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# METC/Shell Cooperative Agreement CRADA 93-011 High Temperature High Pressure Filtration and Sorbent Test Program

**Final Report, Volume II**

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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/Shell CRADA 93-011. Online particulate monitoring began in August, 1993 and ended in October, 1994. The particulate monitoring group participated in six MGCR runs (#5 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 gas flowrate to the PMS unit was controlled by a plate orifice in run #5 but was replaced with a critical orifice in subsequent runs 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.

The record of flow data was found to be incomplete. There were no flow data recorded in runs #7 and #10. However, all data were processed with flowrate values either actually recorded or a fixed value observed during the run. 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). We only processed data sets containing 6 or more hours of continuous records 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 we have constant particle loadings and particle size distribution, we would expect a straight line curve for these last three plots. 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 #5

Figure 1a shows an "unprocessed" particle size distribution as reported by the PMS unit in a measuring cycle on 8/4/93. Figure 1b is the 15-minute averaged size distribution of particle loading (that is, particle number per standard cubic meter, #/SCM). As can be seen the averaged particle size distribution plot is very much similar to the individual distribution plot indicating the particle size distribution generally did not experience large changes during the 15 minutes period. This can also be inferred from the plot of ensemble mean particle diameters over a 10-hour period (Figure 1c), which shows relatively constant mean values except toward the end of the measuring period. However, the particle number concentration

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 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.

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 |
|---|---|---|
| 4 | 108 | 3.78 |
| 5 | 146 | 4.76 |
| 6 | 130 | 1.82 |
| 7 | 119 | 2.12 |
| 8 | 189 | 5.62 |
| 9 | 86 | 3.38 |
| 10 | 89 | 2.56 |

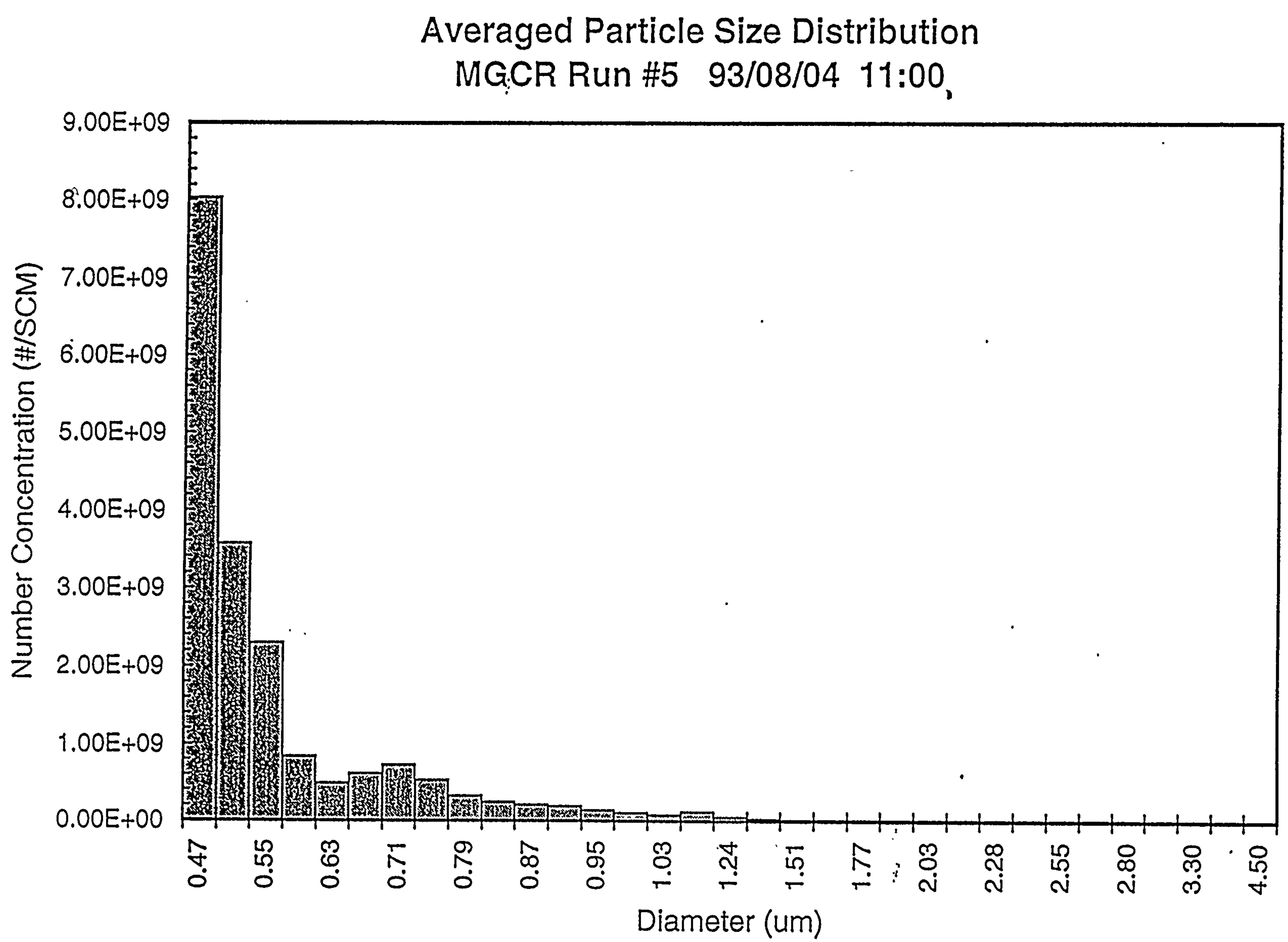


Figure 1a. Unprocessed particle size distribution from a single measurement.

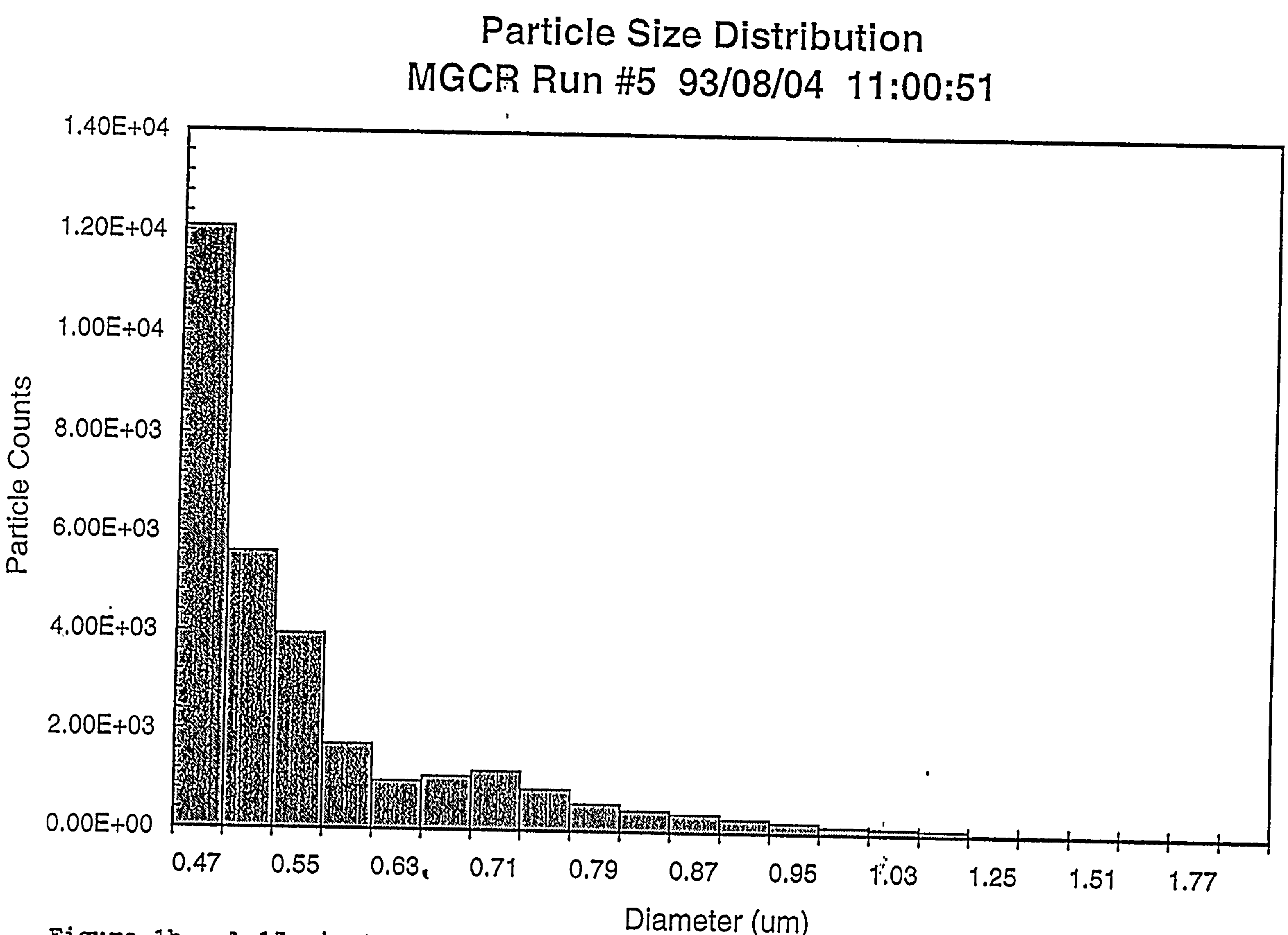



Figure 1b. A 15-minute averaged particle size distribution.

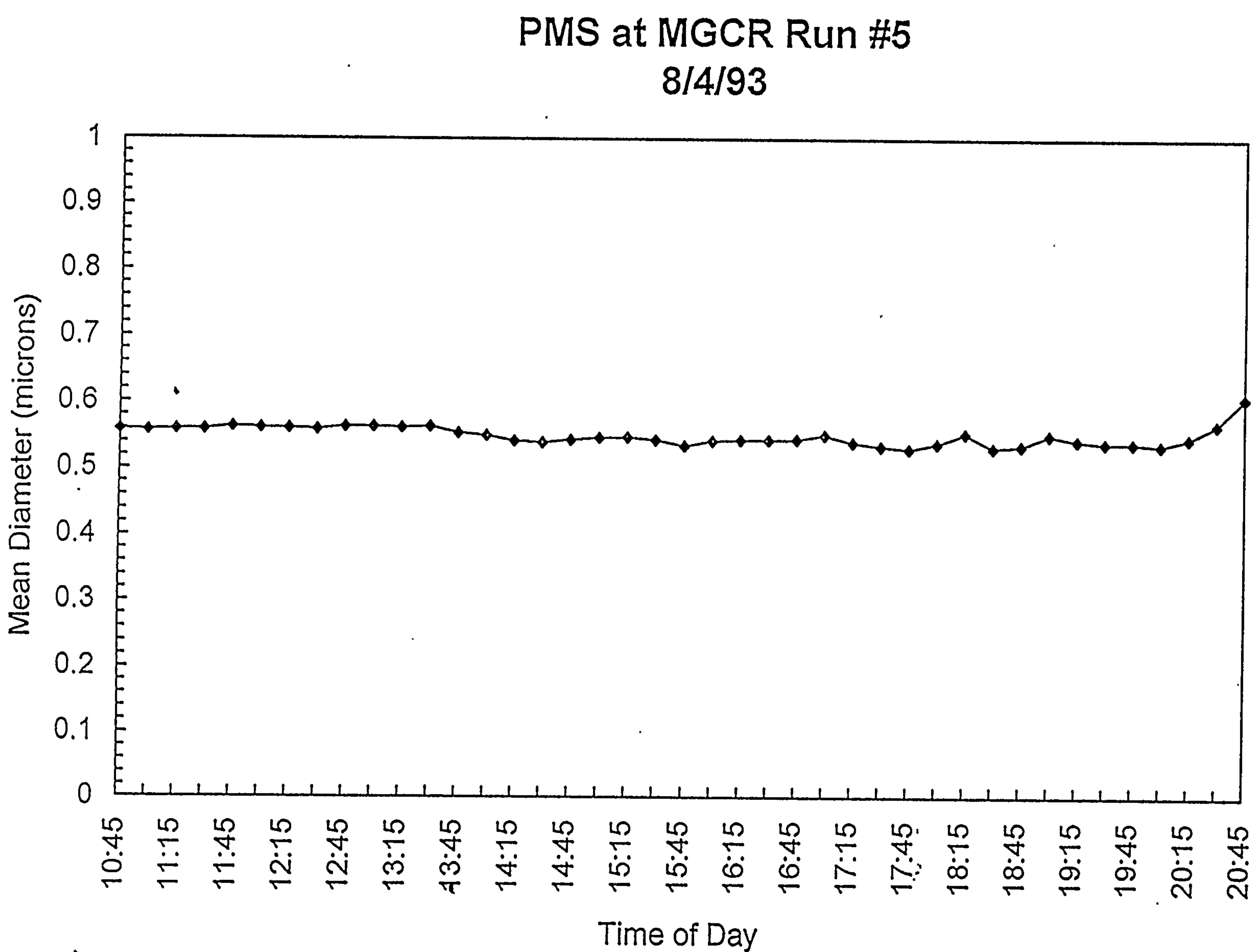



Figure 1c. Ensemble mean particle diameters.

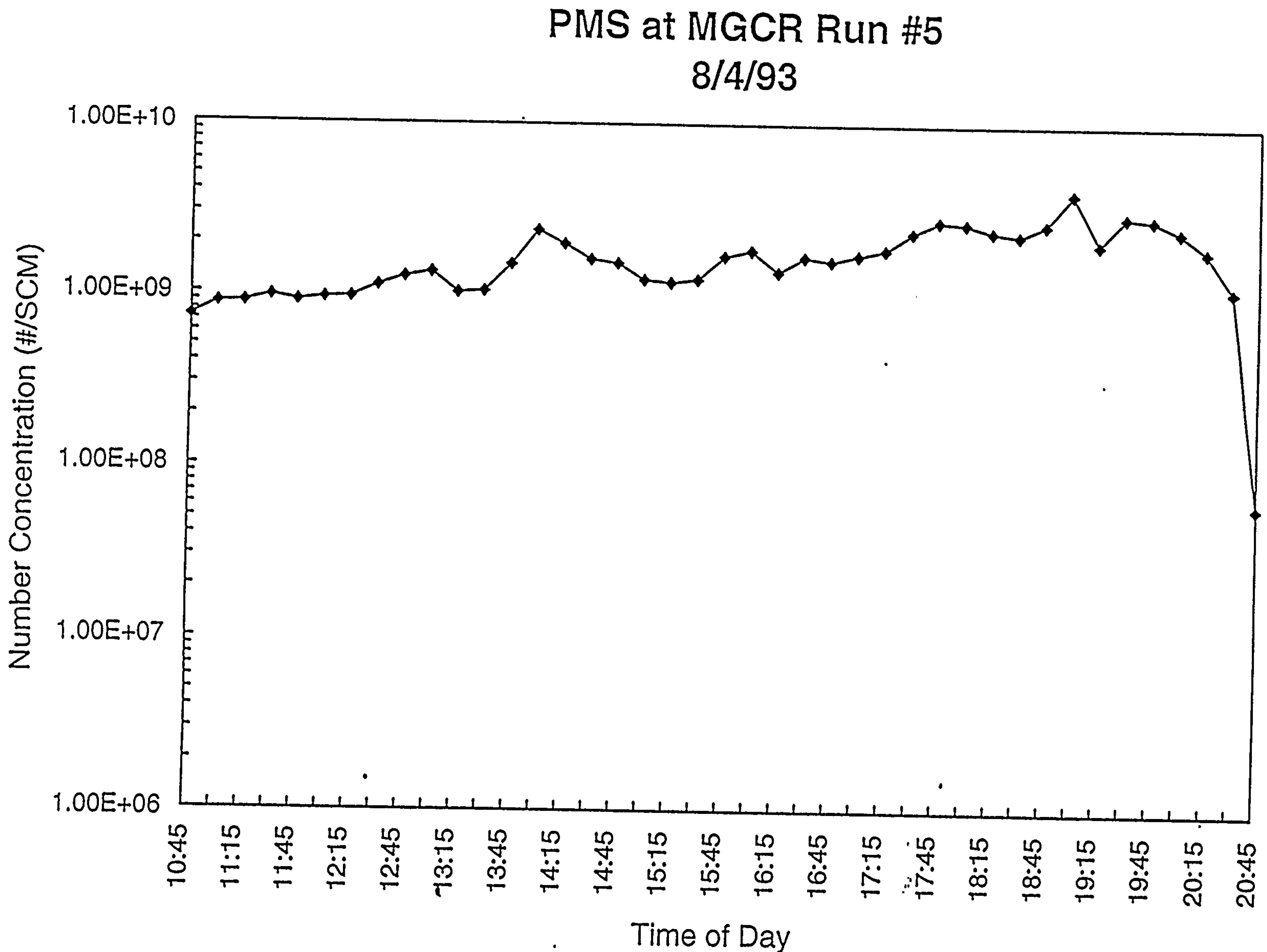



Figure 1d. Ensemble mean particle number concentrations.

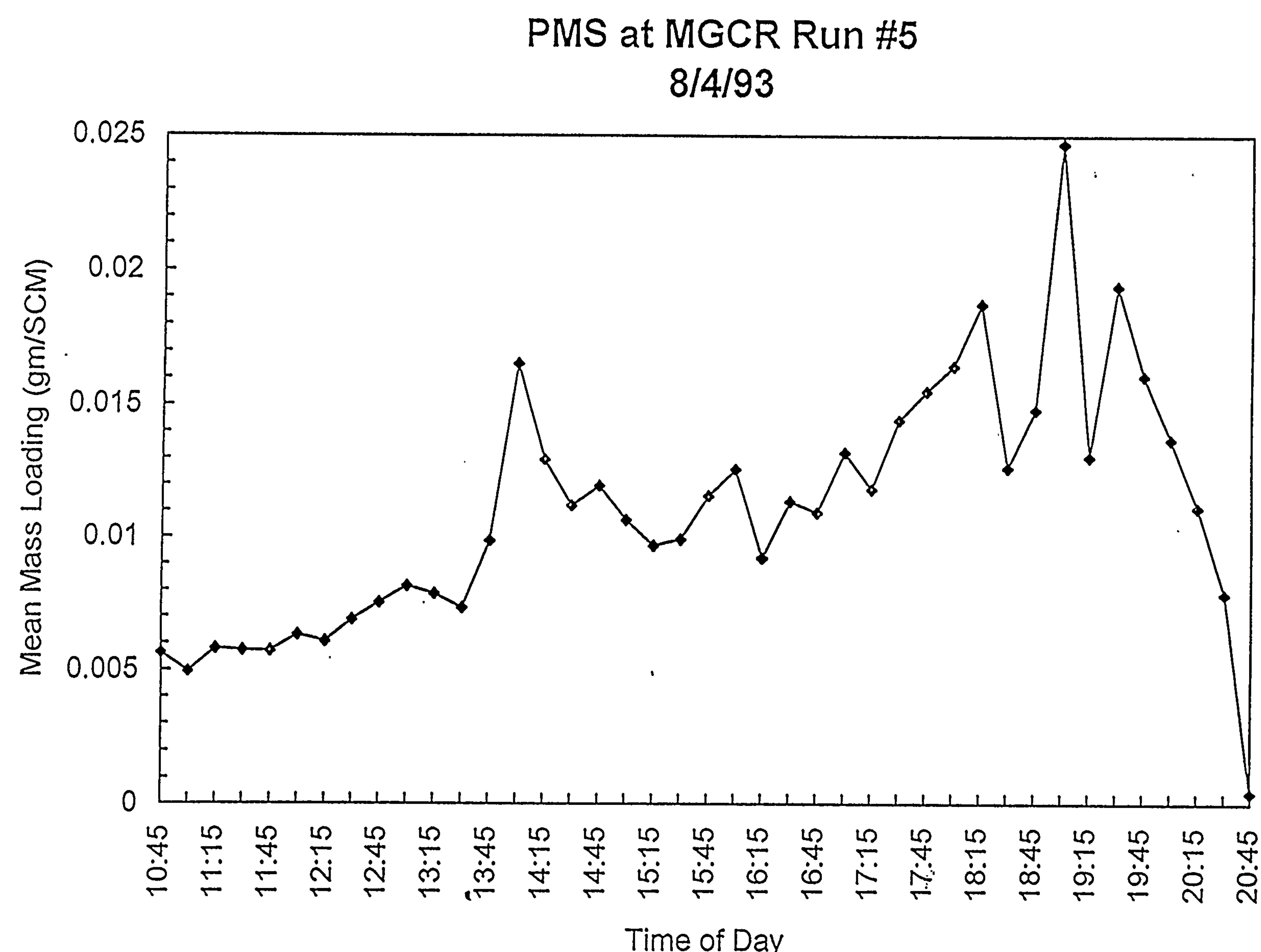



Figure 1e. Ensemble mean particle mass loadings.

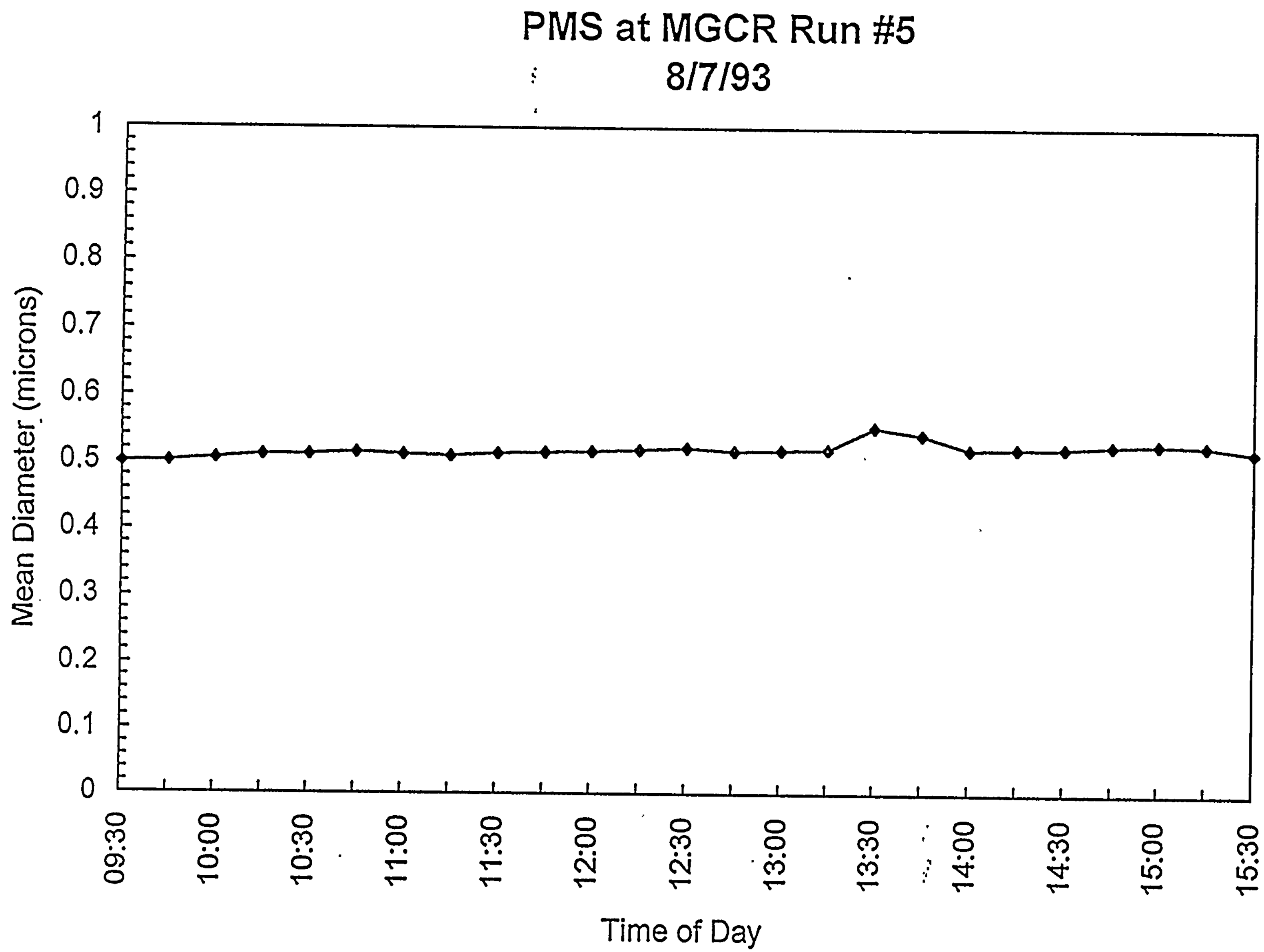



Figure 2a. Ensemble mean particle diameters.

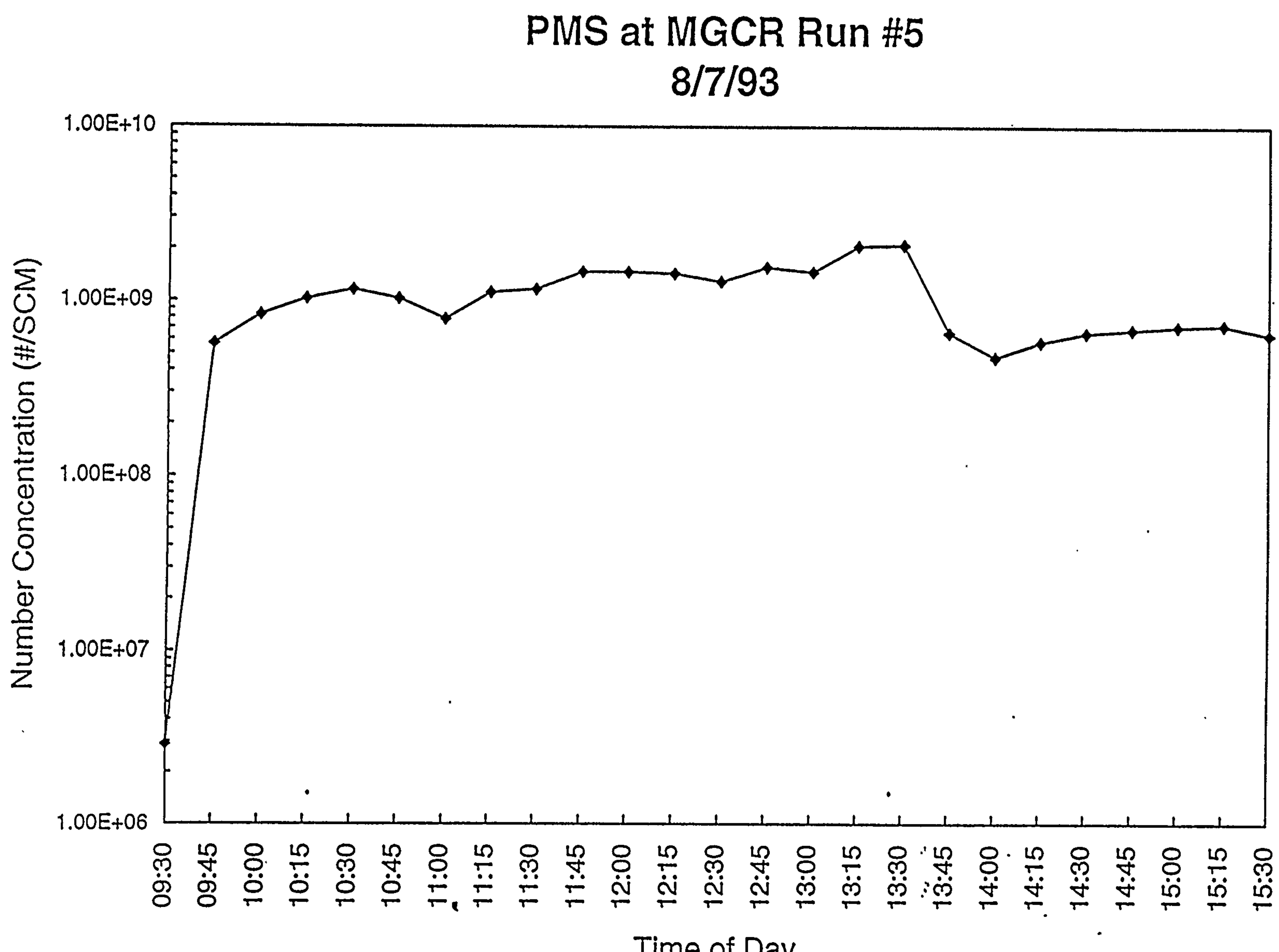



Figure 2b. Ensemble mean particle number concentrations.

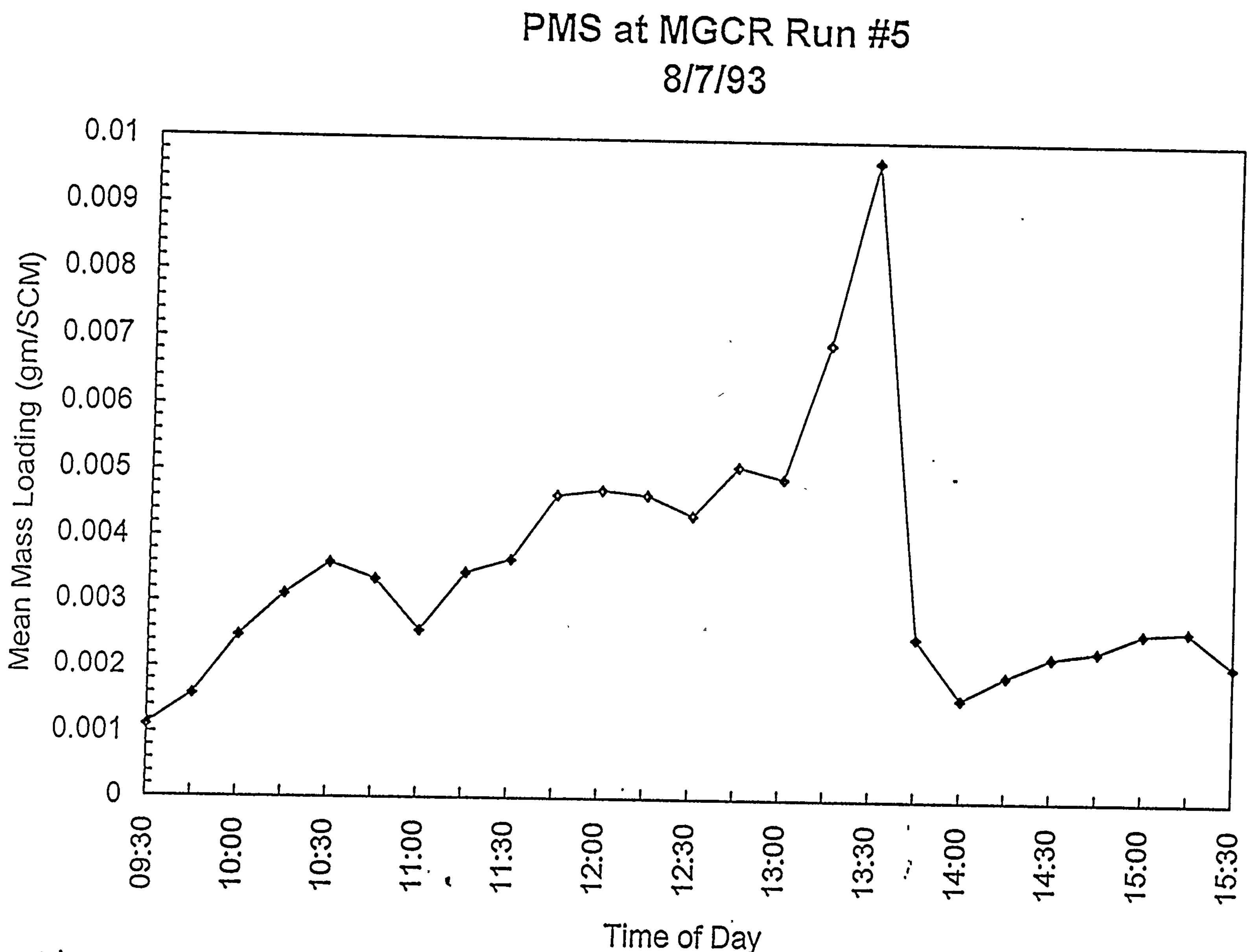



Figure 2c. Ensemble mean mass loadings.

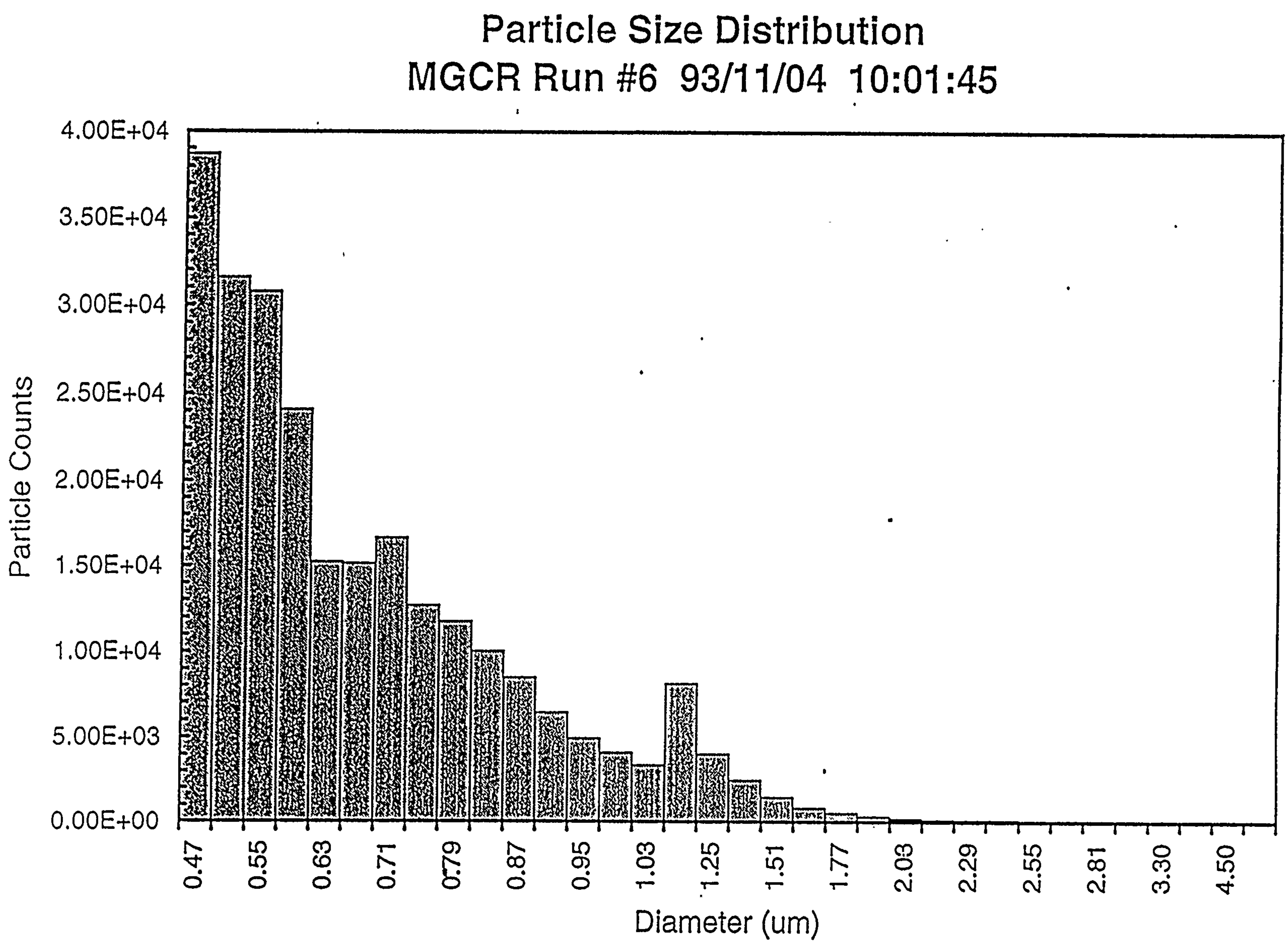



Figure 3a. Unprocessed particle size distribution from a single measurement.

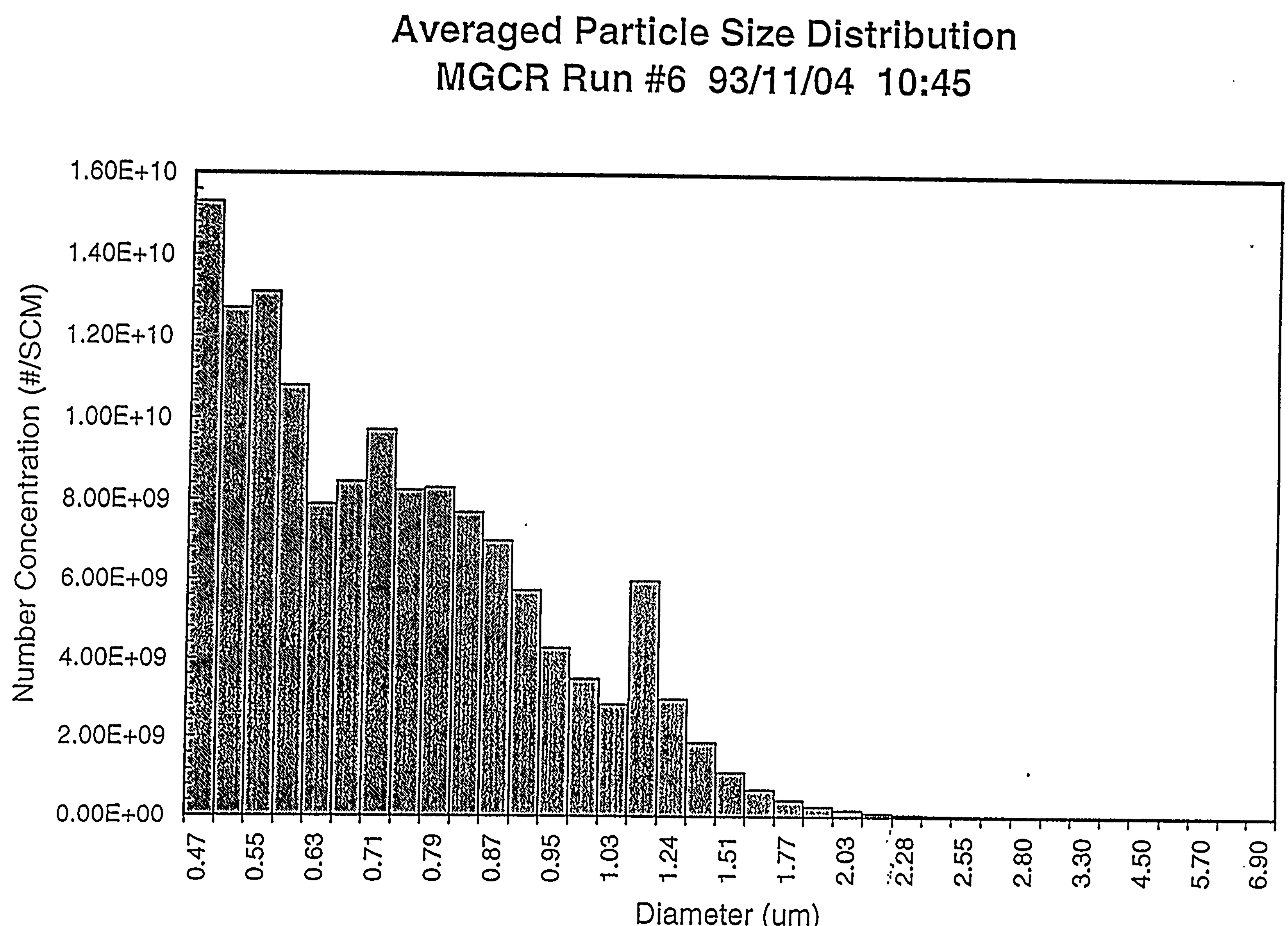



Figure 3b. A 15-minute averaged particle size distribution.

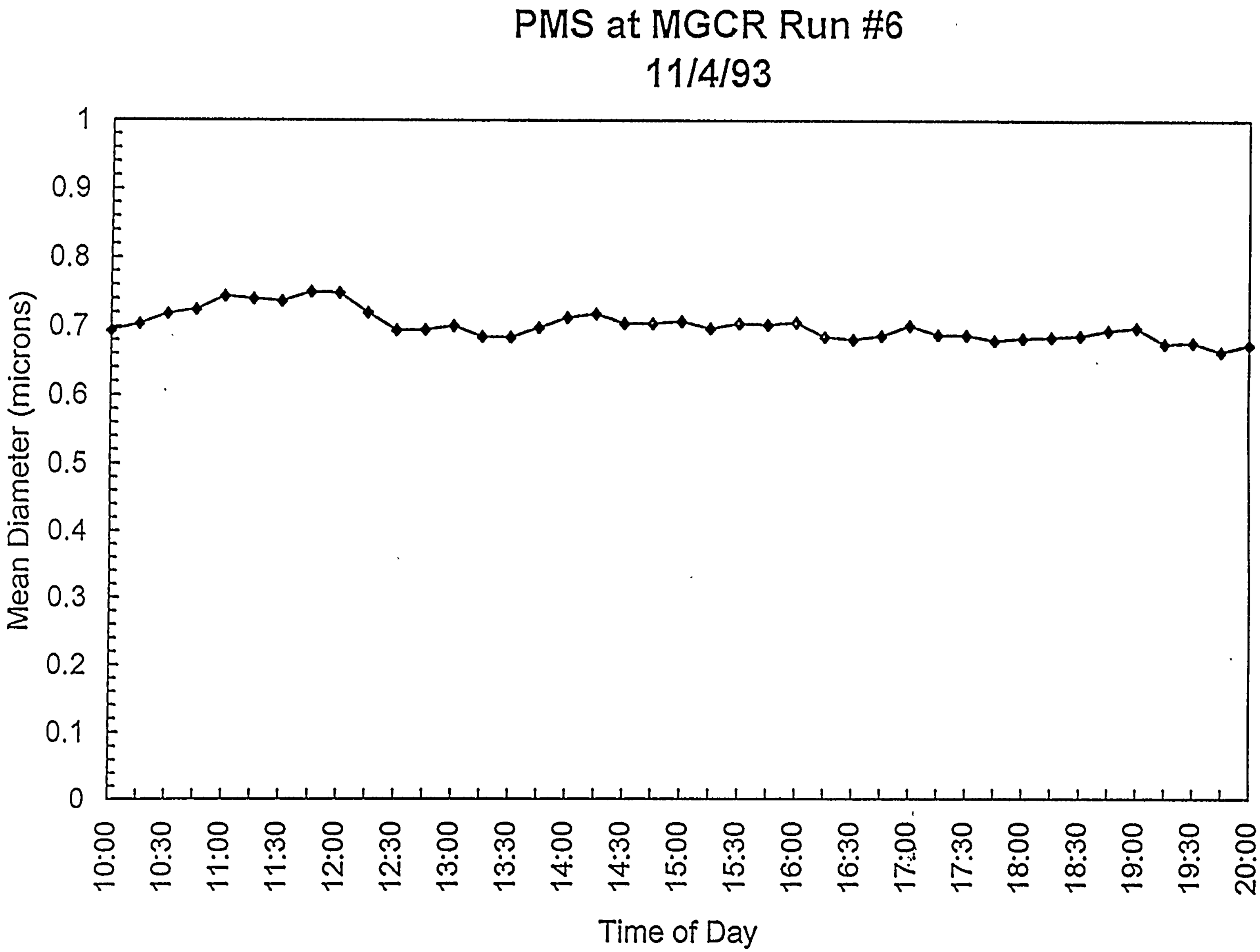


Figure 3c. Ensemble mean particle diameters.

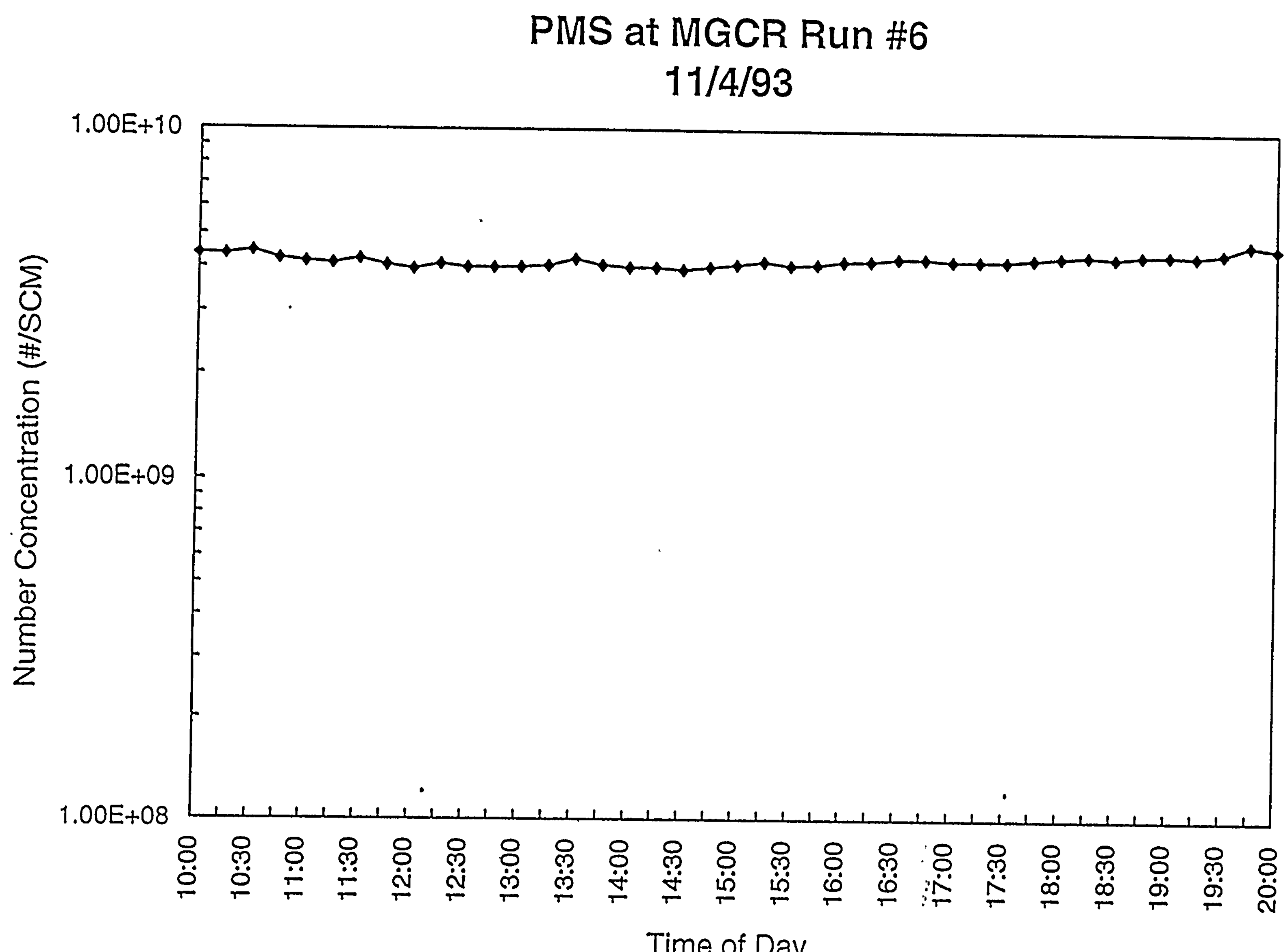



Figure 3d. Ensemble mean particle number concentrations.

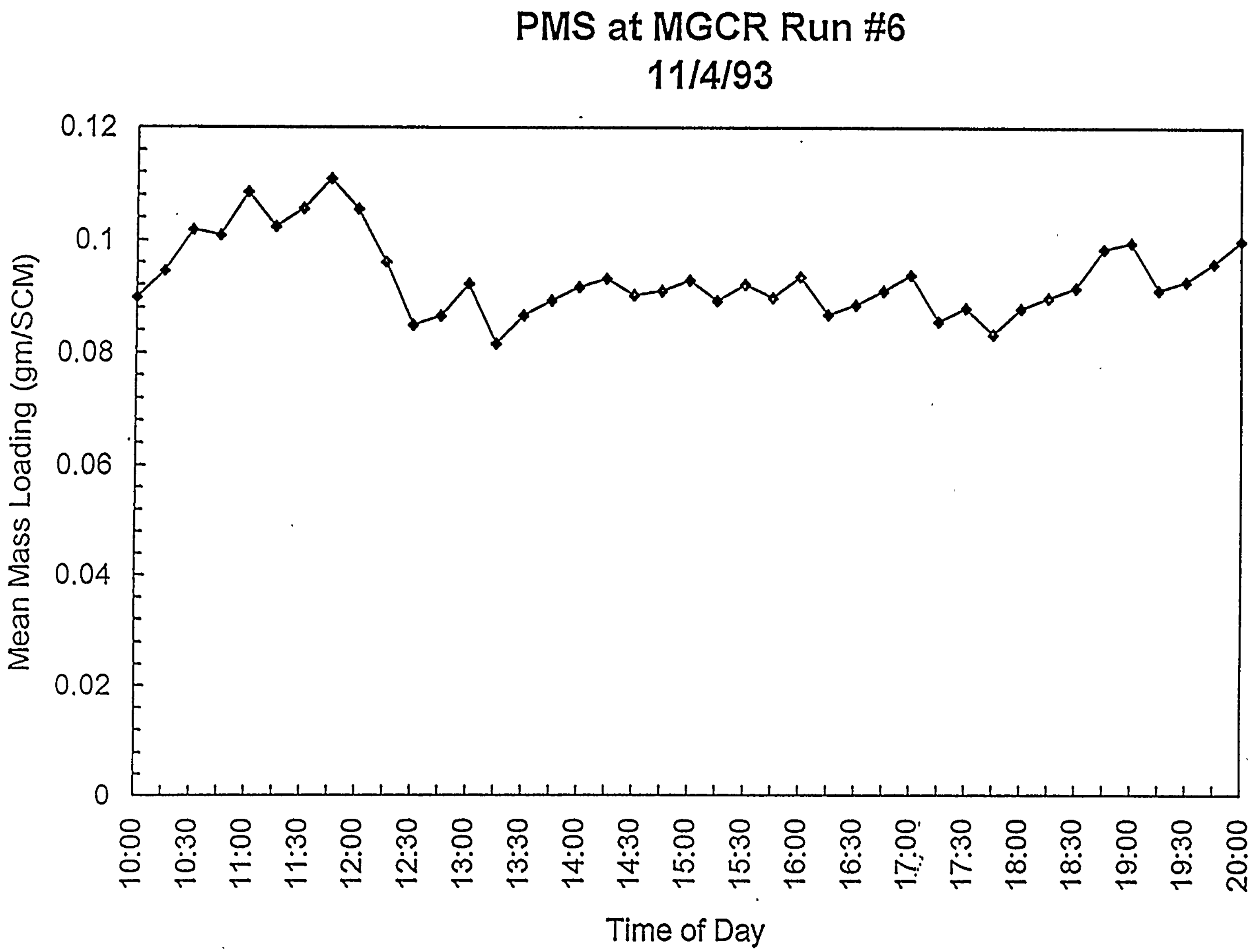



Figure 3e. Ensemble mean mass loadings.

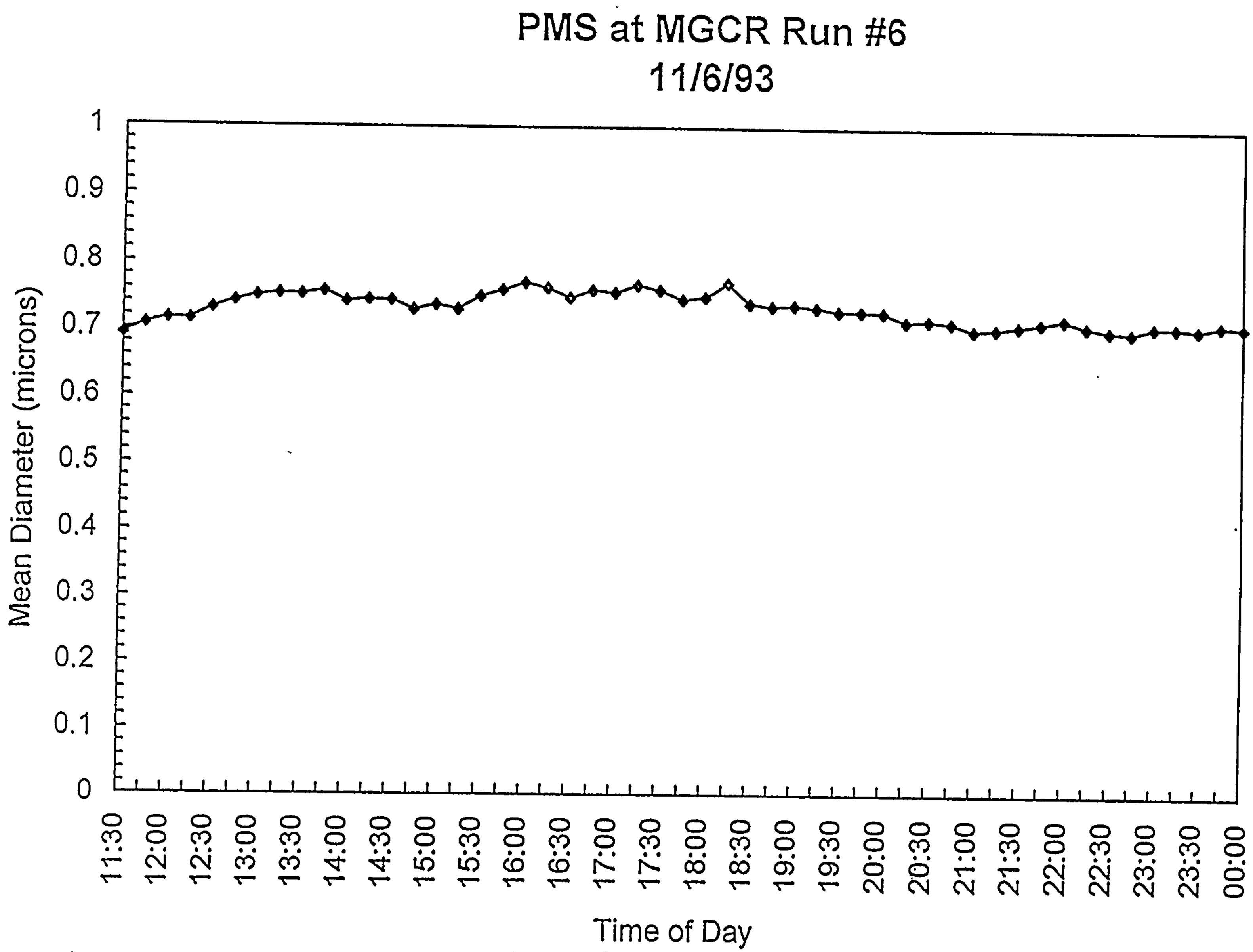



Figure 4a. Ensemble mean particle diameters.

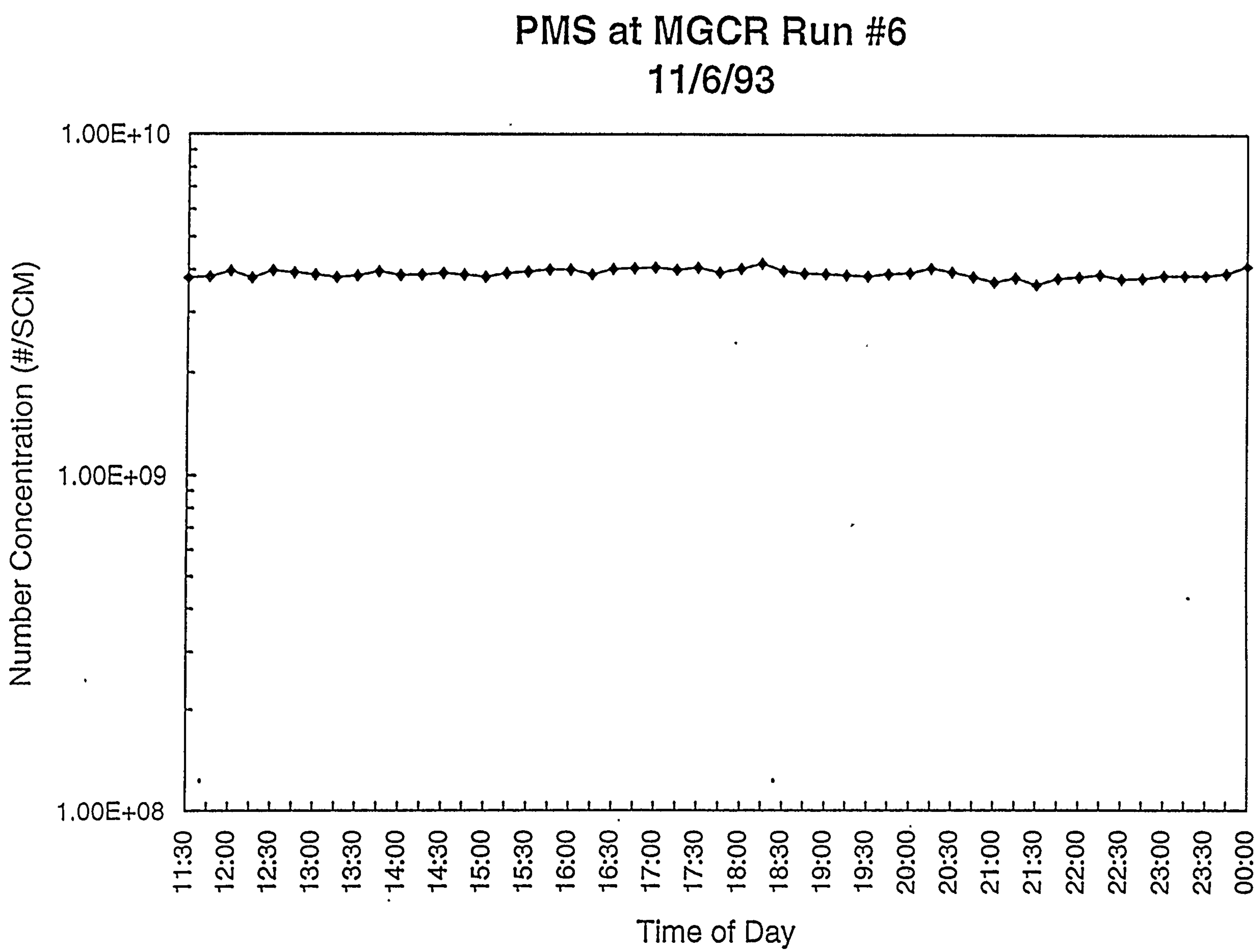


Figure 4b. Ensemble mean particle number concentrations.

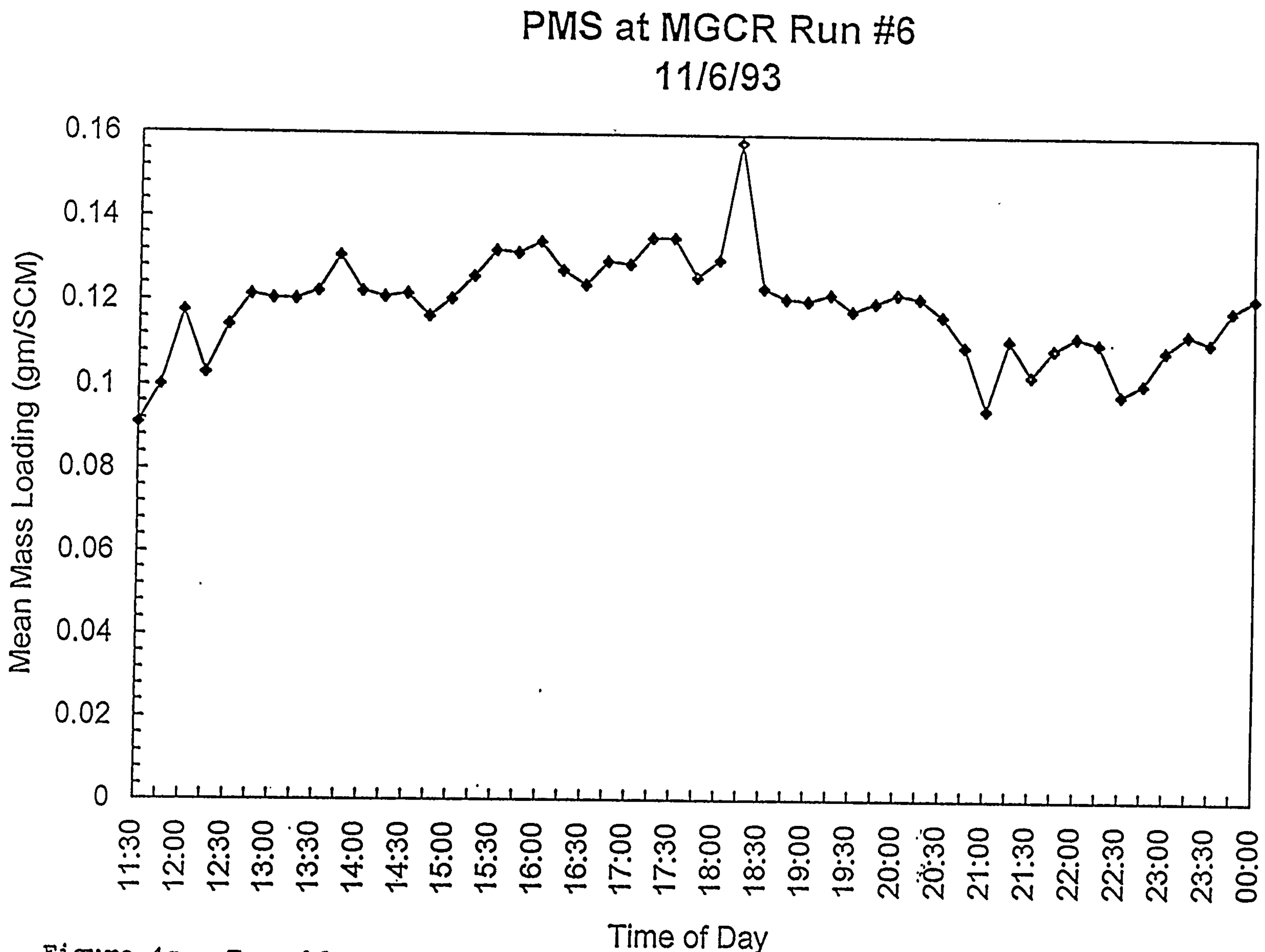



Figure 4c. Ensemble mean particle mass loadings.

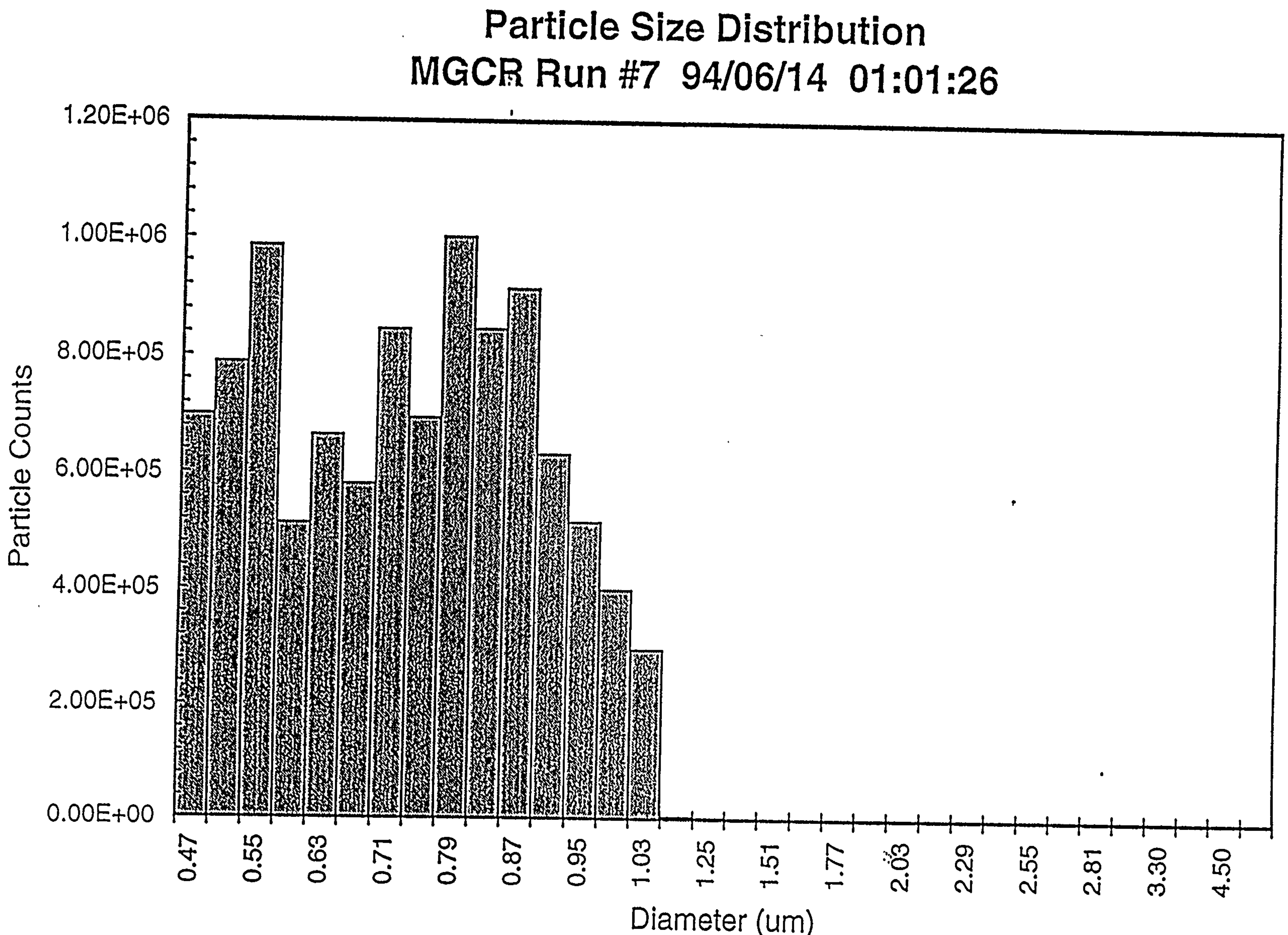



Figure 5a. Unprocessed particle size distribution from a single measurement.

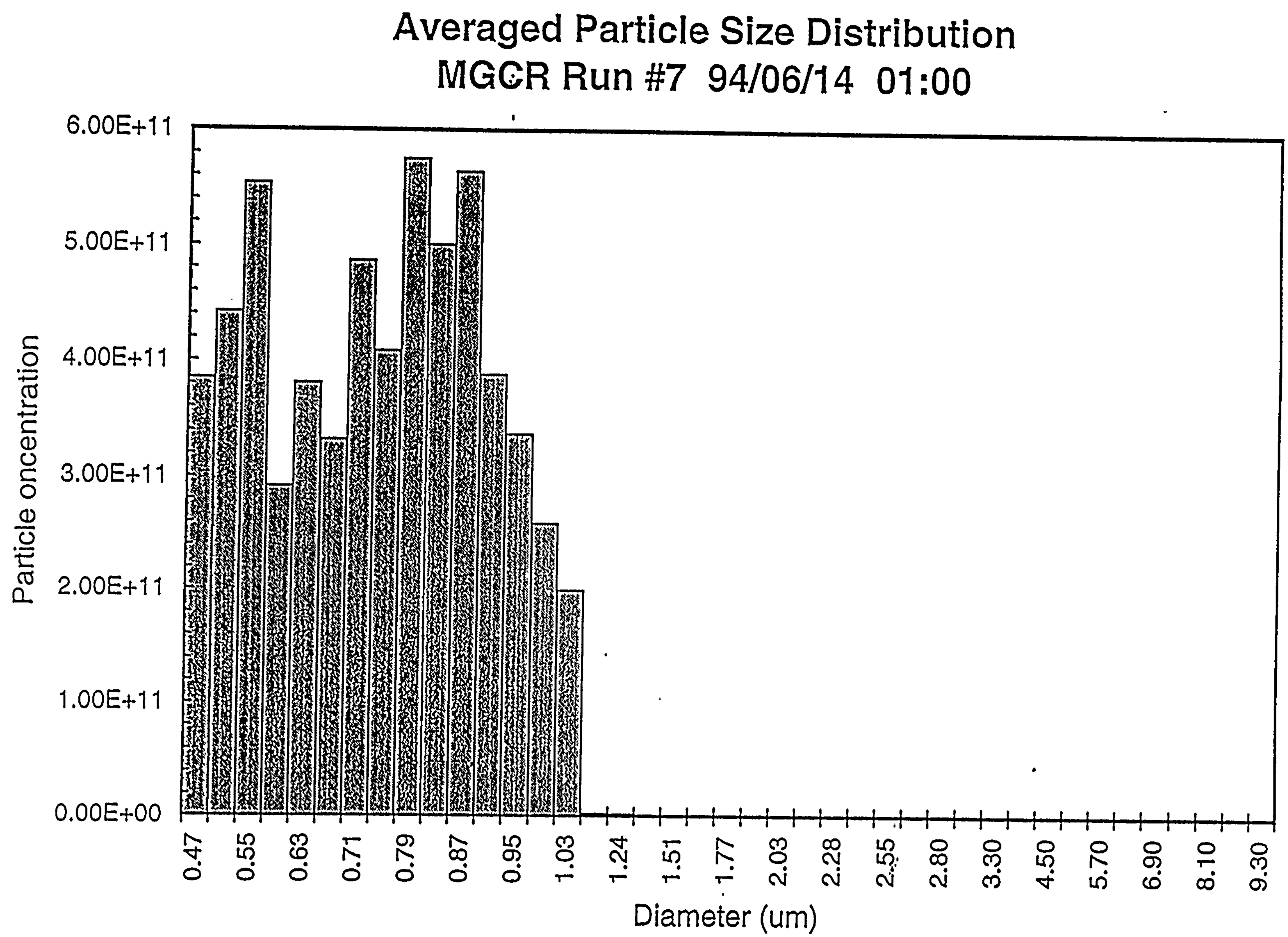



Figure 5b. A 15-minute averaged particle size distribution.

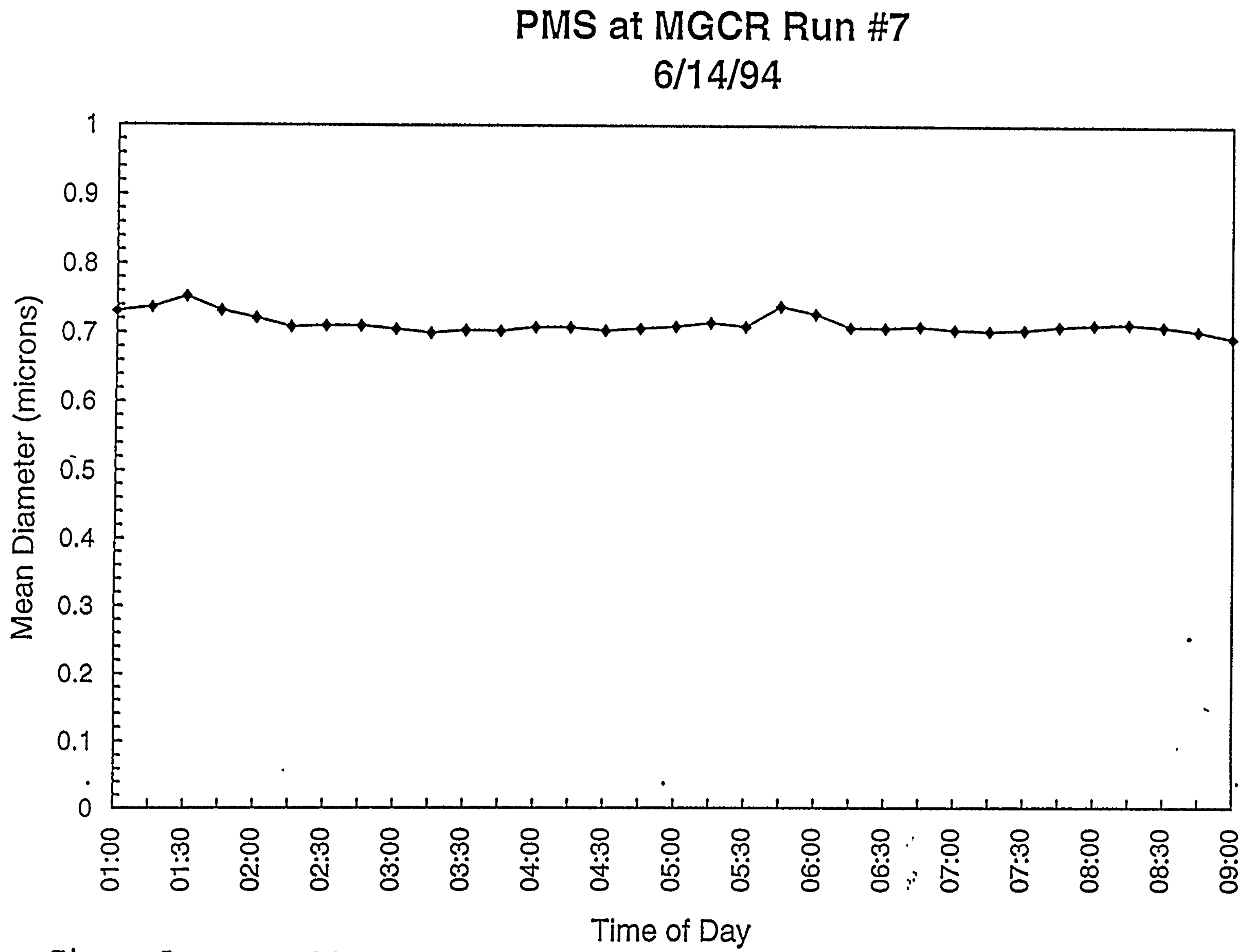



Figure 5c. Ensemble mean particle diameters.

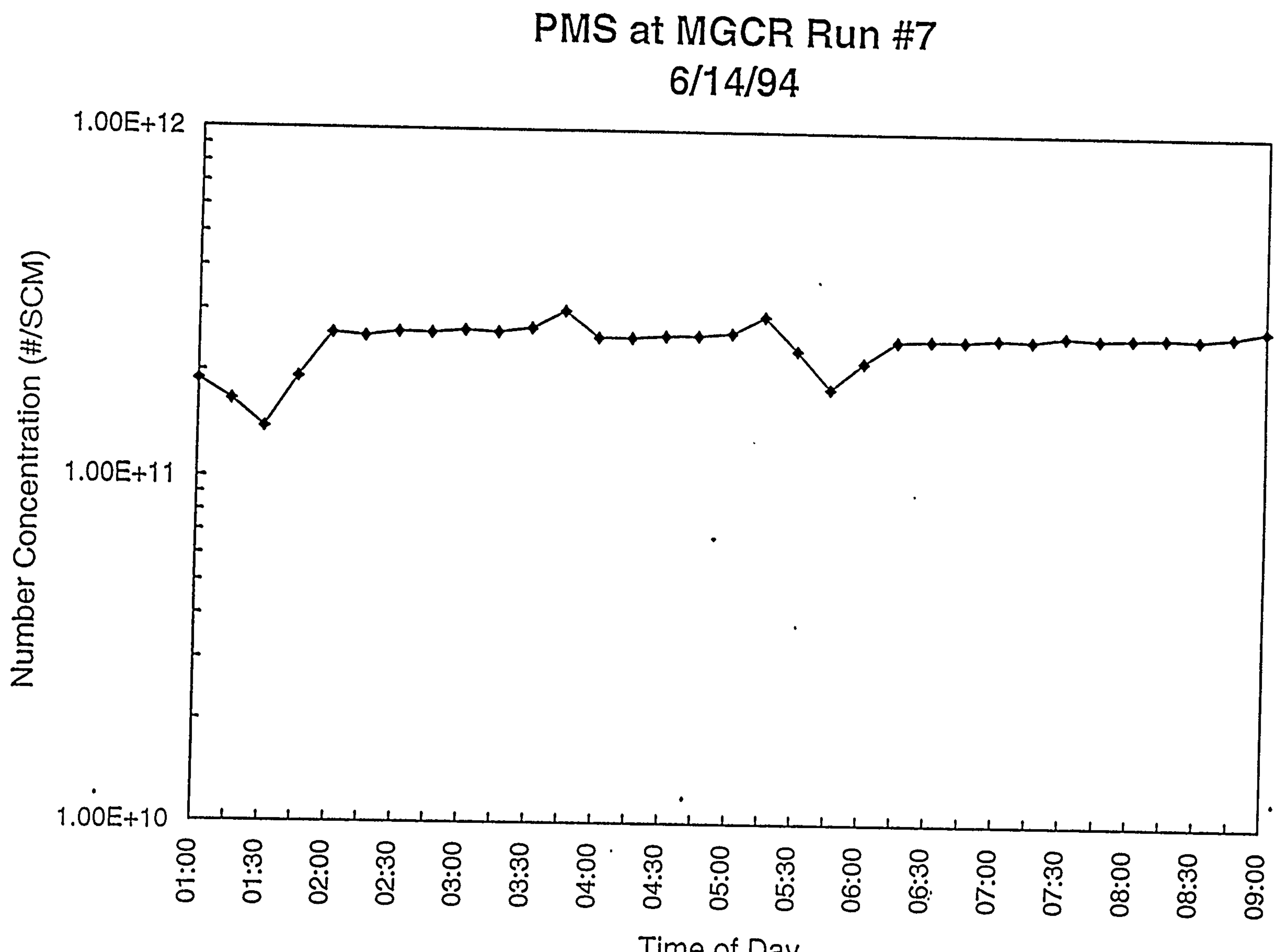



Figure 5d. Ensemble mean particle concentrations.

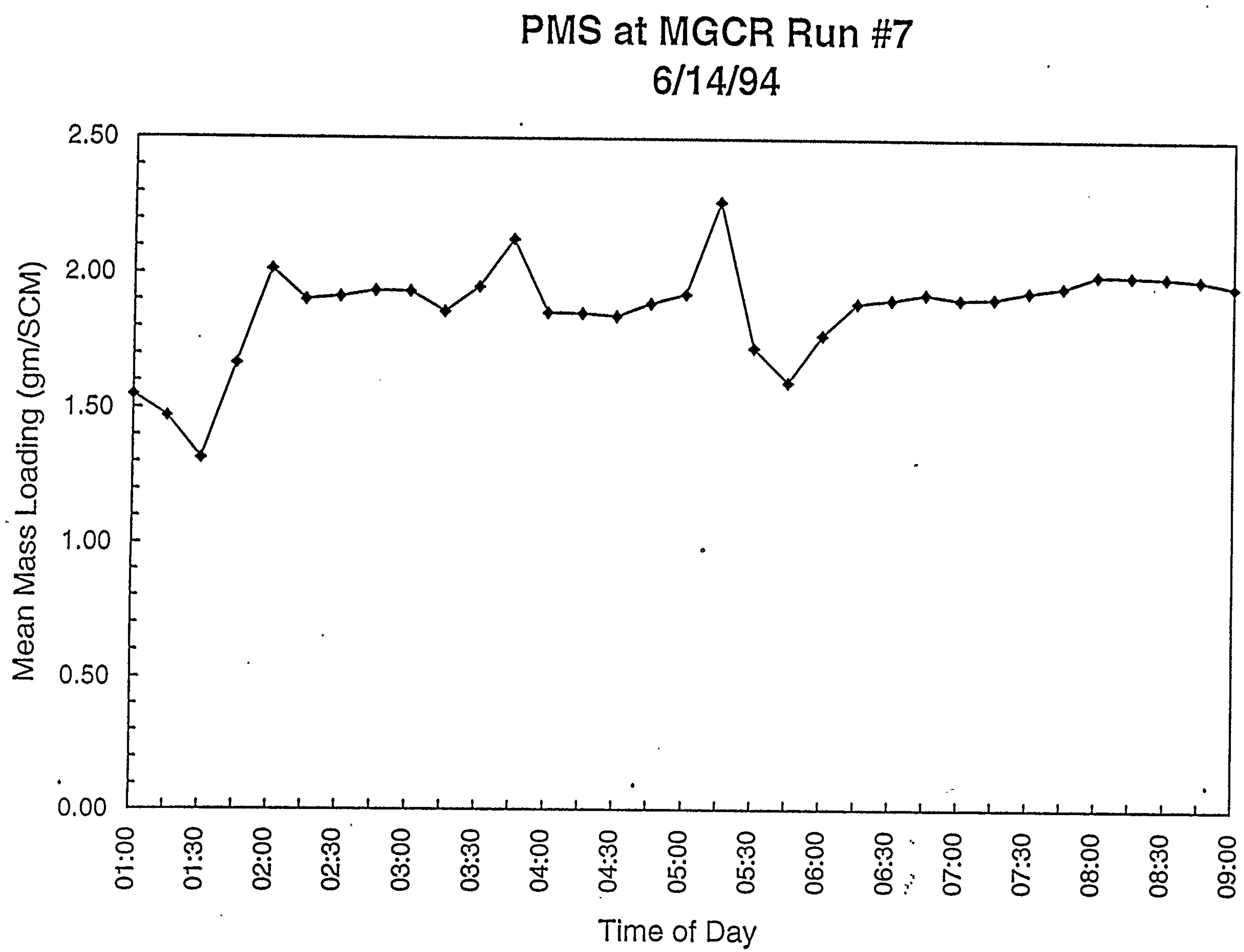



Figure 5e. Ensemble mean mass loadings.

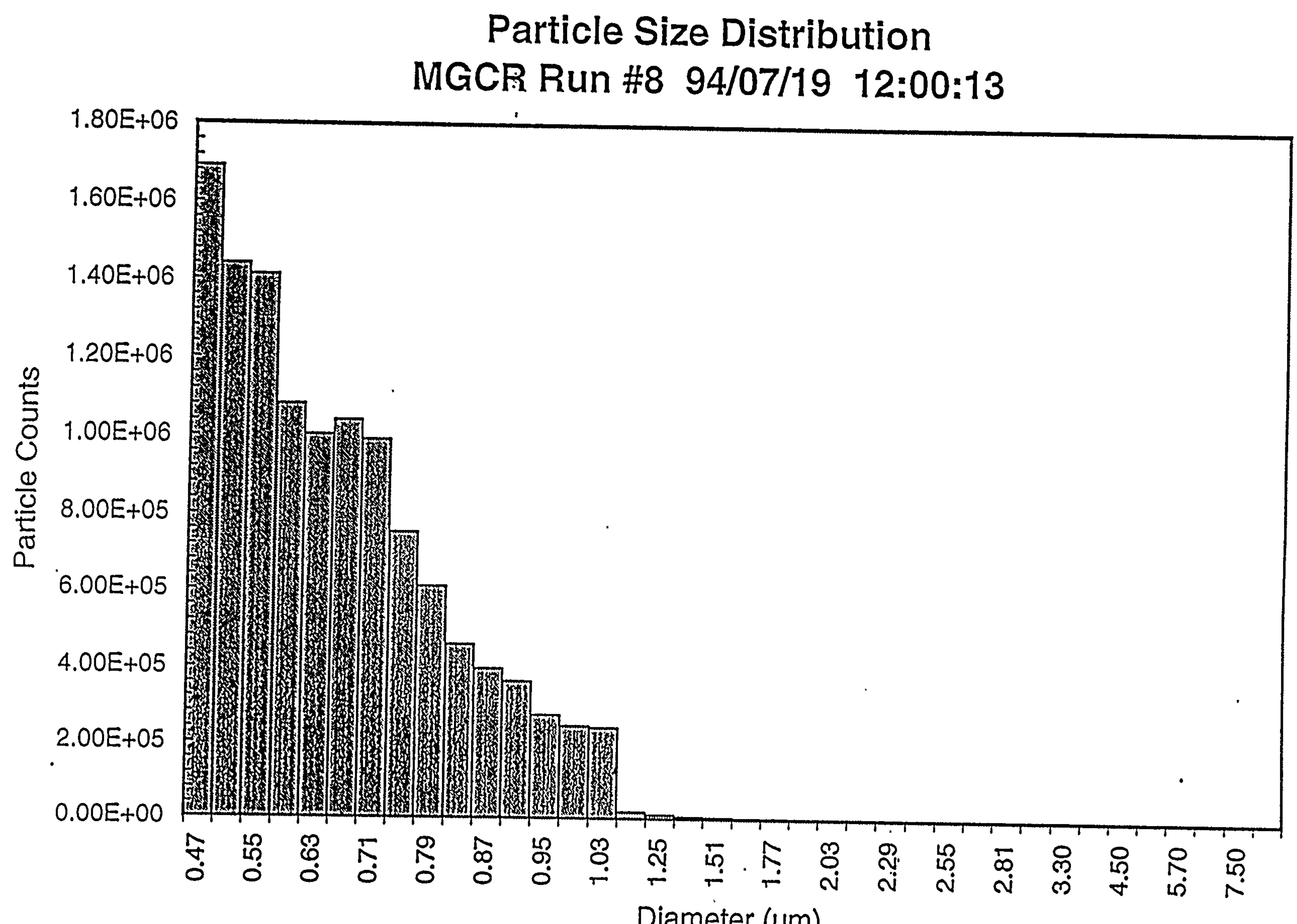



Figure 6a. Unprocessed particle size distribution from a single measurement.

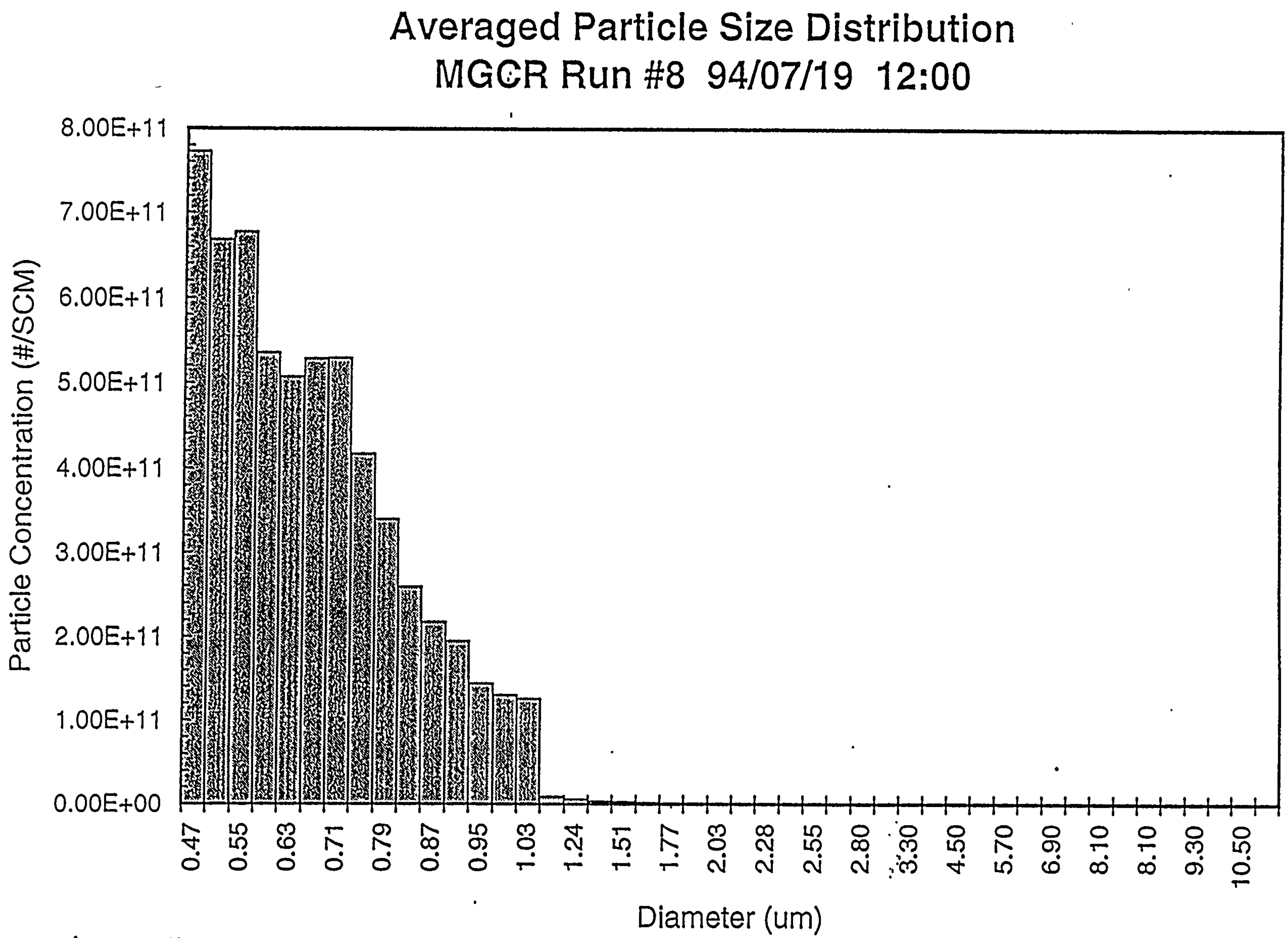



Figure 6b. A 15-minute averaged particle size distribution.

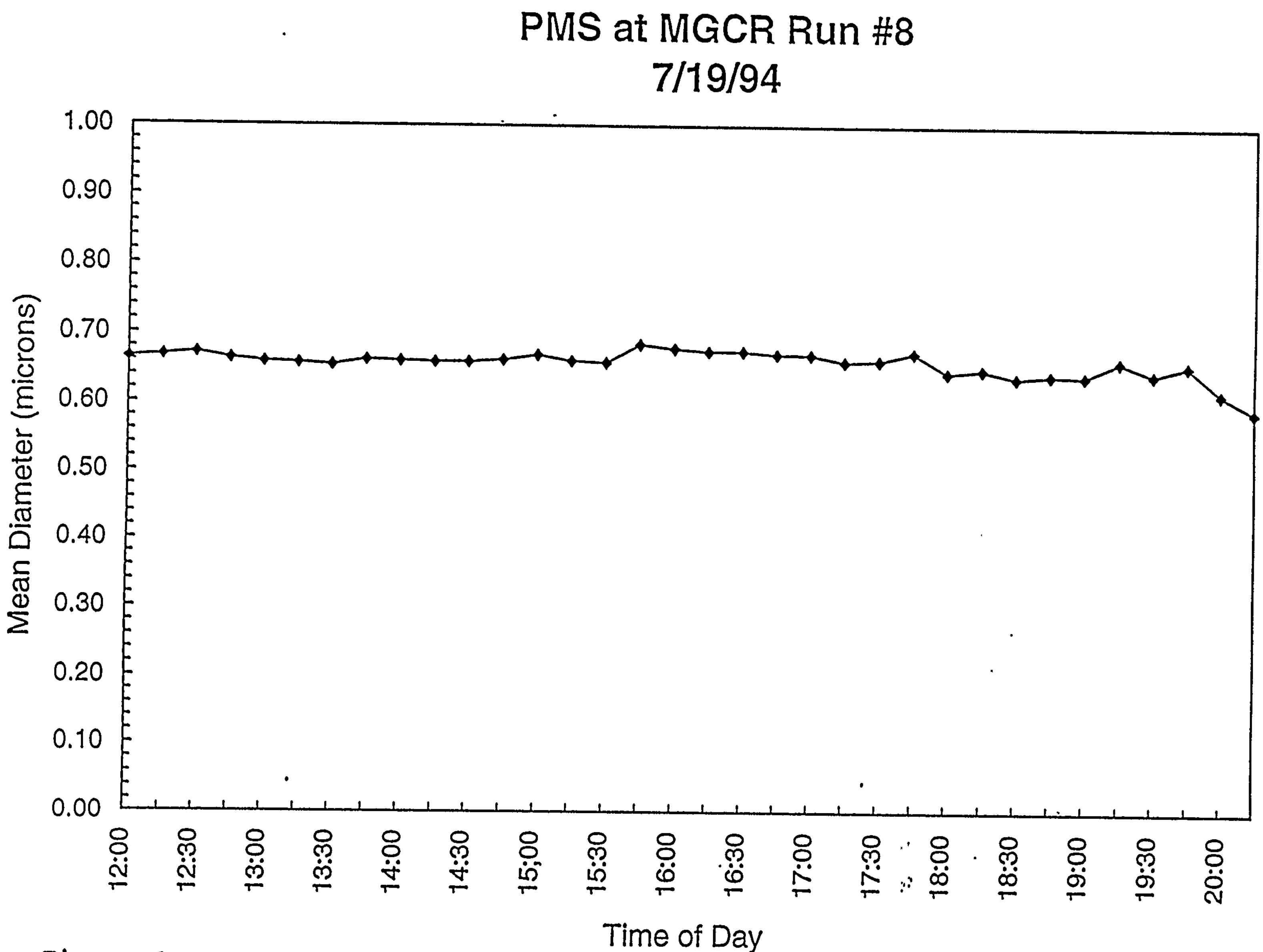



Figure 6c. Ensemble mean particle diameters.

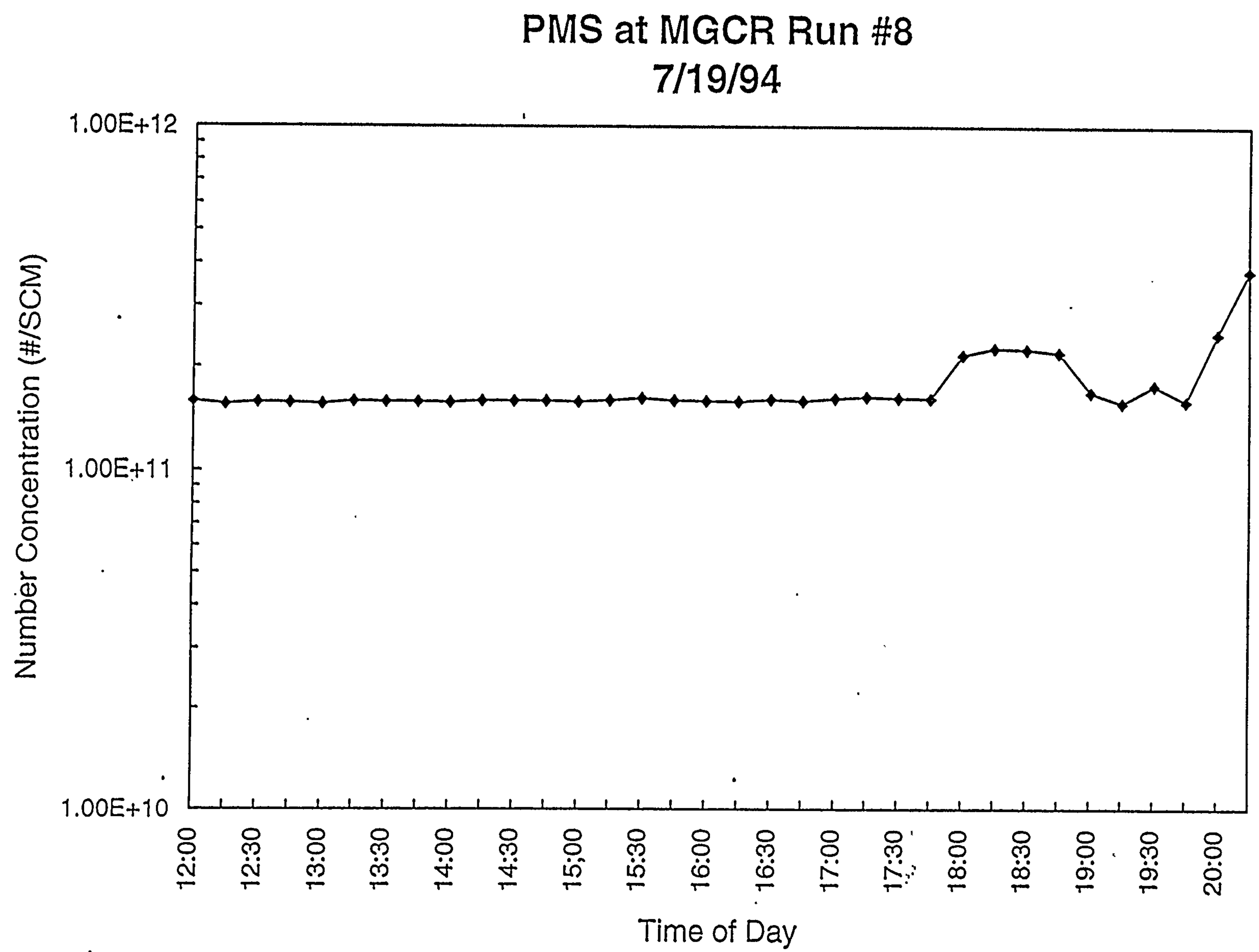



Figure 6d. Ensemble mean particle concentrations.

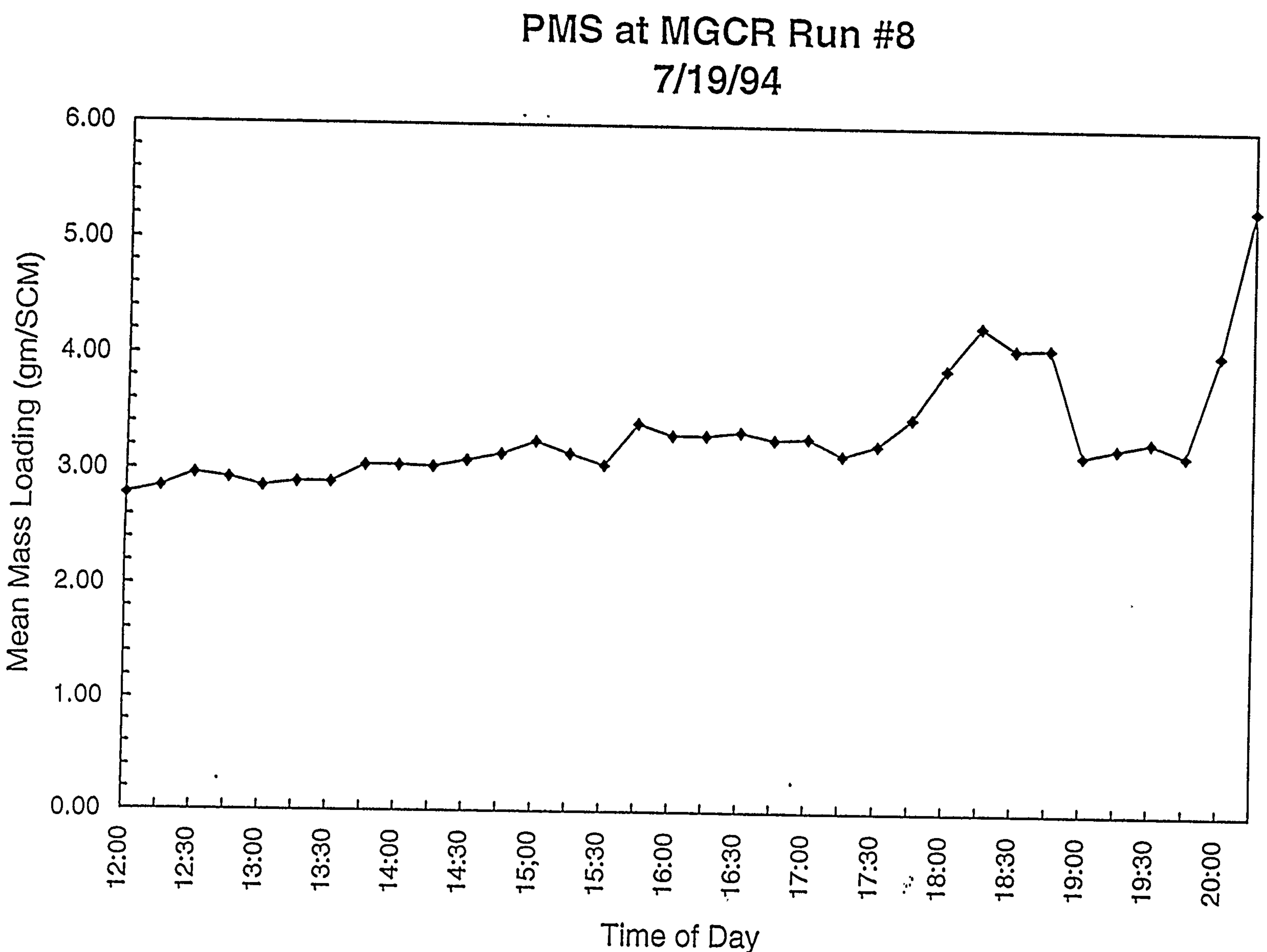



Figure 6e. Ensemble mean mass loadings.

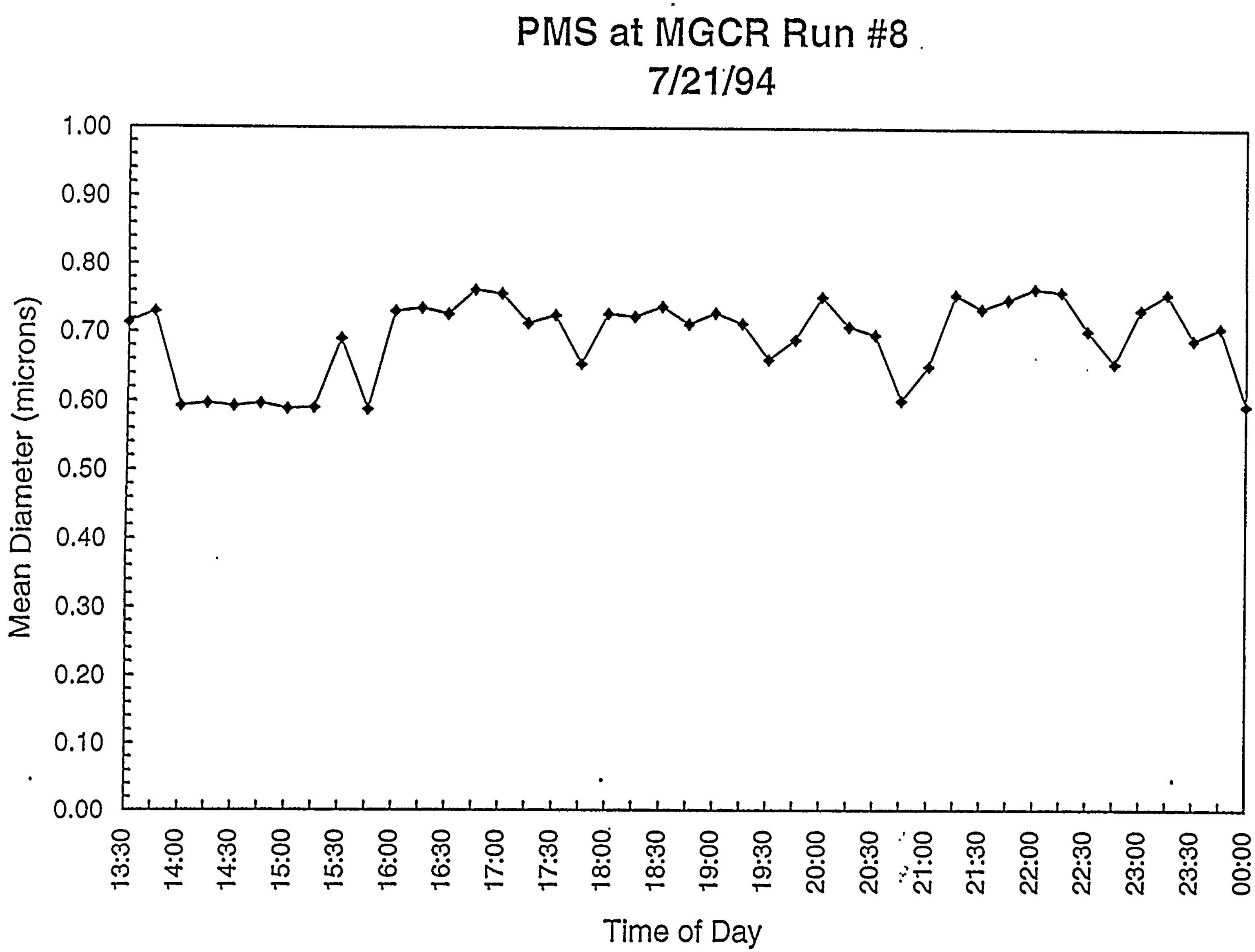



Figure 7a. Ensemble mean particle diameters.

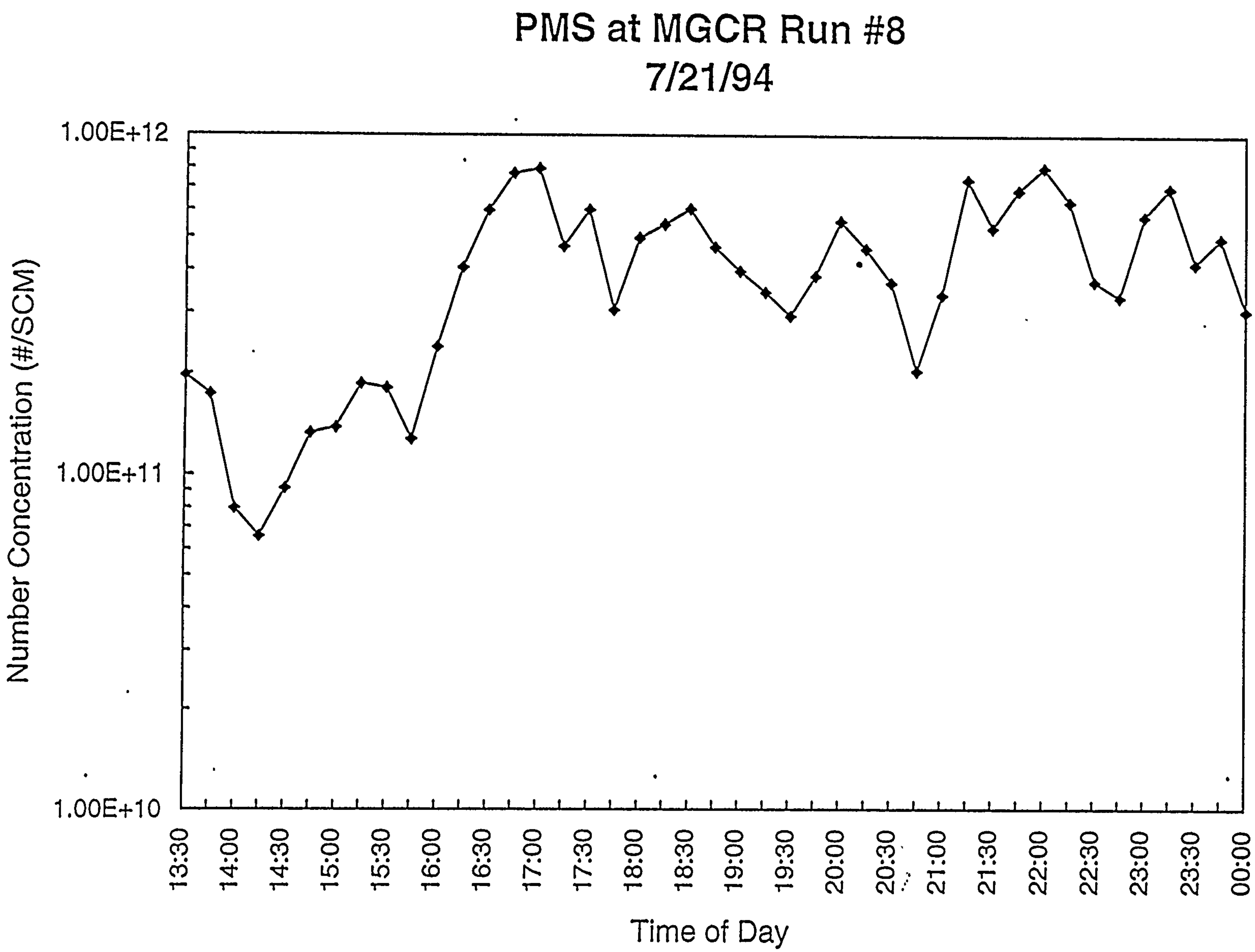



Figure 7b. Ensemble mean particle concentrations.

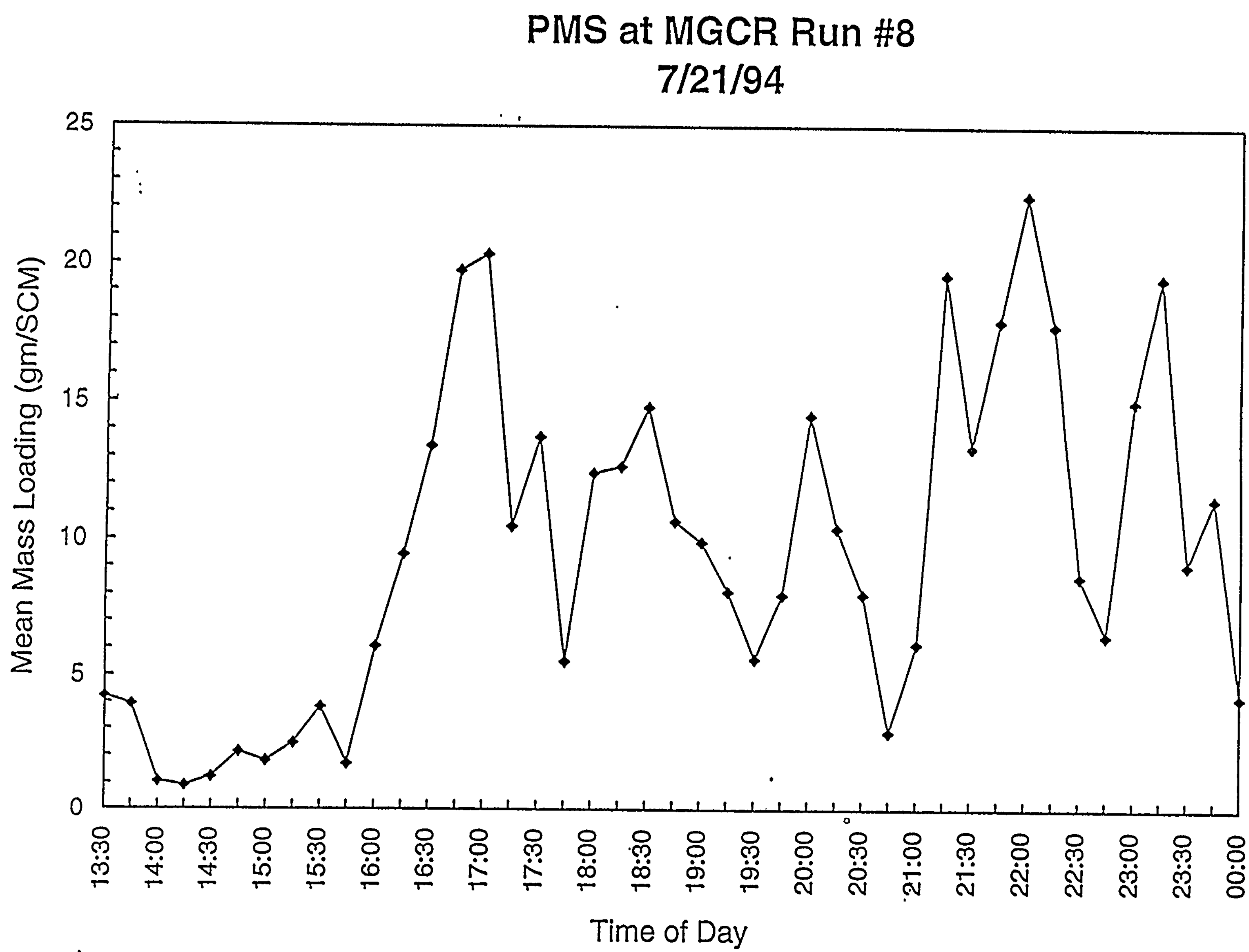


Figure 7c. Ensemble mean mass loadings.

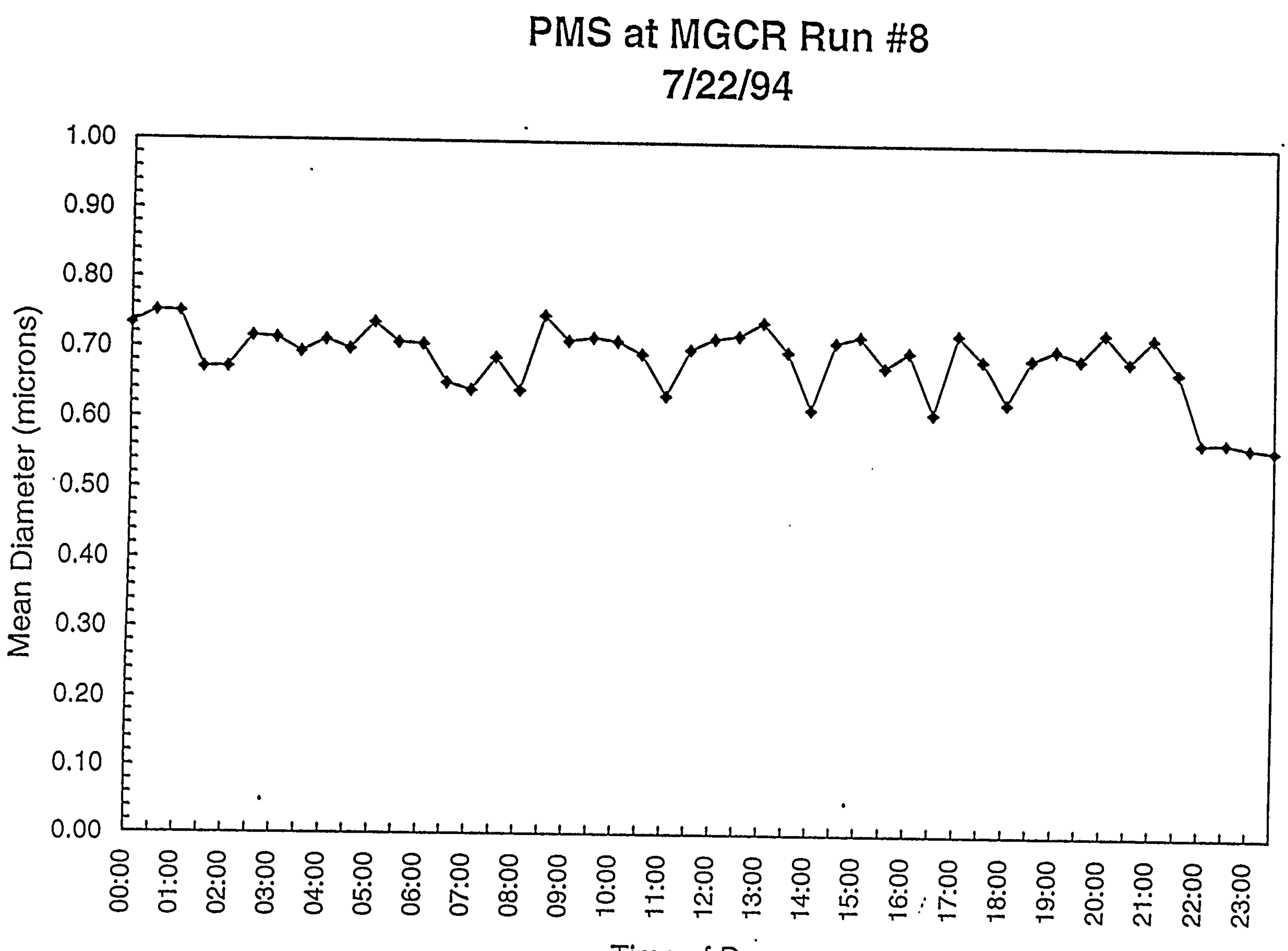



Figure 8a. Ensemble mean particle diameters.

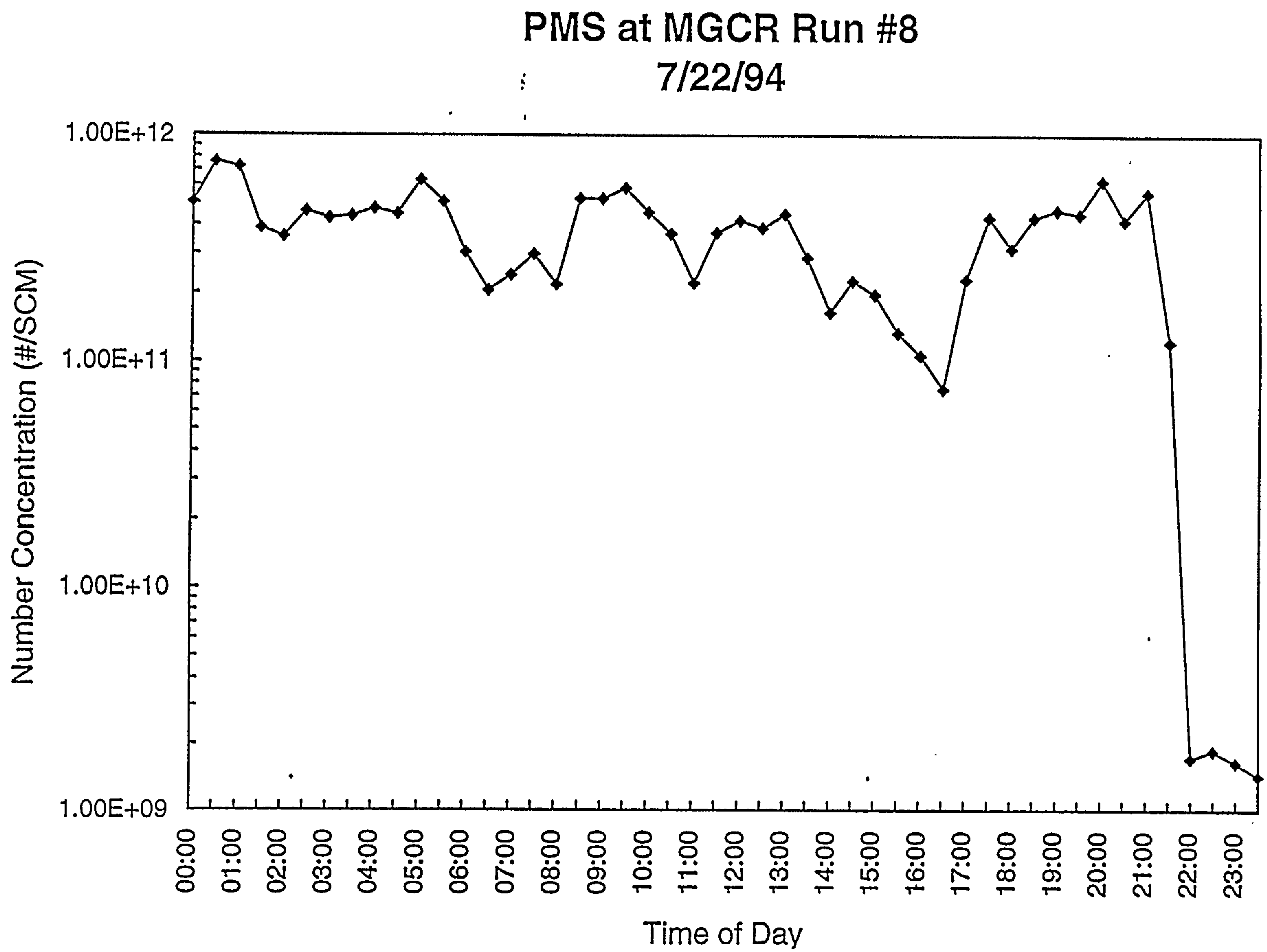



Figure 8b. Ensemble mean particle concentrations.

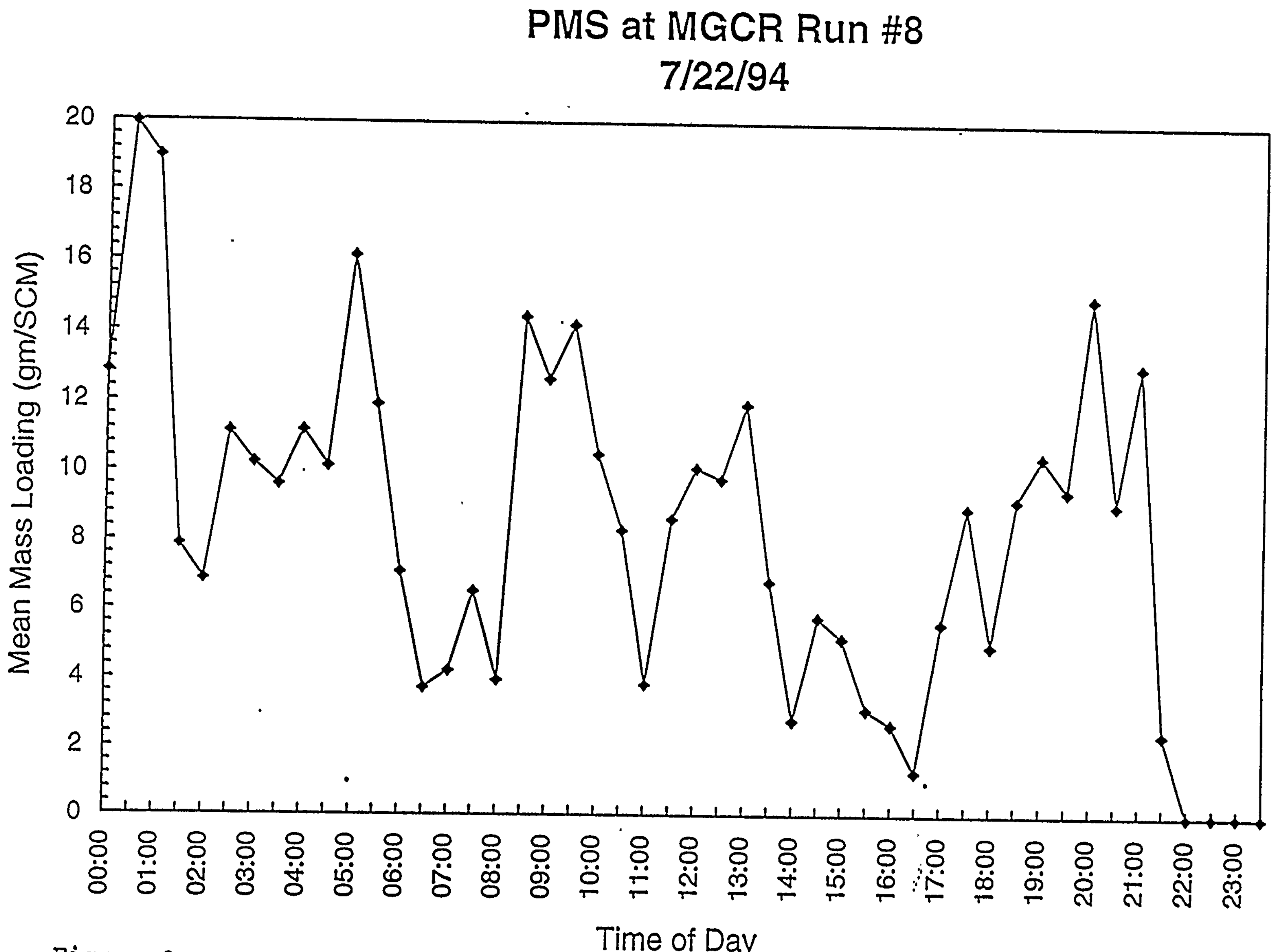


Figure 8c. Ensemble mean mass loadings.

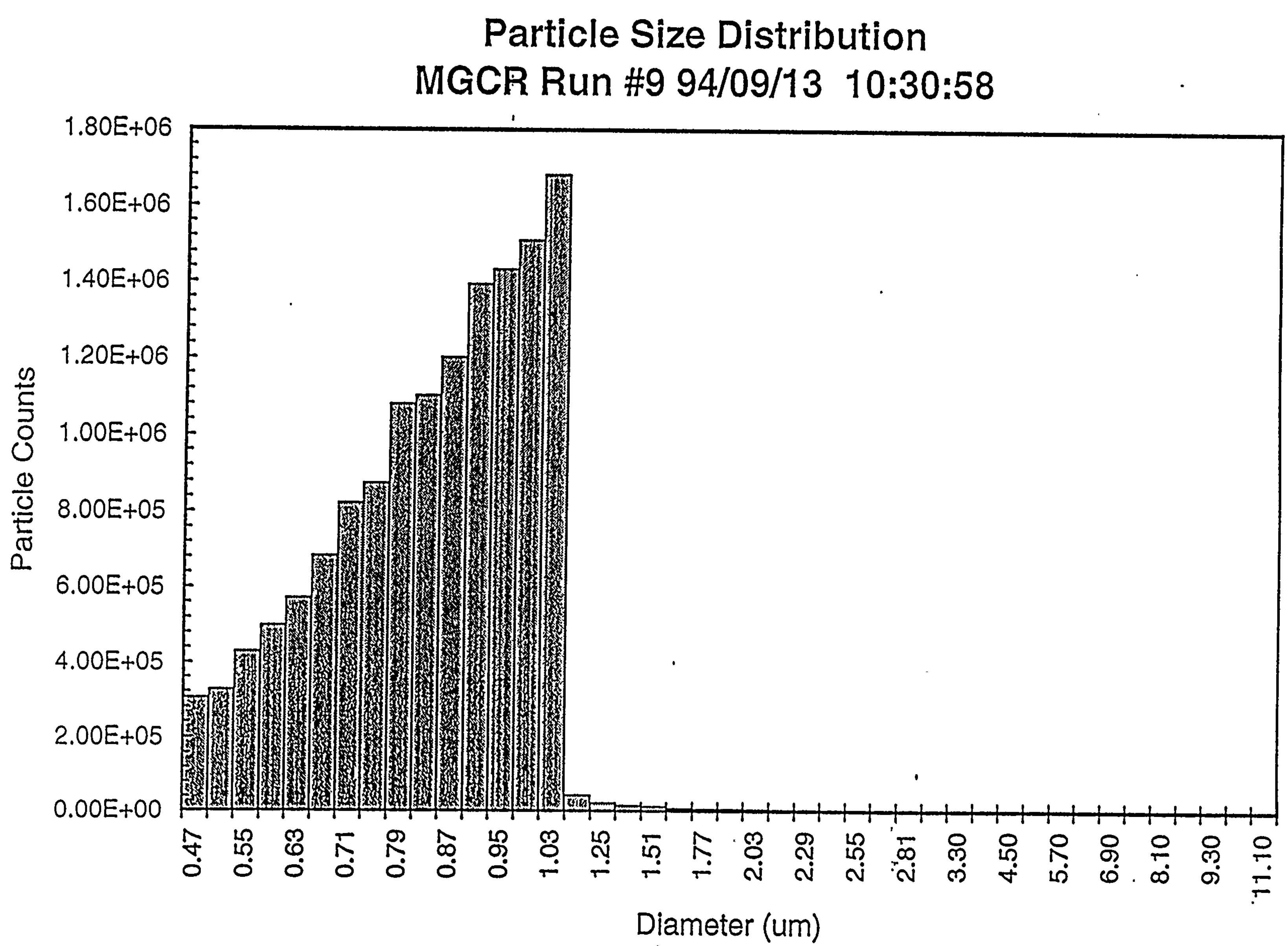



Figure 9a. Unprocessed particle size distribution from a single measurement.

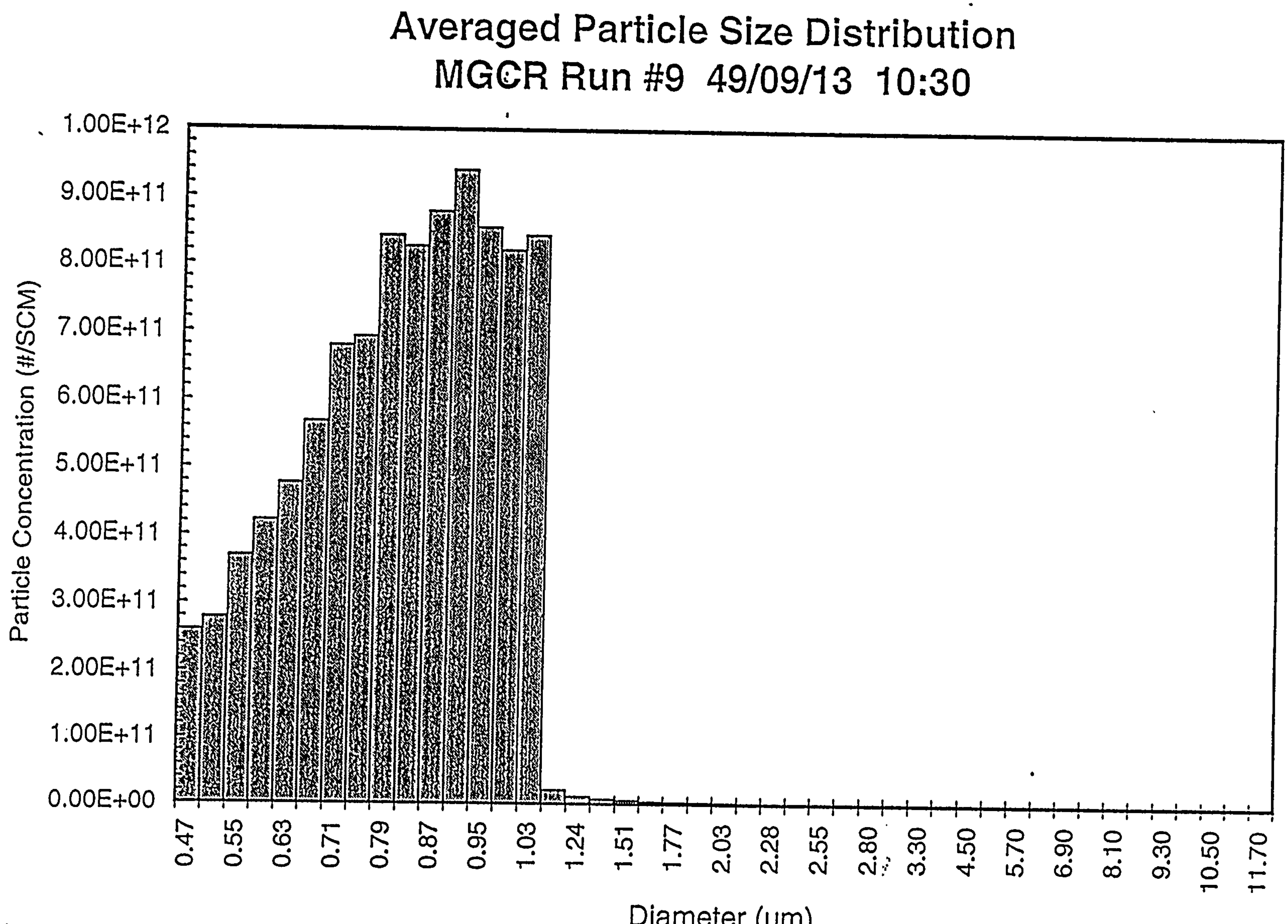



Figure 9b. A 15-minute averaged particle size distribution.

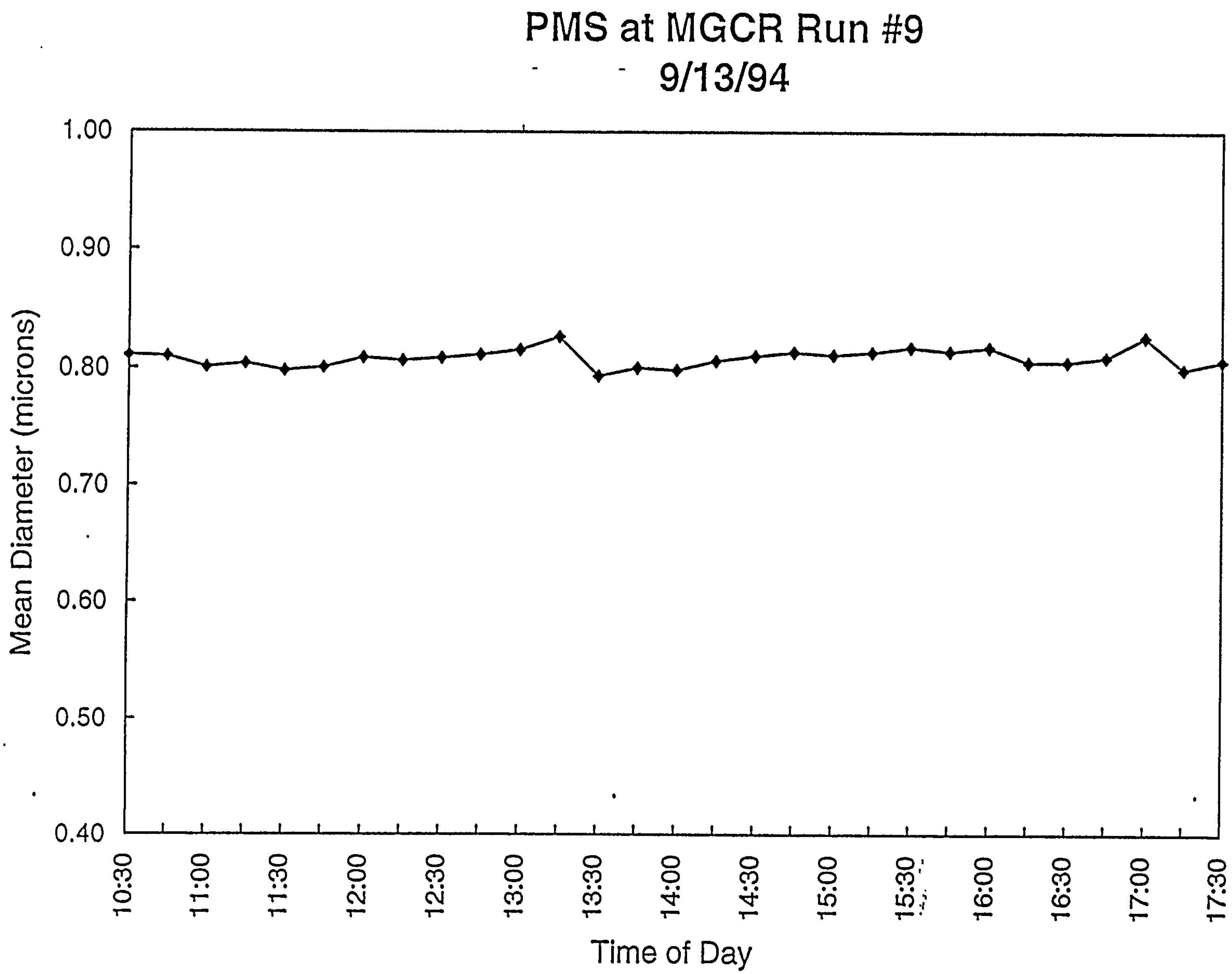



Figure 9c. Ensemble mean particle diameters.

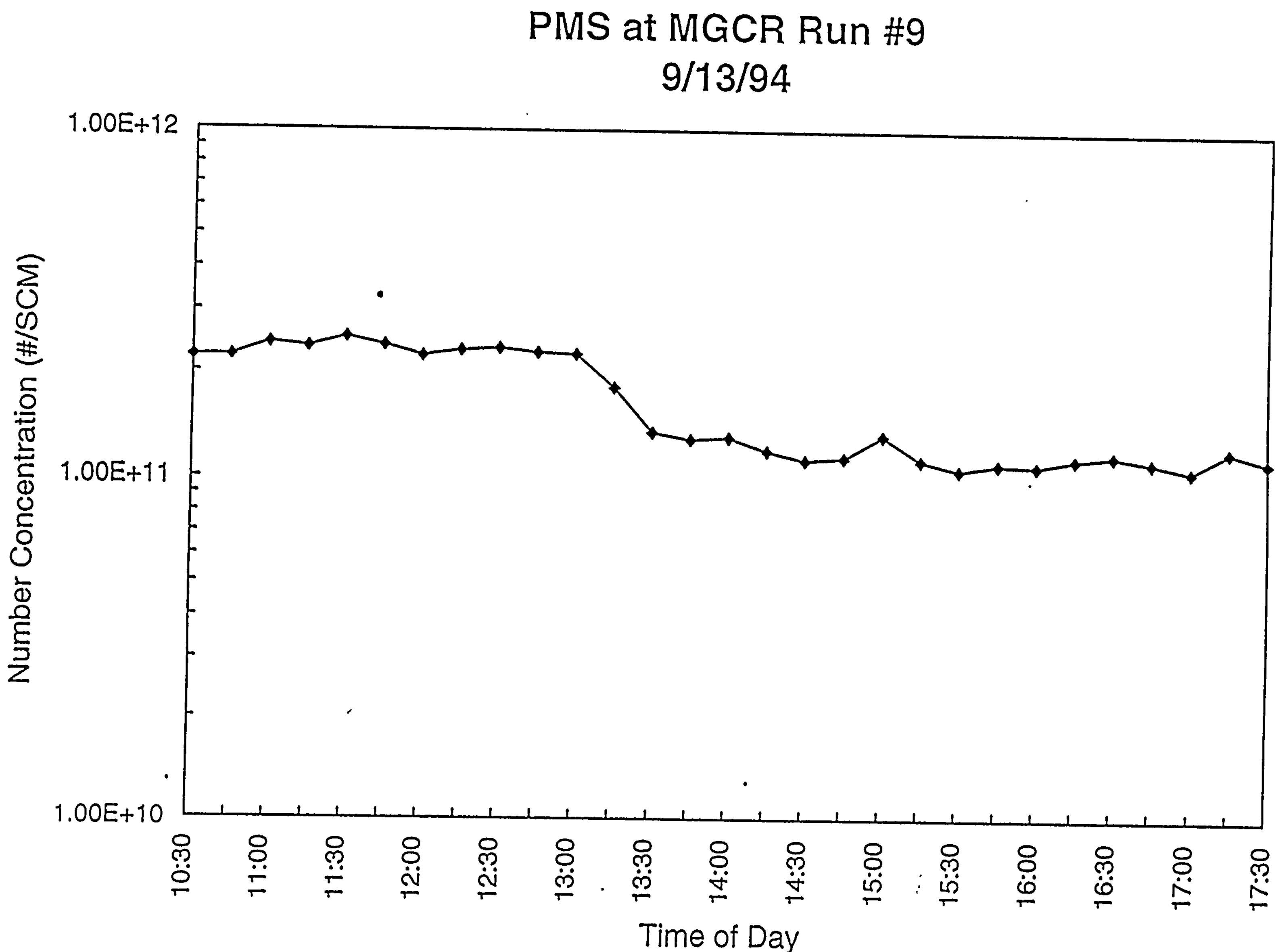



Figure 9d. Ensemble mean particle concentrations.

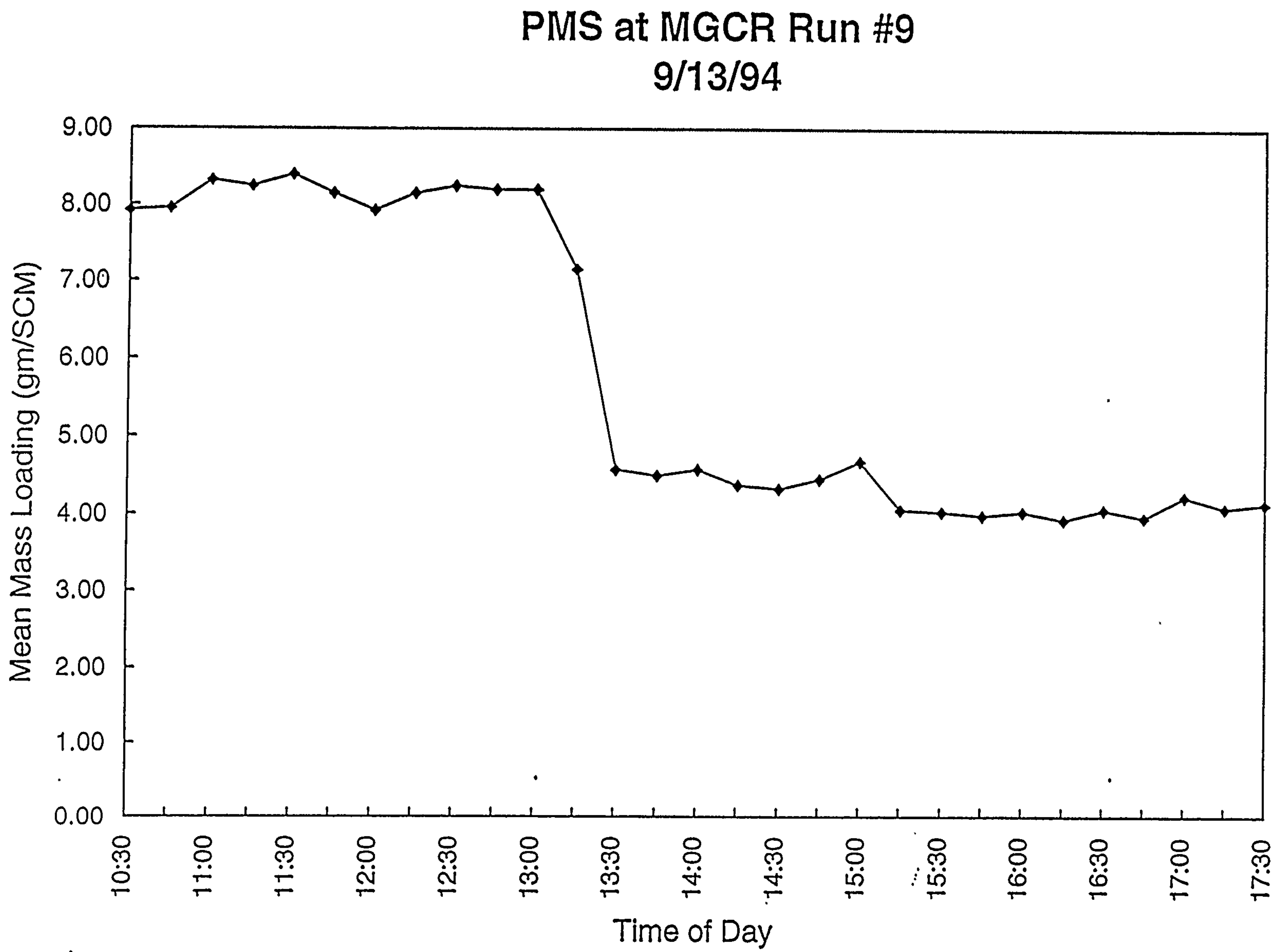



Figure 9e. Ensemble mean mass loadings.

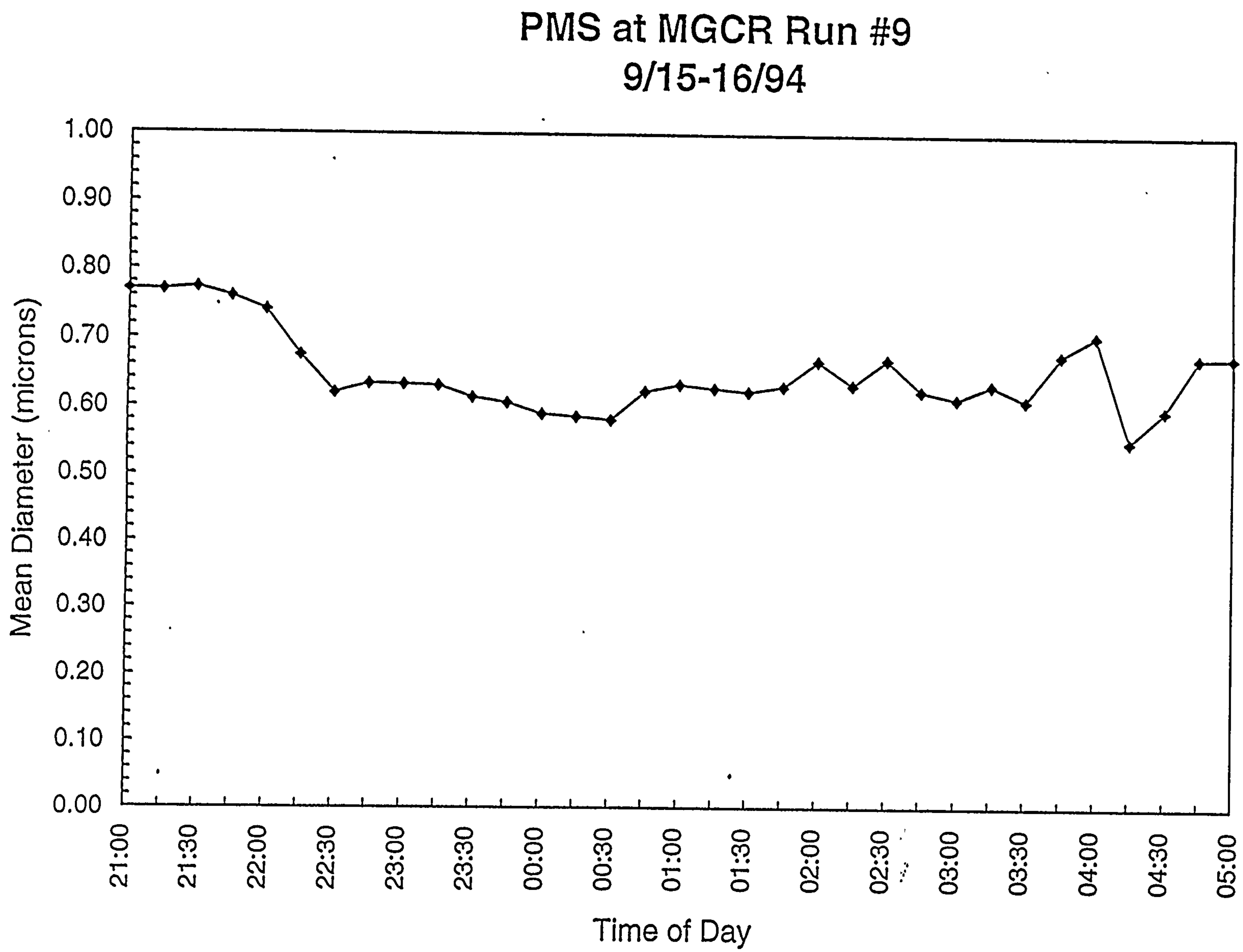



Figure 10a. Ensemble mean particle diameters.

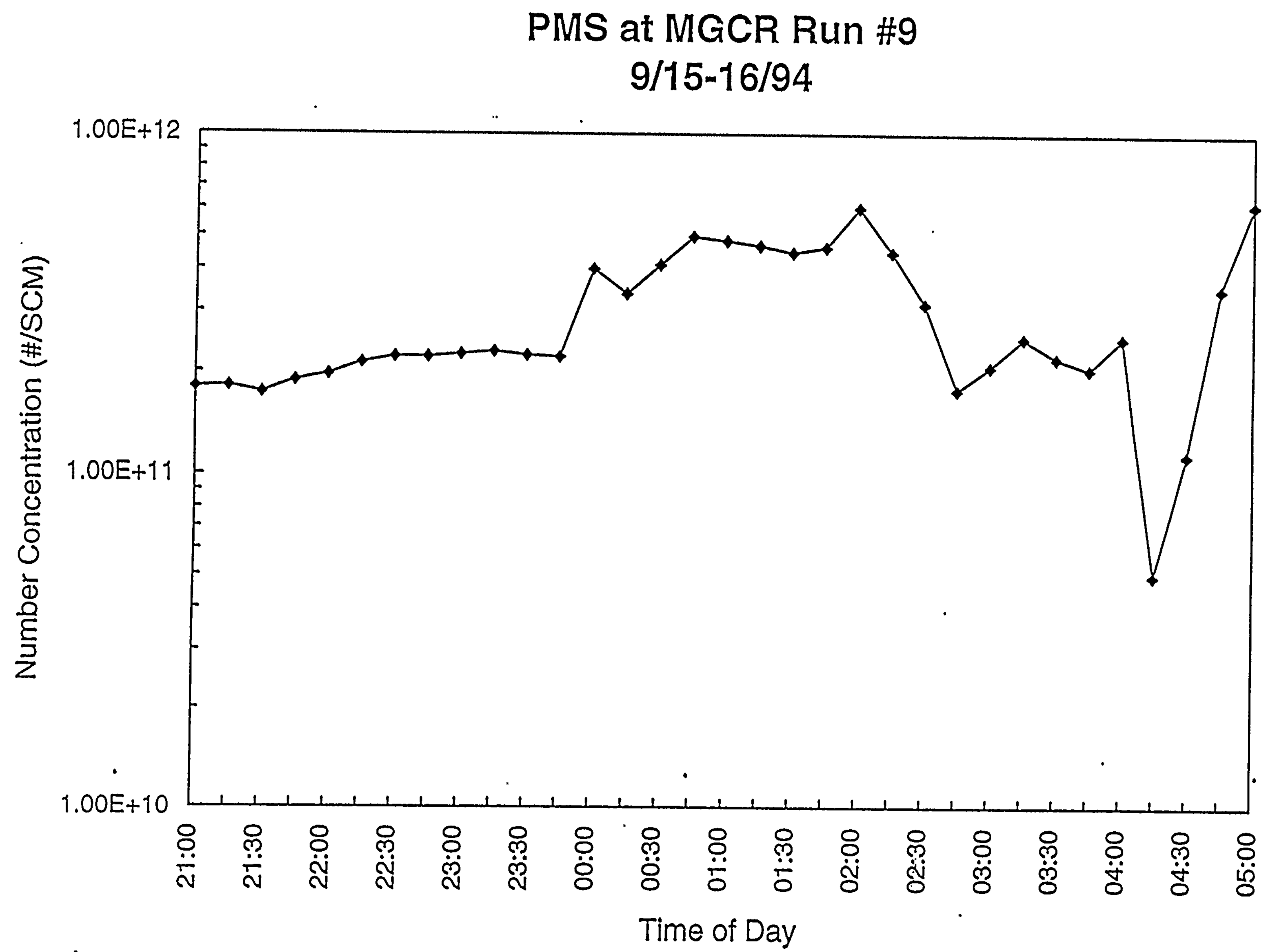



Figure 10b. Ensemble mean particle concentrations.

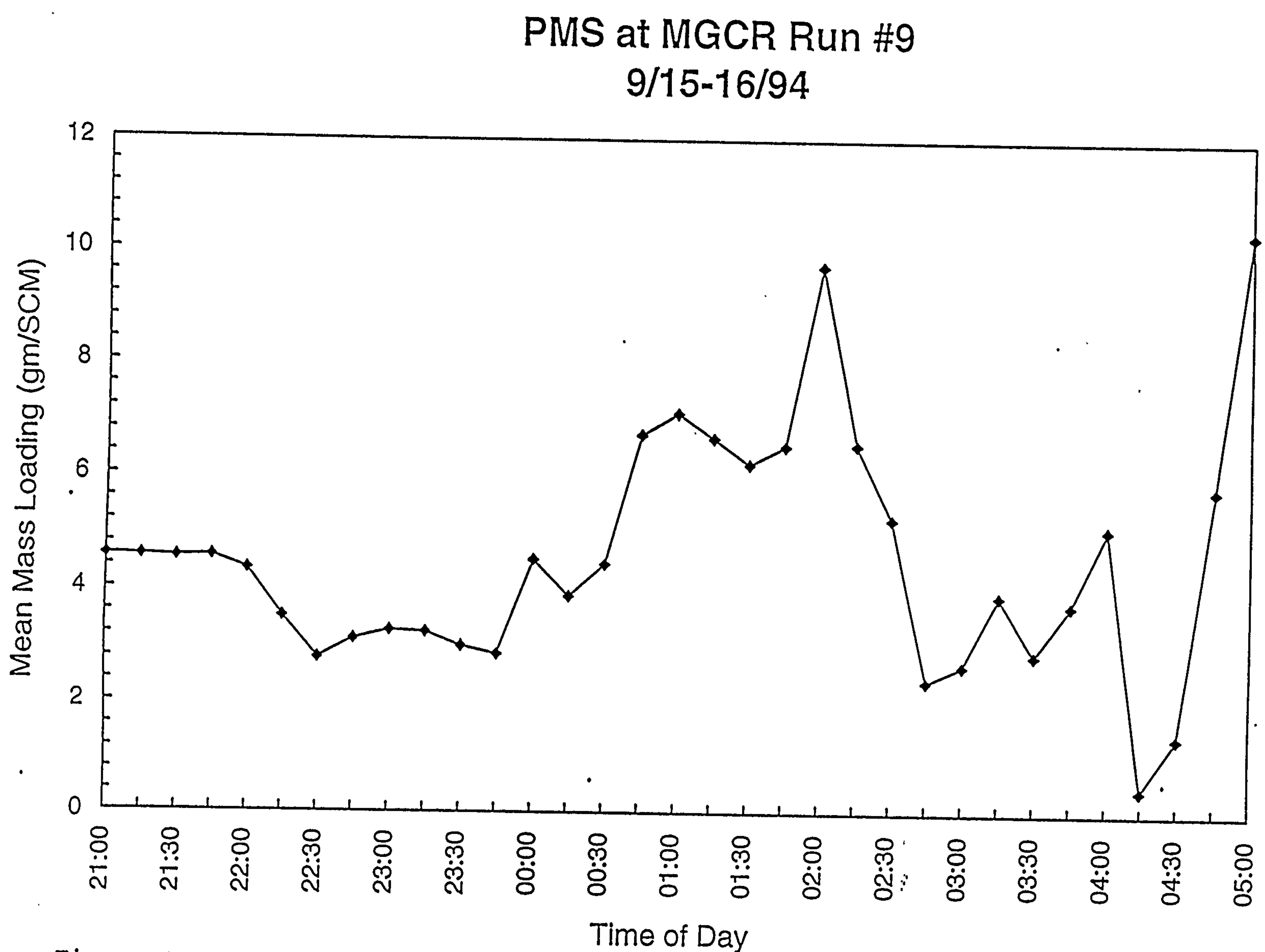



Figure 10c. Ensemble mean mass loadings.

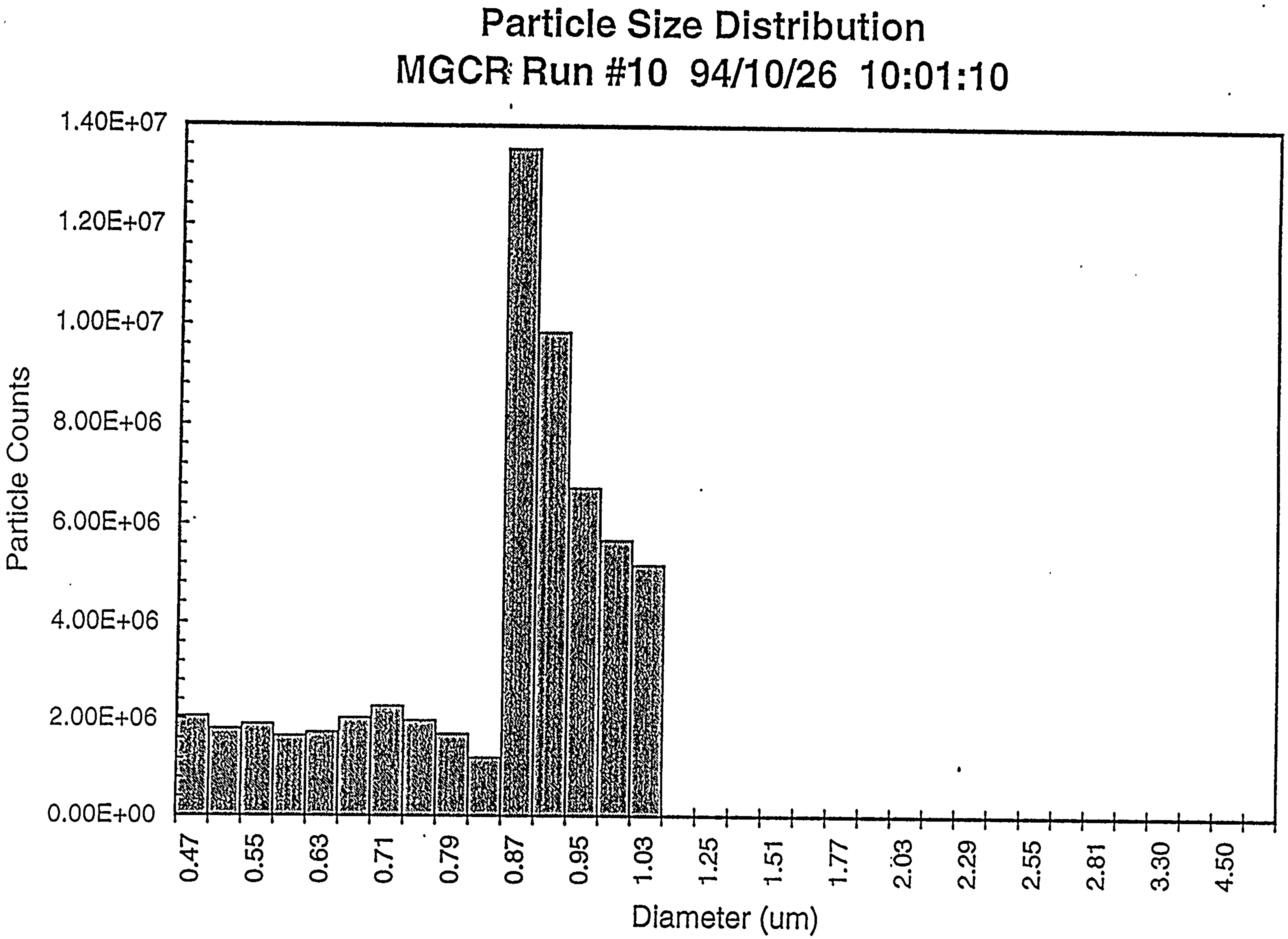



Figure 11a. Unprocessed particle size distribution from a single measurement.

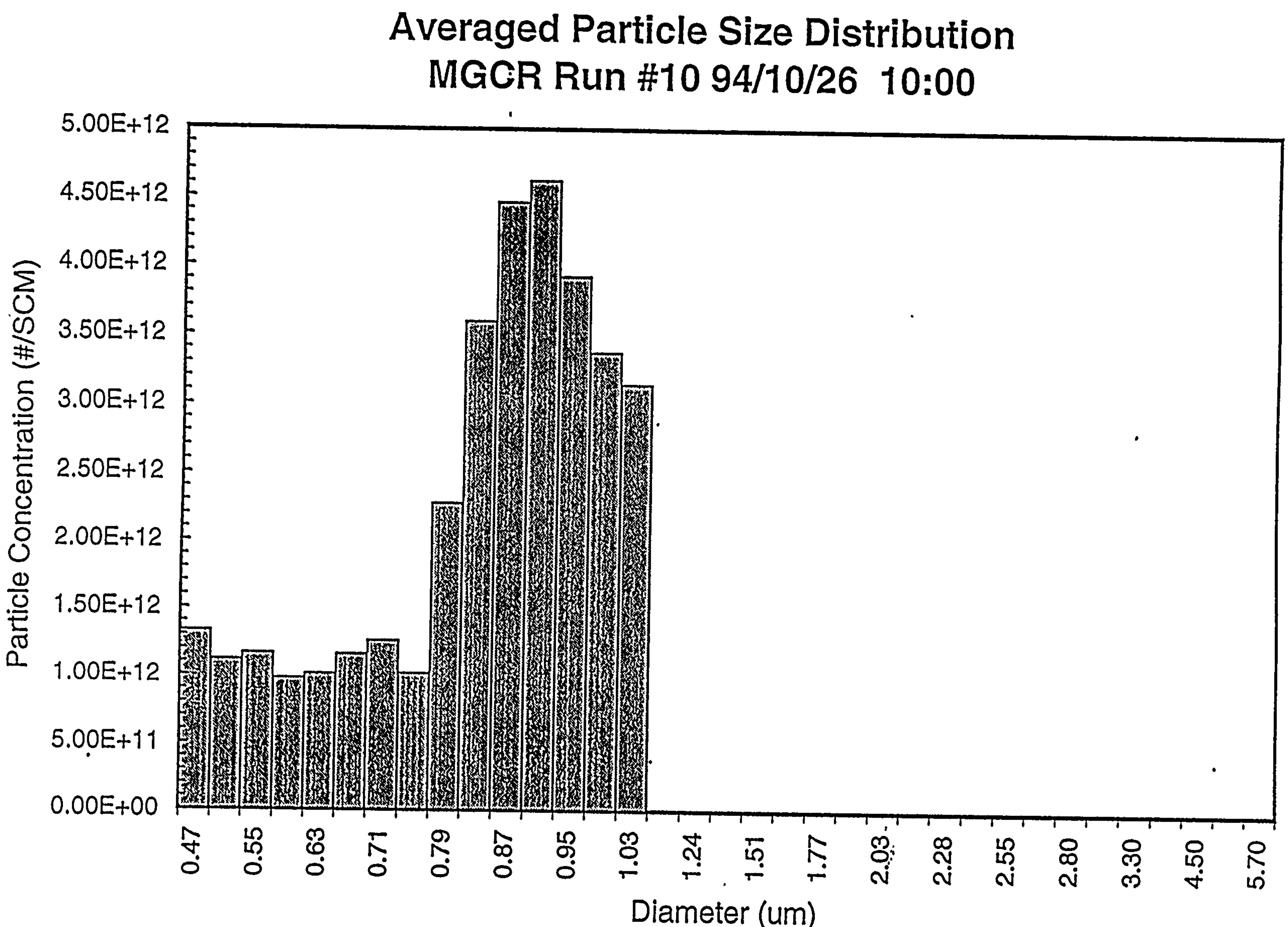
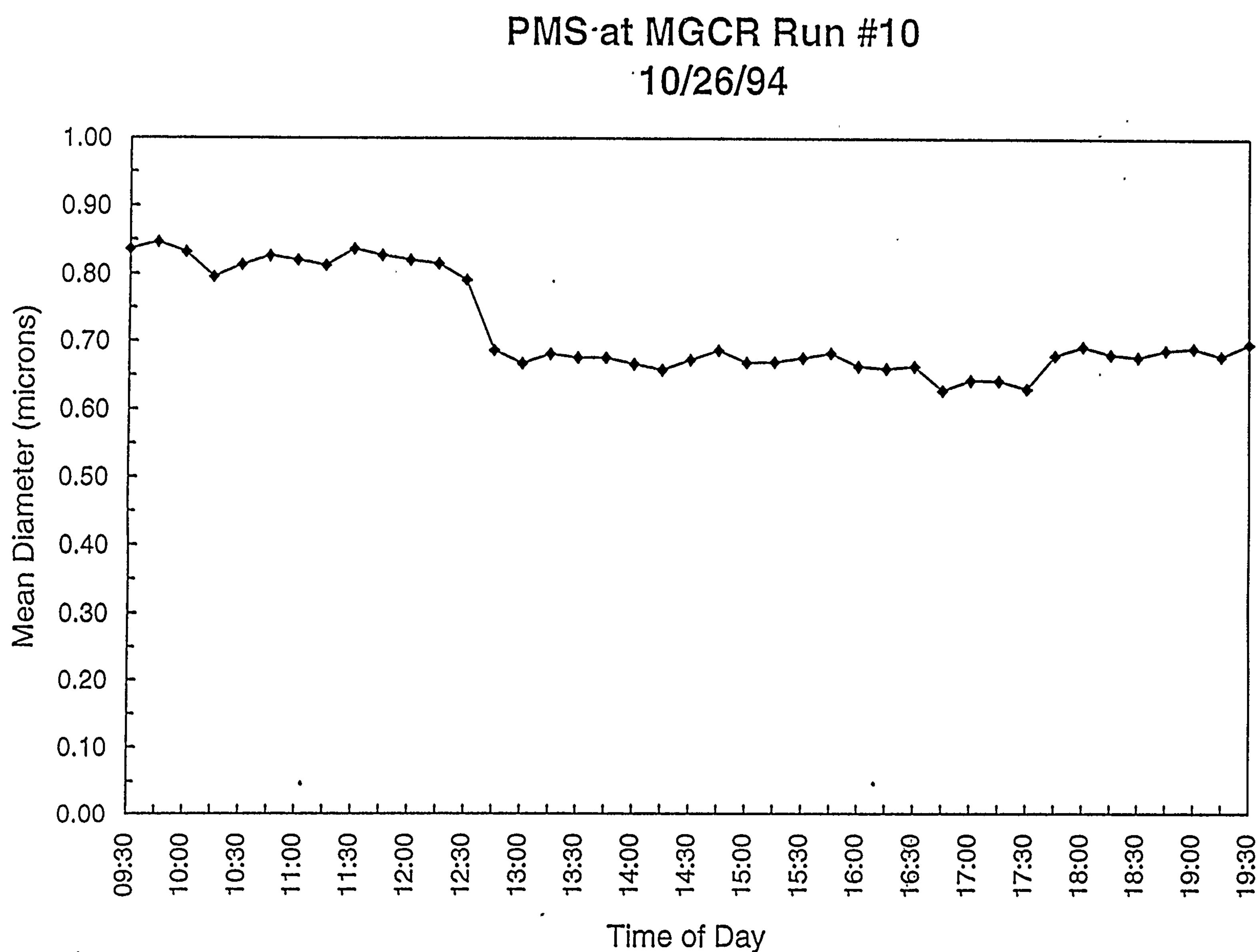



Figure 11b. A 15-minute averaged particle size distribution.

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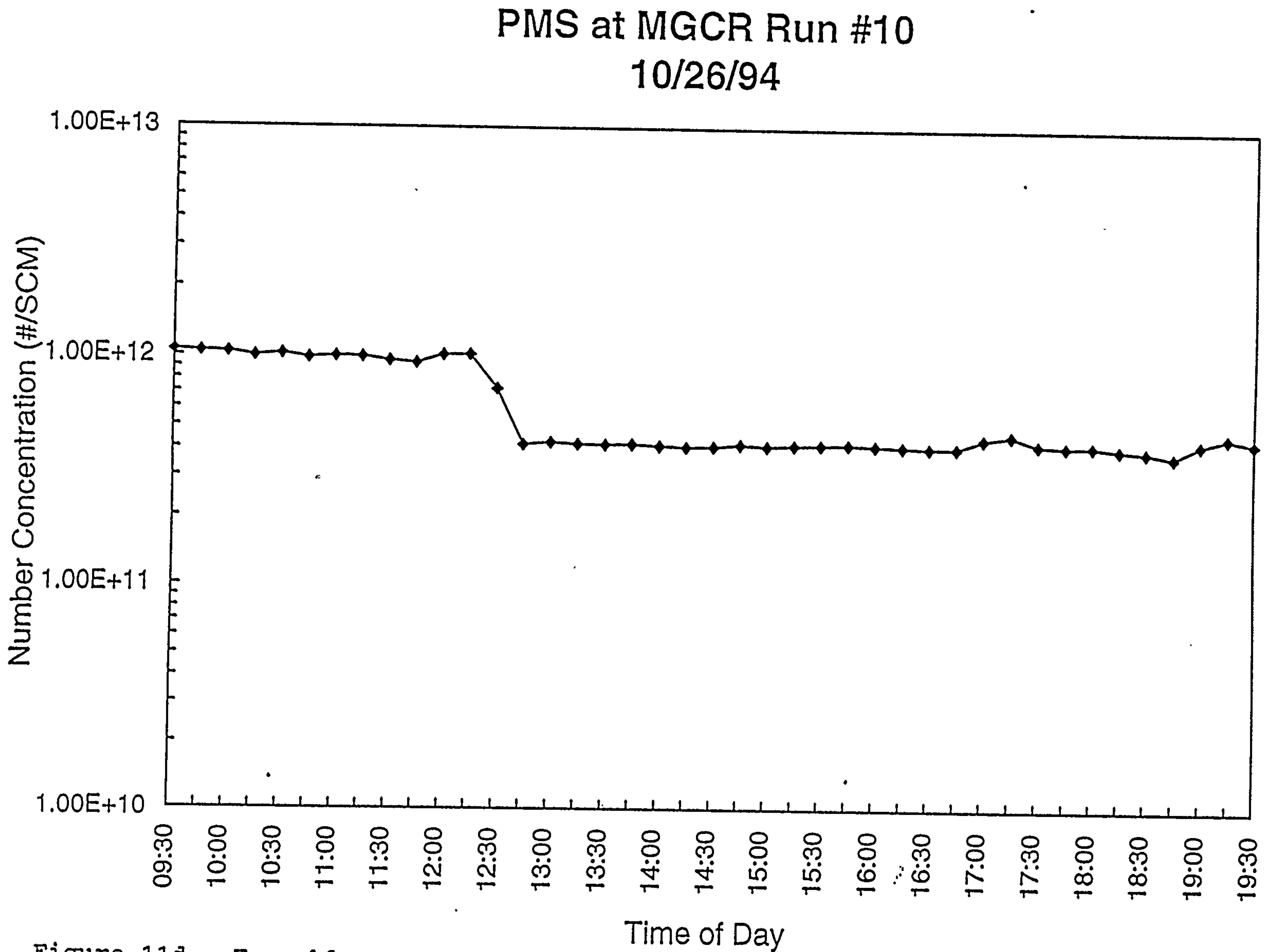


Figure 11d. Ensemble mean particle concentrations.

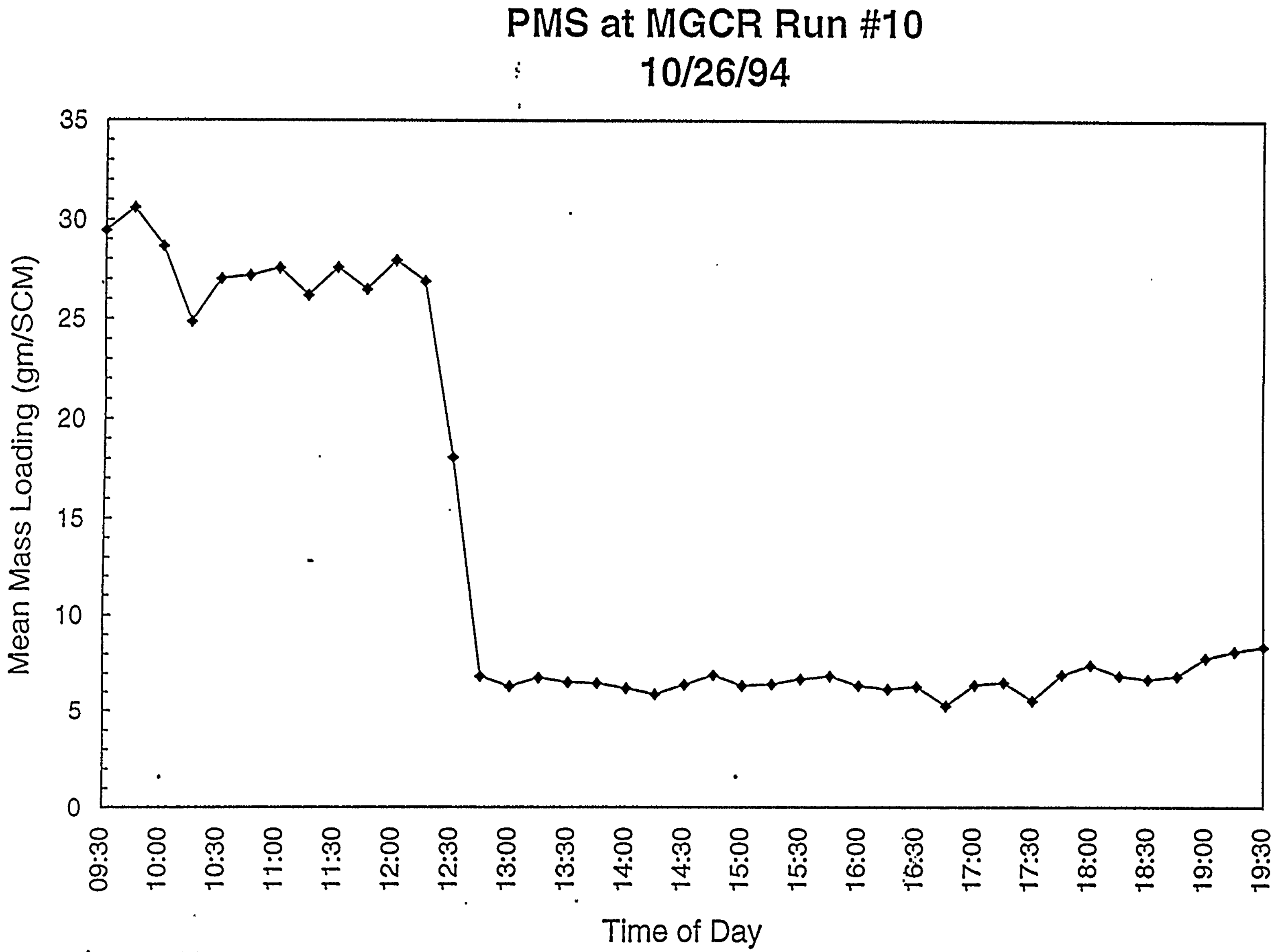

Figure 11e. Ensemble mean mass loadings.

## APPENDIX 2

SUMMARY OF ALKALI MONITORING RESULTS NOVEMBER 1993

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# Summary of Alkali Monitoring Results for November 1993 at Morgantown Energy Technology Center

Enclosed are graphs of our 2 November through 8 November 1993 alkali monitoring results from the Modular Gasification Cleanup Rig (MGCR) at Morgantown Energy Technology Center (METC) in Morgantown, West Virginia. The alkali (sodium and potassium) concentrations are plotted as ppb by weight versus time of the day in hours. In addition, the calcium concentrations and a signal proportional to the sample flow into the monitor's burner are plotted. During the operation of the gasifier from 1 November until the 9 November, approximately 33 hours of on-line alkali and calcium data were collected. The primary sampling point for the alkali monitor was shared with the Particle Monitoring System (PMS) and was upstream from the MGCR's filter used to test sorbent material.

The alkali concentrations for the particulate laden process gas varied from lows of approximately 50 ppbw for sodium and 20 ppbw for potassium to a highs of approximately 400 ppbw for sodium and 150 ppbw for potassium. The monitoring of vapor phase alkali occurred several times in the time frame from 2 November to 8 November. To monitor vapor phase alkali, a sintered metal inertial gas sampling filter was used to remove the particulate material from the process gas. There was very little vapor phase alkali detected. The observed concentration levels were less than 1 ppbw for both sodium and potassium. The alkali monitor's sample line was routinely operated at approximately 1000°F (538°C).

Six mass loading samples were collected by Paul Yue of METC during the time the alkali monitor was measuring the sodium and potassium content of the particulate matter in the sample stream. The average sodium to potassium concentration ratio of the material collected during each mass loading measurement was determined by METC personnel to be 5.4 with a standard deviation of 1.2. An examination of the sodium to potassium concentration ratio for the 4 days of sampling with the alkali monitor shows the ratio varied from approximately 3 to 6.

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# Alkali Monitoring Results for November 1993 at Morgantown Energy Technology Center

Enclosed are graphs of our 2 November through 8 November 1993 alkali monitoring results from the Modular Gasification Cleanup Rig (MGCR) at Morgantown Energy Technology Center (METC) in Morgantown, West Virginia. The alkali (sodium and potassium) concentrations are plotted as ppb by weight versus time of the day in hours. In addition, the calcium concentrations and a signal proportional to the sample flow into the monitor's burner are plotted. On 3 November, data were not collected as the gasifier was shut down that day to remove a clinker. Data for 6 and 7 November were not collected due to difficulties with the alkali monitor sample line caused by an obstruction of the primary flow control orifice. On November 6, several attempts at unplugging the orifice on by purging with compressed nitrogen were unsuccessful. Consequently, on 7 November, the orifice was removed and replaced. Operation of the alkali monitor was resumed on 8 November.

The primary sampling point for the alkali monitor was shared with the Particle Monitoring System (PMS) and was upstream from the MGCR's filter used to test sorbent material. A double gas sampling technique was employed to select a representative sample for the alkali monitor. First, a high volume sample flow was isokinetically selected from the process gas flow with most of the sampled gas exhausting into the vent line from the secondary sampling chamber. Second, a much lower gas flow that matched the flow requirement of the alkali monitor was isokinetically sampled in the secondary sampling chamber. Two critical flow orifices were employed to control the sample flow from the process gas stream at 415 psig (2.96 MPa) and 1100°F (593°C) to the alkali monitor. The primary flow orifice was 0.028" in diameter to allow 190 SCFH (90 standard L/min) flow in the primary sampling line to the secondary sampling chamber. The secondary flow orifice, which was downstream from the secondary sampling chamber, was 0.035" in diameter to allow the required 19 SCFH (9 standard L/min) flow in the secondary sampling line to the alkali monitor's flame. The flow to the alkali monitor's flame was controlled by adjusting the pressure in the secondary sampling chamber to approximately 20-25 psig with a Nupro flow control valve in the vent line from the secondary sampling chamber.

The first full day of alkali sampling was 2 November. The flow control orifices worked well for the entire day. Once the proper flow to the alkali monitor was established, the sample flow remained approximately constant for hours. The measured concentrations for the day are for total alkali. The sample stream from the MGCR during this period was not filtered to remove the particulates. Particulates in the sample stream contain both alkali and calcium from the coal added to the gasifier. For the period from approximately 12:05 to 14:30, the measured concentrations were approximately 200-300 ppbw for sodium, 75-150 ppbw for potassium, and 150-300 ppbw for calcium. The presence of a significant calcium signal indicates that particulate matter was present in the sample stream. Vapor phase calcium was not expected in the sample stream because the vapor pressures of the calcium compounds present in the fly ash are very low at these gas temperatures (under 600°C or 1112°F). All of the calcium results during this period were more than an order of magnitude above the minimum observational limit of approximately 4 ppbw for calcium. For the period from approximately 14:30 to 18:00, the measured concentrations were approximately 50-100 ppbw for sodium, 10-25 ppbw for potassium, and 15-30 ppbw for calcium.

alkali sample stream. The flame optical emission technique employed for alkali measurements cannot distinguish between condensed phase alkali associated with particulates and vapor phase alkali. The monitor measures all the alkali independent of the form that enters the flame. Therefore, to measure vapor phase alkali, the particulates need to be removed from the sample stream. The absence of a calcium signal for the filtered sample gas indicates a sample stream very low in particulate matter and, consequently, condensed phase alkali. While monitoring sample gas from the inertial filter from approximately 20:15 to 20:55, the measured alkali concentrations were approximately 1 ppbw or less and the calcium concentrations were less than the minimum observational limit of 4 ppbw. The increase in alkali concentrations at approximately 20:40 is probably a result of reentrainment of particulate matter in the secondary sample line during and after the readjustment of the sample flow. The low calcium concentrations suggest that very little particulate material was passing through the filter and entering the alkali monitor's flame. The low alkali concentrations indicate that no measurable alkali vapor was present in the sample stream with the sample gas temperature of approximately 1030°F (555°C). At this sample gas temperature, measurable quantities of vapor phase alkali would not be expected. Therefore, the low measured alkali concentrations are further validation that at least 99% of the particulate matter present in the alkali sample stream was removed by the inertial gas sampling filter. At approximately 20:55 the sample flow to the alkali monitor was stopped and alkali monitoring was terminated for 4 November.

During the vapor phase alkali measurements, partial clogging of the sintered metal filter was observed. For the vapor phase alkali measurements on 4 August 1993, a differential pressure of approximately 25 psi was needed to obtain the required 19 SCFH (9 standard L/min) for the alkali monitor, but for the period from approximately 20:15 to 20:55 on 4 November, a pressure of 70 to 80 psi was necessary. The sintered Hastelloy X metal filter for alkali monitoring in November is the same filter employed on 4 August. The filter had not been cleaned and was left in place after the 4 August measurements. Corrosion of the filter material or agglomeration of the particulate matter on the filter media may have occurred during the intervening time span between August and November. Removal and initial examination of the filter was recently done in March 1994. The inside of the filter, which has an internal diameter of ½ inch, was filled with what appears to be agglomerated particulate matter. Apparently, a considerable amount of particulate matter from both the pressure required to obtain the proper sample flow to the alkali monitor was approximately 45 psig, which is similar to the pressure requirement on 4 November.

For the period from 16:35 to 17:40, the sample gas was filtered and vapor phase alkali concentrations were determined. The concentrations results are similar to the vapor phase alkali determinations on 4 November. The alkali concentrations are below 1 ppbw for both sodium and potassium and the calcium concentrations are below the observation limit of 4 ppbw. The alkali and calcium concentrations did increase momentarily at approximately 16:55 as a result of stopping and restarting the sample flow in order to purge the sintered metal filter. The differential pressure across the filter required to obtain the proper flow (9 standard L/min) to the alkali monitor was approximately 80 psi. The backward flow of nitrogen to purge the filter did not reduce the differential pressure required. The necessary differential pressure after the resumption of sample flow increased to approximately 90 psi.

For the next period from approximately 17:40 to 20:25, the sample gas was not filtered and total alkali concentrations were determined. The measured sodium concentrations varied in a narrow range from approximately 150-300 ppbw but the potassium and calcium concentrations varied from 40 to 130 ppbw for potassium and from 10 to 150 ppbw for calcium. The sample flow was not constant during this period and varied from approximately 15 SCFH (7 standard L/min) to 20 SCFH (9.5 standard L/min) with frequent readjustment of the sample flow. The concentrations of calcium and potassium sometimes seem to have a larger dependence upon sample flow than the sodium concentrations. This dependence also occurred from approximately 18:15 to 20:15 on 4 November.

Also, during the period from approximately 16:55 to 20:25 on 5 November, there was an increasing problem with the primary flow control orifice. The proper flow to the alkali monitor could not be obtained unless the vent flow control valve was almost closed. Initially, on 2 November approximately 150 SCFH (70 standard L/min) was flowing in the primary sample line but by this period on 5 November only 95 SCFH (45 standard L/min) was available. On 6 November repeated purging of the orifice with the sample line heaters both on and off did not clear the partial obstruction. Consequently, on 7 November the orifice was replaced. Upon examination, the orifice was not plugged but a considerable amount of particulate matter was covering the upstream side of the orifice. The line containing the orifice was mounted vertically for both the primary and secondary orifice with the sample gas flowing downward. In contrast, the flow orifice for the PMS was mounted horizontally and did not experience as much sample flow problems although it did eventually plug and could not be cleared. Also, upon further examination a considerable amount of corrosion was present on the body of the orifice. Both orifices along with the inertial gas sampling filter had been left in place after the August MGCR operation. As a consequence, material may have been present from August.

The next day of sampling was 8 November. Initially, the sample flow was very erratic from 13:20 to 14:00. For the period from approximately 14:00 to 17:30, the sample flow was unfiltered and varied slowly. The sample flow was readjusted once at 16:00. The primary sample flow was approximately 220 SCFH ( 105 standard L/min) during this period. This primary sample flow was more than double the primary flow (95 SCFH) before the replacement of the primary flow control orifice. The alkali concentrations during this period were approximately 210-280 ppbw for sodium and 50-60 ppbw for potassium. The calcium concentrations had more variation from approximately 5 to 20 ppbw. At approximately 17:30 sampling of the process gas from the gasifier was suspended. The secondary flow orifice and filter were purged repeatedly and for long periods of time while alkali measurements were made on the nitrogen purge gas. From approximately 17:45 to 18:15, nitrogen flowed through the inertial gas filter to the alkali monitor and from approximately 18:15 to 18:30, unfiltered nitrogen flowed through the secondary flow orifice to the alkali monitor. From approximately 18:40 to 18:50, filtered sample process gas was measured although the results are not very reliable because the required sample flow of 19 SCFH (9 standard L/min) could not be obtained as shown in the sample flow trace. The sample flow during this time was only approximately 10 SCFH (4.7 standard L/min). From approximately 19:00 to 21:35, unfiltered process gas was measured. The alkali concentrations during this period were approximately 270-290 ppbw for sodium and 50-70 ppbw for potassium. The calcium concentrations varied from approximately 20-30 ppbw. The spike in the potassium and calcium concentrations at approximately 20:50 is a result of a readjustment of the sample flow.

The alkali monitor was calibrated on 31 October 1993 using an aerosol made from aqueous solutions containing known concentrations of calcium chloride and sodium and potassium sulfate in a surrogate sample stream of nitrogen flowing at 150 standard $cm^3/s$ (9 standard L/min or 19 SCFH). The surrogate sample stream containing the aerosol was electrically heated and entered the alkali monitor's burner at a temperature of 1090°F (588°C). This temperature was close to the expected temperature of the sample gas from the MGCR.

After the next MGCR operation, the solid material that has accumulated on the MGCR's filter assembly will be removed and analyzed. At that time, the sodium, potassium, and calcium concentrations of the collected fly ash can be compared to the sodium, potassium, and calcium concentrations determined by the alkali monitor. Also, sodium and potassium analysis of the material collected during the mass loading measurements was recently completed by METC personnel. The average sodium to potassium ratio for the 6 mass loading measurements was 5.4 with a standard deviation of 1.2. An examination of the sodium to potassium ratio for the 4 days of sampling for the alkali monitor shows the ratio varying from approximately 3 to 6.

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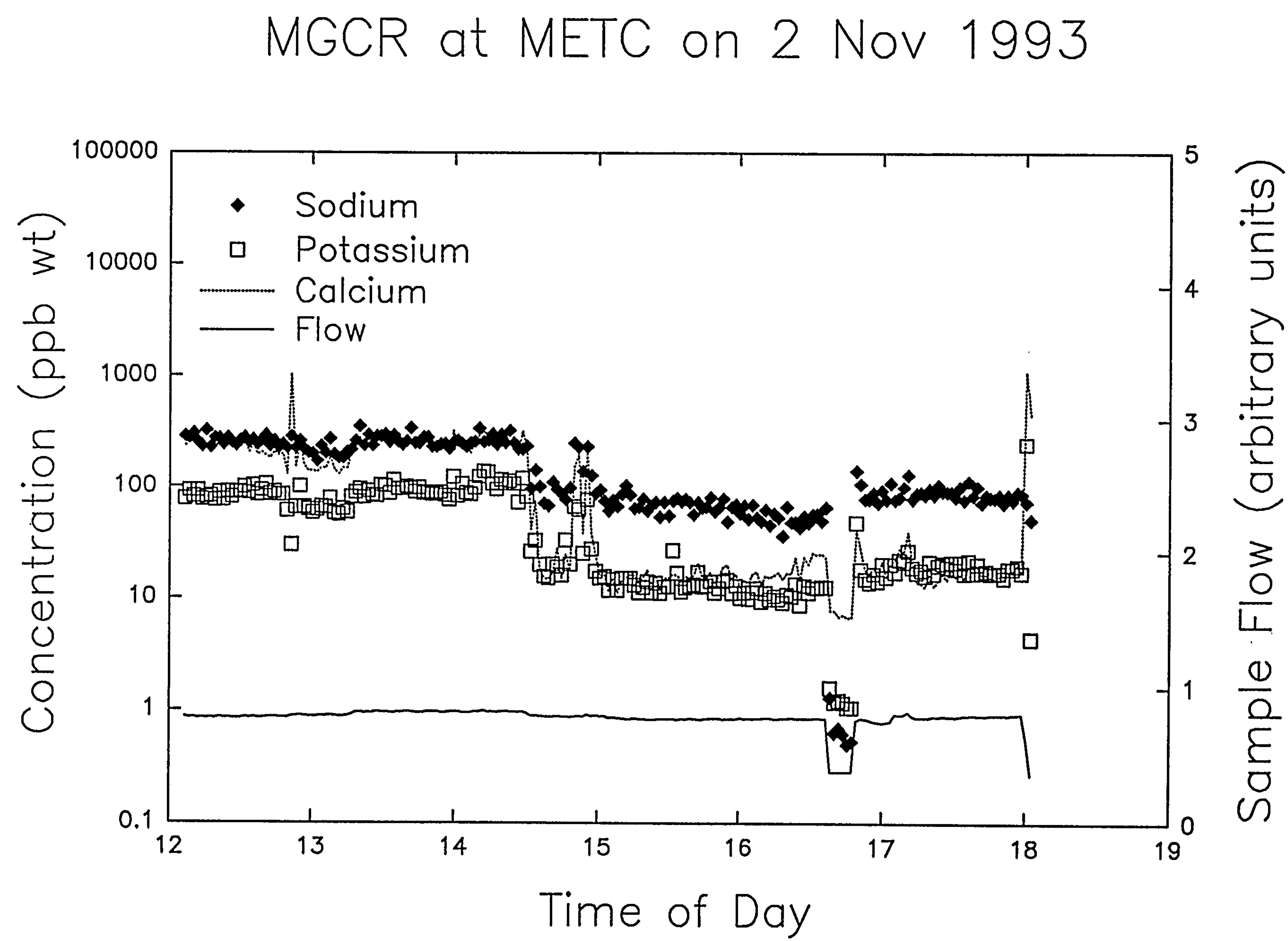
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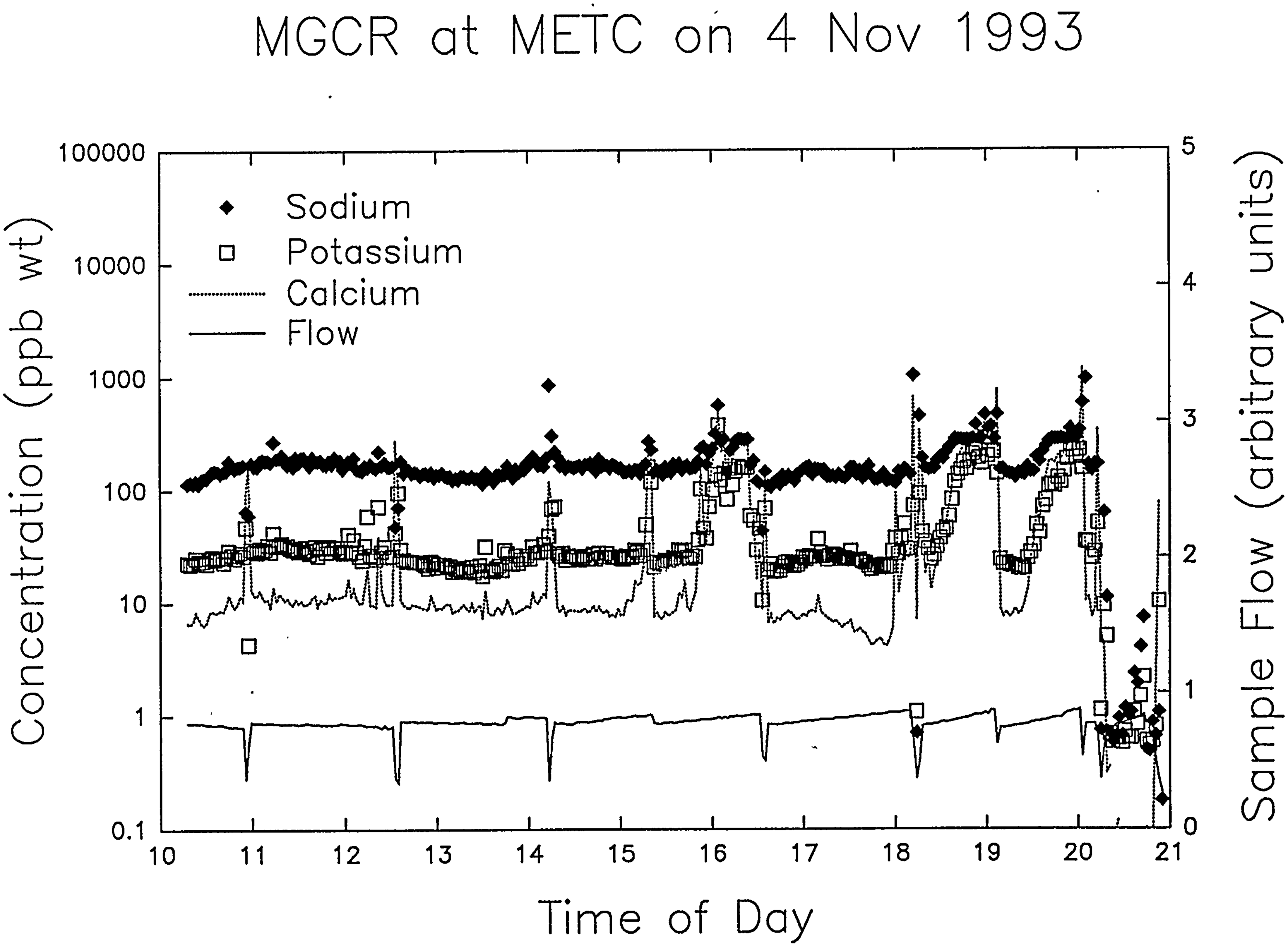
Sodium
Potassium
Calcium
Flow
Concentration (ppb wt)
Sample Flow (arbitrary units)
Time of Day
100000
10000
1000
100
10
1
0.1
12
13
14
15
16
17
18
19
0
1
2
3
4
5


MGCR at METC on 4 Nov 1993
Sodium
Potassium
Calcium
Flow
Concentration (ppb wt)
100000
10000
1000
100
10
1
0.1
Sample Flow (arbitrary units)
5
4
3
2
1
0
10
11
12
13
14
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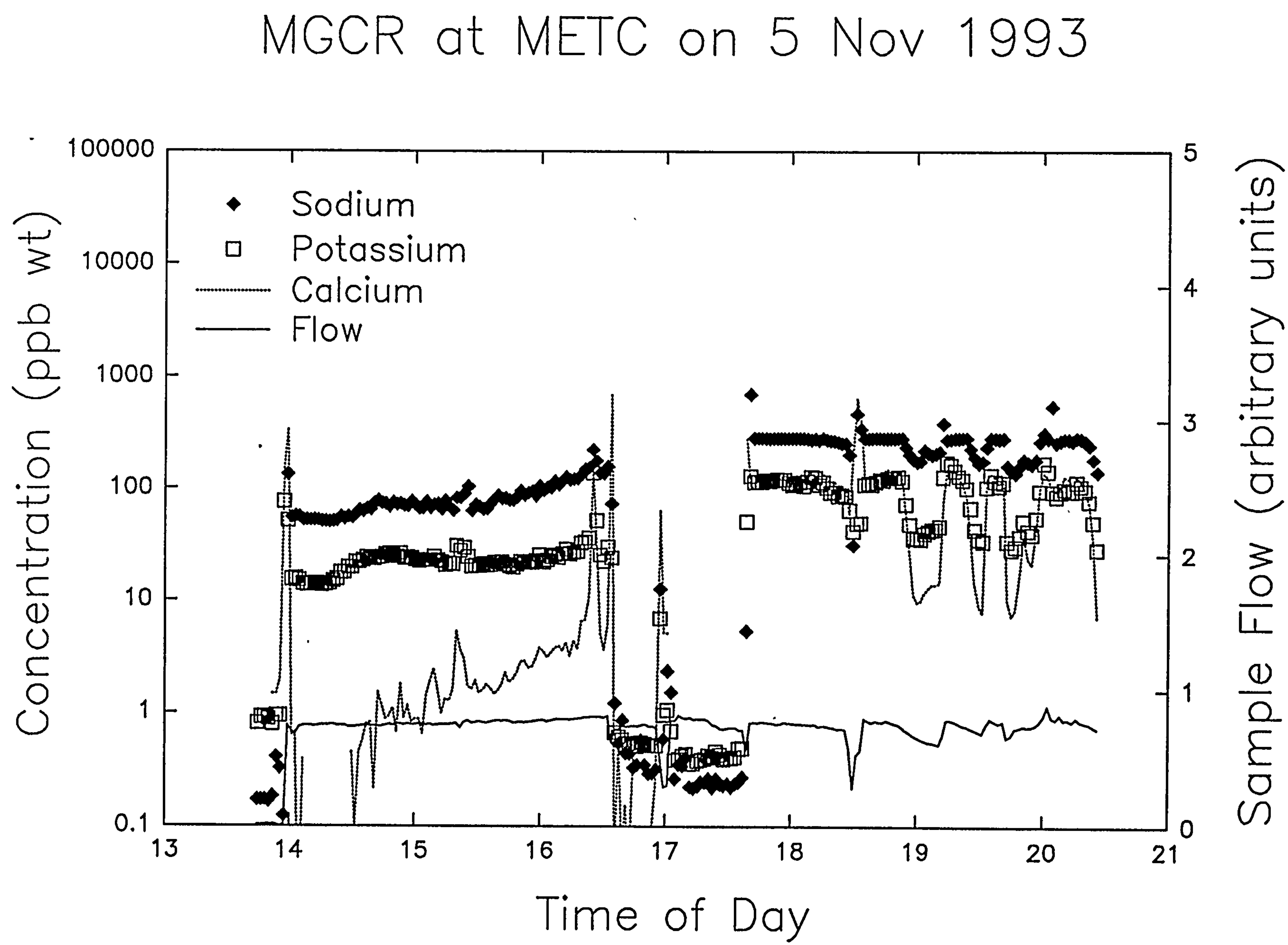
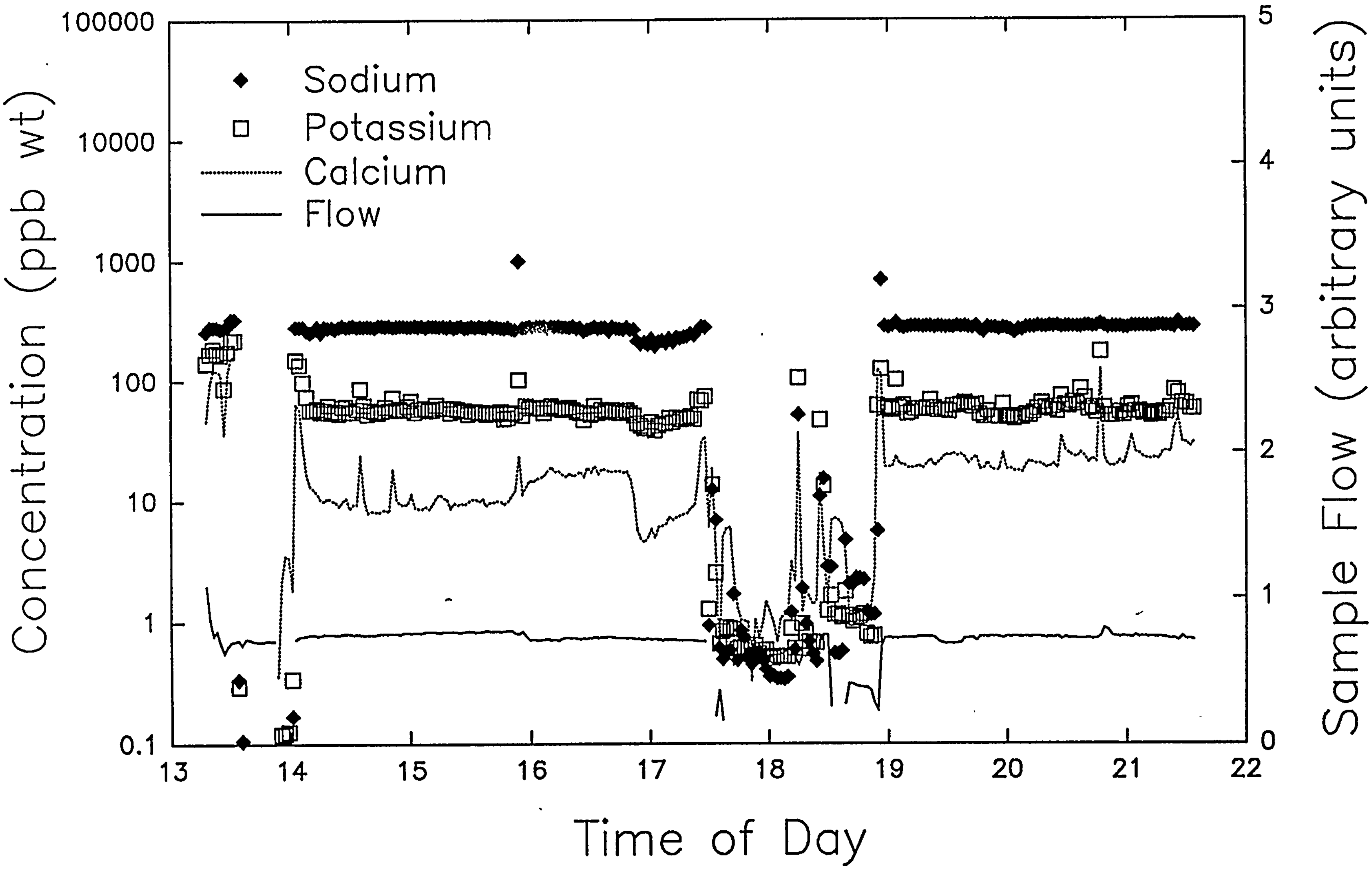
16
17
18
19
20
21
Time of Day


MGCR at METC on 5 Nov 1993
Sodium
Potassium
Calcium
Flow
Concentration (ppb wt)
100000
10000
1000
100
10
1
0.1
Sample Flow (arbitrary units)
5
4
3
2
1
0
13
14
15
16
17
18
19
20
21
Time of Day

# MGCR at METC on 8 Nov 1993



# APPENDIX 3

## DETAILED CHRONOLOGY OF SIGNIFICANT RUN EVENTS

**Table 1. SUMMARY OF MAJOR EVENTS DURING TEST RUN**
(Test No. 93FBG04) May 16-26, 1993

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 5/16 (14:00) | | • Started System Start-up procedure. |
| 5/16 (15:45) - 5/17 (01:42) | 9 hr 57 min. | • Heated up reactor to 800°F.<br>• Loaded 90 lbm of char into feed hopper.<br>• Coal feed line was found hot. Used cold convey air to cool it off once awhile. |
| 5/17 (00:30) | | • Found crushed copper tubing on Sampling Line "B" nearby FLT-805B. Removed the bad section. |
| 5/17 (01:42) - (02:40) | 52 min. | • Started Combustion mode by feeding 6"-FBG char into reactor intermittently. Reactor temp. increased to 1,050°F at the 2nd lift. Reduced feed rate from 8 to 16 rpm. Maintained the temp. for 15 min. for temp. below 1,500 and for 30 min when it reaches 1,500°F. |
| 5/17 (02:40) - (02:48) | 8 min. | • Purge reactor with $N_2$ until $O_2$ content < 10%. |
| 5/17 (03:45) - (05:17) | 4 hr 42 min. | • Stop combustion mode due to coal feeder stuck. |
| 5/17 (05:17) - (09:00) | 3 hr 43 min. | • Resume Combustion mode to heat reactor to 1,600°F. |
| 5/17 (09:00) - (11:45) | 2 hr 45 min. | • Started Gasification mode. |
| 5/17 (11:45) - (14:20) | 2 hr 35 min. | • Controlled Shutdown after the CO alarm in cell went off for 35 min. with no sources being identified.<br>• Found major leaks around the coal batch hopper and boiler sight-glass and fixed them. |
| 5/17 (14:20) - (16:15) | 1 hr 55 min. | • Repressurized the system and fed coal.<br>• CO level in cell up to 100 ppm; Clinker dumped from underflow/overflow; lots of leaks from FV-912 back to the lockhopper.<br>• Performed Normal System Shutdown. |
| 5/17 (17:25) - (21:45) | 3 hr 20 min. | • Removed Reactor Bottom and cleaned out clinker. Reinstalled and retorqued the bottom. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 5/17 (21:45) | | • Reheating the reactor from 350°F |
| 5/17 (23:50) - 5/18 (01:30) | 1 hr 40 min. | • Discovered FV-753 leak. Depressurized reactor, flanged off FV-753. Found leaks on valve body, not on flanges. Reinsulated FV-753. |
| 5/18 (00:05) | | • Discovered Small Fire on the insulation of piping out of air preheater. Extinguished it, burned area was chalked. |
| 5/18 (01:30) - (08:07) | 6 hr 37 min. | • Repressurized the system.<br>• Reposition TE-701 to have same reading as TE-700.<br>• Blew and replaced PSE-753 (manifold rupture disc). |
| 5/18 (08:07) - (10:02) | 1 hr 55 min. | • Started Combustion mode when TIR-700 read 780°F. |
| 5/18 (10:02) - (10:32) | 30 min. | • Started Gasification mode. |
| 5/18 (10:32) - 5/19 (12:50) | 26 hr 18 min. | • Steady State #1. |
| (10:15) | | a. CO alarm in cell (up to 40 ppm) |
| (11:20) | | b. CO alarm in cell (up to 40 ppm) |
| (11:25) | | c. CO alarm in cell (up to 50 ppm) |
| (11:40) | | d. CO alarm in cell (up to 60 ppm) |
| (12:05) | | e. CO alarm in cell (up to 40 ppm) |
| (12:10) | | f. CO alarm in cell (up to 38 ppm) Discovered the cell alarm went off every time at solid dumping. |
| (16:42) | | g. ES&H measured the air flow to be 100 fpm with cell fan turned ON, and 60 fpm with cell fan turned OFF. |
| (18:58) | | h. Found and fixed problem of keeping FV-913 open by purging FV-452 with FV-913 open. |
| (21:48) | | i. 3 CO alarms in alley went off with overflow, primary and secondary cyclone lockhopper dumping. |
| (23:45) | | j. CO alarms in alley (40 ppm) went off with Overflow, Primary and secondary cyclone lockhopper dumping. |
| 5/19 (00:02) | | k. Decreased coal feed rate from 34 to 27 rpm. |
| (00:45) | | l. CO alarms in alley (40 ppm) went off with Overflow, Primary and secondary cyclone lockhopper dumping. |
| (02:06) | | m. Increased steam flow from 45 to 54 lb/h. |

| Date (Time) | Duration | Description of Events (03:58) |
|---|---|---|
| | | n. Turned off Sampling Loop "B" to locate the leaks in Blue M system. Leaks were not found. |
| 5/19 (05:37) | | o. Turned off Sampling Loop "A" to locate the leaks by pressure/leak test of Blue M system. |
| (05:50) | | p. Increased coal feed rate from 27 to 33 rpm. |
| (06:30) | | q. Decreased coal feed rate back to 27 rpm. |
| (07:20) | | r. Discovered Fire on catwalk to MGCR around Zone 5 of line heaters. |
| (08:20) | | s. Found plugging of bottom drain line from Blue M system and switched to the other knockout pot with DOE project engineer's consent. |
| (09:35) | | t. Increased coal feed rate from 27 to 33 rpm and purged reactor bottom with $N_2$ through FV-434 due to rising of temperature (TIR-701) to 1,725°F. |
| (11:50) | | u. Loss of coal feed due to clinker in bed. TIR-701 read 1,050°F. |
| (12:40) | | v. Open HV-112 to purge system with 1,200 psig $N_2$. |
| 5/19 (12:50) - 5/20 (11:00) | 22 hr 10 min. | • Controlled Shutdown to remove clinker from bed.<br>a. Removed reactor bottom and insert. Found clinker covered across the entire cross section of insert. Put a new insert, buttoned up the reactor bottom, pressurized manifold, and fix leaks.<br>b. Replaced the insulation on electrical heater connections with glass tape.<br>c. Replaced TE-504. |
| 5/20 (11:00) - (16:00) | 4 hr | • Continue to replace insulation on all heater connectors. |
| 5/20 (16:00) | | • Started System Start-up procedure. |
| 5/20 (17:25) - 5/21 (01:00) | 7 hr 35 min. | • Heated up reactor to 780°F. |
| 5/21 (01:25) - (03:23) | 1 hr 58 min. | • Started Combustion mode by feeding Montana #5 coal at 22 lb/h. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 5/21 (03:23)-(03:40) | 17 min. | • Purge reactor with $N_2$ through: (1) FV-406 (700 scfh) and convey loop, and (2) FV-313 (740 scfh) until $O_2$ content < 2%. |
| 5/21 (03:40) - (04:10) | 30 min. | • Started <u>Gasification mode</u>. (coal feed at 75 lb/h) |
| 5/21 (04:10) - 5/23 (09:08) | 52 hr 36 min. | • <u>Steady State #2</u>. |
| (04:10) | | a. Switched convey $N_2$ to convey air (650 scfh). |
| (05:50) | | b. Fluffed bed with $N_2$ through FV-434. |
| (06:25) | | c. Increased coal feed to 90 lb/h. |
| (06:40) | | d. Discovered CO leak into control room from Mass Spec. vacuum pump exhaust hose hanging loose in the gas sampling station. Fixed it by connect the hose to the ventilation system in the sampling station. |
| 5/22 (00:30) | | e. Found that if FV-754 is shut, manifold temperature controllers will be erroneous. Kept FV-754 open. |
| (10:45) | | f. Found incinerator stack cap fell down and blocked the exhaust. Knocked off the cap from the stack. |
| 5/23 (05:10) | | g. CO alarm in cell at purging of primary cyclone. |
| (05:46) | | i. CO alarm in cell (20 ppm). |
| (05:50) | | j. Fluffed bed with $N_2$ through FV-434 to bring reactor temperature from around 1,500 to 1,400°F. |
| (05:58) | | k. Discovered a leak from the incinerator bottom door. Stuffed the opening around the door with insulation blanket to stop the leak. |
| (06:00) | | l. Found condensate dripping out from the dump valve (FV-923) of overflow lockhopper. Raised the vessel temperature controller from 500 to 700°F. |
| 5/23 (09:08) - (17:15) | 8 hr 7 min. | • <u>Put on "Hot-Hold" condition</u> to fix the plugging problem in coal feed line. |
| (09:51) | | a. Replaced FV-923 with a newly rebuilt one. |
| (11:40) | | b. Discovered the 480V isolation transformer feeding to the motor controller for coal feeding is bad. Ground it to 3 phases: 58, 136 and 240V. |
| (12:00) | | c. Developed a restart procedure from "Hot-Hold" condition. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| (15:30) | | d. Attempted to restart the reactor but coal line plugged again. |
| 5/23 (17:00) | | f. Fixed the coal feed line and started to purge reactor with $N_2$ to reduce $O_2$ conc. in reactor. |
| 5/23 (18:30) - (19:00) | 30 min. | • Started Gasification mode. |
| 5/23 (19:00) - 5/24 (18:00) | 23 hr | • Steady State #3. |
| (21:00) | | a. Coal transfer line plugged and fixed. |
| 5/24 (10:42) | | b. Got CO exposure to 2 technicians (60 ppm). They were sent to OHU for blood test. |
| (17:00) | | c. Discovered the exit line from rupture disc (PSE-753) is hot, indicating a rupture disc was blown. |
| 5/24 (18:00) - 5/26 (02:15) | 32 hr 15 min. | • Controlled Shutdown to replace bad rupture disc. |
| (21:00) | | a. Isolated FV-755 from the system because of serious leak on the valve body, and repaired. |
| (23:40) | | b. Blew rupture disc (PSE-602) in batch hopper. |
| 5/25 (02:20) | | c. Installed new rupture disc for PSE-753. |
| (02:31) | | d. Unplugged line to PT-602. |
| 5/25 (03:20) - (14:50) | | • Attempted to bring up the reactor pressure and start coal feed but failed for 6 times. Finally, clinker was detected in the reactor, which caused the plugging of feed line. |
| 5/25 (14:50) - (19:30) | 4 hr 40 min. | • Depressurized the reactor and removed the bottom to clean up clinker.<br>• Put back reactor bottom and underflow system. |
| 5/25 (19:30) | | • Started System Start-up procedure. |
| 5/25 (19:40) - (21:20) | 1 hr 40 min. | • Heated up reactor from around 600 to 750°F. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 5/25 (21:20) - 5/26 (00:52) | 3 hr 32 min. | • Attempted to start combustion mode at 750°F but failed due to purged $N_2$ leaking into the reactor. Switched to convey air (HS-106). |
| 5/26 (00:52) - (02:15) | 1 hr 23 min. | • Started Combustion mode again to bring reactor temperature between 1,300 - 1,500° F<br>• Purged reactor with $N_2$ to reduce $O_2$ conc. in bed. |
| 5/26 (02:15) - (03:00) | 45 min. | • Started Gasification mode. |
| (02:20) | | a. Increased coal feed from 73.4 to 85 lb/h to control bed temperature. |
| (02:45) | | b. Reduced $N_2$ (FV-313) and raised reactor air (FV-115). |
| 5/26 (03:00) - (16:30) | 13 hr 30 min. | • Steady State #4. |
| (03:10) | | a. Had pressure spike (PI-756) when flow (FT-501) dropped during MGCR coming on line. Need to set PCV-756 open in manual whenever MGCR comes on line to avoid the same occurrence.<br>b. Decreased coal feed to 73.4 lb/h to raise bed temp.<br>c. Used combination of coal feed rate, reactor air flow and fluffing of bed with $N_2$ to keep the bed temperature at the desirable level. |
| (07:00) | | d. Lost coal feed during coal transfer from batch to feed hoppers. Recovered coal feed by purging the feed line with $N_2$ through FV-409. Reduced reactor air, increased coal feed to maintain pressure drop across feeder (PDI-424) at 80" $H_2O$. |
| (07:15) | | e. Discovered PDI-424 dropped very fast whenever pressurizing the overflow lockhopper with $N_2$ through FV-448. Switched to using YV-919P. |
| (15:15) | | f. Got CO exposure on one tech. at the end of loading coal at the top of silo. (300 increased to 1,200 ppm on Dragger monitor). |
| (16:00) | | g. Got another CO exposure on one tech. during changing of primary cycle receiving bucket. Got an alarm from the Neotronic monitor at around 999 ppm. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| (16:15) | | h. Ordered to shutdown the entire test run by DOE and EG&G management. |
| 5/26 (16:30) - 5/27 (00:20) | 7 hr 50 min. | • Shut down Test Run 93FBG04. System cooled off. |

**Total Gasification Time = 120 hr 12 min.** **Total Steady-State Time = 115 hr 24 min.**
**Total No. of S.S. Periods = 4 (26.3, 52.6, 23, 13.5 hrs).**

**Table 1. SUMMARY OF MAJOR EVENTS DURING TEST RUN**
(Test No. 93FBG05) Aug. 1-13, 1993

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 8/1 (15:00) | | • Started System Start-up procedure. |
| 8/1 (21:20) - 8/2 (15:59) | 18 hr 39 min. | • Attempted to heat up reactor to 800°F, but failed due to reactor air flow restriction at FSV-506. TIR-700 was about 700°F. |
| 8/2 (15:35) | | • Replace spring and gasket in FSV-506. |
| 8/2 (15:59) - (20:15) | 4 hr 16 min. | • Continued to heat up reactor to 800°F. |
| 8/2 (20:15) - (20:49) | 34 min. | • Started Combustion mode. Set coal feed at 34 lb/h (16 rpm) to raise bed temp. to 900- 1,100°F. |
| 8/2 (20:49) - (21:05) | 16 min. | • Raised and kept temp. between 1,200 - 1,500°F with coal feeding at 14 rpm. |
| 8/2 (21:05) - (21:50) | 45 min. | • Raised and kept temp. between 1,400 - 1,600°F with coal feeding at 14 rpm. |
| 8/2 (21:50) - (22:02) | 12 min. | • Purged reactor to reduce $O_2$ conc. to < 1% by replacing reactor air with $N_2$. |
| 8/2 (22:02) - (22:45) | 43 min. | • Started Gasification mode. |
| 8/2 (22:45) - 8/3 (05:20) | 6 hr 35 min. | • Steady State #1. |
| 8/3 (05:20) - (07:00) | 1 hr 40 min. | • Put on "Hot-Hold" condition to fix coal feed line. |
| 8/3 (07:00) - (12:00) | 5 hr | • Steady State #2. |
| 8/3 (12:00) - (18:00) | 6 hr | • Controlled Shutdown due to loss of coal feed caused by clinker built up in bed and plugged feed nozzle. • Cooled reactor to below 600°F before dropping the reactor bottom. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 8/3 (18:00) - (22:00) | 4 hr | • Removed the reactor bottom. Found clinker formed across the 7'-to-10" insert. Replaced with a new 7"-to-10" insert. |
| 8/3 (16:10) | | • Coal for moisture analysis (4.85%wt $H_2O$). |
| 8/3 (22:00) - (23:15) | 1 hr 15 min. | • Pressure test the reactor bottom and repressurized the reactor system back to 425 psig (PIR-713). |
| 8/3 (23:15) - 8/4 (02:40) | 3 hr 25 min. | • <u>Reheated the reactor</u> back to around 800°F. |
| 8/4 (02:40) - (03:15) | 35 min. | • Started <u>Combustion mode</u>. |
| 8/4 (03:15) - (05:20) | 2 hr 10 min. | • Stopped combustion and put back on <u>Heat-up mode</u> after several CO alarms on the 1st level of cell, caused by the gas leak through underflow dump valve (FV-940). Blocked off FV-940 with a piece of flat metal sheet. |
| 8/4 (06:30) - (07:37) | 1 hr 7 min. | • Restarted <u>Combustion mode</u>. |
| 8/4 (07:37) - (08:15) | 38 min. | • Purged reactor with $N_2$ before gasification. |
| 8/4 (08:15) - (08:45) | 30 min. | • Started <u>Gasification mode</u>. |
| 8/4 (08:45) - (20:45) | 12 hr | • <u>Steady State #3</u>. |
| 8/4 (20:45) - (21:45) | 1 hr | • <u>Put on "Hot-Hold" condition</u> due to loss of coal feed caused by Feeder "B" stalled and hammering).<br>• Temporarily fixed Feeder "B". |
| 8/4 (23:00) - (23:07) | 7 min. | • Started <u>Combustion mode</u>. |
| 8/4 (23:07) - 8/5 (00:10) | 1 hr 3 min. | • Started <u>Gasification mode</u>. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 8/5 (00:10) - (05:40) | 5 hr 30 min. | • Put on "Hot-Hold" condition due to loss of coal feed caused by the stalled Feeder "B". |
| 8/5 (00:10) - (04:00) | 3 hr 50 min. | a. Replaced Feeder "B" with "A". |
| 8/5 (04:00) - (05:40) | 1 hr 40 min. | b. Experienced plugging of coal feed line. Try varying air flow to unplug it. Not successful. |
| 8/5 (05:40) - (17:30) | 11 hr 50 min. | • Controlled Shutdown to remove clinker from bed.<br>a. Removed and cleaned the reactor bottom. Clinker formed across the 7"-to-10" reactor insert. Used a new 3"-to-10" insert.<br>b. Flanged off the underflow dump valve (FV-940) with a 4" 600-psi flange. |
| 8/5 (17:30) - (19:55) | 2 hr 25 min. | • Started System Start-up procedure. |
| 8/5 (19:55) - (20:50) | 55 min. | • Started Combustion mode. |
| 8/5 (20:50) - (20:56) | 6 min. | • Purged reactor with $N_2$. |
| 8/5 (20:56) - (21:30) | 34 min. | • Started Gasification mode. |
| 8/5 (21:30) - 8/9 (16:15) | 90 hr 45 min. | • Steady State #4.<br>a. Mass Spectrometer kicked off to Standby by itself twice.<br>b. CO alarm at the 1st level set off several times during cyclone dumping.<br>c. Dump valve of the primary cyclone plugged and later on, unplugged.<br>d. Need to manually close FV-610.<br>e. Wet solid came out from secondary cyclone.<br>f. Hi-side of PDT-707/424 plugged. |
| 8/9 (16:15) - (21:29) | 5 hr 14 min. | • Put on "Hot-Hold" condition due to boiler leaks, TAL-217 went off several times).<br>a. Repaired boiler leaks temporarily by capping off the condensate trap.<br>b. Restarted gasification mode again, but had both convey air and coal feed problems. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 8/9 (21:29) - 8/10 (11:30) | 13 hr 59 min. | • Controlled Shutdown to remove clinker in bed.<br>a. Removed reactor bottom and cleaned out the clinker. Much easier to break & remove the clinker. Cleaned up the 3"-to-10" reactor insert and reused it. |
| 8/10 (11:30) - (19:00) | 7 hr 30 min. | • Started System Start-up procedure. |
| 8/10 (19:00) - (22:25) | 3 hr 25 min. | • Started Combustion mode. |
| 8/10 (22:25) - (23:35) | 1 hr 10 min. | • Started Gasification mode. |
| 8/10 (23:35) - 8/13 (05:35) | 54 hr | • Steady State #5.<br>a. TIR-701 slowly increased from 1300 to 1500°F. Used $N_2$ to purge through TIR-701 port (using YV-424P) and fluff the reactor bottom (using FV-434).<br>b. FV-609/609A were leaking, making coal transfer very difficult.<br>c. Continue to purge TIR-701 through the entire steady state period. |
| 8/13 (05:35) - (15:00) | | • Shut down Test Run 93FBG05. System cooled off. |

**Total Gasification Time = 172 hr 20 min.** **Total Steady-State Time = 168 hr 20 min.**
**Total No. of S.S. Periods = 5 (6.6, 5, 12, 90.75, 54 hrs).**

**Table 1. SUMMARY OF MAJOR EVENTS DURING TEST RUN**
(Test No. 93FBG06) Nov. 1-9, 1993

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 11/1 (00:00) | | • Started System Start-up procedure.<br>• New feed nozzle was installed for testing. |
| 11/1 (01:40) - (12:17) | 10 hr 37 min. | • Air Preheater ignited. Heated up reactor to 800°F (TIR-700 &-701).<br>• DDAS on-line. |
| 11/1 (12:17) - (13:16) | 59 min. | • Started Combustion mode. |
| 11/1 (13:16) - (13:30) | 14 min. | • Purged reactor to reduce $O_2$ conc. to < 1% by replacing reactor air with $N_2$. |
| 11/1 (13:30) - (14:00) | 30 min. | • Started Gasification mode. |
| 11/1 (14:00) - 11/2 (18:42) | 28 hr 42 min. | • Steady State #1.<br>a. Performed routine coal transfer from batch to feed hopper and from silo to batch hopper.<br>b. Performed routine dumping of solids from all lockhoppers every hour; and purging all the vent valves and transmitters every 3 hours.<br>c. DDAS locked up from 16:15 to 16:22; but not logging data until 18:25 on 11/1.<br>d. %$H_2O$ in gas = 9.45; 7.63; 13.62; 12.62; 10.93; 8.48%.<br>e. Meloy analyzer was found leaking and thus shut down the analyzer at 21:20 on 11/1.<br>f. Had difficulty in controlling TIR-700 to keep below 1,650°F at 17:38 & 21:30 on 11/1 and 1,800°F at 11:20 on 11/2. After struggled with raising steam and $N_2$ flow and reducing reactor air flow, TIR-700 was under control but the reactor temperature increases from bottom to top of bed (1,200-1,520°F), opposite to normal.<br>g. Blew rupture disc PSE-753 at 14:50 on 11/2. |

| Date (Time) | Duration | Description of Events |
|---|---|---|
| 11/2 (18:42) | | • Controlled Shutdown to replace rupture disc PSE-753. |
| 11/2 (18:42) - (20:49) | 2 hr 7 min. | • Purged out bed material as much as possible. Reactor cooled to < 1,100°F. |
| 11/2 (20:49) - (21:49) | 1 hr | • Removed the reactor bottom. Found clinker formed across the 3"-to-10" insert. Replaced with a new 3"-to-10" insert. |
| 11/2 (21:50) - 11/3 (15:00) | 17 hr 10 min. | • Removed clinker from bed and cleaned up the bed with special tools. Clinker that covered up the entire reactor cross section was 8" thick at the center & 10" on the wall).<br>• Completed reinstalling the reactor bottom.<br>• Used the old feed nozzle.<br>• Shut down DDAS to fix GC problem from 21:50 to 23:15 on 11/2 and from 11:28 to 16:01 on 11/3. |
| 11/3 (15:00) - (17:10) | 2 hr 10 min. | • Pressure test of reactor and underflow system. |
| 11/3 (17:10) - (21:45) | 4 hr 35 min. | • Started heating up from 320-440°F to 800°F. |
| 11/3 (21:45) - (22:55) | 1 hr 10 min. | • Started Combustion mode by bringing reactor temperature up from 800 to 1,600°F in 3 stages. |
| 11/3 (22:55) - 11/4 (01:00) | 2 hr 5 min. | • Started Gasification mode. |
| 11/4 (01:00) - (21:11) | 20 hr 11 min. | • Steady State #2.<br>a. PDIC-424 worked again (don't know the reason).<br>b. PDIR-707 = 11"; -708 = 1.5"; -709 = 0.07"$H_2O$.<br>c. FV-725 would not open.<br>d. %$H_2O$ in gas = 12.2; 8.45; 7.57; 10%.<br>e. DDAS was down from 14:02 - 14:55 on 11/4.<br>f. Sealed the leak on the baghouse.<br>g. Patched the leak on baghouse (found at 14:20) at 17:45 on 11/4. |

f Events

.32; 15.4; 13.3; and

. System cooled off.

**State Time = 135 hr 43 min.**
**hours).**

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| | Duration | Description of Events |
|---|---|---|
| | | h. Blew rupture disc PSE-753 again at 21:10 on 11/4. |
| | | • Put on "Hot-Hold" condition to replace rupture disc. |
| | 2 hr 6 min. | • Replaced rupture disc PSE-753.<br>• Unplugged FT-425 and performed flow proving. |
| | 33 min. | • Attempted to restart reactor from "Hot-Hold" condition but coal feed line was plugged. |
| 00) | 1 hr 10 min. | • Started Gasification mode. |
| 00) | 60 hr | • Steady State #3.<br>a. DDAS showed a lower feeder speed (actual=36 rpm).<br>b. %$H_2O$ in gas = 10.82; 13.91; 8.74; 12.68; 12.37; 14.5; 10.88; 13.16; 12.25; 11.97; 11.14; 13.13; 14.05%.<br>c. Cleaned up the filter ports (FLT-801A & B).<br>d. Removed a plug right before FLT-810 in gas sampling system.<br>e. Blew rupture disc PSE-753 again at 12:50 on 11/7 while FV-754 was plugged up. |
| | | • Emergency shut down due to fire around FV-754 flanges. |
| | 5 hr 51 min. | • Repaired rupture disc blown. Replaced gasket on orifice of FV-754 and torqued to 45 ft-lbf. Pressurized reactor system and performed leak test. |
| | 1 hr 9 min. | • Started Gasification mode. |
| | 3 hr 20 min. | • Steady State #4.<br>a. Used FV-755 even though it was not flow proven.<br>b. FV-913 plugged up. |

**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 System Start-up 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 Combustion mode. |
| 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 Gasification mode.<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. | • Steady-State #1 (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><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 Gasification mode.<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 | • Steady-State #2 (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. | • Controlled Shutdown 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 System Start-up 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 Combustion mode.<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).**

n of Events

to loss of coal feed.
and found no clinkers adhered on
sert.

Steady State Time = 200 hr 5 min.

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

Description of Events

- Started System Start-up procedure.
- Reactor insert without side-jets was used (from the last S.S. period of Test Run 94FBG07).
- Montana Rosebud #6 coal in silo.

n. • Air Preheater ignited. Heated reactor to 800°F. (Based on TIR-700, -701, -707 & -733, whichever one reached first).
- Opened HV-503 and FCV-115 to obtain the high air flow (apprx. 7000 scfh).
- Repaired broken flexible coupling at VSL-906.
- Set all line heater temperatures to 500°F except Zone 6 & 7 to 1100°F (exits of both cyclones).

n. • Started Combustion mode.

n. • Purged reactor to reduce $O_2$ conc. to < 3% by replacing reactor air with $N_2$.

n. • Started Gasification mode.
  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.
  b. Performed routine coal transfer from batch to feed hopper and from silo to batch hopper.
  c. Performed routine dumping of solids from all lockhoppers every hour; and purging all vent valves and transmitters every 4 hours.

. • Steady State #1 (with regular coal for METC-2 Sorbent Test and Filter Test).
  a. Low sample loop flow (FIR-806) - 3.2 scfh - due to crystal -like material built up. Cleaned and flow resumed.
  b. Sampling frequency: gas grab, detector tube, and condensate every hr., solids for every 4 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. |

| te (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. |
| (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. |
| (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. |
| Morning | | • Dropped the reactor bottom and found no clinkers adhered on the reactor wall and the insert. |

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

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**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) - 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) - (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.
Entire Test Period = 128 hrs.

Test Matrix Time = 94 hr 30 min.
No. of Test Periods = 11

## Appendix 4: Daily Process Variable Plots

| | |
|---|---|
| 93MGC04 | (05/17/93 - 05/26/93) |
| 93MGC05 | (08/02/93 - 08/13/93) |
| 93MGC06 | (11/01/93 - 11/09/93) |
| 94MGC07 | (06/06/94 - 06/15/94) |
| 94MGC08 | (07/18/94 - 07/27/94) |
| 94MGC09 | (09/12/94 - 09/16/94) |
| 94MGC10 | (10/24/94 - 10/28/94) |

The following trend charts were created for runs 93MGC04 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.

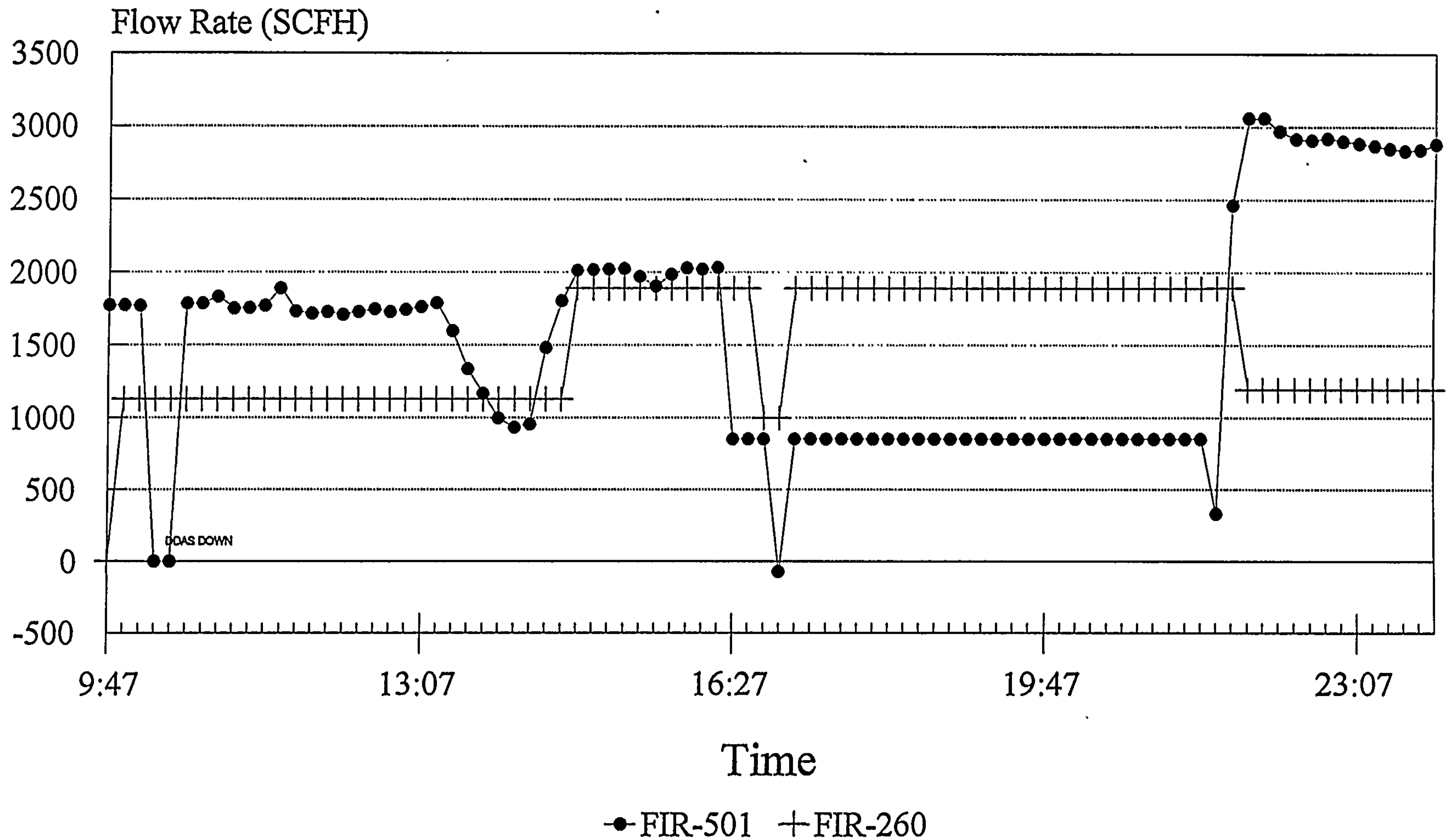
| Process Variable | Description |
|---|---|
| FIR-501 | Cumulative syngas volumetric flow rate to the filtration vessel and the particle measurement system |
| TIR-248 | Inlet gas temperature of the filtration vessel |
| TIR-224 | Outlet gas temperature of the filtration vessel |
| PIR-247 | Inlet gas 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.

