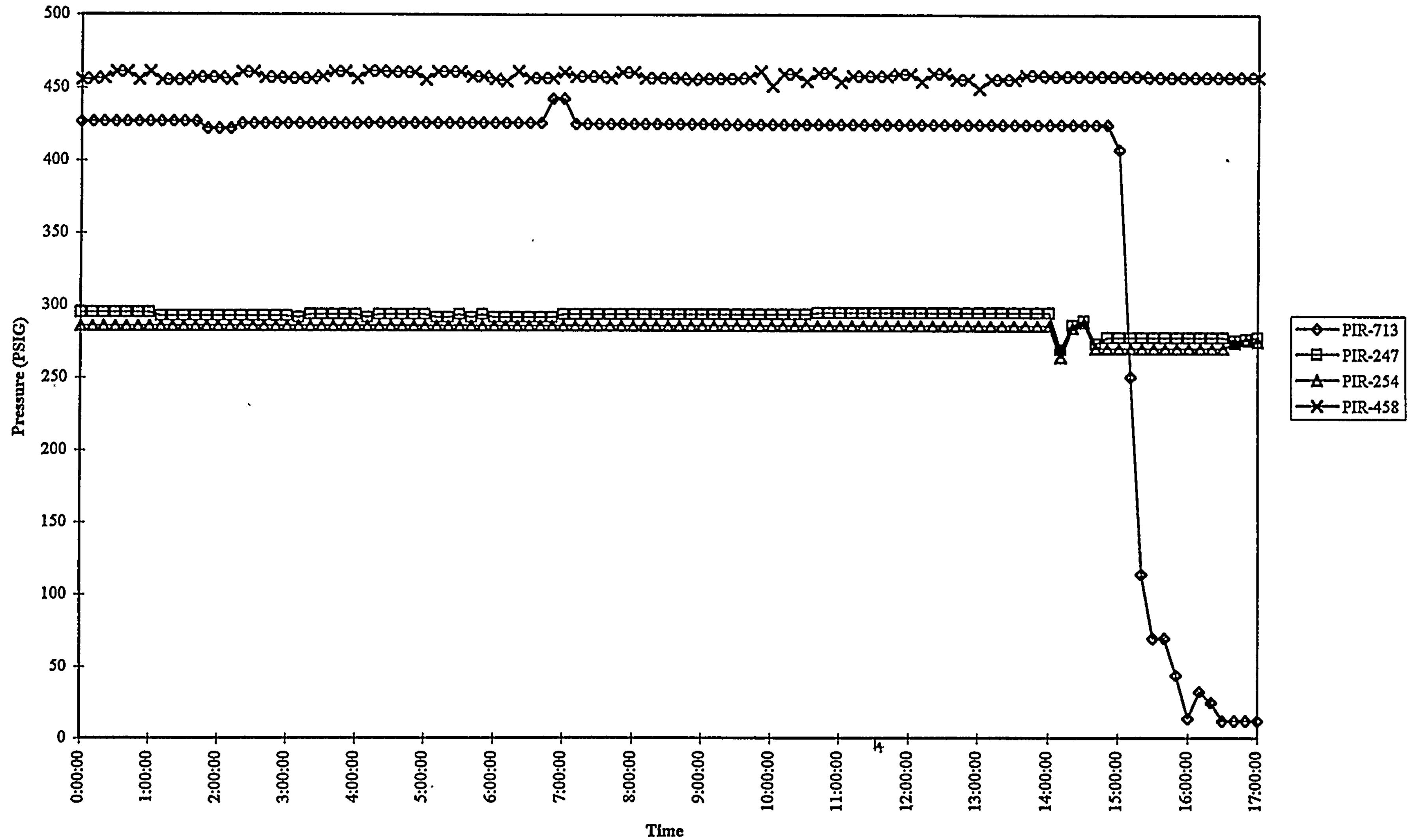
FBG and MGCR Process Pressures
Run 94FBG09, 09/14/94



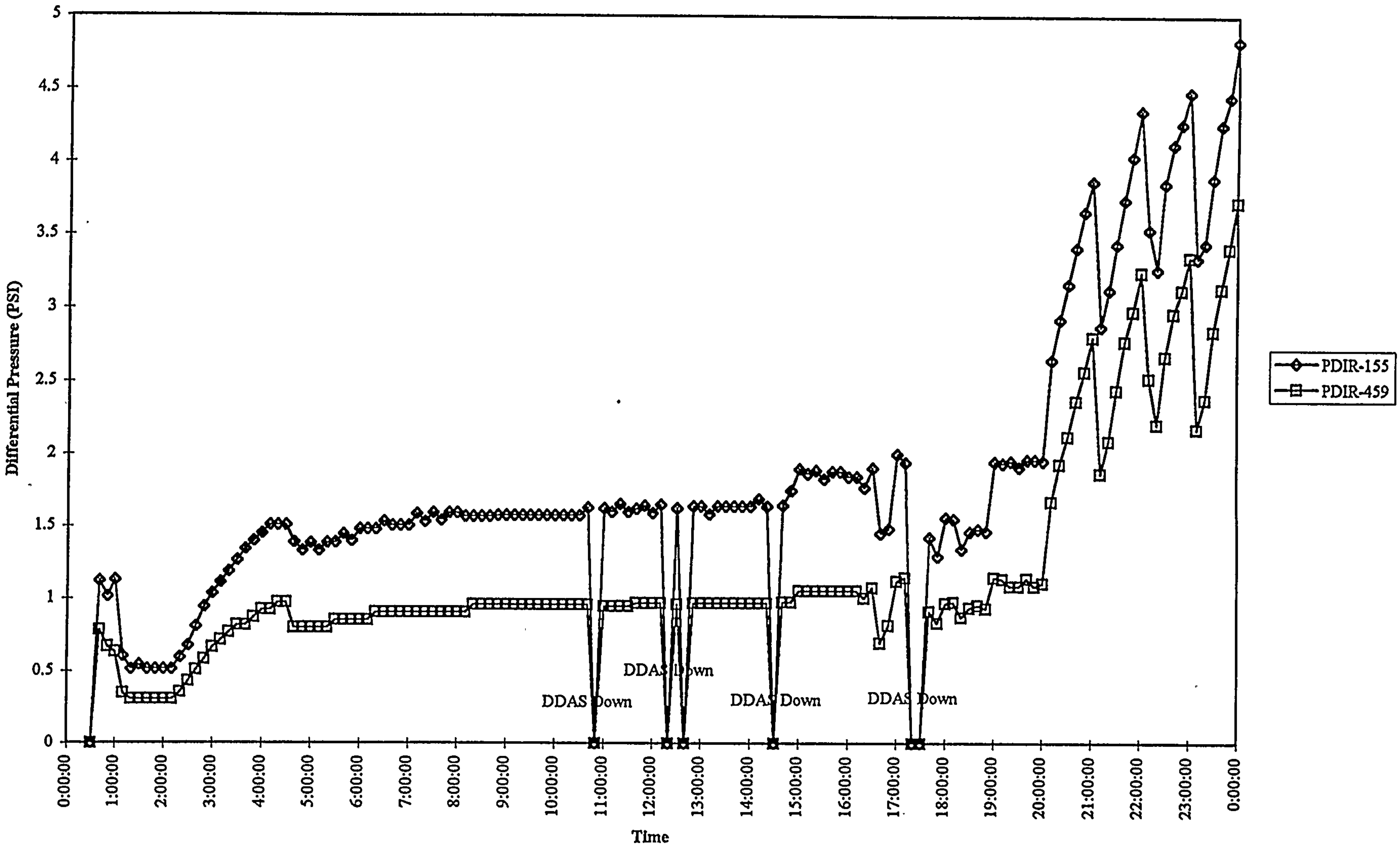
## FBG and MGCR Process Pressures
## Run 94FBG09, 09/15/94



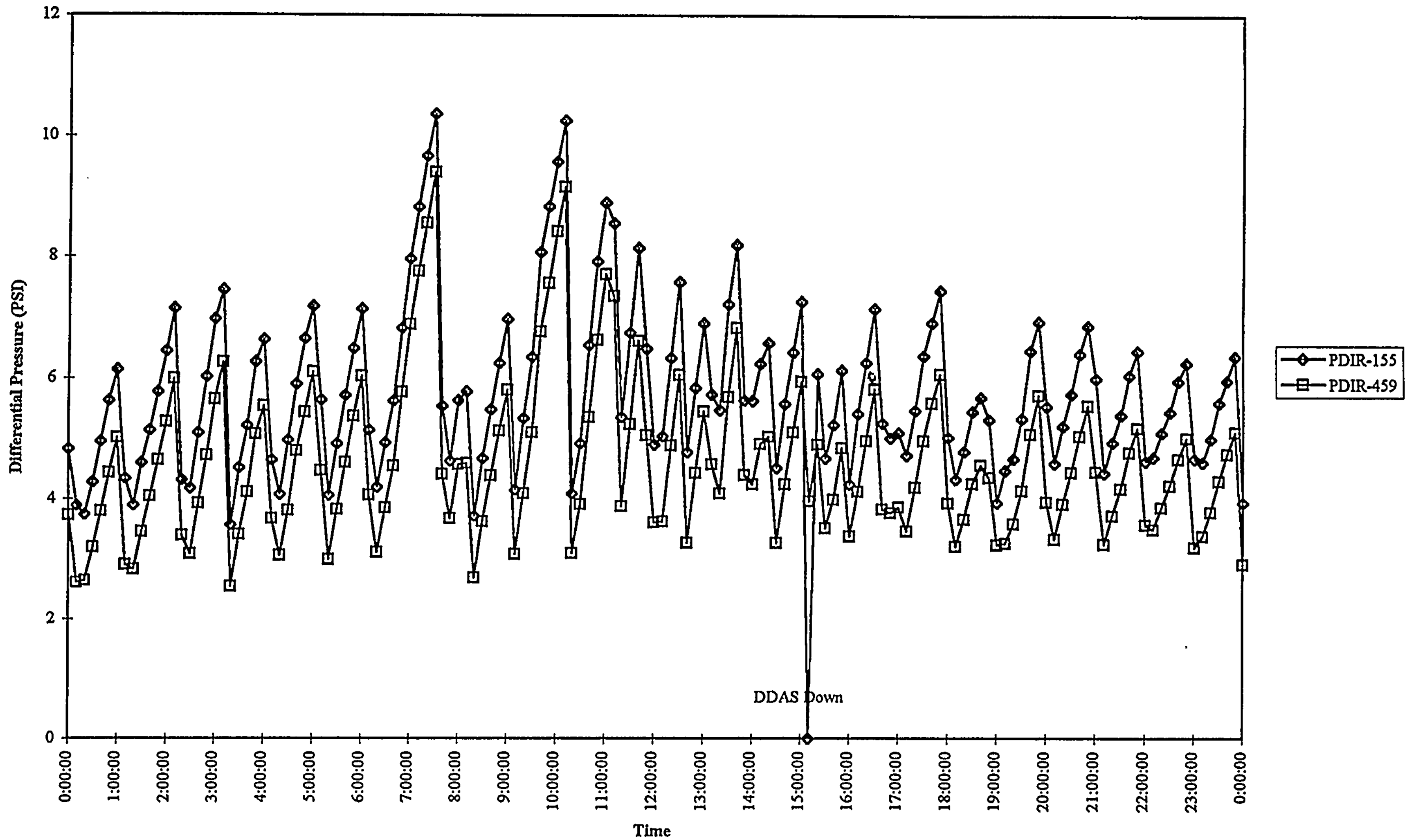
## FBG and MGCR Process Pressures
## Run 94FBG09, 09/16/94



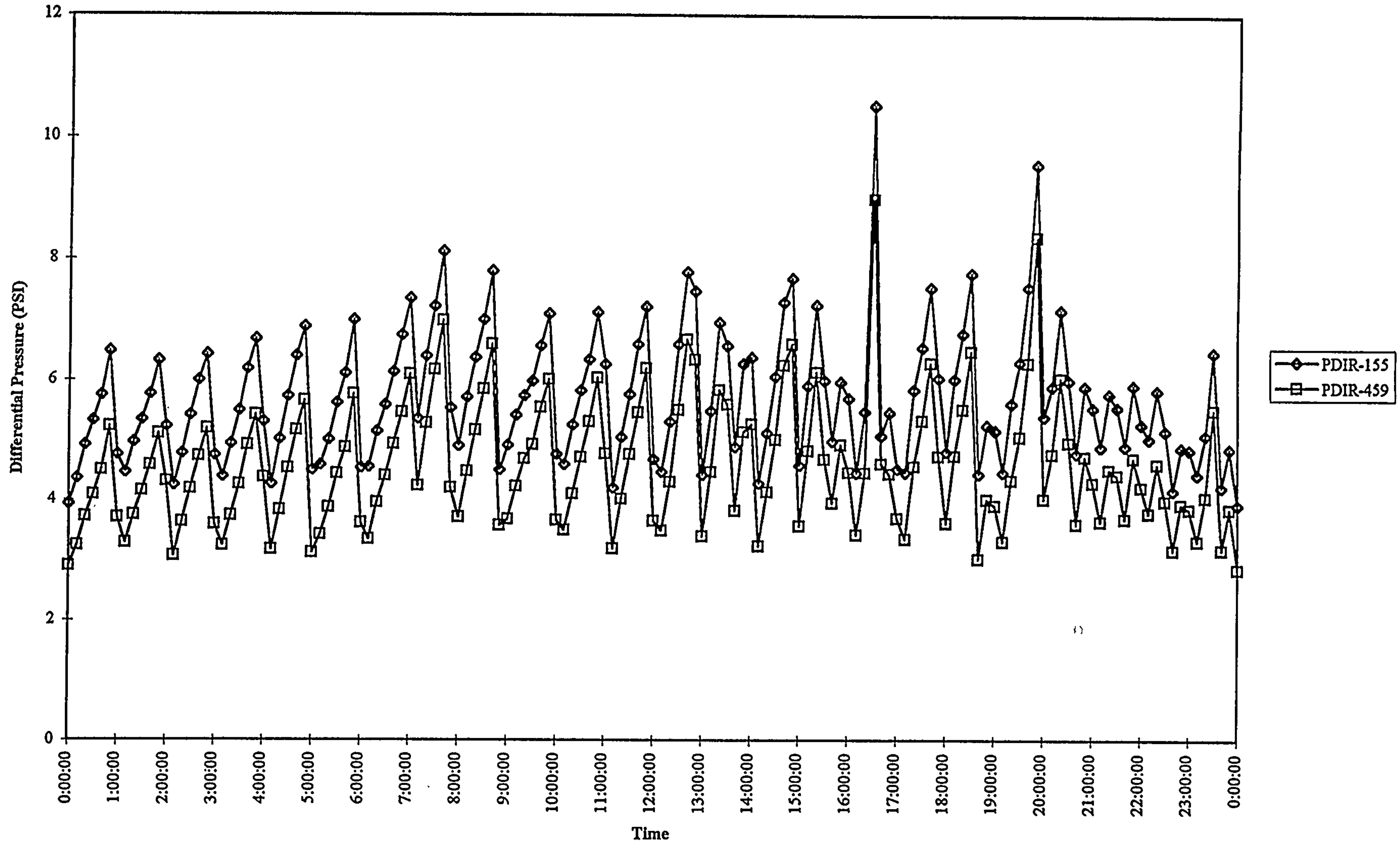
## F-100 Differential Pressure
## Run 94MGC09, 09/12/94



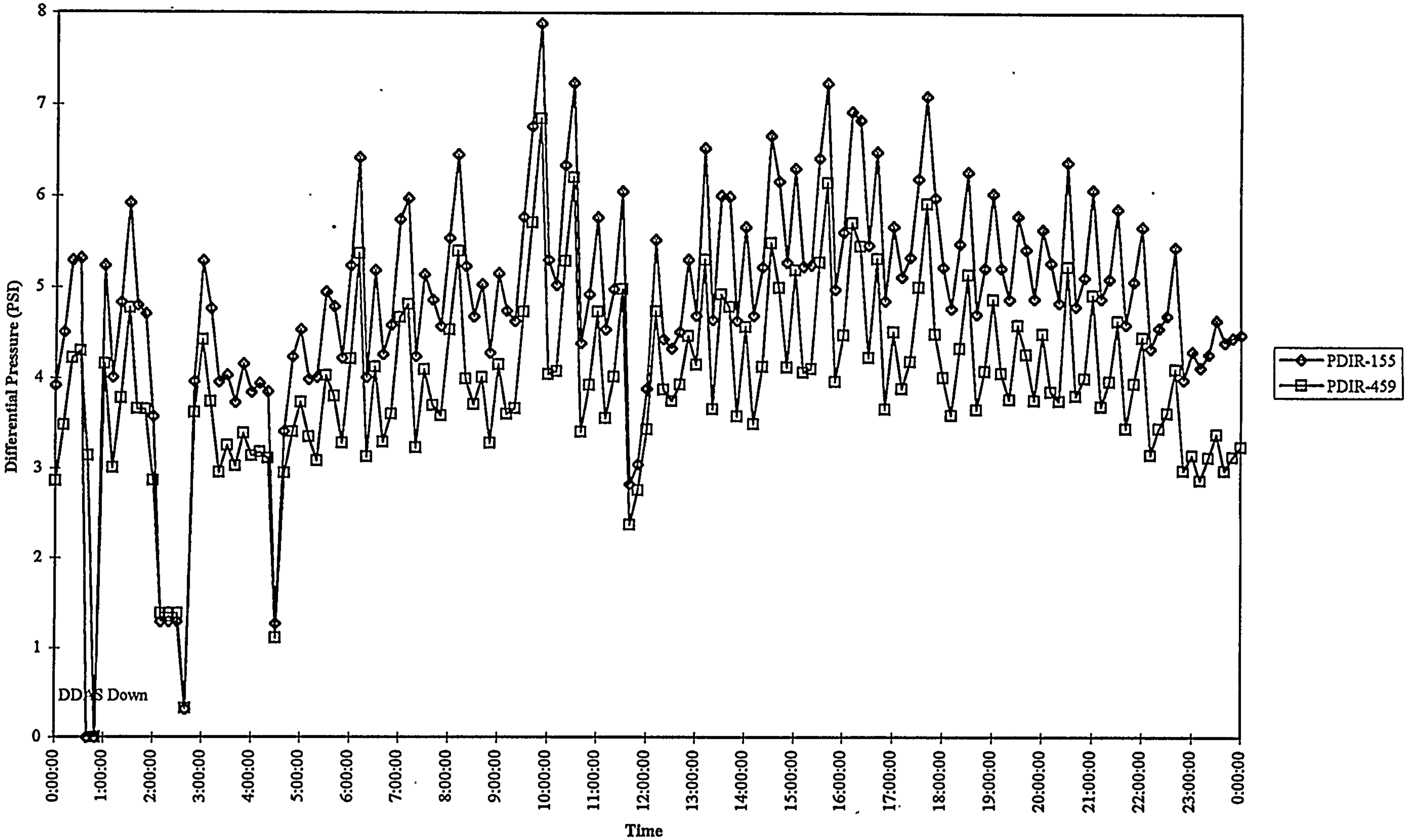
# F-100 Differential Pressure
## Run 94MGC09, 09/13/94



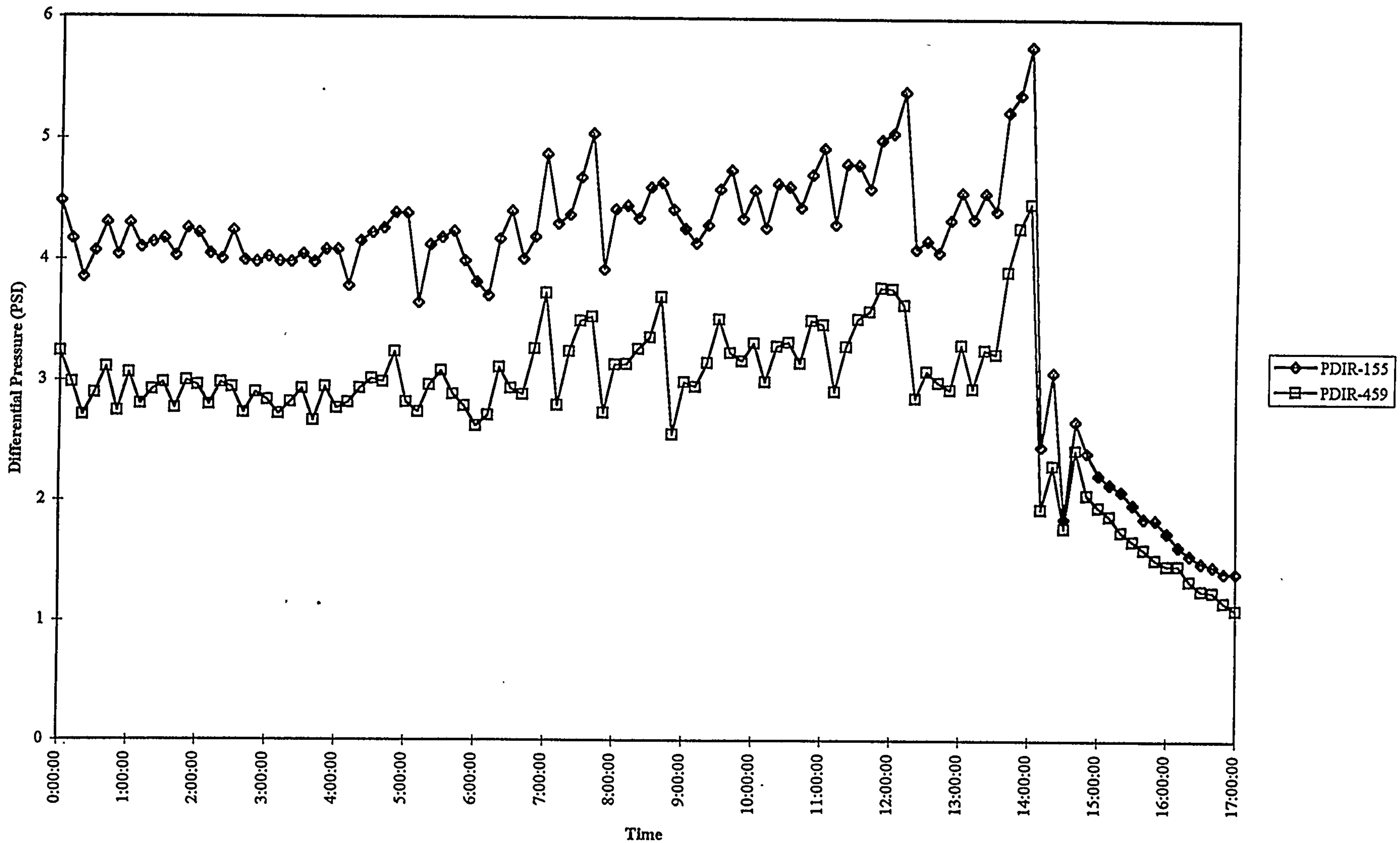
# F-100 Differential Pressure
## Run 94MGC09, 09/14/94



# F-100 Differential Pressure
## Run 94MGC09, 09/15/94

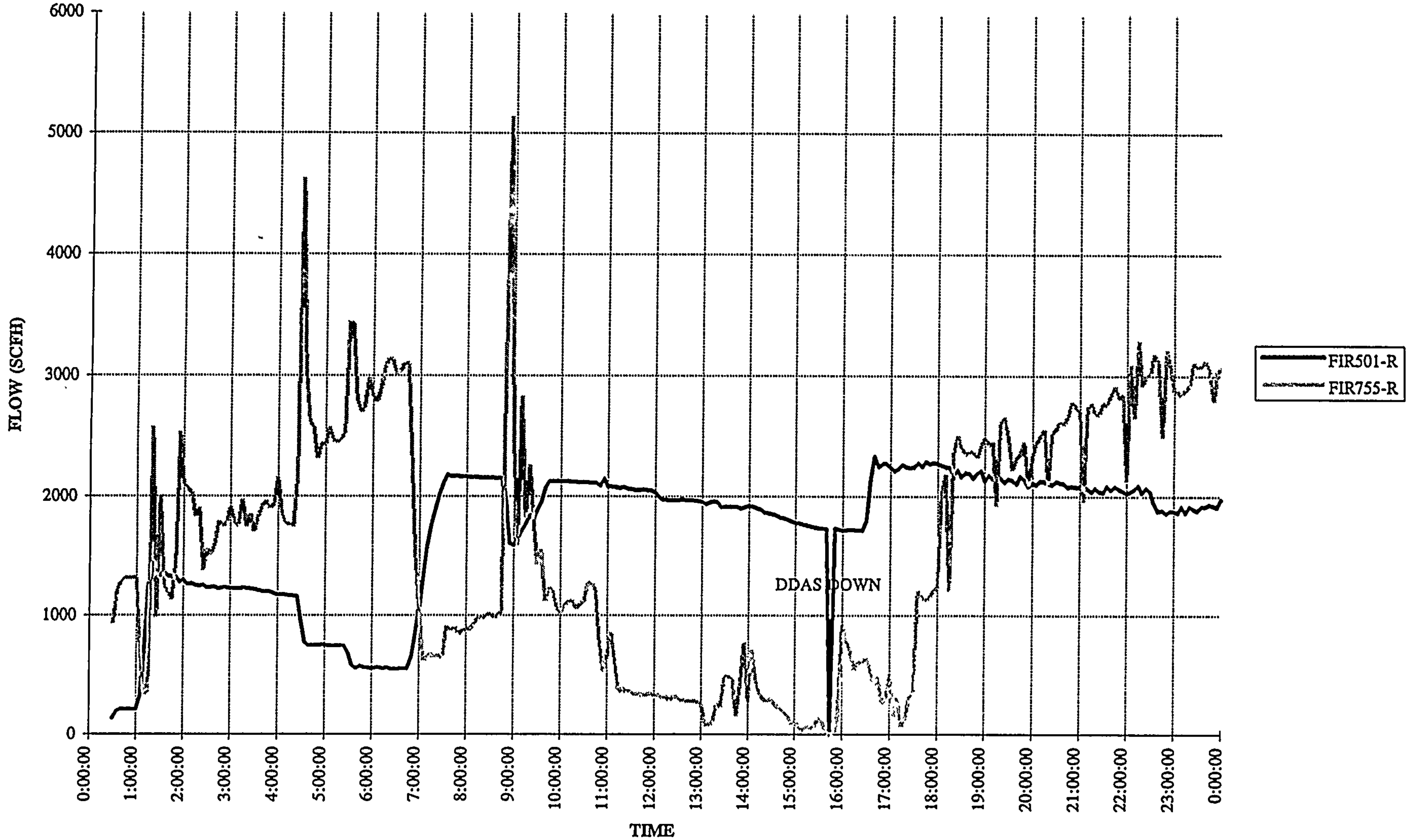


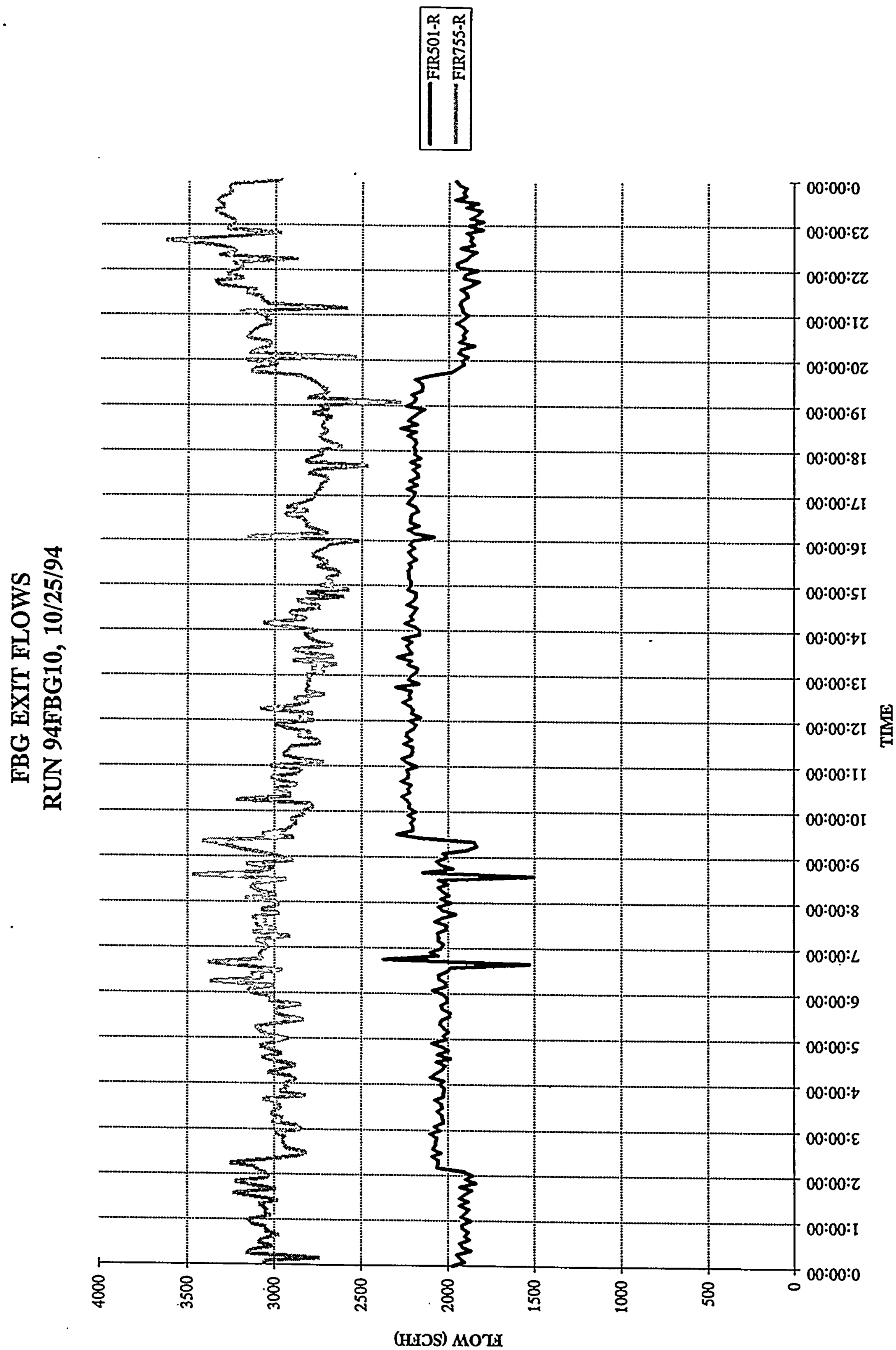
## F-100 Differential Pressure
## Run 94MGC09, 09/16/94



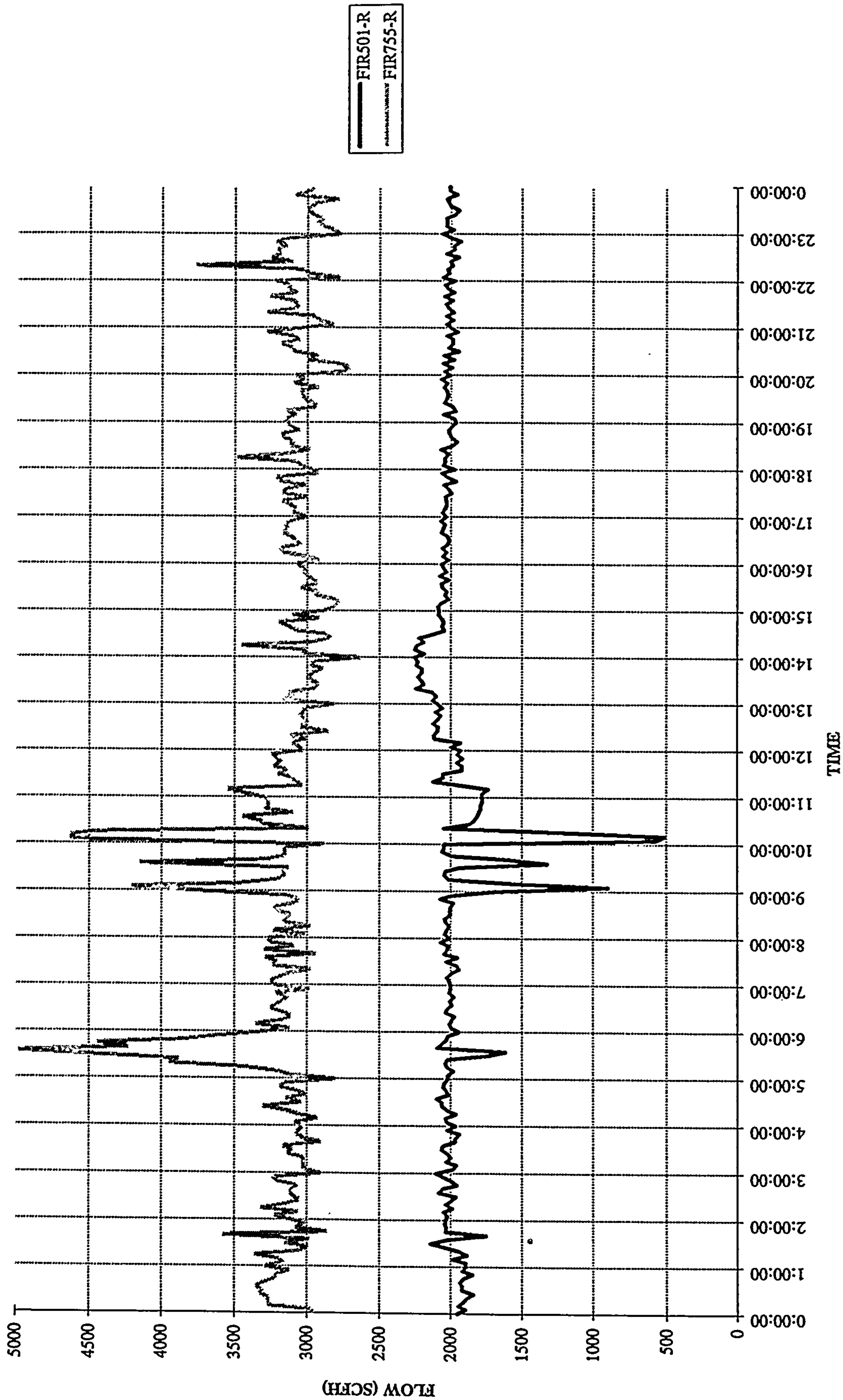
# 94MGC10
# (10/24/94 - 10/28/94)

# FBG EXIT FLOWS
# RUN 94FBG10, 10/24/94

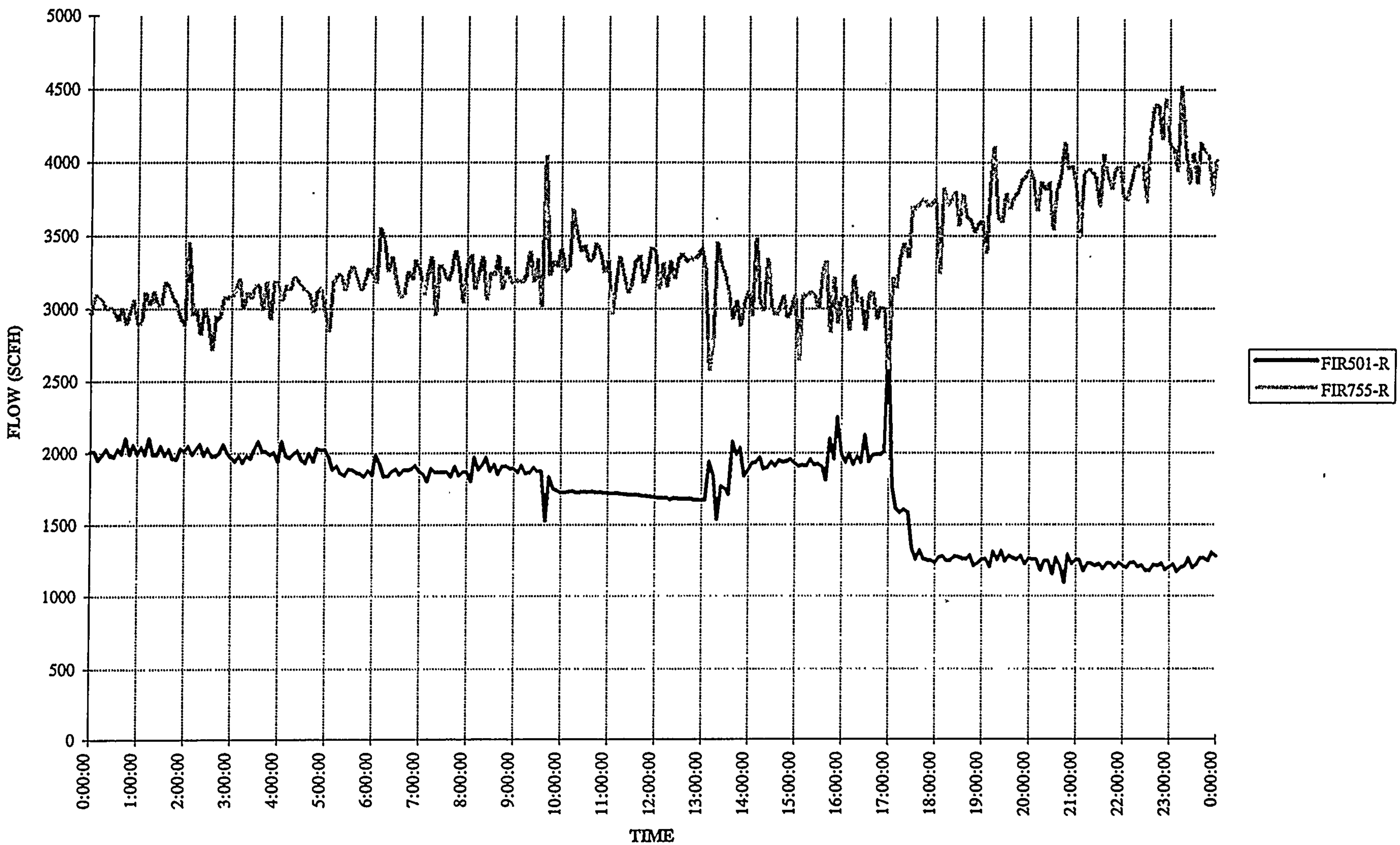



FBG EXIT FLOWS
RUN 94FBG10, 10/25/94
FIR501-R
FIR755-R
FLOW (SCFH)
TIME
0
500
1000
1500
2000
2500
3000
3500
4000
0:00:00
1:00:00
2:00:00
3:00:00
4:00:00
5:00:00
6:00:00
7:00:00
8:00:00
9:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
0:00:00

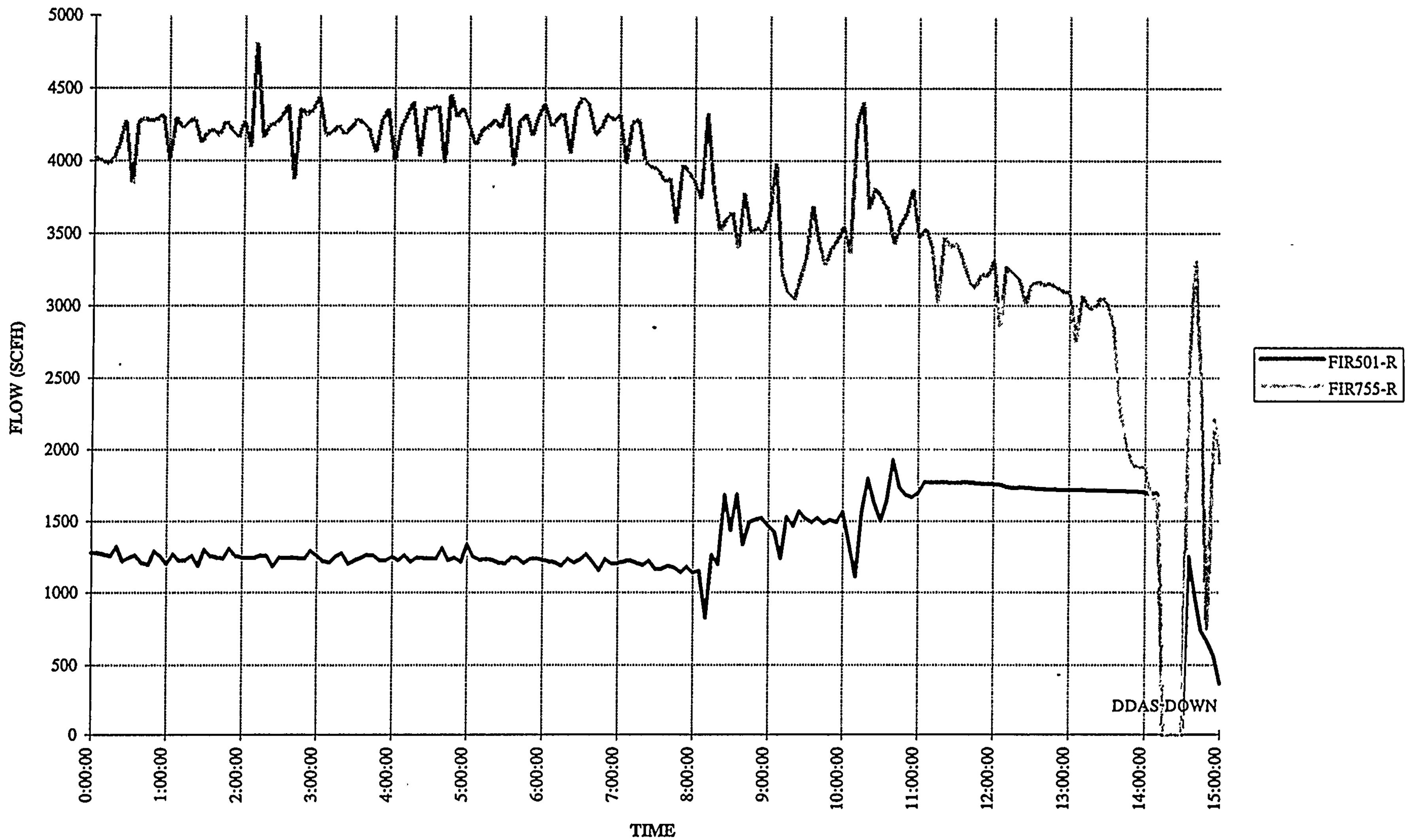
FBG EXIT FLOWS
RUN 94FBG10, 10/26/94



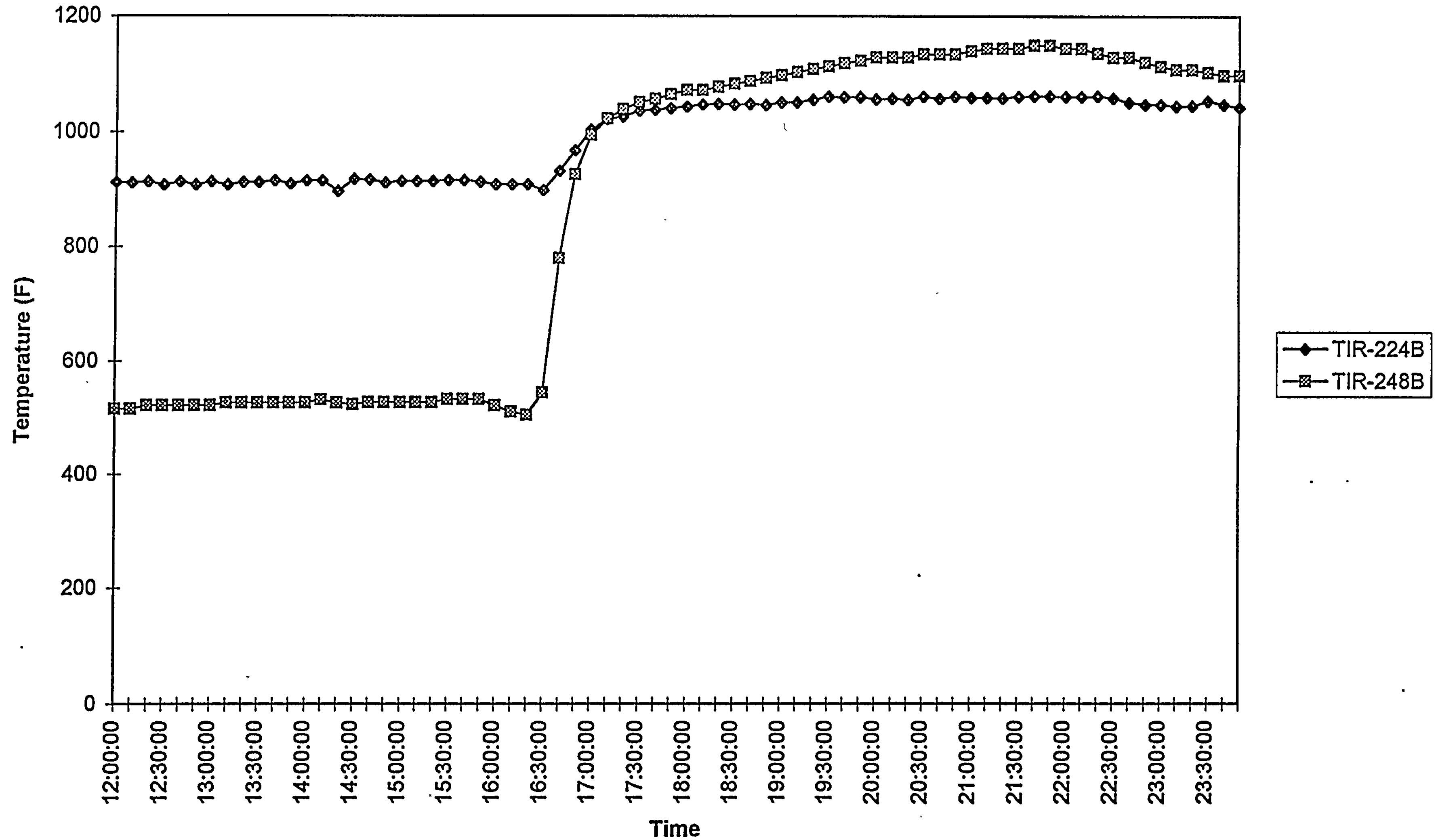
## FBG EXIT FLOWS
## RUN 94FBG10, 10/27/94



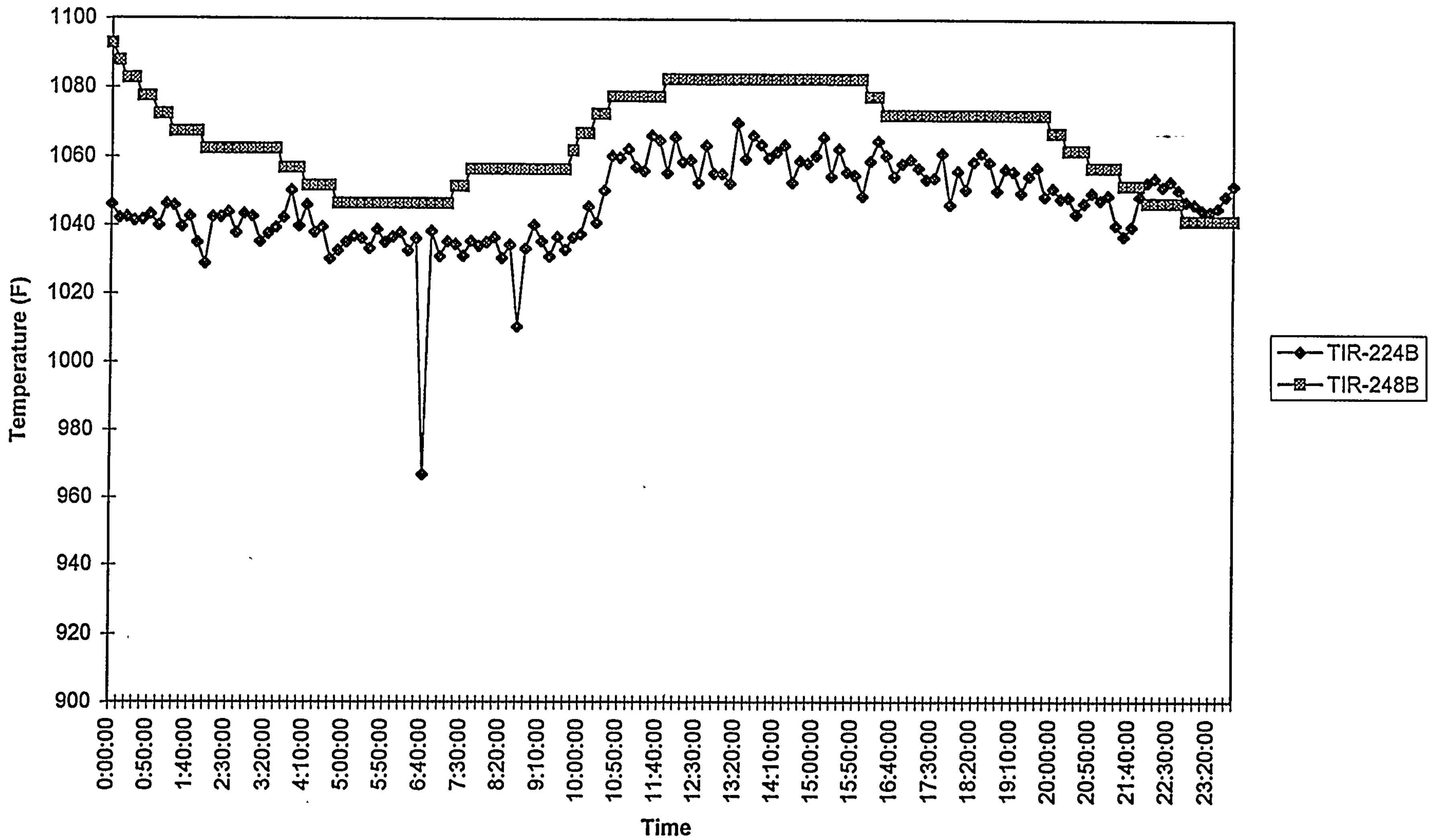
## FBG EXIT FLOWS
## RUN 94FBG10, 10/28/94



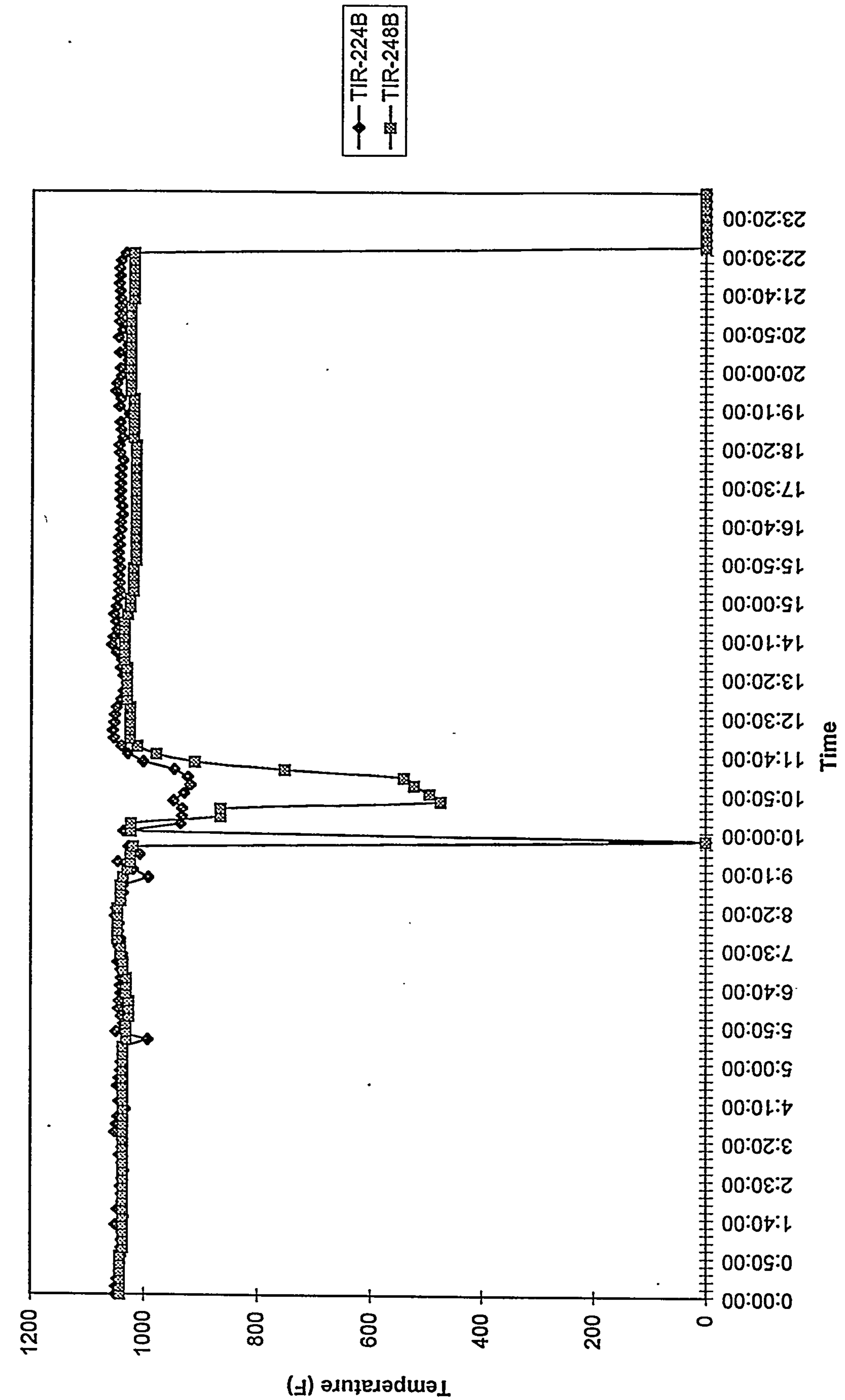
## MGCR Process Gas Line Temperatures
## Run 94MGC10, 10/24/94



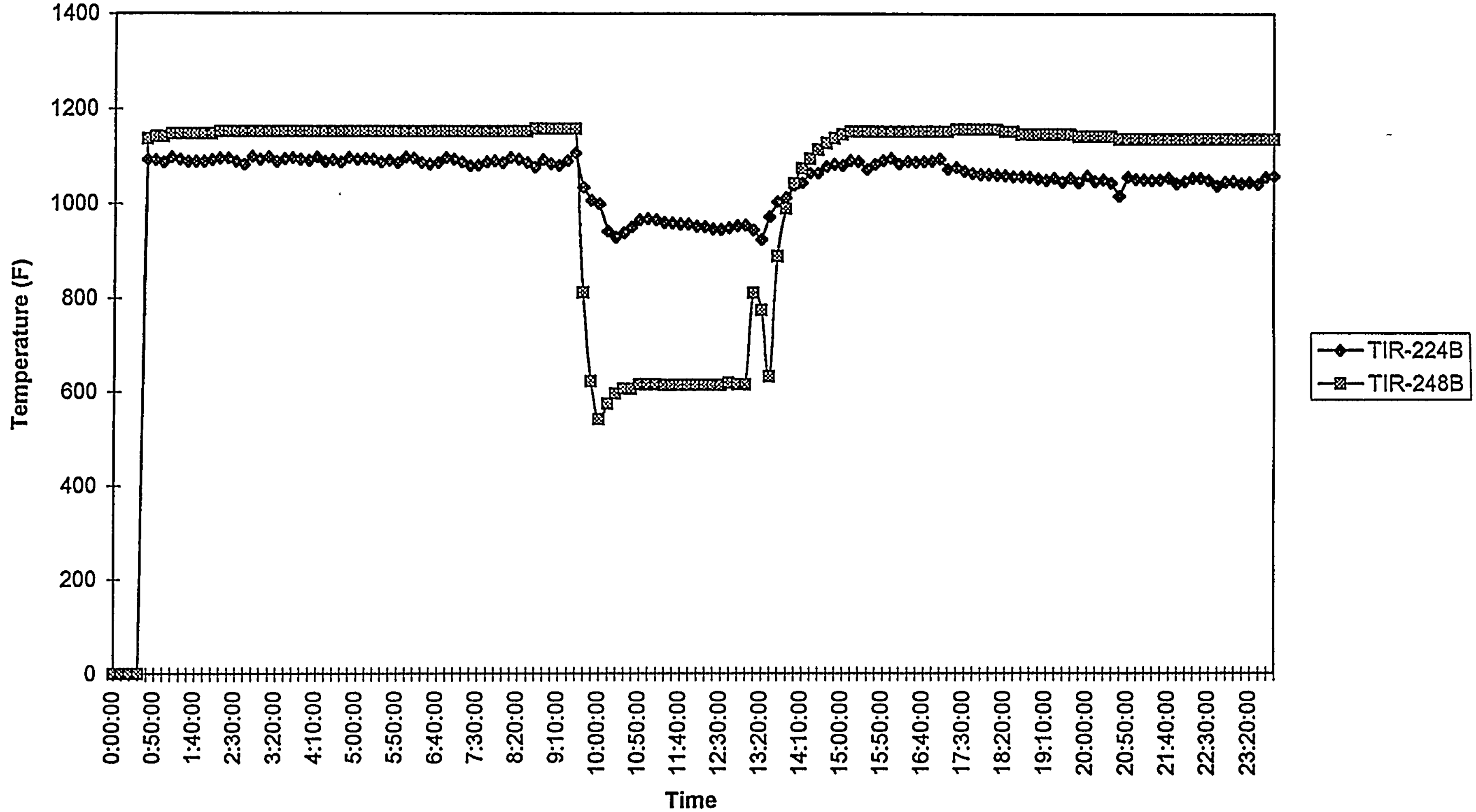
## MGCR Process Gas Line Temperatures
## Run 94MGC10, 10/25/94



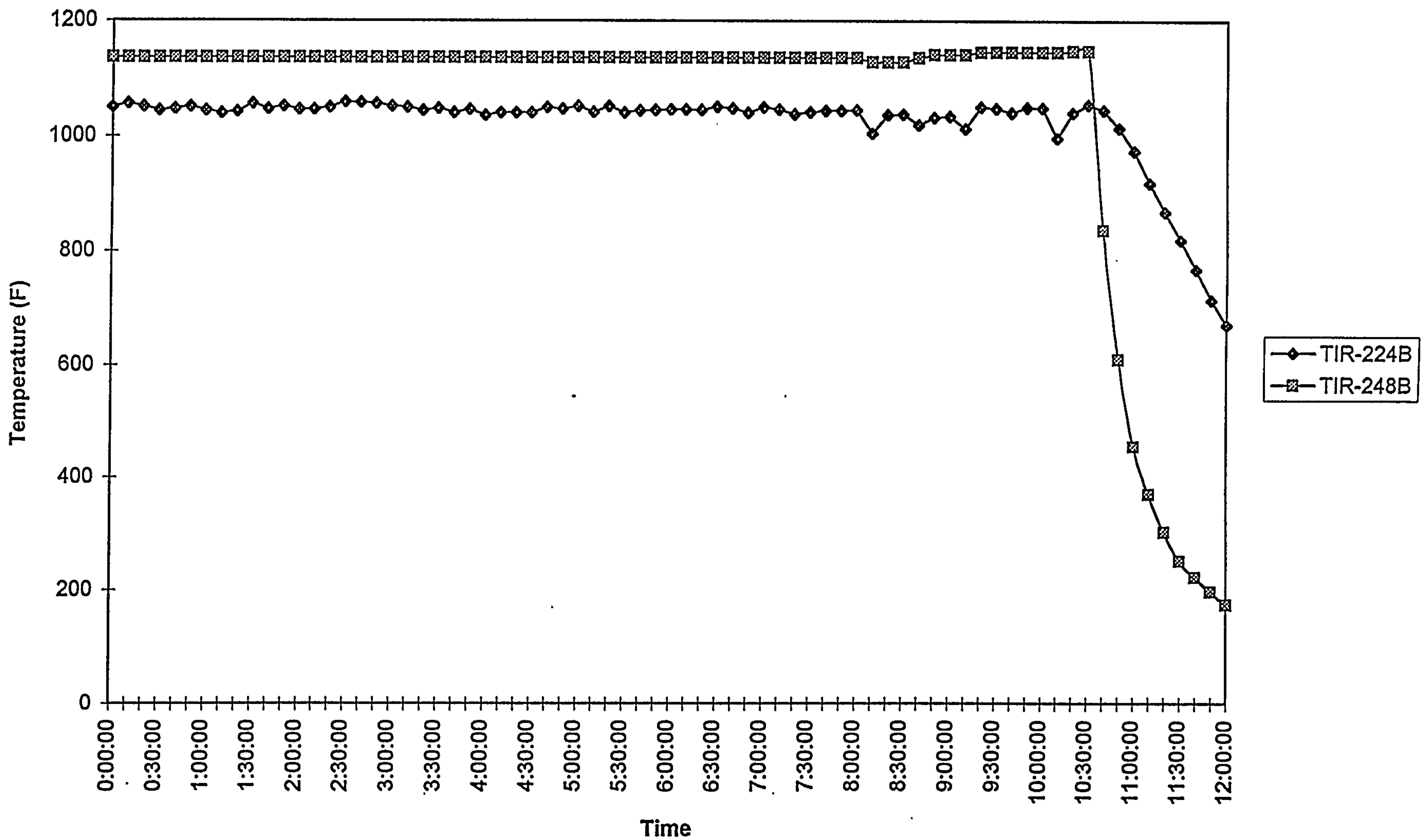
MGCR Process Gas Line Temperatures
Run 94MGC10, 10/26/94



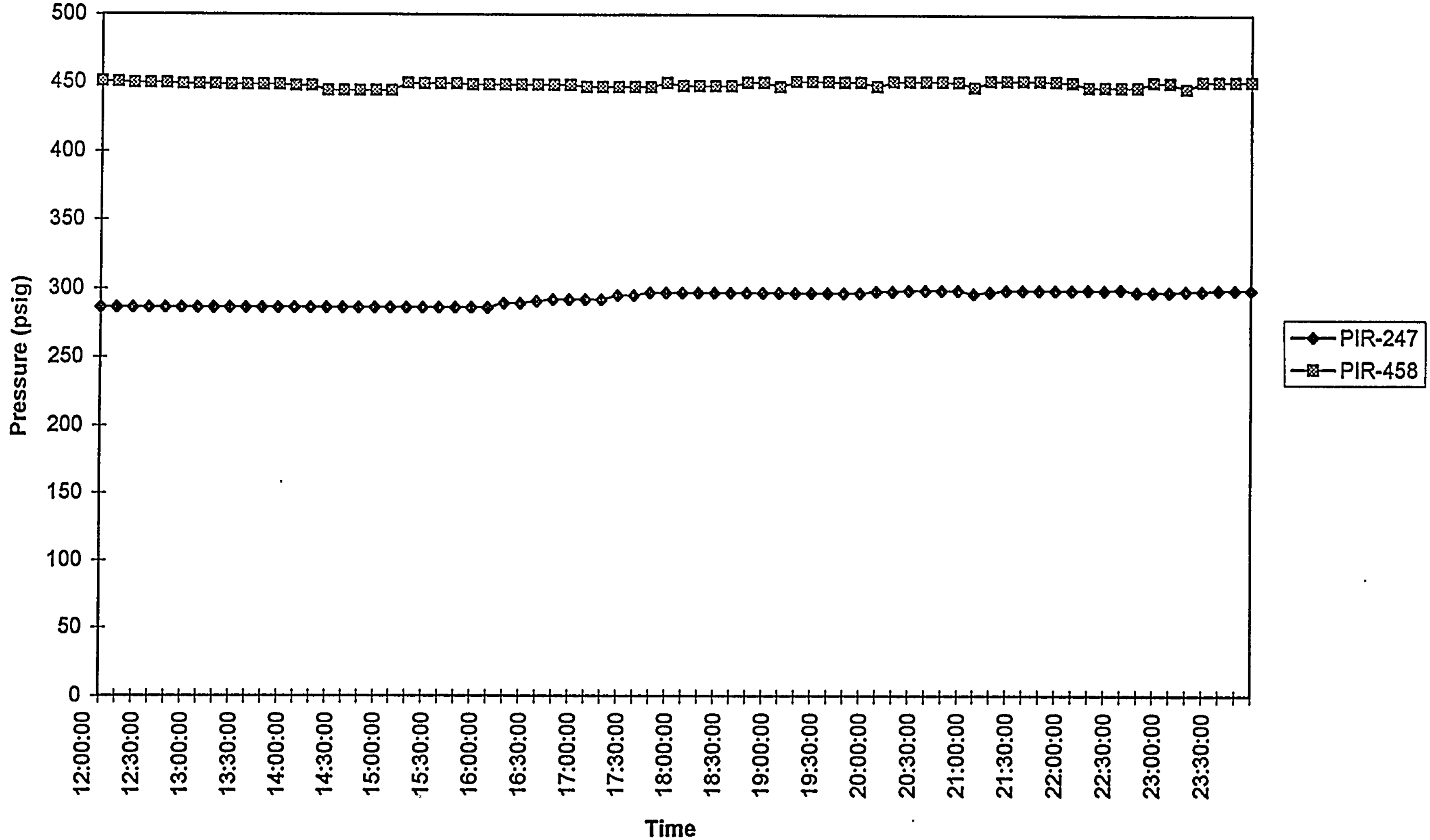
## MGCR Process Gas Line Temperatures
## Run 94MGC10, 10/27/94



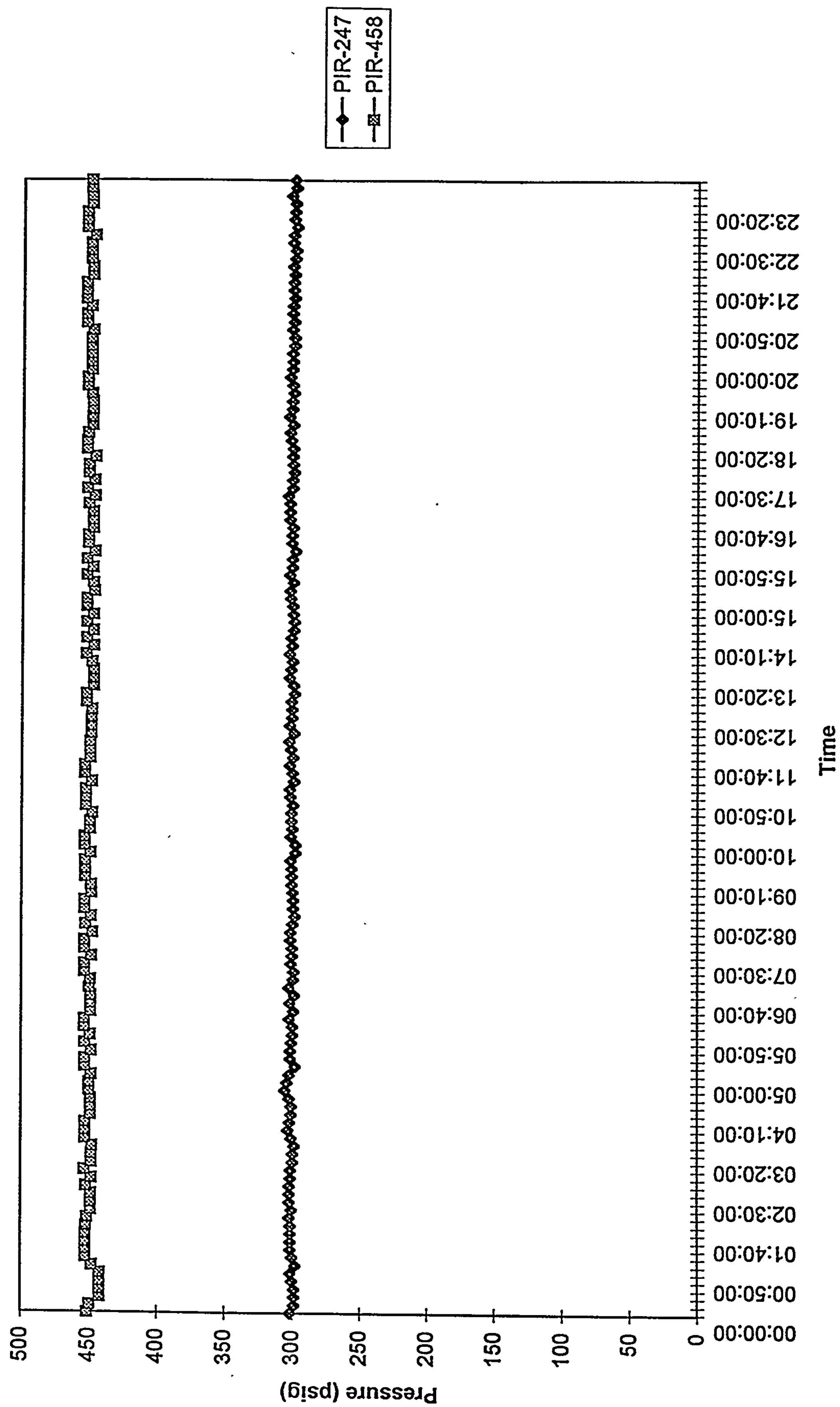
## MGCR Process Gas Line Temperatures
## Run 94MGC10, 10/28/94



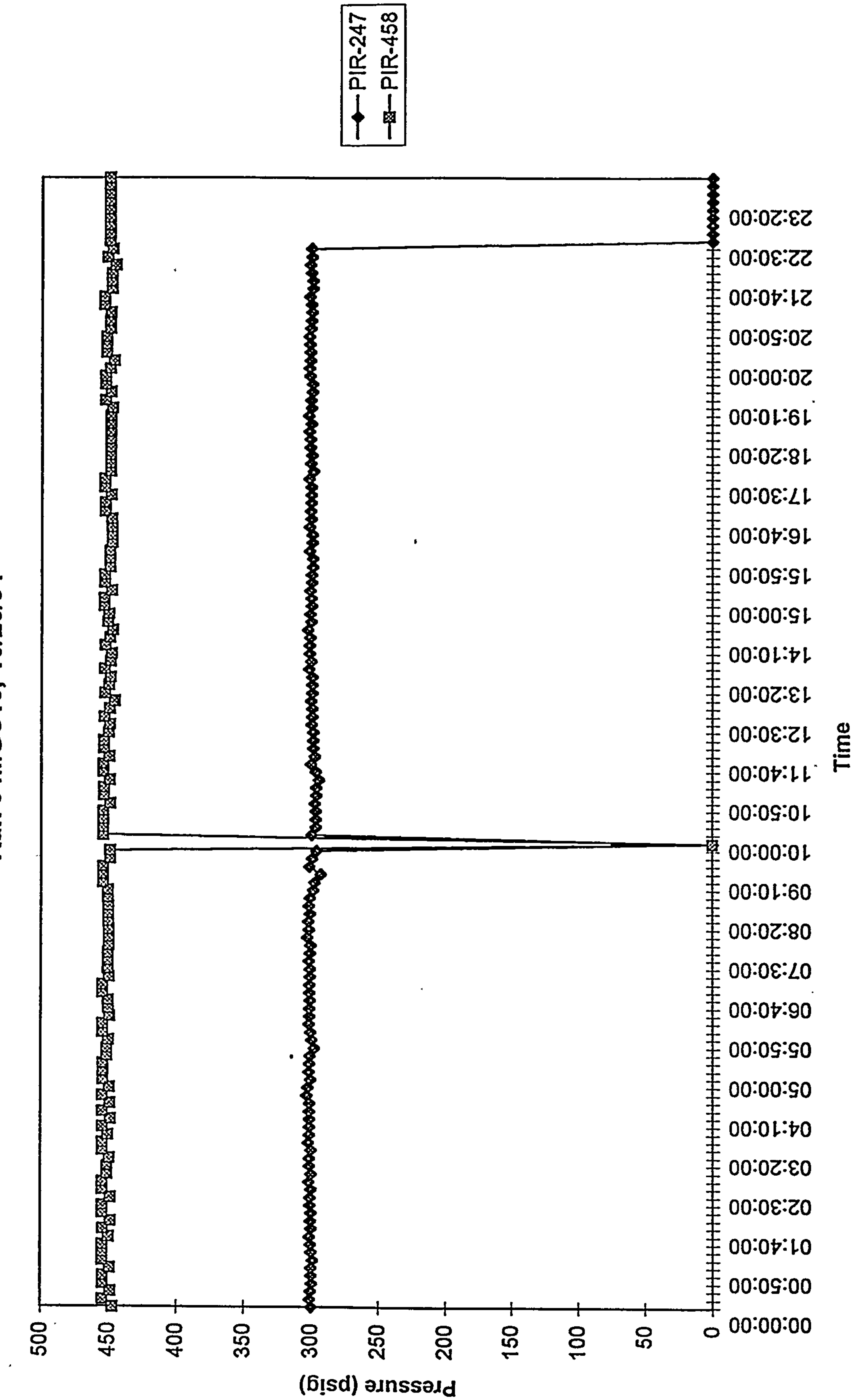
## FBG & MGCR Process Pressures
## Run 94MGC10, 10/24/94



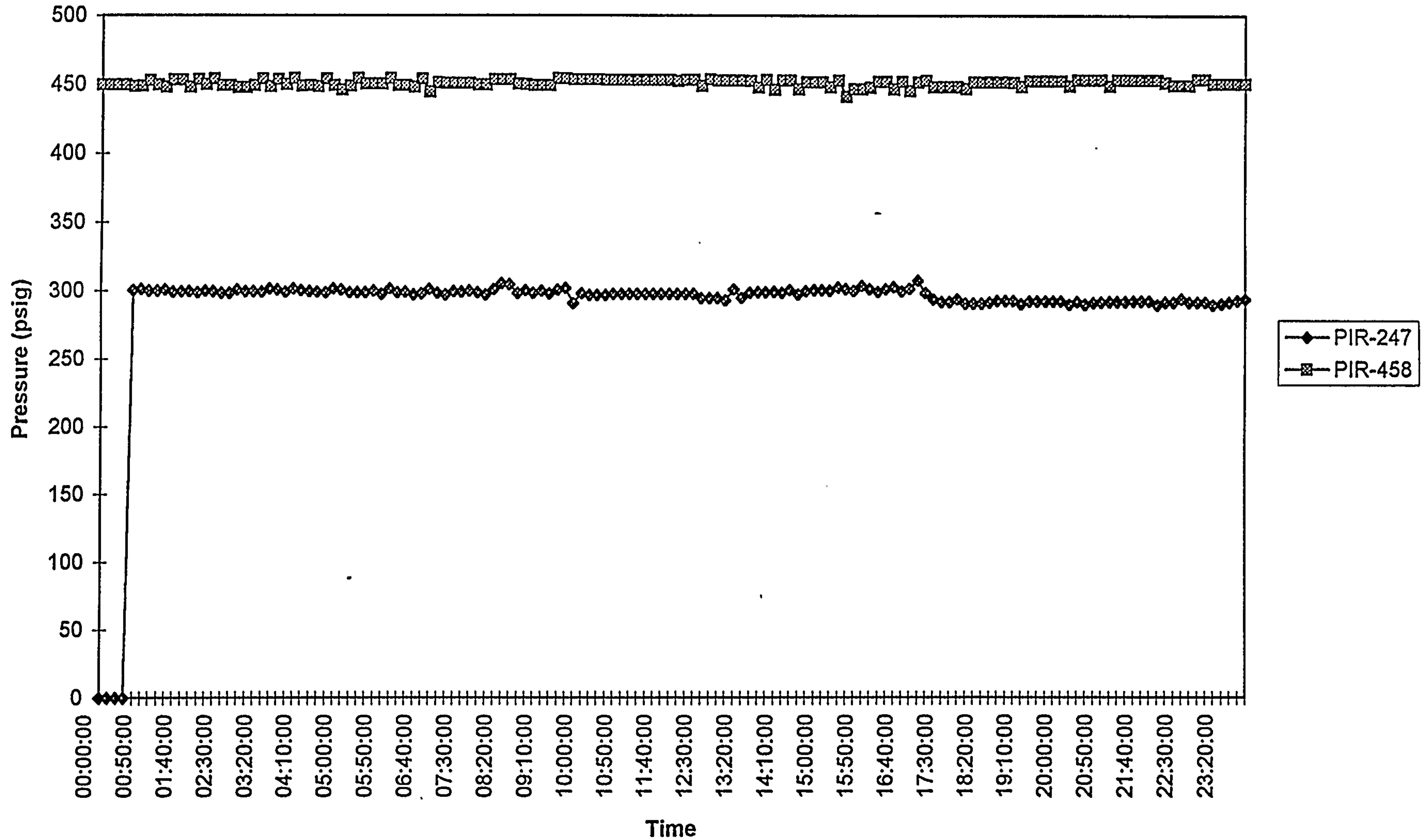
FBG & MGCR Process Pressures
Run 94MGC10, 10/25/94



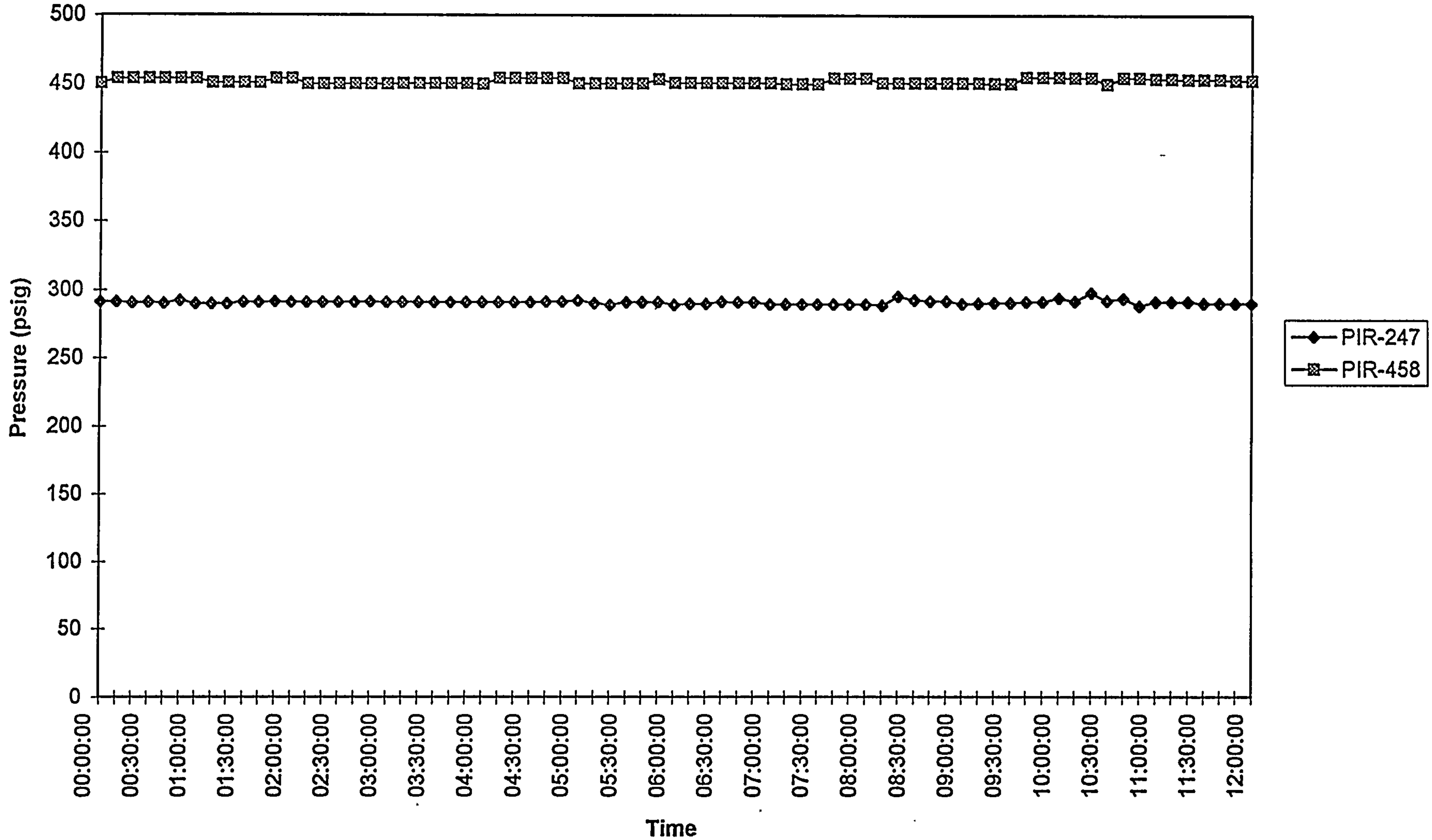
FBG & MGCR Process Pressures
Run 94MGC10, 10/26/94

