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COMPILATION OF DATA FROM EBR-II NATURAL-CIRCULATION-TEST PROCEDURE EX-140, SECTION IV, ADDENDUM 8

J. L. Gillette, J. E. Sullivan, R. M. Singer, J. V. Tokar, and E. M. Dean

~~APPLIED TECHNOLOGY~~

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EBR-II PROJECT
ARGONNE NATIONAL LABORATORY
Argonne, Illinois - Idaho Falls, Idaho

May 1980

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ABSTRACT

The transition from forced to natural-circulation flow of primary coolant after the loss of primary pumping power with concomitant reactor scram has been investigated in Experimental Breeder Reactor No. II. Before the loss-of-flow transient, the reactor was operated at 22.3 MWt (37.2% of the normal full-power value) and at 39.3% of normal full flow. All electrical power to the primary pumping system was terminated, causing the flow rate of the primary-system coolant to coast down. Approximately 1.8 s after the primary pumps were tripped, the reactor was manually scrammed. About 32 s after the primary-pump trip, the electric power to the secondary-system pump was also tripped, thereby causing the secondary-system flow rate to coast down to its natural-circulation level. The effects of inter- and intrasubassembly heat transfer in reducing temperature gradients in the primary system were again observed. Consequences of the delayed secondary-system flow coastdown on the natural-circulation flows and temperatures in the primary system were also measured. Data were collected by the EBR-II data-acquisition system from the usual plant process instrumentation and instrumented subassembly XX08. The method used to correct the data for signal offsets is discussed. The corrected test data are presented graphically.

I. INTRODUCTION

Experimental verification of a smooth transition into natural-circulation flow after a protected loss of all plant pumping power is of extreme importance in demonstrating the safety of a liquid-metal fast breeder reactor (LMFBR). To this end, a number of natural-circulation tests[1-7] have been conducted in Experimental Breeder Reactor No. II (EBR-II) as part of the experimentation with instrumented subassembly XX08.[8]

This test program can be broken down into two categories. The first consists of tests initiated from low reactor decay power levels (a minimum of 1.26% of the full operational power). Most of these tests[1-4] consisted of coastdowns from the flow level provided by the auxiliary electromagnetic (EM) primary pump (approximately 5.5% of normal full flow), which is in the reactor outlet pipe. These early tests, summarized in Ref. 9, were intended to provide information on the dependence of minimum natural-circulation flow rates and maximum coolant temperature on (1) the fission-product-decay power level and (2) the initial temperature distribution in the intermediate heat exchanger (IHX). This temperature distribution is determined by the ratio of primary-system to secondary-system flow rates through the IHX and affects natural-circulation flow by creating an initial buoyancy distribution in the primary-system coolant.

The remaining test in the low-decay-power category is referred to as XX08 Test 10.[5] This test was initiated with the auxiliary pump off and the primary-system mechanical pumps at high values of flow. As with the other tests in the first category, Test 10 consisted of multiple phases, with different initial conditions for each phase. The first three phases of Test 10 were initiated at approximately 100% of the normal primary-system flow rate, but with different values of secondary-system flow through the IHX. The fourth phase was initiated at a reduced primary-system flow (approximately 34%) and provided a reference coastdown curve for the second category of XX08 natural-circulation tests.

The second natural-circulation-test category includes tests initiated with the reactor at some substantial fission power. This type of test would be more similar to an actual loss-of-pumping-power accident in an operating LMFBR. The first test in this category is referred to as XX08 Test 7A and is discussed in Ref. 6. The initial conditions for Test 7A were a reactor power level of 17.1 MWt (28.5% of the normal full-power value) and 32.1% of normal full operational flow. The secondary-system flow rate was set at 29.9% of full flow and remained at that value through the major portion of the transient.

All temperatures observed during Test 7A remained below their respective normal full-power values. The flow coastdown exhibited the expected behavior, with a smooth transition from forced to natural-circulation flow. Because of these successful results, the next test in the series (Test 7C) was planned to be initiated at a somewhat higher power and flow rate. As in Test 7A, the secondary-system flow rate was to remain constant at its initial value throughout the transient.

As planned, the initial conditions for Test 7C[7] were somewhat more typical of those that might exist in a full-power LMFBR. The reactor was stabilized at 22.0 MWt (36.7% of the normal EBR-II operating value) and 39.0% of the normal primary-system flow rate. The secondary-system flow rate was 37.4% of its full-scale value. During the transient, the flow and temperature responses showed no adverse characteristics and, in fact, closely followed the predicted behavior. Although the core temperatures were higher for Test 7C than for Test 7A, they still remained below the corresponding full-power values.

Having conducted successful tests at two different levels of fission power and flow, we then had to make some decisions about the next test in the XX08 natural-circulation-test program. Two possible options were (1) to conduct another test similar to Test 7A or 7C, but at higher initial power and flow, or (2) to experimentally examine the dynamic effects of a flow coastdown in the secondary coolant system. In addition to the various test objectives we wanted to meet, we had to consider an additional factor, namely, the residence time of instrumented subassembly XX08 in the reactor. The end of the approved irradiation time for XX08 was rapidly approaching. Furthermore, some loss of XX08 instrumentation had been experienced, and we feared that additional thermocouples or perhpas a flowmeter would cease to provide data at any time.

In light of the above considerations, we decided to forgo additional tests on increased initial power and flow levels and to examine instead the dynamic effects of a loss of pumping power in the secondary coolant system. One of the earlier XX08 tests[3] consisted of a simultaneous loss of electrical power to the auxiliary EM pump in the primary coolant system and of the electrical power to the secondary-coolant-system pump. The dynamic effects of the simultaneous loss of electrical power were benign in this test, however, because of a combination of factors including low initial power, low initial flow rate in the primary system, and the different rates of flow coastdown in the two systems. Analyses have shown, however, that under initial conditions more typical of those in an LMFBR operating at full power, a coastdown in the secondary coolant system could affect temperatures in the primary coolant system. For EBR-II, analyses presented in Ref. 10 indicate that the maximum primary-coolant temperature is strongly dependent on the time delay between reactor scram and loss of pumping power to the secondary-system pump until the delay is approximately 30 s. Any longer time delay was shown to have virtually no affect on maximum in-core temperatures, because the maximum temperature would have already been reached before loss of pumping power in the secondary system.

With these results in hand and with the experience of the earlier tests, we decided that the next test in the XX08 natural-circulation program be initiated from the same power and flow as in Test 7C[7] and that the secondary-system pump be tripped approximately 30 s after the primary-pump trip. EBR-II Test Procedure EX-140, Section IV, Addendum 8 (hereafter called XX08 Test 8) was then written, and the test was conducted on February 13, 1979.

II. PLANT CONDITIONS

Test 8 was conducted immediately after Test 7C and therefore had the same reactor loading configuration. Figure 1 shows the configuration for the first seven rows (the core region) of the reactor. The temperature of the primary-tank sodium had been reduced from the normal operating temperature of 700°F (371°C) to approximately 664°F (351°C) to provide a greater margin to the maximum allowable test temperatures. An approach to power was begun by establishing a primary-system flow rate equal to approximately 40% of the normal operating value and then increasing the reactor power. A final steady-state power level of 22.3 MWt (37.2% of the normal full operating power of 60.0 MWt) was eventually reached. This power level is quite consistent with the 22.0 MWt before the coastdown of XX08 Test 7C. The reactor power was

C = Control rod
D = Driver fuel
K = Structural dummy
P = ½ driver fuel, ½ SS
PLUG = Instrumented-subassembly plug
R = SS reflector
S = Safety rod
SSDR = Stainless steel drop rod
X = Experimental subassembly

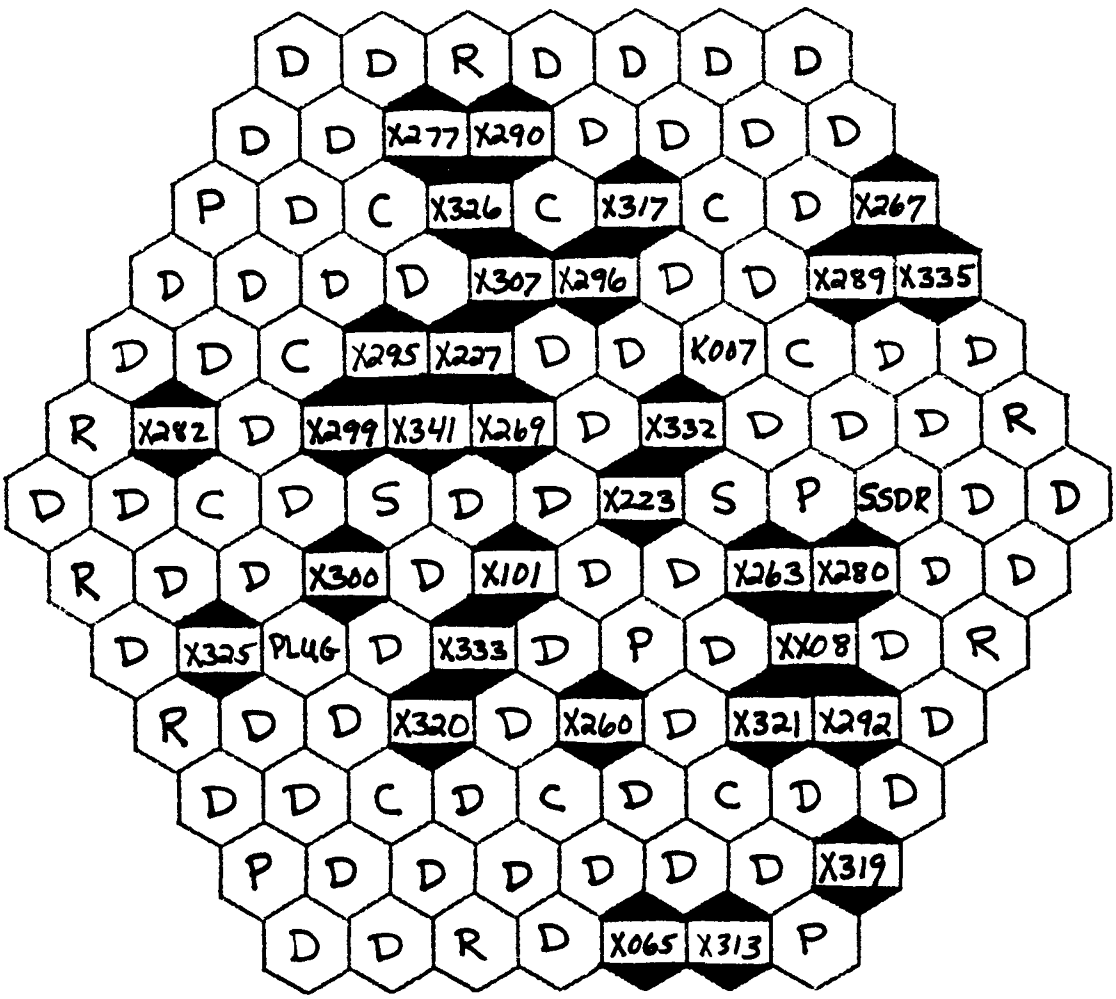


Fig. 1. Core Loading for Test 8

held at 22.3 MWt for approximately 3 h to establish a near-equilibrium state of the fission-product inventory throughout the reactor. During this time, the secondary and steam systems also reached near-equilibrium conditions.

After the reactor had operated at the above conditions for the 3-h period, the electrical power to the auxiliary EM pump was cut off to cause the primary-system flow rate to decrease slightly to 39.3%. The mixed mean reactor outlet coolant temperature increased from 839°F (448°C) to 840°F (449°C) at this time. The conditions in the secondary and steam systems were not affected by turning off the auxiliary pump. Table I lists several of the significant parameters during this part of the test.

Comparison of the data in Table I with the corresponding data for XX08 Test 7C[7] shows that the initial conditions were in fact very similar. The initial power and initial primary-system flow rate were both slightly higher for Test 8, but the mixed mean reactor outlet coolant temperature was the same for both tests. These initial conditions are so close that the experimental data from them can be easily compared and the effects of the secondary-system coastdown easily observed. The slight differences in the initial conditions can be easily accounted for in the analytical representation of these tests.

TABLE I. Reactor Conditions before Coastdown of Test 8

Reactor power	22.3 ± 0.3 MWt
Primary-system flow	3247 gpm[a] (39.3% of normal full flow)
Primary pump No. 1 speed	321 rpm
Primary pump No. 2 speed	320 rpm
Reactor inlet coolant temperature	665°F (352°C)
Mixed mean reactor outlet coolant temperature	840°F (449°C)
Secondary-system flow	2274 gpm[a] (37.9% of full flow[b])
IHX secondary-inlet temperature	557°F (303°C)
IHX secondary-outlet temperature	828°F (442°C)

[a] 1 gpm = 6.31×10^{-5} m^3/s.

[b] A typical value during full-power operation is ~86%.

III. TEST SEQUENCE

Approximately 12-1/3 minutes after the auxiliary pump had been turned off, and with the reactor under the conditions noted in Table I above, the primary pumps were tripped by manually opening the 2400-V breakers and the clutch breakers on the motor-generator set. A delay of approximately 1 s occurred between the opening of the breakers and the start of the flow coastdown. After this termination of electrical power to the primary-system pumps, the procedures called for an automatic reactor scram caused by a low-flow trip setting on the high-pressure-plenum flow. The reactor operator was to manually scram the reactor as a backup to the low-flow trip. This planned reactor scram sequence was the same as that followed in Tests 7A and 7C. In this test, however, the reactor operator manually scrammed the reactor before the low-flow trip setting was reached. As a result, the reactor was scrammed at 1.8 s after the pump trip rather than the 2.1 s that would have occurred if the low-flow trip had been allowed to scram the reactor. The difference in scram delay time is not especially significant in comparisons of the experimental data from Tests 7C and 8 and can be easily accounted for in the analytical results of the tests.

During the coastdown of the primary-system flow and the reactor scram, the secondary-system flow was held constant at 37.9% of its full value. The test procedures called for the secondary-system EM pump to be tripped at approximately 30 s after the breakers on the primary-system pumps were opened. Therefore, 32 s after the breakers were opened, the electrical power to the EM pump in the secondary system was shut off, thereby causing the flow to coast down to its natural-circulation level. After several minutes of near-equilibrium conditions in the primary system, the auxiliary EM pump was turned on and the primary-system flow increased to approximately 5%. After an equilibrium state had been established for several minutes, the primary pumps were turned on to provide 100% of the normal full operational flow rate.

IV. INSTRUMENTATION AND DATA OFFSETS

The test data were collected at the rate of two samples per second by the EBR-II data-acquisition system (DAS). Data were obtained from the normal plant process instrumentation in the primary, secondary, and steam systems and from instrumented subassembly XX08. Included in the normal plant process instruments are thermocouples measuring the coolant temperature at the outlet of several subassemblies in the reactor. Figure 2 shows the location of the in-core subassembly outlet thermocouples (SOT's), and Table II notes the type of subassembly beneath each SOT during Test 8. Also shown in Table II are the calculated powers[11] and calculated flow rates for each of these subassemblies at the steady-state condition of 22.3 MWt of total reactor power and 39.3% reactor-coolant flow. Instrumented subassembly XX08 is included in Table II, because coolant outlet thermocouples are part of its instrumentation package. The recorded flow rate for XX08 is the measured value.

Coolant temperatures in the reactor outlet plenum were measured by the "upper-plenum instrument probe." This probe is above the blanket subassembly in the 14D6 grid position and has thermocouples at eight different axial positions in the outlet plenum. The probe from which Test 8 data were obtained is essentially the same as that shown in Fig. 2.

The bulk of the in-core test data was obtained from instrumentation in instrumented subassembly XX08. This experiment is a uranium-metal-fueled subassembly equipped with two permanent-magnet flowmeters (providing three flow readings) at the core inlet and 24 thermocouples at different radial and axial locations within the subassembly. Figure 3 shows the pattern of the XX08 instrumentation. Not shown in Fig. 3 are two thermocouples (OTC's) that measure the mixed mean outlet coolant temperature from XX08. Reference 8 gives a more complete description of XX08.

As was noted previously, this test was conducted immediately after XX08 Test 7C. As a result the instrument offsets and normalization factors determined for Test 7C are also applicable for Test 8. These offsets and normalization factors were determined during the time after Test 7C that the primary-system pumps were operated at 100% of their normal full flow. The techniques used in determining these values are similar to those used for the earlier XX08 tests and are discussed in detail in Ref. 7. The discussion regarding the offsets in the flowmeters for high-pressure-plenum 2 (HPP2), low-pressure-plenum 1 (LPP1), and low-pressure-plenum 2 (LPP2) is repeated below, however, because of its potential significance in the analysis of these data.

As in all previous XX08 natural-circulation tests, the signal from the HPP2 flowmeter gave indications of negative (i.e., reverse) flow during

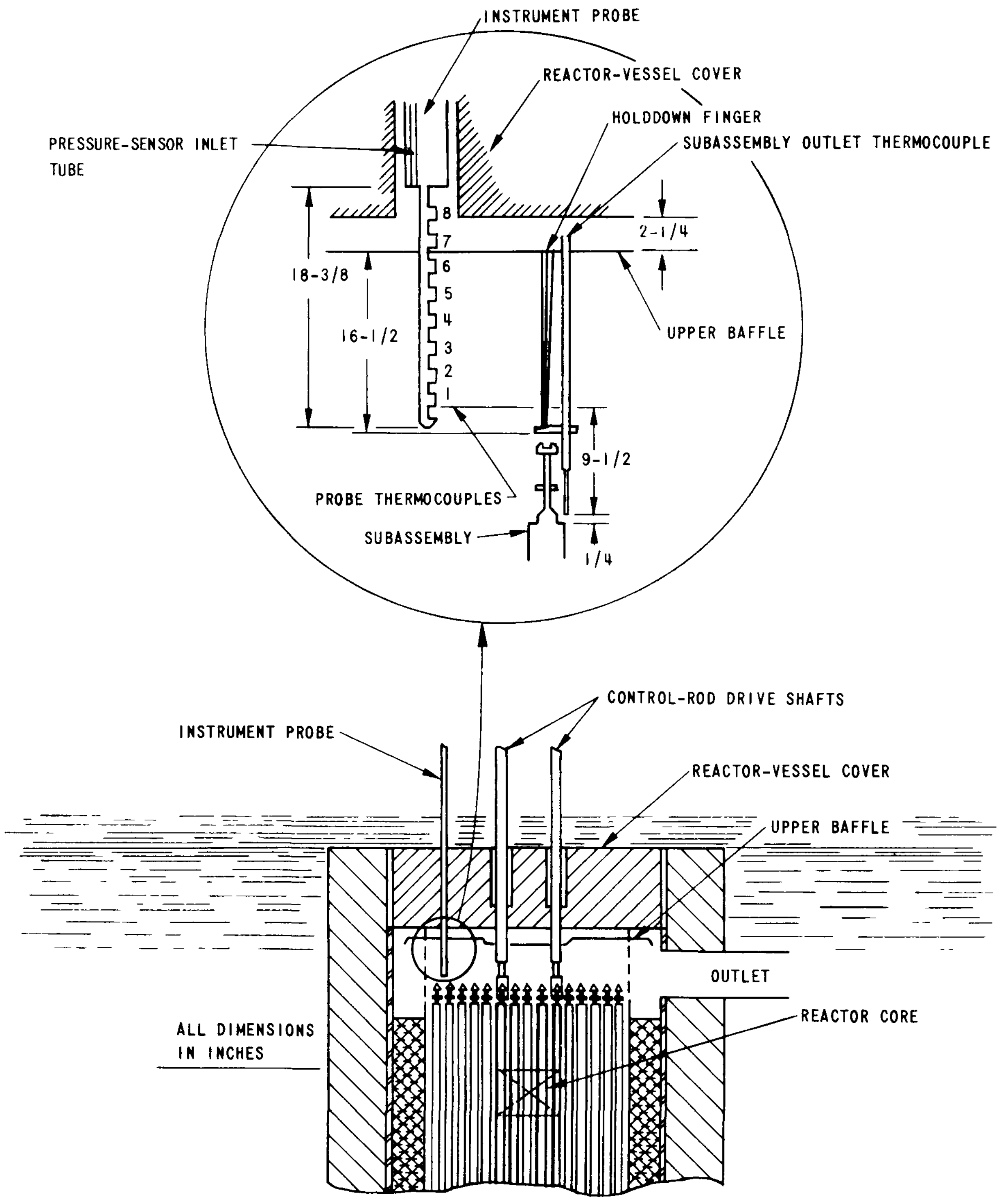


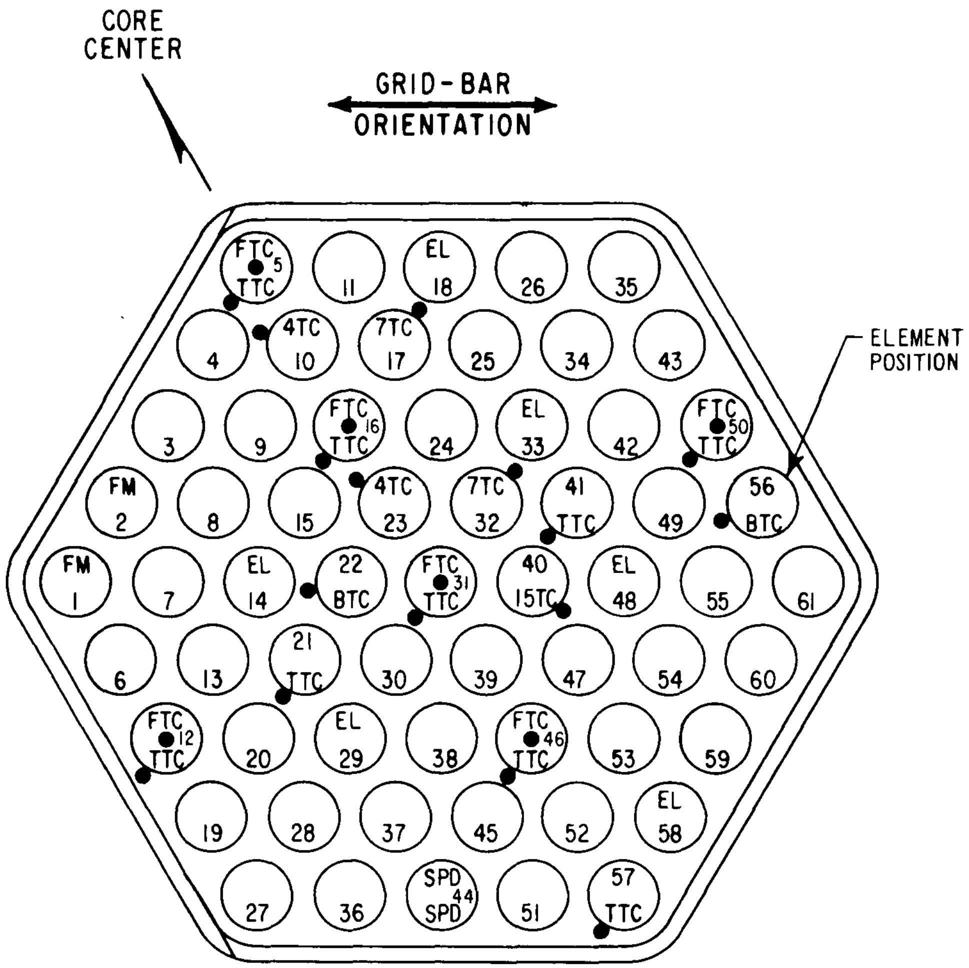
Fig. 2. Location of Subassembly Outlet Thermocouples and Orientation of Upper-plenum Instrument Probe in EBR-II. Conversion factor: 1 in. = 25.4 mm.

TABLE II. Location and In-core Parameters of Subassemblies with SOT's during Test 8

Location	Subassembly	Power, kWt	Flow, gpm[a]
1A1	Driver	279.7	52.25
2A1	Driver	278.8	51.09
2B1	X269A (structural experiment)	5.6	2.30
2C1	Driver	260.3	51.09
2E1	Driver	280.5	51.09
2F1	X101M (structural experiment)	6.7	4.93
3B1	X227A (37-pin oxide/bypass flow experiment)	122.8	20.14
3C1	Driver	274.6	44.04
3F1	X333 (19-pin oxide experiment)	91.5	8.76
4B1	Driver	263.3	33.90
4C3	Driver	254.4	33.90
4E1	Driver	259.5	33.90
4F1	X320 (structural experiment)	8.8	4.45
5A4	Driver	228.9	29.27
5C2	Driver	244.0	29.27
6C4	Driver	230.3	23.80
7A3	Driver	196.8	23.80
7D4	Driver	191.3	23.80
5D3	XX08	141.9	16.77

[a]Conversion factor: 1 gpm = 6.31×10^{-5} m^3/s.

various portions of the test. Because flow reversal in the high-pressure plenum was contrary to expected behavior and, more importantly, was totally inconsistent with other experimental data on flow and temperature, it was concluded that an offset existed in this flowmeter signal. Large differences between the measured flow rates for LPP1 and LPP2 were also observed in this test. The two flow paths from the pumps to the low-pressure plenum were designed identically, and previous experience has shown the two measured flow rates to be nearly equal. Because of the large differences observed in this test, we concluded that these signals should also be corrected by an offset factor.



LEGEND	REQUIRED
FM - FLOWMETER LEAD	2
SPD - SELF-POWERED DETECTOR	2
BTC - CORE-BOTTOM COOLANT TC	2
4TC - COOLANT TC 0.137m ABOVE CORE BOTTOM	2
7TC - COOLANT TC 0.240m ABOVE CORE BOTTOM	2
TTC - COOLANT TC TOP OF CORE	9
FTC - FUEL-CENTERLINE TC	6
15TC - COOLANT TC 0.514m ABOVE CORE BOTTOM	1
EL - EXTENDED-LENGTH (0.660m) MK-II ELEMENTS	6

NOTES: a) DOTS REPRESENT LATERAL POSITION OF TC JUNCTIONS IRRESPECTIVE OF AXIAL LOCATION.

b) TWO OUTLET-COOLANT TC's (NOT SHOWN) EXIST ABOVE THE FUEL ELEMENTS.

c) NUMBERS INDICATE ELEMENT POSITION.

Fig. 3. Location of Instrumentation Sensors in XX08

To quantify the offsets in these signals, a technique was used based on the premise that at the flow rate supplied by the auxiliary pump, the percentage of full flow measured by the HPP2 flowmeter and by each of the two low-pressure-plenum flowmeters should be equal to that measured by the XX08 flowmeters. For the HPP2 flowmeter, determining the offset in this manner is believed to be quite accurate, because the thermal and hydraulic characteristics of XX08 are similar to those of the average subassembly receiving coolant from the high-pressure plenum. Some analytical predictions indicate, however, that because of the slightly greater power-to-flow ratio (and resultant buoyant driving force) in XX08 as compared to the average subassembly, the XX08 flow should be a higher percentage of the full-flow value. This difference is relatively slight, however, and no experimental data have verified it. Therefore, we concluded that we would achieve much greater accuracy by offsetting the signal of the HPP2 flowmeter rather than leaving it uncorrected.

Under conditions of fission-product-decay heat, a reflector or blanket subassembly will retain a greater fraction of its steady-state power than a fueled subassembly. Therefore, when forced flow is provided by the auxiliary pump, the temperature rises in these subassemblies are a larger fraction of the full-power temperature rises than in fueled subassemblies. These larger temperature rises produce buoyant forces that are more comparable to the forced-flow driving forces than those developed in fueled subassemblies. Thus the net flow (forced plus convective) in blanket and reflector subassemblies will be a greater percentage of the full operational value than the net flow in fueled subassemblies.

As noted earlier, in determining the offsets in the low-pressure-plenum flowmeters, the signals were equated to the flow measured by XX08. It is likely, therefore, that the low-pressure-plenum flows reported in the appendix are slightly low, especially at the auxiliary-pump flow level or lower. Nevertheless, we believe that these flows are much closer than the uncorrected values to those actually realized during the test, and therefore decided to use the corrective means discussed above.

In terms of an equation, the flowmeter offsets were determined by solving the following equality:

$$100 \times \frac{\text{(flow signal with auxiliary pump on) + offset}}{\text{(flow signal at full flow) + offset}} = \begin{array}{l}\text{Percent of XX08 flow}\\ \text{with auxiliary pump on.}\end{array}$$

The offsets for the HPP2, LPP1, and LPP2 flowmeters determined from the above relationship were 0.075, 4.110, and -1.492%, respectively. These values were used in preparing the figures presented in the appendix.

Table III lists the correction factors for instruments in the primary system. The corrected data take the form of

Corrected value = (DAS signal + A)/B,

where A is the offset and B is a normalization factor. A value of B not equal to 1.0 is used to express the data in terms of percent of the full-flow value.

The "Neutron Power (Log Range B)" signal (pp. A32 and A33 of the appendix) was normalized to yield the correct percent power during the initial steady-state portion of the test. Values of A = 0.0 and B = 0.749 were used for this purpose.

The secondary-sodium and steam signals are all recorded without offset or normalization factor (i.e., A = 0.0 and B = 1.0).

V. TEST DATA

The data from XX08 Test 8 are presented in graphical form in the appendix. For each plot, time = 0 represents the time at which the primary pumps started to coast down. For the primary-system data, the time period shown covers the interval from just before the auxiliary pump was turned off until the primary system was in an equilibrium natural-circulation state. The time intervals for the secondary- and steam-system data extend beyond that shown for the primary-system data so that any effects having longer time delays may be observed. Some primary-system data are shown twice, with the second plot, which has an expanded time scale, covering only the flow-coast-down interval. In this way, the coastdown characteristics can be observed in finer detail.

TABLE III. Correction Factors for Data from XX08 Test 8

Parameter	Units	Correction Factors A	Correction Factors B
XX08 lower flowmeter	%	0.0	0.4270
XX08 upper flowmeter--signal 1	%	0.0	0.3240
XX08 upper flowmeter--signal 2	%	0.0	0.3236
XX08 FTC-5	°F	2.1	1.0
XX08 FTC-12	°F	1.5	1.0
XX08 FTC-16	°F	1.6	1.0
XX08 FTC-31	°F	0.8	1.0
XX08 FTC-46	°F	1.2	1.0
XX08 FTC-50	°F	1.2	1.0
XX08 BTC-22	°F	1.3	1.0
XX08 BTC-56	°F	1.6	1.0
XX08 4TC-10	°F	1.8	1.0
XX08 4TC-23	°F	3.7	1.0
XX08 7TC-17	°F	3.2	1.0
XX08 7TC-32	°F	2.5	1.0
XX08 15TC-40	°F	1.6	1.0
XX08 TTC-5	°F	3.5	1.0
XX08 TTC-12	°F	1.0	1.0
XX08 TTC-16	°F	1.9	1.0
XX08 TTC-21	°F	2.3	1.0
XX08 TTC-31	°F	2.9	1.0
XX08 TTC-41	°F	2.5	1.0
XX08 TTC-46	°F	0.1	1.0
XX08 TTC-50	°F	2.1	1.0
XX08 TTC-57	°F	0.5	1.0
XX08 OTC-1	°F	2.5	1.0
XX08 OTC-2	°F	-0.7	1.0
Primary-pump-1 speed	rpm	0.0	1.0
Primary-pump-2 speed	rpm	0.0	1.0
High-pressure-plenum-2 flow	%	0.075	1.0024
Low-pressure-plenum-1 flow	%	4.110	1.0524
Low-pressure-plenum-2 flow	%	-1.492	1.0215

TABLE III (contd)

Parameter	Units	Correction Factors A	Correction Factors B
Total primary flow (541 E)	%	0.0	0.9892
Bulk-sodium temp (501 X)	°F	-1.6	1.0
Bulk-sodium temp (501 AA)	°F	0.9	1.0
Bulk-sodium temp (501 V)	°F	-0.6	1.0
Bulk-sodium temp (501 W)	°F	0.4	1.0
Bulk-sodium temp (501 T)	°F	0.4	1.0
Bulk-sodium temp (501 D)	°F	1.3	1.0
Bulk-sodium temp (501 E)	°F	7.2	1.0
Bulk-sodium temp (501 Q)	°F	6.6	1.0
Bulk-sodium temp (501 F)	°F	9.4	1.0
Bulk-sodium temp (530)	°F	1.9	1.0
Primary-pump inlet temp	°F	4.0	1.0
Primary-pump-1 outlet temp (540 C)	°F	-7.5	1.0
Primary-pump-1 outlet temp (540 D)	°F	-8.1	1.0
Primary-pump-2 outlet temp (540 A)	°F	-6.8	1.0
Primary-pump-2 outlet temp (540 E)	°F	-6.1	1.0
Primary-pump-2 outlet temp (540 F)	°F	-5.6	1.0
Low-pressure-plenum sodium temp (540 AR)	°F	0.9	1.0
Low-pressure-plenum sodium temp (540 AS)	°F	2.1	1.0
Low-pressure-plenum sodium temp (540 AV)	°F	2.3	1.0
High-pressure-plenum sodium temp (540 AT)	°F	0.8	1.0
Subassembly outlet temp, position 1A1	°F	1.8	1.0
Subassembly outlet temp, position 2A1	°F	7.7	1.0
Subassembly outlet temp, position 2B1	°F	3.2	1.0
Subassembly outlet temp, position 2C1	°F	0.4	1.0
Subassembly outlet temp, position 2E1	°F	2.4	1.0
Subassembly outlet temp, position 2F1	°F	5.3	1.0
Subassembly outlet temp, position 3B1	°F	2.2	1.0
Subassembly outlet temp, position 3C1	°F	-17.0	1.0
Subassembly outlet temp, position 3F1	°F	0.2	1.0
Subassembly outlet temp, position 4B1	°F	2.2	1.0
Subassembly outlet temp, position 4C3	°F	2.8	1.0

TABLE III (contd)

Parameter	Units	Correction Factors A	Correction Factors B
Subassembly outlet temp, position 4E1	°F	0.6	1.0
Subassembly outlet temp, position 4F1	°F	1.2	1.0
Subassembly outlet temp, position 5A4	°F	0.9	1.0
Subassembly outlet temp, position 5C2	°F	0.7	1.0
Subassembly outlet temp, position 6C4	°F	-0.5	1.0
Subassembly outlet temp, position 7D4	°F	3.0	1.0
Subassembly outlet temp, position 9E4	°F	2.9	1.0
Subassembly outlet temp, position 12E6	°F	0.0	1.0
Subassembly outlet temp, position 16E9	°F	-0.1	1.0
Upper-plenum-probe temp TC1	°F	2.2	1.0
Upper-plenum-probe temp TC2	°F	3.8	1.0
Upper-plenum-probe temp TC3	°F	1.6	1.0
Upper-plenum-probe temp TC4	°F	1.9	1.0
Upper-plenum-probe temp TC5	°F	2.2	1.0
Upper-plenum-probe temp TC6	°F	2.4	1.0
Upper-plenum-probe temp TC7	°F	2.3	1.0
Upper-plenum-probe temp TC8	°F	1.7	1.0
Upper-plenum-probe pressure 1	psi	0.0	1.0
Upper-plenum-probe pressure 2	psi	0.0	1.0
Reactor outlet temp (1534 CF)	°F	5.0	1.0
Reactor outlet temp (506 X)	°F	2.7	1.0
IHX primary-inlet temp (507 BK)	°F	1.4	1.0
IHX primary-inlet temp (507 BQ)	°F	4.1	1.0
IHX primary-outlet temp (540 AB)	°F	-1.1	1.0
IHX primary-outlet temp (540 AC)	°F	-1.1	1.0
IHX primary-outlet temp (540 AD)	°F	-1.2	1.0
IHX primary-outlet temp (540 AE)	°F	-0.8	1.0
IHX primary-outlet temp (540 AM)	°F	-1.4	1.0
IHX primary-outlet temp (540 AW)	°F	-0.7	1.0
IHX primary-outlet temp (540 AP)	°F	-0.8	1.0
IHX primary-outlet temp (540 AQ)	°F	-0.7	1.0
IHX top orifice plate (507 CP)	°F	1.0	1.0

TABLE III (contd)

Parameter	Units	Correction Factors A	Correction Factors B
IHX bottom orifice plate (507 CC)	°F	2.1	1.0
IHX bottom orifice plate (507 BX)	°F	1.1	1.0
IHX bottom orifice plate (507 EF)	°F	0.9	1.0
IHX bottom orifice plate (507 EG)	°F	1.5	1.0
IHX bottom orifice plate (507 CA)	°F	1.0	1.0
IHX bottom orifice plate (507 CG)	°F	1.4	1.0

Conversion factors: °C = (°F - 32)/1.8; 1 psi = 6.89 kPa.

Included in the appendix are plots showing the average values of several combinations of parameters. In each case the heading on the plot states which instruments have been averaged.

The experimental data presented in this document will be compared with the analytical results in a subsequent report. However, some basic observations can be made from the data.

The pump-speed curves are shown on pp. A40-A41. From these curves it is apparent that the run-down time (i.e., the time required for the pump speed to decrease to zero) is about 35 s for primary pump No. 1 and about 42 s for primary pump No. 2. This characteristic behavior has been observed several times with the mode of pump trip used in this test. It is indicative of the greater friction on the shaft of primary pump No. 1 relative to that on the shaft of pump No. 2. A significant feature of the different run-down times is that during the 7-s period that pump No. 2 was still running down and pump No. 1 was stopped, a measurably increased proportion of the total primary flow was supplied by pump No. 2. This is illustrated by the "hump" in the flow-coastdown transient measured by the HPP2 flowmeter and shown on pp. A36-A37. Unfortunately, the flowmeter in the high-pressure-plenum inlet pipe from pump No. 1 (i.e., HPP1) is no longer functional. As a result, no direct experimental observations can be made of the flow rate through this line. Calculations of this phenomenon, however, indicate that the flow in the outlet line from pump No. 1 reversed during this 7-s period, i.e., some coolant pumped into the plenum by pump No. 2 bypassed the reactor core and went into the outlet line from pump No. 1. As additional evidence of this behavior, the in-core flow rate as measured by XX08 (pp. A2-A5) shows a smooth coastdown characteristic and a gradual transition from forced to natural convective flow. The "hump" in the HPP2 flow did not cause a similar condition to appear in-core.

The thermal response of the primary coolant can be seen in the behavior of the XX08 top-of-core thermocouples (pp. A12-A21) and the subassembly outlet thermocouples (pp. A60-A79). For reference, the reactor inlet temperature was 665°F (352°C). Of particular interest are the responses of a thermocouple located in an interior subchannel of the XX08 rod bundle (e.g., TTC-31, pp. A16-A17) and of a thermocouple next to the hex-can wall (e.g., TTC-57, pp. A20-A21). The initially hot interior subchannel and the initially cool wall subchannel reached nearly the same peak temperature during the transient. This behavior, which has been repeatedly observed under low-flow conditions in EBR-II, is caused by intrasubassembly flow redistribution and transverse conduction and results in quite uniform transverse temperature gradients within subassemblies.

Coolant temperatures at the outlet of two fueled subassemblies (2A1 and 4B1), one of which operated initially at a somewhat larger than average temperature rise, and the other at a smaller than average temperature rise, are shown on pp. A62-A63 and pp. A68-A69. As was observed within a single subassembly, the transverse temperature differences between different subassemblies decrease during the natural-circulation transient. For these two fueled subassemblies, the initial at-power temperature rises differ by about 35%, but the temperature rises at the peak of the transient differ only very slightly. This significant flattening of the transverse reactor temperature profile is primarily due to buoyancy-induced flow redistribution and intersubassembly heat transfer.

The effects of intra- and intersubassembly heat transfer in all subassembly types are discussed in detail in Ref. 12, where similar data from other natural-circulation tests in EBR-II are presented.

The effects of the secondary-pump trip that occurred 32 s after the primary-pump trip can be seen by comparing the data in the appendix with the corresponding data for Test 7C.[7] One noticeable result is the natural-circulation flow in the secondary system. For Test 7C, the secondary-system flow leveled out at approximately 2.5%, whereas the corresponding value for Test 8 was about 5.0%. The difference is due primarily to the significantly different thermal conditions existent in the IHX at the instant of the secondary-pump trip. During Test 7C, the secondary pump was tripped approximately 3 minutes after the primary-pump trip. This 3-min delay allowed ample time for the IHX to cool down from its steady-state temperature. Therefore, just before the secondary-pump trip the temperature rise of the secondary-system sodium in the IHX was relatively small. This small temperature rise produced a relatively low net buoyant head in the secondary-system heat-transport loop so that when forced convection was stopped (i.e., when the pump tripped), the natural-convection flow was relatively small. However, during Test 8 the secondary pump was tripped only 32 s after the primary-pump trip, so the IHX had not been cooled down as much. The resultant greater temperature rise in the secondary system yielded a greater buoyant force, thereby causing the higher natural-convective flow seen on pp. A108-A109.

The effect of this considerably different secondary-system behavior on the core temperatures, however, was somewhat modest. The top-of-core and subassembly outlet coolant temperatures differed by only about 5-15°F (3-8°C) from test to test, while the minimum convective flow rate, as measured in XX08, varied from about 2.4 to 2.8% of normal. This relatively moderate effect, which was accurately predicted in the pretest calculations, is primarily due to the thermal inertia of the primary-coolant system and the IHX. Typically, in EBR-II the peak coolant temperature at the top of the core is reached 50-60 s after the primary-pump trip, and the peak temperature at the subassembly outlet is reached approximately 1-2 min after a pump trip with the coastdown rate observed in this test. Therefore, with a 32-s delay between the pump trips in the primary and secondary systems, there is not sufficient time before reaching the peak temperatures for the changing thermal conditions within the IHX to reflect back through the primary system in such a way as to significantly affect those temperatures.

A shorter delay between the primary- and secondary-flow trips--about 15 s, for example--would have increased the peak core temperatures about 45°F (25°C) above those in Test 7C and decreased the minimum convective flow rate to about 1.7% of normal. The next, and final, test in the XX08 natural-circulation test program was similar to Test 8, but with the secondary-pump trip approximately 15 s after the primary-pump trip. The report on this test, Test 8A, is in publication.

ACKNOWLEDGMENTS

We are very appreciative of the efforts of those people in the Operations and Analysis Departments of the EBR-II Project who were instrumental in preparing for and conducting XX08 Test 8. A special note of gratitude goes to William Booty for setting up the special data-acquisition-system program and to the operating crews for the expert and conscientious manner in which the test was conducted.

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1. J. L. Gillette et al., *Compilation of Data from EBR-II Natural-circulation-test Procedure EX-140, Section IV, Addendum 1A,* ANL/EBR-101 (May 1978).
2. J. L. Gillette et al., *Compilation of Data from EBR-II Natural-circulation-test Procedure EX-140, Section IV, Addendum 1E,* ANL/EBR-102 (September 1978).
3. J. L. Gillette et al., *Compilation of Data from EBR-II Natural-circulation-test Procedures EX-140, Section IV, Addenda 1B and 1C,* ANL/EBR-105 (December 1979).
4. J. L. Gillette et al., *Compilation of Data from EBR-II Natural-circulation-test Procedure EX-140, Section IV, Addendum 1D,* ANL/EBR-109 (January 1980).
5. J. L. Gillette et al., *Compilation of Data from EBR-II Natural-circulation-test Procedure EX-140, Section IV, Addendum 10,* ANL/EBR-110 (April 1980).
6. J. L. Gillette et al., *Compilation of Data from EBR-II Natural-circulation-test Procedure EX-140, Section IV, Addendum 7A,* ANL/EBR-104 (April 1979).
7. J. L. Gillette et al., *Compilation of Data from EBR-II Natural-circulation-test Procedure EX-140, Section IV, Addendum 7C,* ANL/EBR-111 (May 1980).
8. A. Smaardyk et al., *EBR-II Environmental Instrumented Subassembly XX08: Engineering and Assembly,* ANL-78-9 (May 1978).
9. J. L. Gillette et al., *Experimental Study of the Transition from Forced to Natural Circulation in EBR-II at Low Power and Flow,*

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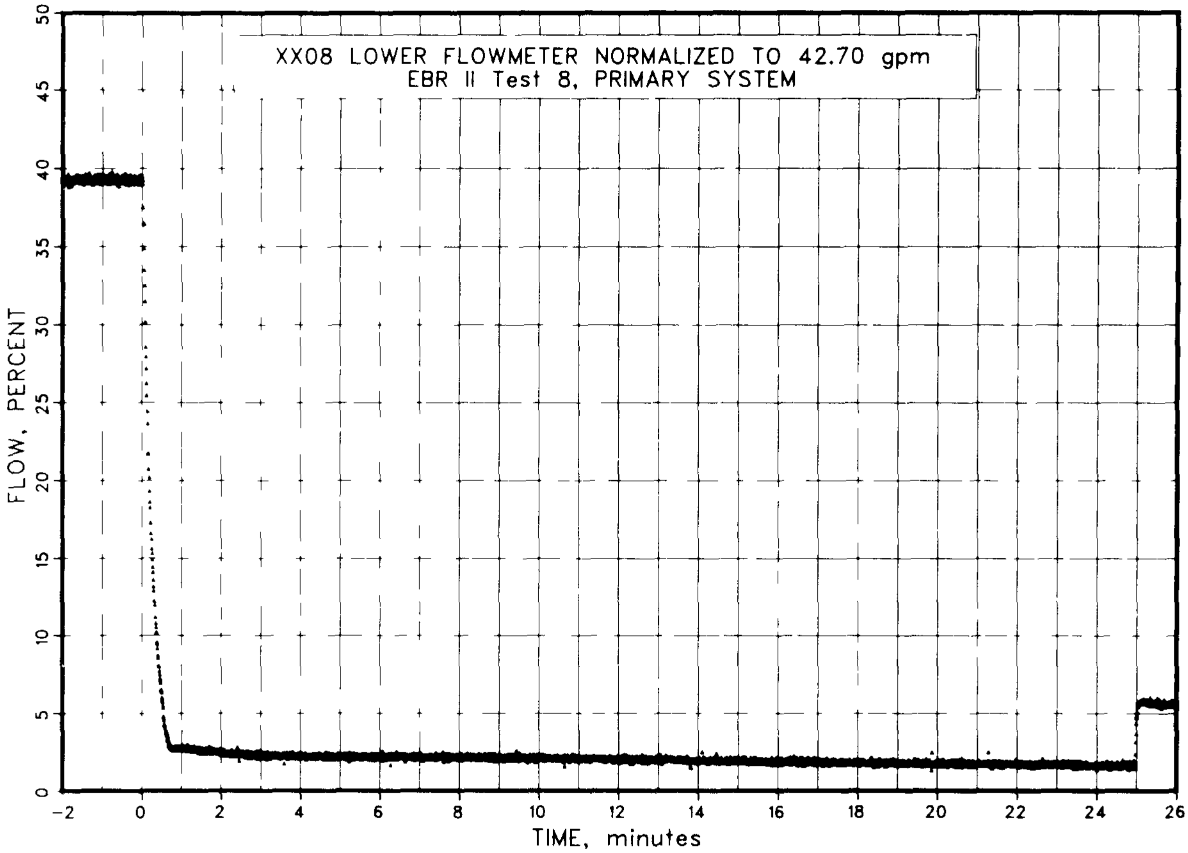
Paper 79-HT-10, presented at the Joint ASME/AIChE 18th National Heat Transfer Conference, San Diego, CA, August 6-8, 1979.

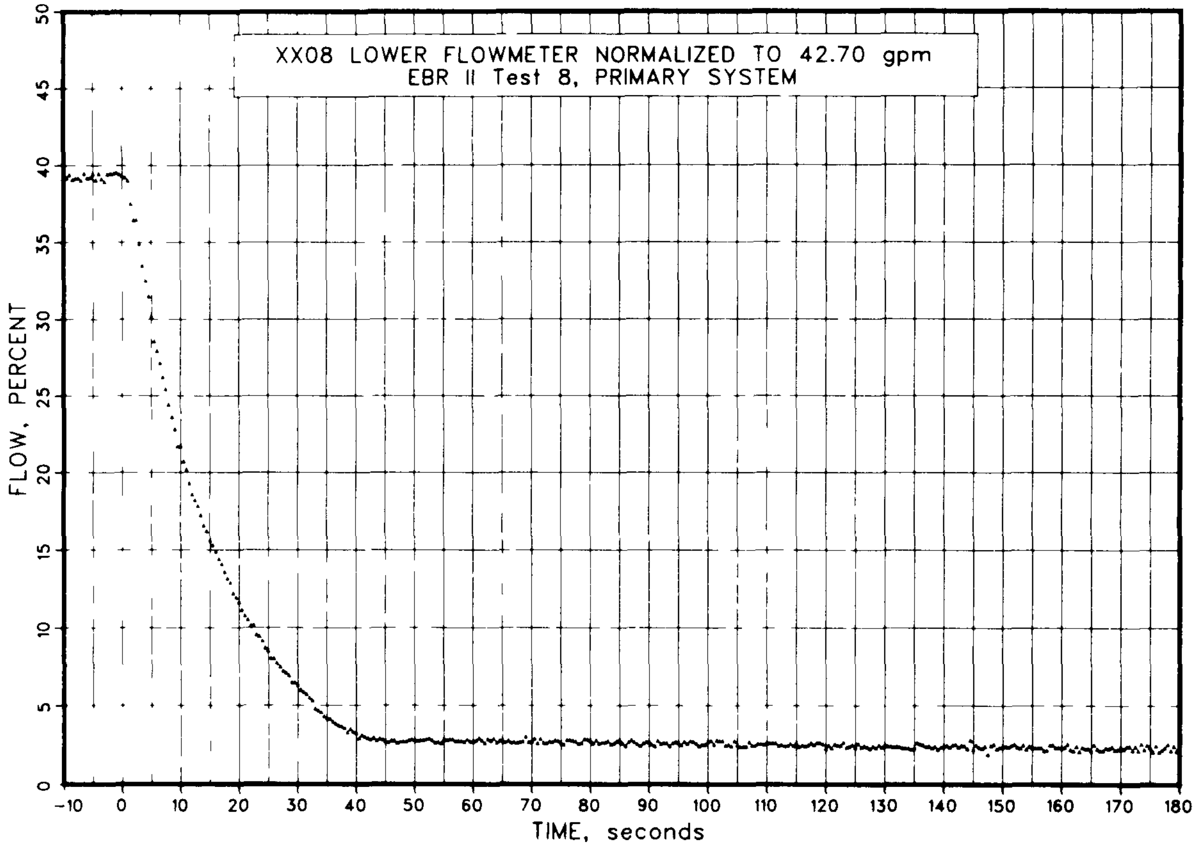
10. R. M. Singer et al., *Studies of Thermal-Hydraulic Phenomena in EBR-II*, to be published in Nuclear Engineering and Design.
11. K. E. Phillips, personal communication (April 1979).
12. R. M. Singer and J. L. Gillette, *Measurements of Subassembly and Core Temperature Distributions in an LMFBR*, AIChE Symposium Series *73* (164), pp. 97-104 (1977).

APPENDIX

Plots of Data from Test 8

The plots of data obtained during XX08 Test 8 are presented in the following order:


XX08 LOWER FLOWMETER NORMALIZED TO 42.70 gpm
EBR II Test 8, PRIMARY SYSTEM
FLOW, PERCENT
TIME, minutes
0
5
10
15
20
25
30
35
40
45
50
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26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EBR II Test 8, PRIMARY SYSTEM
FLOW, PERCENT
TIME, seconds
0
5
10
15
20
25
30
35
40
45
50
-10
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10
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30
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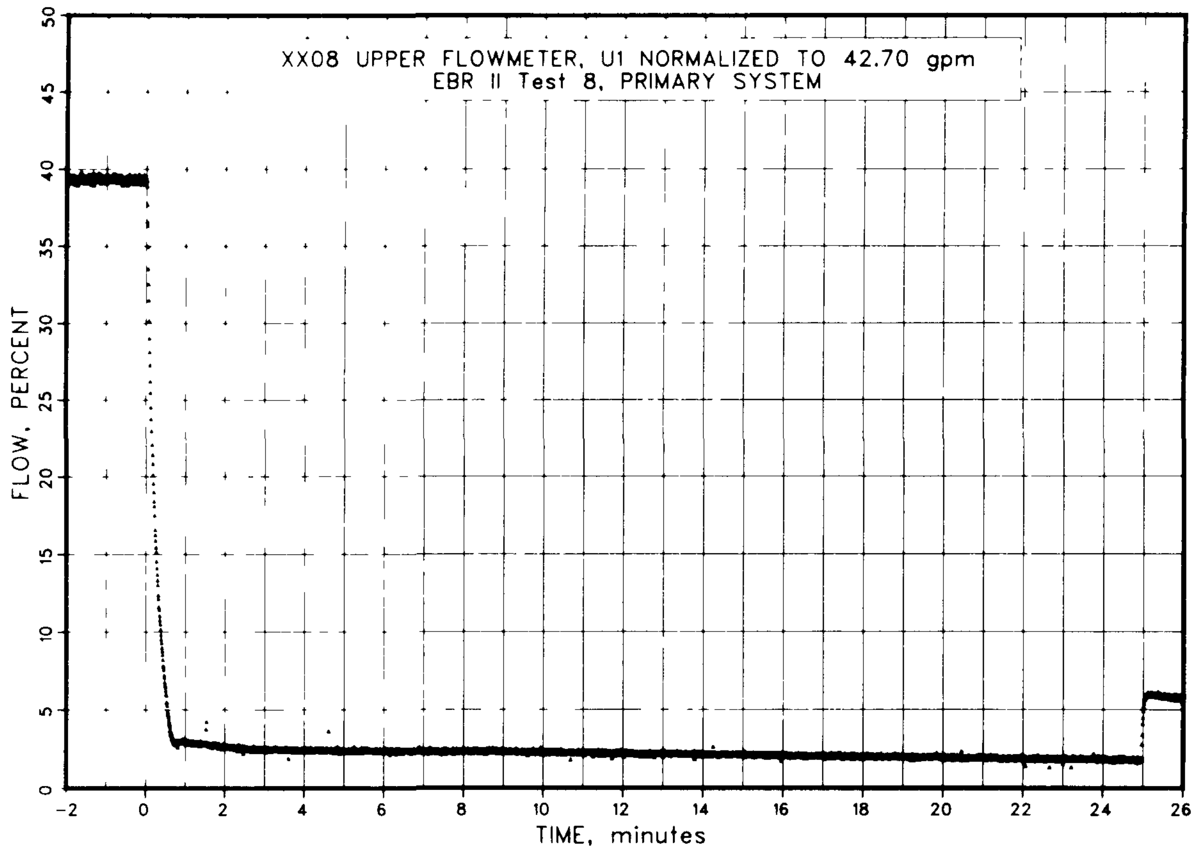
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EBR II Test 8, PRIMARY SYSTEM
FLOW, PERCENT
TIME, minutes
0
5
10
15
20
25
30
35
40
45
50
-2
0
2
4
6
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16
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24
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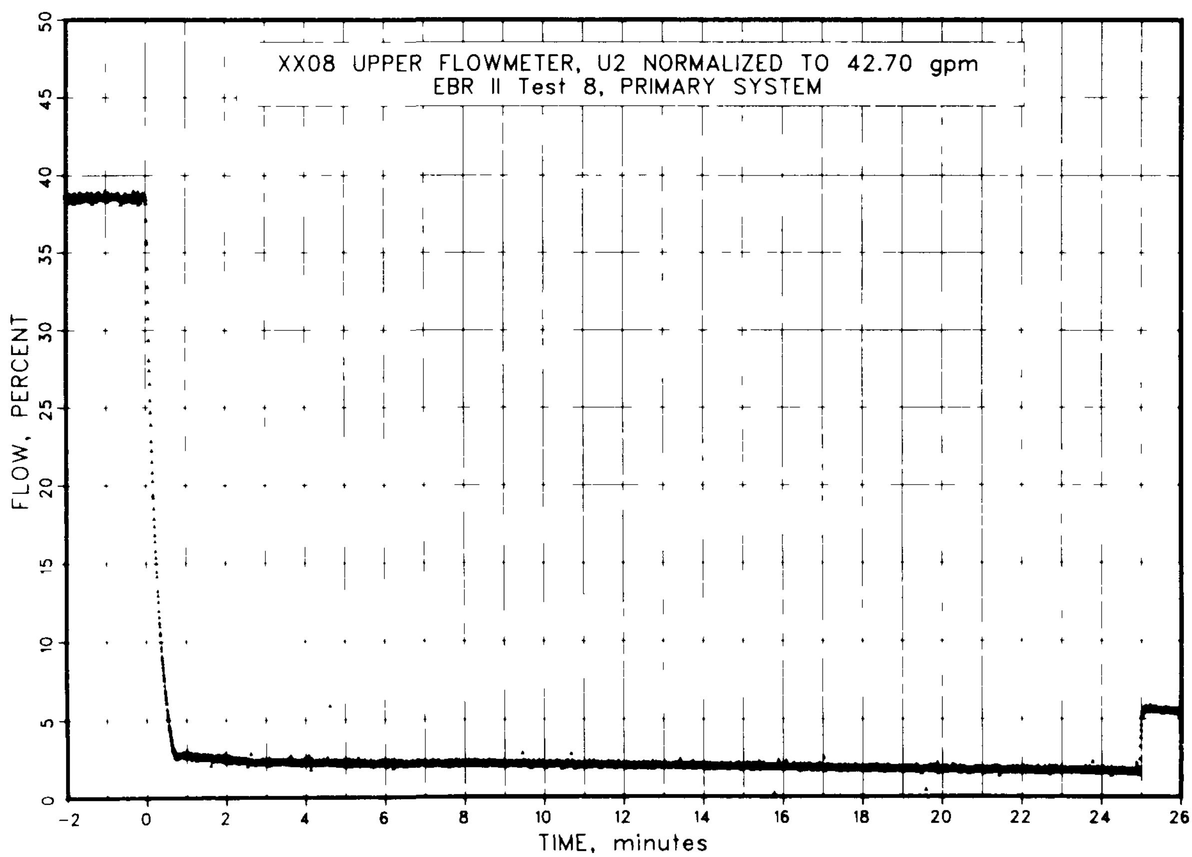
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FLOW, PERCENT
TIME, minutes
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15
20
25
30
35
40
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50
-2
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2
4
6
8
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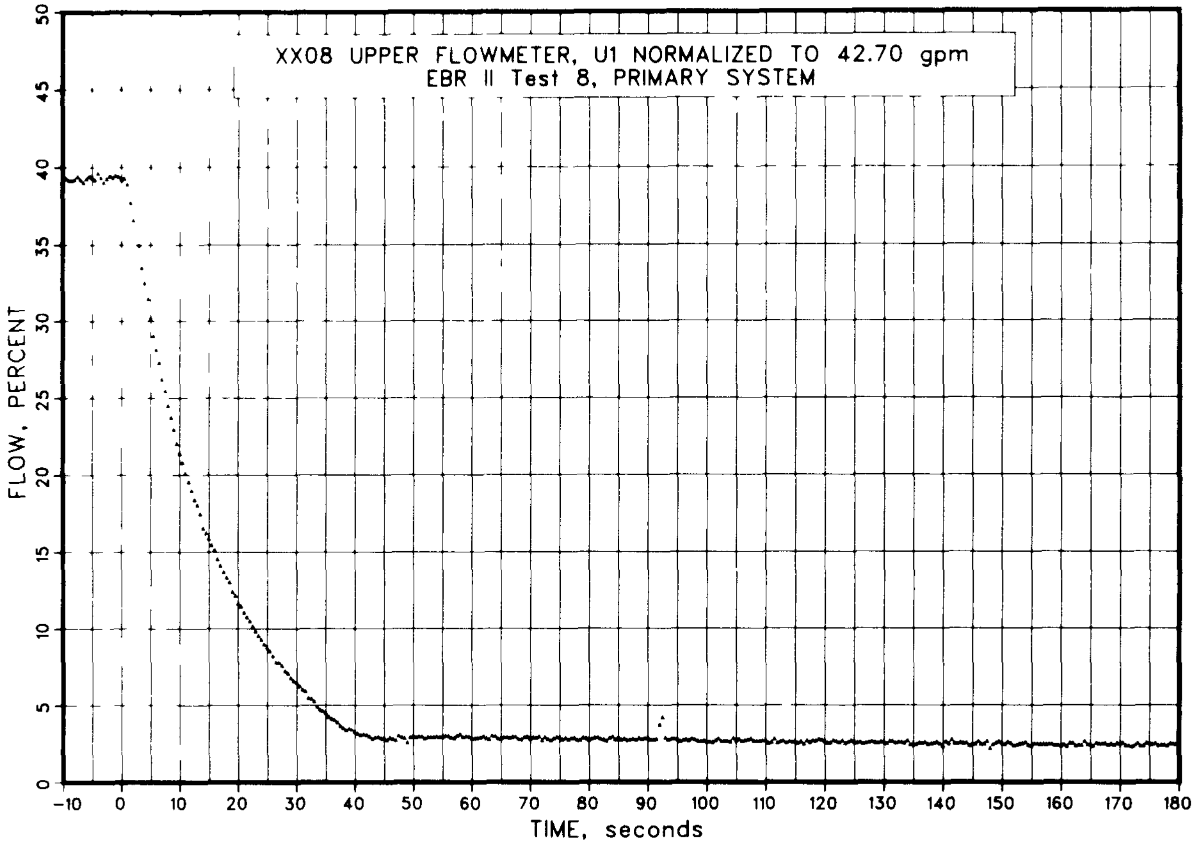
12
14
16
18
20
22
24
26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FLOW, PERCENT
TIME, seconds
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15
20
25
30
35
40
45
50
-10
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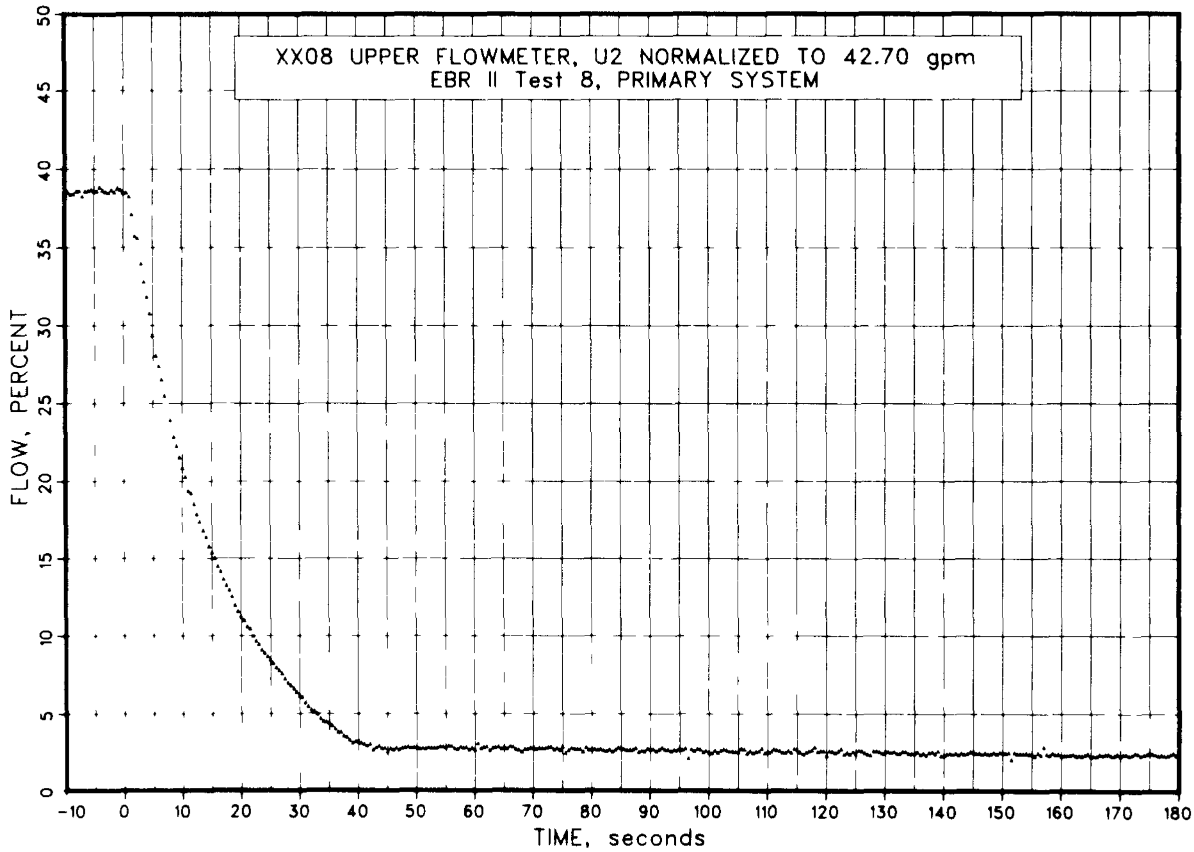
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TIME, seconds
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25
30
35
40
45
50
-10
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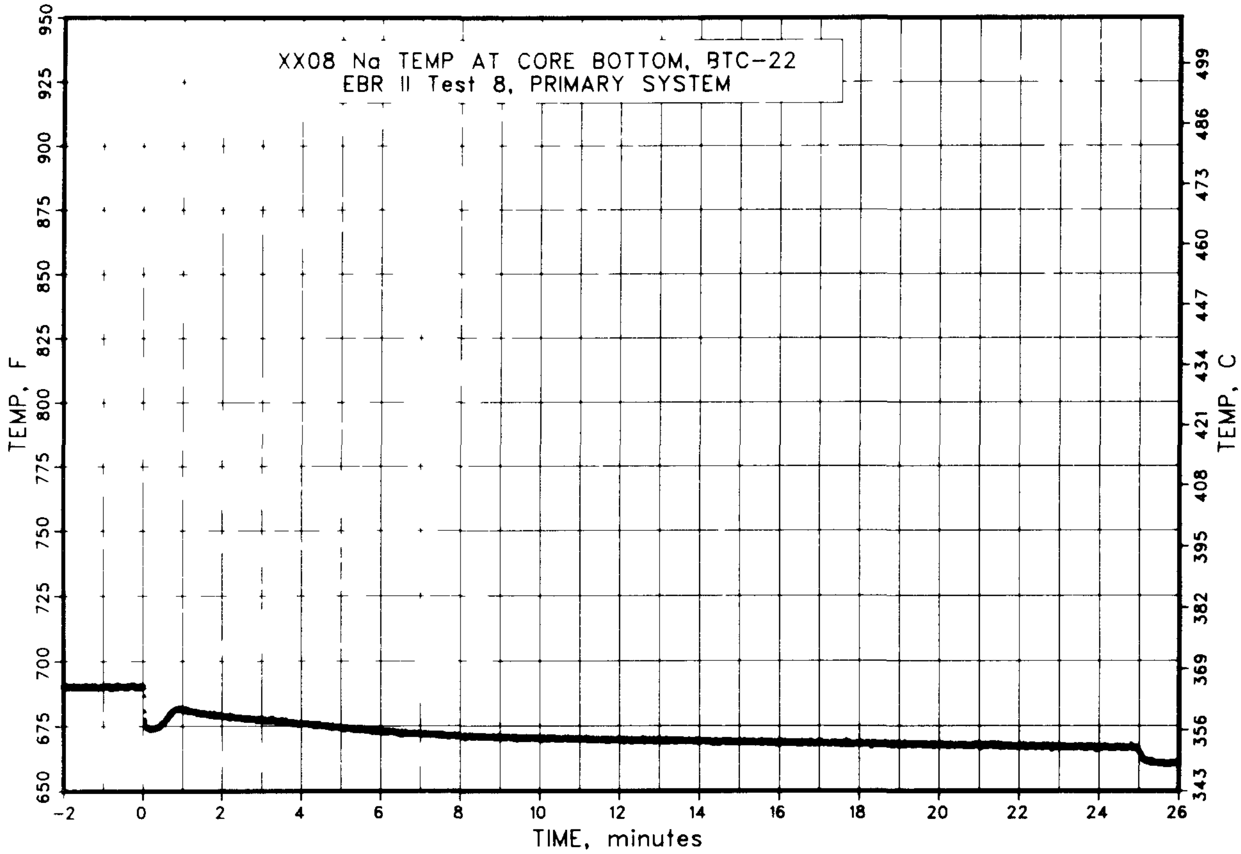
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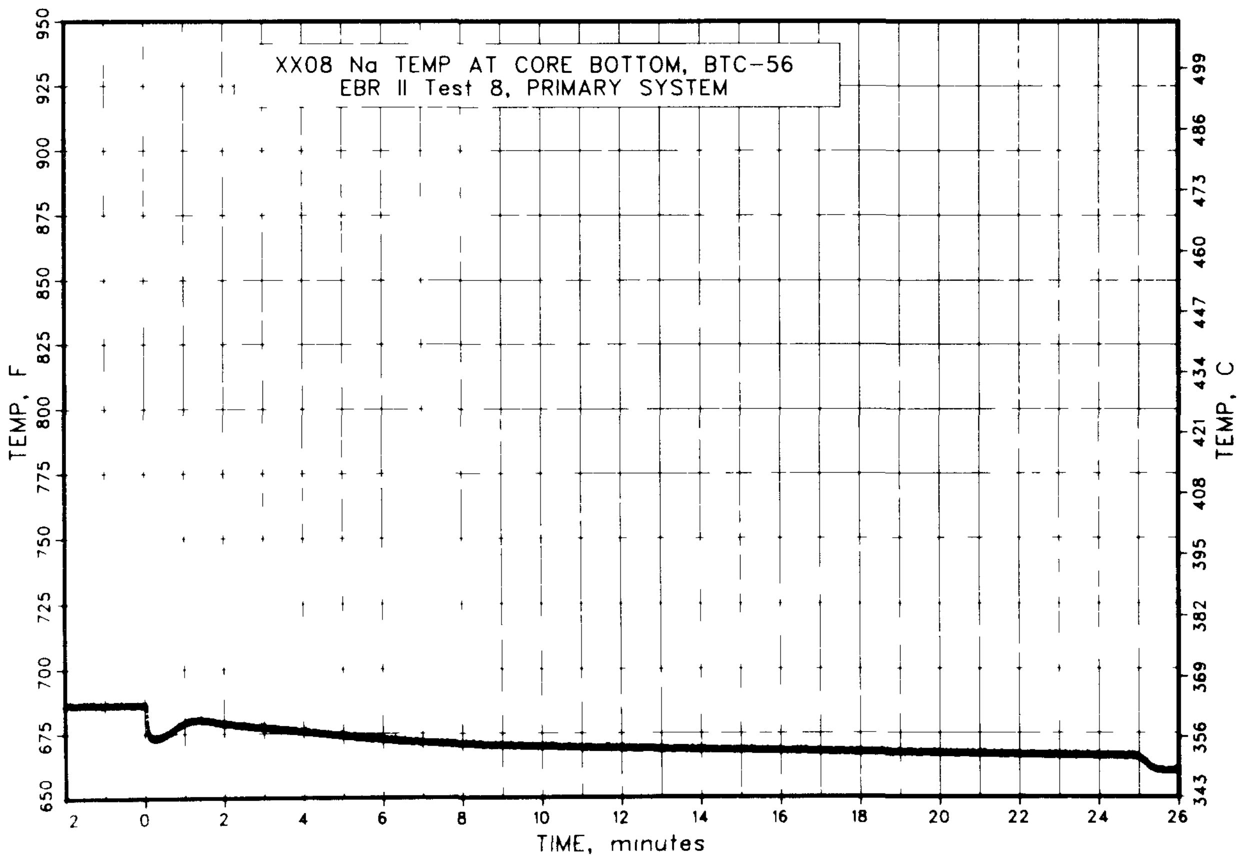
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
950
925
900
875
850
825
800
775
750
725
700
675
650
TEMP, C
499
486
473
460
447
434
421
408
395
382
369
356
343
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes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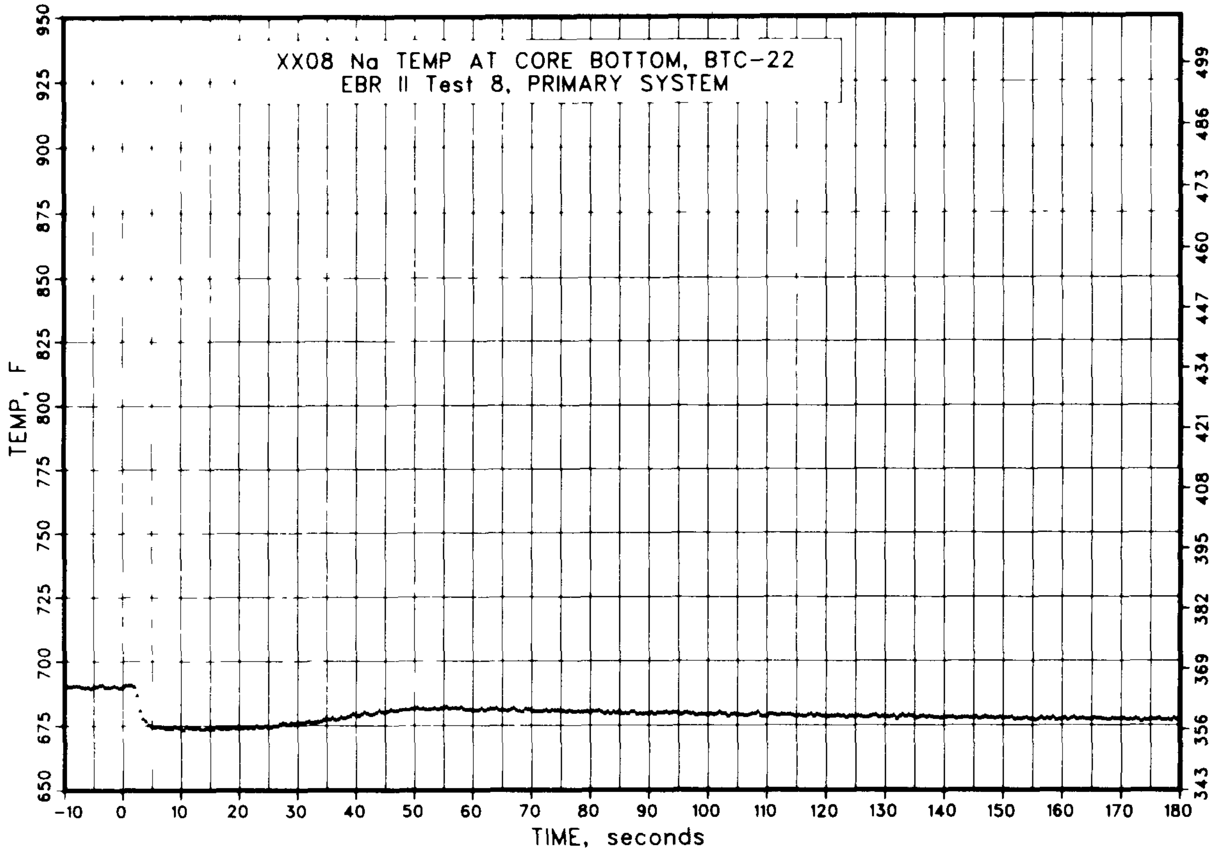
925
900
875
850
825
800
775
750
725
700
675
650
TEMP, C
499
486
473
460
447
434
421
408
395
382
369
356
343
2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes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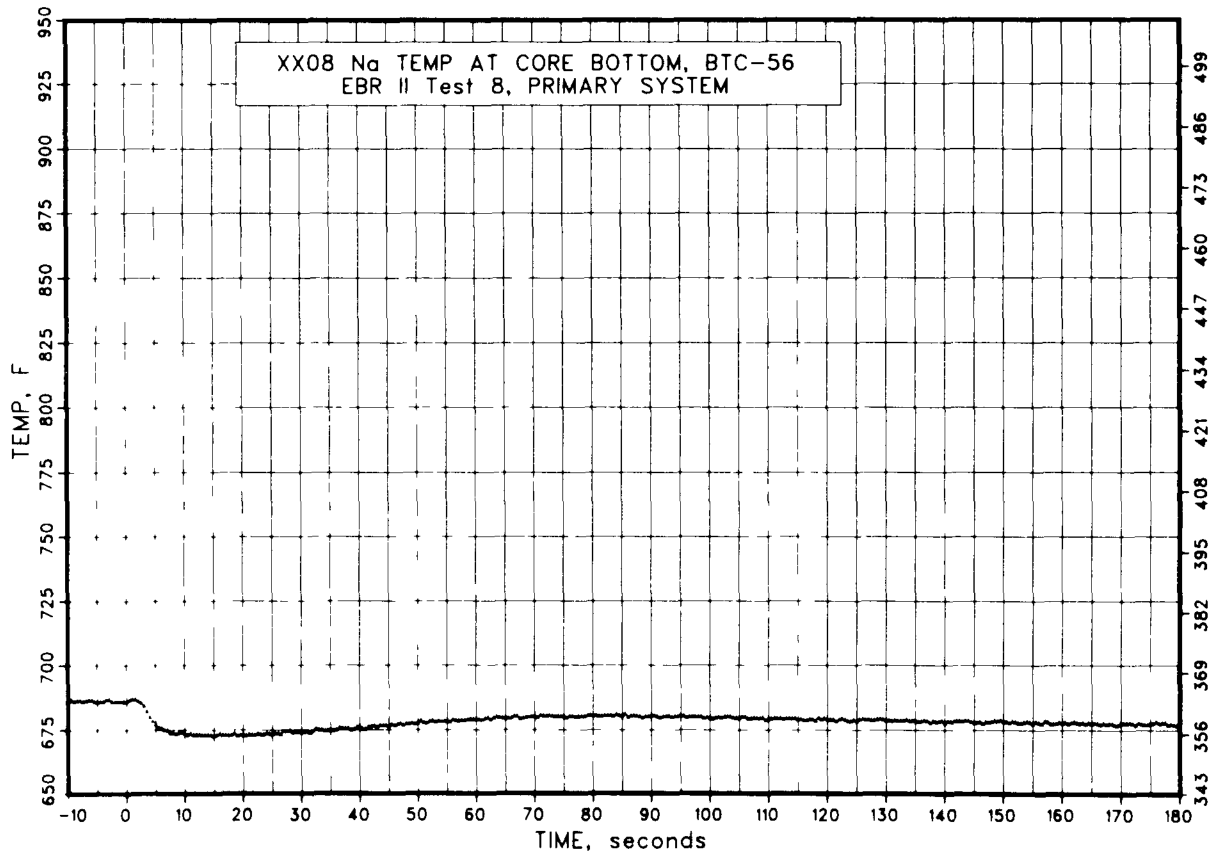
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds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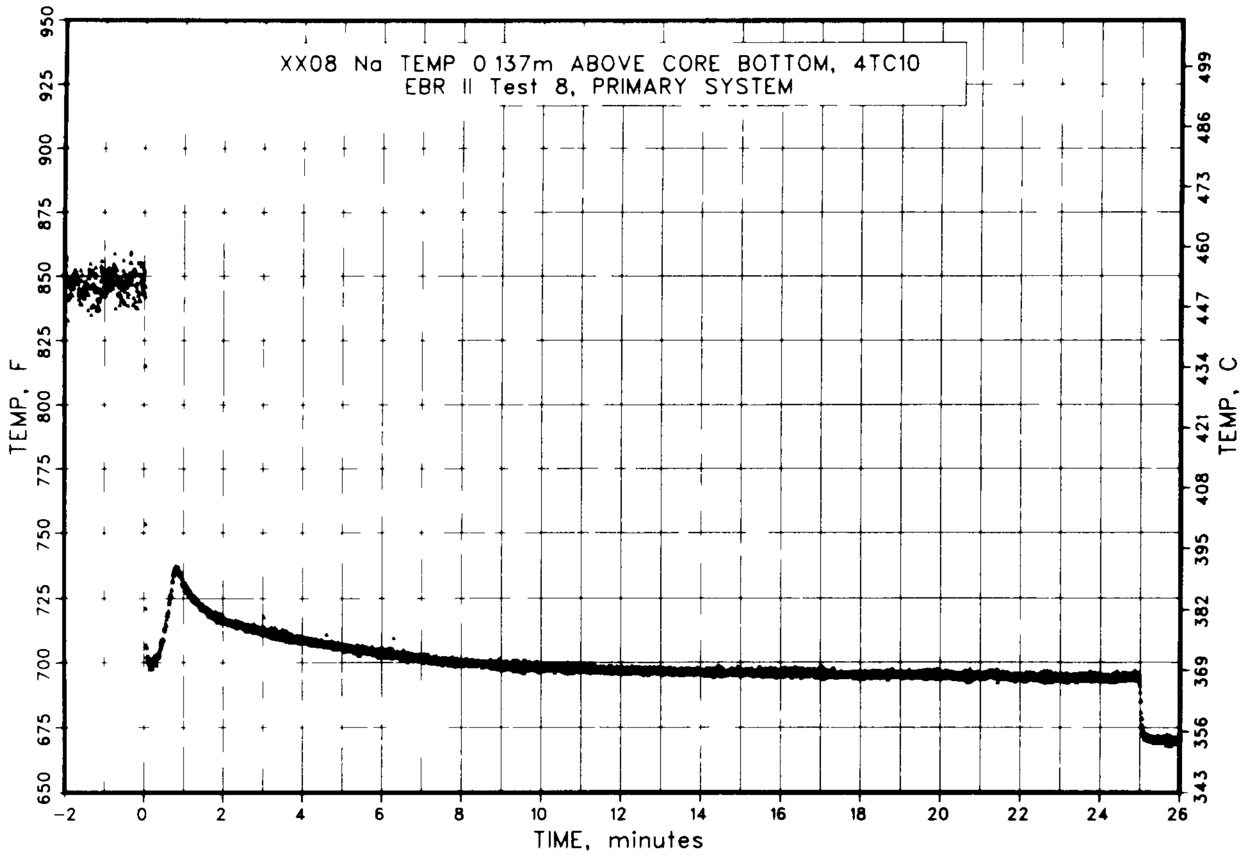
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds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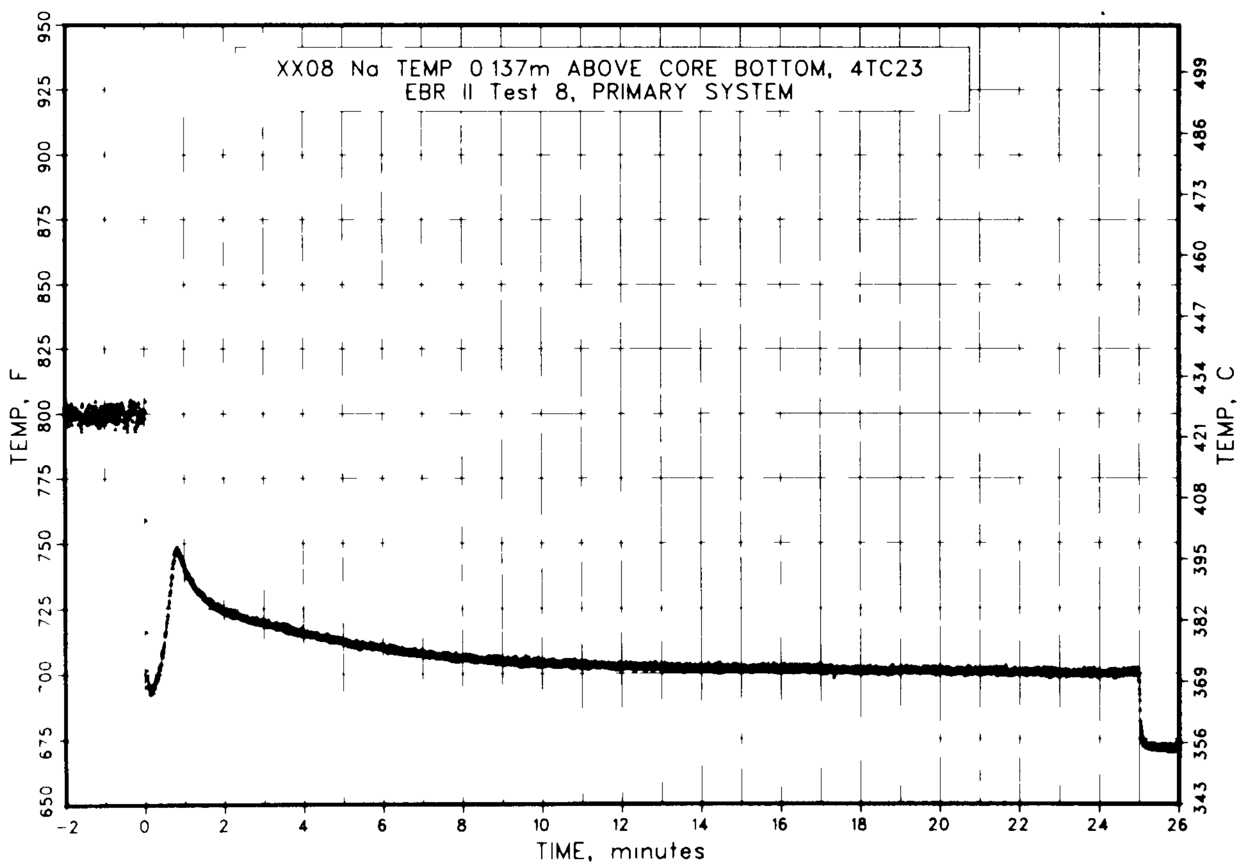
TEMP, F
TEMP, C
TIME, minutes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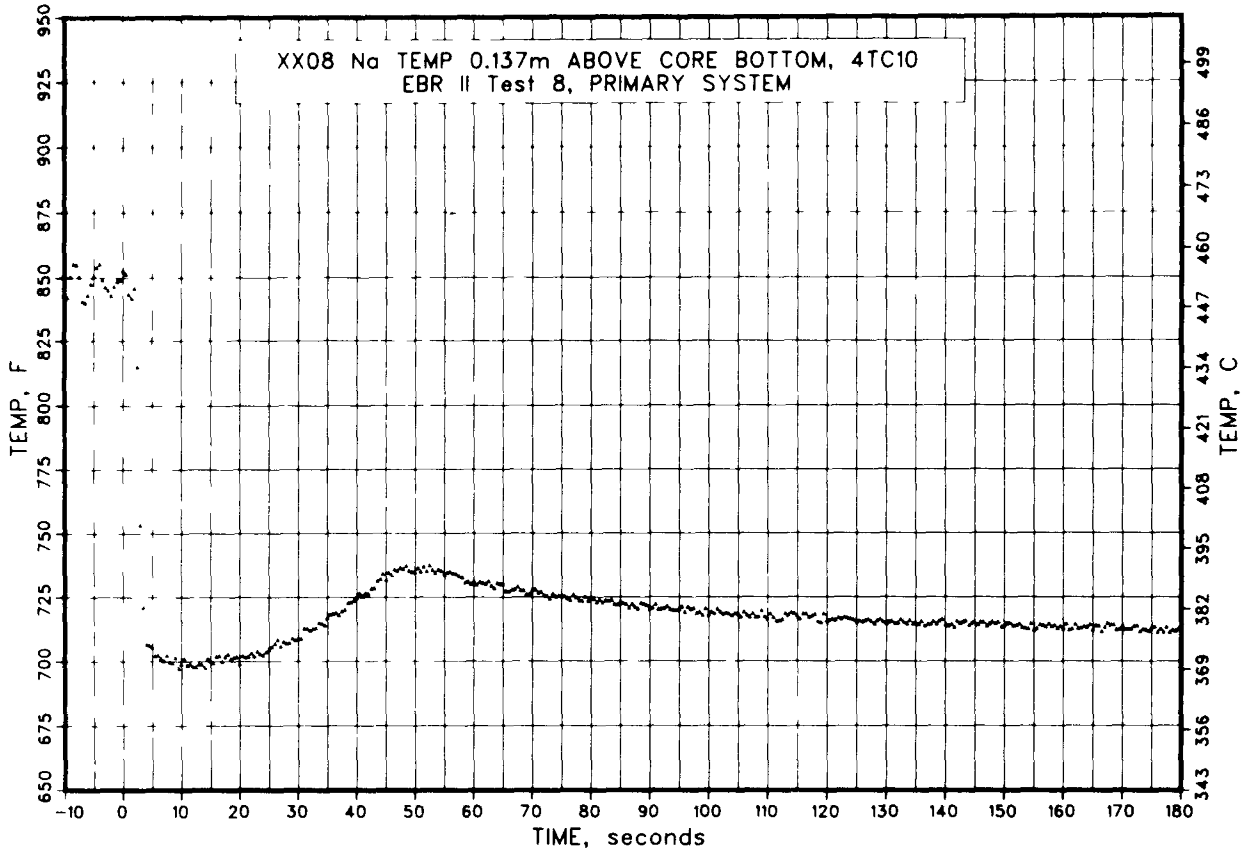
TEMP, F
TEMP, C
TIME, minutes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EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
650
675
700
725
750
775
800
825
850
875
900
925
950
343
356
369
382
395
408
421
434
447
460
473
486
499
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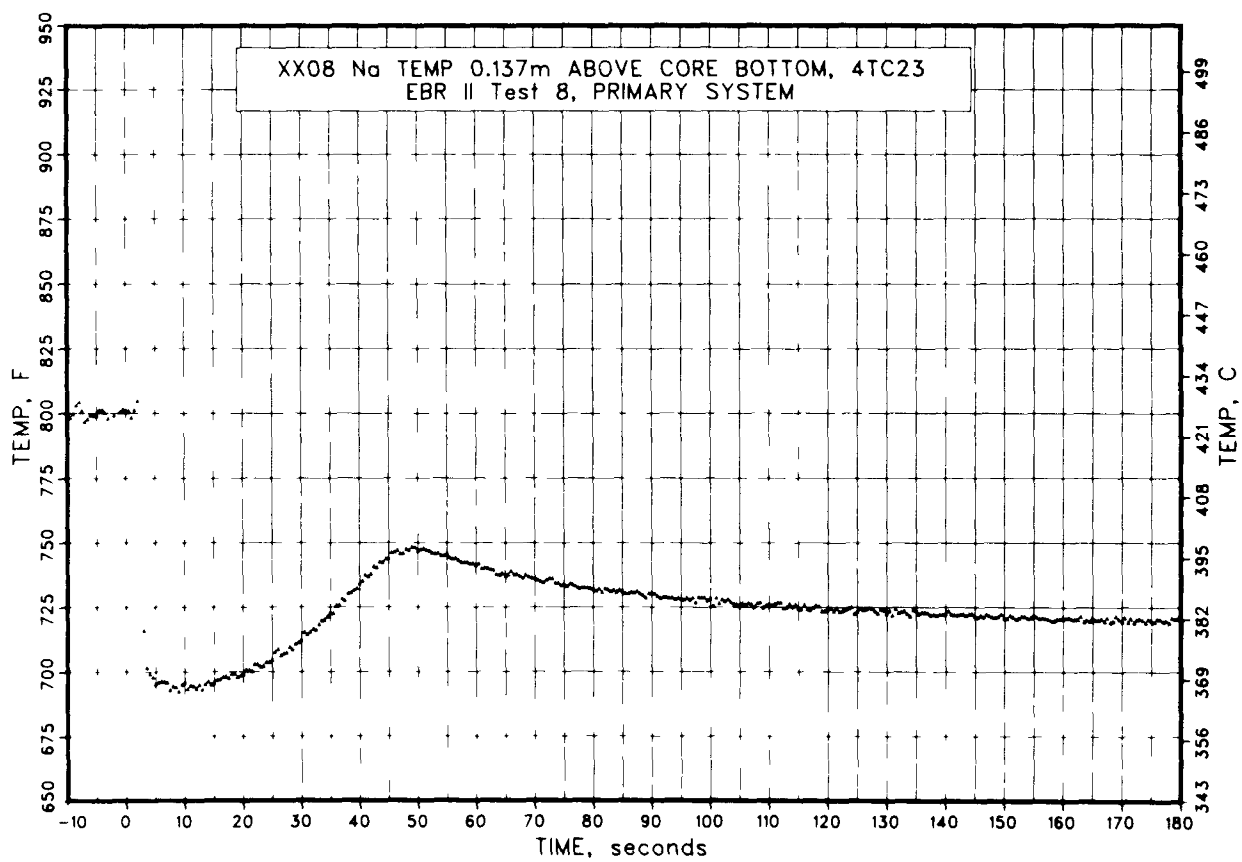
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TEMP, C
TIME, seconds
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675
700
725
750
775
800
825
850
875
900
925
950
343
356
369
382
395
408
421
434
447
460
473
486
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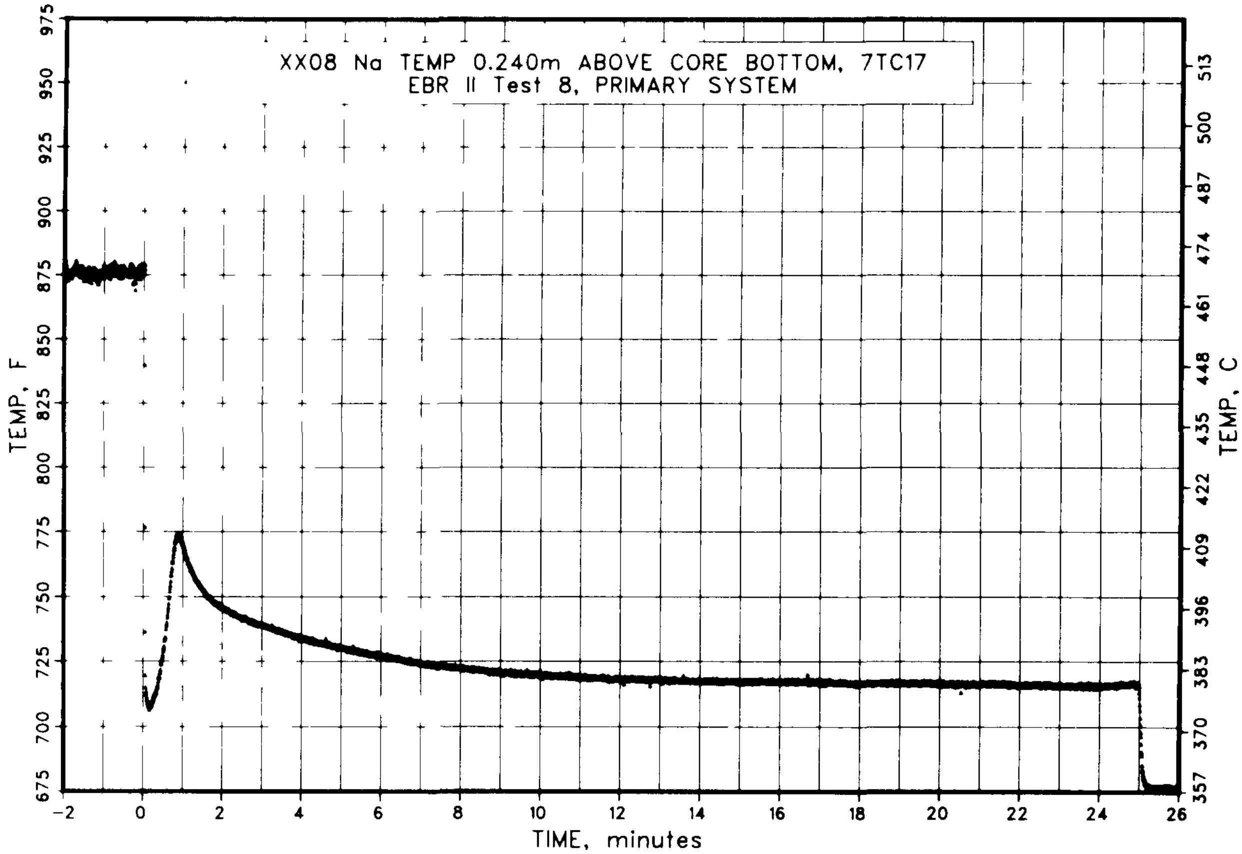
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950
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850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
TIME, minutes
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2
4
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12
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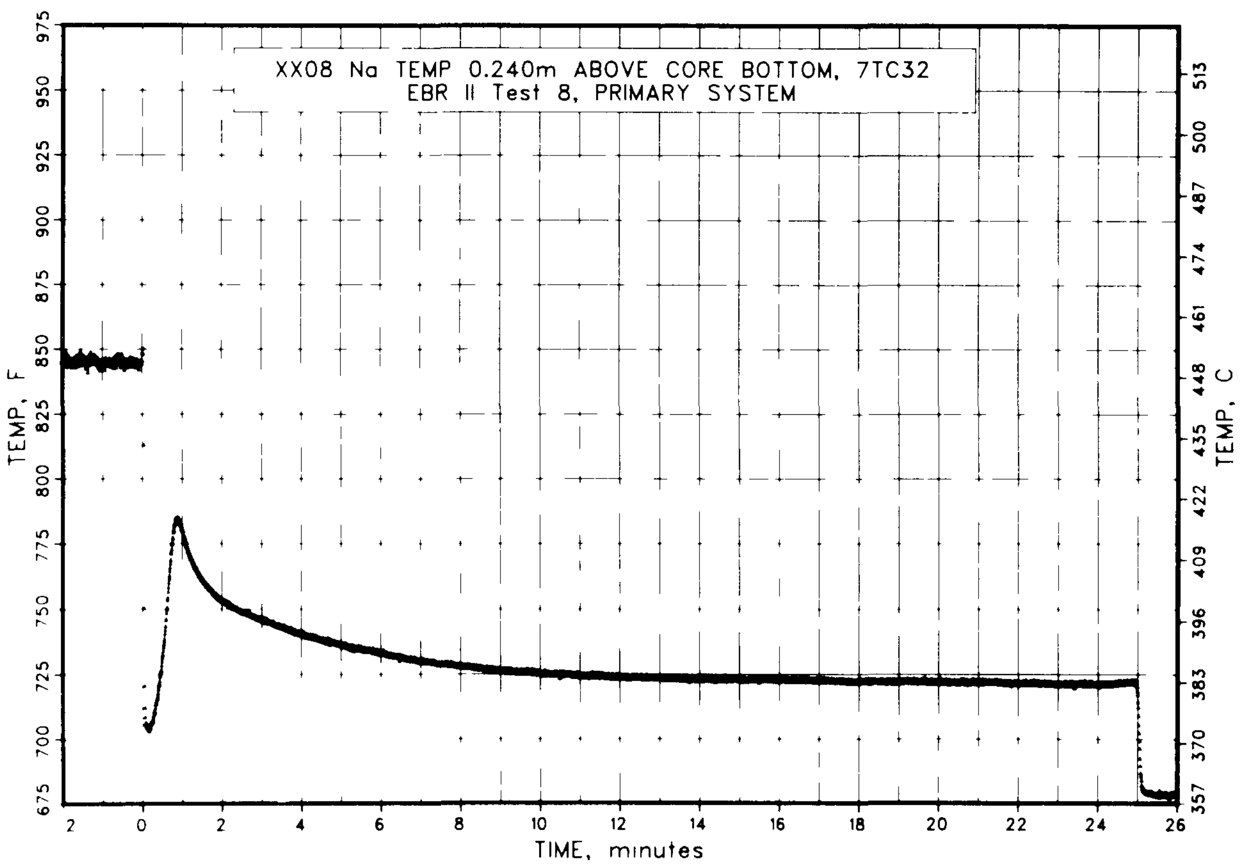
18
20
22
24
26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925
900
875
850
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800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
TIME, minutes
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2
4
6
8
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12
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22
24
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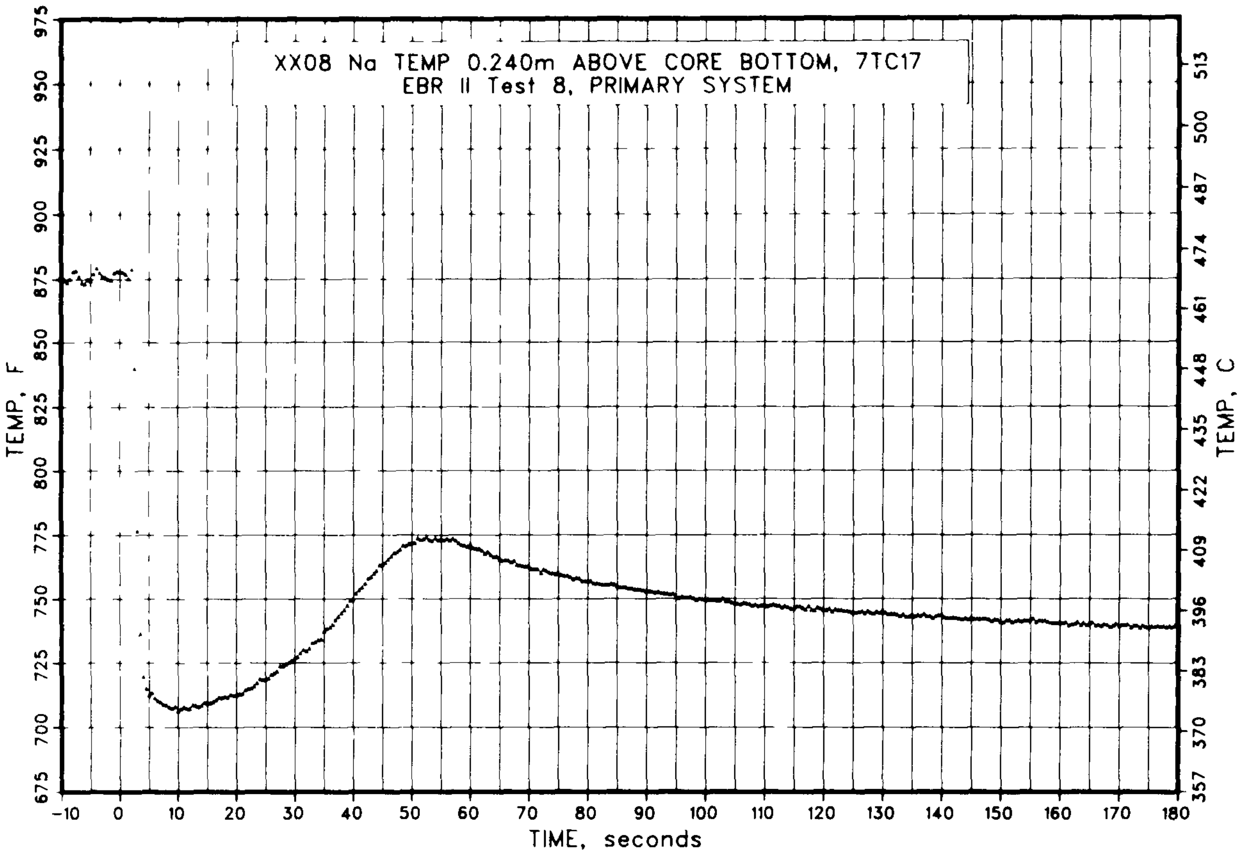
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EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
975
950
925
900
875
850
825
800
775
750
725
700
675
513
500
487
474
461
448
435
422
409
396
383
370
357
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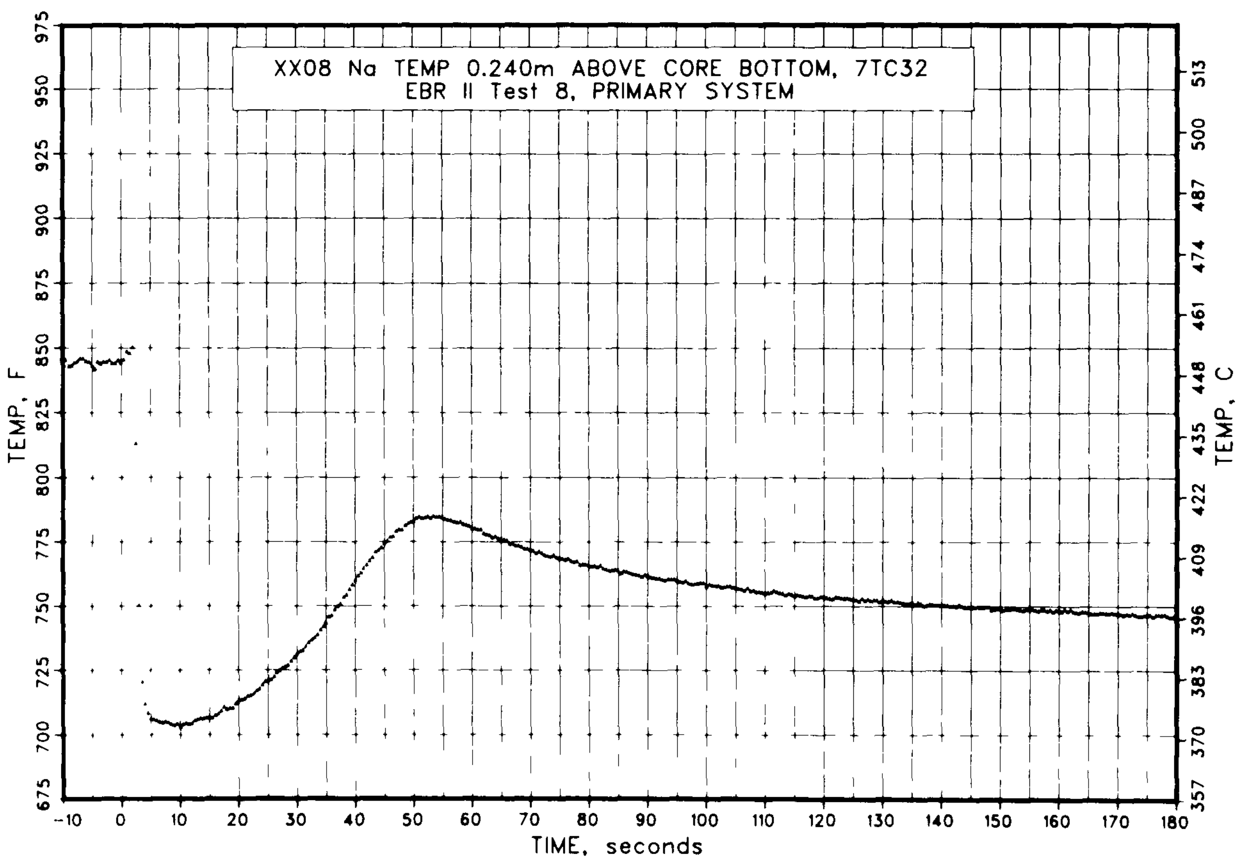
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EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
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875
850
825
800
775
750
725
700
675
513
500
487
474
461
448
435
422
409
396
383
370
357
-10
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170
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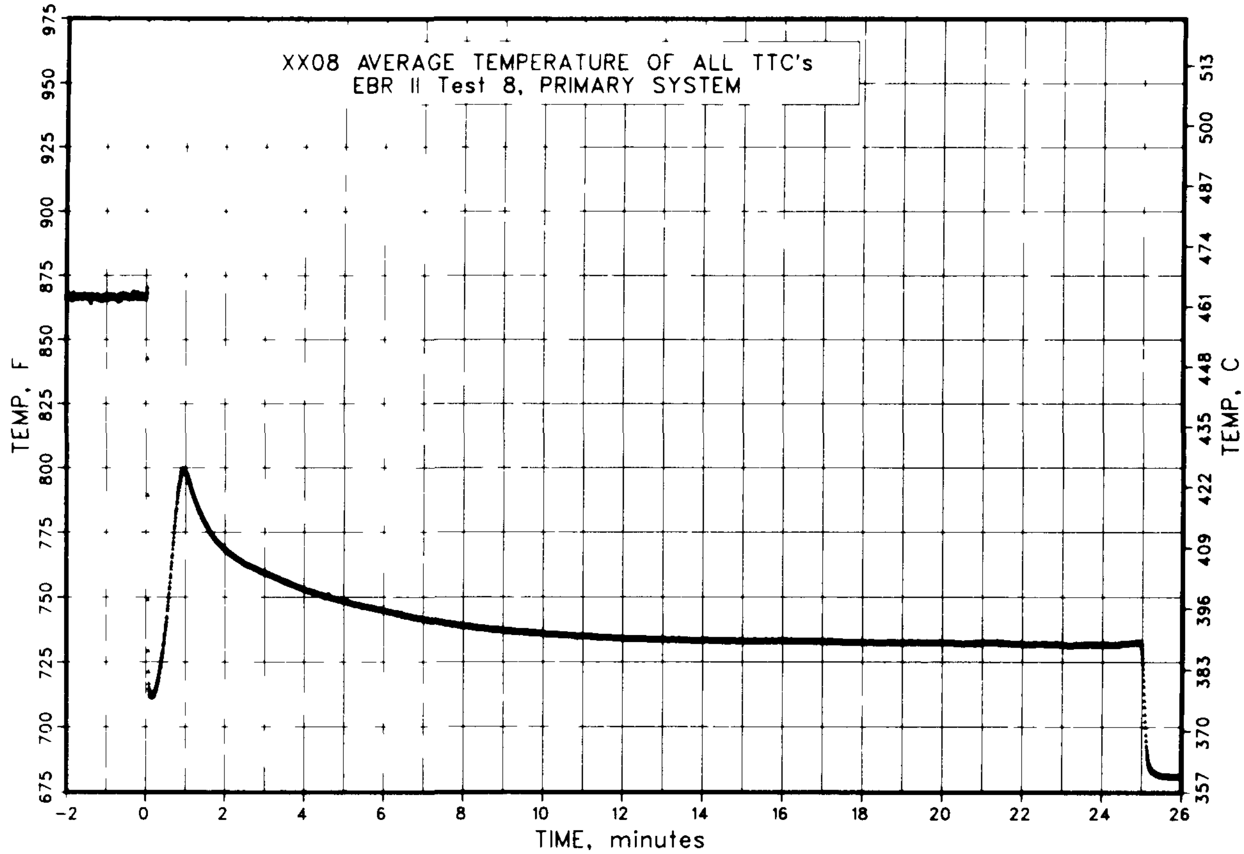
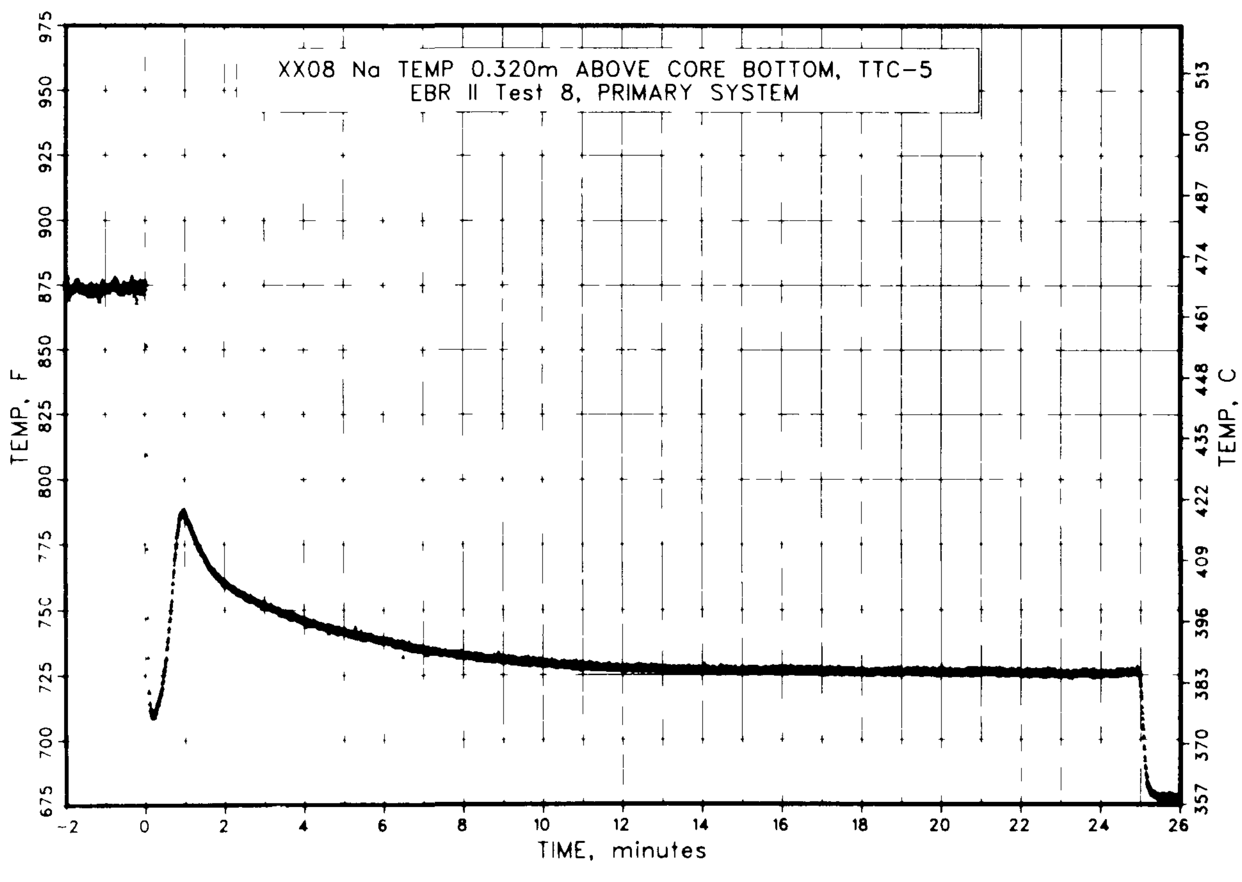