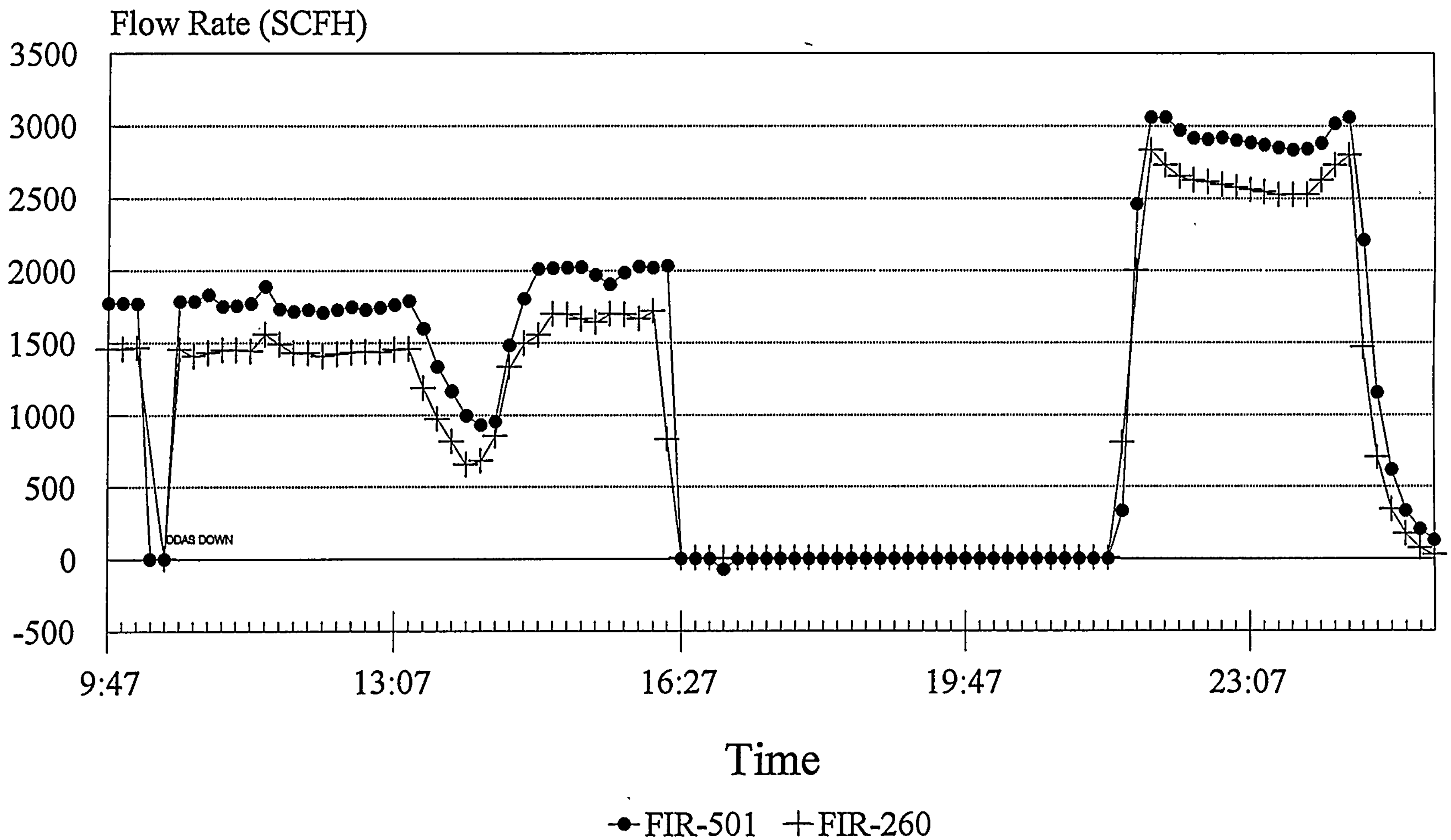
# 93MGC04
# (05/17/93 - 05/26/93)

# Inlet and Process Flow
## 05/16/93



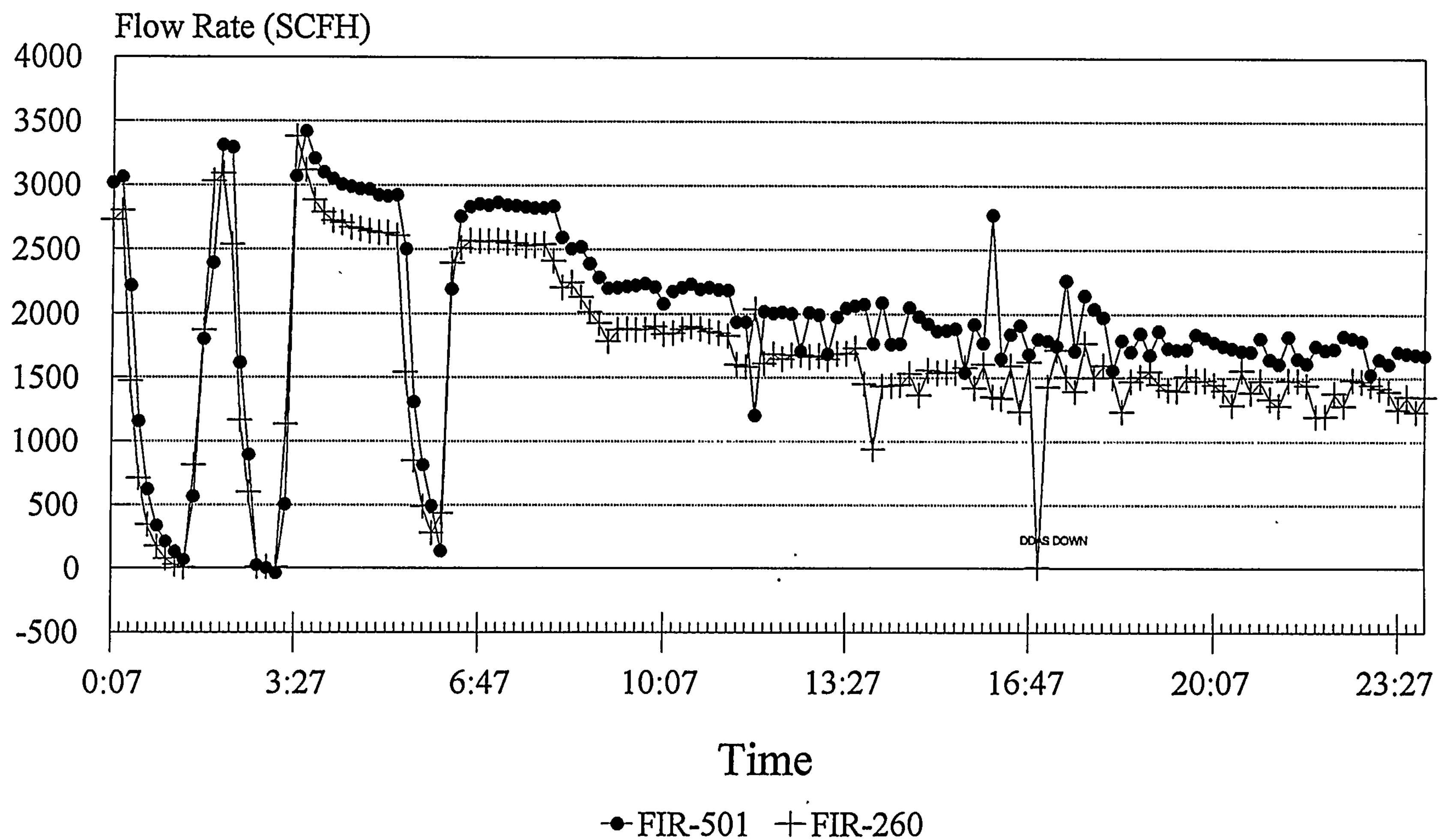

FX0516.CHT Lotus: F501Run4.WK1

# Inlet and Process Flow
## 05/17/93



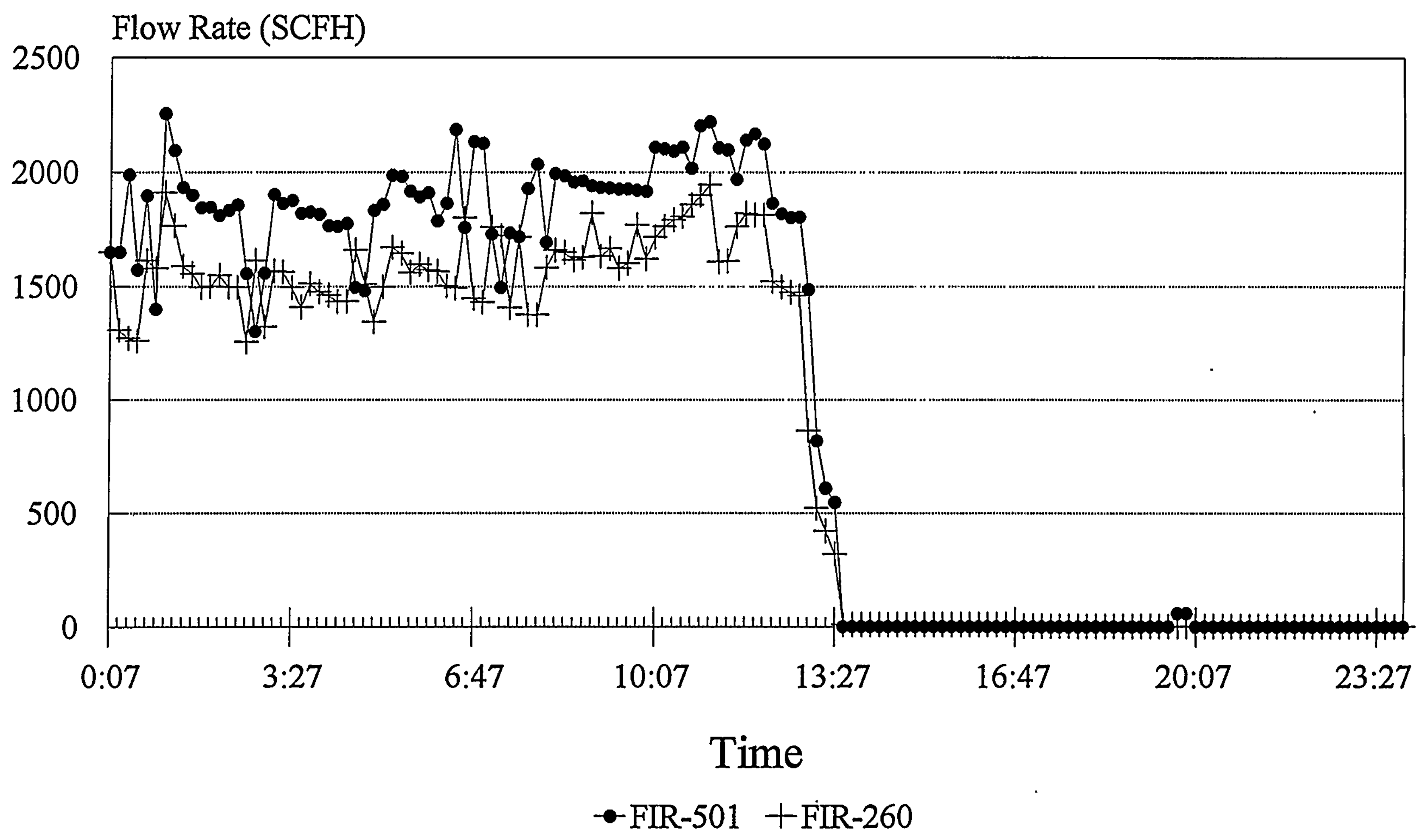

**FX0517.CHT Lotus: F501Run4.WK1**

# Inlet and Process Flow
## 05/18/93



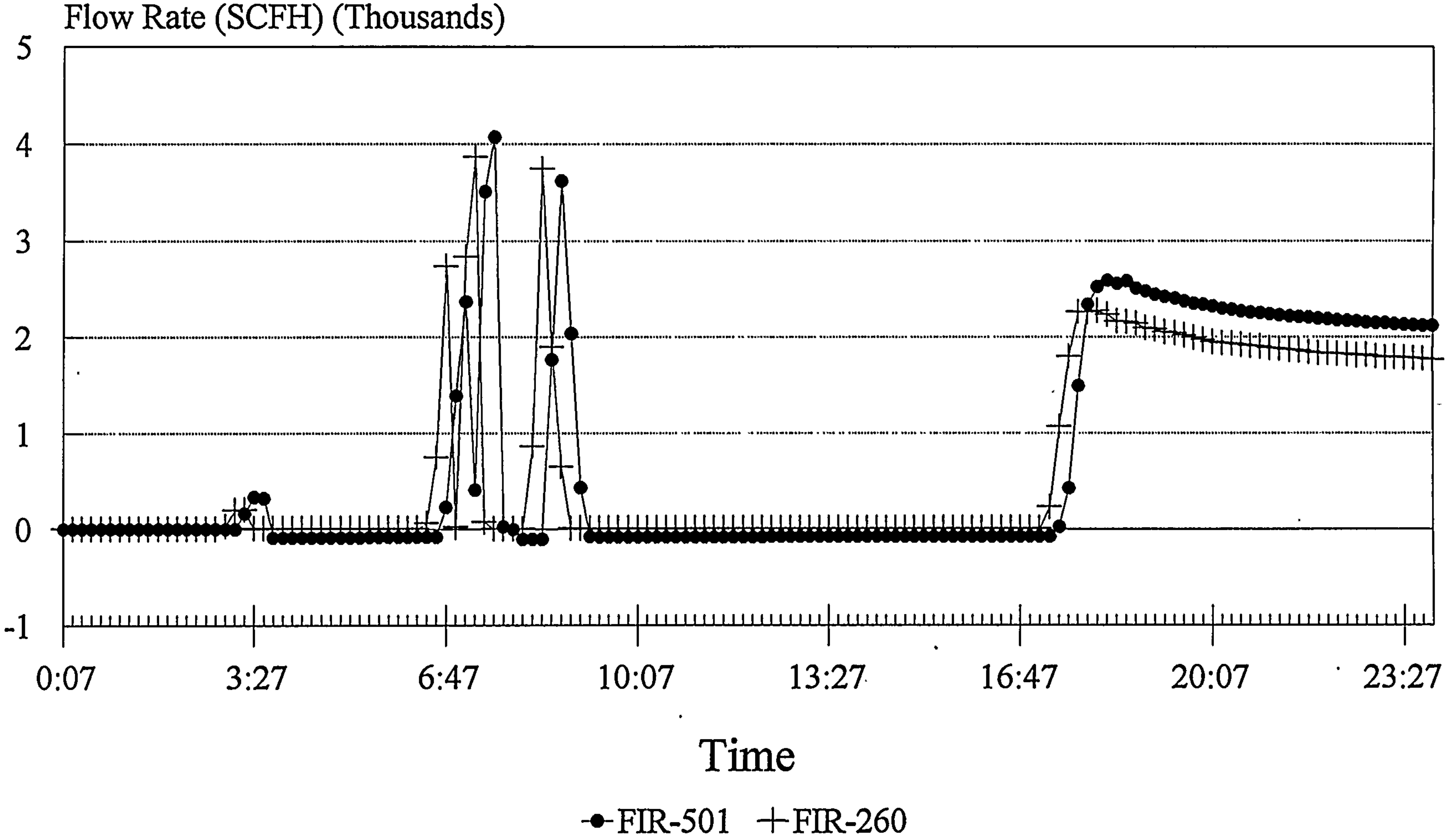

**FX0518.CHT Lotus: F501Run4.WK1**

# Inlet and Process Flow
## 05/19/93




**FX0519.CHT Lotus: F501Run4.WK1**

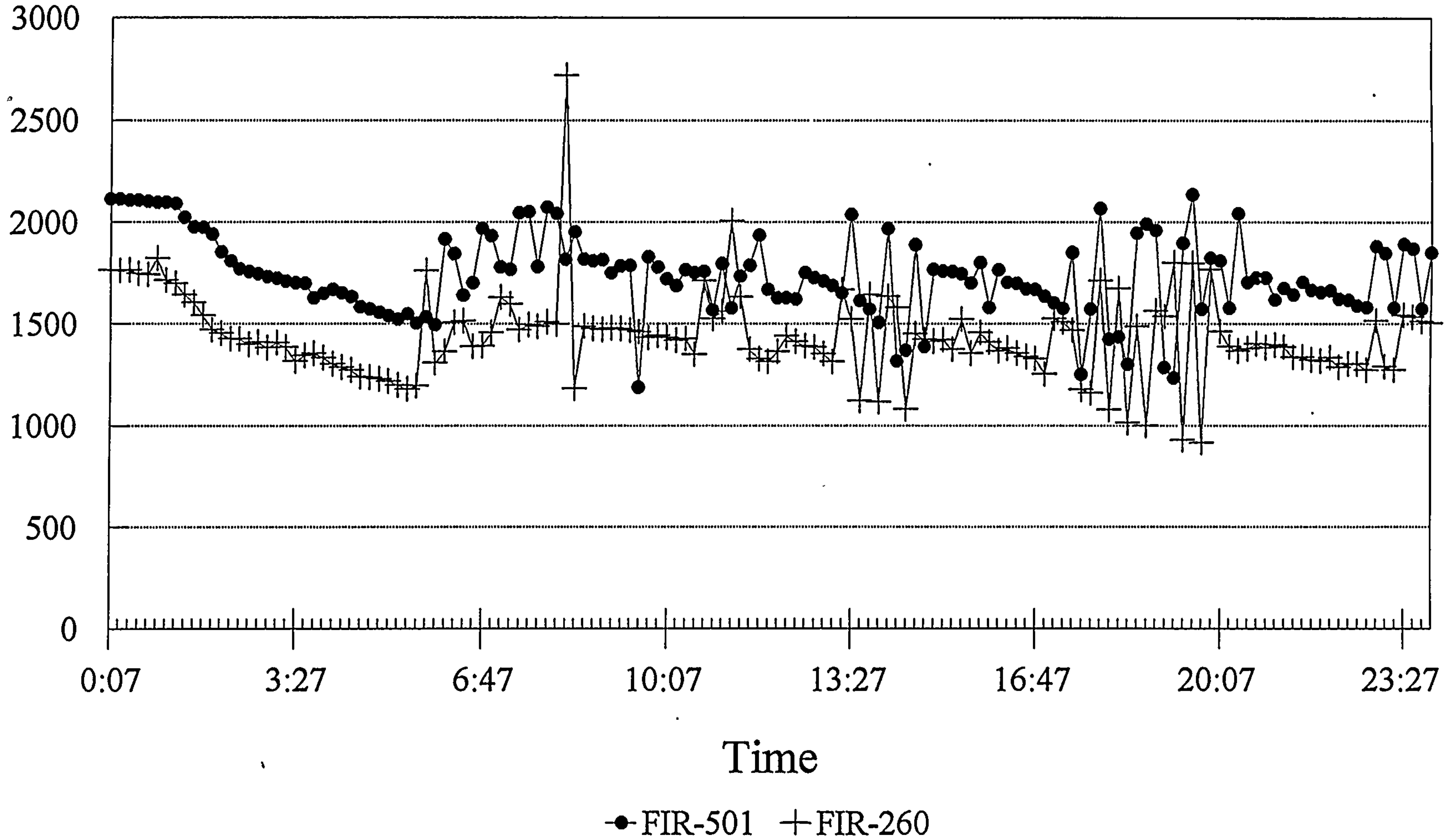
# Inlet and Process Flow
## 05/20/93




**FX0520.CHT Lotus: F501Run4.WK1**

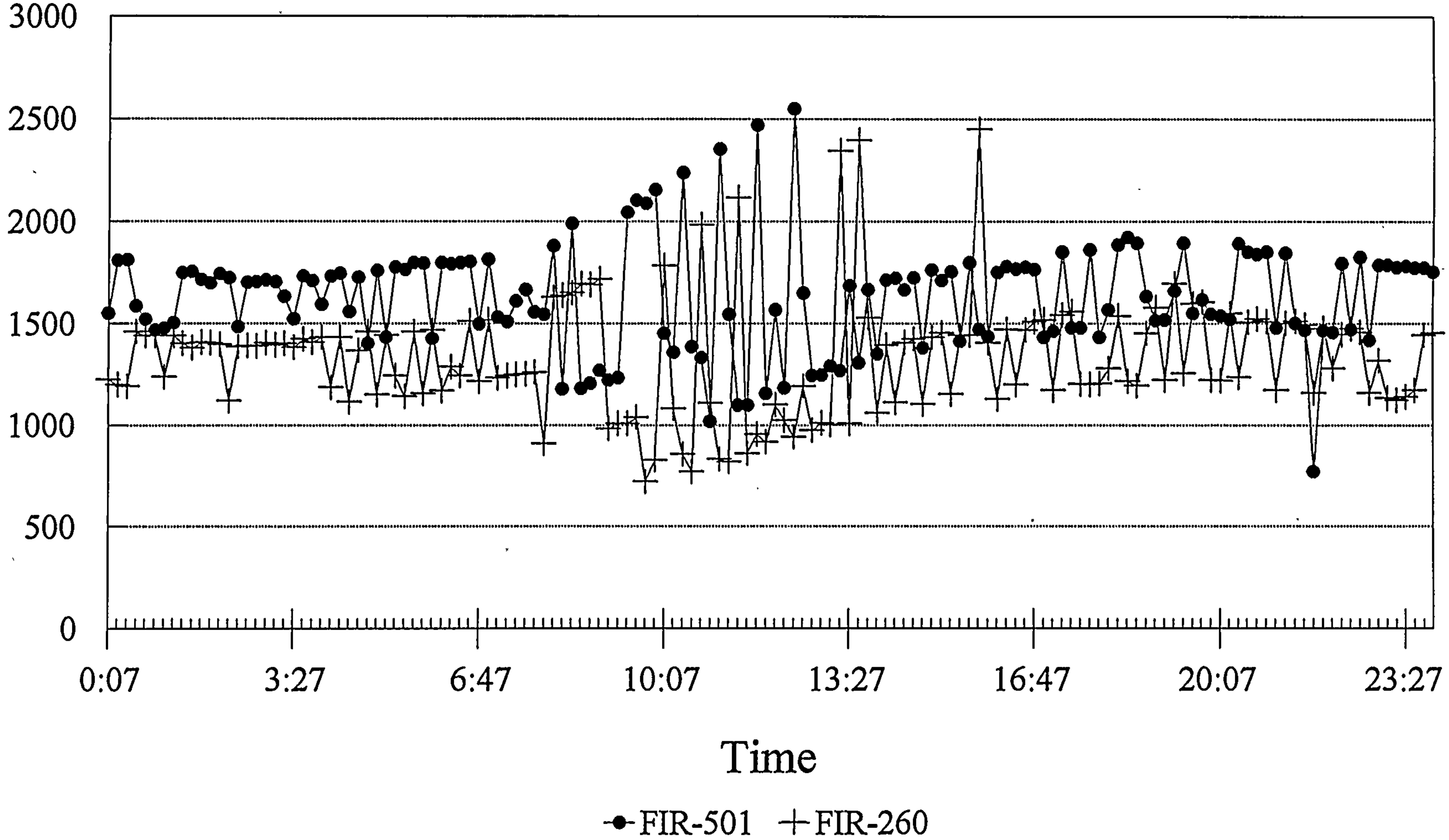
# Inlet and Process Flow

## 05/21/93




FX0521.CHT Lotus: F501Run4.WK1

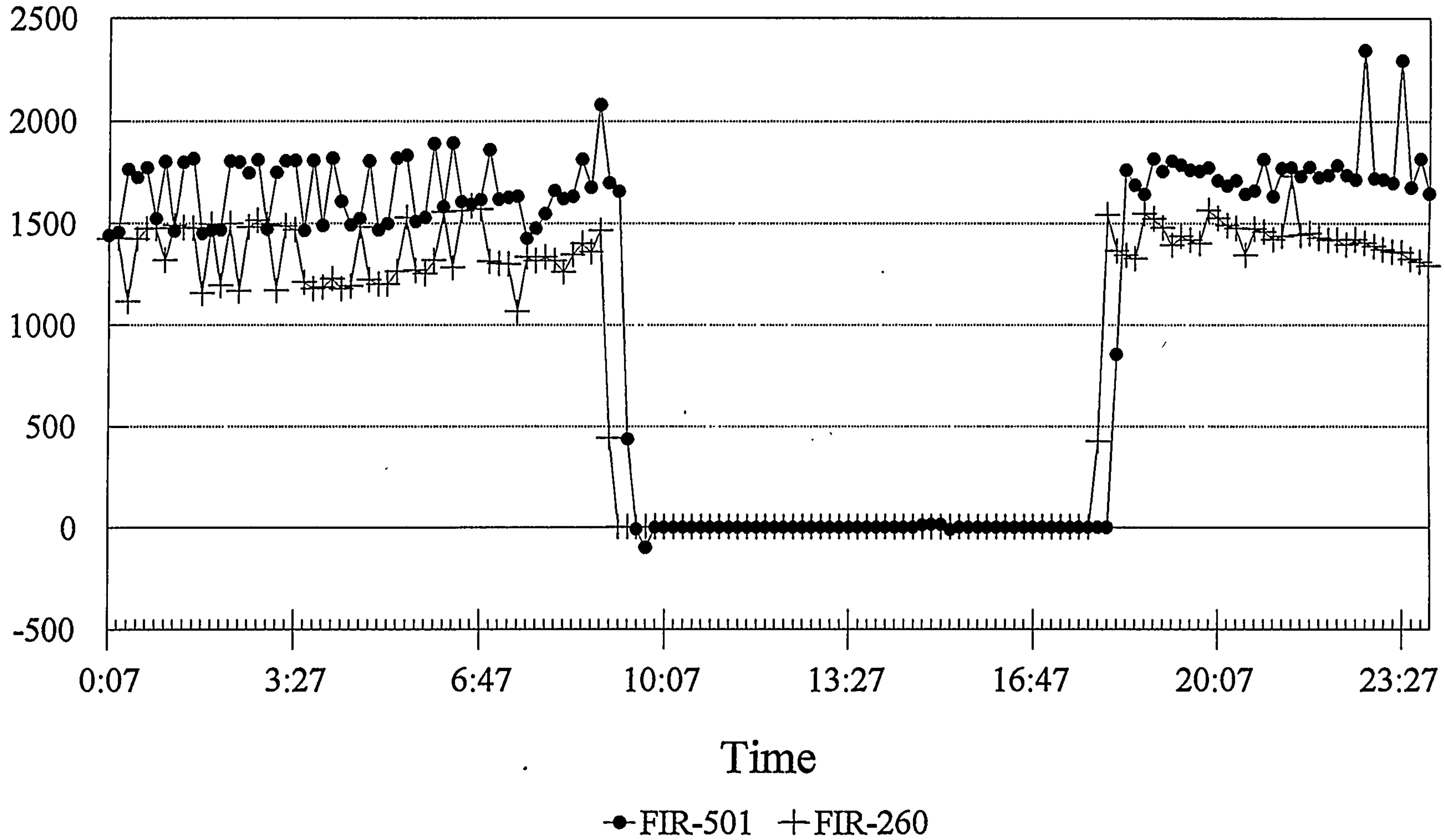
# Inlet and Process Flow
## 05/22/93




FX0522.CHT Lotus: F501Run4.WK1

# Inlet and Process Flow

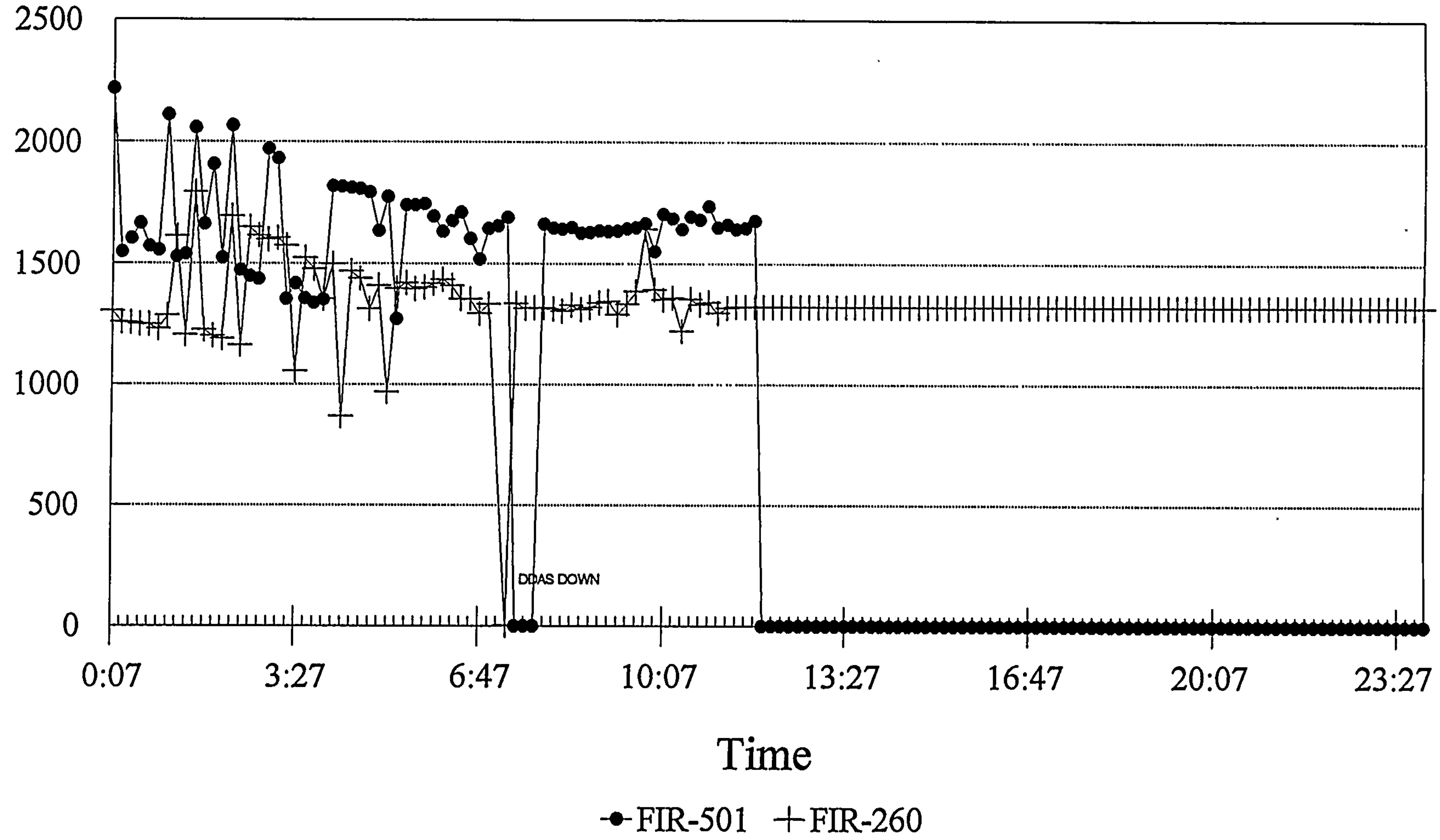
## 05/23/93




FX0523.CHT Lotus: F501Run4.WK1

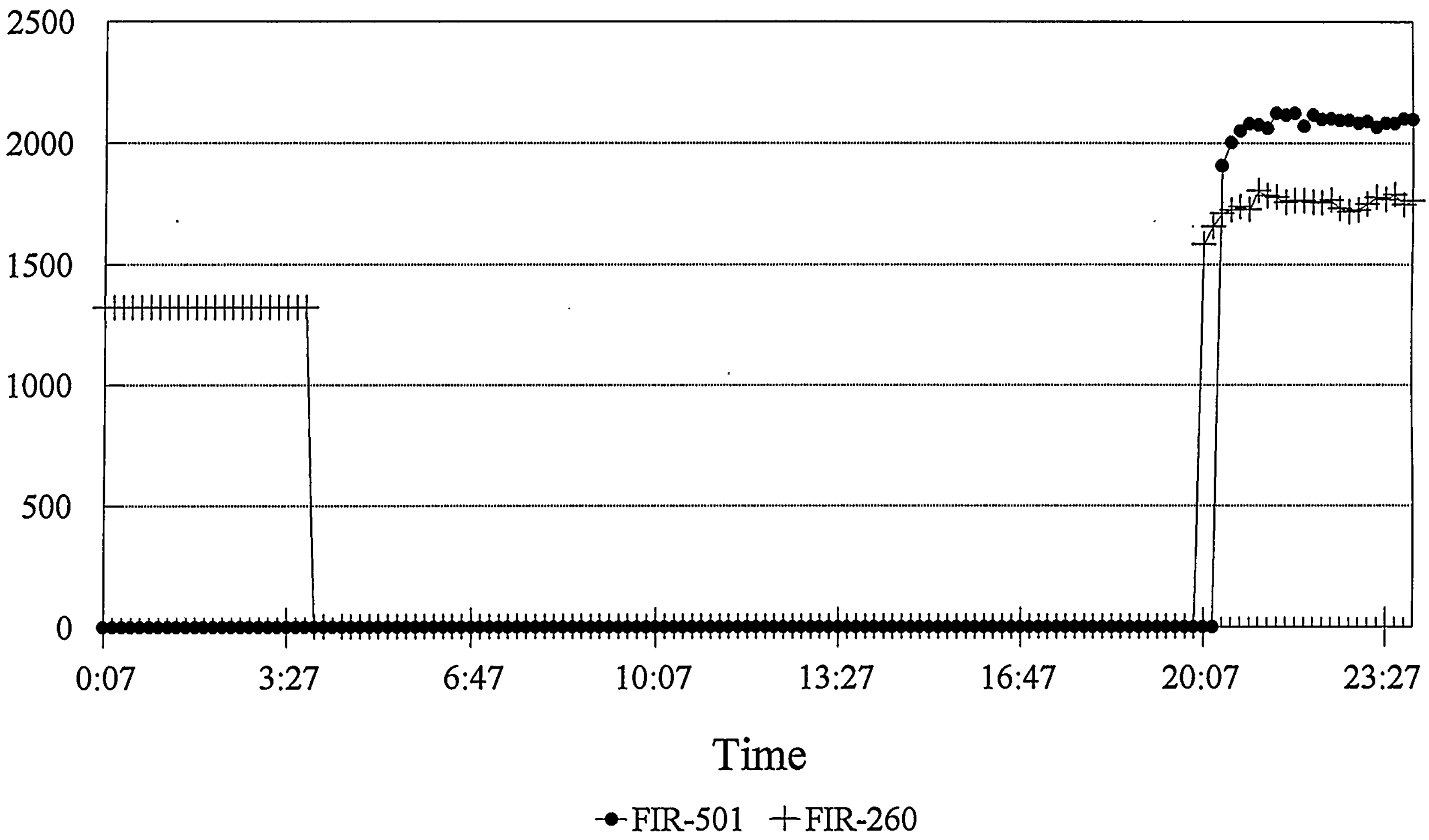
# Inlet and Process Flow

## 05/24/93



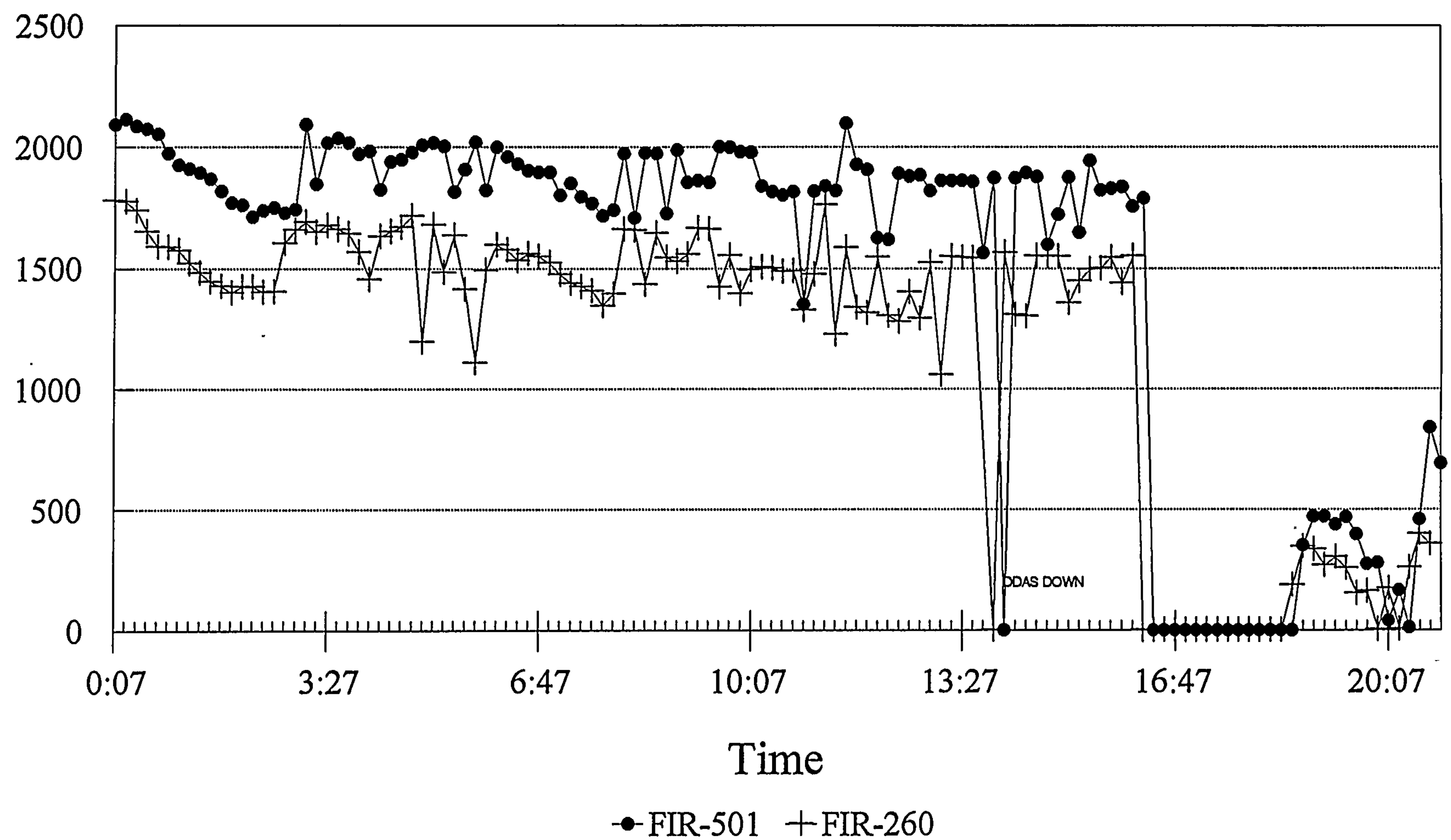

FX0524.CHT Lotus: F501Run4.WK1

# Inlet and Process Flow
## 05/25/93



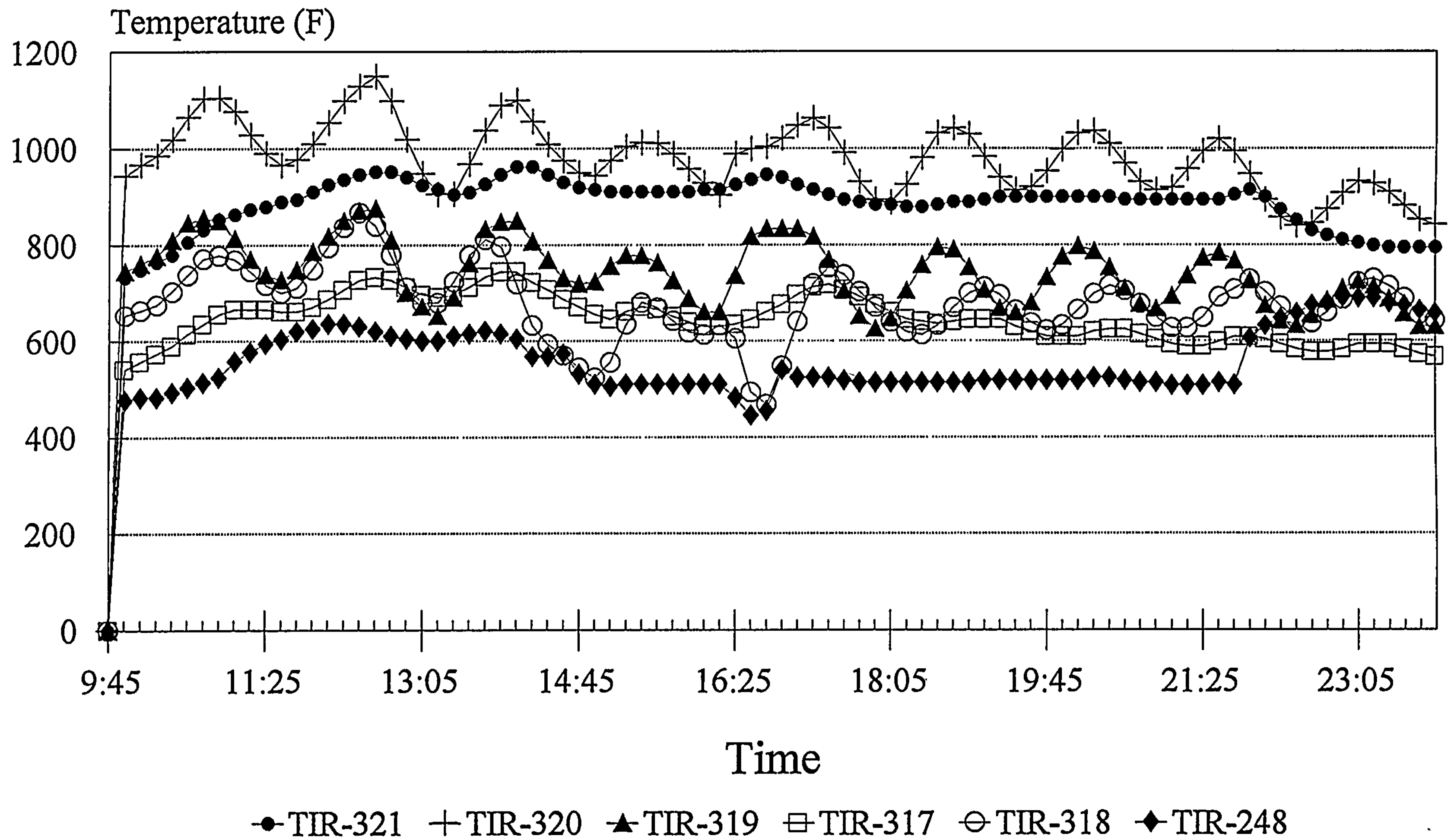

FX0525.CHT Lotus: F501Run4.WKI

# Inlet and Process Flow
## 05/26/93



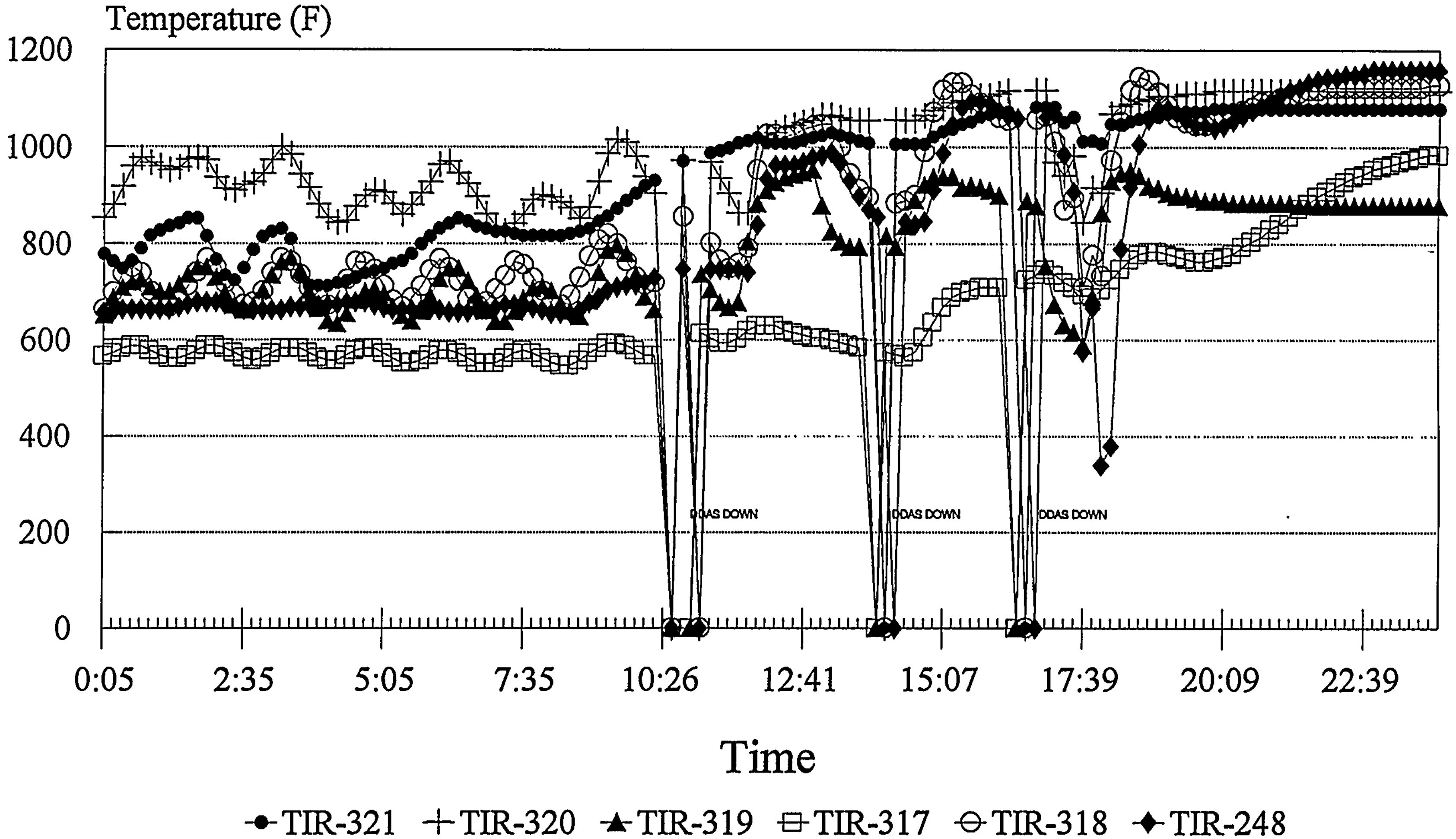

FX0526.CHT Lotus: F501Run4.WK1

# Process Gas Line Temp.
## 05/17/93



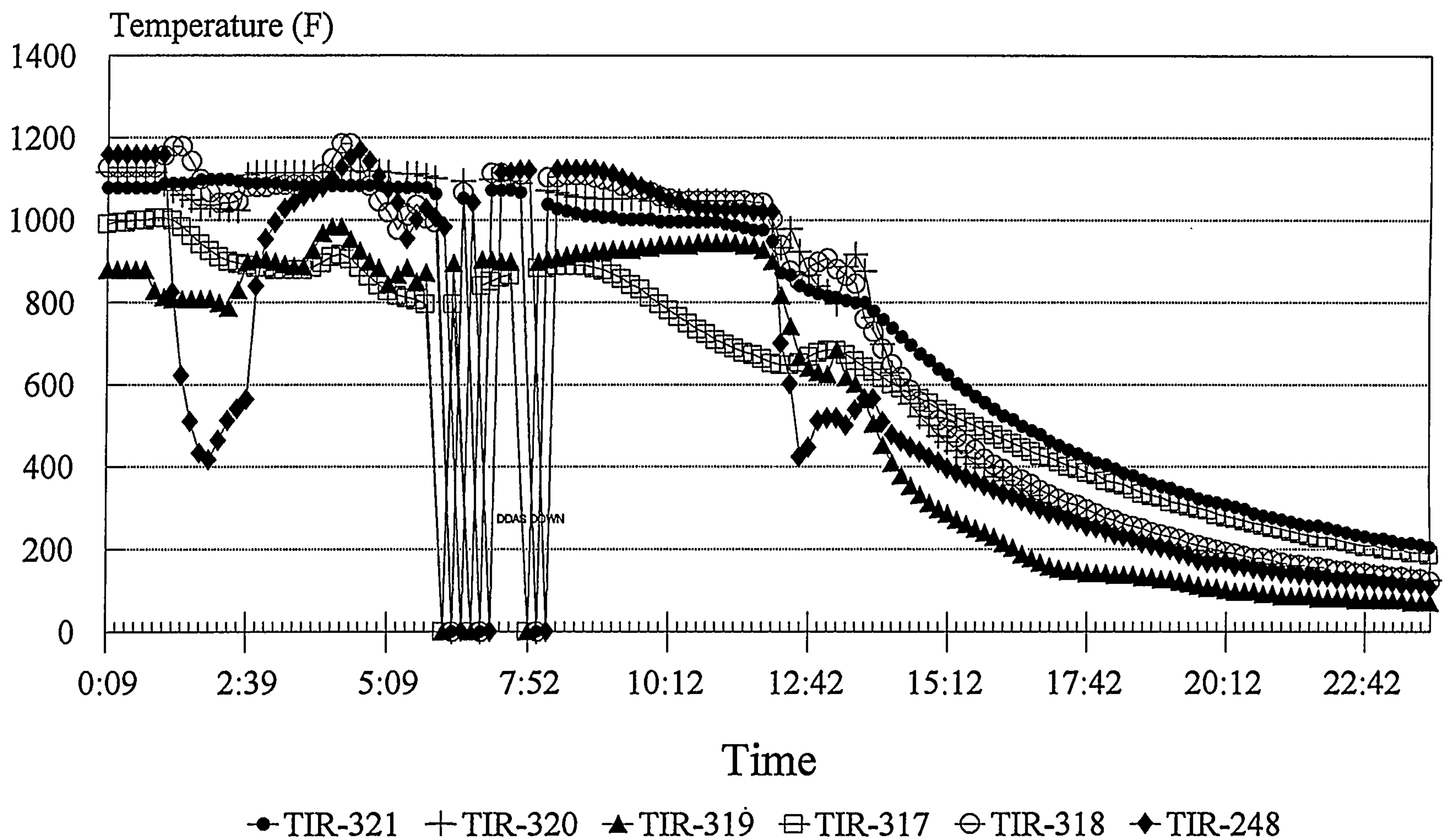

MIT0517.CHT Lotus: MIT51728.WK1

# Process Gas Line Temp.
## 05/18/93



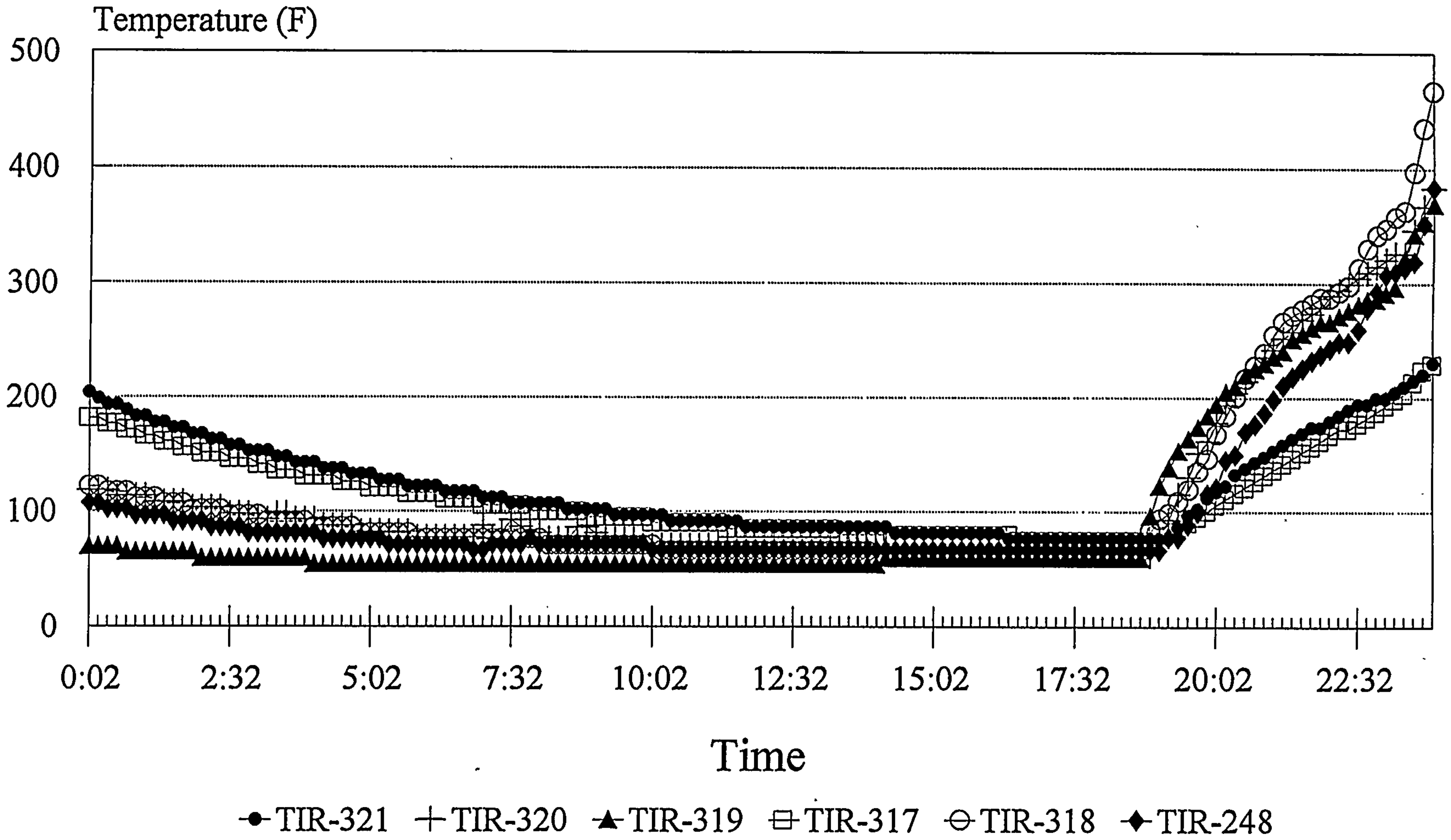

**MIT0518.CHT Lotus: MIT51728.WK1**

# Process Gas Line Temp.
## 05/19/93



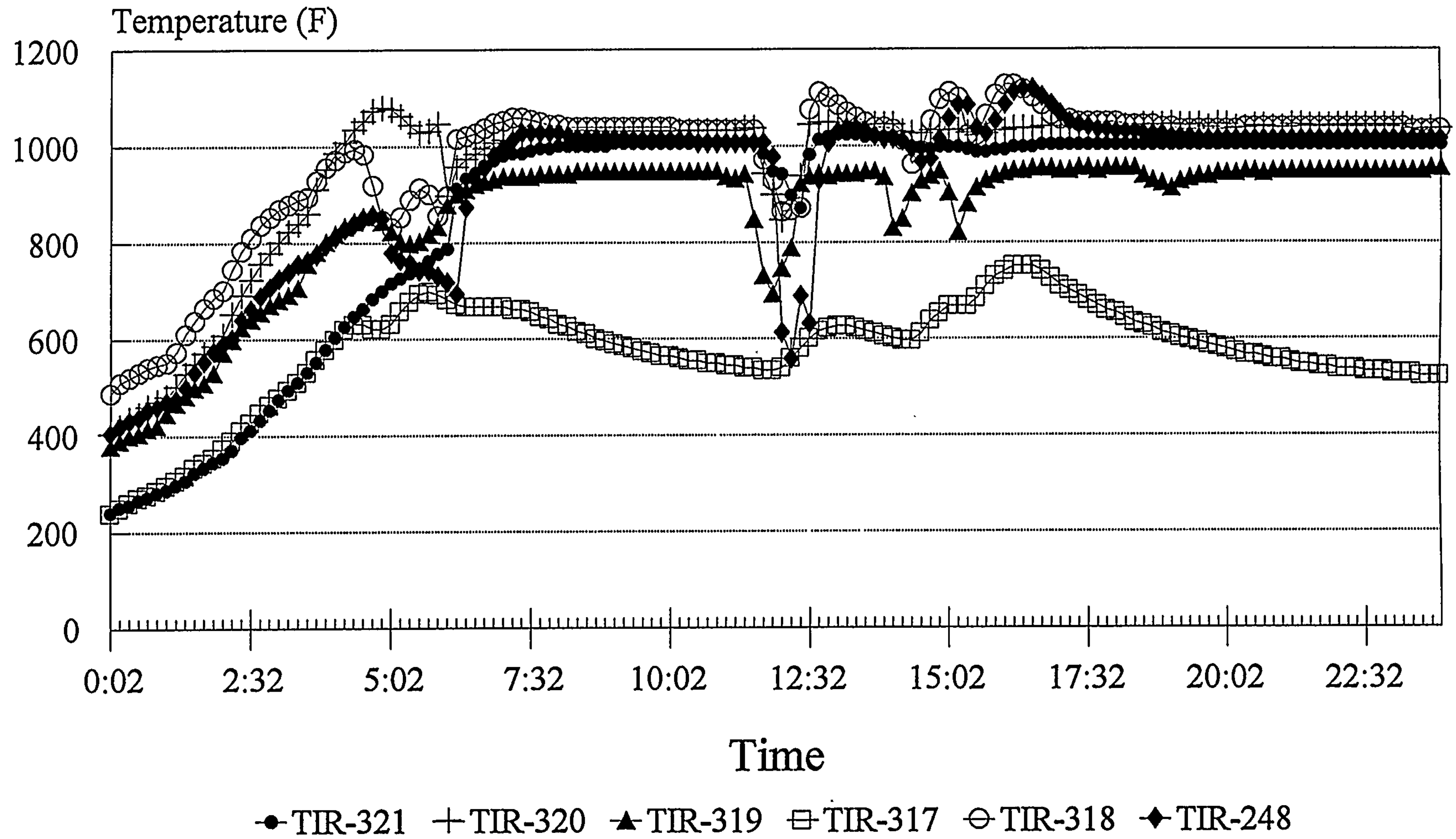

MIT0519.CHT Lotus: MIT51728.WK1

# Process Gas Line Temp.
## 05/20/93



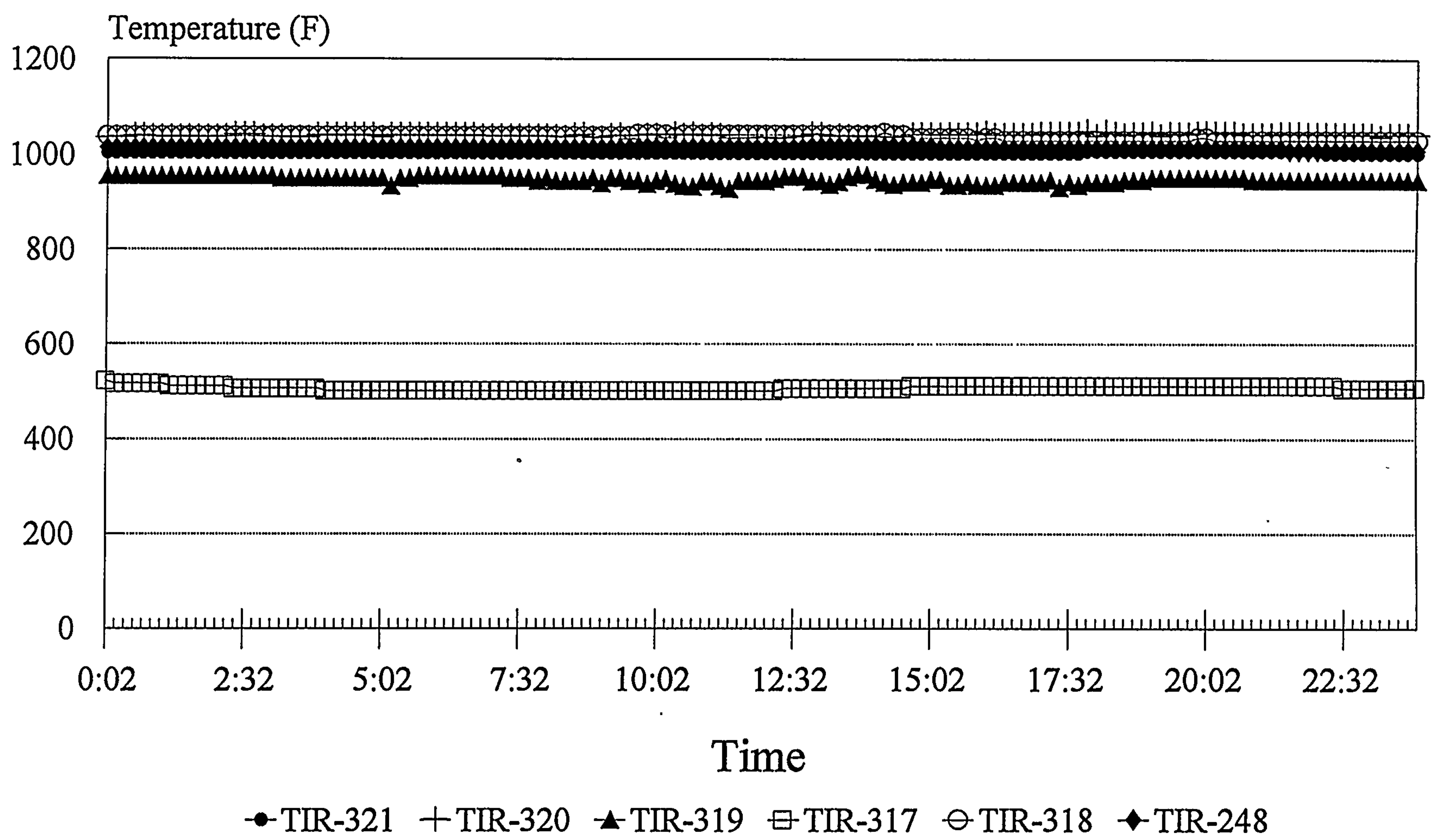

MIT0520.CHT Lotus: MIT51728.WK1

# Process Gas Line Temp.
## 05/21/93



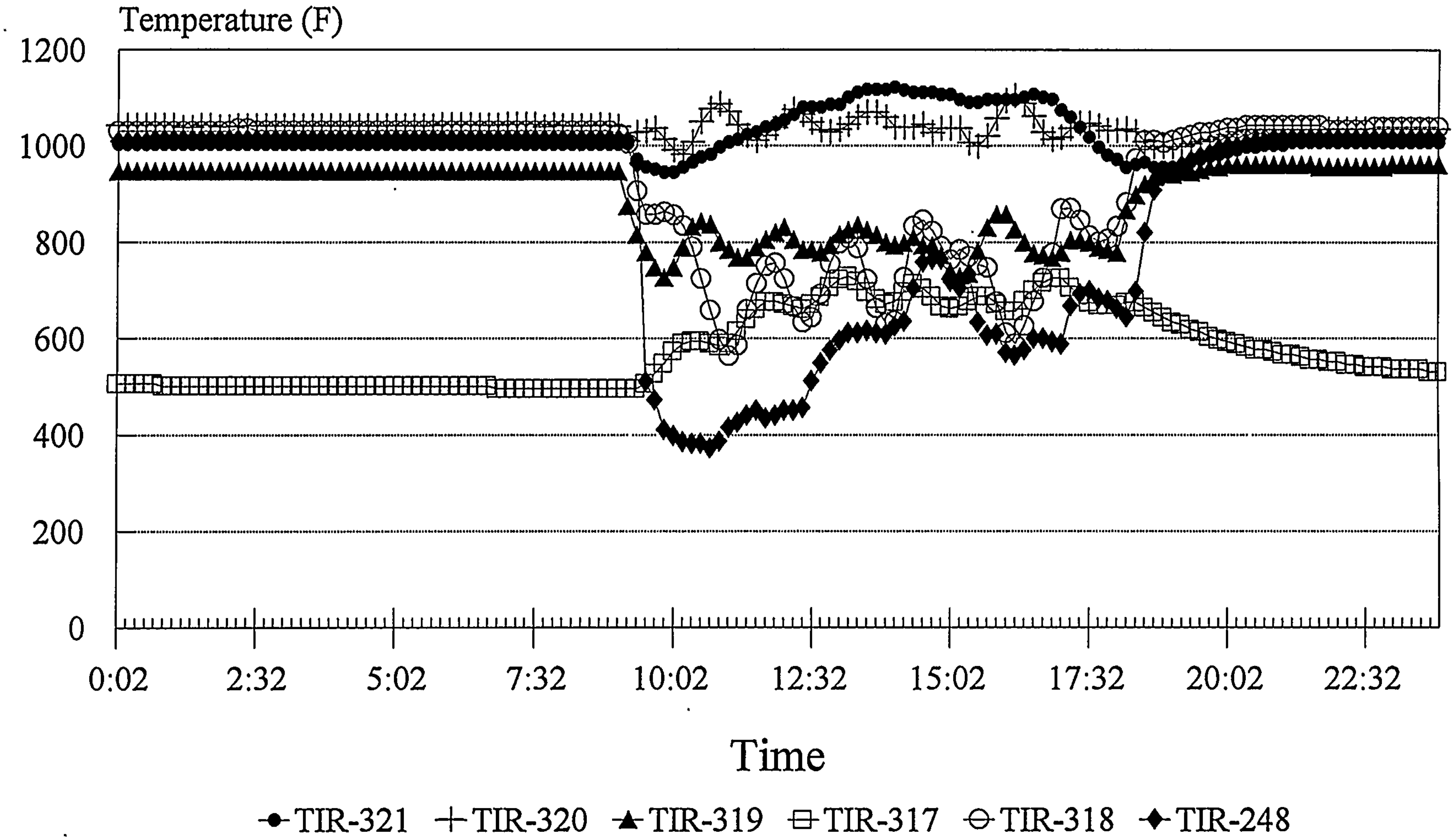

**MIT0521.CHT Lotus: MIT51728.WK1**

# Process Gas Line Temp.
## 05/22/93



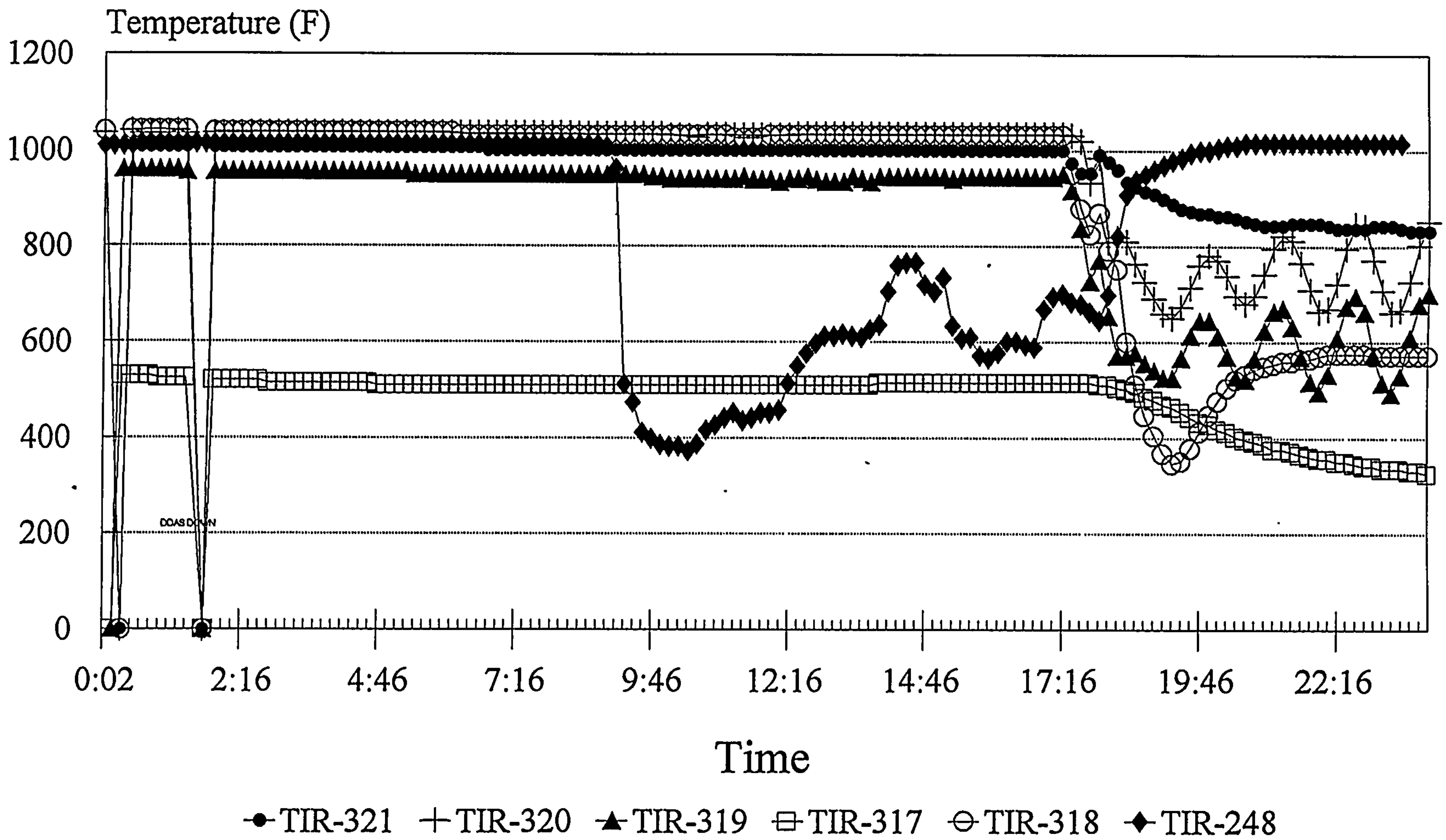

MIT0522.CHT Lotus: MIT51728.WK1

# Process Gas Line Temp.
## 05/23/93



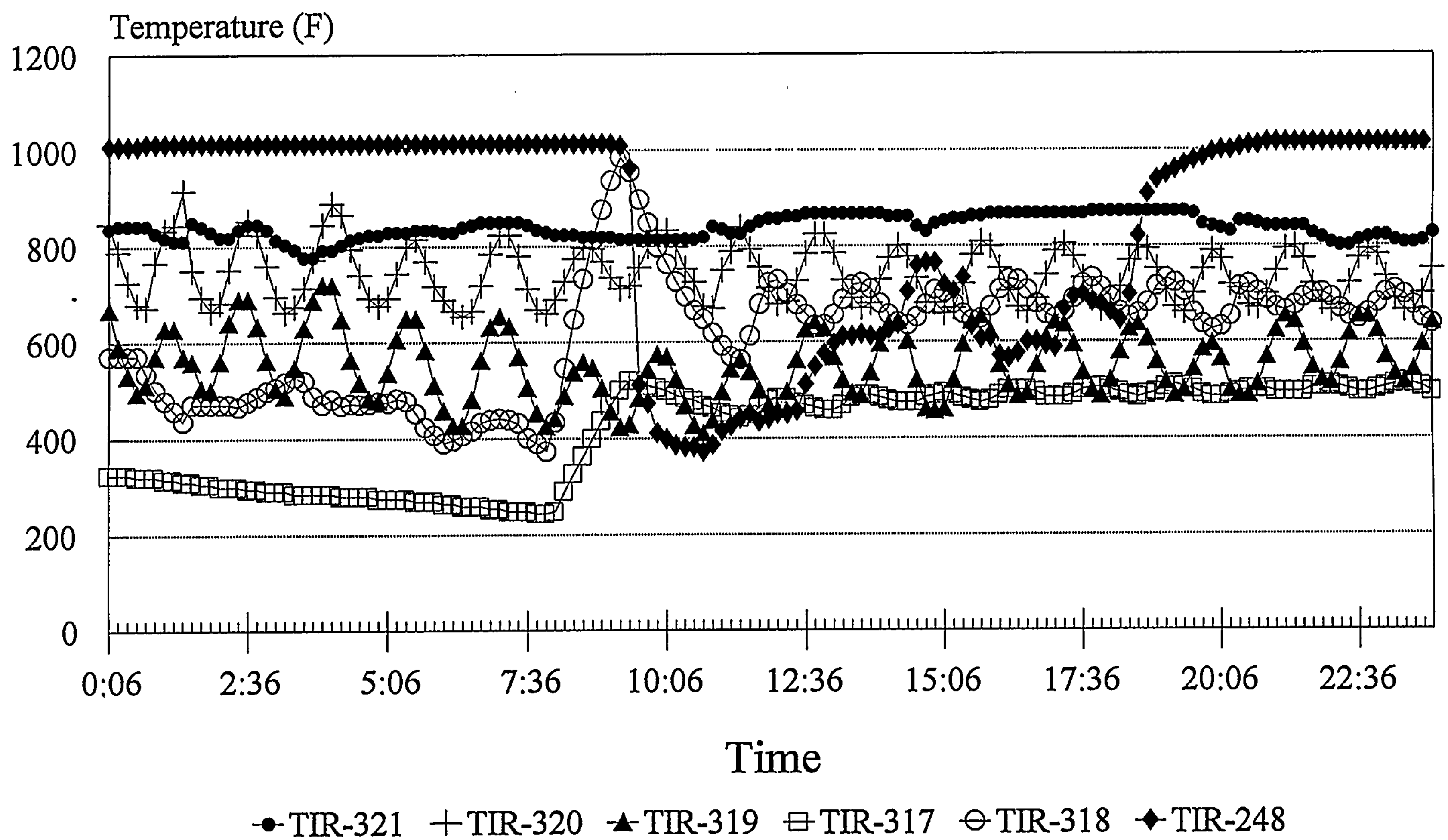

**MIT0523.CHT Lotus: MIT51728.WK1**

# Process Gas Line Temp.
## 05/24/93



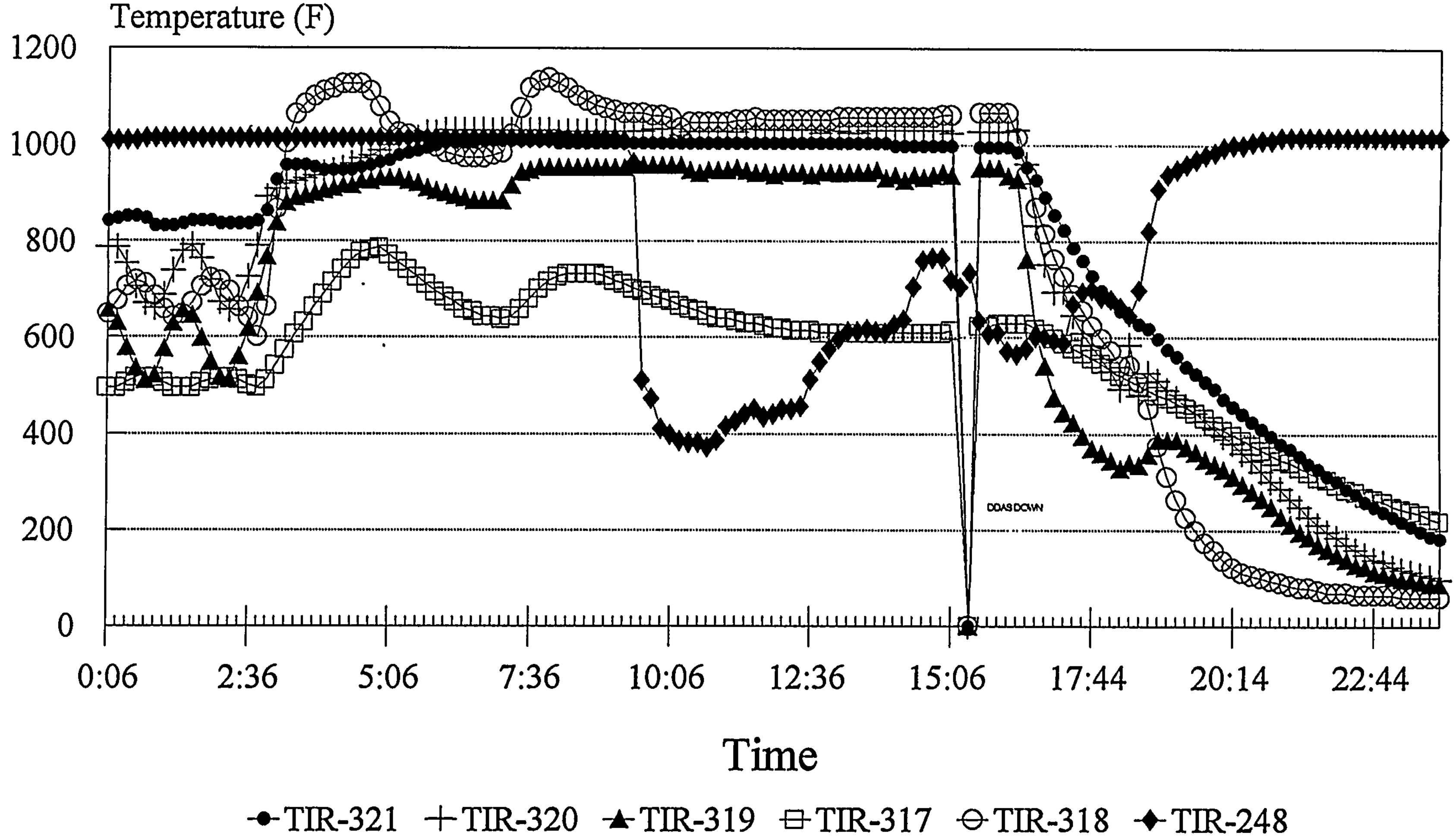

**MIT0524.CHT Lotus: MIT51728.WK1**

# Process Gas Line Temp.
## 05/25/93



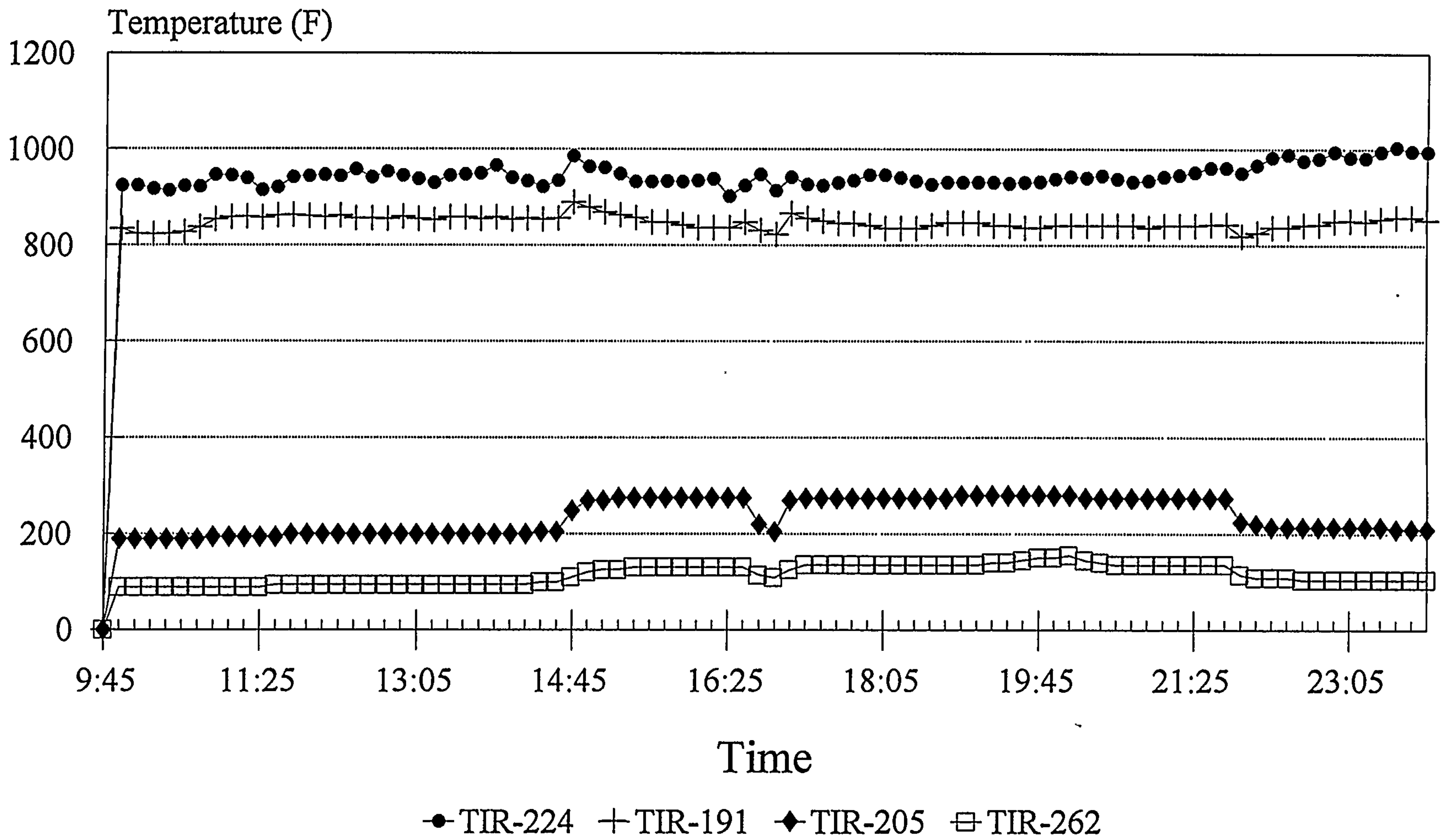

MIT0525.CHT Lotus: MIT51728.WK1

# Process Gas Line Temp.
## 05/26/93



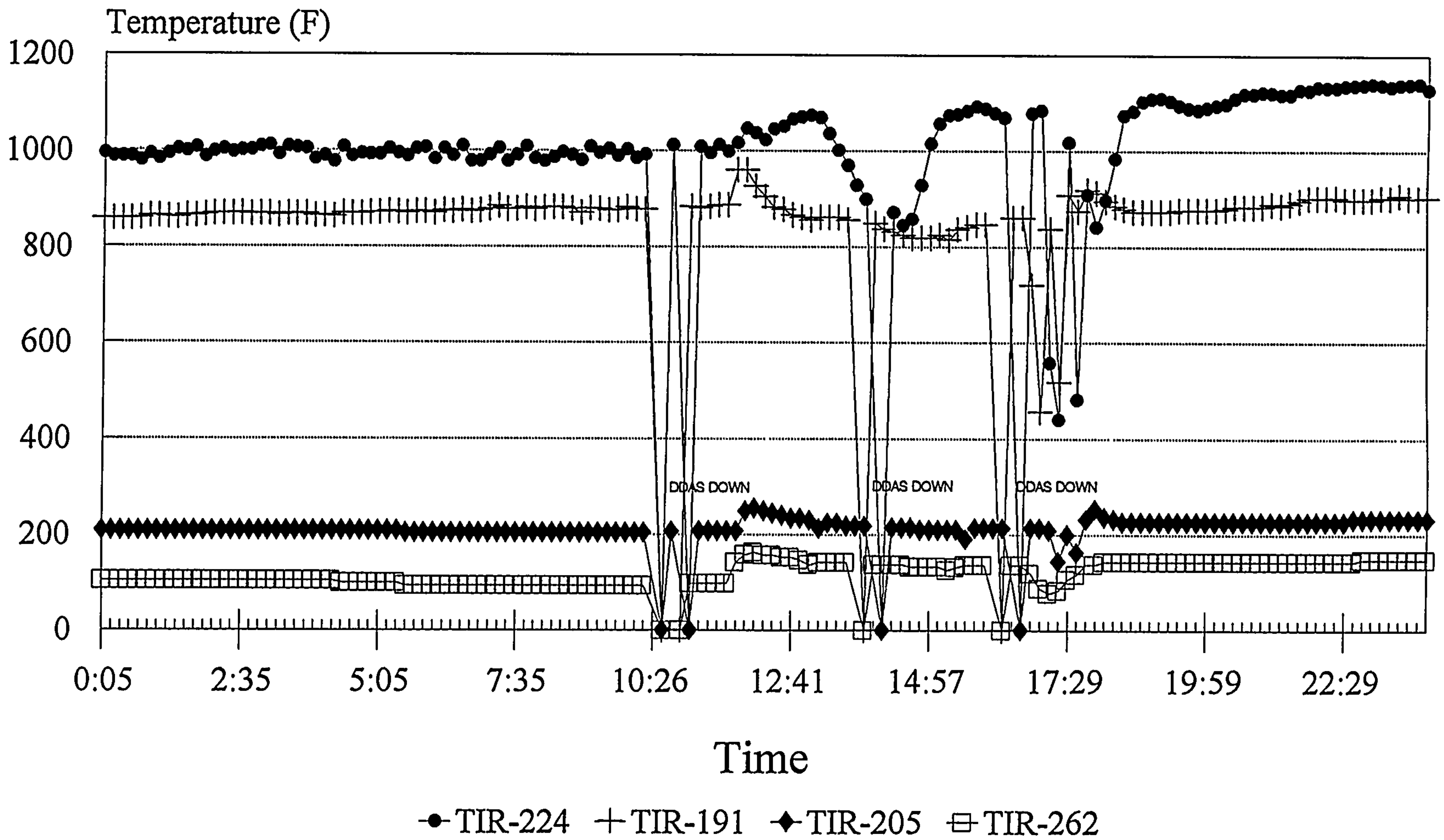

**MIT0526.CHT Lotus: MIT51728.WK1**

# Process Temperatures
## 05/17/93



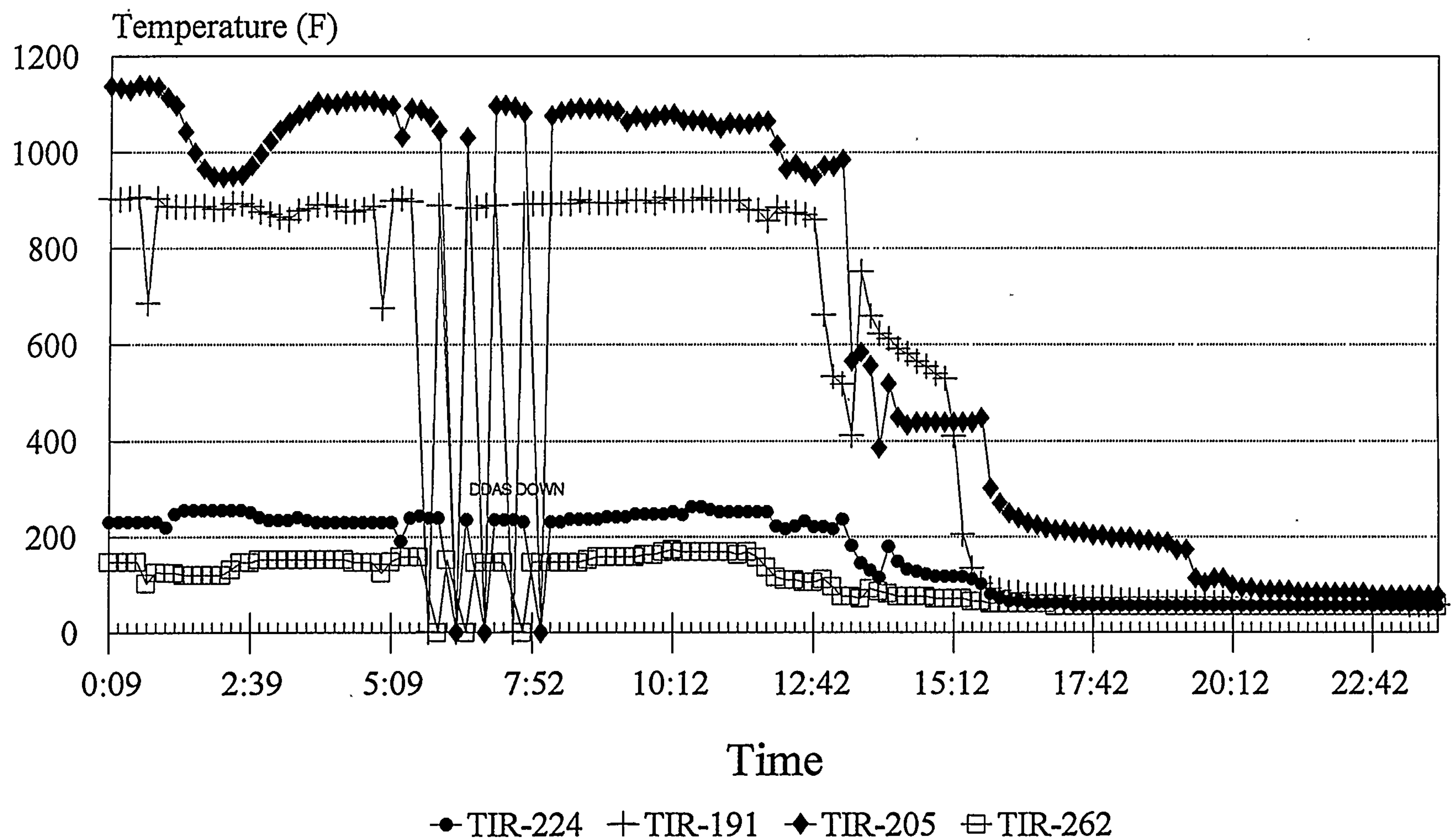

**MT0517.CHT Lotus: MT051728.WK1**

# Process Temperatures
## 05/18/93



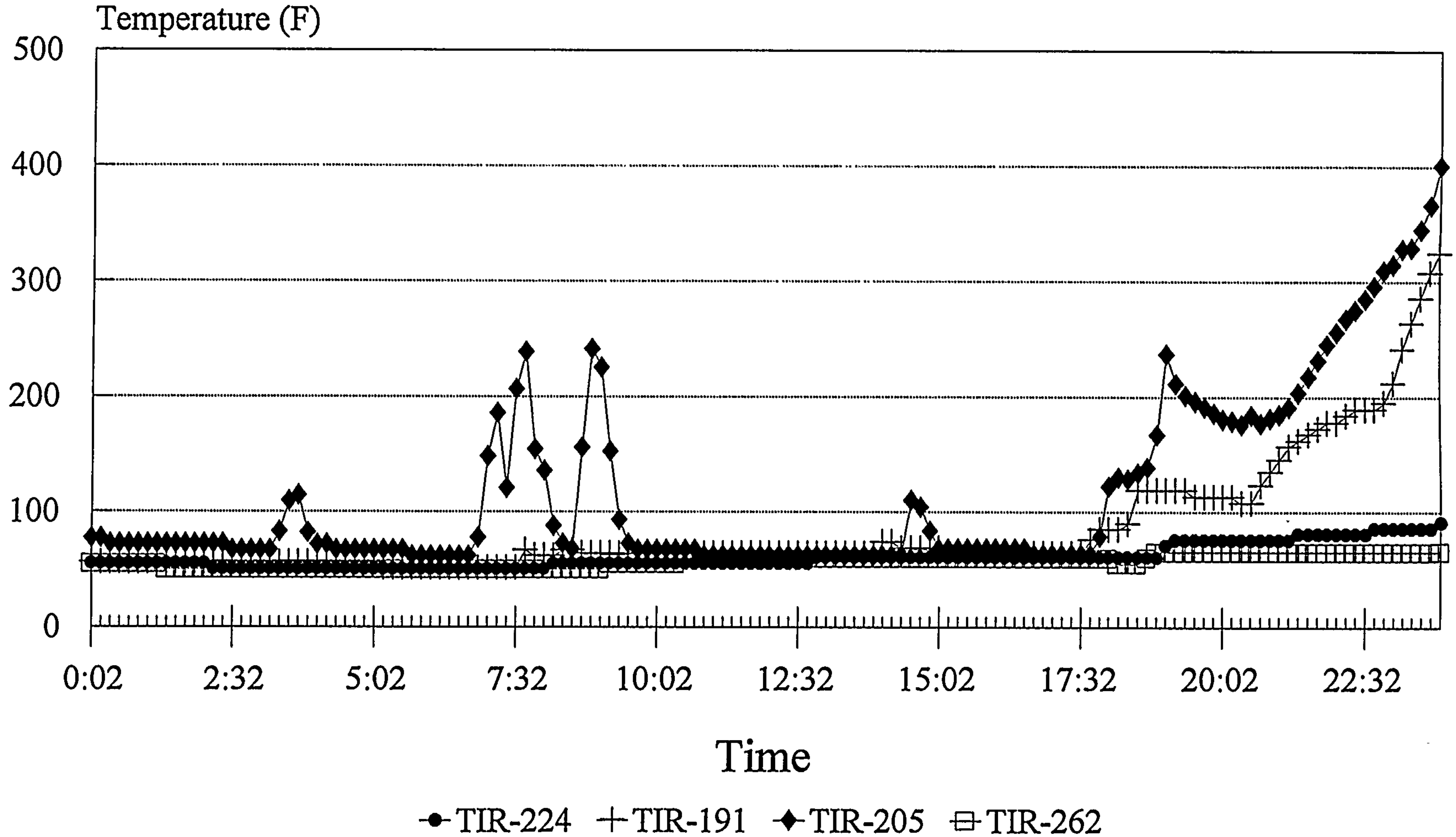

MT0518.CHT Lotus: MT051728.WK1

# Process Temperatures
## 05/19/93



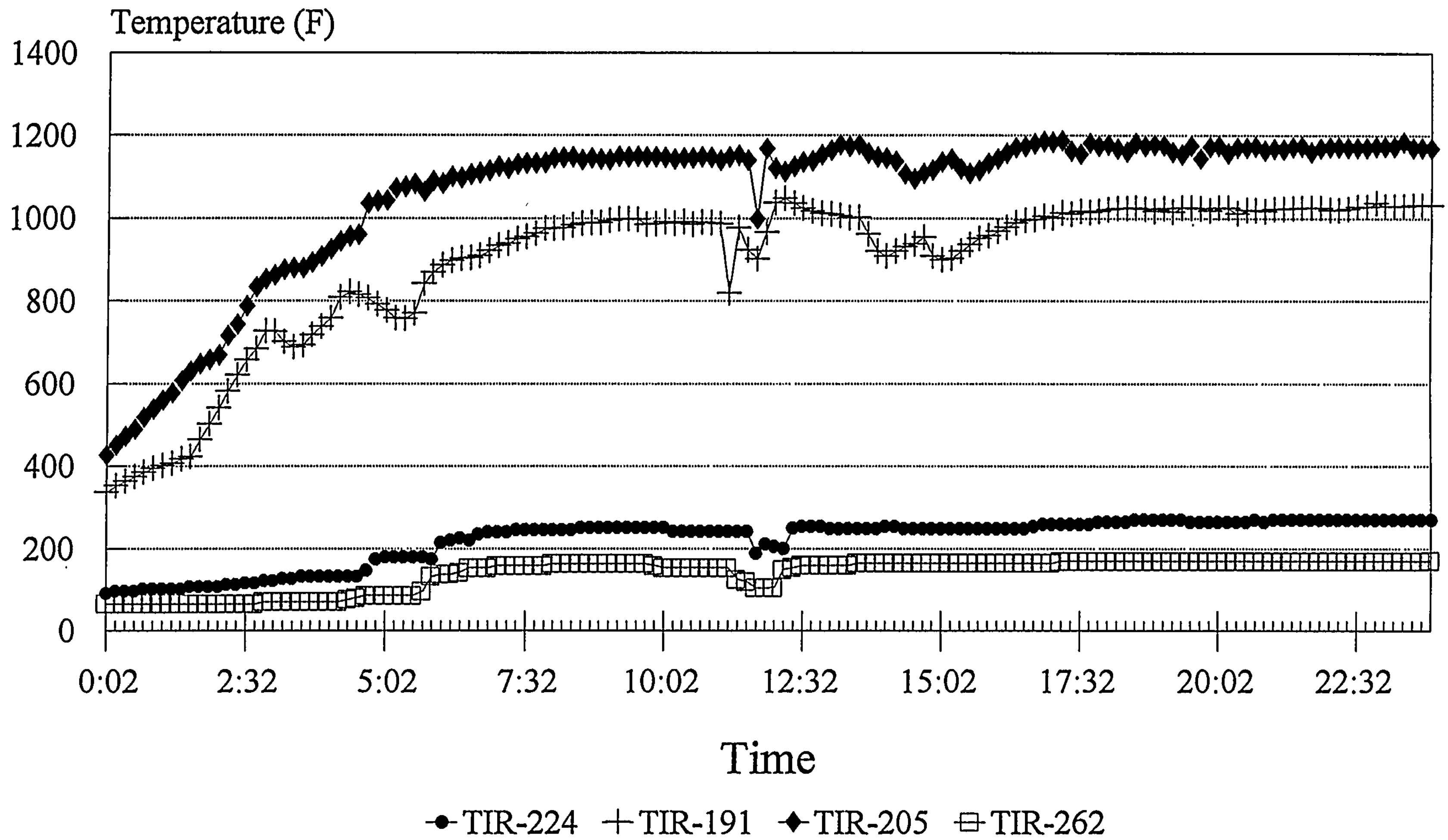

**MT0519.CHT Lotus: MT051728.WK1**

# Process Temperatures
## 05/20/93



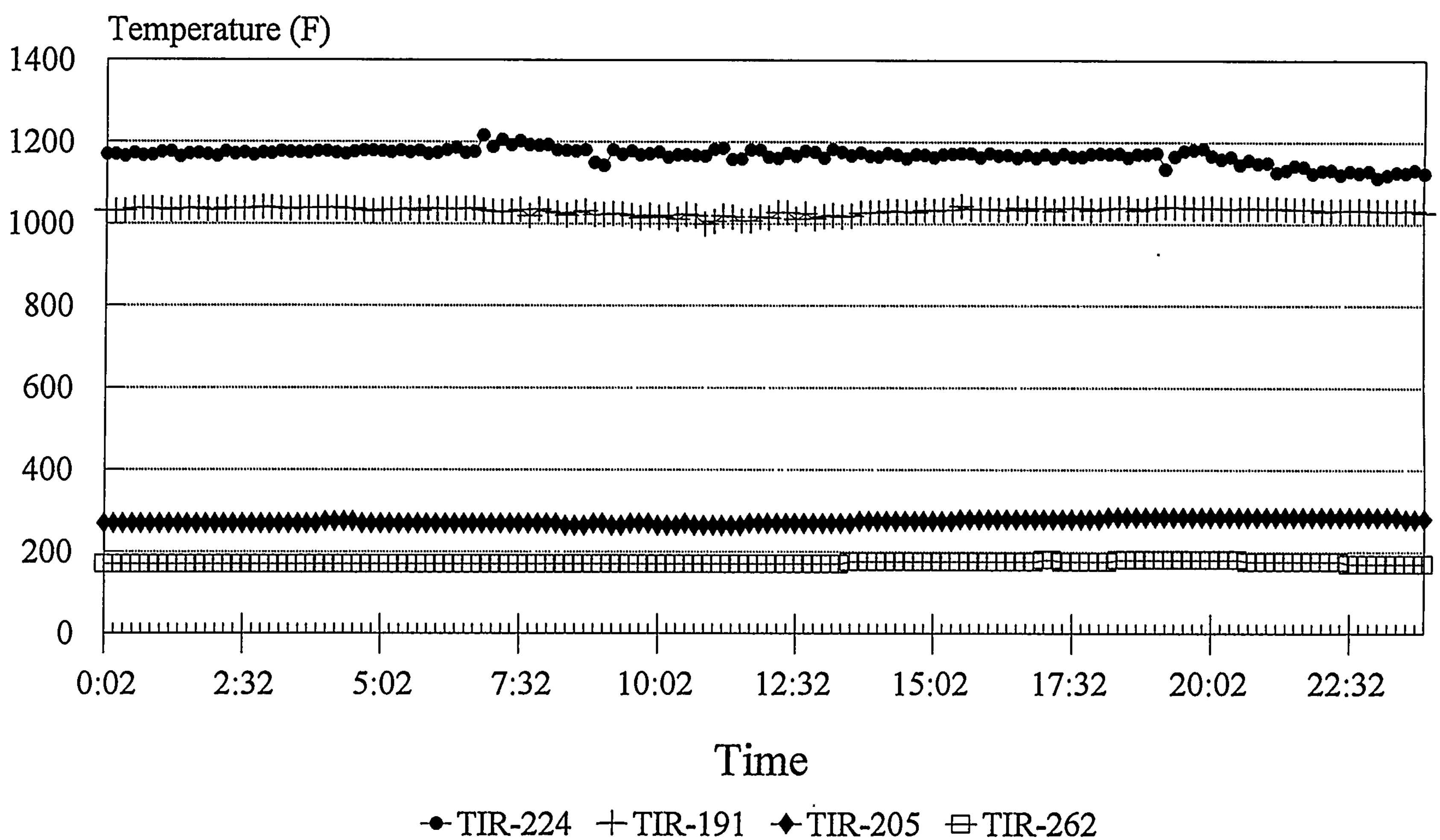

**MT0520.CHT Lotus: MT051728.WK1**

# Process Temperatures
## 05/21/93



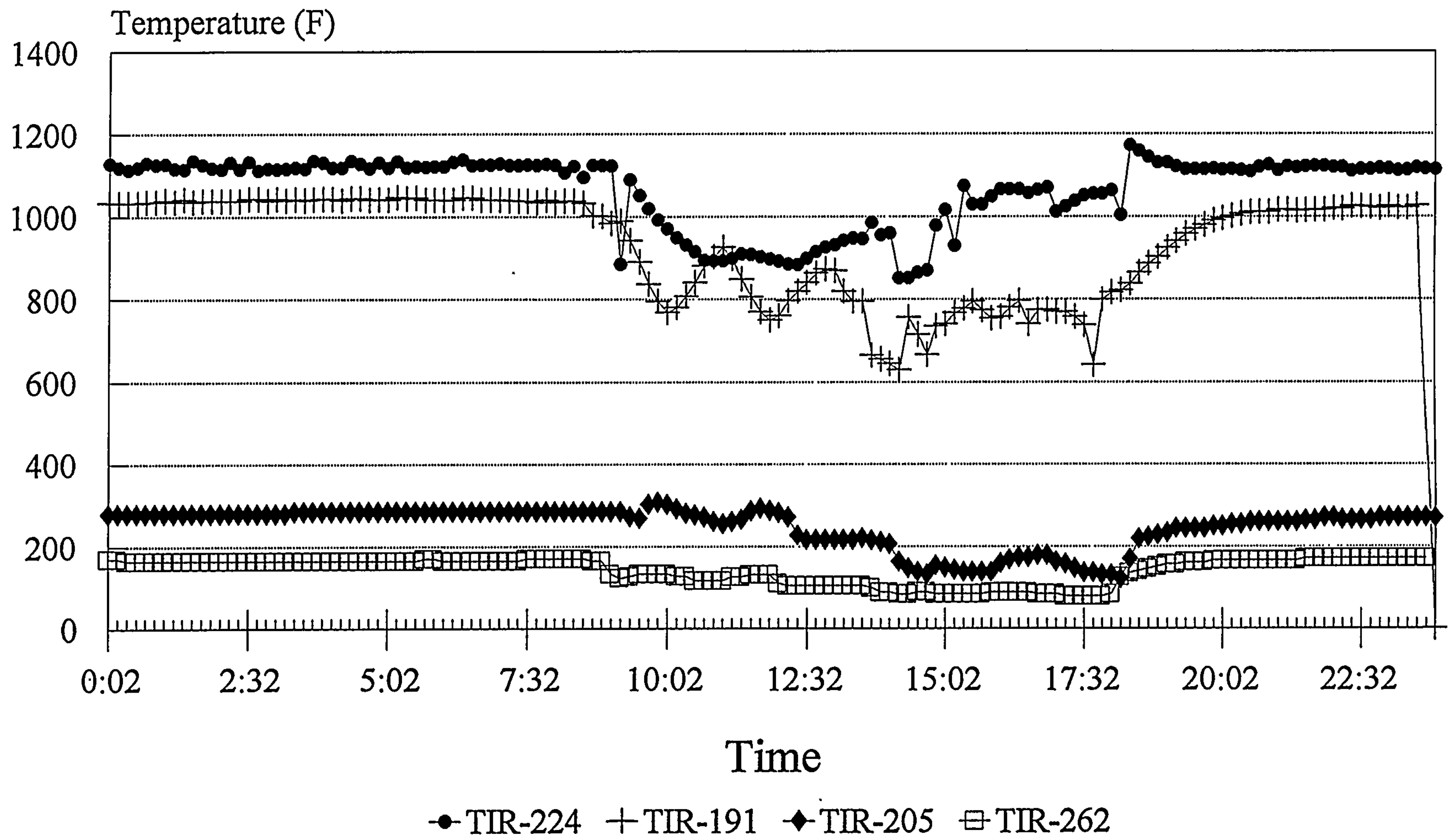

MT0521.CHT Lotus: MT051728.WK1

# Process Temperatures
## 05/22/93



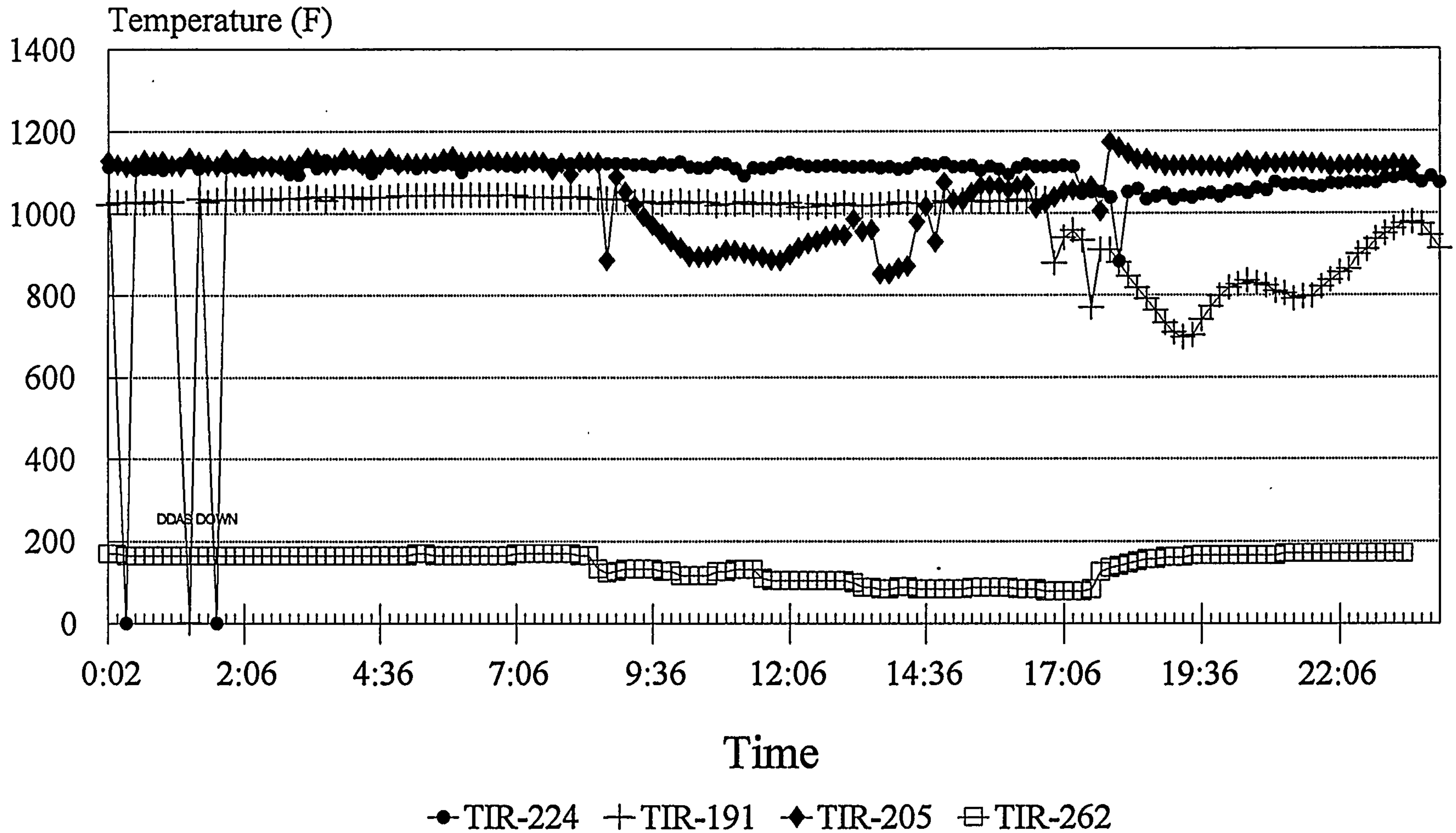

MT0522.CHT Lotus: MT051728.WK1

# Process Temperatures
## 05/23/93



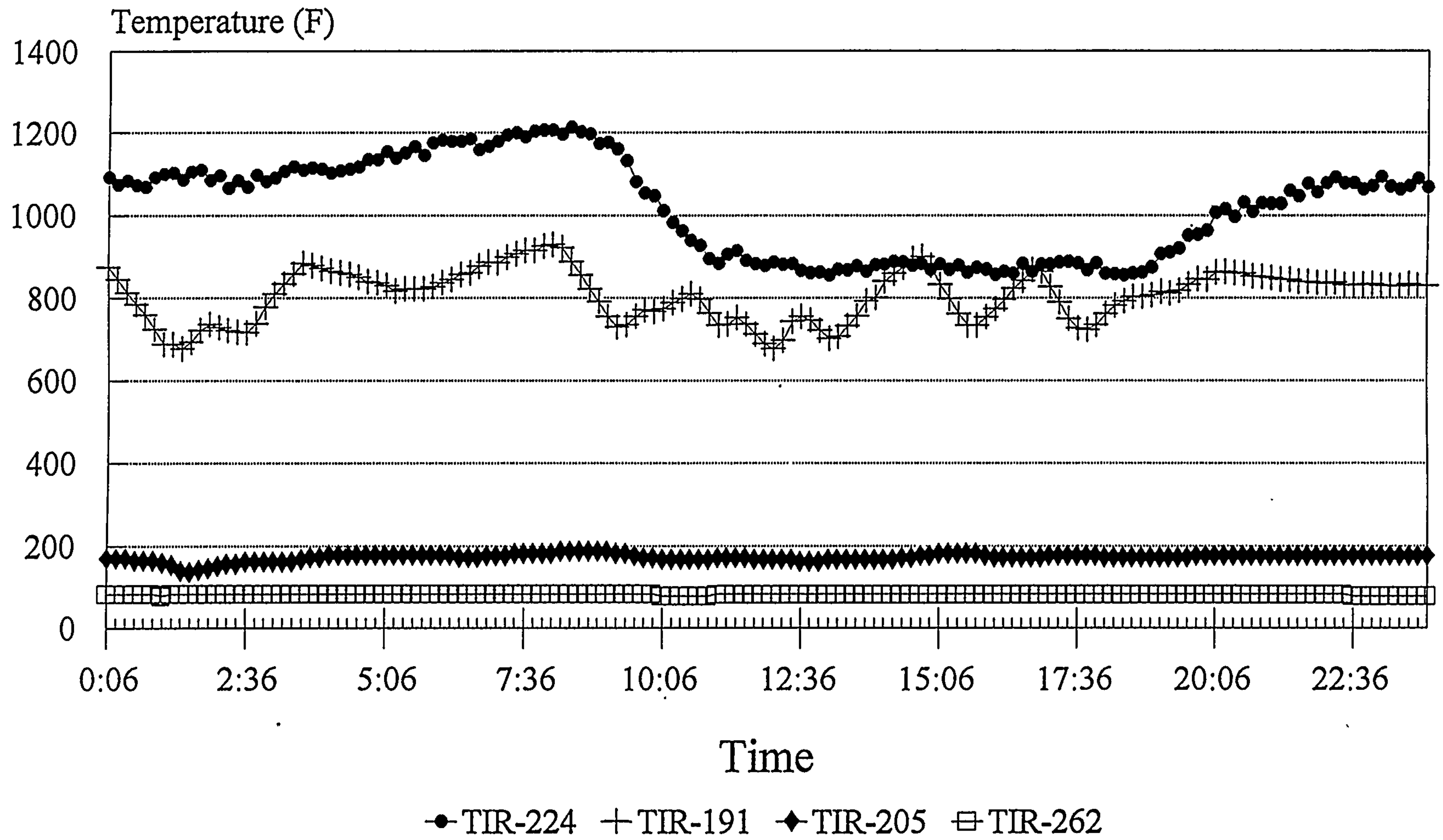

**MT0523.CHT Lotus: MT051728.WK1**

# Process Temperatures
## 05/24/93



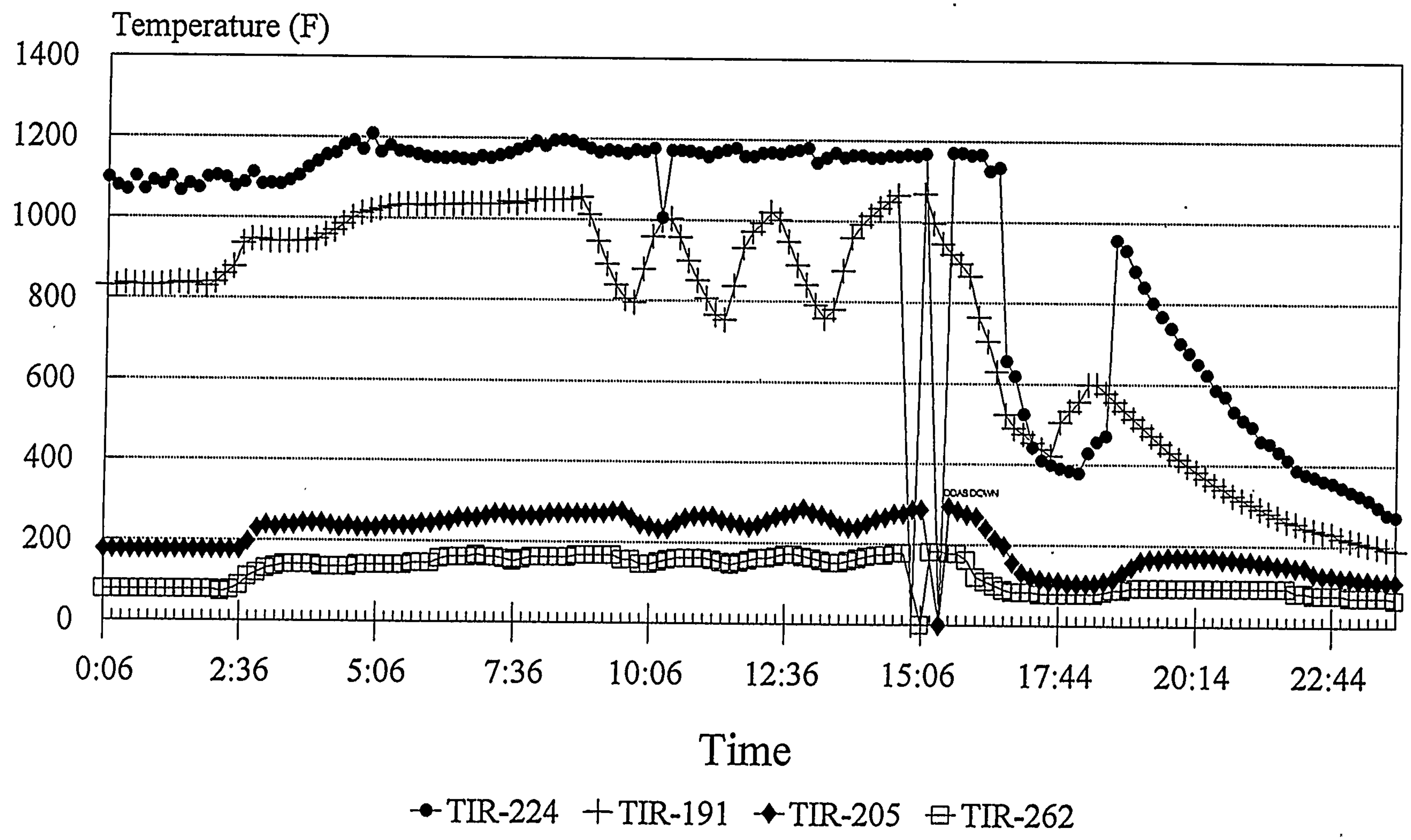

MT0524.CHT Lotus: MT051728.WK1

# Process Temperatures
## 05/25/93



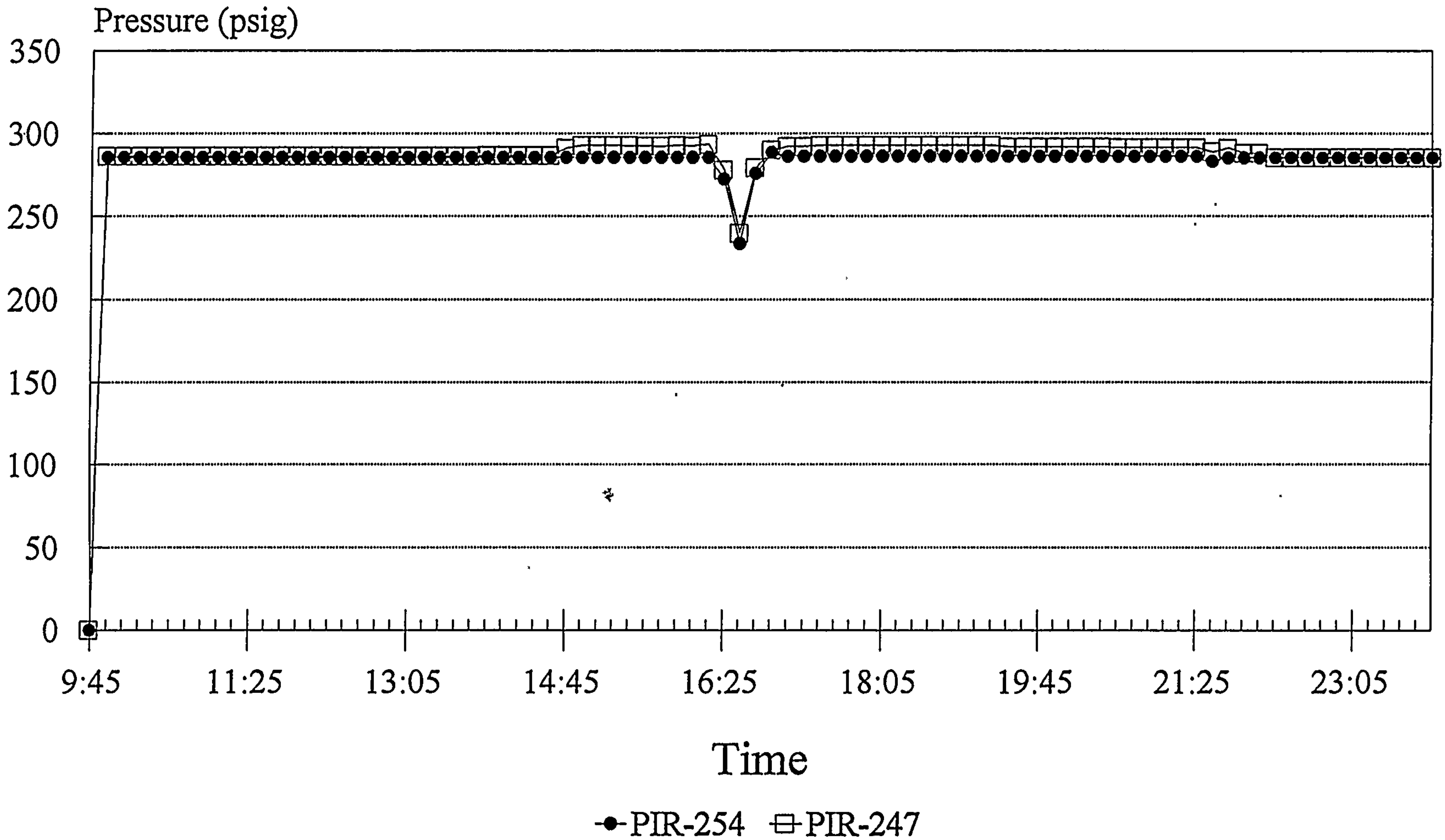

**MT0525.CHT Lotus: MT051728.WK1**

# Process Temperatures
## 05/26/93



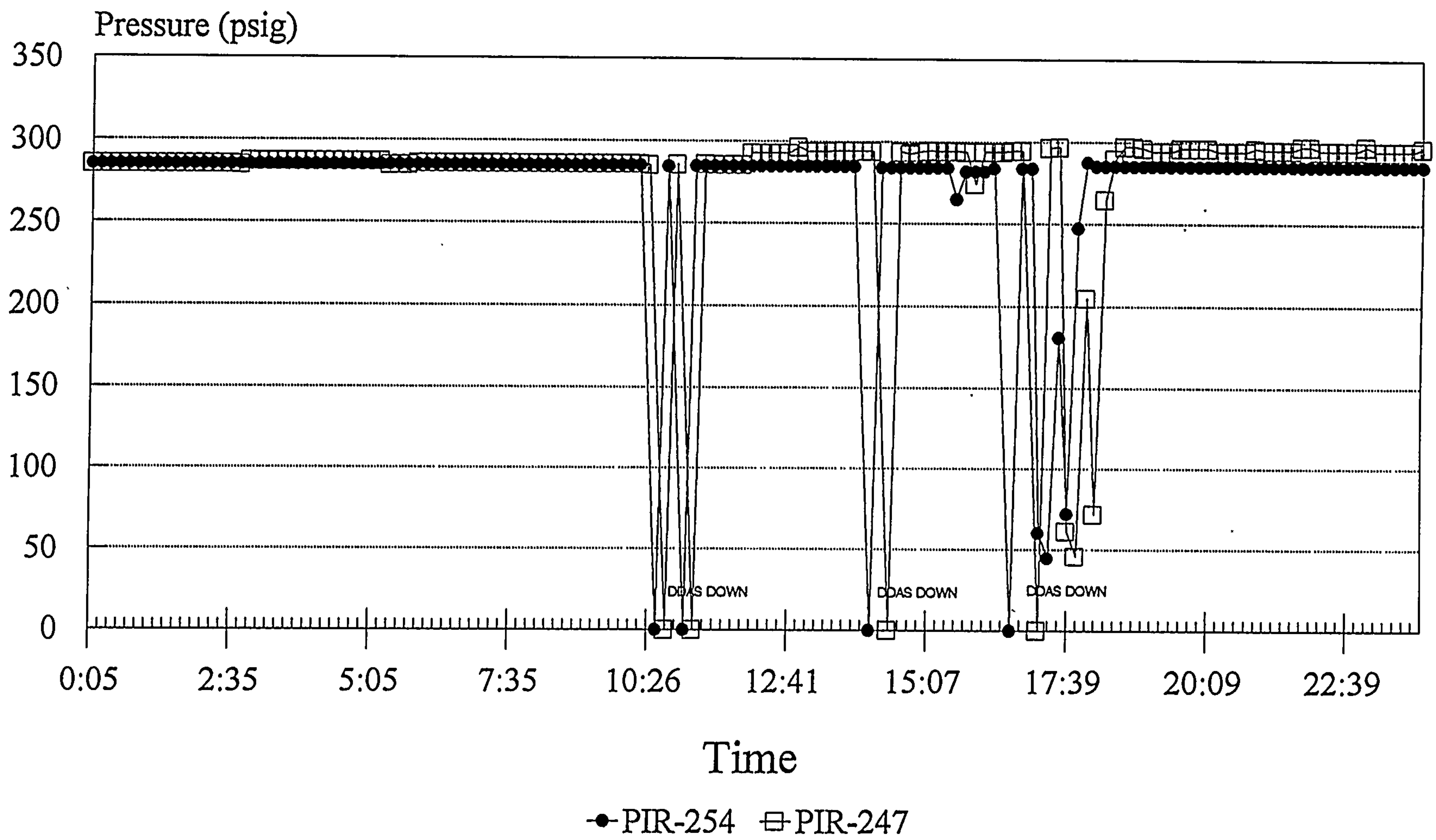

MT0526.CHT Lotus: MT051728.WK1

# Process Pressure
## 05/17/93



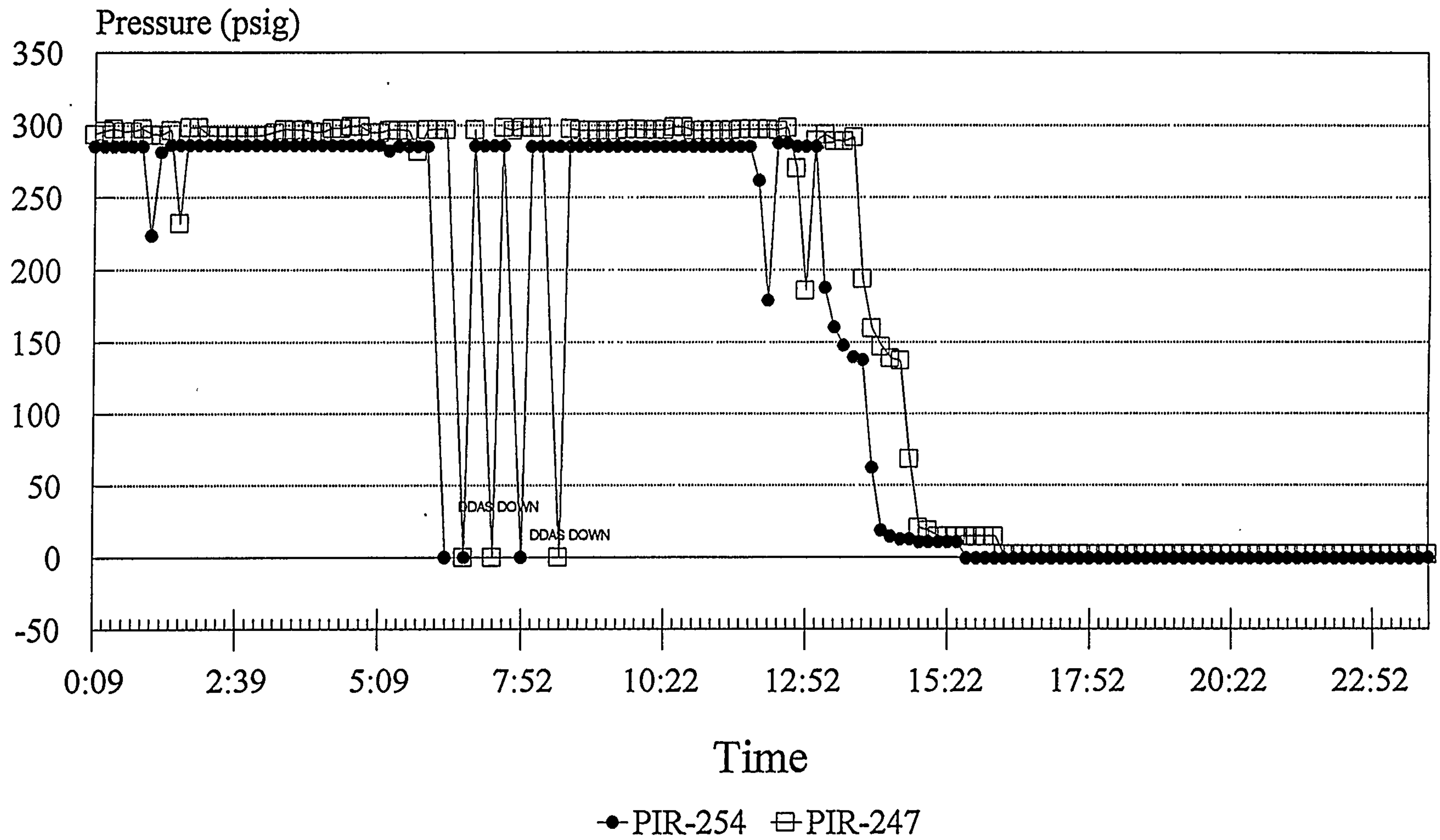

MP0517.CHT Lotus: MP051728.WK1

# Process Pressure
## 05/18/93



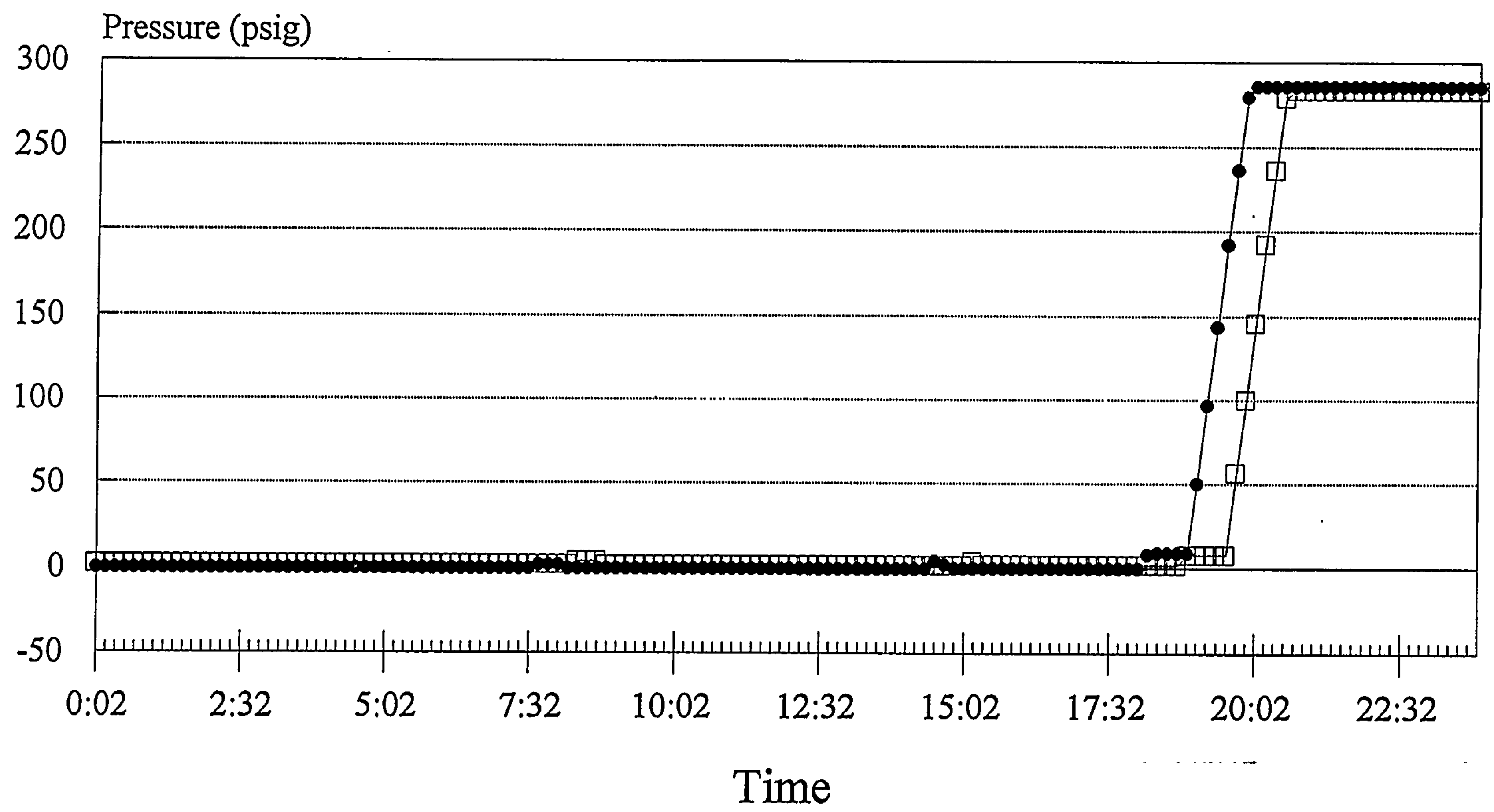

MP0518.CHT Lotus: MP051728.WK1

# Process Pressure
## 05/19/93



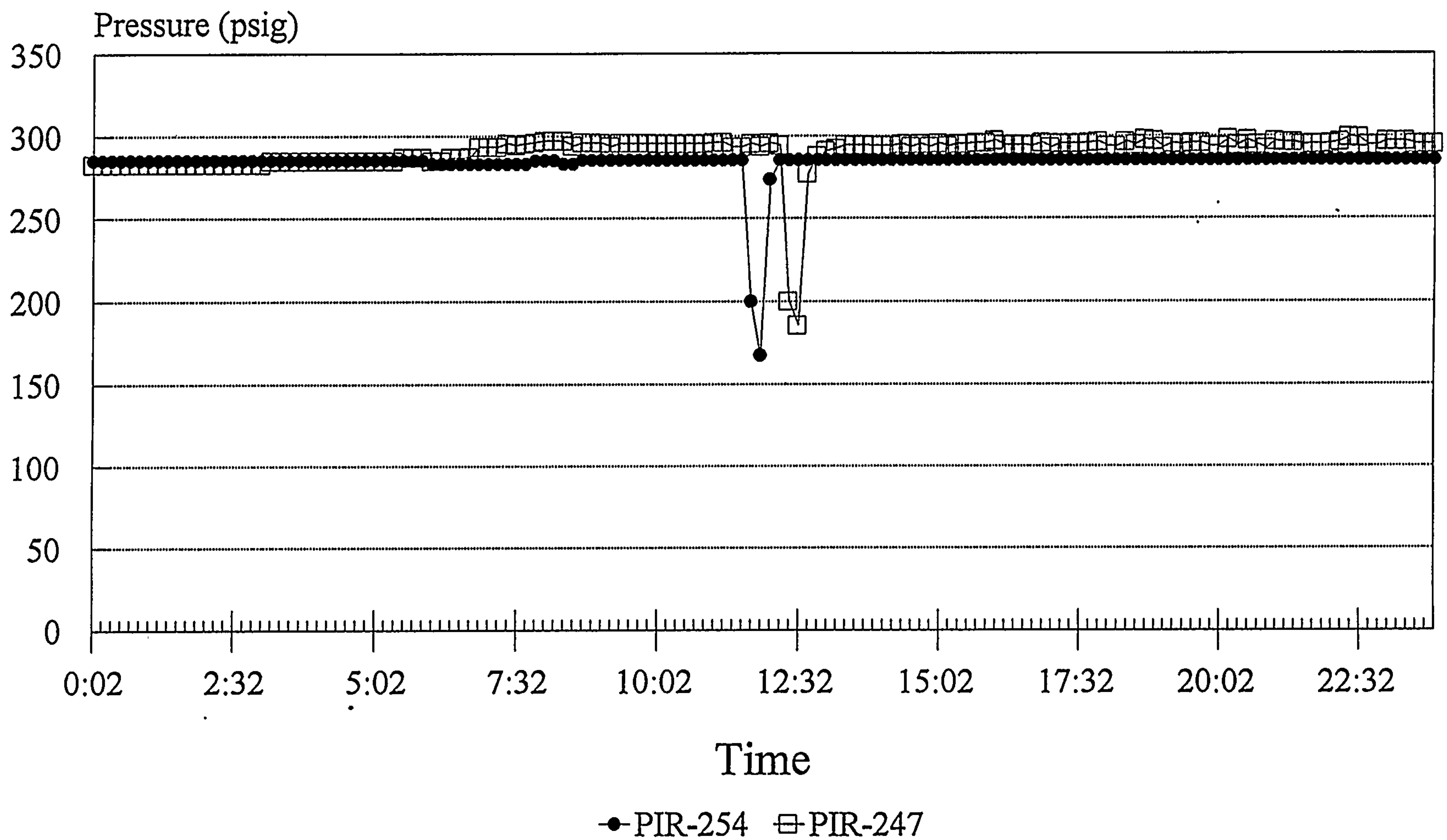

**MP0519.CHT Lotus: MP051728.WK1**

# Process Pressure
## 05/20/93



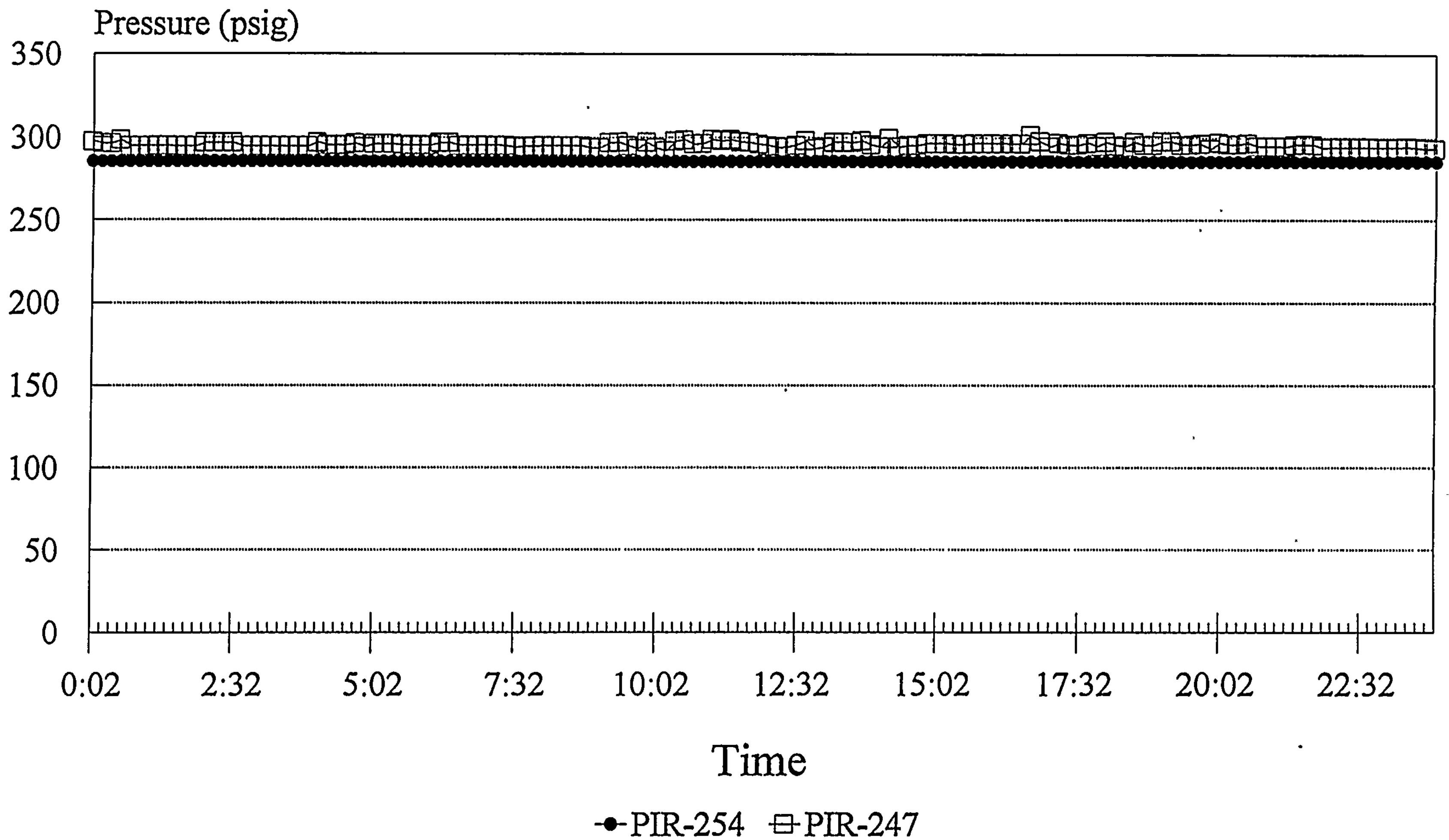

**MP0520.CHT Lotus: MP051728.WK1**

# Process Pressure
## 05/21/93



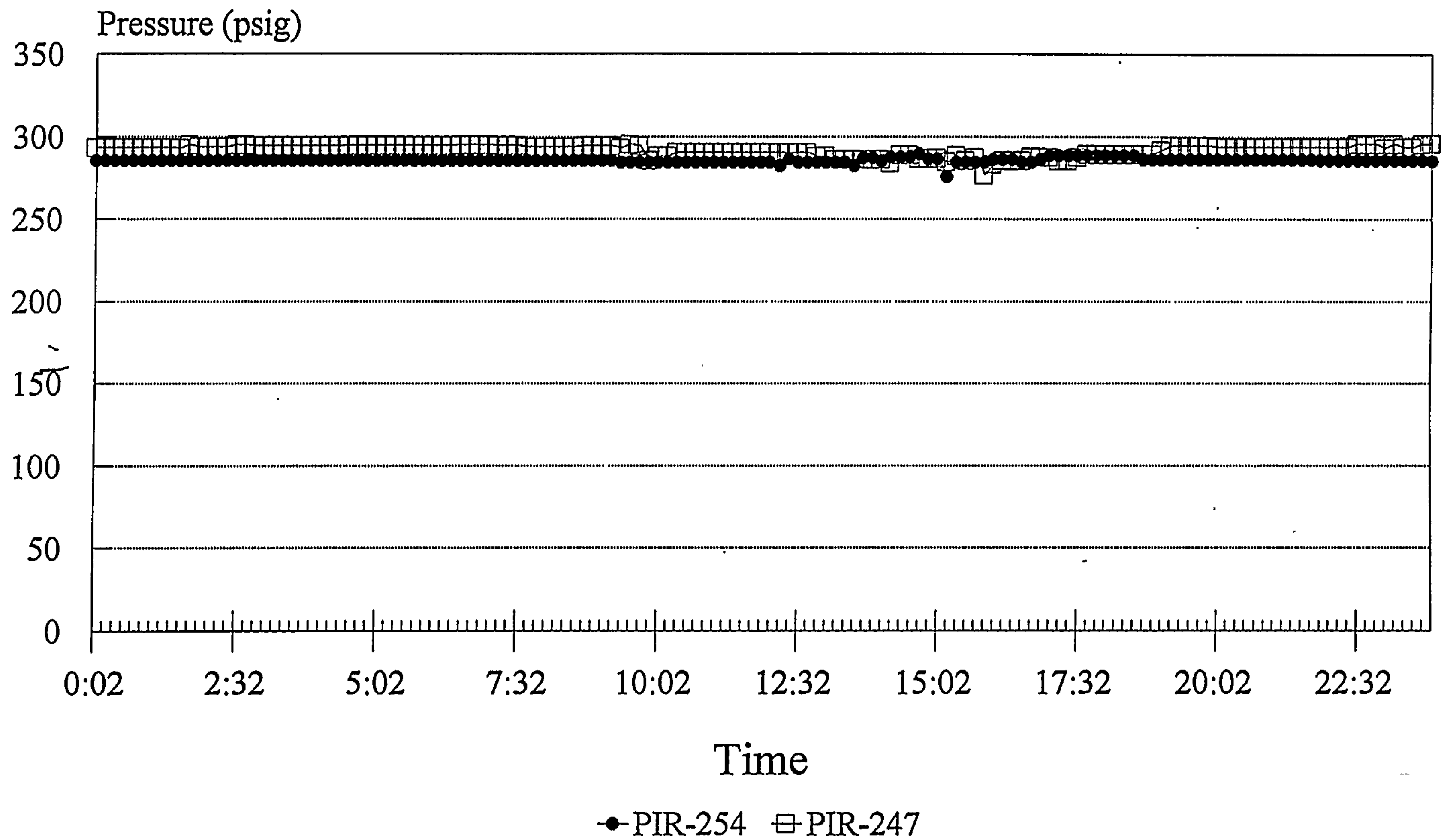

MP0521.CHT Lotus: MP051728.WK1

# Process Pressure
## 05/22/93



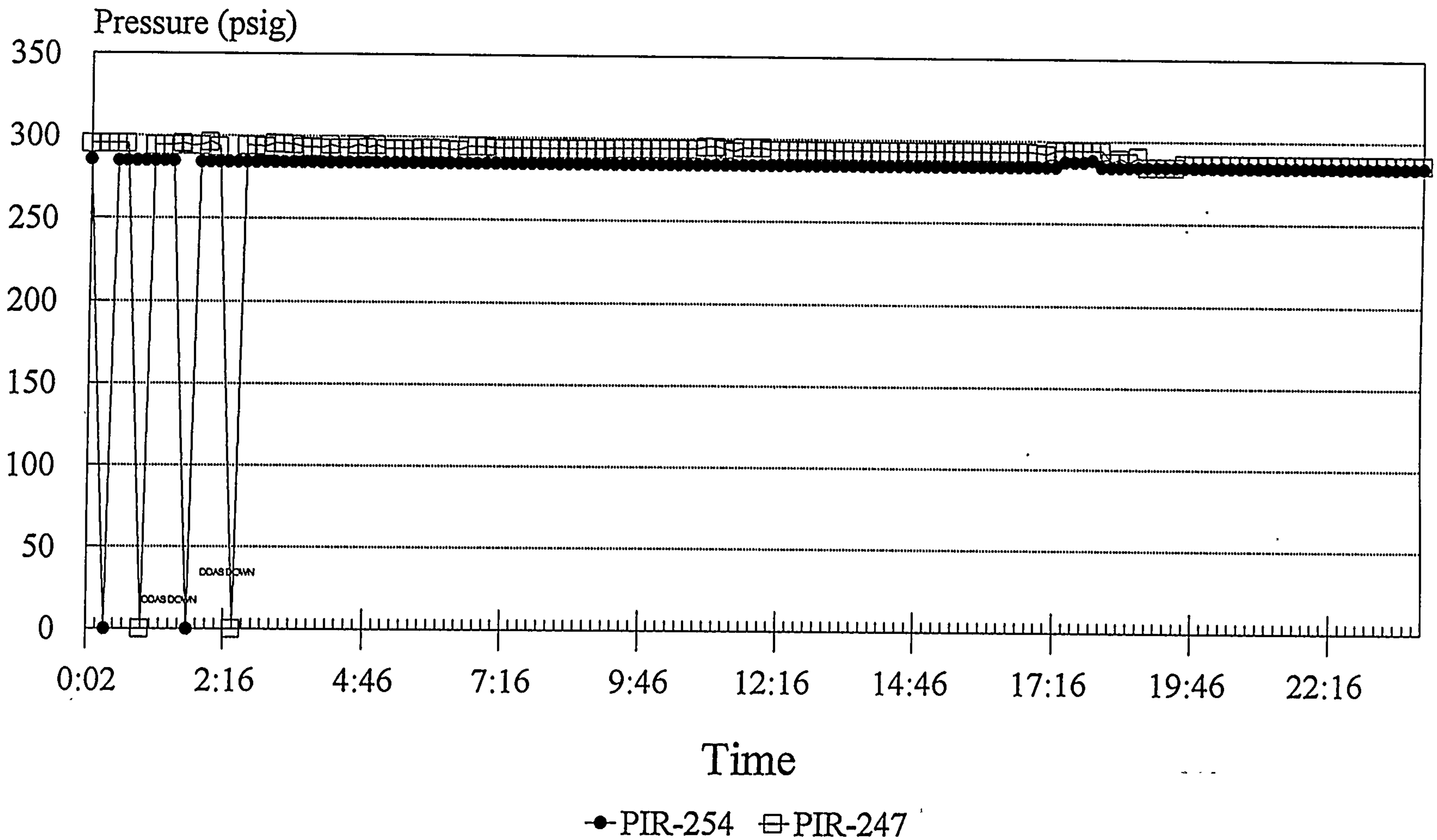

MP0522.CHT Lotus: MP051728.WK1

# Process Pressure
## 05/23/93



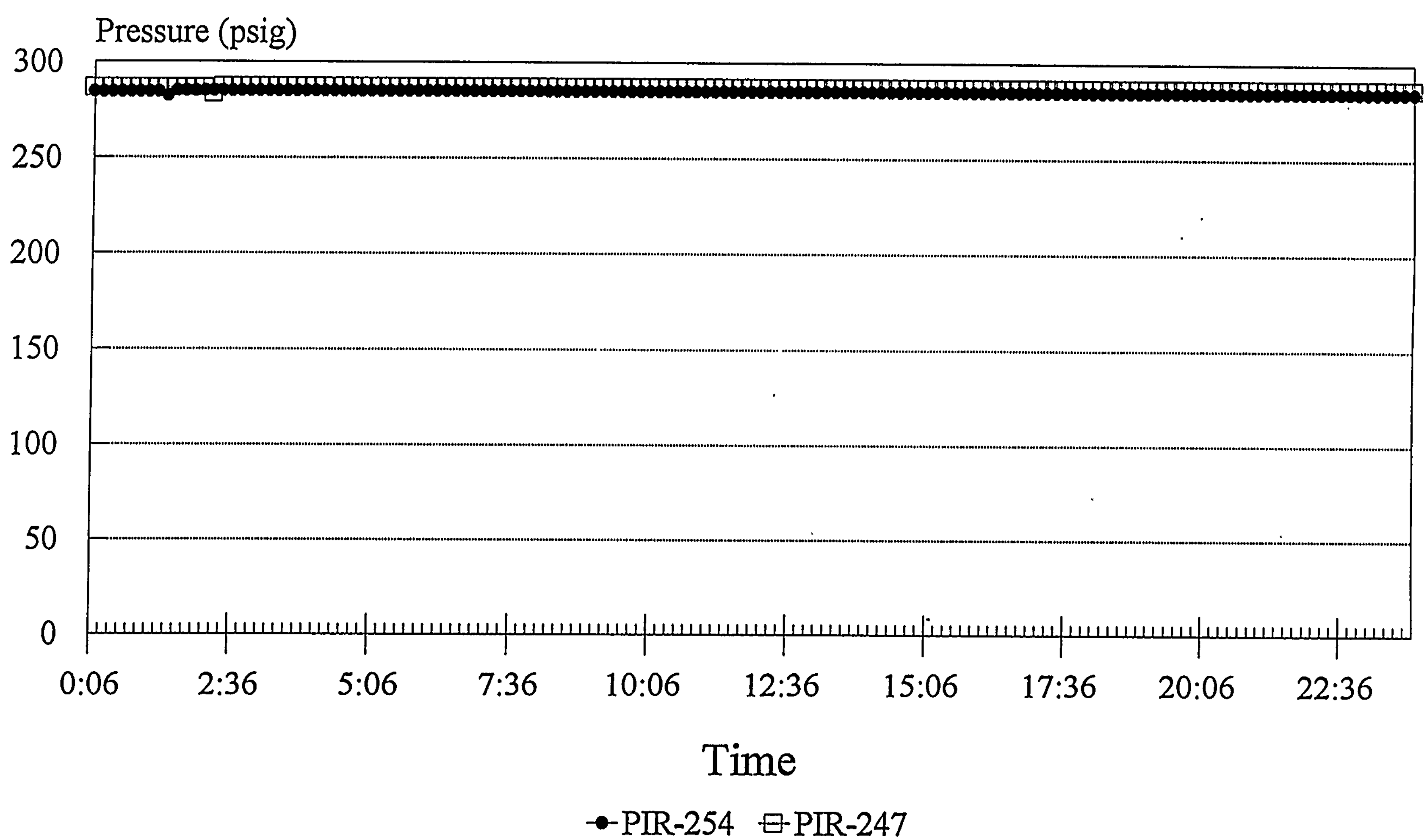

**MP0523.CHT Lotus: MP051728.WK1**

# Process Pressure
## 05/24/93



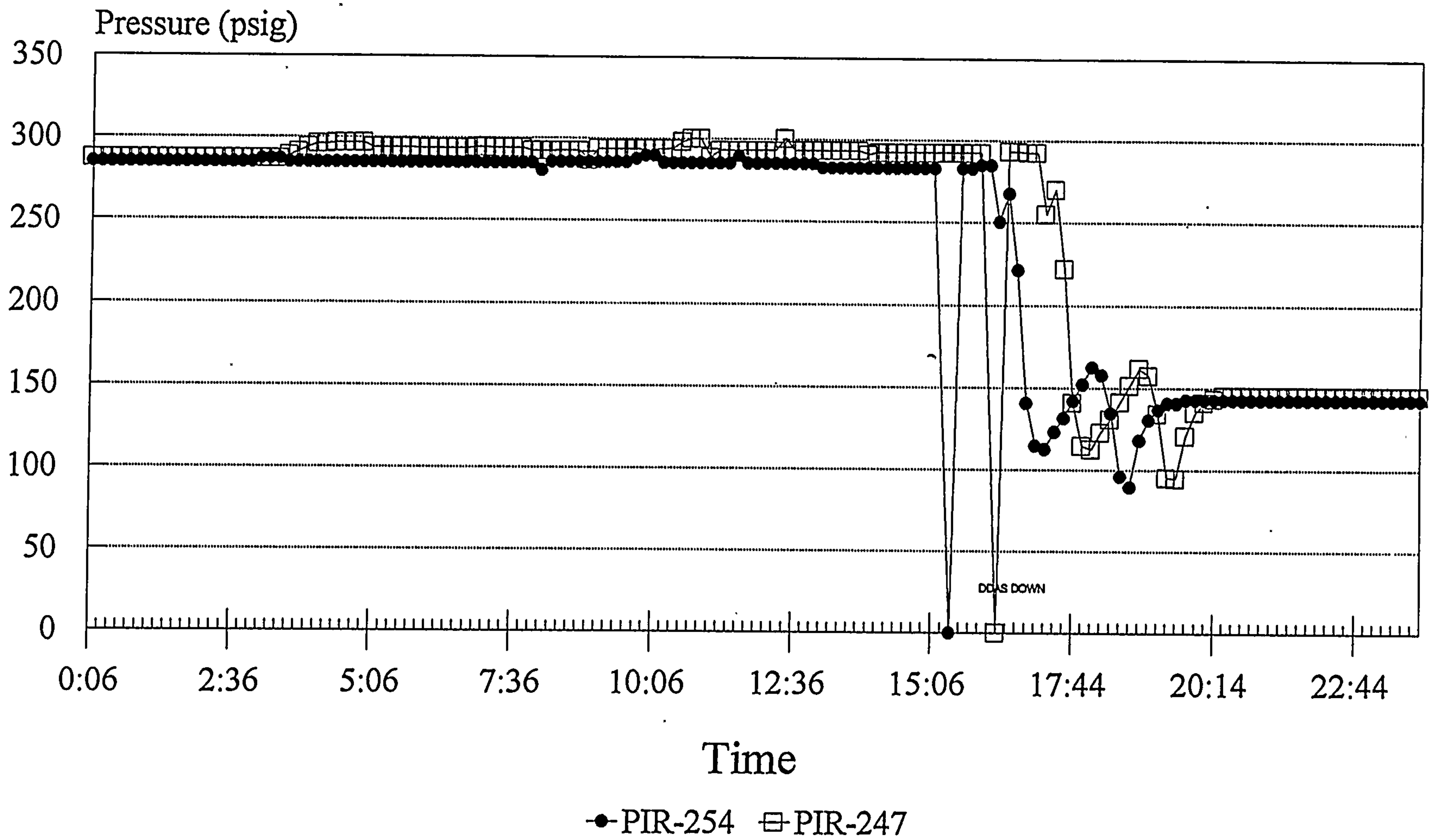

MP0524.CHT Lotus: MP051728.WK1

# Process Pressure
## 05/25/93



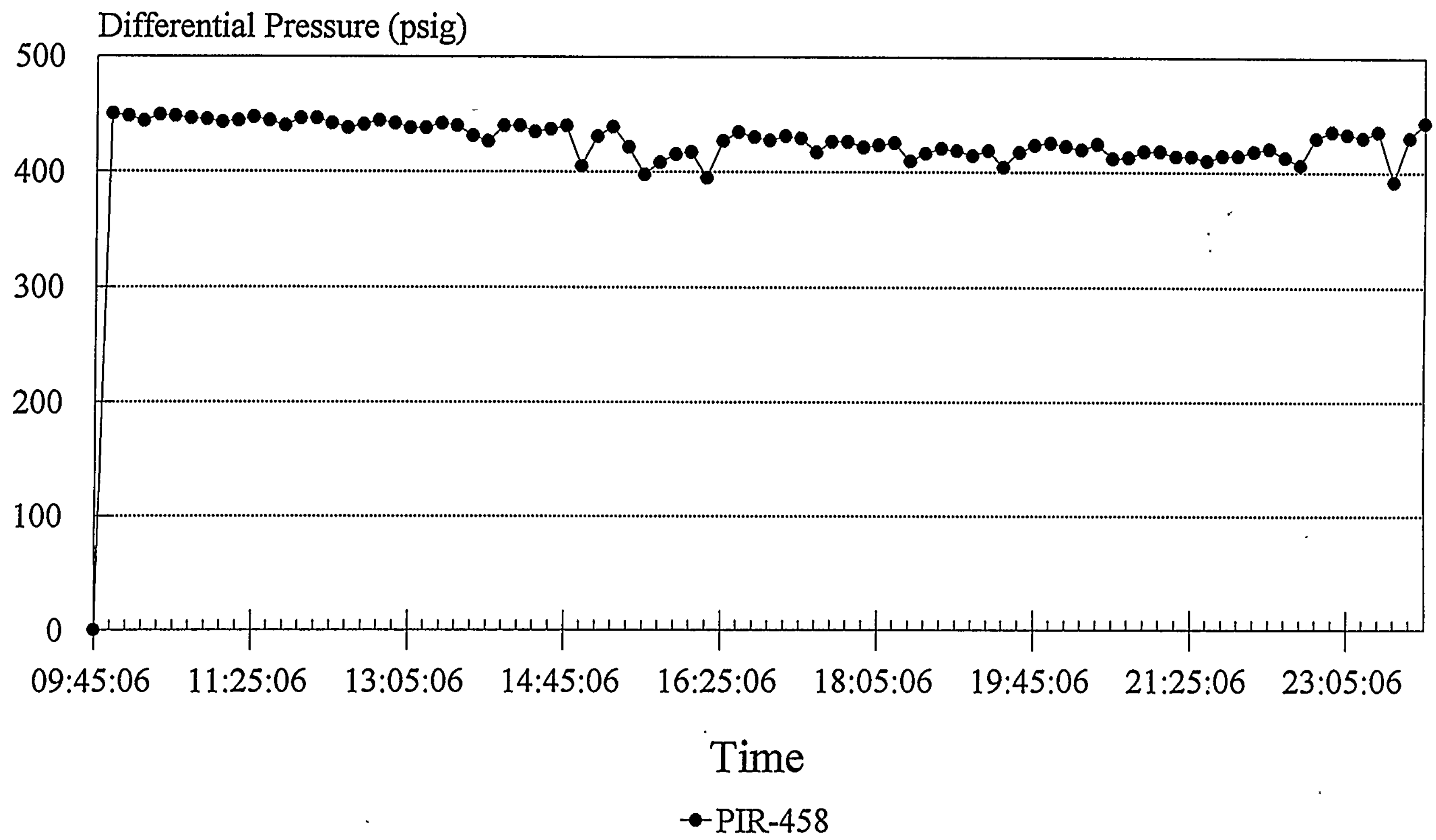

MP0525.CHT Lotus: MP051728.WK1

# Process Pressure
## 05/26/93



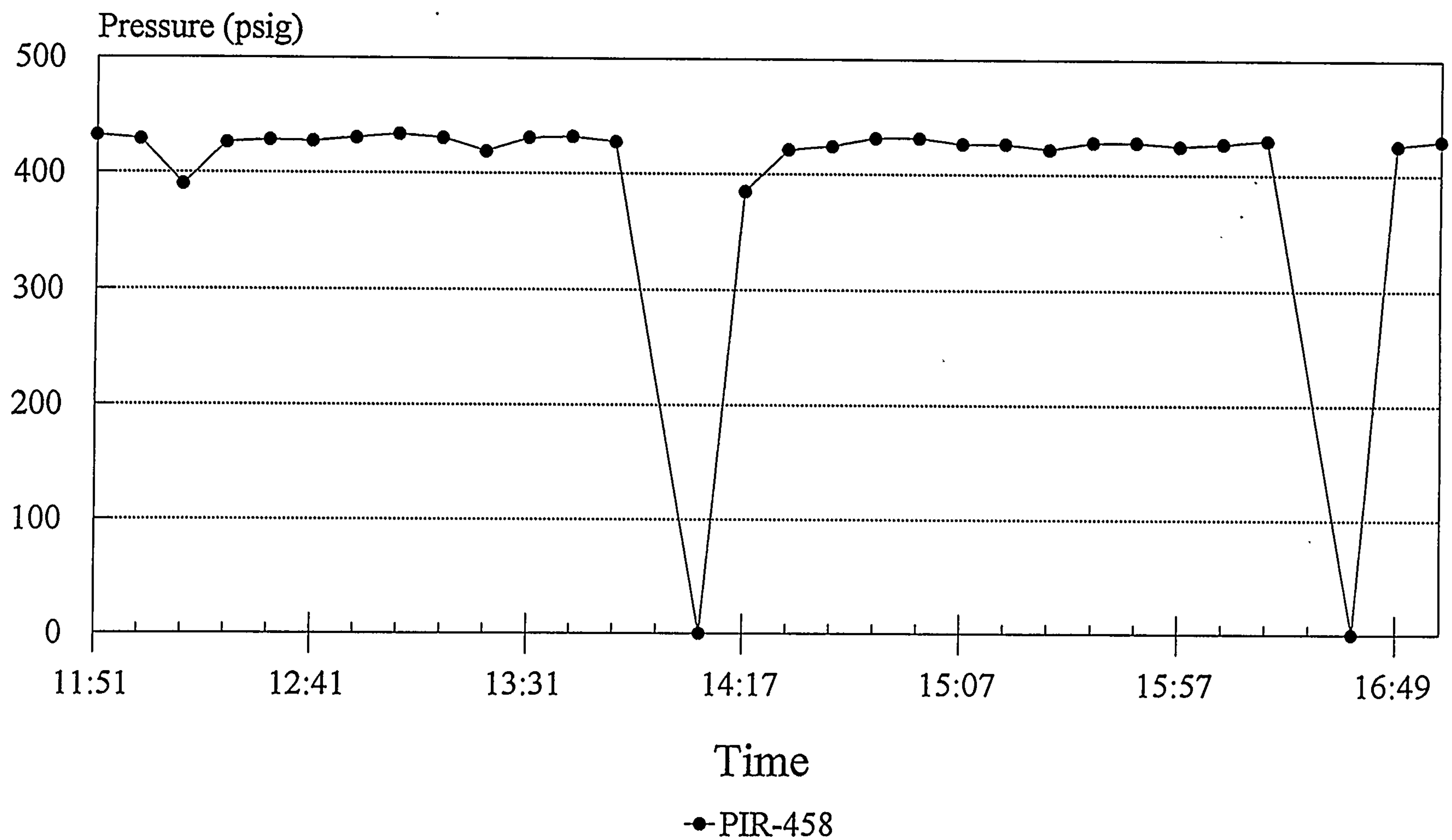

**MP0526.CHT   Lotus: MP051728.WK1**

# Filter Blowback Pressure
## 05/17/93



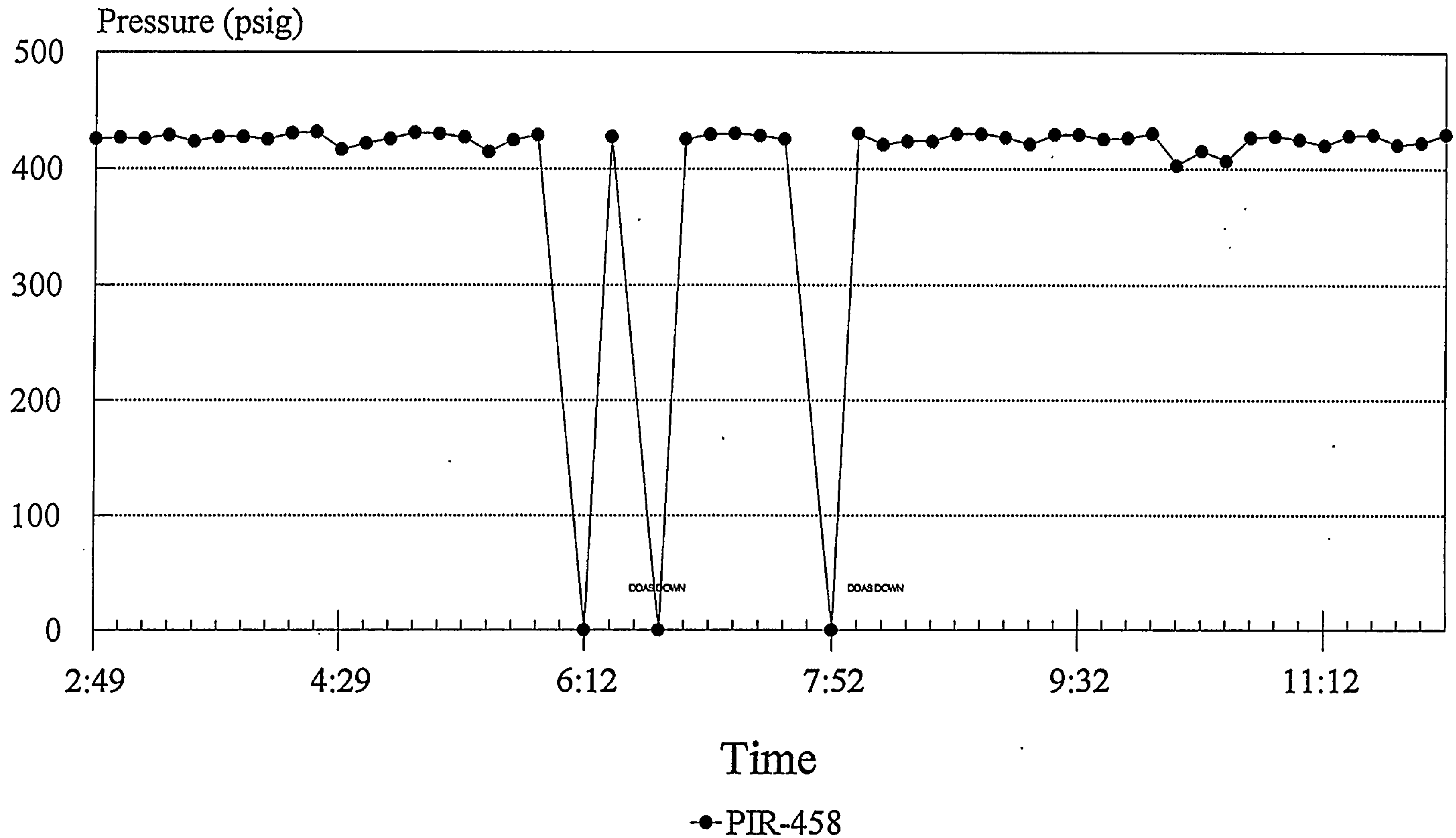

**MFBP0517.PRS  Lotus: MBP51728.WK1**

# Filter Blowback Pressure
## 05/18/93



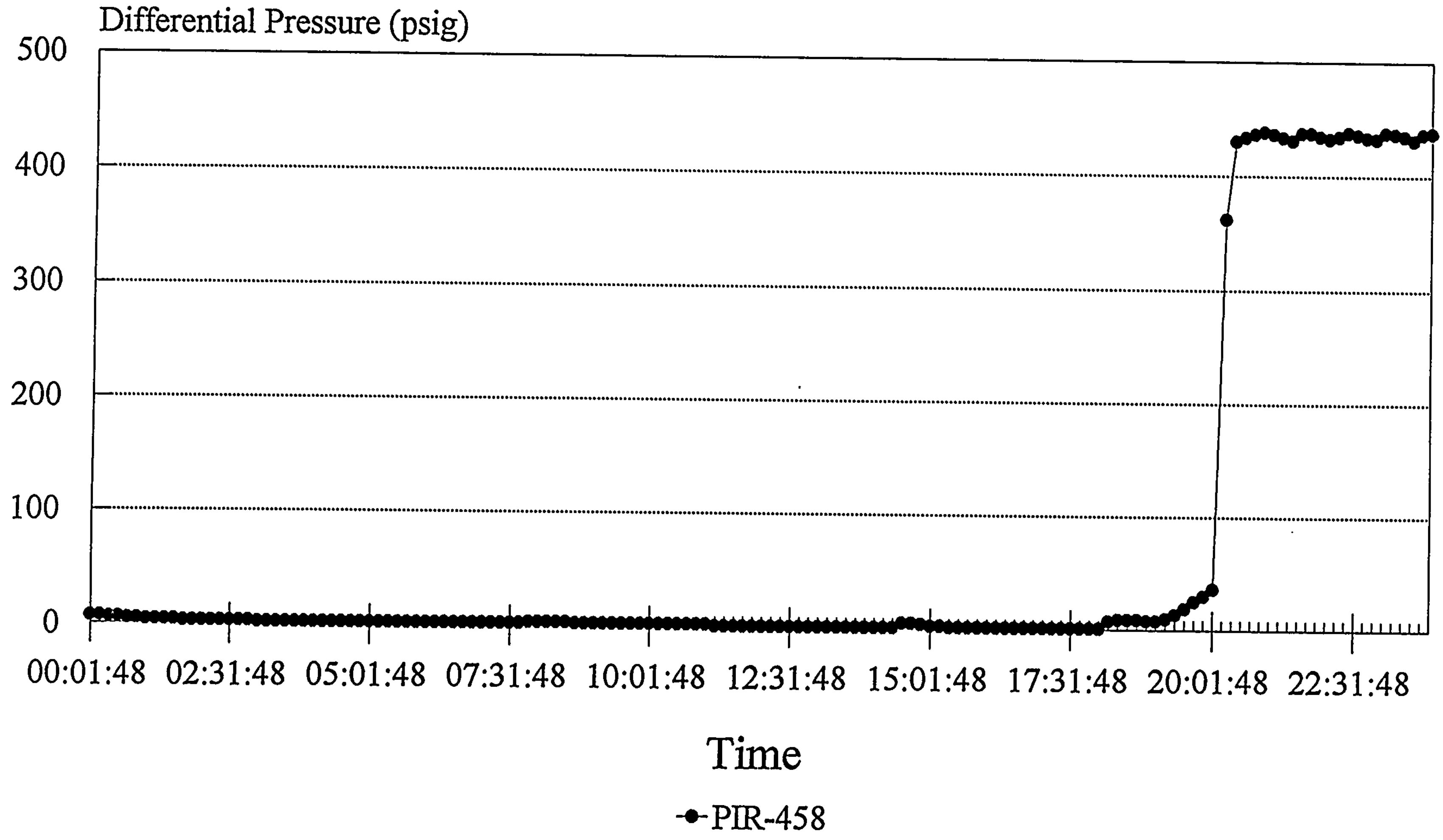

MFBP0518.PRS    Lotus: MBP51728.WK1

# Filter Blowback Pressure
## 05/19/93



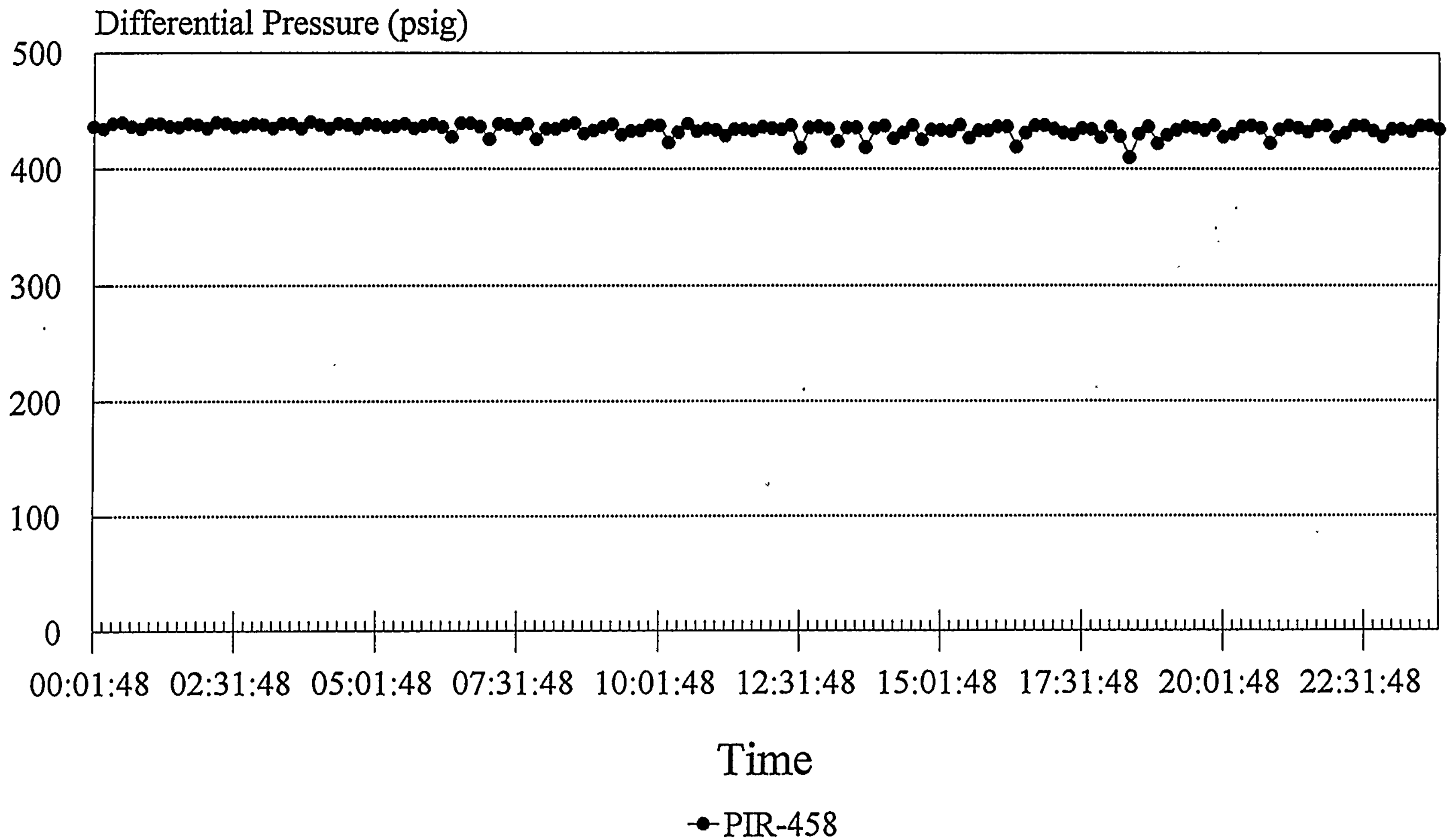

MFBP0519.PRS Lotus: MBP51728.WK1

# Filter Blowback Pressure
## 05/20/93



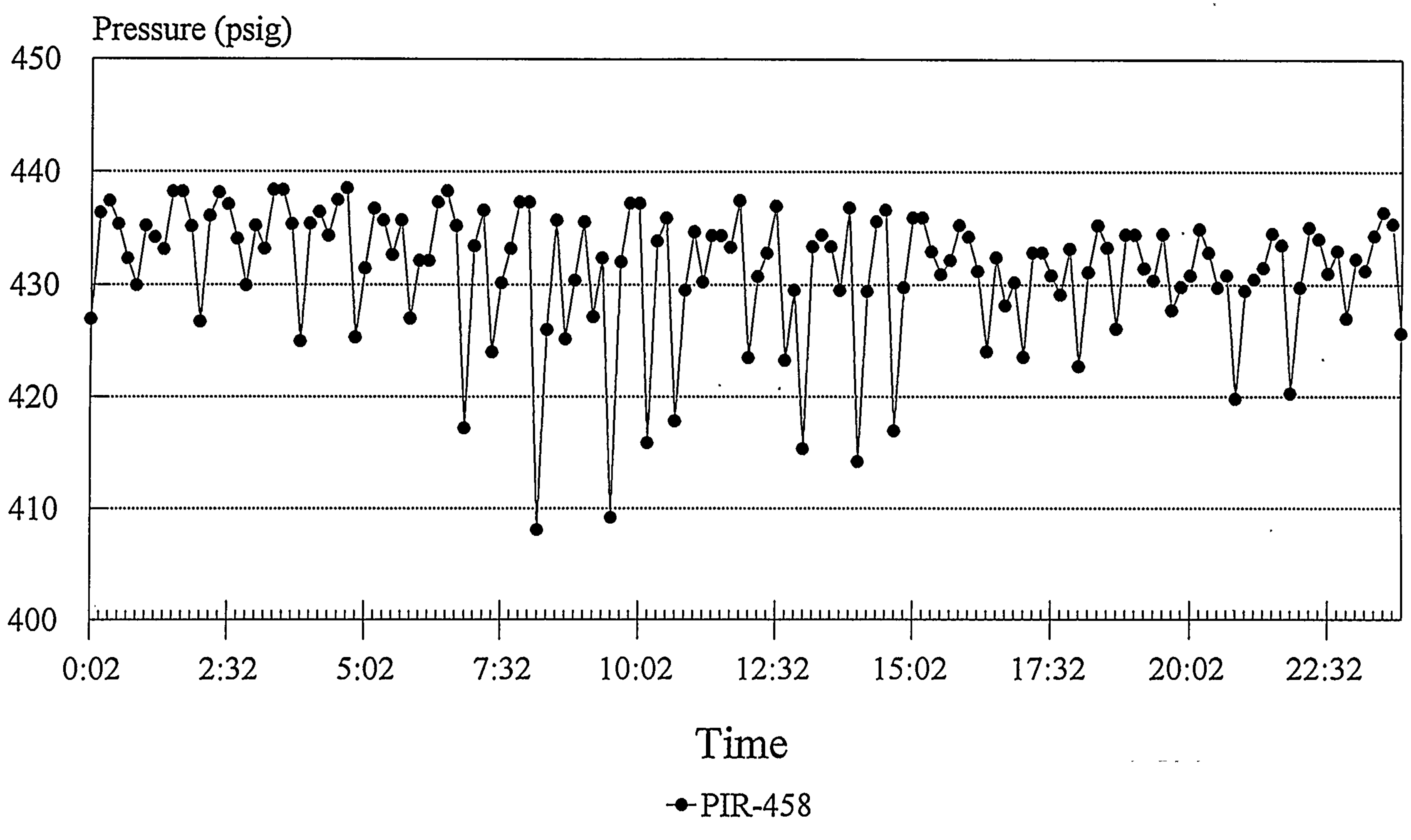

MFBP0520.PRS Lotus: MBP51728.WK1

# Filter Blowback Pressure
## 05/21/93



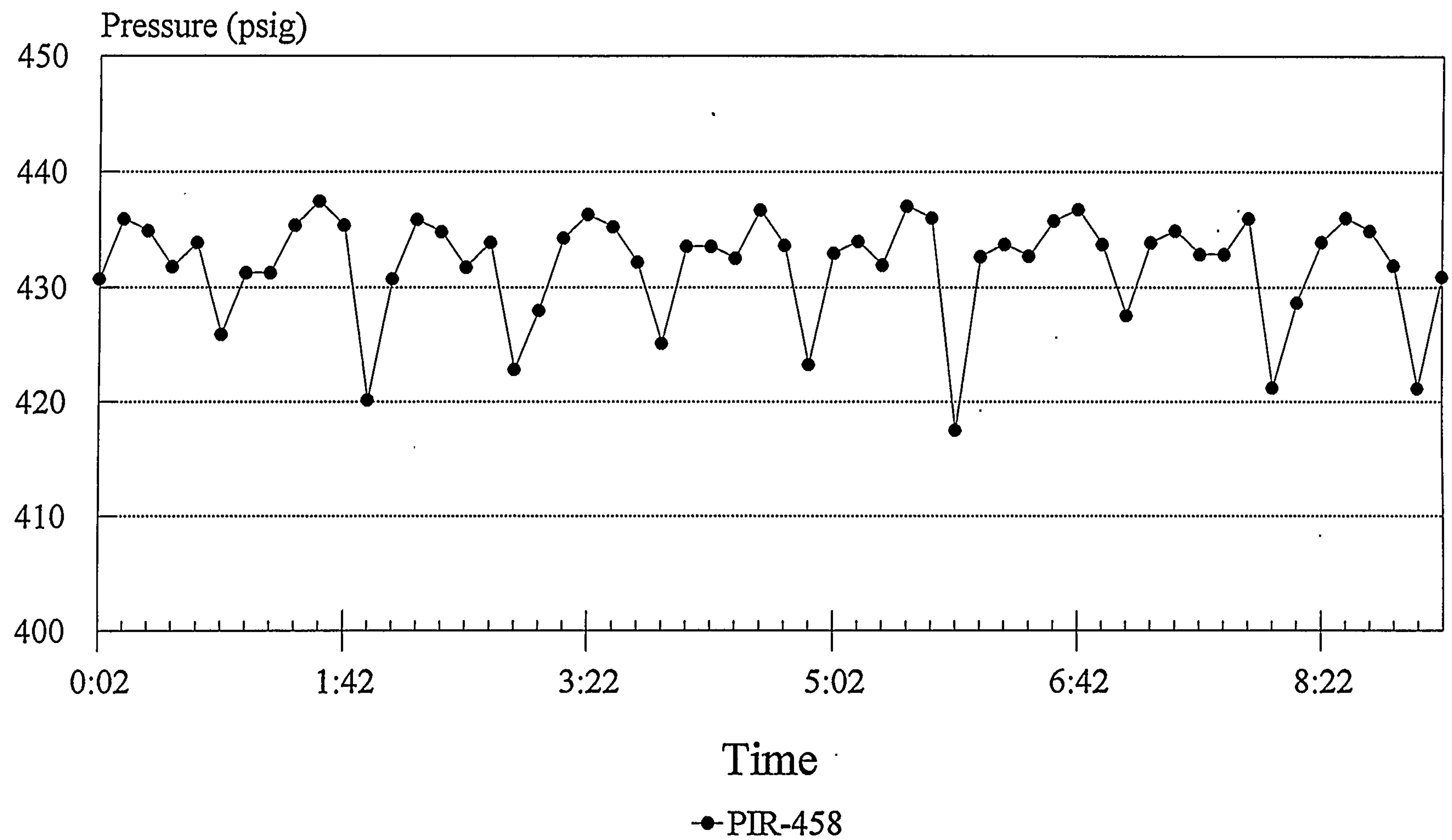

MFBP0521.PRS Lotus: MBP51728.WK1

# Filter Blowback Pressure
## 05/22/93



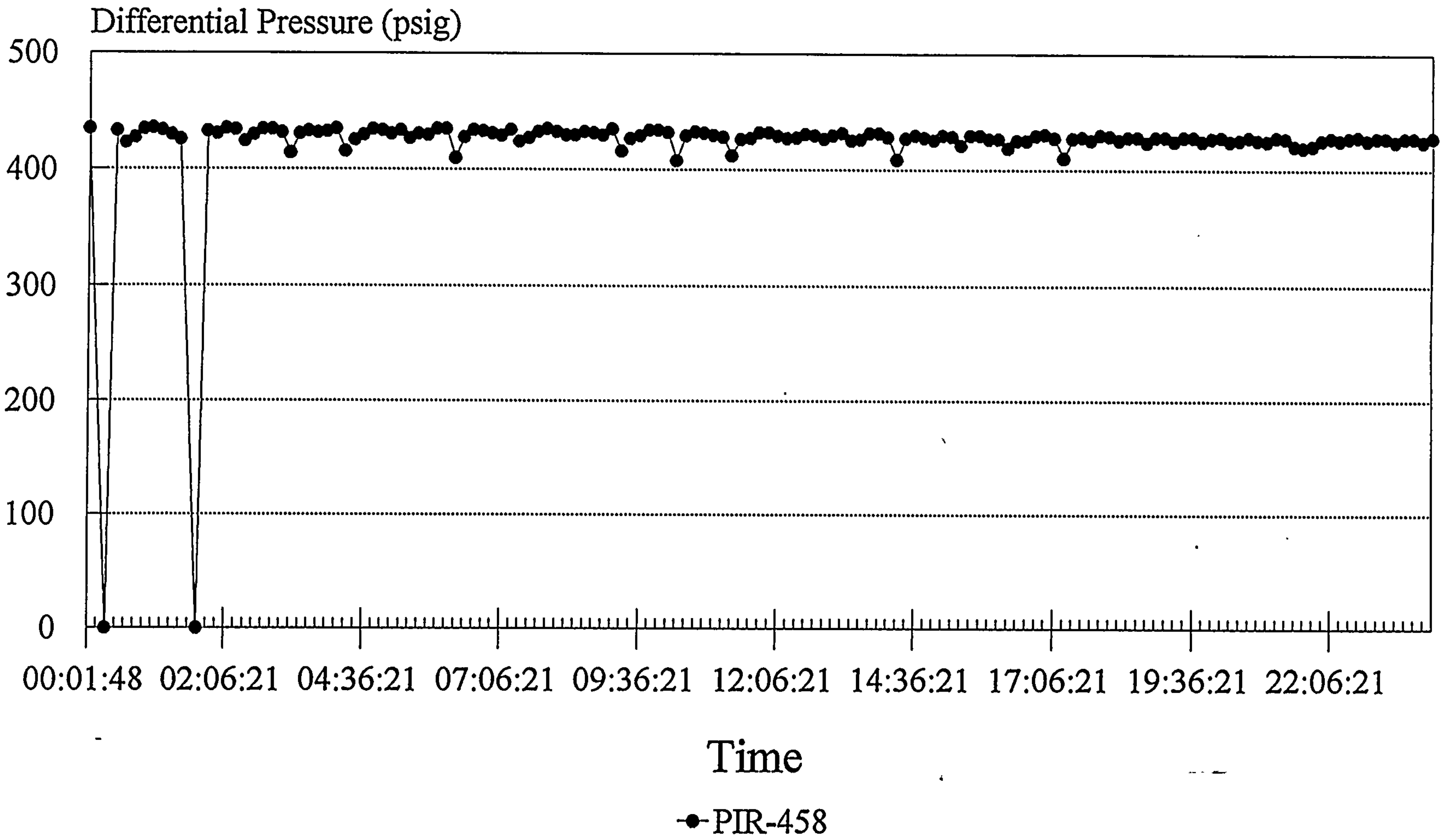

**MFBP0522.PRS Lotus: MBP51728.WK1**

# Filter Blowback Pressure
## 05/23/93



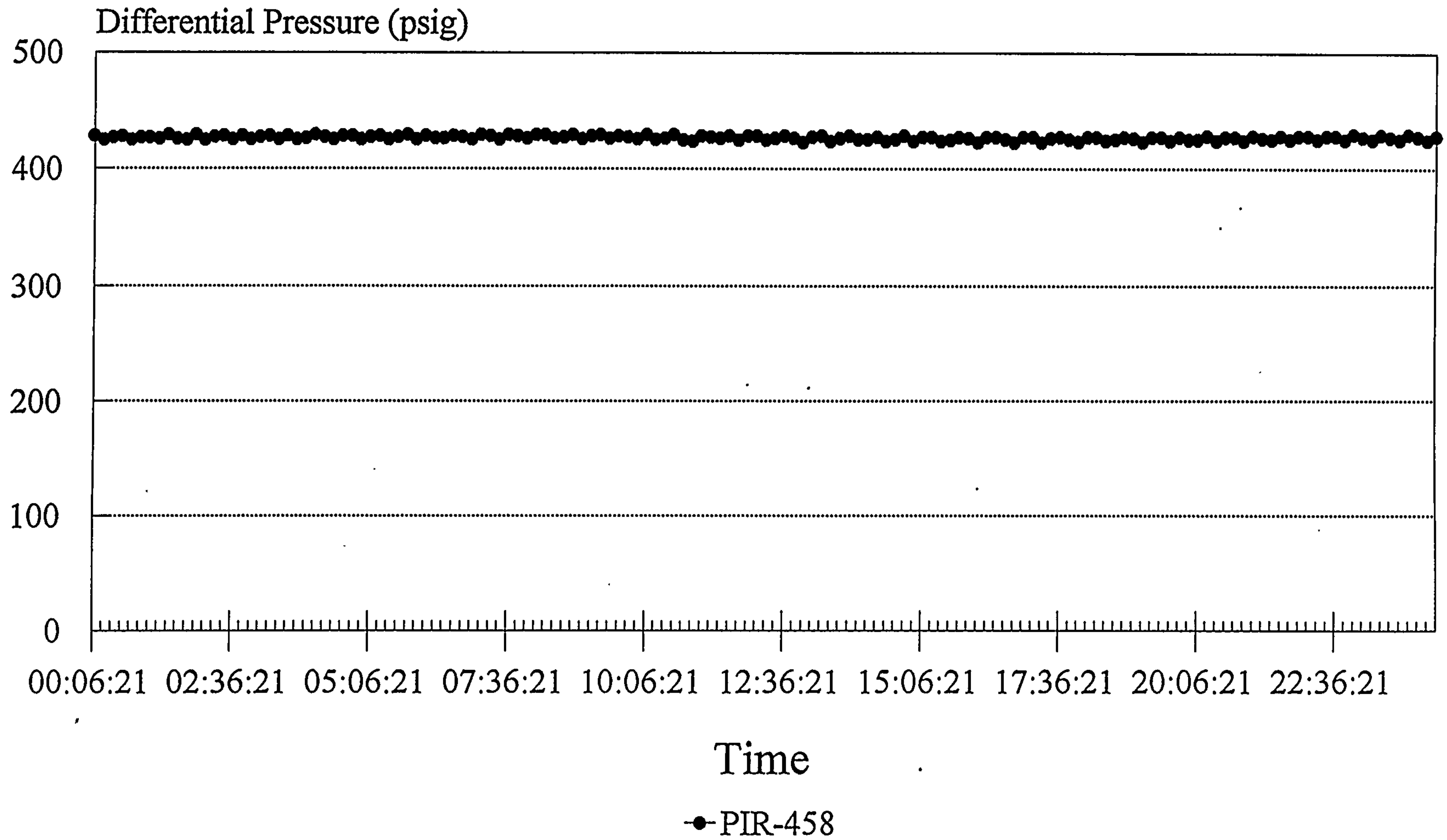

MFBP0523.PRS Lotus: MBP51728.WK1

# Filter Blowback Pressure
## 05/24/93



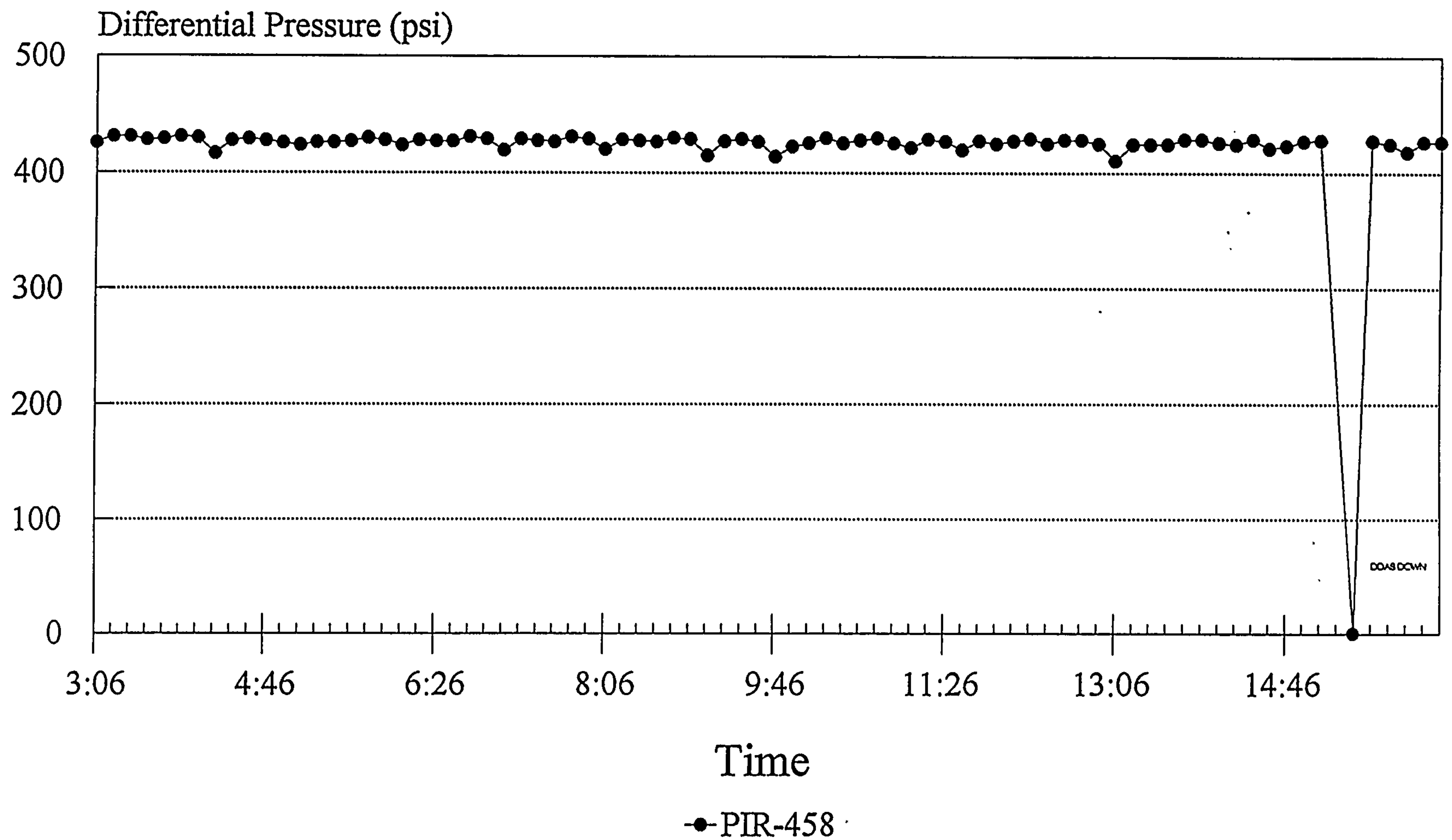

MFBP0524.PRS Lotus: MBP51728.WK1

# Filter Blowback Pressure
## 05/25/93




MFBP0525.PRS Lotus: MBP51728.WK1

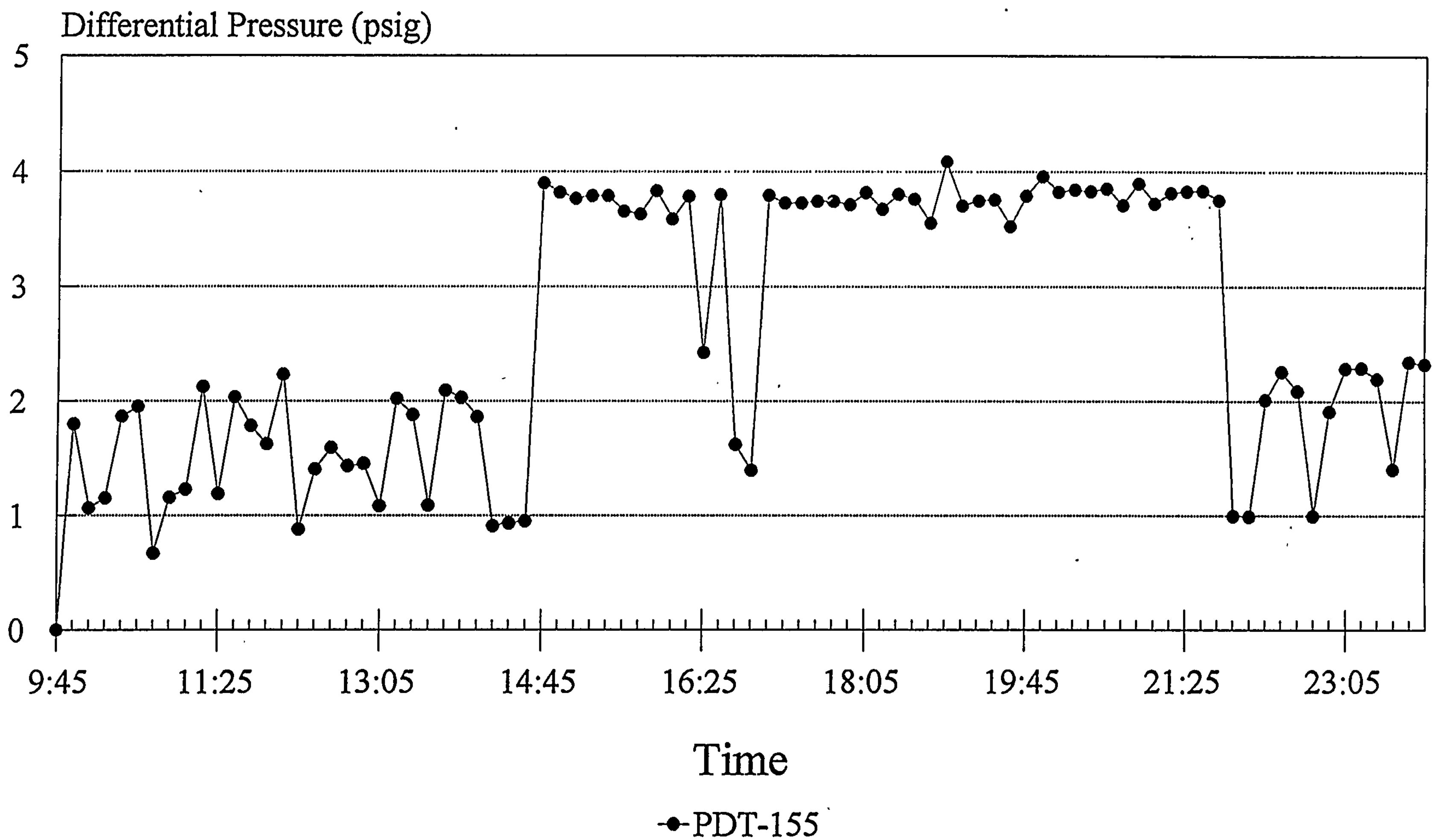
# Filter Blowback Pressure
## 05/26/93




MFBP0526.PRS Lotus: MBP51728.WK1

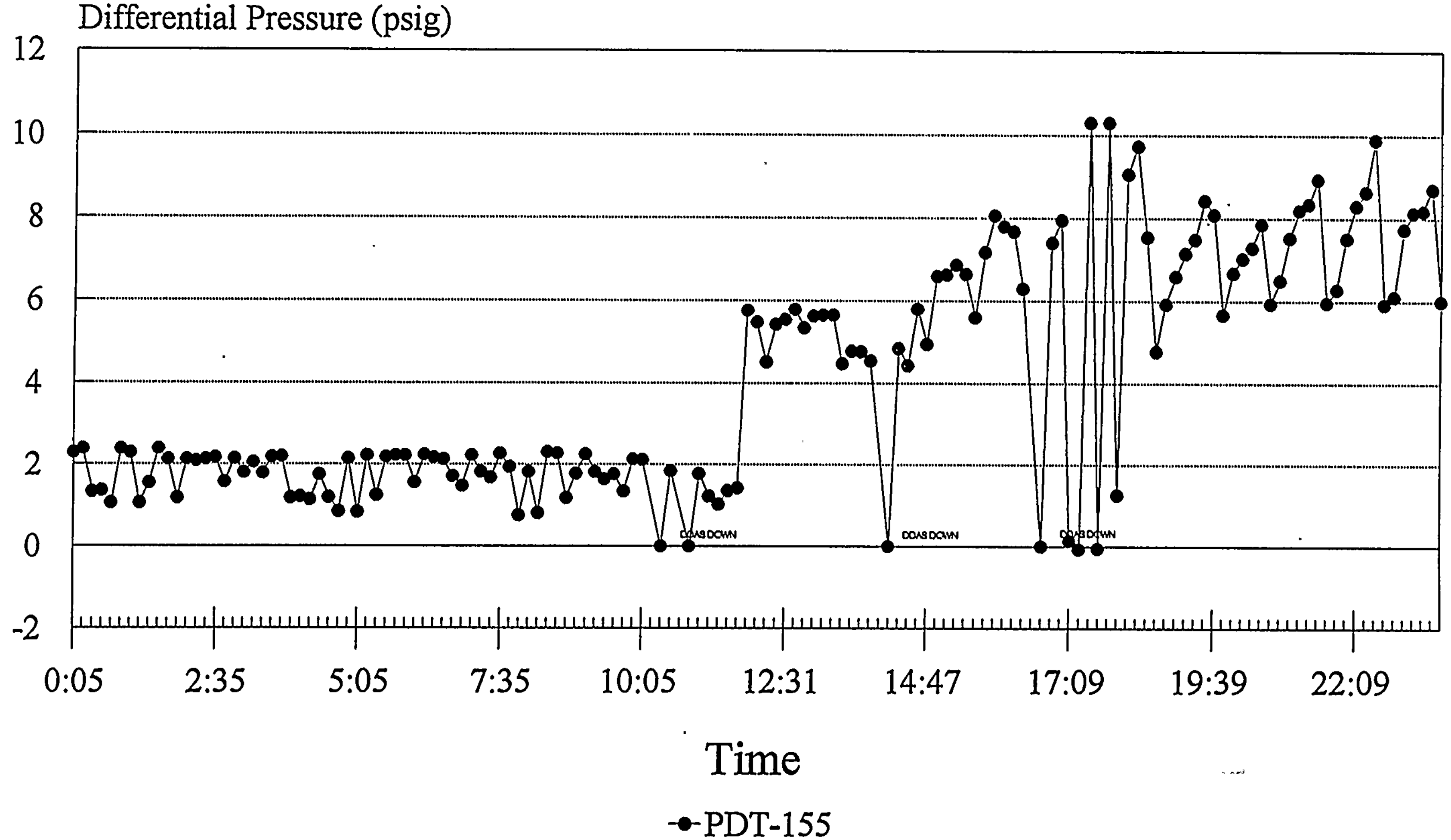
# F-100 Differential Pressure

## 05/17/93



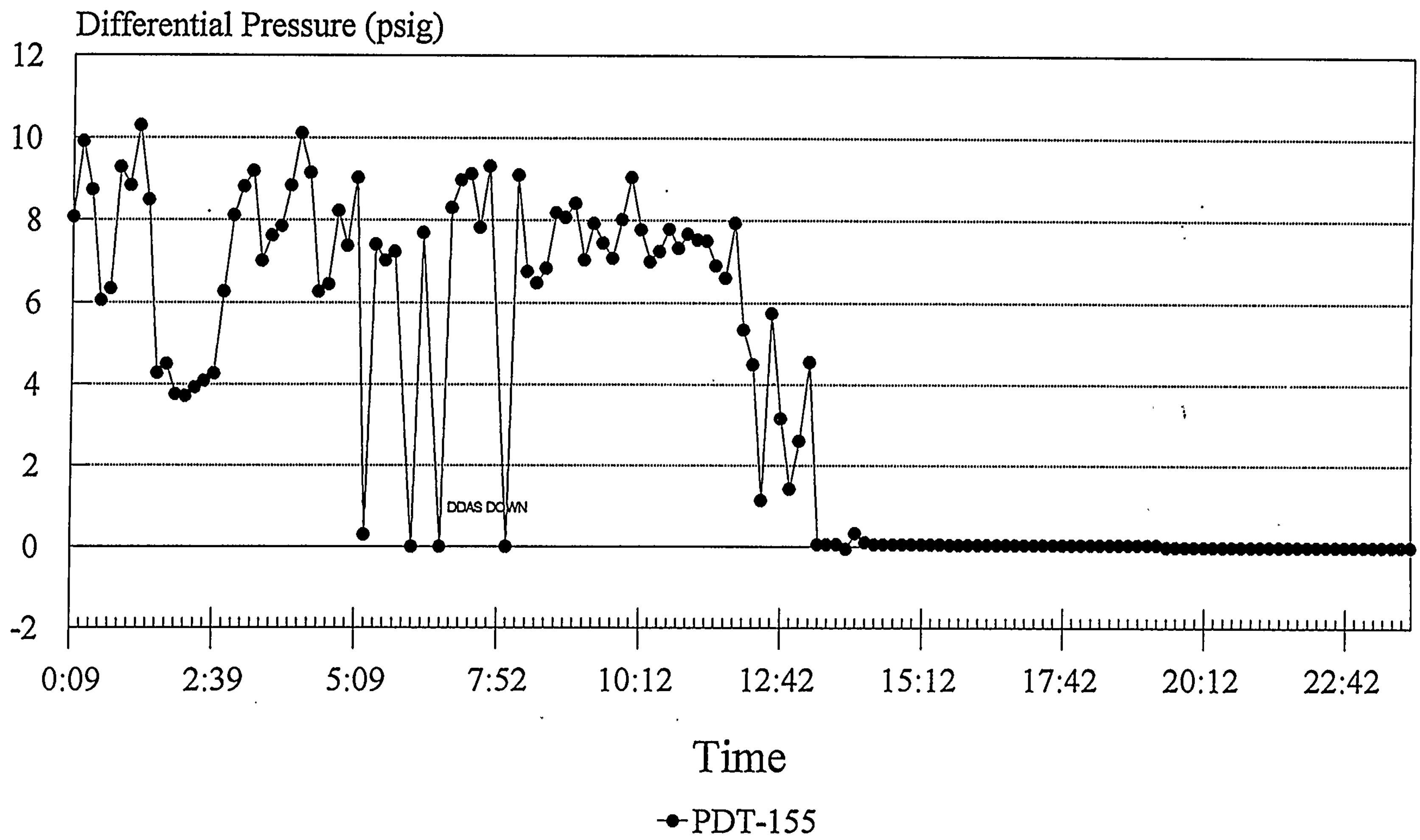

MFDP0517.CHT Lotus: PD051728.WK1

# F-100 Differential Pressure
## 05/18/93



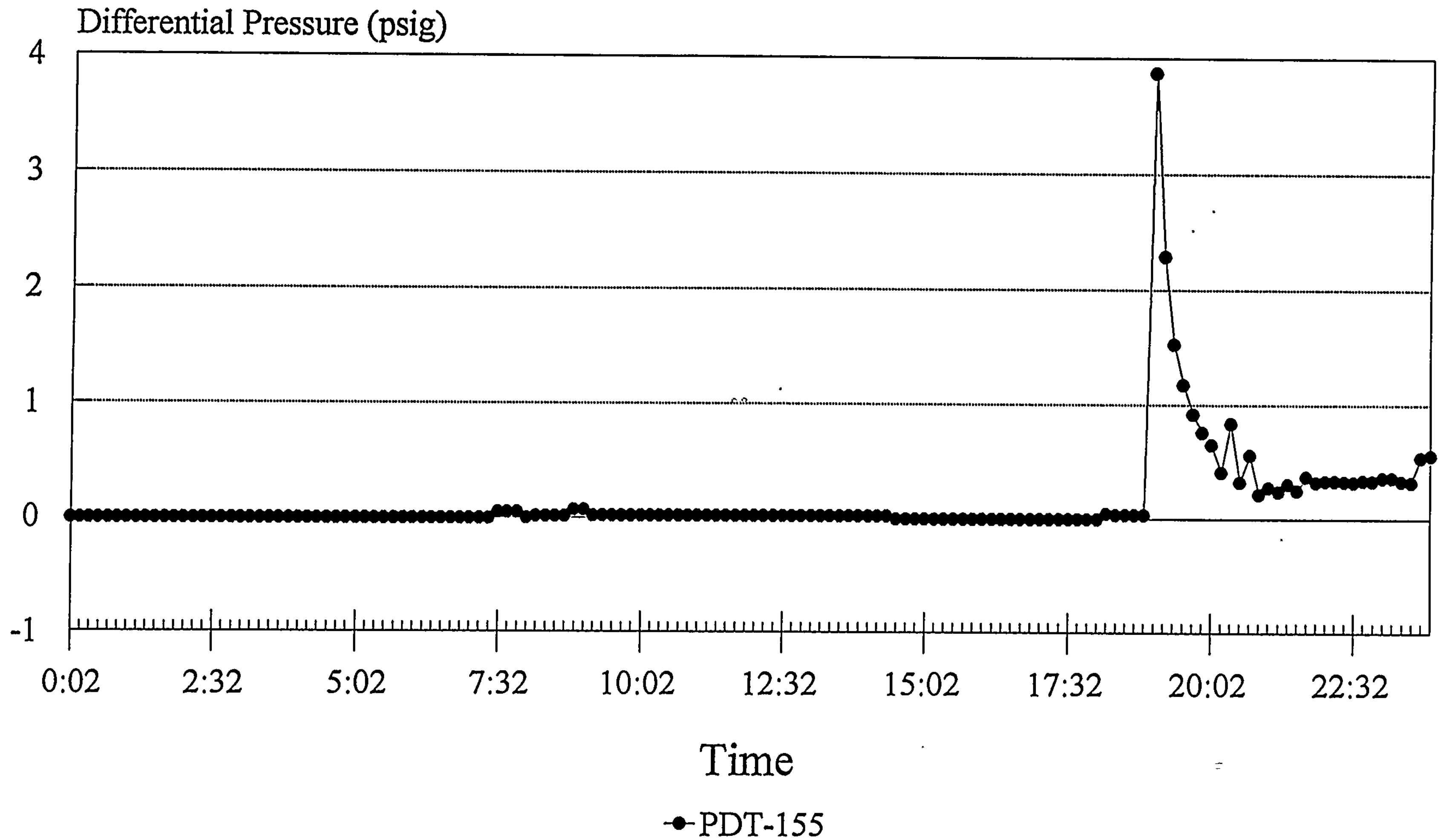

MFDP0518.CHT Lotus: PD051728.WK1

# F-100 Differential Pressure
## 05/19/93



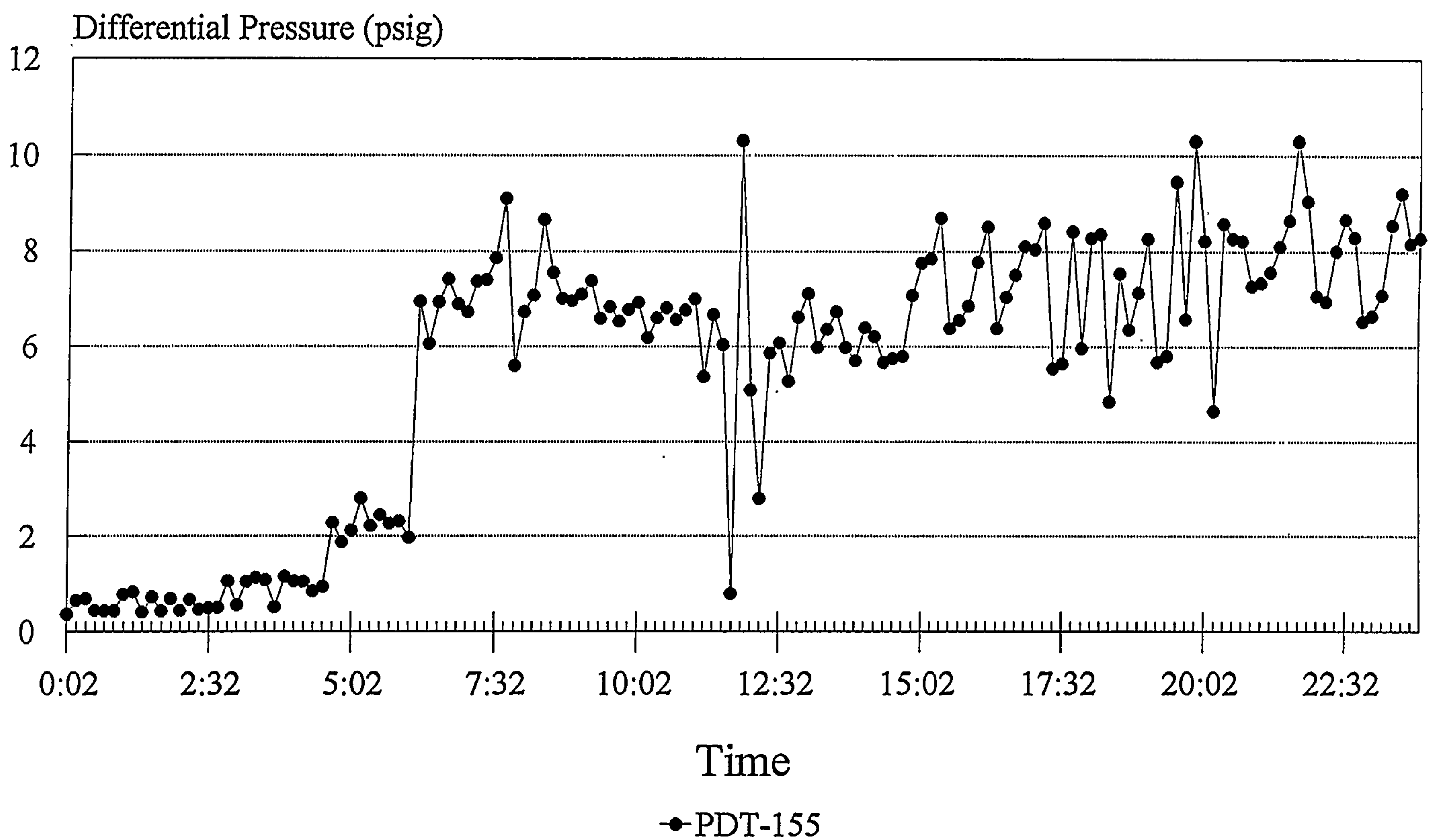

MFDP0519.CHT Lotus: PD051728.WK1

# F-100 Differential Pressure
## 05/20/93



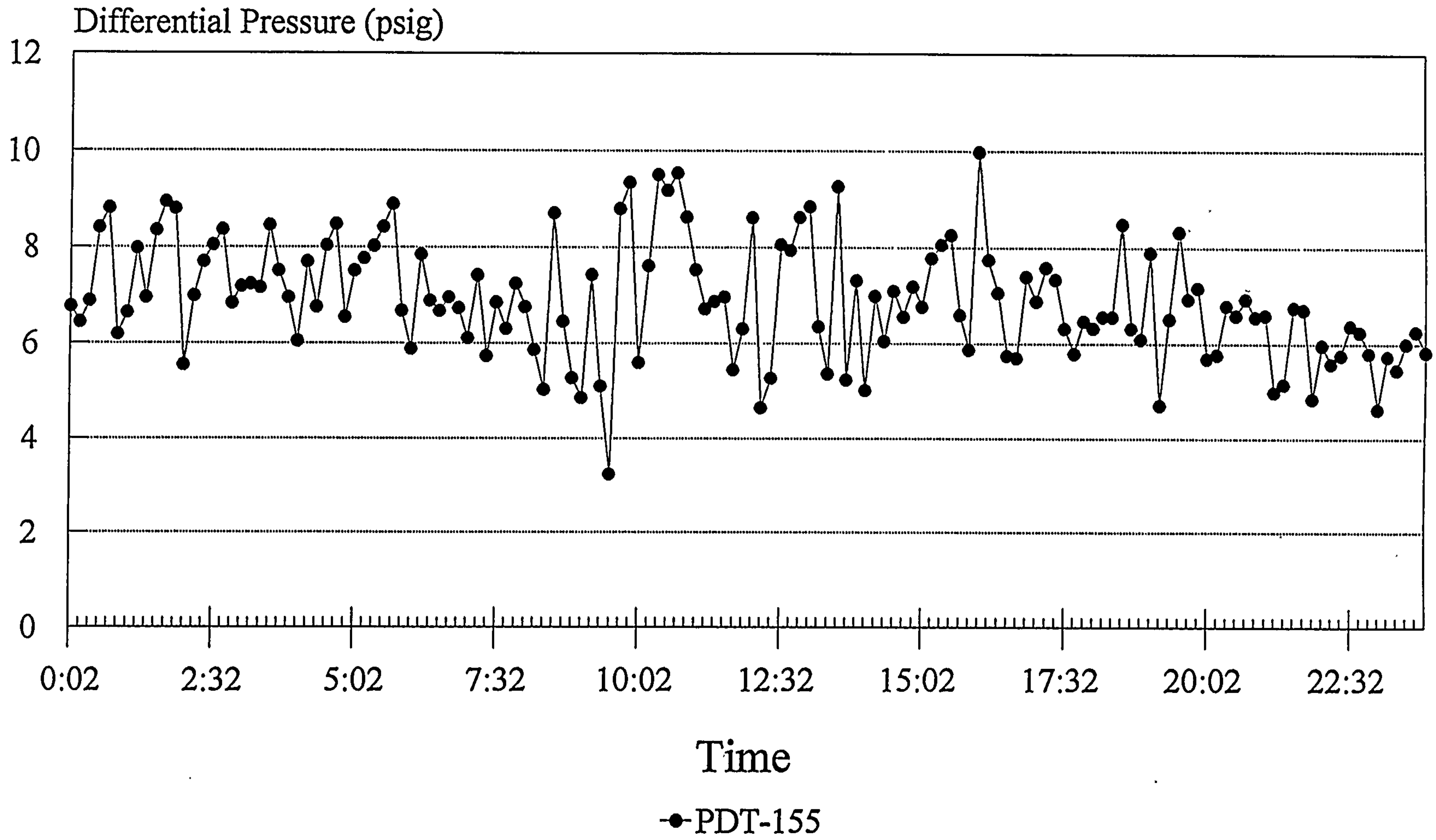

MFDP0520.CHT Lotus: PD051728.WK1

# F-100 Differential Pressure
## 05/21/93




MFDP0521.CHT Lotus: PD051728.WK1

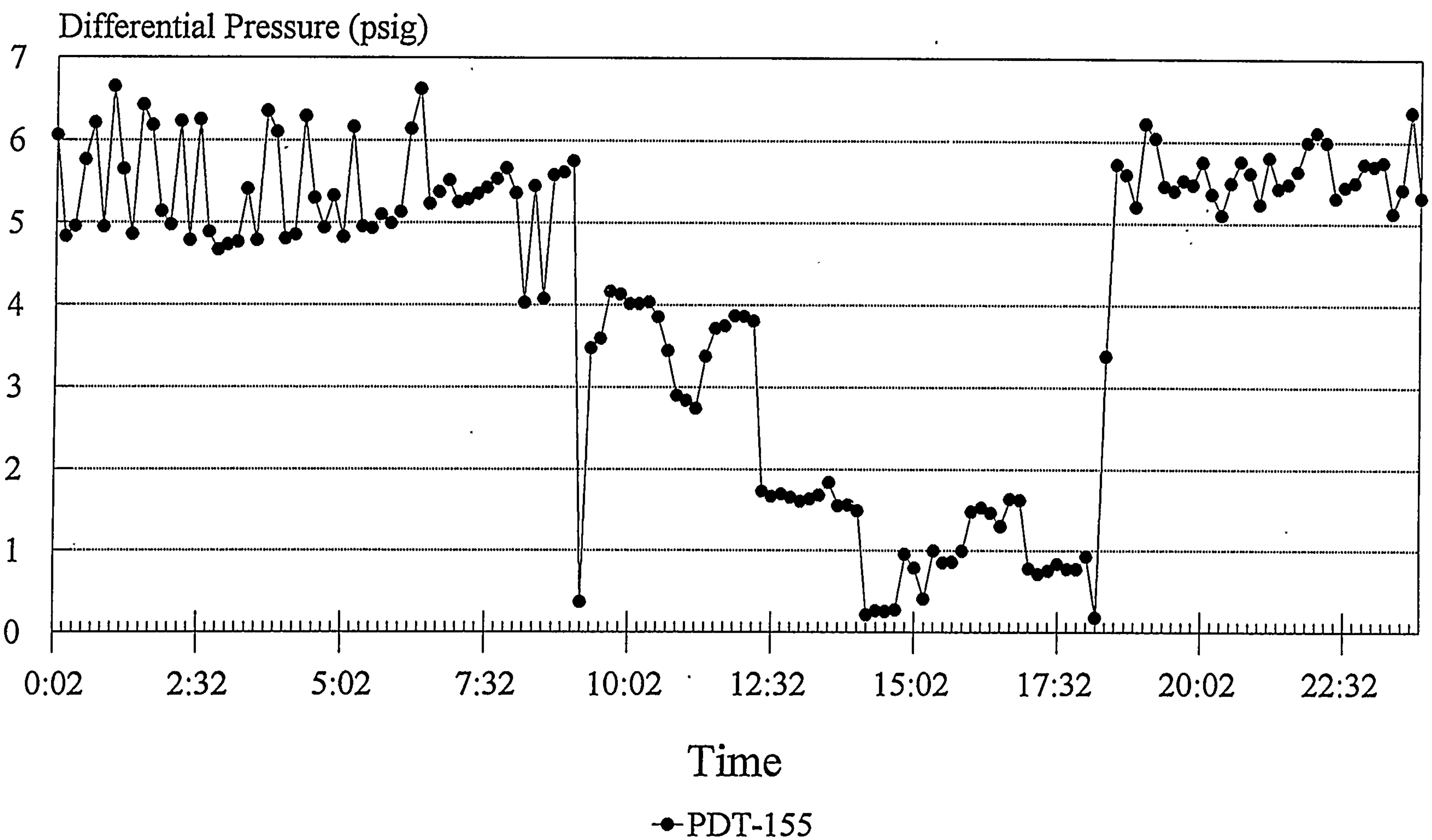
# F-100 Differential Pressure
## 05/22/93




MFDP0522.CHT Lotus: PD051728.WK1

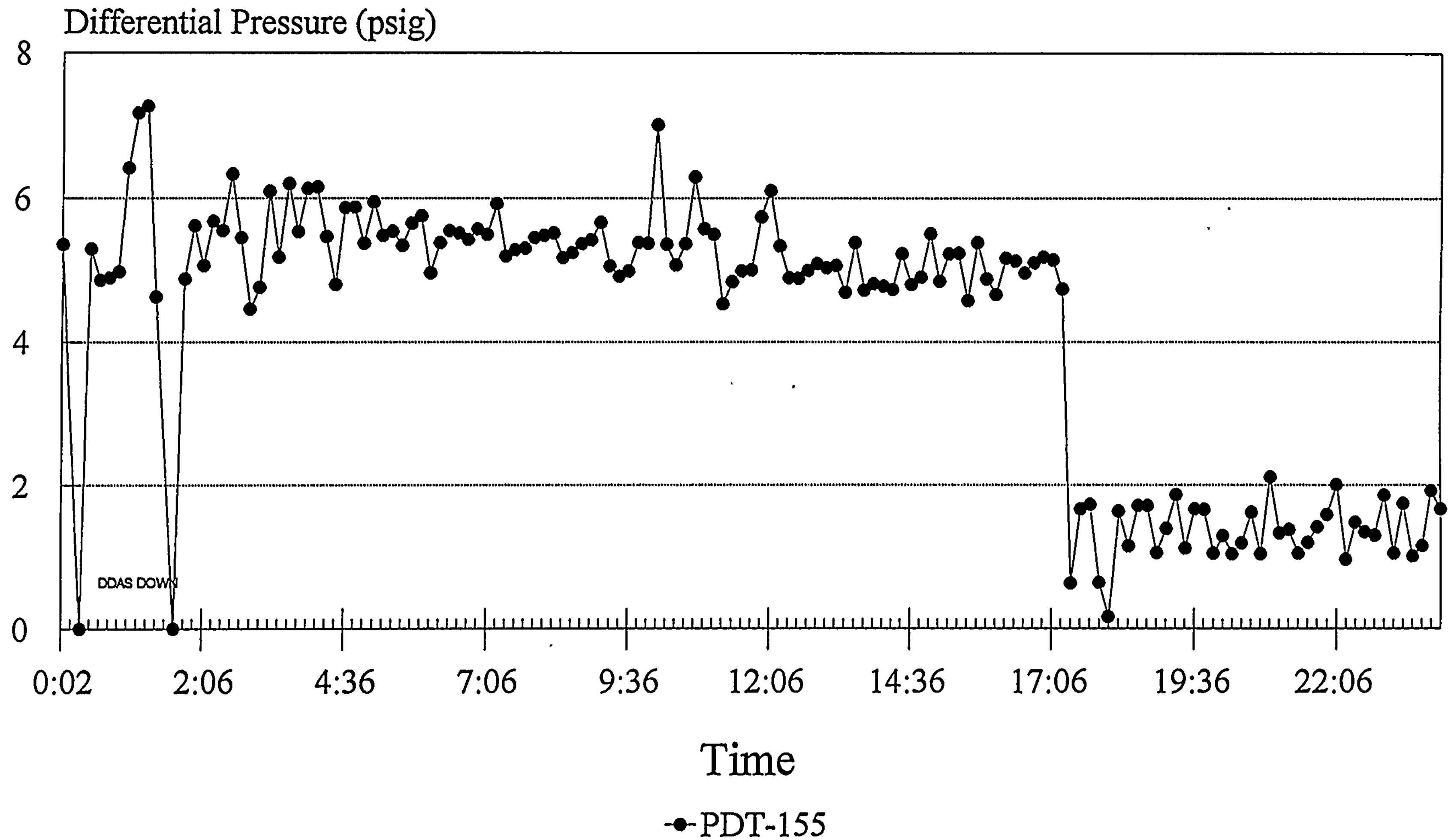
# F-100 Differential Pressure

## 05/23/93




**MFDP0523.CHT Lotus: PD051728.WK1**

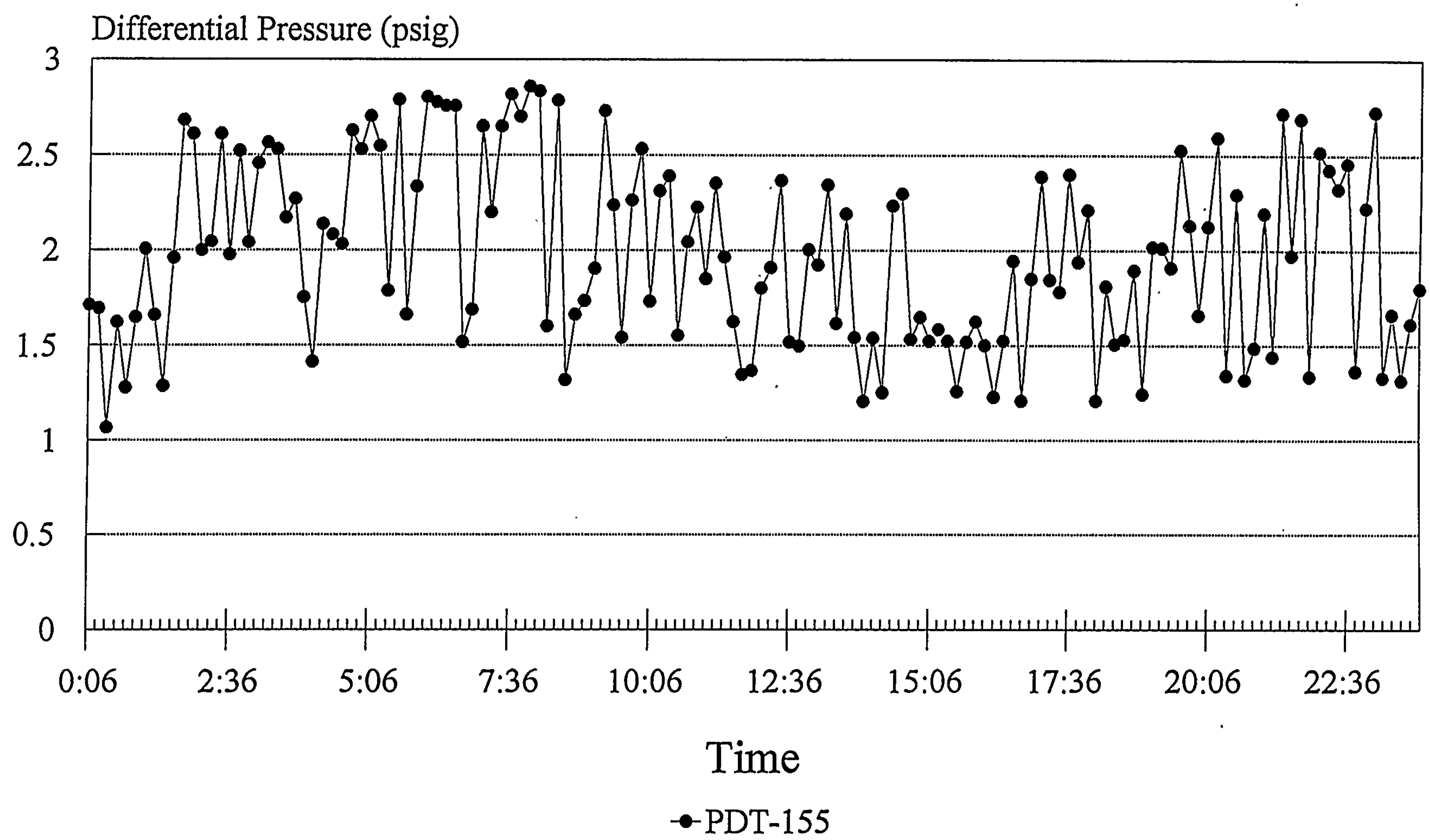
# F-100 Differential Pressure
## 05/24/93




MFDP0524.CHT Lotus: PD051728.WK1

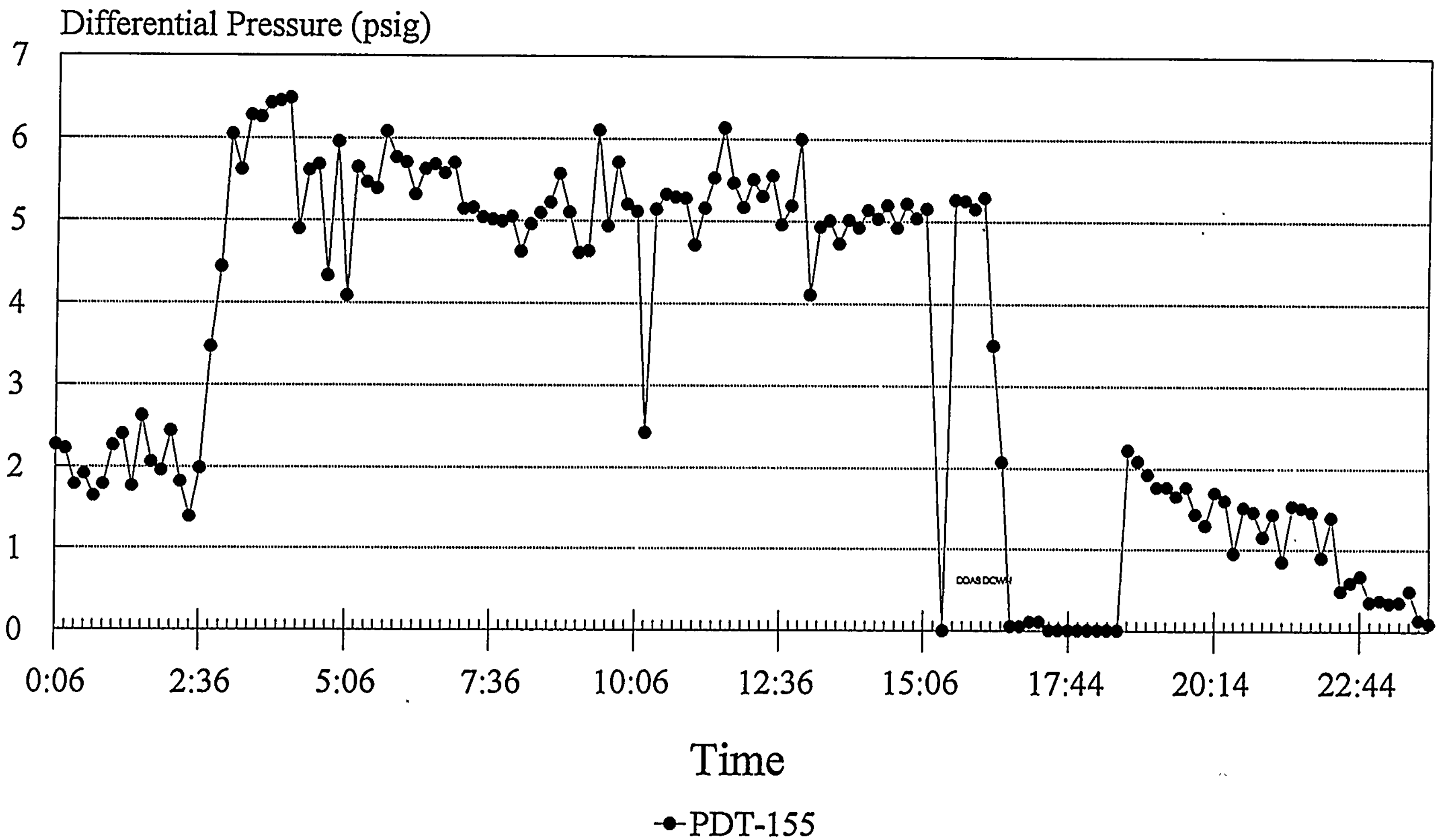
# F-100 Differential Pressure

## 05/25/93



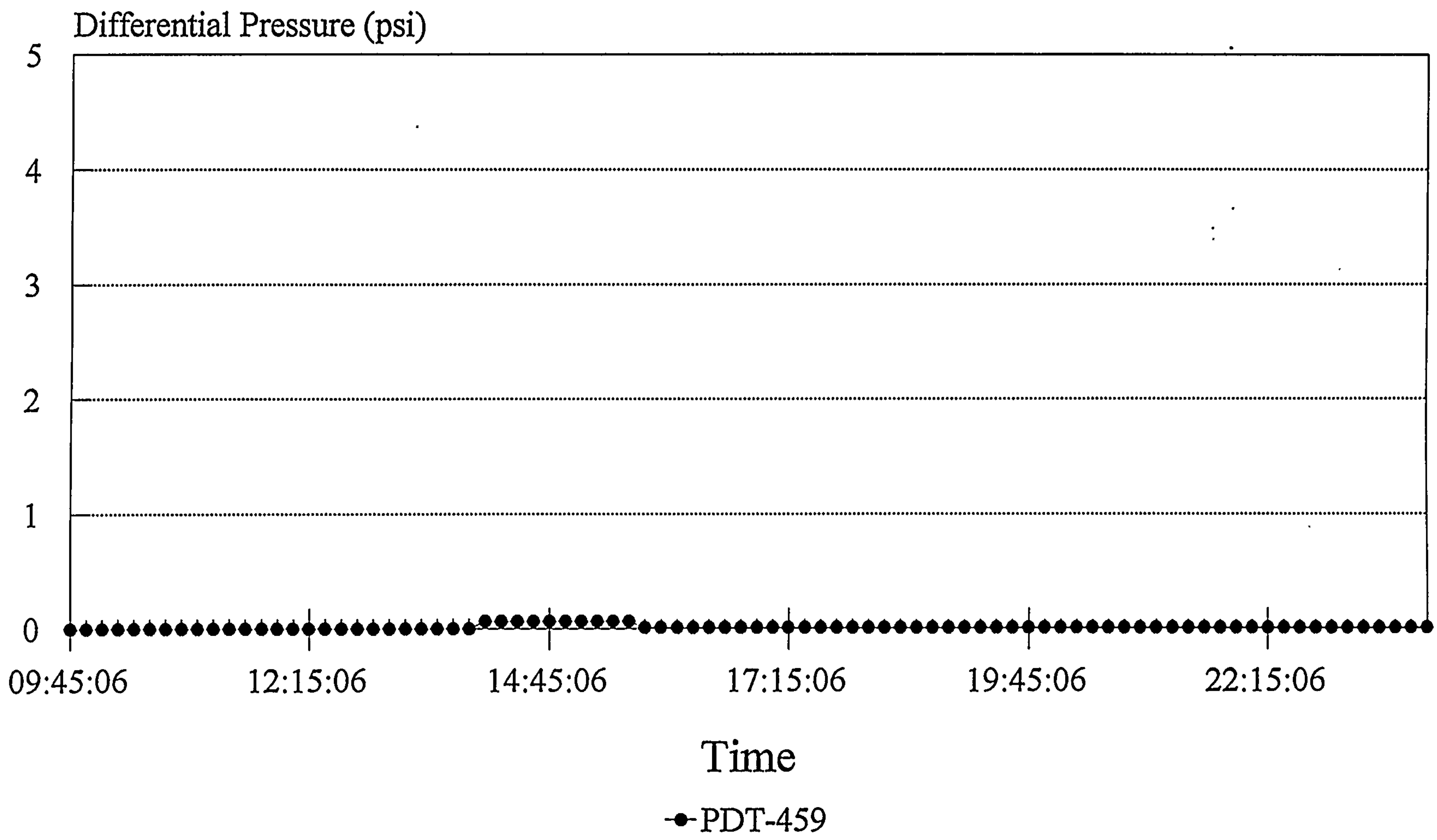

MFDP0525.CHT Lotus: PD051728.WK1

# F-100 Differential Pressure
## 05/26/93



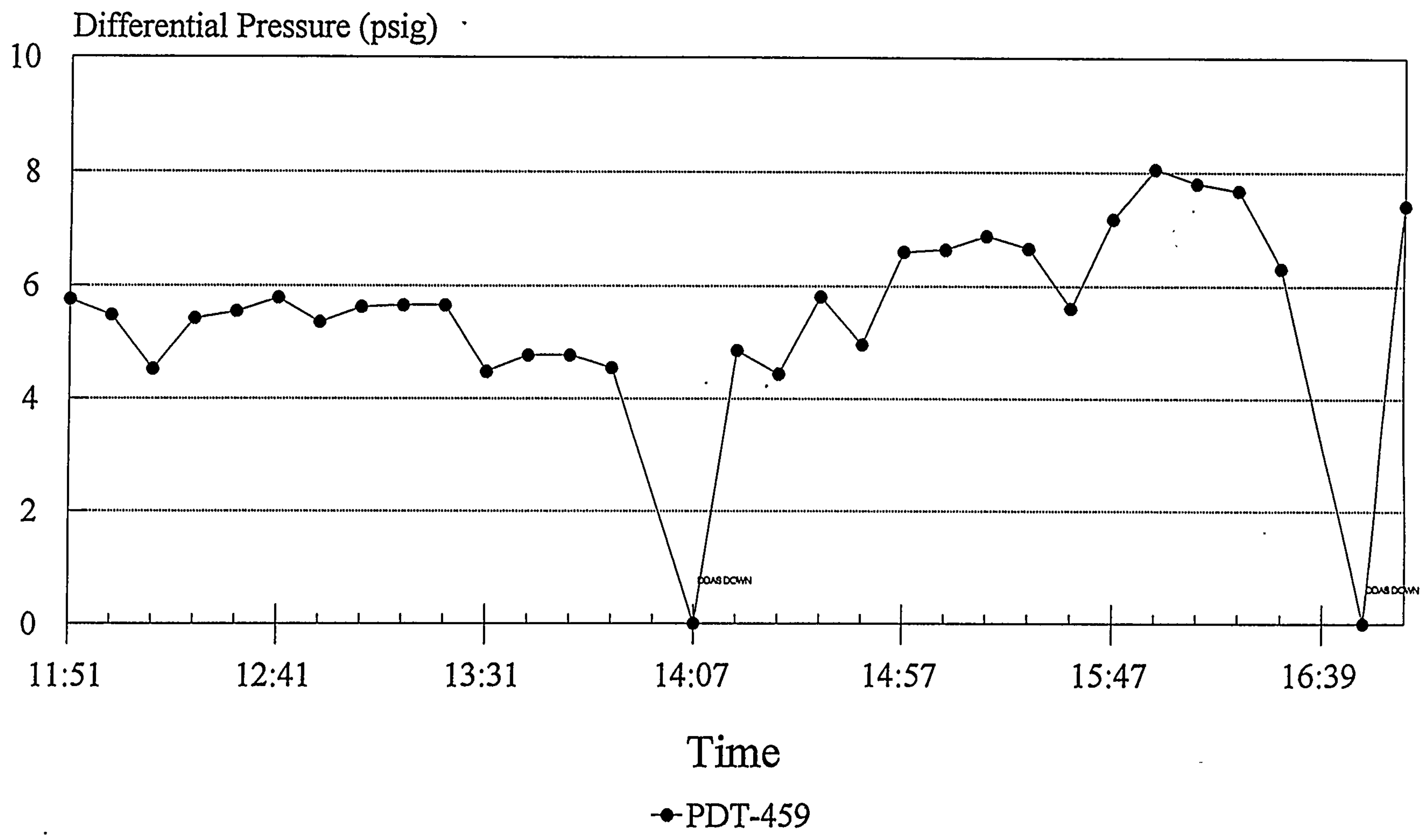

MFDP0526.CHT Lotus: PD051728.WK1

# F-100 Filter Diff. Press.
## 05/17/93




MDFP0517.PRS Lotus: PD051728.WK1

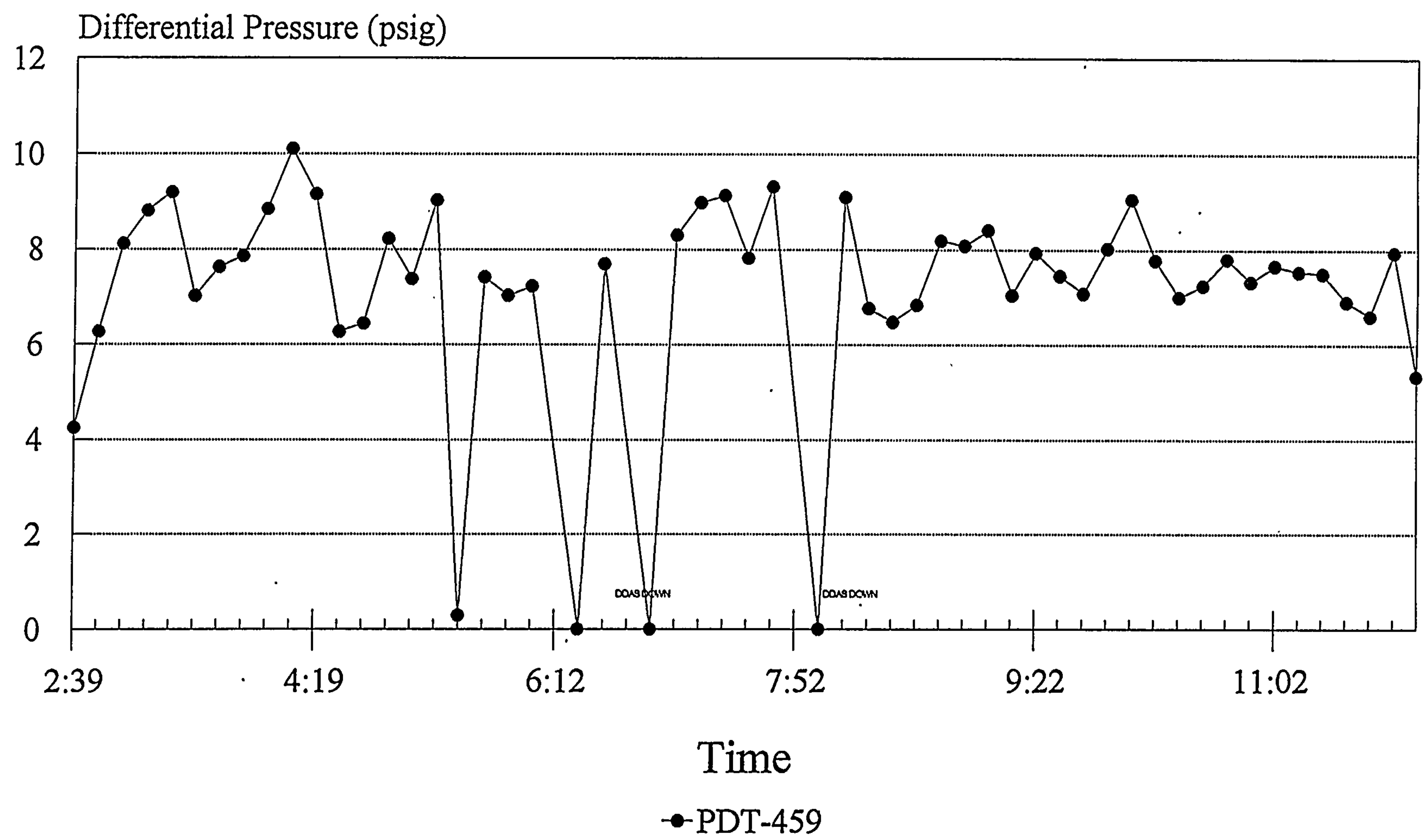
# F-100 Filter Diff. Press.
## 05/18/93




MDFP0518.CHT Lotus: PD051728.WK1

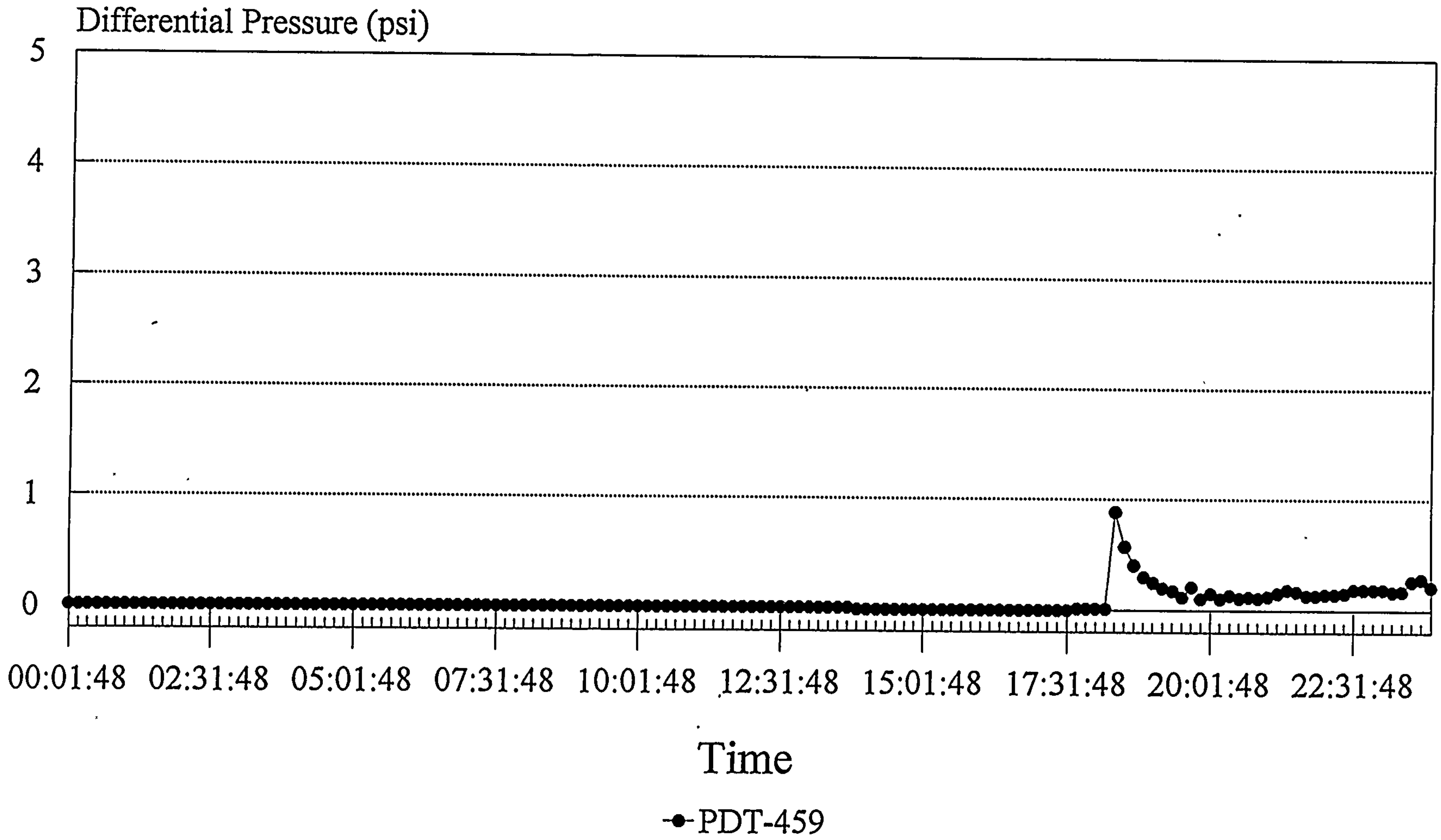
# F-100 Filter Diff. Press.

## 05/19/93




MDFP0519.CHT Lotus: PD051728.WK1

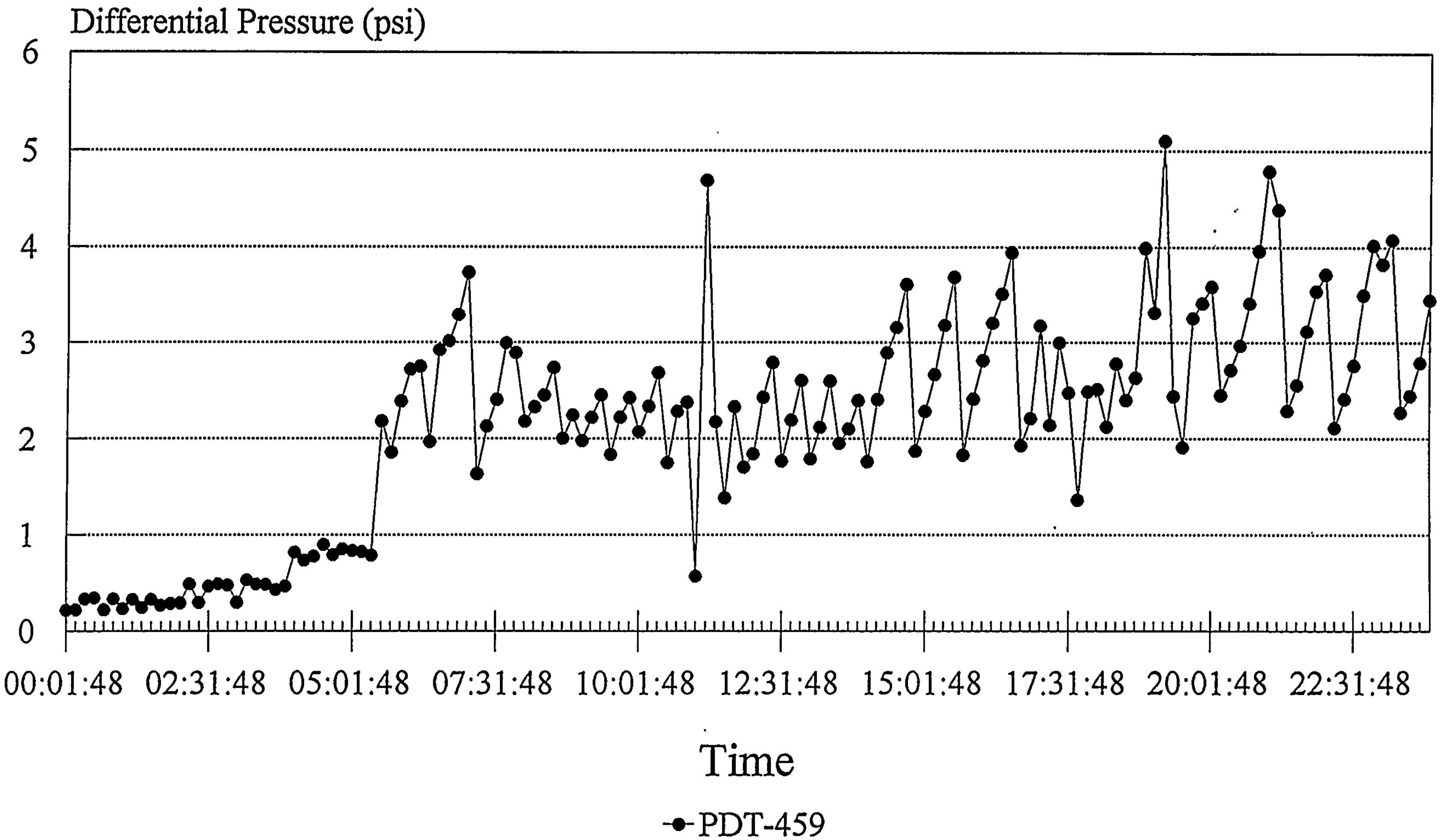
# F-100 Filter Diff. Press.
## 05/20/93




MDFP0520.PRS Lotus: PD051728.WK1

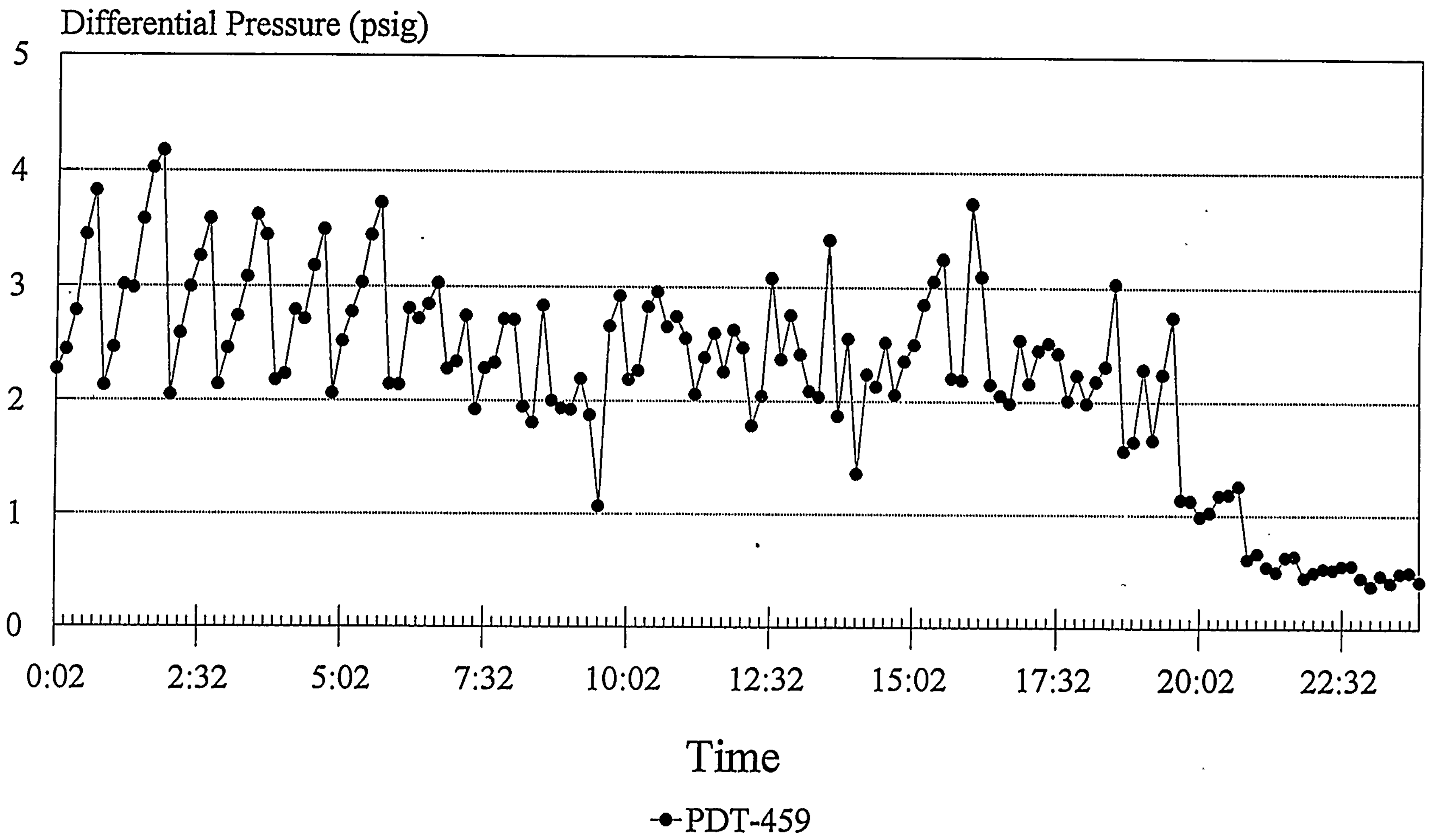
# F-100 Filter Diff. Press.

## 05/21/93



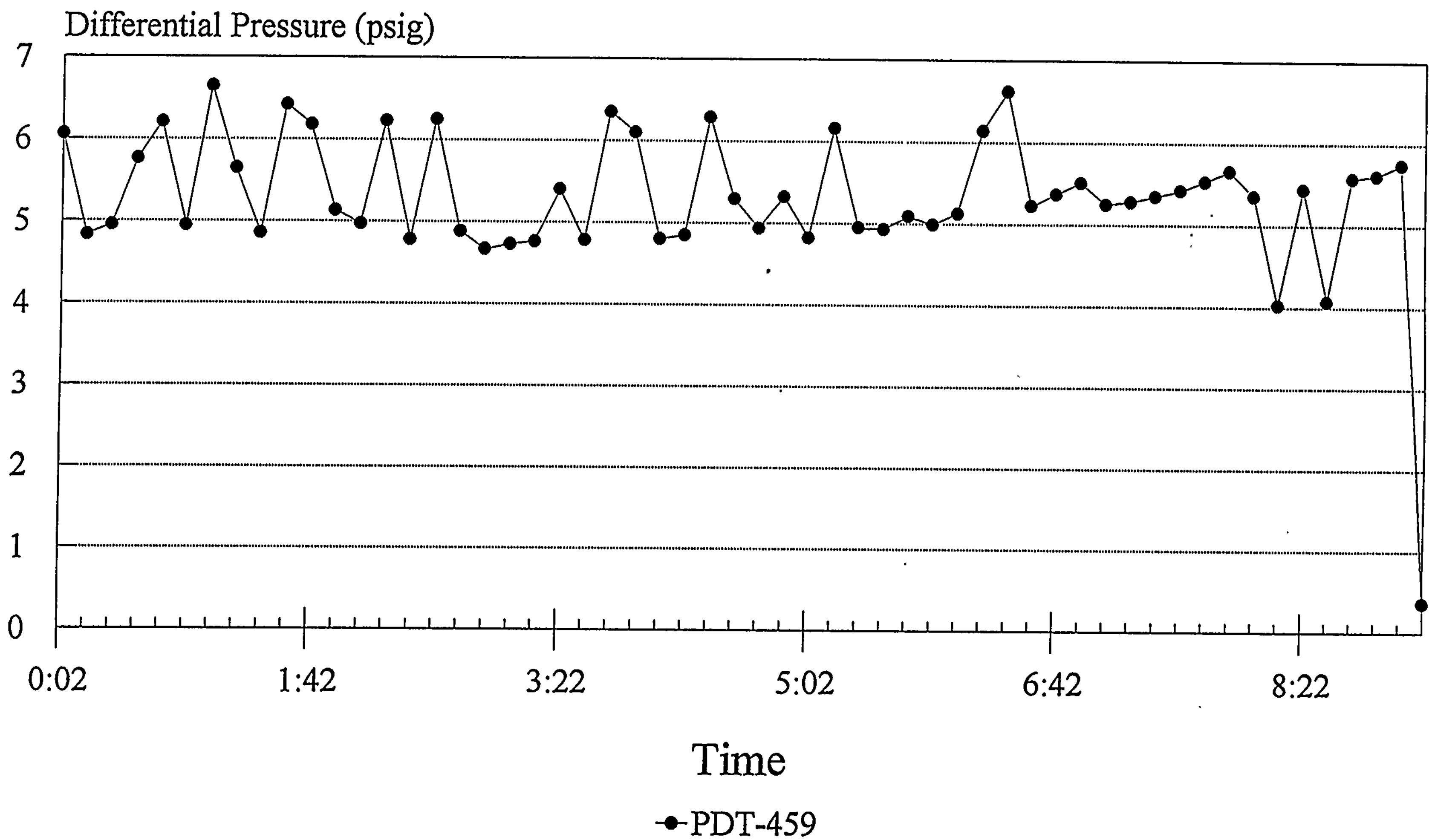

MDFP0521.PRS Lotus: PD051728.WK1

# F-100 Filter Diff. Press.
## 05/22/93



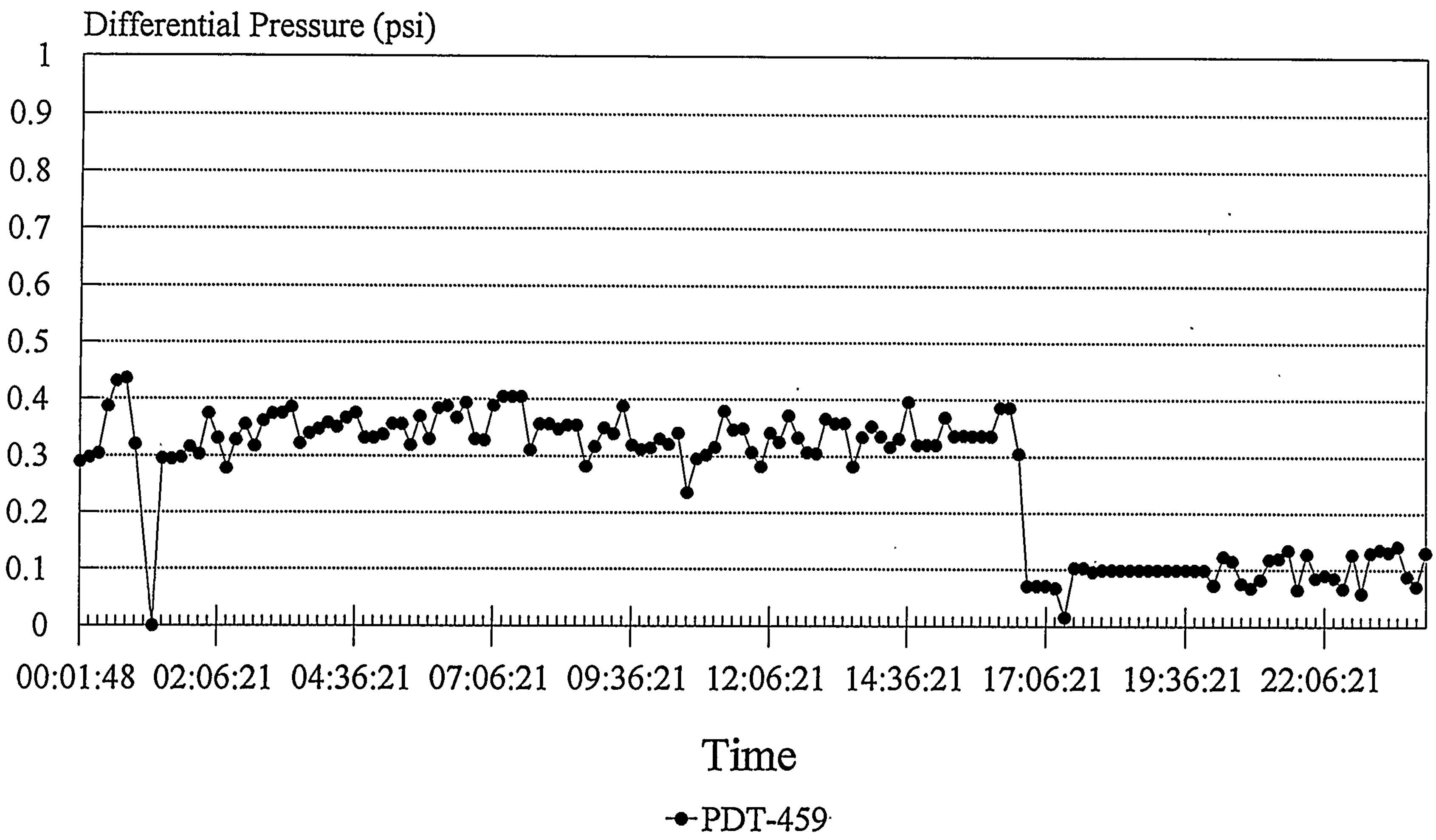

MDFP0522.CHT Lotus: PD051728.WK1

# F-100 Filter Diff. Press.
## 05/23/93




MDFP0523.CHT Lotus: PD051728.WK1

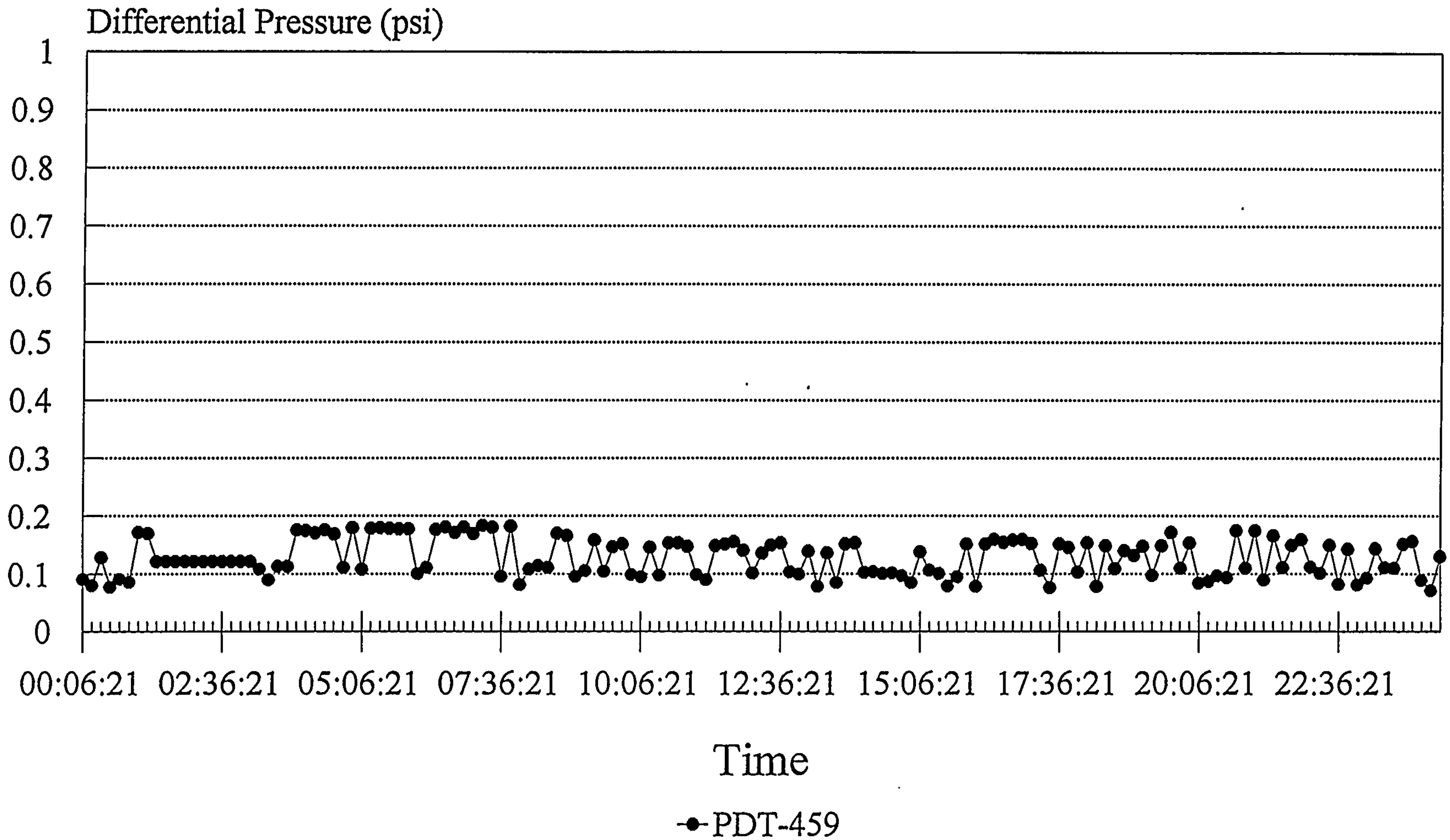
# F-100 Filter Diff. Press.
## 05/24/93




**MDFP0524.PRS Lotus: PD051728.WK1**

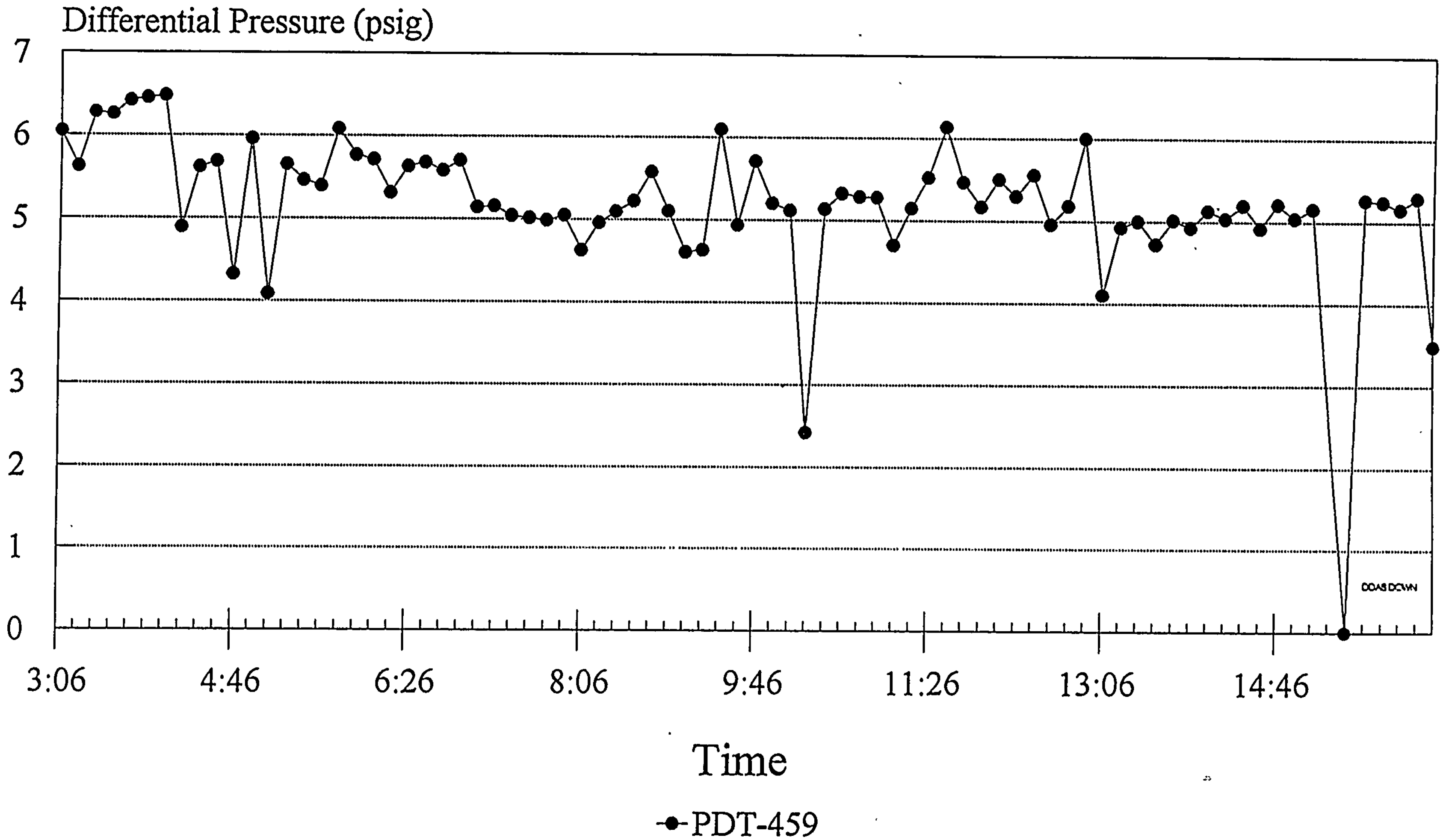
# F-100 Filter Diff. Press.