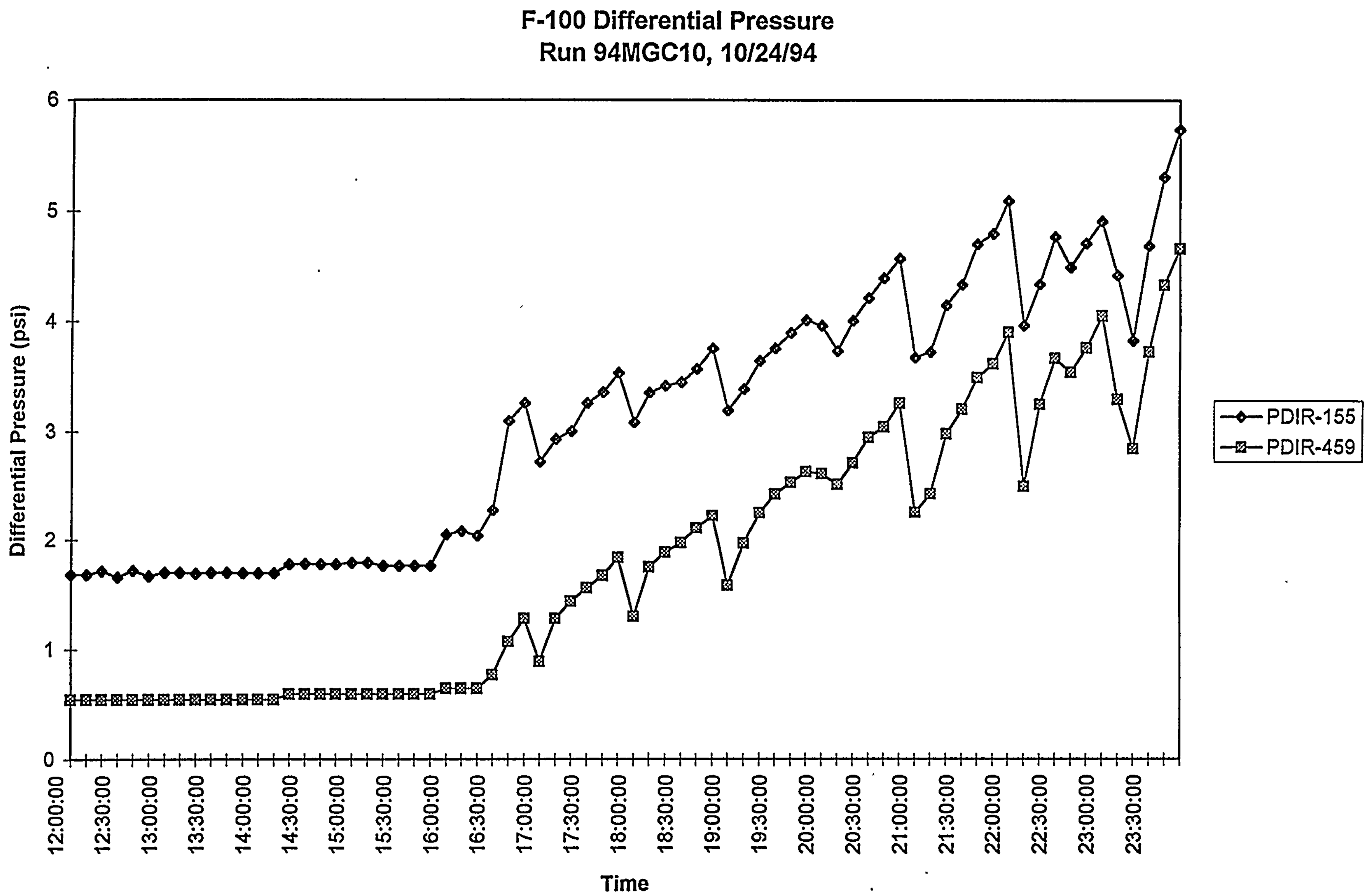


FBG & MGCR Process Pressures
Run 94MGC10, 10/27/94

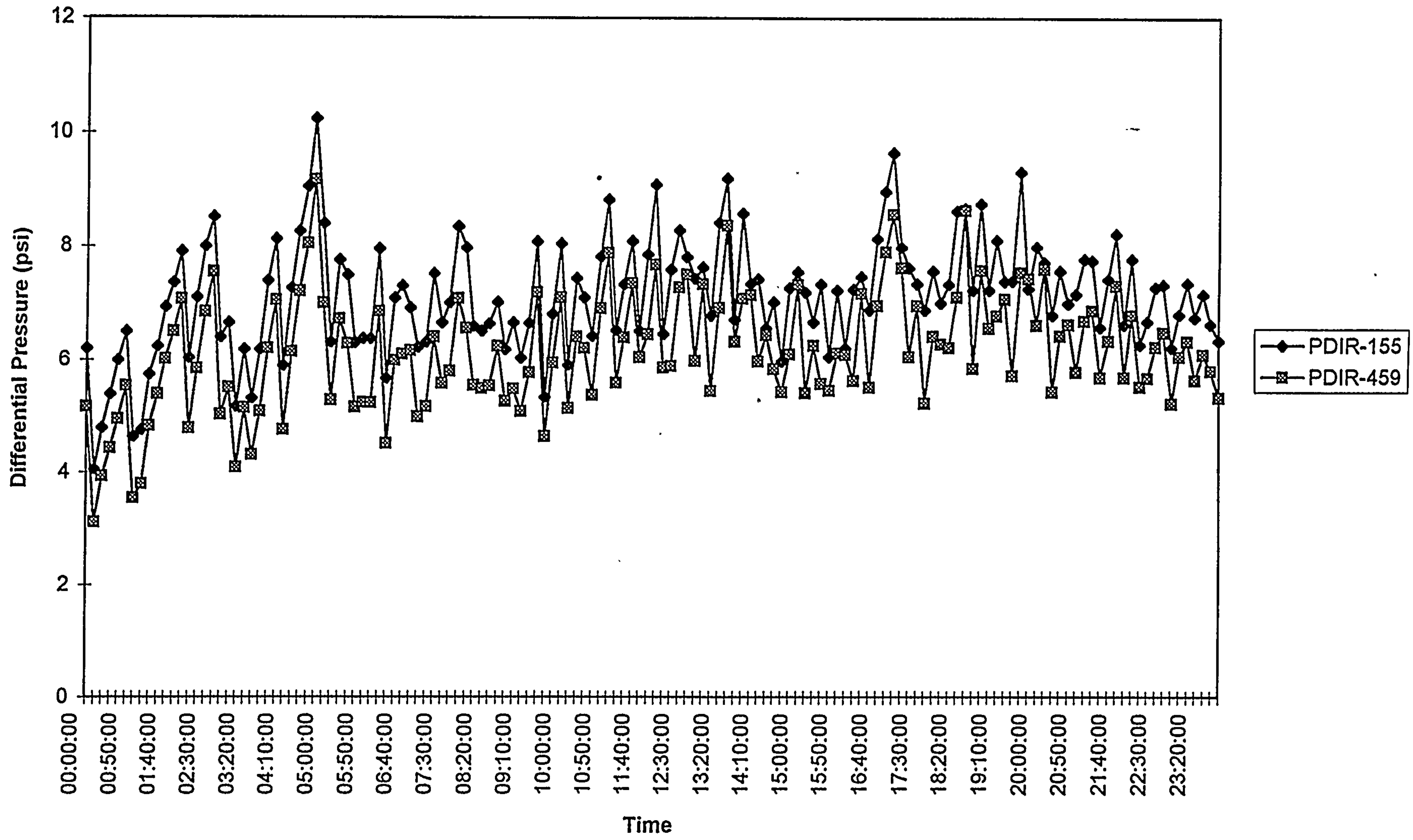


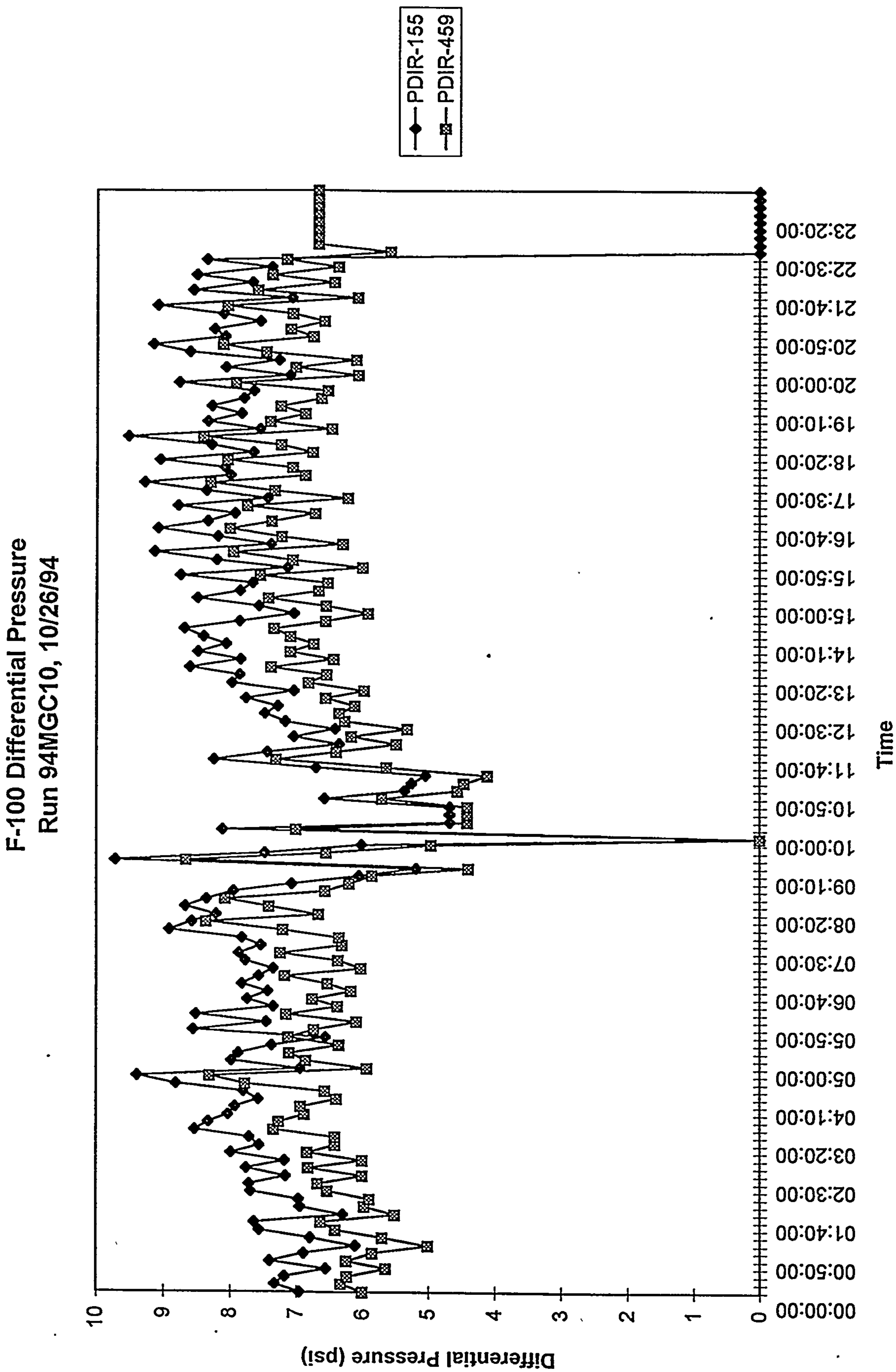
FBG & MGCR Process Pressures
Run 94MGC10, 10/28/94



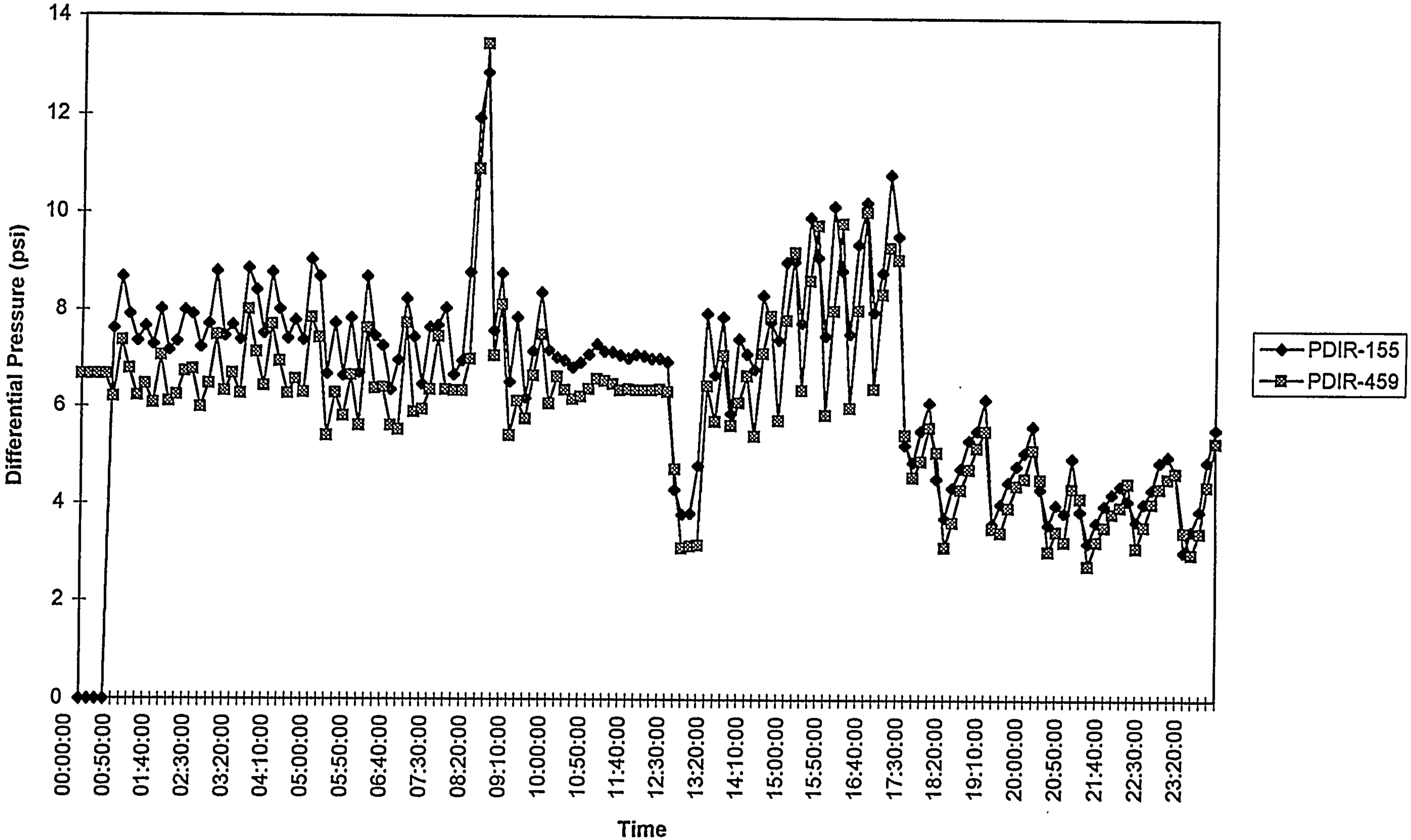

F-100 Differential Pressure
Run 94MGC10, 10/24/94
Differential Pressure (psi)
0
1
2
3
4
5
6
Time
12:00:00
12:30:00
13:00:00
13:30:00
14:00:00
14:30:00
15:00:00
15:30:00
16:00:00
16:30:00
17:00:00
17:30:00
18:00:00
18:30:00
19:00:00
19:30:00
20:00:00
20:30:00
21:00:00
21:30:00
22:00:00
22:30:00
23:00:00
23:30:00
PDIR-155
PDIR-459

## F-100 Differential Pressure
## Run 94MGC10, 10/25/94

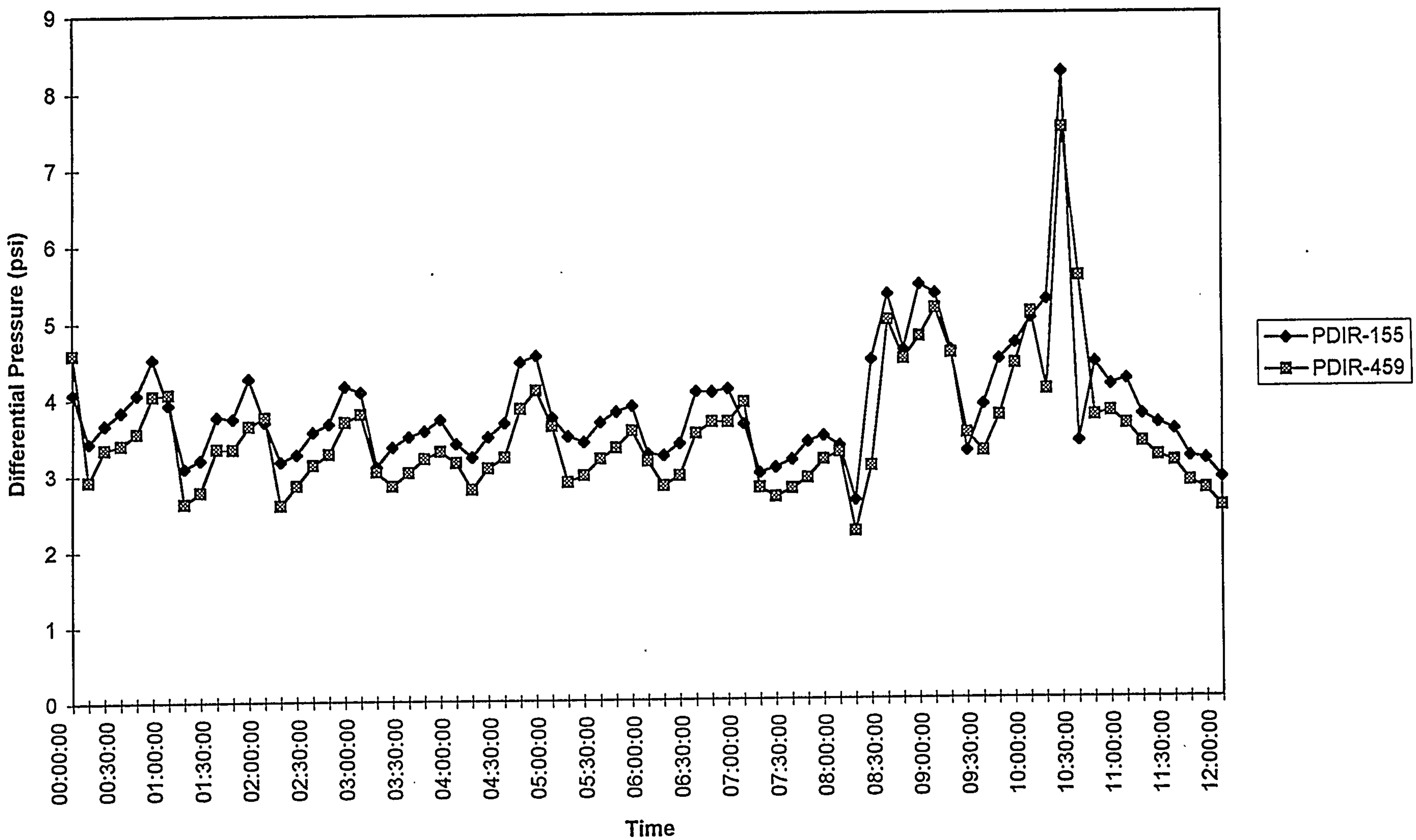



F-100 Differential Pressure
Run 94MGC10, 10/26/94
Differential Pressure (psi)
Time
PDIR-155
PDIR-459
0
1
2
3
4
5
6
7
8
9
10
00:00:00
00:50:00
01:40:00
02:30:00
03:20:00
04:10:00
05:00:00
05:50:00
06:40:00
07:30:00
08:20:00
09:10:00
10:00:00
10:50:00
11:40:00
12:30:00
13:20:00
14:10:00
15:00:00
15:50:00
16:40:00
17:30:00
18:20:00
19:10:00
20:00:00
20:50:00
21:40:00
22:30:00
23:20:00

# F-100 Differential Pressure
## Run 94MGC10, 10/27/94



F-100 Differential Pressure
Run 94MGC10, 10/28/94

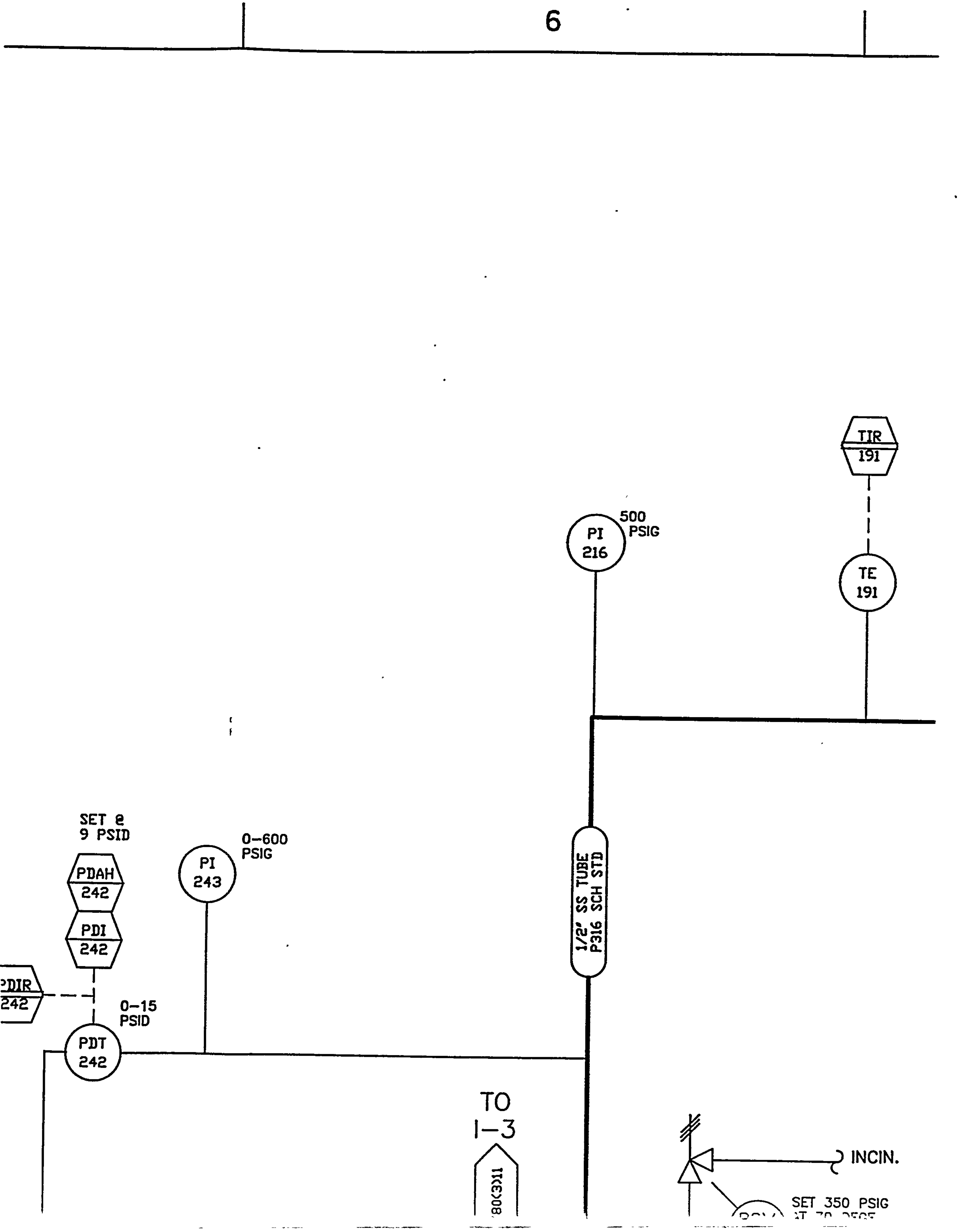


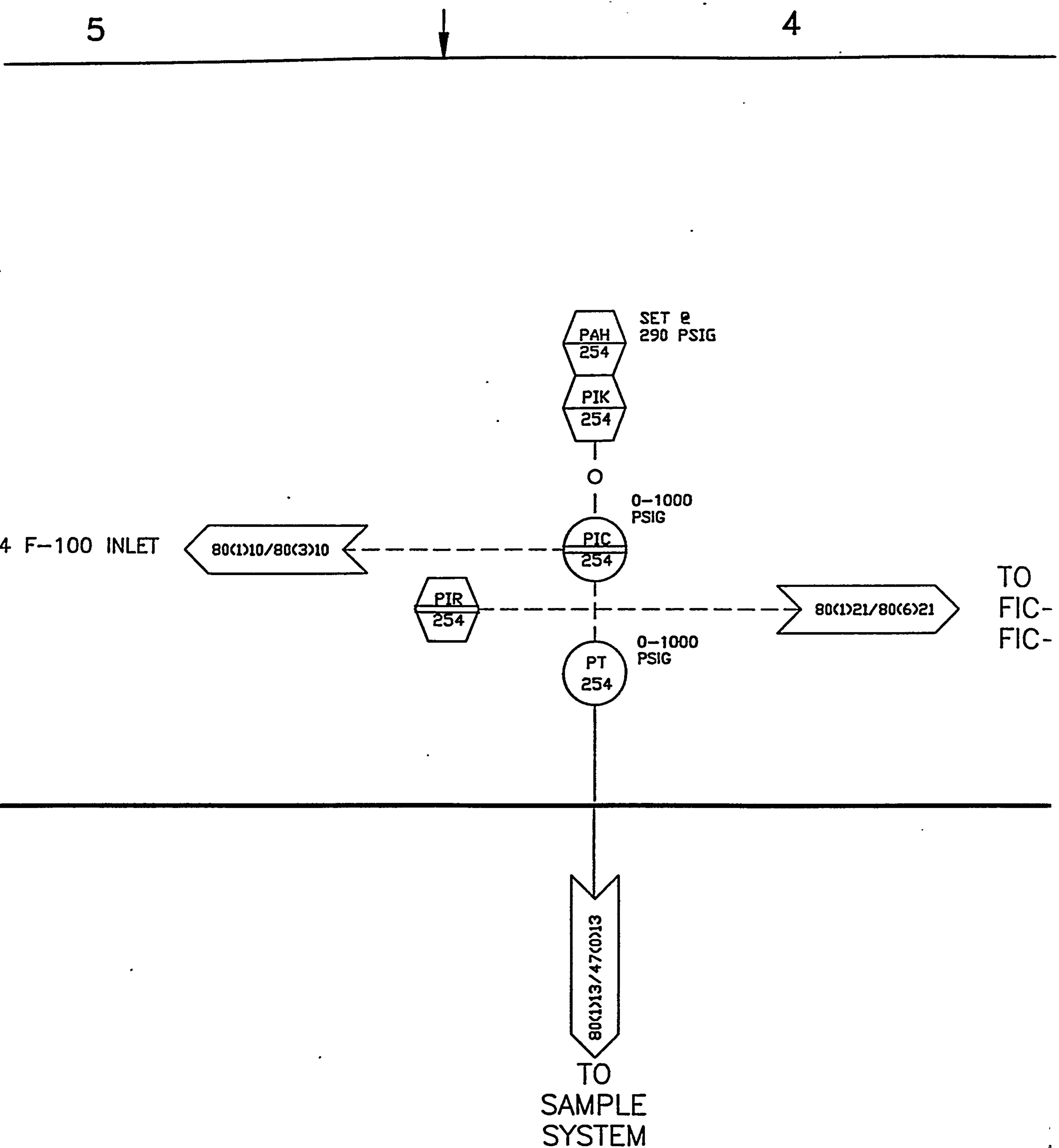
# Appendix 4

# Process and Instrumentation Drawings

8

7


6
TIR
191
PI
216
500
PSIG
TE
191
SET @
9 PSID
PDAH
242
PDI
242
PI
243
0–600
PSIG
1/2" SS TUBE
P316 SCH STD
242
0–15
PSID
PDT
242
TO
1–3
INCIN.
SET 350 PSIG



5
4
SET @
290 PSIG
PAH
254
PIK
254
0–1000
PSIG
4 F–100 INLET
80(1)10/80(3)10
PIC
254
PIR
254
80(1)21/80(6)21
TO
FIC-
FIC-
0–1000
PSIG
PT
254
80(1)13/47(0)13
TO
SAMPLE
SYSTEM

3

2

| ZONE | REV | |
|---|---|---|
| GEN. | 6 | MODIFIED |
| DRAFTER Gary Kulchock | | DAT 5/ |
| EG&G ES&H W. E. Lowry | | DAT 5/ |
| ZONE | REV | |
| GEN. | 7 | MODIFIEI |
| DRAFTER TERRY MCKISIC | | DA 8 |
| EG&G ES&H | | DA |
| ZONE | REV | |
| GEN. | 8 | MODIFIE |
| DRAFTER | | DA |
| ~~EG&G~~ ES&H DOE William E. Lowry | | DA |

80(1)16/80(6)16

TO OUTLET
FILTERATION

2

## REVISION

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN. | 6 | MODIFIED AS PER MARKED PRINT; ISSUED FOR CONSTRUCTION | 5/12/94 |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| Gary Kulchock | 5/18/94 | S. Conko | 5/18/94 | Dave Lunifeld | 5/24/94 | | |
| **EG&G ES&H** | **DATE** | **PROJECT ENGR.** | **DATE** | **BRANCH MANAGER** | **DATE** | **DOE (EOSD)** | **DATE** |
| W. E. Lowry | 5/24/94 | S. Renninger | 5/18/94 | John Rockey | 5/18/94 | WJA John Rotunda | 5/18/94 |

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN. | 7 | MODIFIED AS PER MARKED PRINT; ISSUED FOR CONSTRUCTION | 8/17/94 |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| TERRY MCKISIC | 8/17/94 | GARY KULCHOCK | 8/17/94 | Dave Lunifeld | 8/17/94 | | |
| **EG&G ES&H** | **DATE** | **PROJECT ENGR.** | **DATE** | **BRANCH MANAGER** | **DATE** | **DOE (EOSD)** | **DATE** |
| | | JOHN M. ROCKEY | 8/18/94 | JOHN M. ROCKEY | 8/18/94 | WJA John Rotunda | 8/18/94 |

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN. | 8 | MODIFIED AS PER MARKED PRINT; ISSUED FOR CONSTRUCTION | 9/30/94 |

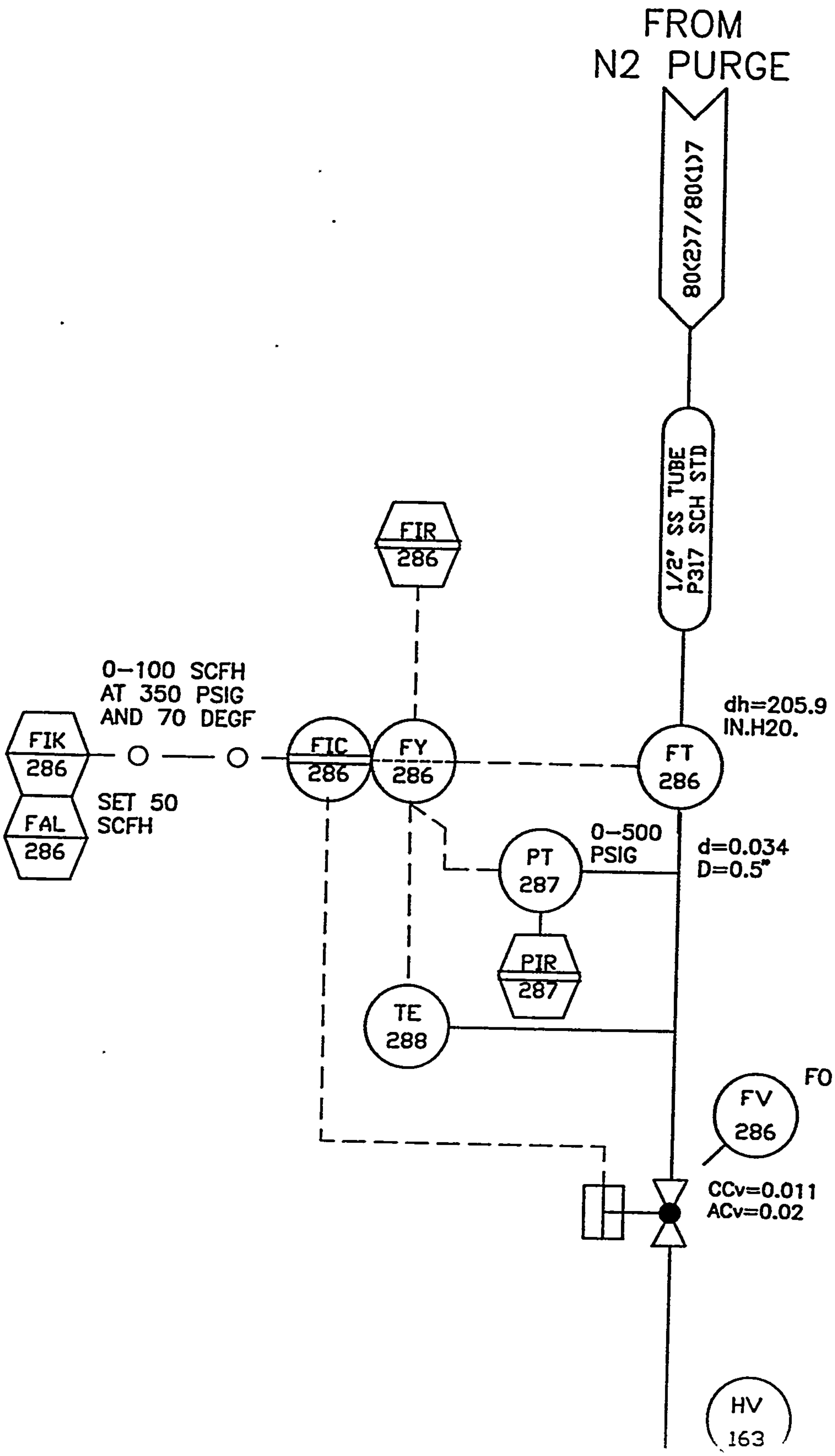
| DRAFTER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| [illegible] | 10-3-94 | Gary Kulchock | 10/3/94 | D Lunifeld | 10/5/94 | | |
| **EG&G ES&H** | **DATE** | **PROJECT ENGR.** | **DATE** | **BRANCH MANAGER** | **DATE** | **DOE (EOSD)** | **DATE** |
| DOE William E Lowry | | [illegible] | 10/3/94 | | | [illegible] WJA | 10/5/94 |

H

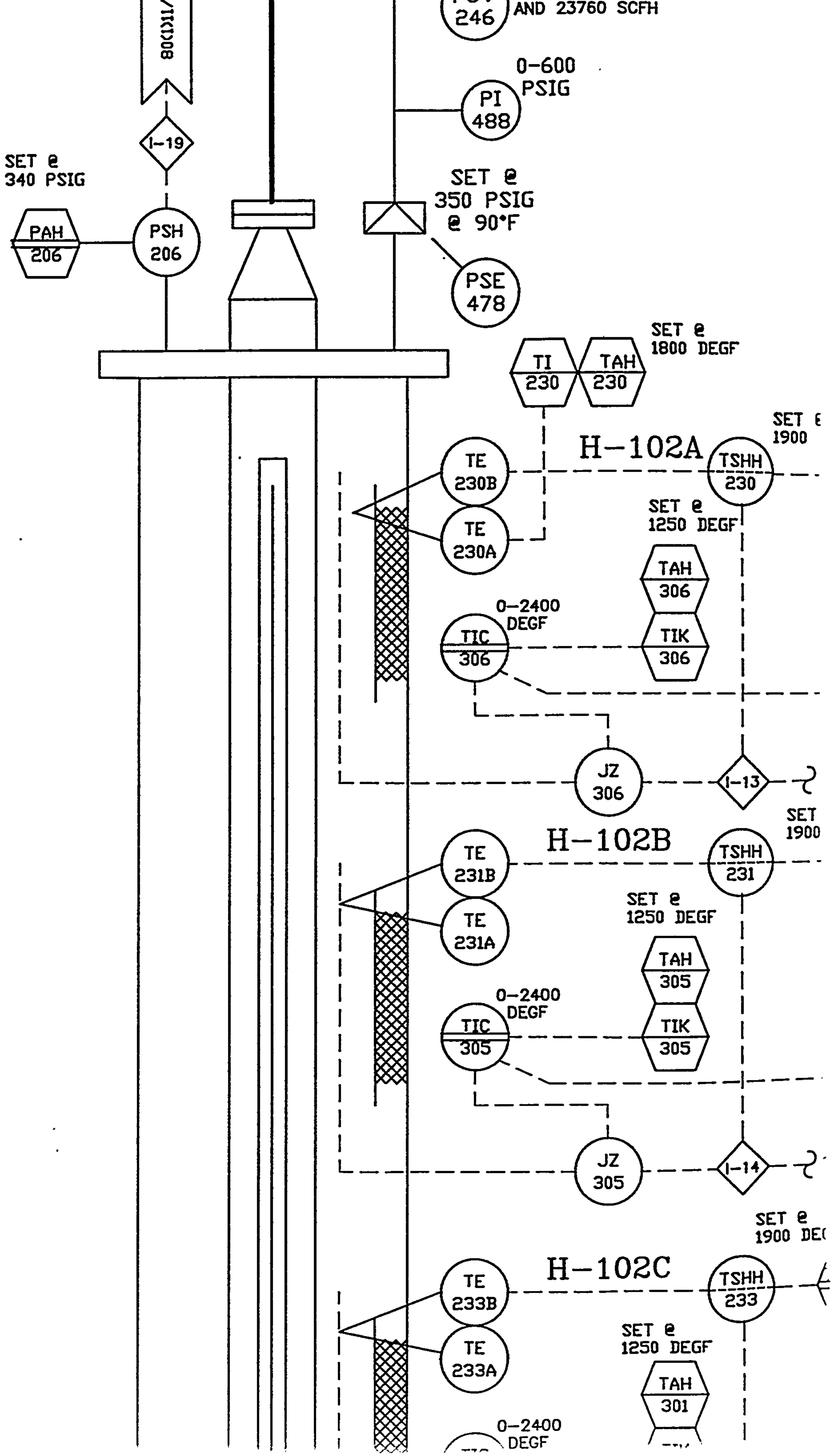
G

F

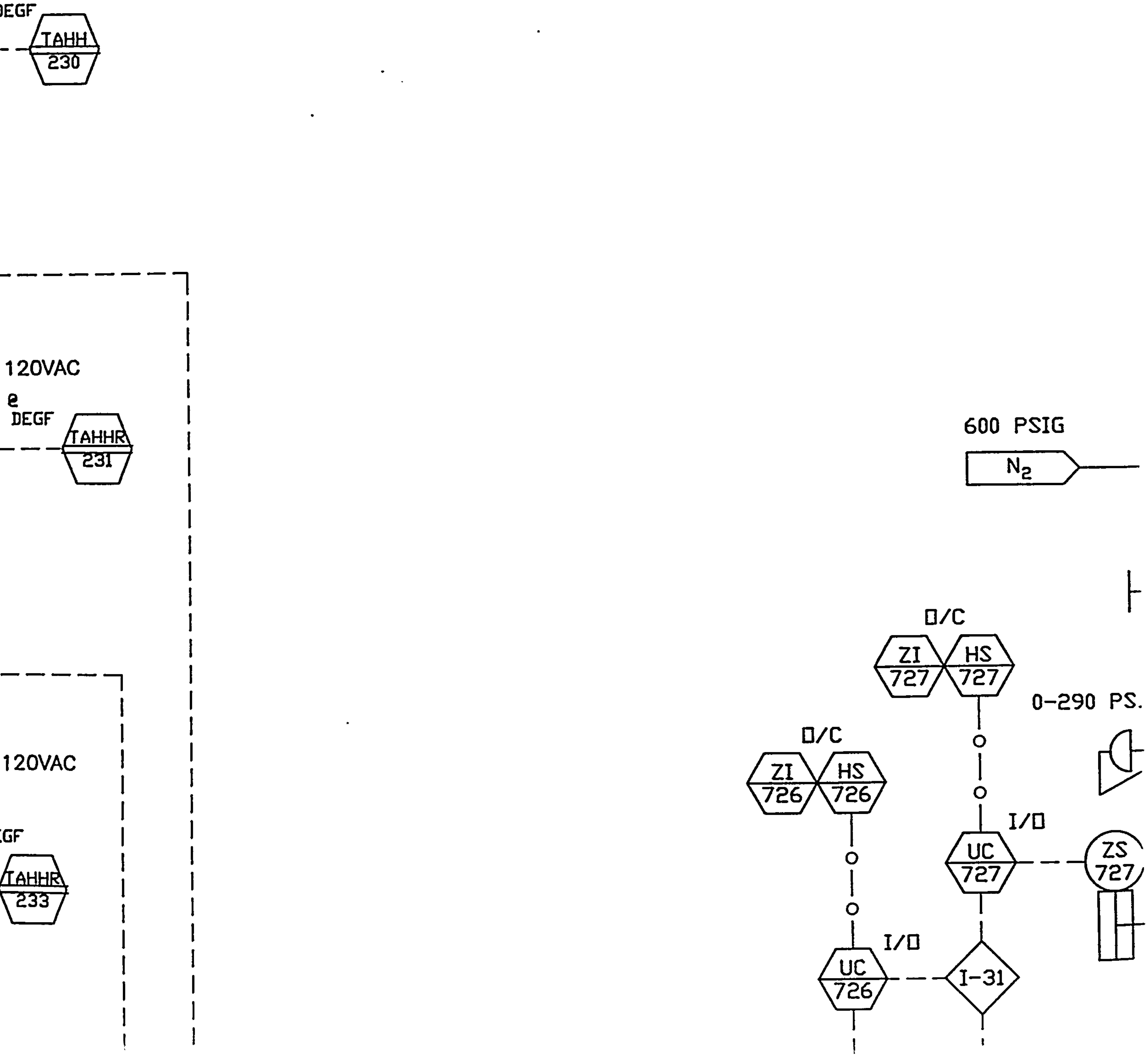
E



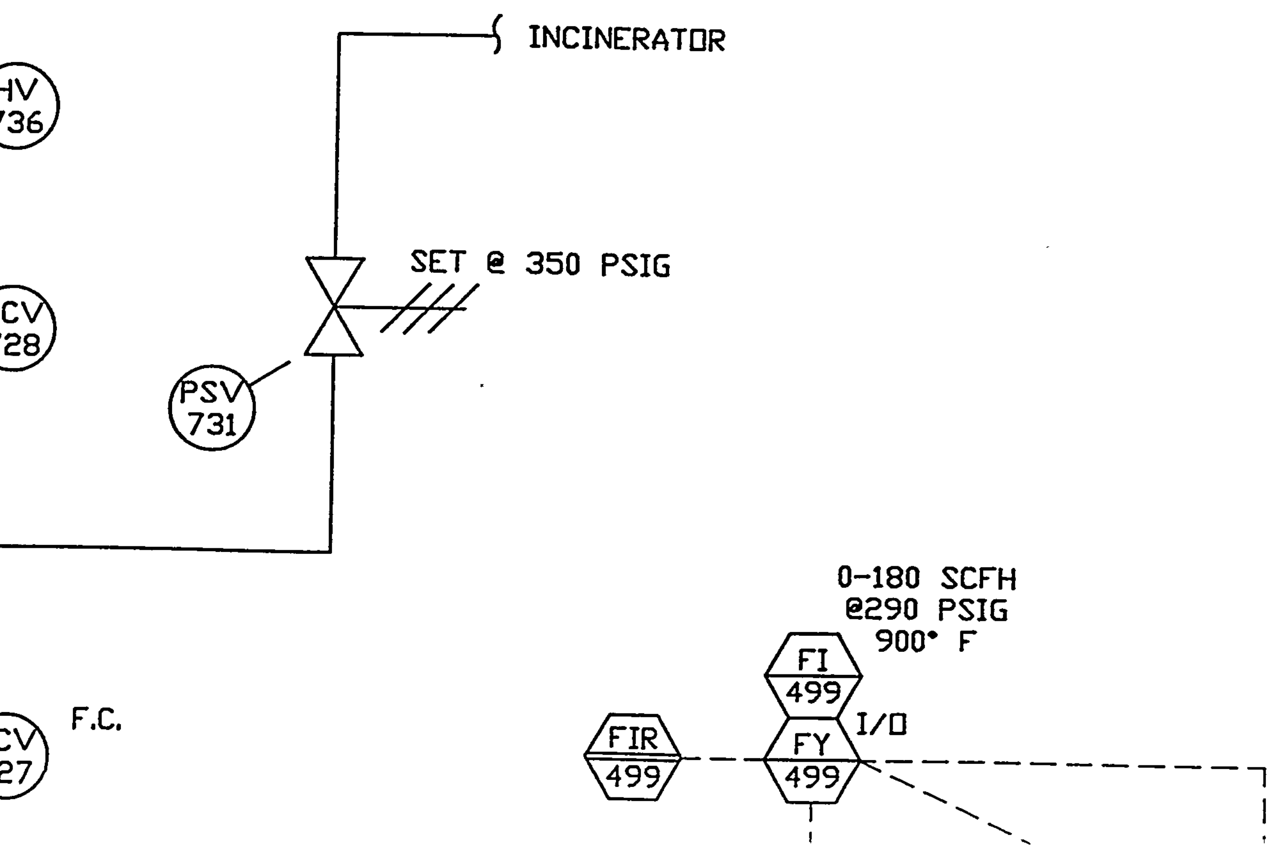
FROM
N2 PURGE
80(2)7/80(1)7
1/2" SS TUBE
P317 SCH STD
FIR
286
0-100 SCFH
AT 350 PSIG
AND 70 DEGF
FIK
286
FAL
286
SET 50
SCFH
FIC
286
FY
286
FT
286
dh=205.9
IN.H20.
PT
287
0-500
PSIG
d=0.034
D=0.5"
PIR
287
TE
288
FV
286
FO
CCv=0.011
ACv=0.02
HV
163

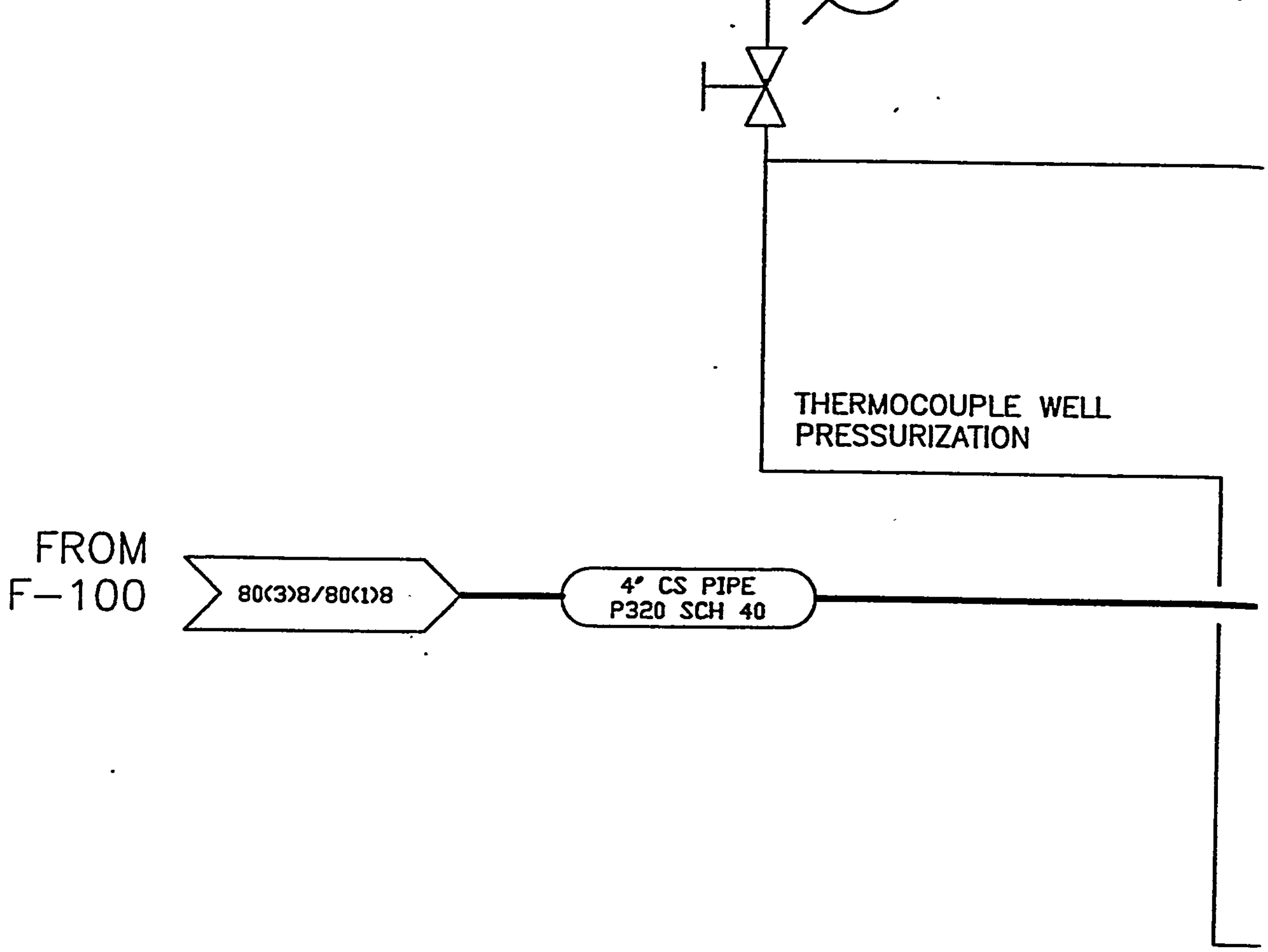


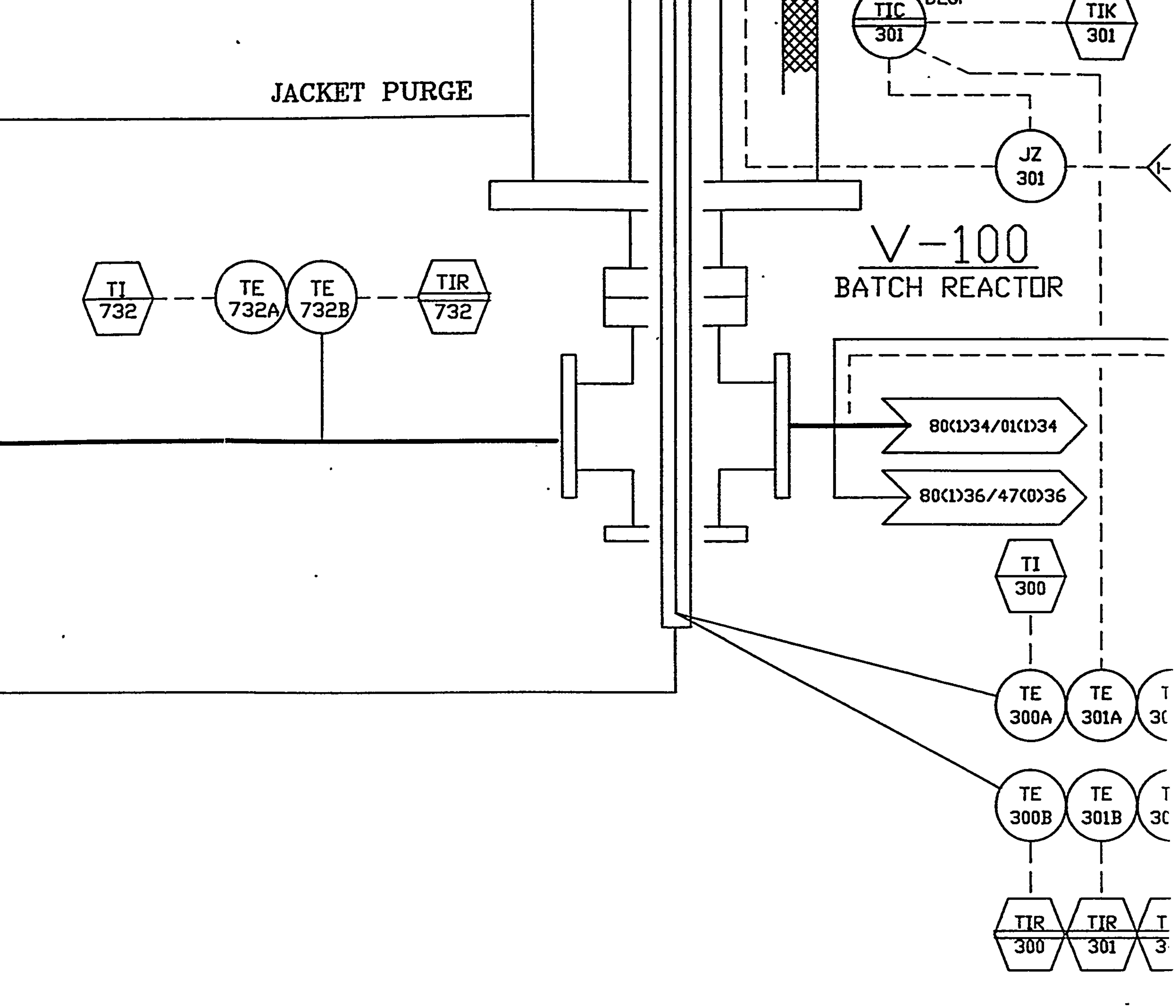
246
AND 23760 SCFH
0-600
PSIG
PI
488
I-19
SET @
340 PSIG
SET @
350 PSIG
@ 90°F
PAH
206
PSH
206
PSE
478
SET @
1800 DEGF
TI
230
TAH
230
H-102A
TSHH
230
1900
TE
230B
TE
230A
SET @
1250 DEGF
TAH
306
0-2400
DEGF
TIC
306
TIK
306
JZ
306
I-13
H-102B
SET
1900
TE
231B
TSHH
231
TE
231A
SET @
1250 DEGF
TAH
305
0-2400
DEGF
TIC
305
TIK
305
JZ
305
I-14
SET @
H-102C
TE
233B
TSHH
233
TE
233A
SET @
1250 DEGF
TAH
301
0-2400
DEGF

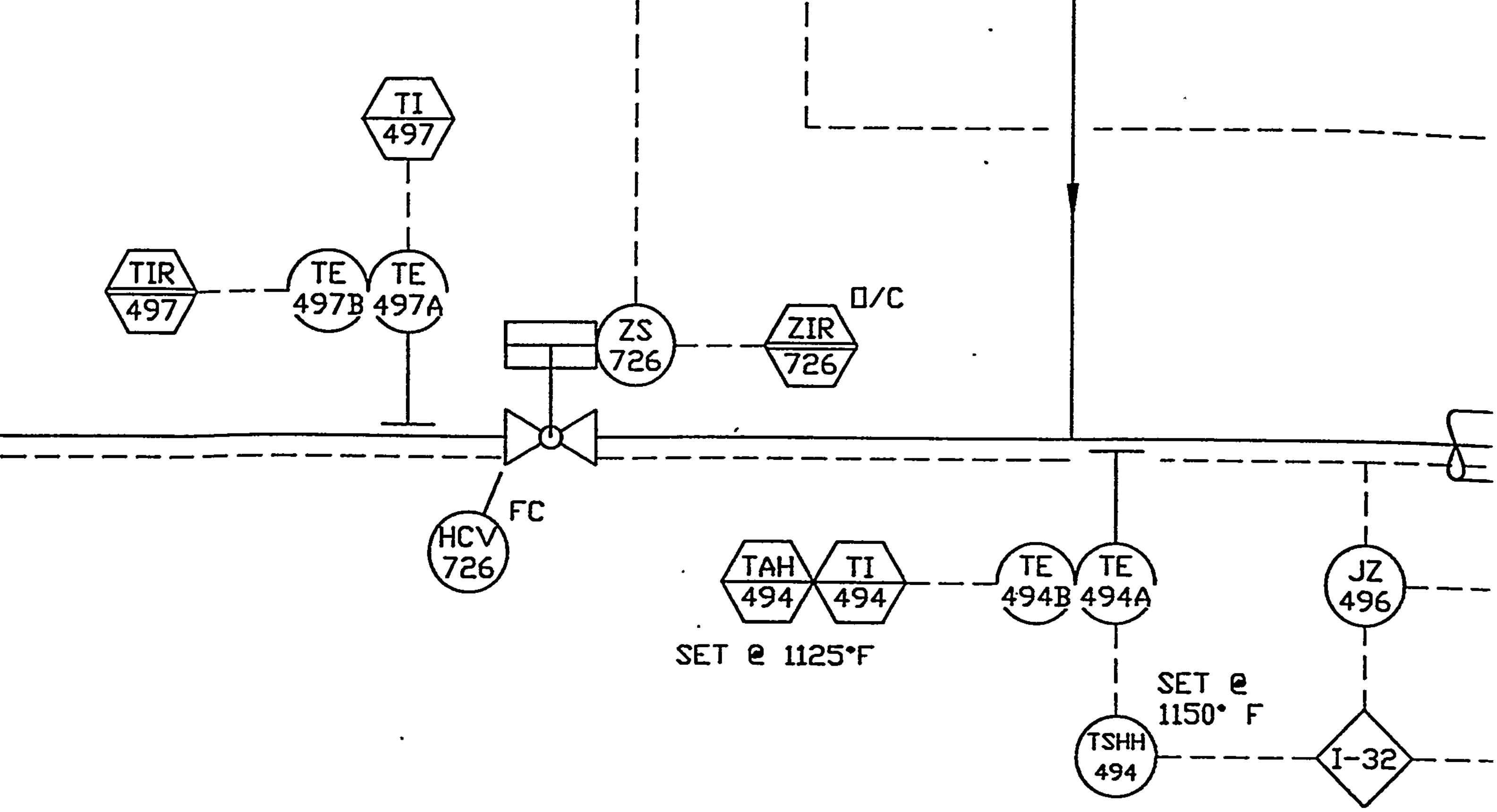


DEGF
TAHH
230
120VAC
DEGF
TAHHR
231
120VAC
GF
TAHHR
233
600 PSIG
N2
O/C
ZI
727
HS
727
0-290 PS.
O/C
ZI
726
HS
726
I/O
UC
727
ZS
727
I/O
UC
726
I-31

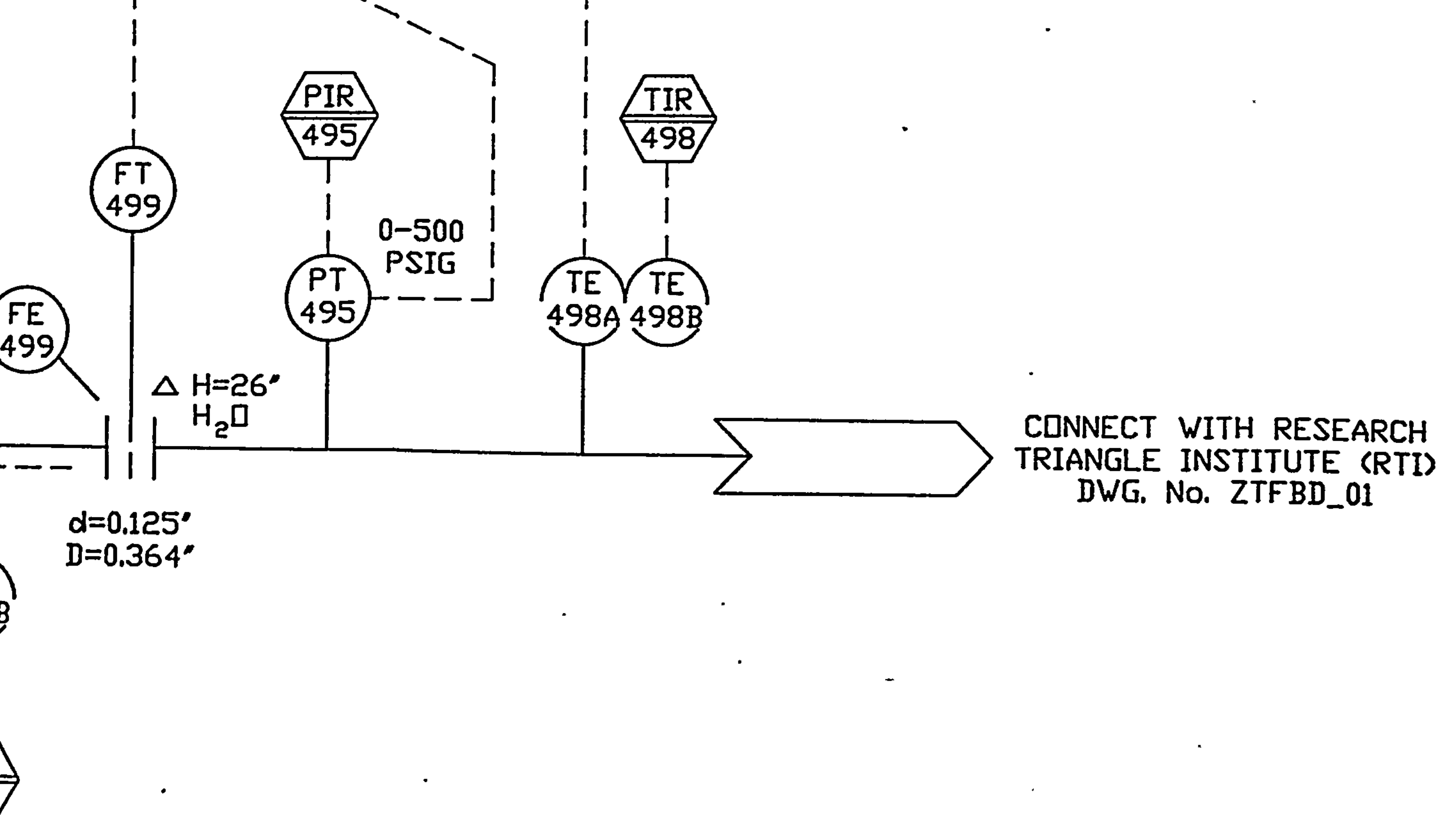

INCINERATOR
HV
736
SET @ 350 PSIG
CV
728
PSV
731
0-180 SCFH
@290 PSIG
900° F
FI
499
I/O
F.C.
CV
27
FIR
499
FY
499


THERMOCOUPLE WELL PRESSURIZATION
FROM F-100
80(3)8/80(1)8
4" CS PIPE
P320 SCH 40


JACKET PURGE
TI 732
TE 732A
TE 732B
TIR 732
TIC 301
TIK 301
JZ 301
V-100
BATCH REACTOR
80(1)34/01(1)34
80(1)36/47(0)36
TI 300
TE 300A
TE 301A
TE 300B
TE 301B
TIR 300
TIR 301



TI 497
TIR 497
TE 497B
TE 497A
ZS 726
ZIR 726
O/C
FC
HCV 726
TAH 494
TI 494
TE 494B
TE 494A
JZ 496
SET @ 1125°F
SET @ 1150° F
TSHH 494
I-32




NOTES:

1. ALL IMPULSE LINES ARE 3/8
2. PREV. BLOCK RANGE (0-425
3. CURRENT BLOCK RANGE (451
4. LAST POINT NUMBER USED 3
5. LAST TAG NUMBER USED 493

| REFERENCE DRAWINGS | | DATE | |
|---|---|---|---|
| | DRAFTER Jimmy Thorton | 10/28/93 | |
| | PROJECT ENGINEER John Rockey | 11/2/93 | |
| | REQUESTOR John Rockey | 11/2/93 | |
| | BRANCH MANAGER Larry Strickland | 11/2/93 | TITLE: B-12 AI MODU PRC DR |
| | ES&H | DATE | |
| | DOE WJA John Rotunda | 10/28/93 | |
| | | DATE | SIZE E / FSCM NO |
| | | DATE | |

THIS DRAWING IS PART OF THE EG&G DOCUMENT CONTROL SYSTEM

C

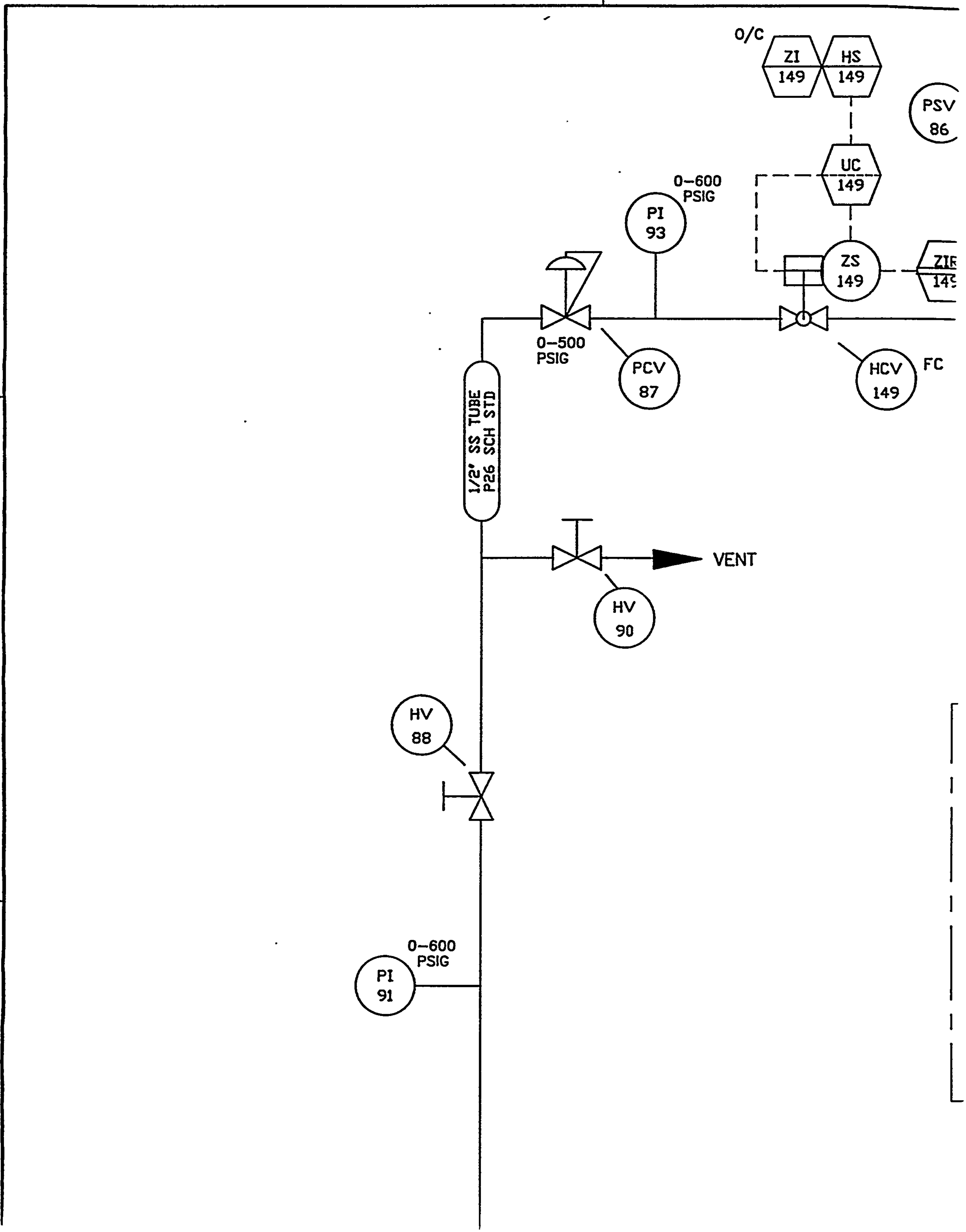
CONNECT WITH RESEARCH
TRIANGLE INSTITUTE (RTI)
DWG. No. ZTFBD_01

DWG NO STD920080.08 SH 1

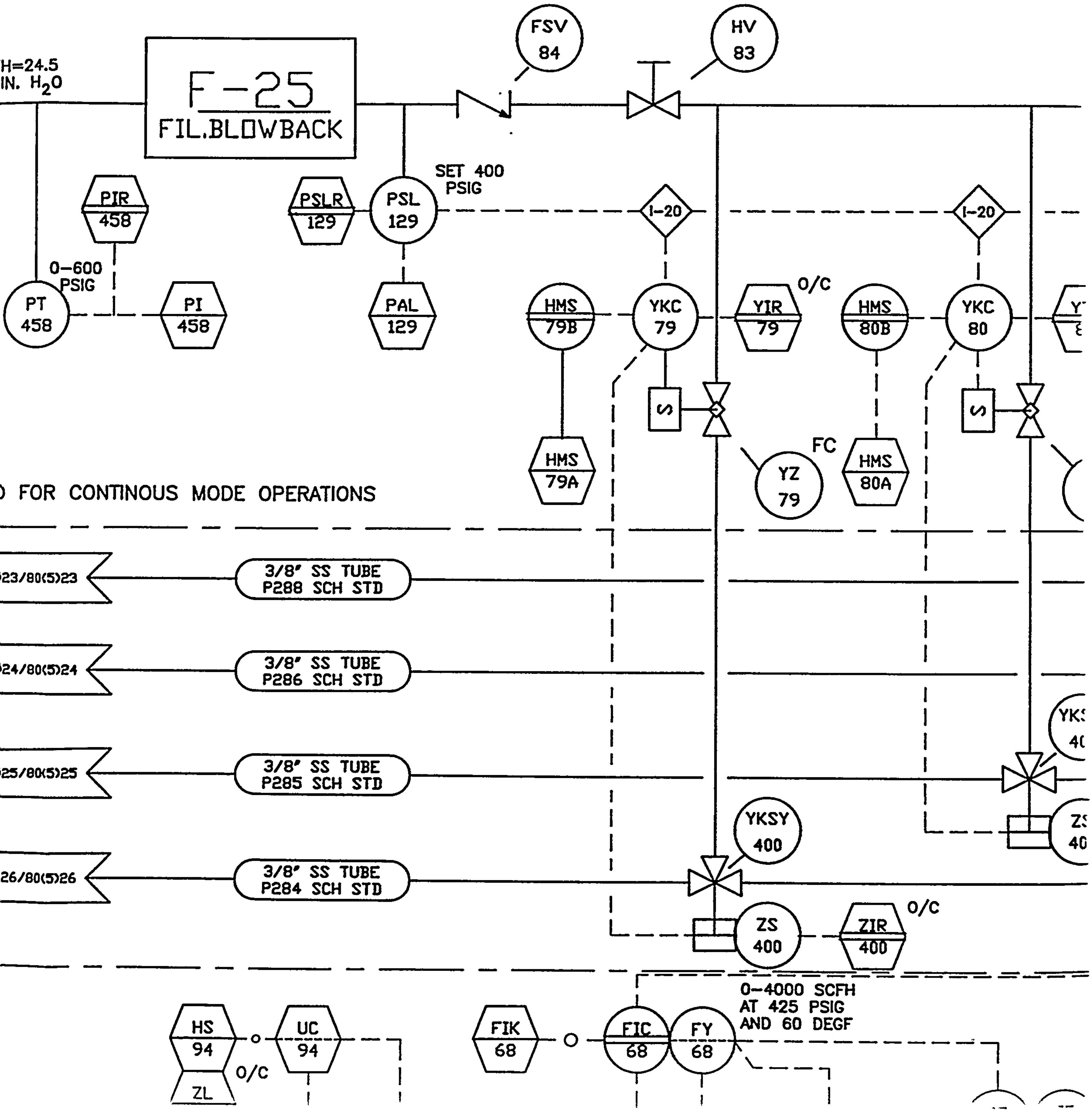
S:
L IMPULSE LINES ARE 3/8 UNLESS OTHERWISE NOTED.
EV. BLOCK RANGE (0-425).
RRENT BLOCK RANGE (451-499) P&ID's 1,2,3,6.
ST POINT NUMBER USED 36.
ST TAG NUMBER USED 493.

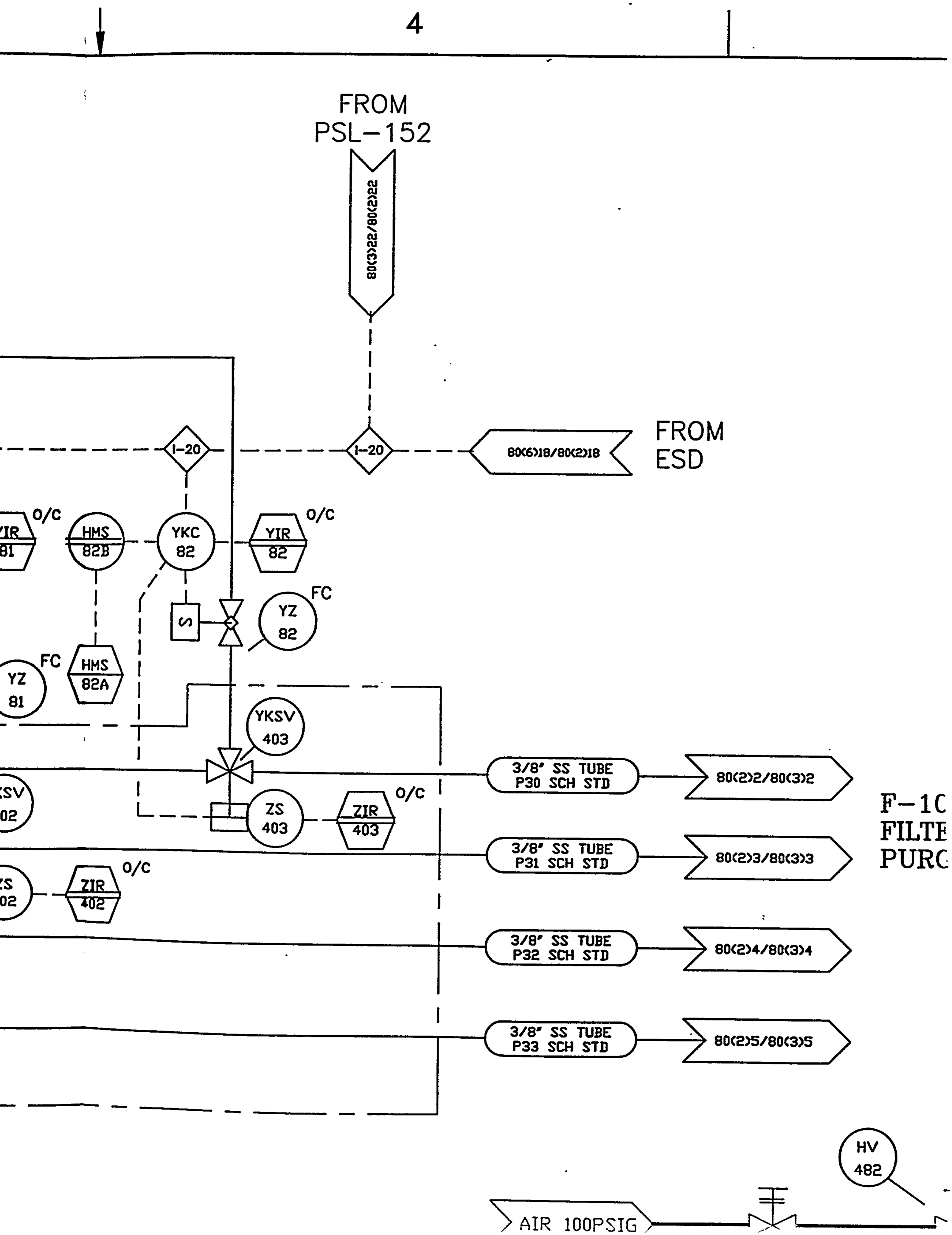
| | | | |
|---|---|---|---|
| DRAFTER Jimmy Thorton | DATE 10/28/93 | United States Department of Energy<br>MORGANTOWN ENERGY TECHNOLOGY CENTER<br>Morgantown, WV | |
| PROJECT ENGINEER John Rockey | DATE 11/2/93 | | |
| REQUESTOR John Rockey | DATE 11/2/93 | | |
| BRANCH MANAGER Larry Strickland | DATE 11/2/93 | TITLE: B-12 ADVANCED GASIFICATION FACILITY<br>MODULAR GAS CLEANUP RIG (MGCR)<br>PROCESS AND INSTRUMENTATION<br>DRAWING (P&ID1) BATCH MODE | |
| ES&H | DATE | | |
| DOE WJA John Rotunda | DATE 10/28/93 | | |
| | DATE | SIZE E / FSCM NO / DWG NO STD920080.08 | REV 8 |
| | DATE | | |

A


O/C
ZI 149
HS 149
PSV 86
UC 149
0-600 PSIG
PI 93
ZS 149
0-500 PSIG
PCV 87
HCV 149
FC
1/2" SS TUBE P26 SCH STD
VENT
HV 90
HV 88
0-600 PSIG
PI 91

VENT


H=24.5
IN. $H_2O$
F-25
FIL.BLOWBACK
FSV 84
HV 83
SET 400
PSIG
PIR 458
PSLR 129
PSL 129
I-20
I-20
0-600
PSIG
PT 458
PI 458
PAL 129
HMS 79B
YKC 79
YIR 79
O/C
HMS 80B
YKC 80
S
S
FC
HMS 79A
YZ 79
HMS 80A
D FOR CONTINOUS MODE OPERATIONS
523/80(5)23
3/8" SS TUBE
P288 SCH STD
524/80(5)24
3/8" SS TUBE
P286 SCH STD
525/80(5)25
3/8" SS TUBE
P285 SCH STD
26/80(5)26
3/8" SS TUBE
P284 SCH STD
YKSY 400
ZS 400
ZIR 400
O/C
0-4000 SCFH
AT 425 PSIG
AND 60 DEGF
HS 94
UC 94
ZL
O/C
FIK 68
FIC 68
FY 68


4
FROM
PSL-152
80(3)22/80(2)22
I-20
I-20
80(6)18/80(2)18
FROM
ESD
O/C
HMS
82B
YKC
82
YIR
82
O/C
S
YZ
82
FC
FC
YZ
81
HMS
82A
YKSV
403
3/8" SS TUBE
P30 SCH STD
80(2)2/80(3)2
ZS
403
ZIR
403
O/C
3/8" SS TUBE
P31 SCH STD
80(2)3/80(3)3
O/C
ZIR
402
3/8" SS TUBE
P32 SCH STD
80(2)4/80(3)4
3/8" SS TUBE
P33 SCH STD
80(2)5/80(3)5
HV
482
AIR 100PSIG

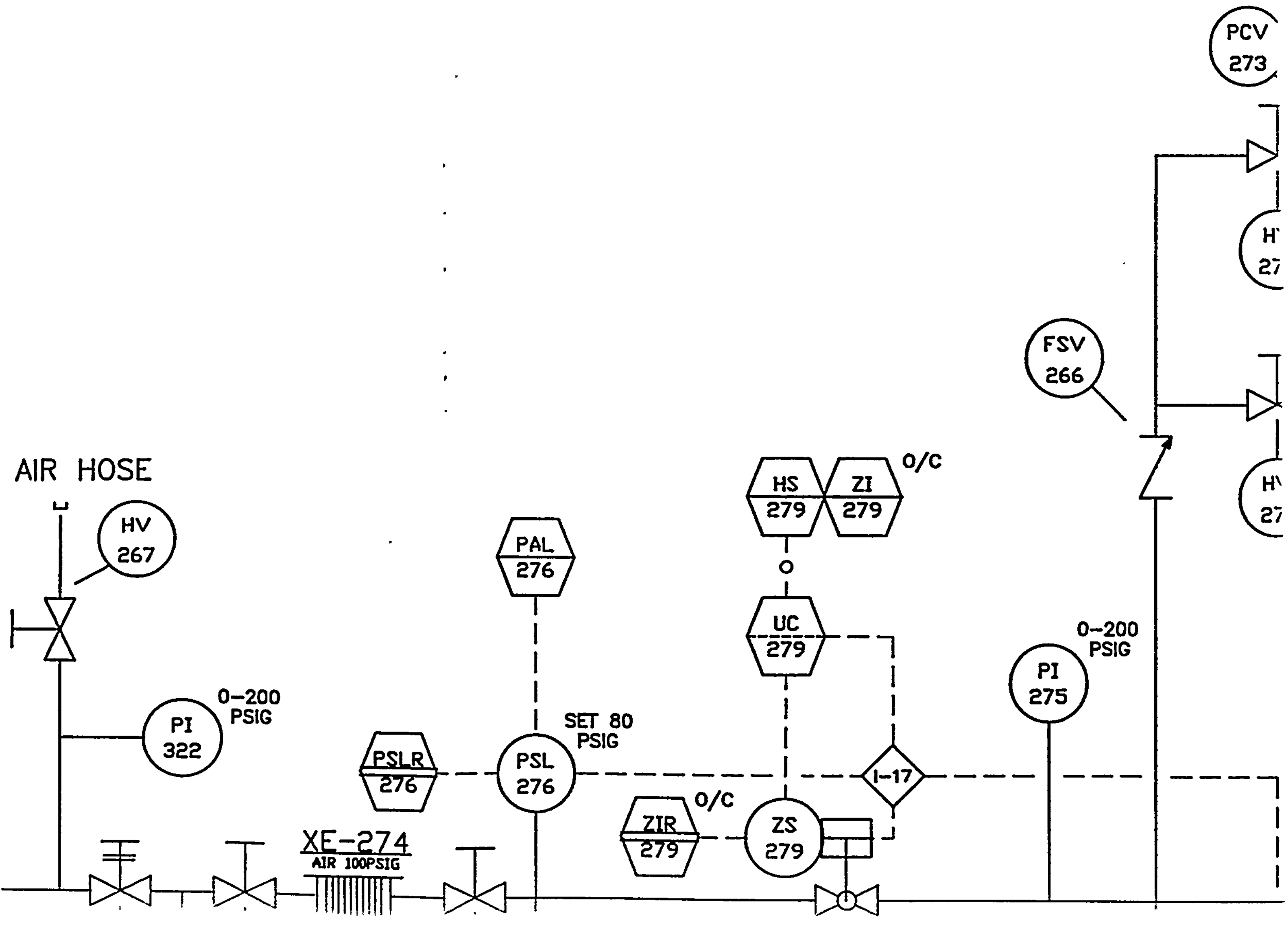
3 | 2

| ZONE | REV | |
|---|---|---|
| GEN. | 6 | MODIFIED AS PER MARKED PRINT |

| DRAFTER | DATE | CHECKER |
|---|---|---|
| GARY J. KULCHOCK | 5/18/94 | S. CONKO |
| EG&G ES&H | DATE | PROJECT ENGR. |
| W.E. LOWRY | 5/24/94 | S. RENNINGEF |

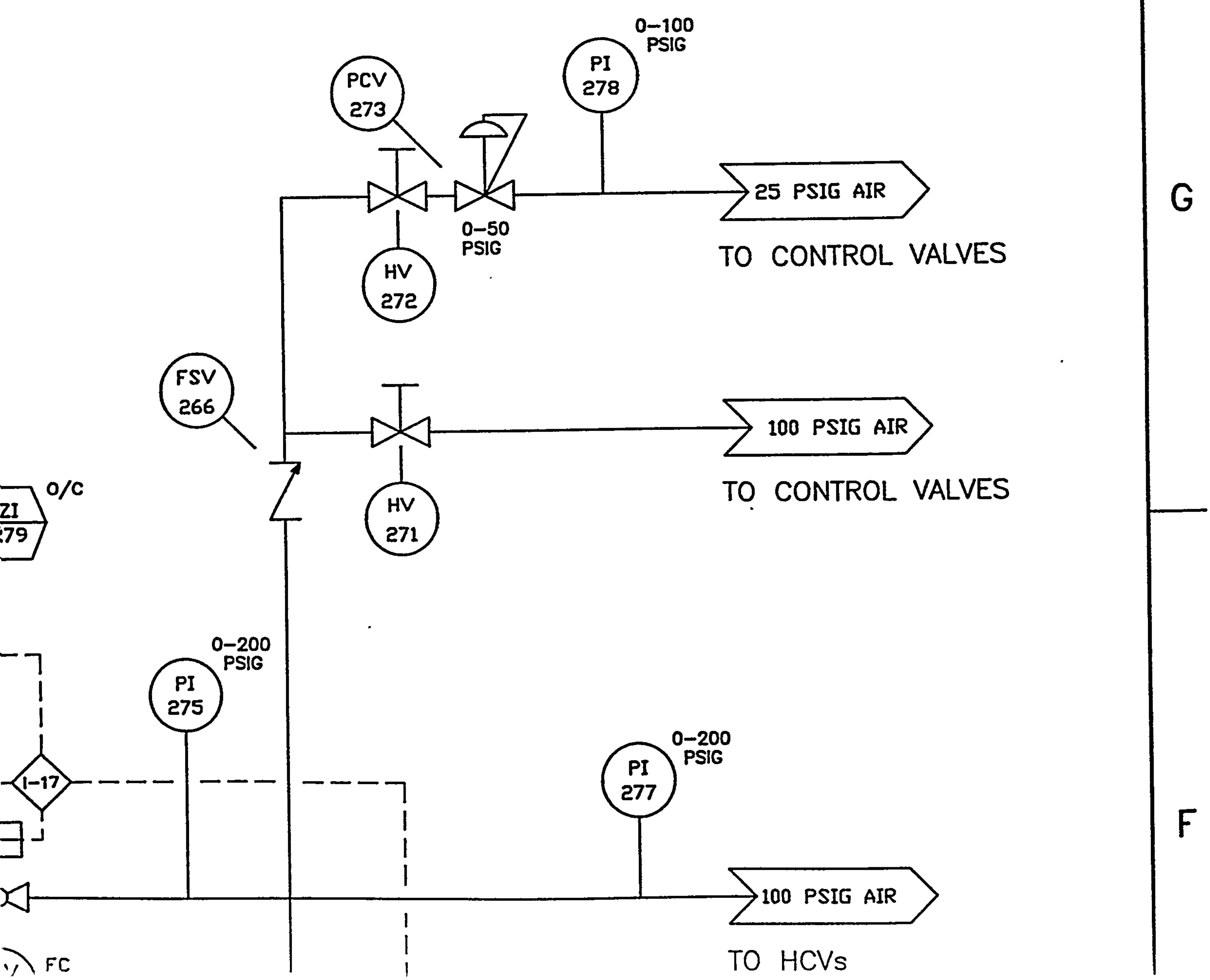
| ZONE | REV | |
|---|---|---|
| GEN. | 7 | MODIFIED AS PER MARKED PRINT |

| DRAFTER | DATE | CHECKER |
|---|---|---|
| [illegible] | 10-3-94 | [illegible] |
| ~~EG&G~~ ES&H DBD | DATE | PROJECT ENGR. |
| William E. Lowry | 10/11/94 | Scott [illegible] |



REVISION

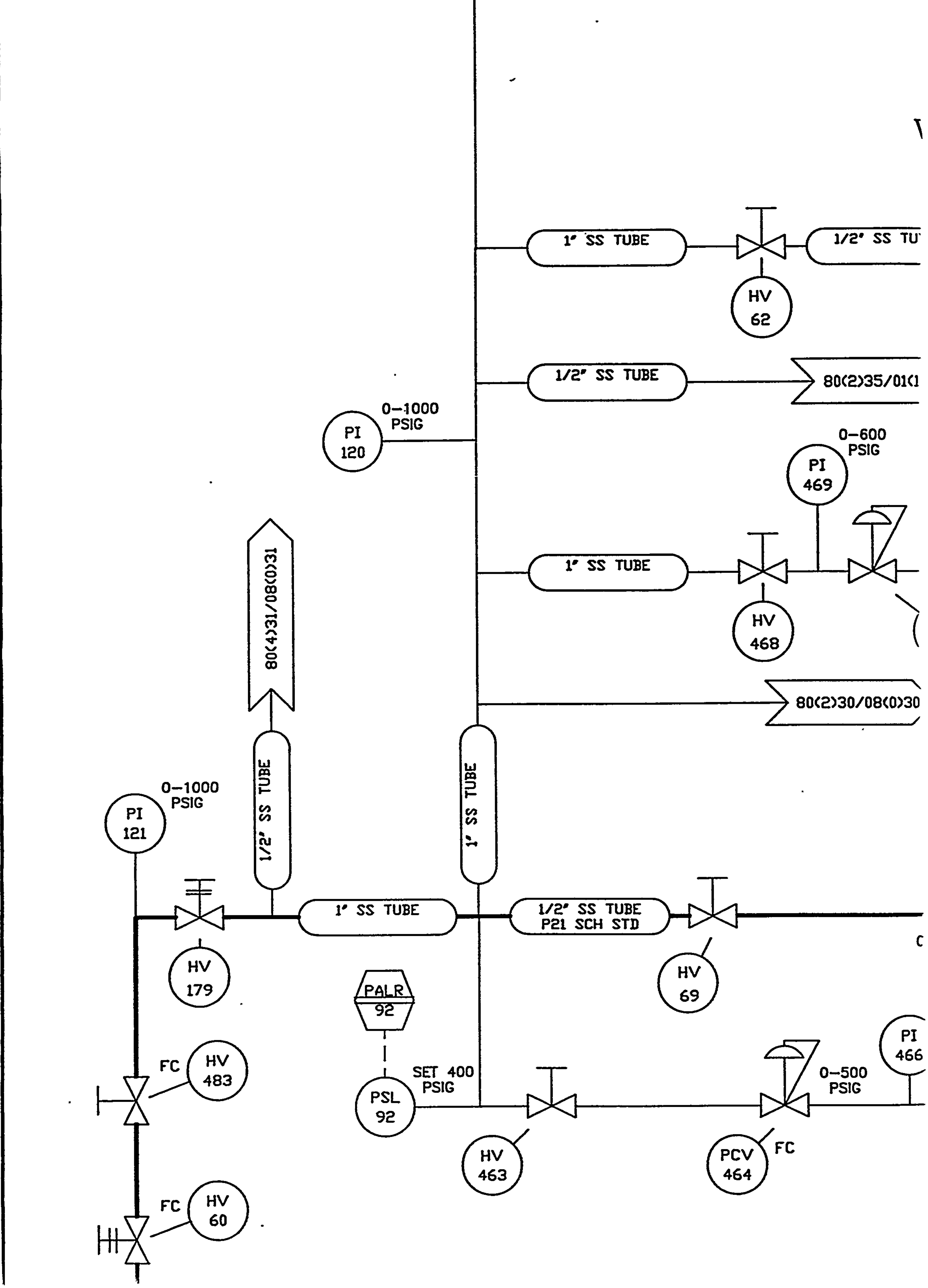
| ZONE | REV | DESCRIPTION | | | | | | | DATE |
|---|---|---|---|---|---|---|---|---|---|
| GEN. | 6 | MODIFIED AS PER MARKED PRINT; ISSUED FOR CONSTRUCTION | | | | | | | 5/13/94 |
| DRAFTER: ...RY J. KULCHOCK | DATE: 5/18/94 | CHECKER: S. CONKO | DATE: 5/18/94 | EG&G RESPONSIBLE ENGR.: DAVID LUNIFELD | DATE: 5/24/94 | REVIEWER | | | DATE |
| ...ES&H: ...E. LOWRY | DATE: 5/24/94 | PROJECT ENGR.: S. RENNINGER | DATE: 5/18/94 | BRANCH MANAGER: JOHN M. ROCKEY | DATE: 5/18/94 | DOE (EDSD): JOHN R. ROTUNDA | | | DATE: 5/18/94 |
| ZONE | REV | DESCRIPTION | | | | | | | DATE |
| GEN. | 7 | MODIFIED AS PER MARKED PRINT; ISSUED FOR CONSTRUCTION | | | | | | | 9/30/94 |
| DRAFTER: ... McFise | DATE: 10-3-94 | CHECKER: Larry J Kulchock | DATE: 10/3/94 | EG&G RESPONSIBLE ENGR.: David Lunifeld | DATE: 10/5/94 | REVIEWER | | | DATE |
| ...ES&H DBD: William E. Lowry | DATE: 10/11/94 | PROJECT ENGR.: Scott Renninger | DATE: 10/4/94 | BRANCH MANAGER | DATE | DOE (EDSD): [signature] | | | DATE: 10/5/94 |