XX08 AVERAGE TEMPERATURE OF ALL TTC's
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes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EBR II Test 8, PRIMARY SYSTEM
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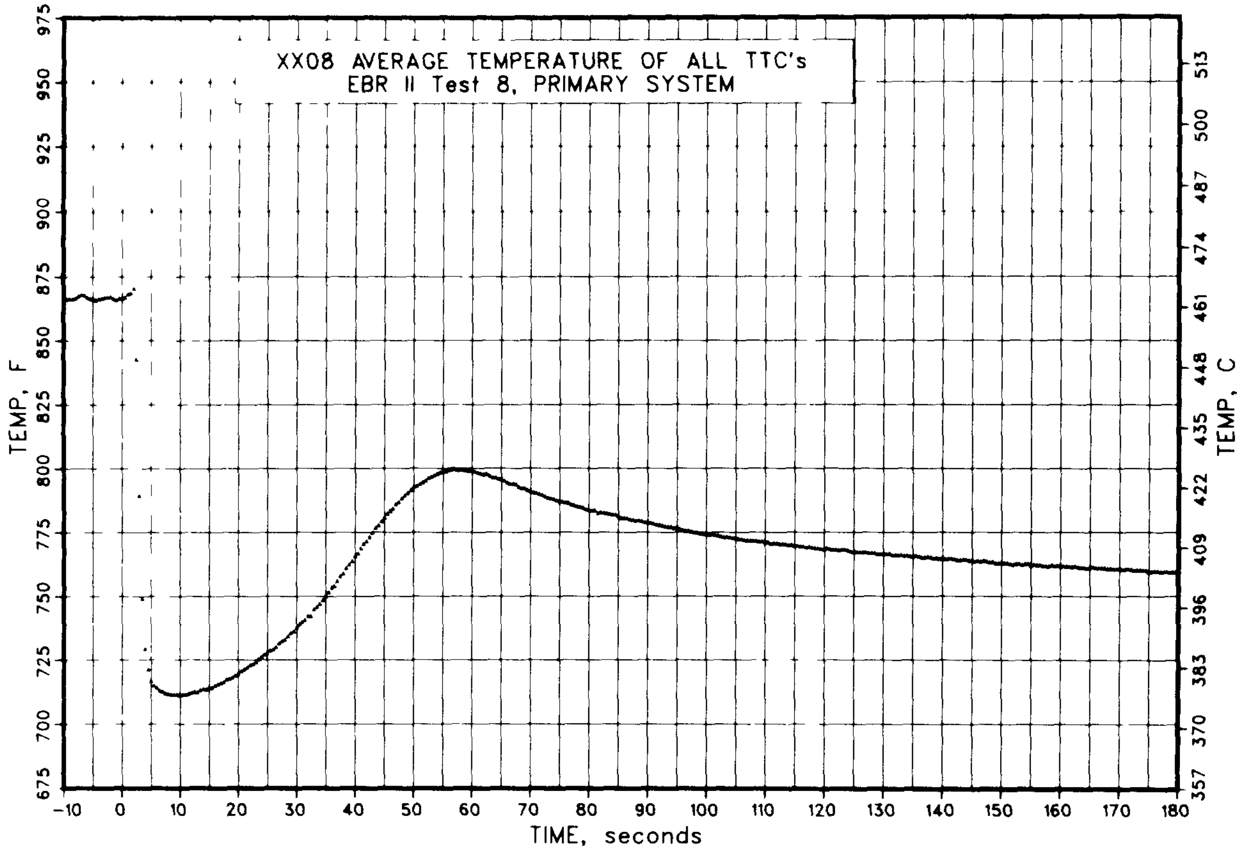
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes


XX08 AVERAGE TEMPERATURE OF ALL TTC's
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TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-10
0
10
20
30
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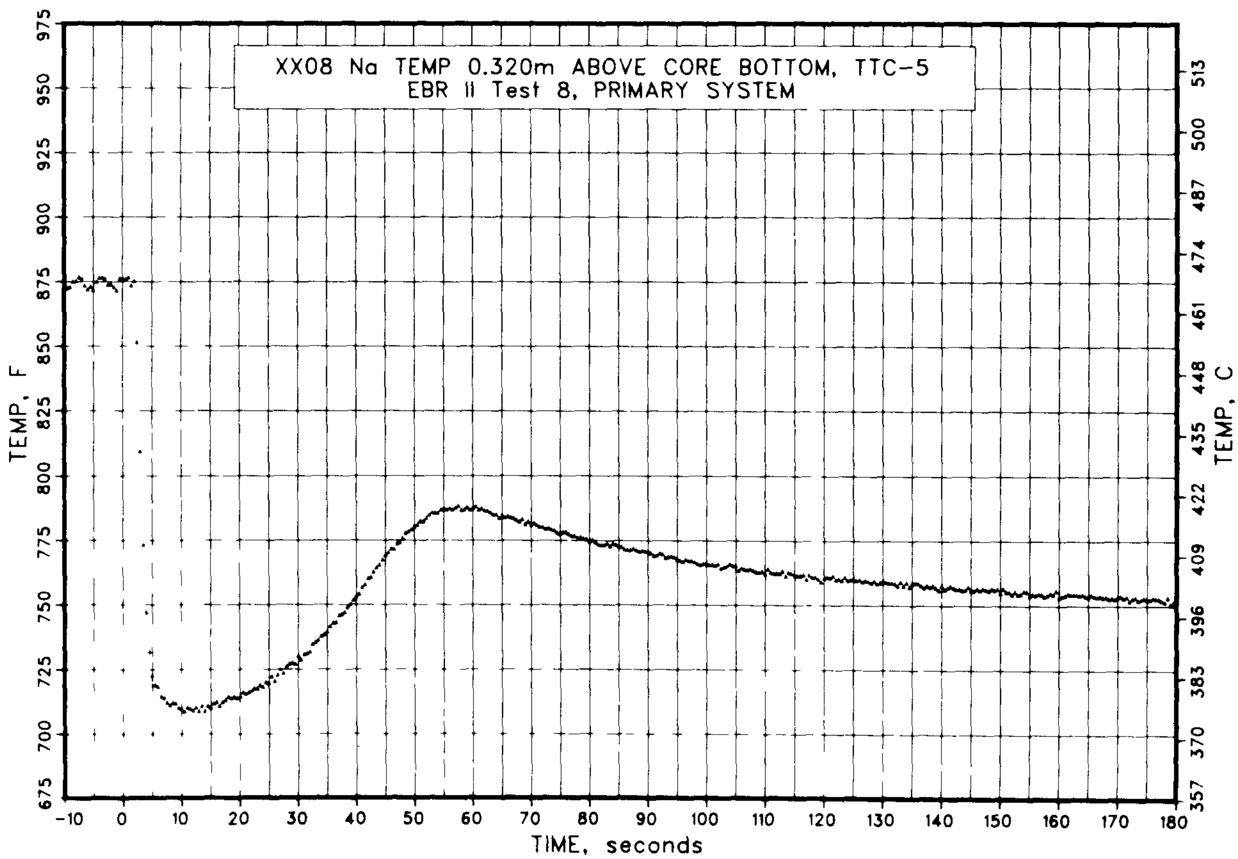
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds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TEMP, F
975
950
925
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875
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825
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775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-10
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100
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130
140
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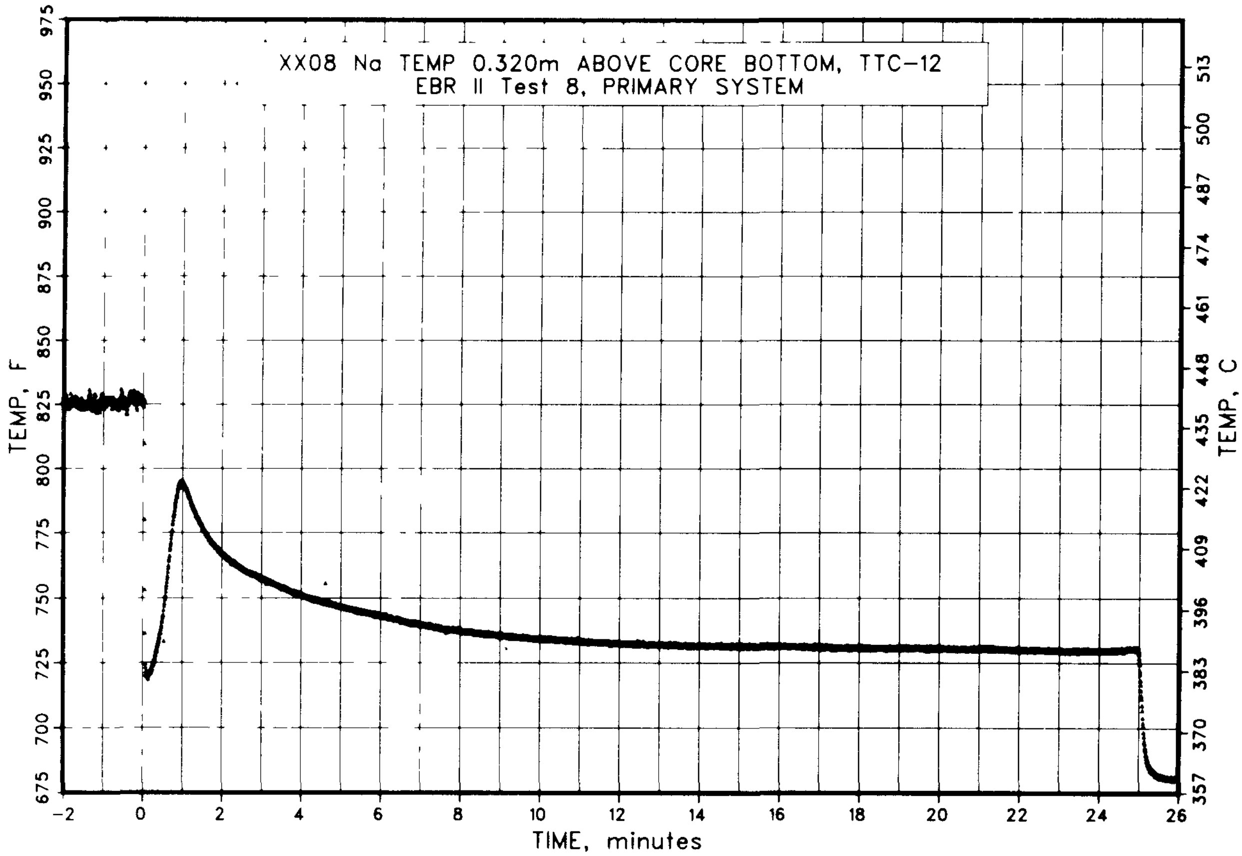
160
170
180
TIME, seconds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925
900
875
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825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
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8
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14
16
18
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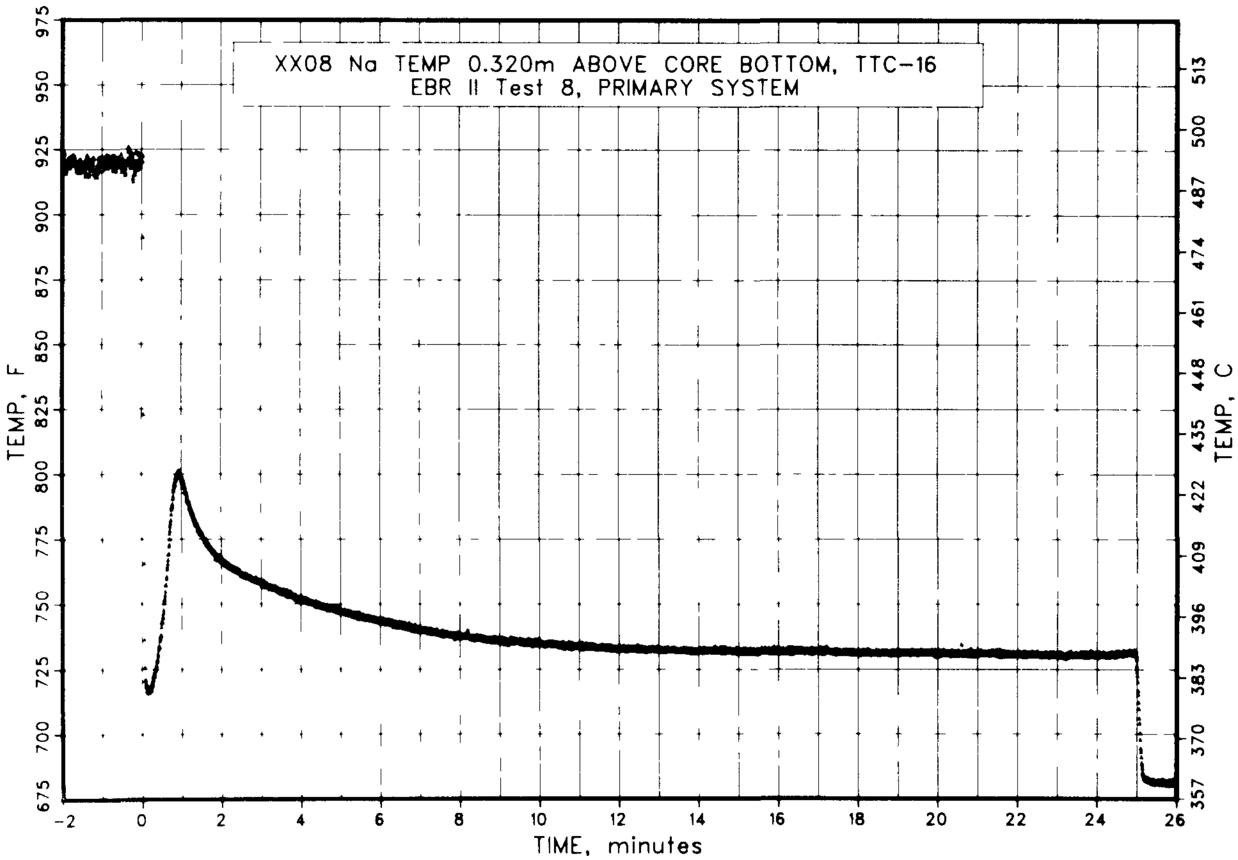
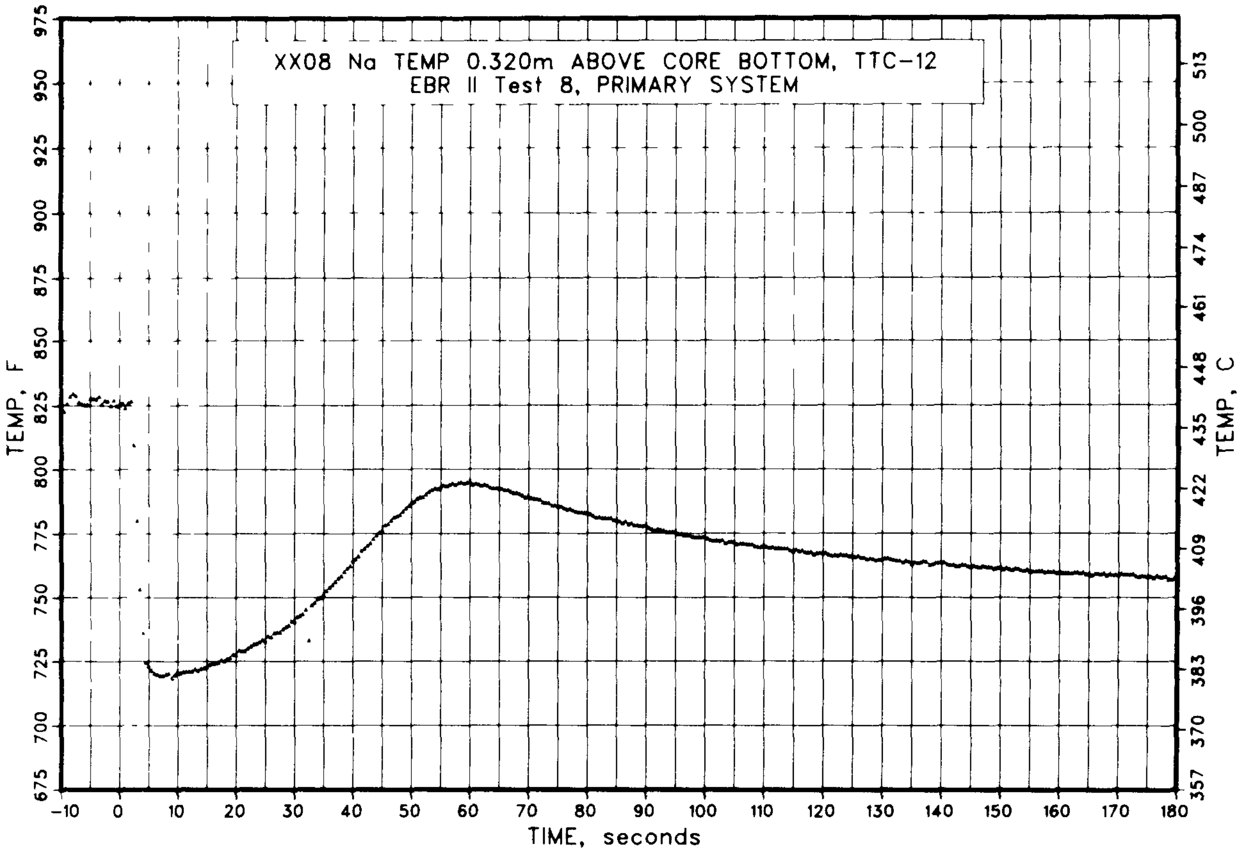
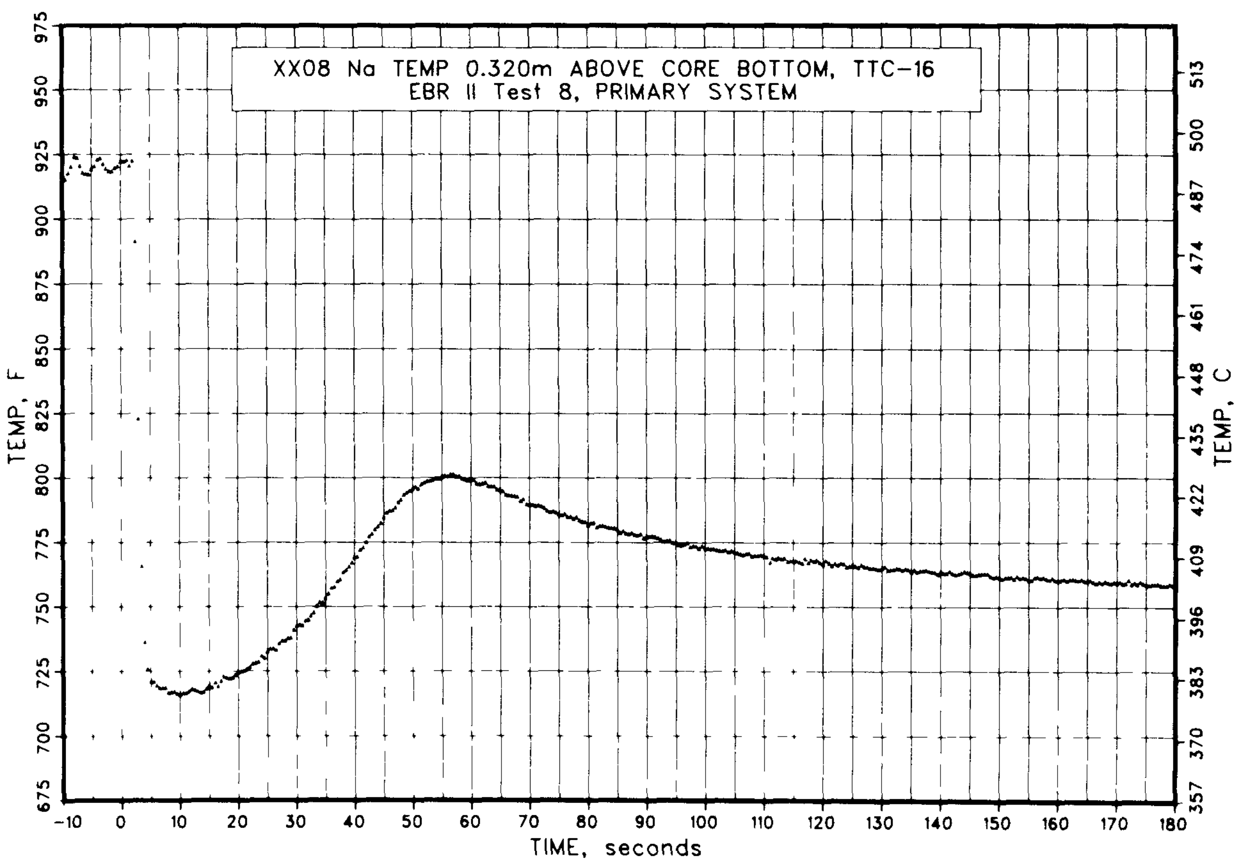
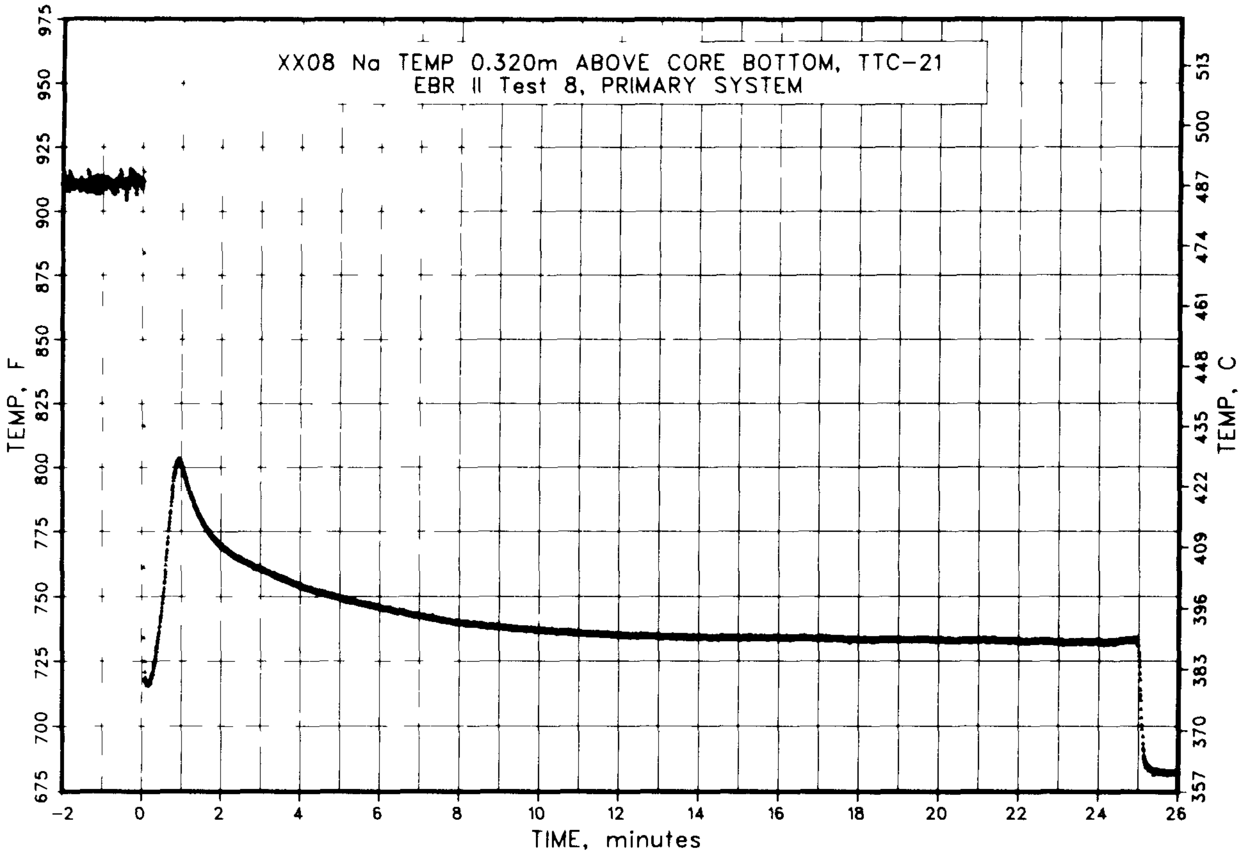
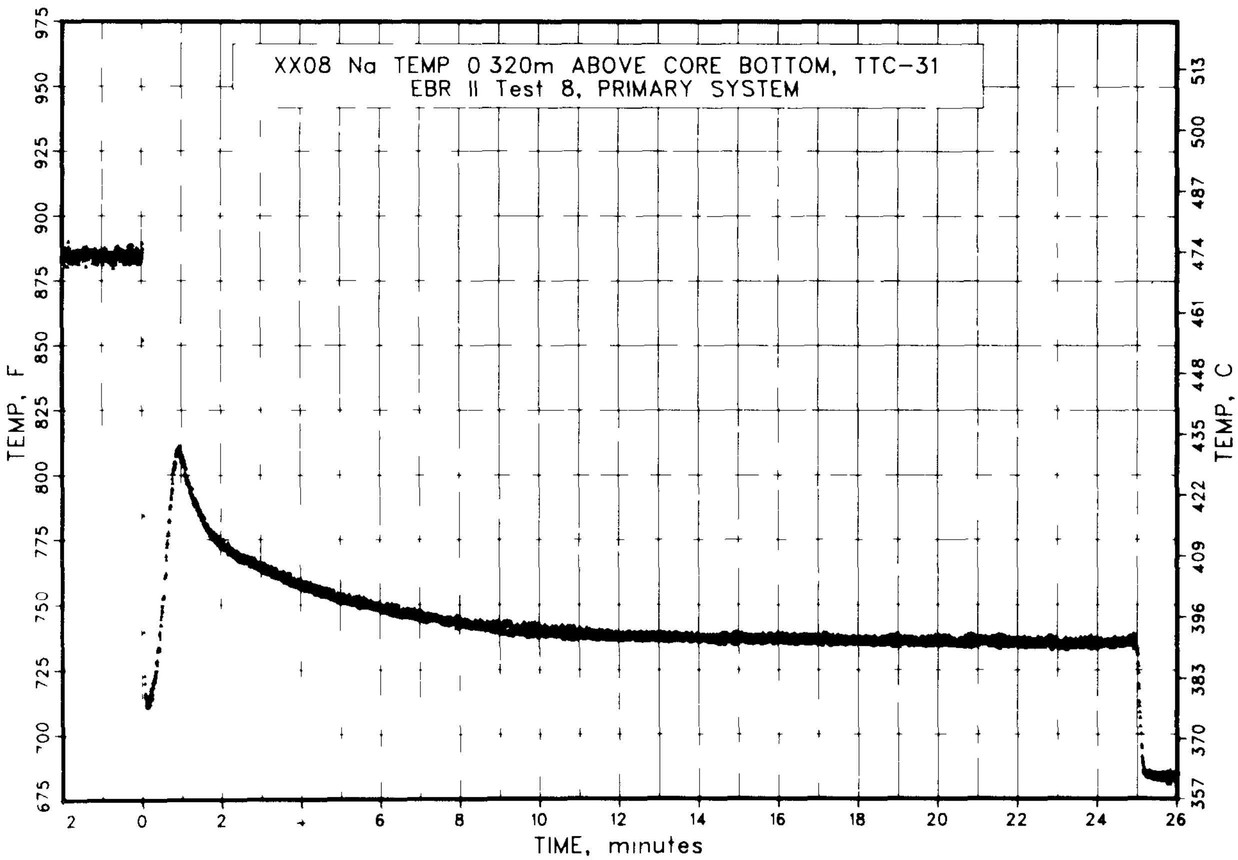
22
24
26
TIME, minutes

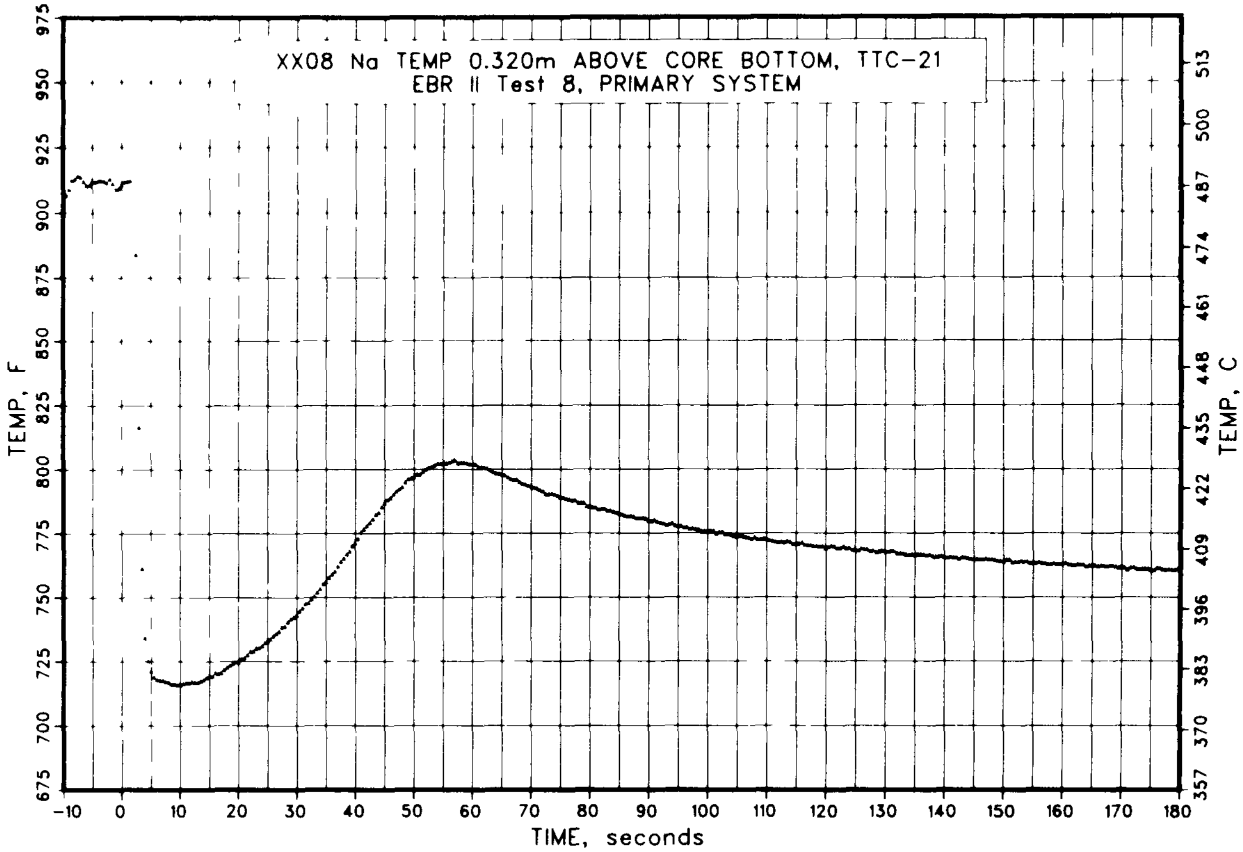

XX08 Na TEMP 0.320m ABOVE CORE BOTTOM, TTC-16
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes


XX08 Na TEMP 0.320m ABOVE CORE BOTTOM, TTC-12
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds


XX08 Na TEMP 0.320m ABOVE CORE BOTTOM, TTC-16
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds


XX08 Na TEMP 0.320m ABOVE CORE BOTTOM, TTC-21
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


XX08 Na TEMP 0.320m ABOVE CORE BOTTOM, TTC-31
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


XX08 Na TEMP 0.320m ABOVE CORE BOTTOM, TTC-21
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
975
950
925
900
875
850
825
800
775
750
725
700
675
513
500
487
474
461
448
435
422
409
396
383
370
357
-10
0
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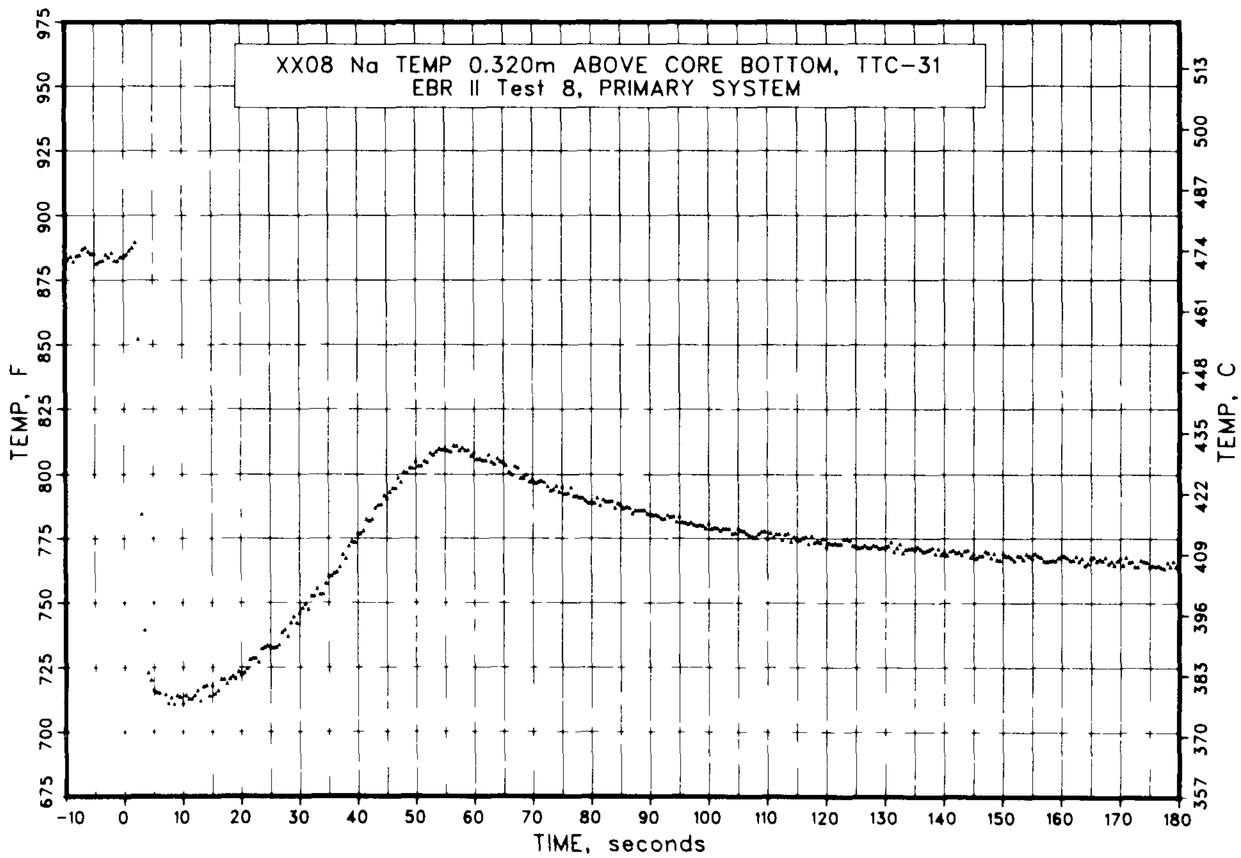
70
80
90
100
110
120
130
140
150
160
170
180


XX08 Na TEMP 0.320m ABOVE CORE BOTTOM, TTC-31
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
975
950
925
900
875
850
825
800
775
750
725
700
675
513
500
487
474
461
448
435
422
409
396
383
370
357
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170
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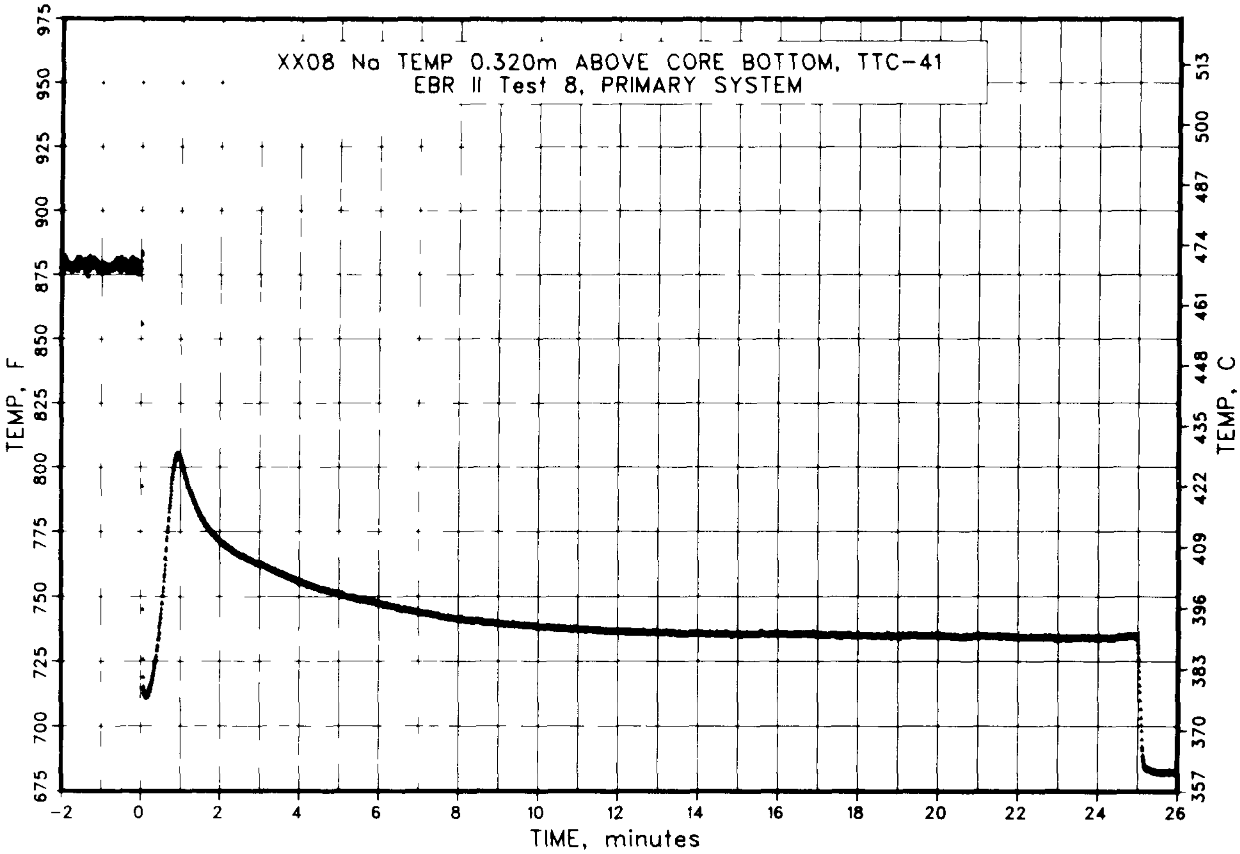
XX08 Na TEMP 0.320m ABOVE CORE BOTTOM, TTC-41
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-2
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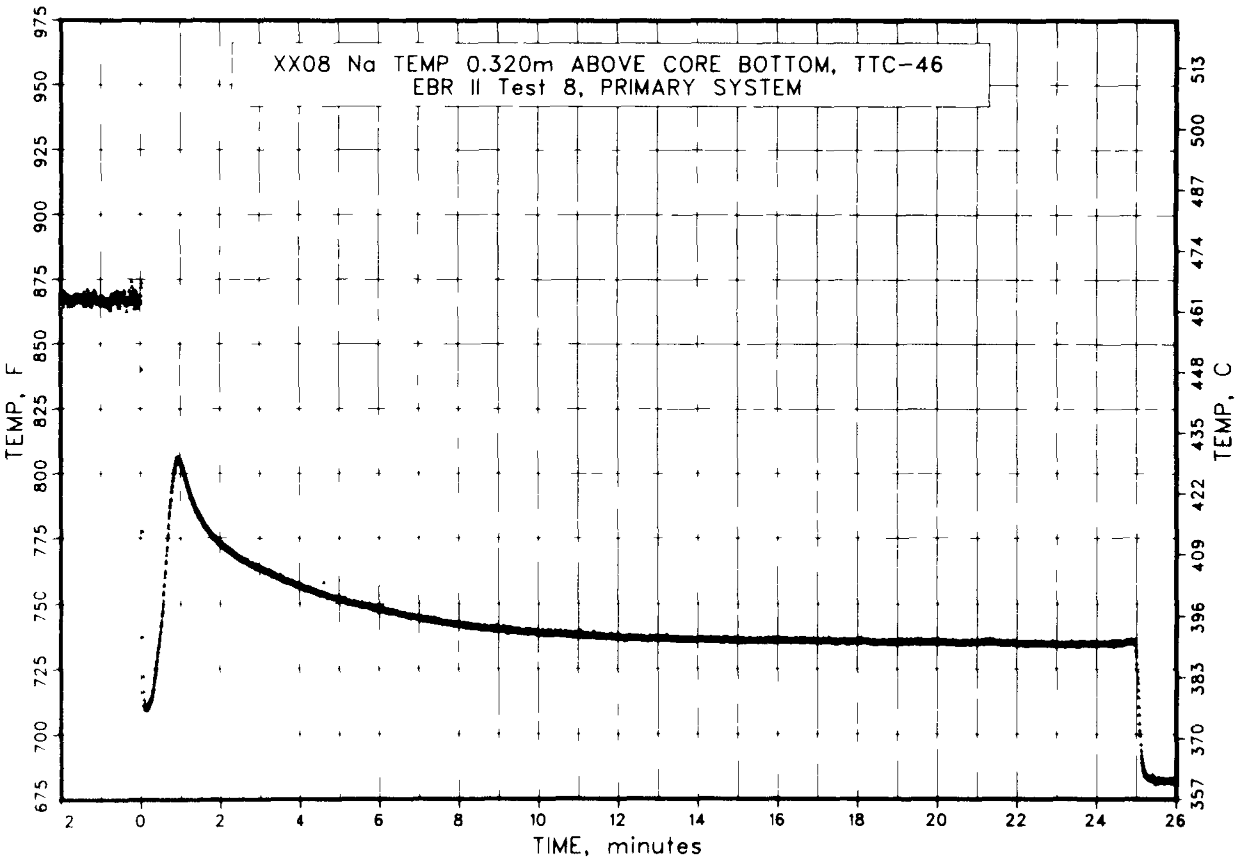
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes


XX08 Na TEMP 0.320m ABOVE CORE BOTTOM, TTC-46
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
75C
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
2
0
2
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6
8
10
12
14
16
18
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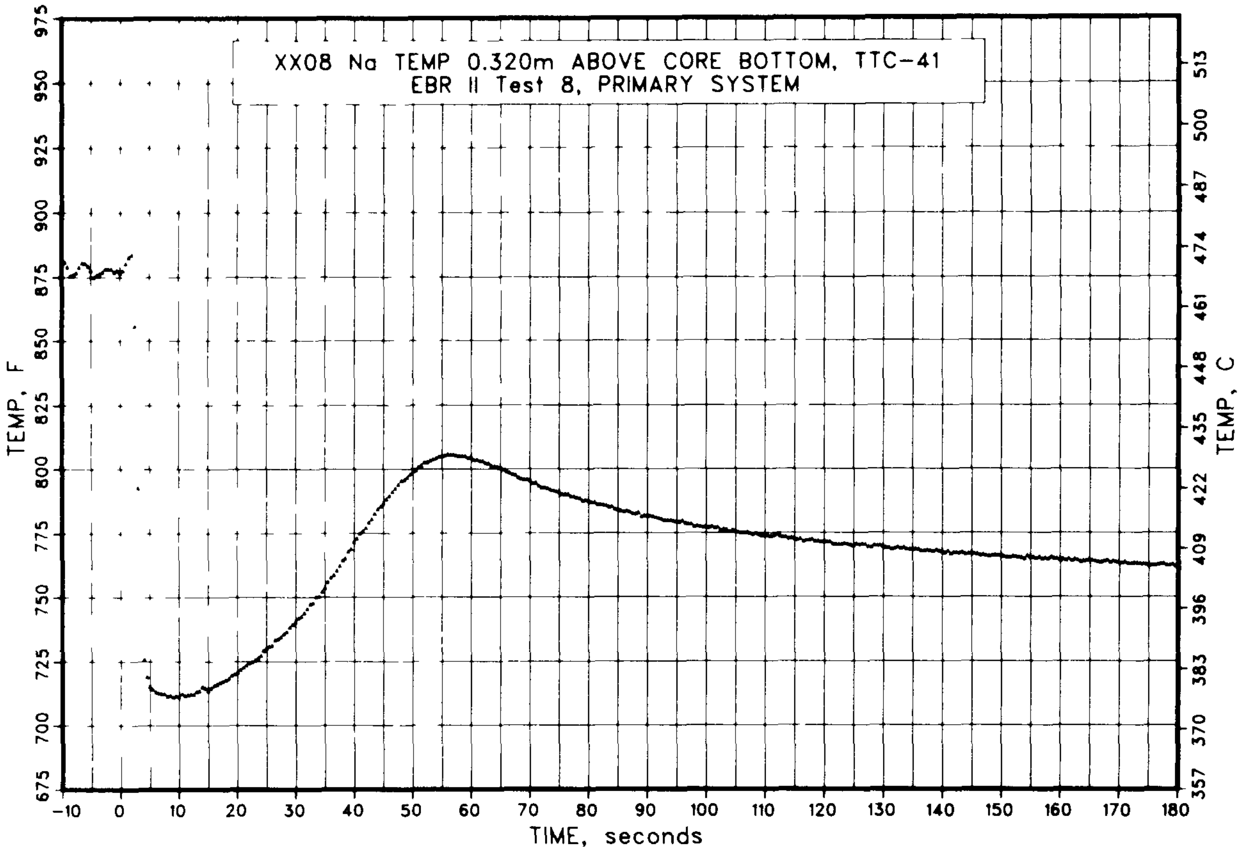
22
24
26
TIME, minutes


XX08 Na TEMP 0.320m ABOVE CORE BOTTOM, TTC-41
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
675
700
725
750
775
800
825
850
875
900
925
950
975
357
370
383
396
409
422
435
448
461
474
487
500
513
-10
0
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120
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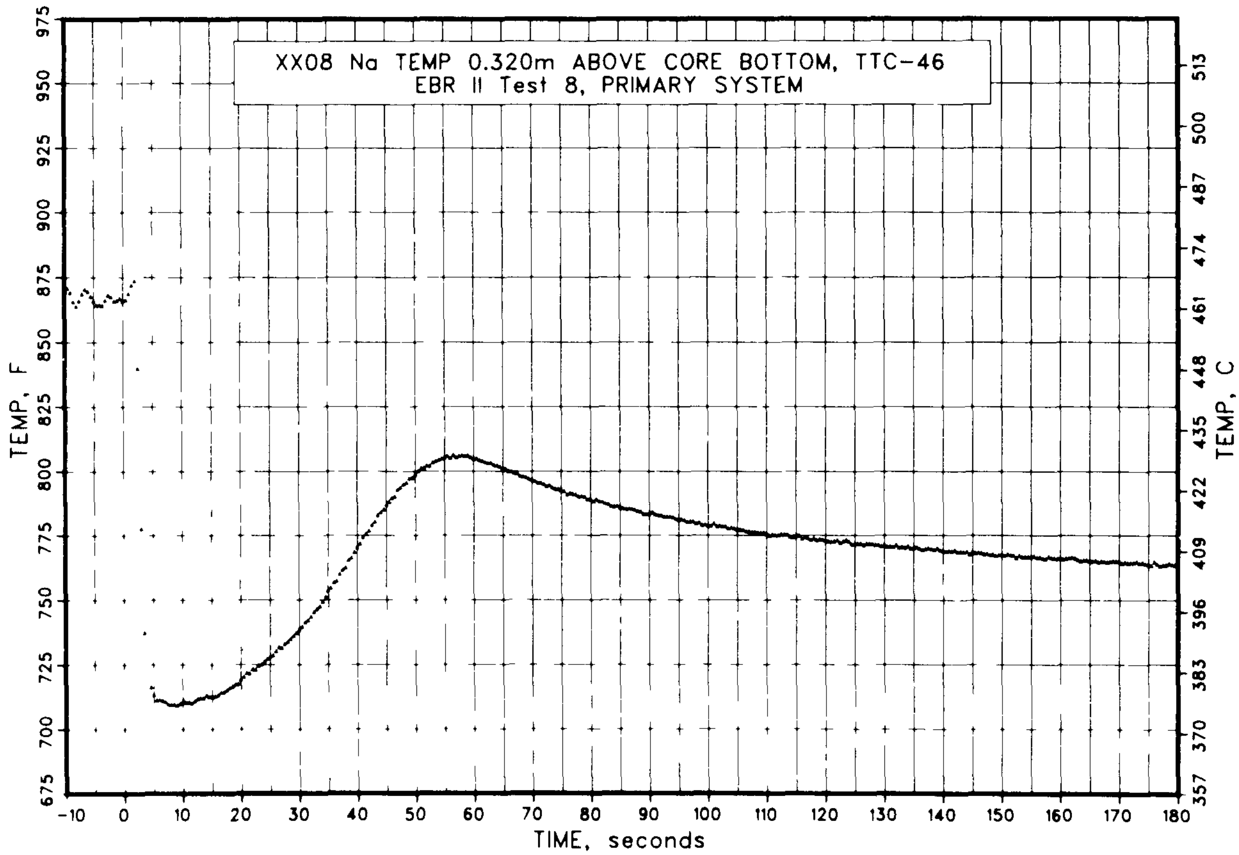
170
180


XX08 Na TEMP 0.320m ABOVE CORE BOTTOM, TTC-46
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
675
700
725
750
775
800
825
850
875
900
925
950
975
357
370
383
396
409
422
435
448
461
474
487
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513
-10
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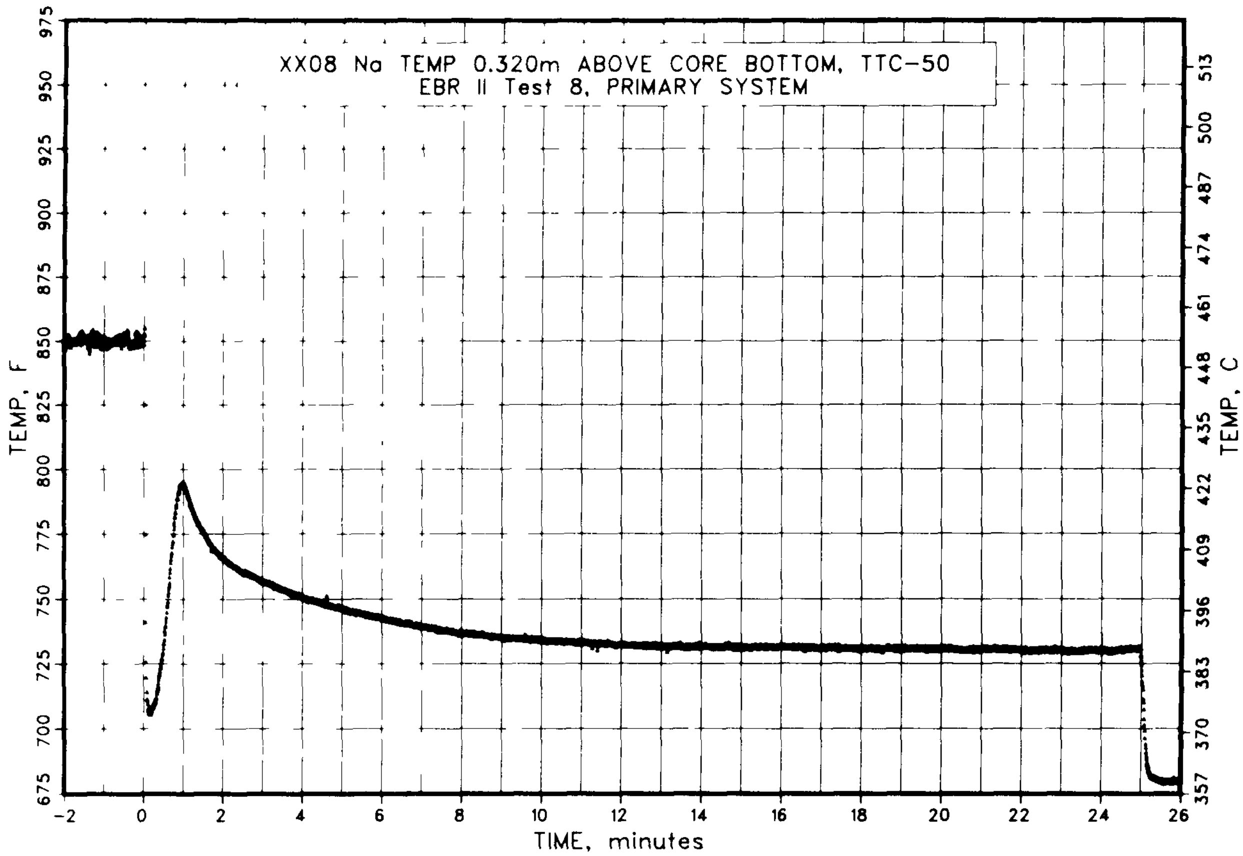
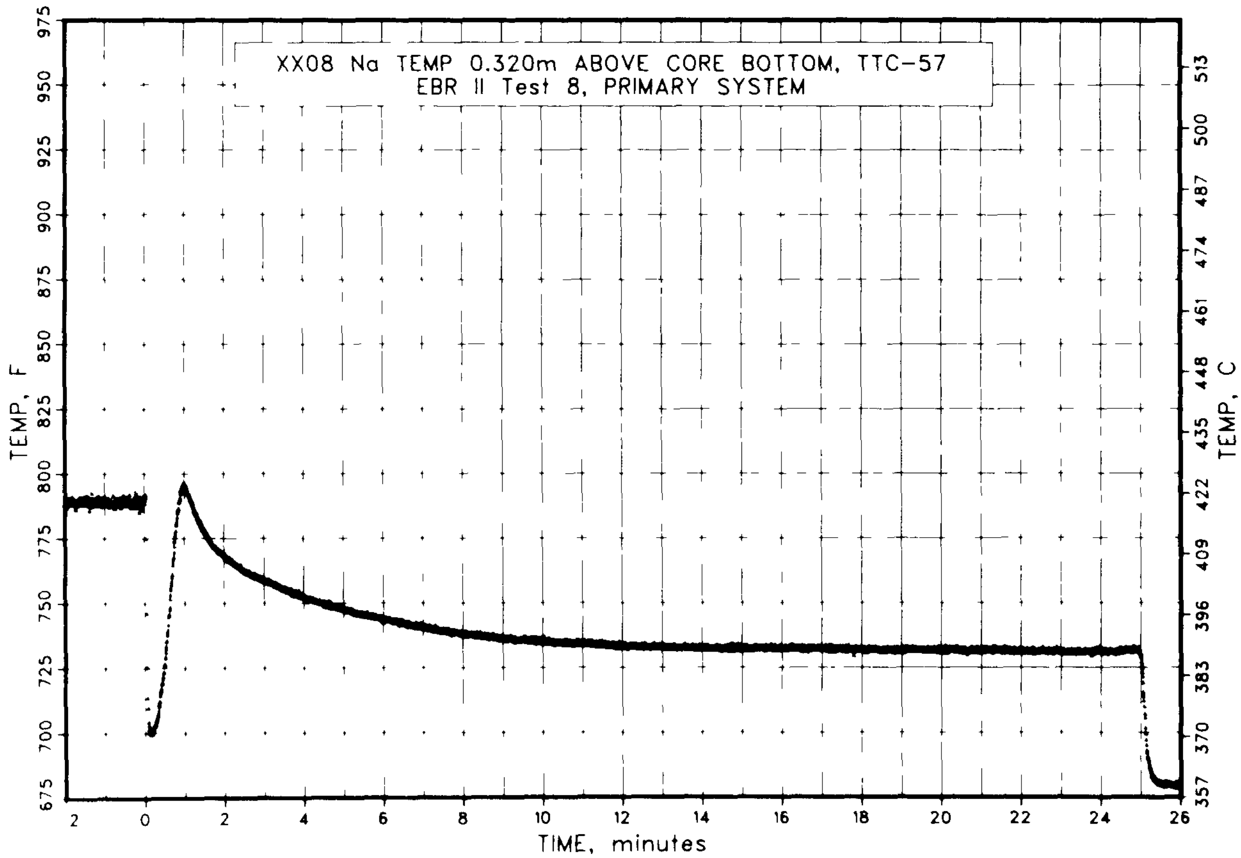
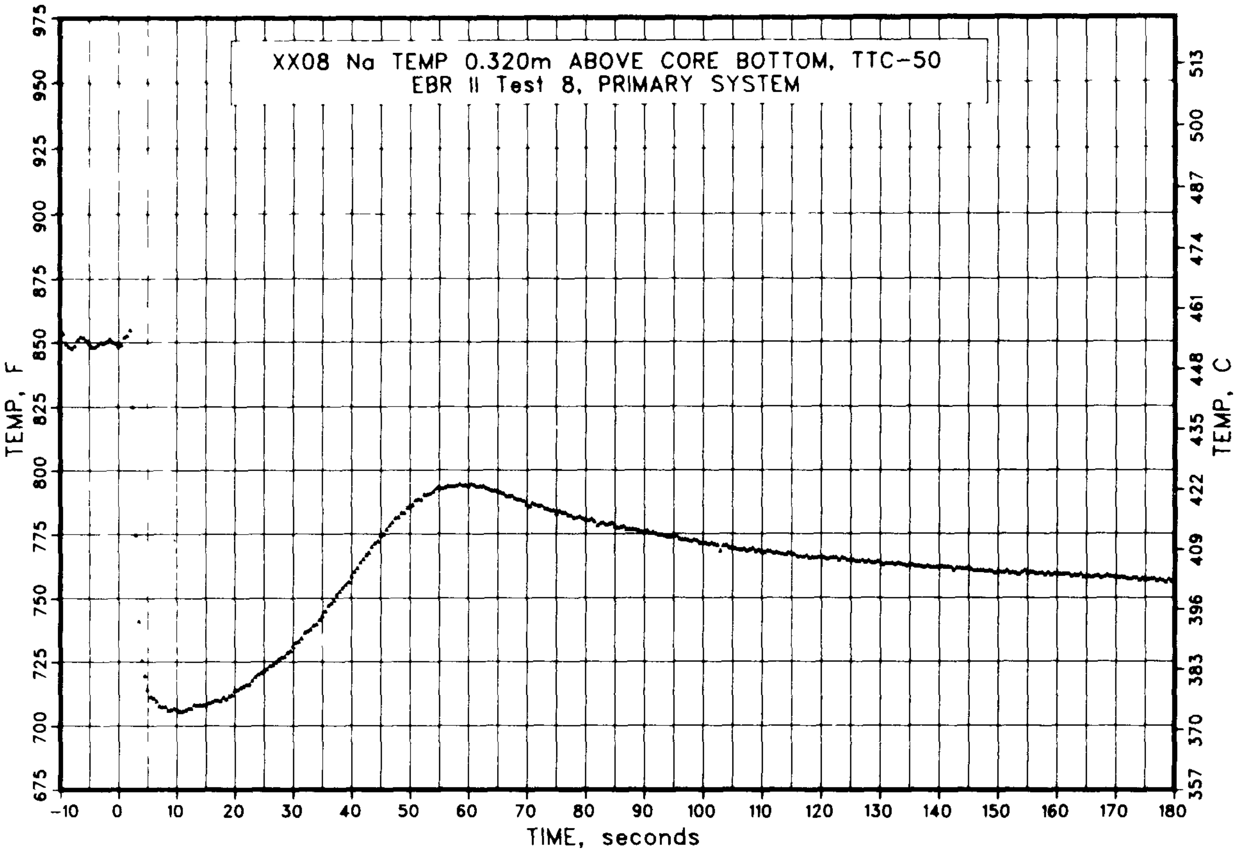
180


XX08 Na TEMP 0.320m ABOVE CORE BOTTOM, TTC-50
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


XX08 Na TEMP 0.320m ABOVE CORE BOTTOM, TTC-57
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


XX08 Na TEMP 0.320m ABOVE CORE BOTTOM, TTC-50
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
975
950
925
900
875
850
825
800
775
750
725
700
675
513
500
487
474
461
448
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422
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383
370
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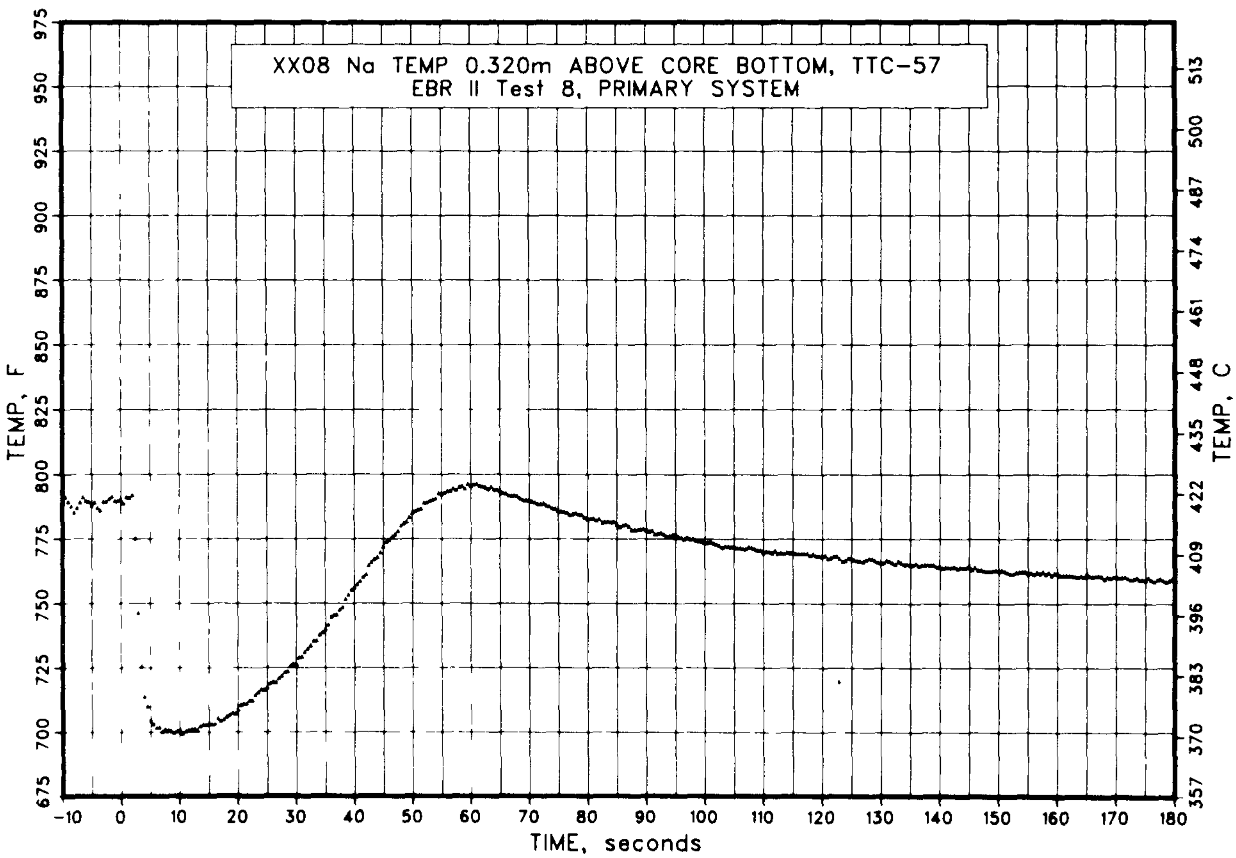
XX08 Na TEMP 0.320m ABOVE CORE BOTTOM, TTC-57
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
975
950
925
900
875
850
825
800
775
750
725
700
675
513
500
487
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461
448
435
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170
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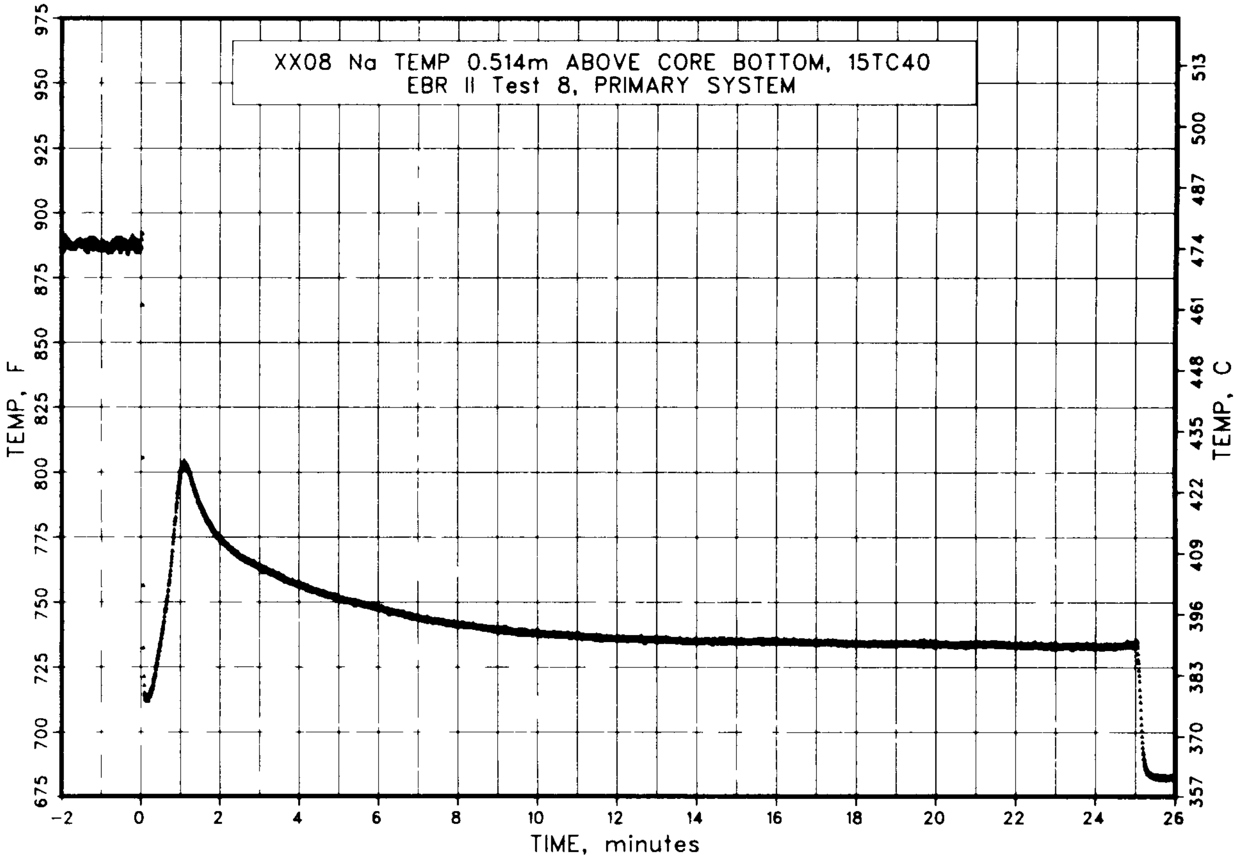
XX08 Na TEMP 0.514m ABOVE CORE BOTTOM, 15TC40
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-2
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2
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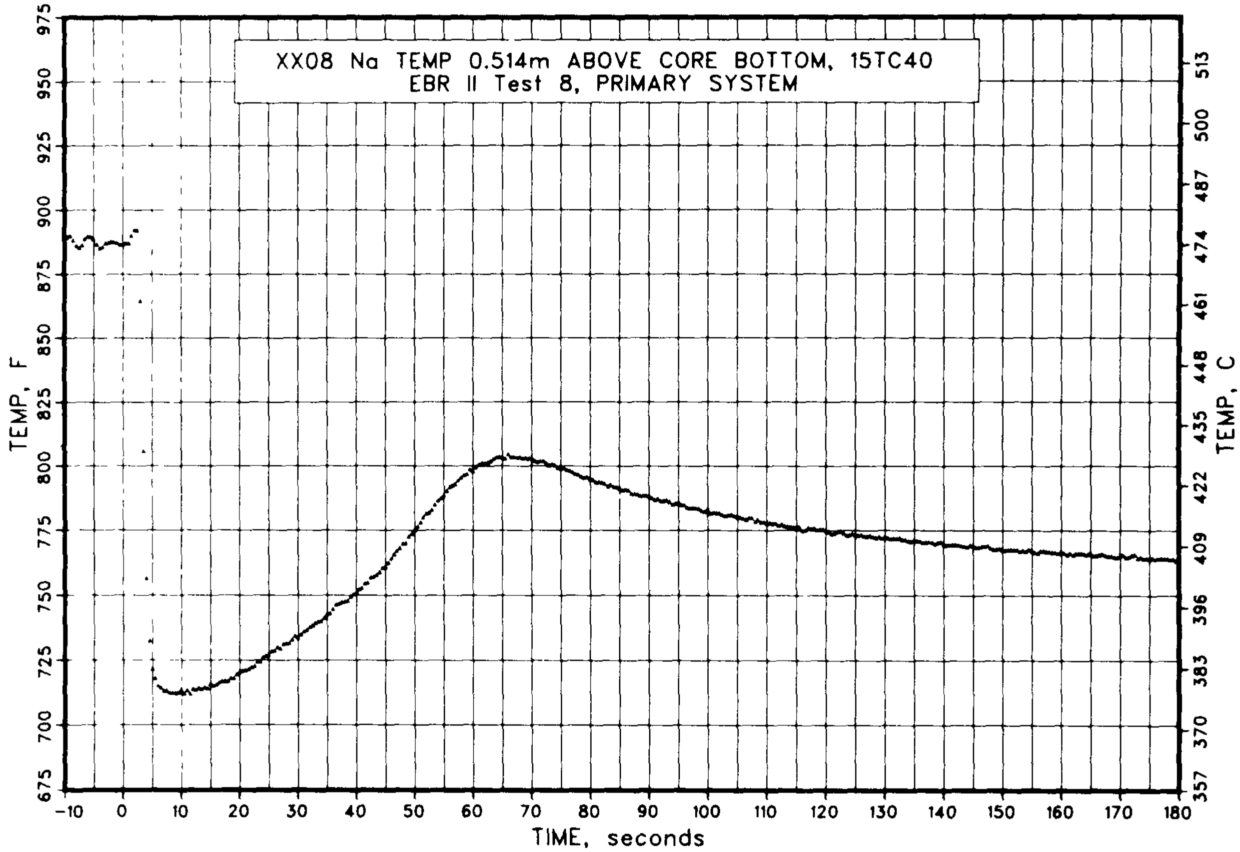
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes


XX08 Na TEMP 0.514m ABOVE CORE BOTTOM, 15TC40
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
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383
370
357
-10
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70
80
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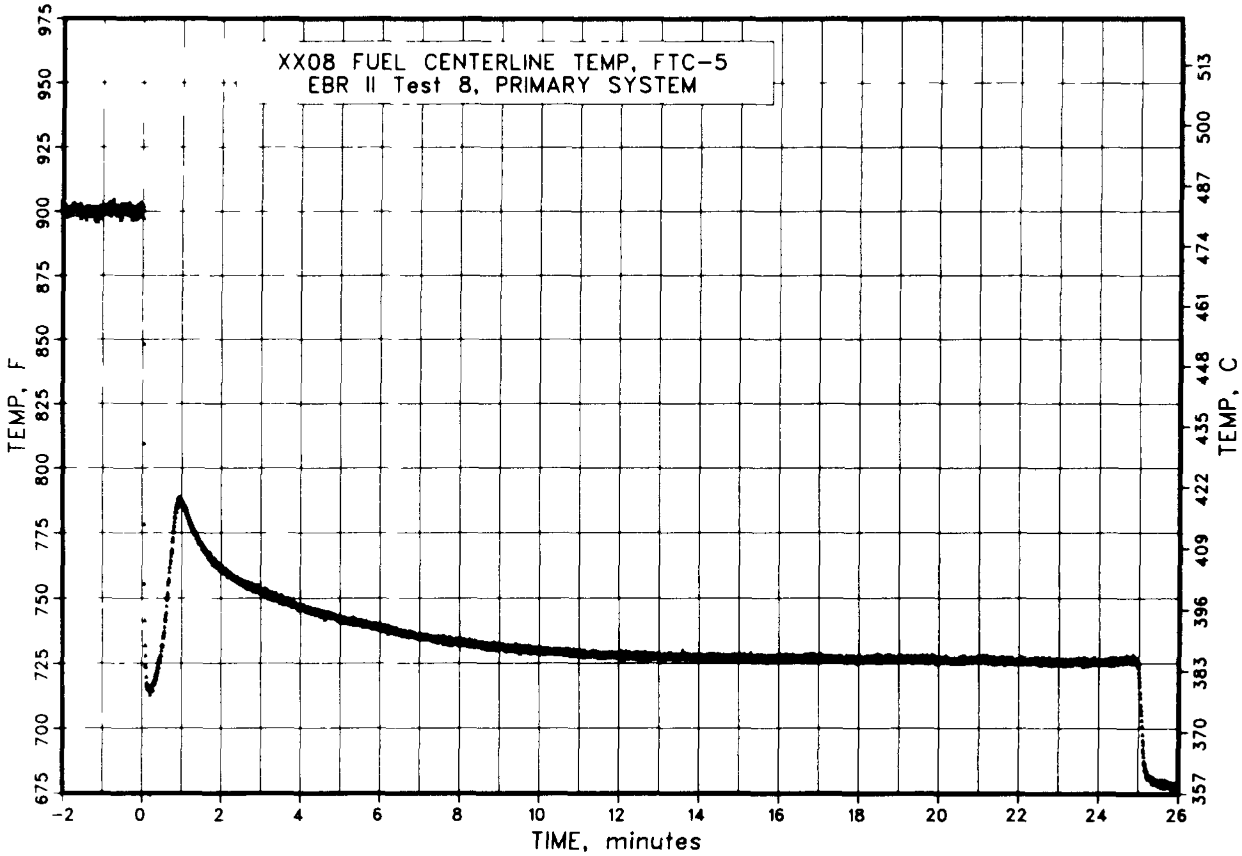
100
110
120
130
140
150
160
170
180
TIME, seconds


XX08 FUEL CENTERLINE TEMP, FTC-5
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
TIME, minutes
-2
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4
6
8
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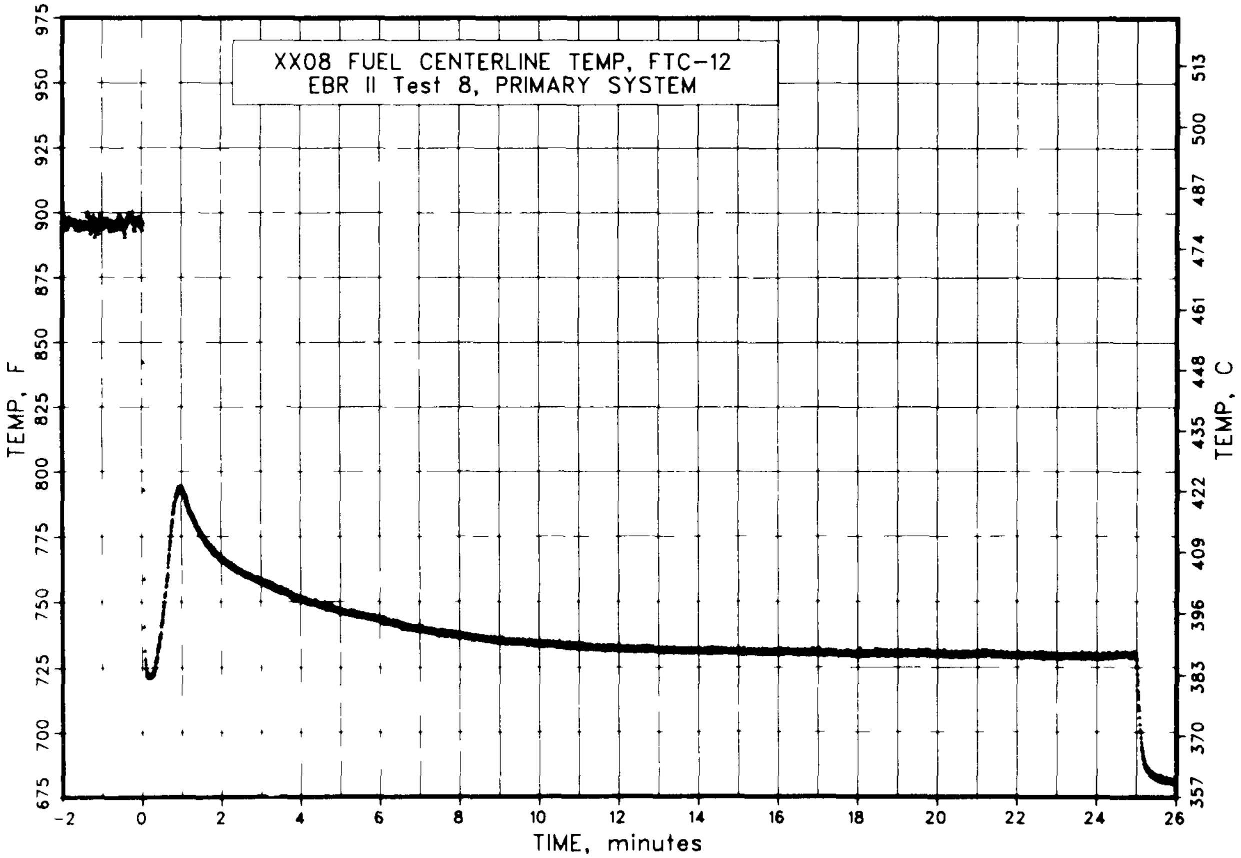
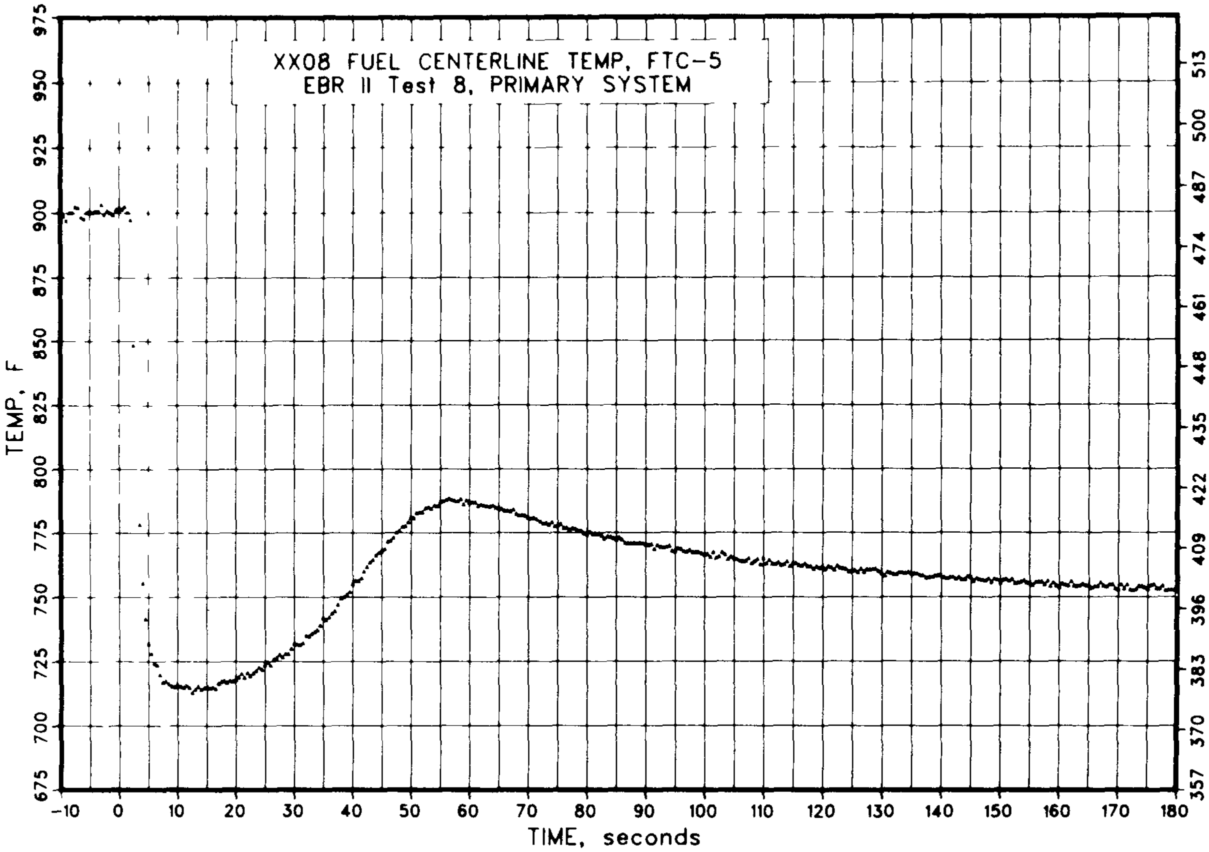
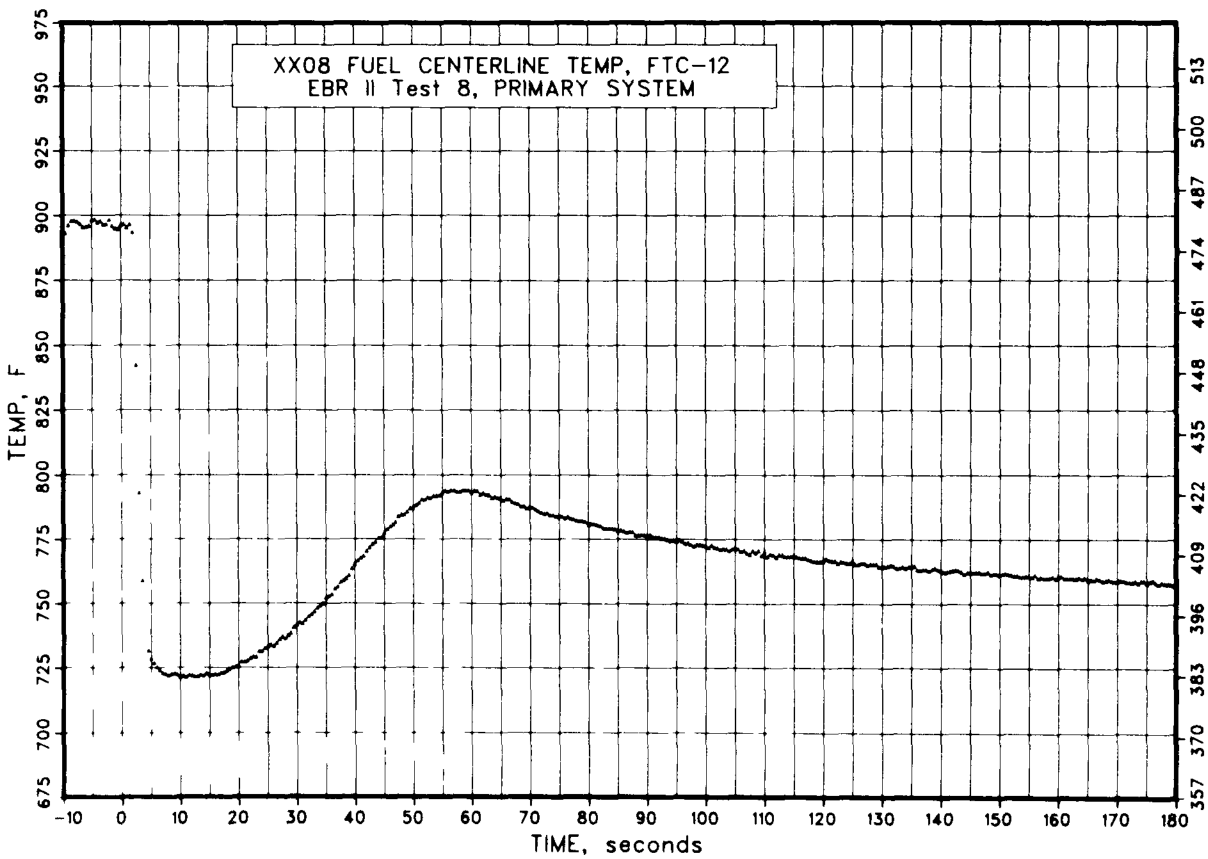
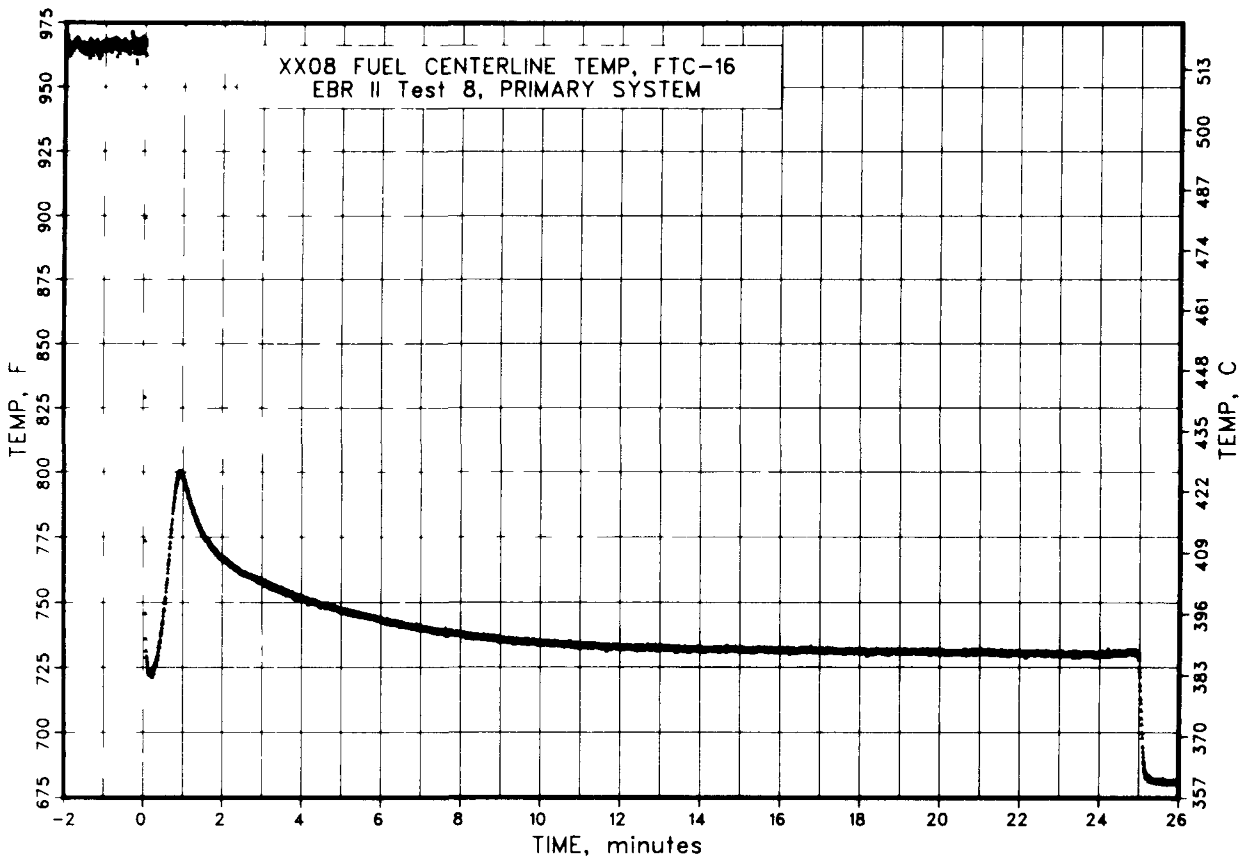
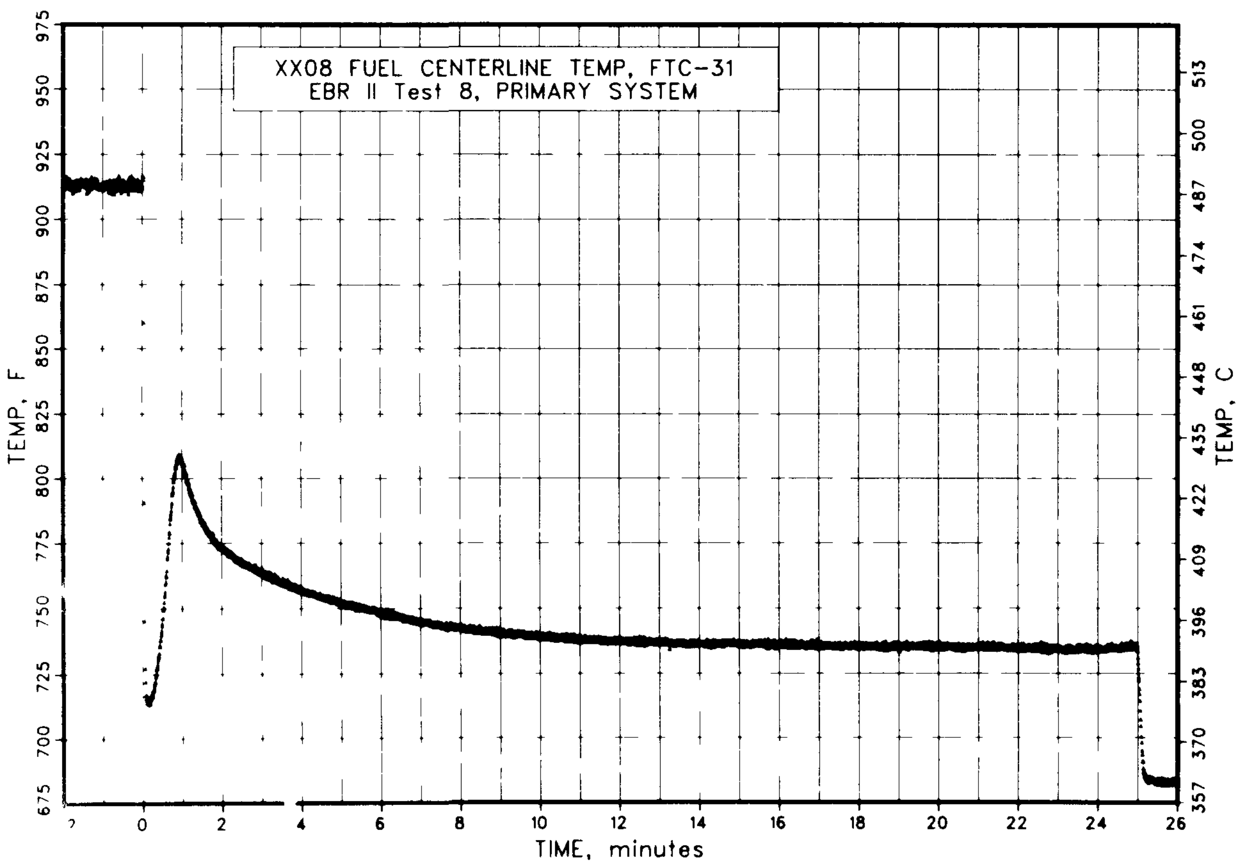
12
14
16
18
20
22
24
26

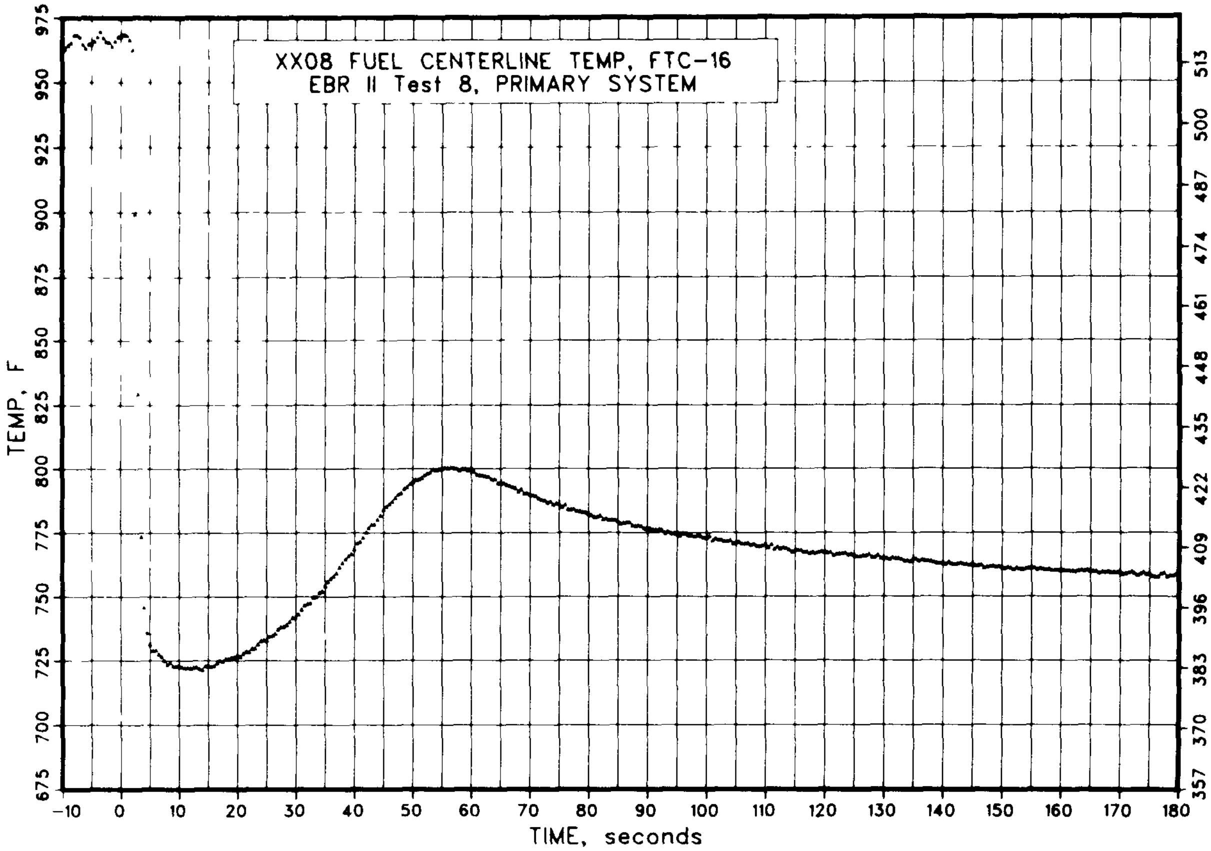

XX08 FUEL CENTERLINE TEMP, FTC-12
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
TIME, minutes
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26


XX08 FUEL CENTERLINE TEMP, FTC-5
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds


XX08 FUEL CENTERLINE TEMP, FTC-12
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds


XX08 FUEL CENTERLINE TEMP, FTC-16
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


XX08 FUEL CENTERLINE TEMP, FTC-31
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


XX08 FUEL CENTERLINE TEMP, FTC-16
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-10
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10
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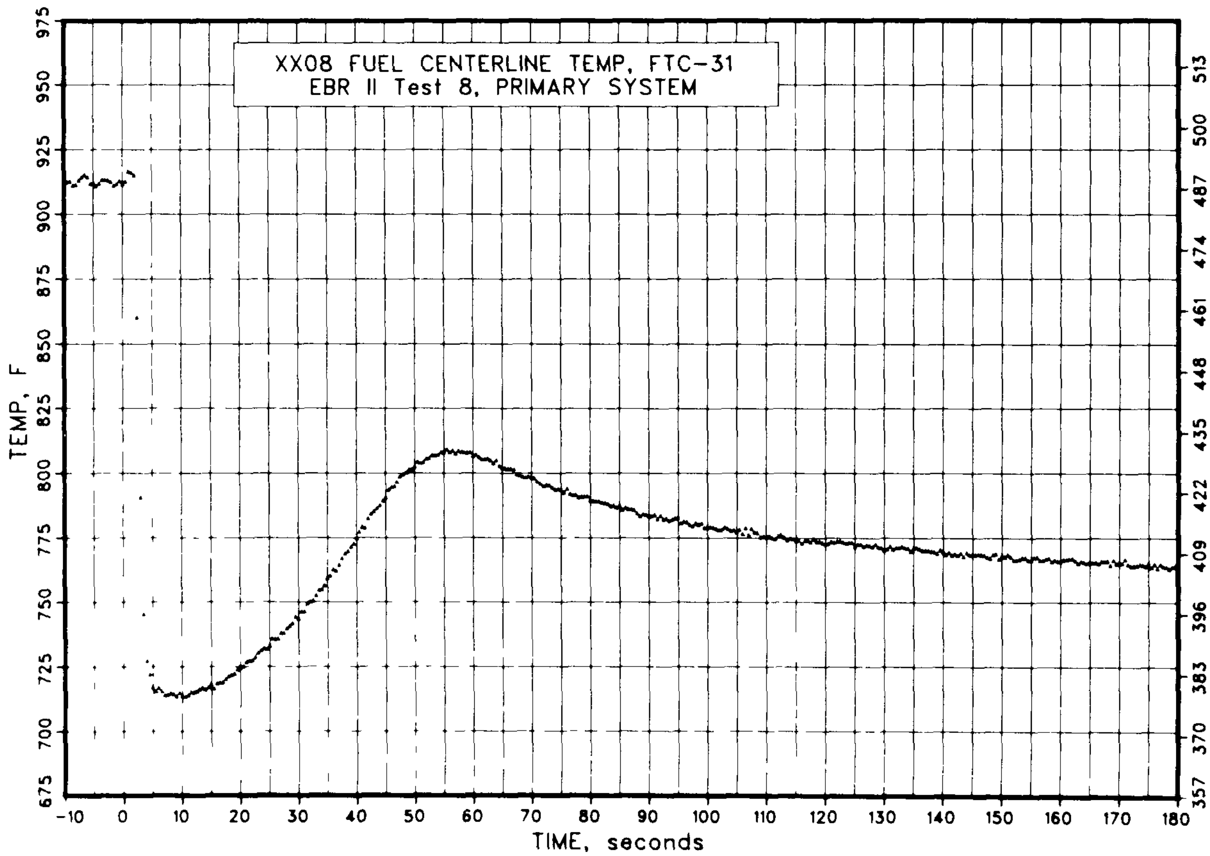
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds


XX08 FUEL CENTERLINE TEMP, FTC-31
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-10
0
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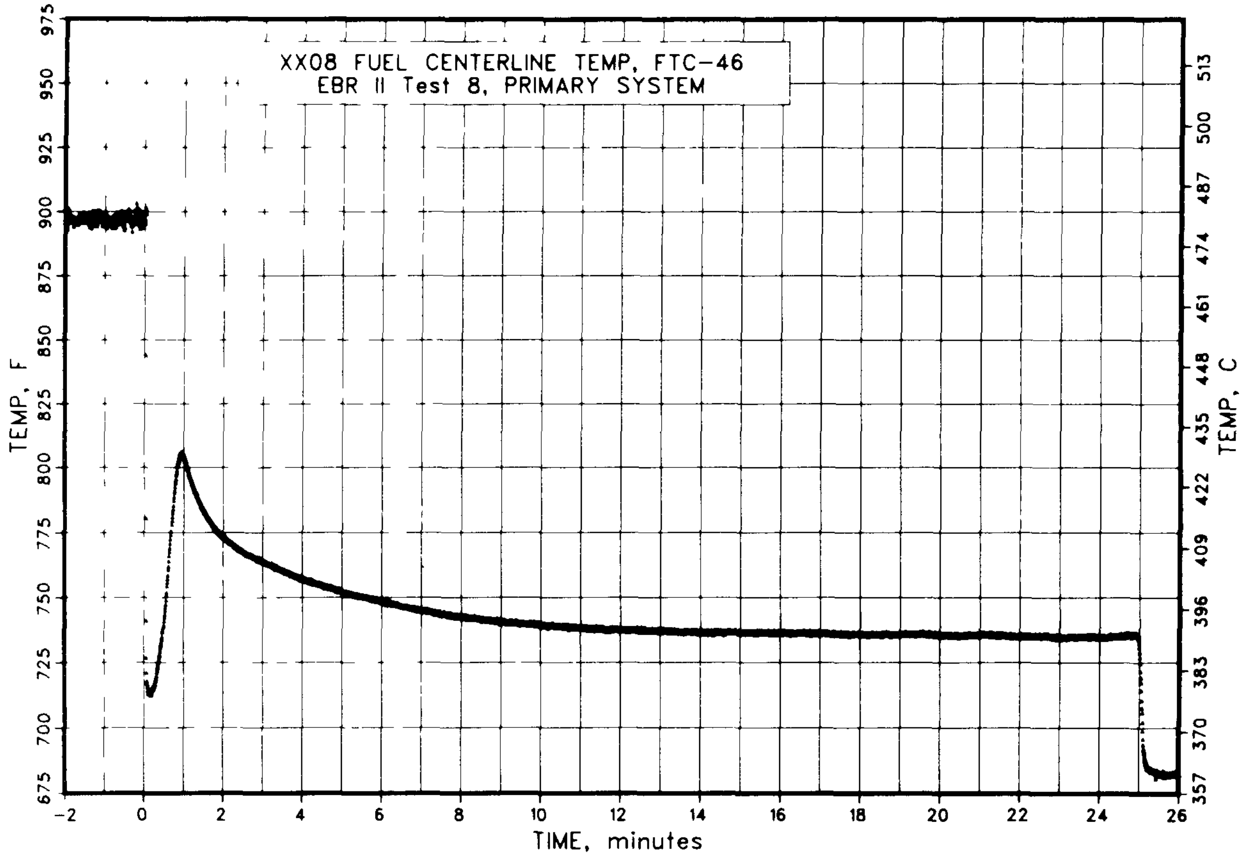
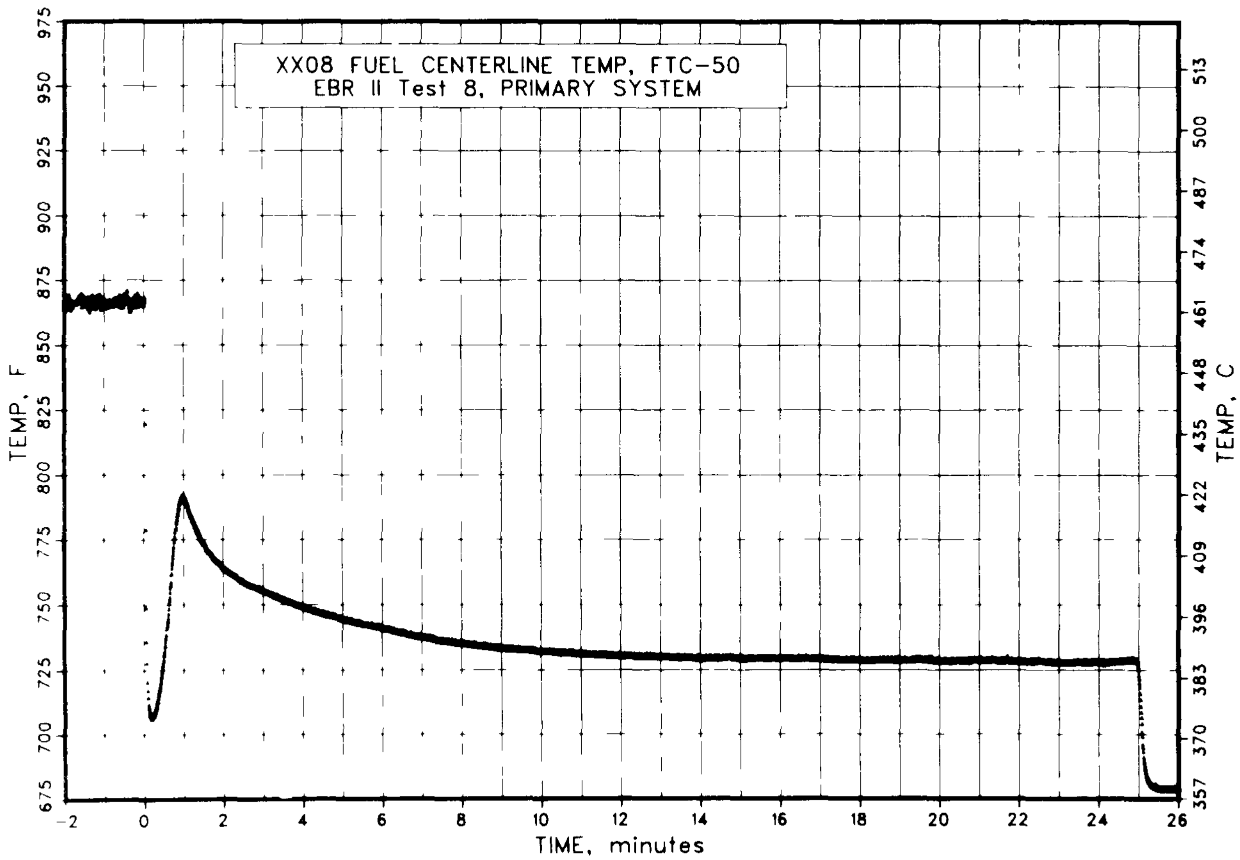
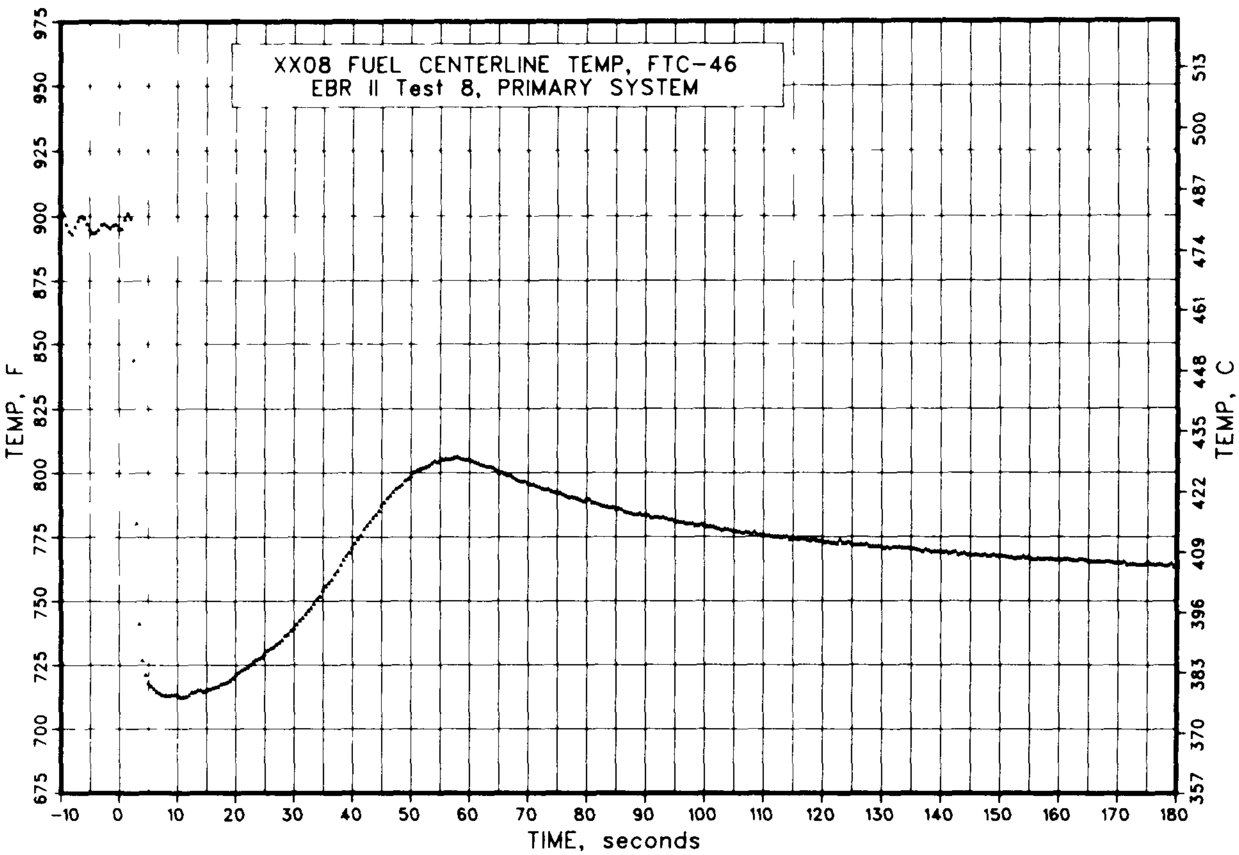
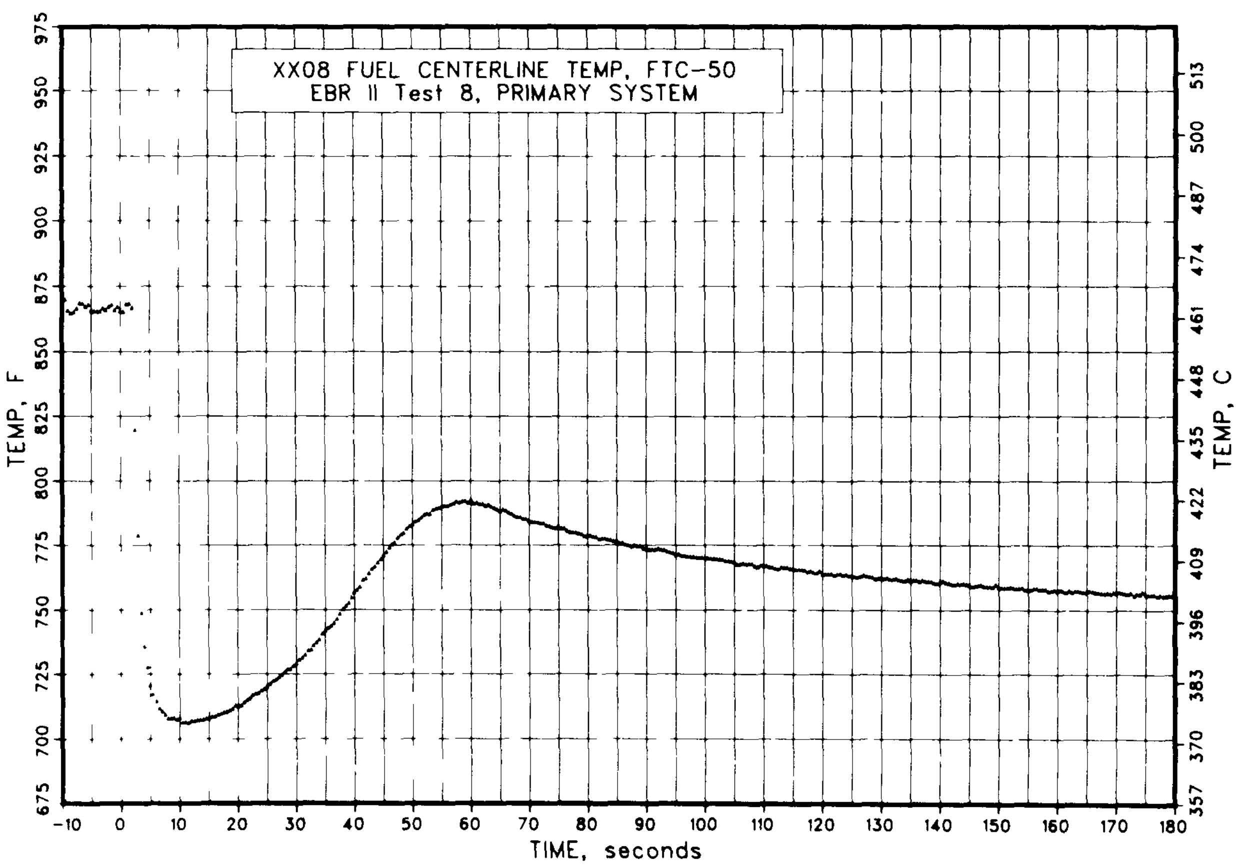
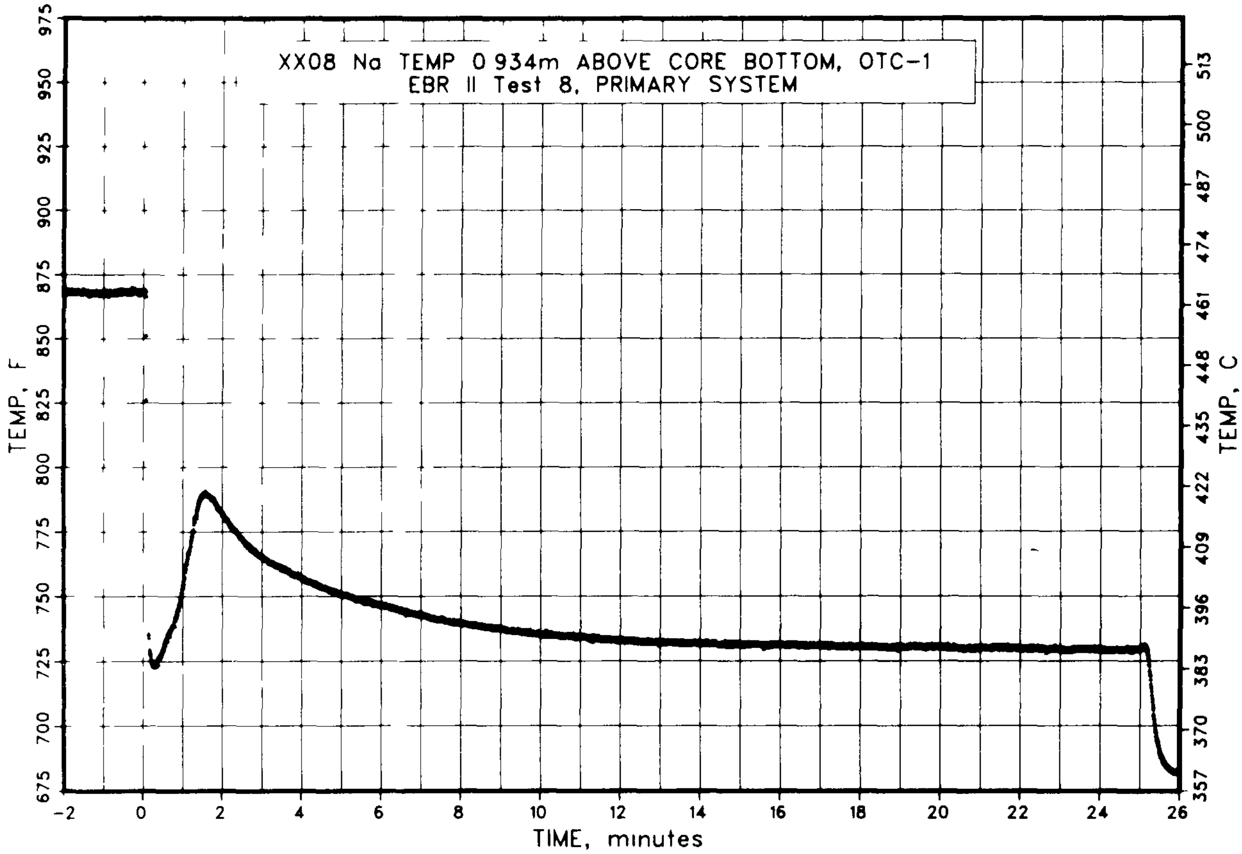
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds

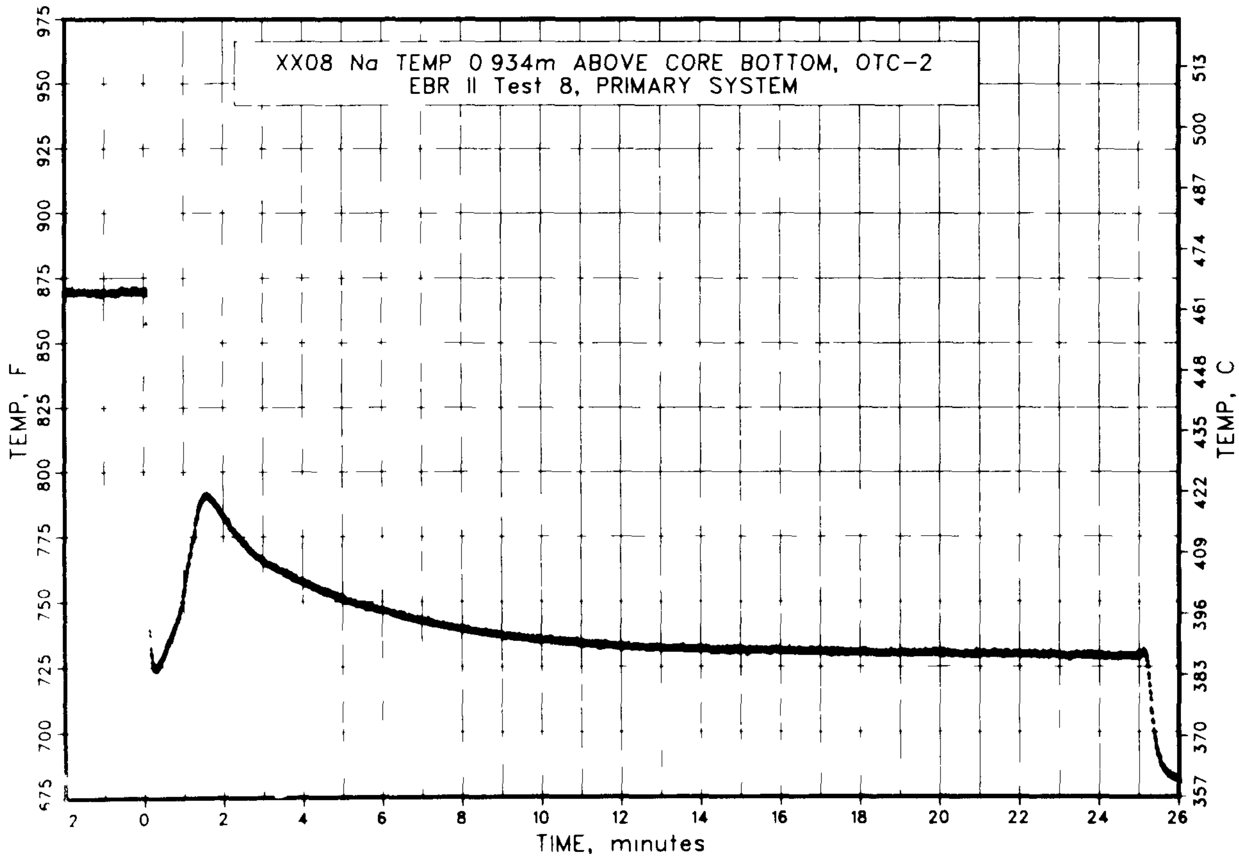

XX08 FUEL CENTERLINE TEMP, FTC-46
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes

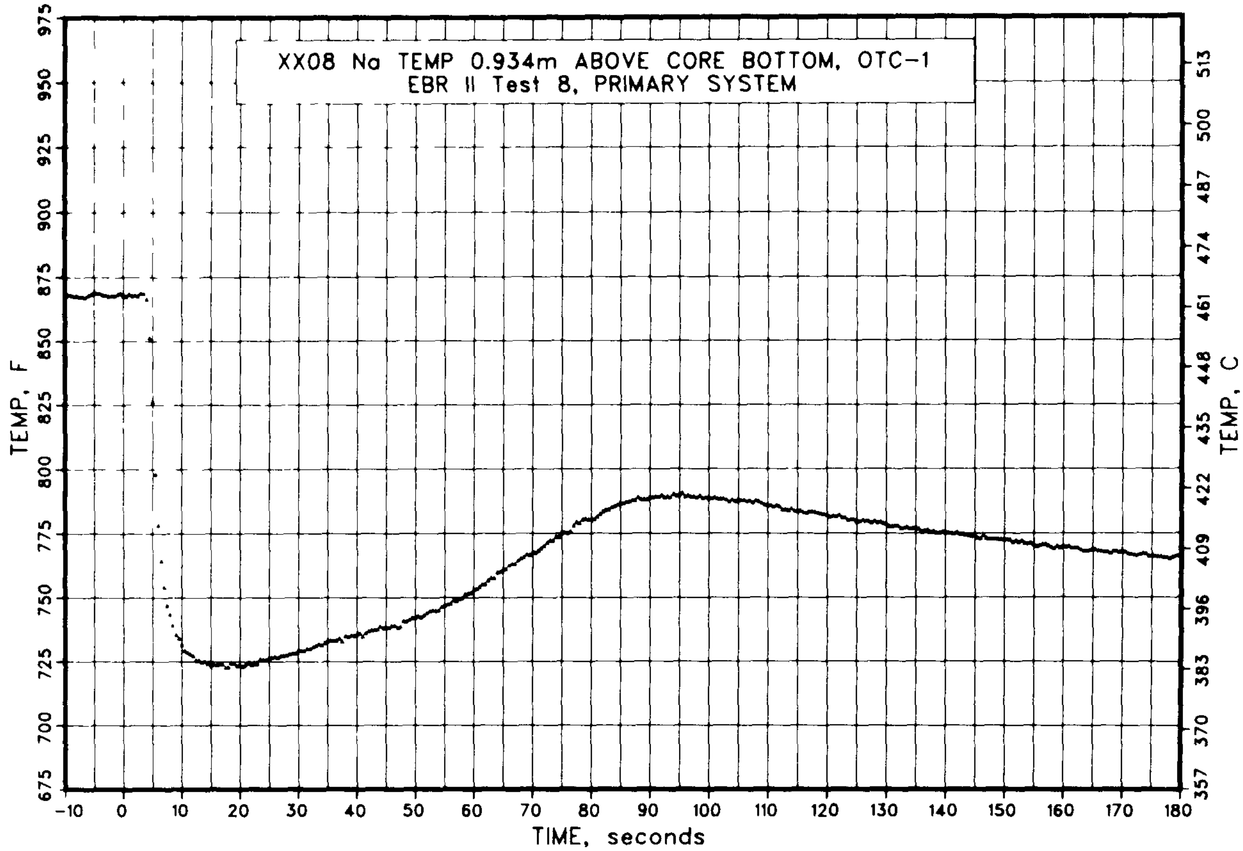

XX08 FUEL CENTERLINE TEMP, FTC-50
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes

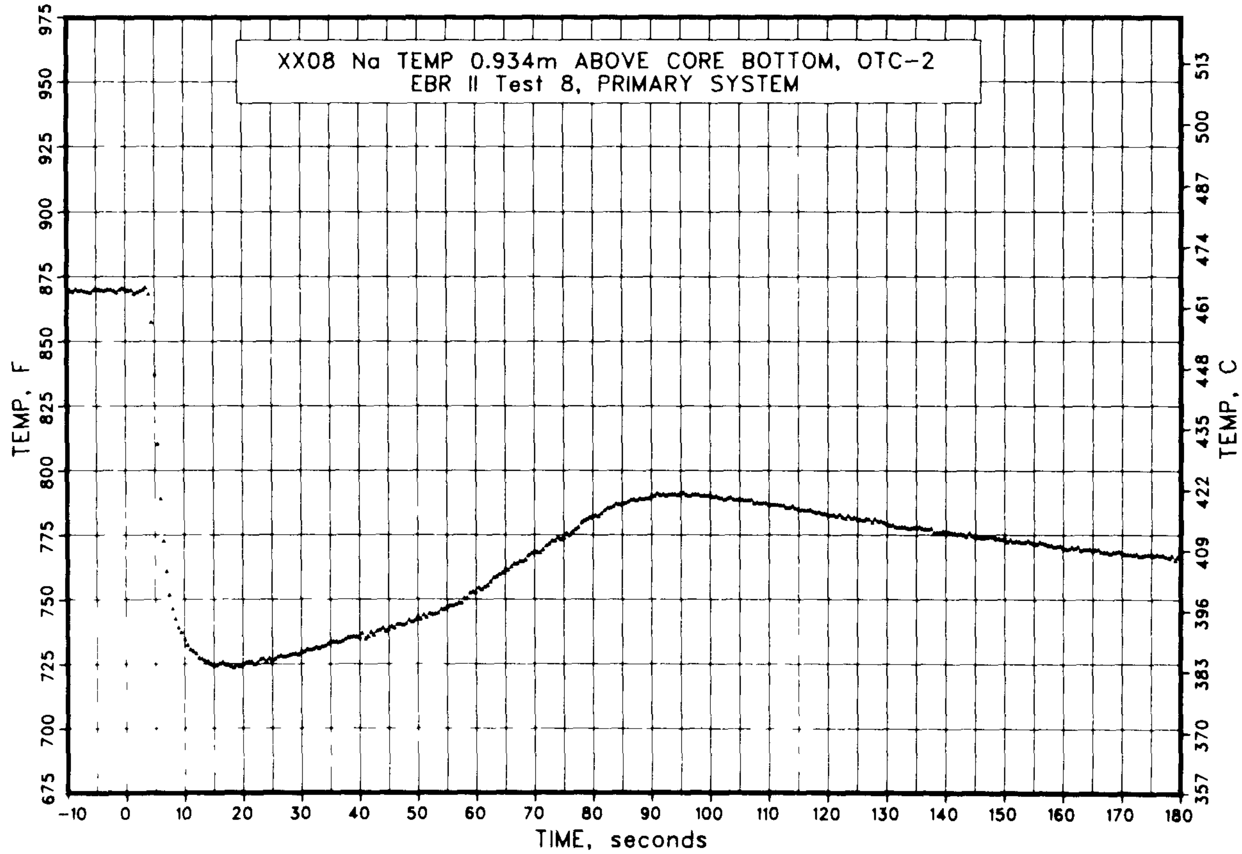

XX08 FUEL CENTERLINE TEMP, FTC-46
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds

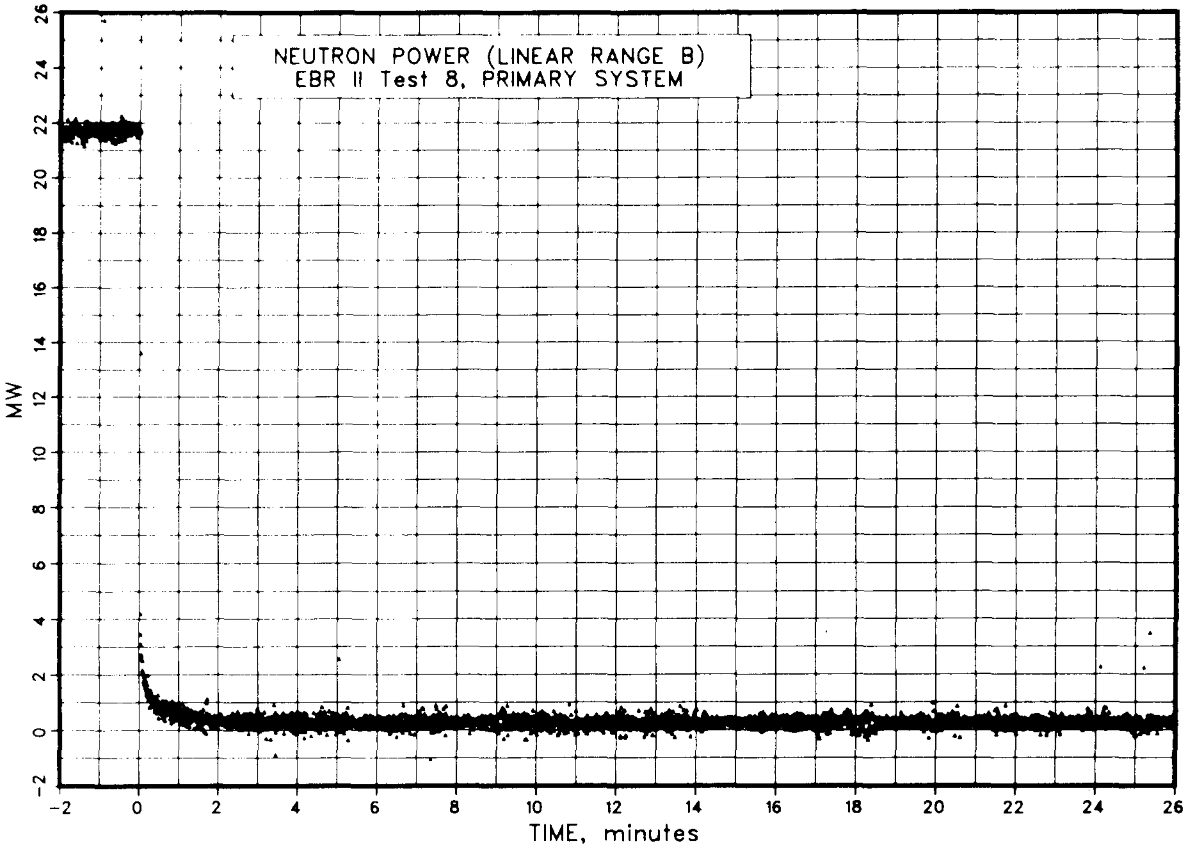

XX08 FUEL CENTERLINE TEMP, FTC-50
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds

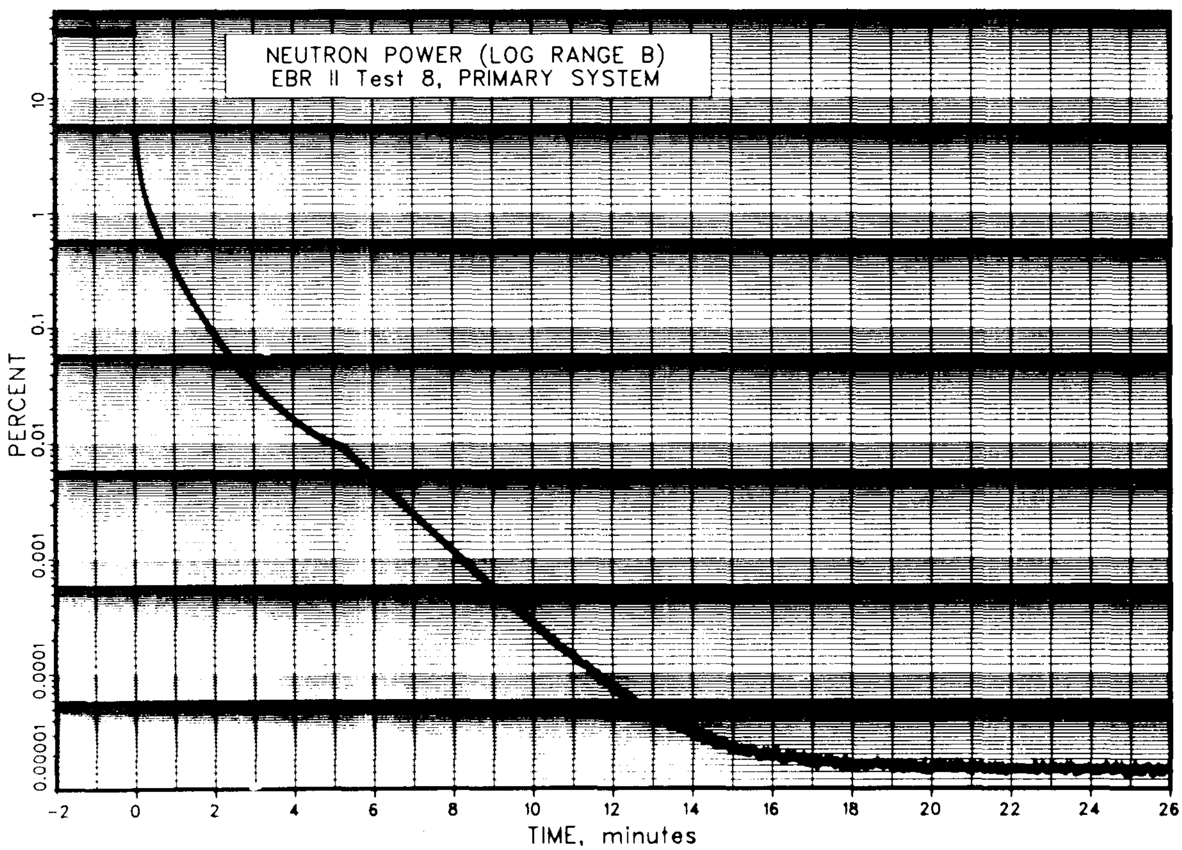

XX08 Na TEMP 0.934m ABOVE CORE BOTTOM, OTC-1
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975 950 925 900 875 850 825 800 775 750 725 700 675
TEMP, C
513 500 487 474 461 448 435 422 409 396 383 370 357
-2 0 2 4 6 8 10 12 14 16 18 20 22 24 26
TIME, minutes

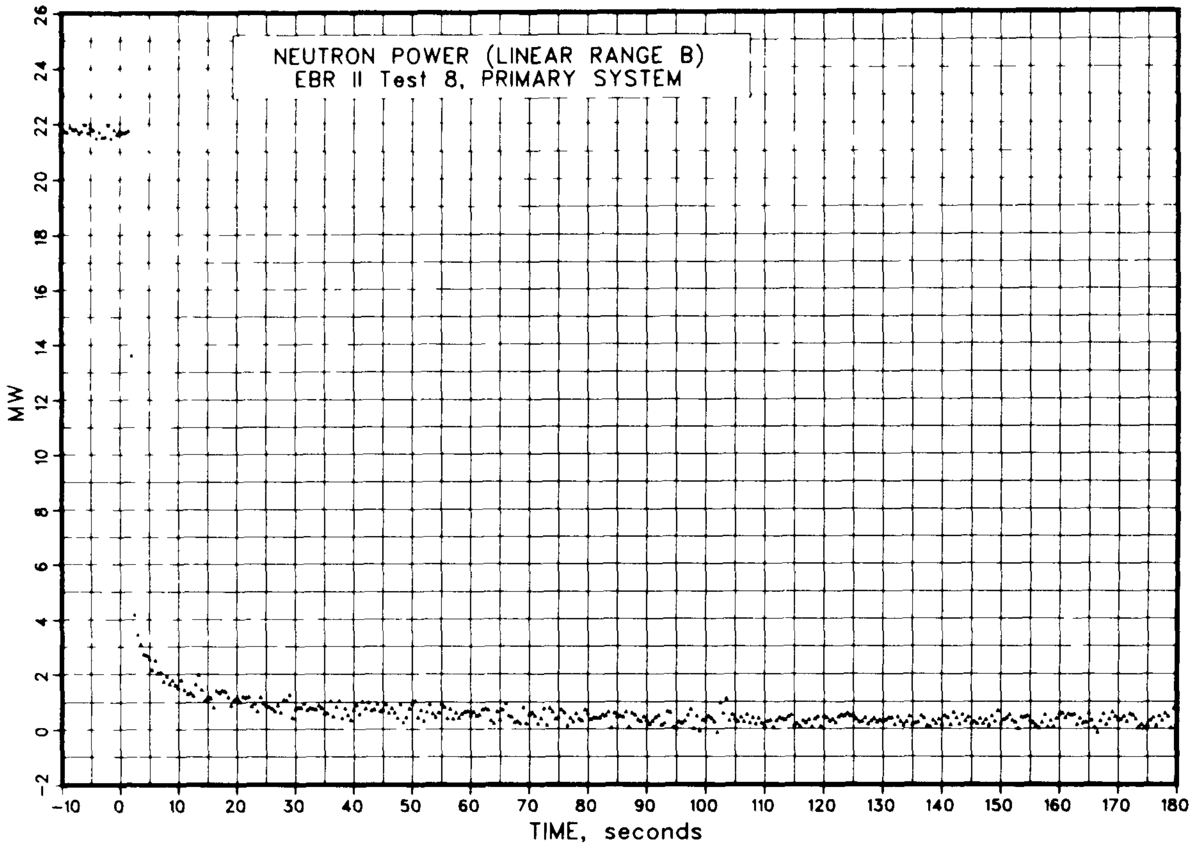

XX08 Na TEMP 0.934m ABOVE CORE BOTTOM, OTC-2
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975 950 925 900 875 850 825 800 775 750 725 700 675
TEMP, C
513 500 487 474 461 448 435 422 409 396 383 370 357
2 0 2 4 6 8 10 12 14 16 18 20 22 24 26
TIME, minutes

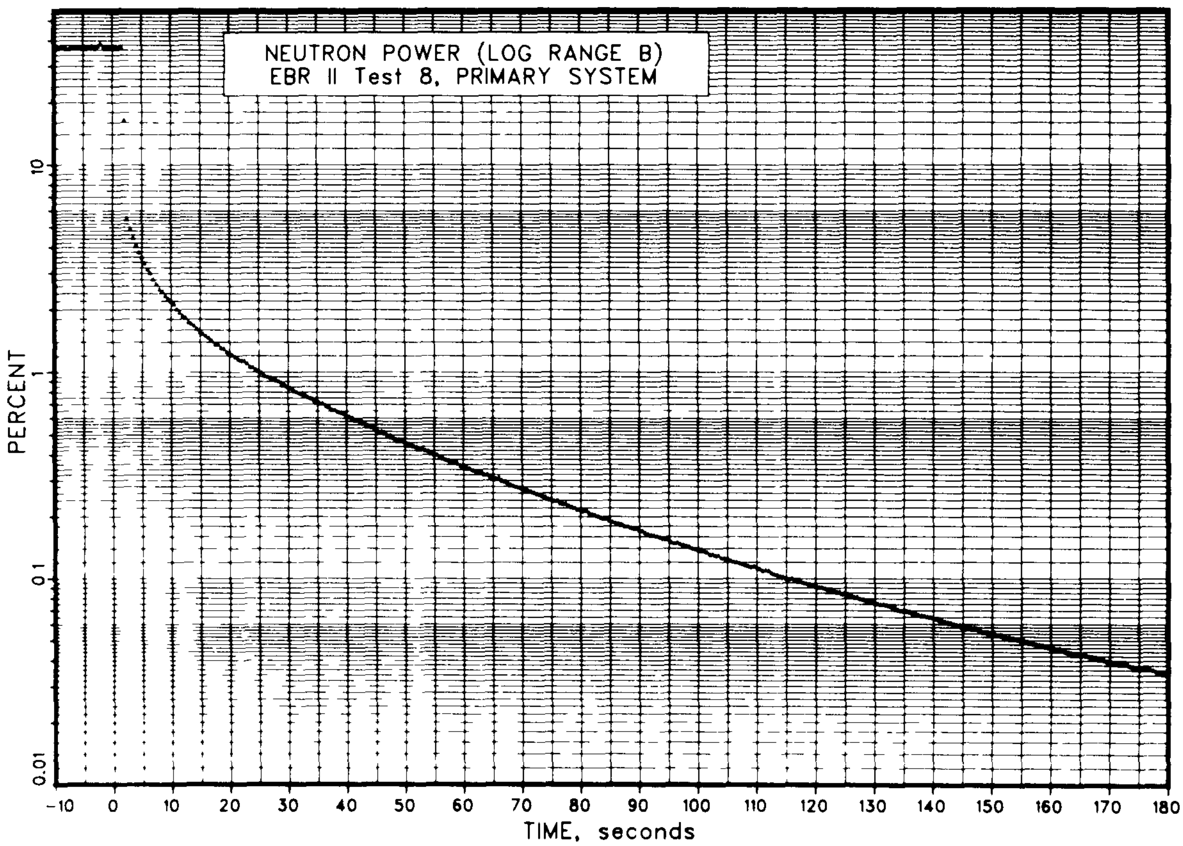

XX08 Na TEMP 0.934m ABOVE CORE BOTTOM, OTC-1
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
675
700
725
750
775
800
825
850
875
900
925
950
975
TEMP, C
357
370
383
396
409
422
435
448
461
474
487
500
513
TIME, seconds
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180

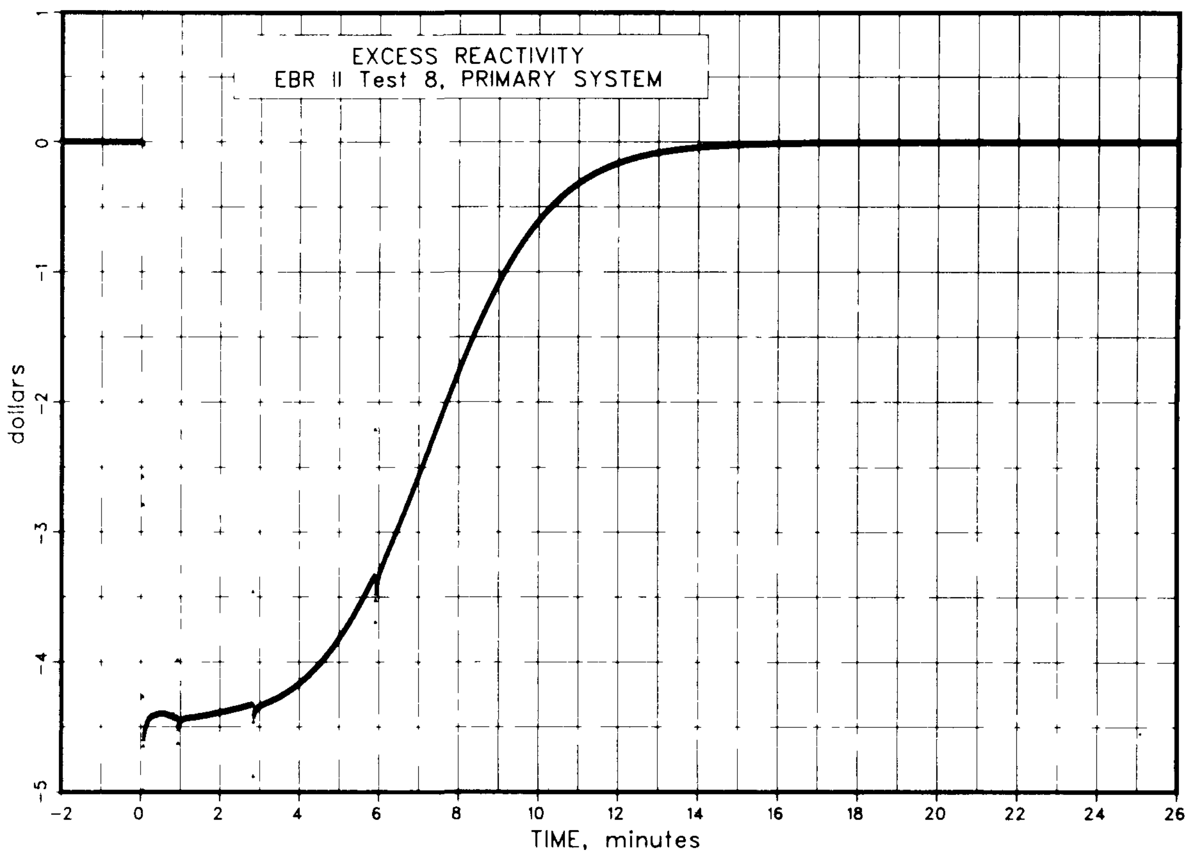

XX08 Na TEMP 0.934m ABOVE CORE BOTTOM, OTC-2
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
675
700
725
750
775
800
825
850
875
900
925
950
975
TEMP, C
357
370
383
396
409
422
435
448
461
474
487
500
513
TIME, seconds
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180

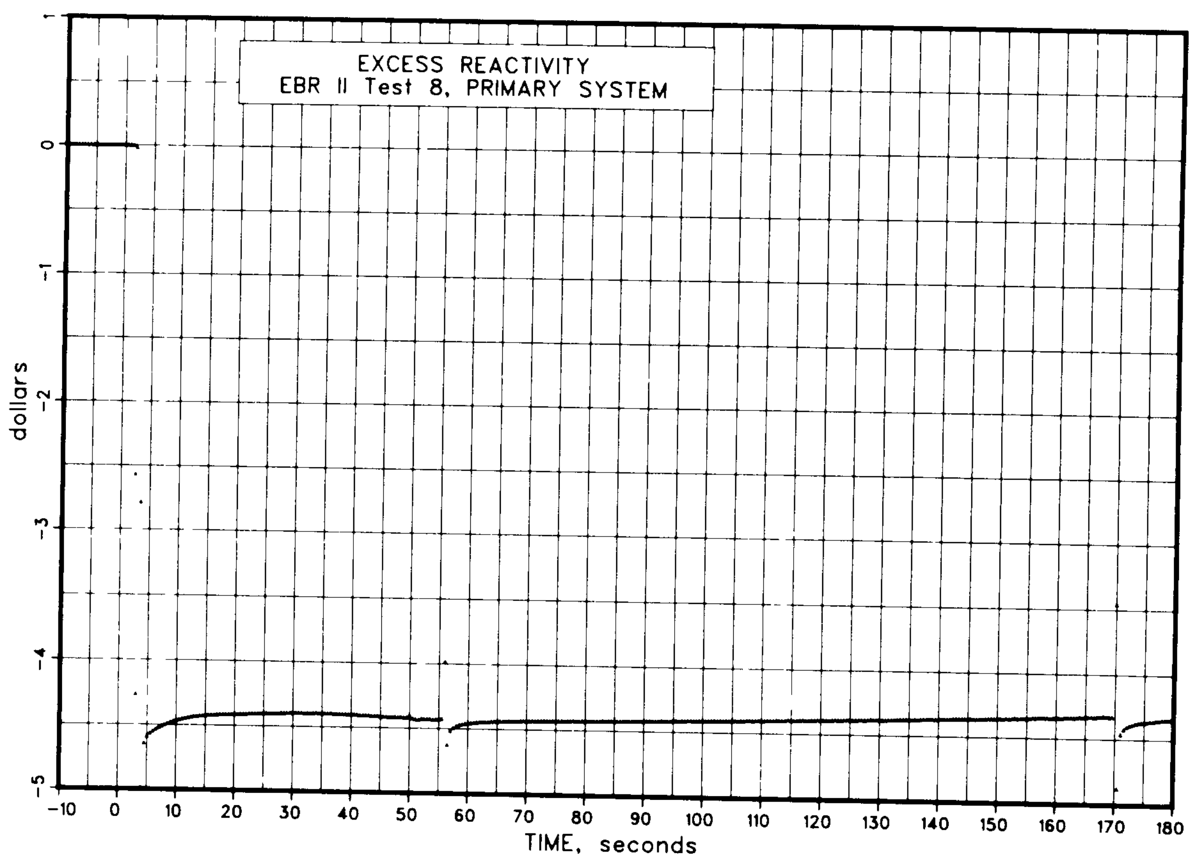

NEUTRON POWER (LINEAR RANGE B)
EBR II Test 8, PRIMARY SYSTEM
MW
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

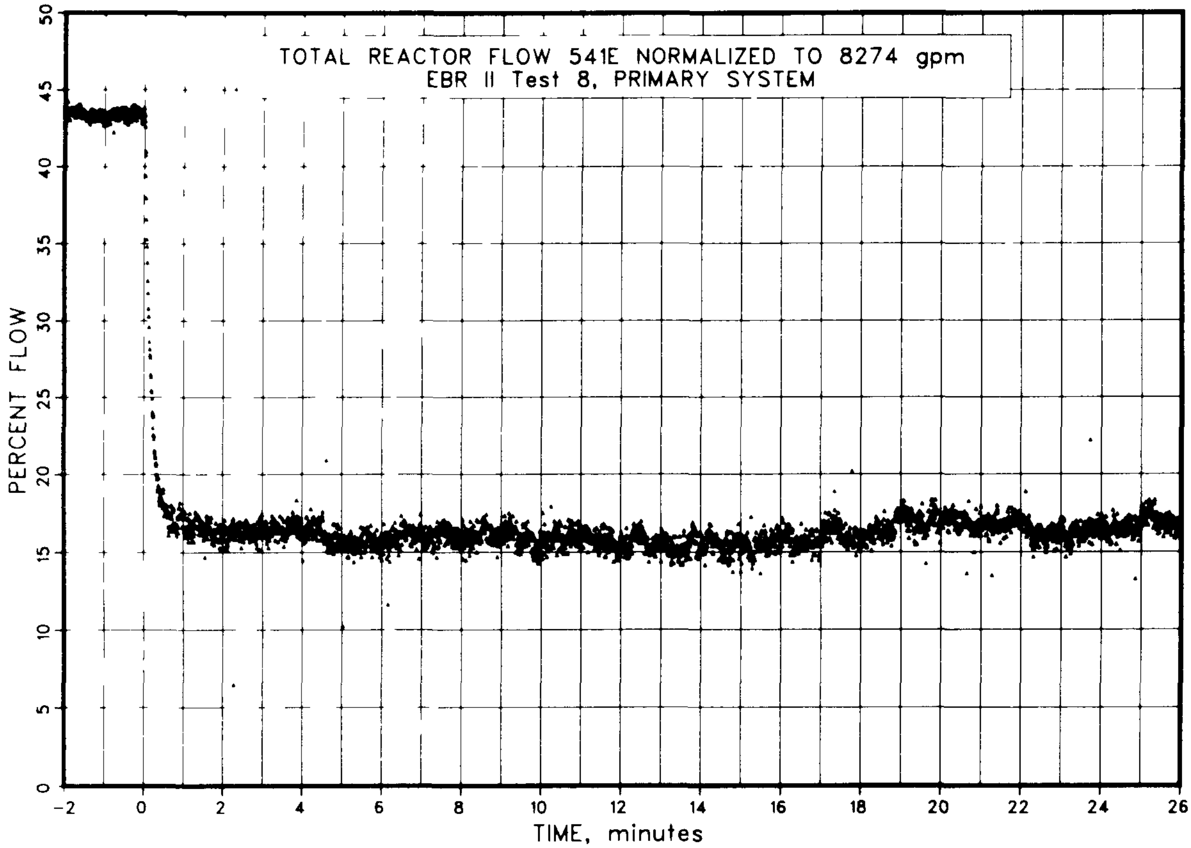

NEUTRON POWER (LOG RANGE B)
EBR II Test 8, PRIMARY SYSTEM
PERCENT
10
1
0.1
0.01
0.001
0.0001
0.00001
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

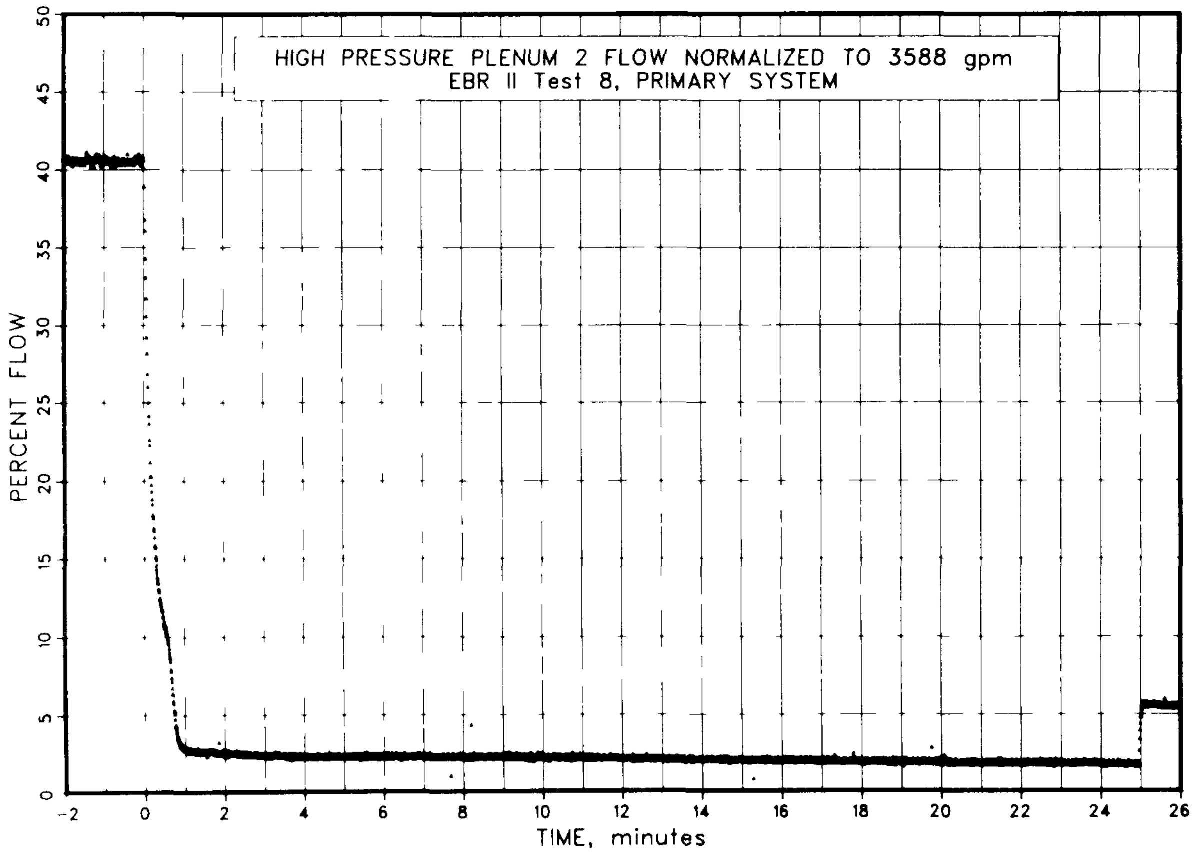

NEUTRON POWER (LINEAR RANGE B)
EBR II Test 8, PRIMARY SYSTEM
MW
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds

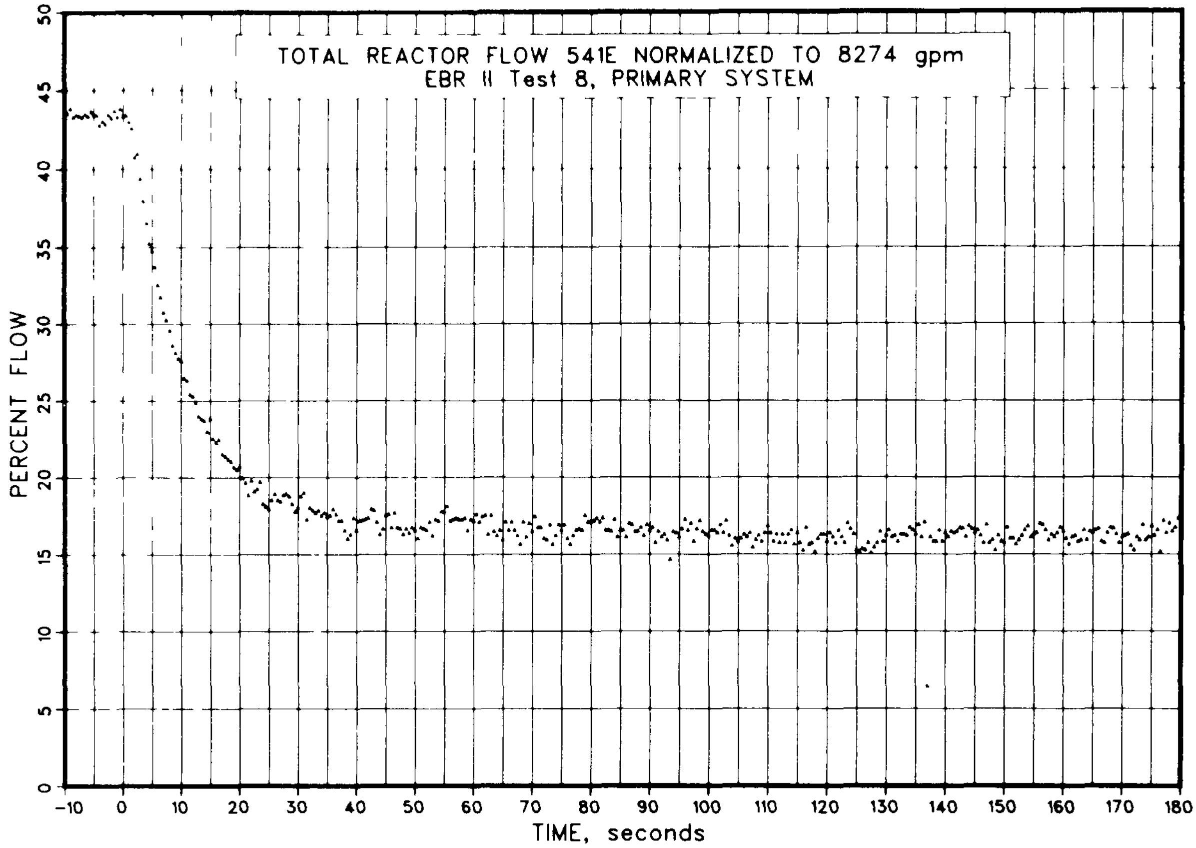

NEUTRON POWER (LOG RANGE B)
EBR II Test 8, PRIMARY SYSTEM
PERCENT
0.01
0.1
1
10
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds

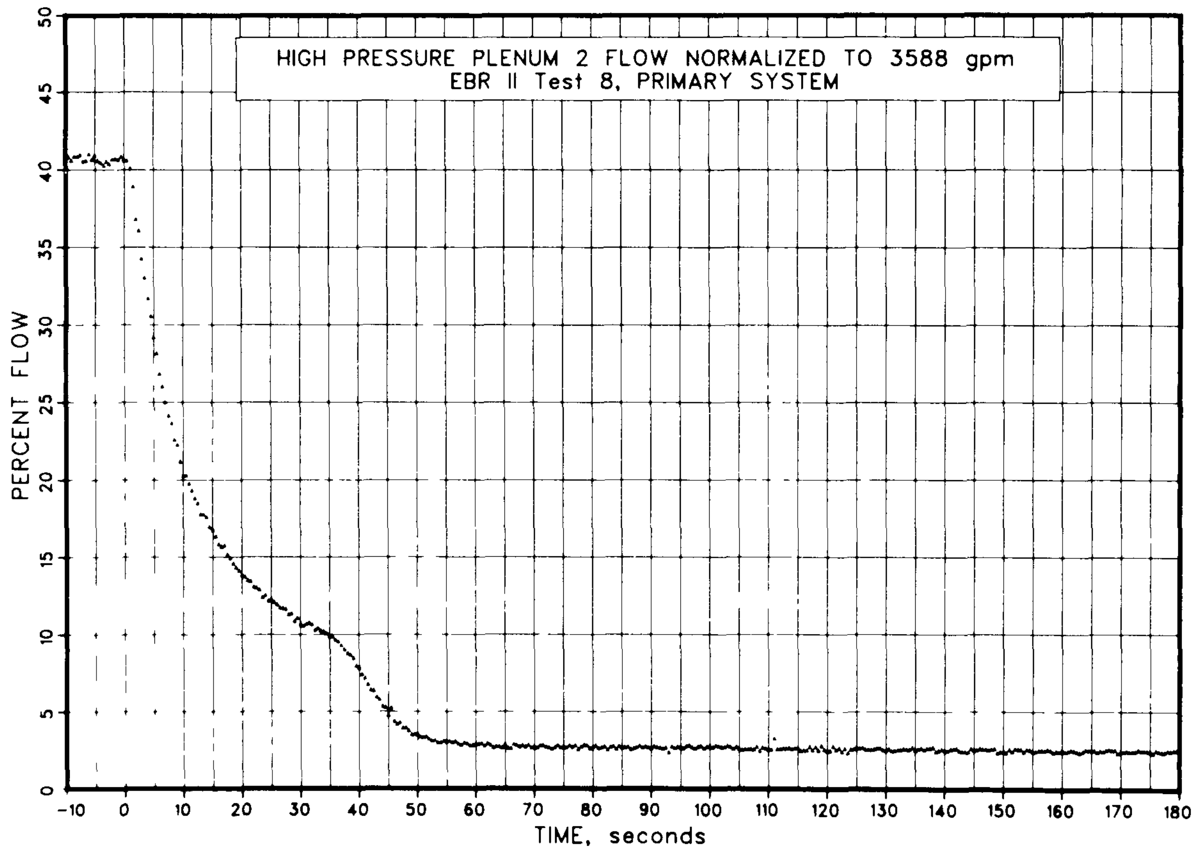

EXCESS REACTIVITY
EBR II Test 8, PRIMARY SYSTEM
dollars
1
0
-1
-2
-3
-4
-5
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

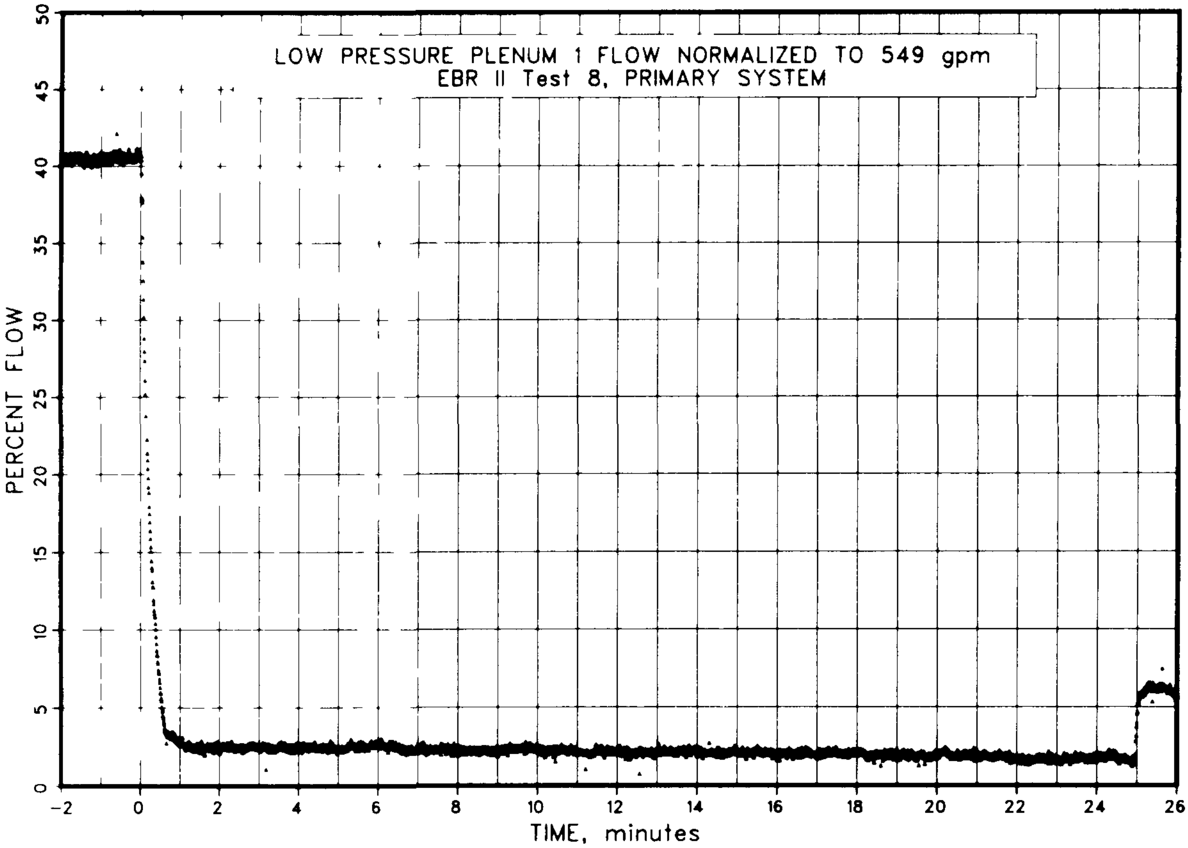

EXCESS REACTIVITY
EBR II Test 8, PRIMARY SYSTEM
dollars
0
-1
-2
-3
-4
-5
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds

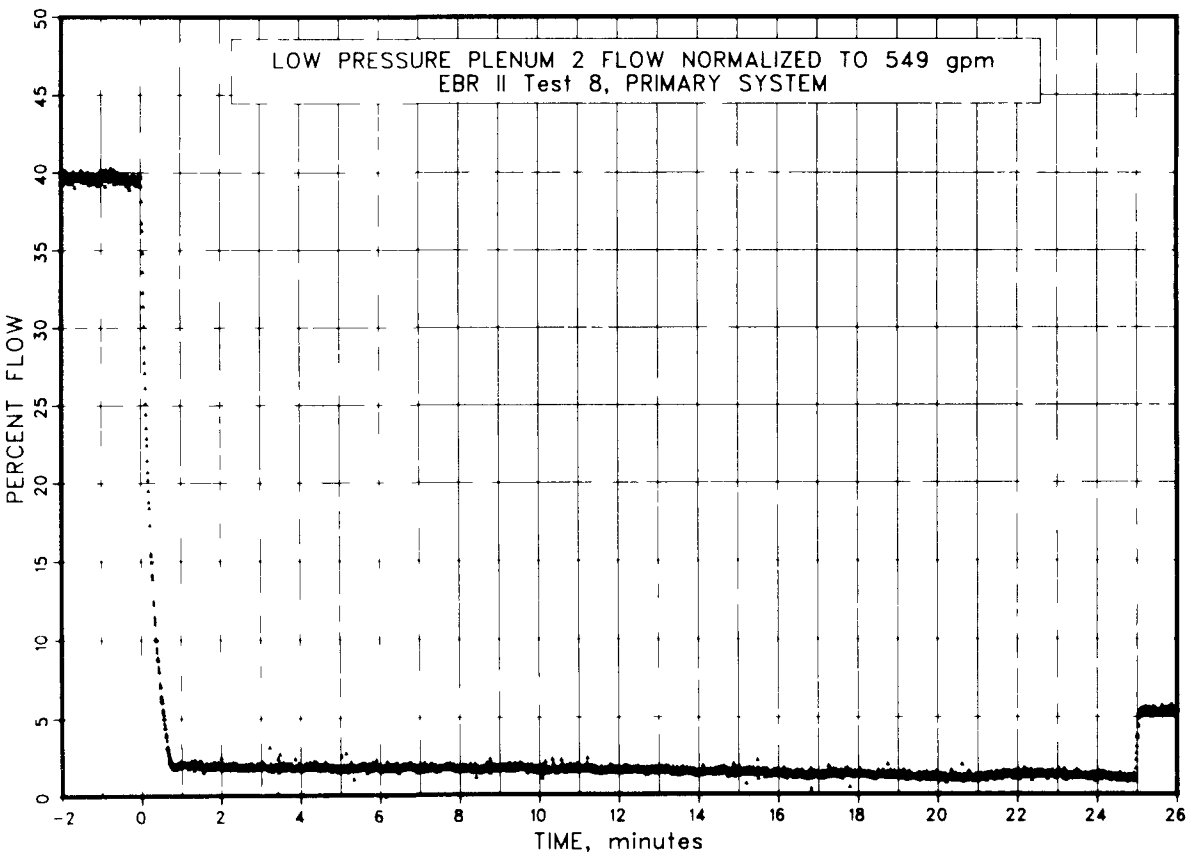

TOTAL REACTOR FLOW 541E NORMALIZED TO 8274 gpm
EBR II Test 8, PRIMARY SYSTEM
PERCENT FLOW
TIME, minutes
0
5
10
15
20
25
30
35
40
45
50
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26

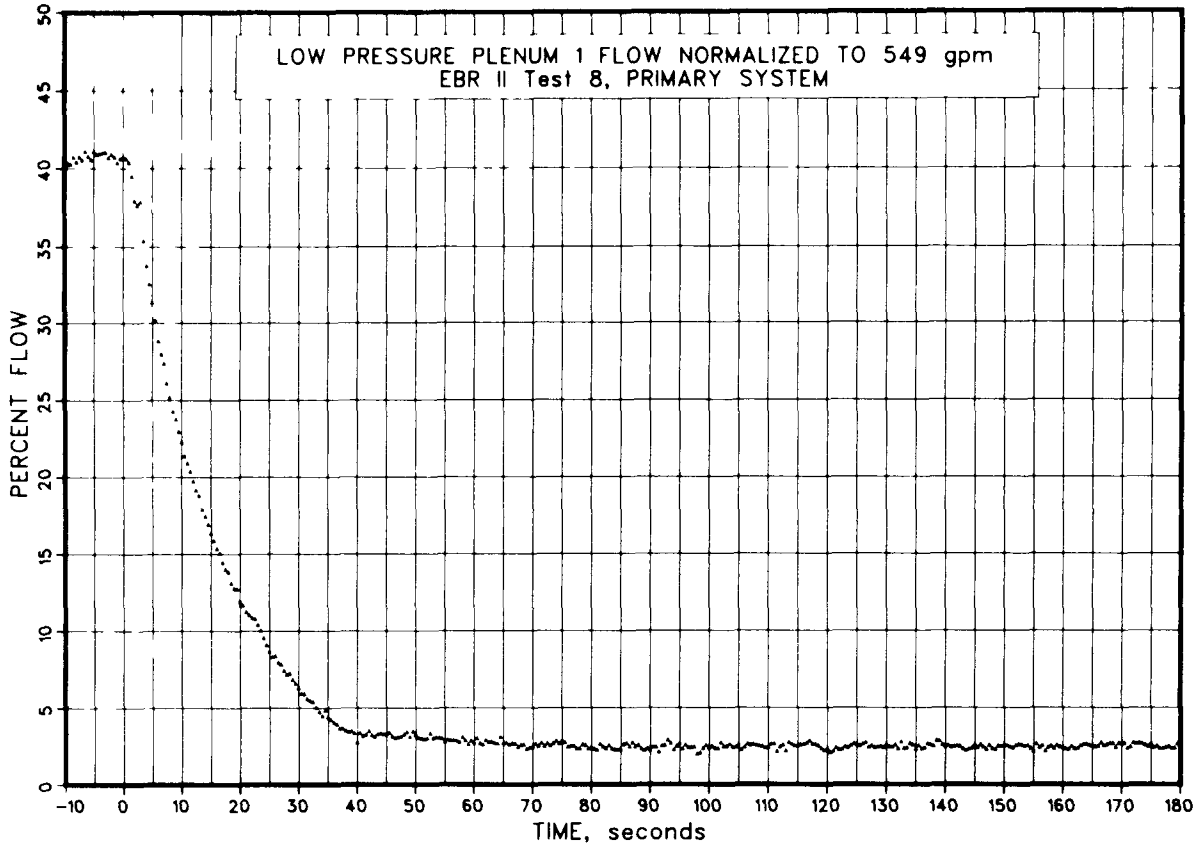

HIGH PRESSURE PLENUM 2 FLOW NORMALIZED TO 3588 gpm
EBR II Test 8, PRIMARY SYSTEM
PERCENT FLOW
TIME, minutes
0
5
10
15
20
25
30
35
40
45
50
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26


TOTAL REACTOR FLOW 541E NORMALIZED TO 8274 gpm
EBR II Test 8, PRIMARY SYSTEM
PERCENT FLOW
0
5
10
15
20
25
30
35
40
45
50
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds

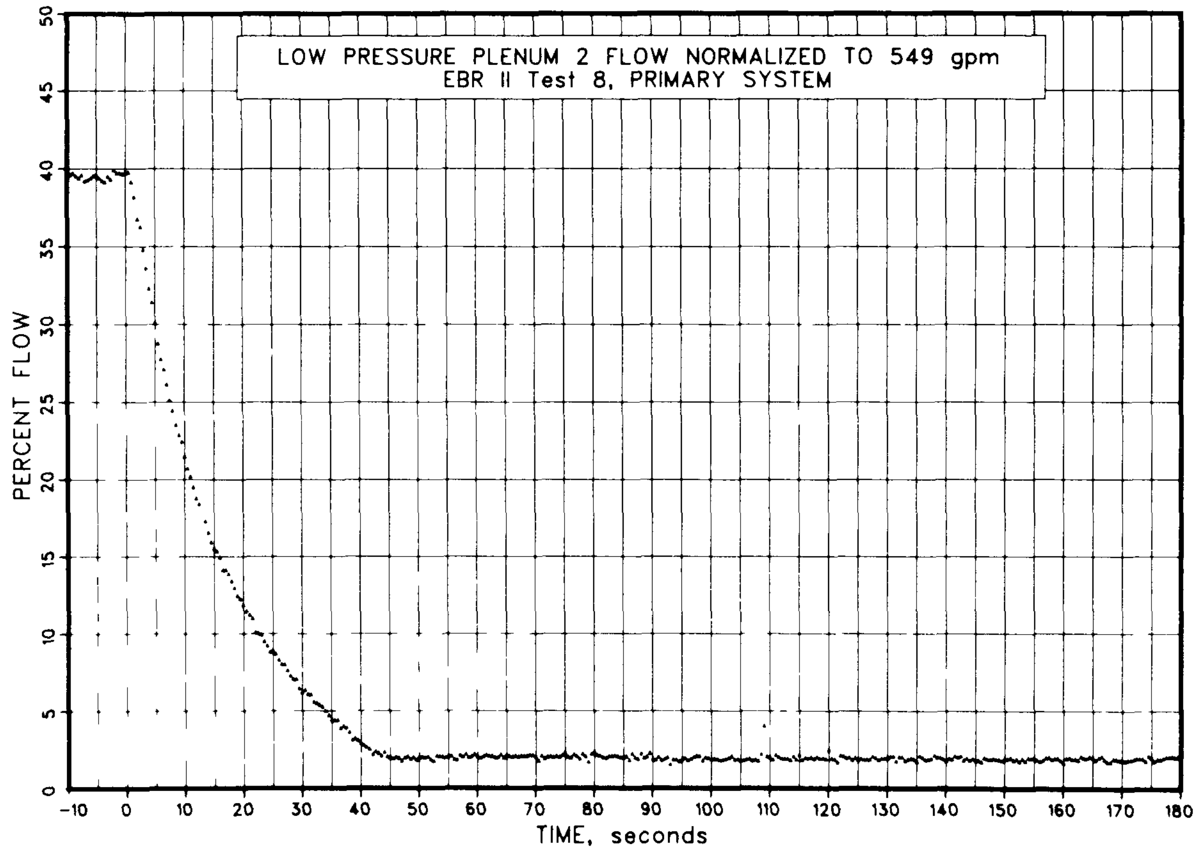

HIGH PRESSURE PLENUM 2 FLOW NORMALIZED TO 3588 gpm
EBR II Test 8, PRIMARY SYSTEM
PERCENT FLOW
0
5
10
15
20
25
30
35
40
45
50
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds


LOW PRESSURE PLENUM 1 FLOW NORMALIZED TO 549 gpm
EBR II Test 8, PRIMARY SYSTEM
PERCENT FLOW
TIME, minutes
0
5
10
15
20
25
30
35
40
45
50
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26

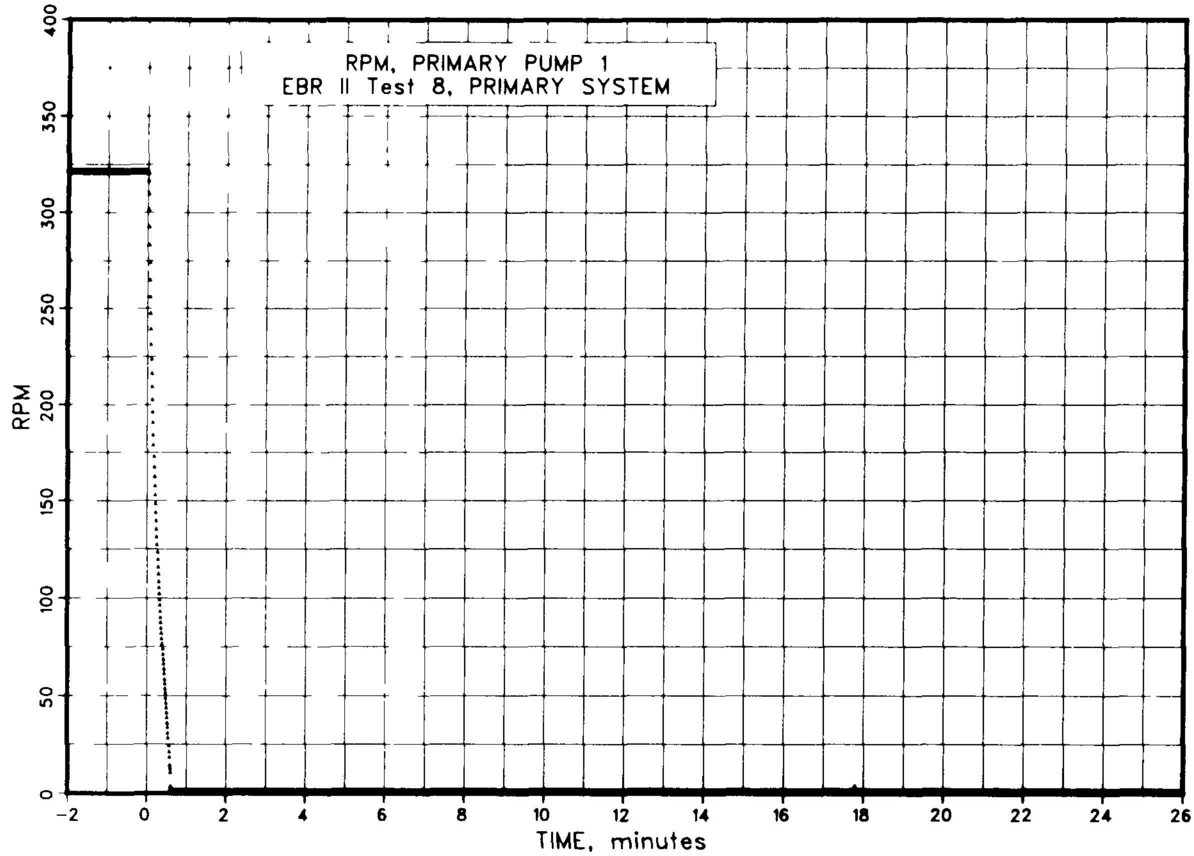

LOW PRESSURE PLENUM 2 FLOW NORMALIZED TO 549 gpm
EBR II Test 8, PRIMARY SYSTEM
PERCENT FLOW
TIME, minutes
0
5
10
15
20
25
30
35
40
45
50
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26

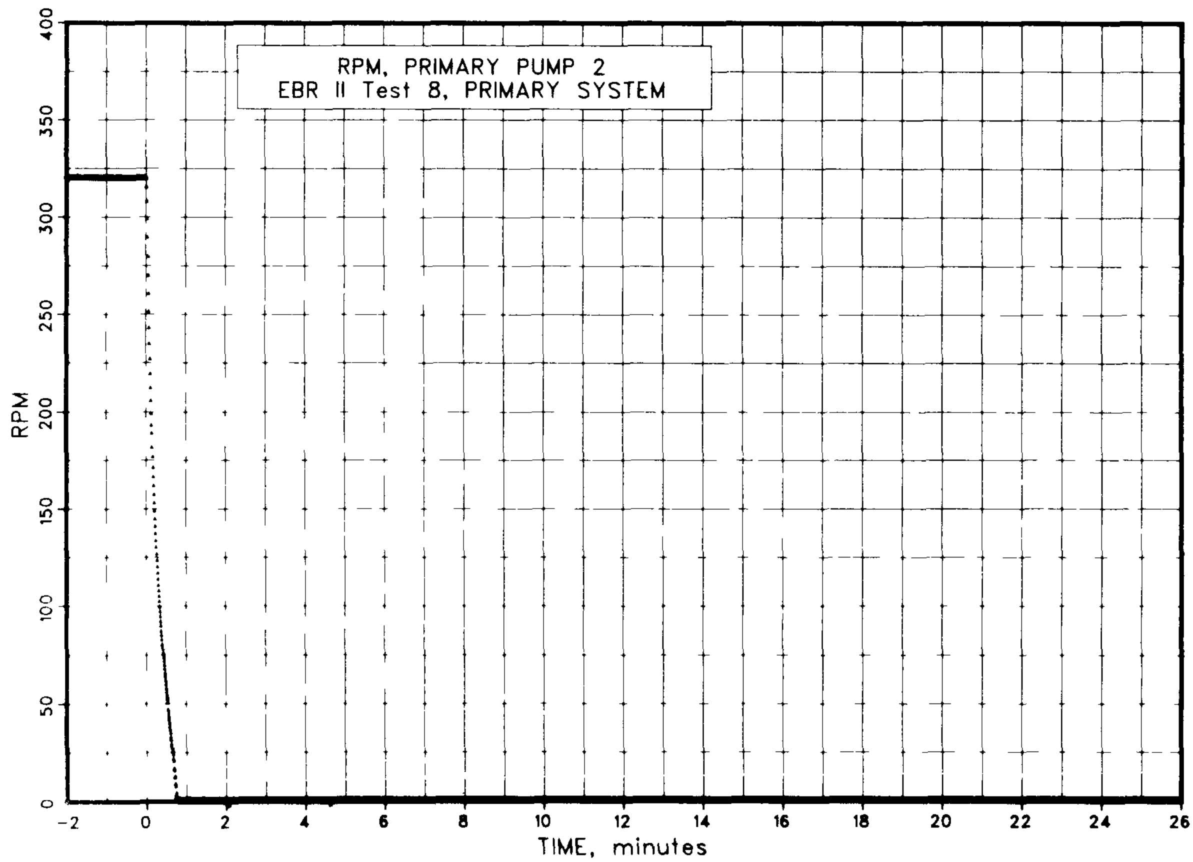


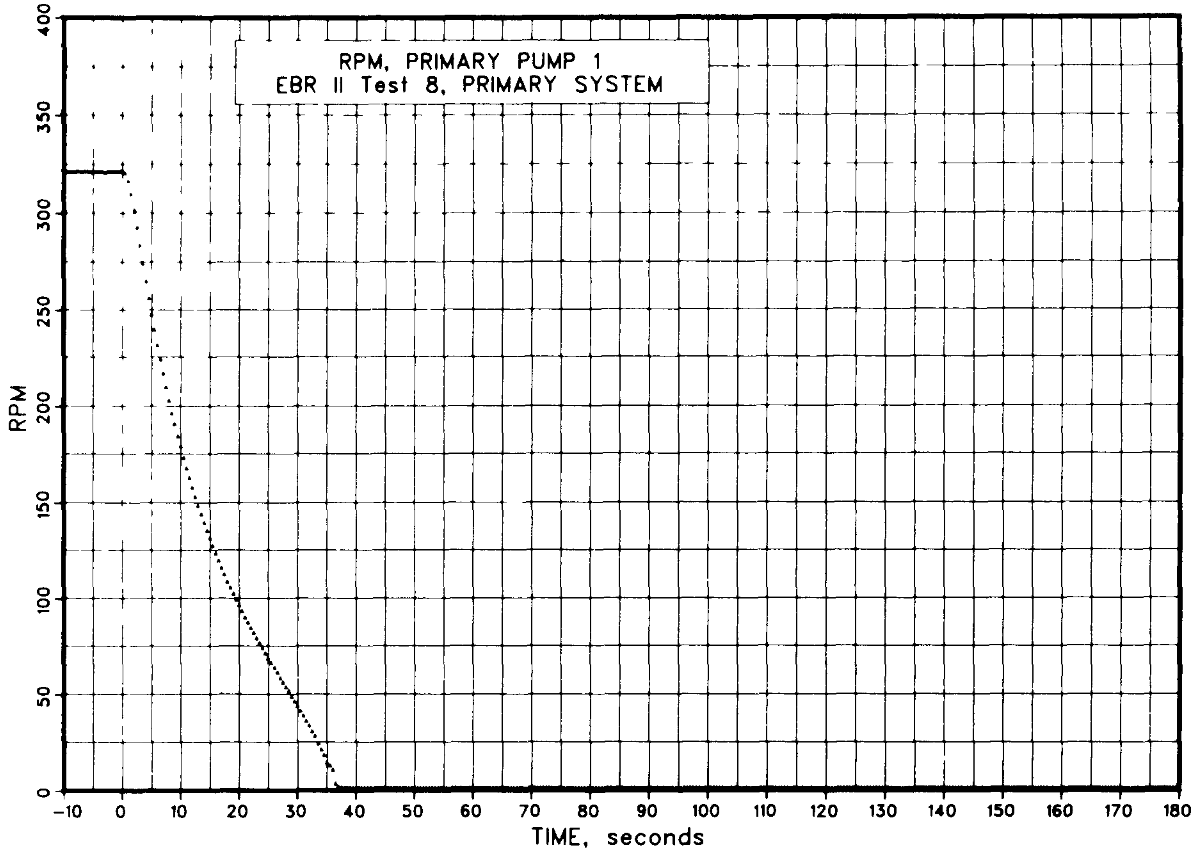
LOW PRESSURE PLENUM 1 FLOW NORMALIZED TO 549 gpm
EBR II Test 8, PRIMARY SYSTEM
PERCENT FLOW
TIME, seconds

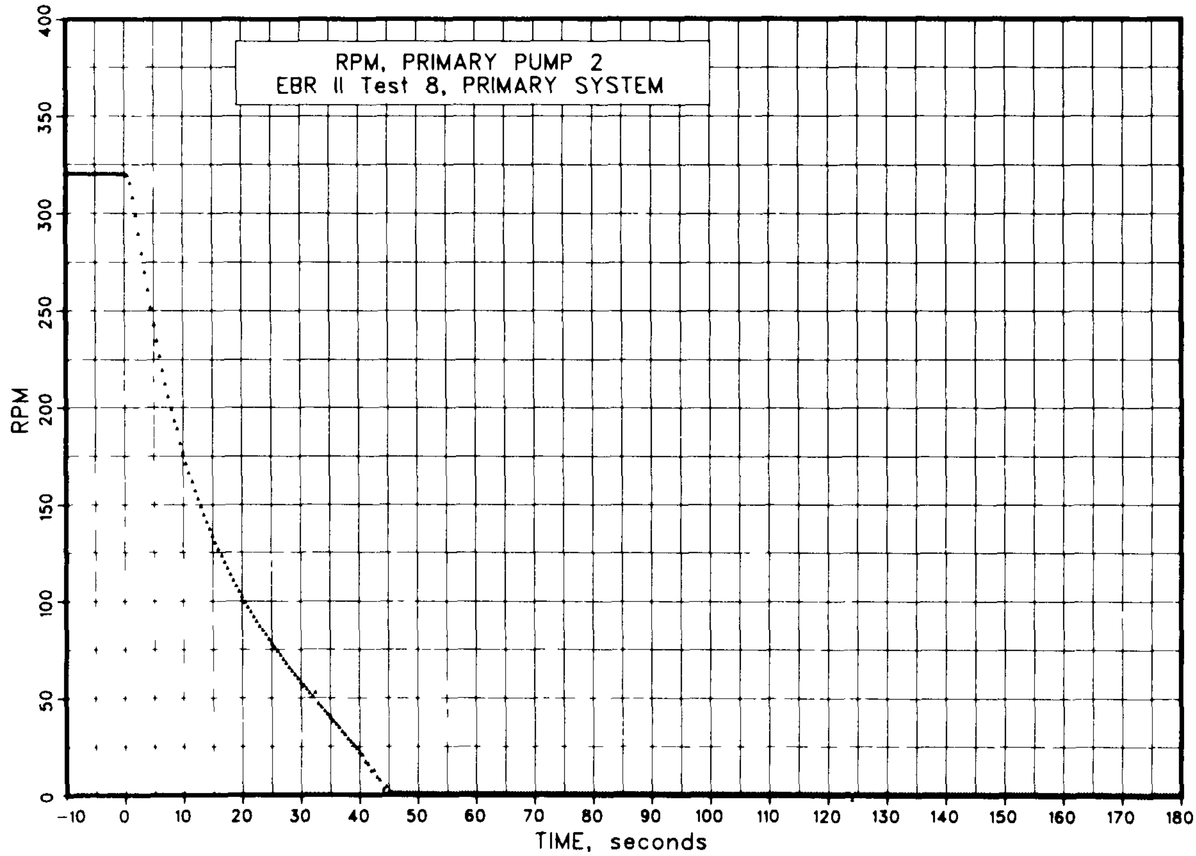


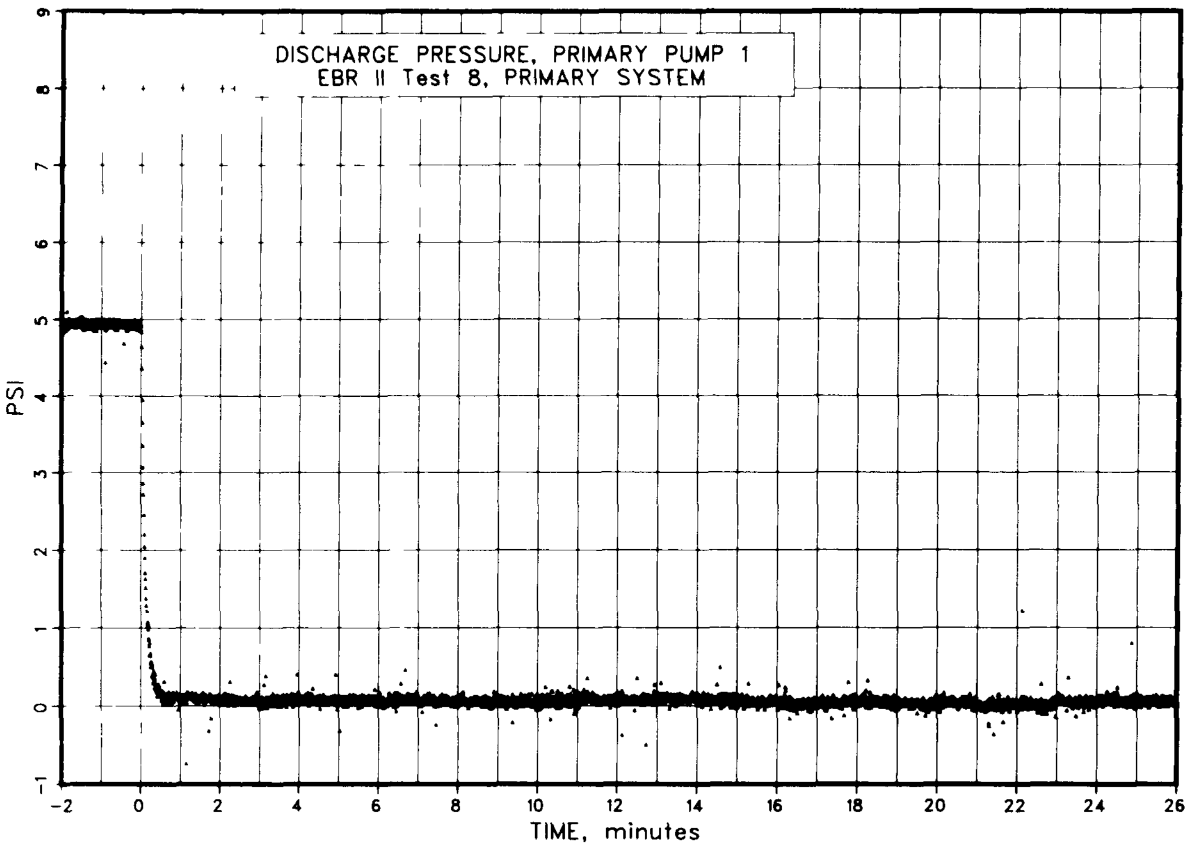
LOW PRESSURE PLENUM 2 FLOW NORMALIZED TO 549 gpm
EBR II Test 8, PRIMARY SYSTEM
PERCENT FLOW
TIME, seconds

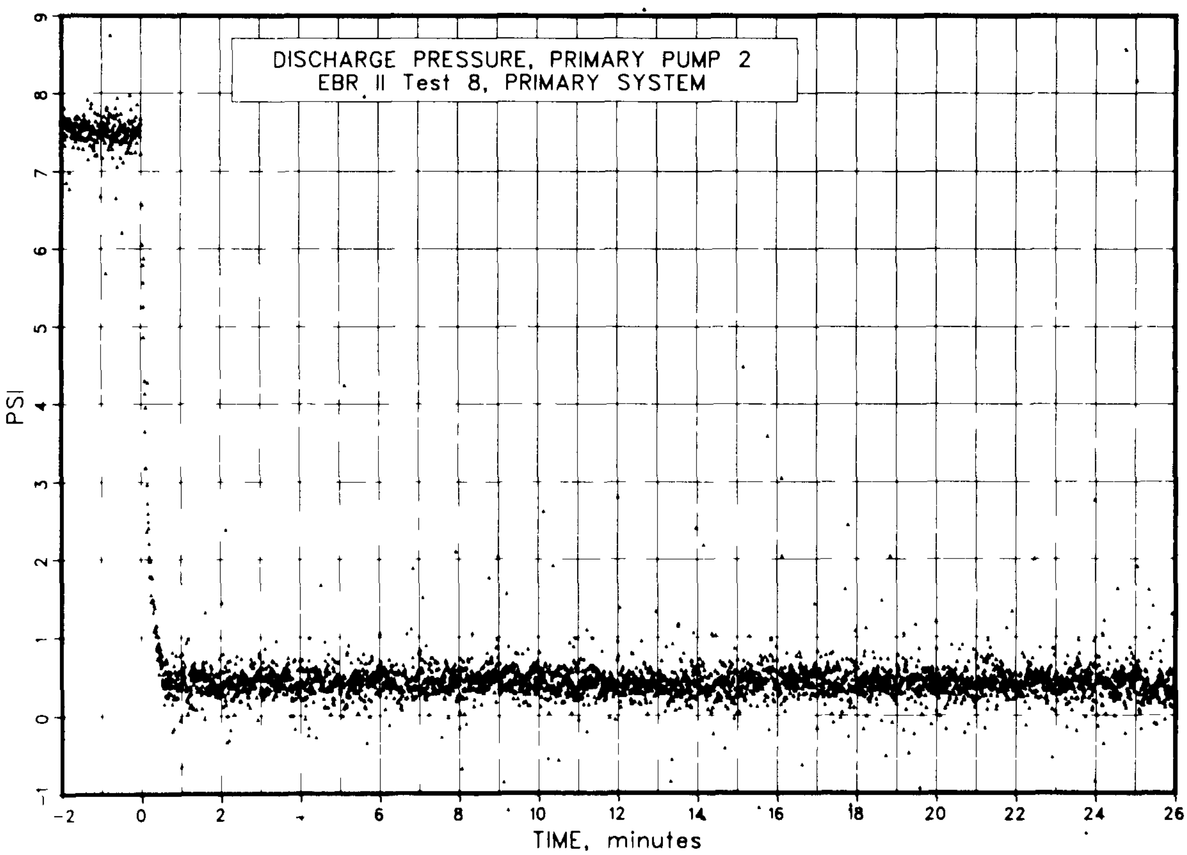

RPM, PRIMARY PUMP 1
EBR II Test 8, PRIMARY SYSTEM
RPM
0
50
100
150
200
250
300
350
400
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

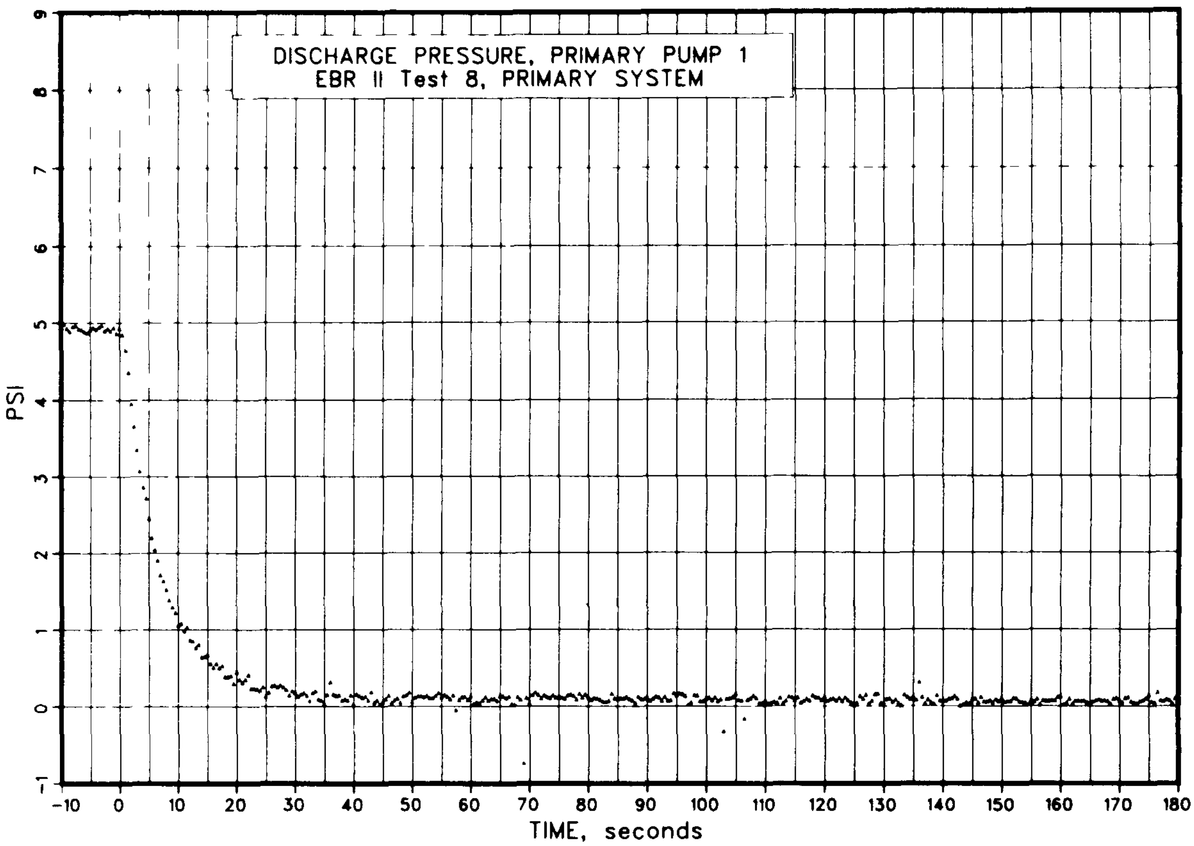

RPM, PRIMARY PUMP 2
EBR II Test 8, PRIMARY SYSTEM
RPM
0
50
100
150
200
250
300
350
400
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

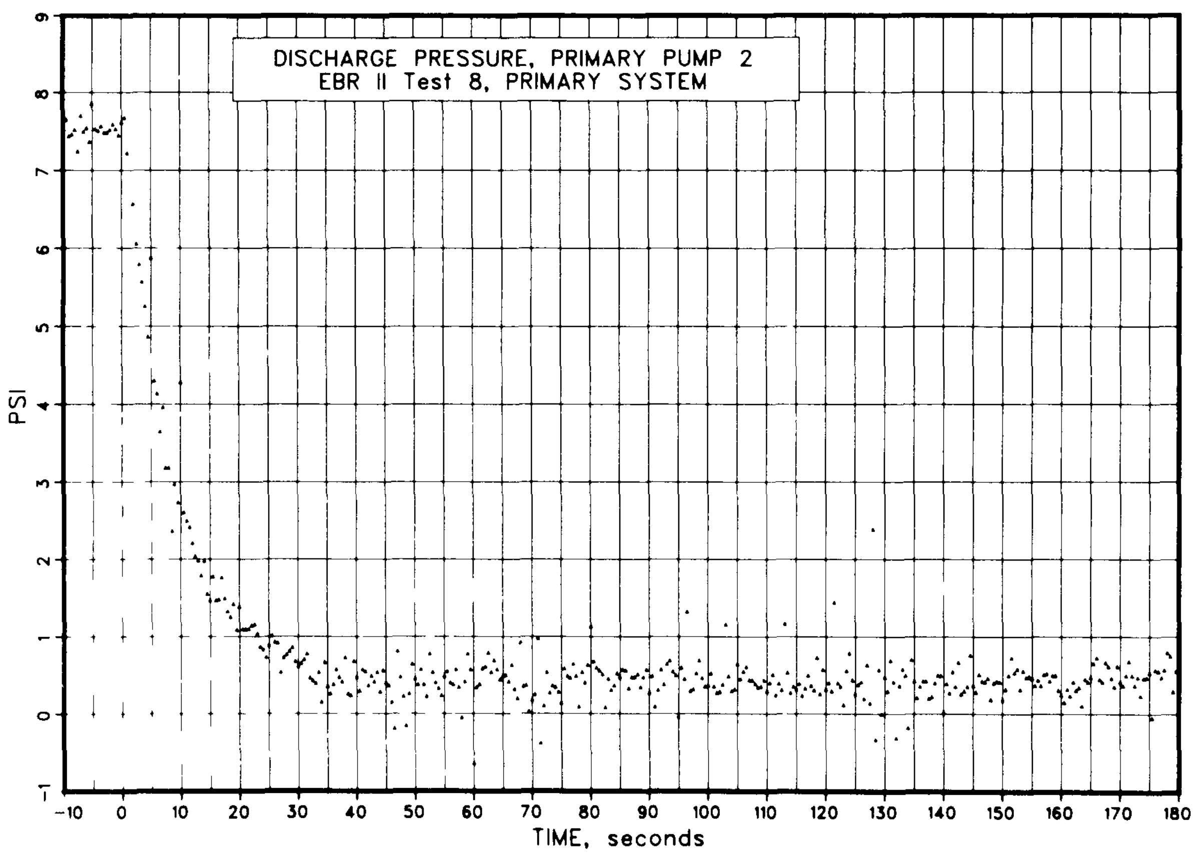

RPM, PRIMARY PUMP 1
EBR II Test 8, PRIMARY SYSTEM
RPM
0
50
100
150
200
250
300
350
400
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds

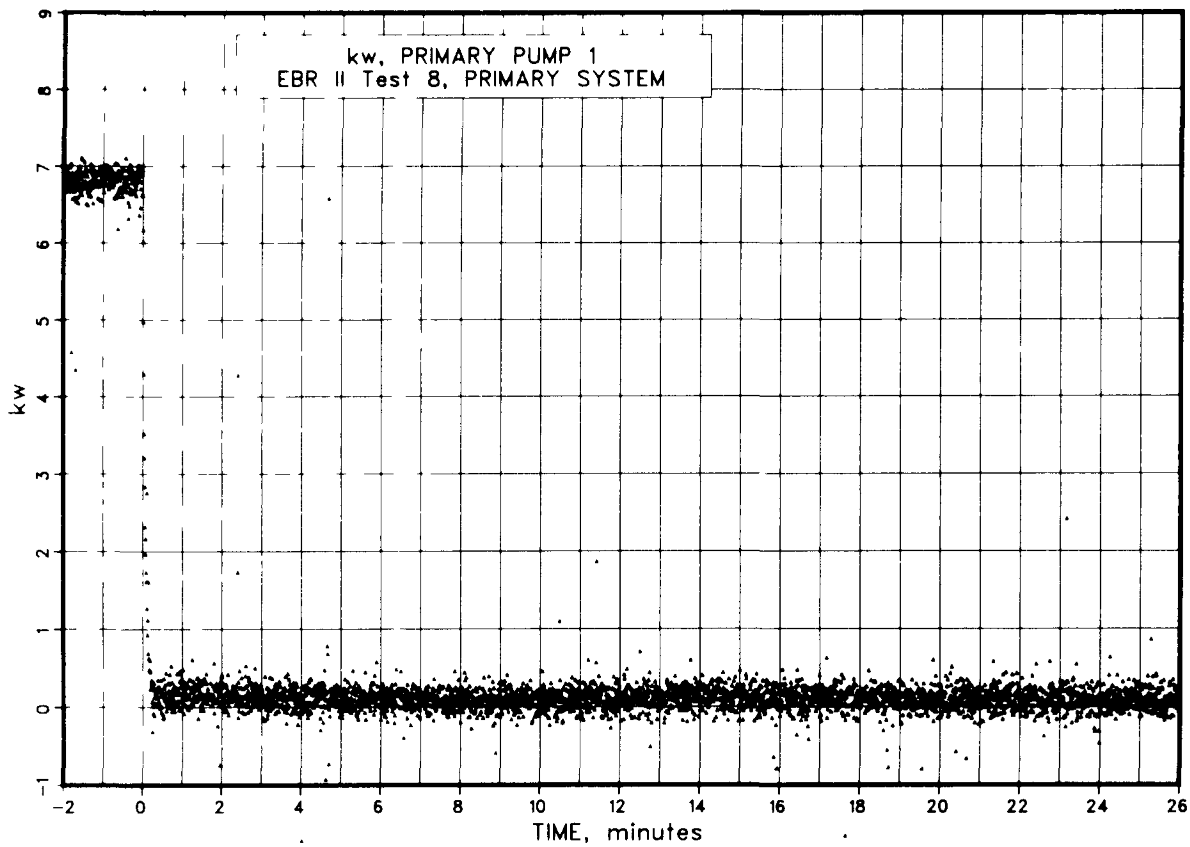

RPM, PRIMARY PUMP 2
EBR II Test 8, PRIMARY SYSTEM
RPM
0
50
100
150
200
250
300
350
400
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds

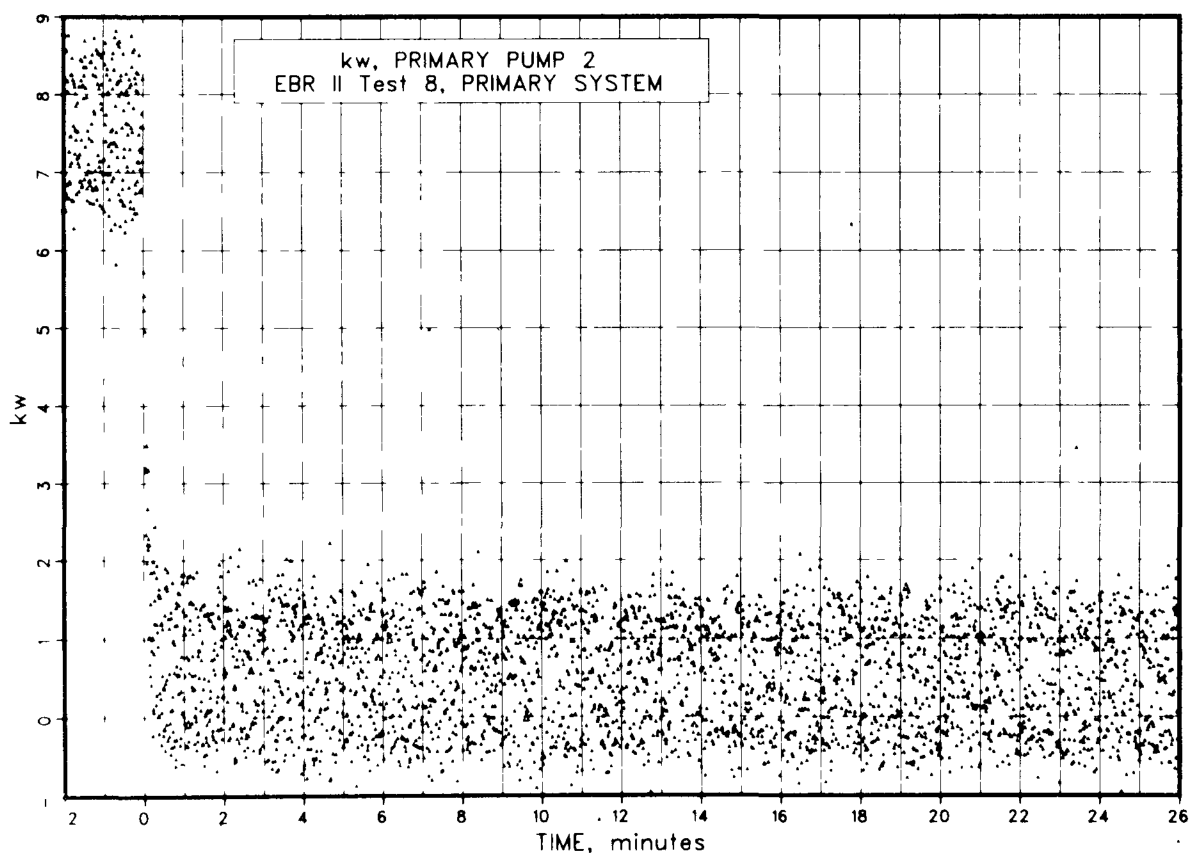

DISCHARGE PRESSURE, PRIMARY PUMP 1
EBR II Test 8, PRIMARY SYSTEM
PSI
TIME, minutes

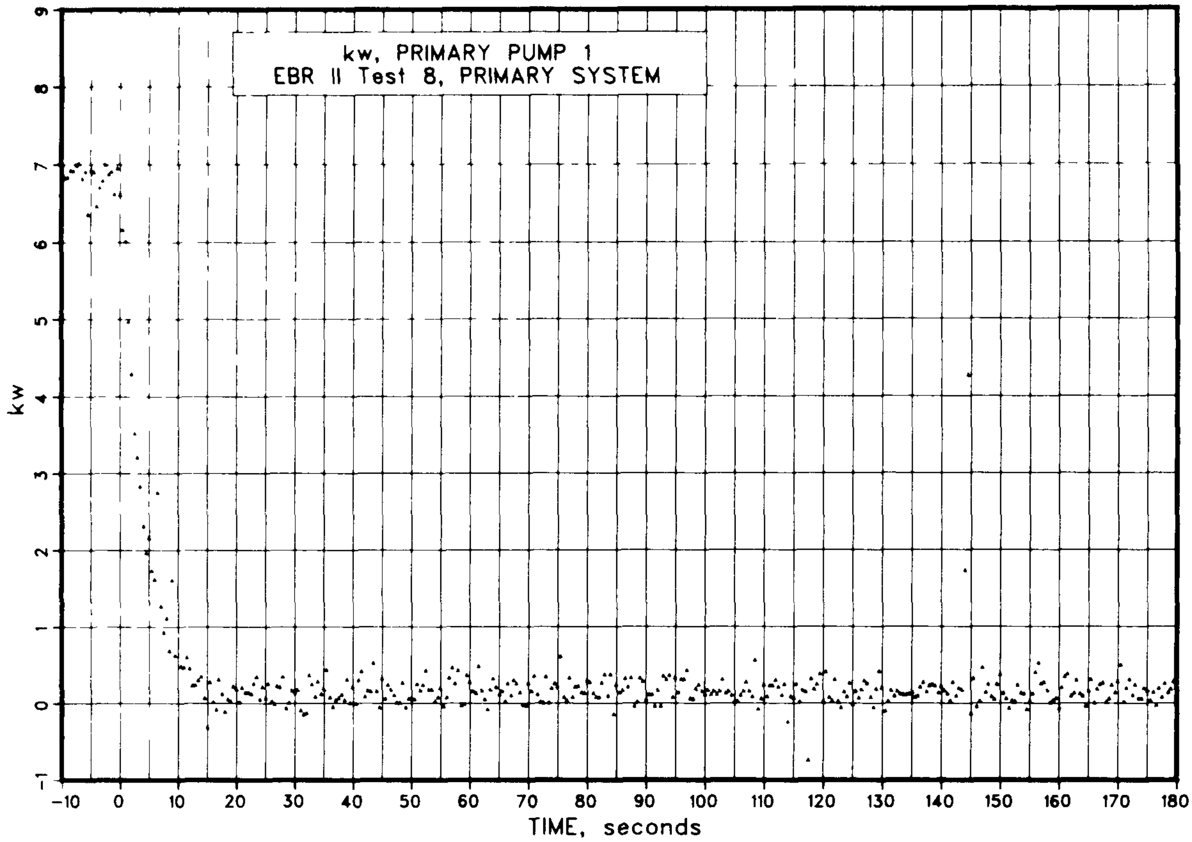

DISCHARGE PRESSURE, PRIMARY PUMP 2
EBR II Test 8, PRIMARY SYSTEM
PSI
TIME, minutes

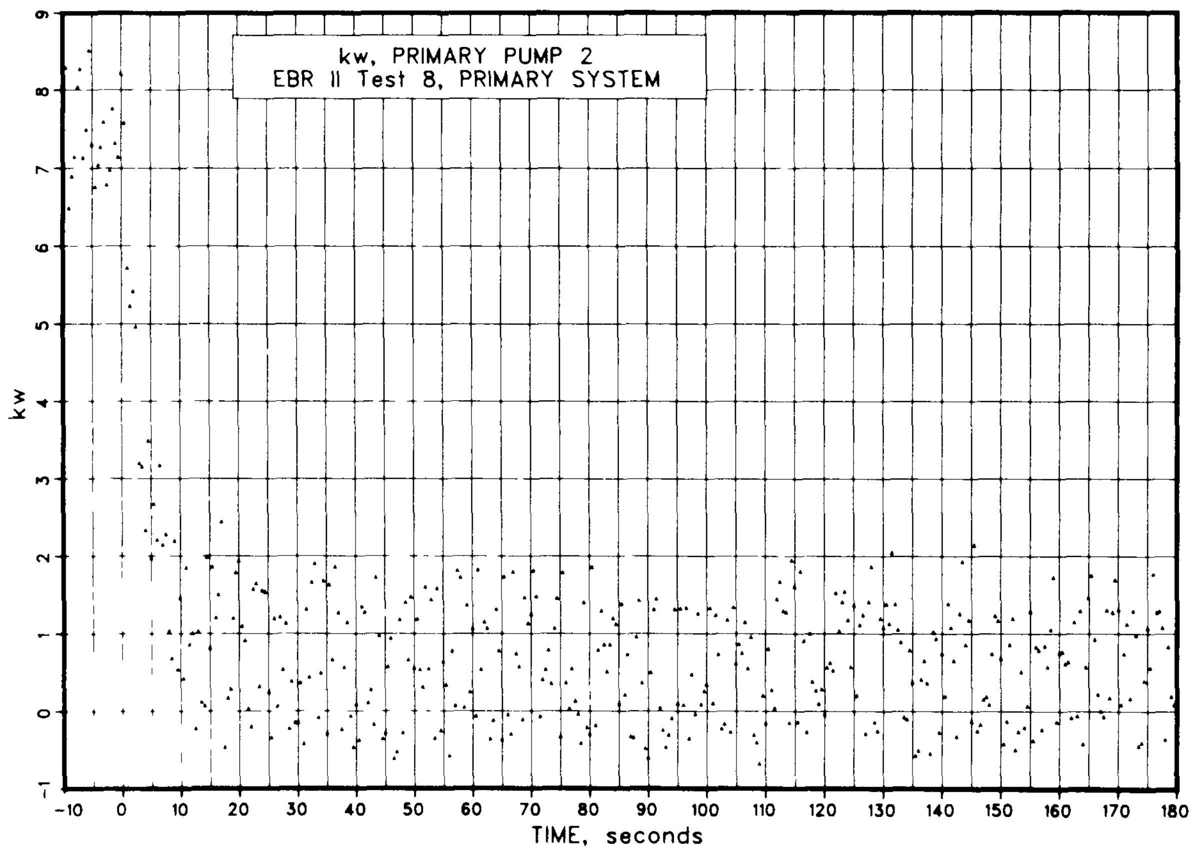

DISCHARGE PRESSURE, PRIMARY PUMP 1
EBR II Test 8, PRIMARY SYSTEM
PSI
TIME, seconds

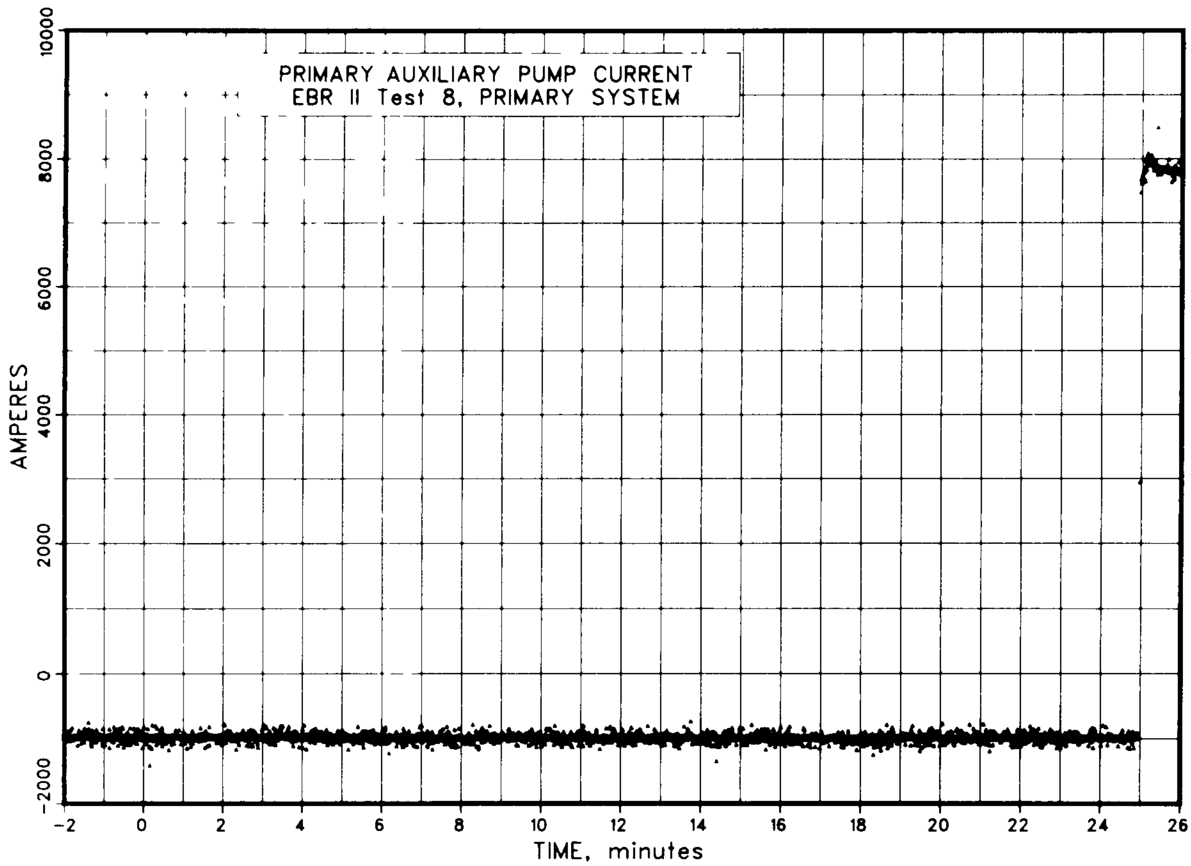

DISCHARGE PRESSURE, PRIMARY PUMP 2
EBR II Test 8, PRIMARY SYSTEM
PSI
TIME, seconds

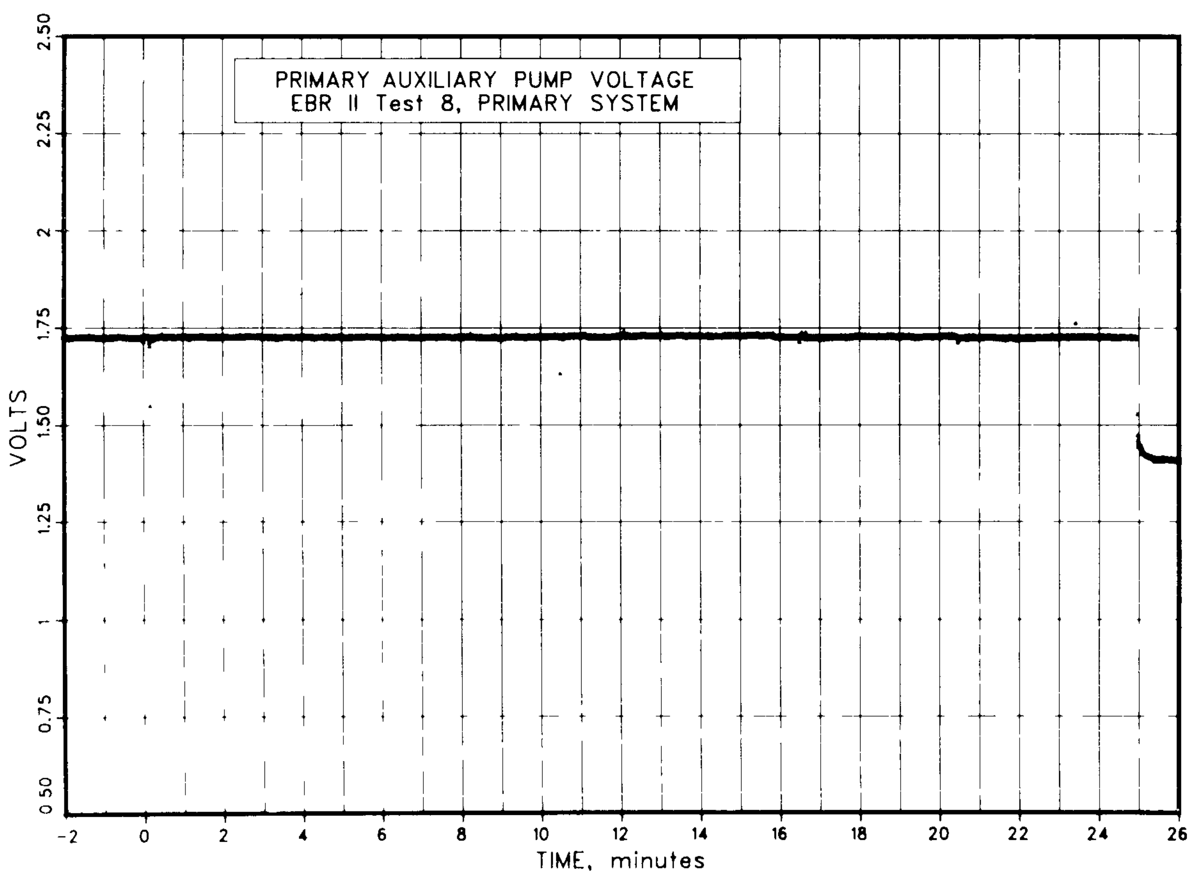

kw, PRIMARY PUMP 1
EBR II Test 8, PRIMARY SYSTEM
kw
TIME, minutes

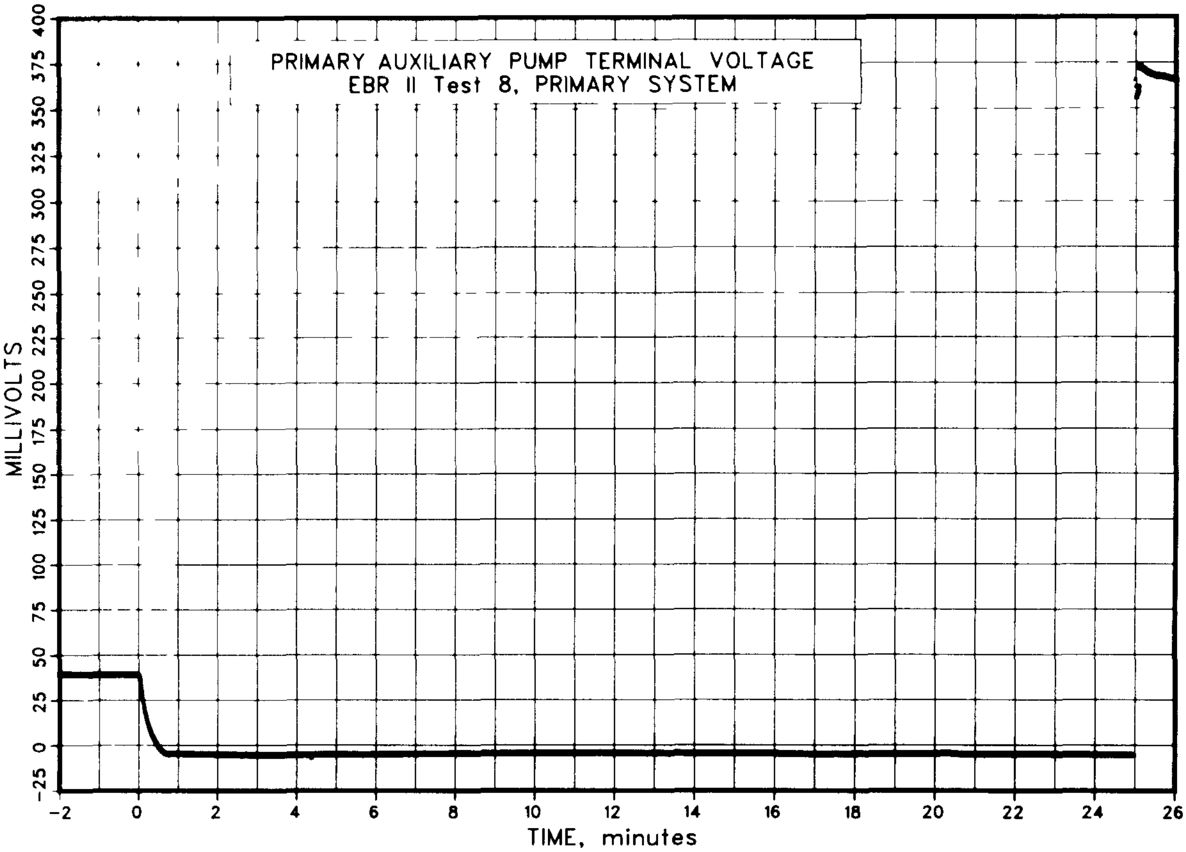

kw, PRIMARY PUMP 2
EBR II Test 8, PRIMARY SYSTEM
kw
TIME, minutes

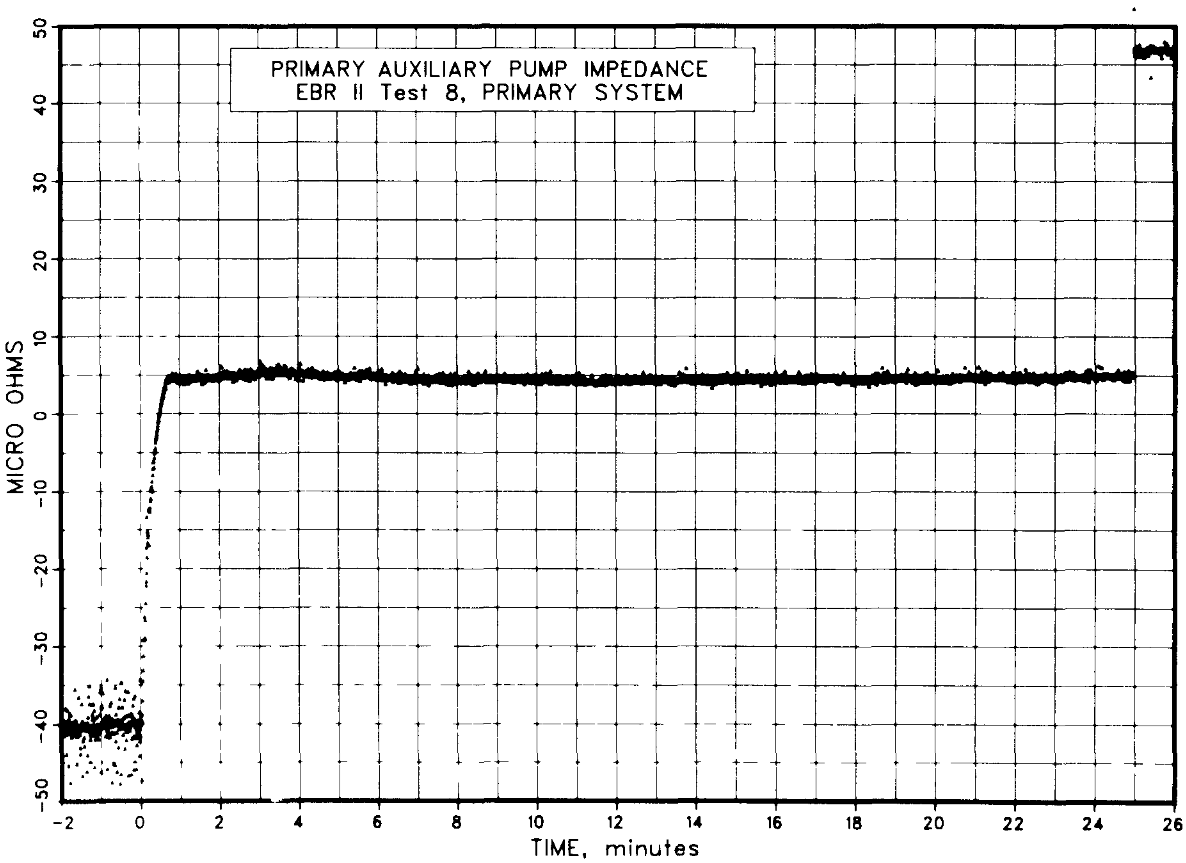

kw, PRIMARY PUMP 1
EBR II Test 8, PRIMARY SYSTEM
kw
-1
0
1
2
3
4
5
6
7
8
9
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds

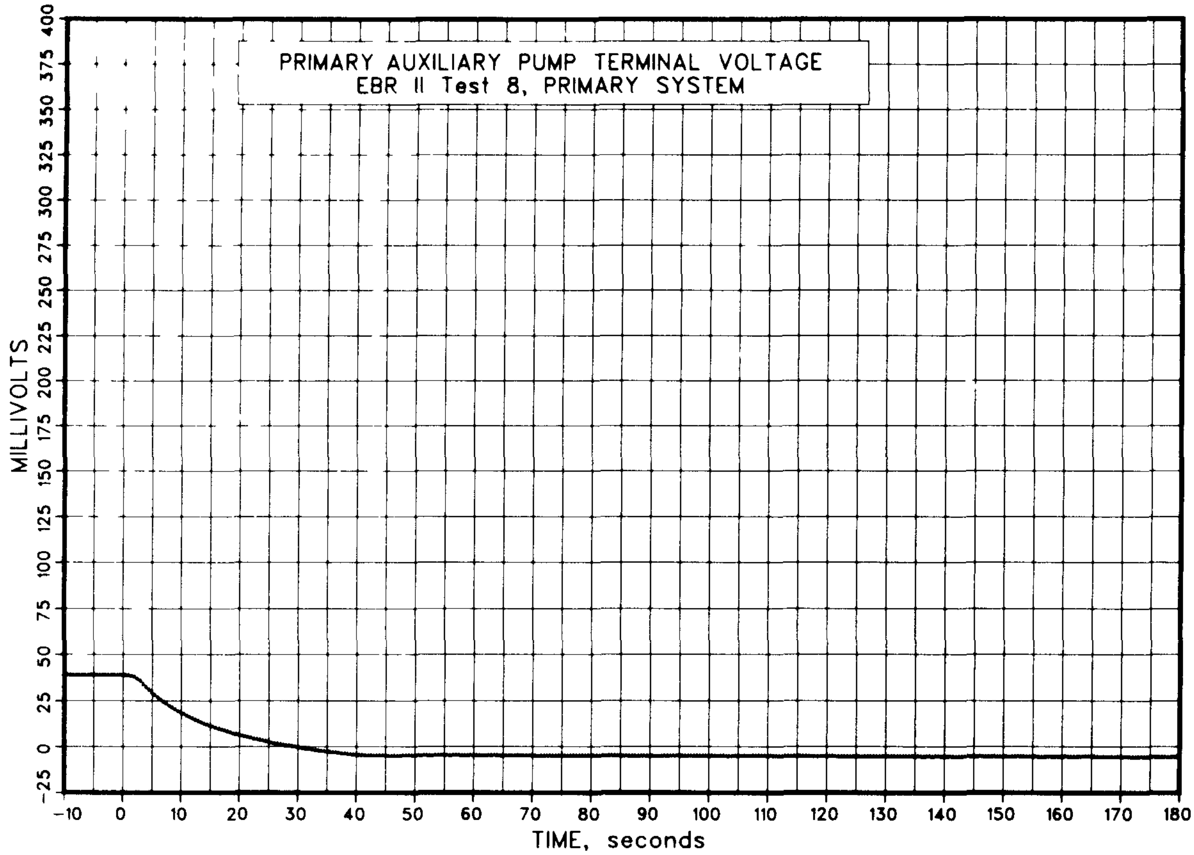

kw, PRIMARY PUMP 2
EBR II Test 8, PRIMARY SYSTEM
kw
-1
0
1
2
3
4
5
6
7
8
9
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds

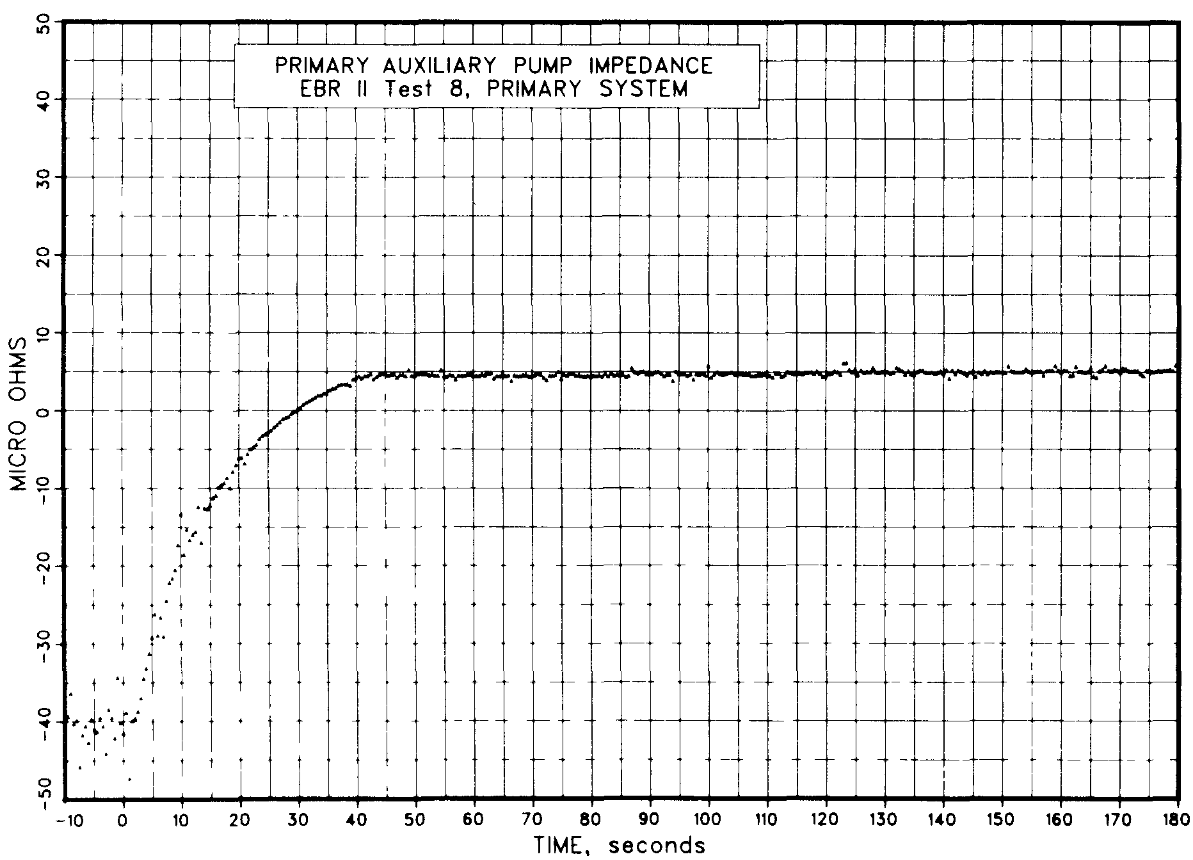

PRIMARY AUXILIARY PUMP CURRENT
EBR II Test 8, PRIMARY SYSTEM
AMPERES
10000
8000
6000
4000
2000
0
-2000
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

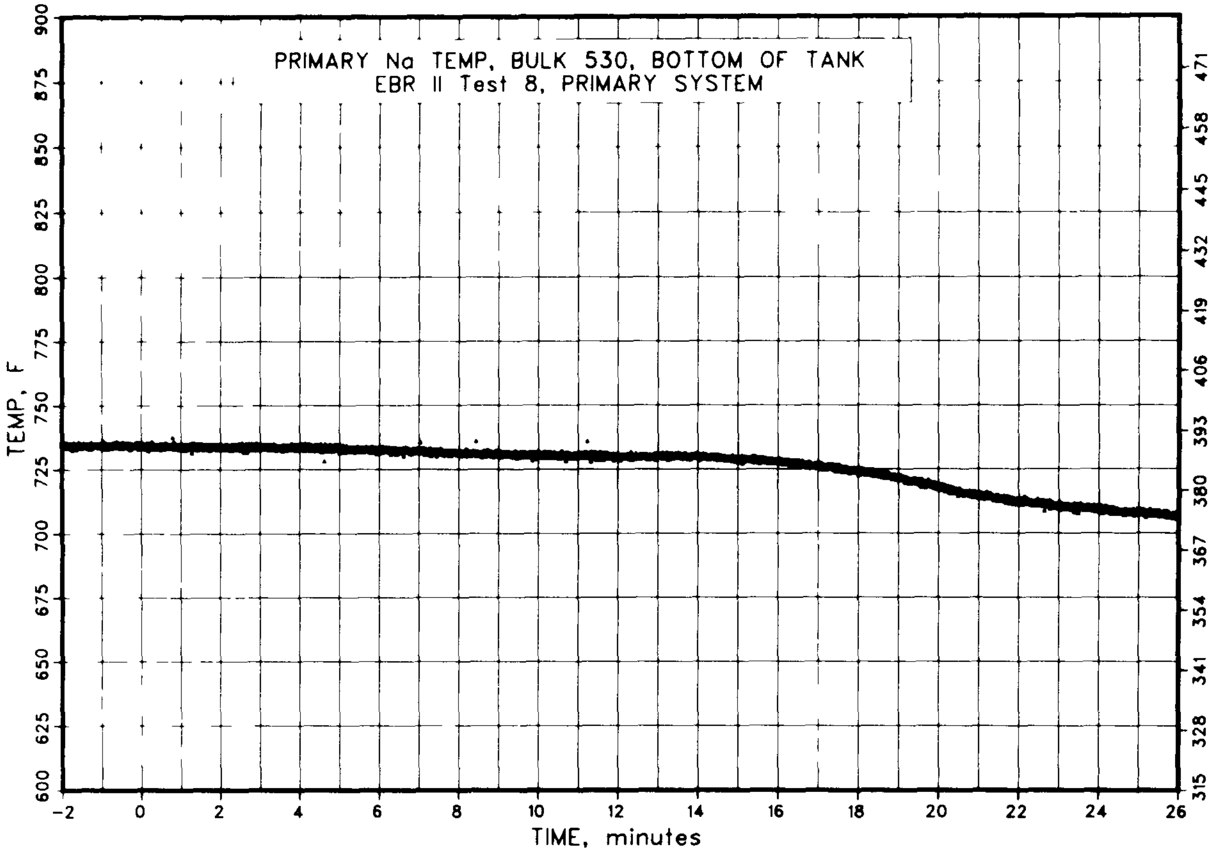

PRIMARY AUXILIARY PUMP VOLTAGE
EBR II Test 8, PRIMARY SYSTEM
VOLTS
2.50
2.25
2
1.75
1.50
1.25
1
0.75
0.50
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

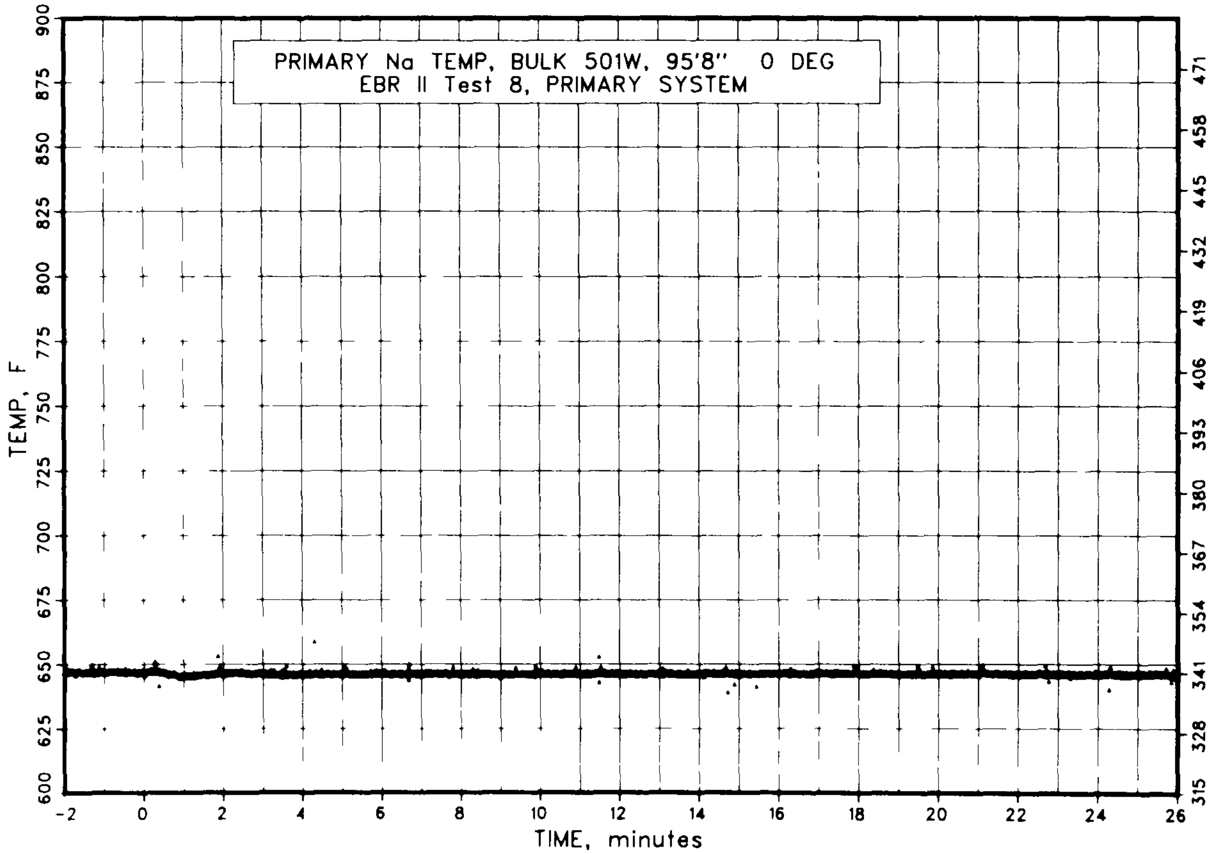

PRIMARY AUXILIARY PUMP TERMINAL VOLTAGE
EBR II Test 8, PRIMARY SYSTEM
MILLIVOLTS
TIME, minutes

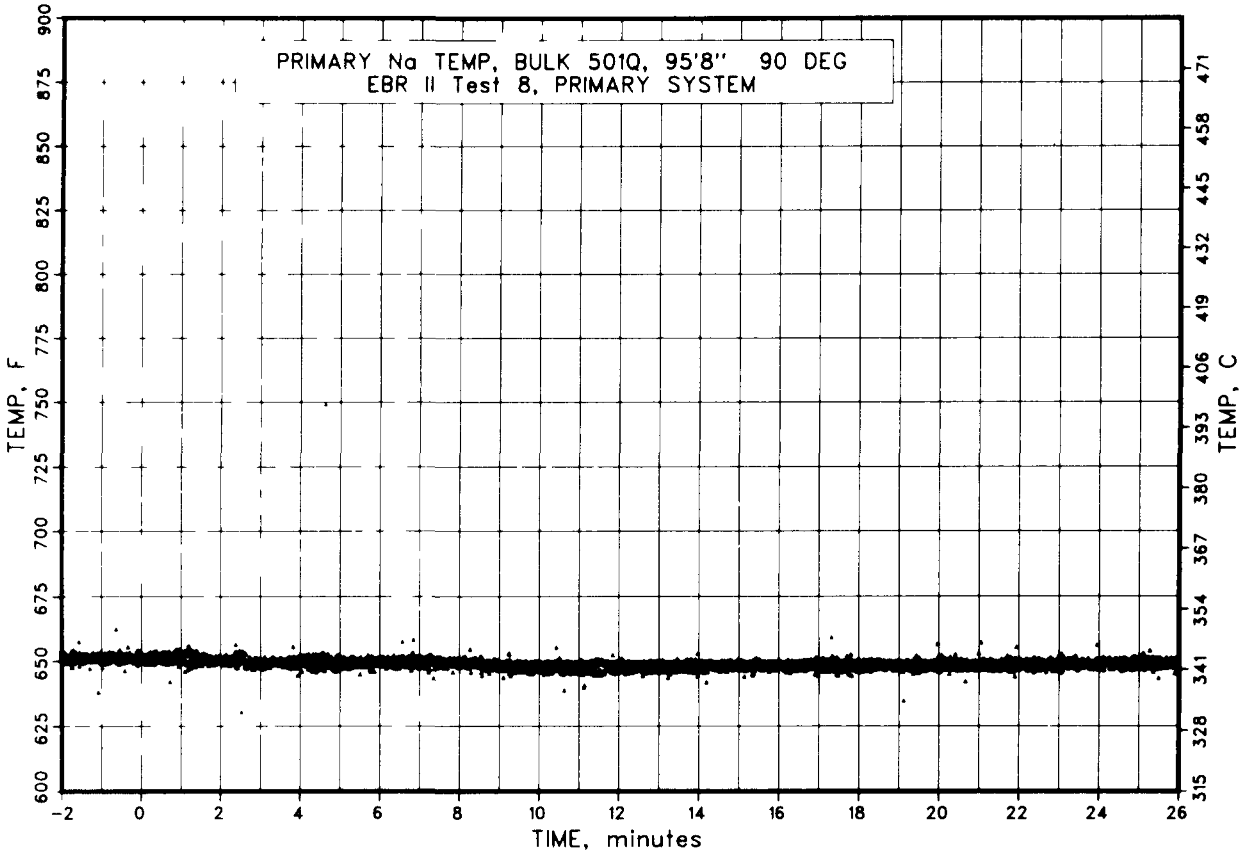

PRIMARY AUXILIARY PUMP IMPEDANCE
EBR II Test 8, PRIMARY SYSTEM
MICRO OHMS
TIME, minutes

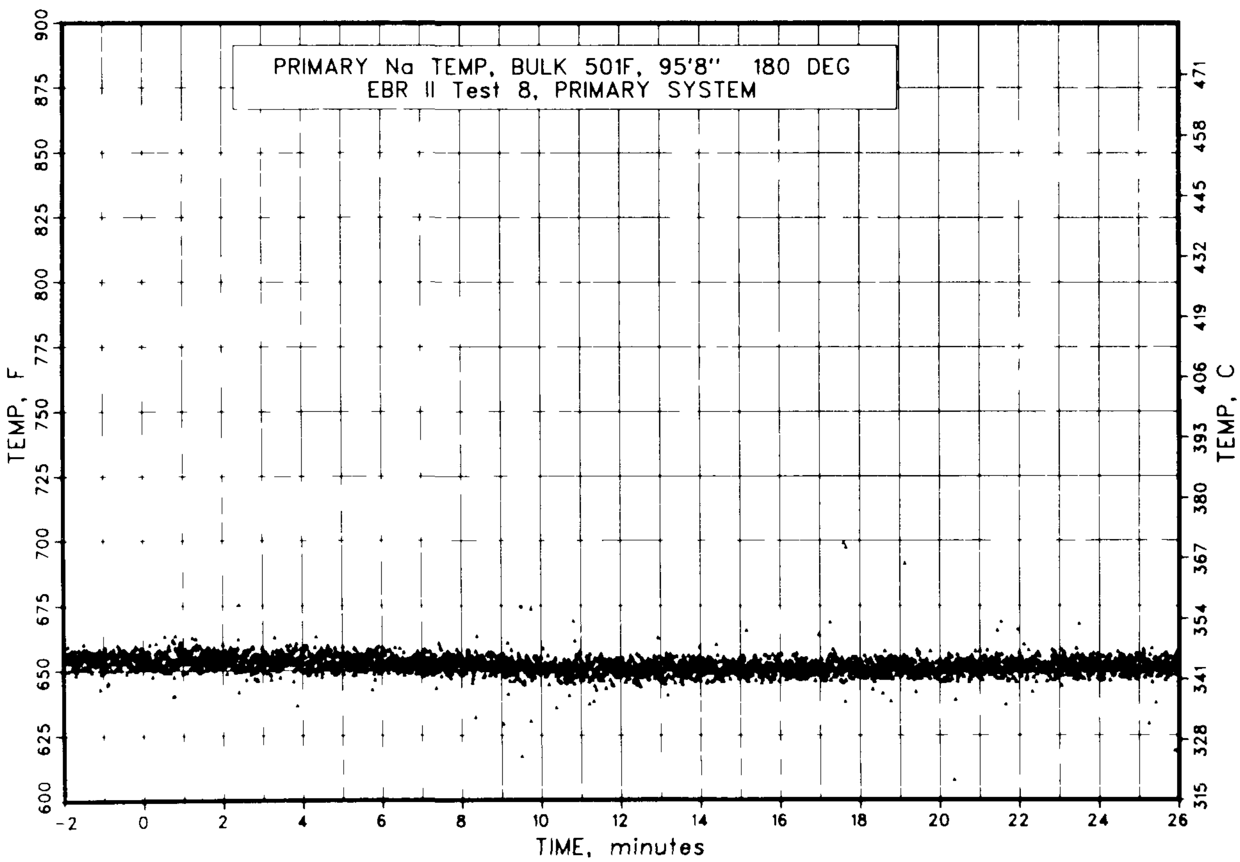

PRIMARY AUXILIARY PUMP TERMINAL VOLTAGE
EBR II Test 8, PRIMARY SYSTEM
MILLIVOLTS
-25
0
25
50
75
100
125
150
175
200
225
250
275
300
325
350
375
400
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds

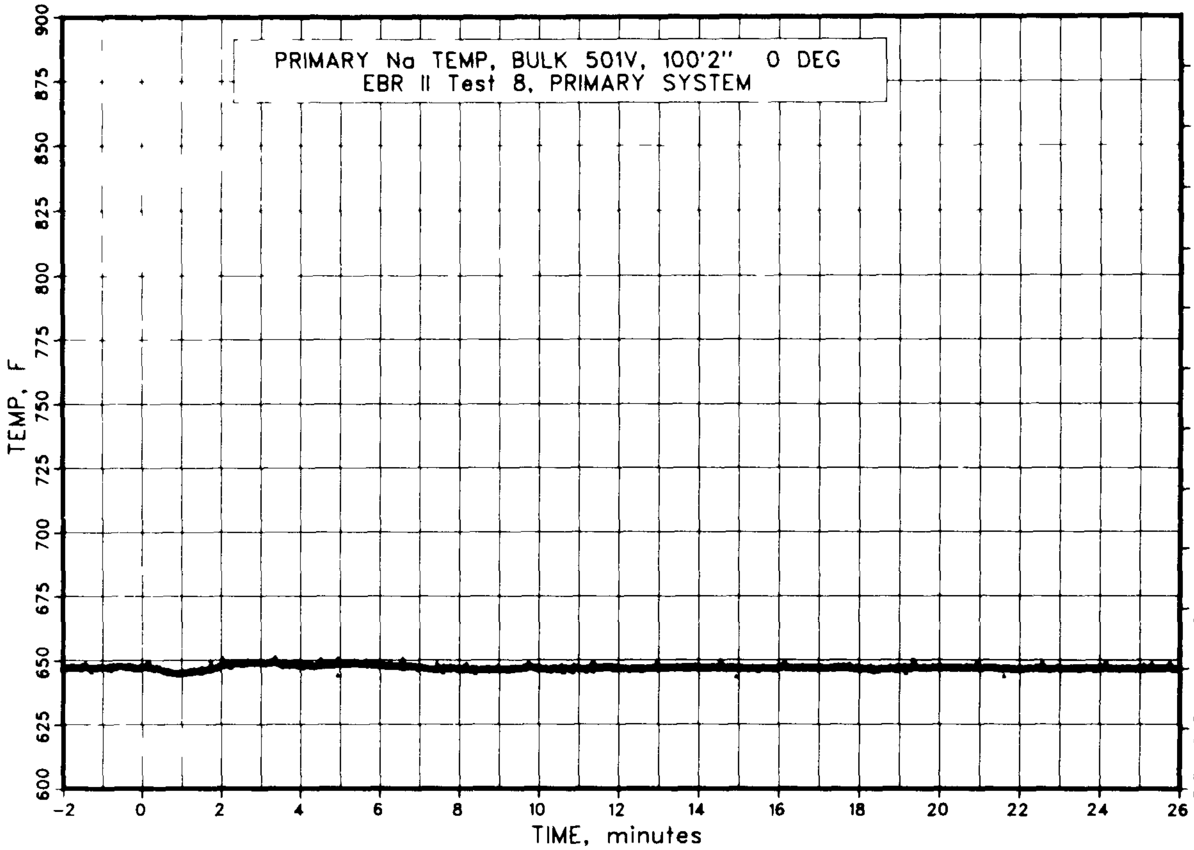

PRIMARY AUXILIARY PUMP IMPEDANCE
EBR II Test 8, PRIMARY SYSTEM
MICRO OHMS
-50
-40
-30
-20
-10
0
10
20
30
40
50
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds


PRIMARY Na TEMP, BULK 530, BOTTOM OF TANK
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
900
875
850
825
800
775
750
725
700
675
650
625
600
471
458
445
432
419
406
393
380
367
354
341
328
315
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26

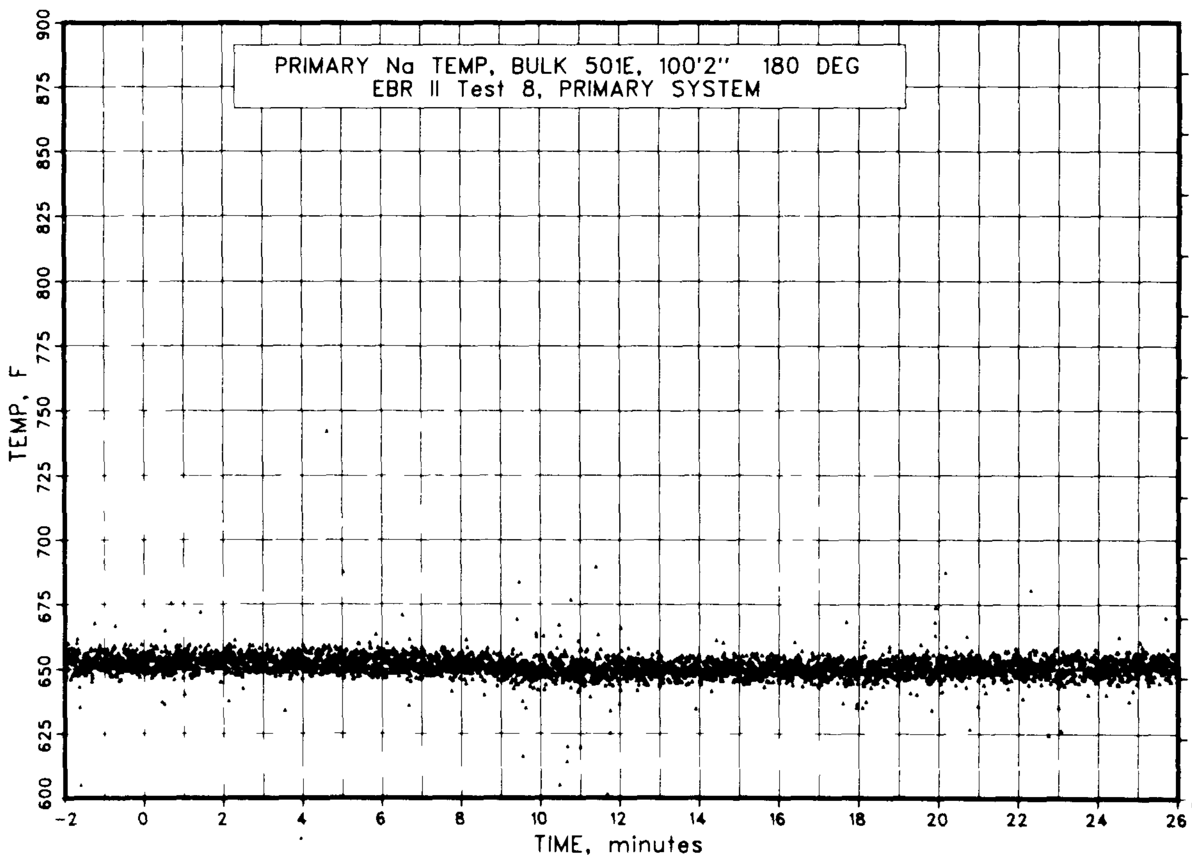

PRIMARY Na TEMP, BULK 501W, 95'8" 0 DEG
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
900
875
850
825
800
775
750
725
700
675
650
625
600
471
458
445
432
419
406
393
380
367
354
341
328
315
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26


PRIMARY Na TEMP, BULK 501Q, 95'8" 90 DEG
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes

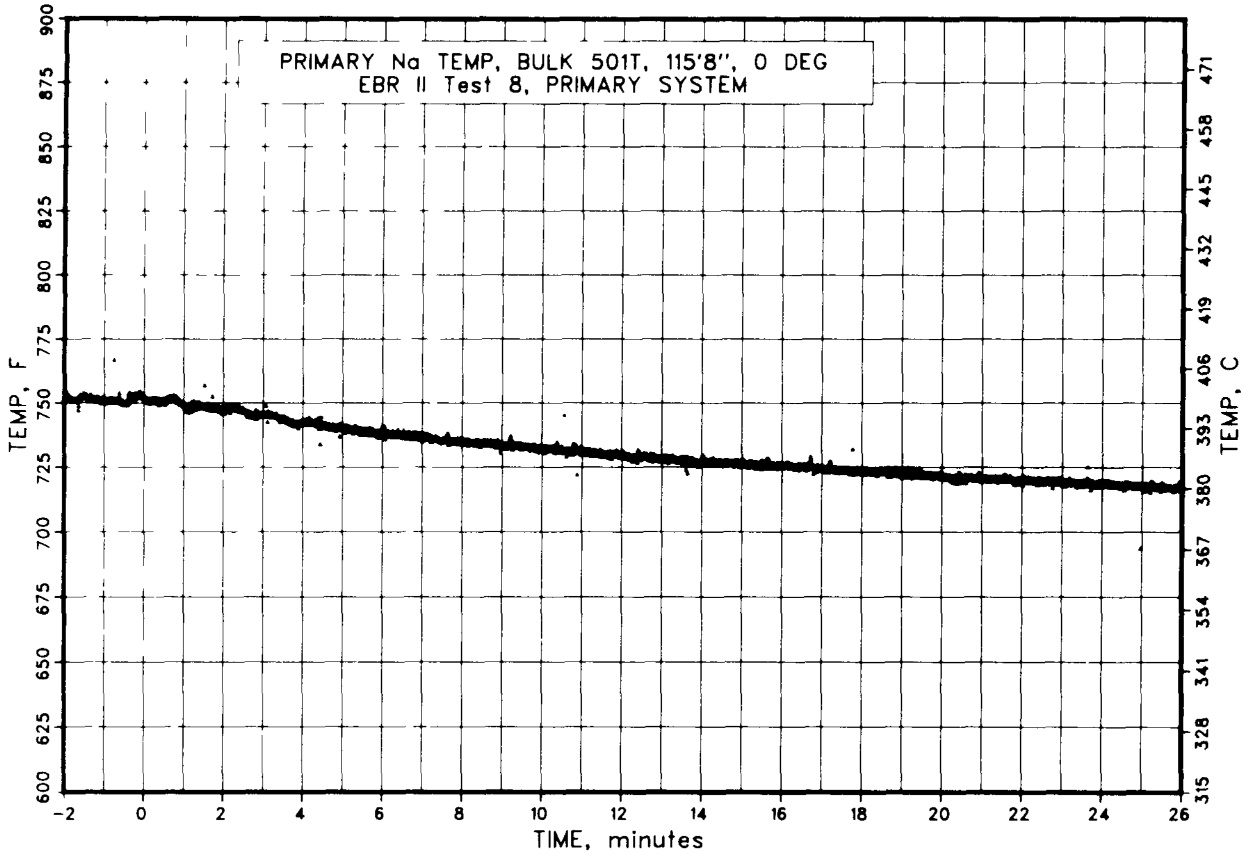

PRIMARY Na TEMP, BULK 501F, 95'8" 180 DEG
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes

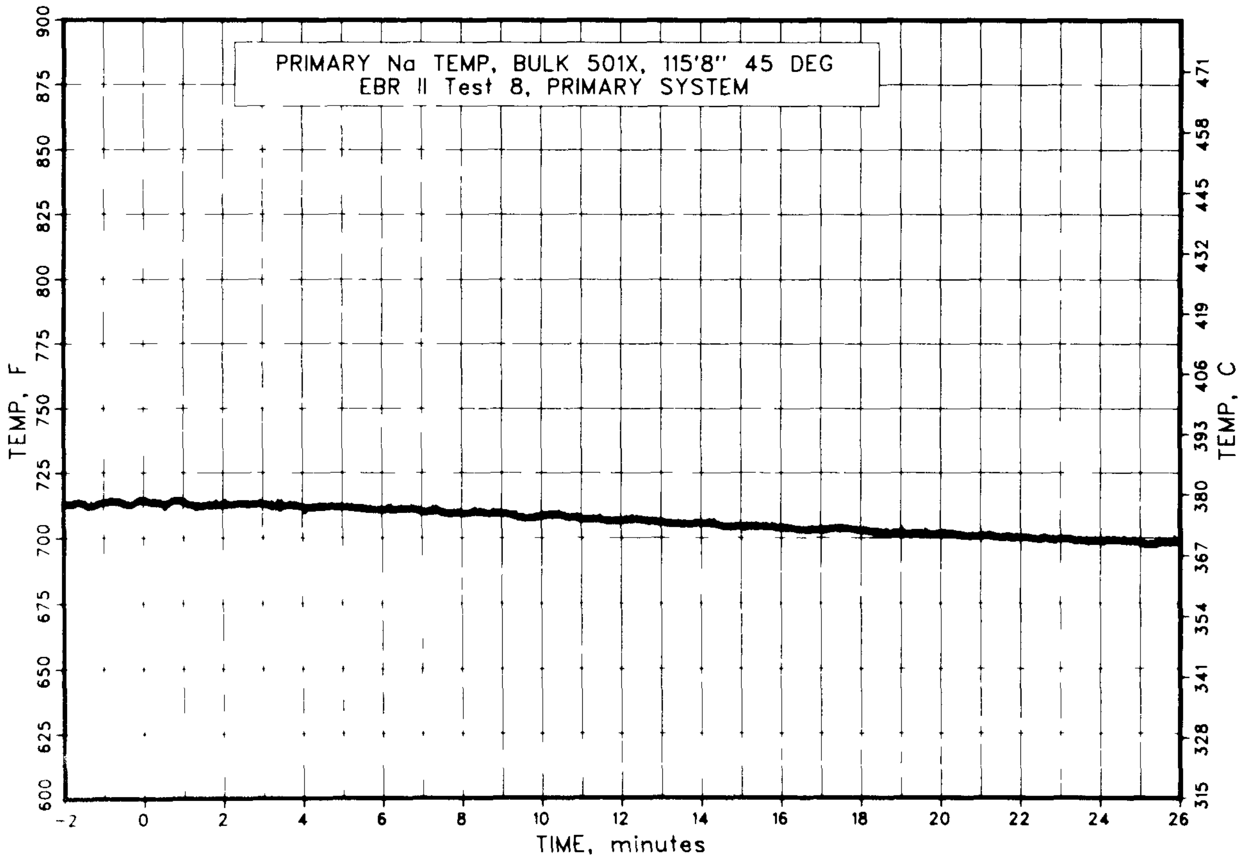


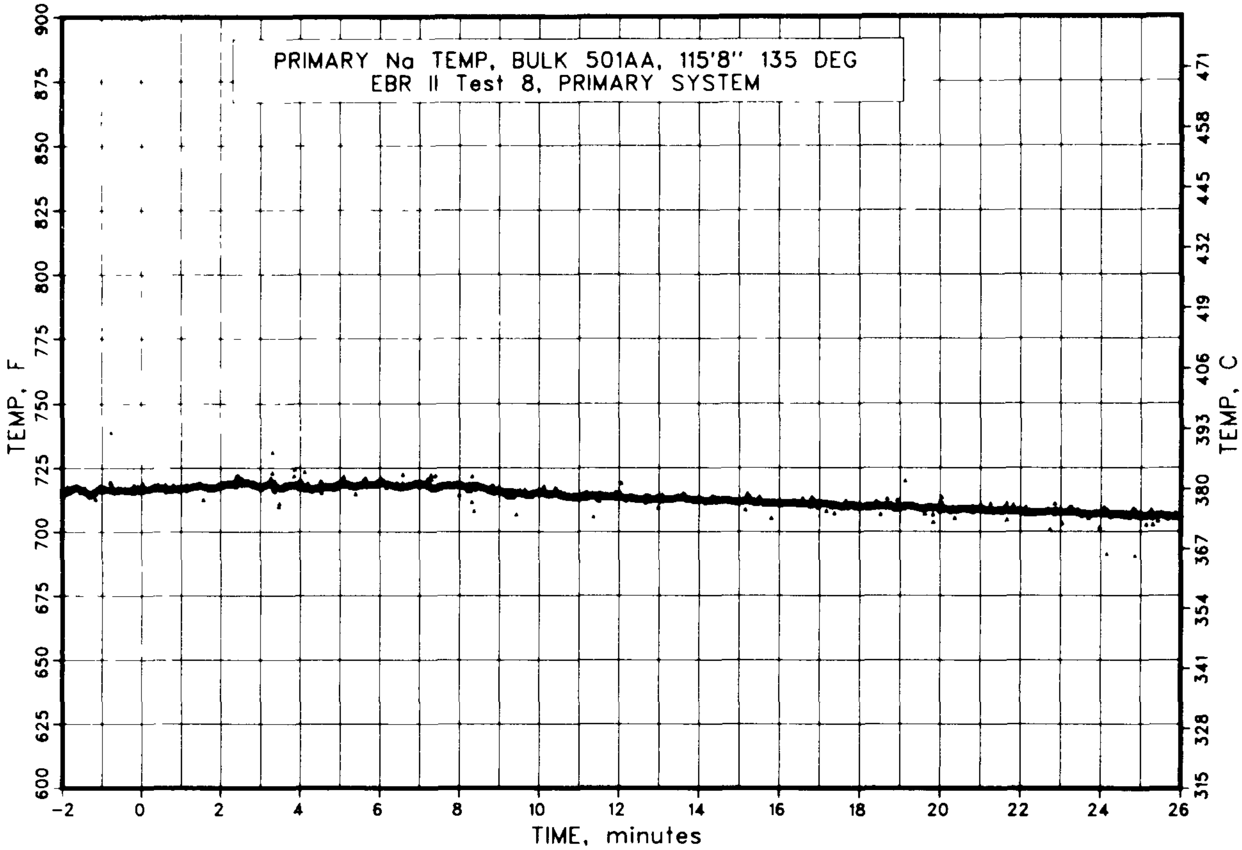
PRIMARY Na TEMP, BULK 501V, 100'2" 0 DEG
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes

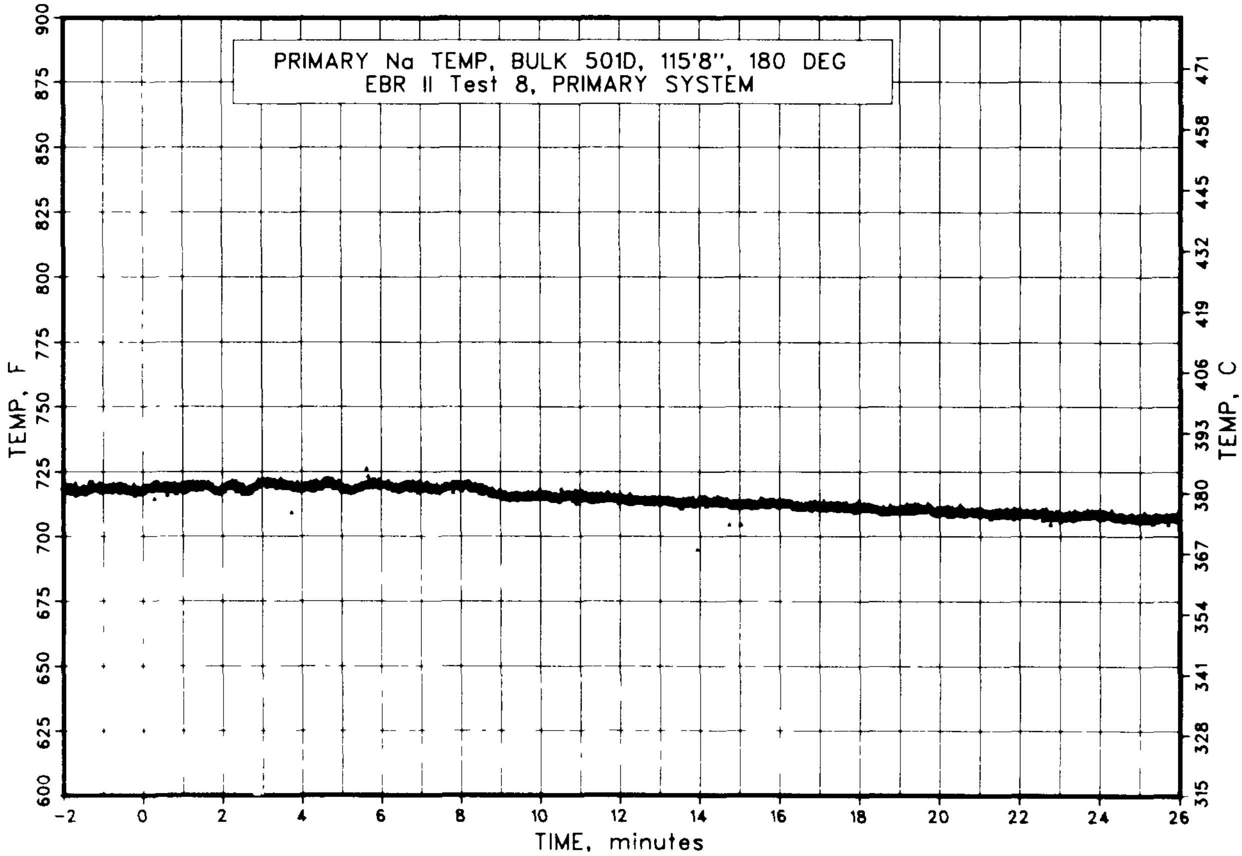


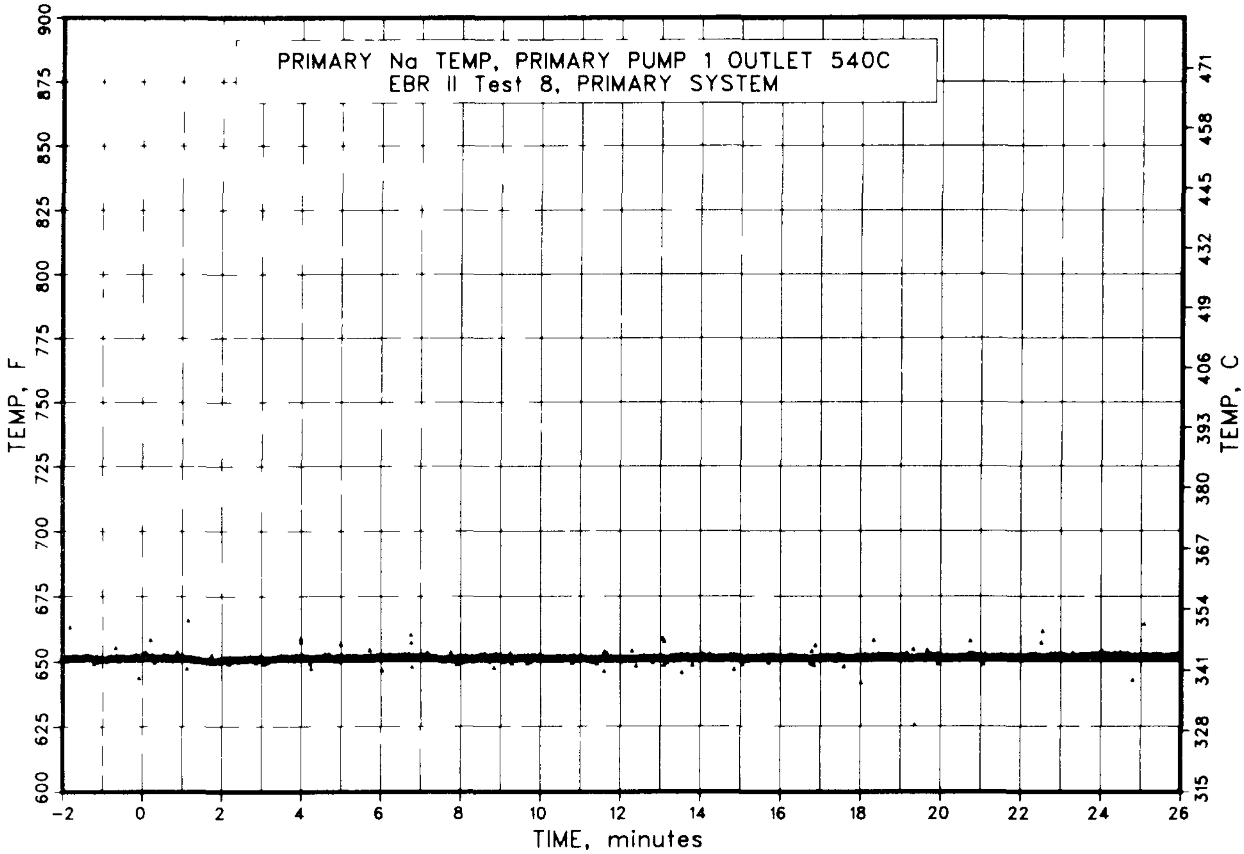
PRIMARY Na TEMP, BULK 501E, 100'2" 180 DEG
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


PRIMARY Na TEMP, BULK 501T, 115'8", 0 DEG
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
600
625
650
675
700
725
750
775
800
825
850
875
900
315
328
341
354
367
380
393
406
419
432
445
458
471
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26


PRIMARY Na TEMP, BULK 501X, 115'8" 45 DEG
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
600
625
650
675
700
725
750
775
800
825
850
875
900
315
328
341
354
367
380
393
406
419
432
445
458
471
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26


PRIMARY Na TEMP, BULK 501AA, 115'8" 135 DEG
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


PRIMARY Na TEMP, BULK 501D, 115'8", 180 DEG
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


PRIMARY Na TEMP, PRIMARY PUMP 1 OUTLET 540C
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
900
875
850
825
800
775
750
725
700
675
650
625
600
TEMP, C
471
458
445
432
419
406
393
380
367
354
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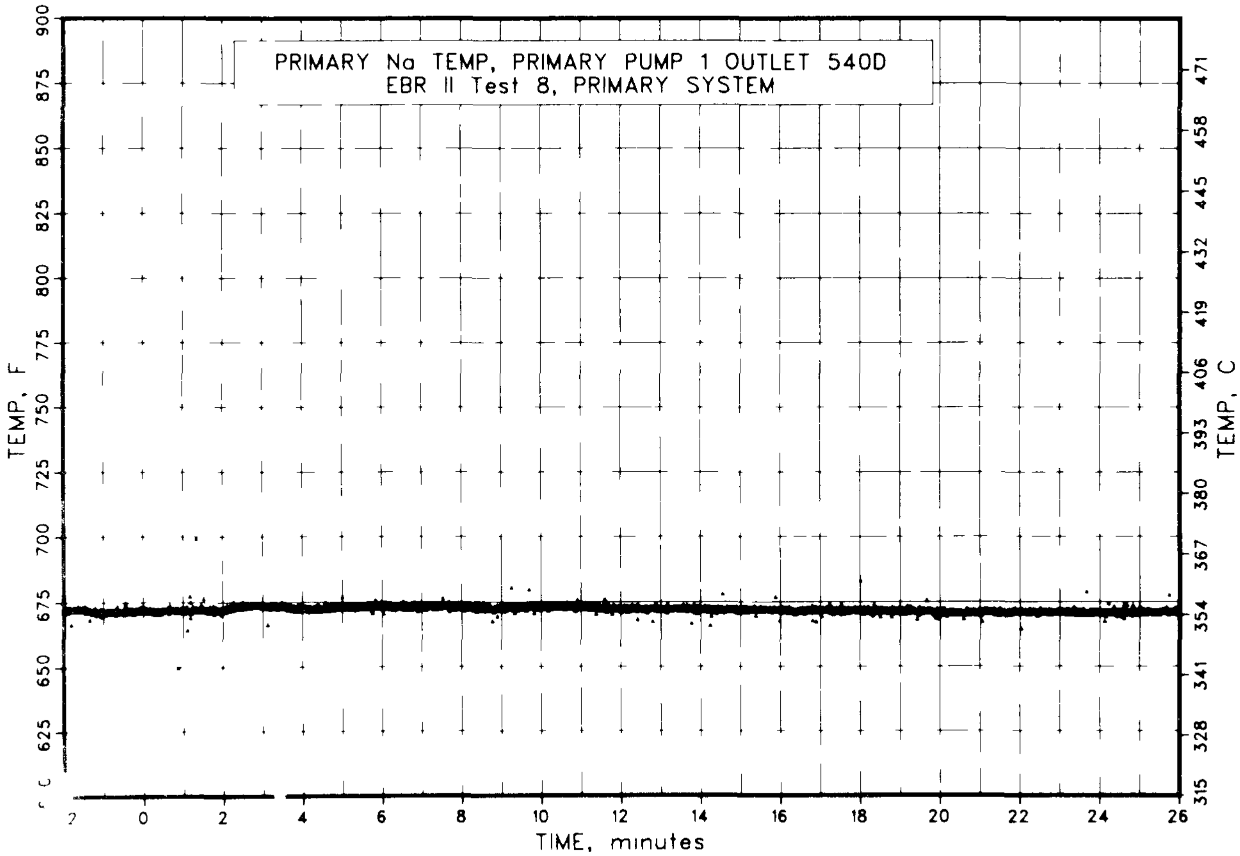
TIME, minutes


PRIMARY Na TEMP, PRIMARY PUMP 1 OUTLET 540D
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
900
875
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825
800
775
750
725
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675
650
625
TEMP, C
471
458
445
432
419
406
393
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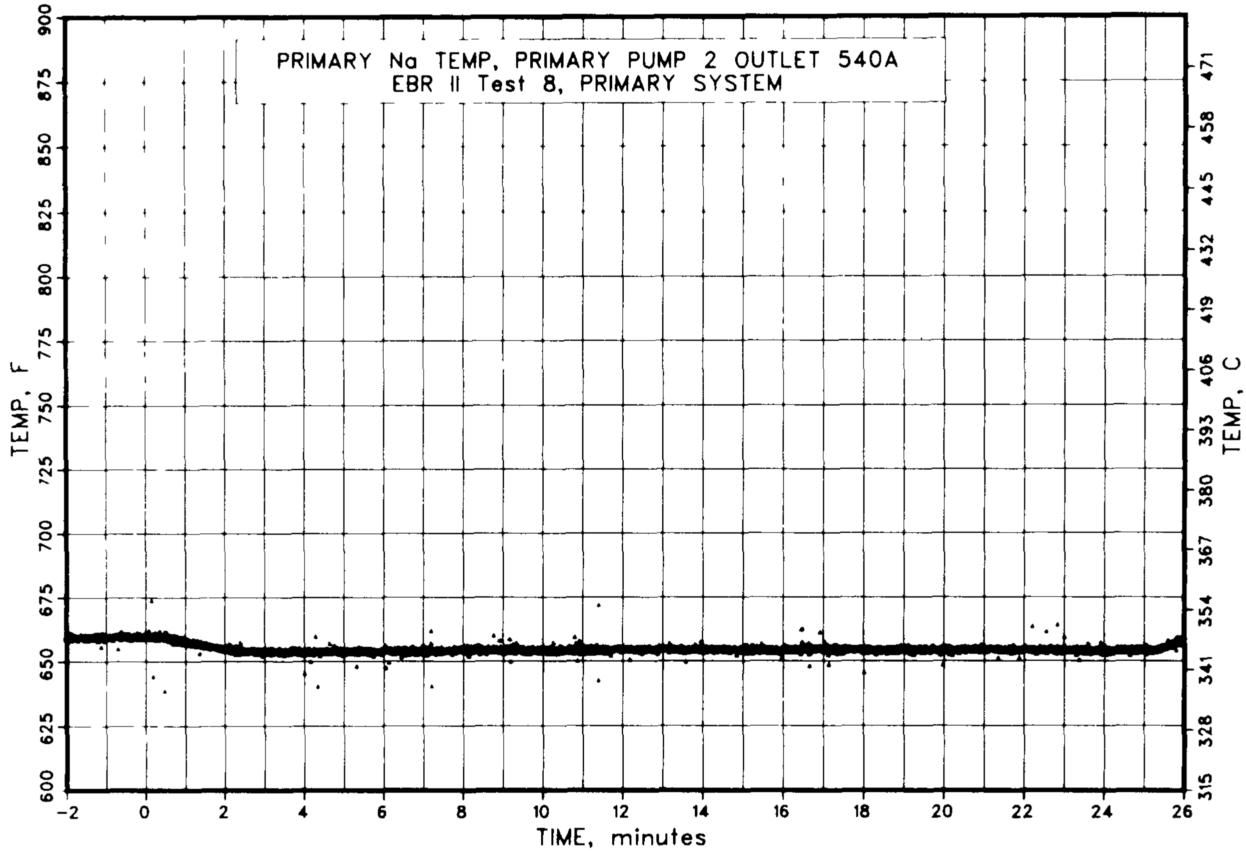
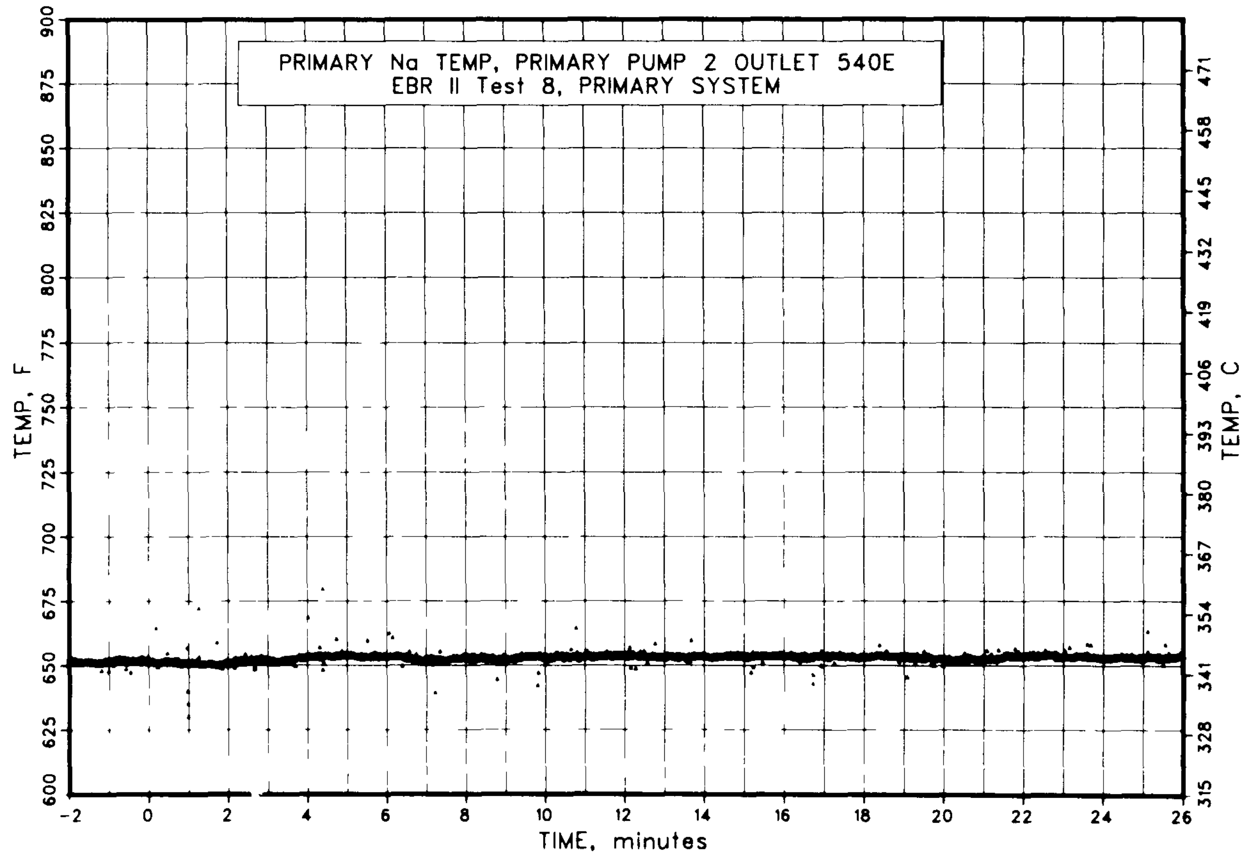
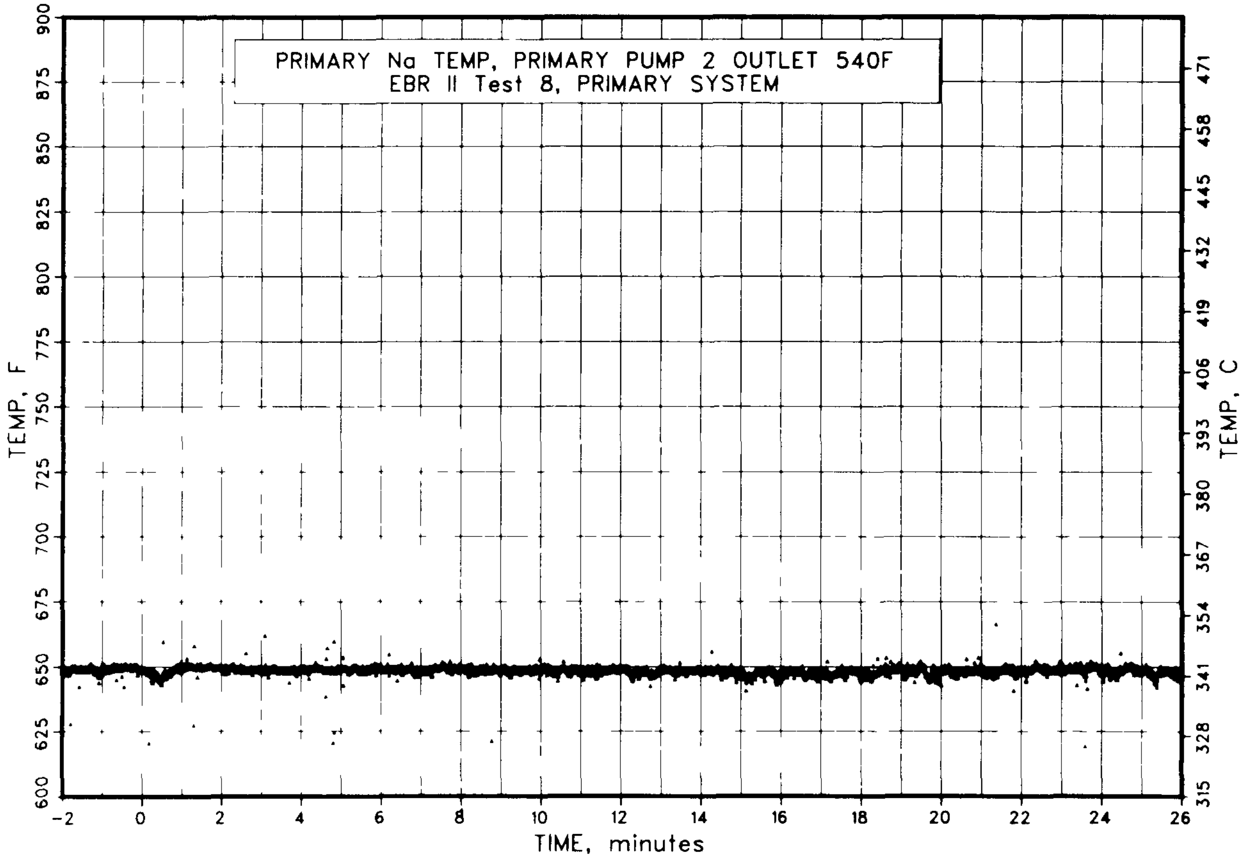
TIME, minutes


PRIMARY Na TEMP, PRIMARY PUMP 2 OUTLET 540A
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


PRIMARY Na TEMP, PRIMARY PUMP 2 OUTLET 540E
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


PRIMARY Na TEMP, PRIMARY PUMP 2 OUTLET 540F
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TEMP, F
900
875
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825
800
775
750
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675
650
625
600
TEMP, C
471
458
445
432
419
406
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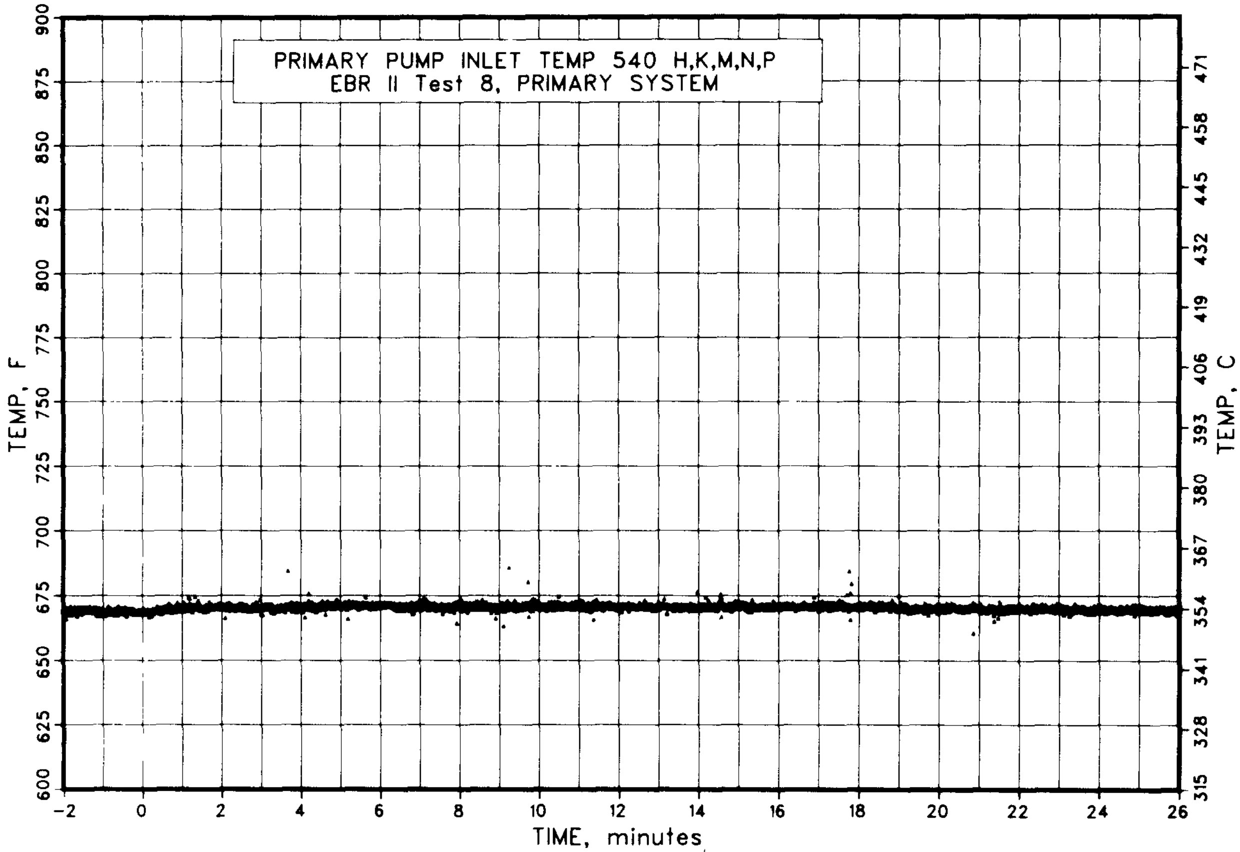
TIME, minutes


PRIMARY PUMP INLET TEMP 540 H,K,M,N,P
EBR II Test 8, PRIMARY SYSTEM
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900
875
850
825
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775
750
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700
675
650
625
600
TEMP, C
471
458
445
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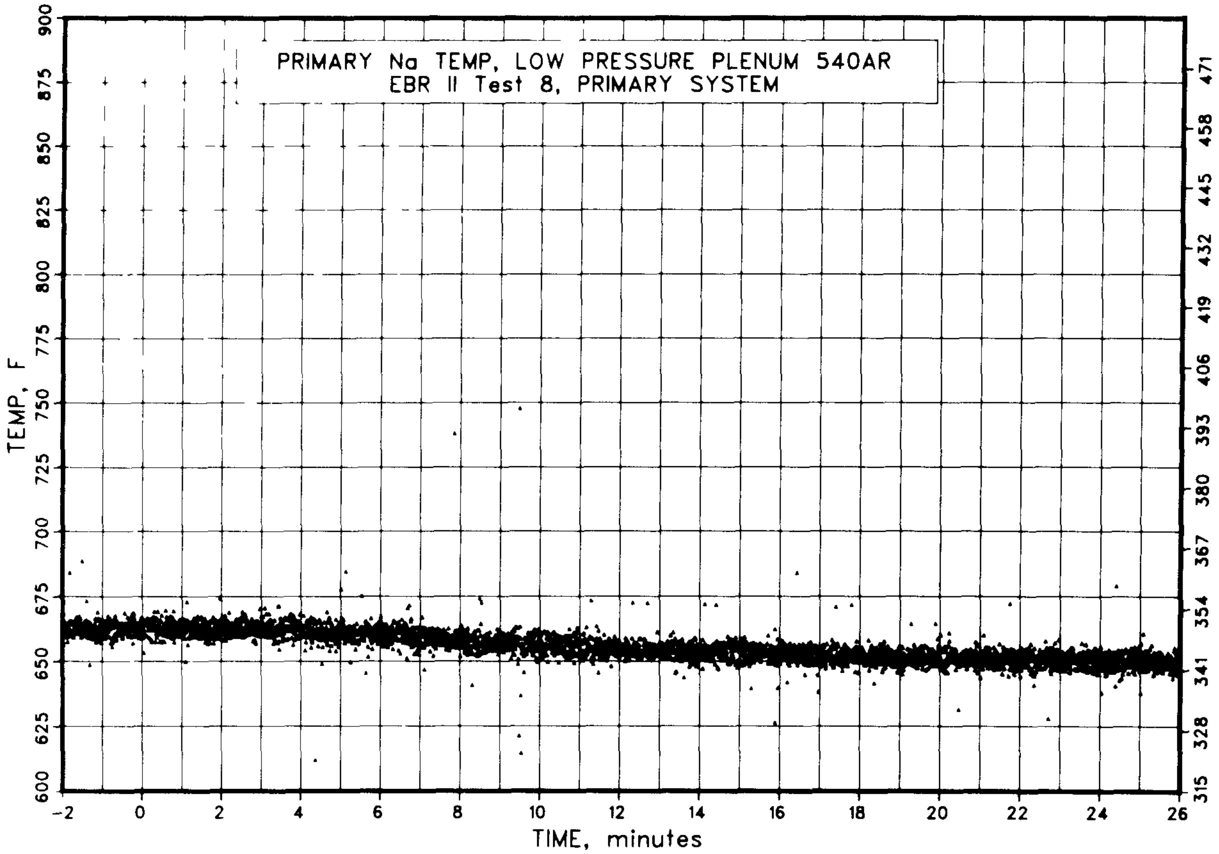
TIME, minutes


PRIMARY Na TEMP, LOW PRESSURE PLENUM 540AR
EBR II Test 8, PRIMARY SYSTEM
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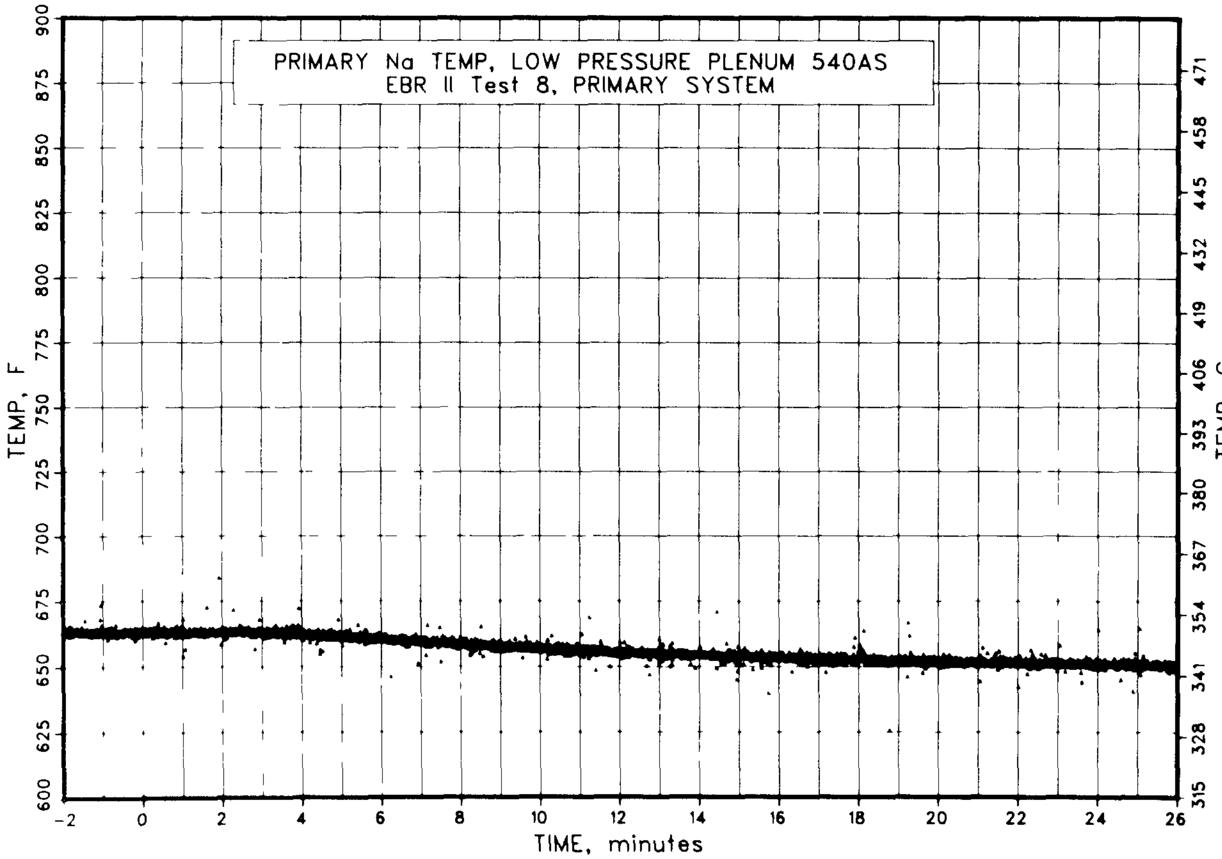
TEMP, C
TIME, minutes


PRIMARY Na TEMP, LOW PRESSURE PLENUM 540AS
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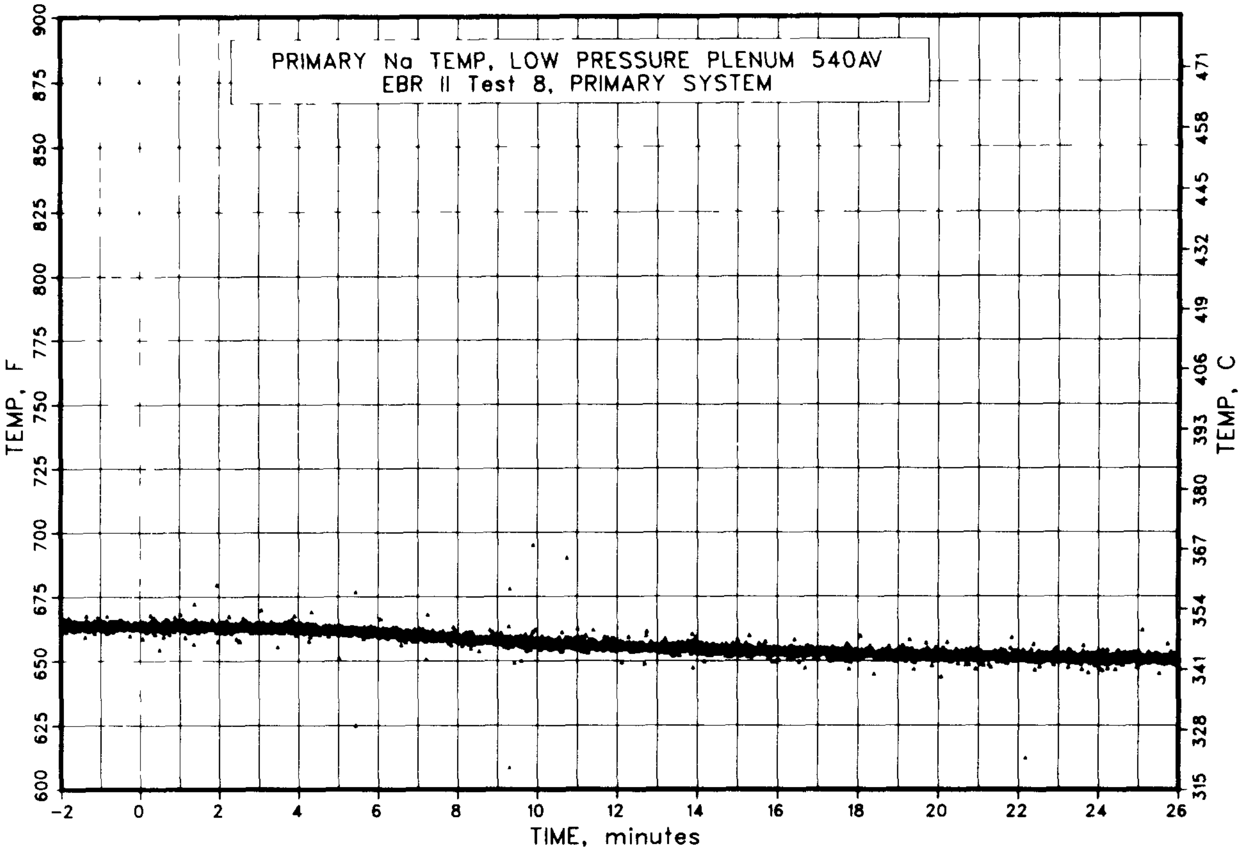
TEMP, C
TIME, minutes


PRIMARY Na TEMP, LOW PRESSURE PLENUM 540AV
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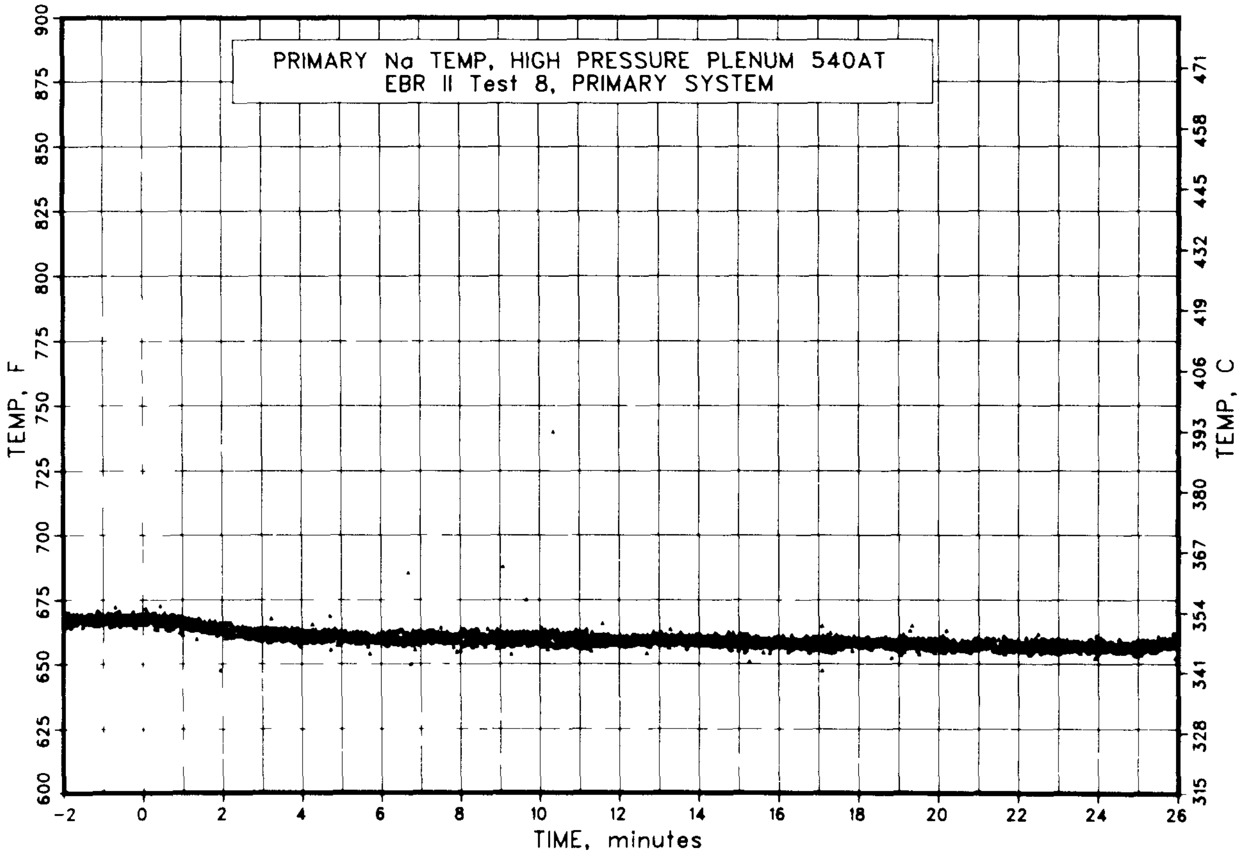
TEMP, C
TIME, minutes


PRIMARY Na TEMP, HIGH PRESSURE PLENUM 540AT
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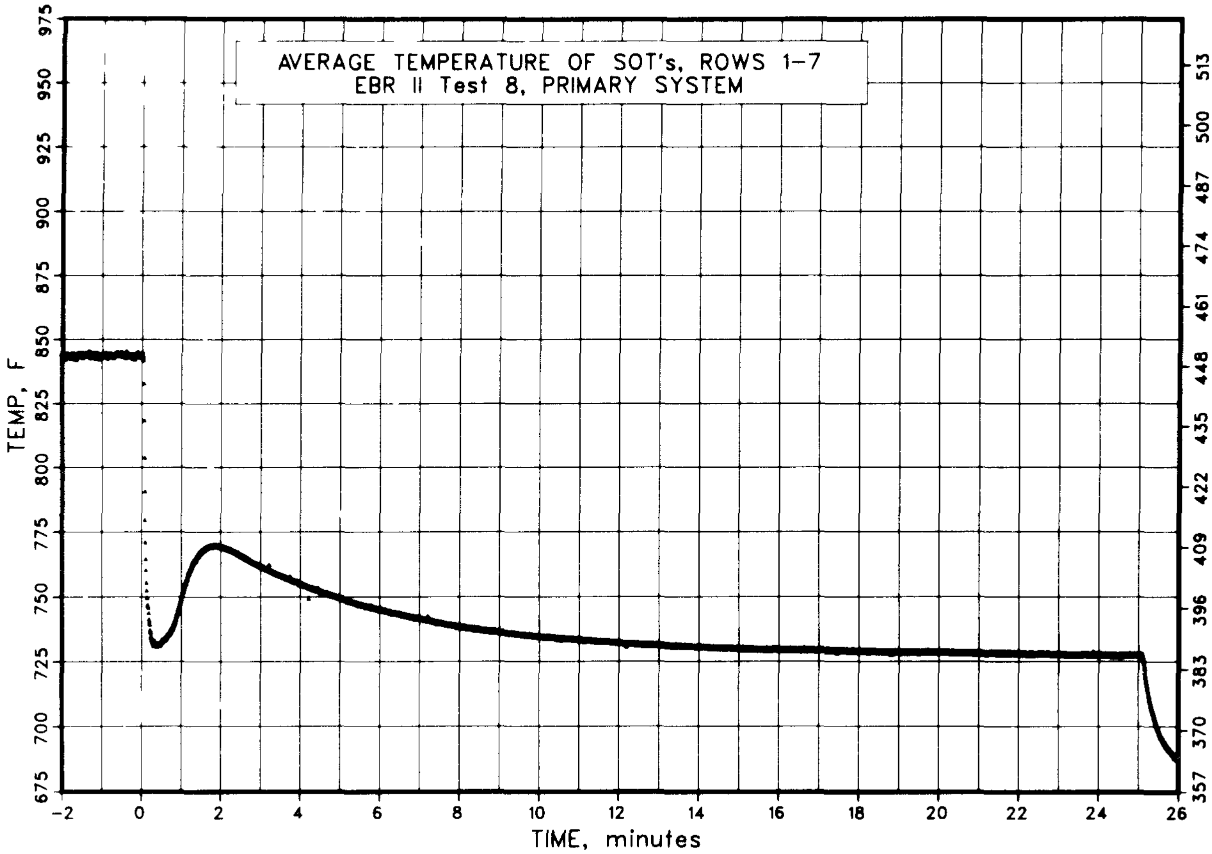
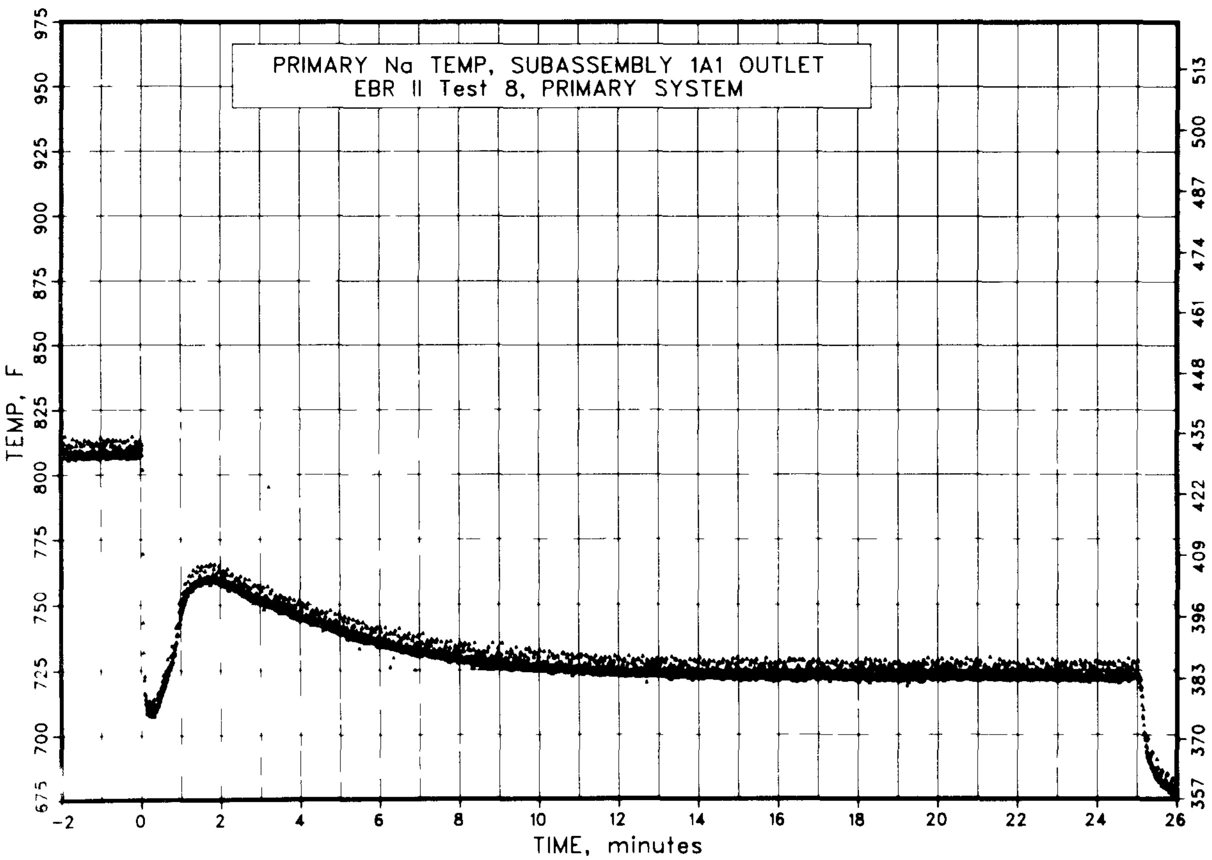
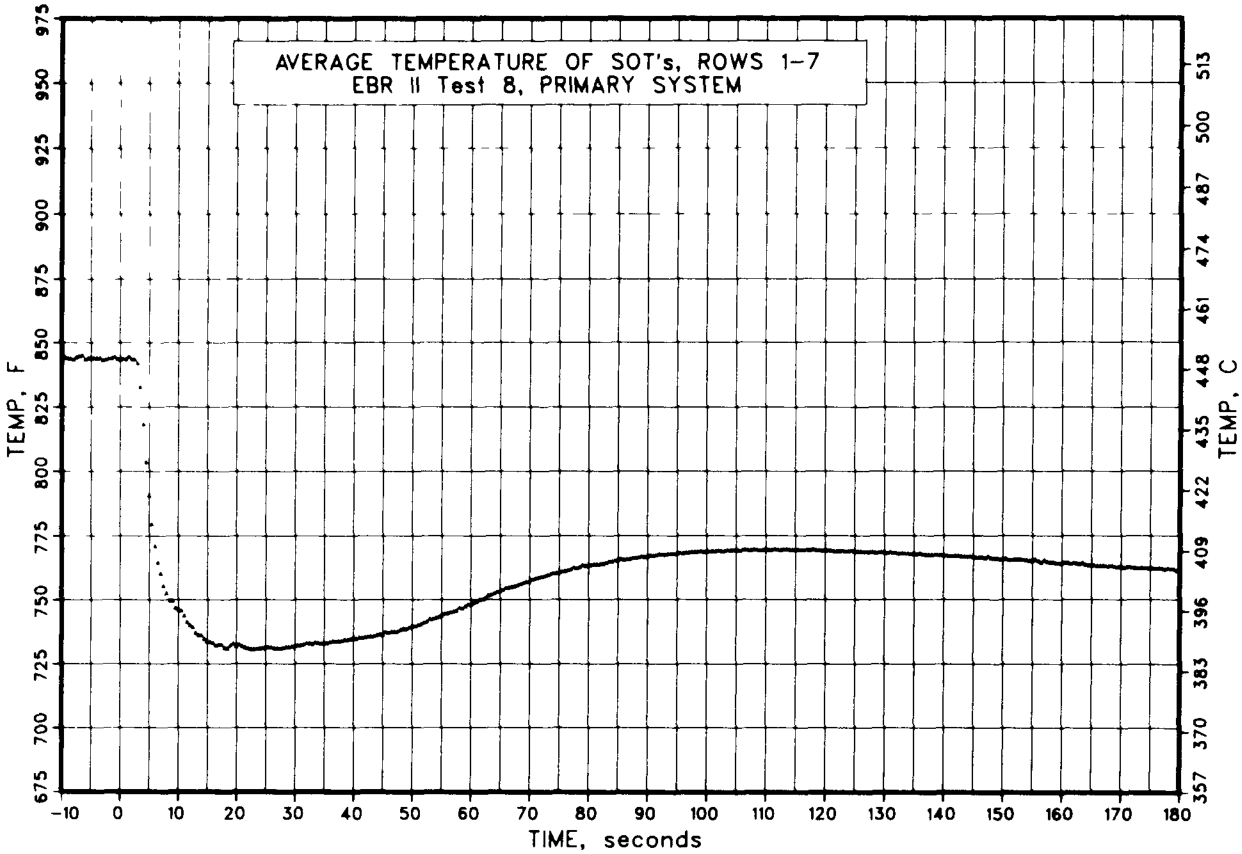
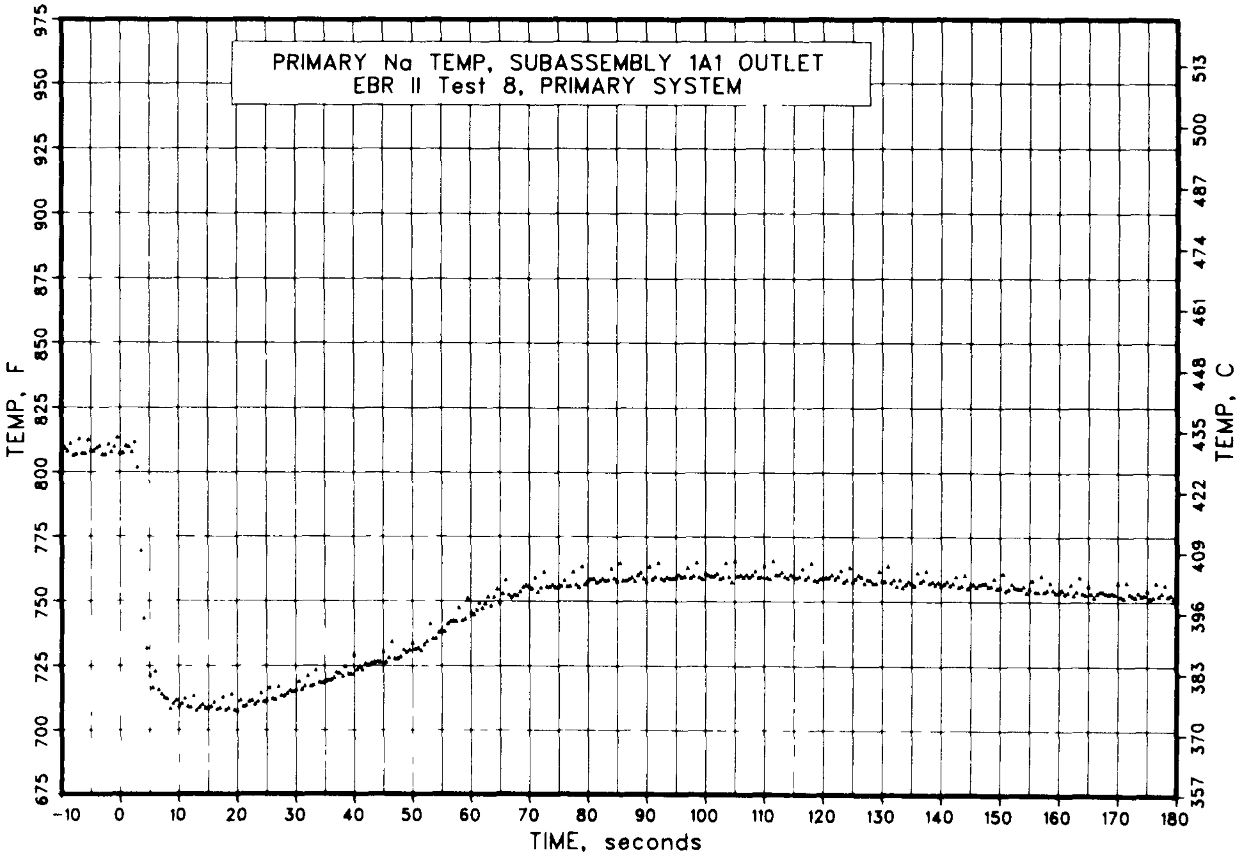
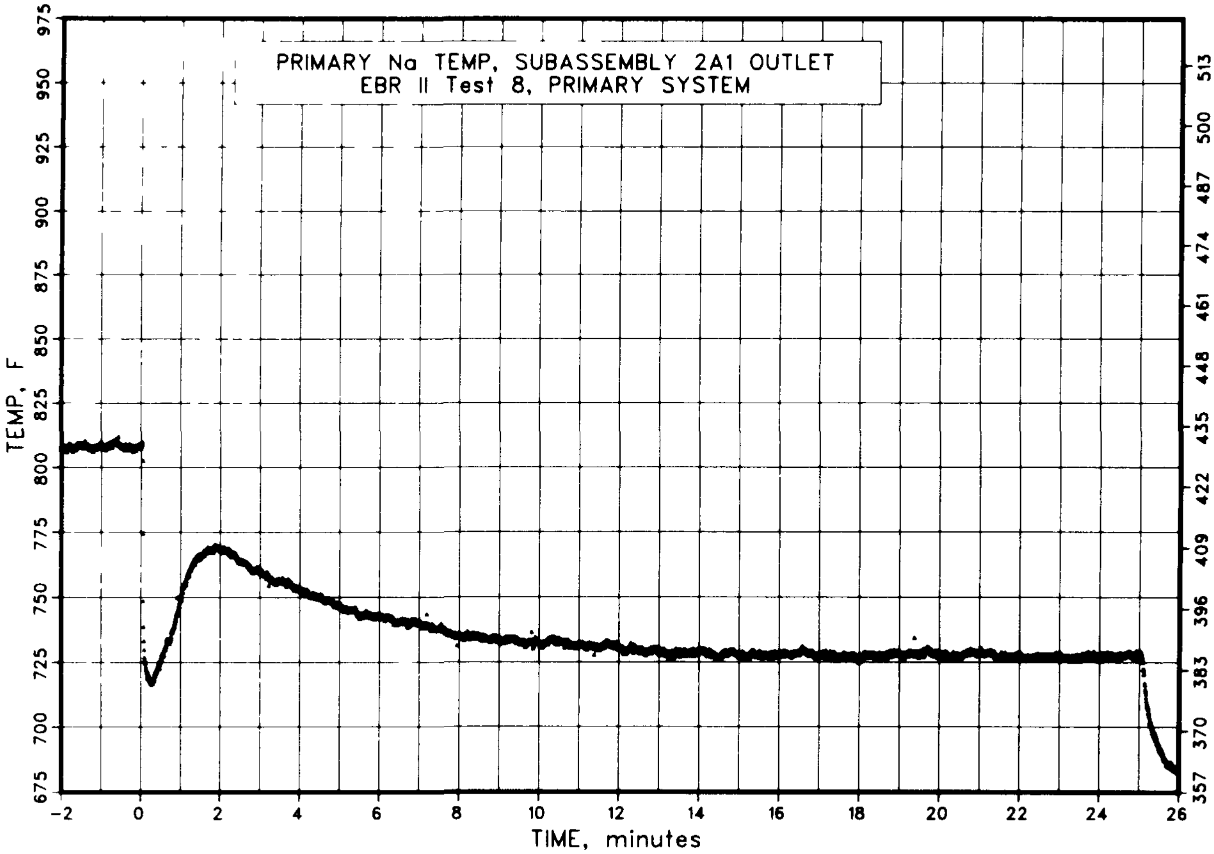
TEMP, C
TIME, minutes

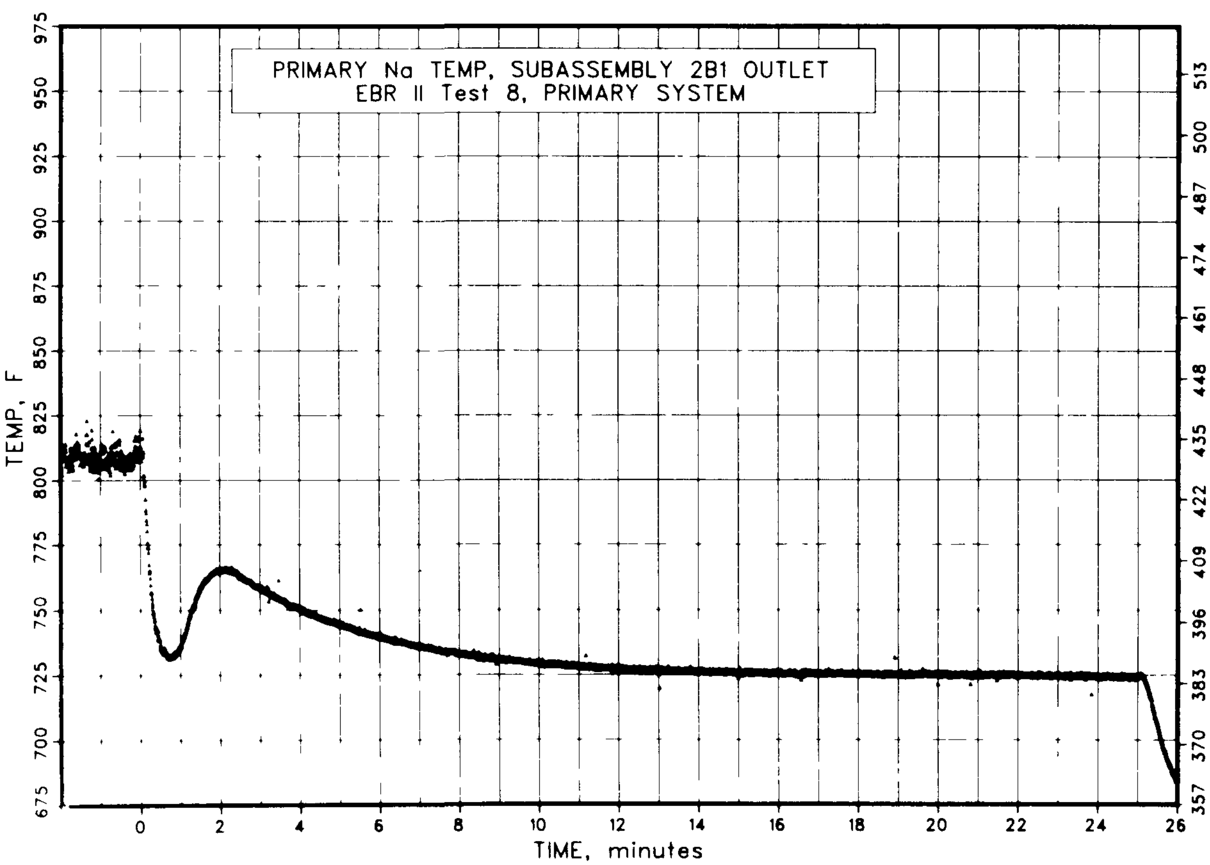

AVERAGE TEMPERATURE OF SOT's, ROWS 1–7
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes

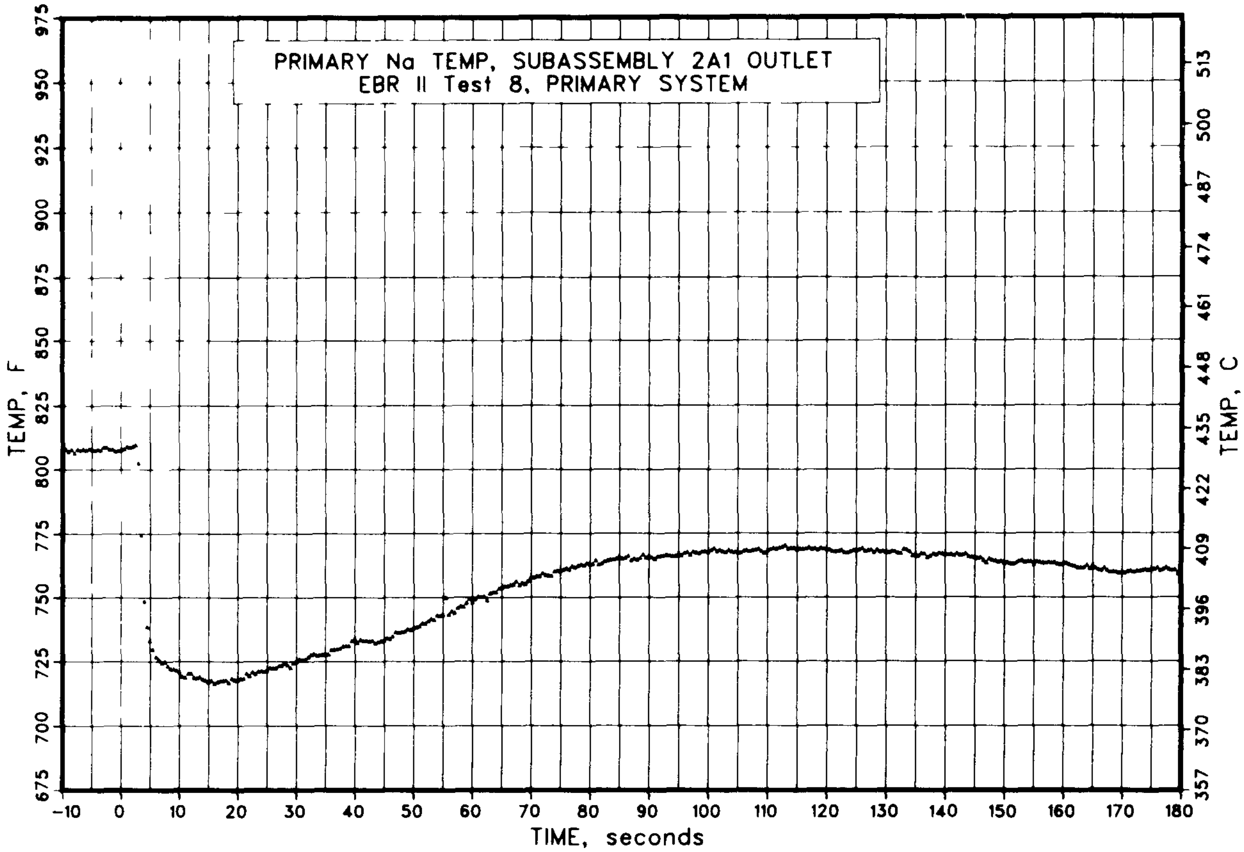

PRIMARY Na TEMP, SUBASSEMBLY 1A1 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


AVERAGE TEMPERATURE OF SOT's, ROWS 1-7
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds


PRIMARY Na TEMP, SUBASSEMBLY 1A1 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds


PRIMARY Na TEMP, SUBASSEMBLY 2A1 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


PRIMARY Na TEMP, SUBASSEMBLY 2B1 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


PRIMARY Na TEMP, SUBASSEMBLY 2A1 OUTLET
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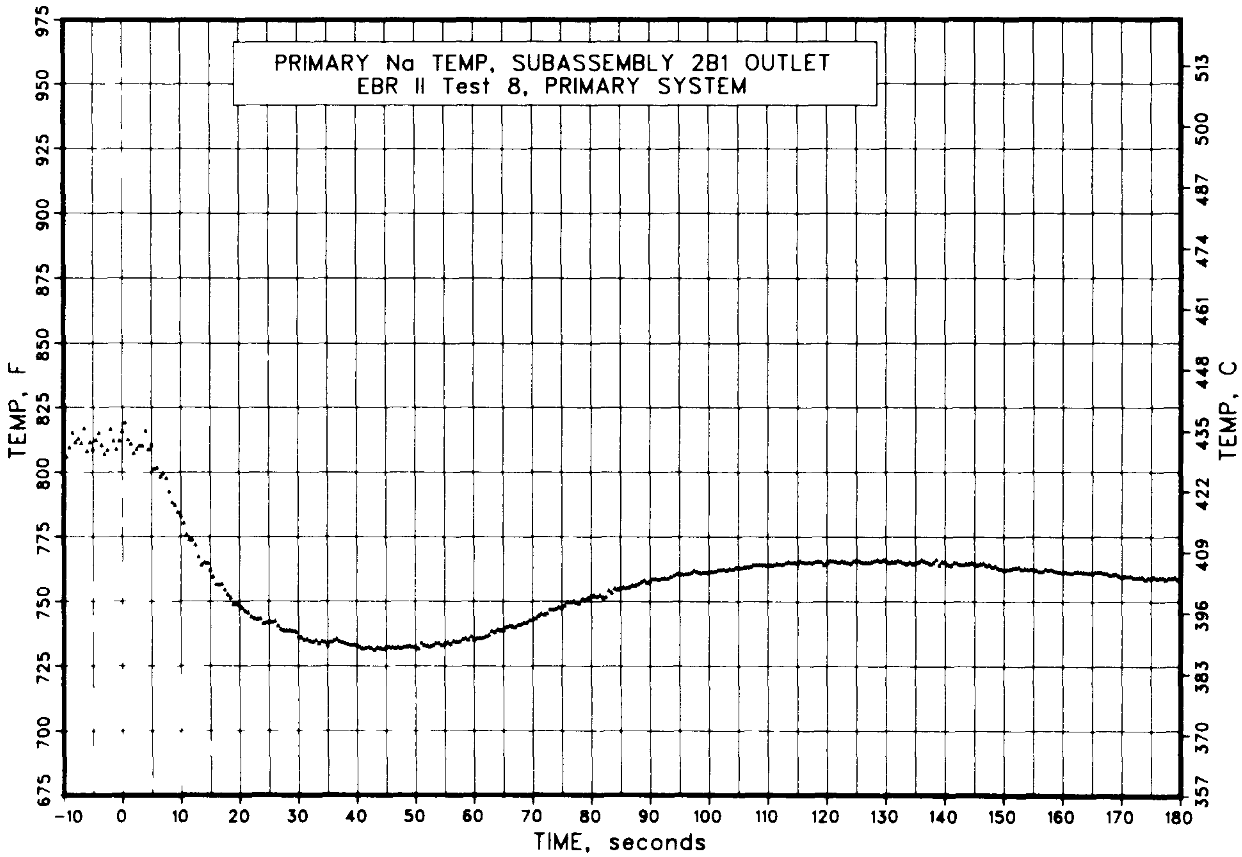
TEMP, F
TEMP, C
TIME, seconds