## 05/25/93




MDFP0525.PRS Lotus: PD051728.WK1

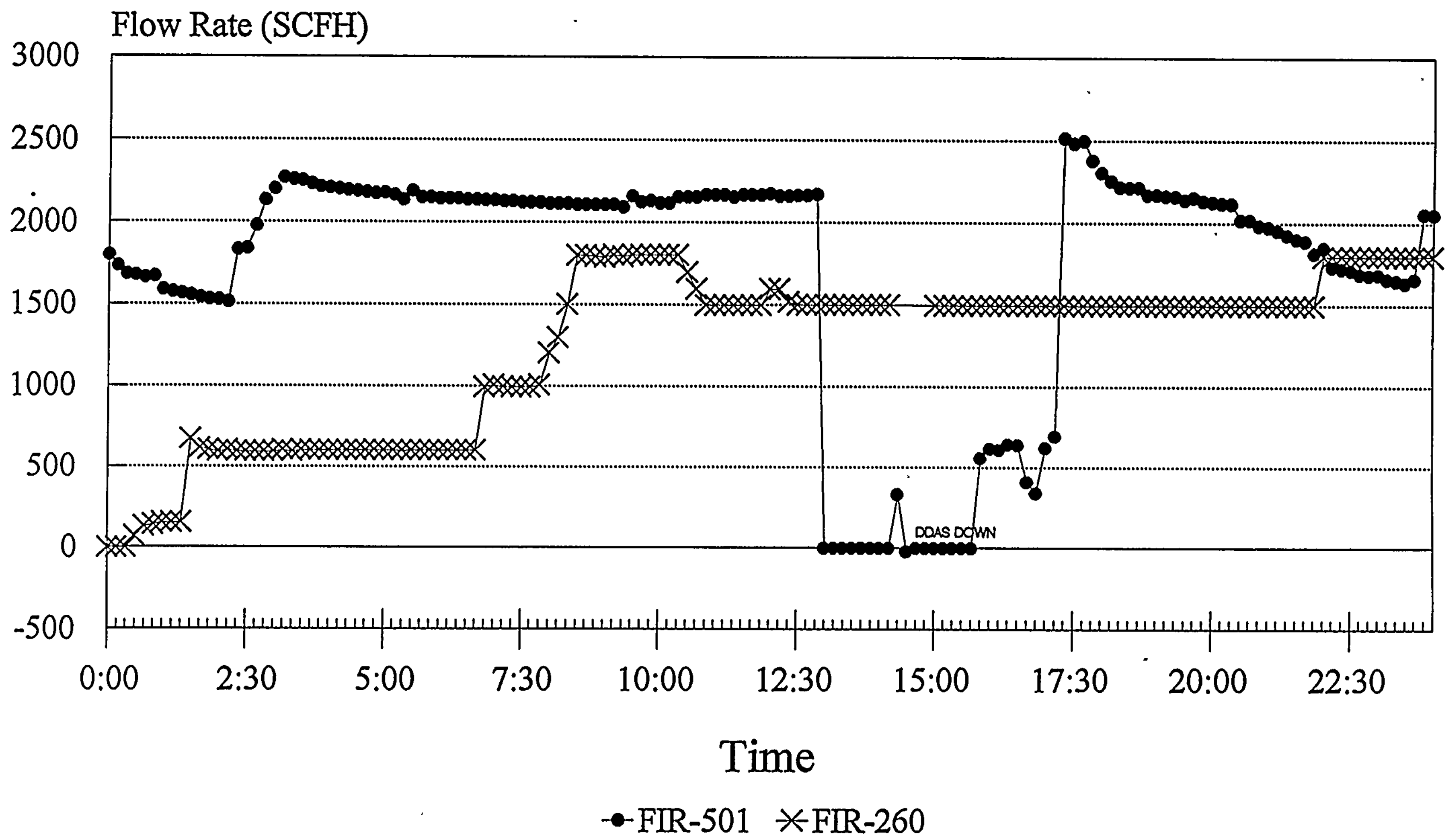
# F-100 Filter Diff. Press.
## 05/26/93




MDFP0526.CHT Lotus: PD051728.WK1

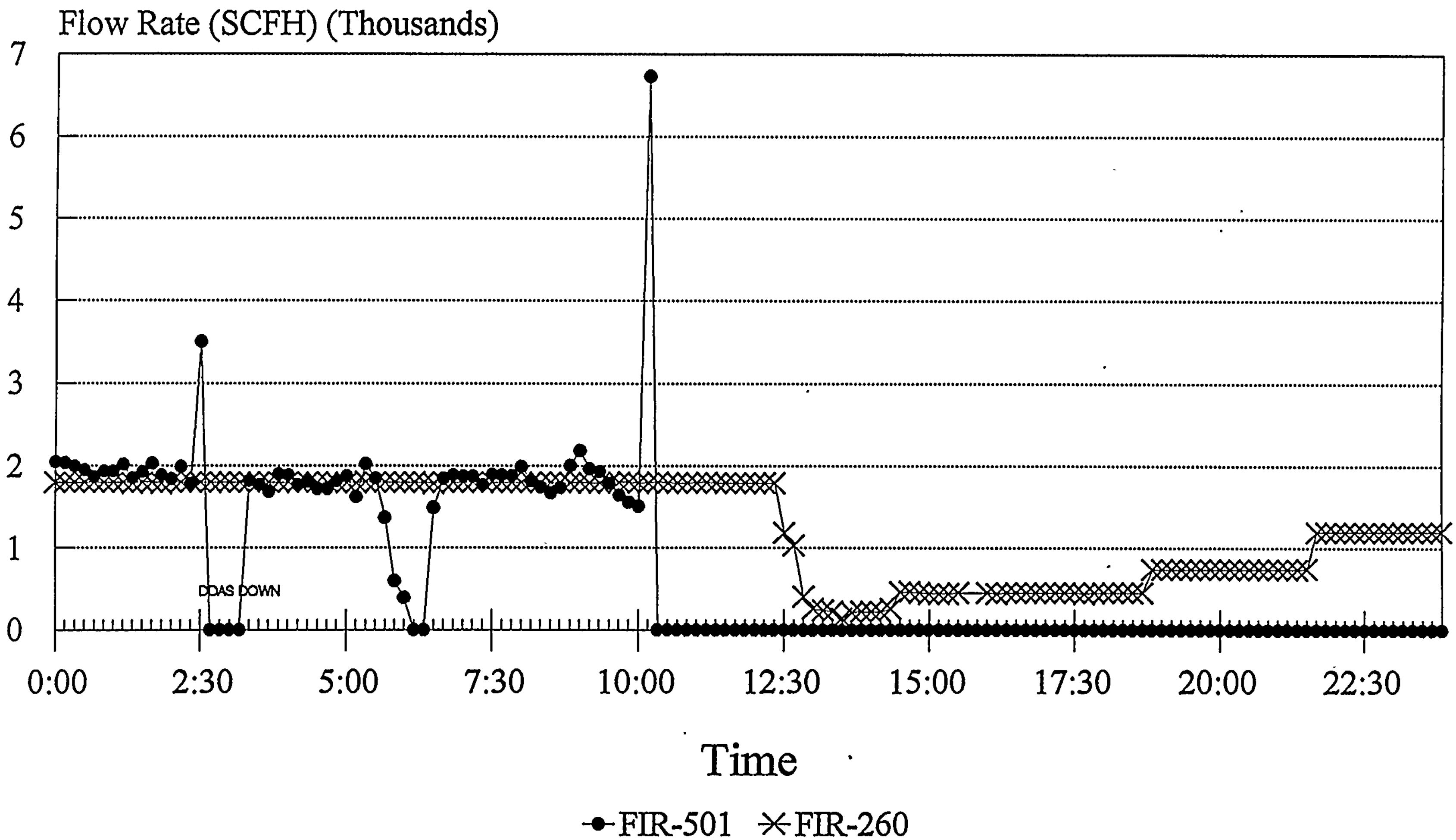
# 93MGC05
# (08/02/93 - 08/13/93)

# Inlet and Process Flow
## 08/02/93




F5010802.CHT Lotus: 5CORF501.WK1

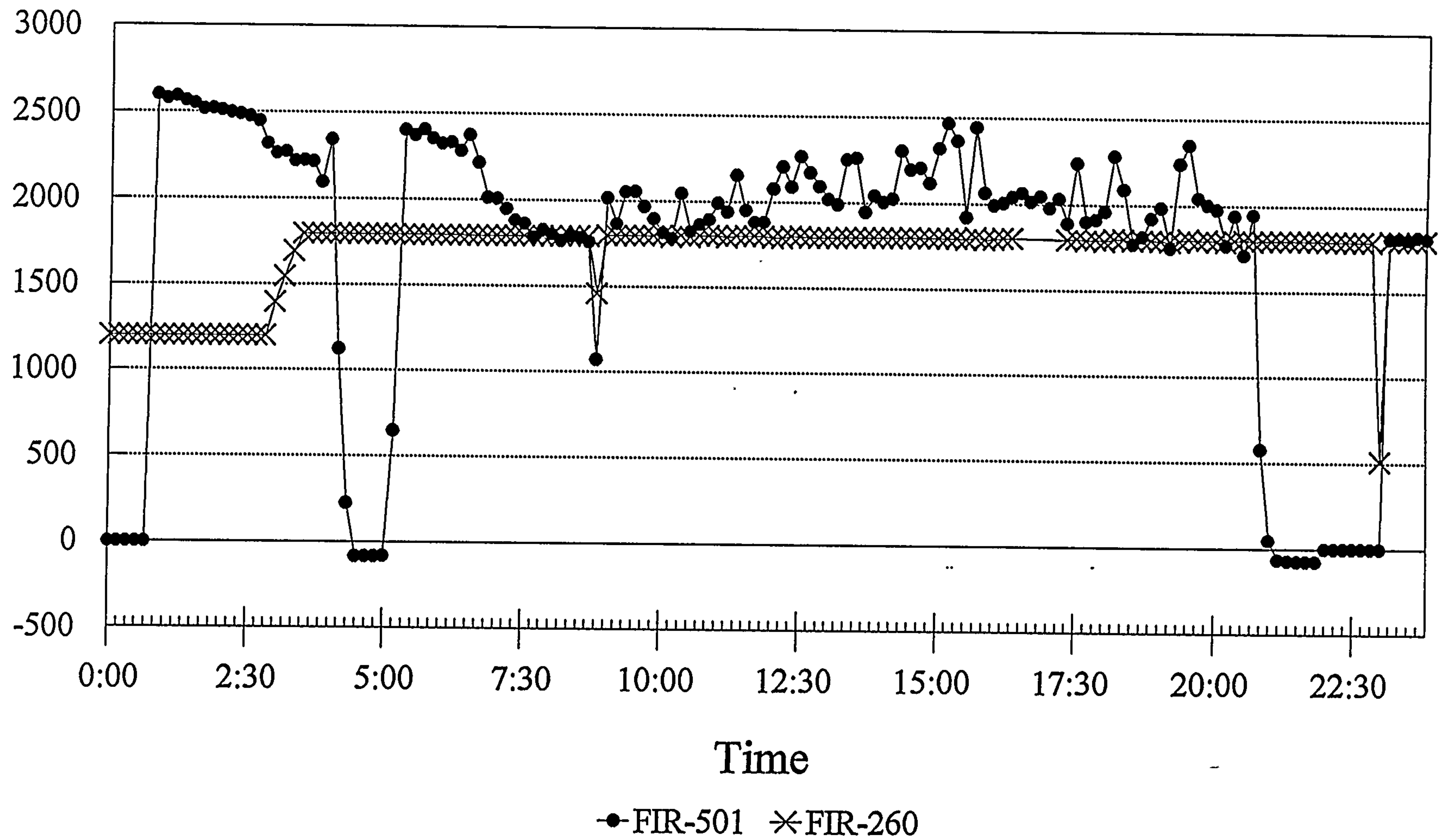
# Inlet and Process Flow
## 08/03/93




F5010803.CHT Lotus: 5CORF501.WK1

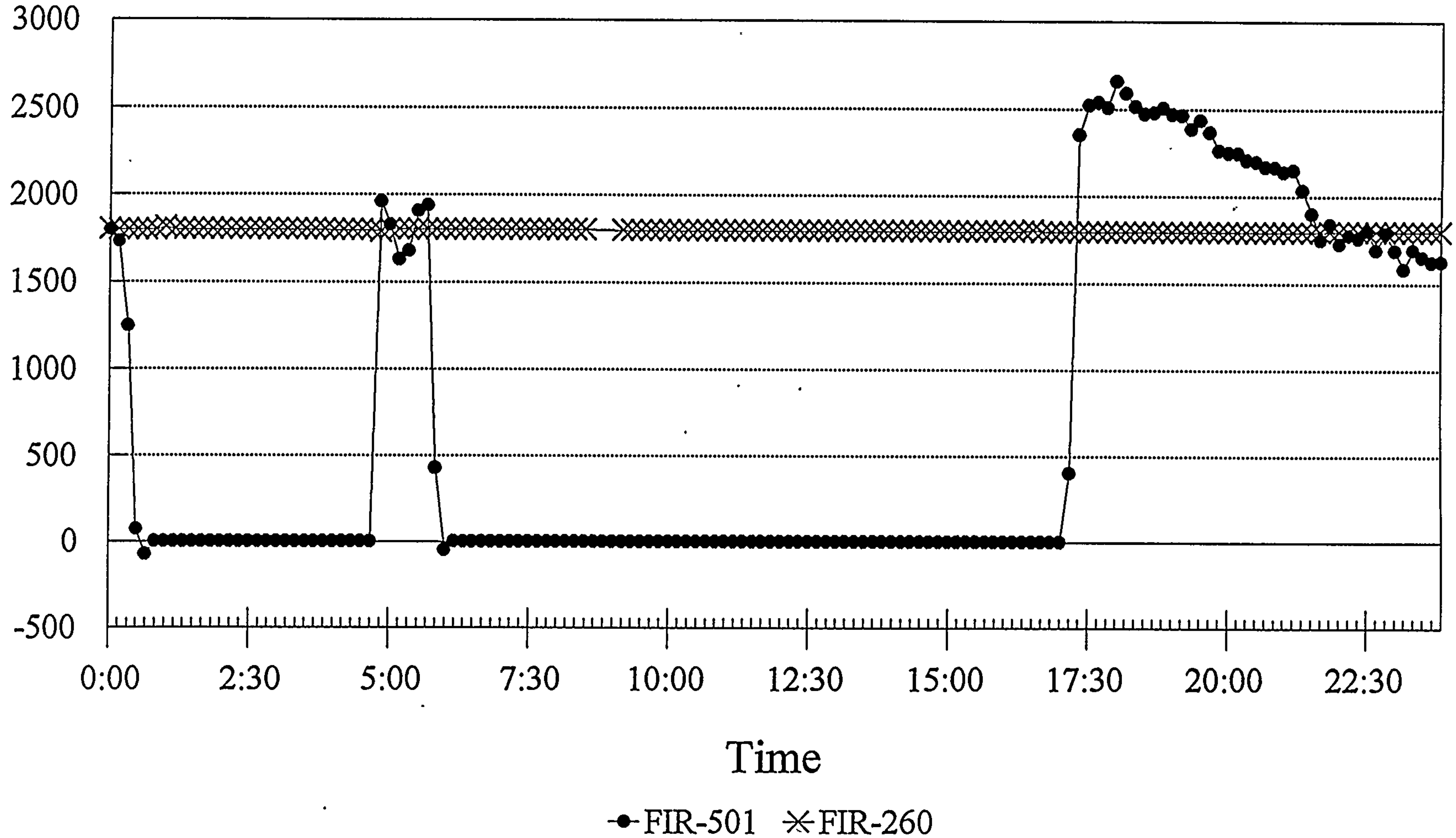
# Inlet and Process Flow

## 08/04/93



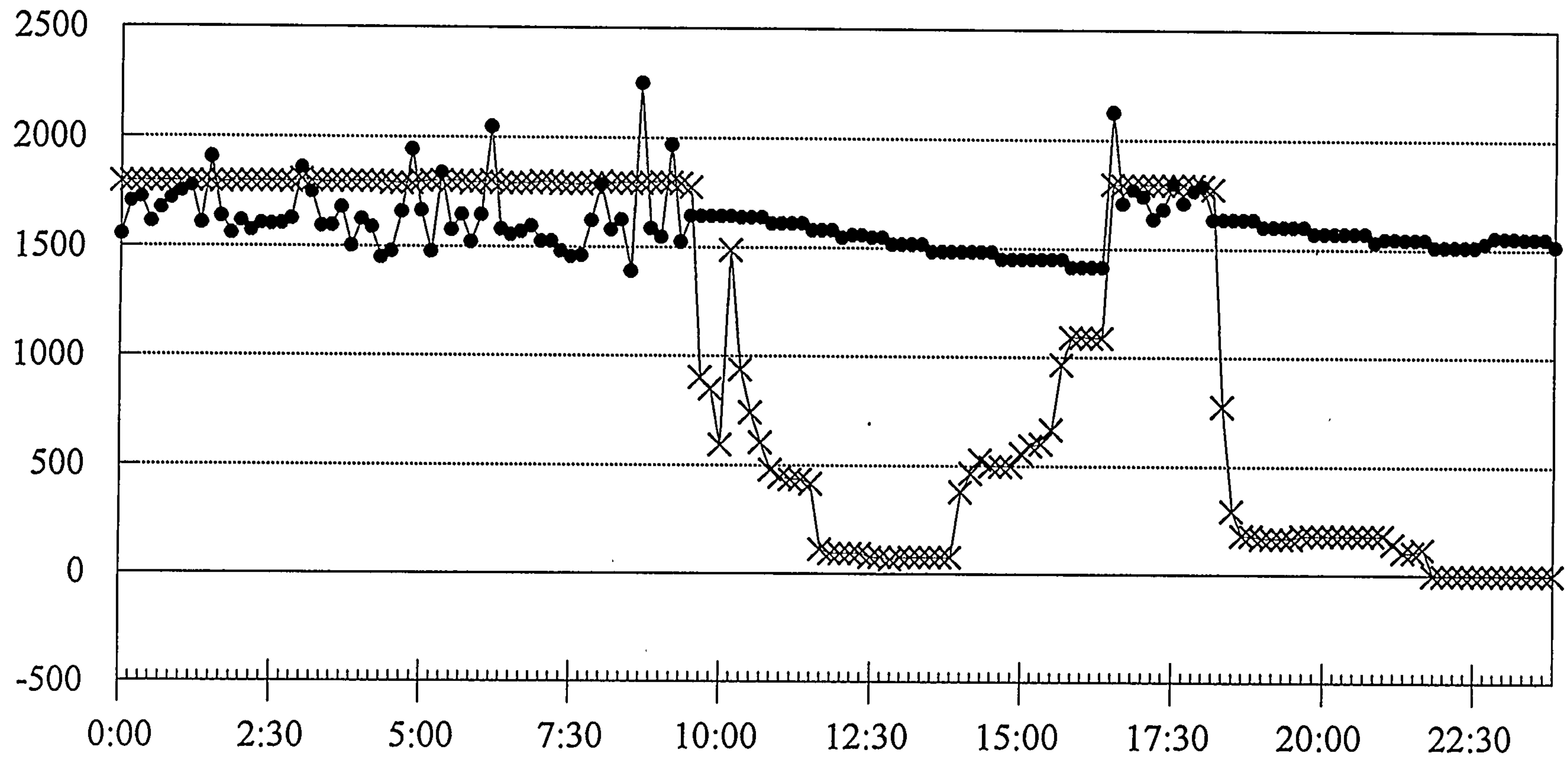

F5010804.CHT Lotus: 5CORF501.WK1

# Inlet and Process Flow
## 08/05/93



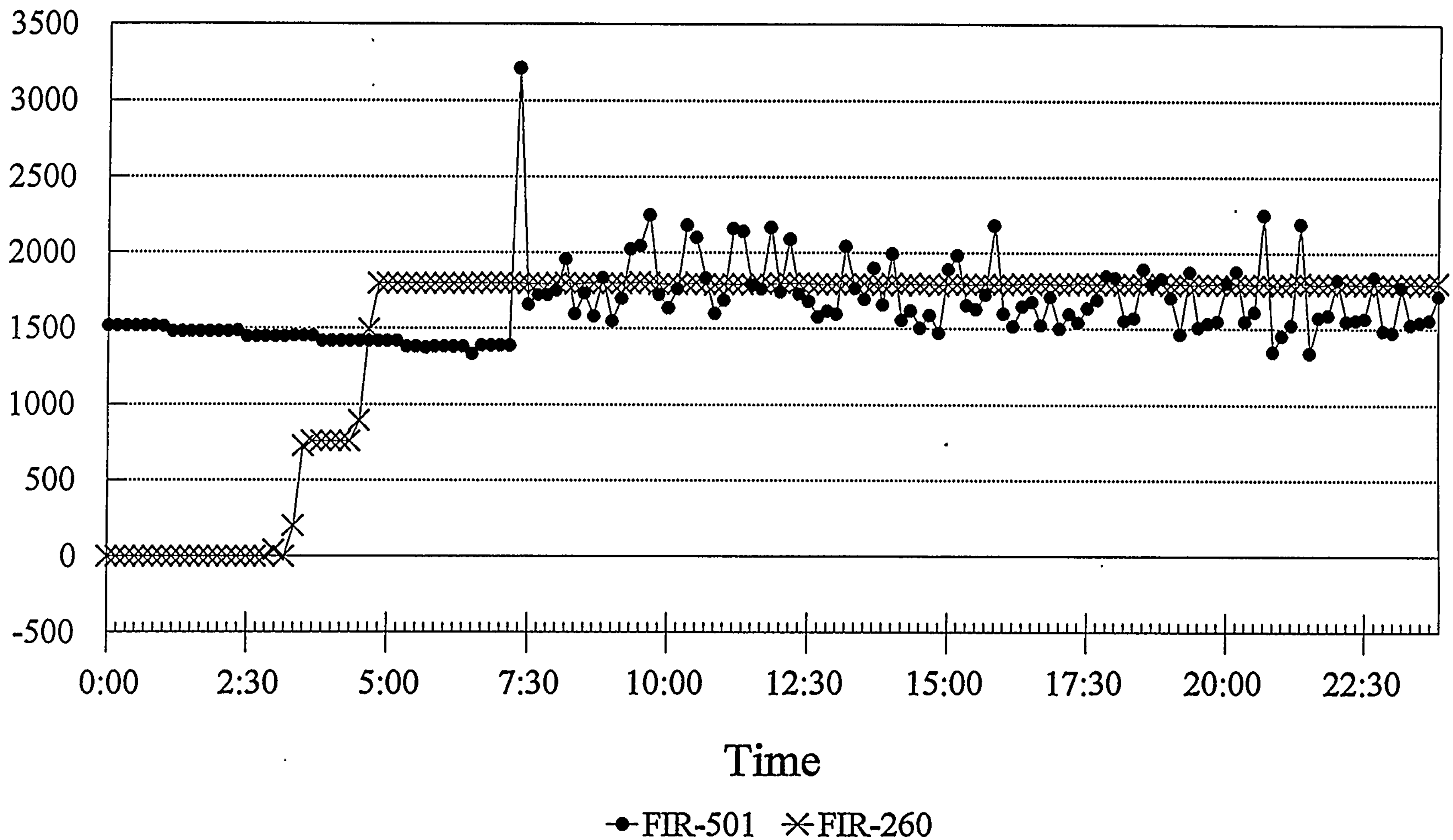

F5010805.CHT    Lotus: 5CORF501.WK1

# Inlet and Process Flow
## 08/06/93



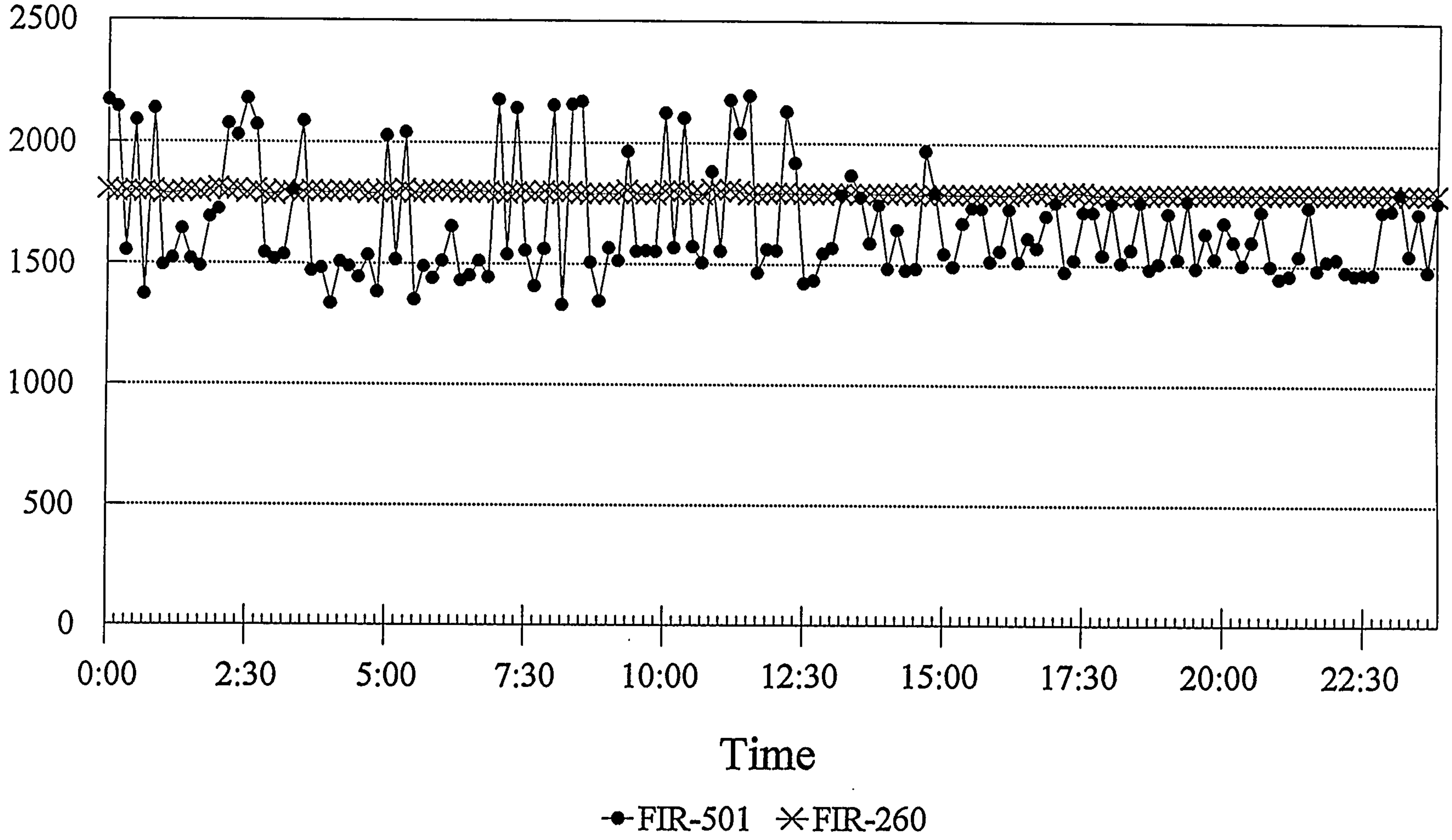

F5010806.CHT Lotus: 5CORF501.WK1

# Inlet and Process Flow
## 08/07/93



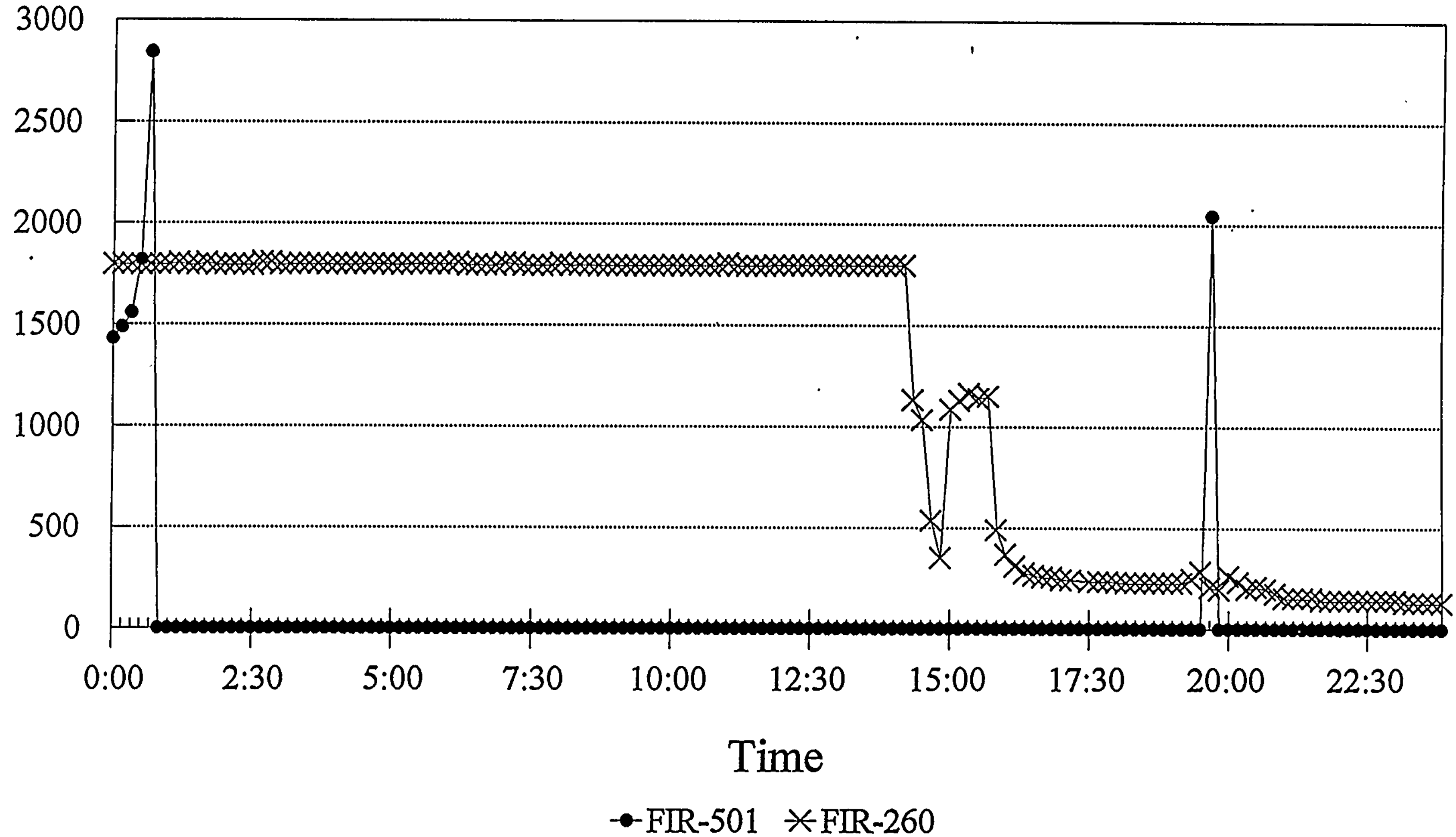

**F5010807.CHT Lotus: 5CORF501.WK1**

# Inlet and Process Flow
## 08/08/93



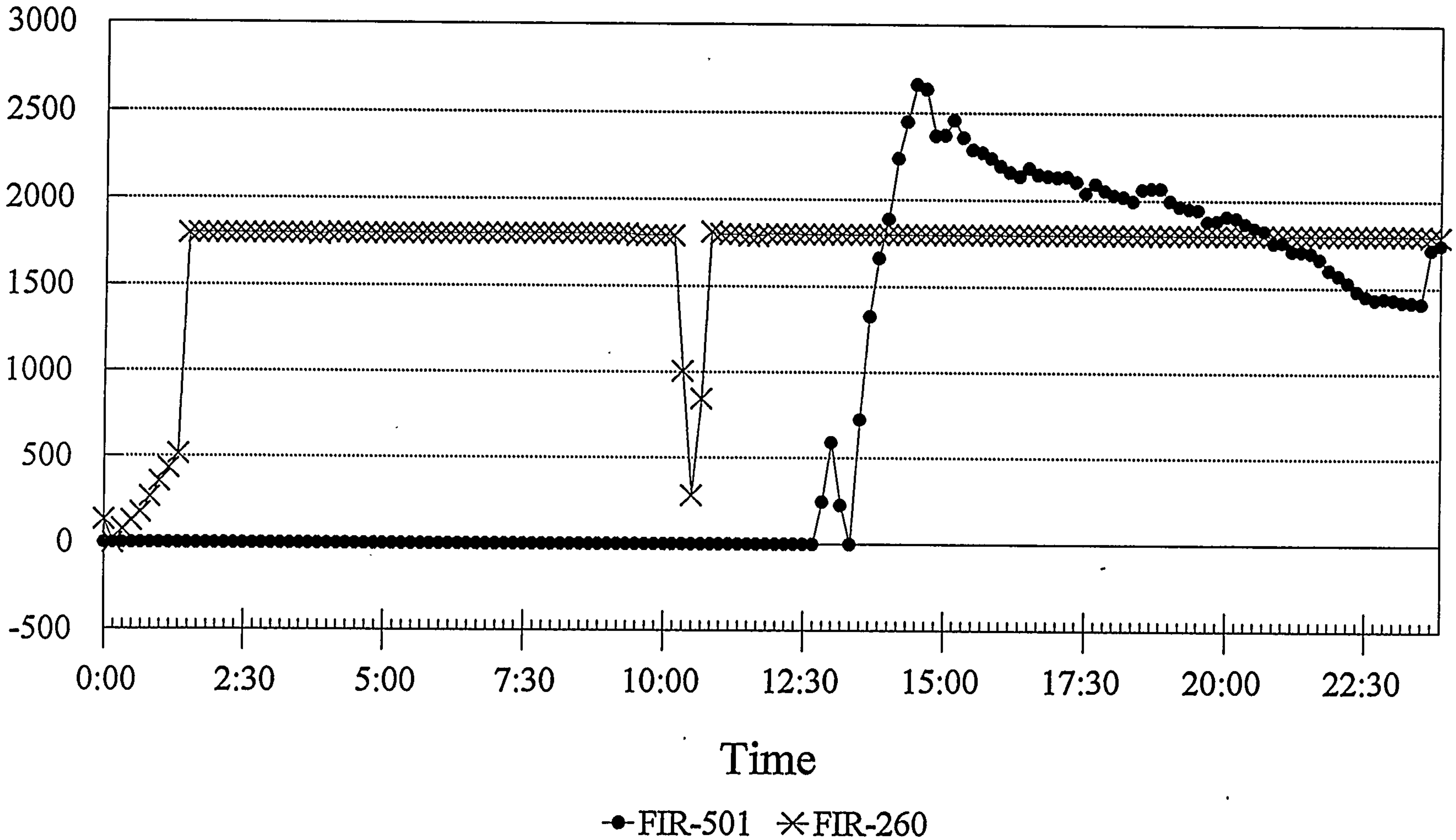

F5010808.CHT Lotus: 5CORF501.WK1

# Inlet and Process Flow
## 08/09/93



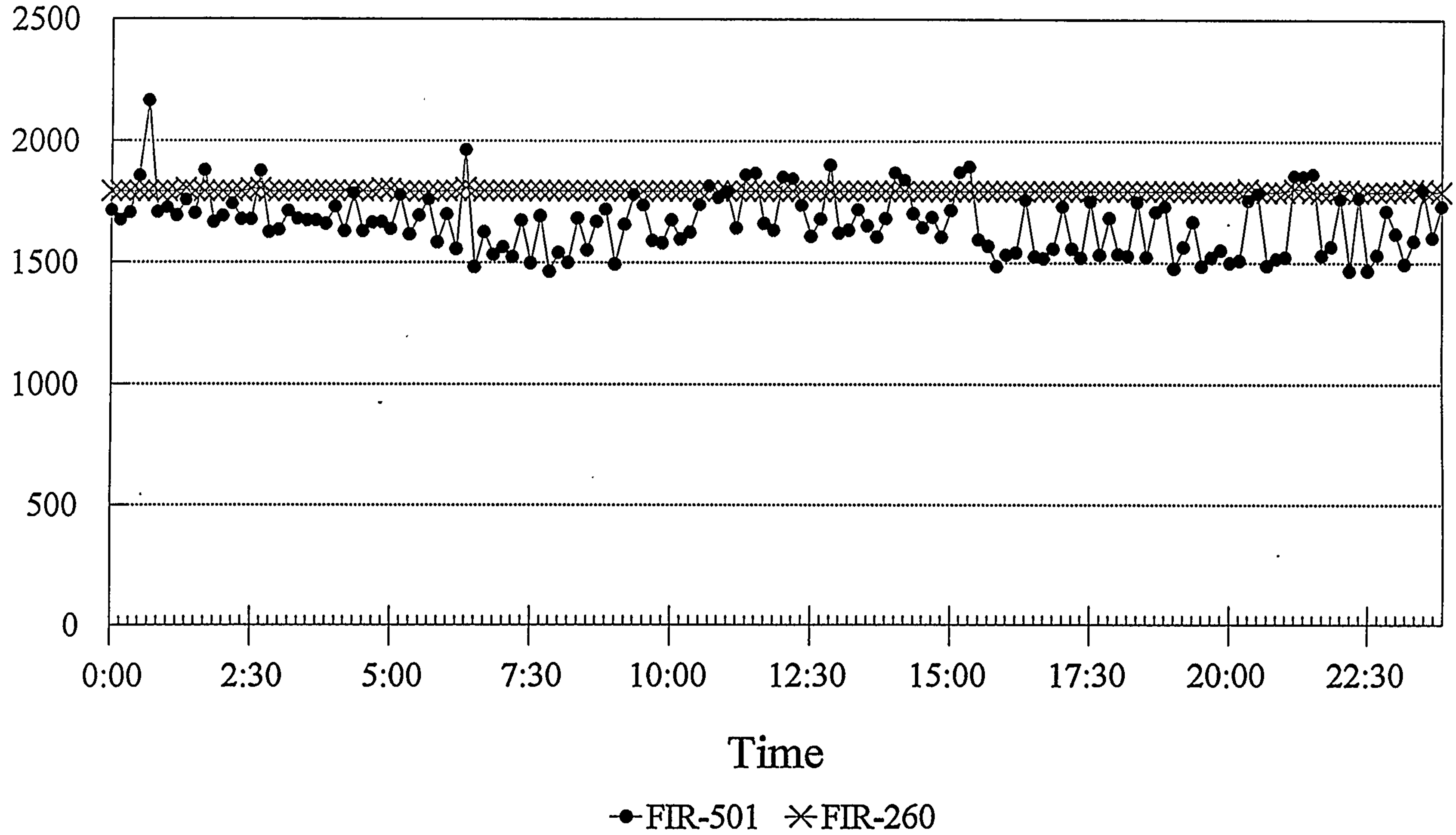

**F5010809.CHT  Lotus: 5CORF501.WK1**

# Inlet and Process Flow
## 08/10/93



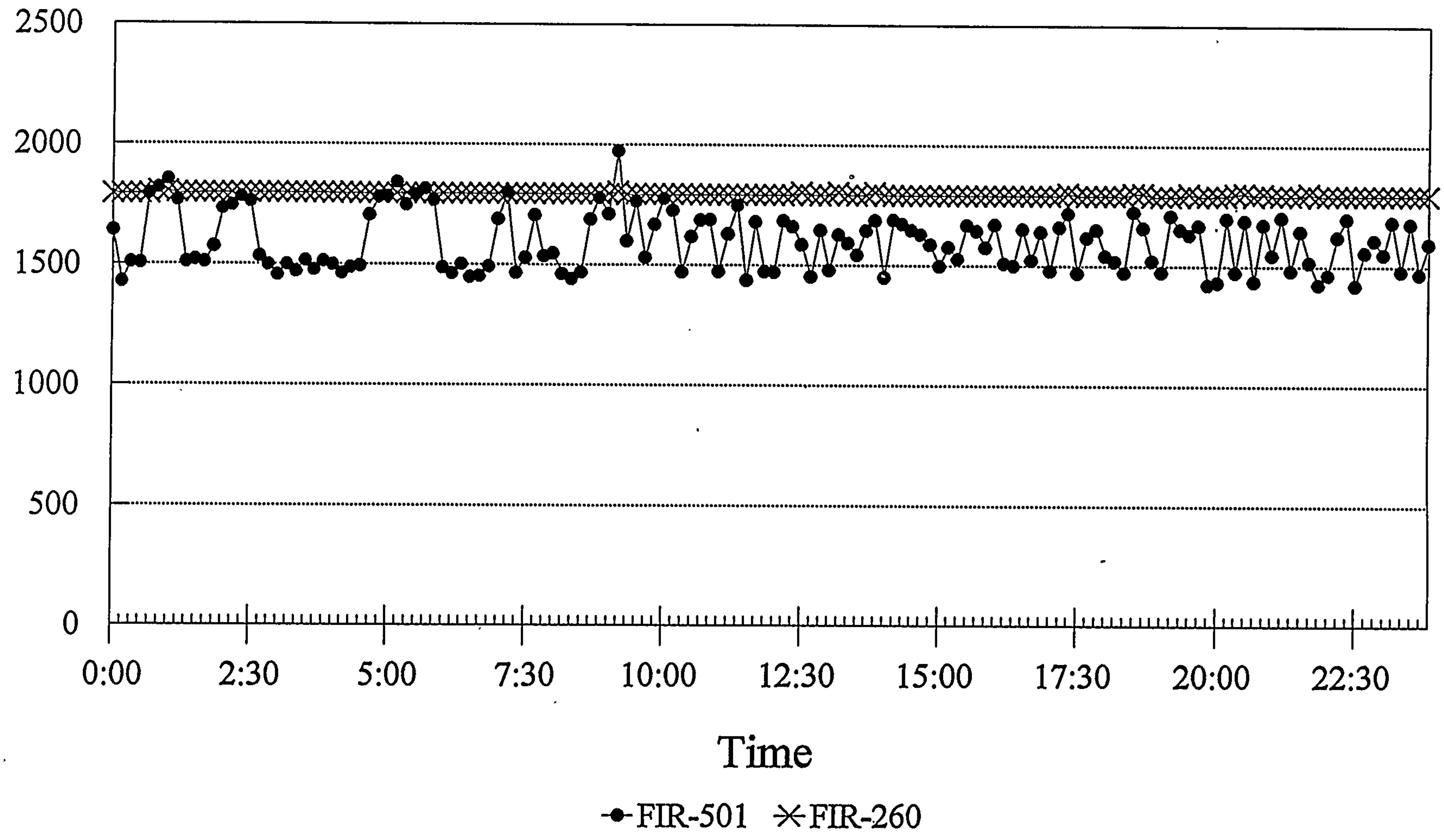

F5010810.CHT Lotus: 5CORF501.WK1

# Inlet and Process Flow
## 08/11/93



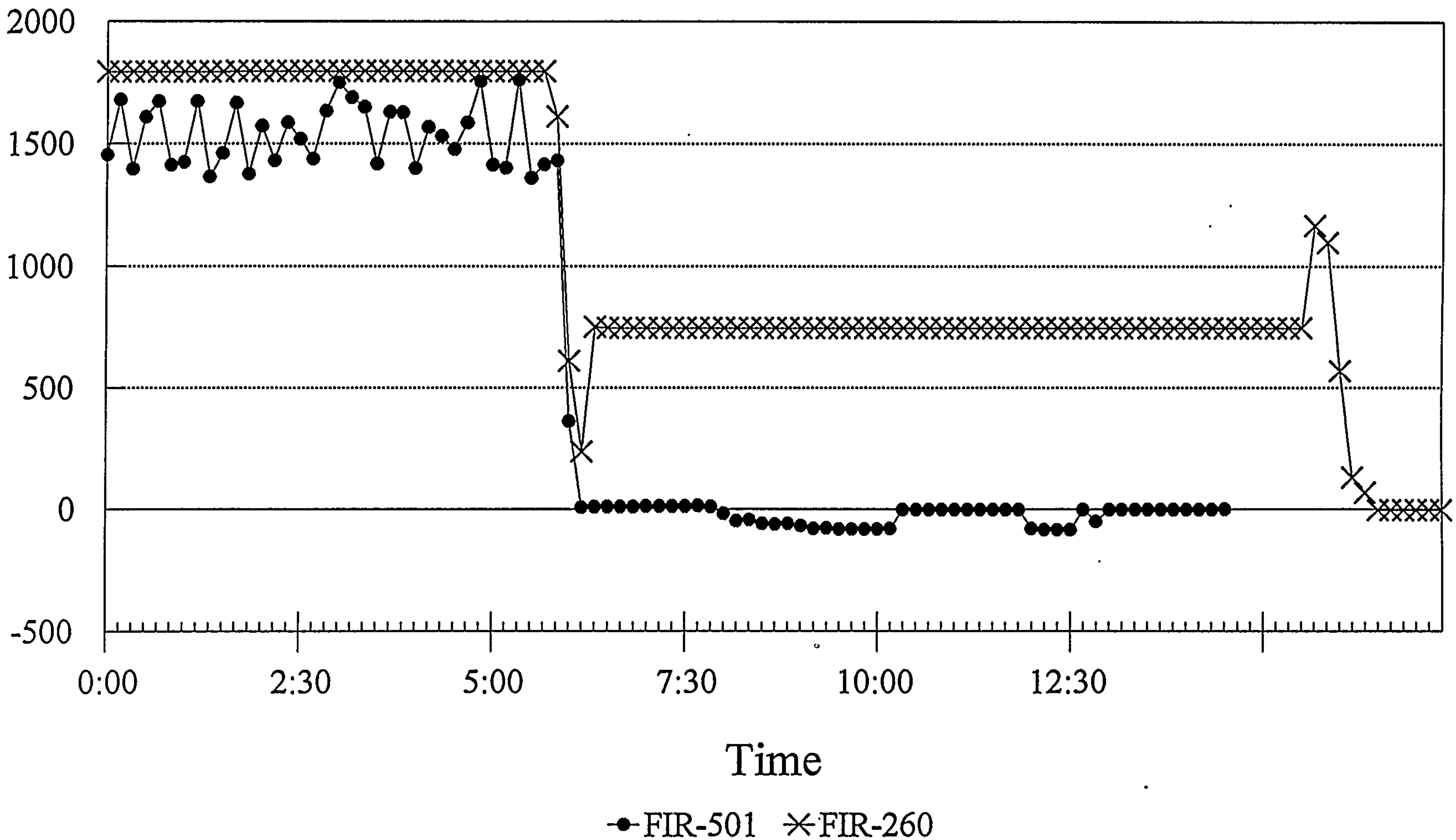

F5010811.CHT Lotus: 5CORF501.WK1

# Inlet and Process Flow
## 08/12/93



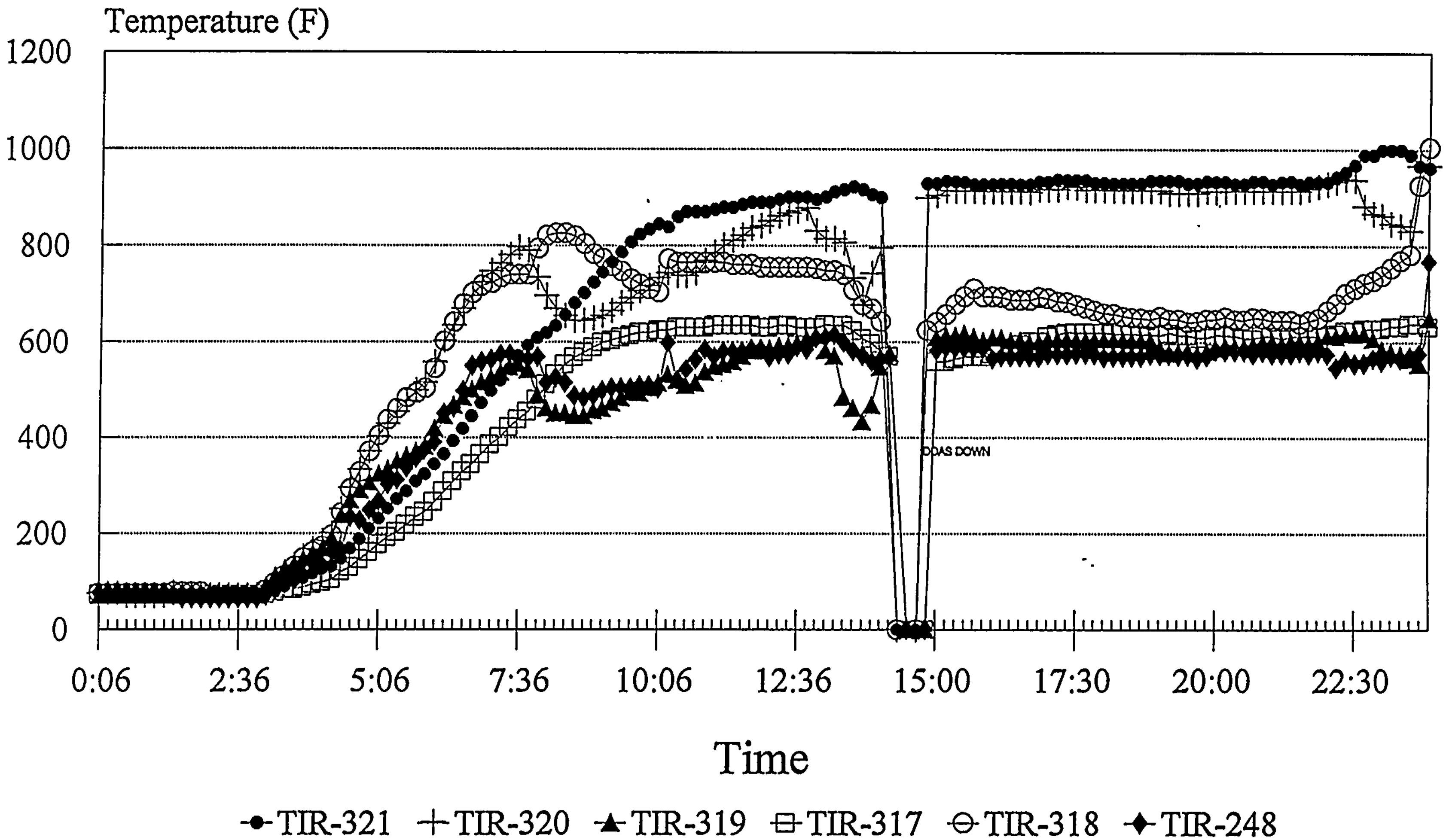

F5010812.CHT Lotus: 5CORF501.WK1

# Inlet and Process Flow
## 08/13/93



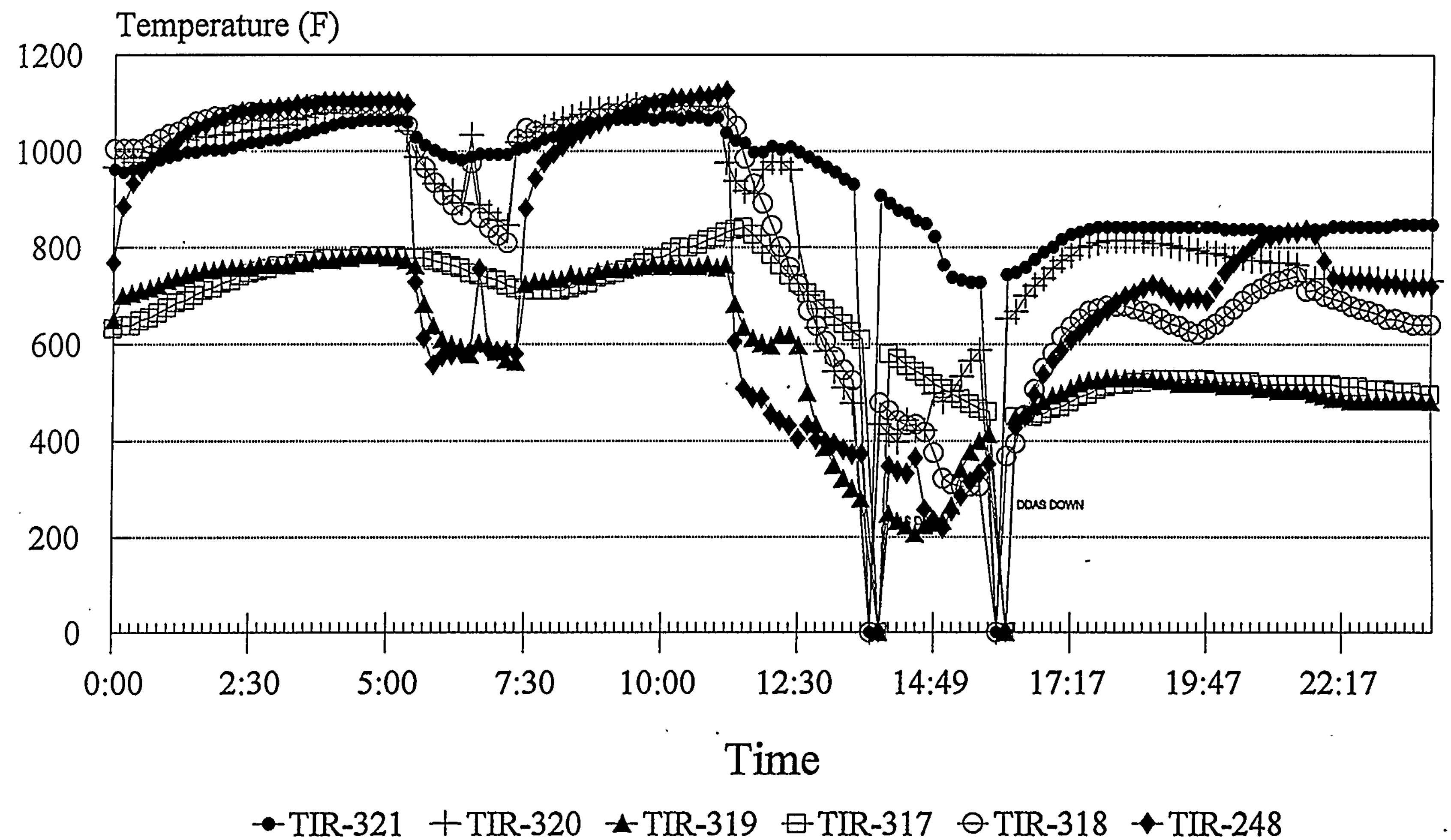

F5010812.CHT Lotus: 5CORF501.WK1

# Process Gas Line Temp.
## 08/02/93



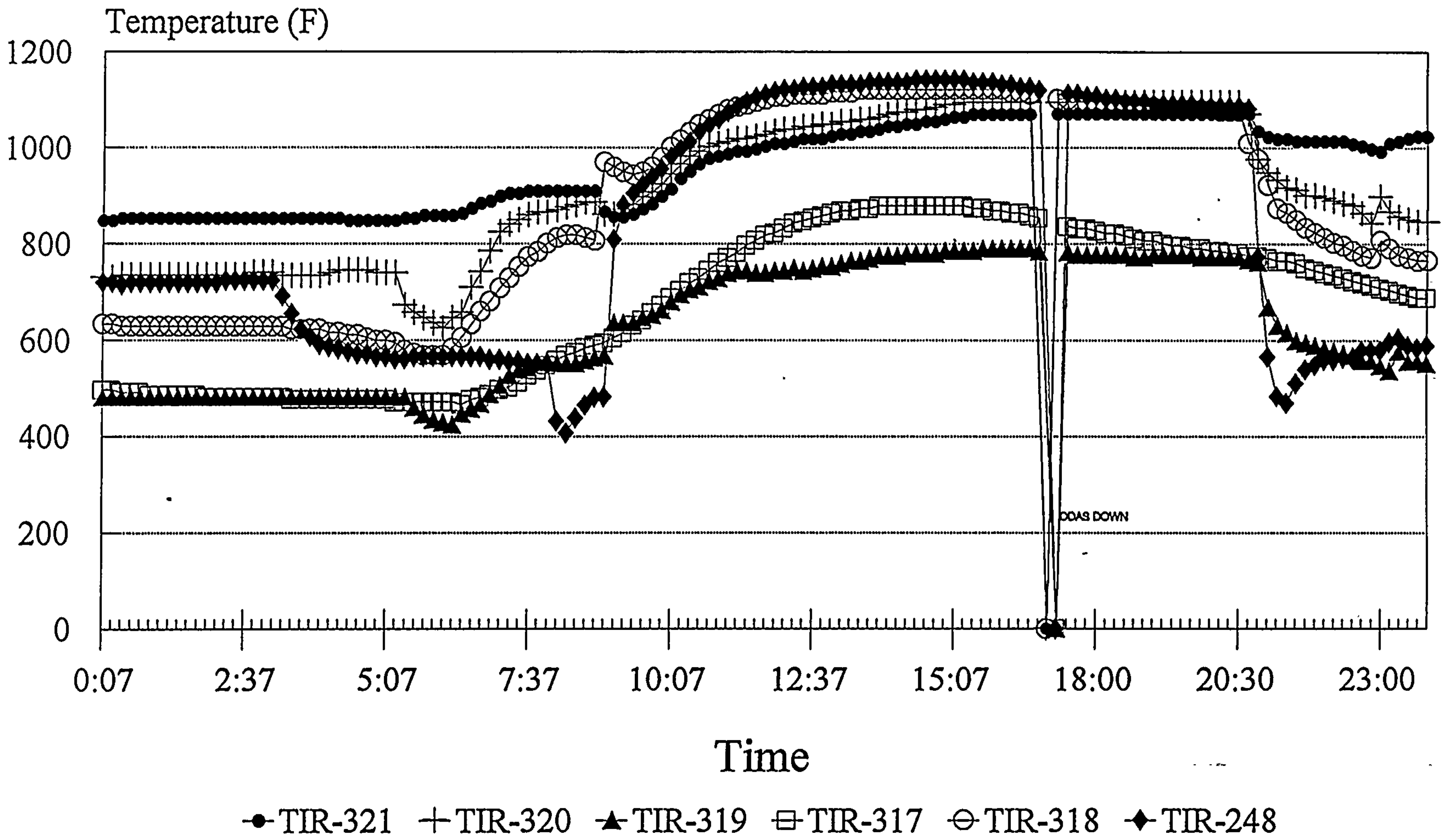

MIT0802.CHT Lotus: MIT80213.WK1

# Process Gas Line Temp.
## 08/03/93



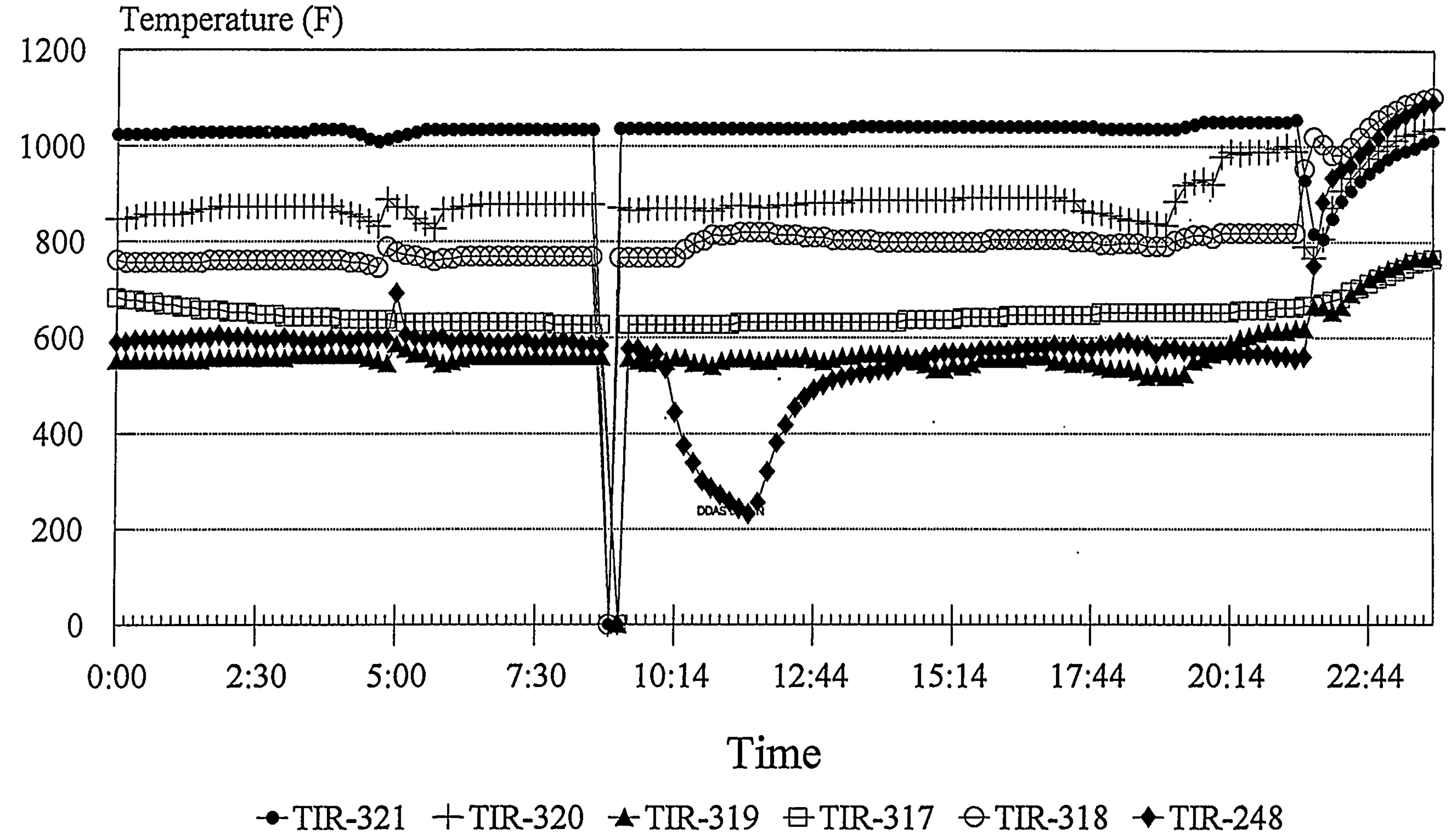

MIT0803.CHT Lotus: MIT80213.WK1

# Process Gas Line Temp.
## 08/04/93



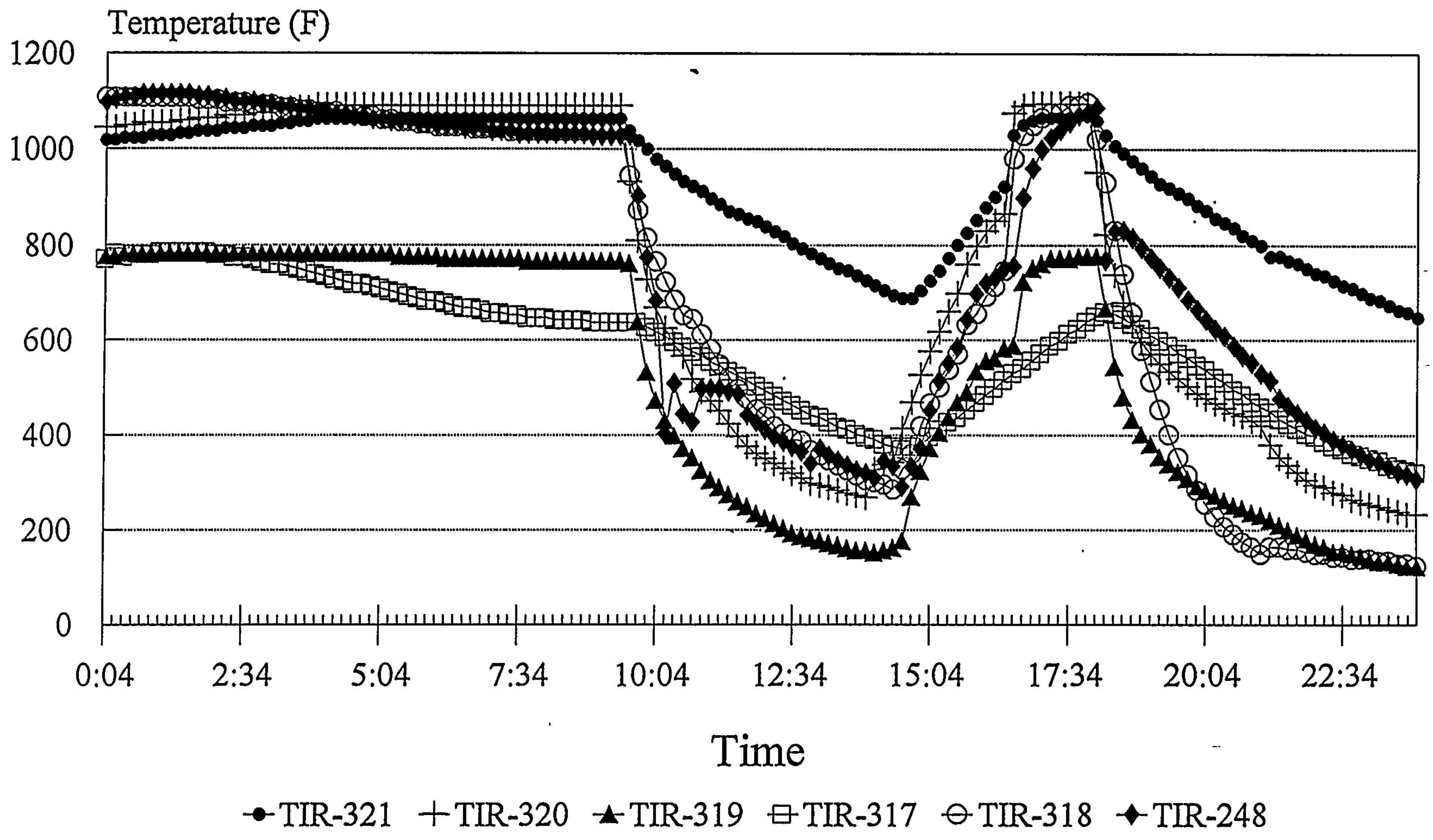

MIT0804.CHT Lotus: MIT80213,WK1

# Process Gas Line Temp.
## 08/05/93



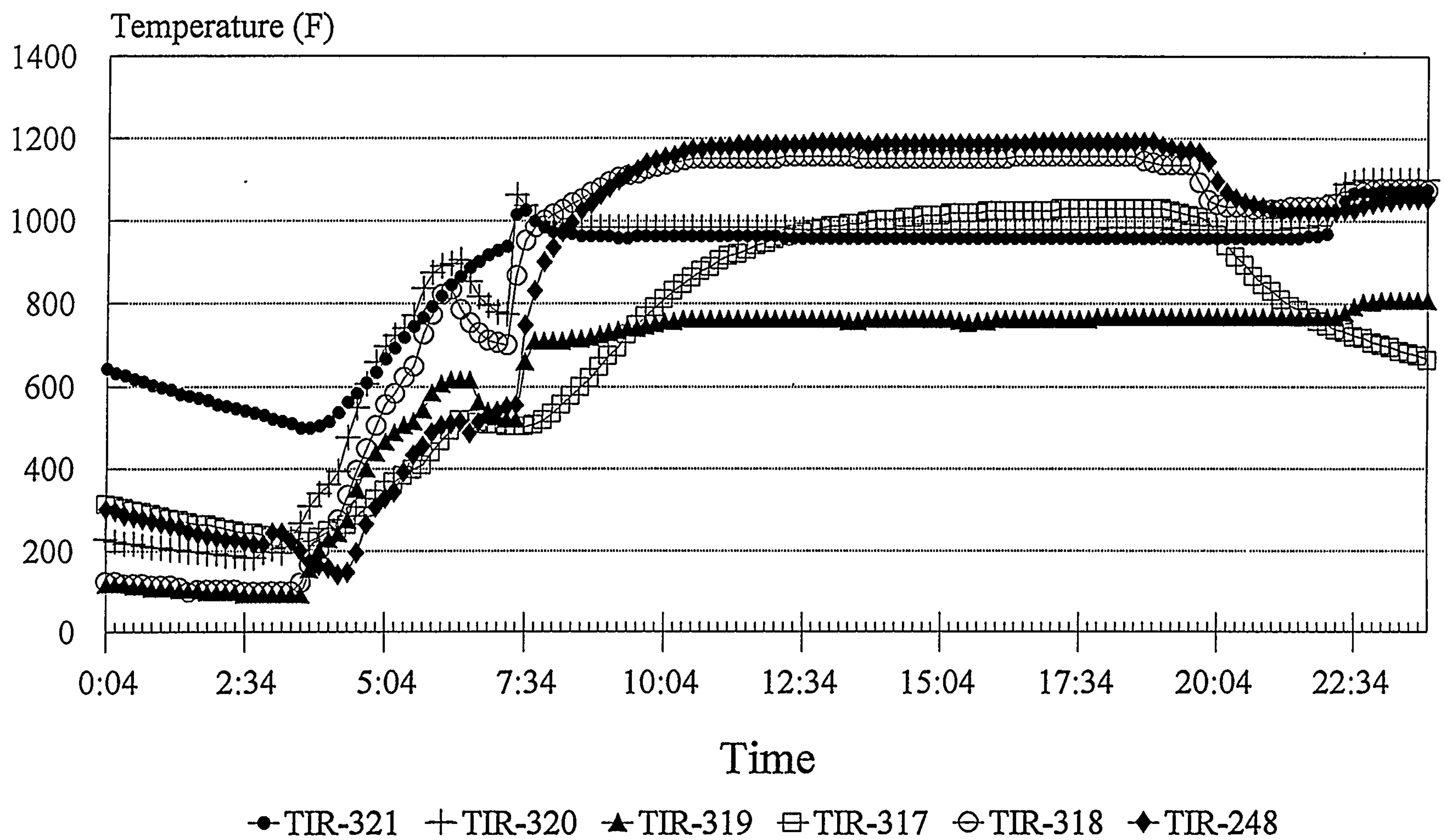

MIT0805.CHT Lotus: MIT80213.WK1

# Process Gas Line Temp.
## 08/06/93



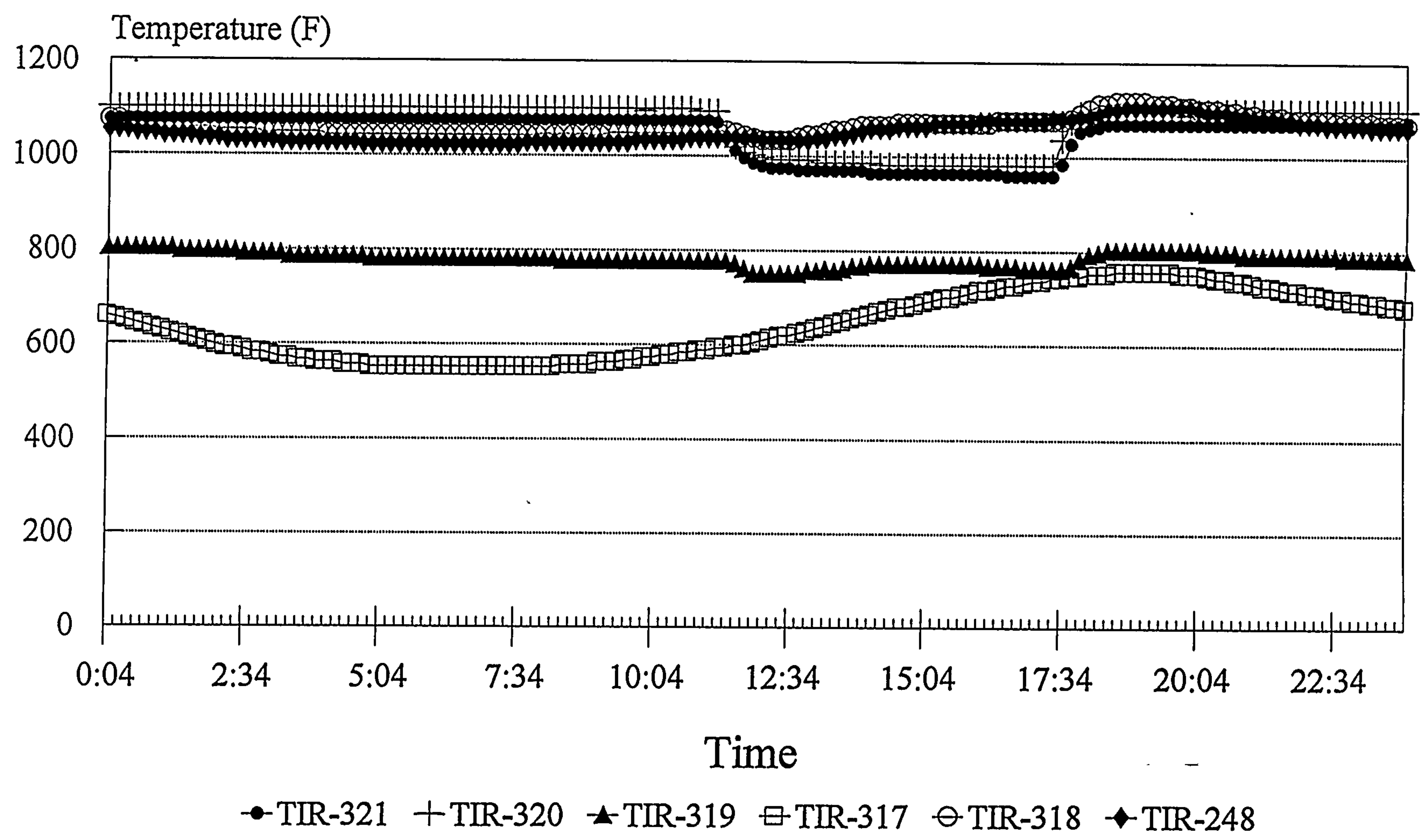

**MIT0806.CHT Lotus: MIT80213.WK1**

# Process Gas Line Temp.
## 08/07/93



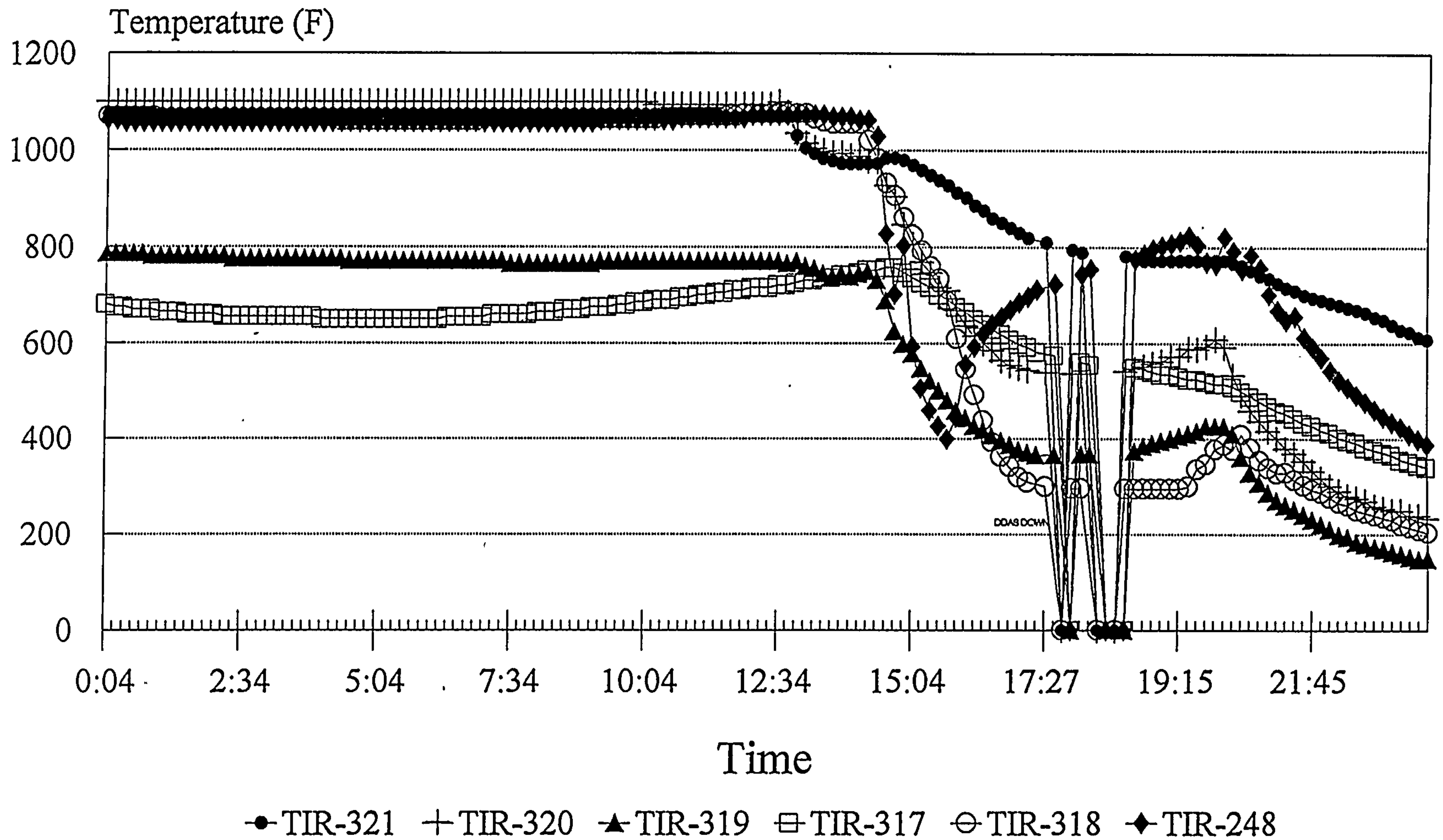

**MIT0807.CHT Lotus: MIT80213.WK1**

# Process Gas Line Temp.
## 08/08/93



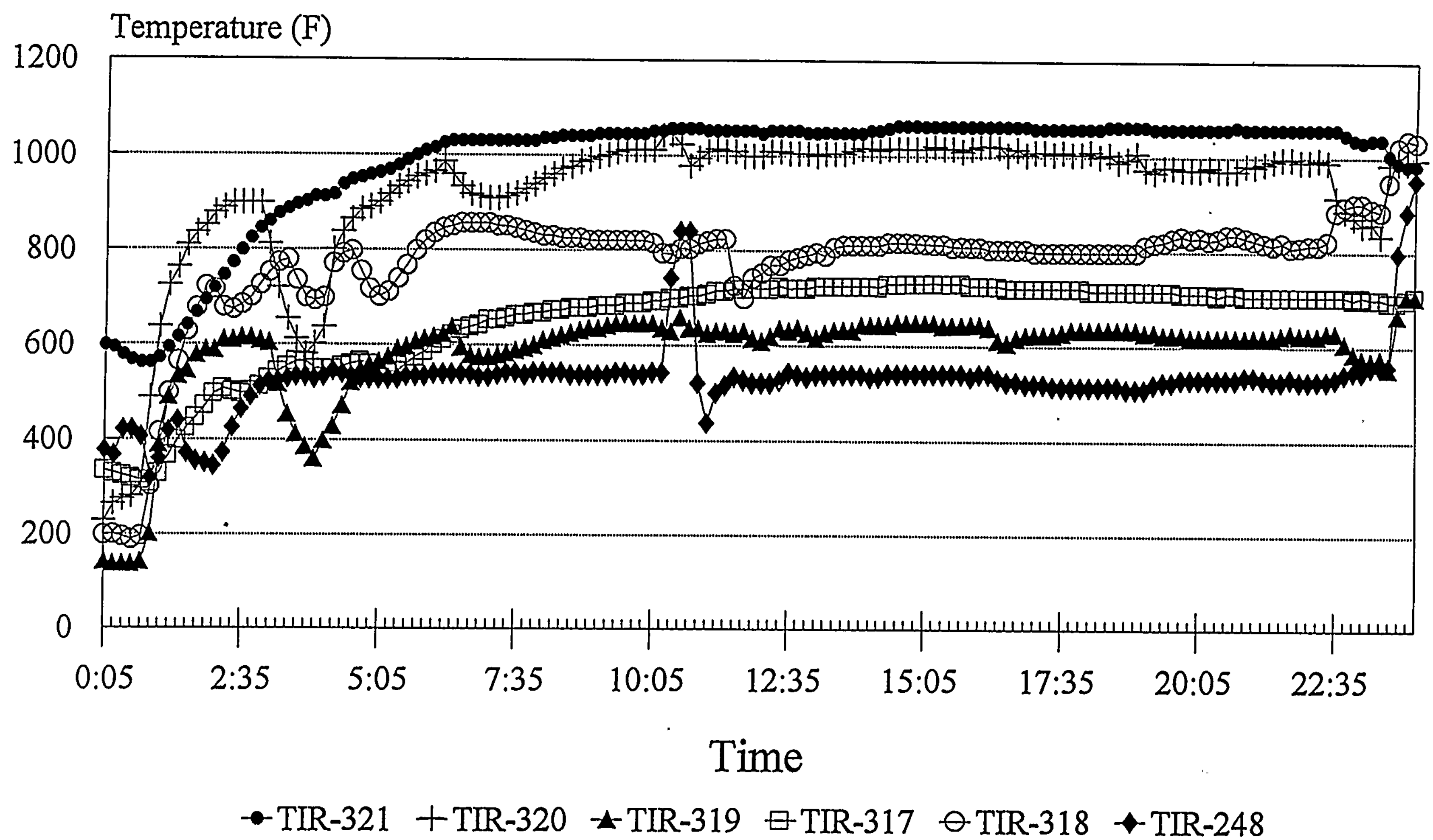

MIT0808.CHT Lotus: MIT80213.WK1

# Process Gas Line Temp.
## 08/09/93



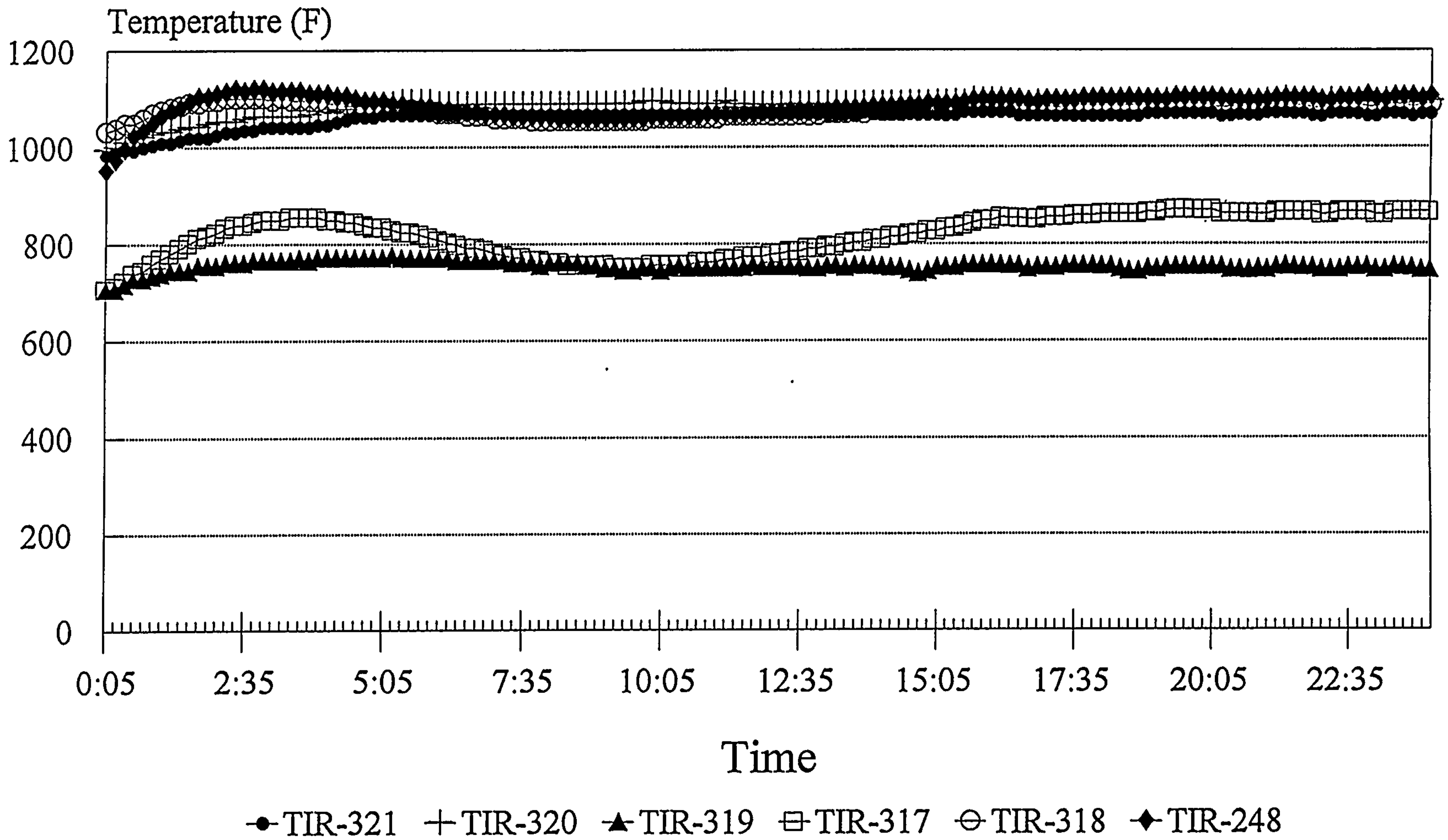

MIT0809.CHT Lotus: MIT80213.WK1

# Process Gas Line Temp.
## 08/10/93



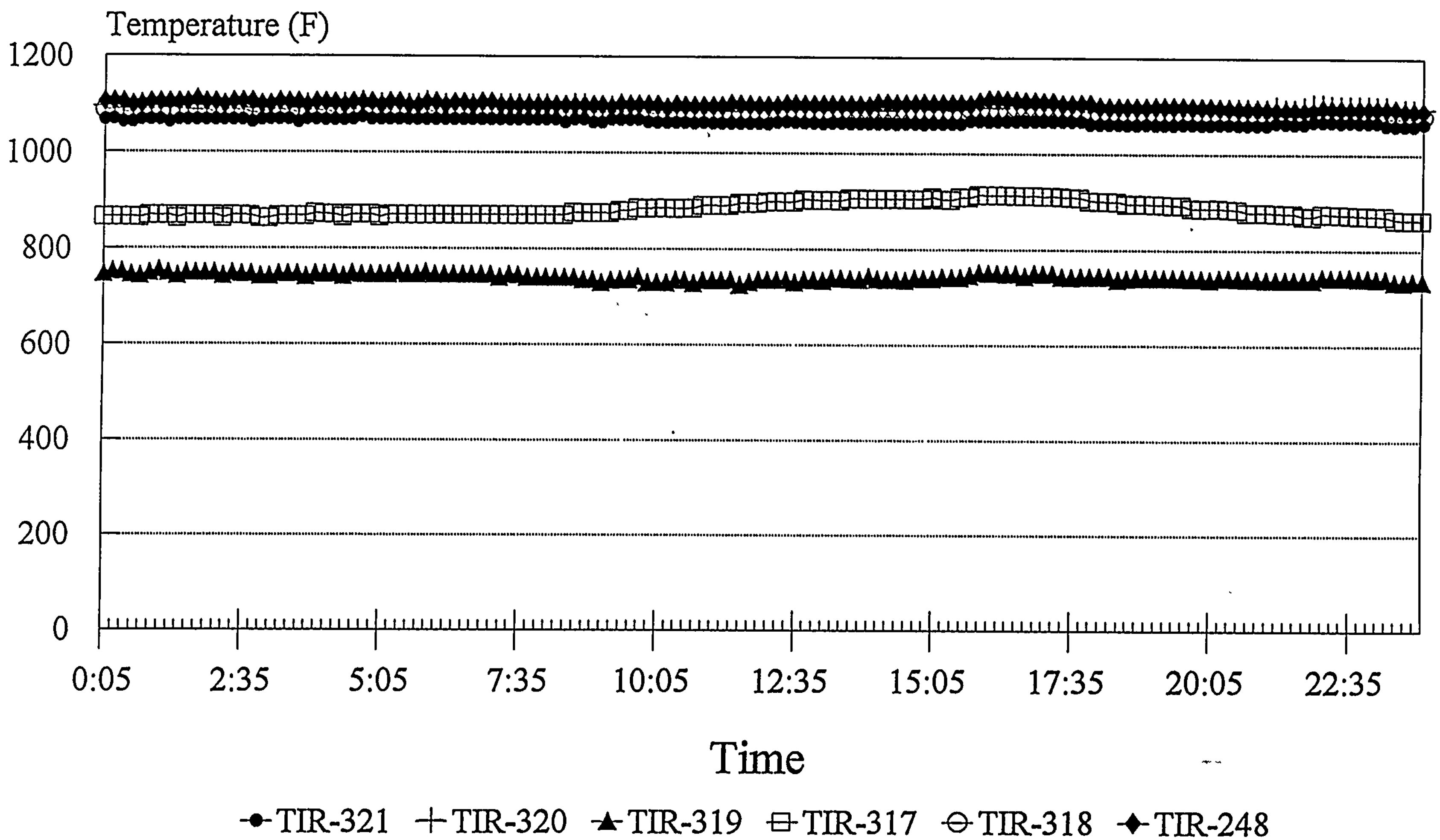

**MIT0810.CHT Lotus: MIT80213.WK1**

# Process Gas Line Temp.
## 08/11/93



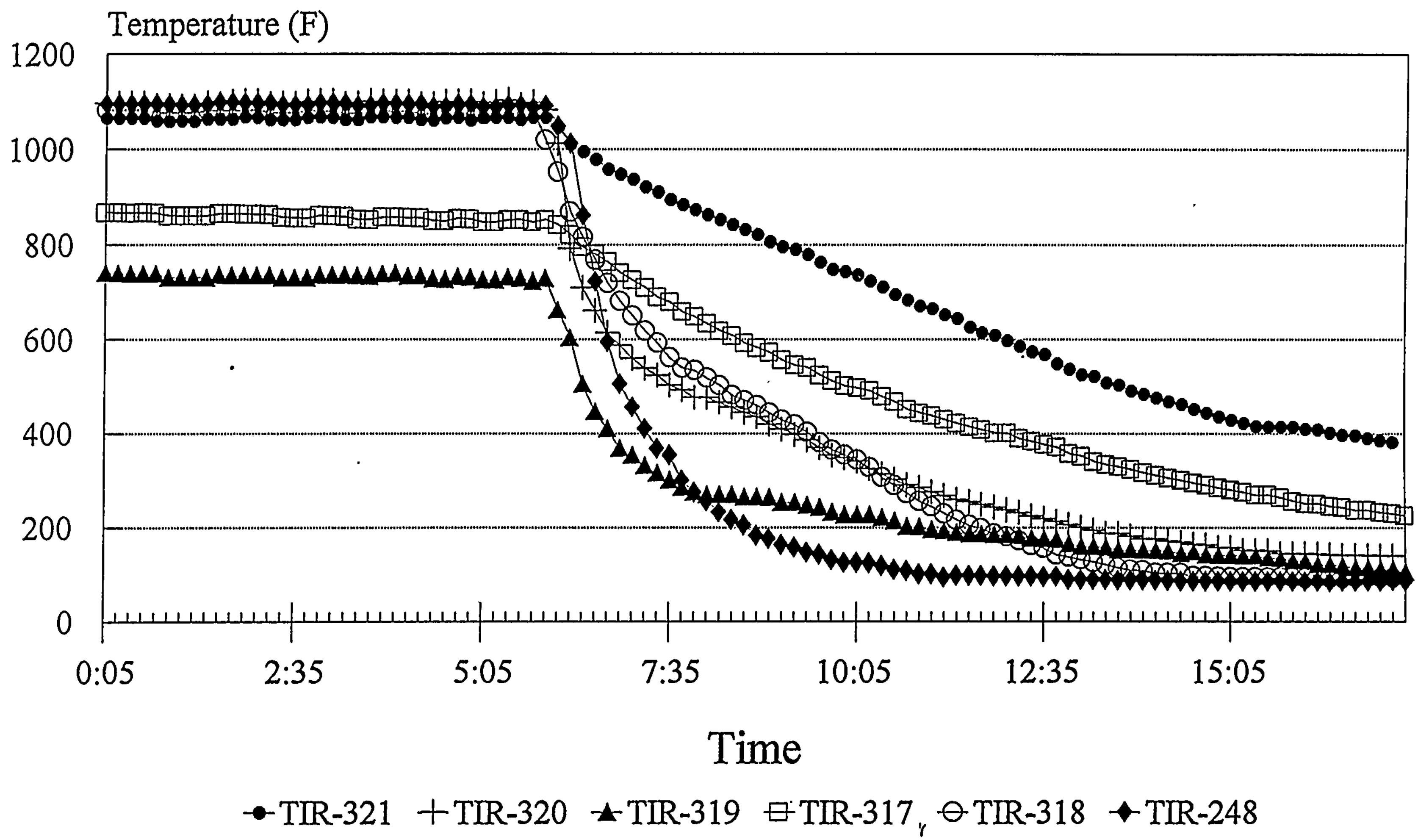

MIT0811.CHT Lotus: MIT80213.WK1

# Process Gas Line Temp.
## 08/12/93



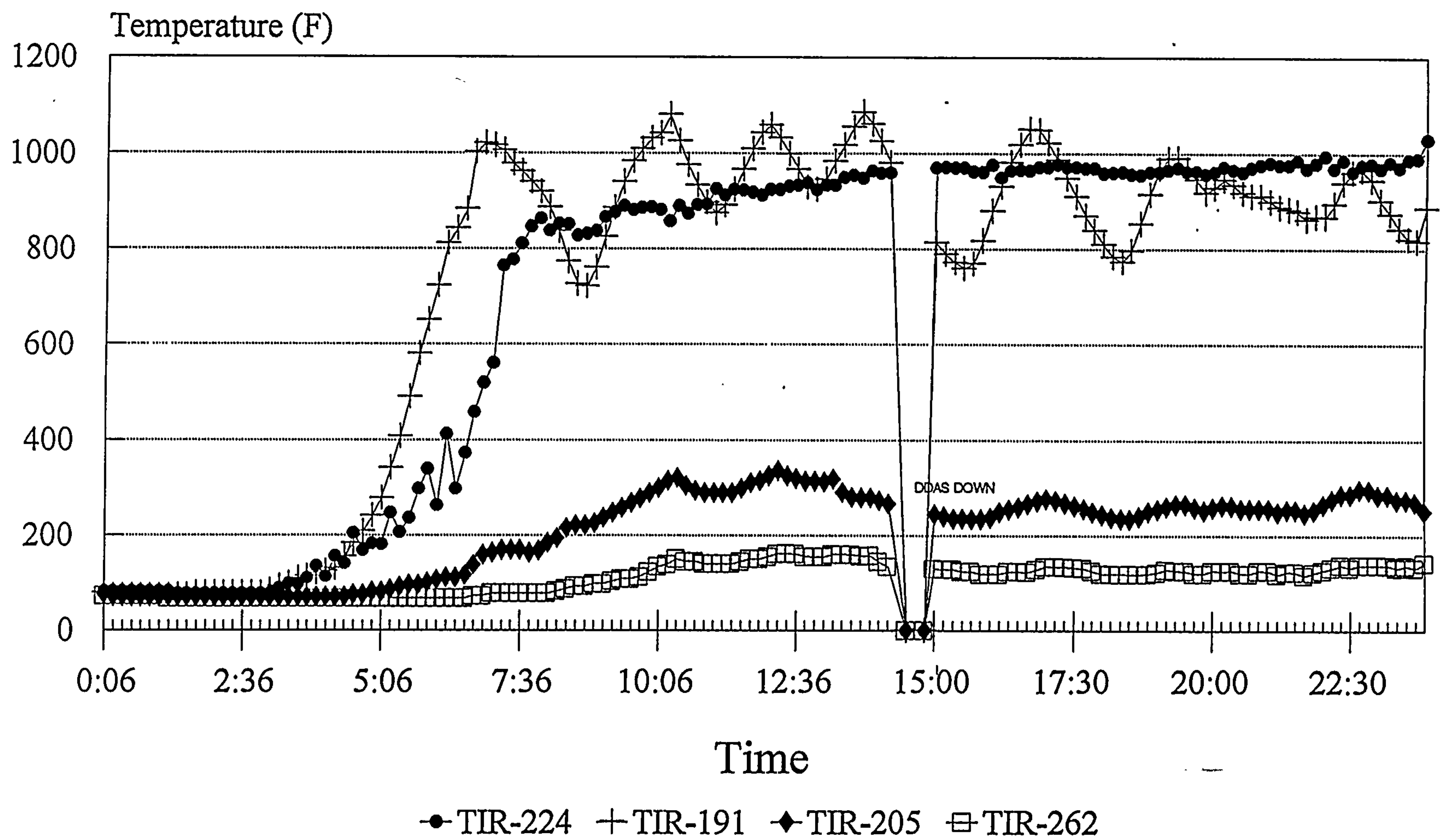

MIT0812.CHT Lotus: MIT80213.WK1

# Process Gas Line Temp.
## 08/13/93



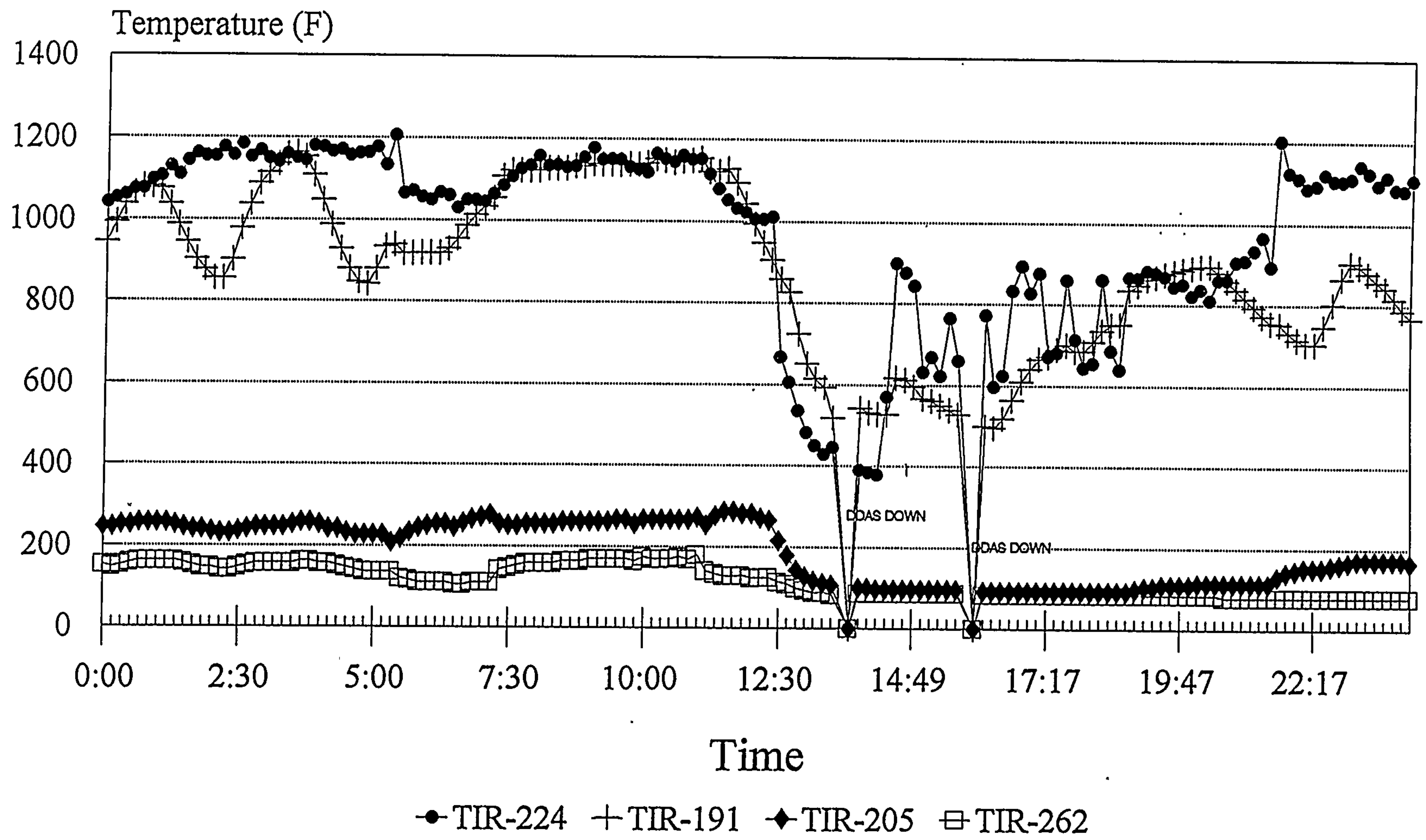

MIT0813.CHT Lotus: MIT80213.WK1

# Process Temperatures
## 08/02/93



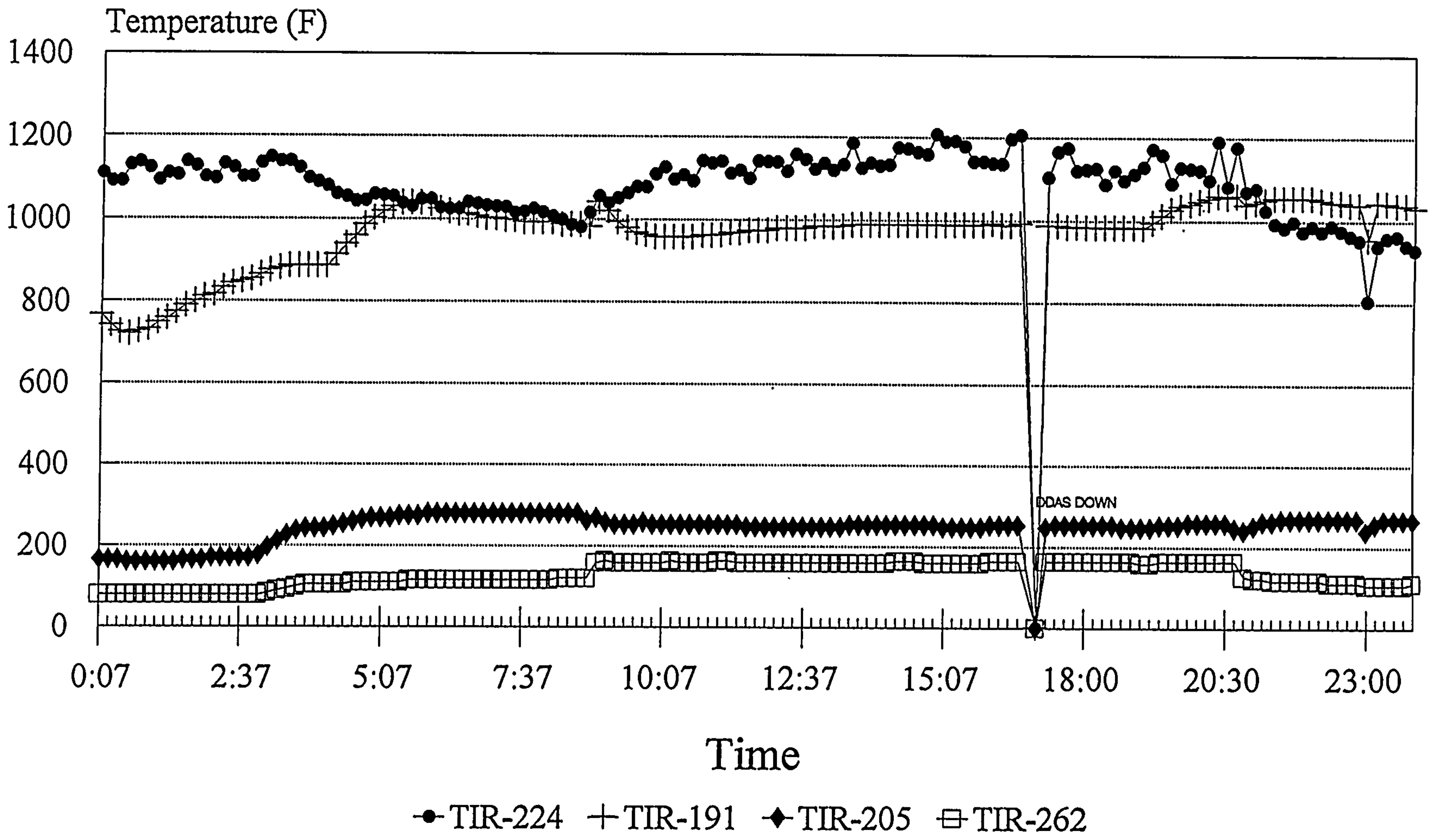

MT0802.CHT Lotus: MT080213.WK1

# Process Temperatures
## 08/03/93



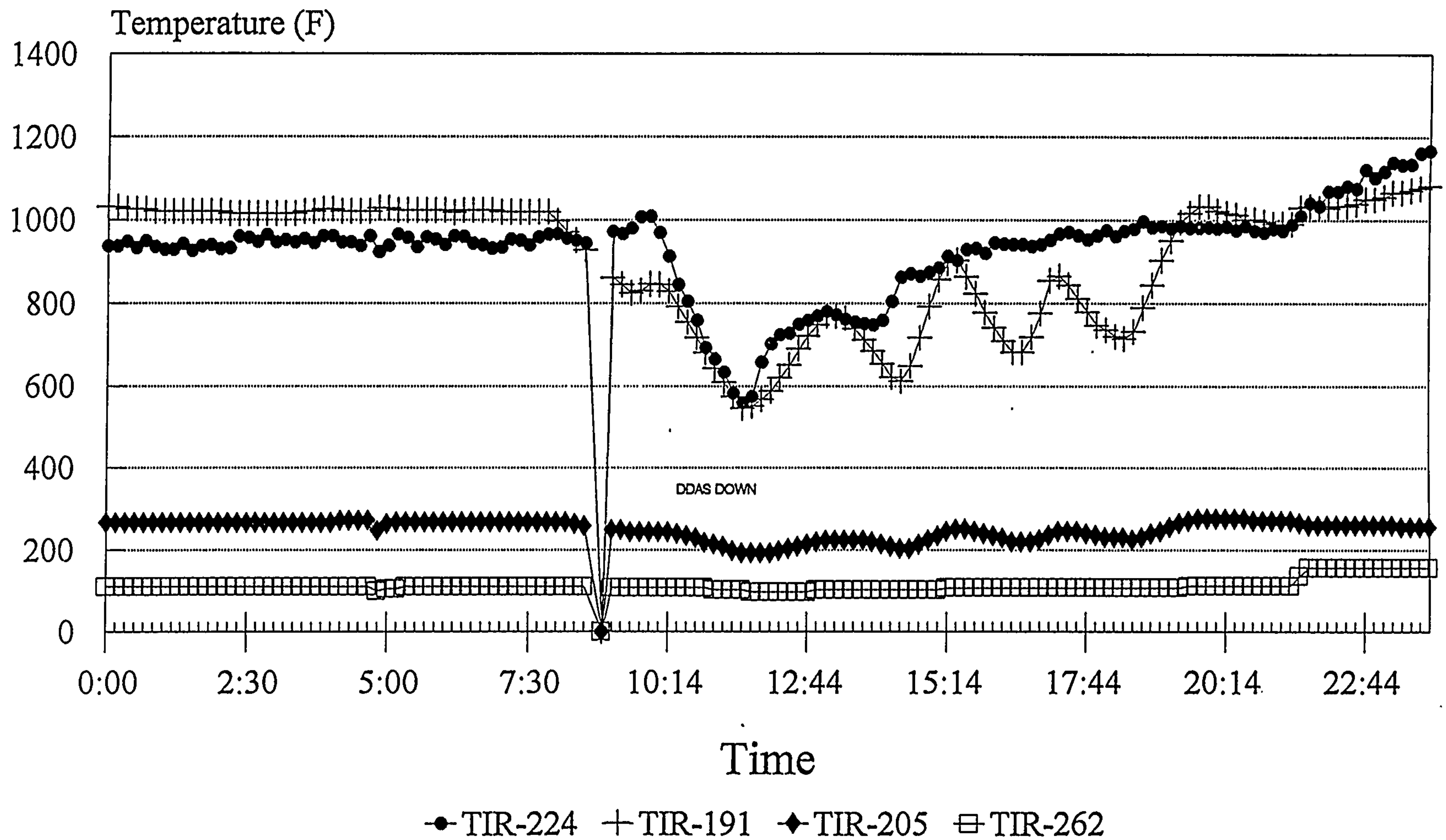

MT0503.CHT Lotus: MT050213.WK1

# Process Temperatures
## 08/04/93



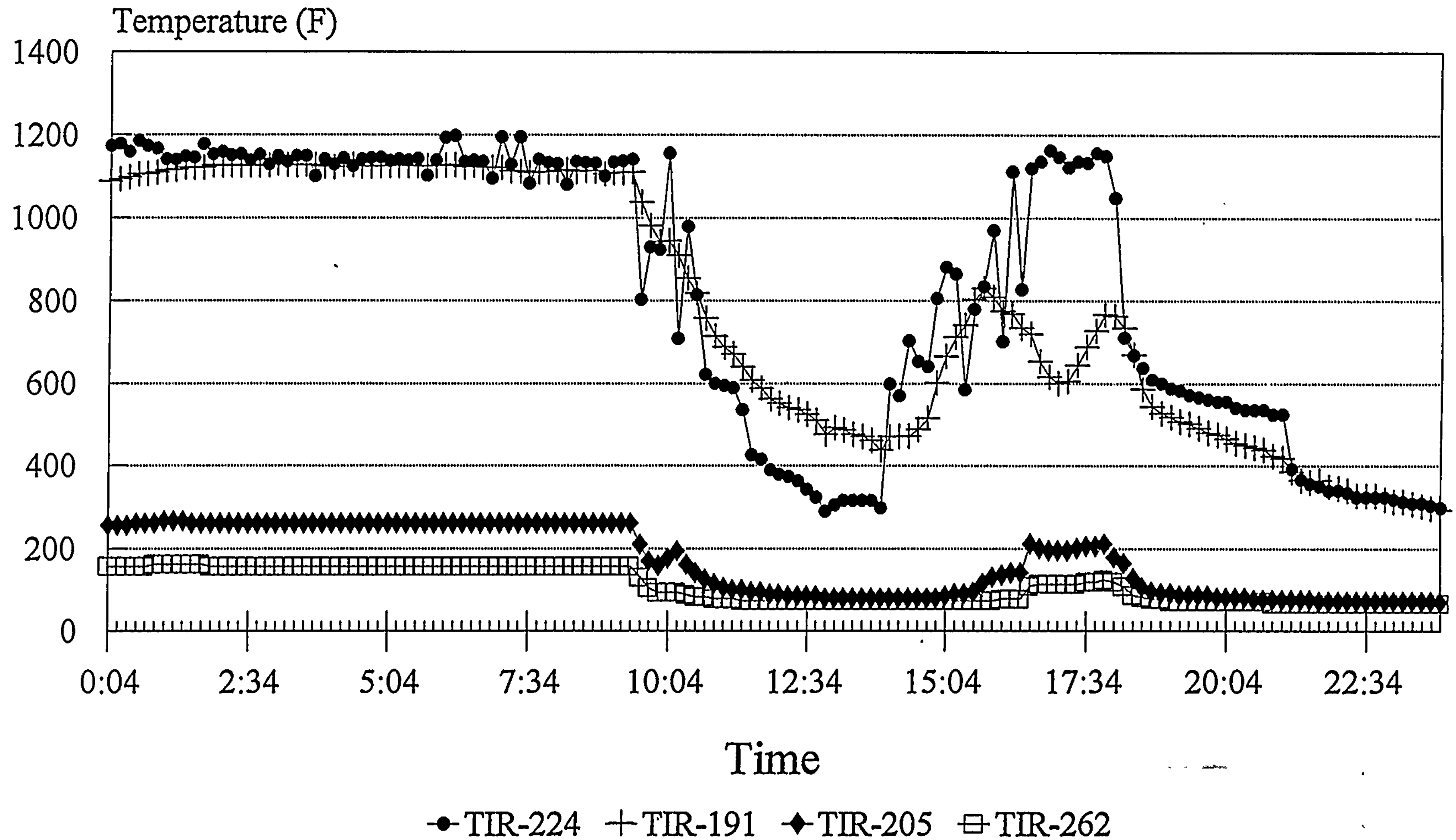

MT0804.CHT Lotus: MT080213.WK1

# Process Temperatures
## 08/05/93



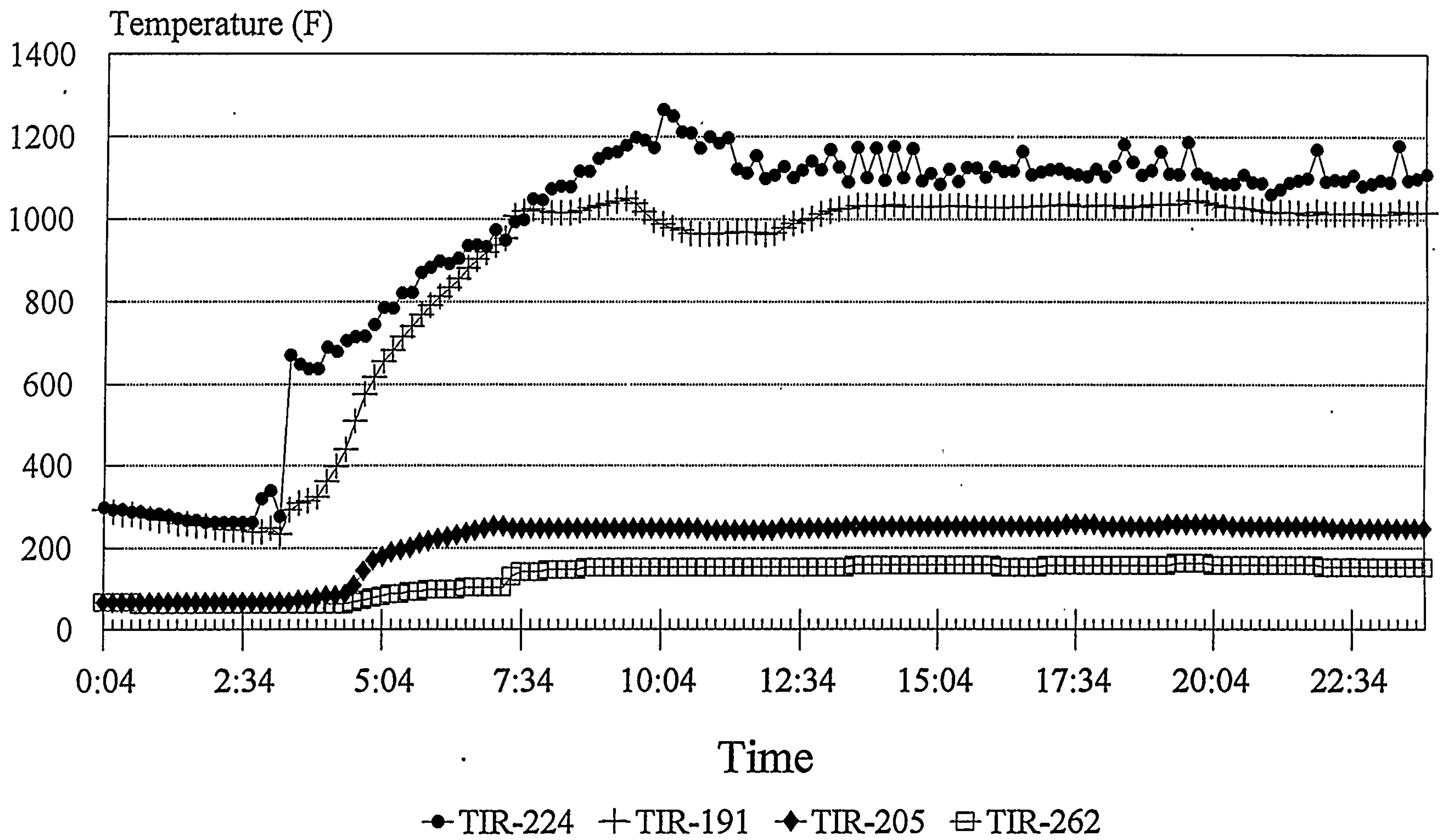

**MT0805.CHT Lotus: MT080213.WK1**

# Process Temperatures
## 08/06/93



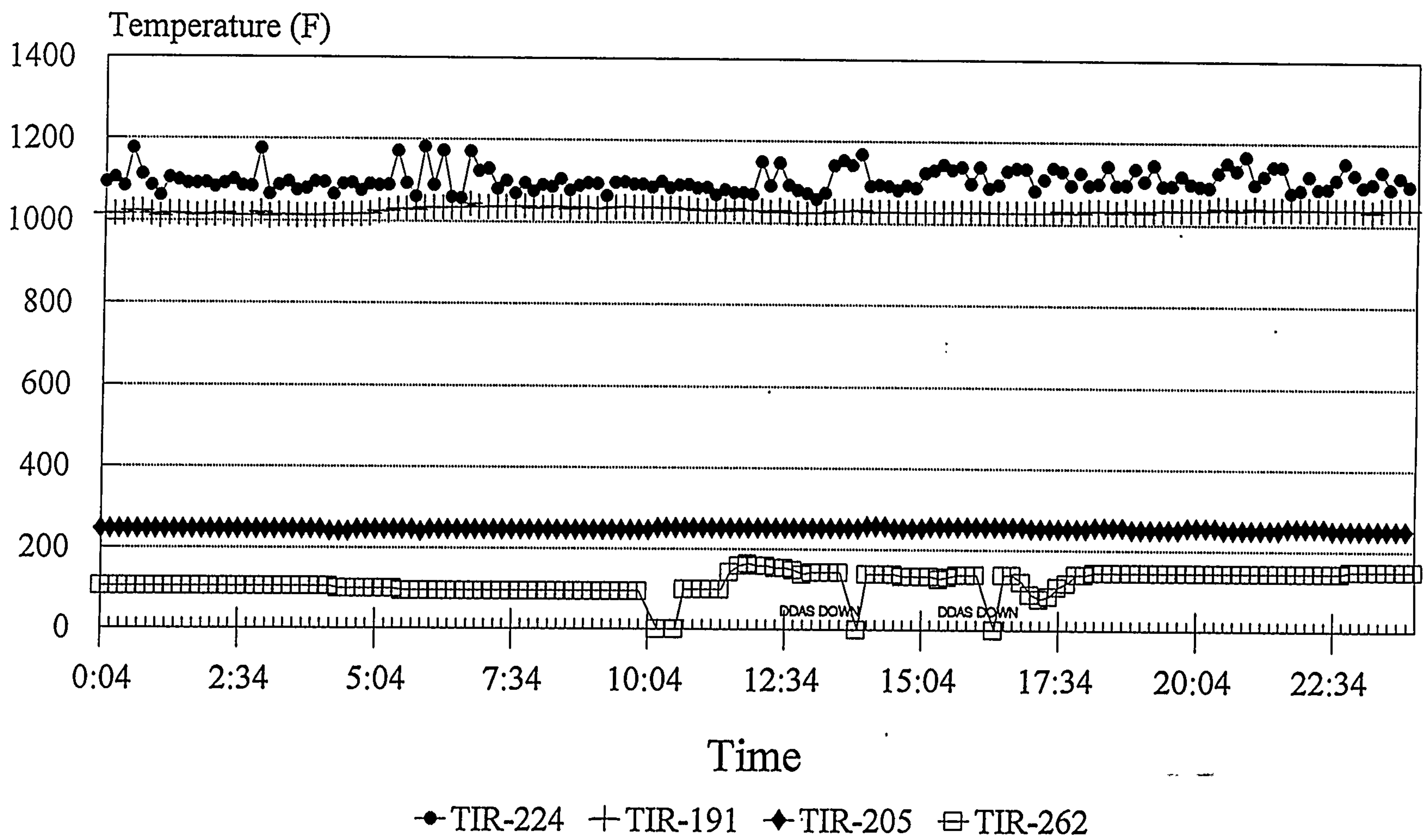

**MT0806.CHT Lotus: MT080213.WK1**

# Process Temperatures
## 08/07/93



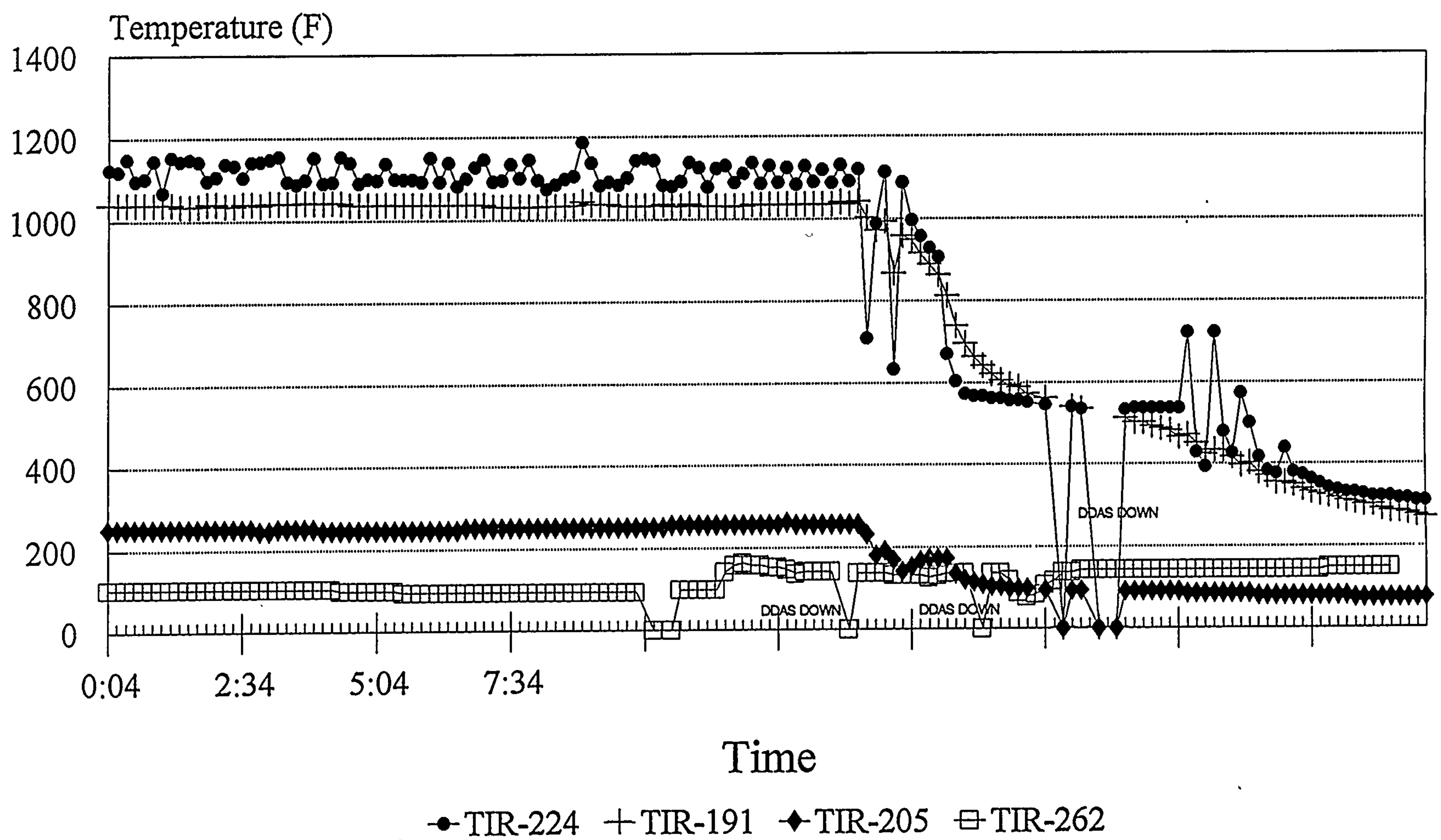

MT0807.CHT Lotus: MT080213.WK1

# Process Temperatures
## 08/08/93



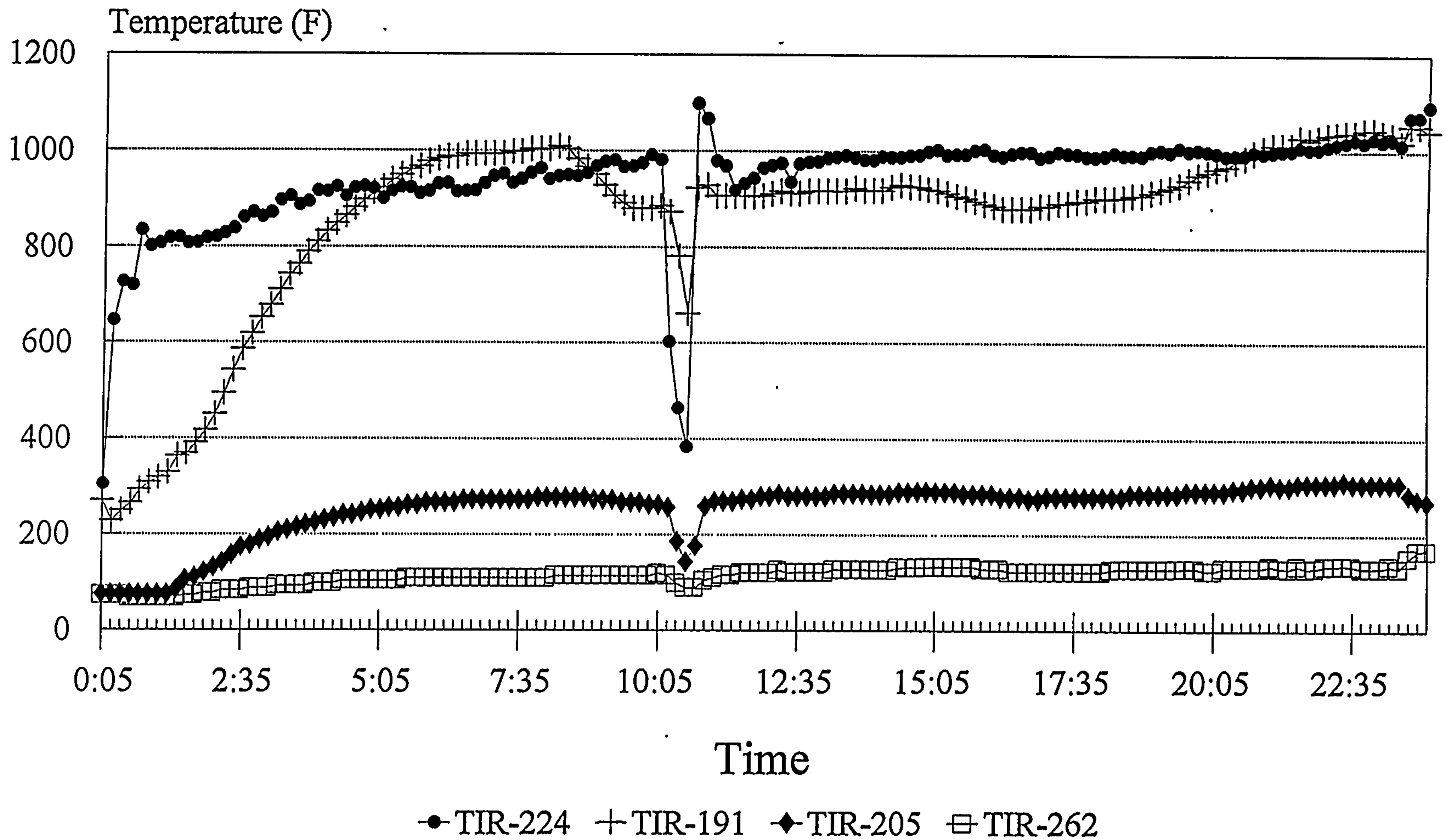

MT0808.CHT Lotus: MT080213.WK1

# Process Temperatures
## 08/09/93



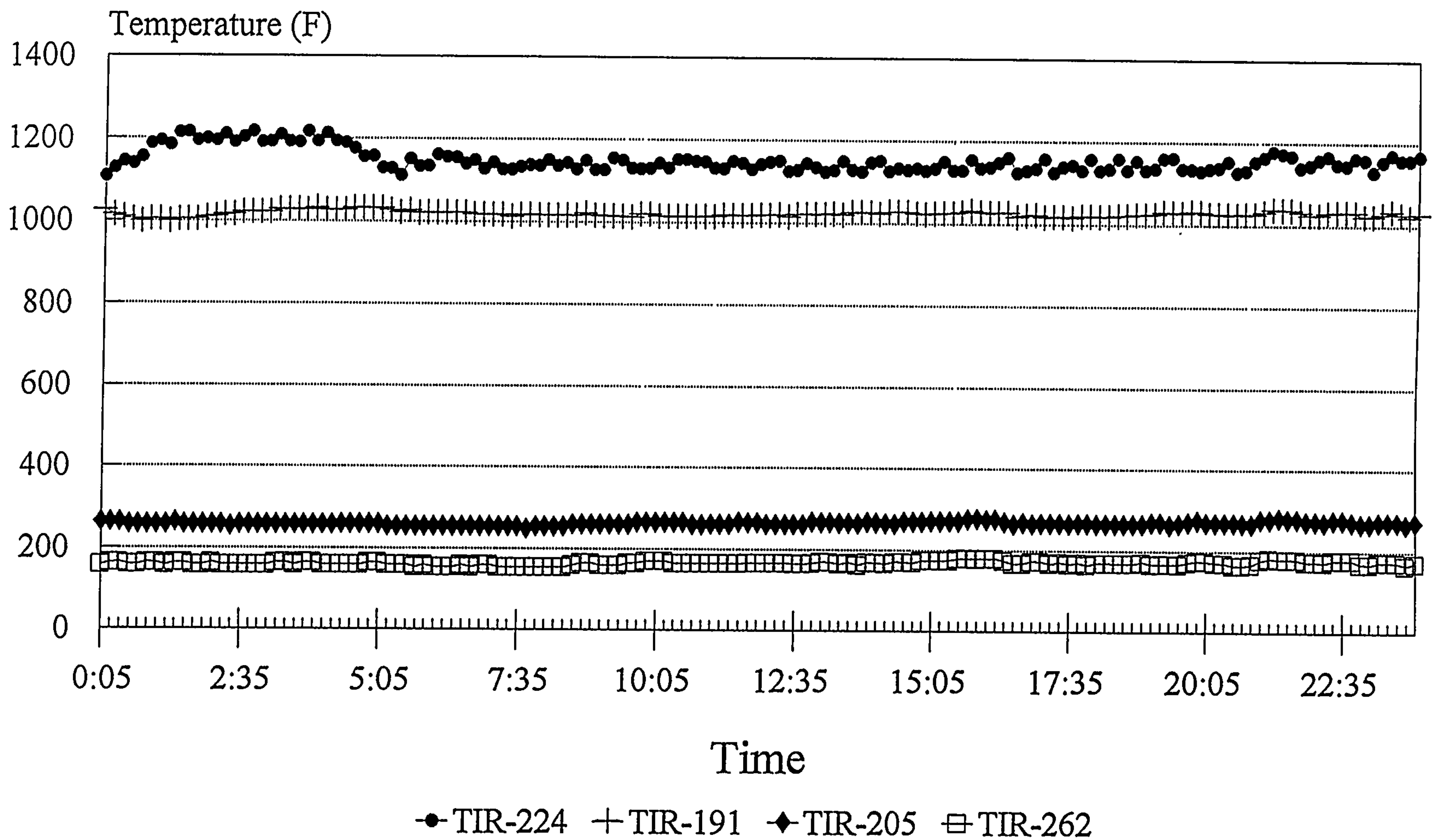

MT0809.CHT Lotus: MT080213.WK1

# Process Temperatures
## 08/10/93



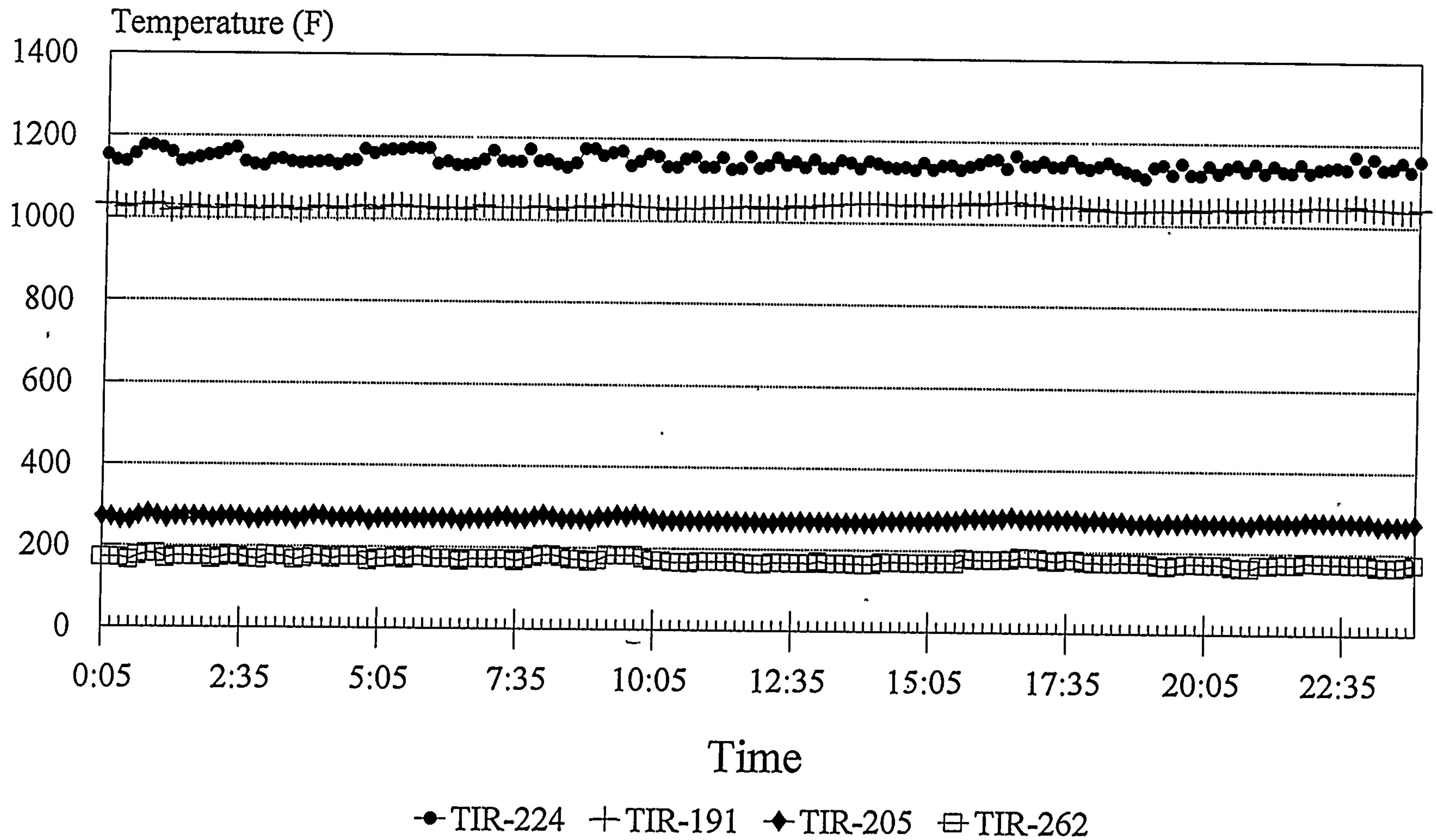

MT0810.CHT Lotus: MT080213.WK1

# Process Temperatures
## 08/11/93



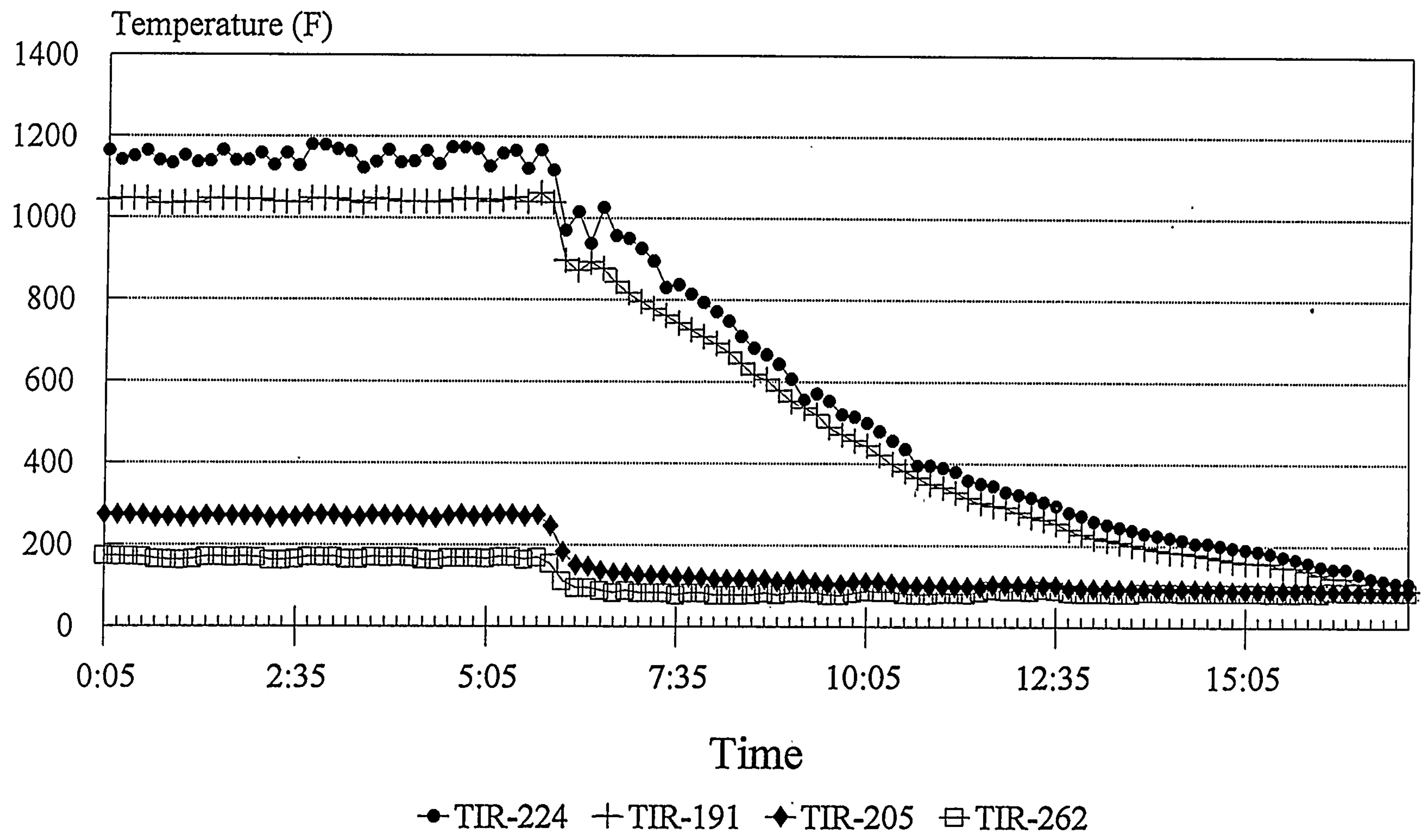

**MT0811.CHT Lotus: MT080213.WK1**

# Process Temperatures
## 08/12/93



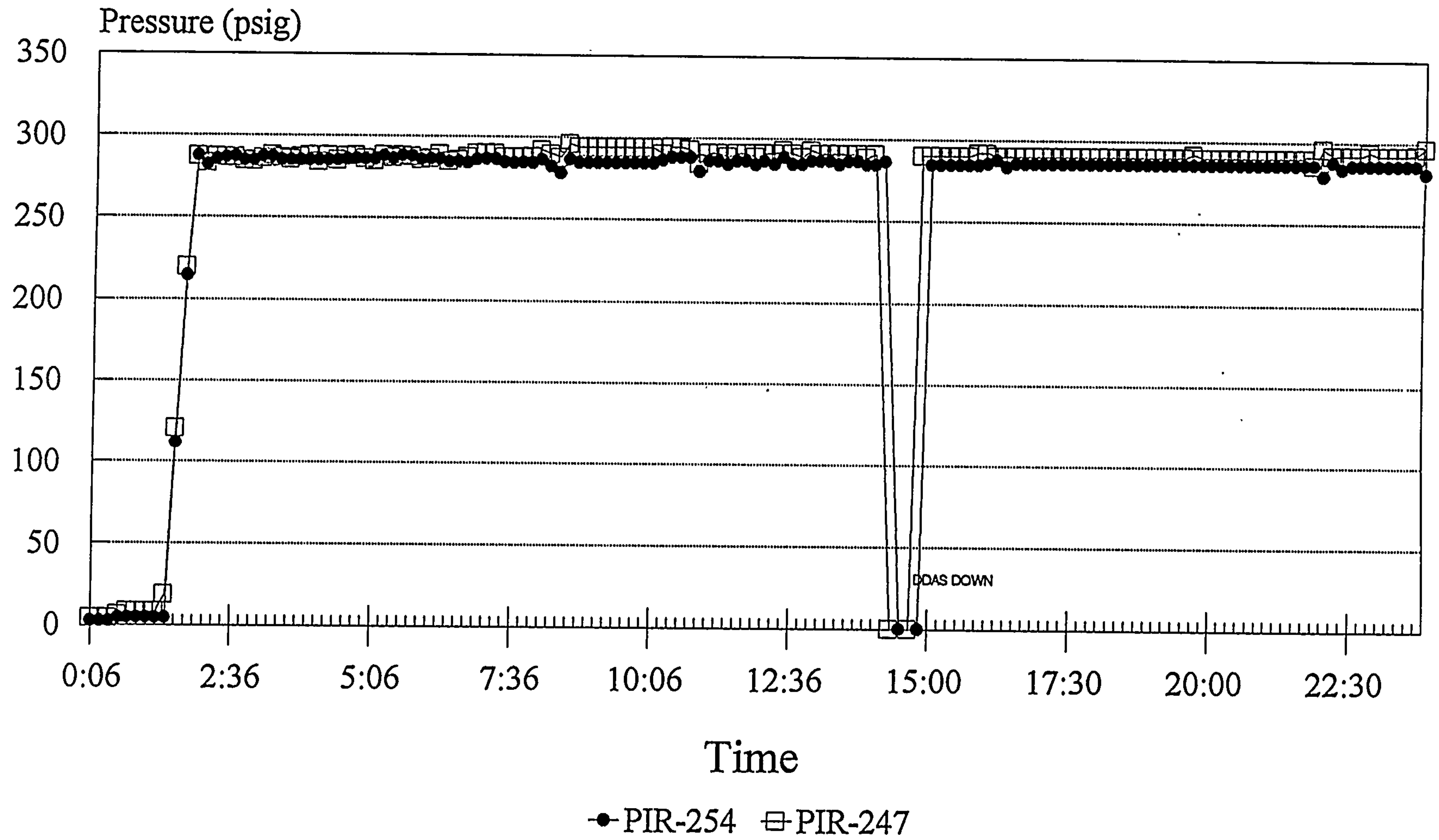

MT0812.CHT Lotus: MT080213.WK1

# Process Temperatures
## 08/13/93



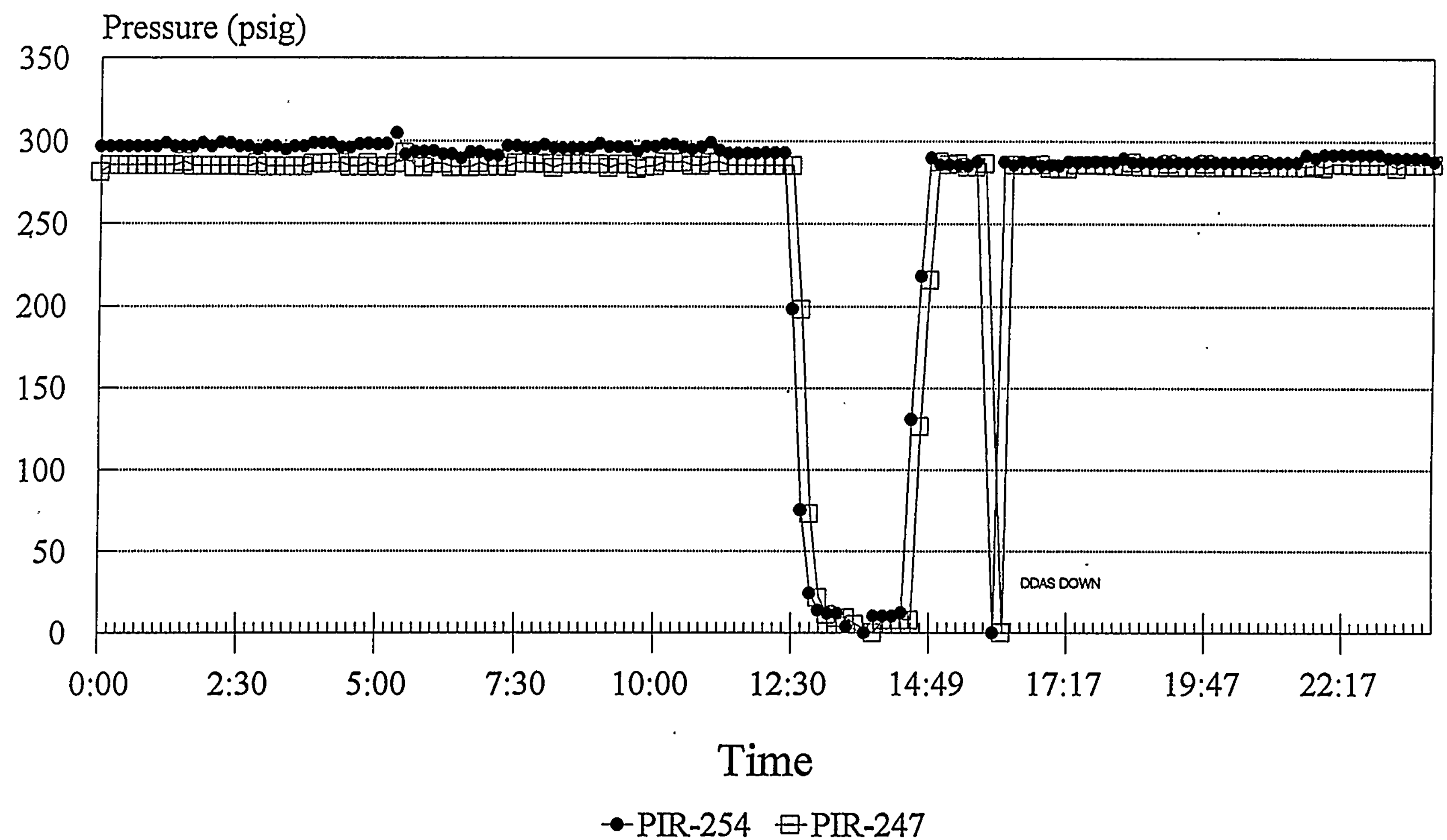

MT0813.CHT Lotus: MT080213.WK1

# Process Pressure
## 08/02/93



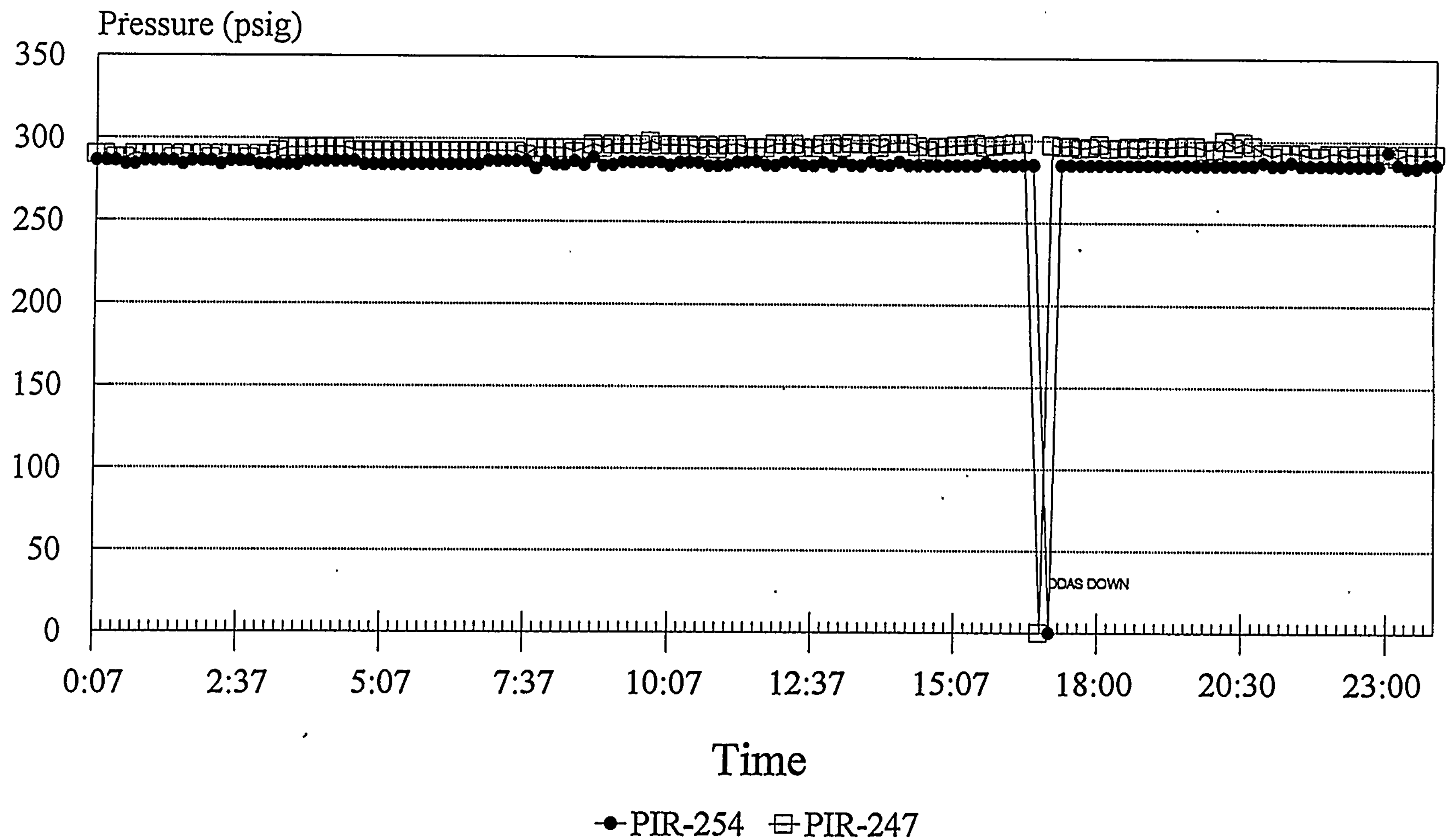

MP0802.CHT Lotus: MP080213.WK1

# Process Pressure
## 08/03/93



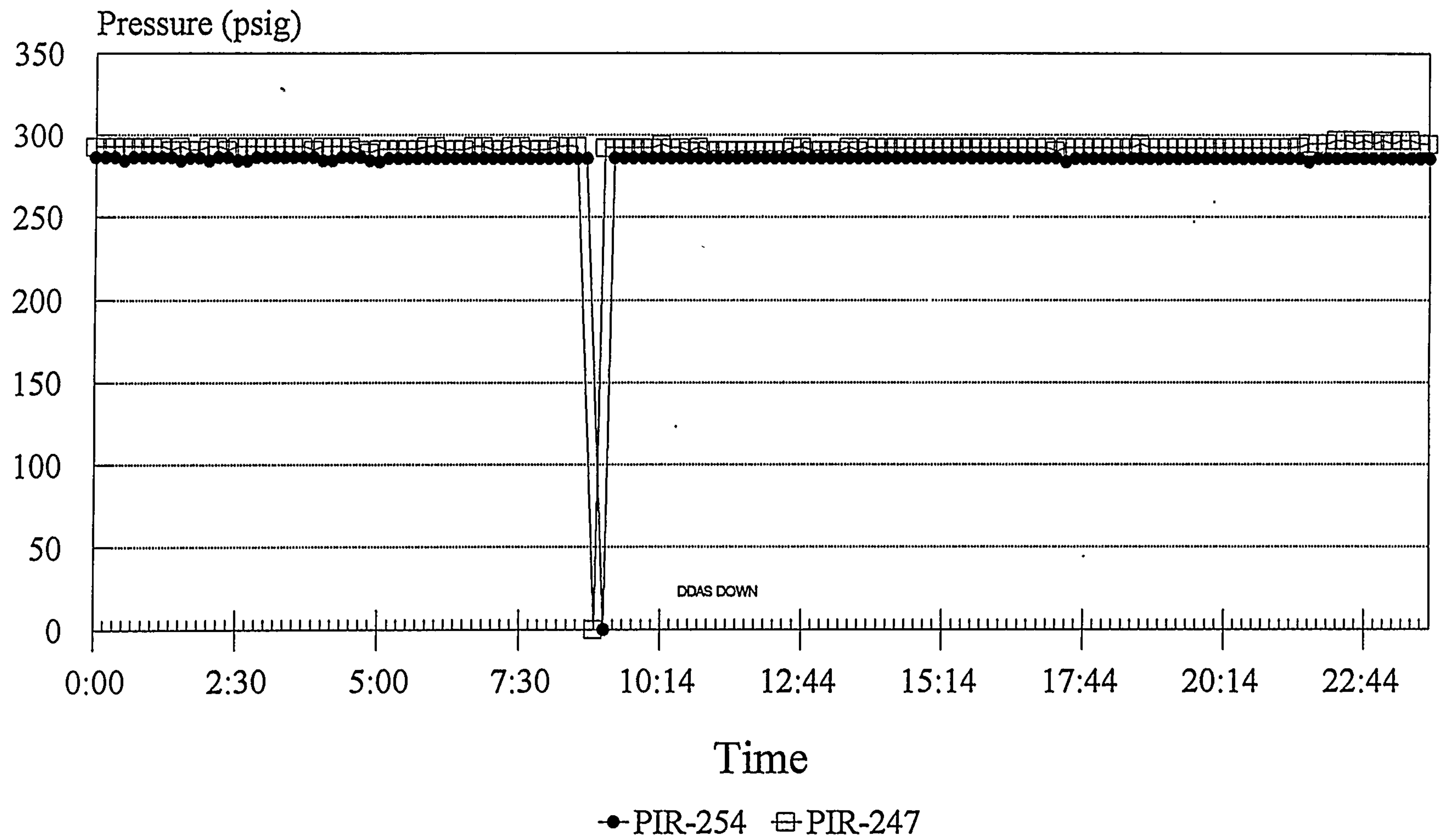

**MP0803.CHT Lotus: MP080213.WK1**

# Process Pressure
## 08/04/93



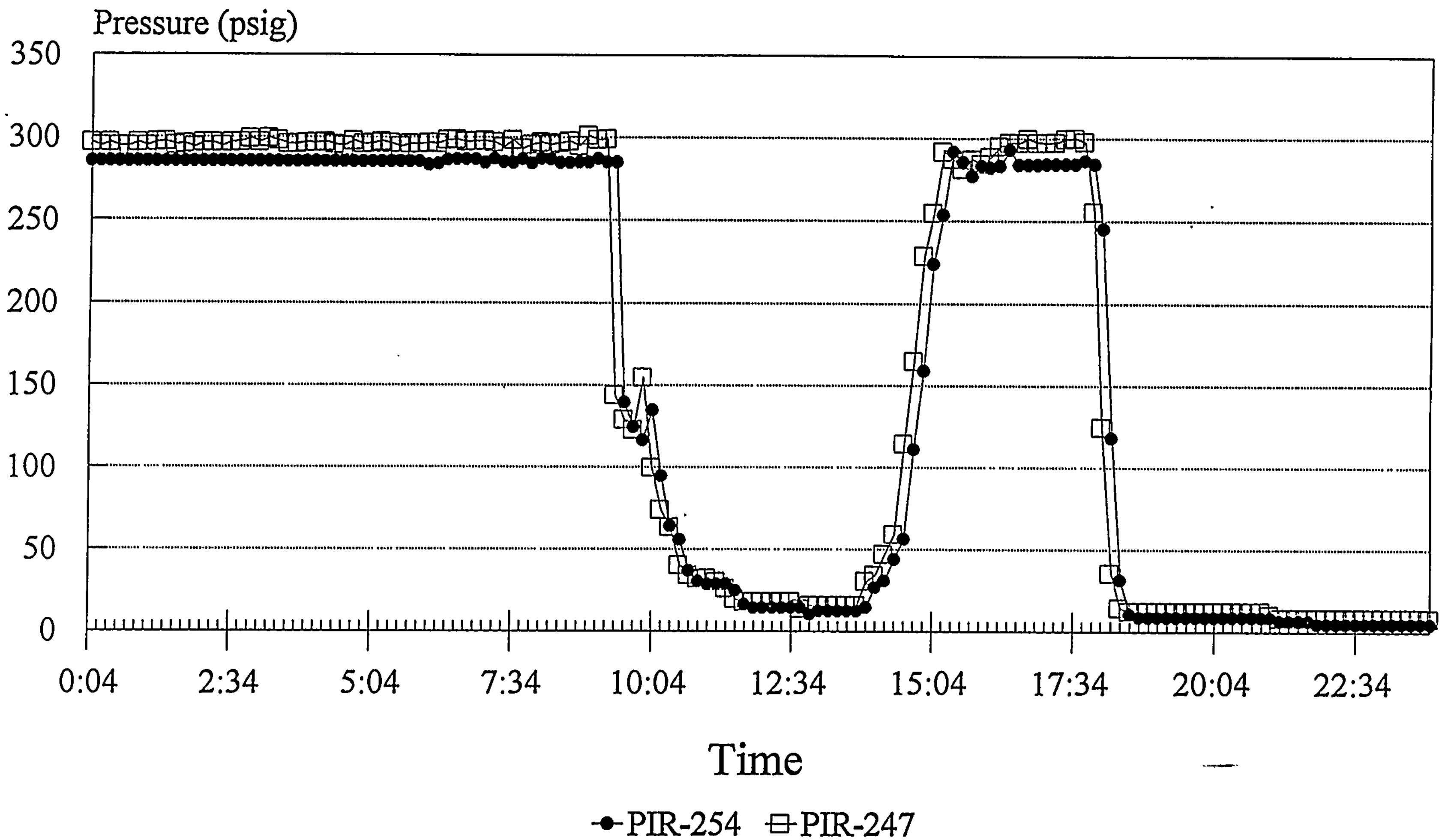

MP0804.CHT Lotus: MP080213.WK1

# Process Pressure
## 08/05/93



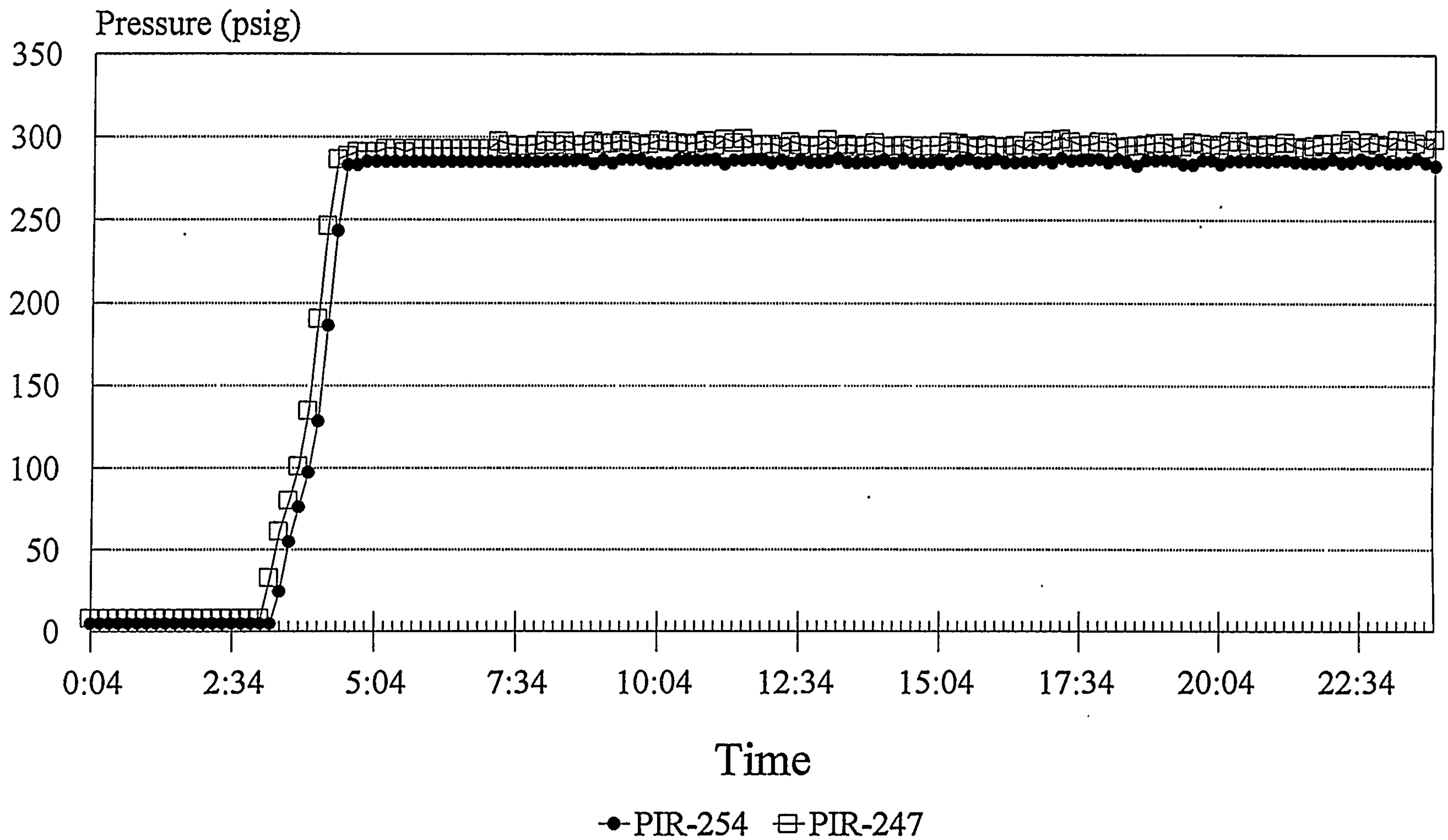

MP0805.CHT Lotus: MP080213.WK1

# Process Pressure
## 08/06/93



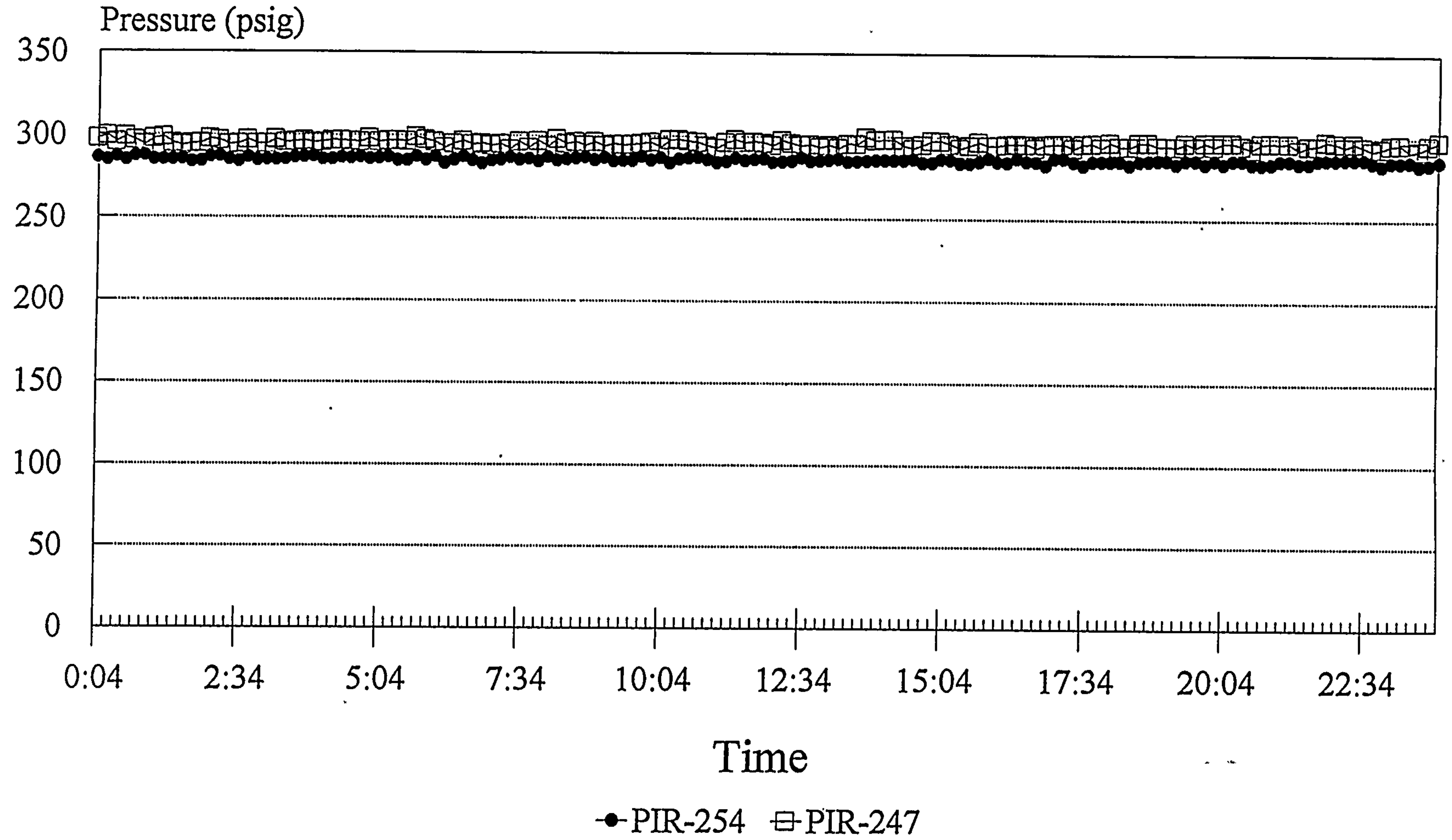

MP0806.CHT Lotus: MP080213.WK1

# Process Pressure
## 08/07/93



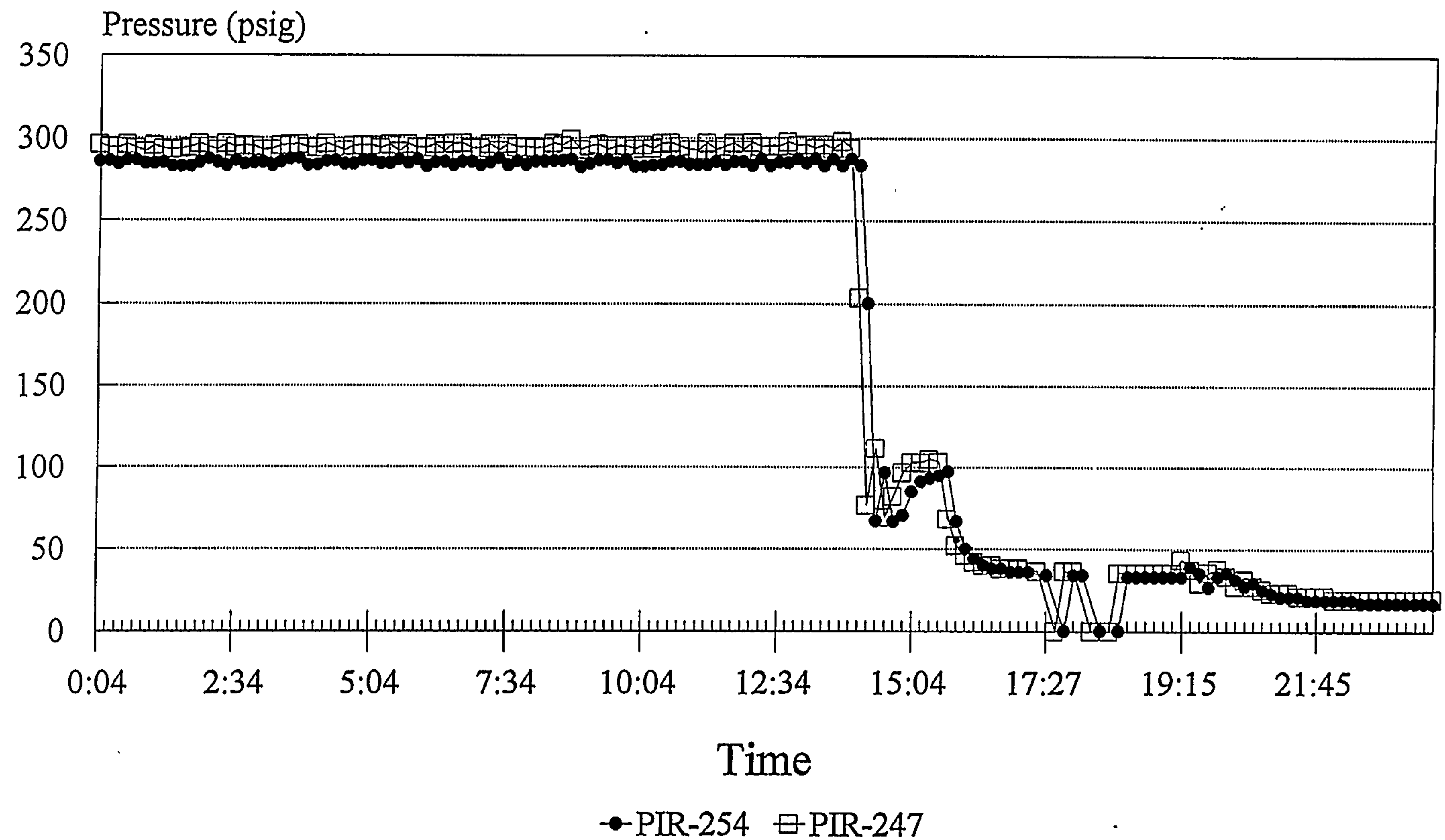

**MP0807.CHT Lotus: MP080213.WK1**

# Process Pressure
## 08/08/93



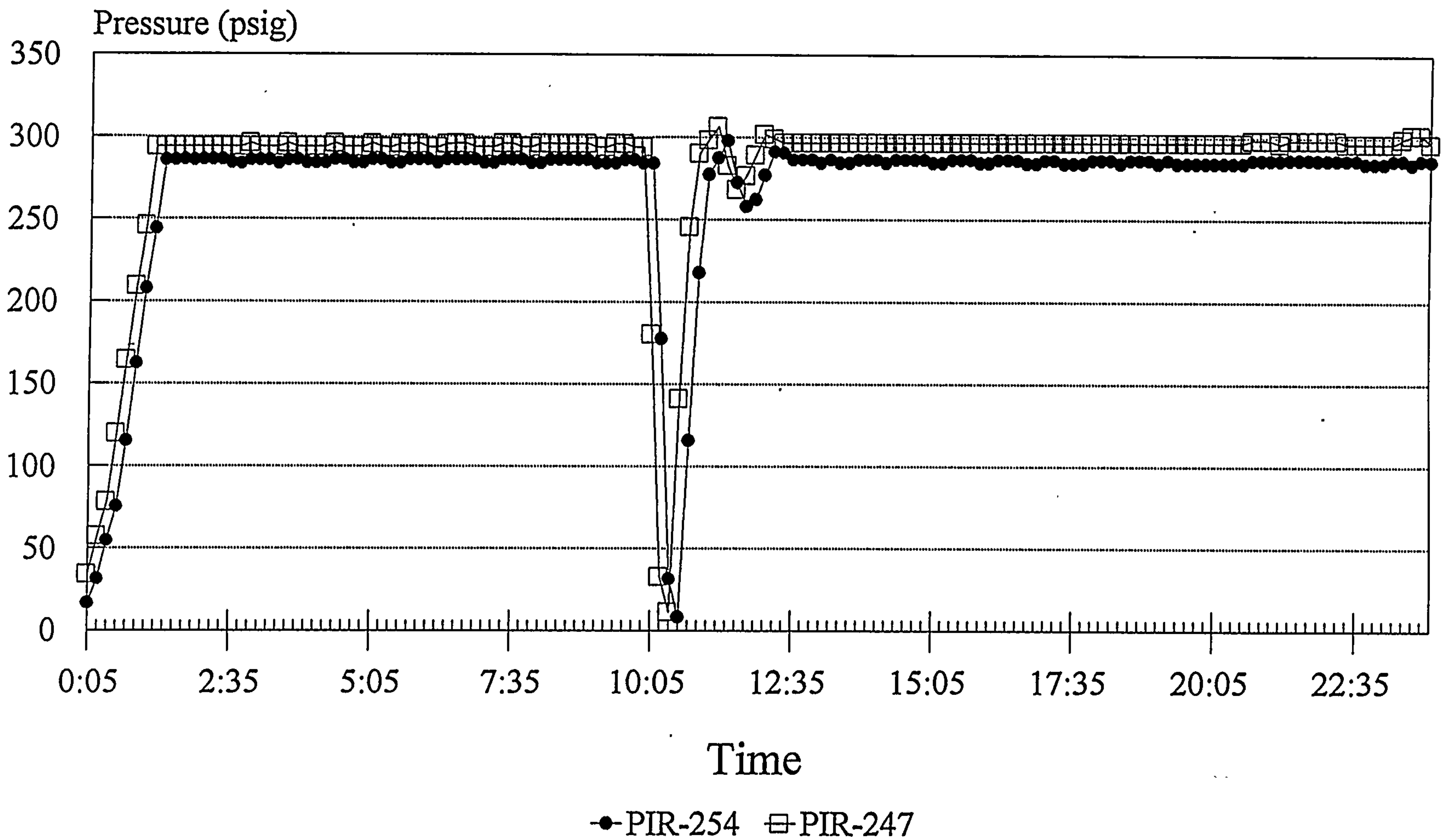

**MP0808.CHT Lotus: MP080213.WK1**

# Process Pressure
## 08/09/93



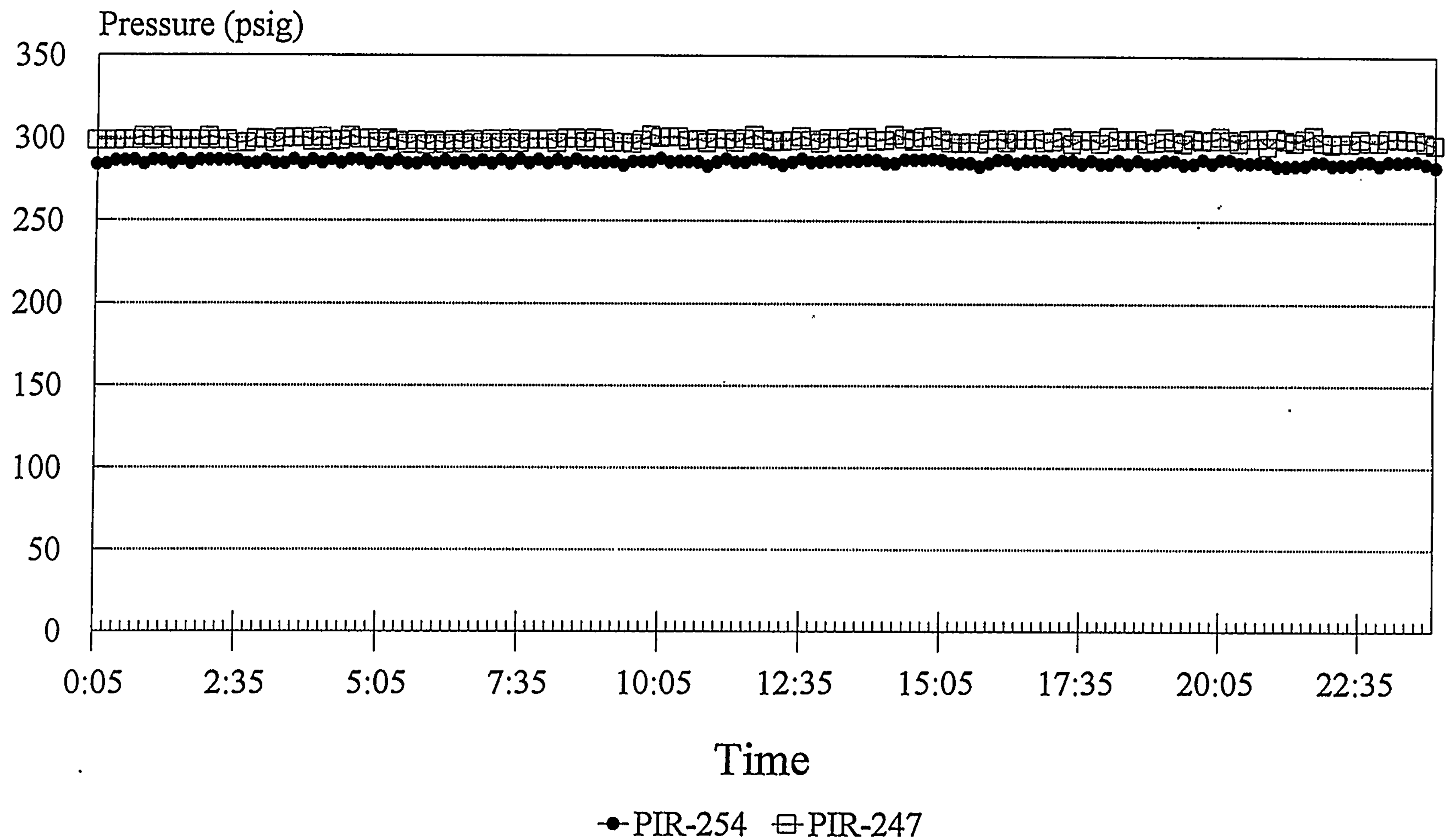

MP0809.CHT Lotus: MP080213.WK1

# Process Pressure
## 08/10/93



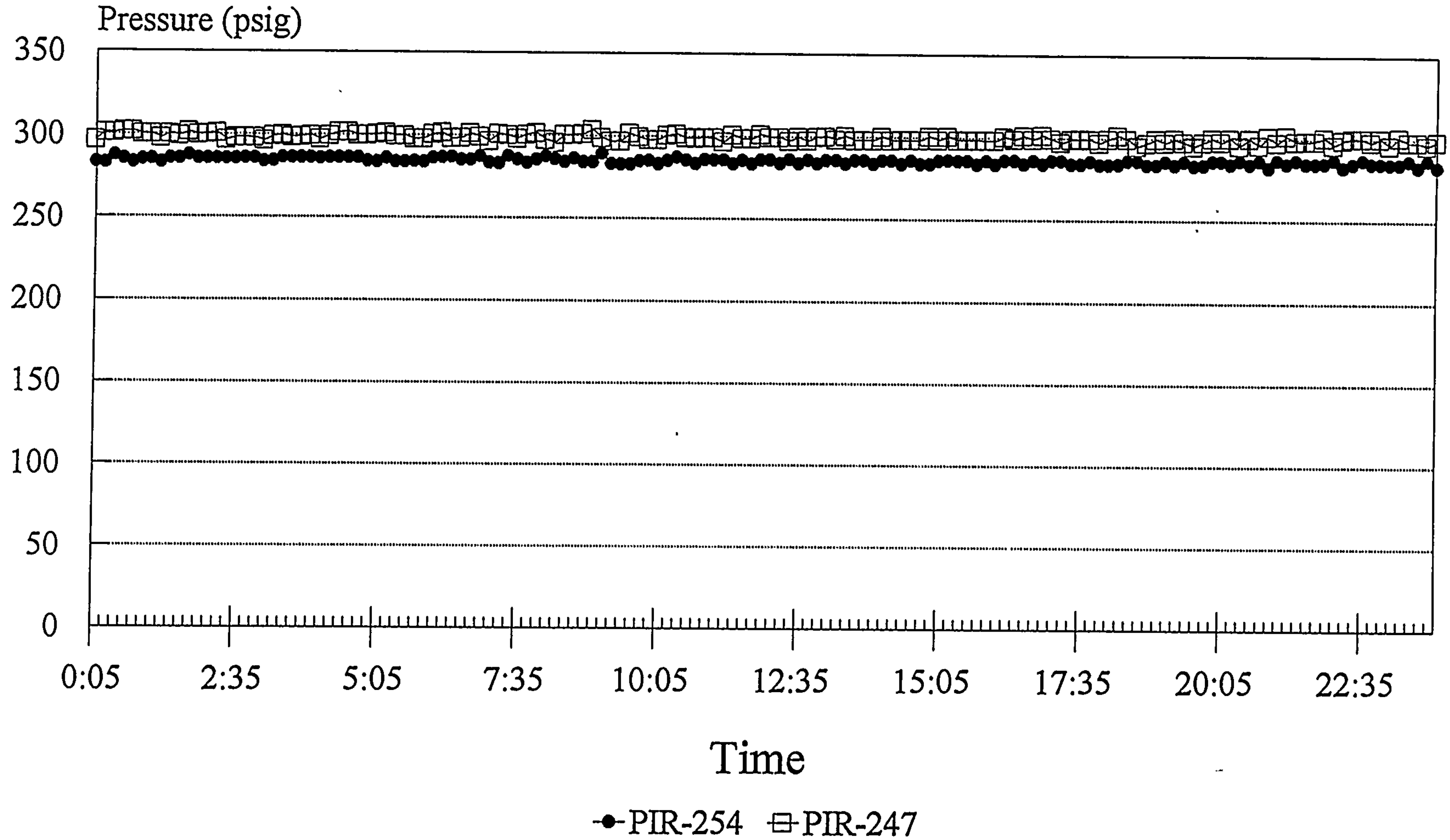

MP0810.CHT   Lotus: MP080213.WK1

# Process Pressure
## 08/11/93



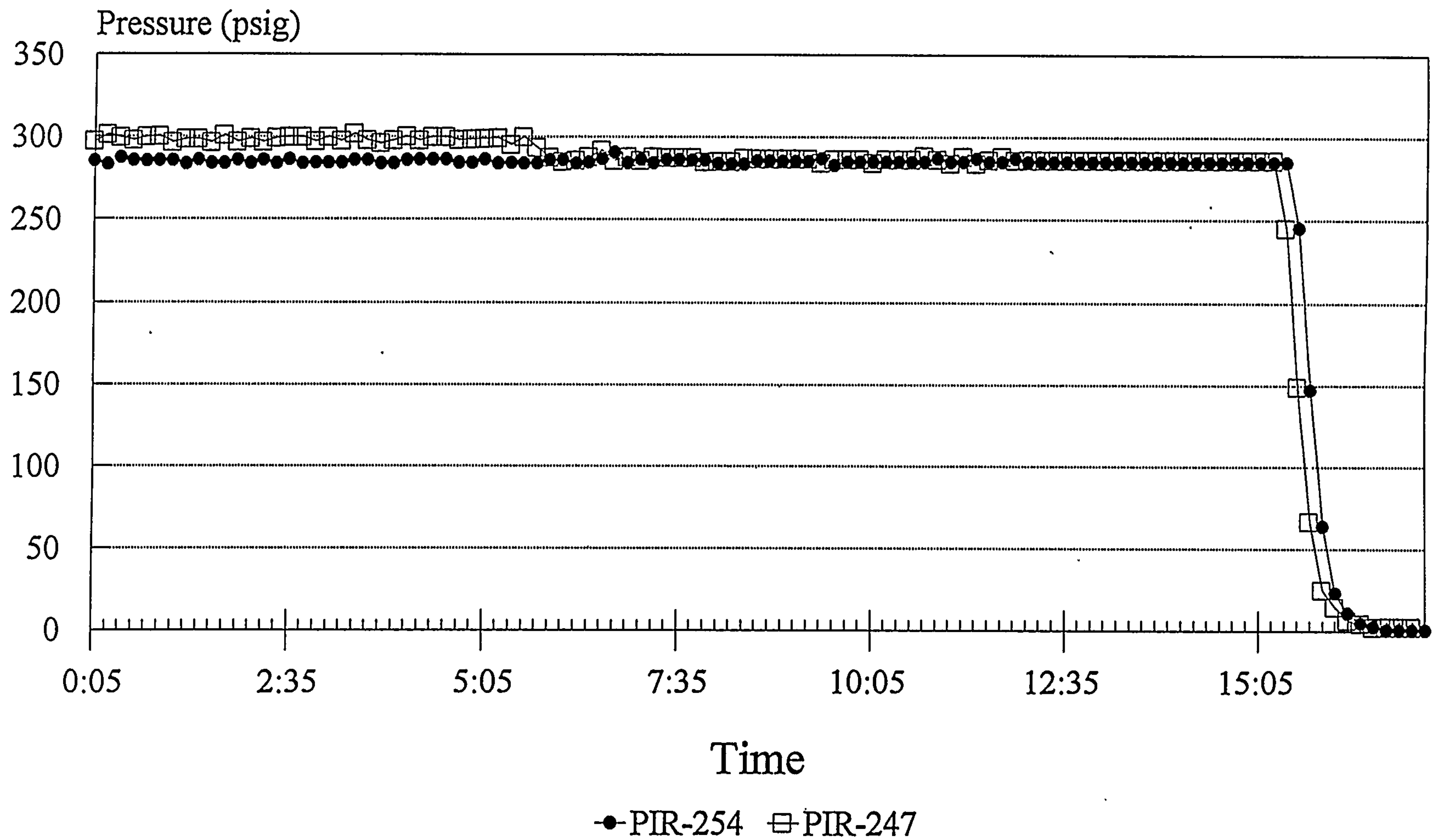

MP0811.CHT **Lotus:** MP080213.WK1

# Process Pressure
## 08/12/93



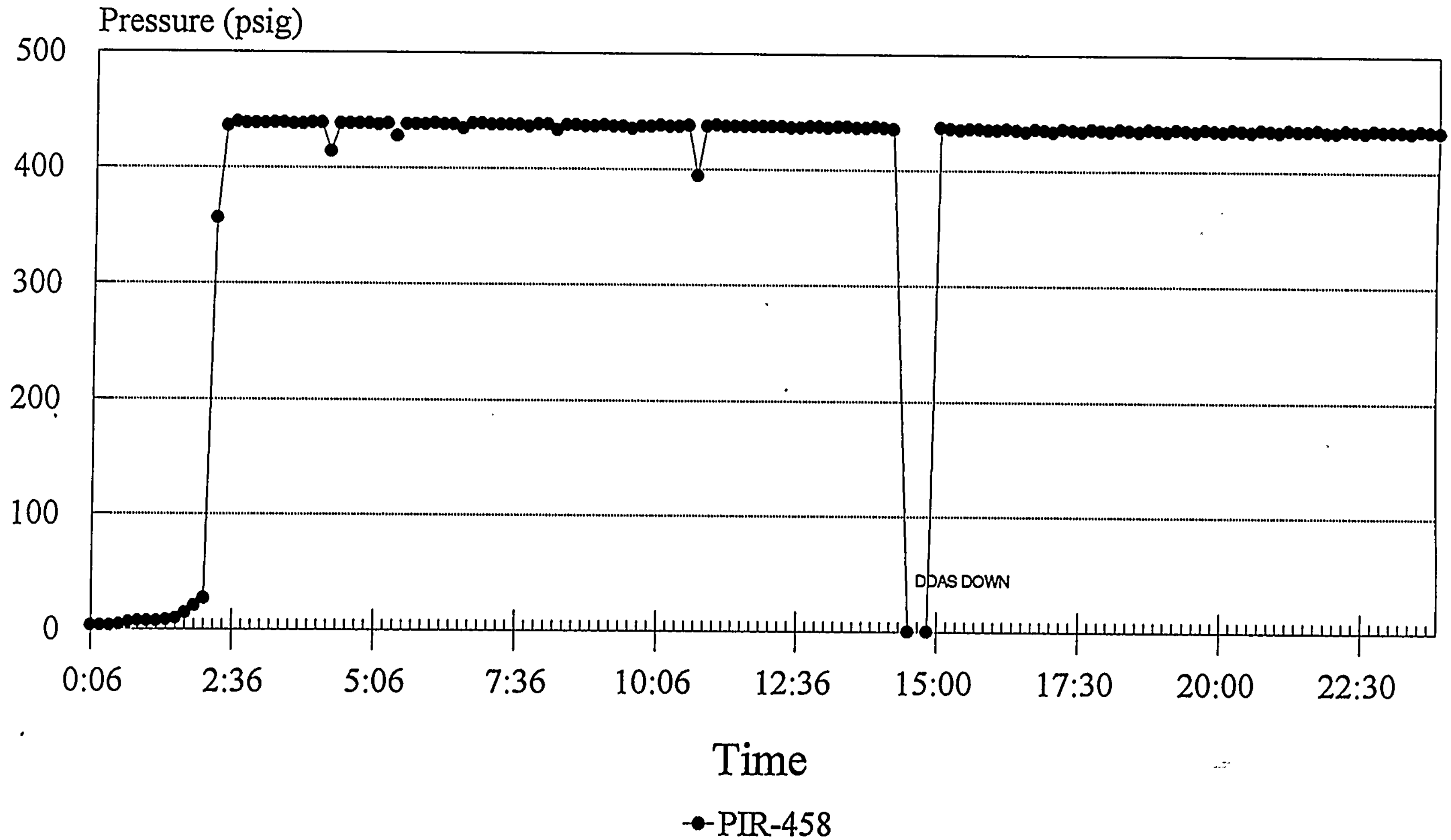

MP0812.CHT Lotus: MP080213.WK1

# Process Pressure
## 08/13/93



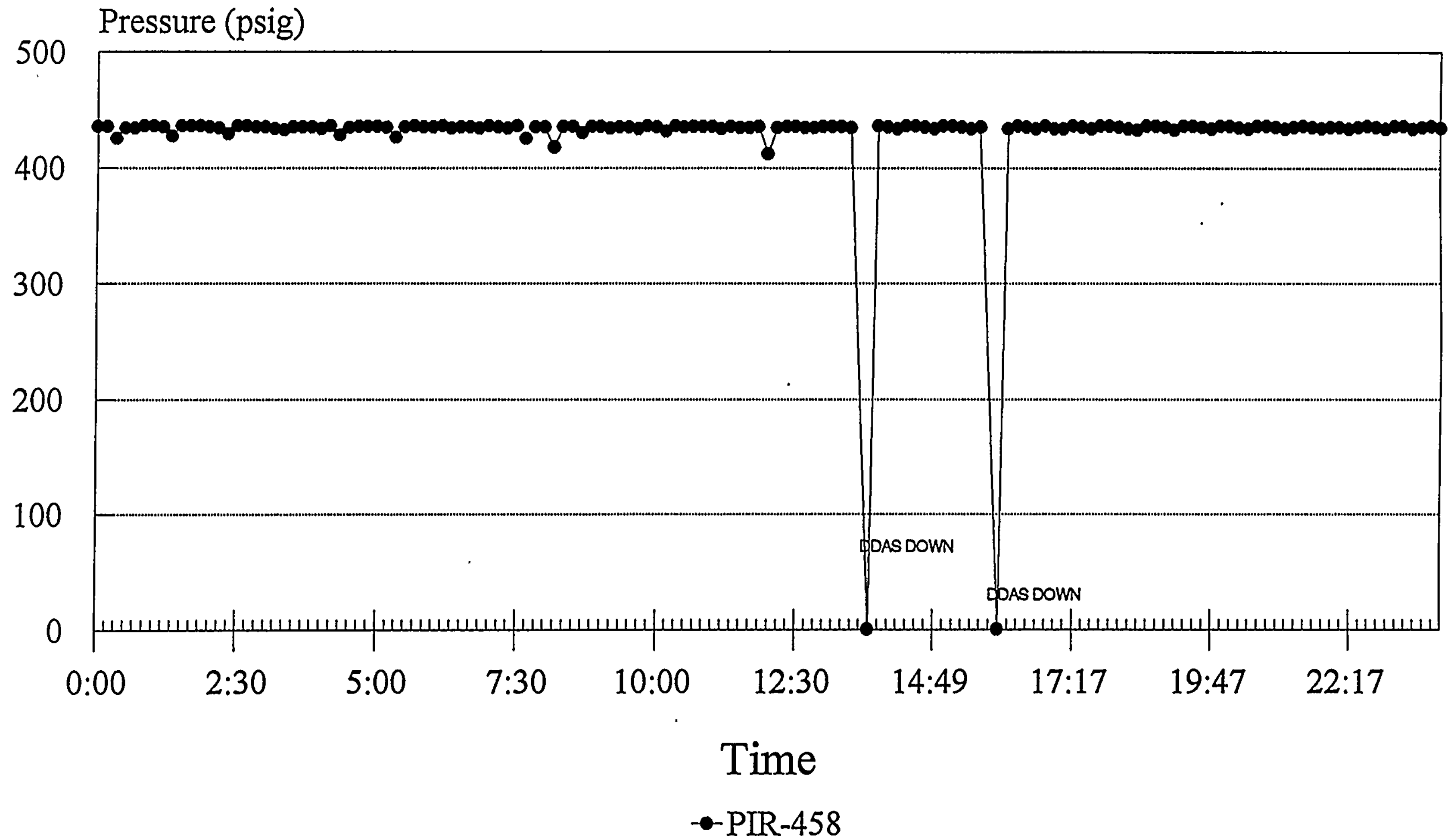

MP0813.CHT Lotus: MP080213.WK1

# Filter Blowback Pressure
## 08/02/93



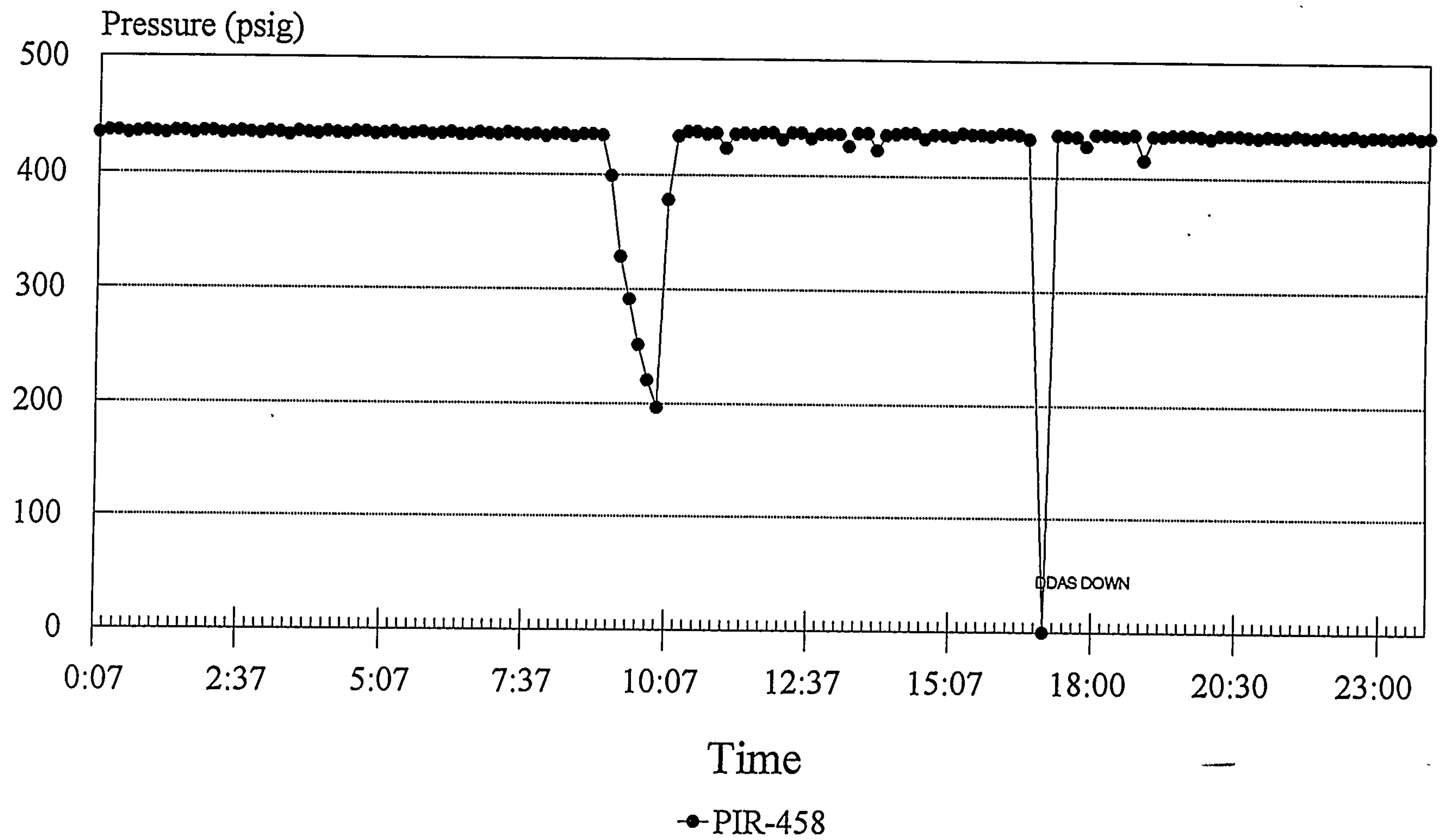

MFBP0802.CHT Lotus: MBP80213.WK1

# Filter Blowback Pressure
## 08/03/93



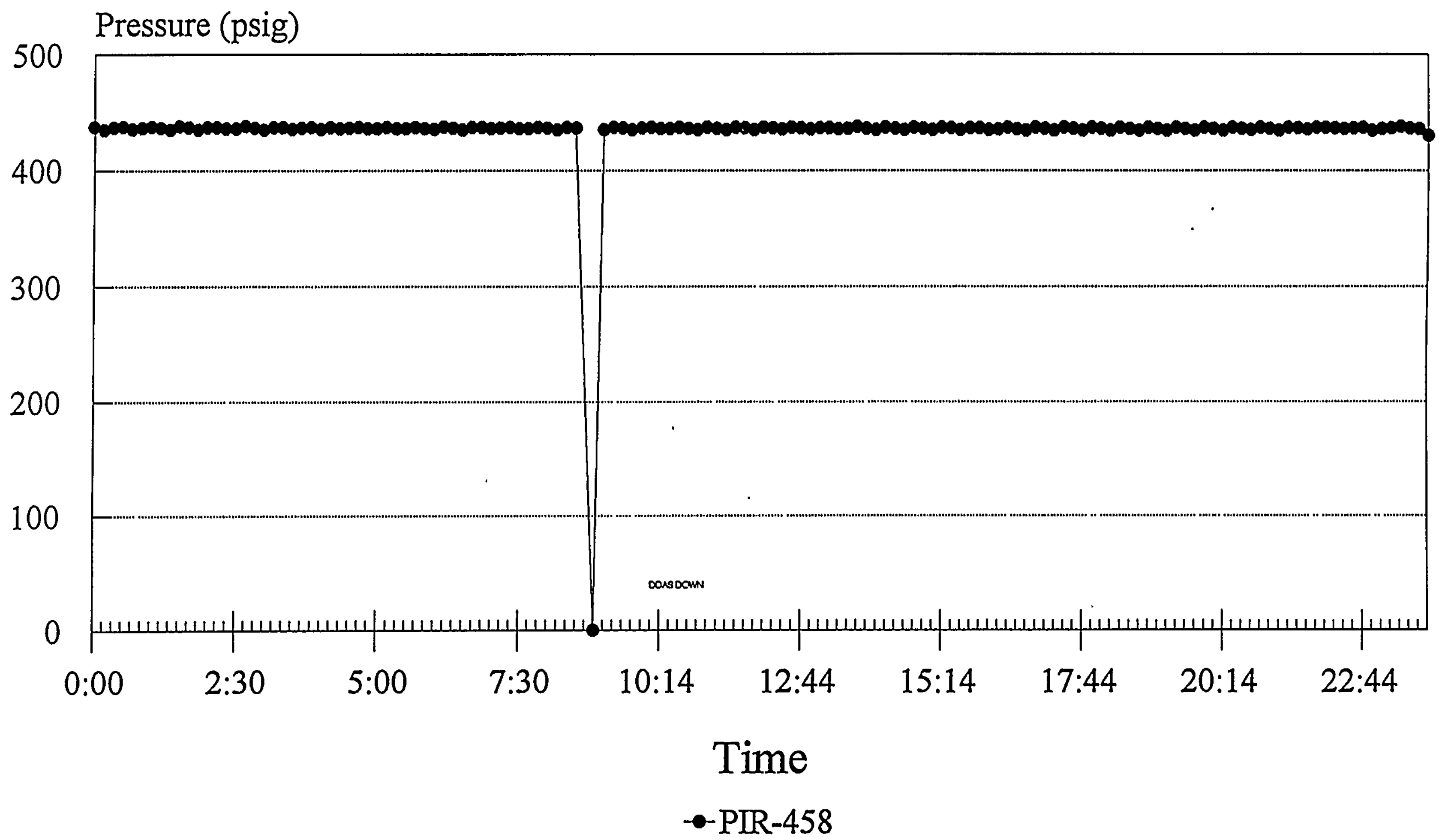

MFBP0803.CHT Lotus: MBP80213.WK1

# Filter Blowback Pressure
## 08/04/93



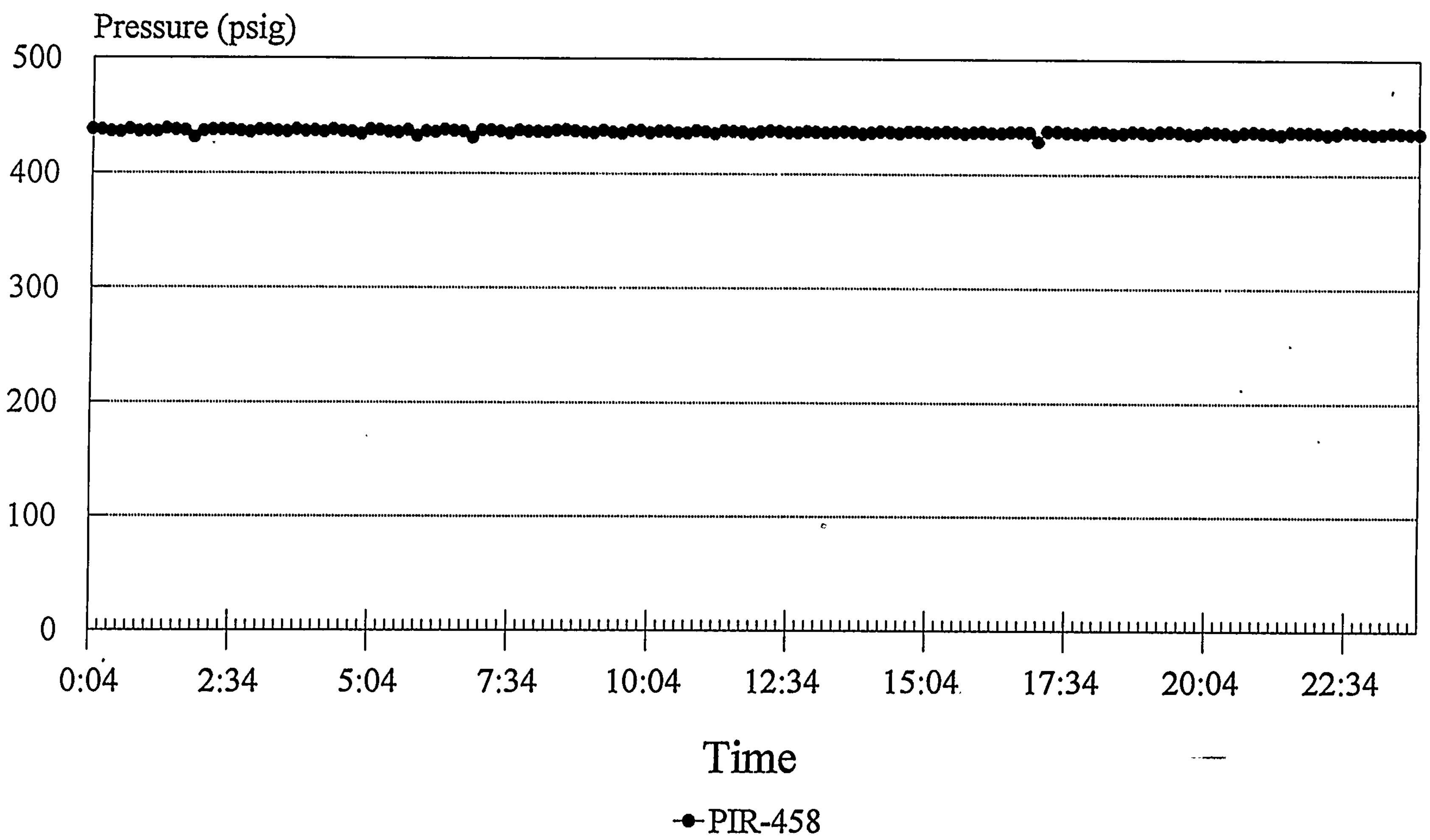

MFBP0804.CHT Lotus: MBP80213.WK1

# Filter Blowback Pressure
## 08/05/93



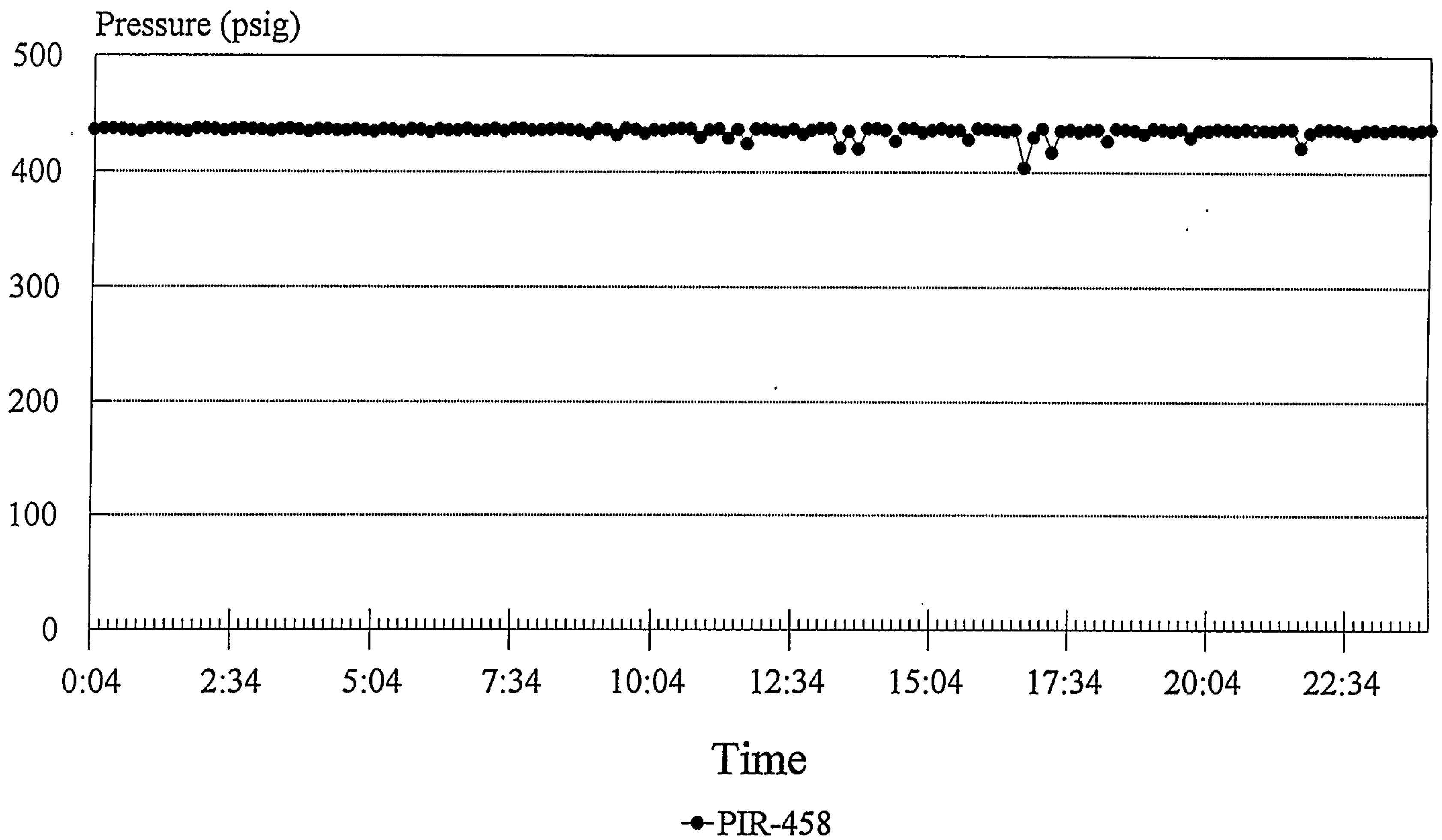

MFBP0805.CHT Lotus: MBP80213.WK1

# Filter Blowback Pressure
## 08/06/93



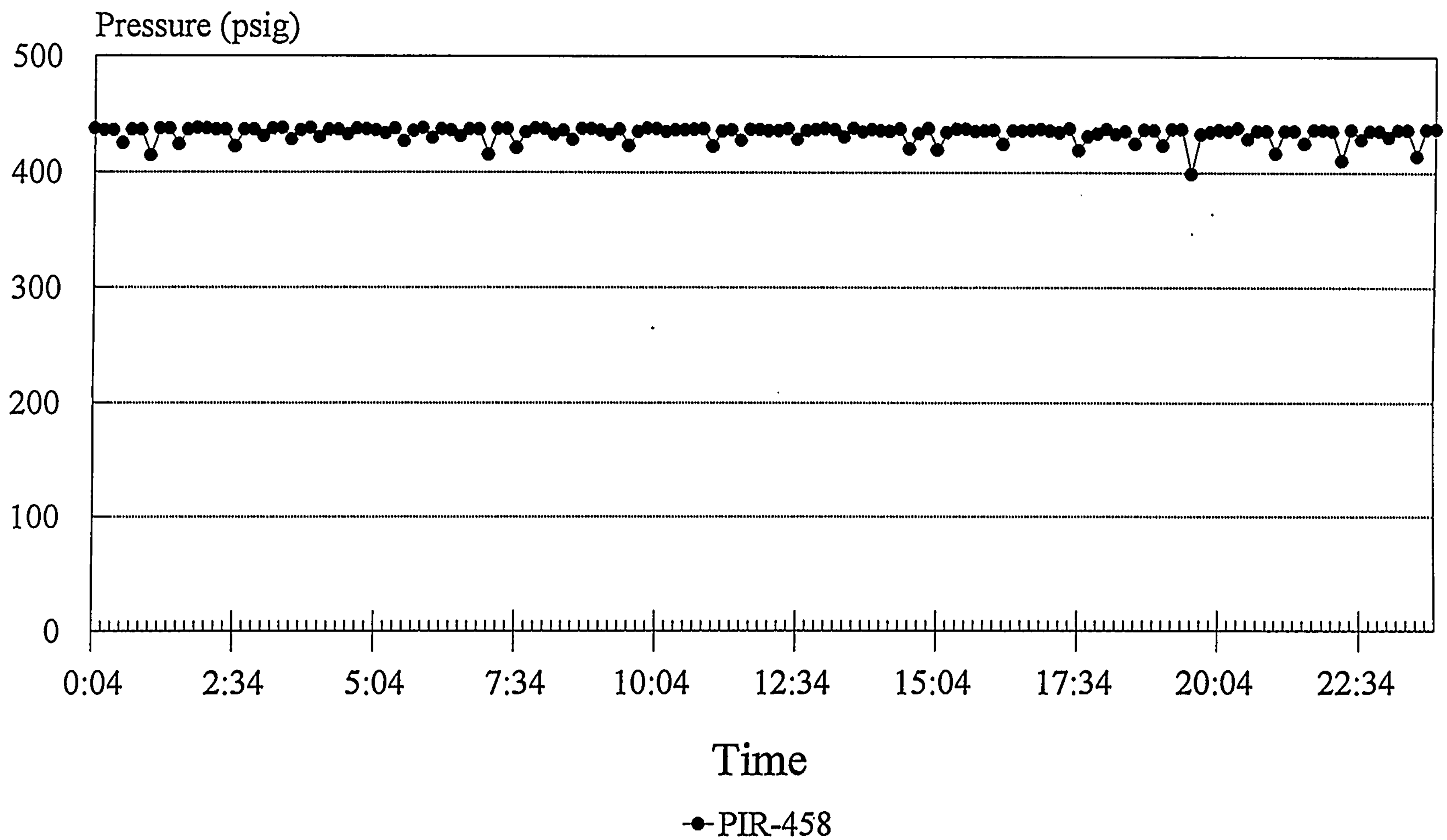

MFBP0806.CHT Lotus: MBP80213.WK1

# Filter Blowback Pressure
## 08/07/93




**MFBP0807.CHT Lotus: MBP80213.WK1**

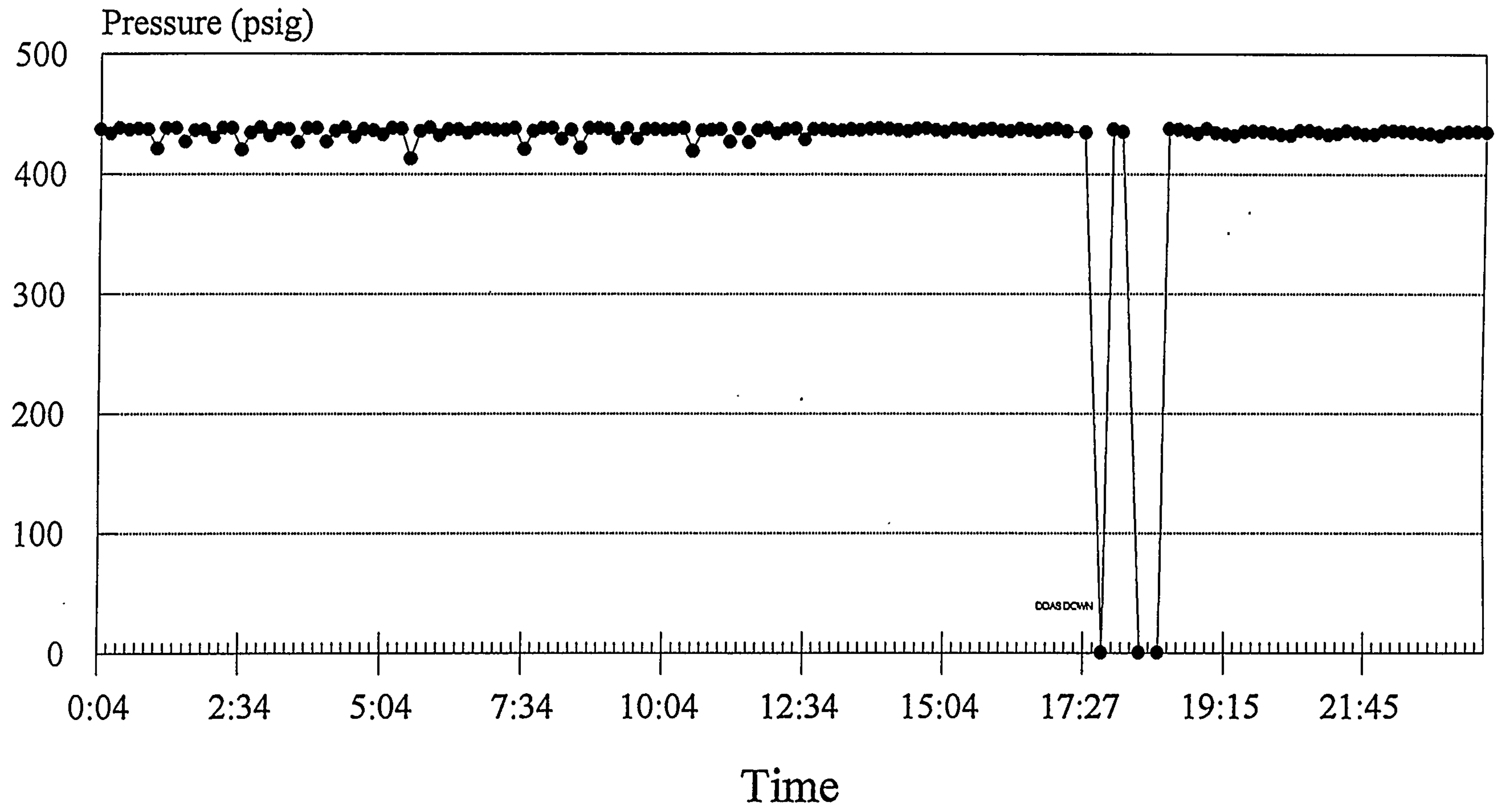
# Filter Blowback Pressure
## 08/08/93




MFBP0808.CHT Lotus: MBP80213.WK1

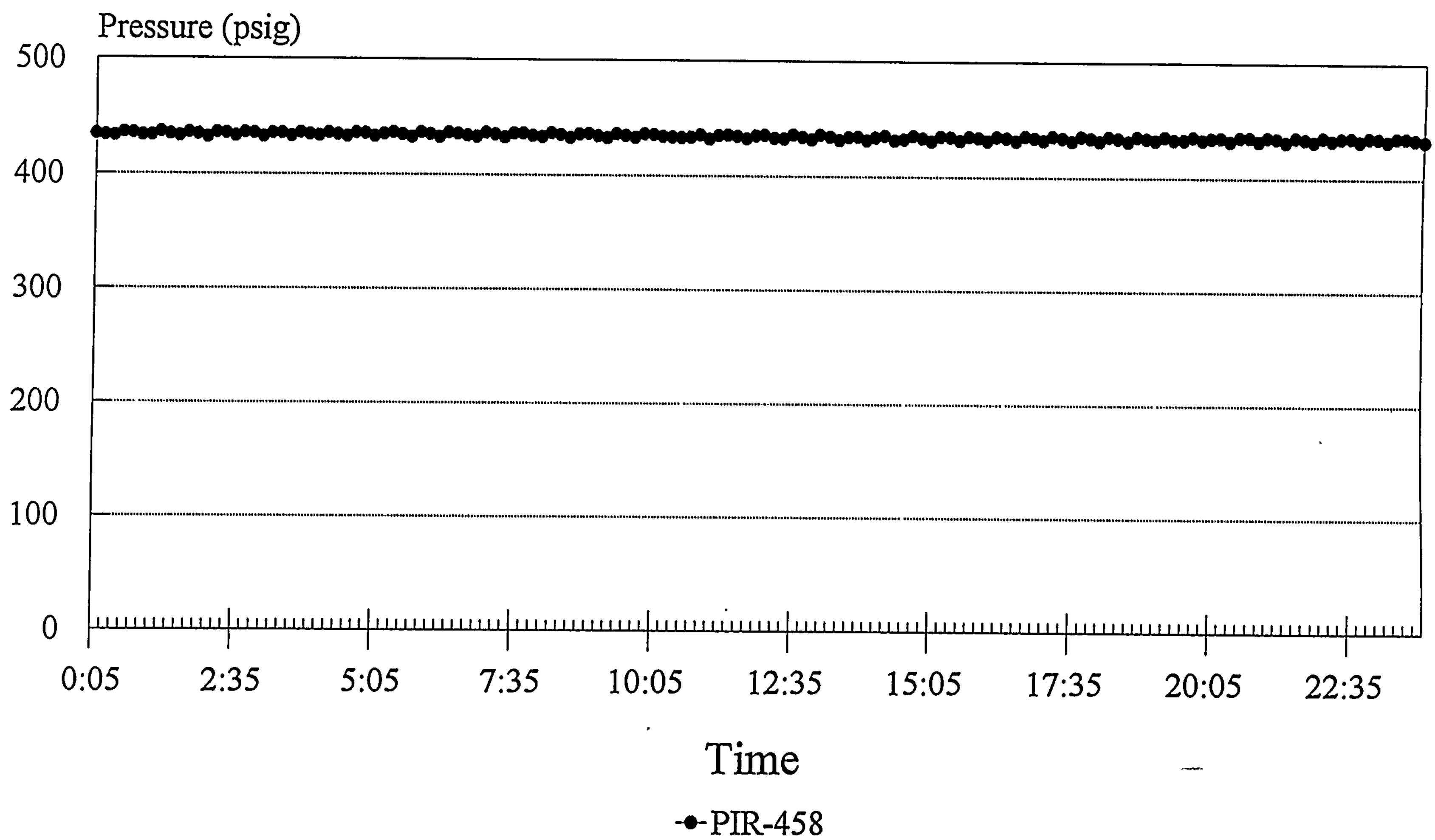
# Filter Blowback Pressure

## 08/09/93



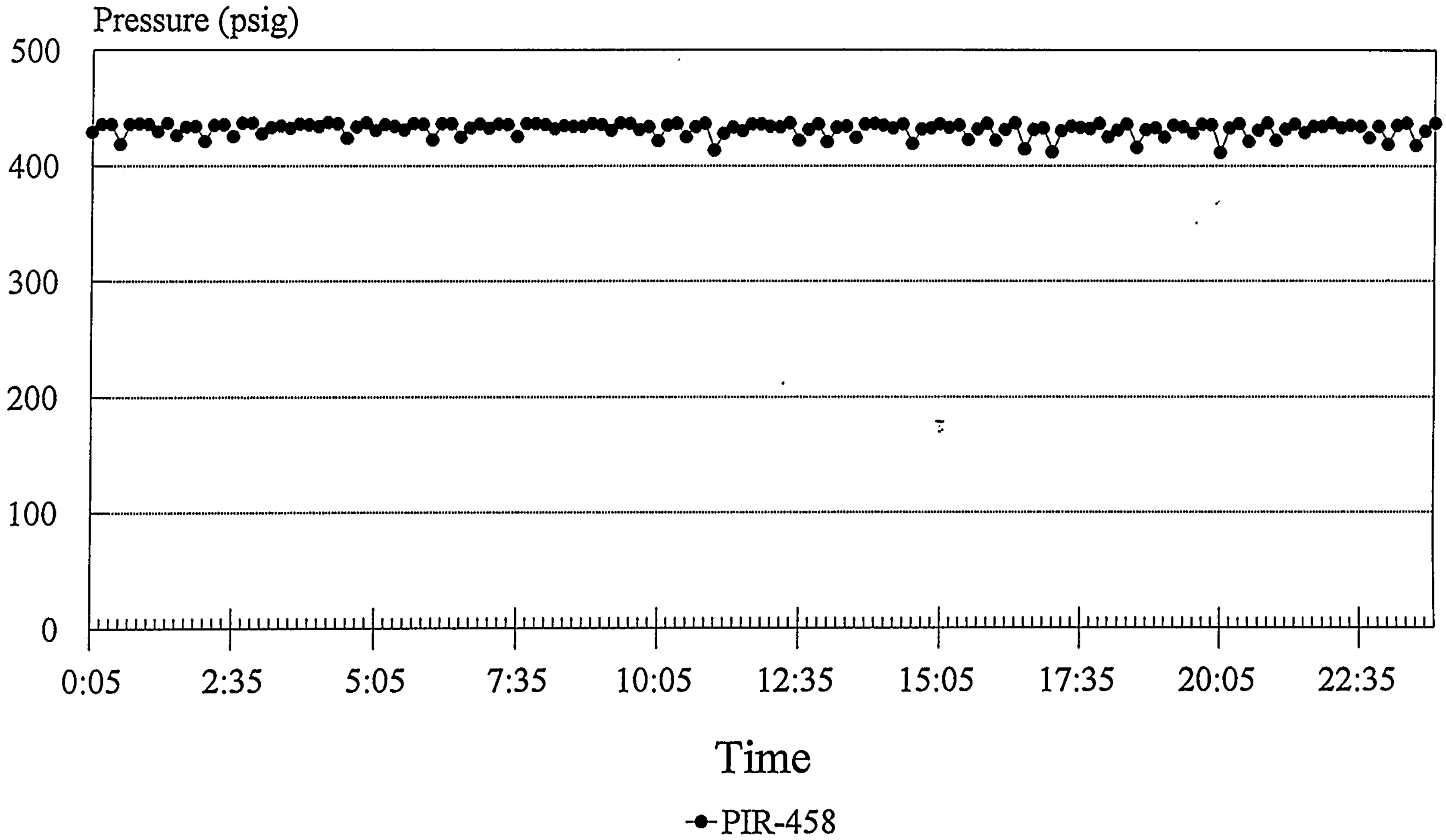

MFBP0809.CHT Lotus: MBP80213.WK1

# Filter Blowback Pressure
## 08/10/93



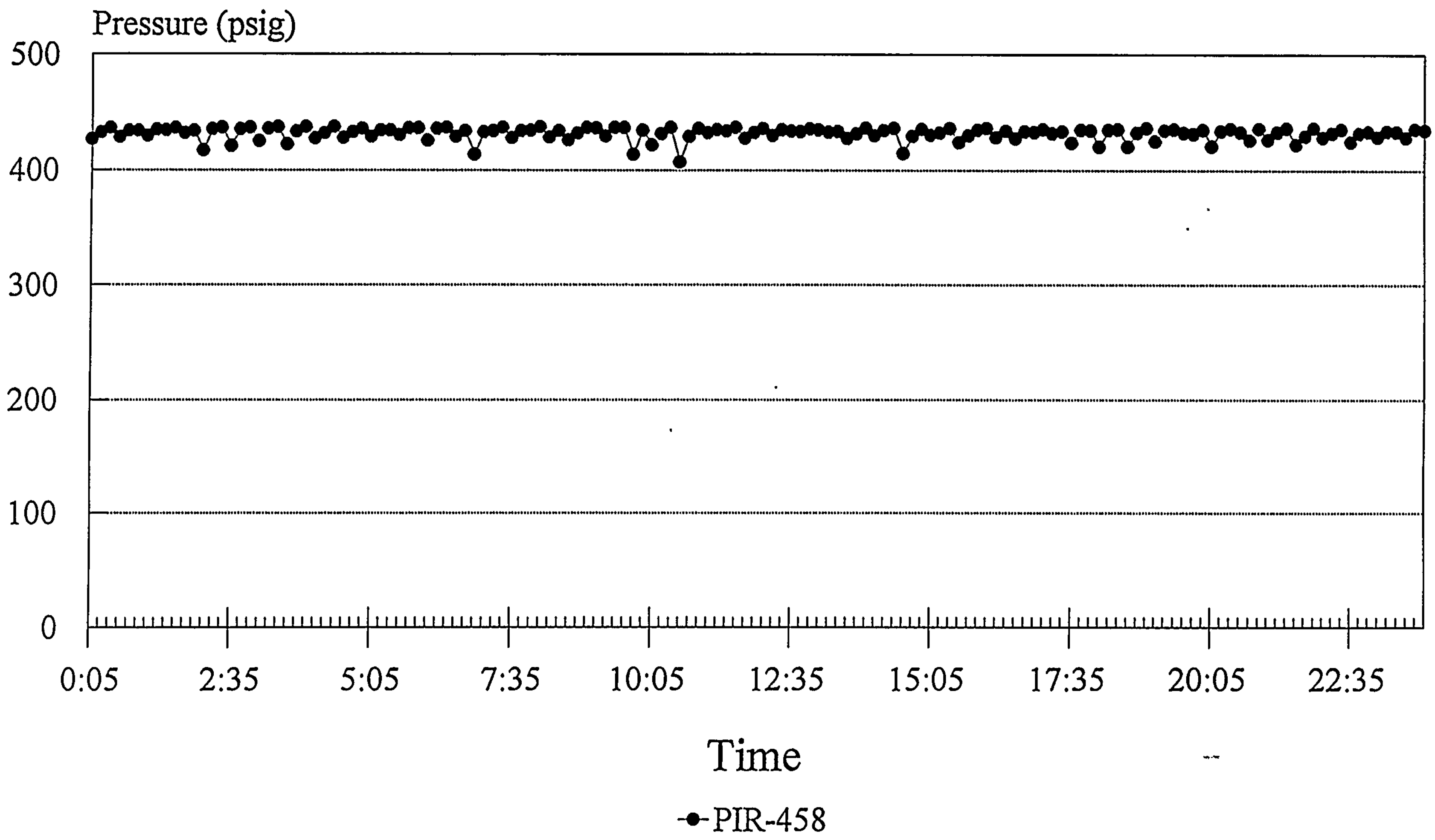

**MFBP0810.CHT Lotus: MBP80213.WK1**

# Filter Blowback Pressure
## 08/11/93



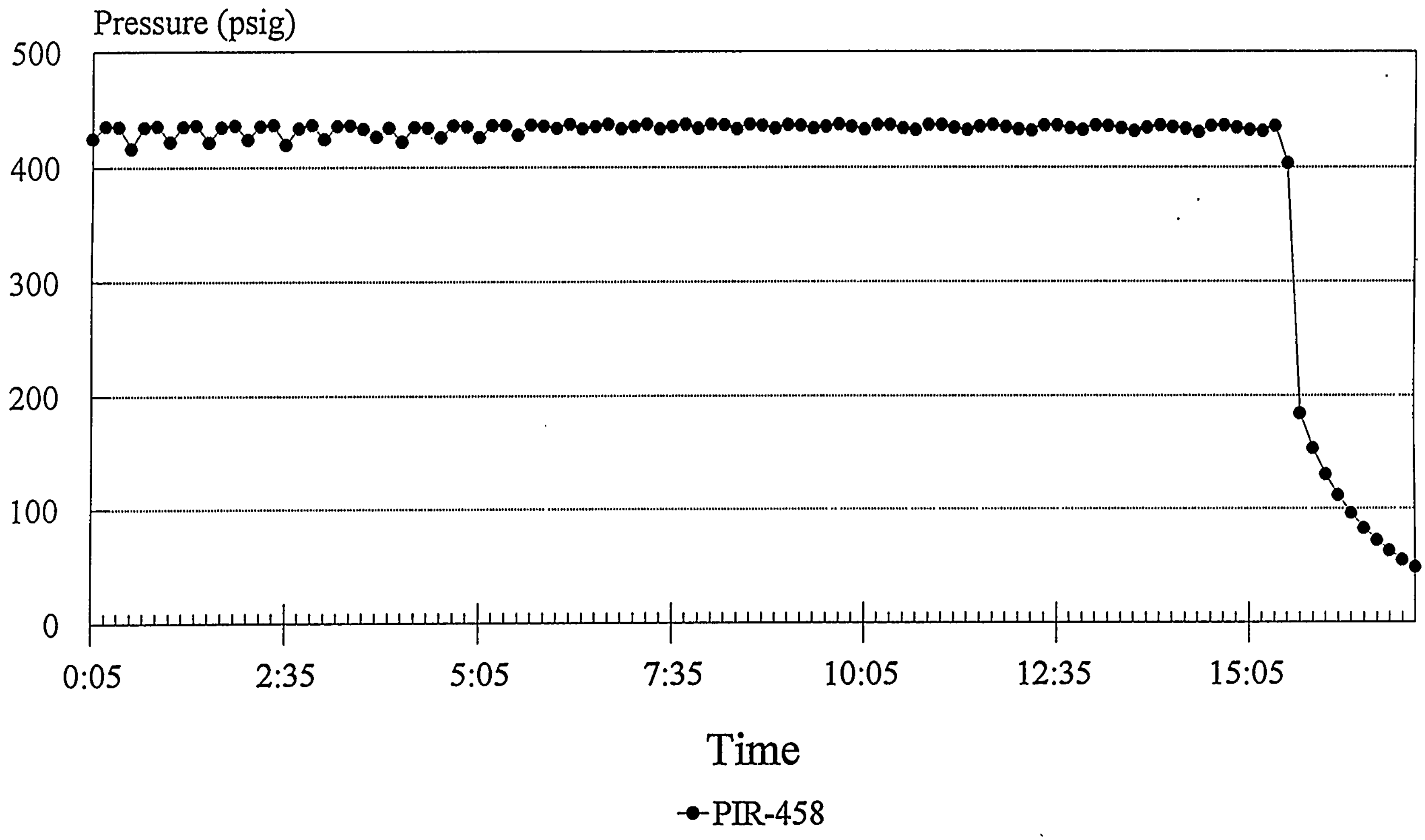

MFBP0811.CHT Lotus: MBP80213.WK1

# Filter Blowback Pressure
## 08/12/93



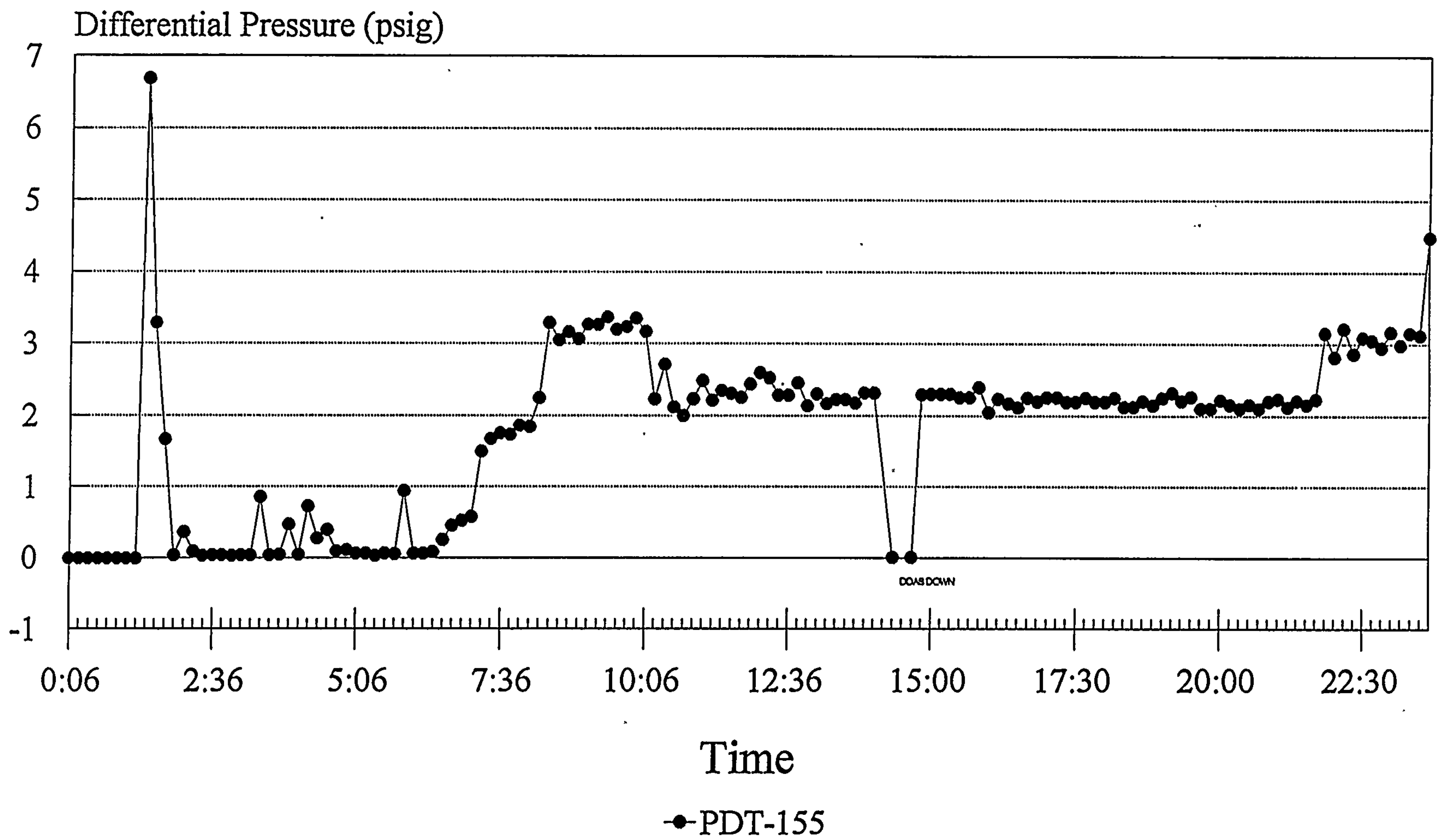

MFBP0812.CHT Lotus: MBP80213.WK1

# Filter Blowback Pressure
## 08/13/93



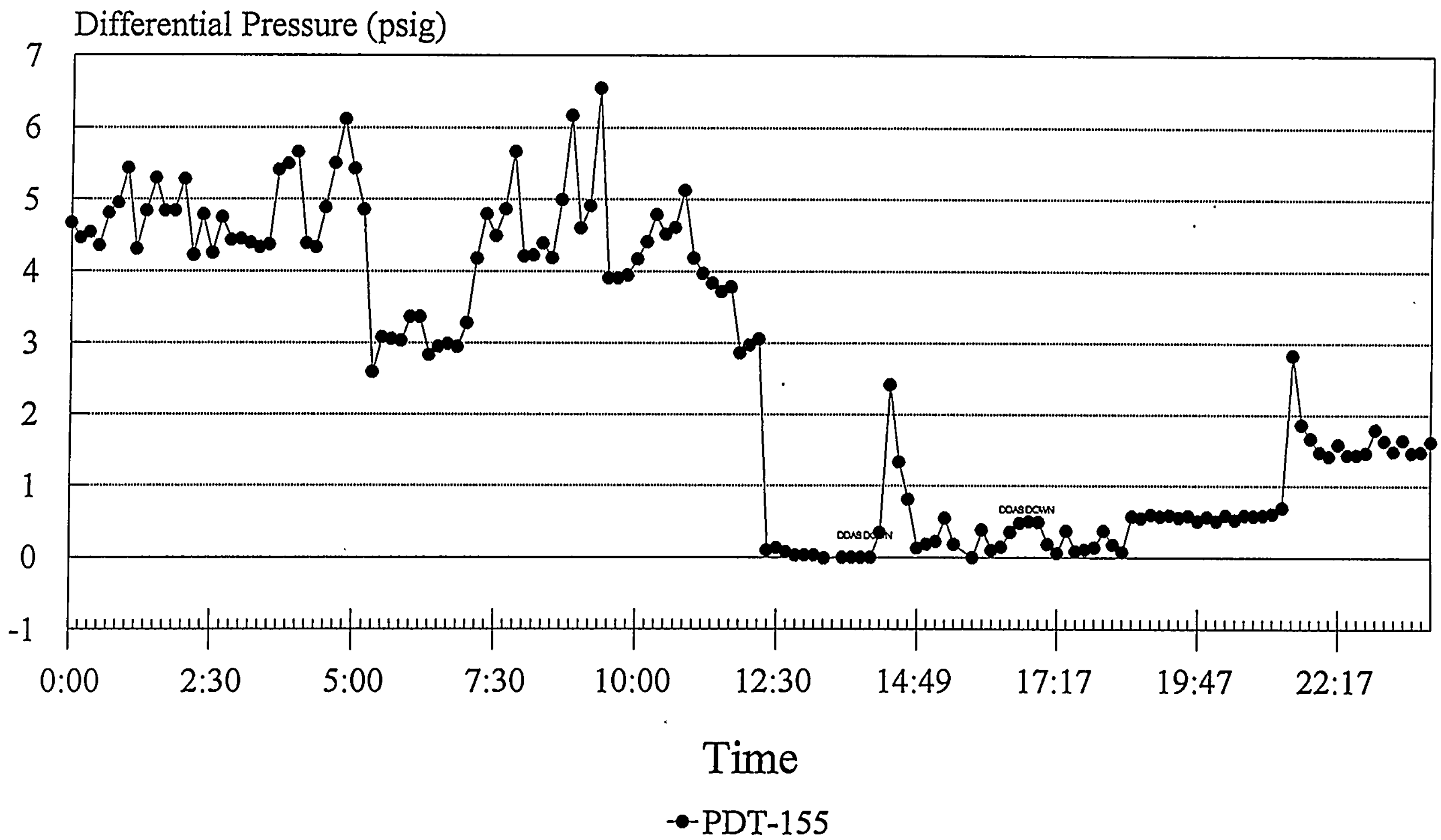

MFBP0813.CHT Lotus: MBP80213.WK1

# F-100 Differential Pressure
## 08/02/93




MFDP0802.CHT Lotus: PD080213.WK1

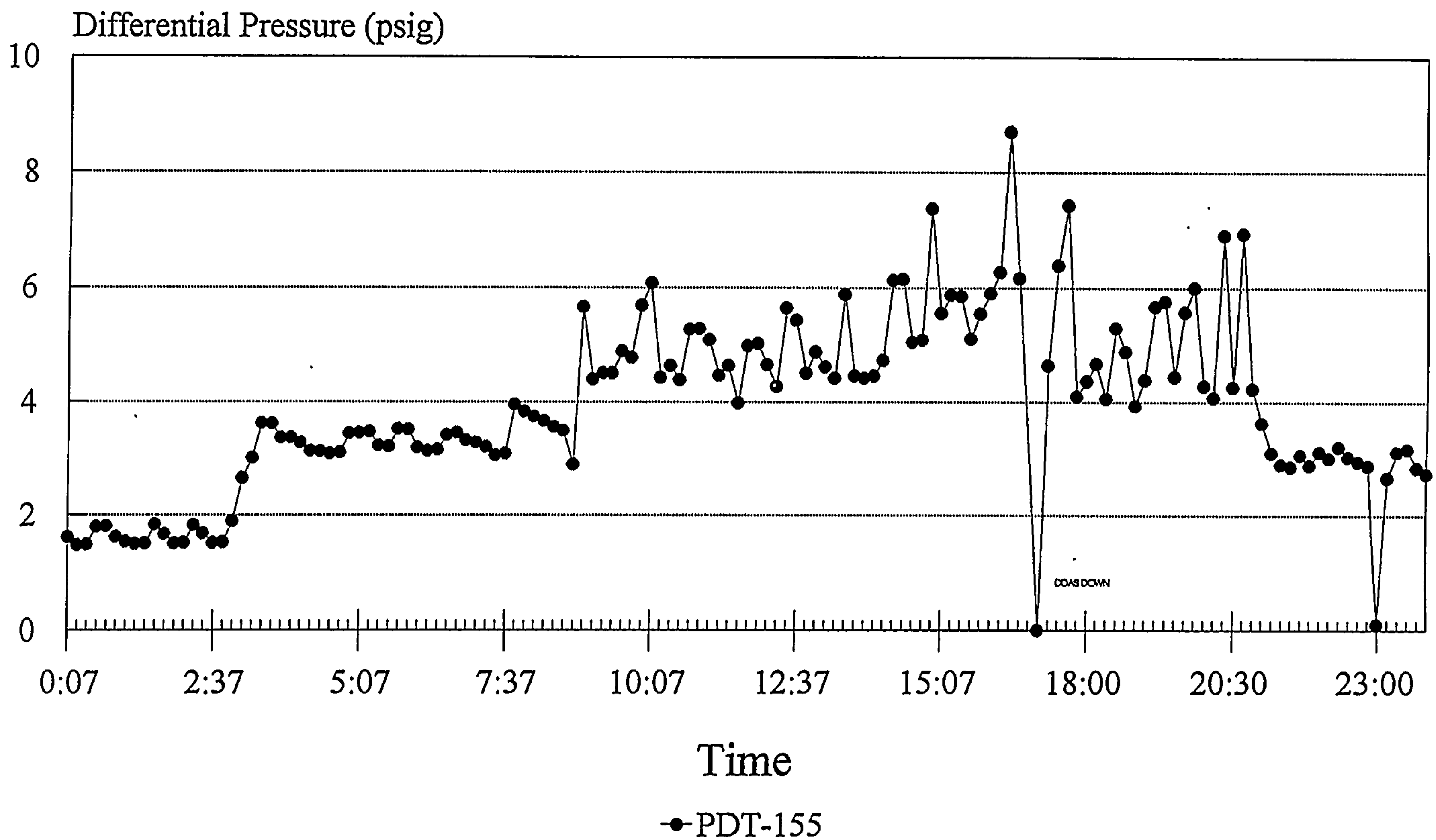
# F-100 Differential Pressure
## 08/03/93