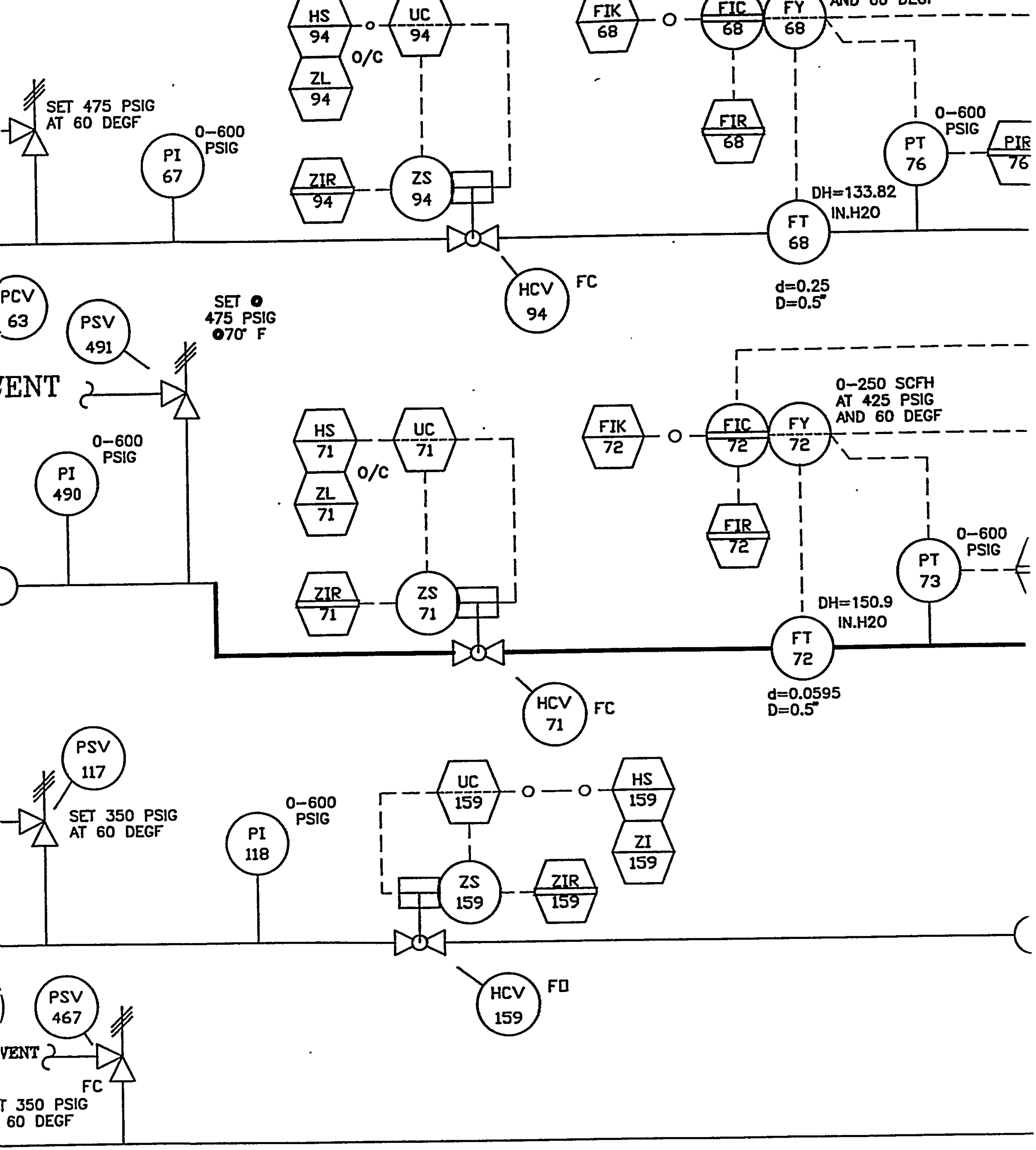
F

E

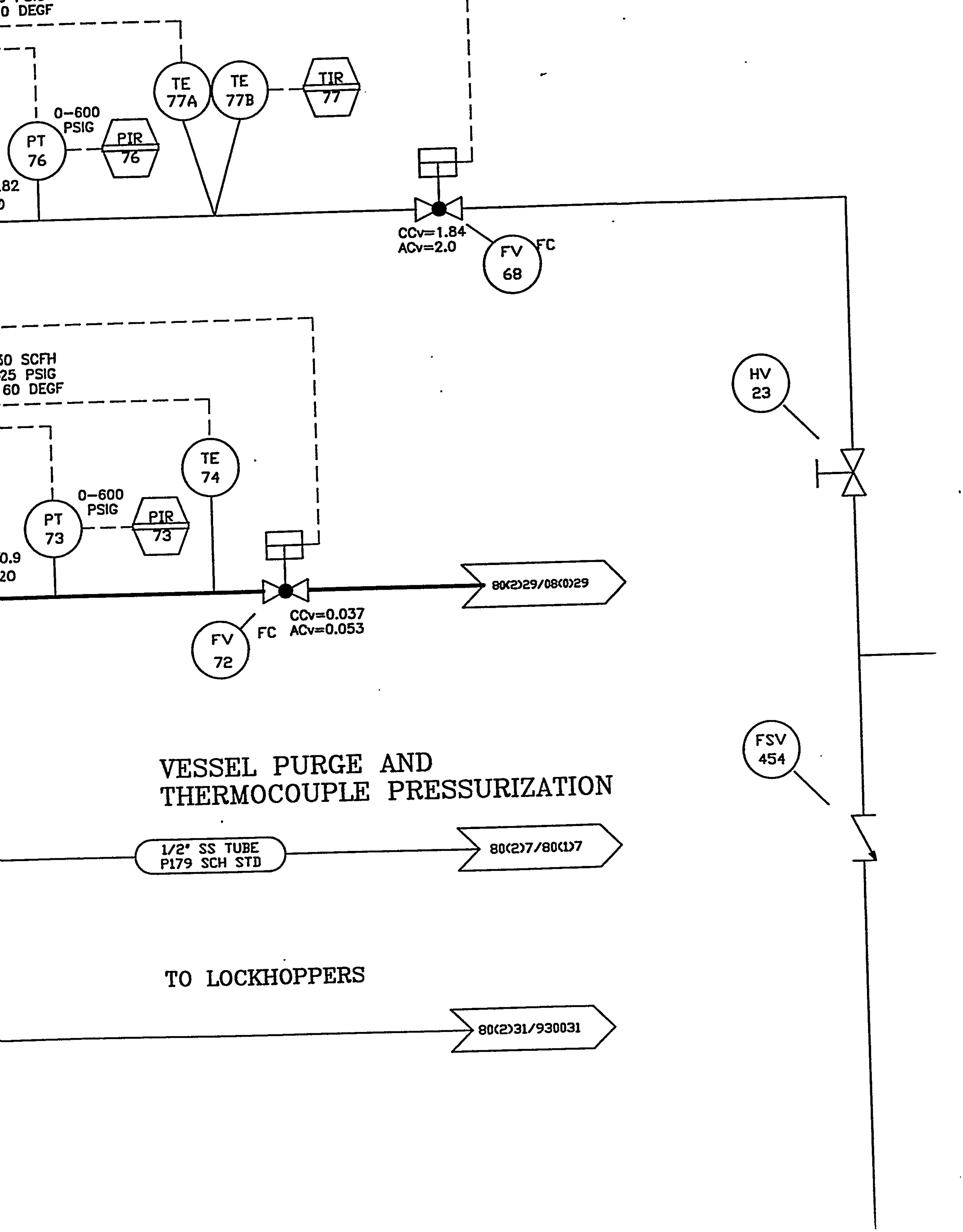
D



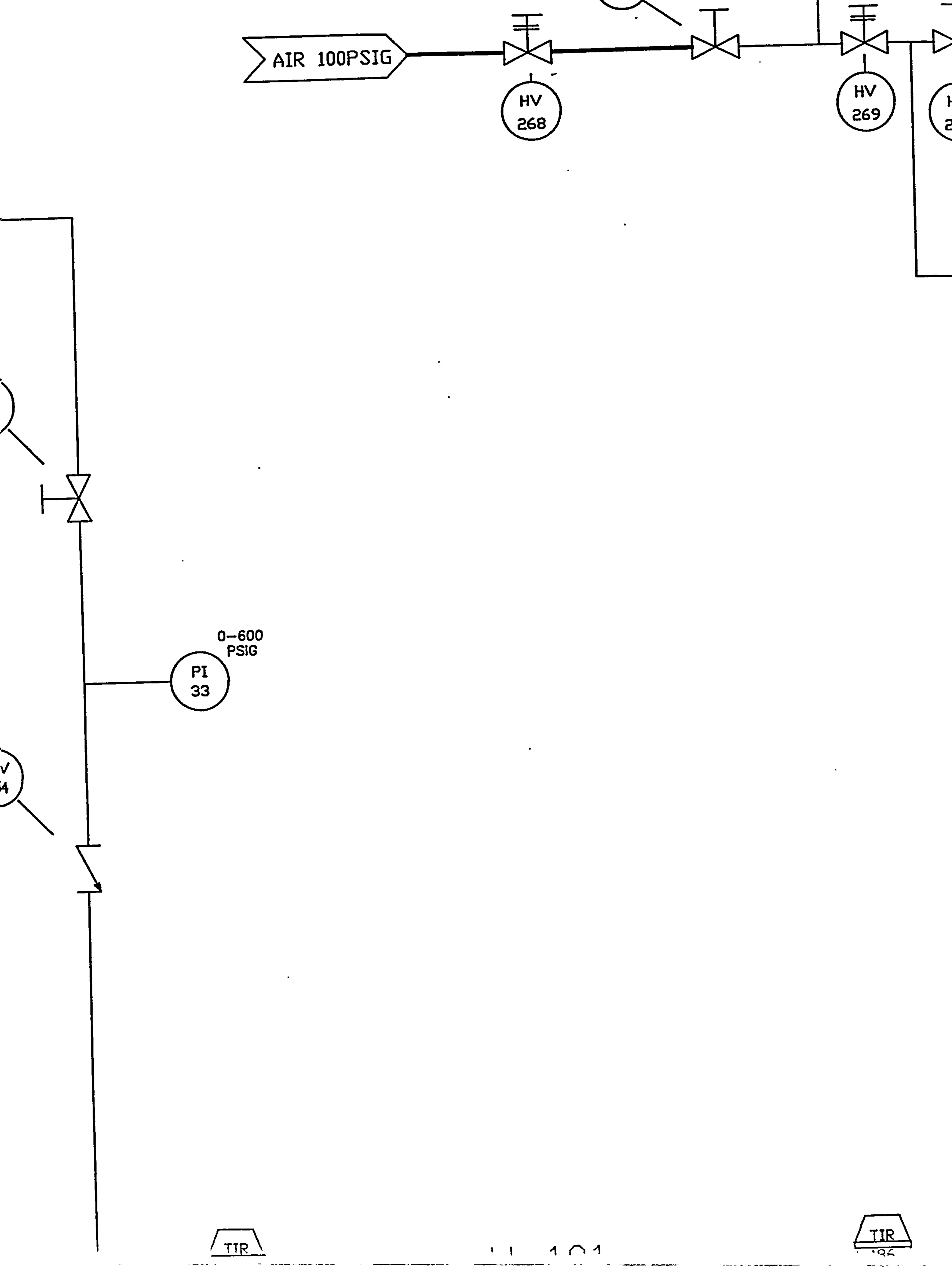
1" SS TUBE
1/2" SS TU
HV 62
1/2" SS TUBE
80(2)35/01(1
PI 120
0-1000 PSIG
0-600 PSIG
PI 469
1" SS TUBE
HV 468
80(4)31/08(0)31
80(2)30/08(0)30
1/2" SS TUBE
1" SS TUBE
0-1000 PSIG
PI 121
1" SS TUBE
1/2" SS TUBE P21 SCH STD
HV 179
HV 69
PALR 92
PI 466
FC
HV 483
SET 400 PSIG
PSL 92
0-500 PSIG
HV 463
PCV 464
FC
FC
HV 60



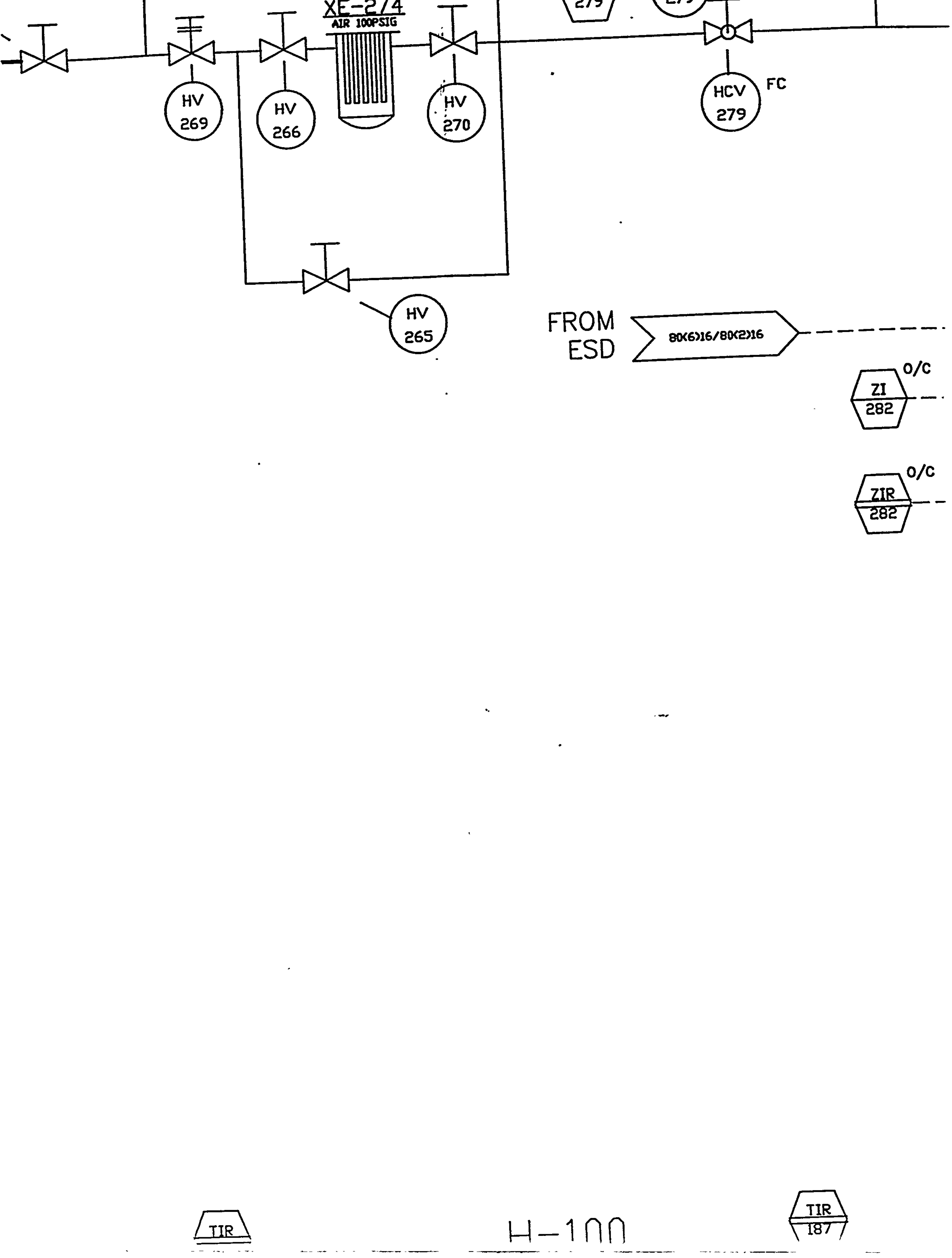
HS 94
UC 94
ZL 94
O/C
FIK 68
FIC 68
FY 68
AND 60 DEGF
SET 475 PSIG
AT 60 DEGF
0-600 PSIG
PI 67
FIR 68
0-600 PSIG
PT 76
PIR 76
ZIR 94
ZS 94
DH=133.82 IN.H2O
FT 68
HCV 94
FC
PCV 63
PSV 491
SET @ 475 PSIG @70° F
d=0.25
D=0.5"
VENT
0-250 SCFH
AT 425 PSIG
AND 60 DEGF
HS 71
UC 71
ZL 71
O/C
FIK 72
FIC 72
FY 72
0-600 PSIG
PI 490
FIR 72
0-600 PSIG
PT 73
ZIR 71
ZS 71
DH=150.9 IN.H2O
FT 72
HCV 71
FC
d=0.0595
D=0.5"
PSV 117
SET 350 PSIG
AT 60 DEGF
0-600 PSIG
PI 118
UC 159
HS 159
ZI 159
ZS 159
ZIR 159
HCV 159
FO
PSV 467
VENT
FC
T 350 PSIG
60 DEGF

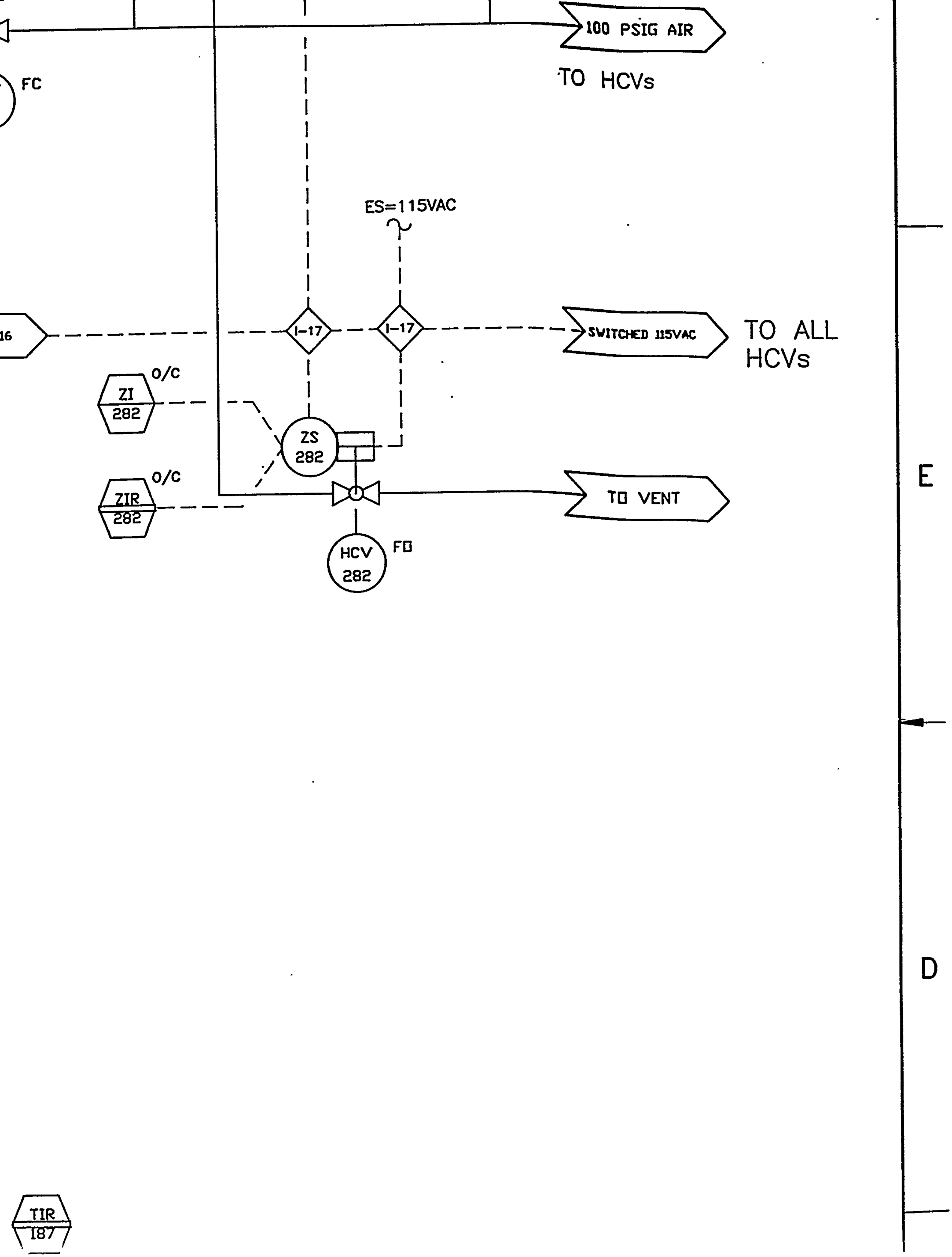


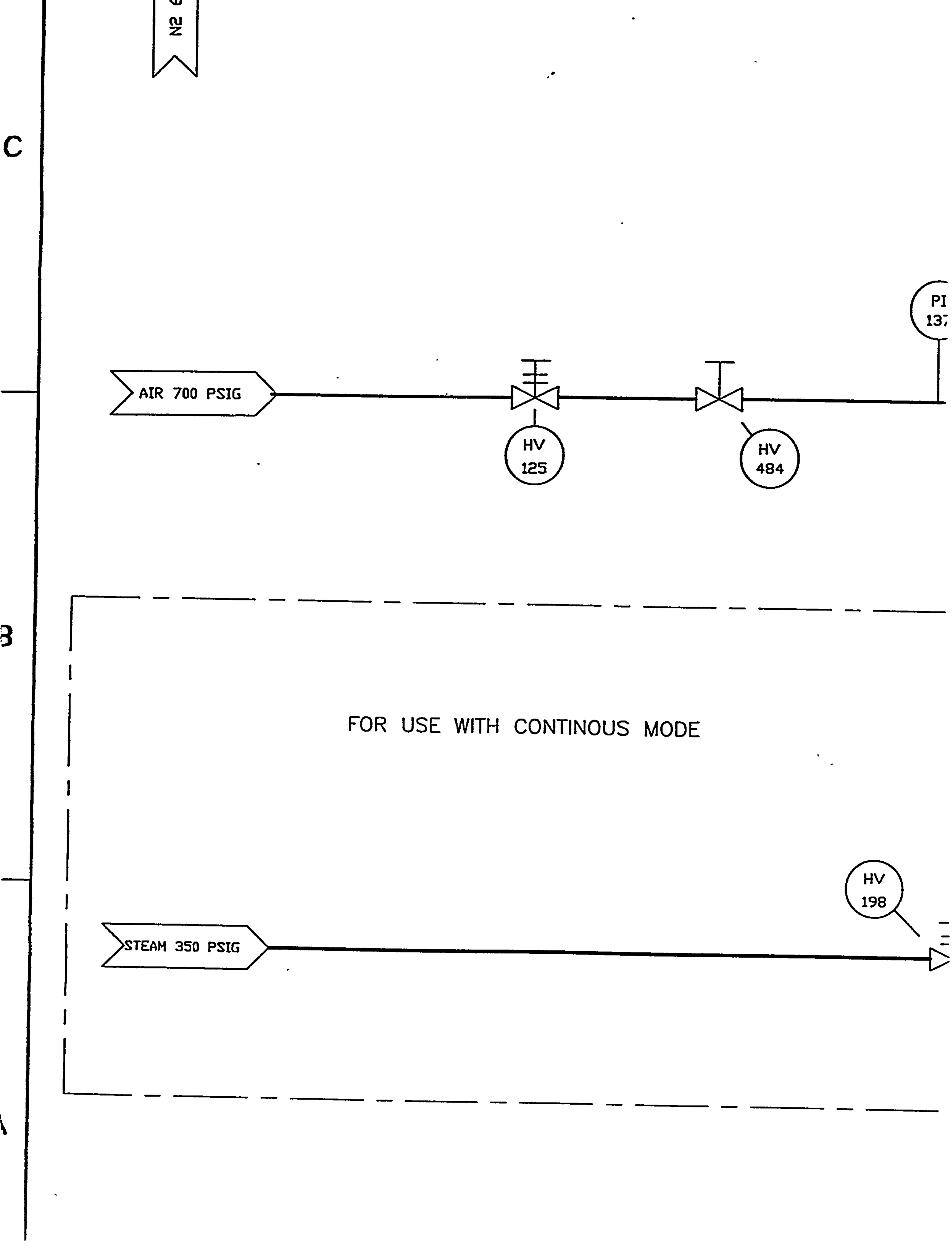
0 DEGF
TE 77A
TE 77B
TIR 77
0-600 PSIG
PT 76
PIR 76
.82
CCv=1.84
ACv=2.0
FV 68
FC
30 SCFH
25 PSIG
60 DEGF
HV 23
TE 74
0-600 PSIG
PT 73
PIR 73
0.9
20
80(2)29/08(0)29
CCv=0.037
ACv=0.053
FV 72
FC
FSV 454
VESSEL PURGE AND THERMOCOUPLE PRESSURIZATION
1/2" SS TUBE
P179 SCH STD
80(2)7/80(1)7
TO LOCKHOPPERS
80(2)31/930031



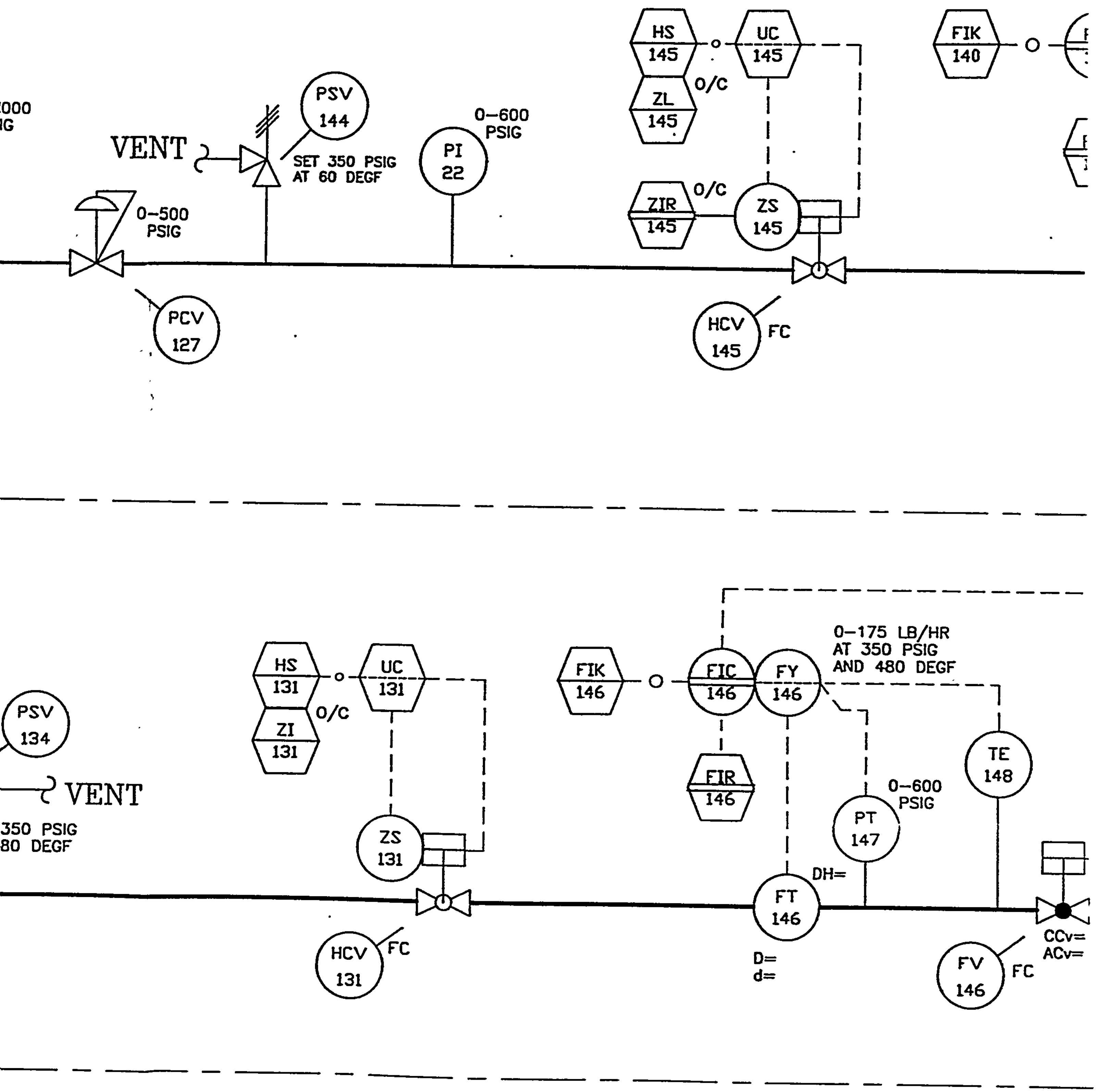
AIR 100PSIG
HV 268
HV 269
0-600 PSIG
PI 33
TIR
TIR


XE-274
AIR 100PSIG
HV 269
HV 266
HV 270
HCV 279
FC
HV 265
FROM ESD
80(6)16/80(2)16
O/C
ZI 282
O/C
ZIR 282
TIR
H-100
TIR 187

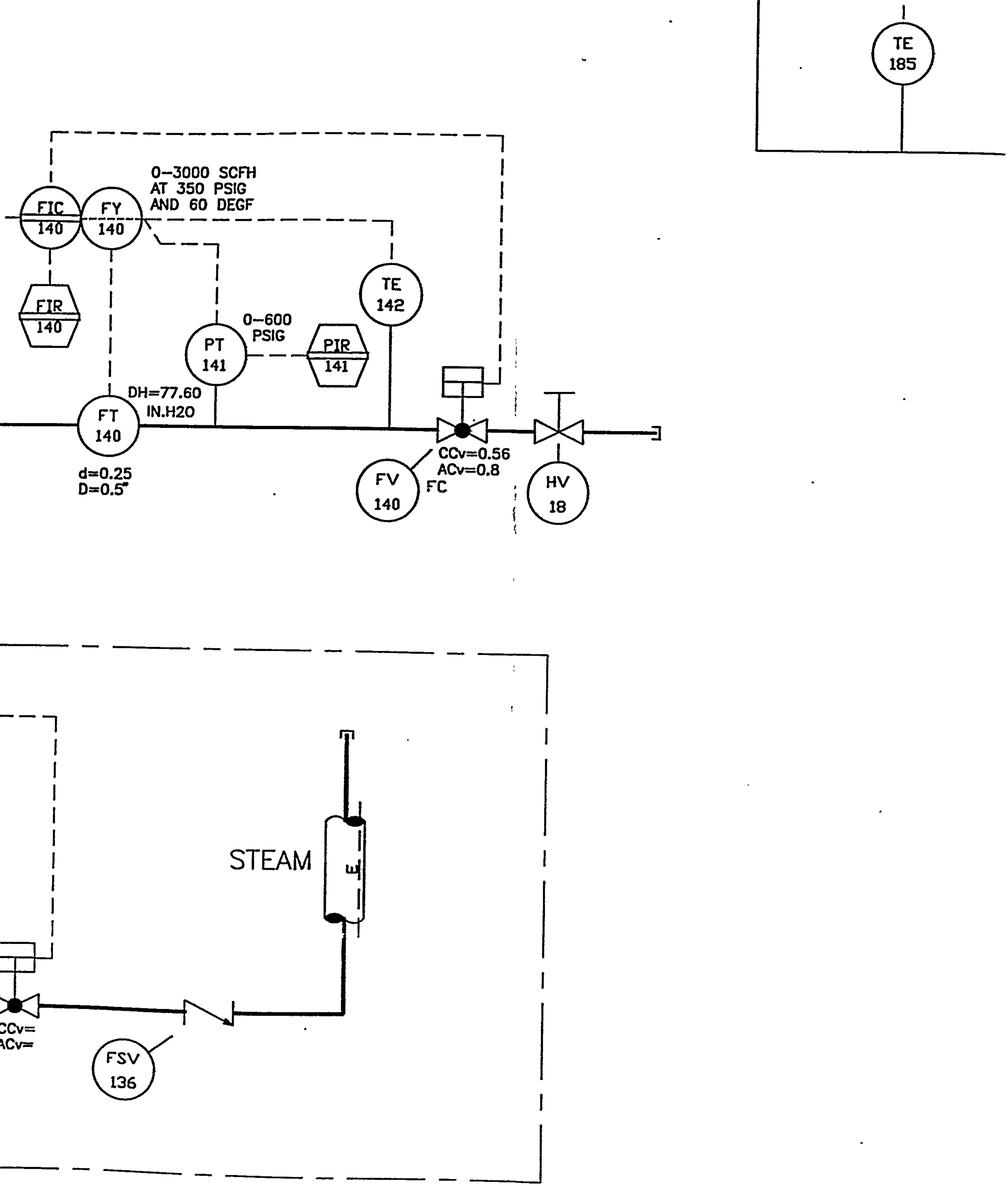

100 PSIG AIR
TO HCVs
FC
ES=115VAC
16
I-17
I-17
SWITCHED 115VAC
TO ALL HCVs
O/C
ZI
282
ZS
282
O/C
ZIR
282
TO VENT
HCV
282
FO
E
D
TIR
187



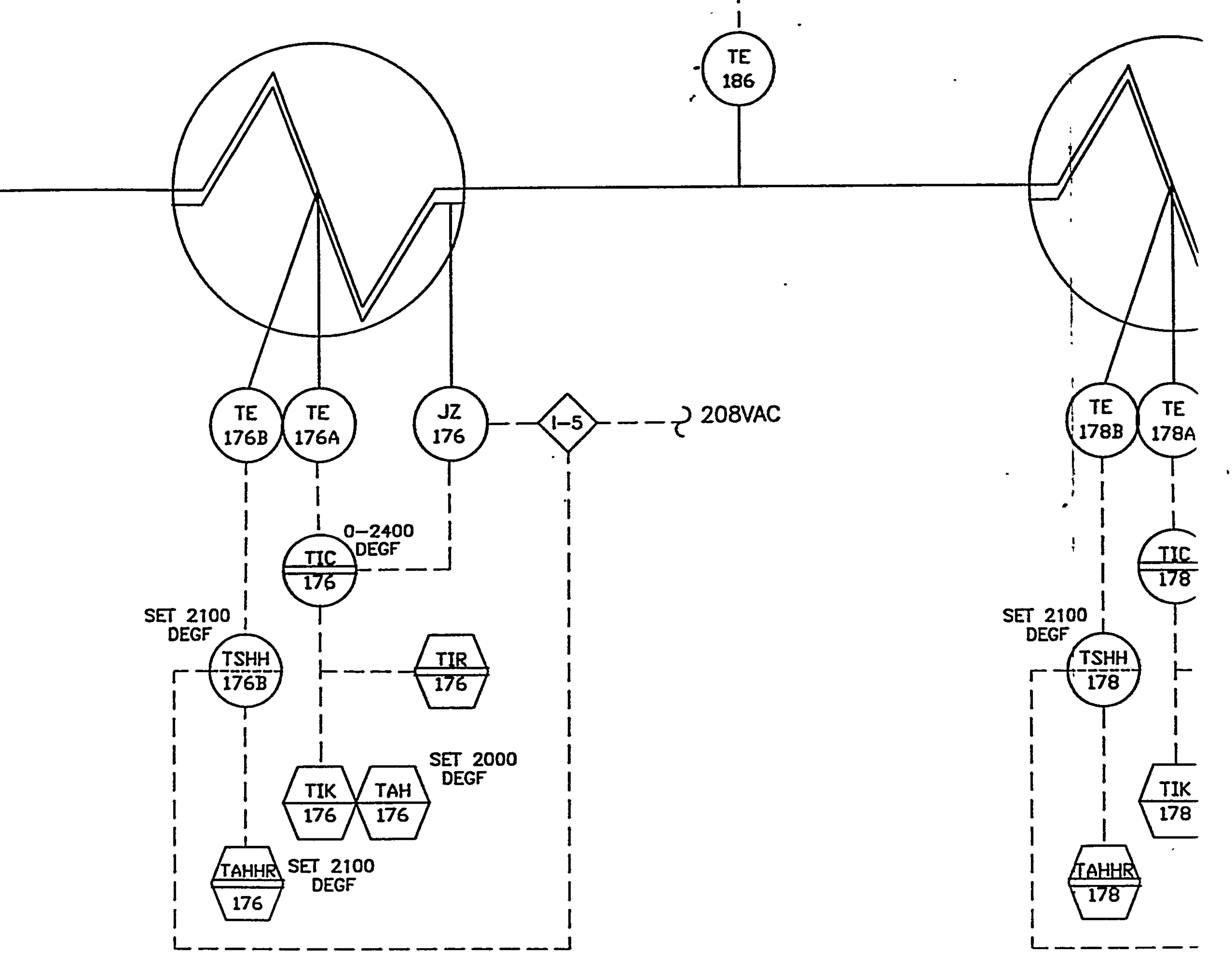
C
B
AIR 700 PSIG
HV
125
HV
484
PI
FOR USE WITH CONTINOUS MODE
STEAM 350 PSIG
HV
198



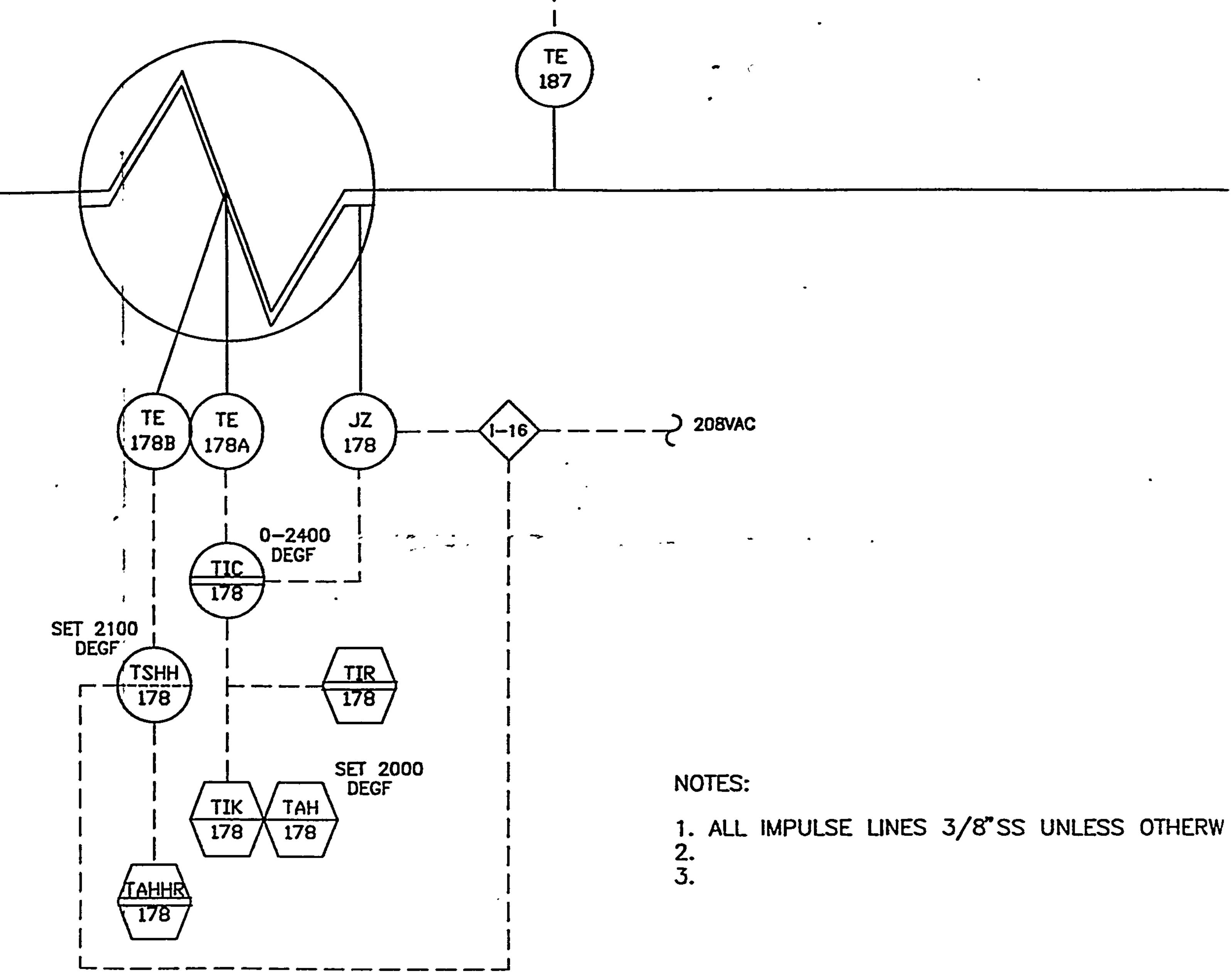
HS 145
UC 145
ZL 145
O/C
FIK 140
PSV 144
0–600 PSIG
VENT
SET 350 PSIG AT 60 DEGF
PI 22
0–500 PSIG
ZIR 145
ZS 145
PCV 127
HCV 145
FC
HS 131
UC 131
ZI 131
FIK 146
FIC 146
FY 146
0–175 LB/HR AT 350 PSIG AND 480 DEGF
PSV 134
FIR 146
TE 148
0–600 PSIG
PT 147
VENT
350 PSIG
80 DEGF
ZS 131
DH=
FT 146
CCv=
ACv=
HCV 131
D=
d=
FV 146



TE
185
0-3000 SCFH
AT 350 PSIG
AND 60 DEGF
FIC
140
FY
140
FIR
140
TE
142
0-600
PSIG
PT
141
PIR
141
DH=77.60
IN.H2O
FT
140
d=0.25
D=0.5"
CCv=0.56
ACv=0.8
FC
FV
140
HV
18
STEAM
E
CCv=
ACv=
FSV
136




THIS DRAWING IS PA
OF THE EG&G DOCUME
CONTROL SYSTEM




NOTES:

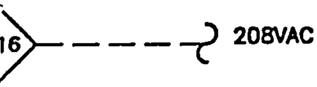
1. ALL IMPULSE LINES 3/8"SS UNLESS OTHERW
2.
3.

| REFERENCE DRAWINGS | DRAFTER Jimmy Thorton | DATE 10/28/93 | United S MORGANTOW |
|---|---|---|---|
| | PROJECT ENGINEER John Rockey | DATE 11/2/93 | |
| | REQUESTOR John Rockey | DATE 11/2/93 | |
| | BRANCH MANAGER Larry Strickland | DATE 11/2/93 | TITLE B-12 ADVANCED MODULAR GAS PROCESS ANI DRAWING (P&ID2 |
| | ES&H | DATE | |
| | DOE WJA John Rotunda | DATE 10/28/93 | |
| | | DATE | SIZE E FSCM NO DWG NO S |
| | | DATE | |

S DRAWING IS PART
THE EG&G DOCUMENT
CONTROL SYSTEM


C

N2 PREHEAT AND FLUIDIZING




DWG NO STD920080.07 SH 2

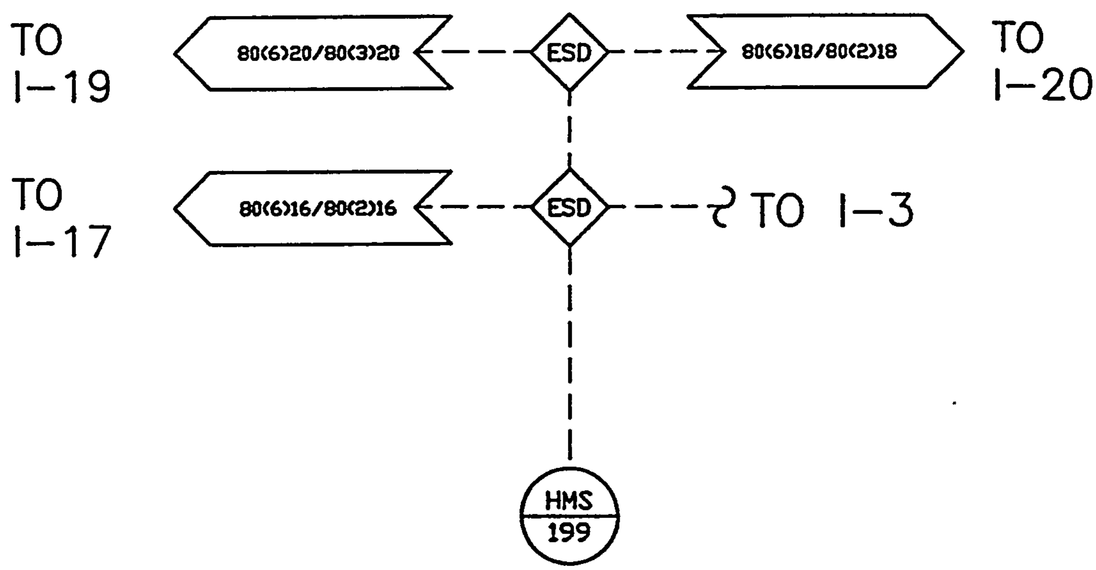
NOTES:

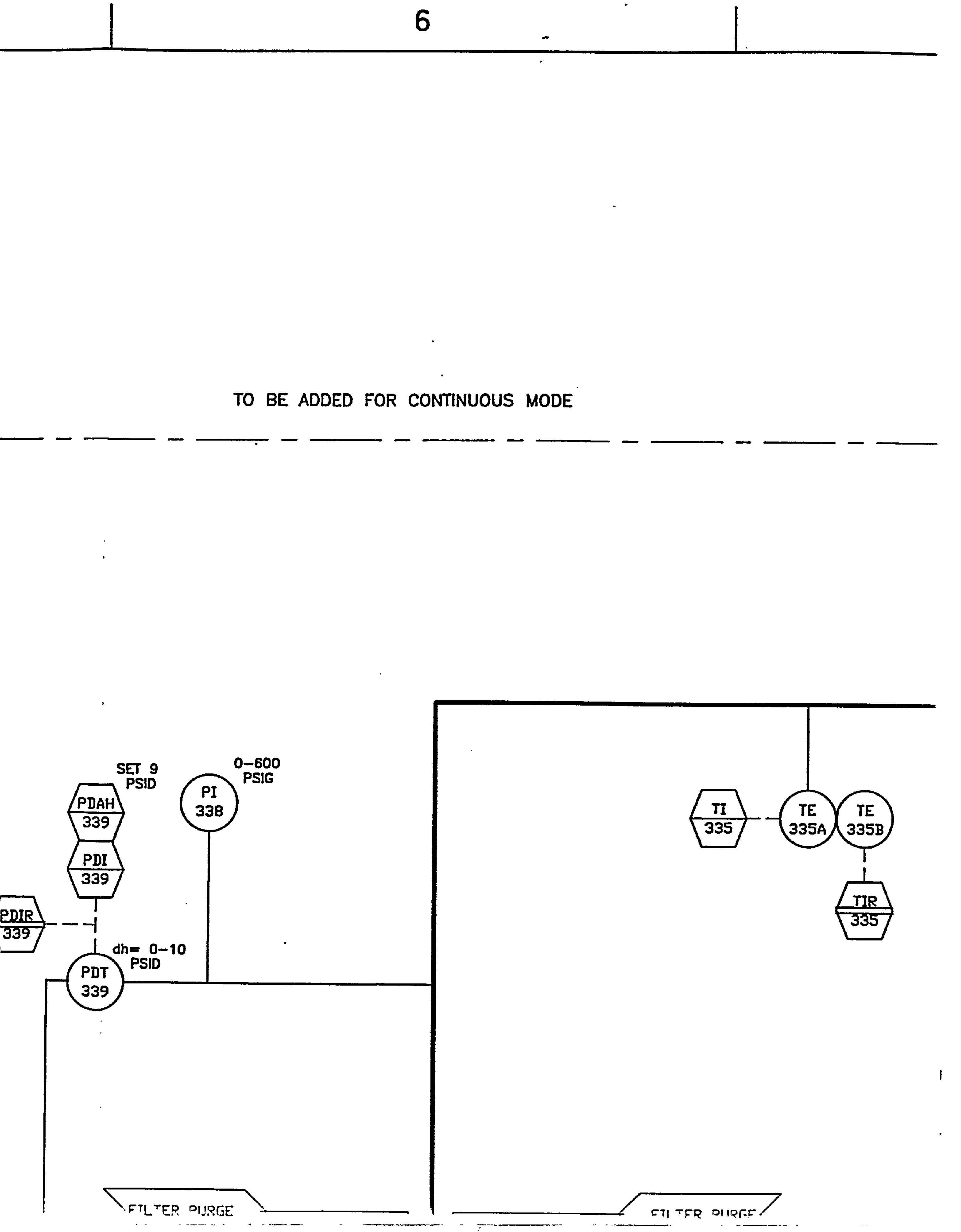
1. ALL IMPULSE LINES 3/8"SS UNLESS OTHERWISE NOTED
2.
3.

A

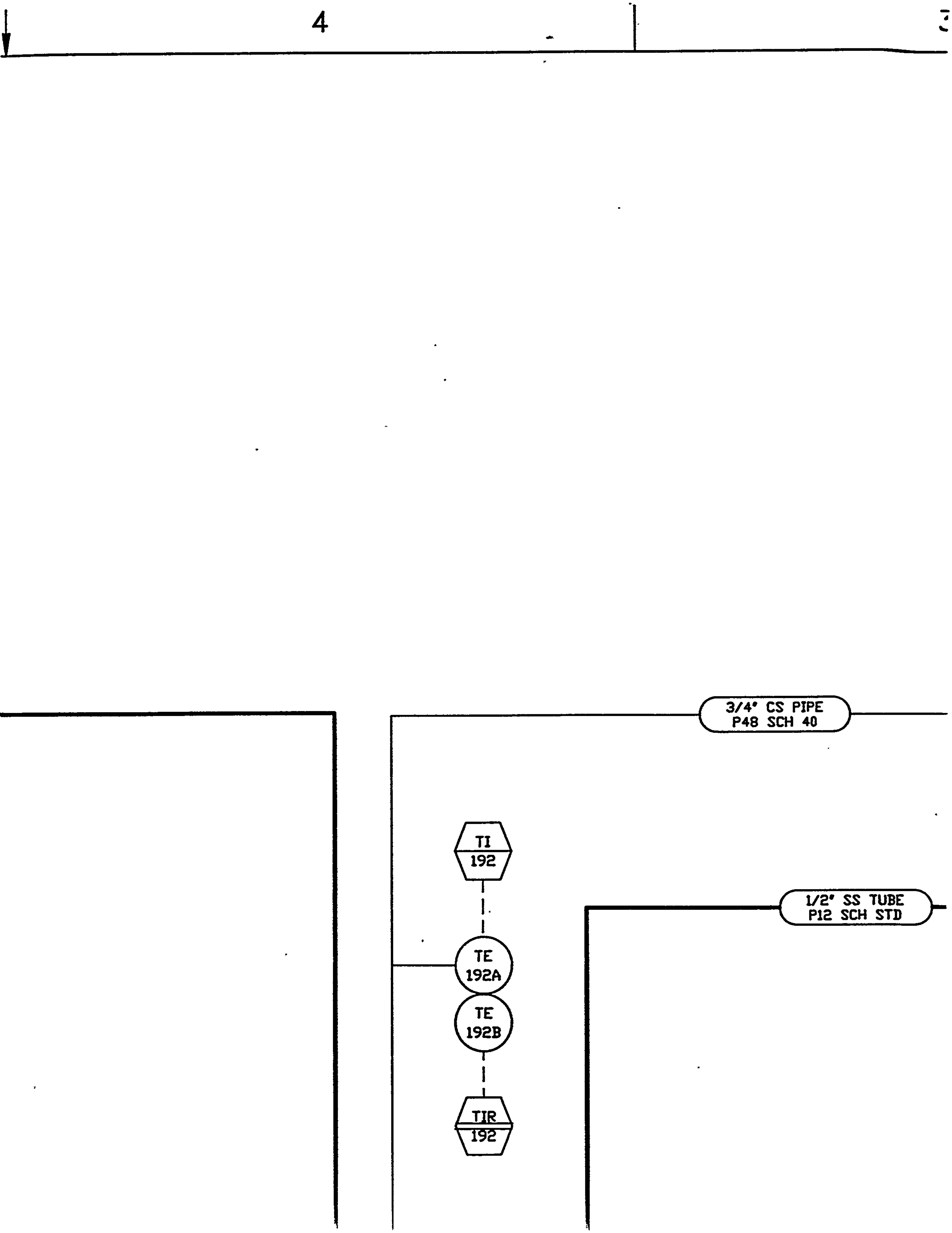
| | | | |
|---|---|---|---|
| DRAFTER Jimmy Thorton | DATE 10/28/93 | United States Department of Energy<br>MORGANTOWN ENERGY TECHNOLOGY CENTER<br>Morgantown, WV | |
| PROJECT ENGINEER John Rockey | DATE 11/2/93 | | |
| REQUESTOR John Rockey | DATE 11/2/93 | | |
| BRANCH MANAGER Larry Strickland | DATE 11/2/93 | TITLE B-12 ADVANCED GASIFICATION FACILITY<br>MODULAR GAS CLEANUP RIG (MGCR)<br>PROCESS AND INSTRUMENTATION<br>DRAWING (P&ID2) FACILITY SERVICES | |
| ES&H | DATE | | |
| DOE WJA John Rotunda | DATE 10/28/93 | | |
| | DATE | SIZE E FSCH NO DWG NO STD920080.07 | REV 7 |

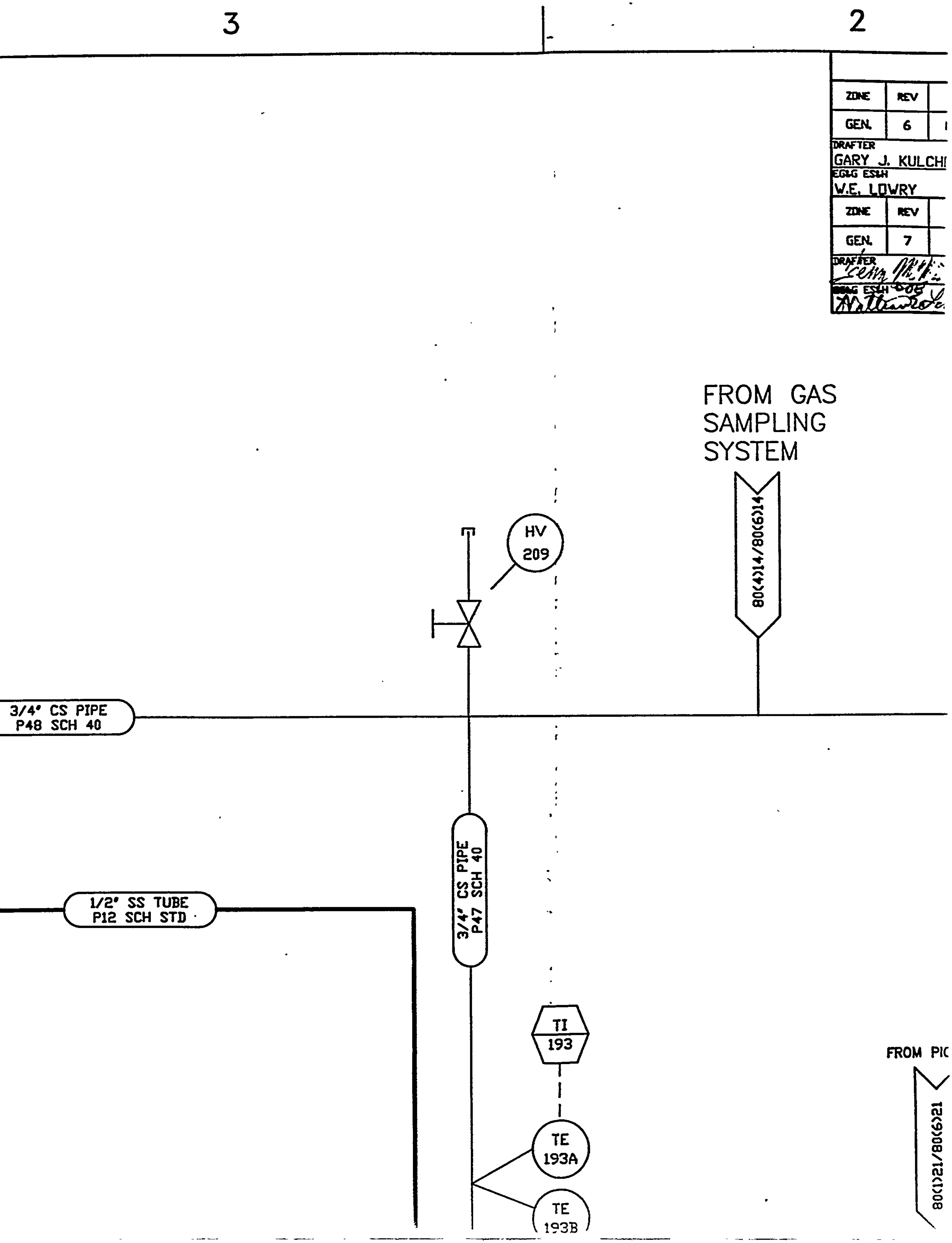
8 7


TO 1–19
80(6)20/80(3)20
ESD
80(6)18/80(2)18
TO 1–20
TO 1–17
80(6)16/80(2)16
ESD
TO 1–3
HMS
199



6
TO BE ADDED FOR CONTINUOUS MODE
SET 9
PSID
PDAH
339
PDI
339
PDIR
339
0–600
PSIG
PI
338
dh= 0–10
PSID
PDT
339
TI
335
TE
335A
TE
335B
TIR
335
FILTER PURGE


4
3/4" CS PIPE
P48 SCH 40
1/2" SS TUBE
P12 SCH STD
TI
192
TE
192A
TE
192B
TIR
192


3
2
ZONE
REV
GEN.
6
DRAFTER
GARY J. KULCH
EG&G ES&H
W.E. LOWRY
ZONE
REV
GEN.
7
DRAFTER
EG&G ES&H
FROM GAS SAMPLING SYSTEM
80(4)14/80(6)14
HV 209
3/4" CS PIPE P48 SCH 40
1/2" SS TUBE P12 SCH STD
3/4" CS PIPE P47 SCH 40
TI 193
TE 193A
TE 193B
FROM PI
80(1)21/80(6)21

2 | 1

## REVISION

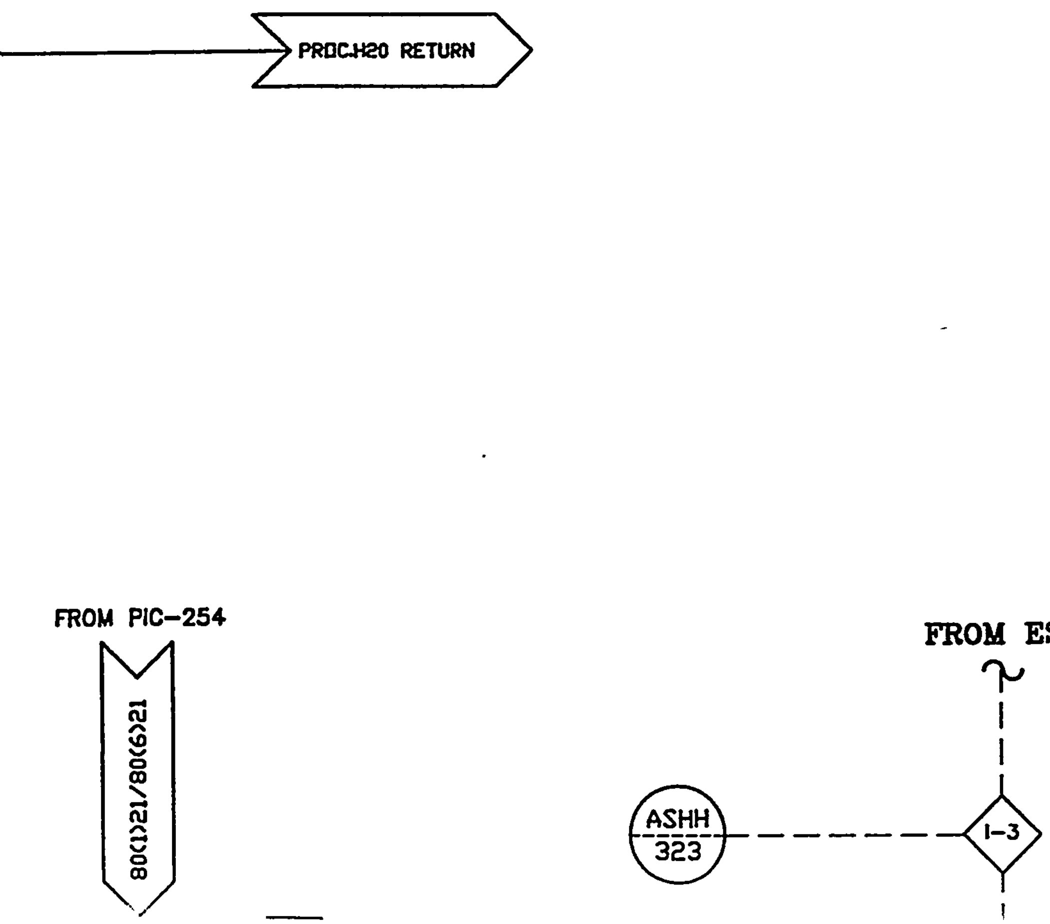
| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN. | 6 | MODIFIED AS PER MARKED PRINT; ISSUED FOR CONSTRUCTION | 5/16/94 |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| GARY J. KULCHOCK | 5/18/94 | S. CONKO | 5/18/94 | DAVID LUNIFELD | 5/24/94 | GARY J. KULCHOCK | 5/18/94 |
| **EG&G ES&H** | **DATE** | **PROJECT ENGR.** | **DATE** | **BRANCH MANAGER** | **DATE** | **DOE (EDSD)** | **DATE** |
| E. LOWRY | 5/24/94 | S. RENNINGER | 5/18/94 | JOHN M. ROCKEY | 5/18/94 | JOHN R. ROTUNDA WJA | 5/18/94 |

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN. | 7 | MODIFIED AS PER MARKED PRINT; ISSUED FOR CONSTRUCTION | 9/30/94 |

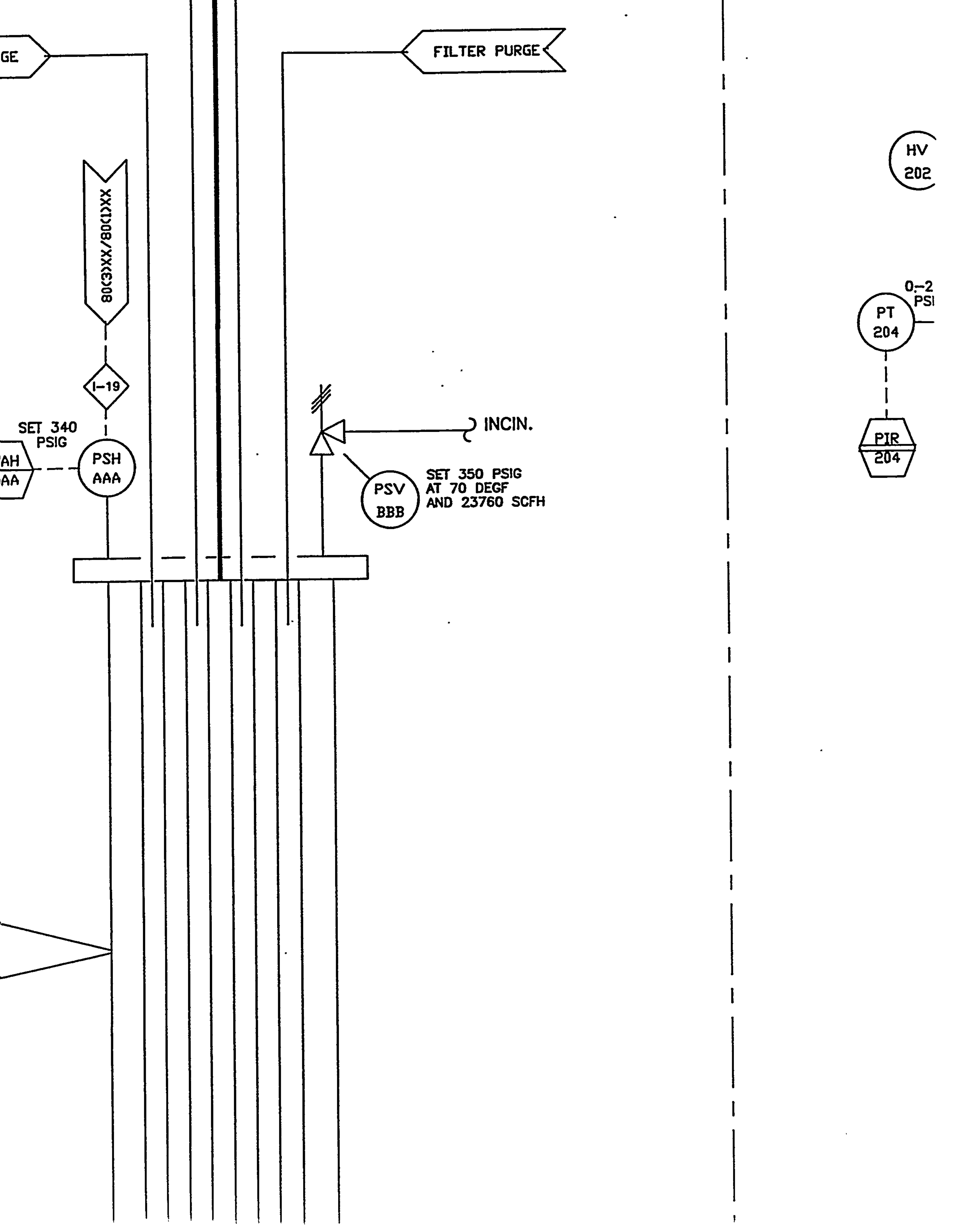
| DRAFTER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| [illegible] | 10-3-94 | Gary J Kulchock | 10/3/94 | David Lunifeld | 10/5/94 | | |
| **EG&G ES&H** | **DATE** | **PROJECT ENGR.** | **DATE** | **BRANCH MANAGER** | **DATE** | **DOE (EDSD)** | **DATE** |
| [illegible] Lowry | 10/17/94 | Scott Renninger | 10/4/94 | | | [illegible] WJA | 10/5/94 |

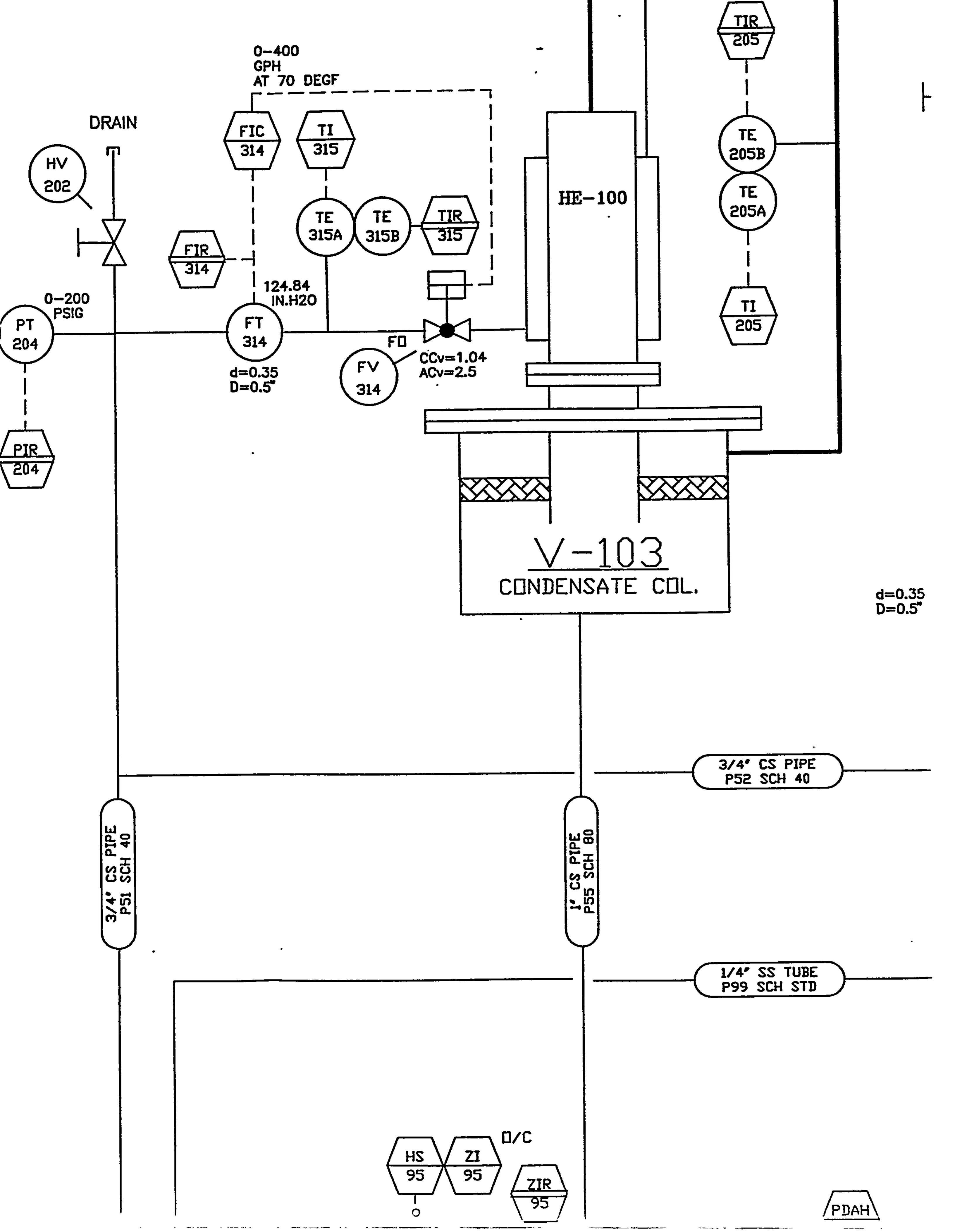
H



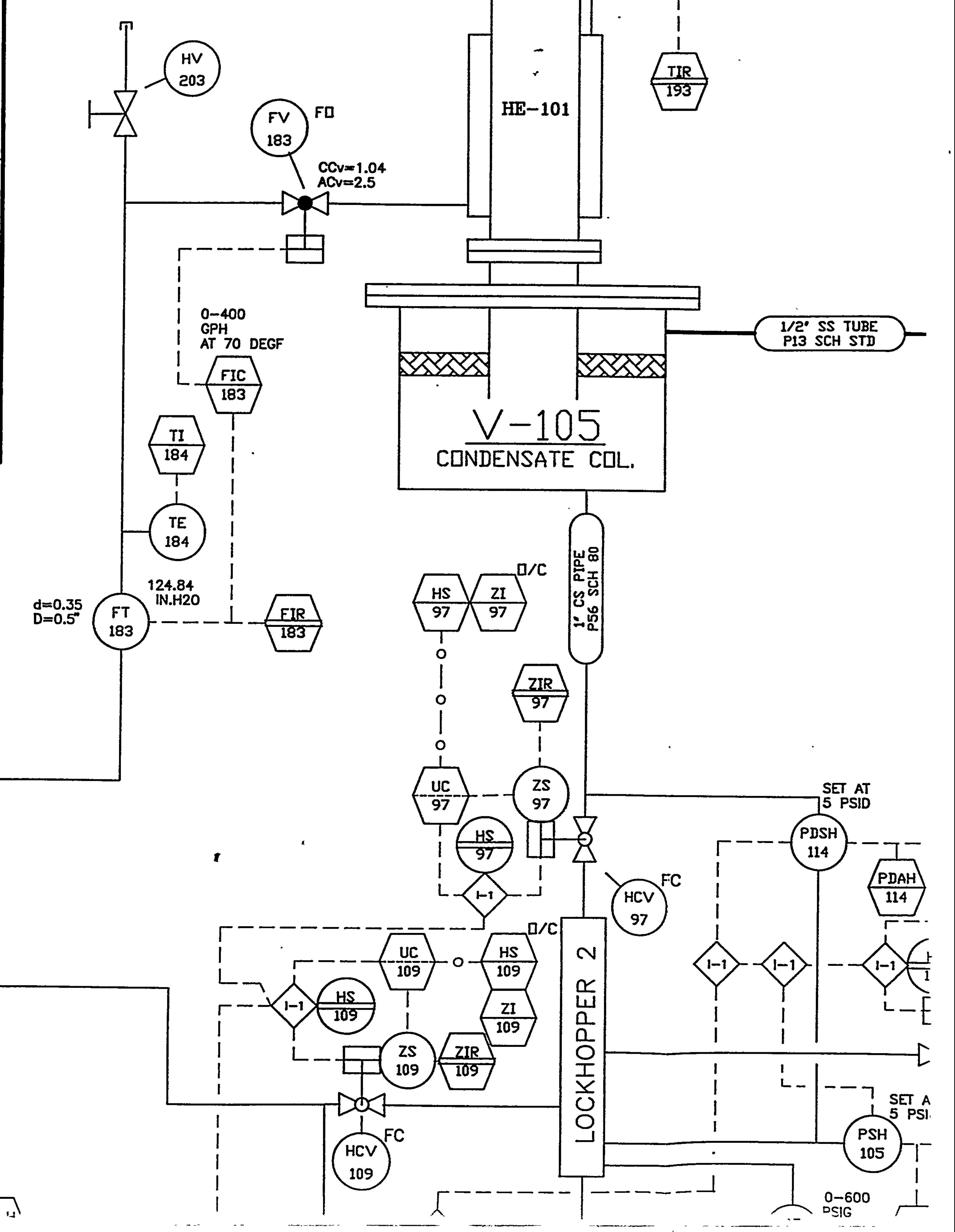

G

F

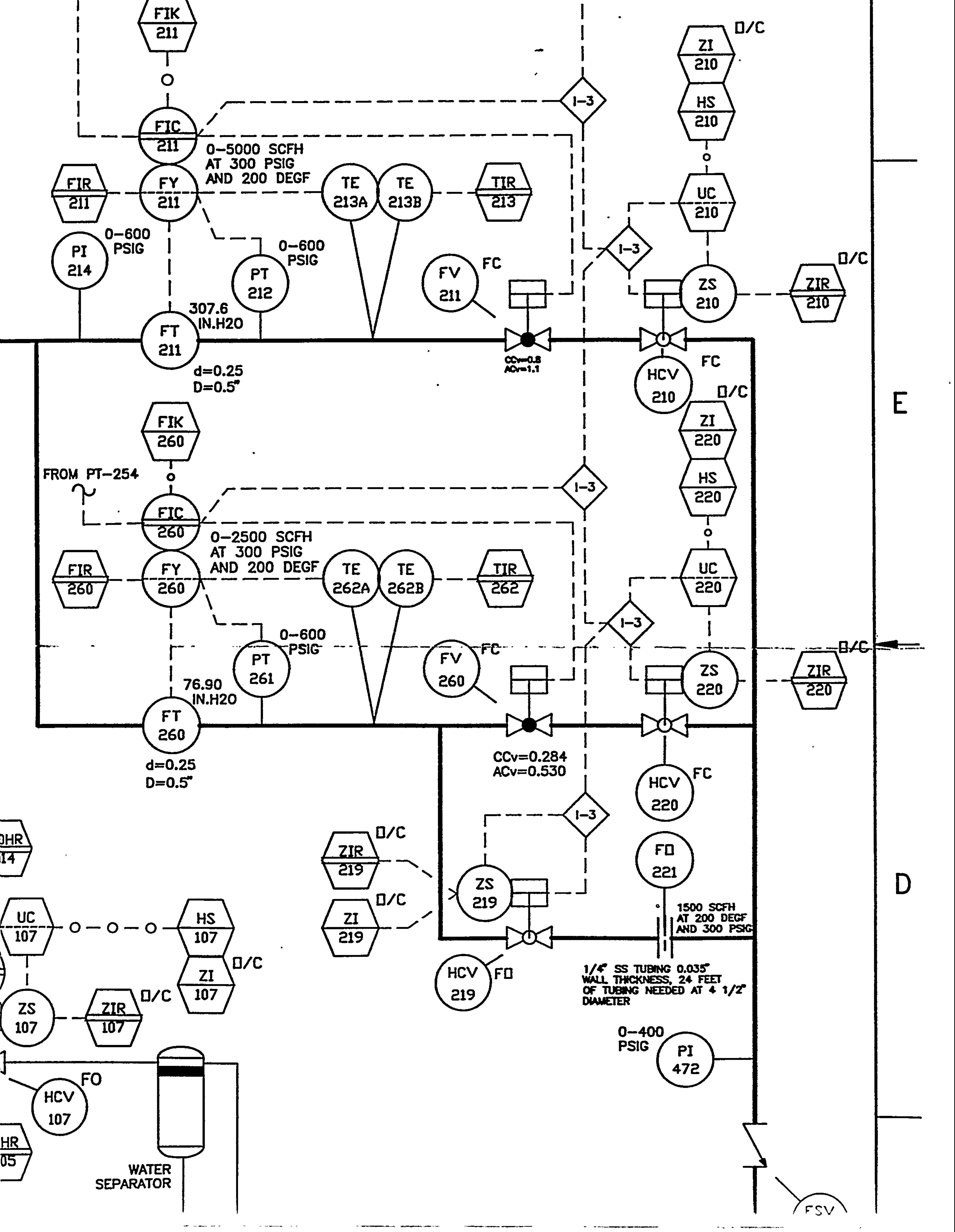

GE
FILTER PURGE
XX(1)08/XX(3)08
I-19
SET 340
PSIG
AH
AA
PSH
AAA
INCIN.
PSV
BBB
SET 350 PSIG
AT 70 DEGF
AND 23760 SCFH
HV
202
0-2
PSI
PT
204
PIR
204

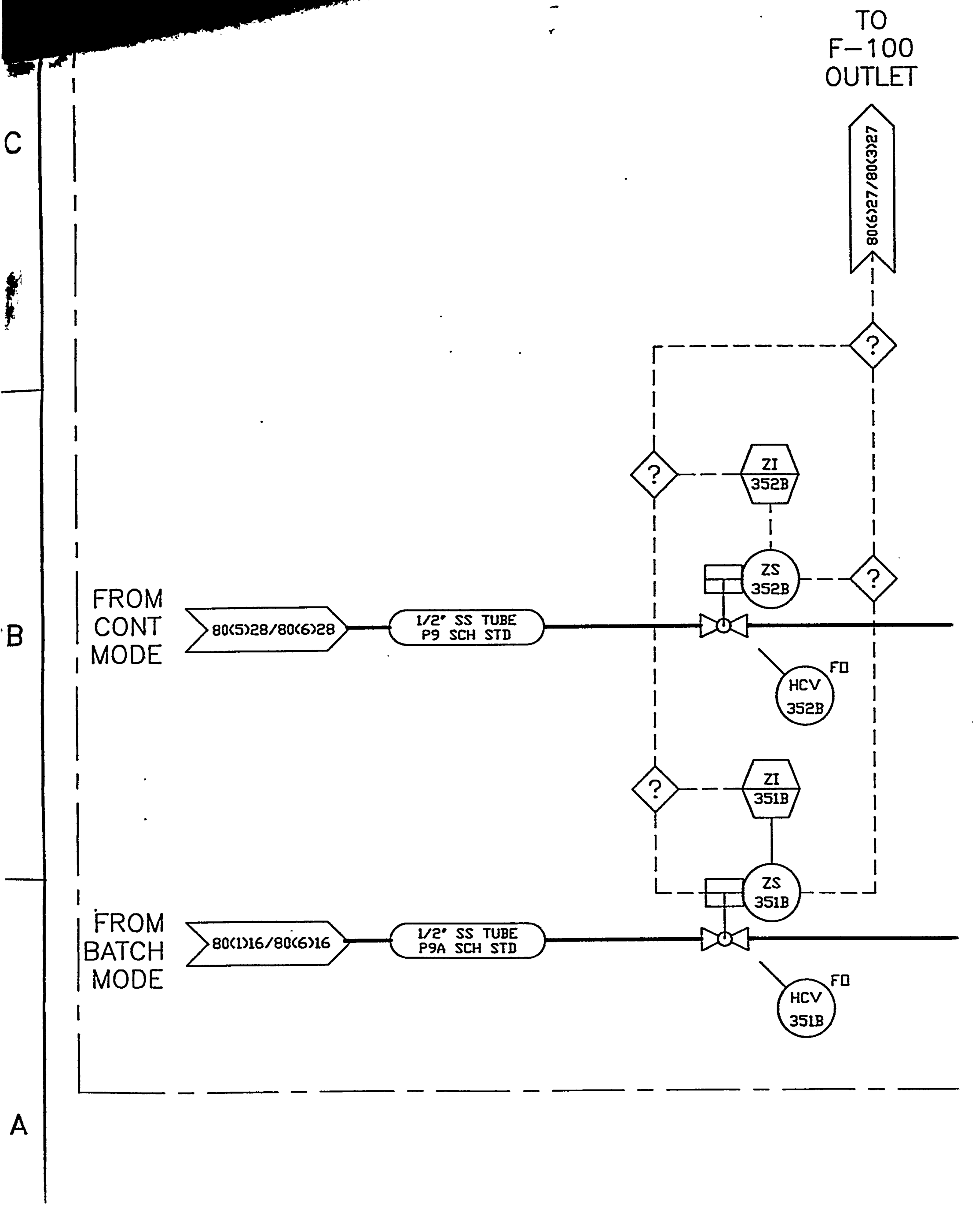


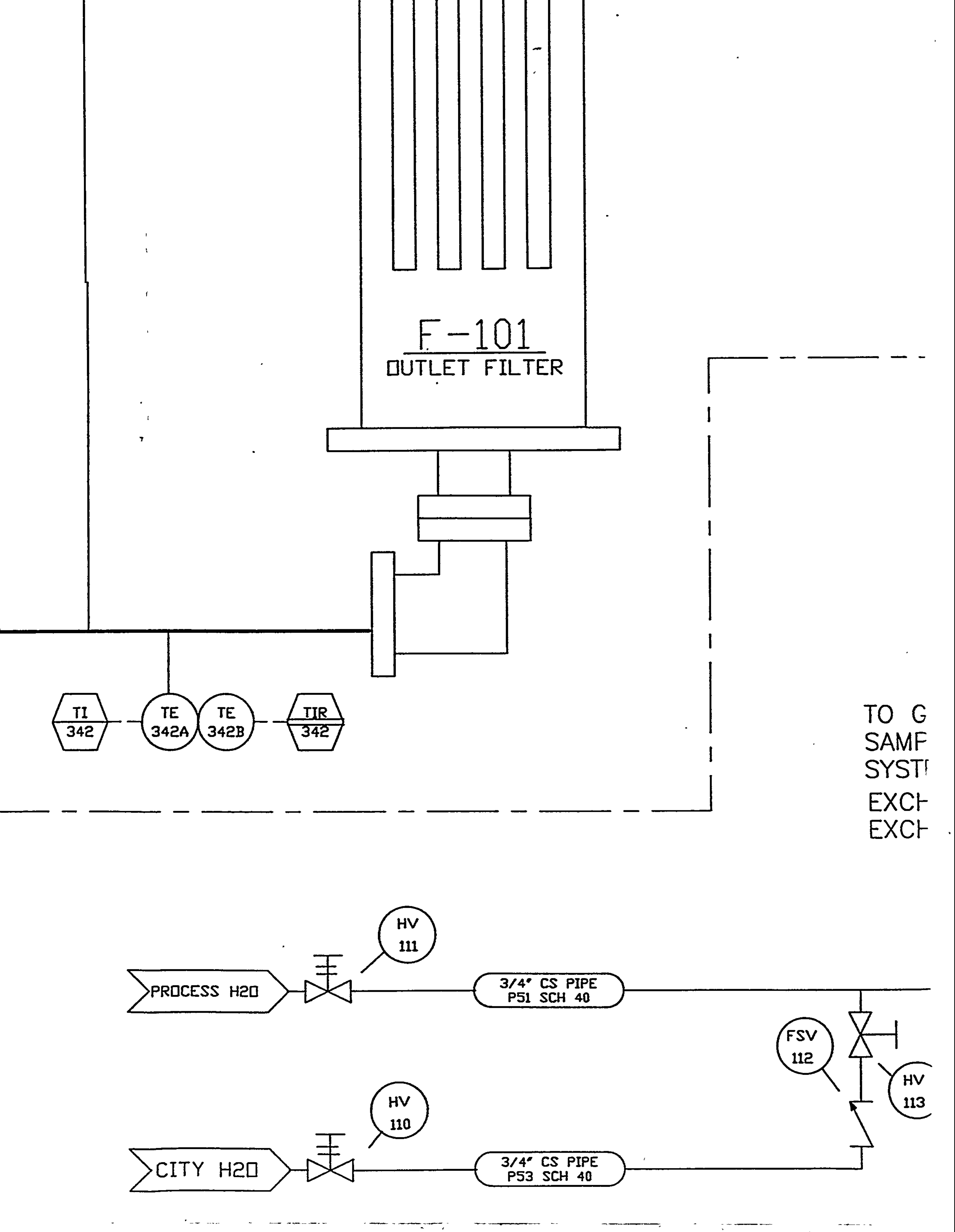
TIR 205
0-400 GPH AT 70 DEGF
DRAIN
HV 202
FIC 314
TI 315
TE 205B
TE 205A
HE-100
TE 315A
TE 315B
TIR 315
FIR 314
124.84 IN.H2O
0-200 PSIG
PT 204
FT 314
FO
TI 205
d=0.35 D=0.5"
FV 314
CCv=1.04 ACv=2.5
PIR 204
V-103
CONDENSATE COL.
d=0.35 D=0.5"
3/4" CS PIPE P52 SCH 40
3/4" CS PIPE P51 SCH 40
1" CS PIPE P55 SCH 80
1/4" SS TUBE P99 SCH STD
O/C
HS 95
ZI 95
ZIR 95
PDAH