PRIMARY Na TEMP, SUBASSEMBLY 2B1 OUTLET
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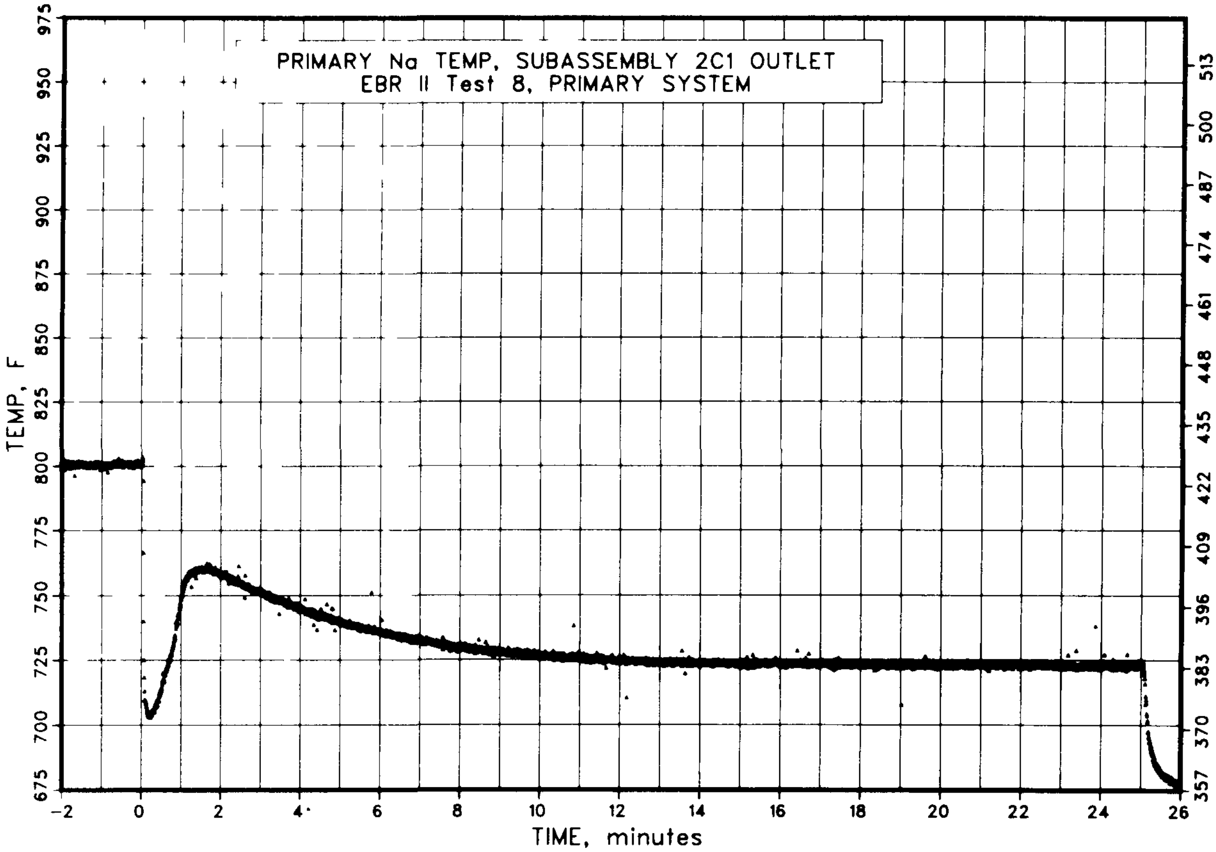
TEMP, F
TEMP, C
TIME, seconds


PRIMARY Na TEMP, SUBASSEMBLY 2C1 OUTLET
EBR II Test 8, PRIMARY SYSTEM
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TEMP, C
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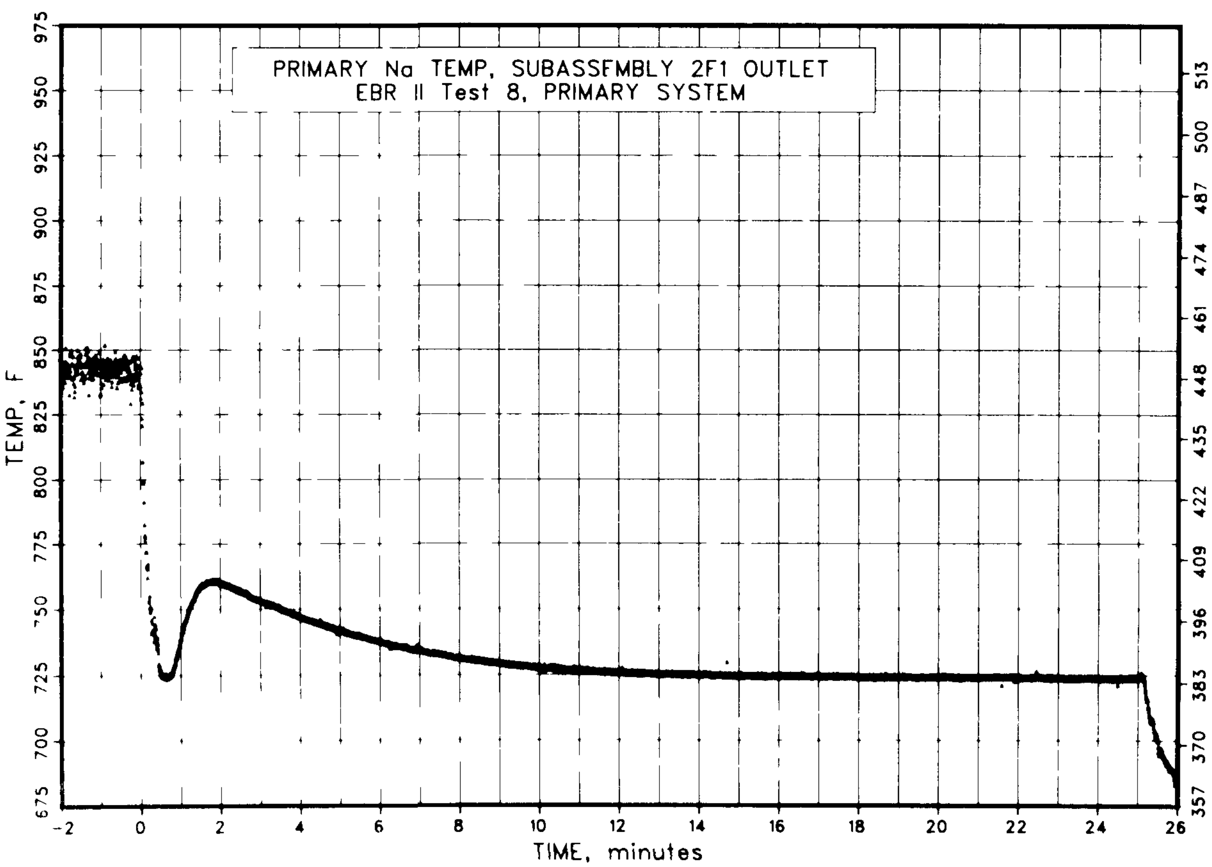
PRIMARY Na TEMP, SUBASSEMBLY 2F1 OUTLET
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TEMP, C
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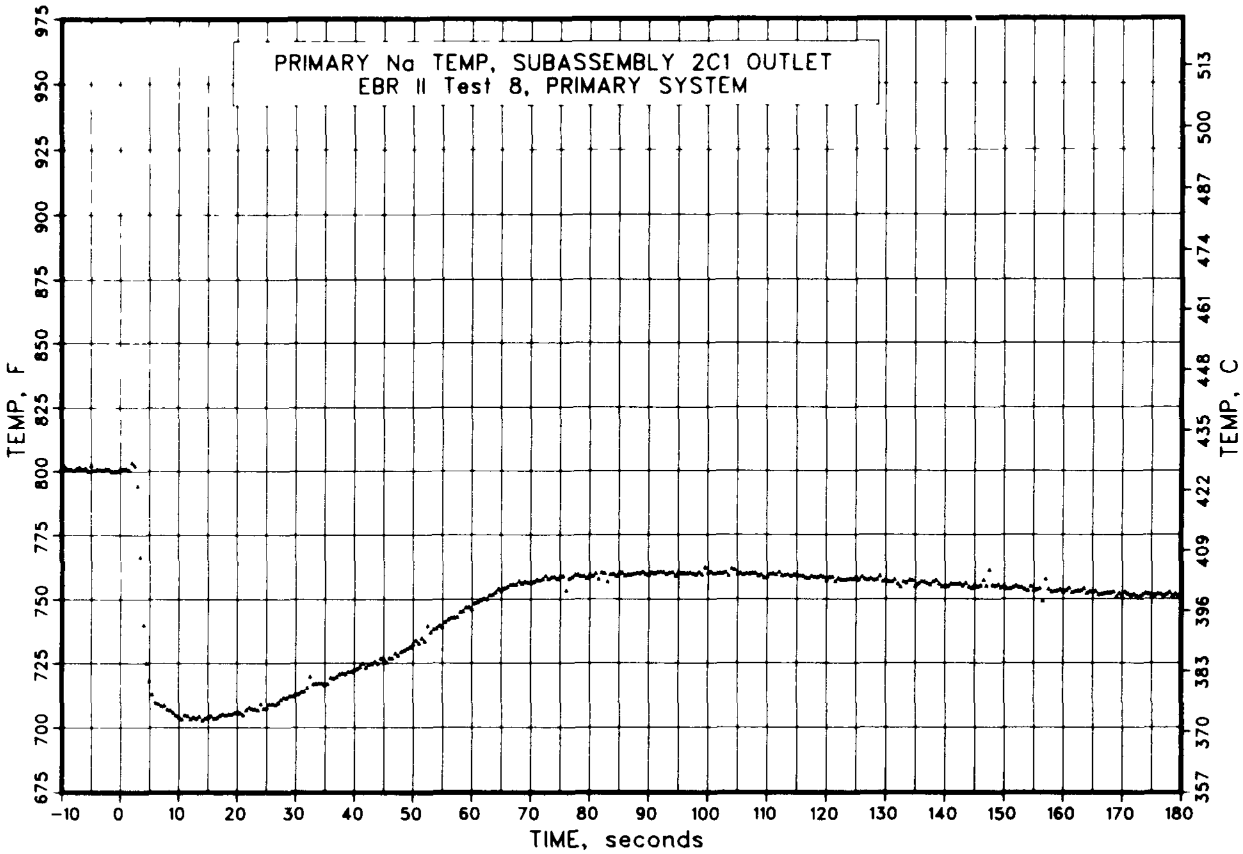
PRIMARY Na TEMP, SUBASSEMBLY 2C1 OUTLET
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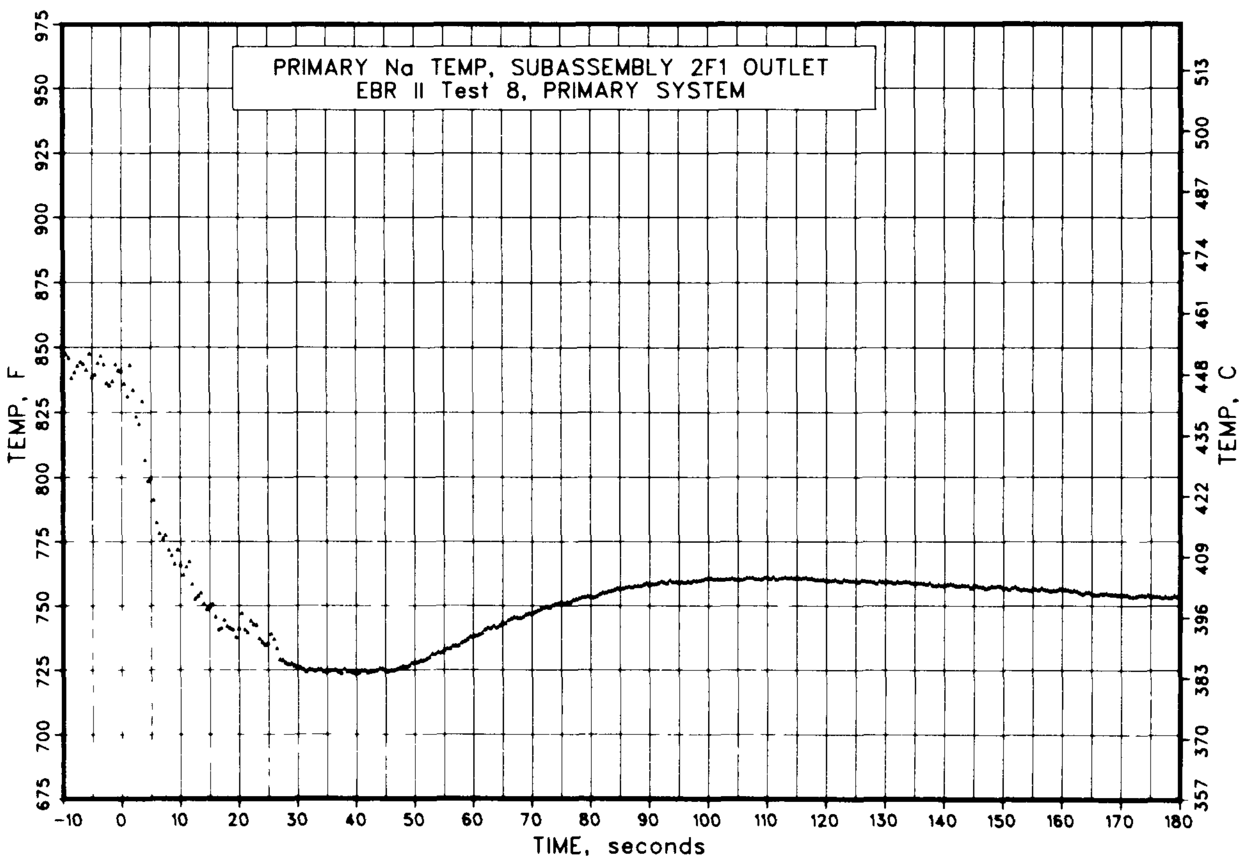
TIME, seconds


PRIMARY Na TEMP, SUBASSEMBLY 2F1 OUTLET
EBR II Test 8, PRIMARY SYSTEM
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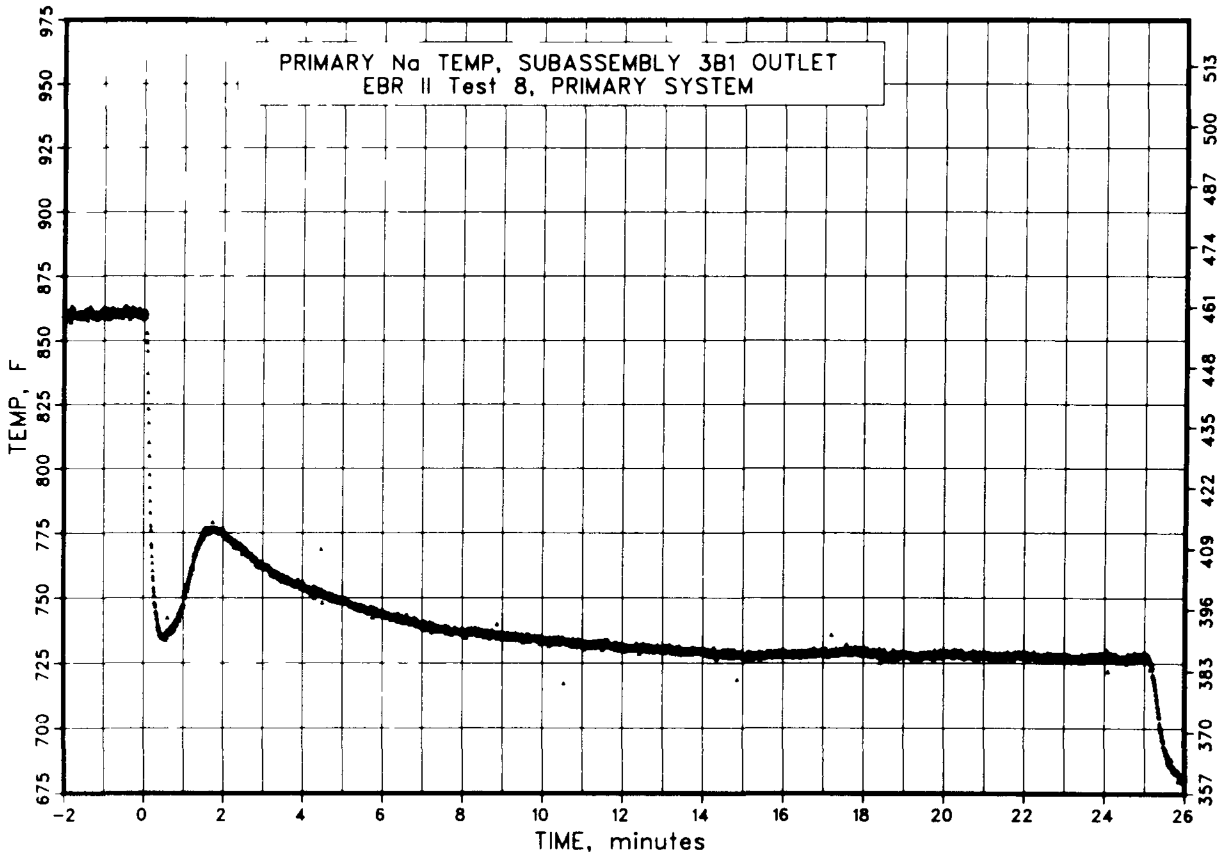
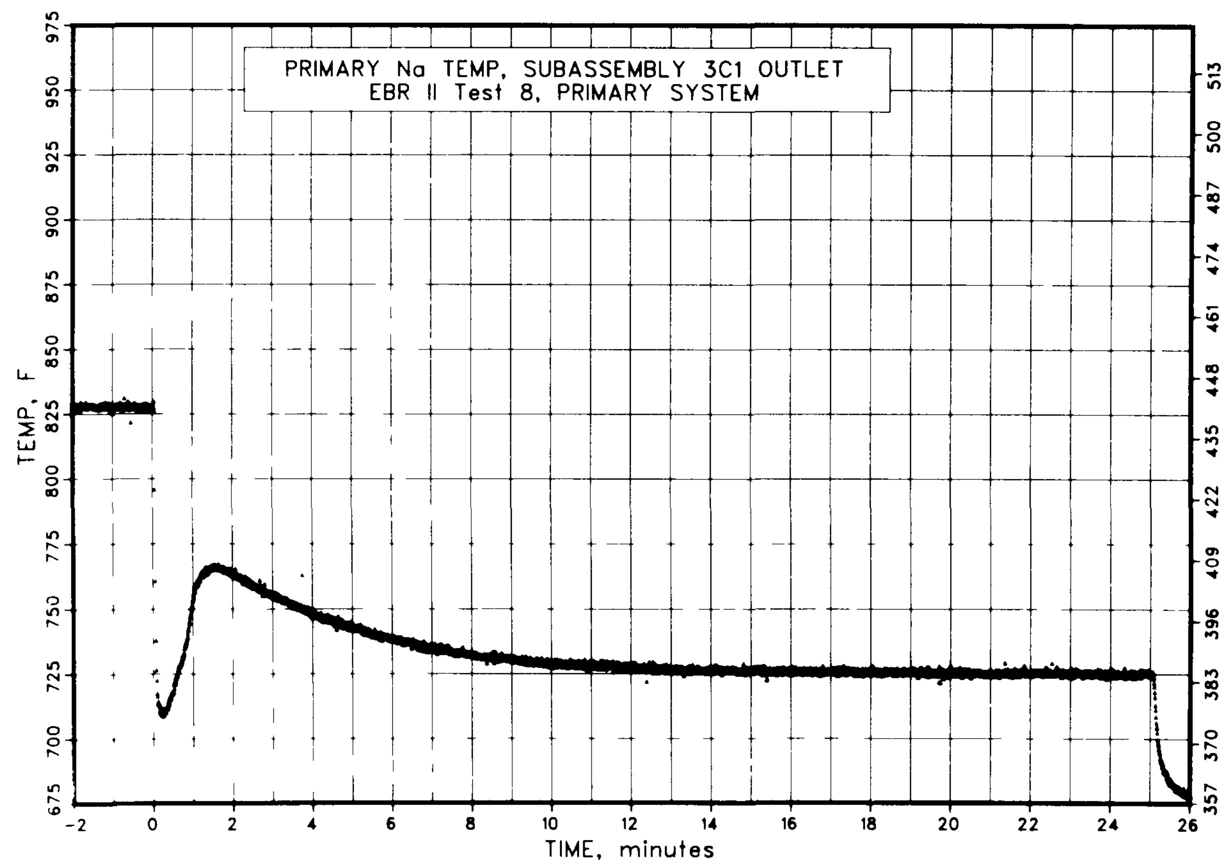
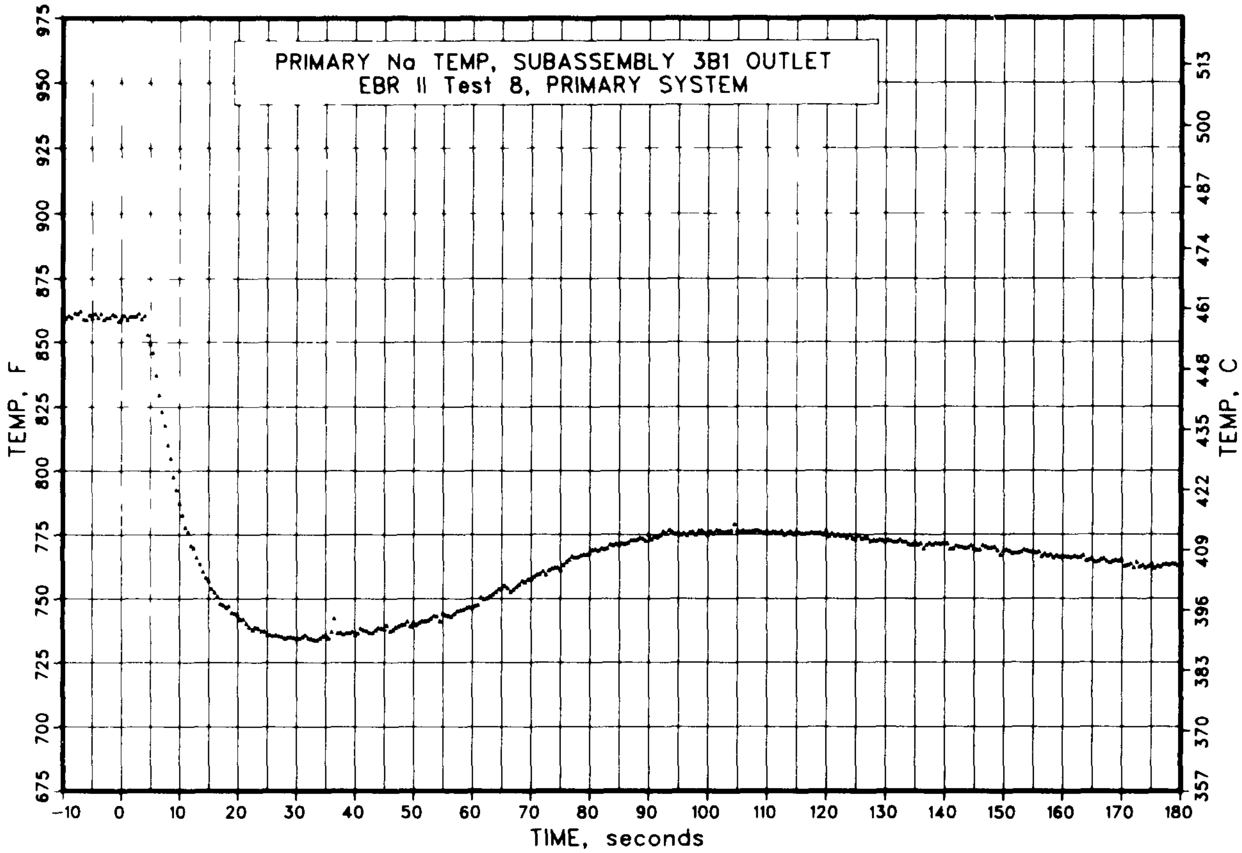
TIME, seconds


PRIMARY Na TEMP, SUBASSEMBLY 3B1 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


PRIMARY Na TEMP, SUBASSEMBLY 3C1 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


PRIMARY Na TEMP, SUBASSEMBLY 3B1 OUTLET
EBR II Test 8, PRIMARY SYSTEM
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TEMP, C
TIME, seconds
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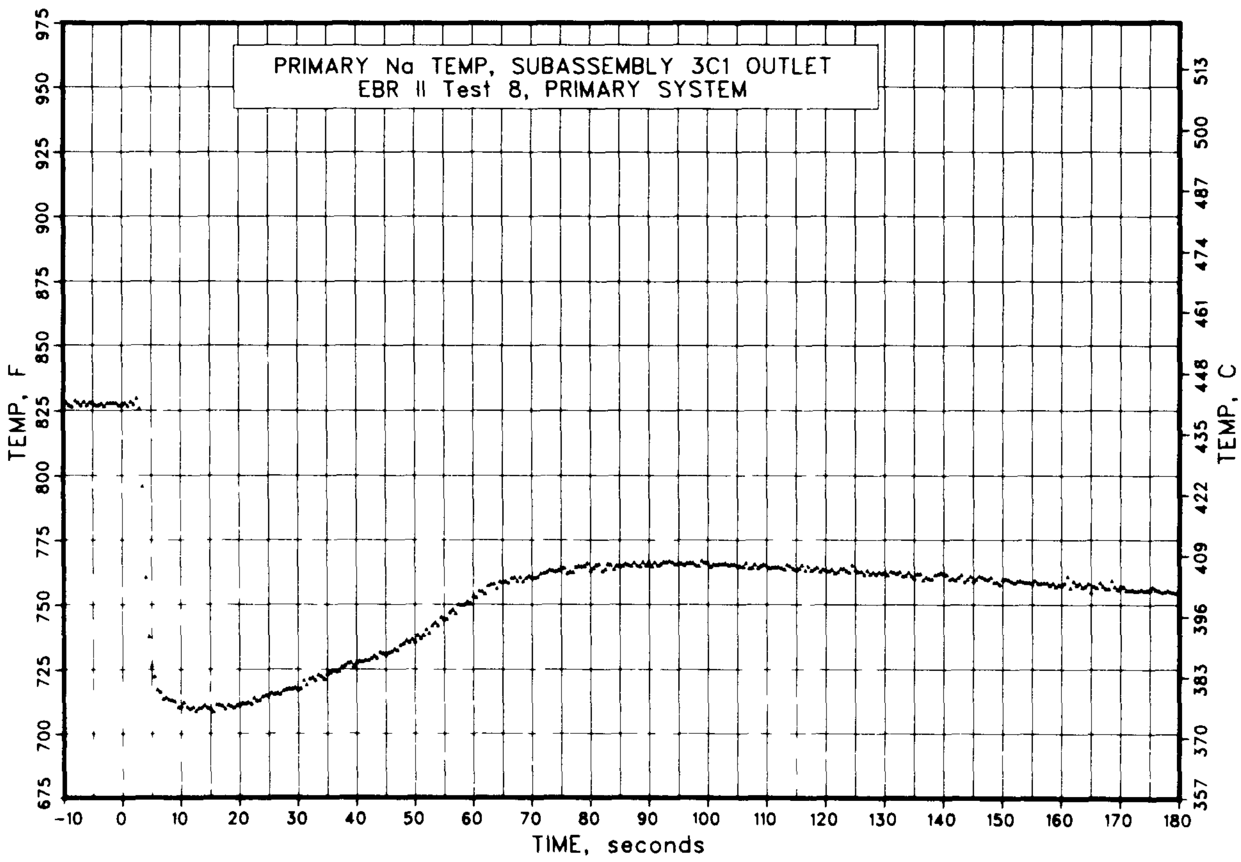
PRIMARY Na TEMP, SUBASSEMBLY 3C1 OUTLET
EBR II Test 8, PRIMARY SYSTEM
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TEMP, C
TIME, seconds
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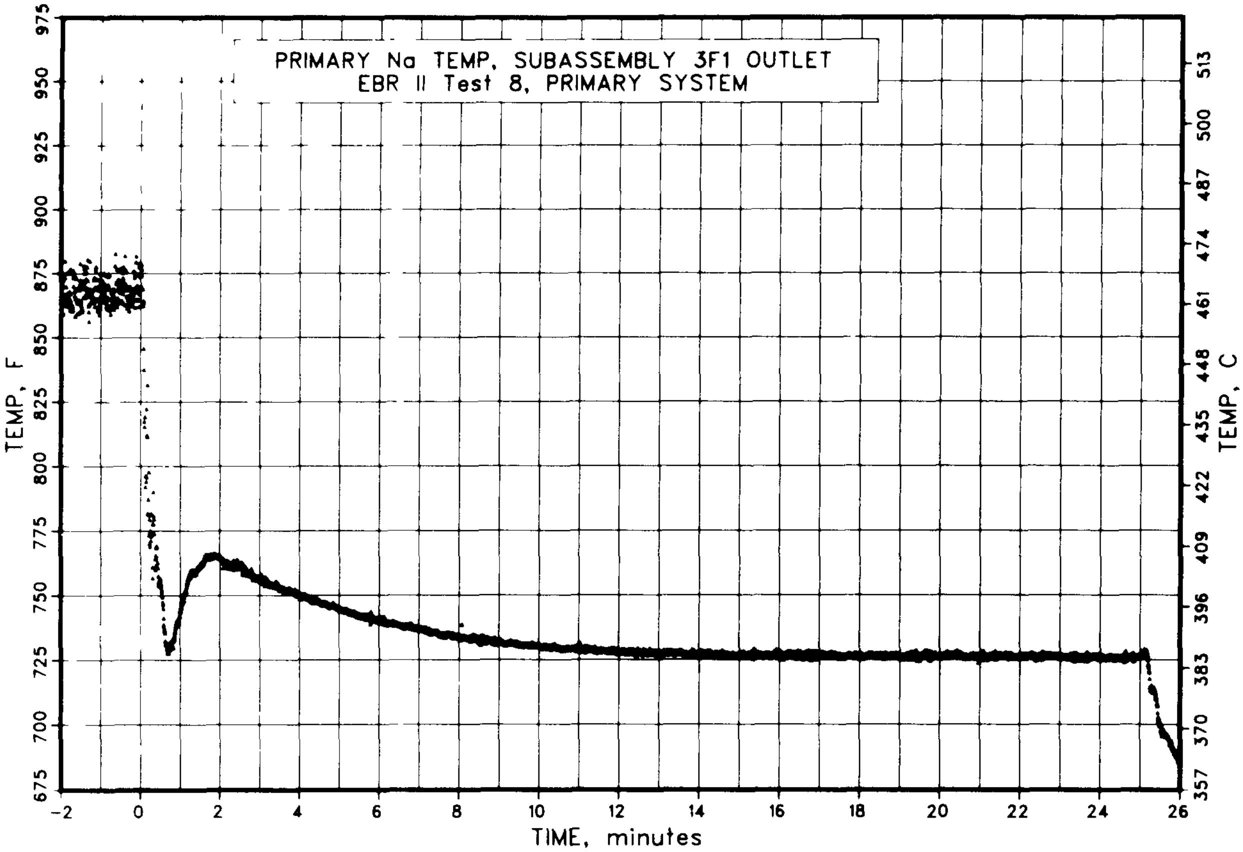
PRIMARY Na TEMP, SUBASSEMBLY 3F1 OUTLET
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TEMP, C
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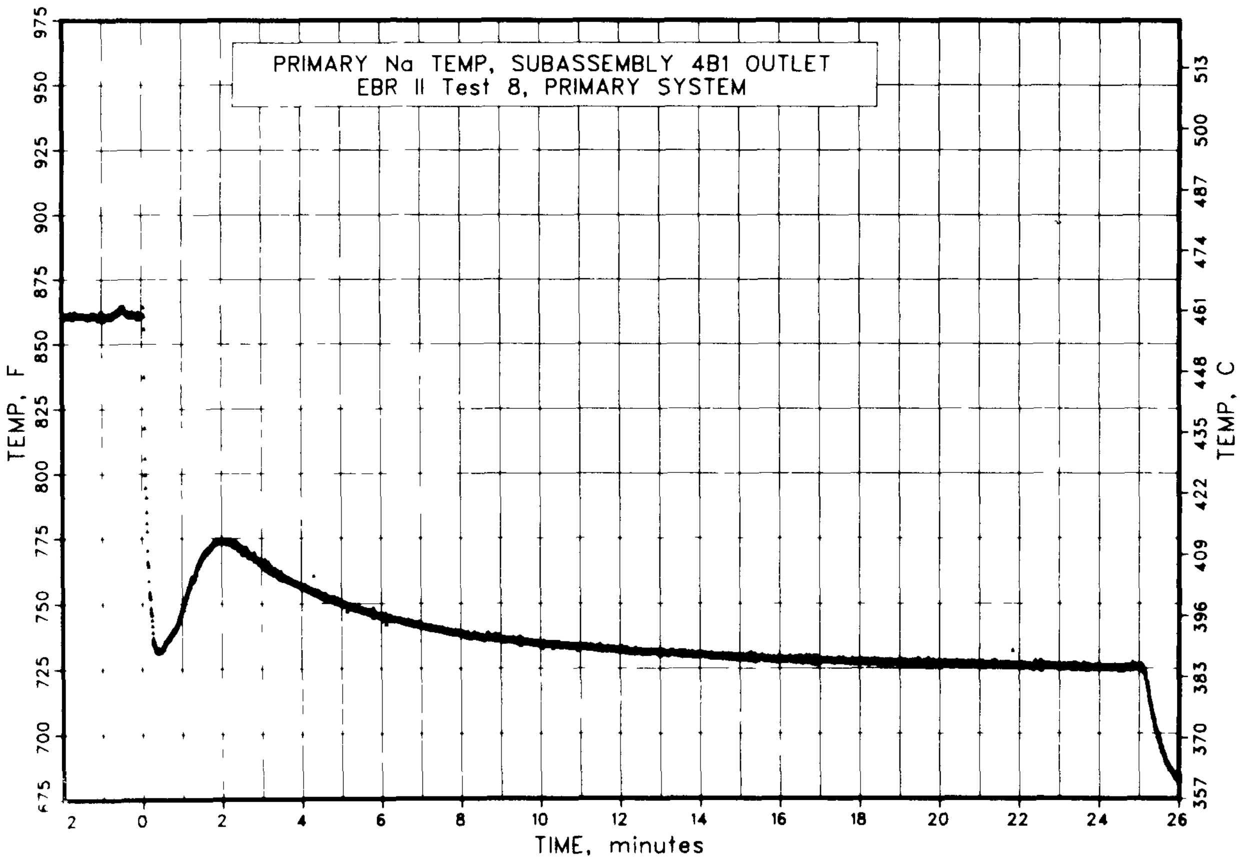
PRIMARY Na TEMP, SUBASSEMBLY 4B1 OUTLET
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TEMP, C
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TIME, minutes
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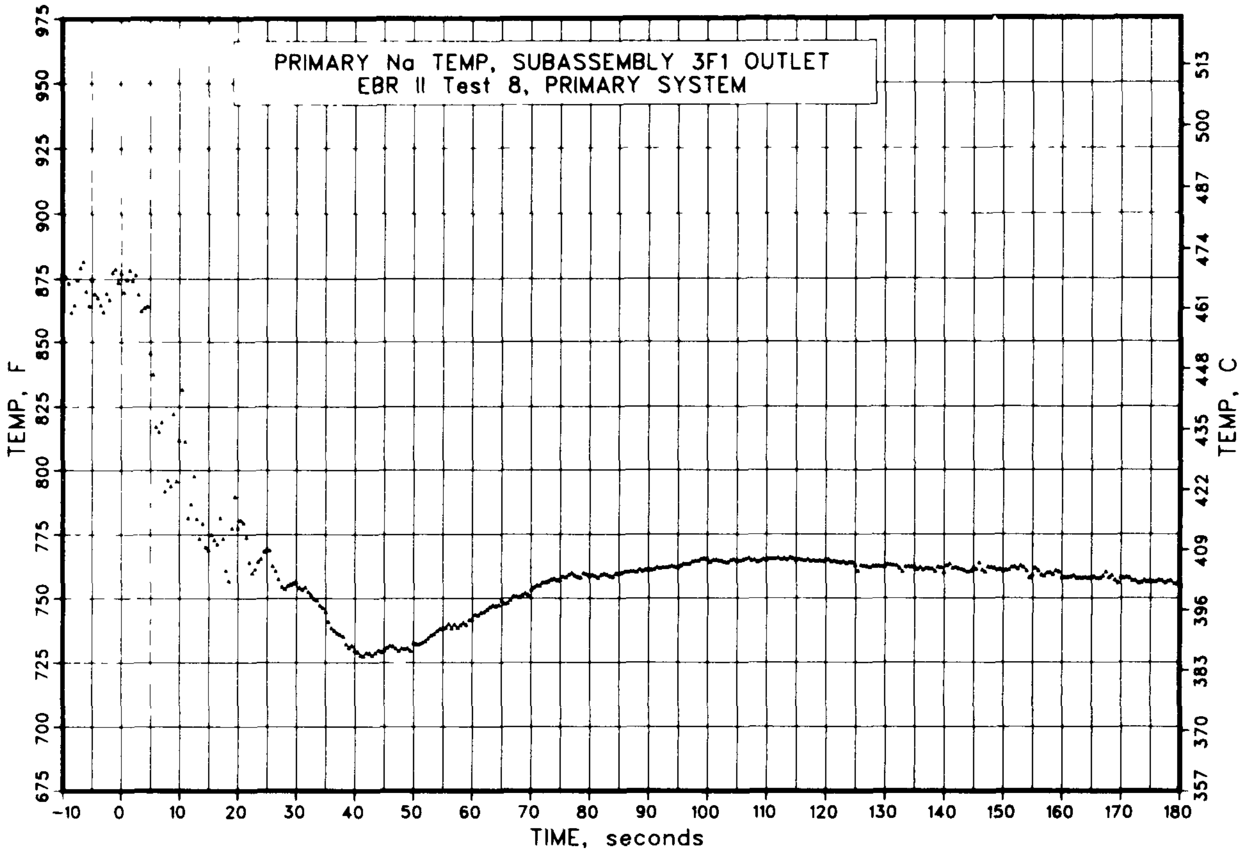
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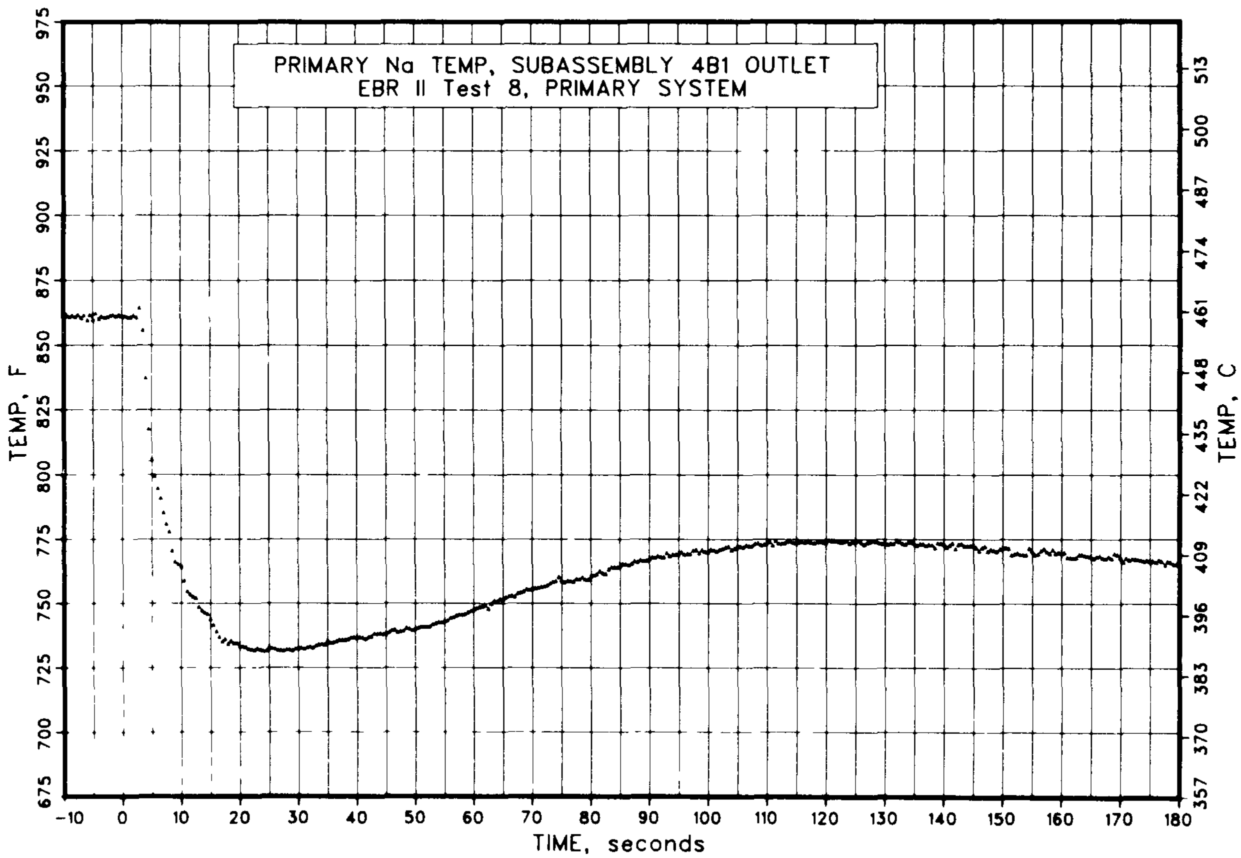
TEMP, F
TEMP, C
TIME, seconds


PRIMARY Na TEMP, SUBASSEMBLY 4B1 OUTLET
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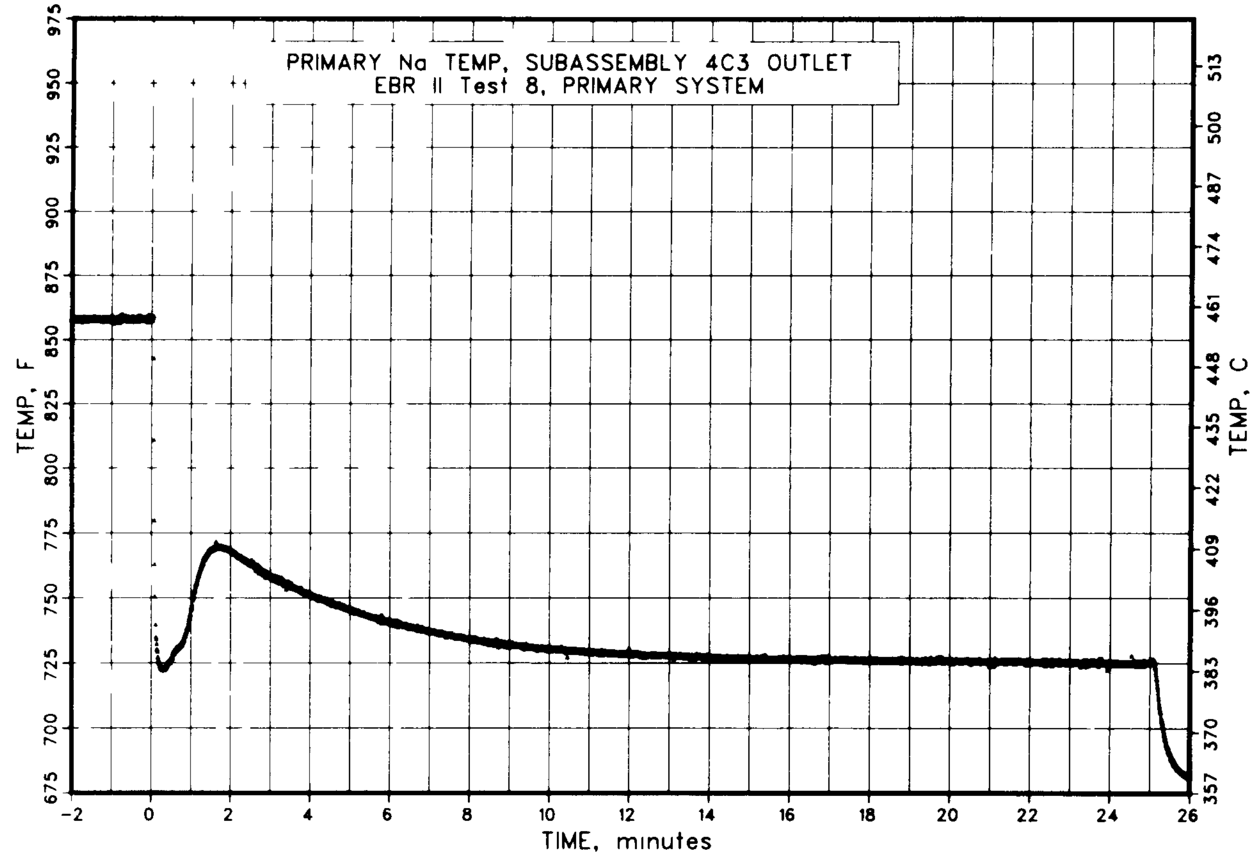
TEMP, F
TEMP, C
TIME, seconds


PRIMARY Na TEMP, SUBASSEMBLY 4C3 OUTLET
EBR II Test 8, PRIMARY SYSTEM
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TEMP, C
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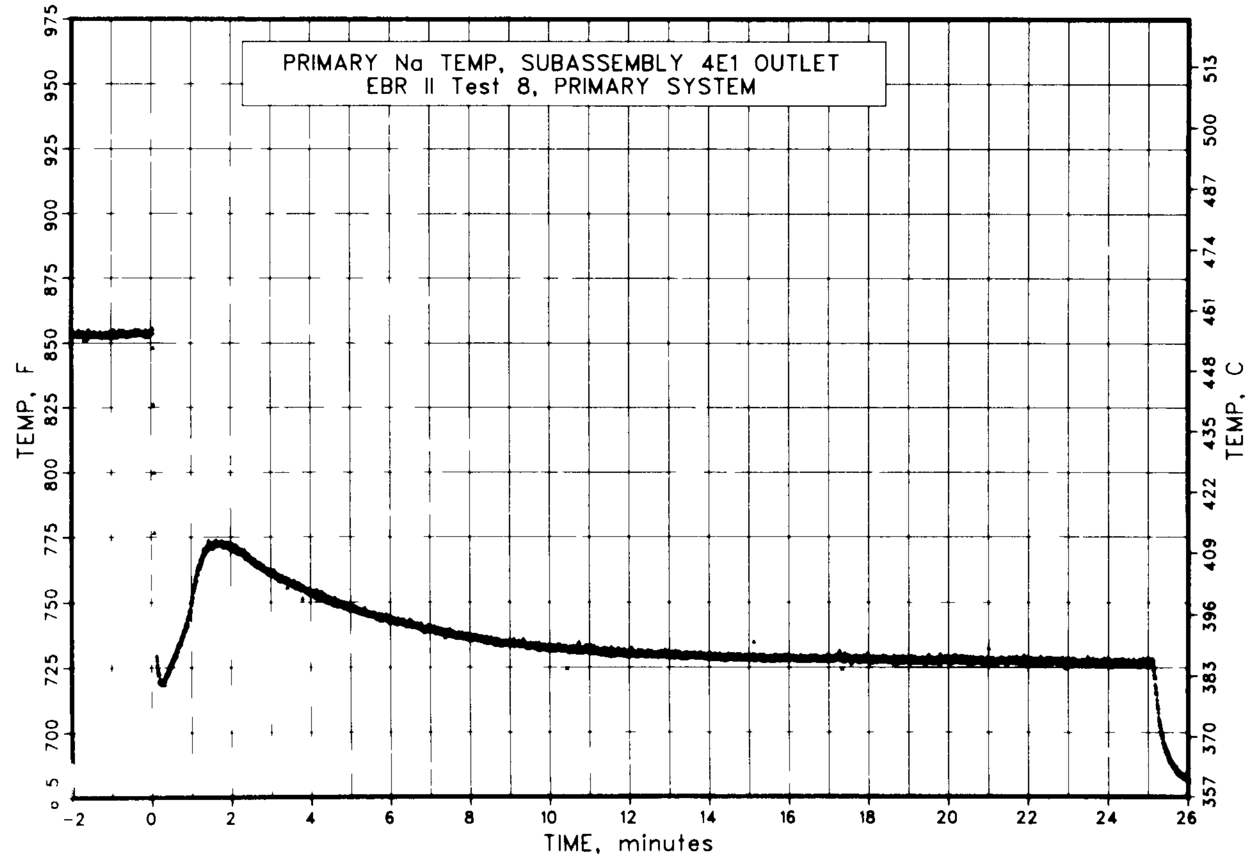
PRIMARY Na TEMP, SUBASSEMBLY 4E1 OUTLET
EBR II Test 8, PRIMARY SYSTEM
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TEMP, C
TIME, minutes
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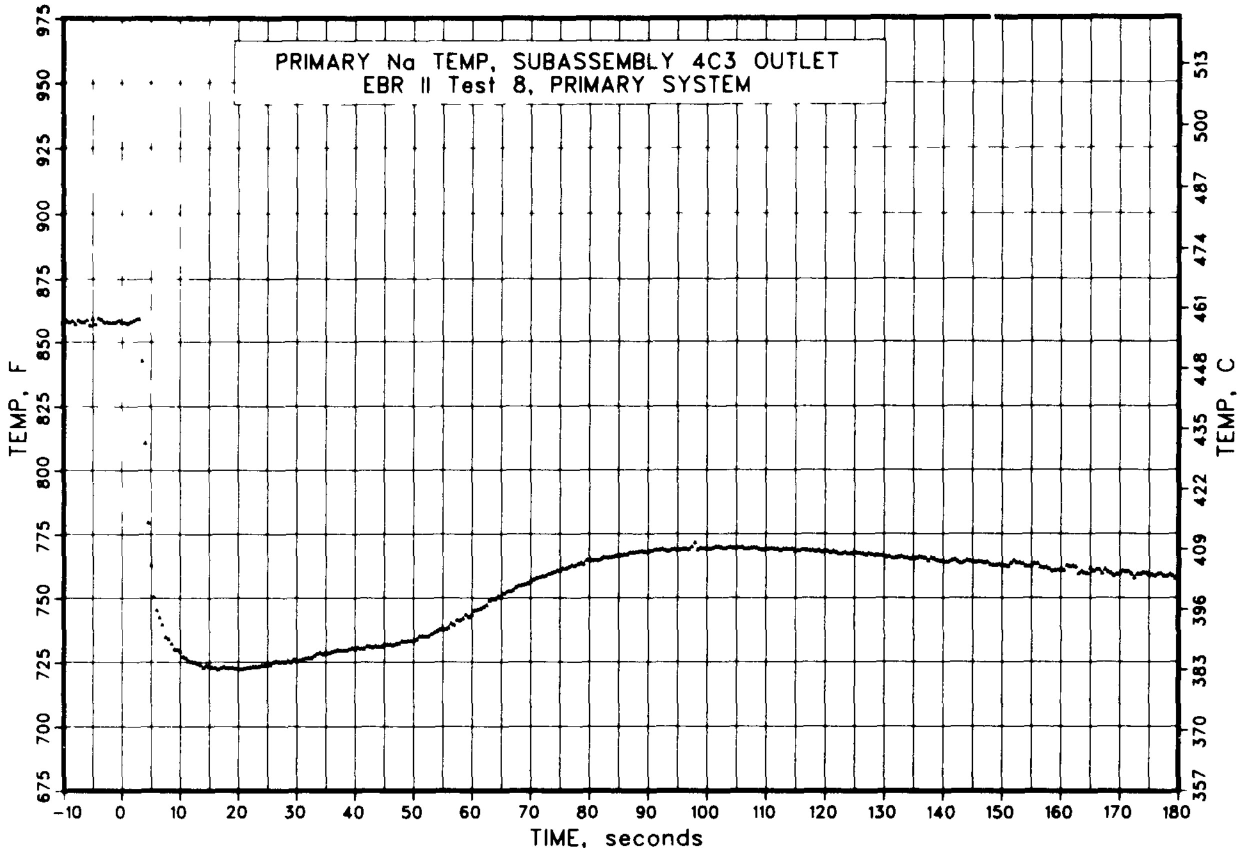
PRIMARY Na TEMP, SUBASSEMBLY 4C3 OUTLET
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TEMP, F
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TEMP, C
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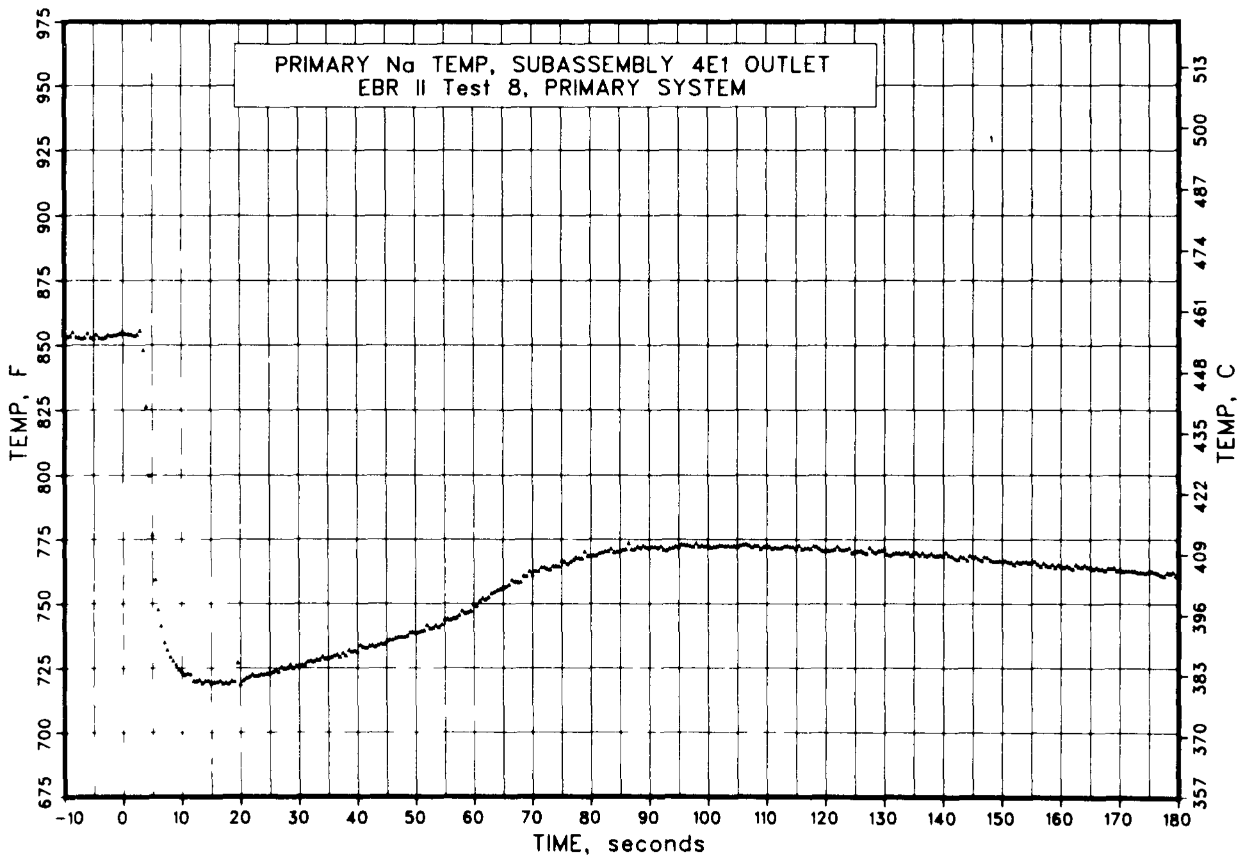
TIME, seconds


PRIMARY Na TEMP, SUBASSEMBLY 4E1 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
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TEMP, C
513 500 487 474 461 448 435 422 409 396 383 370 357
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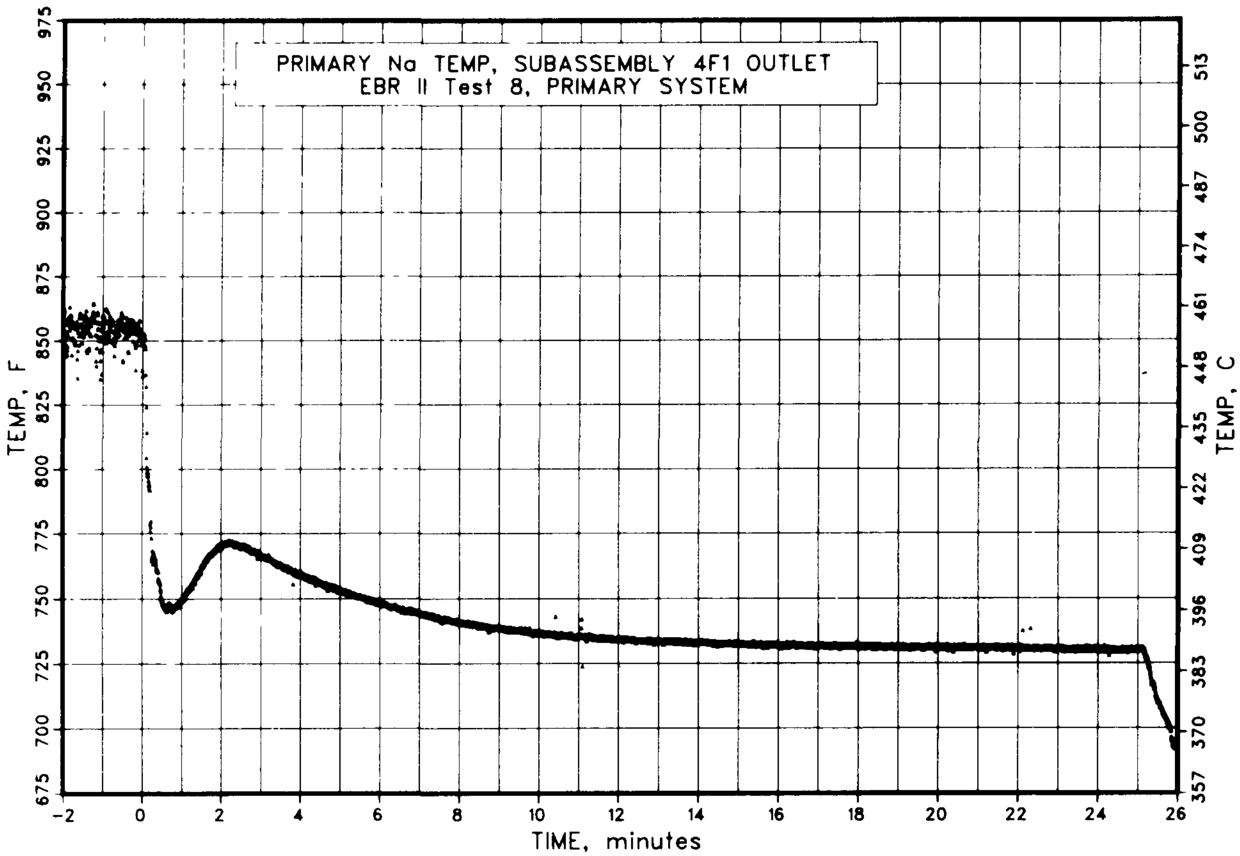
TIME, seconds


PRIMARY Na TEMP, SUBASSEMBLY 4F1 OUTLET
EBR II Test 8, PRIMARY SYSTEM
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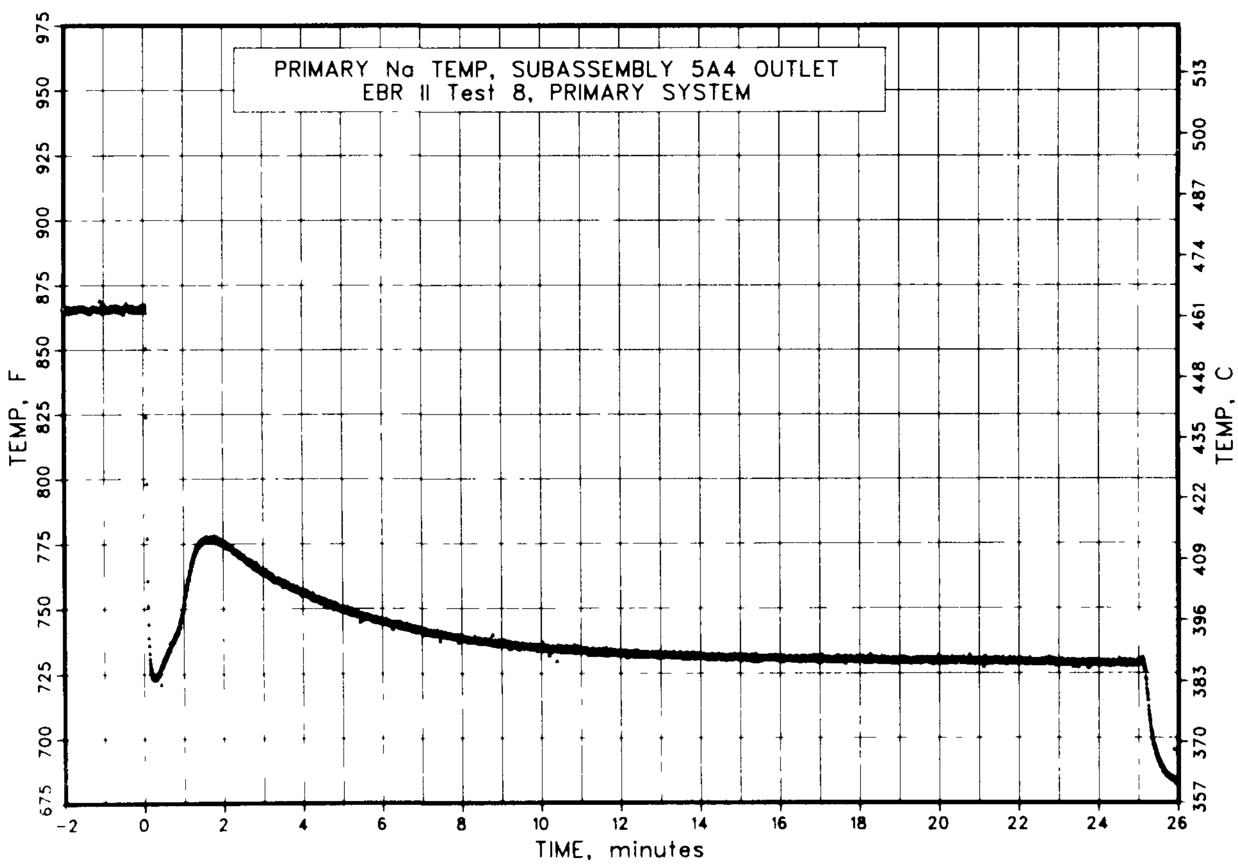
TIME, minutes


PRIMARY Na TEMP, SUBASSEMBLY 5A4 OUTLET
EBR II Test 8, PRIMARY SYSTEM
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TEMP, C
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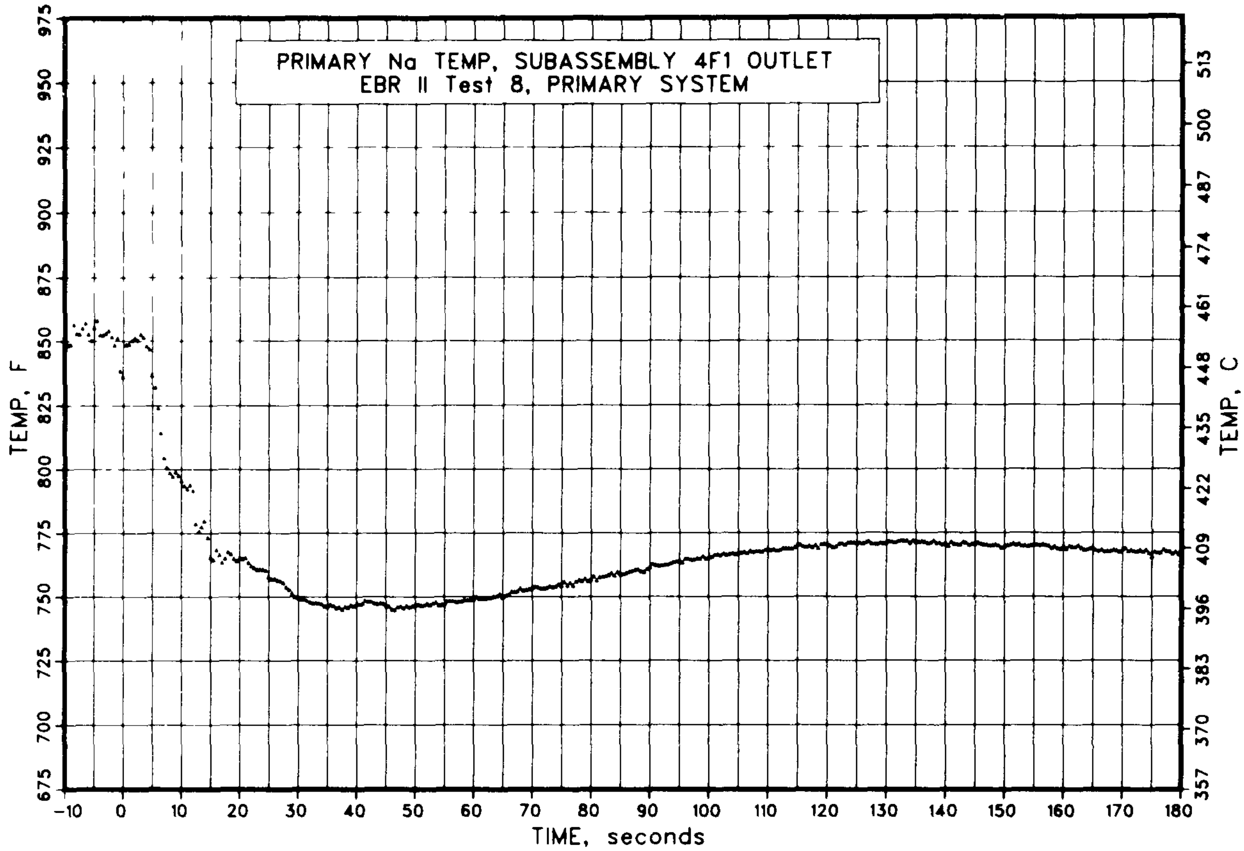
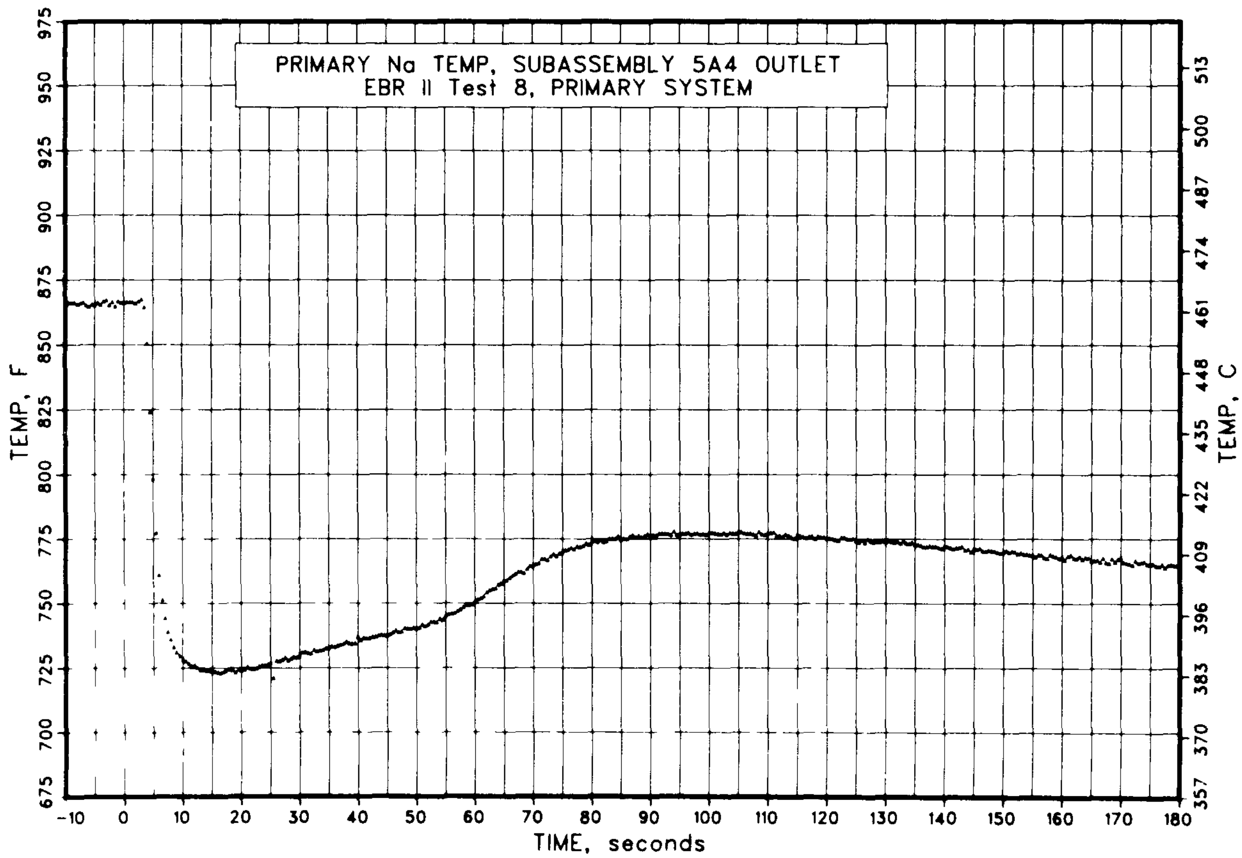
TIME, minutes


PRIMARY Na TEMP, SUBASSEMBLY 4F1 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds


PRIMARY Na TEMP, SUBASSEMBLY 5A4 OUTLET
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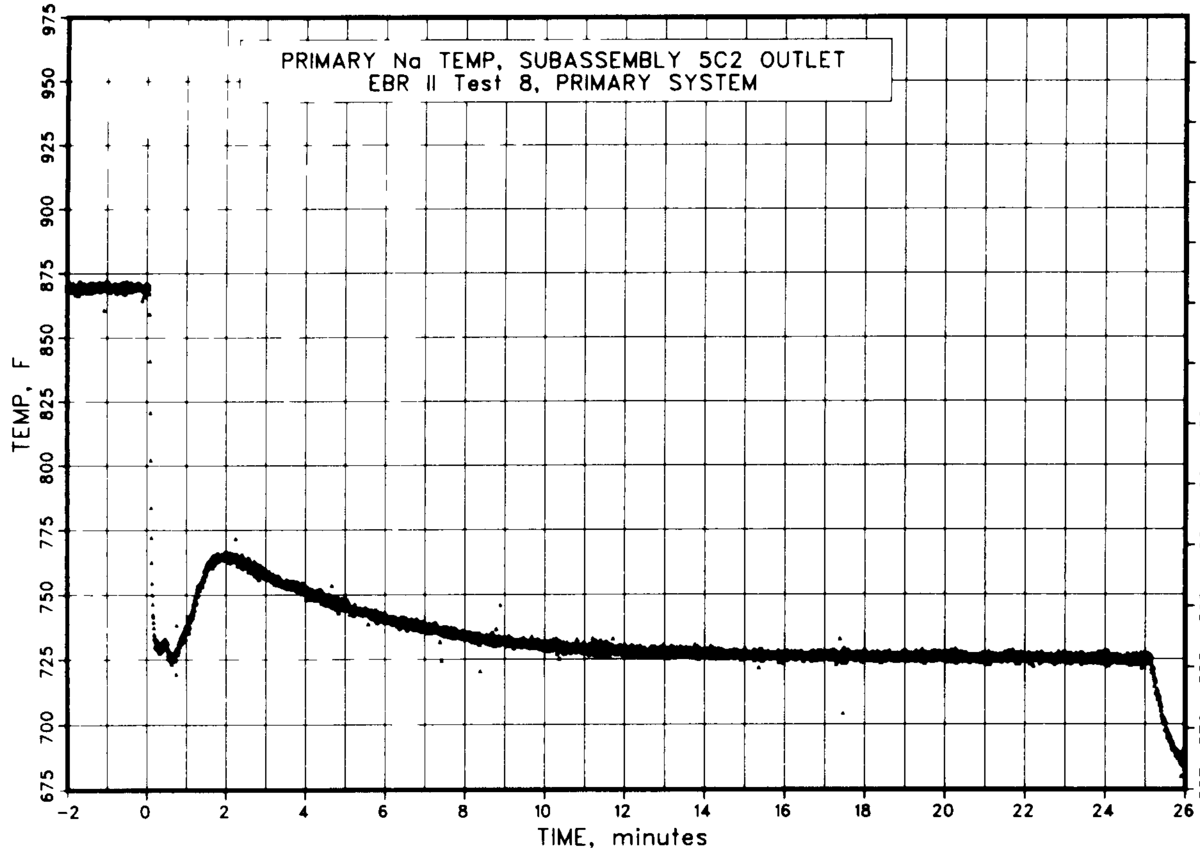
TEMP, F
TEMP, C
TIME, seconds


PRIMARY Na TEMP, SUBASSEMBLY 5C2 OUTLET
EBR II Test 8, PRIMARY SYSTEM
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TEMP, C
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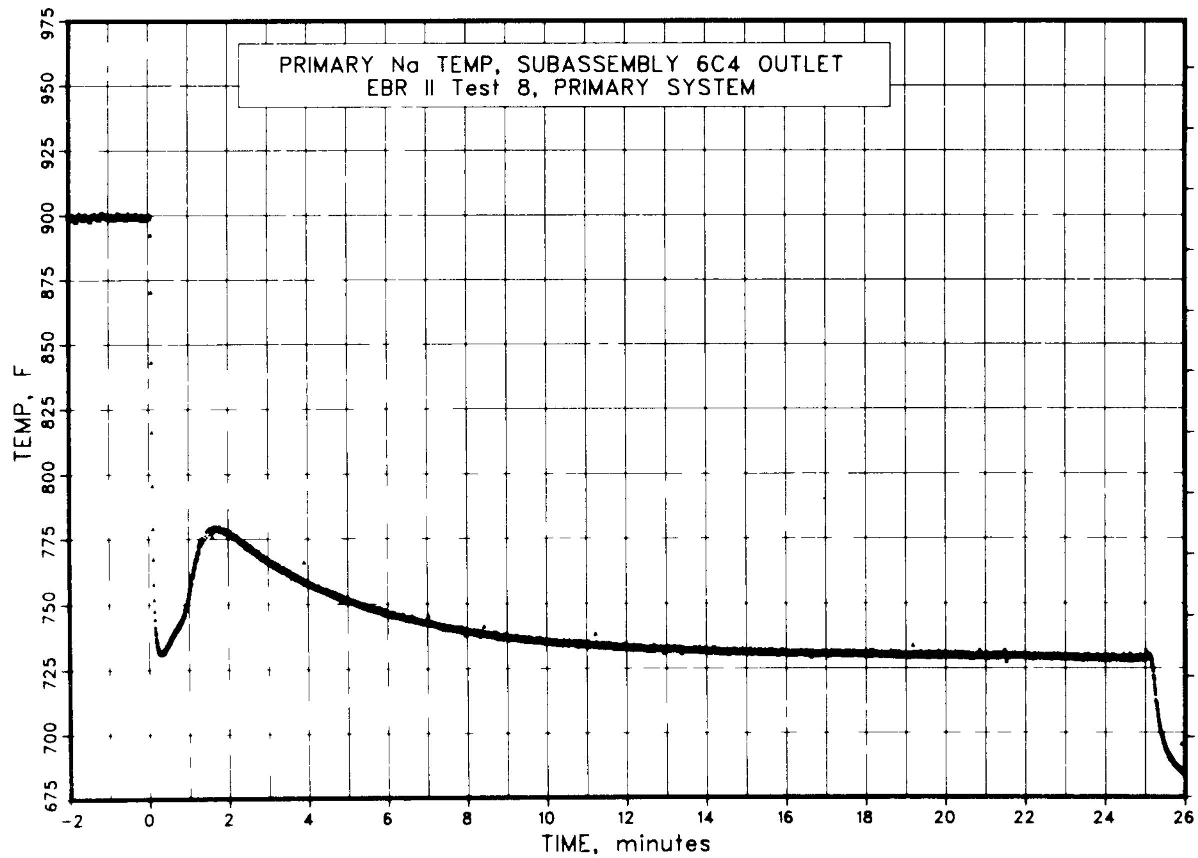
TIME, minutes


PRIMARY Na TEMP, SUBASSEMBLY 6C4 OUTLET
EBR II Test 8, PRIMARY SYSTEM
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TEMP, C
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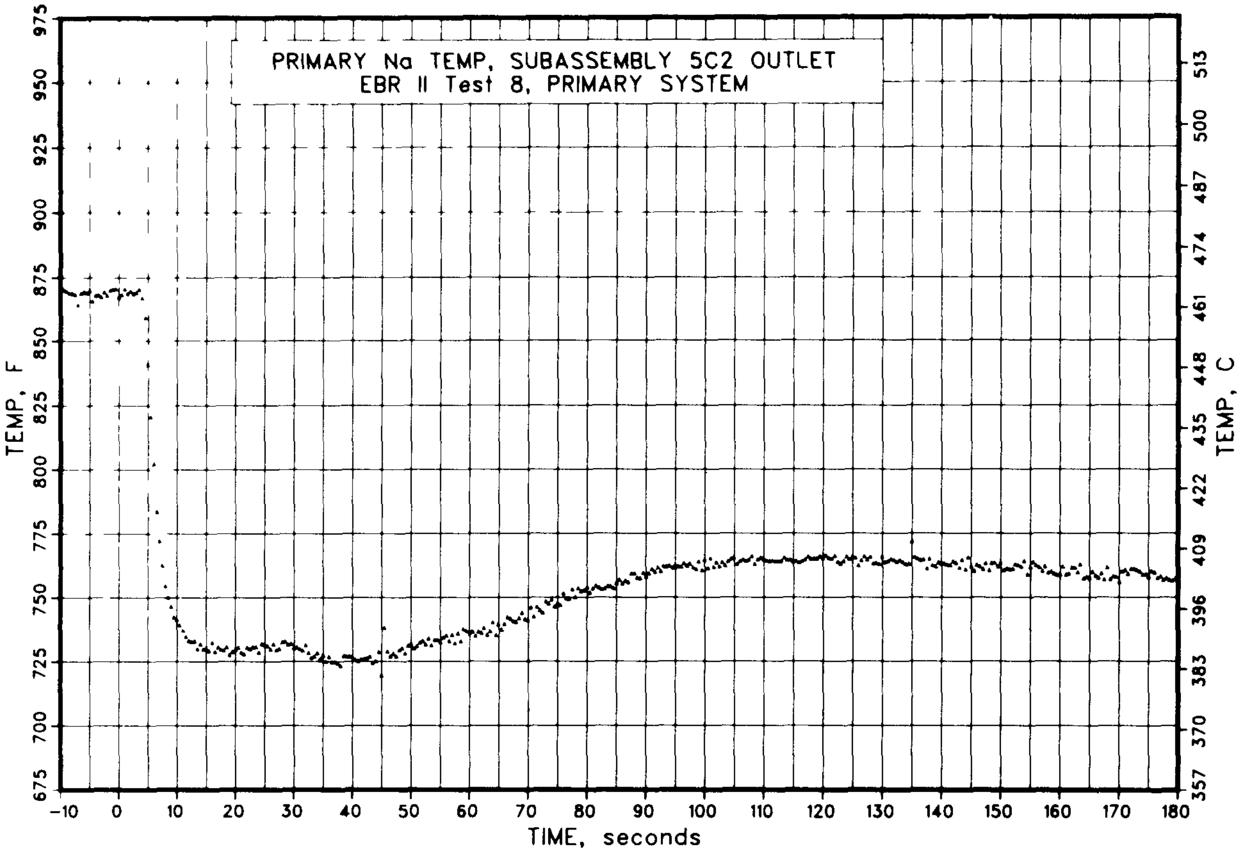
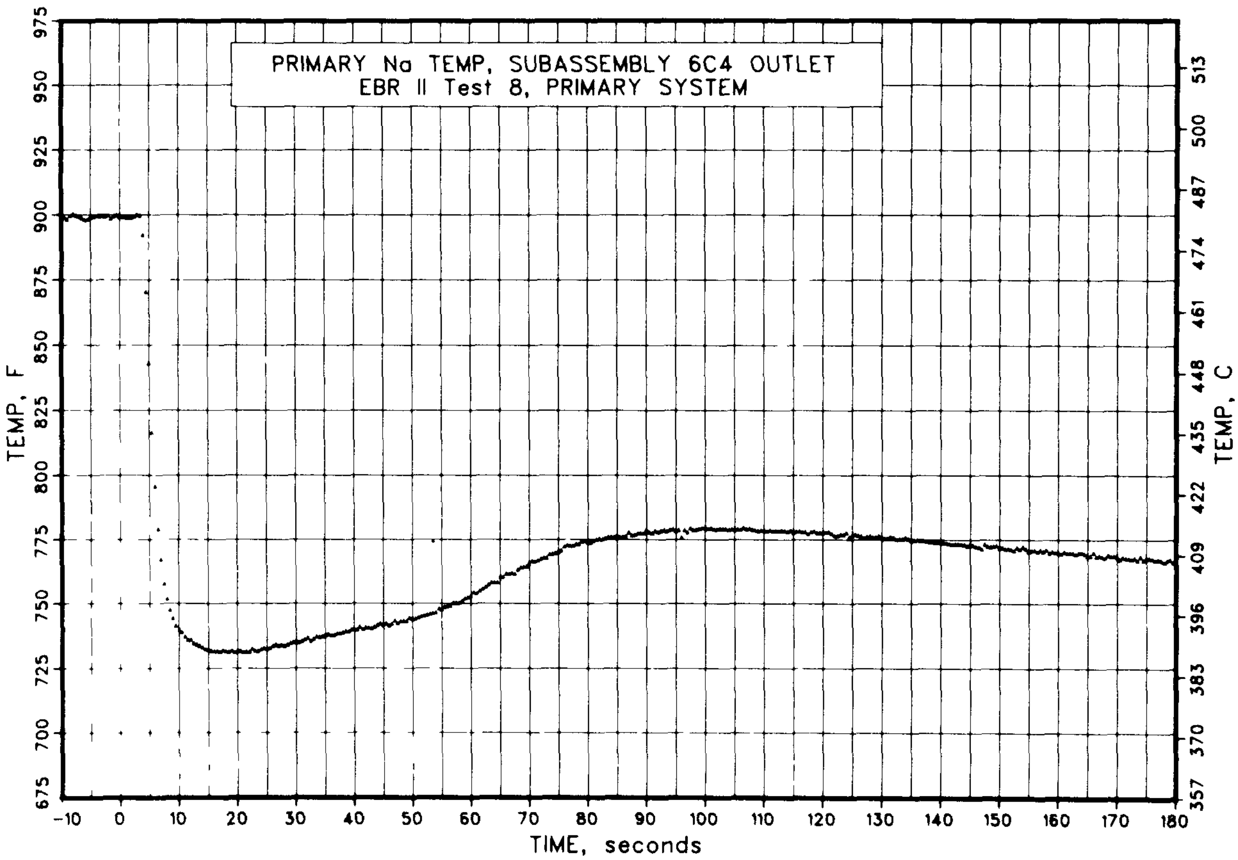
26
TIME, minutes


PRIMARY Na TEMP, SUBASSEMBLY 5C2 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds


PRIMARY Na TEMP, SUBASSEMBLY 6C4 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-10
0
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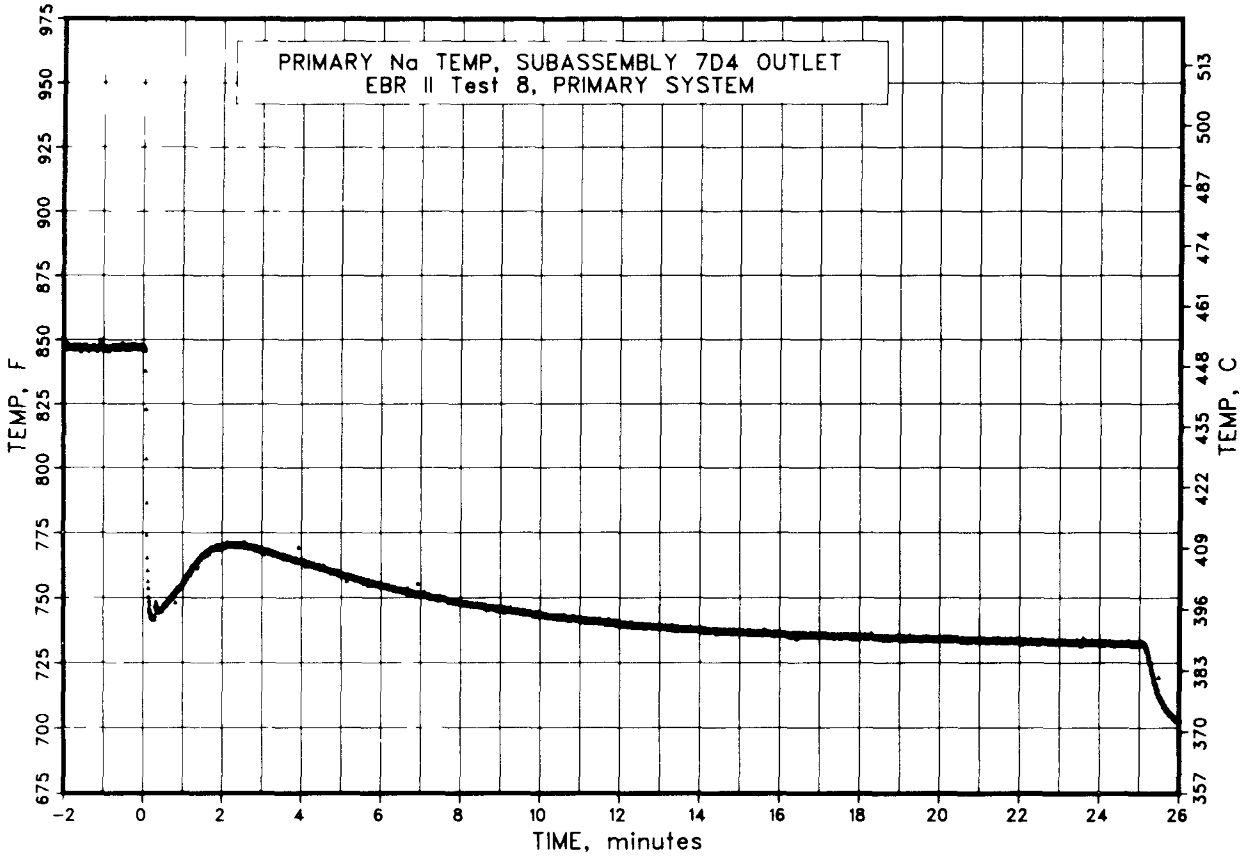
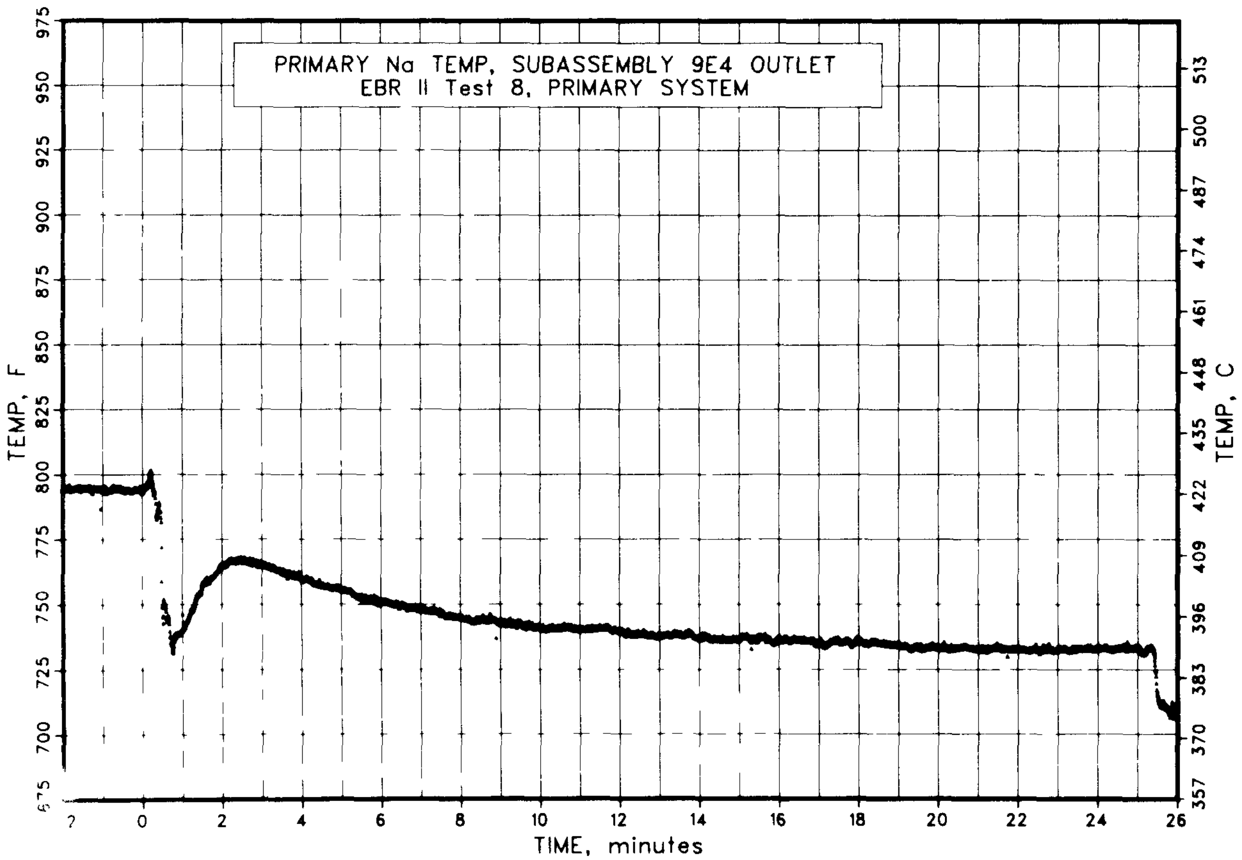
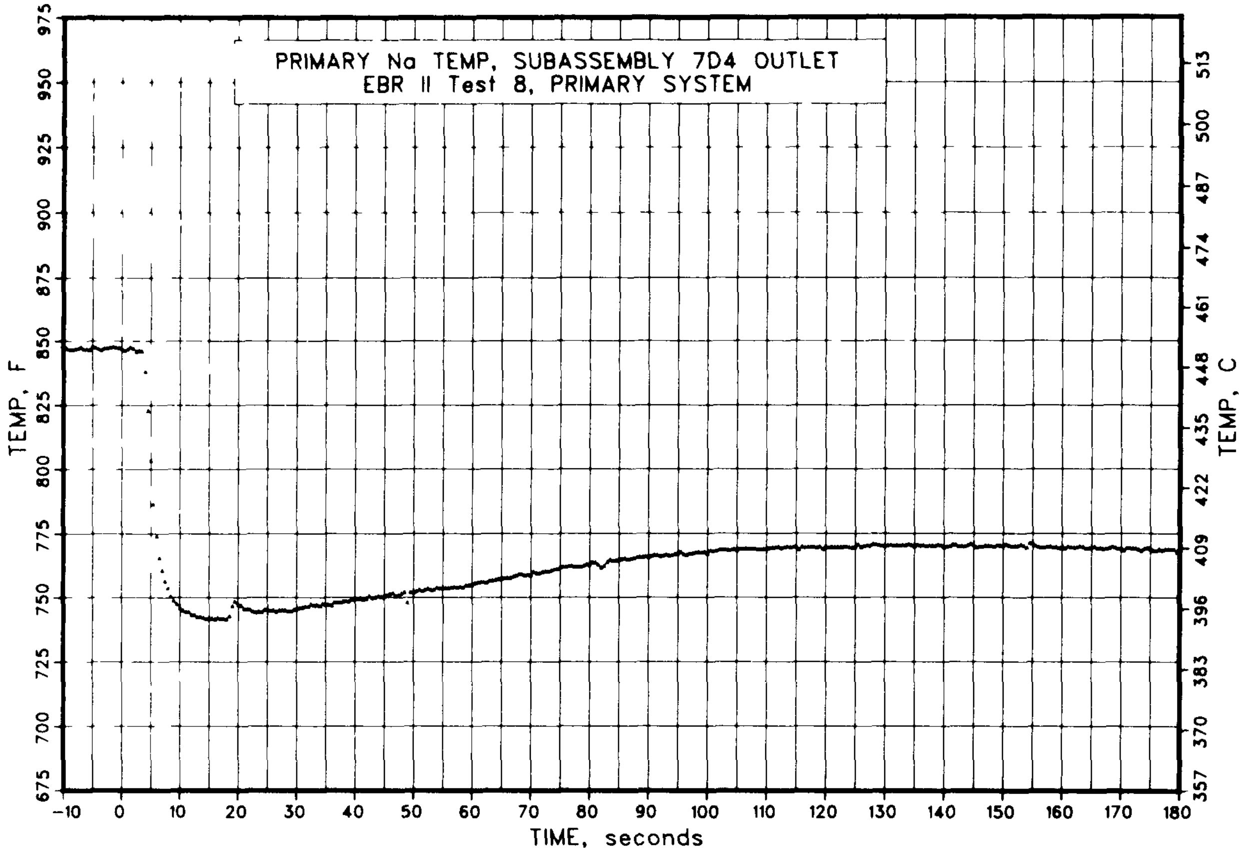
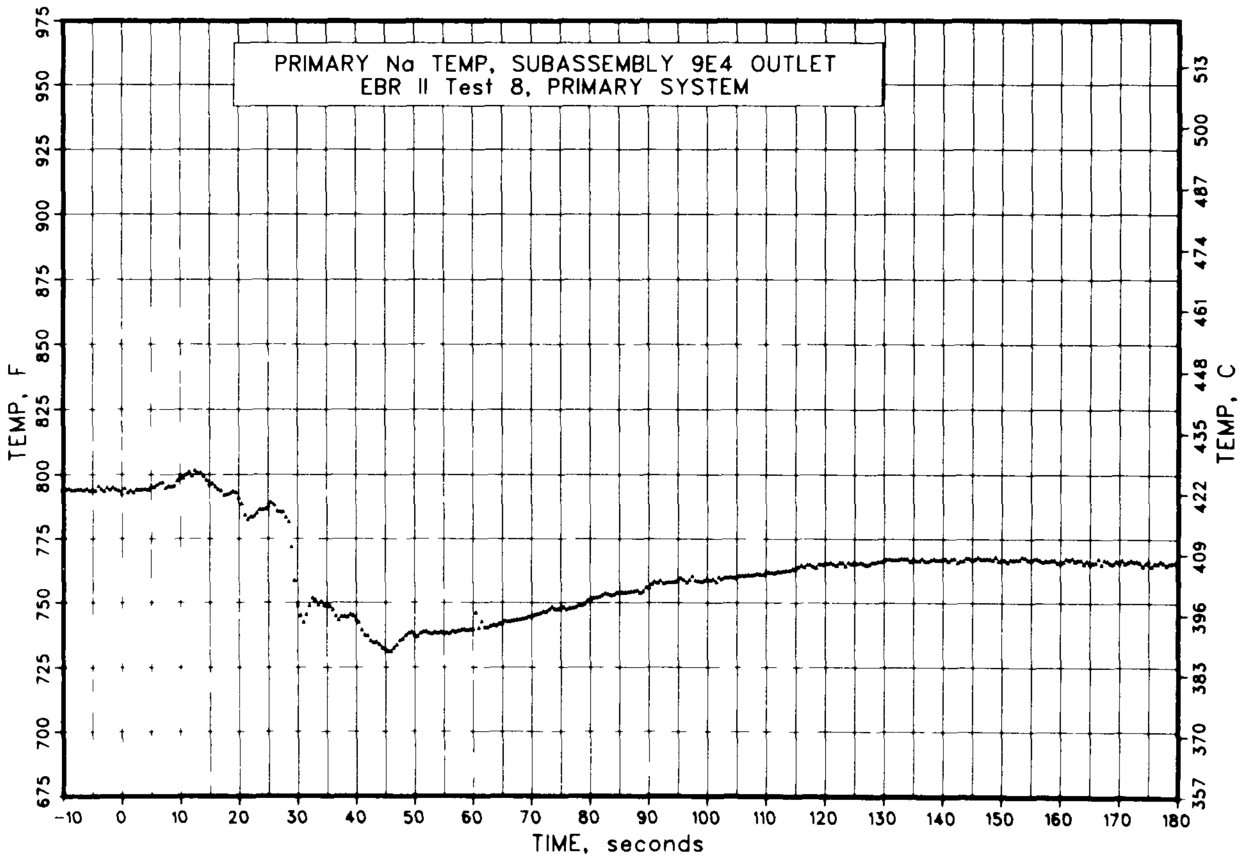
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds


PRIMARY Na TEMP, SUBASSEMBLY 7D4 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

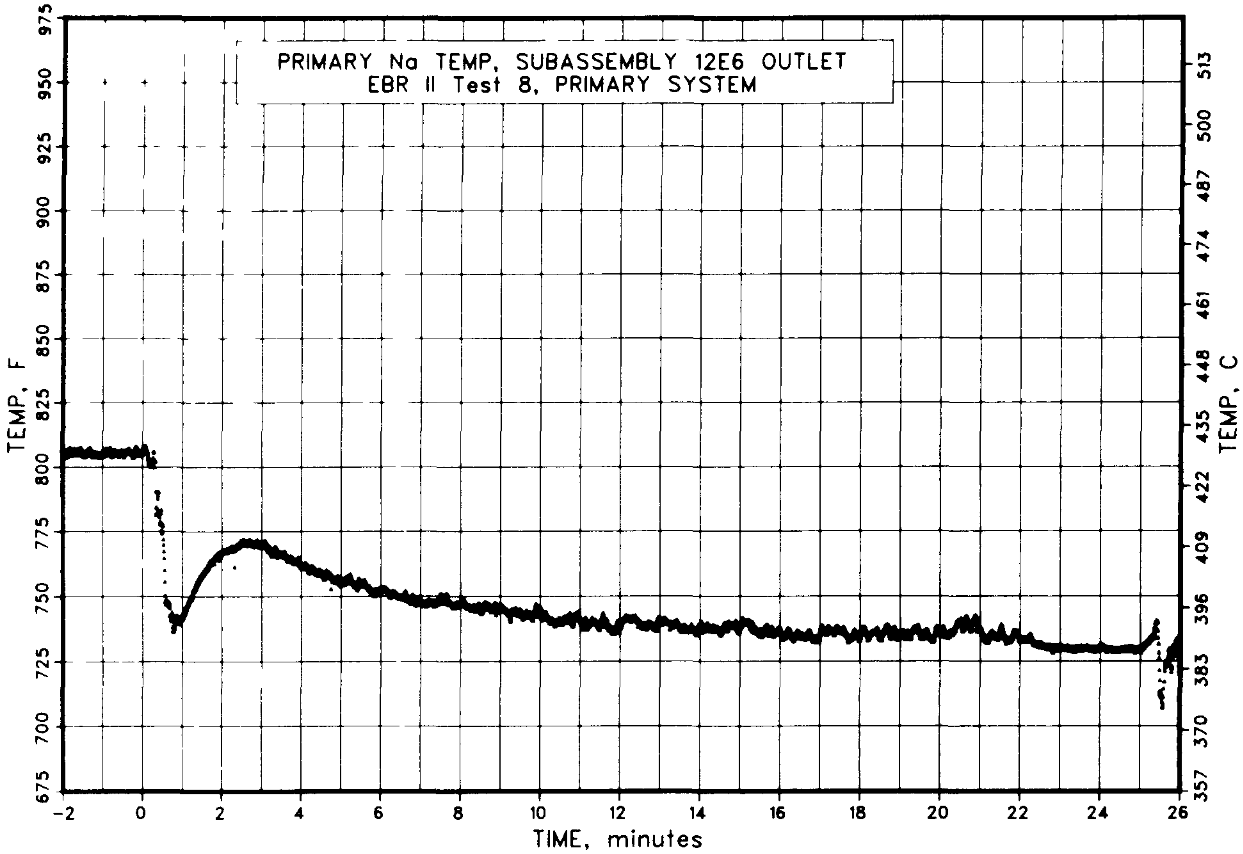

PRIMARY Na TEMP, SUBASSEMBLY 9E4 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes



PRIMARY Na TEMP, SUBASSEMBLY 7D4 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds



PRIMARY Na TEMP, SUBASSEMBLY 9E4 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds


PRIMARY Na TEMP, SUBASSEMBLY 12E6 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
975
950
925
900
875
850
825
800
775
750
725
700
675
513
500
487
474
461
448
435
422
409
396
383
370
357
-2
0
2
4
6
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12
14
16
18
20
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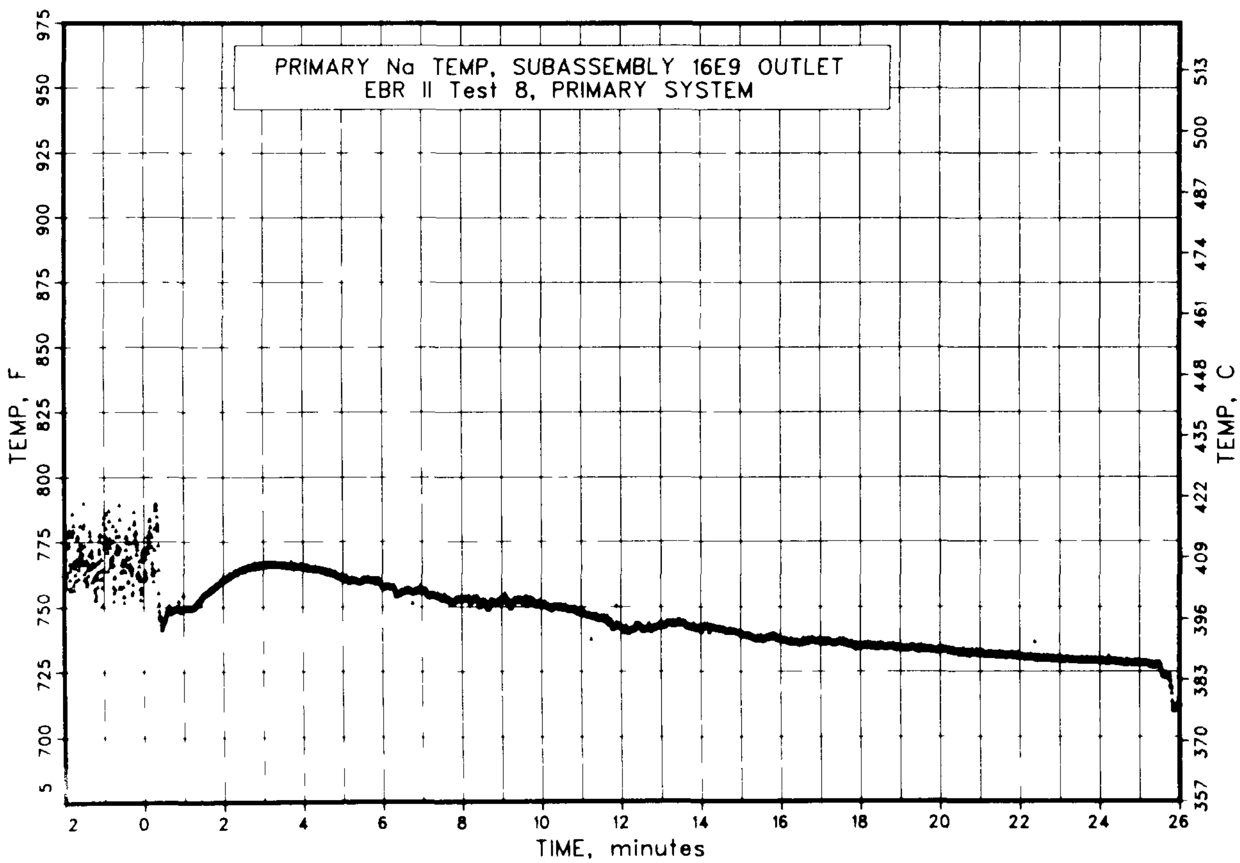
24
26


PRIMARY Na TEMP, SUBASSEMBLY 16E9 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
975
950
925
900
875
850
825
800
775
750
725
700
5
513
500
487
474
461
448
435
422
409
396
383
370
357
2
0
2
4
6
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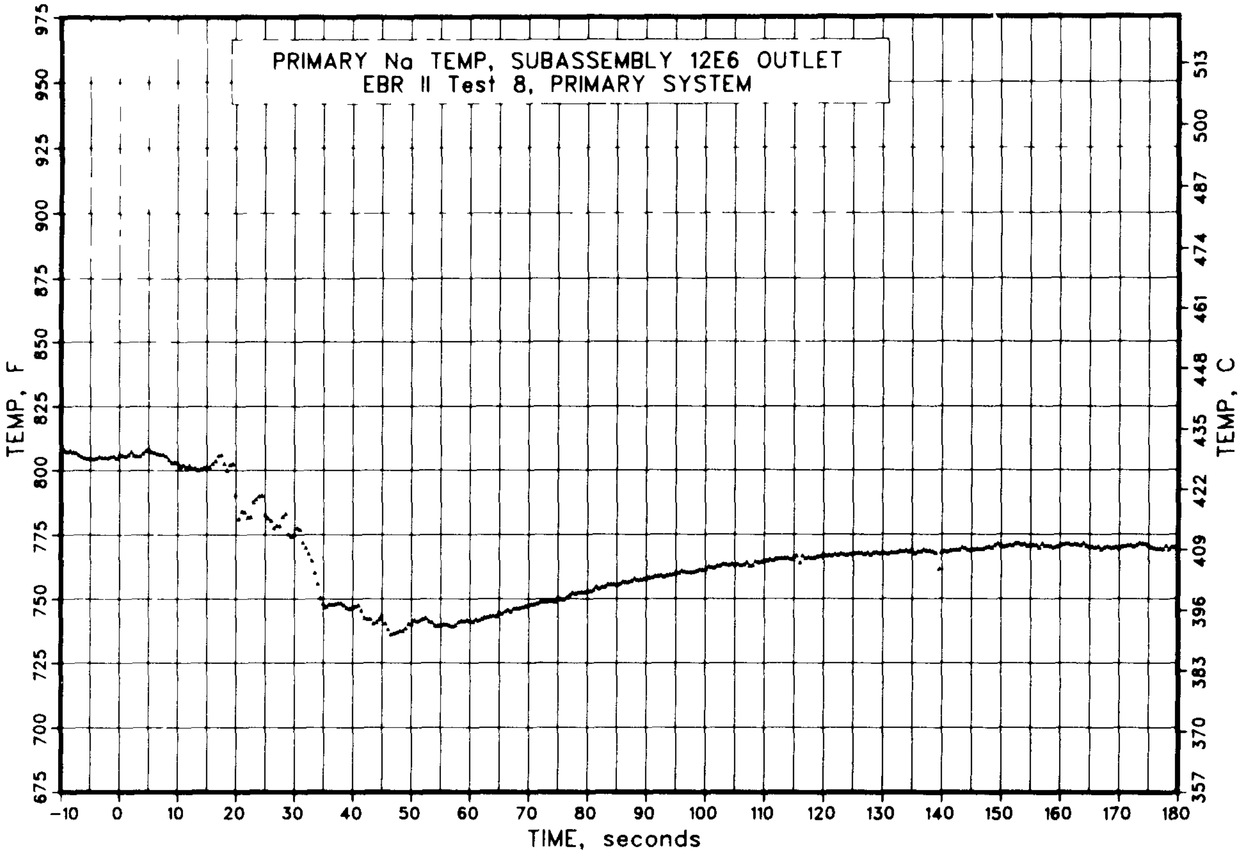
12
14
16
18
20
22
24
26


PRIMARY Na TEMP, SUBASSEMBLY 12E6 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
975
950
925
900
875
850
825
800
775
750
725
700
675
513
500
487
474
461
448
435
422
409
396
383
370
357
-10
0
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20
30
40
50
60
70
80
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100
110
120
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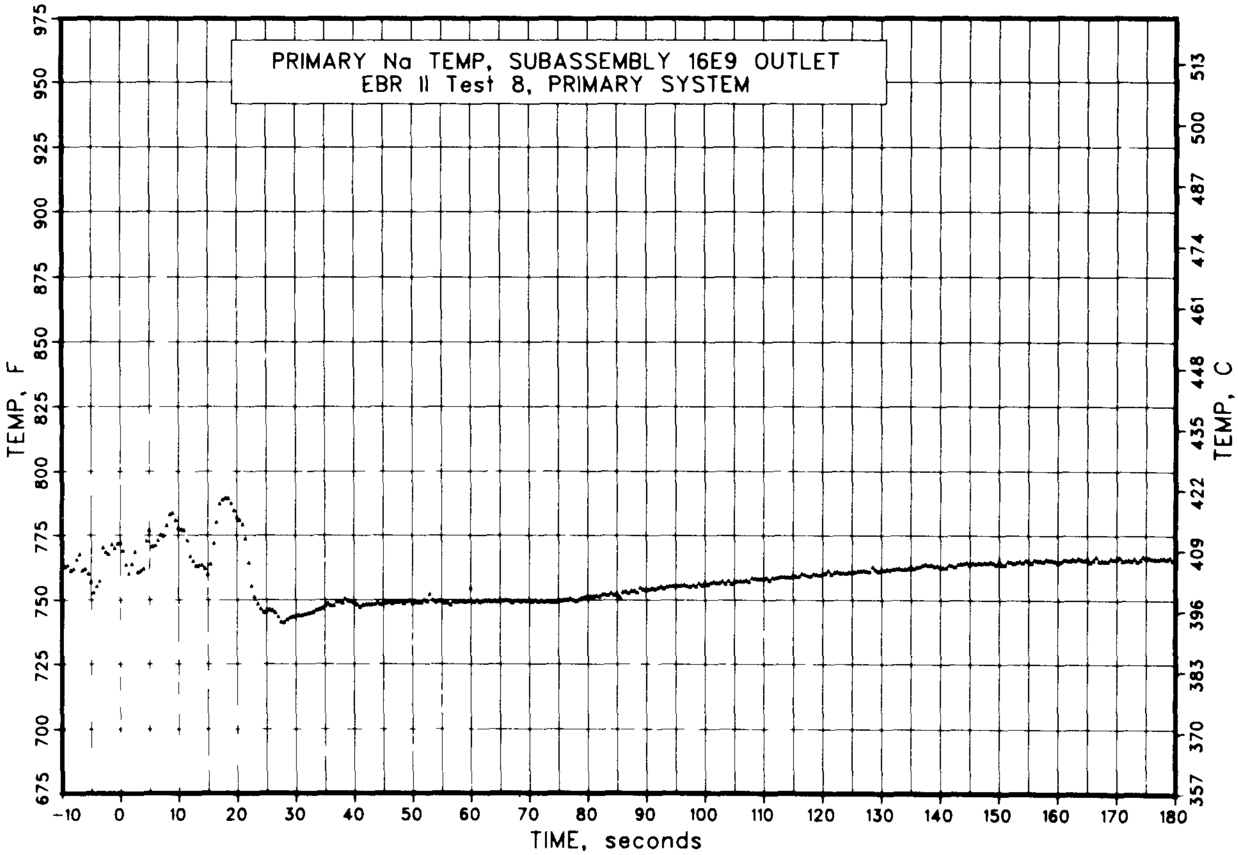
150
160
170
180