**MFDP0803.CHT Lotus: PD080213.WK1**

# F-100 Differential Pressure

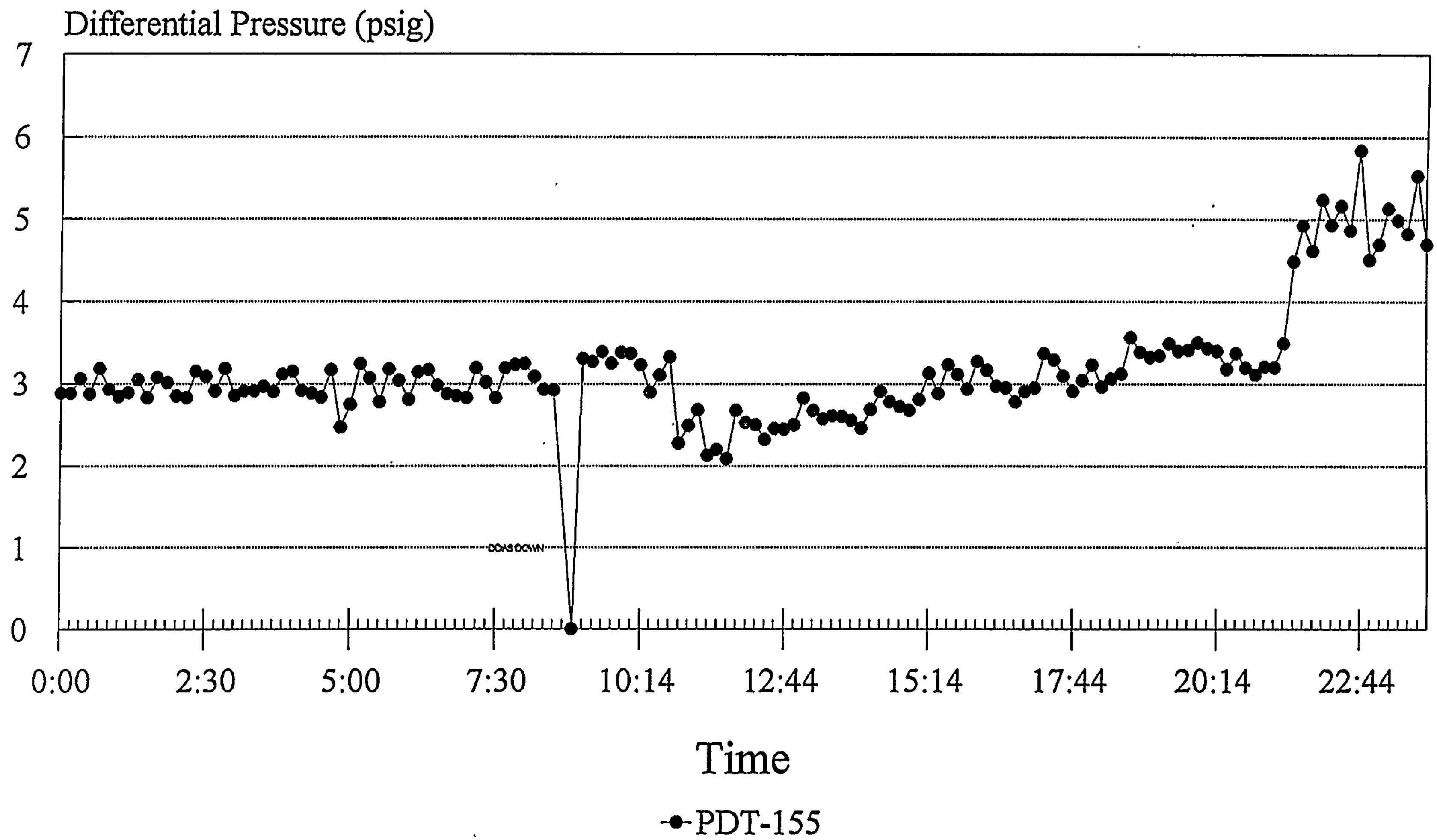
## 08/04/93




MFDP0804.CHT Lotus: PD080213.WK1

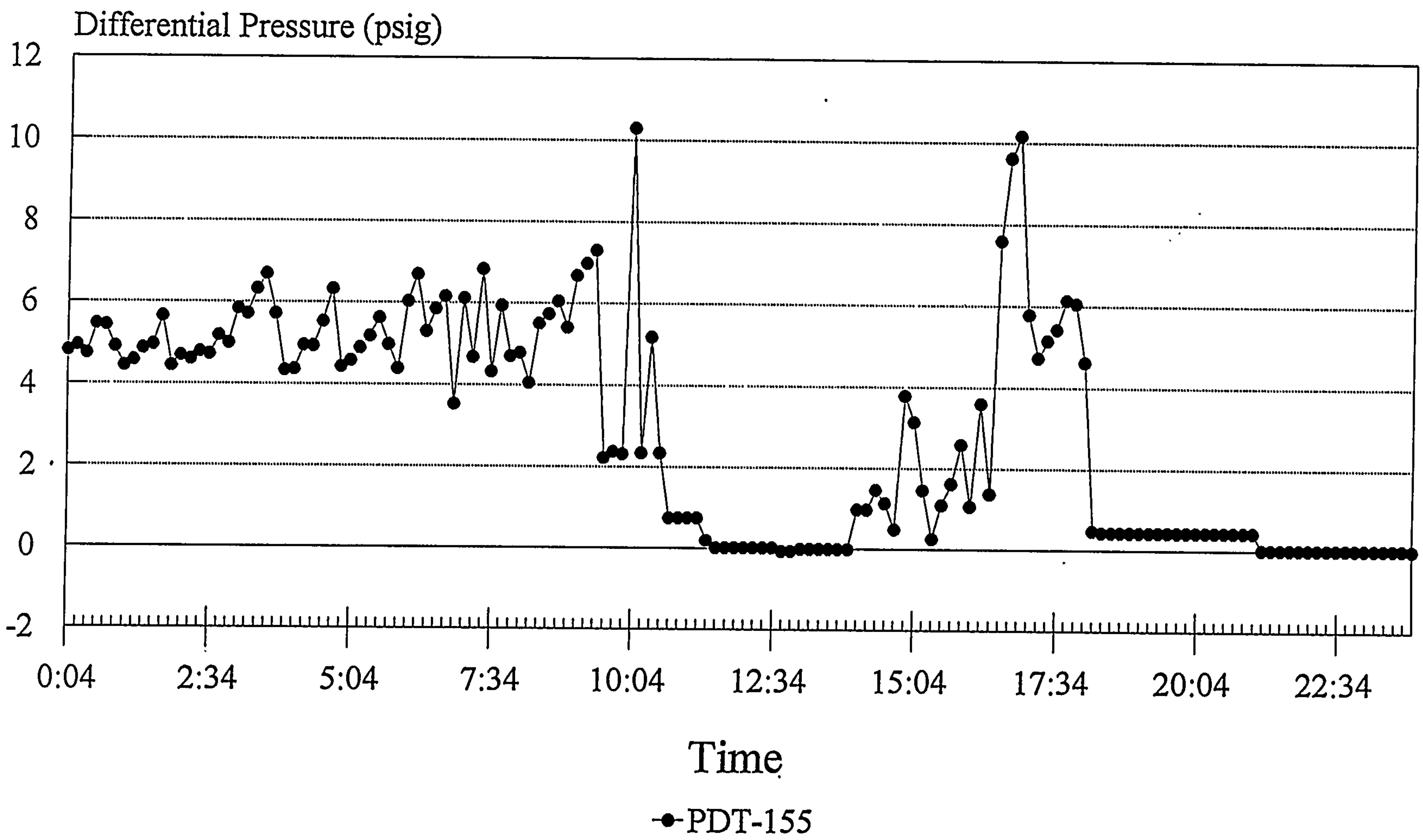
# F-100 Differential Pressure

## 08/05/93



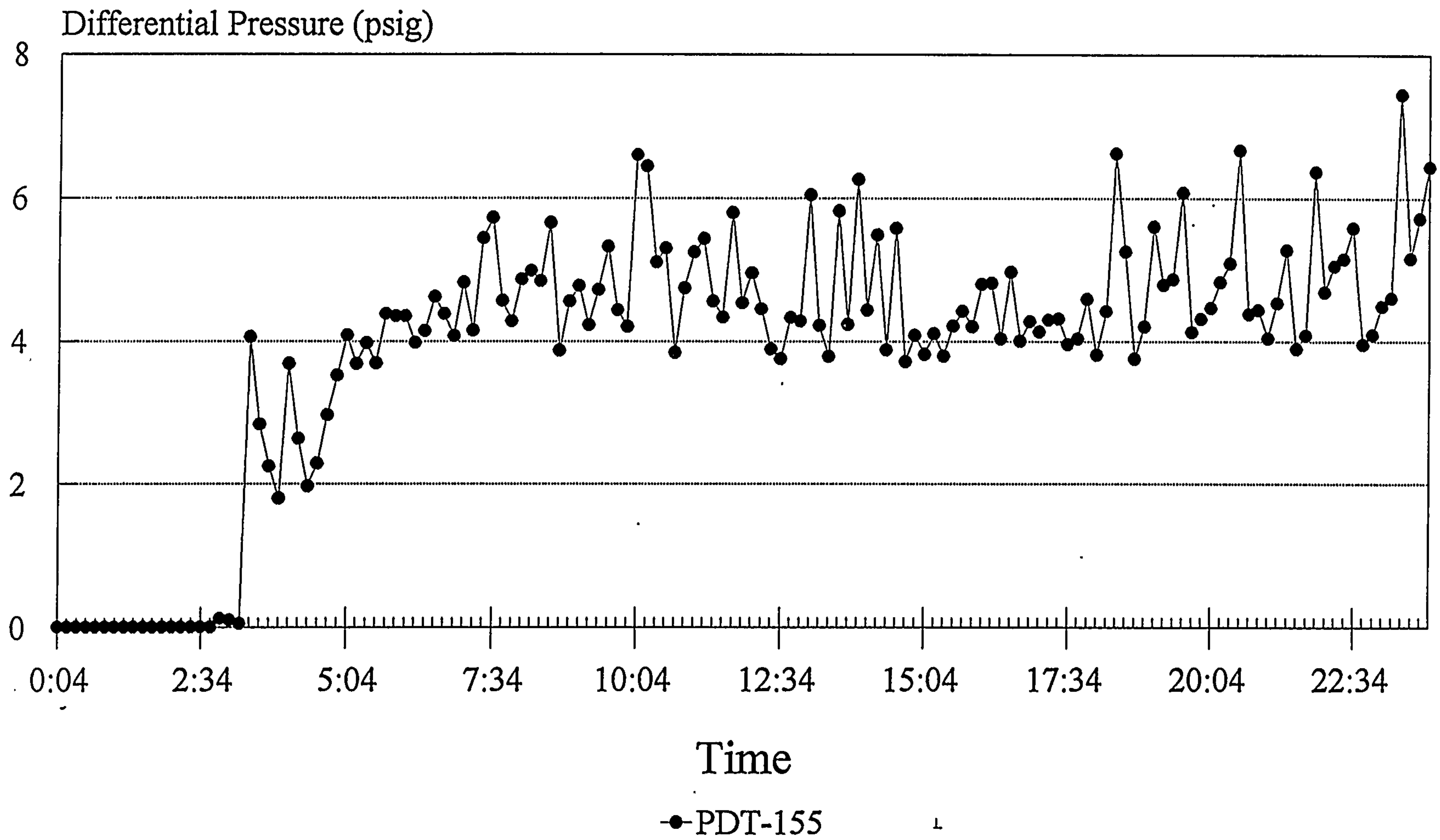

**MFDP0805.CHT Lotus: PD080213.WK1**

# F-100 Differential Pressure
## 08/06/93



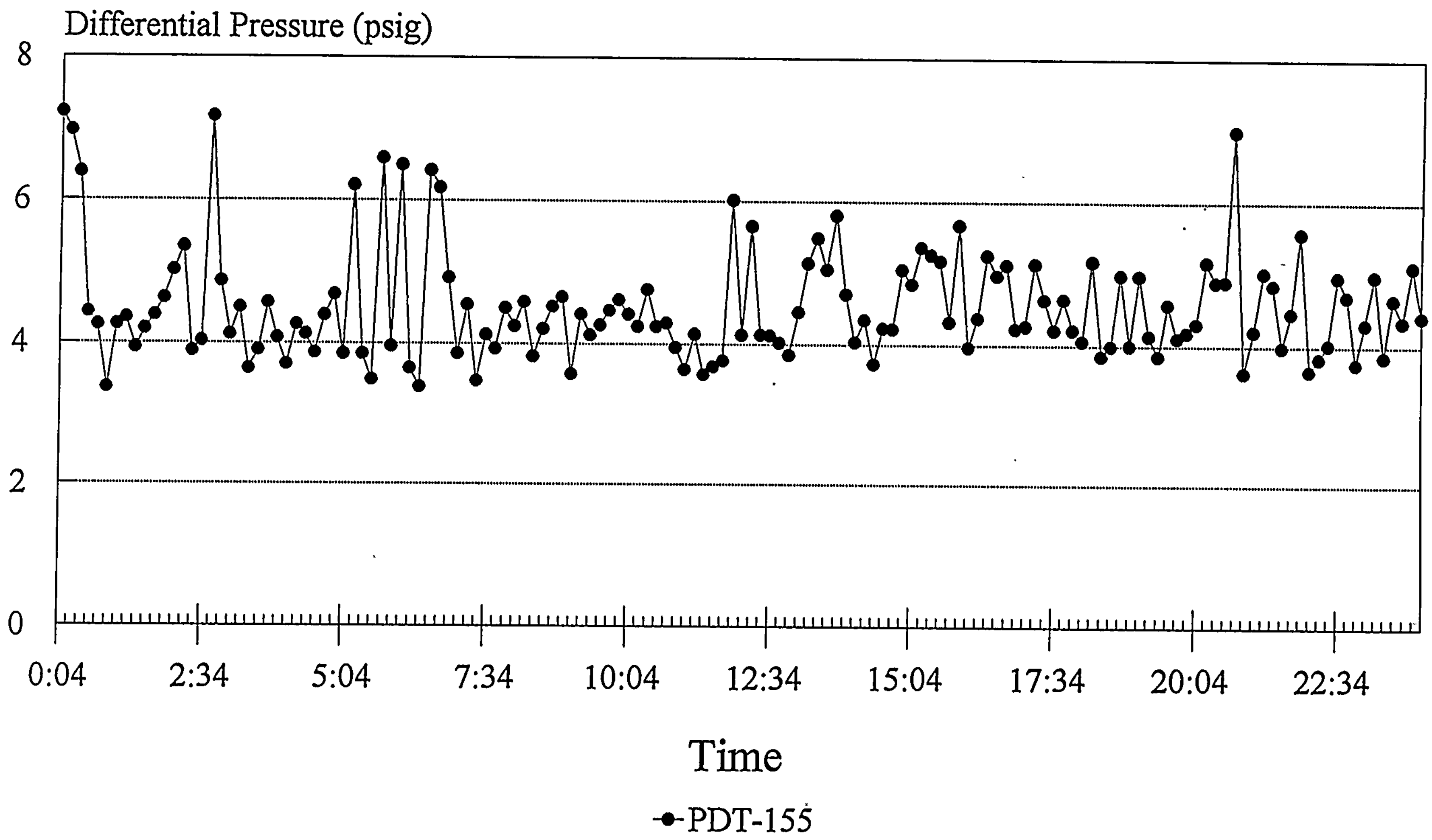

MFDP0806.CHT Lotus: PD080213.WK1

# F-100 Differential Pressure
## 08/07/93



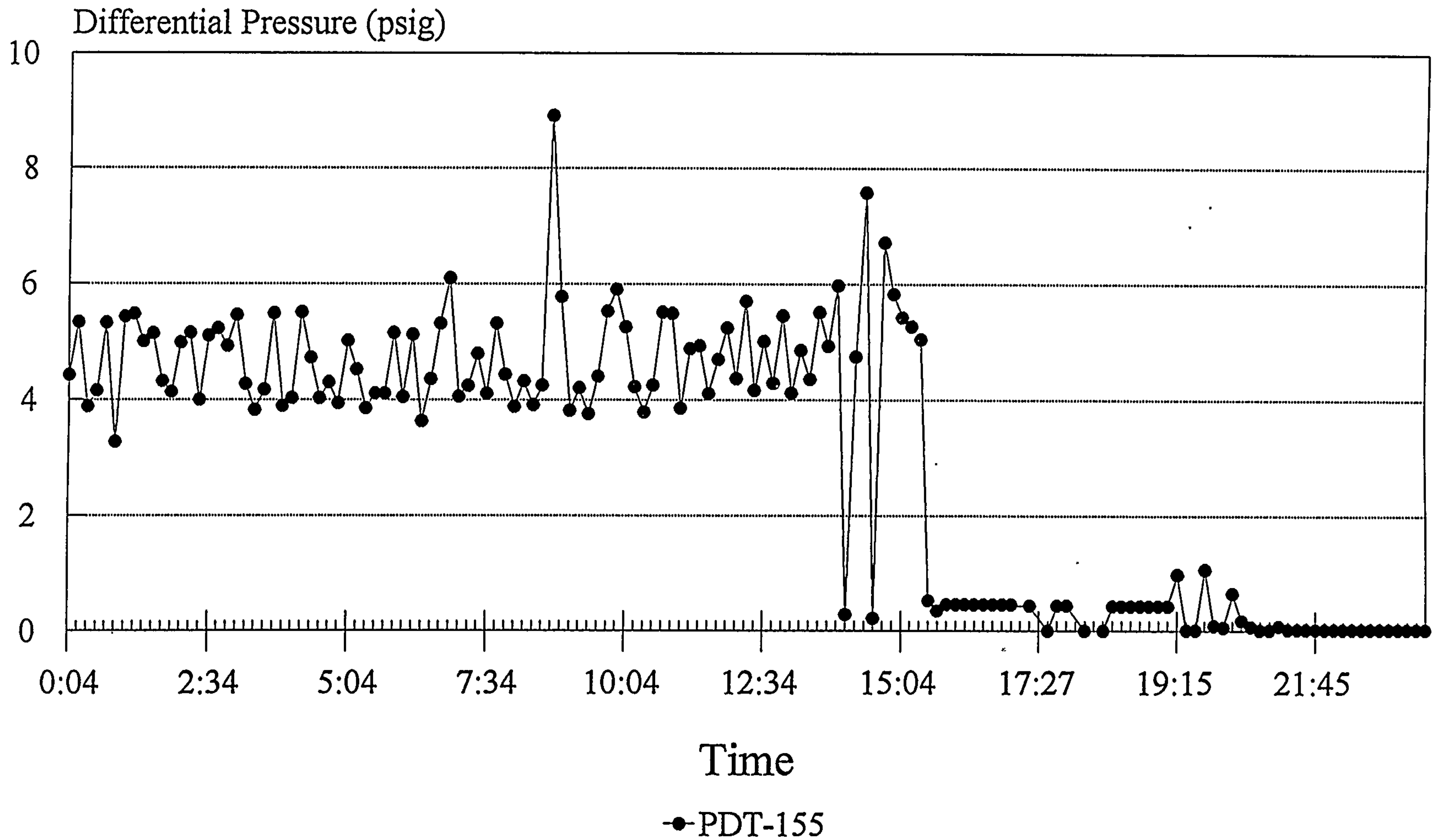

MFDP0807.CHT Lotus: PD080213.WK1

# F-100 Differential Pressure
## 08/08/93



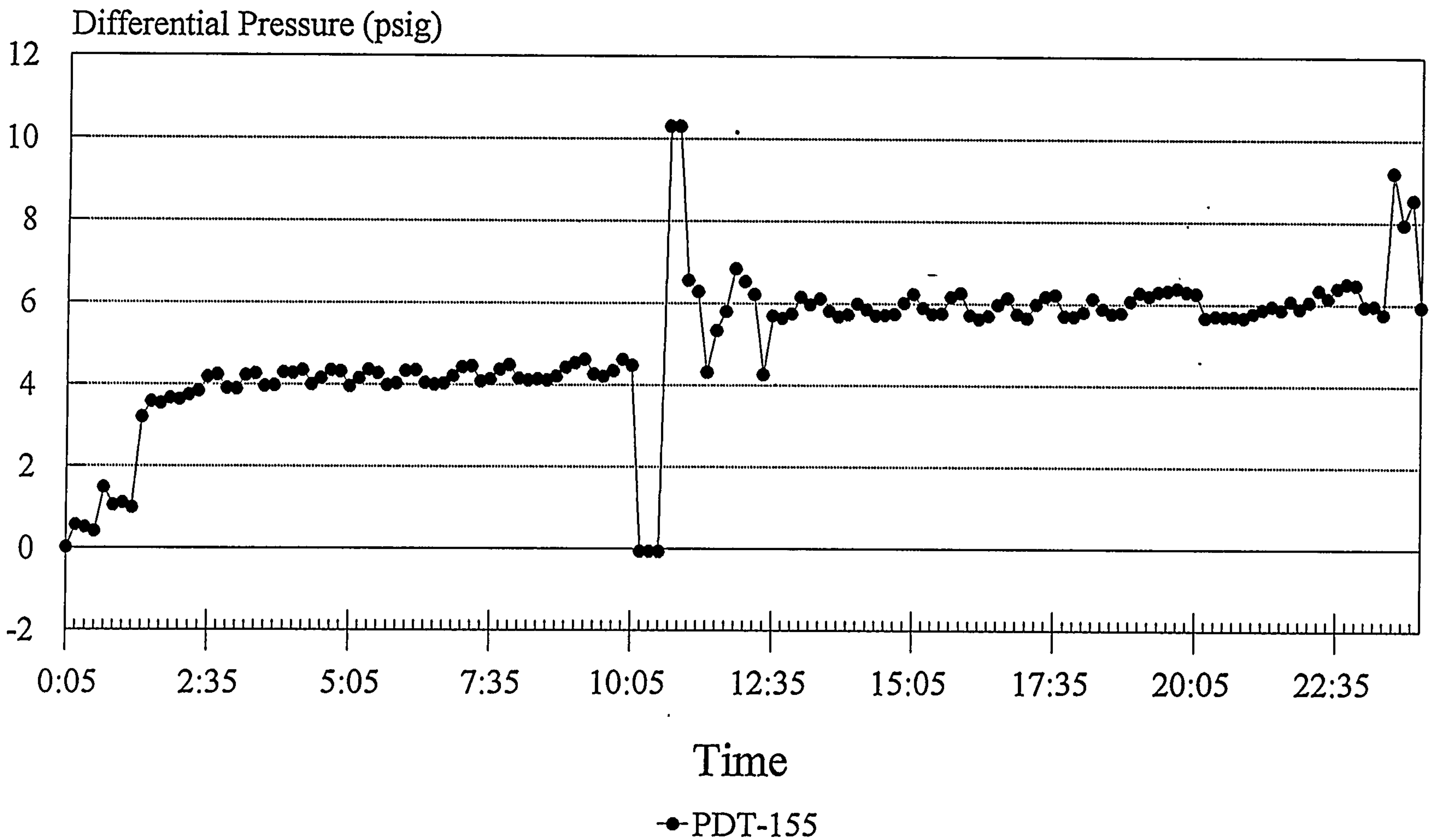

MFDP0808.CHT Lotus: PD080213.WK1

# F-100 Differential Pressure
## 08/09/93



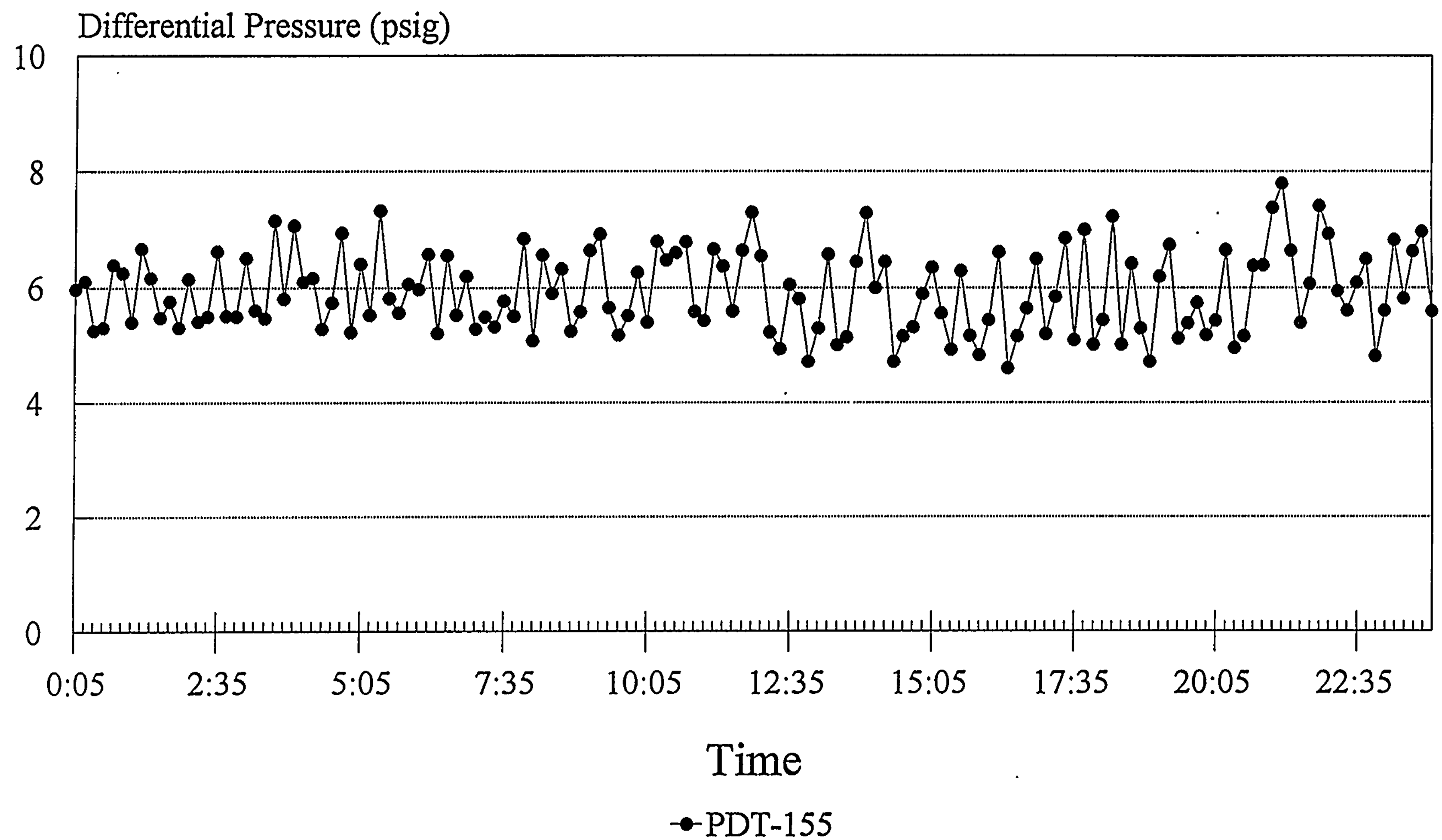

MFDP0809.CHT **Lotus: PD080213.WK1**

# F-100 Differential Pressure
## 08/10/93



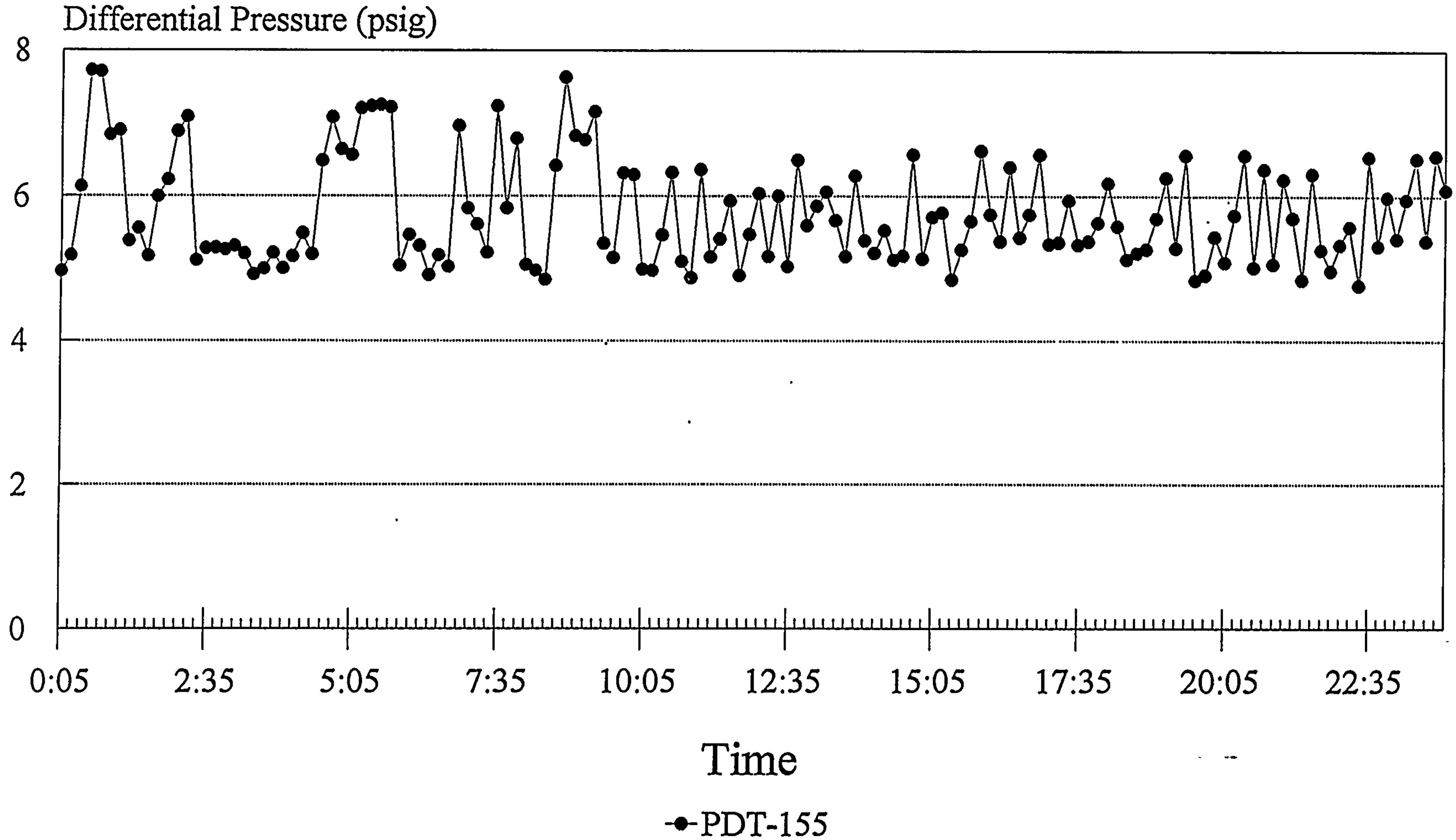

MFDP0810.CHT Lotus: PD080213.WK1

# F-100 Differential Pressure
## 08/11/93



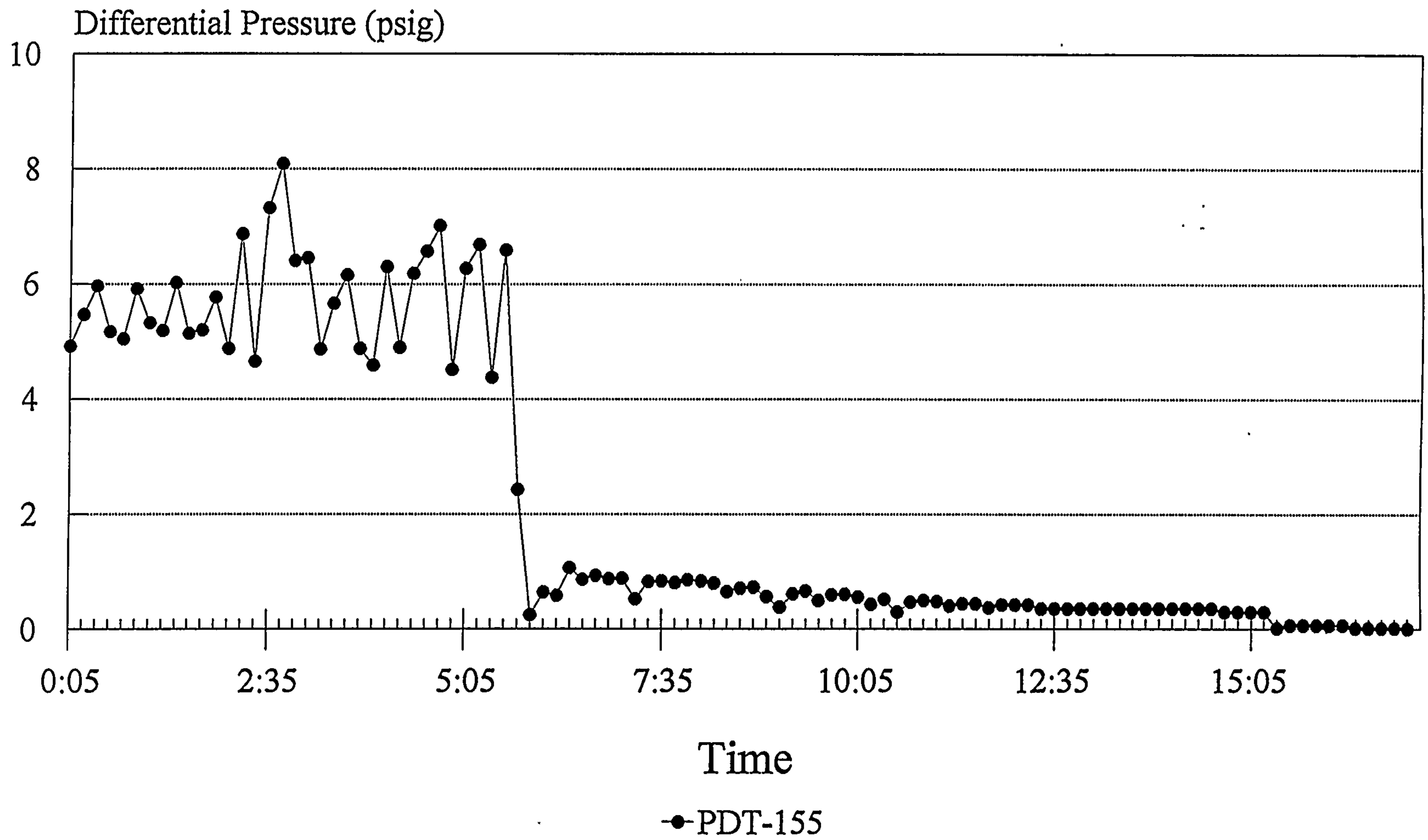

MFDP0811.CHT Lotus: PD080213.WK1

# F-100 Differential Pressure
## 08/12/93



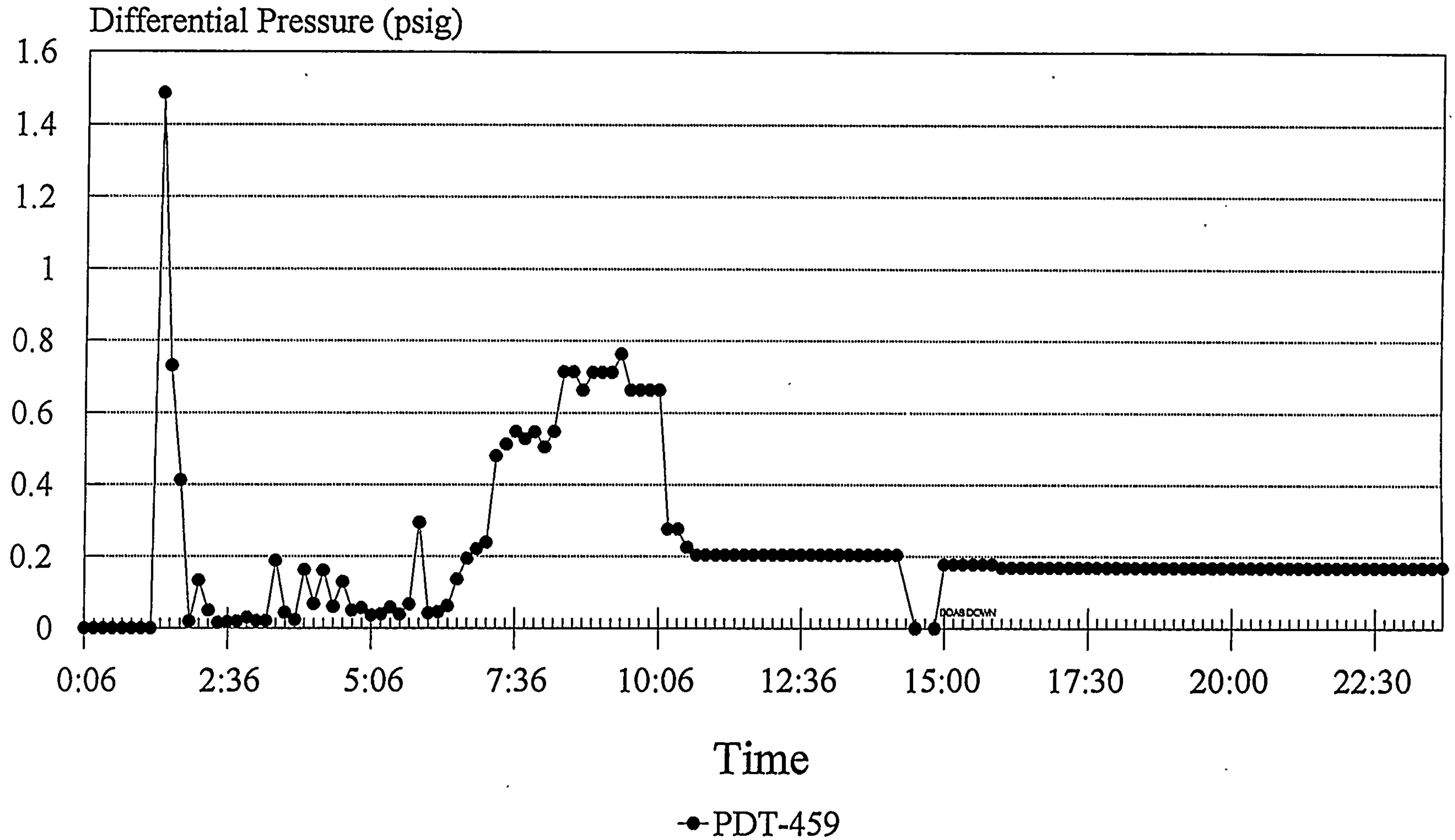

MFDP0812.CHT  Lotus: PD080213.WK1

# F-100 Differential Pressure
## 08/13/93



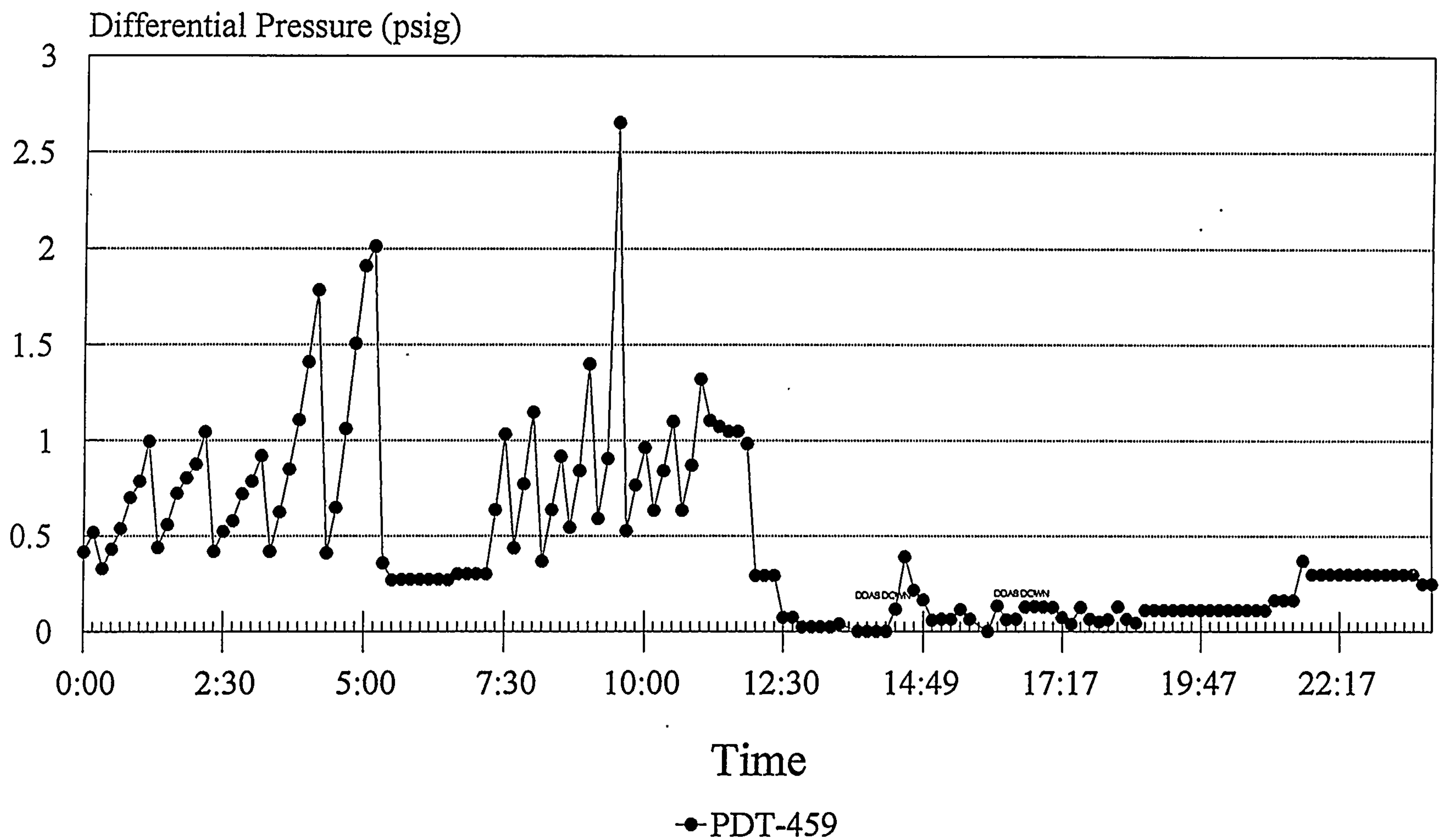

**MFDP0813.CHT Lotus: PD080213.WK1**

# F-100 Filter Diff. Press.
## 08/02/93



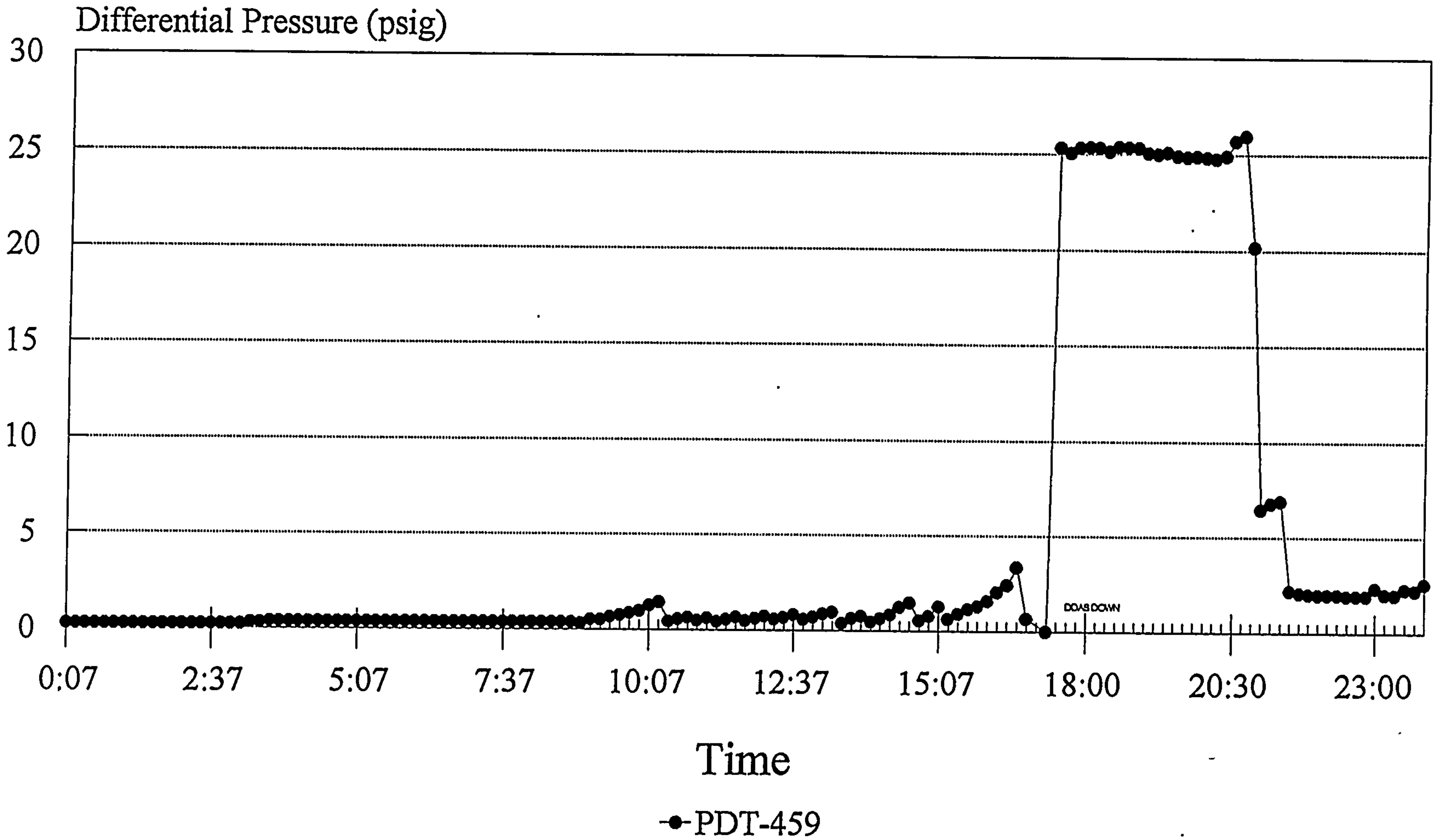

MDFP0802.CHT    Lotus: PD080213.WK1

# F-100 Filter Diff. Press.
## 08/03/93



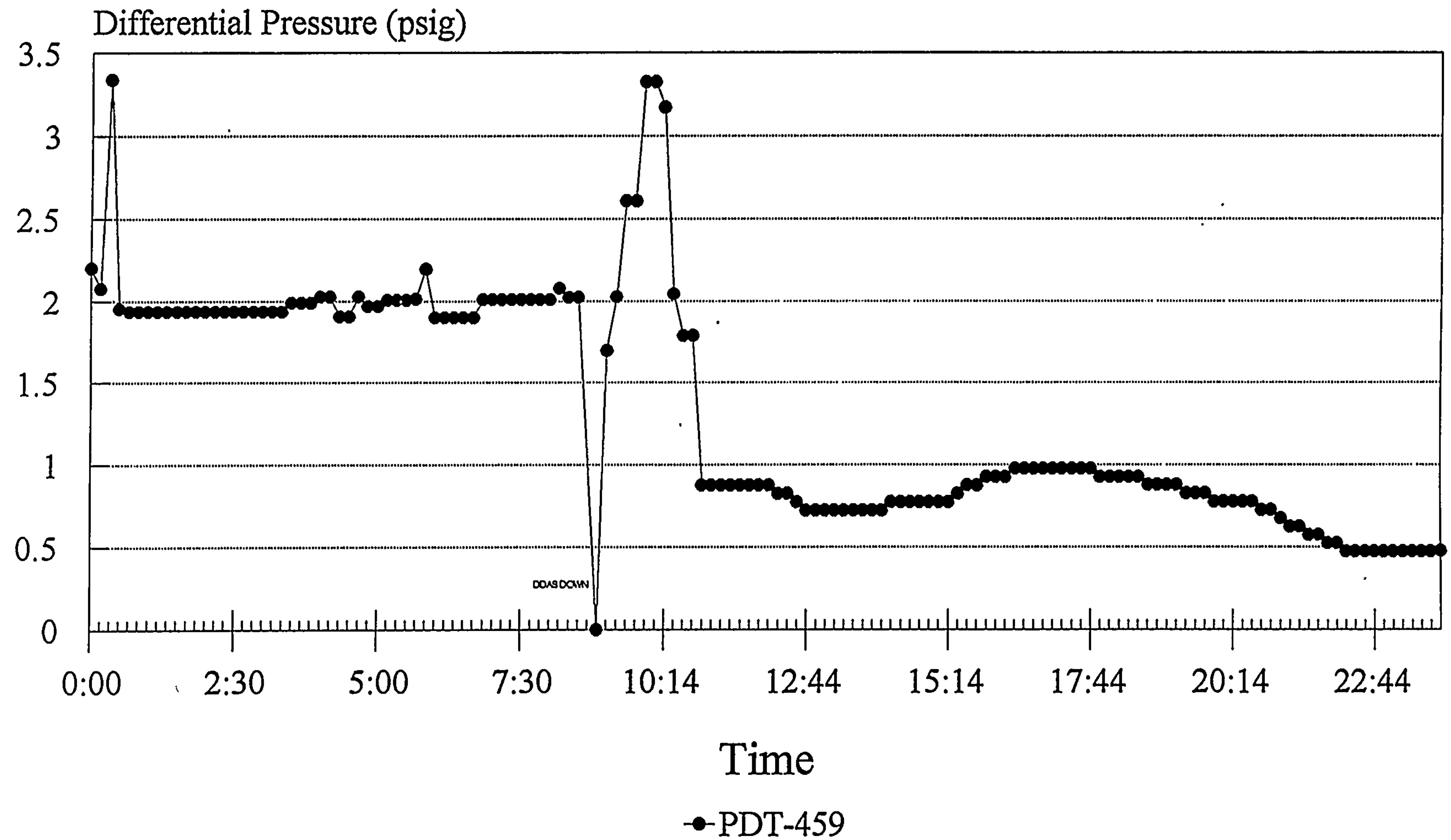

MDFP0803.CHT Lotus: PD080213.WK1

# F-100 Filter Diff. Press.
## 08/04/93




MDFP0804.CHT Lotus: PD080213.WK1

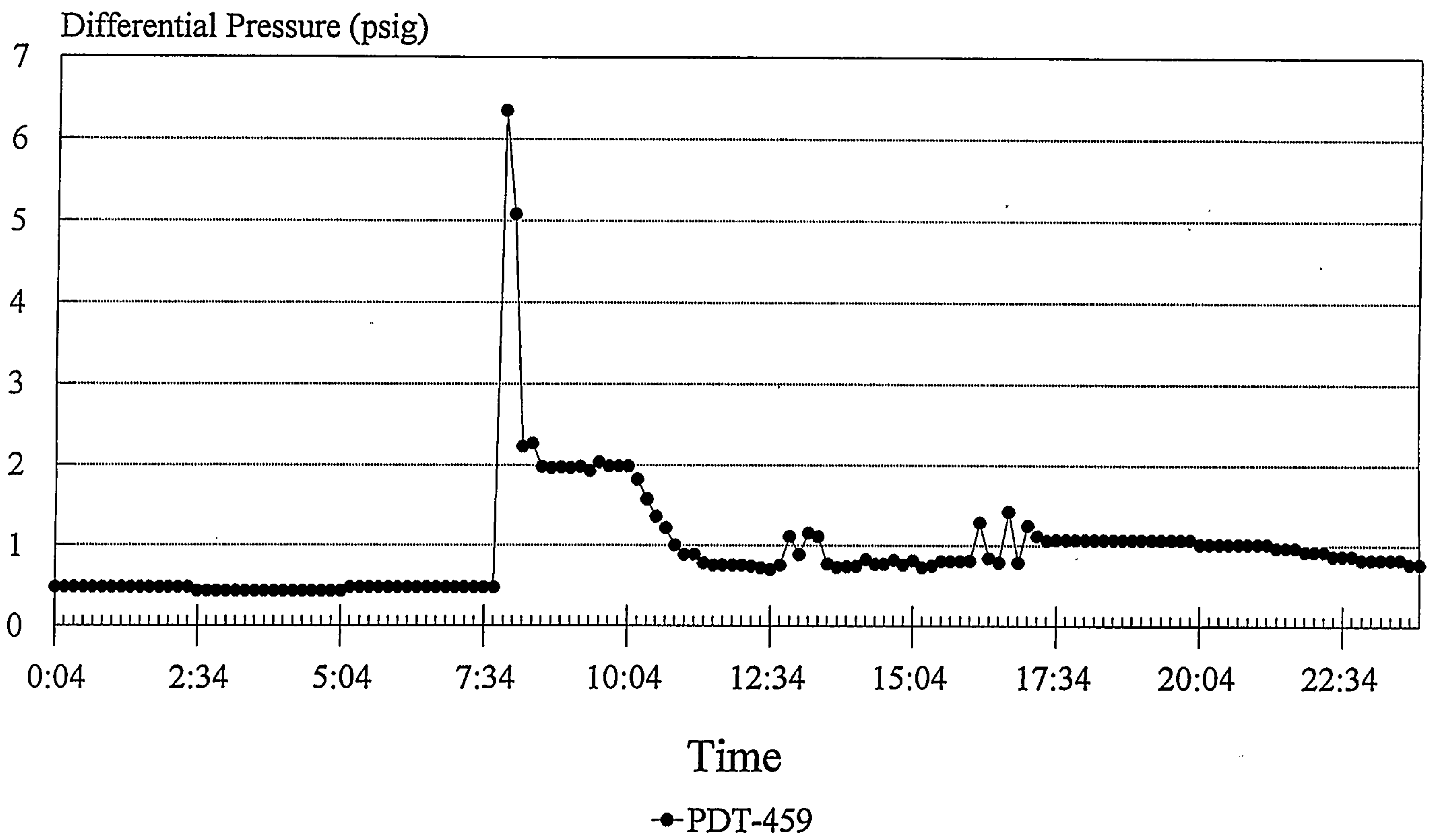
# F-100 Filter Diff. Press.
## 08/05/93




MDFP0805.CHT Lotus: PD080213.WK1

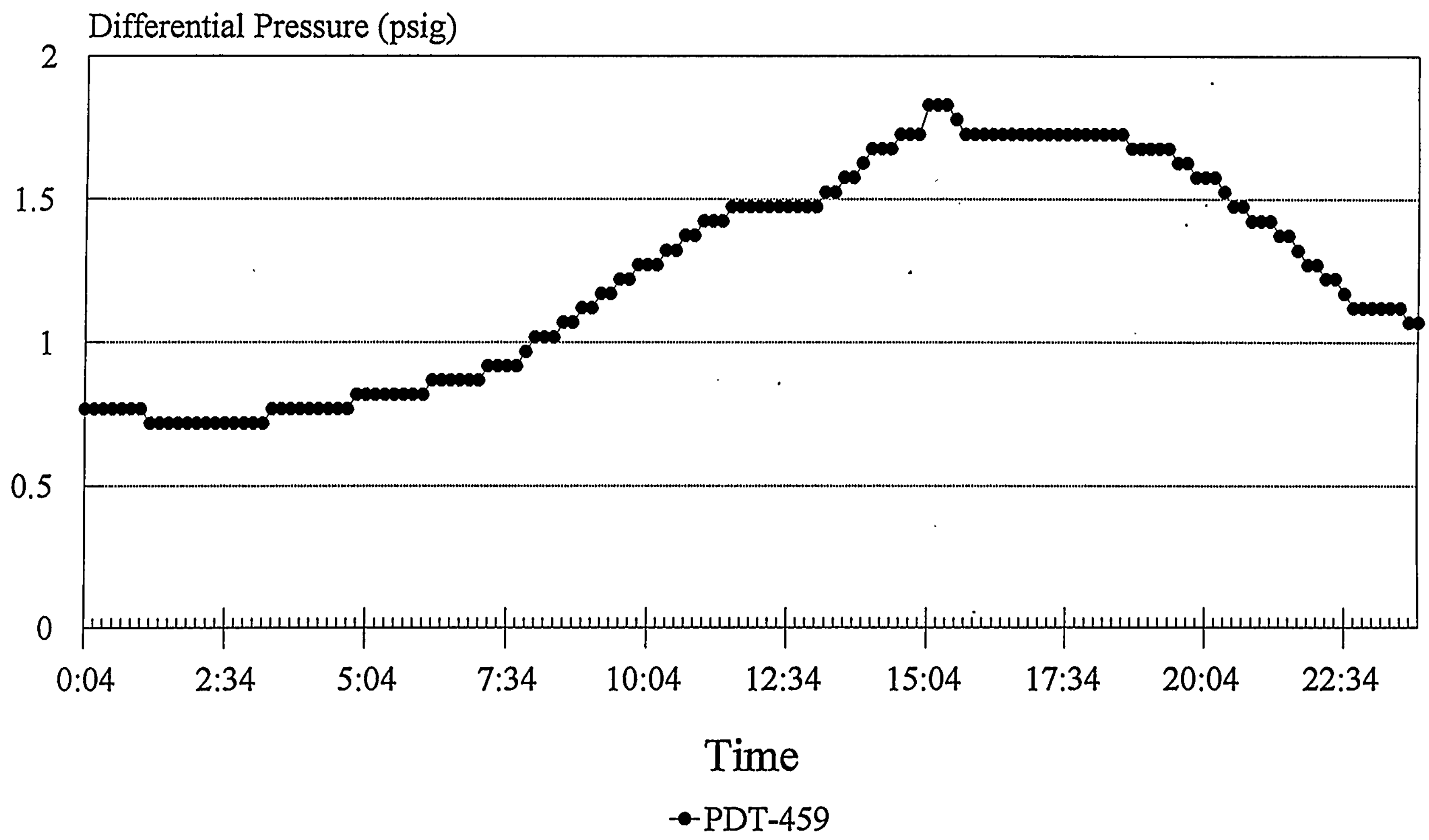
# F-100 Filter Diff. Press.

## 08/06/93



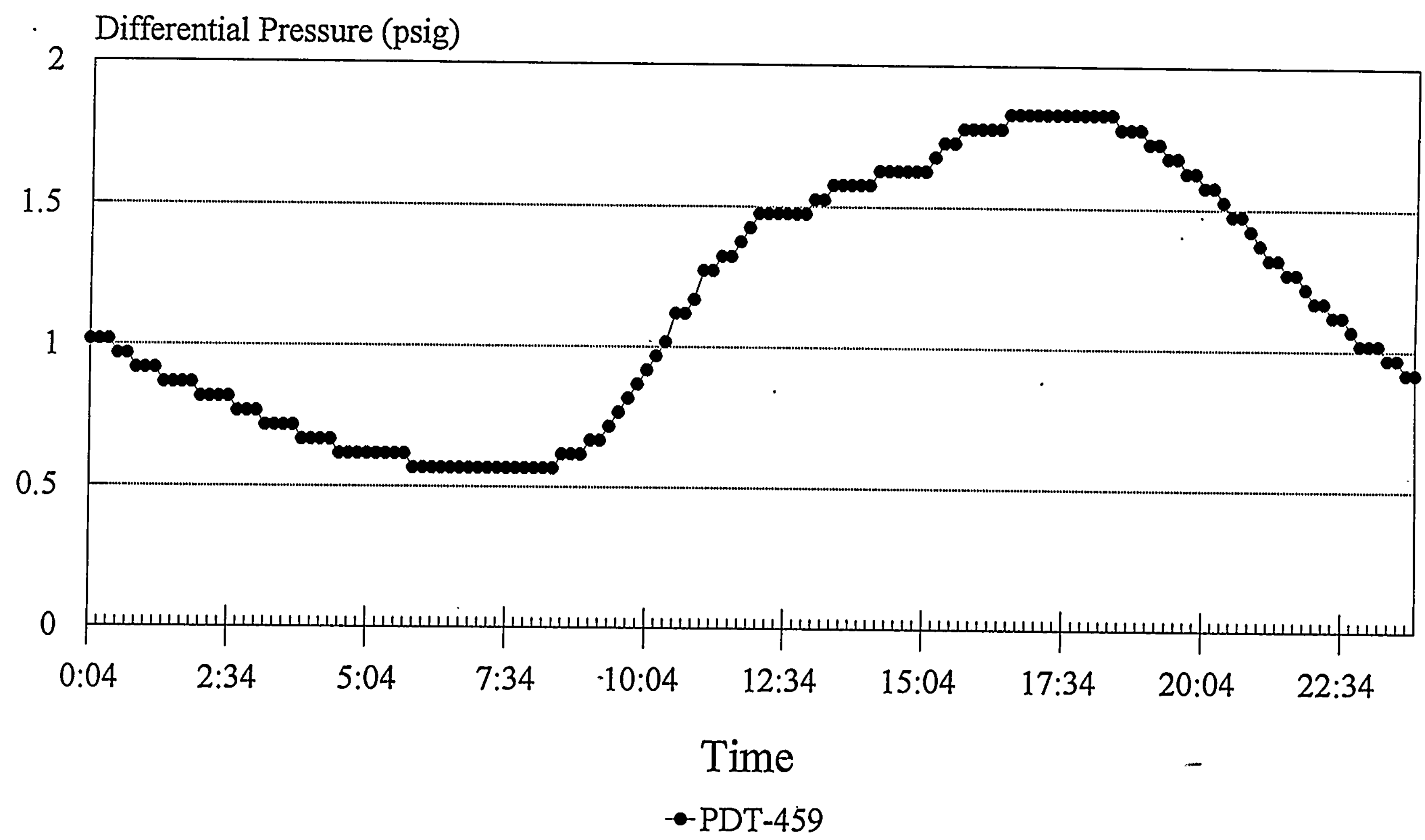

**MDFP0806.CHT Lotus: PDF80213.WK1**

# F-100 Filter Diff. Press.
## 08/07/93



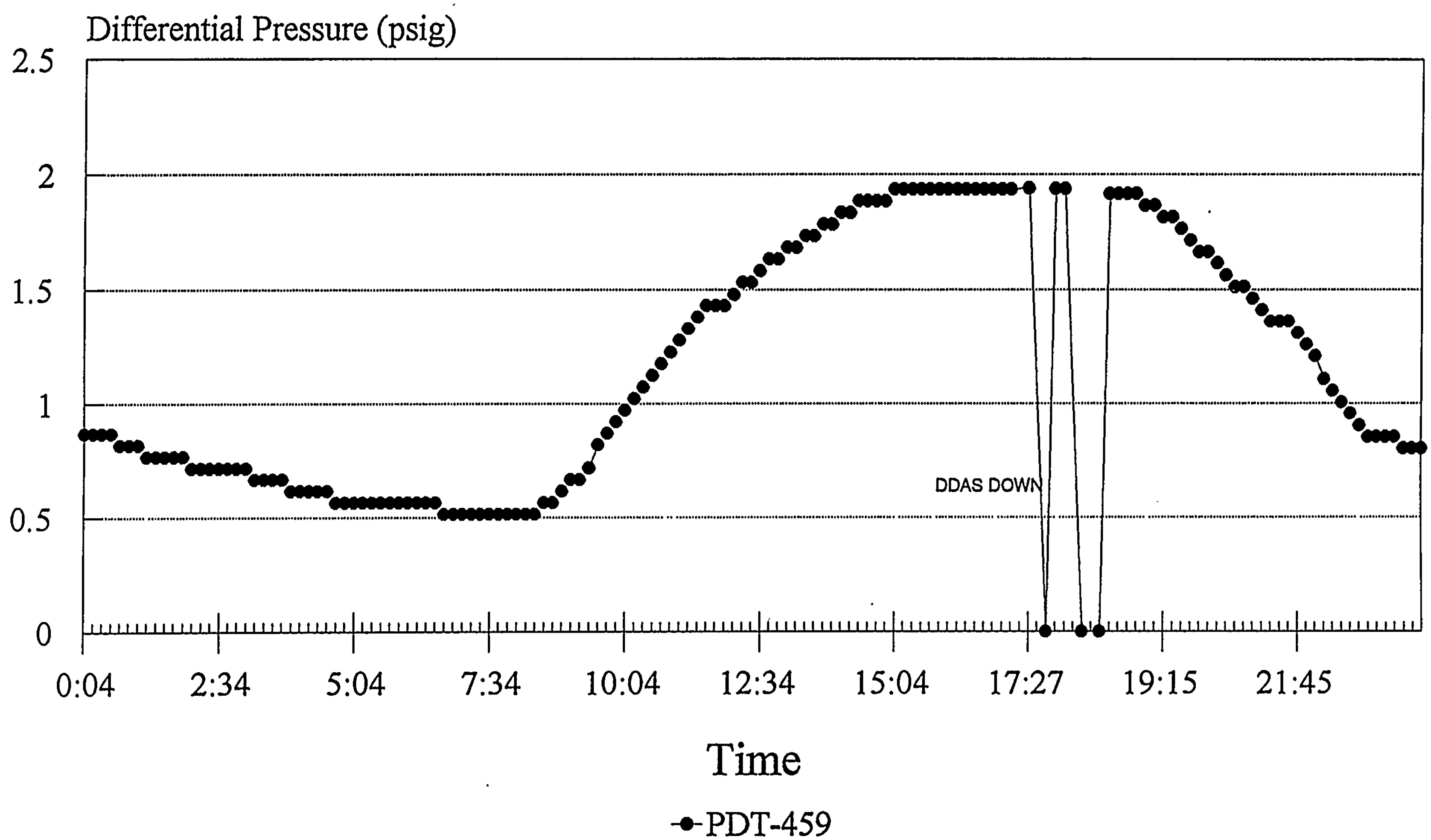

MDFP0807.CHT Lotus: PDF80213.WK1

# F-100 Filter Diff. Press.
## 08/08/93



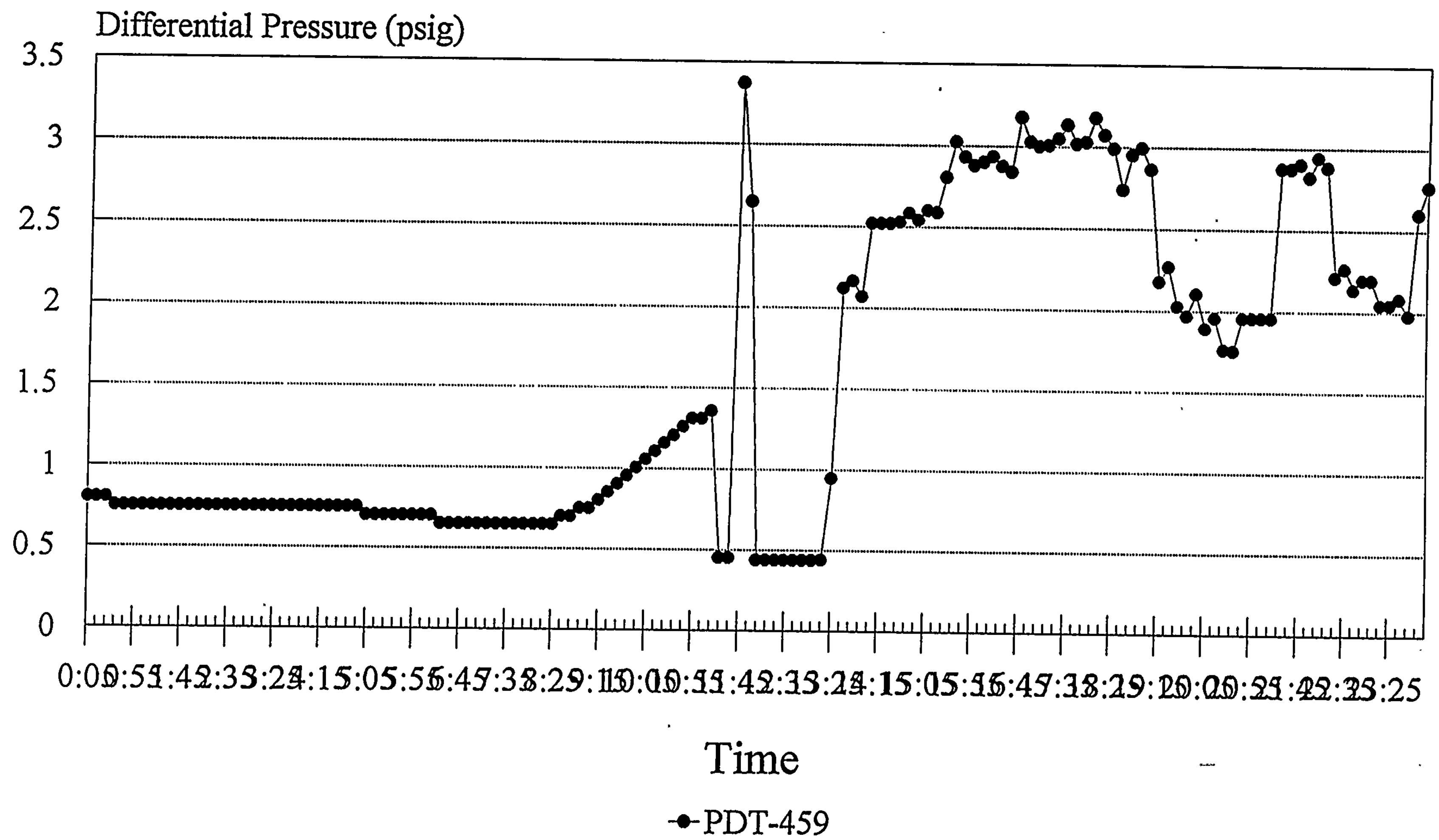

MDFP0808.CHT Lotus: PD080213.WK1

# F-100 Filter Diff. Press.
## 08/09/93



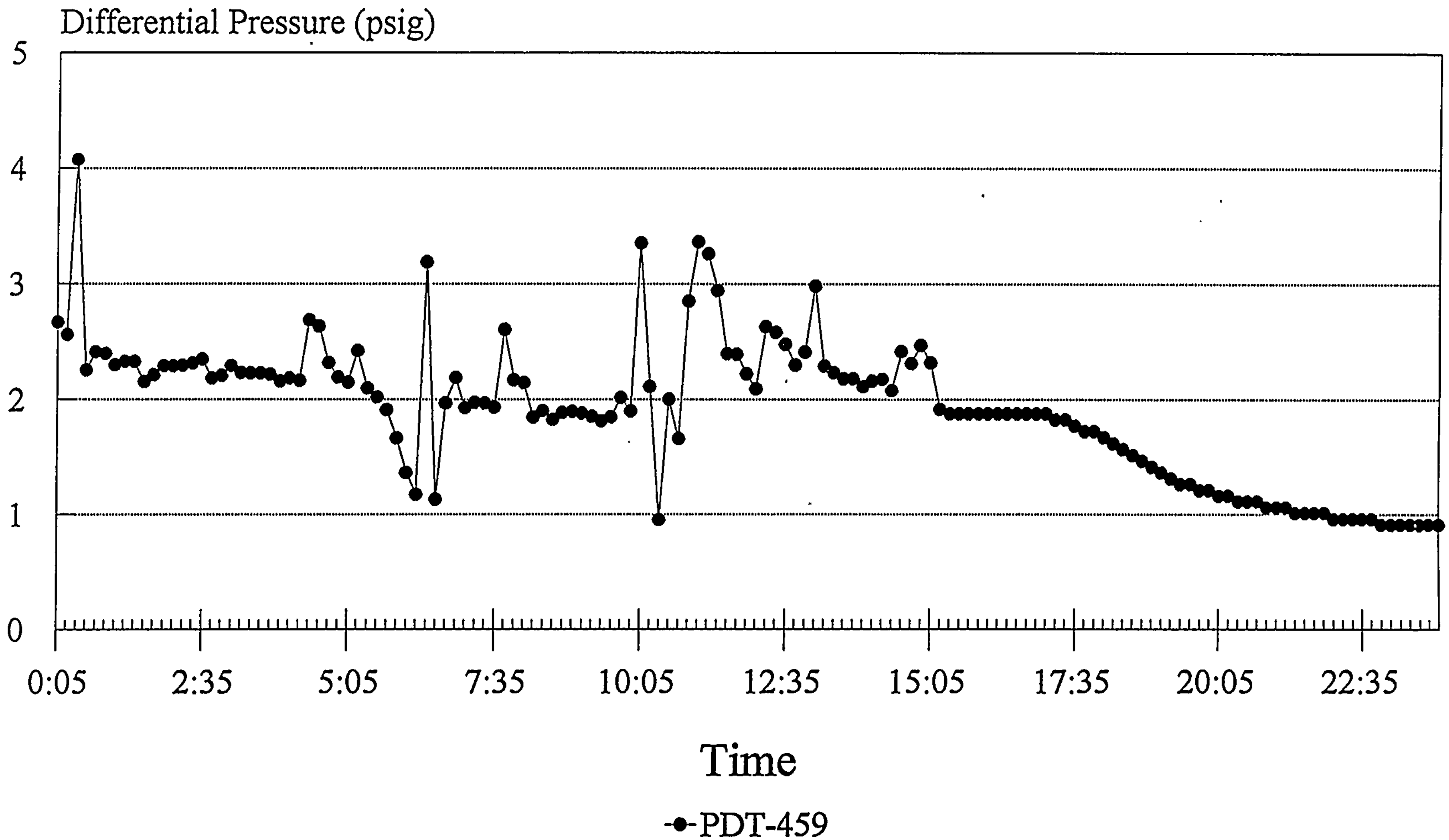

MDFP0809.CHT Lotus: PD080213.WK1

# F-100 Filter Diff. Press.
## 08/10/93



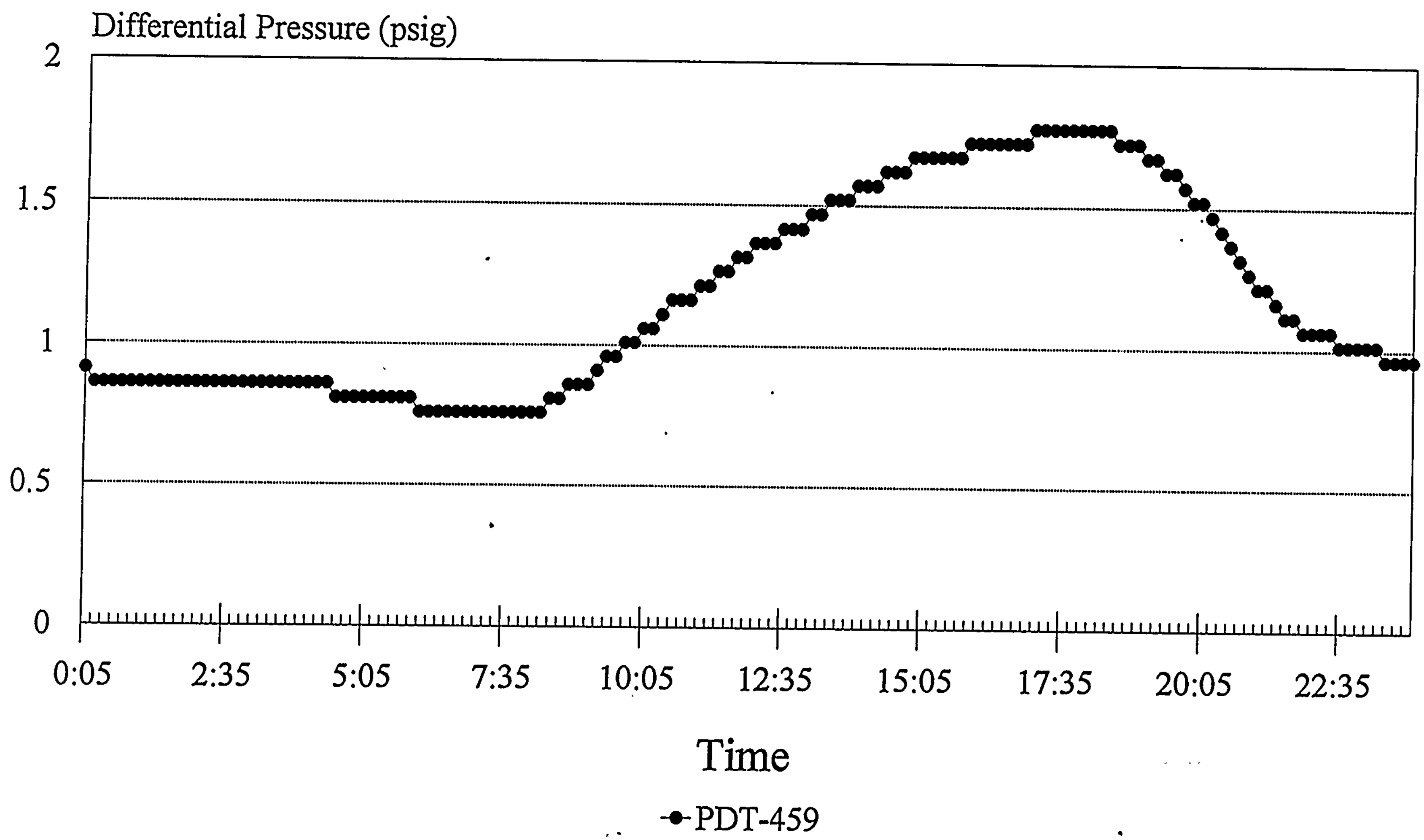

MDFP0810.CHT Lotus: PD080213.WK1

# F-100 Filter Diff. Press.
## 08/11/93



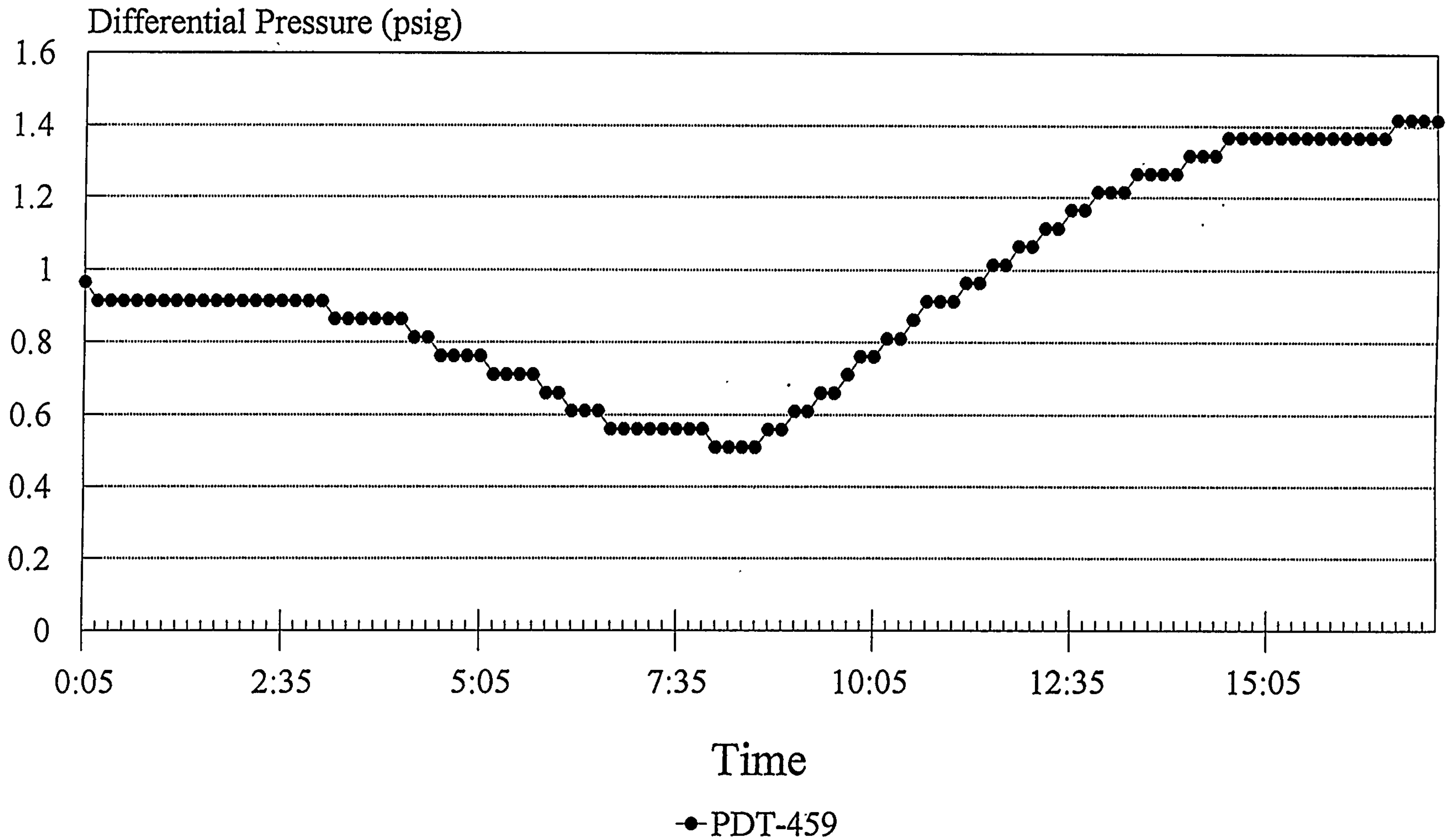

MDFP0811.CHT Lotus: PD080213.WK1

# F-100 Filter Diff. Press.
## 08/12/93




MDFP0812.CHT  Lotus: PD080213.WK1

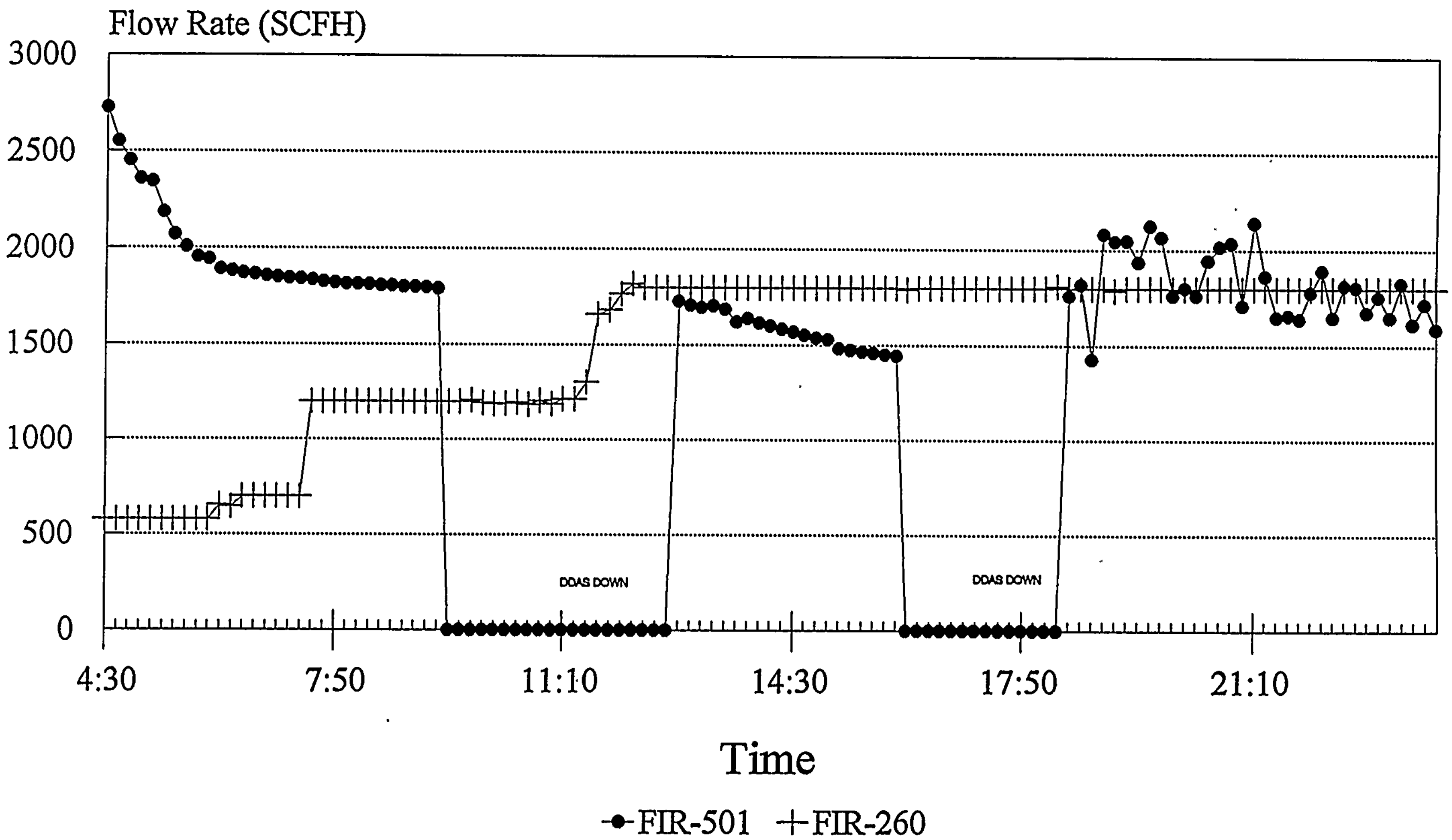
# F-100 Filter Diff. Press.
## 08/13/93




MDFP0813.CHT Lotus: PD080213.WK1

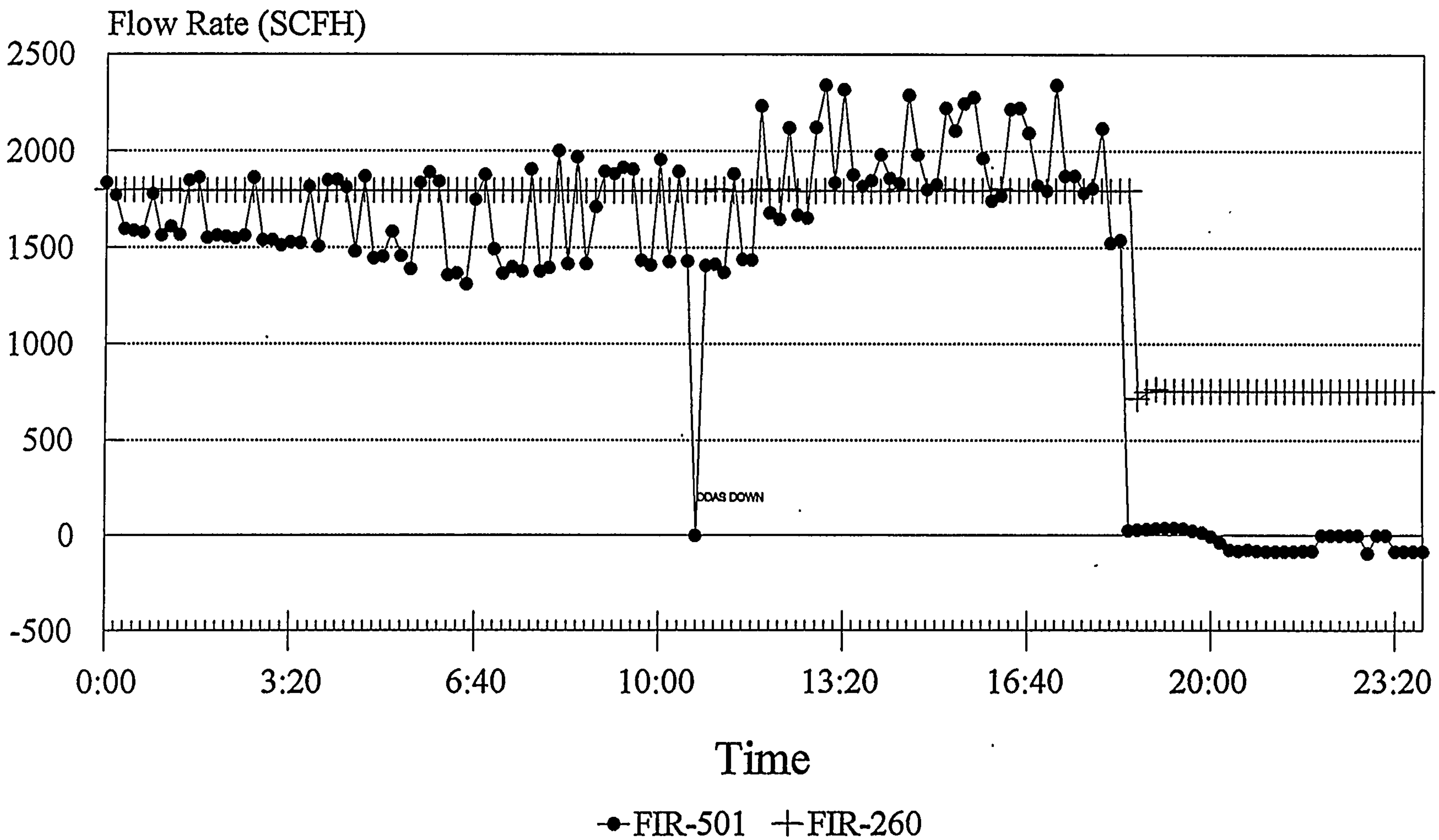
# 93MGC06
# (11/01/93 - 11/09/93)

# Inlet and Process Flow
## 11/01/93



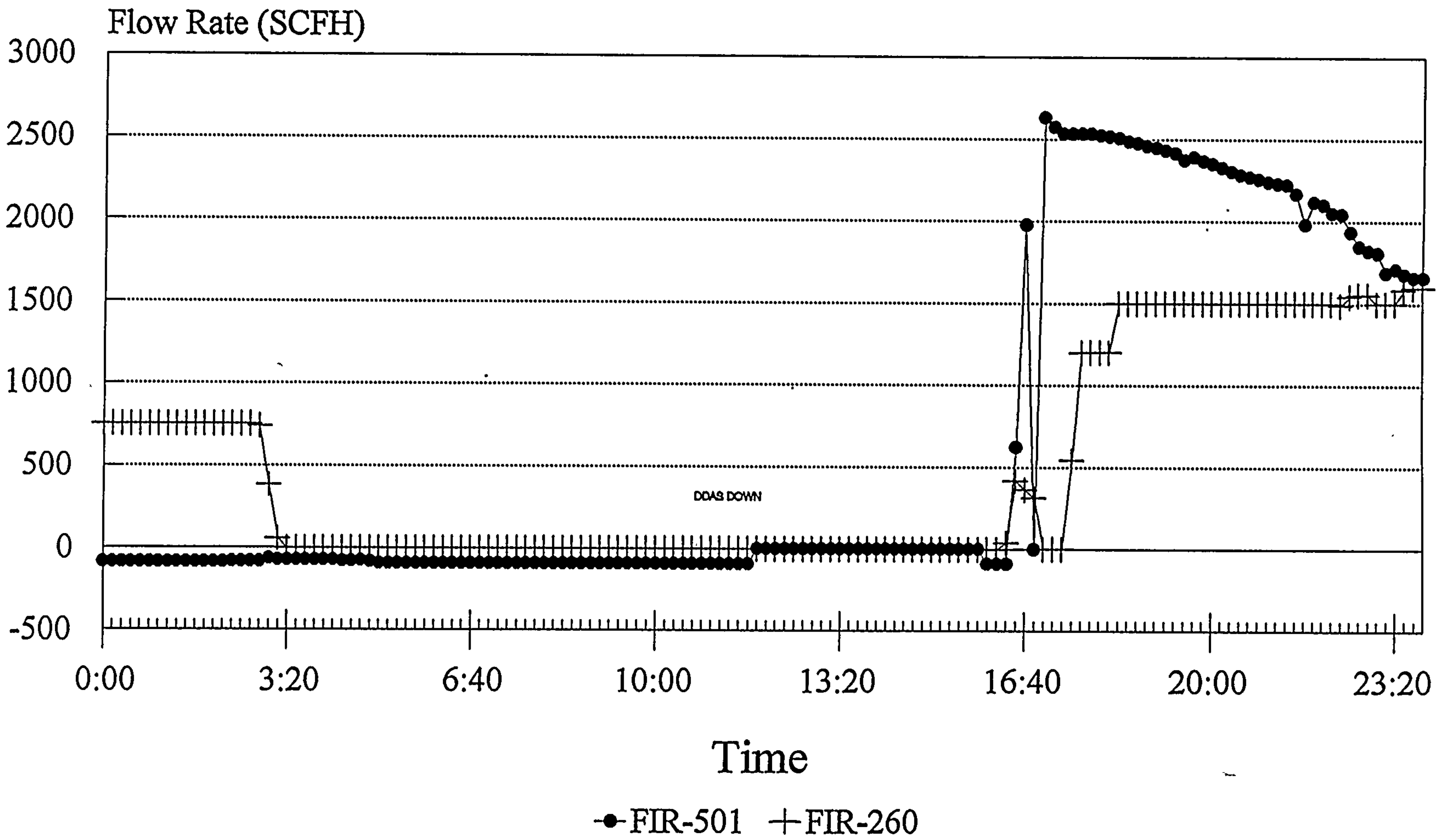

FX1011.CHT Lotus: FX110111.WK1

# Inlet and Process Flow Rate
## 11/02/93



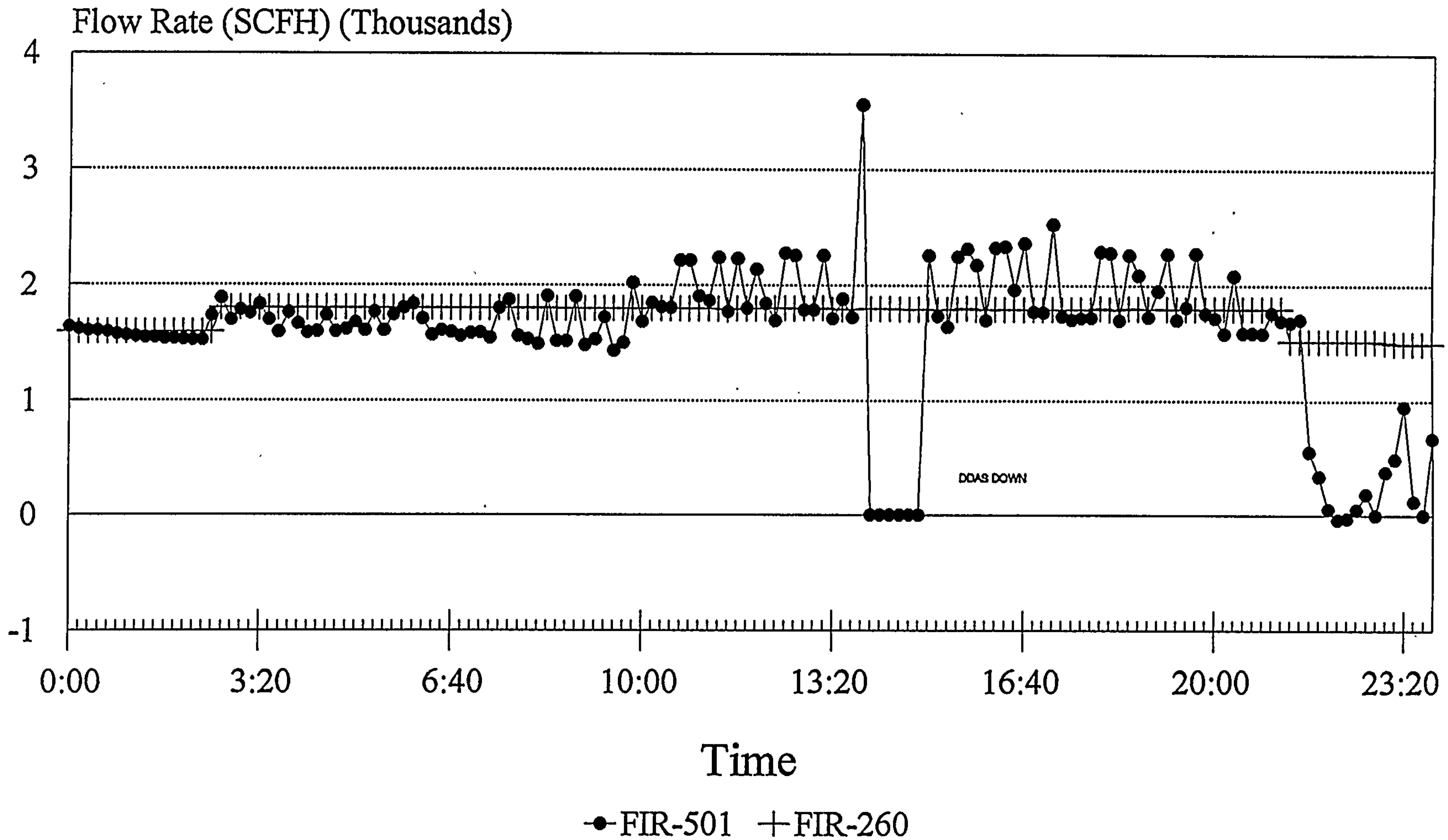

FX1102.CHT Lotus: FX110111.WK1

# Inlet and Process Flow Rate
## 11/03/93



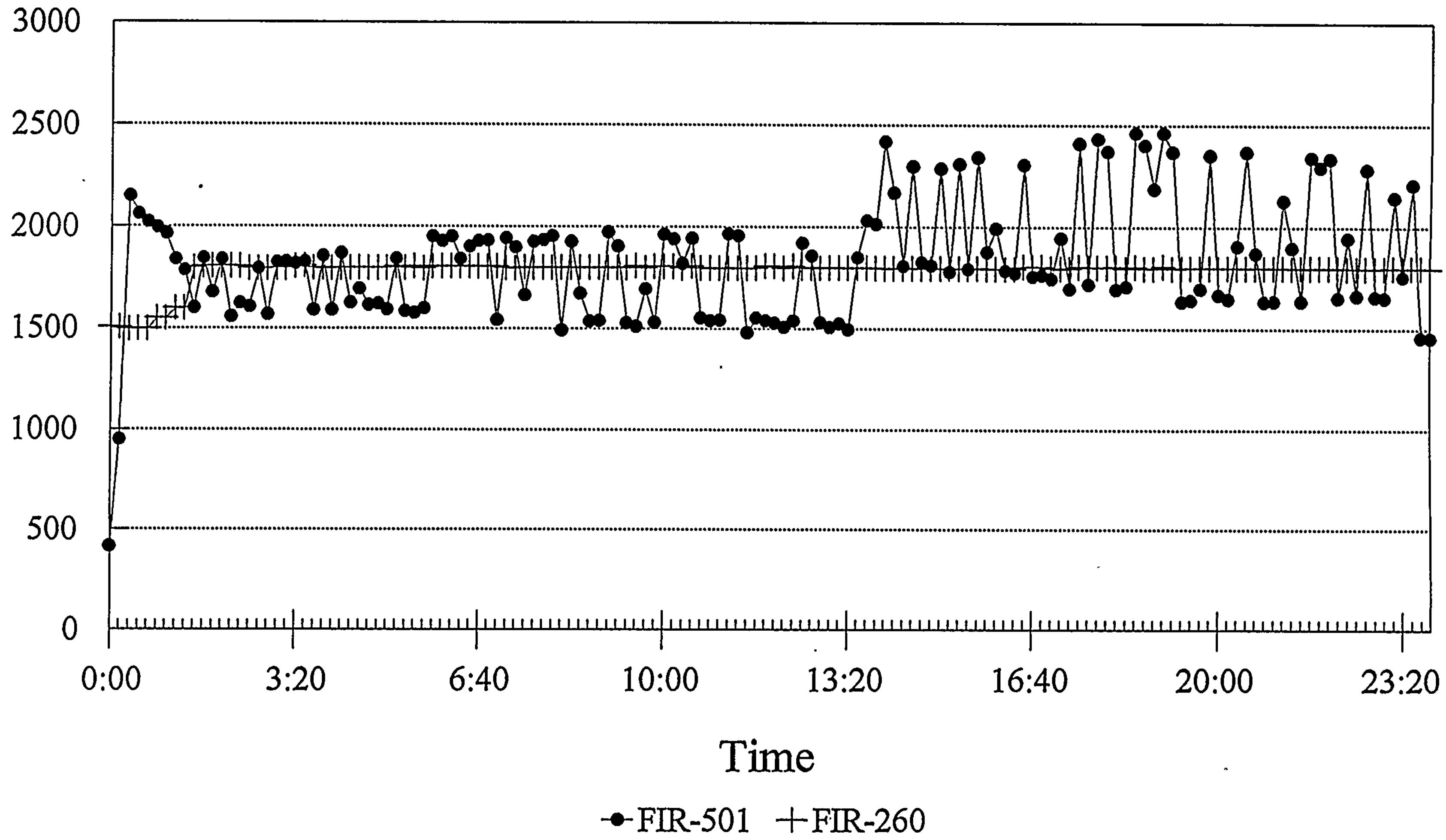

FX1103.CHT Lotus: FX110111.WK1

# Inlet and Process Flow Rate
## 11/04/93



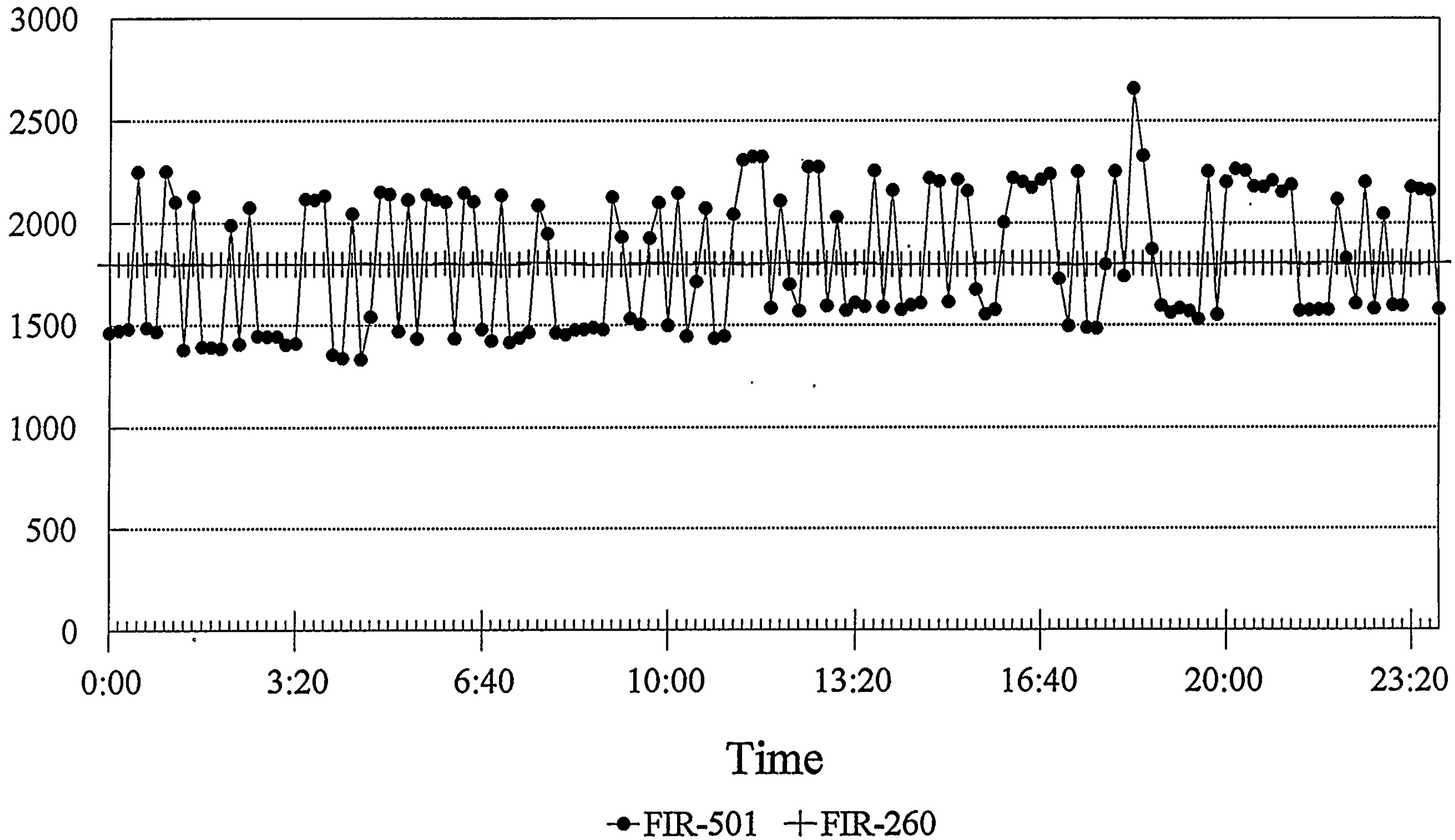

**FX1104.CHT Lotus: FX110111.WK1**

# Inlet and Process Flow Rate
## 11/05/93




FX1105.CHT Lotus: FX110111.WK1

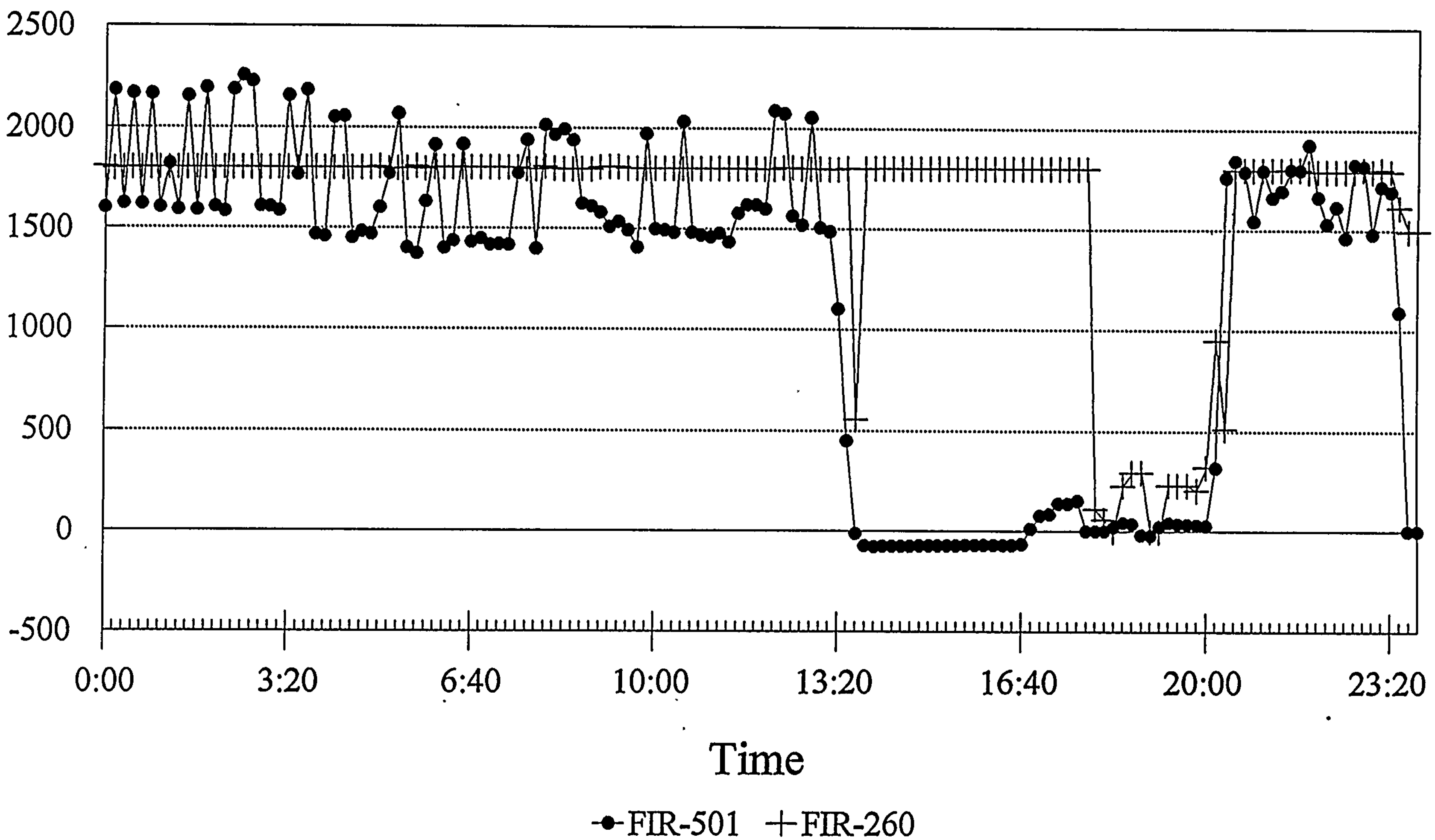
# Inlet and Process Flow Rate
## 11/06/93




FX1106.CHT Lotus: FX110111.WK1

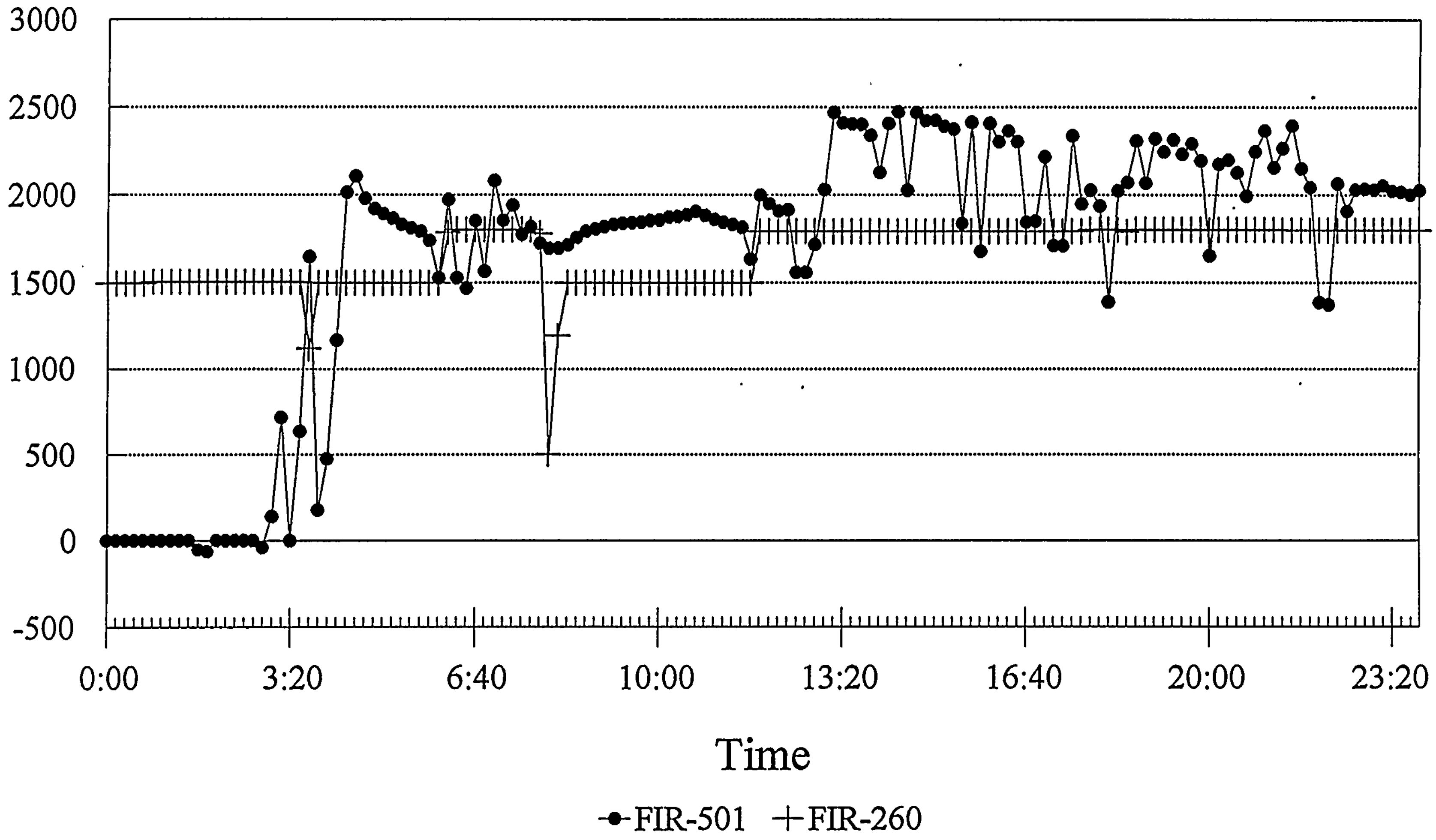
# Inlet and Process Flow Rate

## 11/07/93



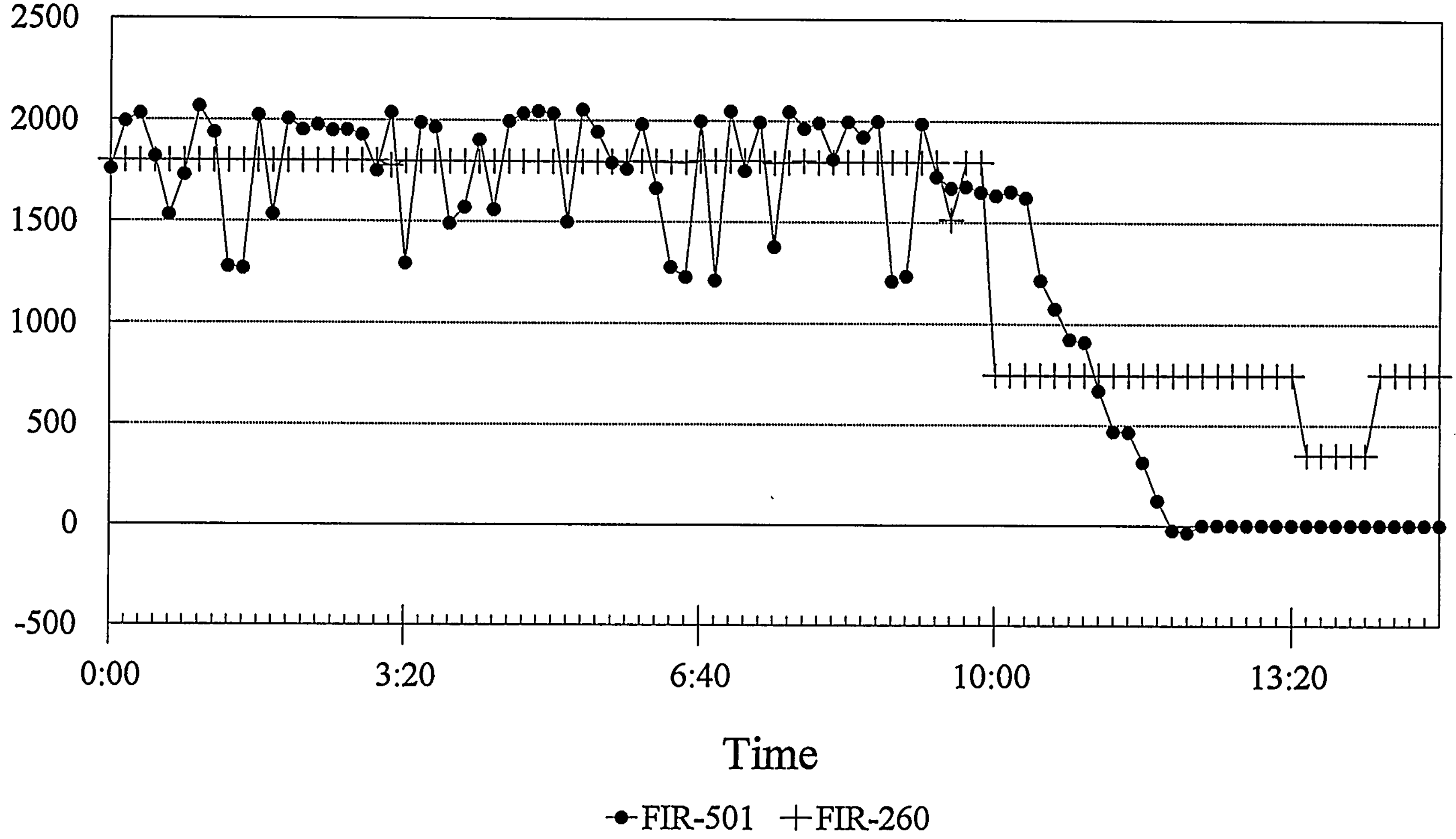

FX1107.CHT Lotus: FX110111.WK1

# Inlet and Process Flow Rate
## 11/08/93



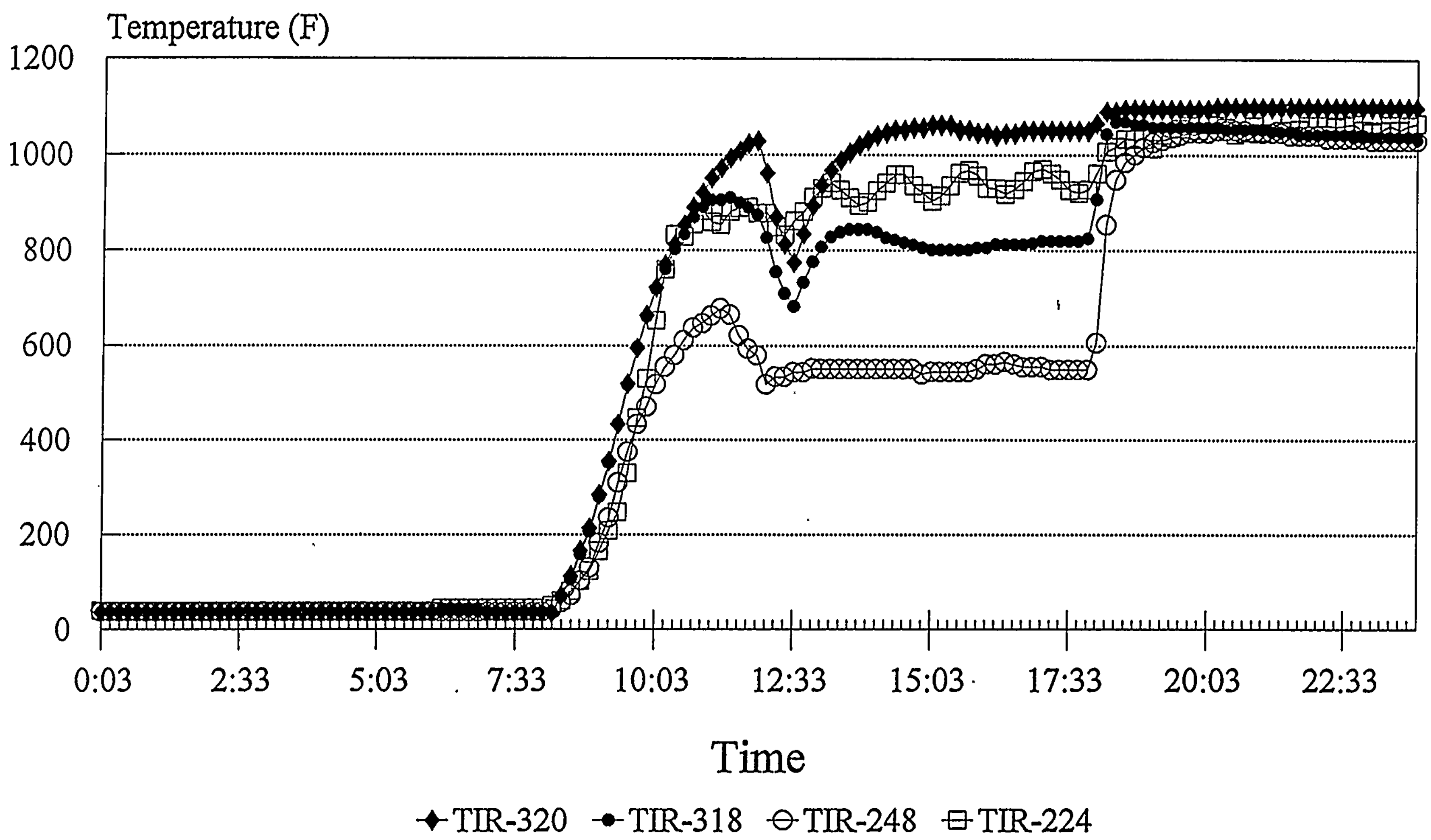

FX1108.CHT Lotus: FX110111.WK1

# Inlet and Process Flow Rate
## 11/09/93



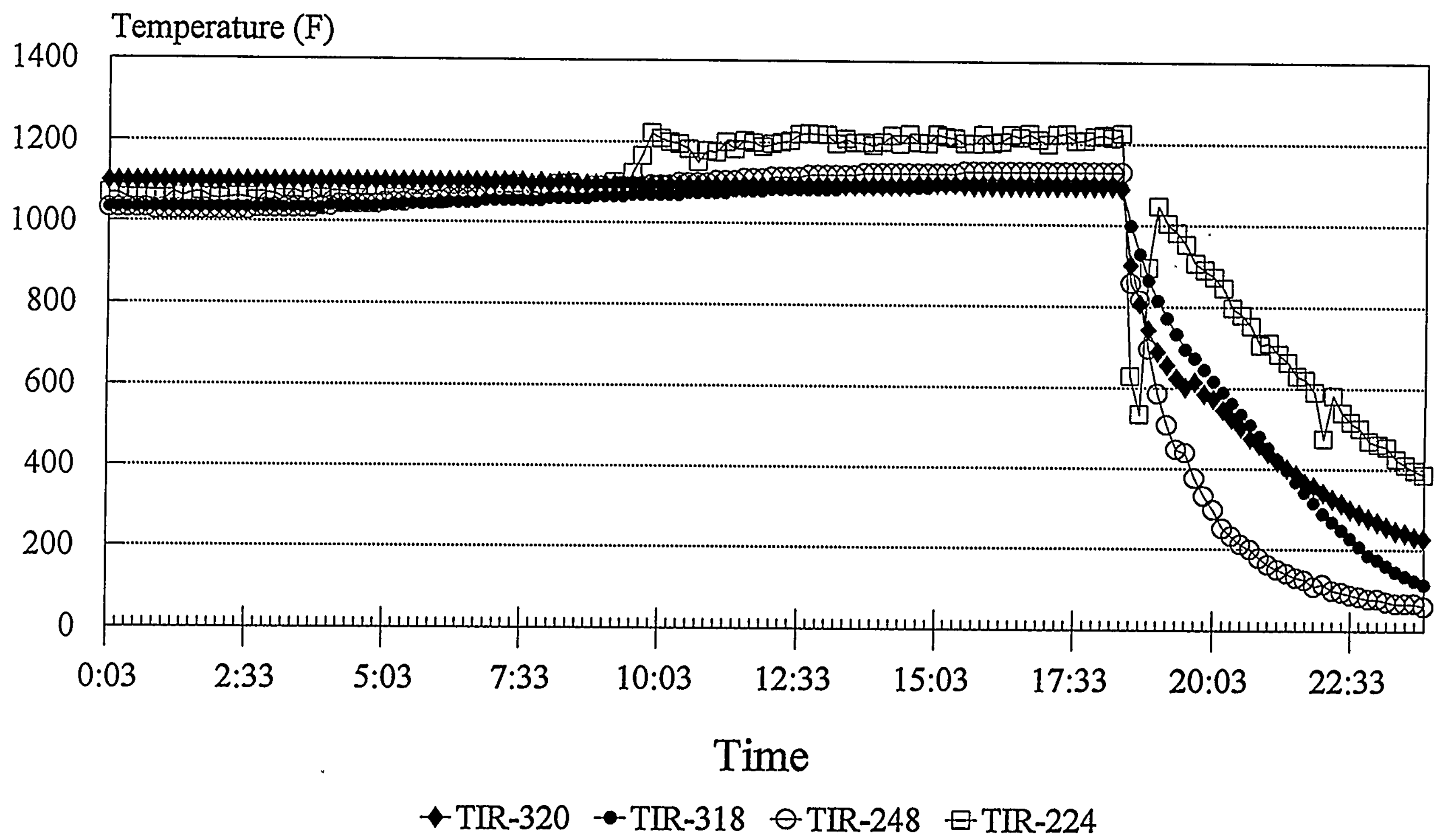

FX1109.CHT Lotus: FX110111.WK1

# MGCR Gas Line Temps.
## 11/01/93



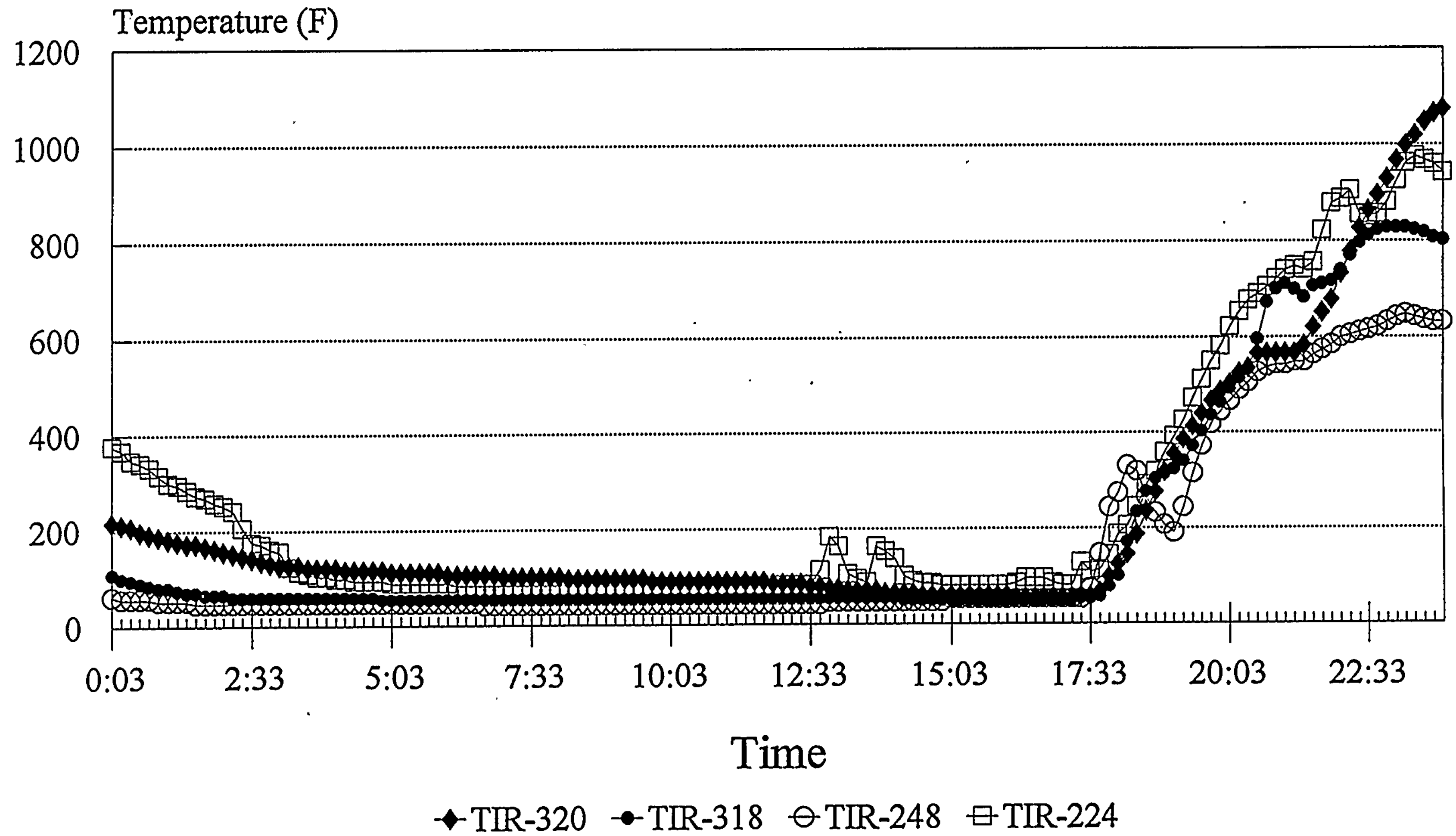

ML1101.CHT Lotus: ML110110.WK1

# MGCR Gas Line Temps.
## 11/02/93



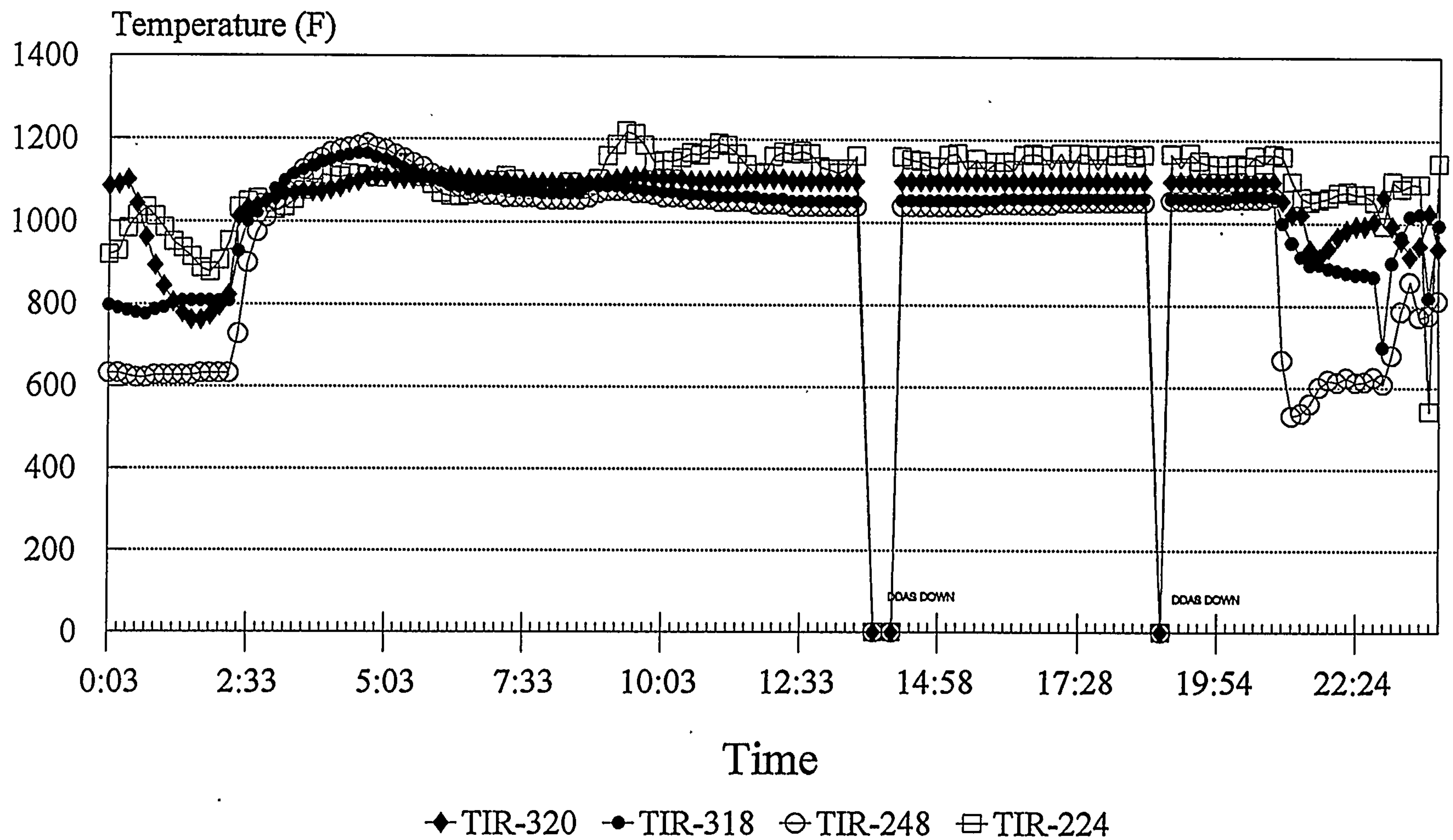

ML1102.CHT Lotus: ML110110.WK1

# MGCR Gas Line Temps.
## 11/03/93



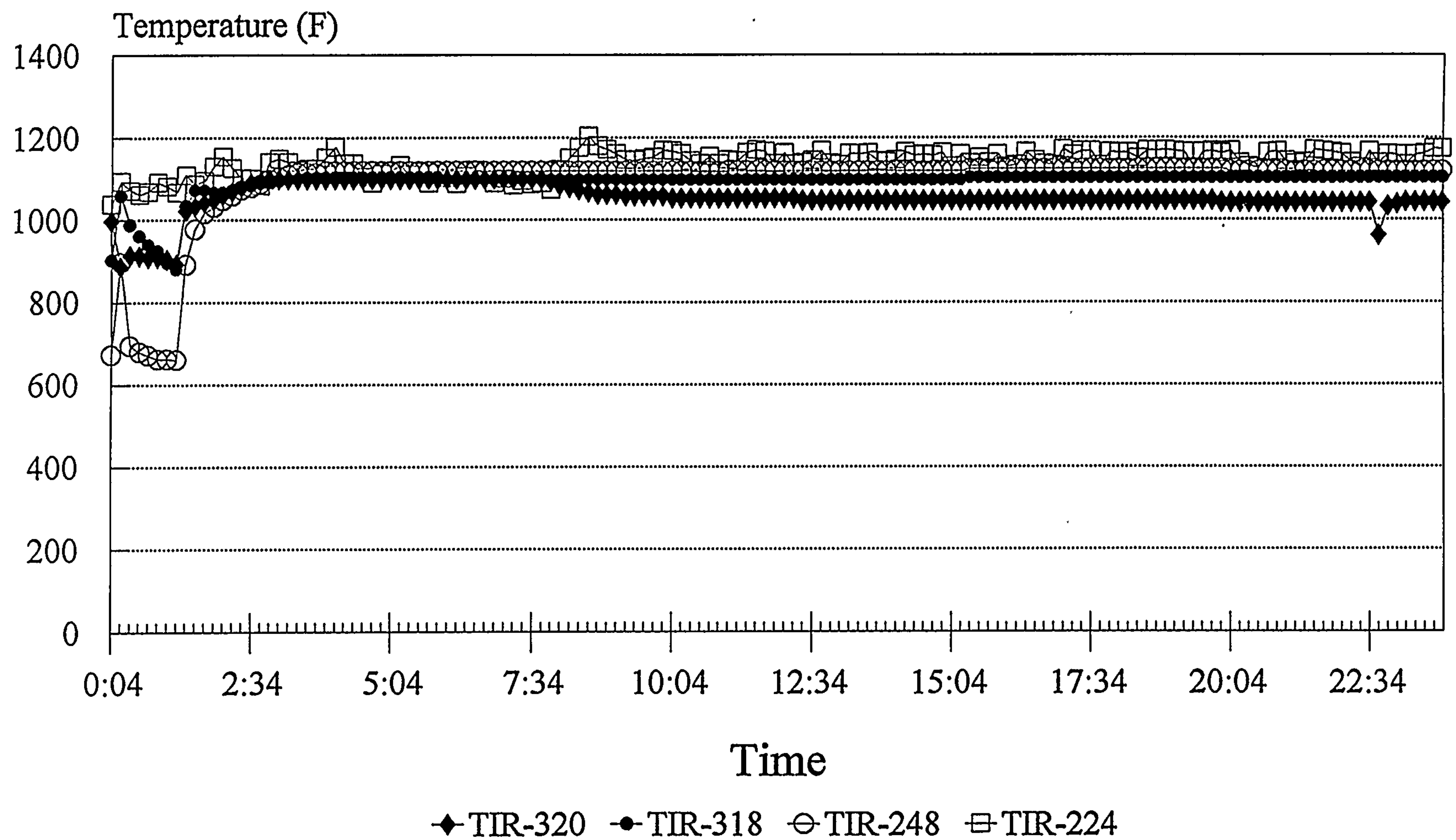

ML1103.CHT Lotus: ML110110.WK1

# MGCR Gas Line Temps.
## 11/04/93



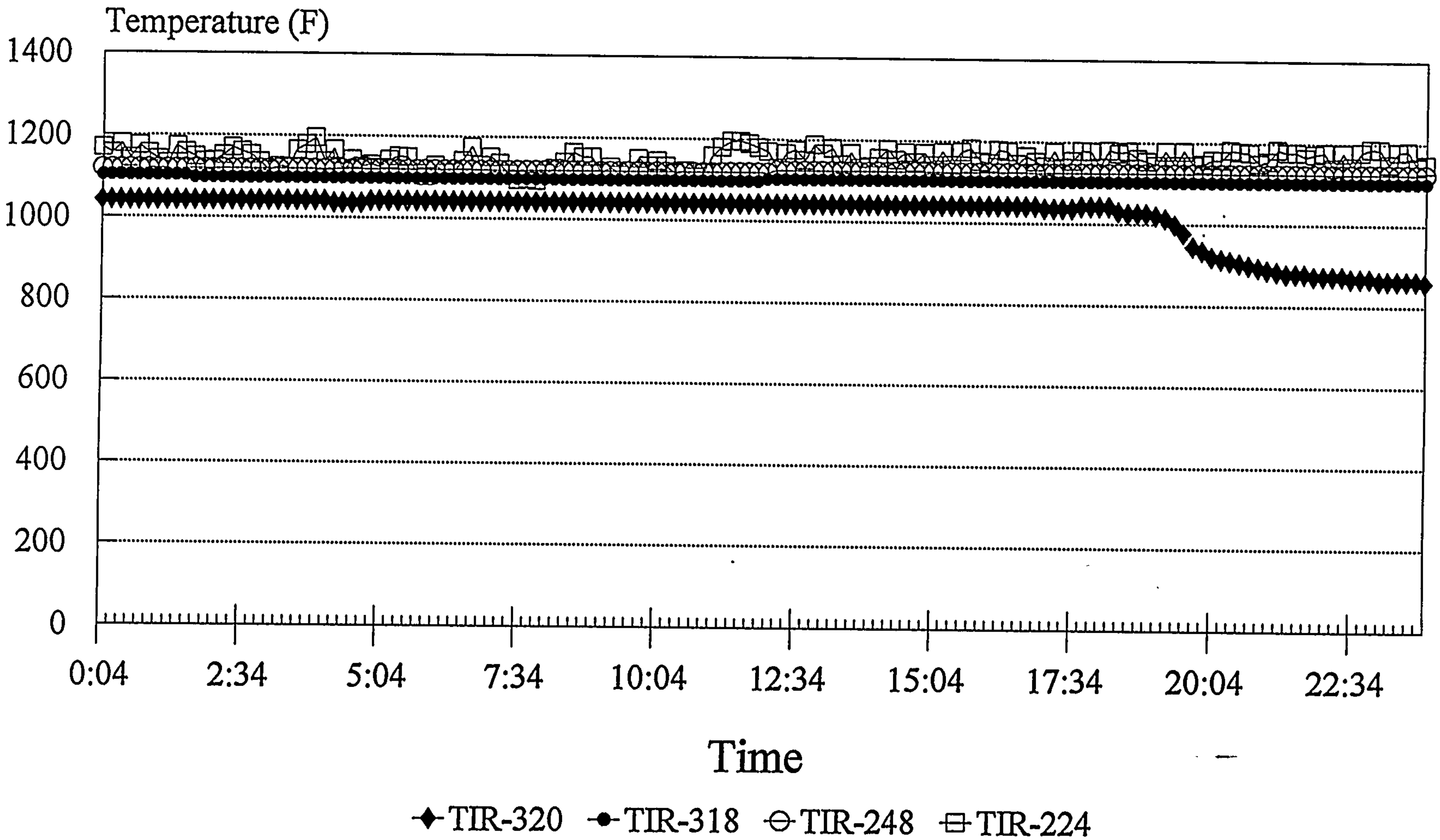

ML1104.CHT Lotus: ML110110.WK1

# MGCR Gas Line Temps.
## 11/05/93



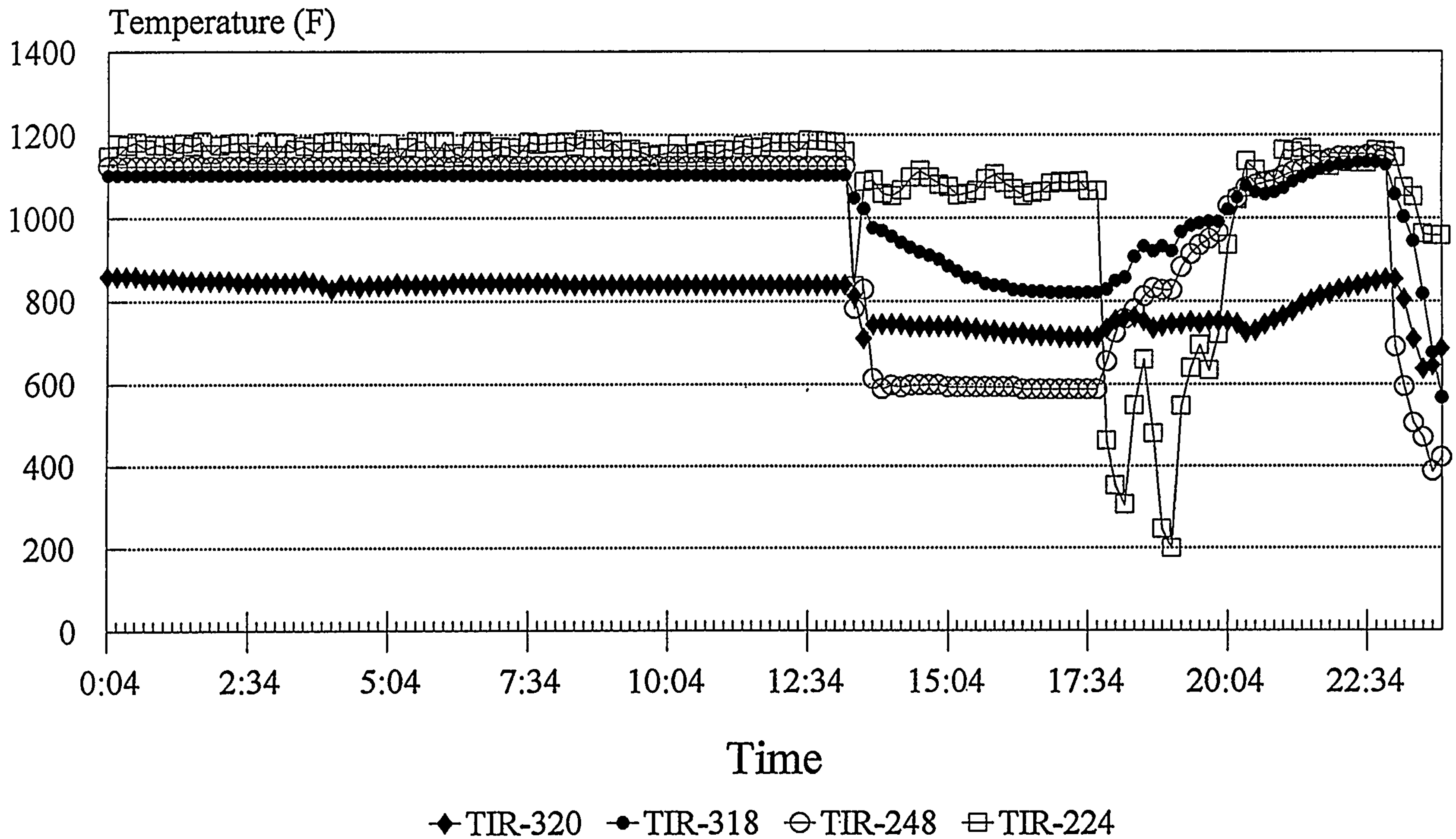

ML1105.CHT Lotus: ML110110.WK1

# MGCR Gas Line Temps.
## 11/06/93



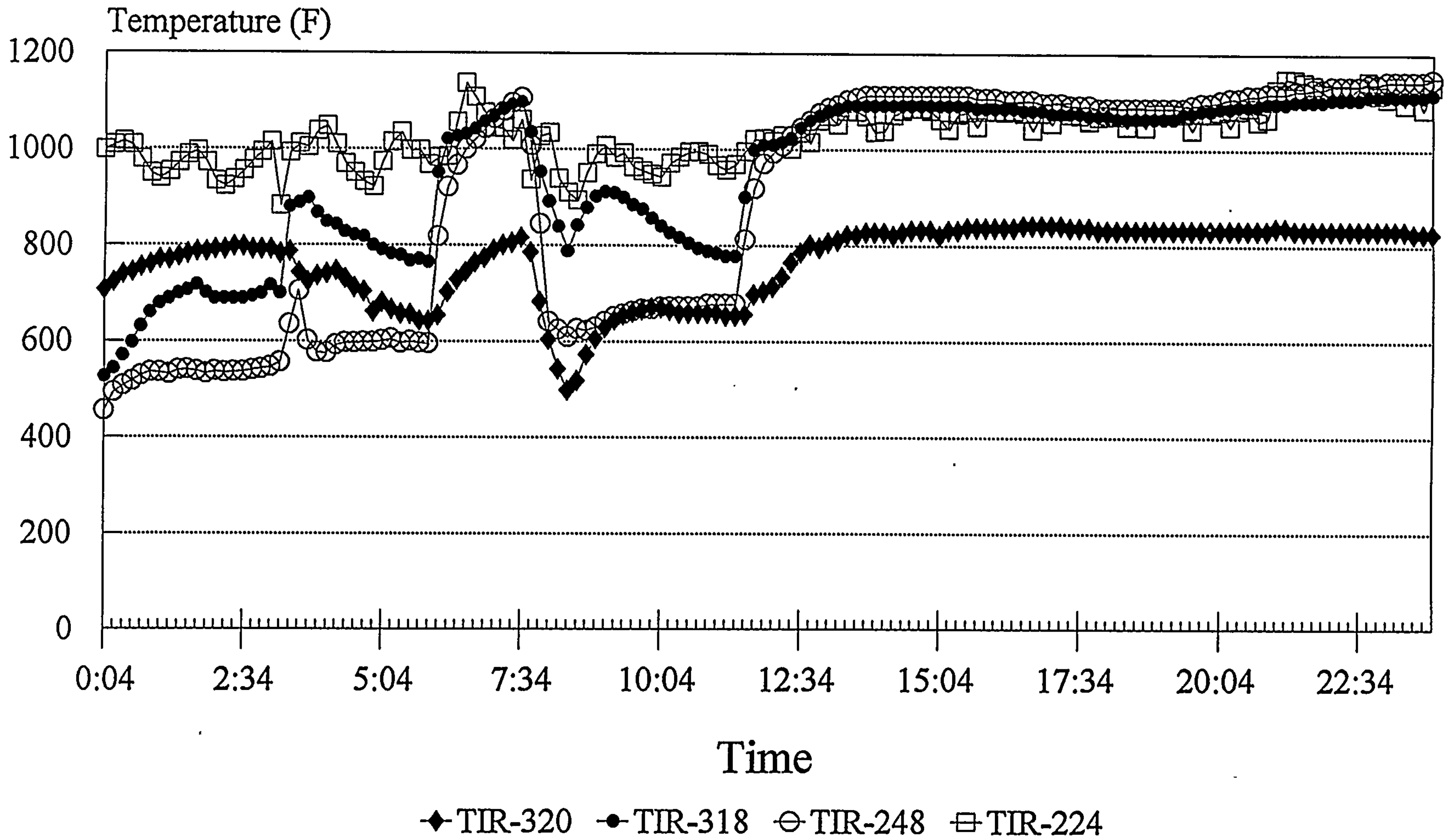

ML1106.CHT Lotus: ML110110.WK1

# MGCR Gas Line Temps.
## 11/07/93




ML1107.CHT Lotus: ML110110.WK1

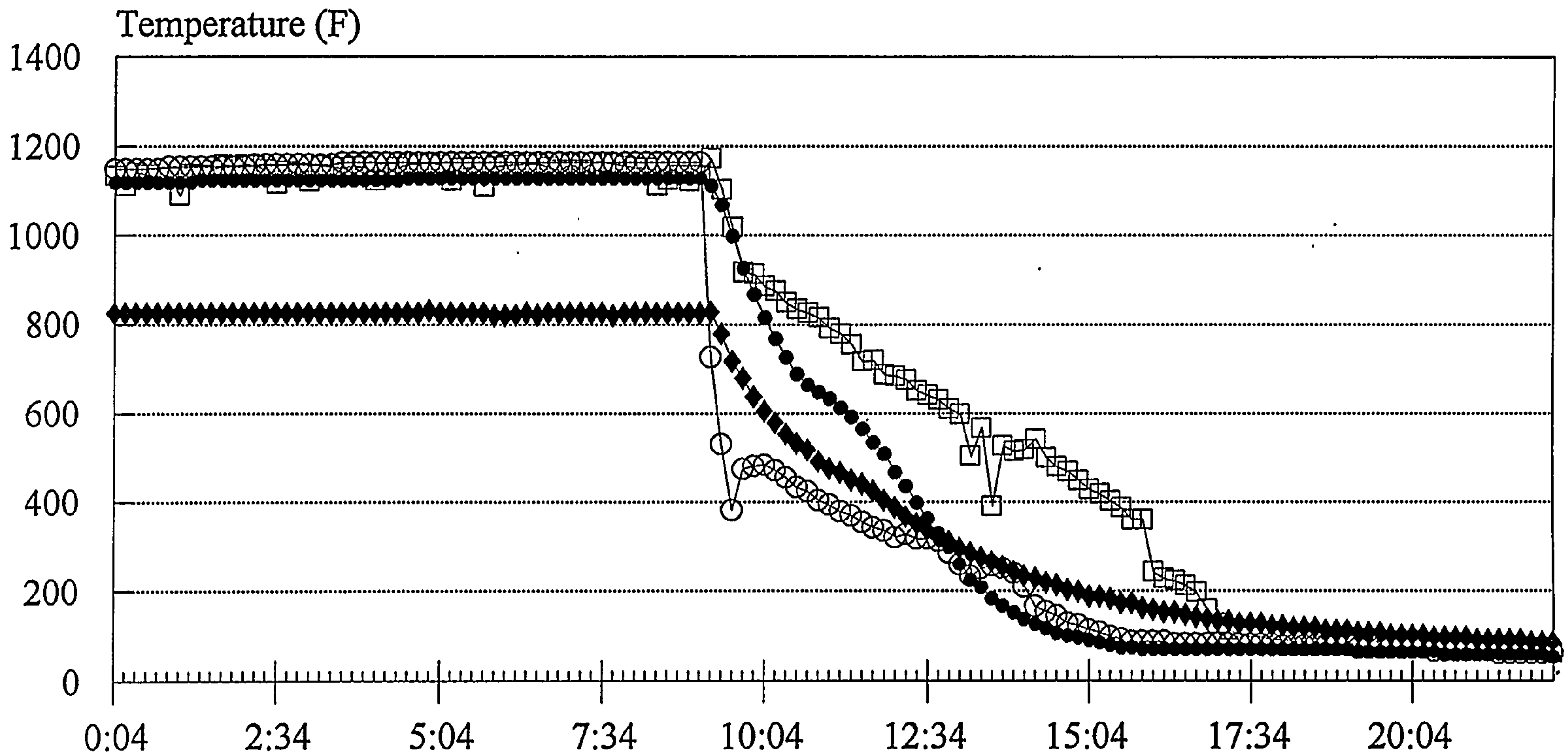
# MGCR Gas Line Temps.
## 11/08/93




ML1108.CHT Lotus: ML110110.WK1

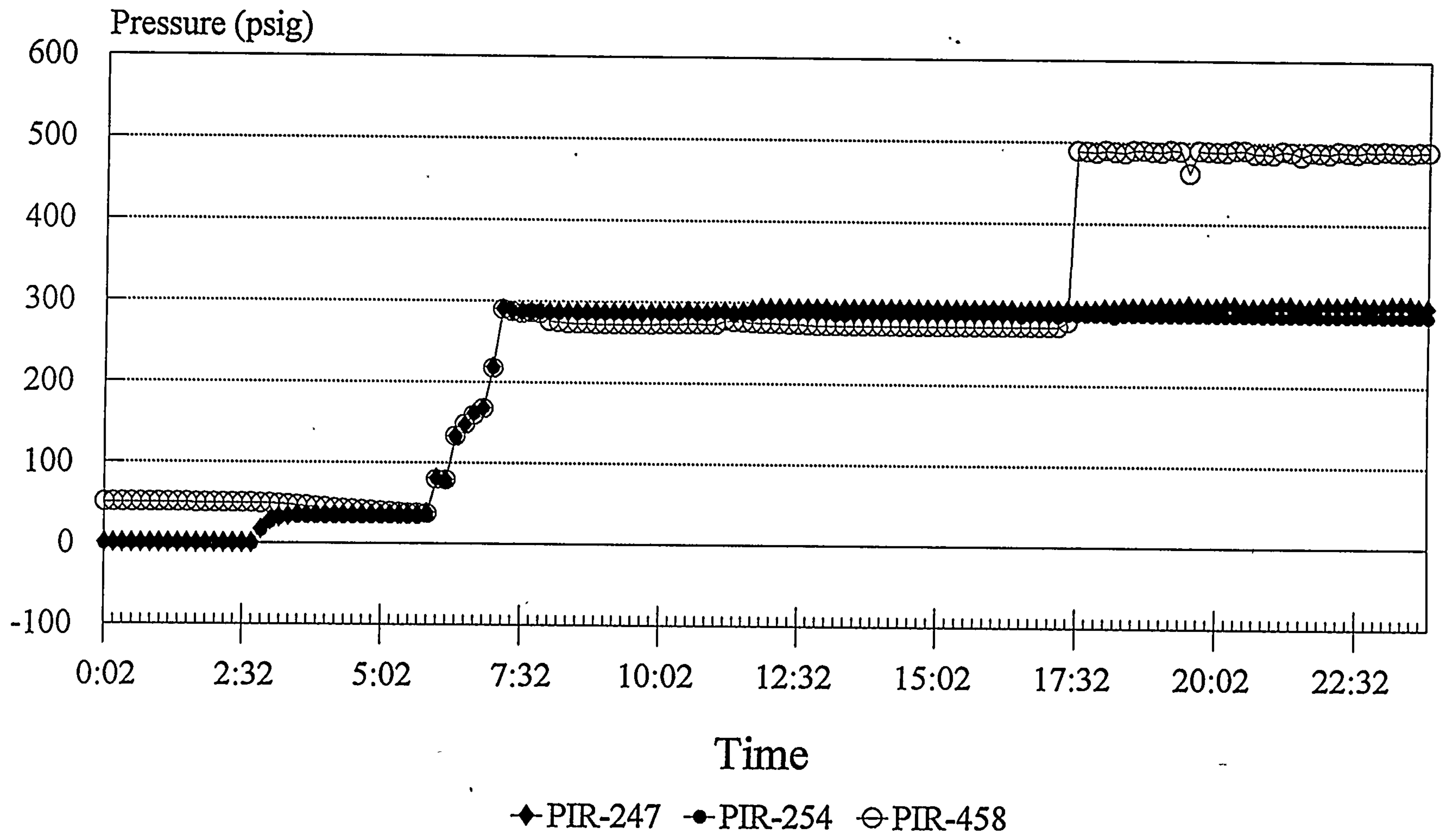
# MGCR Gas Line Temps.

## 11/09/93



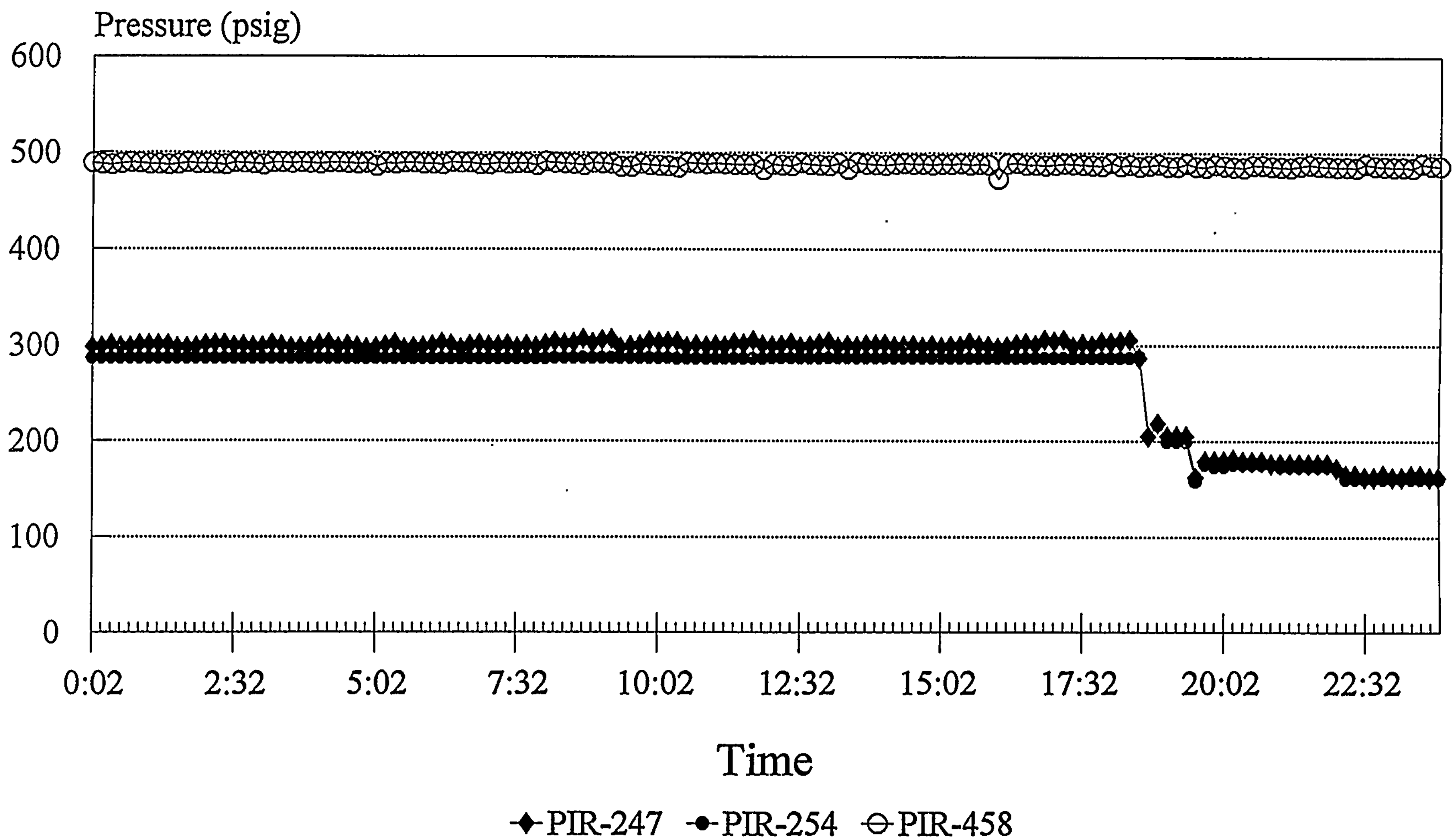

ML1109.CHT Lotus: ML110110.WK1

# MGCR Process Pressures
## 11/01/93



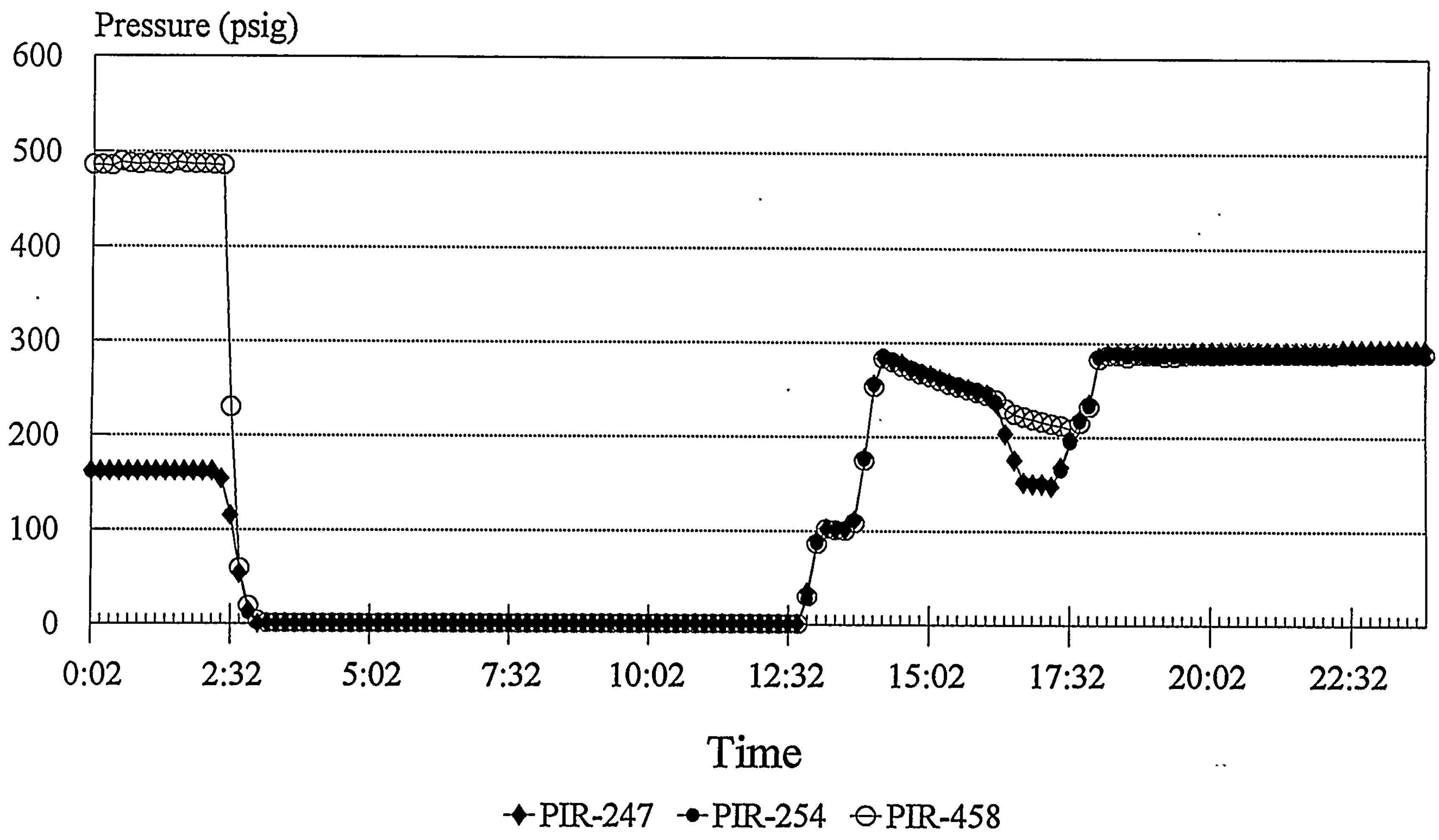

MP1101.CHT Lotus: MP110110.WK1

# MGCR Process Pressures
## 11/02/93



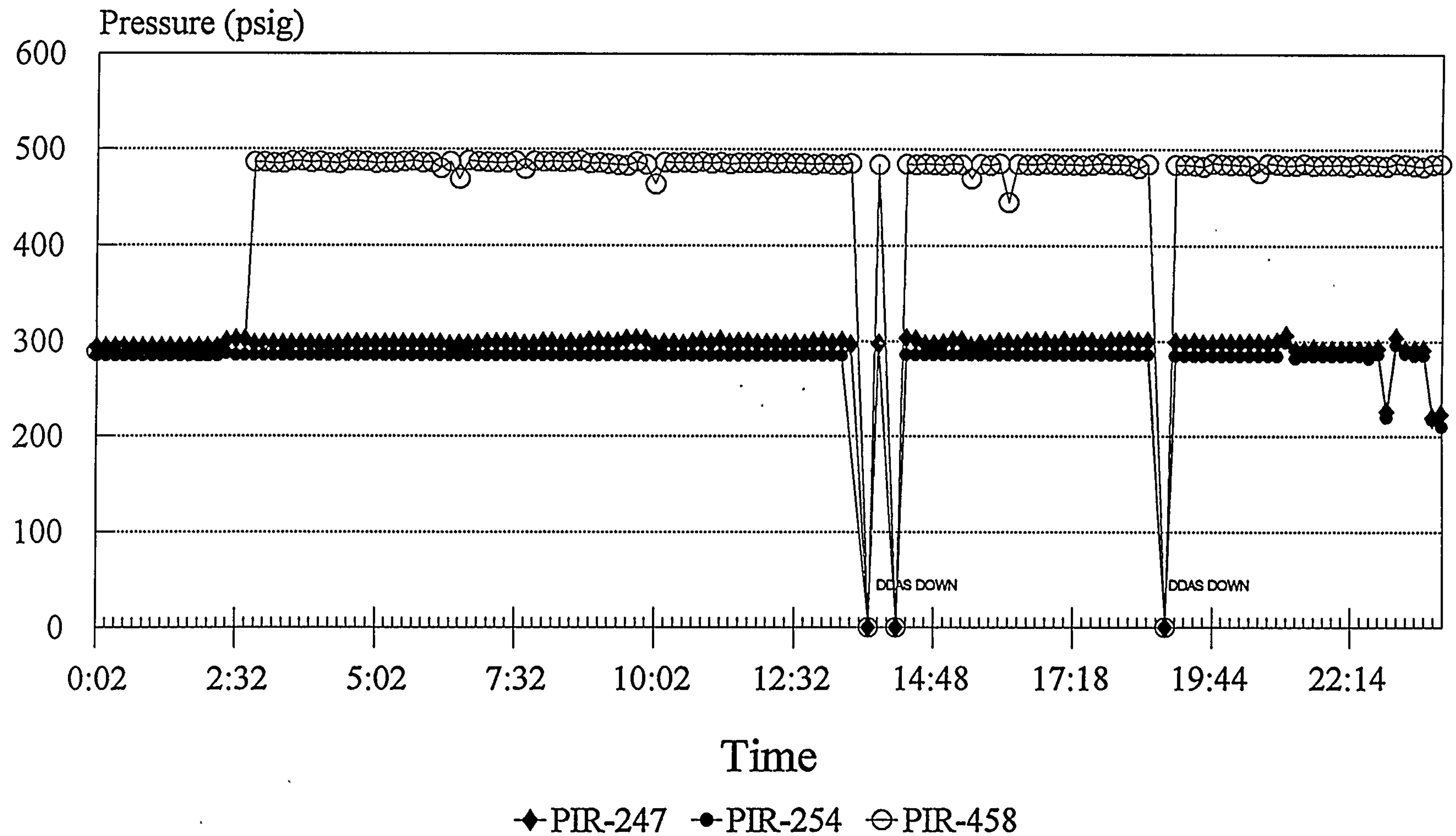

MP1102.CHT Lotus: MP110110.WK1

# MGCR Process Pressures
## 11/03/93



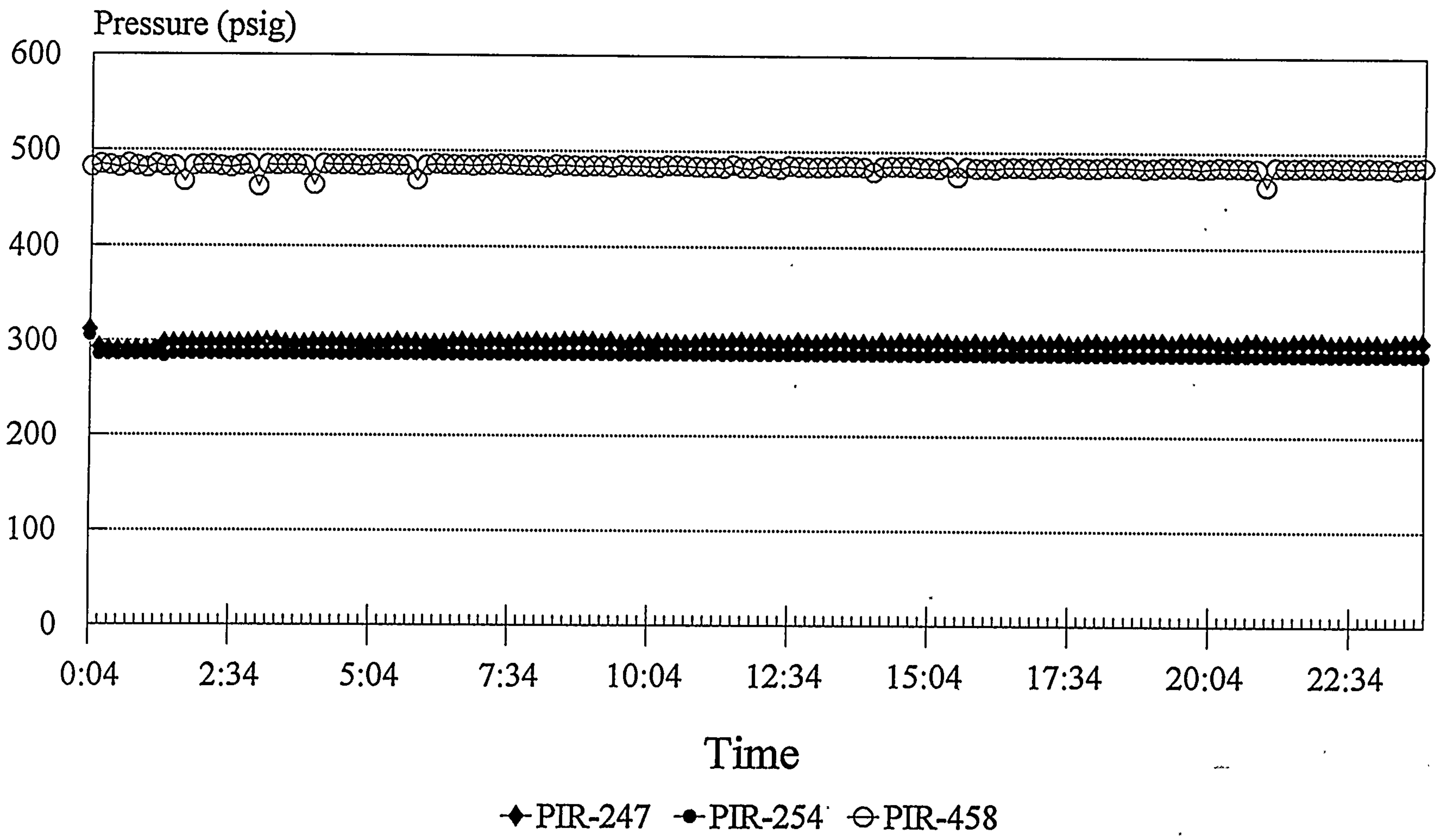

MP1103.CHT Lotus: MP110110.WK1

# MGCR Process Pressures
## 11/04/93




MP1104.CHT Lotus: MP110110.WK1

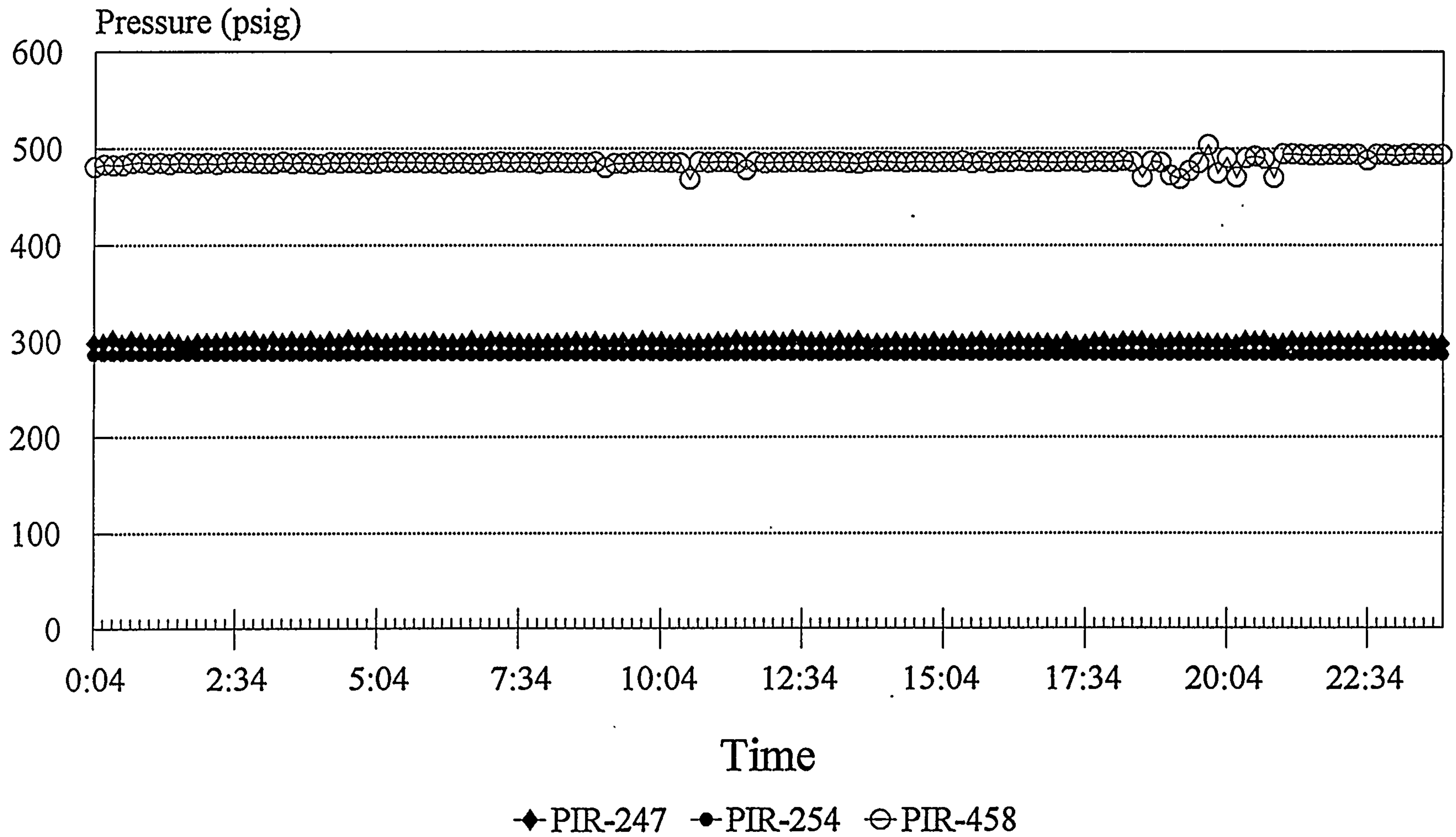
# MGCR Process Pressures
## 11/05/93




MP1105.CHT Lotus: MP110110.WK1

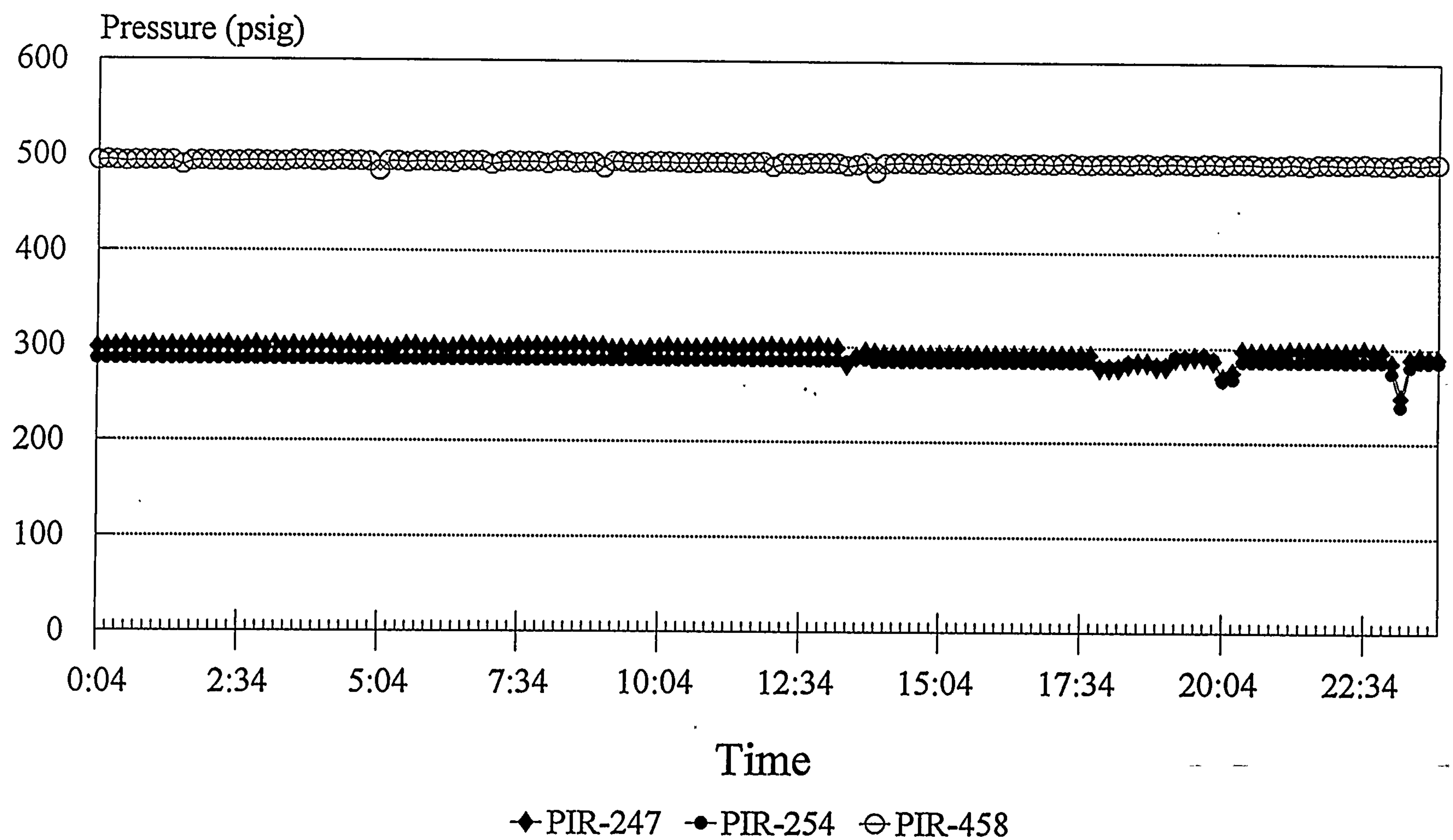
# MGCR Process Pressures

## 11/06/93



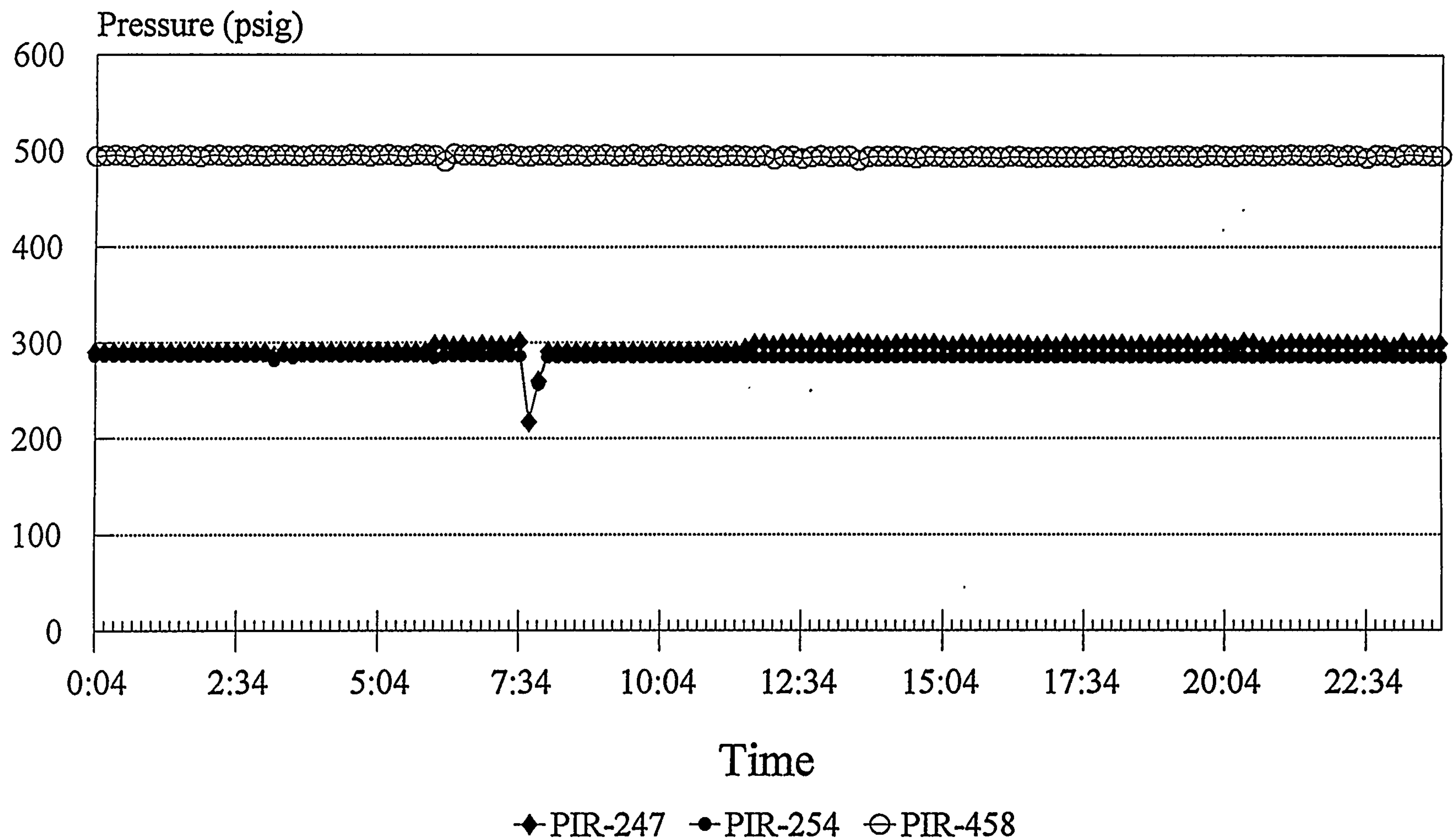

**MP1106.CHT    Lotus:  MP110110.WK1**

# MGCR Process Pressures
## 11/07/93



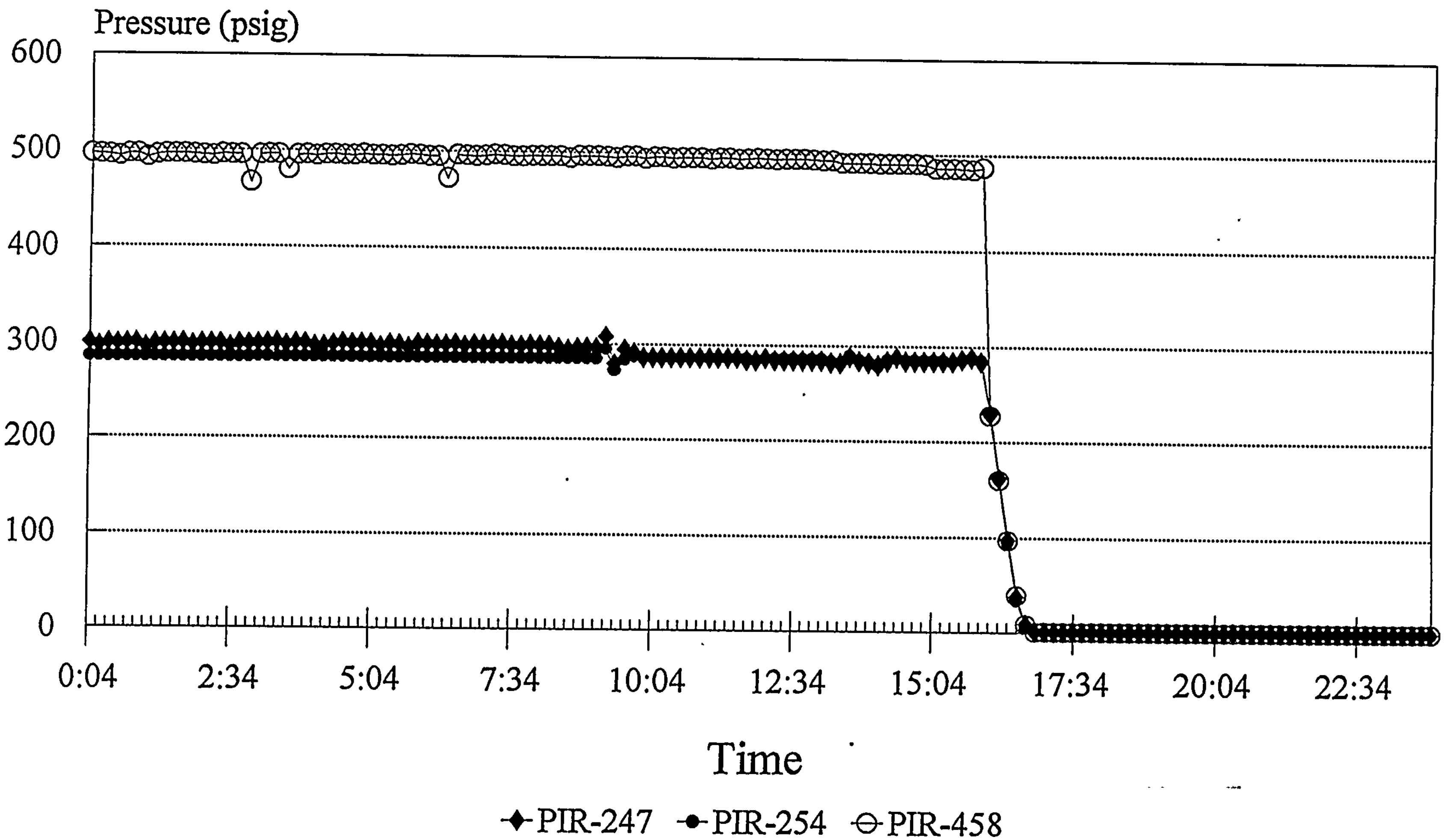

**MP1107.CHT Lotus: MP110110.WK1**

# MGCR Process Pressures
## 11/08/93



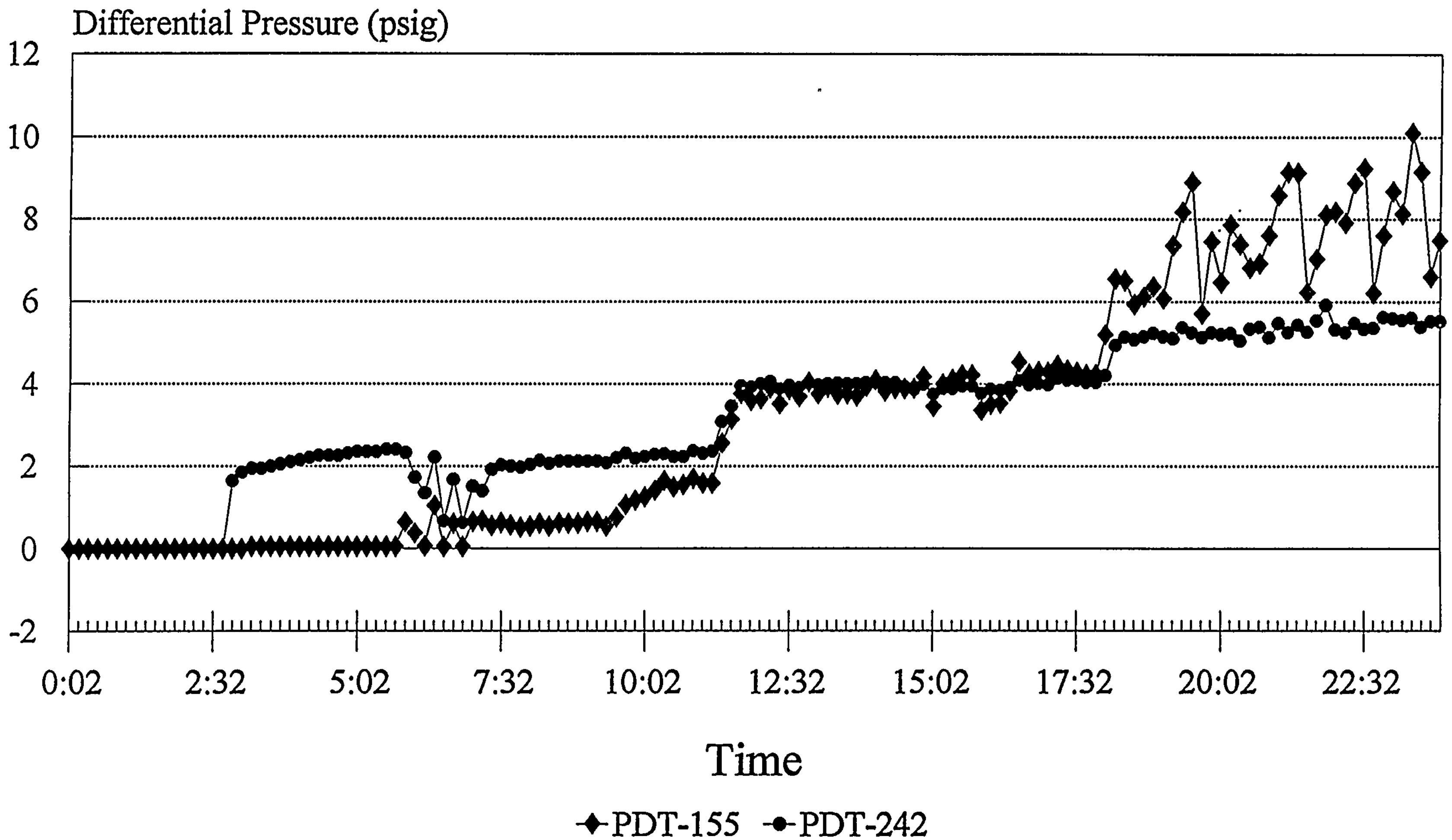

MP1108.CHT Lotus: MP110110.WK1

# MGCR Process Pressures
## 11/09/93



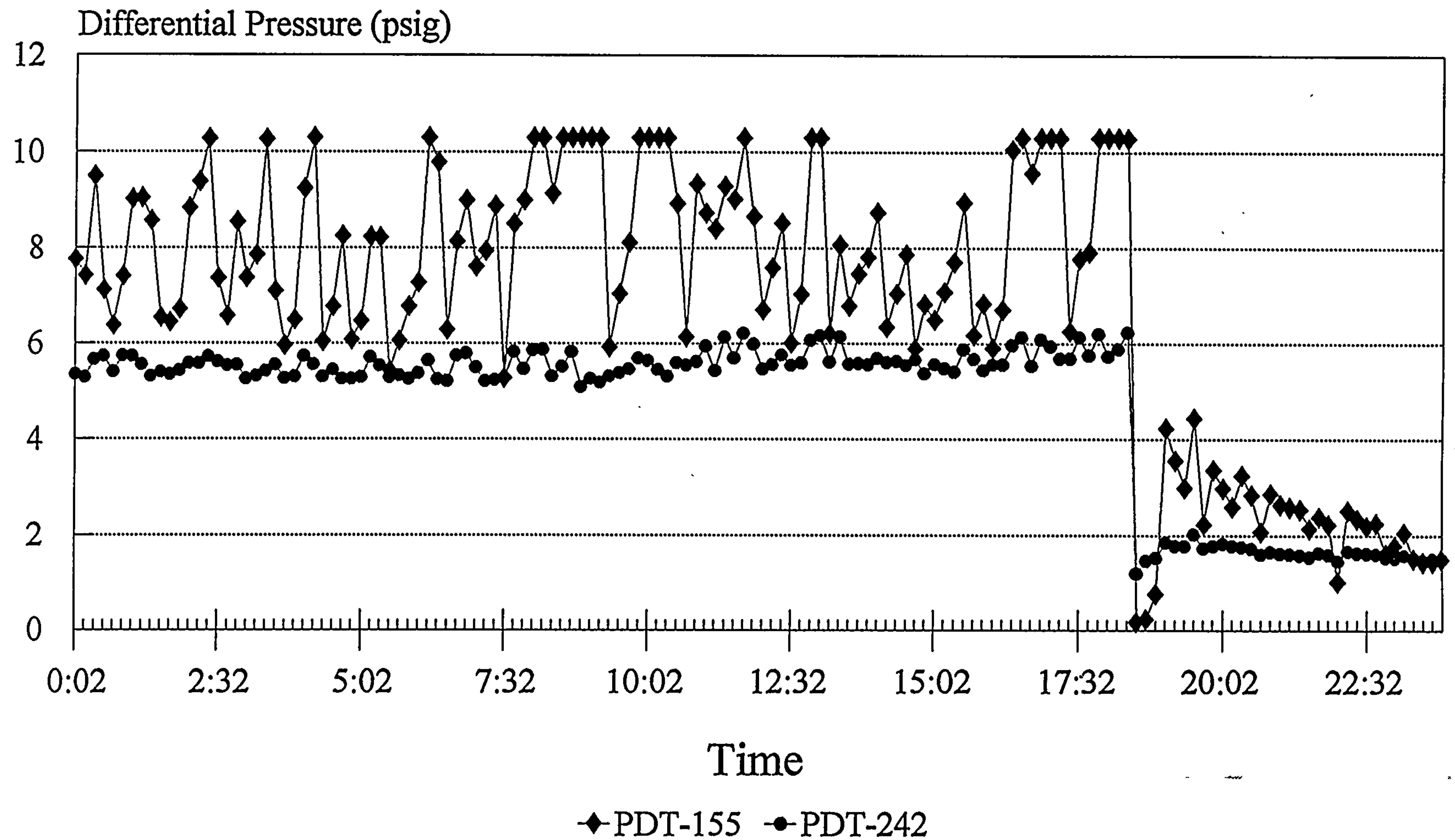

MP1109.CHT Lotus: MP110110.WK1

# MGCR Differential Press.
## 11/01/93



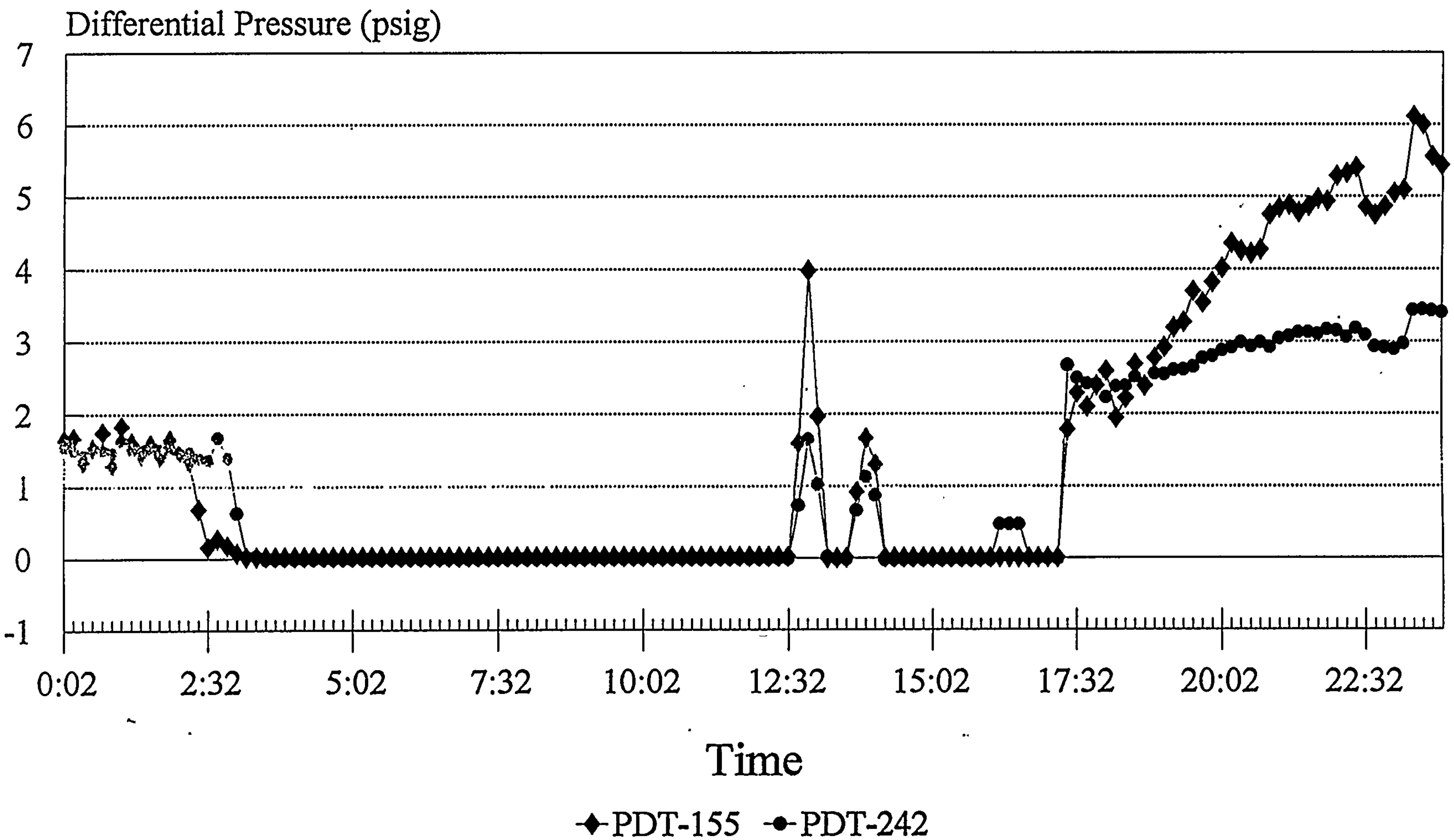

**PD1101.CHT Lotus: PD110110.WK1**

# MGCR Differential Press.
## 11/02/93



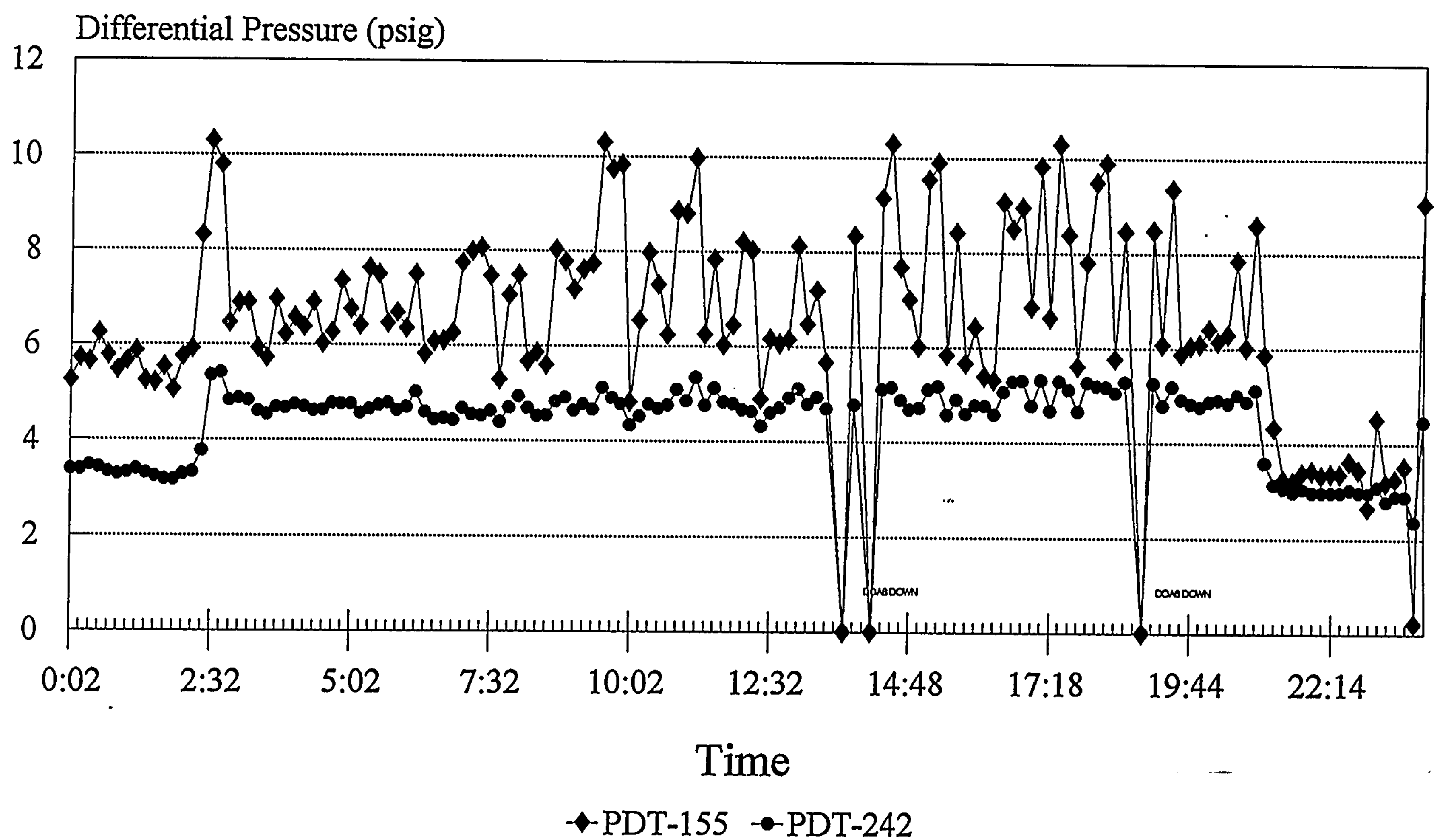

PD1102.CHT Lotus: PD110110.WK1

# MGCR Differential Press.
## 11/03/93



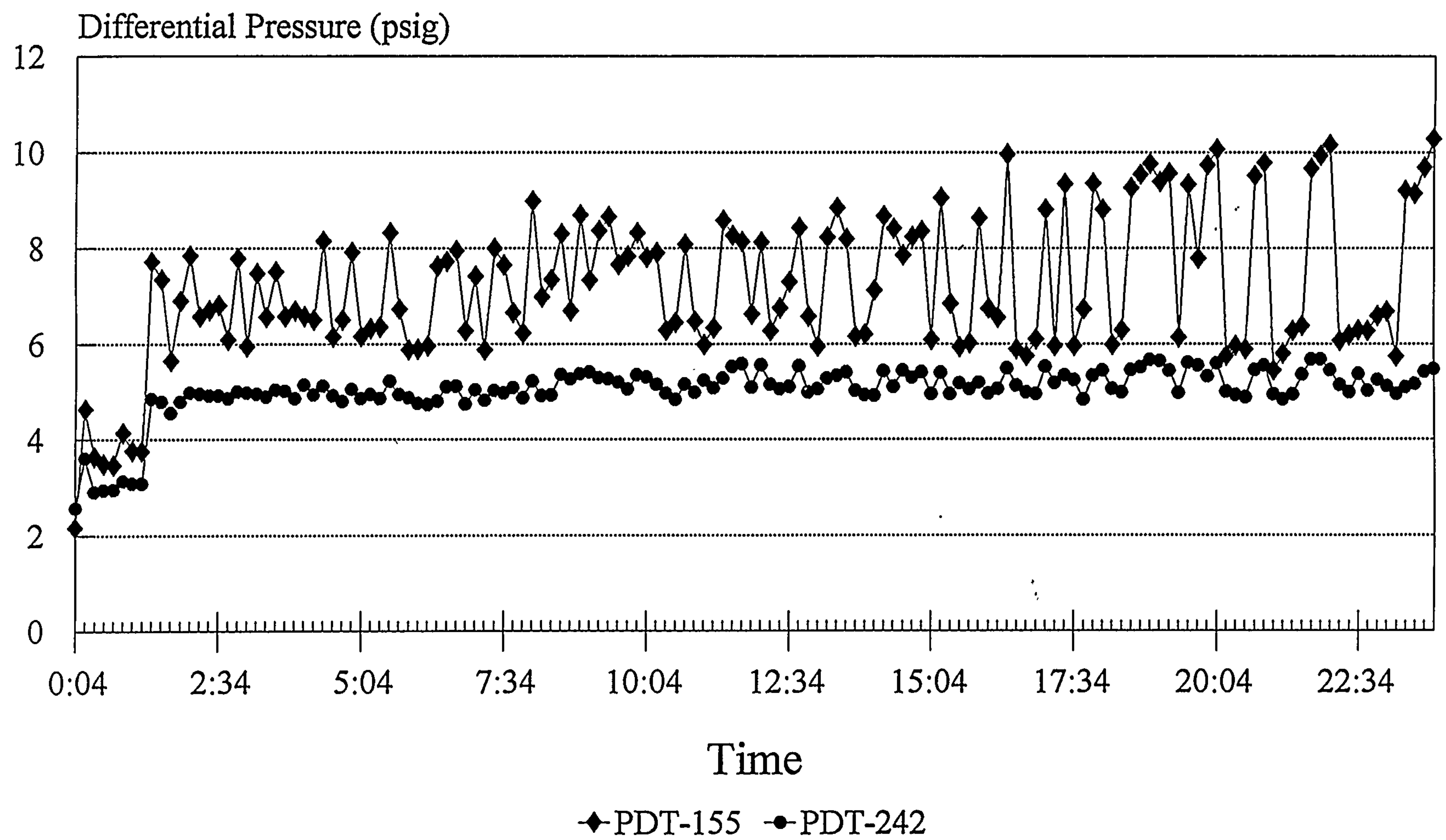

**PD1103.CHT Lotus: PD110110.WK1**

# MGCR Differential Press.
## 11/04/93



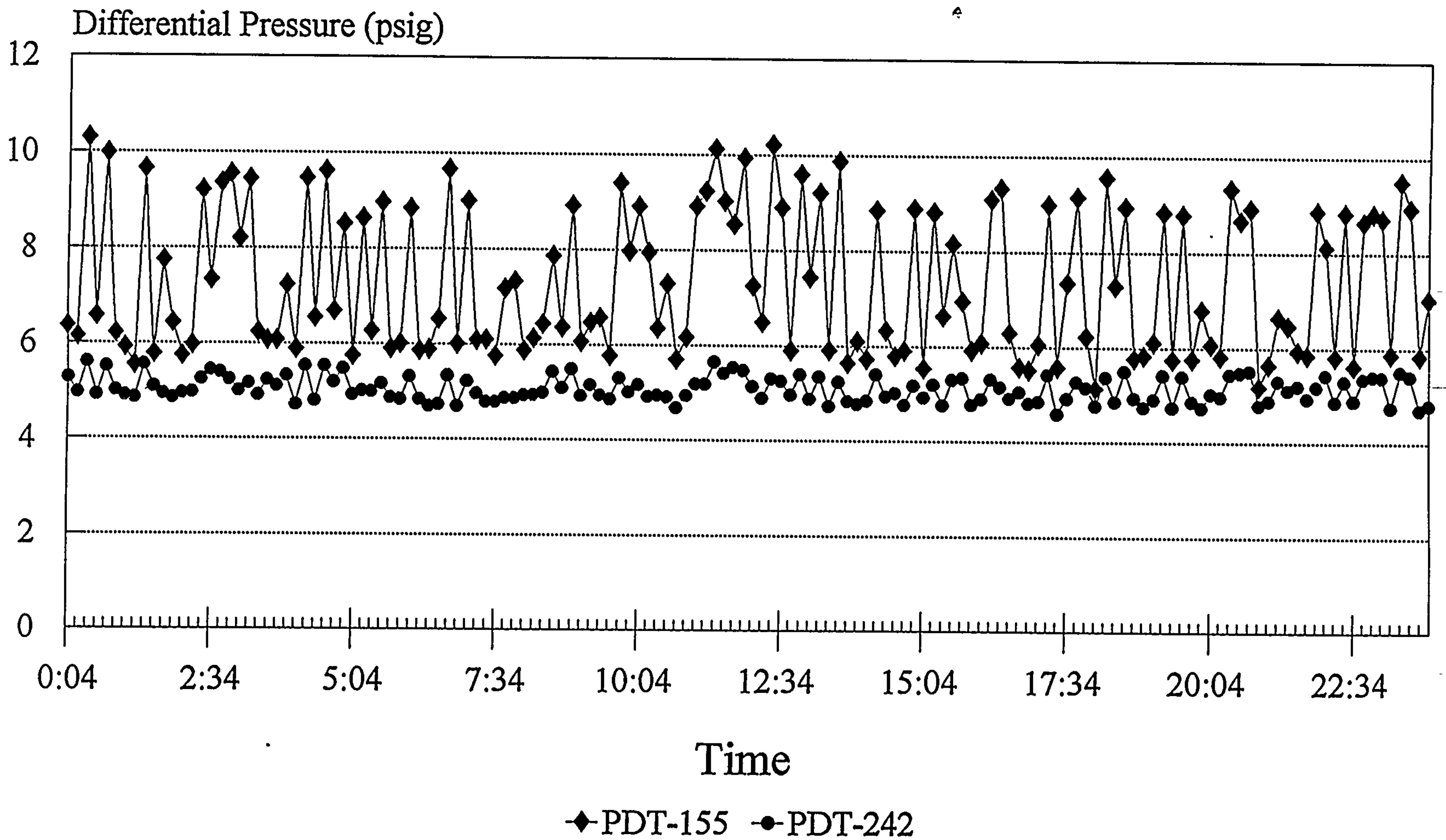

**PD1104.CHT Lotus: PD110110.WK1**

# MGCR Differential Press.
## 11/05/93



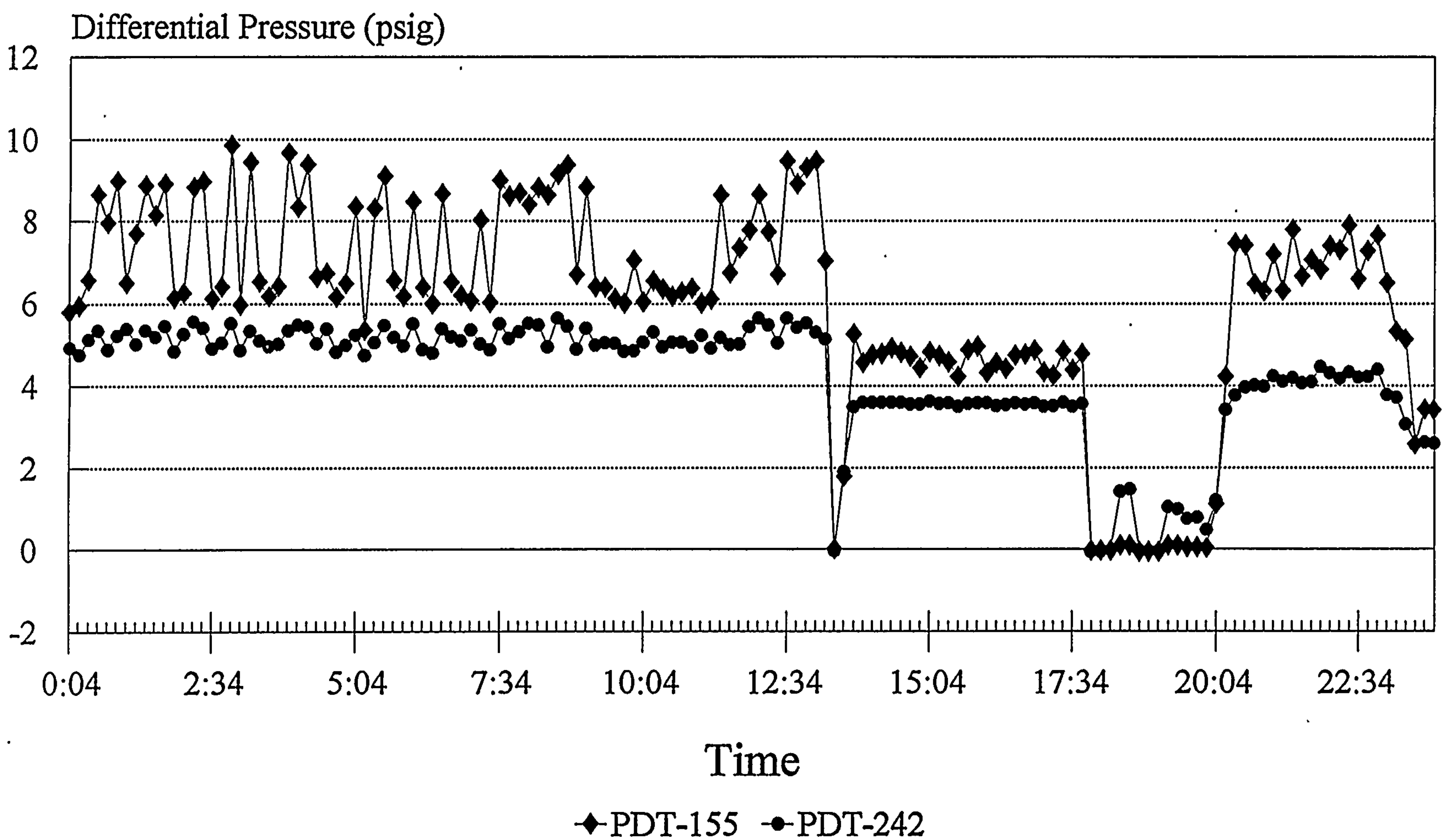

PD1105.CHT Lotus: PD110110.WK1

# MGCR Differential Press.
## 11/06/93



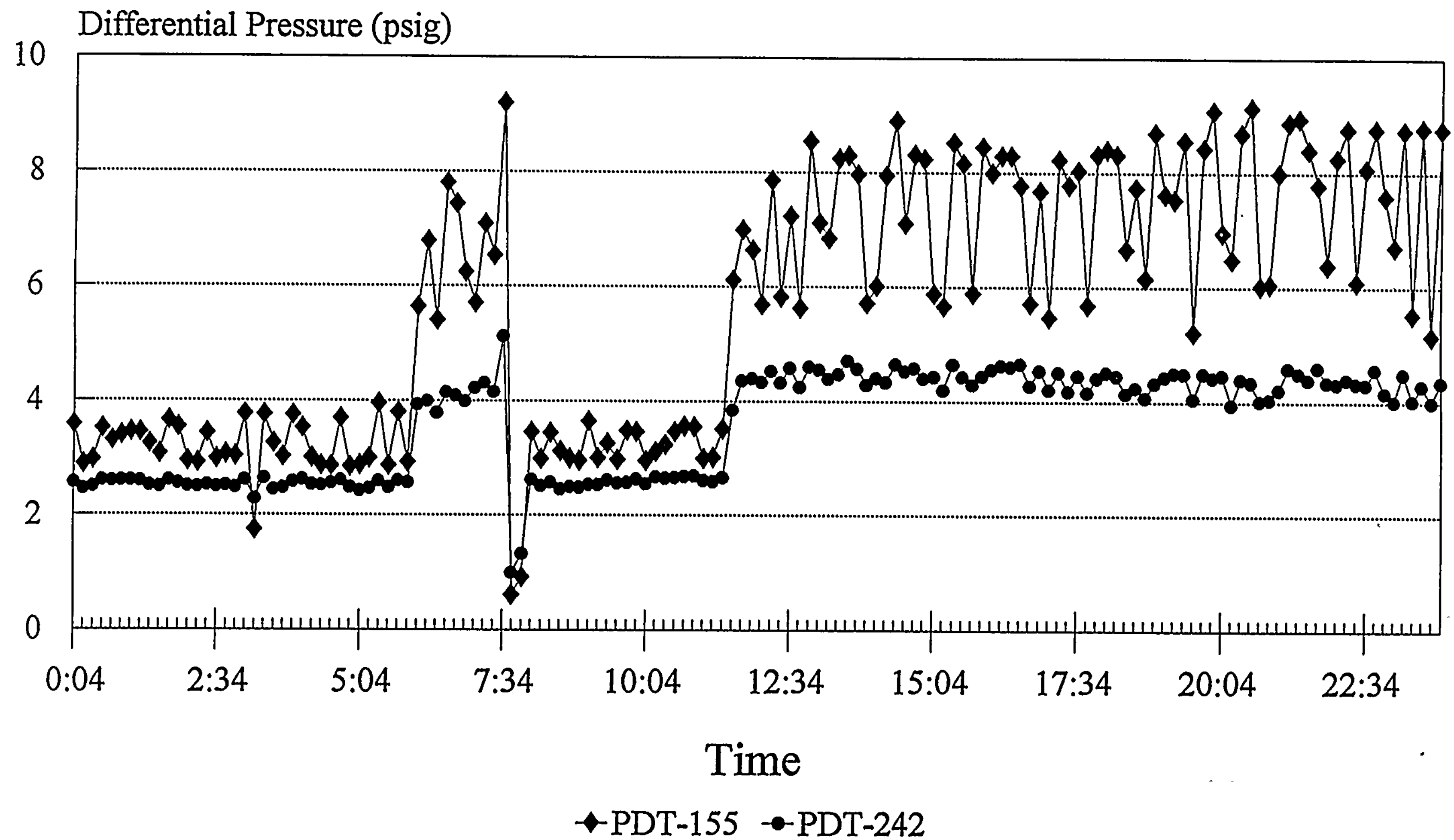

PD1106.CHT Lotus: PD110110.WK1

# MGCR Differential Press.
## 11/07/93



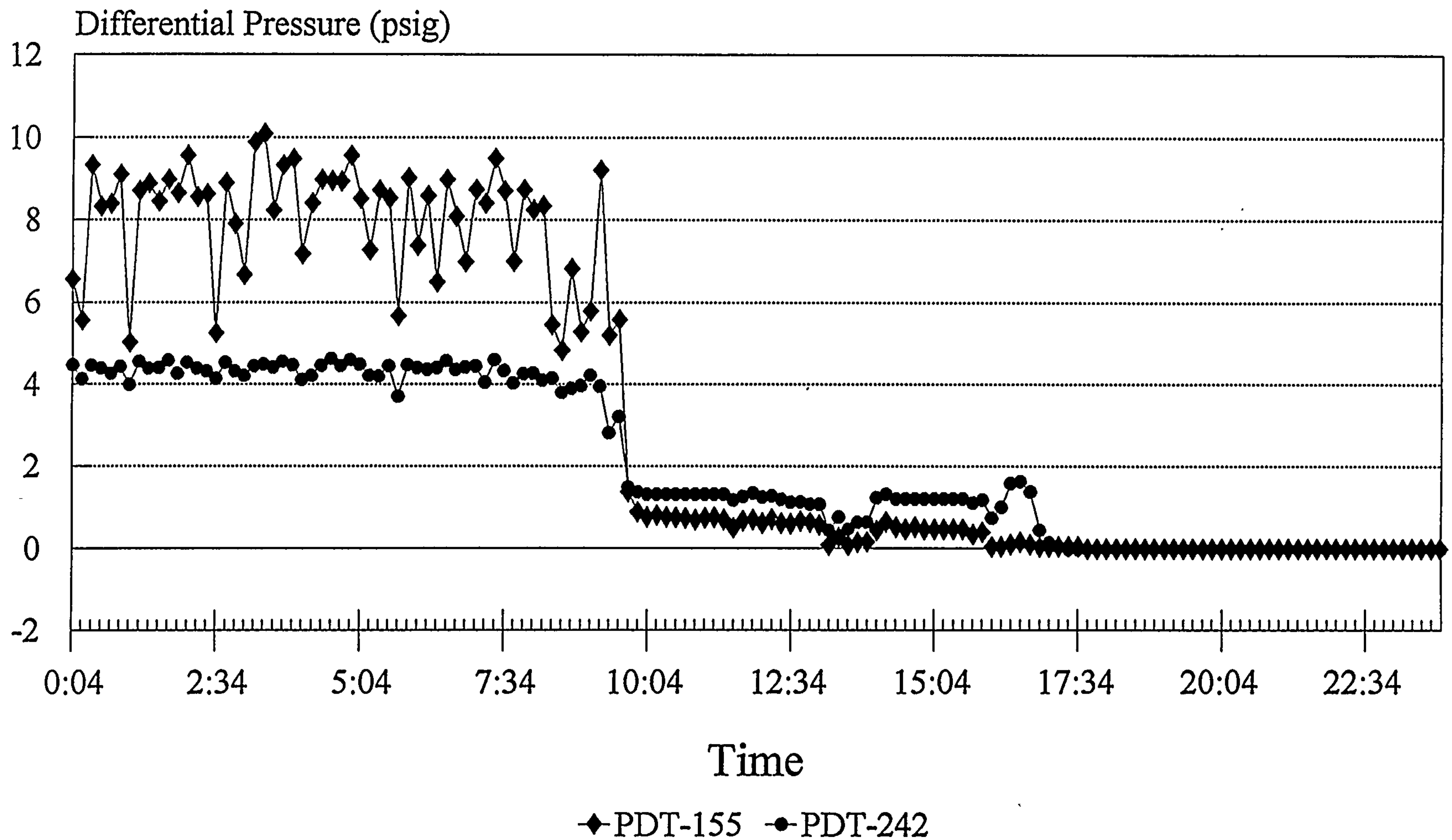

**PD1107.CHT Lotus: PD110110.WK1**

# MGCR Differential Press.
## 11/08/93




**PD1108.CHT Lotus: PD110110.WK1**

# MGCR Differential Press.
## 11/09/93




PD1109.CHT Lotus: PD110110.WK1

# PDIR-459

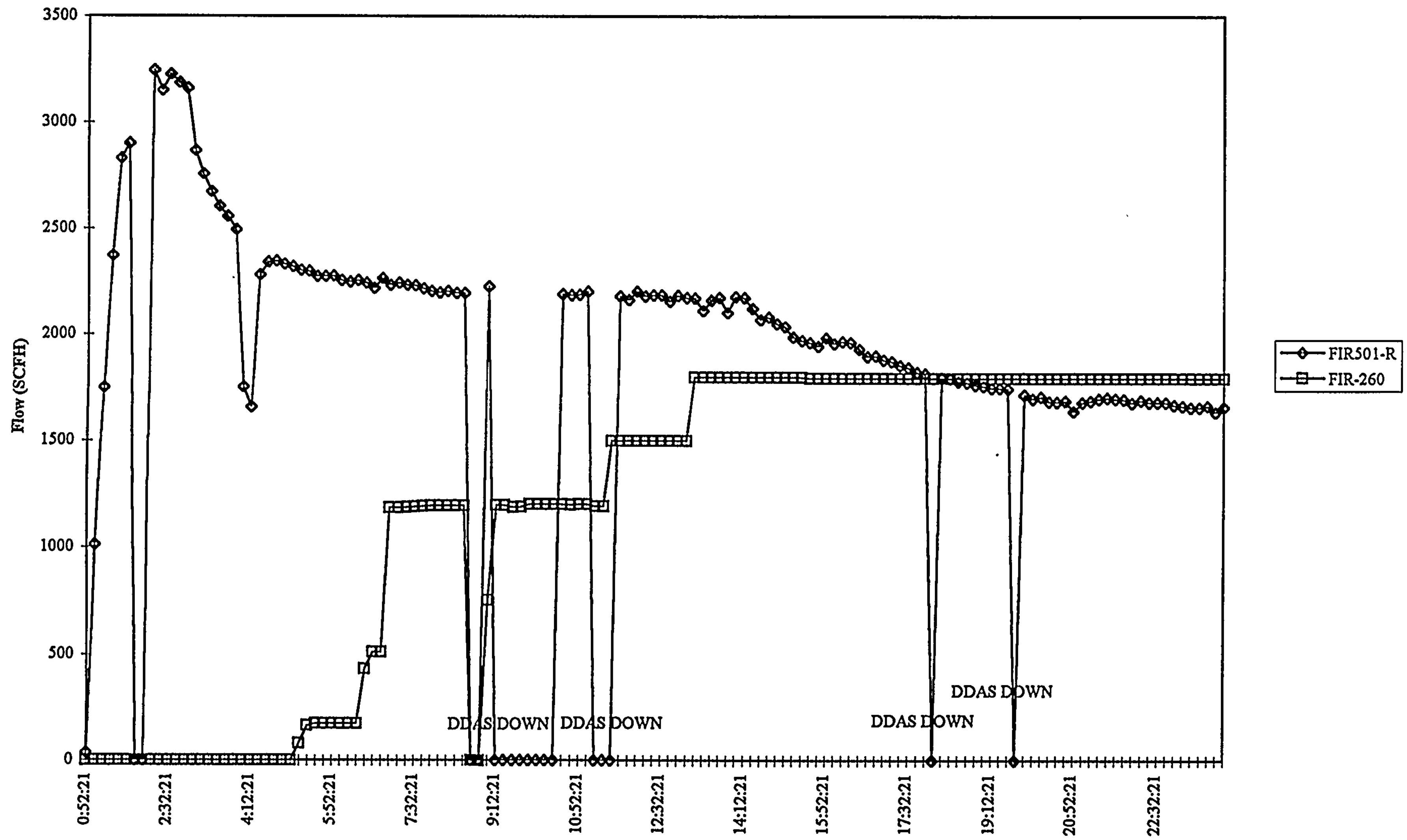
# was not in use

# during

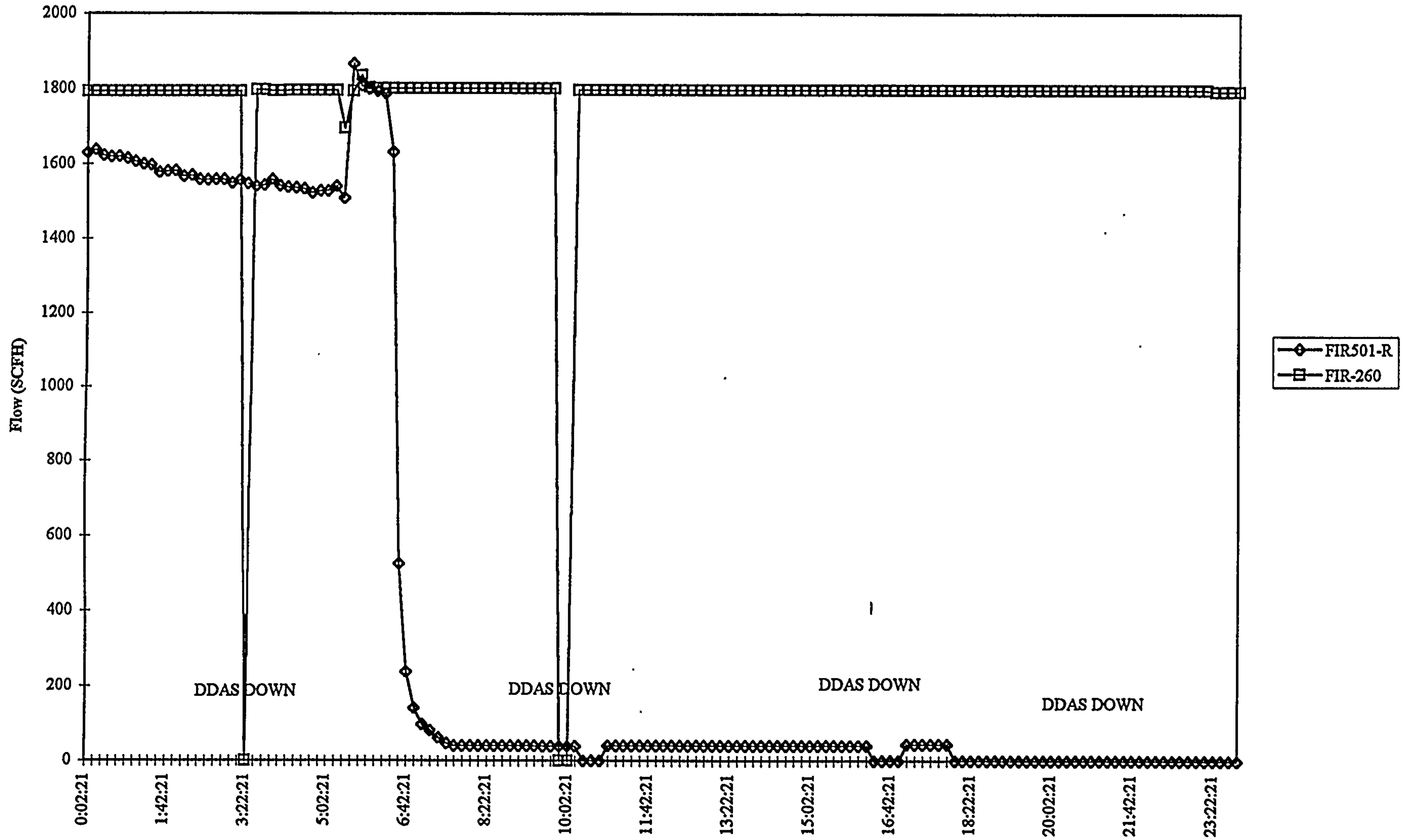
# Run 93MGC06.