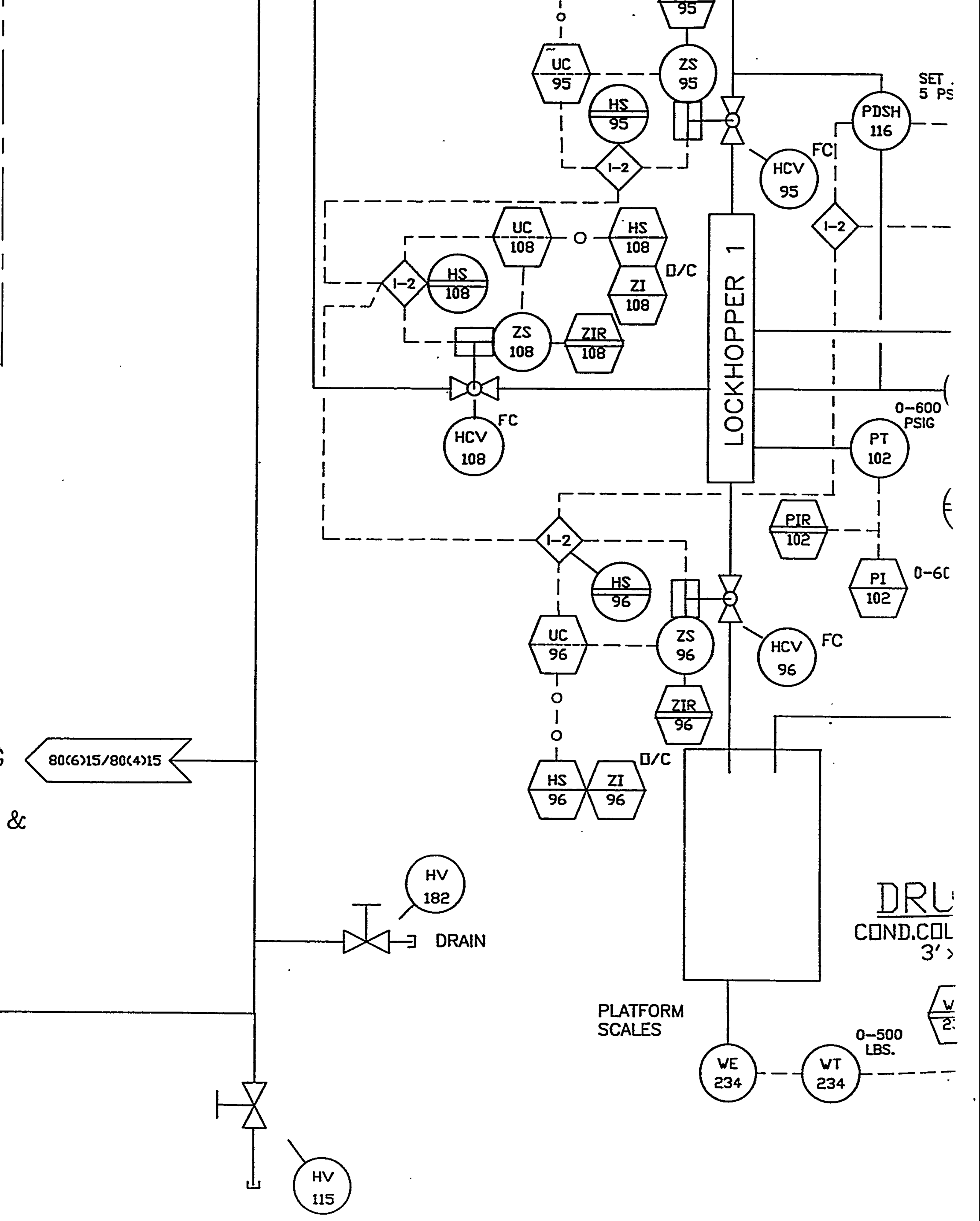
HV 203
FV 183
FO
CCv=1.04
ACv=2.5
HE-101
TIR 193
1/2' SS TUBE
P13 SCH STD
0-400
GPH
AT 70 DEGF
FIC 183
V-105
CONDENSATE COL.
TI 184
TE 184
1" CS PIPE
P56 SCH 80
O/C
HS 97
ZI 97
124.84
IN.H2O
d=0.35
D=0.5"
FT 183
FIR 183
ZIR 97
UC 97
ZS 97
HS 97
SET AT
5 PSID
PDSH 114
PDAH 114
I-1
HCV 97
FC
UC 109
HS 109
ZI 109
ZS 109
ZIR 109
LOCKHOPPER 2
HCV 109
PSH 105
0-600
PSIG


FIK 211
FIC 211
0-5000 SCFH
AT 300 PSIG
AND 200 DEGF
FIR 211
FY 211
TE 213A
TE 213B
TIR 213
I-3
ZI 210
HS 210
UC 210
ZS 210
ZIR 210
O/C
PI 214
0-600 PSIG
PT 212
0-600 PSIG
FV 211
FC
FT 211
307.6 IN.H2O
d=0.25
D=0.5"
CCv=0.8
ACv=1.1
HCV 210
FC
ZI 220
HS 220
FIK 260
FROM PT-254
FIC 260
0-2500 SCFH
AT 300 PSIG
AND 200 DEGF
FIR 260
FY 260
TE 262A
TE 262B
TIR 262
UC 220
ZS 220
ZIR 220
PT 261
0-600 PSIG
FV 260
FT 260
76.90 IN.H2O
d=0.25
D=0.5"
CCv=0.284
ACv=0.530
HCV 220
FO 221
1500 SCFH
AT 200 DEGF
AND 300 PSIG
1/4" SS TUBING 0.035"
WALL THICKNESS, 24 FEET
OF TUBING NEEDED AT 4 1/2"
DIAMETER
ZIR 219
ZI 219
ZS 219
HCV 219
FO
UC 107
HS 107
ZI 107
ZS 107
ZIR 107
HCV 107
FO
WATER
SEPARATOR
0-400
PSIG
PI 472
FSV
E
D

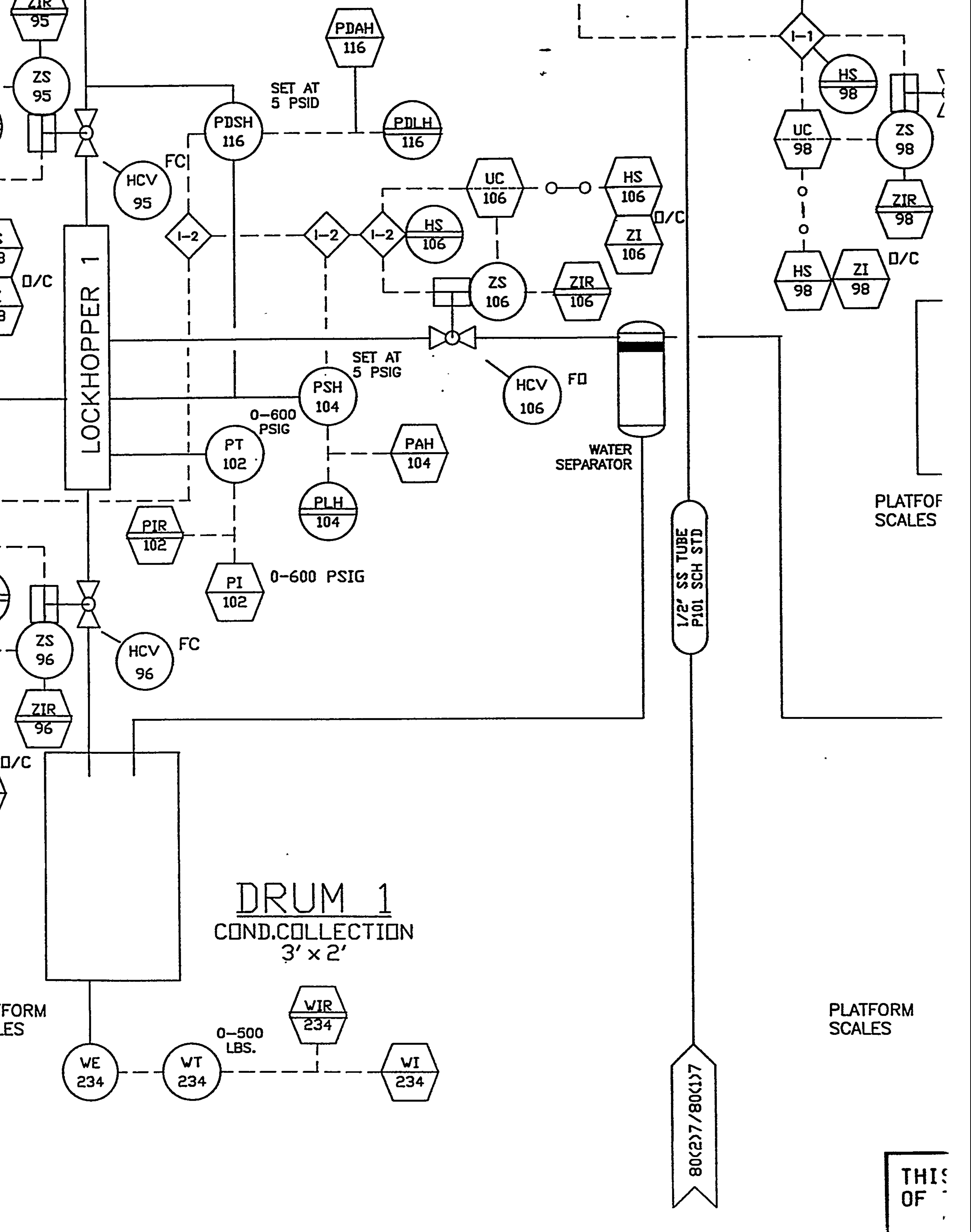

C
TO
F-100
OUTLET
80(6)27/80(3)27
?
ZI
352B
?
ZS
352B
?
B
FROM
CONT
MODE
80(5)28/80(6)28
1/2" SS TUBE
P9 SCH STD
FO
HCV
352B
?
ZI
351B
ZS
351B
FROM
BATCH
MODE
80(1)16/80(6)16
1/2" SS TUBE
P9A SCH STD
FO
HCV
351B
A



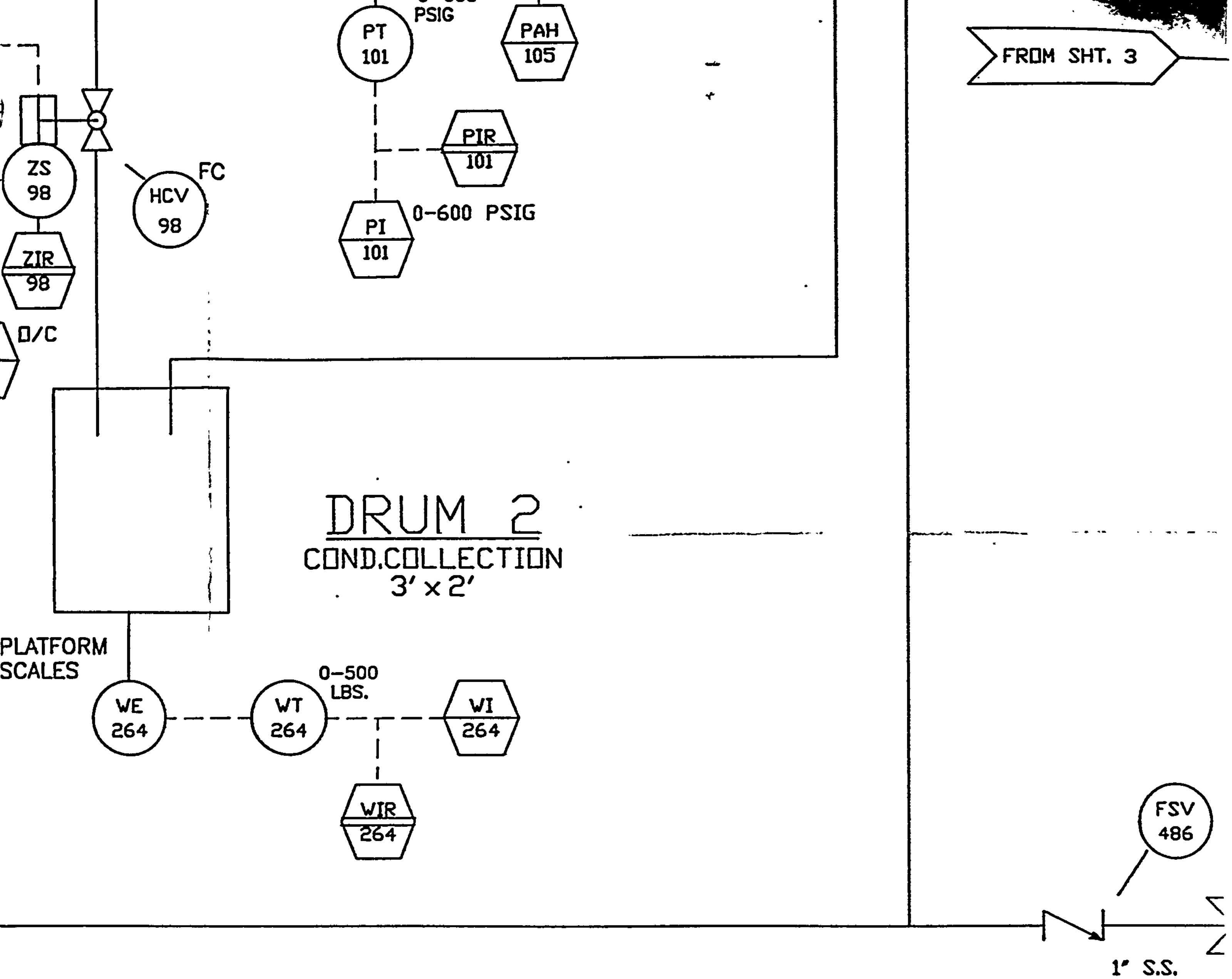
F-101
OUTLET FILTER
TI 342
TE 342A
TE 342B
TIR 342
TO G
SAMF
SYSTI
EXCH
EXCH
HV 111
PROCESS H2O
3/4" CS PIPE P51 SCH 40
FSV 112
HV 113
HV 110
CITY H2O
3/4" CS PIPE P53 SCH 40



95
UC
95
ZS
95
HS
95
SET
5 PS
PDSH
116
1-2
FC
HCV
95
UC
108
HS
108
1-2
HS
108
ZI
108
D/C
LOCKHOPPER 1
ZS
108
ZIR
108
HCV
108
FC
0-600
PSIG
PT
102
PIR
102
PI
102
0-6C
1-2
HS
96
UC
96
ZS
96
HCV
96
FC
ZIR
96
HS
96
ZI
96
D/C
80(6)15/80(4)15
&
HV
182
DRAIN
DRU
COND.COL
3'
PLATFORM
SCALES
WE
234
WT
234
0-500
LBS.
HV
115



ZIR 95
ZS 95
HCV 95
FC
PDAH 116
SET AT 5 PSID
PDSH 116
PDLH 116
UC 106
HS 106
O/C
ZI 106
I-2
I-2
I-2
HS 106
ZS 106
ZIR 106
I-1
HS 98
UC 98
ZS 98
ZIR 98
HS 98
ZI 98
O/C
LOCKHOPPER 1
SET AT 5 PSIG
PSH 104
HCV 106
FO
0-600 PSIG
PT 102
PAH 104
WATER SEPARATOR
PLH 104
PIR 102
PI 102
0-600 PSIG
1/2" SS TUBE P101 SCH STD
PLATFORM SCALES
ZS 96
HCV 96
FC
ZIR 96
O/C
DRUM 1
COND.COLLECTION
3′ x 2′
WIR 234
0-500 LBS.
WE 234
WT 234
WI 234
PLATFORM SCALES
80(2)7/80(1)7
THIS OF



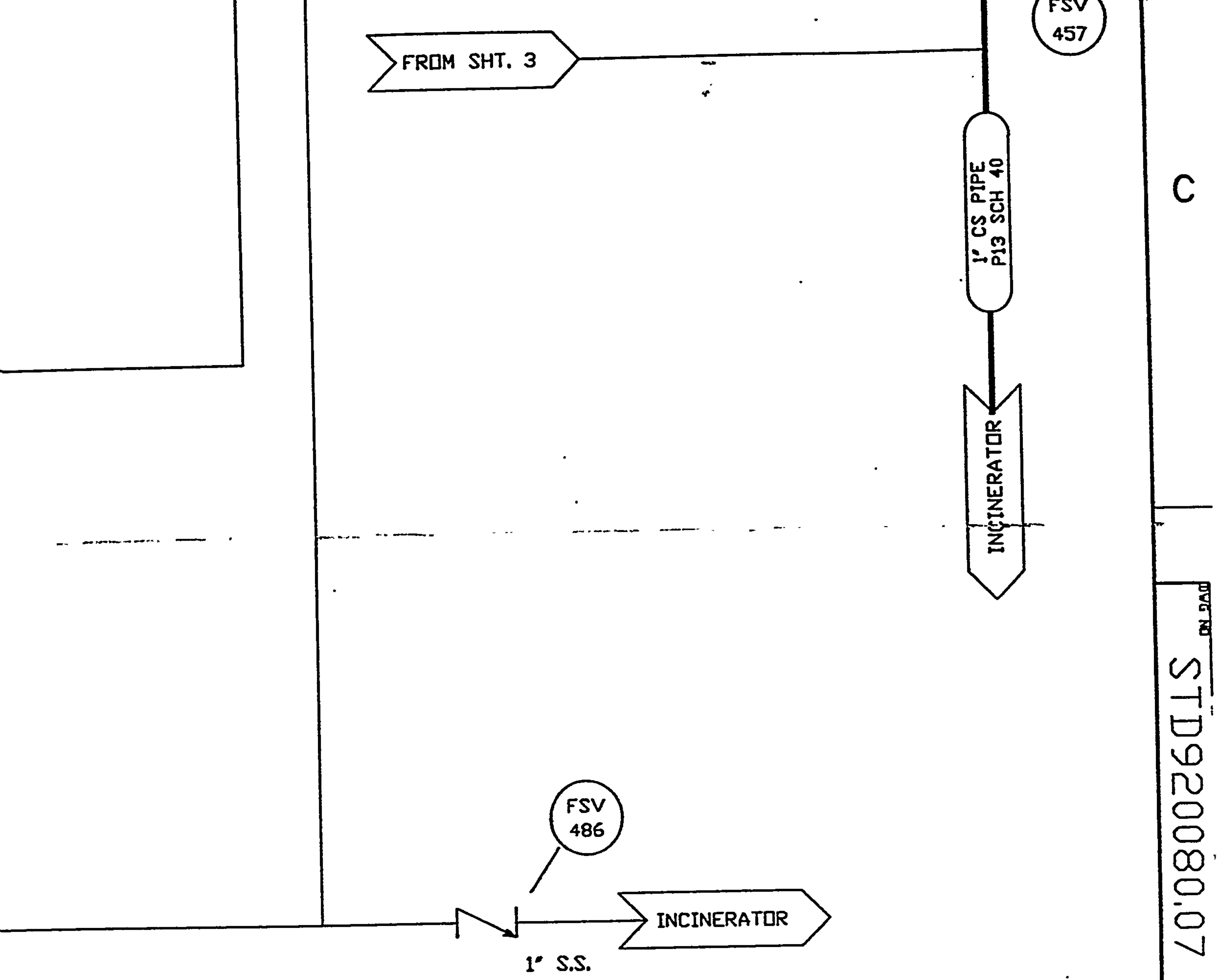

NOTES:

1. ALL IMPULSE LINES ARE 3/8"SS TUBING UNLESS OTHERWISE NOTED.
2.
3.

ORM
S

| REFERENCE DRAWINGS | | | |
|---|---|---|---|
| | DRAFTER Jimmy Thorton | DATE 10/28/93 | U |
| | PROJECT ENGINEER John Rockey | DATE 11/2/93 | MORG |
| | REQUESTOR John Rockey | DATE 11/2/93 | |
| | BRANCH MANAGER Larry Strickland | DATE 11/2/93 | TITLE: B-12 ADVAN MODULAR PROCESS AN (P&ID |
| | ES&H | DATE | |
| | DOE WJA John Rotunda | DATE 10/28/93 | |
| | | DATE | SIZE E FSCM NO |
| | | DATE | |

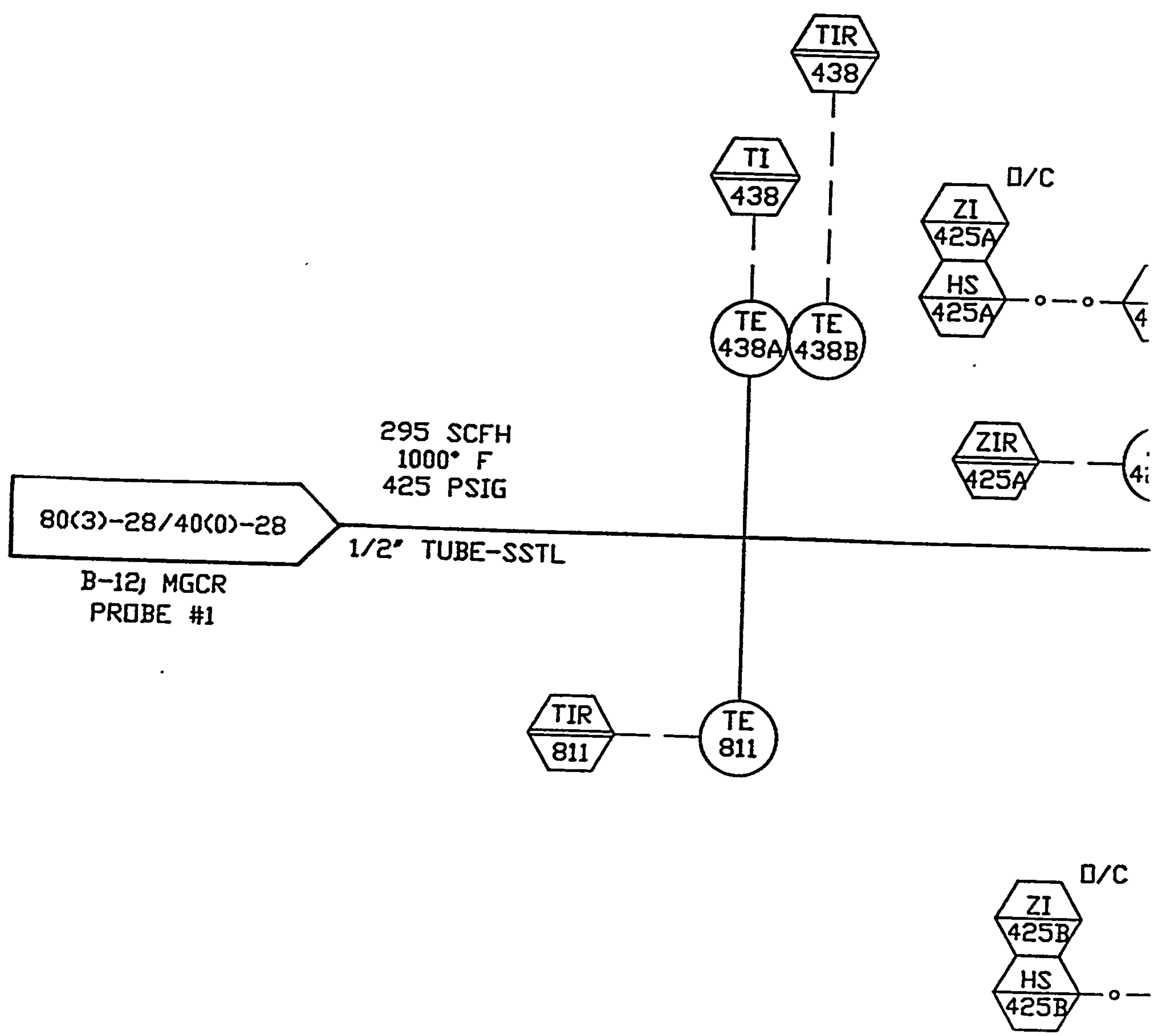
THIS DRAWING IS PART OF THE EG&G DOCUMENT CONTROL SYSTEM



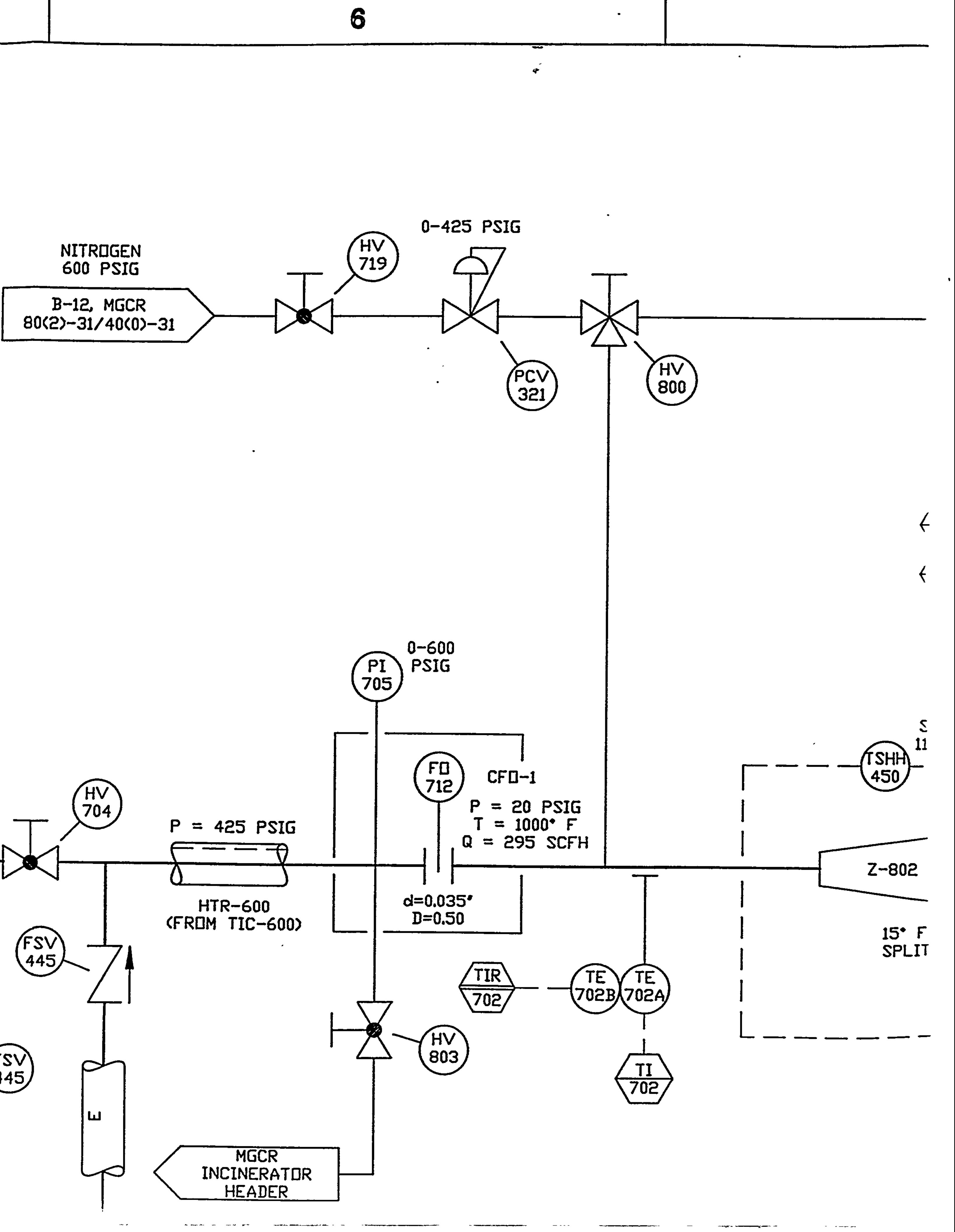

LINES ARE 3/8"SS TUBING UNLESS OTHERWISE NOTED.

| | | | |
|---|---|---|---|
| DRAFTER Jimmy Thorton | DATE 10/28/93 | United States Department of Energy MORGANTOWN ENERGY TECHNOLOGY CENTER Morgantown, WV | |
| PROJECT ENGINEER John Rockey | DATE 11/2/93 | | |
| REQUESTOR John Rockey | DATE 11/2/93 | | |
| BRANCH MANAGER Larry Strickland | DATE 11/2/93 | TITLE: B-12 ADVANCED GASIFICATION FACILITY MODULAR GAS CLEANUP RIG (MGCR) PROCESS AND INSTRUMENTATION DRAWING (P&ID6) OUTLET FILTRATION | |
| ES&H | DATE | | |
| DOE WJA John Rotunda | DATE 10/28/93 | | |
| | DATE | SIZE E / FSCM NO / DWG NO STD920080.07 | REV 7 |
| | DATE | | |

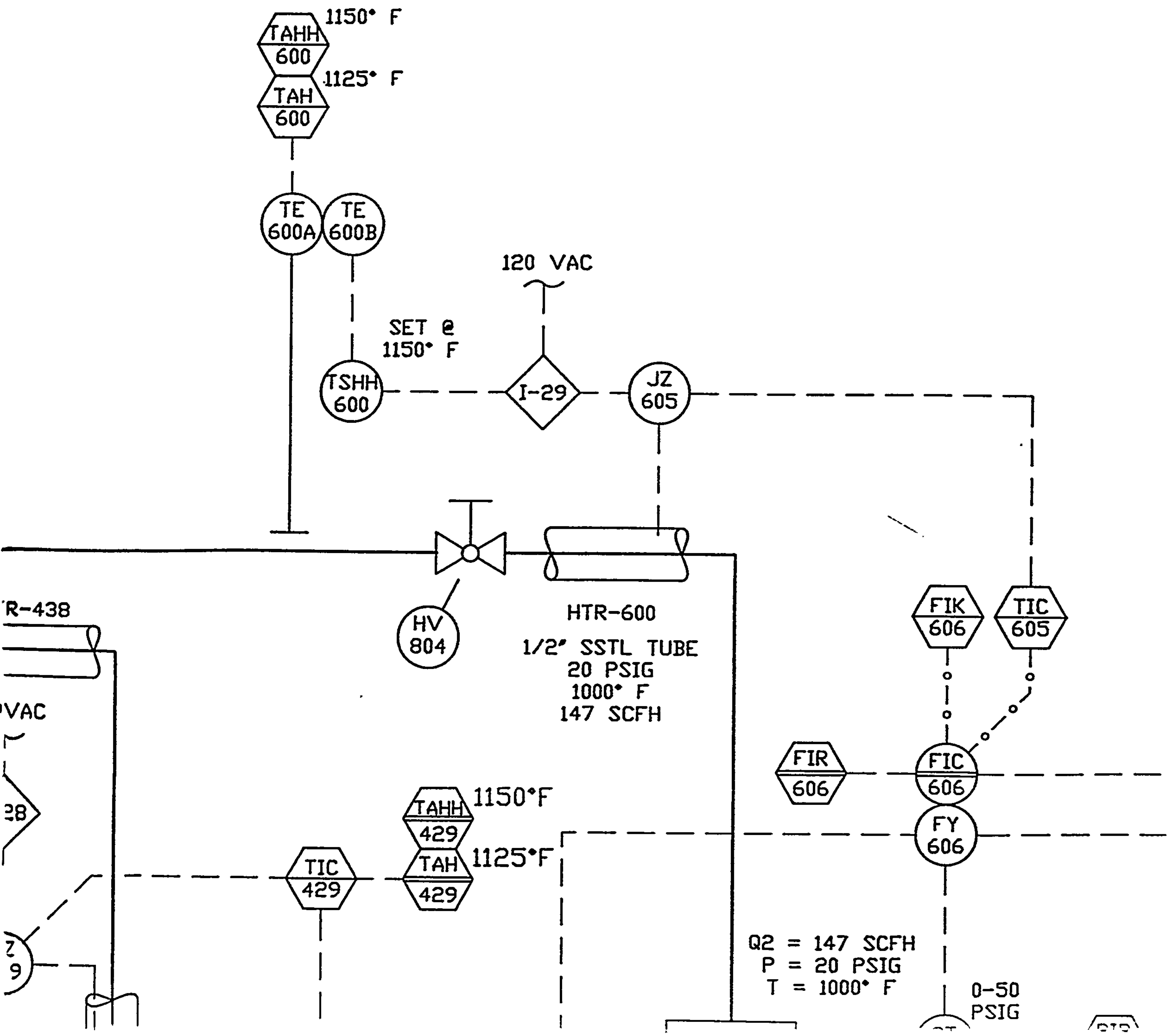
A



TIR 438
TI 438
O/C
ZI 425A
HS 425A
TE 438A
TE 438B
ZIR 425A
295 SCFH
1000° F
425 PSIG
80(3)-28/40(0)-28
1/2" TUBE-SSTL
B-12, MGCR
PROBE #1
TIR 811
TE 811
O/C
ZI 425B
HS 425B


6
NITROGEN
600 PSIG
B-12, MGCR
80(2)-31/40(0)-31
HV
719
0-425 PSIG
PCV
321
HV
800
0-600
PSIG
PI
705
FO
712
CFO-1
P = 20 PSIG
T = 1000° F
Q = 295 SCFH
HV
704
P = 425 PSIG
HTR-600
(FROM TIC-600)
d=0.035"
D=0.50
Z-802
TSHH
450
15° F
SPLIT
FSV
445
TIR
702
TE
702B
TE
702A
TI
702
HV
803
E
MGCR
INCINERATOR
HEADER

4



1150° F
TAHH 600
1125° F
TAH 600
TE 600A
TE 600B
120 VAC
SET @ 1150° F
TSHH 600
I-29
JZ 605
HV 804
HTR-600
1/2" SSTL TUBE
20 PSIG
1000° F
147 SCFH
R-438
VAC
28
FIK 606
TIC 605
FIR 606
FIC 606
FY 606
TAHH 429
1150°F
TAH 429
1125°F
TIC 429
Q2 = 147 SCFH
P = 20 PSIG
T = 1000° F
0-50 PSIG

3

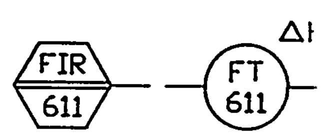
2

| ZONE | REV | |
|---|---|---|
| GEN | 0 | ISSUED FOR CONSTRUCT |
| ZONE | REV | |
| GEN. | 1 | MODIFIED AS PER MARKED |

| DRAFTER | DATE | CHECKER |
|---|---|---|
| GARY J. KULCHOCK | 6/30/94 | S. CONK |
| ES&H | DATE | DOE (EOSD) |
| J.L. BUCKLEW | 6/30/94 | EDWIN |

| ZONE | REV | |
|---|---|---|
| GEN. | 2 | MODIFIED AS PER MARKED |

| DRAFTER | DATE | CHECKER |
|---|---|---|
| Gary J Kulchock | 8/15/95 | S. Co |
| ES&H | DATE | DOE (EOSD) |
| R. L. Long | 9/8/95 | [illegible] |



2 1

## REVISION

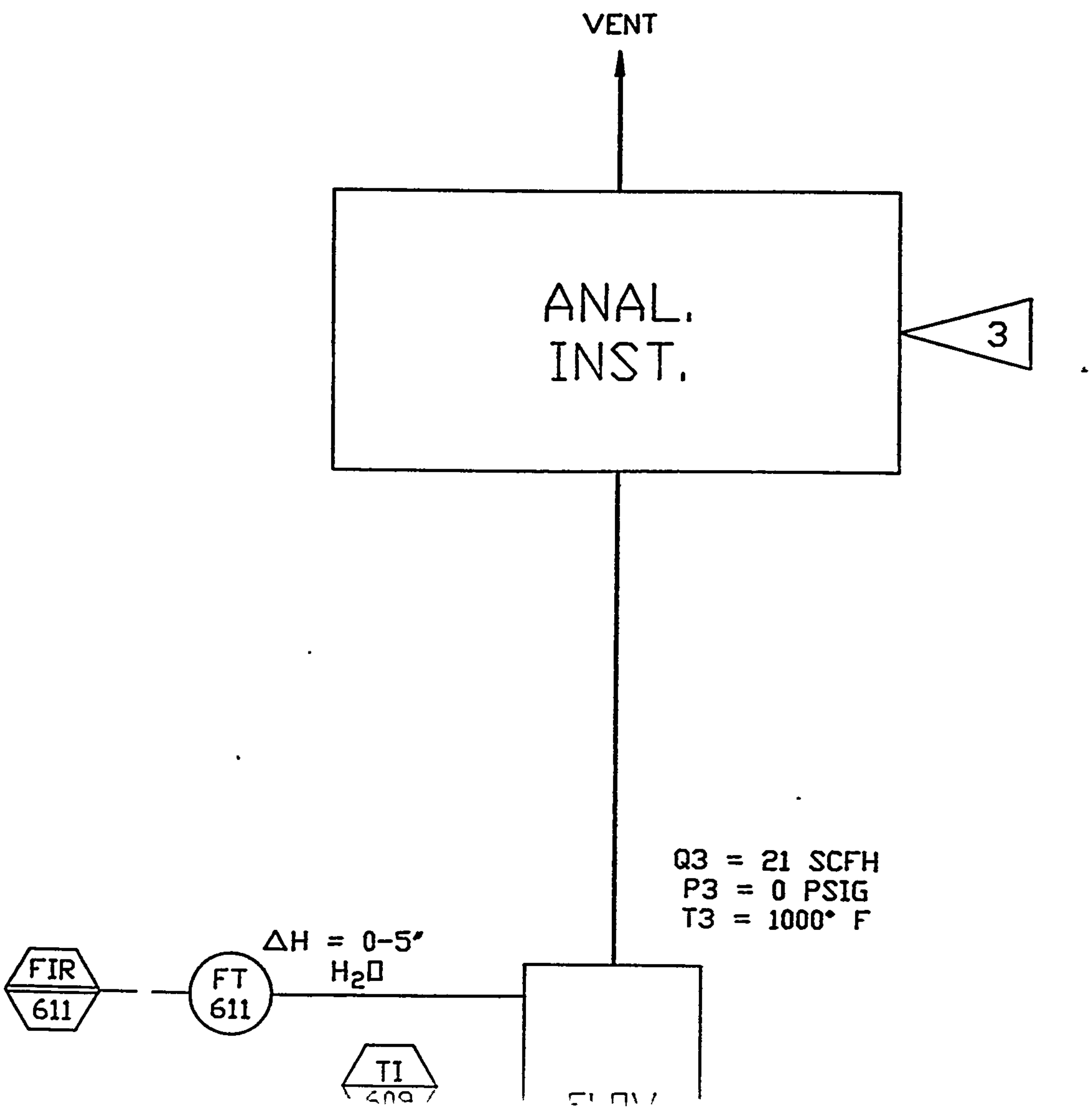
| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 0 | ISSUED FOR CONSTRUCTION | 5/25/94 |
| GEN. | 1 | MODIFIED AS PER MARKED PRINT. ISSUED FOR CONSTRUCTION | 6/24/94 |

| AFTER | DATE | CHECKER | DATE | DESIGNER | DATE | RESPONSIBLE PERSON | DATE |
|---|---|---|---|---|---|---|---|
| GARY J. KULCHOCK | 6/30/94 | S. CONKO | 6/30/94 | C. ELAINE EVERITT | 6/30/94 | | |
| J.L. BUCKLEW | 6/30/94 | DOE (EOSD) EDWIN GALLOWAY | 6/30/94 | ROBERT ROMANOSKY | 7/1/94 | JOHN ROTUNDA | 6/30/94 |

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN. | 2 | MODIFIED AS PER MARKED PRINT. ISSUED FOR CONSTRUCTION | 8/15/95 |

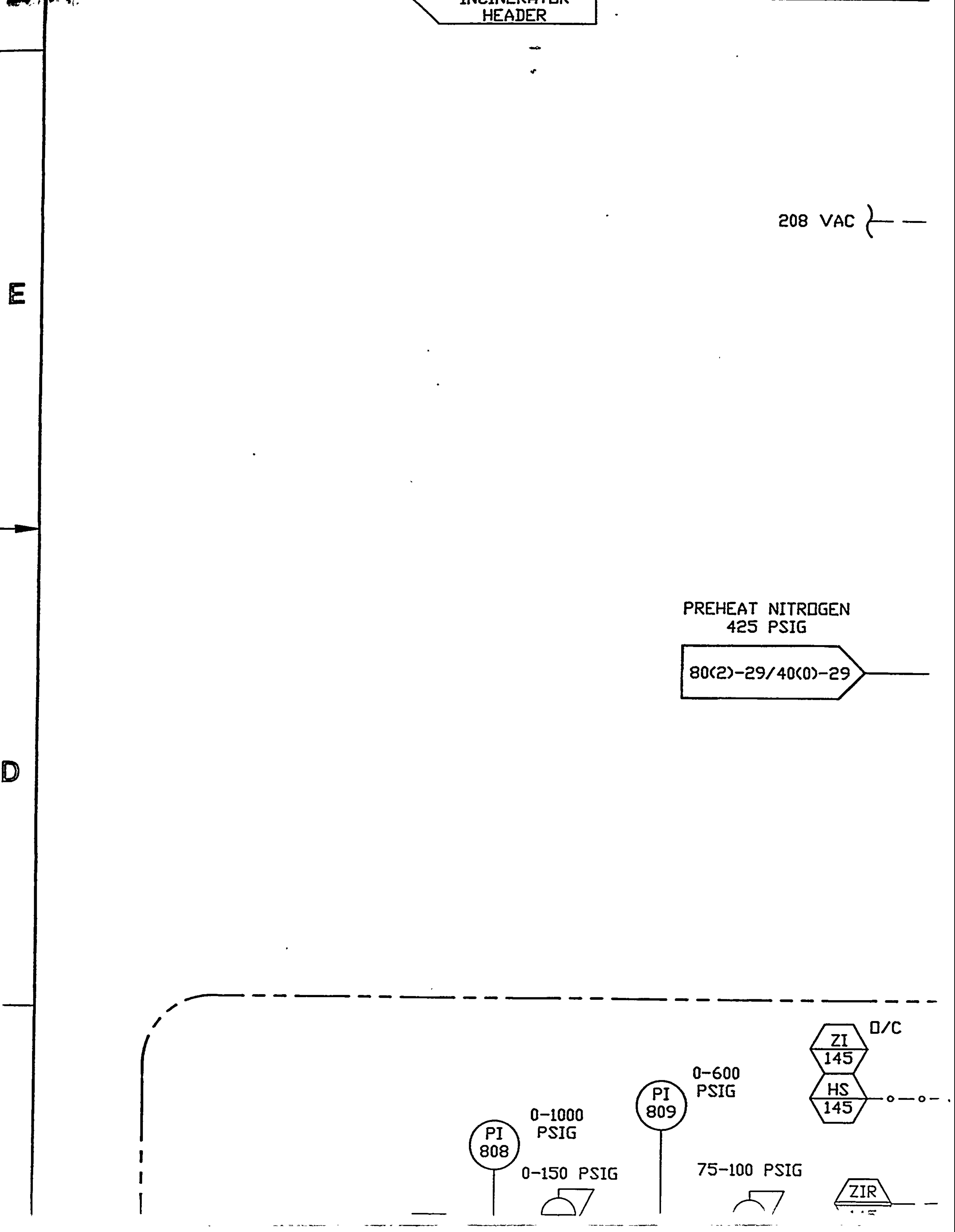
| AFTER | DATE | CHECKER | DATE | DESIGNER | DATE | RESPONSIBLE PERSON | DATE |
|---|---|---|---|---|---|---|---|
| [illegible] | 8/15/95 | S. Conko | 8-15-95 | [illegible] | 8/30/95 | [illegible] | 9/1/95 |
| [illegible] | 9/8/95 | DOE (EOSD) [illegible] | 9/8/95 | | DATE | | DATE |

H

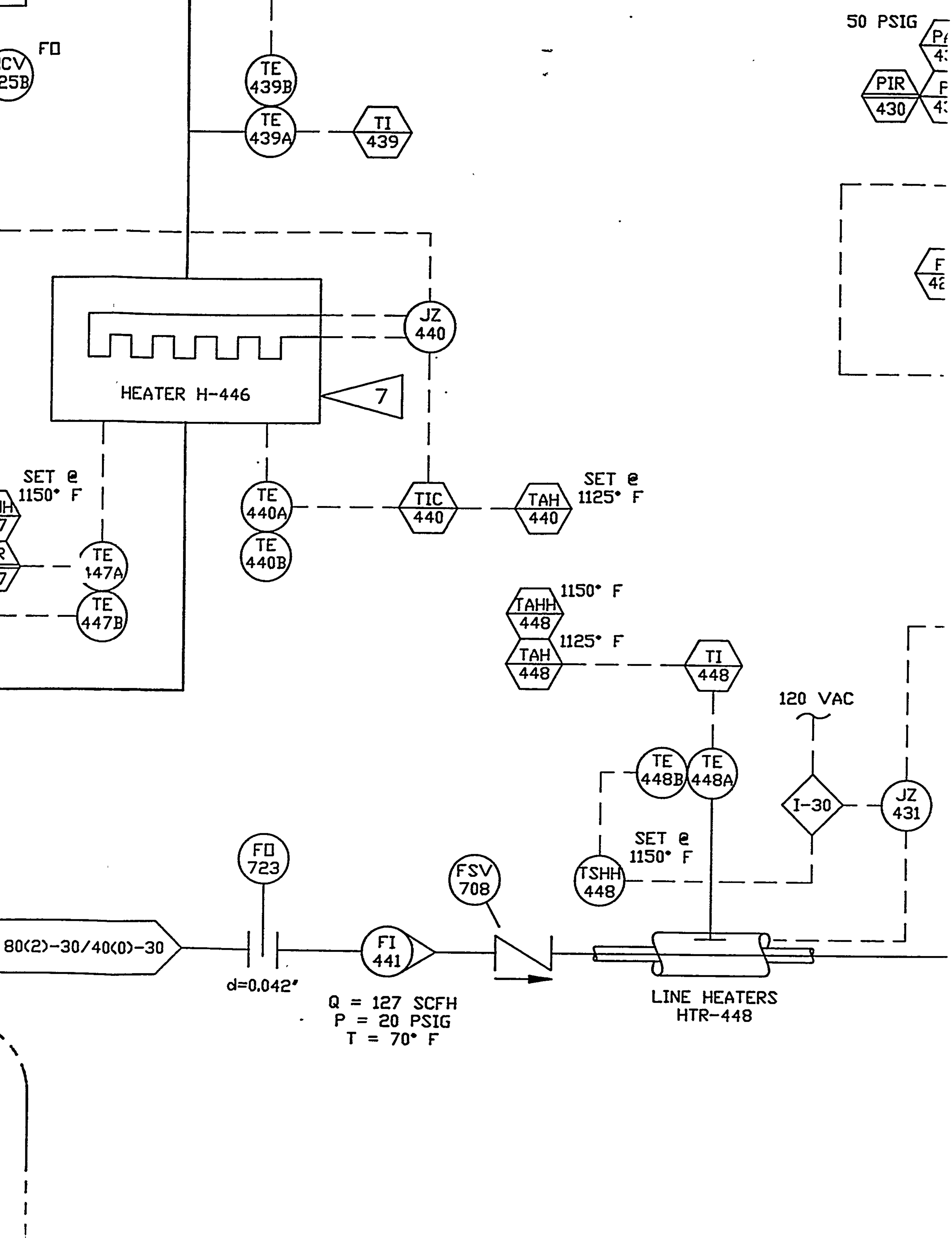


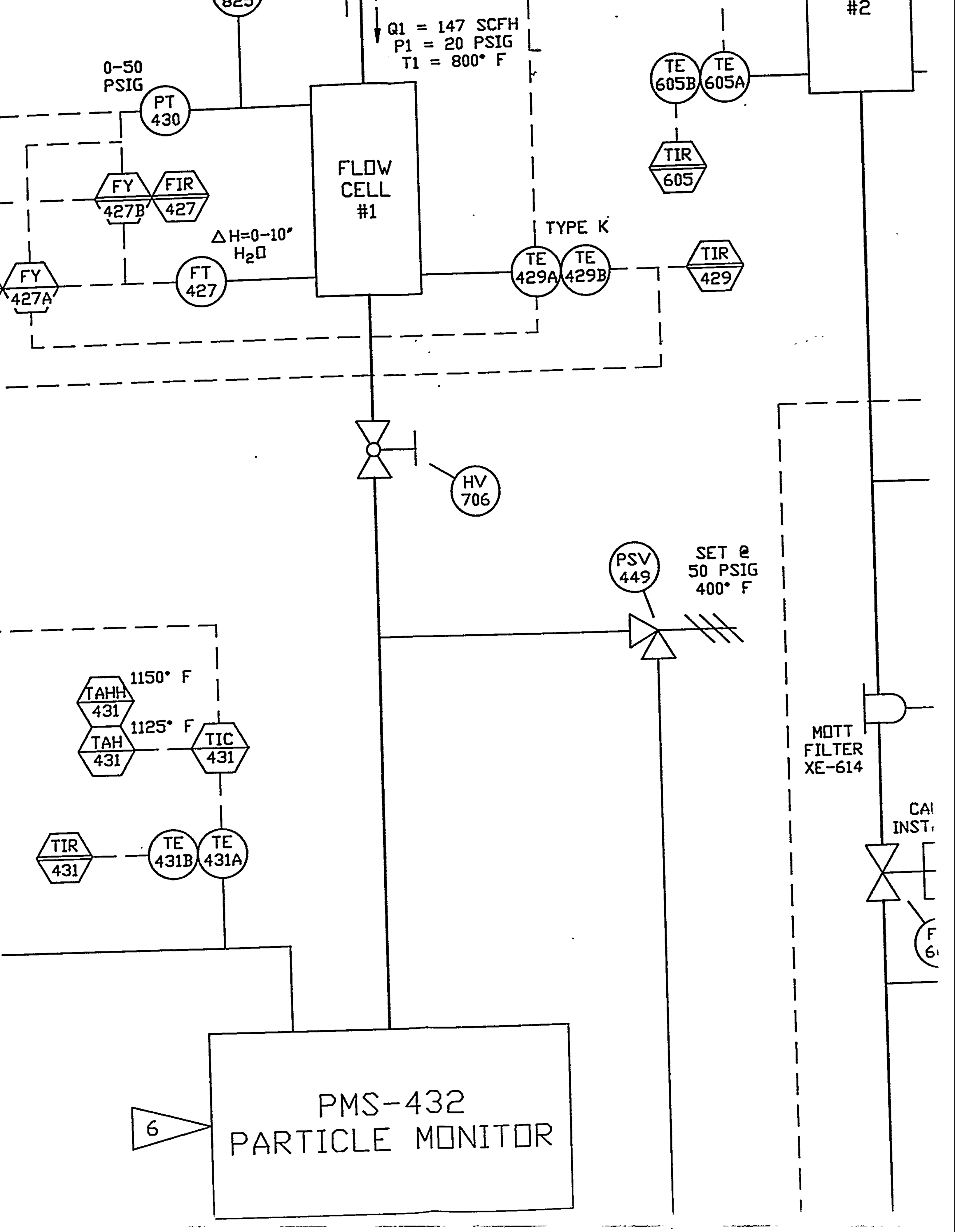

G

F

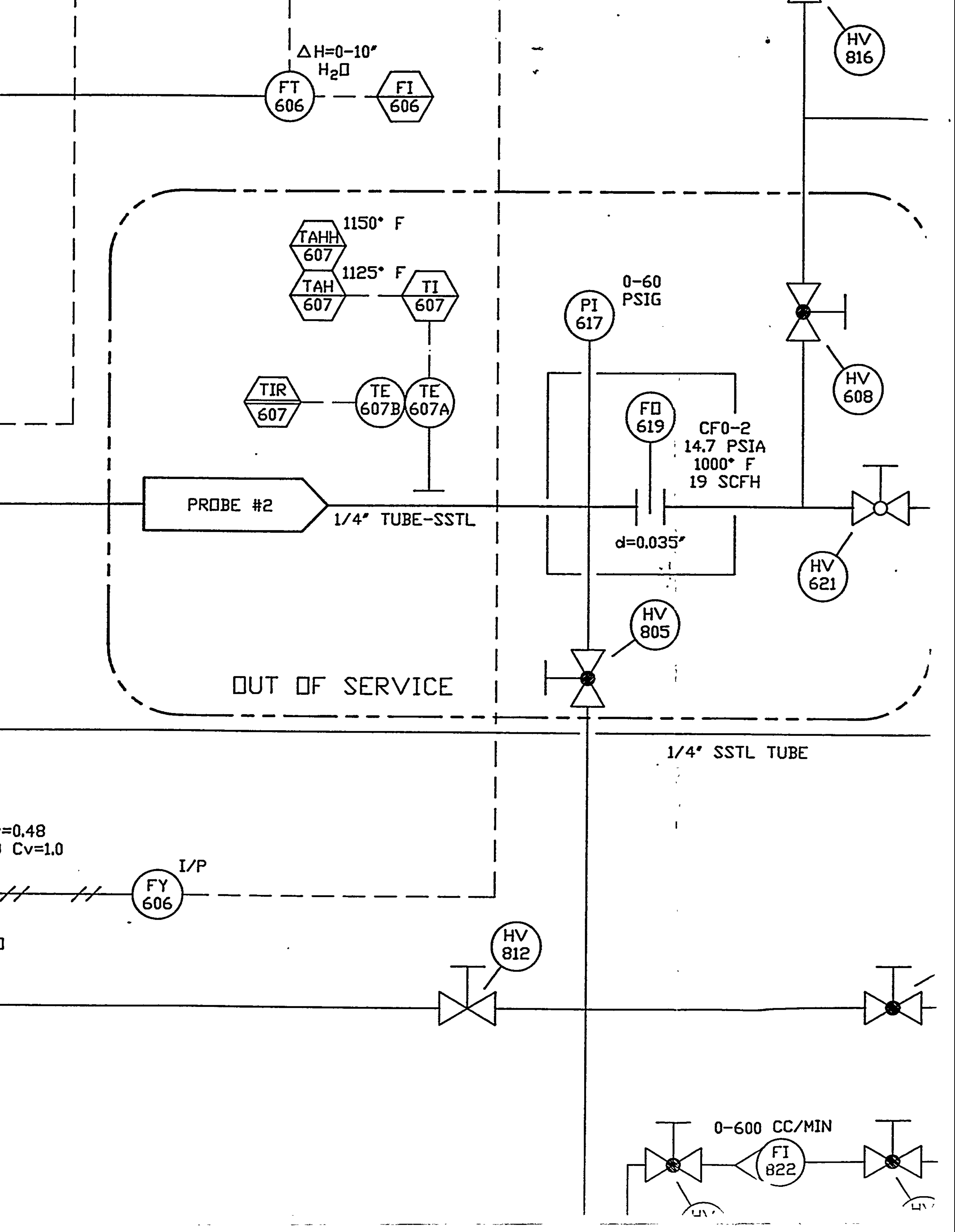


HEADER
208 VAC
E
PREHEAT NITROGEN
425 PSIG
80(2)-29/40(0)-29
D
O/C
ZI
145
HS
145
0-600
PSIG
PI
809
0-1000
PSIG
PI
808
0-150 PSIG
75-100 PSIG
ZIR

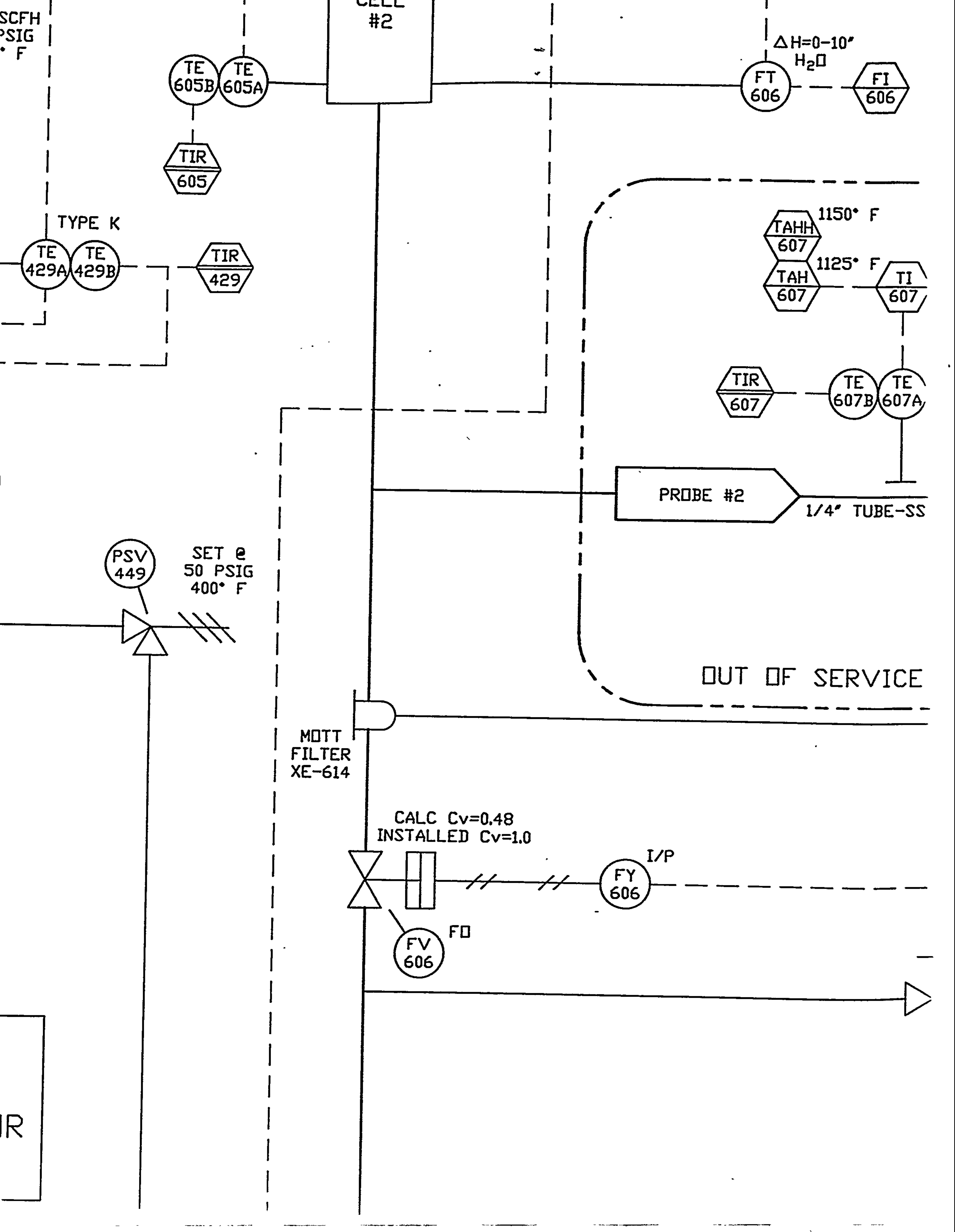

50 PSIG
PIR 430
FO
TE 439B
TE 439A
TI 439
JZ 440
HEATER H-446
7
SET @ 1150° F
TE 447A
TE 447B
TE 440A
TE 440B
TIC 440
TAH 440
SET @ 1125° F
TAHH 448
1150° F
TAH 448
1125° F
TI 448
120 VAC
TE 448B
TE 448A
I-30
JZ 431
SET @ 1150° F
TSHH 448
FO 723
FSV 708
80(2)-30/40(0)-30
FI 441
d=0.042"
Q = 127 SCFH
P = 20 PSIG
T = 70° F
LINE HEATERS
HTR-448



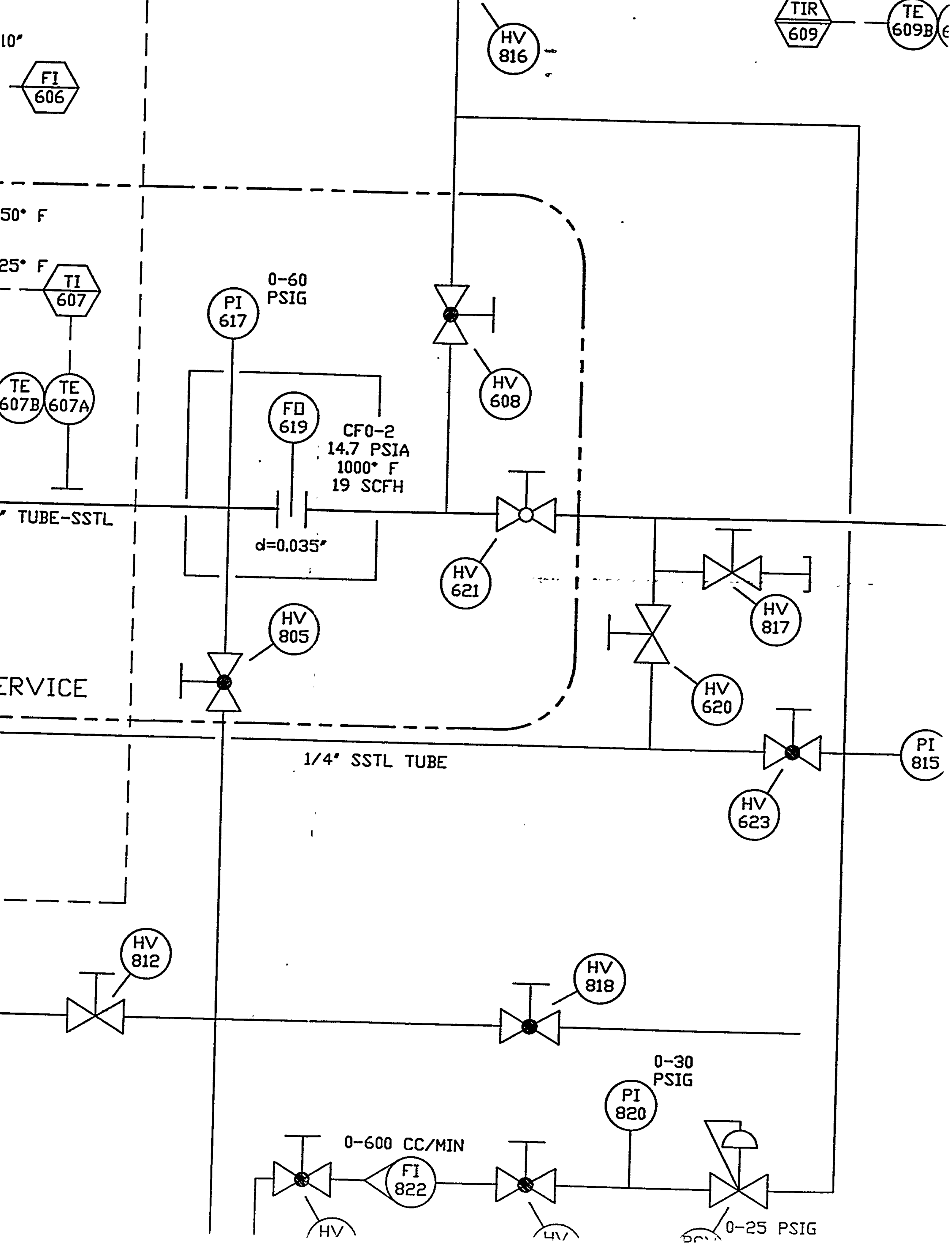
825
#2
Q1 = 147 SCFH
P1 = 20 PSIG
T1 = 800° F
0-50
PSIG
PT
430
FLOW
CELL
#1
TE
605B
TE
605A
TIR
605
FY
427B
FIR
427
ΔH=0-10"
H2O
TYPE K
FY
427A
FT
427
TE
429A
TE
429B
TIR
429
HV
706
PSV
449
SET @
50 PSIG
400° F
TAHH
431
1150° F
TAH
431
1125° F
TIC
431
MOTT
FILTER
XE-614
TIR
431
TE
431B
TE
431A
6
PMS-432
PARTICLE MONITOR

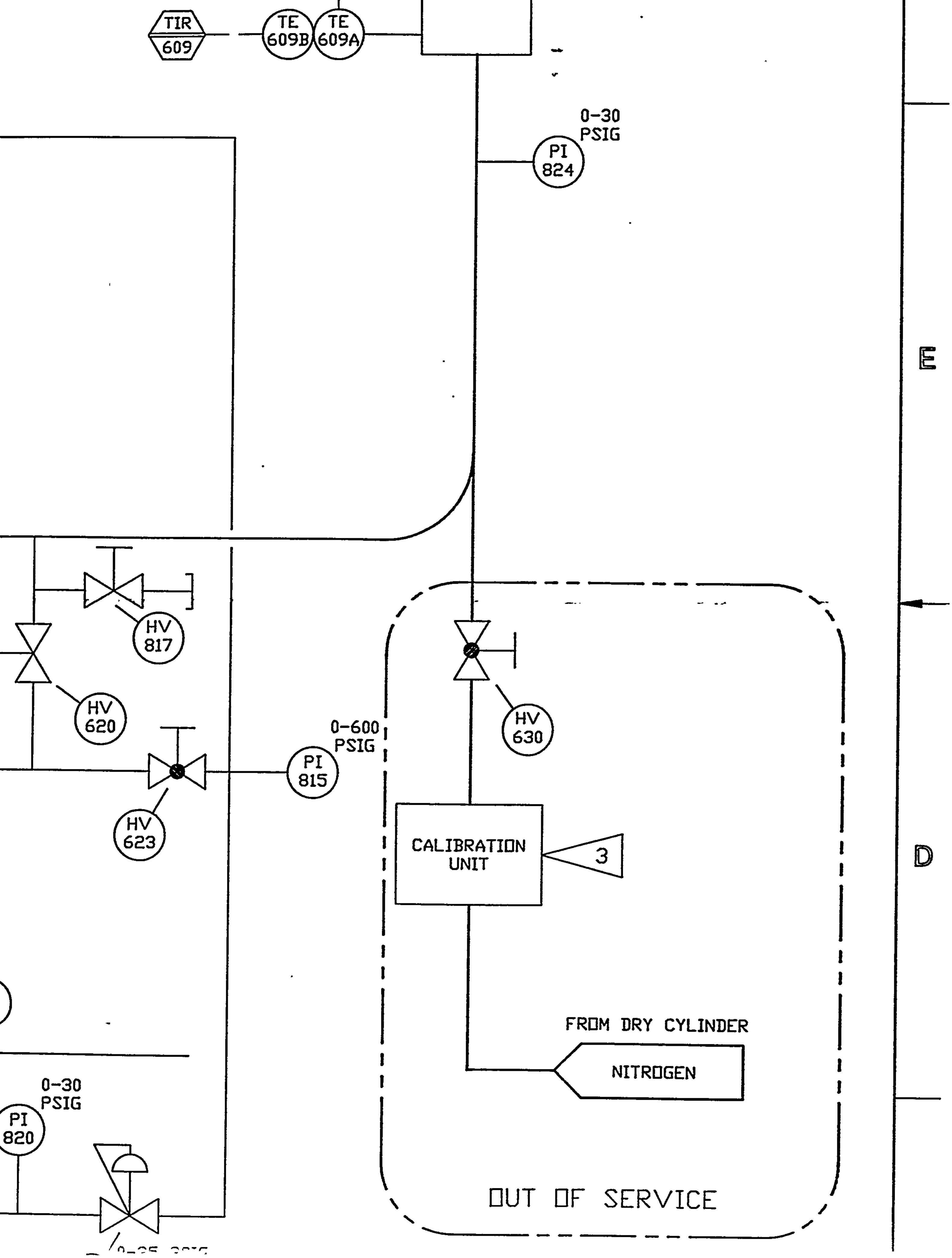


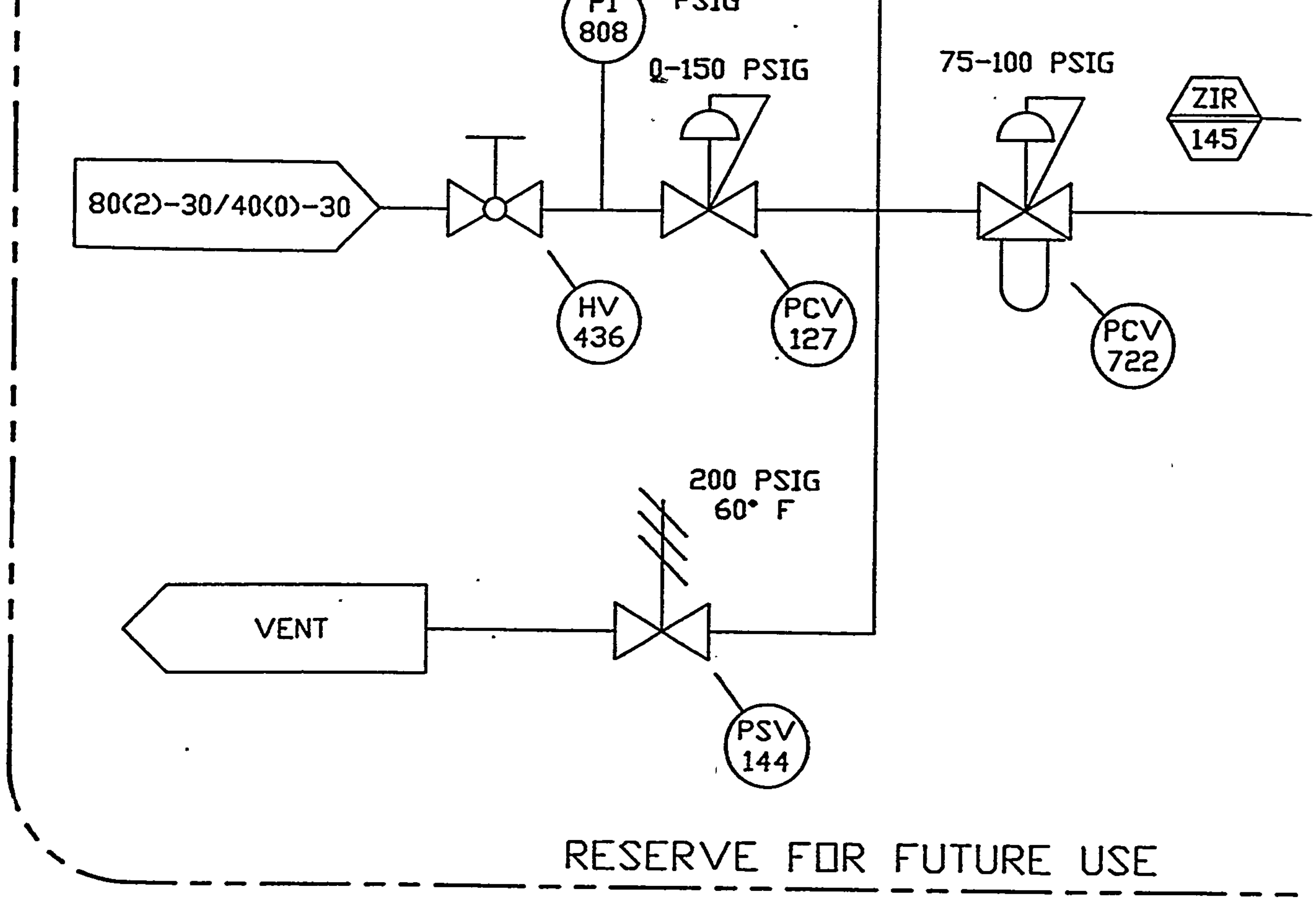
HV 816
ΔH=0-10" H2O
FT 606
FI 606
1150° F
TAHH 607
1125° F
TAH 607
TI 607
0-60 PSIG
PI 617
HV 608
TIR 607
TE 607B
TE 607A
FO 619
CFO-2
14.7 PSIA
1000° F
19 SCFH
PROBE #2
1/4" TUBE-SSTL
d=0.035"
HV 621
HV 805
OUT OF SERVICE
1/4" SSTL TUBE
=0.48
Cv=1.0
I/P
FY 606
HV 812
0-600 CC/MIN
FI 822



SCFH
PSIG
° F
CELL
#2
TE
605B
TE
605A
TIR
605
ΔH=0-10"
$H_2O$
FT
606
FI
606
TYPE K
TE
429A
TE
429B
TIR
429
1150° F
TAHH
607
1125° F
TAH
607
TI
607
TIR
607
TE
607B
TE
607A
PROBE #2
1/4" TUBE-SS
PSV
449
SET @
50 PSIG
400° F
OUT OF SERVICE
MOTT
FILTER
XE-614
CALC Cv=0.48
INSTALLED Cv=1.0
I/P
FY
606
FV
606
FO


10"
FI 606
TIR 609
TE 609B
HV 816
50° F
25° F
TI 607
TE 607B
TE 607A
PI 617
0-60 PSIG
HV 608
FO 619
CF0-2
14.7 PSIA
1000° F
19 SCFH
" TUBE-SSTL
d=0.035"
HV 621
HV 817
HV 805
HV 620
ERVICE
1/4" SSTL TUBE
PI 815
HV 623
HV 812
HV 818
0-30 PSIG
PI 820
0-600 CC/MIN
FI 822
HV
HV
0-25 PSIG


TIR
609
TE
609B
TE
609A
0-30
PSIG
PI
824
E
HV
817
HV
620
0-600
PSIG
PI
815
HV
623
HV
630
CALIBRATION
UNIT
3
D
FROM DRY CYLINDER
NITROGEN
0-30
PSIG
PI
820
OUT OF SERVICE




## NOTES:

(1) "NOTE REMOVED"

(2) "NOTE REMOVED"

3 SUPPLIED BY AMES

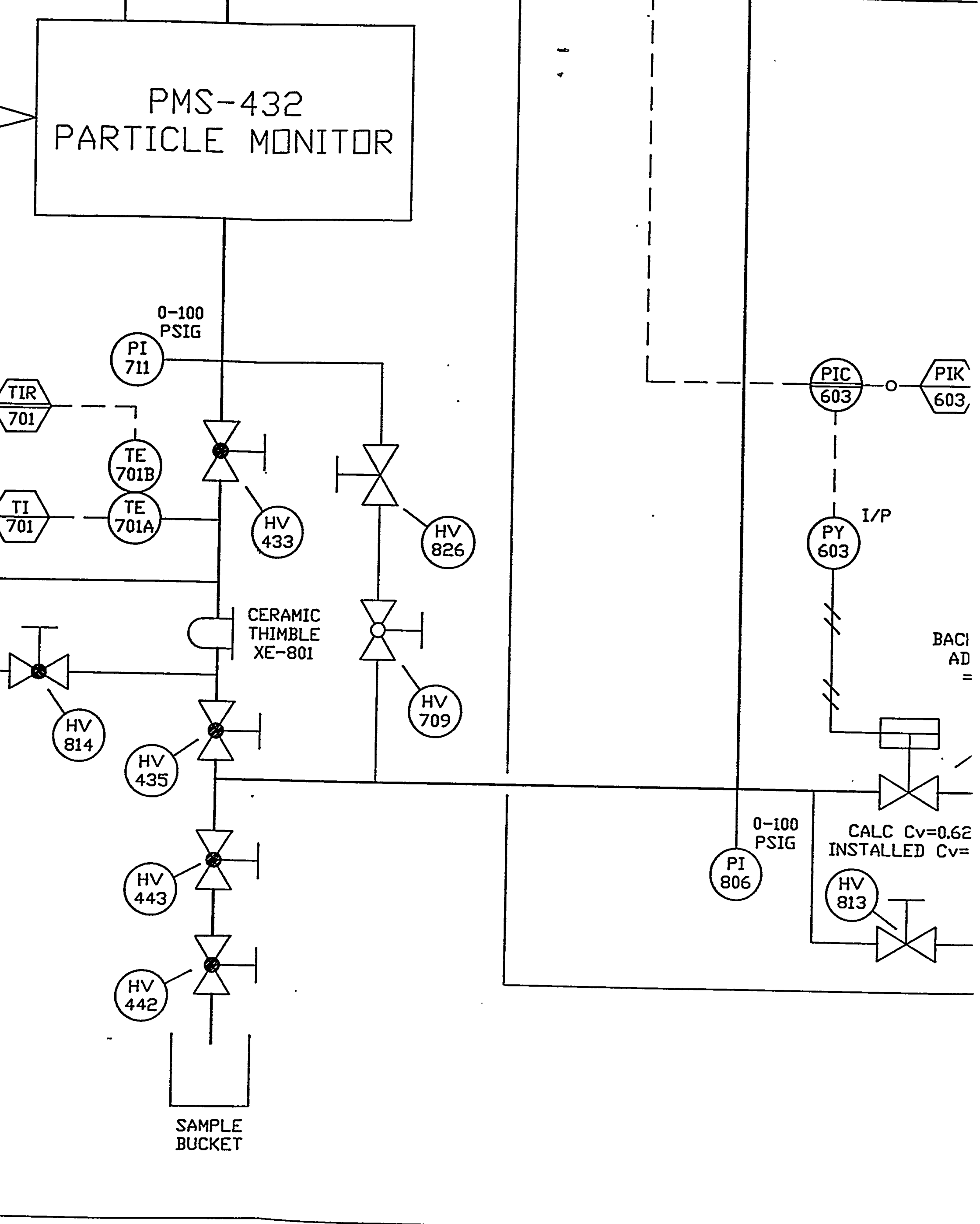
(4) PREV. TAG # BLOCK RANGE ALLOCATED FOR THIS P&ID:
425-450, 600-650, 701-725
CURRENT BLOCK RANGE 800-850

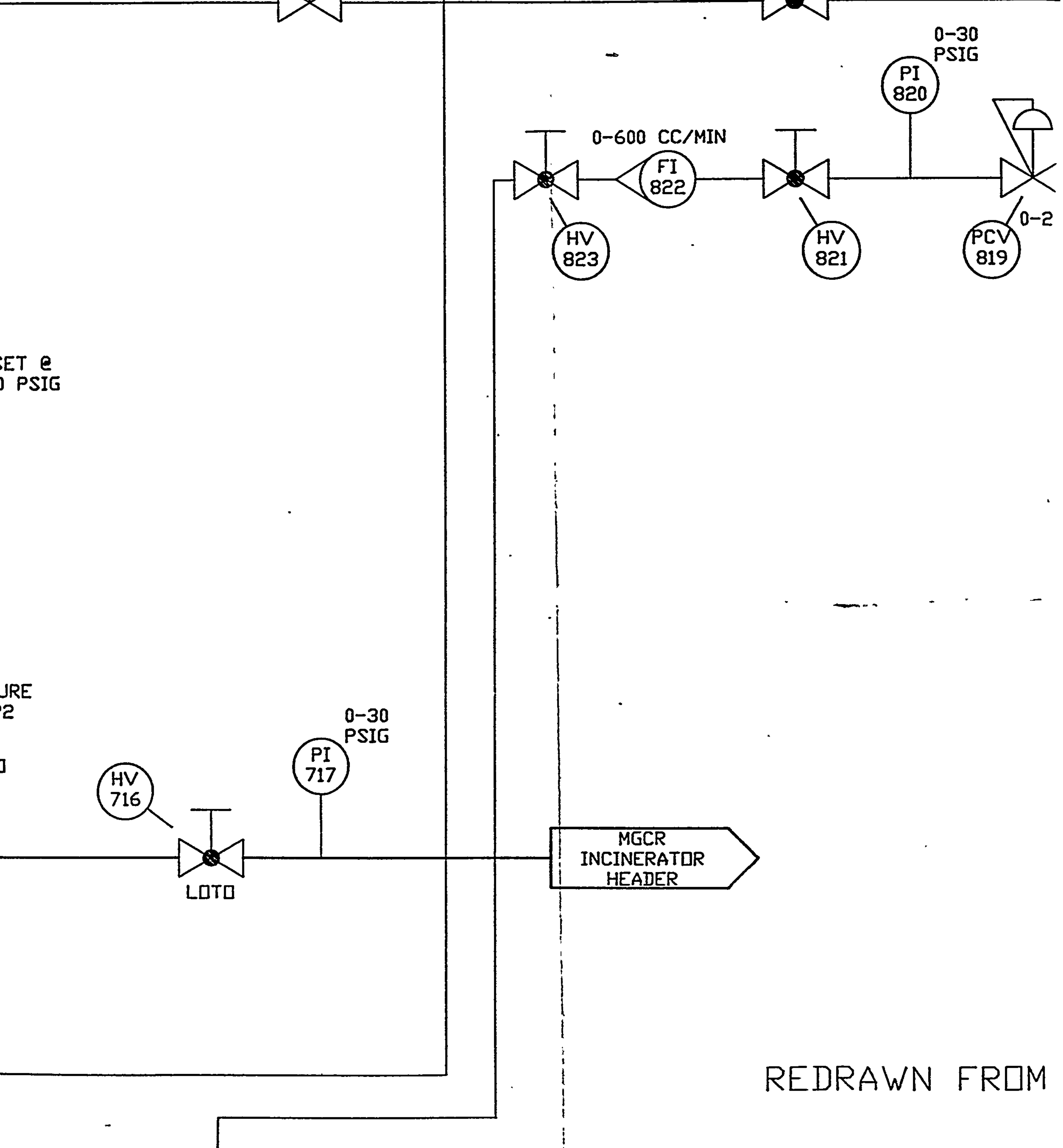
(5) LAST TAG No. USED: HV-826

6 COMMERCIALLY PURCHASED UNIT: MODEL No. PMS CSASP H

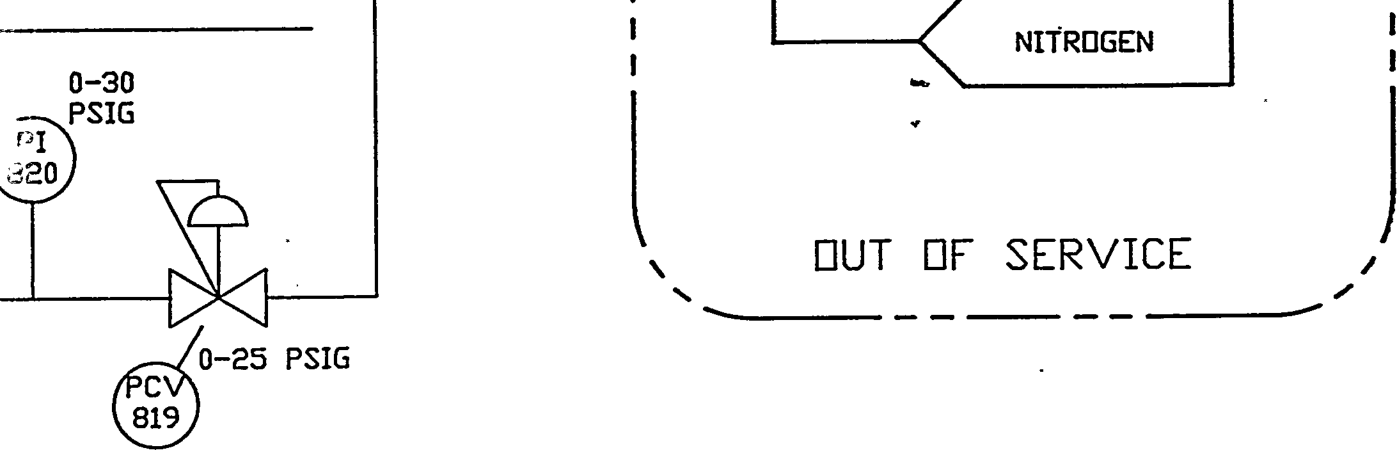
7 COMMERCIALLY PURCHASED UNIT: MODEL LINDBERG; TYPE

(8) TIR-609 AND FIR-611 ARE USED FOR MASS FLOW CALCUL


PMS-432
PARTICLE MONITOR
0-100
PSIG
PI
711
TIR
701
TE
701B
TI
701
TE
701A
HV
433
HV
826
CERAMIC
THIMBLE
XE-801
HV
709
HV
814
HV
435
HV
443
HV
442
SAMPLE
BUCKET
PIC
603
PIK
603
I/P
PY
603
0-100
PSIG
PI
806
CALC Cv=0.62
INSTALLED Cv=
HV
813




| ECN NO | DESCRIPTION | REFERENCE DRAWINGS | DRAFTER<br>Gary Kulchc |
|---|---|---|---|
| 1 | | | CHECKER<br>S. Conko |
| | | | DESIGNER<br>Dave Lunife |
| 2 | | | RESPONSIBLE PERSON<br>-NA- |
| | | | ES&H |