PRIMARY Na TEMP, SUBASSEMBLY 16E9 OUTLET
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
975
950
925
900
875
850
825
800
775
750
725
700
675
513
500
487
474
461
448
435
422
409
396
383
370
357
-10
0
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20
30
40
50
60
70
80
90
100
110
120
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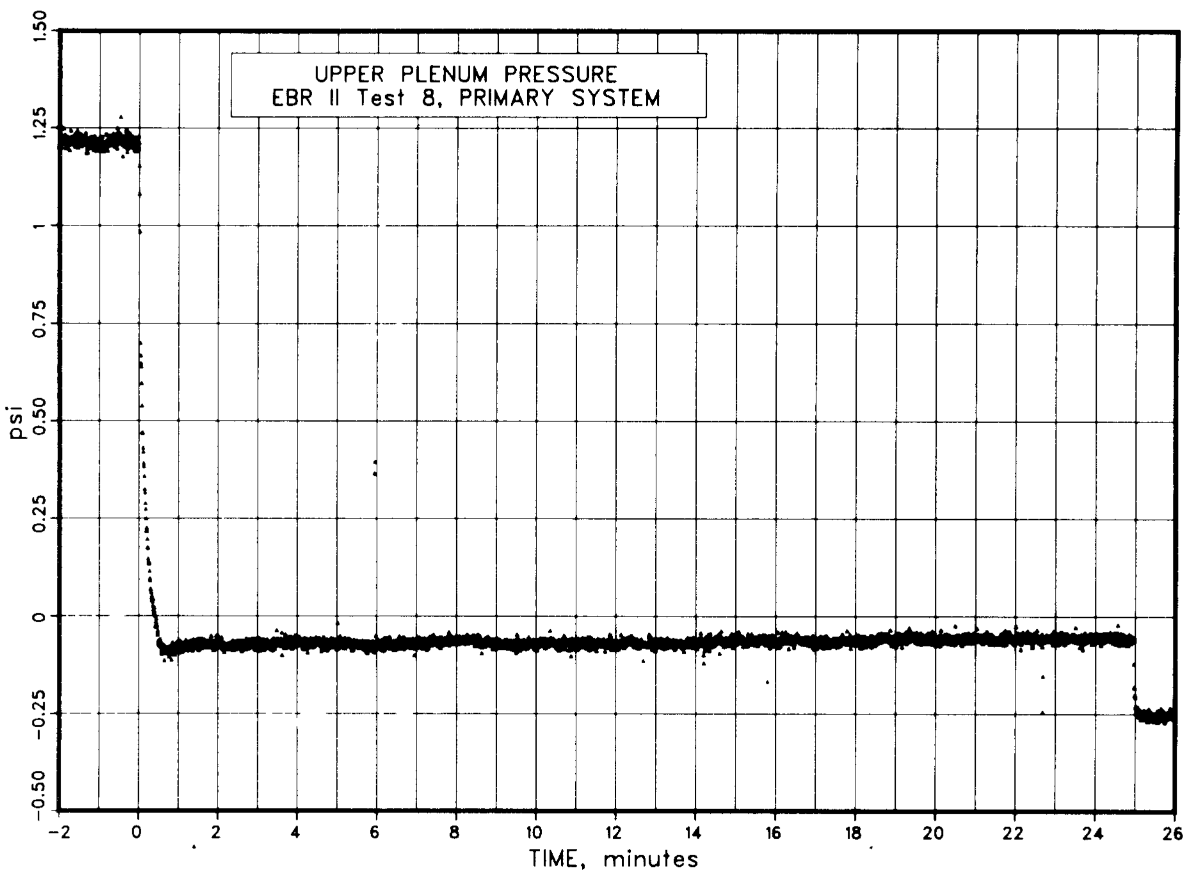
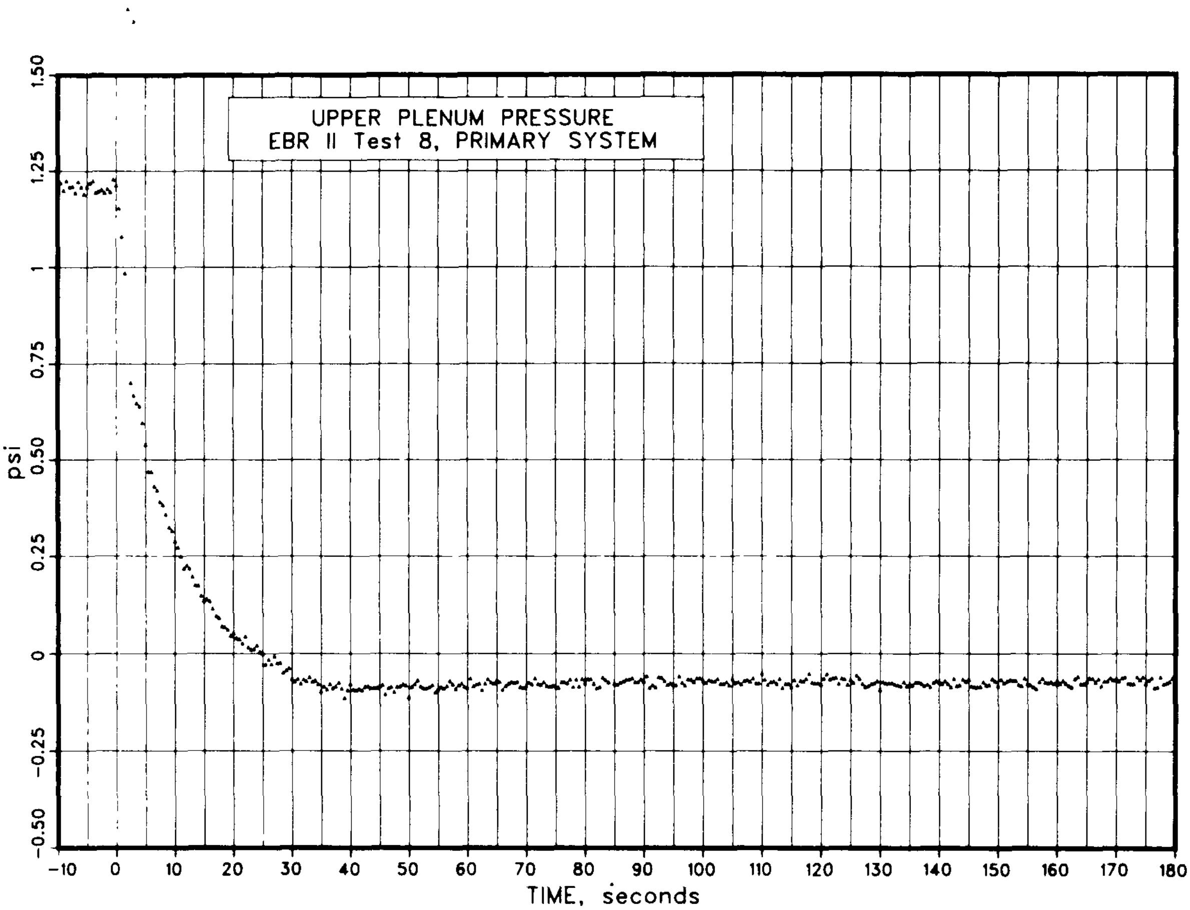
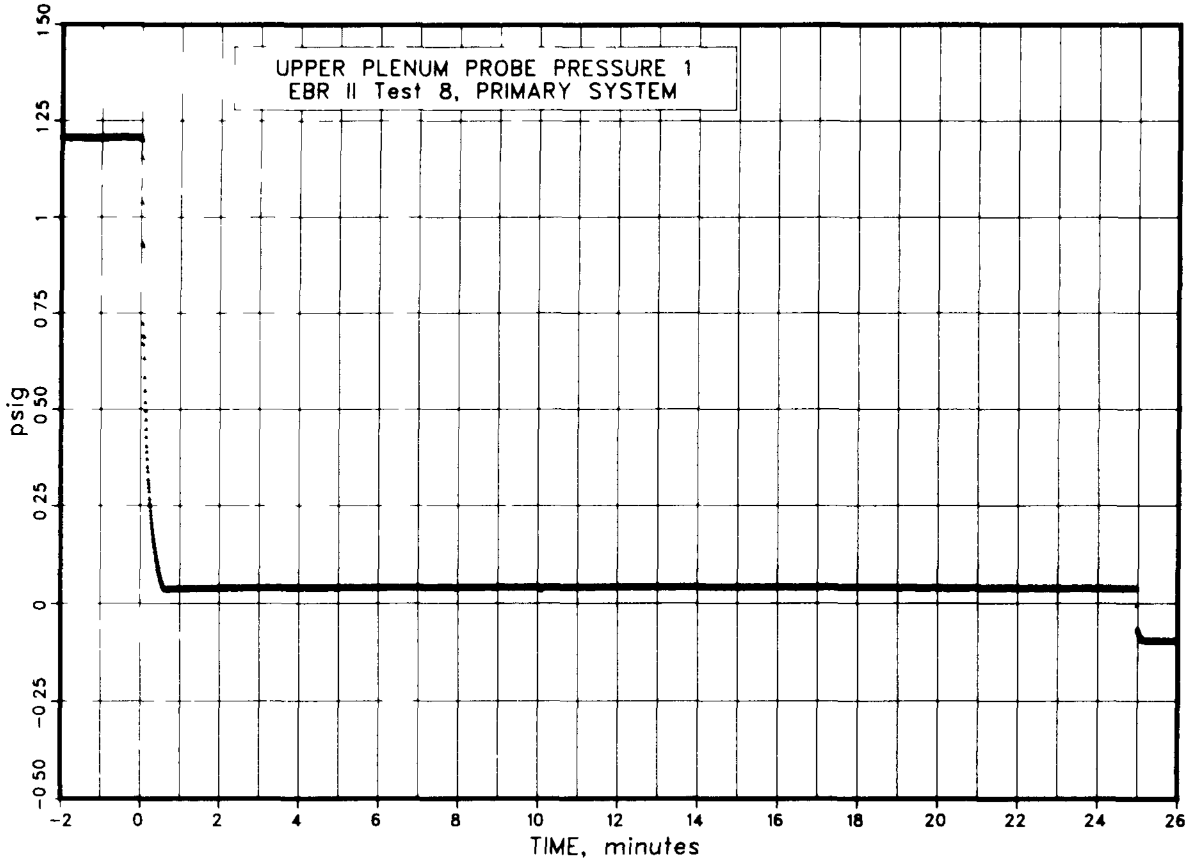
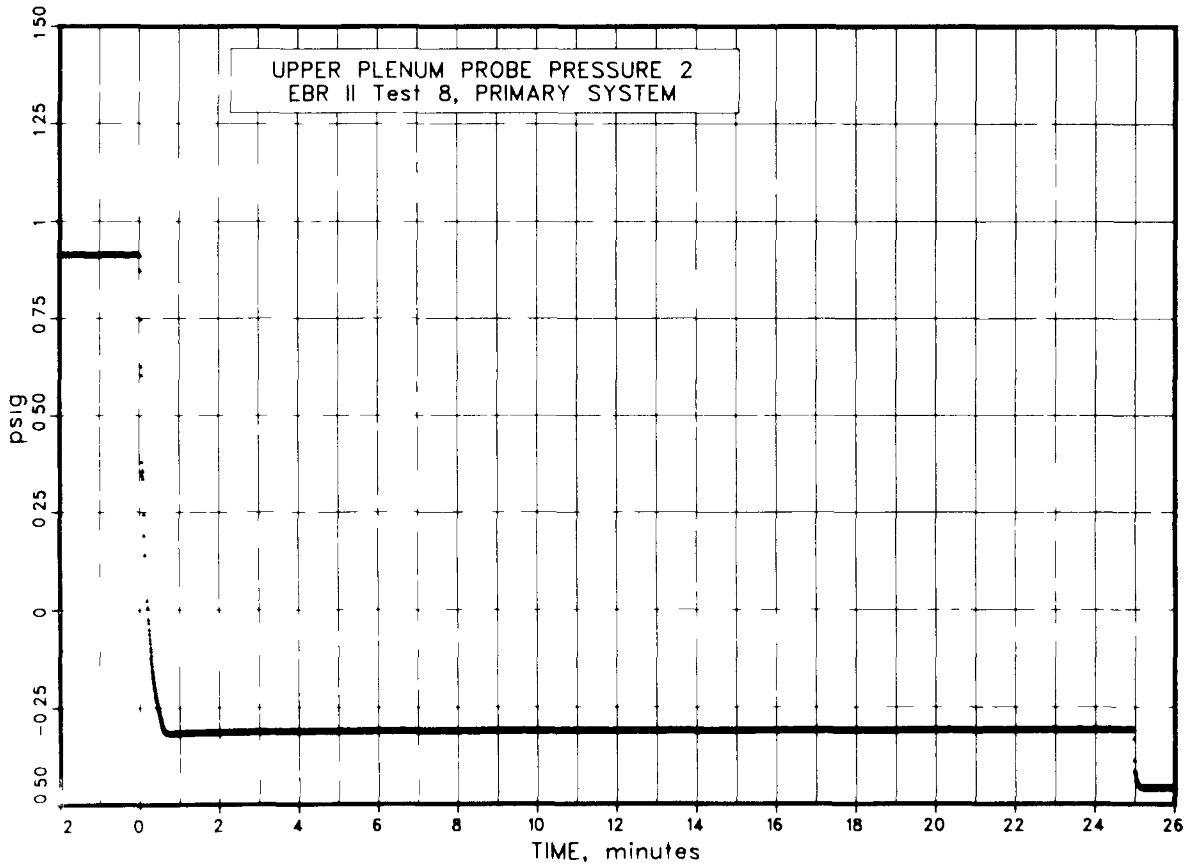
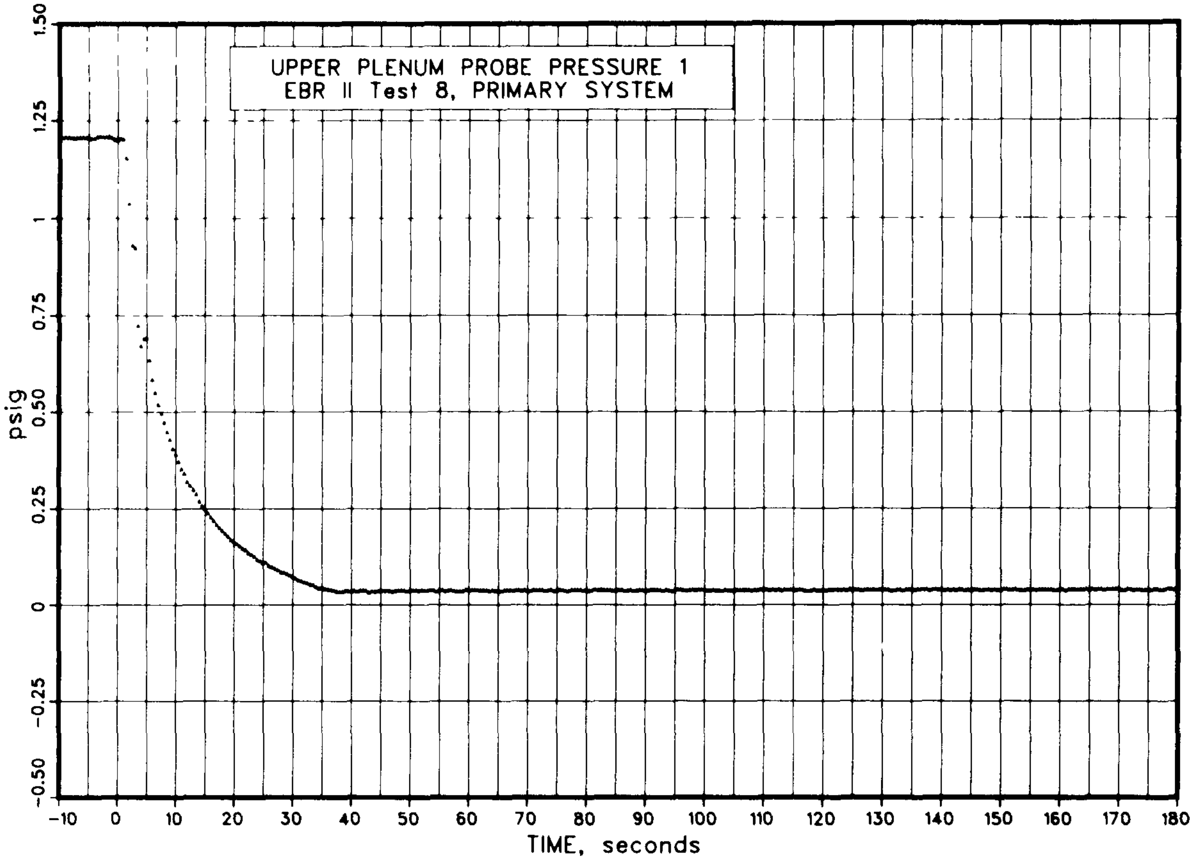
150
160
170
180

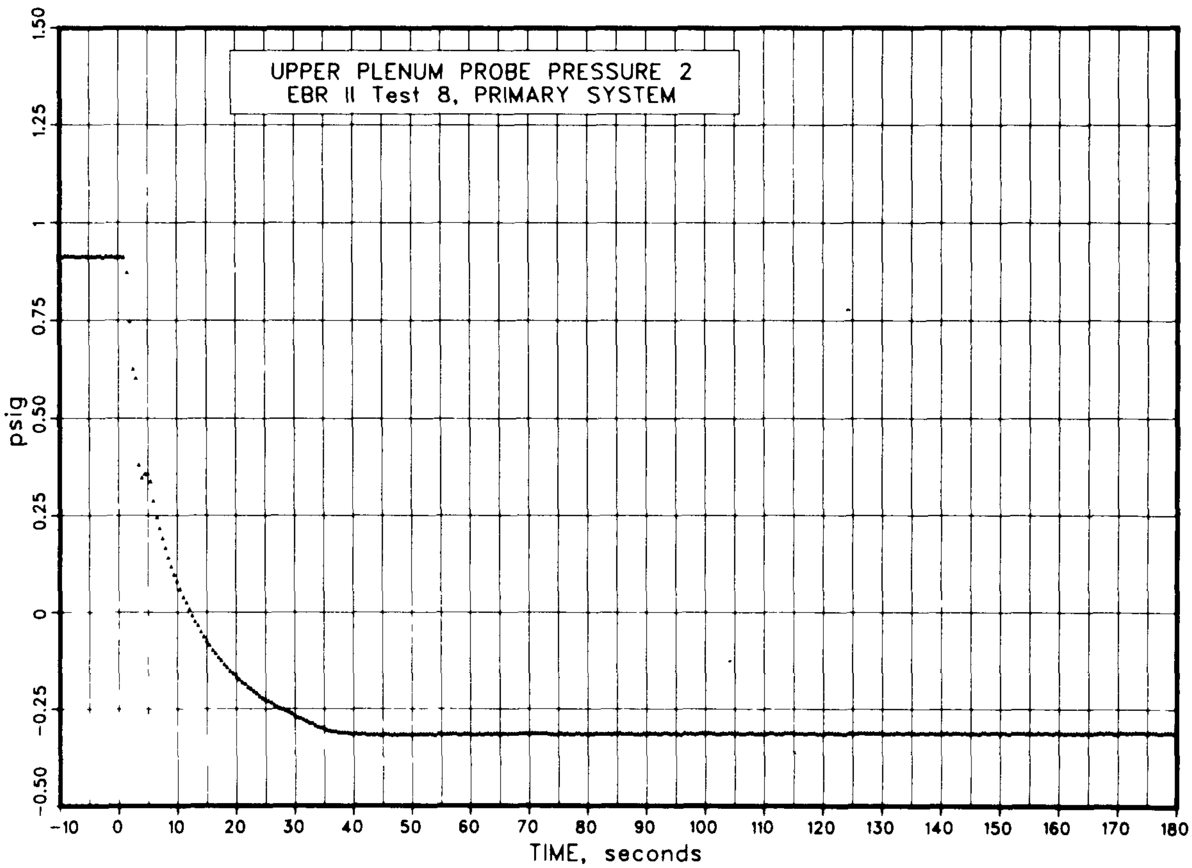

UPPER PLENUM PRESSURE
EBR II Test 8, PRIMARY SYSTEM
psi
1.50
1.25
1
0.75
0.50
0.25
0
-0.25
-0.50
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

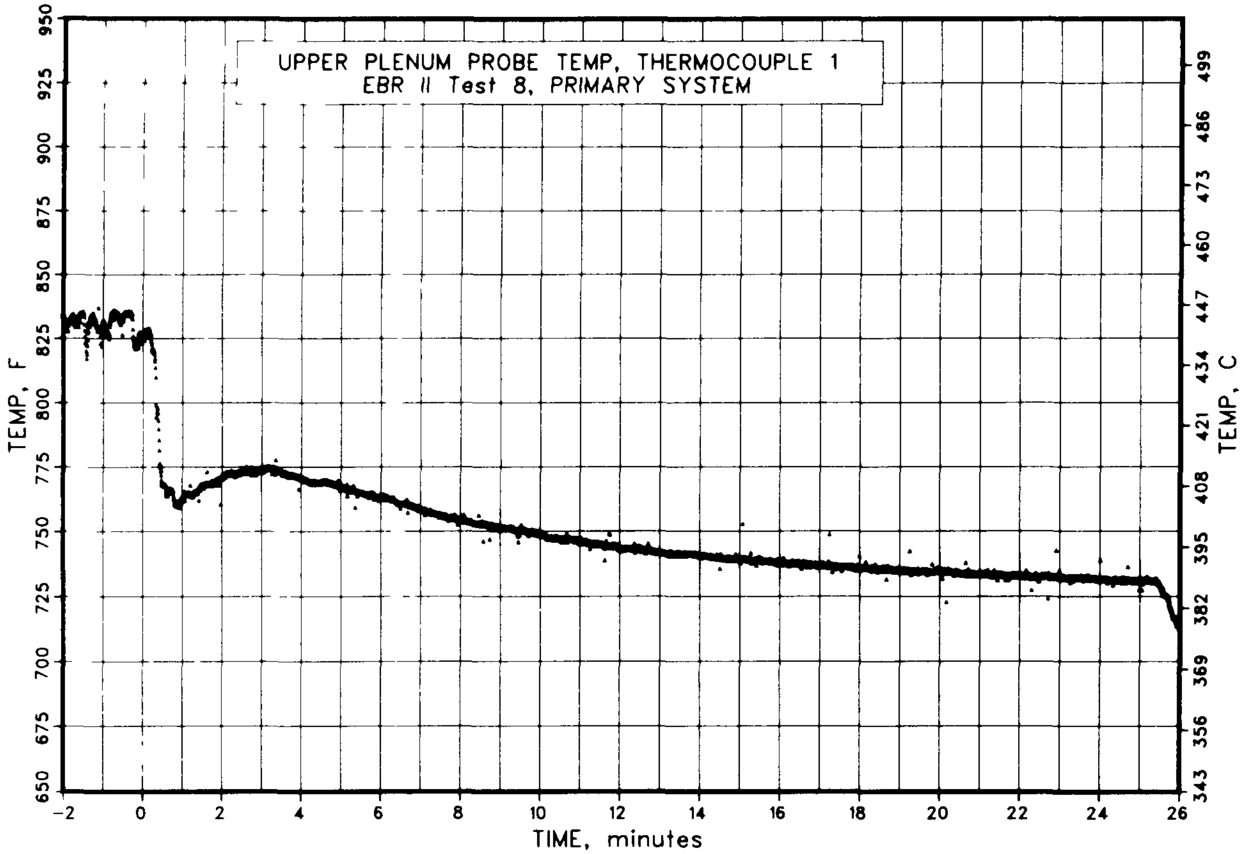

UPPER PLENUM PRESSURE
EBR II Test 8, PRIMARY SYSTEM
psi
1.50
1.25
1
0.75
0.50
0.25
0
-0.25
-0.50
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds

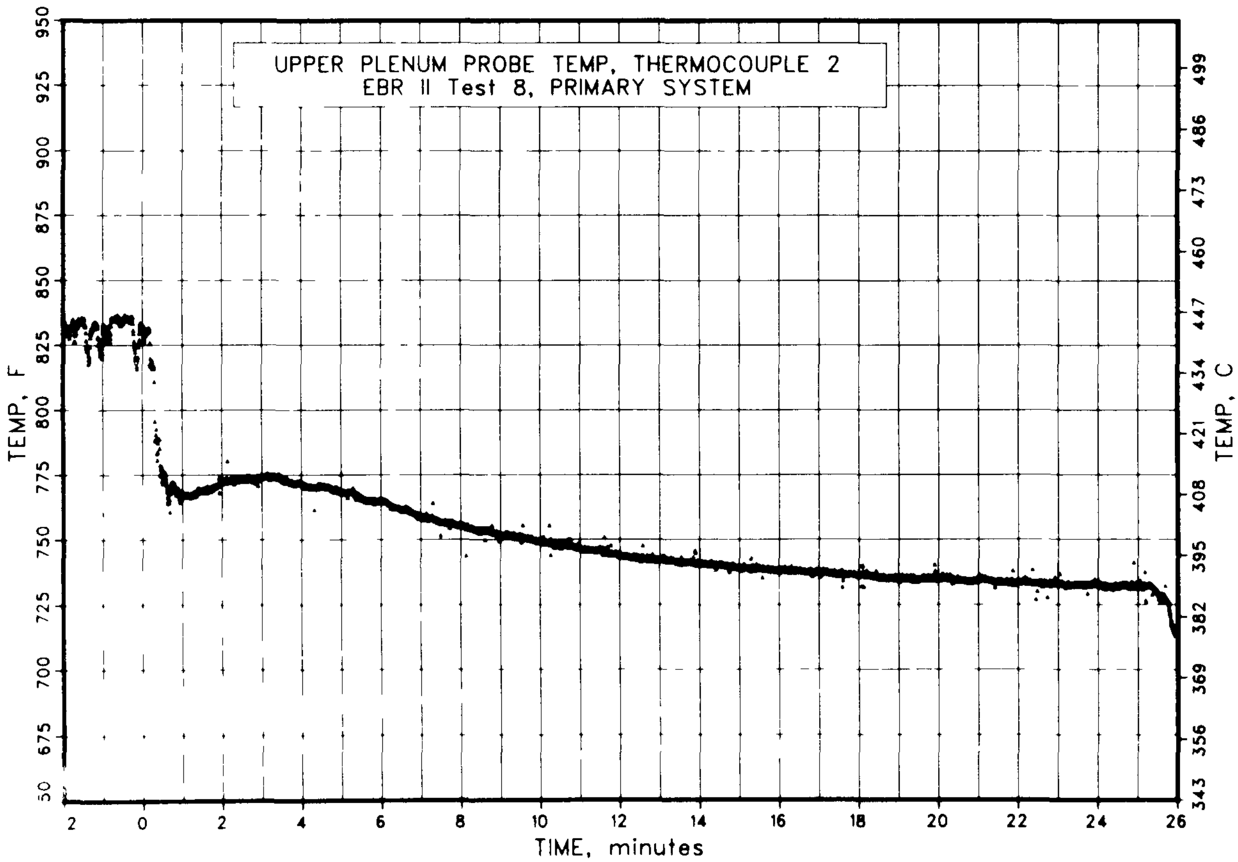

UPPER PLENUM PROBE PRESSURE 1
EBR II Test 8, PRIMARY SYSTEM
psig
1.50
1.25
1
0.75
0.50
0.25
0
-0.25
-0.50
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

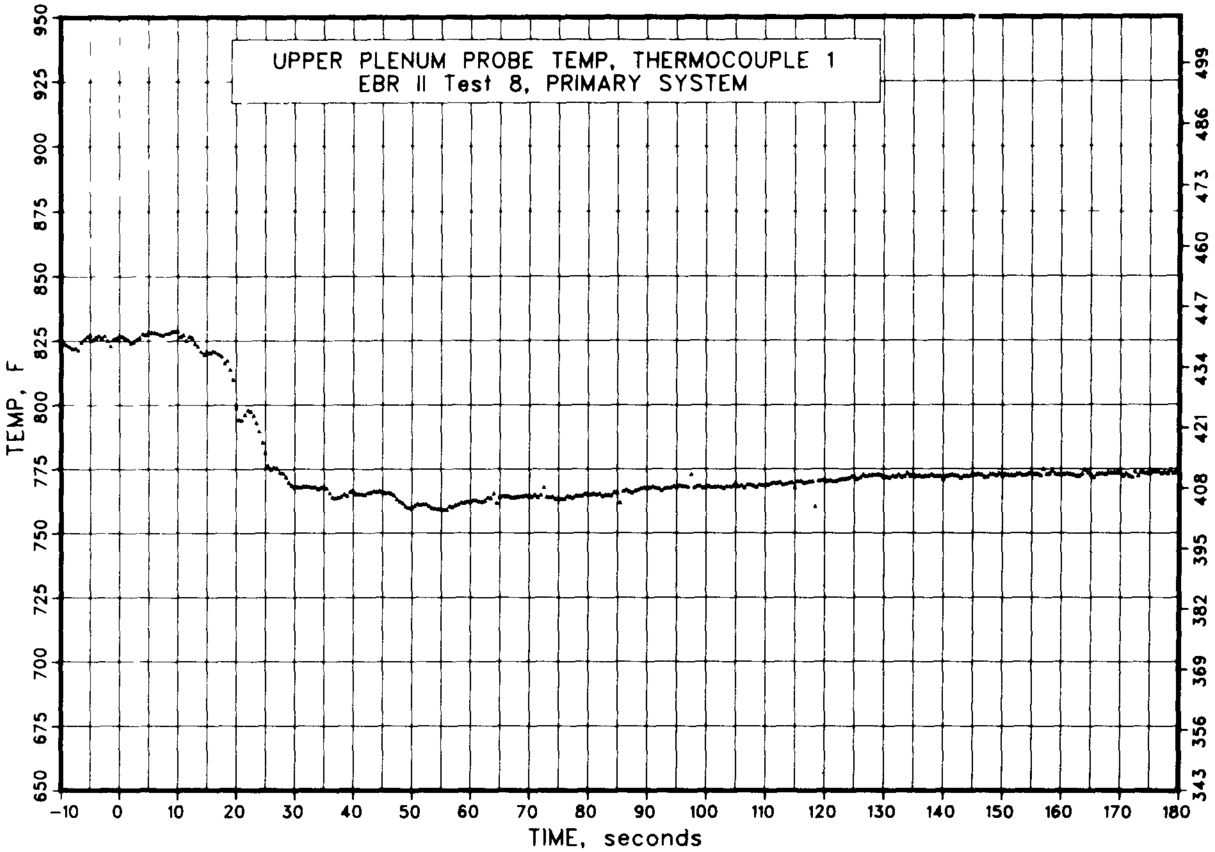

UPPER PLENUM PROBE PRESSURE 2
EBR II Test 8, PRIMARY SYSTEM
psig
1.50
1.25
1
0.75
0.50
0.25
0
-0.25
0.50
2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

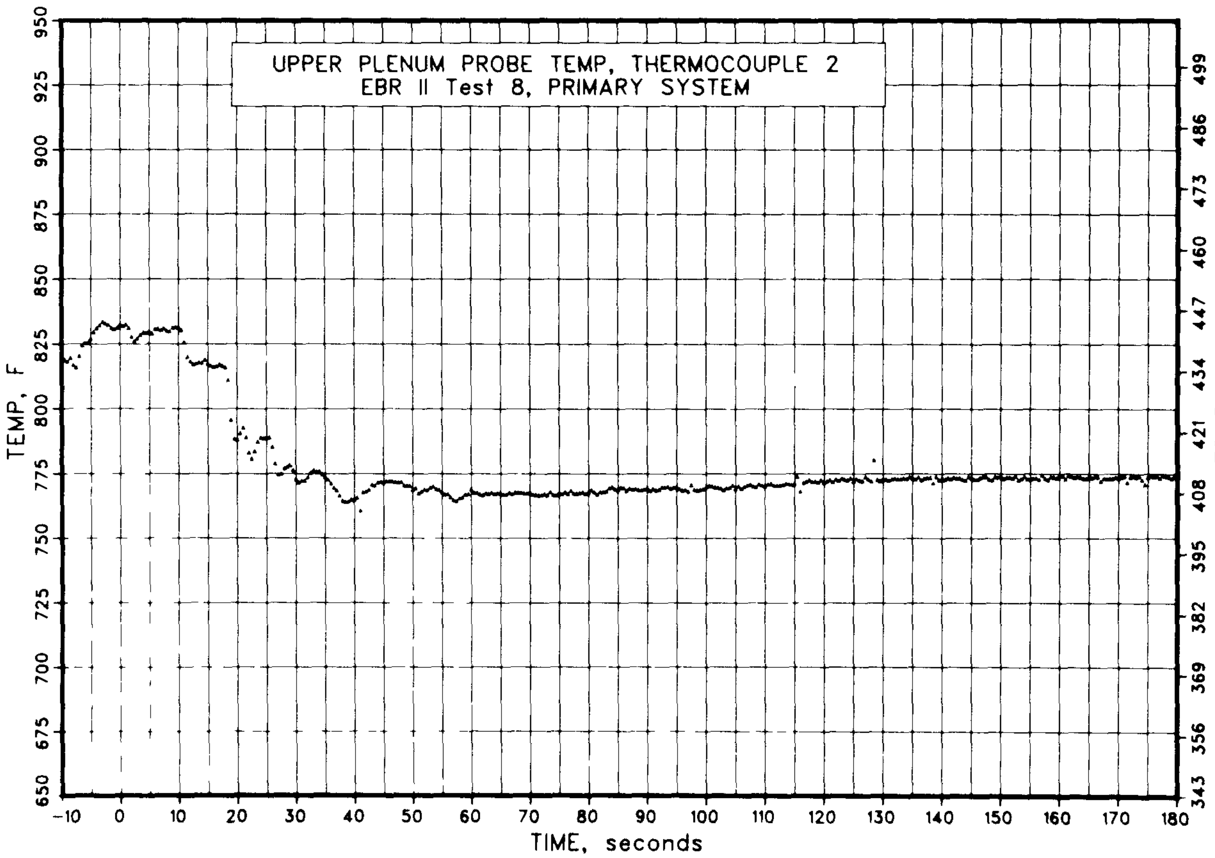

UPPER PLENUM PROBE PRESSURE 1
EBR II Test 8, PRIMARY SYSTEM
psig
TIME, seconds


UPPER PLENUM PROBE PRESSURE 2
EBR II Test 8, PRIMARY SYSTEM
psig
TIME, seconds


UPPER PLENUM PROBE TEMP, THERMOCOUPLE 1
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


UPPER PLENUM PROBE TEMP, THERMOCOUPLE 2
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


UPPER PLENUM PROBE TEMP, THERMOCOUPLE 1
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
650
675
700
725
750
775
800
825
850
875
900
925
950
343
356
369
382
395
408
421
434
447
460
473
486
499
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180


UPPER PLENUM PROBE TEMP, THERMOCOUPLE 2
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
650
675
700
725
750
775
800
825
850
875
900
925
950
343
356
369
382
395
408
421
434
447
460
473
486
499
-10
0
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20
30
40
50
60
70
80
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110
120
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150
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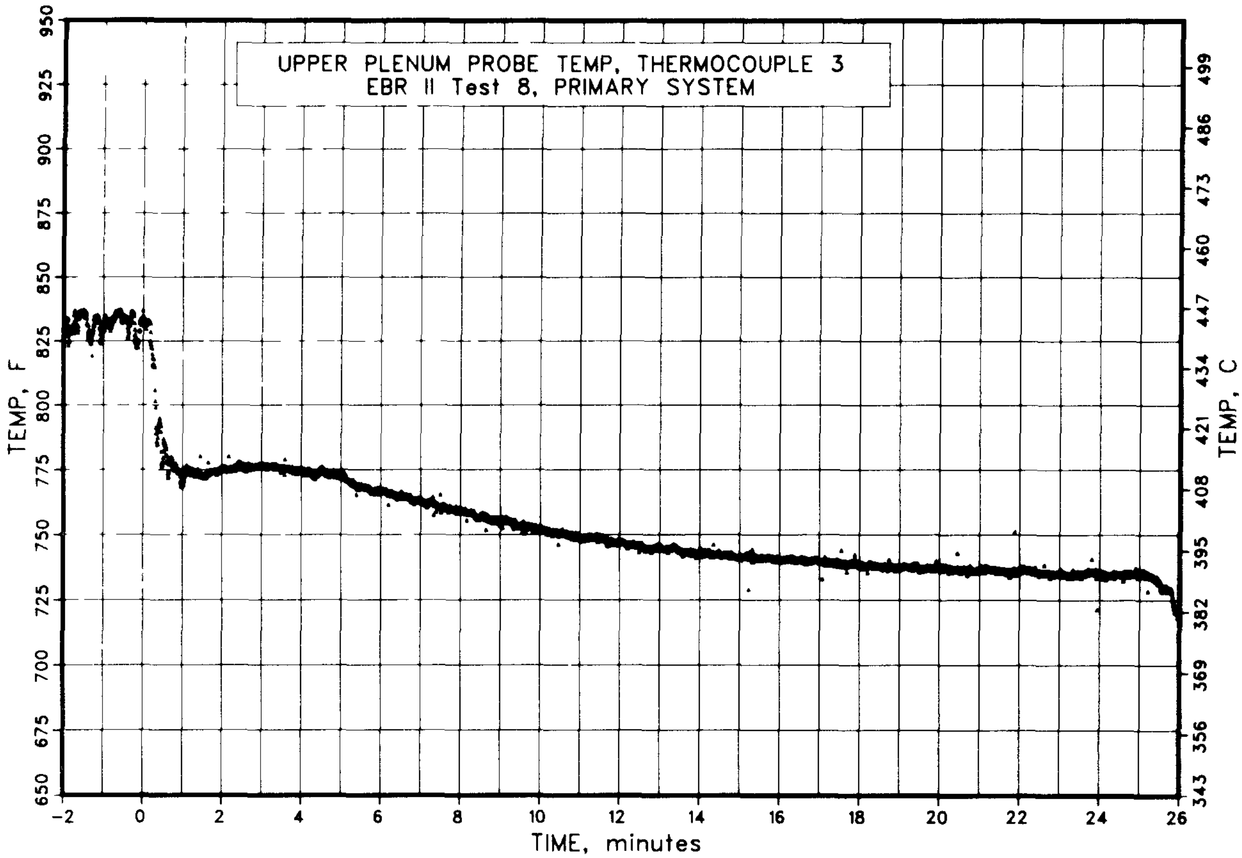
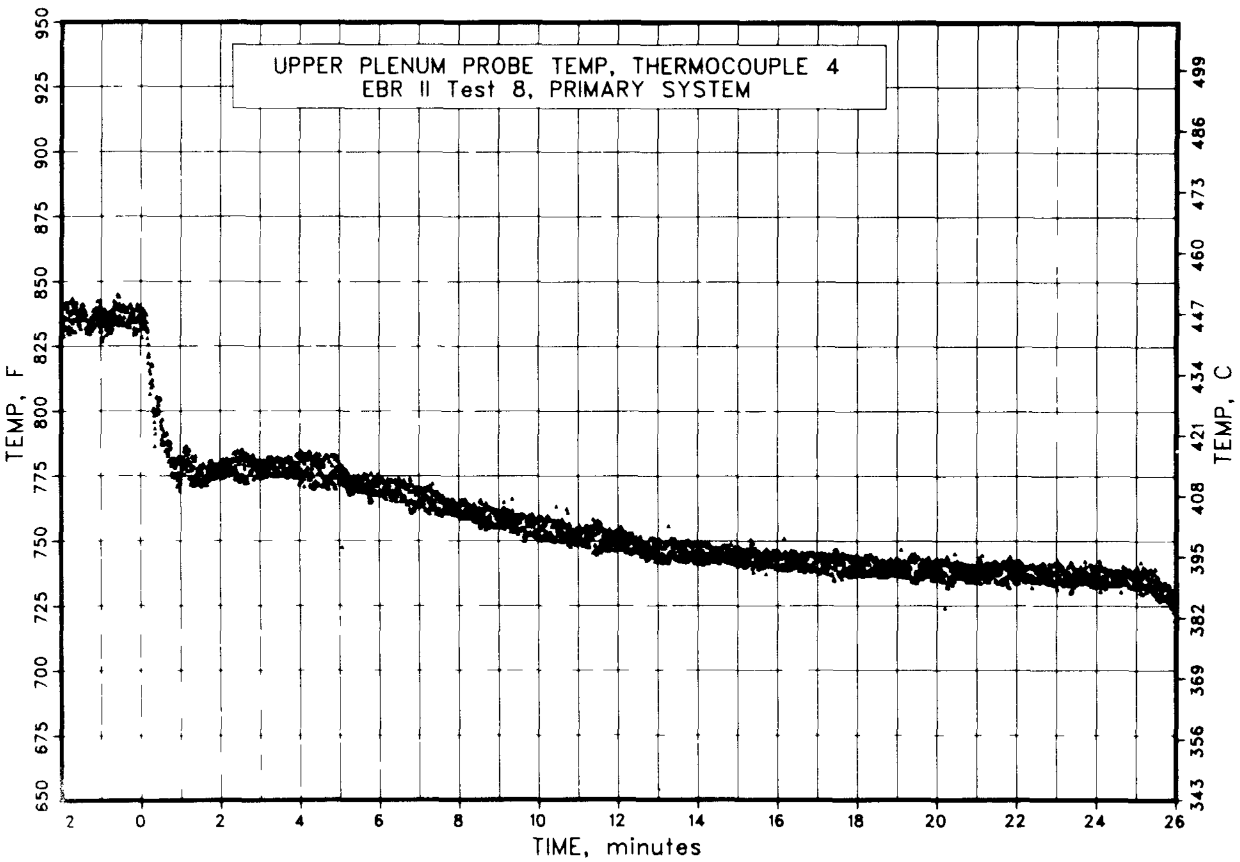
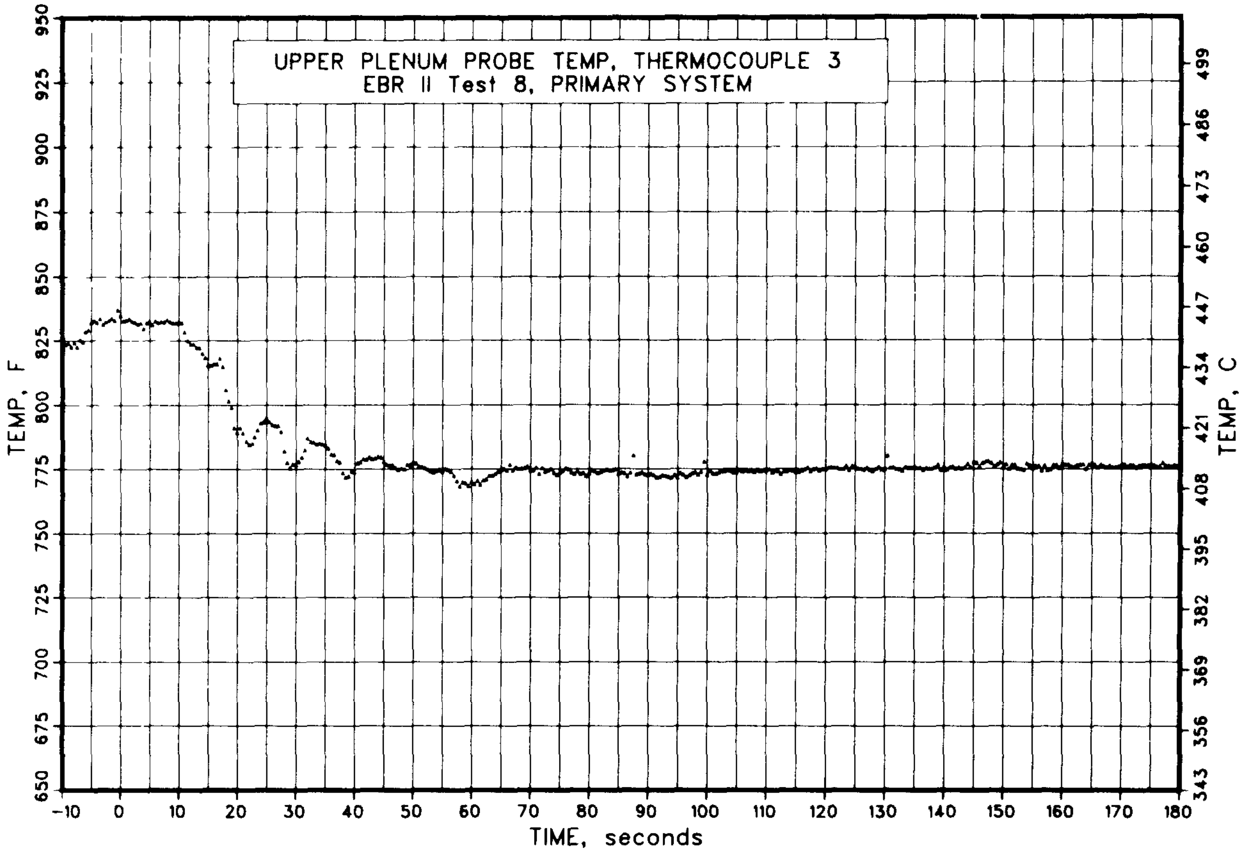
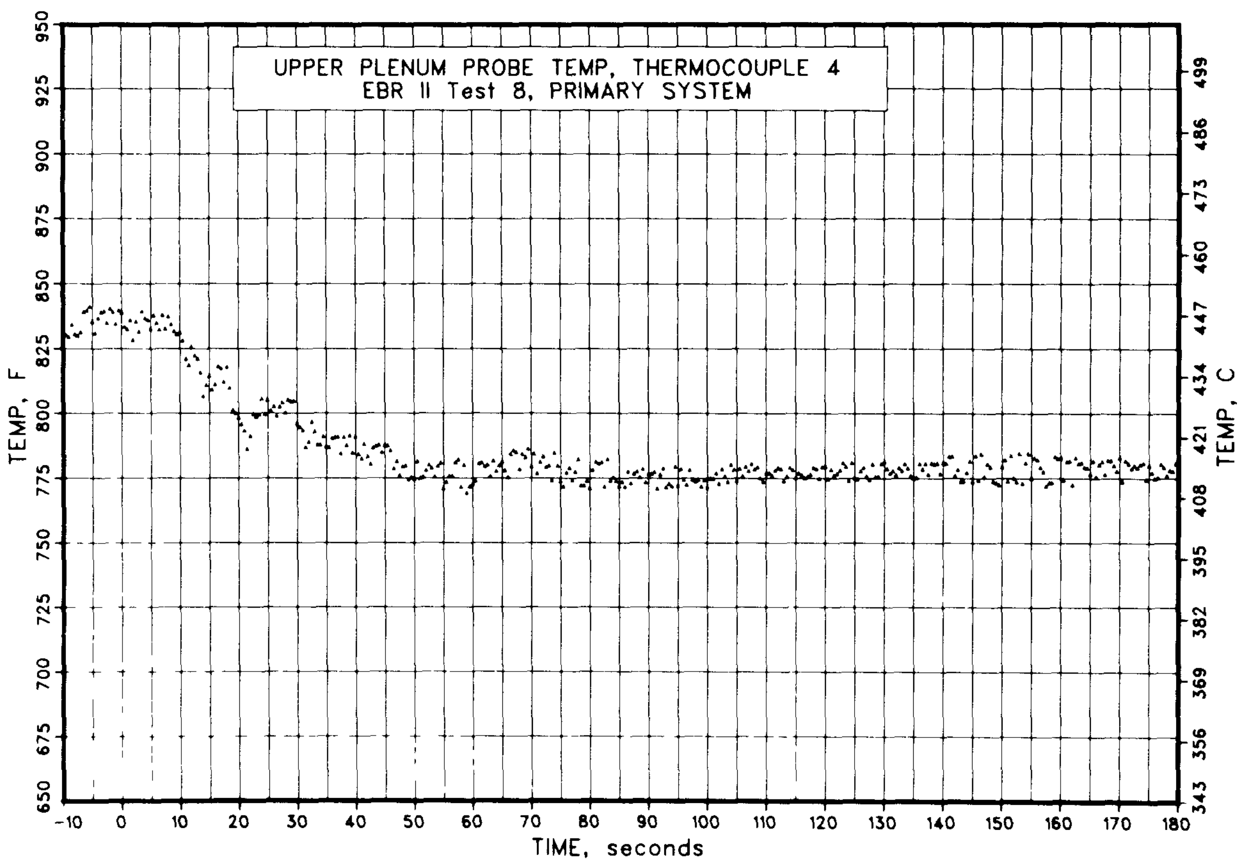
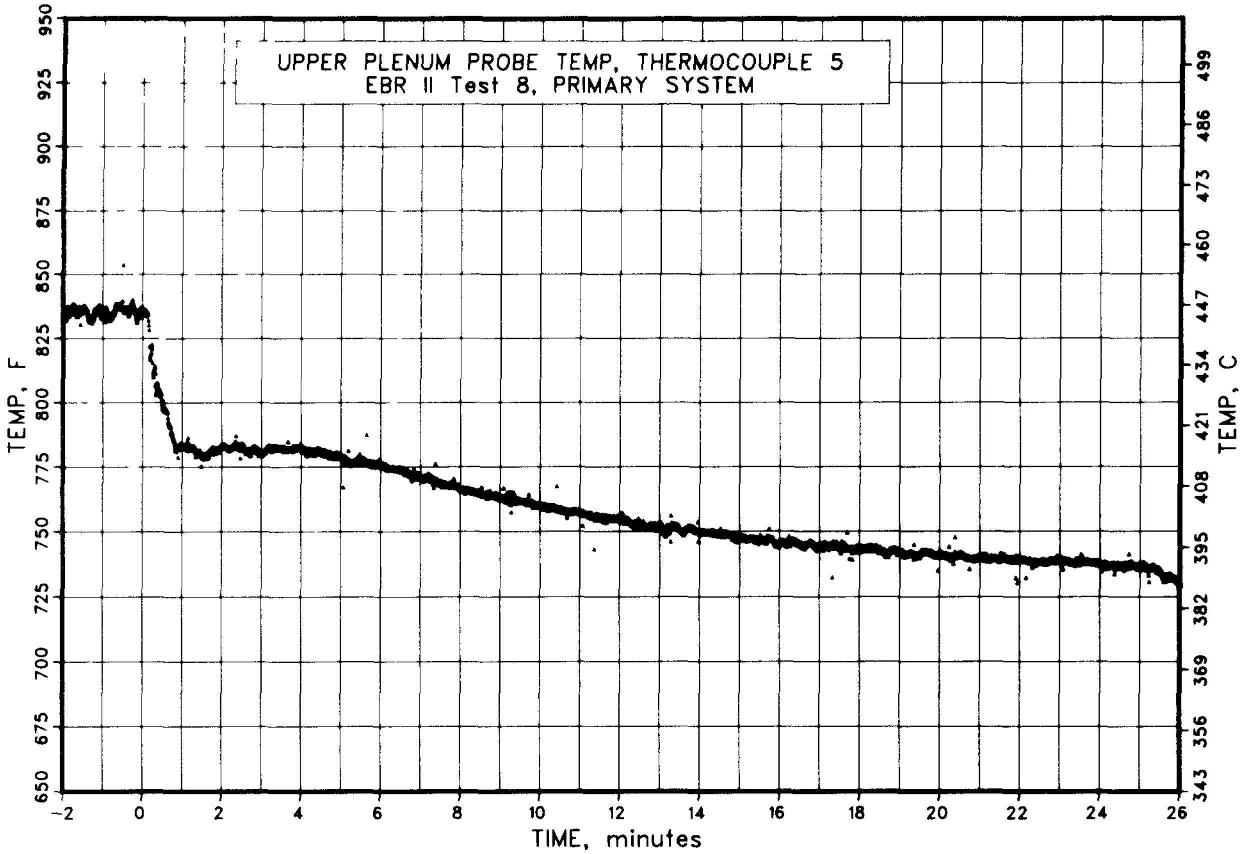
170
180

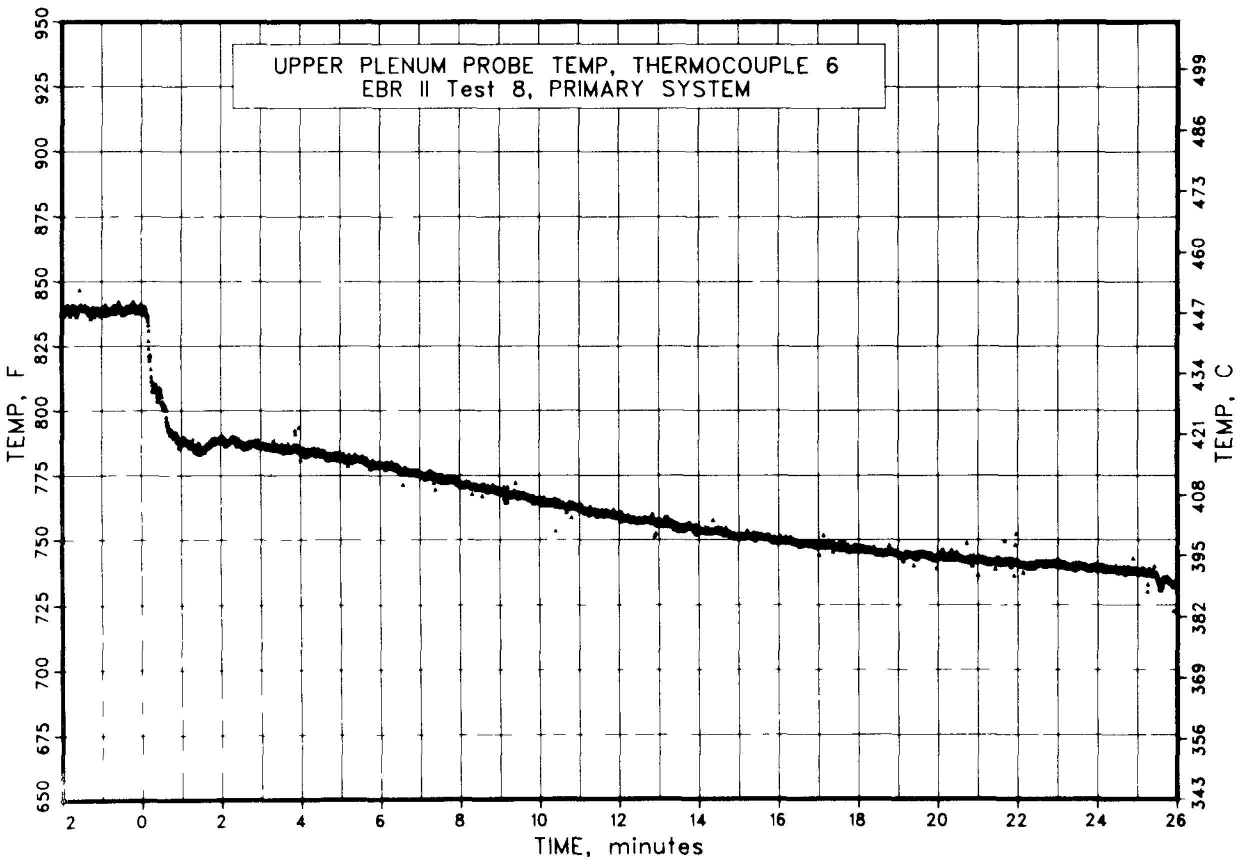

UPPER PLENUM PROBE TEMP, THERMOCOUPLE 3
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
950
925
900
875
850
825
800
775
750
725
700
675
650
TEMP, C
499
486
473
460
447
434
421
408
395
382
369
356
343
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

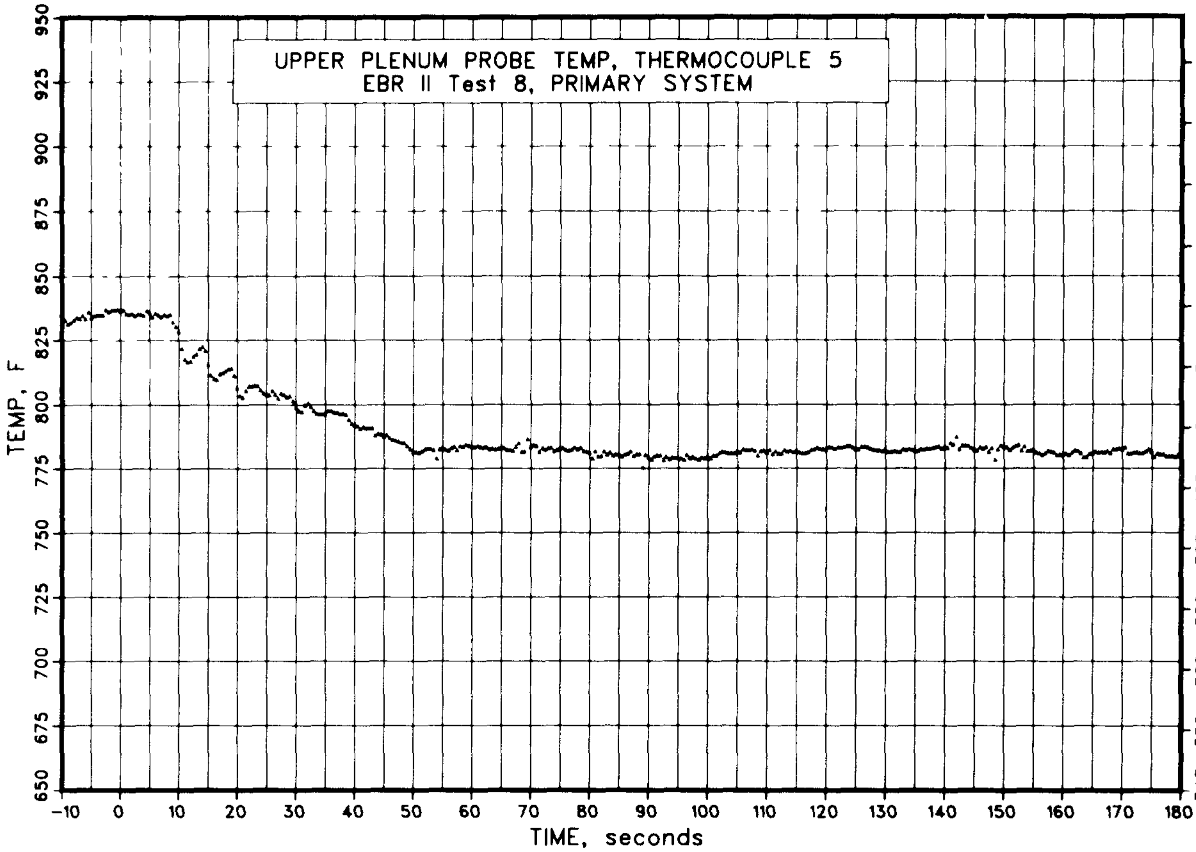

UPPER PLENUM PROBE TEMP, THERMOCOUPLE 4
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
950
925
900
875
850
825
800
775
750
725
700
675
650
TEMP, C
499
486
473
460
447
434
421
408
395
382
369
356
343
2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

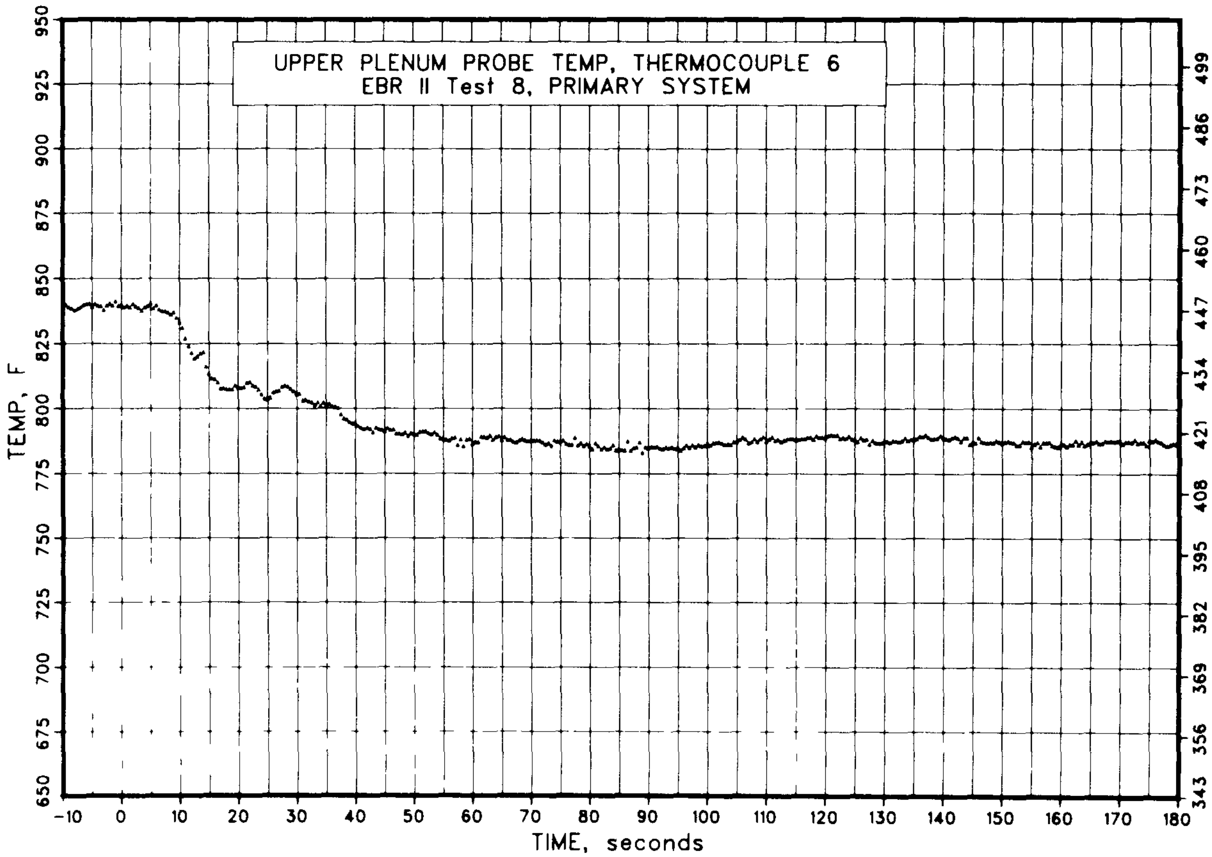

UPPER PLENUM PROBE TEMP, THERMOCOUPLE 3
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds


UPPER PLENUM PROBE TEMP, THERMOCOUPLE 4
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds


UPPER PLENUM PROBE TEMP, THERMOCOUPLE 5
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
650 675 700 725 750 775 800 825 850 875 900 925 950
TEMP, C
343 356 369 382 395 408 421 434 447 460 473 486 499
TIME, minutes
-2 0 2 4 6 8 10 12 14 16 18 20 22 24 26


UPPER PLENUM PROBE TEMP, THERMOCOUPLE 6
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
650 675 700 725 750 775 800 825 850 875 900 925 950
TEMP, C
343 356 369 382 395 408 421 434 447 460 473 486 499
TIME, minutes
2 0 2 4 6 8 10 12 14 16 18 20 22 24 26


UPPER PLENUM PROBE TEMP, THERMOCOUPLE 5
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
650
675
700
725
750
775
800
825
850
875
900
925
950
343
356
369
382
395
408
421
434
447
460
473
486
499
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180


UPPER PLENUM PROBE TEMP, THERMOCOUPLE 6
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
650
675
700
725
750
775
800
825
850
875
900
925
950
343
356
369
382
395
408
421
434
447
460
473
486
499
-10
0
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20
30
40
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60
70
80
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110
120
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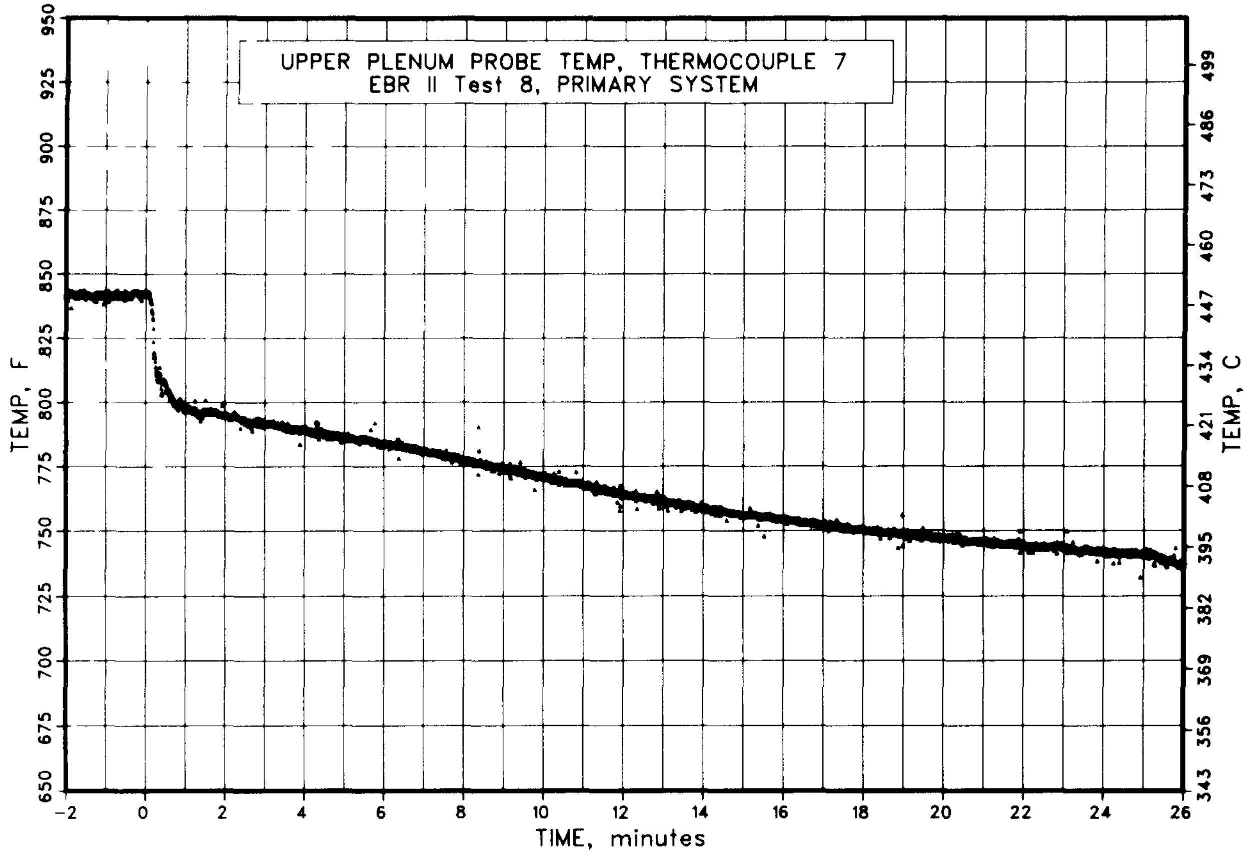
170
180


UPPER PLENUM PROBE TEMP, THERMOCOUPLE 7
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
950
925
900
875
850
825
800
775
750
725
700
675
650
499
486
473
460
447
434
421
408
395
382
369
356
343
-2
0
2
4
6
8
10
12
14
16
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20
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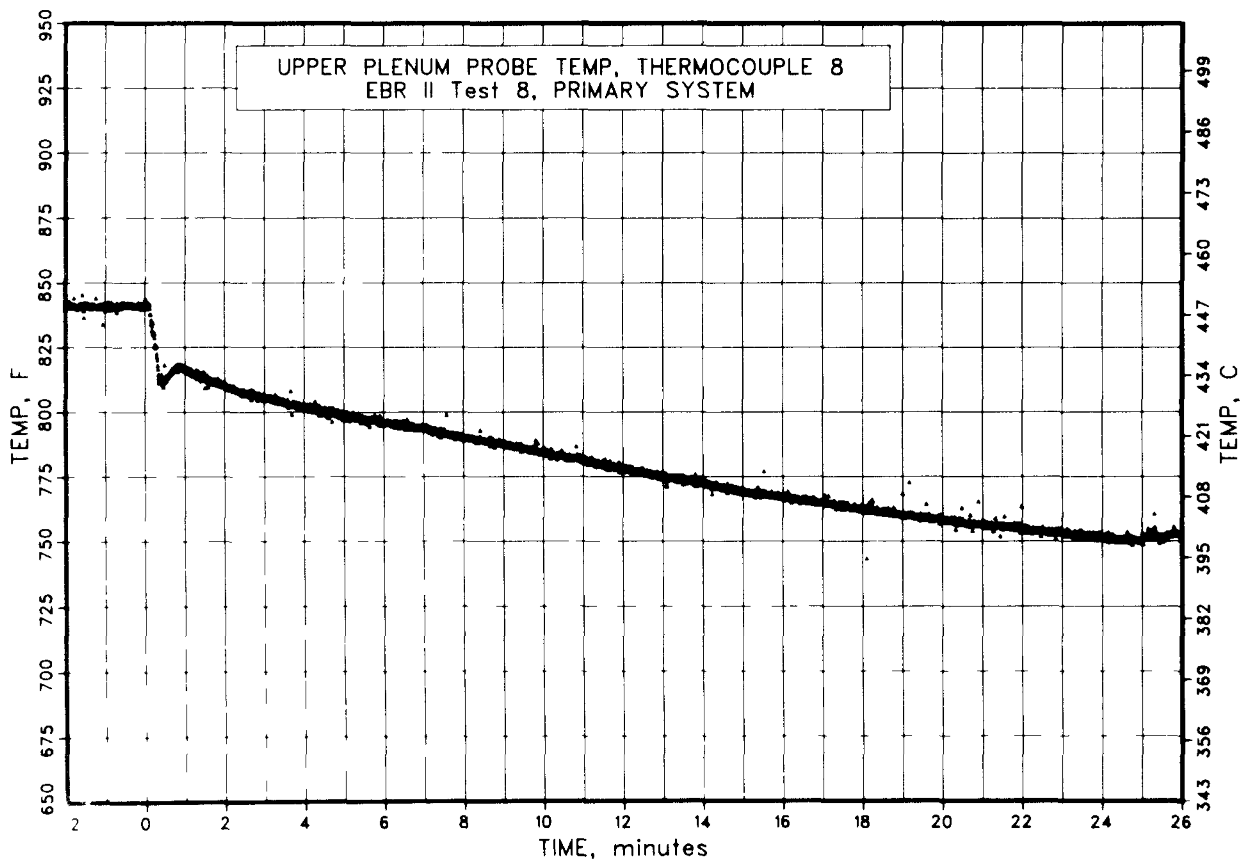
24
26


UPPER PLENUM PROBE TEMP, THERMOCOUPLE 8
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
950
925
900
875
850
825
800
775
750
725
700
675
650
499
486
473
460
447
434
421
408
395
382
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343
2
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4
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12
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24
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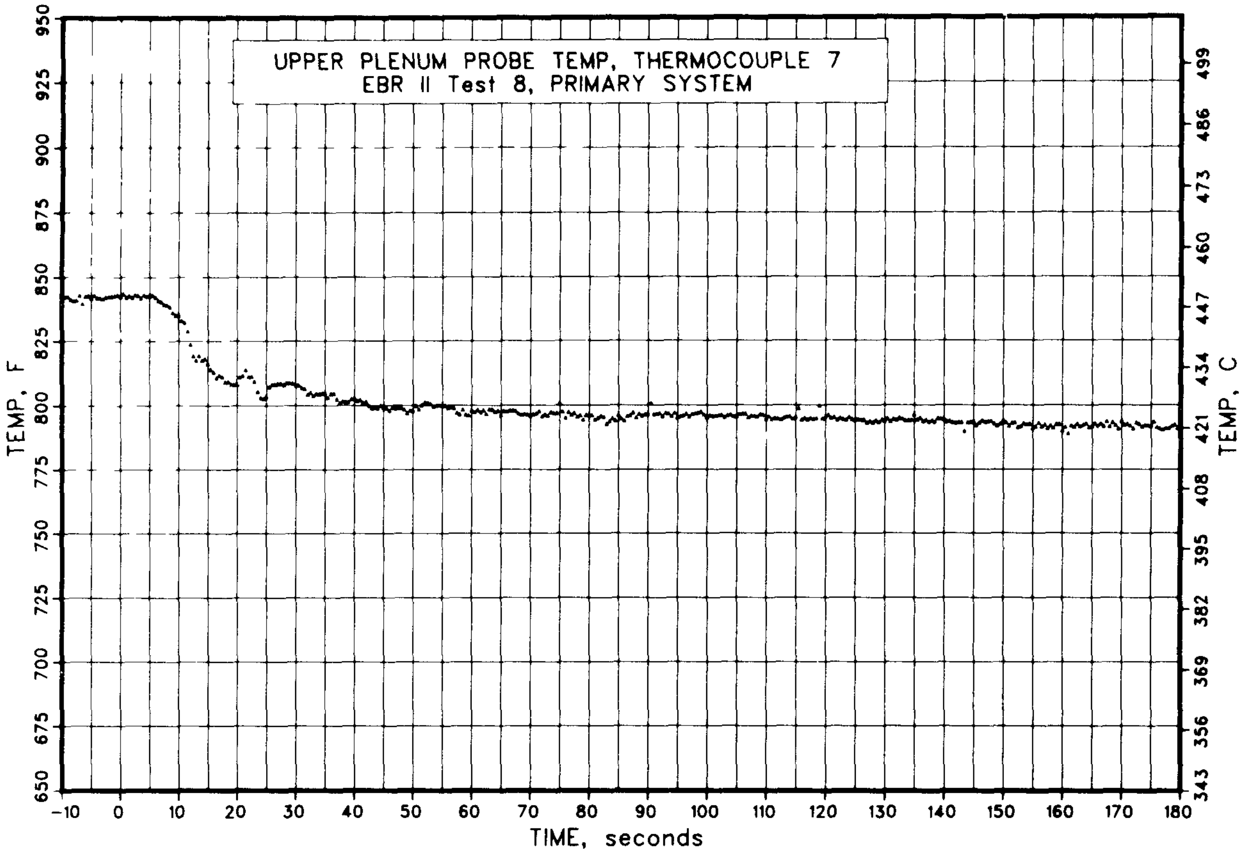
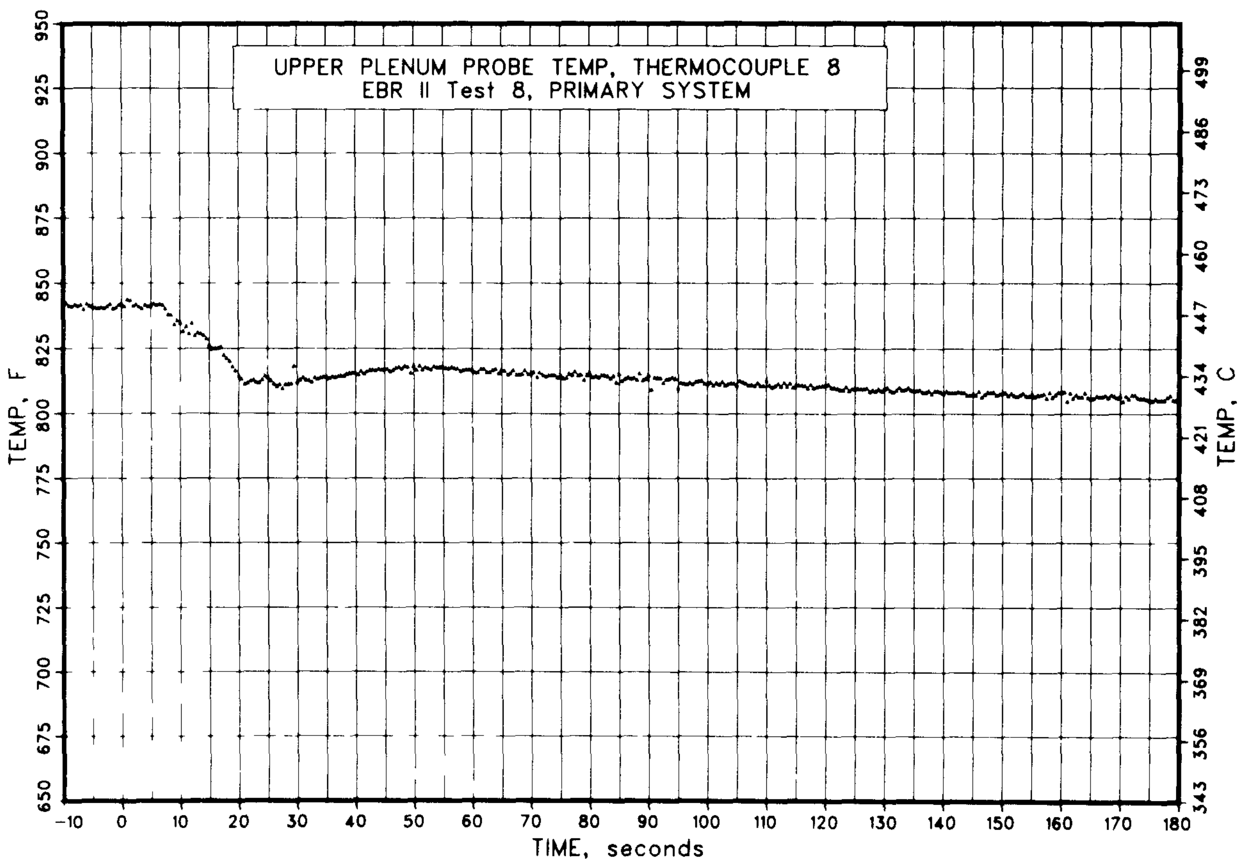
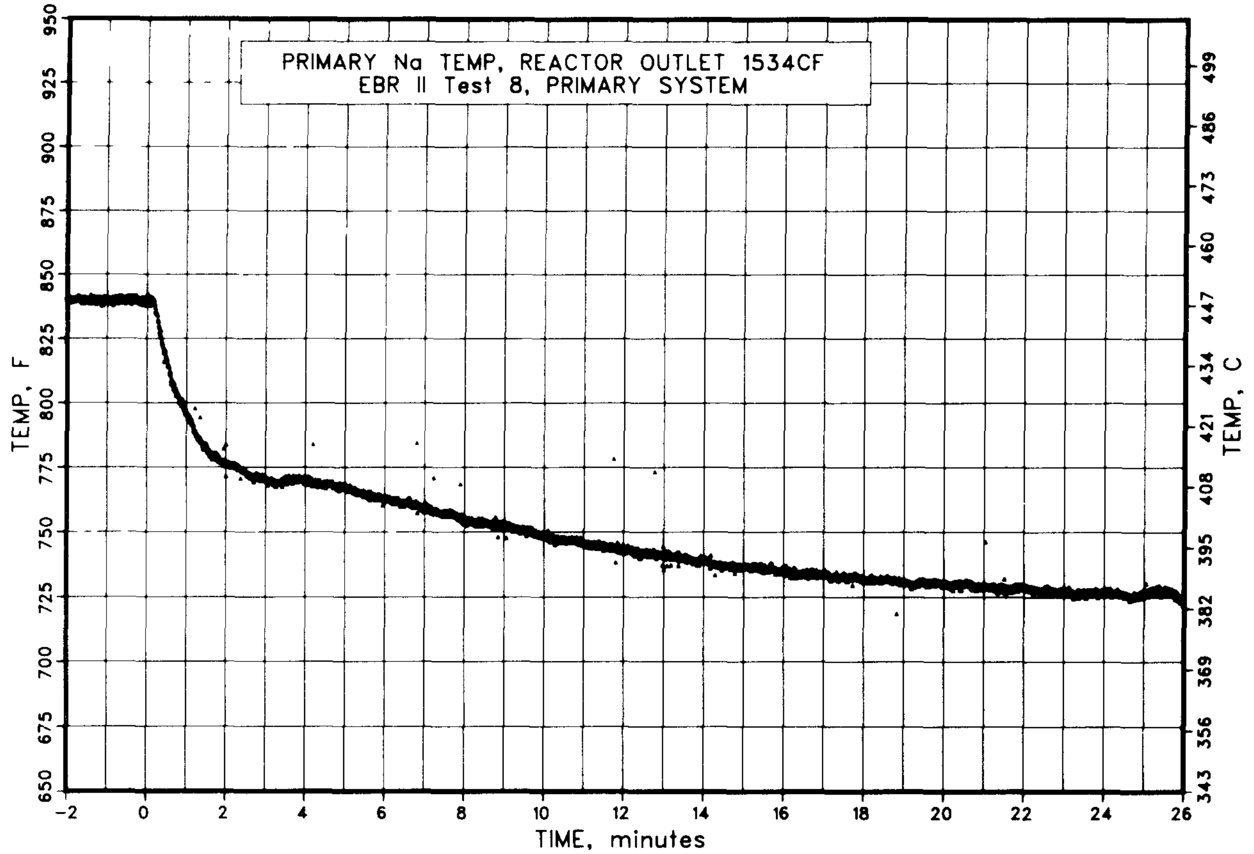
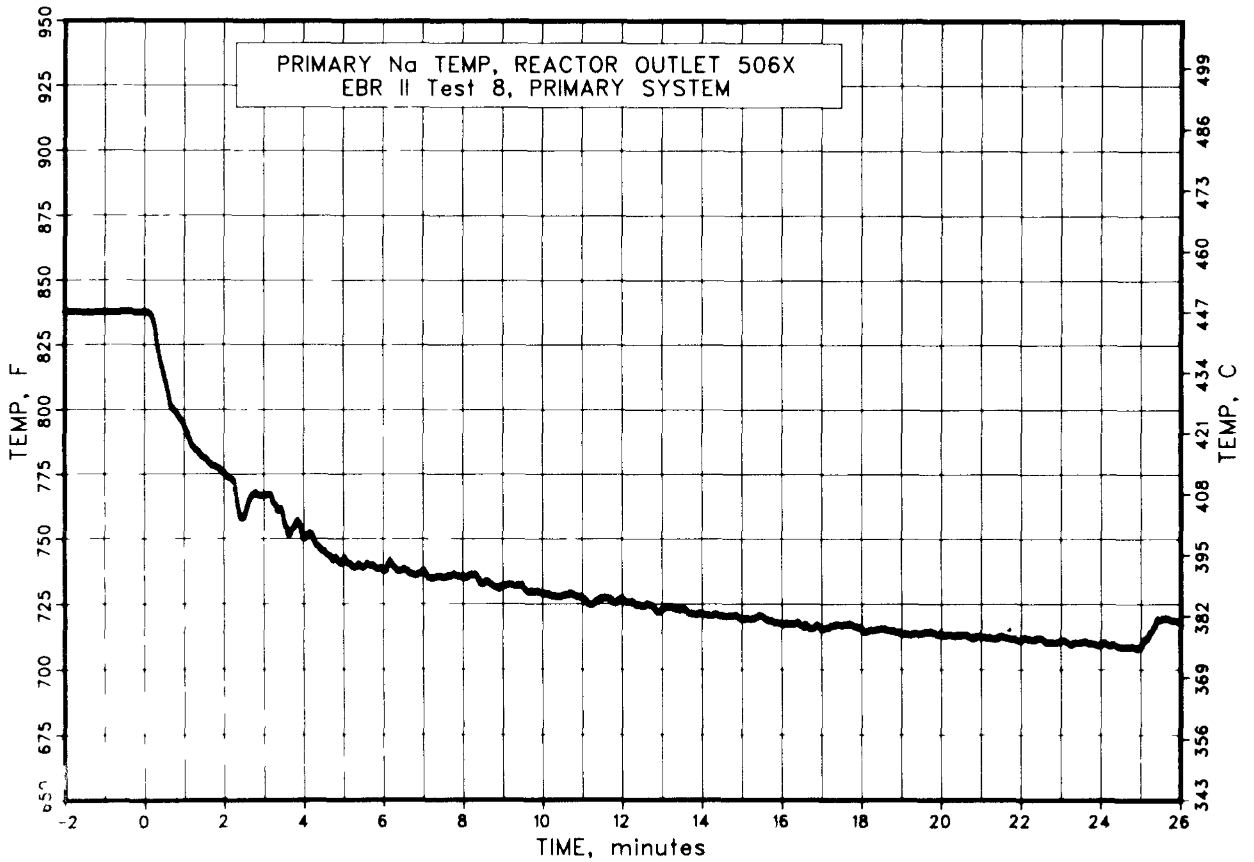

UPPER PLENUM PROBE TEMP, THERMOCOUPLE 7
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
650 675 700 725 750 775 800 825 850 875 900 925 950
343 356 369 382 395 408 421 434 447 460 473 486 499
-10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180


UPPER PLENUM PROBE TEMP, THERMOCOUPLE 8
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
650 675 700 725 750 775 800 825 850 875 900 925 950
343 356 369 382 395 408 421 434 447 460 473 486 499
-10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180


PRIMARY Na TEMP, REACTOR OUTLET 1534CF
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
950
925
900
875
850
825
800
775
750
725
700
675
650
499
486
473
460
447
434
421
408
395
382
369
356
343
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26


PRIMARY Na TEMP, REACTOR OUTLET 506X
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
950
925
900
875
850
825
800
775
750
725
700
675
499
486
473
460
447
434
421
408
395
382
369
356
343
-2
0
2
4
6
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10
12
14
16
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20
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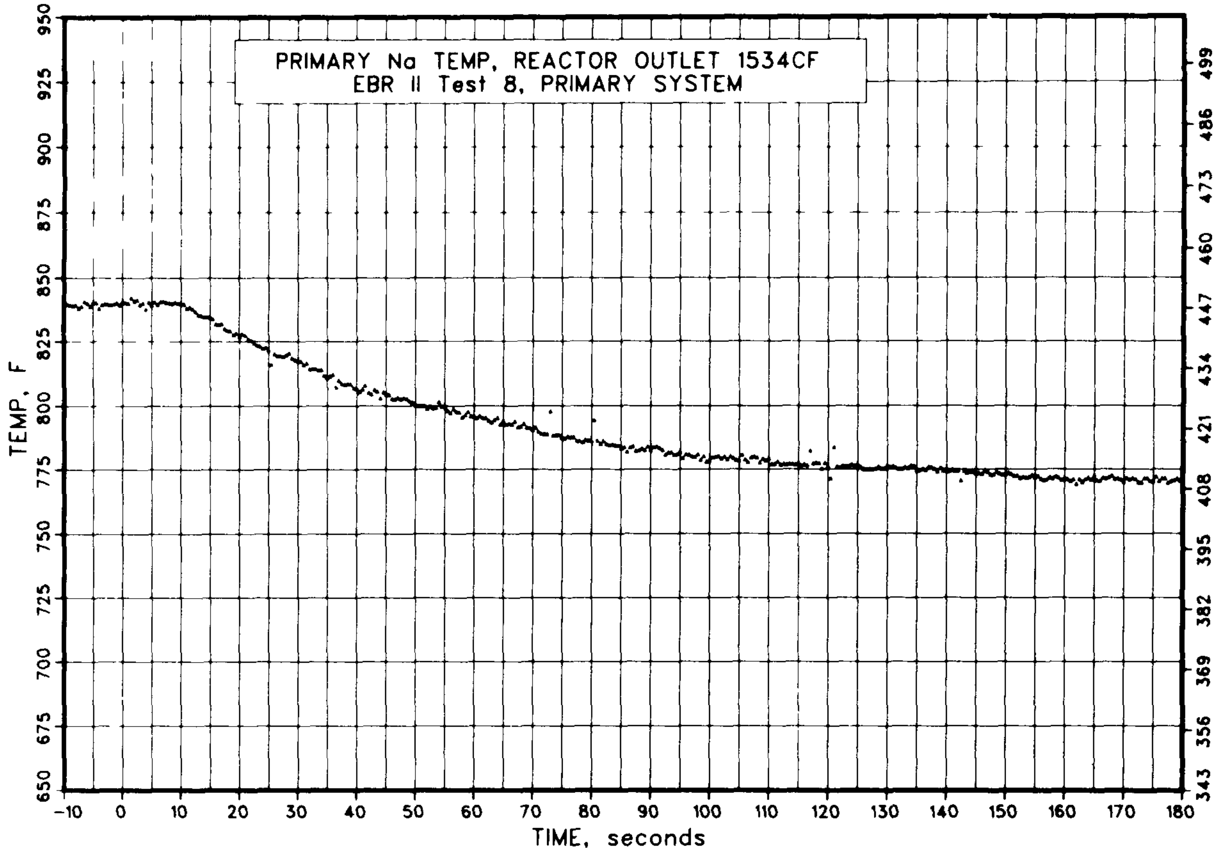
24
26


PRIMARY Na TEMP, REACTOR OUTLET 1534CF
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
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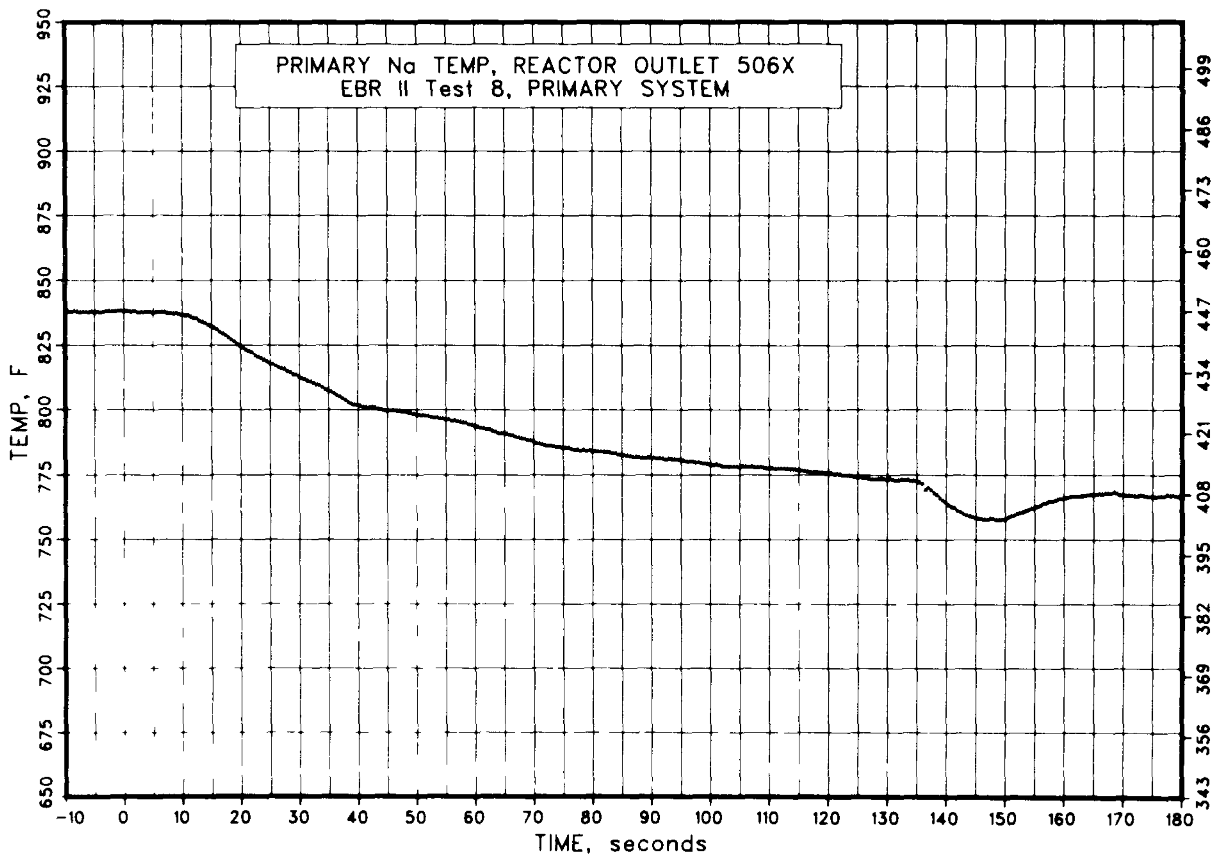
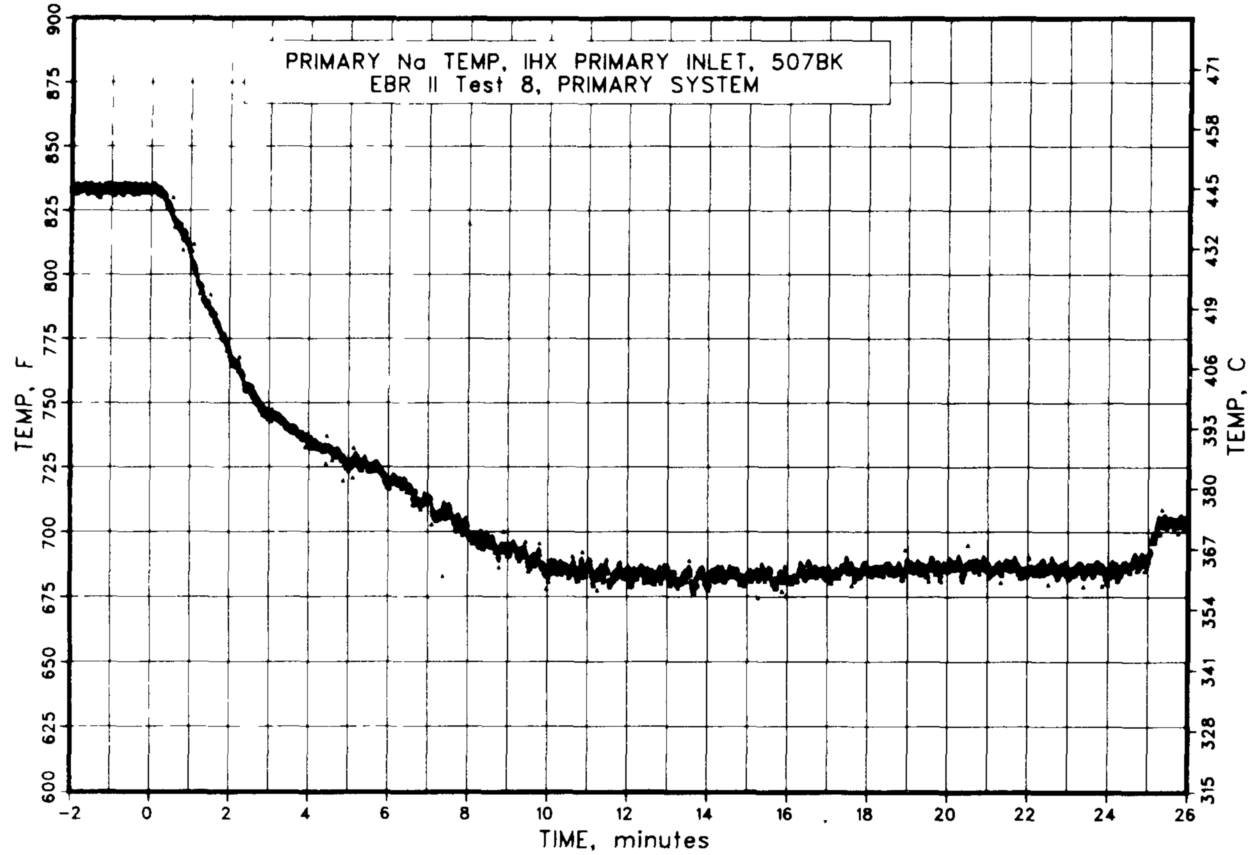
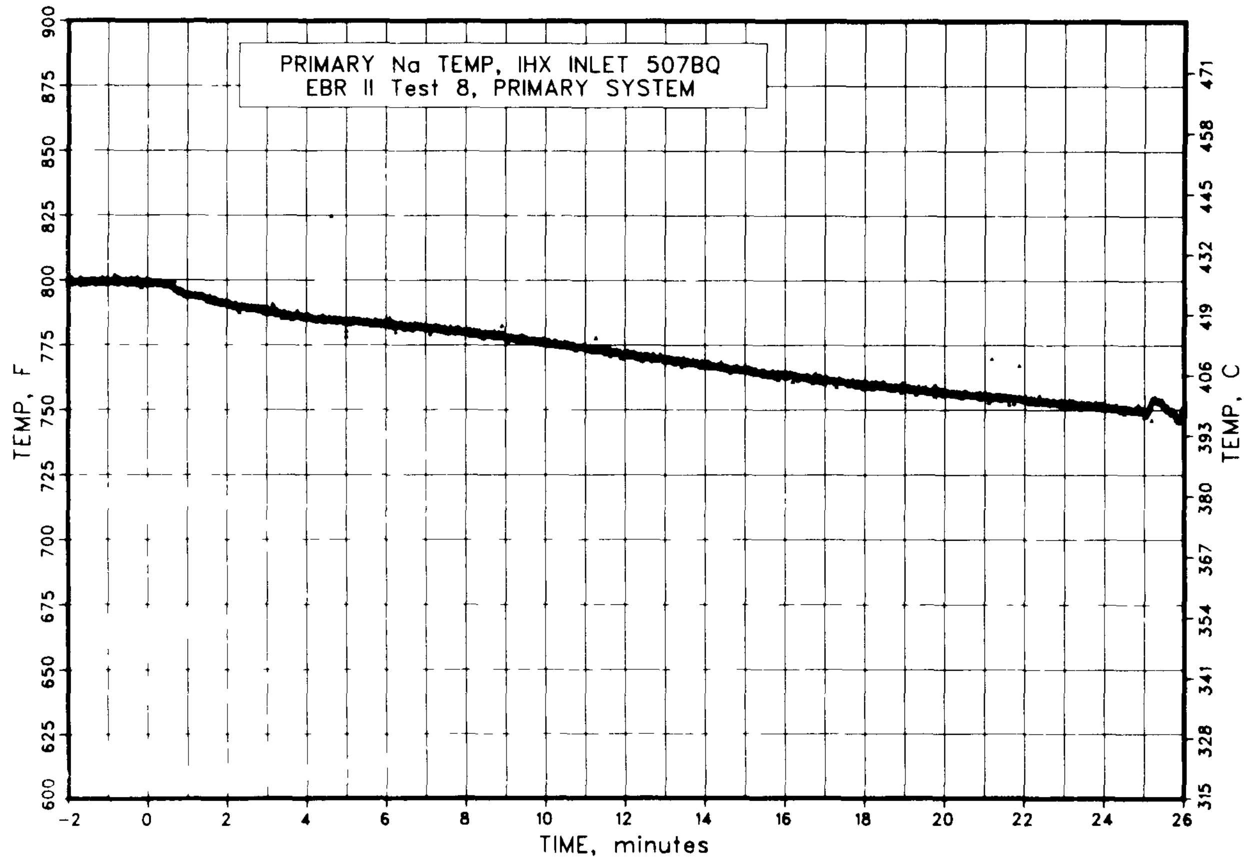
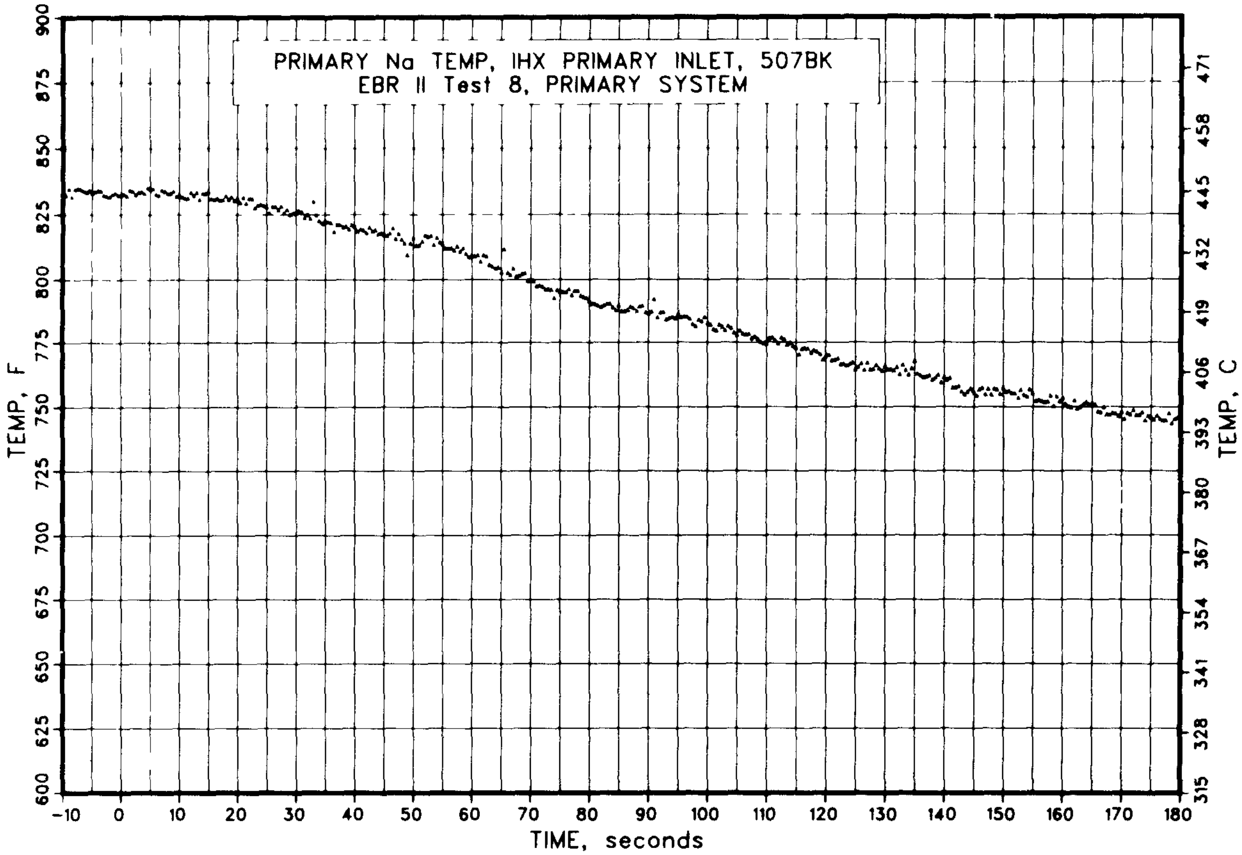
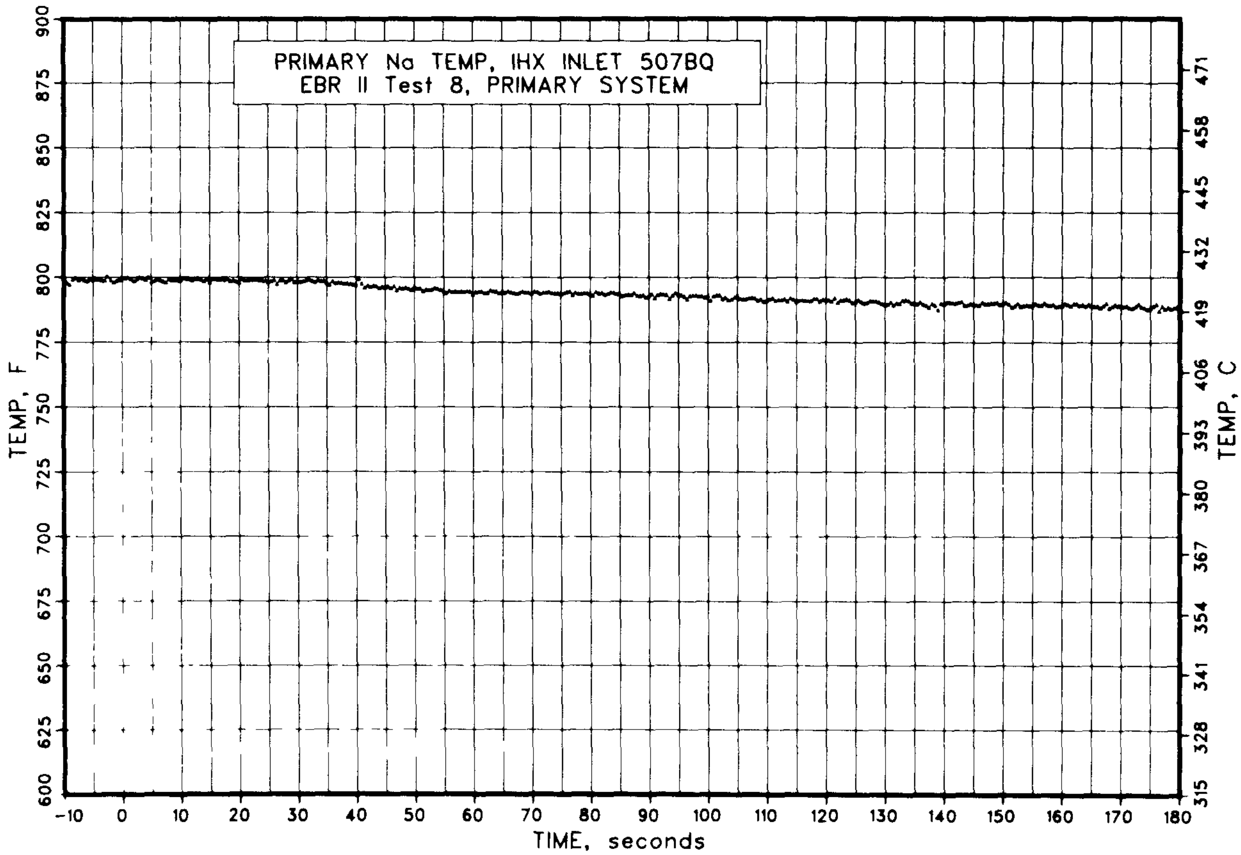
925
900
875
850
825
800
775
750
725
700
675
650
499
486
473
460
447
434
421
408
395
382
369
356
343
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180

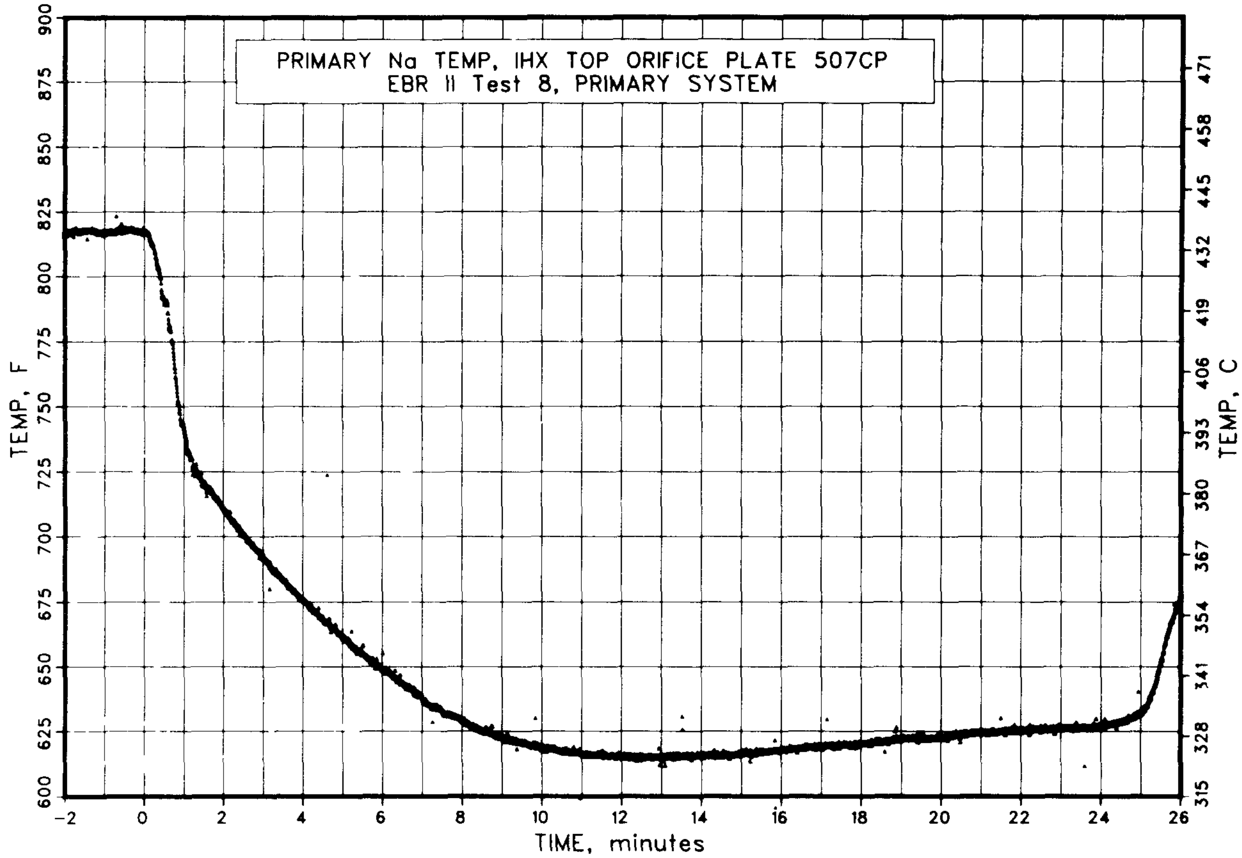

PRIMARY Na TEMP, REACTOR OUTLET 506X
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
950
925
900
875
850
825
800
775
750
725
700
675
650
499
486
473
460
447
434
421
408
395
382
369
356
343
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180