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

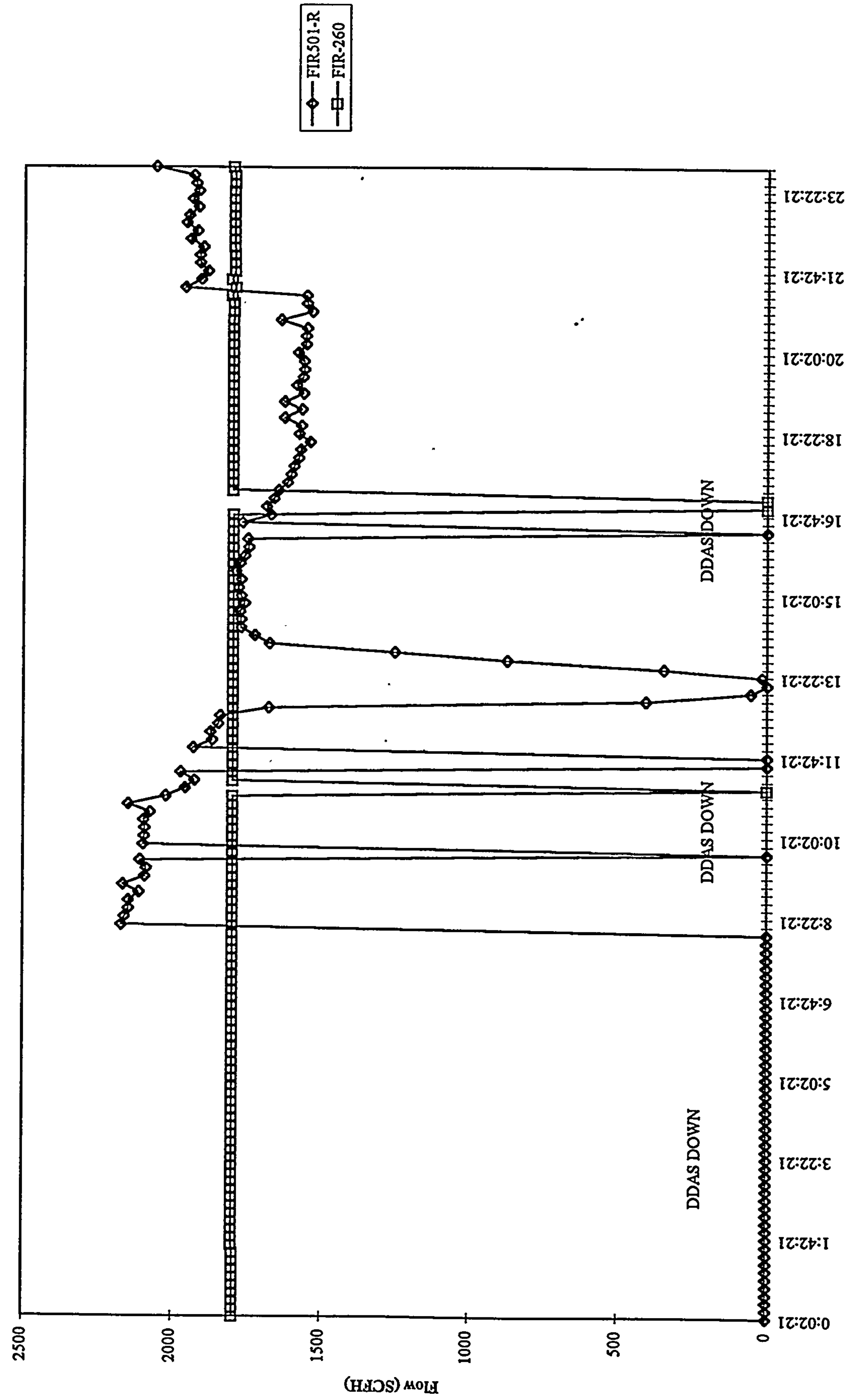
## MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/06/94



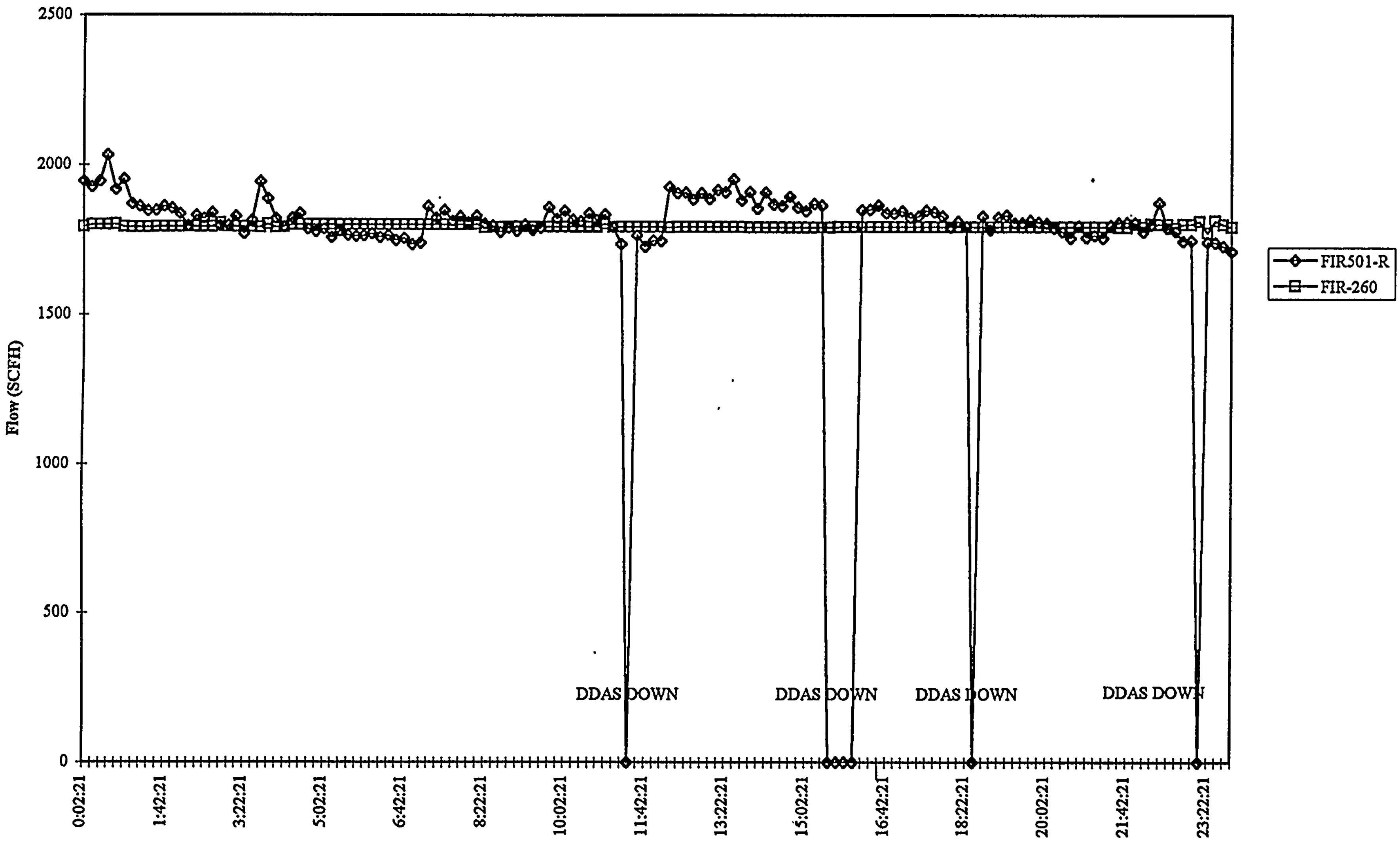
## MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/07/94

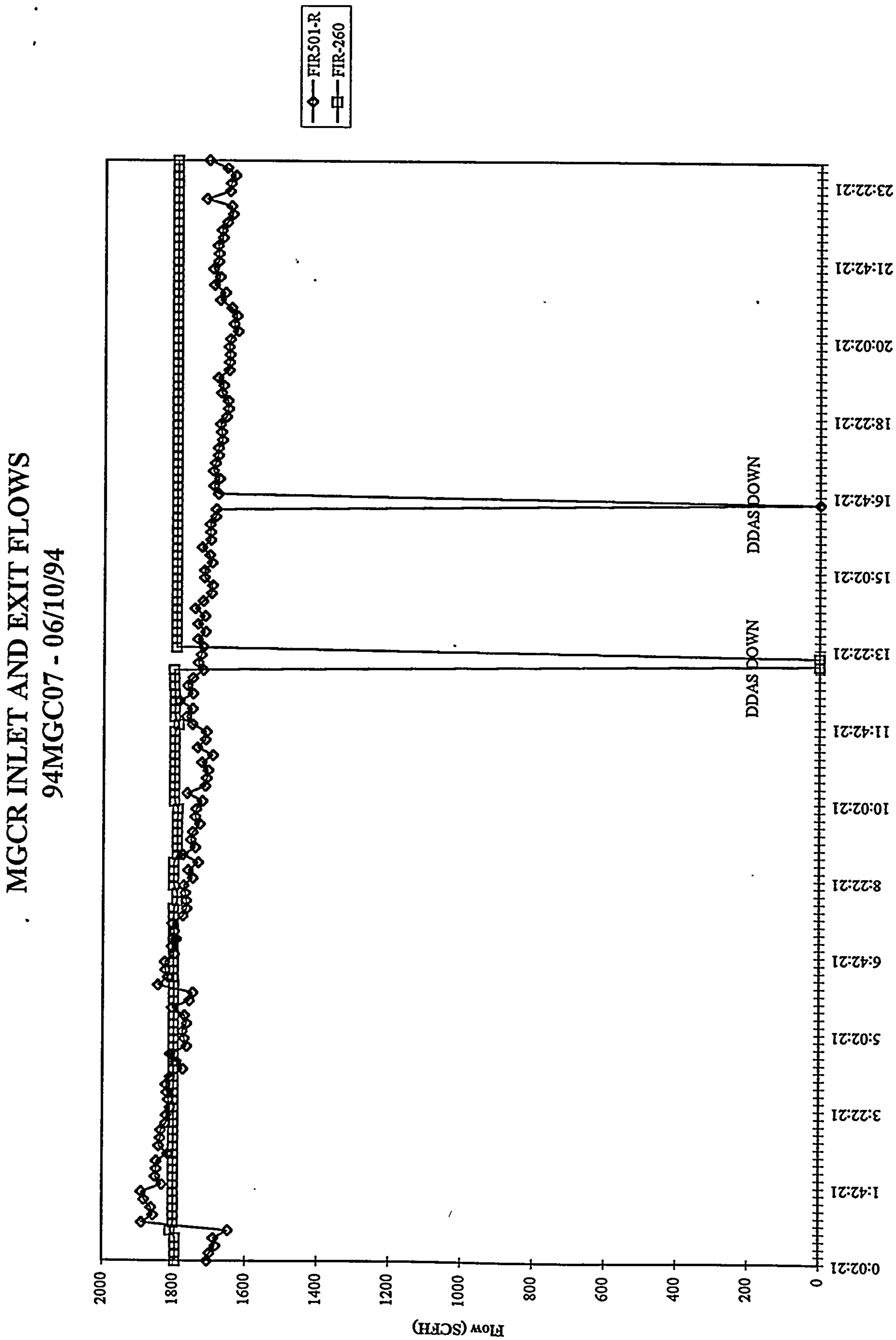


# MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/08/94

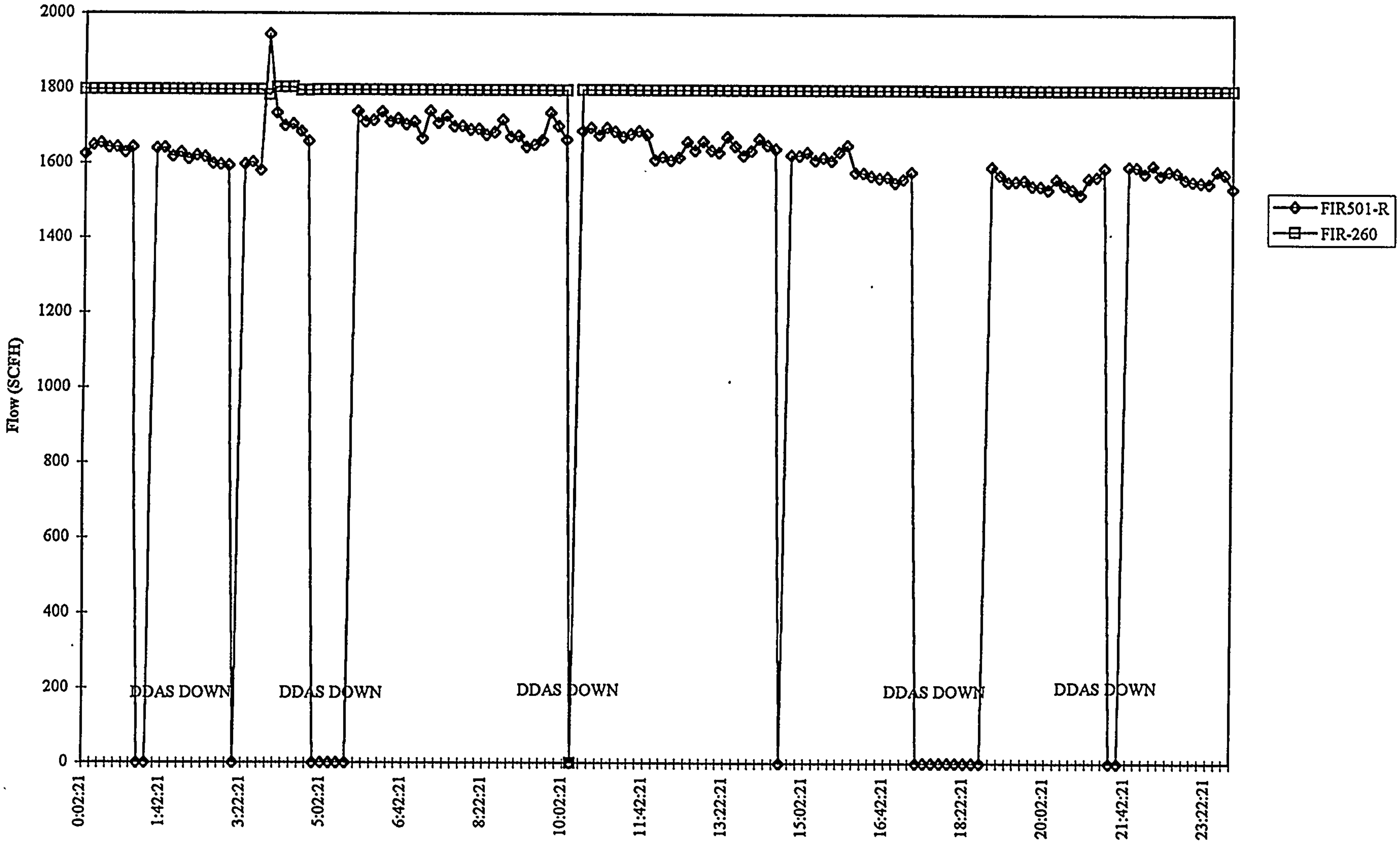


# MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/09/94

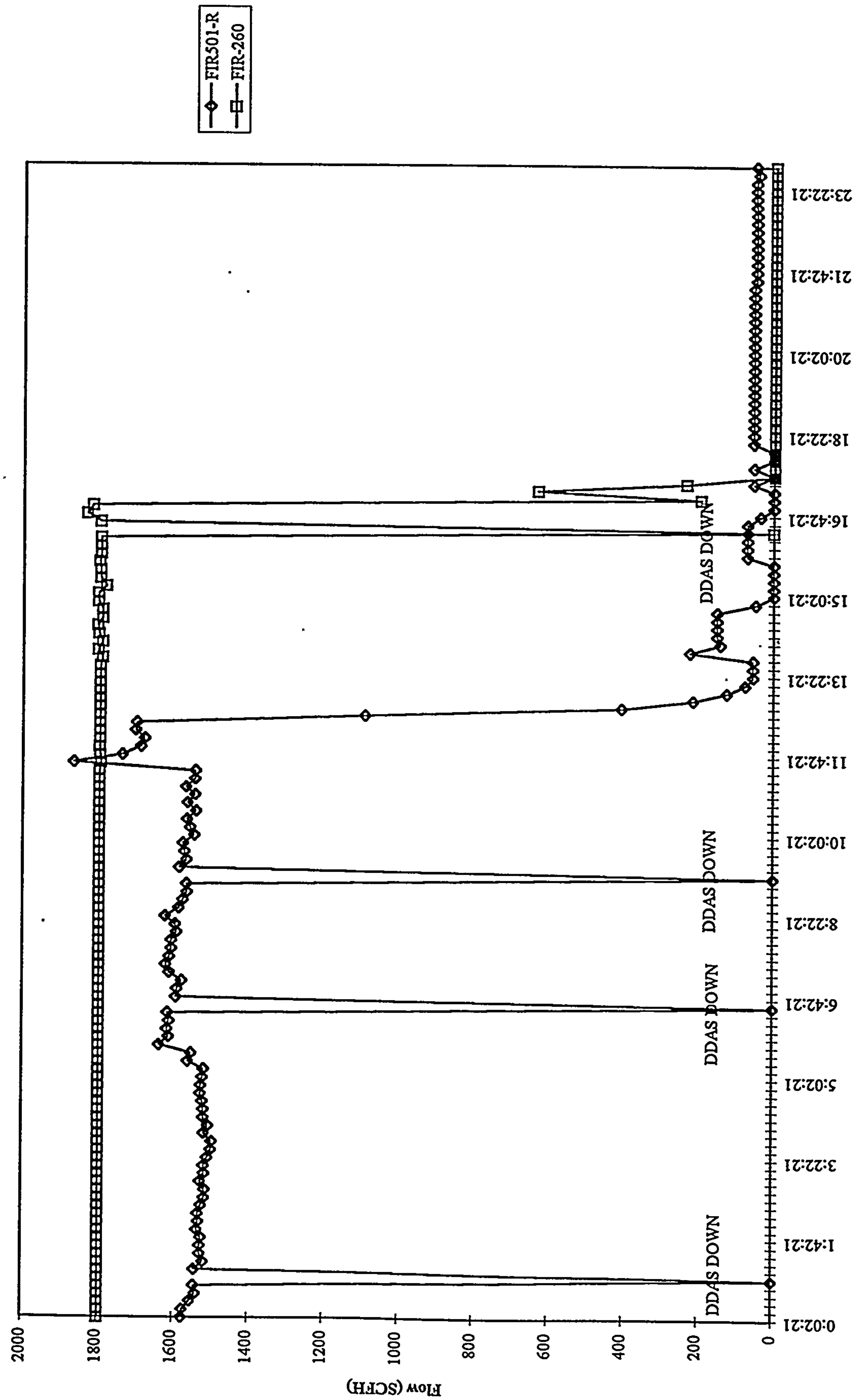



MGCR INLET AND EXIT FLOWS
94MGC07 - 06/10/94
FIR501-R
FIR-260
Flow (SCFH)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0:02:21
1:42:21
3:22:21
5:02:21
6:42:21
8:22:21
10:02:21
11:42:21
13:22:21
15:02:21
16:42:21
18:22:21
20:02:21
21:42:21
23:22:21
DDAS DOWN
DDAS DOWN

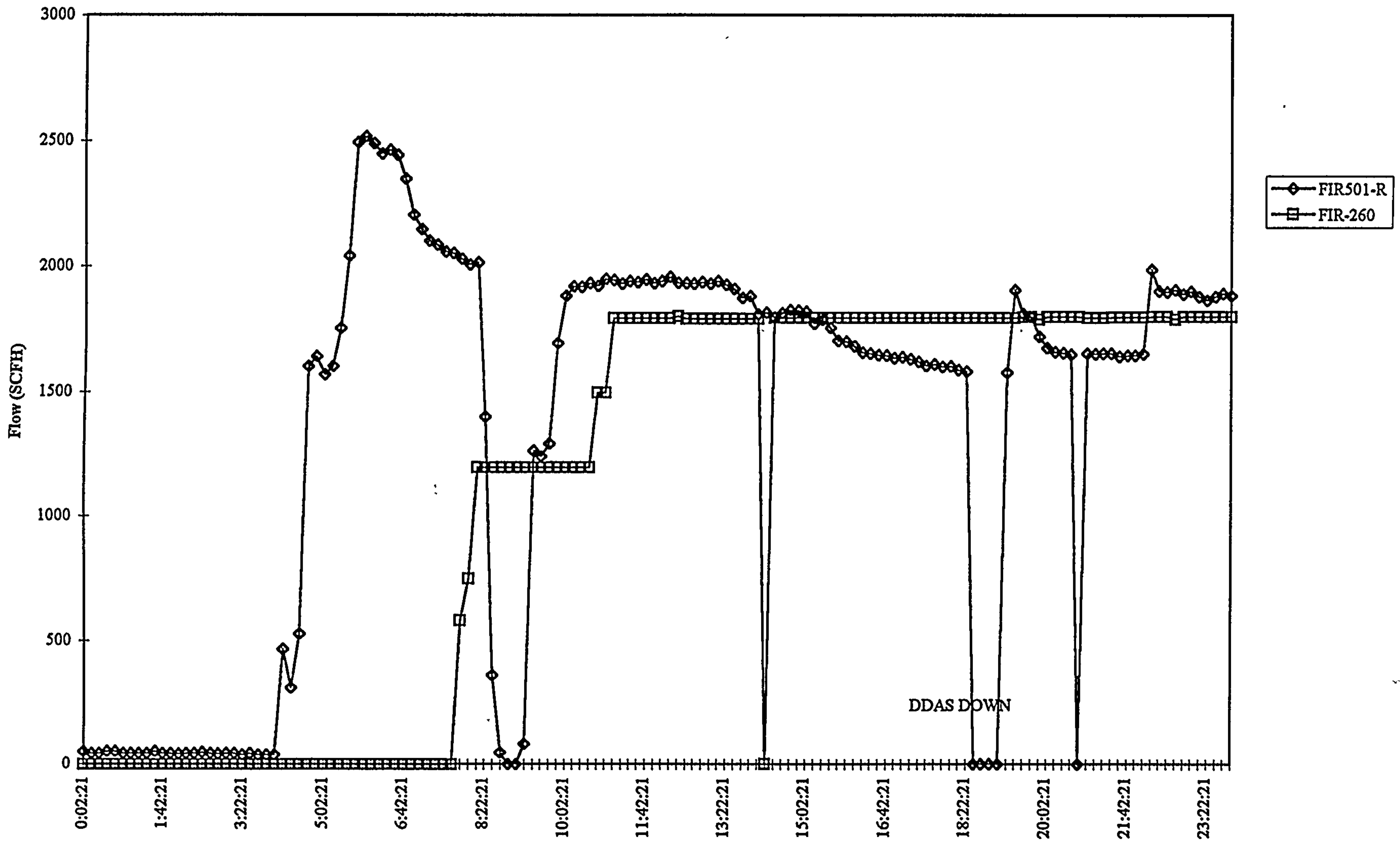
# MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/11/94



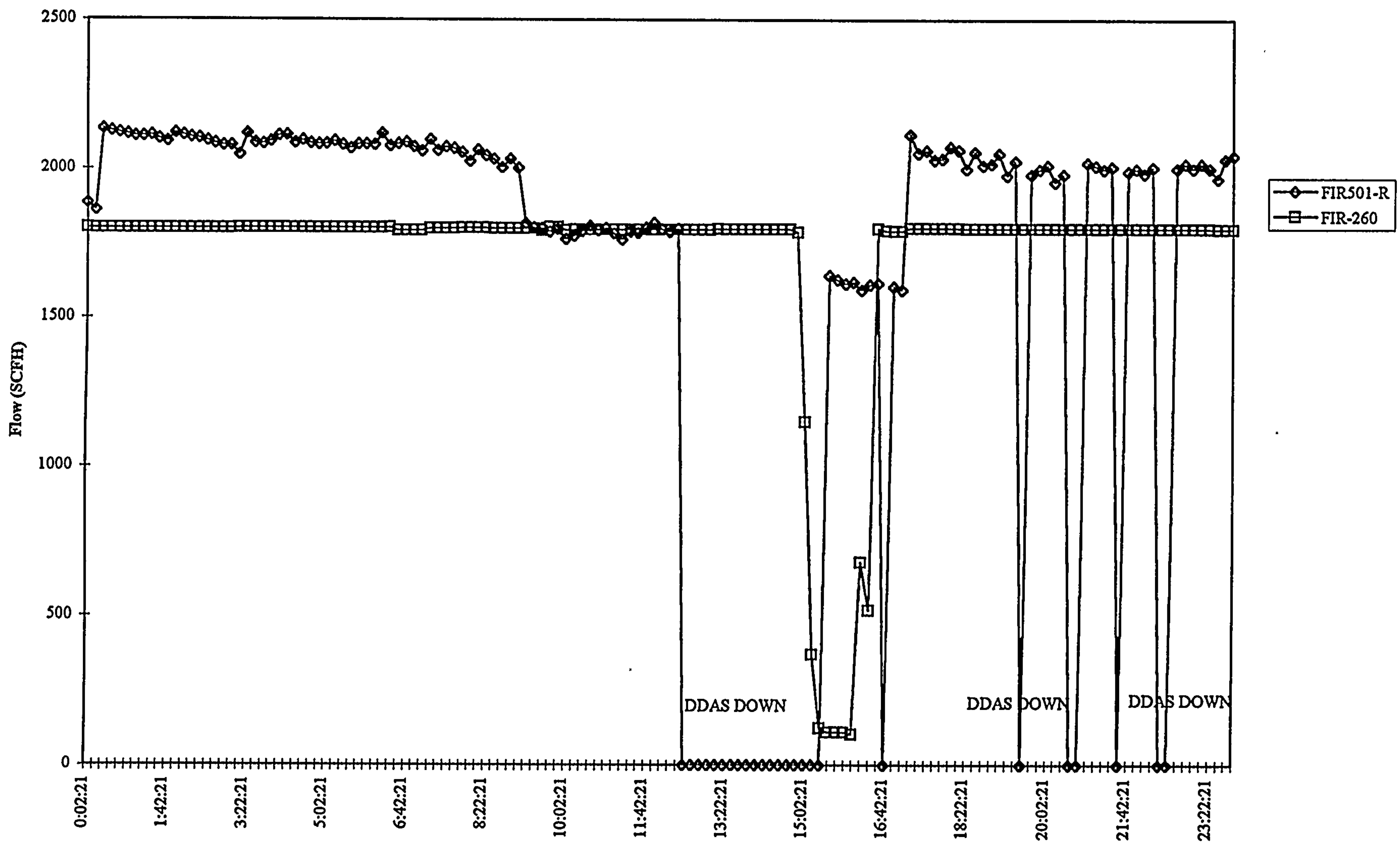
# MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/12/94



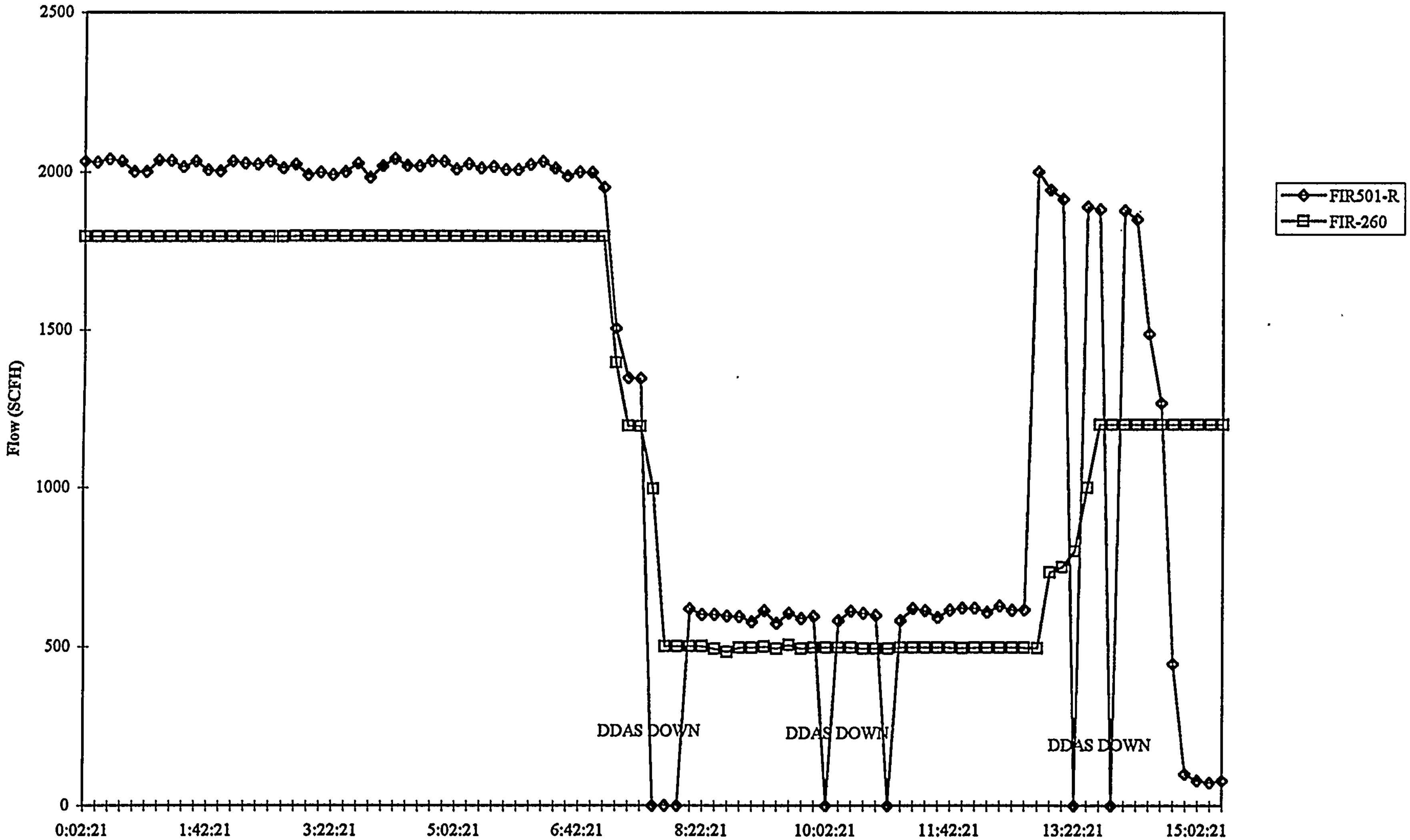
## MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/13/94



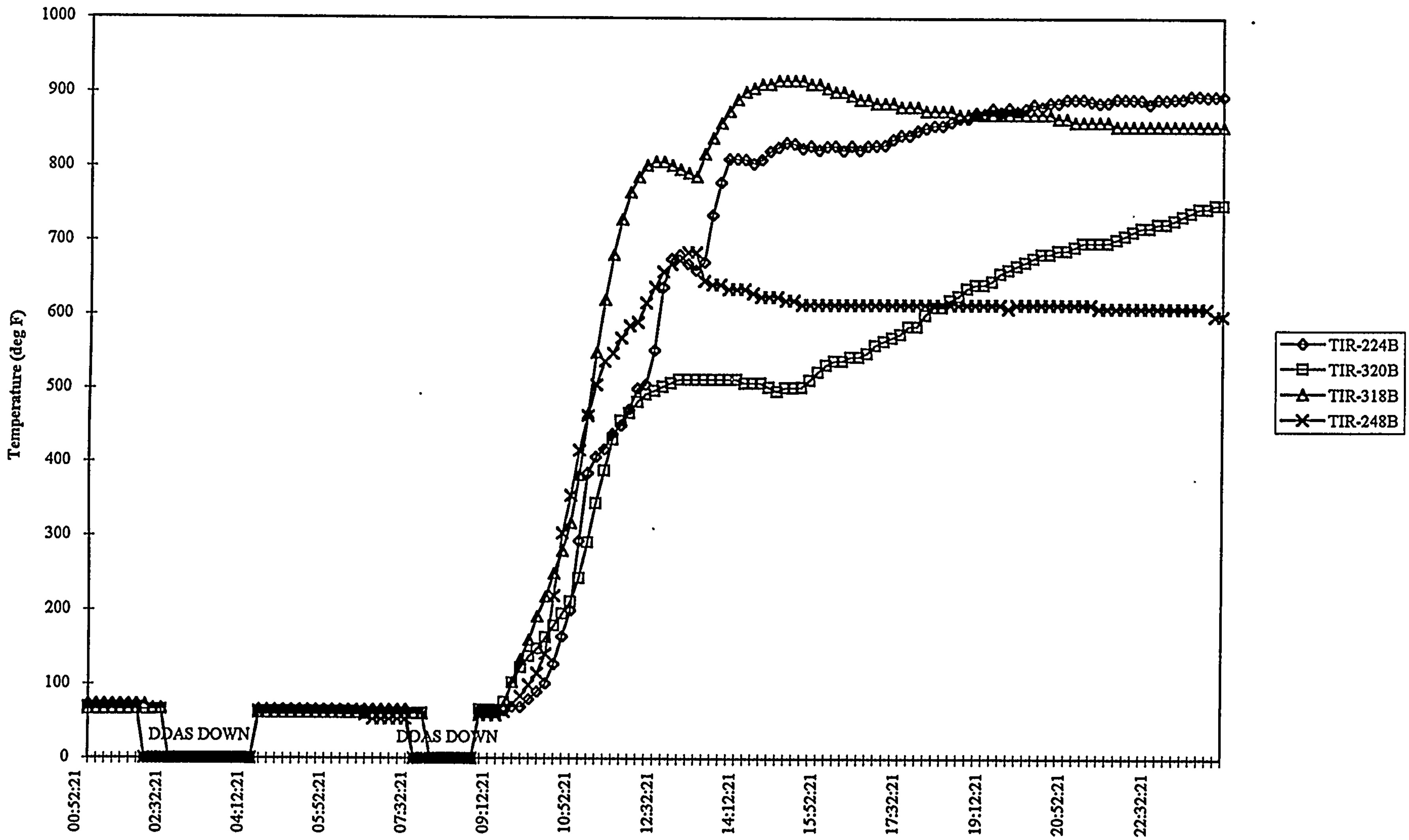
# MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/14/94



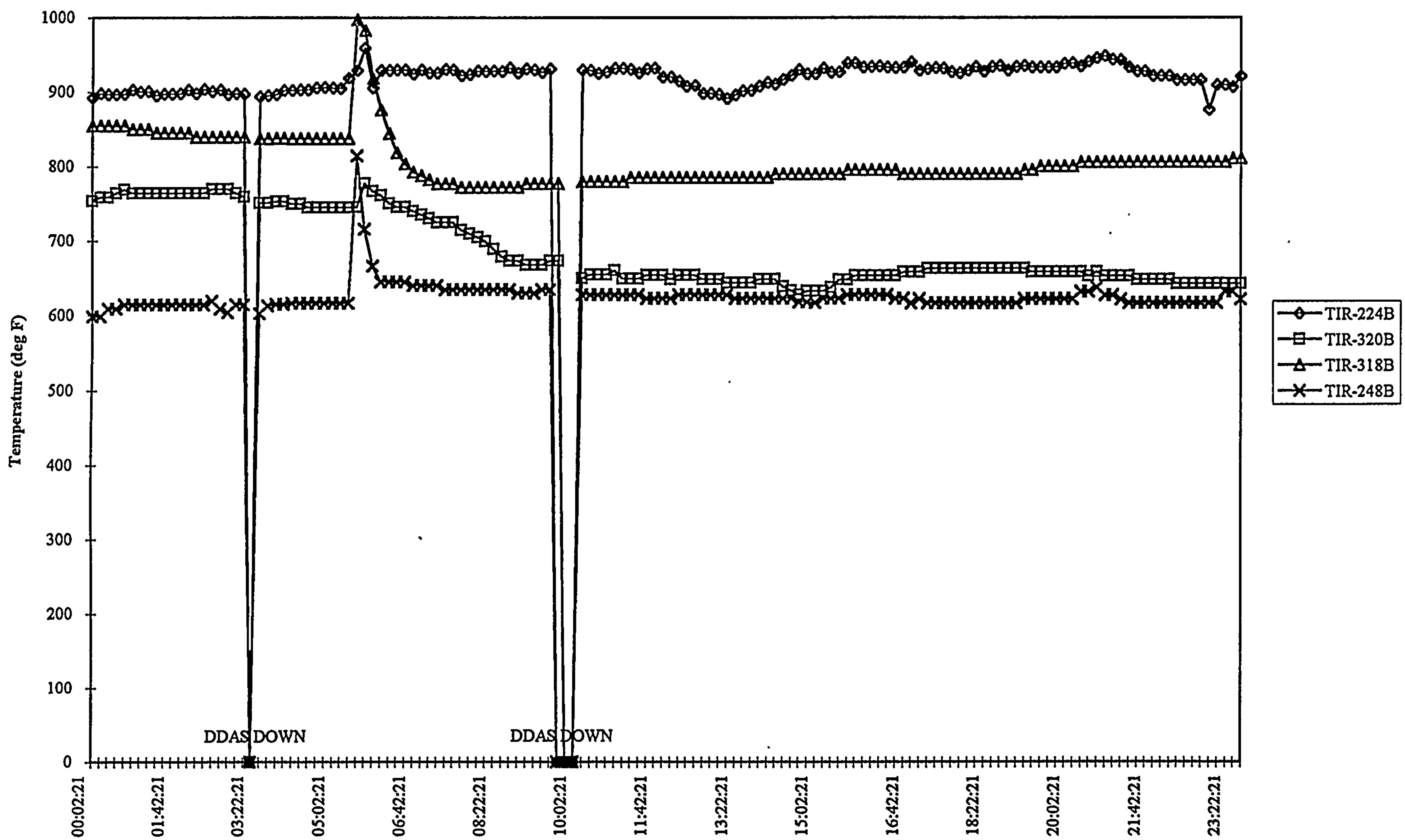
## MGCR INLET AND EXIT FLOWS
## 94MGC07 - 06/15/94



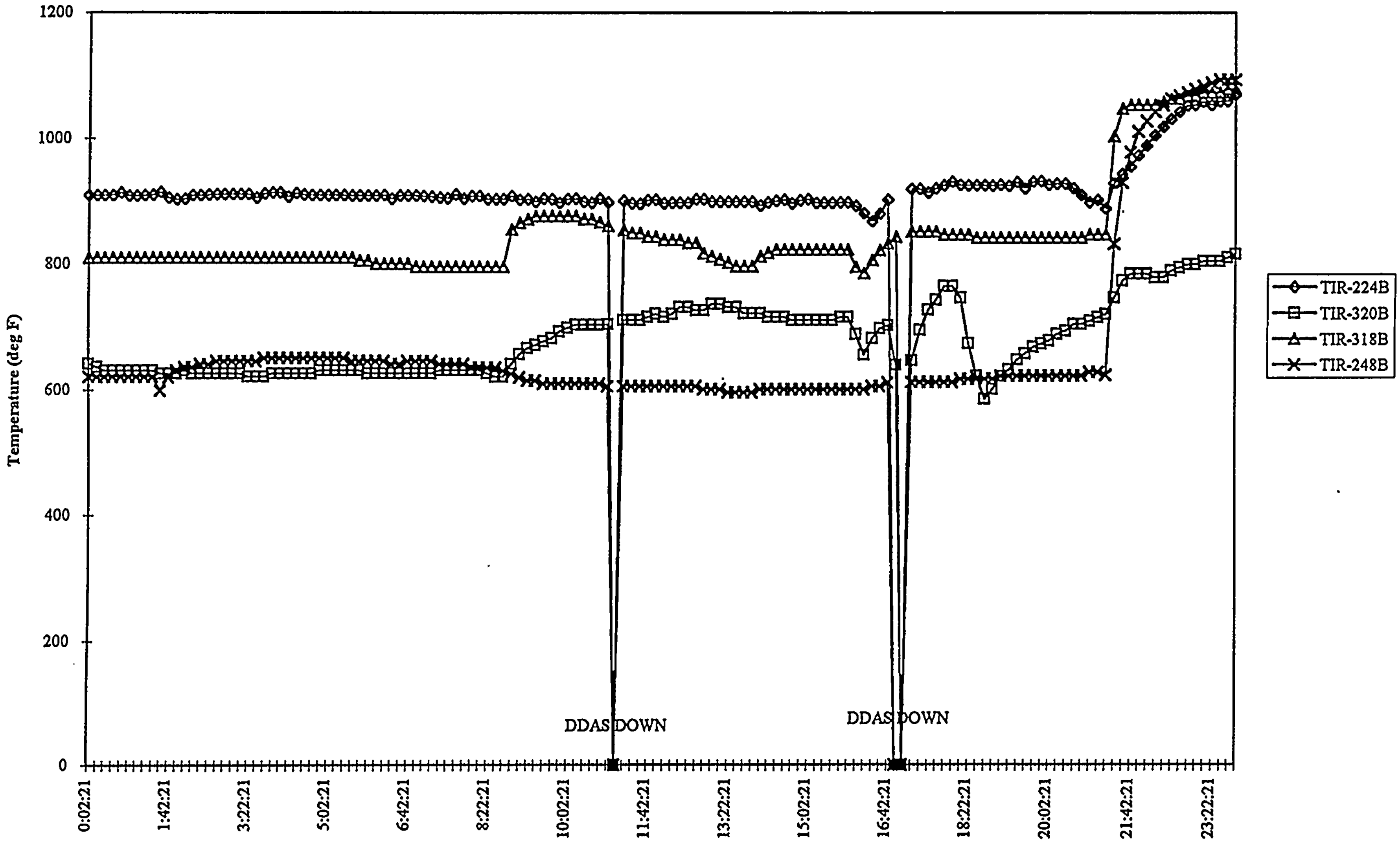
MGCR PROCESS GAS LINE TEMPERATURES
94MGC07 - 06/06/94



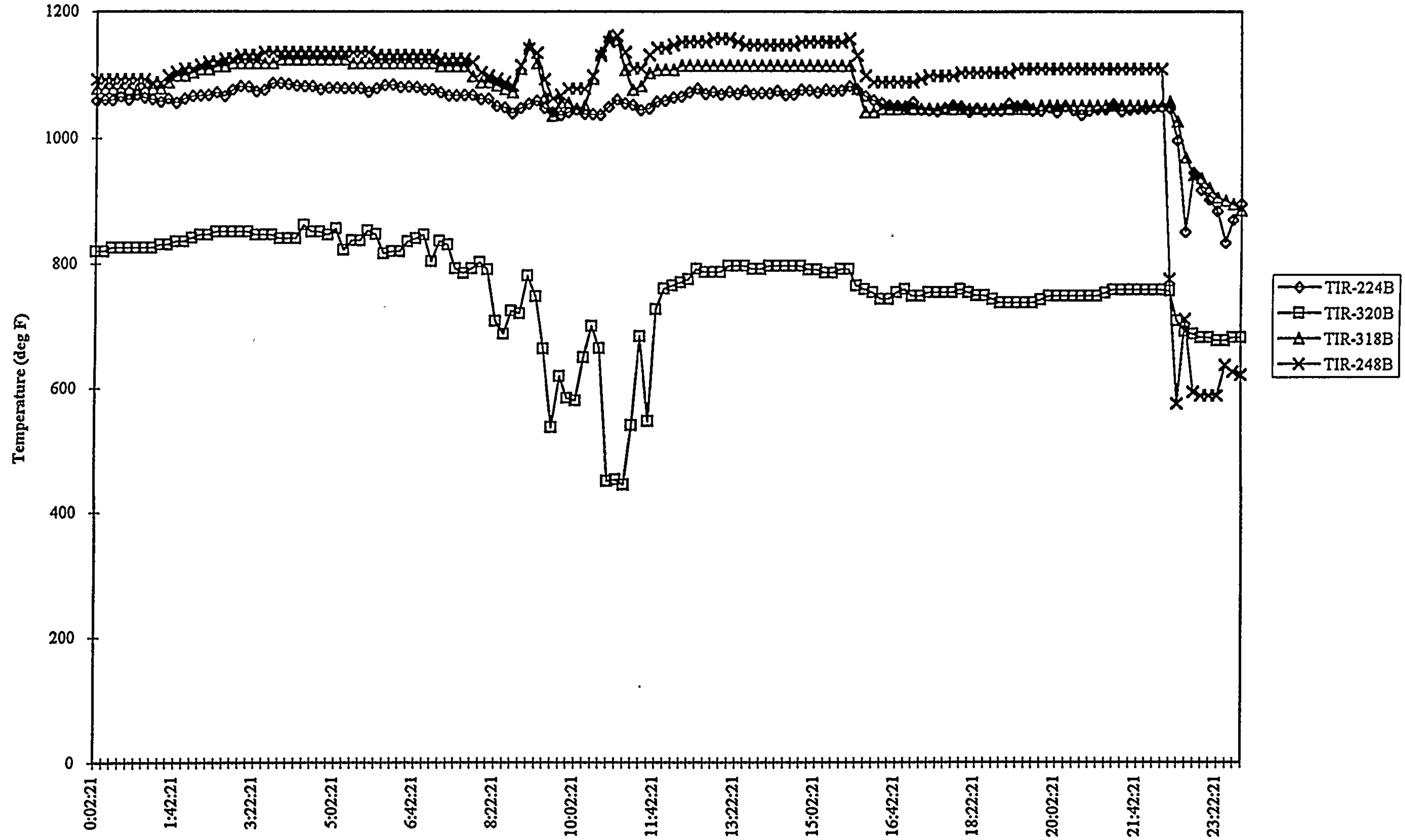
# MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/07/94



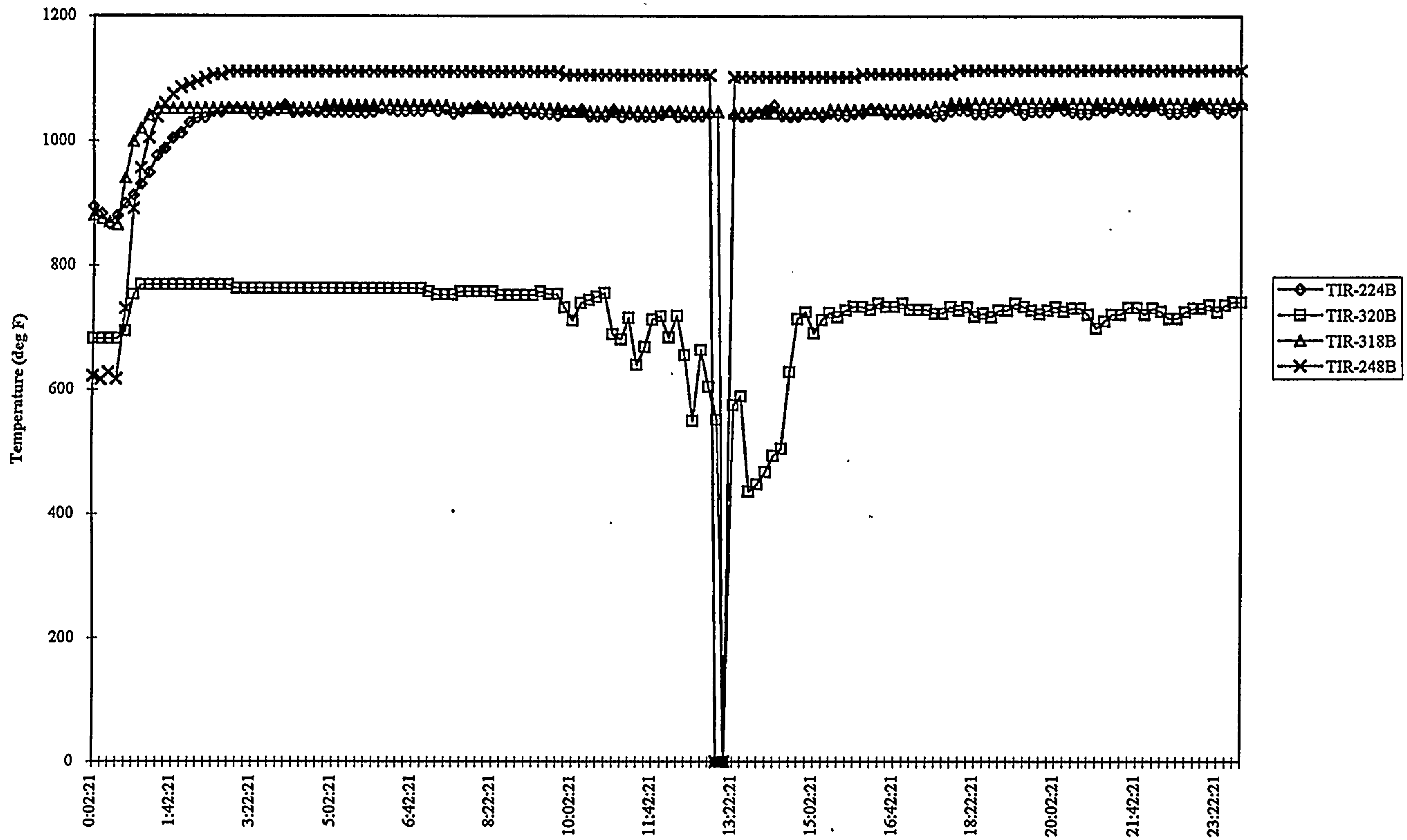
# MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/08/94



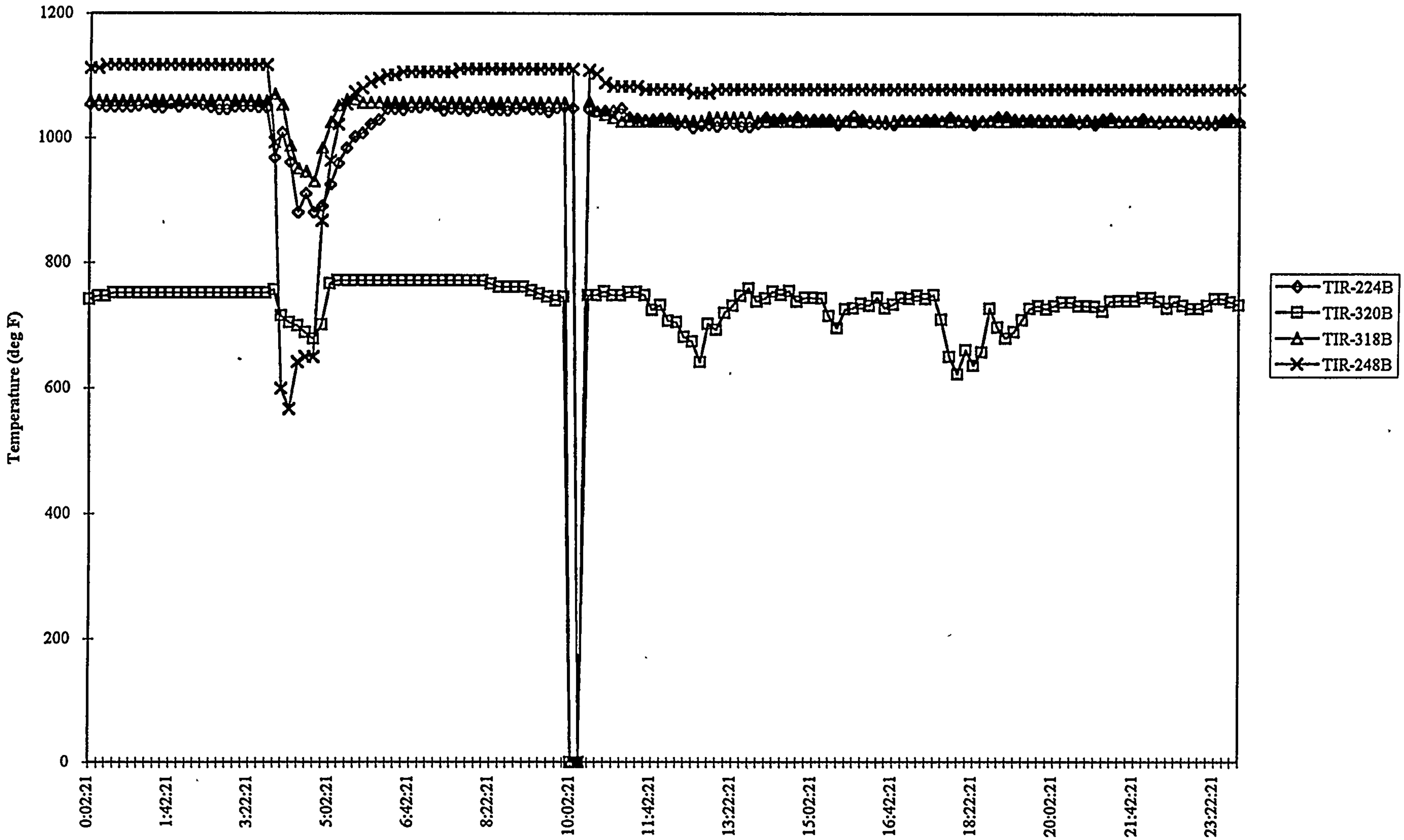
# MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/09/94



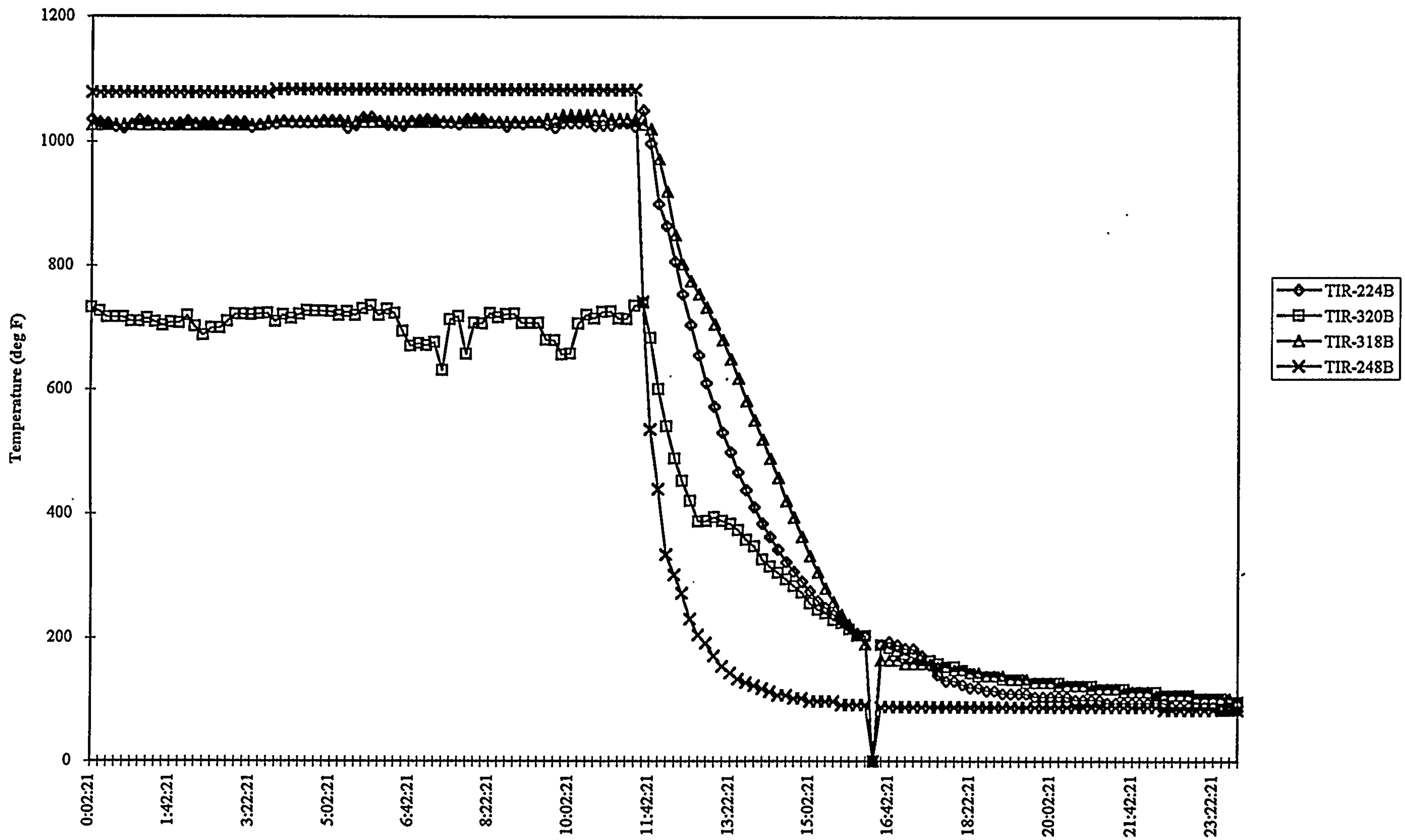
## MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/10/94



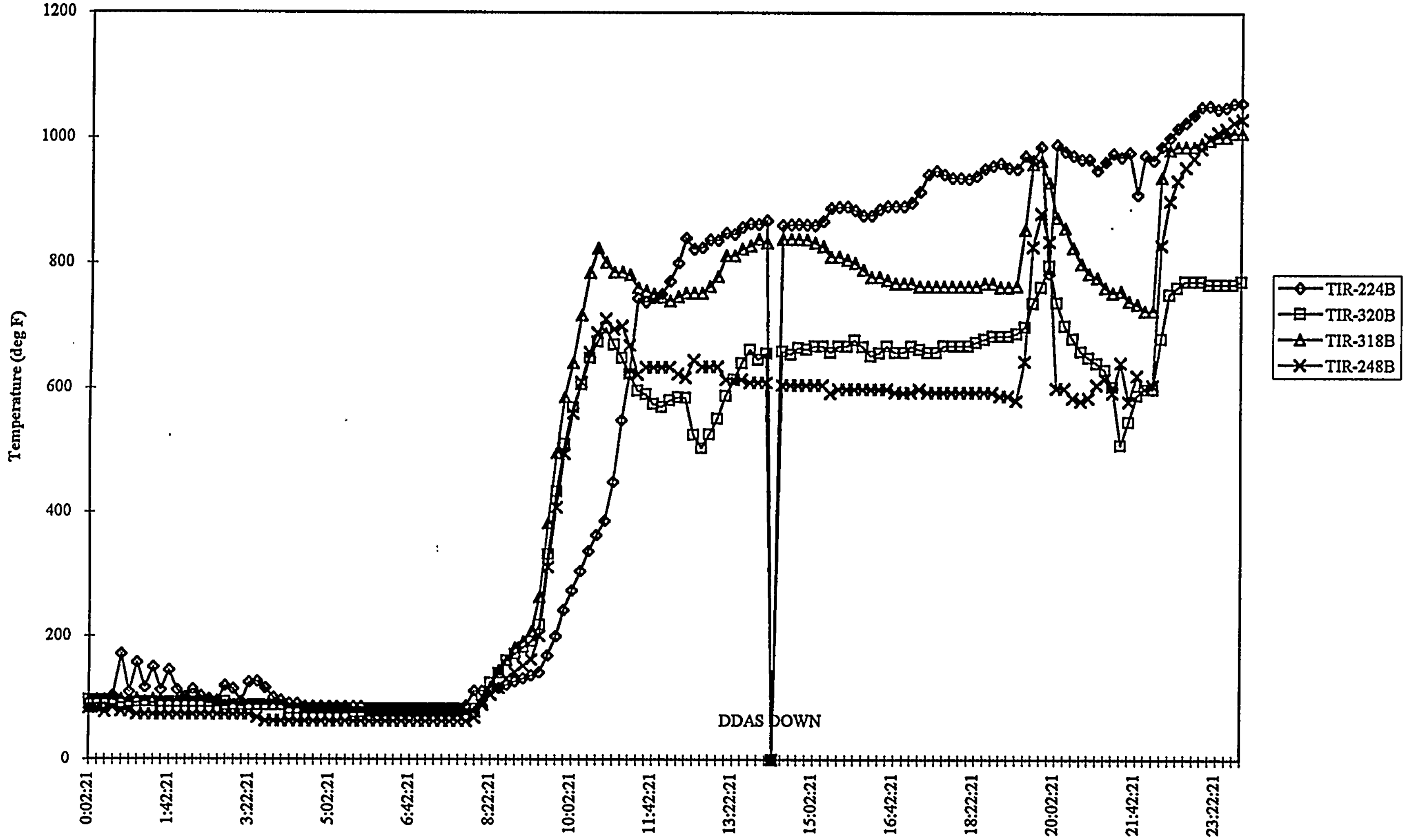
MGCR PROCESS GAS LINE TEMPERATURES
94MGC07 - 06/11/94



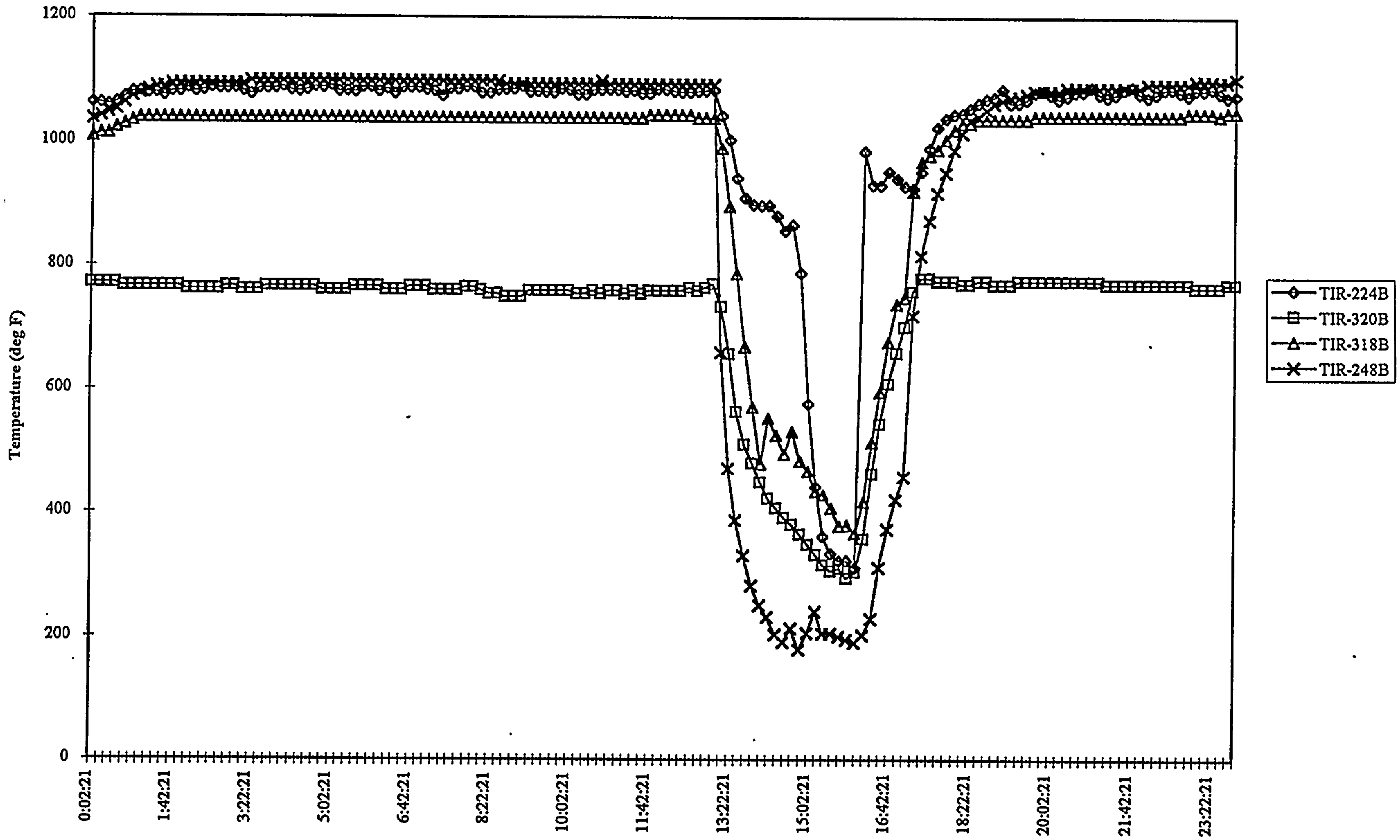
## MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/12/94



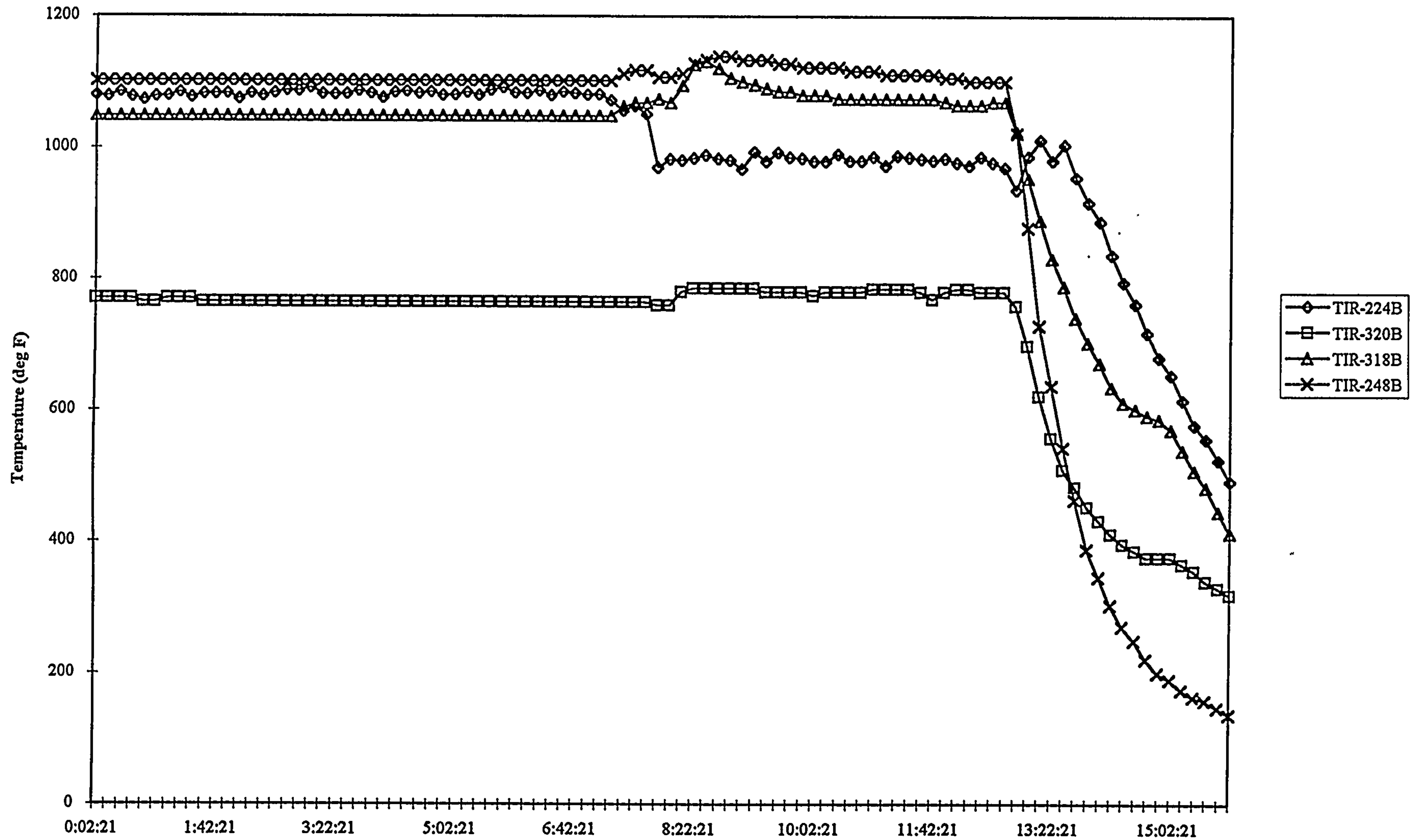
# MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/13/94



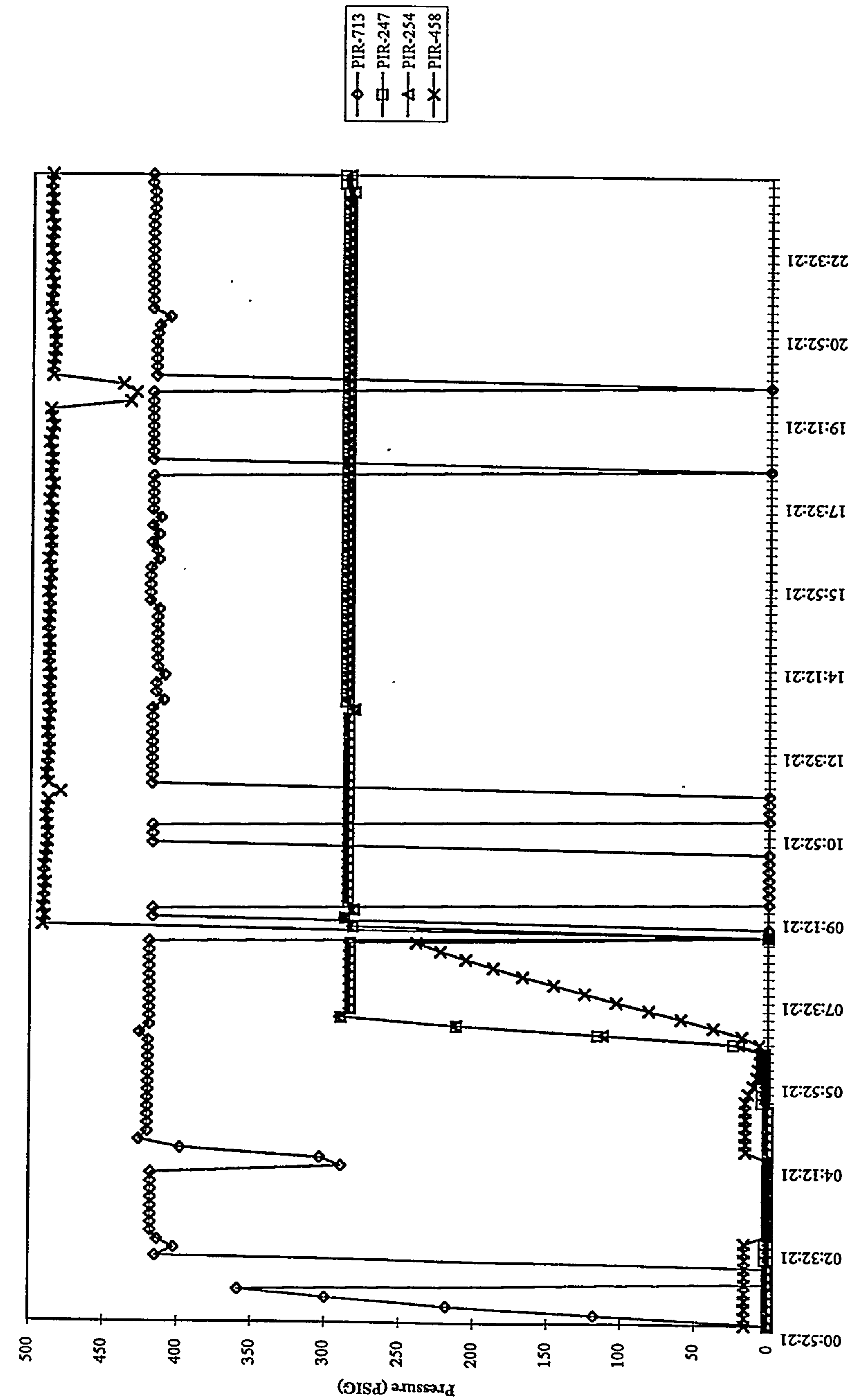
## MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/14/94



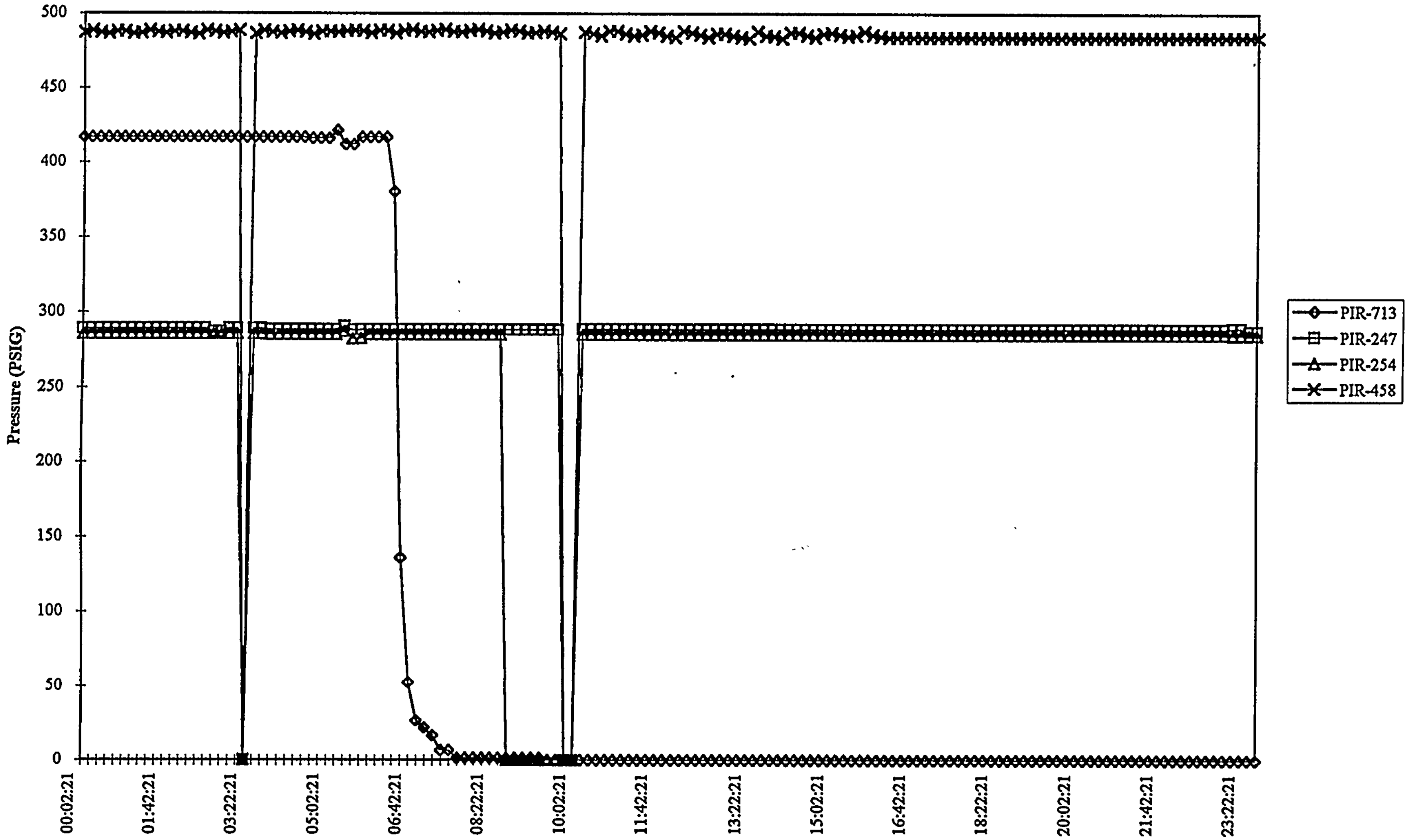
## MGCR PROCESS GAS LINE TEMPERATURES
## 94MGC07 - 06/15/94



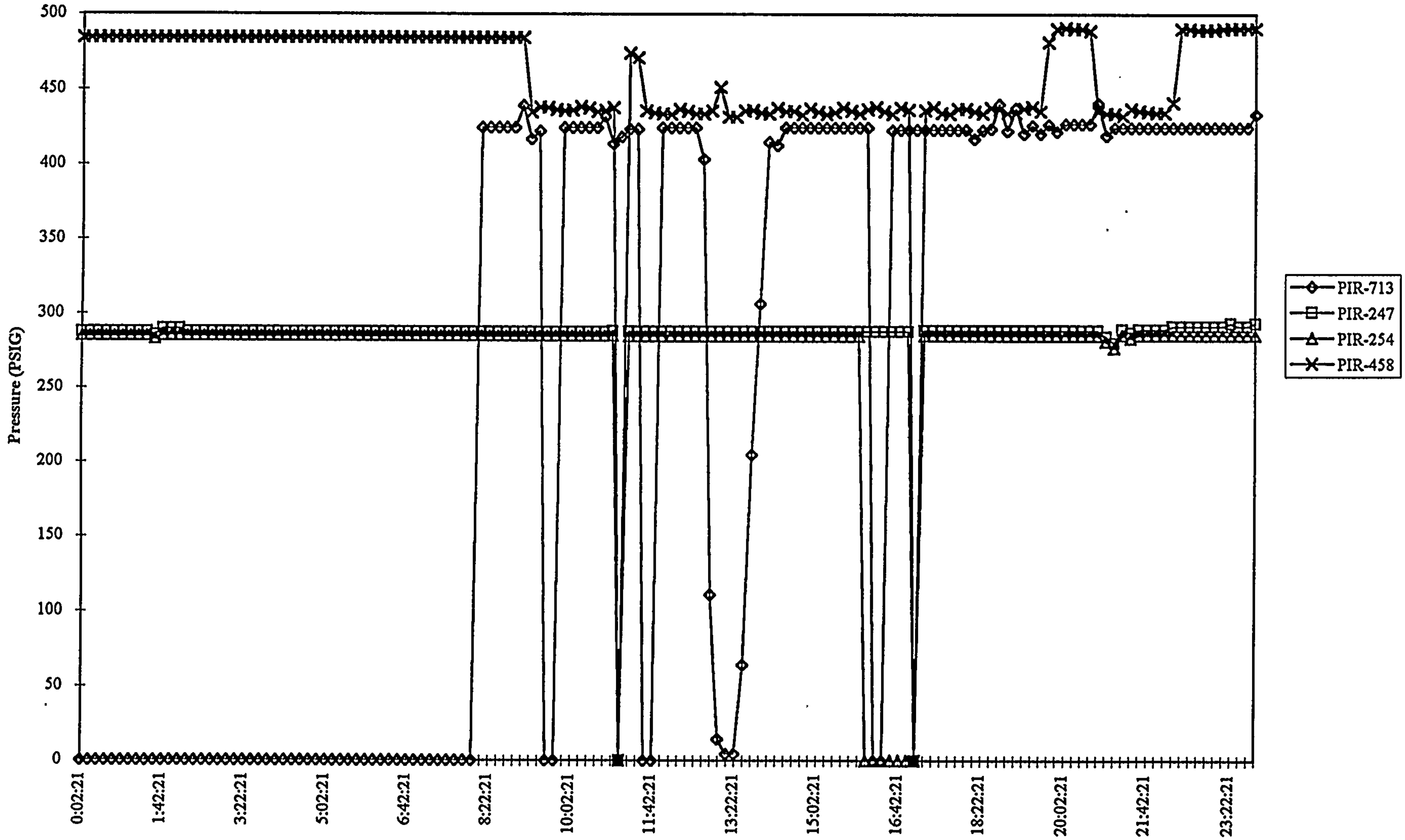
FBG & MGCR PROCESS PRESSURES
94FBG07 - 94MGC07 - 06/06/94

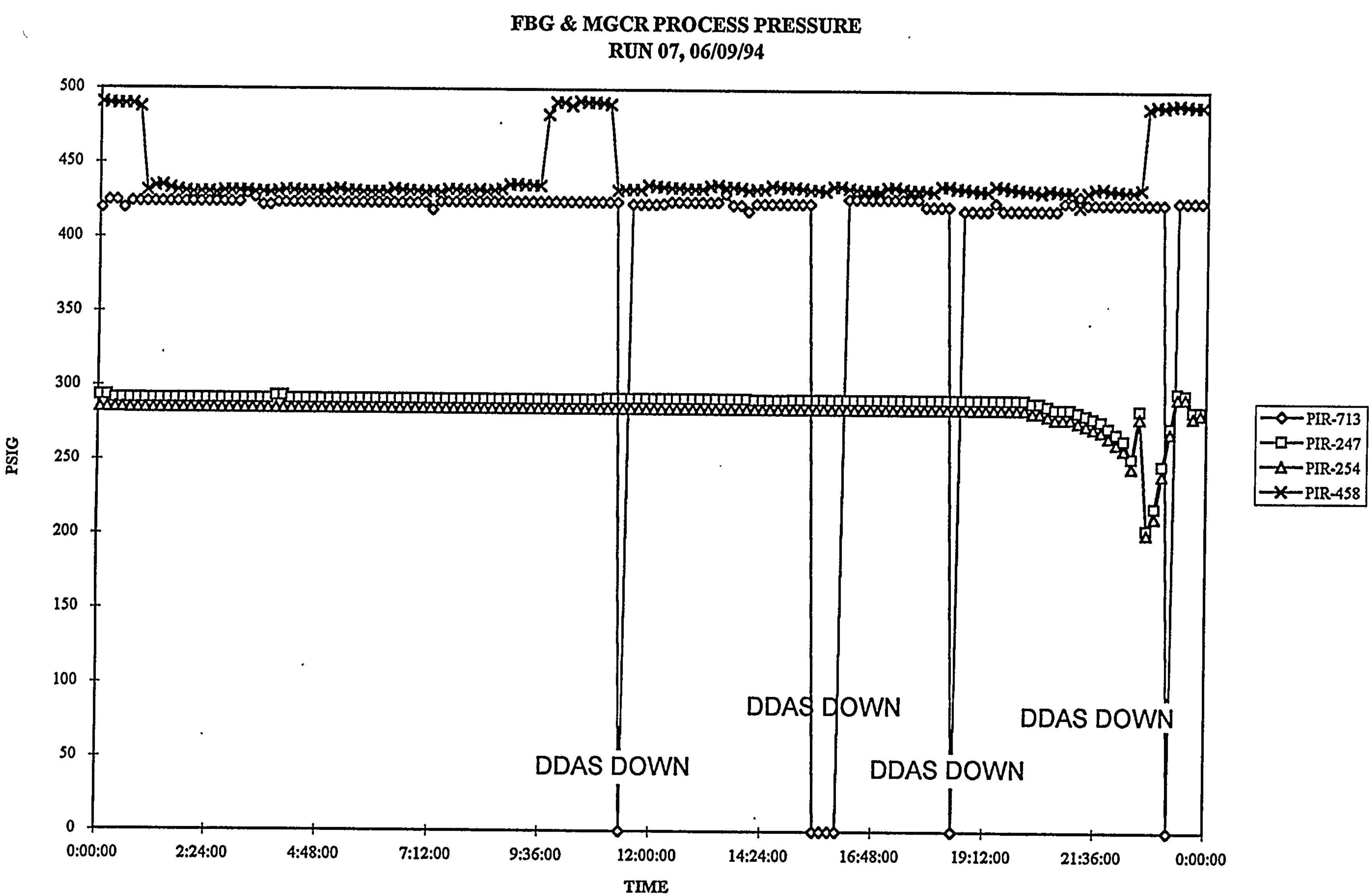


## FBG & MGCR PROCESS PRESSURES
## 94FBG07 - 94MGC07 - 06/07/94

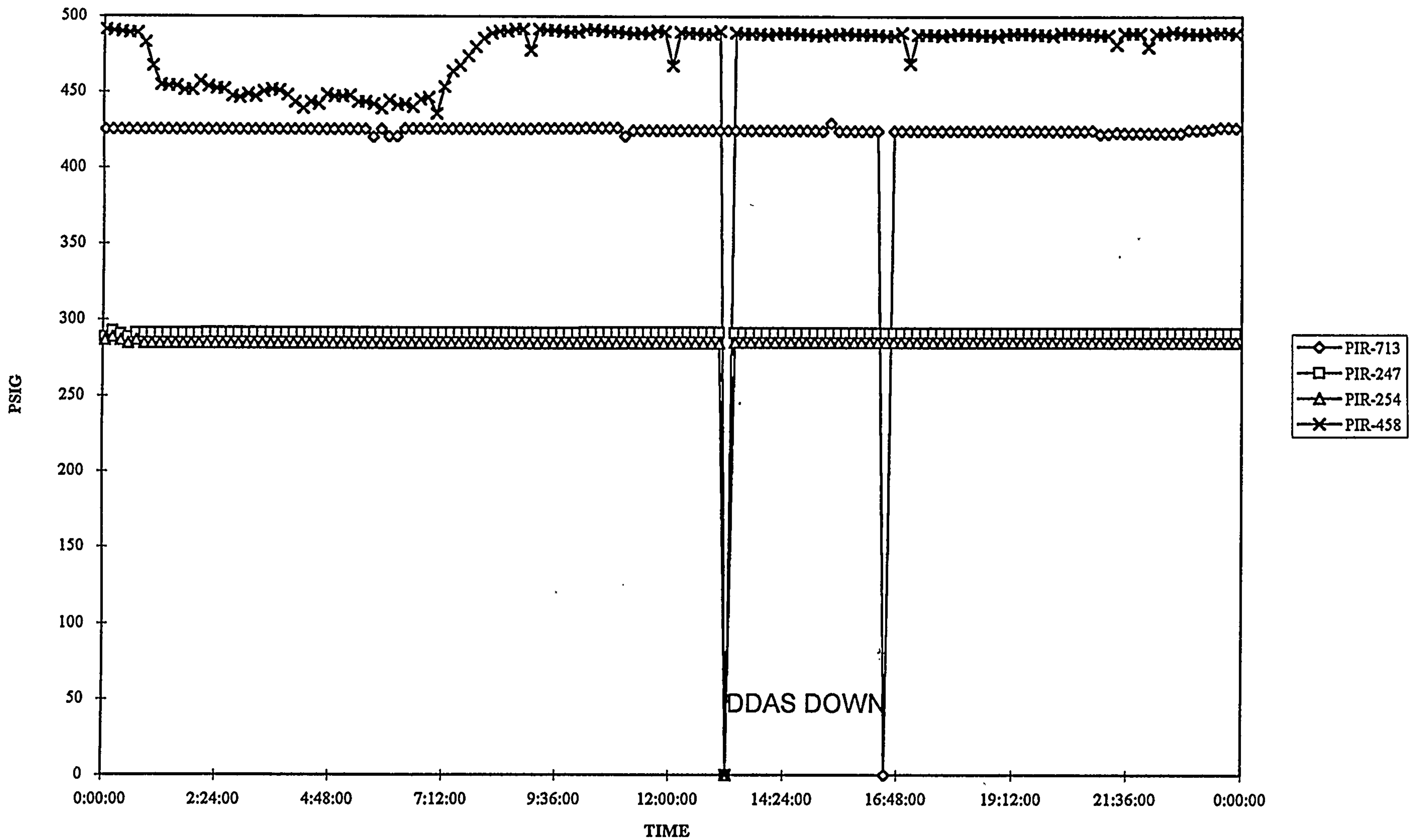


## FBG & MGCR PROCESS PRESSURES
## 94FBG07 - 94MGC07 - 06/08/94

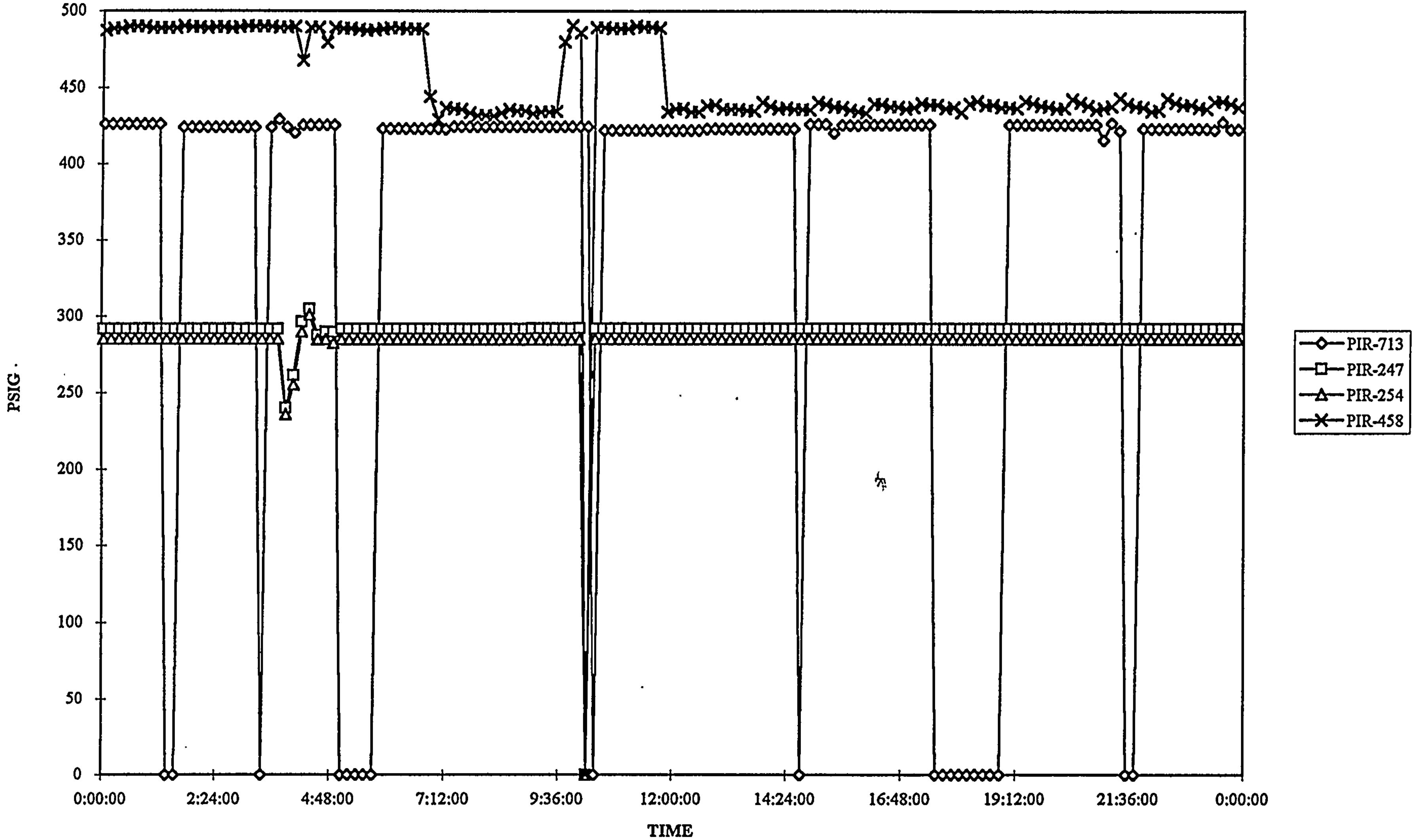


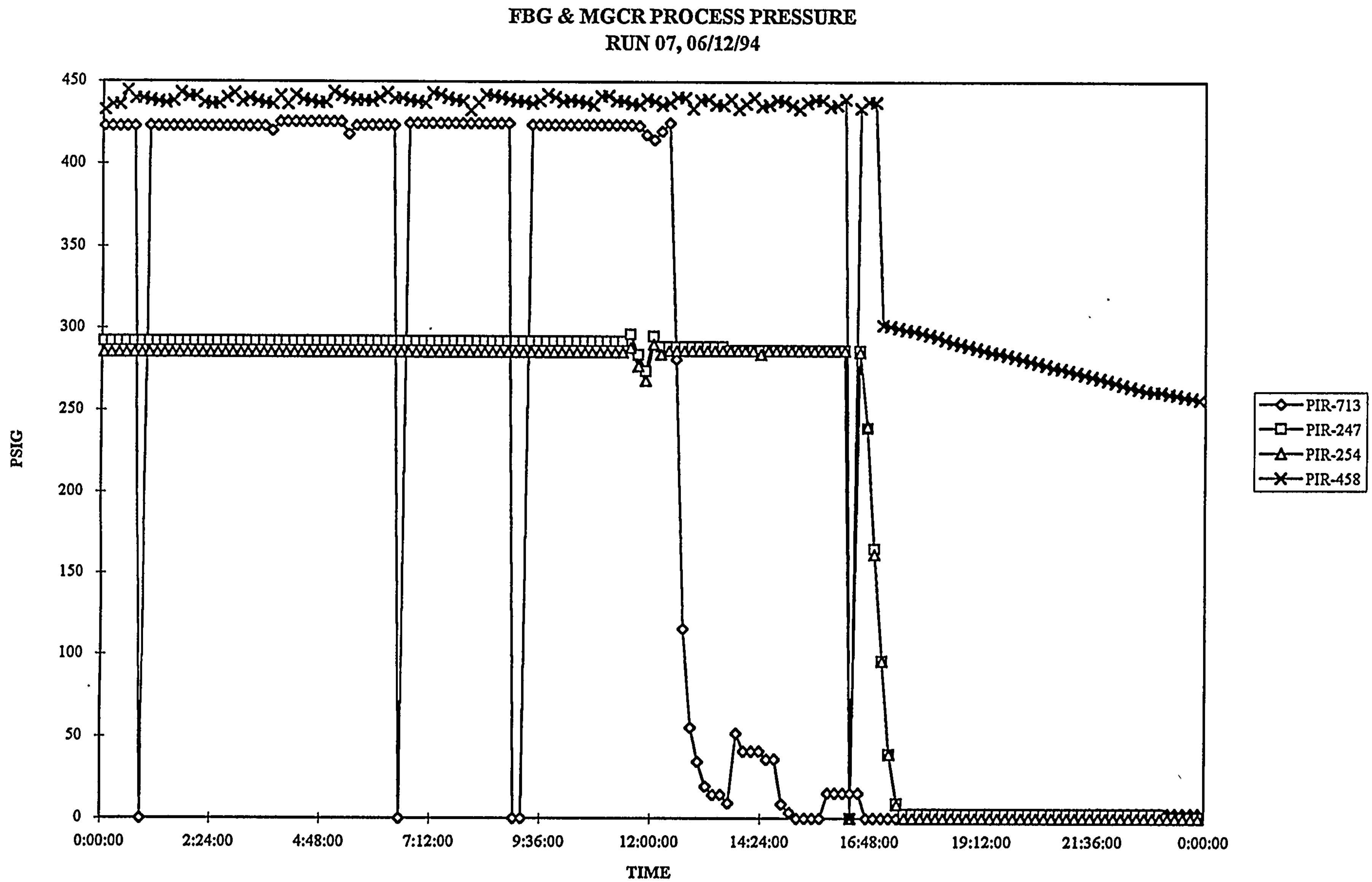

FBG & MGCR PROCESS PRESSURE
RUN 07, 06/09/94
500
450
400
350
300
250
200
150
100
50
0
PSIG
0:00:00
2:24:00
4:48:00
7:12:00
9:36:00
12:00:00
14:24:00
16:48:00
19:12:00
21:36:00
0:00:00
TIME
DDAS DOWN
DDAS DOWN
DDAS DOWN
DDAS DOWN
PIR-713
PIR-247
PIR-254
PIR-458

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

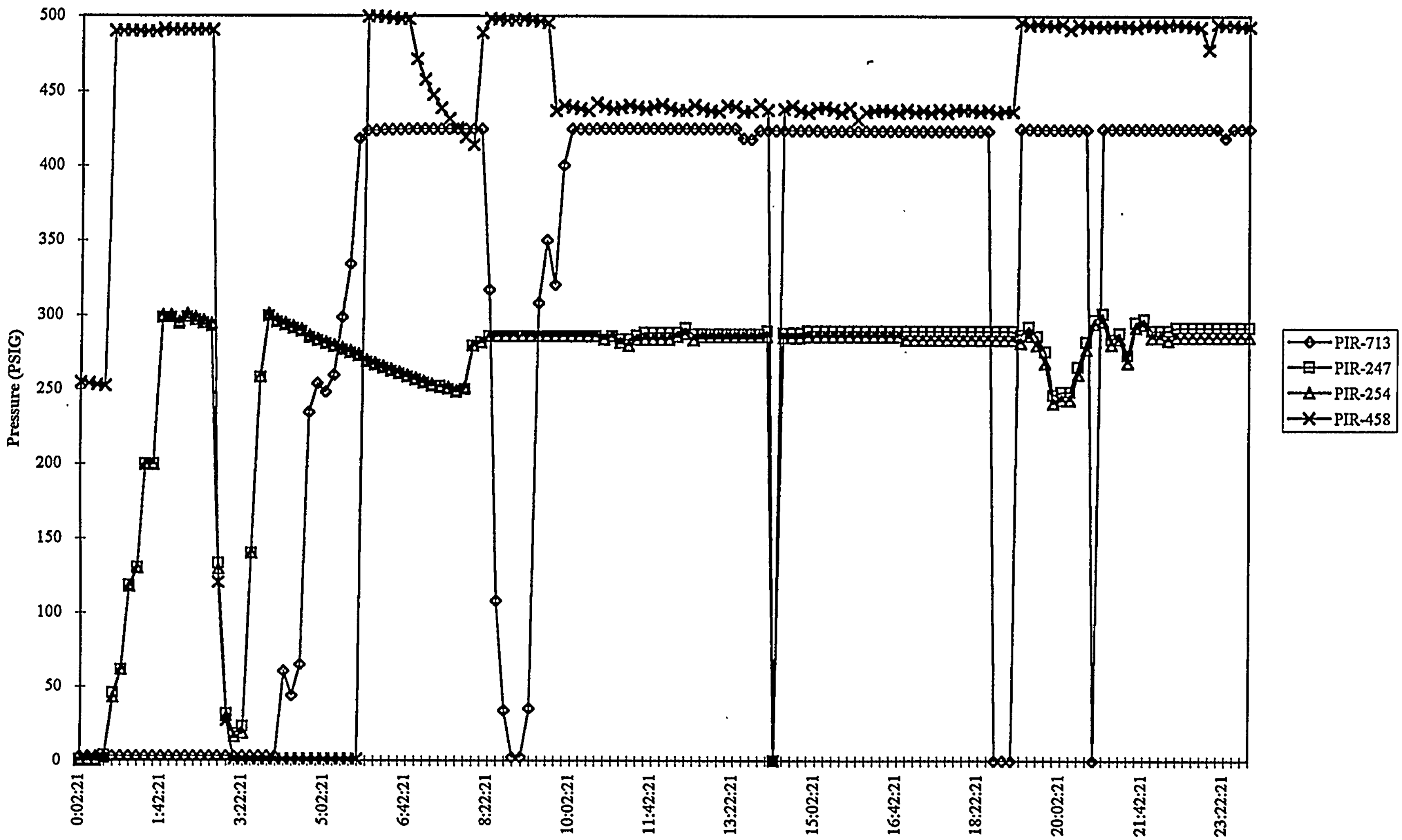


FBG & MGCR PROCESS PRESSURE
RUN 07, 06/11/94

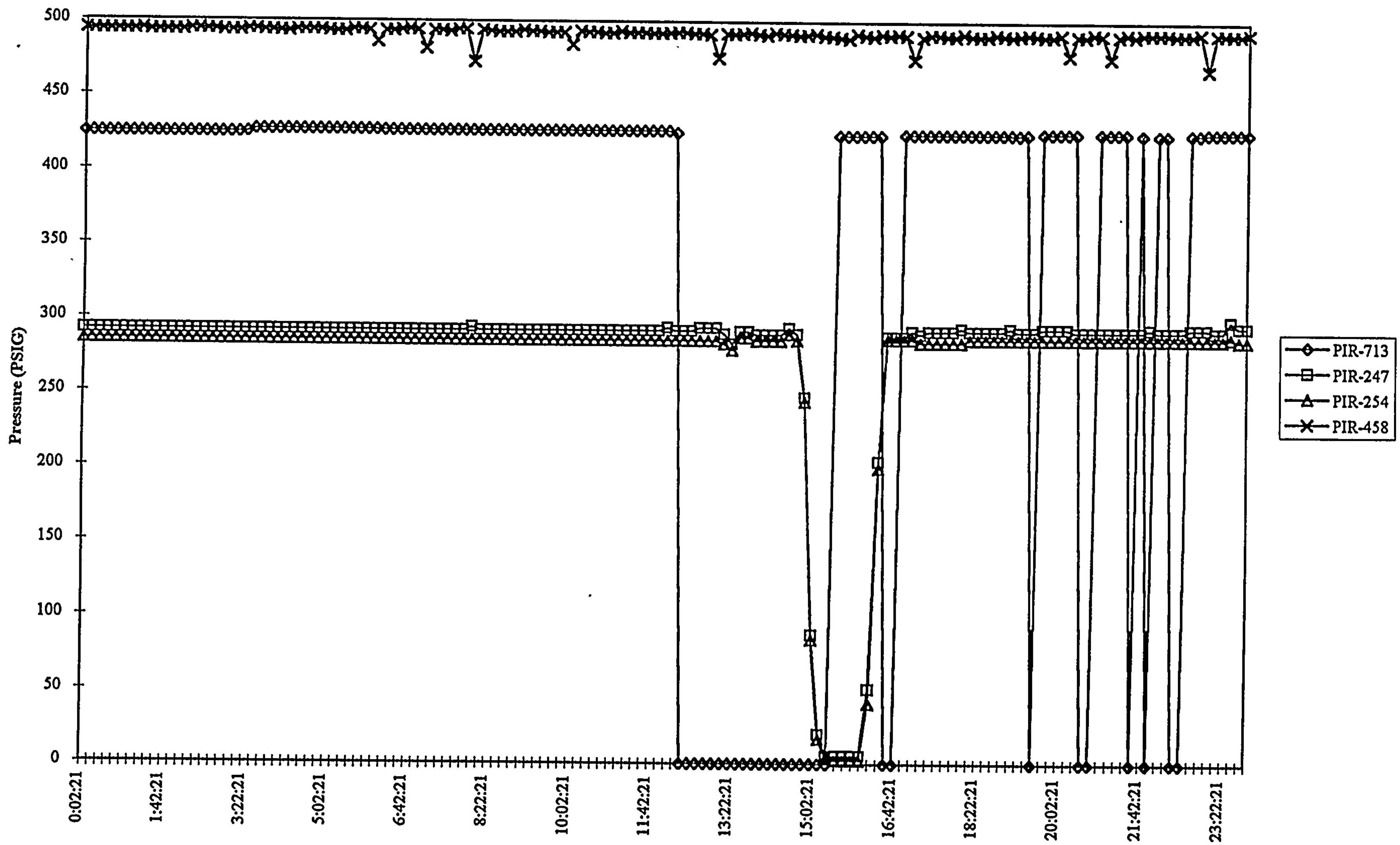



FBG & MGCR PROCESS PRESSURE
RUN 07, 06/12/94
PSIG
450
400
350
300
250
200
150
100
50
0
0:00:00
2:24:00
4:48:00
7:12:00
9:36:00
12:00:00
14:24:00
16:48:00
19:12:00
21:36:00
0:00:00
TIME
PIR-713
PIR-247
PIR-254
PIR-458

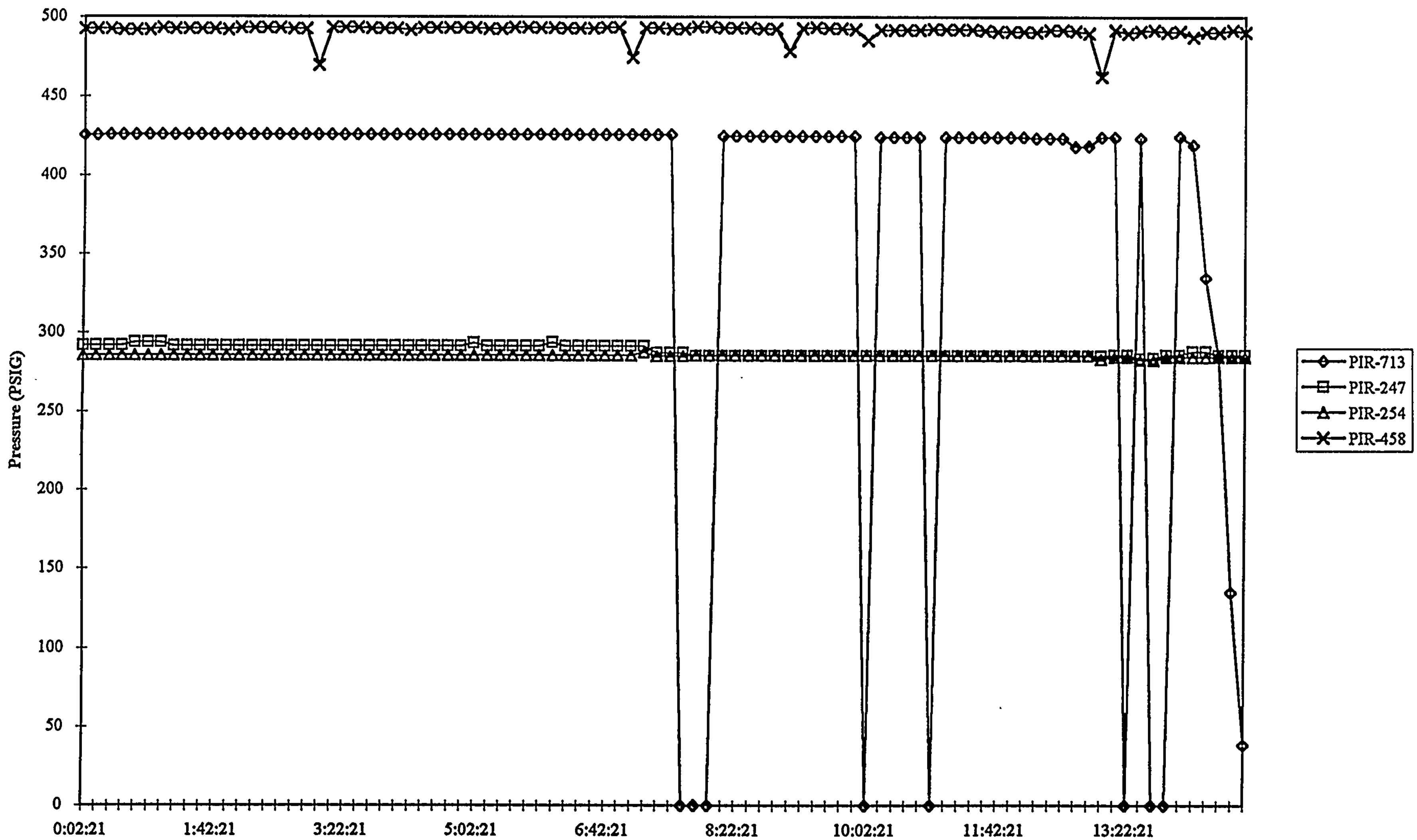
# FBG & MGCR PROCESS PRESSURES
## 94FBG07 - 94MGC07 - 06/13/94



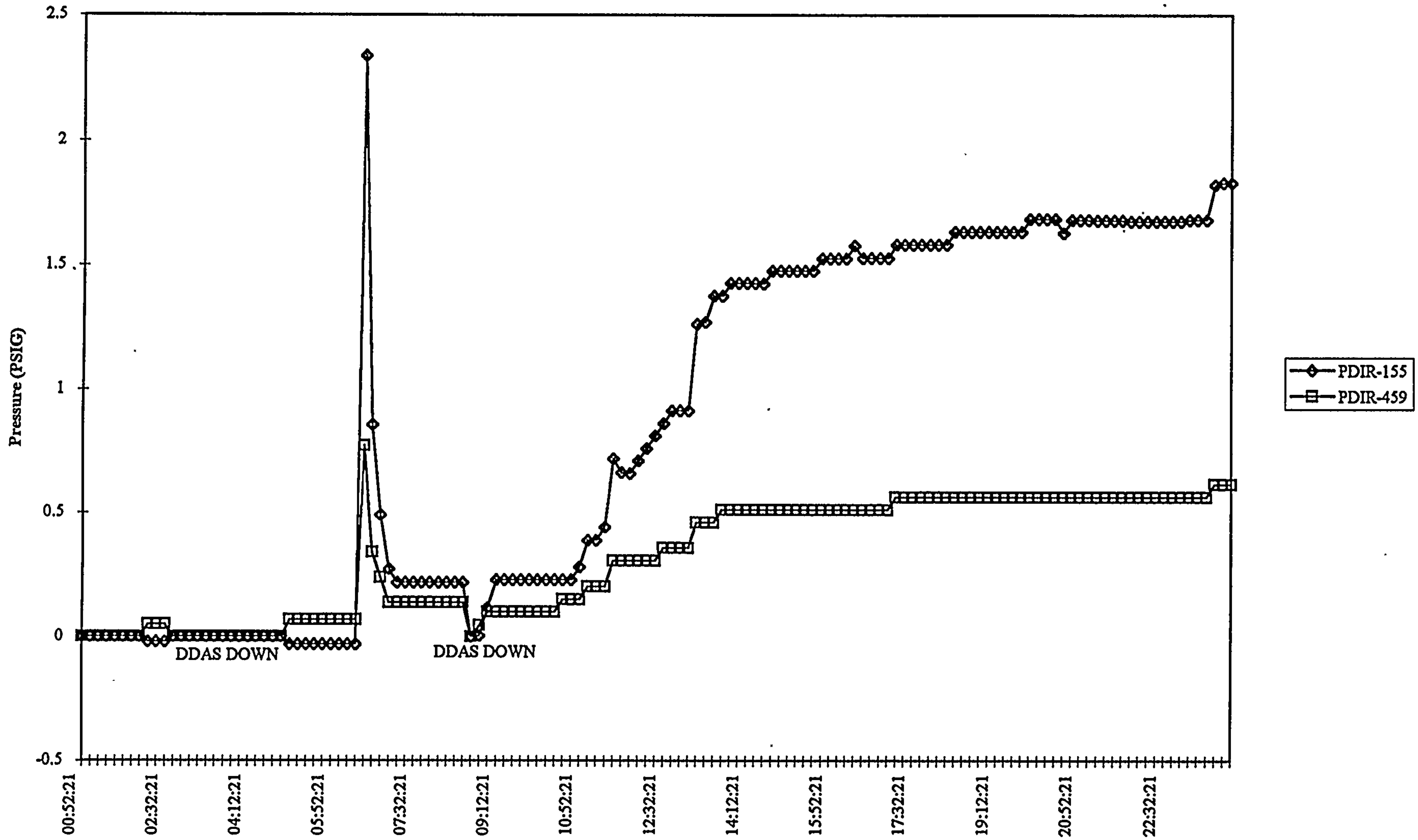
## FBG & MGCR PROCESS PRESSURES
## 94FBG07 - 94MGC07 - 06/14/94



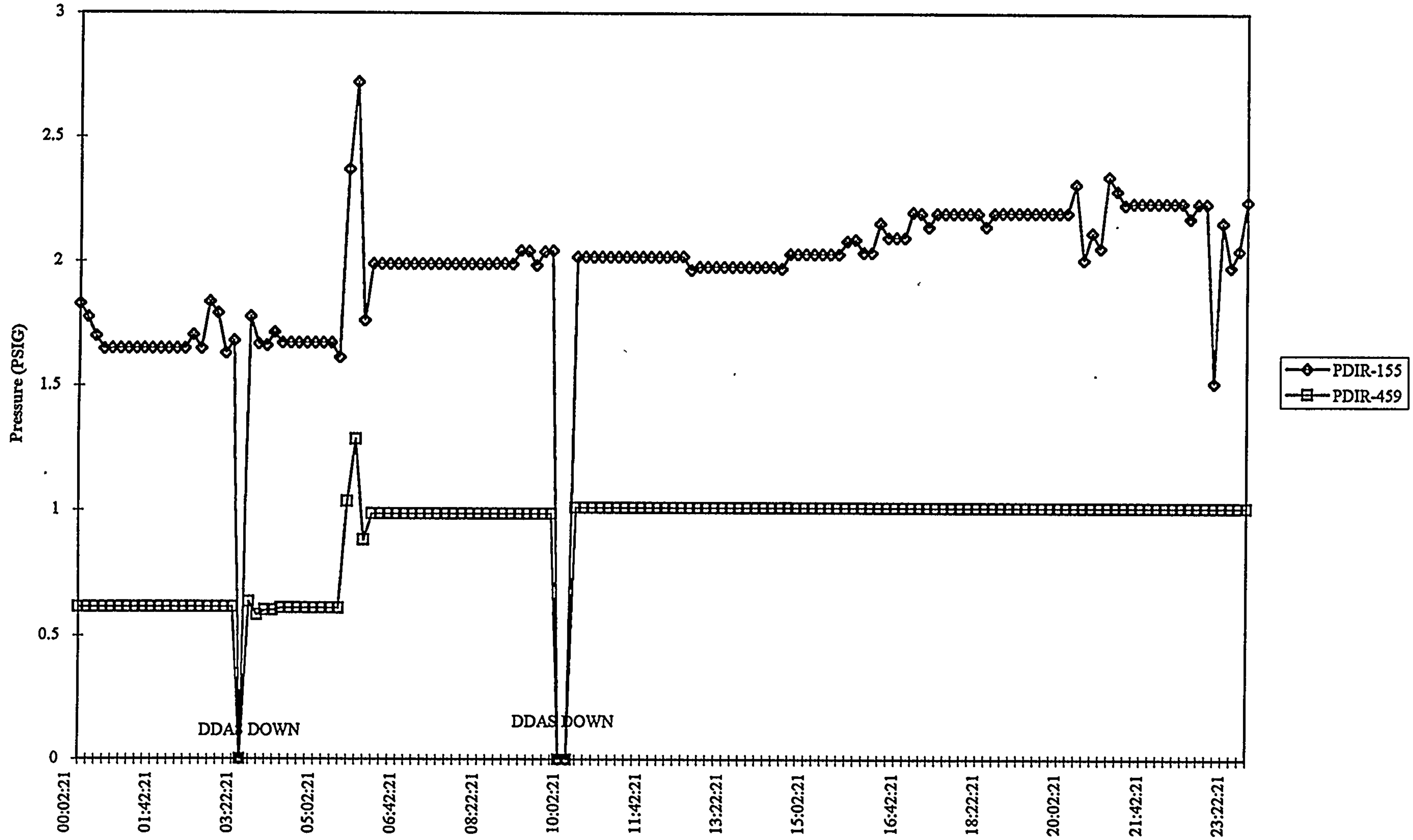
## FBG & MGCR PROCESS PRESSURES
## 94FBG07 - 94MGC07 - 06/15/94



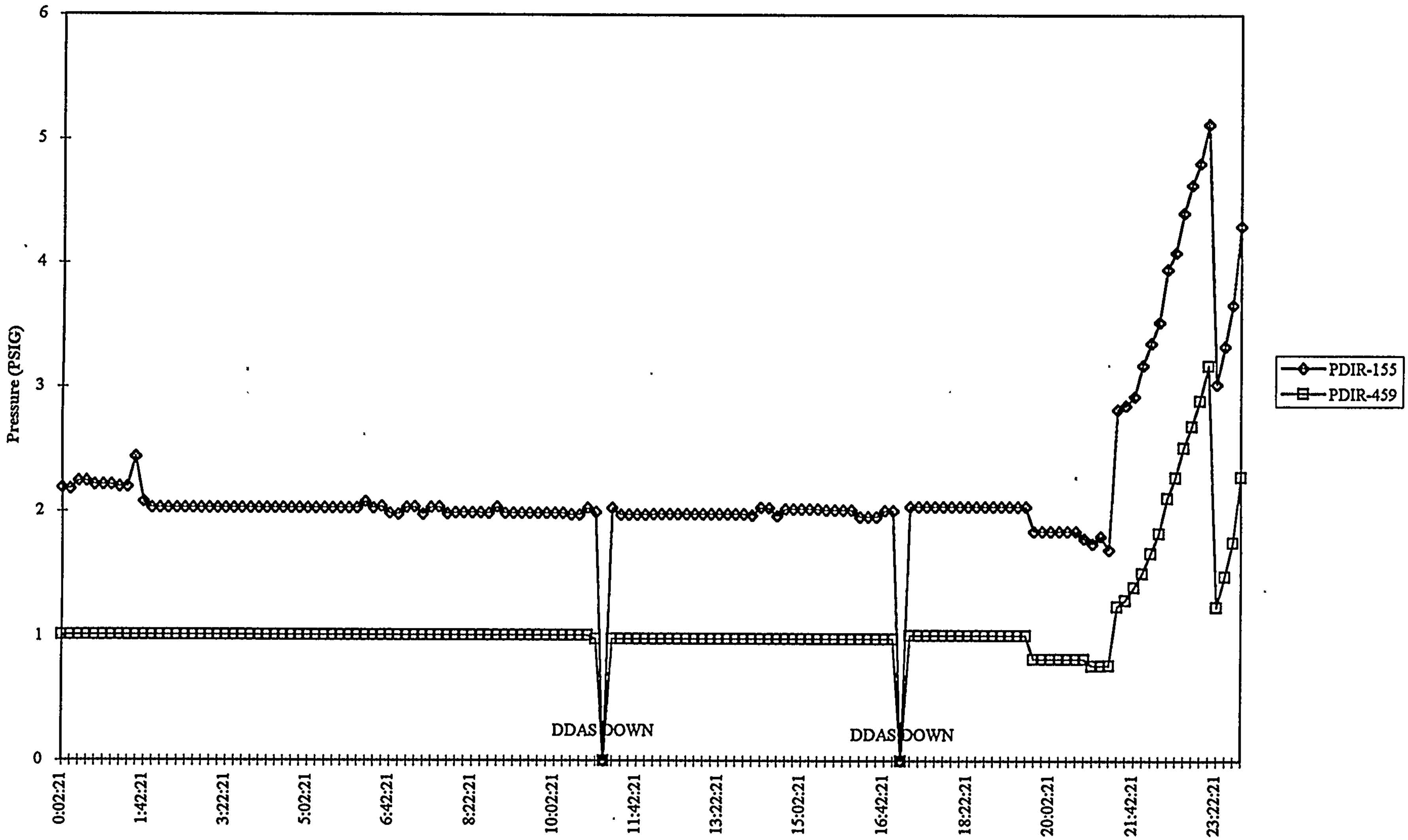
## MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/06/94



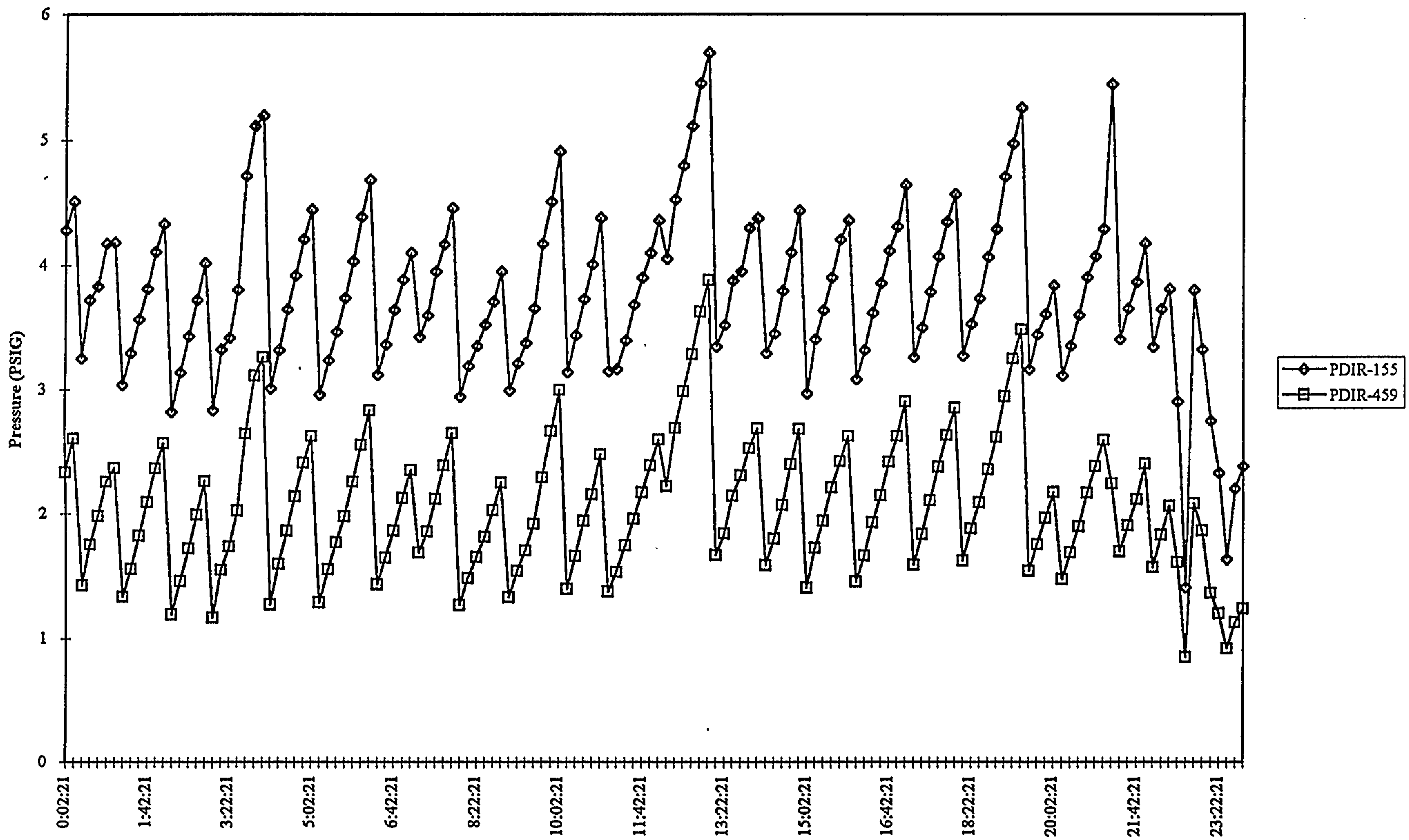
MGCR F-100 DIFFERENTIAL PRESSURE
94MGC07 - 06/07/94



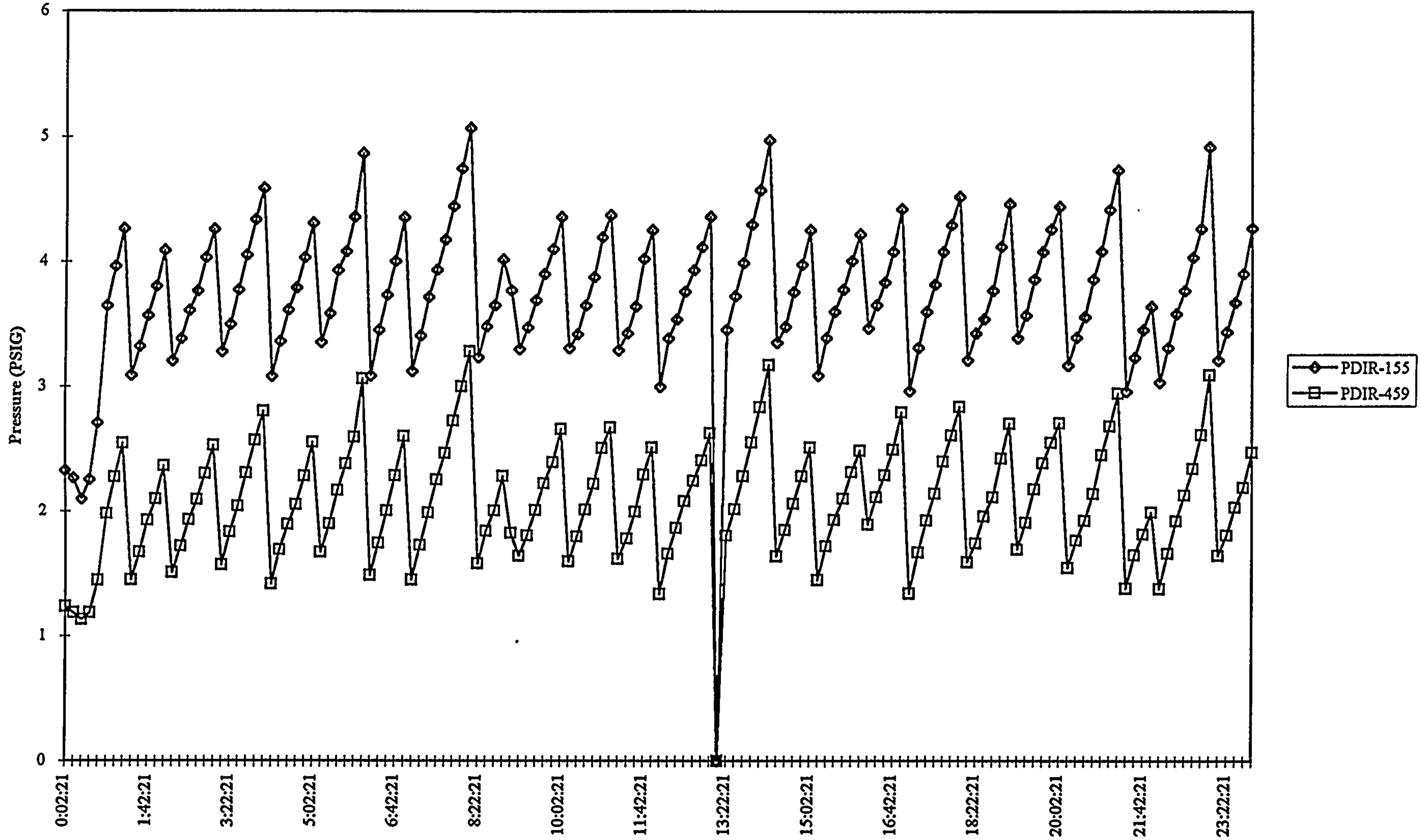
# MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/08/94



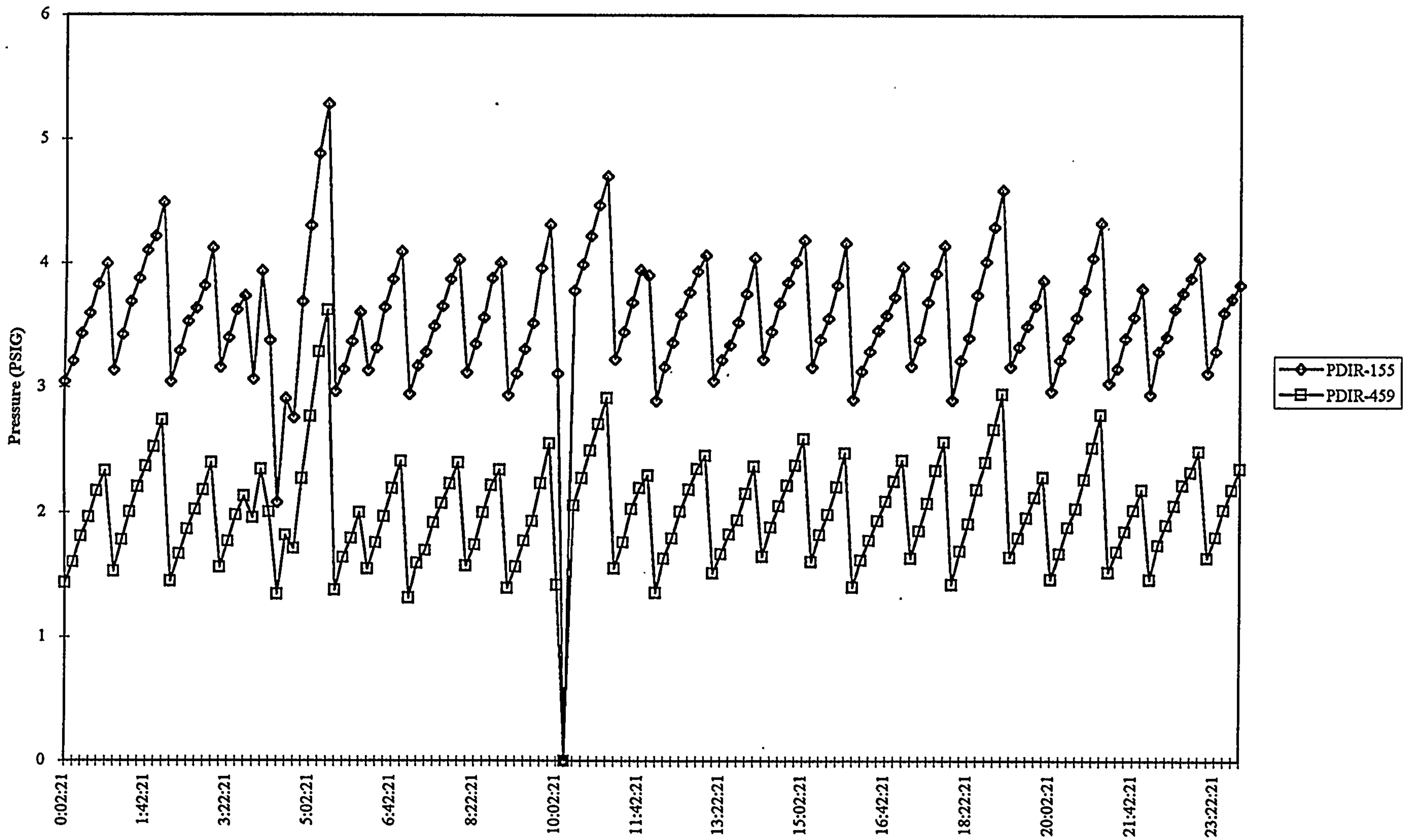
# MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/09/94



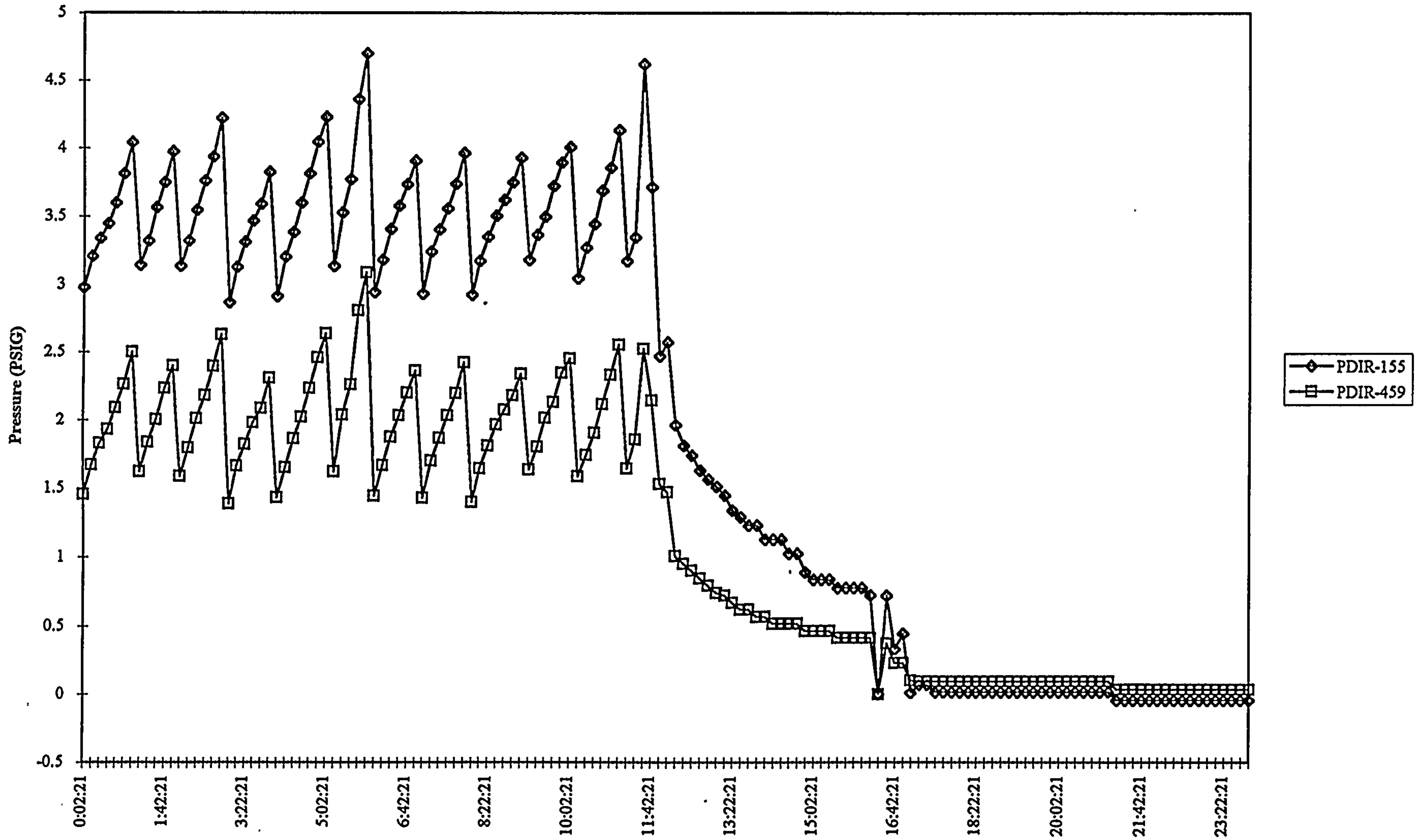
# MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/10/94



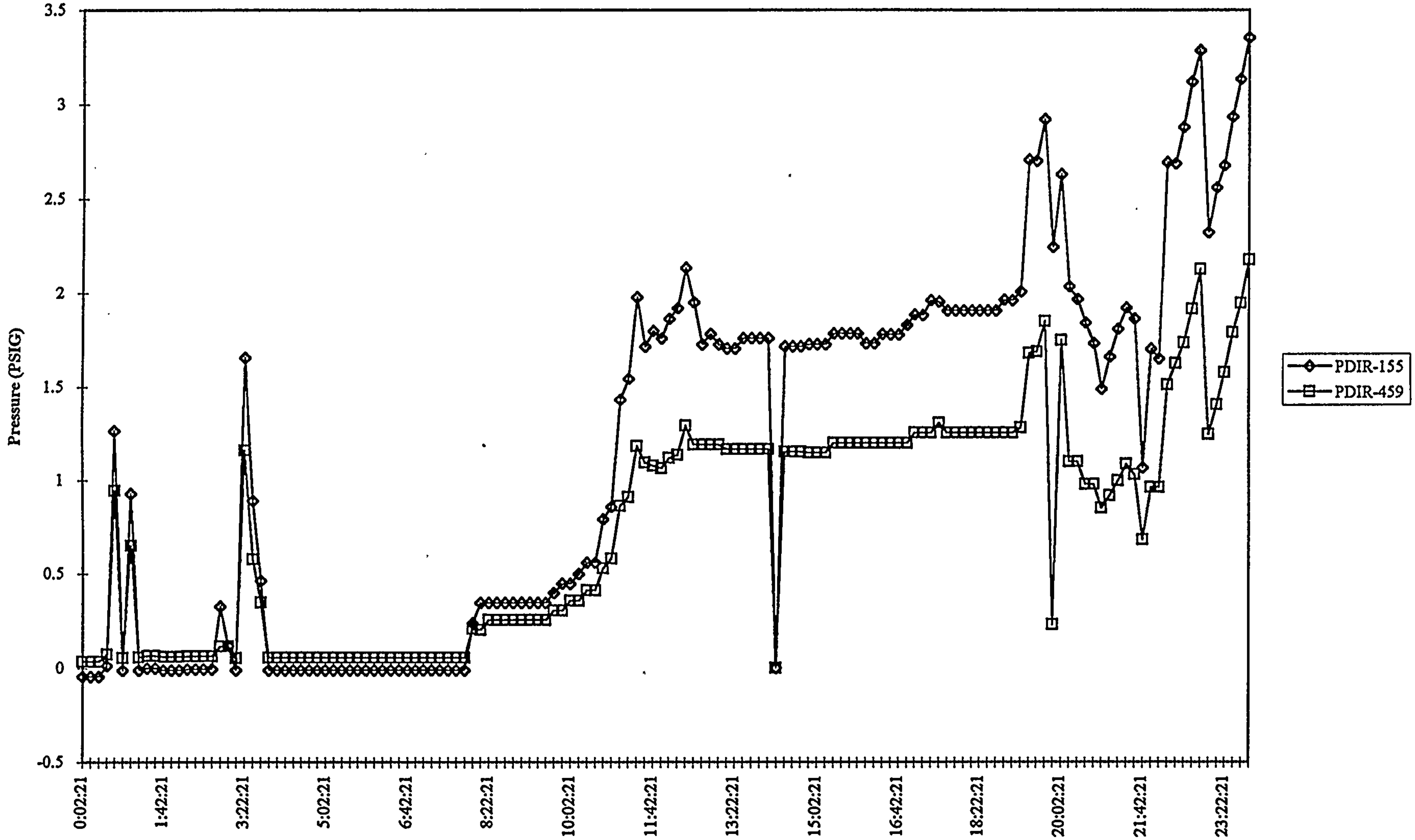
## MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/11/94



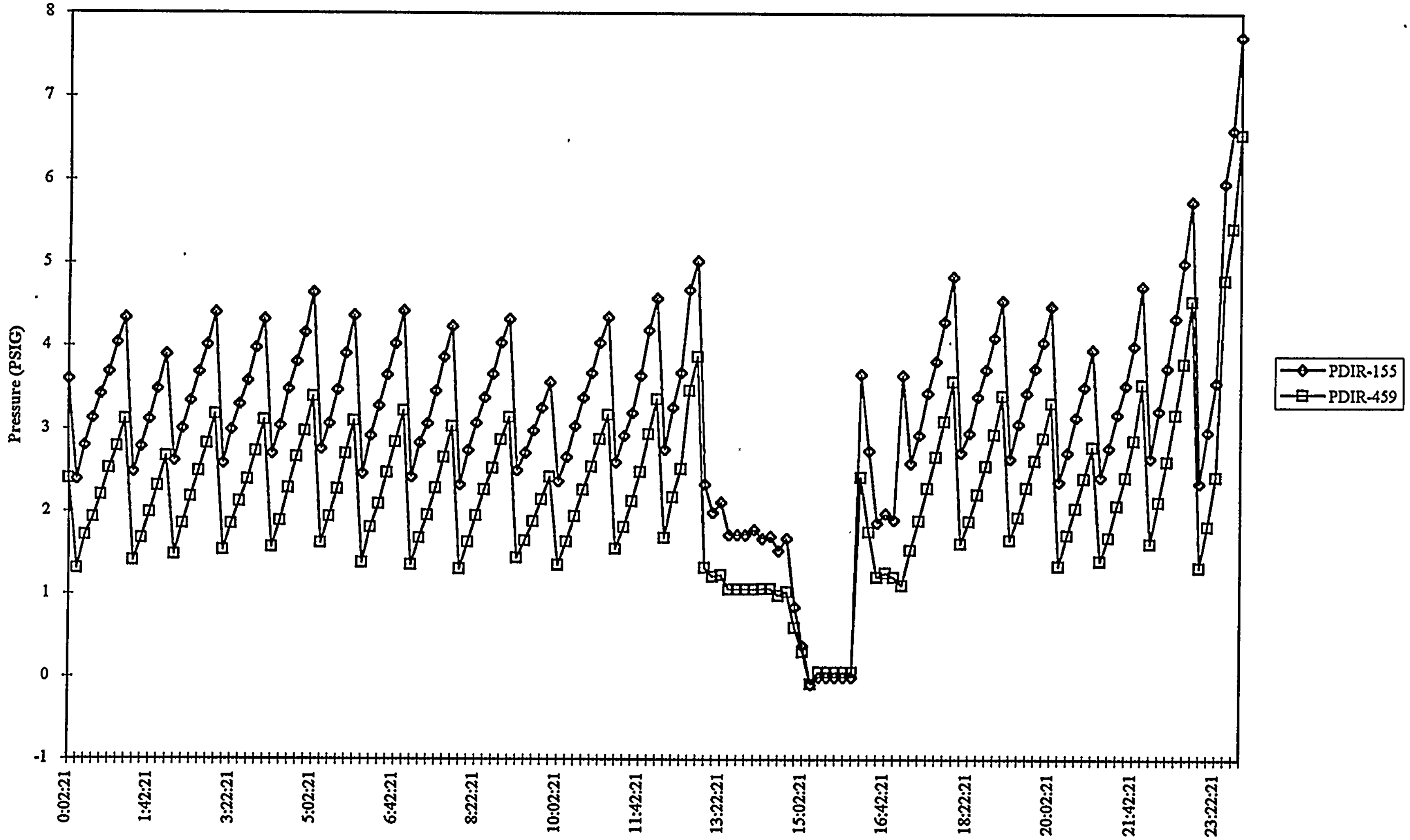
# MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/12/94



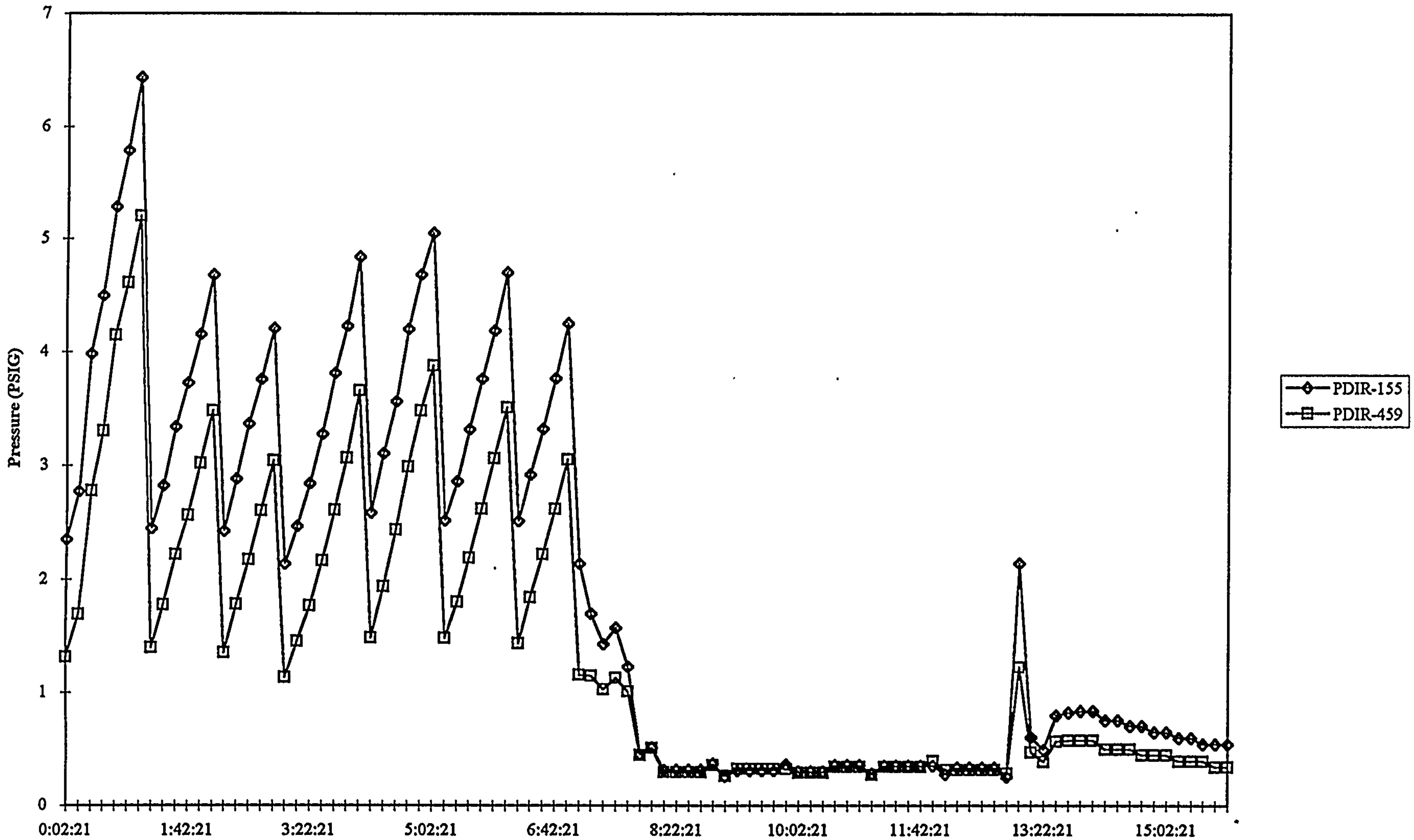
# MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/13/94



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

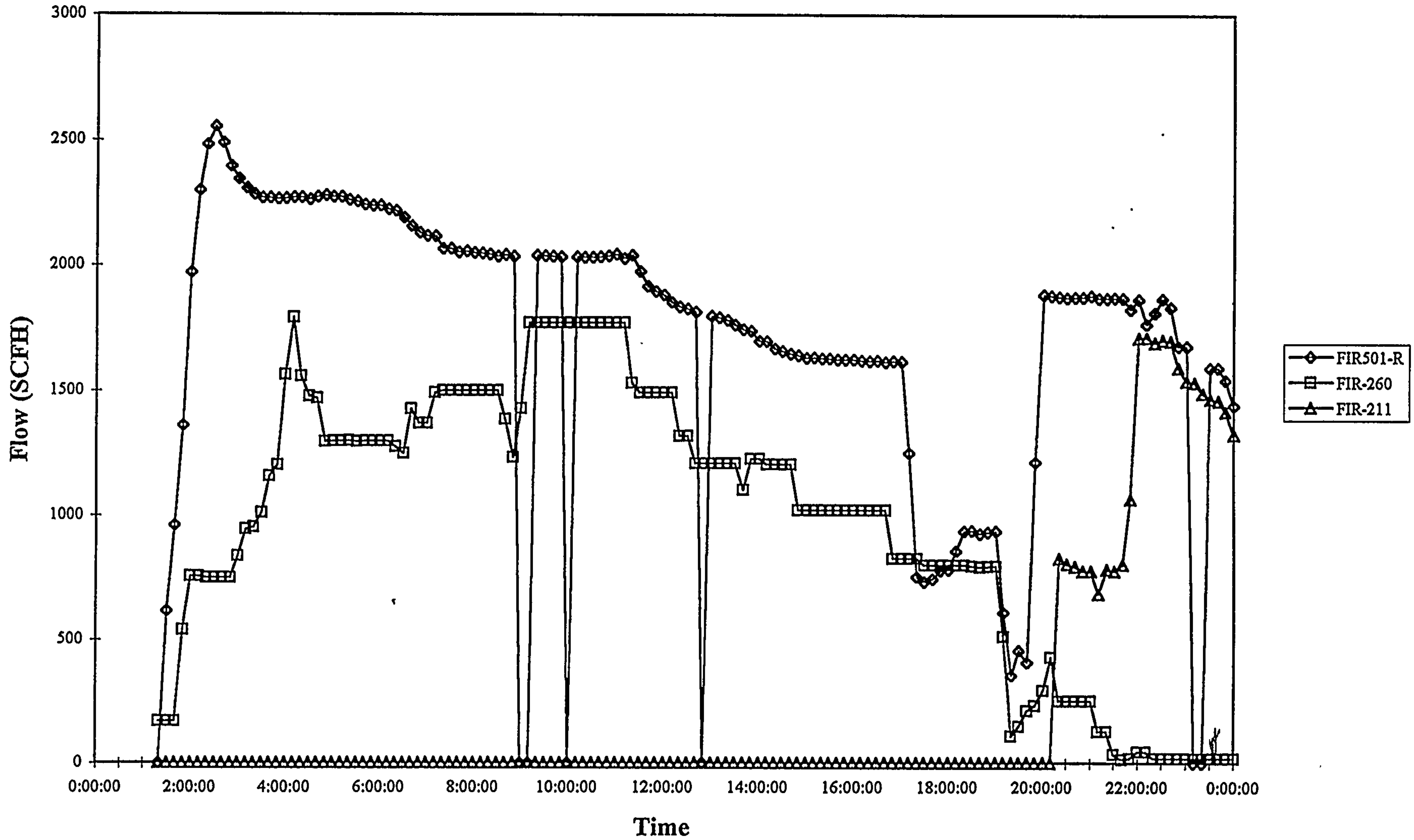


# MGCR F-100 DIFFERENTIAL PRESSURE
## 94MGC07 - 06/15/94

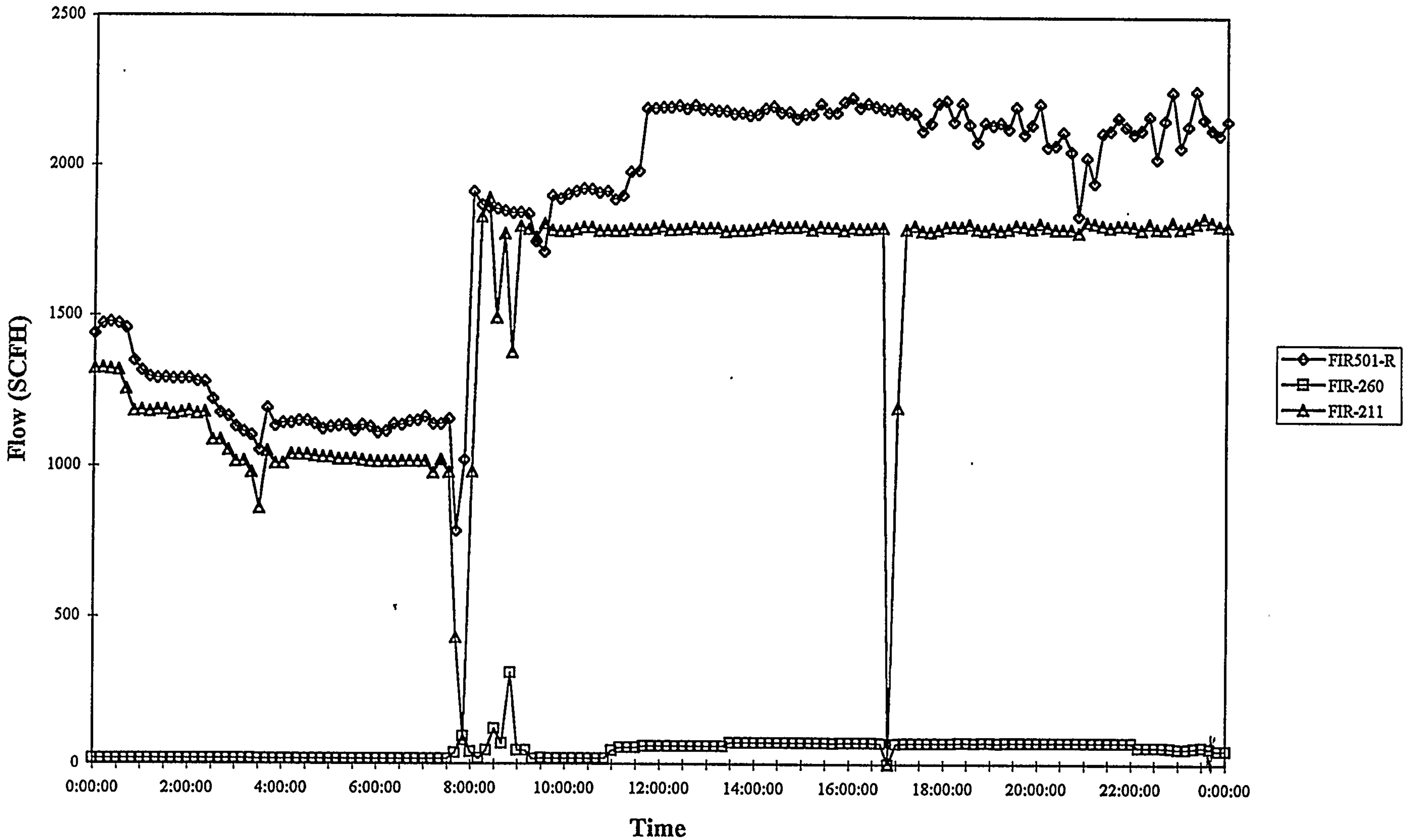


# 94MGC08
# (07/18/94 - 07/27/94)

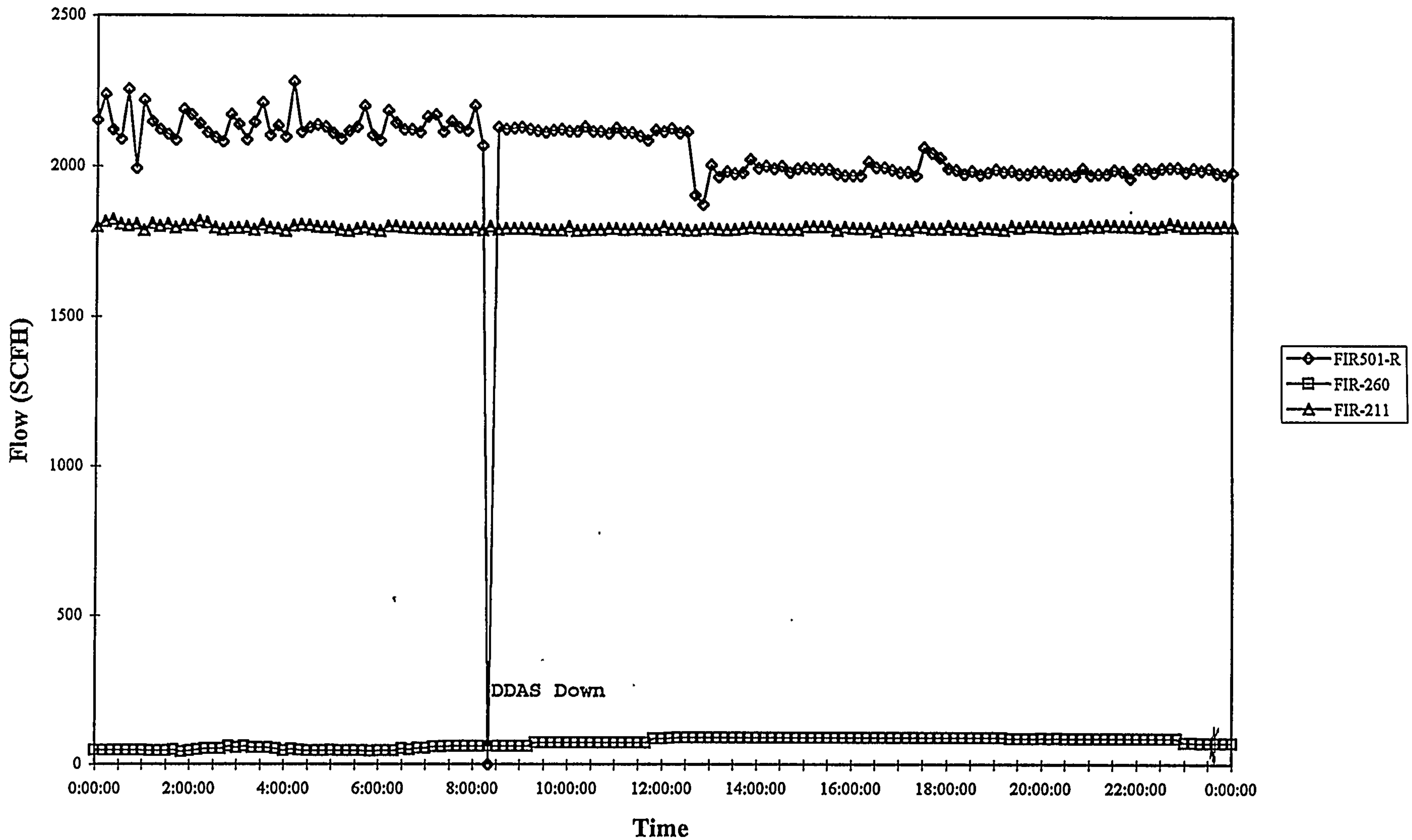
MGCR Inlet and Exit Flows
Run 94MGC08, 07/18/94



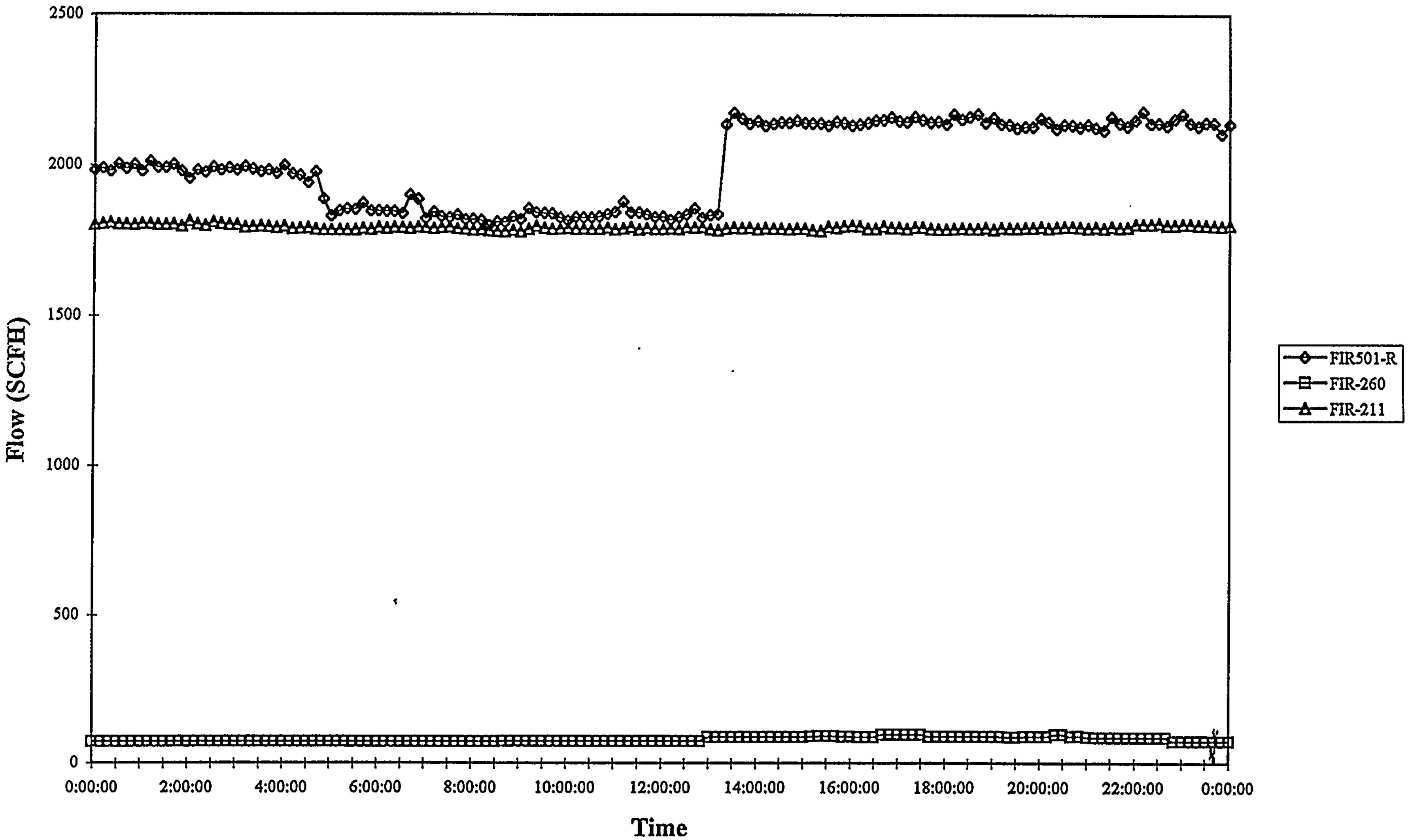
MGCR Inlet and Exit Flows
Run 94MGC08, 07/19/94



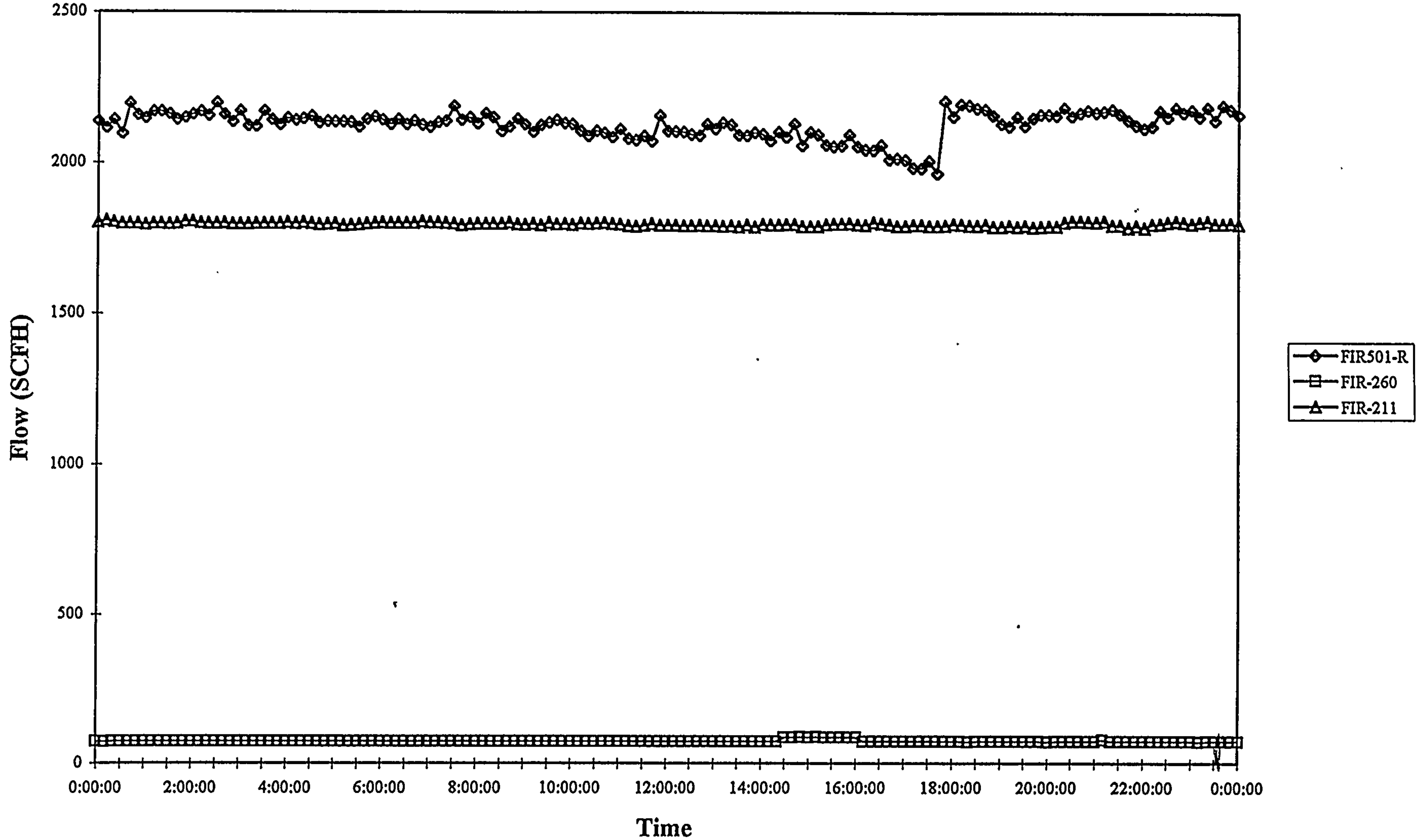
## MGCR Inlet and Exit Flows
## Run 94MGC08, 07/20/94



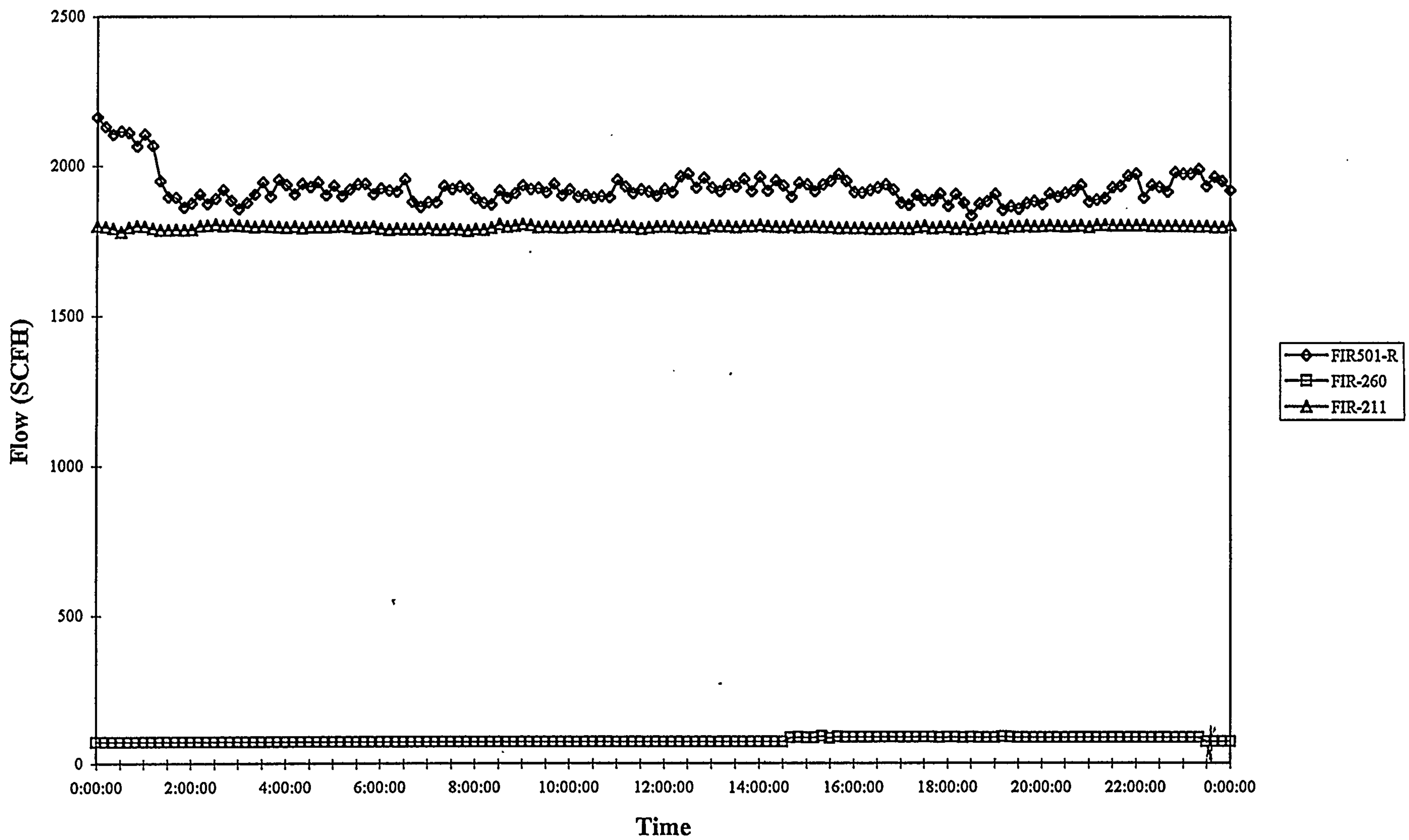
## MGCR Inlet and Exit Flows
## Run 94MGC08, 07/21/94



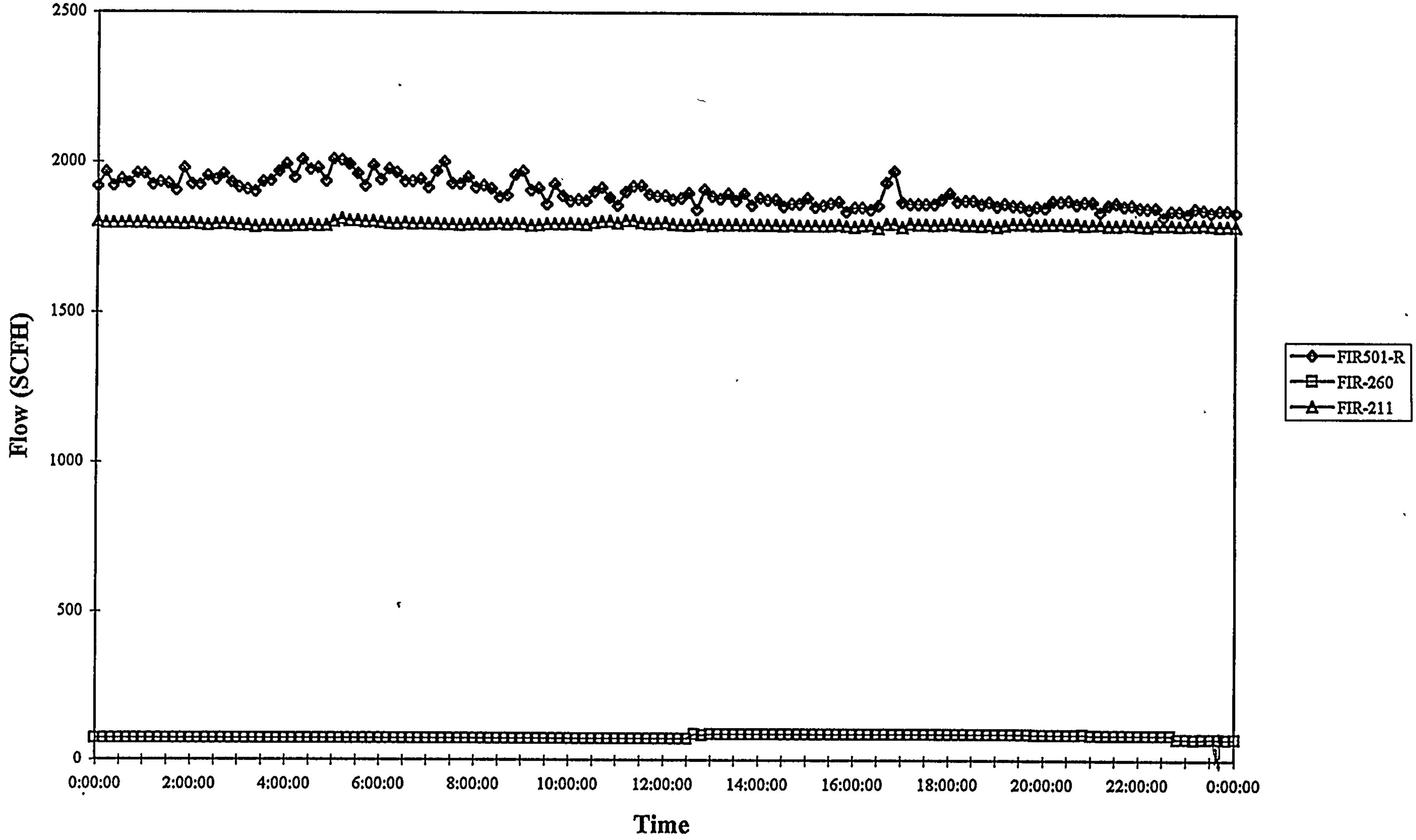
## MGCR Inlet and Exit Flows
## Run 94MGC08, 07/22/94



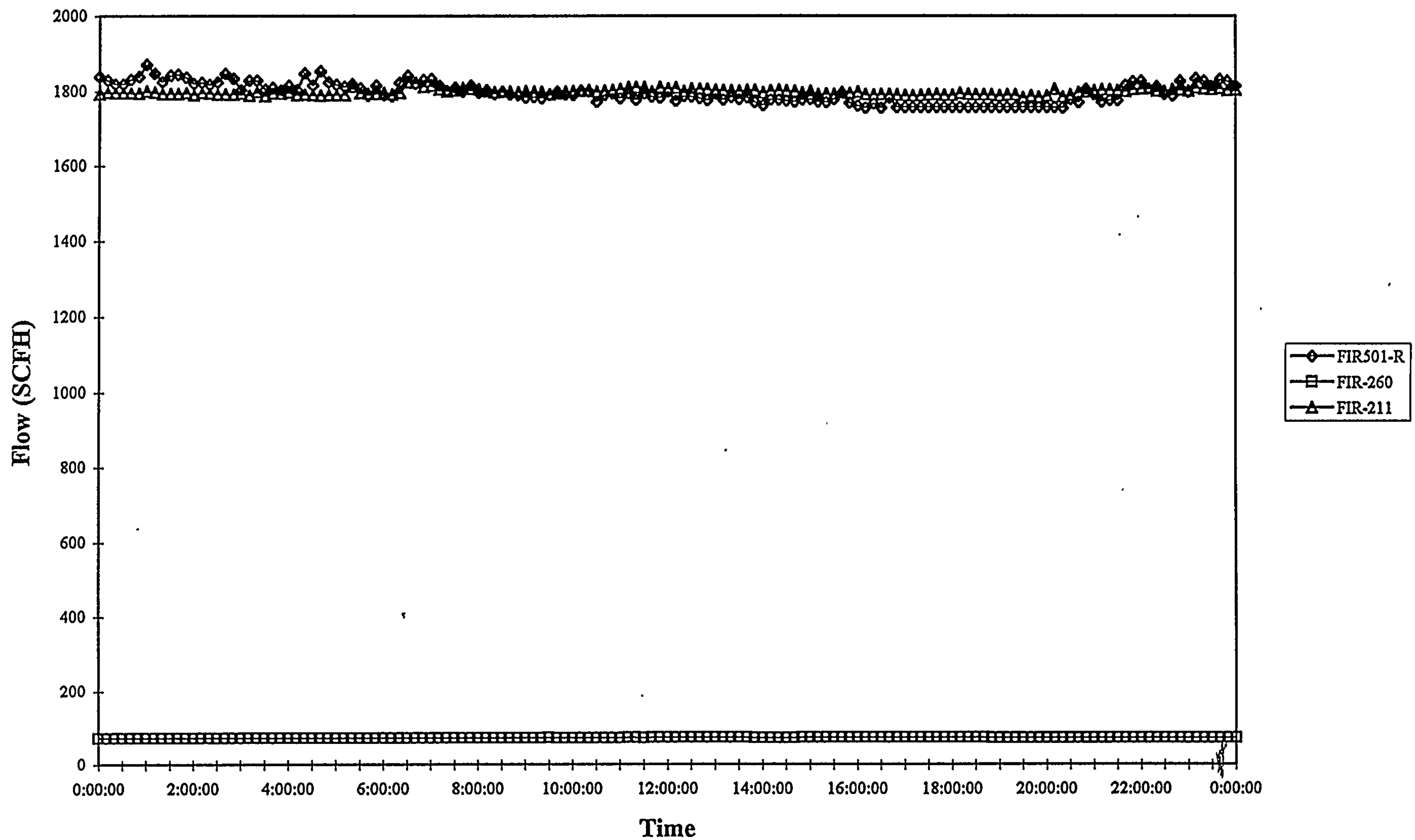
MGCR Inlet and Exit Flows
Run 94MGC08, 07/23/94



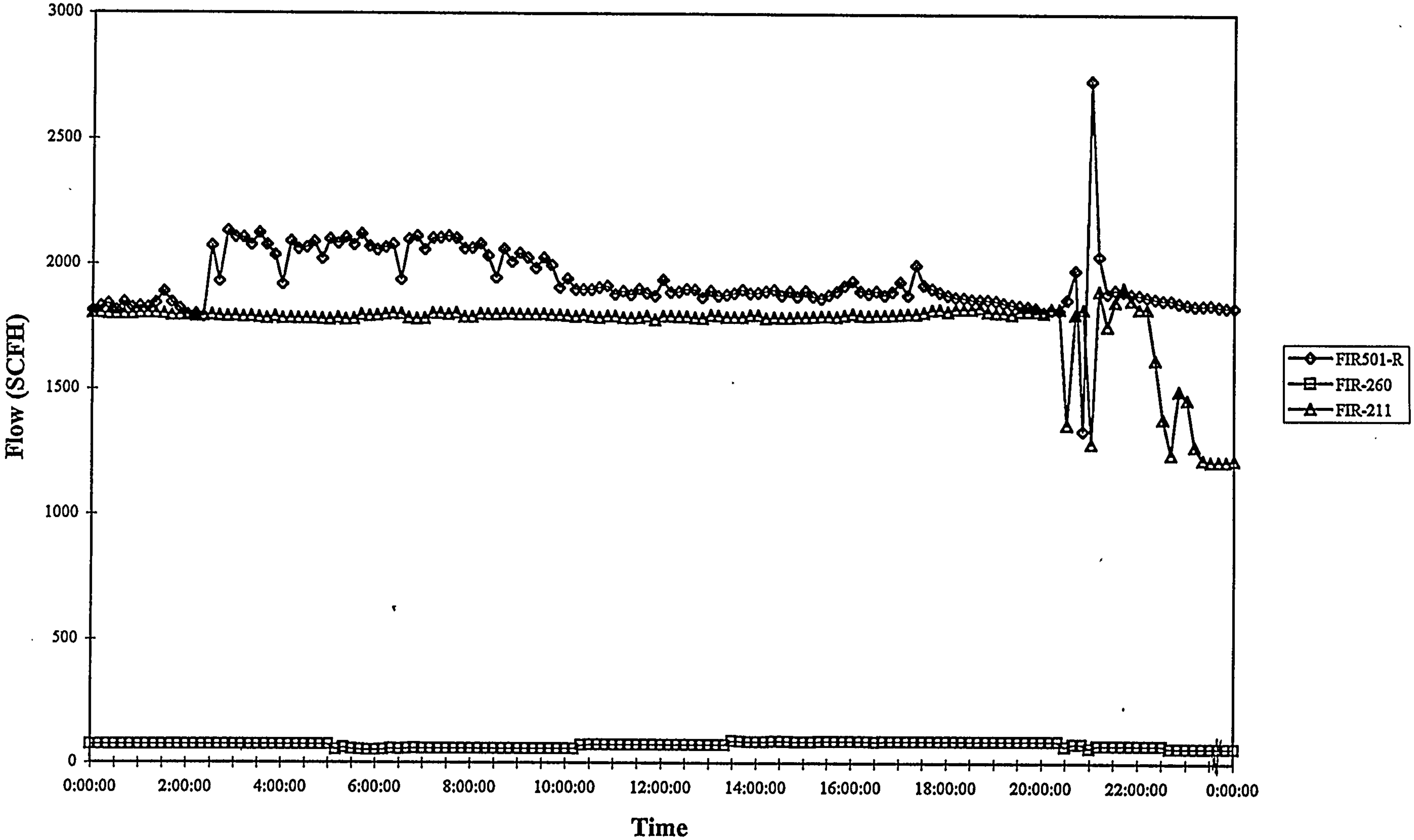
## MGCR Inlet and Exit Flows
## Run 94MGC08, 07/24/94



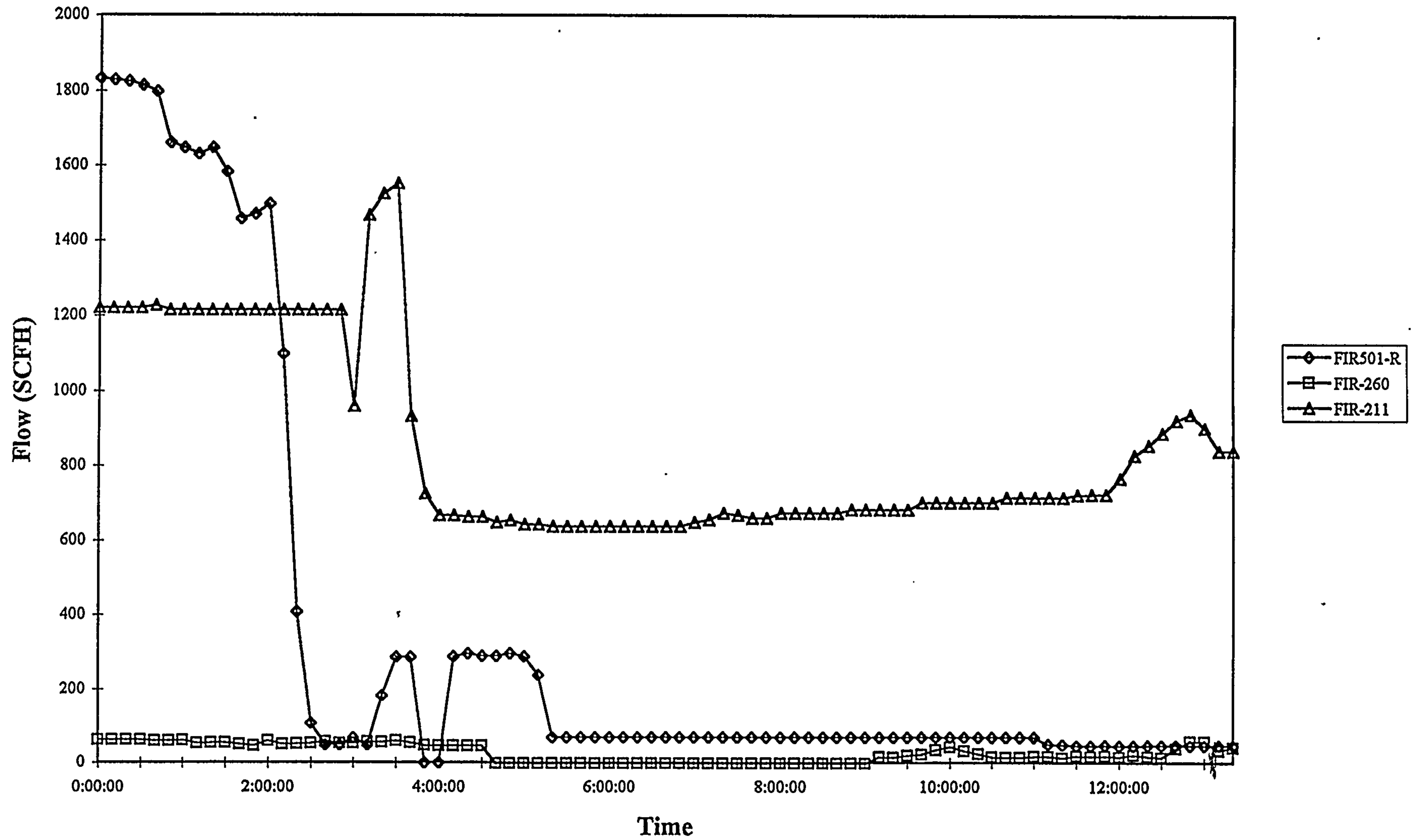
## MGCR Inlet and Exit Flows
## Run 94MGC08, 07/25/94



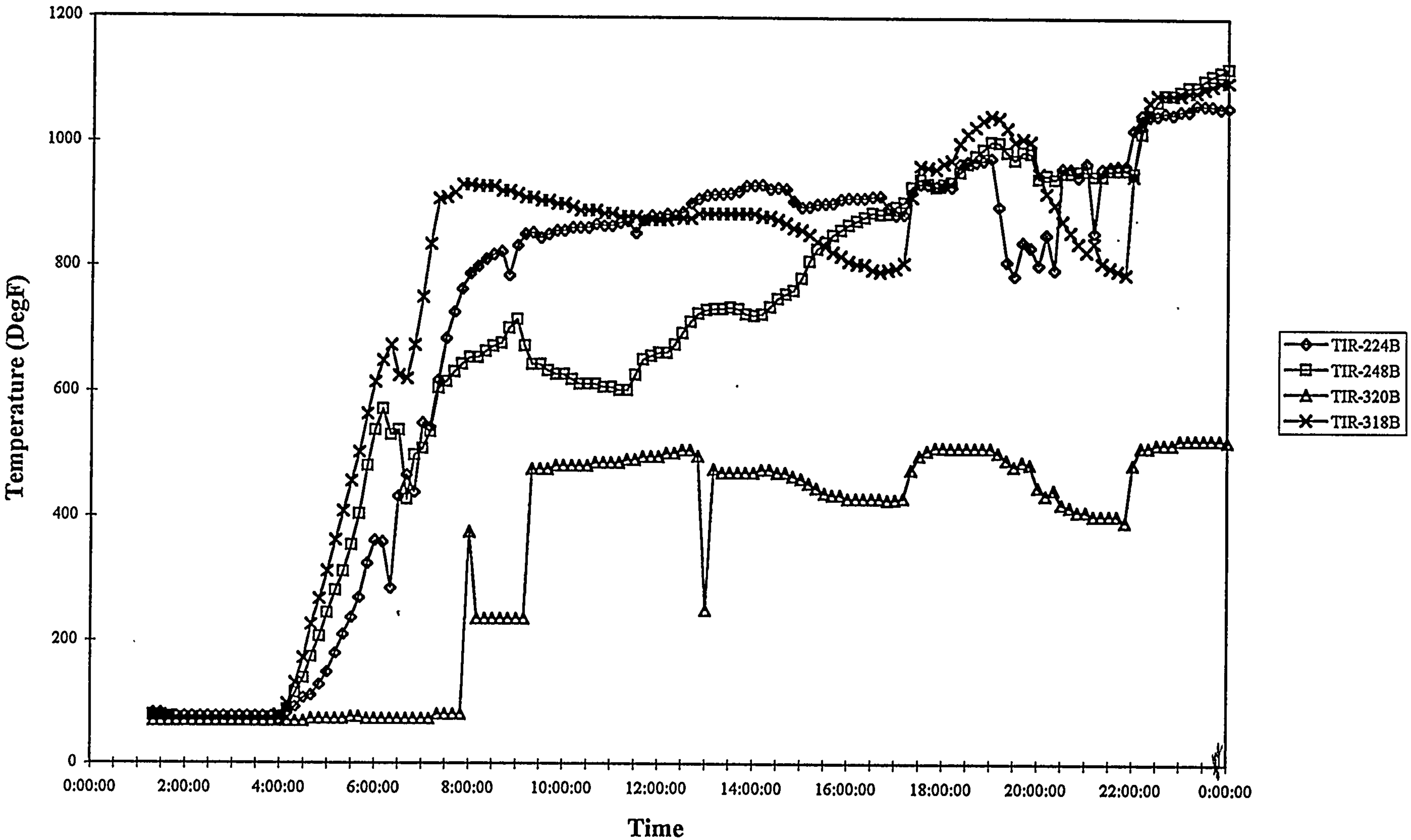
## MGCR Inlet and Exit Flows
## Run 94MGC08, 07/26/94



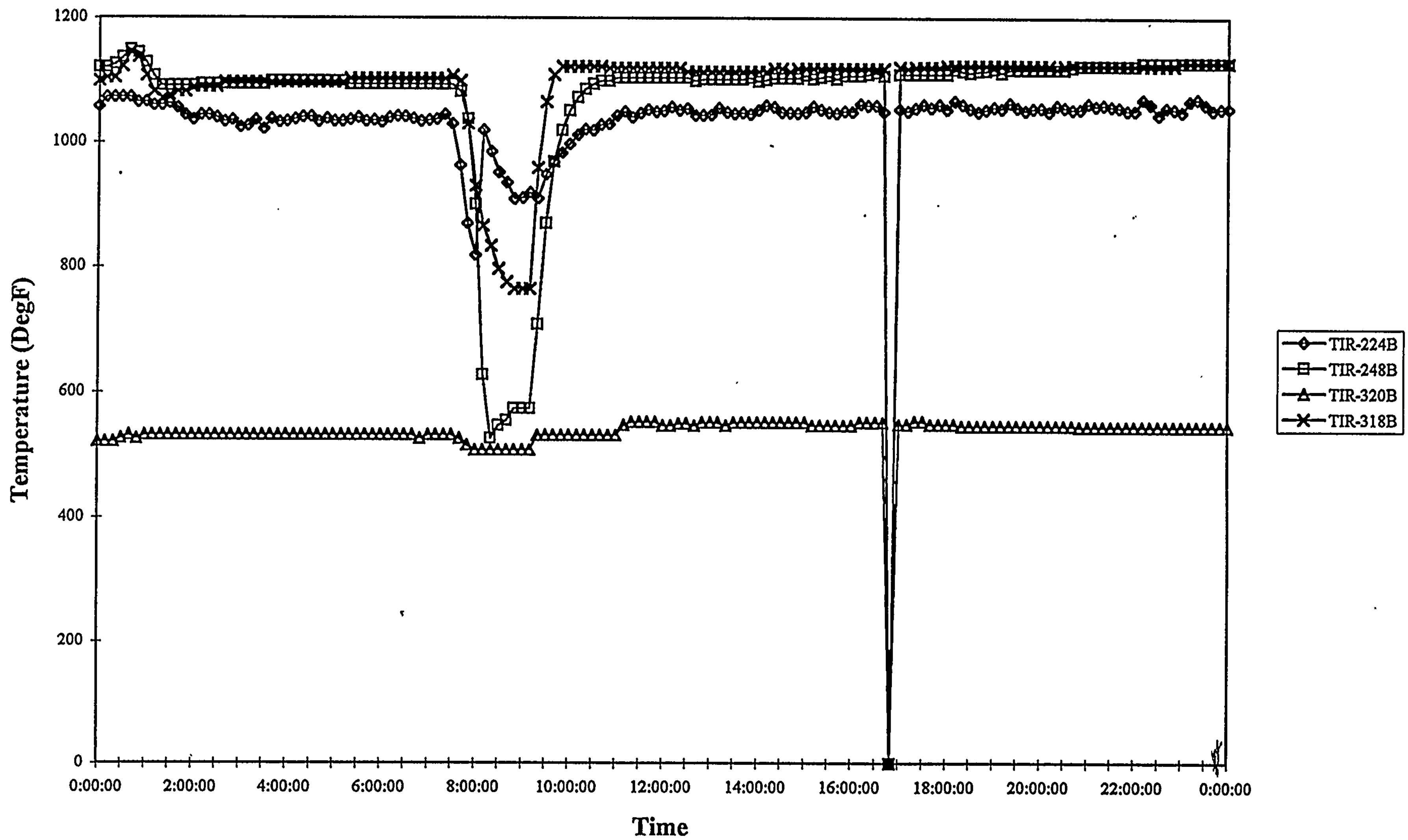
MGCR Inlet and Exit Flows
Run 94MGC08, 07/27/94

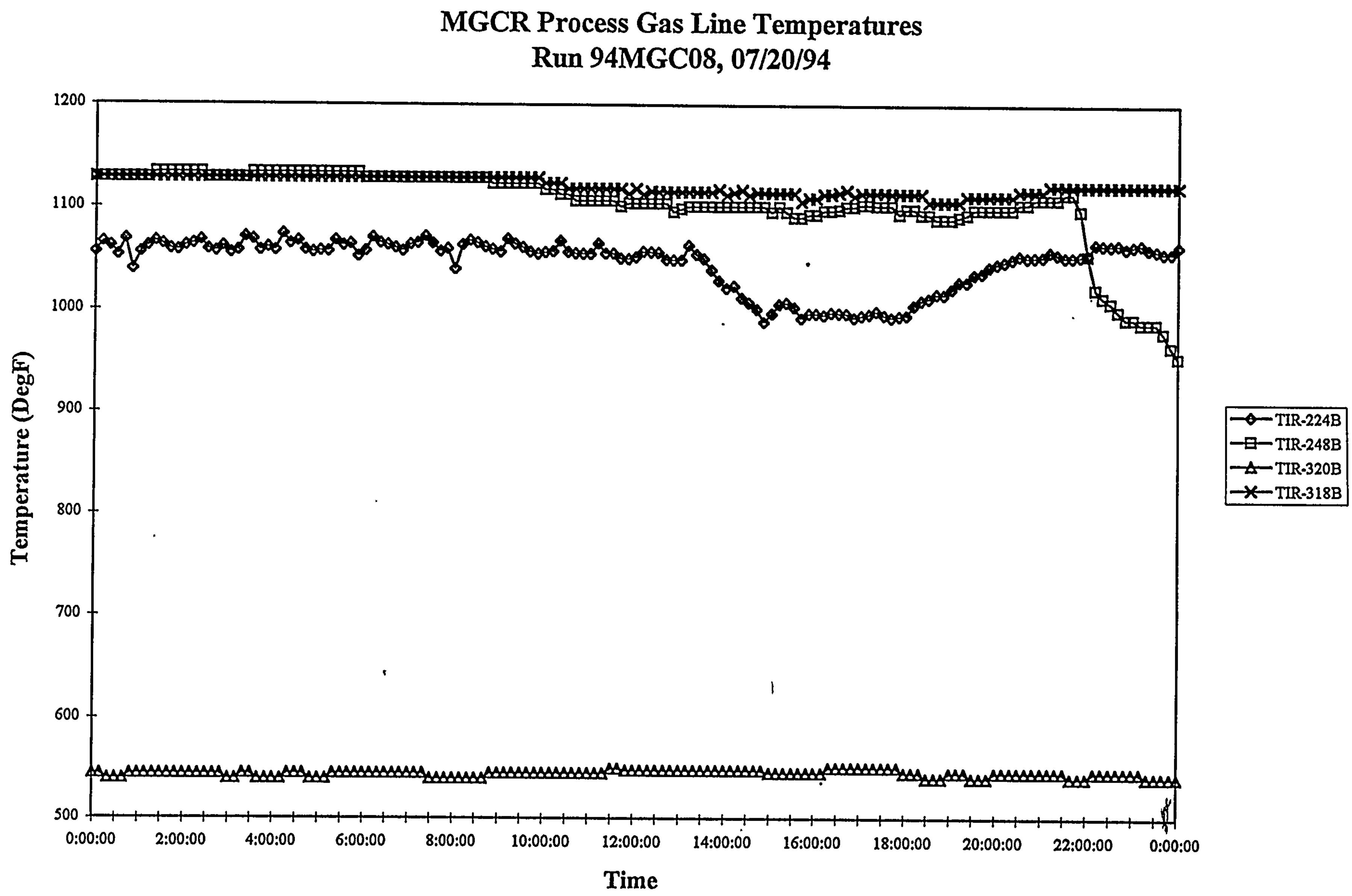


# MGCR Process Gas Line Temperatures
## Run 94MGC08, 07/18/94



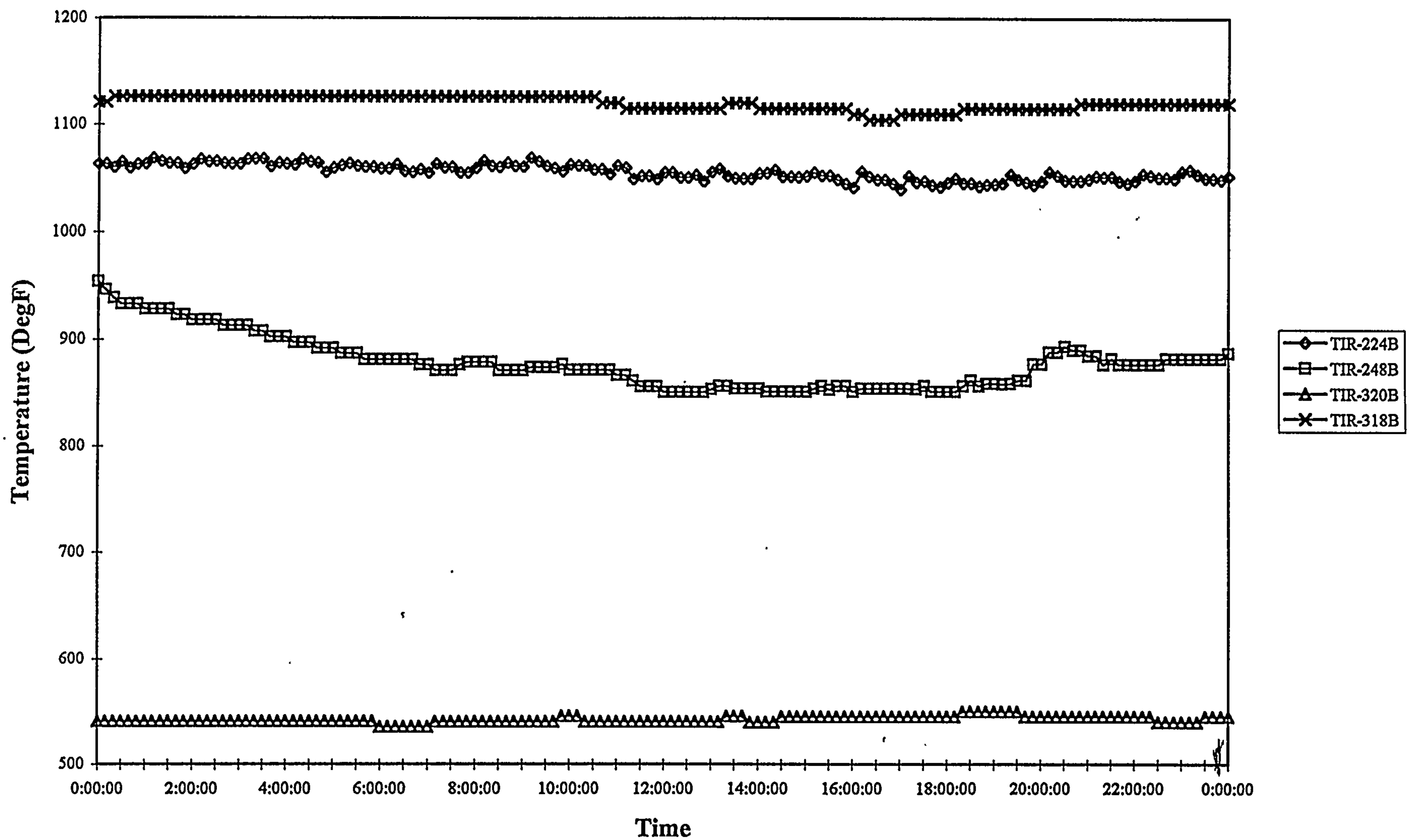
## MGCR Process Gas Line Temperatures
## Run 94MGC08, 07/19/94



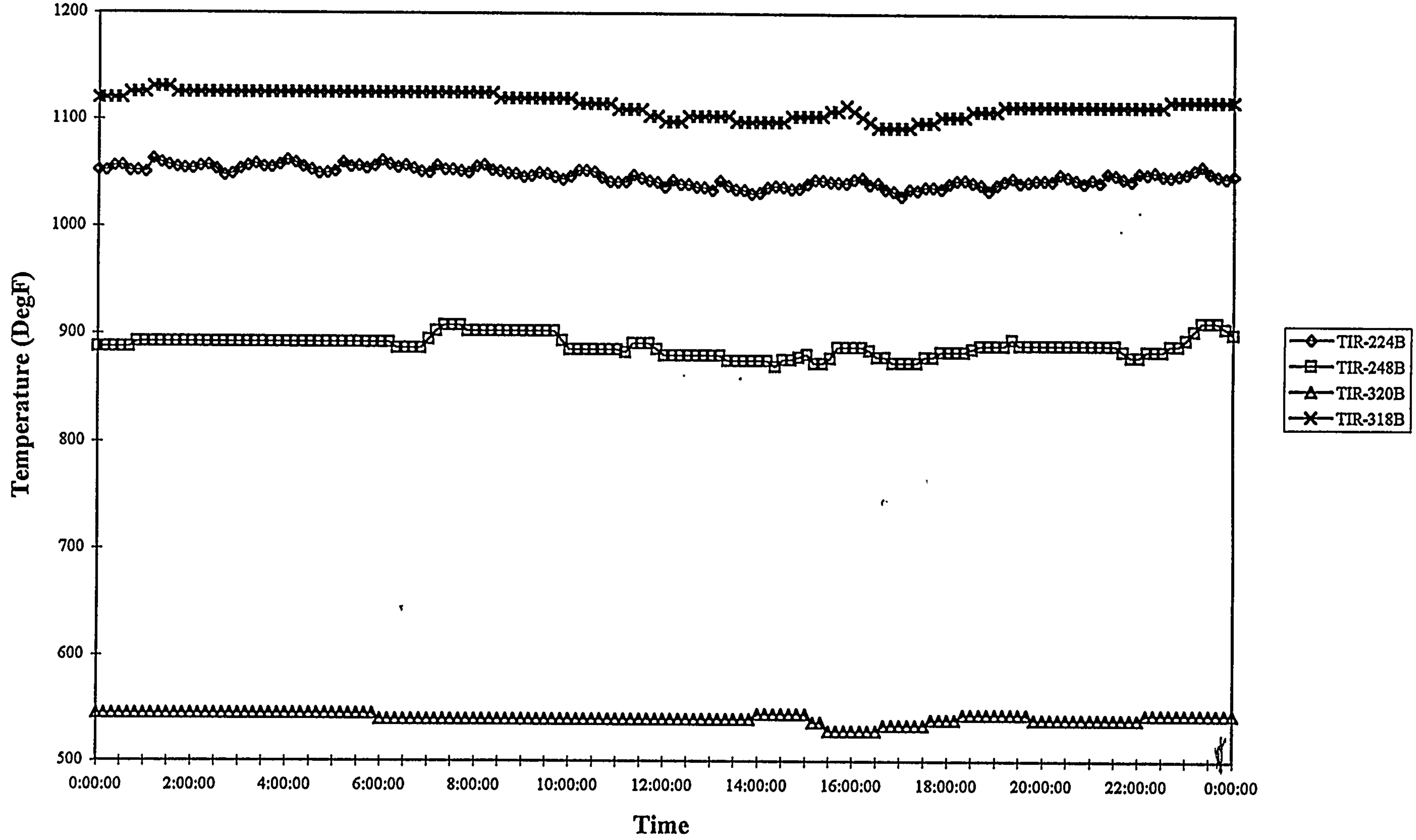


MGCR Process Gas Line Temperatures
Run 94MGC08, 07/20/94
Temperature (DegF)
1200
1100
1000
900
800
700
600
500
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
16:00:00
18:00:00
20:00:00
22:00:00
0:00:00
Time
TIR-224B
TIR-248B
TIR-320B
TIR-318B

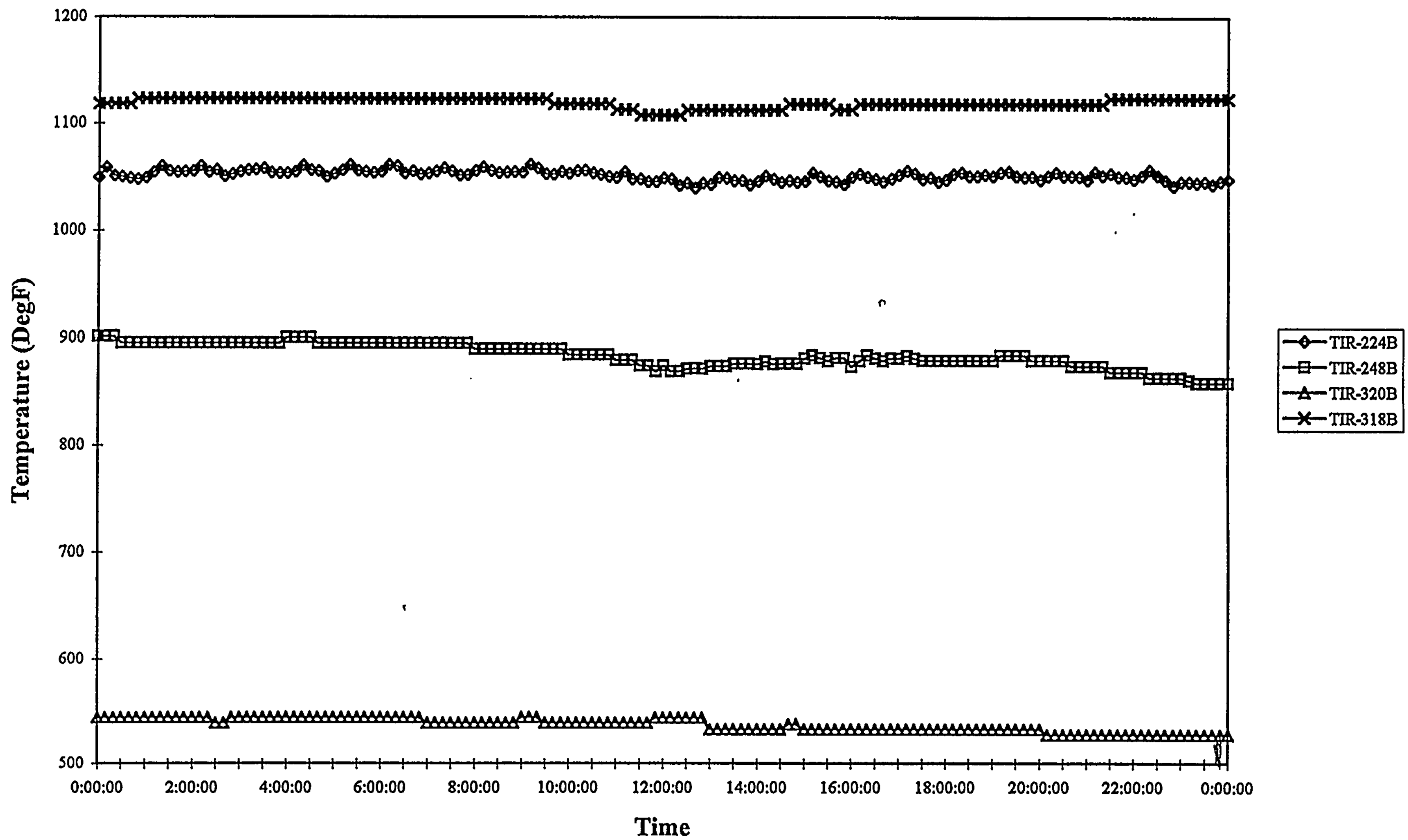
## MGCR Process Gas Line Temperatures
## Run 94MGC08, 07/21/94



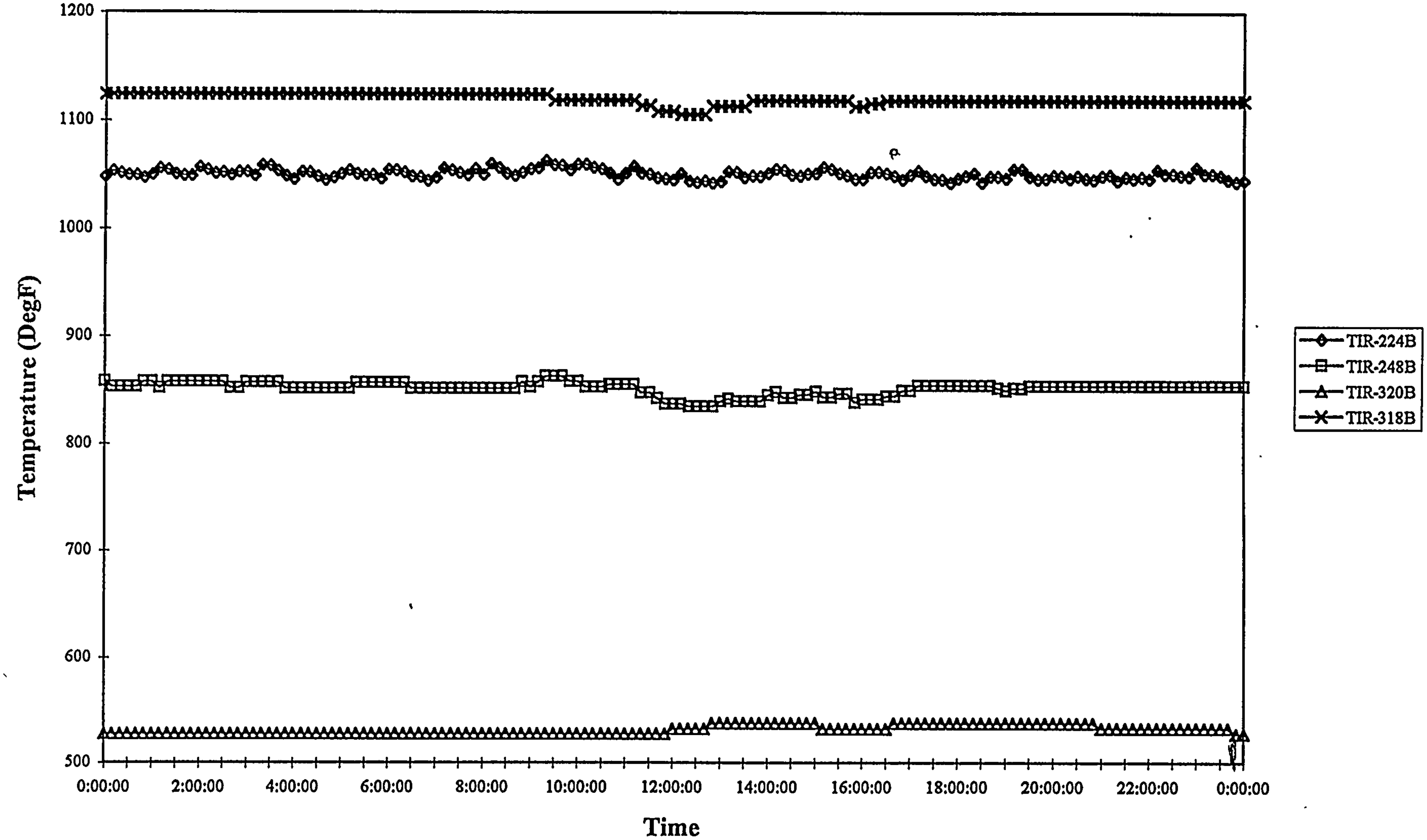
## MGCR Process Gas Line Temperatures
## Run 94MGC08, 07/22/94

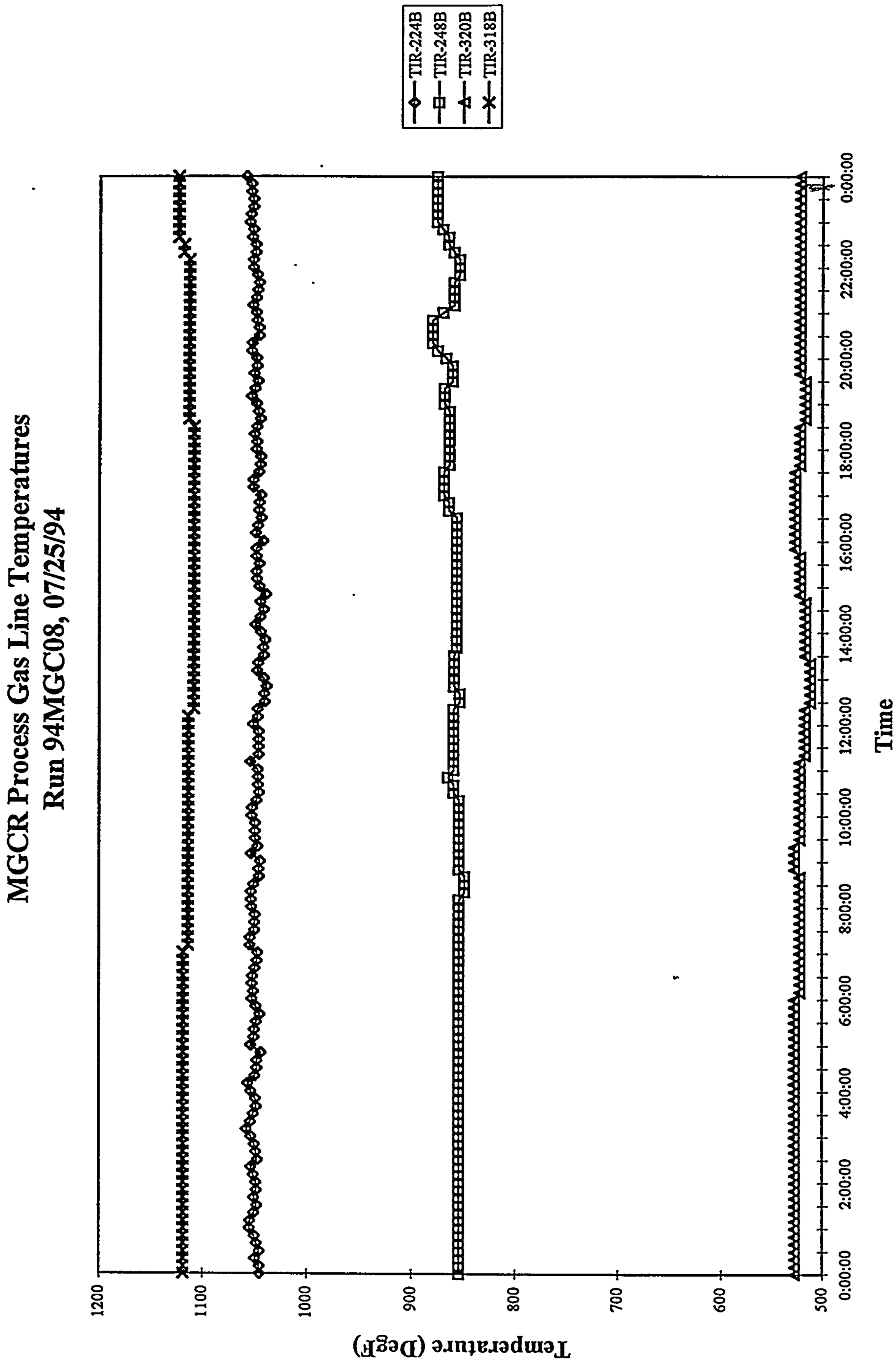


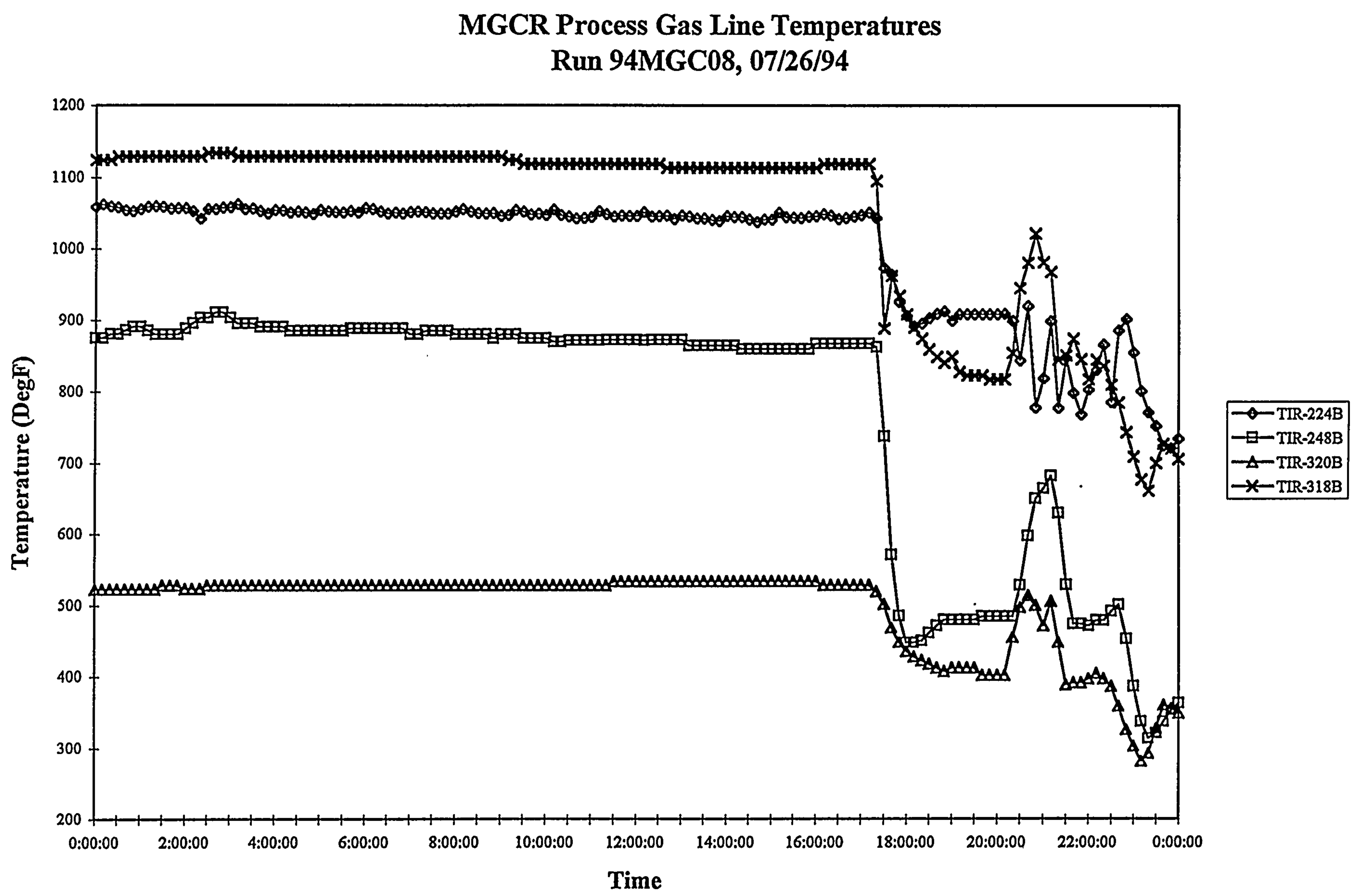
## MGCR Process Gas Line Temperatures
## Run 94MGC08, 07/23/94



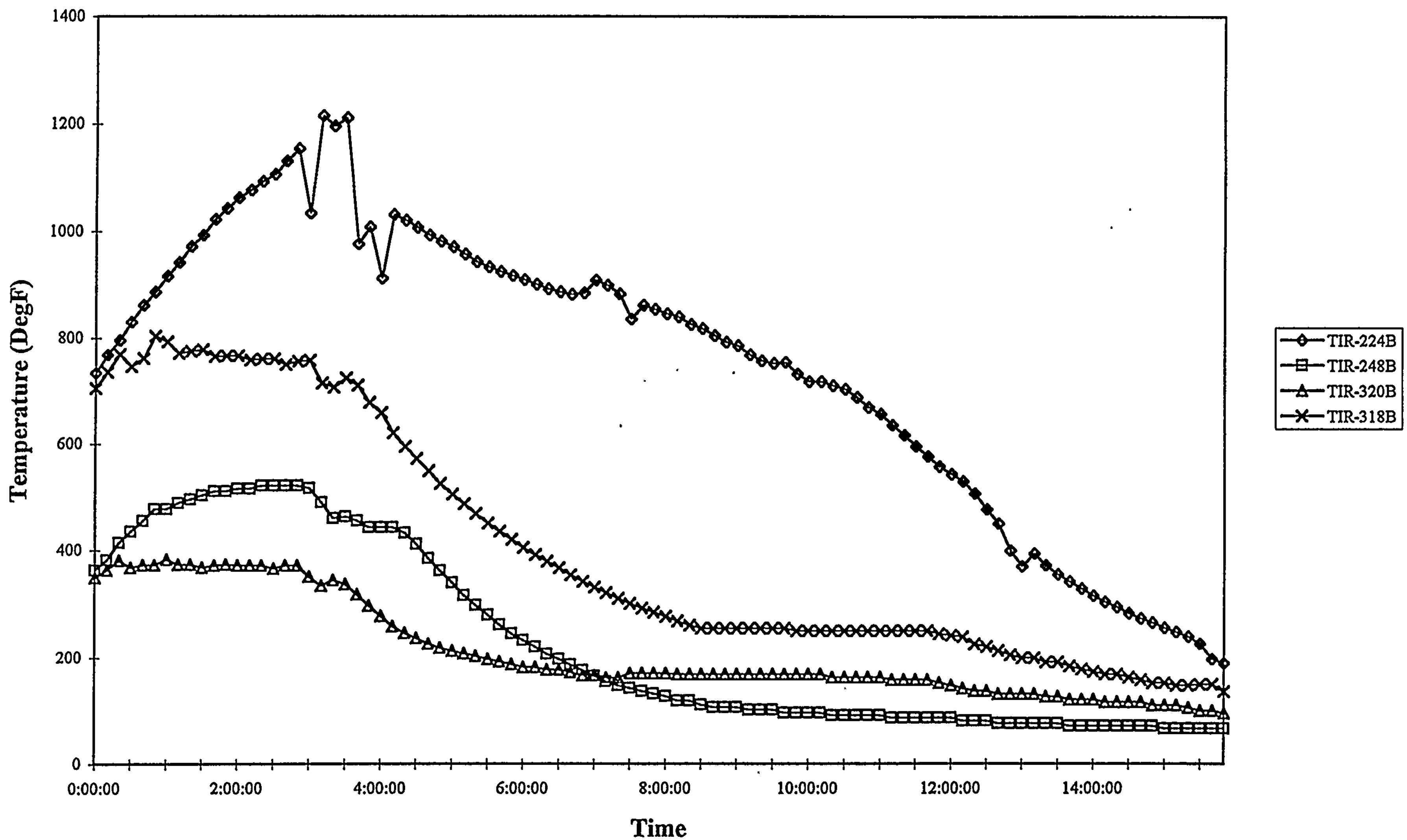
## MGCR Process Gas Line Temperatures
## Run 94MGC08, 07/24/94



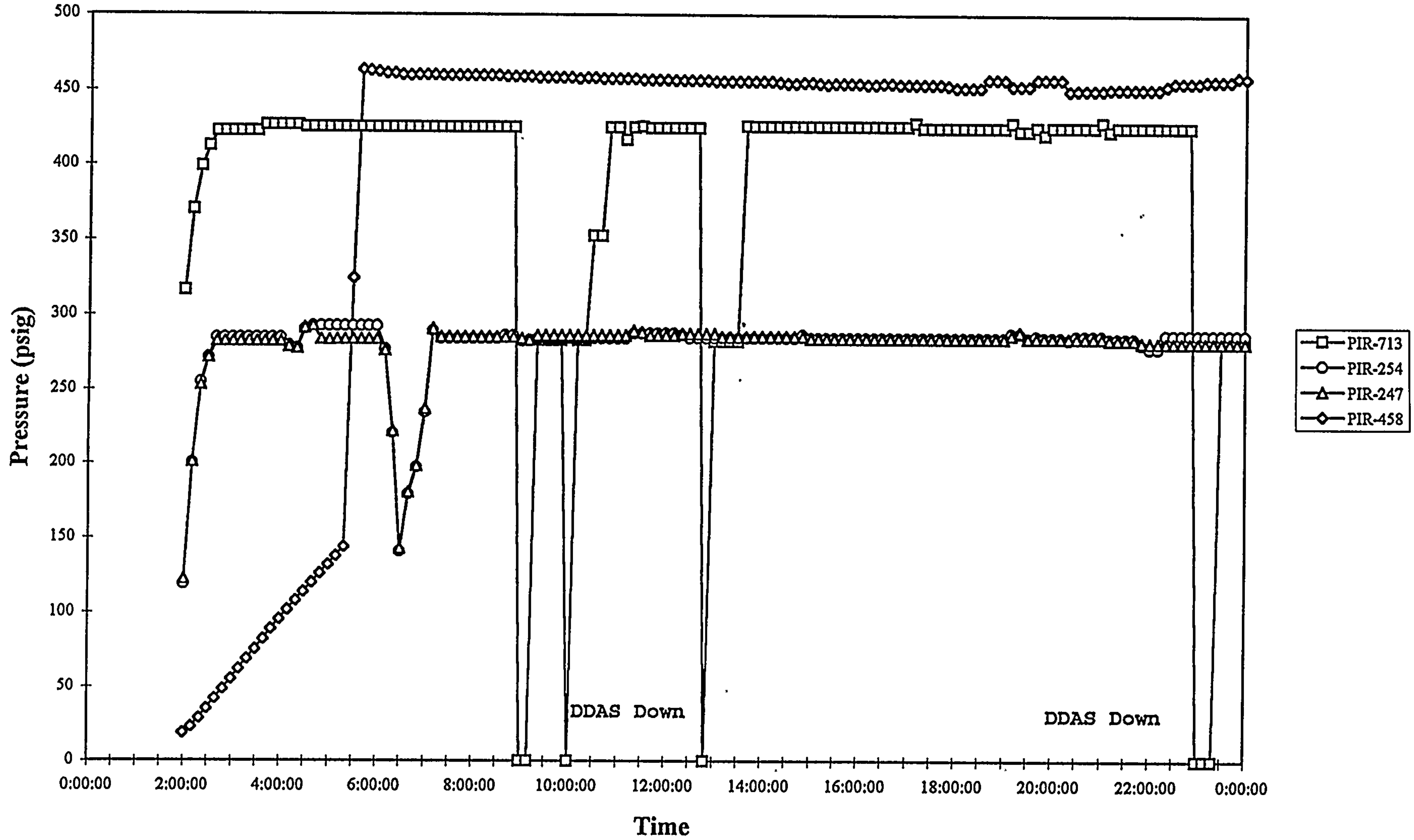

MGCR Process Gas Line Temperatures
Run 94MGC08, 07/25/94
TIR-224B
TIR-248B
TIR-320B
TIR-318B
Temperature (DegF)
1200
1100
1000
900
800
700
600
500
Time
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
16:00:00
18:00:00
20:00:00
22:00:00
0:00:00


MGCR Process Gas Line Temperatures
Run 94MGC08, 07/26/94
Temperature (DegF)
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
Time
TIR-224B
TIR-248B
TIR-320B
TIR-318B

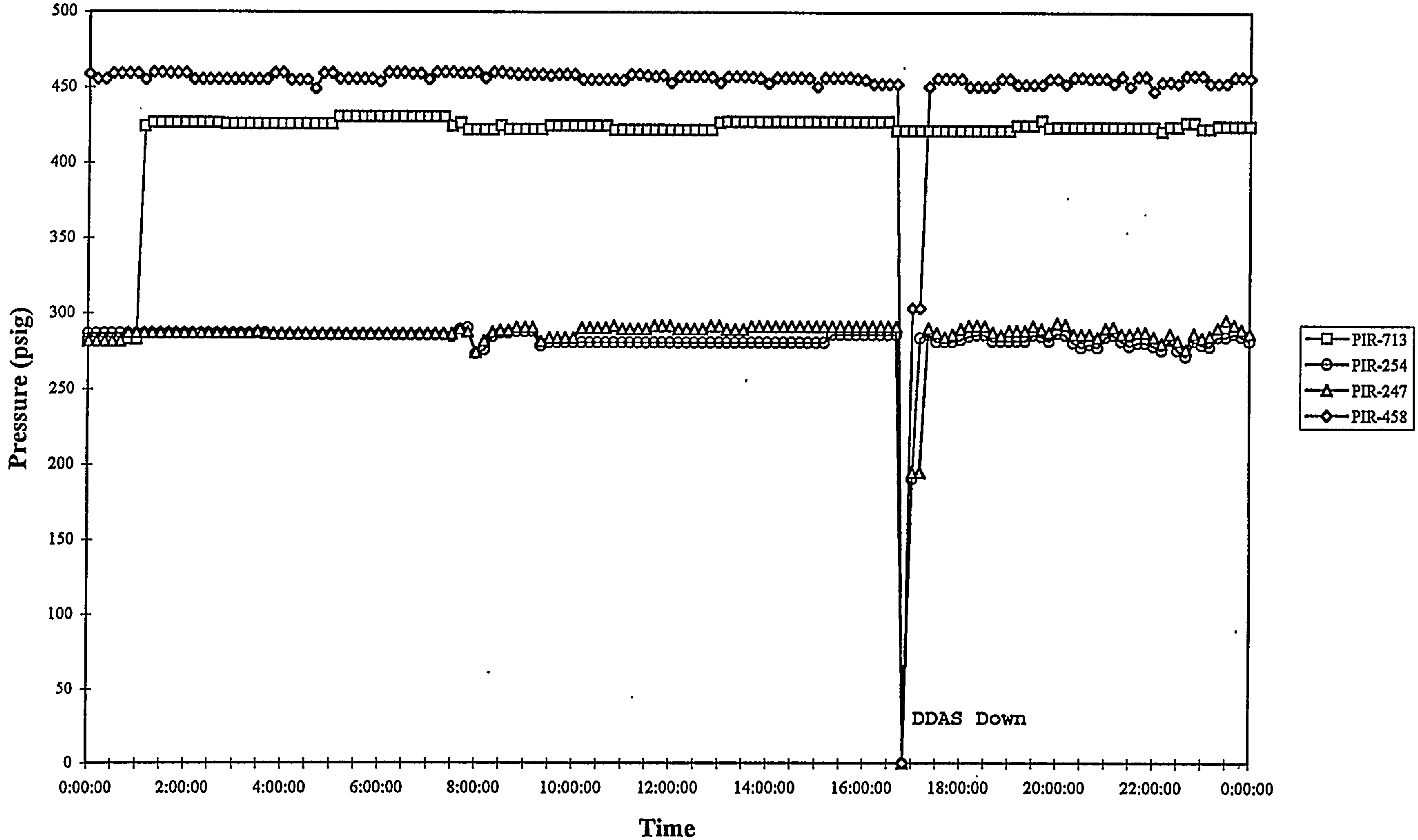
MGCR Process Gas Line Temperatures
Run 94MGC08, 07/27/94

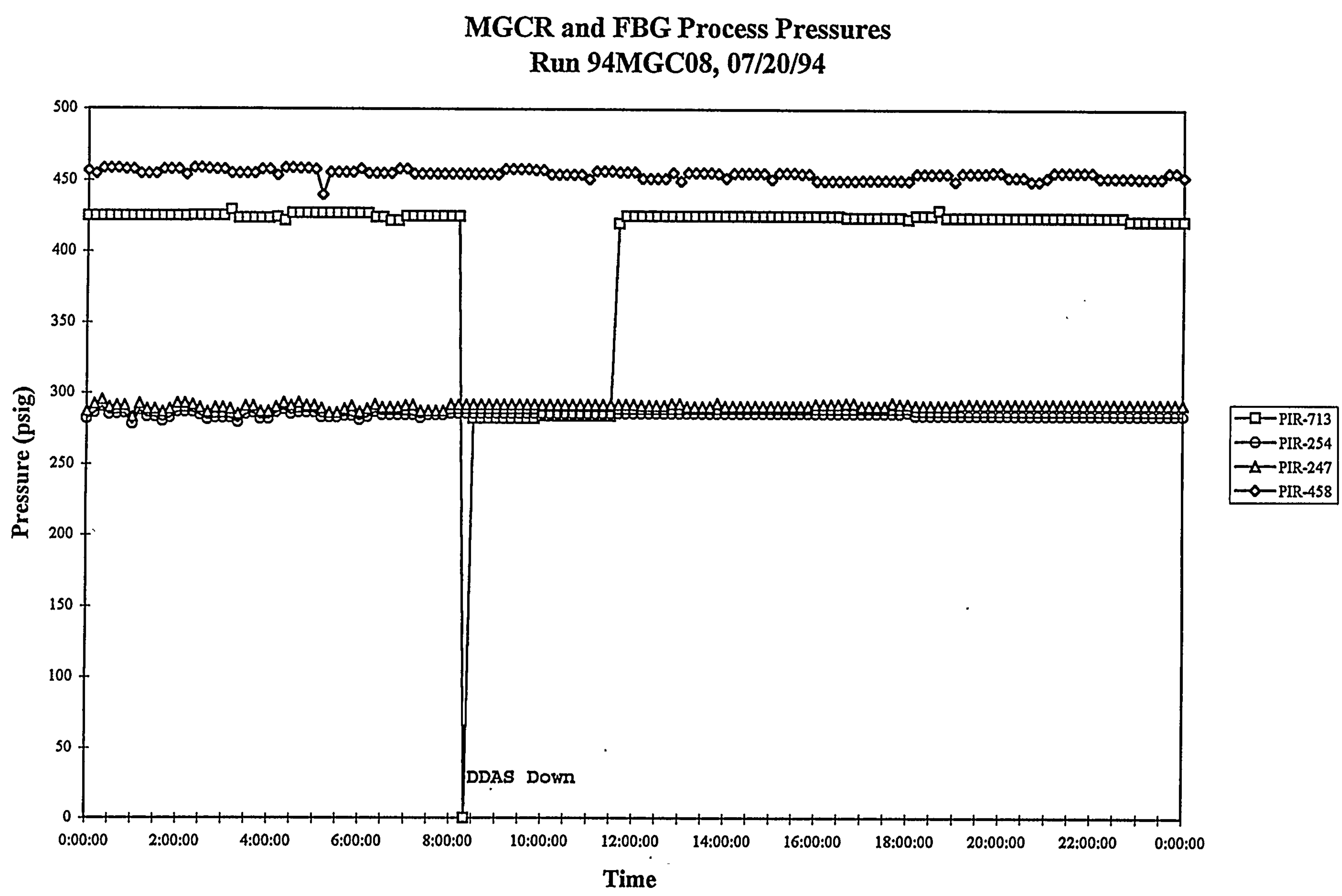


## MGCR and FBG Process Pressures
## Run 94MGC08, 07/18/94

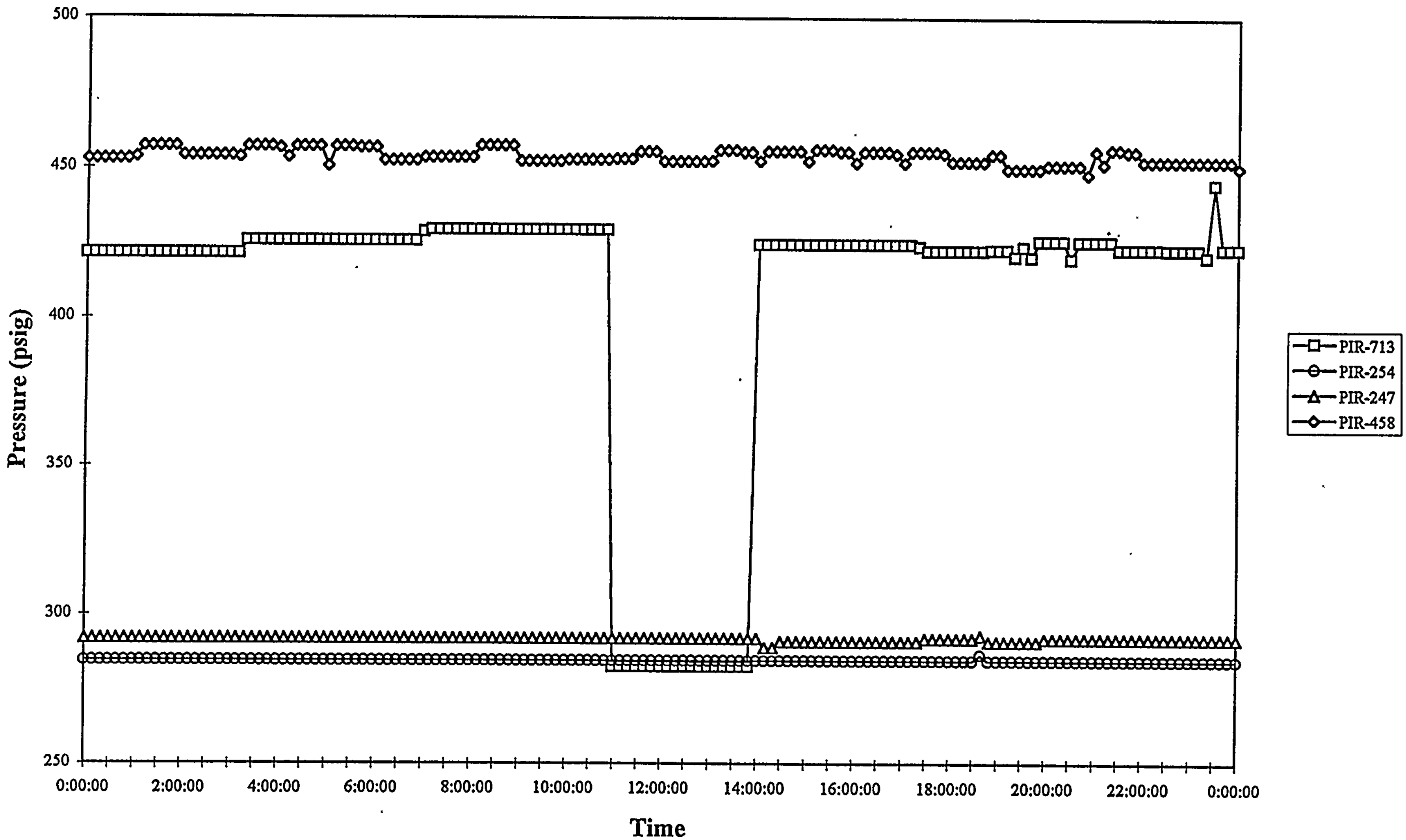


## MGCR and FBG Process Pressures
## Run 94MGC08, 07/19/94

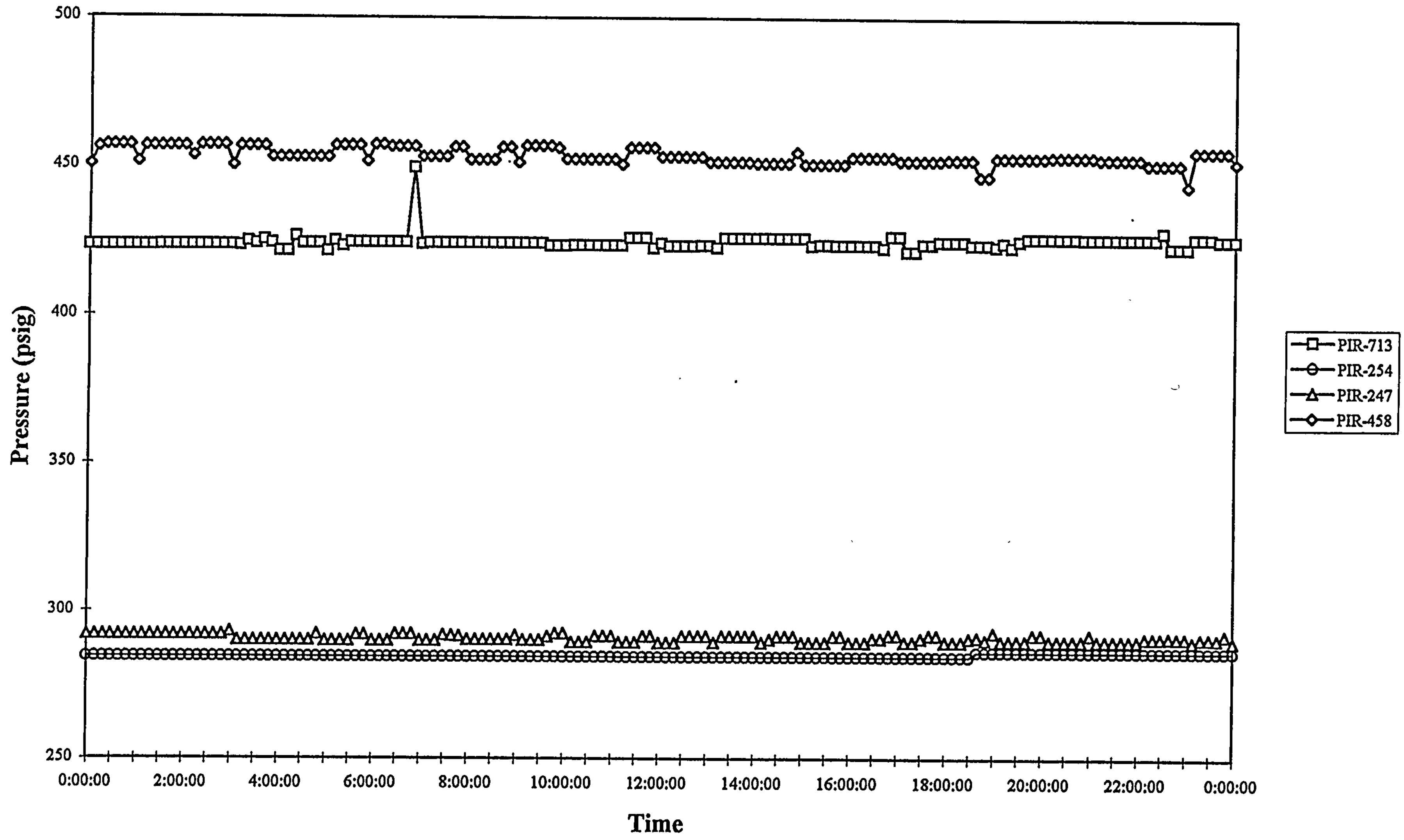



MGCR and FBG Process Pressures
Run 94MGC08, 07/20/94
Pressure (psig)
500
450
400
350
300
250
200
150
100
50
0
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
16:00:00
18:00:00
20:00:00
22:00:00
0:00:00
Time
DDAS Down
PIR-713
PIR-254
PIR-247
PIR-458

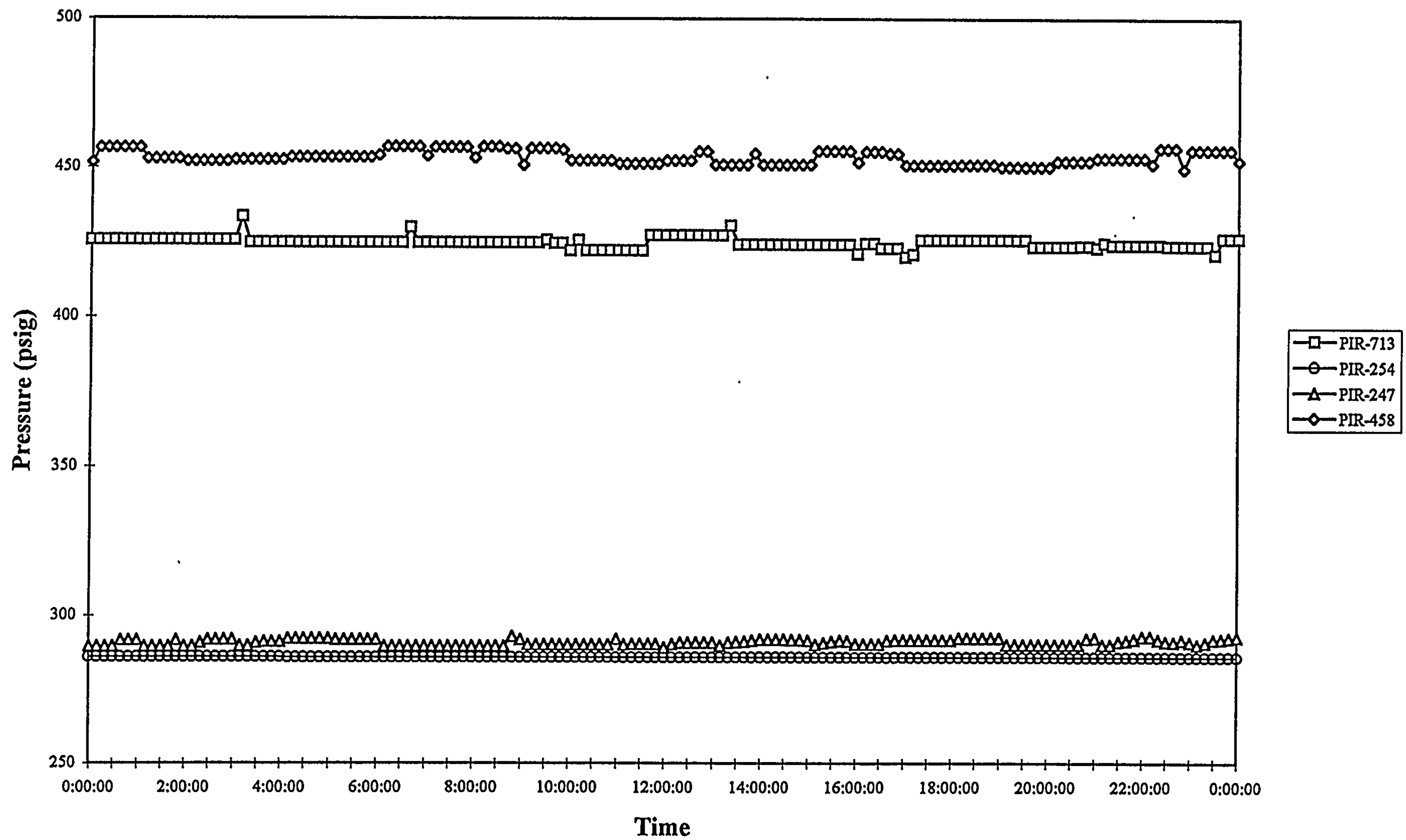
## MGCR and FBG Process Pressures
## Run 94MGC08, 07/21/94



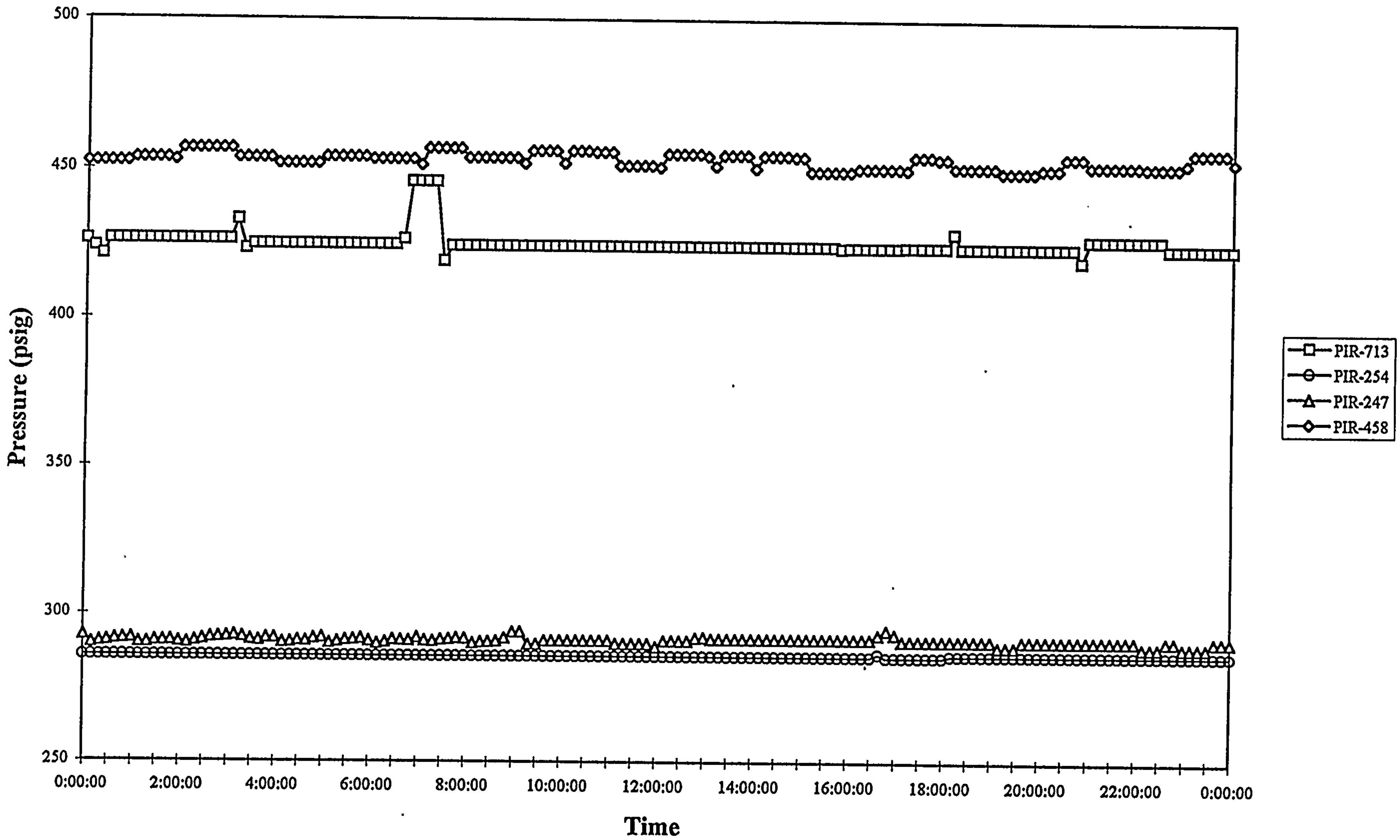
MGCR and FBG Process Pressures
Run 94MGC08, 07/22/94



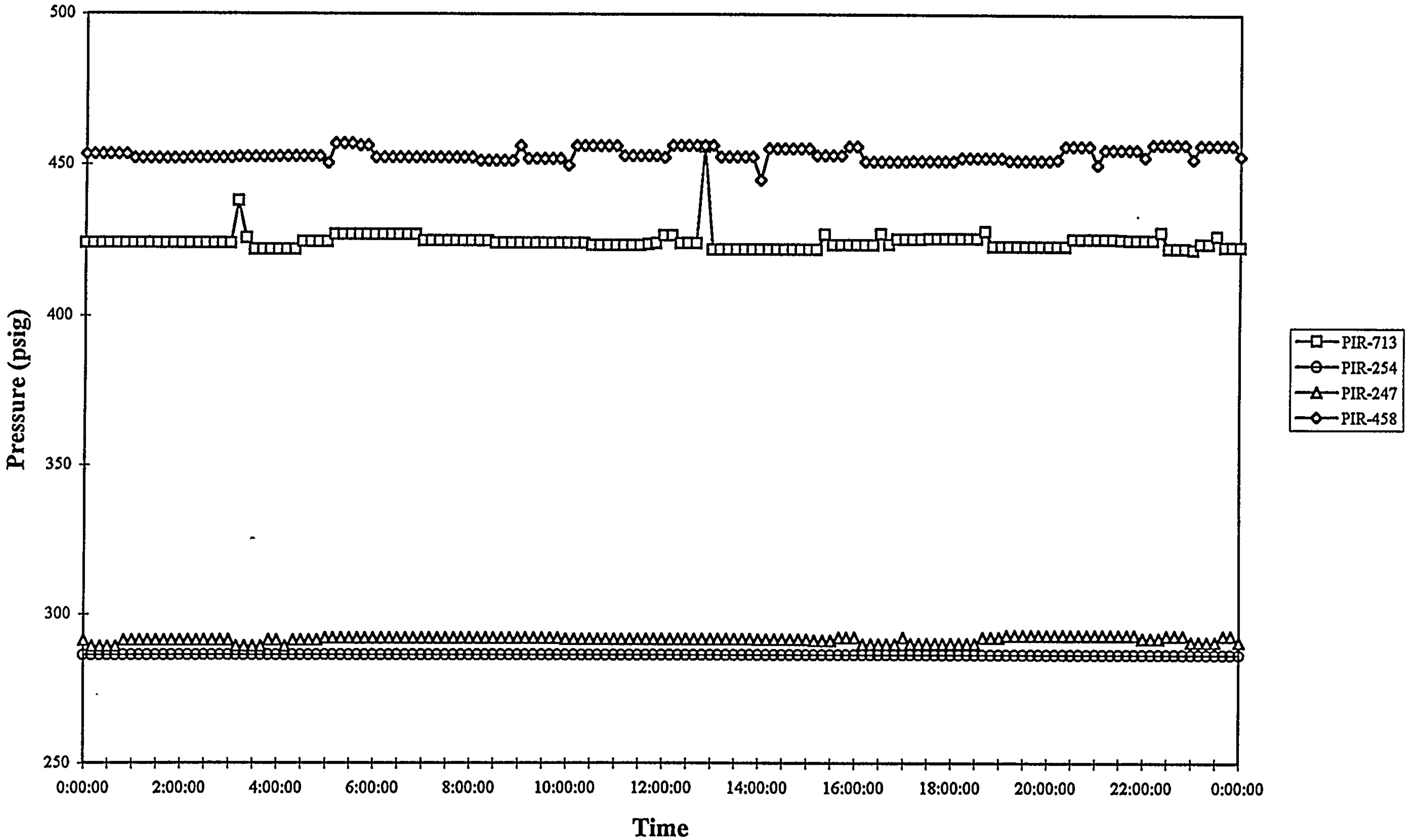
# MGCR and FBG Process Pressures
## Run 94MGC08, 07/23/94

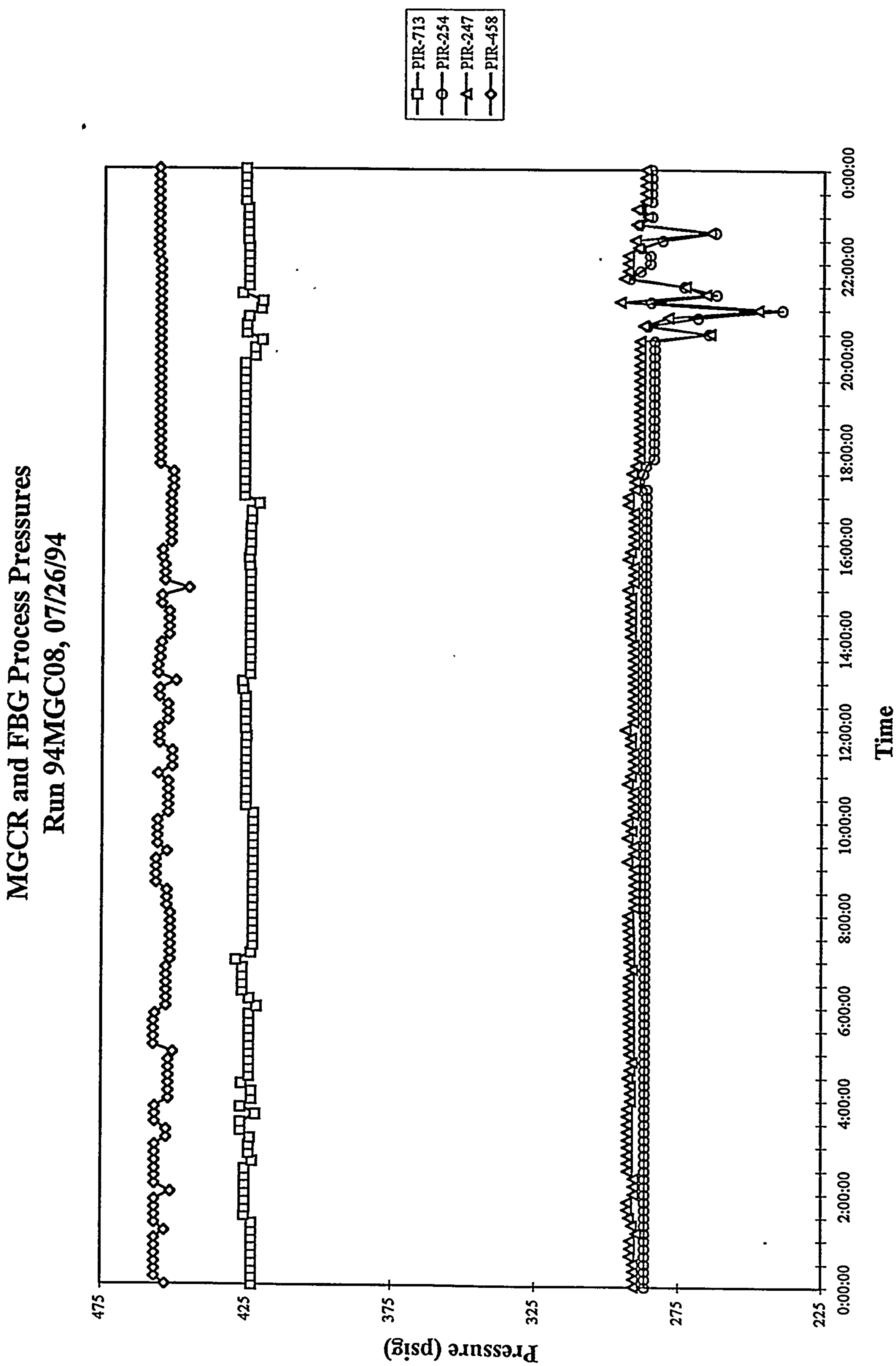


## MGCR and FBG Process Pressures
## Run 94MGC08, 07/24/94



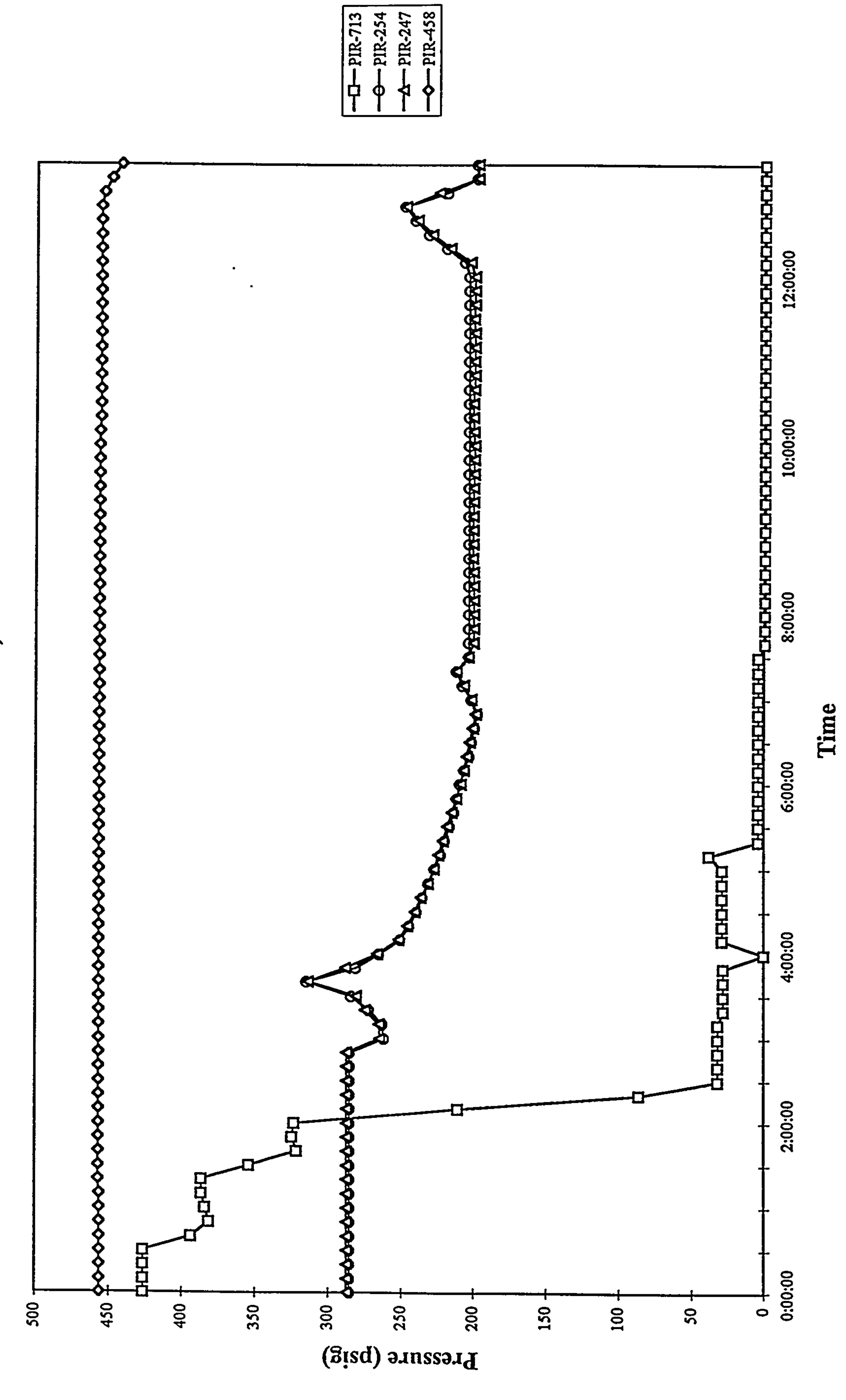
## MGCR and FBG Process Pressures
## Run 94MGC08, 07/25/94



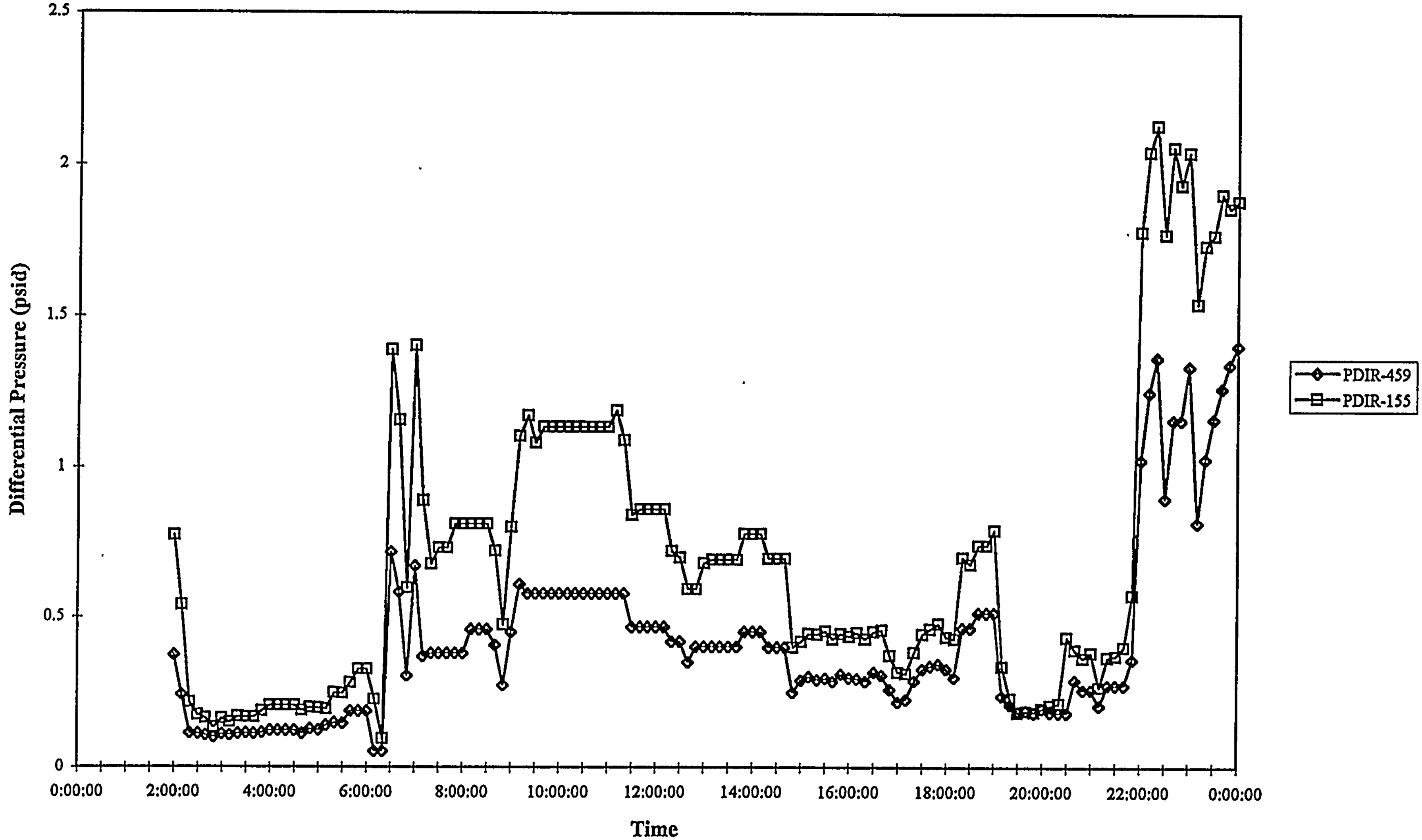


MGCR and FBG Process Pressures
Run 94MGC08, 07/26/94
Pressure (psig)
475
425
375
325
275
225
Time
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
16:00:00
18:00:00
20:00:00
22:00:00
0:00:00
PIR-713
PIR-254
PIR-247
PIR-458

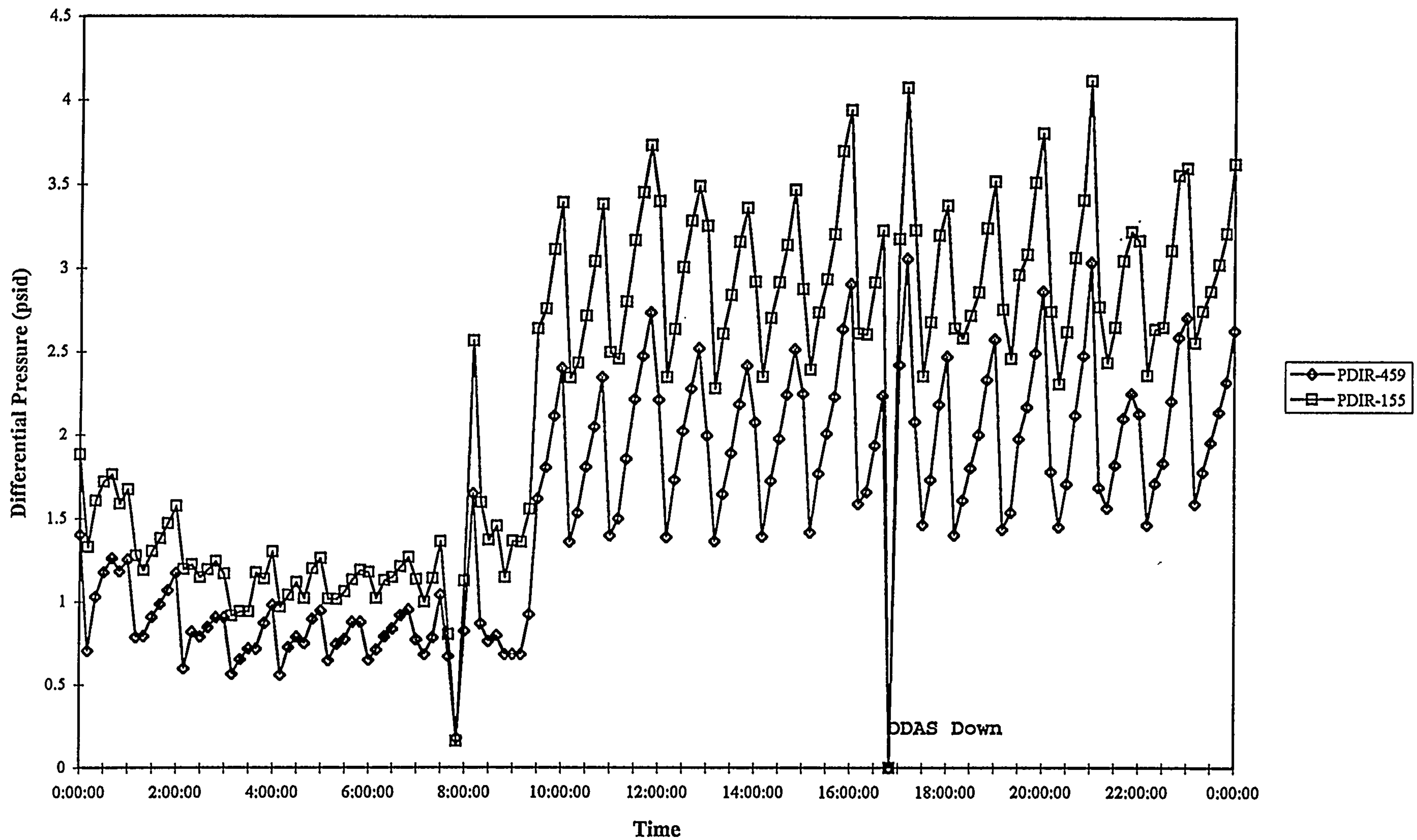
MGCR and FBG Process Pressures
Run 94MGC08, 07/27/94



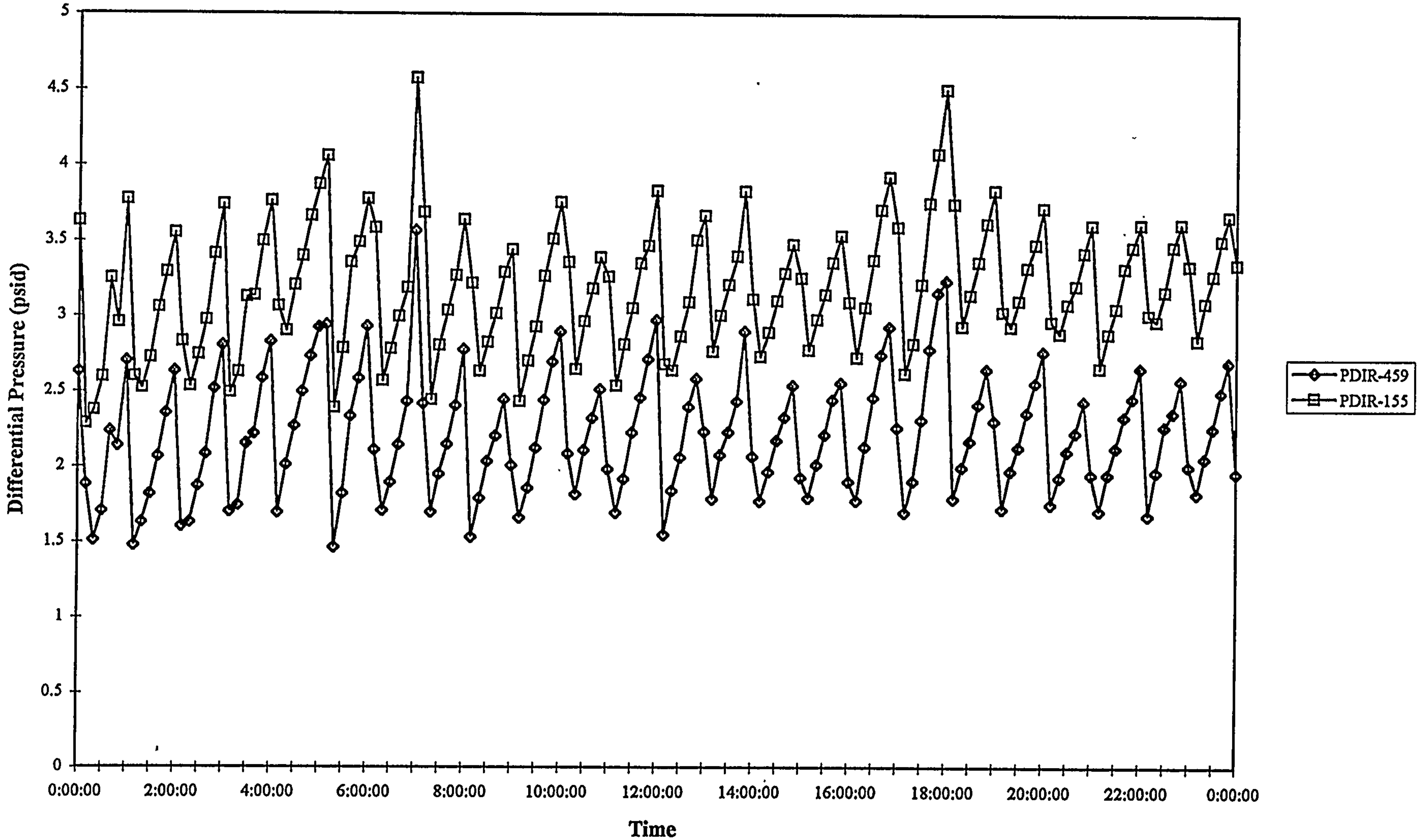
# F-100 Differential Pressure
# Run 94MGC08, 07/18/94

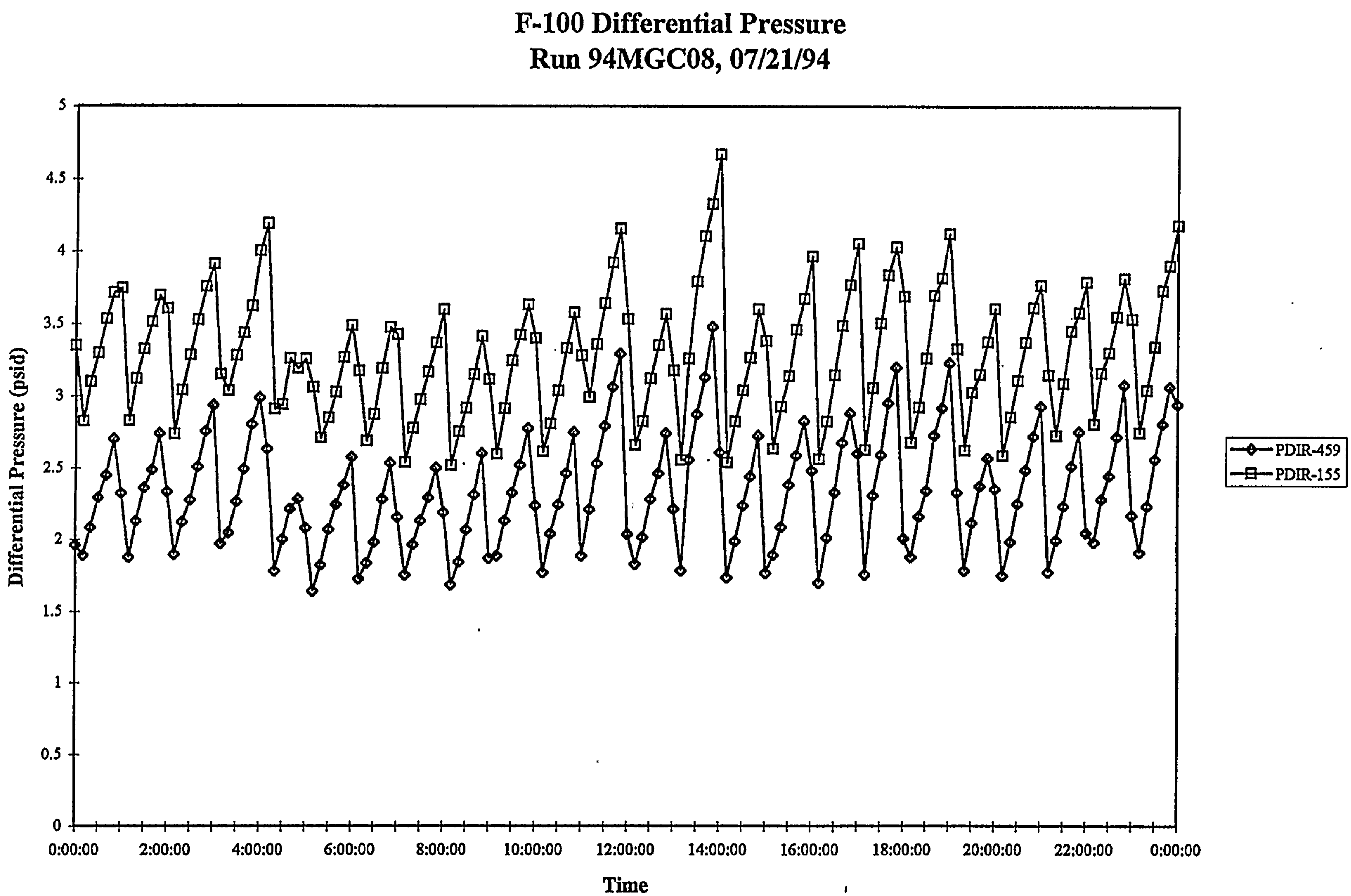


## F-100 Differential Pressure
## Run 94MGC08, 07/19/94

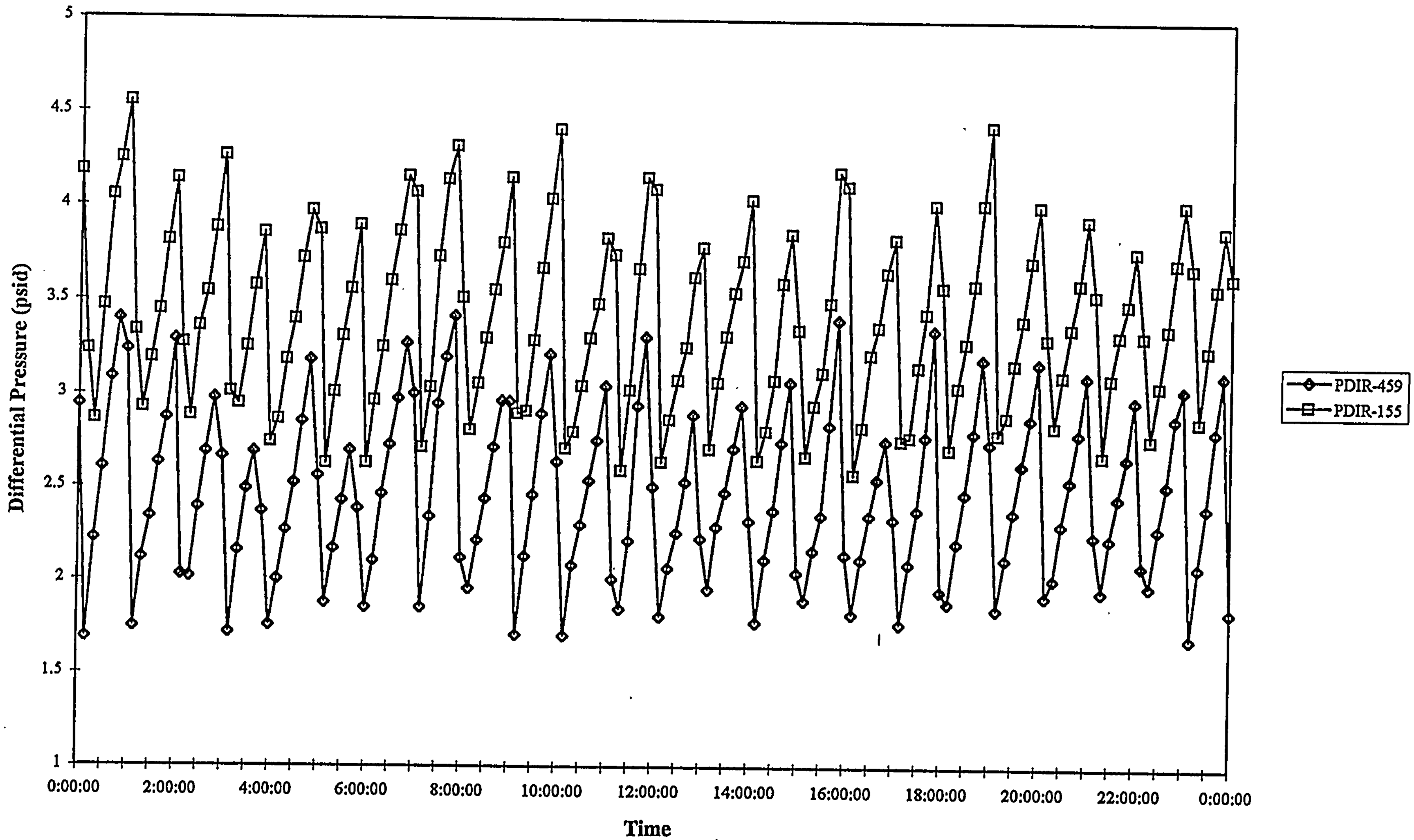


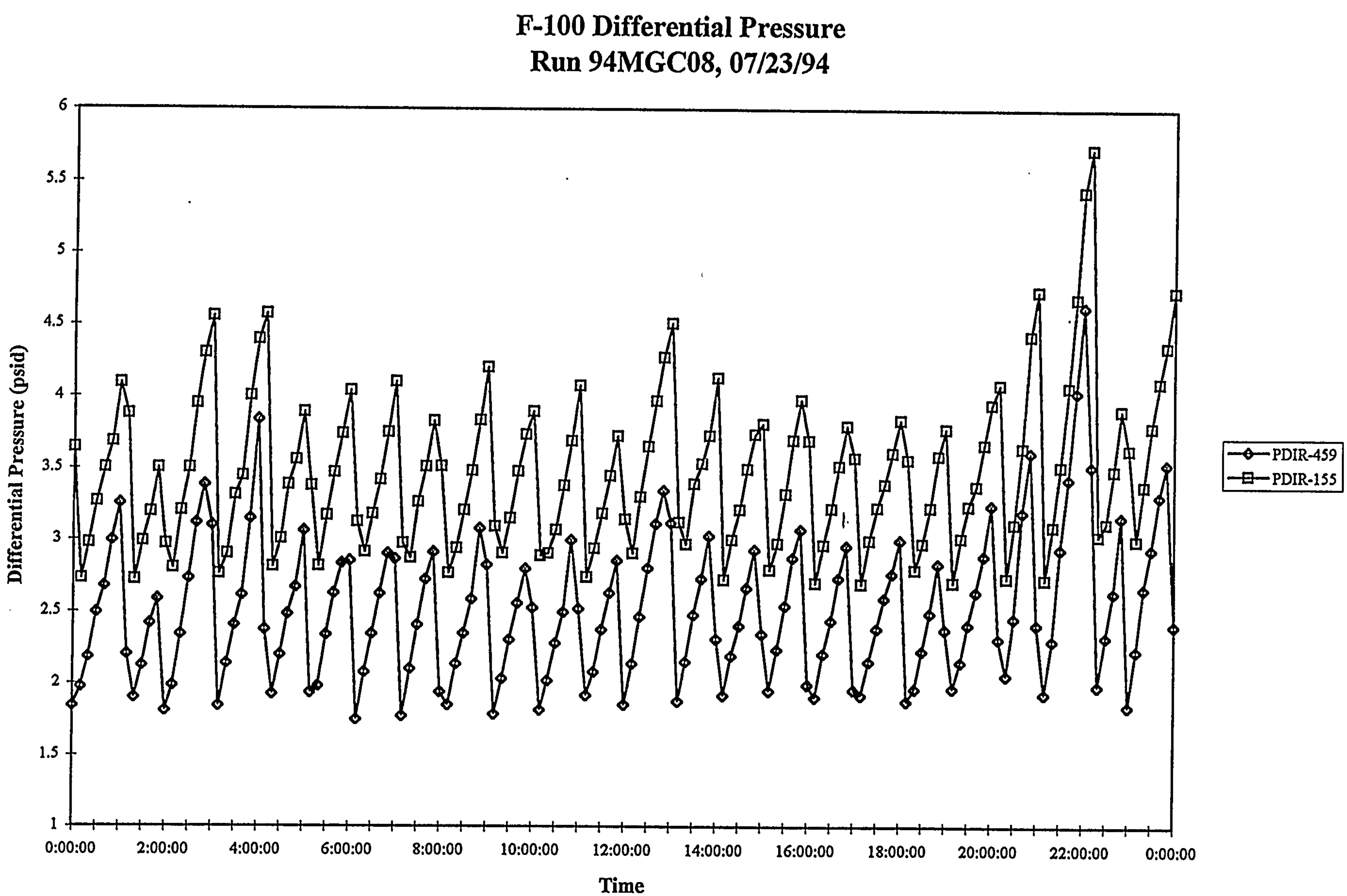
# F-100 Differential Pressure
## Run 94MGC08, 07/20/94



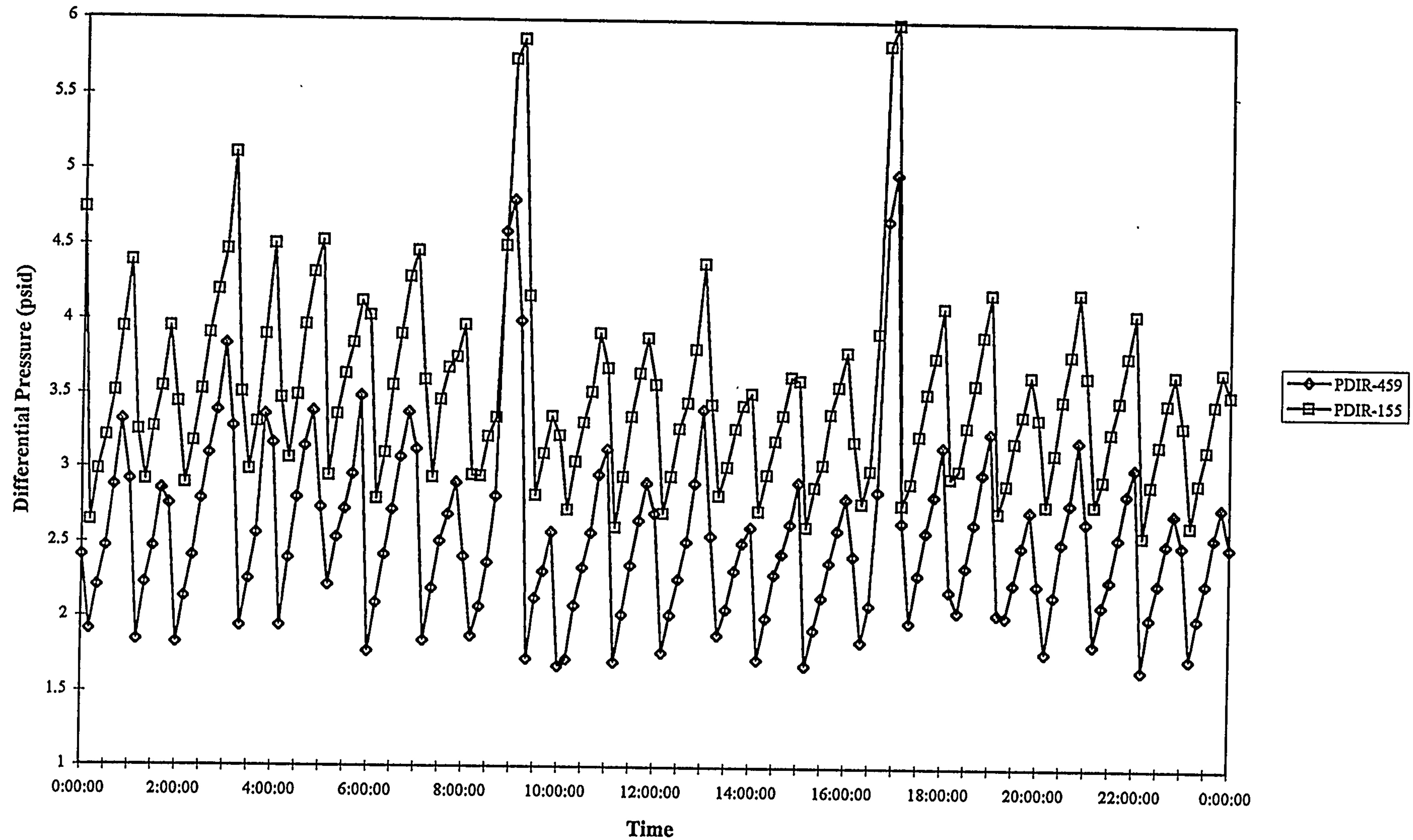

F-100 Differential Pressure
Run 94MGC08, 07/21/94
Differential Pressure (psid)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
16:00:00
18:00:00
20:00:00
22:00:00
0:00:00
Time
PDIR-459
PDIR-155

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

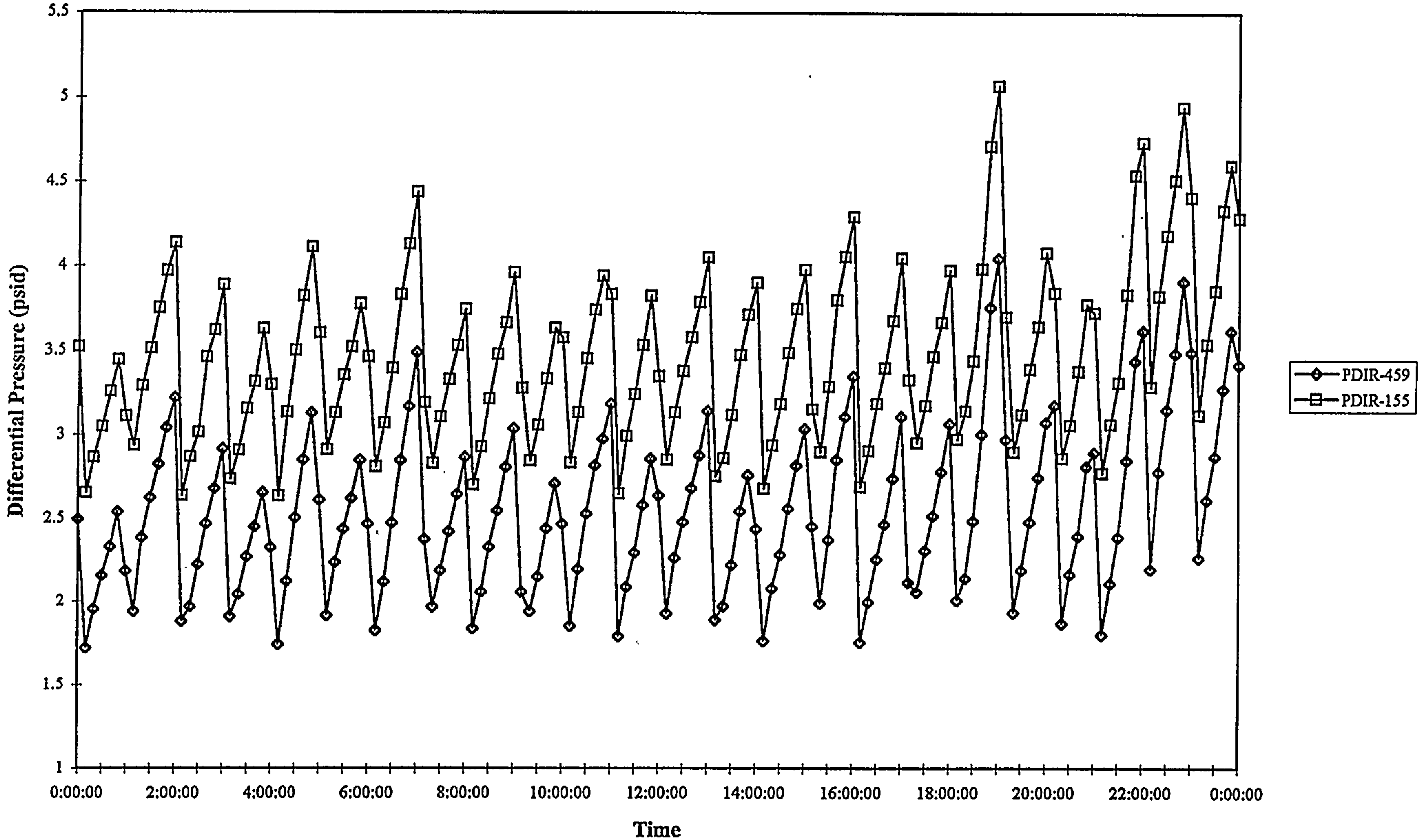


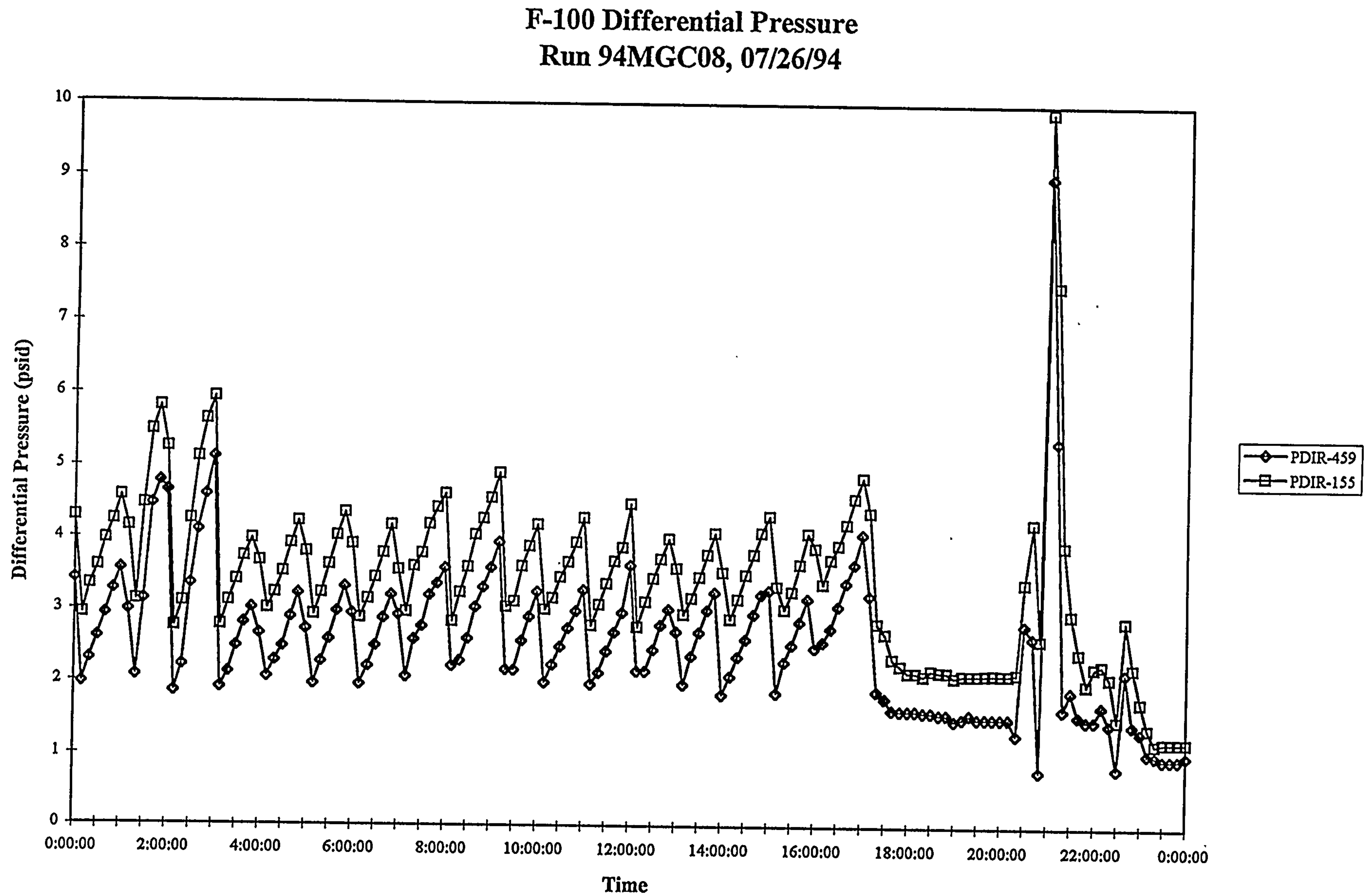

F-100 Differential Pressure
Run 94MGC08, 07/23/94
Differential Pressure (psid)
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
16:00:00
18:00:00
20:00:00
22:00:00
0:00:00
Time
PDIR-459
PDIR-155