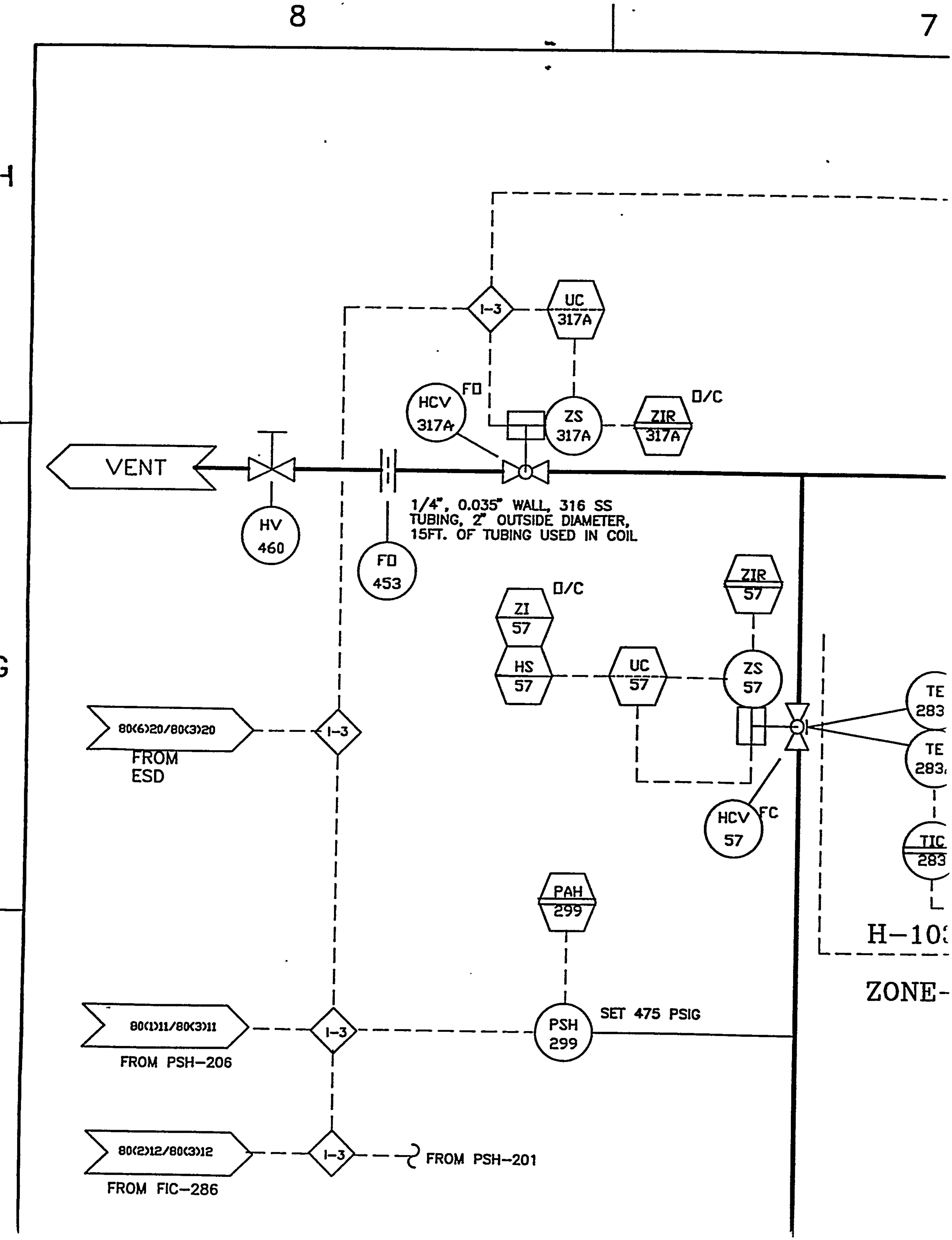


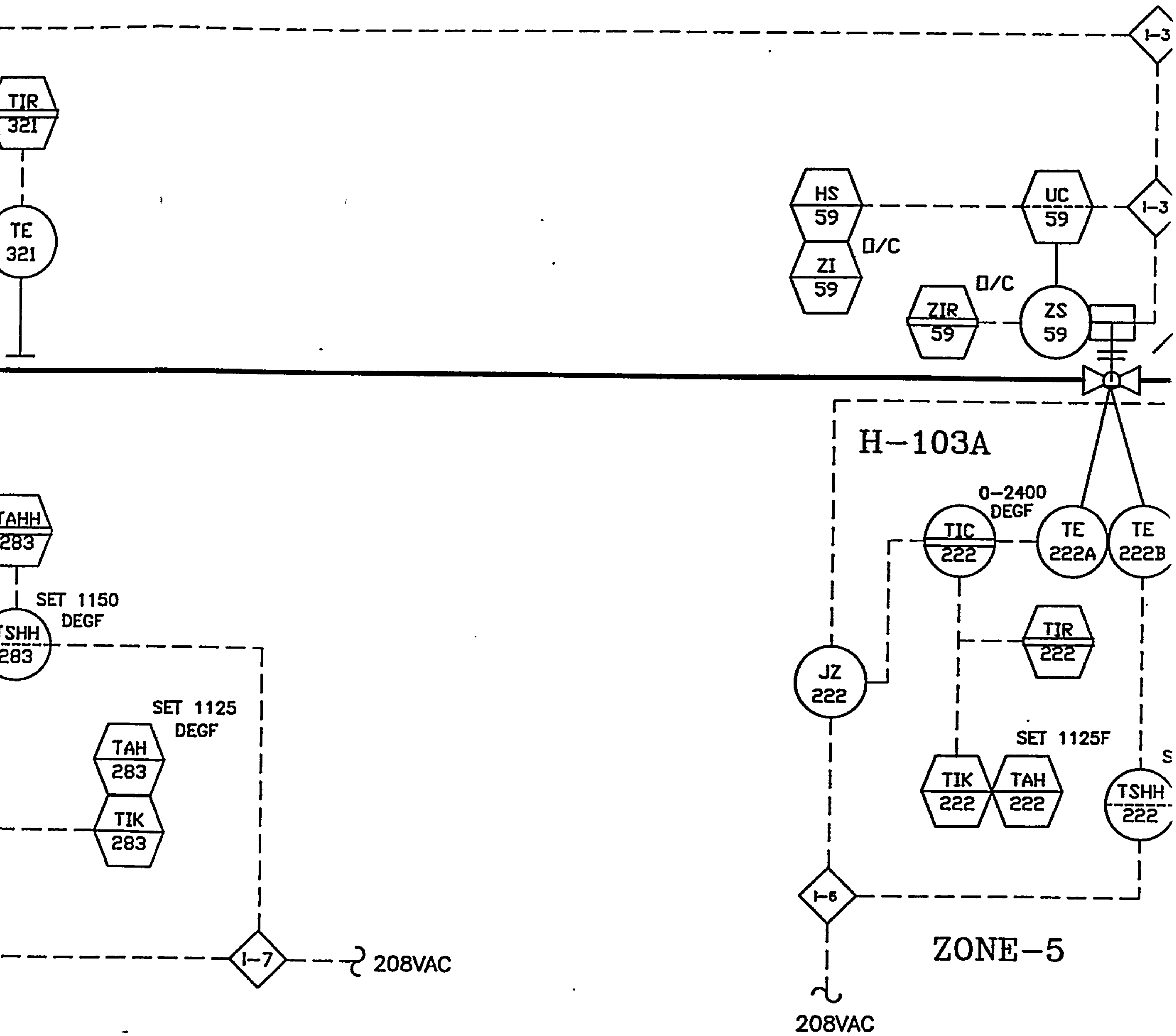

C

DWG NO E94040 SH 1

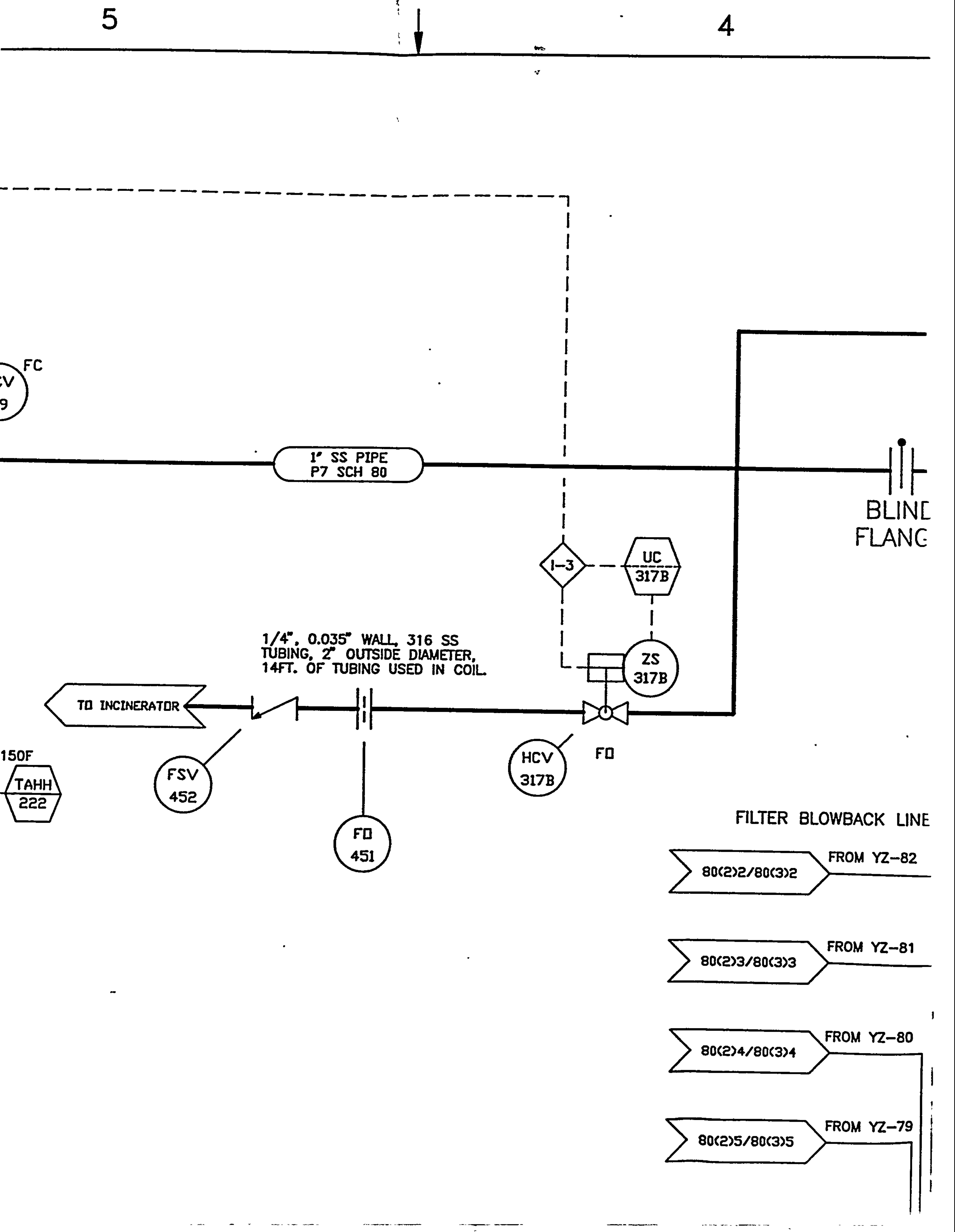
WN FROM DRAWINGS STD930075 AND STD930008
WITH CHANGES

| | | |
|---|---|---|
| DRAFTER Gary Kulchock | DATE 5/26/94 | United States Department of Energy |
| CHECKER S. Conko | DATE 5/26/94 | MORGANTOWN ENERGY TECHNOLOGY CENTER |
| DESIGNER Dave Lunifeld | DATE 5/26/94 | Morgantown, WV |
| RESPONSIBLE PERSON -NA- | DATE -NA- | TITLE: BUILDING 12 |
| | DATE | MGCR PARTICLE MEASURING |

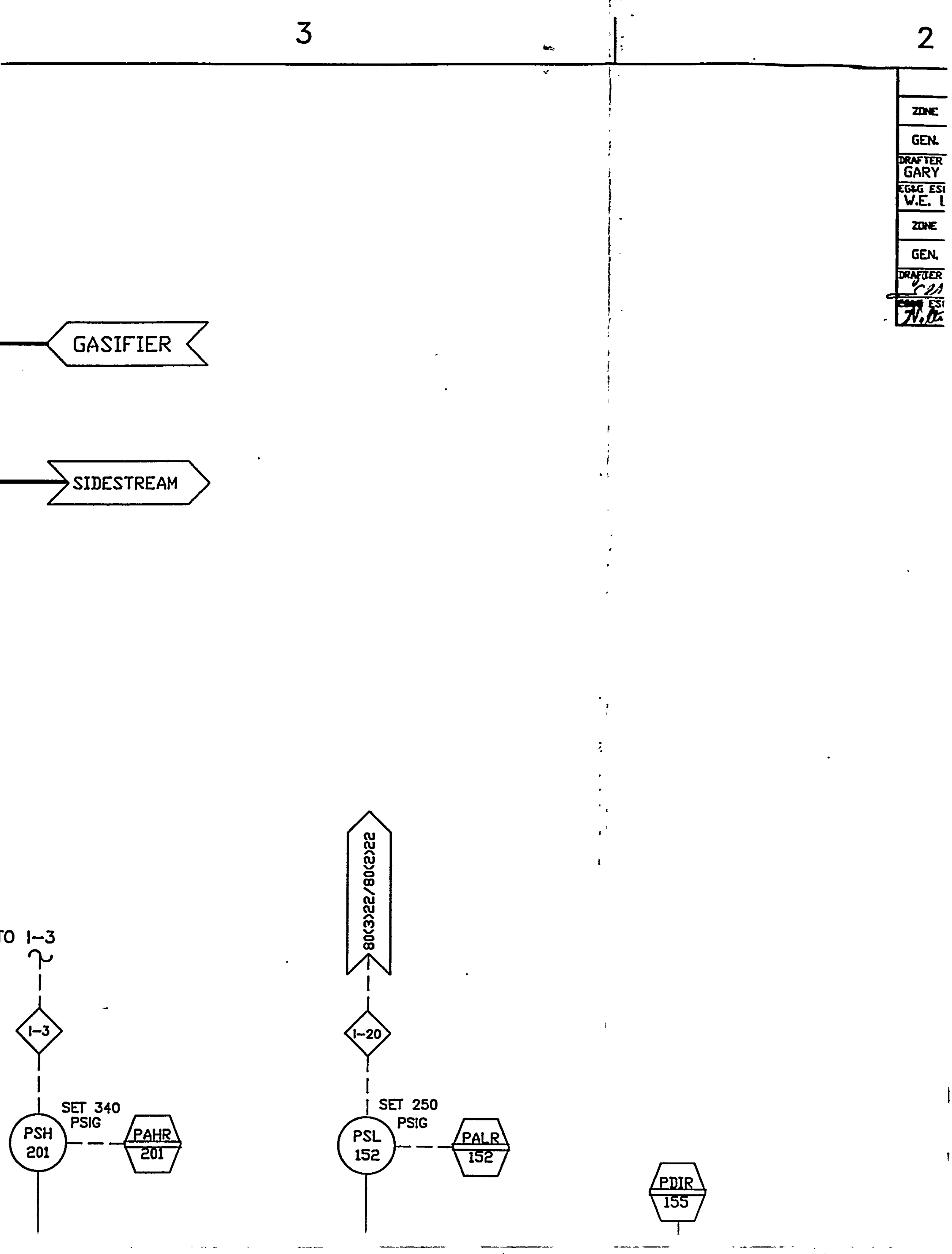

8
7
VENT
HV 460
FO 453
1/4", 0.035" WALL, 316 SS TUBING, 2" OUTSIDE DIAMETER, 15FT. OF TUBING USED IN COIL
HCV 317A
FO
I-3
UC 317A
ZS 317A
ZIR 317A
O/C
ZI 57
O/C
HS 57
UC 57
ZS 57
ZIR 57
HCV 57
FC
TE 283
TE 283
TIC 283
H-10
ZONE-
80(6)20/80(3)20
FROM ESD
I-3
PAH 299
PSH 299
SET 475 PSIG
80(1)11/80(3)11
FROM PSH-206
I-3
80(2)12/80(3)12
FROM FIC-286
I-3
FROM PSH-201



TIR
321
TE
321
HS
59
ZI
59
O/C
UC
59
ZIR
59
O/C
ZS
59
I-3
I-3
H-103A
0-2400
DEGF
TIC
222
TE
222A
TE
222B
TIR
222
JZ
222
SET 1125F
TIK
222
TAH
222
TSHH
222
I-6
ZONE-5
208VAC
TAHH
283
SET 1150
DEGF
TSHH
283
SET 1125
DEGF
TAH
283
TIK
283
I-7
208VAC



5
4
FC
1" SS PIPE
P7 SCH 80
BLIND
FLANG
I-3
UC
317B
ZS
317B
1/4", 0.035" WALL, 316 SS
TUBING, 2" OUTSIDE DIAMETER,
14FT. OF TUBING USED IN COIL.
TO INCINERATOR
FSV
452
FO
451
HCV
317B
FO
150F
TAHH
222
FILTER BLOWBACK LINE
80(2)2/80(3)2
FROM YZ-82
80(2)3/80(3)3
FROM YZ-81
80(2)4/80(3)4
FROM YZ-80
80(2)5/80(3)5
FROM YZ-79



3
2
ZONE
GEN.
DRAFTER
GARY
EG&G ES
W.E. L
ZONE
GEN.
DRAFTER
ES
GASIFIER
SIDESTREAM
80(3)22/80(2)22
TO 1-3
1-3
1-20
SET 340
PSIG
SET 250
PSIG
PSH
201
PAHR
201
PSL
152
PALR
152
PDIR
155

2 1

# REVISION

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN. | 6 | MODIFIED AS PER MARKED PRINT; ISSUED FOR CONSTRUCTION | 5/16/94 |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| GARY J. KULCHOCK | 5/18/94 | S. CONKO | 5/18/94 | DAVID LUNIFELD | 5/24/94 | | |
| **EG&G ES&H** W.E. LOWRY | **DATE** 5/24/94 | **PROJECT ENGR.** S. RENNINGER | **DATE** 5/18/94 | **BRANCH MANAGER** JOHN M. ROCKEY | **DATE** 5/18/94 | **DOE (EOSD)** JOHN R. ROTUNDA WJA | **DATE** 5/18/94 |

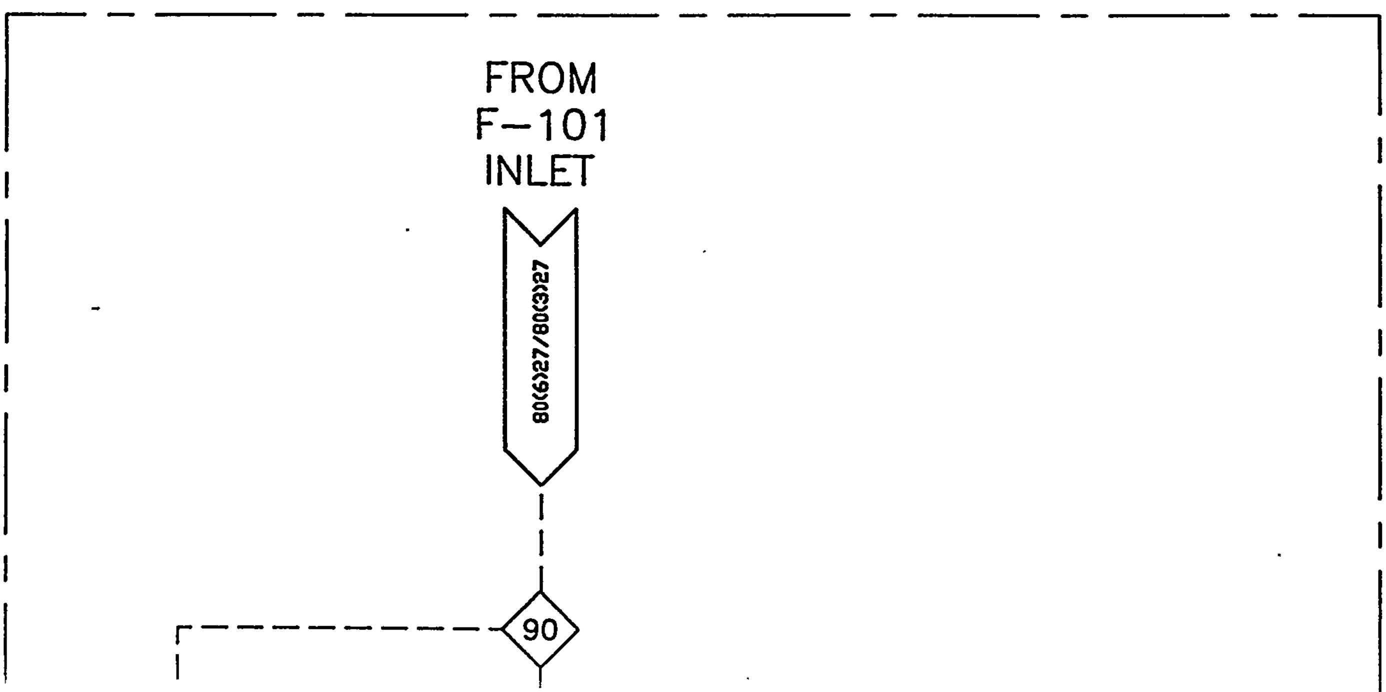
| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN. | 7 | MODIFIED AS PER MARKED PRINT; ISSUED FOR CONSTRUCTION | 9/30/94 |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| Sam McKim | 10-3-94 | Gary Kulchock | 10/3/94 | David Lunifeld | 10/5/94 | | |
| **EG&G ES&H** W. Frank Lowry | **DATE** 10/11/94 | **PROJECT ENGR.** Scott Renninger | **DATE** 10/?/94 | **BRANCH MANAGER** | **DATE** | **DOE (EOSD)** [illegible] WJA | **DATE** 10/5/94 |

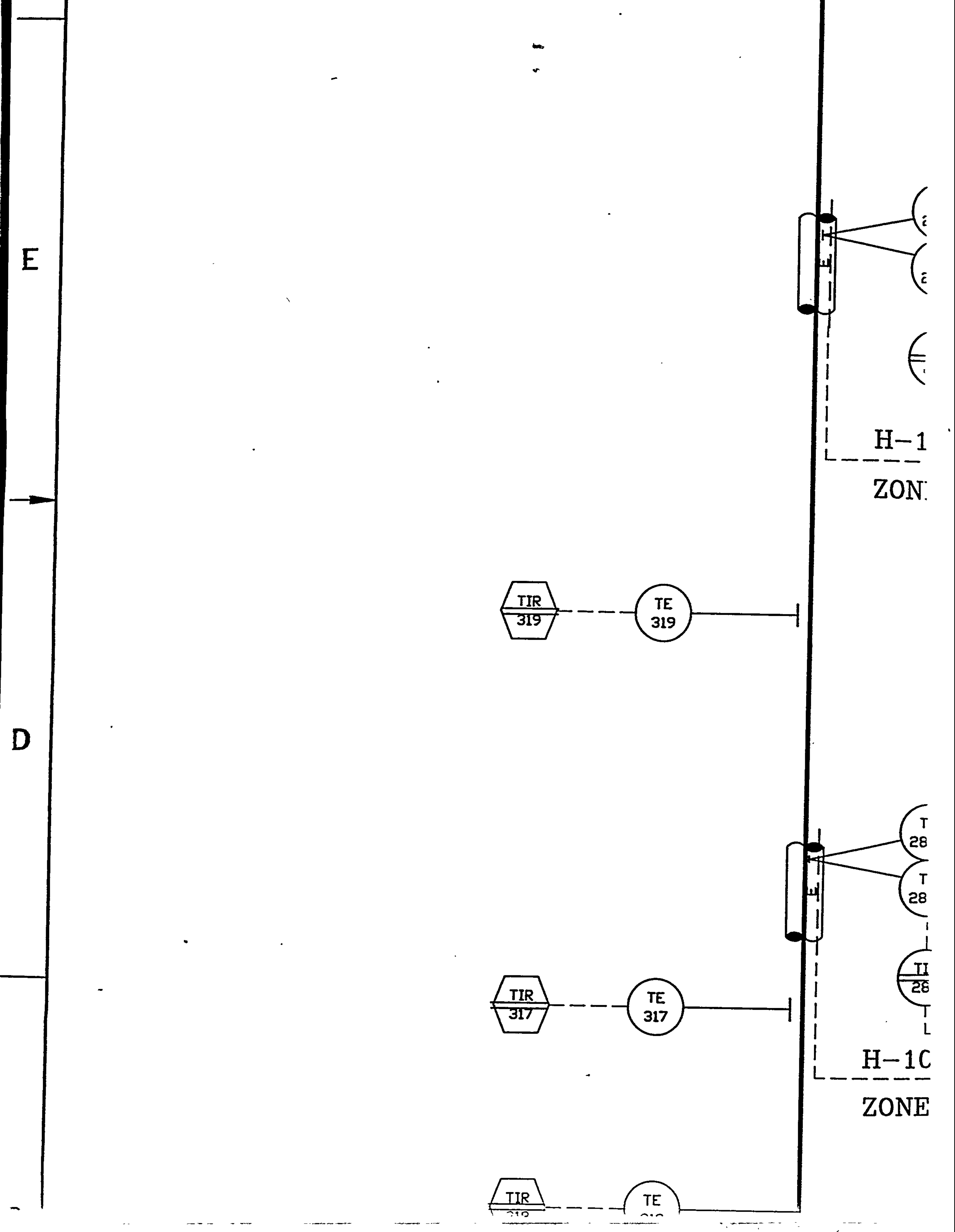
H

G

TO BE ADDED FOR CONTINOUS MODE OPERATIONS

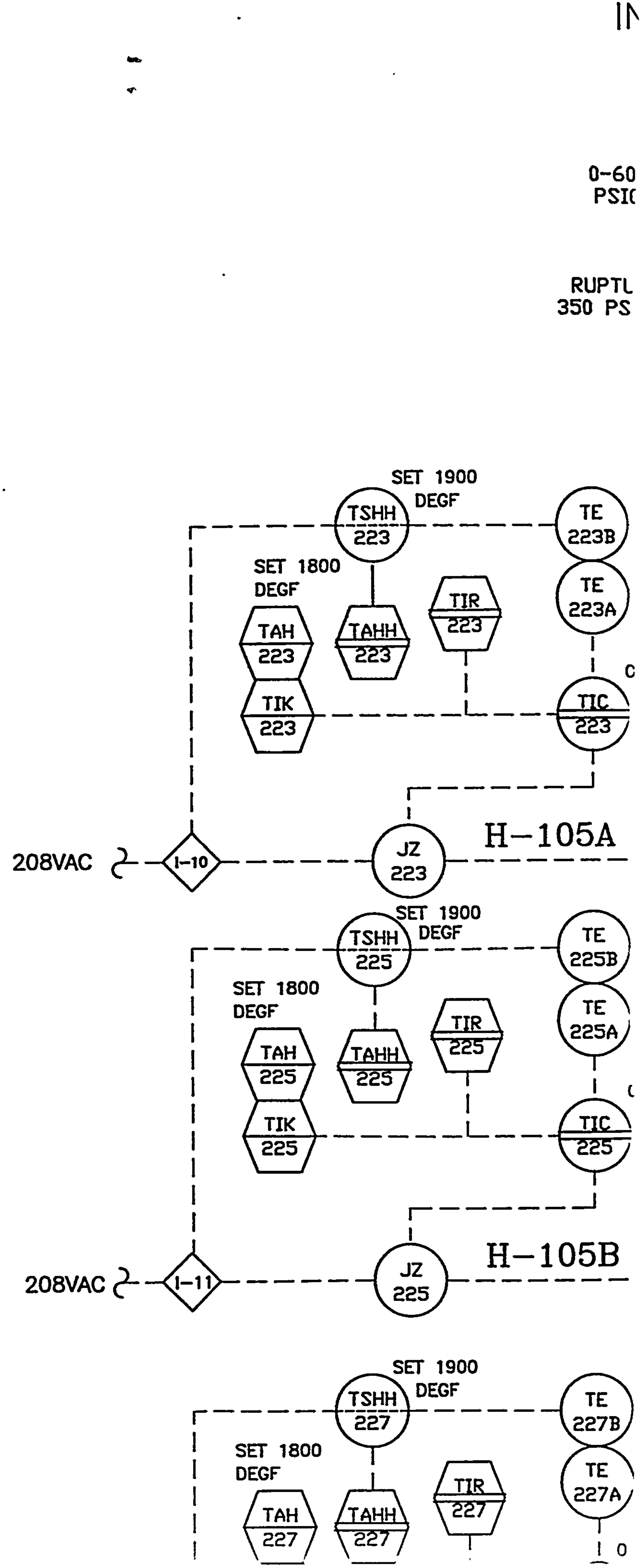



F

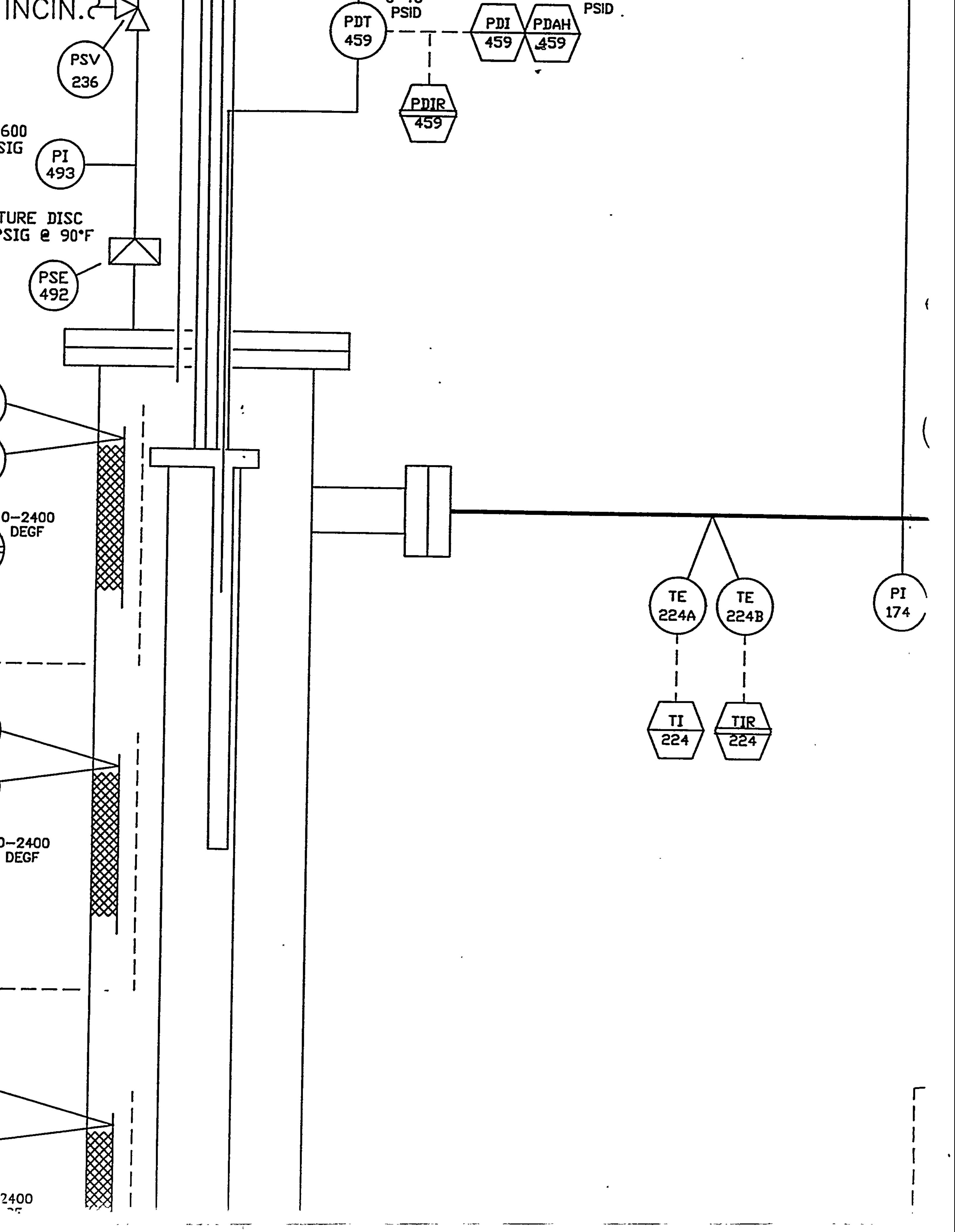


E
D
TIR
319
TE
319
TIR
317
TE
317
TIR
TE
H-1
ZON
H-1C
ZONE

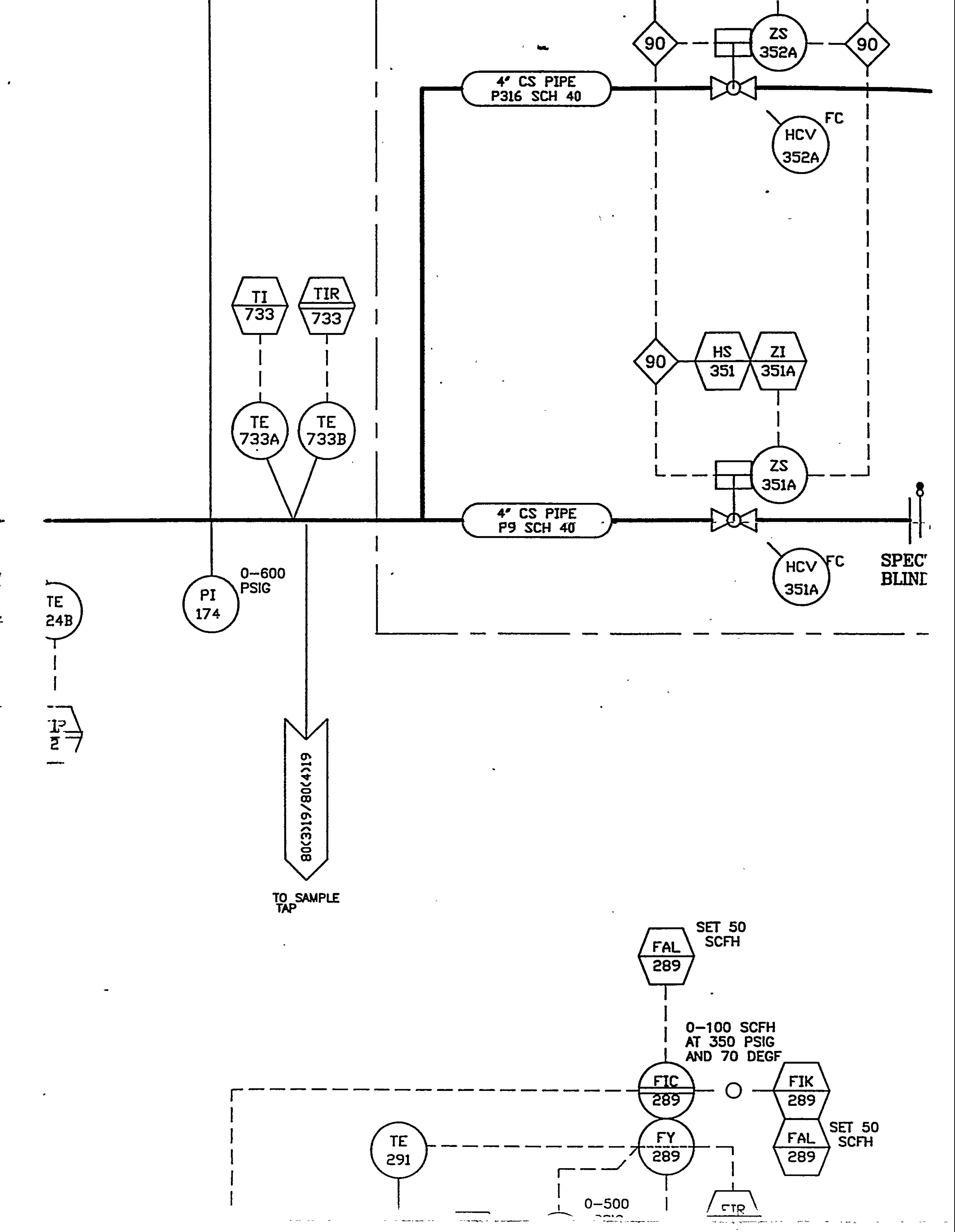

T 1125
DEGF
I-8
208VAC
ET 1125
DEGF
I-9
208VAC

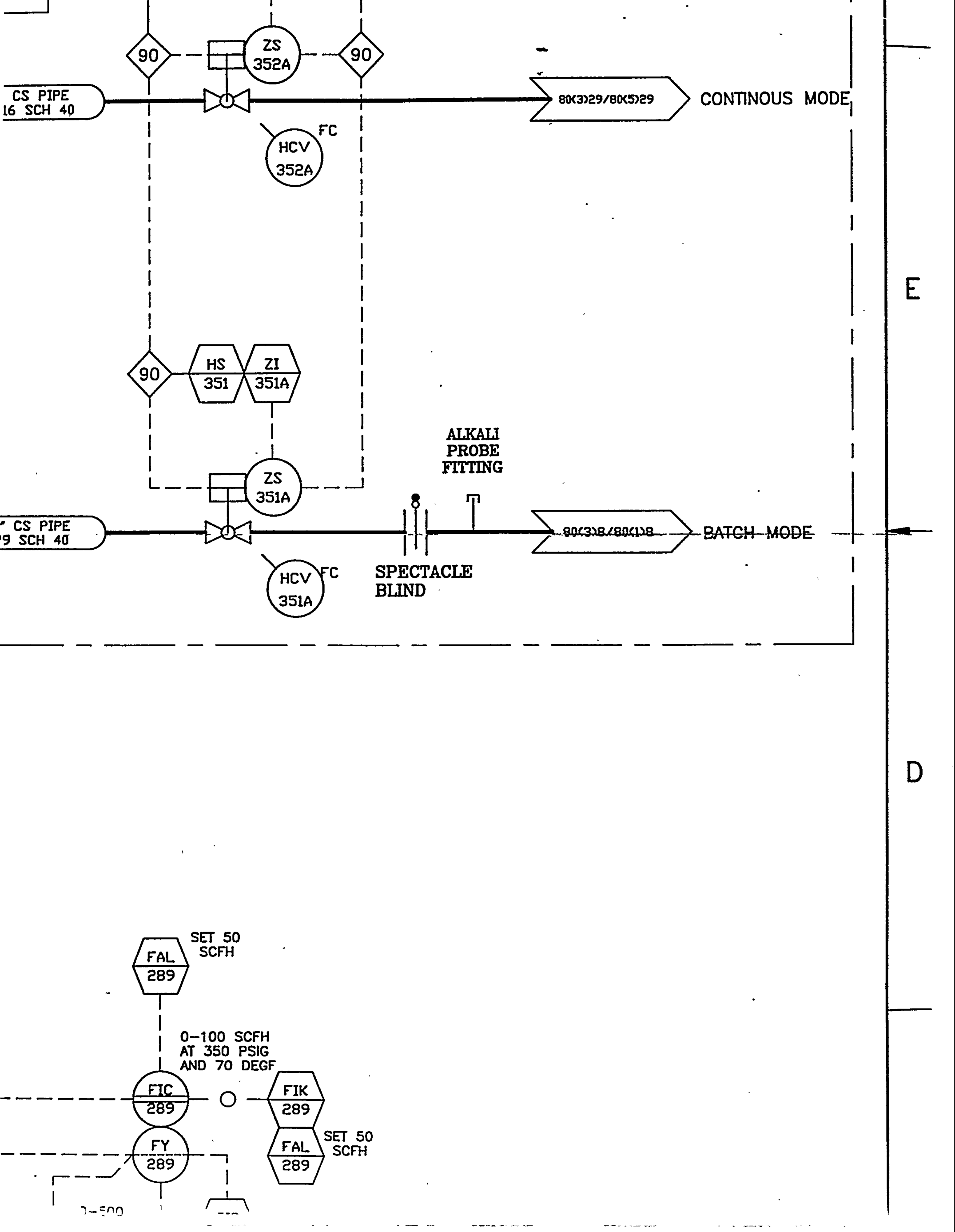


0-60
PSI(
RUPTL
350 PS
SET 1900
DEGF
TSHH
223
TE
223B
SET 1800
DEGF
TE
223A
TAH
223
TAHH
223
TIR
223
TIK
223
TIC
223
208VAC
I-10
JZ
223
H-105A
SET 1900
DEGF
TSHH
225
TE
225B
SET 1800
DEGF
TE
225A
TAH
225
TAHH
225
TIR
225
TIK
225
TIC
225
208VAC
I-11
JZ
225
H-105B
SET 1900
DEGF
TSHH
227
TE
227B
SET 1800
DEGF
TE
227A
TAH
227
TAHH
227
TIR
227

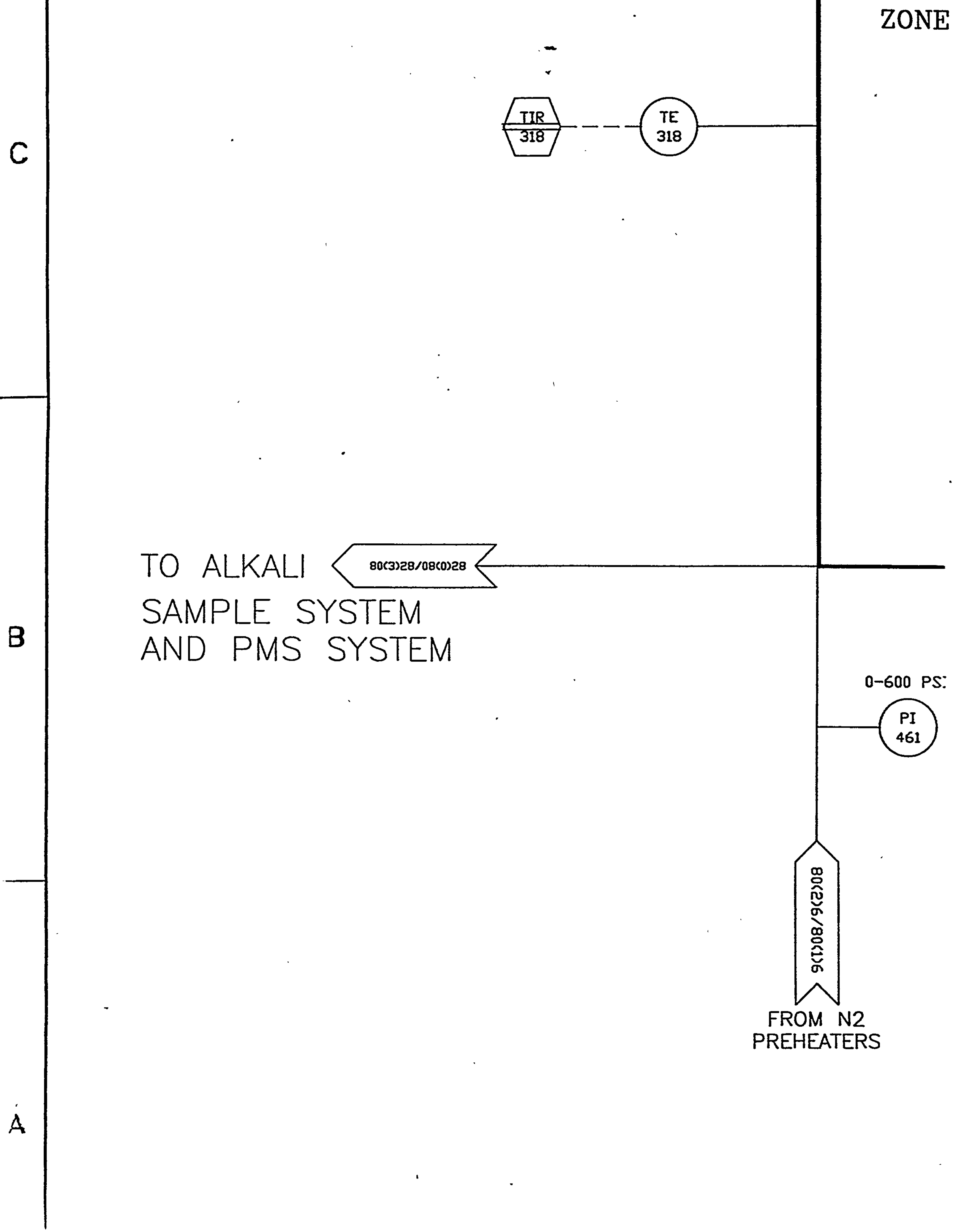


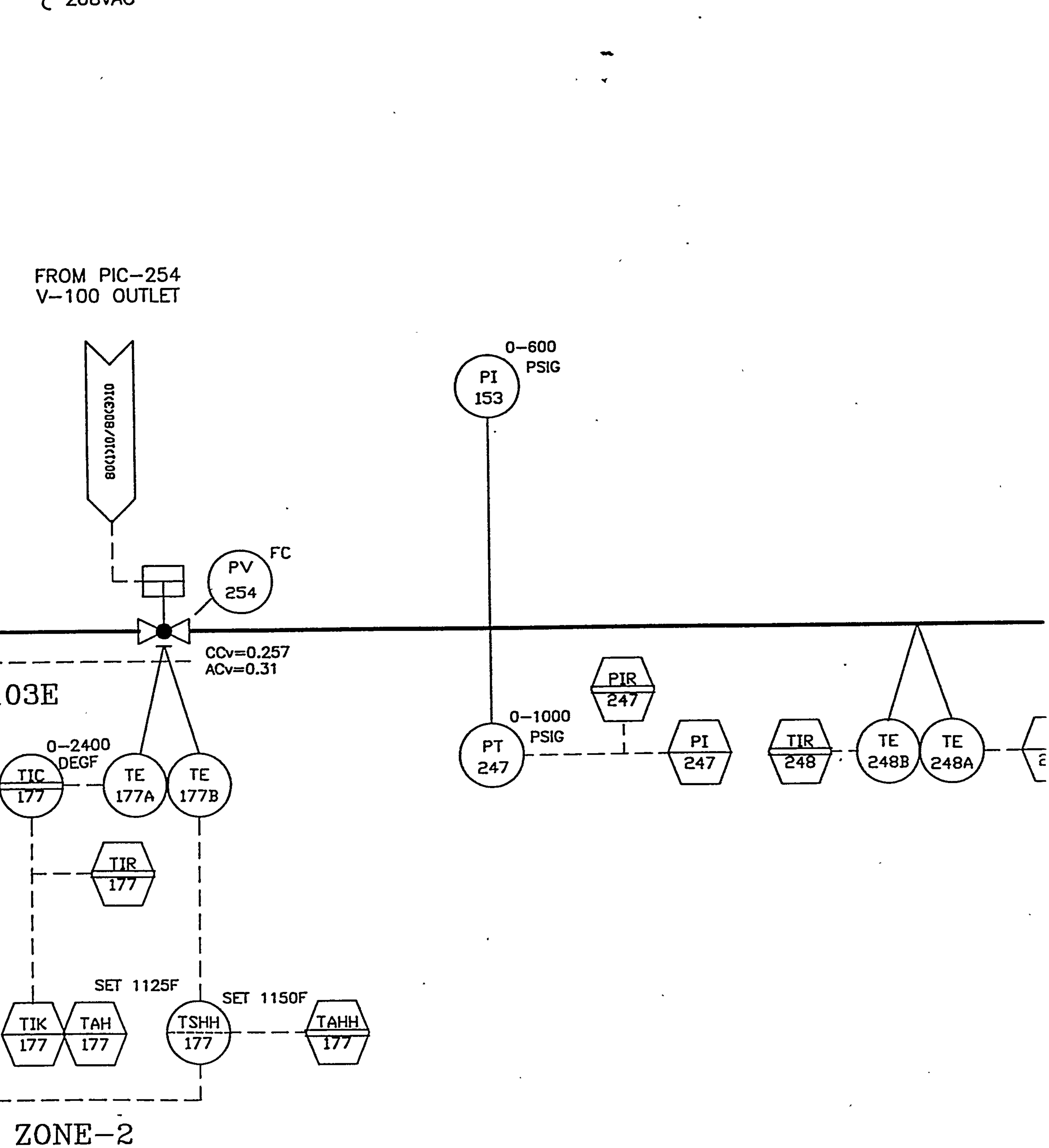
INCIN.
PSV 236
600
SIG
PI 493
TURE DISC
PSIG @ 90°F
PSE 492
PDT 459
PSID
PDI 459
PDAH 459
PSID
PDIR 459
0–2400
DEGF
0–2400
DEGF
2400
TE 224A
TE 224B
PI 174
TI 224
TIR 224

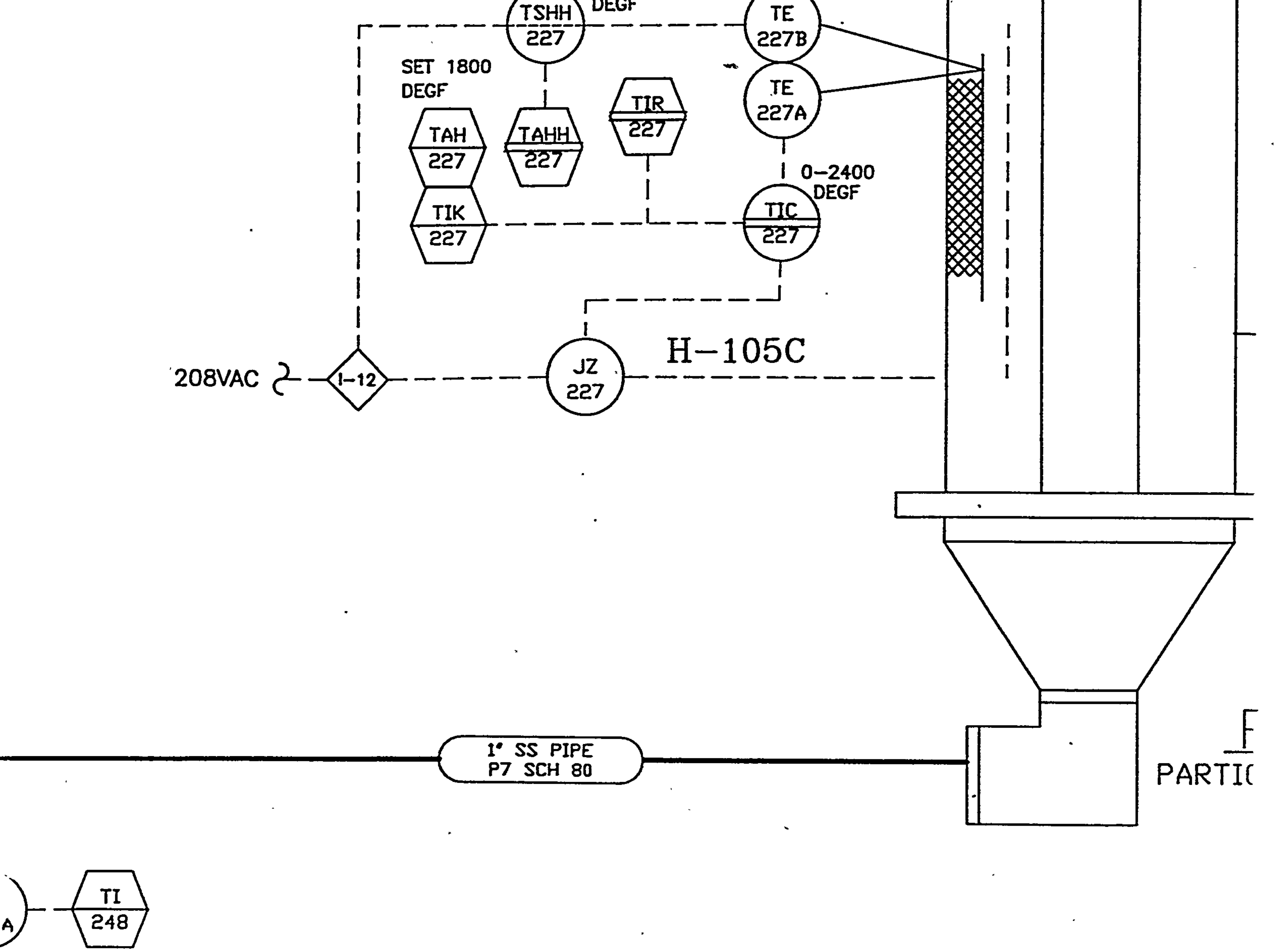

90
ZS 352A
90
4" CS PIPE P316 SCH 40
FC
HCV 352A
TI 733
TIR 733
90
HS 351
ZI 351A
TE 733A
TE 733B
ZS 351A
4" CS PIPE P9 SCH 40
HCV 351A
FC
SPEC
BLIND
TE 24B
PI 174
0–600 PSIG
TO SAMPLE TAP
FAL 289
SET 50 SCFH
0–100 SCFH AT 350 PSIG AND 70 DEGF
FIC 289
FIK 289
FAL 289
SET 50 SCFH
TE 291
FY 289
0–500



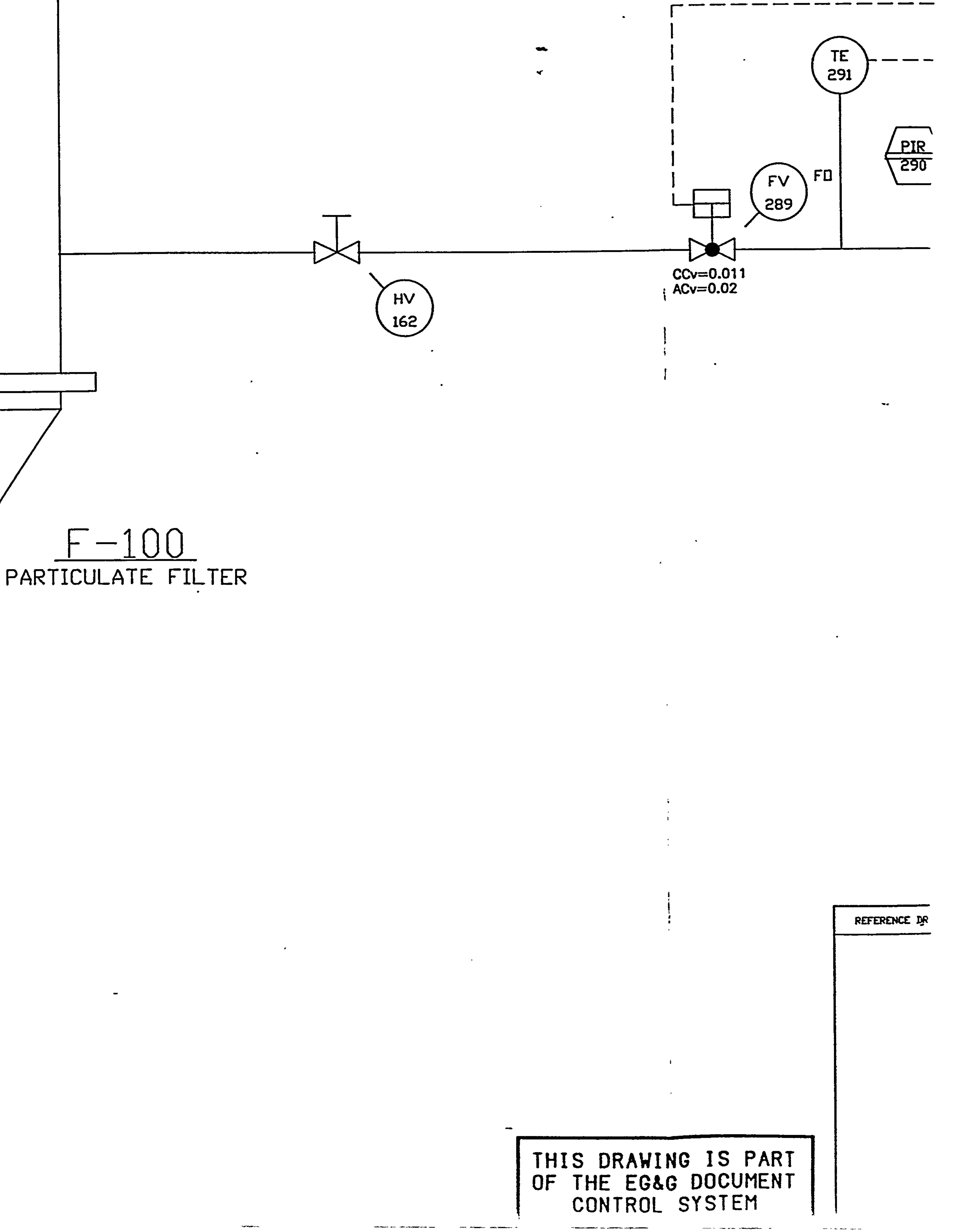
90
ZS 352A
90
CS PIPE
16 SCH 40
80(3)29/80(5)29
CONTINOUS MODE
FC
HCV 352A
E
90
HS 351
ZI 351A
ALKALI
PROBE
FITTING
ZS 351A
CS PIPE
9 SCH 40
80(3)8/80(1)8
BATCH MODE
HCV 351A
FC
SPECTACLE
BLIND
D
SET 50
SCFH
FAL 289
0-100 SCFH
AT 350 PSIG
AND 70 DEGF
FIC 289
FIK 289
FY 289
FAL 289
SET 50
SCFH

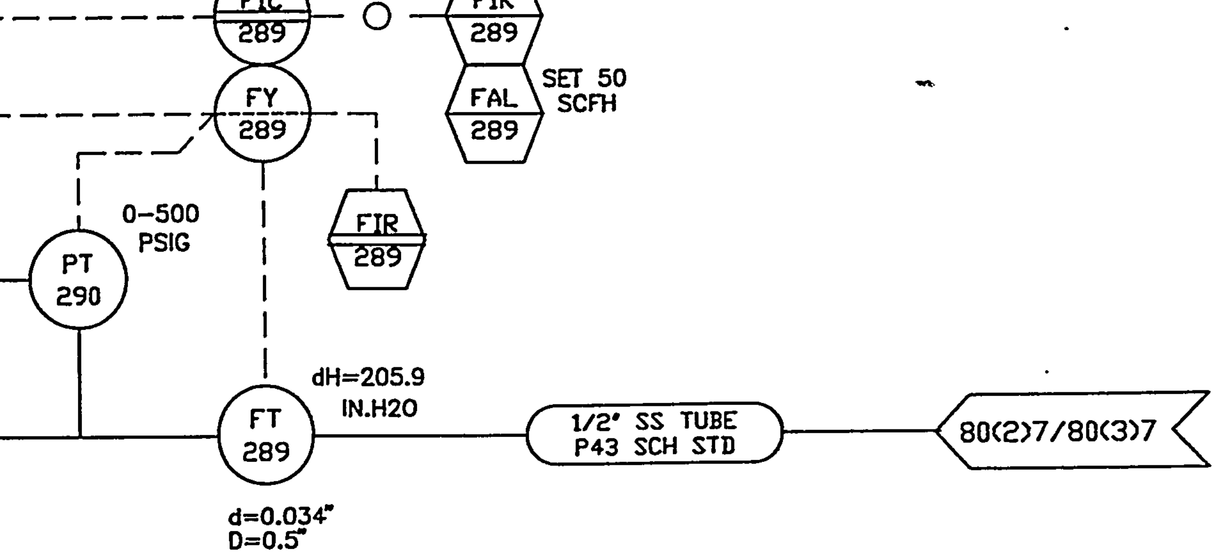

ZONE
C
B
A
TIR
318
TE
318
TO ALKALI
SAMPLE SYSTEM
AND PMS SYSTEM
80(3)28/08(0)28
0-600 PS:
PI
461
80(2)6/80(1)6
FROM N2
PREHEATERS


FROM PIC-254
V-100 OUTLET
PV
254
FC
CCv=0.257
ACv=0.31
.03E
0-2400
DEGF
TIC
177
TE
177A
TE
177B
TIR
177
SET 1125F
TIK
177
TAH
177
SET 1150F
TSHH
177
TAHH
177
ZONE-2
0-600
PSIG
PI
153
0-1000
PSIG
PT
247
PIR
247
PI
247
TIR
248
TE
248B
TE
248A



TSHH
227
DEGF
TE
227B
SET 1800
DEGF
TE
227A
TIR
227
TAH
227
TAHH
227
0–2400
DEGF
TIK
227
TIC
227
JZ
227
H–105C
208VAC
I–12
1" SS PIPE
P7 SCH 80
PARTI(
TI
248


TE
291
PIR
290
FV
289
FO
HV
162
CCv=0.011
ACv=0.02
F-100
PARTICULATE FILTER
REFERENCE DR
THIS DRAWING IS PART
OF THE EG&G DOCUMENT
CONTROL SYSTEM




C

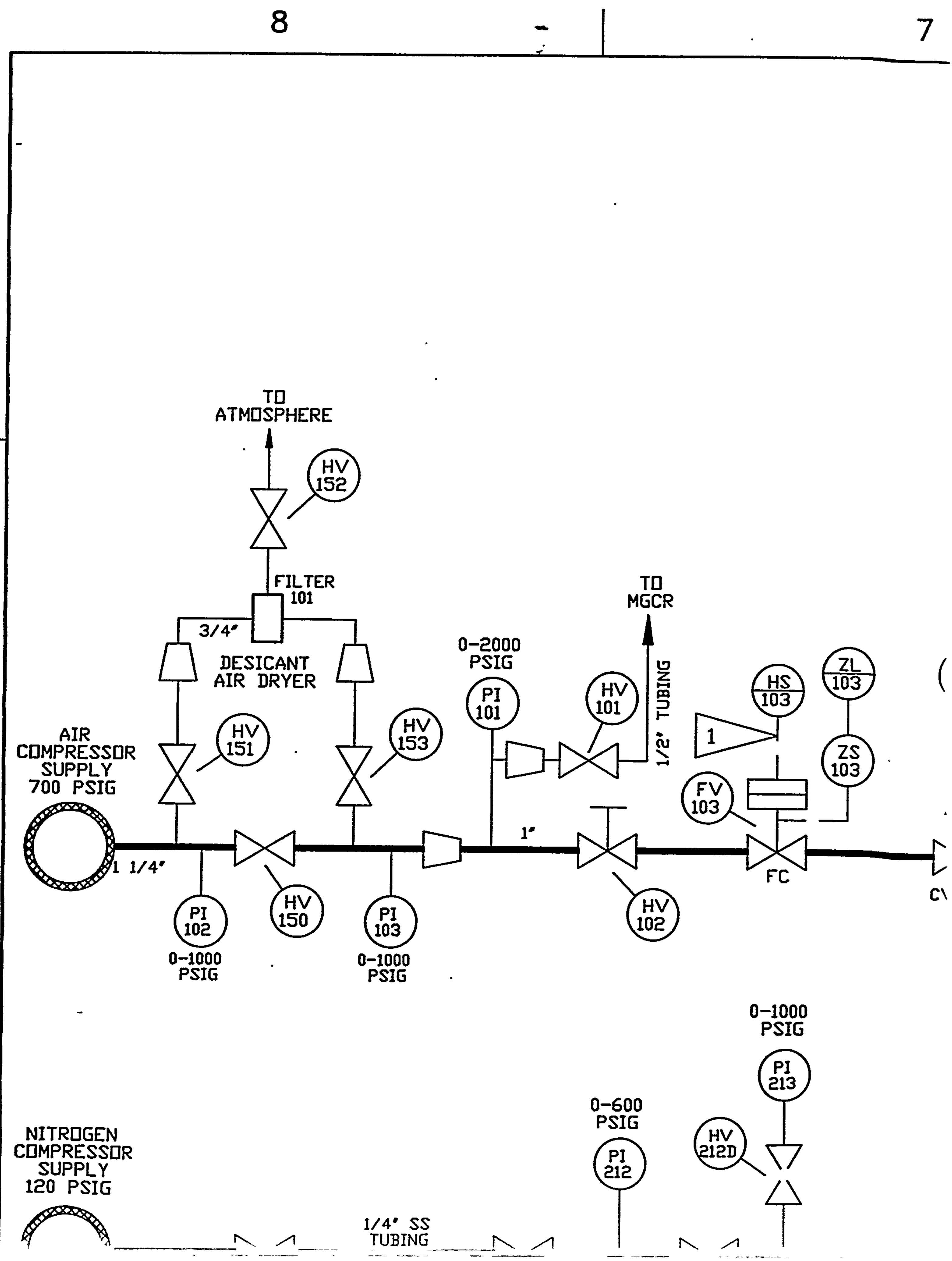
NOTES:

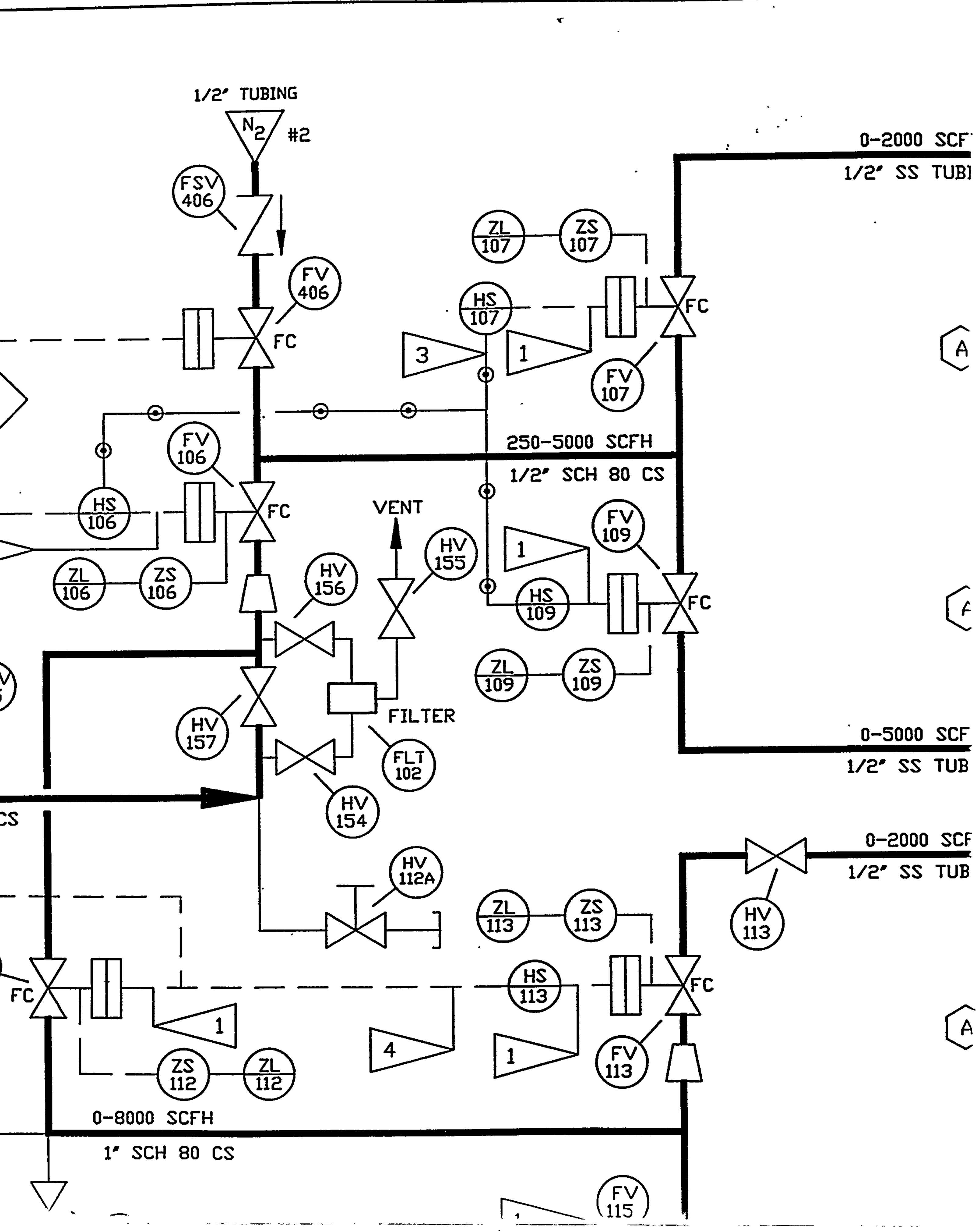
1. ALL IMPULSE LINES ARE 3/8"SS UNLESS OTHERWISE NOTED.
2.
3.

DWG NO STD920080.07 SH 3

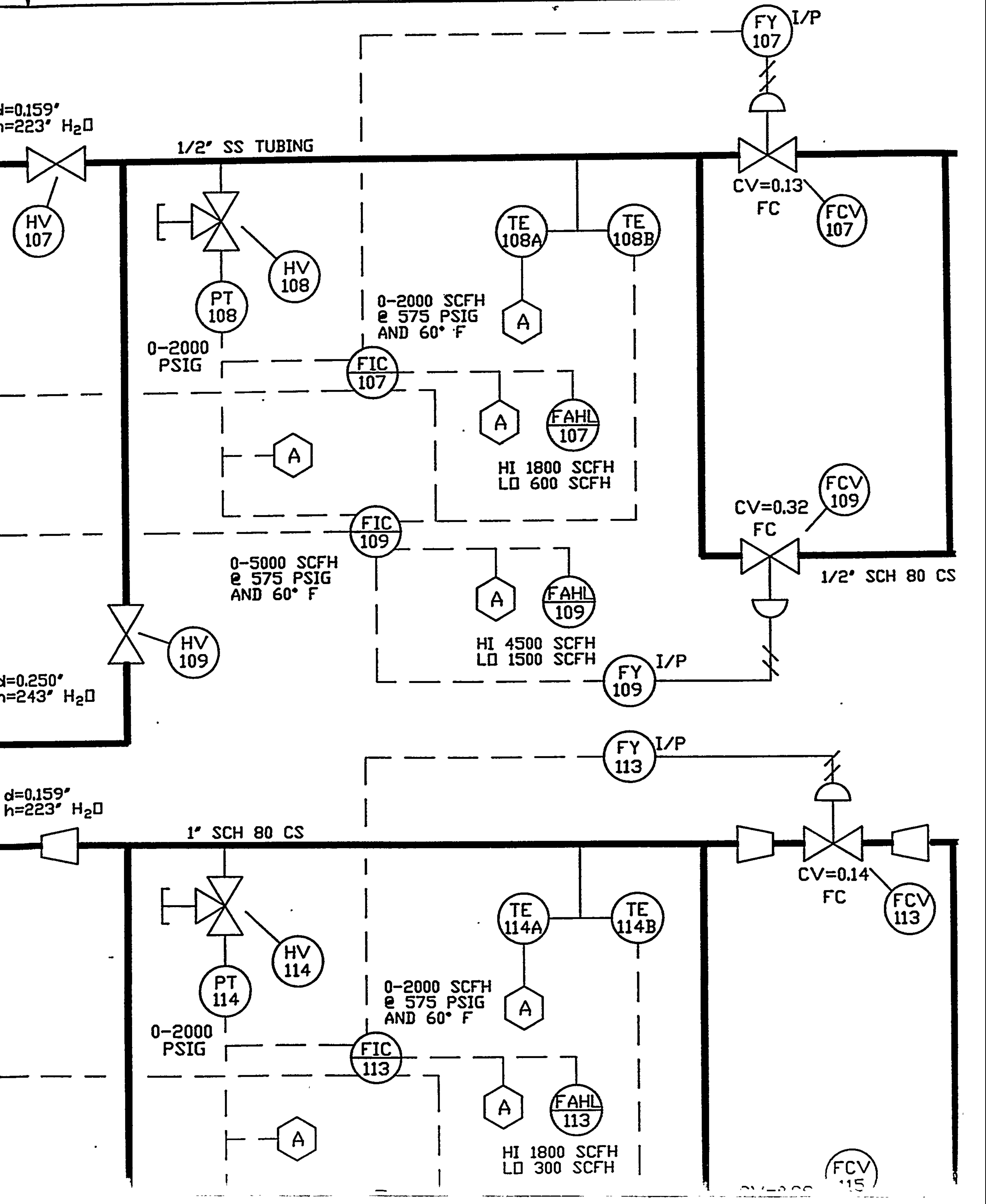
A

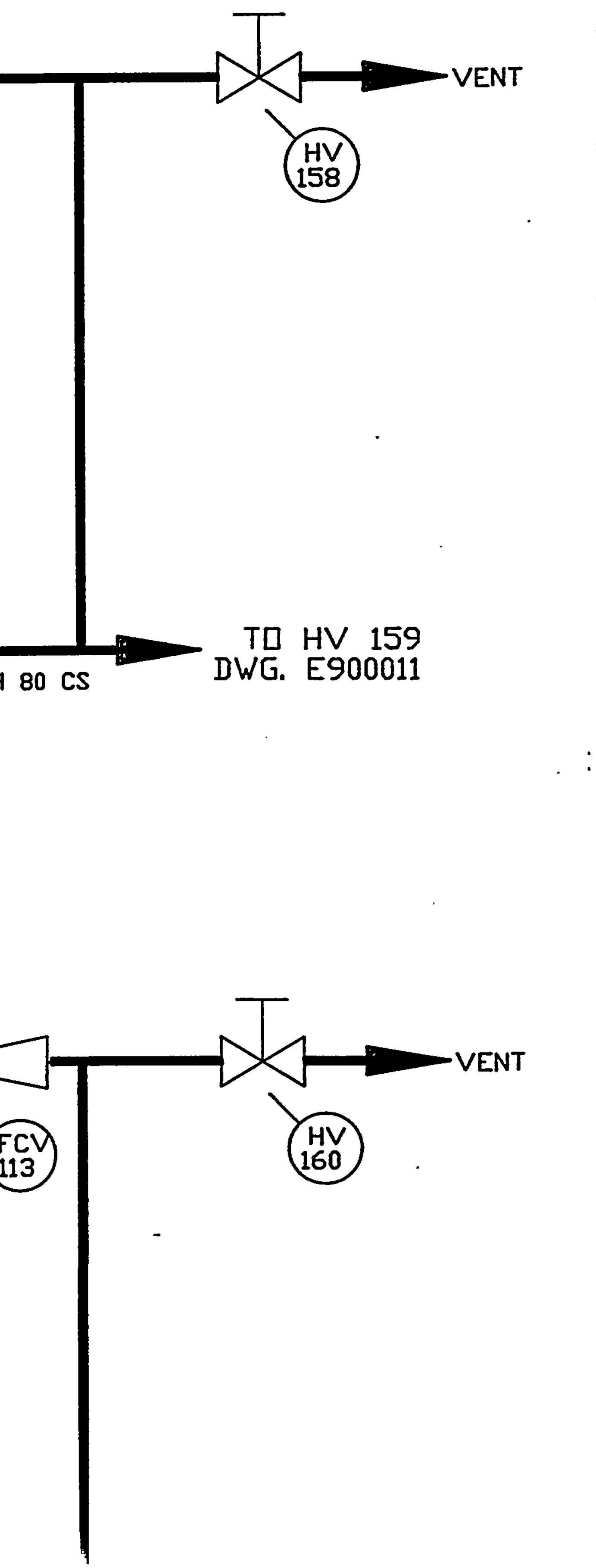
| | | | |
|---|---|---|---|
| DRAFTER Jimmy Thorton | DATE 10/28/93 | United States Department of Energy<br>MORGANTOWN ENERGY TECHNOLOGY CENTER<br>Morgantown, WV | |
| PROJECT ENGINEER John Rockey | DATE 11/2/93 | | |
| REQUESTOR John Rockey | DATE 11/2/93 | | |
| BRANCH MANAGER Larry Strickland | DATE 11/2/93 | TITLE: B-12 ADVANCED GASIFICATION FACILITY MODULAR GAS CLEANUP RIG (MGCR) PROCESS AND INSTRUMENTATION DRAWING (P&ID3) GAS TRANSPORT SYSTEM | |
| ES&H | DATE | | |
| DOE WJA John Rotunda | DATE 10/28/93 | | |
| | DATE | SIZE E / FSCM NO / DWG NO STD920080.07 | REV 7 |
| | DATE | | |


8
7
TO ATMOSPHERE
HV 152
FILTER 101
3/4"
DESICANT AIR DRYER
HV 151
HV 153
AIR COMPRESSOR SUPPLY 700 PSIG
1 1/4"
PI 102
0-1000 PSIG
HV 150
PI 103
0-1000 PSIG
0-2000 PSIG
PI 101
1"
HV 101
TO MGCR
1/2" TUBING
HV 102
HS 103
ZL 103
ZS 103
FV 103
1
FC
0-1000 PSIG
PI 213
HV 212D
0-600 PSIG
PI 212
NITROGEN COMPRESSOR SUPPLY 120 PSIG
1/4" SS TUBING



1/2" TUBING
N2
#2
FSV 406
FV 406
FC
0-2000 SCF
1/2" SS TUB
ZL 107
ZS 107
HS 107
3
1
FV 107
250-5000 SCFH
1/2" SCH 80 CS
FV 106
HS 106
ZL 106
ZS 106
VENT
HV 155
HV 156
FV 109
HS 109
ZL 109
ZS 109
FILTER
FLT 102
HV 157
HV 154
0-5000 SCF
CS
HV 112A
ZL 113
ZS 113
HV 113
HS 113
4
FV 113
ZS 112
ZL 112
0-8000 SCFH
1" SCH 80 CS
FV 115


d=0.159"
h=223" H2O
1/2" SS TUBING
HV 107
HV 108
PT 108
0-2000 PSIG
FY 107
I/P
CV=0.13
FC
FCV 107
TE 108A
TE 108B
0-2000 SCFH
@ 575 PSIG
AND 60° F
A
FIC 107
FAHL 107
HI 1800 SCFH
LO 600 SCFH
FIC 109
0-5000 SCFH
@ 575 PSIG
AND 60° F
FAHL 109
HI 4500 SCFH
LO 1500 SCFH
CV=0.32
FC
FCV 109
1/2" SCH 80 CS
HV 109
d=0.250"
h=243" H2O
FY 109
FY 113
d=0.159"
h=223" H2O
1" SCH 80 CS
HV 114
PT 114
0-2000 PSIG
TE 114A
TE 114B
0-2000 SCFH
@ 575 PSIG
AND 60° F
FIC 113
FAHL 113
HI 1800 SCFH
LO 300 SCFH
CV=0.14
FC
FCV 113
FCV 115




| ZONE | REV | |
|---|---|---|
| GEN | 1 | UPDATED AS PER MARKE |
| GEN | | REVISED PER MARKED F |
| E-8 | | REMOVED HV-201 & PI- |
| B-6,7 | | REROUTED LINE BETWEE |
| C-8 | | RELOCATED CAPPED LIN |
| E-6 | | ADDED STEAM SITE LIN |
| B-7,8 | | ADDED HV-402, 402A, 4( |
| DRAFTER S.P.C. | | DATE 12/10/90 CHECI |
| | | DATE |

| ZONE | REV | |
|---|---|---|
| GEN | 2 | UPDATED AS PER MARKI |
| GEN | | ADDED NEW DWG. FORM |
| GEN | | UPDATED AS PER MARK |
| GEN | | UPDATED AS PER MARK |
| B-2 | | ADDED NOTE 8 AND NC |
| C-7 | | MODIFIED FILTER #208 |
| GEN | | ISSUED FOR CUSTOMER |
| DRAFTER JIMMY SMITH | | DATE 7/17/92 CHECI GA' |
| EG&G RESPON SECT SUPV BURTON W. HARRELL | | DATE 7/20/92 EG&G |

| ZONE | REV | |
|---|---|---|
| A-1 | 3 | CHANGED DWG. TITLE |
| GEN | | UPDATED AS PER MARK |
| GEN | | ISSUED FOR CONSTRUC' |
| E-7 | | ADDED ENTRAINED BOI |
| G-7 | | "PI-104" WAS "PI-105, |
| F-7 | | "650 PSIG" ON PAHL-2 |
| D-6 | | ADDED "HS-217" TO ' |
| A-8 | | ADDED NOTE TO "HV- |
| GEN | | REVISED DESIGNATION BEHIND PANEL" |
| DRAFTER GARY J. KULCHOCK | | DATE 11/18/92 CHEC |
| EG&G ES&H J. L. BUCKLEW | | DATE 11/19/92 PROJ |

| ZONE | REV | |
|---|---|---|
| GEN. | 4 | REVISED SHTR-201 T<br>REMOVED ALL NUMBE<br>MODIFIED VARIOUS S<br>ADDED FT-406, PT-4 |
| DRAFTER GARY J. KULCHOCK | | DATE 4/5/93 CHEC |
| EG&G ES&H J. L. BUCKLEW | | DATE 4/7/93 PROJ |

| ZONE | REV | |
|---|---|---|
| GEN. | 5 | ADDED NOTE 10; RE<br>REVISED LINETYPE D<br>ADDED "#2" TO $N_2$, 2<br>PAHL-214, 700 PSIG<br>ADDED FSV-412, FV-<br>ISSUED FOR CONSTRU |
| DRAFTER Gary Kulchock | | DATE 9/10/93 CHEC |
| EG&G ES&H Larry Bucklew | | DATE 9/17/93 PROJ |

| ZONE | REV | |
|---|---|---|
| GEN | 6 | EXTENSIVE CHANGES<br>ISSUED FOR CONSTRUC |
| DRAFTER [signature] | | DATE 10/7/94 CHEC S. |
| EG&G ES&H [signature] | | DATE 10-11-94 PROJ |