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

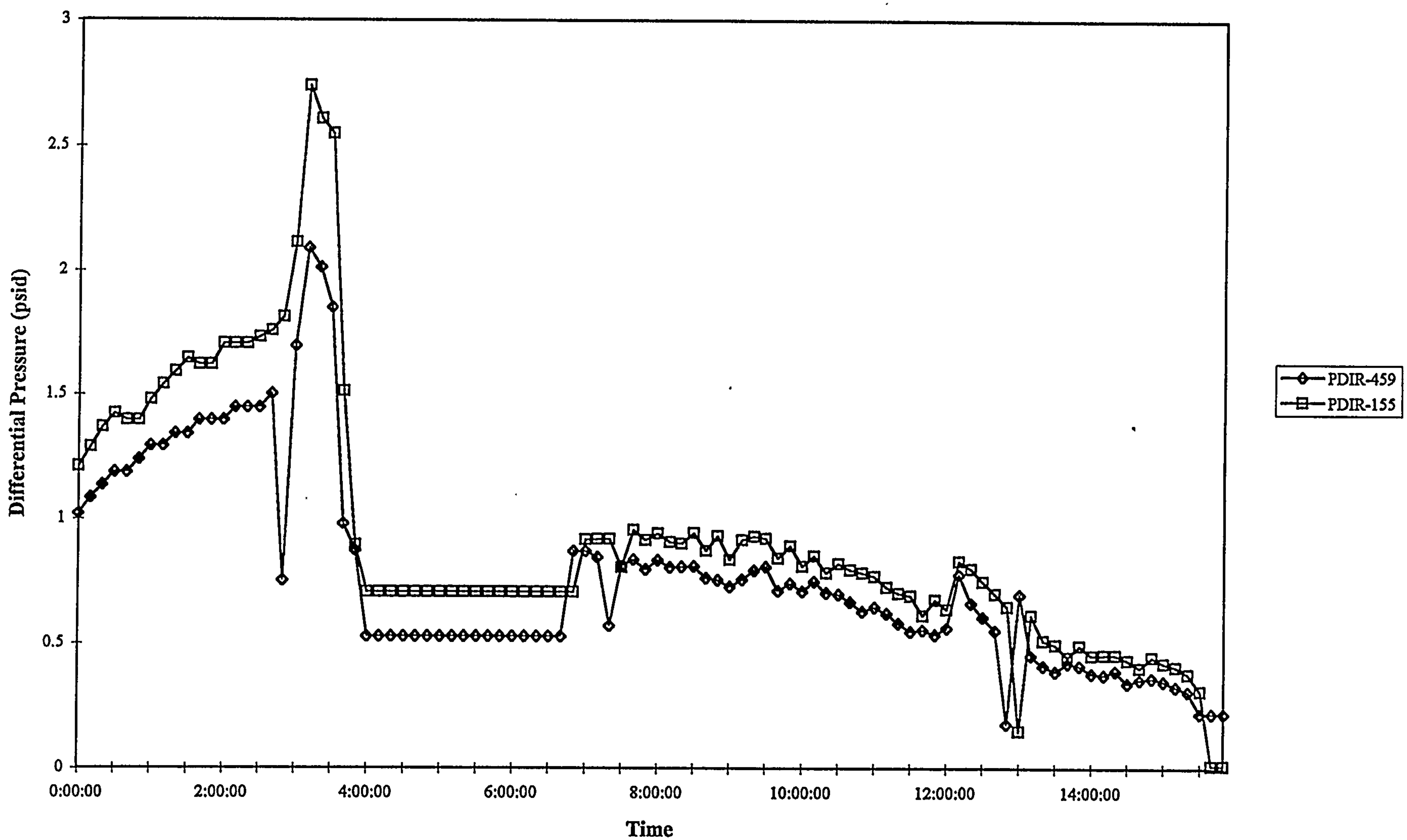


# F-100 Differential Pressure
## Run 94MGC08, 07/25/94

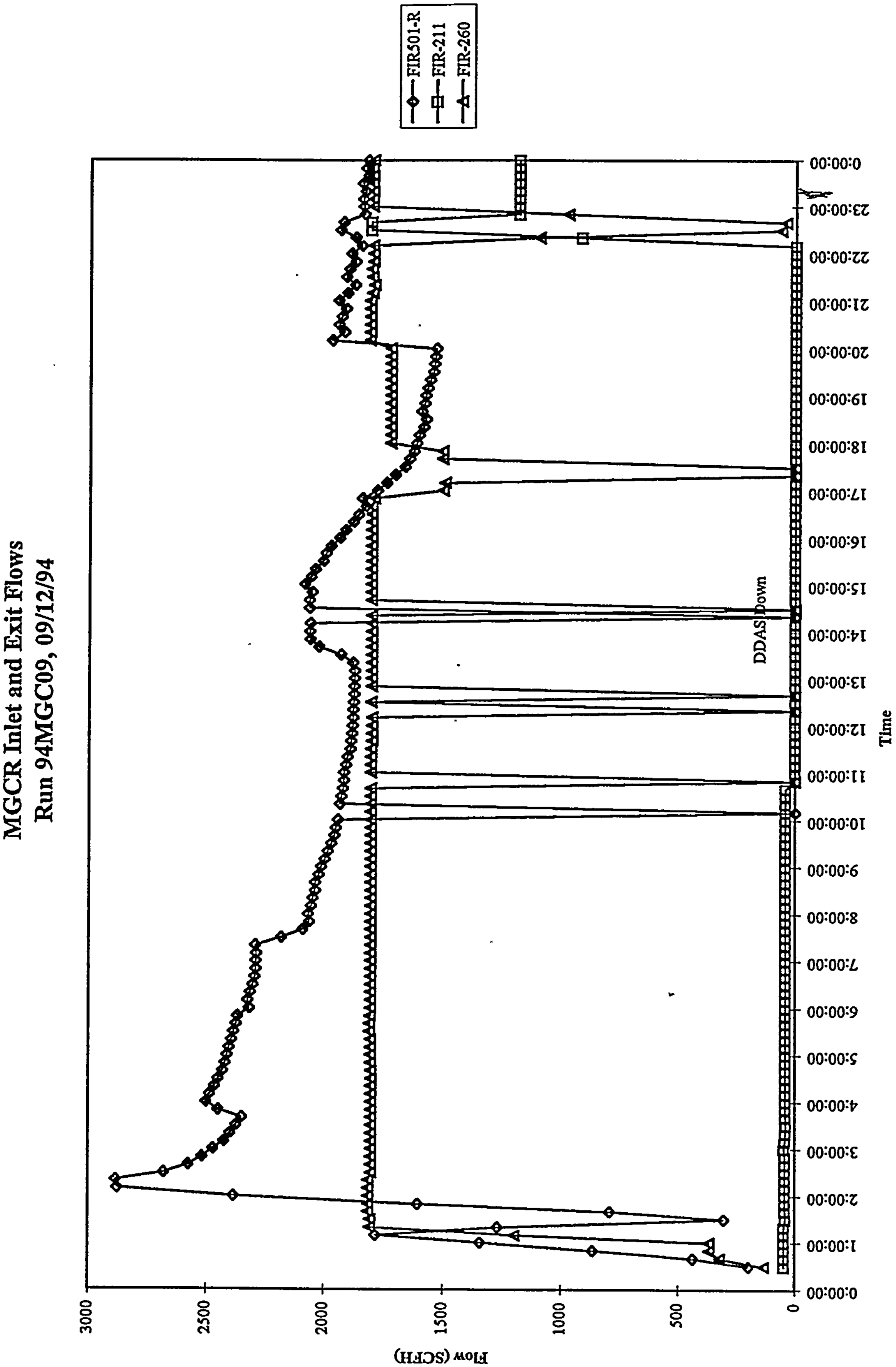



F-100 Differential Pressure
Run 94MGC08, 07/26/94
Differential Pressure (psid)
0
1
2
3
4
5
6
7
8
9
10
0:00:00
2:00:00
4:00:00
6:00:00
8:00:00
10:00:00
12:00:00
14:00:00
16:00:00
18:00:00
20:00:00
22:00:00
0:00:00
Time
PDIR-459
PDIR-155

# F-100 Differential Pressure
# Run 94MGC08, 07/27/94

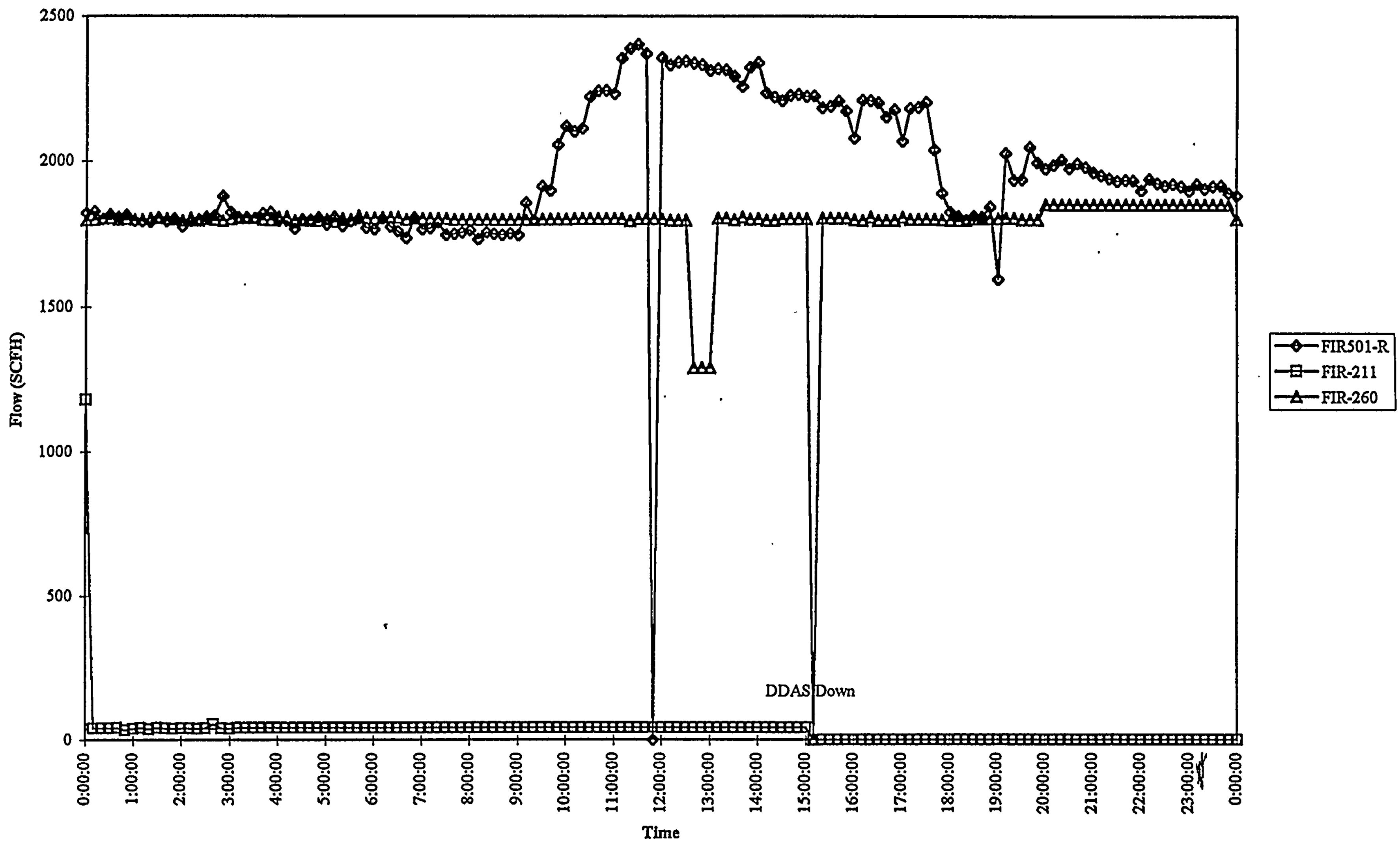


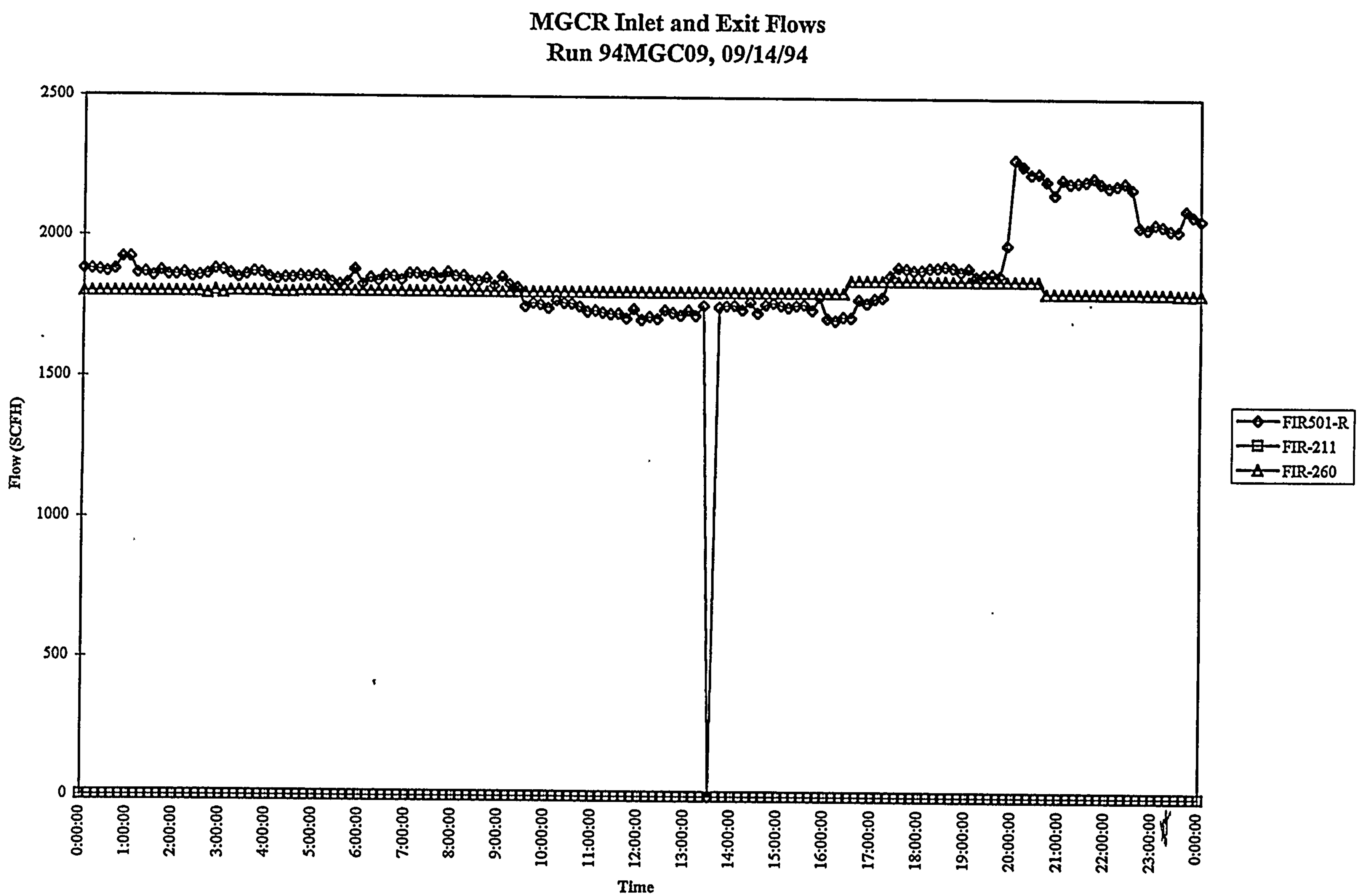
# 94MGC09
# (09/12/94 - 09/16/94)



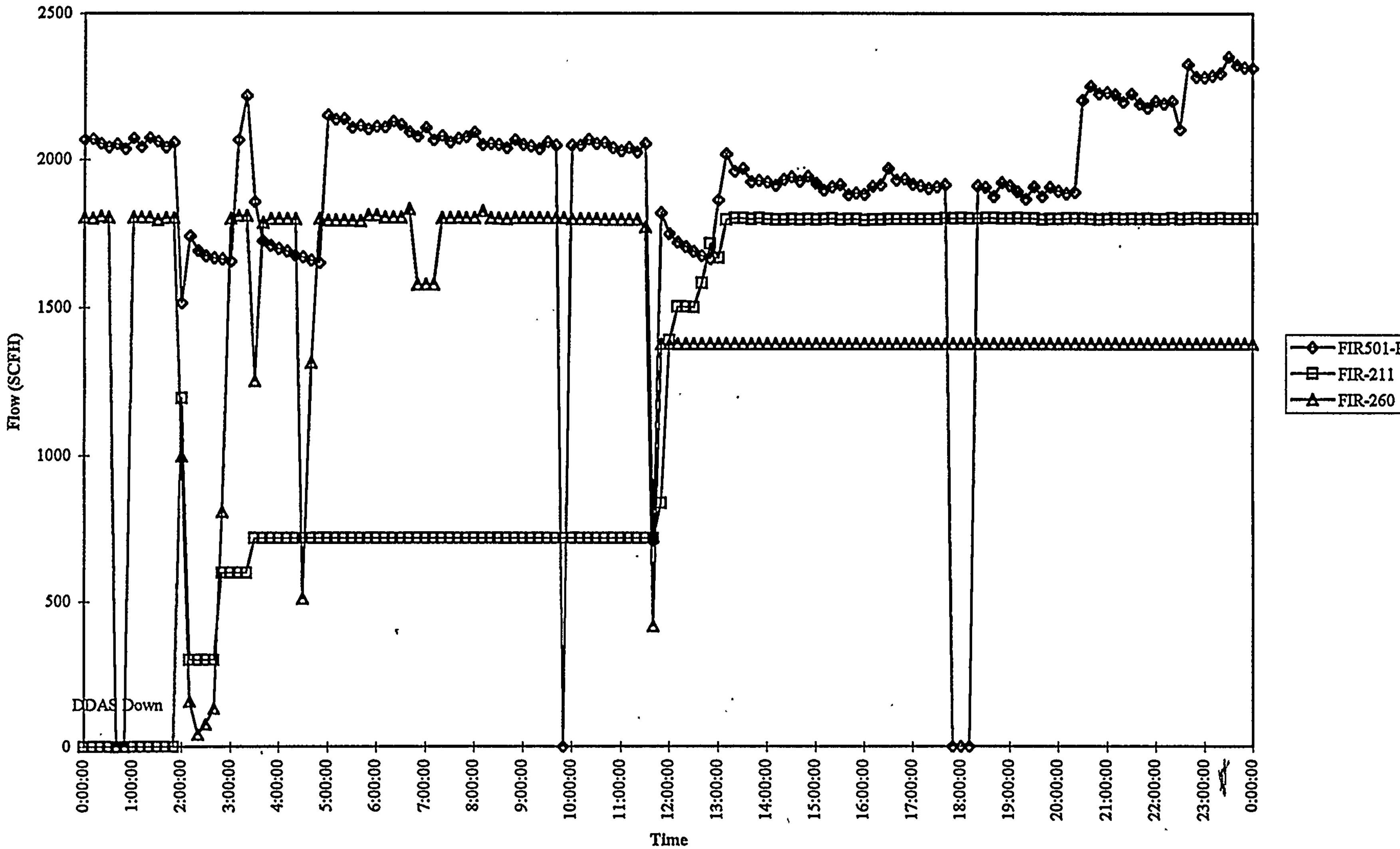
MGCR Inlet and Exit Flows
Run 94MGC09, 09/12/94
FIR501-R
FIR-211
FIR-260
DDAS Down
Flow (SCFH)
Time
3000
2500
2000
1500
1000
500
0
0:00:00
1:00:00
2:00:00
3:00:00
4:00:00
5:00:00
6:00:00
7:00:00
8:00:00
9:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
0:00:00

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

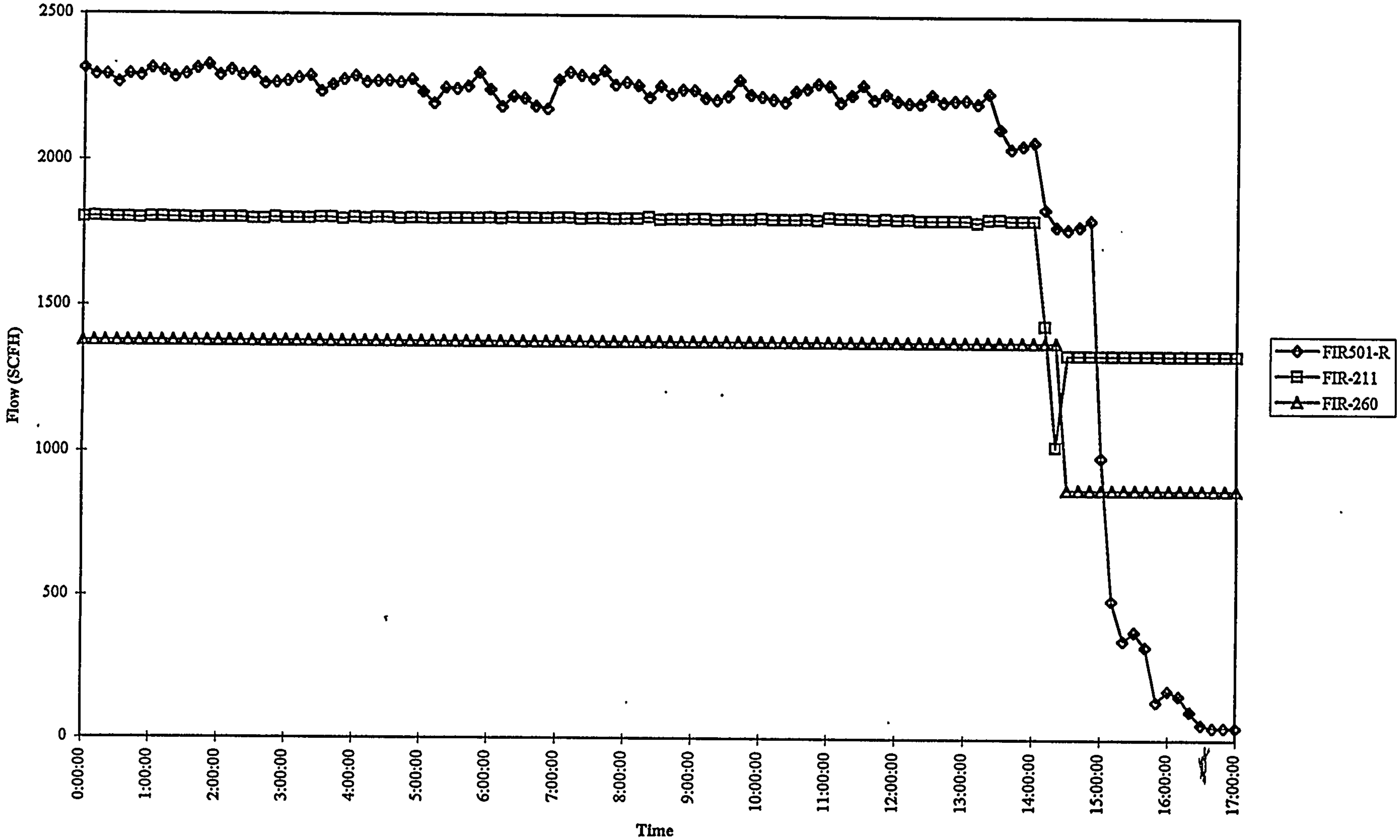



MGCR Inlet and Exit Flows
Run 94MGC09, 09/14/94
Flow (SCFH)
2500
2000
1500
1000
500
0
0:00:00
1:00:00
2:00:00
3:00:00
4:00:00
5:00:00
6:00:00
7:00:00
8:00:00
9:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
0:00:00
Time
FIR501-R
FIR-211
FIR-260

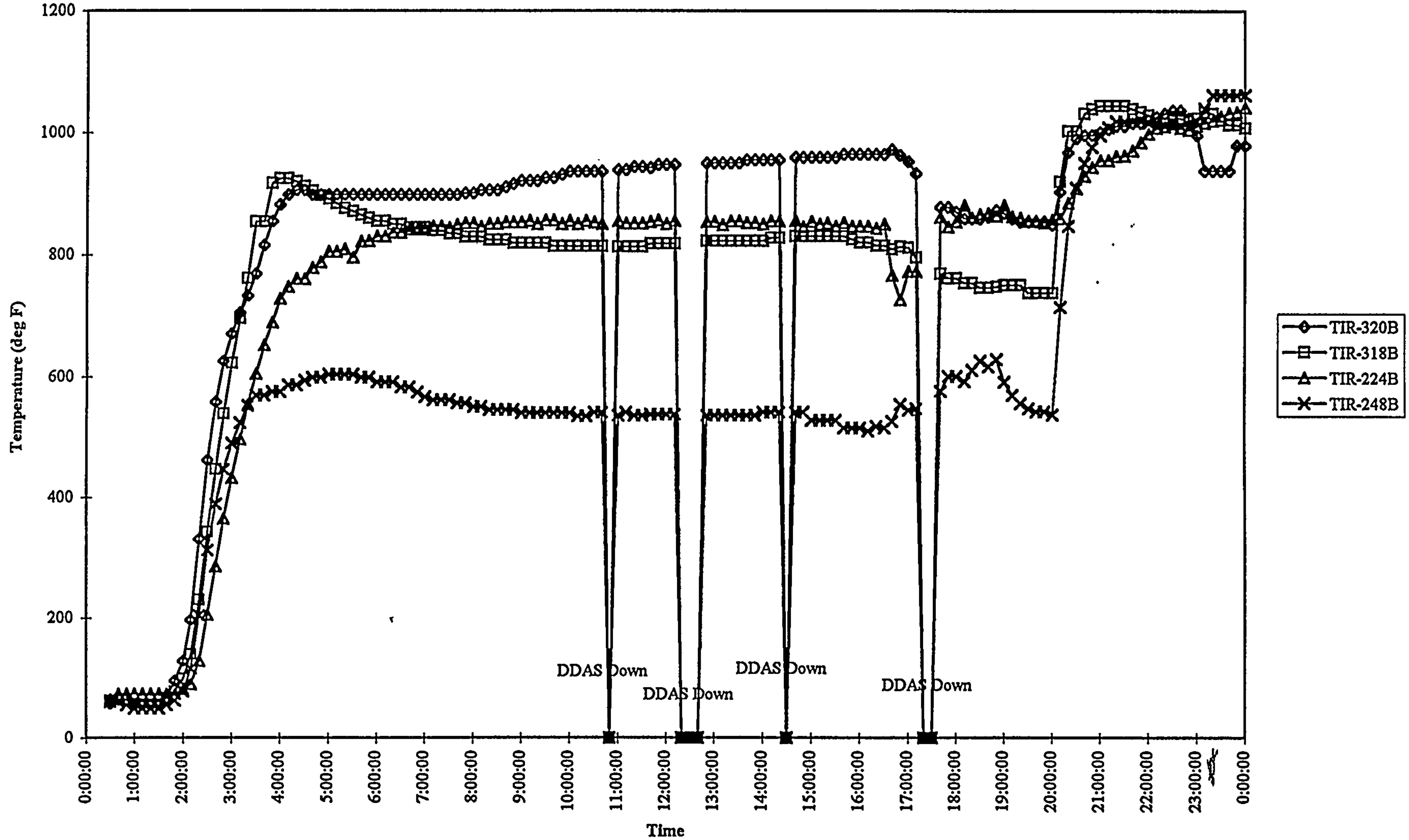
MGCR Inlet and Exit Flows
Run 94MGC09, 09/15/94



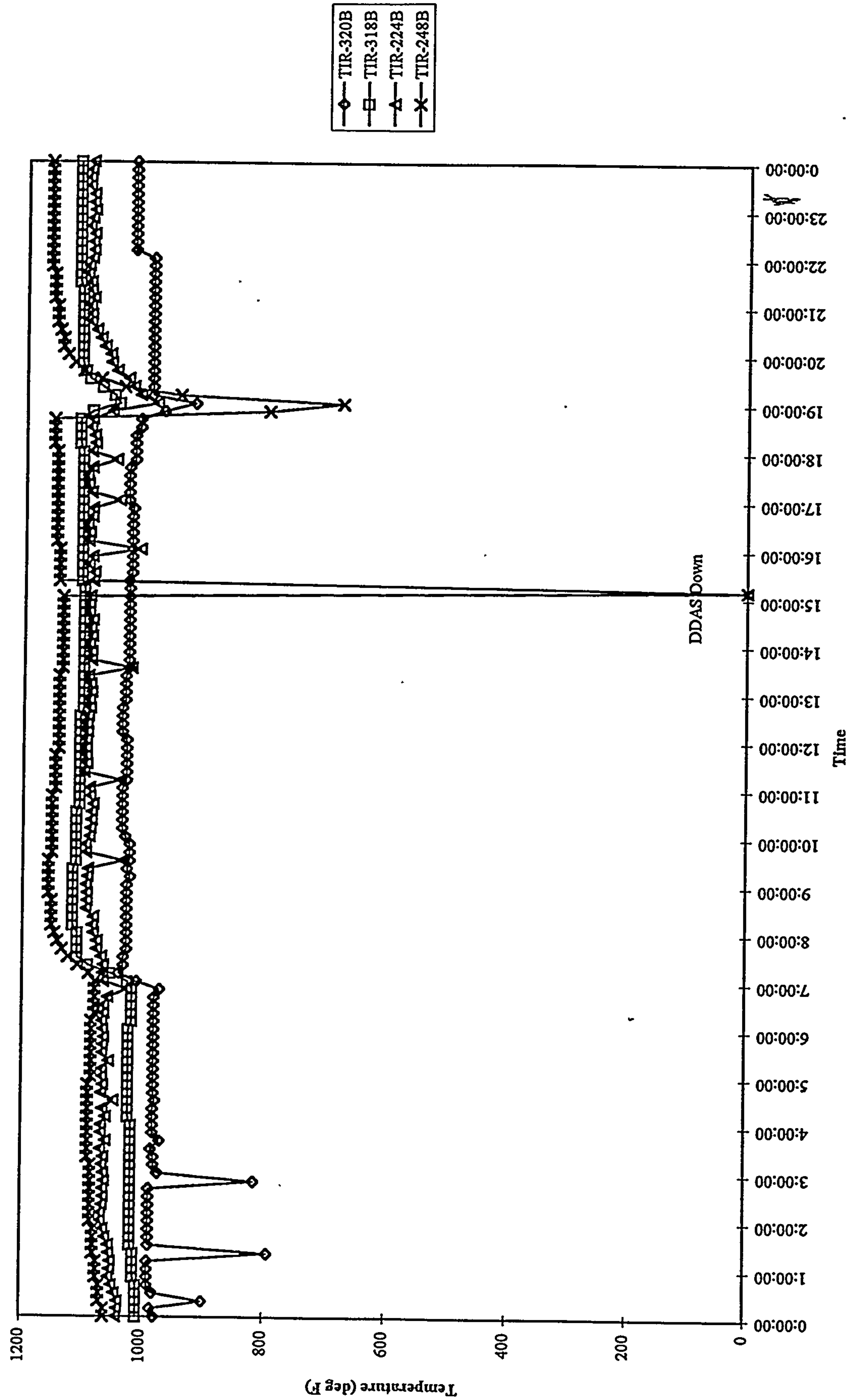
## MGCR Inlet and Exit Flows
## Run 94MGC09, 09/16/94



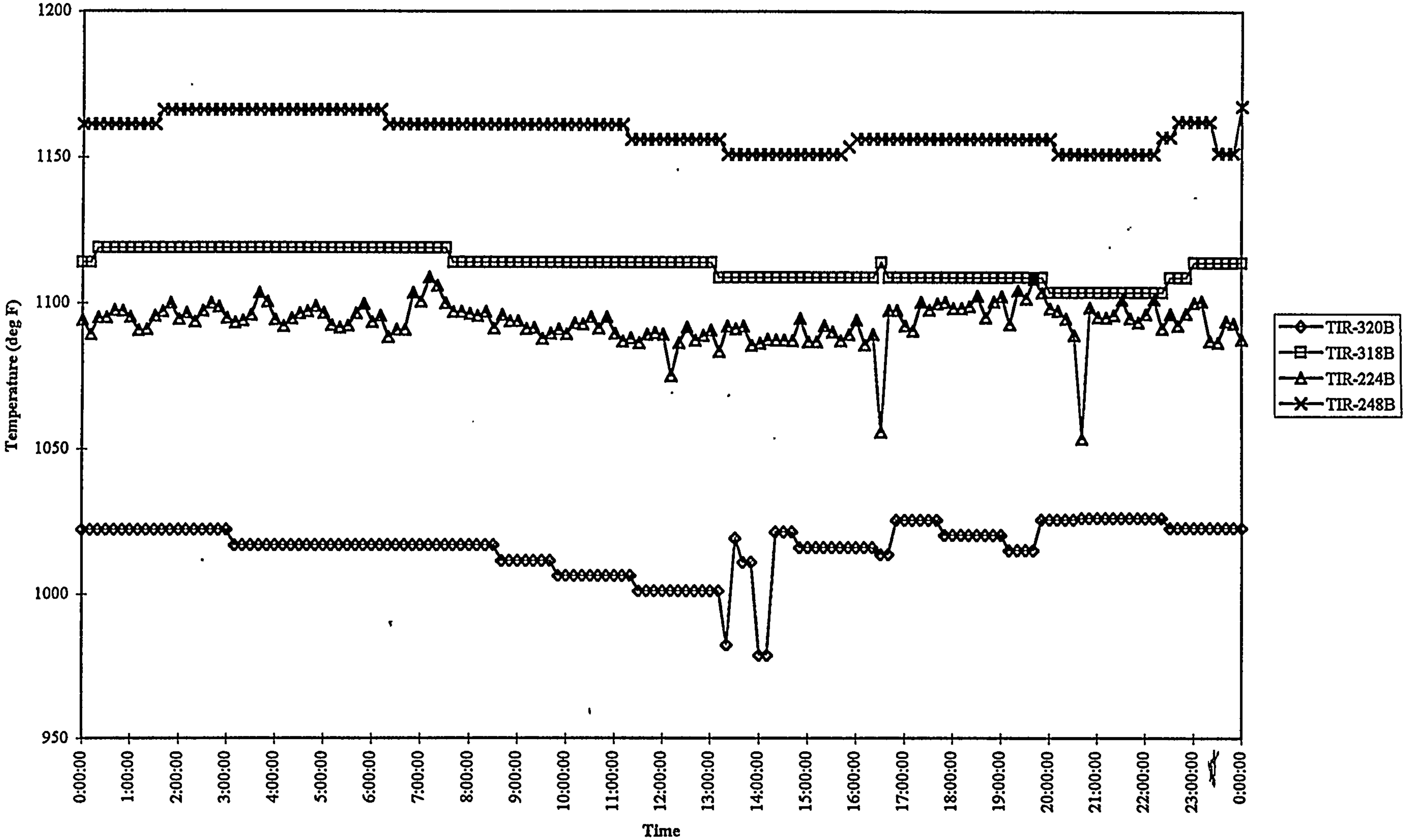
## MGCR Process Gas Line Temperatures
## Run 94MGC09, 09/12/94



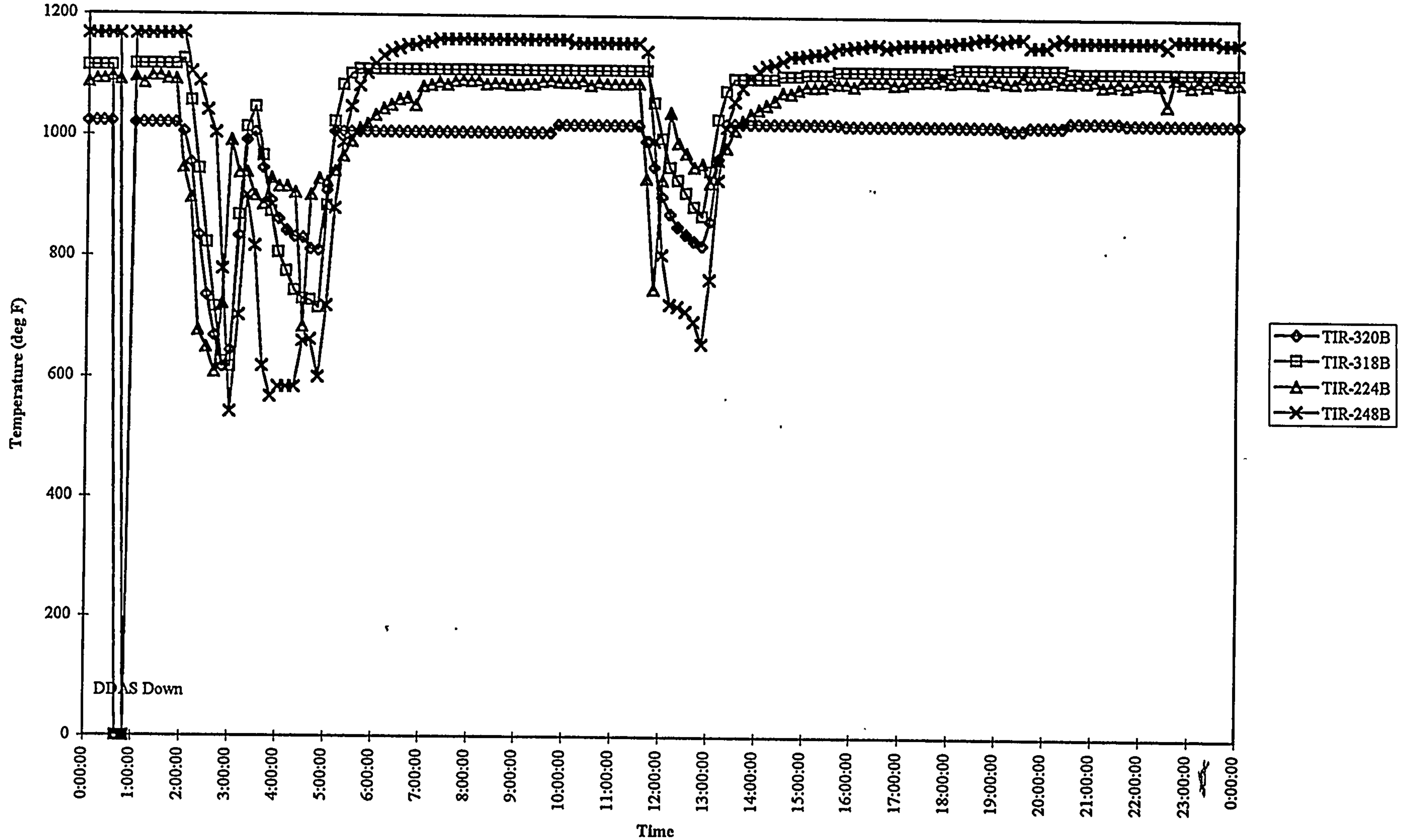
MGCR Process Gas Line Temperatures
Run 94MGC09, 09/13/94

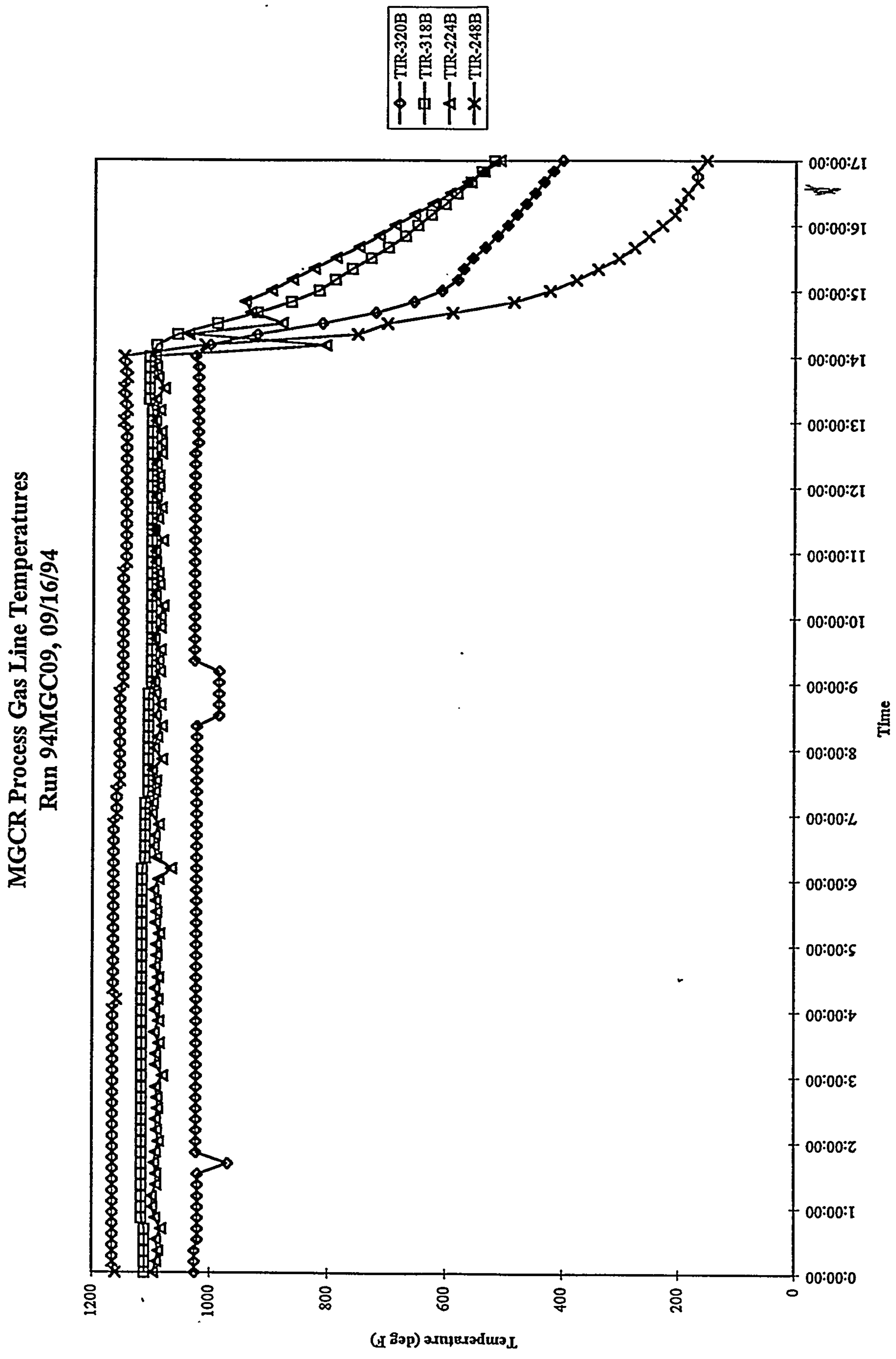


MGCR Process Gas Line Temperatures
Run 94MGC09, 09/14/94

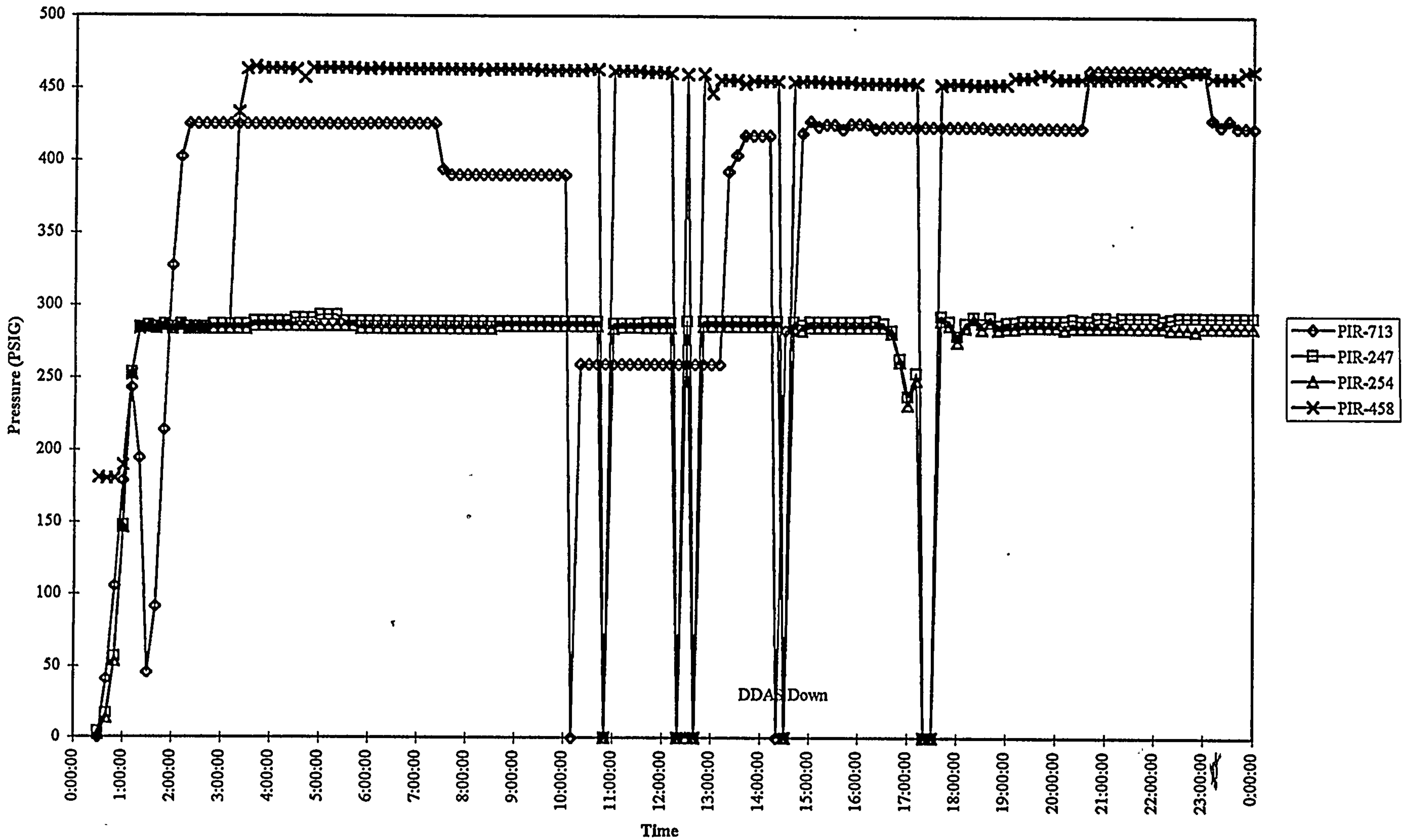


## MGCR Process Gas Line Temperatures
## Run 94MGC09, 09/15/94

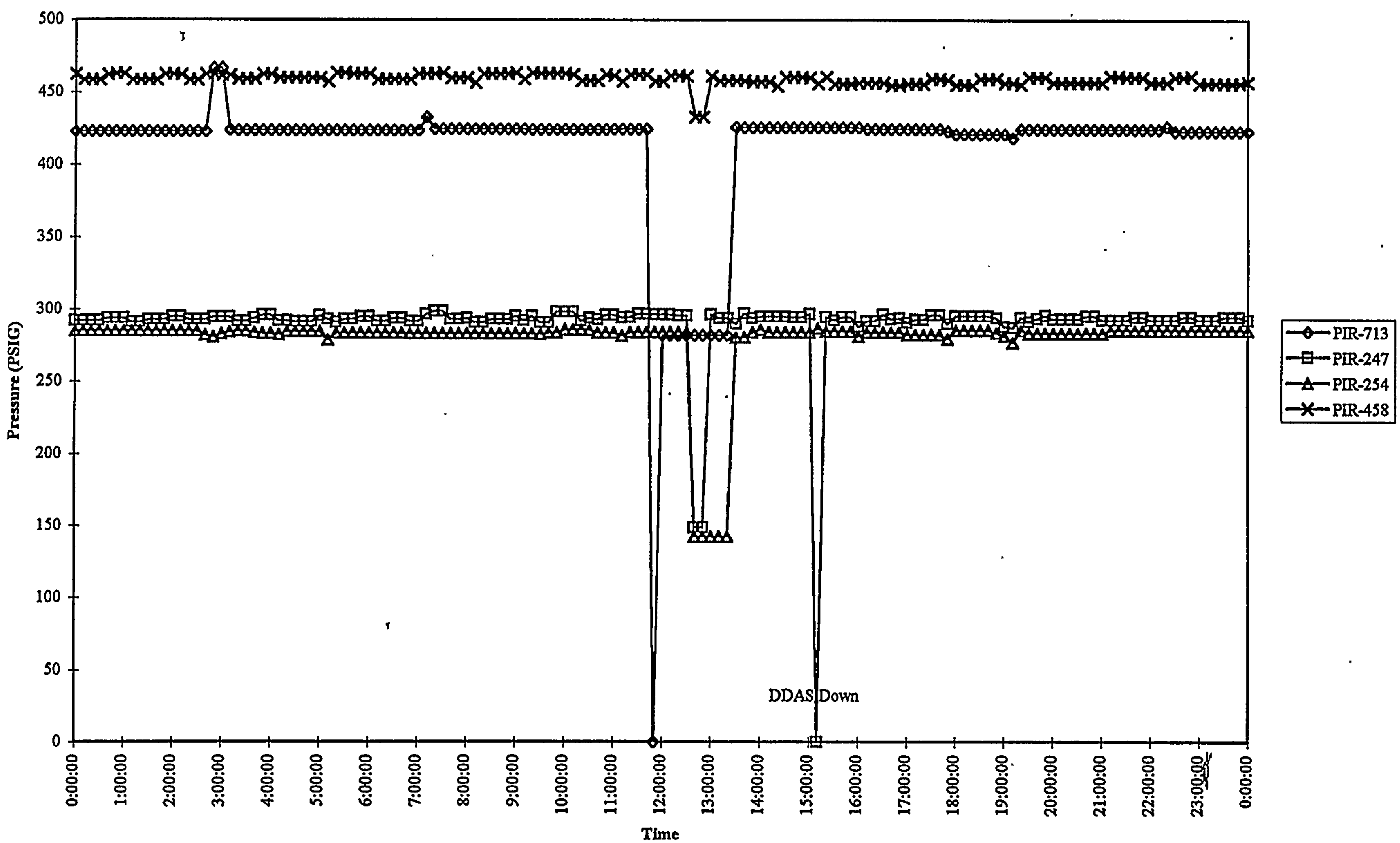



MGCR Process Gas Line Temperatures
Run 94MGC09, 09/16/94
TIR-320B
TIR-318B
TIR-224B
TIR-248B
Temperature (deg F)
1200
1000
800
600
400
200
0
Time
0:00:00
1:00:00
2:00:00
3:00:00
4:00:00
5:00:00
6:00:00
7:00:00
8:00:00
9:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00

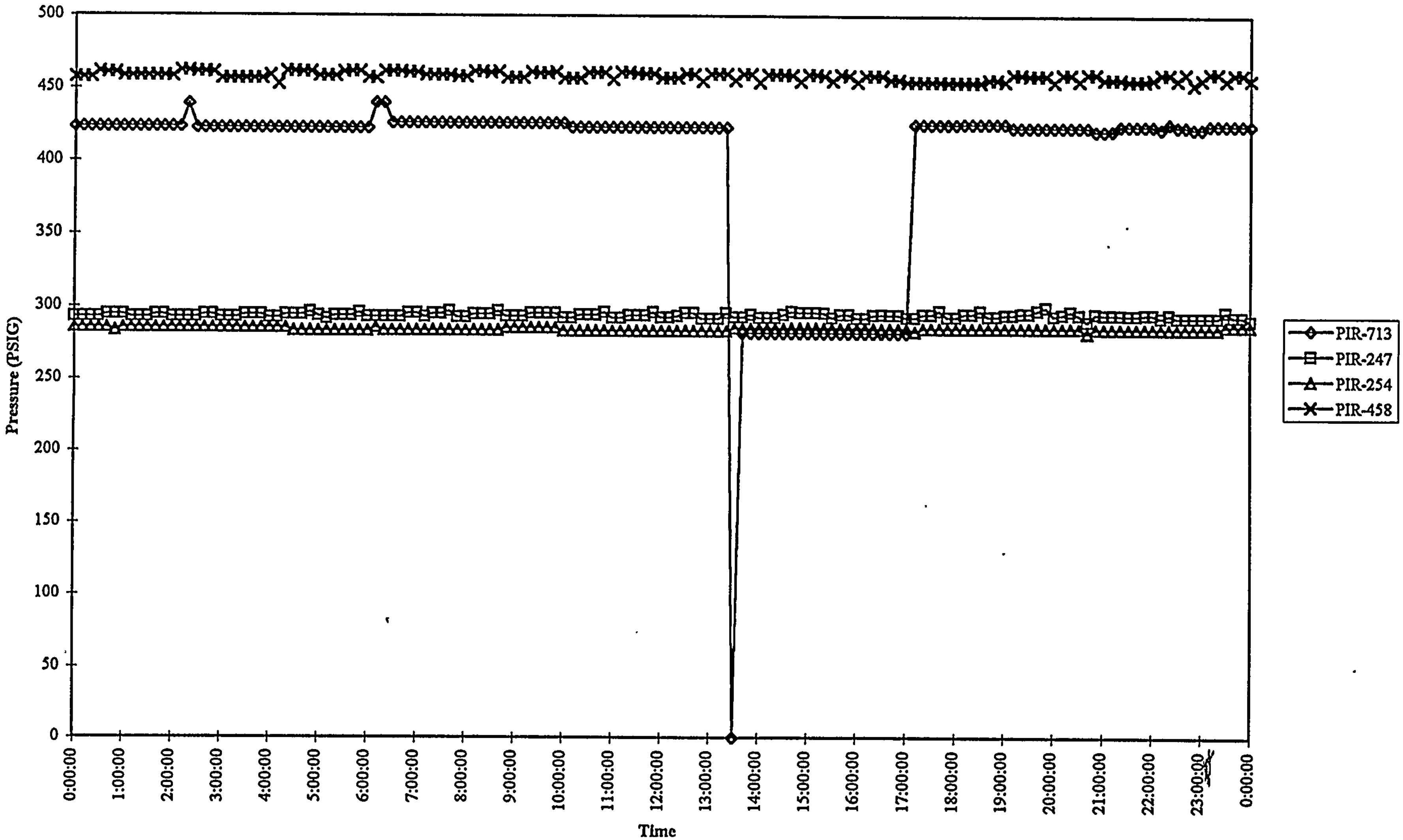
# FBG and MGCR Process Pressures
## Run 94FBG09, 09/12/94



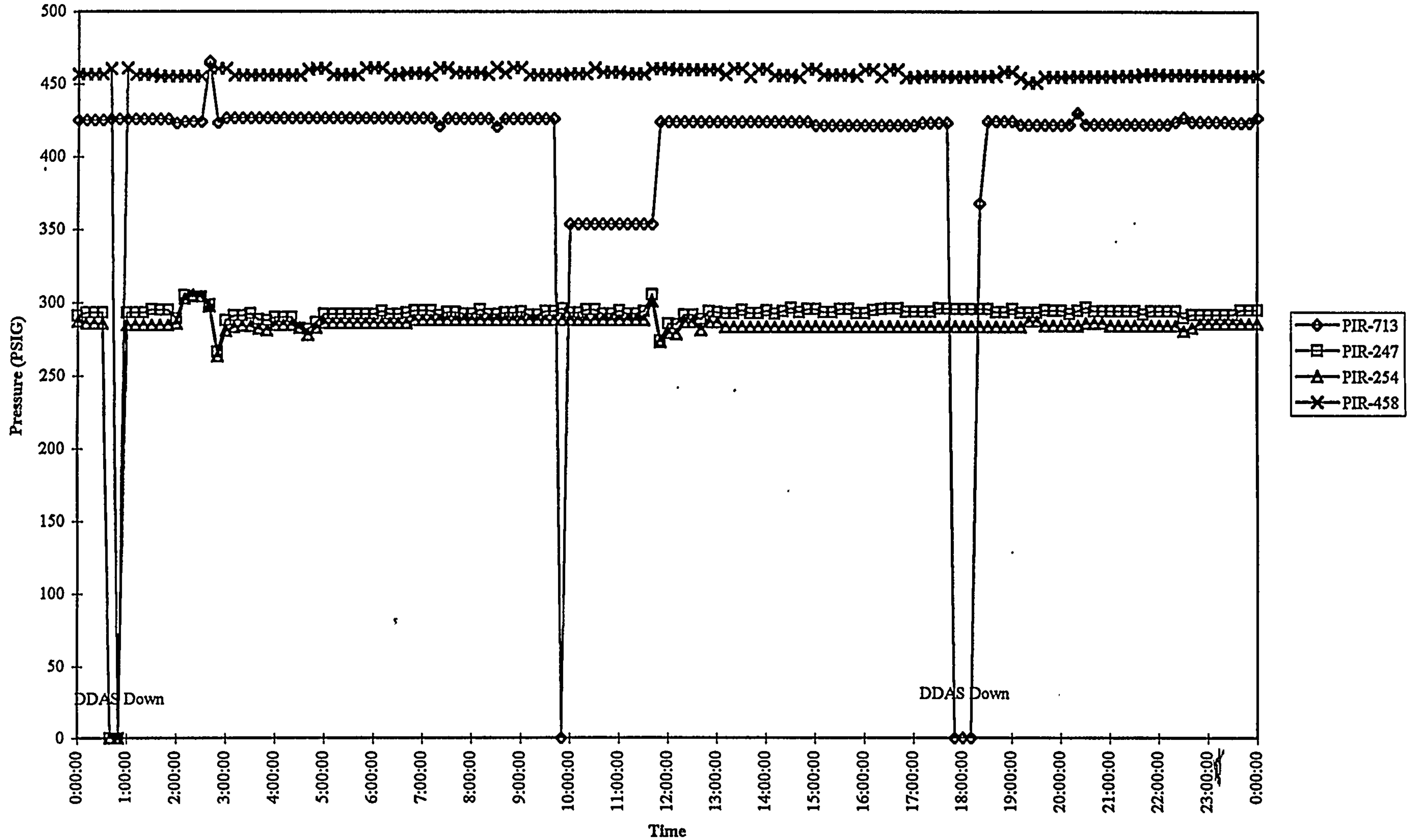
## FBG and MGCR Process Pressures
## Run 94FBG09, 09/13/94



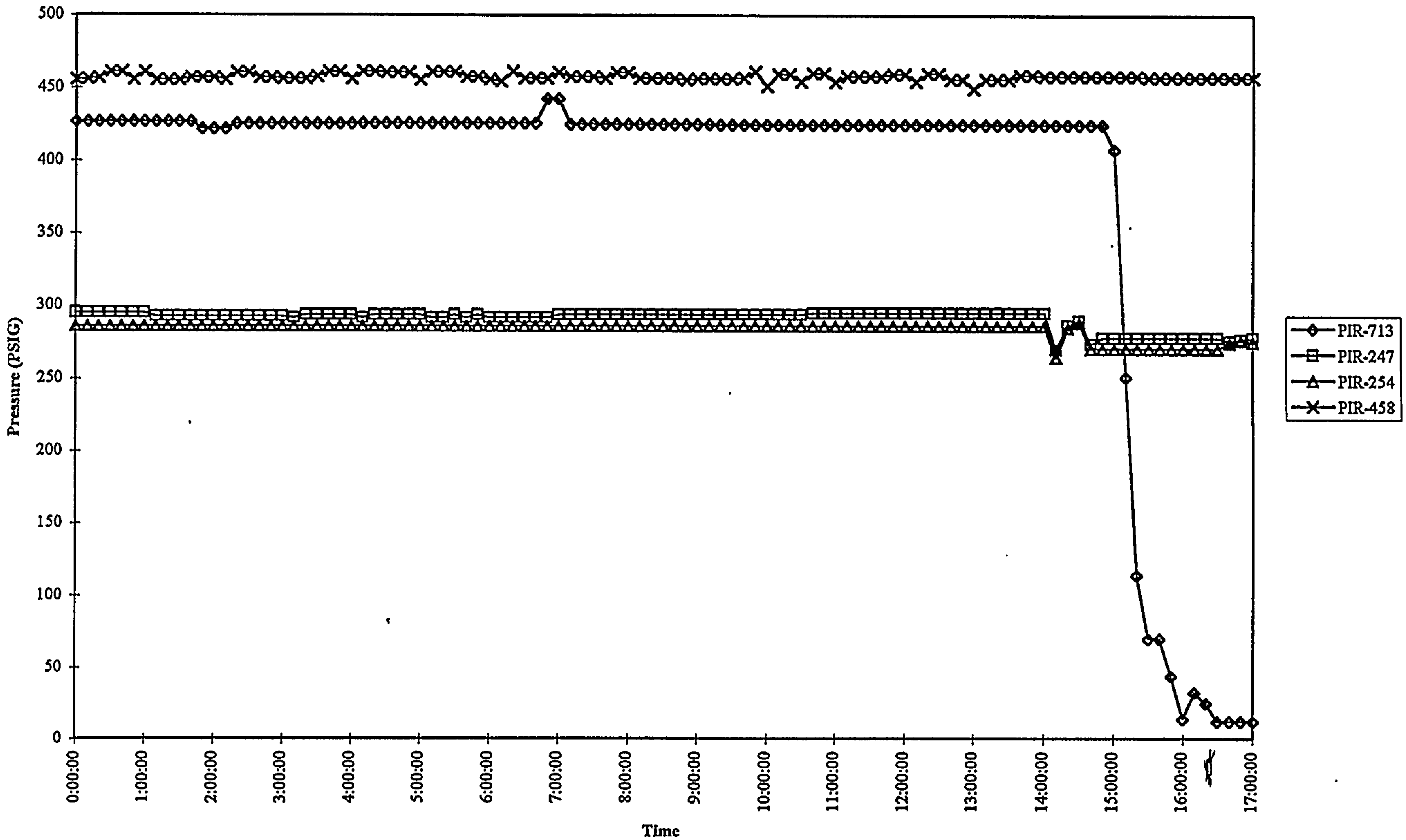
# FBG and MGCR Process Pressures
## Run 94FBG09, 09/14/94



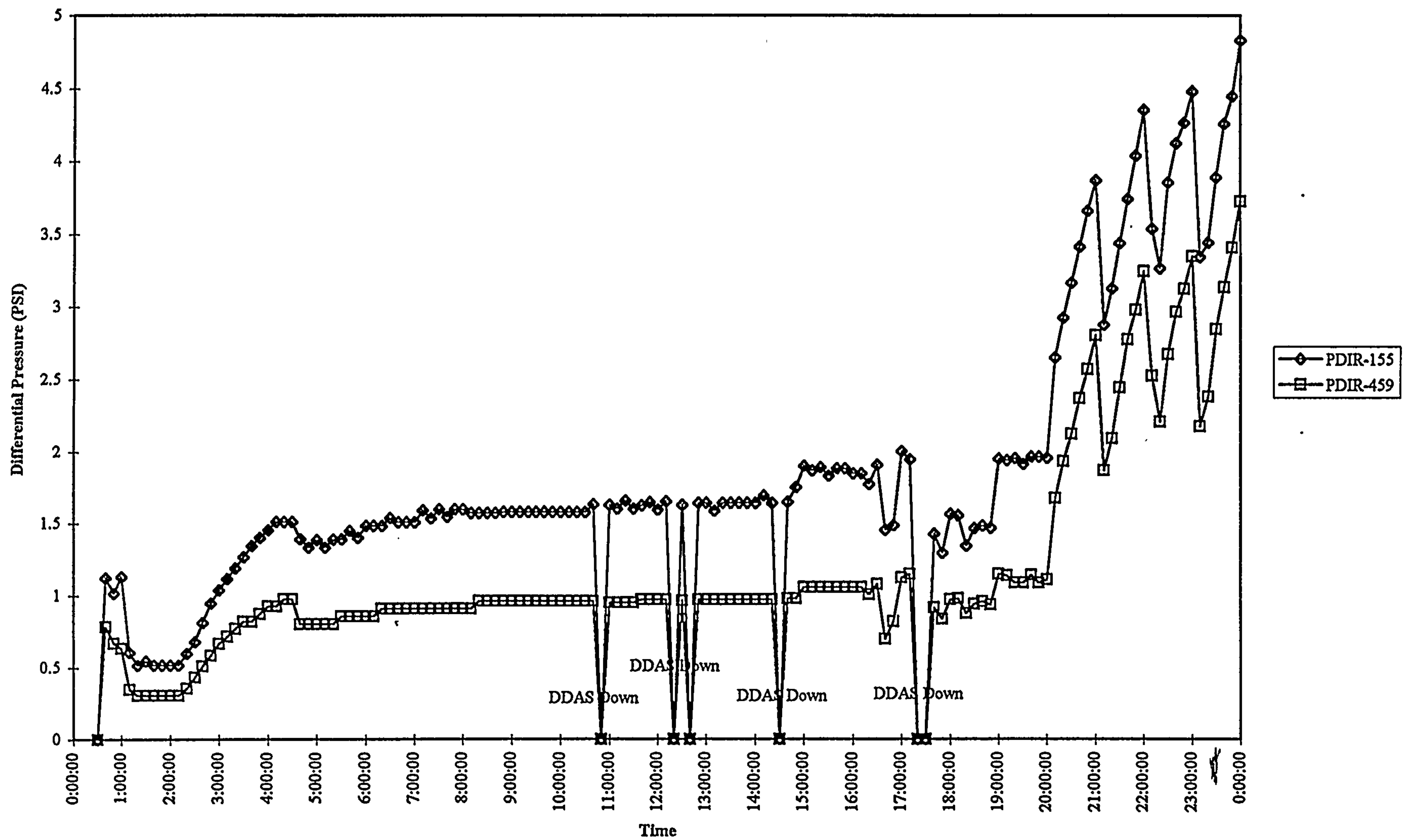
## FBG and MGCR Process Pressures
## Run 94FBG09, 09/15/94



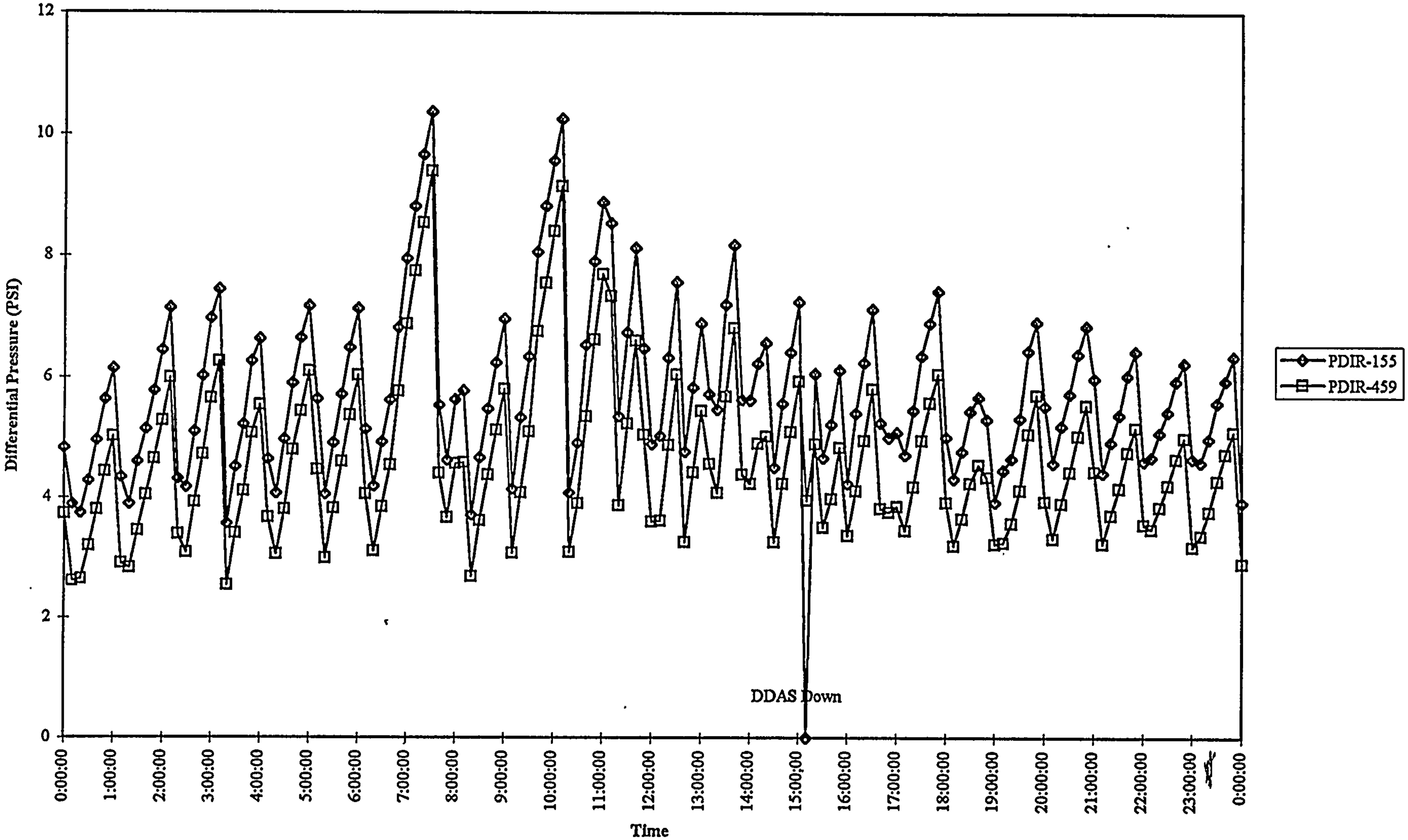
## FBG and MGCR Process Pressures
## Run 94FBG09, 09/16/94



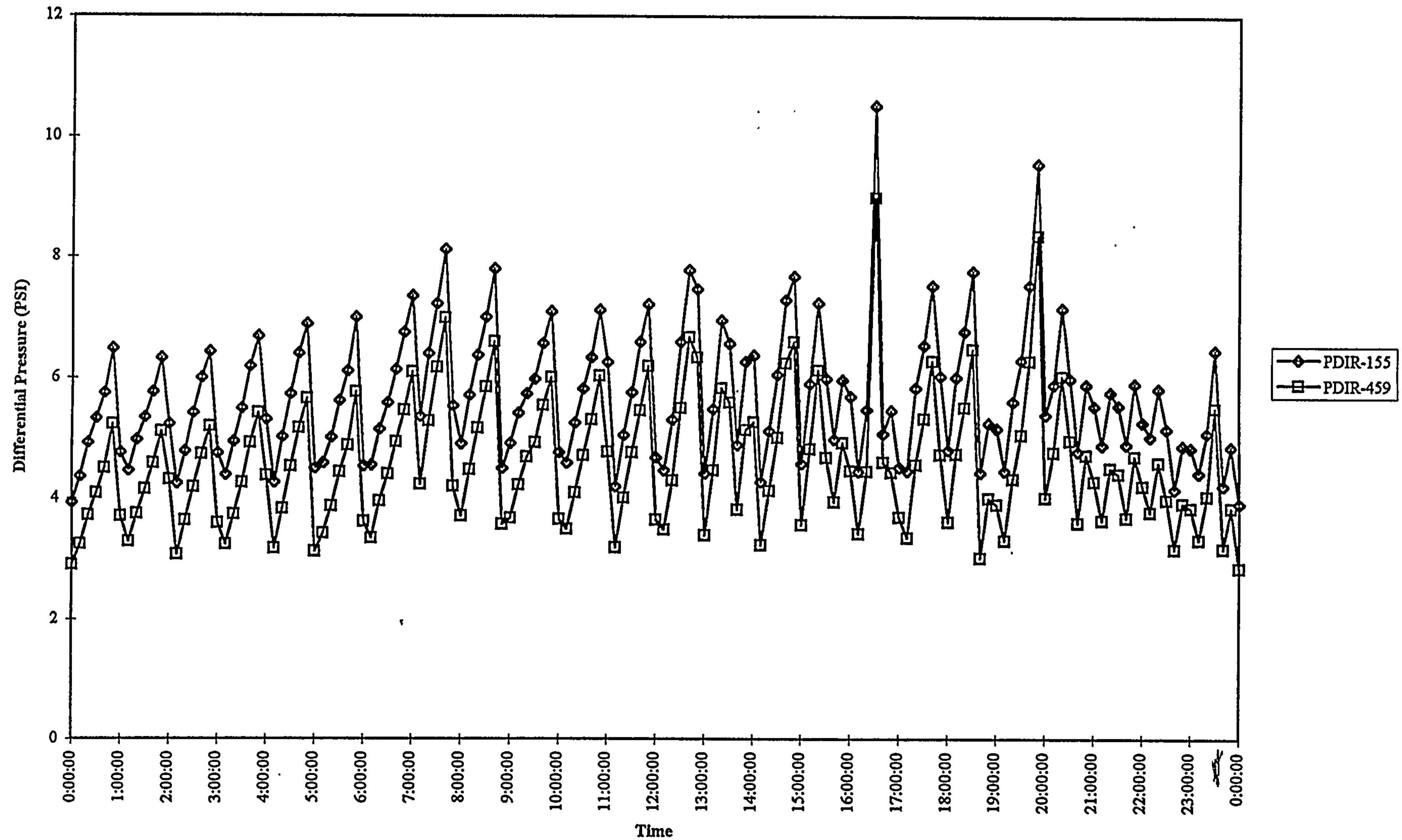
## F-100 Differential Pressure
## Run 94MGC09, 09/12/94

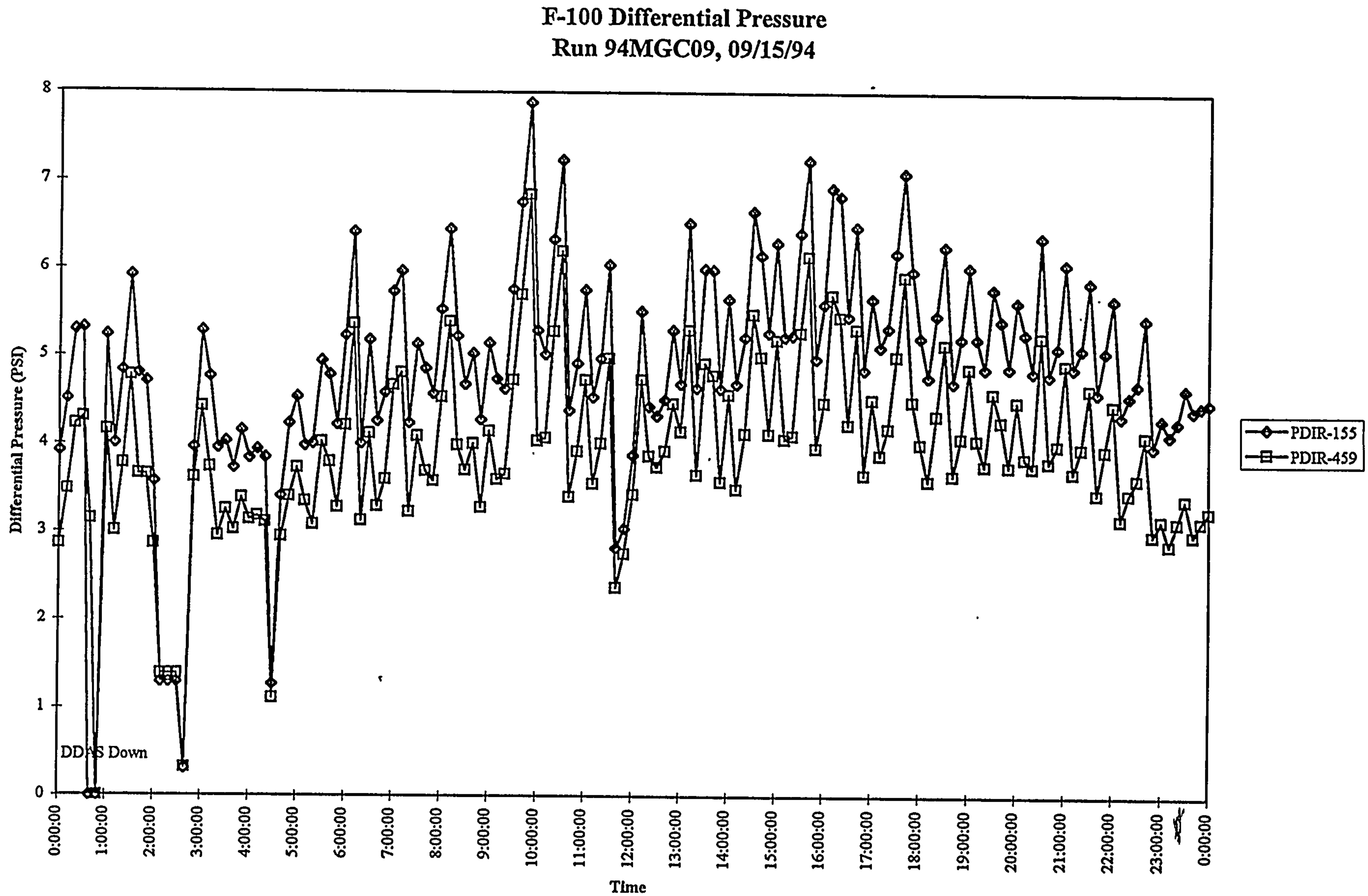


## F-100 Differential Pressure
## Run 94MGC09, 09/13/94

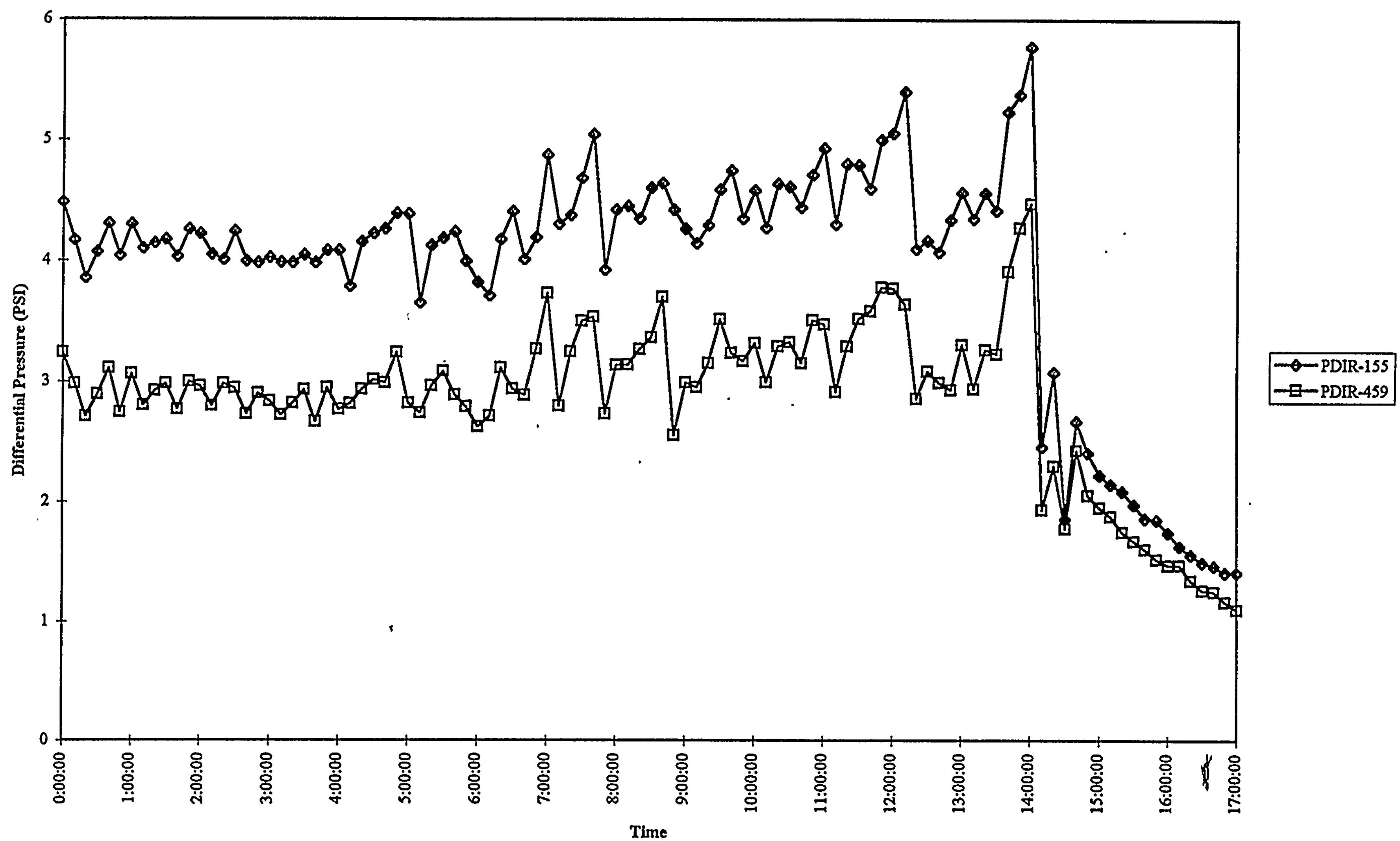


## F-100 Differential Pressure
## Run 94MGC09, 09/14/94



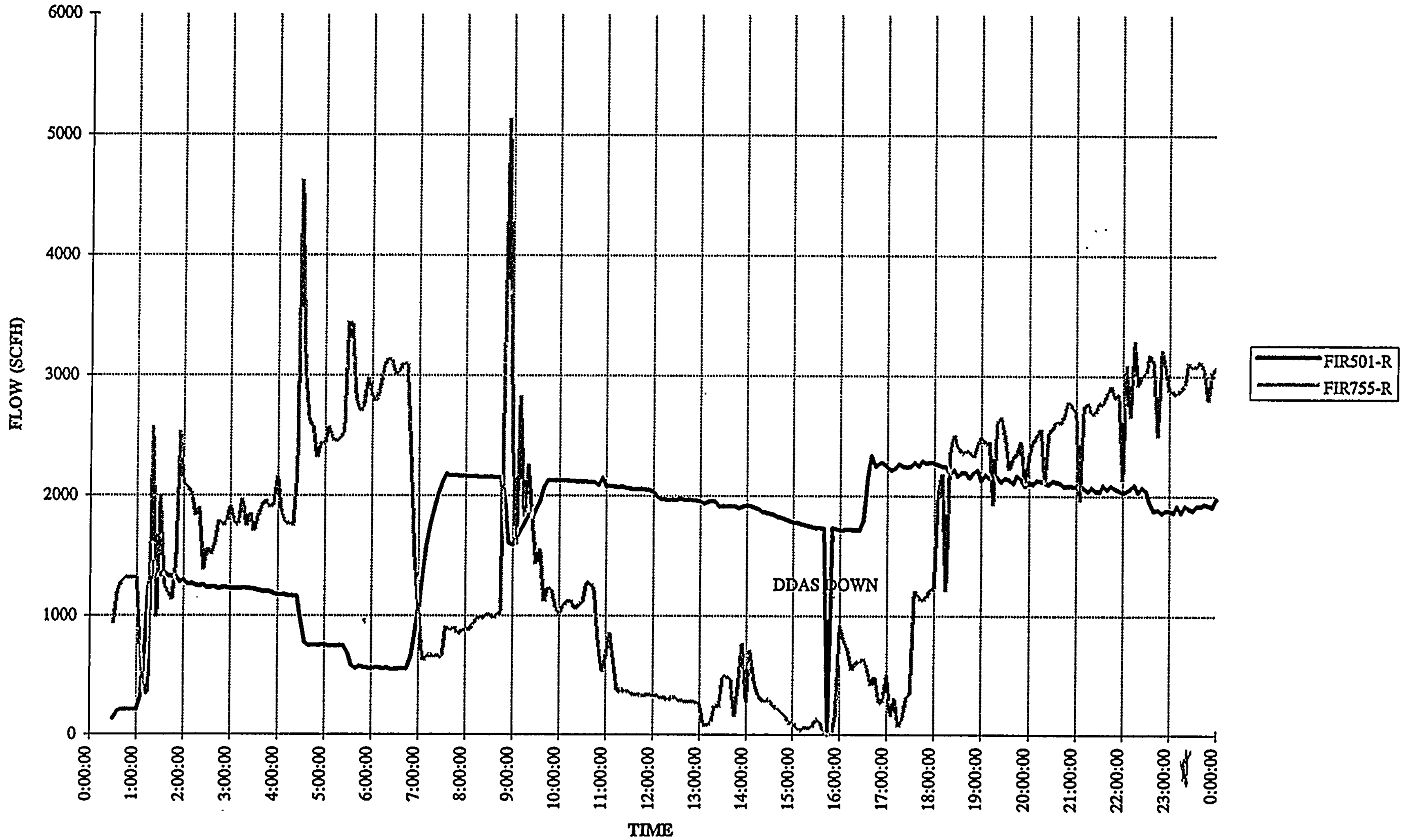

F-100 Differential Pressure
Run 94MGC09, 09/15/94
Differential Pressure (PSI)
0
1
2
3
4
5
6
7
8
Time
0:00:00
1:00:00
2:00:00
3:00:00
4:00:00
5:00:00
6:00:00
7:00:00
8:00:00
9:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
0:00:00
DDAS Down
PDIR-155
PDIR-459

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

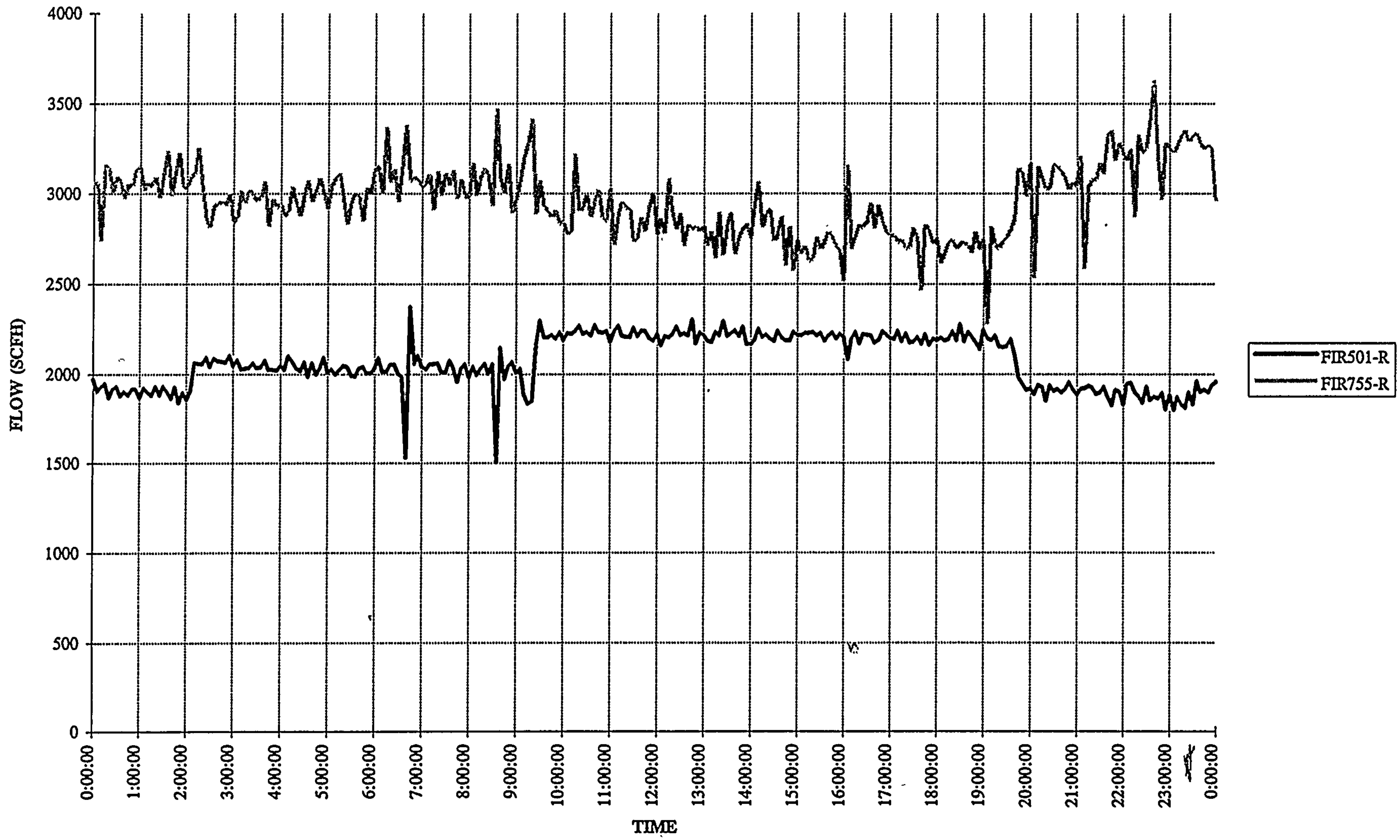


# 94MGC10
# (10/24/94 - 10/28/94)

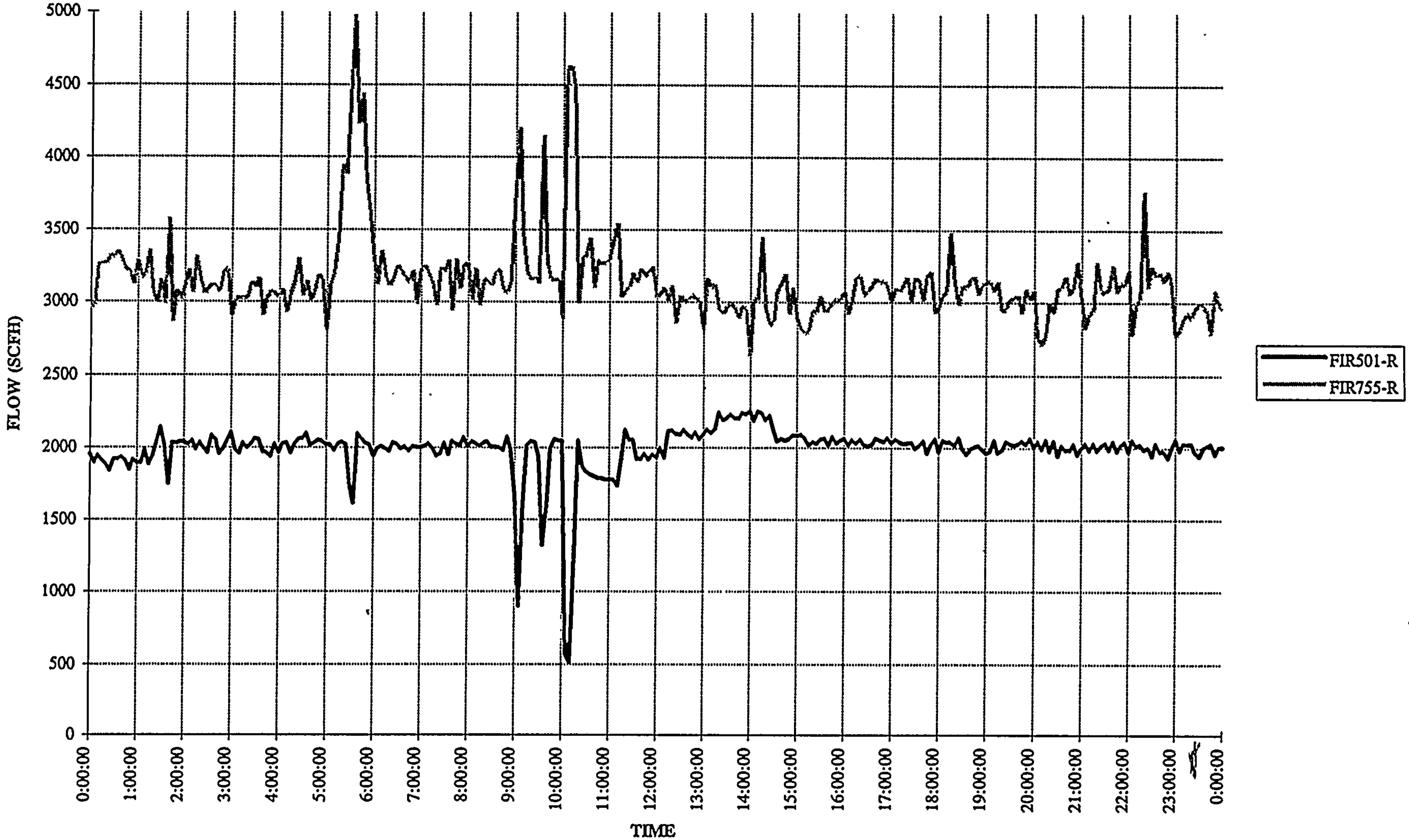
# FBG EXIT FLOWS
# RUN 94FBG10, 10/24/94



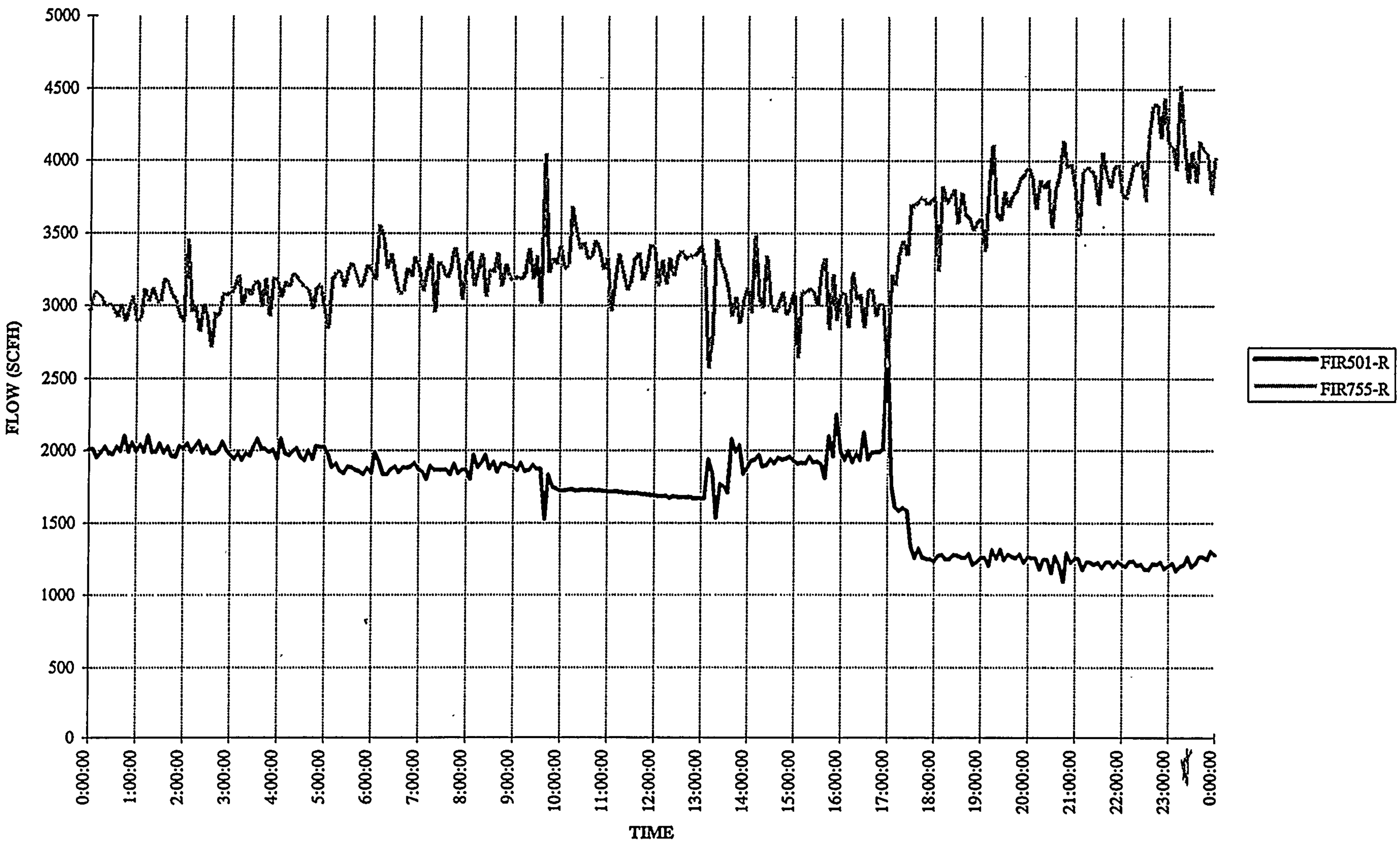
## FBG EXIT FLOWS
## RUN 94FBG10, 10/25/94



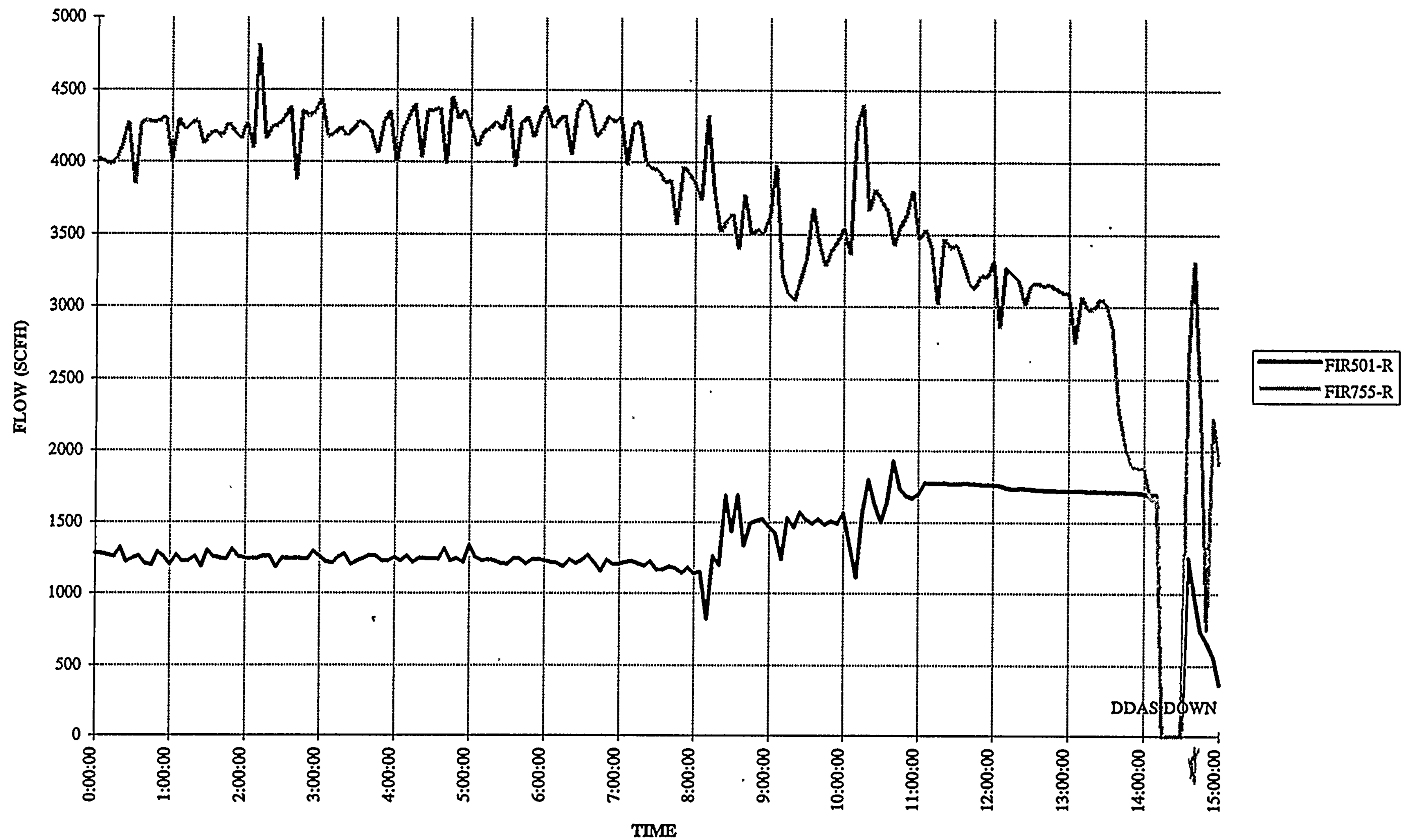
# FBG EXIT FLOWS
# RUN 94FBG10, 10/26/94



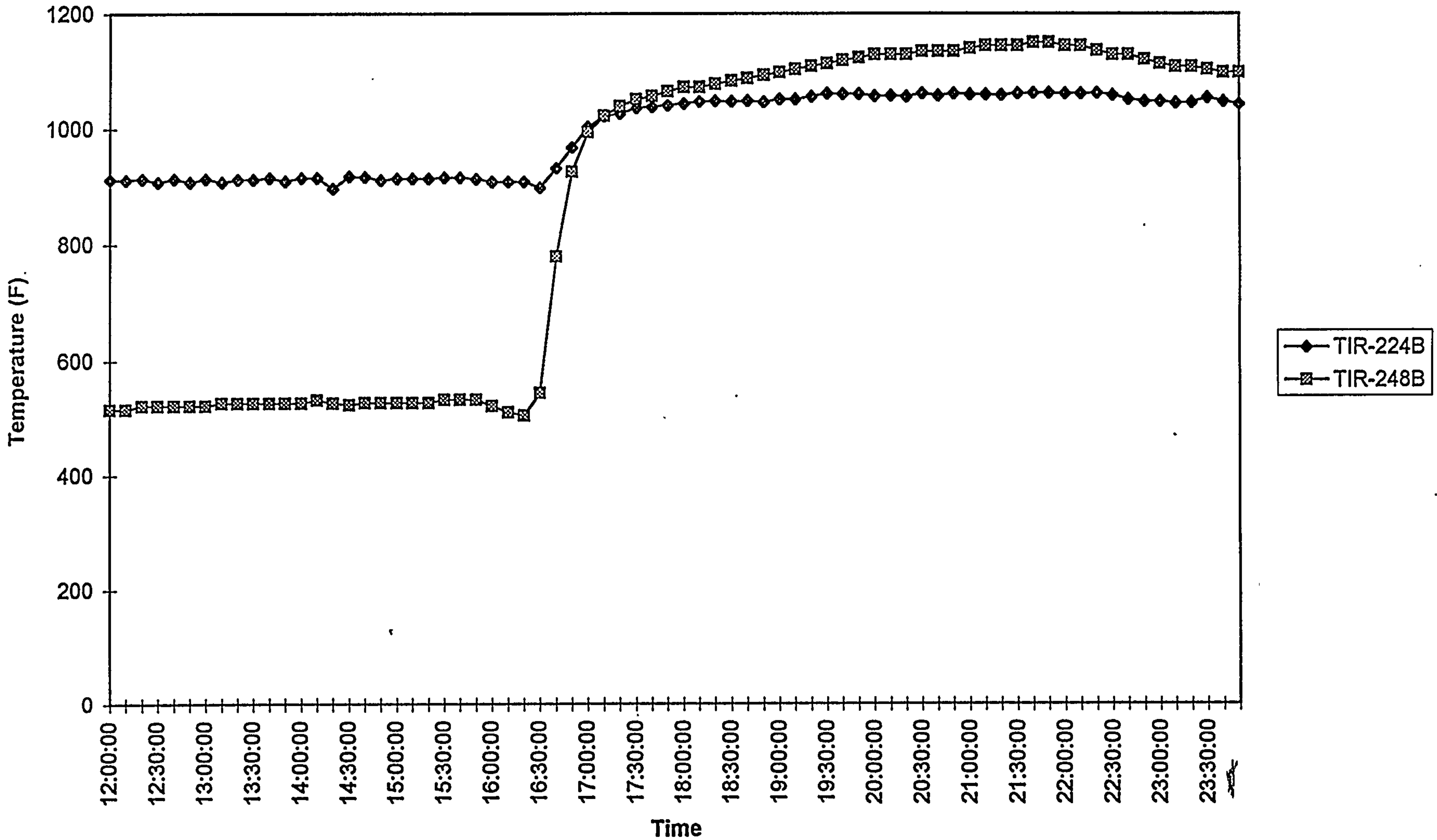
# FBG EXIT FLOWS
## RUN 94FBG10, 10/27/94



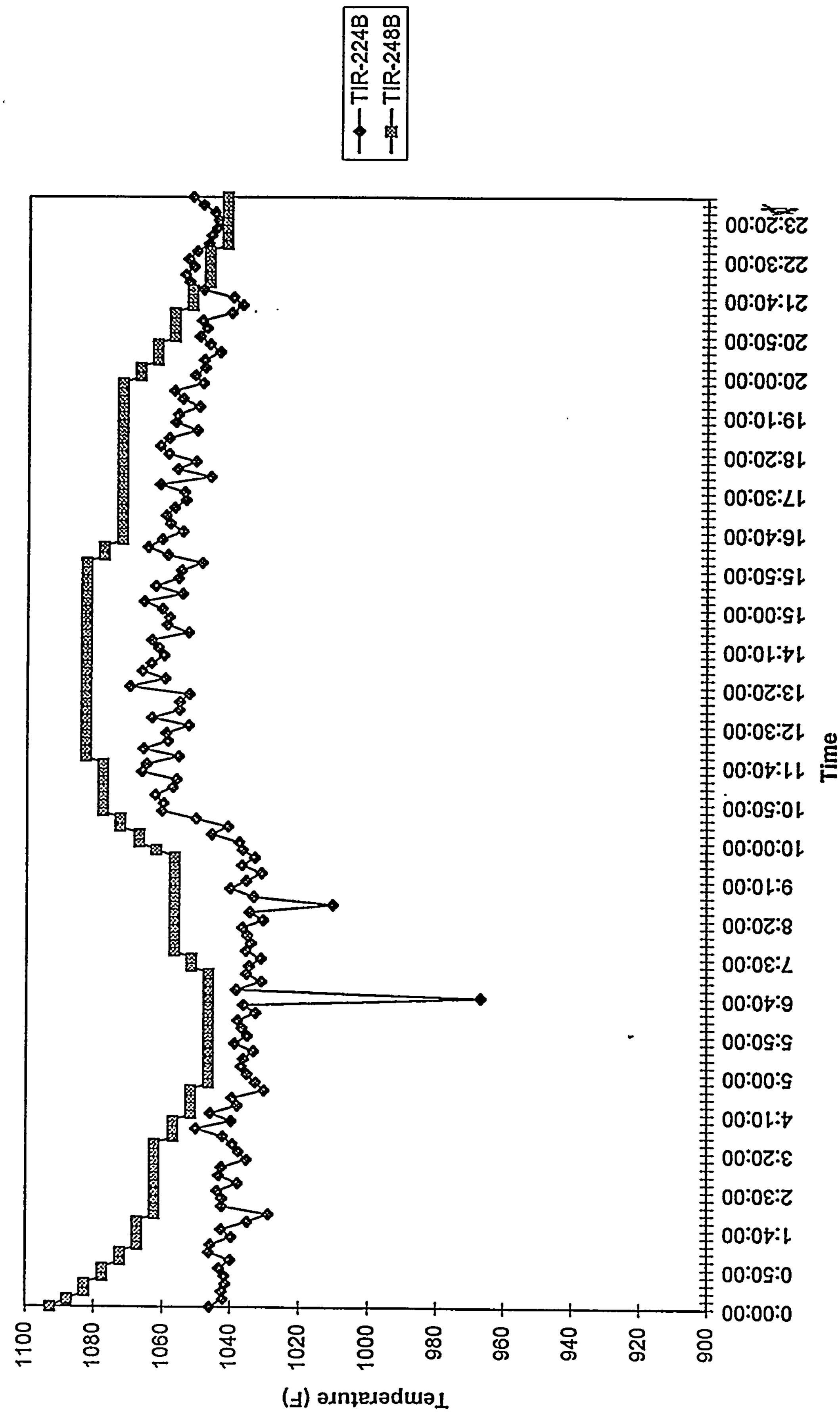
# FBG EXIT FLOWS
## RUN 94FBG10, 10/28/94

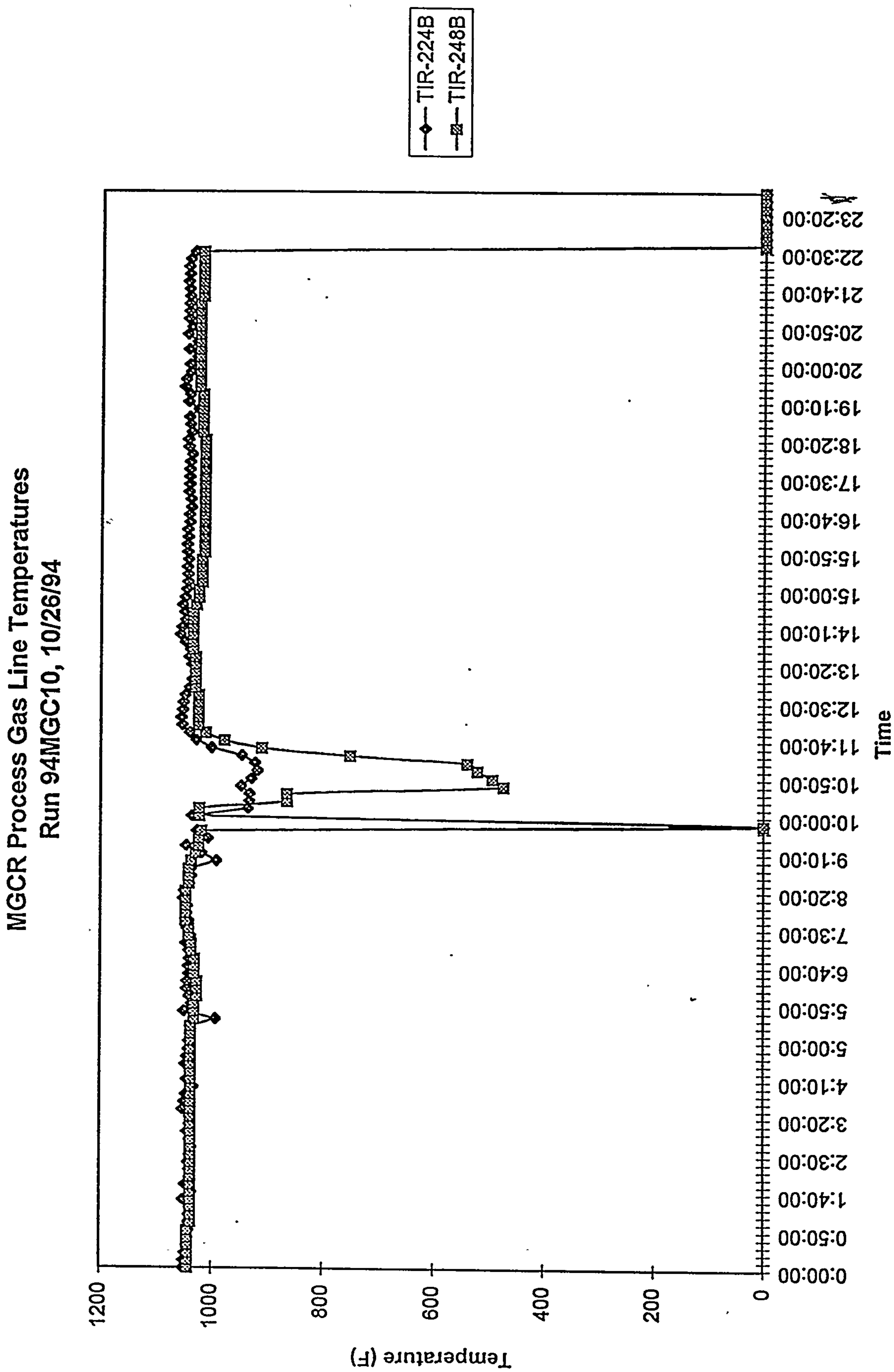


## MGCR Process Gas Line Temperatures
## Run 94MGC10, 10/24/94

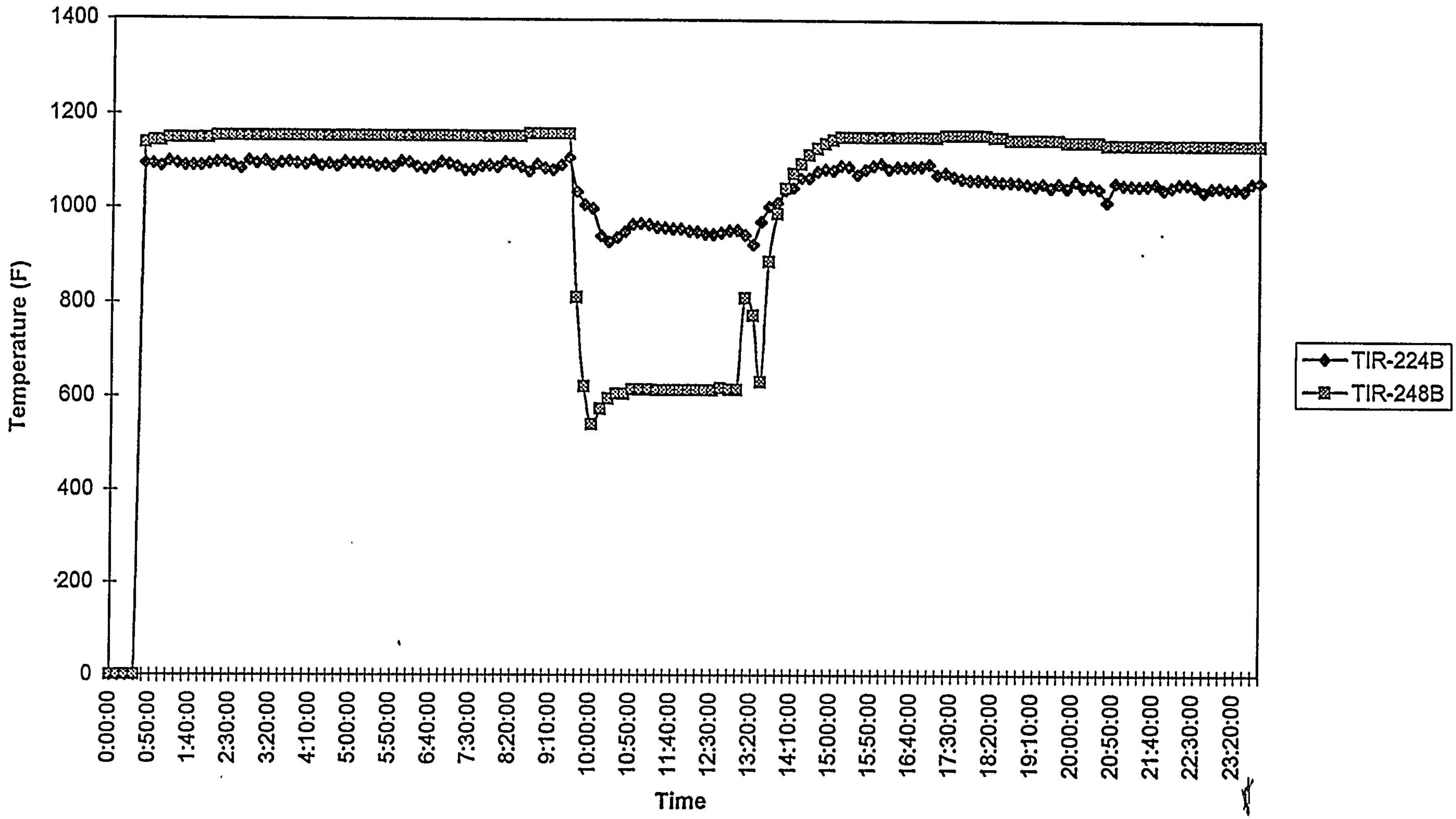


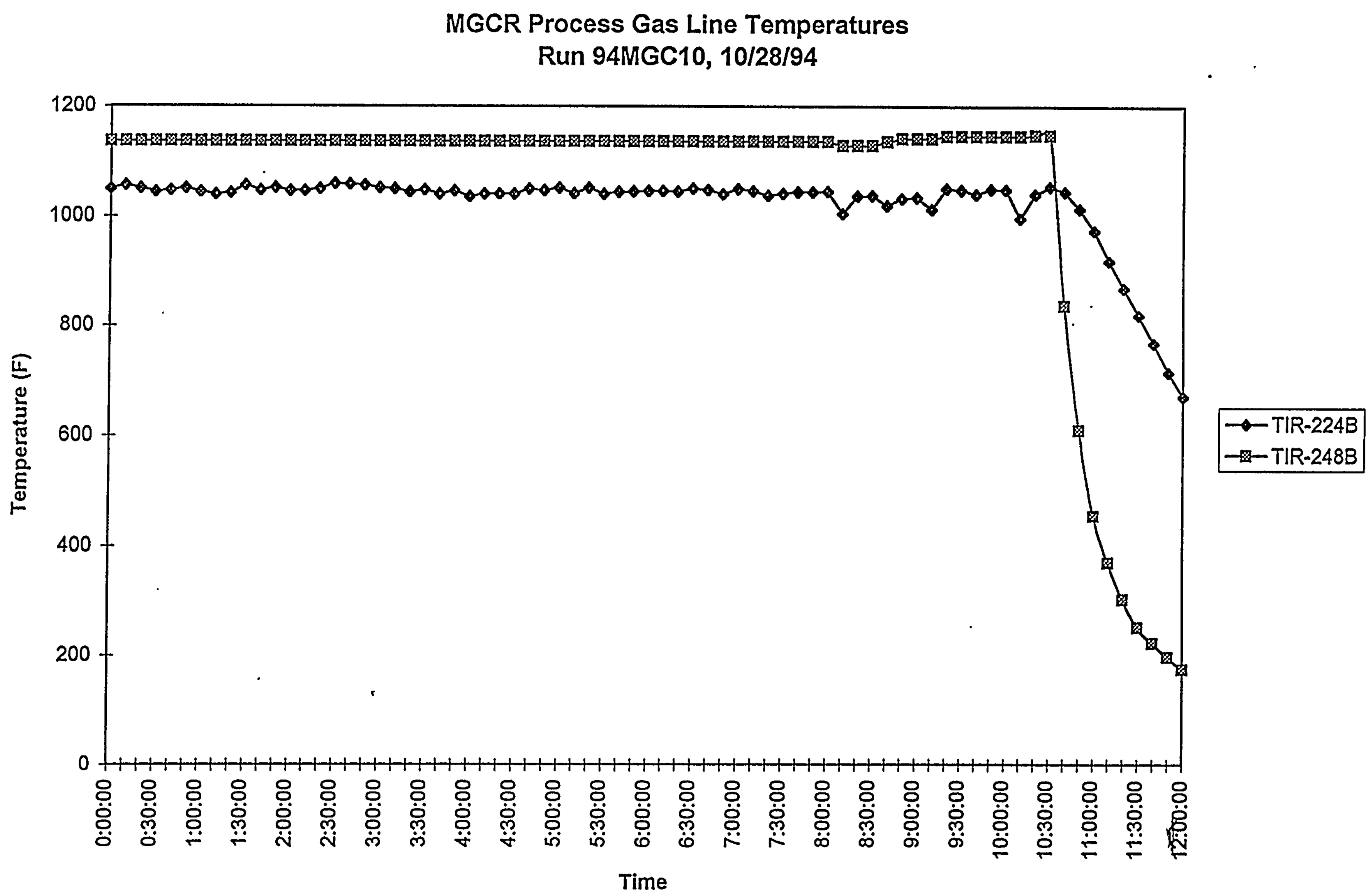
MGCR Process Gas Line Temperatures
Run 94MGC10, 10/25/94



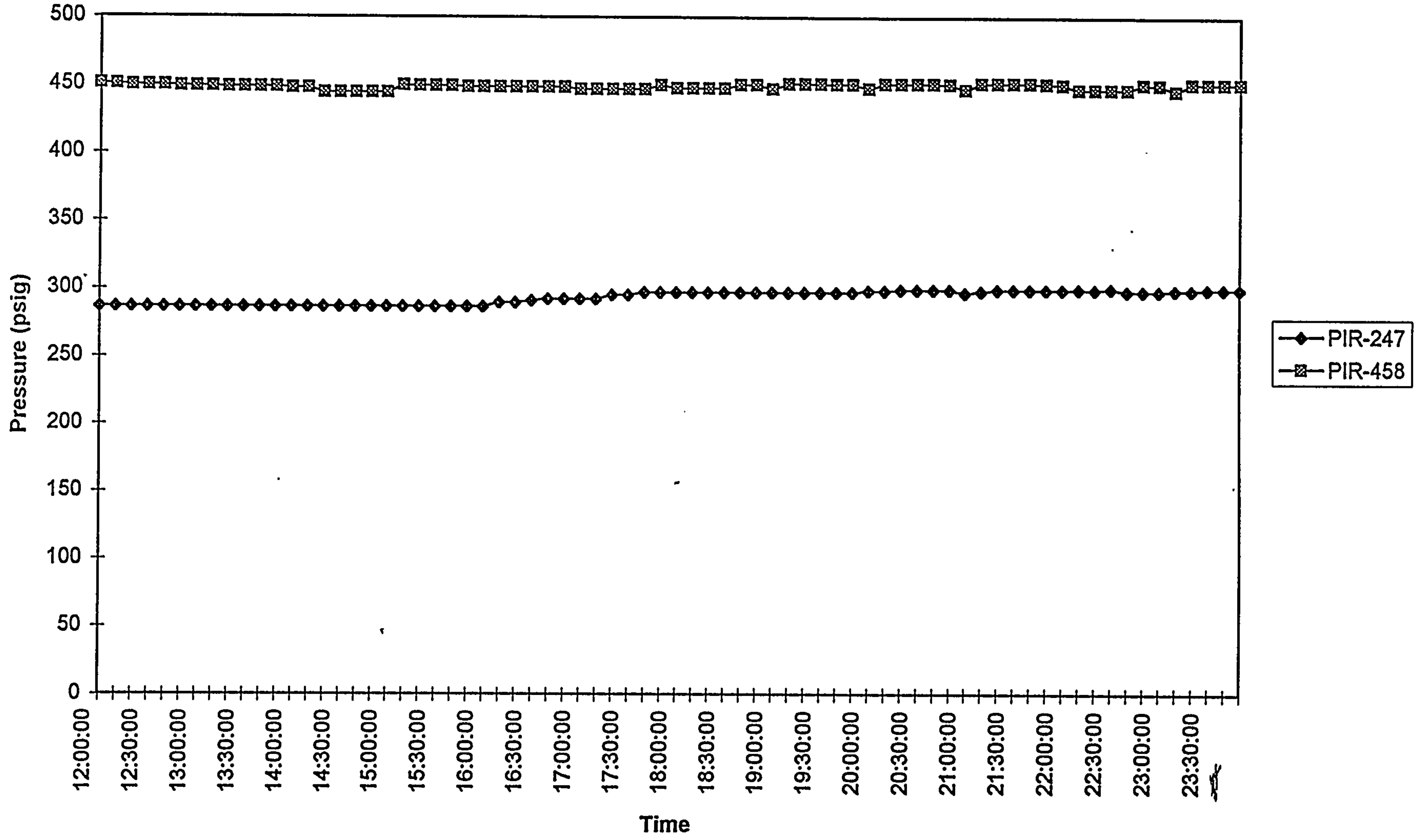

MGCR Process Gas Line Temperatures
Run 94MGC10, 10/26/94
TIR-224B
TIR-248B
Temperature (F)
0
200
400
600
800
1000
1200
Time
0:00:00
0:50:00
1:40:00
2:30:00
3:20:00
4:10:00
5:00:00
5:50:00
6:40:00
7:30:00
8:20:00
9:10:00
10:00:00
10:50:00
11:40:00
12:30:00
13:20:00
14:10:00
15:00:00
15:50:00
16:40:00
17:30:00
18:20:00
19:10:00
20:00:00
20:50:00
21:40:00
22:30:00
23:20:00

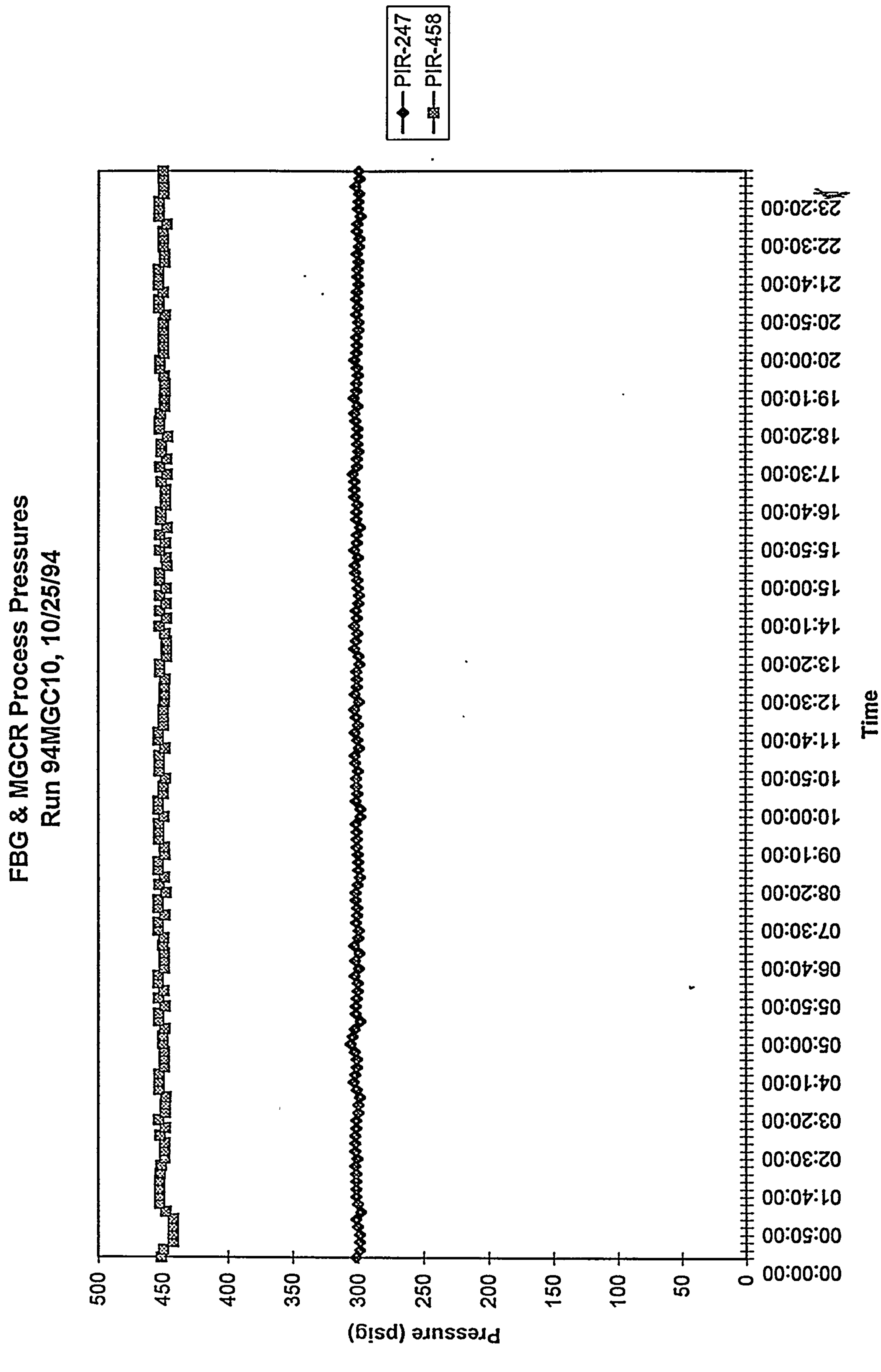
MGCR Process Gas Line Temperatures
Run 94MGC10, 10/27/94




MGCR Process Gas Line Temperatures
Run 94MGC10, 10/28/94
Temperature (F)
0
200
400
600
800
1000
1200
Time
0:00:00
0:30:00
1:00:00
1:30:00
2:00:00
2:30:00
3:00:00
3:30:00
4:00:00
4:30:00
5:00:00
5:30:00
6:00:00
6:30:00
7:00:00
7:30:00
8:00:00
8:30:00
9:00:00
9:30:00
10:00:00
10:30:00
11:00:00
11:30:00
12:00:00
TIR-224B
TIR-248B

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





FBG & MGCR Process Pressures
Run 94MGC10, 10/25/94
PIR-247
PIR-458
Pressure (psig)
500
450
400
350
300
250
200
150
100
50
0
Time
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
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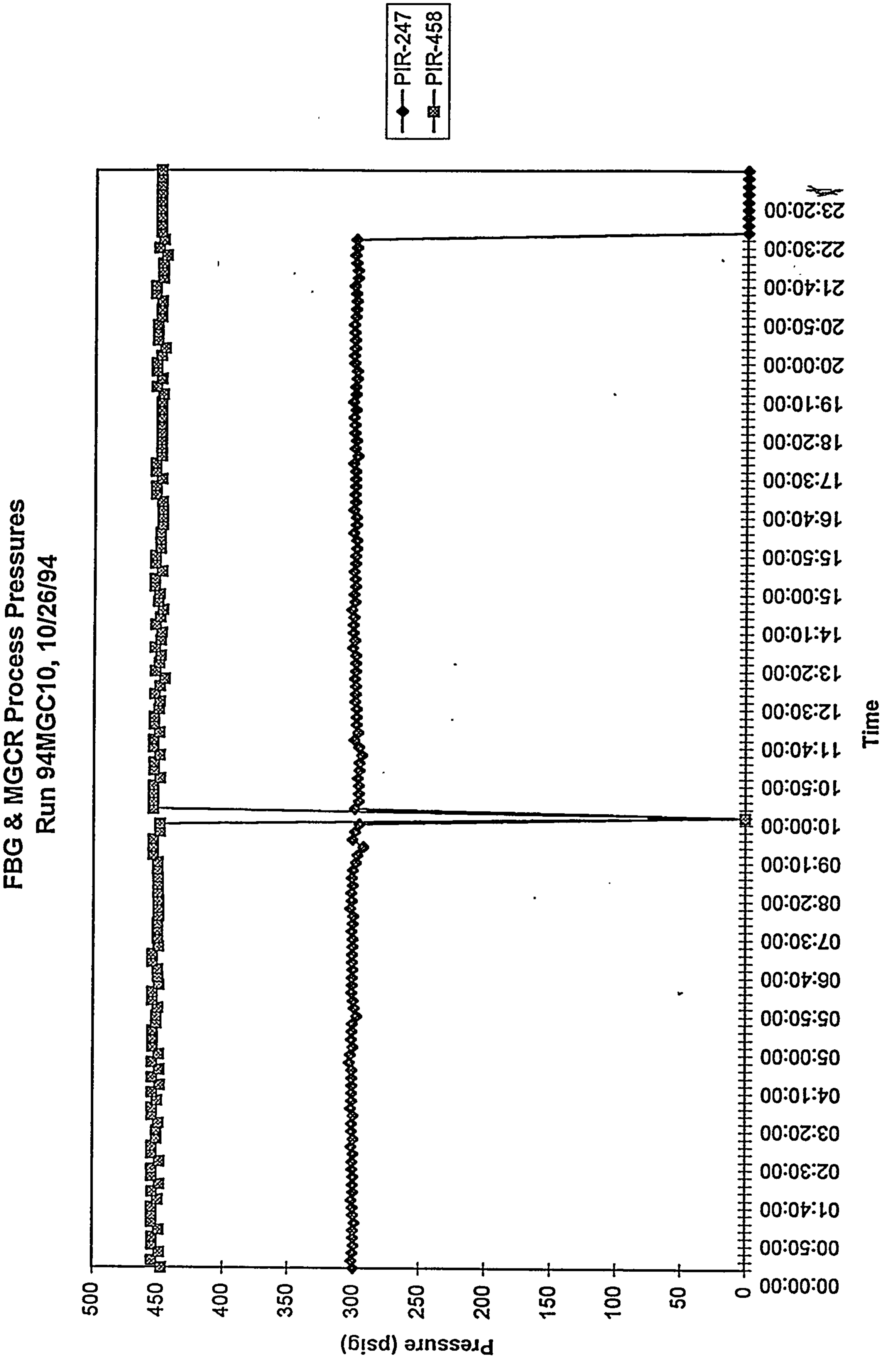
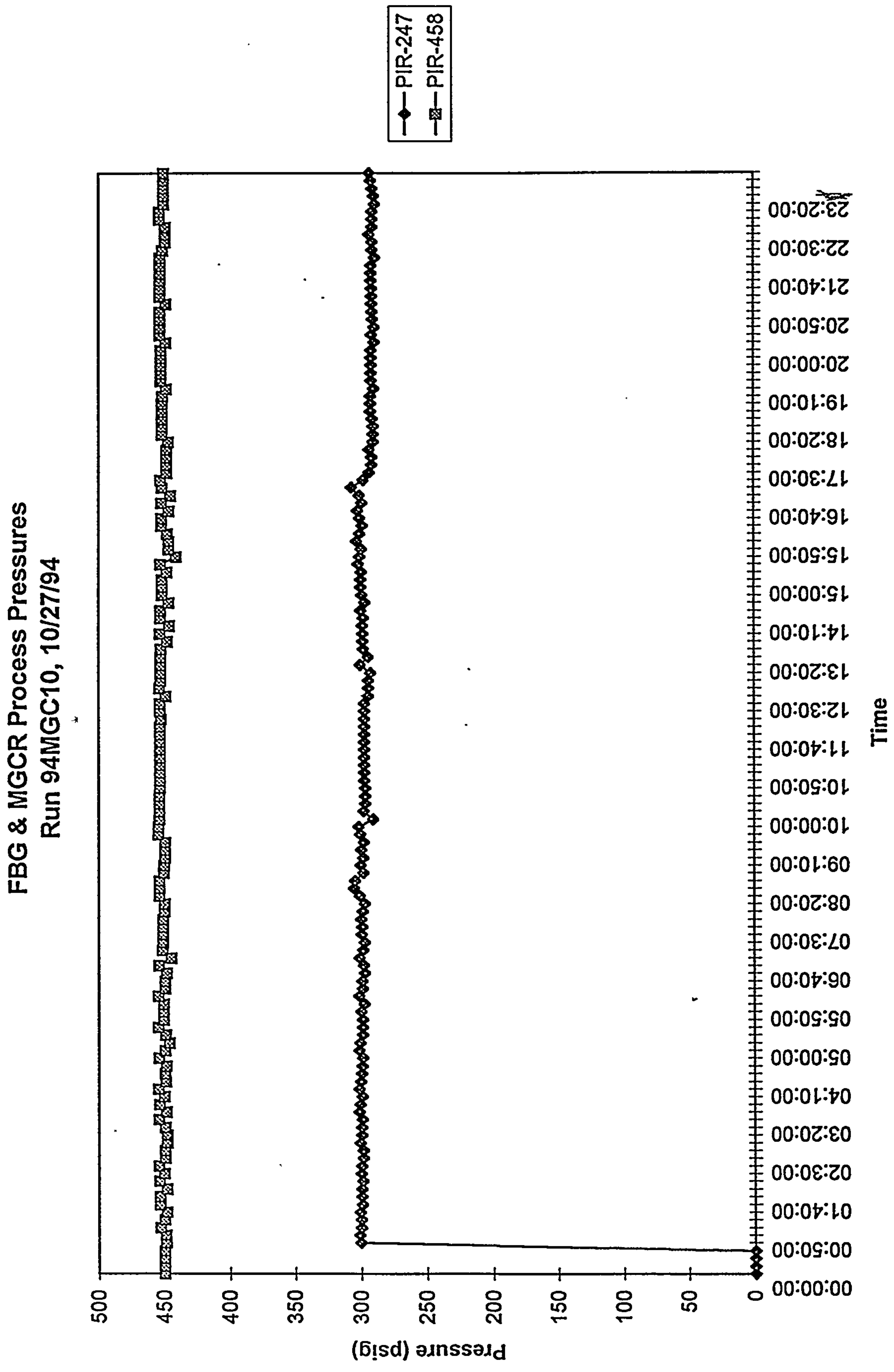
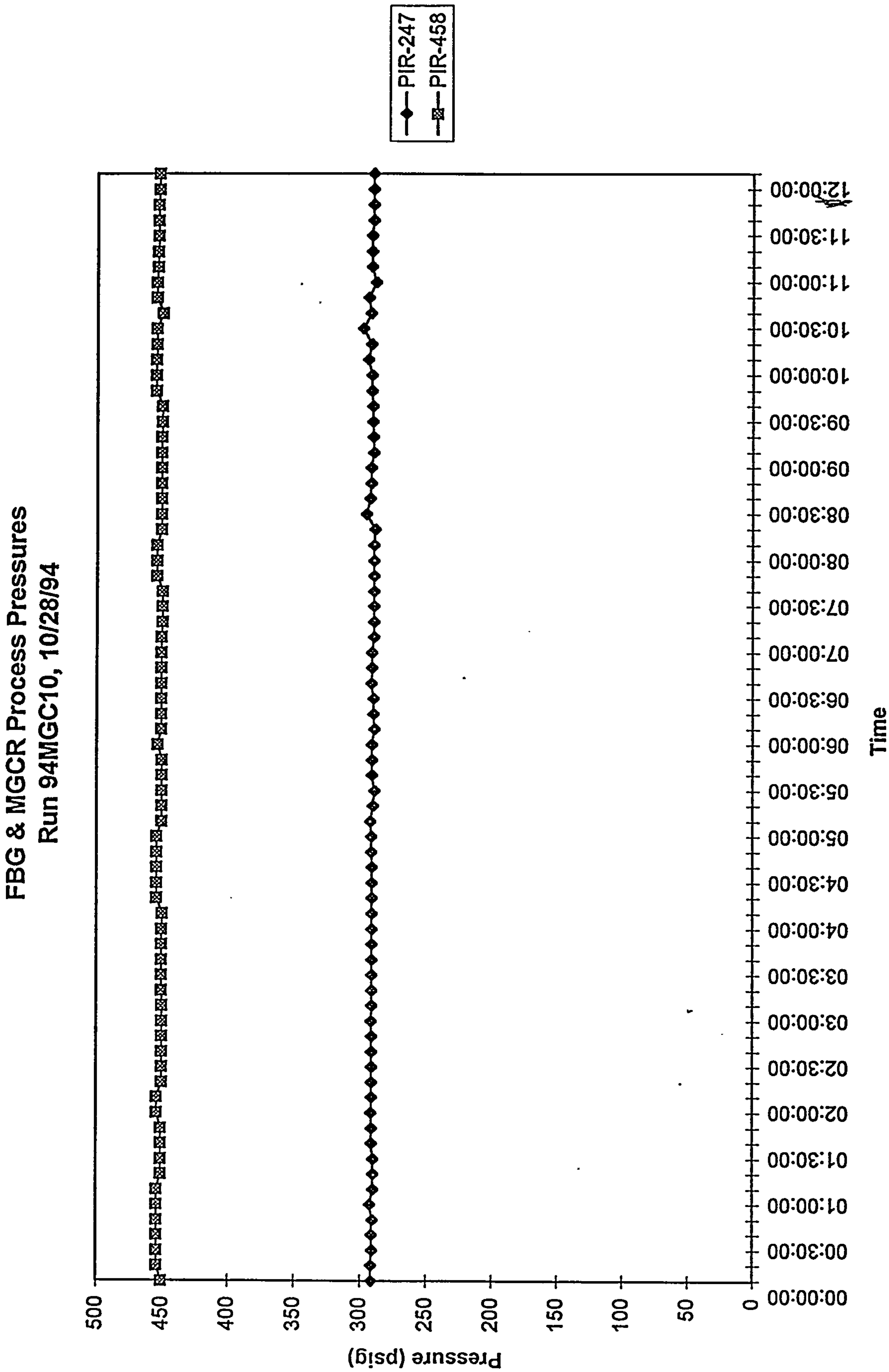
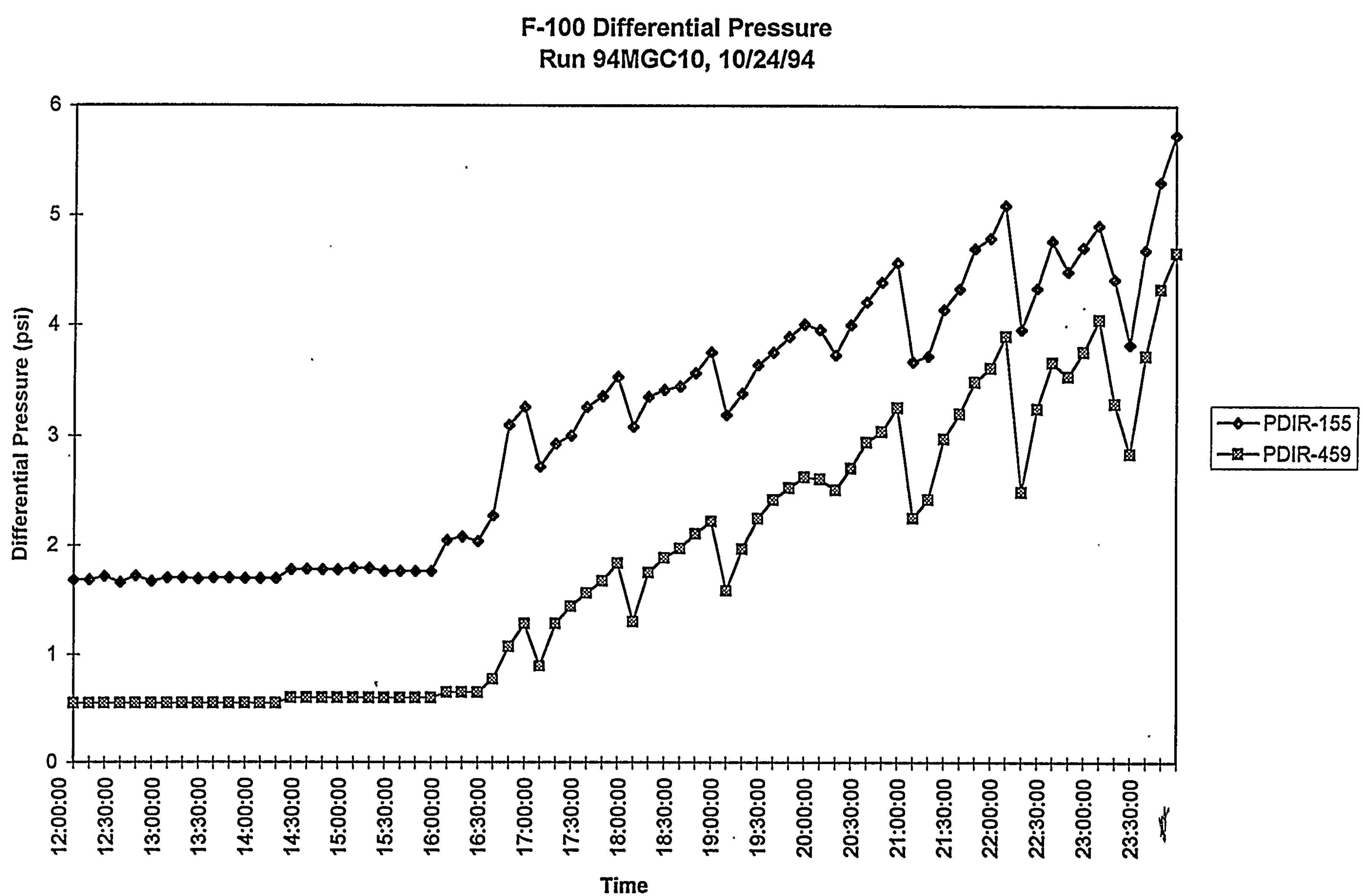
19:10:00
20:00:00
20:50:00
21:40:00
22:30:00
23:20:00


FBG & MGCR Process Pressures
Run 94MGC10, 10/26/94
PIR-247
PIR-458
Pressure (psig)
Time
500
450
400
350
300
250
200
150
100
50
0
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

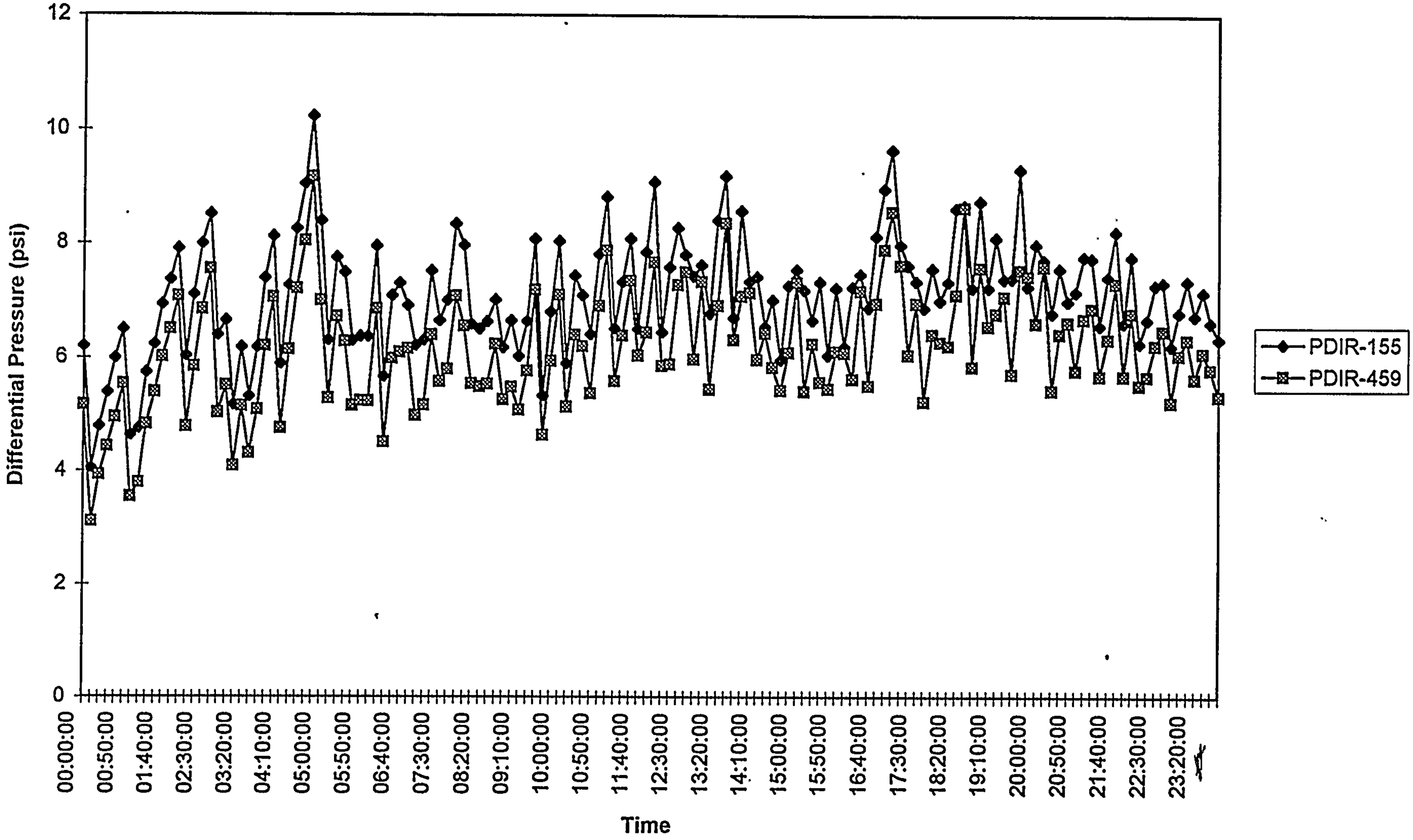

FBG & MGCR Process Pressures
Run 94MGC10, 10/27/94
PIR-247
PIR-458
Pressure (psig)
500
450
400
350
300
250
200
150
100
50
0
Time
00:00:00
00:50:00
01:40:00
02:30:00
03:20:00
04:10:00
05:00:00
05:50:00
06:40:00
07:30:00
08:20:00
09:10:00
10:00:00
10:50:00
11:40:00
12:30:00
13:20:00
14:10:00
15:00:00
15:50:00
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

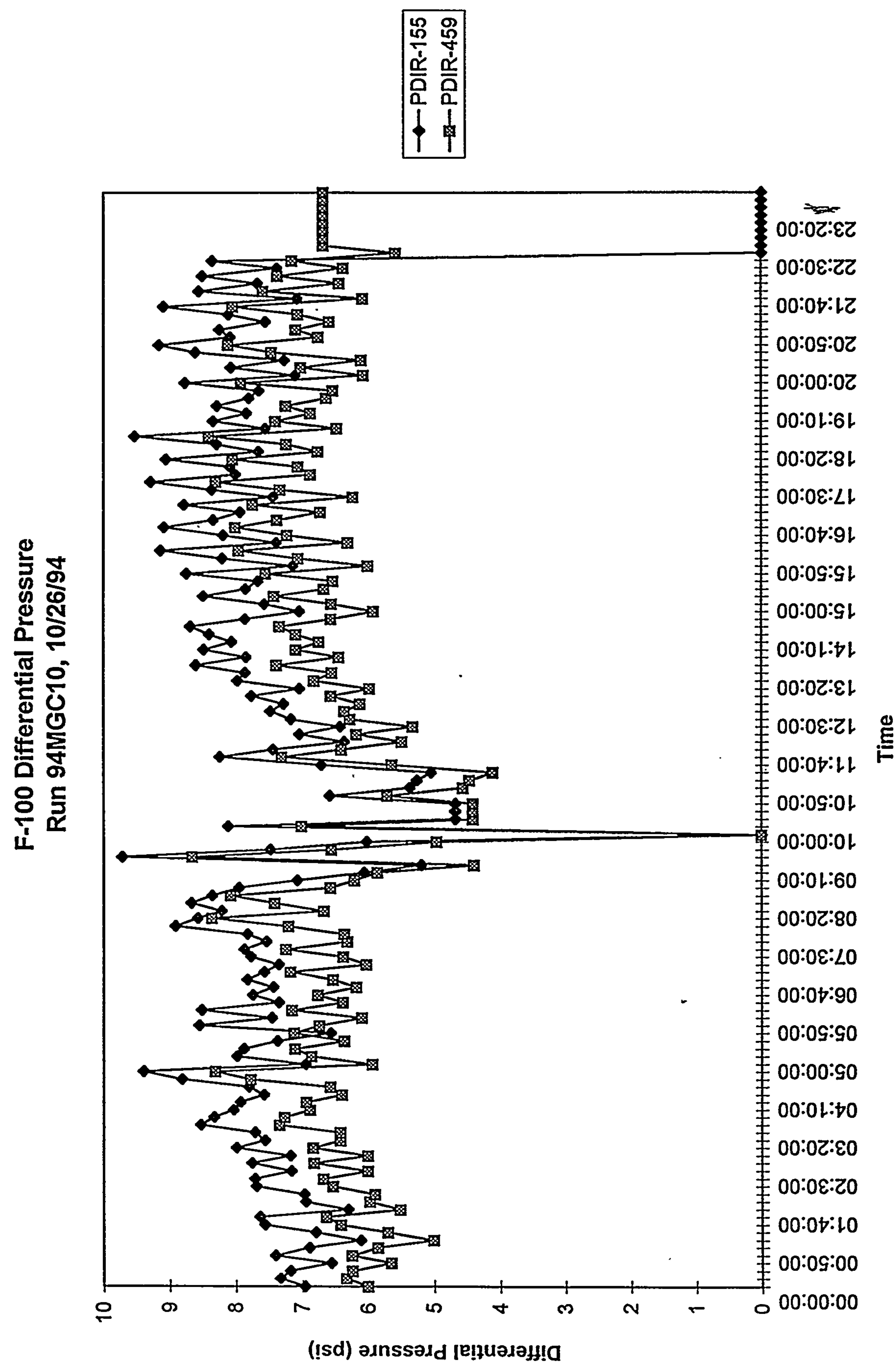

FBG & MGCR Process Pressures
Run 94MGC10, 10/28/94
PIR-247
PIR-458
Pressure (psig)
500
450
400
350
300
250
200
150
100
50
0
Time
00:00:00
00:30:00
01:00:00
01:30:00
02:00:00
02:30:00
03:00:00
03:30:00
04:00:00
04:30:00
05:00:00
05:30:00
06:00:00
06:30:00
07:00:00
07:30:00
08:00:00
08:30:00
09:00:00
09:30:00
10:00:00
10:30:00
11:00:00
11:30:00
12:00:00



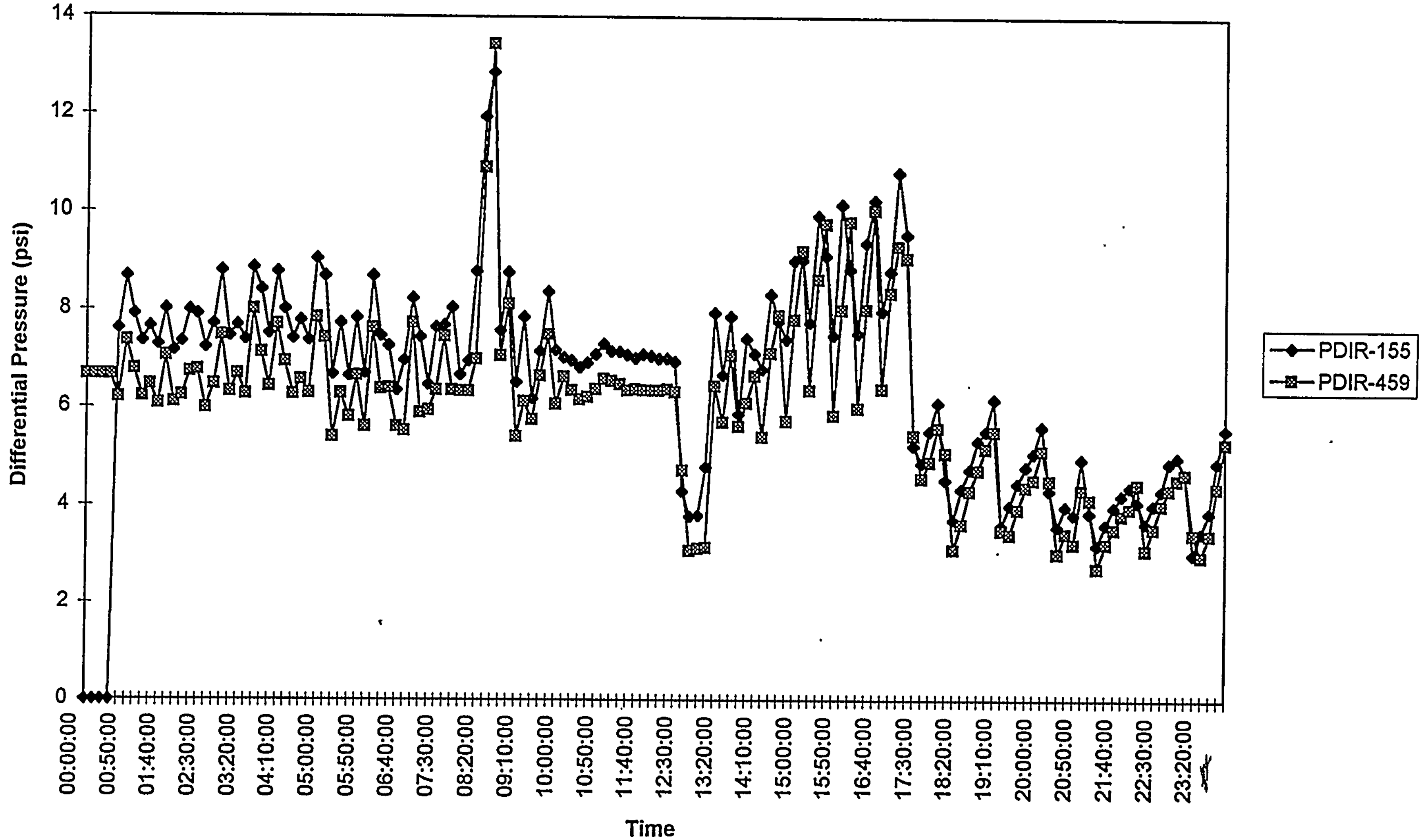
F-100 Differential Pressure
Run 94MGC10, 10/24/94
Differential Pressure (psi)
0
1
2
3
4
5
6
12:00:00
12:30:00
13:00:00
13:30:00
14:00:00
14:30:00
15:00:00
15:30:00
16:00:00
16:30:00
17:00:00
17:30:00
18:00:00
18:30:00
19:00:00
19:30:00
20:00:00
20:30:00
21:00:00
21:30:00
22:00:00
22:30:00
23:00:00
23:30:00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

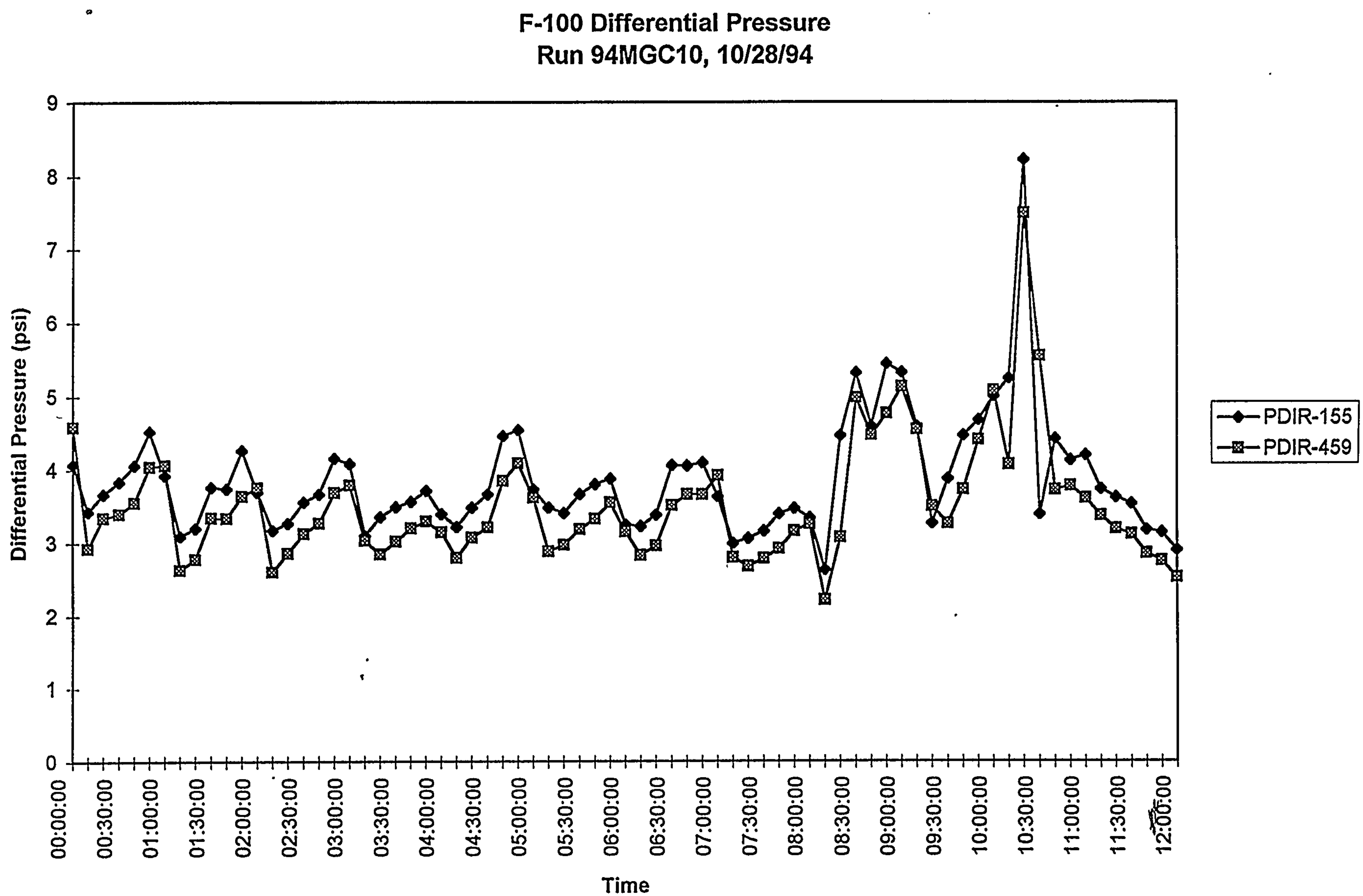
F-100 Differential Pressure
Run 94MGC10, 10/25/94




F-100 Differential Pressure
Run 94MGC10, 10/26/94
PDIR-155
PDIR-459
Differential Pressure (psi)
Time
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



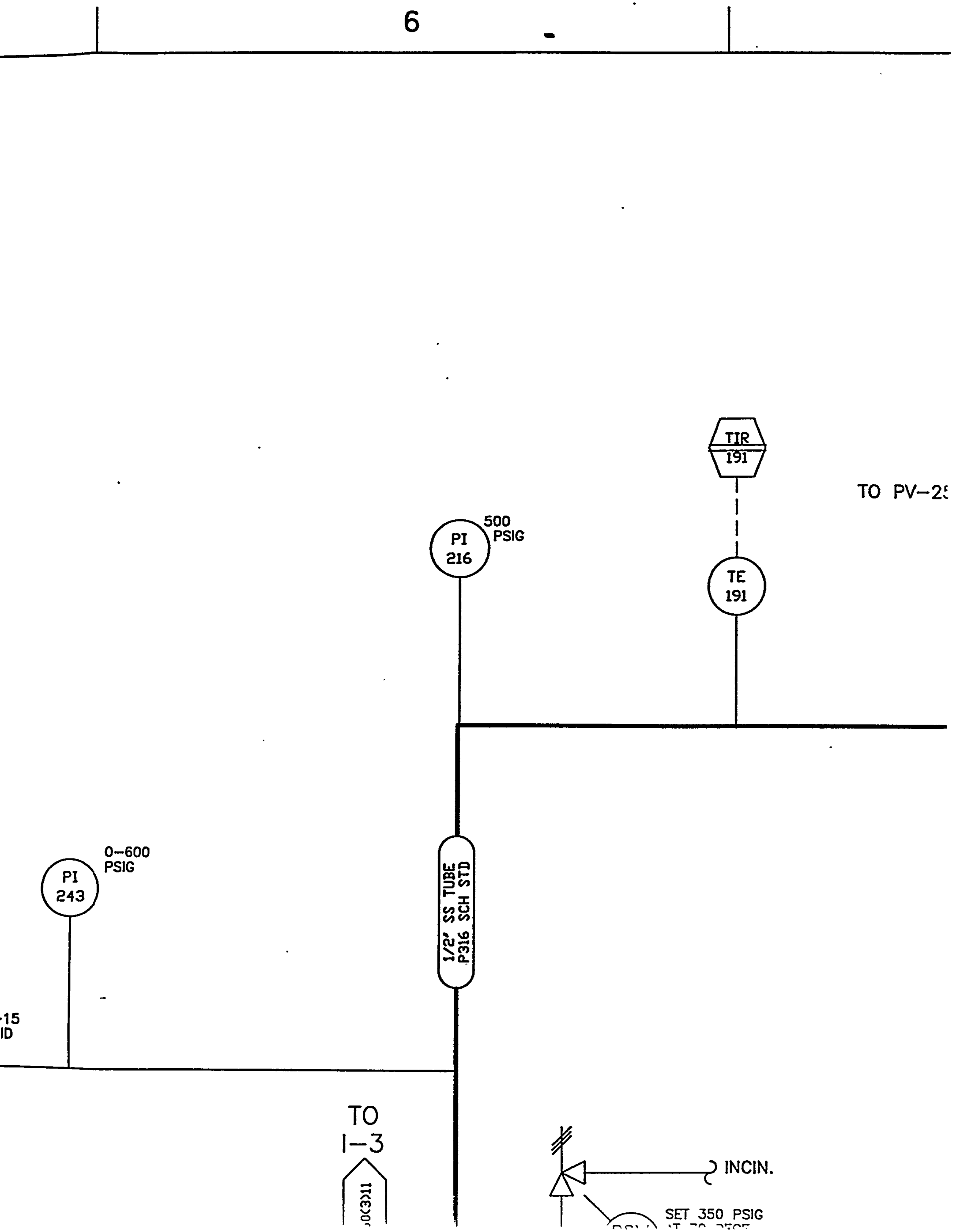


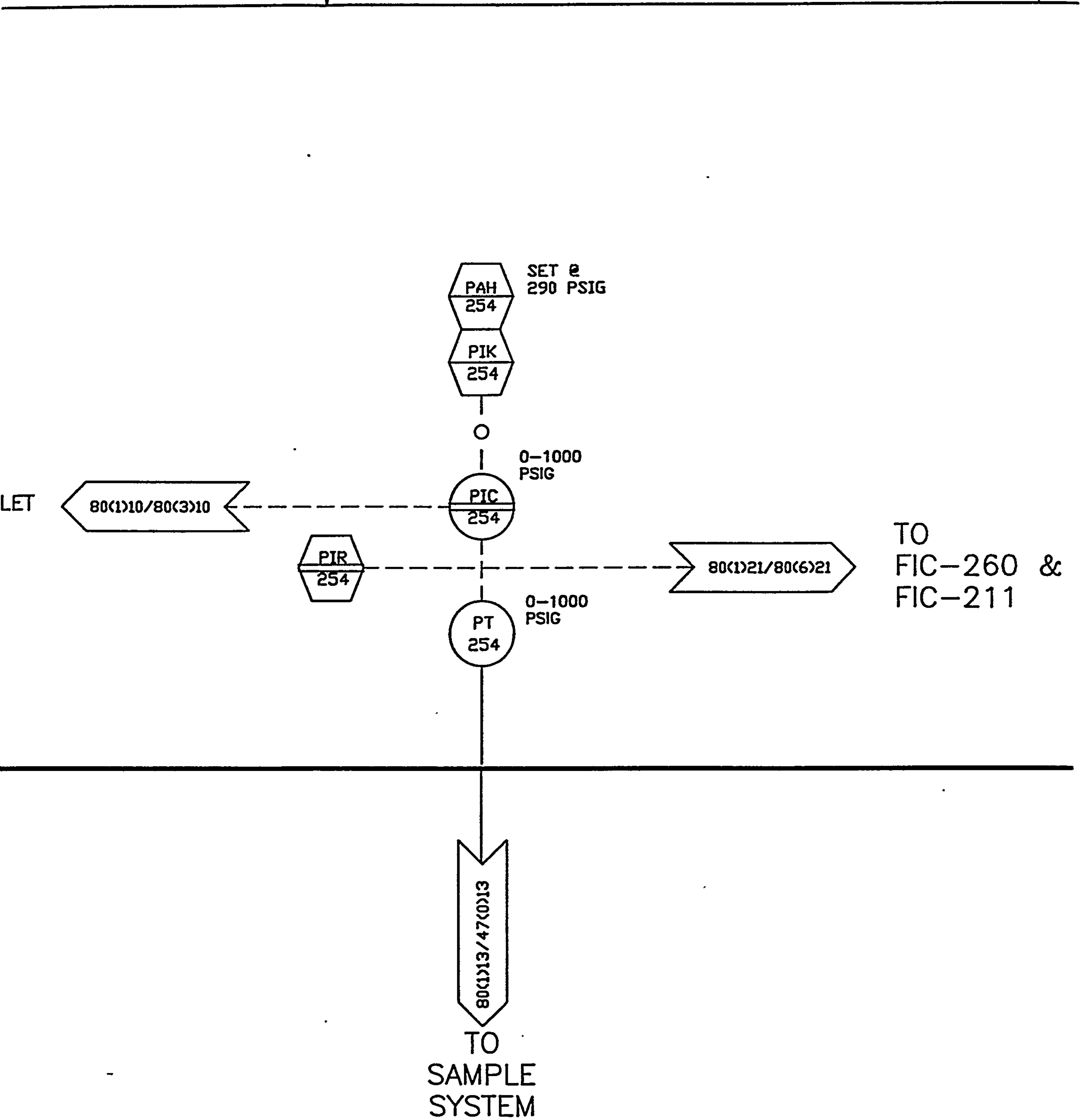
F-100 Differential Pressure
Run 94MGC10, 10/28/94
Differential Pressure (psi)
0
1
2
3
4
5
6
7
8
9
00:00:00
00:30:00
01:00:00
01:30:00
02:00:00
02:30:00
03:00:00
03:30:00
04:00:00
04:30:00
05:00:00
05:30:00
06:00:00
06:30:00
07:00:00
07:30:00
08:00:00
08:30:00
09:00:00
09:30:00
10:00:00
10:30:00
11:00:00
11:30:00
12:00:00
Time
PDIR-155
PDIR-459

# Appendix 5

# Process and Instrumentation Drawings

8 7


6
TIR
191
TO PV–2
PI
216
500
PSIG
TE
191
0–600
PSIG
PI
243
1/2" SS TUBE
P316 SCH STD
TO
1–3
INCIN.
SET 350 PSIG


SET @
290 PSIG
PAH
254
PIK
254
0–1000
PSIG
PIC
254
LET
80(1)10/80(3)10
PIR
254
80(1)21/80(6)21
TO
FIC–260 &
FIC–211
0–1000
PSIG
PT
254
80(1)13/47(0)13
TO
SAMPLE
SYSTEM

3

0 &
1


TO OUTLET
FILTERATION

2 | 1

## REVISION

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

| FTER | 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 | | |
| **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 |

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

| FTER | 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 | | |
| **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 |

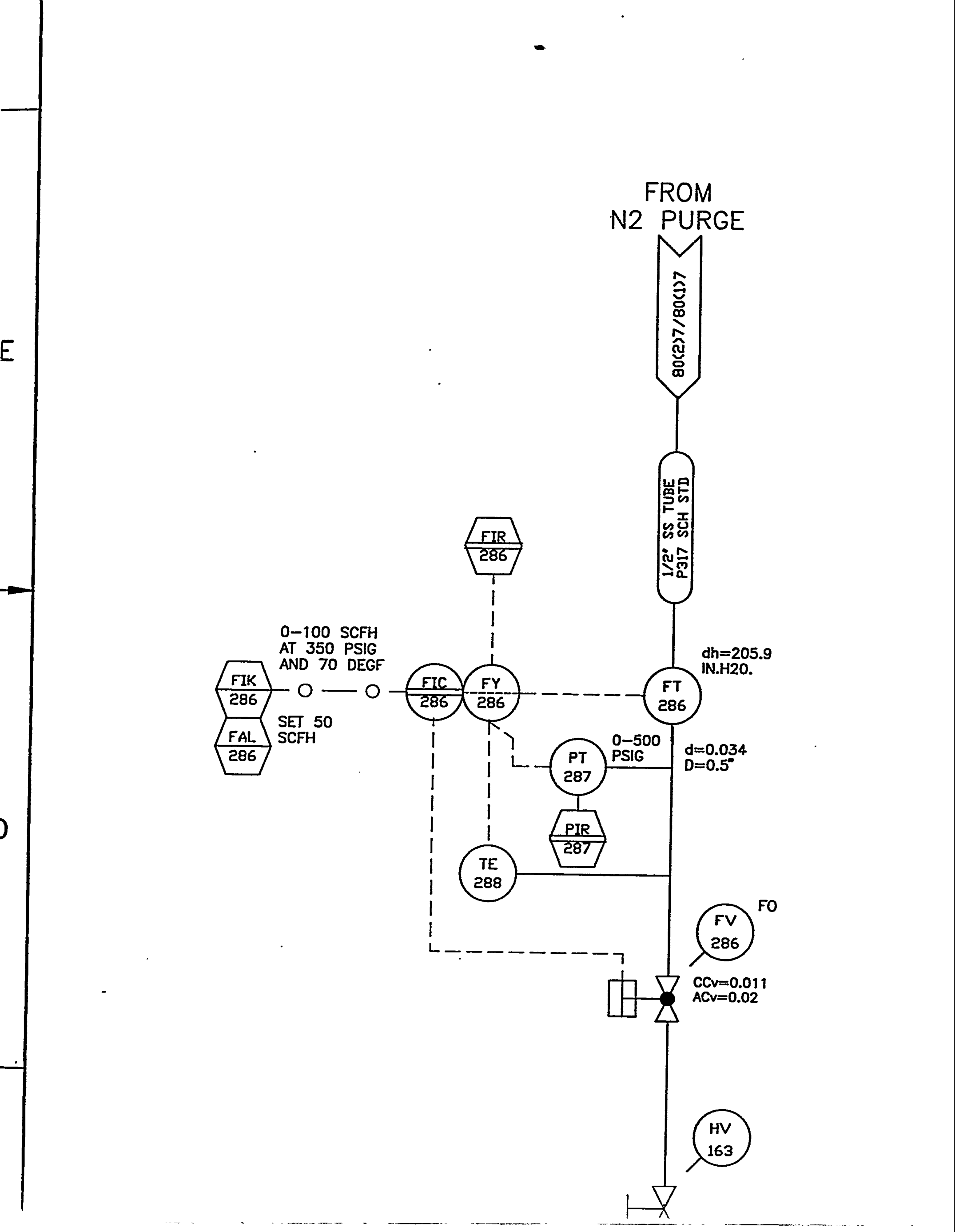
| ONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| EN. | 8 | MODIFIED AS PER MARKED PRINT; ISSUED FOR CONSTRUCTION | 9/30/94 |

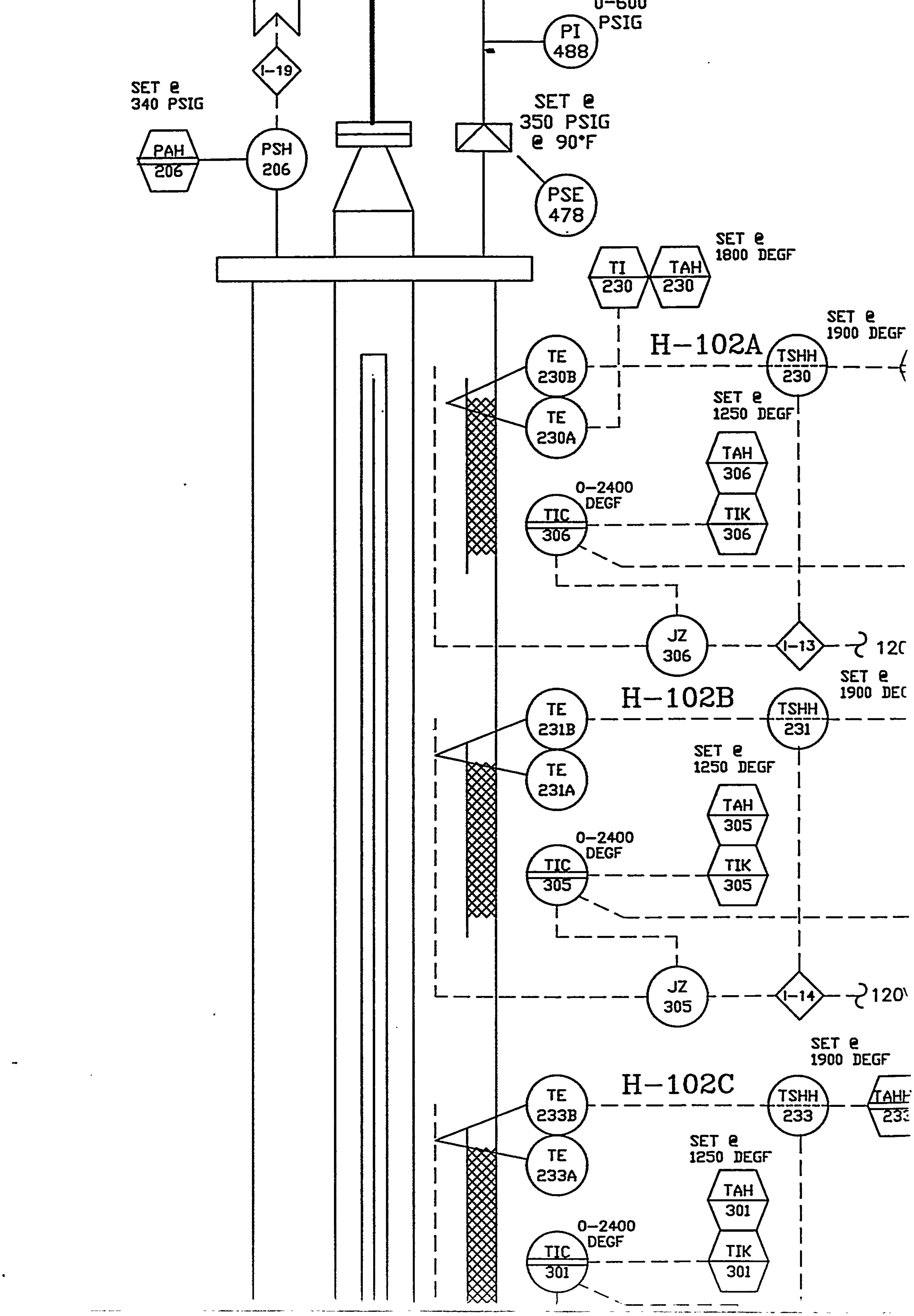
| FTER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| [illegible] | 10-3-94 | Gary Kulchock | 10/3/94 | D Lunifeld | 10/5/94 | | |
| **G ES&H** | **DATE** | **PROJECT ENGR.** | **DATE** | **BRANCH MANAGER** | **DATE** | **DOE (EOSD)** |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

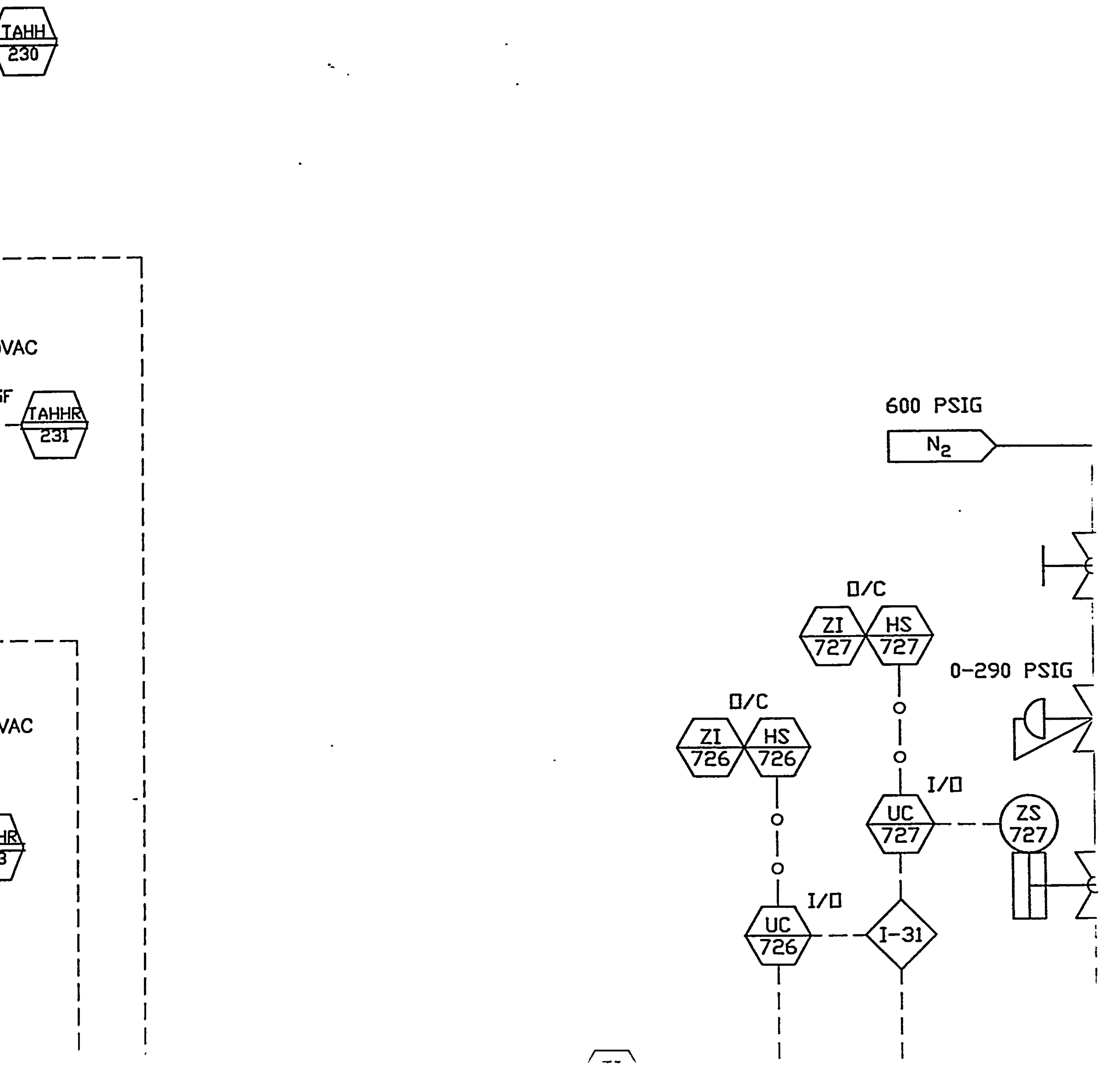
H

G

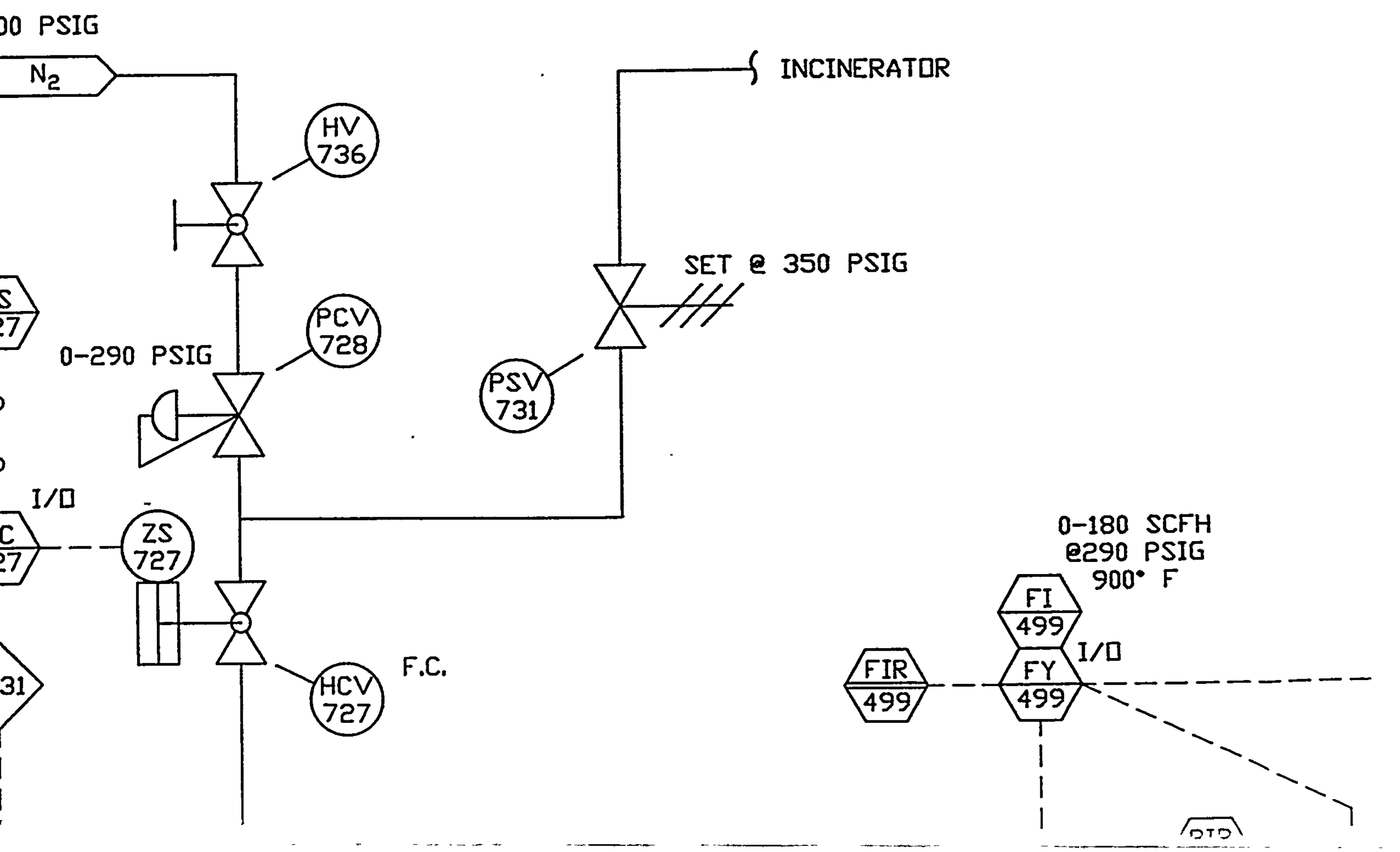
F


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

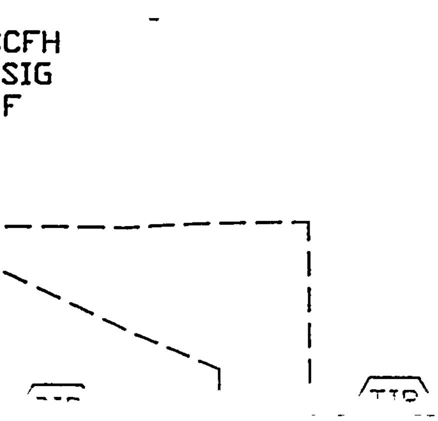

0-600
PSIG
PI
488
I-19
SET @
340 PSIG
PAH
206
PSH
206
SET @
350 PSIG
@ 90°F
PSE
478
SET @
1800 DEGF
TI
230
TAH
230
SET @
1900 DEGF
H-102A
TE
230B
TSHH
230
TE
230A
SET @
1250 DEGF
TAH
306
0-2400
DEGF
TIC
306
TIK
306
JZ
306
I-13
SET @
1900 DEG
H-102B
TE
231B
TSHH
231
TE
231A
SET @
1250 DEGF
TAH
305
0-2400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



TAHH
230
VAC
F
TAHHR
231
VAC
HR
3
600 PSIG
$N_2$
O/C
ZI
727
HS
727
0-290 PSIG
O/C
ZI
726
HS
726
I/O
UC
727
ZS
727
I/O
UC
726
I-31

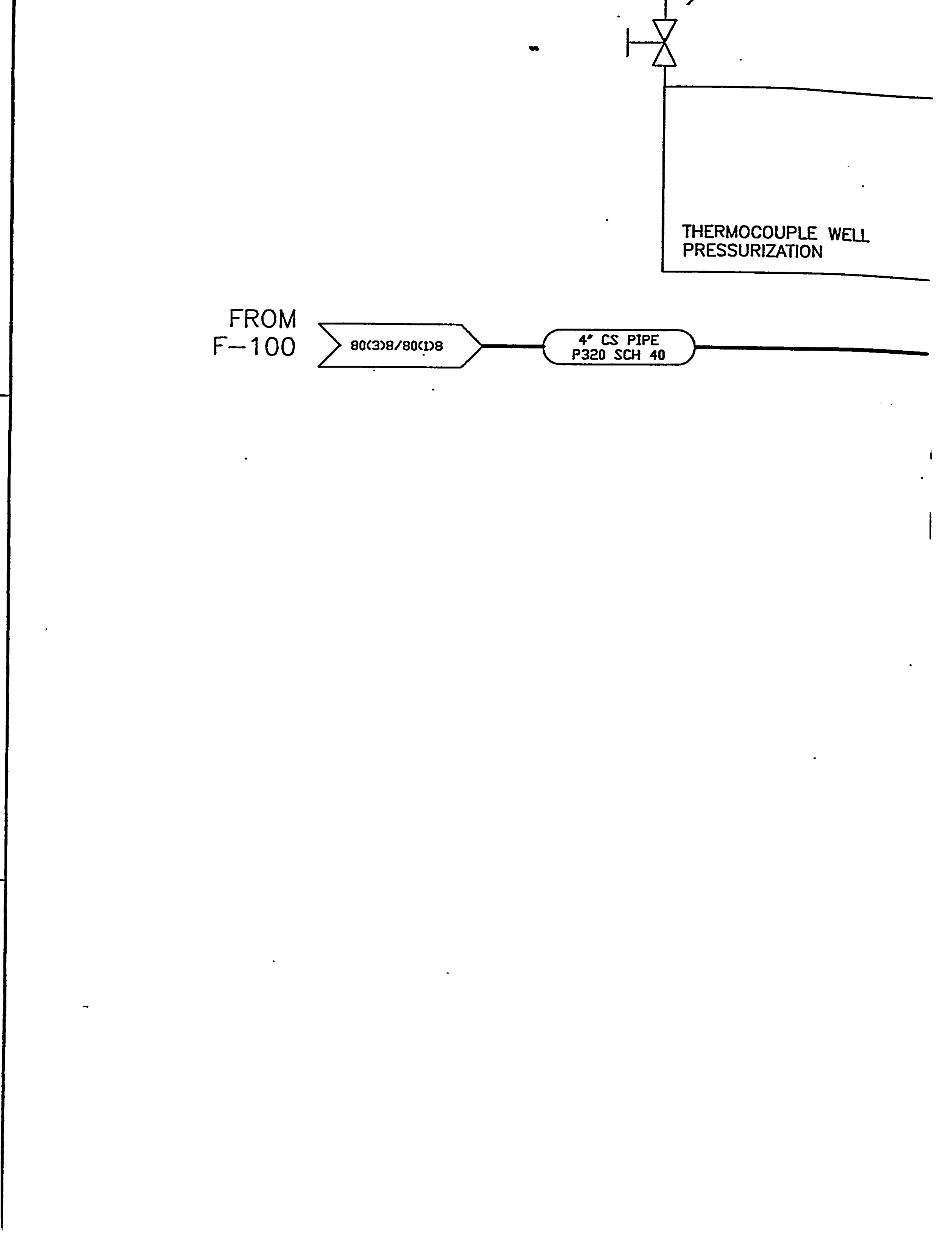


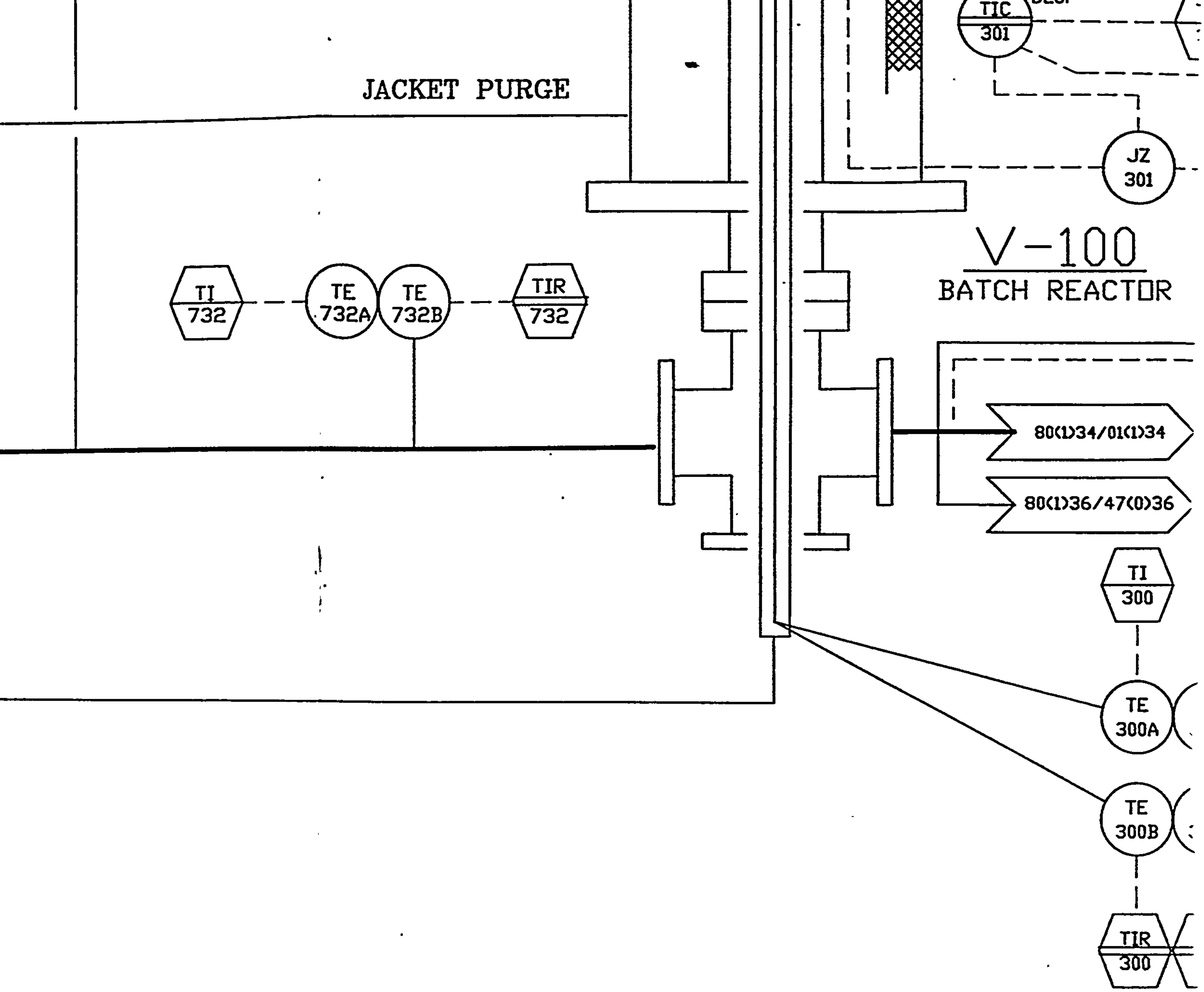
00 PSIG
$N_2$
INCINERATOR
HV 736
SET @ 350 PSIG
PCV 728
0-290 PSIG
PSV 731
I/O
ZS 727
HCV 727
F.C.
0-180 SCFH
@290 PSIG
900° F
FI 499
I/O
FIR 499
FY 499


CFH
SIG
F

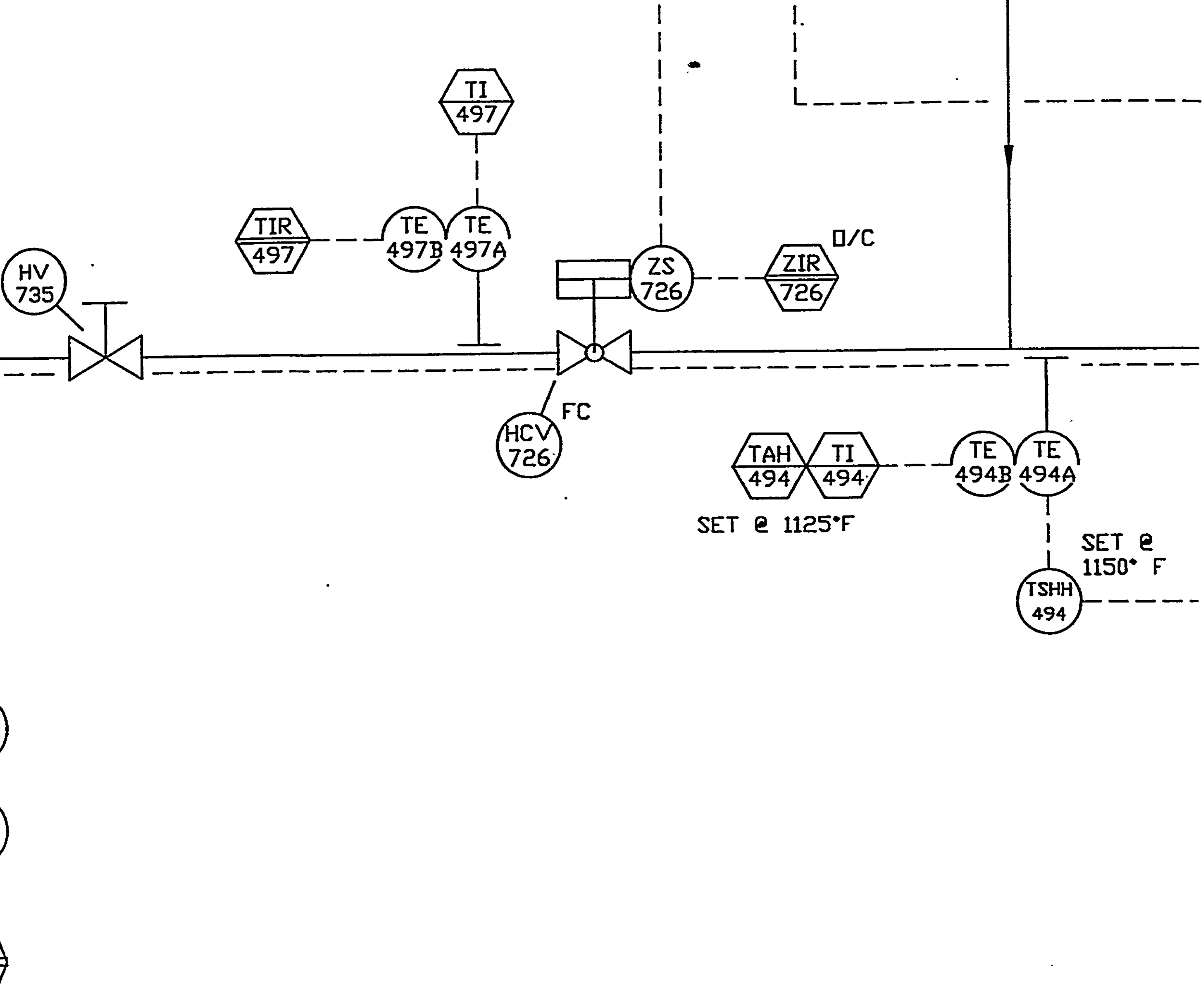
E

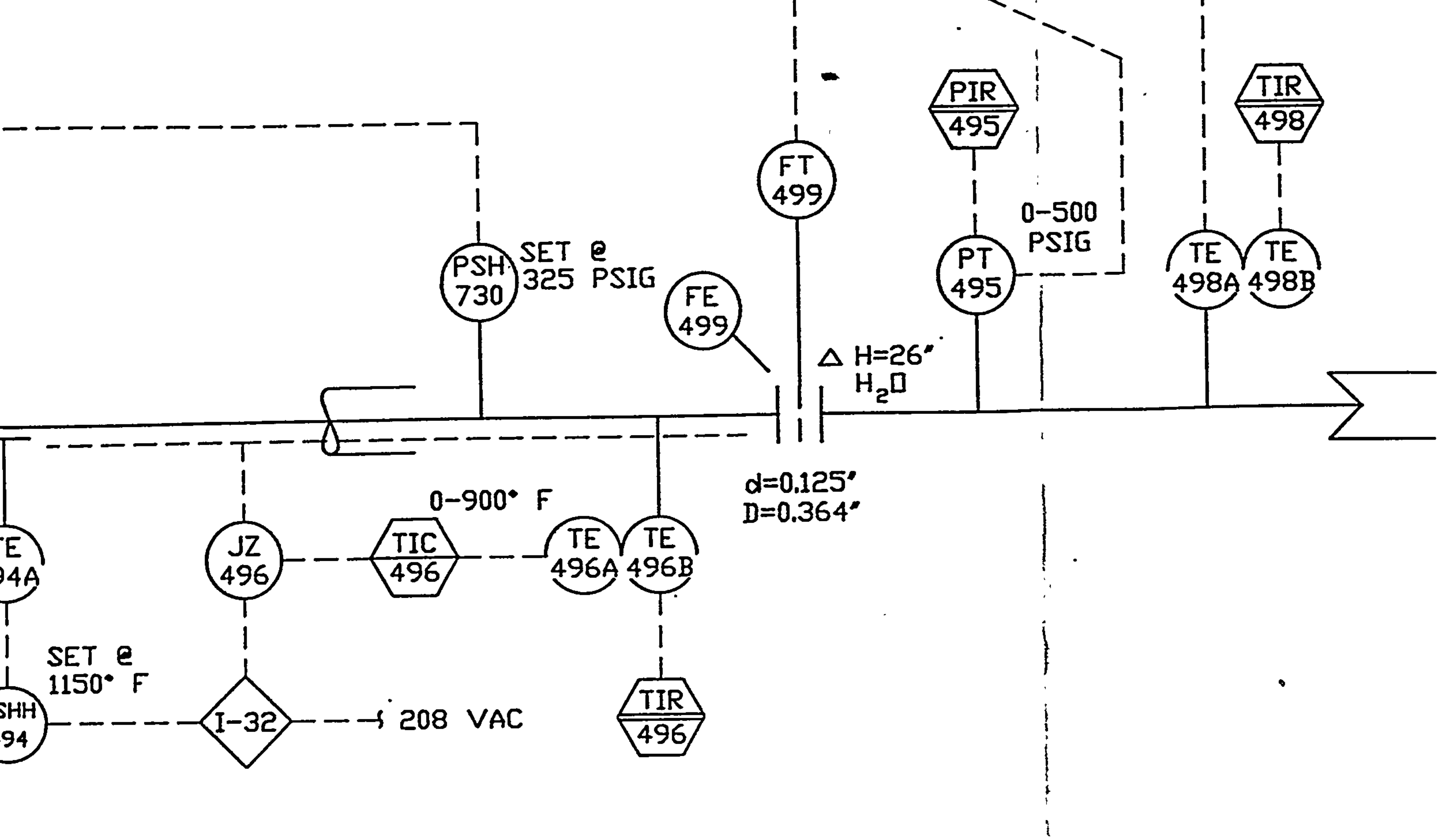
D


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



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


TI 497
TIR 497
TE 497B
TE 497A
HV 735
ZS 726
ZIR 726
O/C
FC
HCV 726
TAH 494
TI 494
TE 494B
TE 494A
SET @ 1125°F
SET @ 1150° F
TSHH 494




NO
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3.
4.
5.

REFERENCE D

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.

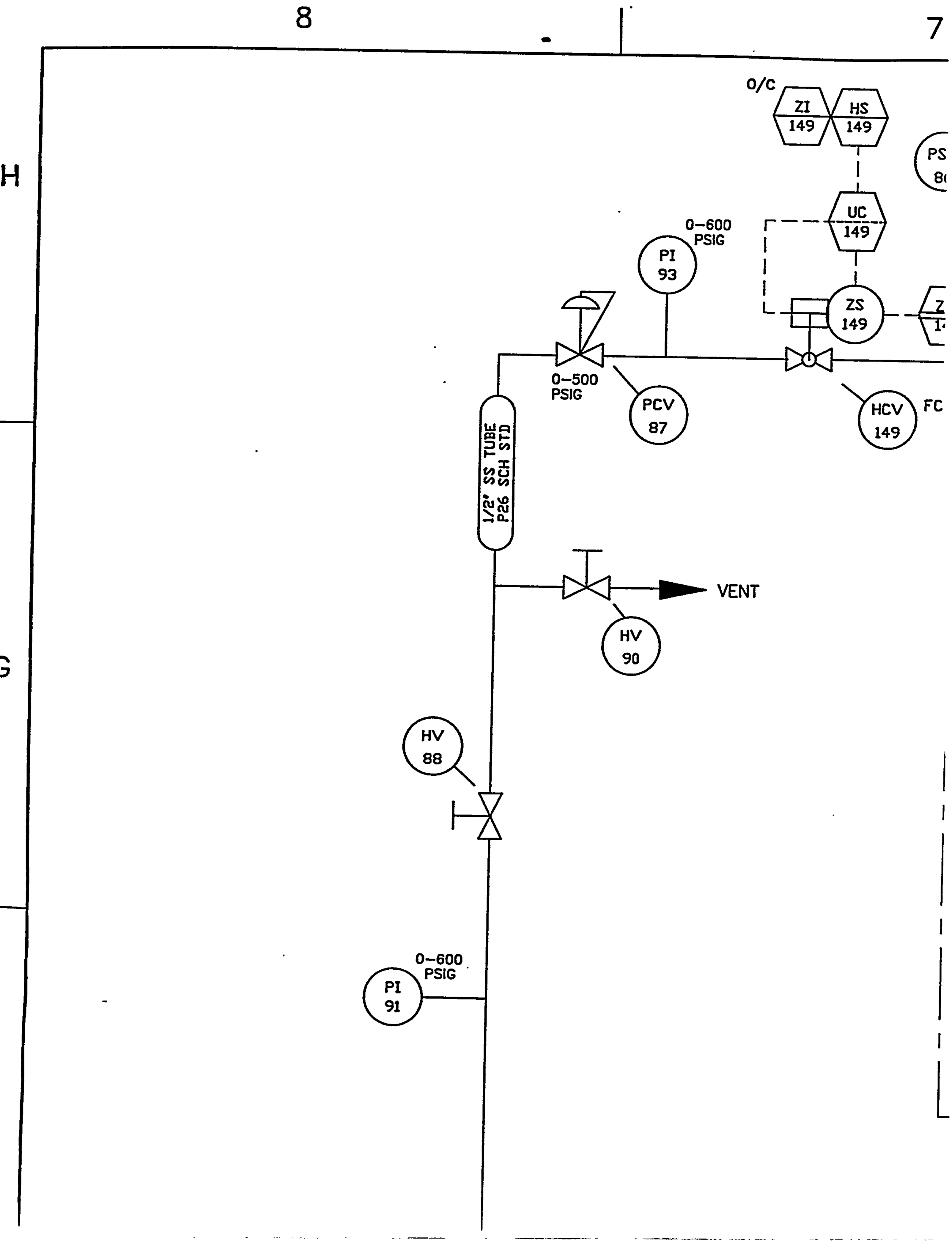
| | |
|---|---|
| DRAFTER Jimmy Thorton | DATE 10/28/93 |
| PROJECT ENGINEER John Rockey | DATE 11/2/93 |
| REQUESTOR John Rockey | DATE 11/2/93 |
| BRANCH MANAGER Larry Strickland | DATE 11/2/93 |
| ES&H | DATE |
| DOE WJA John Rotunda | DATE 10/28/93 |
| | DATE |
| | DATE |

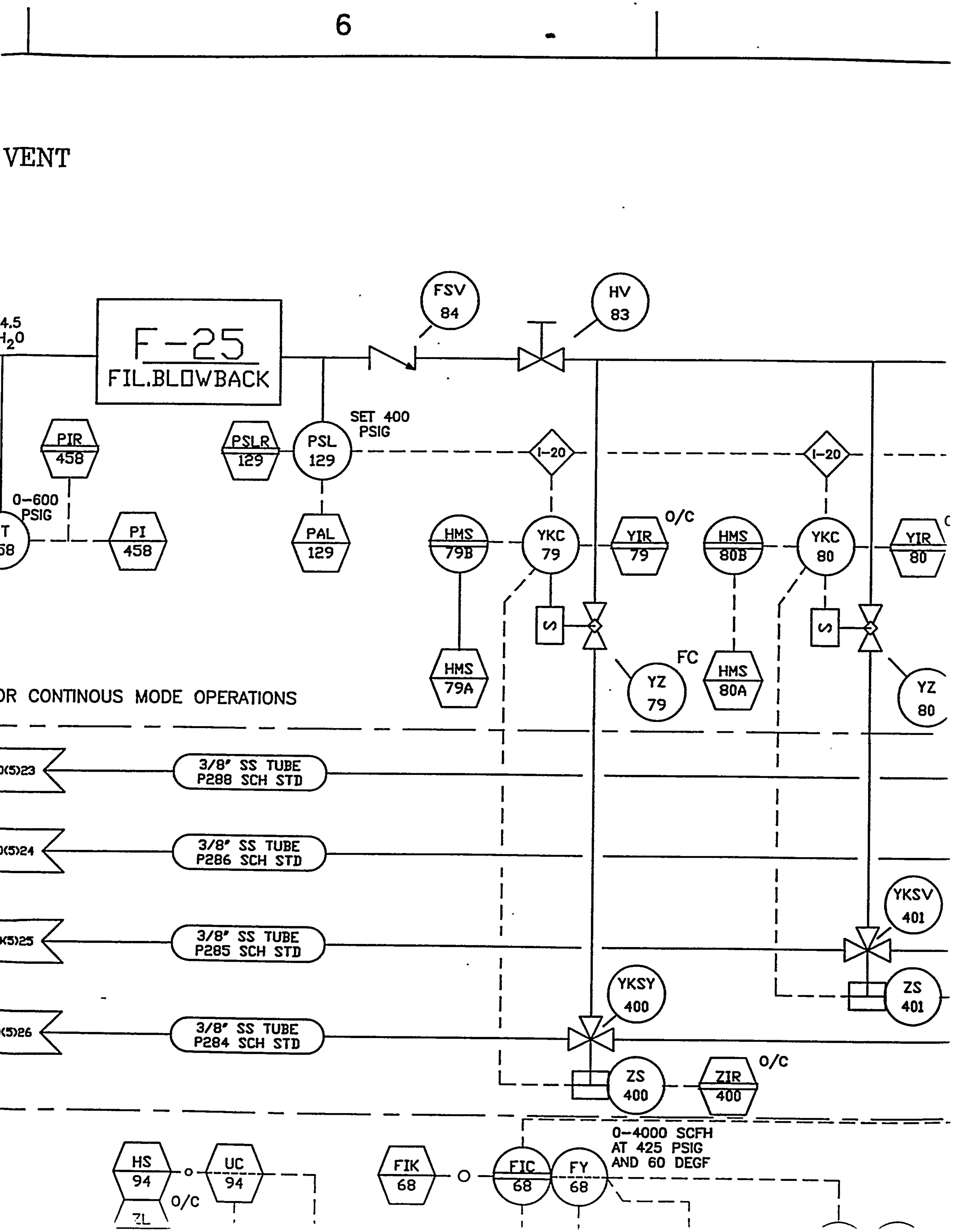
United States Department of Energy
MORGANTOWN ENERGY TECHNOLOGY CENTER
Morgantown, WV

TITLE: B-12 ADVANCED GASIFICATION FACILITY
MODULAR GAS CLEANUP RIG (MGCR)
PROCESS AND INSTRUMENTATION
DRAWING (P&ID1) BATCH MODE

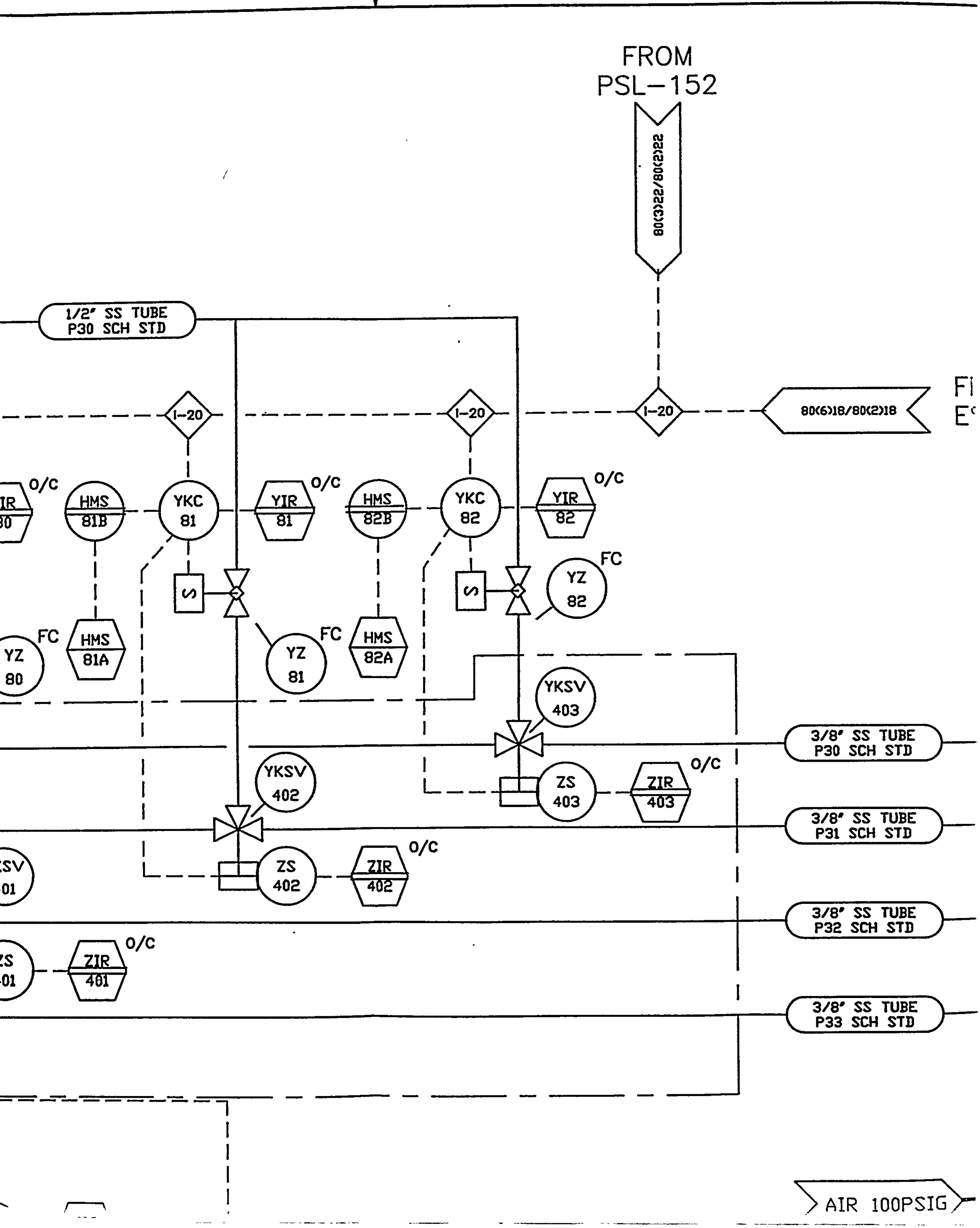
| SIZE | FSCM NO | DWG NO | REV |
|---|---|---|---|
| E | | STD920080.08 | 8 |

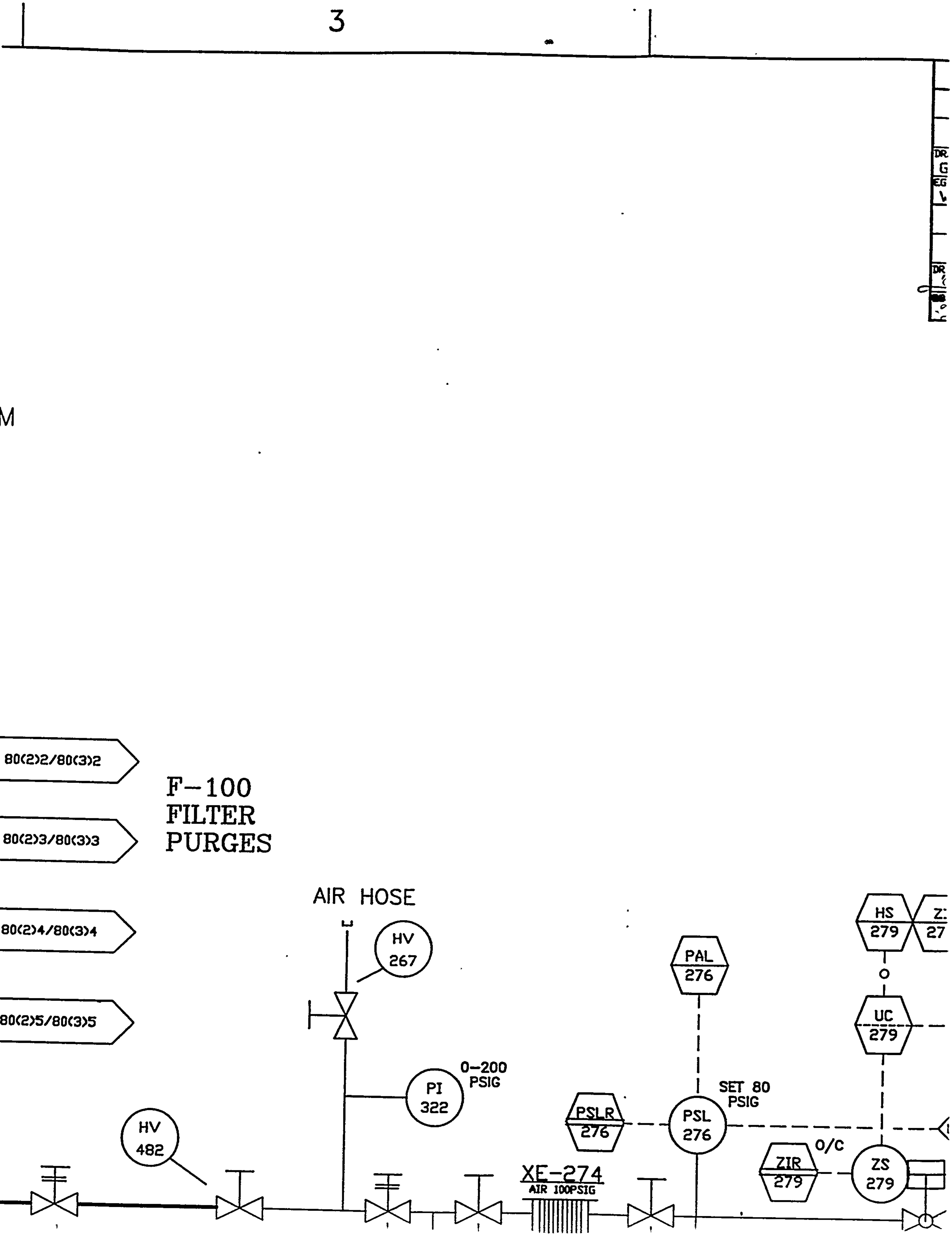
A


8
7
H
G
O/C
ZI 149
HS 149
UC 149
ZS 149
0-600 PSIG
PI 93
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


6
VENT
4.5
$H_2O$
F-25
FIL.BLOWBACK
FSV 84
HV 83
SET 400 PSIG
PIR 458
PSLR 129
PSL 129
I-20
I-20
0-600 PSIG
PI 458
PAL 129
HMS 79B
YKC 79
YIR 79
O/C
HMS 80B
YKC 80
YIR 80
S
S
FC
HMS 79A
YZ 79
HMS 80A
YZ 80
OR CONTINOUS MODE OPERATIONS
(5)23
3/8" SS TUBE P288 SCH STD
(5)24
3/8" SS TUBE P286 SCH STD
YKSV 401
(5)25
3/8" SS TUBE P285 SCH STD
ZS 401
YKSY 400
(5)26
3/8" SS TUBE P284 SCH STD
ZS 400
ZIR 400
O/C
0-4000 SCFH AT 425 PSIG AND 60 DEGF
HS 94
UC 94
O/C
ZL
FIK 68
FIC 68
FY 68

5 4


FROM
PSL-152
80(3)22/80(2)22
1/2" SS TUBE
P30 SCH STD
I-20
I-20
I-20
80(6)18/80(2)18
O/C
HMS 81B
YKC 81
YIR 81
O/C
HMS 82B
YKC 82
YIR 82
O/C
S
S
FC
YZ 82
FC
YZ 80
HMS 81A
FC
YZ 81
HMS 82A
YKSV 403
3/8" SS TUBE
P30 SCH STD
YKSV 402
ZS 403
ZIR 403
O/C
3/8" SS TUBE
P31 SCH STD
ZS 402
ZIR 402
O/C
3/8" SS TUBE
P32 SCH STD
ZIR 401
O/C
3/8" SS TUBE
P33 SCH STD
AIR 100PSIG


3
M
80(2)2/80(3)2
F-100
FILTER
PURGES
80(2)3/80(3)3
80(2)4/80(3)4
80(2)5/80(3)5
AIR HOSE
HV
267
PI
322
0-200
PSIG
HV
482
XE-274
AIR 100PSIG
PAL
276
PSLR
276
PSL
276
SET 80
PSIG
HS
279
UC
279
ZIR
279
O/C
ZS
279

2 1

REVISION

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| DRAFTER ...ARY 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 |
| EG&G 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 (EOSD) JOHN R. ROTUNDA | DATE 5/18/94 |
| ZONE | REV | DESCRIPTION | | | | | DATE |
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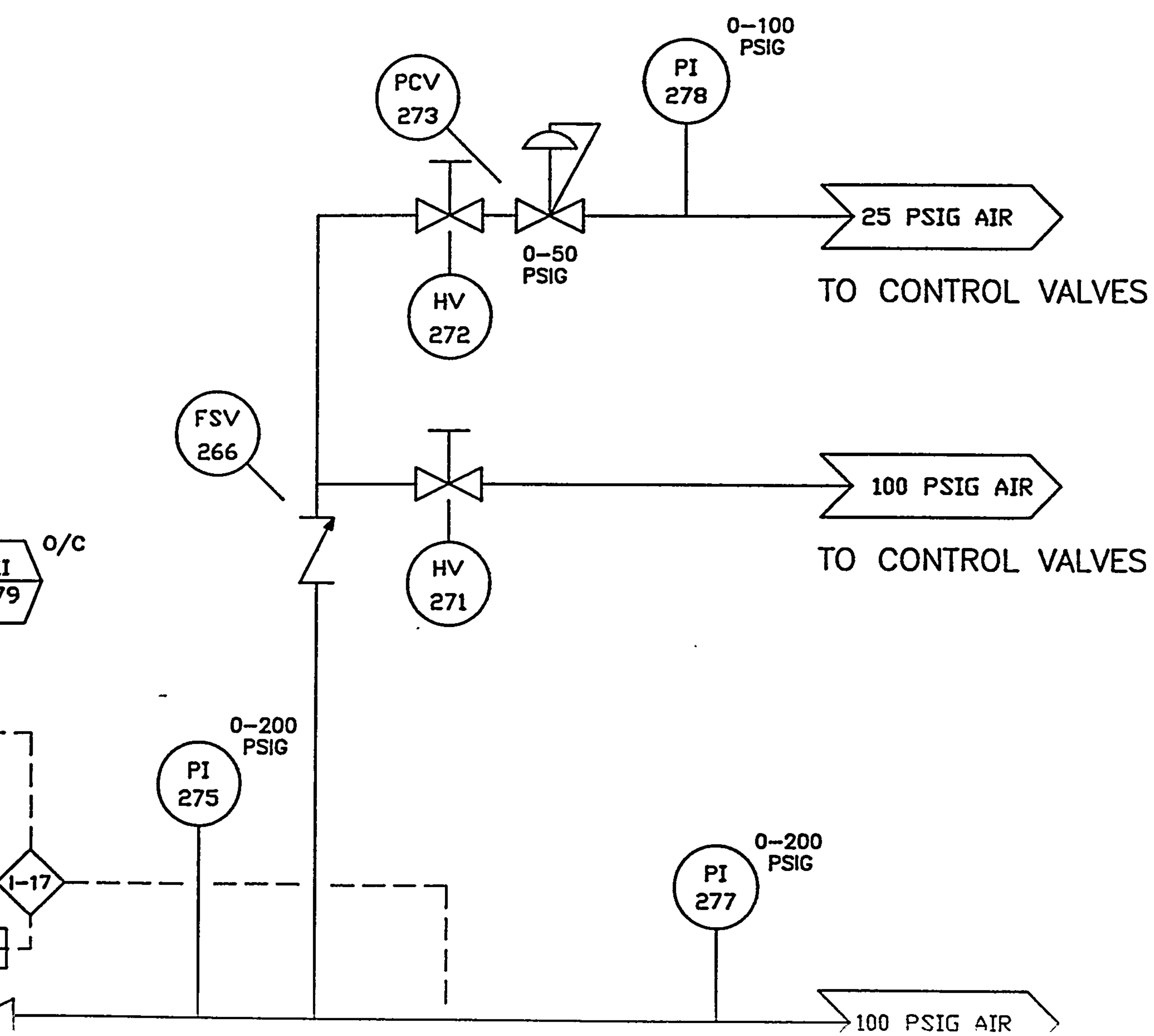
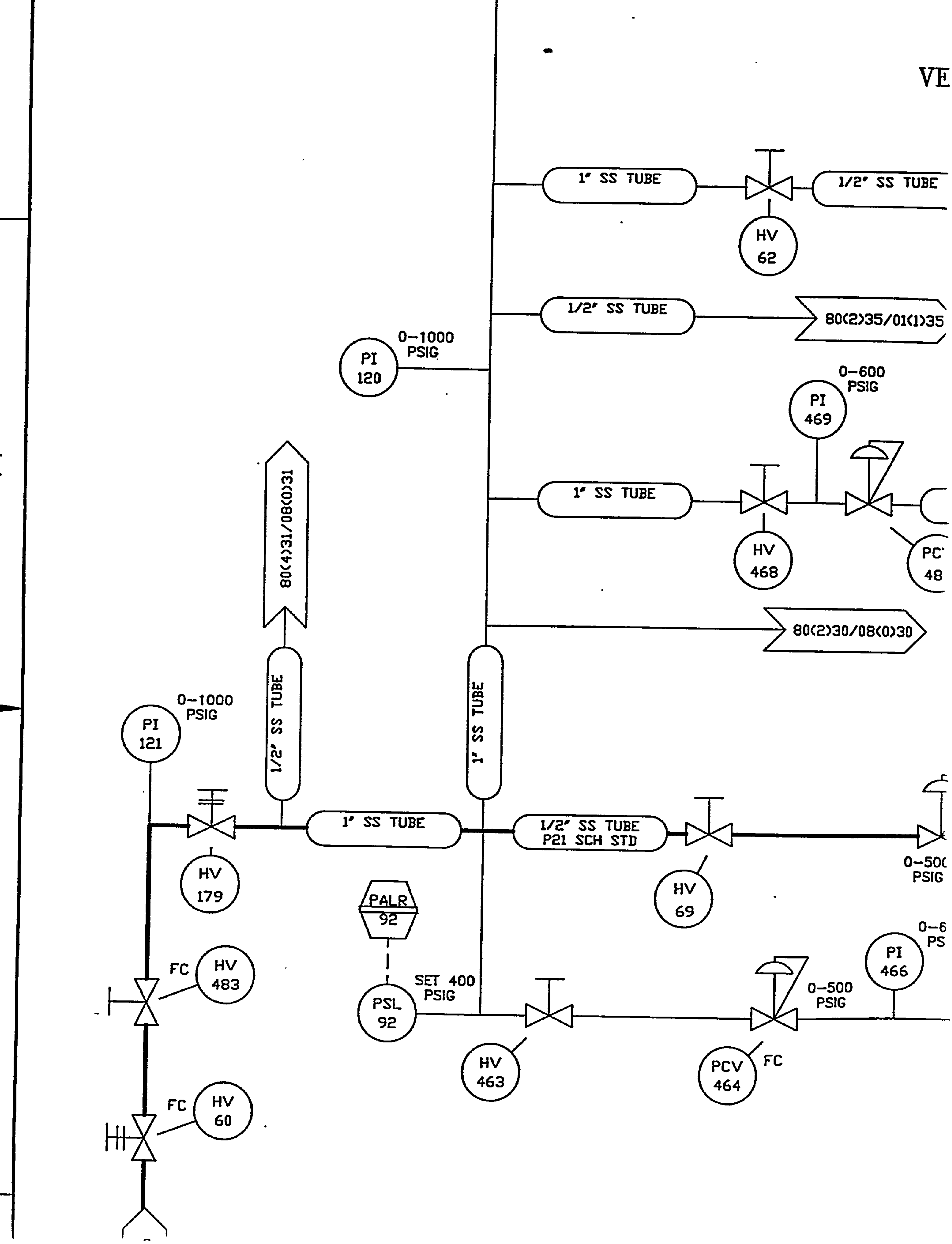
| DRAFTER [signature] | DATE 10-3-94 | CHECKER [signature] | DATE 10/3/94 | EG&G RESPONSIBLE ENGR. David Lunifeld | DATE 10/5/94 | REVIEWER | DATE |
| EG&G ES&H [signature] | DATE 10/11/94 | PROJECT ENGR. Scott Renninger | DATE 10/4/94 | BRANCH MANAGER | DATE | DOE (EOSD) [signature] | DATE 10/5/94 |

H

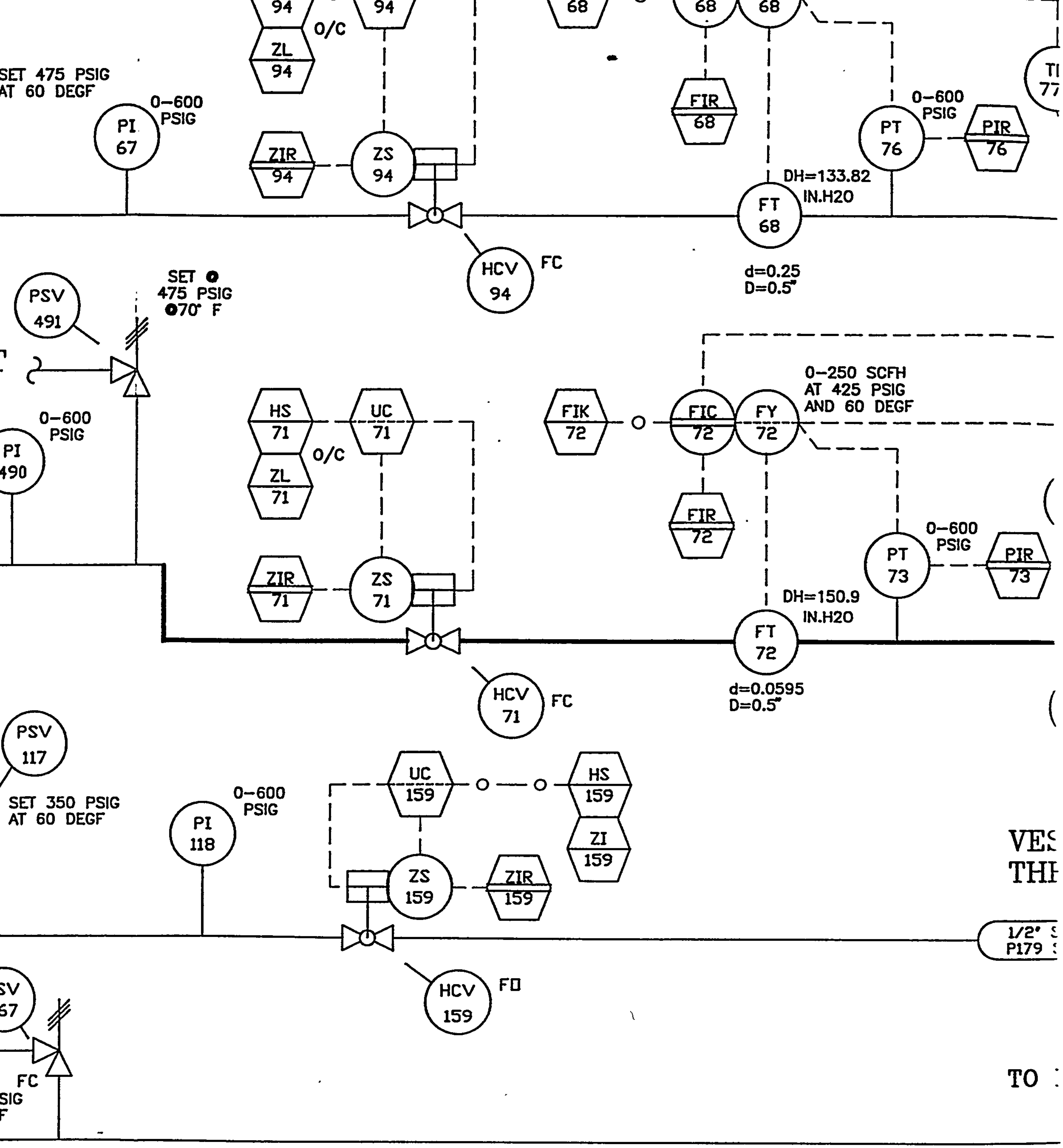
G

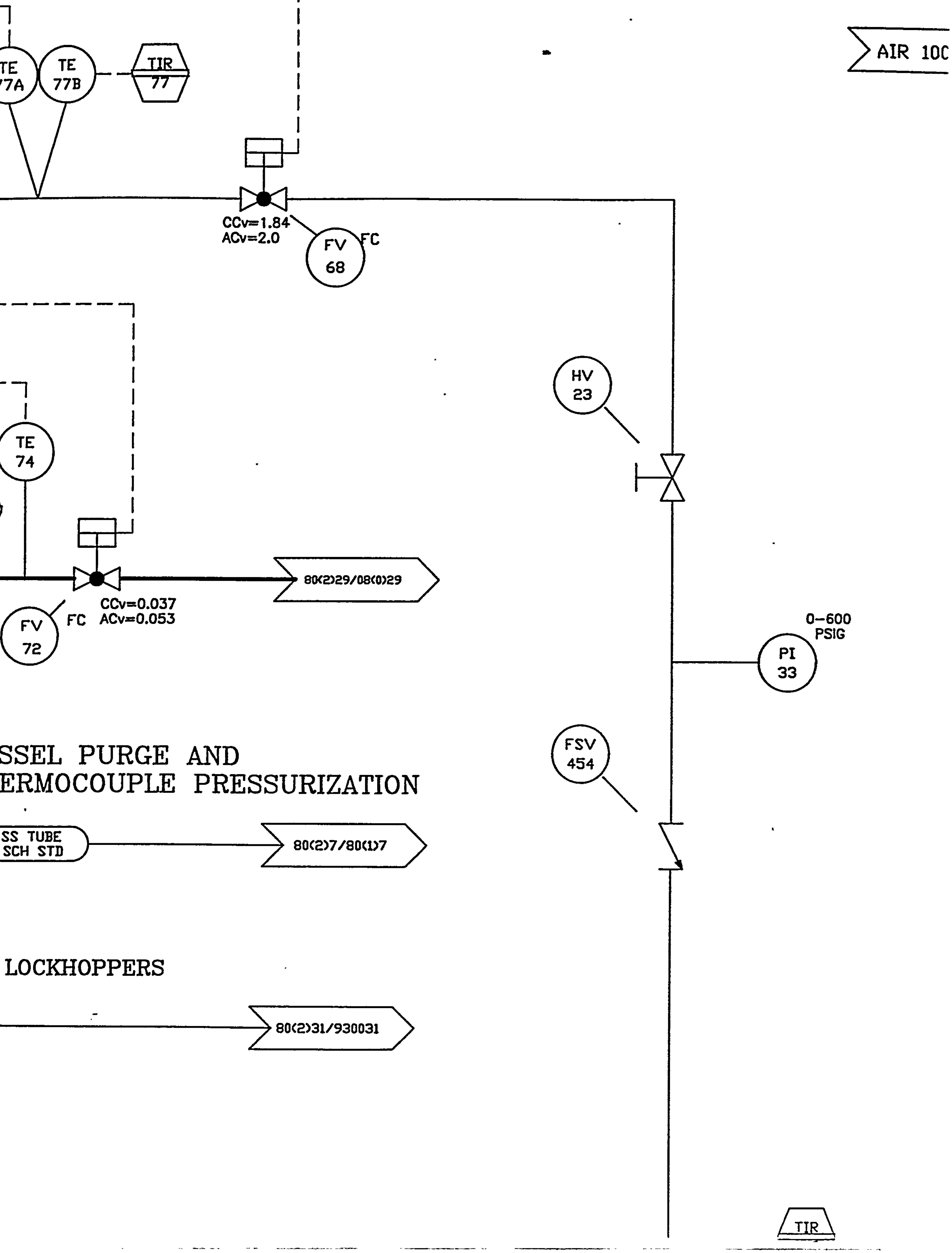
F



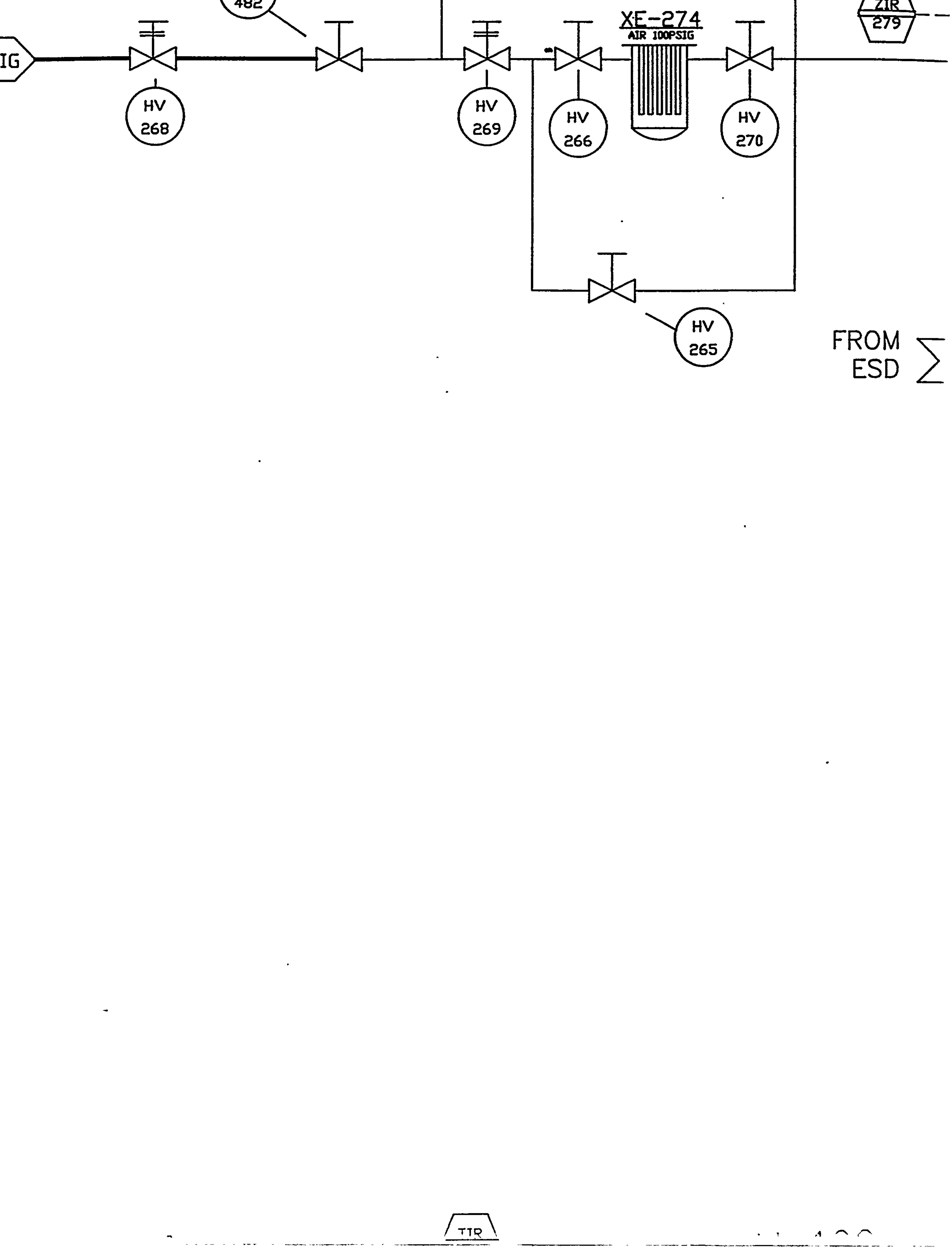


VE
1" SS TUBE
1/2" SS TUBE
HV 62
1/2" SS TUBE
80(2)35/01(1)35
0-1000 PSIG
PI 120
0-600 PSIG
PI 469
80(4)31/08(0)31
1" SS TUBE
HV 468
PC' 48
80(2)30/08(0)30
0-1000 PSIG
PI 121
1/2" SS TUBE
1" SS TUBE
1" SS TUBE
1/2" SS TUBE P21 SCH STD
HV 179
HV 69
0-50( PSIG
PALR 92
0-6 PS
PI 466
FC
HV 483
SET 400 PSIG
PSL 92
0-500 PSIG
HV 463
PCV 464
FC
FC
HV 60

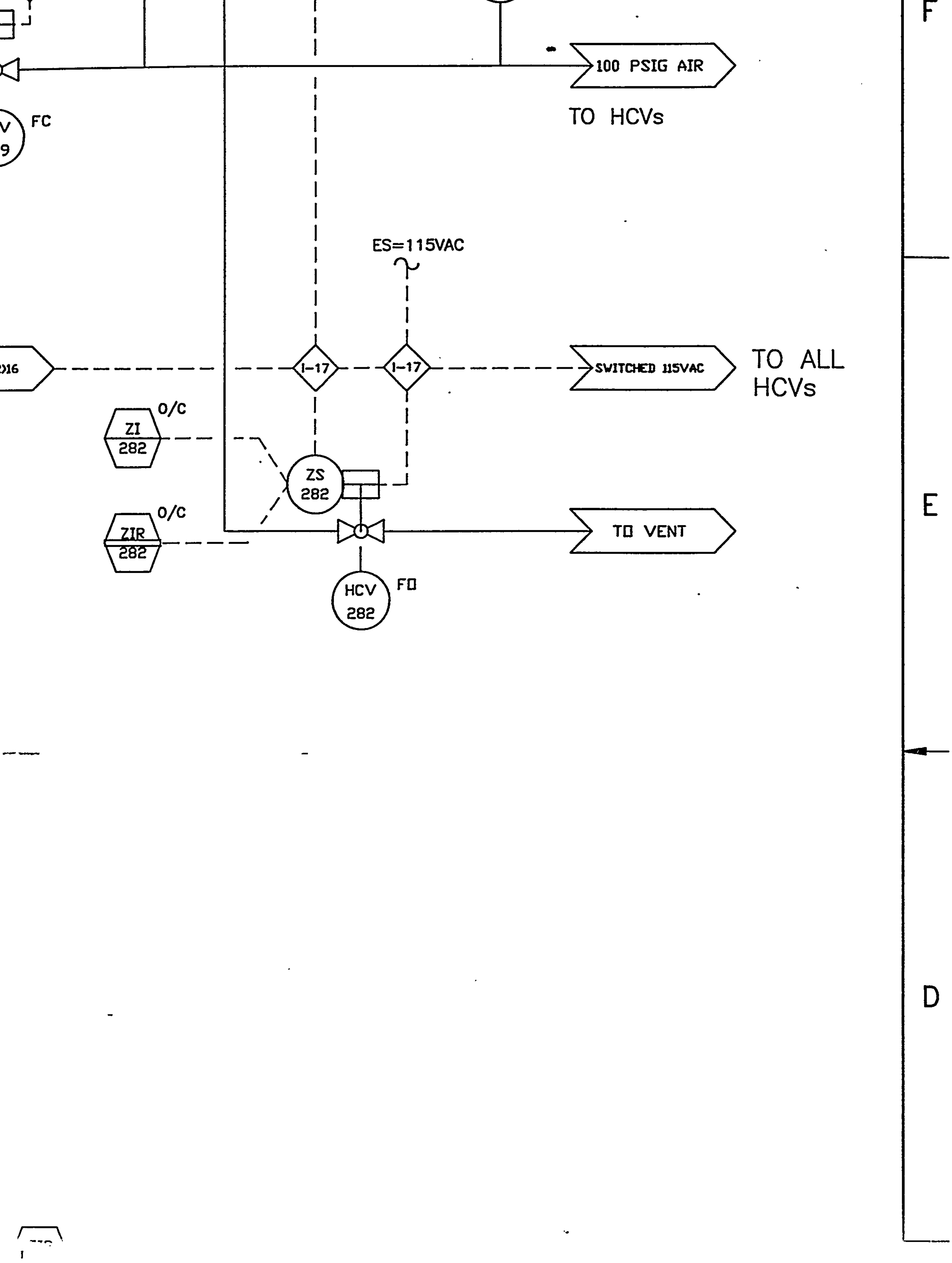

94
94
O/C
ZL 94
68
68
68
SET 475 PSIG AT 60 DEGF
0-600 PSIG
PI 67
ZIR 94
ZS 94
FIR 68
0-600 PSIG
PT 76
PIR 76
TI 77
DH=133.82 IN.H2O
FT 68
HCV 94
FC
d=0.25
D=0.5"
PSV 491
SET @ 475 PSIG @70° F
0-250 SCFH AT 425 PSIG AND 60 DEGF
HS 71
UC 71
FIK 72
FIC 72
FY 72
0-600 PSIG
PI 490
O/C
ZL 71
FIR 72
0-600 PSIG
PT 73
PIR 73
ZIR 71
ZS 71
DH=150.9 IN.H2O
FT 72
HCV 71
FC
d=0.0595
D=0.5"
PSV 117
UC 159
HS 159
SET 350 PSIG AT 60 DEGF
0-600 PSIG
PI 118
ZI 159
ZS 159
ZIR 159
VES
THI
1/2" S
P179 S
SV 67
HCV 159
FO
FC
SIG
F
TO



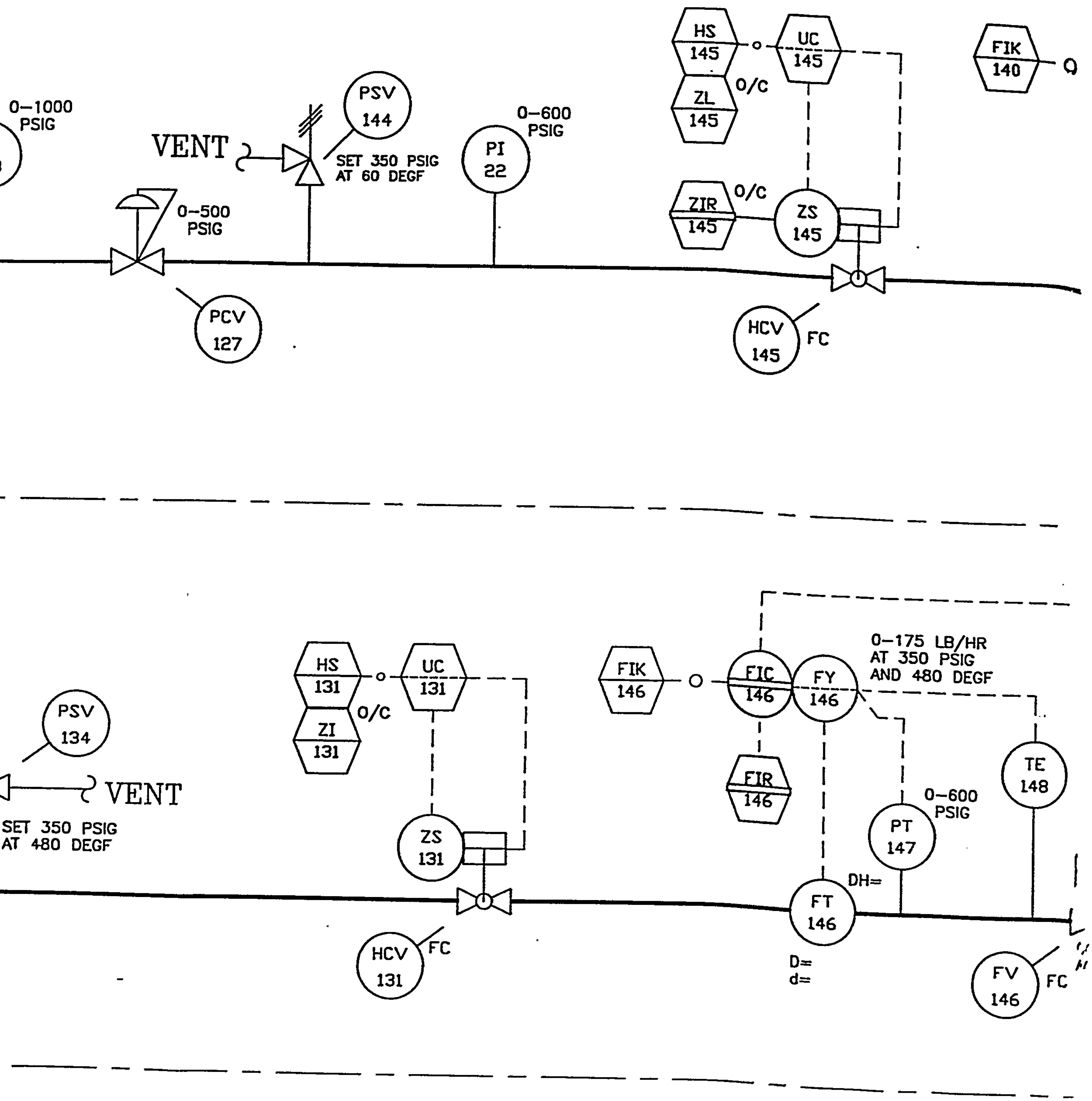
TE 77A
TE 77B
TIR 77
AIR 10C
CCv=1.84
ACv=2.0
FV 68
FC
HV 23
TE 74
CCv=0.037
ACv=0.053
FV 72
FC
80(2)29/08(0)29
0–600 PSIG
PI 33
SSEL PURGE AND
ERMOCOUPLE PRESSURIZATION
FSV 454
SS TUBE
SCH STD
80(2)7/80(1)7
LOCKHOPPERS
80(2)31/930031
TIR

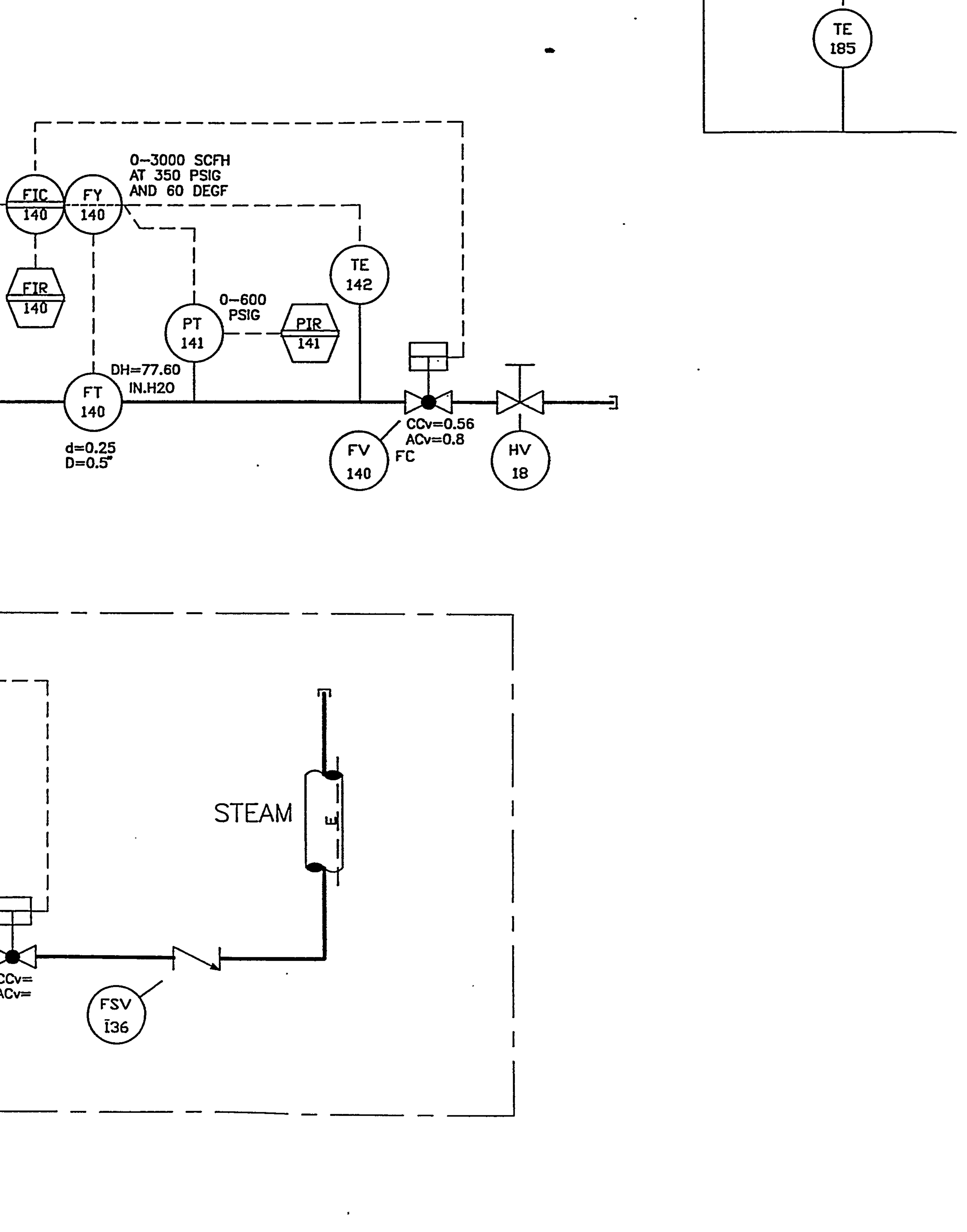


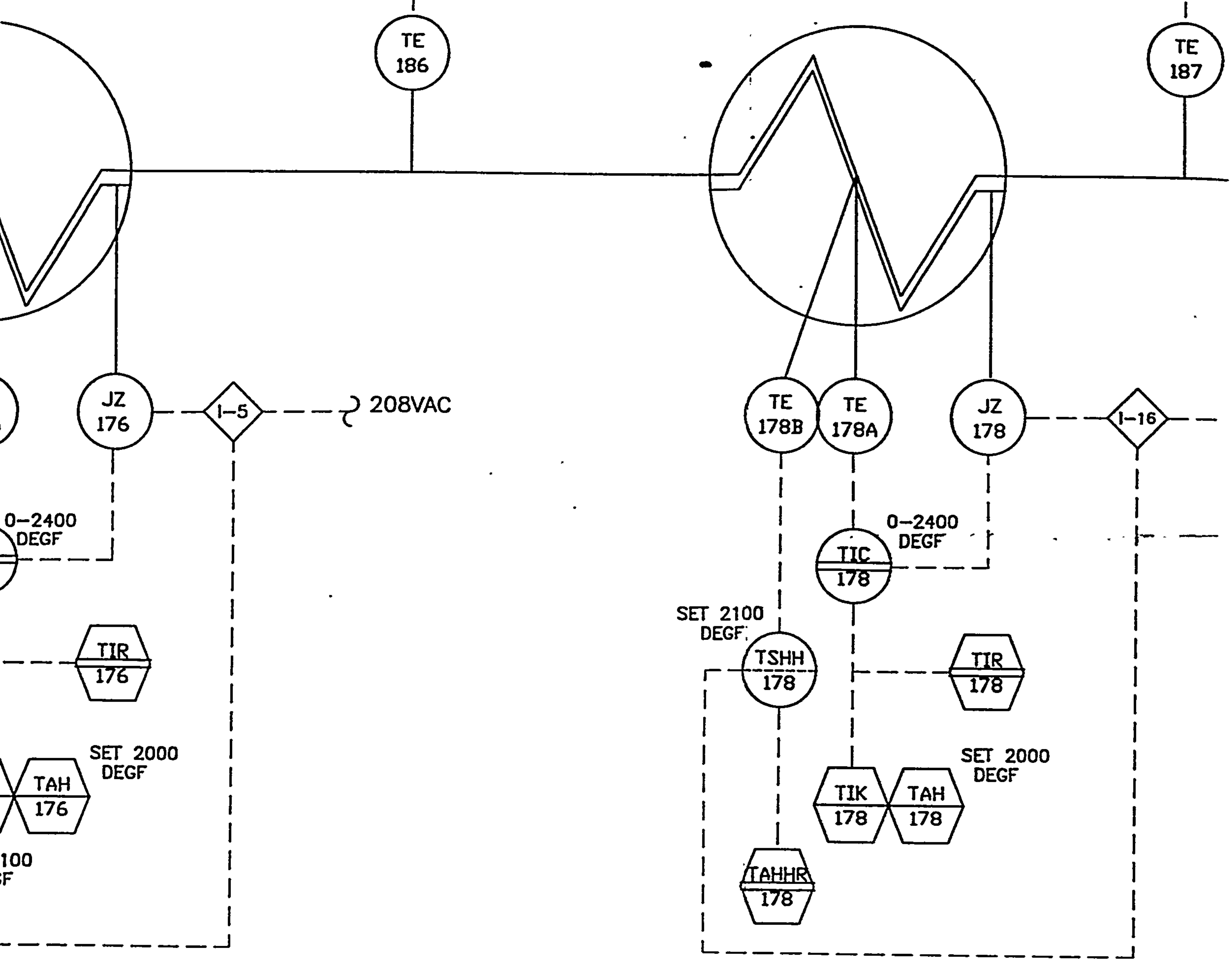
IG
482
HV 268
HV 269
XE-274
AIR 100PSIG
HV 266
HV 270
ZIR 279
HV 265
FROM ESD
TIR



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

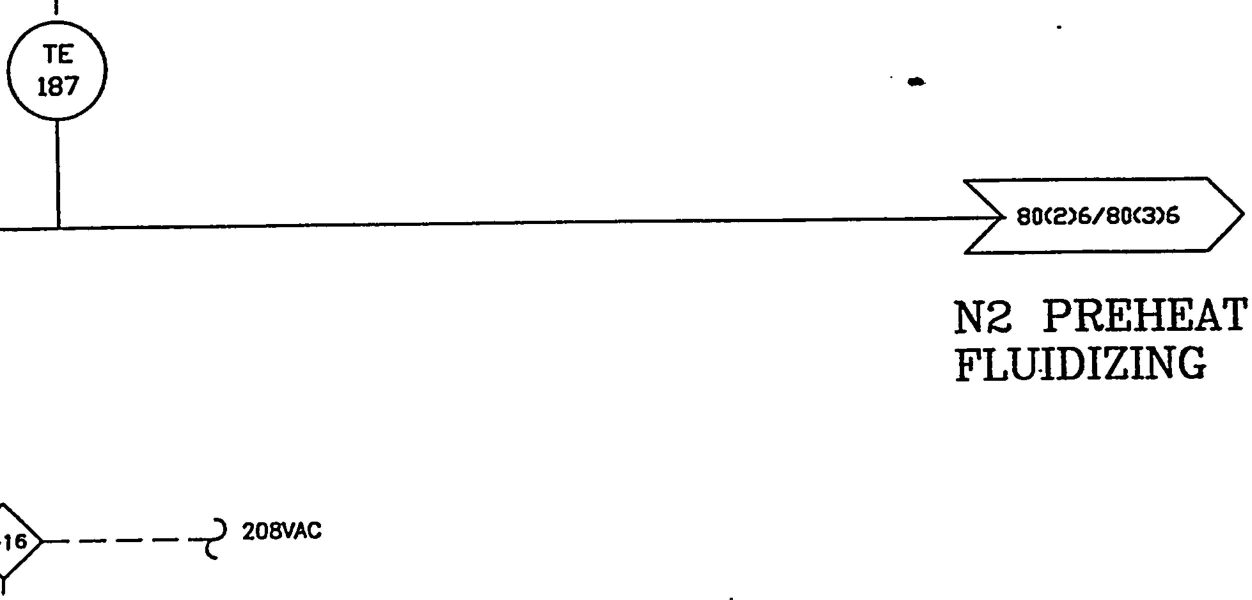

HS 145
UC 145
O/C
ZL 145
FIK 140
0–1000 PSIG
PSV 144
VENT
SET 350 PSIG AT 60 DEGF
0–600 PSIG
PI 22
0–500 PSIG
O/C
ZIR 145
ZS 145
PCV 127
HCV 145
FC
HS 131
UC 131
O/C
ZI 131
FIK 146
FIC 146
FY 146
0–175 LB/HR AT 350 PSIG AND 480 DEGF
PSV 134
VENT
SET 350 PSIG AT 480 DEGF
FIR 146
0–600 PSIG
PT 147
TE 148
ZS 131
DH=
FT 146
HCV 131
FC
D=
d=
FV 146
FC


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




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

| REFERENCE DRAWINGS | |
|---|---|
| | DRAFTER Jim |
| | PROJECT L Jo |
| | REQUESTOR Jo |
| | BRANCH M Larr |
| | ES&H |
| | DOE Joh |




C

## N2 PREHEAT AND FLUIDIZING

NOTES:

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

DWG NO STD920080.07 SH 2

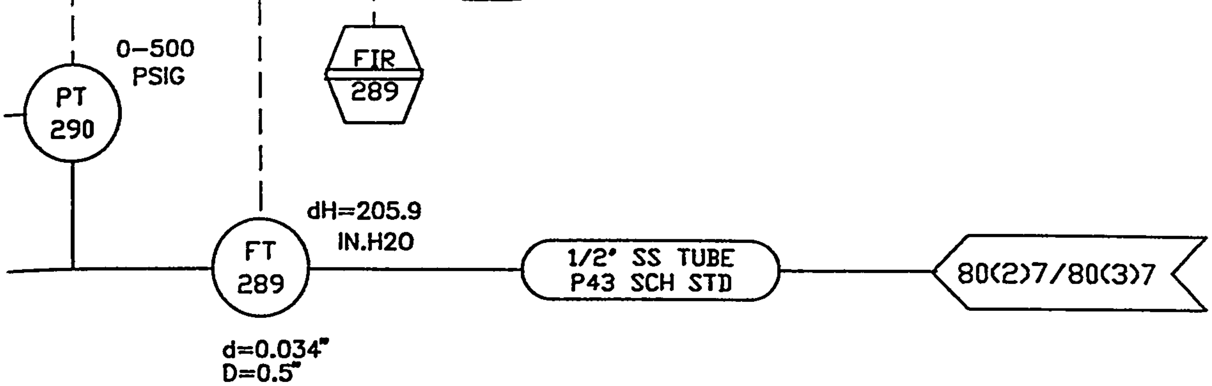
| | |
|---|---|
| DRAFTER Jimmy Thorton | DATE 10/28/93 |
| PROJECT ENGINEER John Rockey | DATE 11/2/93 |
| REQUESTOR John Rockey | DATE 11/2/93 |
| BRANCH MANAGER Larry Strickland | DATE 11/2/93 |
| ES&H | DATE |
| DOE WJA John Rotunda | DATE 10/28/93 |
| | DATE |
| | DATE |

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

TITLE
B-12 ADVANCED GASIFICATION FACILITY
MODULAR GAS CLEANUP RIG (MGCR)
PROCESS AND INSTRUMENTATION
DRAWING (P&ID2) FACILITY SERVICES

A

| SIZE | FSCM NO | DWG NO | REV |
|---|---|---|---|
| E | | STD920080.07 | 7 |




C

DWG NO STD920080.07 SH 3

NOTES:

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

| | | 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 |
| ES&H | | |
| DOE | WJA John Rotunda | 10/28/93 |
| | | |
| | | |

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

TITLE: B-12 ADVANCED GASIFICATION FACILITY MODULAR GAS CLEANUP RIG (MGCR) PROCESS AND INSTRUMENTATION DRAWING (P&ID3) GAS TRANSPORT SYSTEM

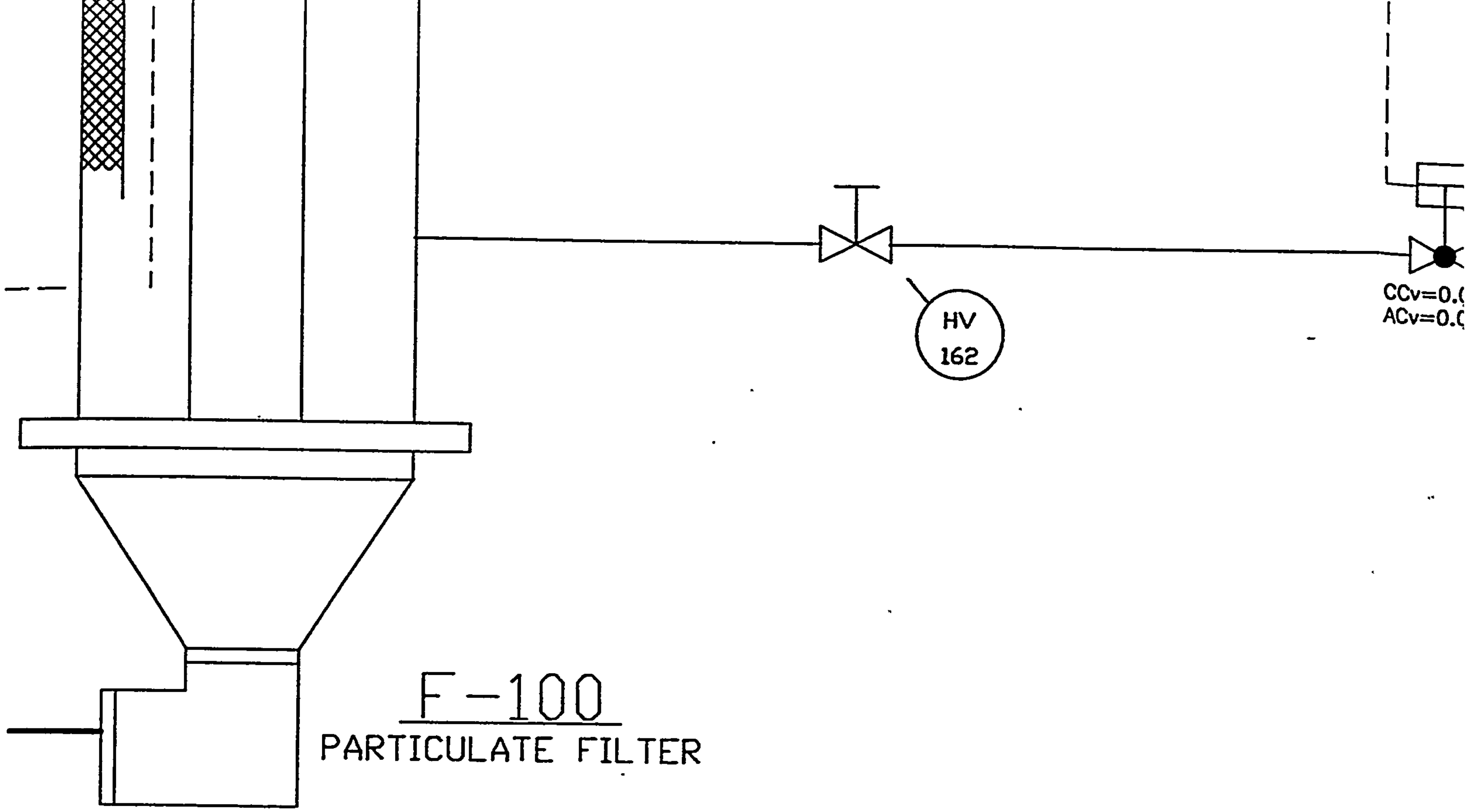
| SIZE | FSCM NO | DWG NO | REV |
|---|---|---|---|
| E | | STD920080.07 | 7 |

| SCALE | WEIGHT | SHEET |
|---|---|---|
| NONE | MGCR0307.DWG | 3 of 6 |

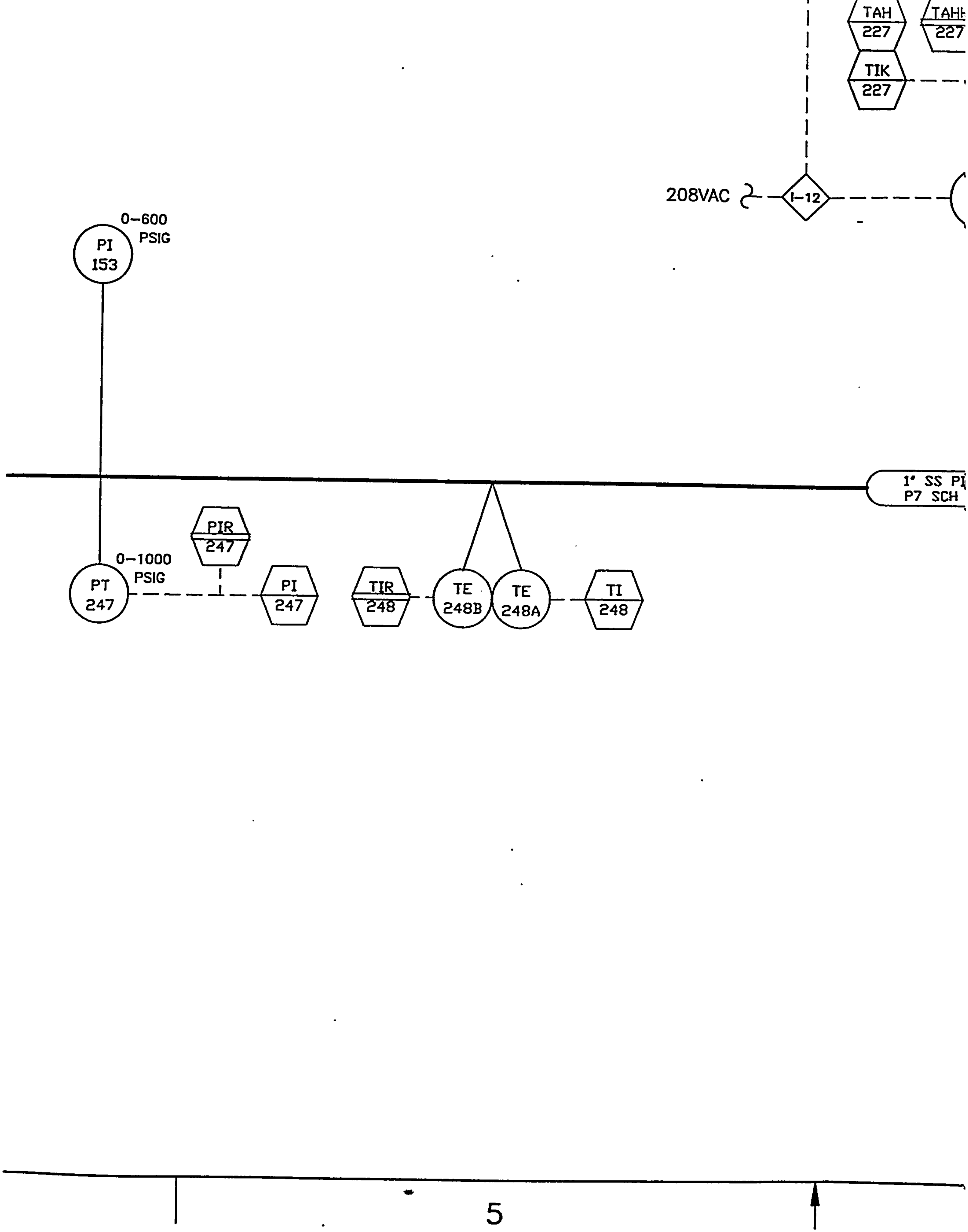
A

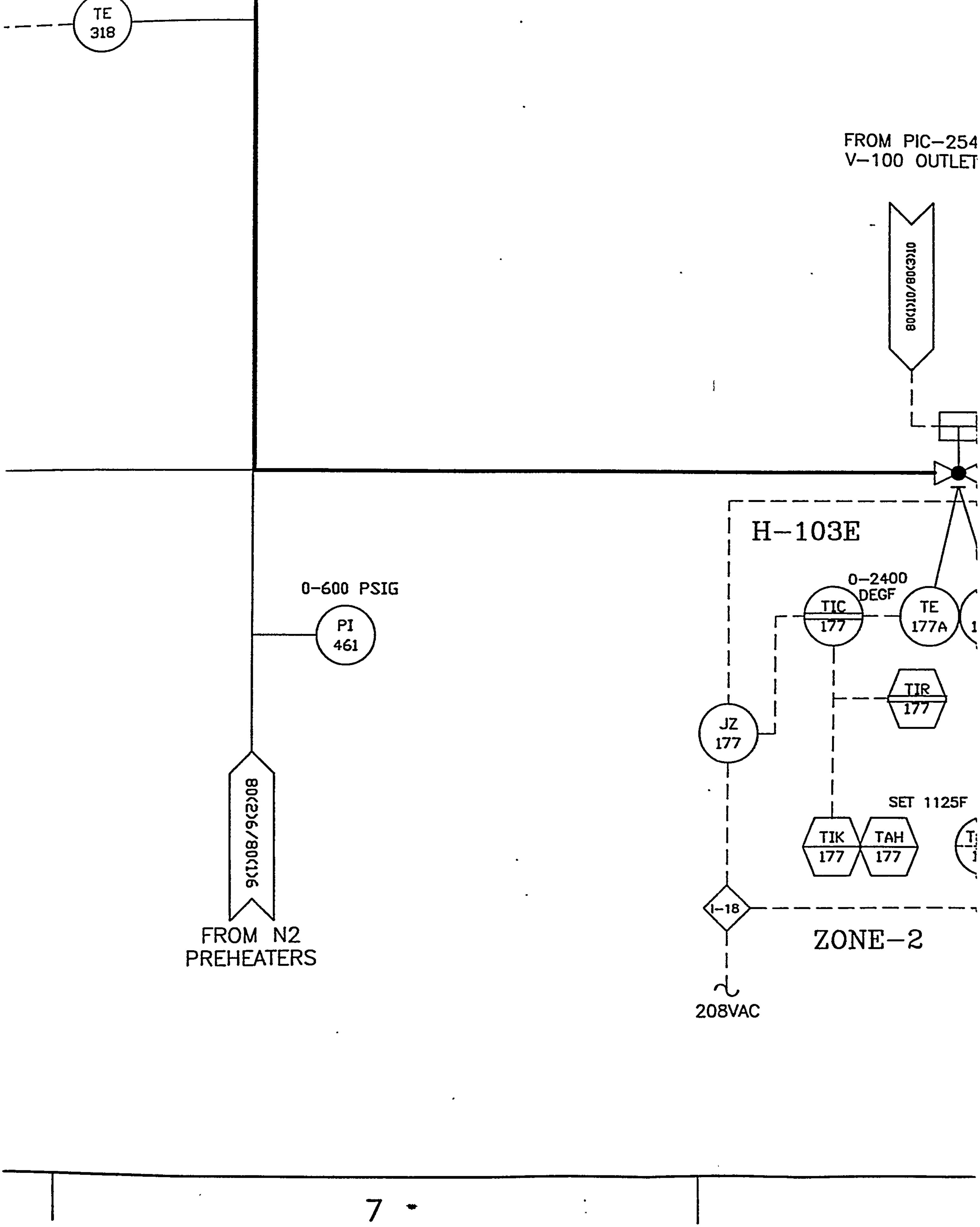
2 1

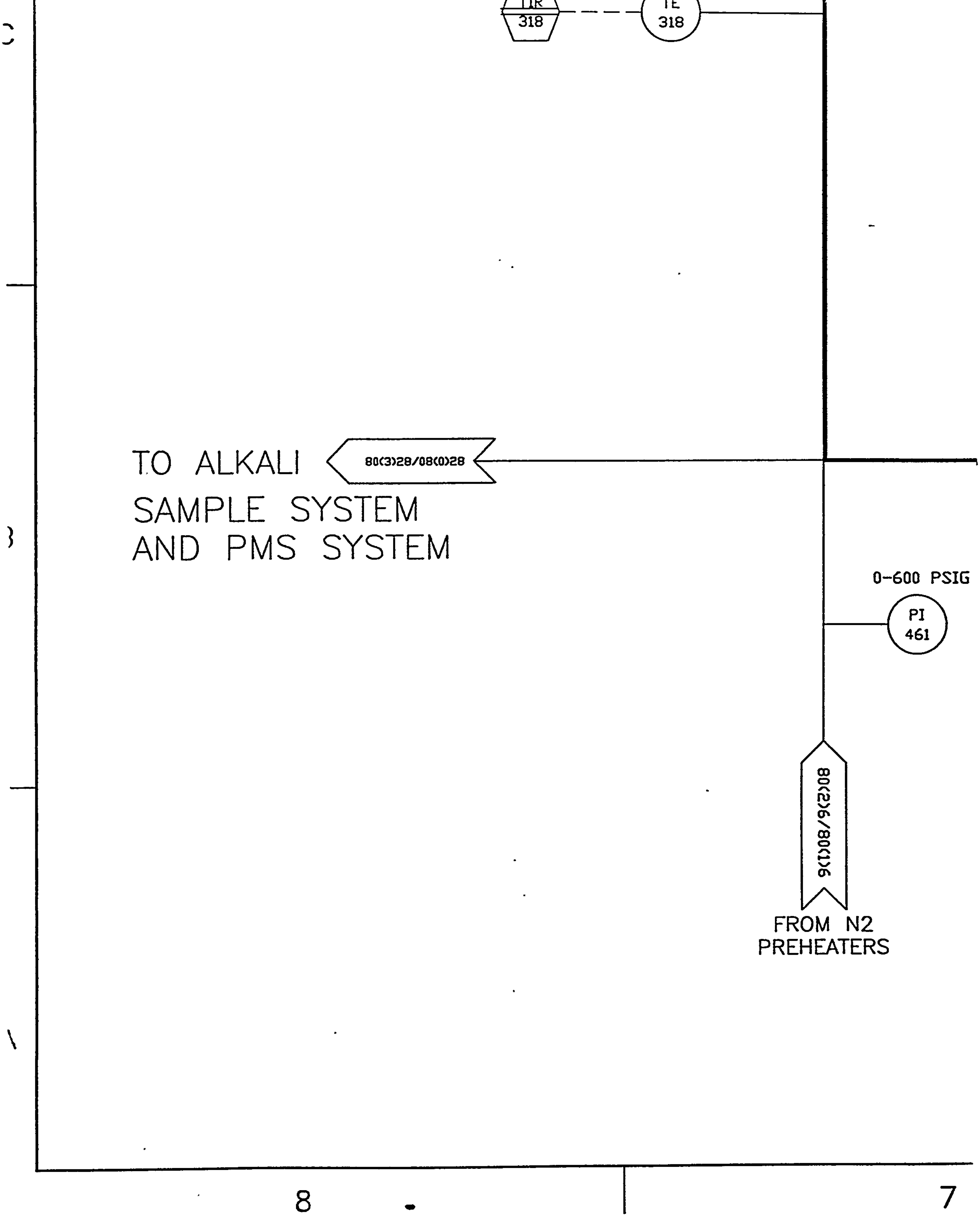
PLOT DATE: 9/30/94

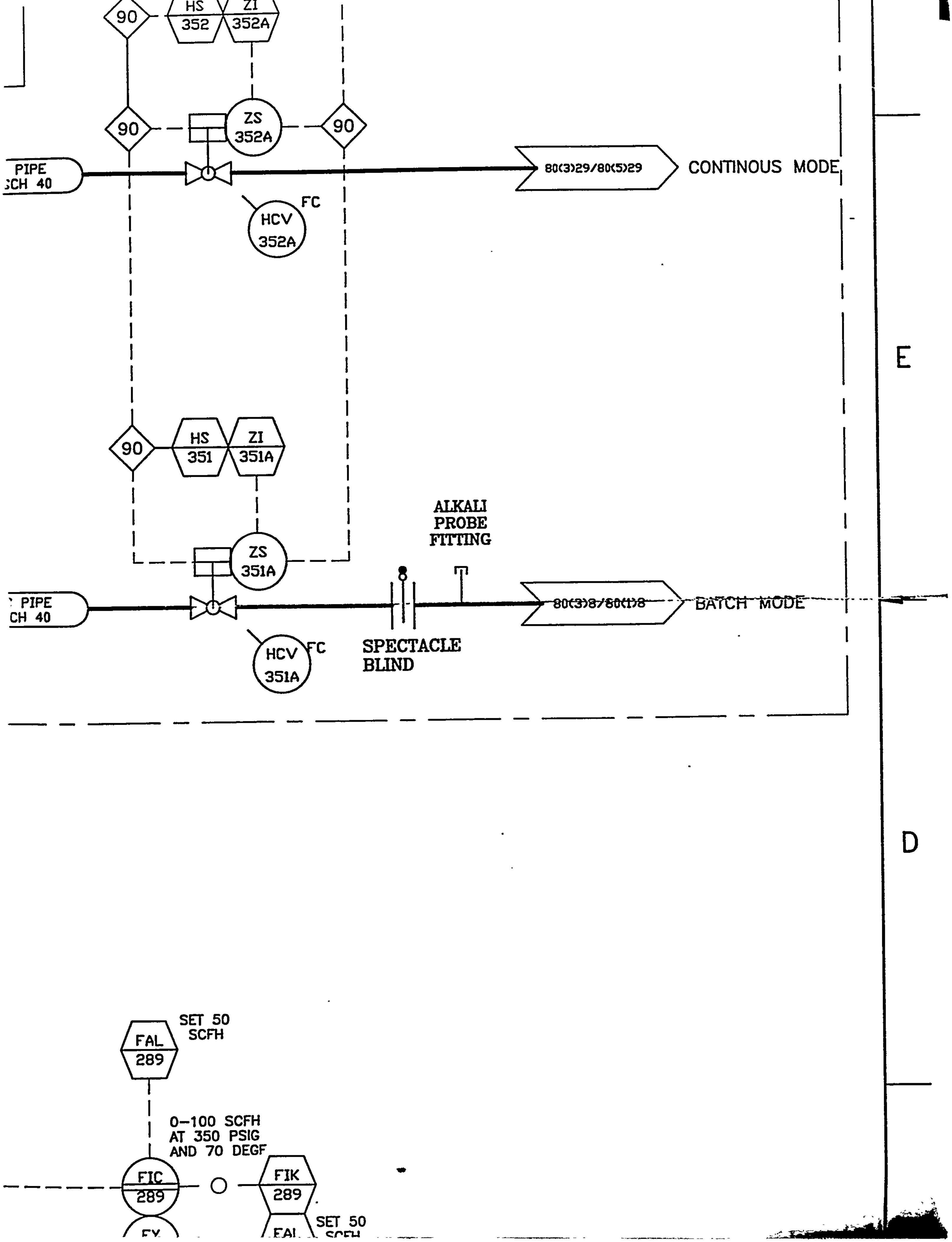



THIS DRAWING IS
OF THE EG&G DOCU
CONTROL SYSTE

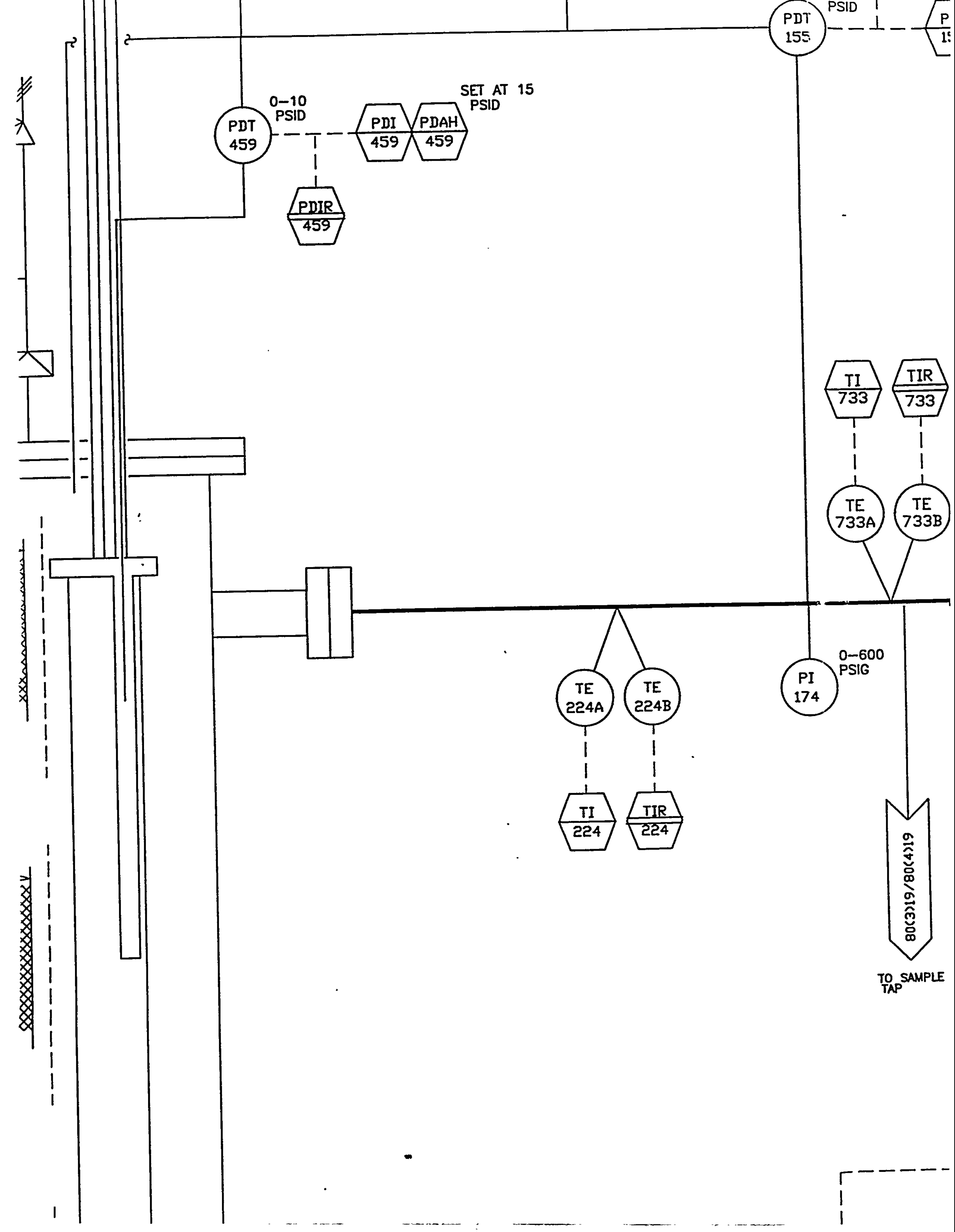

TAH
227
TAH
227
TIK
227
208VAC
I-12
0-600
PSIG
PI
153
1" SS PI
P7 SCH
PIR
247
0-1000
PSIG
PT
247
PI
247
TIR
248
TE
248B
TE
248A
TI
248


TE 318
FROM PIC-254
V-100 OUTLET
H-103E
0-600 PSIG
PI 461
0-2400 DEGF
TIC 177
TE 177A
TIR 177
JZ 177
SET 1125F
TIK 177
TAH 177
I-18
ZONE-2
FROM N2 PREHEATERS
208VAC
7

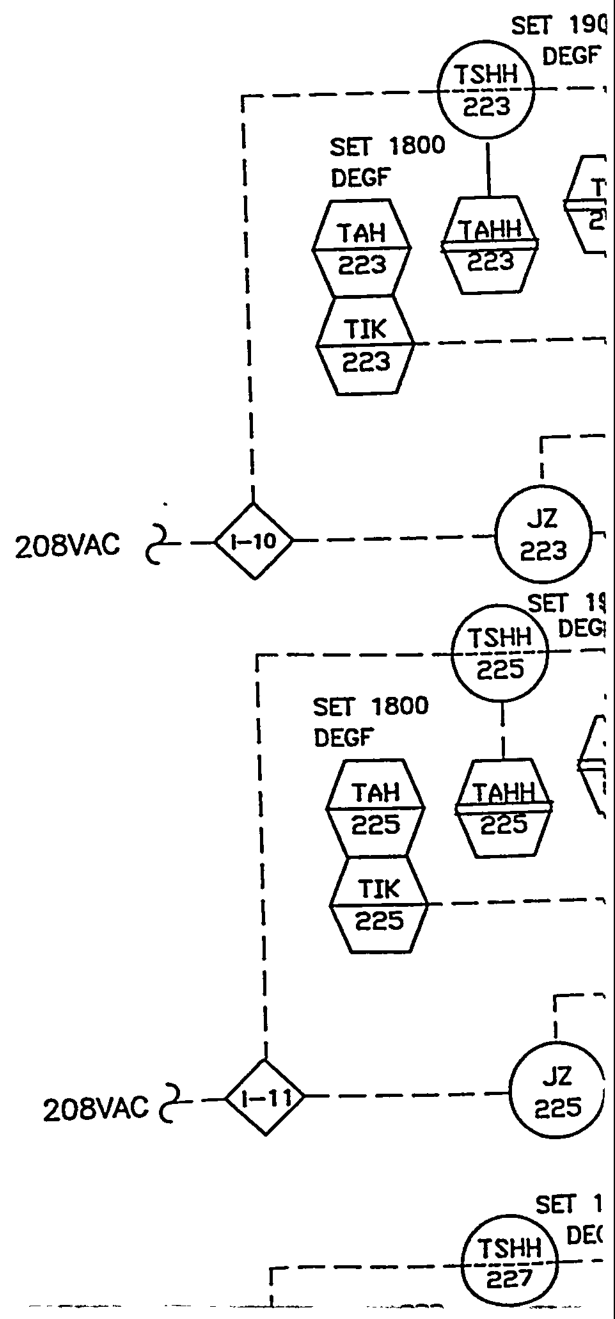

318
TE
318
TO ALKALI
SAMPLE SYSTEM
AND PMS SYSTEM
80(3)28/08(0)28
0-600 PSIG
PI
461
80(2)6/80(1)6
FROM N2
PREHEATERS
8
7



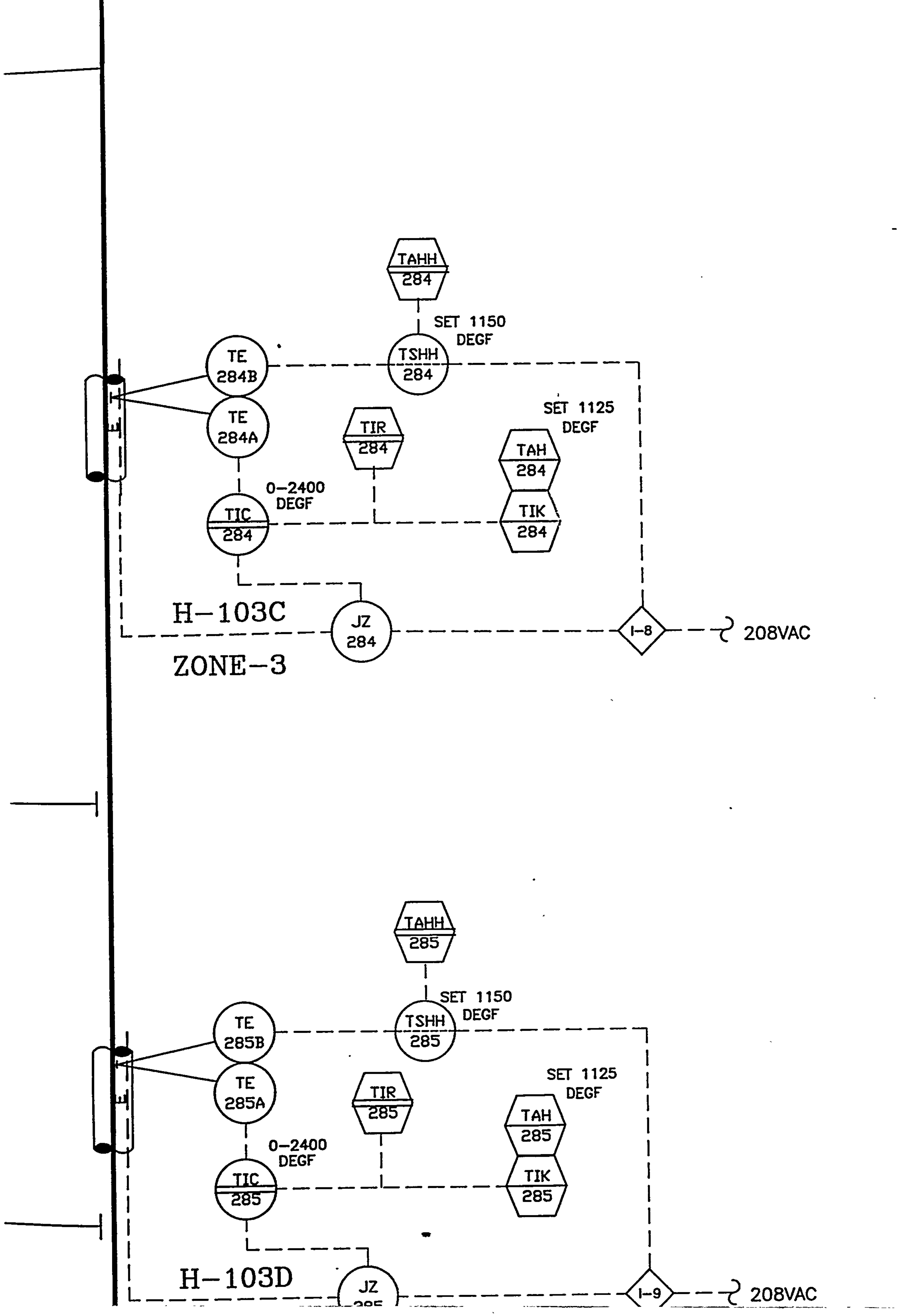
HS
352
ZI
352A
90
ZS
352A
PIPE
SCH 40
80(3)29/80(5)29
CONTINOUS MODE
FC
HCV
352A
E
HS
351
ZI
351A
ALKALI
PROBE
FITTING
ZS
351A
PIPE
CH 40
80(3)8/80(1)8
BATCH MODE
HCV
351A
SPECTACLE
BLIND
D
FAL
289
SET 50
SCFH
0–100 SCFH
AT 350 PSIG
AND 70 DEGF
FIC
289
FIK
289
SET 50
SCFH



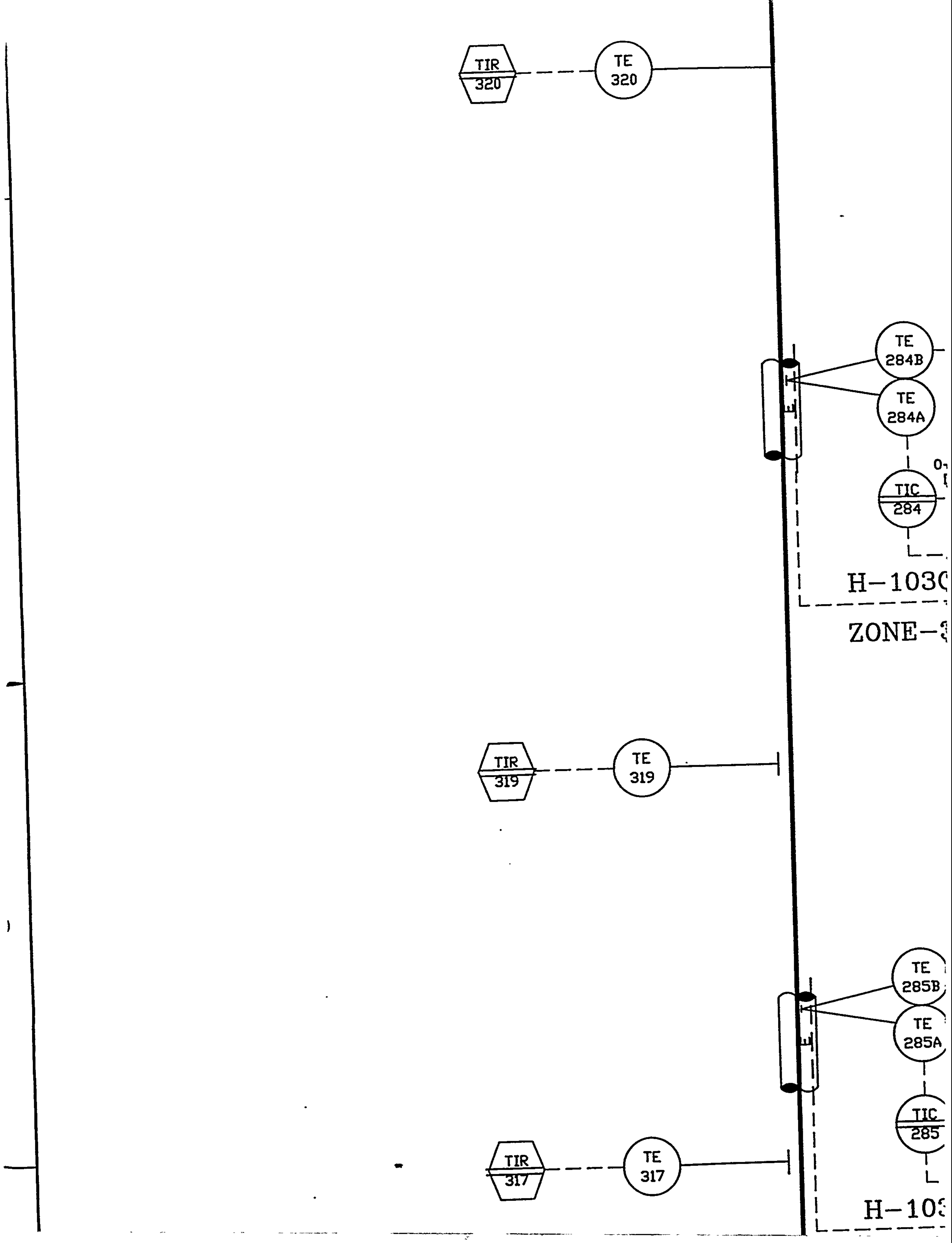
PSID
PDT
155
SET AT 15
PSID
0–10
PSID
PDT
459
PDI
459
PDAH
459
PDIR
459
TI
733
TIR
733
TE
733A
TE
733B
0–600
PSIG
PI
174
TE
224A
TE
224B
TI
224
TIR
224
80(3)19/80(4)19
TO SAMPLE TAP



SET 190
DEGF
TSHH 223
SET 1800
DEGF
TAH 223
TAHH 223
TIK 223
208VAC
I-10
JZ 223
SET 1
DEG
TSHH 225
SET 1800
DEGF
TAH 225
TAHH 225
TIK 225
208VAC
I-11
JZ 225
SET 1
DE
TSHH 227



TAHH 284
SET 1150 DEGF
TE 284B
TSHH 284
TE 284A
TIR 284
SET 1125 DEGF
TAH 284
0–2400 DEGF
TIC 284
TIK 284
H–103C
JZ 284
I–8
208VAC
ZONE–3
TAHH 285
SET 1150 DEGF
TE 285B
TSHH 285
TE 285A
TIR 285
SET 1125 DEGF
TAH 285
0–2400 DEGF
TIC 285
TIK 285
H–103D
JZ
I–9
208VAC



TIR 320
TE 320
TE 284B
TE 284A
TIC 284
H-103
ZONE-
TIR 319
TE 319
TE 285B
TE 285A
TIC 285
TIR 317
TE 317
H-10

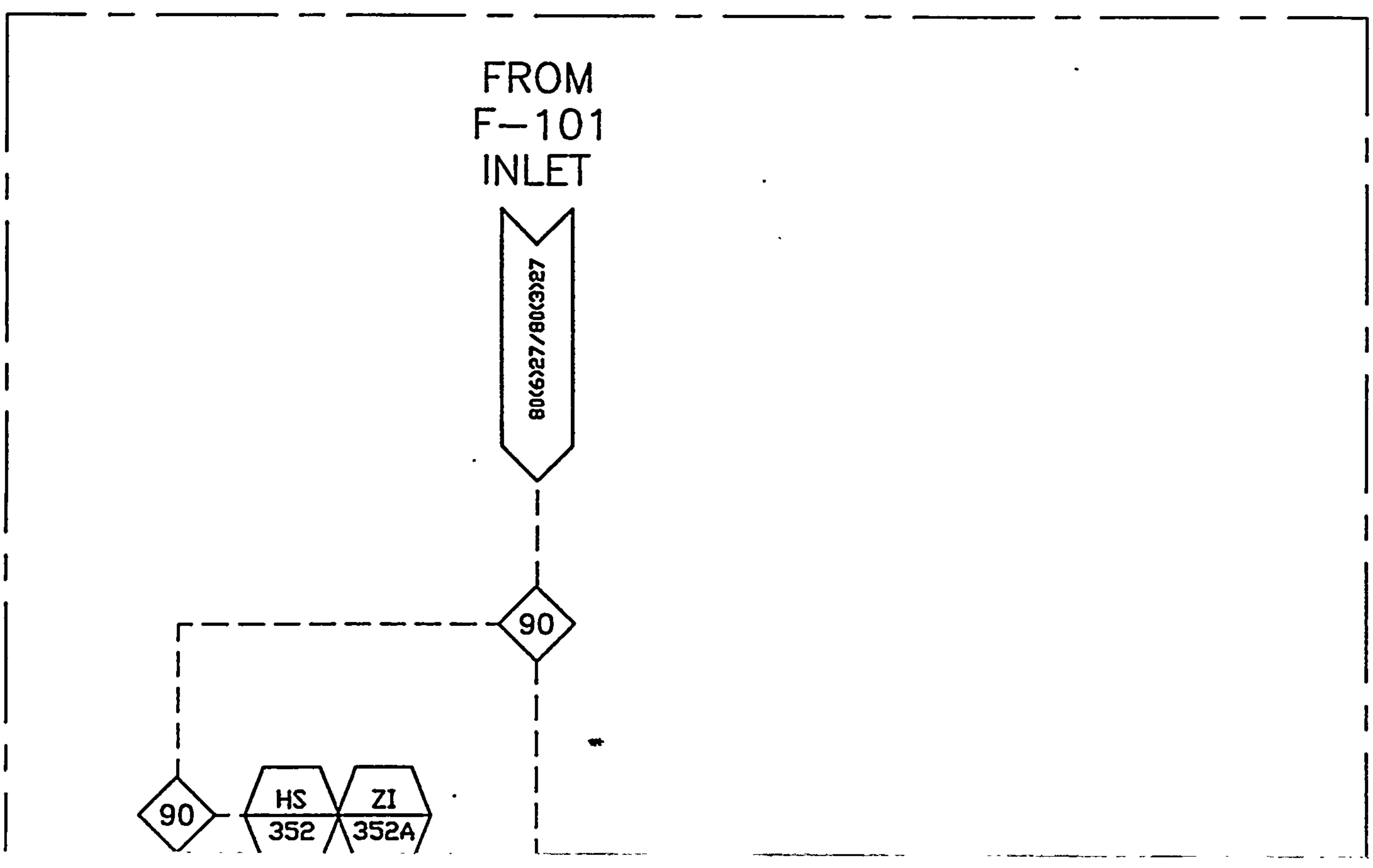
| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN. | 6 | MODIFIED AS PER MARKED PRINT; ISSUED FOR CONSTRUCTION | 5/16/94 |

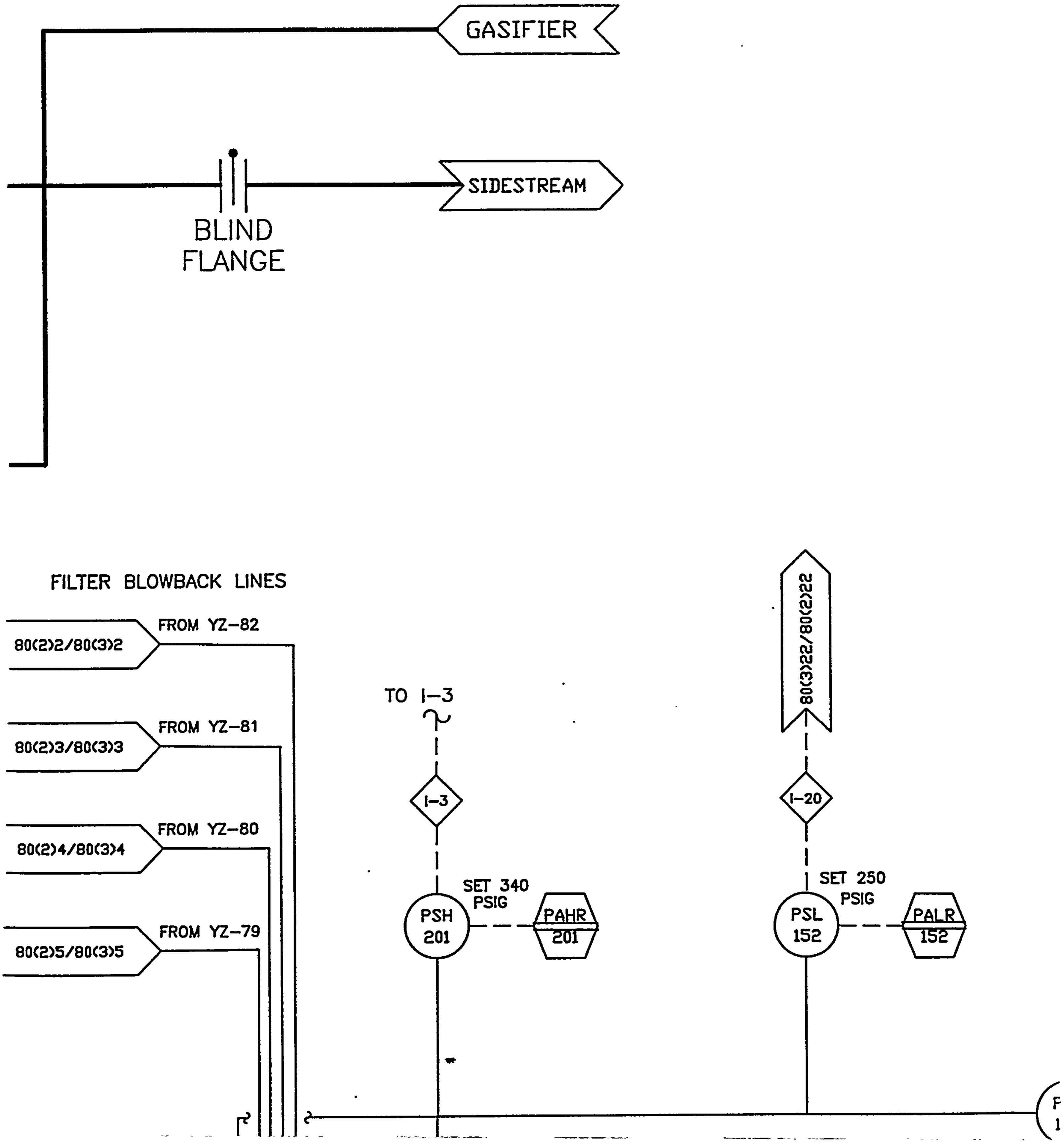
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DRAFTER GARY J. KULCHOCK | DATE 5/18/94 | CHECKER S. CONKO | DATE 5/18/94 | EG&G RESPONSIBLE ENGR. DAVID LUNIFELD | DATE 5/24/94 | REVIEWER | DATE |
| EG&G ES&H W.E. LOWRY | DATE 5/24/94 | PROJECT ENGR. S. RENNINGER | DATE 5/18/94 | BRANCH MANAGER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

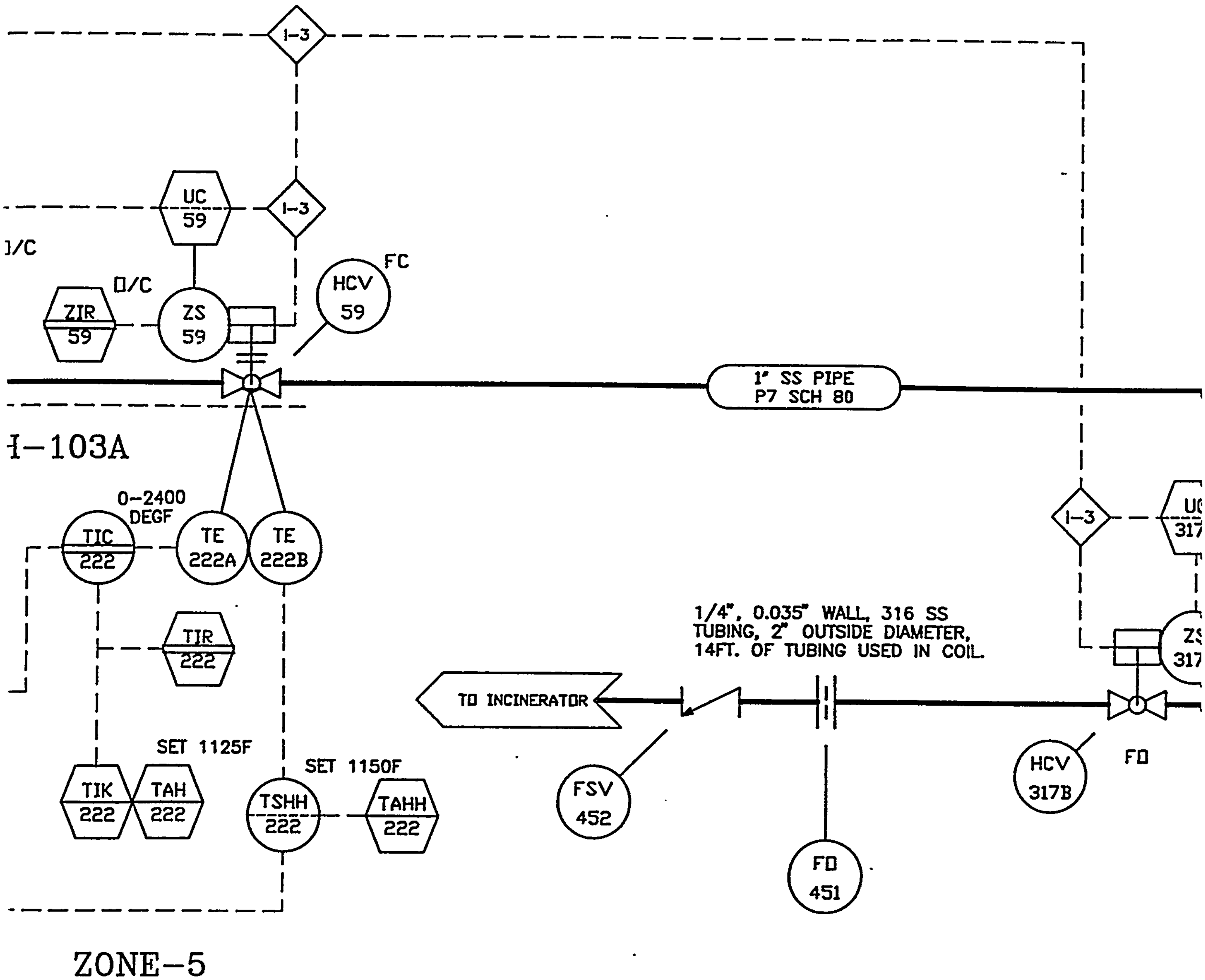
| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN. | 7 | MODIFIED AS PER MARKED PRINT; ISSUED FOR CONSTRUCTION | 9/30/94 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DRAFTER [illegible] | DATE 10-3-94 | CHECKER [illegible] | DATE 10/3/94 | EG&G RESPONSIBLE ENGR. David Lunifeld | DATE 10/5/94 | REVIEWER | DATE |
| EG&G ES&H W. Lowry | DATE 10/11/94 | PROJECT ENGR. Scott Renninger | DATE 10/18/94 | BRANCH MANAGER | DATE | DOE (EOSD) WJA [illegible] | DATE 10/5/94 |

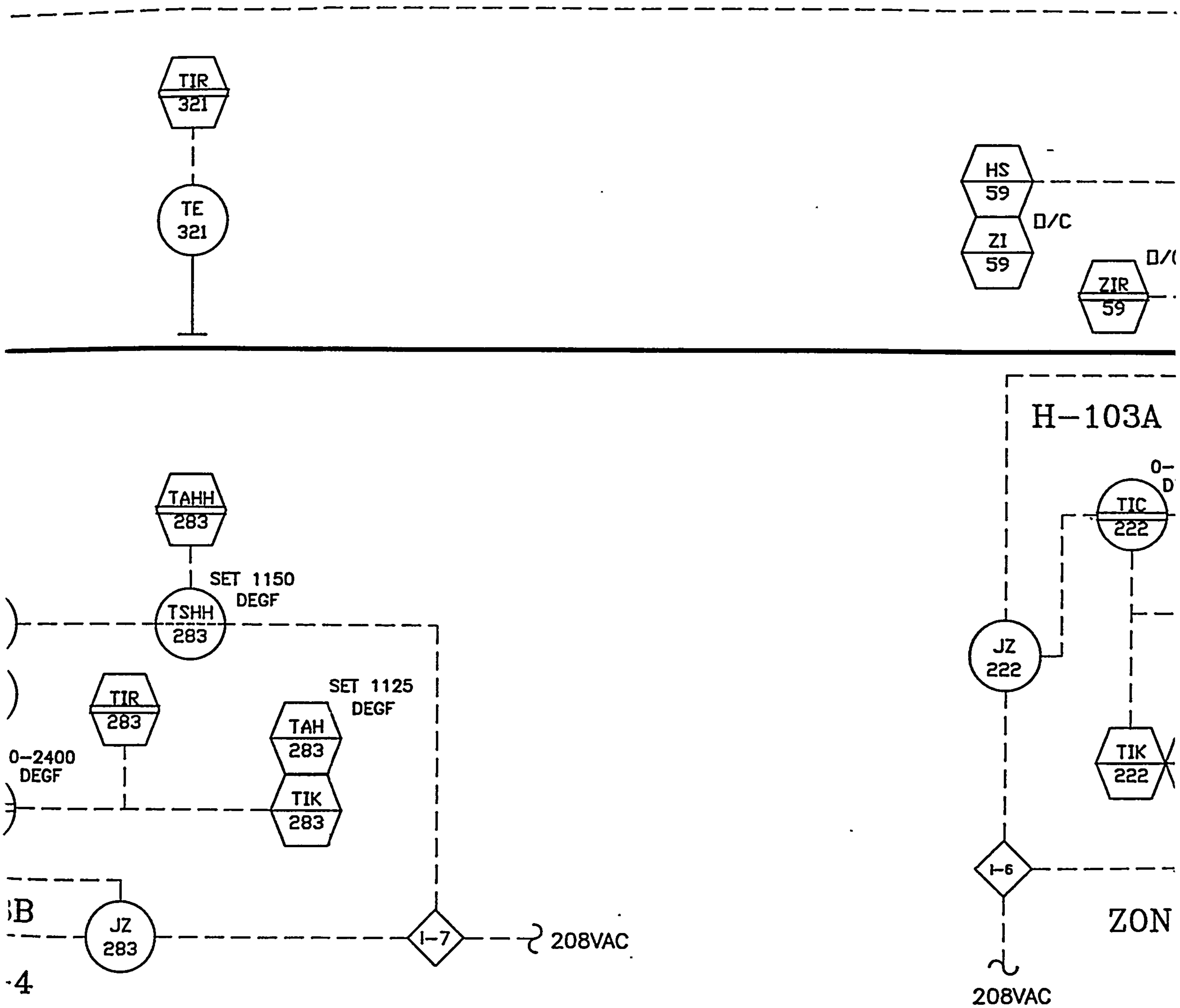
TO BE ADDED FOR CONTINOUS MODE OPERATIONS



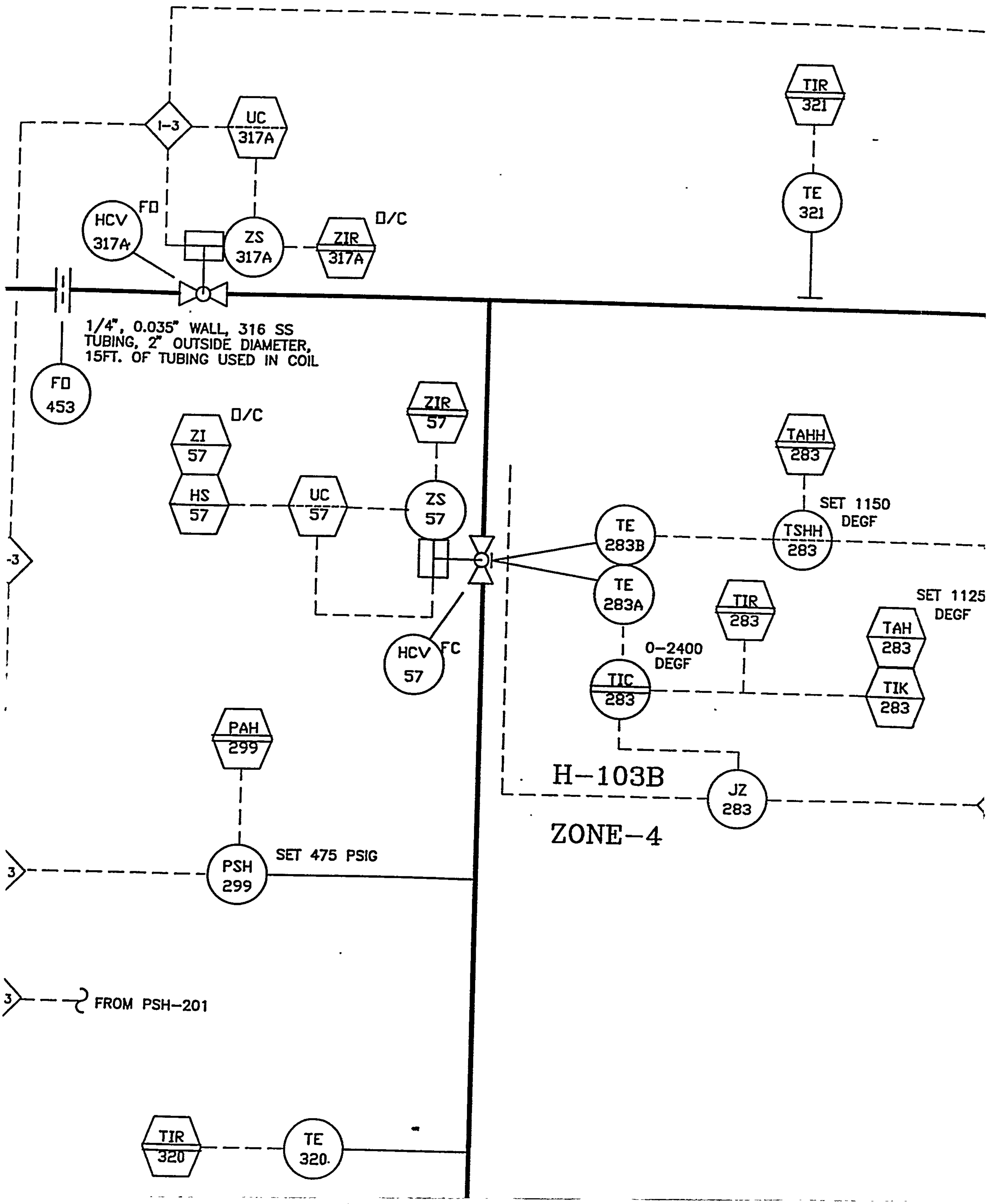

GASIFIER
SIDESTREAM
BLIND FLANGE
FILTER BLOWBACK LINES
FROM YZ-82
80(2)2/80(3)2
FROM YZ-81
80(2)3/80(3)3
FROM YZ-80
80(2)4/80(3)4
FROM YZ-79
80(2)5/80(3)5
TO I-3
I-3
SET 340 PSIG
PSH 201
PAHR 201
80(3)22/80(2)22
I-20
SET 250 PSIG
PSL 152
PALR 152



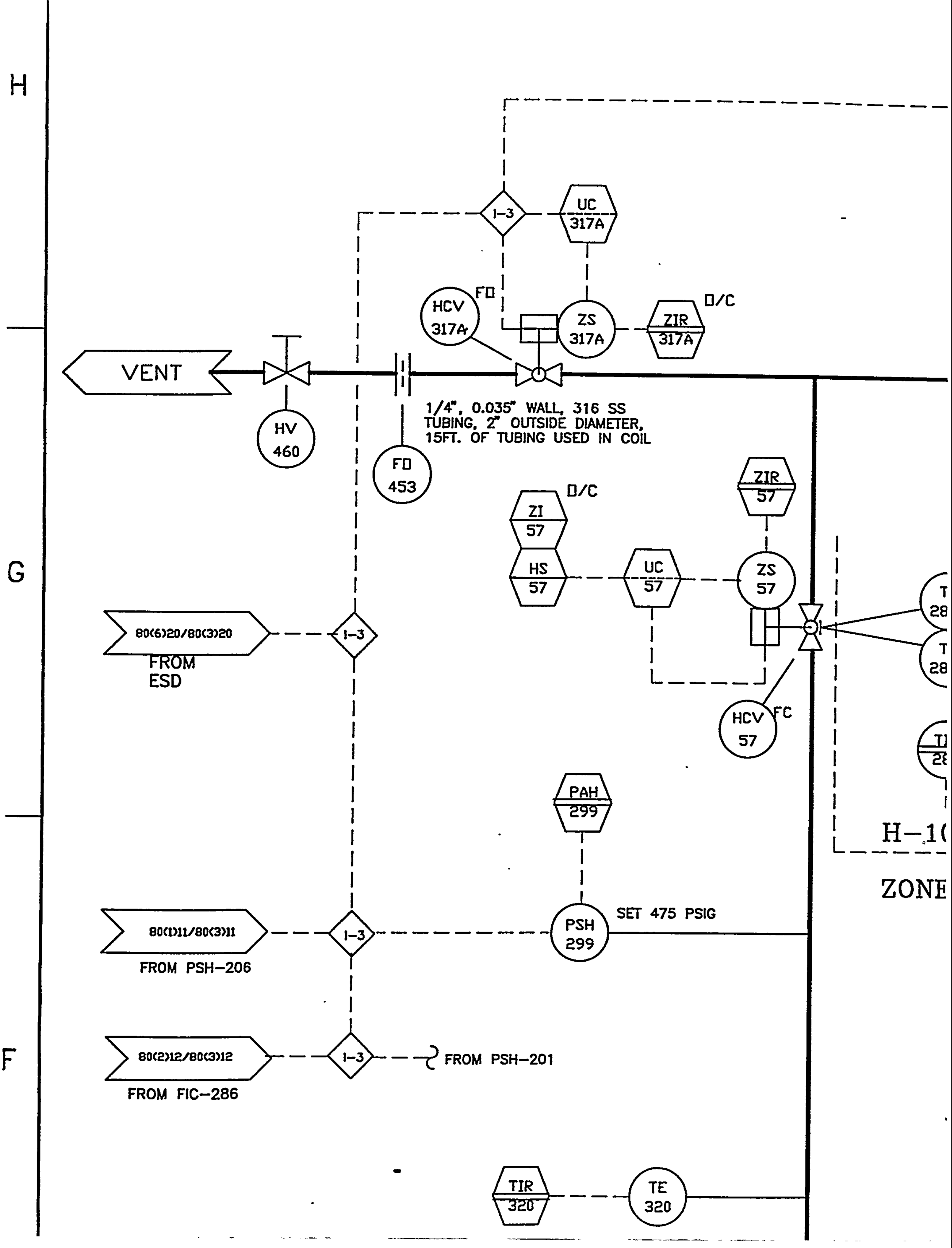
I-3
I-3
UC 59
]/C
O/C
ZIR 59
ZS 59
HCV 59
FC
1" SS PIPE P7 SCH 80
I-103A
0-2400 DEGF
TIC 222
TE 222A
TE 222B
TIR 222
I-3
ZS 317
1/4", 0.035" WALL, 316 SS TUBING, 2" OUTSIDE DIAMETER, 14FT. OF TUBING USED IN COIL.
TO INCINERATOR
SET 1125F
SET 1150F
TIK 222
TAH 222
TSHH 222
TAHH 222
FSV 452
FO 451
HCV 317B
FO
ZONE-5



TIR
321
TE
321
HS
59
ZI
59
D/C
ZIR
59
H-103A
TAHH
283
SET 1150
DEGF
TSHH
283
TIR
283
SET 1125
DEGF
TAH
283
TIK
283
0-2400
DEGF
B
JZ
283
I-7
208VAC
-4
TIC
222
JZ
222
TIK
222
I-6
ZON
208VAC

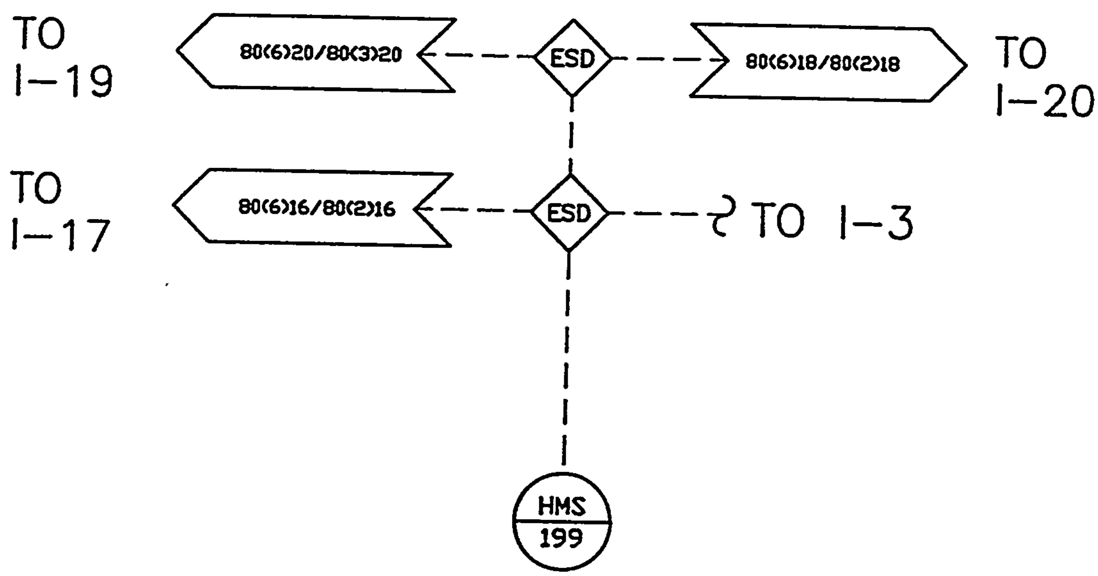


TIR 321
1-3
UC 317A
TE 321
HCV 317A
FO
ZS 317A
ZIR 317A
O/C
1/4", 0.035" WALL, 316 SS TUBING, 2" OUTSIDE DIAMETER, 15FT. OF TUBING USED IN COIL
FO 453
ZIR 57
ZI 57
O/C
TAHH 283
HS 57
UC 57
ZS 57
SET 1150 DEGF
TE 283B
TSHH 283
-3
TE 283A
TIR 283
SET 1125 DEGF
TAH 283
HCV 57
FC
0-2400 DEGF
TIC 283
TIK 283
PAH 299
H-103B
JZ 283
ZONE-4
PSH 299
SET 475 PSIG
3
3
FROM PSH-201
TIR 320
TE 320.

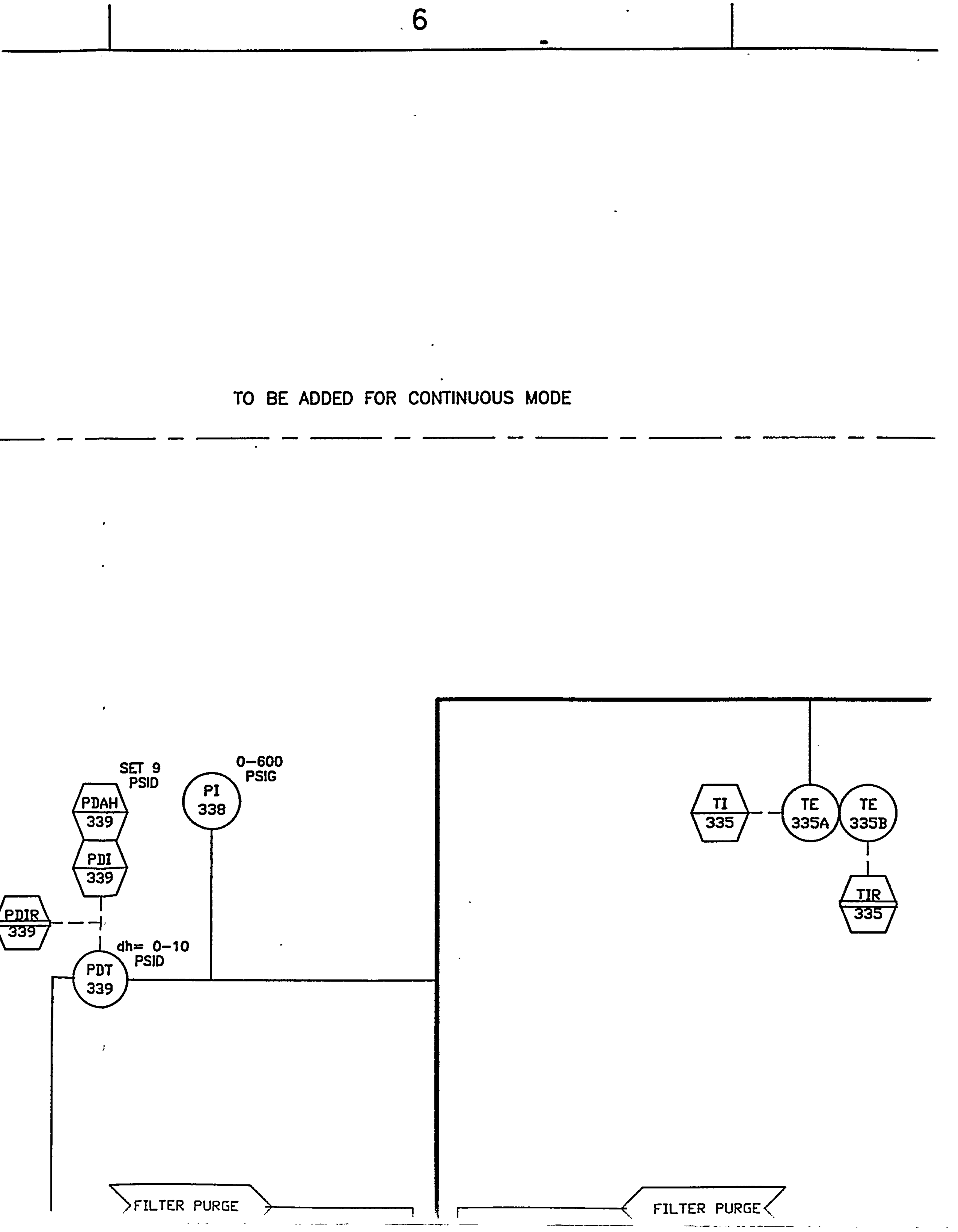

H
G
F
VENT
HV
460
FO
453
HCV
317A
FO
UC
317A
1-3
ZS
317A
ZIR
317A
O/C
1/4", 0.035" WALL, 316 SS
TUBING, 2" OUTSIDE DIAMETER,
15FT. OF TUBING USED IN COIL
ZI
57
O/C
HS
57
UC
57
ZIR
57
ZS
57
HCV
57
FC
80(6)20/80(3)20
FROM
ESD
1-3
PAH
299
PSH
299
SET 475 PSIG
80(1)11/80(3)11
FROM PSH-206
80(2)12/80(3)12
FROM FIC-286
FROM PSH-201
TIR
320
TE
320
ZONE

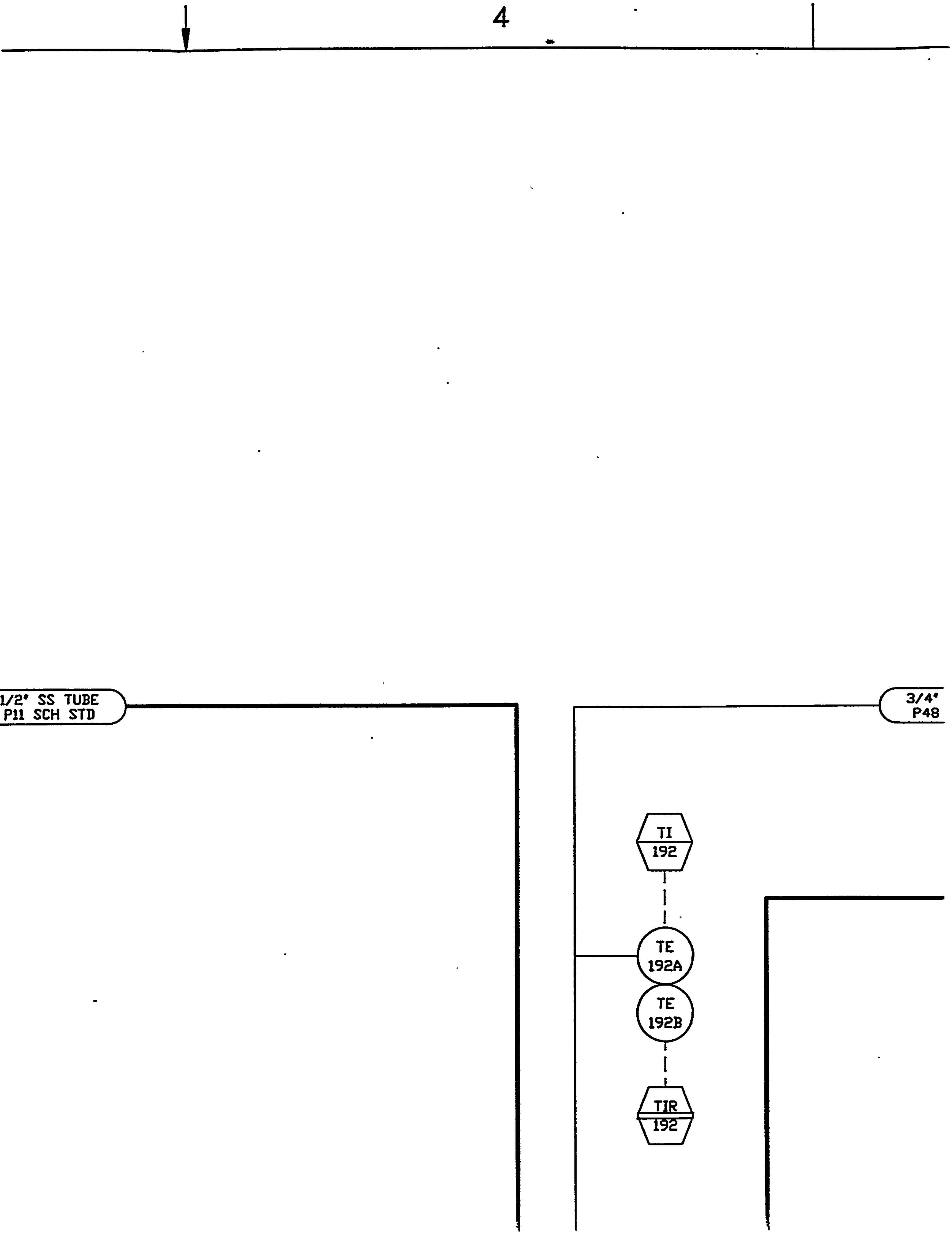
8 7

H


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

G


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
FILTER PURGE


4
1/2" SS TUBE
P11 SCH STD
3/4"
P48
TI
192
TE
192A
TE
192B
TIR
192

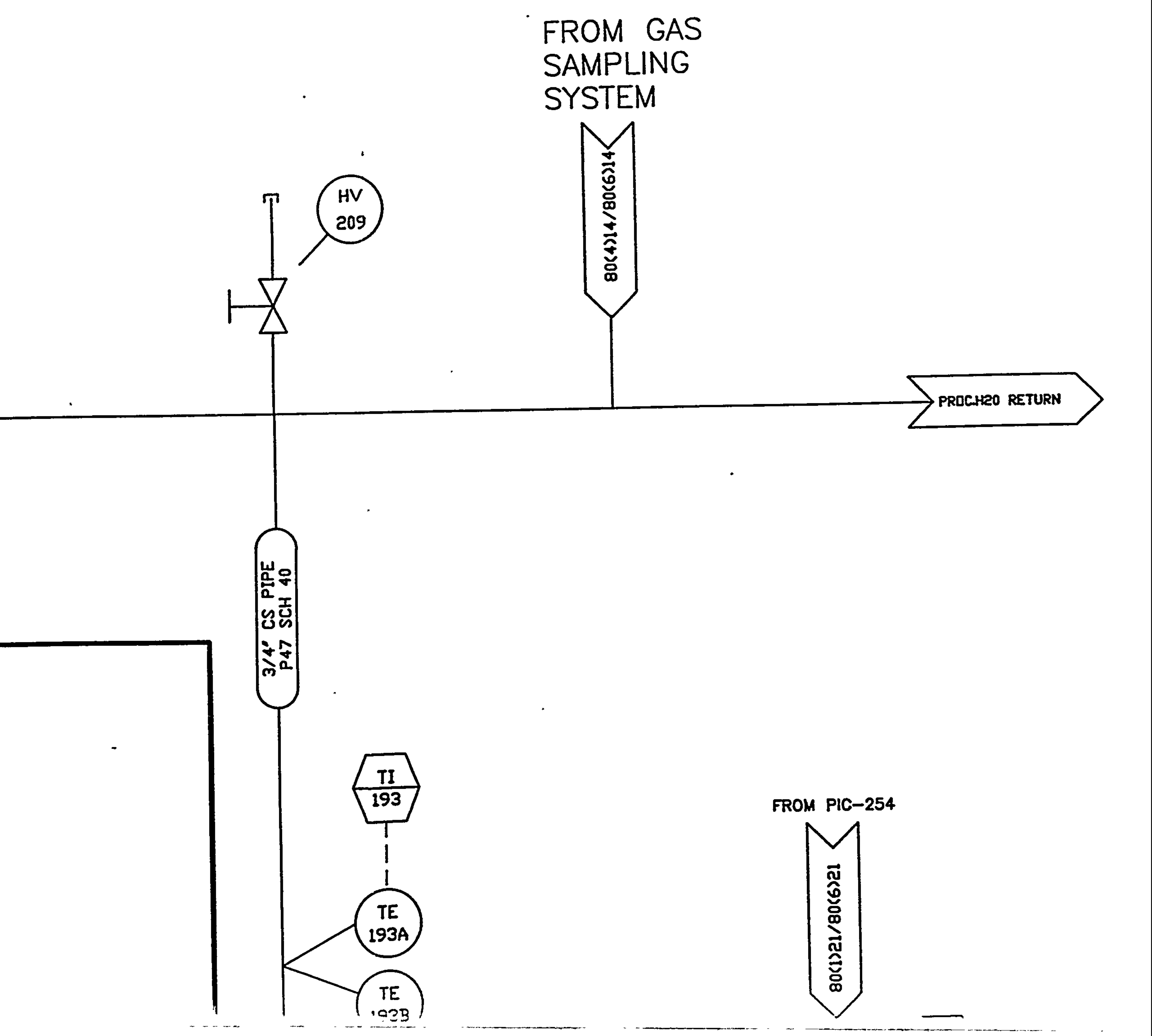
2

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

| 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. RENNINGER |

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

| DRAFTER | DATE | CHECKER |
|---|---|---|
| [illegible] | 10-3-94 | [illegible] |
| EG&G ES&H DOE | DATE | PROJECT ENGR. |
| [illegible] | [illegible] | Scott [illegible] |



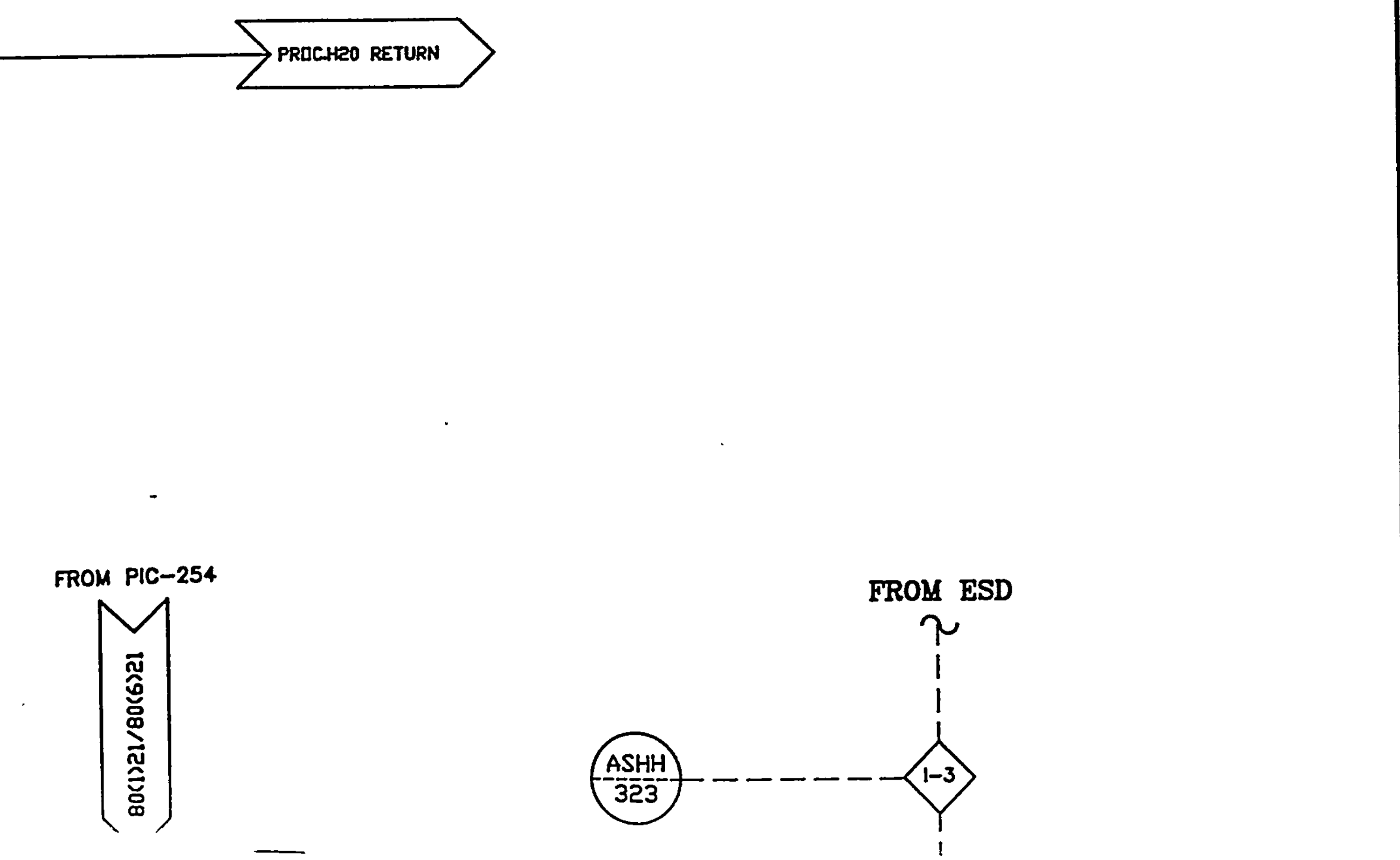
## REVISION

| ZONE | REV | DESCRIPTION | | | | | DATE |
|---|---|---|---|---|---|---|---|
| GEN. | 6 | MODIFIED AS PER MARKED PRINT; ISSUED FOR CONSTRUCTION | | | | | 5/16/94 |
| DRAFTER: ...Y J. KULCHOCK | DATE: 5/18/94 | CHECKER: S. CONKO | DATE: 5/18/94 | EG&G RESPONSIBLE ENGR.: DAVID LUNIFELD | DATE: 5/24/94 | REVIEWER: GARY J. KULCHOCK | DATE: 5/18/94 |
| ESH: ... 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: [illegible] | DATE: 10-3-94 | CHECKER: Gary J Kulchock | DATE: 10/3/94 | EG&G RESPONSIBLE ENGR.: David Lunifeld | DATE: 10/5/94 | REVIEWER: | DATE: |
| ESH DOE: [illegible] Lowry | DATE: 10/17/94 | PROJECT ENGR.: Scott Renninger | DATE: 10/4/94 | BRANCH MANAGER: | DATE: | DOE (EOSD): [illegible] WJA | DATE: 10/5/94 |

H

G

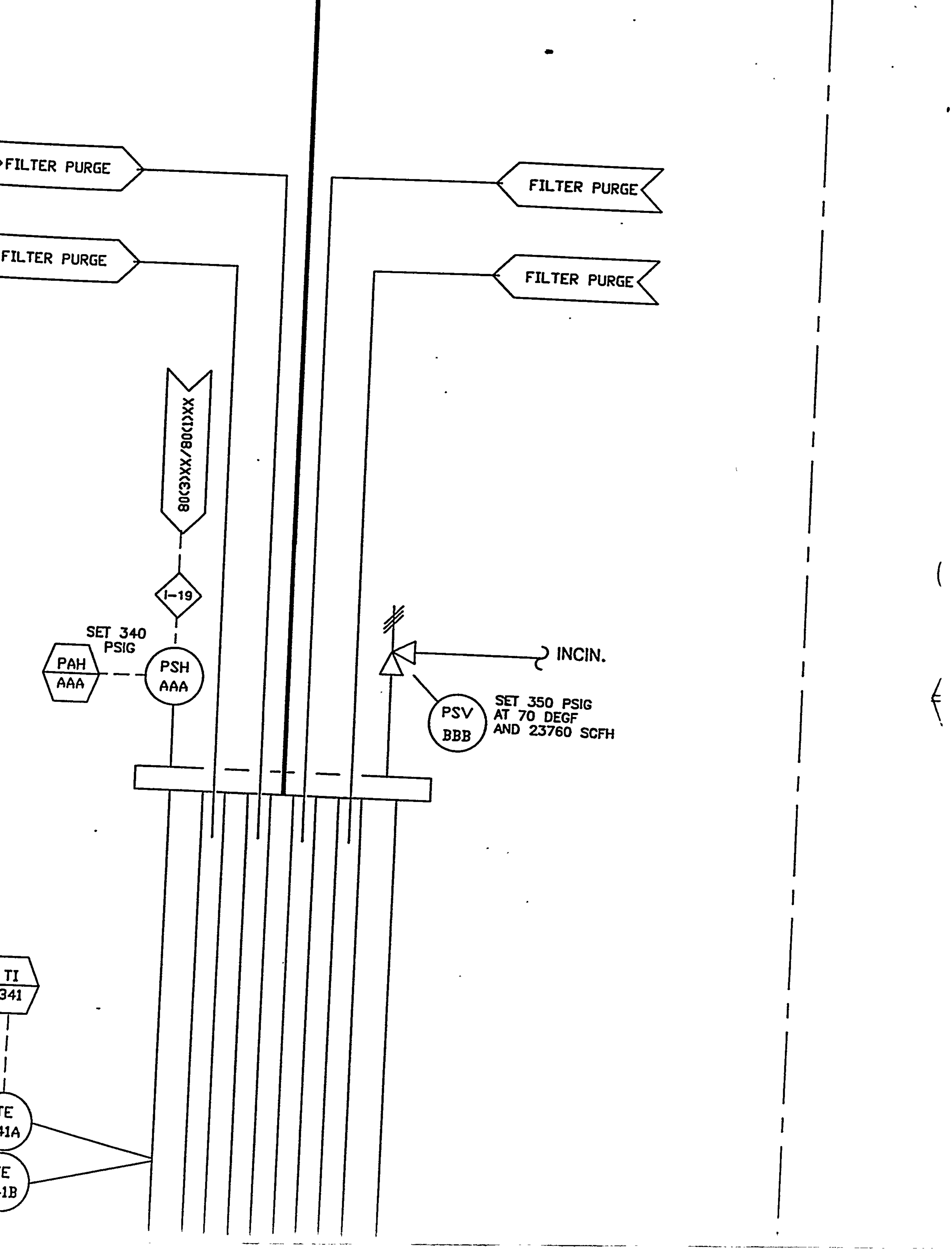
F

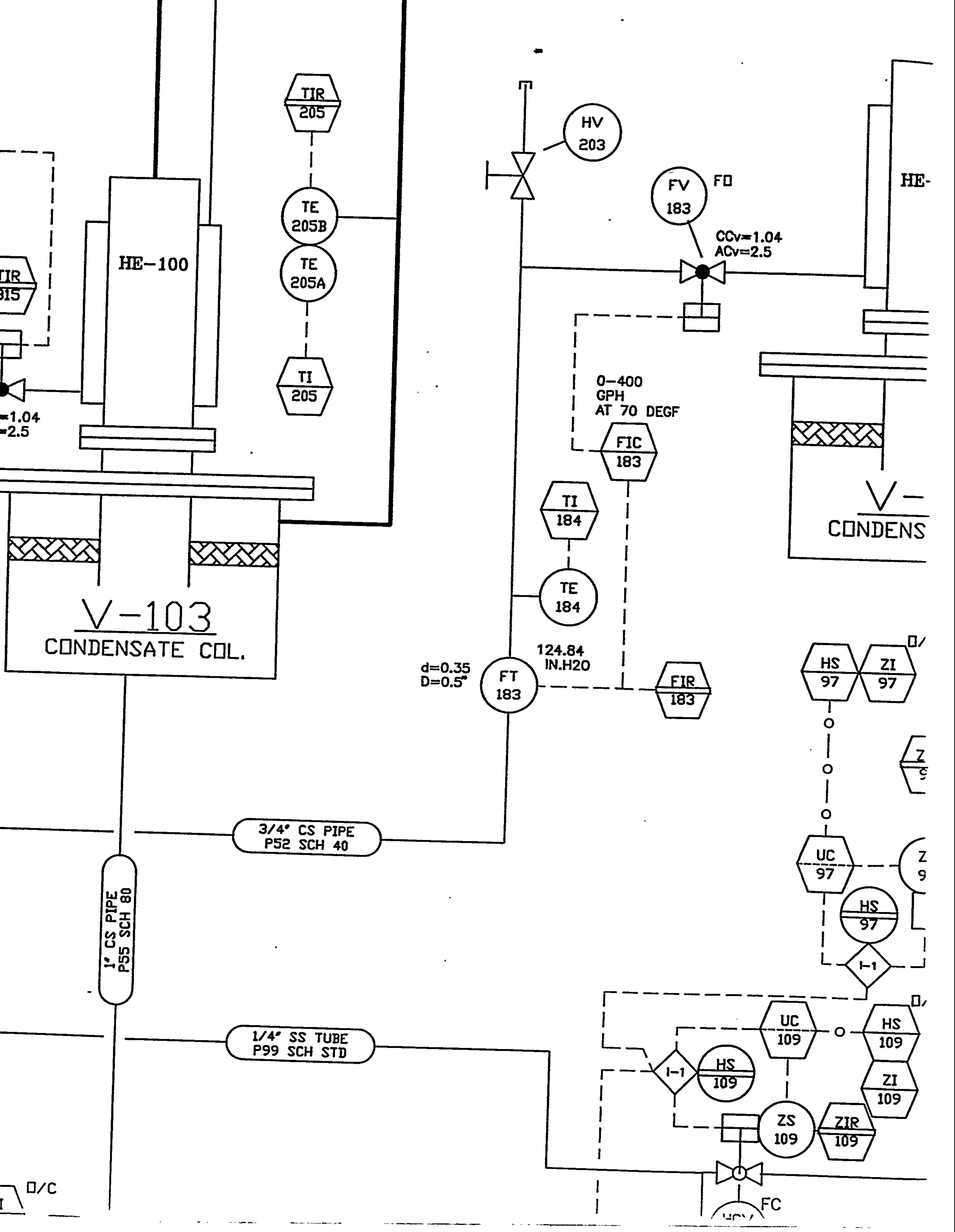


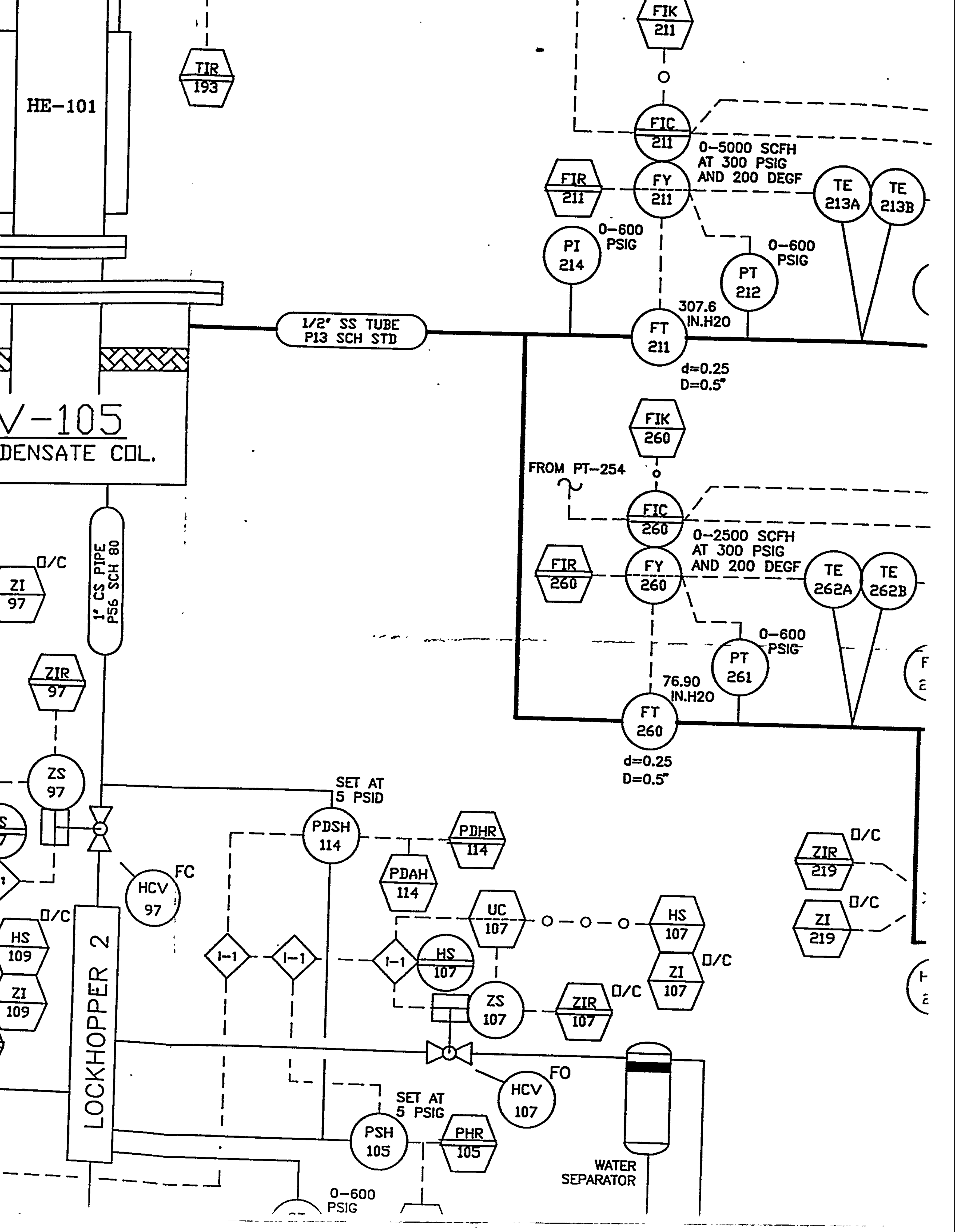
F

E

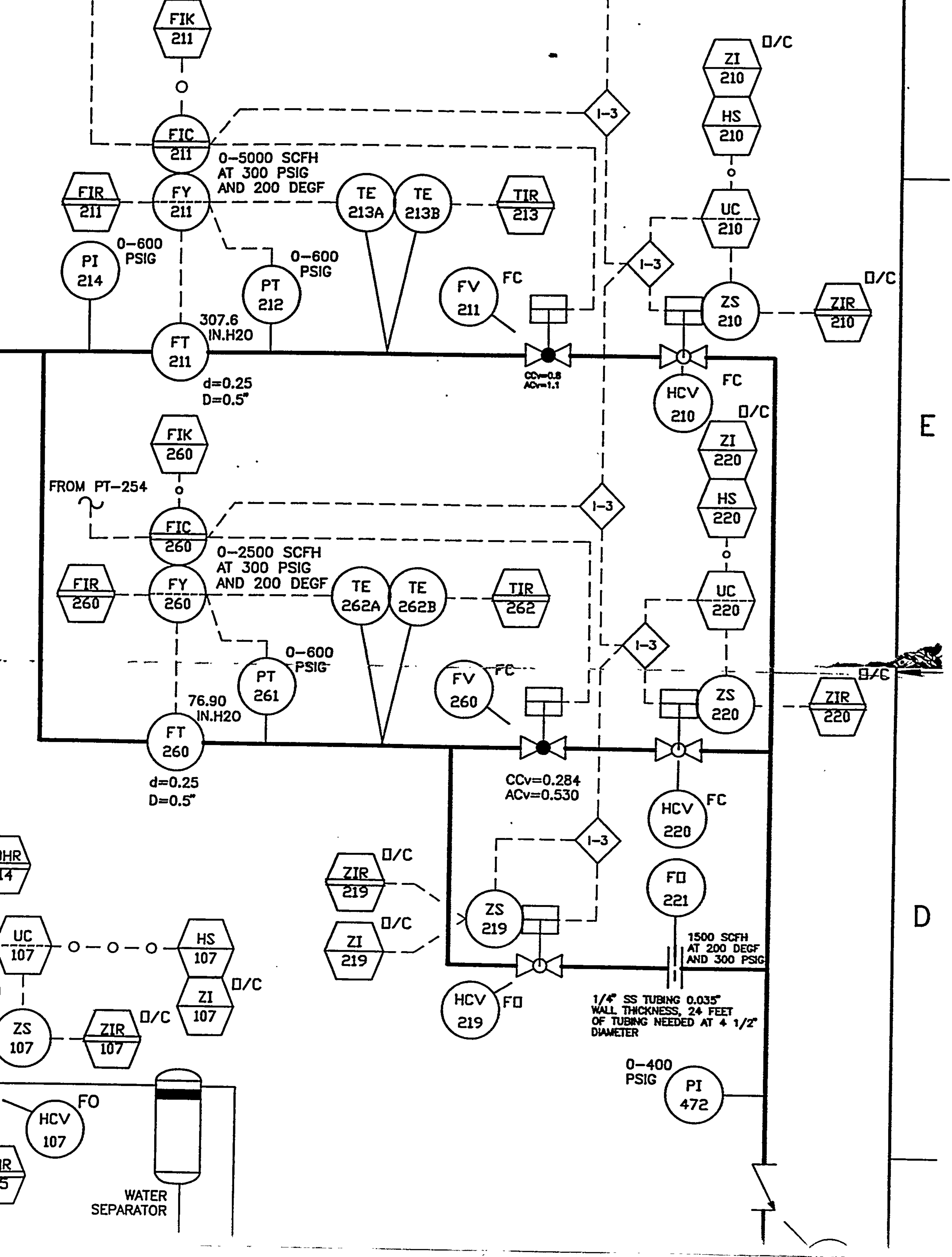
D


FILTER PURGE
FILTER PURGE
FILTER PURGE
FILTER PURGE
XX(1)08/XX(3)08
I-19
SET 340
PSIG
PAH
AAA
PSH
AAA
INCIN.
PSV
BBB
SET 350 PSIG
AT 70 DEGF
AND 23760 SCFH
TI
341

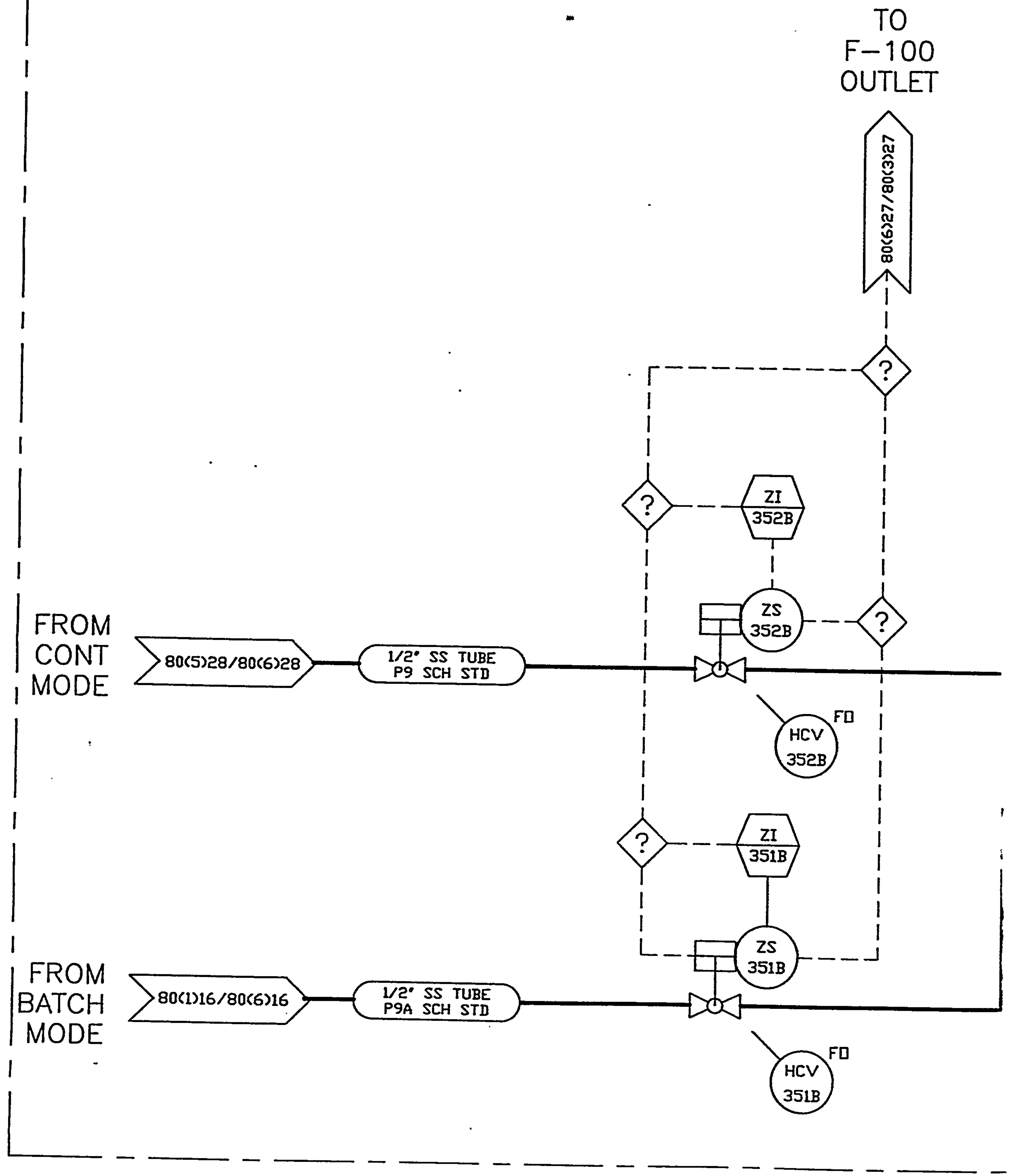

TIR 205
TE 205B
TE 205A
TI 205
HE-100
TIR 315
=1.04
=2.5
V-103
CONDENSATE COL.
HV 203
FV 183
FO
CCv=1.04
ACv=2.5
HE-
0-400
GPH
AT 70 DEGF
FIC 183
TI 184
TE 184
V-
CONDENS
d=0.35
D=0.5"
FT 183
124.84
IN.H20
FIR 183
HS 97
ZI 97
UC 97
HS 97
I-1
3/4" CS PIPE
P52 SCH 40
1" CS PIPE
P55 SCH 80
1/4" SS TUBE
P99 SCH STD
UC 109
HS 109
I-1
HS 109
ZI 109
ZS 109
ZIR 109
FC
O/C



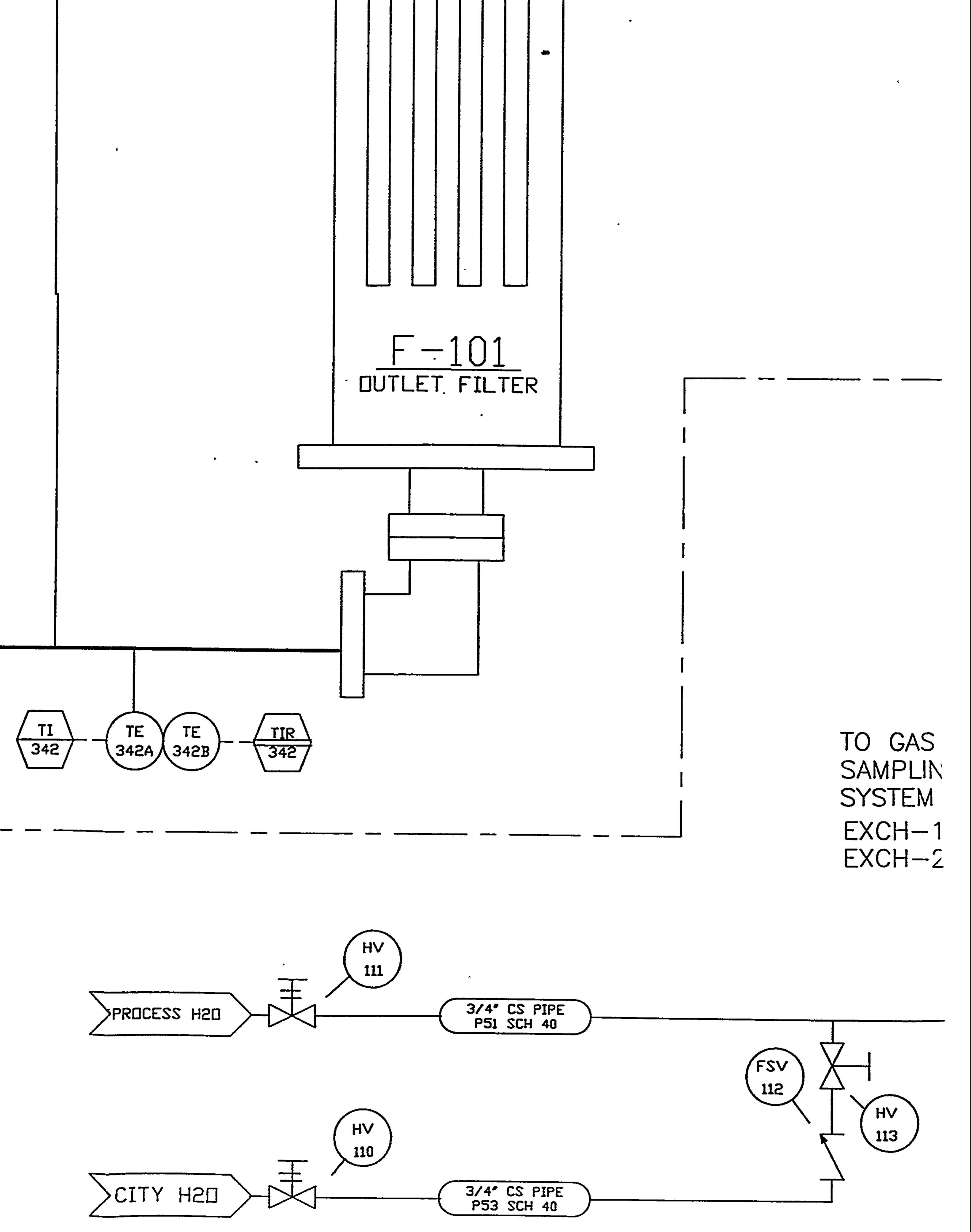
HE-101
TIR 193
FIK 211
FIC 211
FY 211
FIR 211
0-5000 SCFH AT 300 PSIG AND 200 DEGF
TE 213A
TE 213B
PI 214
0-600 PSIG
PT 212
0-600 PSIG
1/2" SS TUBE P13 SCH STD
FT 211
307.6 IN.H2O
d=0.25 D=0.5"
V-105
DENSATE COL.
FIK 260
FROM PT-254
FIC 260
FY 260
FIR 260
0-2500 SCFH AT 300 PSIG AND 200 DEGF
TE 262A
TE 262B
PT 261
0-600 PSIG
FT 260
76.90 IN.H2O
d=0.25 D=0.5"
1" CS PIPE P56 SCH 80
ZI 97
O/C
ZIR 97
ZS 97
SET AT 5 PSID
PDSH 114
PDHR 114
PDAH 114
HCV 97
FC
HS 109
ZI 109
O/C
LOCKHOPPER 2
UC 107
HS 107
ZS 107
ZIR 107
ZI 107
O/C
I-1
HCV 107
FO
SET AT 5 PSIG
PSH 105
PHR 105
WATER SEPARATOR
0-600 PSIG
ZIR 219
ZI 219
O/C

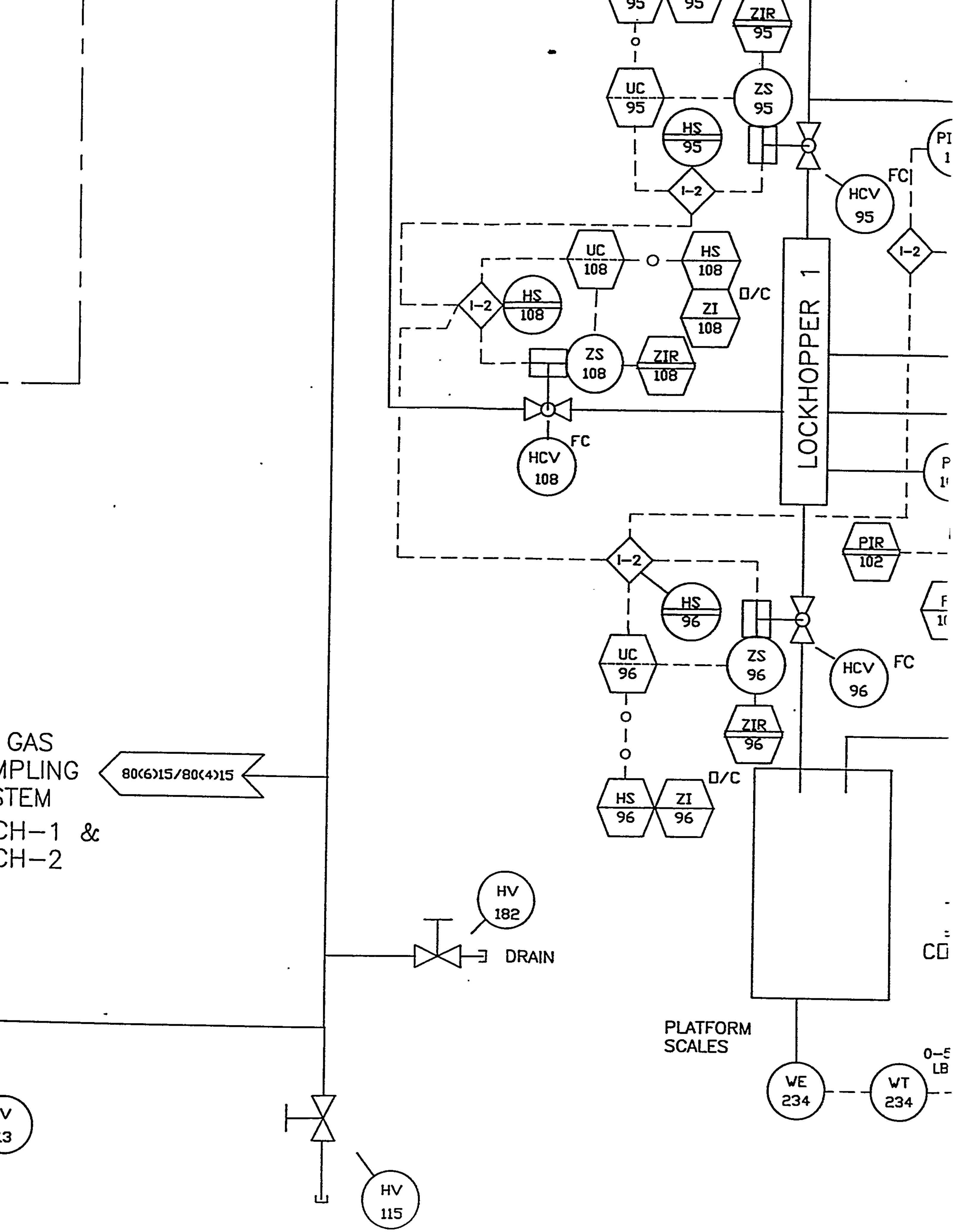


FIK 211
FIC 211
0–5000 SCFH
AT 300 PSIG
AND 200 DEGF
FIR 211
FY 211
TE 213A
TE 213B
TIR 213
I-3
0/C
ZI 210
HS 210
UC 210
PI 214
0–600
PSIG
PT 212
0–600
PSIG
FV 211
FC
ZS 210
ZIR 210
307.6
IN.H20
FT 211
d=0.25
D=0.5"
CCv=0.8
ACv=1.1
HCV 210
FC
ZI 220
HS 220
E
FIK 260
FROM PT–254
FIC 260
0–2500 SCFH
AT 300 PSIG
AND 200 DEGF
FIR 260
FY 260
TE 262A
TE 262B
TIR 262
UC 220
0–600
PSIG
PT 261
FV 260
FC
76.90
IN.H20
FT 260
d=0.25
D=0.5"
ZS 220
ZIR 220
CCv=0.284
ACv=0.530
HCV 220
FC
ZIR 219
ZI 219
ZS 219
FO 221
1500 SCFH
AT 200 DEGF
AND 300 PSIG
HCV 219
FO
1/4" SS TUBING 0.035" WALL THICKNESS, 24 FEET OF TUBING NEEDED AT 4 1/2" DIAMETER
D
UC 107
HS 107
ZI 107
ZS 107
ZIR 107
HCV 107
FO
WATER
SEPARATOR
0–400
PSIG
PI 472

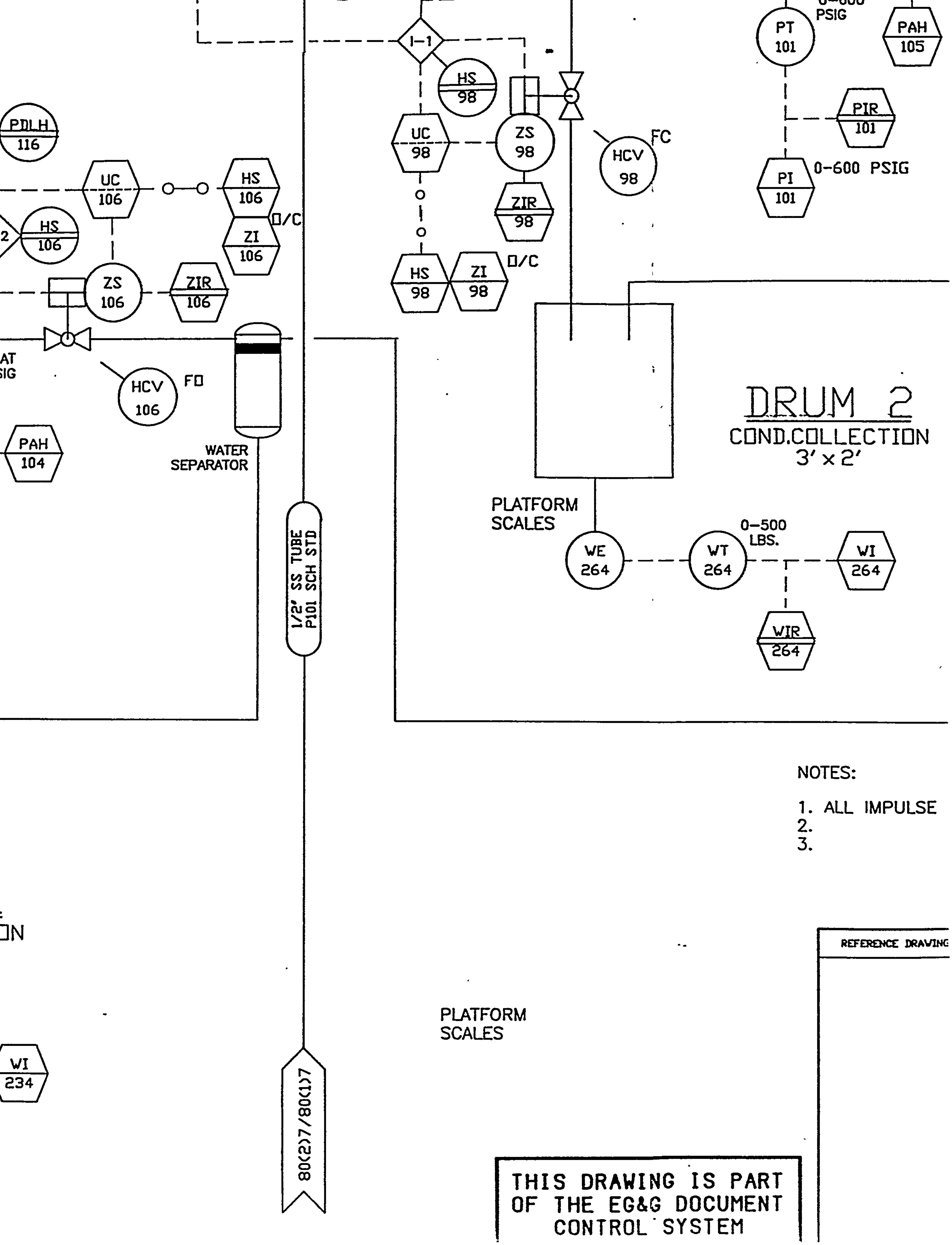


TO
F-100
OUTLET
80(6)27/80(3)27
?
?
ZI
352B
ZS
352B
?
FROM
CONT
MODE
80(5)28/80(6)28
1/2" SS TUBE
P9 SCH STD
FO
HCV
352B
?
ZI
351B
ZS
351B
FROM
BATCH
MODE
80(1)16/80(6)16
1/2" SS TUBE
P9A SCH STD
FO
HCV
351B

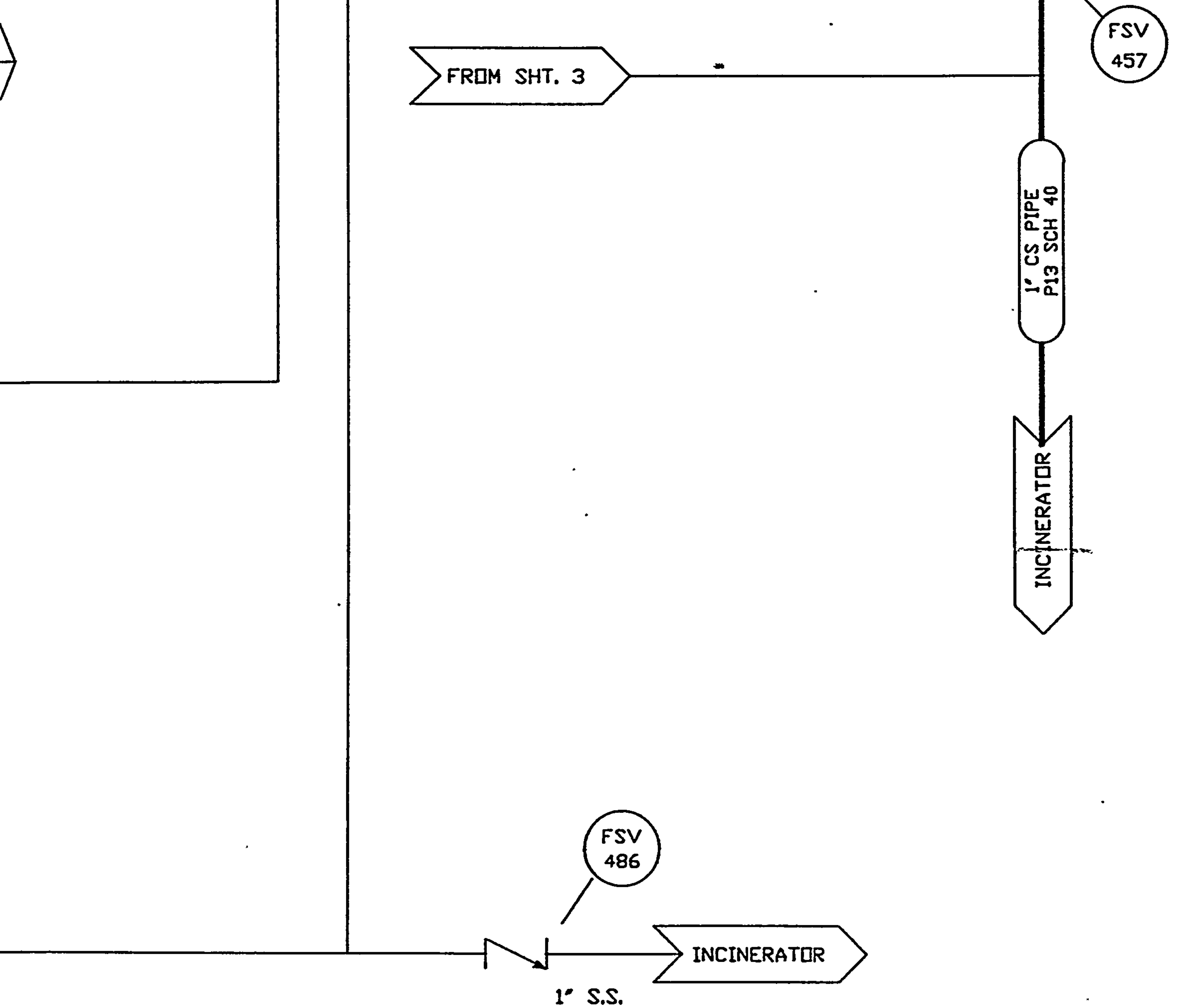

F-101
OUTLET FILTER
TI
342
TE
342A
TE
342B
TIR
342
TO GAS
SAMPLIN
SYSTEM
EXCH-1
EXCH-2
HV
111
PROCESS H2O
3/4" CS PIPE
P51 SCH 40
FSV
112
HV
113
HV
110
CITY H2O
3/4" CS PIPE
P53 SCH 40



95
95
ZIR 95
UC 95
ZS 95
HS 95
I-2
HCV 95
FC
PI
I-2
UC 108
HS 108
O/C
ZI 108
HS 108
I-2
ZS 108
ZIR 108
LOCKHOPPER 1
HCV 108
FC
PIR 102
I-2
HS 96
ZS 96
HCV 96
FC
UC 96
ZIR 96
O/C
HS 96
ZI 96
GAS
MPLING
STEM
CH-1 &
CH-2
80(6)15/80(4)15
HV 182
DRAIN
PLATFORM
SCALES
WE 234
WT 234
HV 115

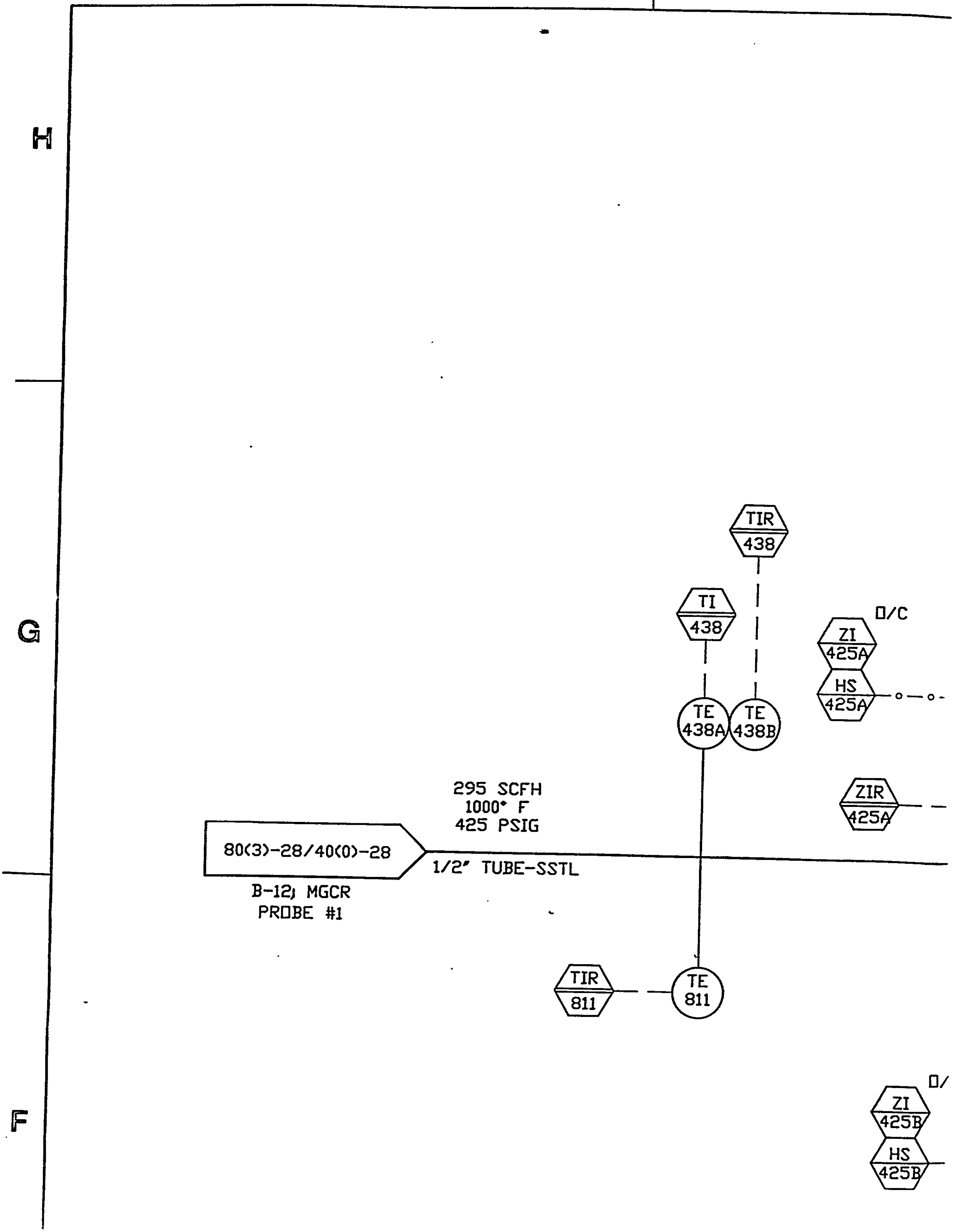


PSIG
PT 101
PAH 105
I-1
HS 98
PDLH 116
UC 98
ZS 98
FC
HCV 98
PIR 101
PI 101
0-600 PSIG
UC 106
HS 106
O/C
ZIR 98
HS 106
ZI 106
HS 98
ZI 98
O/C
ZS 106
ZIR 106
HCV 106
FO
PAH 104
WATER SEPARATOR
1/2" SS TUBE P101 SCH STD
DRUM 2
COND.COLLECTION
3' x 2'
PLATFORM SCALES
0-500 LBS.
WE 264
WT 264
WI 264
WIR 264
NOTES:
1. ALL IMPULSE
2.
3.
REFERENCE DRAWING
PLATFORM SCALES
WI 234
80(2)7/80(1)7
THIS DRAWING IS PART OF THE EG&G DOCUMENT CONTROL SYSTEM

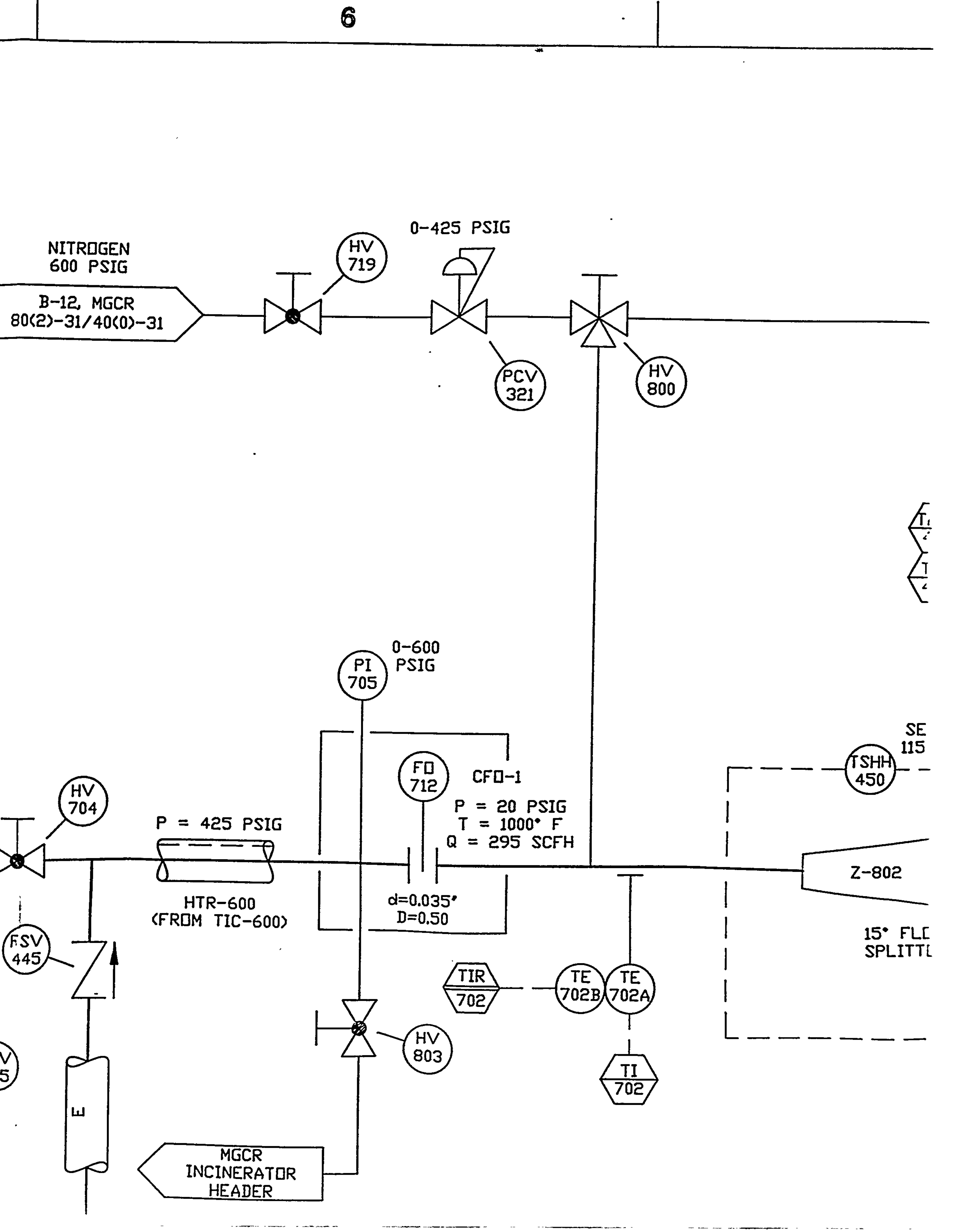


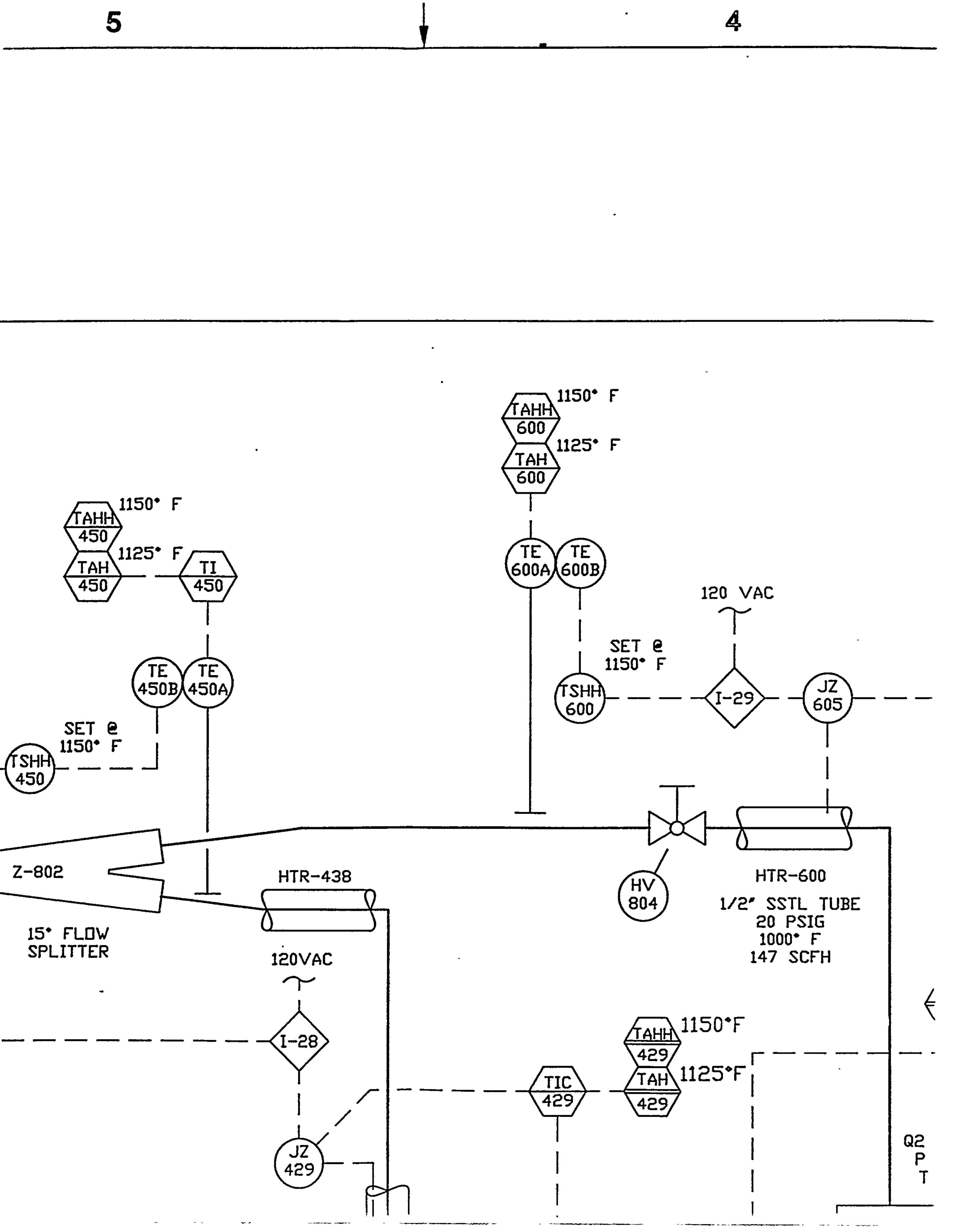

E LINES ARE 3/8"SS TUBING UNLESS OTHERWISE NOTED.

| | | | |
|---|---|---|---|
| VINGS | 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 John Rotunda WJA | DATE 10/28/93 | |
| | | DATE | SIZE E \| FSCM NO \| DWG NO STD920080.07 \| REV 7 |

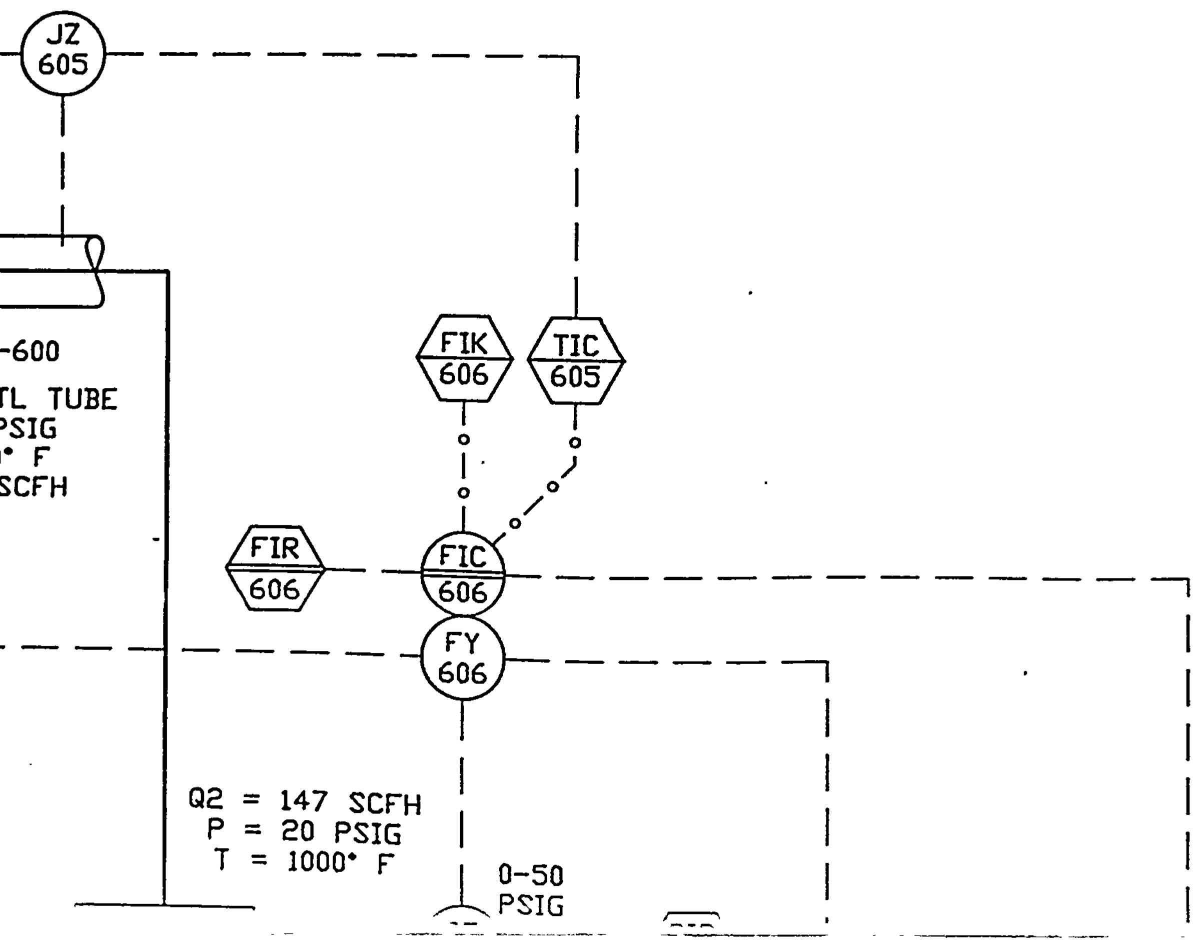


H
G
F
TIR
438
TI
438
O/C
ZI
425A
HS
425A
TE
438A
TE
438B
295 SCFH
1000° F
425 PSIG
ZIR
425A
80(3)-28/40(0)-28
1/2" TUBE-SSTL
B-12; MGCR
PROBE #1
TIR
811
TE
811
O/
ZI
425B
HS
425B


6
NITROGEN
600 PSIG
B-12, MGCR
80(2)-31/40(0)-31
HV
719
0-425 PSIG
PCV
321
HV
800
PI
705
0-600
PSIG
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
SE
115
TSHH
450
Z-802
15° FLC
SPLITTL
FSV
445
E
TIR
702
TE
702B
TE
702A
TI
702
HV
803
MGCR
INCINERATOR
HEADER

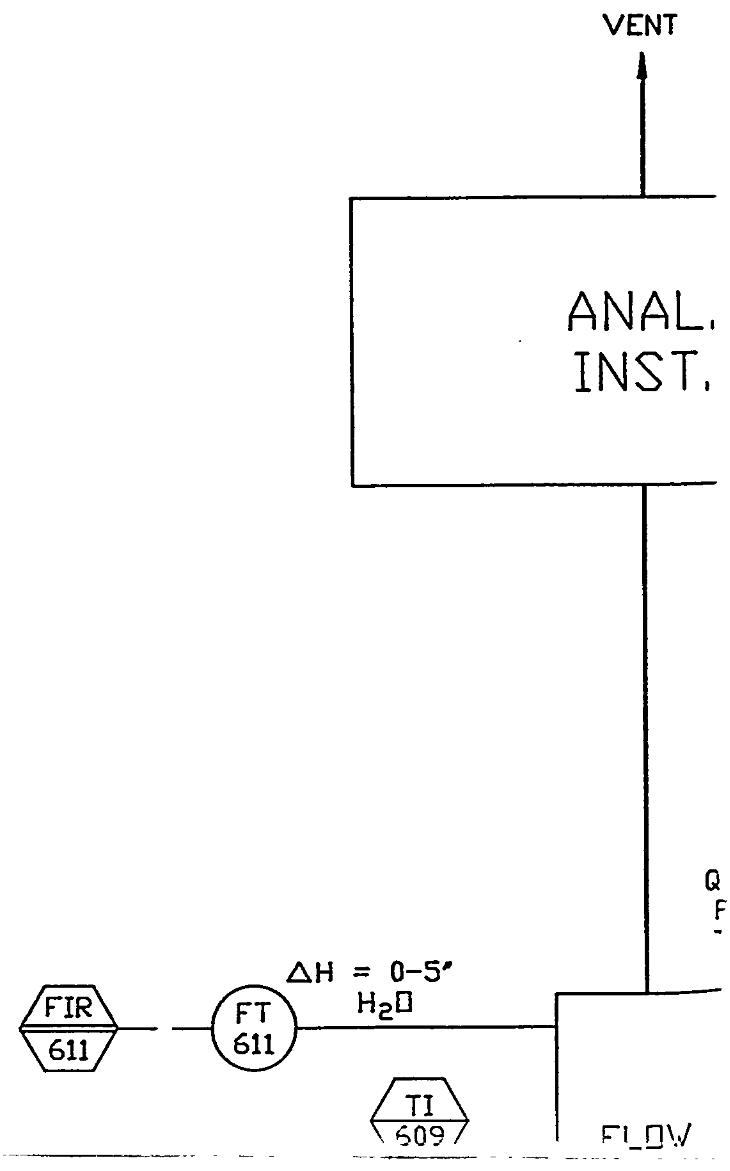


5
4
TAHH 600
1150° F
TAH 600
1125° F
TE 600A
TE 600B
120 VAC
SET @ 1150° F
TSHH 600
I-29
JZ 605
TAHH 450
1150° F
TAH 450
1125° F
TI 450
TE 450B
TE 450A
SET @ 1150° F
TSHH 450
Z-802
15° FLOW SPLITTER
HTR-438
HV 804
HTR-600
1/2" SSTL TUBE
20 PSIG
1000° F
147 SCFH
120VAC
I-28
TAHH 429
1150°F
TAH 429
1125°F
TIC 429
JZ 429
Q2
P
T


JZ
605
-600
TL TUBE
PSIG
° F
SCFH
FIK
606
TIC
605
FIR
606
FIC
606
FY
606
Q2 = 147 SCFH
P = 20 PSIG
T = 1000° F
0-50
PSIG

2

| REVISION | | | | | |
|---|---|---|---|---|---|
| ZONE | REV | DESCRIPTION | | | |
| GEN | 0 | ISSUED FOR CONSTRUCTION | | | |
| ZONE | REV | DESCRIPTION | | | |
| GEN. | 1 | MODIFIED AS PER MARKED PRINT: ISSUED FOR CONSTRUCTION | | | |
| DRAFTER GARY J. KULCHOCK | DATE 6/30/94 | CHECKER S. CONKO | DATE 6/30/94 | DESIGNER C. ELAINE | |
| ES&H J.L. BUCKLEW | DATE 6/30/94 | DOE (EOSD) EDWIN GALLOWAY | DATE 6/30/94 | ROBERT R[illegible] | |
| ZONE | REV | DESCRIPTION | | | |
| GEN. | 2 | MODIFIED AS PER MARKED PRINT: ISSUED FOR CONSTRUCTION | | | |
| DRAFTER [illegible] | DATE 8/15/95 | CHECKER S. Conko | DATE 8-15-95 | DESIGNER [illegible] | |
| ES&H [illegible] | DATE 9/8/95 | DOE (EOSD) [illegible] | DATE 9/8/95 | | |



2 1

## REVISION

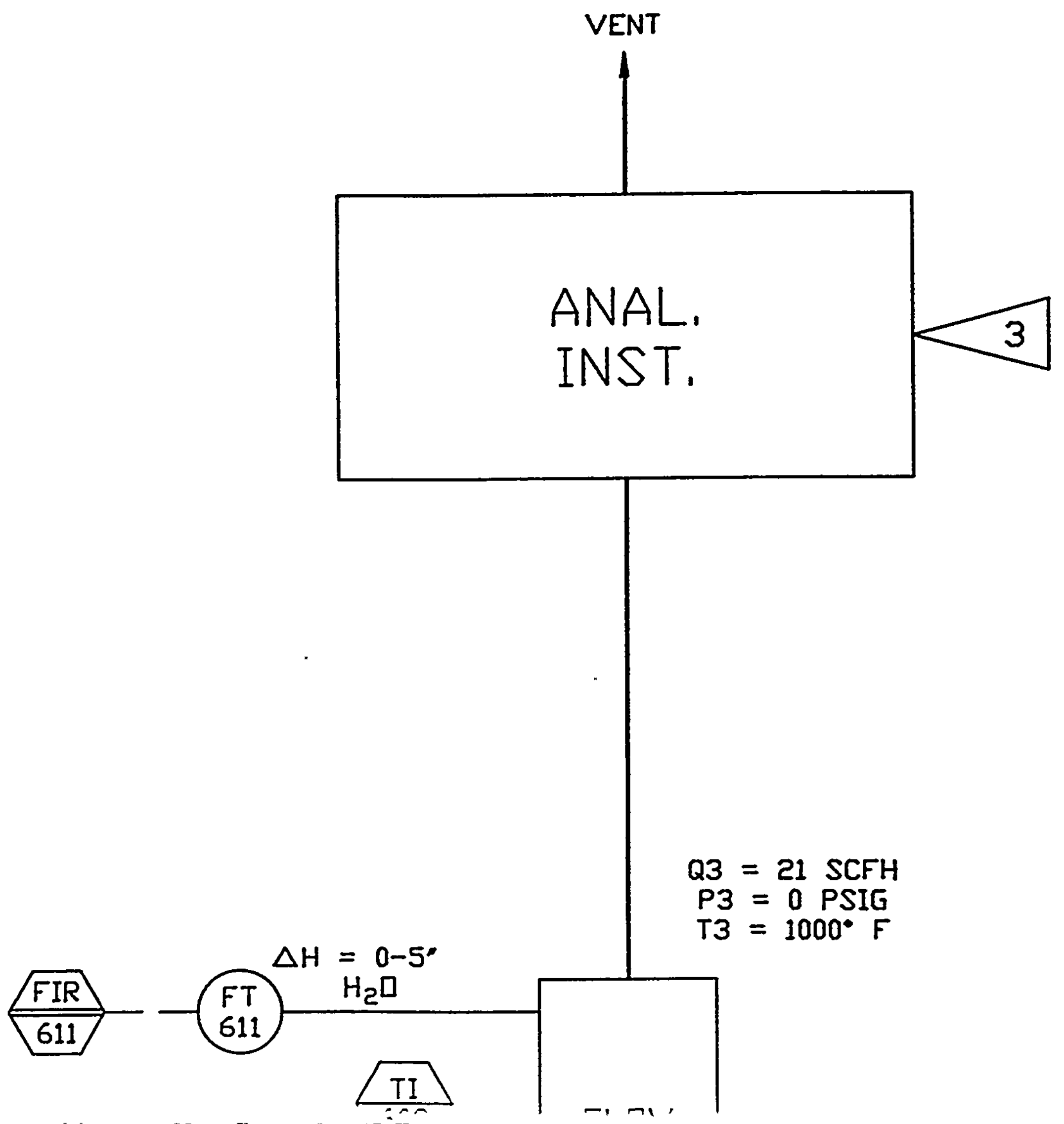
| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 0 | ISSUED FOR CONSTRUCTION | 5/25/94 |
| ZONE | REV | DESCRIPTION | DATE |
| GEN. | 1 | MODIFIED AS PER MARKED PRINT. ISSUED FOR CONSTRUCTION | 6/24/94 |

| 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 | | |
| 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 |

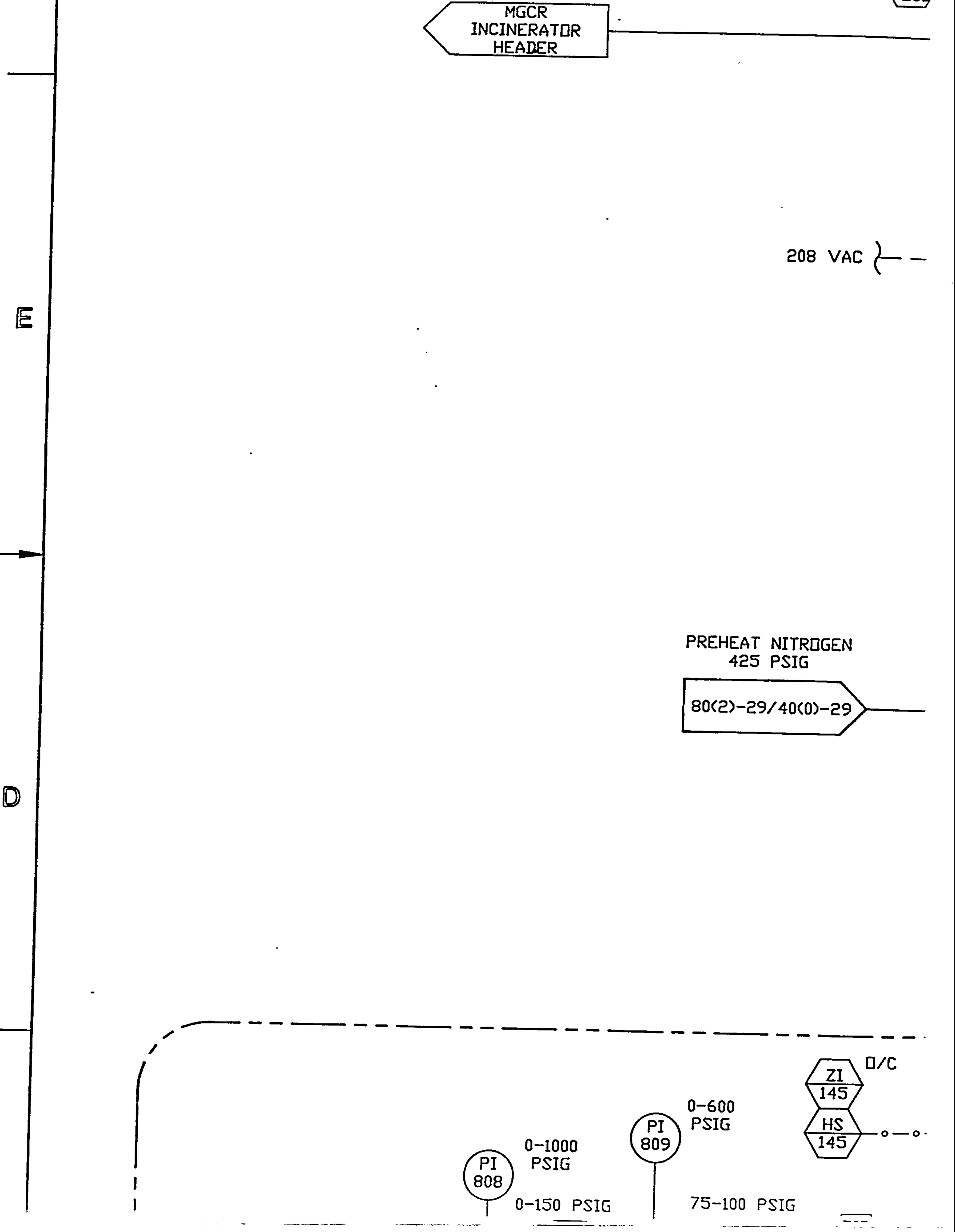
| AFTER | DATE | CHECKER | DATE | DESIGNER | DATE | RESPONSIBLE PERSON | DATE |
|---|---|---|---|---|---|---|---|
| [illegible signature] | 8/15/95 | S. Conko | 8-15-95 | [illegible signature] | 8/30/95 | [illegible signature] | 9/1/95 |
| [illegible signature] | 9/8/95 | DOE (EOSD) [illegible signature] | 9/3/95 | | DATE | | DATE |

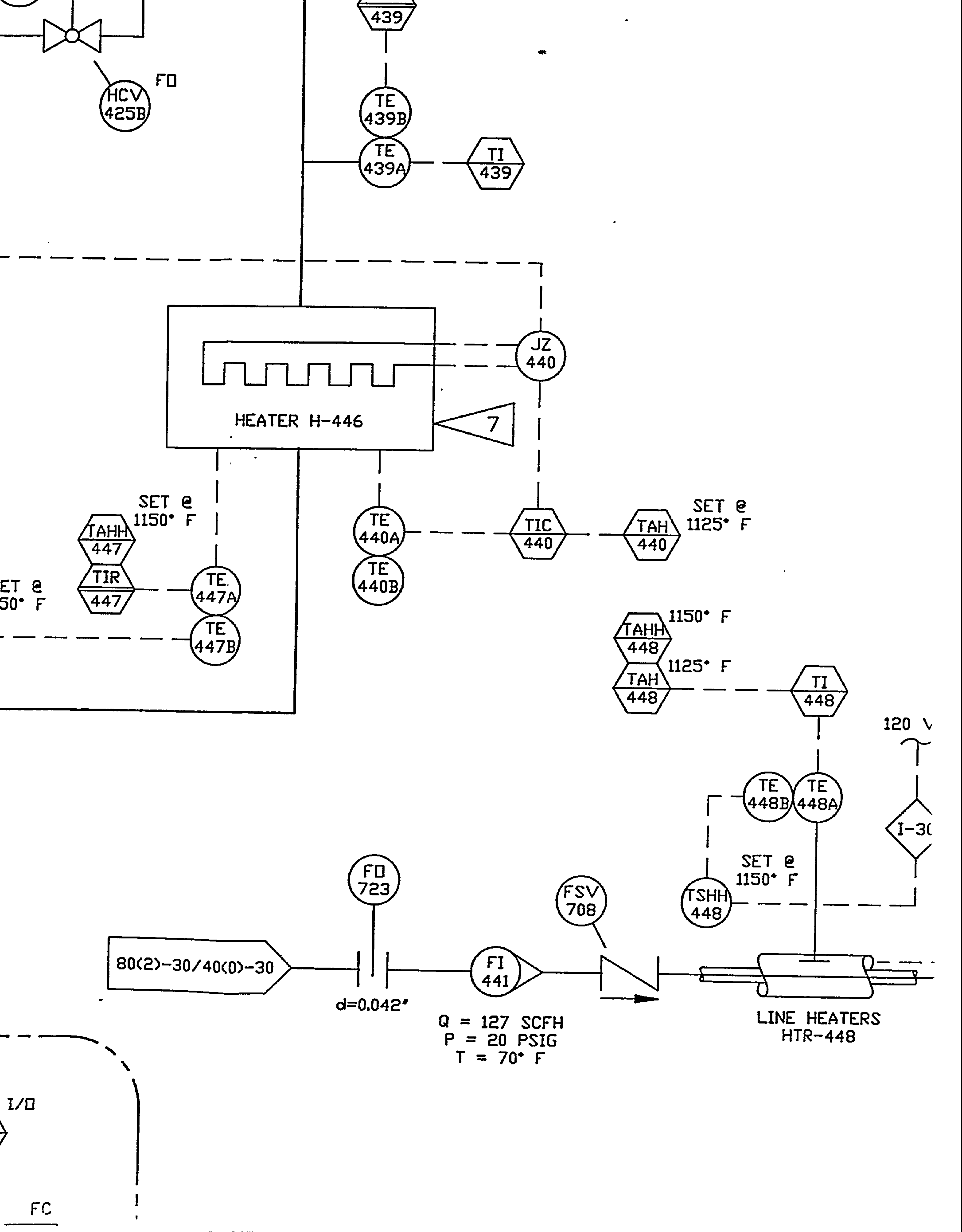
H

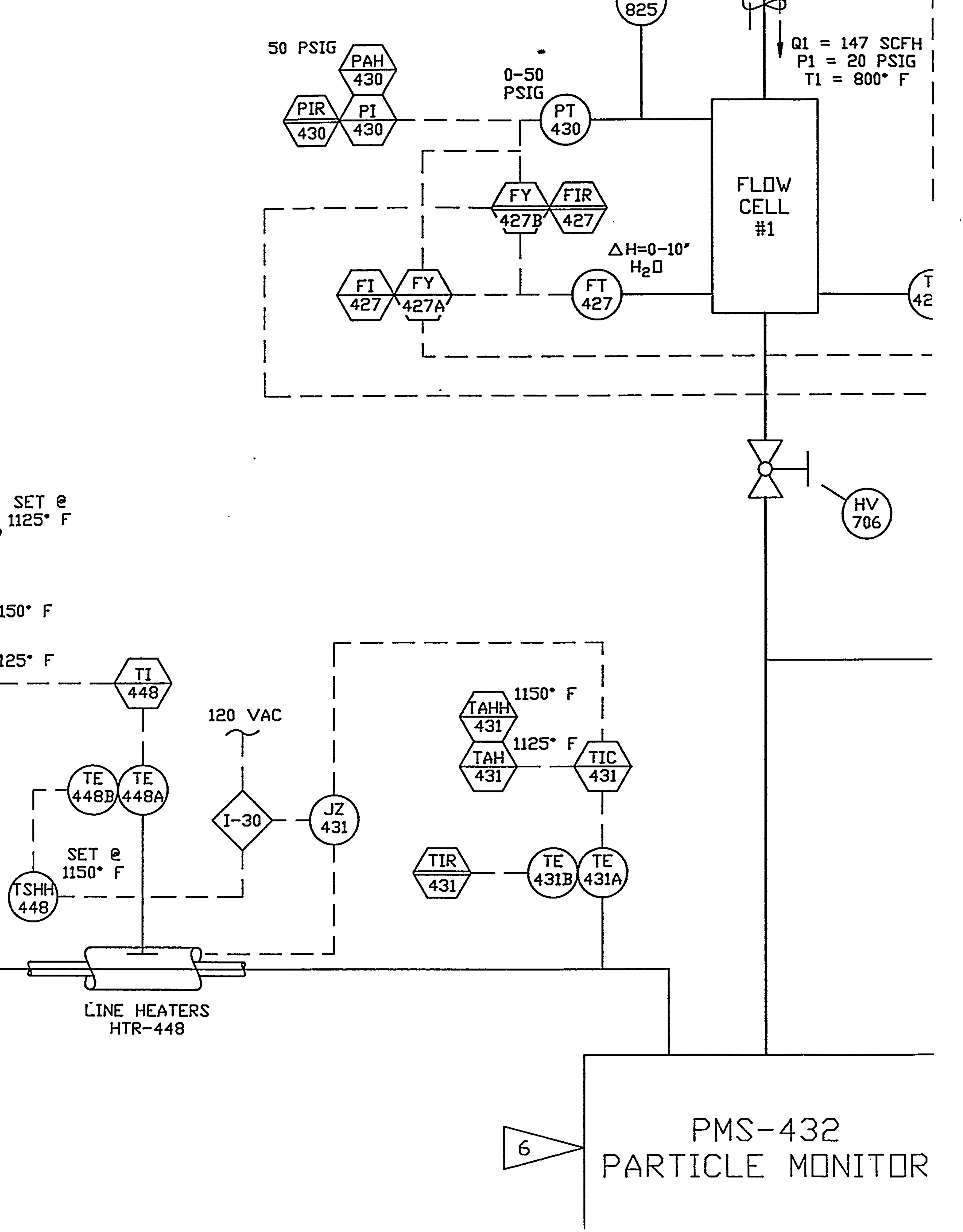



G

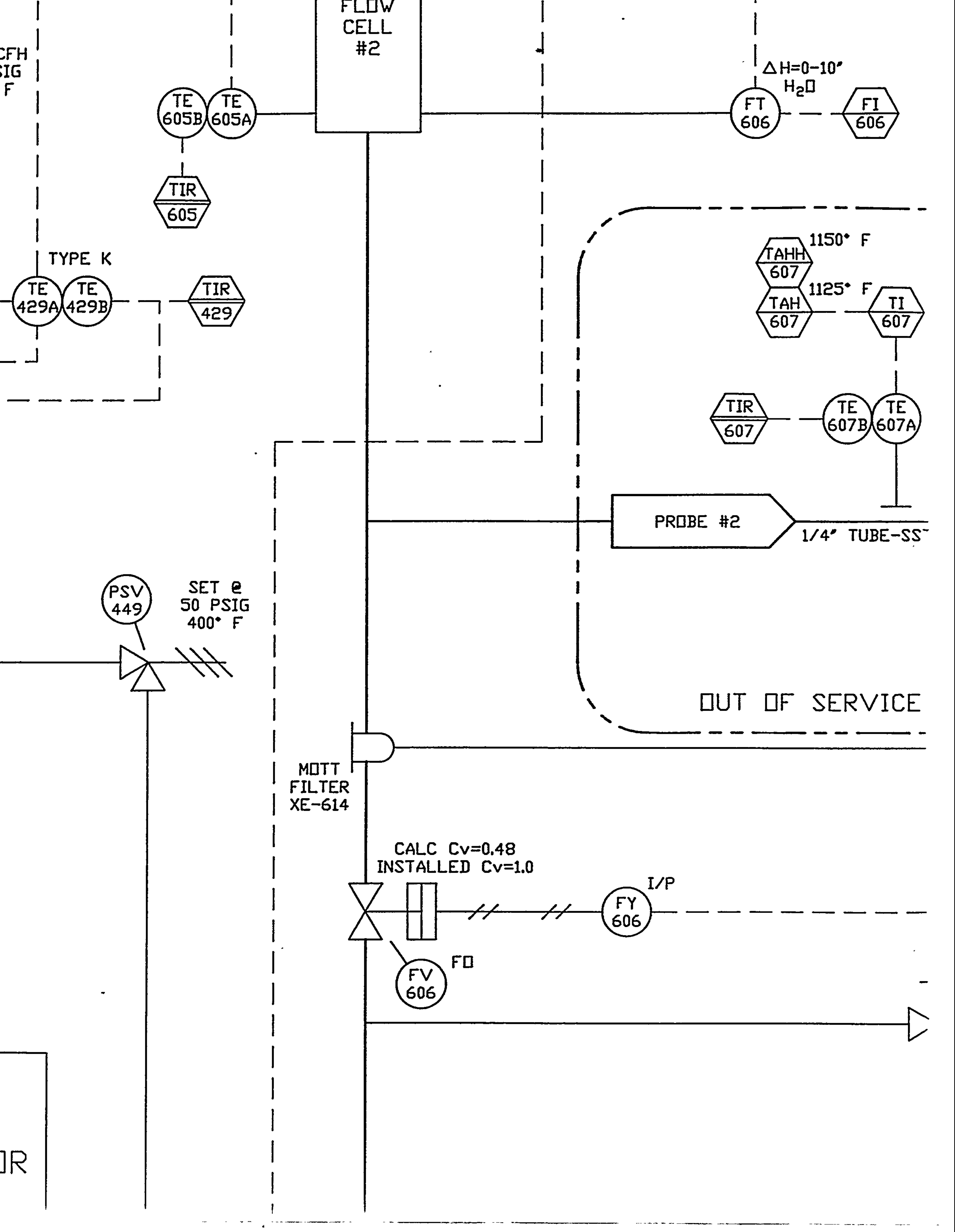
F


MGCR
INCINERATOR
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

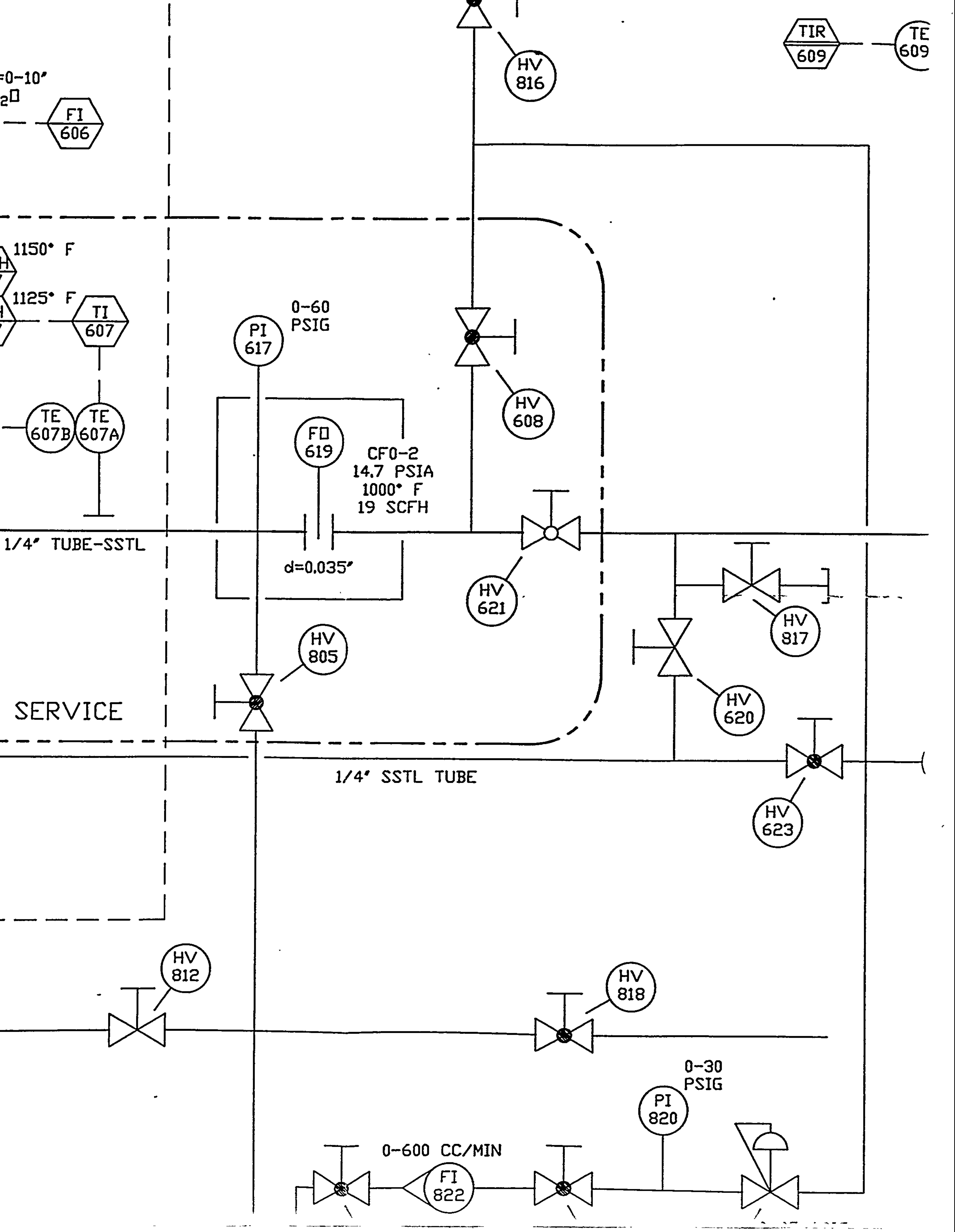

439
HCV 425B
FO
TE 439B
TE 439A
TI 439
JZ 440
HEATER H-446
7
SET @ 1150° F
TAHH 447
TIR 447
TE 447A
TE 447B
ET @
50° F
TE 440A
TE 440B
TIC 440
TAH 440
SET @ 1125° F
TAHH 448
1150° F
TAH 448
1125° F
TI 448
120 V
TE 448B
TE 448A
I-30
SET @ 1150° F
TSHH 448
FO 723
FSV 708
80(2)-30/40(0)-30
FI 441
d=0.042"
Q = 127 SCFH
P = 20 PSIG
T = 70° F
LINE HEATERS
HTR-448
I/O
FC



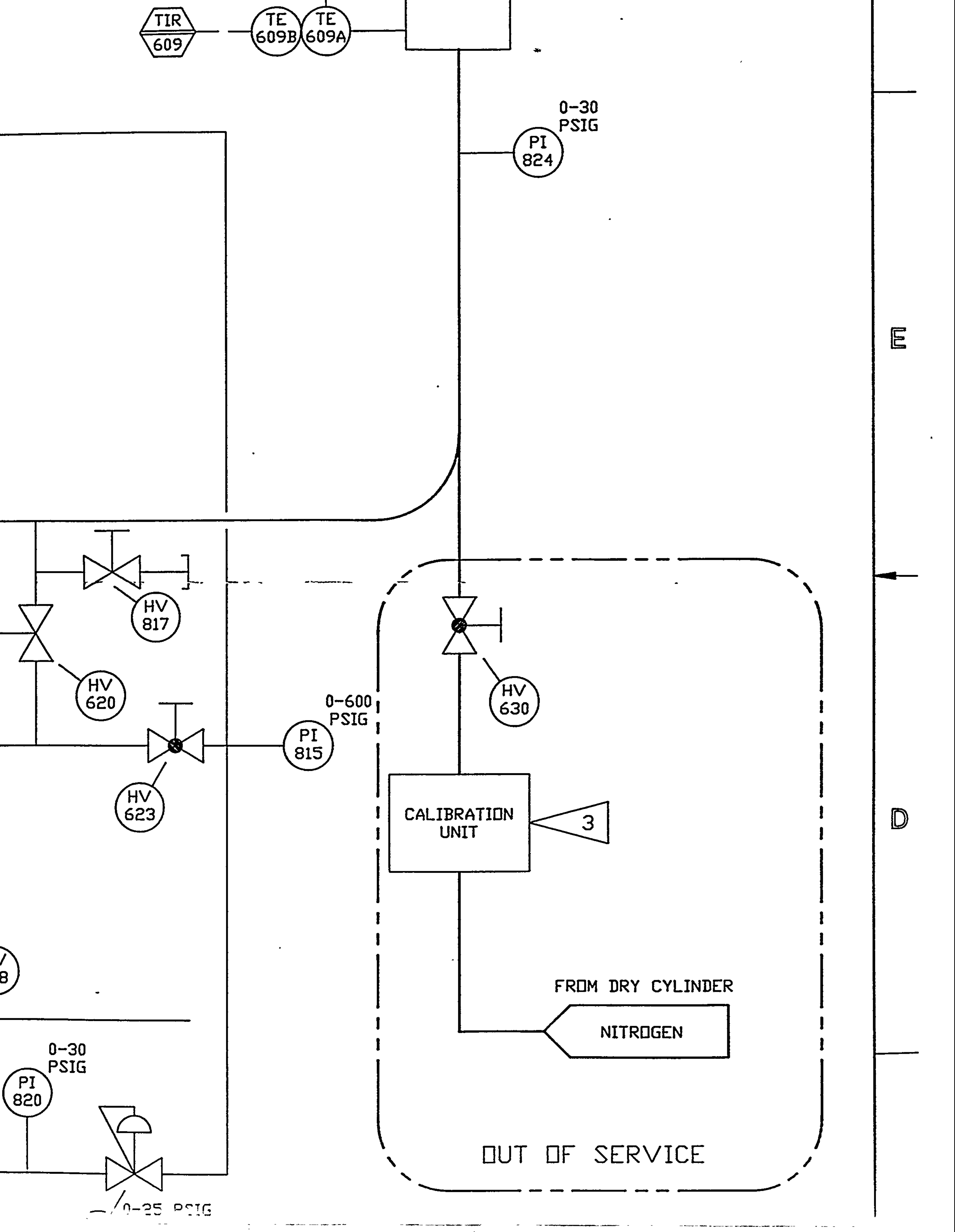
825
50 PSIG
PAH 430
PIR 430
PI 430
0-50 PSIG
PT 430
Q1 = 147 SCFH
P1 = 20 PSIG
T1 = 800° F
FLOW CELL #1
FY 427B
FIR 427
ΔH=0-10" H2O
FI 427
FY 427A
FT 427
HV 706
SET @ 1125° F
150° F
125° F
TI 448
120 VAC
TAHH 431
1150° F
TAH 431
1125° F
TIC 431
TE 448B
TE 448A
I-30
JZ 431
SET @ 1150° F
TSHH 448
TIR 431
TE 431B
TE 431A
LINE HEATERS HTR-448
6
PMS-432 PARTICLE MONITOR



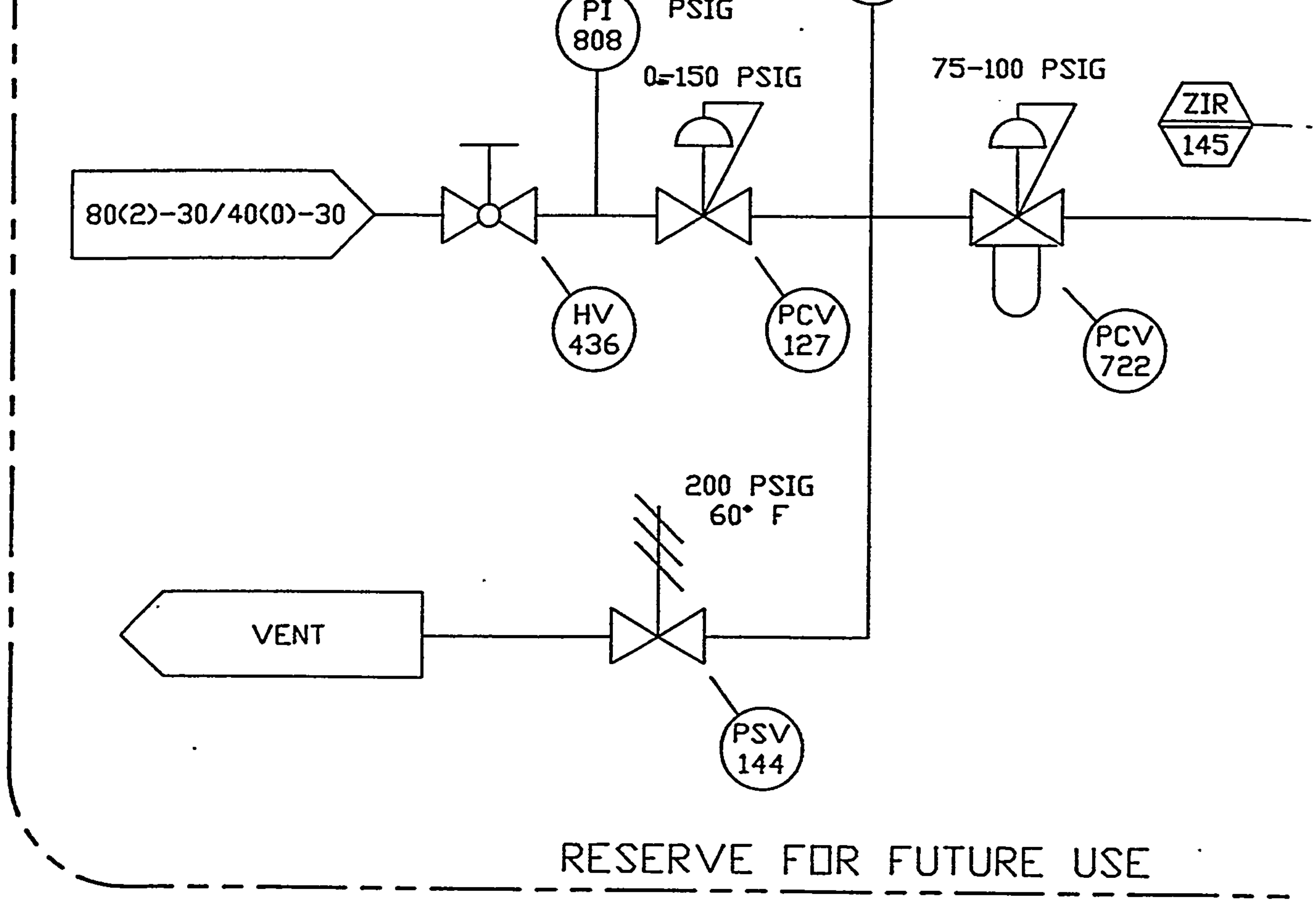
FLOW CELL #2
CFH
SIG
F
TE 605B
TE 605A
TIR 605
ΔH=0-10" H2O
FT 606
FI 606
TYPE K
TE 429A
TE 429B
TIR 429
TAHH 607
1150° F
TAH 607
1125° F
TI 607
TIR 607
TE 607B
TE 607A
PROBE #2
1/4" TUBE-SS
PSV 449
SET @ 50 PSIG 400° F
OUT OF SERVICE
MOTT FILTER XE-614
CALC Cv=0.48
INSTALLED Cv=1.0
I/P
FY 606
FV 606
FO
OR



=0-10"
FI 606
HV 816
TIR 609
TE 609
1150° F
1125° F
TI 607
TE 607B
TE 607A
0-60 PSIG
PI 617
FO 619
CFO-2
14.7 PSIA
1000° F
19 SCFH
HV 608
HV 621
d=0.035"
1/4" TUBE-SSTL
HV 805
HV 817
HV 620
SERVICE
1/4" SSTL TUBE
HV 623
HV 812
HV 818
0-30 PSIG
PI 820
0-600 CC/MIN
FI 822



TIR
609
TE
609B
TE
609A
0-30
PSIG
PI
824
E
HV
817
HV
620
HV
630
0-600
PSIG
PI
815
HV
623
CALIBRATION
UNIT
3
D
FROM DRY CYLINDER
NITROGEN
0-30
PSIG
PI
820
0-25 PSIG
OUT OF SERVICE




## NOTES:

(1) "NOTE REMOVED"

(2) "NOTE REMOVED"

3 SUPPLIED BY AMES

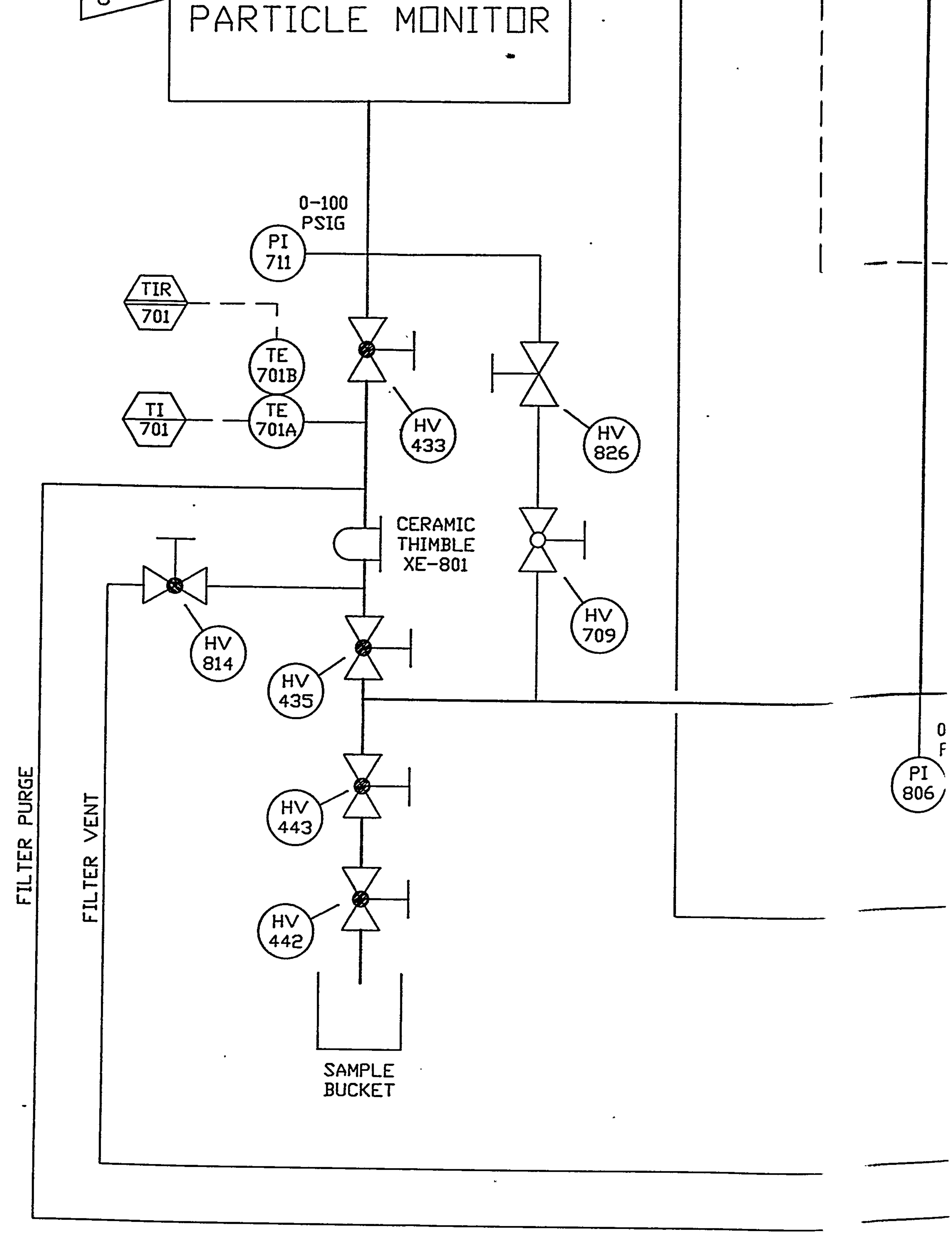
(4) PREV. TAG # BLOCK RANGE ALLOCATED FOR THIS P&ID:
425-450, 600-650, 701-725
CURRENT BLOCK RANGE 800-850

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

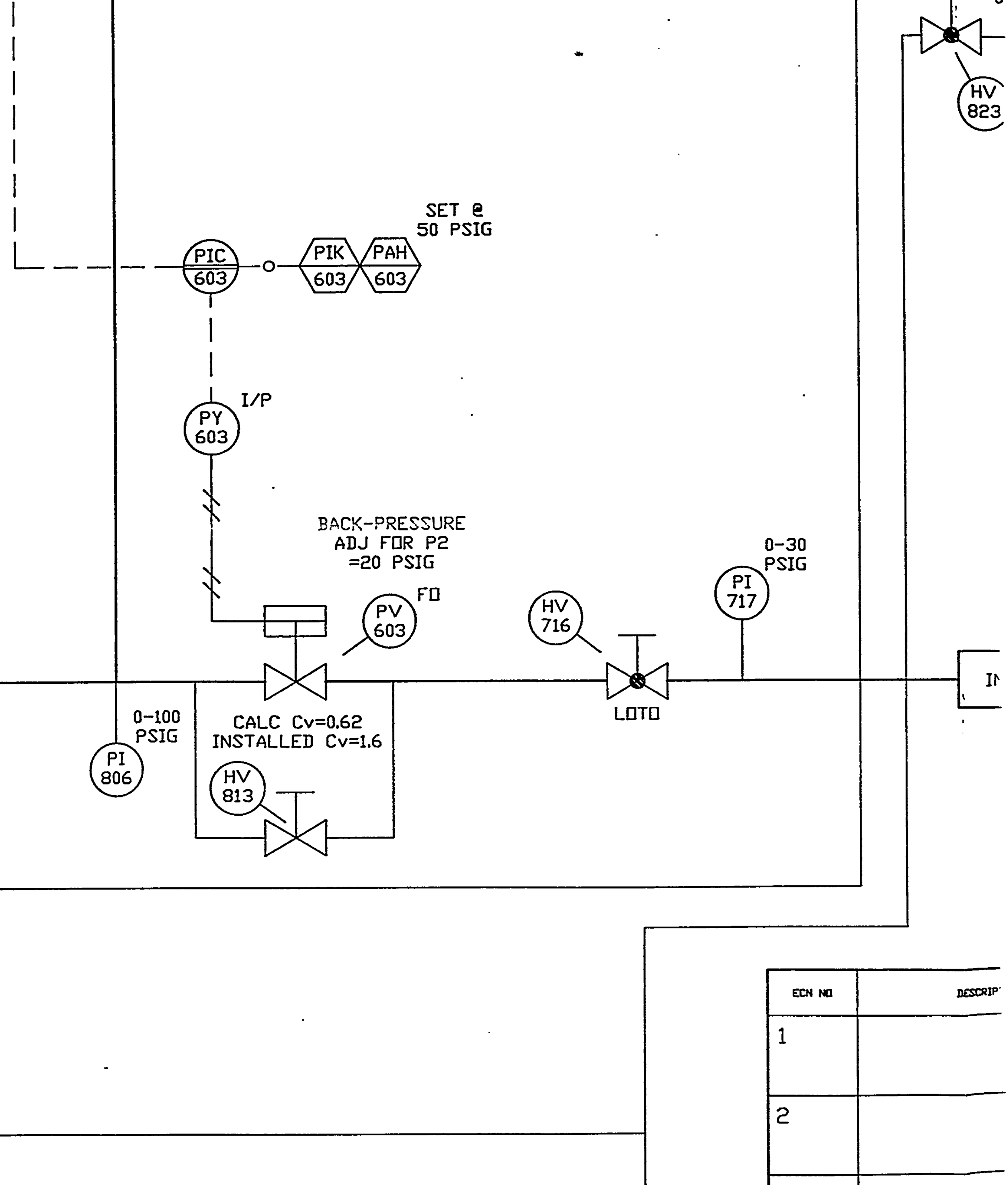
6 COMMERCIALLY PURCHASED UNIT: MODEL No. PMS CSASP H

7 COMMERCIALLY PURCHASED UNIT: MODEL LINDBERG; TYPE

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



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
FILTER PURGE
FILTER VENT
PI
806

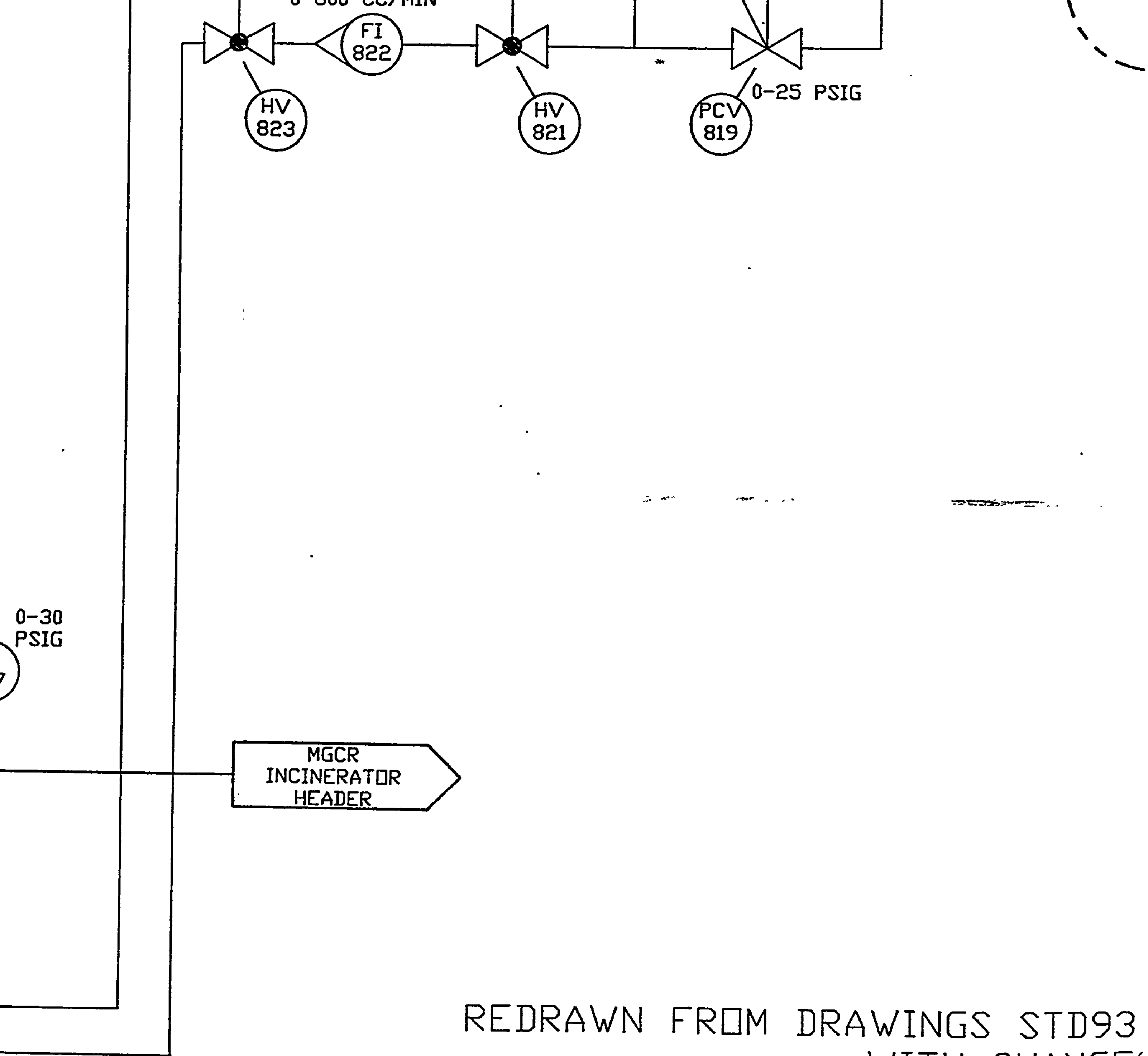



| ECN NO | DESCRIP |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |

-RELEASED-

ISSUE DATE: 9/25/95

-FOR CONSTRUCTION-




REDRAWN FROM DRAWINGS STD93
WITH CHANGE

| ECN NO | DESCRIPTION | REFERENCE DRAWINGS | | DATE |
|---|---|---|---|---|
| 1 | | | DRAFTER<br>Gary Kulchock | 5/26/94 |
| | | | CHECKER<br>S. Conko | 5/26/94 |
| 2 | | | DESIGNER<br>Dave Lunifeld | 5/26/94 |
| | | | RESPONSIBLE PERSON<br>-NA- | -NA- |
| 3 | | | ES&H<br>W. E. Lowry | 5/31/94 |
| | | | DOE (EOSD) | |
| 4 | | | Wm. P. Chisholm | 5/31/94 |
| | | | | DATE |

MO

TITLE:
MGC
SYSTEM

SIZE: E
FSCM NO


C

| DWG NO | SH |
|---|---|
| E940040 | 1 |

...WN FROM DRAWINGS STD930075 AND STD930008
WITH CHANGES

| | |
|---|---|
| DRAFTER: Gary Kulchock | DATE: 5/26/94 |
| CHECKER: S. Conko | DATE: 5/26/94 |
| DESIGNER: Dave Lunifeld | DATE: 5/26/94 |
| RESPONSIBLE PERSON: -NA- | DATE: -NA- |
| ES&H: W. E. Lowry | DATE: 5/31/94 |
| DOE (EOSD) | DATE |
| Wm. P. Chisholm | DATE: 5/31/94 |
| | DATE |

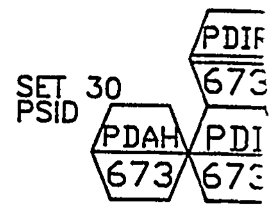
United States Department of Energy
**MORGANTOWN ENERGY TECHNOLOGY CENTER**
Morgantown, WV

TITLE:
BUILDING 12
MGCR PARTICLE MEASURING
SYSTEM AND ALKALI MONITOR LOOP
P&ID

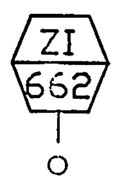
| SIZE | FSCM NO | DWG NO | REV |
|---|---|---|---|
| E | | E940040 | 2 |

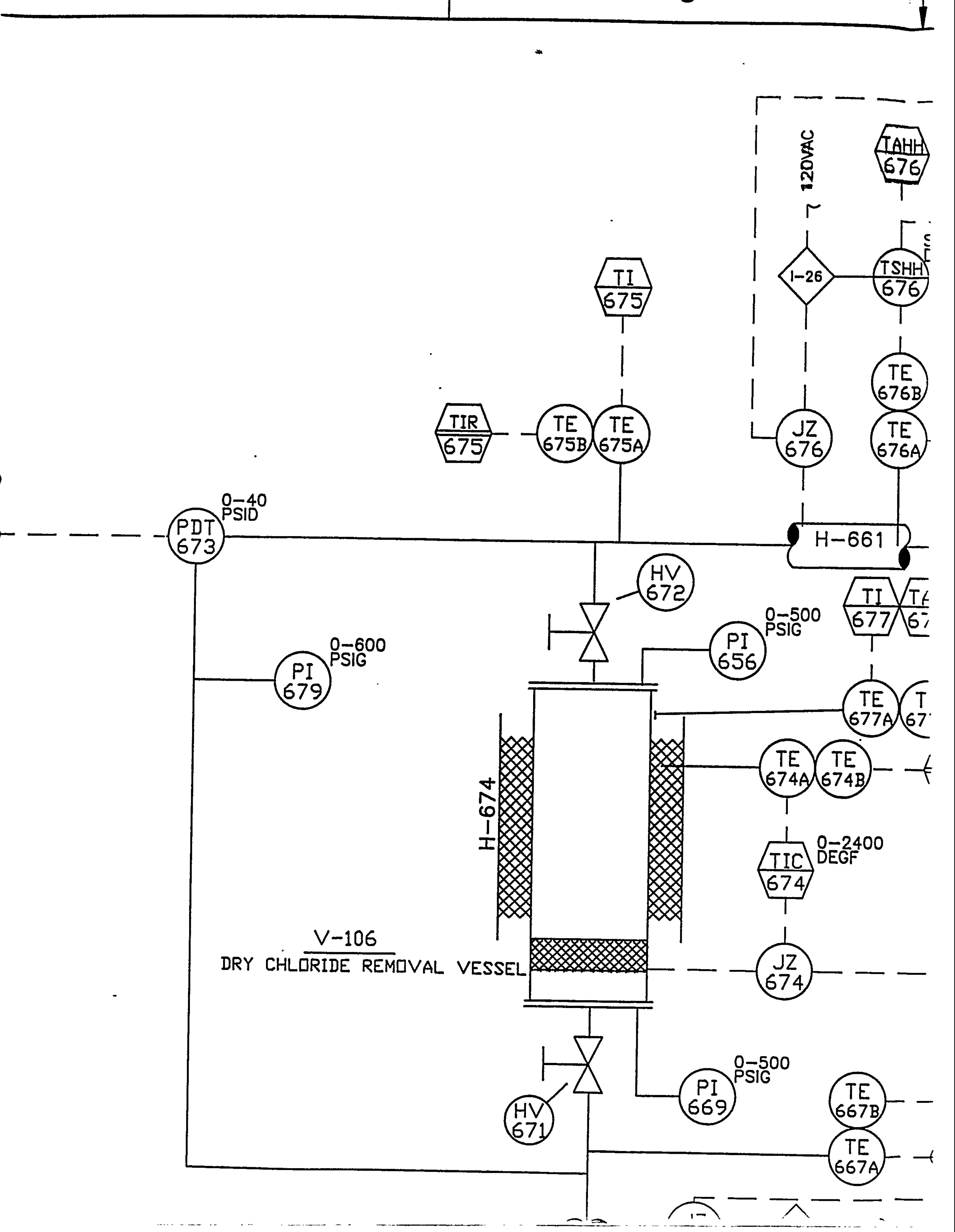
A

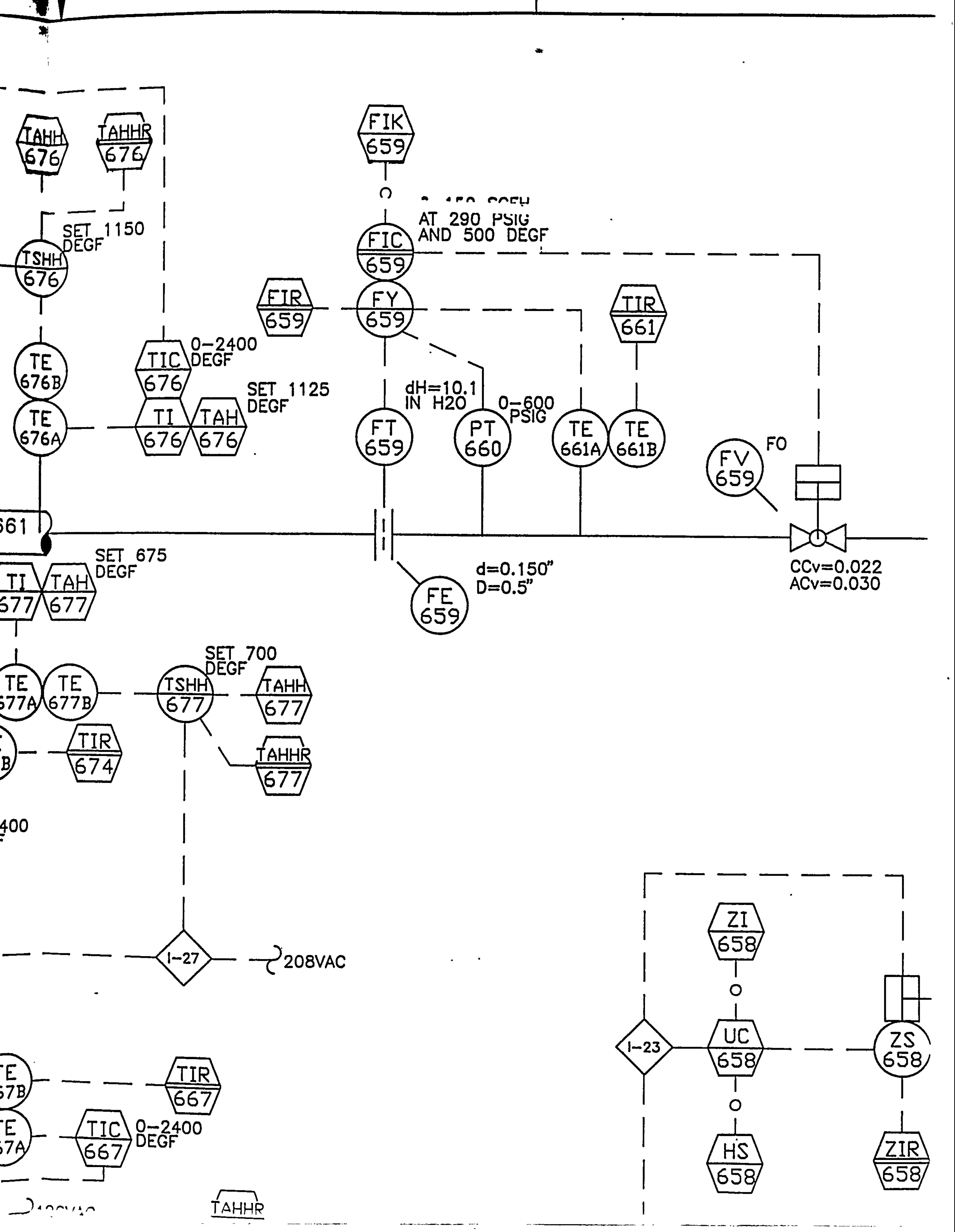
D




C




120VAC
TAHH 676
I-26
TSHH 676
TI 675
TE 676B
TIR 675
TE 675B
TE 675A
JZ 676
TE 676A
0-40 PSID
PDT 673
H-661
HV 672
TI 677
0-500 PSIG
PI 656
0-600 PSIG
PI 679
TE 677A
TE 674A
TE 674B
H-674
0-2400 DEGF
TIC 674
V-106
DRY CHLORIDE REMOVAL VESSEL
JZ 674
0-500 PSIG
PI 669
TE 667B
HV 671
TE 667A



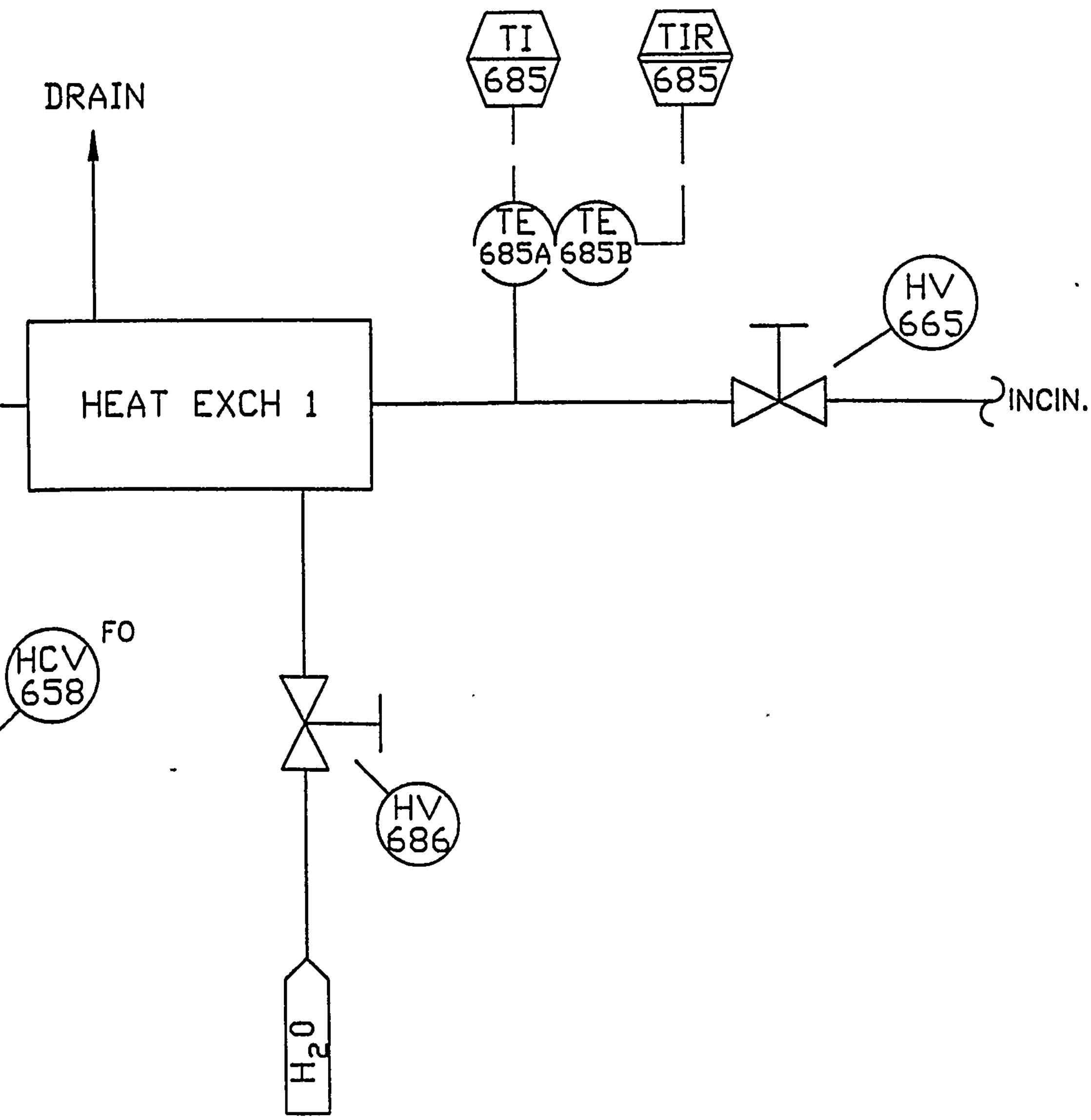
TAHH 676
TAHHR 676
SET 1150 DEGF
TSHH 676
TE 676B
TE 676A
TIC 676
0–2400 DEGF
TI 676
TAH 676
SET 1125 DEGF
FIK 659
AT 290 PSIG
AND 500 DEGF
FIC 659
FIR 659
FY 659
TIR 661
FT 659
dH=10.1 IN H2O
PT 660
0–600 PSIG
TE 661A
TE 661B
FV 659
FO
FE 659
d=0.150"
D=0.5"
CCv=0.022
ACv=0.030
SET 675 DEGF
TI 677
TAH 677
SET 700 DEGF
TE 677A
TE 677B
TSHH 677
TAHH 677
TIR 674
TAHHR 677
I–27
208VAC
TIR 667
TIC 667
0–2400 DEGF
TAHHR
ZI 658
I–23
UC 658
ZS 658
HS 658
ZIR 658

STD940001.02 | 2

| REVISION | | |
|---|---|---|
| REV | DESCRIPTION | DATE |
| 1 | MODIFIED AS PER MARKED PRINT, ISSUED FOR CONSTRUCTION | 9/12/94 |
| REV | DESCRIPTION | DATE |
| 2 | MODIFIED AS PER MARKED PRINT, ISSUED FOR CONSTRUCTION | 9/30/94 |

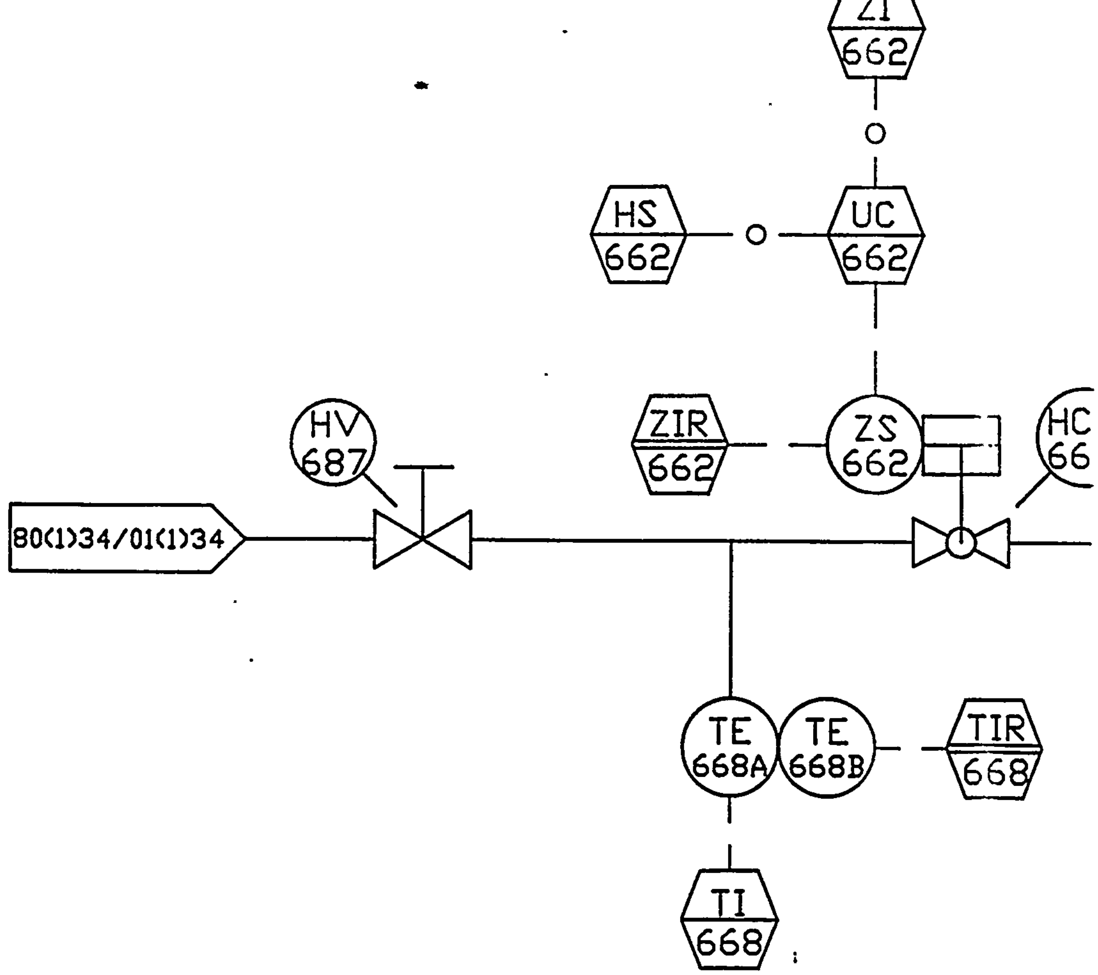
| | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| | 10·3·94 | | 10/3/94 | | 10/3/94 | | |
| | DATE | PROJECT ENGR. | DATE | BRANCH MANAGER | DATE | DOE (EOSD) | DATE |
| | 10/12/94 | | 10/3/94 | | | | 10/3/94 |

D



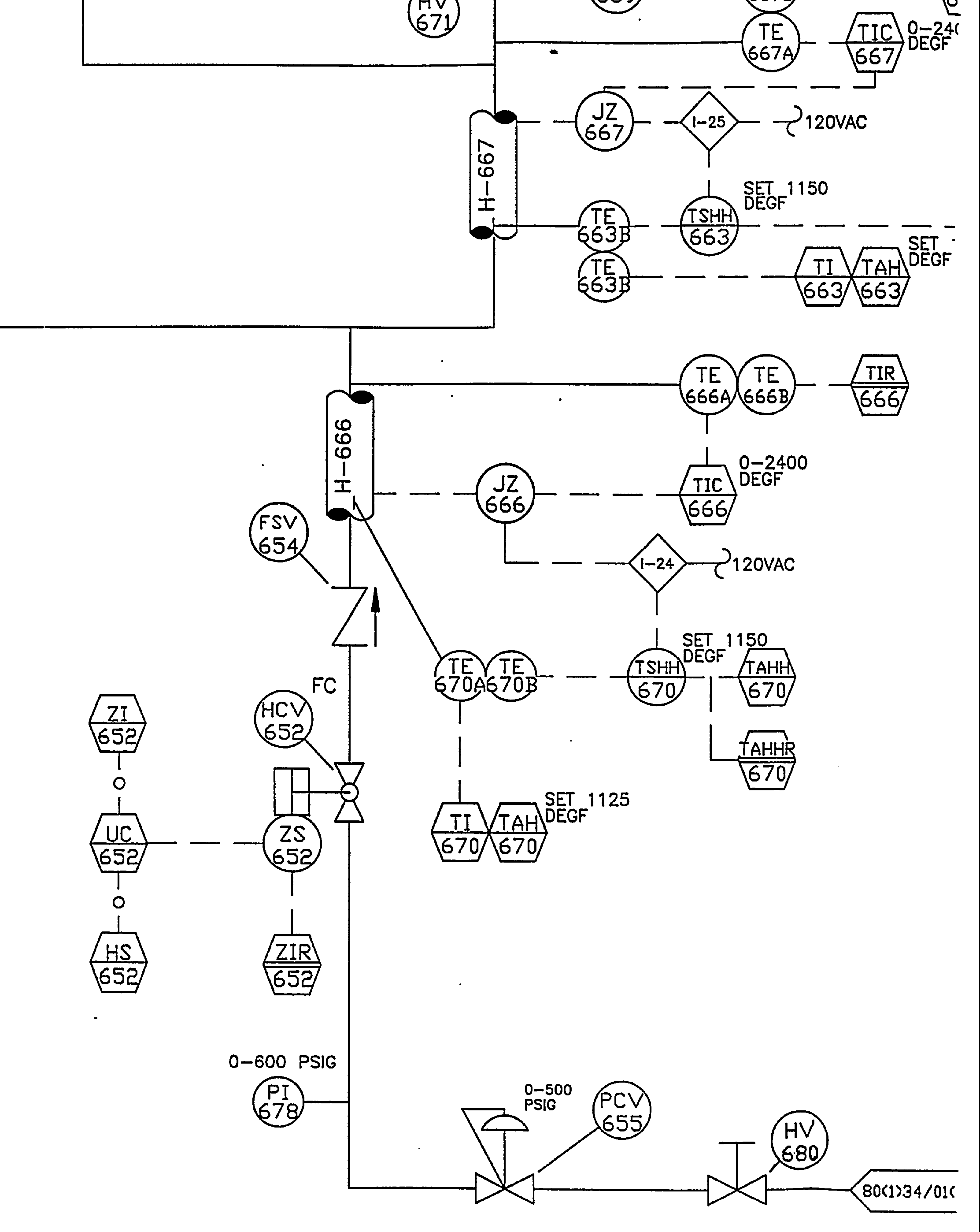

C

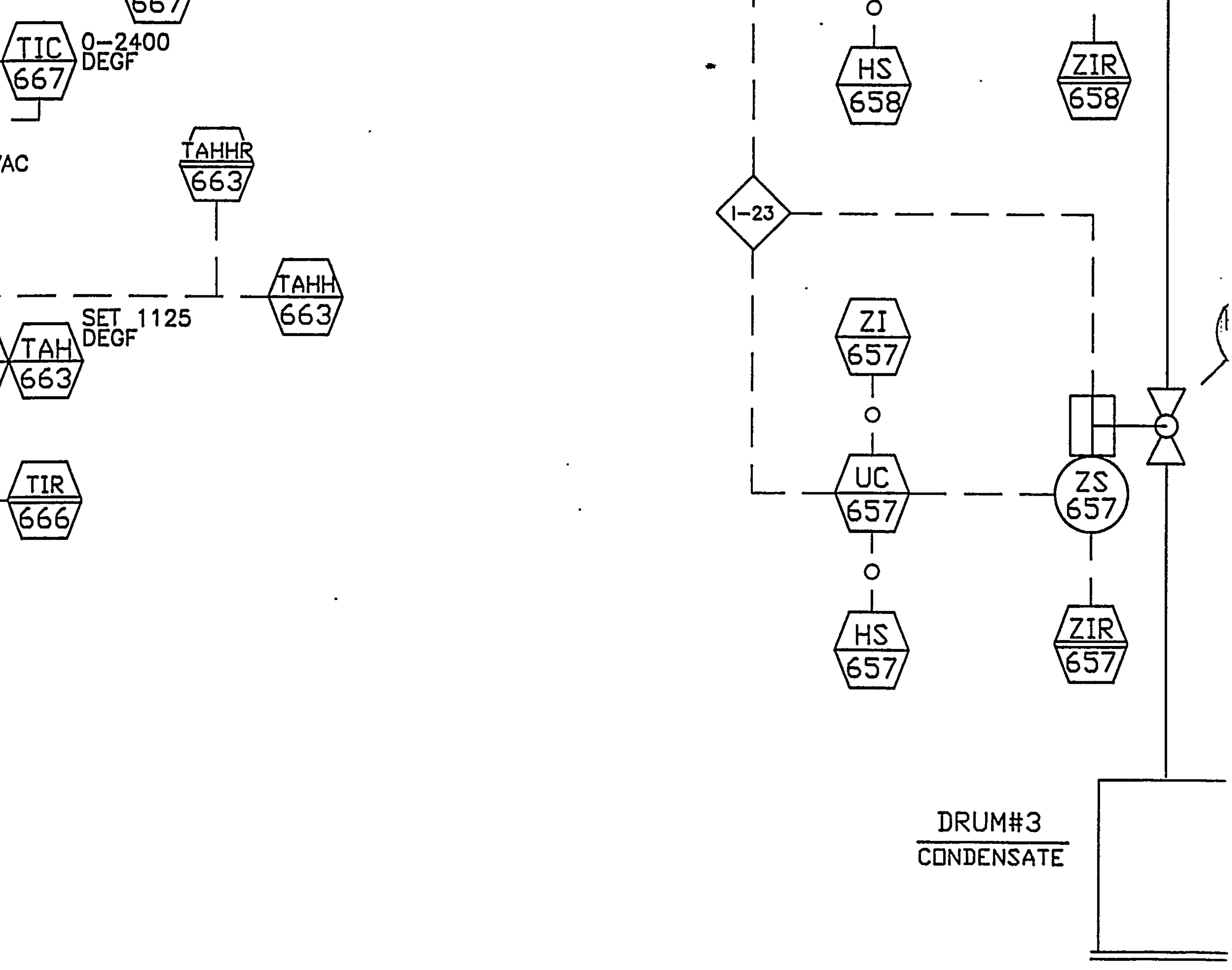
B



ZI
662
HS
662
UC
662
ZIR
662
ZS
662
HC
66
HV
687
80(1)34/01(1)34
TE
668A
TE
668B
TIR
668
TI
668


A

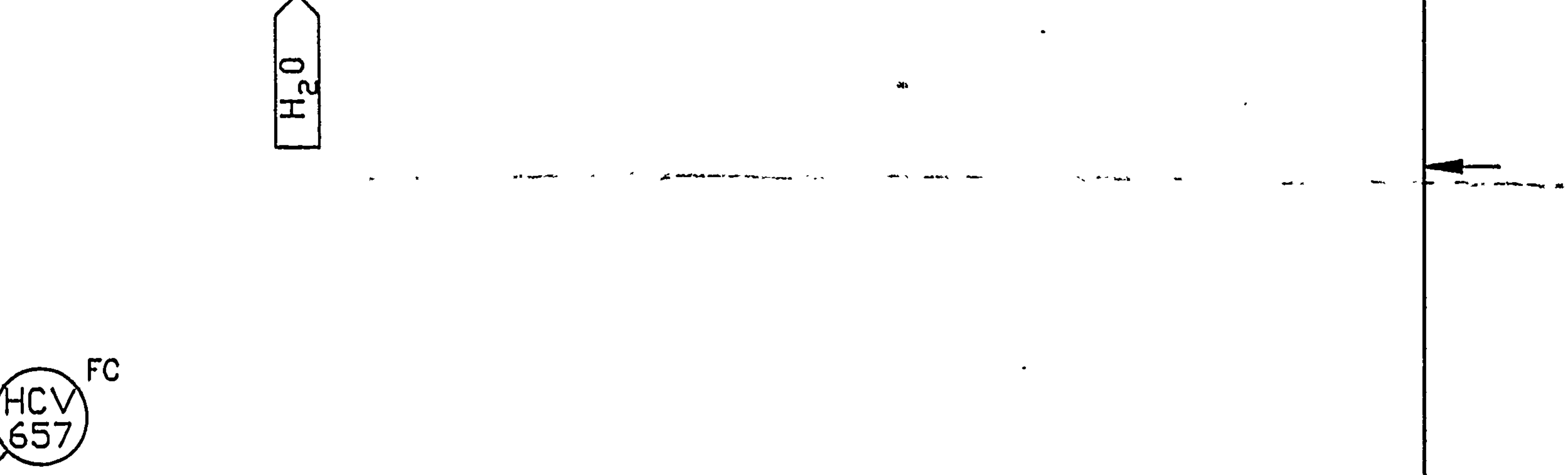

HV 671
TE 667A
TIC 667
0-24
DEGF
JZ 667
I-25
120VAC
H-667
SET 1150
DEGF
TE 663B
TSHH 663
TE 663B
TI 663
TAH 663
SET
DEGF
TE 666A
TE 666B
TIR 666
H-666
0-2400
DEGF
JZ 666
TIC 666
FSV 654
I-24
120VAC
SET 1150
DEGF
TE 670A
TE 670B
TSHH 670
TAHH 670
FC
ZI 652
HCV 652
TAHHR 670
UC 652
ZS 652
TI 670
TAH 670
SET 1125
DEGF
HS 652
ZIR 652
0-600 PSIG
PI 678
0-500
PSIG
PCV 655
HV 680
80(1)34/01




80(1)34/01(1)34

| REFERENCE DRAWINGS |
|---|
| STD920080 |

THIS DRAWING IS PART




NOTES:

1. TAG# BLOCK RANGE ALLOCATED FOR THIS P&ID IS (651-700).
2. LAST TAG# USED HV-687
3. ALL IMPULSE LINES ARE 3/8" SS TUBING UNLESS OTHERWISE NOTED.
4. ALL PROCESS LINES ARE 1/2" SS TUBING UNLESS OTHERWISE NOTED.
5. TIC-676 AND JE-676 CHANGED FROM TIC-661 AND JZ-676.