2 | 1

# REVISION

| NE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| EN | | UPDATED AS PER MARKED PRINT | 4/25/90 |
| EN<br>-8<br>5,7<br>-8<br>-6<br>7,8 | 1 | REVISED PER MARKED PRINT<br>REMOVED HV-201 & PI-201<br>REROUTED LINE BETWEEN HV-480 & PCV-308<br>RELOCATED CAPPED LINE<br>ADDED STEAM SITE LINE, HV & CV<br>ADDED HV-402, 402A, 403A & 404 | 10/11/90 |

| TER | DATE | CHECKER | DATE | PROJECT ENGINEER | DATE | | DATE |
|---|---|---|---|---|---|---|---|
| S.P.C. | 12/10/90 | G.J.K. | 12/10/90 | J.P.K. | 2/13/91 | | |
| | DATE | | DATE | | DATE | | DATE |

| NE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| EN | | UPDATED AS PER MARKED PRINT WITH W.O. #68547 | 10/3/91 |
| EN<br>EN | 2 | ADDED NEW DWG. FORMAT<br>UPDATED AS PER MARKED PRINT WITH W.O. #70756 | 1/10/92 |
| EN | | UPDATED AS PER MARKED PRINT WITH WORK PLAN | 3/6/92 |
| -2<br>-7<br>EN | | ADDED NOTE 8 AND NOTE DESIGNATIONS<br>MODIFIED FILTER #208 SYMBOL<br>ISSUED FOR CUSTOMER REVIEW AND COMMENT | 7/17/92 |

| TER | DATE | CHECKER | DATE | EG&G RESPON ENGINEER | DATE | EG&G REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| JIMMY SMITH | 7/17/92 | GARY J. KULCHOCK | 7/17/92 | JAY RUTTEN | 7/17/92 | D. LUNIFIELD | 7/17/92 |
| RESPON SECT SUPV<br>RTON W. HARRELL | DATE<br>7/20/92 | EG&G ES&H<br>J. L. BUCKLEW | DATE<br>7/20/92 | | DATE | | DATE |

| NE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| -1<br>EN<br>EN | 3 | CHANGED DWG. TITLE<br>UPDATED AS PER MARKED PRINT WITH WORK PLAN<br>ISSUED FOR CONSTRUCTION | 9/16/92 |
| -7<br>-7<br>-7<br>-6<br>-8<br>EN | | ADDED ENTRAINED BOILER, VALVE HV-0601A, AND TIC-201<br>"PI-104" WAS "PI-105, AND "PI-105" WAS "PI-104"<br>"650 PSIG" ON PAHL-214 WAS "500 PSIG"<br>ADDED "HS-217" TO "JC-217"<br>ADDED NOTE TO "HV-401A"<br>REVISED DESIGNATIONS ON ALL FLOW COMPUTERS FROM "MOUNTED ON PANEL" TO "MOUNTED BEHIND PANEL" | 11/16/92 |

| TER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| ARY J. KULCHOCK | 11/18/92 | S. CONKO | 11/18/92 | JAY RUTTEN | 11/19/92 | D. LUNIFIELD | 11/19/92 |
| ES&H<br>. L. BUCKLEW | DATE<br>11/19/92 | PROJECT ENGR. | DATE | BRANCH MANAGER | DATE | DOE (EOSID)<br>JOHN ROTUNDA | DATE<br>11/24/92 |

| NE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| EN. | 4 | REVISED SHTR-201 TO INCLUDE THE MAX. PRESS. AND TEMP.<br>REMOVED ALL NUMBERS FROM ADACS SYMBOLS<br>MODIFIED VARIOUS SCFH RATINGS<br>ADDED FT-406, PT-406, HV-406A, HV-406B, HV-406C, TE-406A, TE-406B, AND ASSOCIATED ADACS SYMBOLS | 4/1/93 |

| TER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| ARY J. KULCHOCK | 4/5/93 | S. CONKO | 4/5/93 | JAY RUTTEN | 4/7/93 | D. LUNIFIELD | 4/7/93 |
| ES&H<br>. L. BUCKLEW | DATE<br>4/7/93 | PROJECT ENGR.<br>JOHN ROCKEY | DATE<br>5/27/93 | BRANCH MANAGER<br>LARRY STRICKLAND | DATE<br>5/27/93 | DOE (EOSID)<br>JOHN ROTUNDA | DATE<br>5/27/93 |

| NE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| EN. | 5 | ADDED NOTE 10; REVISED BOLD LINETYPE ON YY-209, PI-207, & PI-208<br>REVISED LINETYPE ON FV-103; REVISED LINE ROUTING IN ZONE G-6<br>ADDED "#2" TO $N_2$, 2 PLACES<br>PAHL-214, 700 PSIG RATING WAS 650 PSIG<br>ADDED FSV-412, FV-412, AND ASSOCIATED PIPING<br>ISSUED FOR CONSTRUCTION | 8/24/93 |

| TER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| Gary Kulchock | 9/10/93 | S. Conko | 9/14/93 | Jay Rutten | 9/15/93 | Dave Lunifeld | 9/20/93 |
| ES&H<br>Larry Bucklew | DATE<br>9/17/93 | PROJECT ENGR.<br>John Rockey | DATE<br>9/21/93 | BRANCH MANAGER<br>Larry Shadle | DATE<br>9/21/93 | DOE (EOSID)<br>John Rotunda/WJA | DATE<br>9/20/93 |

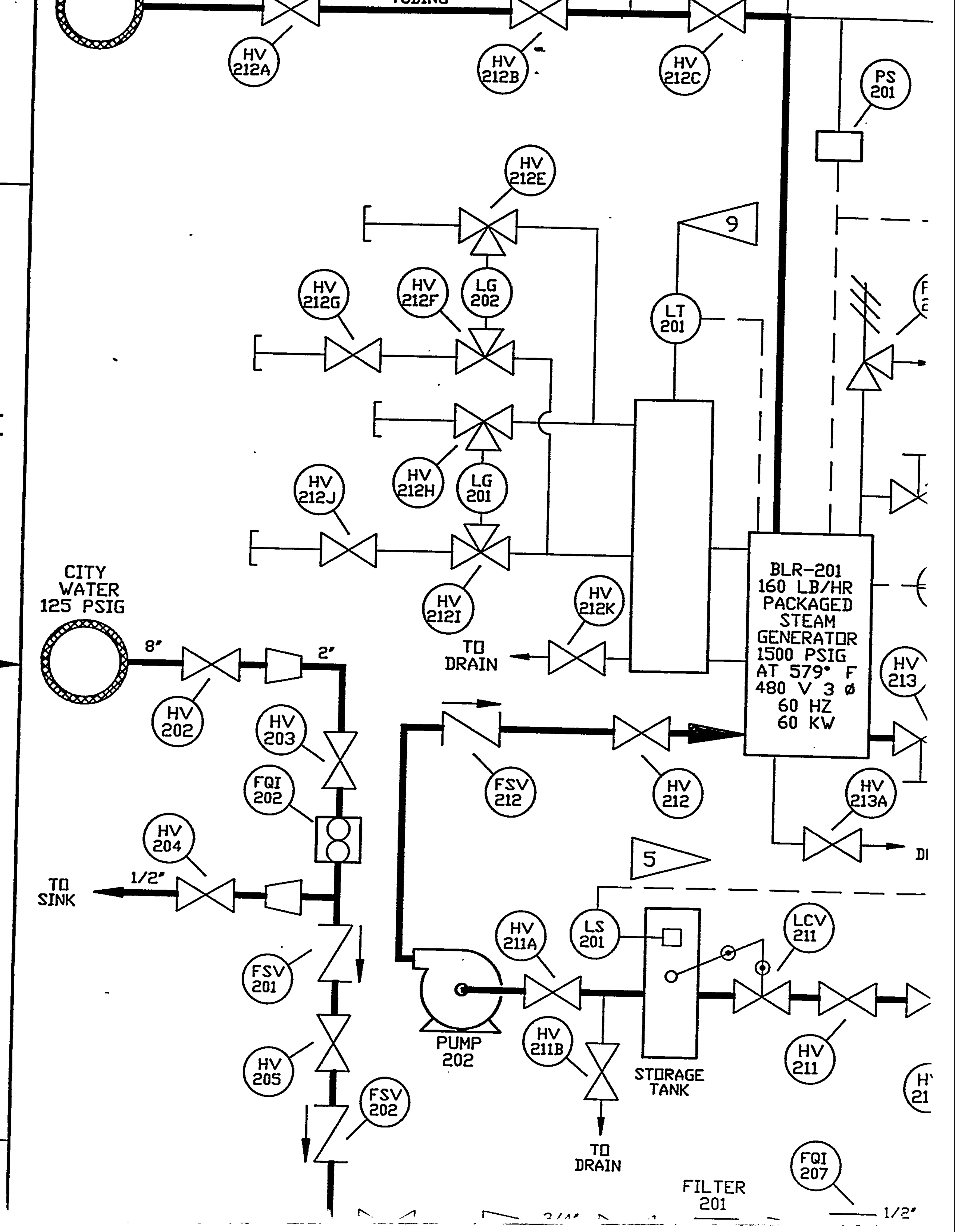
| NE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| EN | 6 | EXTENSIVE CHANGES AS PER MARKED PRINT REDLINED BY JAY RUTTEN ON 15 FEB 94.<br>ISSUED FOR CONSTRUCTION | 9/29/94 |

| TER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| Gary J Kulchock | 10/7/94 | S. Conko | 10-7-94 | Jay Rutten | 10-11-94 | D Lunifeld | 10/11/94 |
| ES&H<br>Bucklew | DATE<br>10-11-94 | PROJECT ENGR.<br>John M Rockey | DATE<br>10/13/94 | BRANCH MANAGER<br>Larry Shadle | DATE<br>10-18-94 | DOE (EOSID)<br>[illegible] | DATE<br>[illegible] |

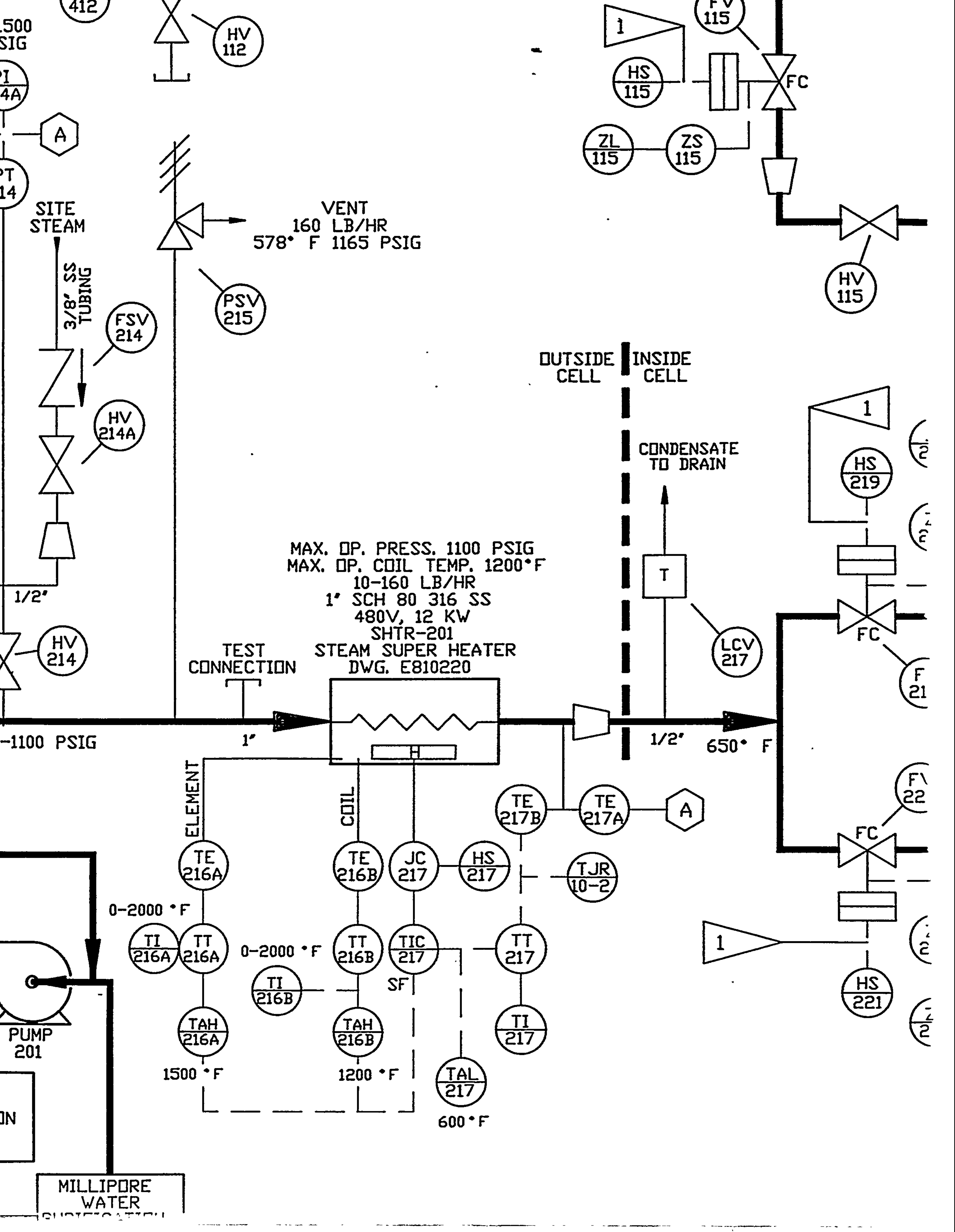
H

G

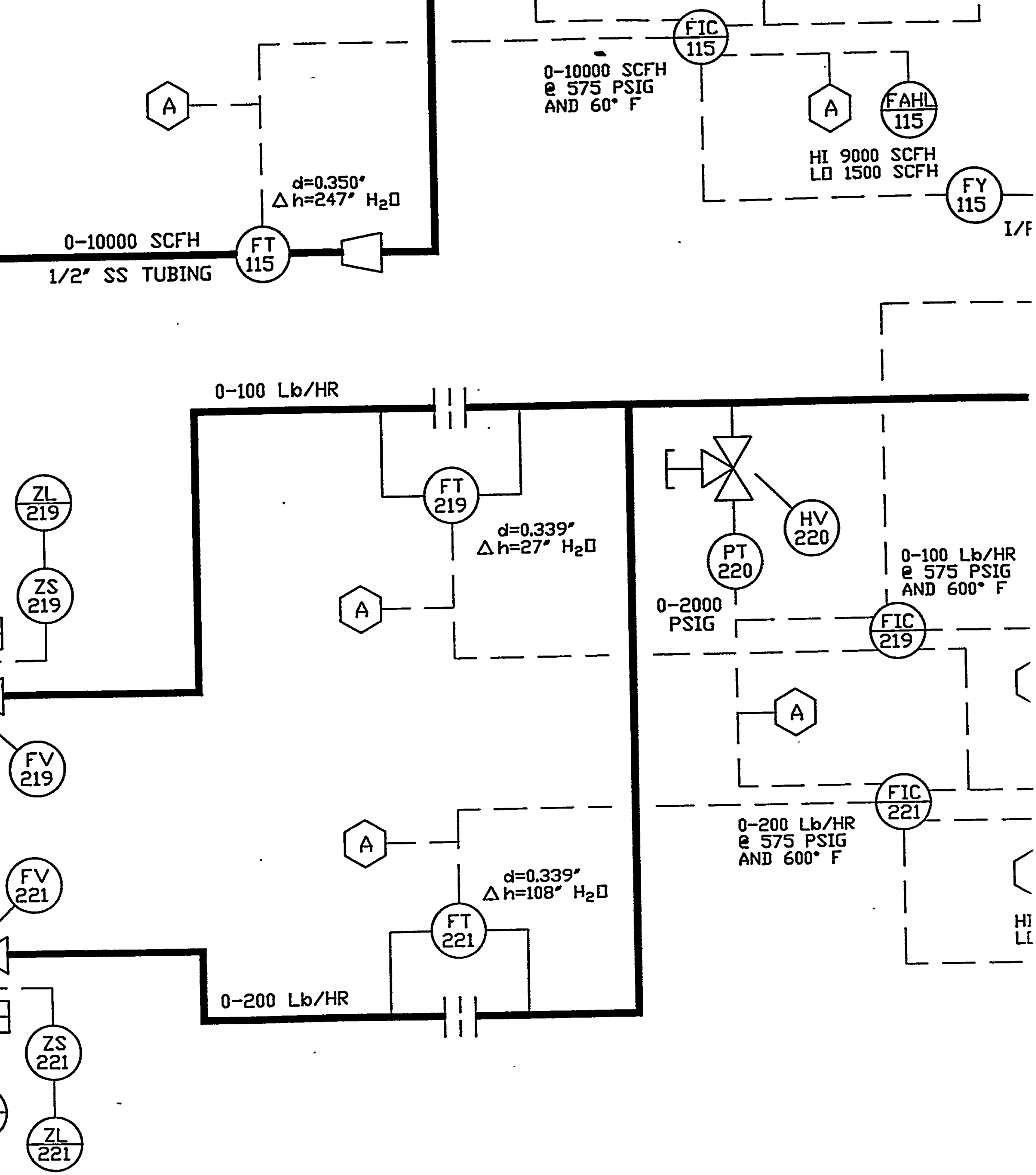
F

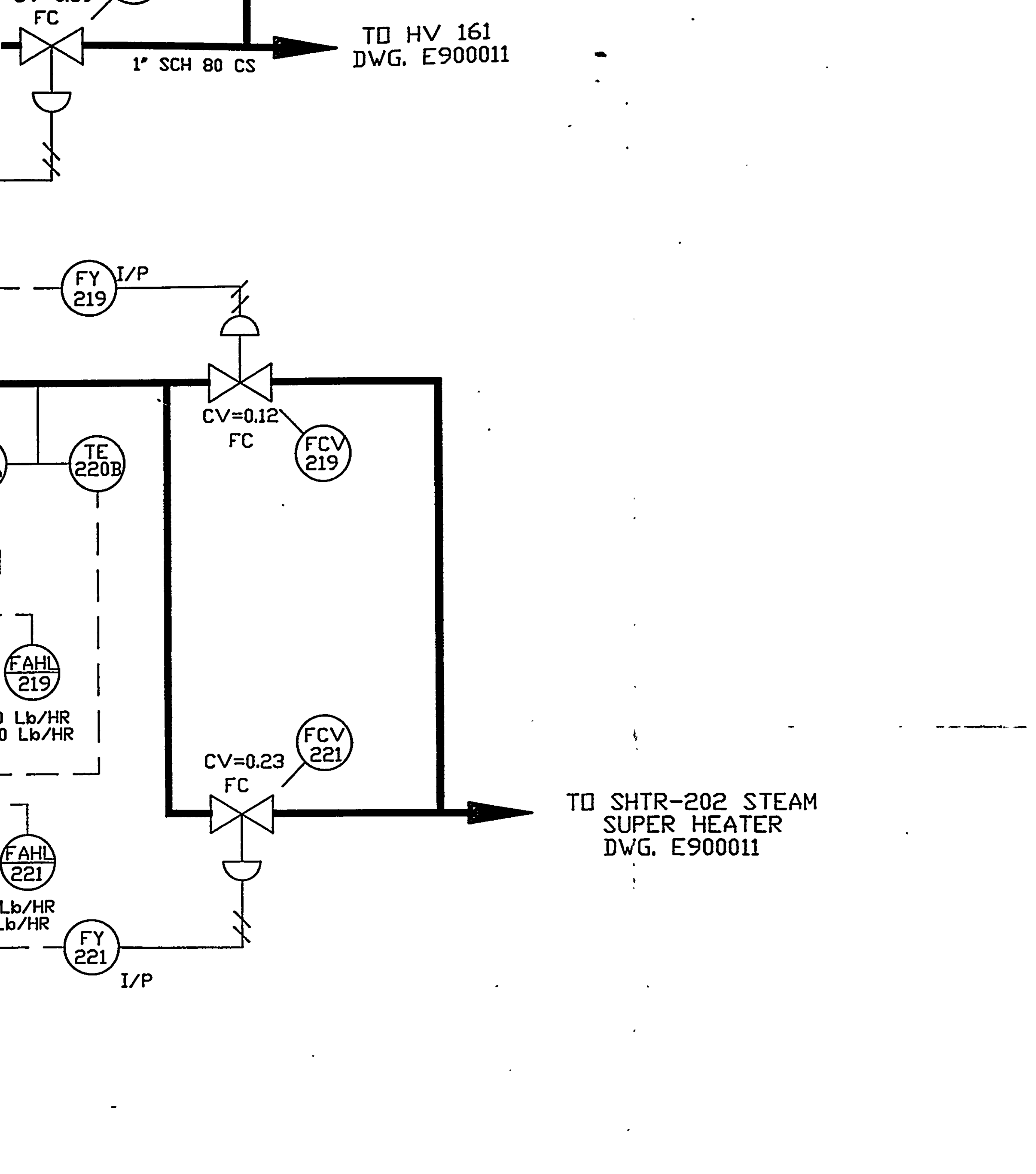


HV 212A
HV 212B
HV 212C
PS 201
HV 212E
9
HV 212G
HV 212F
LG 202
LT 201
HV 212H
LG 201
HV 212J
HV 212I
CITY WATER 125 PSIG
HV 212K
TO DRAIN
BLR-201
160 LB/HR
PACKAGED
STEAM
GENERATOR
1500 PSIG
AT 579° F
480 V 3 ø
60 HZ
60 KW
HV 213
8″
2″
HV 202
HV 203
FSV 212
HV 212
HV 213A
FQI 202
HV 204
5
TO SINK
1/2″
LS 201
LCV 211
HV 211A
FSV 201
PUMP 202
HV 211B
STORAGE TANK
HV 211
HV 205
FSV 202
TO DRAIN
FQI 207
FILTER 201
1/2″



412
1500 PSIG
HV 112
PI 214A
A
PT 214
SITE STEAM
3/8" SS TUBING
VENT
160 LB/HR
578° F 1165 PSIG
PSV 215
FSV 214
HV 214A
1/2"
HV 214
-1100 PSIG
TEST CONNECTION
1"
MAX. OP. PRESS. 1100 PSIG
MAX. OP. COIL TEMP. 1200°F
10-160 LB/HR
1" SCH 80 316 SS
480V, 12 KW
SHTR-201
STEAM SUPER HEATER
DWG. E810220
ELEMENT
COIL
TE 216A
0-2000 °F
TI 216A
TT 216A
TAH 216A
1500 °F
TE 216B
TT 216B
0-2000 °F
TI 216B
TAH 216B
1200 °F
JC 217
HS 217
TIC 217
SF
TAL 217
600 °F
TE 217B
TE 217A
A
TJR 10-2
TT 217
TI 217
OUTSIDE CELL
INSIDE CELL
CONDENSATE TO DRAIN
T
LCV 217
1/2"
650° F
PUMP 201
MILLIPORE WATER
FV 115
1
HS 115
FC
ZL 115
ZS 115
HV 115
1
HS 219
FC
FC
1
HS 221


FIC 115
0-10000 SCFH
@ 575 PSIG
AND 60° F
A
FAHL 115
HI 9000 SCFH
LO 1500 SCFH
FY 115
I/P
A
d=0.350"
$\Delta$h=247" $H_2O$
0-10000 SCFH
1/2" SS TUBING
FT 115
0-100 Lb/HR
FT 219
d=0.339"
$\Delta$h=27" $H_2O$
ZL 219
ZS 219
A
HV 220
PT 220
0-2000
PSIG
0-100 Lb/HR
@ 575 PSIG
AND 600° F
FIC 219
A
FV 219
FIC 221
0-200 Lb/HR
@ 575 PSIG
AND 600° F
A
FV 221
d=0.339"
$\Delta$h=108" $H_2O$
FT 221
0-200 Lb/HR
ZS 221
ZL 221



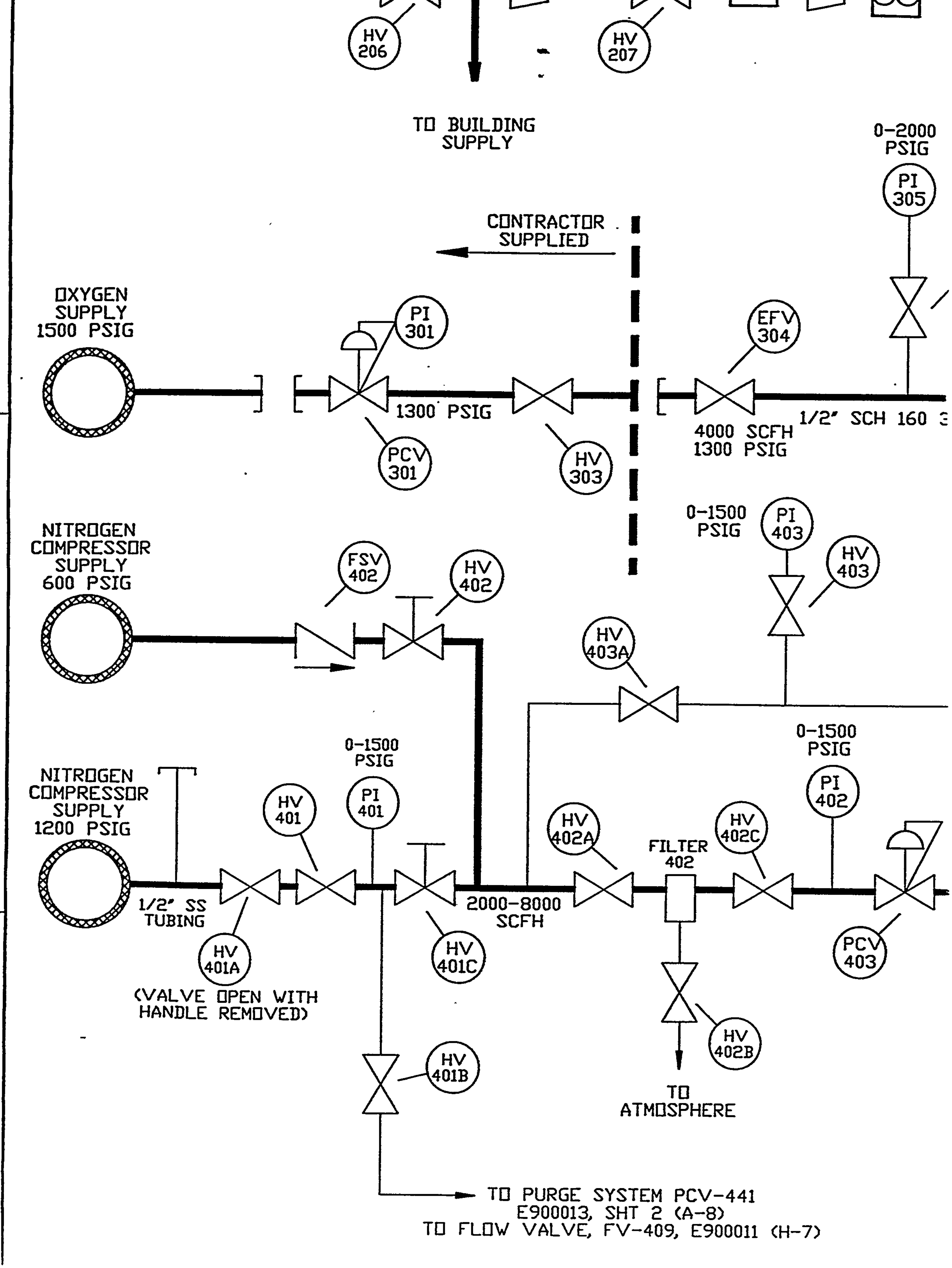
FC
TO HV 161
DWG. E900011
1" SCH 80 CS
FY
219
I/P
CV=0.12
FC
FCV
219
TE
220B
FAHL
219
Lb/HR
Lb/HR
FCV
221
CV=0.23
FC
TO SHTR-202 STEAM
SUPER HEATER
DWG. E900011
FAHL
221
Lb/HR
Lb/HR
FY
221
I/P
N

E

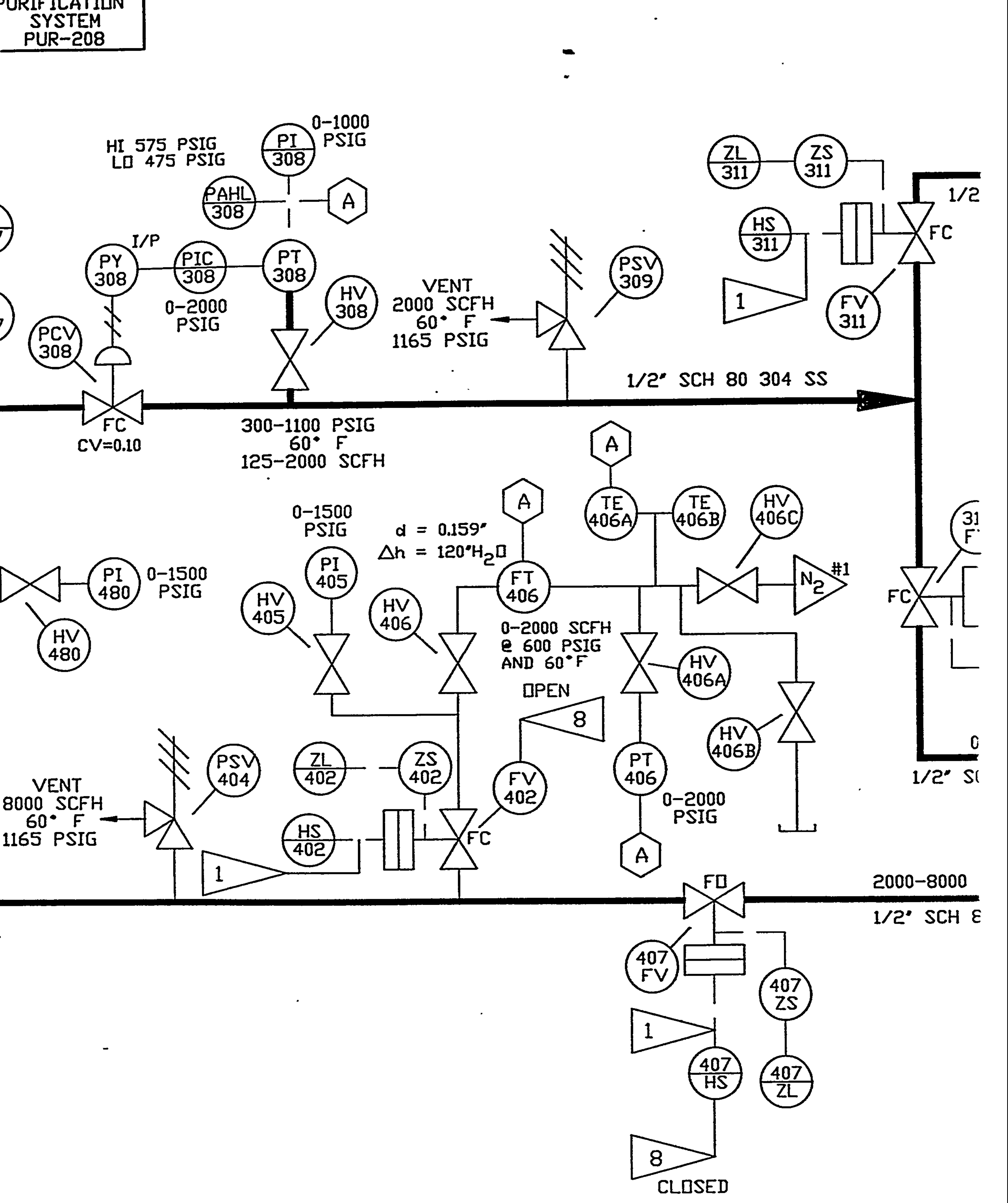
D

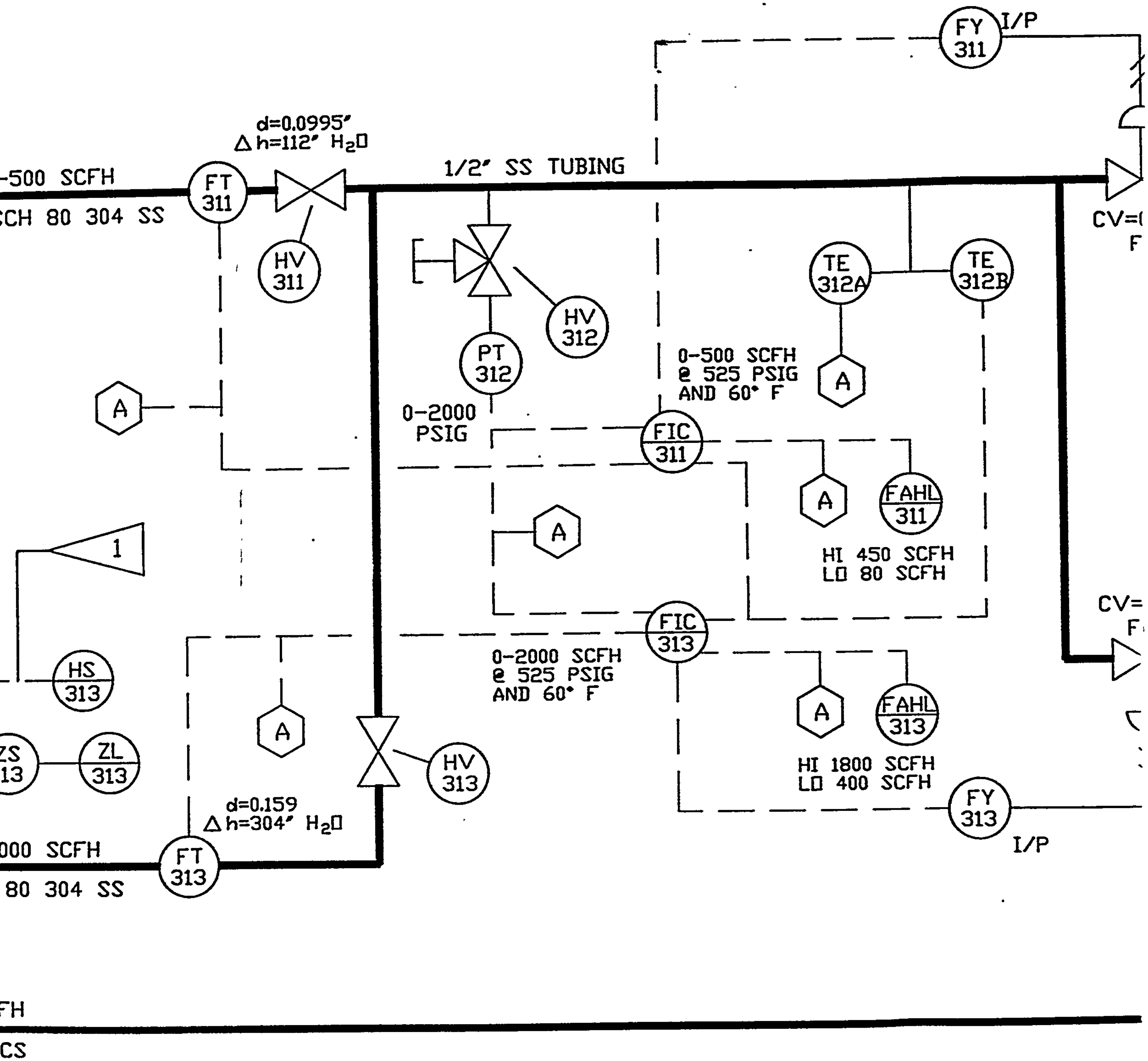
NOTES:

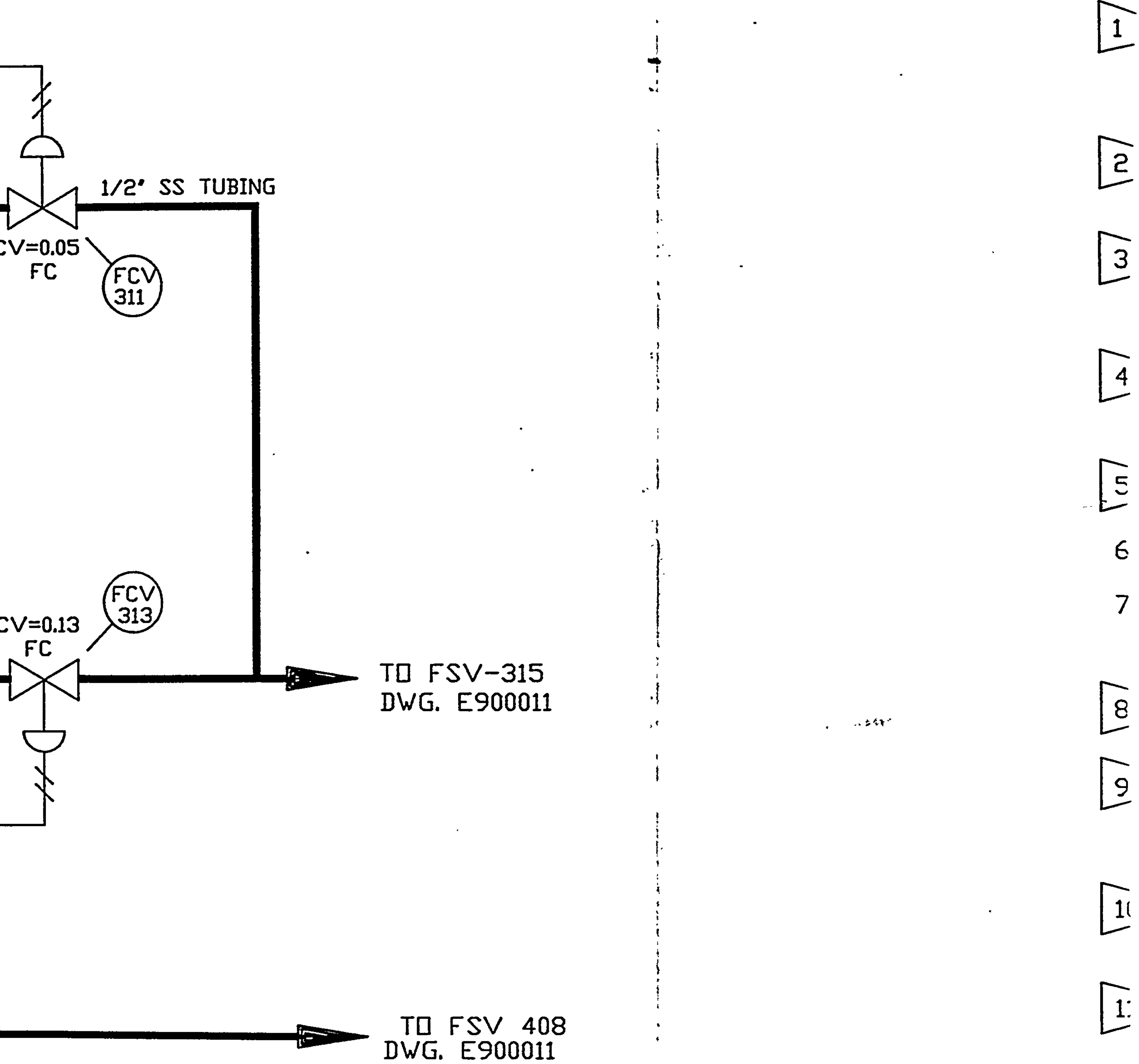
THIS FLAGGED NOTE DESIGNATES THE FOLLOWING EQUIPMENT
[illegible] SHOWN ON THIS DWG FOR CLARITY:



HV 206
HV 207
TO BUILDING SUPPLY
0-2000 PSIG
PI 305
CONTRACTOR SUPPLIED
OXYGEN SUPPLY 1500 PSIG
PI 301
EFV 304
1300 PSIG
4000 SCFH 1300 PSIG
1/2" SCH 160
PCV 301
HV 303
0-1500 PSIG
PI 403
HV 403
NITROGEN COMPRESSOR SUPPLY 600 PSIG
FSV 402
HV 402
HV 403A
0-1500 PSIG
0-1500 PSIG
NITROGEN COMPRESSOR SUPPLY 1200 PSIG
HV 401
PI 401
PI 402
HV 402A
FILTER 402
HV 402C
1/2" SS TUBING
2000-8000 SCFH
HV 401A
HV 401C
PCV 403
(VALVE OPEN WITH HANDLE REMOVED)
HV 402B
HV 401B
TO ATMOSPHERE
TO PURGE SYSTEM PCV-441
E900013, SHT 2 (A-8)
TO FLOW VALVE, FV-409, E900011 (H-7)


PURIFICATION SYSTEM PUR-208
HI 575 PSIG
LO 475 PSIG
0-1000 PSIG
PI 308
PAHL 308
A
I/P
PY 308
PIC 308
PT 308
0-2000 PSIG
HV 308
PCV 308
FC
CV=0.10
VENT
2000 SCFH
60° F
1165 PSIG
PSV 309
1/2" SCH 80 304 SS
300-1100 PSIG
60° F
125-2000 SCFH
ZL 311
ZS 311
HS 311
FV 311
1
1/2
TE 406A
TE 406B
HV 406C
0-1500 PSIG
d = 0.159"
Δh = 120"H2O
PI 405
HV 405
HV 406
FT 406
N2
#1
PI 480
0-1500 PSIG
HV 480
0-2000 SCFH
@ 600 PSIG
AND 60°F
HV 406A
OPEN
8
HV 406B
PT 406
0-2000 PSIG
VENT
8000 SCFH
60° F
1165 PSIG
PSV 404
ZL 402
ZS 402
FV 402
HS 402
FO
2000-8000
1/2" SCH
407 FV
407 ZS
407 HS
407 ZL
CLOSED


FY 311
I/P
d=0.0995"
Δh=112" H2O
-500 SCFH
FT 311
1/2" SS TUBING
CH 80 304 SS
HV 311
CV=
F
TE 312A
TE 312B
HV 312
PT 312
0-500 SCFH
@ 525 PSIG
AND 60° F
A
0-2000
PSIG
FIC 311
FAHL 311
HI 450 SCFH
LO 80 SCFH
1
CV=
F
FIC 313
HS 313
0-2000 SCFH
@ 525 PSIG
AND 60° F
FAHL 313
ZS 13
ZL 313
HV 313
HI 1800 SCFH
LO 400 SCFH
d=0.159
Δh=304" H2O
FY 313
I/P
000 SCFH
FT 313
80 304 SS
FH
CS




| REFERENCE DRAWINGS | |
|---|---|
| E900011<br>E900012<br>E900013 | DRAFTER S.<br>CHECKER A. R<br>PROJECT EN J. P. |

THIS DRAWING IS PART
OF THE EG&G DOCUMENT
CONTROL SYSTEM

WHICH IS NOT SHOWN ON THIS DWG. FOR CLARITY)

1 PANEL-MOUNTED ON/OFF STATION (HAND SWITCH WITH POSITION INDICATION LAMPS), 24 VDC RELAY, 117 VAC 60 HZ SOLENOID VALVE.

2 FV-106 & FV-406 ARE ELECTRICALLY SELECTED BY A PANEL-MOUNTED 2-POSITION TOGGLE SWITCH. ONLY ONE VALVE CAN BE OPEN AT A TIME. REF. PRINT DWG D820030 SHTS 3 & 17.

3 HS-106, HS-107, AND HS-109 ARE ELECTRICALLY INTERLOCKED. FV-106 OPENS WHEN EITHER FV-107 OR FV-109 IS OPENED. FV-107 AND FV-109 CAN BOTH BE OPEN AT THE SAME TIME.

4 HS-112, HS-113 AND HS-115 ARE ELECTRICALLY INTERLOCKED. FV-112 OPENS WHEN EITHER FV-113 OR FV-115 IS OPENED. FV-113 AND FV-115 CAN BOTH BE OPEN AT THE SAME TIME.

5 WATER LEVEL SWITCH CONTROLS RELAY TO 117 VAC 60 HZ 3-WAY SOLENOID VALVE

6 LB/HR = (lb mass / hour)

7 THIS DWG. & DWGS. E900011, E900012 & E900013 SUPERCEDES DWG. R800524 (SEE DWG. E900013 FOR NOTES, TUBING & PIPING SUMMARY).

8 DESIGNATES THE CONTROL PANEL SWITCH IS PHYSICALLY LOCKED TO PREVENT ACCIDENTAL ACTUATION.

9 BOILER WATER LEVEL IS CONTROLLED BY 3 CAPACITANCE PROBES. SHORTEST PROBE SHUTS BOILER FEED WATER PUMP OFF. MIDDLE PROBE TURNS BOILER FEED WATER PUMP ON. LONGEST PROBE SHUTS THE BOILER DOWN.

10 FV-112 & FV-412 ARE ELECTRICALLY SELECTED BY A PANEL-MOUNTED 2-POSITION TOGGLE SWITCH. ONLY ONE VALVE CAN BE OPEN AT A TIME.

11 "NOTE REMOVED"

C

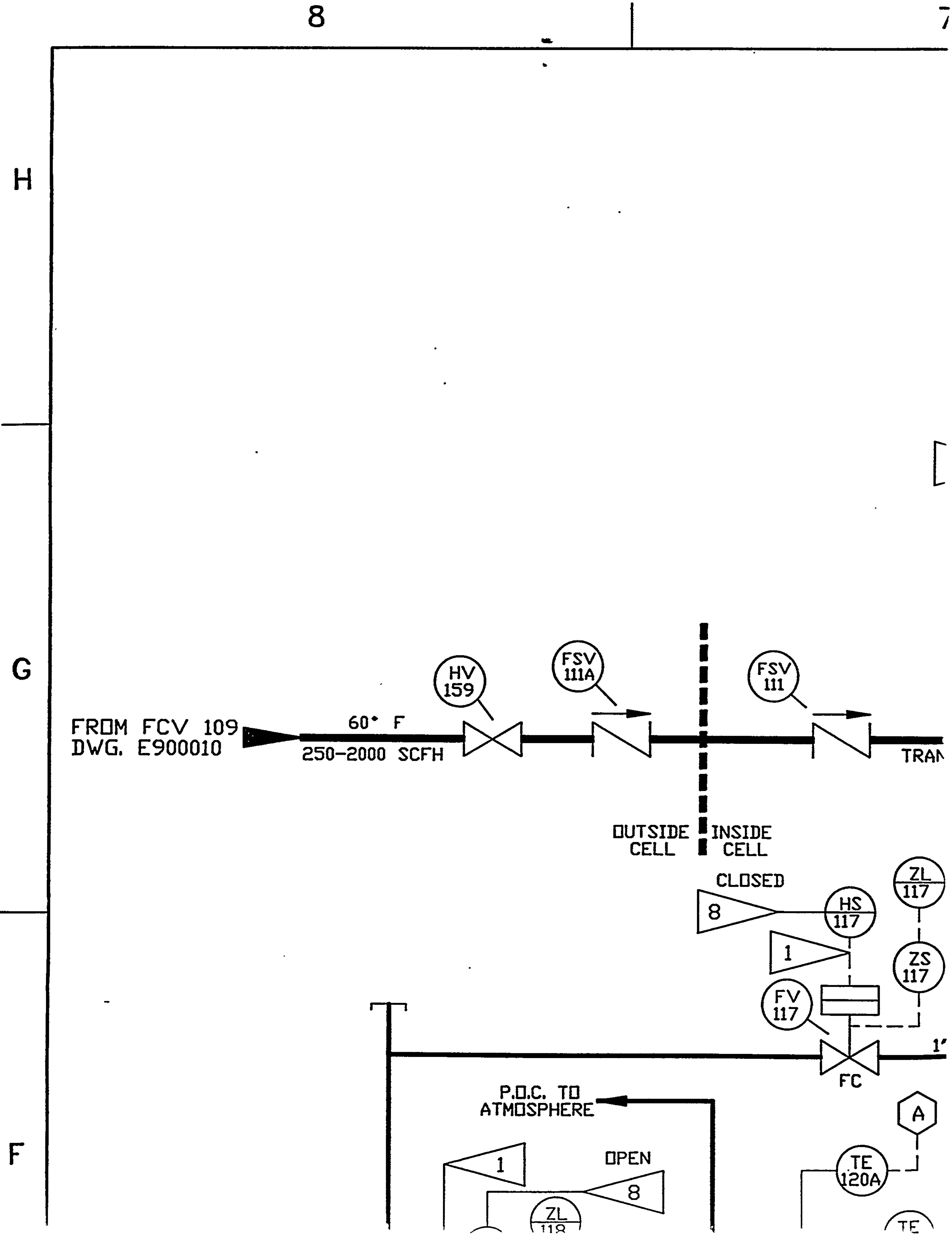
E900010

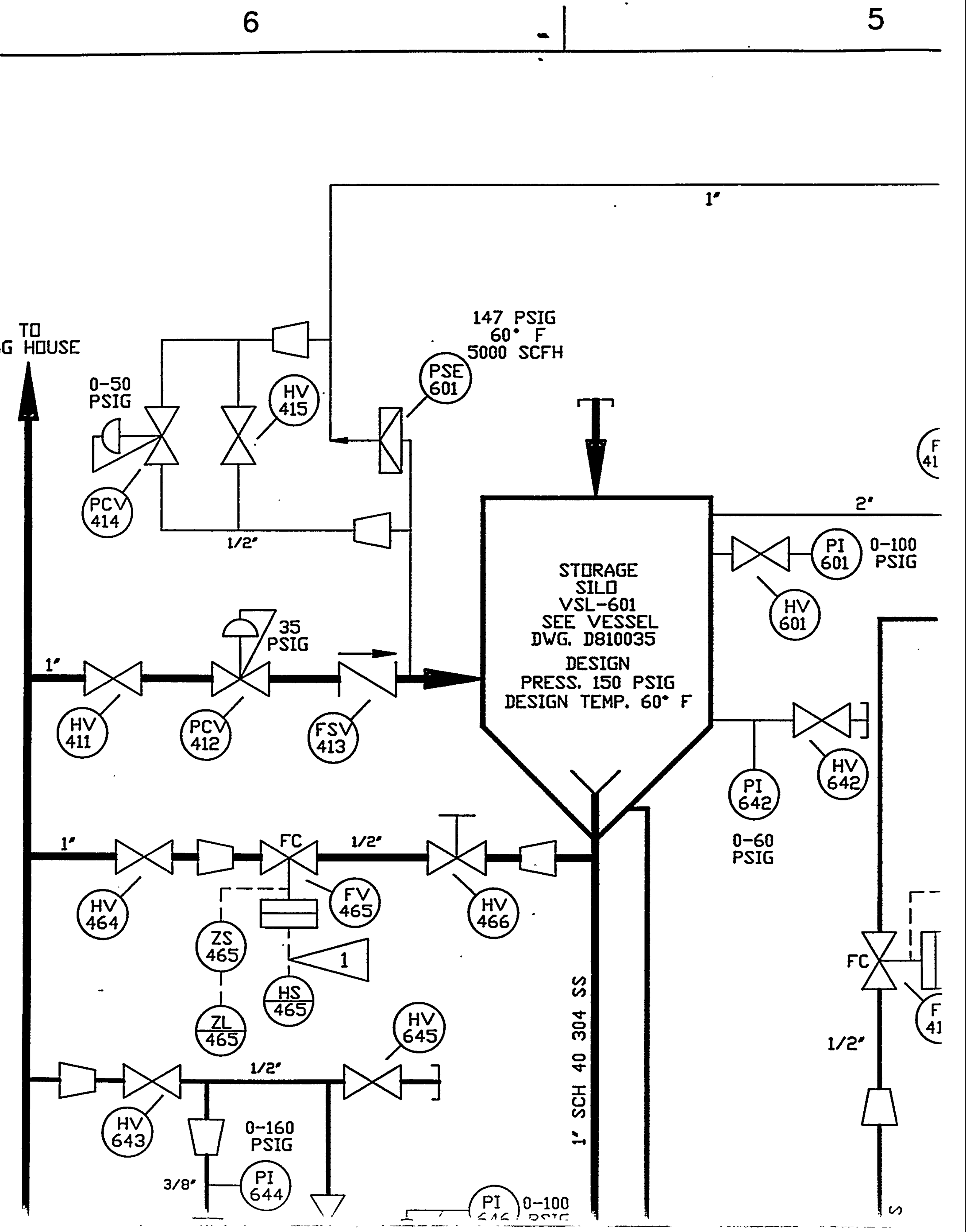
| DRAFTER | DATE |
|---|---|
| S. CONKO | 3/6/90 |
| CHECKER A. R. KUBALA | 3/6/90 |
| PROJECT ENGINEER J. P. KANOSKY | 3/6/90 |
| — | DATE — |
| — | DATE — |
| — | DATE — |
| — | DATE — |

United States Department of Energy
MORGANTOWN ENERGY TECHNOLOGY CENTER
Morgantown, WV

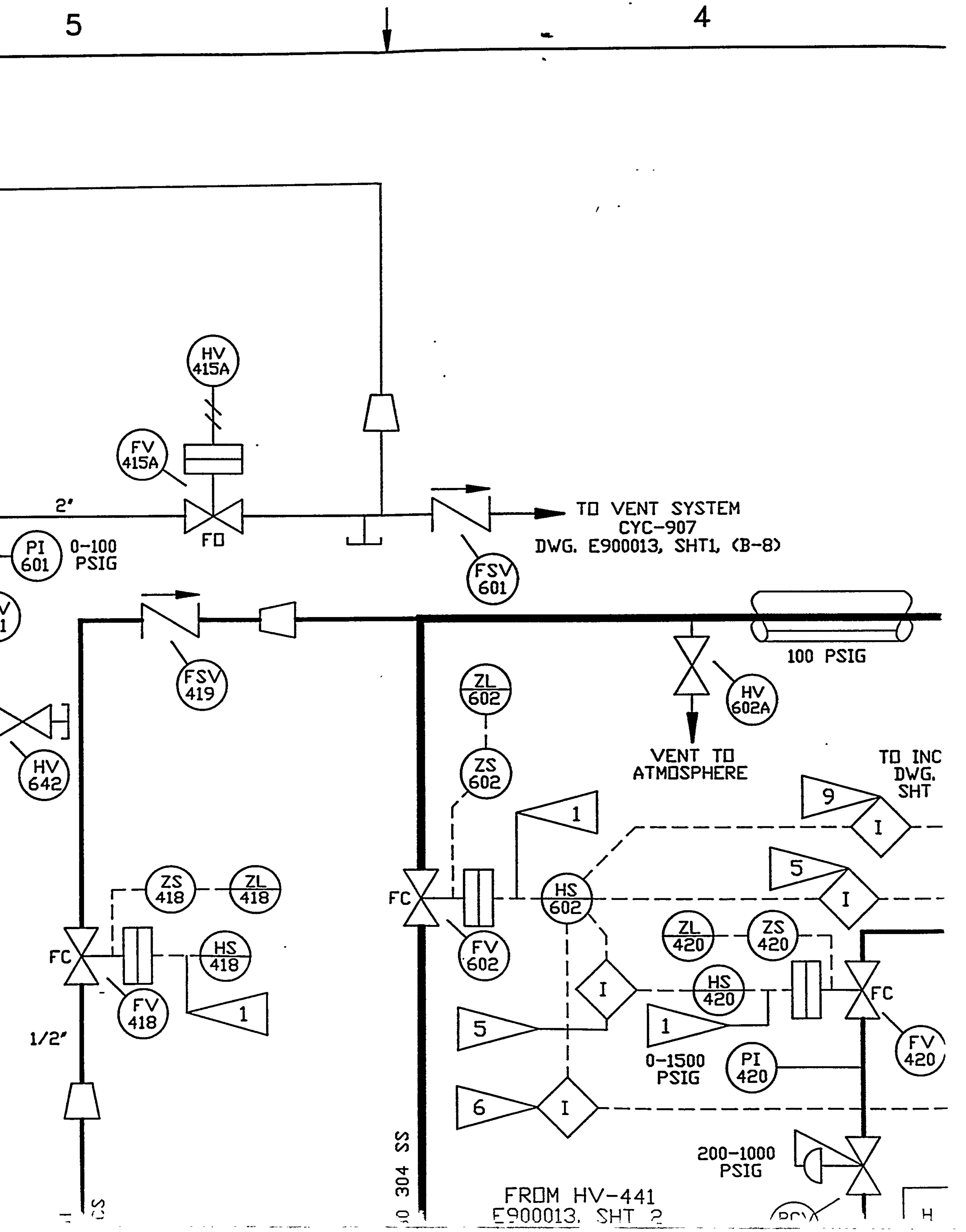
TITLE: B-12 P&ID FLUIDIZED BED GASIFIER A.G.C., CONCEPTUAL

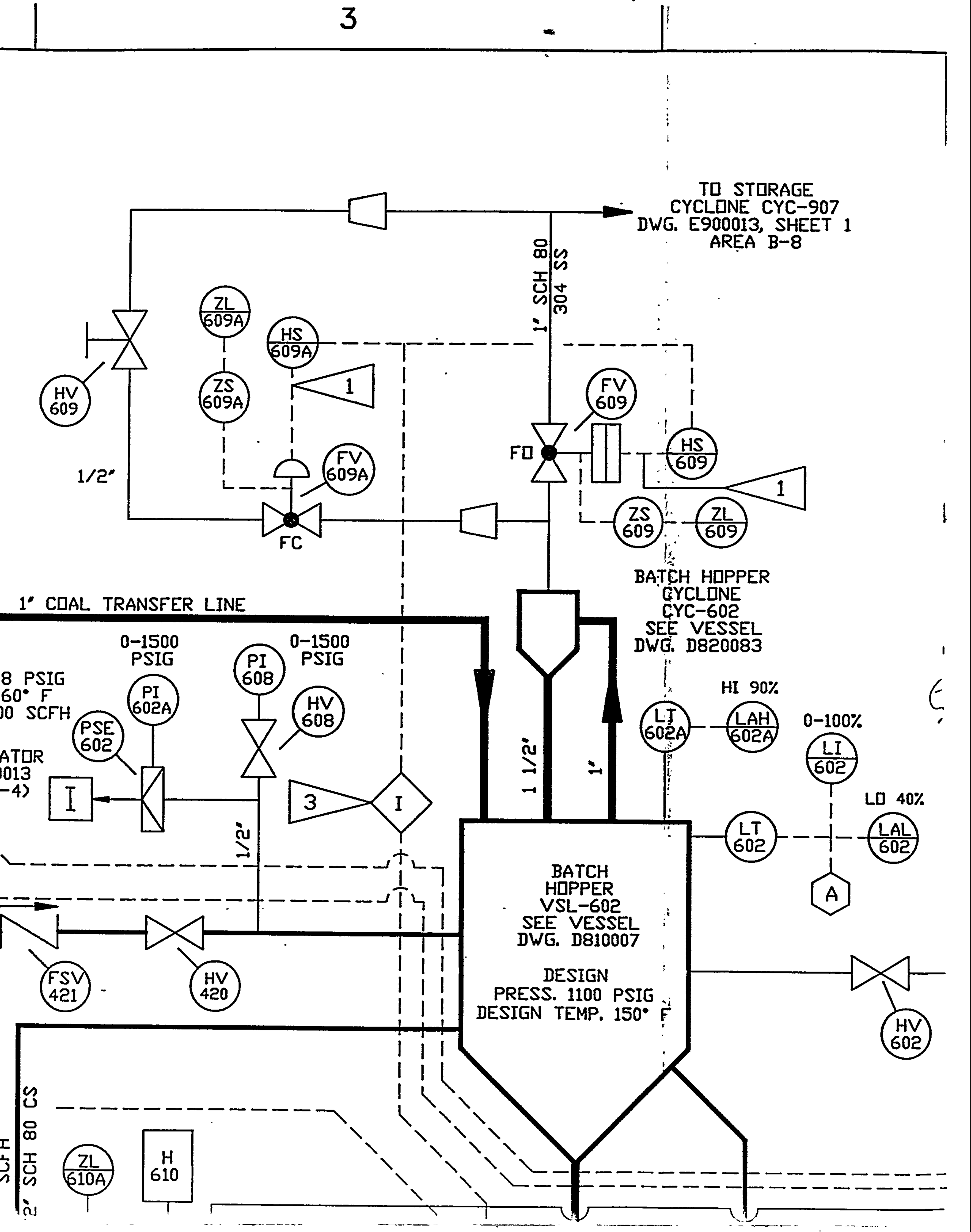
| SIZE | FSCM NO | DWG NO | REV |
|---|---|---|---|
| E | | E900010 | 6 |


8
7
H
G
F
FROM FCV 109
DWG. E900010
60° F
250-2000 SCFH
HV 159
FSV 111A
FSV 111
TRAN
OUTSIDE CELL
INSIDE CELL
CLOSED
8
HS 117
ZL 117
1
ZS 117
FV 117
1"
FC
P.O.C. TO ATMOSPHERE
A
1
OPEN
8
TE 120A
ZL 118
TE



6
5
1"
TO
G HOUSE
147 PSIG
60° F
5000 SCFH
0-50
PSIG
PSE
601
HV
415
PCV
414
1/2"
2"
PI
601
0-100
PSIG
HV
601
STORAGE
SILO
VSL-601
SEE VESSEL
DWG. D810035
DESIGN
PRESS. 150 PSIG
DESIGN TEMP. 60° F
35
PSIG
1"
HV
411
PCV
412
FSV
413
HV
642
PI
642
0-60
PSIG
1"
FC
1/2"
HV
464
FV
465
HV
466
ZS
465
1
HS
465
ZL
465
1" SCH 40 304 SS
FC
1/2"
HV
645
1/2"
HV
643
0-160
PSIG
3/8"
PI
644
PI
0-100


5
4
HV
415A
FV
415A
2'
FO
PI
601
0-100
PSIG
TO VENT SYSTEM
CYC-907
DWG. E900013, SHT1, (B-8)
FSV
601
FSV
419
100 PSIG
ZL
602
ZS
602
HV
602A
VENT TO
ATMOSPHERE
TO INC
DWG.
SHT
HV
642
9
I
1
5
ZS
418
ZL
418
FC
HS
602
FV
602
ZL
420
ZS
420
HS
418
FV
418
1/2'
HS
420
FV
420
0-1500
PSIG
PI
420
6
200-1000
PSIG
304 SS
FROM HV-441
E900013, SHT 2
H


3
TO STORAGE
CYCLONE CYC-907
DWG. E900013, SHEET 1
AREA B-8
1" SCH 80
304 SS
ZL 609A
HS 609A
ZS 609A
HV 609
1/2"
FV 609A
FC
FV 609
FO
HS 609
ZS 609
ZL 609
BATCH HOPPER
CYCLONE
CYC-602
SEE VESSEL
DWG. D820083
1" COAL TRANSFER LINE
0-1500
PSIG
PI 602A
PI 608
HV 608
PSE 602
8 PSIG
60° F
00 SCFH
ATOR
013
-4)
I
3
1/2"
1 1/2"
1"
HI 90%
LT 602A
LAH 602A
0-100%
LI 602
LO 40%
LT 602
LAL 602
A
BATCH
HOPPER
VSL-602
SEE VESSEL
DWG. D810007
DESIGN
PRESS. 1100 PSIG
DESIGN TEMP. 150° F
FSV 421
HV 420
HV 602
2" SCH 80 CS
ZL 610A
H 610

2 1

## REVISION

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| -1<br>EN<br>EN | 3 | CHANGED DWG. TITLE<br>UPDATED AS PER MARKED PRINT WITH WORK PLAN<br>ISSUED FOR CONSTRUCTION | 9/16/92 |
| EN | | RELOCATED SAMPLE SYSTEM TO E900013_SHT_2<br>REVISED AS PER MARKED PRINT | 11/16/92 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TER<br>GARY KULCHOCK | DATE<br>11/18/92 | CHECKER<br>S CONKO | DATE<br>11/18/92 | EG&G RESPON ENGINEER<br>JAY RUTTEN | DATE<br>11/19/92 | EG&G REVIEWER<br>D. LUNIFIELD | DATE<br>11/19/92 |
| RESPON SECT SUPV<br>NA | DATE | EG&G ES&H<br>J. L. BUCKLEW | DATE<br>11/19/92 | | DATE | JOHN ROTUNDA | DATE<br>11/24/92 |

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| EN | 4 | ADDED DESIGN PRESS. AND TEMP. TO FDR-601, VSL-602, & VSL-601<br>ADDED MAX. OPP. PRESS. AND COIL TEMP. TO SHTR-202 AND HTR-101<br>ADDED PSE-120, REMOVED NUMBERS FROM ALL ADACS SYMBOLS | 4/1/93 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TER<br>GARY KULCHOCK | DATE<br>4/5/93 | CHECKER<br>S CONKO | DATE<br>4/5/93 | EG&G RESPONSIBLE ENGR.<br>JAY RUTTEN | DATE<br>4/7/93 | REVIEWER<br>D. LUNIFIELD | DATE<br>4/7/93 |
| ES&H<br>. L. BUCKLEW | DATE<br>4/7/93 | PROJECT ENGR.<br>JOHN ROCKEY | DATE<br>5/27/93 | BRANCH MANAGER<br>LARRY STRICKLAND | DATE<br>5/27/93 | DOE (EDSD)<br>BILL AYERS | DATE<br>5/27/93 |

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| EN | 5 | ADDED LT-602A, LT-603A, FSV-601, HV-321 & HV-320; MODIFIED LAHL 602 TO LAH-602 & LAL-602<br>MODIFIED LAHL 603 TO LAH-603 & LAL-603; ADDED "#1" TO $N_2$, ADDED NOTE 10<br>ADDED INCINERATOR NOTES TO (2) INCINERATOR DESIGNATIONS; ADDED NOTE TO VENT SYSTEM (G-4)<br>REMOVED PSE-120, HCV-118, TCV-126 AND RELATED PIPING; RELOCATED FSV-315<br>ISSUED FOR CONSTRUCTION | 9/01/93 |

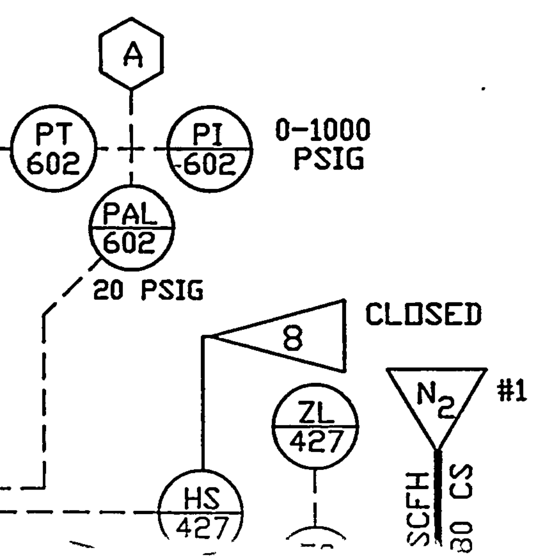
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TER<br>Gary Kulchock | DATE<br>9/10/93 | CHECKER<br>S. Conko | DATE<br>9/14/93 | EG&G RESPONSIBLE ENGR.<br>Jay Rutten | DATE<br>9/15/93 | REVIEWER<br>Dave Lunifeld | DATE<br>9/20/93 |
| ES&H<br>Larry Bucklew | DATE<br>9/17/93 | PROJECT ENGR.<br>John Rockey | DATE<br>9/21/93 | BRANCH MANAGER<br>Larry Shadle | DATE<br>9/21/93 | DOE (EDSD)<br>John Rotunda/WJA | DATE<br>9/20/93 |

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| EN | 6 | EXTENSIVE CHANGES AS PER MARKED PRINT REDLINED BY JAY RUTTEN ON 15 FEB 94.<br>ISSUED FOR CONSTRUCTION | 8/18/94 |

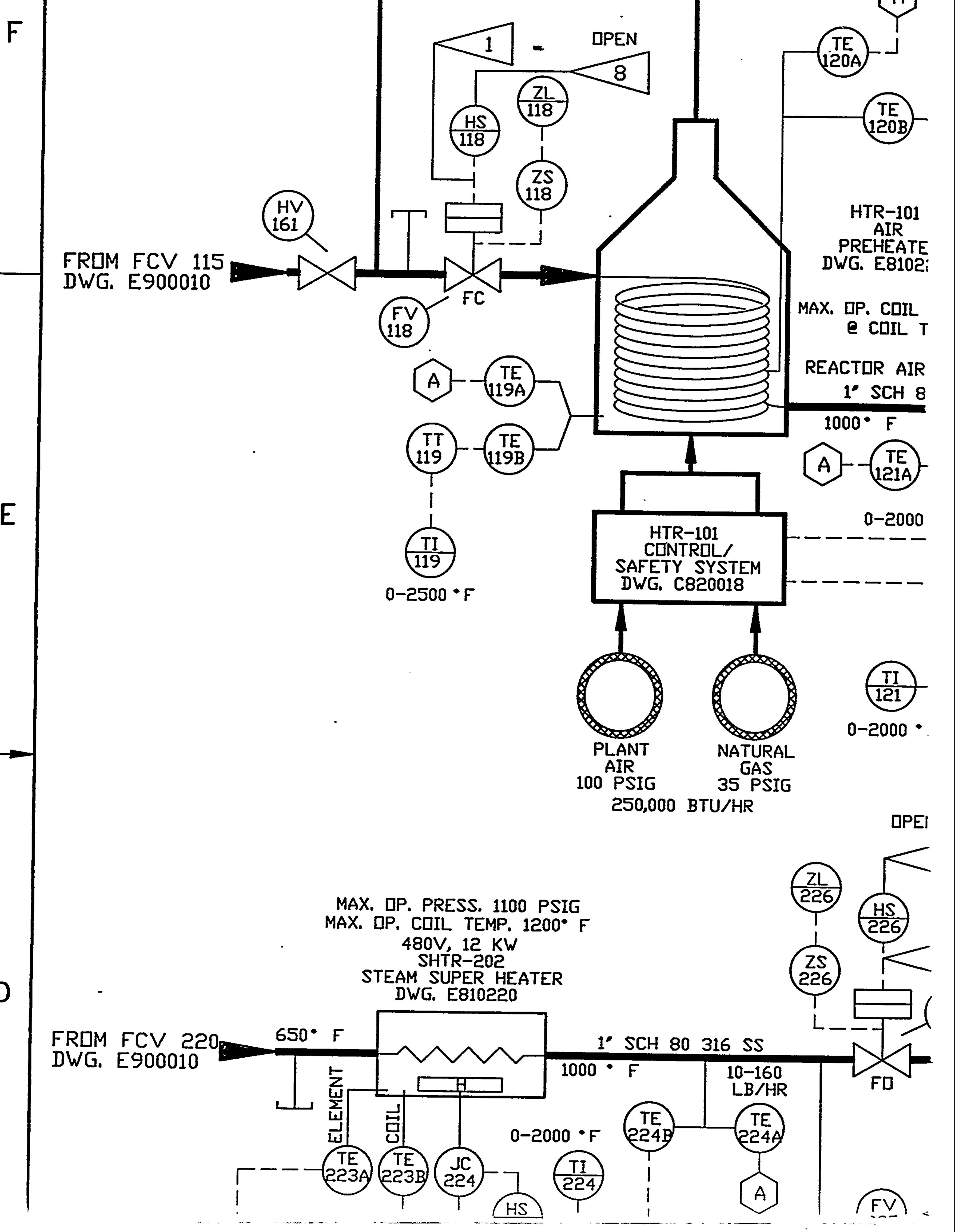
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TER<br>Gary Kulchock | DATE<br>10/7/94 | CHECKER<br>S. Conko | DATE<br>10-7-94 | EG&G RESPONSIBLE ENGR.<br>Jay Rutten | DATE<br>10-11-94 | REVIEWER<br>D. Lunifeld | DATE<br>10/11/94 |
| ES&H<br>Bucklew | DATE<br>10-11-94 | PROJECT ENGR.<br>John M Rockey | DATE<br>10/13/94 | BRANCH MANAGER<br>Larry Shadle | DATE<br>10-18-94 | DOE (EDSD)<br>[illegible] | DATE<br>10/14/94 |

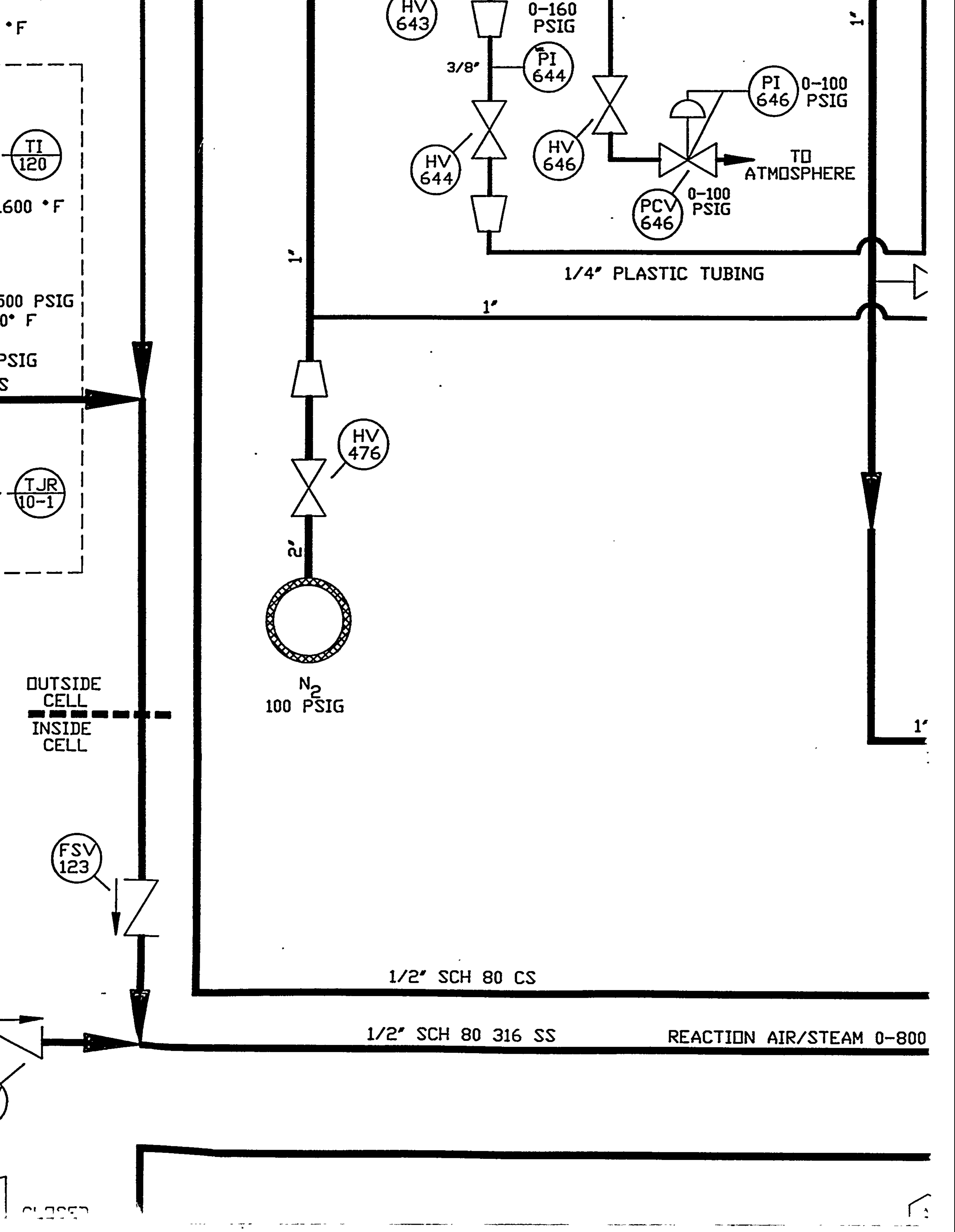
H

G

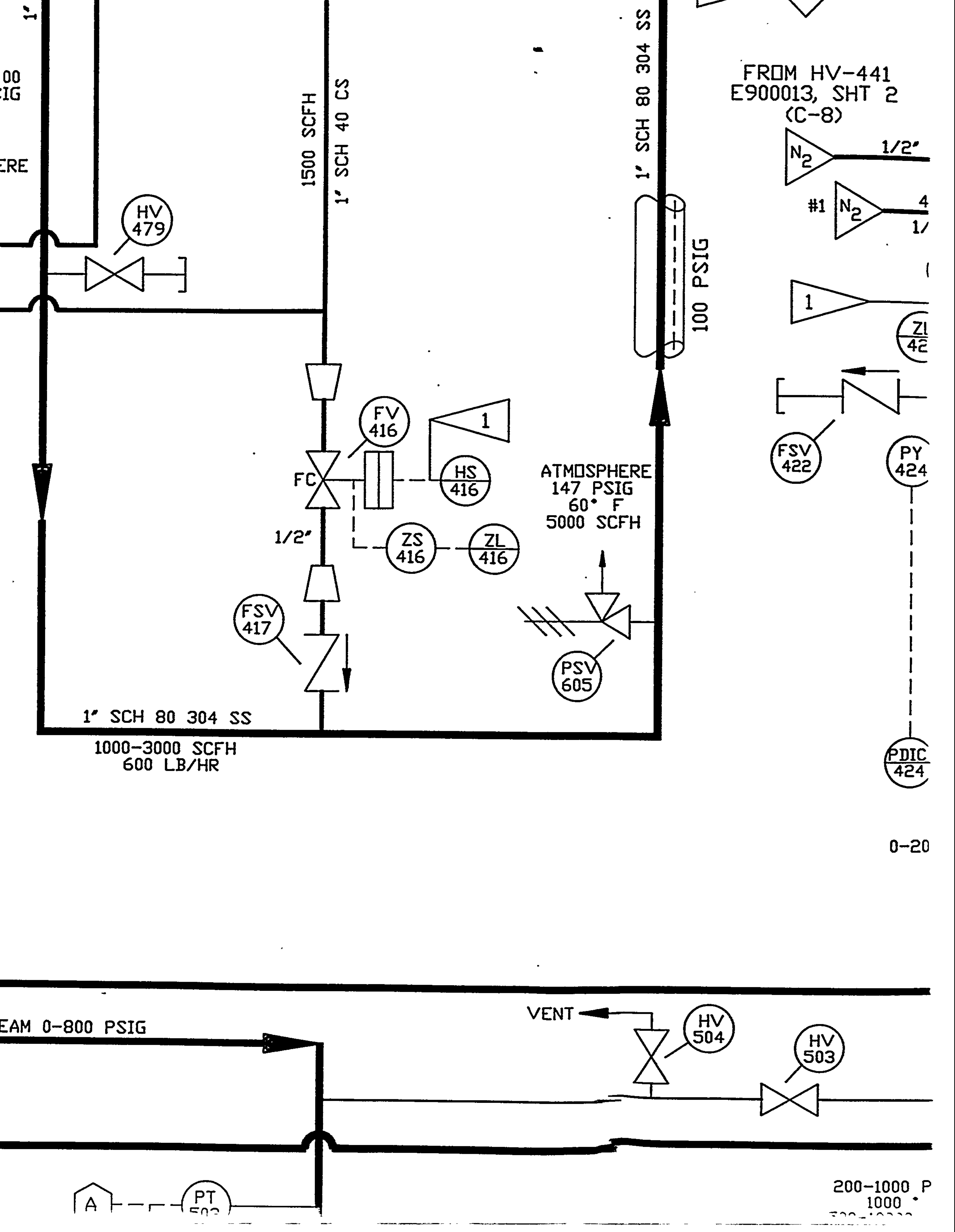



F

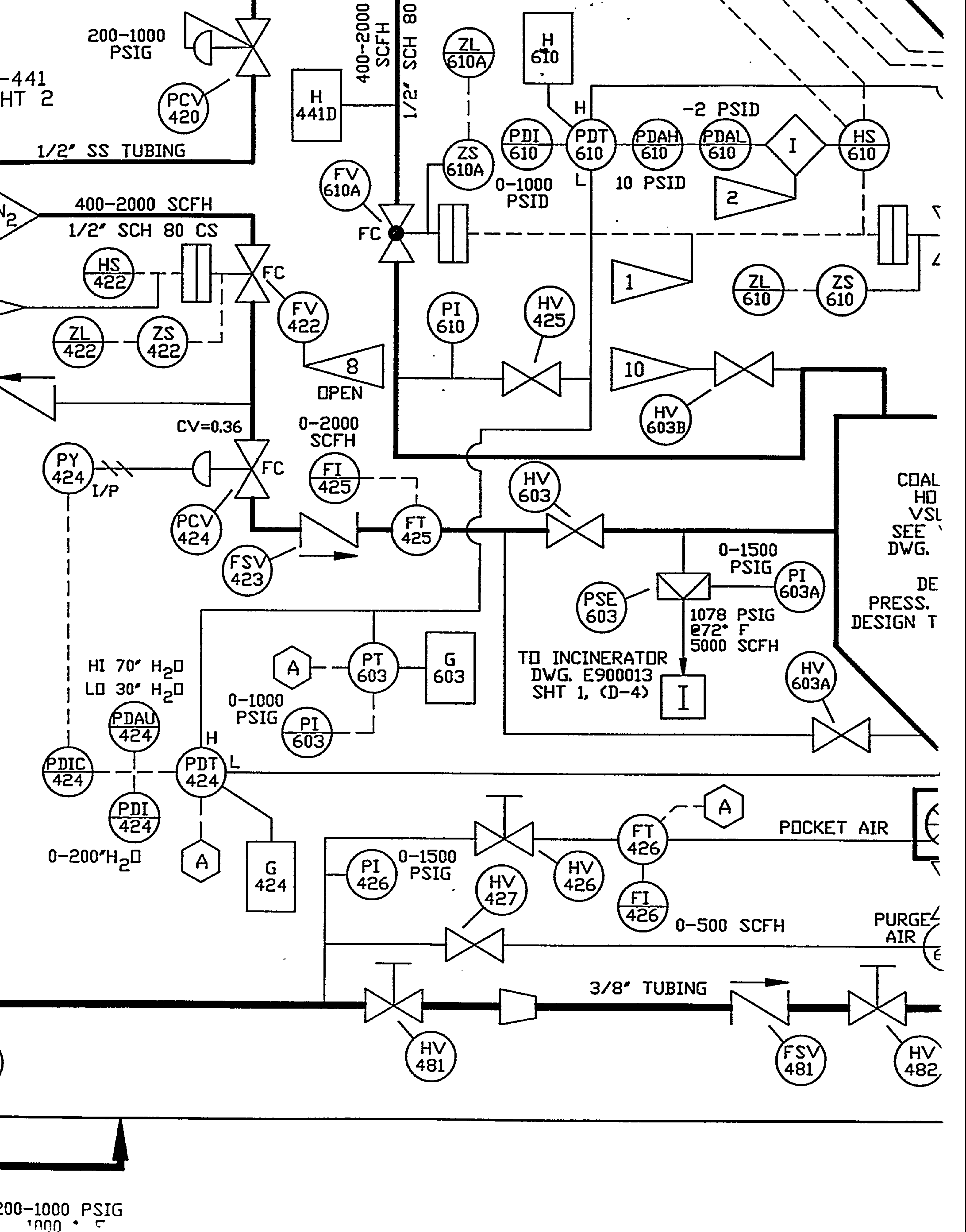

F
E
D
OPEN
1
8
ZL 118
HS 118
ZS 118
HV 161
FROM FCV 115
DWG. E900010
FC
FV 118
TE 120A
TE 120B
HTR-101
AIR
PREHEATE
DWG. E8102
MAX. OP. COIL
@ COIL T
REACTOR AIR
1' SCH 8
1000° F
A
TE 119A
TT 119
TE 119B
TI 119
0-2500 °F
TE 121A
0-2000
HTR-101
CONTROL/
SAFETY SYSTEM
DWG. C820018
PLANT
AIR
100 PSIG
NATURAL
GAS
35 PSIG
250,000 BTU/HR
TI 121
0-2000 °
OPE
MAX. OP. PRESS. 1100 PSIG
MAX. OP. COIL TEMP. 1200° F
480V, 12 KW
SHTR-202
STEAM SUPER HEATER
DWG. E810220
FROM FCV 220
DWG. E900010
650° F
1' SCH 80 316 SS
1000 ° F
10-160
LB/HR
FO
ZL 226
HS 226
ZS 226
ELEMENT
COIL
TE 223A
TE 223B
JC 224
HS
0-2000 °F
TI 224
TE 224B
TE 224A
FV



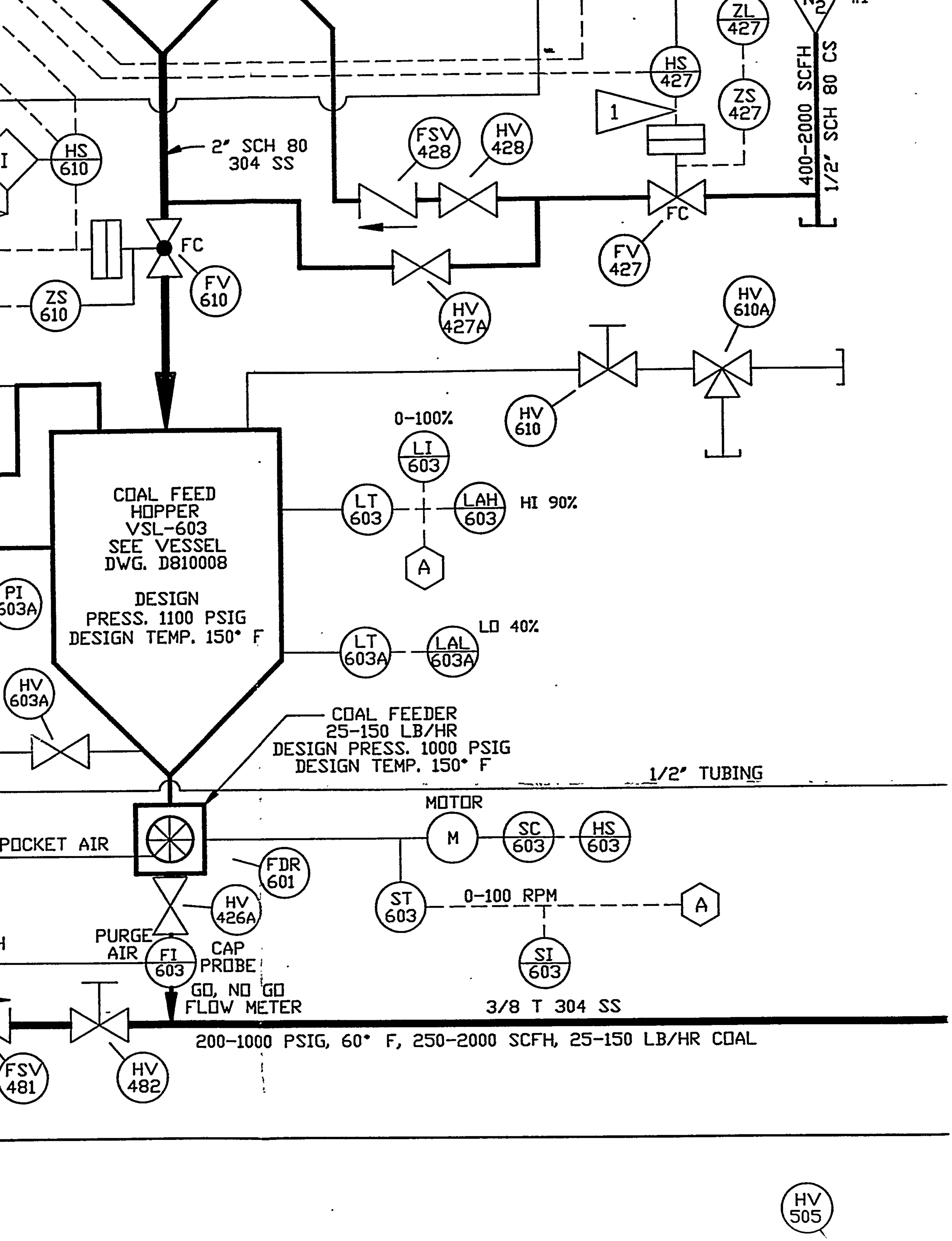
•F
HV 643
0-160 PSIG
3/8″
PI 644
PI 646
0-100 PSIG
TI 120
HV 644
HV 646
TO ATMOSPHERE
.600 •F
PCV 646
0-100 PSIG
1″
1/4″ PLASTIC TUBING
500 PSIG
0• F
1″
PSIG
S
HV 476
TJR 10-1
2″
OUTSIDE CELL
INSIDE CELL
$N_2$
100 PSIG
1″
FSV 123
1/2″ SCH 80 CS
1/2″ SCH 80 316 SS
REACTION AIR/STEAM 0-800



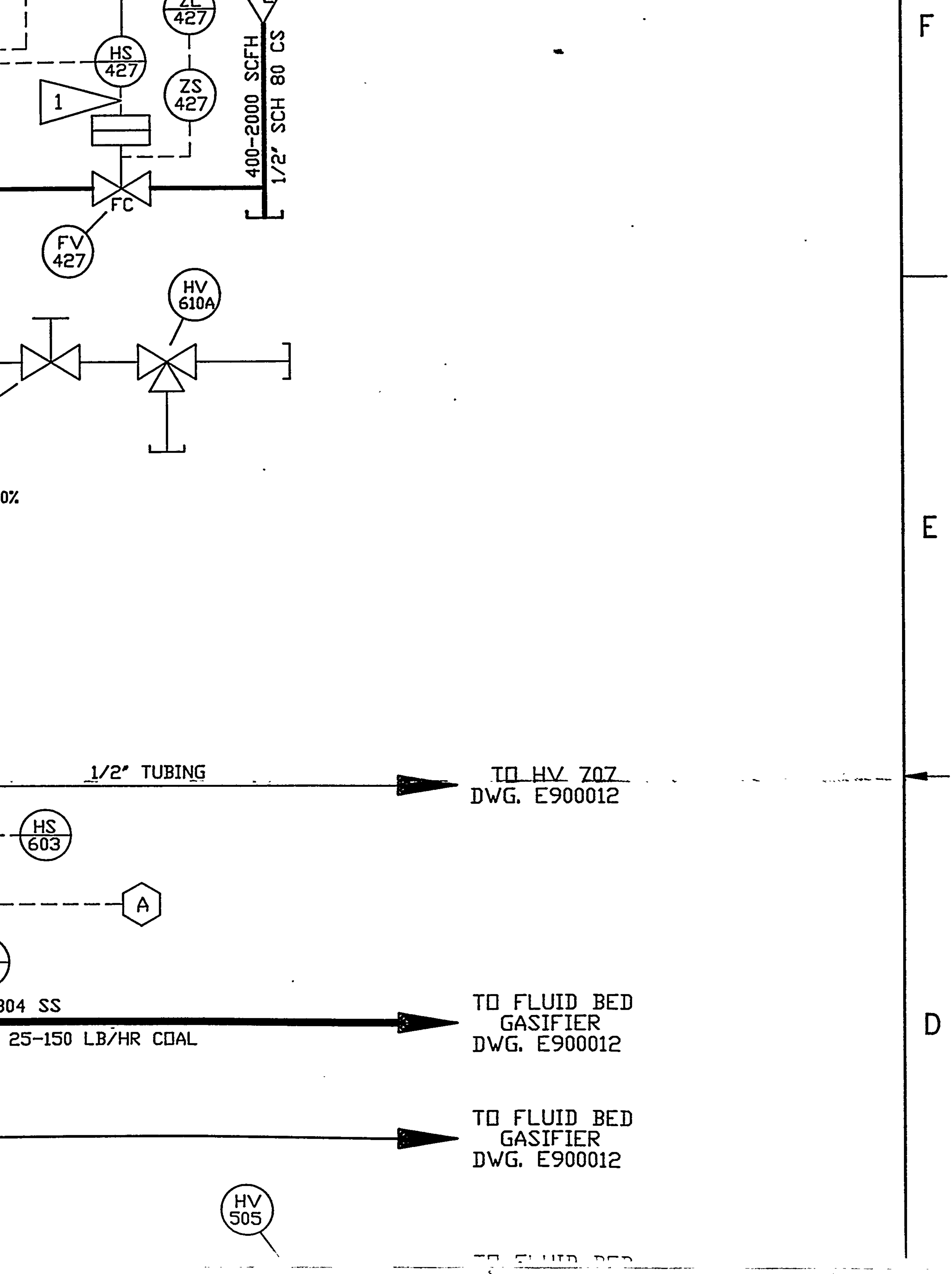
FROM HV-441
E900013, SHT 2
(C-8)
1/2"
#1
1500 SCFH
1" SCH 40 CS
1" SCH 80 304 SS
100 PSIG
HV
479
FV
416
FC
HS
416
1/2"
ZS
416
ZL
416
FSV
417
1" SCH 80 304 SS
1000-3000 SCFH
600 LB/HR
ATMOSPHERE
147 PSIG
60° F
5000 SCFH
PSV
605
FSV
422
PY
424
PDIC
424
0-20
EAM 0-800 PSIG
VENT
HV
504
HV
503
PT
A
200-1000 P
1000 °

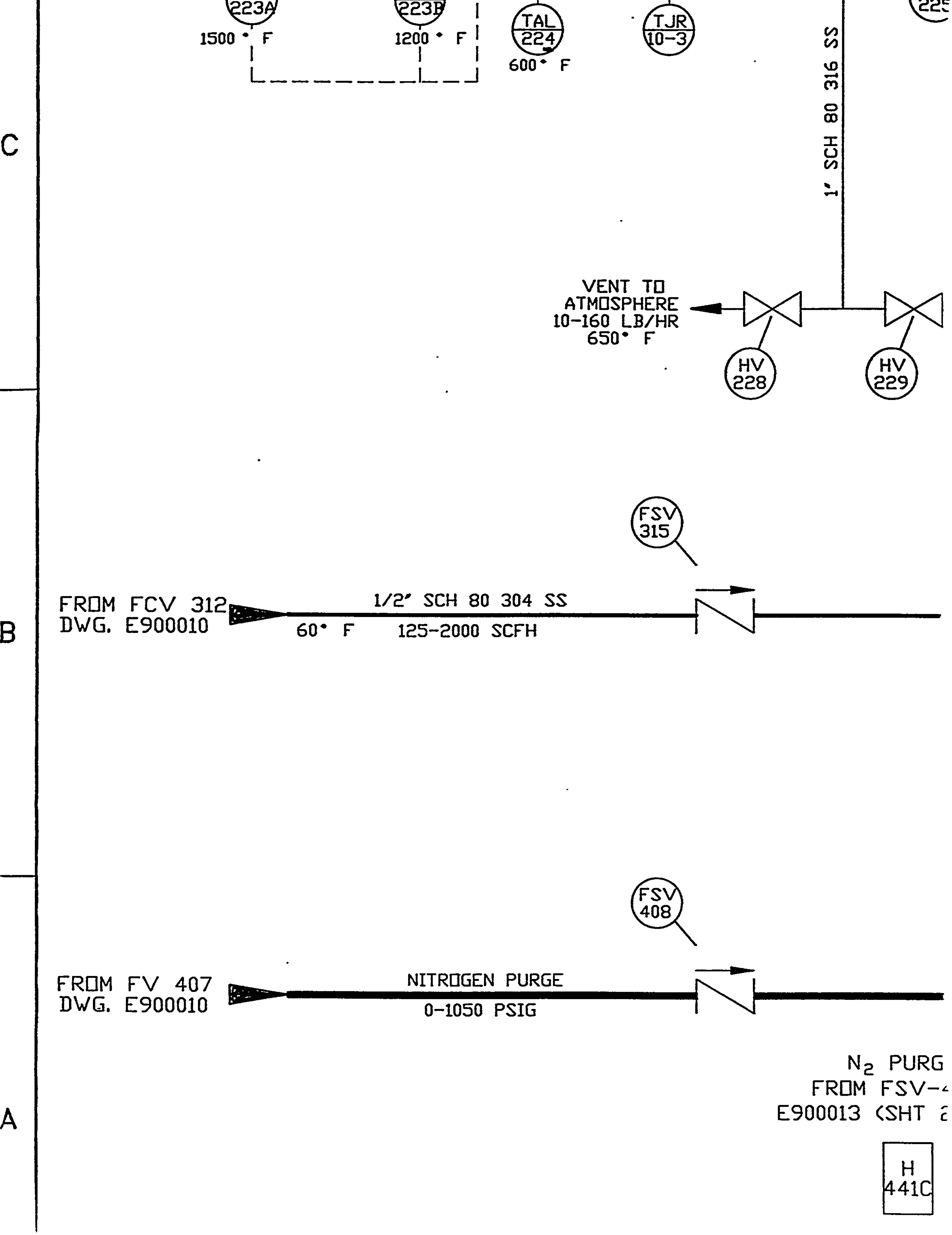


200-1000
PSIG
-441
HT 2
PCV
420
1/2" SS TUBING
400-2000
SCFH
1/2" SCH 80
H
441D
ZL
610A
H
610
ZS
610A
FV
610A
FC
400-2000 SCFH
1/2" SCH 80 CS
HS
422
FC
FV
422
ZL
422
ZS
422
8
OPEN
H
-2 PSID
PDI
610
PDT
610
PDAH
610
PDAL
610
I
HS
610
0-1000
PSID
L
10 PSID
2
1
ZL
610
ZS
610
PI
610
HV
425
10
HV
603B
CV=0.36
0-2000
SCFH
PY
424
I/P
FC
FI
425
PCV
424
FT
425
FSV
423
HV
603
COAL
HD
VSL
SEE
DWG.
0-1500
PSIG
PI
603A
PSE
603
DE
PRESS.
DESIGN T
1078 PSIG
@72° F
5000 SCFH
TO INCINERATOR
DWG. E900013
SHT 1, (D-4)
I
HV
603A
A
PT
603
G
603
HI 70" $H_2O$
LO 30" $H_2O$
0-1000
PSIG
PI
603
PDAU
424
H
PDIC
424
PDT
424
L
PDI
424
0-200"$H_2O$
A
G
424
A
FT
426
POCKET AIR
PI
426
0-1500
PSIG
HV
427
HV
426
FI
426
0-500 SCFH
PURGE
AIR
3/8" TUBING
HV
481
FSV
481
HV
482
200-1000 PSIG
1000 ° F

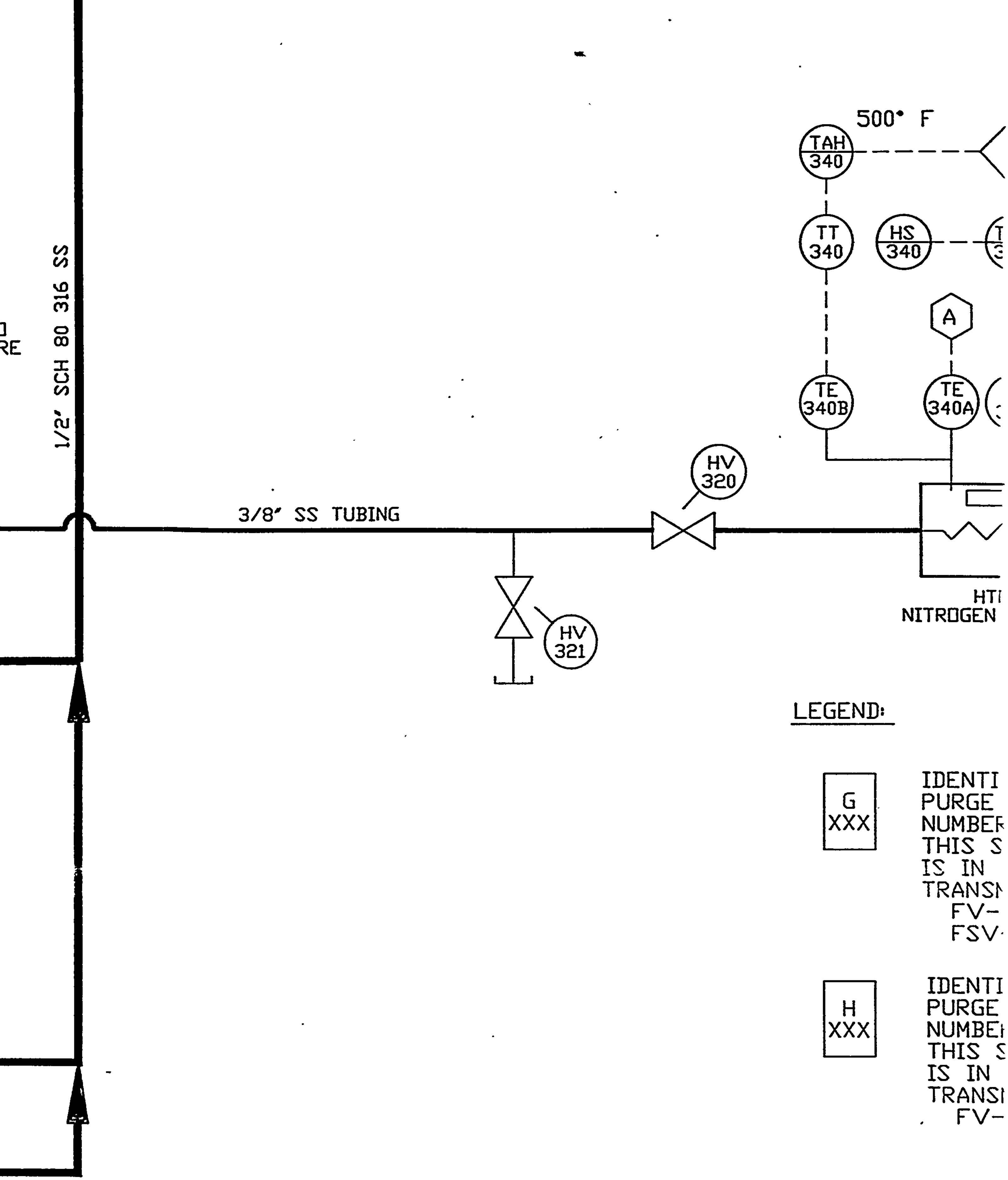


ZL 427
HS 427
ZS 427
1
400-2000 SCFH
1/2" SCH 80 CS
FSV 428
HV 428
FC
FV 427
HS 610
2" SCH 80
304 SS
FC
FV 610
ZS 610
HV 427A
HV 610A
HV 610
0-100%
LI 603
LT 603
LAH 603
HI 90%
A
COAL FEED
HOPPER
VSL-603
SEE VESSEL
DWG. D810008
DESIGN
PRESS. 1100 PSIG
DESIGN TEMP. 150° F
PI 603A
LT 603A
LAL 603A
LO 40%
HV 603A
COAL FEEDER
25-150 LB/HR
DESIGN PRESS. 1000 PSIG
DESIGN TEMP. 150° F
1/2" TUBING
MOTOR
M
SC 603
HS 603
POCKET AIR
FDR 601
ST 603
0-100 RPM
A
HV 426A
PURGE
AIR
FI 603
CAP
PROBE
SI 603
GO, NO GO
FLOW METER
3/8 T 304 SS
200-1000 PSIG, 60° F, 250-2000 SCFH, 25-150 LB/HR COAL
FSV 481
HV 482
HV 505

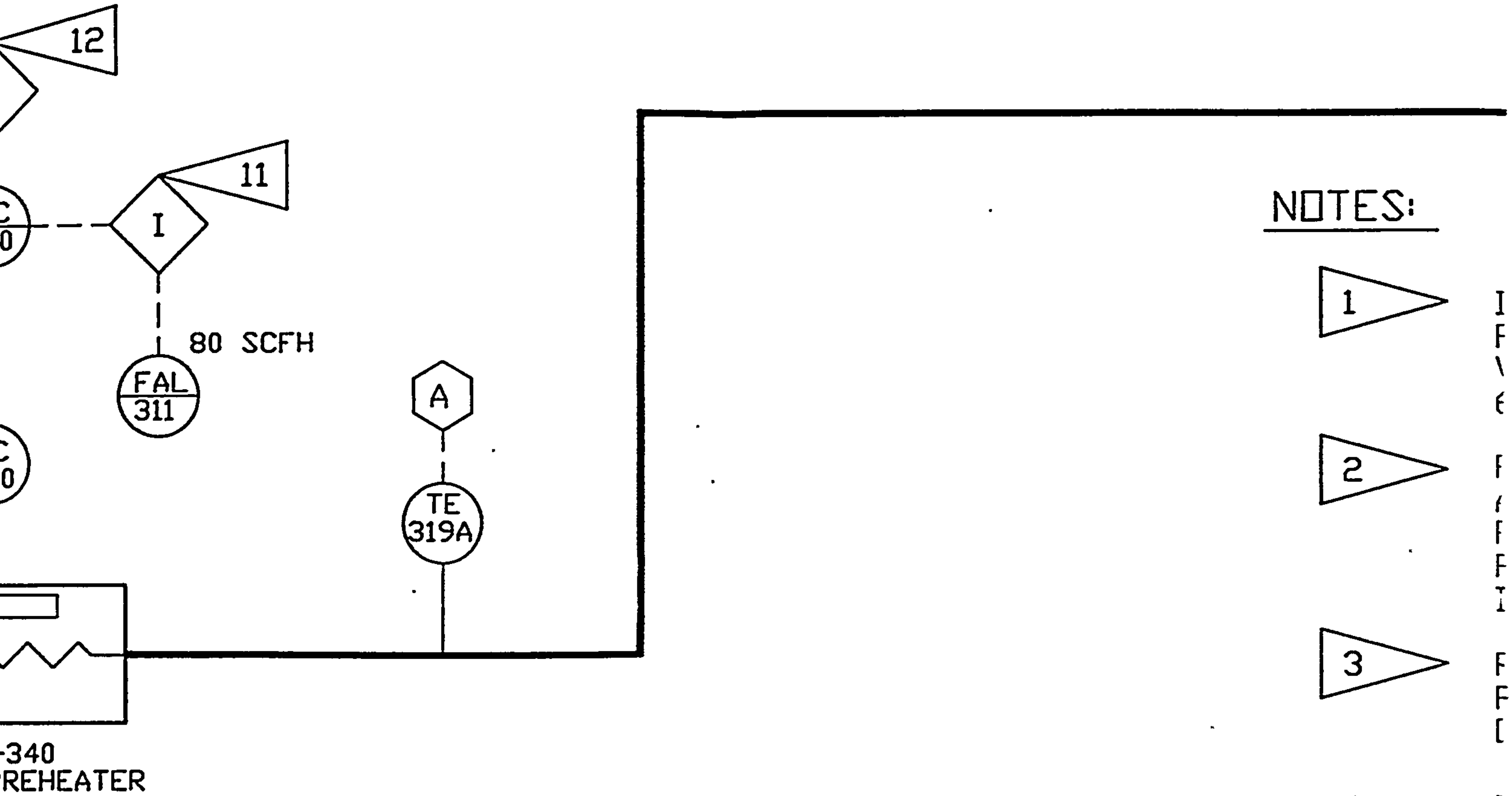

ZL 427
HS 427
1
ZS 427
400-2000 SCFH
1/2" SCH 80 CS
FC
FV 427
HV 610A
0%
1/2" TUBING
TO HV 707
DWG. E900012
HS 603
A
304 SS
25-150 LB/HR COAL
TO FLUID BED GASIFIER DWG. E900012
TO FLUID BED GASIFIER DWG. E900012
HV 505
F
E
D



223A
1500 ° F
223B
1200 ° F
TAL 224
600 ° F
TJR 10-3
1" SCH 80 316 SS
C
VENT TO ATMOSPHERE 10-160 LB/HR 650° F
HV 228
HV 229
FSV 315
FROM FCV 312 DWG. E900010
1/2" SCH 80 304 SS
60° F
125-2000 SCFH
B
FSV 408
FROM FV 407 DWG. E900010
NITROGEN PURGE
0-1050 PSIG
$N_2$ PURG
FROM FSV-
E900013 (SHT
A
H 441C



500° F
TAH 340
TT 340
HS 340
A
TE 340B
TE 340A
1/2" SCH 80 316 SS
3/8" SS TUBING
HV 320
HV 321
NITROGEN
LEGEND:
G XXX
IDENTI
PURGE
THIS
IS IN
FV-
H XXX
IDENTI
PURGE
IS IN
FV-




NOTES:

1

2

3

4

5

6

7

8

9

10

11

12

IES THE CONNECTING SEGMENT OF THE TRANSMITTER
SYSTEM, WHERE XXX IS THE SEGMENT IDENTIFICATION
SEE DWG. E900013, SHT. 2 OF 2 FOR DETAILS)
MBOL INDICATES THAT THE FOLLOWING EQUIPMENT
HE PURGE LINE FROM THE NITROGEN HEADER TO THE
TTER:
40, FSV-441, HV-441, HV-XXXP, FV-XXXP, &
XXXP

IES THE CONNECTING SEGMENT OF THE TRANSMITTER
SYSTEM, WHERE XXX IS THE SEGMENT IDENTIFICATION
SEE DWG. E900013, SHT. 2 OF 2 FOR DETAILS)
YMBOL INDICATES THAT THE FOLLOWING EQUIPMENT
HE PURGE LINE FROM THE NITROGEN HEADER TO THE
ITTER:
40, FSV-441, HV-441, HV-XXXP, & FSV-XXXP.

DESIGNATES EQUIPMENT WHICH IS NOT SHOWN ON THIS DWG. FOR CLARITY, PANEL MOUNTED ON/OFF STATION (HAND SWITCH WITH POSITION INDICATION LAMPS), 24VDC RELAY, 117 VAC 60 Hz SOLENOID VALVES.

FV-610 & FV-610A WILL NOT OPEN UNTIL PDT-610 MEASURES A PRESSURE DIFFERENTIAL LESS THAN OR EQUAL TO 10 PSID. REF. DWGS: D820047 SHT 14 & D820030 SHT 9. THE PRESSURE IN VSL-602 MUST BE HIGHER THAN THE PRESSURE IN VSL-603.

RELAY INTERLOCKS DO NOT ALLOW THE TWO PAIRS OF PARALLEL FLOW VALVES (609 & 609A, 610 & 610A) TO BE OPEN AT THE SAME TIME. REFERENCE DRAWING: D920031

THIS DWG. & DWGS. E900010, E900012, & E900013 SUPERCEDES DWG. R800524 (SEE DWG. E900013 FOR NOTES, TUBING AND PIPING SUMMARY).

RELAY INTERLOCKS DO NOT ALLOW FV-602 AND FLOW VALVES 420 OR 427 TO BE OPEN AT THE SAME TIME.

RELAY INTERLOCKS DO NOT ALLOW FV-602 AND THE PAIR OF PARALLEL FLOW VALVES 610 & 610A TO BE OPEN AT THE SAME TIME.

"NOTE DELETED"

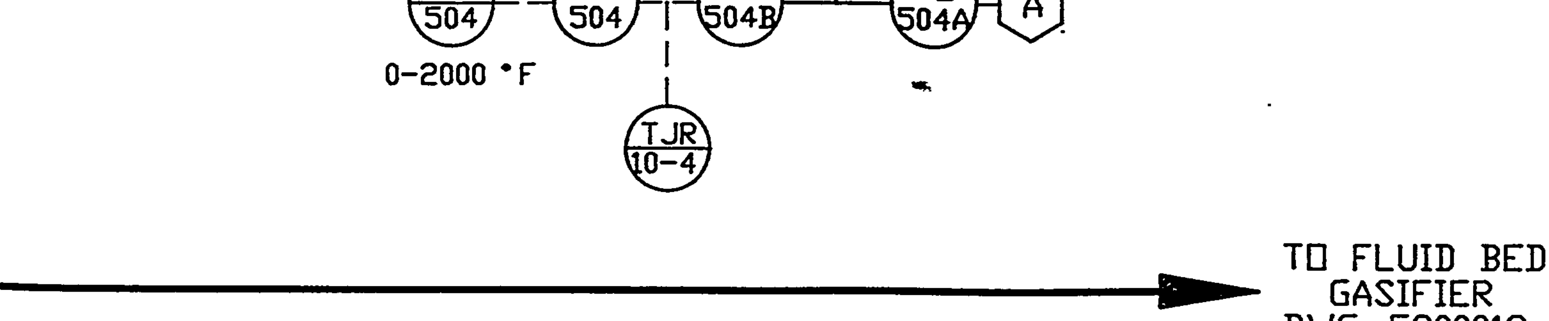
DESIGNATES THAT THE CONTROL PANEL SWITCH IS PHYSICALLY LOCKED TO PREVENT ACCIDENTAL ACTUATION.

FV-602 WILL NOT OPEN UNTIL PT-602 MEASURES A PRESSURE LESS THAN 20 PSIG.

THROUGH FV-912 TO VENT SYSTEM VSL-906, DWG. E900013, SHEET 1, (B-3)

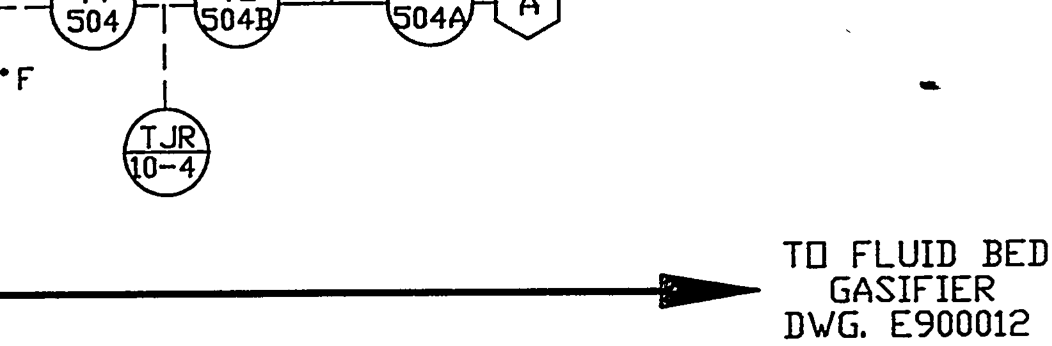
INTERLOCKS PREVENT HTR-340 FROM OPERATING UNTIL NITROGEN FLOWS EXCEED 80 SCFH

INTERLOCKS PREVENT HTR-340 FROM OPERATING WHEN THE COIL TEMPERATURE EXCEEDS 500° F




| REFERENCE DRAWINGS | DRAFTER | DATE | |
|---|---|---|---|
| E900010<br>E900012<br>E900013 | S. CONKO | 3/6/90 | United States Depc<br>MORGANTOWN ENERGY<br>Morgant |
| | CHECKER<br>A. R. KUBALA | DATE<br>3/6/90 | |
| | PROJECT ENGINEER<br>J. P. KANOSKY | DATE<br>3/6/90 | |
| | | DATE | TITLE:<br>B-12 P&<br>FLUIDIZED BED<br>A.G.C. |
| | | DATE | |
| | | DATE | |
| | | DATE | SIZE: E / FSCM NO / DWG NO: E90 |
| | | DATE | |

G IS PART
DOCUMENT
SYSTEM




C

| | |
|---|---|
| DRAFTER S. CONKO | DATE 3/6/90 |
| CHECKER A. R. KUBALA | DATE 3/6/90 |
| PROJECT ENGINEER J. P. KANOSKY | DATE 3/6/90 |
| | DATE |
| | DATE |
| | DATE |
| | DATE |
| | DATE |

United States Department of Energy
**MORGANTOWN ENERGY TECHNOLOGY CENTER**
Morgantown, WV

TITLE:
# B-12 P&ID
# FLUIDIZED BED GASIFIER
# A.G.C.

| SIZE | FSCH NO | DWG NO | REV |
|---|---|---|---|
| E | | E900011 | 6 |

A

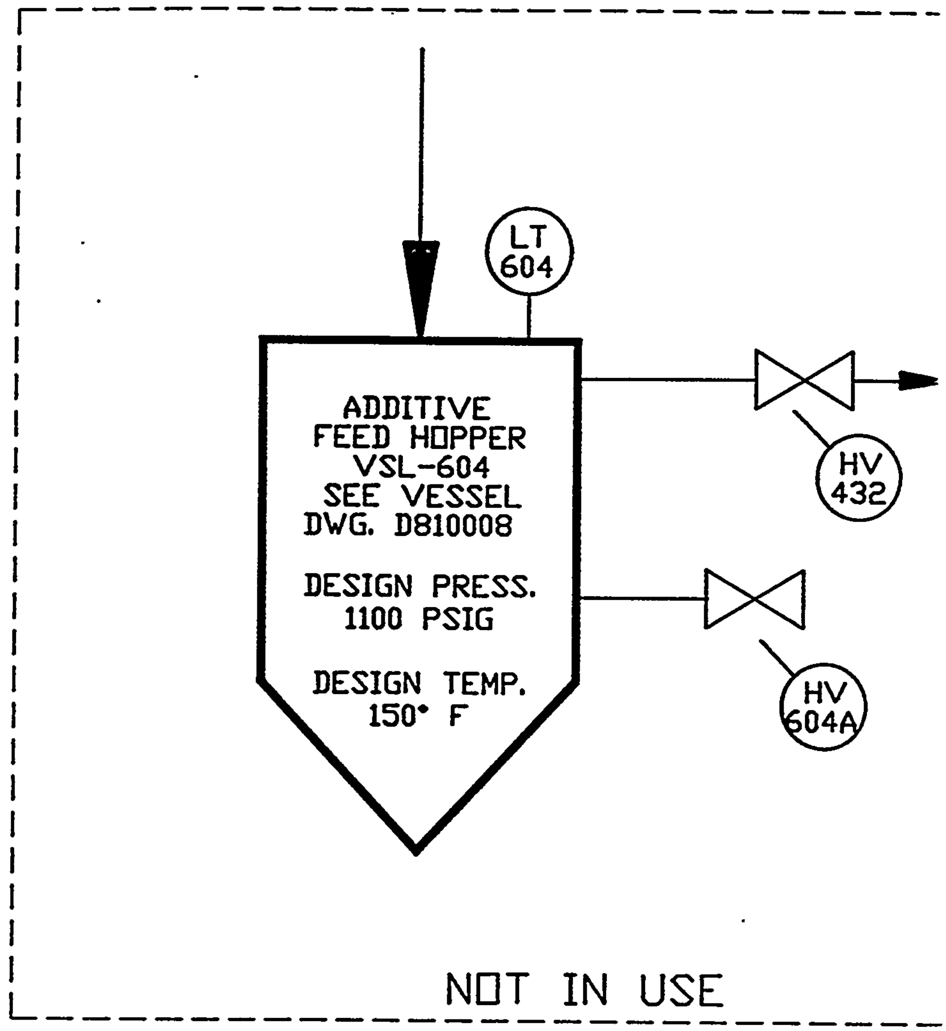
DWG NO E900011 SH 1

8

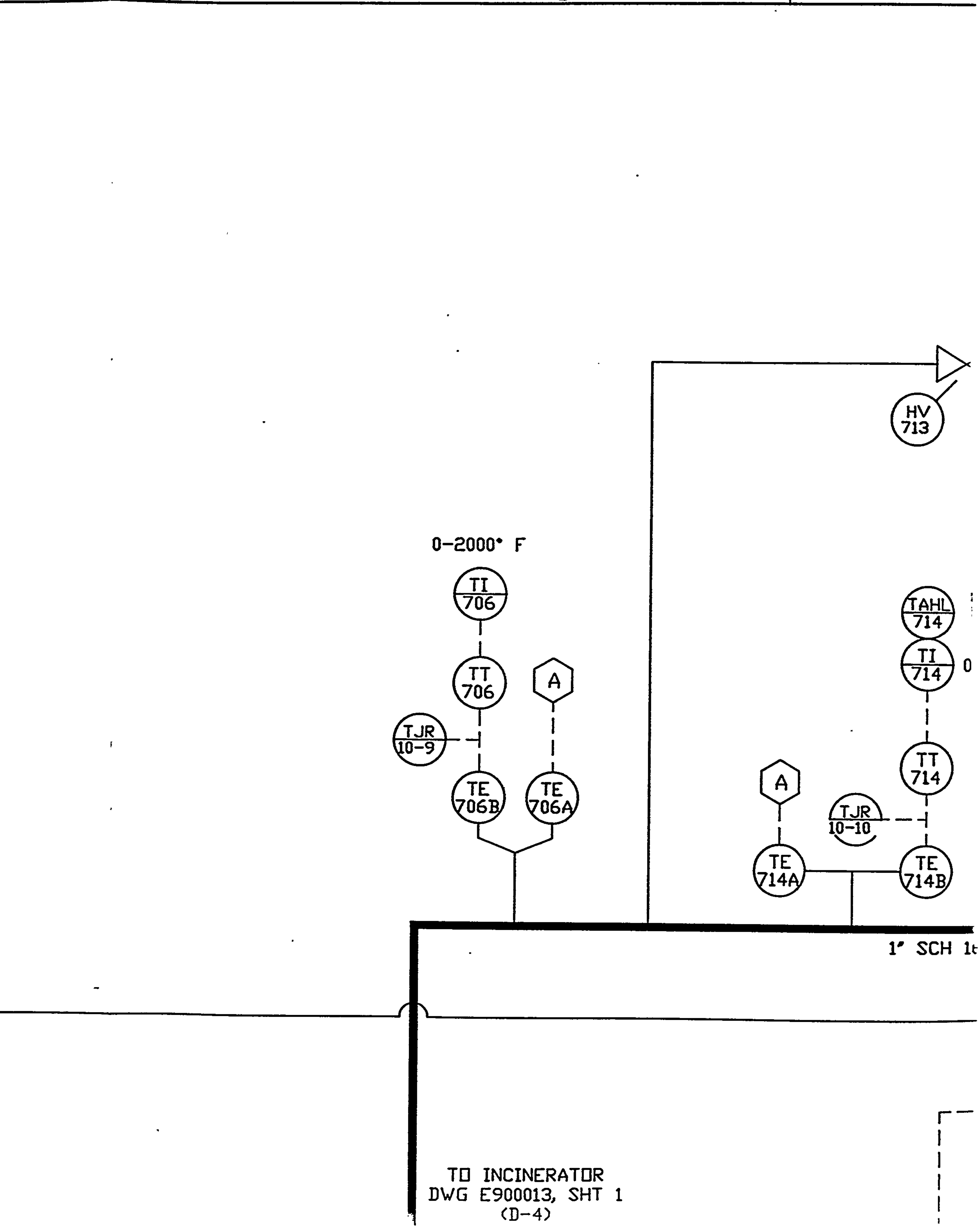
H

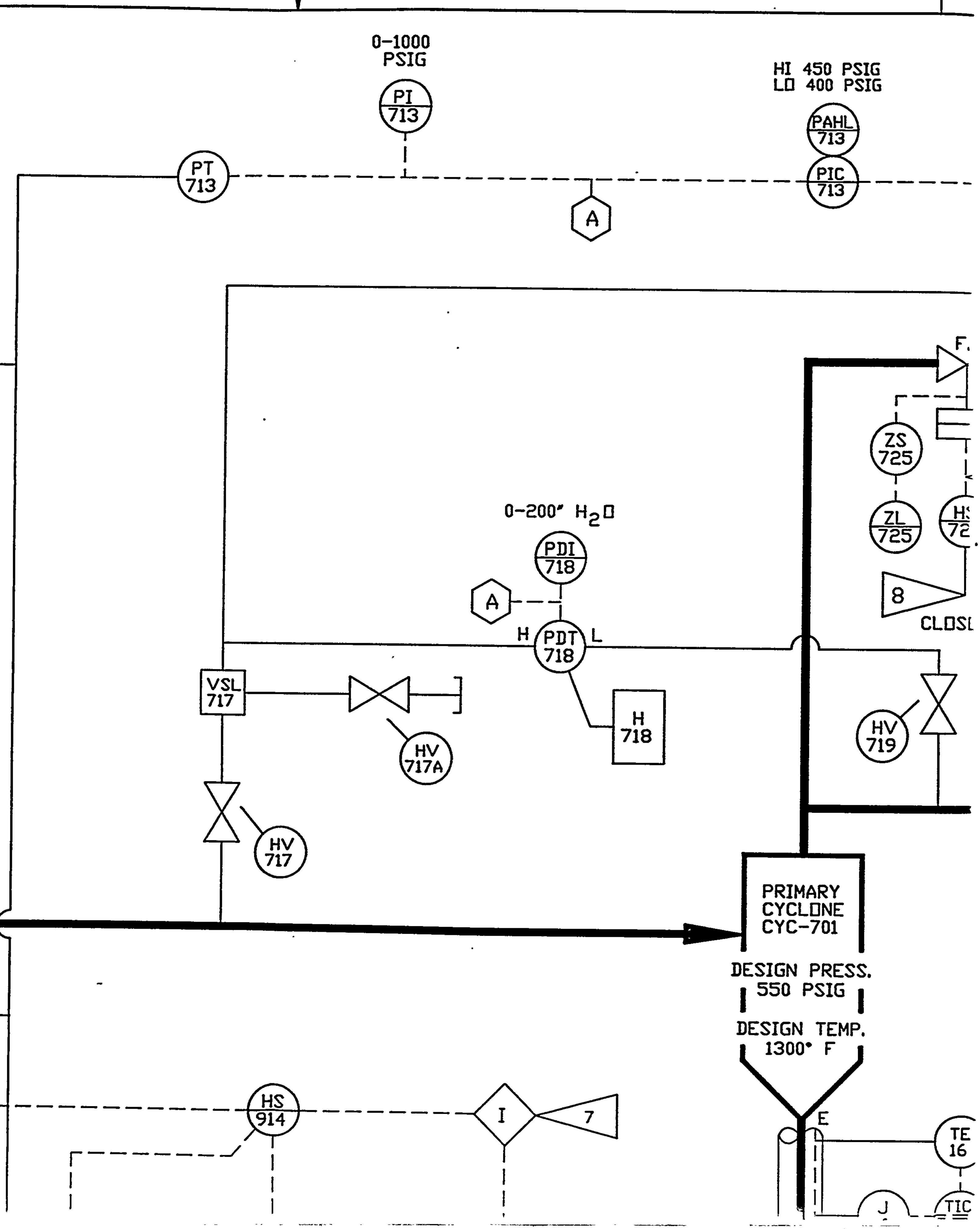
G

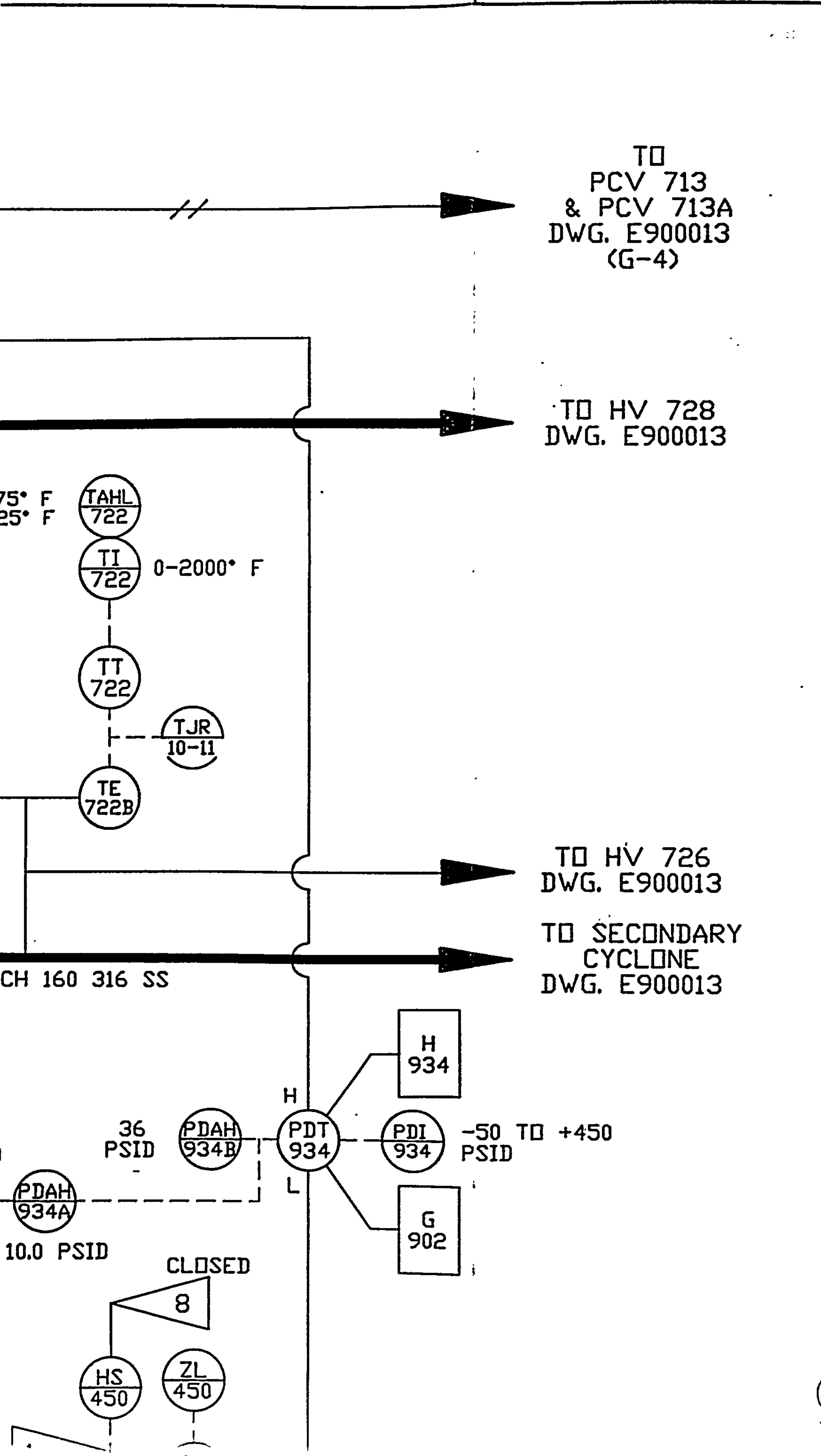
F



LT
604
ADDITIVE
FEED HOPPER
VSL-604
SEE VESSEL
DWG. D810008
DESIGN PRESS.
1100 PSIG
DESIGN TEMP.
150° F
HV
432
HV
604A
NOT IN USE


HV
713
0-2000° F
TI
706
TT
706
A
TJR
10-9
TE
706B
TE
706A
TAHL
714
TI
714
0
TT
714
A
TJR
10-10
TE
714A
TE
714B
1" SCH 1
TO INCINERATOR
DWG E900013, SHT 1
(D-4)


0-1000
PSIG
PI
713
HI 450 PSIG
LO 400 PSIG
PAHL
713
PT
713
PIC
713
A
ZS
725
ZL
725
0-200" $H_2O$
PDI
718
A
8
CLOS
H
PDT
718
L
VSL
717
H
718
HV
717A
HV
719
HV
717
PRIMARY
CYCLONE
CYC-701
DESIGN PRESS.
550 PSIG
DESIGN TEMP.
1300° F
HS
914
I
7
E
TE
16
J
TIC




| ZONE | REV | |
|---|---|---|
| GEN | 1 | UPDATED AS PER MARKED |
| E-6 | | REVISED PRESSURE RATIN |
| GEN | | REVISED PER MARKED PRI |
| B-3 | | REMOVED LS AND LAH-90 |
| C-3 | | REMOVED LS AND LAH-90 |
| E-3 | | REMOVED LS AND LAH-90 |
| G-7 | | REWORDED NOTE FOR ADD |
| F-6 | | NOTE 1150 °F WAS 1100 °F |
| DRAFTER G.J.K. | DATE 1/3/91 | CHECKER |
| | DATE | |

| ZONE | REV | |
|---|---|---|
| GEN | 2 | UPDATED AS PER MARKED |
| GEN | | ADDED NEW DWG. FORMAT |
| GEN | | UPDATED AS PER MARKED |
| GEN | | UPDATED AS PER MARKED |
| GEN | | ISSUED FOR CUSTOMER RE |
| DRAFTER JIMMY SMITH | DATE 7/17/92 | CHECKER GARY |
| EG&G RESPON SECT SUPV BURTON W. HARRELL | DATE 7/20/92 | EG&G ES J. L |

| ZONE | REV | |
|---|---|---|
| A-1 | 3 | CHANGED DWG. TITLE |
| GEN | | UPDATED AS PER MARKED |
| GEN | | ISSUED FOR CONSTRUCTI |
| B-2 | | ADDED NOTES 13 AND 14, |
| GEN | | UPDATED AS PER MARKE |
| DRAFTER GARY J. KULCHOCK | DATE 11/18/92 | CHECKER S |
| EG&G ES&H J. L. BUCKLEW | DATE 11/19/92 | PROJECT |

| ZONE | REV | |
|---|---|---|
| GEN | 4 | ADDED DESIGN PRESSURE VSL-904, VSL-604, RPV- REMOVED NUMBERS FROM ISSUED FOR CONSTRUCTI |
| DRAFTER GARY J. KULCHOCK | DATE 4/5/93 | CHECKER S |
| EG&G ES&H J. L. BUCKLEW | DATE 4/7/93 | PROJECT JOH |

| ZONE | REV | |
|---|---|---|
| GEN | 5 | ADDED NOTE ON ALL IN "PDAH-934B", "PDAH-9 "FO" WAS "FC" ON FV- TI-901, AND TE-901B; REVISED PIPING AROUN ISSUED FOR CONSTRUCT |
| DRAFTER Gary Kulchock | DATE 9/10/93 | CHECKER |
| EG&G ES&H Larry Bucklew | DATE 9/17/93 | PROJECT Jo |

| ZONE | REV | |
|---|---|---|
| GEN | 6 | EXTENSIVE CHANGES AS ISSUED FOR CONSTRUCTIO |
| DRAFTER [signature] | DATE 10/7/94 | CHECKER |
| EG&G ES&H [signature] | DATE 10-11-94 | PROJECT |

2 | 1

# REVISION

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 1 | UPDATED AS PER MARKED PRINT | 4/25/90 |
| C-6 | | REVISED PRESSURE RATINGS | 6/26/90 |
| GEN<br>B-3<br>C-3<br>E-3<br>G-7<br>F-6 | | REVISED PER MARKED PRINT<br>REMOVED LS AND LAH-904<br>REMOVED LS AND LAH-903<br>REMOVED LS AND LAH-902<br>REWORDED NOTE FOR ADDITIVE FEED HOPPER<br>NOTE 1150 °F WAS 1100 °F | 10/11/90 |

| DRAFTER | DATE | CHECKER | DATE | PROJECT ENGINEER | DATE | | DATE |
|---|---|---|---|---|---|---|---|
| G.J.K. | 1/3/91 | D.F. | 1/3/91 | J.P.K. | 2/13/91 | | |
| | | | | | | | |

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 2 | UPDATED AS PER MARKED PRINT WITH W.O. #68547 | 10/3/91 |
| GEN<br>GEN | | ADDED NEW DWG. FORMAT<br>UPDATED AS PER MARKED PRINT WITH W.O. #70756 | 1/10/92 |
| GEN<br>GEN | | UPDATED AS PER MARKED PRINT WITH WORK PLAN<br>ISSUED FOR CUSTOMER REVIEW AND COMMENT | 7/17/92 |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESPON ENGINEER | DATE | EG&G REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| JIMMY SMITH | 7/17/92 | GARY J. KULCHOCK | 7/17/92 | JAY RUTTEN | 7/17/92 | D. LUNIFELD | 7/17/92 |
| EG&G RESPON SECT SUPV: ...RTON W. HARRELL | 7/20/92 | EG&G ES&H: J. L. BUCKLEW | 7/20/92 | | | | |

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| A-1<br>GEN<br>GEN | 3 | CHANGED DWG. TITLE<br>UPDATED AS PER MARKED PRINT WITH WORK PLAN<br>ISSUED FOR CONSTRUCTION | 9/10/92 |
| B-2 | | ADDED NOTES 13 AND 14, AND CORRESPONDING INTERLOCKS | 9/16/92 |
| GEN | | UPDATED AS PER MARKED PRINT WITH WORK PLAN | 11/16/92 |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| ...RY J. KULCHOCK | 11/18/92 | S CONKO | 11/18/92 | JAY RUTTEN | 11/19/92 | D. LUNIFELD | 11/19/92 |
| EG&G ES&H: J. L. BUCKLEW | 11/19/92 | PROJECT ENGR. | | BRANCH MANAGER | | DOE (EOSD): JOHN ROTUNDA | 11/24/92 |

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 4 | ADDED DESIGN PRESSURE AND DESIGN TEMPERATURE TO VSL-901, VSL-902, VSL-903, VSL-904, VSL-604, RPV-701 AND CYC-701<br>REMOVED NUMBERS FROM ADACS SYMBOLS<br>ISSUED FOR CONSTRUCTION | 03/26/93 |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| ...RY J. KULCHOCK | 4/5/93 | S CONKO | 4/5/93 | JAY RUTTEN | 4/7/93 | D. LUNIFELD | 4/7/93 |
| EG&G ES&H: J. L. BUCKLEW | 4/7/93 | PROJECT ENGR.: JOHN ROCKEY | 5/27/93 | BRANCH MANAGER: LARRY STRICKLAND | 5/27/93 | DOE (EOSD): BILL AYERS | 5/27/93 |

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 5 | ADDED NOTE ON ALL INCINERATOR DESIGNATIONS; "PLAL-934A" WAS "PLAL-934B"; "PDAH-934A" WAS "PDAH-934B"; "PDAH-934B" WAS "PDAH-934A"; MODIFIED PSID RANGE ON PDI-934, WAS "0-50" "FO" WAS "FC" ON FV-725; ADDED "#1" TO ALL N DESIGNATIONS; RELOCATED HV-436A, TE-901A, T1-901, AND TE-901B; ADDED HV-437 AND HV-438; ADDED NOTE TO VENT SYSTEM, ZONE A-6<br>REVISED PIPING AROUND VSL-901; ADDED LINE AHEAD OF FSV-435, ZONE C-8 & C-7<br>ISSUED FOR CONSTRUCTION | 09/01/93 |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| Gary Kulchock | 9/10/93 | S. Conko | 9/14/93 | Jay Rutten | 9/15/93 | Dave Lunifeld | 9/20/93 |
| EG&G ES&H: Larry Bucklew | 9/17/93 | PROJECT ENGR.: John Rockey | 9/21/93 | BRANCH MANAGER: Larry Shadle | 9/21/93 | DOE (EOSD): John Rotunda/WJA | 9/20/93 |

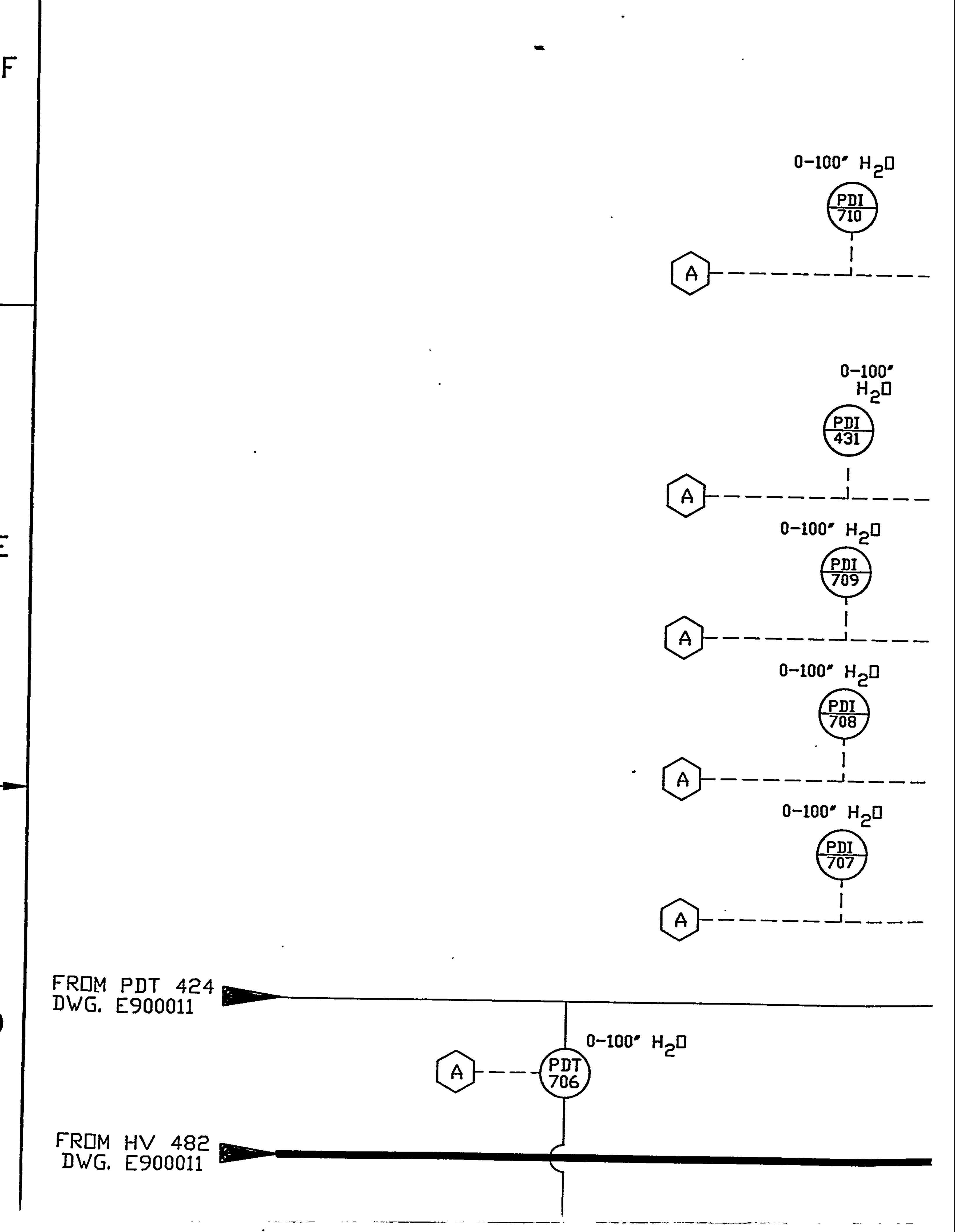
| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 6 | EXTENSIVE CHANGES AS PER MARKED PRINT REDLINED BY JAY RUTTEN ON 15 FEB 94.<br>ISSUED FOR CONSTRUCTION | 9/30/94 |

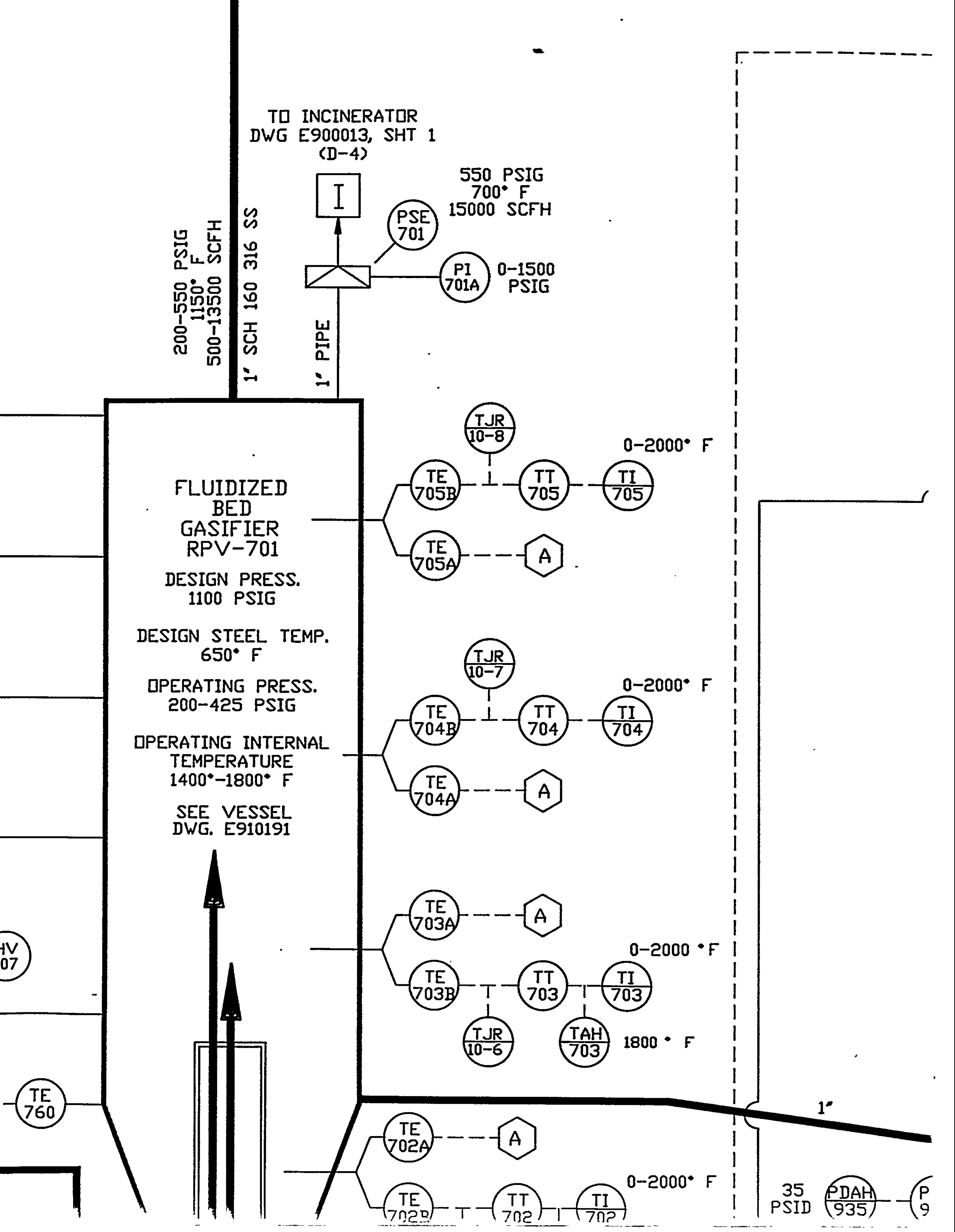
| DRAFTER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| Gary Kulchock | 10/7/94 | S. Conko | 10-7-94 | Jay Rutten | 10-11-94 | D. Lunifeld | 10/11/94 |
| EG&G ES&H: Bucklew | 10-11-94 | PROJECT ENGR.: J. M. Rockey | 10/13/94 | BRANCH MANAGER: Larry Shadle | 10-18-94 | DOE (EOSD): [illegible] | 1-/11/94 |

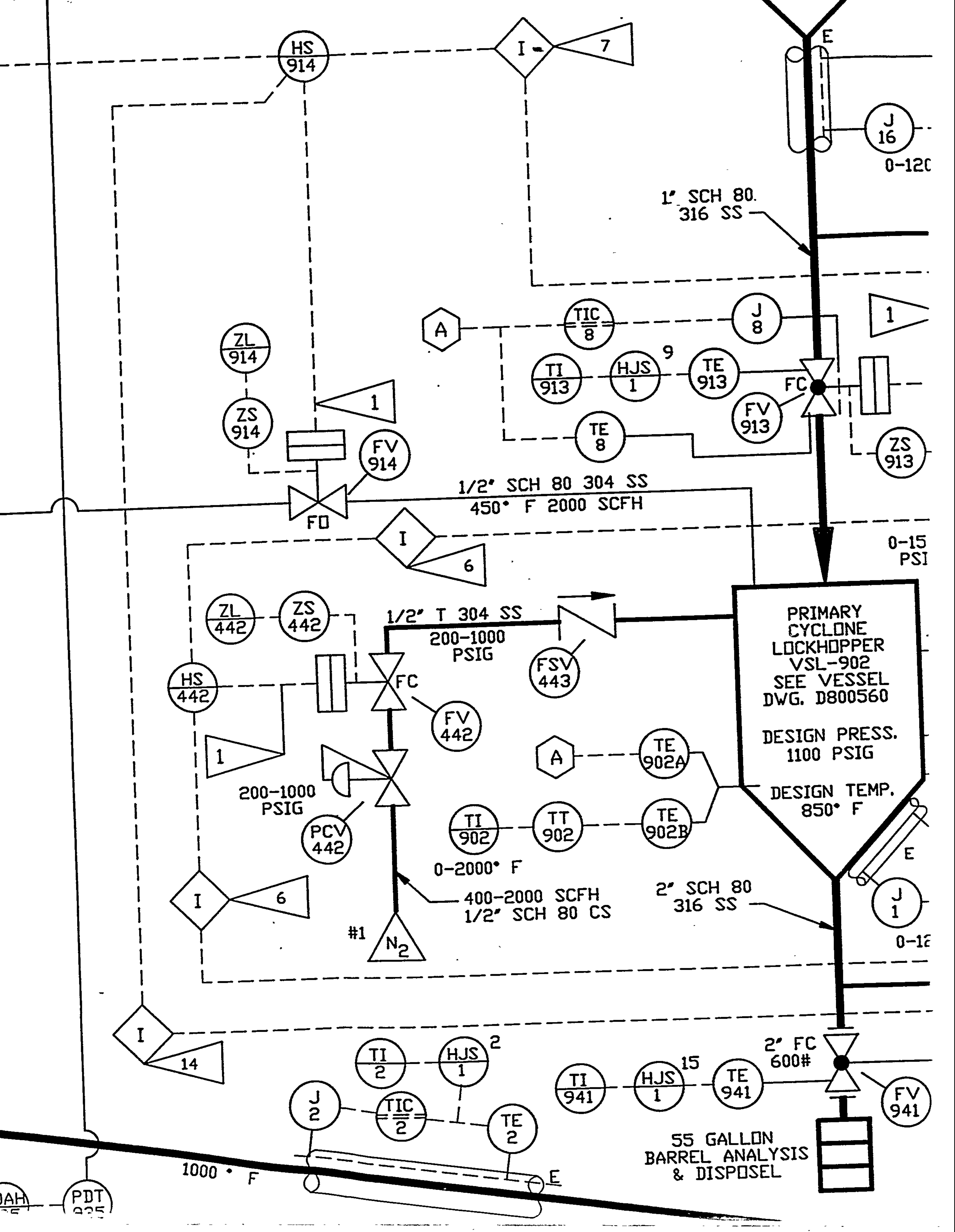
H

G

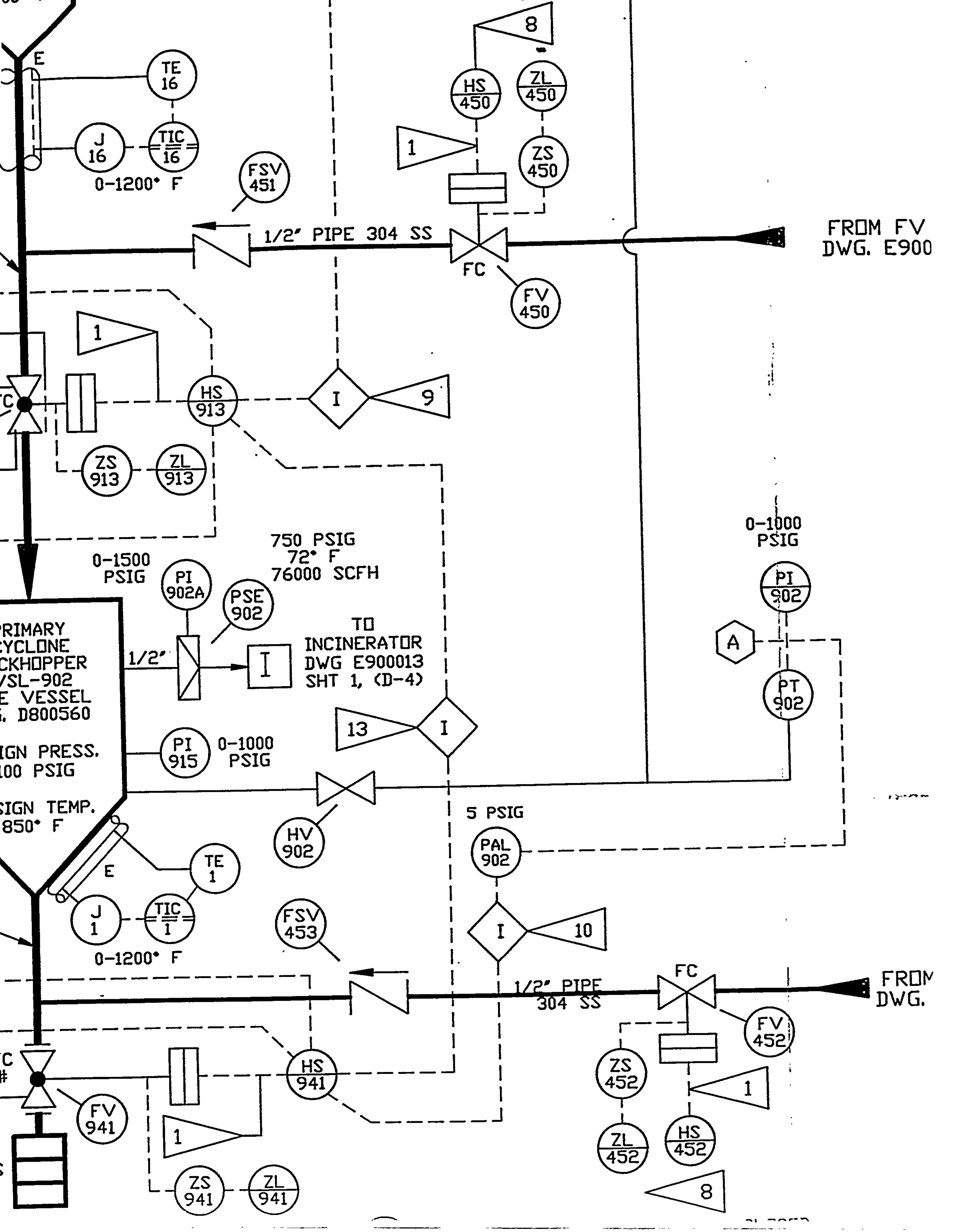
F


F
0-100" H2O
PDI 710
A
0-100" H2O
PDI 431
A
E
0-100" H2O
PDI 709
A
0-100" H2O
PDI 708
A
0-100" H2O
PDI 707
A
FROM PDT 424
DWG. E900011
0-100" H2O
A
PDT 706
FROM HV 482
DWG. E900011


TO INCINERATOR
DWG E900013, SHT 1
(D-4)
I
550 PSIG
700° F
15000 SCFH
PSE 701
PI 701A
0-1500 PSIG
200-550 PSIG
1150° F
500-13500 SCFH
1" SCH 160 316 SS
1" PIPE
TJR 10-8
0-2000° F
TE 705B
TT 705
TI 705
TE 705A
A
FLUIDIZED
BED
GASIFIER
RPV-701
DESIGN PRESS.
1100 PSIG
DESIGN STEEL TEMP.
650° F
OPERATING PRESS.
200-425 PSIG
OPERATING INTERNAL
TEMPERATURE
1400°-1800° F
SEE VESSEL
DWG. E910191
TJR 10-7
0-2000° F
TE 704B
TT 704
TI 704
TE 704A
A
TE 703A
A
0-2000 °F
TE 703B
TT 703
TI 703
TJR 10-6
TAH 703
1800 ° F
HV 07
TE 760
1"
TE 702A
A
0-2000° F
TE 702B
TT 702
TI 702
35 PSID
PDAH 935



HS 914
I
7
J 16
0-120
1" SCH 80
316 SS
TIC 8
J 8
1
A
ZL 914
ZS 914
1
FV 914
FO
TI 913
HJS 1
9
TE 913
FC
FV 913
TE 8
ZS 913
1/2" SCH 80 304 SS
450° F 2000 SCFH
I
6
0-15
PSI
ZL 442
ZS 442
1/2" T 304 SS
200-1000
PSIG
FSV 443
PRIMARY
CYCLONE
LOCKHOPPER
VSL-902
SEE VESSEL
DWG. D800560
DESIGN PRESS.
1100 PSIG
DESIGN TEMP.
850° F
HS 442
FC
FV 442
1
A
TE 902A
200-1000
PSIG
PCV 442
TI 902
TT 902
TE 902B
E
0-2000° F
J 1
2" SCH 80
316 SS
I
6
400-2000 SCFH
1/2" SCH 80 CS
#1
N2
0-12
I
14
TI 2
HJS 1
2
2" FC
600#
TI 941
HJS 1
15
TE 941
FV 941
J 2
TIC 2
TE 2
55 GALLON
BARREL ANALYSIS
& DISPOSEL
1000 ° F
E
PDT



TE 16
J 16
TIC 16
0-1200° F
FSV 451
8
HS 450
ZL 450
1
ZS 450
1/2" PIPE 304 SS
FC
FV 450
FROM FV
DWG. E900
1
HS 913
I
9
ZS 913
ZL 913
0-1500
PSIG
PI 902A
PSE 902
750 PSIG
72° F
76000 SCFH
0-1000
PSIG
PI 902
A
PT 902
PRIMARY
CYCLONE
CKHOPPER
/SL-902
E VESSEL
. D800560
1/2"
I
TO
INCINERATOR
DWG E900013
SHT 1, (D-4)
IGN PRESS.
100 PSIG
SIGN TEMP.
850° F
PI 915
0-1000
PSIG
13
I
HV 902
5 PSIG
PAL 902
E
TE 1
J 1
TIC 1
0-1200° F
FSV 453
I
10
FC
1/2" PIPE
304 SS
FROM
DWG.
FV 452
ZS 452
1
ZL 452
HS 452
8
HS 941
FV 941
1
ZS 941
ZL 941

| GEN | 6 | EXTENSIVE CHANGES AS PER MARKED PRINT REDLINED BY ... ISSUED FOR CONSTRUCTION |
|---|---|---|

| DRAFTER | DATE 10/7/94 | CHECKER S. Carlee | DATE 10-7-94 | EG&G RESPONSIBLE ENGR. | DATE 10-11-94 |
|---|---|---|---|---|---|
| EG&G ES&H | DATE 10-11-94 | PROJECT ENGR. | DATE 10/13/94 | BRANCH MANAGER | DATE 10-18-94 |

FROM FV 454
DWG. E900013

000
IG

PI
902

PT
902

LEGEND:

I = PIPED TO PACKAGED INCINERATOR SYSTEM

A = INPUT TO THE DDAS SYSTEM

G XXX IDENTIFIES THE CONNECTING SEGMENT OF THE T
PURGE SYSTEM, WHERE XXX IS THE SEGMENT IDE
NUMBER. (SEE DWG. E900013, SHT. 2 OF 2 FOR
THIS SYMBOL INDICATES THAT THE FOLLOWING E
IS IN THE PURGE LINE FROM THE NITROGEN HEA
TRANSMITTER:
FV-440, FSV-441, HV-441, HV-XXXP, FV-XXX
FSV-XXXP

H XXX ~~IDENTIFIES THE CONNECTING SEGMENT OF THE~~
PURGE SYSTEM, WHERE XXX IS THE SEGMENT II
NUMBER. (SEE DWG. E900013, SHT. 2 OF 2 FOR
THIS SYMBOL INDICATES THAT THE FOLLOWING
IS IN THE PURGE LINE FROM THE NITROGEN HE
TRANSMITTER:
FV-440, FSV-441, HV-441, HV-XXXP, & FSV-

FROM FV 458
DWG. E900013

V
52

NOTES:

1 THIS FLAGGED NOTE DESIGNATES THE FOLLOWIN
WHICH IS NOT SHOWN ON THIS DWG. FOR CLARI
PANEL-MOUNTED ON/OFF STATION (HAND SWITCH
POSITION INDICATION LAMPS), 24 VDC RELAY, 11
60 HZ SOLENOID VALVE.

2 FV-940 WILL NOT OPEN UNTIL PT-901 MEASURE

| | | |
|---|---|---|
| GEN | 0 | ISSUED FOR CONSTRUCTION |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| | 10/7/94 | | 10-7-94 | | 10-11-94 | | 10/11/94 |
| **G ESH** | **DATE** | **PROJECT ENGR.** | **DATE** | **BRANCH MANAGER** | **DATE** | **DOE (EOSD)** | **DATE** |
| | 10-11-94 | | 10/13/94 | | 10-18-94 | | 10/18/94 |

F

GEND:

I = PIPED TO PACKAGED INCINERATOR SYSTEM

A = INPUT TO THE DDAS SYSTEM

E

G XXX IDENTIFIES THE CONNECTING SEGMENT OF THE TRANSMITTER PURGE SYSTEM, WHERE XXX IS THE SEGMENT IDENTIFICATION NUMBER. (SEE DWG. E900013, SHT. 2 OF 2 FOR DETAILS.) THIS SYMBOL INDICATES THAT THE FOLLOWING EQUIPMENT IS IN THE PURGE LINE FROM THE NITROGEN HEADER TO THE TRANSMITTER:
FV-440, FSV-441, HV-441, HV-XXXP, FV-XXXP, & FSV-XXXP

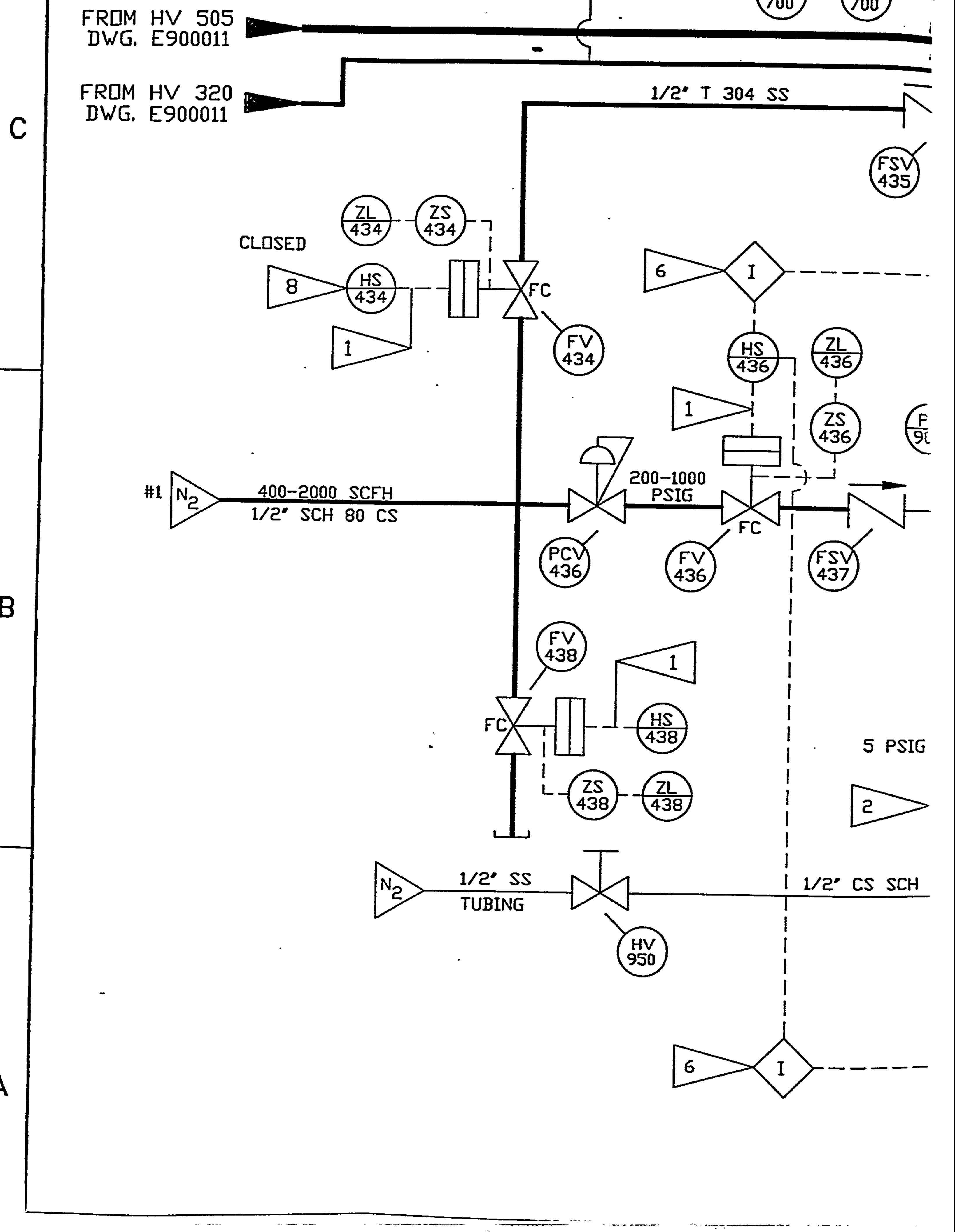
H XXX ~~IDENTIFIES THE CONNECTING SEGMENT OF THE TRANSMITTER~~ PURGE SYSTEM, WHERE XXX IS THE SEGMENT IDENTIFICATION NUMBER. (SEE DWG. E900013, SHT. 2 OF 2 FOR DETAILS.) THIS SYMBOL INDICATES THAT THE FOLLOWING EQUIPMENT IS IN THE PURGE LINE FROM THE NITROGEN HEADER TO THE TRANSMITTER:
FV-440, FSV-441, HV-441, HV-XXXP, & FSV-XXXP.

S:

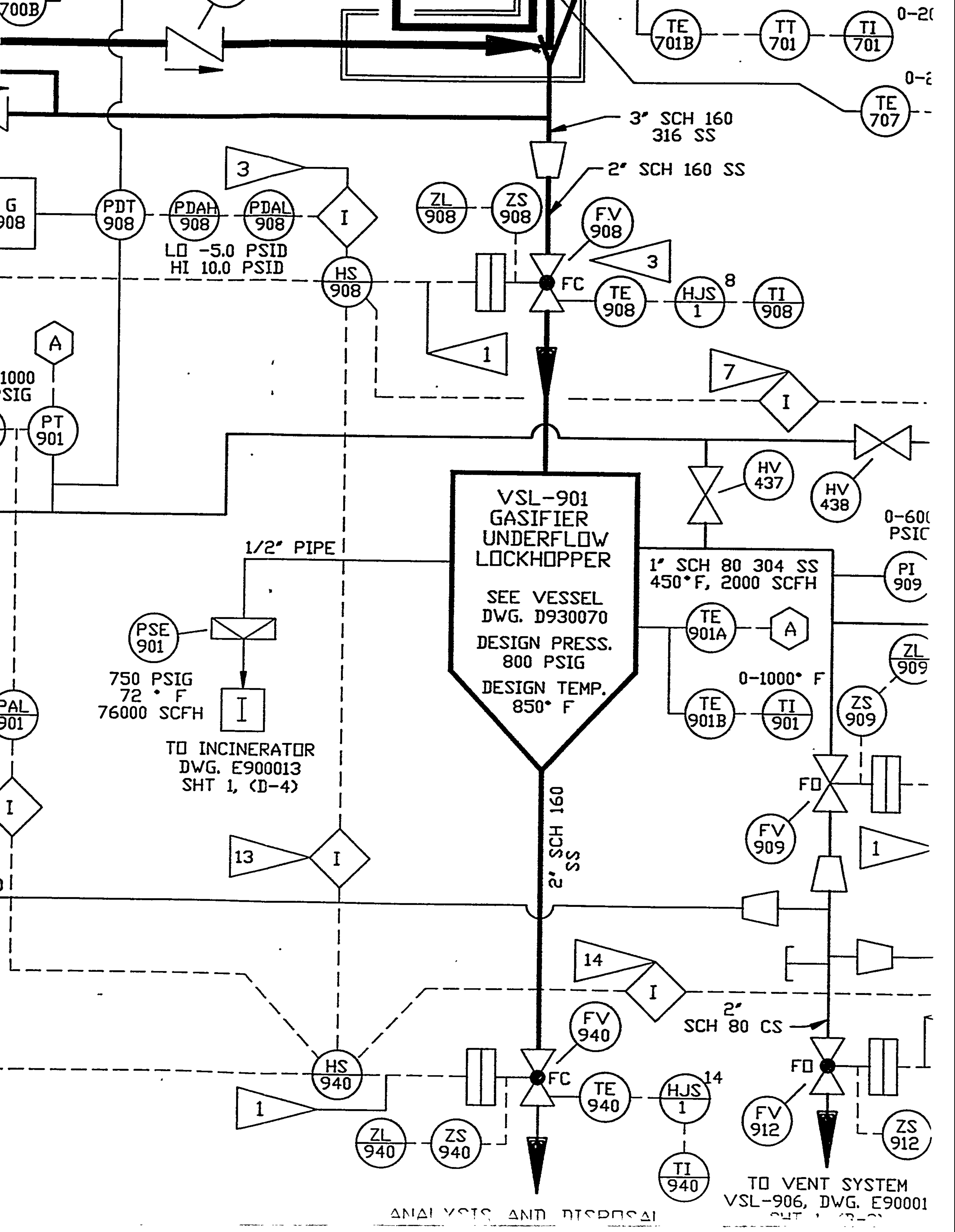
D

THIS FLAGGED NOTE DESIGNATES THE FOLLOWING EQUIPMENT WHICH IS NOT SHOWN ON THIS DWG. FOR CLARITY; PANEL-MOUNTED ON/OFF STATION (HAND SWITCH WITH POSITION INDICATION LAMPS), 24 VDC RELAY, 117 VAC 60 HZ SOLENOID VALVE.

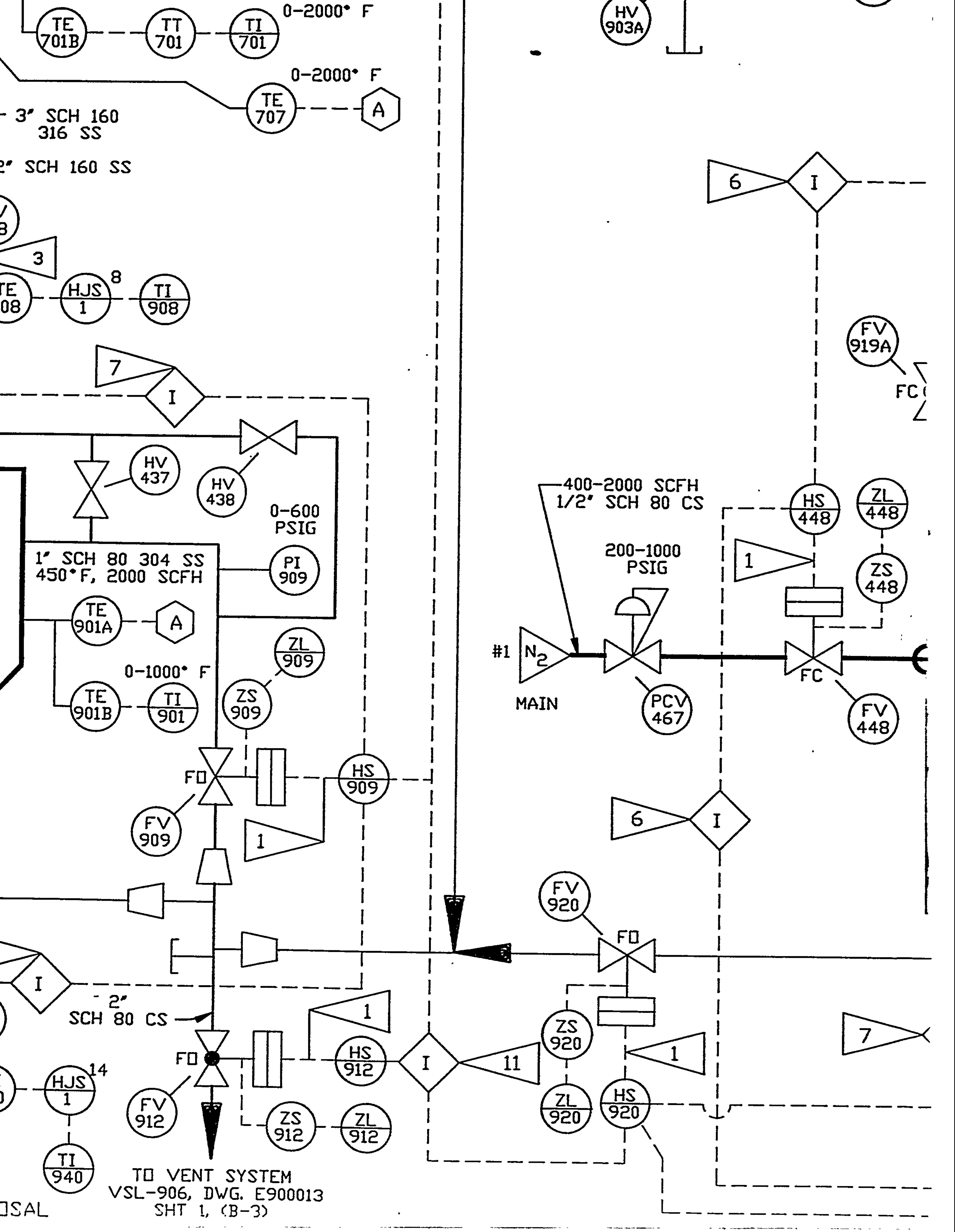
FV-940 WILL NOT OPEN UNTIL PT-901 MEASURES A PRESSURE LESS THAN OR EQUAL TO 2 PSIG.