B

| OPERATING CONDITIONS |
|---|
| 290 PSIG<br>500 DEGF<br>100 SCFH |

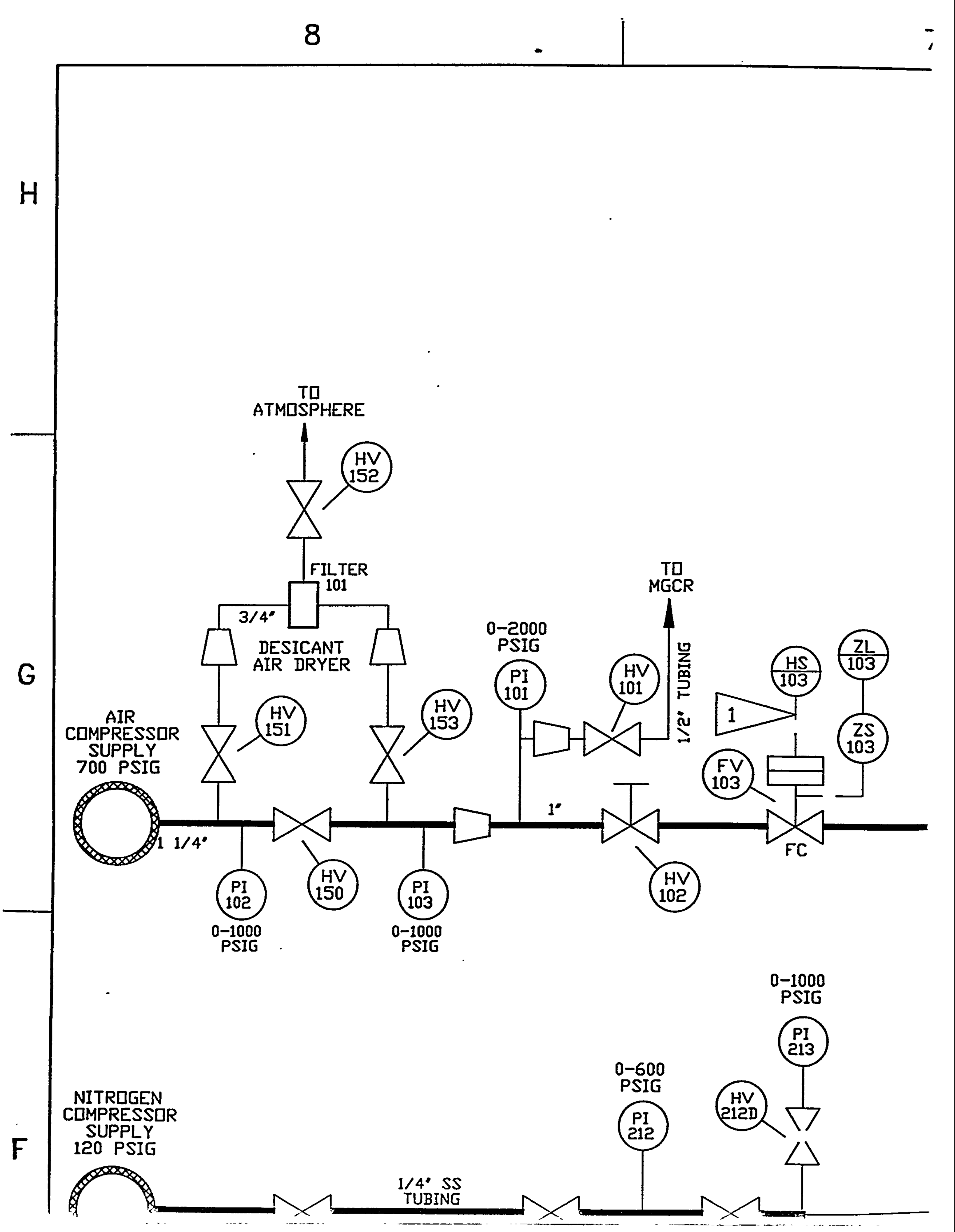
| | |
|---|---|
| DRAFTER<br>JIMMY THORNTON | DATE<br>01/20/94 |
| CHECKER<br>EDWIN GALLOWAY | DATE<br>01/25/94 |
| EG&G RESPONSIBLE ENGR.<br>EDWIN GALLOWAY | DATE<br>01/25/94 |
| EG&G REVIEWER<br>N/A | DATE |
| EG&G ES&H | DATE |
| PROJECT ENGR. | DATE |
| BRANCH MANAGER | DATE |

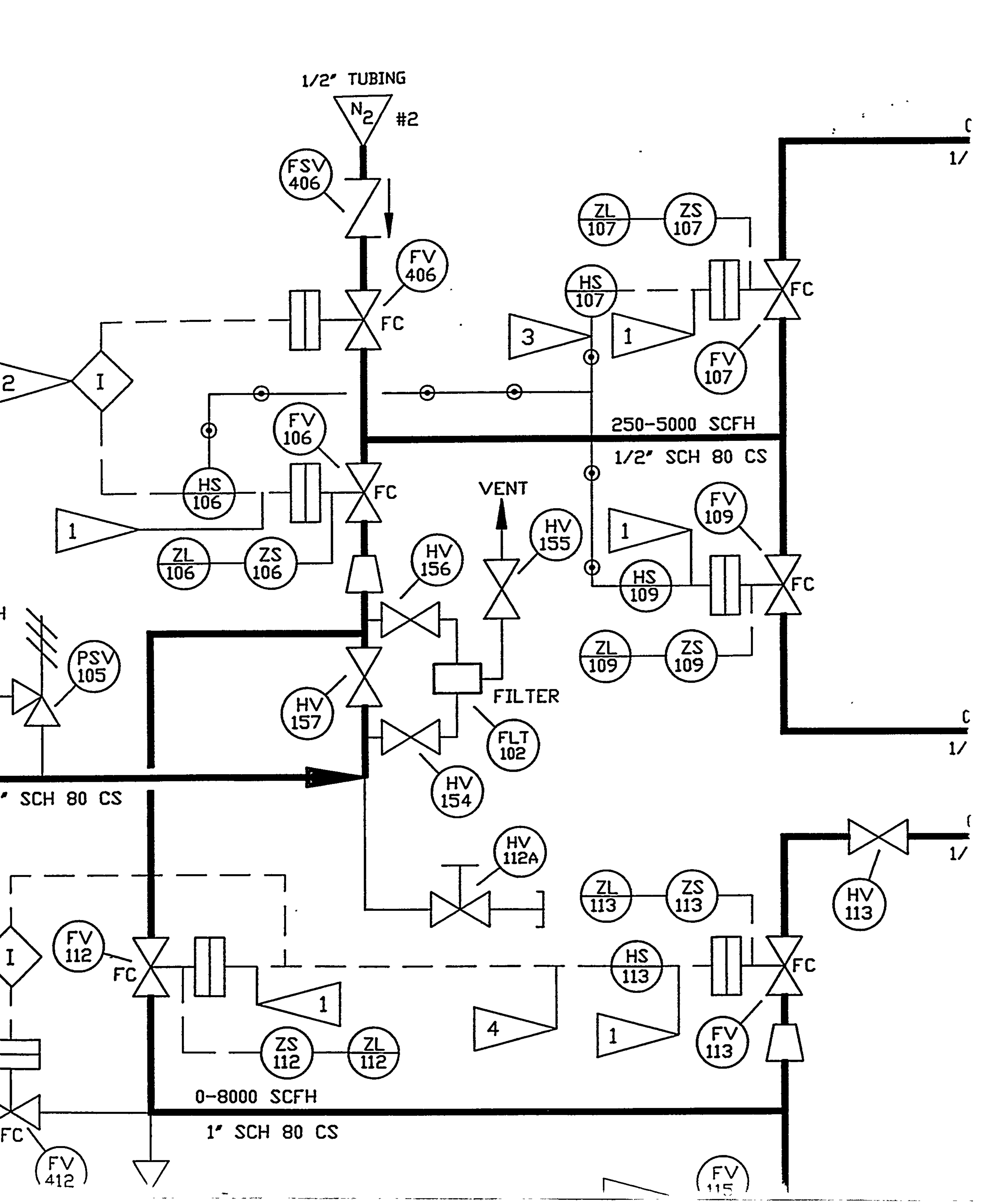
United States Department of Energy
MORGANTOWN ENERGY TECHNOLOGY CENTER
Morgantown, WV

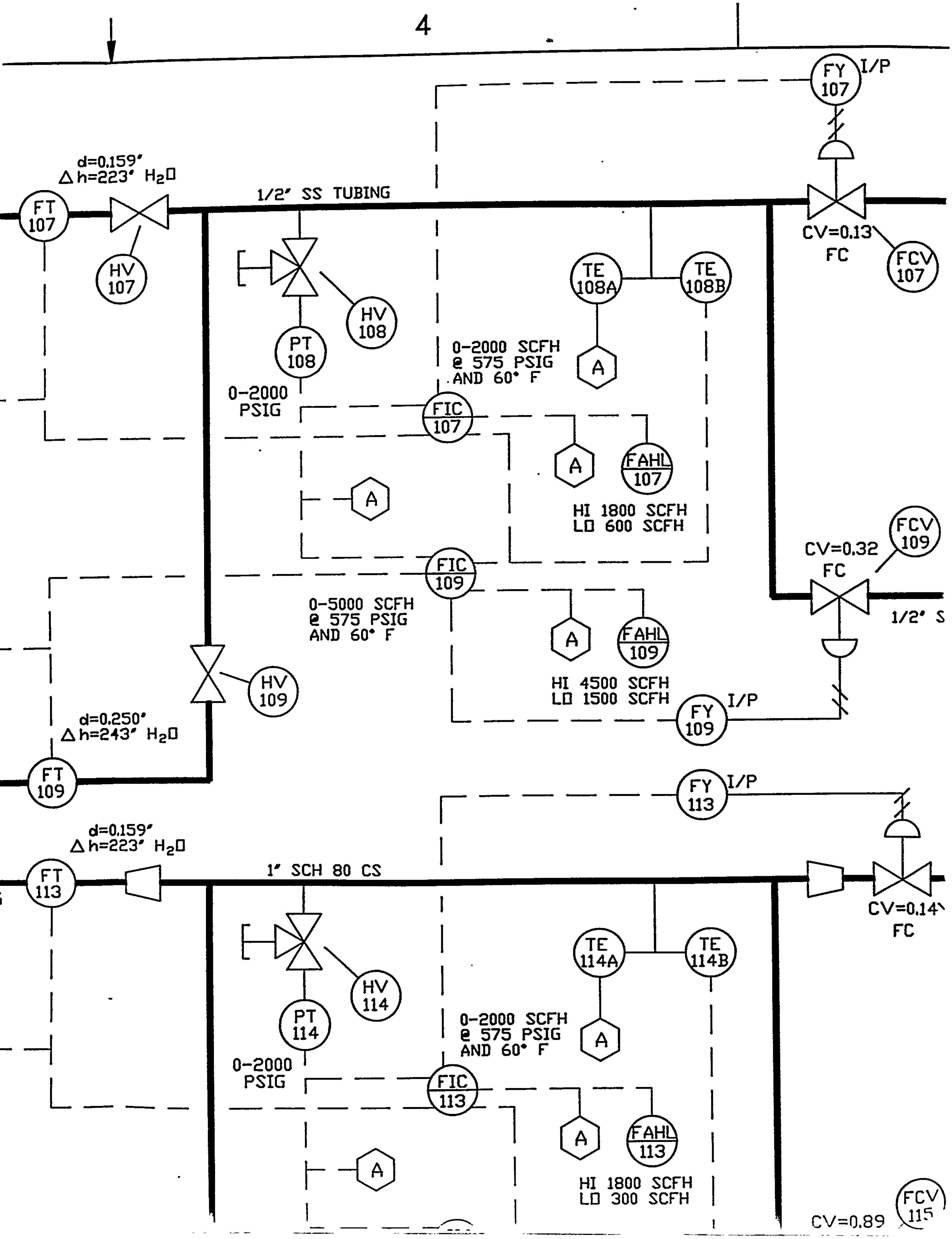
A

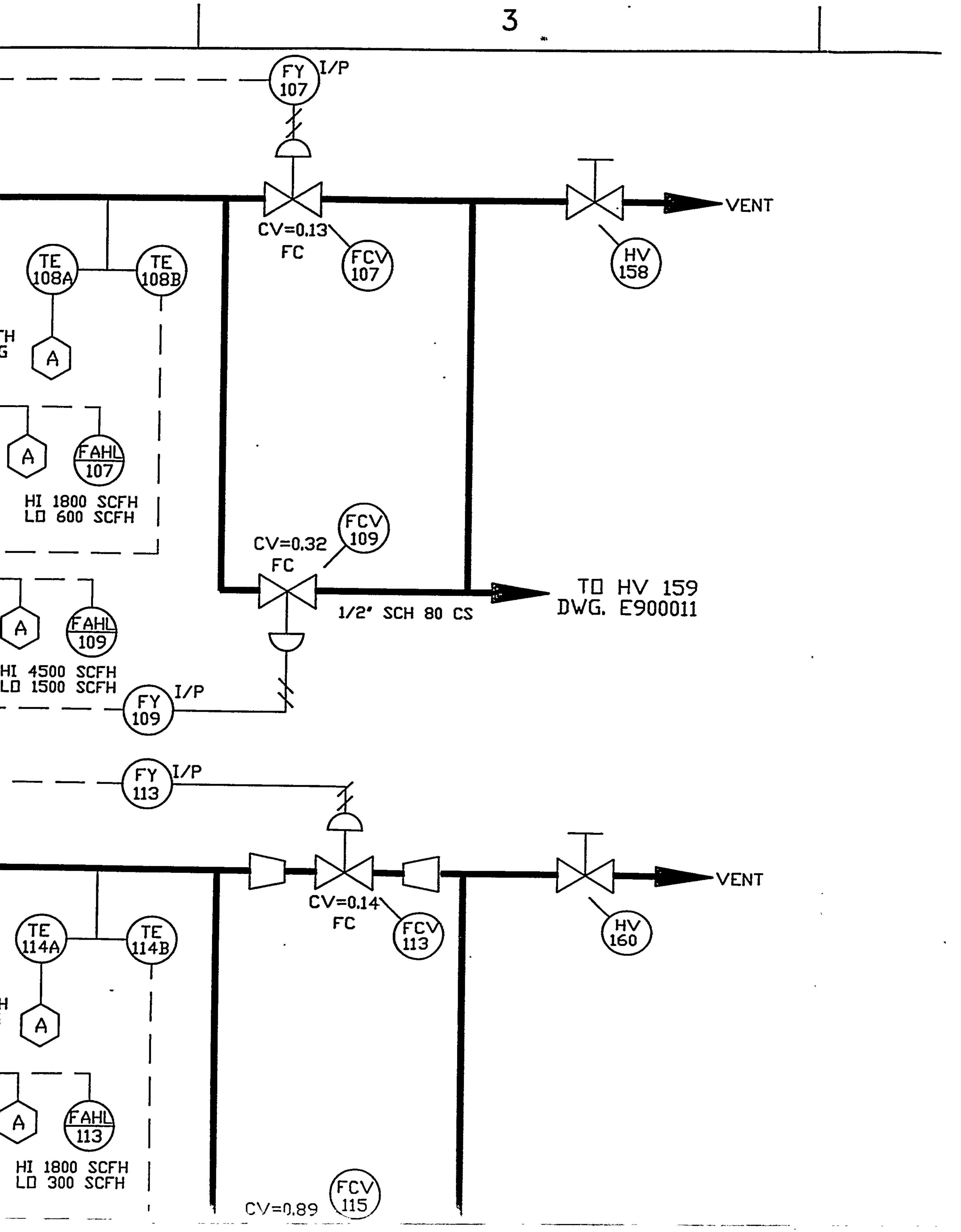
TITLE: MODULAR GAS CLEANUP RIG (MGCR) DRY CHLORIDE REMOVAL SYSTEM(DCR) P&ID

| SIZE | FSCM NO | DWG NO | REV |
|---|---|---|---|
| | | | |


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


1/2" TUBING
N2
#2
FSV 406
FV 406
FC
ZL 107
ZS 107
HS 107
FC
3
1
FV 107
I
2
FV 106
FC
HS 106
1
ZL 106
ZS 106
250-5000 SCFH
1/2" SCH 80 CS
VENT
HV 155
HV 156
FV 109
1
HS 109
FC
ZL 109
ZS 109
PSV 105
HV 157
FILTER
FLT 102
HV 154
" SCH 80 CS
HV 112A
ZL 113
ZS 113
HV 113
I
FV 112
FC
1
HS 113
FC
4
1
FV 113
ZS 112
ZL 112
0-8000 SCFH
1" SCH 80 CS
FC
FV 412
FV 115
1/
1/
1/


4
FY 107
I/P
d=0.159'
Δh=223' H2O
FT 107
HV 107
1/2' SS TUBING
HV 108
PT 108
0-2000 PSIG
CV=0.13
FC
FCV 107
TE 108A
TE 108B
A
0-2000 SCFH
@ 575 PSIG
AND 60° F
FIC 107
FAHL 107
HI 1800 SCFH
LO 600 SCFH
FCV 109
CV=0.32
FC
FIC 109
0-5000 SCFH
@ 575 PSIG
AND 60° F
FAHL 109
HI 4500 SCFH
LO 1500 SCFH
1/2' S
HV 109
FY 109
I/P
d=0.250'
Δh=243' H2O
FT 109
FY 113
I/P
d=0.159'
Δh=223' H2O
FT 113
1' SCH 80 CS
CV=0.14
FC
TE 114A
TE 114B
HV 114
PT 114
0-2000 SCFH
@ 575 PSIG
AND 60° F
0-2000 PSIG
FIC 113
FAHL 113
HI 1800 SCFH
LO 300 SCFH
FCV 115
CV=0.89


3
FY 107
I/P
CV=0.13
FC
FCV 107
VENT
HV 158
TE 108A
TE 108B
A
A
FAHL 107
HI 1800 SCFH
LO 600 SCFH
FCV 109
CV=0.32
FC
TO HV 159
DWG. E900011
1/2" SCH 80 CS
A
FAHL 109
HI 4500 SCFH
LO 1500 SCFH
FY 109
I/P
FY 113
I/P
CV=0.14
FC
FCV 113
VENT
HV 160
TE 114A
TE 114B
A
A
FAHL 113
HI 1800 SCFH
LO 300 SCFH
CV=0.89
FCV 115

2

VENT

159
011

VENT

REVISION

| ZONE | REV | DESCRIPTION |
|---|---|---|
| GEN | 1 | UPDATED AS PER MARKED PRINT |
| GEN | | REVISED PER MARKED PRINT |
| E-8 | | REMOVED HV-201 & PI-201 |
| B-6,7 | | REROUTED LINE BETWEEN HV-480 & PCV-308 |
| C-8 | | RELOCATED CAPPED LINE |
| E-6 | | ADDED STEAM SITE LINE, HV & CV |
| B-7,8 | | ADDED HV-402, 402A, 403A & 404 |

| DRAFTER | DATE | CHECKER | DATE | PROJECT E |
|---|---|---|---|---|
| S.P.C. | 12/10/90 | G.J.K. | 12/10/90 | |
| | DATE | | DATE | |

| ZONE | REV | DESCRIPTION |
|---|---|---|
| GEN | 2 | UPDATED AS PER MARKED PRINT WITH W.O. #68547 |
| GEN | | ADDED NEW DWG. FORMAT |
| GEN | | UPDATED AS PER MARKED PRINT WITH W.O. #70756 |
| GEN | | UPDATED AS PER MARKED PRINT WITH WORK PLAN |
| B-2 | | ADDED NOTE 8 AND NOTE DESIGNATIONS |
| C-7 | | MODIFIED FILTER #208 SYMBOL |
| GEN | | ISSUED FOR CUSTOMER REVIEW AND COMMENT |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESP |
|---|---|---|---|---|
| JIMMY SMITH | 7/17/92 | GARY J. KULCHOCK | 7/17/92 | JAY |
| EG&G RESPON SECT SUPV | DATE | EG&G ES&H | DATE | |
| BURTON W. HARRELL | 7/20/92 | J. L. BUCKLEW | 7/20/92 | |

| ZONE | REV | DESCRIPTION |
|---|---|---|
| A-1 | 3 | CHANGED DWG. TITLE |
| GEN | | UPDATED AS PER MARKED PRINT WITH WORK PLAN |
| GEN | | ISSUED FOR CONSTRUCTION |
| E-7 | | ADDED ENTRAINED BOILER, VALVE HV-0601A, AND TIC-201 |
| G-7 | | "PI-104" WAS "PI-105, AND "PI-105" WAS "PI-104" |
| F-7 | | "650 PSIG" ON PAHL-214 WAS "500 PSIG" |
| D-6 | | ADDED "HS-217" TO "JC-217" |
| A-8 | | ADDED NOTE TO "HV-401A" |
| GEN | | REVISED DESIGNATIONS ON ALL FLOW COMPUTERS FROM "MO BEHIND PANEL" |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESP |
|---|---|---|---|---|
| GARY J. KULCHOCK | 11/18/92 | S. CONKO | 11/18/92 | JAY |
| EG&G ES&H | DATE | PROJECT ENGR. | DATE | BRANCH MA |
| J. L. BUCKLEW | 11/19/92 | | | |

| ZONE | REV | DESCRIPTION |
|---|---|---|
| GEN. | 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-4 |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESP |
|---|---|---|---|---|
| GARY J. KULCHOCK | 4/5/93 | S. CONKO | 4/5/93 | JAY |
| EG&G ES&H | DATE | PROJECT ENGR. | DATE | BRANCH MA |
| J. L. BUCKLEW | 4/7/93 | JOHN ROCKEY | 5/27/93 | LARRY |

| ZONE | REV | DESCRIPTION |
|---|---|---|
| GEN. | 5 | ADDED NOTE 10; REVISED BOLD LINETYPE ON YY-209, PI-2<br>REVISED LINETYPE ON FV-103; REVISED LINE ROUTING IN<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 |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESP |
|---|---|---|---|---|
| Gary Kulchock | 9/10/93 | S. Conko | 9/14/93 | Jay |
| EG&G ES&H | DATE | PROJECT ENGR. | DATE | BRANCH MA |
| Larry Bucklew | 9/17/93 | John Rockey | 9/21/93 | Larr |

| ZONE | REV | DESCRIPTION |
|---|---|---|
| GEN | 6 | EXTENSIVE CHANGES AS PER MARKED PRINT REDLINED BY JA<br>ISSUED FOR CONSTRUCTION |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESP |
|---|---|---|---|---|
| Gary J Kulchock | 10/7/94 | S. Conko | 10-7-94 | Jay |
| EG&G ES&H | DATE | PROJECT ENGR. | DATE | BRANCH MAN |
| J L Bucklew | 10-11-94 | John M Rockey | 10/13/94 | Larry |

2 1

# REVISION

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 1 | UPDATED AS PER MARKED PRINT | 4/25/90 |
| GEN<br>E-8<br>-6,7<br>C-8<br>E-6<br>-7,8 | | 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 |

| DRAFTER | 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 |

| 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 | | UPDATED AS PER MARKED PRINT WITH WORK PLAN | 3/6/92 |
| B-2<br>C-7<br>GEN | | ADDED NOTE 8 AND NOTE DESIGNATIONS<br>MODIFIED FILTER #208 SYMBOL<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. LUNIFIELD | 7/17/92 |
| EG&G RESPON SECT SUPV<br>BURTON W. HARRELL | DATE<br>7/20/92 | EG&G ES&H<br>J. L. BUCKLEW | DATE<br>7/20/92 | | DATE | | DATE |

| 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 | 9/16/92 |
| E-7<br>G-7<br>F-7<br>D-6<br>A-8<br>GEN | | 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 |

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

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN. | 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 |

| DRAFTER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| GARY J. KULCHOCK | 4/5/93 | S. CONKO | 4/5/93 | JAY RUTTEN | 4/7/93 | D. LUNIFIELD | 4/7/93 |
| EG&G ES&H<br>J. 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 (EOSD)<br>JOHN ROTUNDA | DATE<br>5/27/93 |

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN. | 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 |

| 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<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 (EOSD)<br>John Rotunda/WJA | DATE<br>9/20/93 |

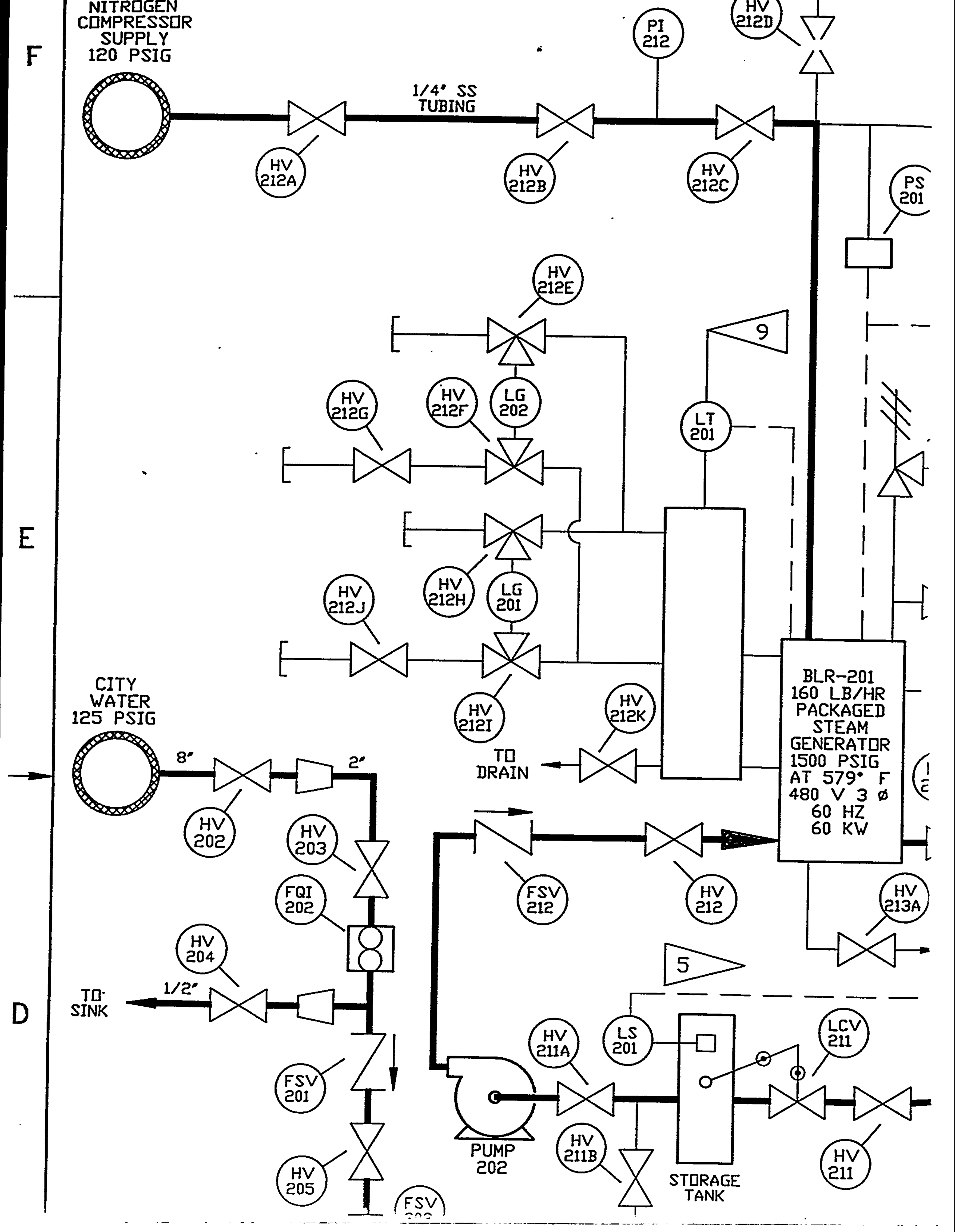
| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 6 | EXTENSIVE CHANGES AS PER MARKED PRINT REDLINED BY JAY RUTTEN ON 15 FEB 94.<br>ISSUED FOR CONSTRUCTION | 9/29/94 |

| DRAFTER | 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 |
| EG&G ES&H<br>L 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 (EOSD)<br>[illegible] | DATE<br>[illegible] |

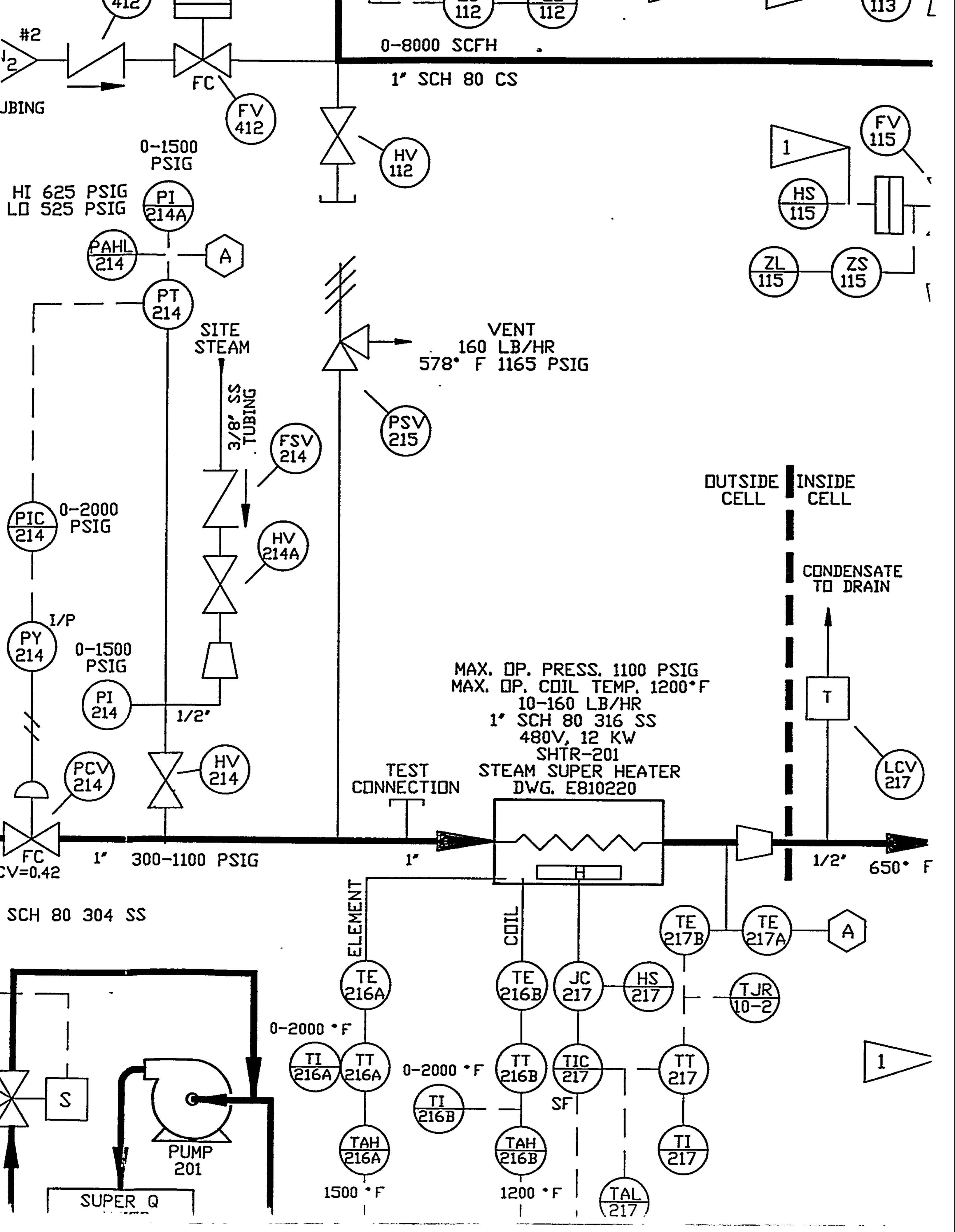
H

G

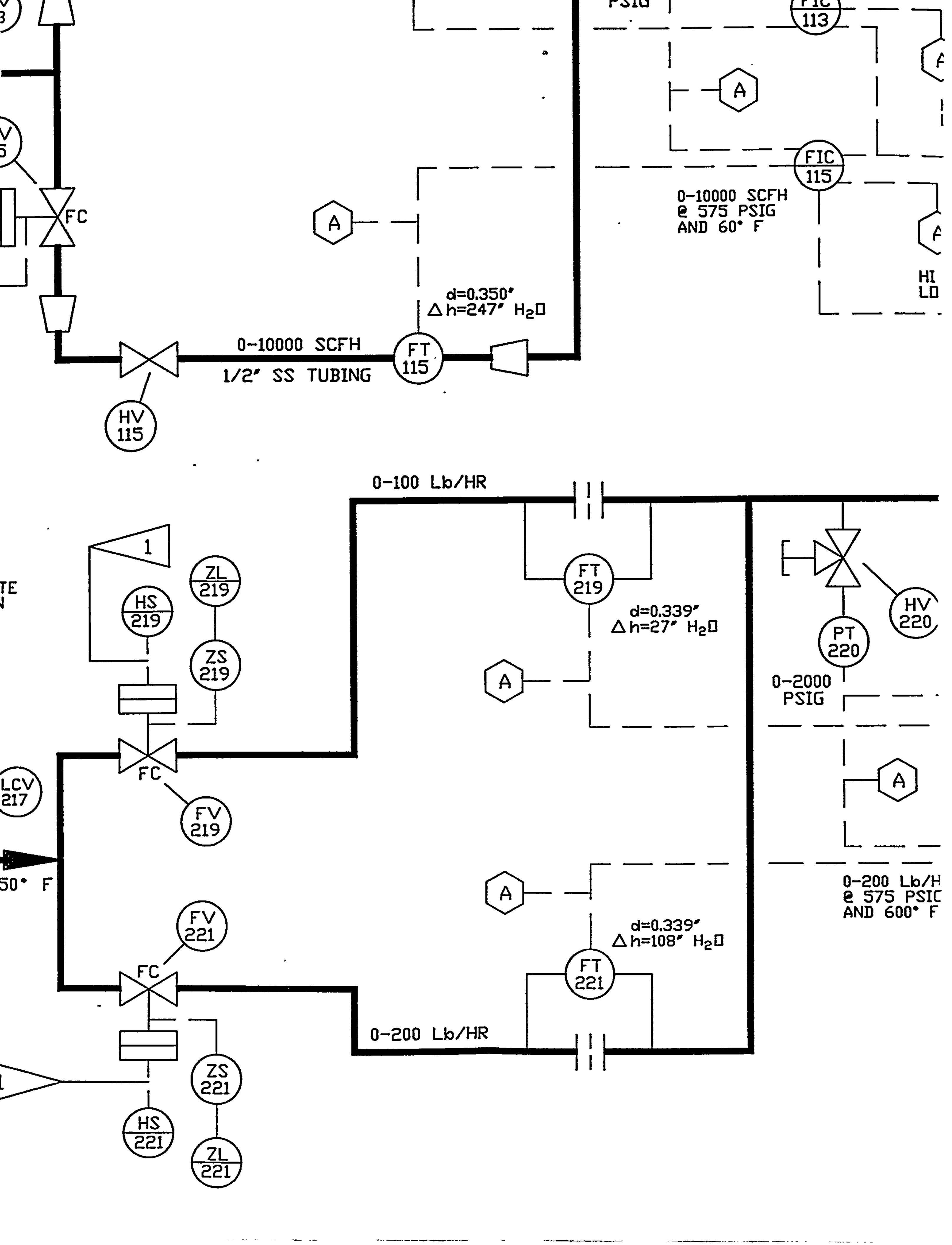
F



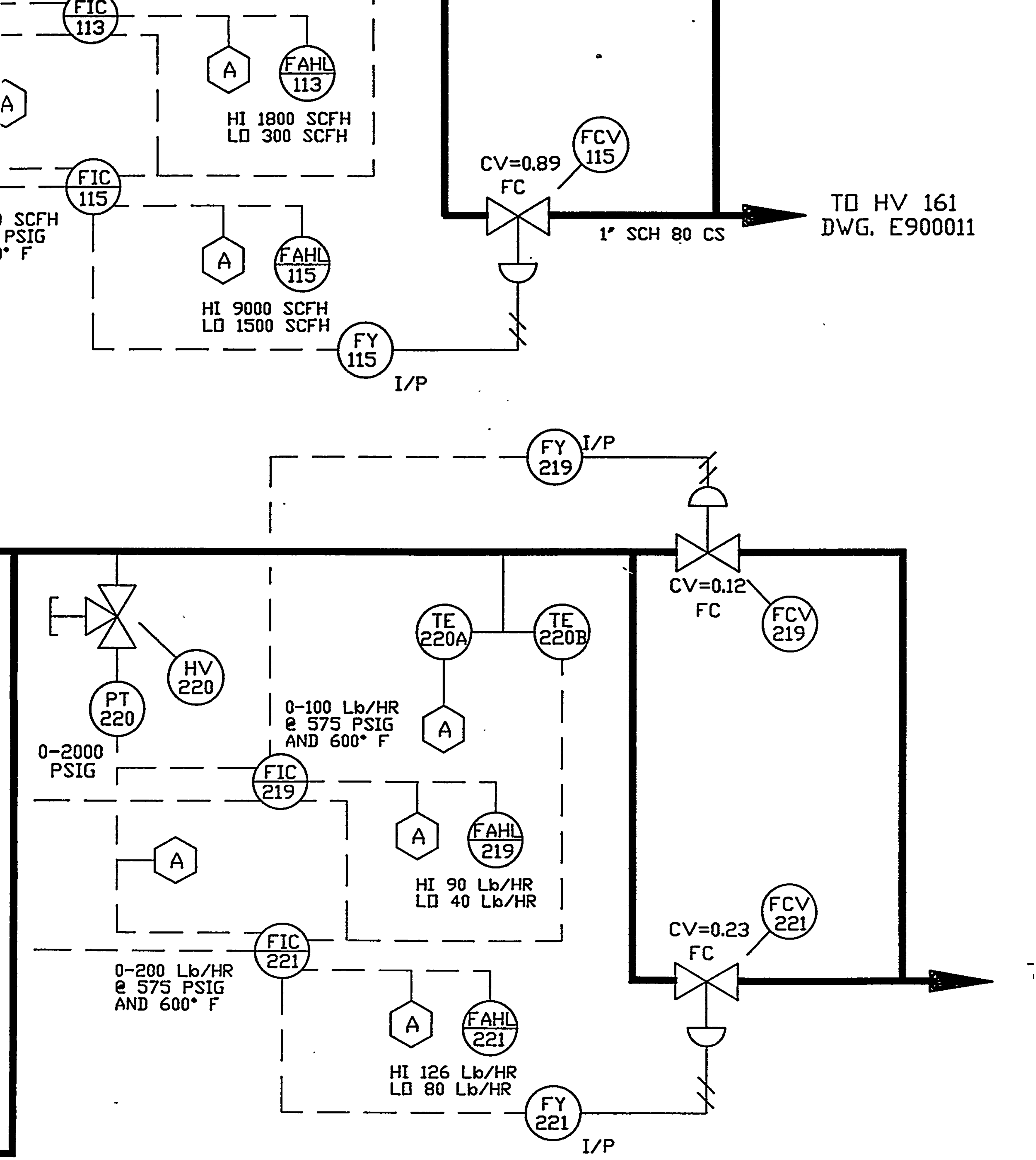
F
E
D
NITROGEN COMPRESSOR SUPPLY 120 PSIG
1/4" SS TUBING
HV 212A
HV 212B
HV 212C
HV 212D
PI 212
PS 201
HV 212E
9
HV 212G
HV 212F
LG 202
LT 201
HV 212H
LG 201
HV 212J
HV 212I
HV 212K
TO DRAIN
BLR-201 160 LB/HR PACKAGED STEAM GENERATOR 1500 PSIG AT 579° F 480 V 3 ø 60 HZ 60 KW
CITY WATER 125 PSIG
8"
2"
HV 202
HV 203
FQI 202
HV 204
1/2"
TO SINK
FSV 201
HV 205
FSV 212
HV 212
HV 213A
5
LS 201
HV 211A
LCV 211
PUMP 202
HV 211B
STORAGE TANK
HV 211



#2
FC
FV 412
JBING
0-8000 SCFH
1" SCH 80 CS
HV 112
FV 115
HS 115
ZL 115
ZS 115
0-1500 PSIG
HI 625 PSIG
LO 525 PSIG
PI 214A
PAHL 214
A
PT 214
SITE STEAM
3/8" SS TUBING
VENT
160 LB/HR
578° F 1165 PSIG
PSV 215
FSV 214
HV 214A
OUTSIDE CELL
INSIDE CELL
CONDENSATE TO DRAIN
PIC 214
0-2000 PSIG
PY 214
I/P
0-1500 PSIG
PI 214
1/2"
T
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
LCV 217
PCV 214
HV 214
TEST CONNECTION
FC
CV=0.42
1"
300-1100 PSIG
1"
1/2"
650° F
SCH 80 304 SS
ELEMENT
COIL
TE 217B
TE 217A
A
TE 216A
TE 216B
JC 217
HS 217
TJR 10-2
0-2000 °F
TI 216A
TT 216A
0-2000 °F
TT 216B
TIC 217
TT 217
1
S
PUMP 201
TI 216B
SF
TAH 216A
TAH 216B
TI 217
1500 °F
1200 °F
TAL 217
SUPER Q

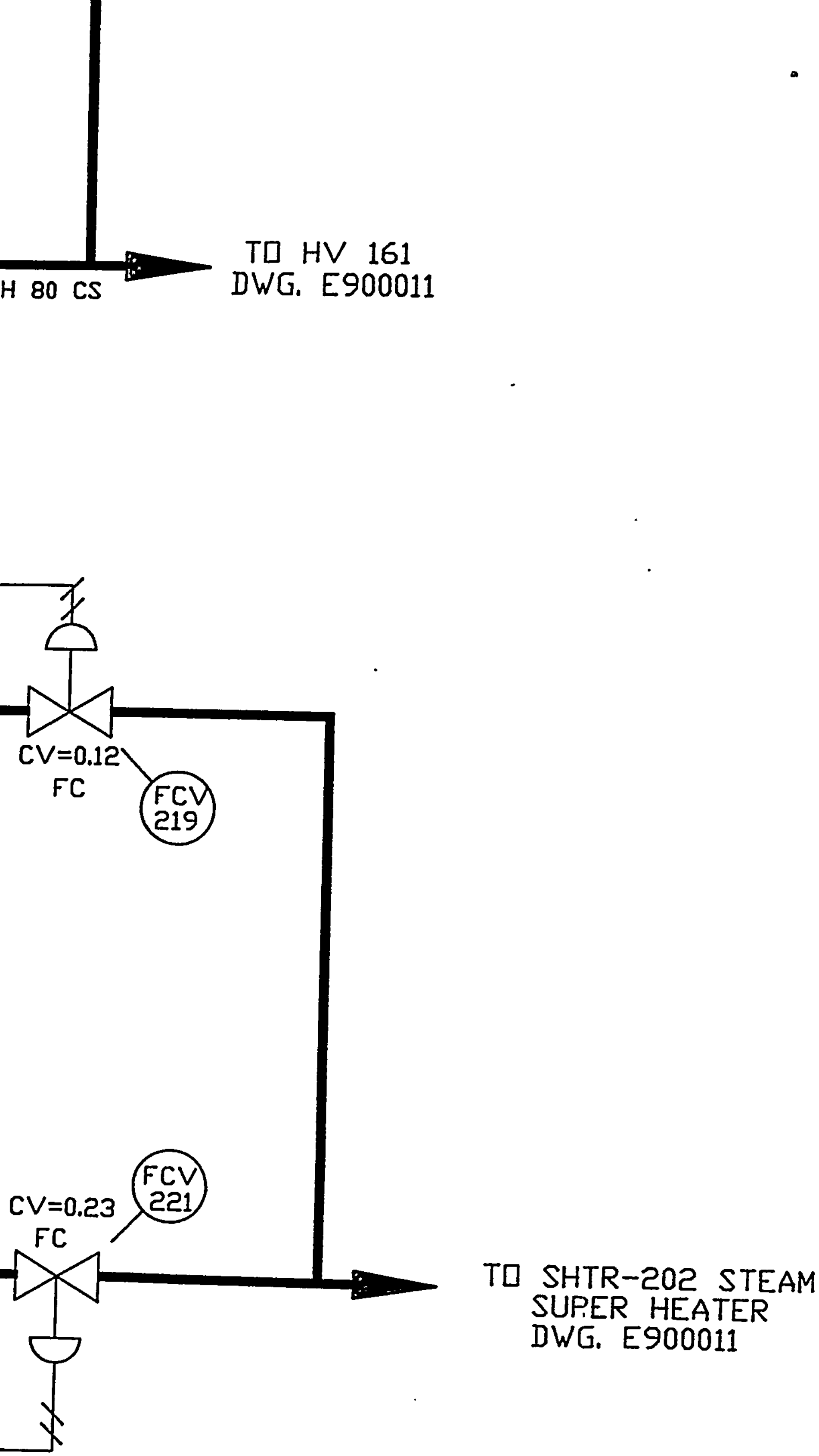


PSIG
FIC 113
A
FIC 115
0-10000 SCFH
@ 575 PSIG
AND 60° F
HI
LO
FC
A
d=0.350"
Δh=247" $H_2O$
0-10000 SCFH
1/2" SS TUBING
FT 115
HV 115
0-100 Lb/HR
FT 219
d=0.339"
Δh=27" $H_2O$
A
1
ZL 219
HS 219
ZS 219
TE
HV 220
PT 220
0-2000
PSIG
A
FC
LCV 217
FV 219
50° F
A
0-200 Lb/H
@ 575 PSIG
AND 600° F
FV 221
d=0.339"
Δh=108" $H_2O$
FC
FT 221
0-200 Lb/HR
ZS 221
HS 221
ZL 221


FIC 113
A
FAHL 113
HI 1800 SCFH
LO 300 SCFH
A
FIC 115
SCFH
PSIG
° F
A
FAHL 115
HI 9000 SCFH
LO 1500 SCFH
FY 115
I/P
CV=0.89
FC
FCV 115
1" SCH 80 CS
TO HV 161
DWG. E900011
FY 219
I/P
CV=0.12
FC
FCV 219
TE 220A
TE 220B
HV 220
PT 220
0-2000
PSIG
0-100 Lb/HR
@ 575 PSIG
AND 600° F
A
FIC 219
A
FAHL 219
HI 90 Lb/HR
LO 40 Lb/HR
A
FIC 221
0-200 Lb/HR
@ 575 PSIG
AND 600° F
A
FAHL 221
HI 126 Lb/HR
LO 80 Lb/HR
FY 221
I/P
CV=0.23
FC
FCV 221

| ZONE | REV | |
|---|---|---|
| GEN | 6 | EXTENSIVE CHANGES<br>ISSUED FOR CONSTRU |

| DRAFTER | DATE 10/7/94 | CHE |
|---|---|---|
| EG&G ES&H | DATE 10-11-94 | PRO |



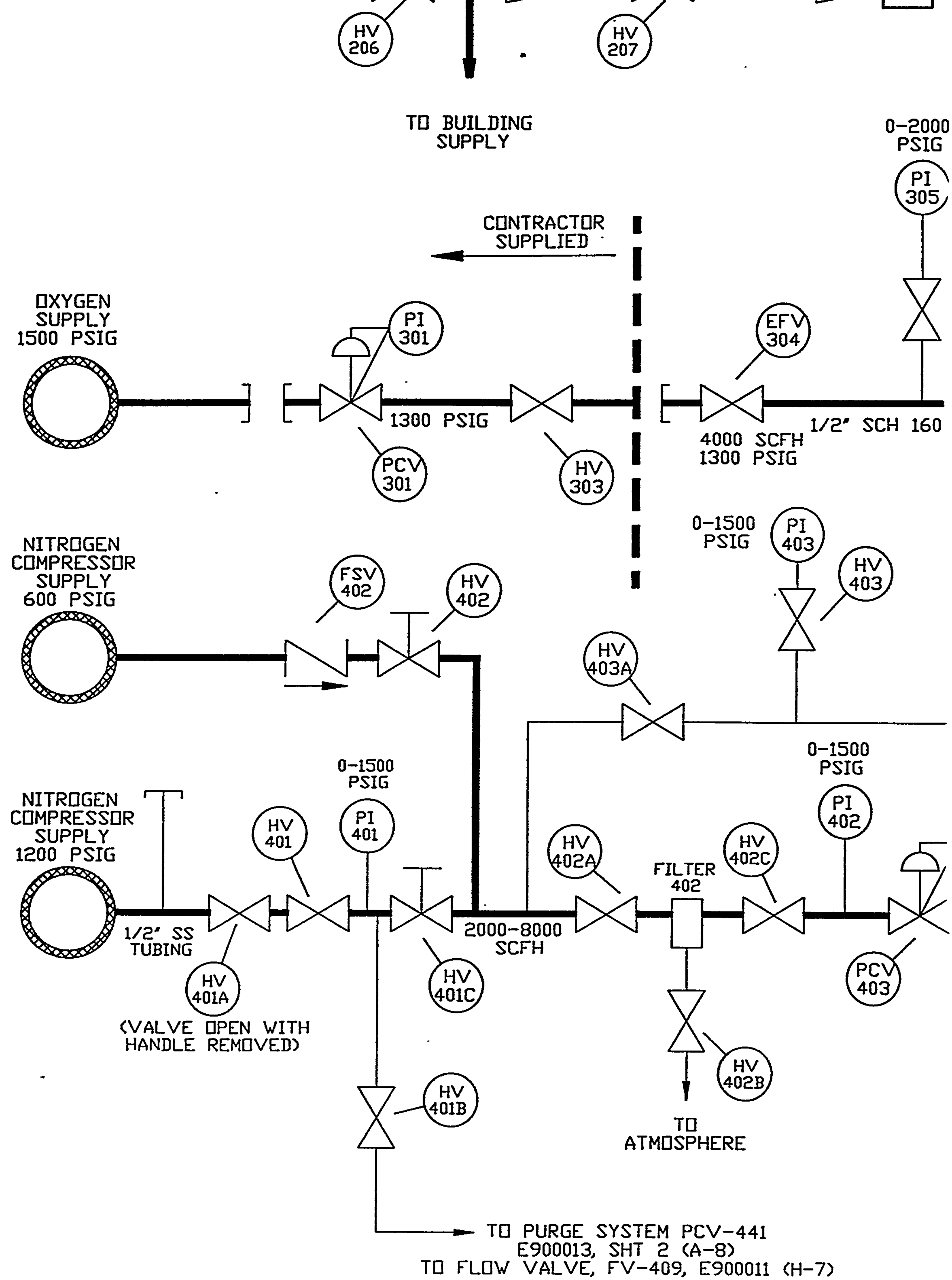
| | | | |
|---|---|---|---|
| GEN | 6 | EXTENSIVE CHANGES AS PER MARKED PRINT REDLINED BY JAY RUTTEN ON 15 FEB 94. ISSUED FOR CONSTRUCTION | 9/29/94 |

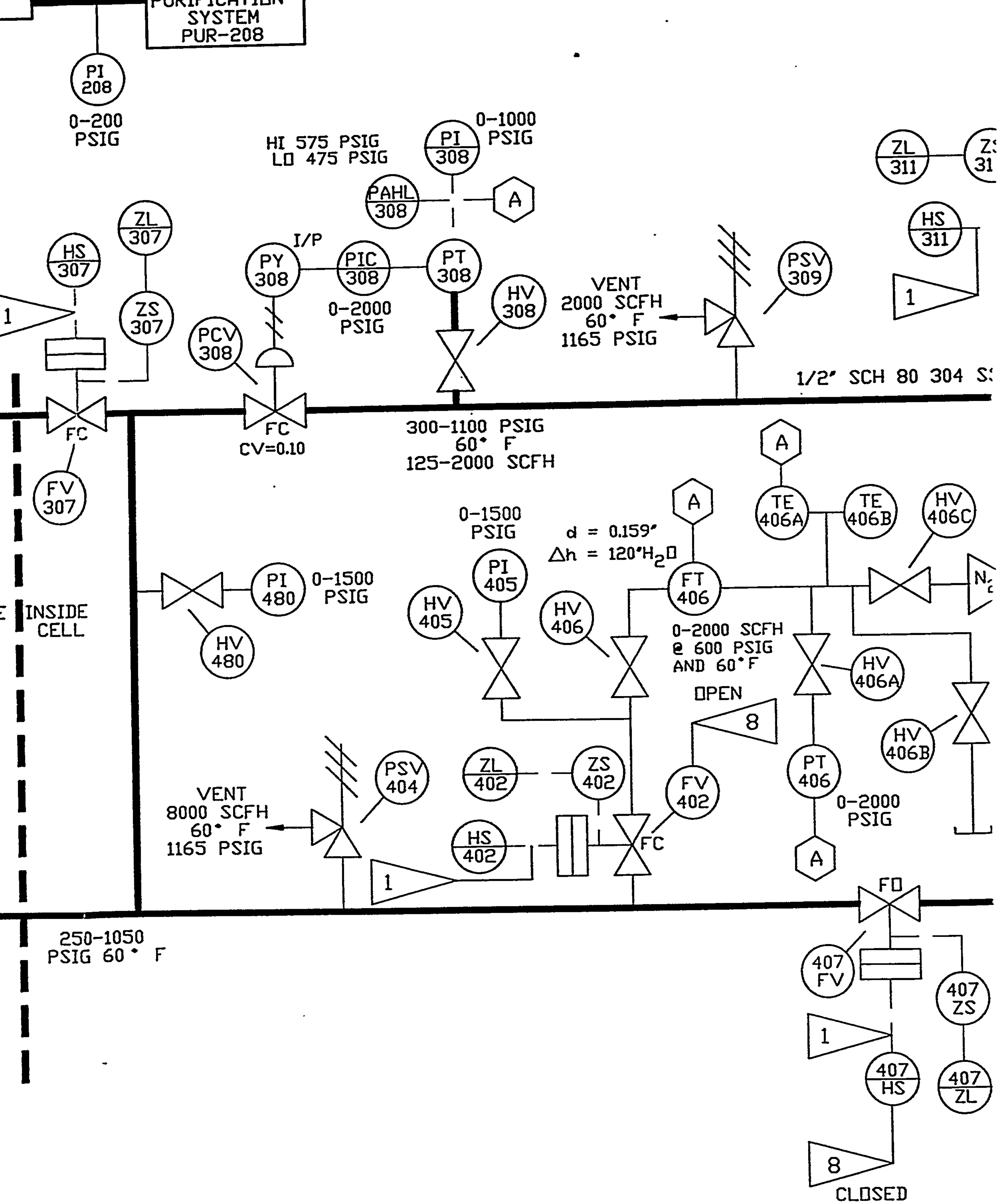
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| [DRAF]TER | DATE 10/7/94 | CHECKER S. Caska | DATE 10-7-94 | EG&G RESPONSIBLE ENGR. Jay Rutten | DATE 10-11-94 | REVIEWER | DATE 10/11/94 |
| [EG&]G ES&H | DATE 10-11-94 | PROJECT ENGR. John M Rockey | DATE 10/13/94 | BRANCH MANAGER | DATE 10-18-94 | DOE (EDSID) | DATE 11/11/94 |

F

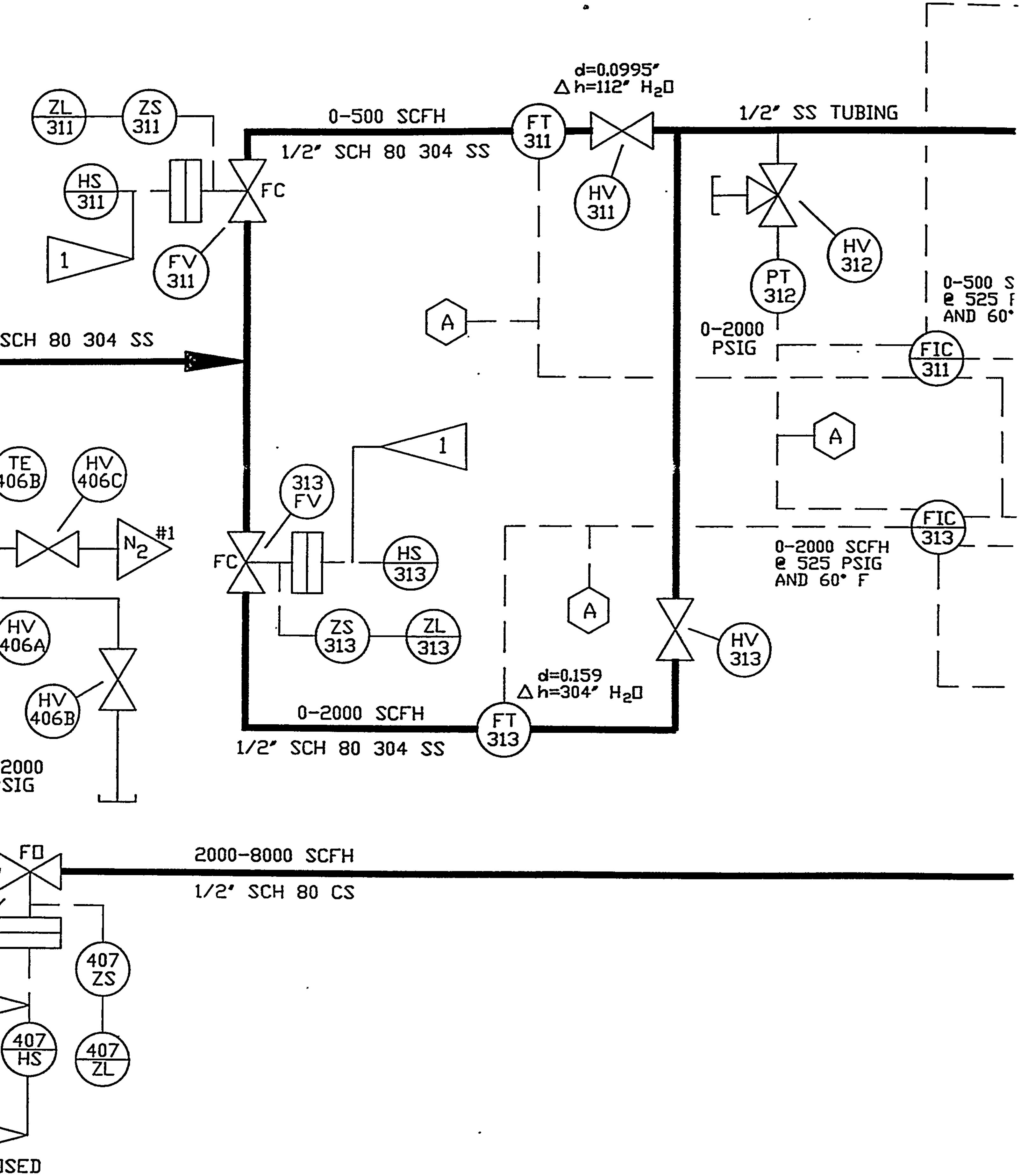
E

D

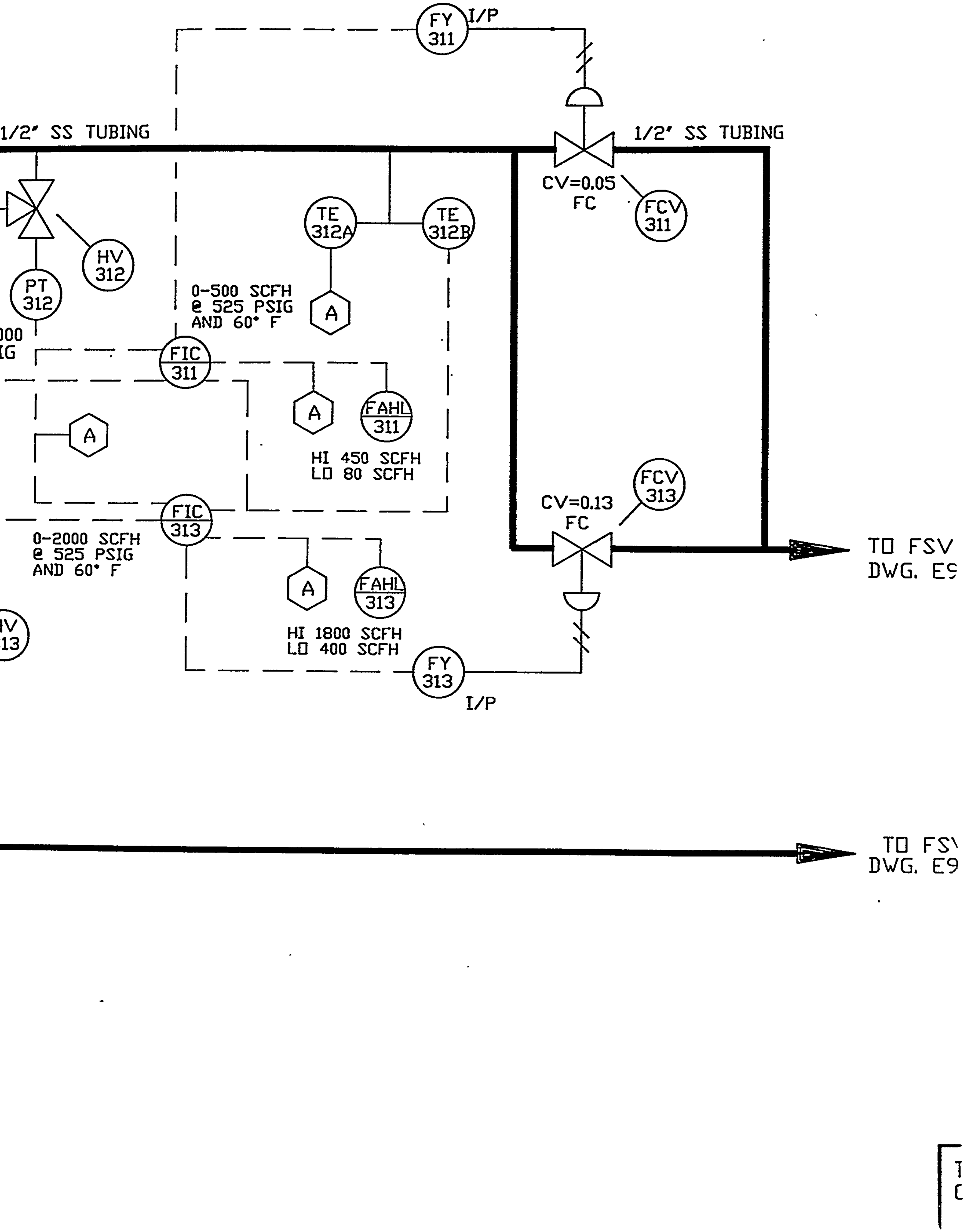

HV 206
HV 207
TO BUILDING SUPPLY
0-2000 PSIG
PI 305
CONTRACTOR SUPPLIED
OXYGEN SUPPLY 1500 PSIG
PI 301
EFV 304
1300 PSIG
PCV 301
HV 303
4000 SCFH 1300 PSIG
1/2" SCH 160
0-1500 PSIG
PI 403
HV 403
NITROGEN COMPRESSOR SUPPLY 600 PSIG
FSV 402
HV 402
HV 403A
0-1500 PSIG
0-1500 PSIG
NITROGEN COMPRESSOR SUPPLY 1200 PSIG
HV 401
PI 401
HV 402A
FILTER 402
HV 402C
PI 402
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)
C
B
A

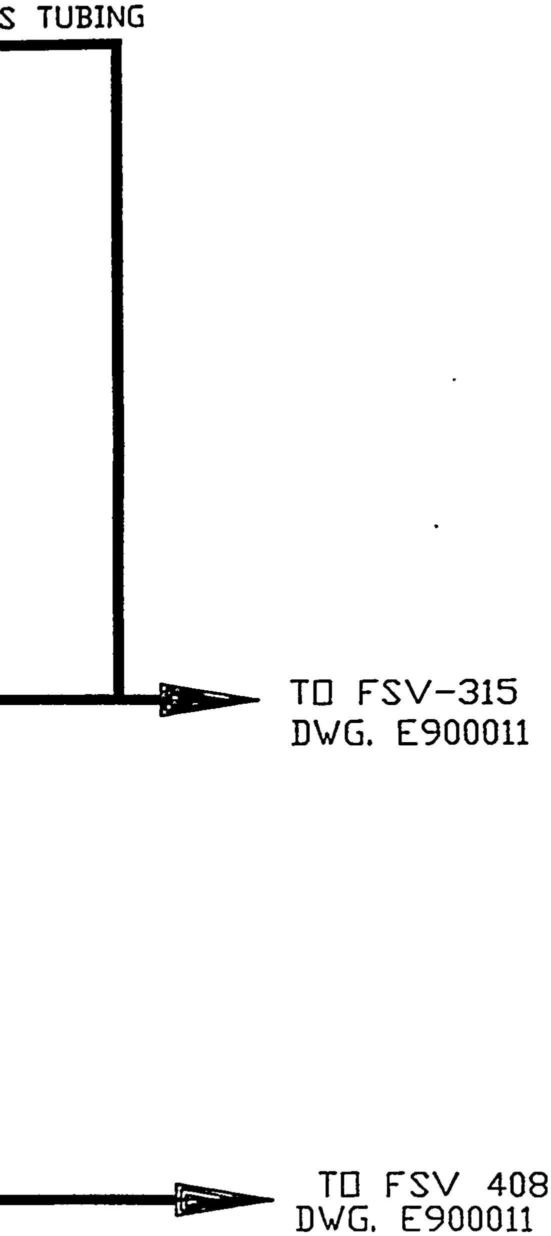


PURIFICATION SYSTEM PUR-208
PI 208
0-200 PSIG
HI 575 PSIG
LO 475 PSIG
0-1000 PSIG
PI 308
PAHL 308
A
ZL 311
HS 311
1
ZL 307
HS 307
ZS 307
1
I/P
PY 308
PIC 308
PT 308
0-2000 PSIG
HV 308
PCV 308
VENT
2000 SCFH
60° F
1165 PSIG
PSV 309
1/2" SCH 80 304 S
FC
FC
CV=0.10
300-1100 PSIG
60° F
125-2000 SCFH
FV 307
A
0-1500 PSIG
A
TE 406A
TE 406B
HV 406C
d = 0.159"
Δh = 120"H2O
PI 405
FT 406
PI 480
0-1500 PSIG
HV 405
HV 406
0-2000 SCFH
@ 600 PSIG
AND 60° F
INSIDE CELL
HV 480
HV 406A
OPEN
8
HV 406B
PSV 404
ZL 402
ZS 402
FV 402
PT 406
0-2000 PSIG
VENT
8000 SCFH
60° F
1165 PSIG
HS 402
FC
1
A
FO
250-1050 PSIG 60° F
407 FV
407 ZS
1
407 HS
407 ZL
8
CLOSED



d=0.0995"
Δh=112" $H_2O$
ZL 311
ZS 311
0-500 SCFH
FT 311
1/2" SS TUBING
1/2" SCH 80 304 SS
HS 311
FC
HV 311
HV 312
1
FV 311
PT 312
0-500 S
@ 525 F
AND 60°
SCH 80 304 SS
A
0-2000 PSIG
FIC 311
A
TE 406B
HV 406C
1
313 FV
$N_2$ #1
FC
HS 313
FIC 313
0-2000 SCFH
@ 525 PSIG
AND 60° F
A
HV 406A
ZS 313
ZL 313
HV 313
HV 406B
d=0.159
Δh=304" $H_2O$
0-2000 SCFH
FT 313
1/2" SCH 80 304 SS
2000
SIG
FO
2000-8000 SCFH
1/2" SCH 80 CS
407 ZS
407 HS
407 ZL
USED


FY 311
I/P
1/2" SS TUBING
1/2" SS TUBING
CV=0.05
FC
FCV 311
TE 312A
TE 312B
HV 312
PT 312
A
0-500 SCFH
@ 525 PSIG
AND 60° F
FIC 311
A
FAHL 311
A
HI 450 SCFH
LO 80 SCFH
FCV 313
CV=0.13
FC
FIC 313
0-2000 SCFH
@ 525 PSIG
AND 60° F
A
FAHL 313
HI 1800 SCFH
LO 400 SCFH
FY 313
I/P
TO FSV
DWG. E9
TO FS
DWG. E9




1 WHICH
PANEL-
POSITIC
60 HZ

2 FV-106
PANEL-
VALVE
D820030

3 HS-106,
FV-106
FV-107

4 HS-112,
FV-112
FV-113

5 WATER
~~3-WAY~~

6 LB/HR

7 THIS D
SUPERC
NOTES,

8 DESIGN
LOCKEI

9 BOILER
PROBES
PUMP C
PUMP C

10 FV-112
PANEL-
VALVE

11 *NOTE

| REFERENCE DRAWINGS | | |
|---|---|---|
| E900011<br>E900012<br>E900013 | DRAFTER<br>S. CONKO | DA |
| | CHECKER<br>A. R. KUBALA | DA |
| | PROJECT ENGINEER<br>J. P. KANOSKY | DA |
| | | DA |
| | | DA |
| | | DA |
| | | DA |

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

1 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.

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

DWG NO E900010 SH 1

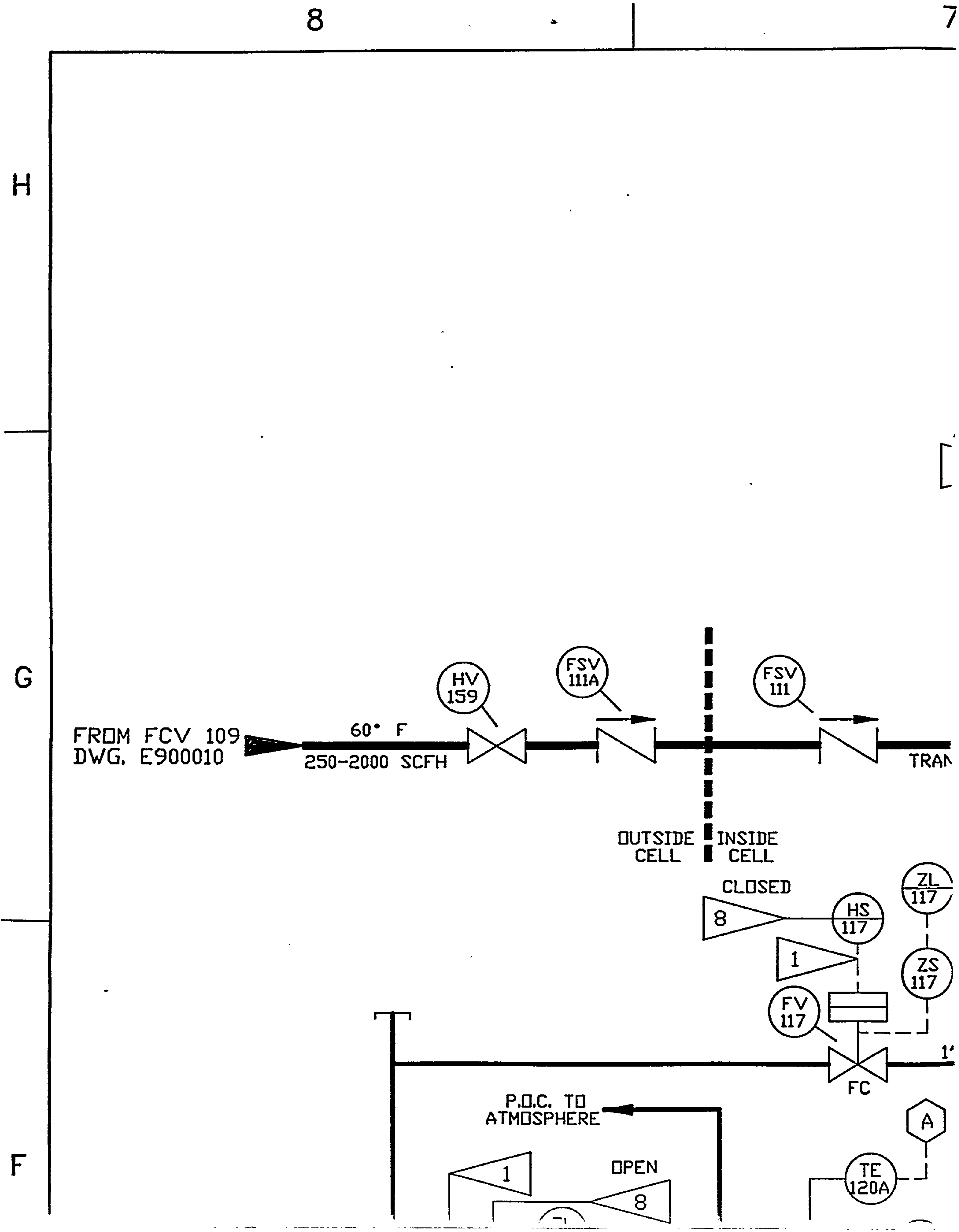
A

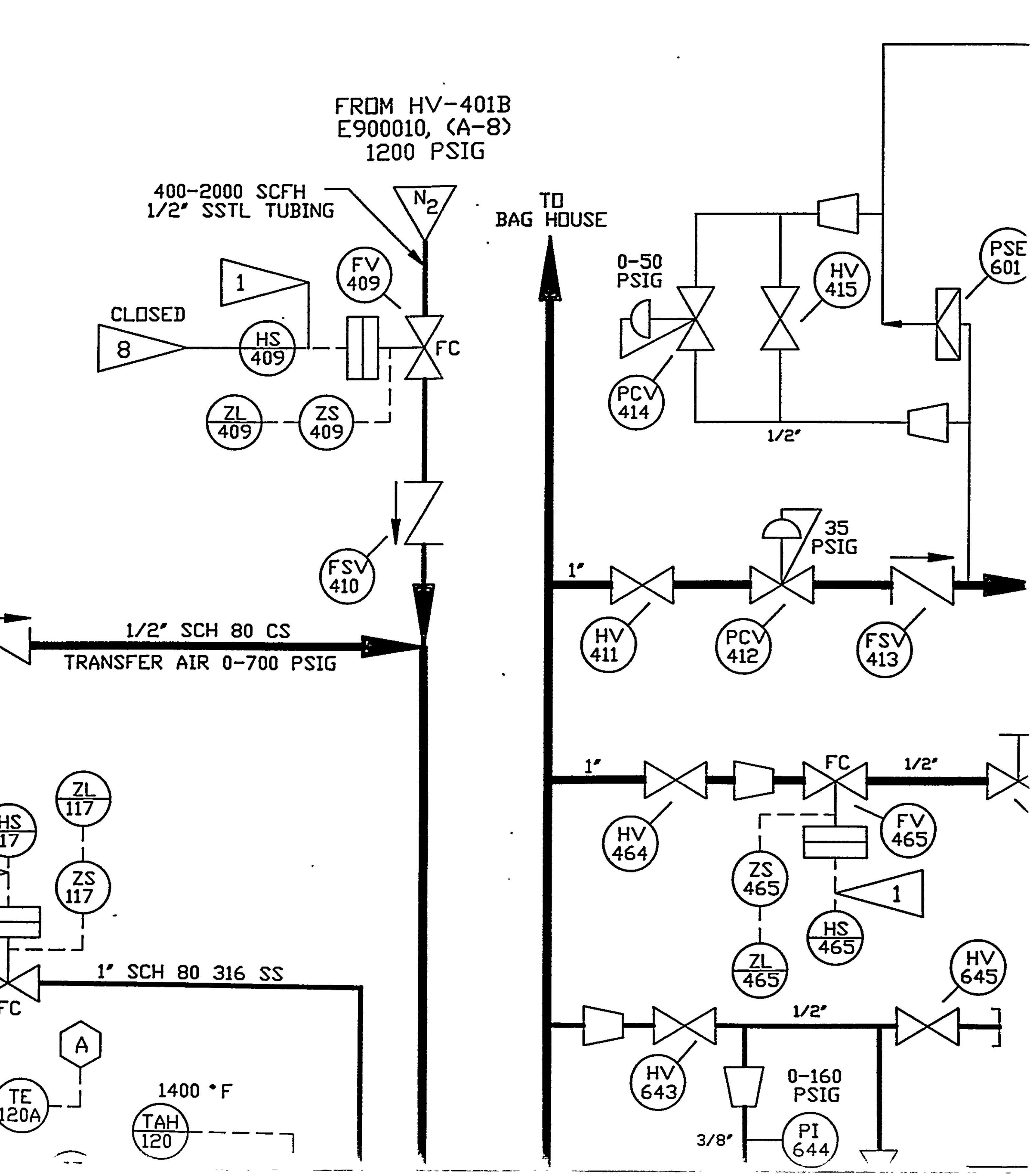
| | |
|---|---|
| DRAFTER S. CONKO | DATE 3/6/90 |
| CHECKER A. R. KUBALA | DATE 3/6/90 |
| PROJECT ENGINEER J. P. KANOSKY | DATE 3/6/90 |
| | DATE |
| | DATE |
| | DATE |
| | DATE |
| | DATE |

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

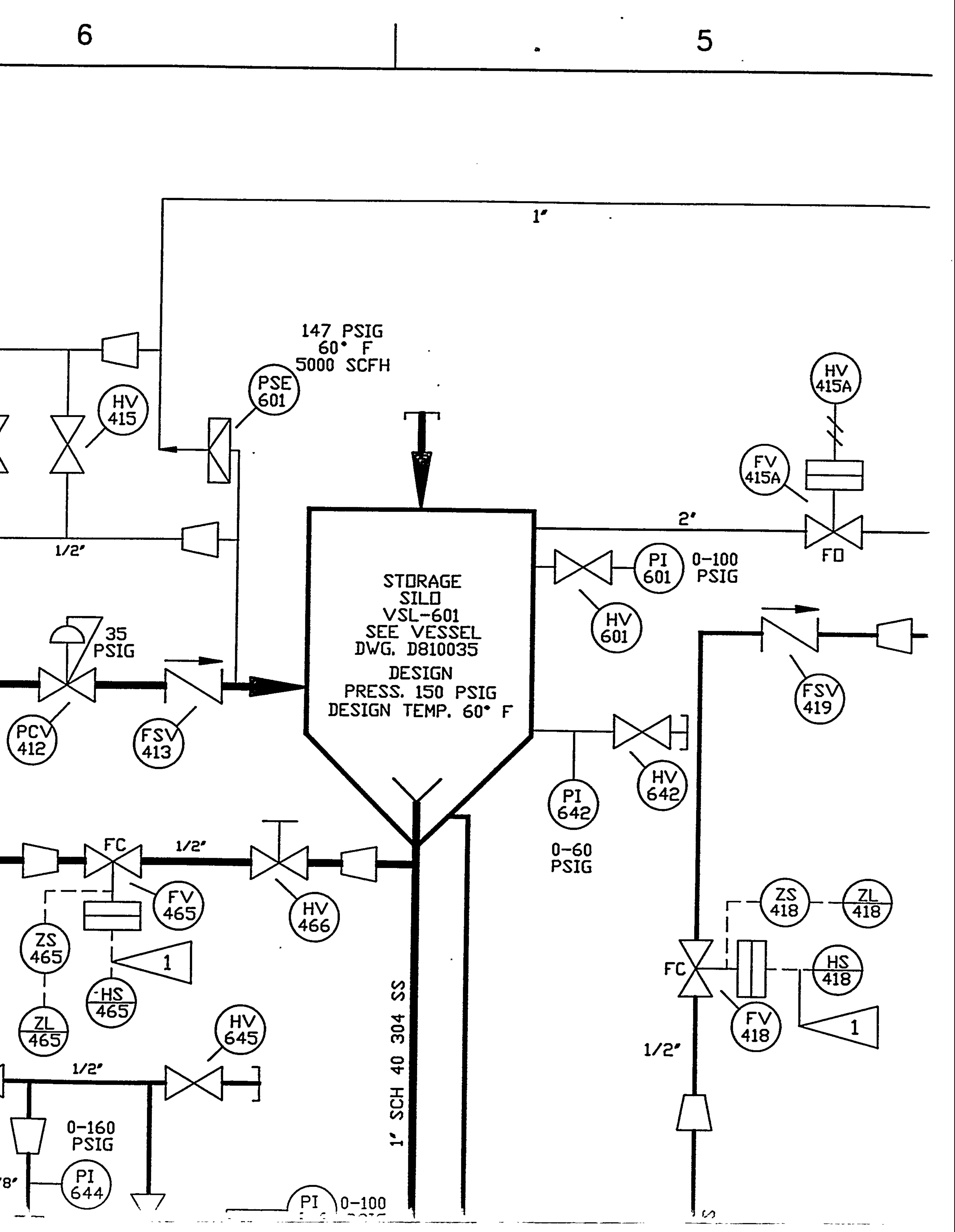
TITLE:
B-12 P&ID
FLUIDIZED BED GASIFIER
A.G.C., CONCEPTUAL

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

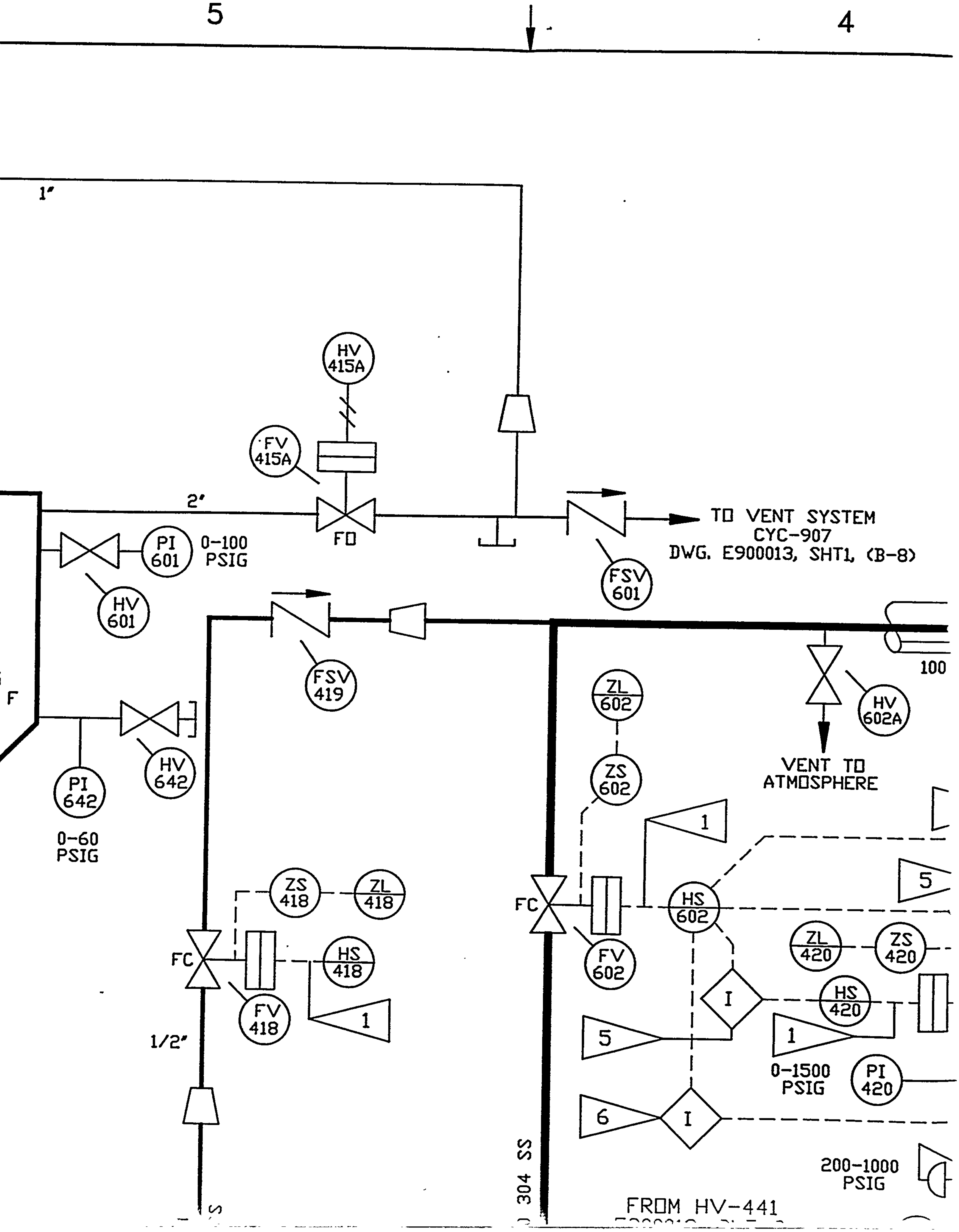

8
7
H
G
F
FROM FCV 109
DWG. E900010
60° F
250-2000 SCFH
HV
159
FSV
111A
FSV
111
TRAN
OUTSIDE
CELL
INSIDE
CELL
CLOSED
8
HS
117
1
ZL
117
ZS
117
FV
117
FC
1'
P.O.C. TO
ATMOSPHERE
A
TE
120A
1
OPEN
8



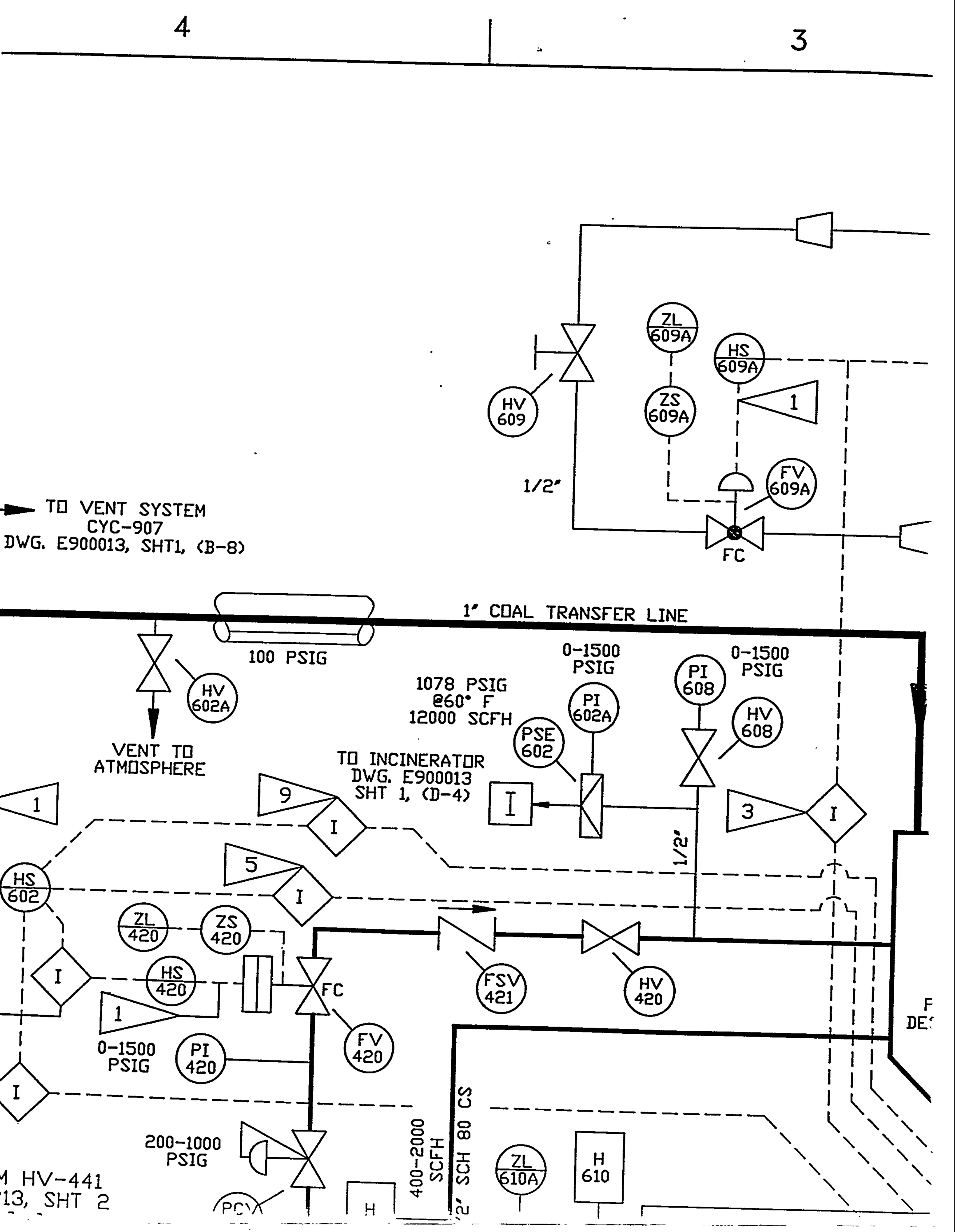
FROM HV-401B
E900010, (A-8)
1200 PSIG
400-2000 SCFH
1/2" SSTL TUBING
$N_2$
TO
BAG HOUSE
0-50
PSIG
HV
415
PSE
601
1
CLOSED
8
HS
409
FV
409
FC
ZL
409
ZS
409
PCV
414
1/2"
FSV
410
35
PSIG
1"
HV
411
PCV
412
FSV
413
1/2" SCH 80 CS
TRANSFER AIR 0-700 PSIG
1"
FC
1/2"
ZL
117
HS
117
ZS
117
HV
464
FV
465
ZS
465
1
HS
465
ZL
465
HV
645
1" SCH 80 316 SS
FC
1/2"
A
TE
120A
1400 °F
TAH
120
HV
643
0-160
PSIG
3/8"
PI
644



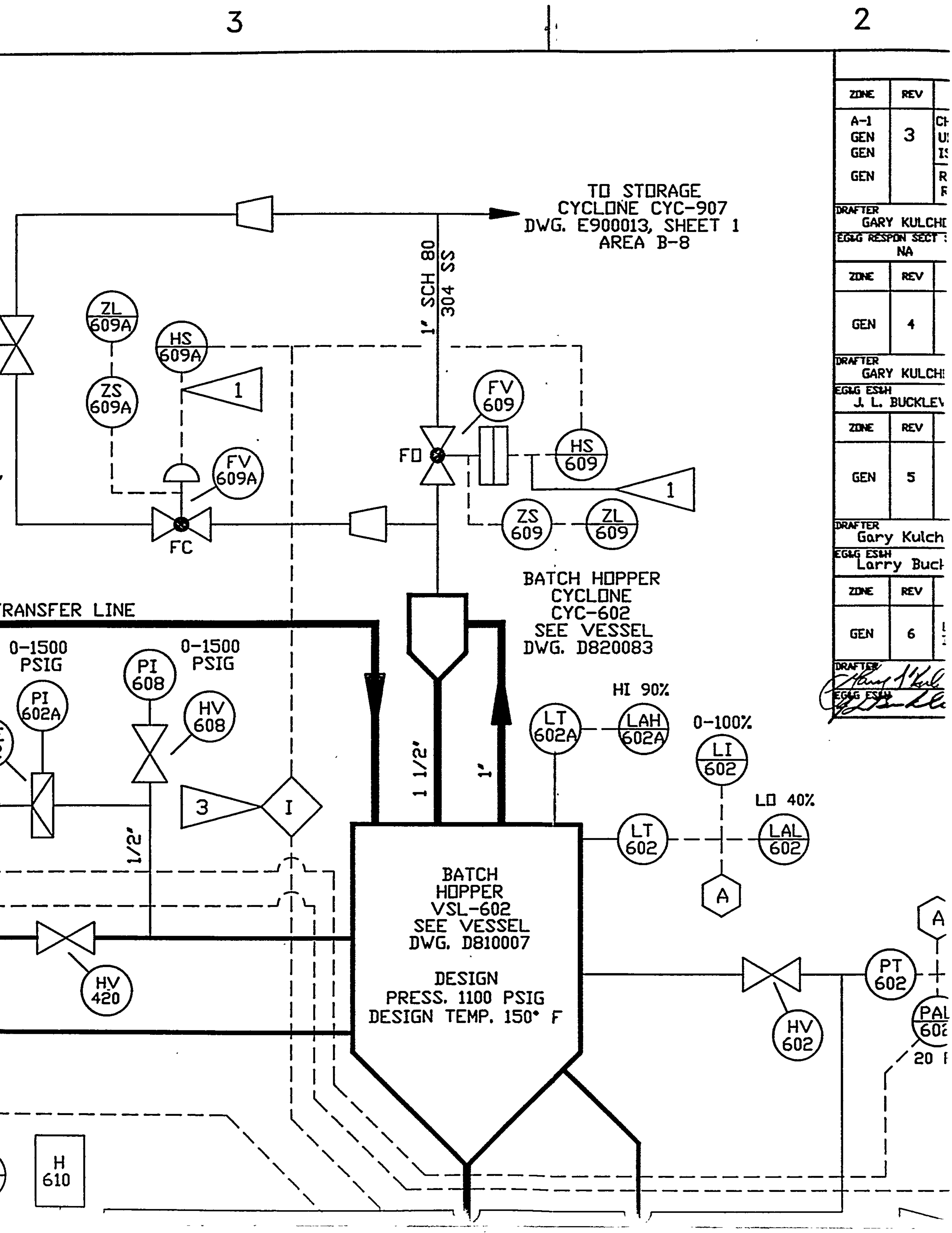
6
5
1"
147 PSIG
60° F
5000 SCFH
PSE 601
HV 415
HV 415A
FV 415A
2"
FO
1/2"
PI 601
0-100 PSIG
HV 601
STORAGE
SILO
VSL-601
SEE VESSEL
DWG. D810035
DESIGN
PRESS. 150 PSIG
DESIGN TEMP. 60° F
35 PSIG
PCV 412
FSV 413
FSV 419
HV 642
PI 642
0-60 PSIG
FC
1/2"
FV 465
HV 466
ZS 465
HS 465
ZL 465
1
ZS 418
ZL 418
HS 418
FC
FV 418
1/2"
1
HV 645
1/2"
0-160 PSIG
PI 644
1" SCH 40 304 SS
PI
0-100



5
4
1"
HV 415A
FV 415A
2"
FO
TO VENT SYSTEM
CYC-907
DWG. E900013, SHT1, (B-8)
PI 601
0-100 PSIG
HV 601
FSV 601
FSV 419
F
100
ZL 602
ZS 602
HV 602A
VENT TO ATMOSPHERE
HV 642
PI 642
0-60 PSIG
ZS 418
ZL 418
FC
HS 418
FV 418
1
1/2"
FC
FV 602
HS 602
1
5
ZL 420
ZS 420
I
HS 420
5
1
0-1500 PSIG
PI 420
6
I
304 SS
200-1000 PSIG
FROM HV-441



4
3
TO VENT SYSTEM
CYC-907
DWG. E900013, SHT1, (B-8)
1" COAL TRANSFER LINE
100 PSIG
HV 602A
VENT TO ATMOSPHERE
1078 PSIG
@60° F
12000 SCFH
TO INCINERATOR
DWG. E900013
SHT 1, (D-4)
0-1500 PSIG
PI 602A
PSE 602
PI 608
HV 608
HV 609
ZL 609A
ZS 609A
HS 609A
FV 609A
FC
1/2"
HS 602
ZL 420
ZS 420
HS 420
FV 420
PI 420
FSV 421
HV 420
0-1500 PSIG
200-1000 PSIG
400-2000 SCFH
2" SCH 80 CS
ZL 610A
H 610
H
M HV-441
13, SHT 2



3
2
ZONE
REV
A-1
GEN
GEN
GEN
3
DRAFTER
GARY KULCHI
EG&G RESPON SECT
NA
ZONE
REV
GEN
4
DRAFTER
GARY KULCHI
EG&G ES&H
J. L. BUCKLEY
ZONE
REV
GEN
5
DRAFTER
Gary Kulch
EG&G ES&H
Larry Buck
ZONE
REV
GEN
6
DRAFTER
EG&G ES&H
TO STORAGE
CYCLONE CYC-907
DWG. E900013, SHEET 1
AREA B-8
1" SCH 80
304 SS
ZL 609A
ZS 609A
HS 609A
1
FV 609A
FC
FV 609
FO
HS 609
1
ZS 609
ZL 609
BATCH HOPPER
CYCLONE
CYC-602
SEE VESSEL
DWG. D820083
TRANSFER LINE
0-1500
PSIG
PI 602A
0-1500
PSIG
PI 608
HV 608
3
I
1/2"
1 1/2"
1"
HI 90%
LT 602A
LAH 602A
0-100%
LI 602
LO 40%
LT 602
LAL 602
A
A
BATCH
HOPPER
VSL-602
SEE VESSEL
DWG. D810007
DESIGN
PRESS. 1100 PSIG
DESIGN TEMP. 150° F
HV 420
HV 602
PT 602
PAL 602
20
H 610

2 1

## REVISION

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

H

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

| ONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 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 |

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

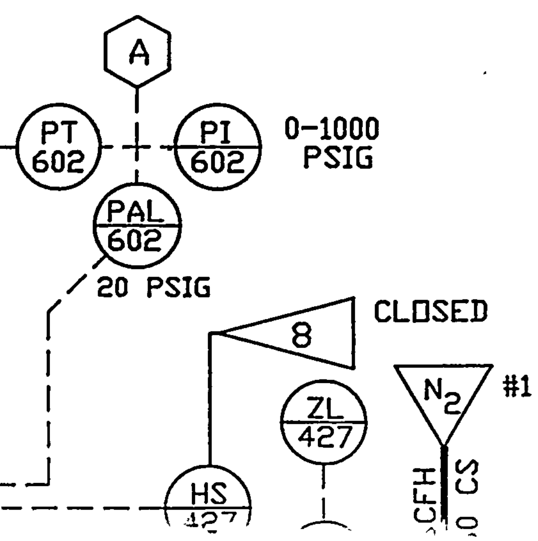
| ONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 5 | ADDED LT-602A, LT-603A, FSV-601, HV-321 & HV-320; MODIFIED LAHL 602 TO LAH-602 & LAL-602<br>MODIFIED LAHL 603 TO LAH-603 & LAL-603; ADDED "#1" TO $N_2$, ADDED NOTE 10<br>ADDED INCINERATOR NOTES TO (2) INCINERATOR DESIGNATIONS; ADDED NOTE 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 |

| FTER | 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 |
| G ES&H Larry Bucklew | DATE 9/17/93 | PROJECT ENGR. John Rockey | DATE 9/21/93 | BRANCH MANAGER Larry Shadle | DATE 9/21/93 | DOE (EDSD) John Rotunda/WJA | DATE 9/20/93 |

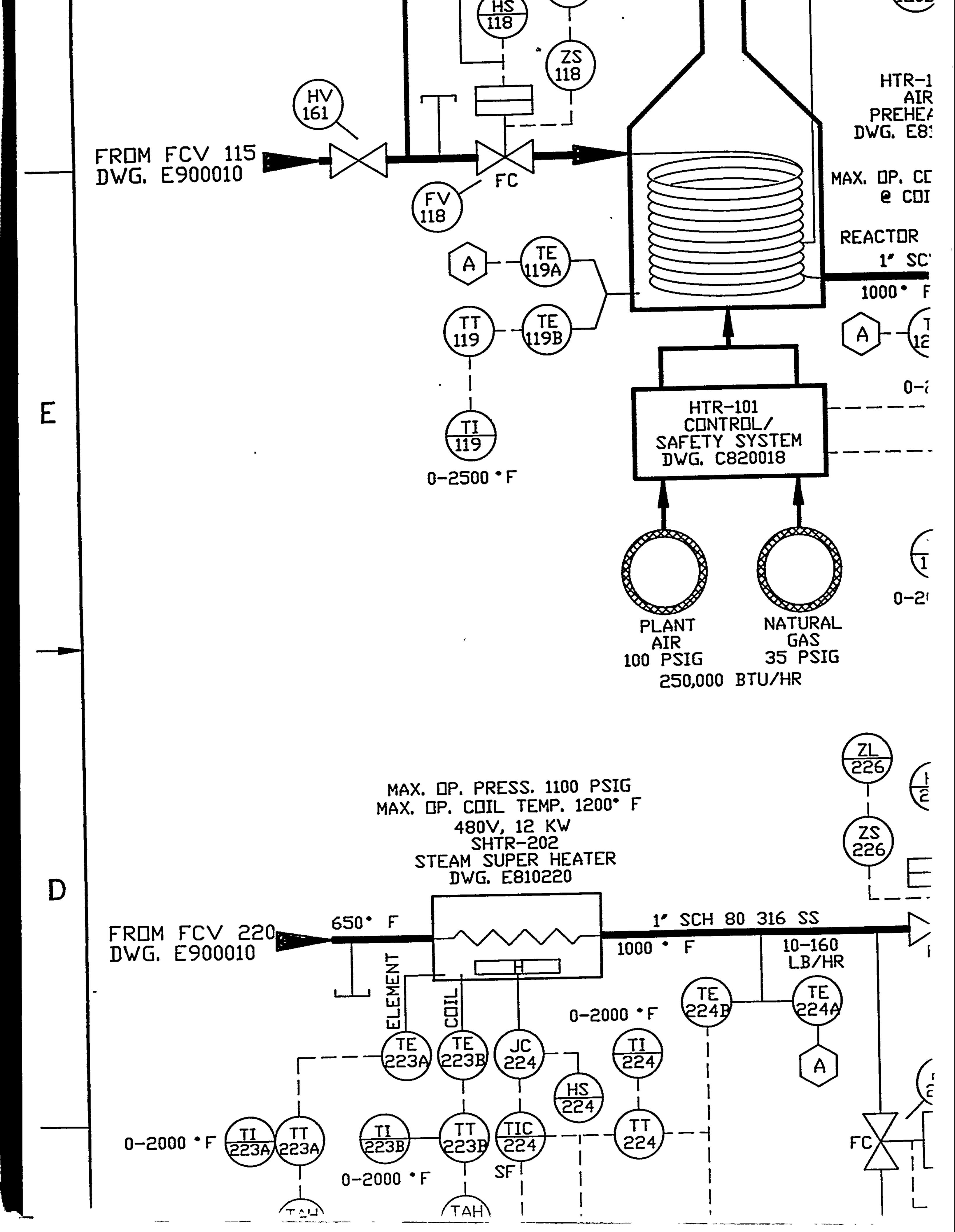
| ONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 6 | EXTENSIVE CHANGES AS PER MARKED PRINT REDLINED BY JAY RUTTEN ON 15 FEB 94.<br>ISSUED FOR CONSTRUCTION | 8/18/94 |

| FTER | 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 |
| G ES&H Bucklew | DATE 10-11-94 | PROJECT ENGR. John M Rockey | DATE 10/13/94 | BRANCH MANAGER Larry Shadle | DATE 10-18-94 | DOE (EDSD) [illegible] | DATE 10/14/94 |

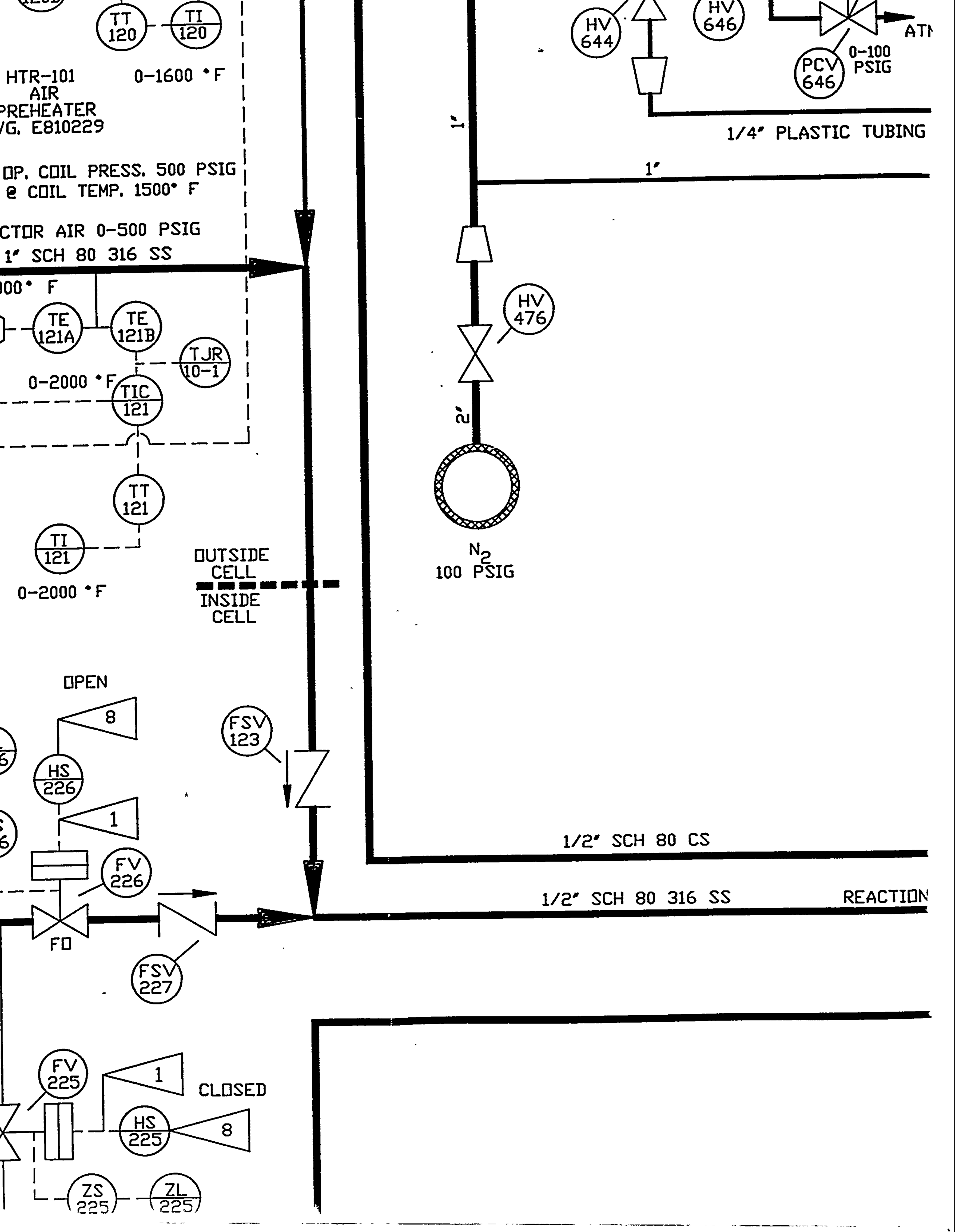
G



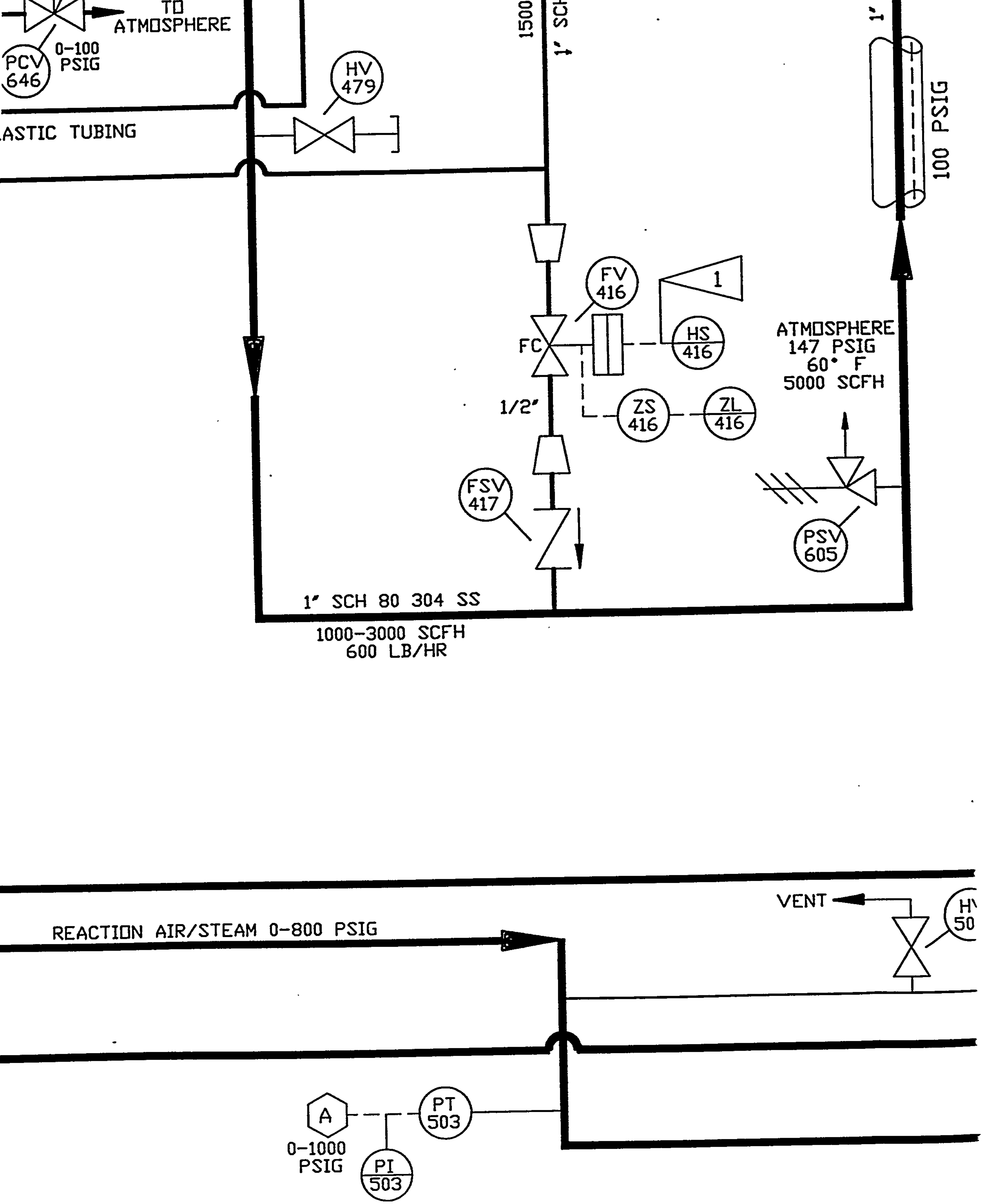

F



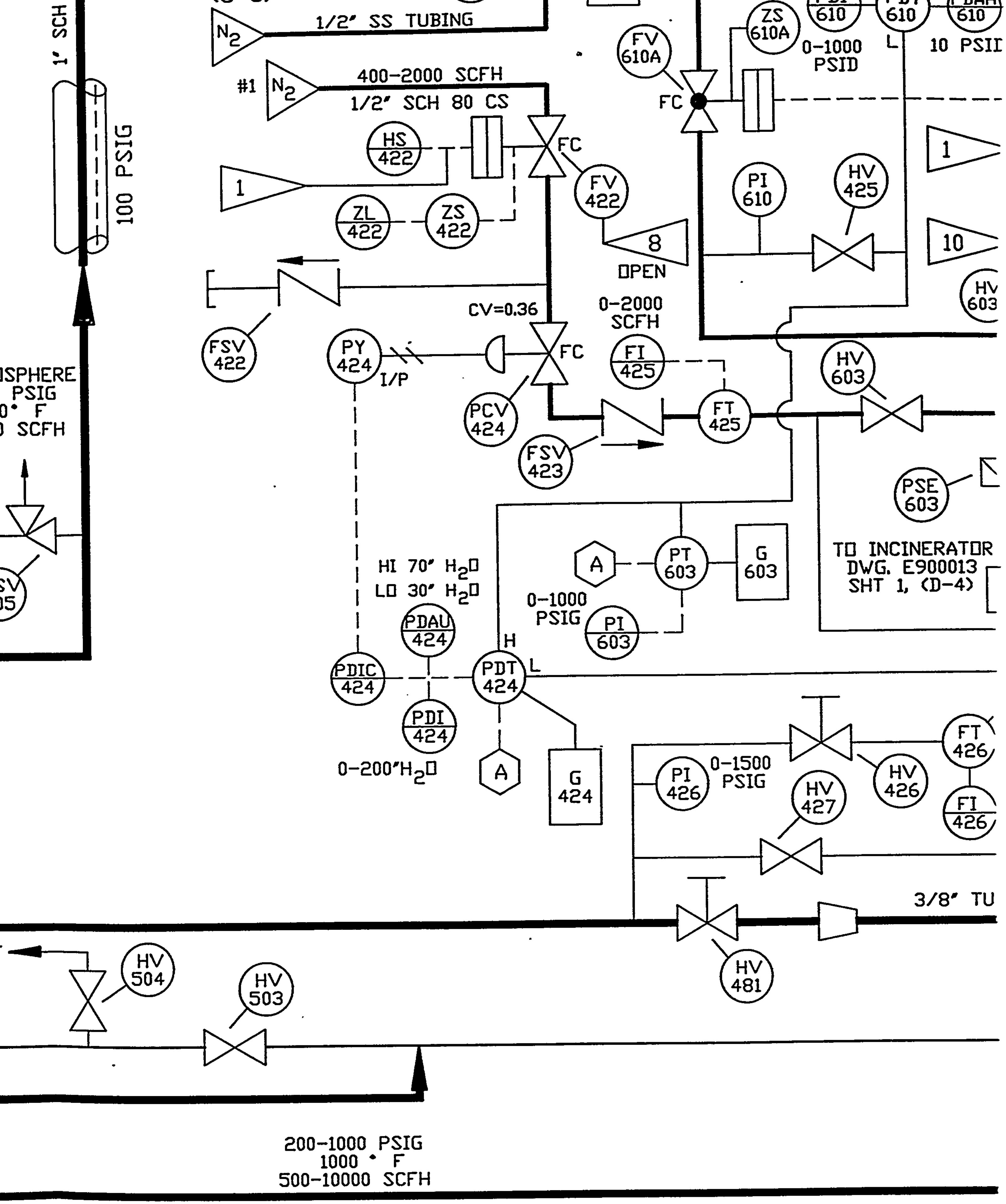
E
D
HS 118
ZS 118
HV 161
FROM FCV 115
DWG. E900010
FC
FV 118
HTR-1
AIR
PREHE
DWG. E8
MAX. OP. C
@ CO
REACTOR
1" SC
1000° F
A
TE 119A
TT 119
TE 119B
TI 119
0-2500 °F
HTR-101
CONTROL/
SAFETY SYSTEM
DWG. C820018
PLANT
AIR
100 PSIG
NATURAL
GAS
35 PSIG
250,000 BTU/HR
ZL 226
ZS 226
MAX. OP. PRESS. 1100 PSIG
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
ELEMENT
COIL
TE 224B
TE 224A
0-2000 °F
TE 223A
TE 223B
JC 224
TI 224
HS 224
TI 223A
TT 223A
TI 223B
TT 223B
TIC 224
TT 224
SF
0-2000 °F
TAH
FC



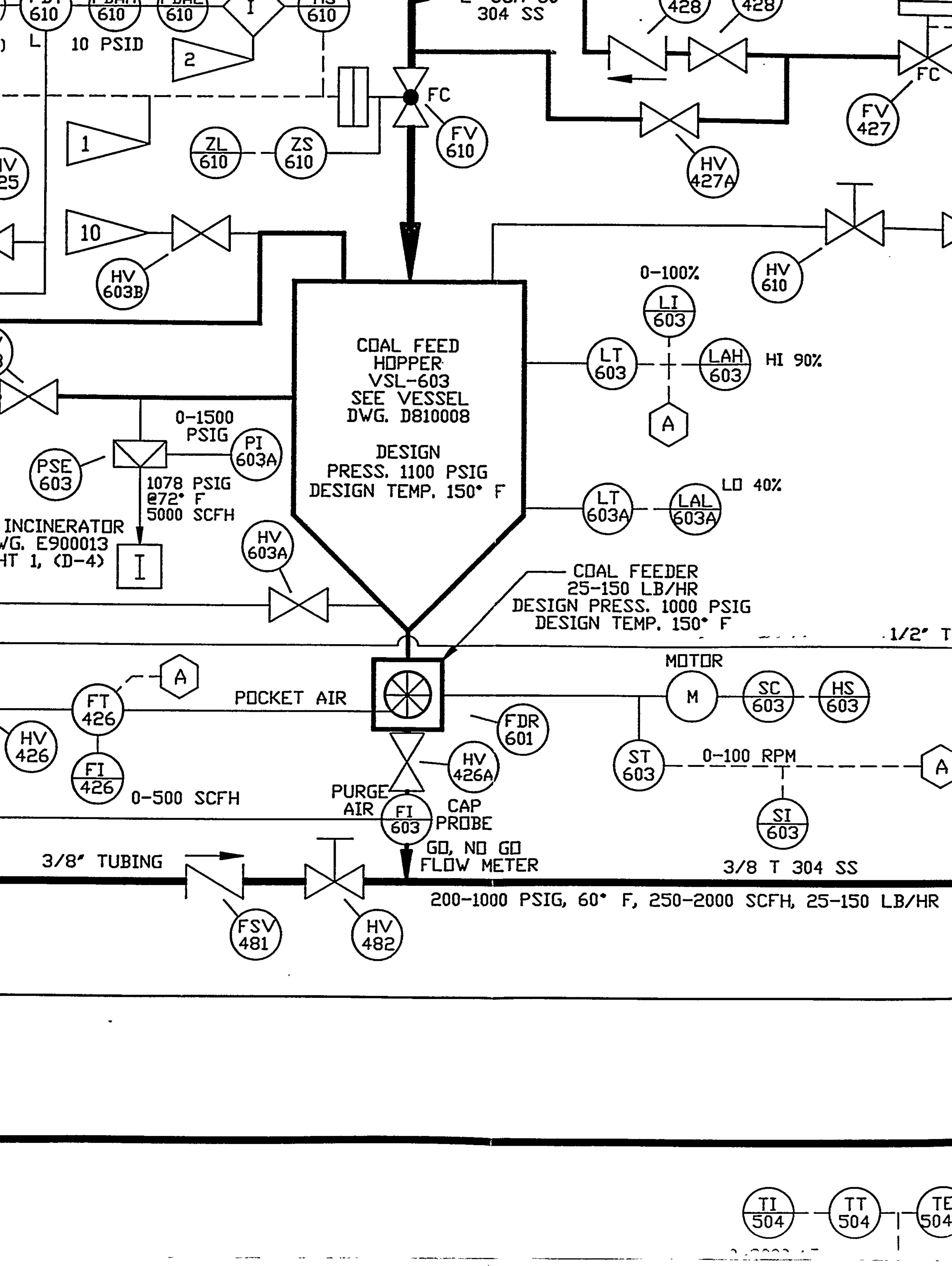
TT 120
TI 120
HTR-101
AIR
PREHEATER
/G. E810229
0-1600 °F
DP. COIL PRESS. 500 PSIG
@ COIL TEMP. 1500° F
CTOR AIR 0-500 PSIG
1" SCH 80 316 SS
00° F
TE 121A
TE 121B
TJR 10-1
0-2000 °F
TIC 121
TT 121
TI 121
0-2000 °F
OUTSIDE
CELL
INSIDE
CELL
OPEN
8
HS 226
1
FV 226
FO
FSV 227
FSV 123
FV 225
1
CLOSED
HS 225
8
ZS 225
ZL 225
HV 644
HV 646
PCV 646
0-100
PSIG
ATM
1"
1/4" PLASTIC TUBING
1"
HV 476
2"
$N_2$
100 PSIG
1/2" SCH 80 CS
1/2" SCH 80 316 SS
REACTION



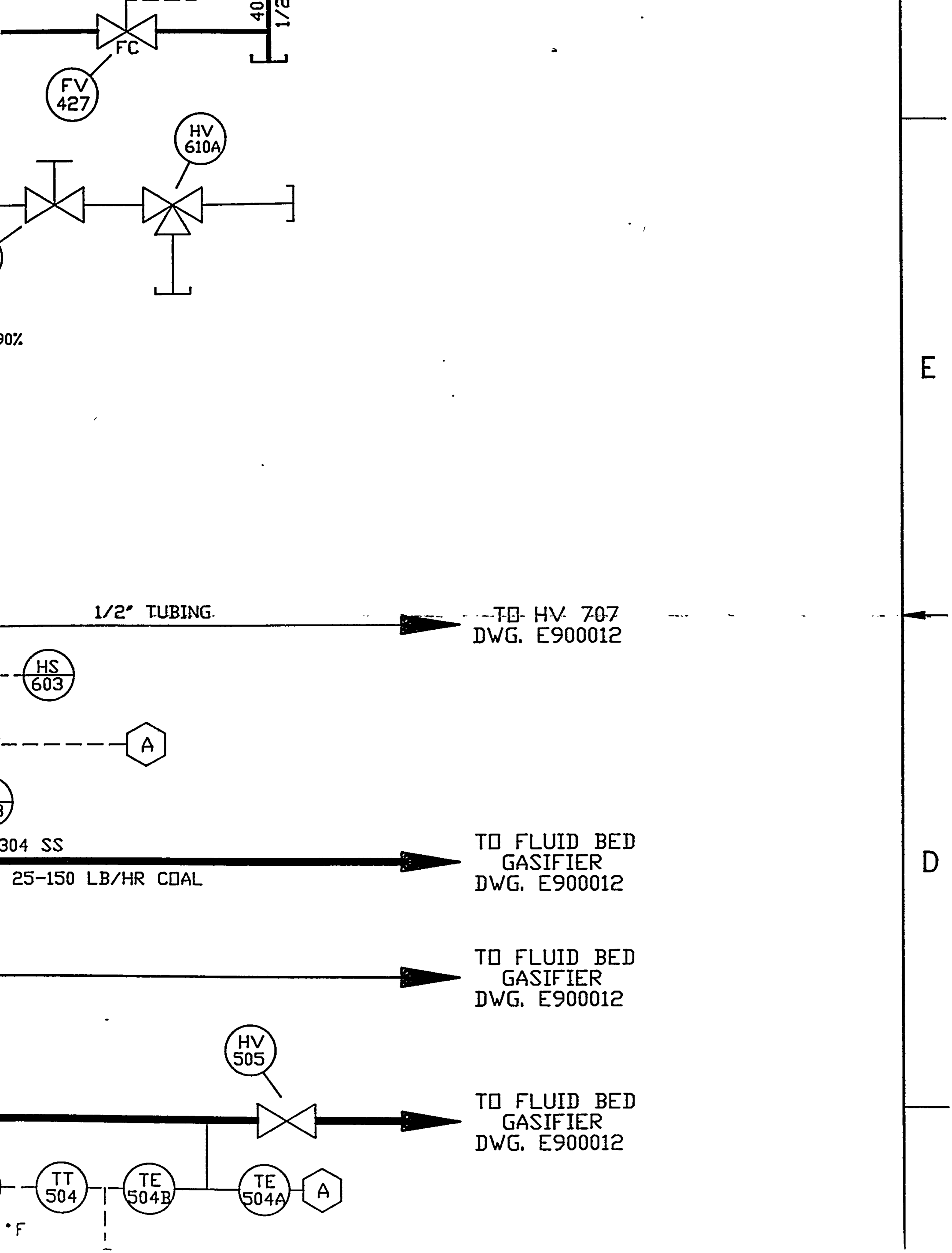
TO ATMOSPHERE
PCV 646
0-100 PSIG
HV 479
ASTIC TUBING
1500
1" SCH
1"
100 PSIG
FV 416
FC
1
HS 416
ATMOSPHERE
147 PSIG
60° F
5000 SCFH
1/2"
ZS 416
ZL 416
FSV 417
PSV 605
1" SCH 80 304 SS
1000-3000 SCFH
600 LB/HR
VENT
HV 50
REACTION AIR/STEAM 0-800 PSIG
A
PT 503
0-1000 PSIG
PI 503



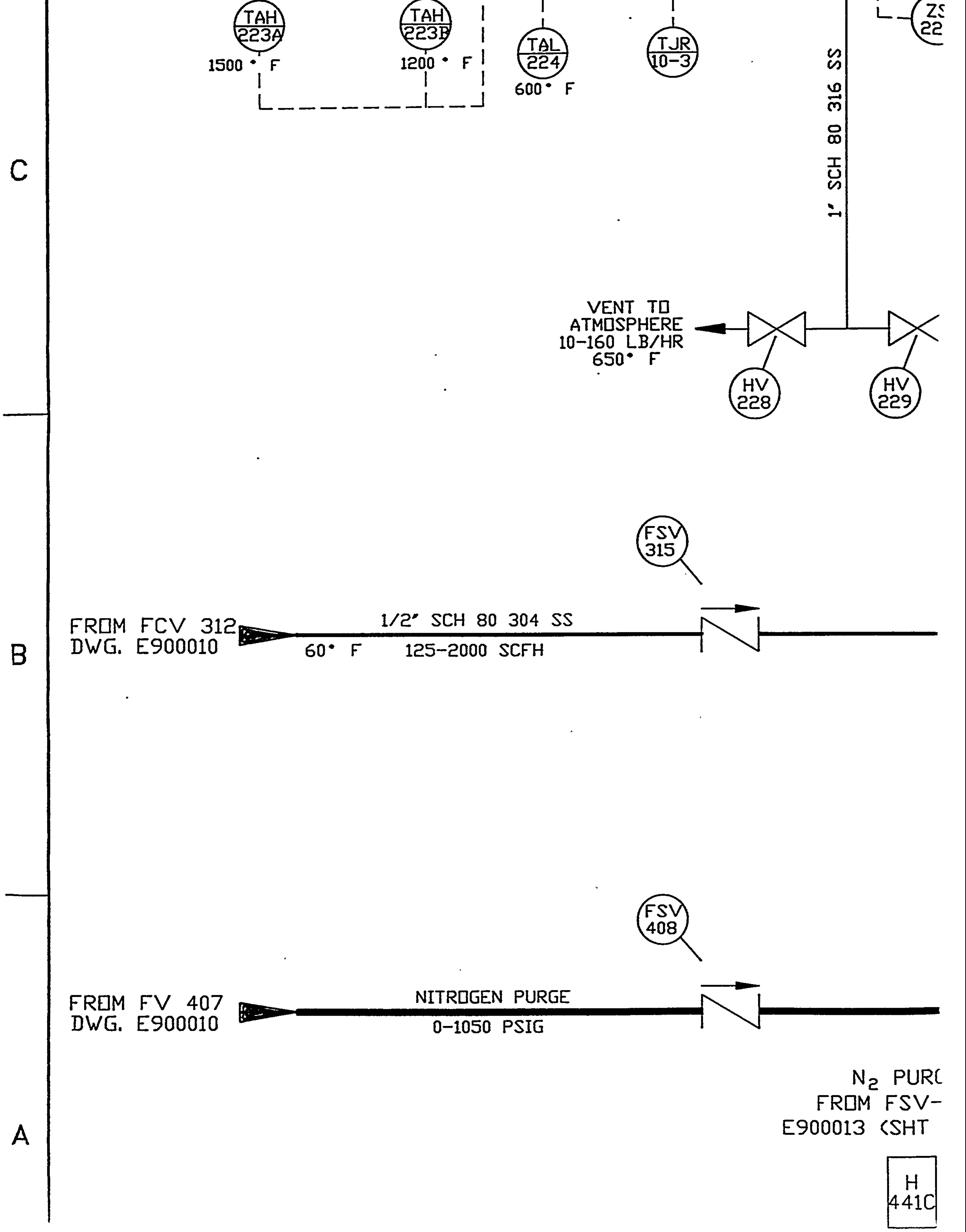
1/2" SS TUBING
$N_2$
#1
$N_2$
400-2000 SCFH
1/2" SCH 80 CS
1" SCH
100 PSIG
HS 422
FC
1
FV 422
ZL 422
ZS 422
8
OPEN
FSV 422
CV=0.36
0-2000 SCFH
PY 424
I/P
FC
FI 425
PCV 424
FT 425
FSV 423
ATMOSPHERE
PSIG
°F
SCFH
HI 70" $H_2O$
LO 30" $H_2O$
PDAU 424
PDIC 424
PDT 424
H
L
PDI 424
0-200"$H_2O$
A
G 424
FV 610A
ZS 610A
FC
0-1000 PSID
610
610
610
L
10 PSID
1
PI 610
HV 425
10
HV 603
HV 603
PSE 603
A
PT 603
G 603
0-1000 PSIG
PI 603
TO INCINERATOR DWG. E900013 SHT 1, (D-4)
PI 426
0-1500 PSIG
HV 427
HV 426
FT 426
FI 426
3/8" TU
HV 481
HV 504
HV 503
SV 505
200-1000 PSIG
1000 °F
500-10000 SCFH

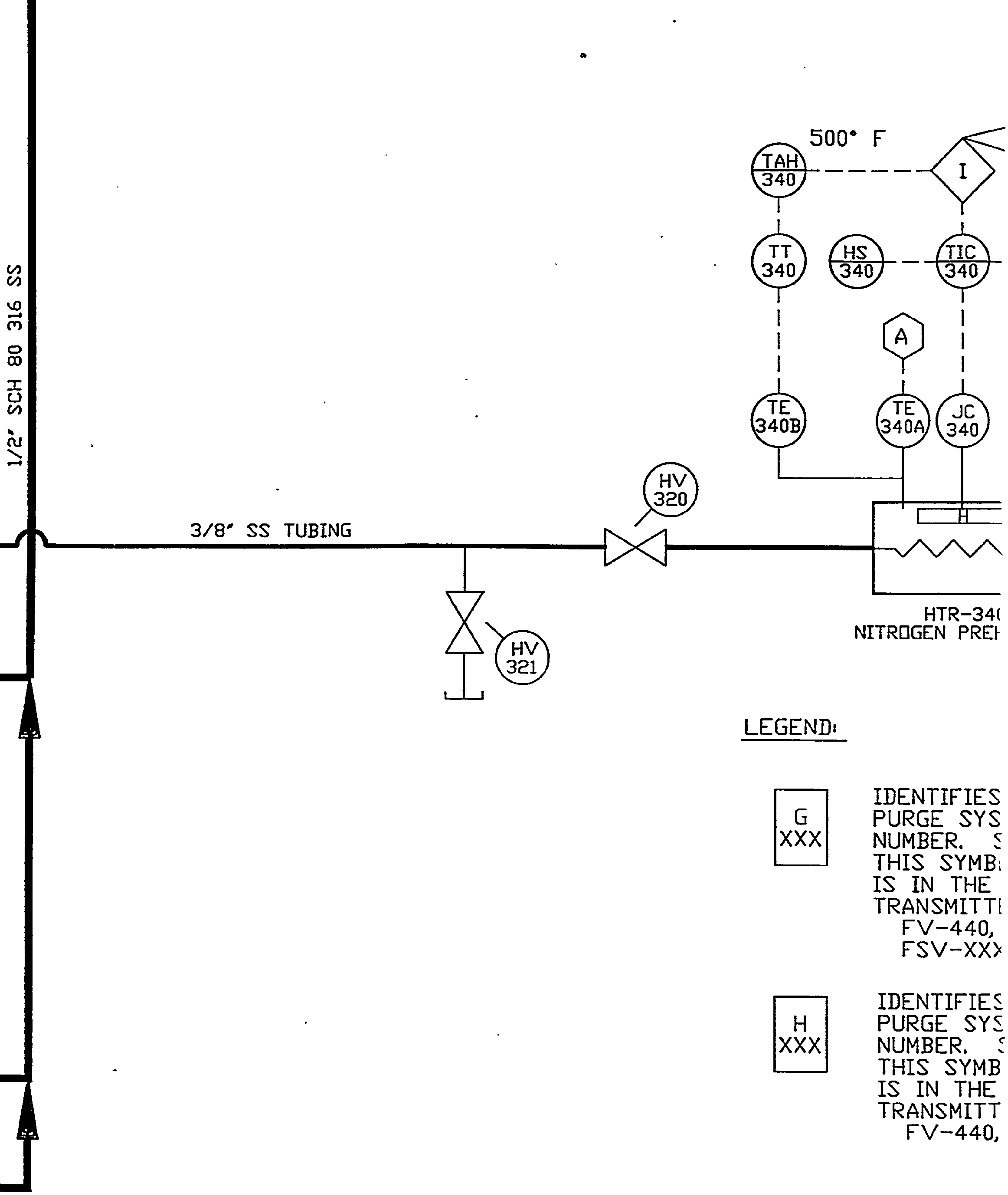


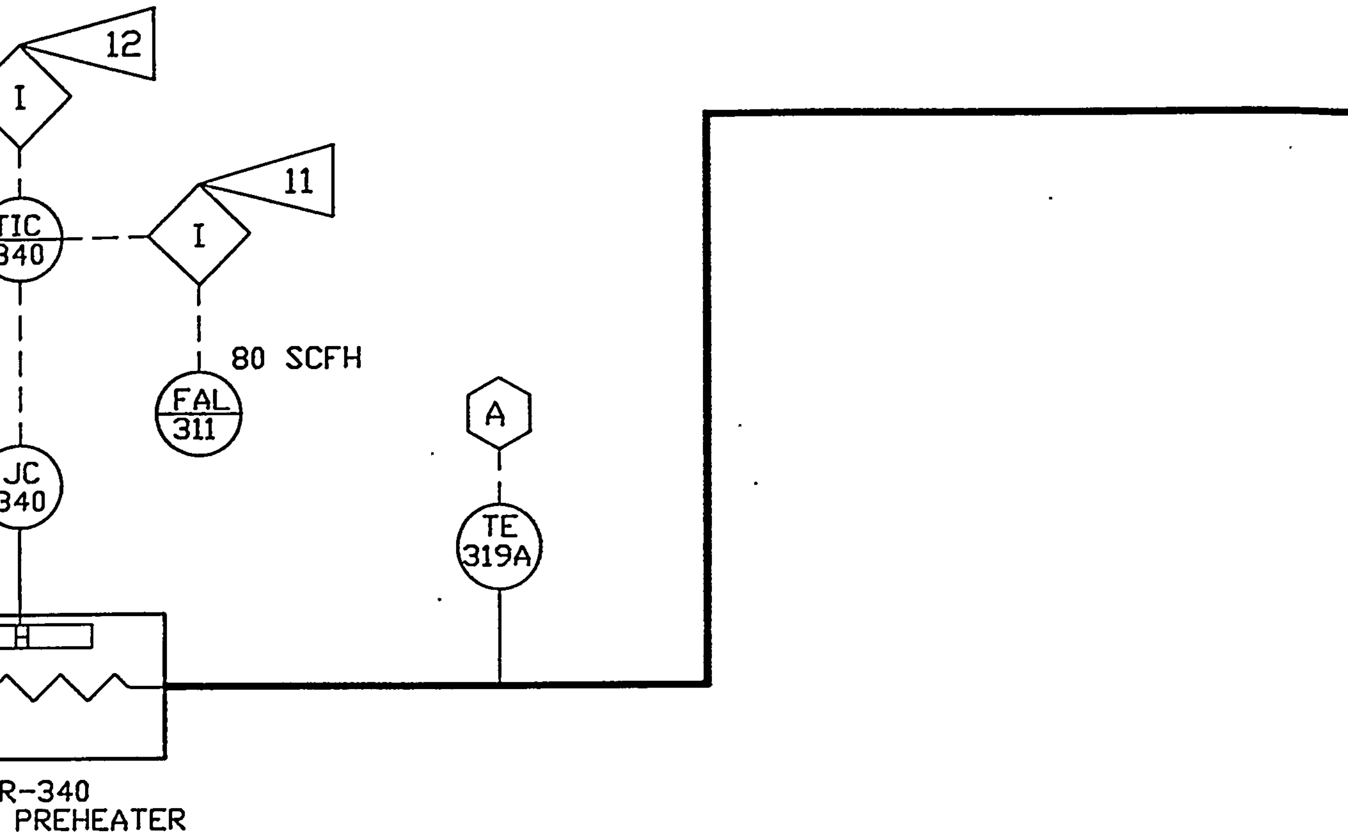
610
L
10 PSID
304 SS
FC
FV 610
ZL 610
ZS 610
FV 427
HV 427A
HV 603B
HV 610
0-100%
LI 603
LT 603
LAH 603
HI 90%
COAL FEED
HOPPER
VSL-603
SEE VESSEL
DWG. D810008
DESIGN
PRESS. 1100 PSIG
DESIGN TEMP. 150° F
0-1500
PSIG
PI 603A
PSE 603
1078 PSIG
@72° F
5000 SCFH
INCINERATOR
WG. E900013
HT 1, (D-4)
LT 603A
LAL 603A
LO 40%
HV 603A
COAL FEEDER
25-150 LB/HR
DESIGN PRESS. 1000 PSIG
DESIGN TEMP. 150° F
1/2" T
MOTOR
M
SC 603
HS 603
FT 426
POCKET AIR
HV 426
FI 426
0-500 SCFH
FDR 601
HV 426A
ST 603
0-100 RPM
SI 603
PURGE
AIR
FI 603
CAP
PROBE
GO, NO GO
FLOW METER
3/8" TUBING
3/8 T 304 SS
200-1000 PSIG, 60° F, 250-2000 SCFH, 25-150 LB/HR
FSV 481
HV 482
TI 504
TT 504



FC
FV 427
40
1/2
HV 610A
90%
E
1/2" TUBING
TO HV 707
DWG. E900012
HS 603
A
304 SS
25-150 LB/HR COAL
TO FLUID BED GASIFIER
DWG. E900012
D
TO FLUID BED GASIFIER
DWG. E900012
HV 505
TO FLUID BED GASIFIER
DWG. E900012
TT 504
TE 504B
TE 504A
A
°F


TAH 223A
1500° F
TAH 223B
1200° F
TAL 224
600° F
TJR 10-3
ZS 22
1" SCH 80 316 SS
VENT TO ATMOSPHERE
10-160 LB/HR
650° F
HV 228
HV 229
C
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


1/2" SCH 80 316 SS
500° F
TAH 340
I
TT 340
HS 340
TIC 340
A
TE 340B
TE 340A
JC 340
HV 320
3/8" SS TUBING
HV 321
HTR-34
NITROGEN PRE
LEGEND:
G XXX
IDENTIFIES
PURGE SYS
NUMBER.
THIS SYMB
IS IN THE
TRANSMITT
FV-440,
FSV-XX
H XXX
IDENTIFIES
PURGE SYS
NUMBER.
THIS SYMB
IS IN THE
TRANSMITT
FV-440,




NOTES:

1

2

3

4

5

6

7

8

9

10

11

12

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

IFIES THE CONNECTING SEGMENT OF THE TRANSMITTER
SYSTEM, WHERE XXX IS THE SEGMENT IDENTIFICATION
R. SEE DWG. E900013, SHT. 2 OF 2 FOR DETAILS)
SYMBOL INDICATES THAT THE FOLLOWING EQUIPMENT
THE PURGE LINE FROM THE NITROGEN HEADER TO THE
MITTER:
-440, 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.

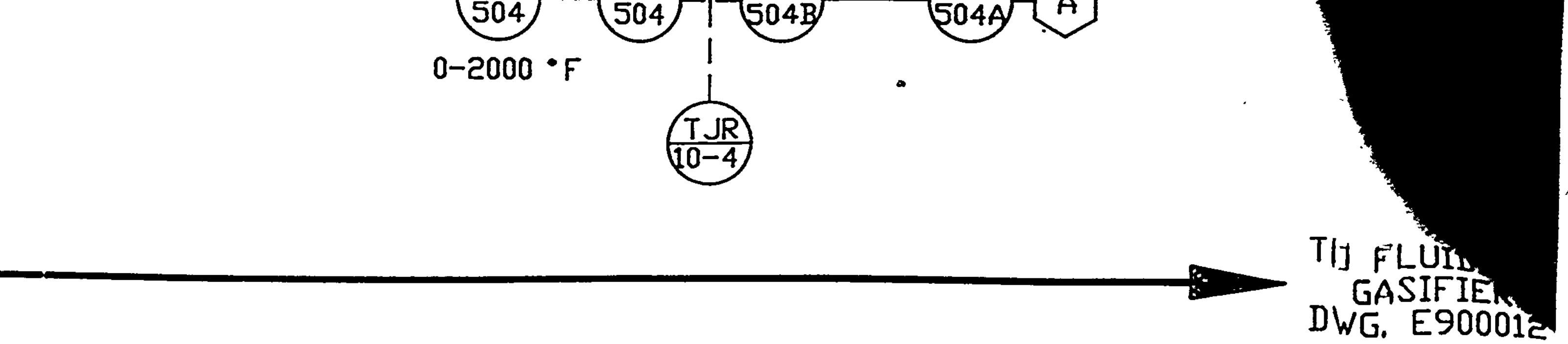
FV-602 WILL NOT OPEN UNTIL PT-602 MEASURES A PRESSURE LESS THAN 20 PSIG.

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

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




| REFERENCE DRAWINGS | DRAFTER | DATE |
|---|---|---|
| E900010<br>E900012<br>E900013 | S. CONKO | 3/6/90 |
| | CHECKER<br>A. R. KUBALA | DATE<br>3/6/90 |
| | PROJECT ENGINEER<br>J. P. KANOSKY | DATE<br>3/6/90 |
| | | DATE |
| | | DATE |
| | | DATE |
| | | DATE |
| | | DATE |

United States D

MORGANTOWN ENER

Morg

TITLE:

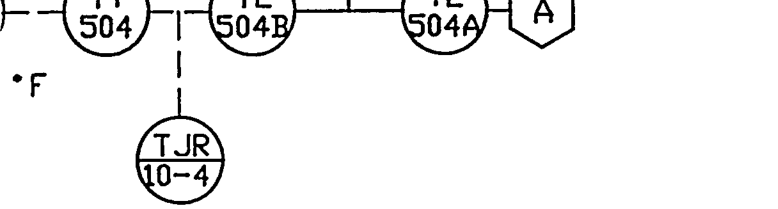
B-12 F

FLUIDIZED BE

A.G.C

| SIZE | FSCM NO | DWG NO |
|---|---|---|
| E | | E9 |

ING IS PART
&G DOCUMENT
L SYSTEM




C

DWG NO E900011 SH 1

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

United States Department of Energy

MORGANTOWN ENERGY TECHNOLOGY CENTER

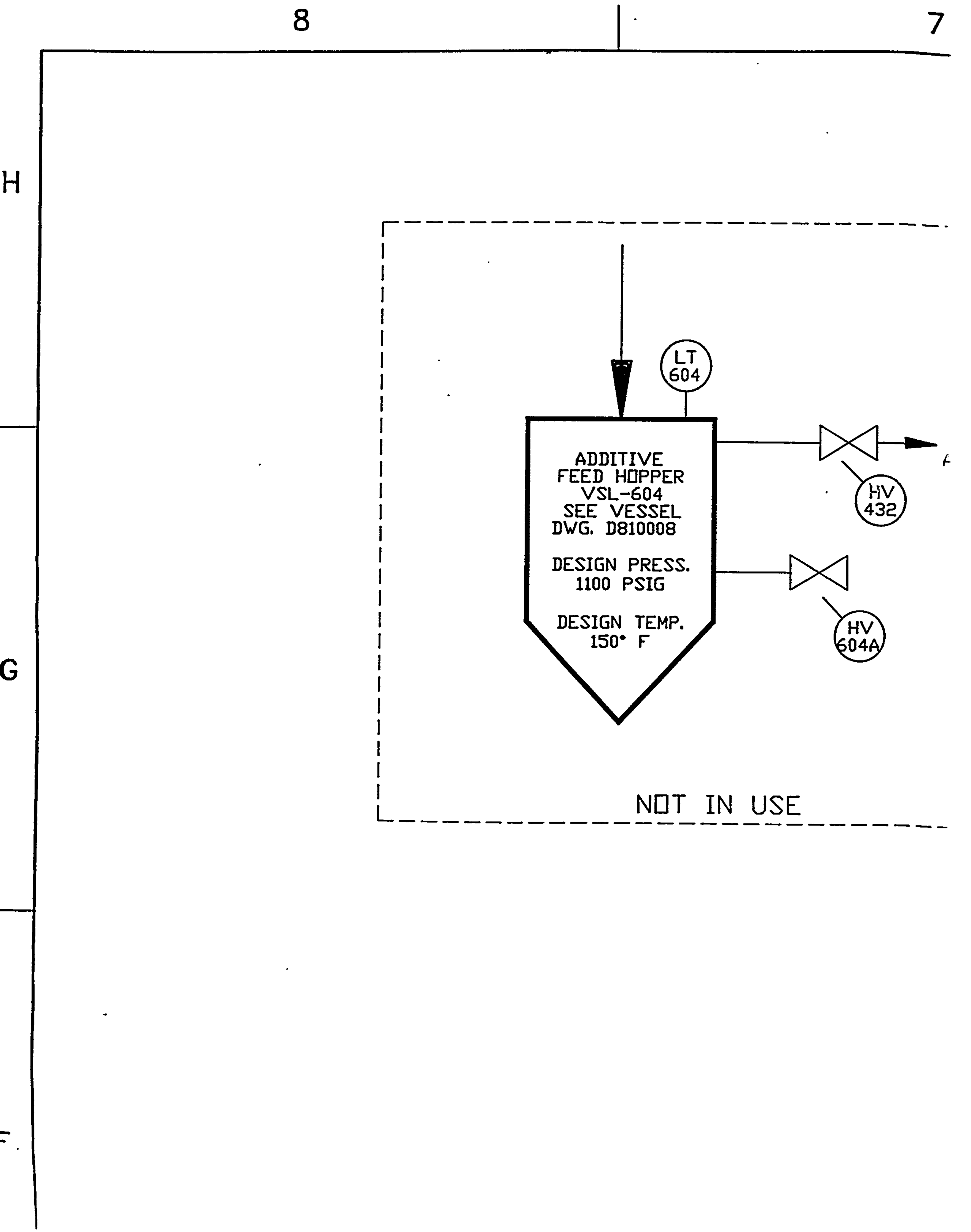
Morgantown, WV

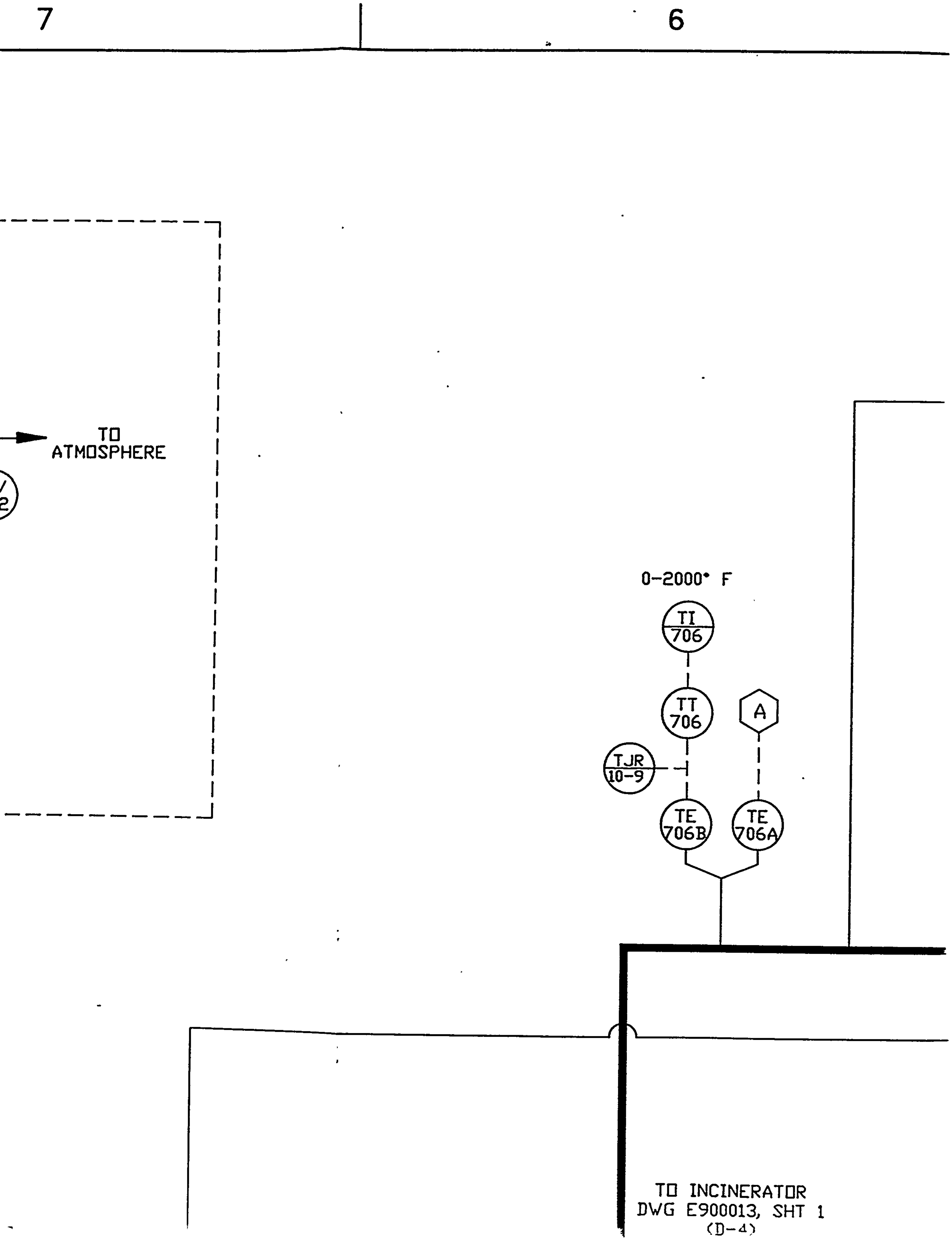
TITLE:

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

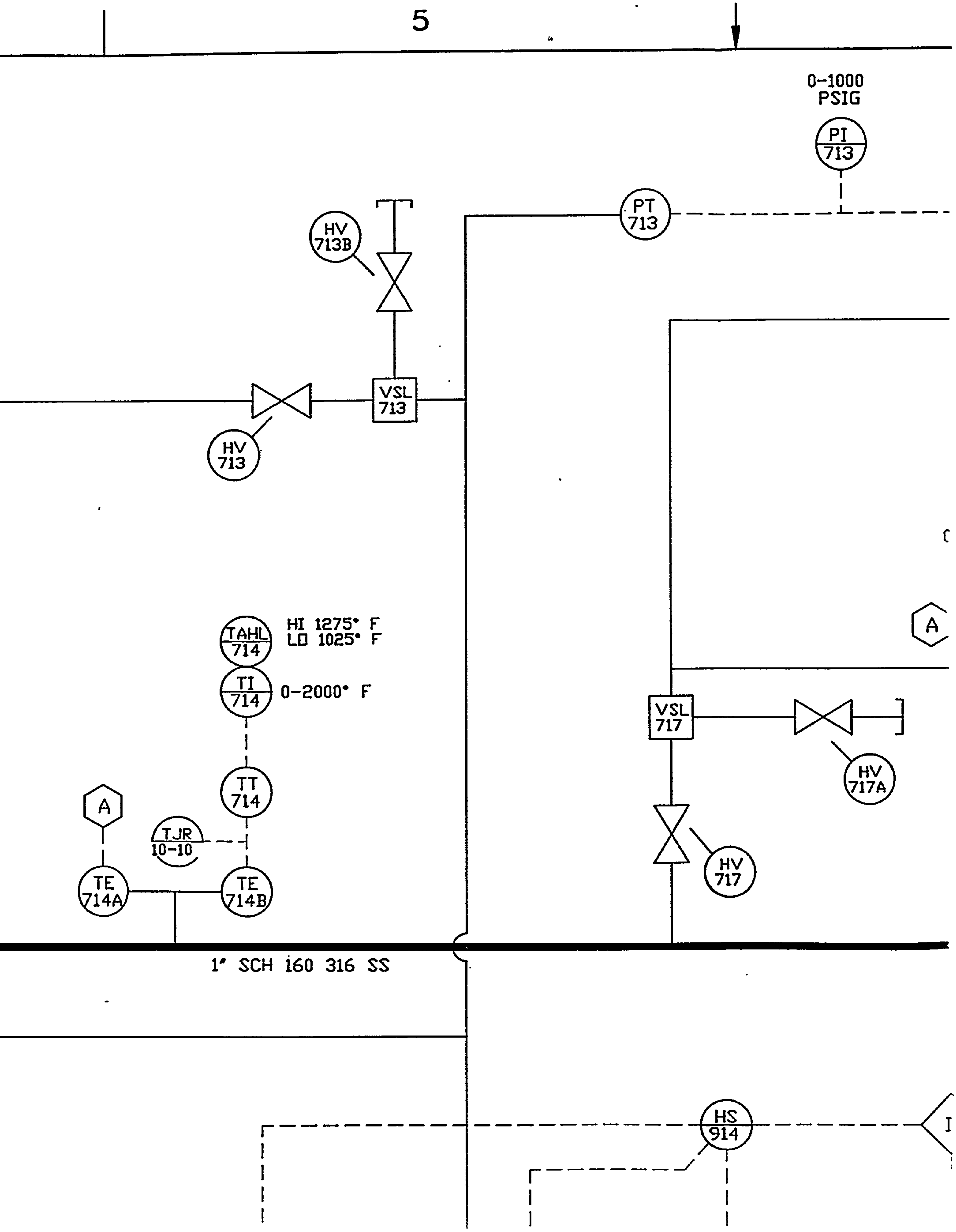
| SIZE | FSCM NO | DWG NO | REV |
|---|---|---|---|
| E | | E900011 | 6 |

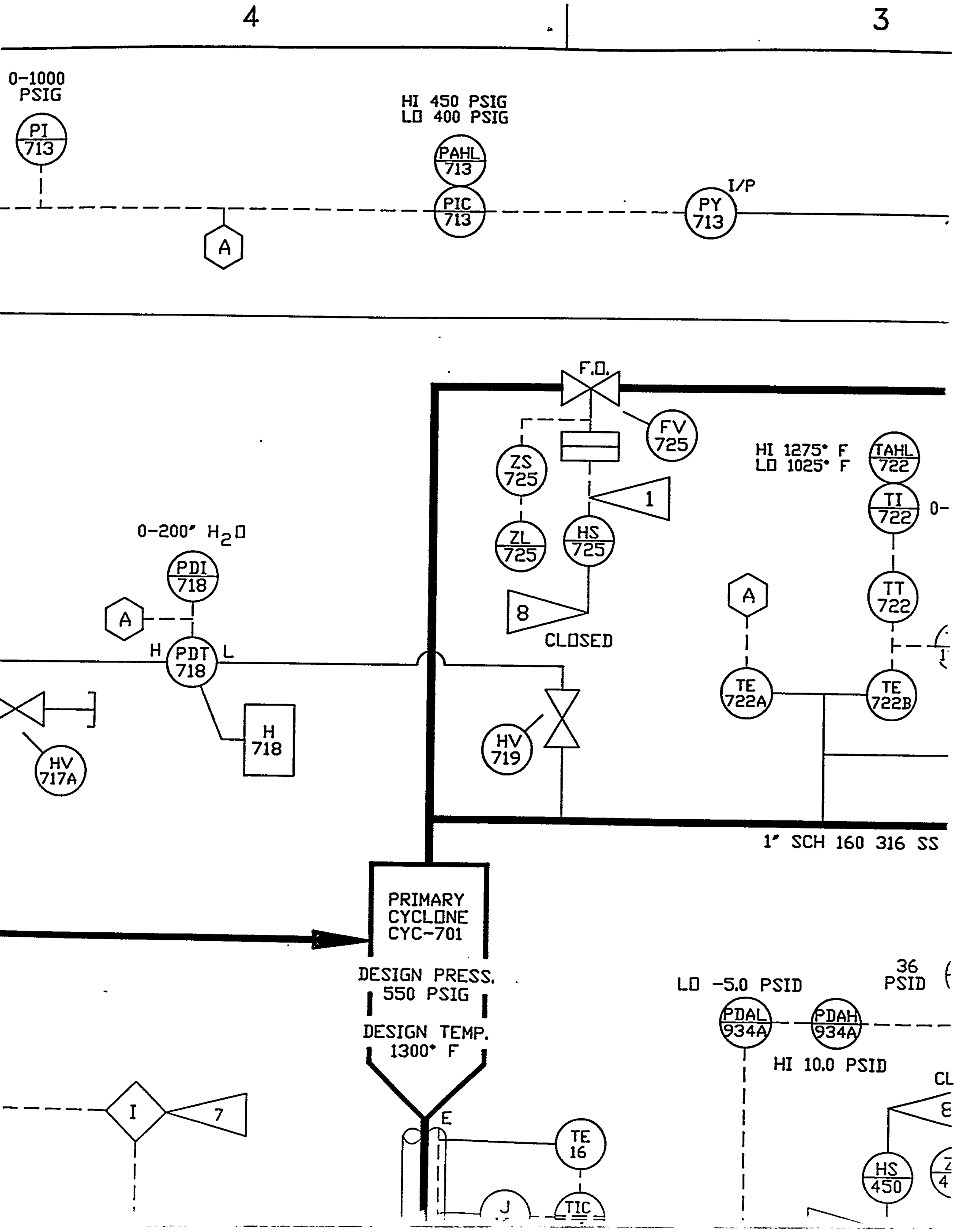
A

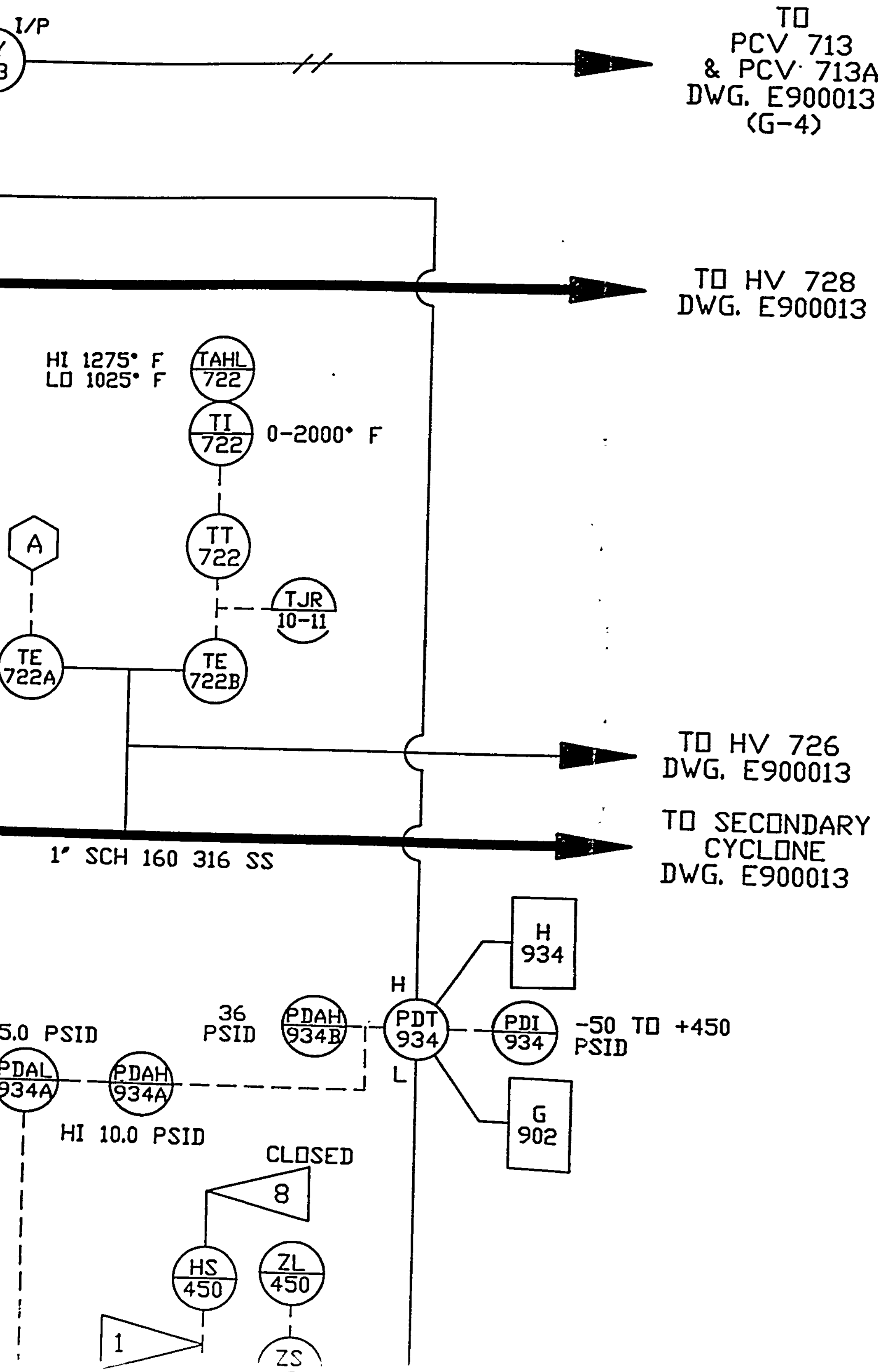

8
7
H
G
F
LT
604
ADDITIVE
FEED HOPPER
VSL-604
SEE VESSEL
DWG. D810008
DESIGN PRESS.
1100 PSIG
DESIGN TEMP.
150° F
HV
432
HV
604A
NOT IN USE



7
6
TO ATMOSPHERE
0-2000° F
TI 706
TT 706
A
TJR 10-9
TE 706B
TE 706A
TO INCINERATOR
DWG E900013, SHT 1
(D-4)


5
0-1000
PSIG
PI
713
PT
713
HV
713B
VSL
713
HV
713
TAHL
714
HI 1275° F
LO 1025° F
TI
714
0-2000° F
TT
714
A
TJR
10-10
TE
714A
TE
714B
1" SCH 160 316 SS
VSL
717
HV
717A
HV
717
A
HS
914
I


4
3
0-1000 PSIG
PI 713
HI 450 PSIG
LO 400 PSIG
PAHL 713
PIC 713
PY 713
I/P
A
F.O.
FV 725
ZS 725
ZL 725
HS 725
1
8
CLOSED
HI 1275° F
LO 1025° F
TAHL 722
TI 722
TT 722
TE 722A
TE 722B
0-200" H2O
PDI 718
PDT 718
H
L
H 718
HV 717A
HV 719
1" SCH 160 316 SS
PRIMARY CYCLONE CYC-701
DESIGN PRESS. 550 PSIG
DESIGN TEMP. 1300° F
LO -5.0 PSID
36 PSID
PDAL 934A
PDAH 934A
HI 10.0 PSID
I
7
E
TE 16
J
TIC
HS 450




| ZONE | REV | |
|---|---|---|
| GEN | 1 | UPDATED AS |
| E-6 | | REVISED PRI |
| GEN | | REVISED PE |
| B-3 | | REMOVED LS |
| C-3 | | REMOVED LS |
| E-3 | | REMOVED LS |
| G-7 | | REWORDED N |
| F-6 | | NOTE 1150 °F |
| DRAFTER G.J.K. | | DATE 1/3 |
| | | DATE |

| ZONE | REV | |
|---|---|---|
| GEN | 2 | UPDATED AS |
| GEN | | ADDED NEW |
| GEN | | UPDATED AS |
| GEN | | UPDATED AS |
| GEN | | ISSUED FOR |
| DRAFTER JIMMY SMITH | | DATE 7/17 |
| EG&G RESPON SECT SUPV BURTON W. HARRELL | | DATE 7/20 |

| ZONE | REV | |
|---|---|---|
| A-1 | 3 | CHANGED DW |
| GEN | | UPDATED AS |
| GEN | | ISSUED FOR |
| B-2 | | ADDED NOTES |
| GEN | | UPDATED AS |
| DRAFTER GARY J. KULCHOCK | | DATE 11/18 |
| EG&G ES&H J. L. BUCKLEW | | DATE 11/19 |

| ZONE | REV | |
|---|---|---|
| GEN | 4 | ADDED DESIGN VSL-904, VSL REMOVED NUM ISSUED FOR C |
| DRAFTER GARY J. KULCHOCK | | DATE 4/5/9 |
| EG&G ES&H J. L. BUCKLEW | | DATE 4/7/9 |

| ZONE | REV | |
|---|---|---|
| GEN | 5 | ADDED NOTE "PDAH-934B", "FO" WAS "F T1-901, AND REVISED PIP ISSUED FOR |
| DRAFTER Gary Kulchock | | DATE 9/10/9 |
| EG&G ES&H Larry Bucklew | | DATE 9/17/9 |

| ZONE | REV | |
|---|---|---|
| GEN | 6 | EXTENSIVE CHA ISSUED FOR CO |
| DRAFTER Gary Kulchock | | DATE 10/7/9 |
| EG&G ES&H L Bucklew | | DATE 10-1-9 |

2 | 1

## REVISION

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 1 | UPDATED AS PER MARKED PRINT | 4/25/90 |
| E-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 |

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

H

| 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 |

| RAFTER | 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 |
| G&G RESPON SECT SUPV | DATE | EG&G ES&H | DATE | | DATE | | DATE |
| URTON W. HARRELL | 7/20/92 | 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 |

| RAFTER | 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. LUNIFELD | 11/19/92 |
| G&G ES&H | DATE | PROJECT ENGR. | DATE | BRANCH MANAGER | DATE | DOE (EOSD) | DATE |
| J. L. BUCKLEW | 11/19/92 | | | | | JOHN ROTUNDA | 11/24/92 |

G

| 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 |

| RAFTER | 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. LUNIFELD | 4/7/93 |
| G&G ES&H | DATE | PROJECT ENGR. | DATE | BRANCH MANAGER | DATE | DOE (EOSD) | DATE |
| J. L. BUCKLEW | 4/7/93 | JOHN ROCKEY | 5/27/93 | LARRY STRICKLAND | 5/27/93 | BILL AYERS | 5/27/93 |

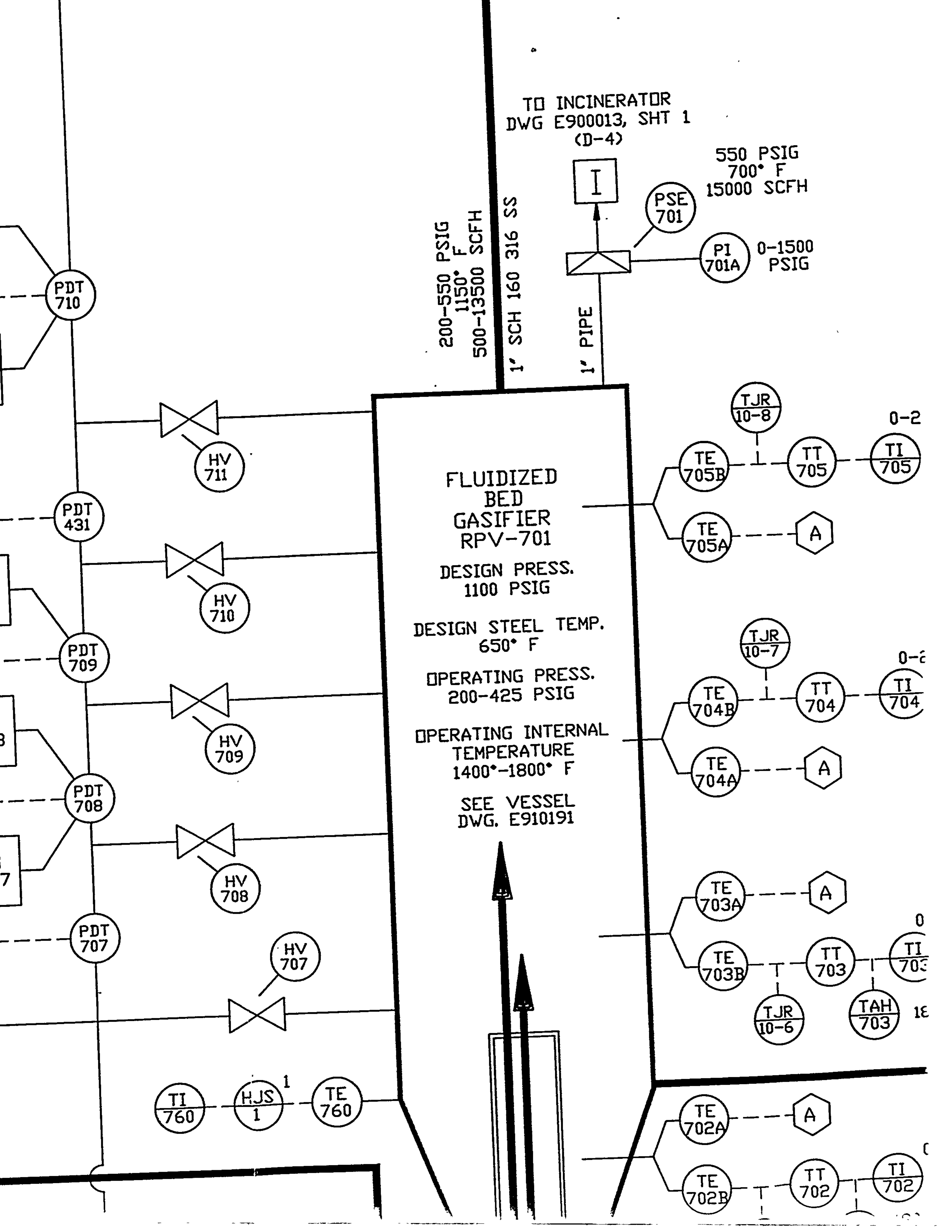
| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 5 | ADDED NOTE ON ALL INCINERATOR DESIGNATIONS; "PLAL-934A" WAS "PLAL-934B"; "PDAH-934A" WAS "PDAH-934B"; "PDAH-934B" WAS "PDAH-934A"; MODIFIED PSID RANGE ON PDI-934, WAS "0-50" "FO" WAS "FC" ON FV-725; ADDED "#1" TO ALL N DESIGNATIONS; RELOCATED 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 |

| RAFTER | 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 |
| G&G 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 |

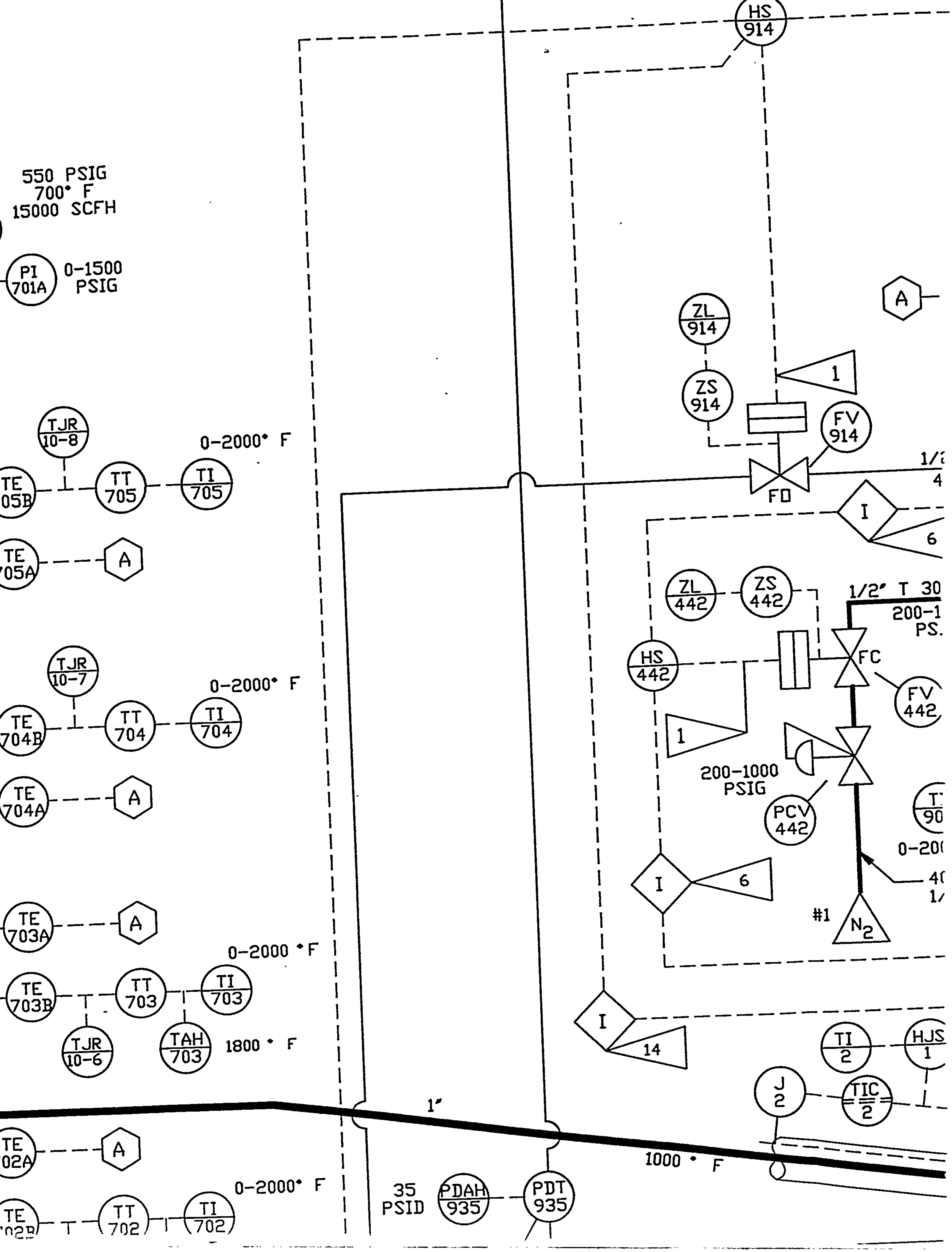
| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 6 | EXTENSIVE CHANGES AS PER MARKED PRINT REDLINED BY JAY RUTTEN ON 15 FEB 94.<br>ISSUED FOR CONSTRUCTION | 9/30/94 |

| RAFTER | 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 |
| G&G ES&H | DATE | PROJECT ENGR. | DATE | BRANCH MANAGER | DATE | DOE (EOSD) | DATE |
| L Bucklew | 10-11-94 | J. M Rockey | 10/13/94 | Larry Shadle | 10-18-94 | [illegible] | 10/11/94 |

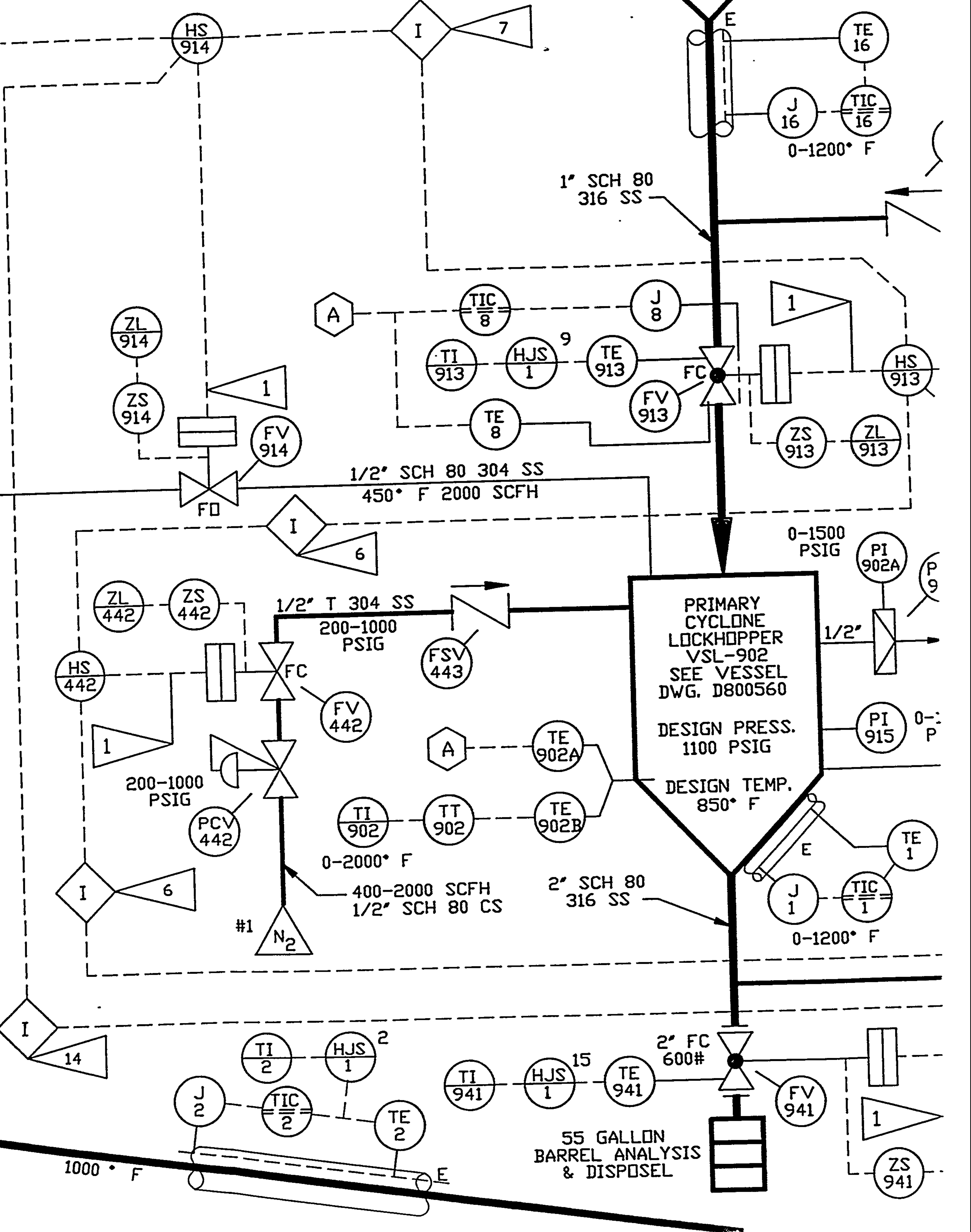
F



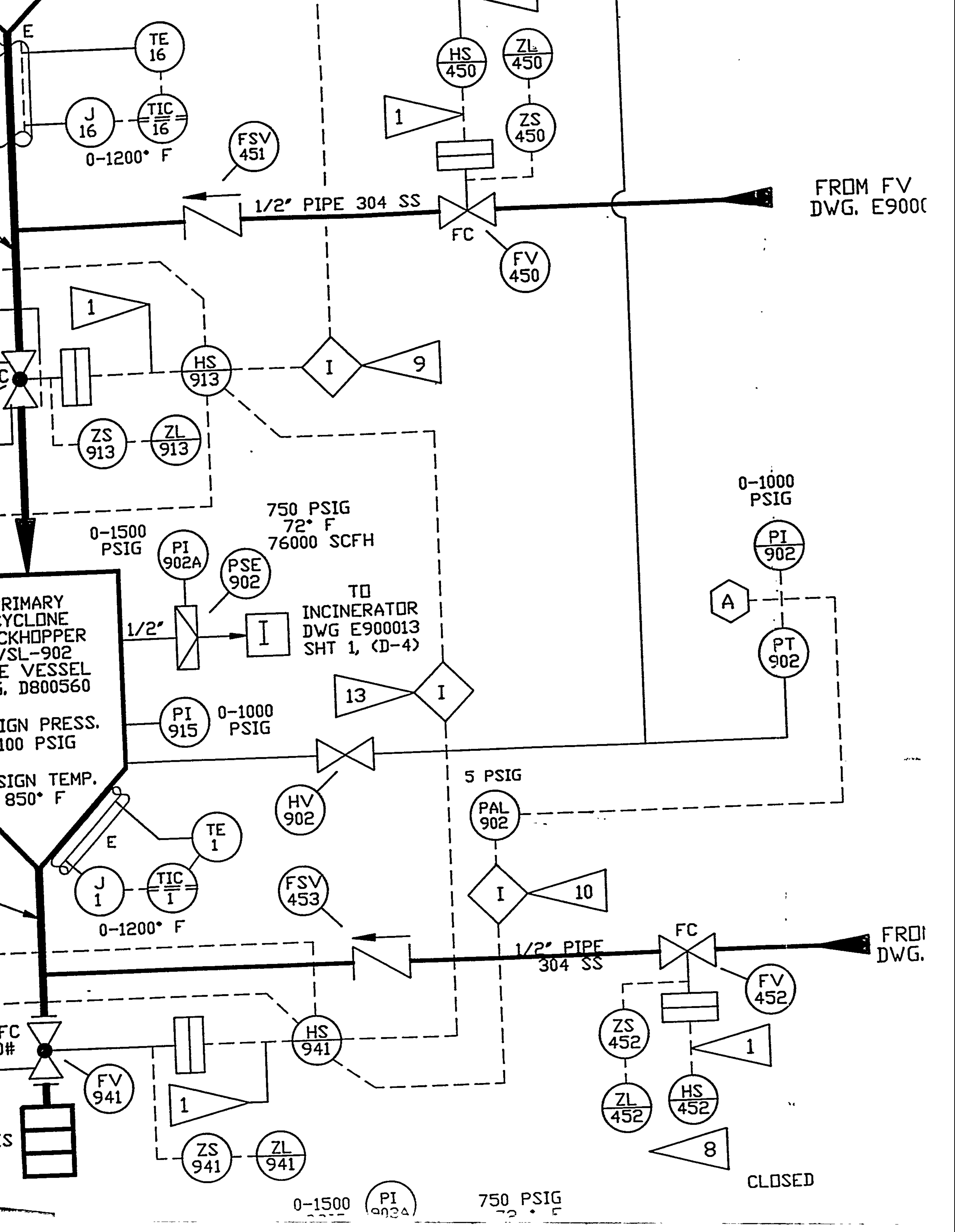
TO INCINERATOR
DWG E900013, SHT 1
(D-4)
I
550 PSIG
700° F
15000 SCFH
PSE 701
PI 701A
0-1500 PSIG
200-550 PSIG
1150° F
500-13500 SCFH
1" SCH 160 316 SS
1" PIPE
PDT 710
PDT 431
PDT 709
PDT 708
PDT 707
HV 711
HV 710
HV 709
HV 708
HV 707
FLUIDIZED
BED
GASIFIER
RPV-701
DESIGN PRESS.
1100 PSIG
DESIGN STEEL TEMP.
650° F
OPERATING PRESS.
200-425 PSIG
OPERATING INTERNAL
TEMPERATURE
1400°-1800° F
SEE VESSEL
DWG. E910191
TJR 10-8
TE 705B
TT 705
TI 705
TE 705A
A
TJR 10-7
TE 704B
TT 704
TI 704
TE 704A
TE 703A
TE 703B
TT 703
TJR 10-6
TAH 703
TE 702A
TE 702B
TT 702
TI 702
TI 760
HJS 1
TE 760



HS 914
550 PSIG
700° F
15000 SCFH
PI 701A
0-1500 PSIG
A
ZL 914
ZS 914
1
FV 914
FO
1/2
I
6
TJR 10-8
0-2000° F
TE 705B
TT 705
TI 705
TE 705A
A
ZL 442
ZS 442
1/2" T 30
200-1
PS.
HS 442
FC
FV 442
TJR 10-7
0-2000° F
TE 704B
TT 704
TI 704
1
200-1000
PSIG
PCV 442
TE 704A
A
0-20
I
6
#1
$N_2$
TE 703A
A
0-2000 °F
TE 703B
TT 703
TI 703
I
14
TJR 10-6
TAH 703
1800 ° F
TI 2
HJS 1
J 2
TIC 2
1"
TE 702A
A
1000 ° F
0-2000° F
35
PSID
PDAH 935
PDT 935
TE 702B
TT 702
TI 702



HS 914
I
7
E
TE 16
J 16
TIC 16
0-1200° F
1" SCH 80
316 SS
A
TIC 8
J 8
1
ZL 914
ZS 914
1
TI 913
HJS 1
9
TE 913
FC
HS 913
FV 913
TE 8
ZS 913
ZL 913
FV 914
1/2" SCH 80 304 SS
450° F 2000 SCFH
FO
I
6
0-1500
PSIG
PI 902A
ZL 442
ZS 442
1/2" T 304 SS
200-1000
PSIG
PRIMARY
CYCLONE
LOCKHOPPER
VSL-902
SEE VESSEL
DWG. D800560
1/2"
HS 442
FC
FSV 443
FV 442
DESIGN PRESS.
1100 PSIG
PI 915
1
A
TE 902A
200-1000
PSIG
DESIGN TEMP.
850° F
PCV 442
TI 902
TT 902
TE 902B
E
TE 1
0-2000° F
I
6
400-2000 SCFH
1/2" SCH 80 CS
2" SCH 80
316 SS
J 1
TIC 1
#1
N2
0-1200° F
I
14
TI 2
HJS 1
2
2" FC
600#
15
TI 941
HJS 1
TE 941
FV 941
J 2
TIC 2
TE 2
1
55 GALLON
BARREL ANALYSIS
& DISPOSEL
1000 ° F
E
ZS 941



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

| EN | 6 | ISSUED FOR CONSTRUCTION | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TER | DATE 10/7/94 | CHECKER | DATE 10-7-94 | EG&G RESPONSIBLE ENGR. | DATE 10-11-94 | REVIEWER | DATE 10/11/94 | |
| ESH | DATE 10-11-94 | PROJECT ENGR. | DATE 10/13/94 | BRANCH MANAGER | DATE 10-18-94 | DOE (EDSD) | DATE 10/11/94 | |

F

E

D

GEND:

I = PIPED TO PACKAGED INCINERATOR SYSTEM

A = INPUT TO THE DDAS SYSTEM

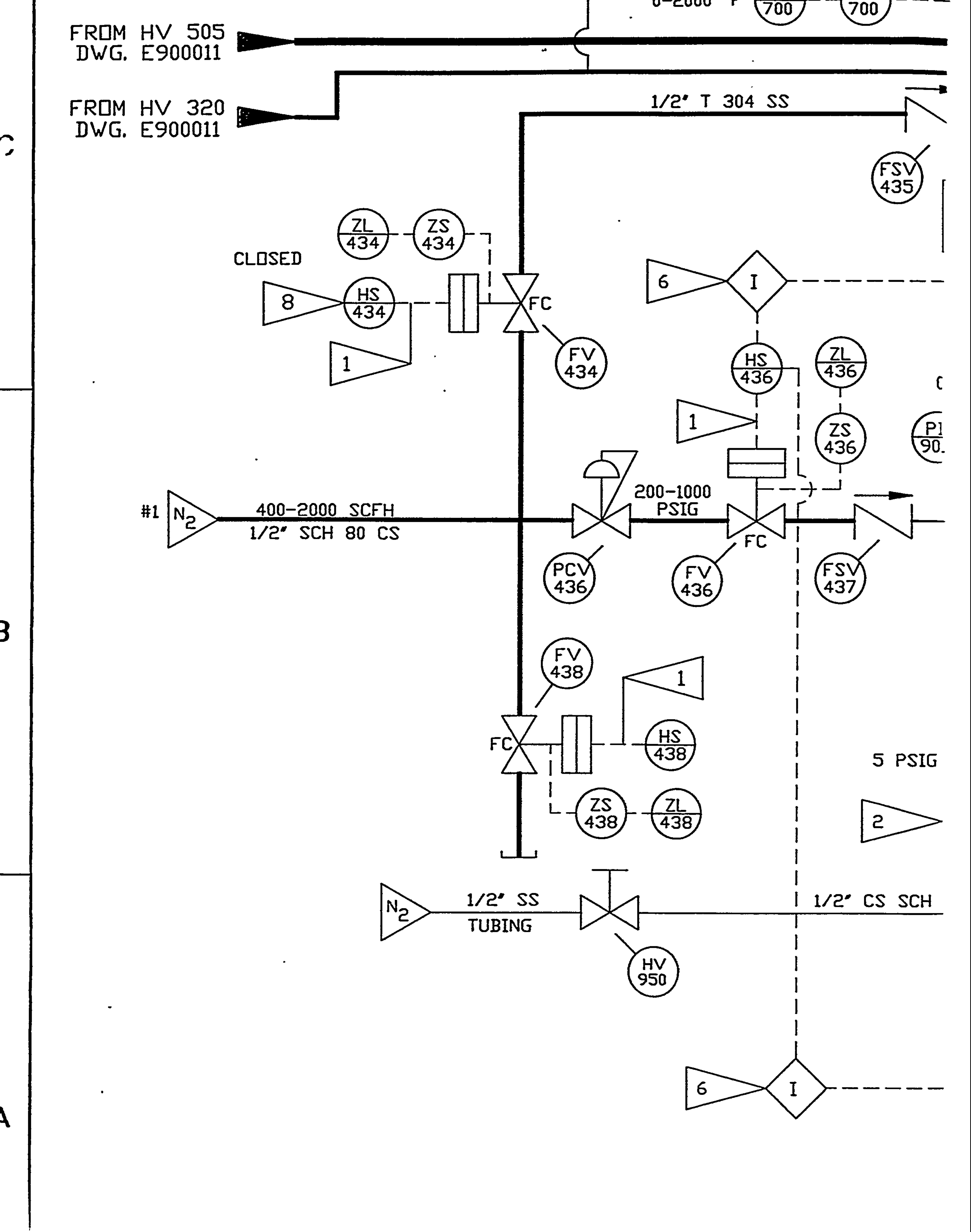
G XXX — IDENTIFIES THE CONNECTING SEGMENT OF THE TRANSMITTER PURGE SYSTEM, WHERE XXX IS THE SEGMENT IDENTIFICATION NUMBER. (SEE DWG. E900013, SHT. 2 OF 2 FOR DETAILS.) THIS SYMBOL INDICATES THAT THE FOLLOWING EQUIPMENT IS IN THE PURGE LINE FROM THE NITROGEN HEADER TO THE TRANSMITTER:
FV-440, FSV-441,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

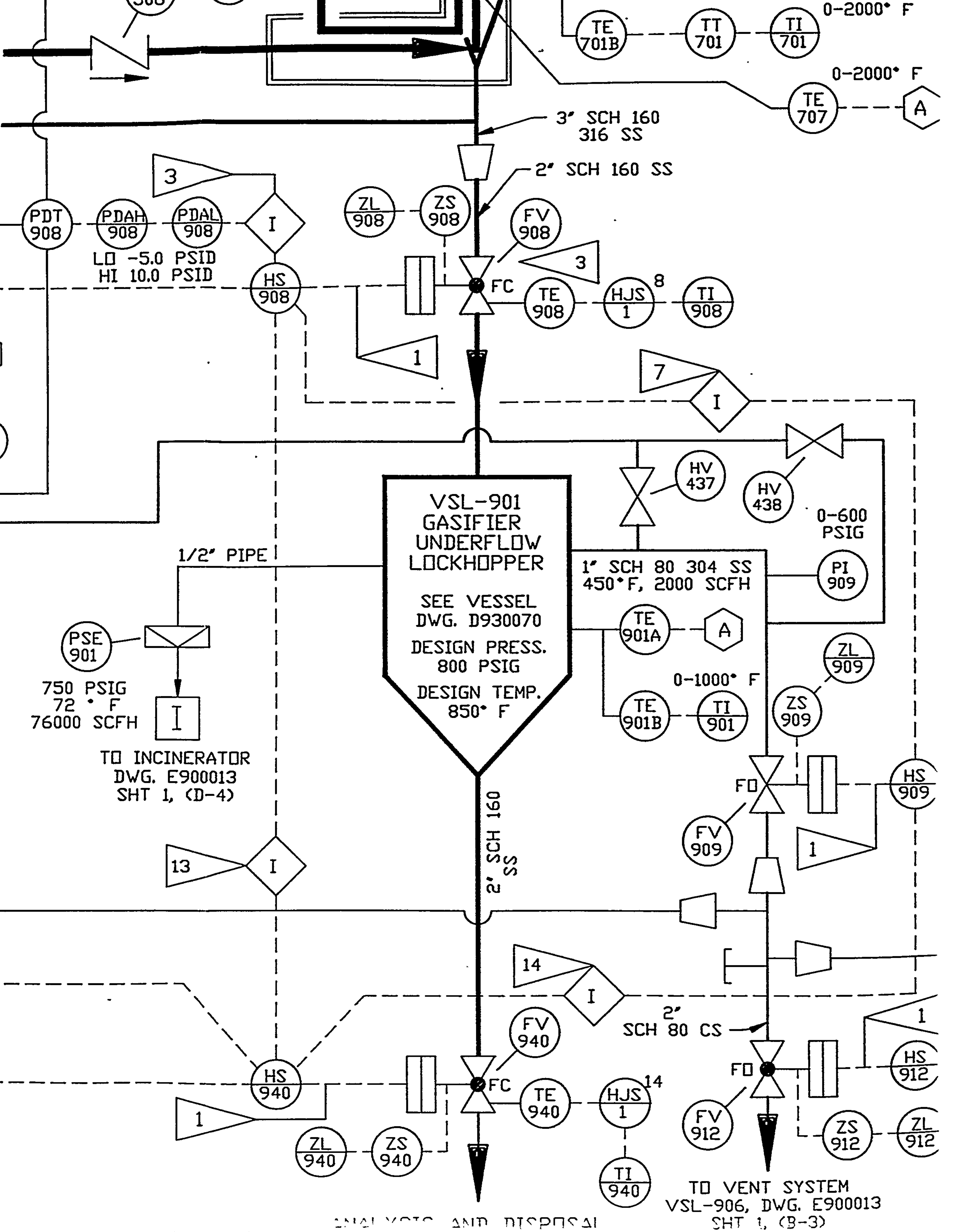
ES:

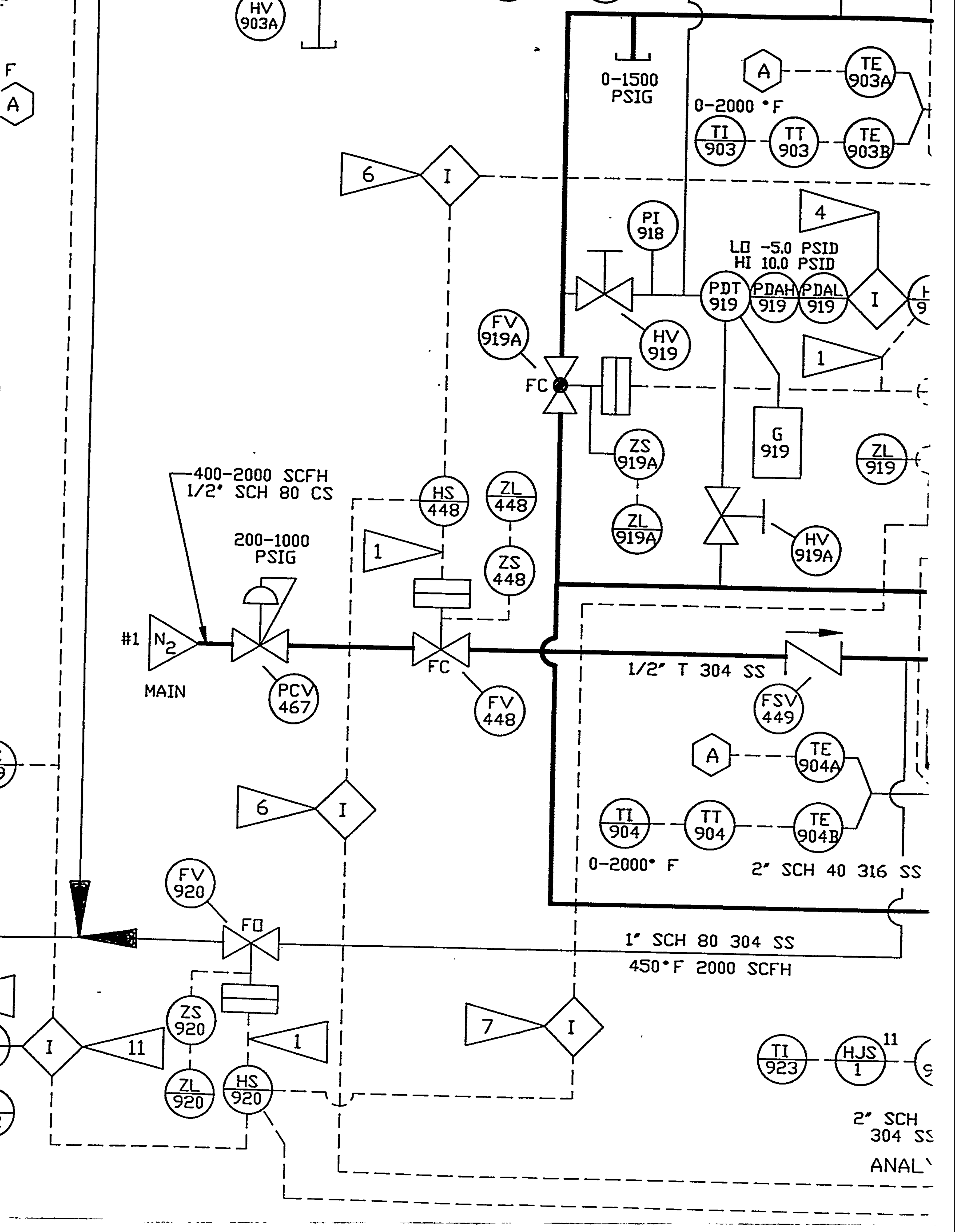
1 — THIS FLAGGED NOTE DESIGNATES THE FOLLOWING EQUIPMENT WHICH IS NOT SHOWN ON THIS DWG. FOR CLARITY; PANEL-MOUNTED ON/OFF STATION (HAND SWITCH WITH POSITION INDICATION LAMPS), 24 VDC RELAY, 117 VAC 60 HZ SOLENOID VALVE.

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

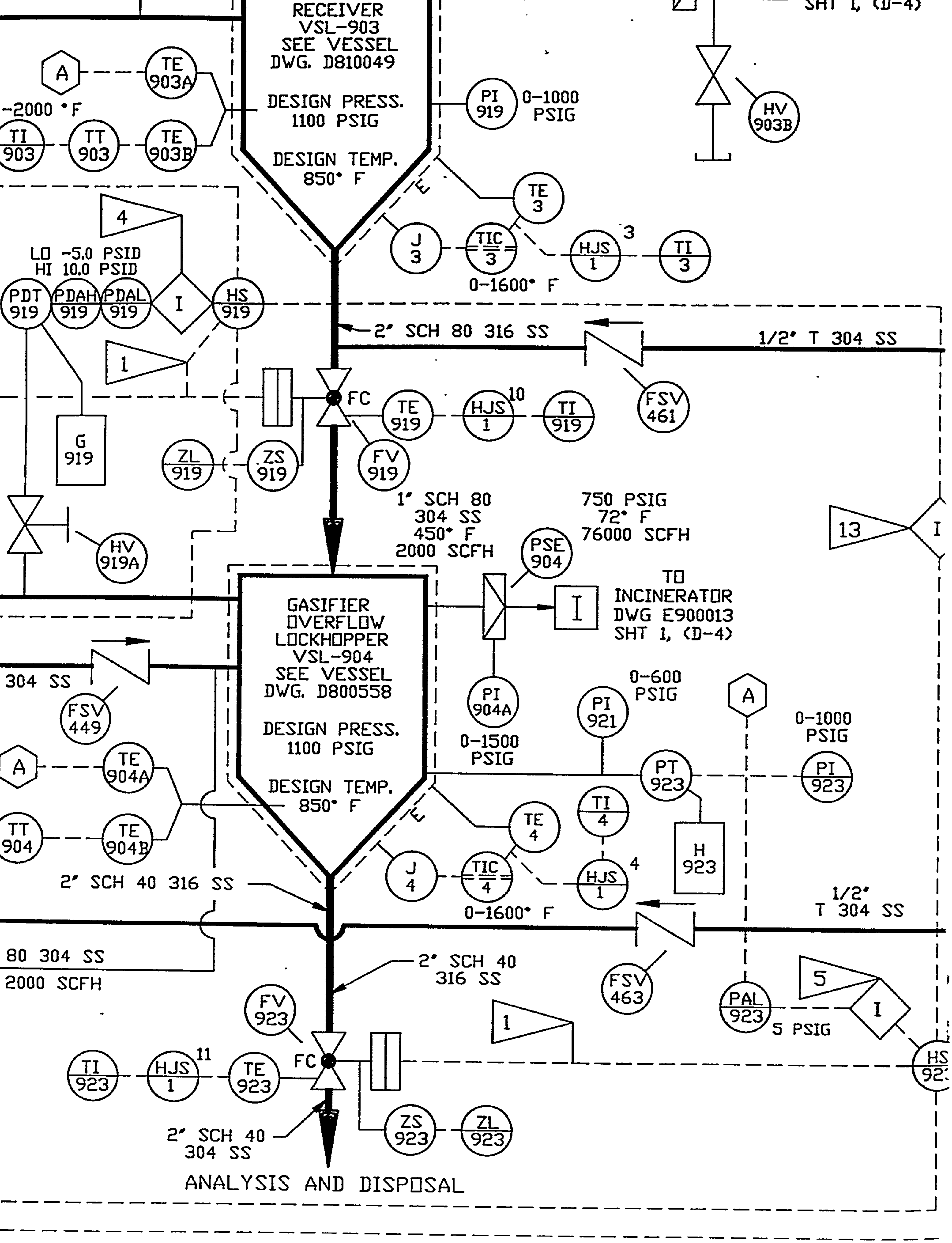


FROM HV 505
DWG. E900011
FROM HV 320
DWG. E900011
1/2" T 304 SS
FSV 435
ZL 434
ZS 434
CLOSED
8
HS 434
1
FC
FV 434
6
I
HS 436
ZL 436
1
ZS 436
200-1000
PSIG
#1
$N_2$
400-2000 SCFH
1/2" SCH 80 CS
FC
PCV 436
FV 436
FSV 437
FV 438
1
FC
HS 438
ZS 438
ZL 438
5 PSIG
2
$N_2$
1/2" SS
TUBING
1/2" CS SCH
HV 950
6
I
C
B
A


0-2000° F
TE 701B
TT 701
TI 701
0-2000° F
TE 707
A
3" SCH 160
316 SS
2" SCH 160 SS
3
PDT 908
PDAH 908
PDAL 908
I
ZL 908
ZS 908
FV 908
LO -5.0 PSID
HI 10.0 PSID
HS 908
FC
TE 908
HJS 1
8
TI 908
1
7
I
HV 437
HV 438
0-600
PSIG
VSL-901
GASIFIER
UNDERFLOW
LOCKHOPPER
SEE VESSEL
DWG. D930070
DESIGN PRESS.
800 PSIG
DESIGN TEMP.
850° F
1/2" PIPE
1" SCH 80 304 SS
450°F, 2000 SCFH
PI 909
TE 901A
A
PSE 901
0-1000° F
ZL 909
TE 901B
TI 901
ZS 909
750 PSIG
72 ° F
76000 SCFH
I
TO INCINERATOR
DWG. E900013
SHT 1, (D-4)
FO
HS 909
FV 909
2" SCH 160
SS
13
I
1
14
I
2"
SCH 80 CS
1
FV 940
HS 940
FC
TE 940
HJS 1
14
FO
HS 912
1
FV 912
ZL 940
ZS 940
ZS 912
ZL 912
TI 940
TO VENT SYSTEM
VSL-906, DWG. E900013
SHT 1, (B-3)



HV 903A
A
0-1500 PSIG
A
TE 903A
0-2000 °F
TI 903
TT 903
TE 903B
6
I
PI 918
4
LO -5.0 PSID
HI 10.0 PSID
PDT 919
PDAH 919
PDAL 919
I
FV 919A
HV 919
1
FC
ZS 919A
G 919
ZL 919
400-2000 SCFH
1/2" SCH 80 CS
HS 448
ZL 448
ZL 919A
HV 919A
200-1000 PSIG
1
ZS 448
#1
N2
MAIN
FC
1/2" T 304 SS
PCV 467
FV 448
FSV 449
A
TE 904A
6
I
TI 904
TT 904
TE 904B
0-2000° F
2" SCH 40 316 SS
FV 920
FO
1" SCH 80 304 SS
450°F 2000 SCFH
ZS 920
7
I
I
11
1
TI 923
HJS 1
11
ZL 920
HS 920
2" SCH
304 SS
ANAL



RECEIVER
VSL-903
SEE VESSEL
DWG. D810049
DESIGN PRESS.
1100 PSIG
DESIGN TEMP.
850° F
SHT 1, (D-4)
A
TE 903A
-2000 °F
TI 903
TT 903
TE 903B
PI 919
0-1000 PSIG
HV 903B
TE 3
J 3
TIC 3
HJS 1
3
TI 3
0-1600° F
4
LO -5.0 PSID
HI 10.0 PSID
PDT 919
PDAH 919
PDAL 919
I
HS 919
2" SCH 80 316 SS
1/2" T 304 SS
1
FC
TE 919
HJS 1
10
TI 919
FSV 461
G 919
ZL 919
ZS 919
FV 919
1" SCH 80
304 SS
450° F
2000 SCFH
750 PSIG
72° F
76000 SCFH
13
I
HV 919A
PSE 904
TO
INCINERATOR
DWG E900013
SHT 1, (D-4)
GASIFIER
OVERFLOW
LOCKHOPPER
VSL-904
SEE VESSEL
DWG. D800558
DESIGN PRESS.
1100 PSIG
DESIGN TEMP.
850° F
304 SS
FSV 449
PI 904A
0-600 PSIG
PI 921
A
0-1000 PSIG
0-1500 PSIG
A
TE 904A
PT 923
PI 923
TT 904
TE 904B
TE 4
TI 4
H 923
J 4
TIC 4
HJS 1
4
2" SCH 40 316 SS
0-1600° F
1/2" T 304 SS
80 304 SS
2000 SCFH
2" SCH 40
316 SS
FSV 463
5
PAL 923
I
5 PSIG
FV 923
1
TI 923
HJS 1
11
TE 923
FC
HS 923
2" SCH 40
304 SS
ZS 923
ZL 923
ANALYSIS AND DISPOSAL

1, (D-4)

RPV-701.

4 FV-919 & FV-919A WILL NO
A PRESSURE DIFFERENTIAL L
5.0 PSID. REF. DWG. NO. D910
MUST BE HIGHER THAN THE

5 FV-923 WILL NOT OPEN UNT
LESS THAN OR EQUAL TO 2

6 LOCKHOPPER FILL VALVE C
VALVE IS OPENED. DUMP V
$N_2$ CHARGING VALVE IS OPE
OPENED IF THE FILL OR DUI

7 RELAY INTERLOCKS PREVENT
VENT VALVE FROM BEING O

8 DESIGNATES THAT THE CONT
LOCKED TO PREVENT ACCIDE

9 FV-913 WILL NOT OPEN UNT
PRESSURE DIFFERENTIAL LES
5.0 PSID. THE PRESSURE IN
LOWER THAN THE PRESSURE

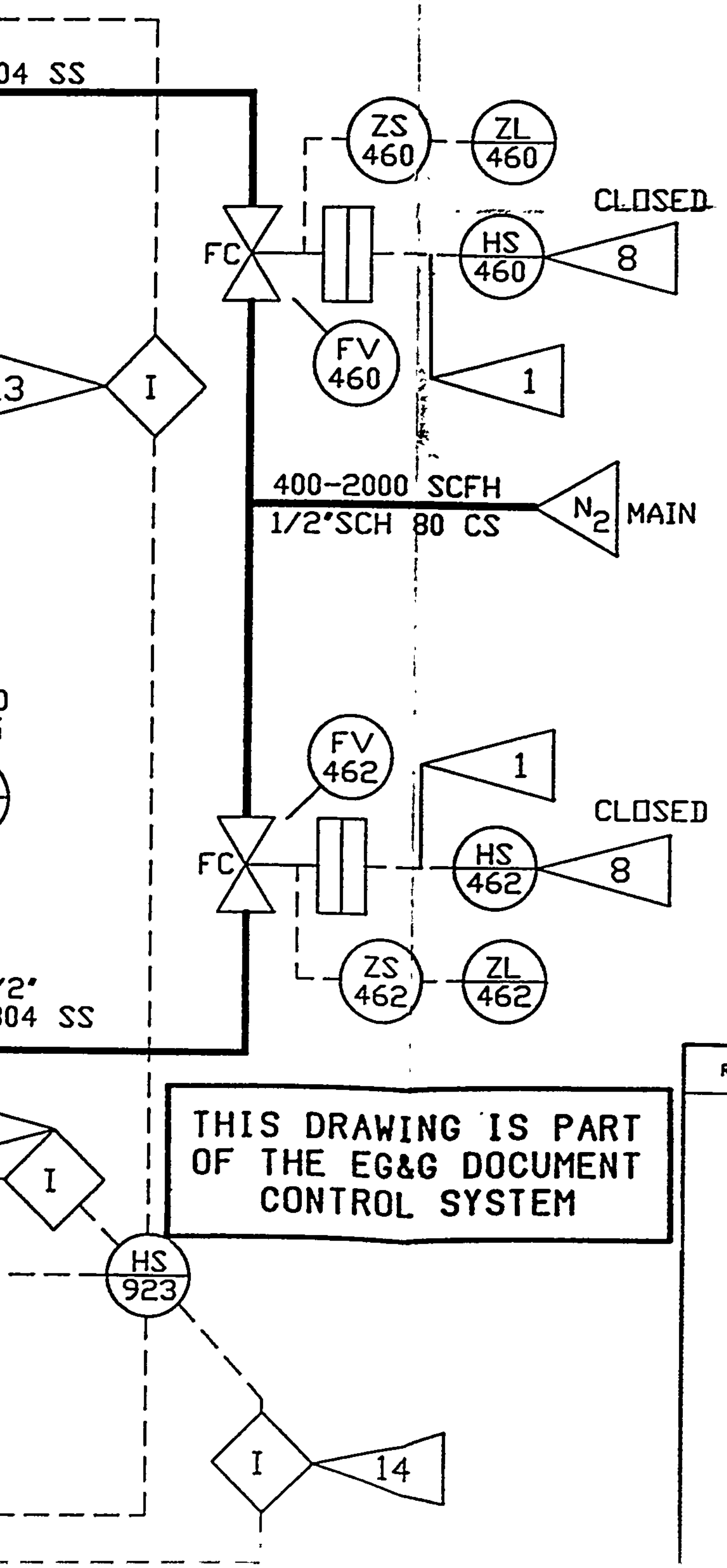
10 FV-941 WILL NOT OPEN UNT
PRESSURE LESS THAN OR EQ

11 RELAY INTERLOCKS PREVENT
909, 920 & 914 FROM OPENIN

12 THIS DWG. & DWGS. E900010,
SUPERCEDES DWG. R800524 (
TUBING & PIPING SUMMARY).

13 RELAY INTERLOCKS PREVENT
VALVES FROM BEING OPEN

14 RELAY INTERLOCKS PREVENT
FROM OPENING UNLESS THE




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

| REFERENCE DRAWINGS | | DATE |
|---|---|---|
| E900010<br>E900011<br>E900013 | DRAFTER: S. CONKO | 3/6/90 |
| | CHECKER: A. R. KUBALA | 3/6/90 |
| | PROJECT ENGINEER: J.P. KANOSKY | 3/6/90 |
| | | DATE |
| | | DATE |
| | | DATE |
| | | DATE |
| | | DATE |

TITLE: FL

SIZE: E | FSCM NO

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

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.

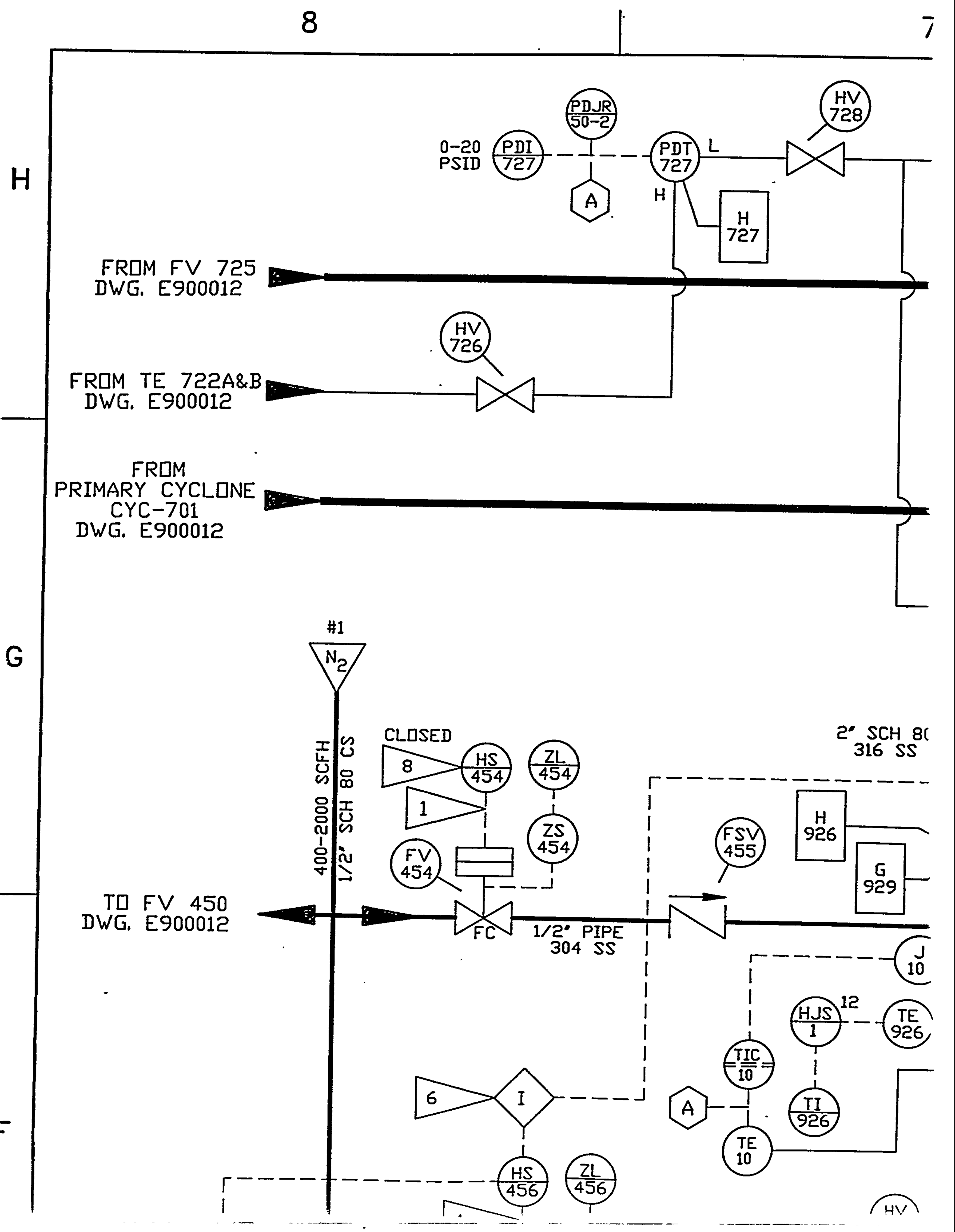
RELAY INTERLOCKS PREVENT THE LOCKHOPPER'S DUMP VALVE FROM OPENING UNLESS THE VENT VALVE IS OPEN.

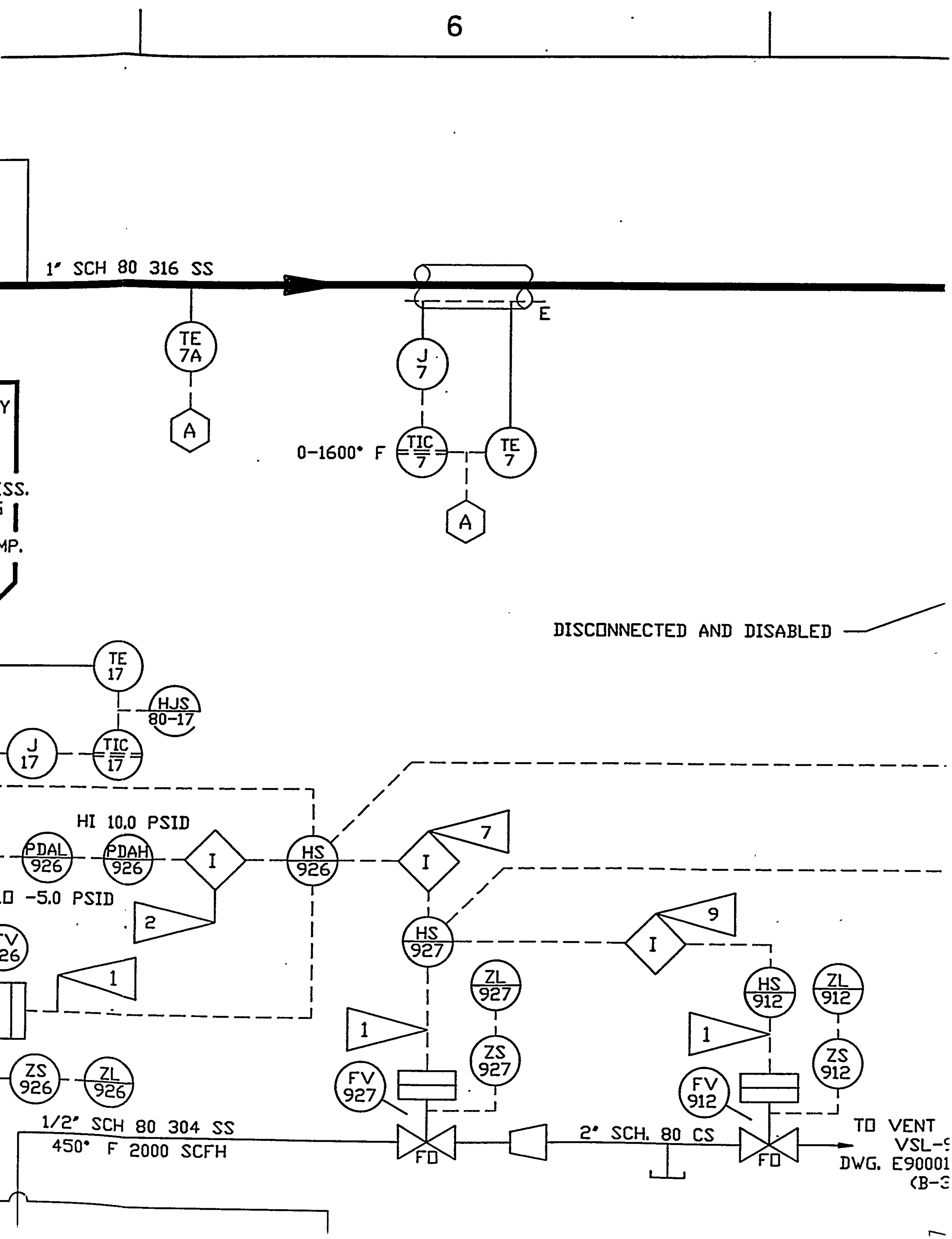
C

DWG NO E900012 SH 1

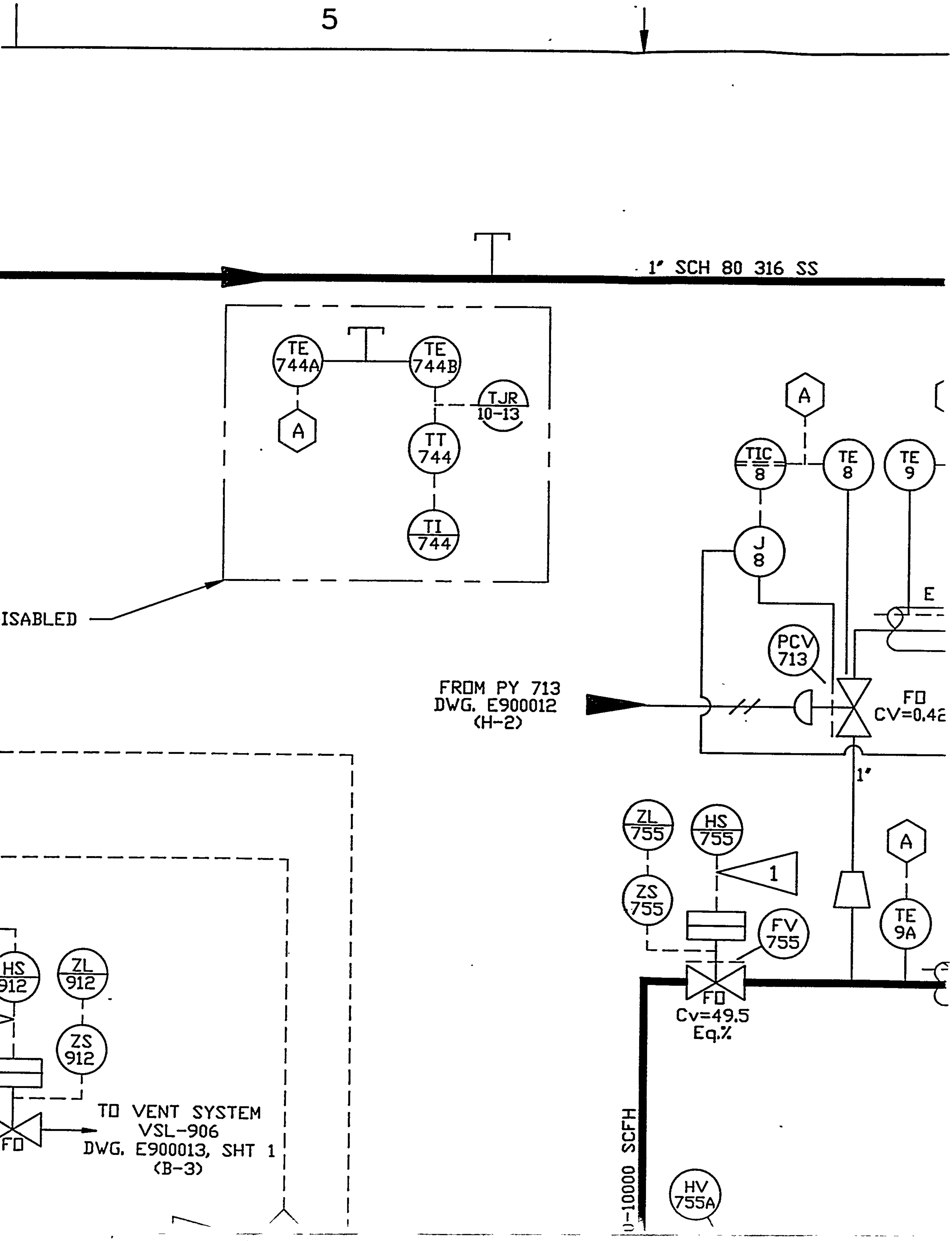
A

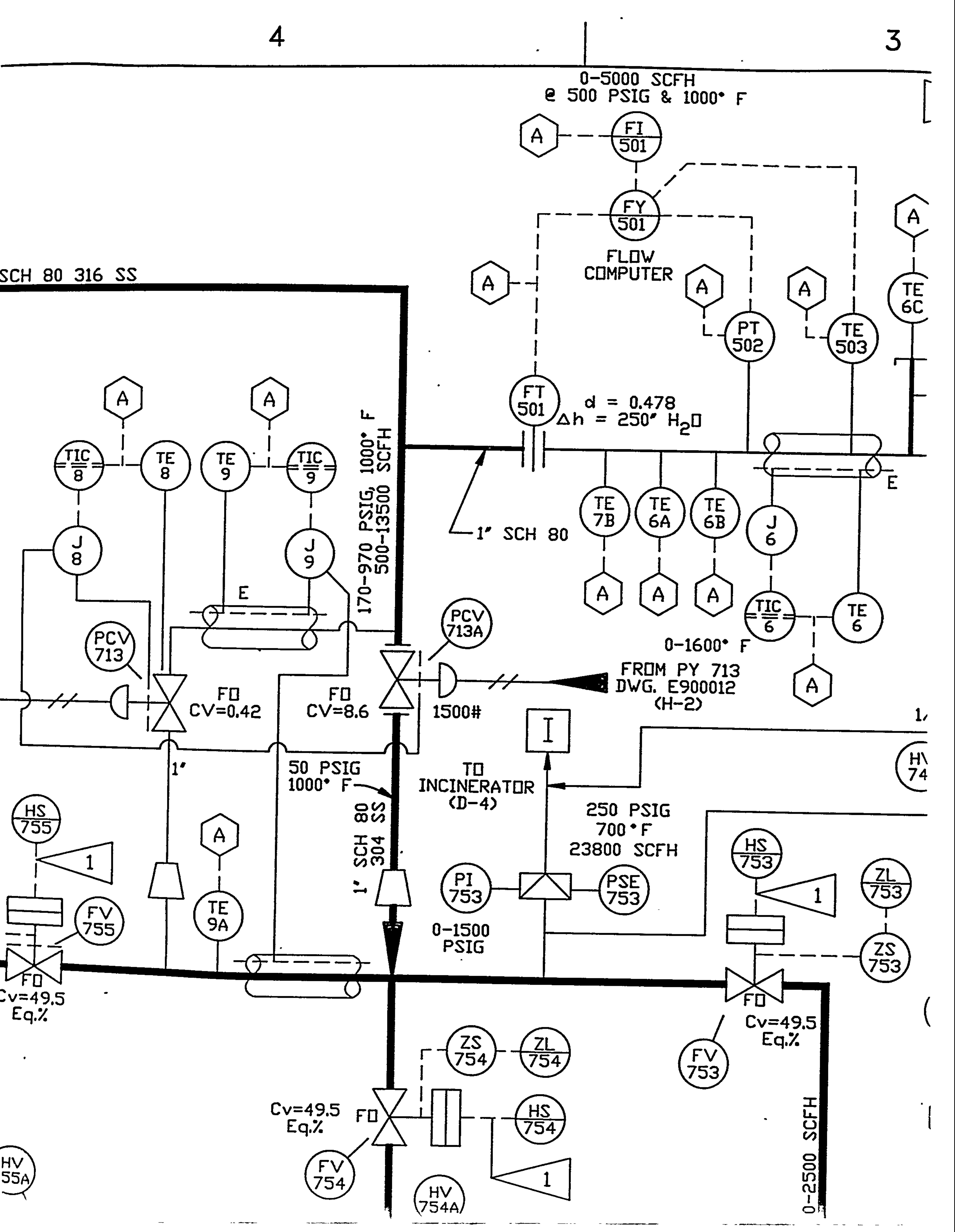
| | | |
|---|---|---|
| DRAFTER S. CONKO | DATE 3/6/90 | United States Department of Energy<br>MORGANTOWN ENERGY TECHNOLOGY CENTER<br>Morgantown, WV |
| CHECKER A. R. KUBALA | DATE 3/6/90 | |
| PROJECT ENGINEER J.P. KANOSKY | DATE 3/6/90 | |
| | DATE | TITLE: B-12 P&ID FLUIDIZED BED GASIFIER A.G.C. |
| | DATE | |
| | DATE | |
| | DATE | SIZE E · FSCH NO · DWG NO E900012 · REV 6 |
| | DATE | |


8
7
H
G
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
1
ZL
454
ZS
454
FV
454
FC
TO FV 450
DWG. E900012
1/2" PIPE
304 SS
2" SCH 8(
316 SS
FSV
455
H
926
G
929
J
10
HJS
1
12
TE
926
TIC
10
TI
926
A
TE
10
6
I
HS
456
ZL
456
HV



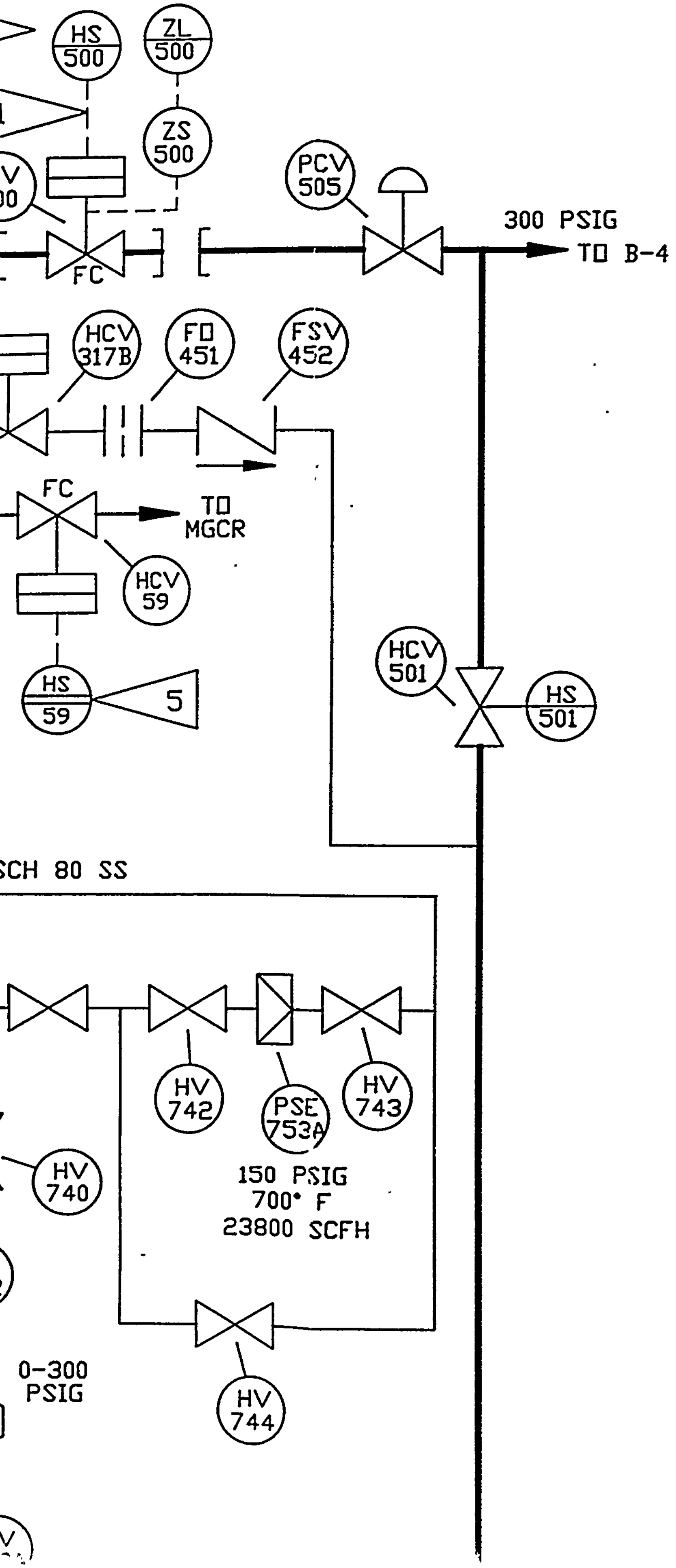
6
1" SCH 80 316 SS
TE 7A
A
E
J 7
0-1600° F
TIC 7
TE 7
A
SS.
MP.
DISCONNECTED AND DISABLED
TE 17
HJS 80-17
J 17
TIC 17
HI 10.0 PSID
PDAL 926
PDAH 926
I
HS 926
7
I
-5.0 PSID
2
HS 927
9
I
1
ZL 927
HS 912
ZL 912
1
1
ZS 927
ZS 912
FV 927
FV 912
ZS 926
ZL 926
1/2" SCH 80 304 SS
450° F 2000 SCFH
2" SCH. 80 CS
FO
FO
TO VENT
DWG. E90001


5
1" SCH 80 316 SS
TE 744A
TE 744B
TJR 10-13
A
TT 744
TI 744
ISABLED
A
TIC 8
TE 8
TE 9
J 8
E
PCV 713
FROM PY 713
DWG. E900012
(H-2)
FO
CV=0.42
1"
ZL 755
HS 755
1
A
ZS 755
TE 9A
FV 755
FO
Cv=49.5
Eq.%
HS 912
ZL 912
ZS 912
TO VENT SYSTEM
VSL-906
DWG. E900013, SHT 1
(B-3)
FO
0-10000 SCFH
HV 755A



4
3
0-5000 SCFH
@ 500 PSIG & 1000° F
FI 501
FY 501
FLOW COMPUTER
A
SCH 80 316 SS
PT 502
TE 503
TE 6C
FT 501
d = 0.478
Δh = 250" H2O
TIC 8
TE 8
TE 9
TIC 9
J 8
J 9
E
170-970 PSIG, 1000° F
500-13500 SCFH
1" SCH 80
TE 7B
TE 6A
TE 6B
J 6
TIC 6
TE 6
0-1600° F
PCV 713
PCV 713A
FO
CV=0.42
FO
CV=8.6
1500#
FROM PY 713
DWG. E900012
(H-2)
I
1"
50 PSIG
1000° F
TO INCINERATOR
(D-4)
250 PSIG
700° F
23800 SCFH
1" SCH 80 304 SS
HS 755
FV 755
TE 9A
PI 753
PSE 753
0-1500 PSIG
HS 753
ZL 753
ZS 753
FO
Cv=49.5
Eq.%
FV 753
ZS 754
ZL 754
HS 754
Cv=49.5
Eq.%
FO
FV 754
HV 754A
HV 55A
0-2500 SCFH

2




REV

| ZONE | REV | |
|---|---|---|
| GEN | 4 | ADDED DESIGN PRESSURE AND DESIGN TEMPERATU CYC-906, CYC-908, AND CYC-702; MODIFIED FI- REMOVED ALL NUMBERS FROM ADACS SYMBOLS ADDED FO-451, HCV-317B & FSV-452 ISSUED FOR CONSTRUCTION |

| DRAFTER | DATE | CHECKER | DATE |
|---|---|---|---|
| GARY J. KULCHOCK | 4/5/93 | S CONKO | 4/5/9 |
| EG&G ES&H | DATE | PROJECT ENGR. | DATE |
| J. L. BUCKLEW | 4/7/93 | JOHN ROCKEY | 5/27/ |

| ZONE | REV | |
|---|---|---|
| GEN | 5 | ADDED NOTE ON (2) INCINERATOR DESIGNATION. ADDED "#1" TO ALL $N_2$ DESIGNATIONS; REMOV MODIFIED INCINERATOR DESCRIPTION IN "LEGEN ADDED NOTE TO VENT SYSTEM, ZONE F-5; AD CONNECTED PIPING FROM VENT SYSTEM, ZONE ISSUED FOR CONSTRUCTION |

| DRAFTER | DATE | CHECKER | DATE |
|---|---|---|---|
| Gary Kulchock | 9/10/93 | S. Conko | 9/14/ |
| EG&G ES&H | DATE | PROJECT ENGR. | DATE |
| Larry Bucklew | 9/17/93 | John Rockey | 9/21/ |

| ZONE | REV | |
|---|---|---|
| GEN | 6 | EXTENSIVE CHANGES AS PER MARKED PRINT RED ISSUED FOR CONSTRUCTION |

| DRAFTER | DATE | CHECKER | DATE |
|---|---|---|---|
| Gary J Kulchock | 10/7/94 | S. Conko | 10-7- |
| EG&G ES&H | DATE | PROJECT ENGR. | DATE |
| J L Bucklew | 10-11-94 | John M Rockey | 10/13/ |

## TUBING SUMMA

| SIZE | WALL THICKNES |
|---|---|
| 1/4" | 0.035 |
| 1/2" | 0.035 |
| 1/2" | 0.065 |
| 1" | 0.049 |

## PIPING SUMMA

| SIZE | WALL THICKNES |
|---|---|
| 1/2" | SCH 40 |
| 1/2" | SCH 80 |
| 1/2" | SCH 80 |

2 1

H

G

F

REVISION

| ZONE | REV | DESCRIPTION | DATE |
|---|---|---|---|
| GEN | 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<br>REMOVED ALL NUMBERS FROM ADACS SYMBOLS<br>ADDED FO-451, HCV-317B & FSV-452<br>ISSUED FOR CONSTRUCTION | 04/01/93 |

| 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 |
| 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 (2) INCINERATOR DESIGNATIONS; ADDED PIPE SIZE (ZONE C-6)<br>ADDED "#1" TO ALL $N_2$ DESIGNATIONS; REMOVED HV-932; REVISED AND RENAMED FV-931 "WAS HV-931"<br>MODIFIED INCINERATOR DESCRIPTION IN "LEGEND"; ADDED TUBING SIZE TO SAMPLE SYSTEM B (ZONE D-3)<br>ADDED NOTE TO VENT SYSTEM, ZONE F-5; ADDED HV-800B, HV-800A & TE-900<br>CONNECTED PIPING FROM VENT SYSTEM, ZONE A-7 & VSL-906 TO EXISTING SYSTEM<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 |
| 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 | 9/29/94 |

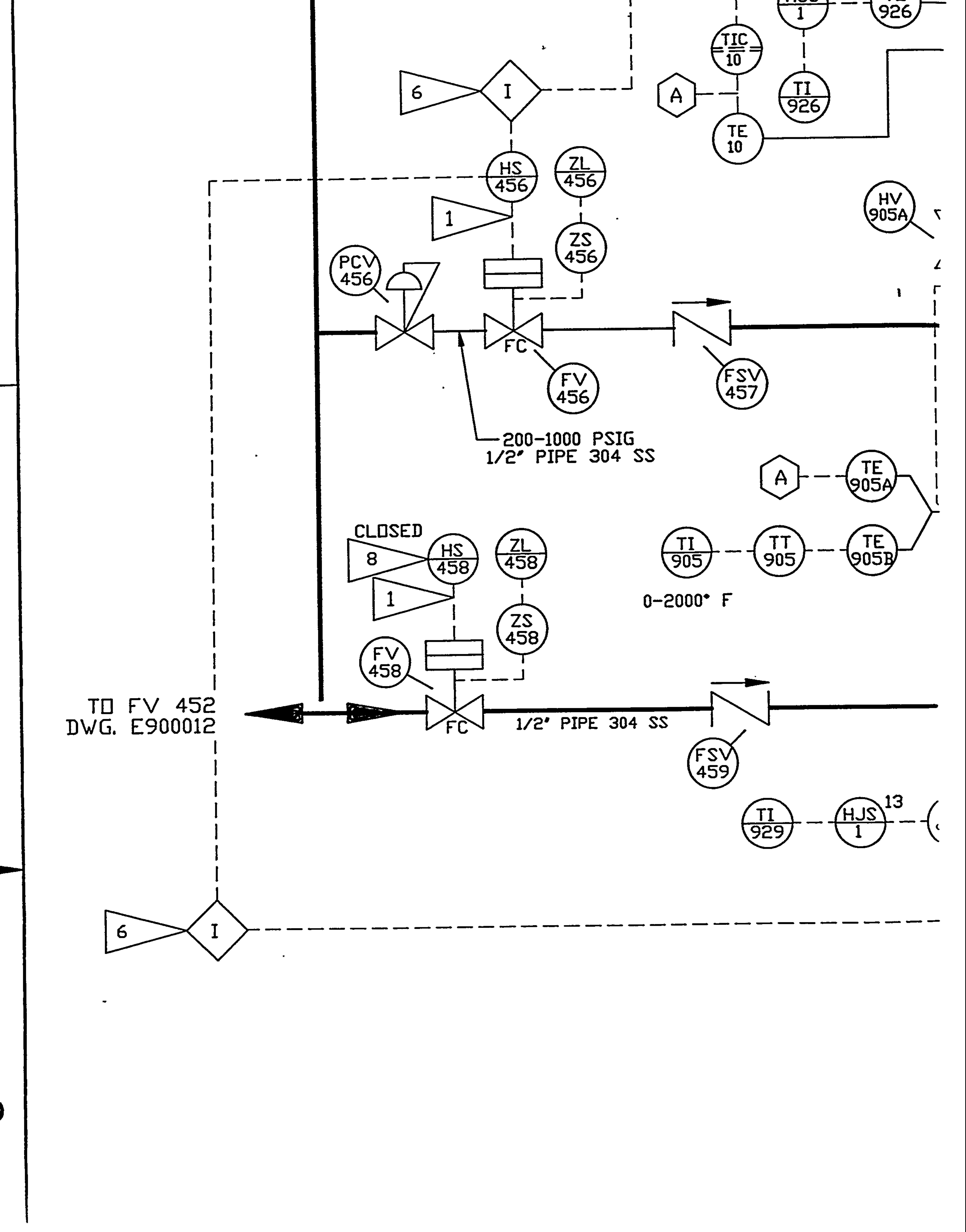
| DRAFTER | DATE | CHECKER | DATE | EG&G RESPONSIBLE ENGR. | DATE | REVIEWER | DATE |
|---|---|---|---|---|---|---|---|
| Gary J Kulchock | 10/7/94 | S. Conko | 10-7-94 | Jay Rutten | 10-11-94 | D. Lunifeld | 10/11/94 |
| G ES&H L Bucklew | 10-11-94 | PROJECT ENGR. John M Rockey | 10/13/94 | BRANCH MANAGER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

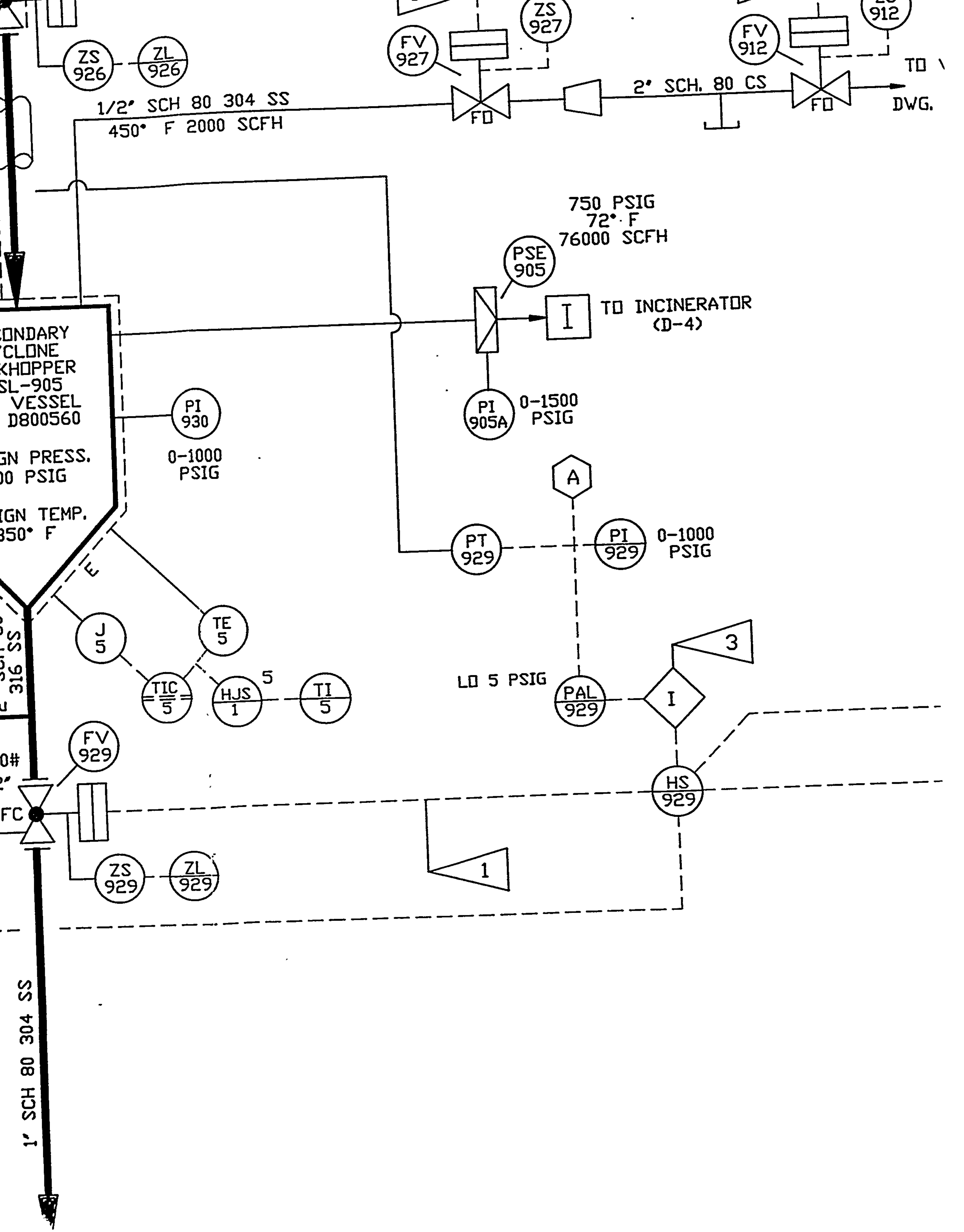
## TUBING SUMMARY

| 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 |

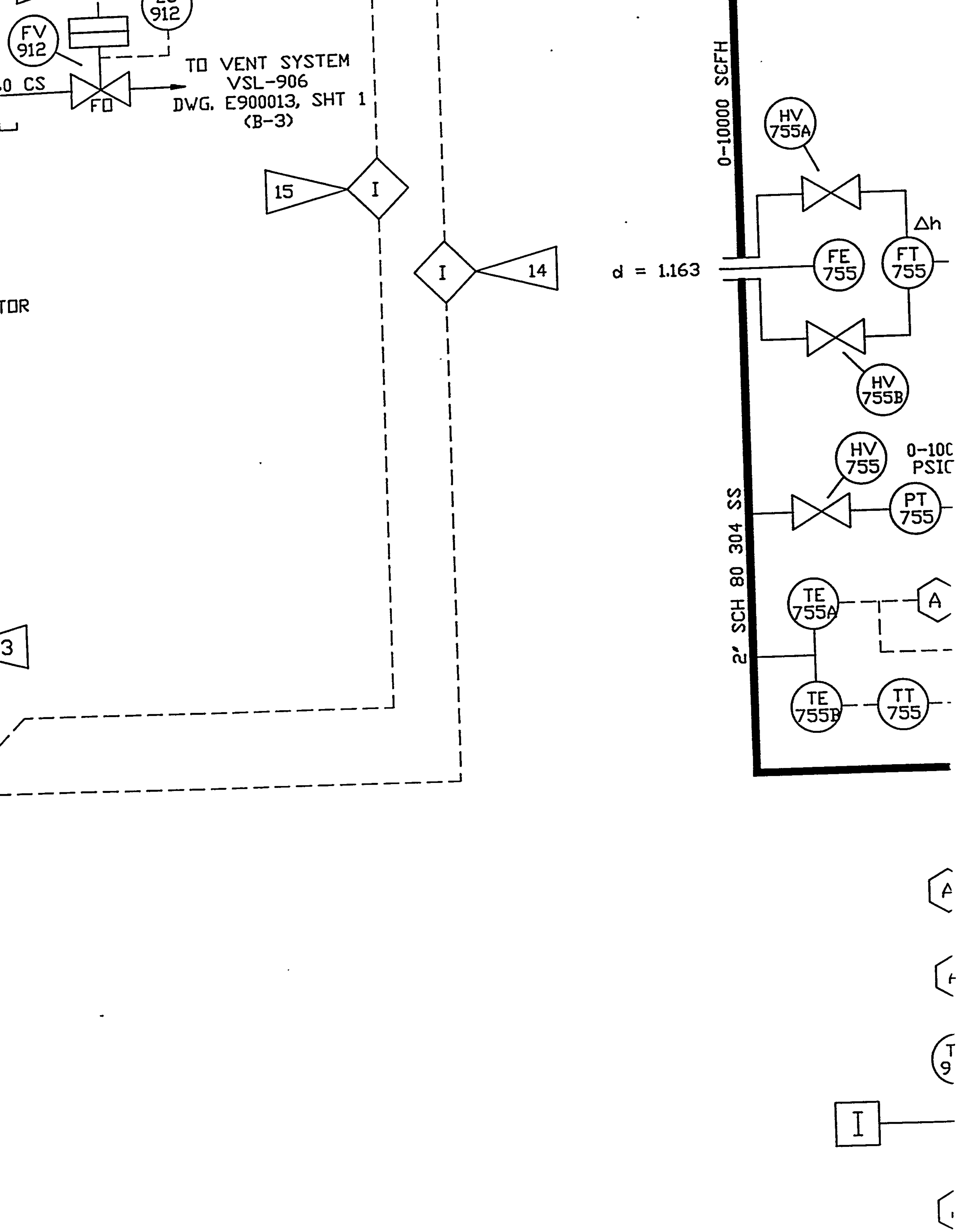
## PIPING SUMMARY

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

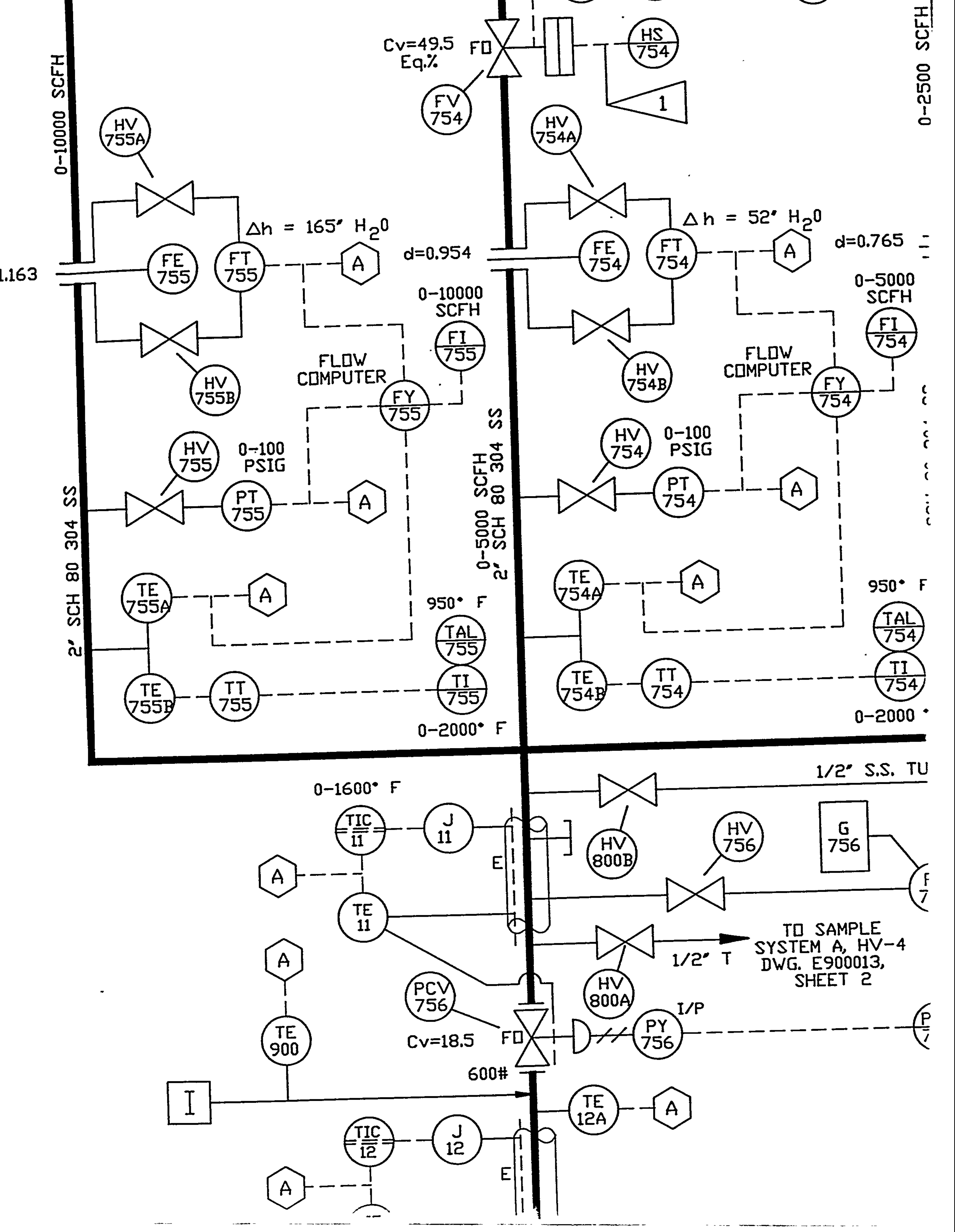

6
I
TIC 10
TI 926
A
TE 10
HS 456
ZL 456
1
ZS 456
PCV 456
HV 905A
FC
FV 456
FSV 457
200-1000 PSIG
1/2" PIPE 304 SS
A
TE 905A
CLOSED
8
HS 458
ZL 458
TI 905
TT 905
TE 905B
1
0-2000° F
ZS 458
FV 458
TO FV 452
DWG. E900012
FC
1/2" PIPE 304 SS
FSV 459
TI 929
HJS 1
13
6
I



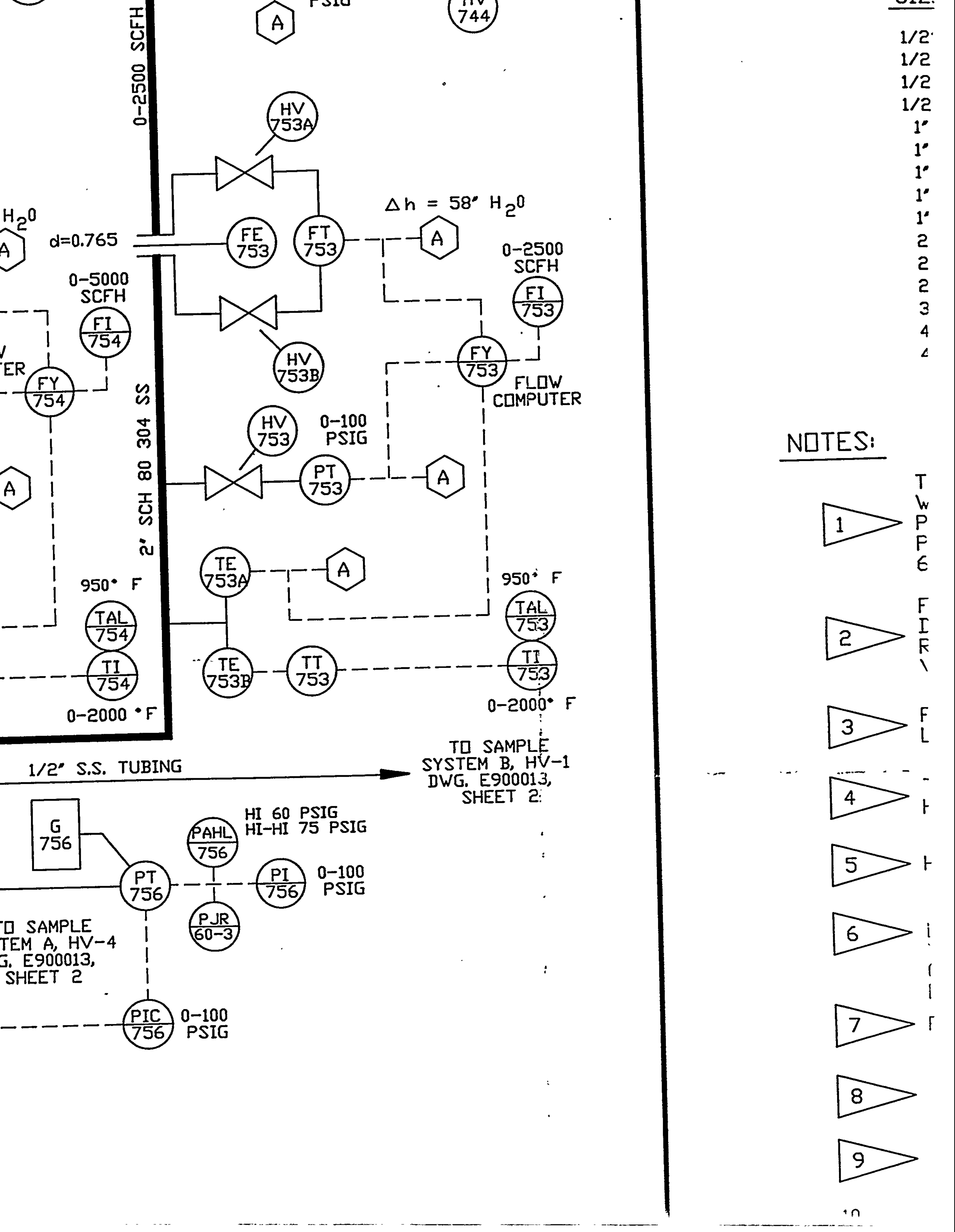
ZS 926
ZL 926
ZS 927
FV 927
FV 912
TO DWG.
1/2" SCH 80 304 SS
450° F 2000 SCFH
FO
2" SCH. 80 CS
750 PSIG
72° F
76000 SCFH
PSE 905
TO INCINERATOR (D-4)
PI 905A
0-1500 PSIG
CONDARY
CLONE
KHOPPER
SL-905
VESSEL
D800560
GN PRESS.
00 PSIG
IGN TEMP.
350° F
PI 930
0-1000 PSIG
A
PT 929
PI 929
0-1000 PSIG
E
J 5
TE 5
TIC 5
HJS 1
5
TI 5
LO 5 PSIG
PAL 929
I
3
FV 929
FC
HS 929
1
ZS 929
ZL 929
316 SS
1" SCH 80 304 SS



912
FV
912
TO VENT SYSTEM
VSL-906
DWG. E900013, SHT 1
(B-3)
0 CS
FO
15
I
I
14
TOR
3
0-10000 SCFH
HV
755A
Δh
d = 1.163
FE
755
FT
755
HV
755B
HV
755
0-100
PSIG
PT
755
2" SCH 80 304 SS
TE
755A
A
TE
755B
TT
755
I



Cv=49.5
Eq.%
FO
FV 754
HS 754
1
0-2500 SCFH
0-10000 SCFH
HV 755A
HV 754A
Δh = 165" H2O
Δh = 52" H2O
d=0.954
d=0.765
1.163
FE 755
FT 755
A
FE 754
FT 754
0-10000 SCFH
FI 755
0-5000 SCFH
FI 754
HV 755B
HV 754B
FLOW COMPUTER
FY 755
FY 754
HV 755
0-100 PSIG
PT 755
HV 754
PT 754
2" SCH 80 304 SS
0-5000 SCFH
2" SCH 80 304 SS
TE 755A
TE 754A
950° F
TAL 755
TAL 754
TE 755B
TT 755
TI 755
TE 754B
TT 754
TI 754
0-2000° F
0-1600° F
1/2" S.S. TU
TIC 11
J 11
E
HV 800B
HV 756
G 756
TE 11
TO SAMPLE SYSTEM A, HV-4 DWG. E900013, SHEET 2
1/2" T
HV 800A
PCV 756
I/P
TE 900
Cv=18.5
FO
PY 756
600#
I
TE 12A
TIC 12
J 12



PSIG
A
HV 744
0-2500 SCFH
HV 753A
$\Delta h$ = 58" $H_2O$
$H_2O$
A
d=0.765
FE 753
FT 753
A
0-2500 SCFH
FI 753
0-5000 SCFH
FI 754
HV 753B
FY 753
FLOW COMPUTER
FY 754
2" SCH 80 304 SS
HV 753
0-100 PSIG
PT 753
A
A
TE 753A
A
950° F
950° F
TAL 754
TAL 753
TI 754
TE 753B
TT 753
TI 753
0-2000 °F
0-2000° F
TO SAMPLE SYSTEM B, HV-1 DWG. E900013, SHEET 2
1/2" S.S. TUBING
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
PIC 756
0-100 PSIG
1/2
1/2
1/2
1/2
1"
1"
1"
1"
1"
2
2
2
3
4
4
NOTES:
1
2
3
4
5
6
7
8
9

| | | |
|---|---|---|
| 1/2" | SCH 40 | CS |
| 1/2" | SCH 80 | CS |
| 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 |

F

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.

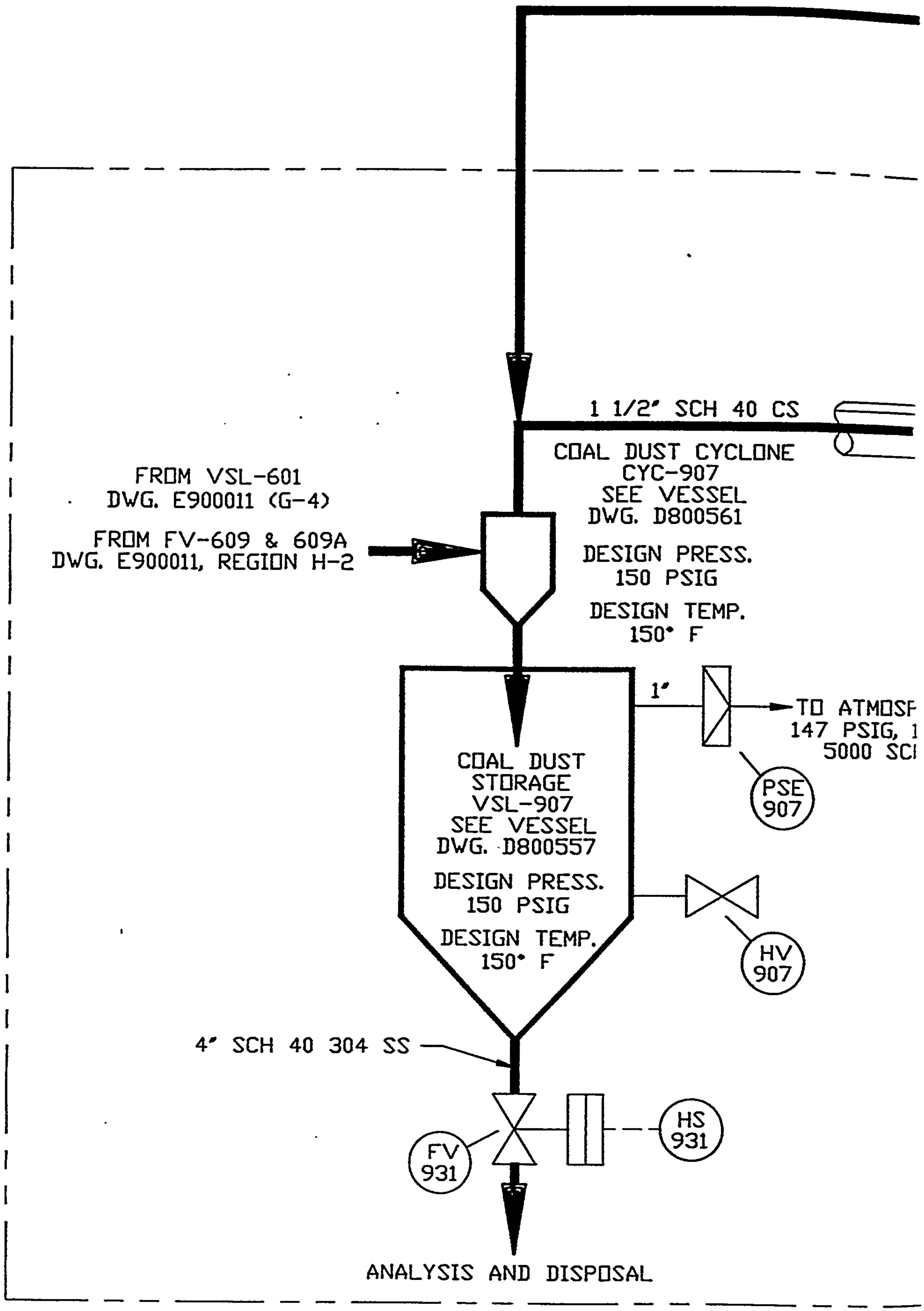
7. RELAY INTERLOCKS PREVENT THE LOCKHOPPERS FILL VALVE AND VENT VALVE FROM BEING OPEN AT THE SAME TIME.

D

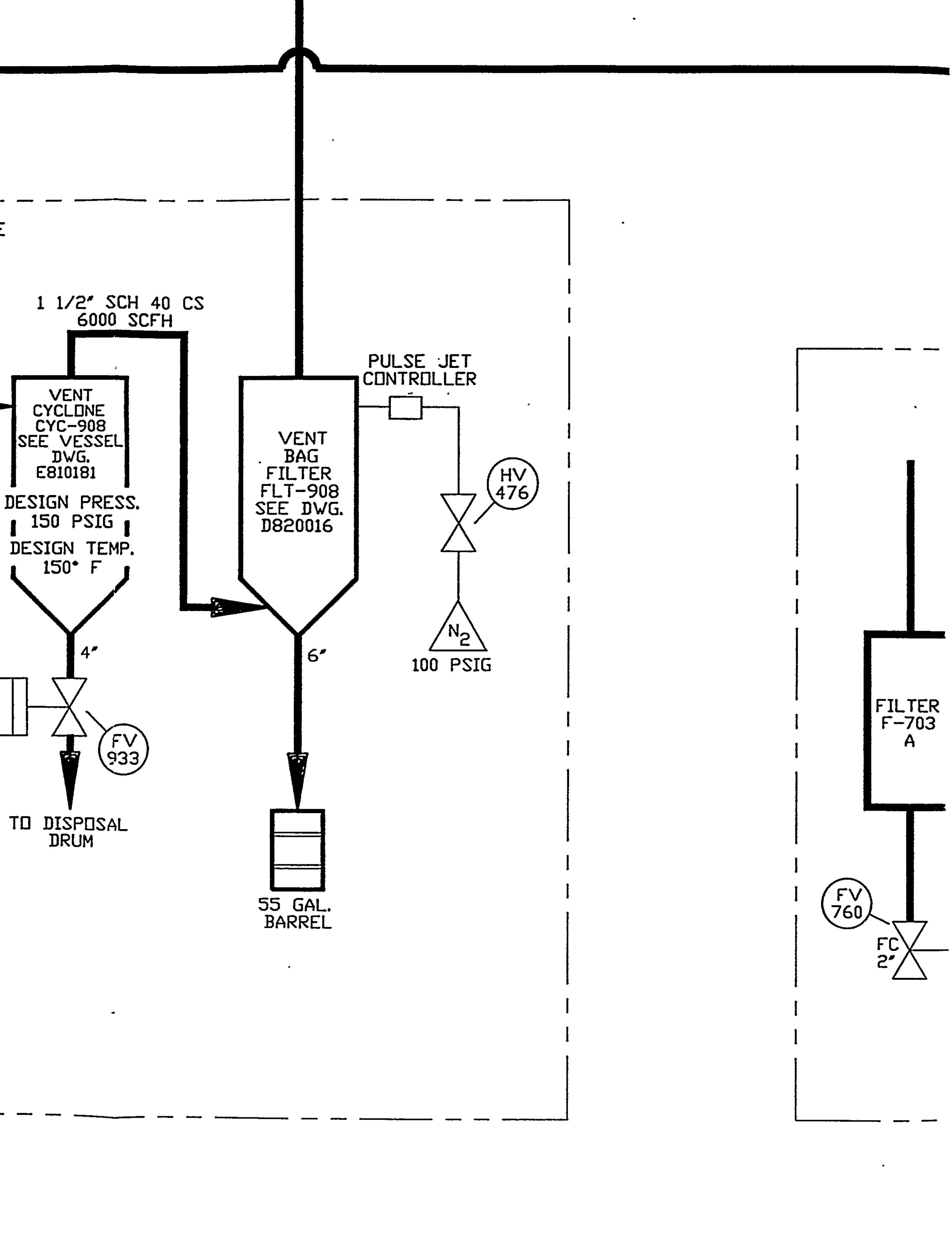
8. DESIGNATES THAT THE CONTROL PANEL SWITCH IS PHYSICALLY LOCKED TO PREVENT ACCIDENTAL ACTUATION.

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

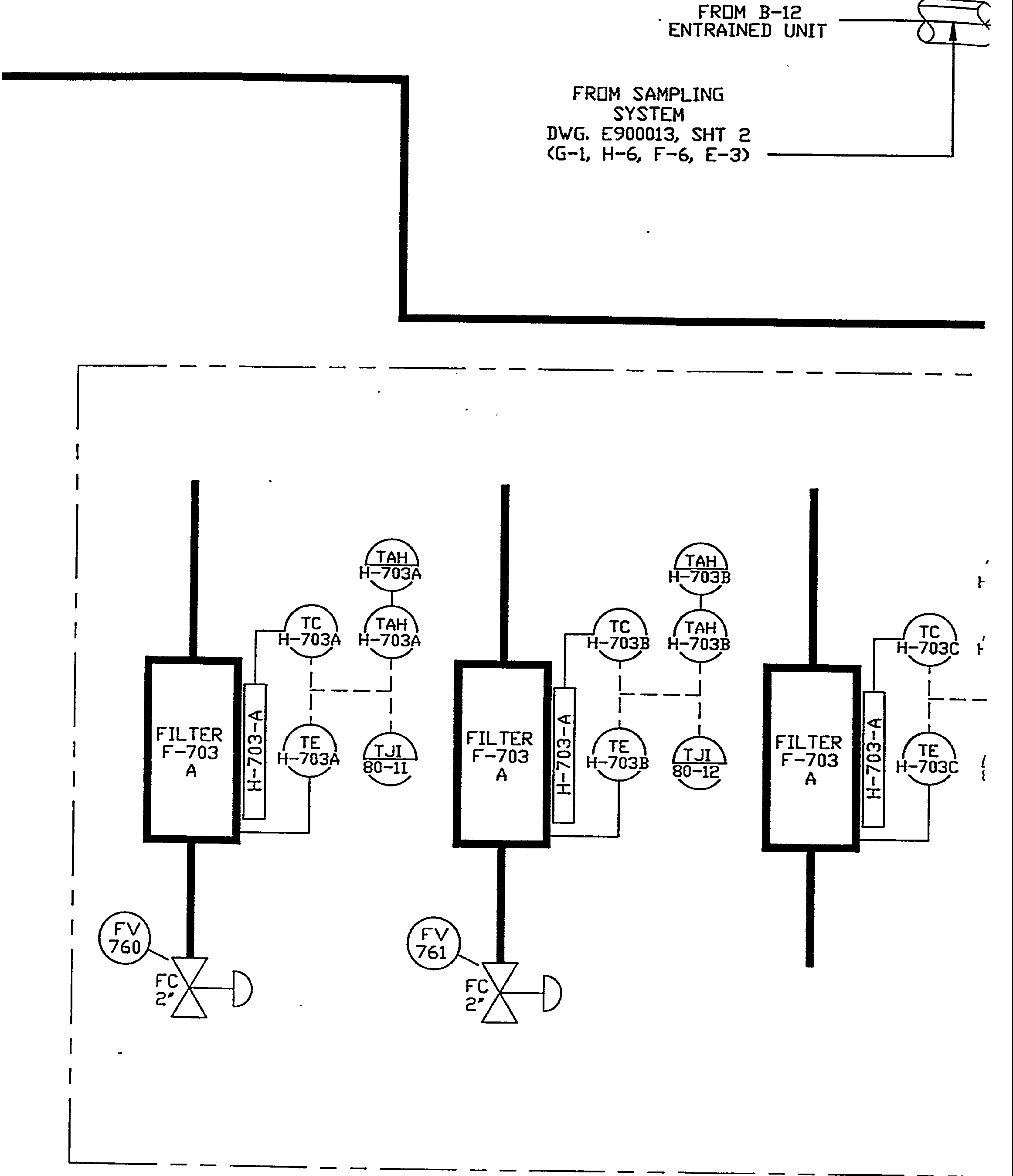
10. LINES TO GAUGES, TRANSMITTERS, & MANUAL PRESSURE RELIEF TO FLAIR ARE 1/2".


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 ATMOSF
147 PSIG,
5000 SC
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

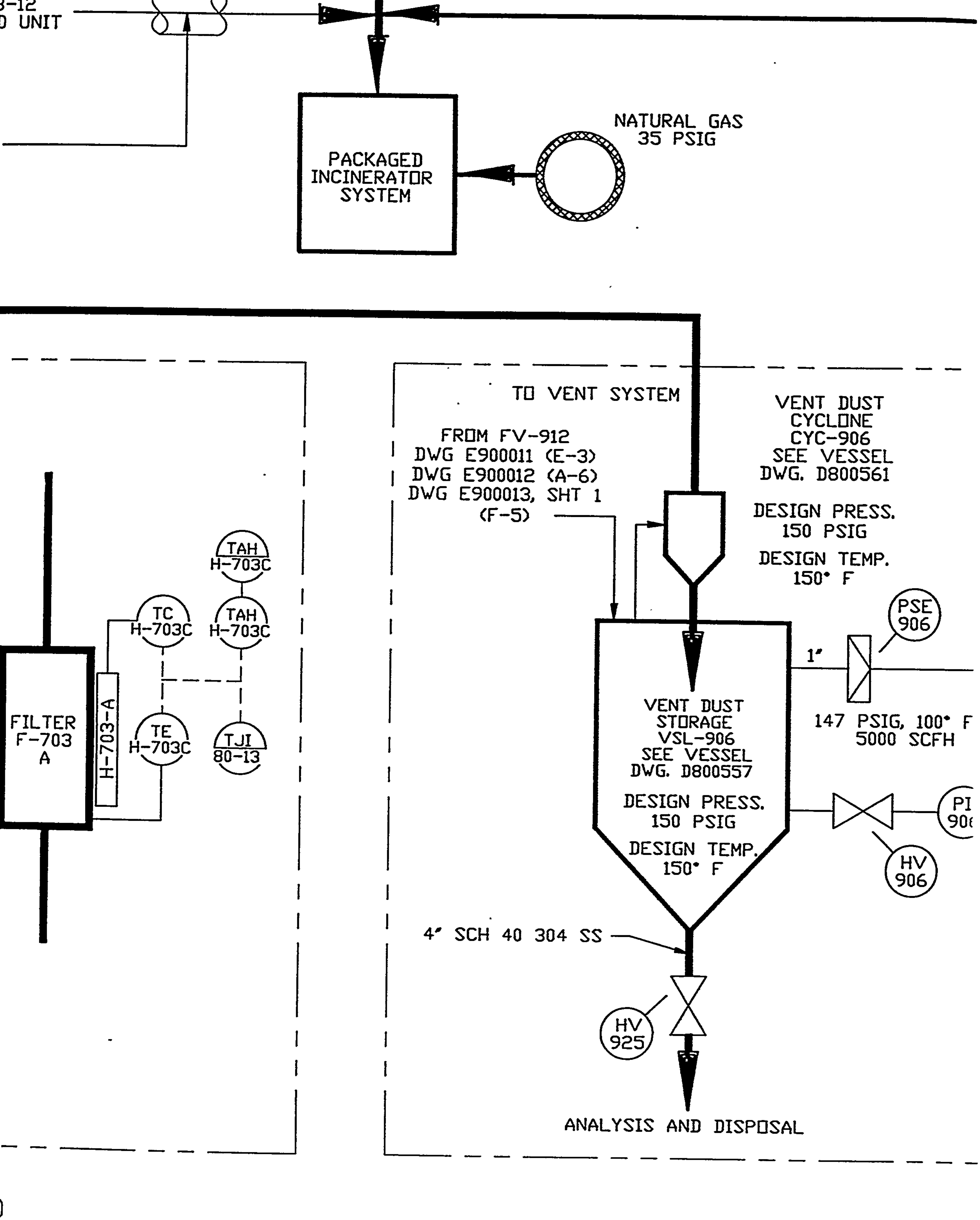
VENT

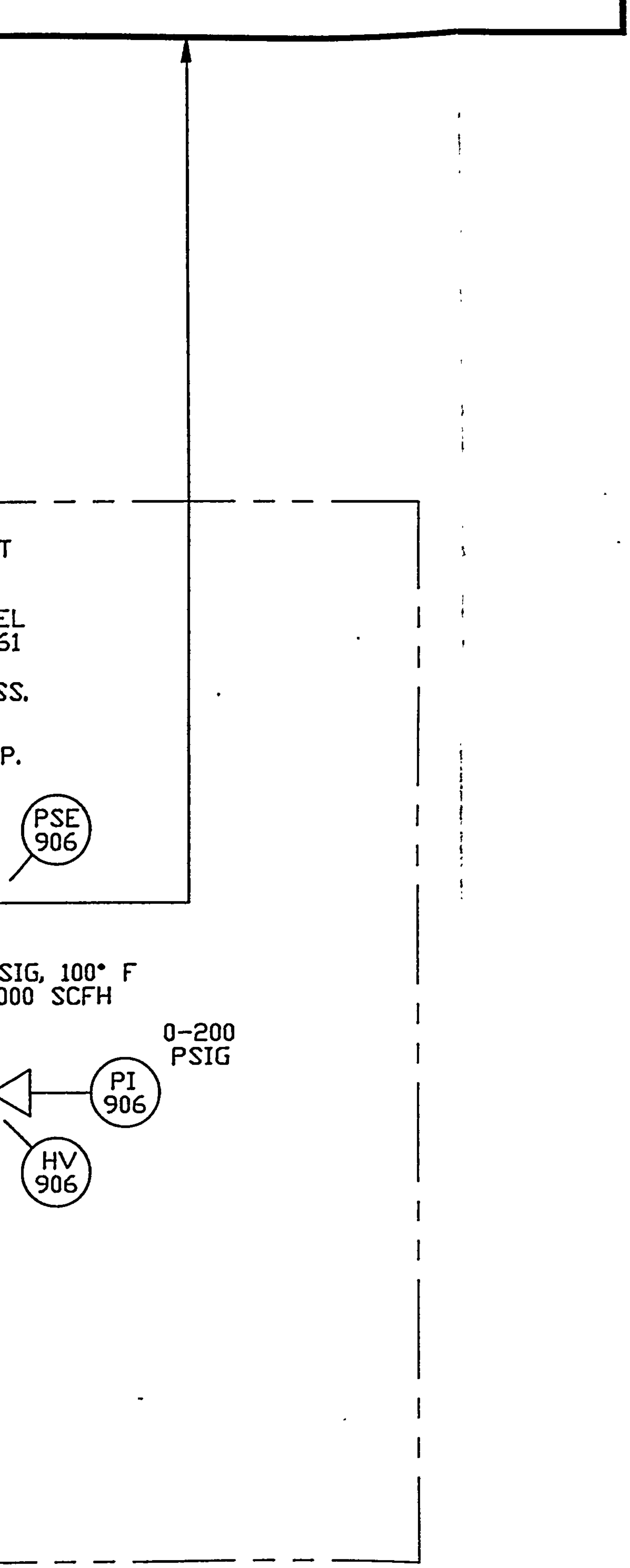


1 1/2" SCH 40 CS
6000 SCFH
VENT
CYCLONE
CYC-908
SEE VESSEL
DWG.
E810181
DESIGN PRESS.
150 PSIG
DESIGN TEMP.
150° F
4"
FV
933
TO DISPOSAL
DRUM
VENT
BAG
FILTER
FLT-908
SEE DWG.
D820016
6"
55 GAL.
BARREL
PULSE JET
CONTROLLER
HV
476
$N_2$
100 PSIG
FILTER
F-703
A
FV
760
FC
2"




DISCONNECTED AND DISABLED


3-12
D UNIT
PACKAGED INCINERATOR SYSTEM
NATURAL GAS
35 PSIG
TO VENT SYSTEM
FROM FV-912
DWG E900011 (E-3)
DWG E900012 (A-6)
DWG E900013, SHT 1
(F-5)
VENT DUST CYCLONE
CYC-906
SEE VESSEL
DWG. D800561
DESIGN PRESS.
150 PSIG
DESIGN TEMP.
150° F
TAH
H-703C
TC
H-703C
TAH
H-703C
TE
H-703C
TJI
80-13
FILTER
F-703
A
H-703-A
VENT DUST STORAGE
VSL-906
SEE VESSEL
DWG. D800557
DESIGN PRESS.
150 PSIG
DESIGN TEMP.
150° F
PSE
906
1"
147 PSIG, 100° F
5000 SCFH
PI
90
HV
906
4" SCH 40 304 SS
HV
925
ANALYSIS AND DISPOSAL




12 SCF IS AT 14.7 PSI

13 THIS DWG. & DWGS.
SUPERCEDES DWG. R

14 RELAY INTERLOCKS
VALVES FROM BEI

15 RELAY INTERLOCKS
FROM OPENING UNL

LEGEND:

RSS = RANGE SELECTOR S

I = MANIFOLD TO PACK

A = INPUT TO THE DDA

G XXX IDENTIFIES THE C
PURGE SYSTEM, WH
NUMBER. (SEE DW
THIS SYMBOL INDIC
IS IN THE PURGE
TRANSMITTER:
FV-440, FSV-44
FSV-XXXP

H XXX IDENTIFIES THE C
PURGE SYSTEM, WH
NUMBER. (SEE DW
THIS SYMBOL INDI
IS IN THE PURGE
TRANSMITTER:
FV-440, FSV-4

| REFERENCE DRAWINGS | | DATE |
|---|---|---|
| E900010 | DRAFTER S. CONKO | 3/6/90 |
| E900011 | CHECKER A. R. KUBALA | 3/6/90 |
| E900012 | PROJECT ENGINEER J. P. KANOSKY | 3/6/90 |
| E920205 | | DATE |
| | | DATE |
| | | DATE |
| | | DATE |

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

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.

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

C

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. KANDSKY | DATE 3/6/90 | Morgantown, WV |
| | DATE | TITLE: B-12 P&ID FLUIDIZED BED GASIFIER A.G.C. |
| | DATE | |
| | DATE | |
| | DATE | SIZE E / FSCH NO / DWG NO E900013 / REV 6 |

A