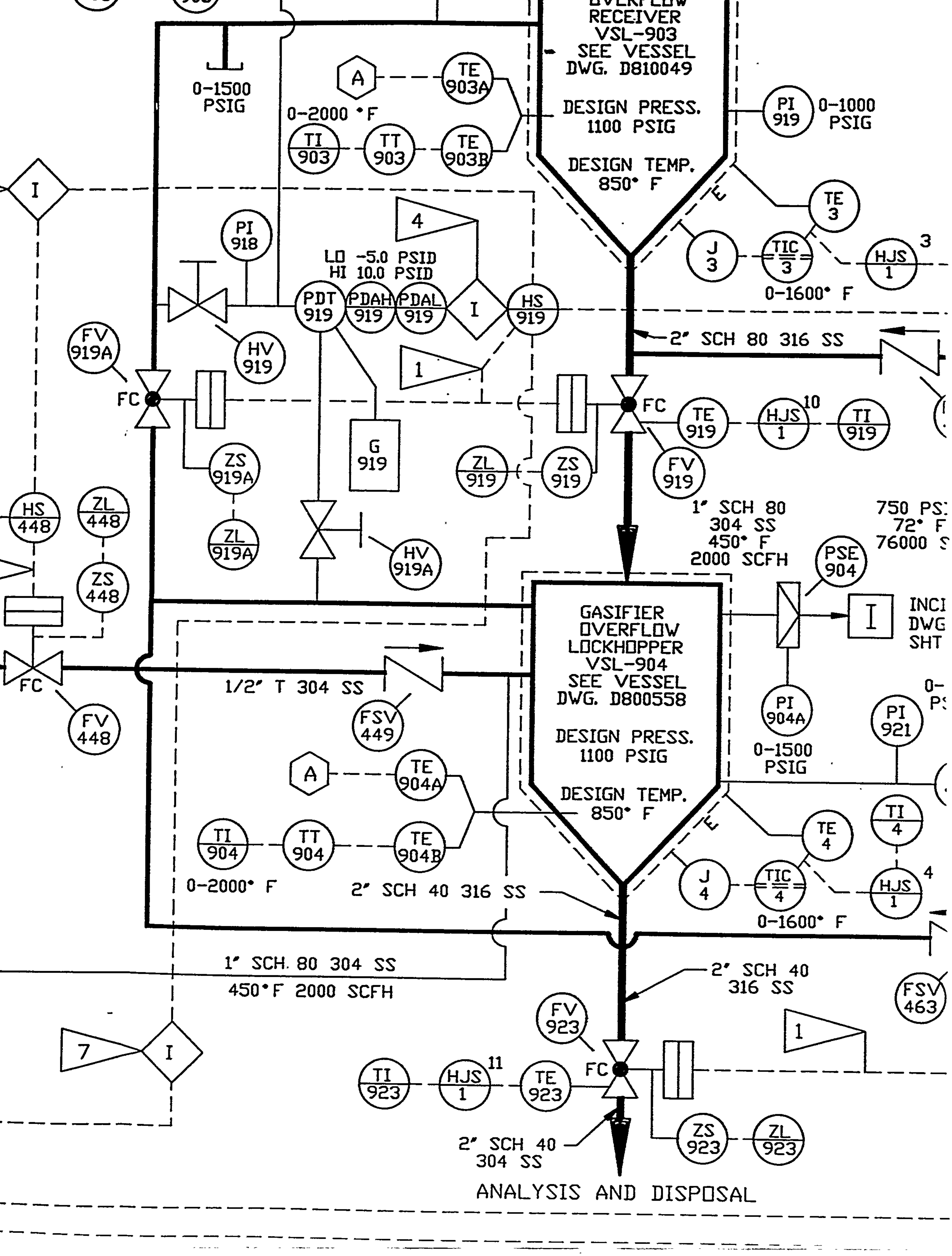
FROM HV 505
DWG. E900011
FROM HV 320
DWG. E900011
1/2" T 304 SS
C
FSV 435
ZL 434
ZS 434
CLOSED
8
HS 434
FC
1
FV 434
6
I
HS 436
ZL 436
1
ZS 436
#1 N2
400-2000 SCFH
1/2" SCH 80 CS
200-1000
PSIG
FC
PCV 436
FV 436
FSV 437
B
FV 438
1
FC
HS 438
5 PSIG
ZS 438
ZL 438
2
N2
1/2" SS
TUBING
1/2" CS SCH
HV 950
6
I
A



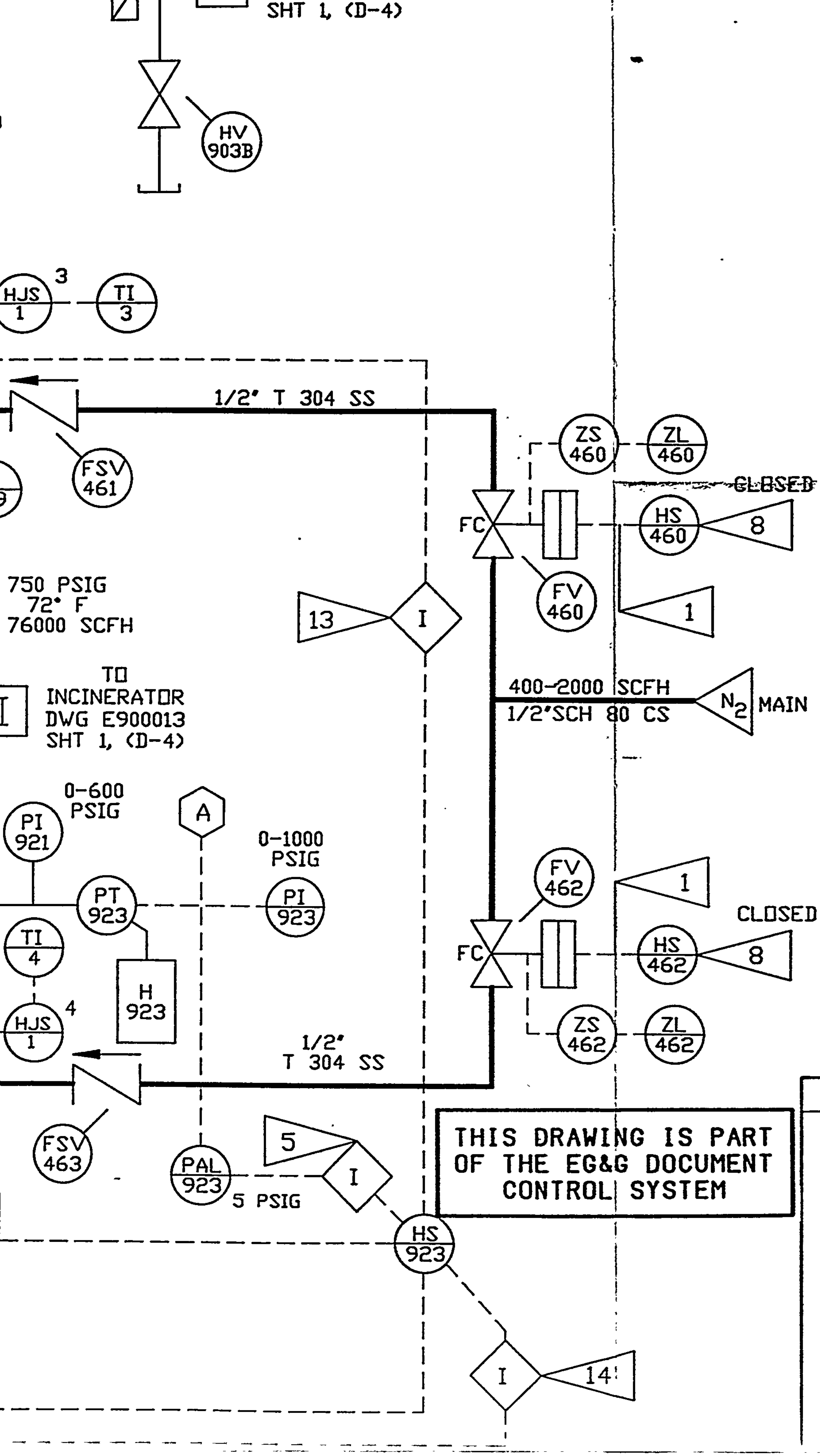
VSL-901
GASIFIER
UNDERFLOW
LOCKHOPPER
SEE VESSEL
DWG. D930070
DESIGN PRESS.
800 PSIG
DESIGN TEMP.
850° F
3" SCH 160
316 SS
2" SCH 160 SS
LO -5.0 PSID
HI 10.0 PSID
1/2" PIPE
750 PSIG
72 ° F
76000 SCFH
TO INCINERATOR
DWG. E900013
SHT 1, (D-4)
1" SCH 80 304 SS
450° F, 2000 SCFH
0-1000° F
2" SCH 160
SS
2"
SCH 80 CS
TO VENT SYSTEM
VSL-906, DWG. E90001
PDT 908
PDAH 908
PDAL 908
HS 908
ZL 908
ZS 908
FV 908
FC
TE 908
HJS 1
TI 908
TE 701B
TT 701
TI 701
TE 707
PT 901
HV 437
HV 438
PI 909
PSE 901
TE 901A
TE 901B
TI 901
ZL 909
ZS 909
FO
FV 909
HS 940
FV 940
TE 940
TI 940
ZL 940
ZS 940
FV 912
ZS 912



TE 701B
TT 701
TI 701
0-2000° F
HV 903A
0-2000° F
TE 707
A
3" SCH 160
316 SS
2" SCH 160 SS
6
I
3
TE 908
HJS 1
8
TI 908
FV 919A
FC
7
I
HV 437
HV 438
0-600
PSIG
400-2000 SCFH
1/2" SCH 80 CS
HS 448
ZL 448
1" SCH 80 304 SS
450°F, 2000 SCFH
PI 909
200-1000
PSIG
1
ZS 448
TE 901A
A
ZL 909
#1
$N_2$
MAIN
FC
0-1000° F
ZS 909
TE 901B
TI 901
PCV 467
FV 448
FO
HS 909
FV 909
1
6
I
FV 920
FO
I
2"
SCH 80 CS
1
ZS 920
1
7
FO
HS 912
I
11
HJS 1
14
FV 912
ZS 912
ZL 912
ZL 920
HS 920
TI 940
TO VENT SYSTEM
VSL-906, DWG. E900013
SHT 1, (B-3)
OSAL



RECEIVER
VSL-903
SEE VESSEL
DWG. D810049
DESIGN PRESS.
1100 PSIG
DESIGN TEMP.
850° F
0-1500
PSIG
TE 903A
0-2000 °F
TI 903
TT 903
TE 903B
PI 919
0-1000
PSIG
TE 3
J 3
TIC 3
HJS 1
3
0-1600° F
PI 918
4
LO -5.0 PSID
HI 10.0 PSID
PDT 919
PDAH 919
PDAL 919
I
HS 919
2" SCH 80 316 SS
FV 919A
HV 919
1
FC
TE 919
HJS 1
10
TI 919
ZS 919A
G 919
ZL 919
ZS 919
FV 919
ZL 919A
HV 919A
1" SCH 80
304 SS
450° F
2000 SCFH
750 PS
72° F
76000 S
PSE 904
HS 448
ZL 448
ZS 448
GASIFIER
OVERFLOW
LOCKHOPPER
VSL-904
SEE VESSEL
DWG. D800558
DESIGN PRESS.
1100 PSIG
DESIGN TEMP.
850° F
INCI
DWG
SHT
1/2" T 304 SS
FSV 449
FV 448
PI 904A
0-1500
PSIG
PI 921
A
TE 904A
TI 904
TT 904
TE 904B
0-2000° F
TE 4
TI 4
J 4
TIC 4
HJS 1
4
0-1600° F
2" SCH 40 316 SS
E
1" SCH. 80 304 SS
450°F 2000 SCFH
2" SCH 40
316 SS
FSV 463
FV 923
7
TI 923
HJS 1
11
TE 923
ZS 923
ZL 923
2" SCH 40
304 SS
ANALYSIS AND DISPOSAL




RPV-

4 FV-9
A PR
5.0 F
MUST

5 FV-9
LESS

6 LOCK
VAL
$N_2$ C
OPEN

7 RELA
VEN

8 DESI
LOCK

9 FV-9
PRES
5.0 F
LOWI

10 FV-
PRES

11 RELA
909,

12 THIS
SUPE
TUBI

13 RELA
VAL

14 RELA
FROM

| REFERENCE DRAWINGS | |
|---|---|
| E900010<br>E900011<br>E900013 | DRAFTER<br>S. CON<br>CHECKER<br>A. R. KL<br>PROJECT ENGINEER<br>J.P. KAN |

RPV-701.

FV-919 & FV-919A WILL NOT OPEN UNTIL PDT-919 MEASURES A PRESSURE DIFFERENTIAL LESS THAN OR EQUAL TO 5.0 PSID. REF. DWG. NO. D910379. THE PRESSURE IN VSL-903 MUST BE HIGHER THAN THE PRESSURE IN VSL-904.

FV-923 WILL NOT OPEN UNTIL PT-923 MEASURES A PRESSURE LESS THAN OR EQUAL TO 2 PSIG. REF. DWG. NO. D910379

C

LOCKHOPPER FILL VALVE CANNOT BE OPENED IF THE N2 CHARGING VALVE IS OPENED. DUMP VALVE CANNOT BE OPENED IF THE $N_2$ CHARGING VALVE IS OPENED. $N_2$ CHARGING VALVE CANNOT BE OPENED IF THE FILL OR DUMP VALVES ARE OPEN.

RELAY INTERLOCKS PREVENT THE LOCKHOPPER'S FILL VALVE AND VENT VALVE FROM BEING OPEN AT THE SAME TIME.

DESIGNATES THAT THE CONTROL PANEL SWITCH IS PHYSICALLY LOCKED TO PREVENT ACCIDENTAL ACTUATION.

FV-913 WILL NOT OPEN UNTIL PDT-934 MEASURES A PRESSURE DIFFERENTIAL LESS THAN OR EQUAL TO 5.0 PSID. THE PRESSURE IN VSL-902 MUST BE LOWER THAN THE PRESSURE IN CYC-701.

FV-941 WILL NOT OPEN UNTIL PT-902 MEASURES A PRESSURE LESS THAN OR EQUAL TO 2 PSIG.

RELAY INTERLOCKS PREVENT THE LOCKHOPPER VENT VALVES 909, 920 & 914 FROM OPENING UNLESS FV-912 IS OPEN.

THIS DWG. & DWGS. E900010, E900011 & E900013 SUPERCEDES DWG. R800524 (SEE DWG. E900013 FOR NOTES, TUBING & PIPING SUMMARY).

RELAY INTERLOCKS PREVENT THE LOCKHOPPER'S FILL AND DUMP VALVES FROM BEING OPEN AT THE SAME TIME.

RELAY INTERLOCKS PREVENT THE LOCKHOPPER'S DUMP VALVE FROM OPENING UNLESS THE VENT VALVE IS OPEN.

DWG NO E900012 SH 1

A

| | |
|---|---|
| DRAFTER S. CONKO | DATE 3/6/90 |
| CHECKER A. R. KUBALA | DATE 3/6/90 |
| PROJECT ENGINEER J.P. KANOSKY | DATE 3/6/90 |
| | DATE |
| | DATE |
| | DATE |
| | DATE |
| | DATE |

DEPARTMENT OF ENERGY · UNITED STATES OF AMERICA

United States Department of Energy

MORGANTOWN ENERGY TECHNOLOGY CENTER

Morgantown, WV

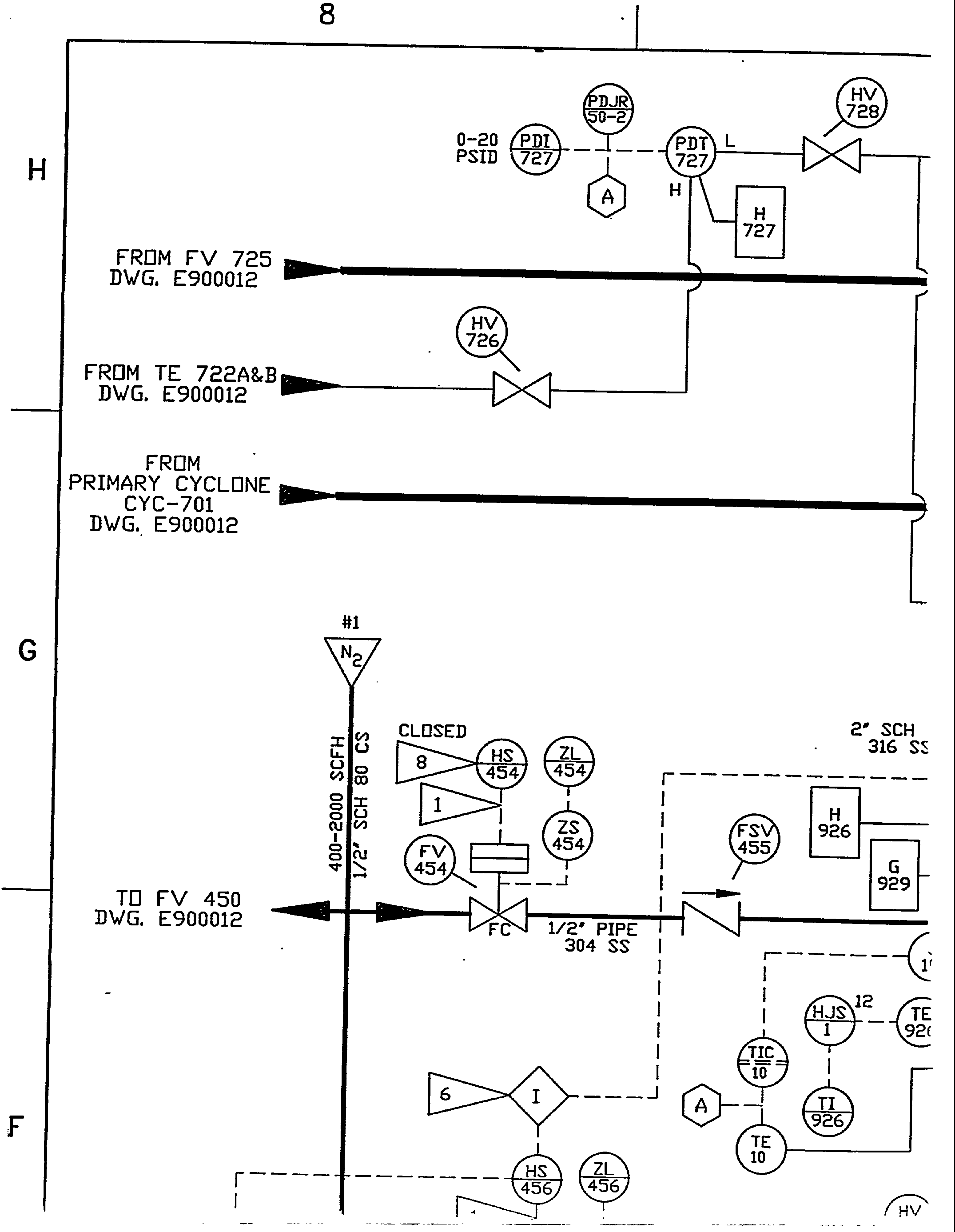
TITLE:

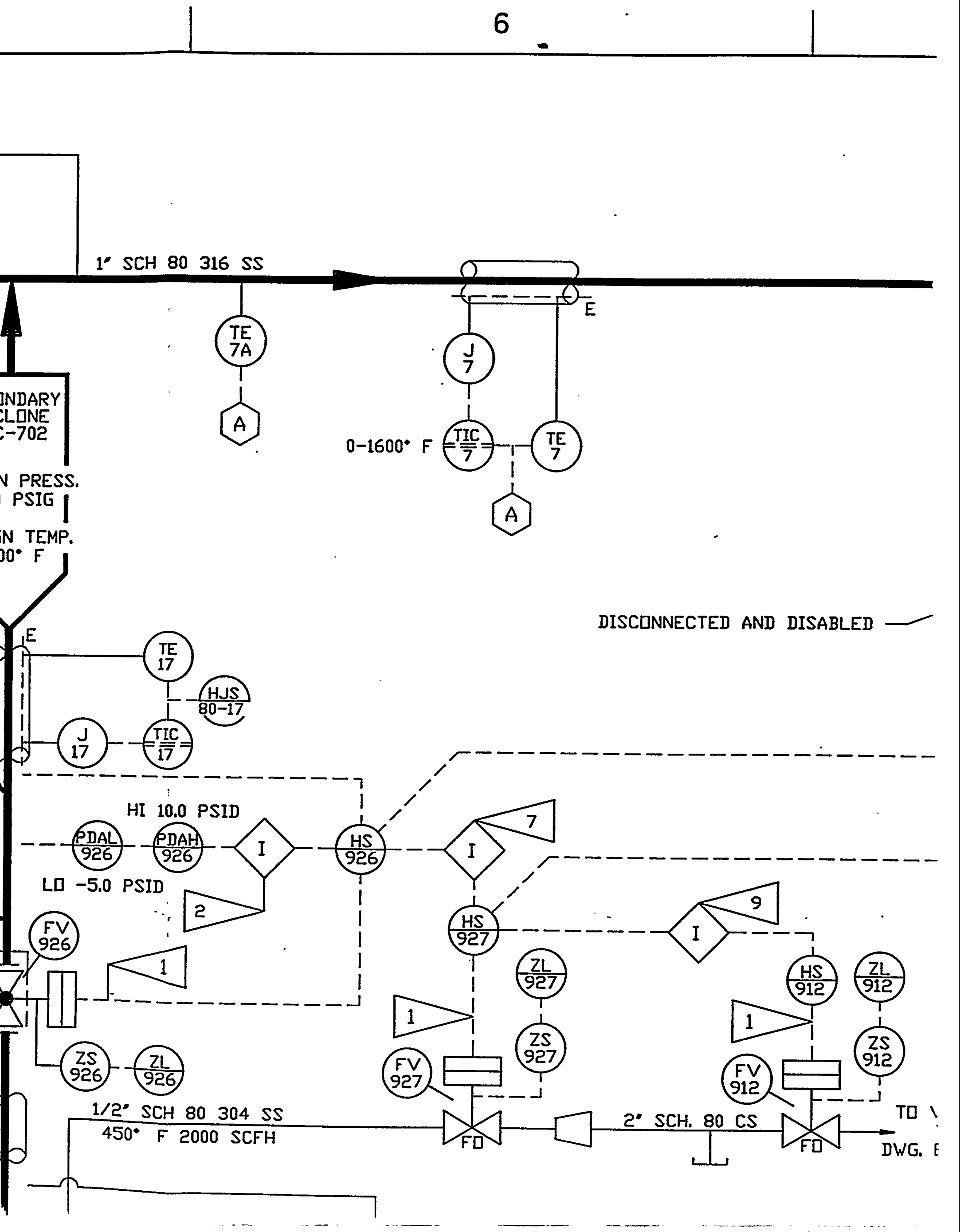
B-12 P&ID

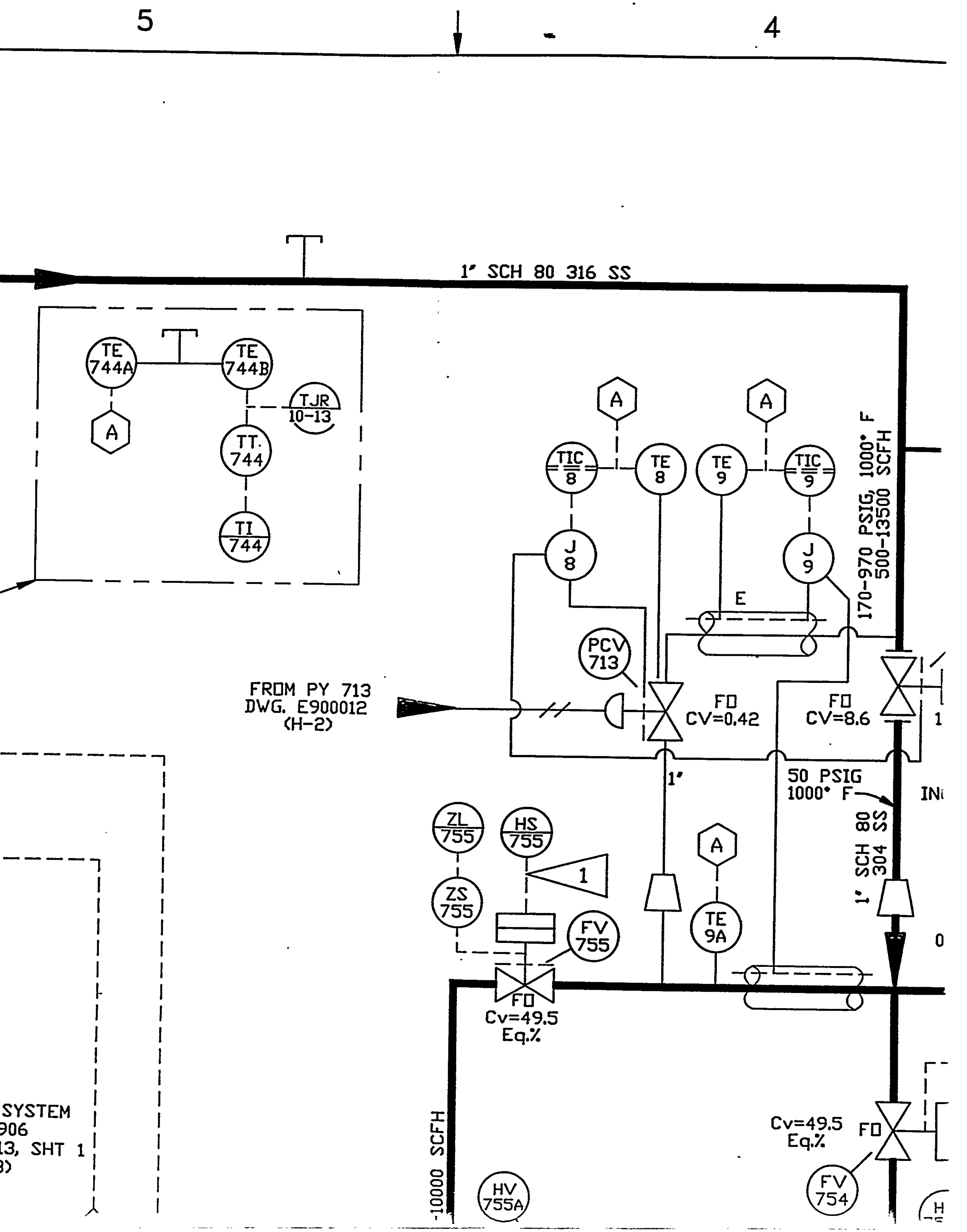
FLUIDIZED BED GASIFIER

A.G.C.

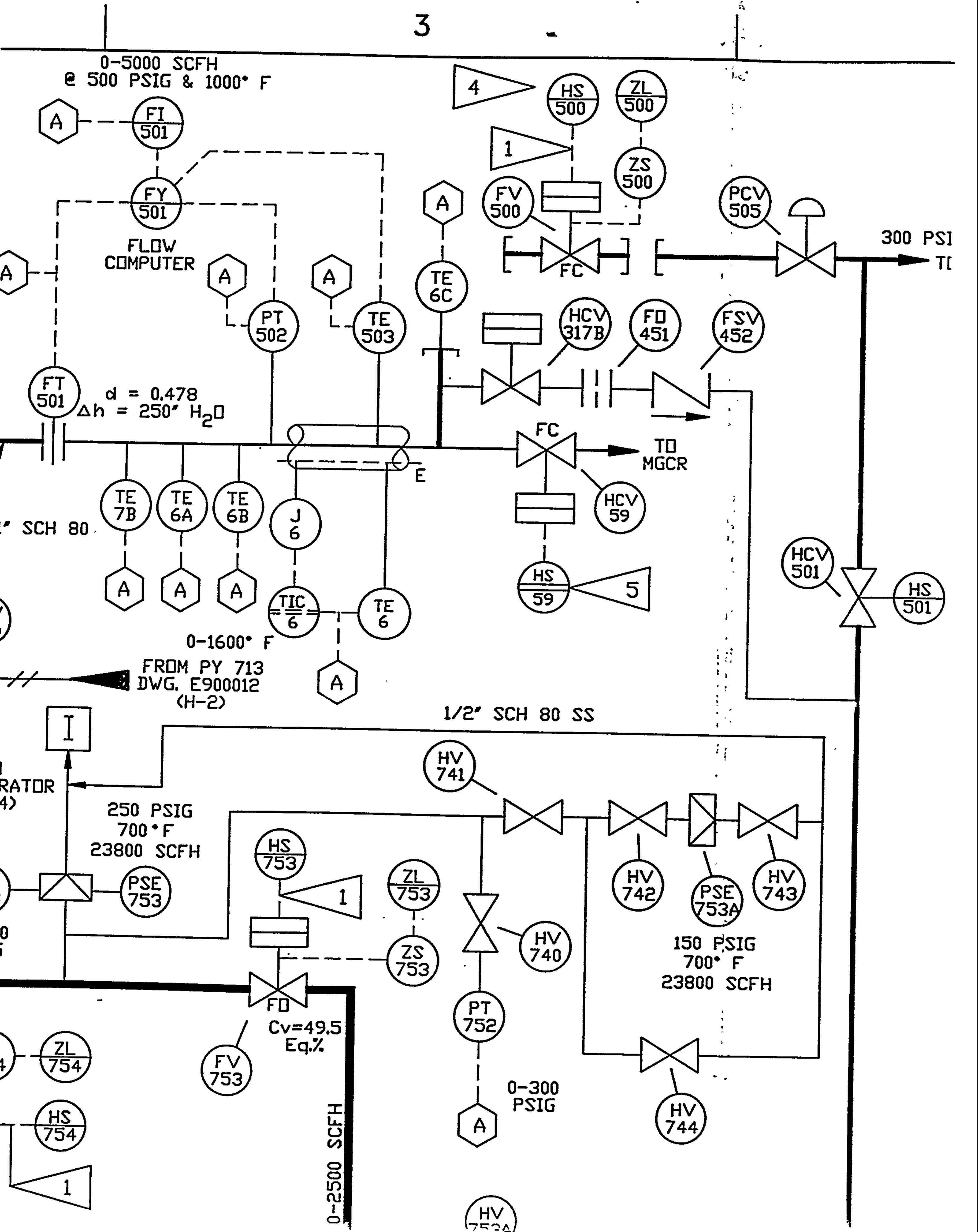
| SIZE | FSCM NO | DWG NO | REV |
|---|---|---|---|
| E | | E900012 | 6 |


8
H
G
F
0-20
PSID
PDI
727
PDJR
50-2
A
PDT
727
L
H
HV
728
H
727
FROM FV 725
DWG. E900012
HV
726
FROM TE 722A&B
DWG. E900012
FROM
PRIMARY CYCLONE
CYC-701
DWG. E900012
#1
$N_2$
400-2000 SCFH
1/2" SCH 80 CS
CLOSED
8
HS
454
ZL
454
1
ZS
454
FV
454
FC
TO FV 450
DWG. E900012
1/2" PIPE
304 SS
FSV
455
2" SCH
316 SS
H
926
G
929
HJS
1
12
TE
TIC
10
TI
926
6
I
A
TE
10
HS
456
ZL
456
HV


6
1" SCH 80 316 SS
E
TE 7A
A
J 7
TIC 7
TE 7
0-1600° F
A
NDARY
CLONE
C-702
N PRESS.
PSIG
N TEMP.
00° F
DISCONNECTED AND DISABLED
E
TE 17
HJS 80-17
J 17
TIC 17
HI 10.0 PSID
PDAL 926
PDAH 926
I
HS 926
I
7
LO -5.0 PSID
2
HS 927
I
9
FV 926
1
ZL 927
HS 912
ZL 912
1
1
ZS 927
ZS 912
ZS 926
ZL 926
FV 927
FV 912
1/2" SCH 80 304 SS
450° F 2000 SCFH
FO
2" SCH. 80 CS
FO
TO
DWG.



5
4
1" SCH 80 316 SS
TE 744A
TE 744B
A
TJR 10-13
TT. 744
TI 744
A
A
TIC 8
TE 8
TE 9
TIC 9
J 8
J 9
170-970 PSIG, 1000° F
500-13500 SCFH
E
PCV 713
FROM PY 713
DWG. E900012
(H-2)
FO
CV=0.42
FO
CV=8.6
1"
50 PSIG
1000° F
1" SCH 80
304 SS
ZL 755
HS 755
1
ZS 755
A
TE 9A
FV 755
FO
Cv=49.5
Eq.%
SYSTEM
906
13, SHT 1
3)
-10000 SCFH
HV 755A
Cv=49.5
Eq.%
FO
FV 754


3
0-5000 SCFH
@ 500 PSIG & 1000° F
FI 501
FY 501
FLOW COMPUTER
FT 501
d = 0.478
Δh = 250" H2O
PT 502
TE 503
TE 6C
TE 7B
TE 6A
TE 6B
J 6
TIC 6
TE 6
E
0-1600° F
" SCH 80
FROM PY 713
DWG. E900012
(H-2)
HS 500
ZL 500
ZS 500
FV 500
FC
PCV 505
300 PSI
HCV 317B
FO 451
FSV 452
FC
TO MGCR
HCV 59
HS 59
HCV 501
HS 501
1/2" SCH 80 SS
I
RATOR
250 PSIG
700° F
23800 SCFH
PSE 753
HS 753
ZL 753
ZS 753
FO
Cv=49.5
Eq.%
FV 753
ZL 754
HS 754
0-2500 SCFH
HV 741
HV 742
PSE 753A
HV 743
HV 740
PT 752
0-300
PSIG
150 PSIG
700° F
23800 SCFH
HV 744
A
1
4
5

2 1

REVISION

| ONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| EN | 4 | ADDED DESIGN PRESSURE AND DESIGN TEMPERATURE TO VSL-905, VSL-906, VSL-907, CYC-906, CYC-908, AND CYC-702; MODIFIED FI-501 AND VARIOUS SCFH's REMOVED ALL NUMBERS FROM ADACS SYMBOLS ADDED FO-451, HCV-317B & FSV-452 ISSUED FOR CONSTRUCTION | 04/01/93 |

| TER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| RY J. KULCHOCK | 4/5/93 | S CONKO | 4/5/93 | JAY RUTTEN | 4/7/93 | D. LUNIFELD | 4/7/93 |
| ES&H | DATE | PROJECT ENGR. | DATE | BRANCH MANAGER | DATE | DOE (EOSD) | DATE |
| . L. BUCKLEW | 4/7/93 | JOHN ROCKEY | 5/27/93 | LARRY STRICKLAND | 5/27/93 | BILL AYERS | 5/27/93 |

| NE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| EN | 5 | ADDED NOTE ON (2) INCINERATOR DESIGNATIONS; ADDED PIPE SIZE (ZONE C-6) ADDED "#1" TO ALL $N_2$ DESIGNATIONS; REMOVED HV-932; REVISED AND RENAMED FV-931 "WAS HV-931" MODIFIED INCINERATOR DESCRIPTION IN "LEGEND"; ADDED TUBING SIZE TO SAMPLE SYSTEM B (ZONE D-3) ADDED NOTE TO VENT SYSTEM, ZONE F-5; ADDED HV-800B, HV-800A & TE-900 CONNECTED PIPING FROM VENT SYSTEM, ZONE A-7 & VSL-906 TO EXISTING SYSTEM ISSUED FOR CONSTRUCTION | 09/01/93 |

| TER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| Gary Kulchock | 9/10/93 | S. Conko | 9/14/93 | Jay Rutten | 9/15/93 | Dave Lunifeld | 9/20/93 |
| ES&H | DATE | PROJECT ENGR. | DATE | BRANCH MANAGER | DATE | DOE (EOSD) | DATE |
| Larry Bucklew | 9/17/93 | John Rockey | 9/21/93 | Larry Shadle | 9/21/93 | John Rotunda/WJA | 9/20/93 |

| NE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| EN | 6 | EXTENSIVE CHANGES AS PER MARKED PRINT REDLINED BY JAY RUTTEN ON 15 FEB 94. ISSUED FOR CONSTRUCTION | 9/29/94 |

| ER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| Gary Kulchock | 10/7/94 | S. Conko | 10-7-94 | Jay Rutten | 10-11-94 | D. Lunifeld | 10/11/94 |
| ES&H | DATE | PROJECT ENGR. | DATE | BRANCH MANAGER | DATE | DOE (EOSD) | DATE |
| Bucklew | 10-11-94 | John M Rockey | 10/13/94 | Larry Shadle | 10-18-94 | [illegible] WJA | 10/19/94 |

H

G

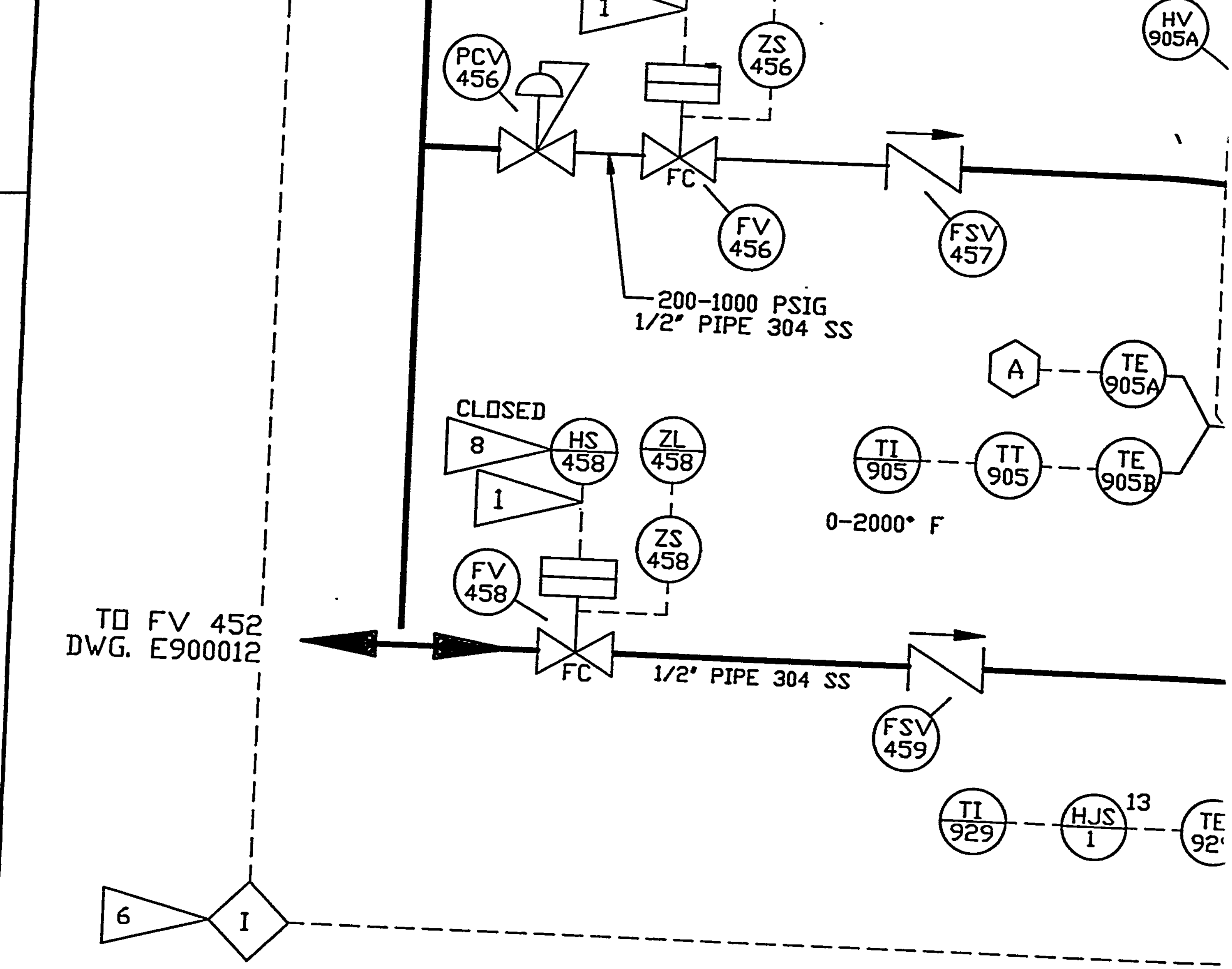
## TUBING SUMMARY

| SIZE | WALL THICKNESS | TYPE |
|---|---|---|
| 1/4" | 0.035 | 304 SS |
| 1/2" | 0.035 | CU TYPE K |
| 1/2" | 0.065 | 304 SS |
| 1" | 0.049 | CU TYPE K |

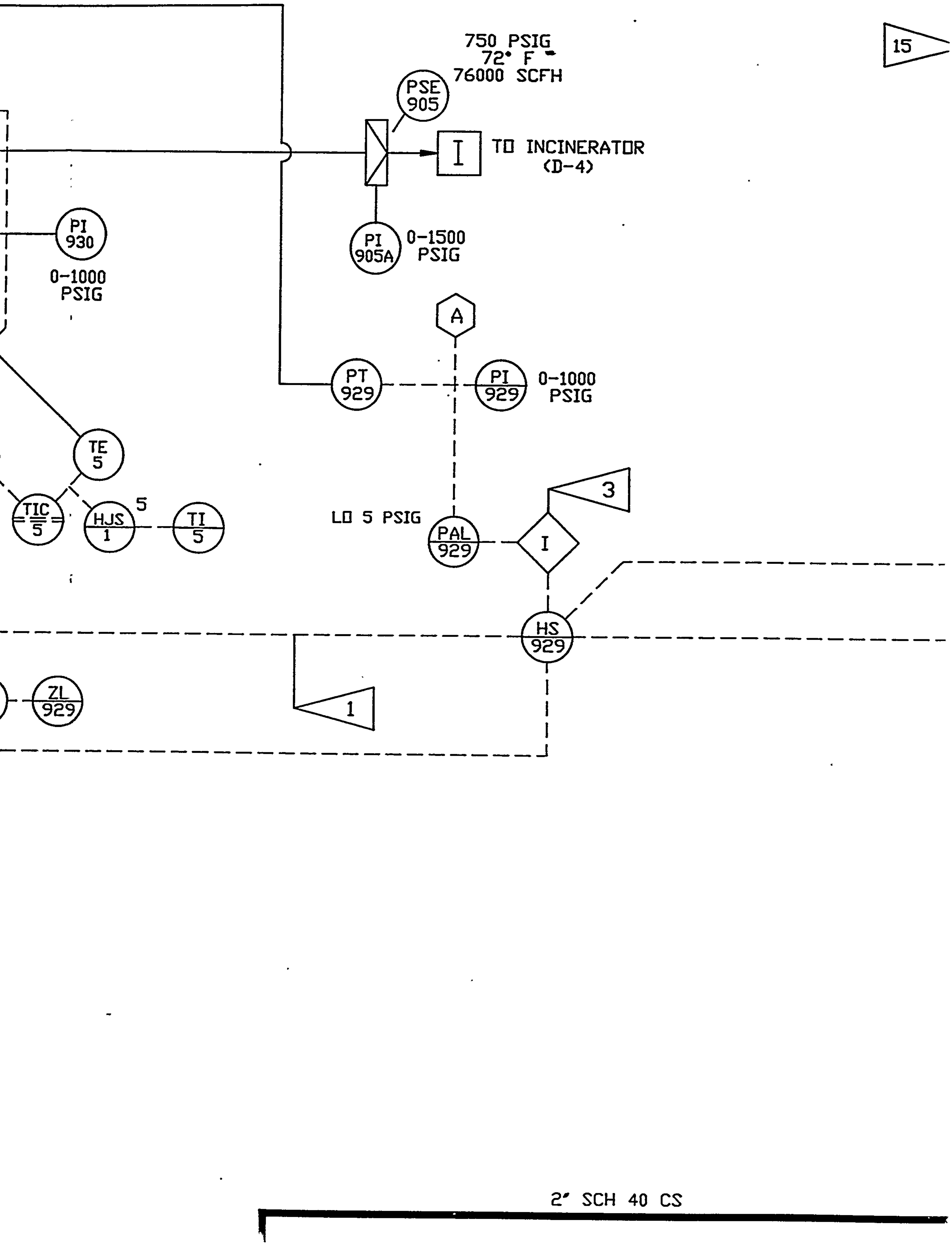
## PIPING SUMMARY

| SIZE | WALL THICKNESS | TYPE |
|---|---|---|
| 1/2" | SCH 40 | CS |
| 1/2" | SCH 80 | CS |
| 1/2" | SCH 80 | 304 SS |
| 1/2" | SCH 80 | 316 SS |

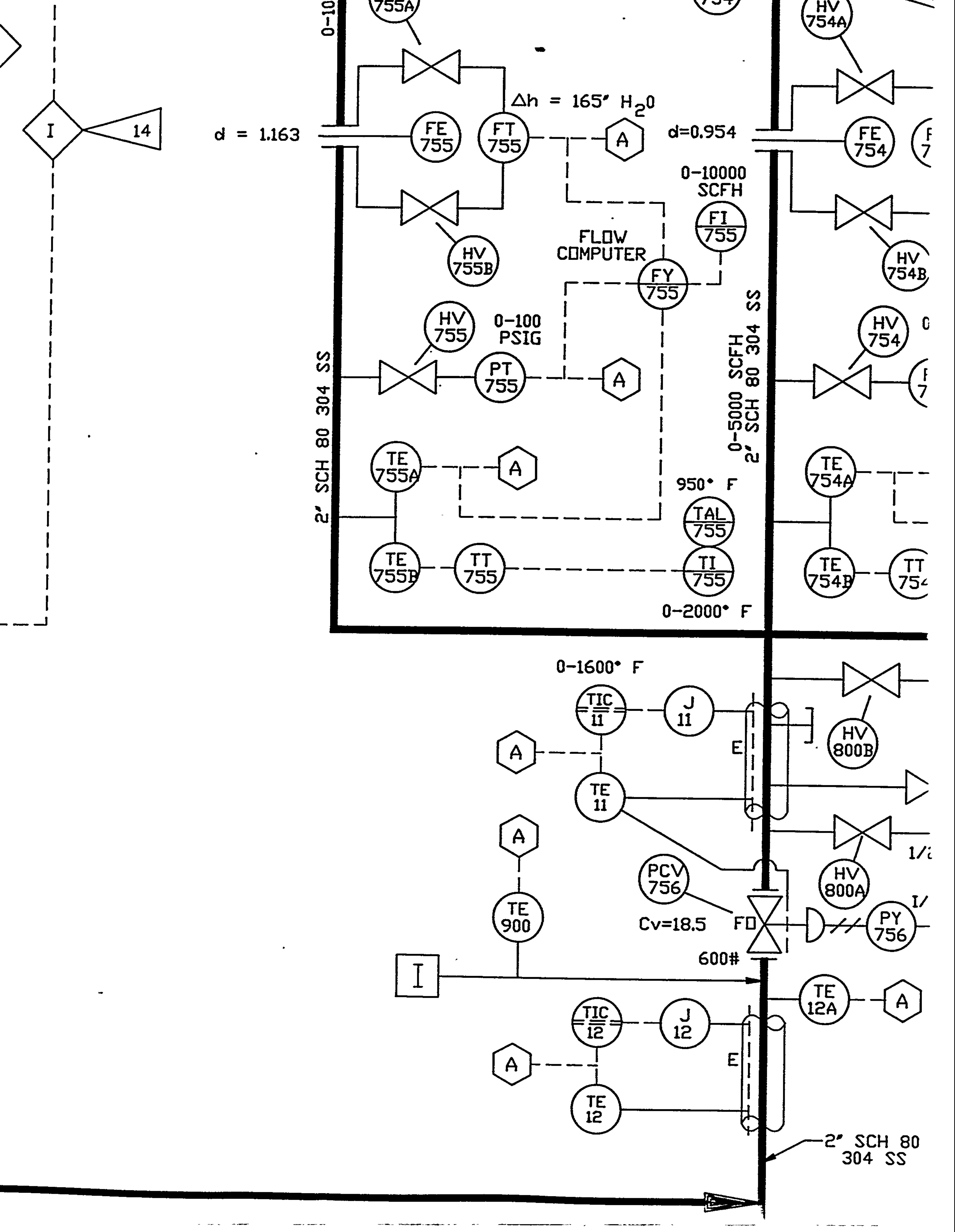
F



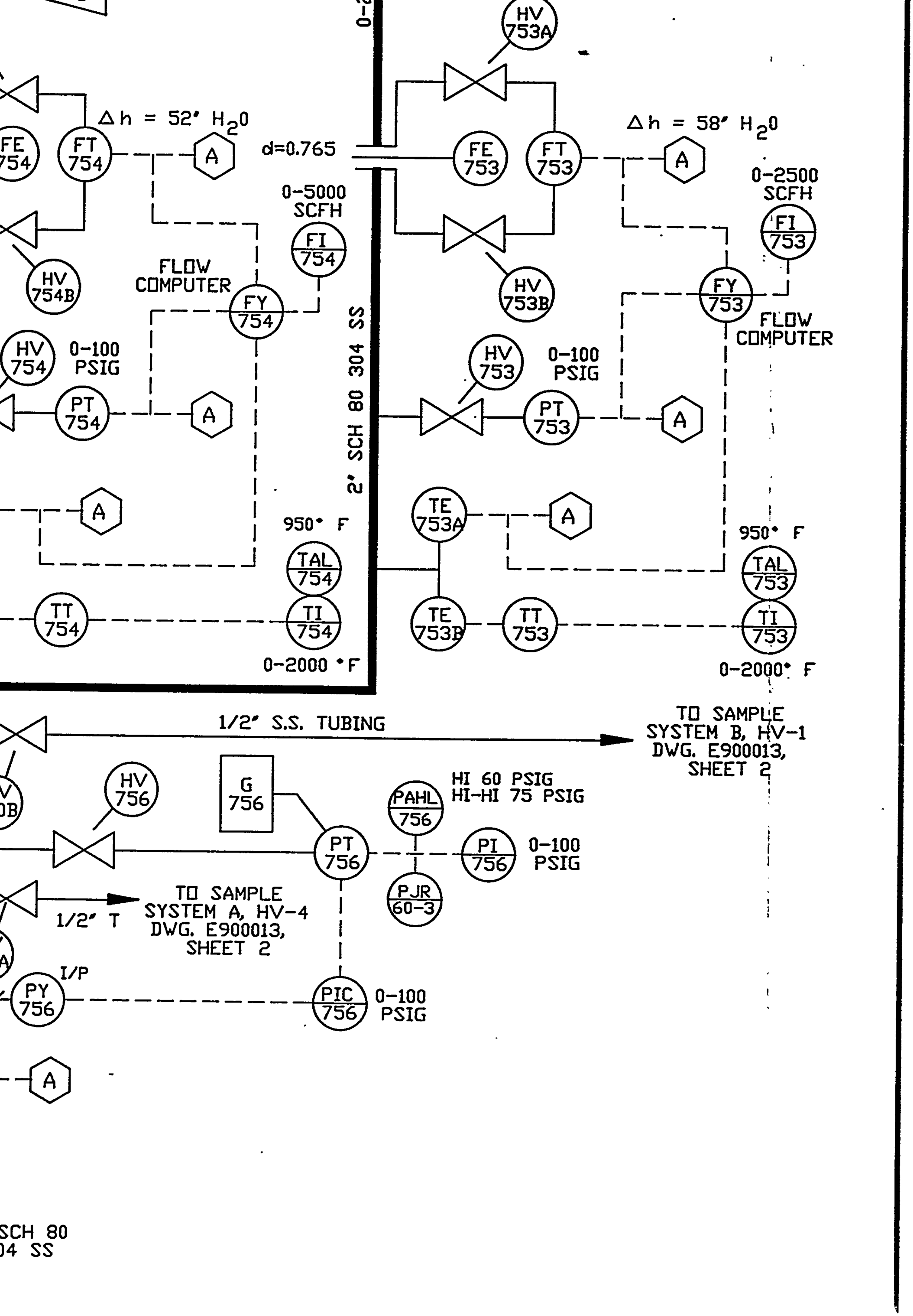
HV 905A
PCV 456
ZS 456
FC
FV 456
FSV 457
200-1000 PSIG
1/2" PIPE 304 SS
A
TE 905A
CLOSED
8
HS 458
ZL 458
1
TI 905
TT 905
TE 905B
0-2000° F
ZS 458
FV 458
TO FV 452
DWG. E900012
FC
1/2" PIPE 304 SS
FSV 459
TI 929
HJS 1
13
6
I



750 PSIG
72° F
76000 SCFH
15
PSE 905
TO INCINERATOR (D-4)
I
PI 930
0-1000 PSIG
PI 905A
0-1500 PSIG
A
PT 929
PI 929
0-1000 PSIG
TE 5
TIC 5
HJS 1
5
TI 5
LO 5 PSIG
PAL 929
I
3
HS 929
ZL 929
1
2" SCH 40 CS



0-10
755A
HV
754A
I
14
d = 1.163
Δh = 165" H2O
FE
755
FT
755
A
d=0.954
FE
754
0-10000
SCFH
FI
755
HV
755B
FLOW
COMPUTER
FY
755
HV
754B
HV
755
0-100
PSIG
PT
755
HV
754
2" SCH 80 304 SS
0-5000 SCFH
2" SCH 80 304 SS
TE
755A
TE
754A
950° F
TAL
755
TE
755B
TT
755
TI
755
TE
754B
TT
0-2000° F
0-1600° F
TIC
11
J
11
HV
800B
E
TE
11
HV
800A
PCV
756
TE
900
Cv=18.5
FO
PY
756
600#
I
TE
12A
TIC
12
J
12
TE
12
2" SCH 80
304 SS



HV 753A
Δh = 52″ H2O
FE 754
FT 754
A
d=0.765
FE 753
FT 753
Δh = 58″ H2O
0-5000 SCFH
FI 754
0-2500 SCFH
FI 753
HV 754B
FLOW COMPUTER
FY 754
HV 753B
FY 753
FLOW COMPUTER
HV 754
0-100 PSIG
PT 754
2″ SCH 80 304 SS
HV 753
0-100 PSIG
PT 753
TE 753A
950° F
TAL 754
950° F
TAL 753
TT 754
TI 754
TE 753B
TT 753
TI 753
0-2000 °F
0-2000° F
1/2″ S.S. TUBING
TO SAMPLE SYSTEM B, HV-1 DWG. E900013, SHEET 2
HV 756
G 756
HI 60 PSIG
HI-HI 75 PSIG
PAHL 756
PT 756
PI 756
0-100 PSIG
PJR 60-3
TO SAMPLE SYSTEM A, HV-4 DWG. E900013, SHEET 2
1/2″ T
I/P
PY 756
PIC 756
0-100 PSIG
SCH 80
04 SS


| | | |
|---|---|---|
| 1/2" | SCH 80 | 304 SS |
| 1/2" | SCH 80 | 316 SS |
| 1" | SCH 40 | CS |
| 1" | SCH 80 | CS |
| 1" | SCH 80 | 304 SS |
| 1" | SCH 80 | 316 SS |
| 1" | SCH 160 | 316 SS |
| 2" | SCH 40 | CS |
| 2" | SCH 80 | 304 SS |
| 2" | SCH 80 | 316 SS |
| 3" | SCH 160 | 316 SS |
| 4" | SCH 40 | CS |
| 4" | SCH 40 | 304 SS |

NOTES:

1. THIS FLAGGED NOTE DESIGNATES THE FOLLOWINC WHICH IS NOT SHOWN ON THIS DWG. FOR CLARIT PANEL-MOUNTED ON/OFF STATION (HAND SWITCH POSITION INDICATION LAMPS), 24 VDC RELAY, 117 60 HZ SOLENOID VALVE.

2. FV-926 WILL NOT OPEN UNTIL PDT-926 MEASUR DIFFERENTIAL LESS THAN OR EQUAL TO 5.0 PSID REF. DWG. NO. D910378. THE PRESSURE IN VSL-905 MUST BE LOWER THAN THE PRESSURE I

3. FV-929 WILL NOT OPEN UNTIL PT-929 MEASURE LESS THAN OR EQUAL TO 2 PSIG. REF. DWG. NO.

4. THE (B-12) FBG'S HS-500 AND THE (B-4) SIDEST HS-500 MUST BOTH BE ON FOR FV-500 TO OPEN.

5. HS-59 IS LOCATED ON THE MGCR CONTROL PANEL

6. 2
LOCKHOPPER FILL VALVE CANNOT BE OPENED IF VALVE IS OPENED. DUMP VALVE CANNOT BE OP CHARGING VALVE IS OPENED. $N_2$ CHARGING VAL OPENED IF THE FILL OR DUMP VALVES ARE OPEN

7. RELAY INTERLOCKS PREVENT THE LOCKHOPPERS F VENT VALVE FROM BEING OPEN AT THE SAME TI

8. DESIGNATES THAT THE CONTROL PANEL SWITCH IS LOCKED TO PREVENT ACCIDENTAL ACTUATION.

9. RELAY INTERLOCKS PREVENT THE LOCKHOPPER VE FV-927 FROM OPENING UNLESS FV-912 IS OPEN.

10. LINES TO GAUGES, TRANSMITTERS, & MANUAL PRES TO FLAIR ARE 1/2".

11. VALVE TYPES & END CONNECTIONS ARE NOT INDI

| | | |
|---|---|---|
| 1/2" | SCH 80 | 304 SS |
| 1/2" | SCH 80 | 316 SS |
| 1" | SCH 40 | CS |
| 1" | SCH 80 | CS |
| 1" | SCH 80 | 304 SS |
| 1" | SCH 80 | 316 SS |
| 1" | SCH 160 | 316 SS |
| 2" | SCH 40 | CS |
| 2" | SCH 80 | 304 SS |
| 2" | SCH 80 | 316 SS |
| 3" | SCH 160 | 316 SS |
| 4" | SCH 40 | CS |
| 4" | SCH 40 | 304 SS |

TES:

1 THIS FLAGGED NOTE DESIGNATES THE FOLLOWING EQUIPMENT WHICH IS NOT SHOWN ON THIS DWG. FOR CLARITY; PANEL-MOUNTED ON/OFF STATION (HAND SWITCH WITH POSITION INDICATION LAMPS), 24 VDC RELAY, 117 VAC 60 HZ SOLENOID VALVE.

E

2 FV-926 WILL NOT OPEN UNTIL PDT-926 MEASURES A PRESSURE DIFFERENTIAL LESS THAN OR EQUAL TO 5.0 PSID. REF. DWG. NO. D910378. THE PRESSURE IN VSL-905 MUST BE LOWER THAN THE PRESSURE IN CYC-702

3 FV-929 WILL NOT OPEN UNTIL PT-929 MEASURES A PRESSURE LESS THAN OR EQUAL TO 2 PSIG. REF. DWG. NO. D910378

4 THE (B-12) FBG'S HS-500 AND THE (B-4) SIDESTREAM'S HS-500 MUST BOTH BE ON FOR FV-500 TO OPEN.

5 HS-59 IS LOCATED ON THE MGCR CONTROL PANEL

6 2
LOCKHOPPER FILL VALVE CANNOT BE OPENED IF THE $N_2$ CHARGING VALVE IS OPENED. DUMP VALVE CANNOT BE OPENED IF THE $N_2$ CHARGING VALVE IS OPENED. $N_2$ CHARGING VALVE CANNOT BE OPENED IF THE FILL OR DUMP VALVES ARE OPEN.

7 RELAY INTERLOCKS PREVENT THE LOCKHOPPERS FILL VALVE AND VENT VALVE FROM BEING OPEN AT THE SAME TIME.

D

DESIGNATES THAT THE CONTROL PANEL SWITCH IS PHYSICALLY LOCKED TO PREVENT ACCIDENTAL ACTUATION.

RELAY INTERLOCKS PREVENT THE LOCKHOPPER VENT VALVE FV-927 FROM OPENING UNLESS FV-912 IS OPEN.

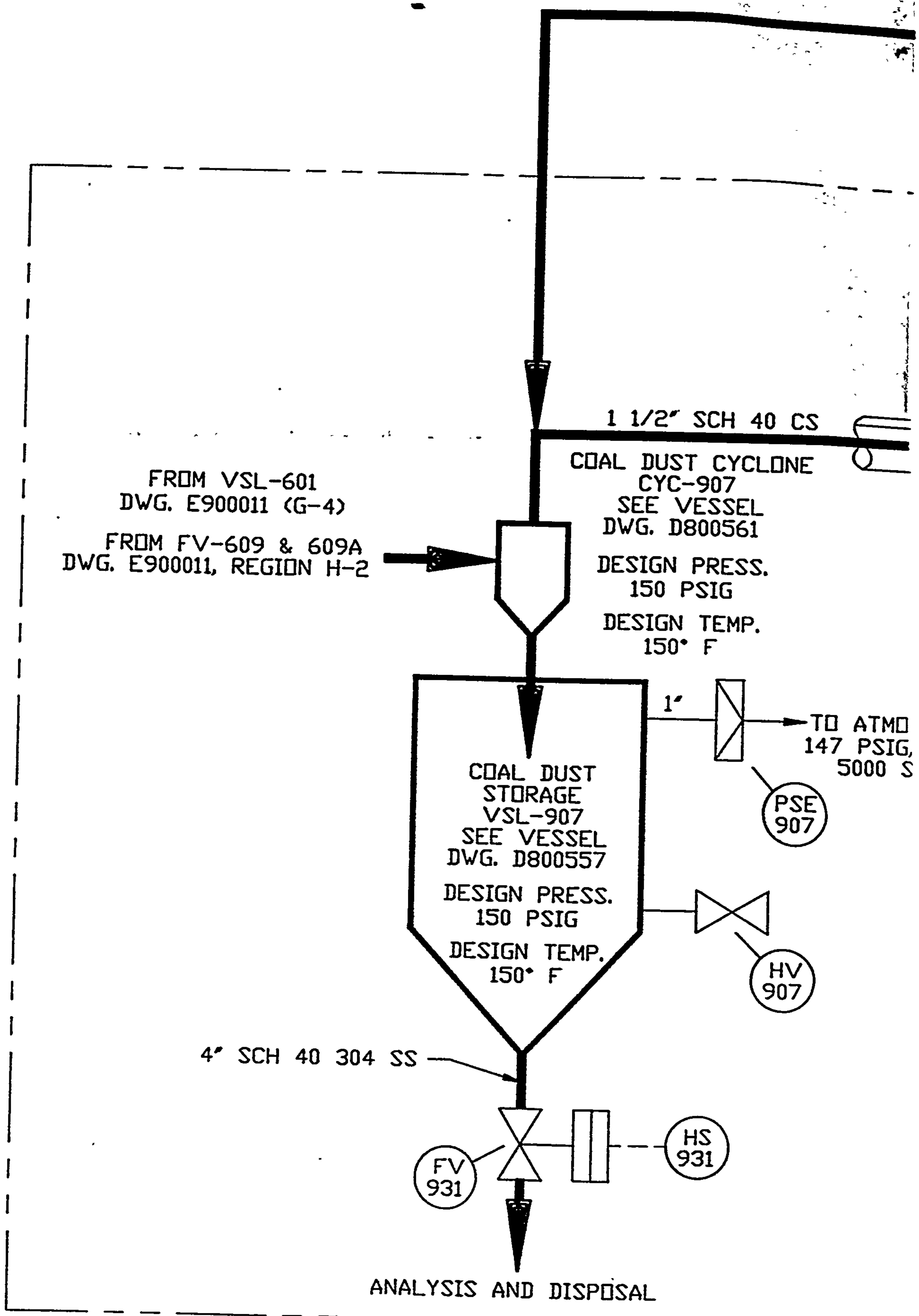
LINES TO GAUGES, TRANSMITTERS, & MANUAL PRESSURE RELIEF TO FLAIR ARE 1/2".

VALVE TYPES & END CONNECTIONS ARE NOT INDICATED

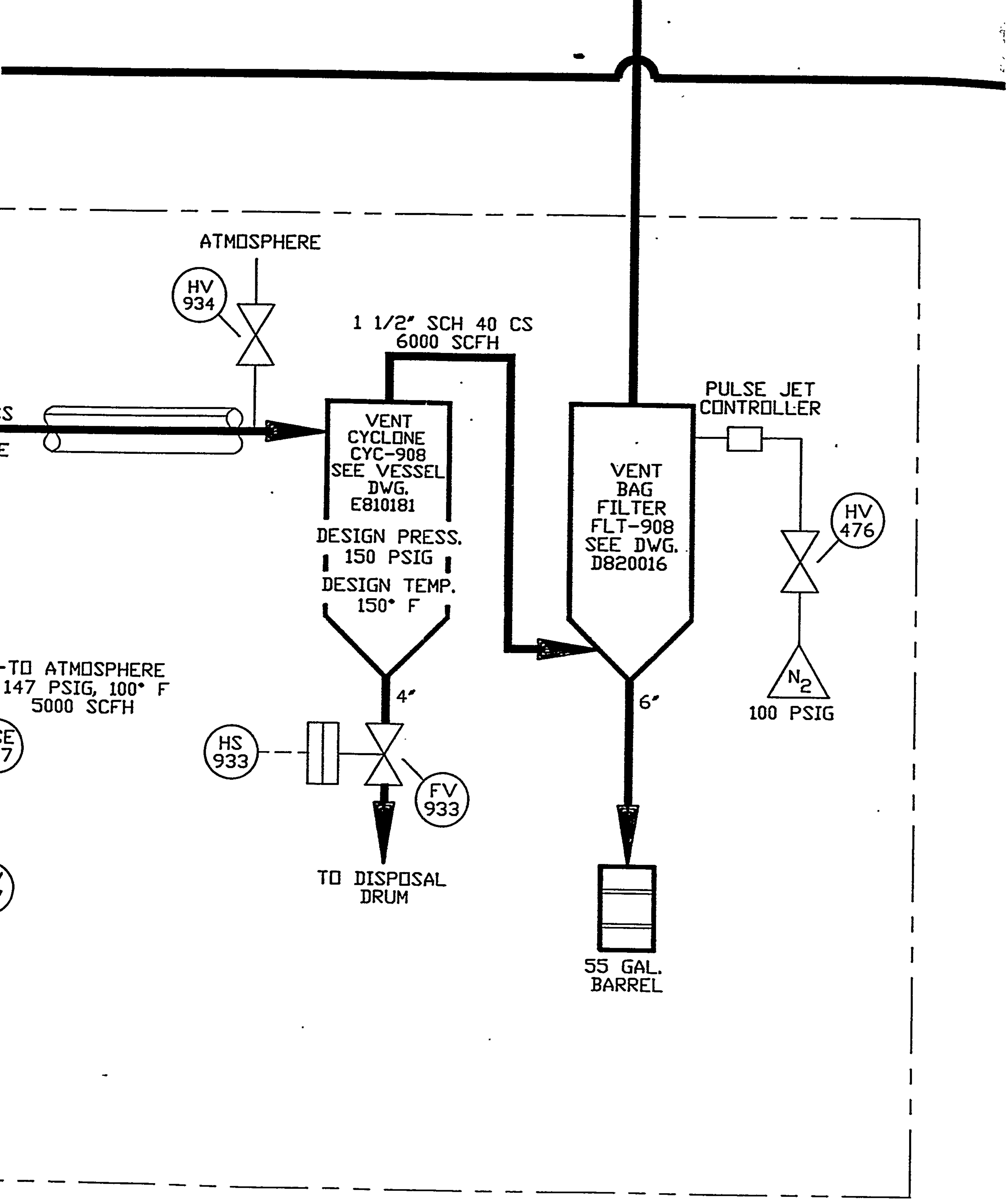
C

B

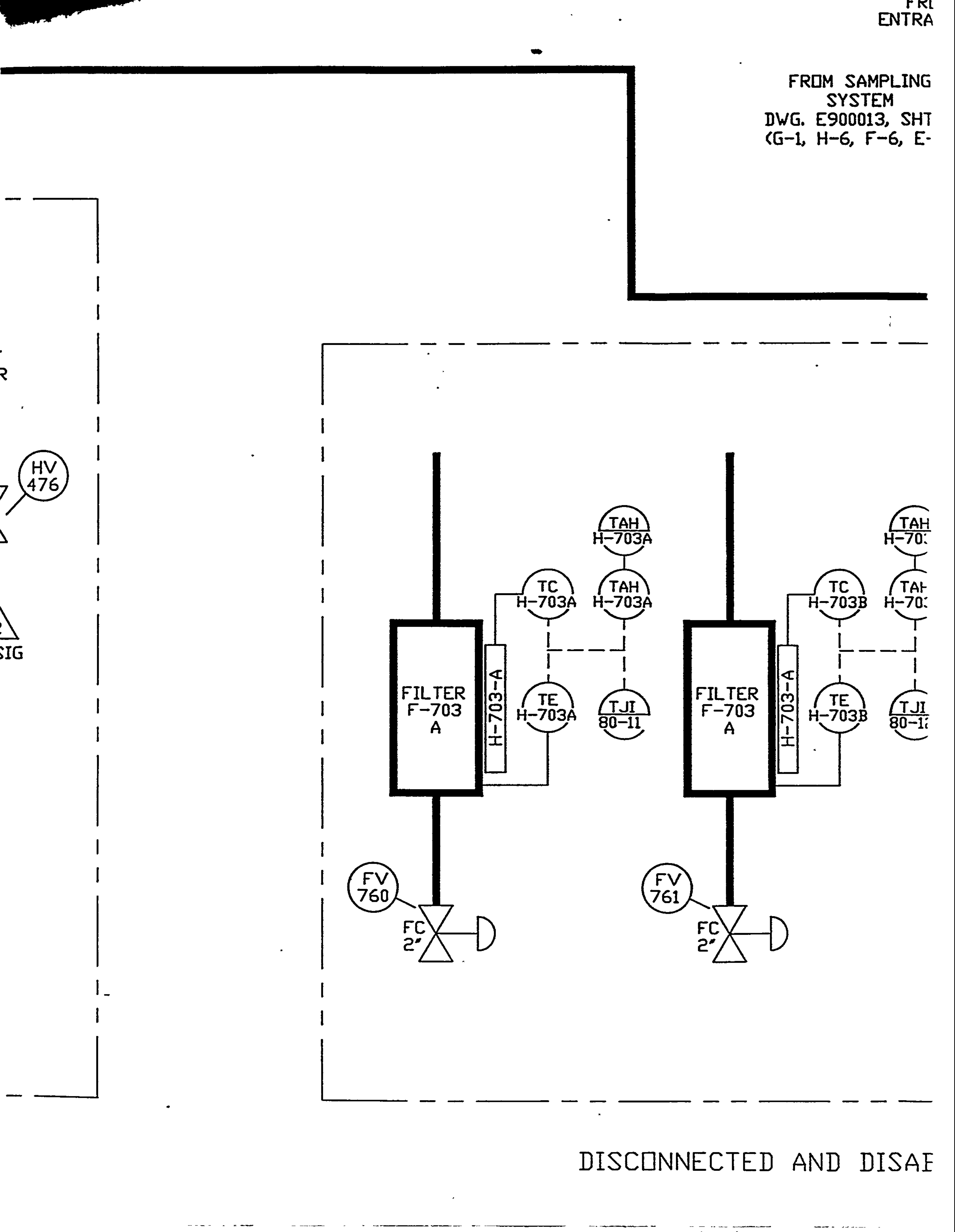
A

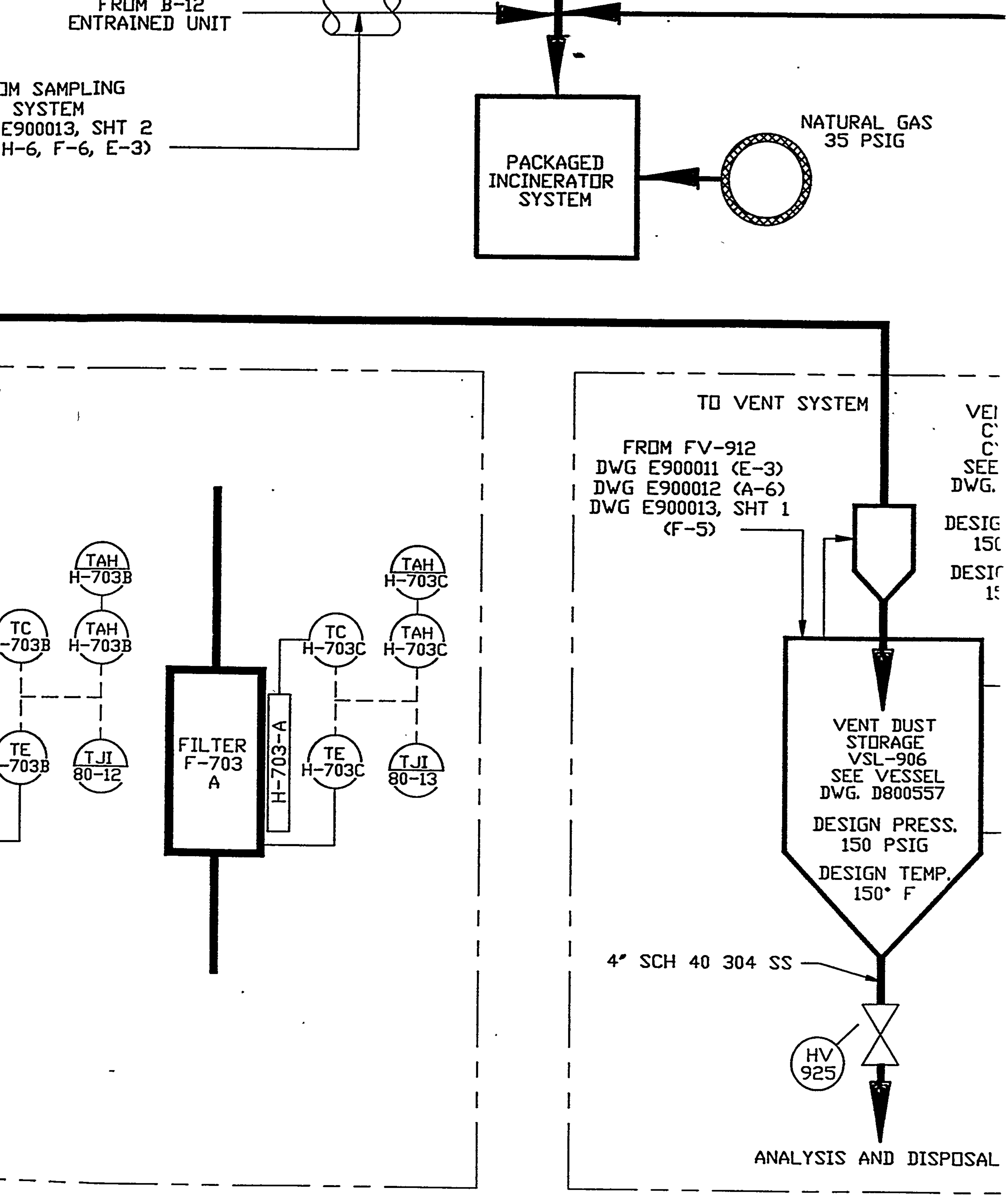

1 1/2" SCH 40 CS
COAL DUST CYCLONE
CYC-907
SEE VESSEL
DWG. D800561
DESIGN PRESS.
150 PSIG
DESIGN TEMP.
150° F
FROM VSL-601
DWG. E900011 (G-4)
FROM FV-609 & 609A
DWG. E900011, REGION H-2
1"
TO ATMO
147 PSIG,
5000 S
PSE
907
COAL DUST
STORAGE
VSL-907
SEE VESSEL
DWG. D800557
DESIGN PRESS.
150 PSIG
DESIGN TEMP.
150° F
HV
907
4" SCH 40 304 SS
FV
931
HS
931
ANALYSIS AND DISPOSAL

VEN


ATMOSPHERE
HV 934
1 1/2" SCH 40 CS
6000 SCFH
PULSE JET
CONTROLLER
VENT
CYCLONE
CYC-908
SEE VESSEL
DWG.
E810181
DESIGN PRESS.
150 PSIG
DESIGN TEMP.
150° F
VENT
BAG
FILTER
FLT-908
SEE DWG.
D820016
HV 476
$N_2$
100 PSIG
-TO ATMOSPHERE
147 PSIG, 100° F
5000 SCFH
4"
6"
HS 933
FV 933
TO DISPOSAL
DRUM
55 GAL.
BARREL

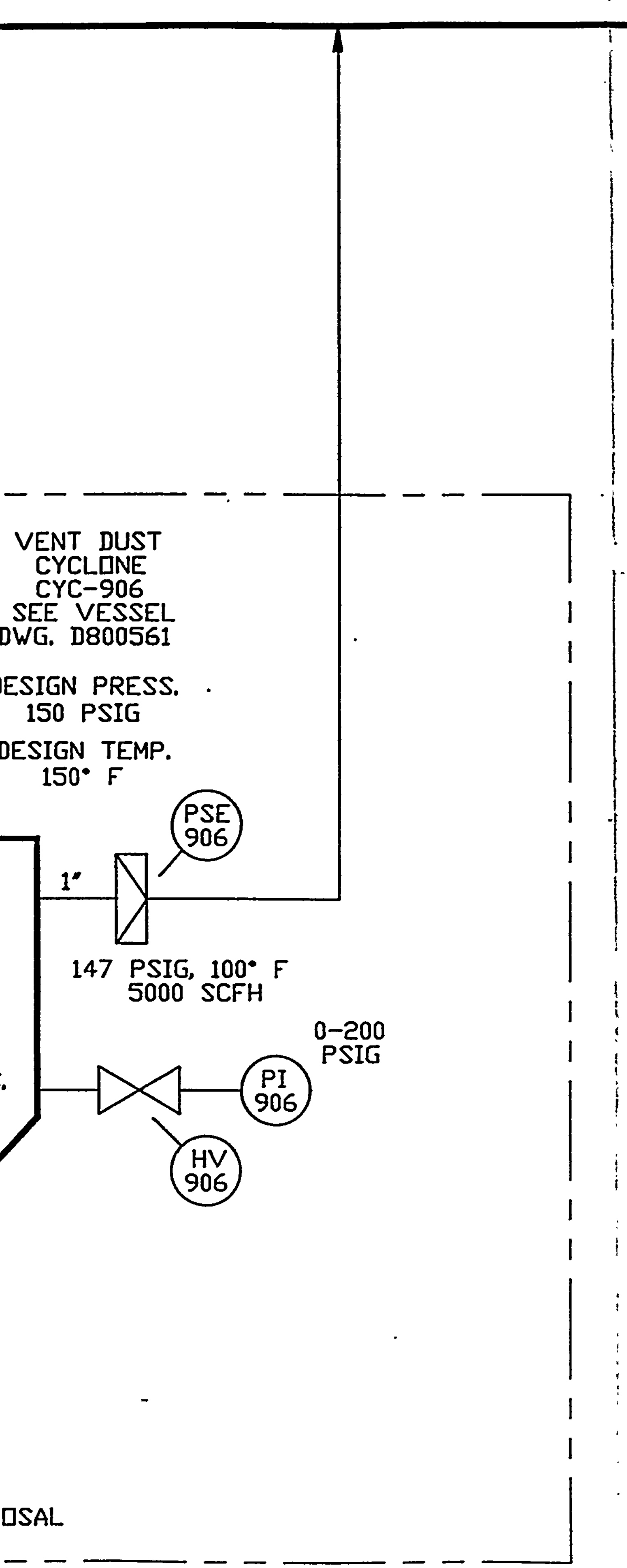
VENT SYSTEM


ENTRA
FROM SAMPLING
SYSTEM
DWG. E900013, SHT
(G-1, H-6, F-6, E-
HV
476
SIG
TAH
H-703A
TC
H-703A
TAH
H-703A
FILTER
F-703
A
H-703-A
TE
H-703A
TJI
80-11
TC
H-703B
FILTER
F-703
A
H-703-A
TE
H-703B
FV
760
FC
2"
FV
761
FC
2"
DISCONNECTED AND DISAE



FROM B-12
ENTRAINED UNIT
OM SAMPLING
SYSTEM
E900013, SHT 2
H-6, F-6, E-3)
PACKAGED
INCINERATOR
SYSTEM
NATURAL GAS
35 PSIG
TAH
H-703B
TC
-703B
TAH
H-703B
TE
-703B
TJI
80-12
FILTER
F-703
A
H-703-A
TC
H-703C
TAH
H-703C
TAH
H-703C
TE
H-703C
TJI
80-13
TO VENT SYSTEM
FROM FV-912
DWG E900011 (E-3)
DWG E900012 (A-6)
DWG E900013, SHT 1
(F-5)
VENT DUST
STORAGE
VSL-906
SEE VESSEL
DWG. D800557
DESIGN PRESS.
150 PSIG
DESIGN TEMP.
150° F
4" SCH 40 304 SS
HV
925
ANALYSIS AND DISPOSAL
SEE
DWG.


D DISABLED




12 SCF IS AT

13 THIS DWG.
SUPERCEDE

14 RELAY IN
VALVES

15 RELAY IN
FROM OPE

LEGEND:

RSS = RANGE SE

I = MANIFOLI

A = INPUT TC

G XXX IDENTIFI
PURGE S
NUMBER.
THIS SYN
IS IN TH
TRANSMIT
FV-44
FSV-X

H XXX IDENTIFI
PURGE S
NUMBER.
THIS SYI
IS IN TH
TRANSMI
FV-44

THIS DRAWING IS PART
OF THE EG&G DOCUMENT
CONTROL SYSTEM

| REFERENCE DRAWINGS | |
|---|---|
| E900010<br>E900011<br>E900012<br>E920205 | DRAFTER<br>S. CONKO |
| | CHECKER<br>A. R. KUBALA |
| | PROJECT ENGINEER<br>J. P. KANOSKY |

12 SCF IS AT 14.7 PSIA AND 60° F

13 THIS DWG. & DWGS. E900010, E900011, AND E900012 SUPERCEDES DWG. R800524.

14 RELAY INTERLOCKS PREVENT THE LOCKHOPPERS FILL AND DUMP VALVES FROM BEING OPEN AT THE SAME TIME.

C

15 RELAY INTERLOCKS PREVENT THE LOCKHOPPERS DUMP VALVE FROM OPENING UNLESS THE VENT VALVE IS OPEN.

LEGEND:

RSS = RANGE SELECTOR SWITCH

I = MANIFOLD TO PACKAGED INCINERATOR SYSTEM

A = INPUT TO THE DDAS SYSTEM

G XXX IDENTIFIES THE CONNECTING SEGMENT OF THE TRANSMITTER PURGE SYSTEM, WHERE XXX IS THE SEGMENT IDENTIFICATION NUMBER. (SEE DWG. E900013, SHT. 2 OF 2 FOR DETAILS.) THIS SYMBOL INDICATES THAT THE FOLLOWING EQUIPMENT IS IN THE PURGE LINE FROM THE NITROGEN HEADER TO THE TRANSMITTER:
FV-440, FSV-441, HV-441, HV-XXXP, FV-XXXP, & FSV-XXXP

H XXX IDENTIFIES THE CONNECTING SEGMENT OF THE TRANSMITTER PURGE SYSTEM, WHERE XXX IS THE SEGMENT IDENTIFICATION NUMBER. (SEE DWG. E900013, SHT. 2 OF 2 FOR DETAILS.) THIS SYMBOL INDICATES THAT THE FOLLOWING EQUIPMENT IS IN THE PURGE LINE FROM THE NITROGEN HEADER TO THE TRANSMITTER:
FV-440, FSV-441, HV-441, HV-XXXP, & FSV-XXXP.

DWG NO E900013 SH 1

| | | |
|---|---|---|
| DRAFTER S. CONKO | DATE 3/6/90 | United States Department of Energy |
| CHECKER A. R. KUBALA | DATE 3/6/90 | MORGANTOWN ENERGY TECHNOLOGY CENTER |
| PROJECT ENGINEER J. P. KANOSKY | DATE 3/6/90 | Morgantown, WV |
| | DATE | TITLE: B-12 P&ID FLUIDIZED BED GASIFIER A.G.C. |
| | DATE | |
| | DATE | |
| | DATE | SIZE E · FSCM NO · DWG NO E900013 · REV 6 |

A