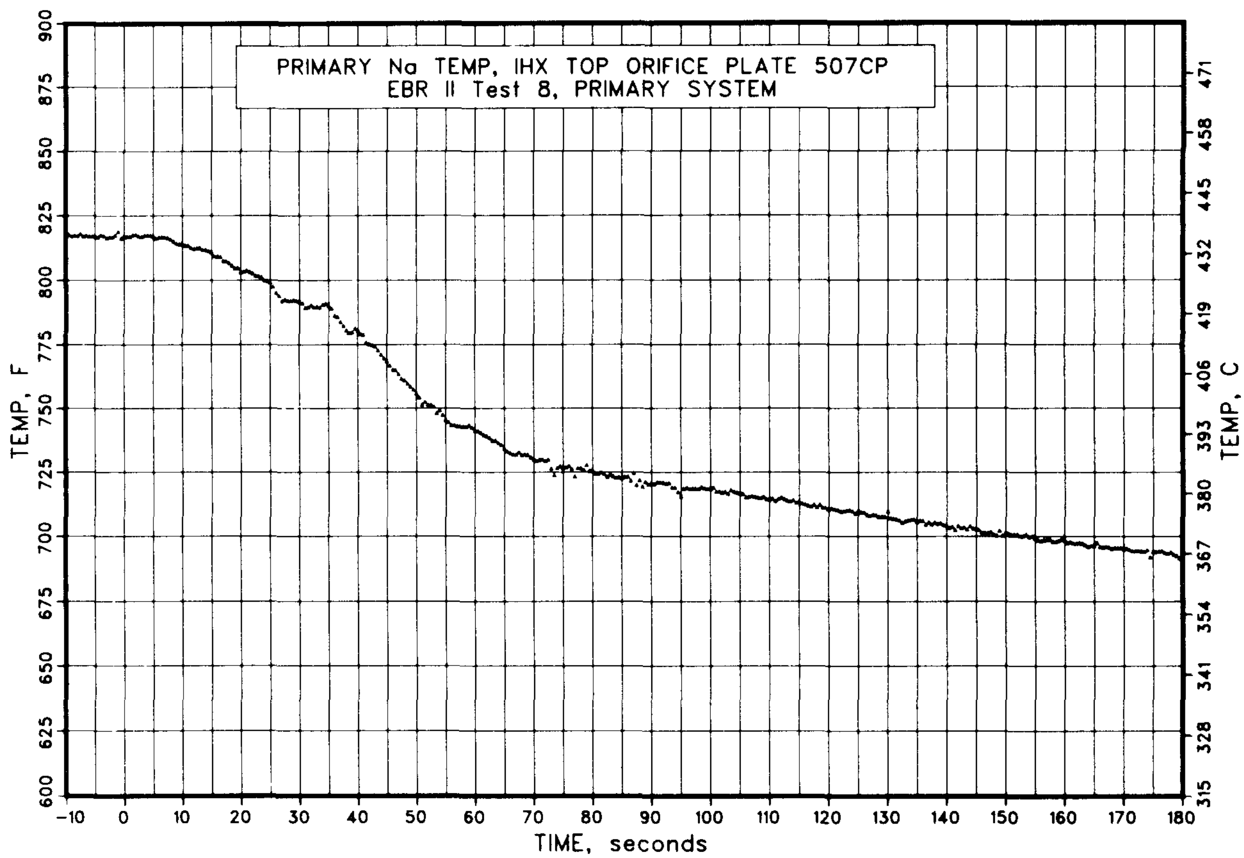

PRIMARY Na TEMP, IHX PRIMARY INLET, 507BK
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


PRIMARY Na TEMP, IHX INLET 507BQ
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes

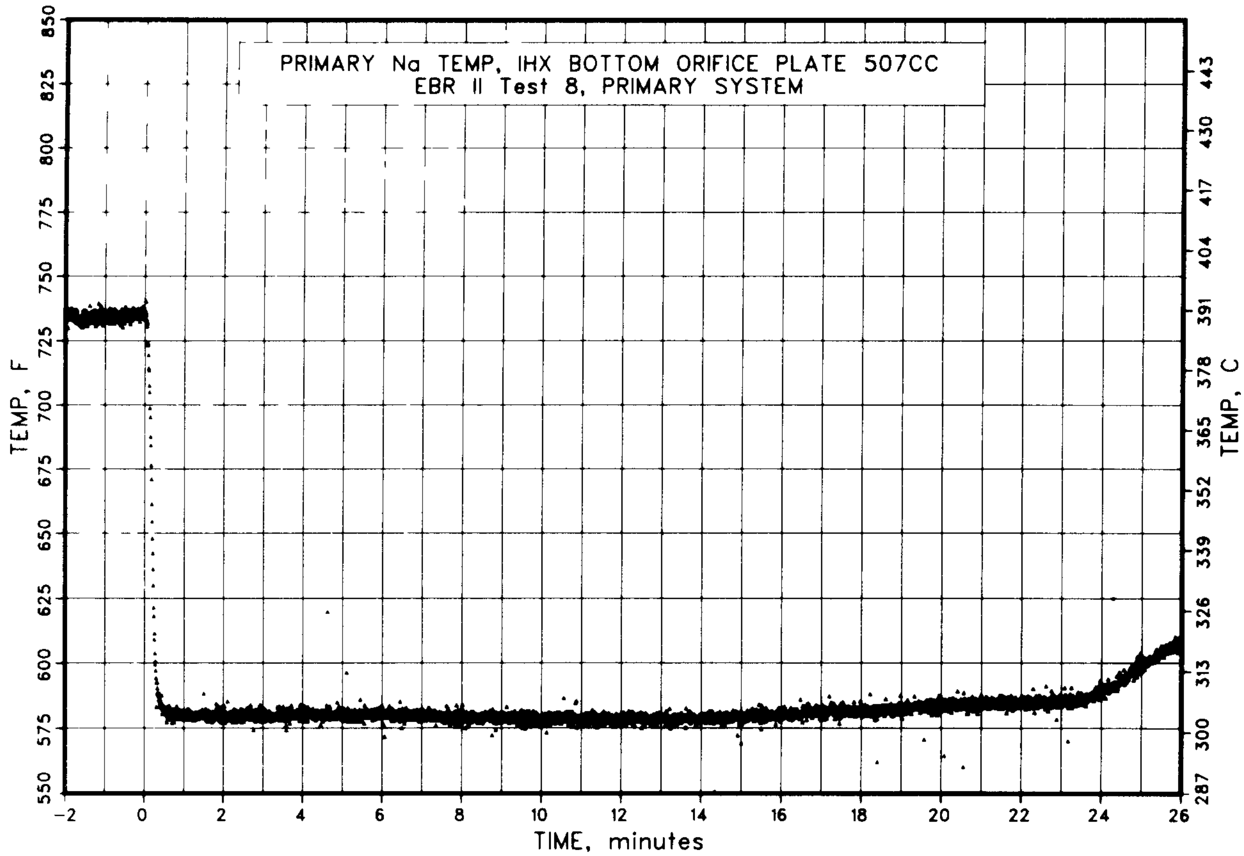

PRIMARY Na TEMP, IHX PRIMARY INLET, 507BK
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
600 625 650 675 700 725 750 775 800 825 850 875 900
TEMP, C
315 328 341 354 367 380 393 406 419 432 445 458 471
TIME, seconds
-10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180

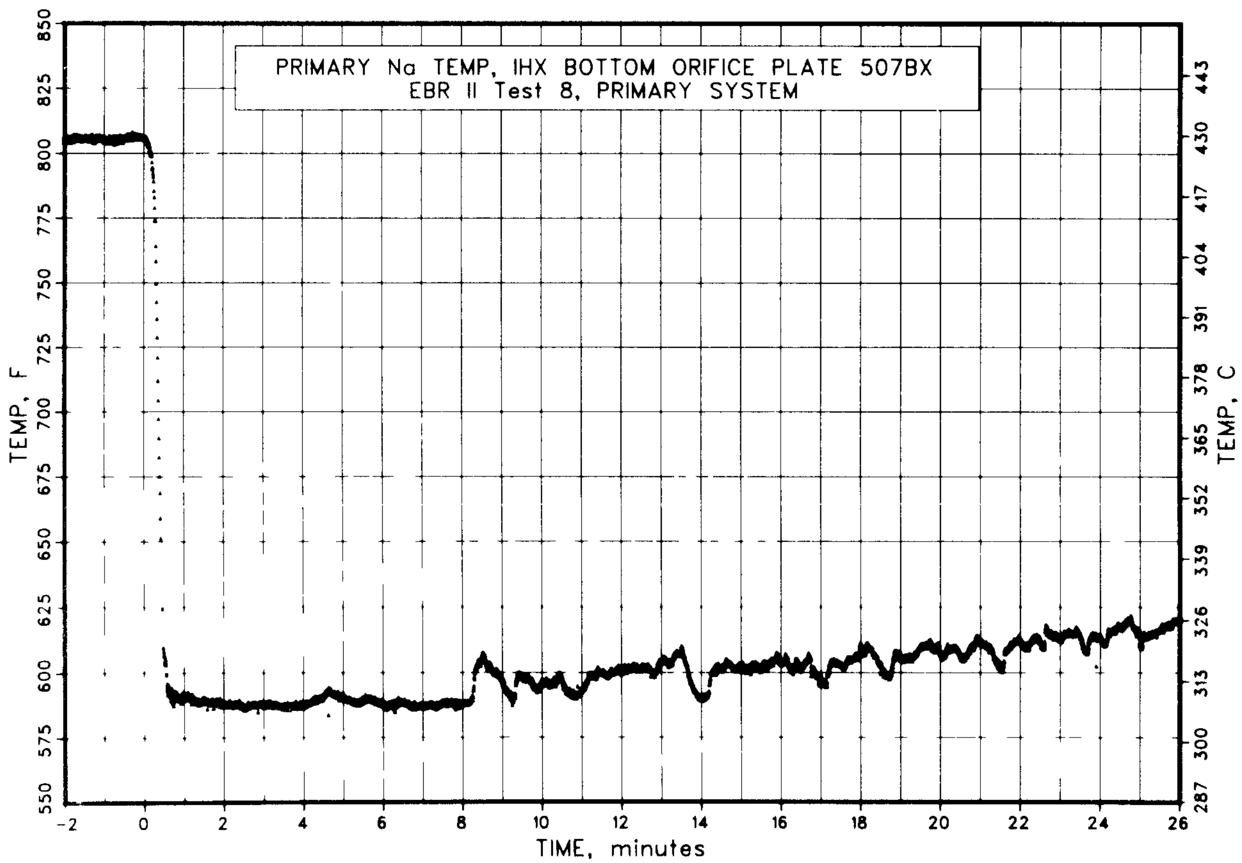

PRIMARY Na TEMP, IHX INLET 507BQ
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
600 625 650 675 700 725 750 775 800 825 850 875 900
TEMP, C
315 328 341 354 367 380 393 406 419 432 445 458 471
TIME, seconds
-10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180

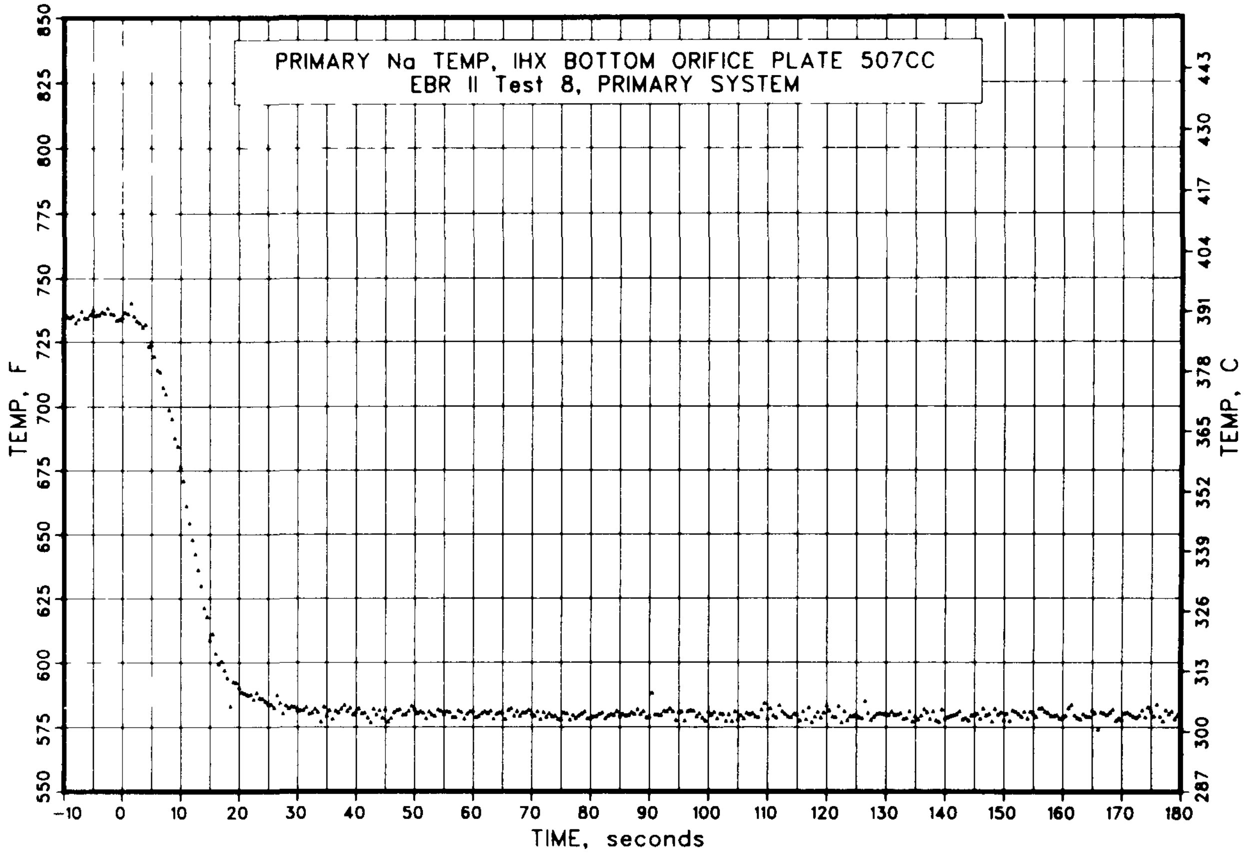

PRIMARY Na TEMP, IHX TOP ORIFICE PLATE 507CP
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
900
875
850
825
800
775
750
725
700
675
650
625
600
471
458
445
432
419
406
393
380
367
354
341
328
315
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26

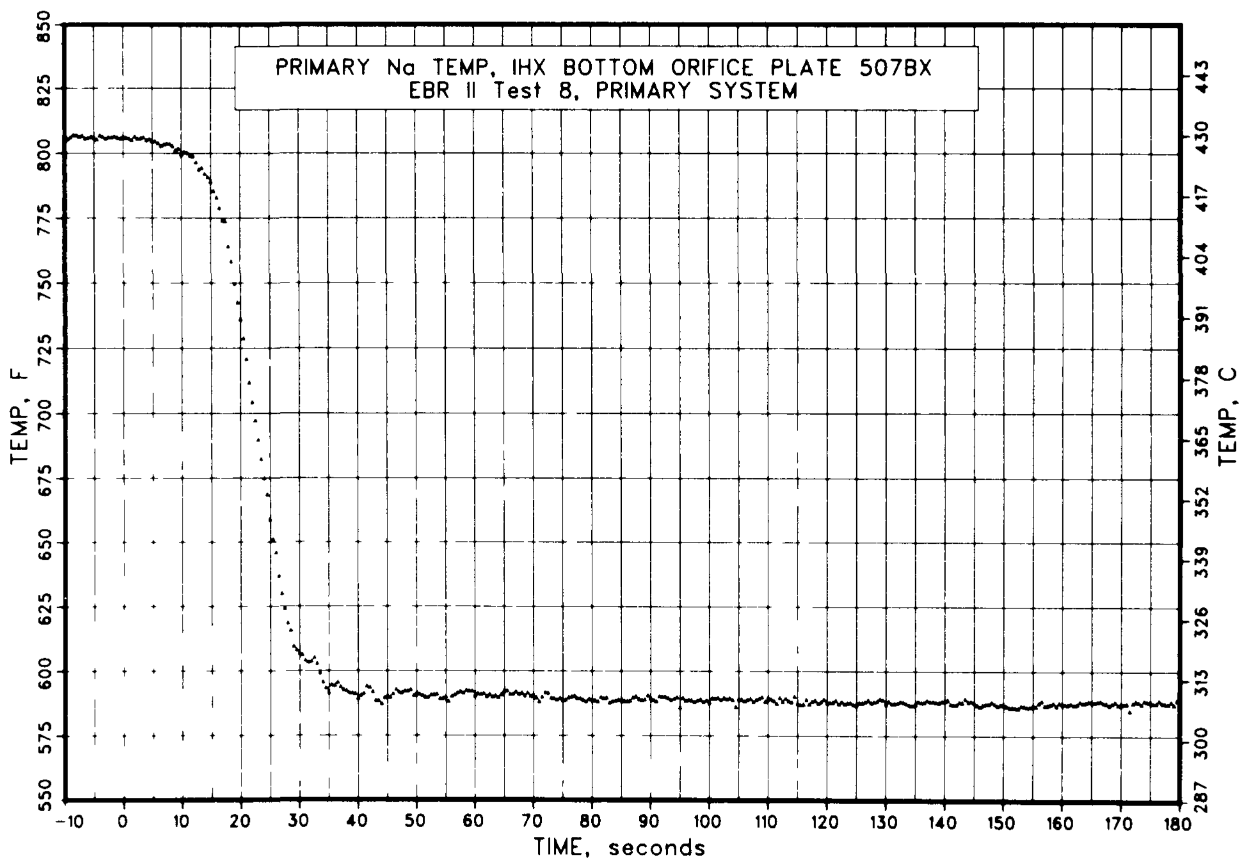


PRIMARY Na TEMP, IHX TOP ORIFICE PLATE 507CP
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
900
875
850
825
800
775
750
725
700
675
650
625
600
TEMP, C
471
458
445
432
419
406
393
380
367
354
341
328
315
TIME, seconds
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180


PRIMARY Na TEMP, IHX BOTTOM ORIFICE PLATE 507CC
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


PRIMARY Na TEMP, IHX BOTTOM ORIFICE PLATE 507BX
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


PRIMARY Na TEMP, IHX BOTTOM ORIFICE PLATE 507CC
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
550
575
600
625
650
675
700
725
750
775
800
825
850
287
300
313
326
339
352
365
378
391
404
417
430
443
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180


PRIMARY Na TEMP, IHX BOTTOM ORIFICE PLATE 507BX
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
550
575
600
625
650
675
700
725
750
775
800
825
850
287
300
313
326
339
352
365
378
391
404
417
430
443
-10
0
10
20
30
40
50
60
70
80
90
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110
120
130
140
150
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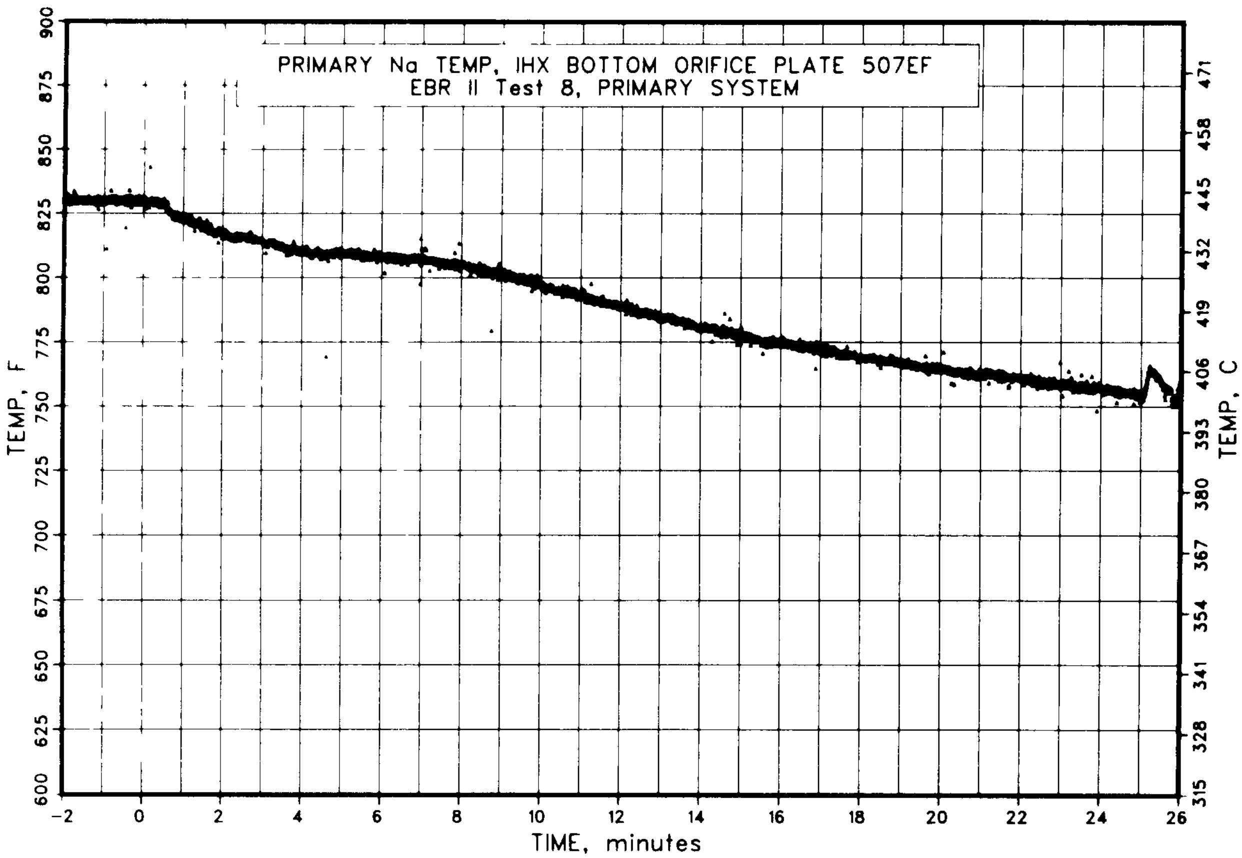
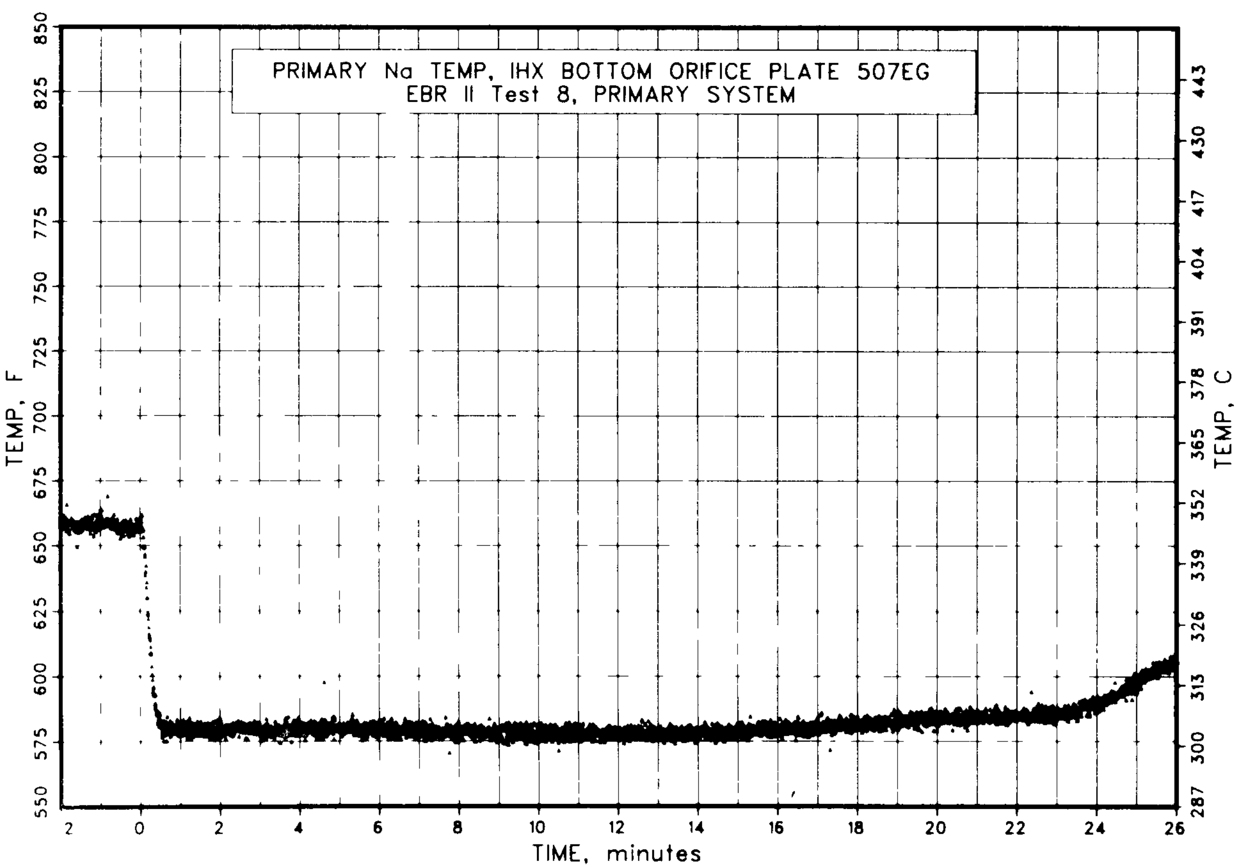
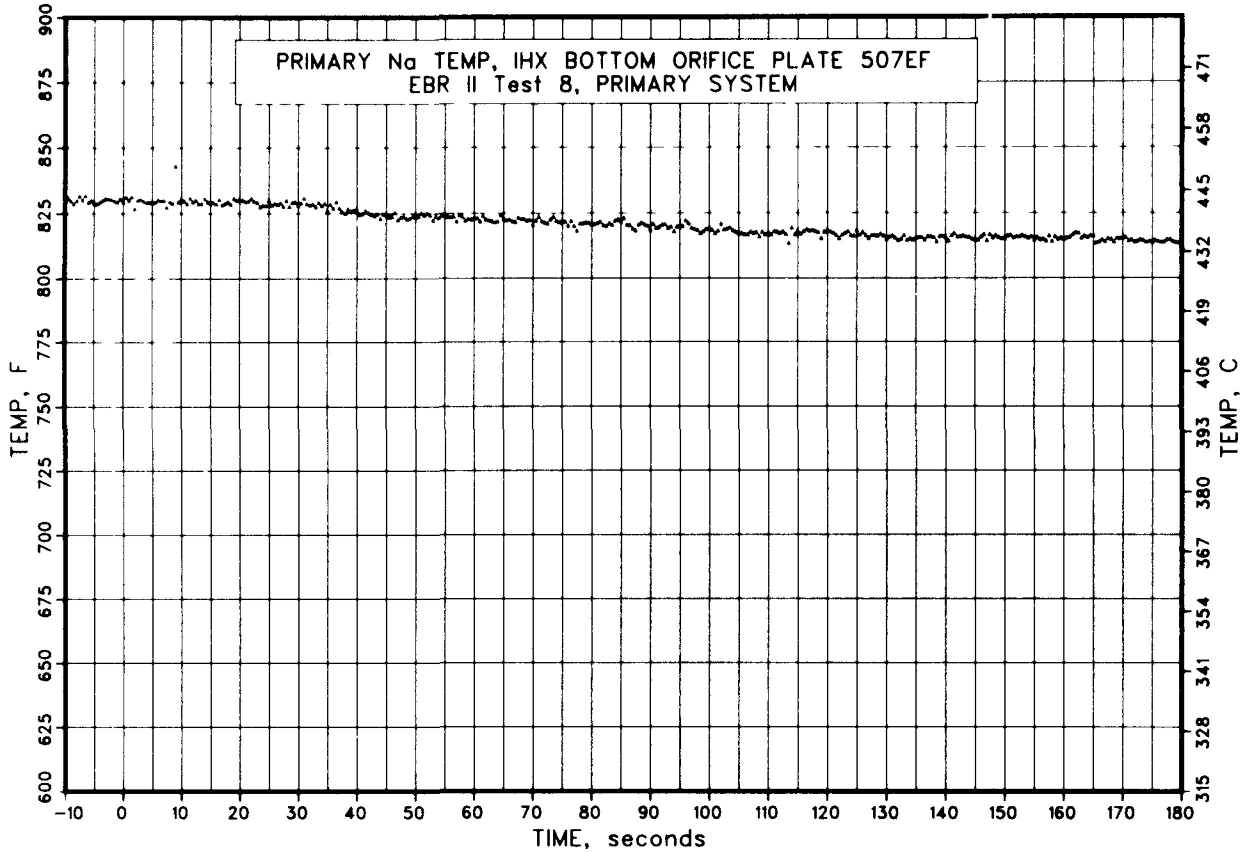
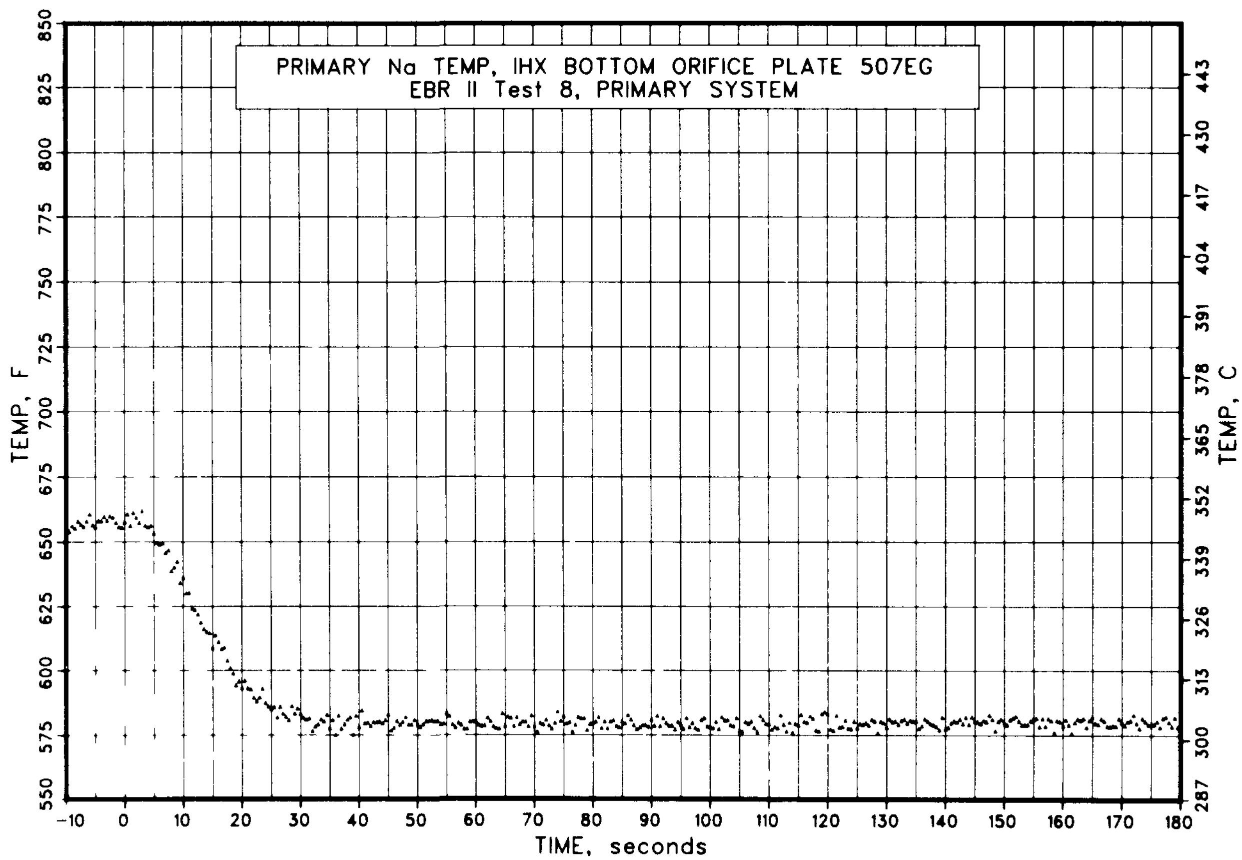
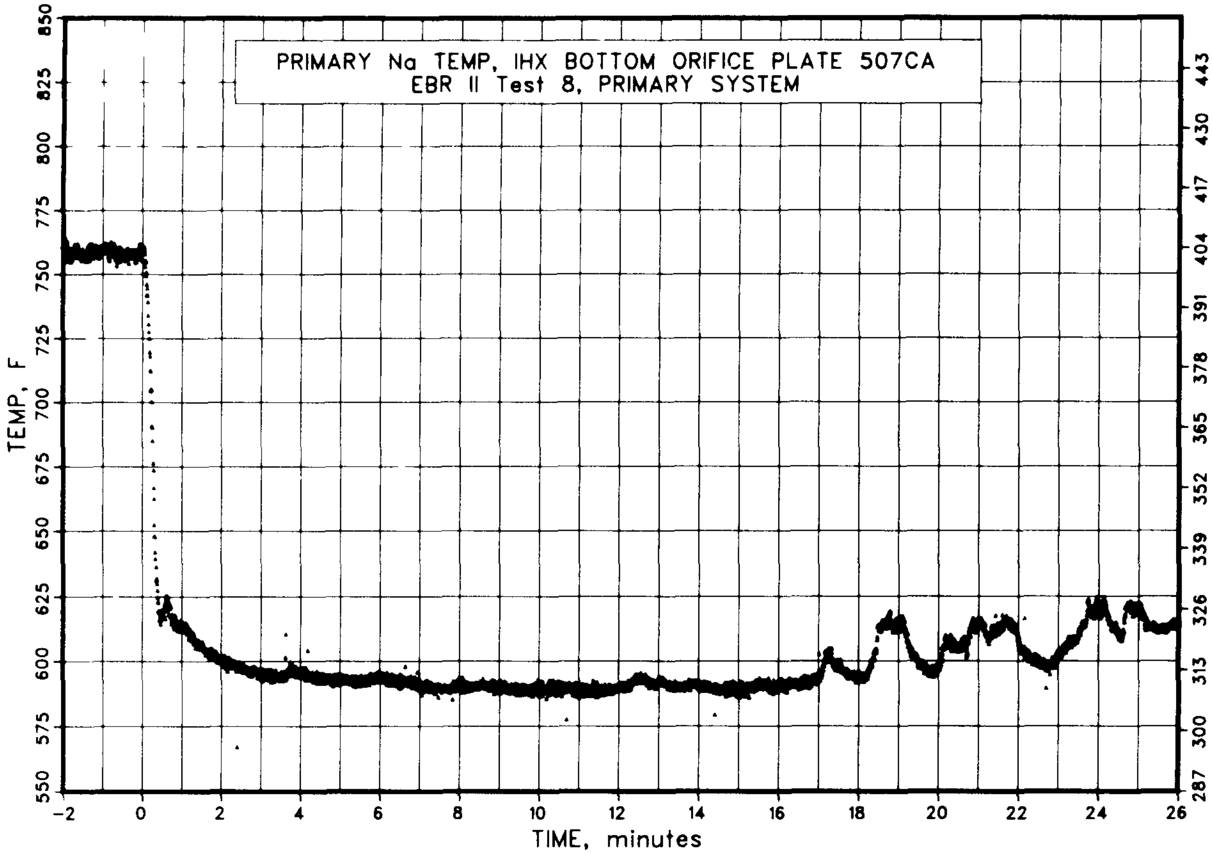
170
180

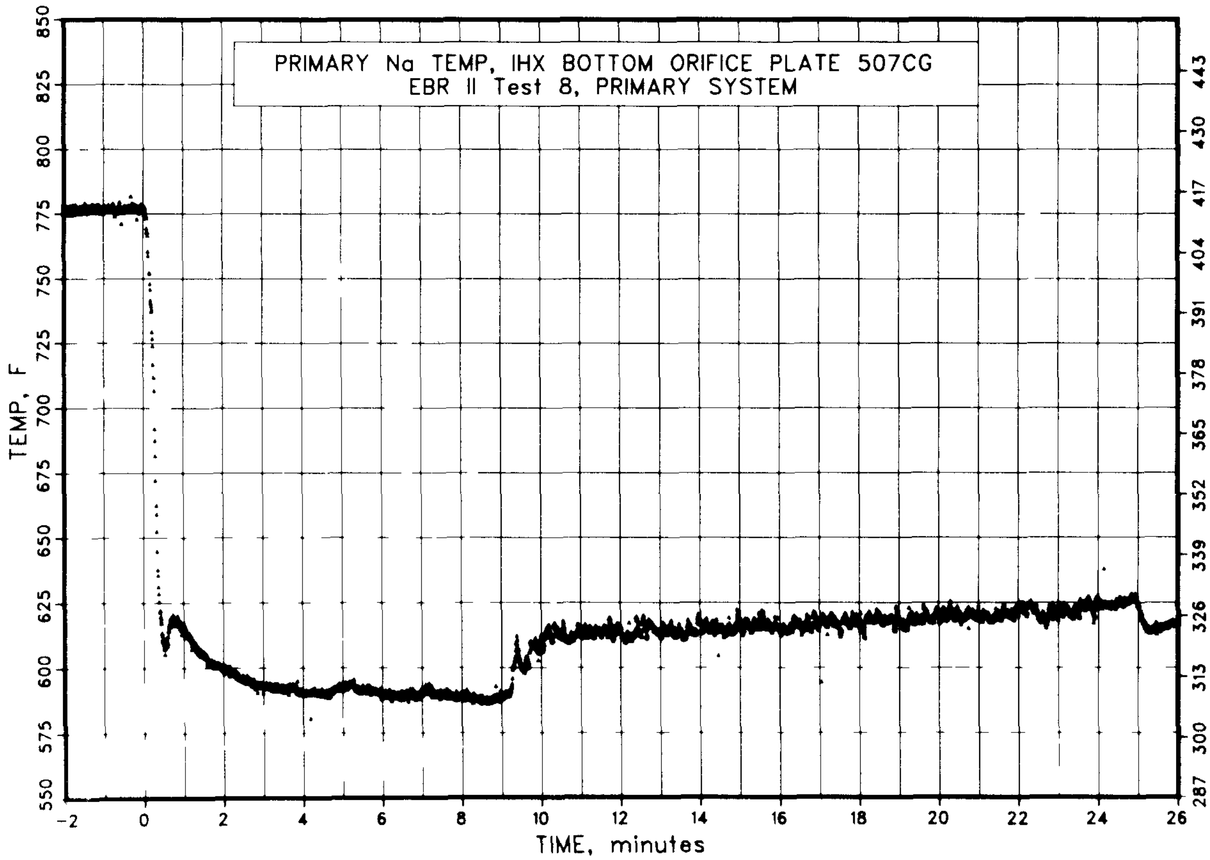

PRIMARY Na TEMP, IHX BOTTOM ORIFICE PLATE 507EF
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes

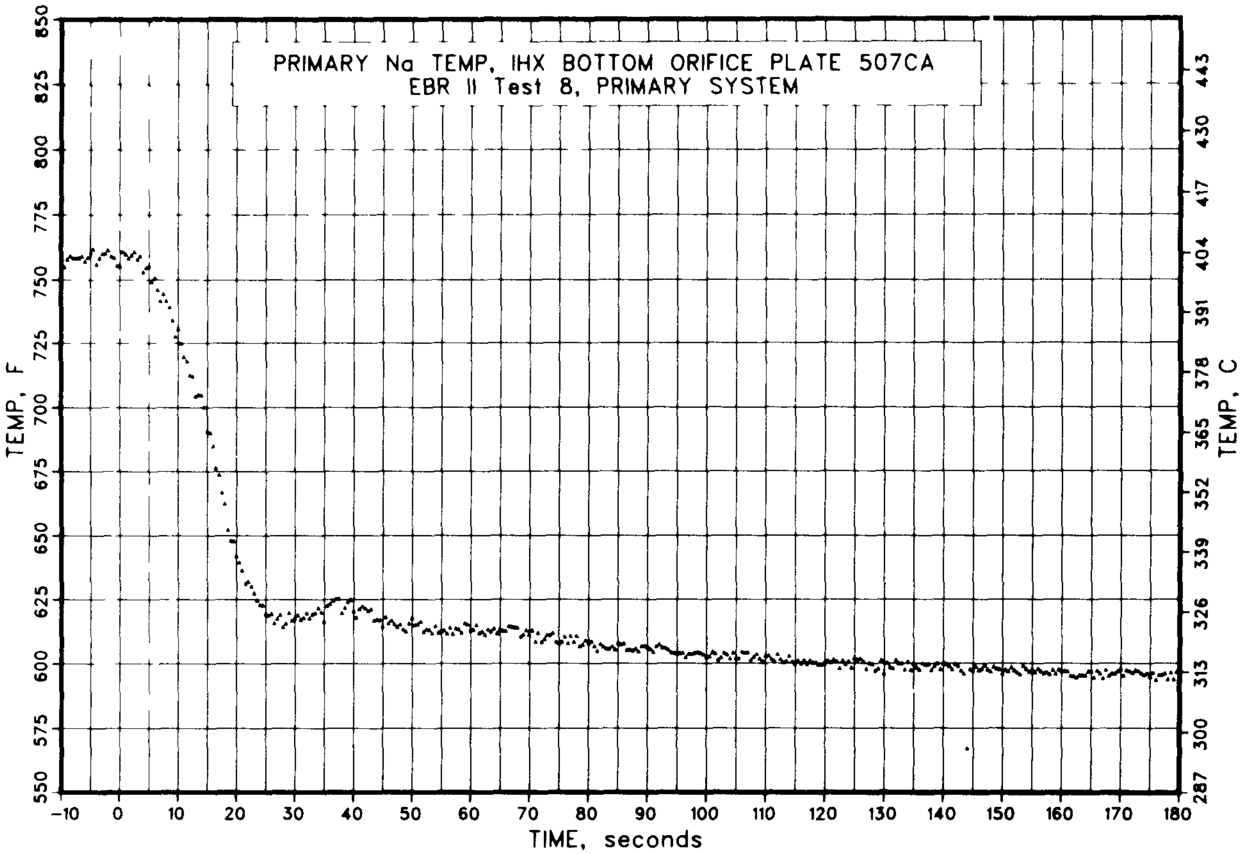

PRIMARY Na TEMP, IHX BOTTOM ORIFICE PLATE 507EG
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes

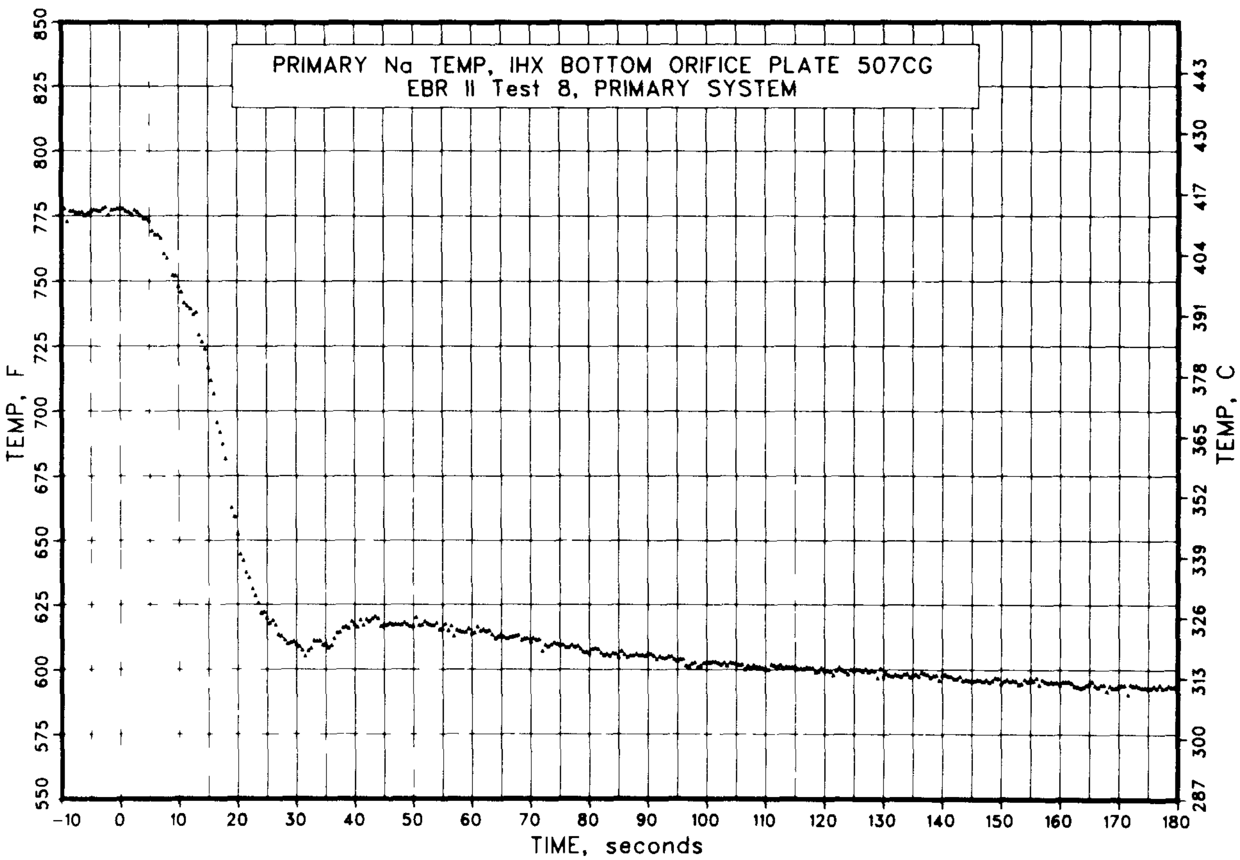

PRIMARY Na TEMP, IHX BOTTOM ORIFICE PLATE 507EF
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds


PRIMARY Na TEMP, IHX BOTTOM ORIFICE PLATE 507EG
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds


PRIMARY Na TEMP, IHX BOTTOM ORIFICE PLATE 507CA
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


PRIMARY Na TEMP, IHX BOTTOM ORIFICE PLATE 507CG
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


PRIMARY Na TEMP, IHX BOTTOM ORIFICE PLATE 507CA
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
850
825
800
775
750
725
700
675
650
625
600
575
550
443
430
417
404
391
378
365
352
339
326
313
300
287
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180


PRIMARY Na TEMP, IHX BOTTOM ORIFICE PLATE 507CG
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
850
825
800
775
750
725
700
675
650
625
600
575
550
443
430
417
404
391
378
365
352
339
326
313
300
287
-10
0
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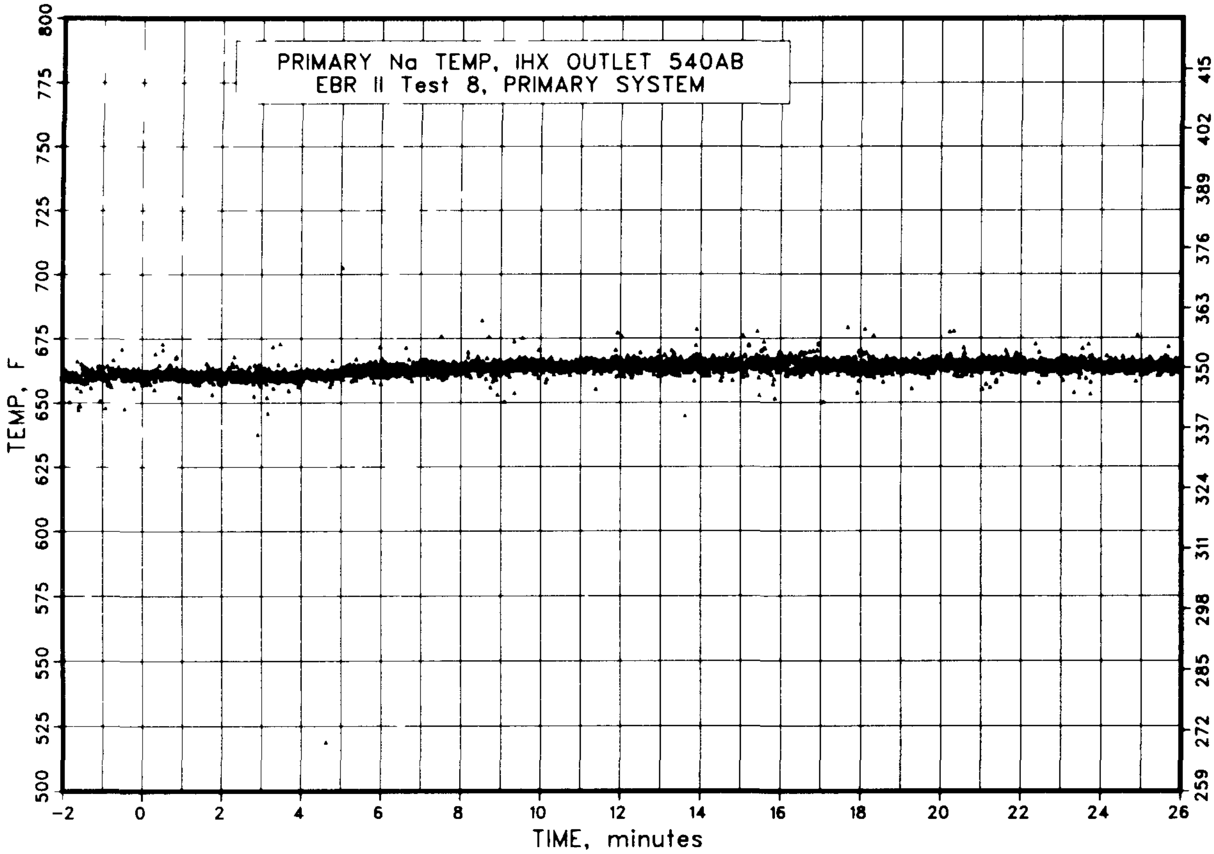
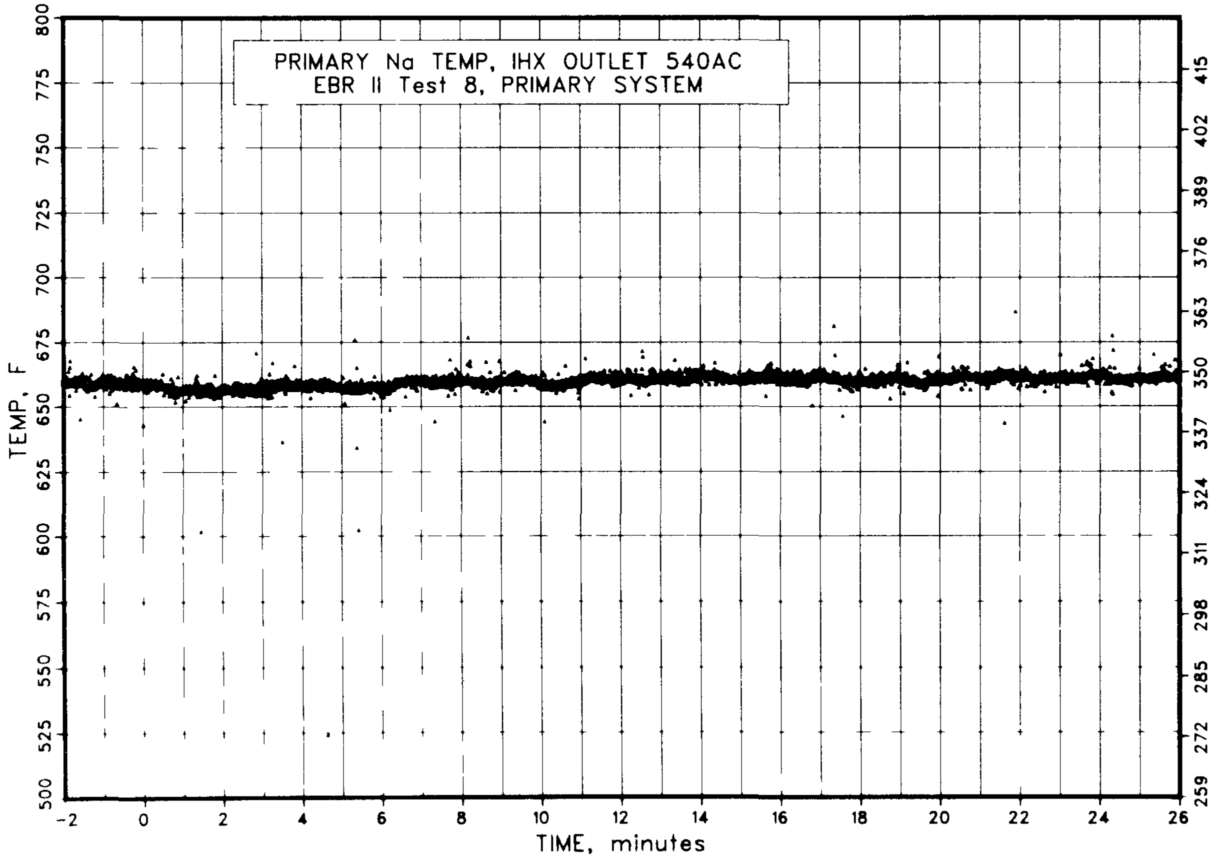
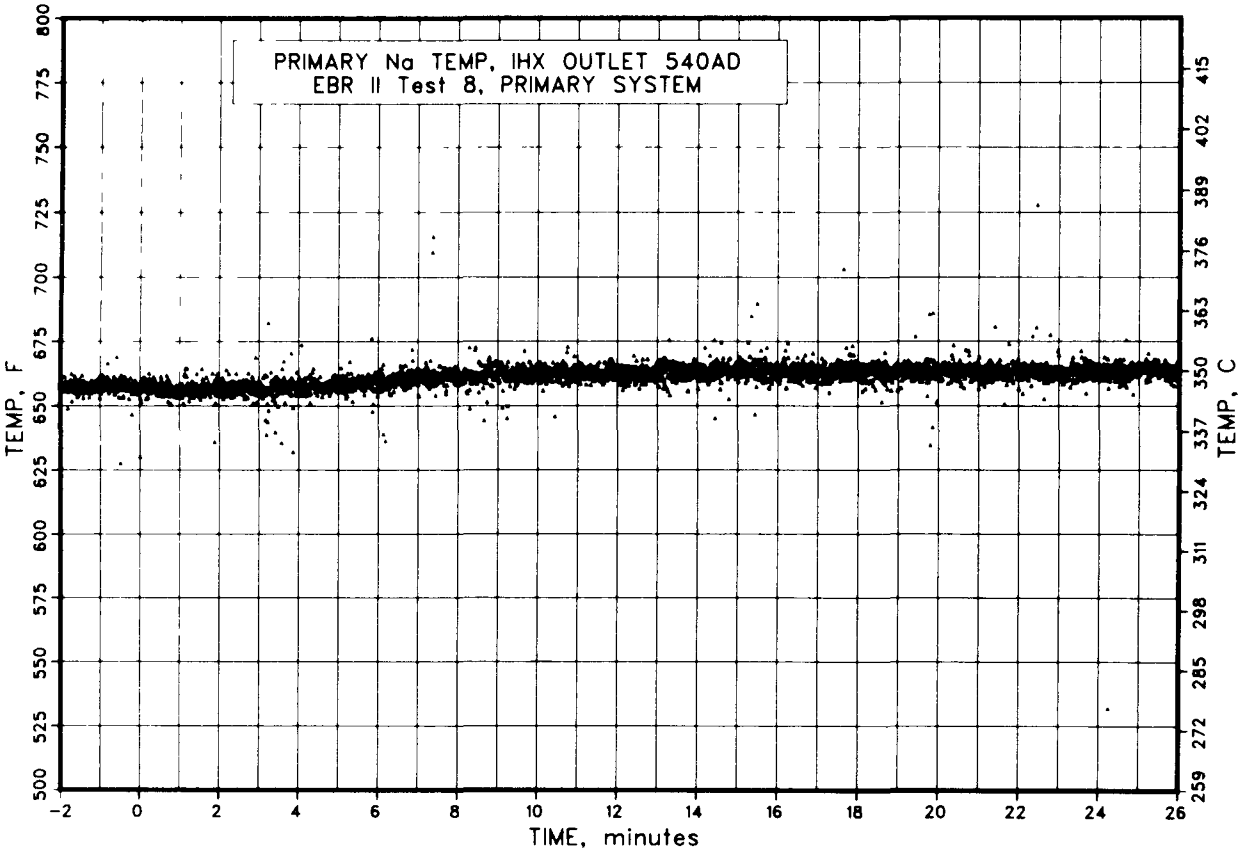
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180

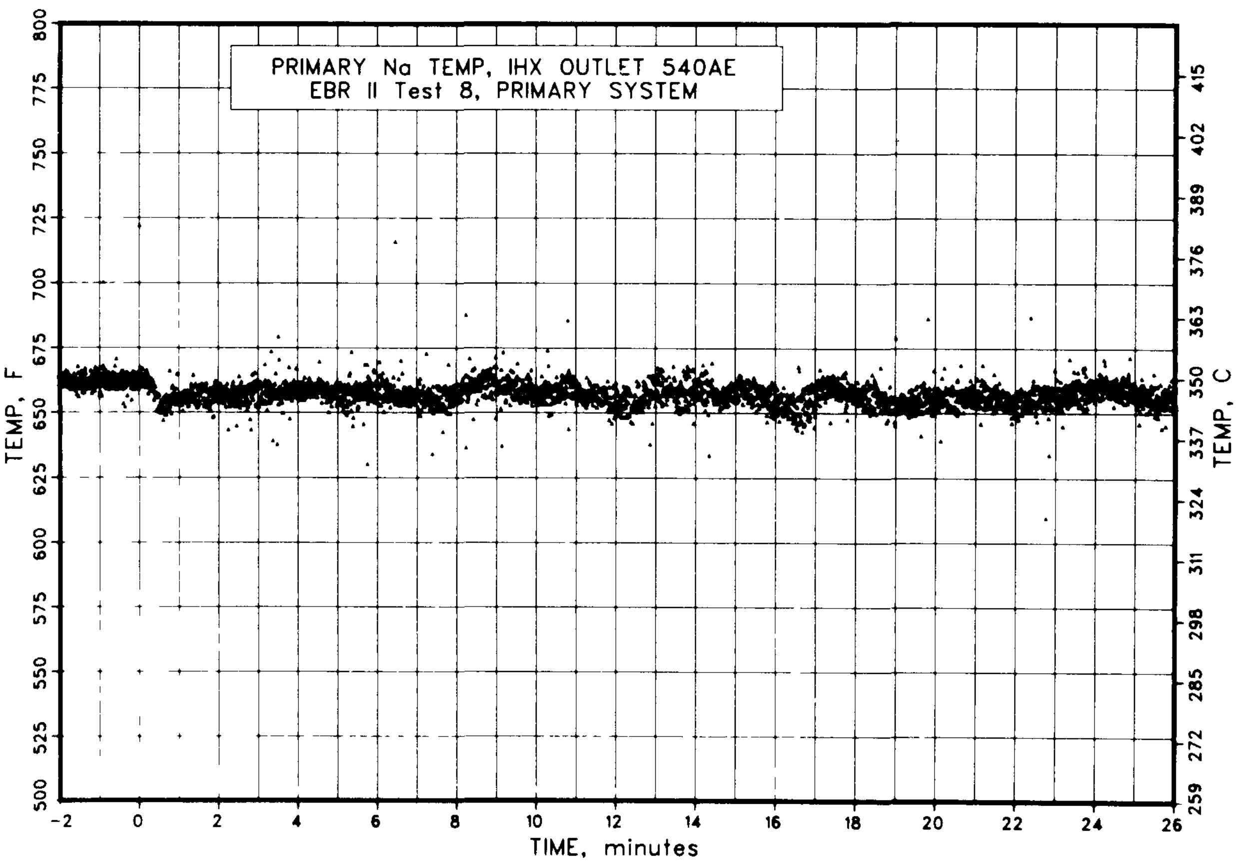


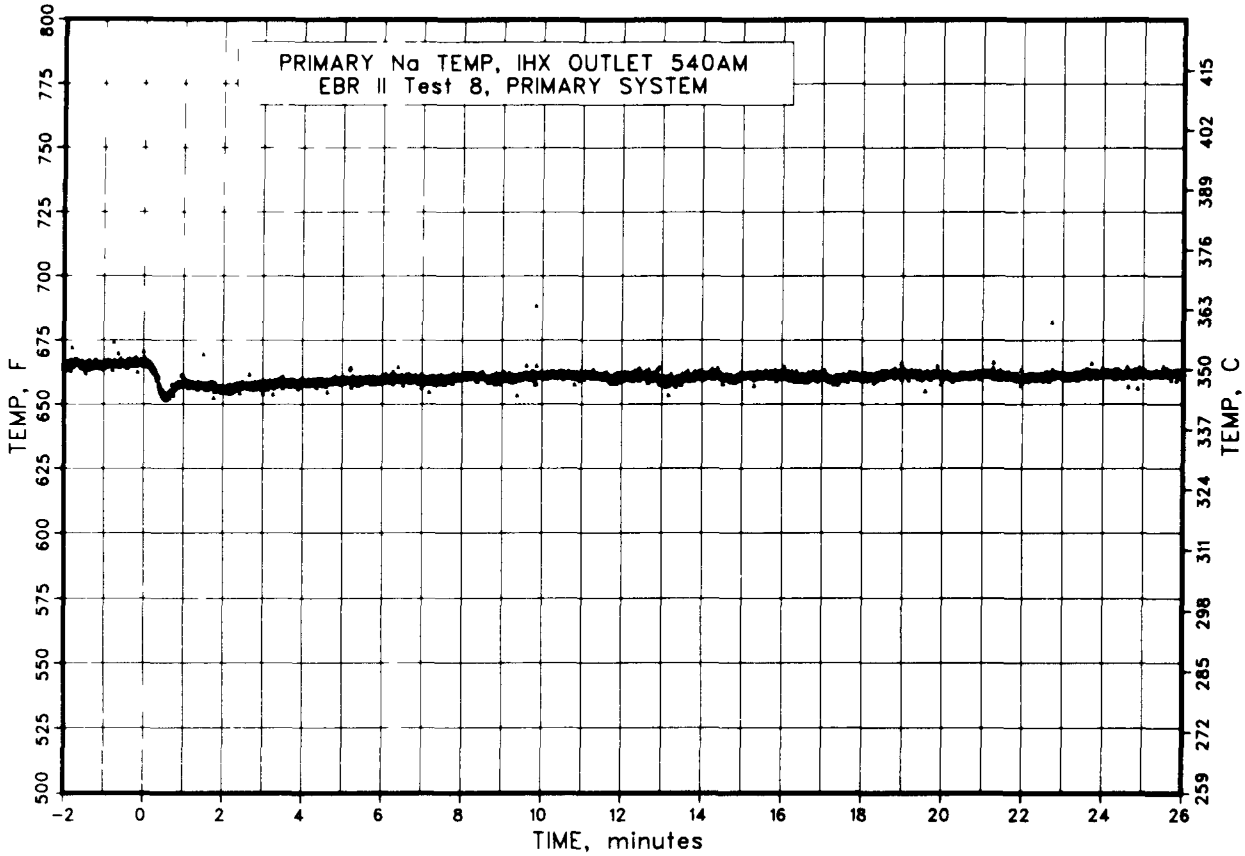
PRIMARY Na TEMP, IHX OUTLET 540AB
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes

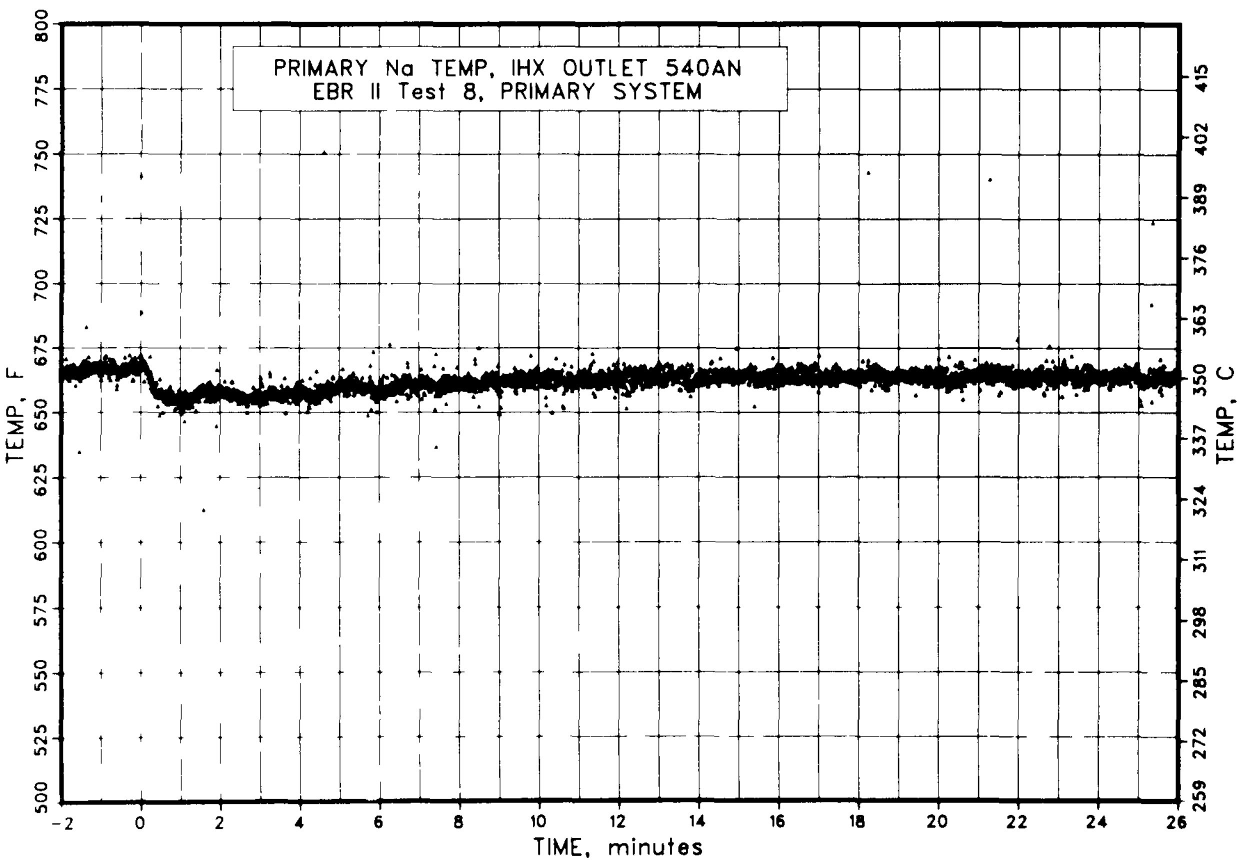


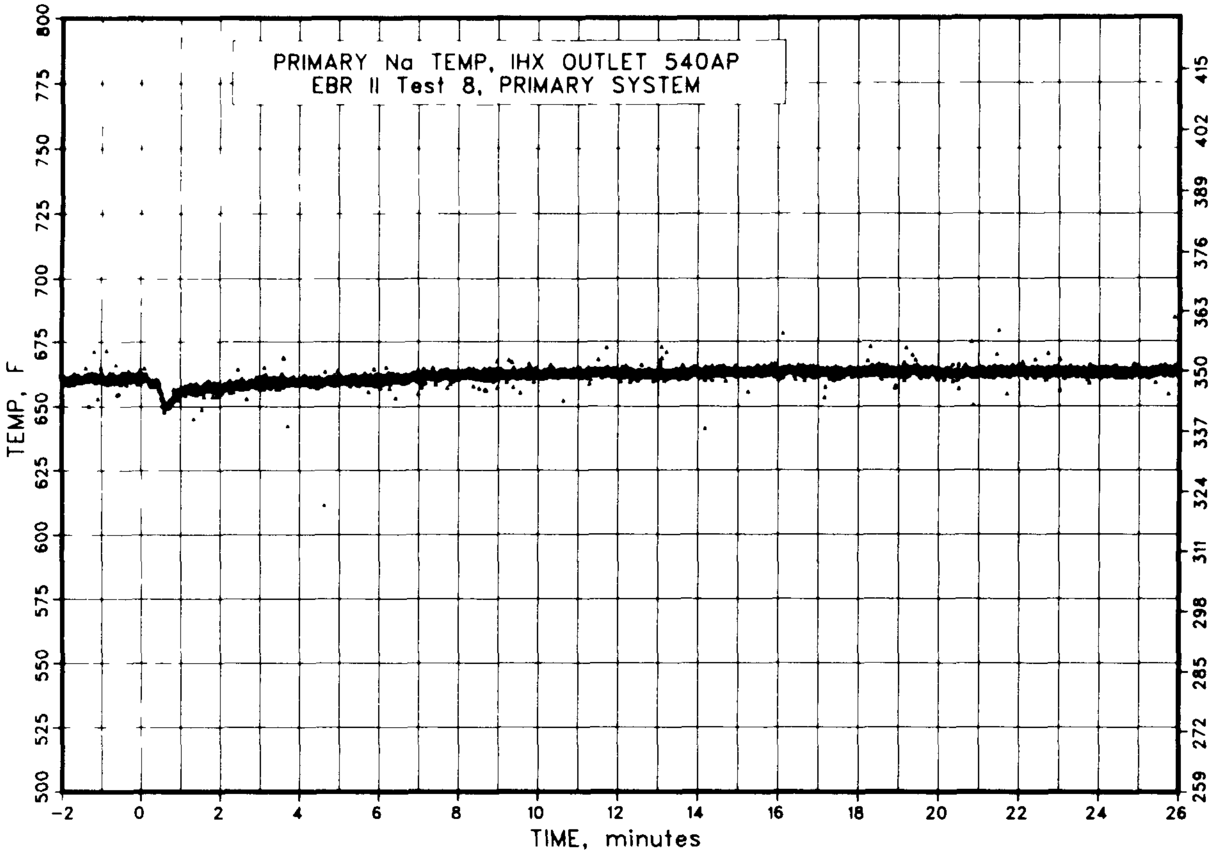
PRIMARY Na TEMP, IHX OUTLET 540AC
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes

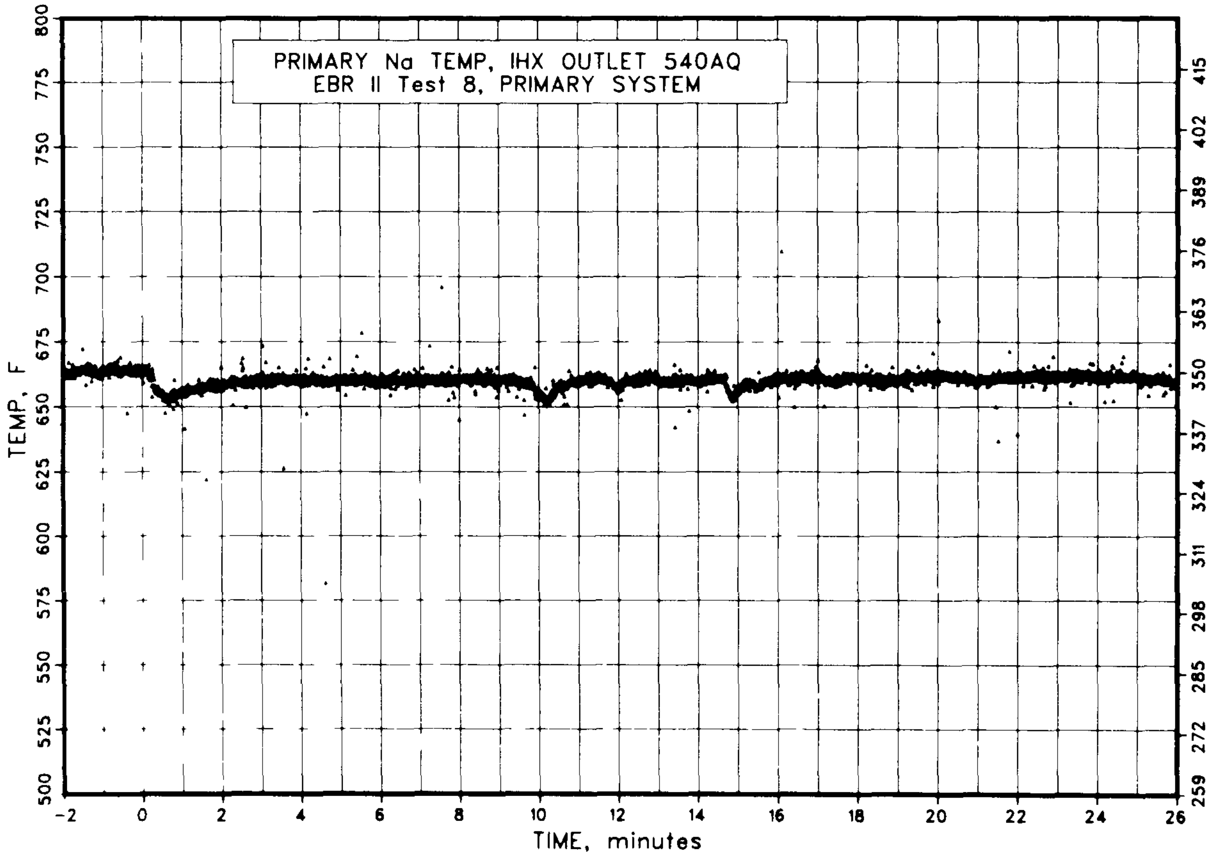

PRIMARY Na TEMP, IHX OUTLET 540AD
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes

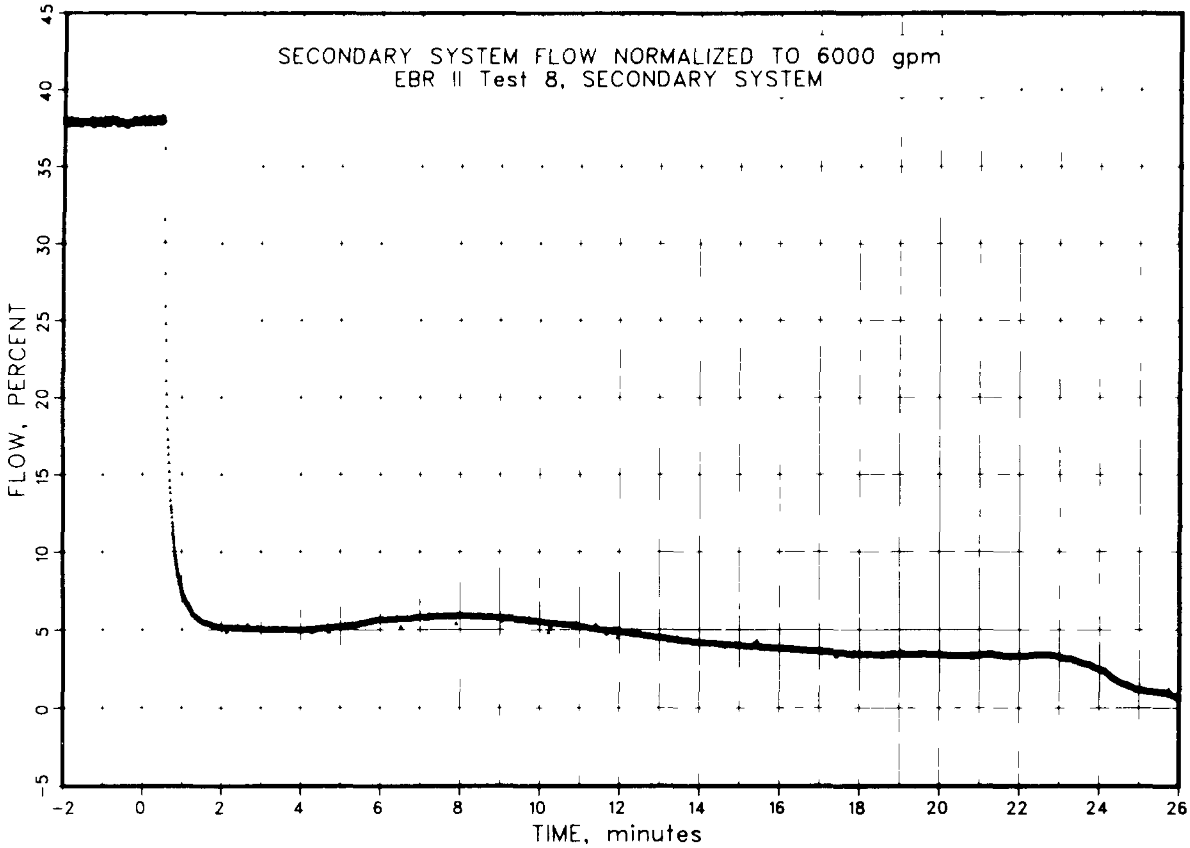

PRIMARY Na TEMP, IHX OUTLET 540AE
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes

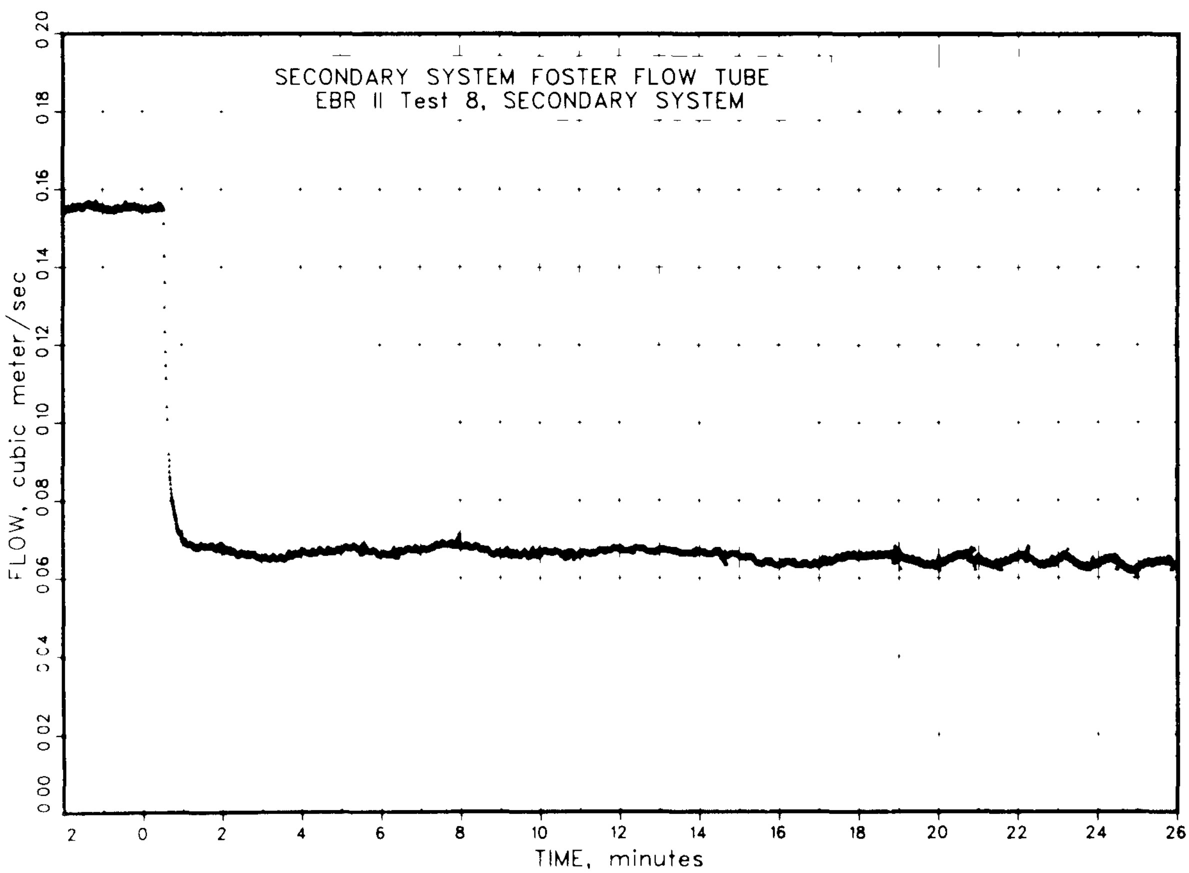

PRIMARY Na TEMP, IHX OUTLET 540AM
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes

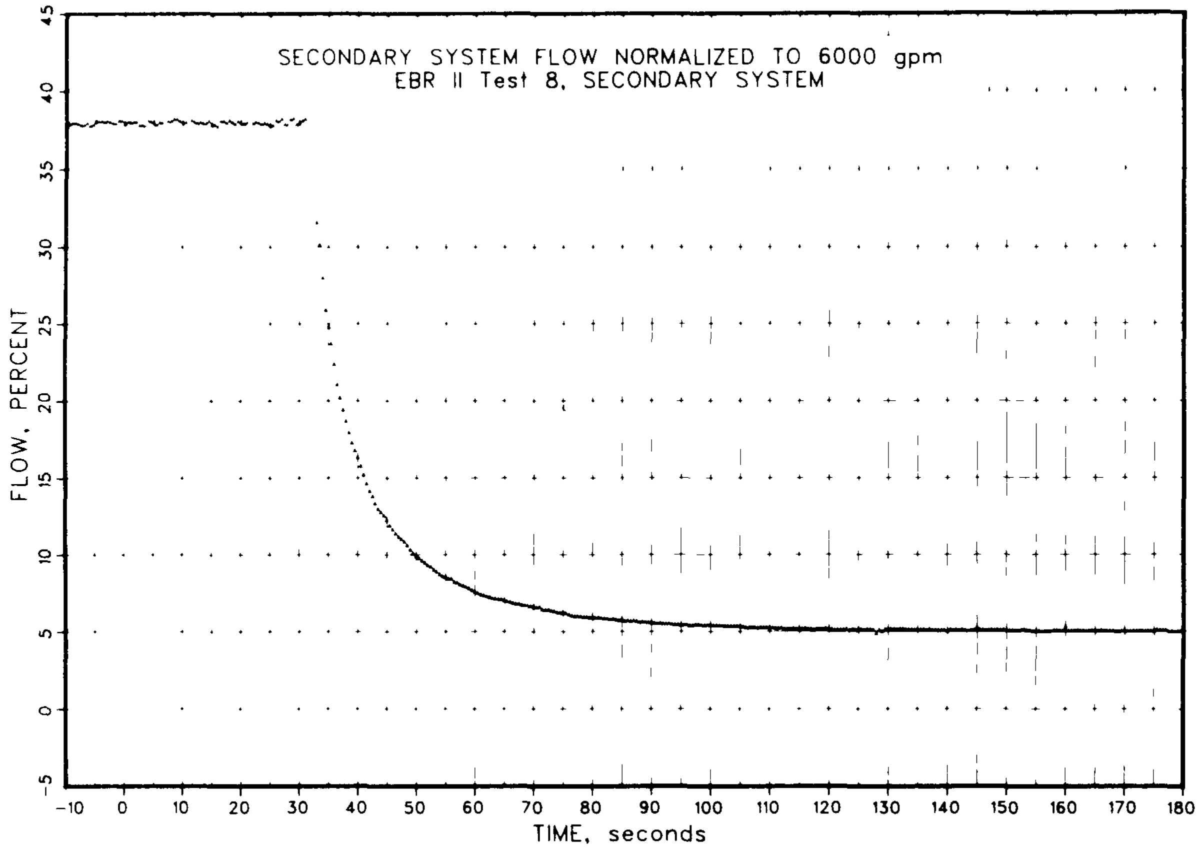

PRIMARY Na TEMP, IHX OUTLET 540AN
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes

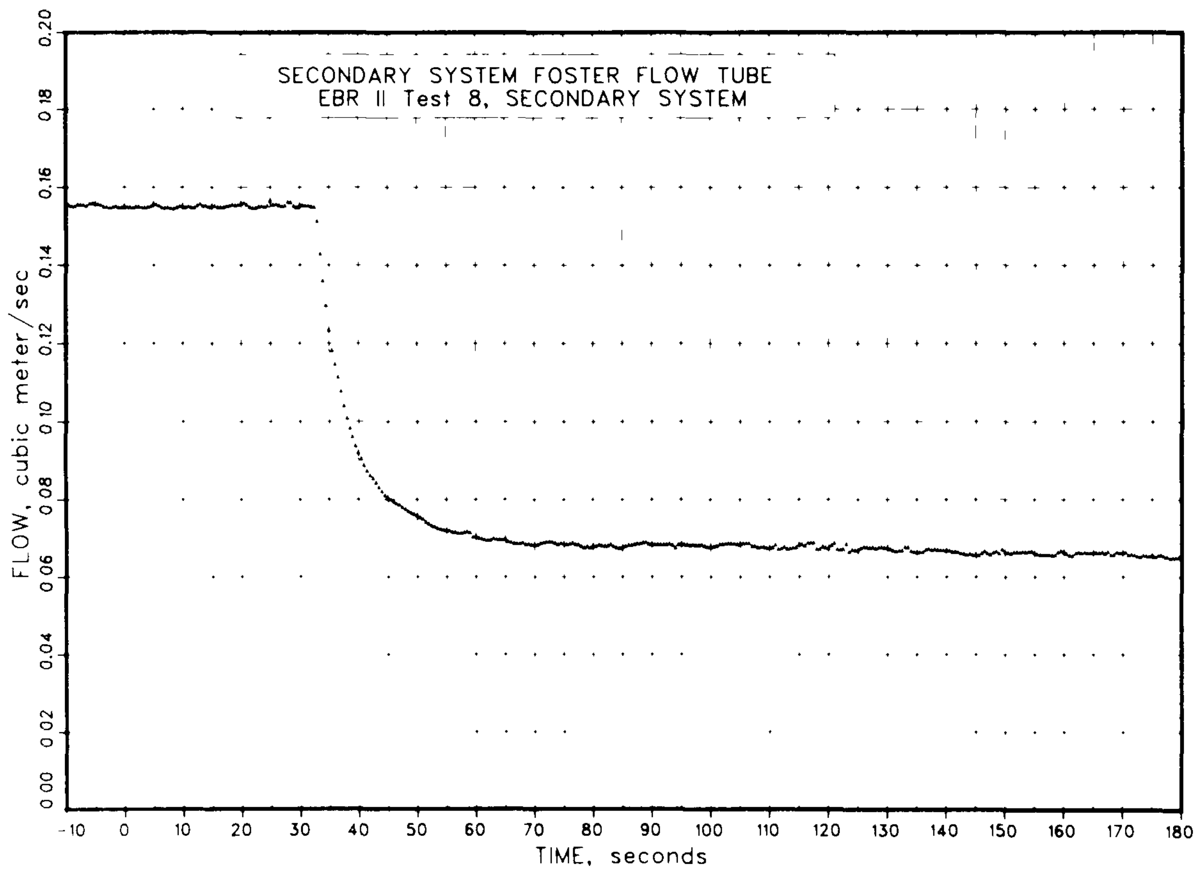

PRIMARY Na TEMP, IHX OUTLET 540AP
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
800
775
750
725
700
675
650
625
600
575
550
525
500
415
402
389
376
363
350
337
324
311
298
285
272
259
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26

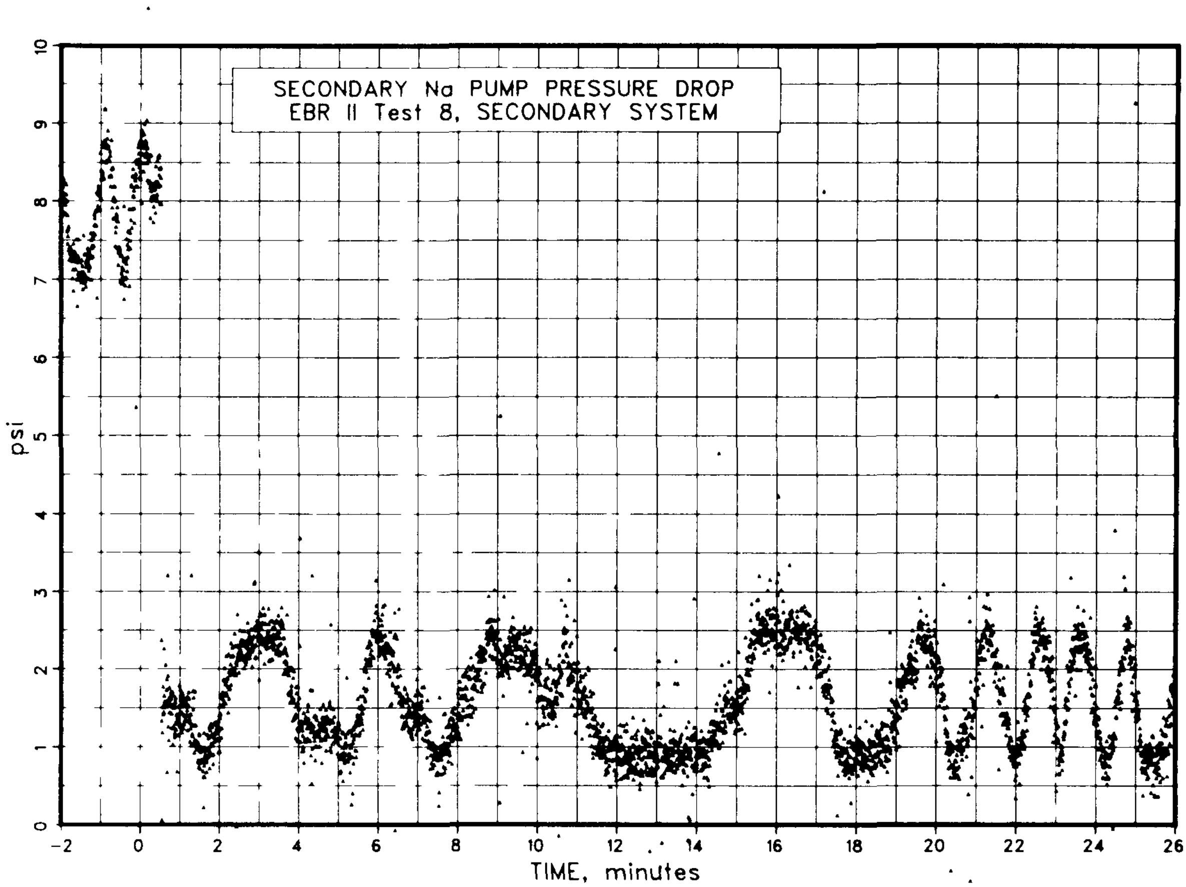

PRIMARY Na TEMP, IHX OUTLET 540AQ
EBR II Test 8, PRIMARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
800
775
750
725
700
675
650
625
600
575
550
525
500
415
402
389
376
363
350
337
324
311
298
285
272
259
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26

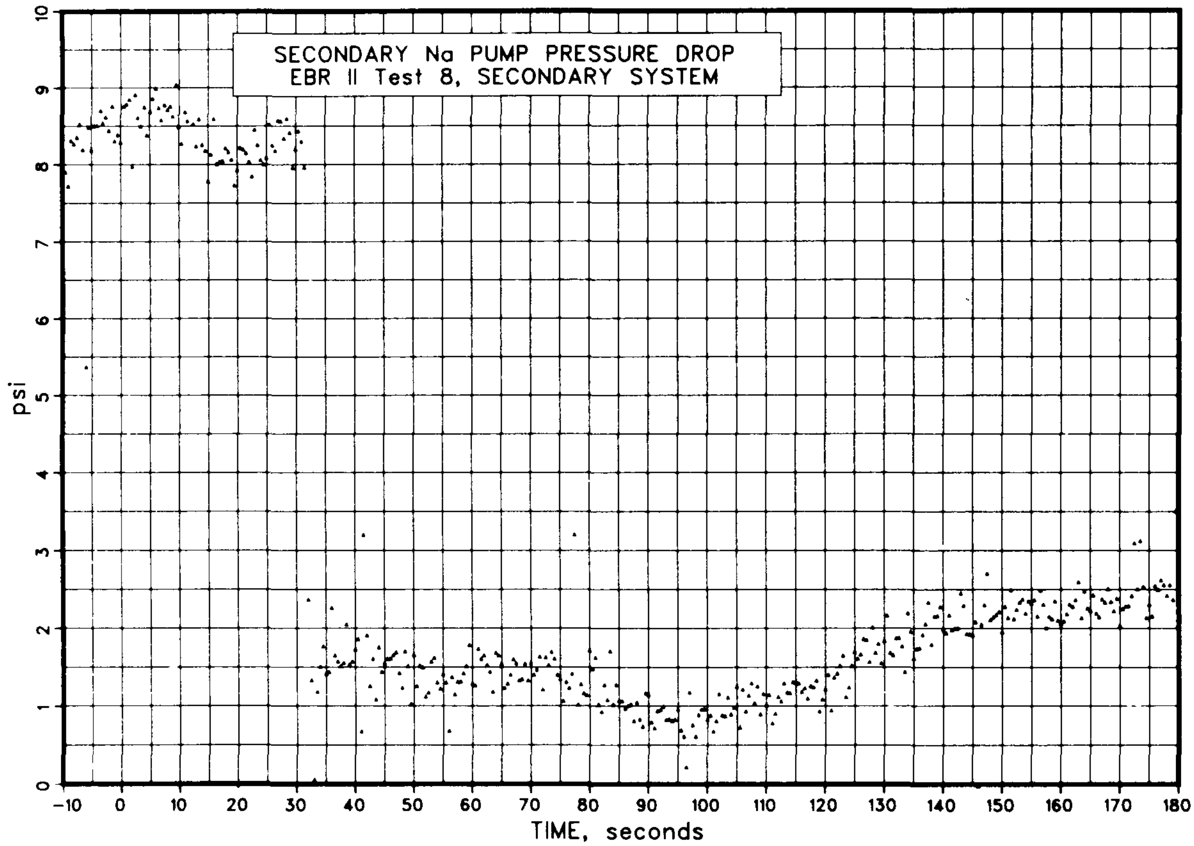

SECONDARY SYSTEM FLOW NORMALIZED TO 6000 gpm
EBR II Test 8, SECONDARY SYSTEM
FLOW, PERCENT
TIME, minutes

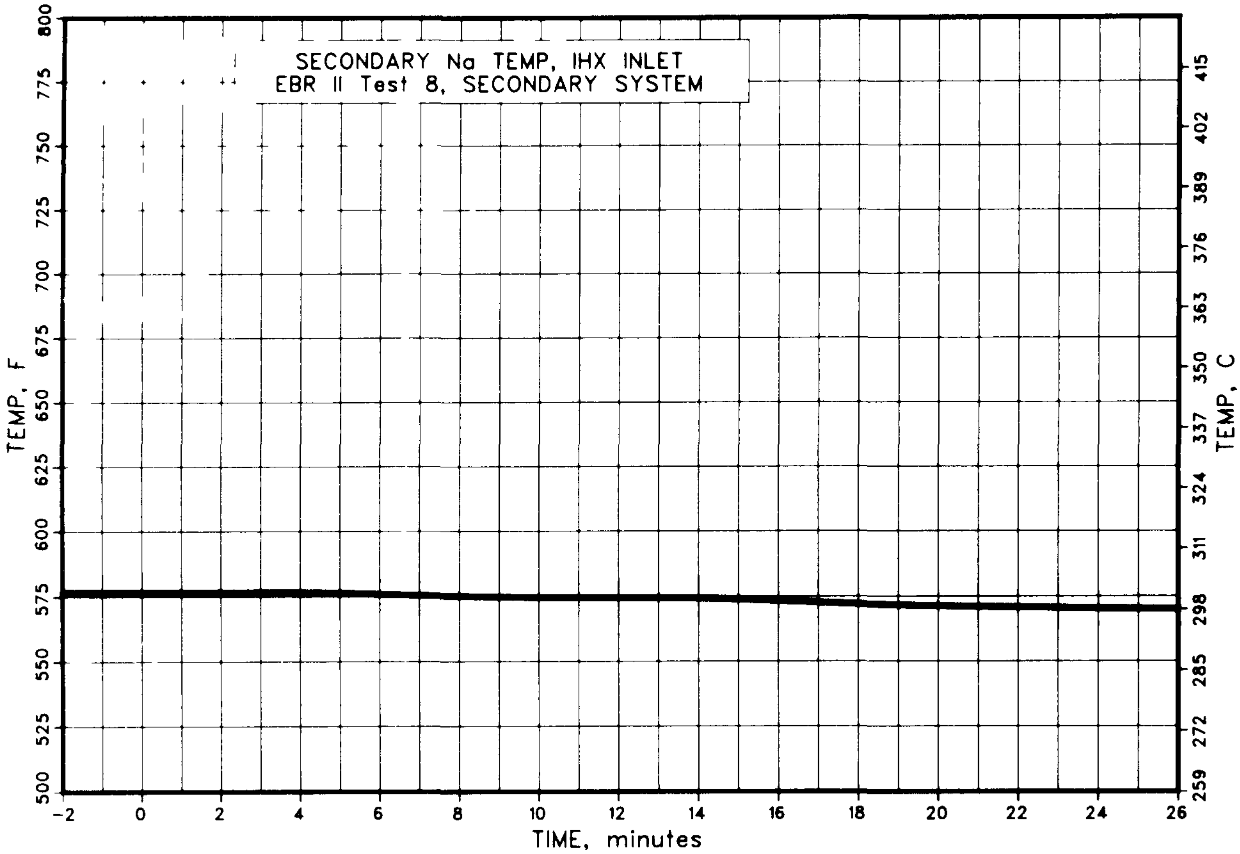

SECONDARY SYSTEM FOSTER FLOW TUBE
EBR II Test 8, SECONDARY SYSTEM
FLOW, cubic meter/sec
TIME, minutes

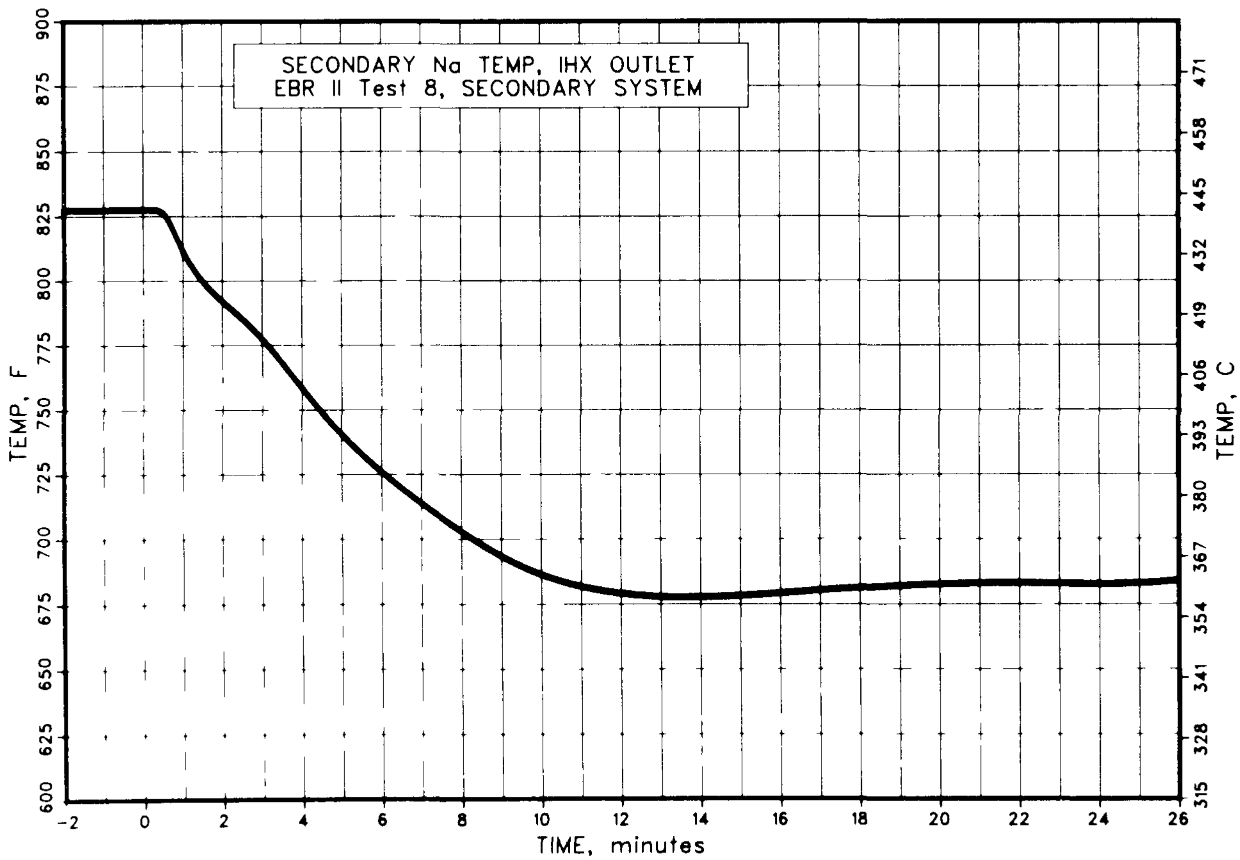

SECONDARY SYSTEM FLOW NORMALIZED TO 6000 gpm
EBR II Test 8, SECONDARY SYSTEM
FLOW, PERCENT
TIME, seconds
-5
0
5
10
15
20
25
30
35
40
45
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180

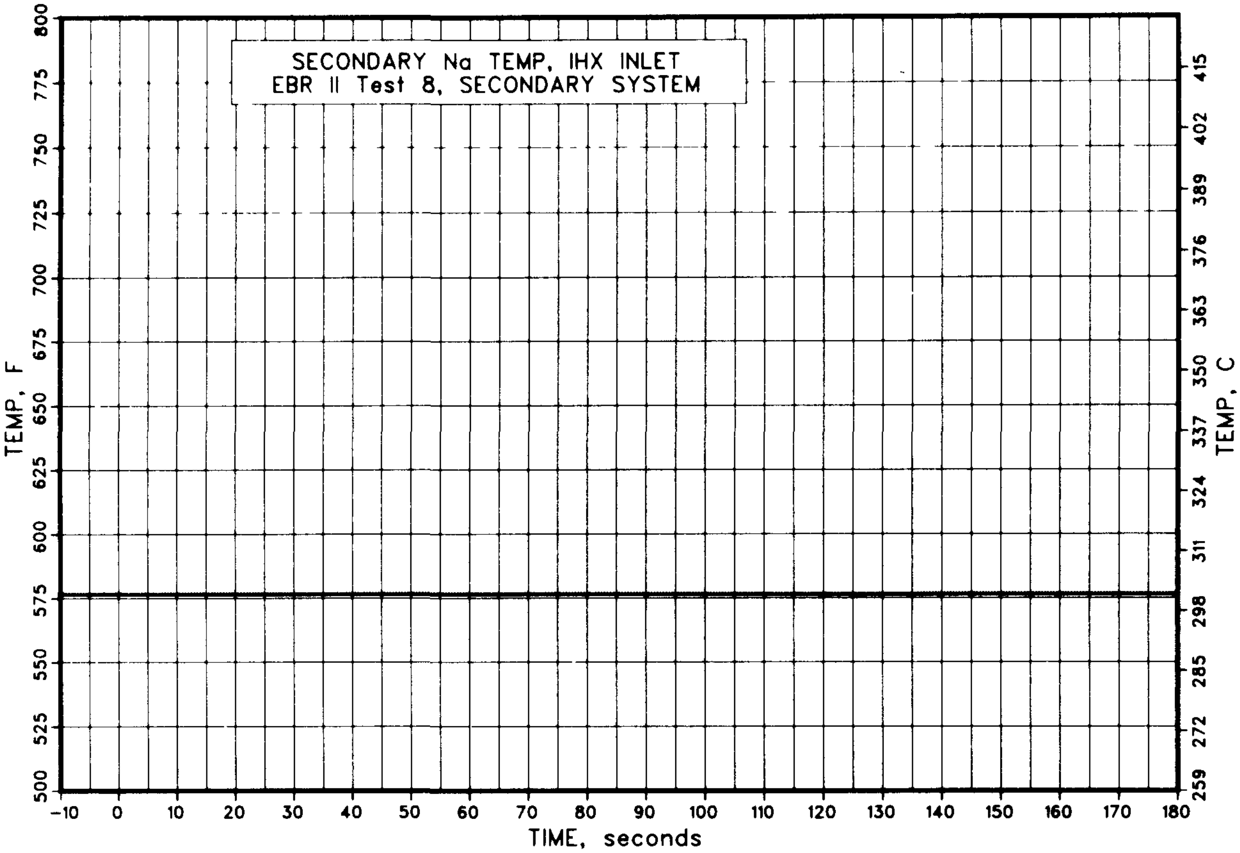

SECONDARY SYSTEM FOSTER FLOW TUBE
EBR II Test 8, SECONDARY SYSTEM
FLOW, cubic meter/sec
TIME, seconds
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180

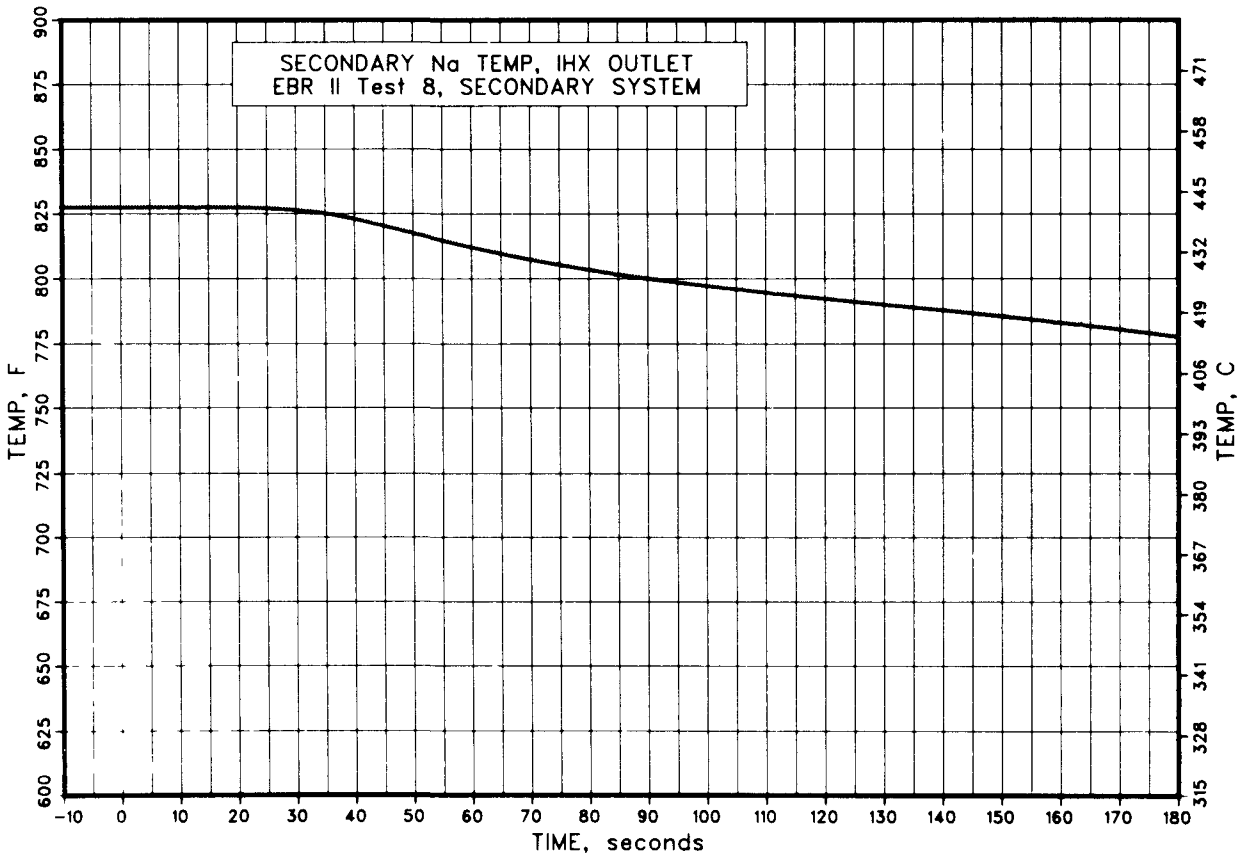

SECONDARY Na PUMP PRESSURE DROP
EBR II Test 8, SECONDARY SYSTEM
psi
0
1
2
3
4
5
6
7
8
9
10
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

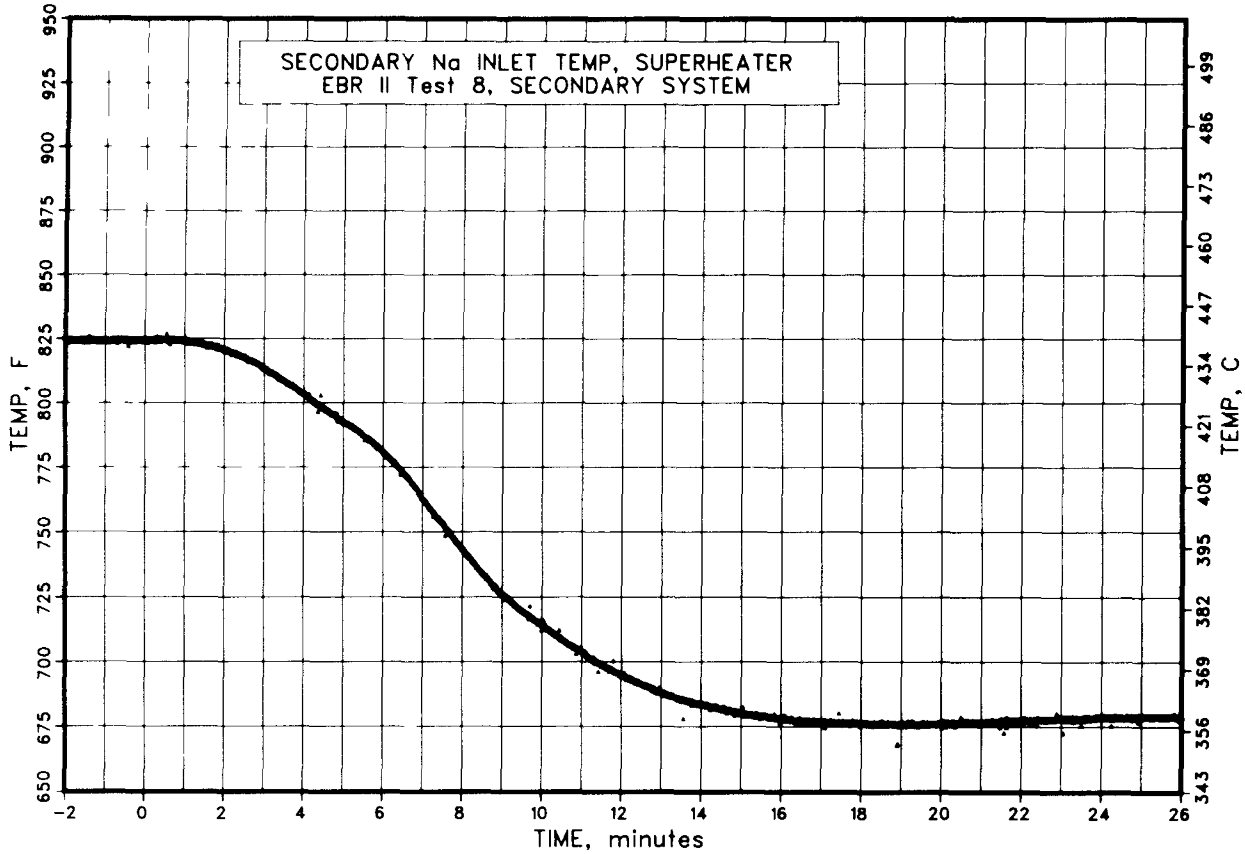

SECONDARY Na PUMP PRESSURE DROP
EBR II Test 8, SECONDARY SYSTEM
psi
0
1
2
3
4
5
6
7
8
9
10
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds

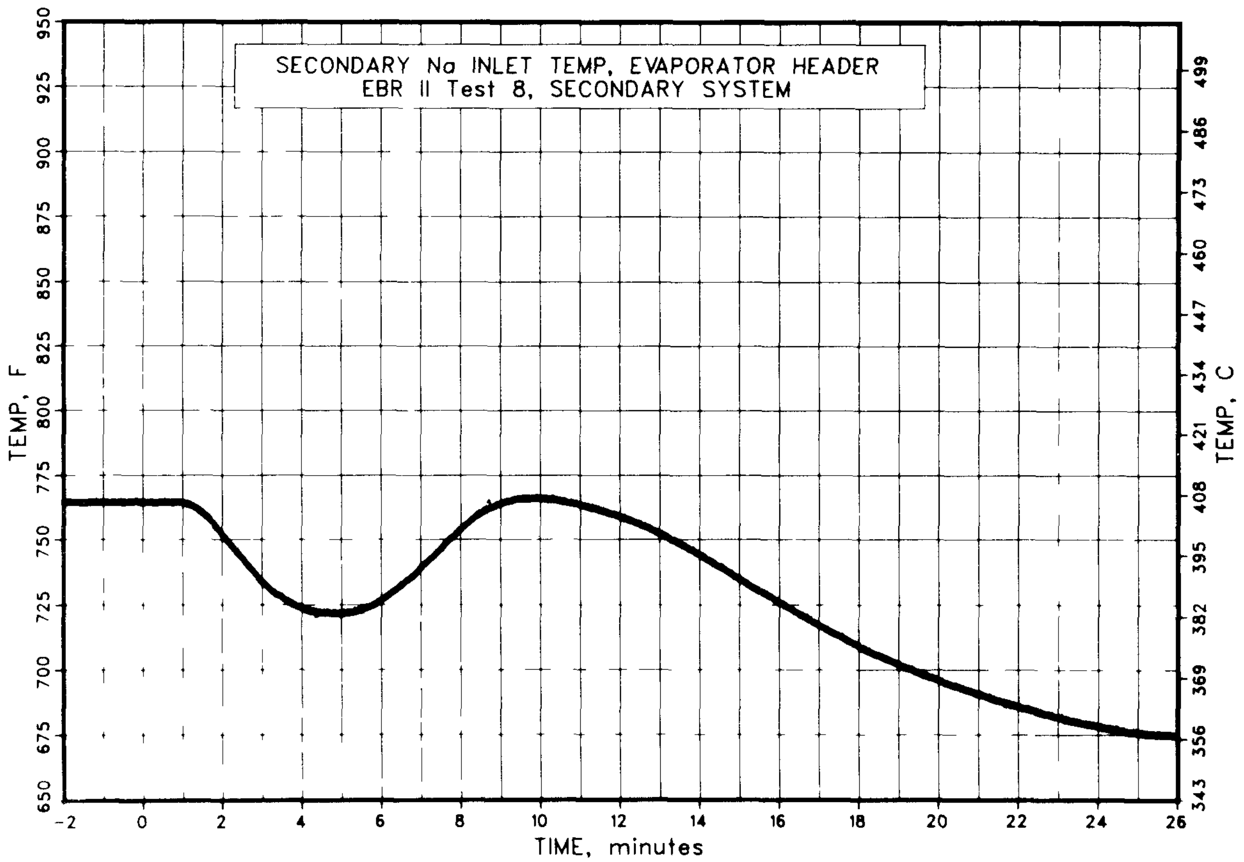

SECONDARY Na TEMP, IHX INLET
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
800
775
750
725
700
675
650
625
600
575
550
525
500
415
402
389
376
363
350
337
324
311
298
285
272
259
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26

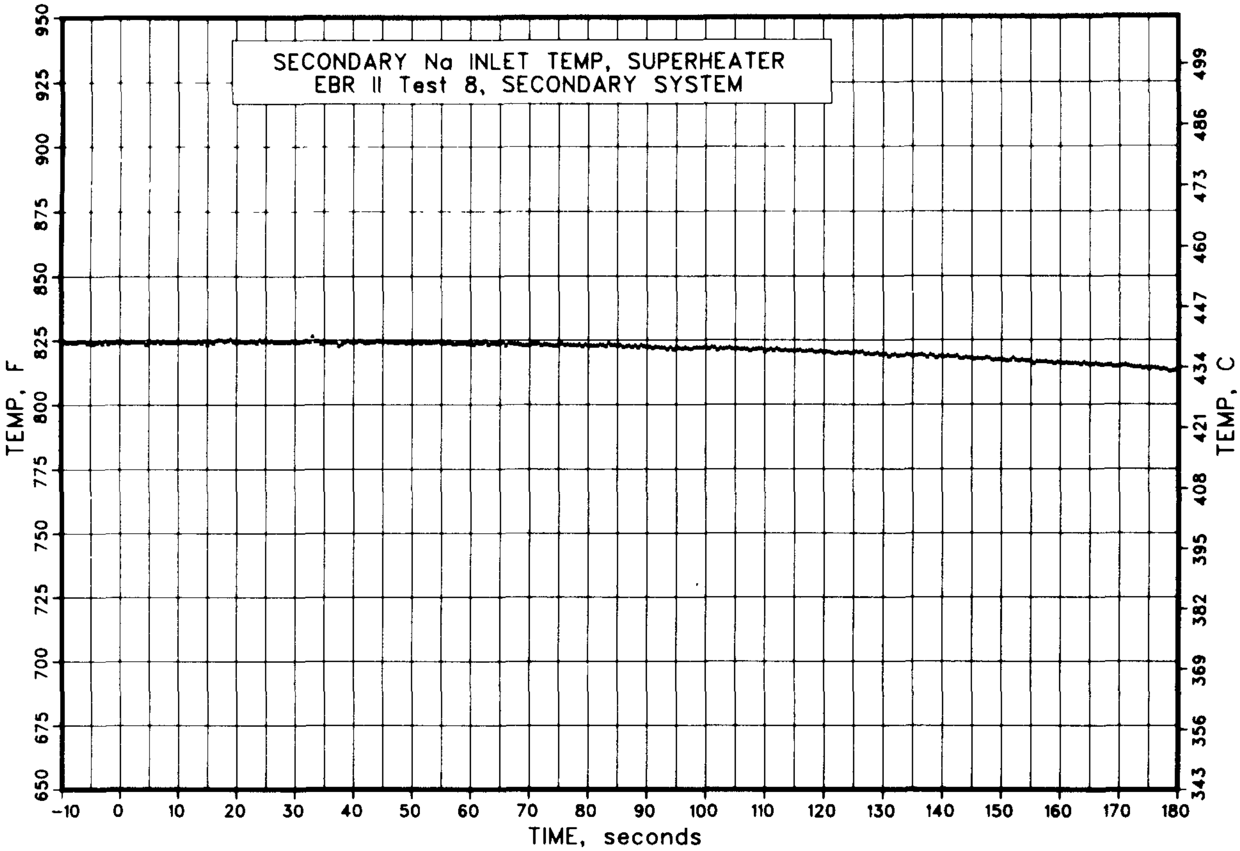

SECONDARY Na TEMP, IHX OUTLET
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
900
875
850
825
800
775
750
725
700
675
650
625
600
471
458
445
432
419
406
393
380
367
354
341
328
315
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26


SECONDARY Na TEMP, IHX INLET
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
800
775
750
725
700
675
650
625
600
575
550
525
500
TEMP, C
415
402
389
376
363
350
337
324
311
298
285
272
259
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds


SECONDARY Na TEMP, IHX OUTLET
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
900
875
850
825
800
775
750
725
700
675
650
625
600
TEMP, C
471
458
445
432
419
406
393
380
367
354
341
328
315
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME, seconds


SECONDARY Na INLET TEMP, SUPERHEATER
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
950
925
900
875
850
825
800
775
750
725
700
675
650
TEMP, C
499
486
473
460
447
434
421
408
395
382
369
356
343
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes


SECONDARY Na INLET TEMP, EVAPORATOR HEADER
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
950
925
900
875
850
825
800
775
750
725
700
675
650
TEMP, C
499
486
473
460
447
434
421
408
395
382
369
356
343
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes


SECONDARY Na INLET TEMP, SUPERHEATER
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
650
675
700
725
750
775
800
825
850
875
900
925
950
TEMP, C
343
356
369
382
395
408
421
434
447
460
473
486
499
TIME, seconds
-10
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40
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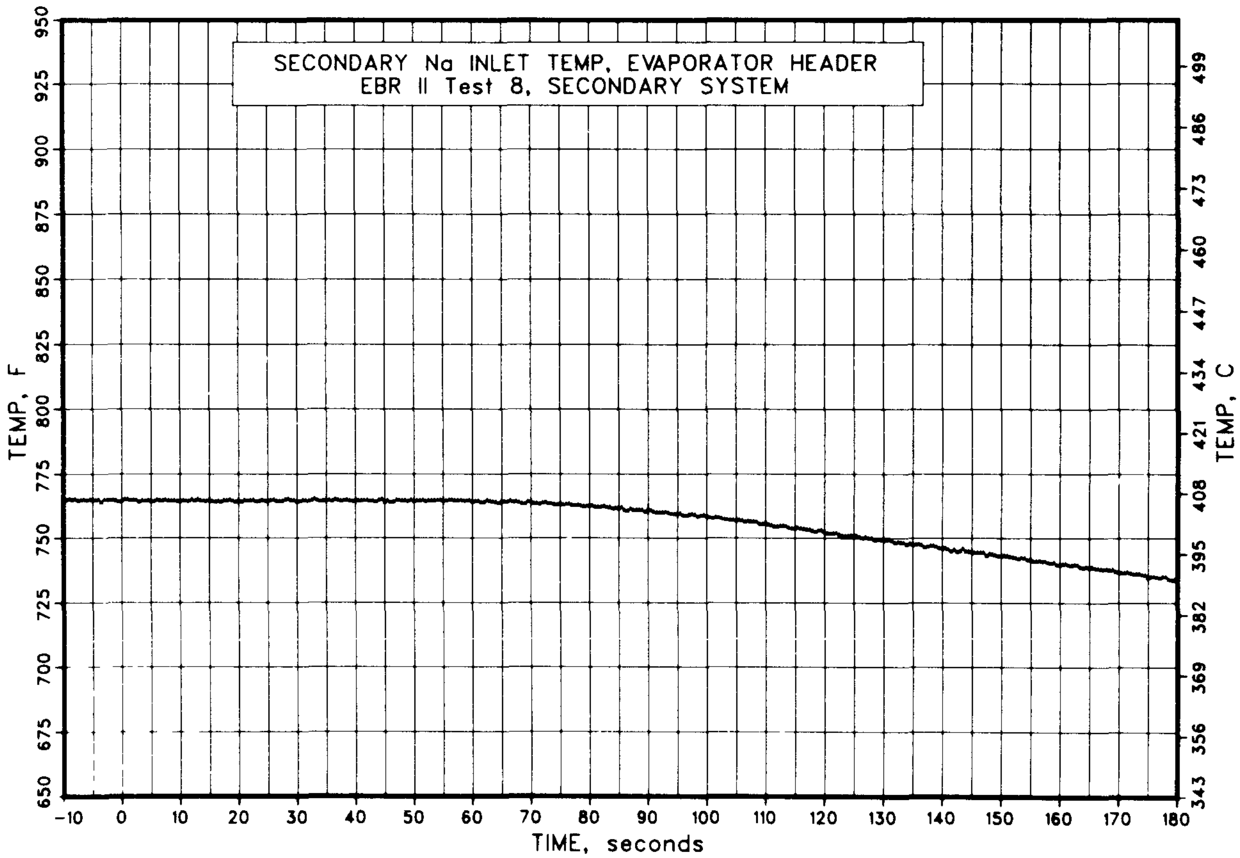
SECONDARY Na INLET TEMP, EVAPORATOR HEADER
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
650
675
700
725
750
775
800
825
850
875
900
925
950
TEMP, C
343
356
369
382
395
408
421
434
447
460
473
486
499
TIME, seconds
-10
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20
30
40
50
60
70
80
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110
120
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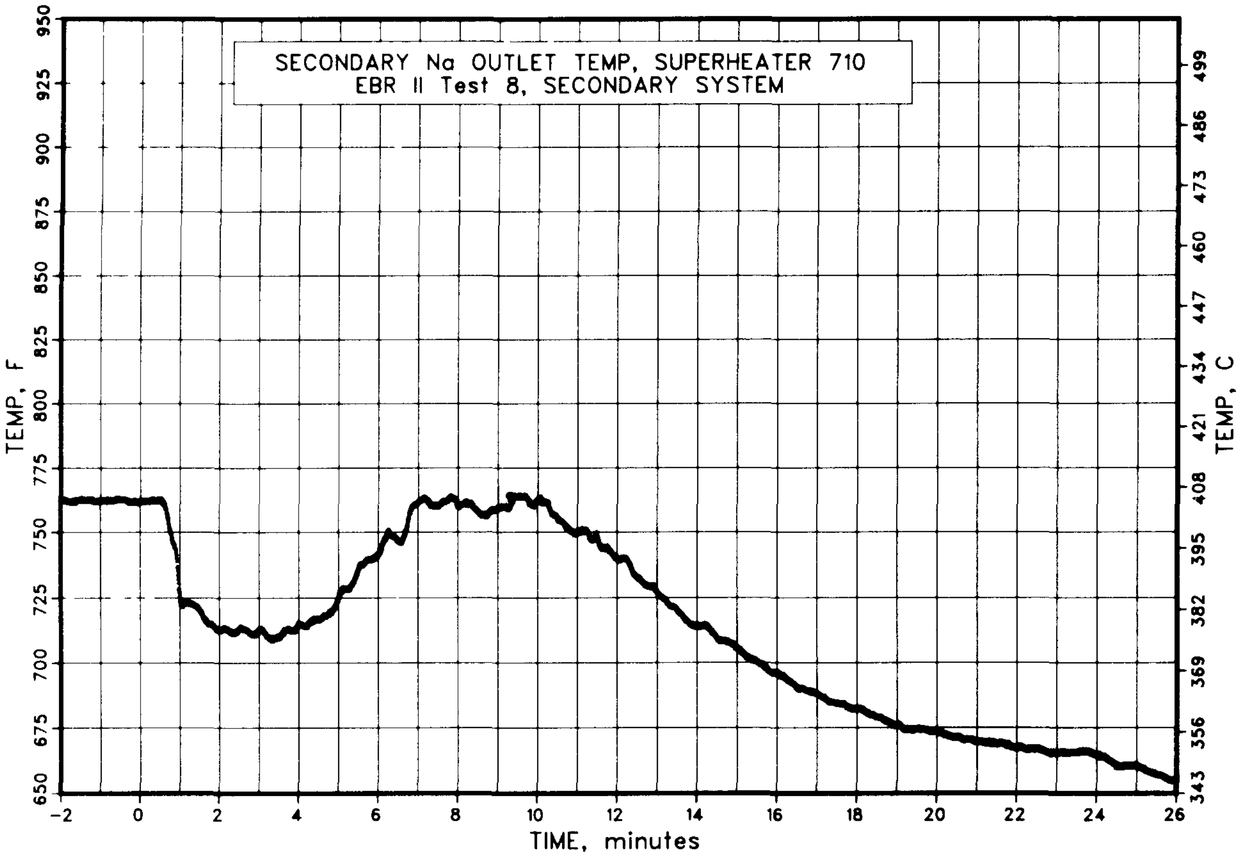
170
180


SECONDARY Na OUTLET TEMP, SUPERHEATER 710
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
650
675
700
725
750
775
800
825
850
875
900
925
950
343
356
369
382
395
408
421
434
447
460
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486
499
-2
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24
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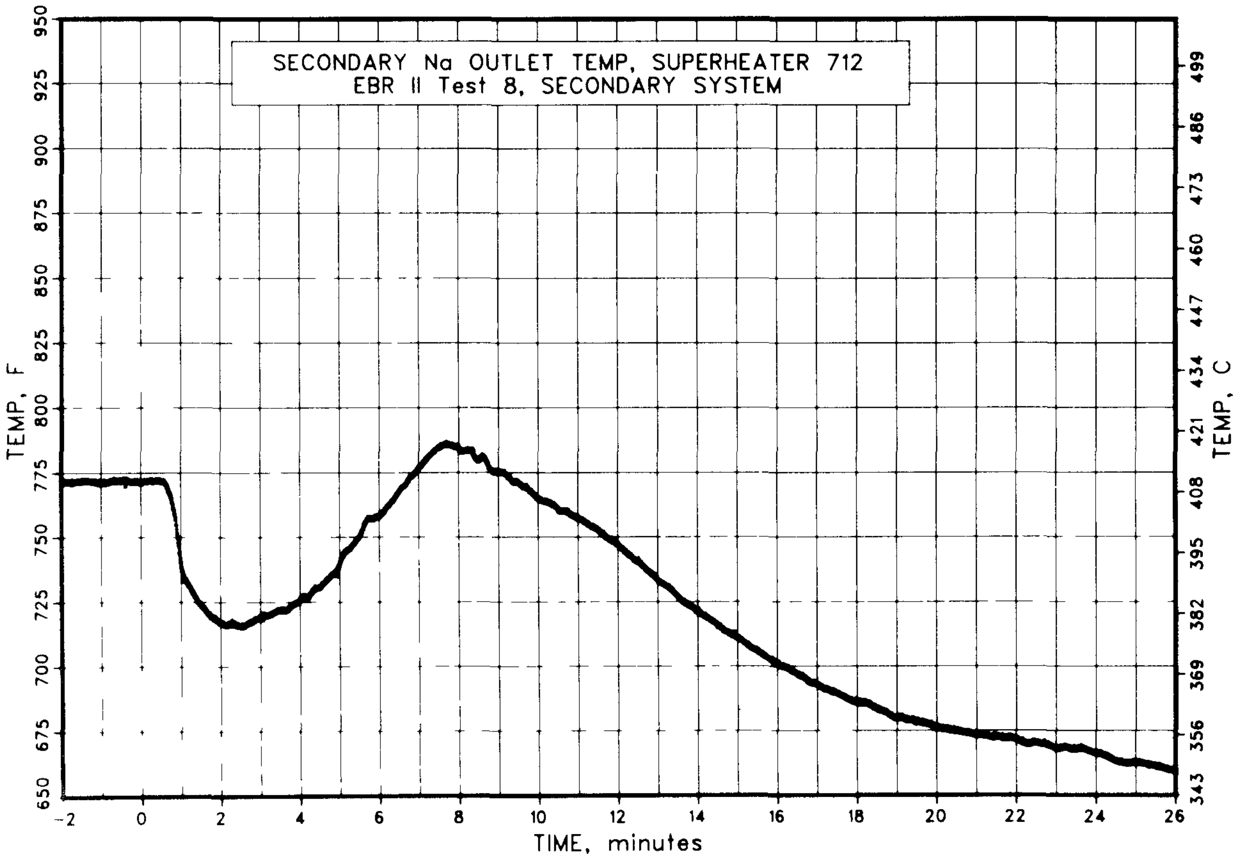
SECONDARY Na OUTLET TEMP, SUPERHEATER 712
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes
650
675
700
725
750
775
800
825
850
875
900
925
950
343
356
369
382
395
408
421
434
447
460
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486
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-2
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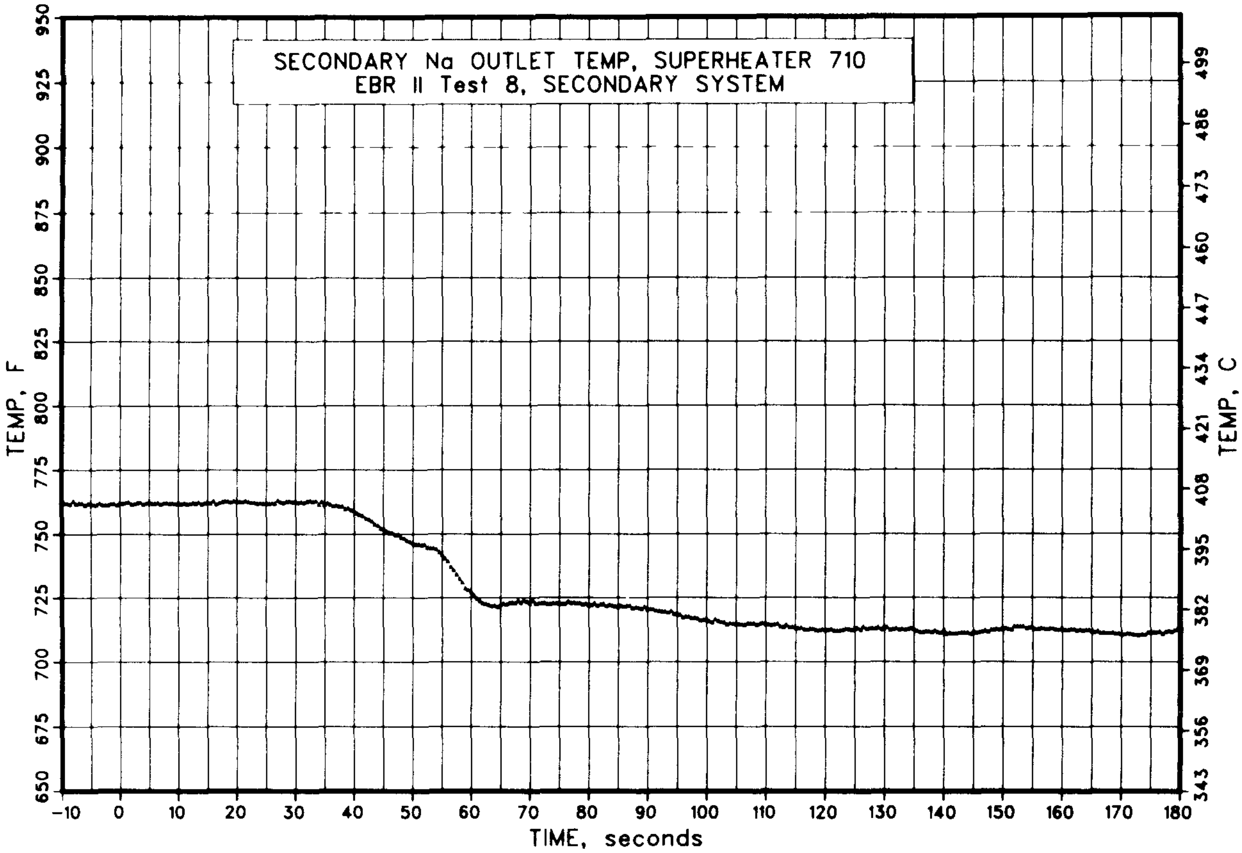
SECONDARY Na OUTLET TEMP, SUPERHEATER 710
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
950
925
900
875
850
825
800
775
750
725
700
675
650
499
486
473
460
447
434
421
408
395
382
369
356
343
-10
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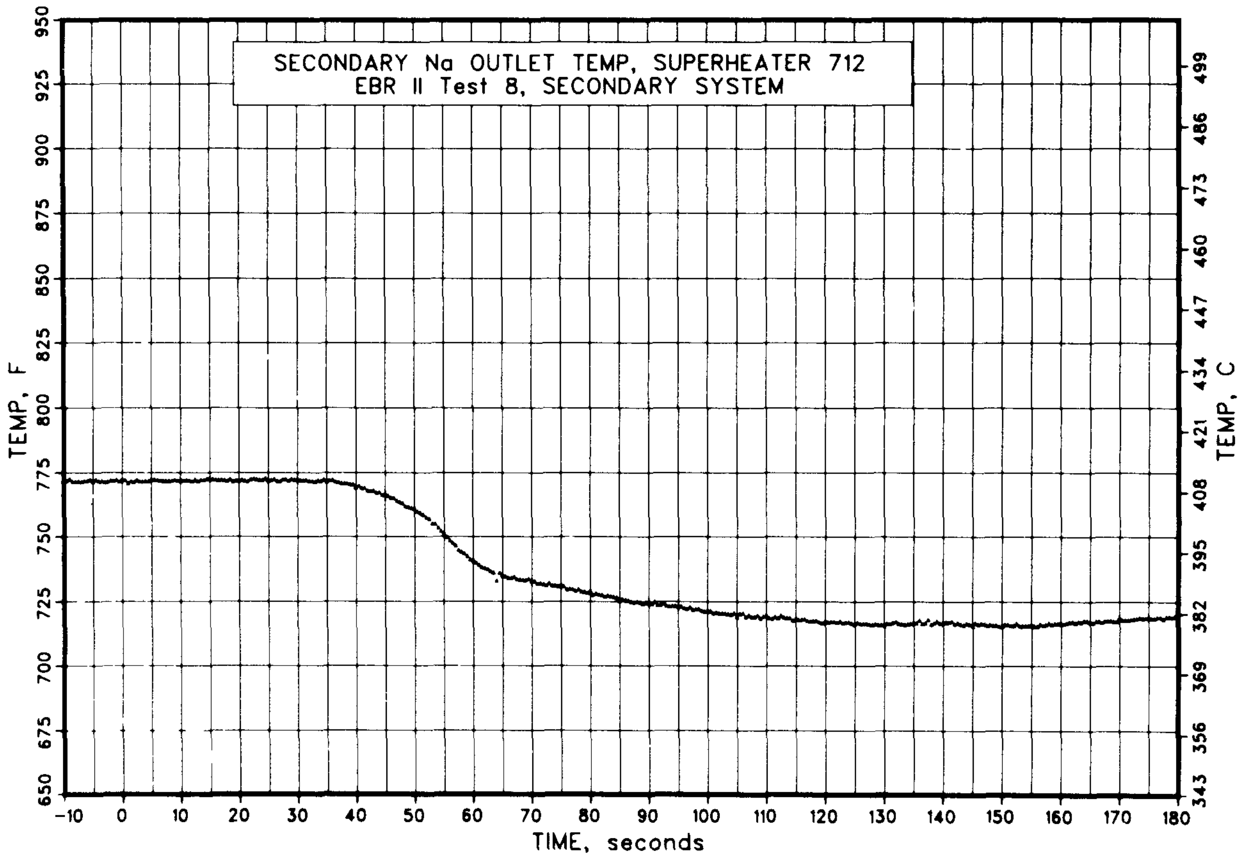
SECONDARY Na OUTLET TEMP, SUPERHEATER 712
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
TEMP, C
TIME, seconds
950
925
900
875
850
825
800
775
750
725
700
675
650
499
486
473
460
447
434
421
408
395
382
369
356
343
-10
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170
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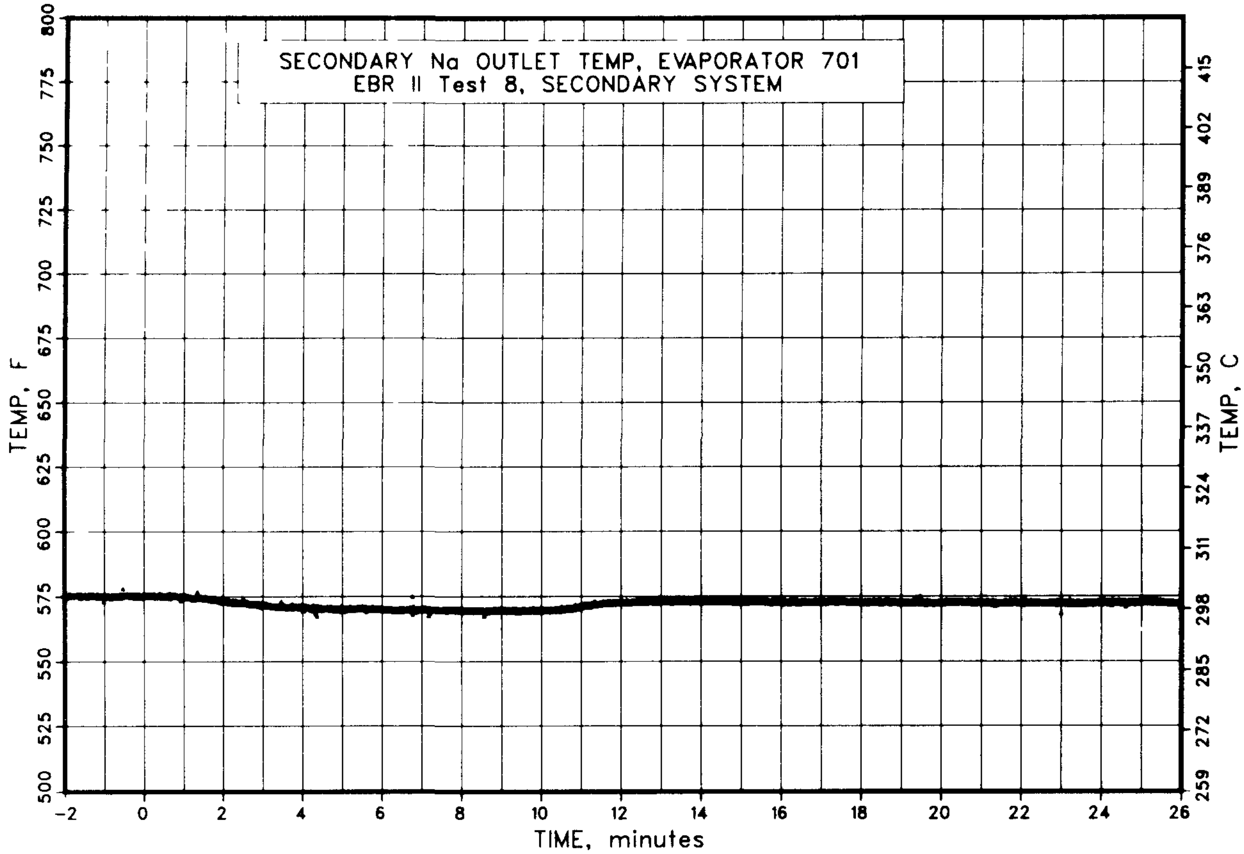
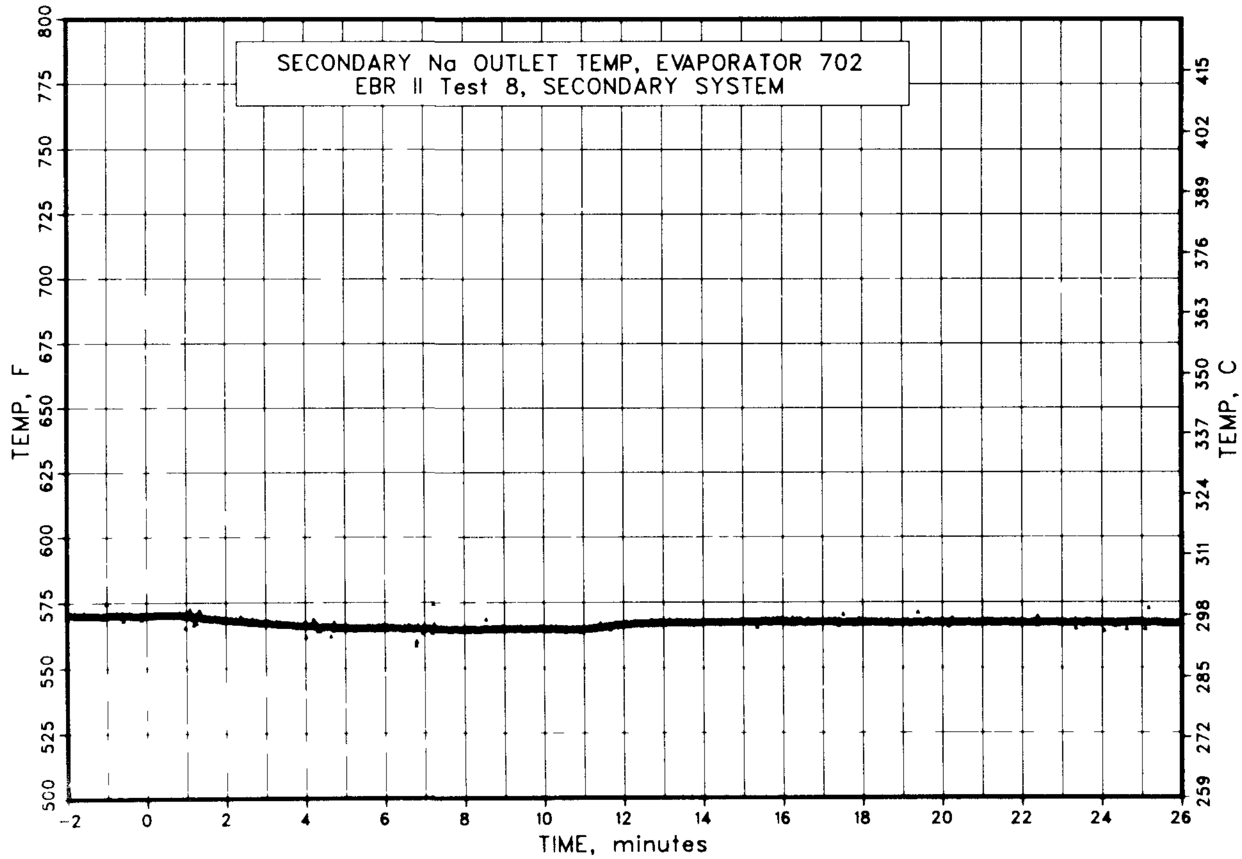

SECONDARY Na OUTLET TEMP, EVAPORATOR 701
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
500
525
550
575
600
625
650
675
700
725
750
775
800
TEMP, C
259
272
285
298
311
324
337
350
363
376
389
402
415
TIME, minutes
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26


SECONDARY Na OUTLET TEMP, EVAPORATOR 702
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
500
525
550
575
600
625
650
675
700
725
750
775
800
TEMP, C
259
272
285
298
311
324
337
350
363
376
389
402
415
TIME, minutes
-2
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4
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12
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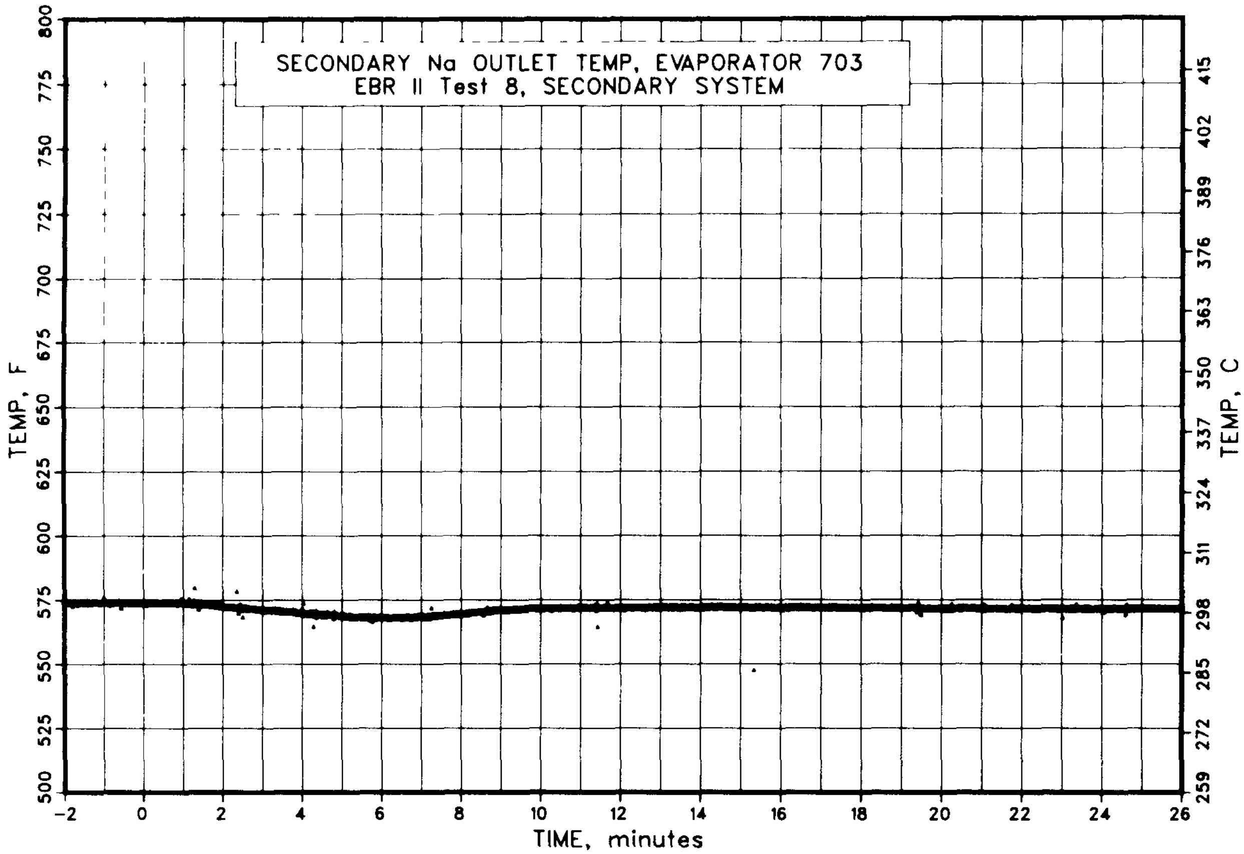
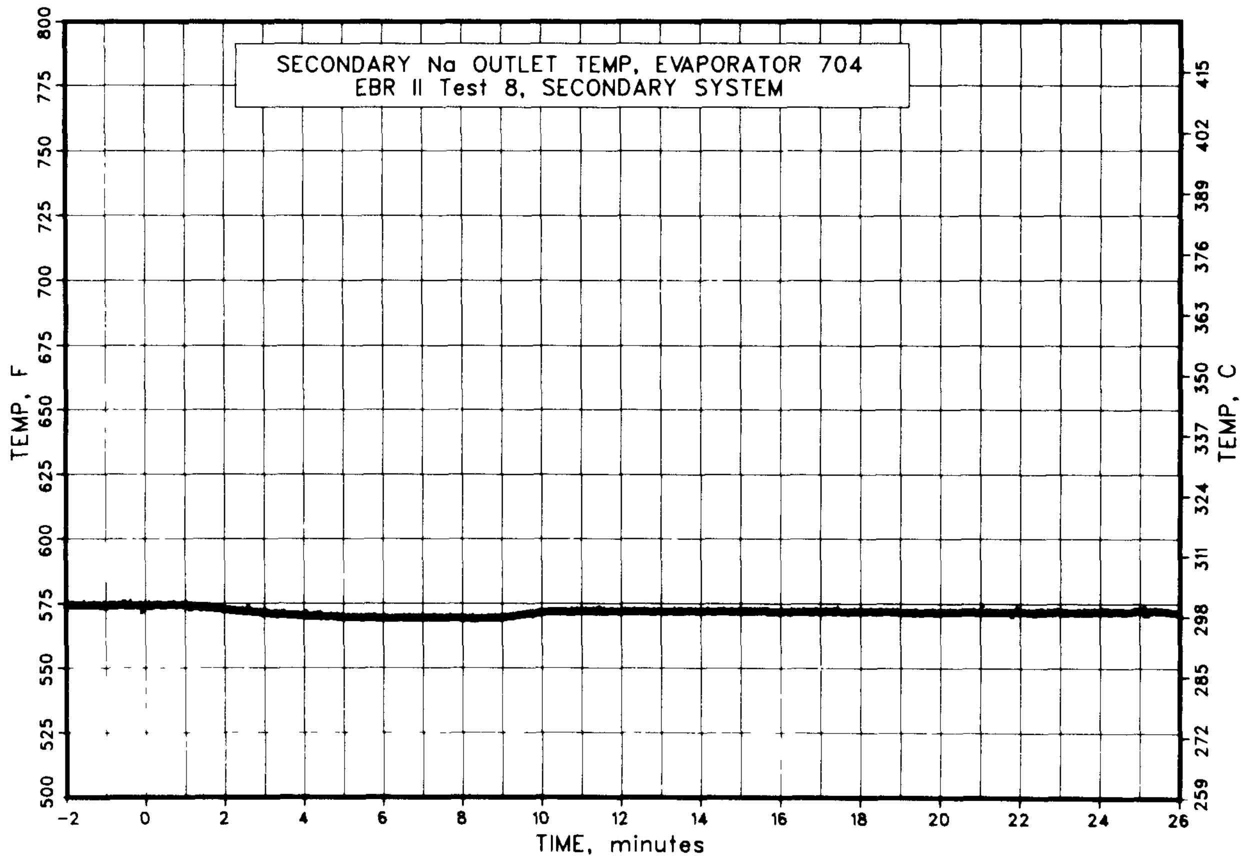
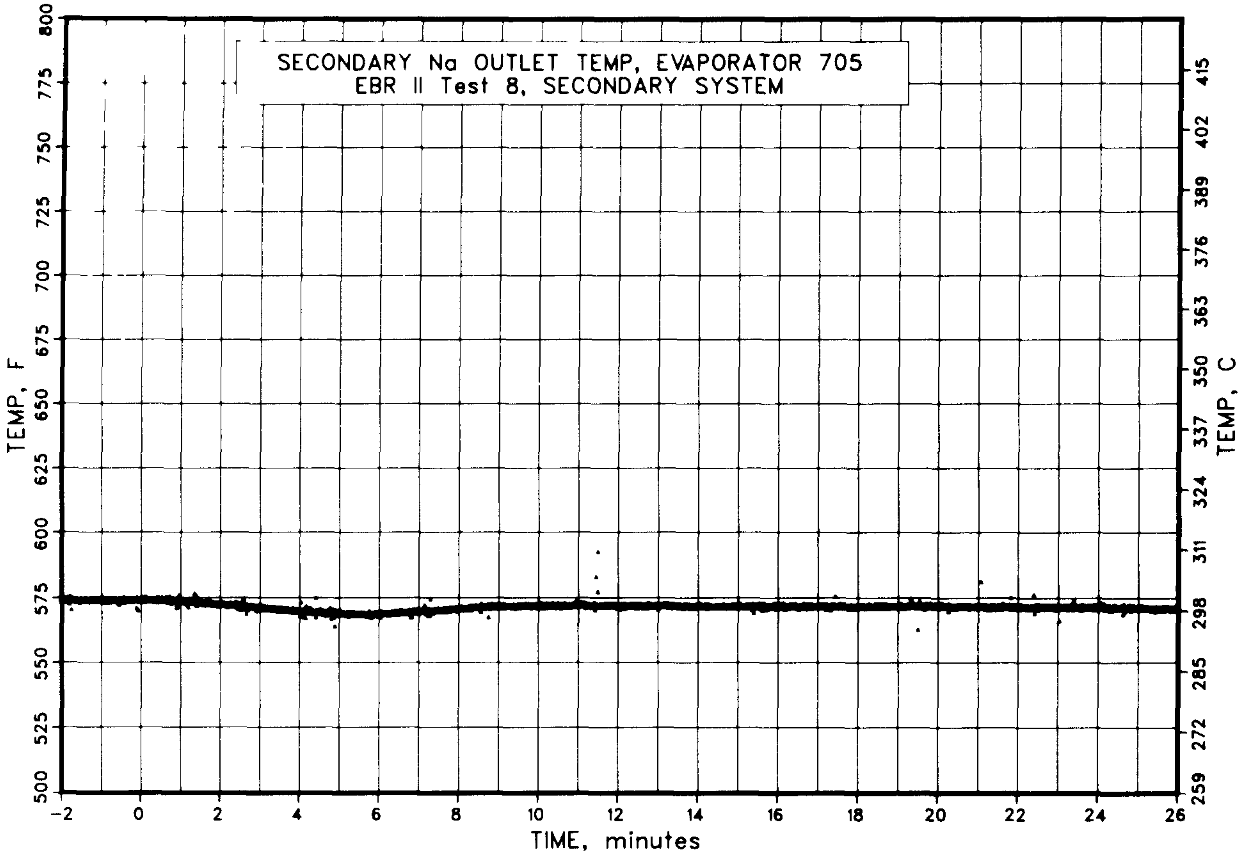

SECONDARY Na OUTLET TEMP, EVAPORATOR 703
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


SECONDARY Na OUTLET TEMP, EVAPORATOR 704
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


SECONDARY Na OUTLET TEMP, EVAPORATOR 705
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
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775
750
725
700
675
650
625
600
575
550
525
500
TEMP, C
415
402
389
376
363
350
337
324
311
298
285
272
259
-2
0
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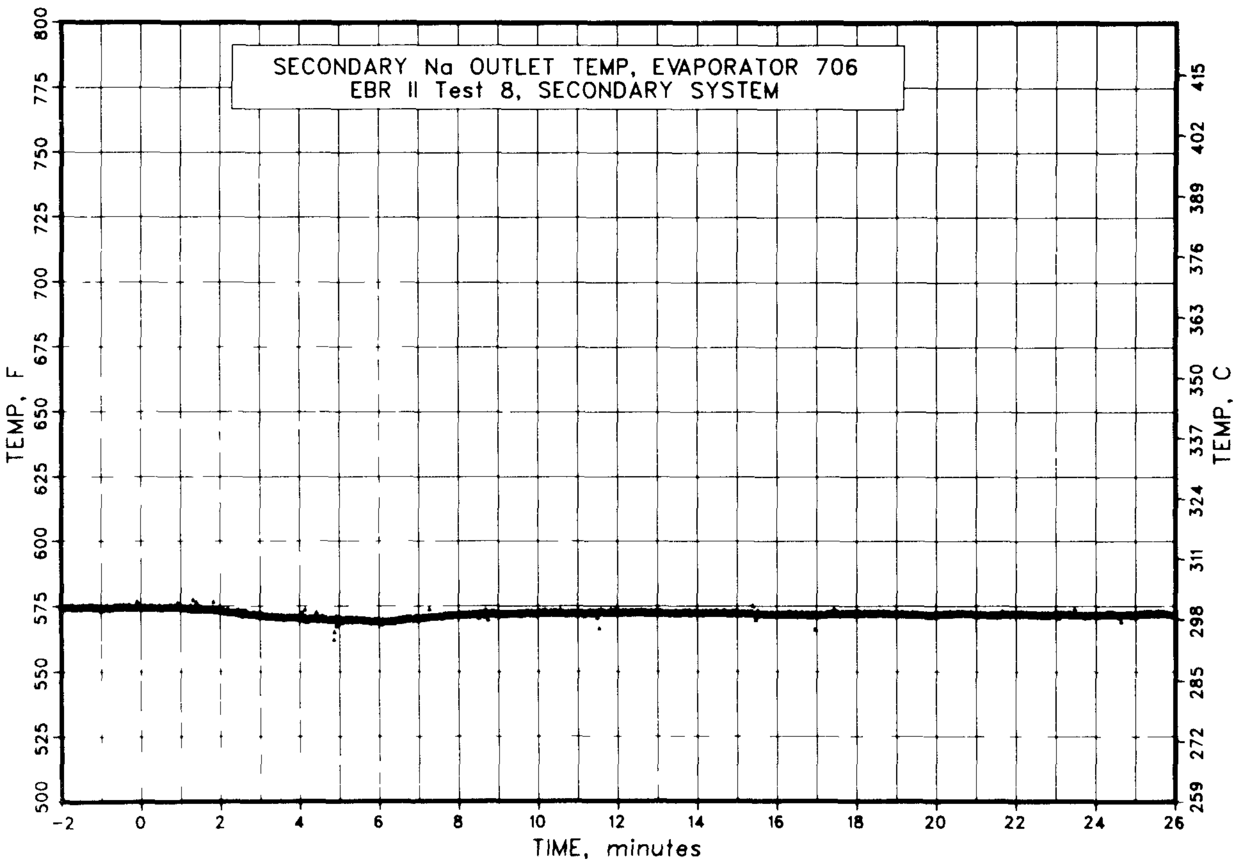
8
10
12
14
16
18
20
22
24
26
TIME, minutes


SECONDARY Na OUTLET TEMP, EVAPORATOR 706
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
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775
750
725
700
675
650
625
600
575
550
525
500
TEMP, C
415
402
389
376
363
350
337
324
311
298
285
272
259
-2
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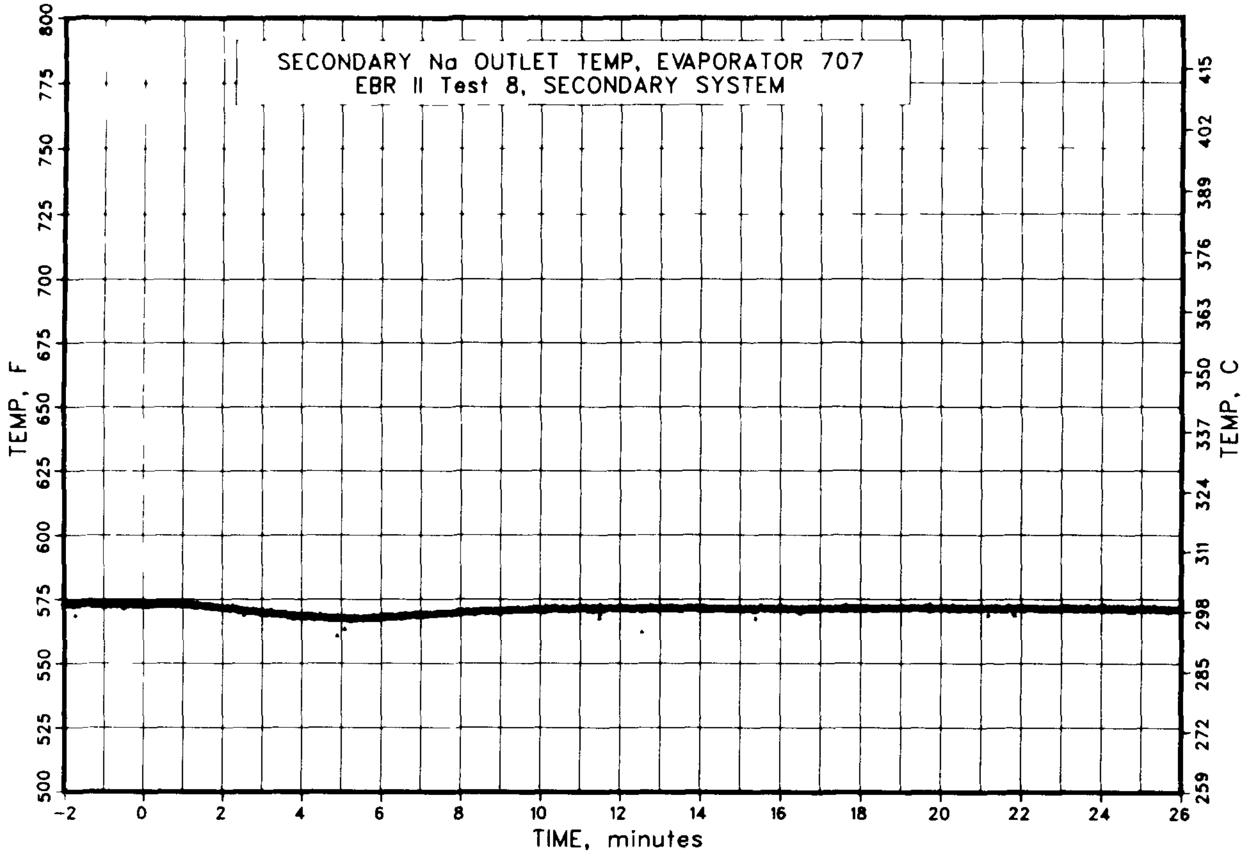
14
16
18
20
22
24
26
TIME, minutes


SECONDARY Na OUTLET TEMP, EVAPORATOR 707
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
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775
750
725
700
675
650
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600
575
550
525
500
TEMP, C
415
402
389
376
363
350
337
324
311
298
285
272
259
TIME, minutes
-2
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2
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24
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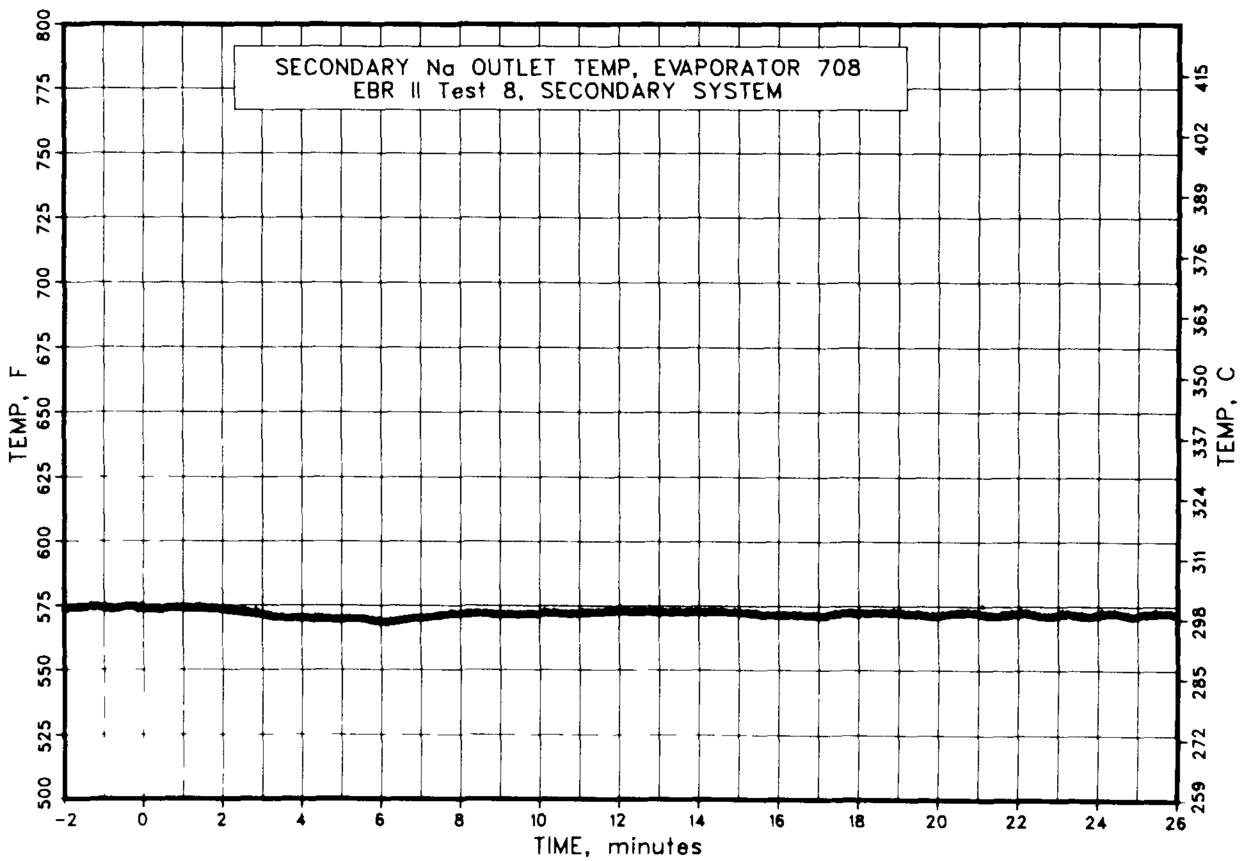
SECONDARY Na OUTLET TEMP, EVAPORATOR 708
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
800
775
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725
700
675
650
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600
575
550
525
500
TEMP, C
415
402
389
376
363
350
337
324
311
298
285
272
259
TIME, minutes
-2
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2
4
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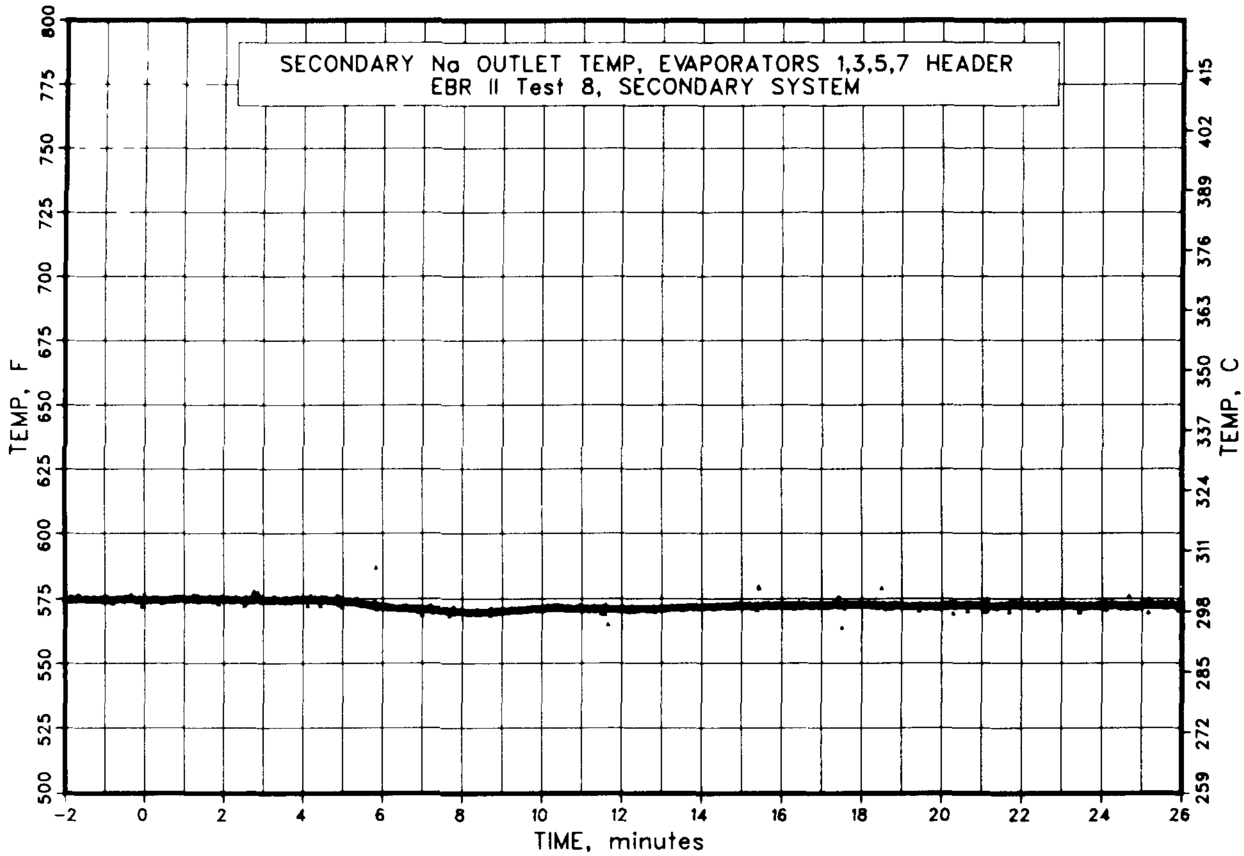
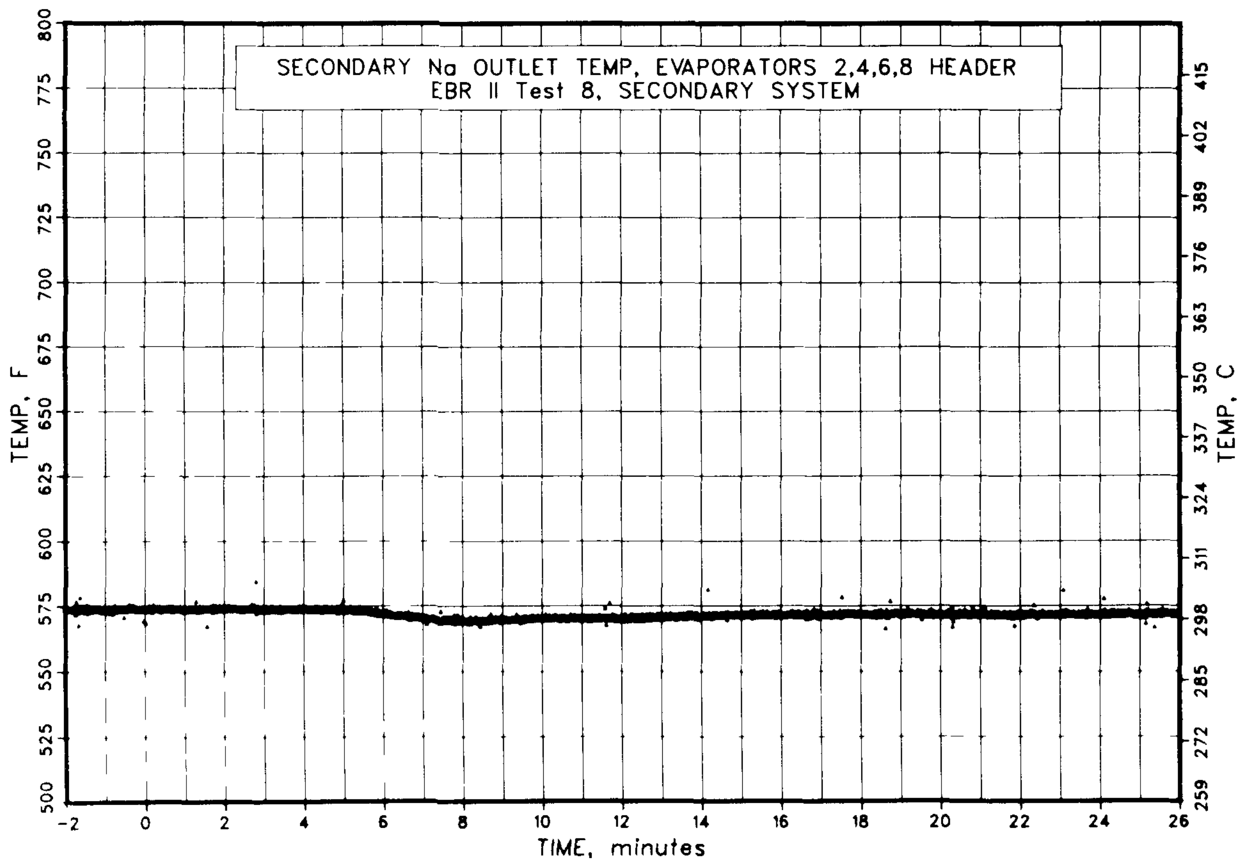
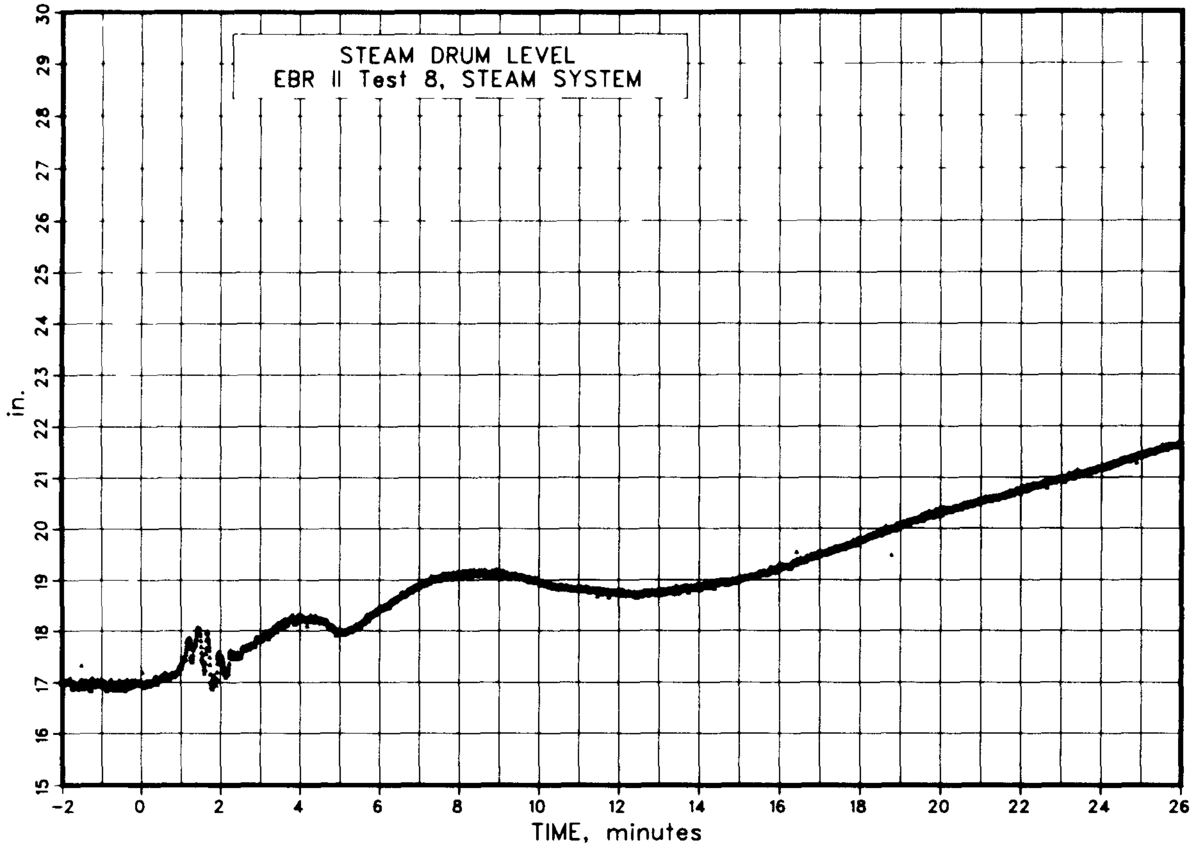
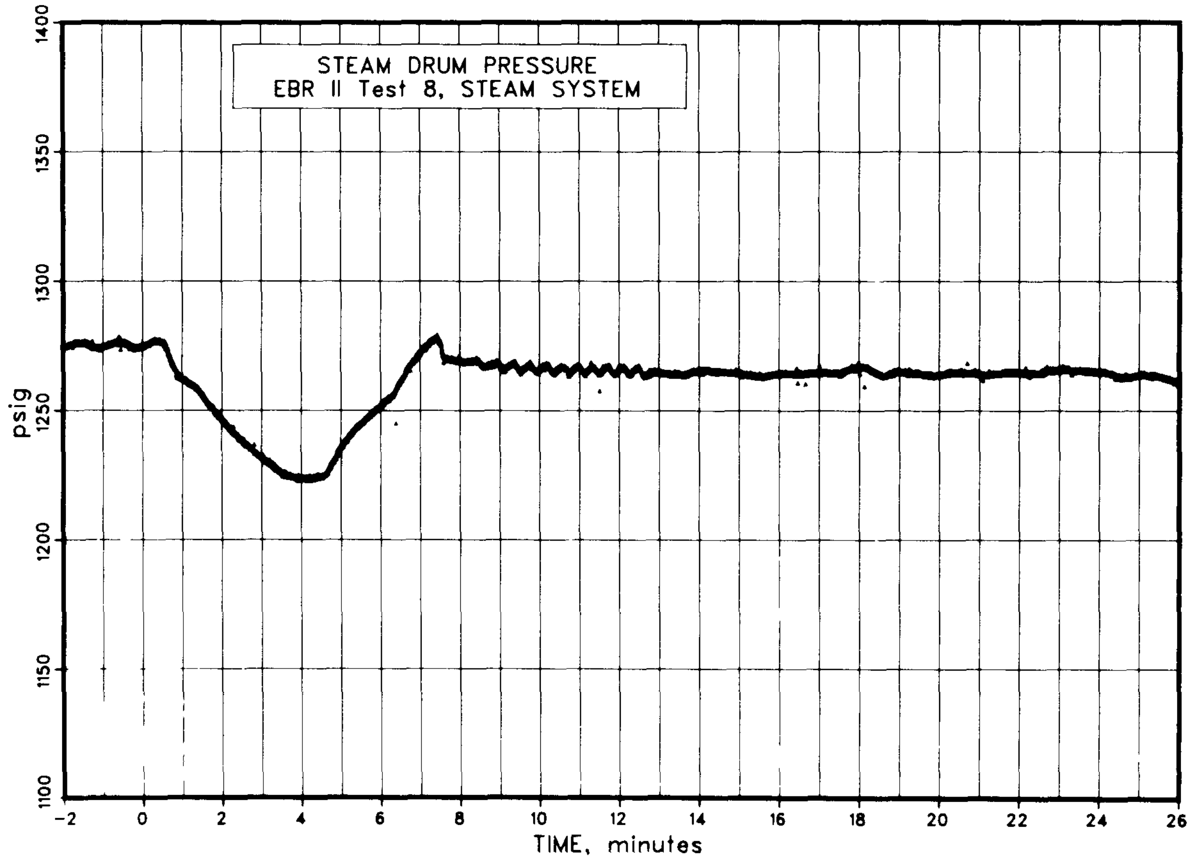
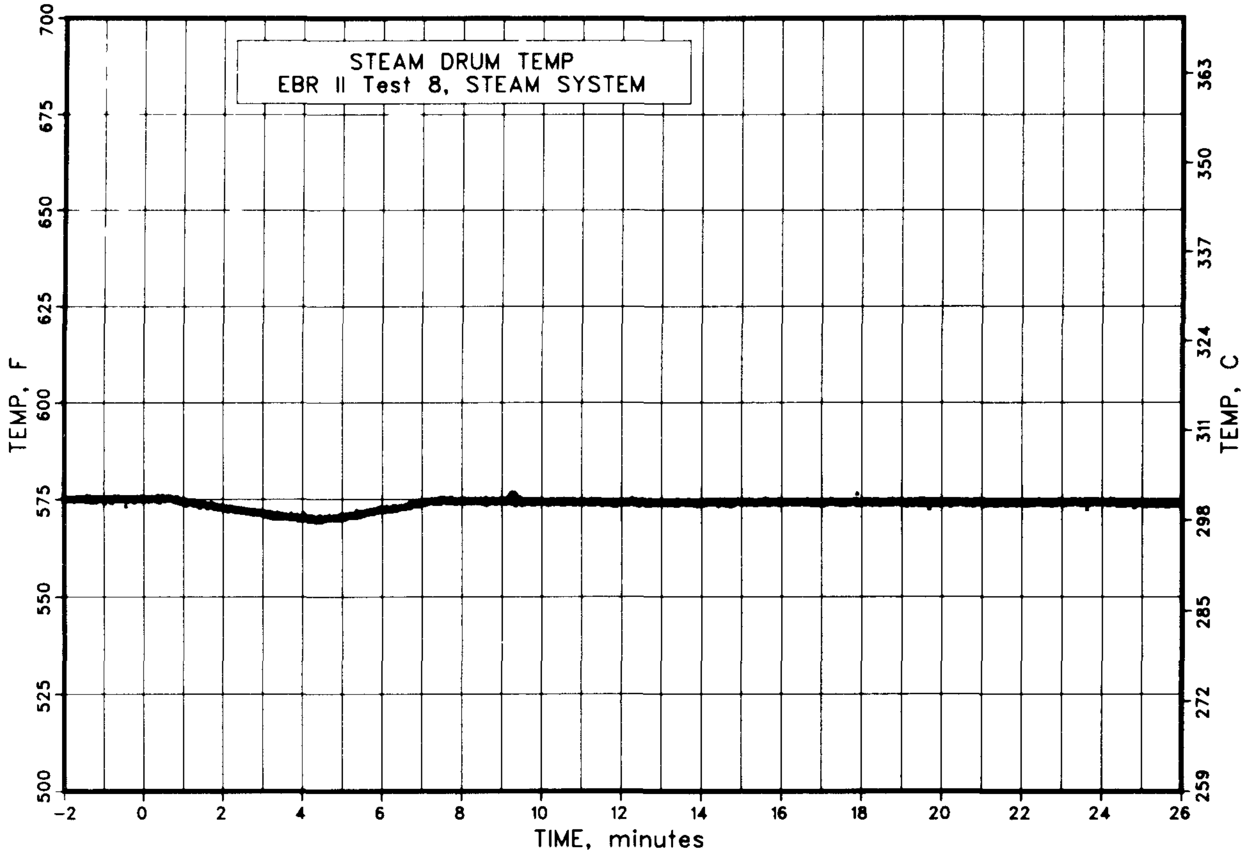

SECONDARY Na OUTLET TEMP, EVAPORATORS 1,3,5,7 HEADER
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


SECONDARY Na OUTLET TEMP, EVAPORATORS 2,4,6,8 HEADER
EBR II Test 8, SECONDARY SYSTEM
TEMP, F
TEMP, C
TIME, minutes


STEAM DRUM LEVEL
EBR II Test 8, STEAM SYSTEM
in.
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes


STEAM DRUM PRESSURE
EBR II Test 8, STEAM SYSTEM
psig
1100
1150
1200
1250
1300
1350
1400
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes


STEAM DRUM TEMP
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
700
675
650
625
600
575
550
525
500
363
350
337
324
311
298
285
272
259
-2
0
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12
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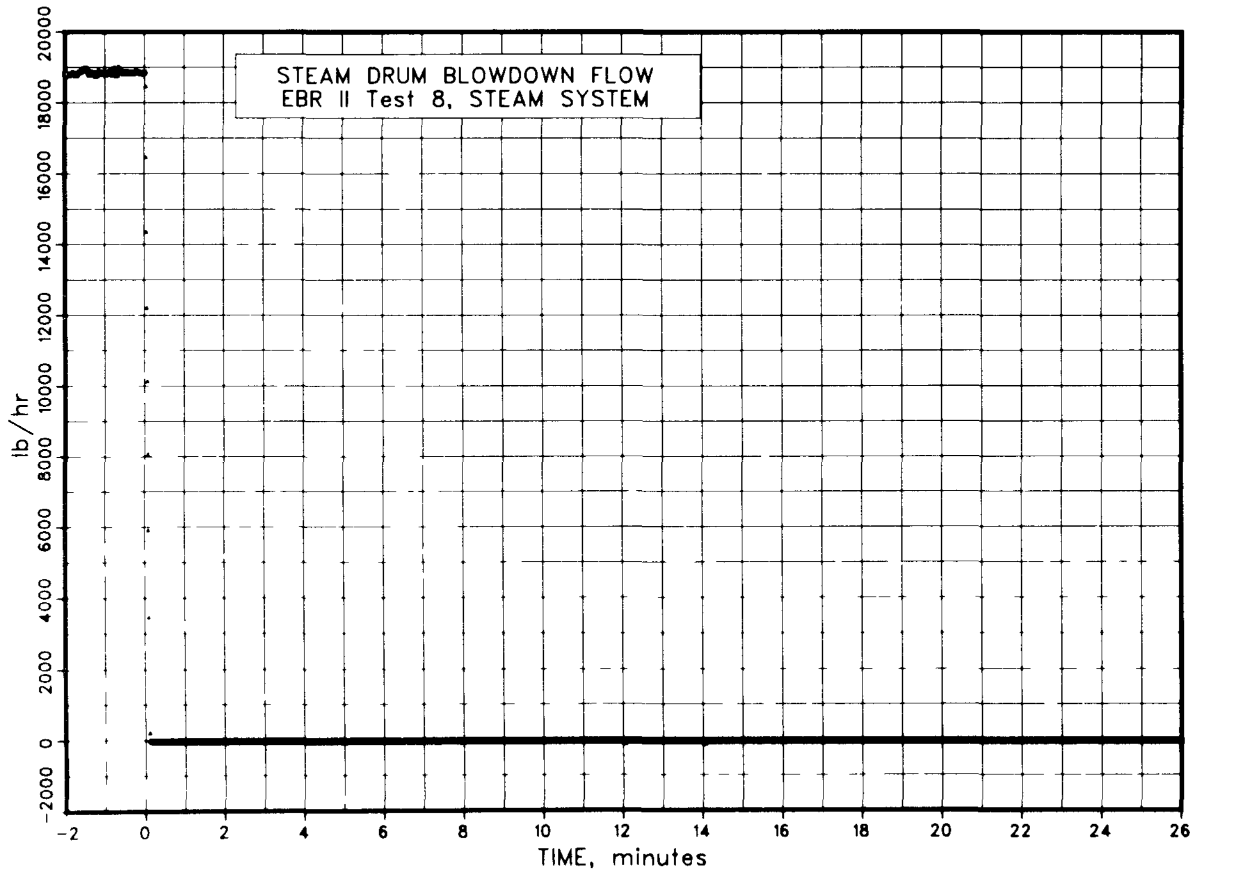
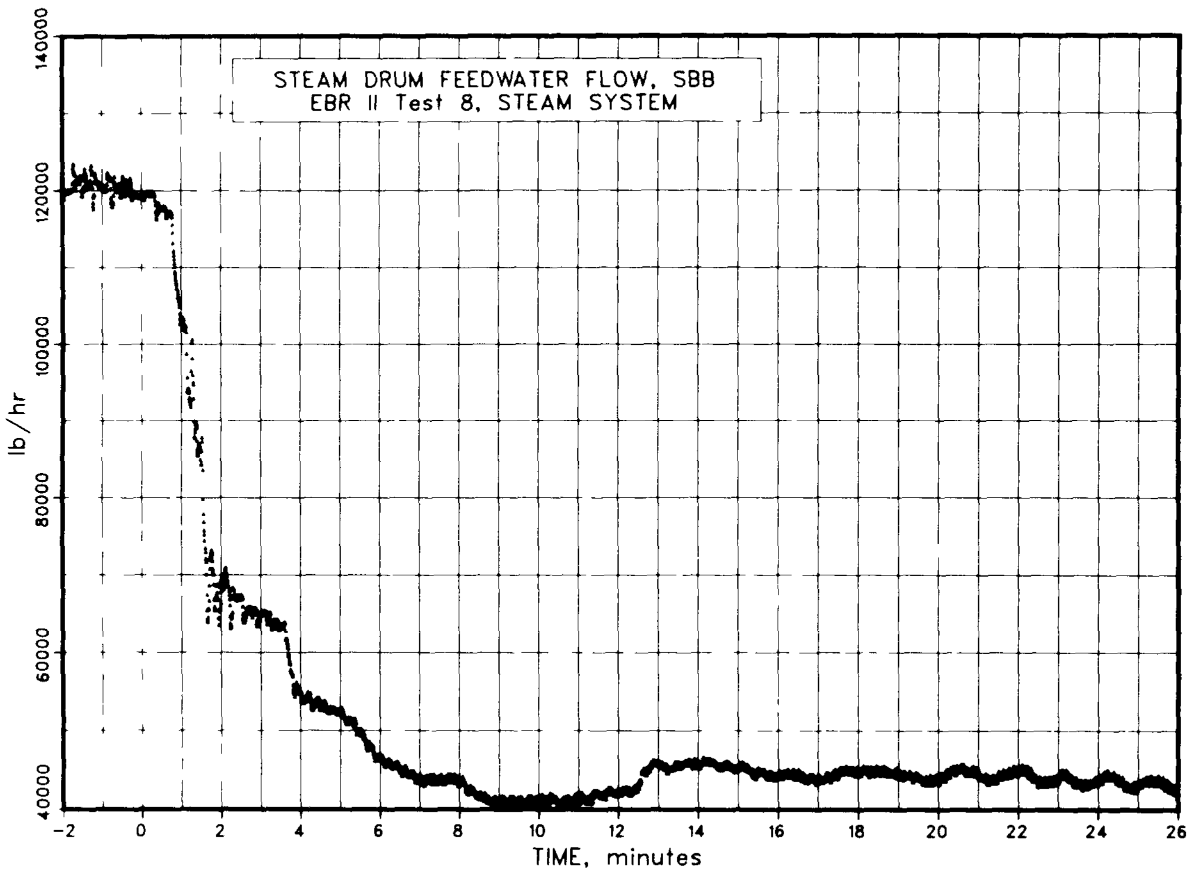
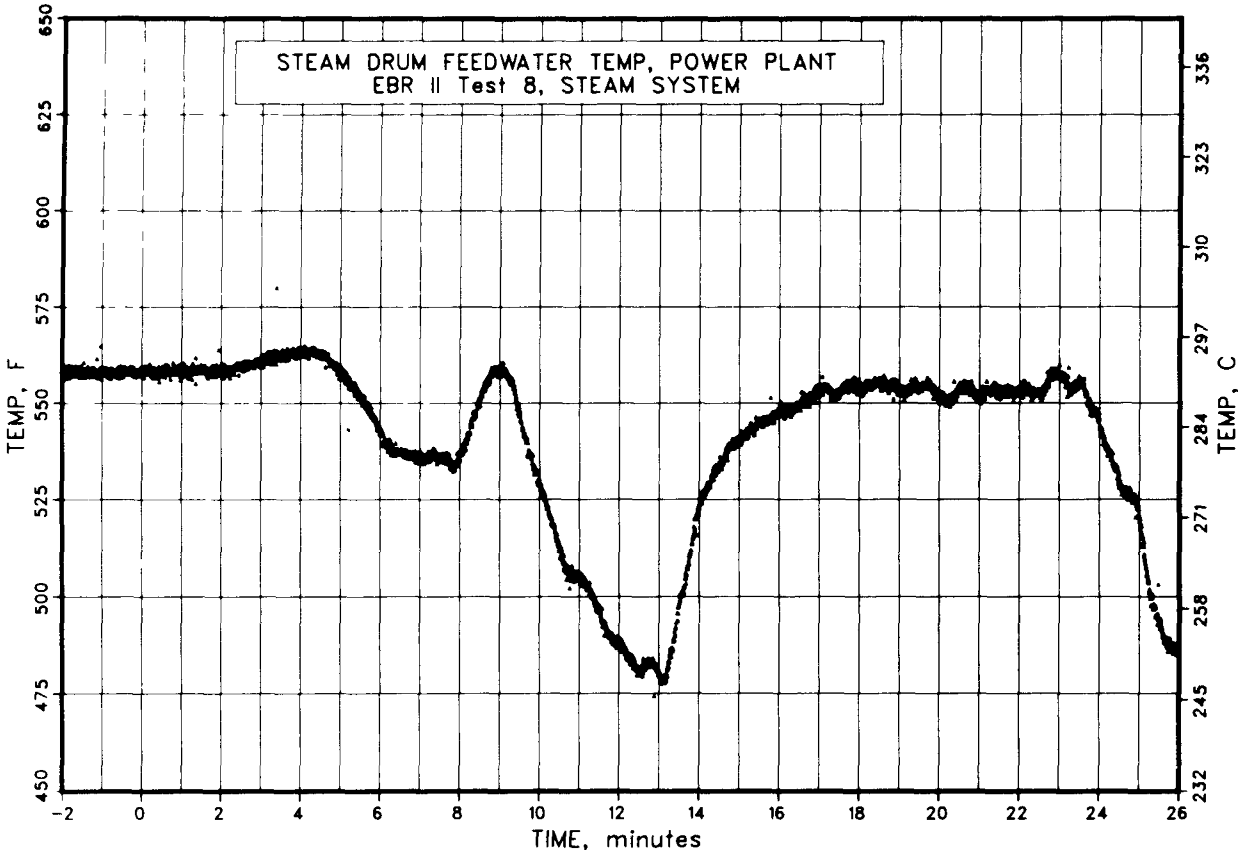
24
26


STEAM DRUM BLOWDOWN FLOW
EBR II Test 8, STEAM SYSTEM
lb/hr
TIME, minutes
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26


STEAM DRUM FEEDWATER FLOW, SBB
EBR II Test 8, STEAM SYSTEM
lb/hr
140000
120000
100000
80000
60000
40000
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes


STEAM DRUM FEEDWATER TEMP, POWER PLANT
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
650
625
600
575
550
525
500
475
450
336
323
310
297
284
271
258
245
232
-2
0
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12
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20
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24
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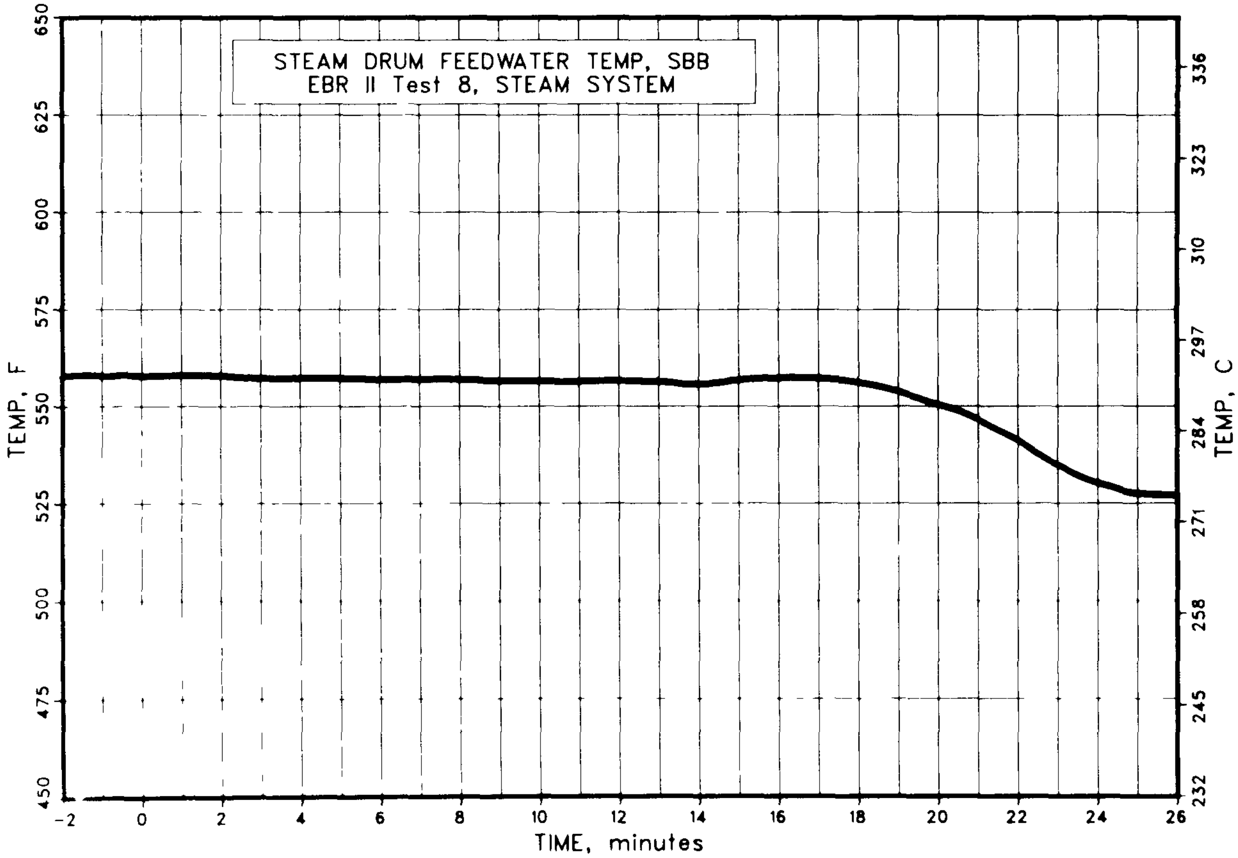
STEAM DRUM FEEDWATER TEMP, SBB
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
650
625
600
575
550
525
500
475
450
336
323
310
297
284
271
258
245
232
-2
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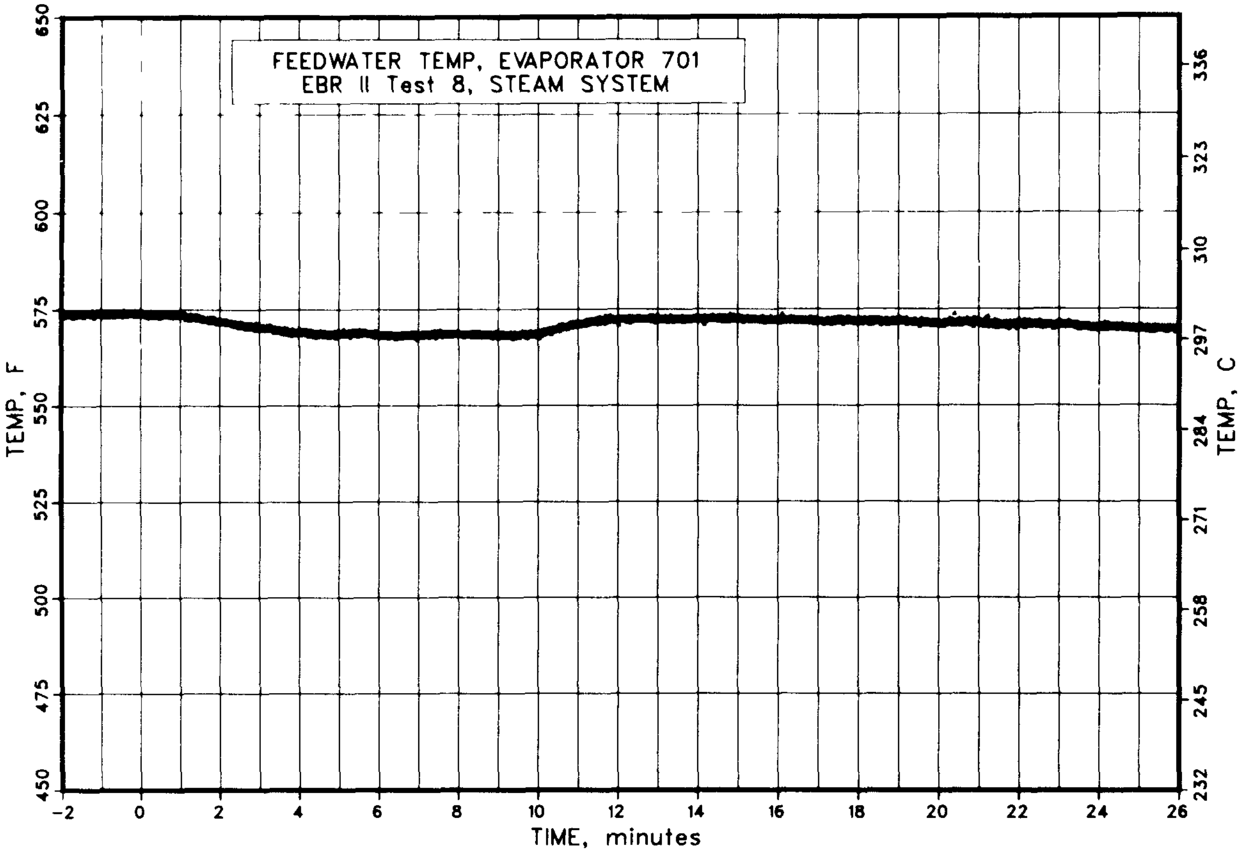
24
26


FEEDWATER TEMP, EVAPORATOR 701
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
650
625
600
575
550
525
500
475
450
336
323
310
297
284
271
258
245
232
-2
0
2
4
6
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12
14
16
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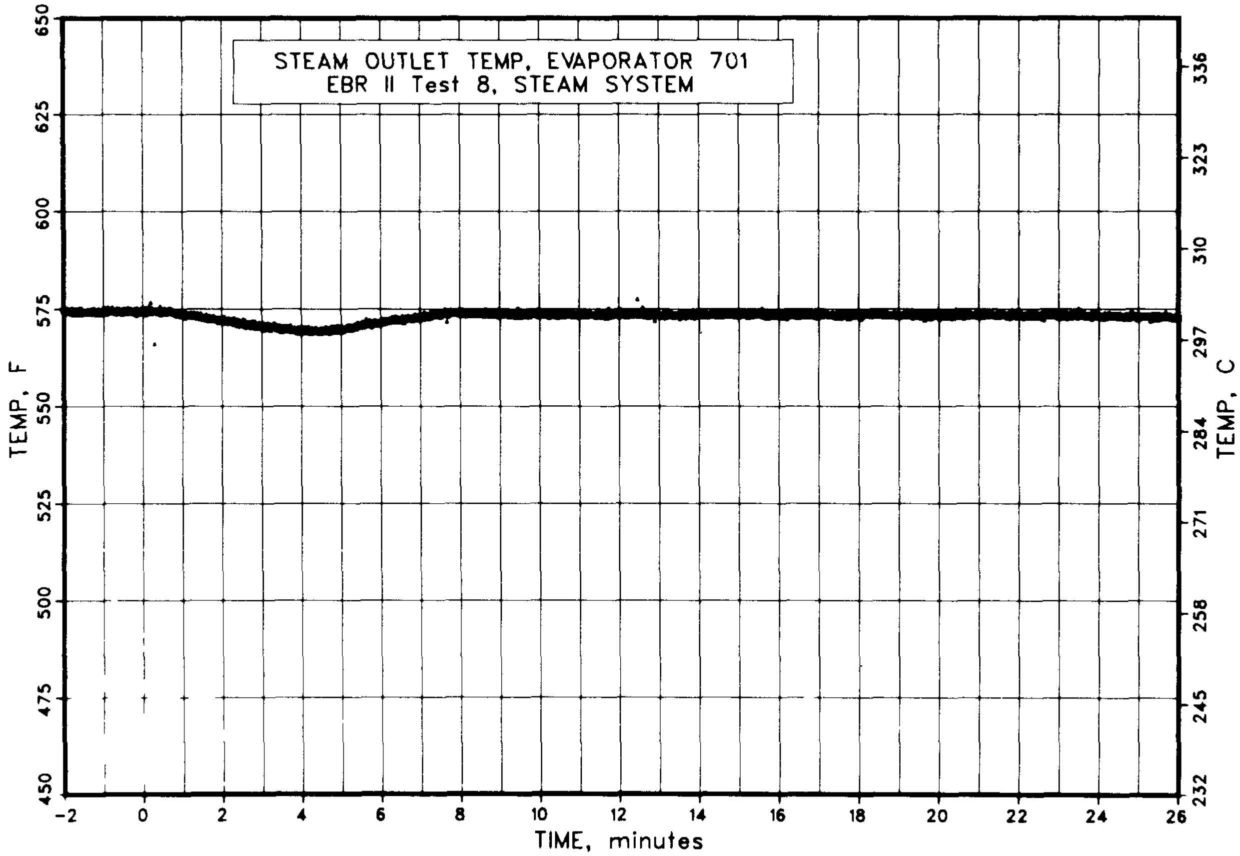
20
22
24
26


STEAM OUTLET TEMP, EVAPORATOR 701
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
650
625
600
575
550
525
500
475
450
336
323
310
297
284
271
258
245
232
-2
0
2
4
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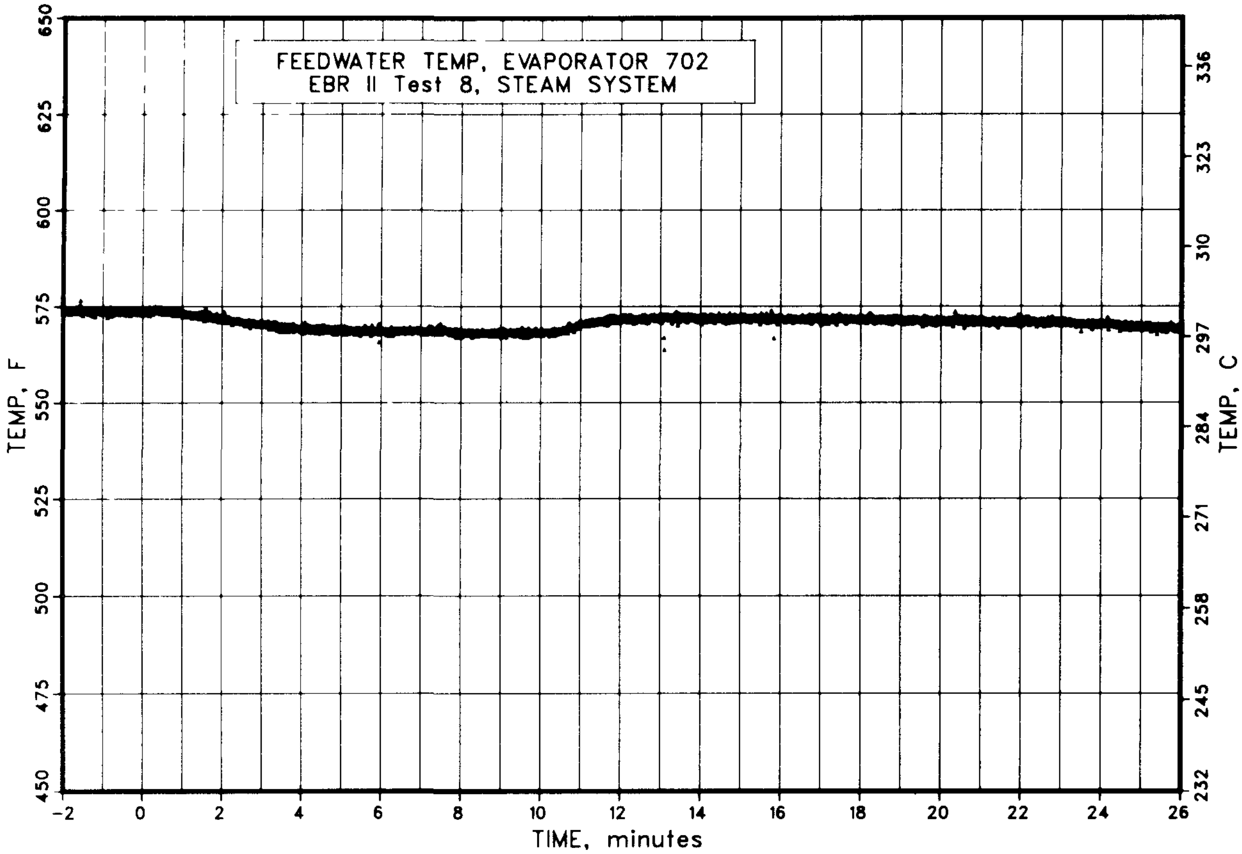
FEEDWATER TEMP, EVAPORATOR 702
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
650
625
600
575
550
525
500
475
450
336
323
310
297
284
271
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232
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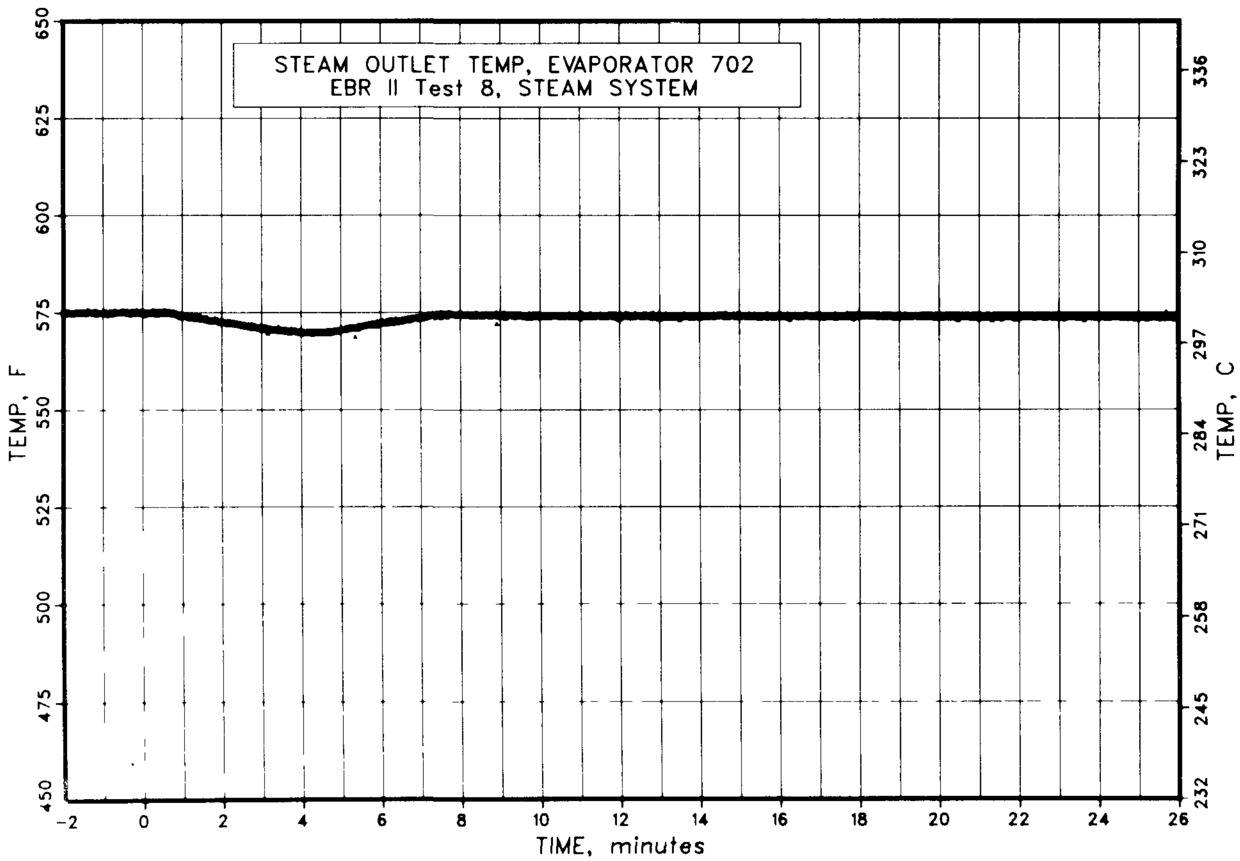
STEAM OUTLET TEMP, EVAPORATOR 702
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
650
625
600
575
550
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500
475
450
336
323
310
297
284
271
258
245
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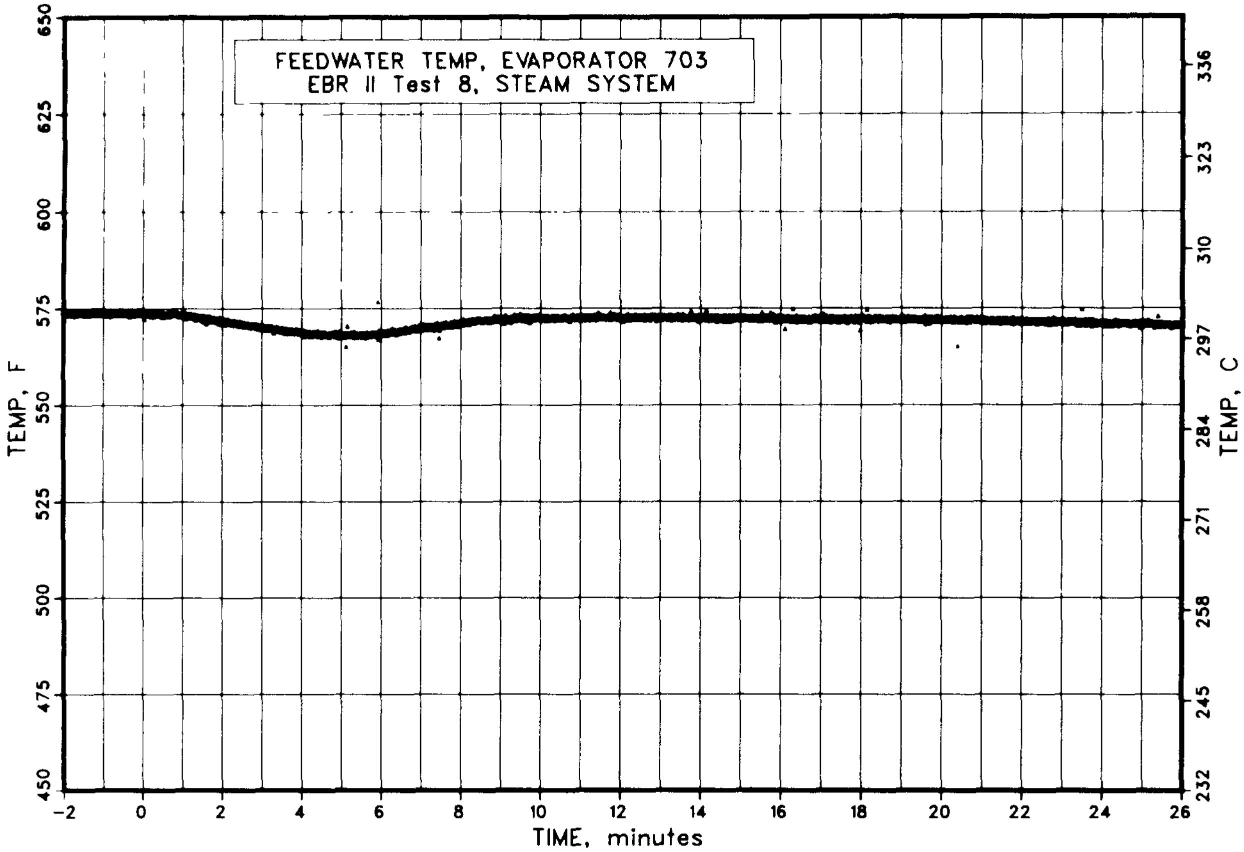
FEEDWATER TEMP, EVAPORATOR 703
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
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625
600
575
550
525
500
475
450
336
323
310
297
284
271
258
245
232
-2
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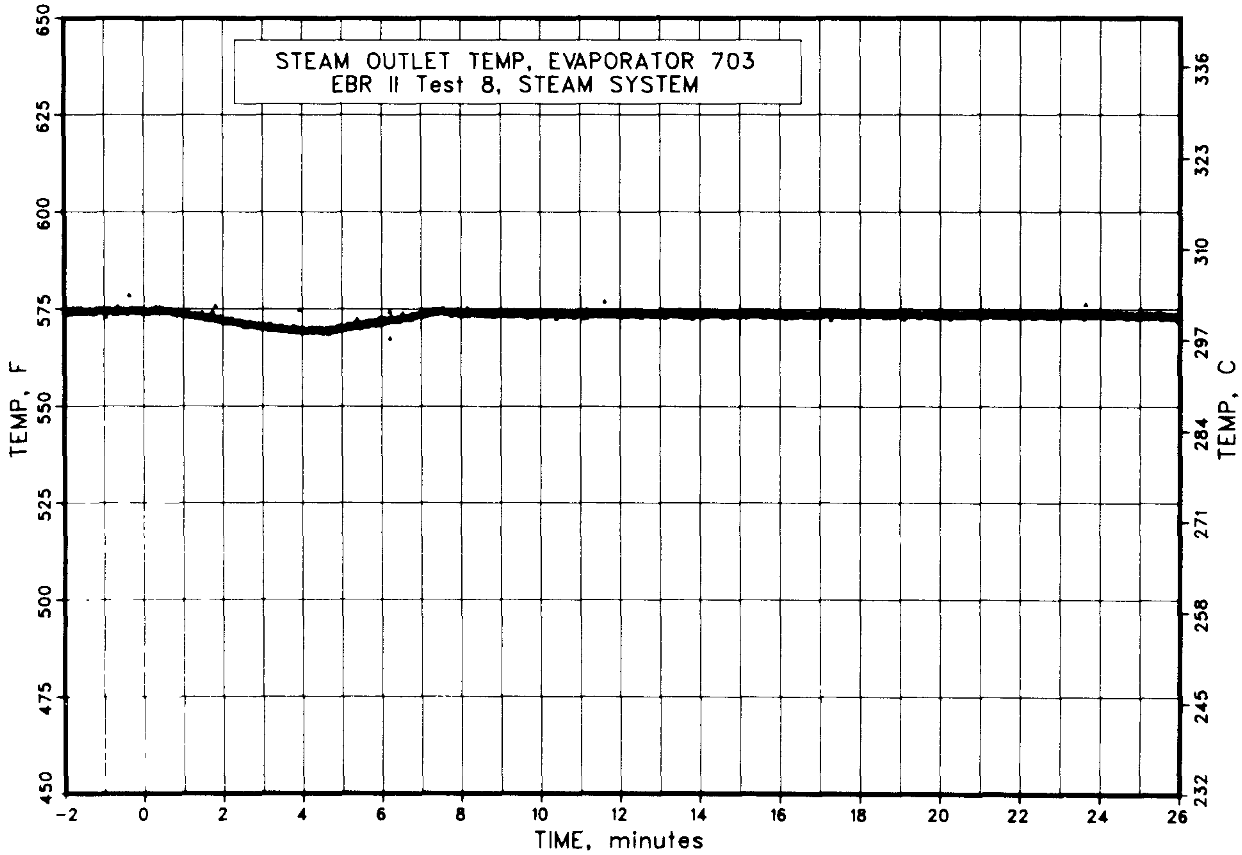
STEAM OUTLET TEMP, EVAPORATOR 703
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
650
625
600
575
550
525
500
475
450
336
323
310
297
284
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245
232
-2
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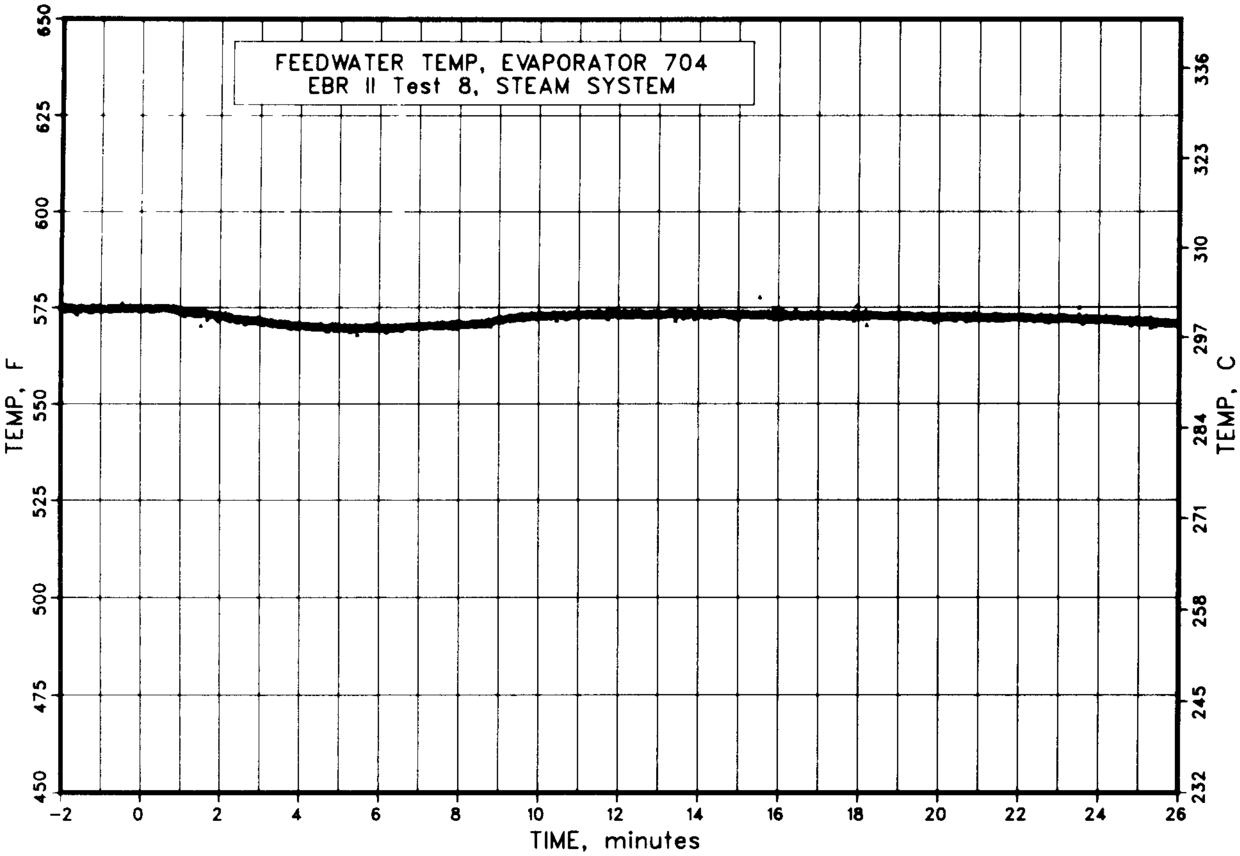
FEEDWATER TEMP, EVAPORATOR 704
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
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625
600
575
550
525
500
475
450
336
323
310
297
284
271
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-2
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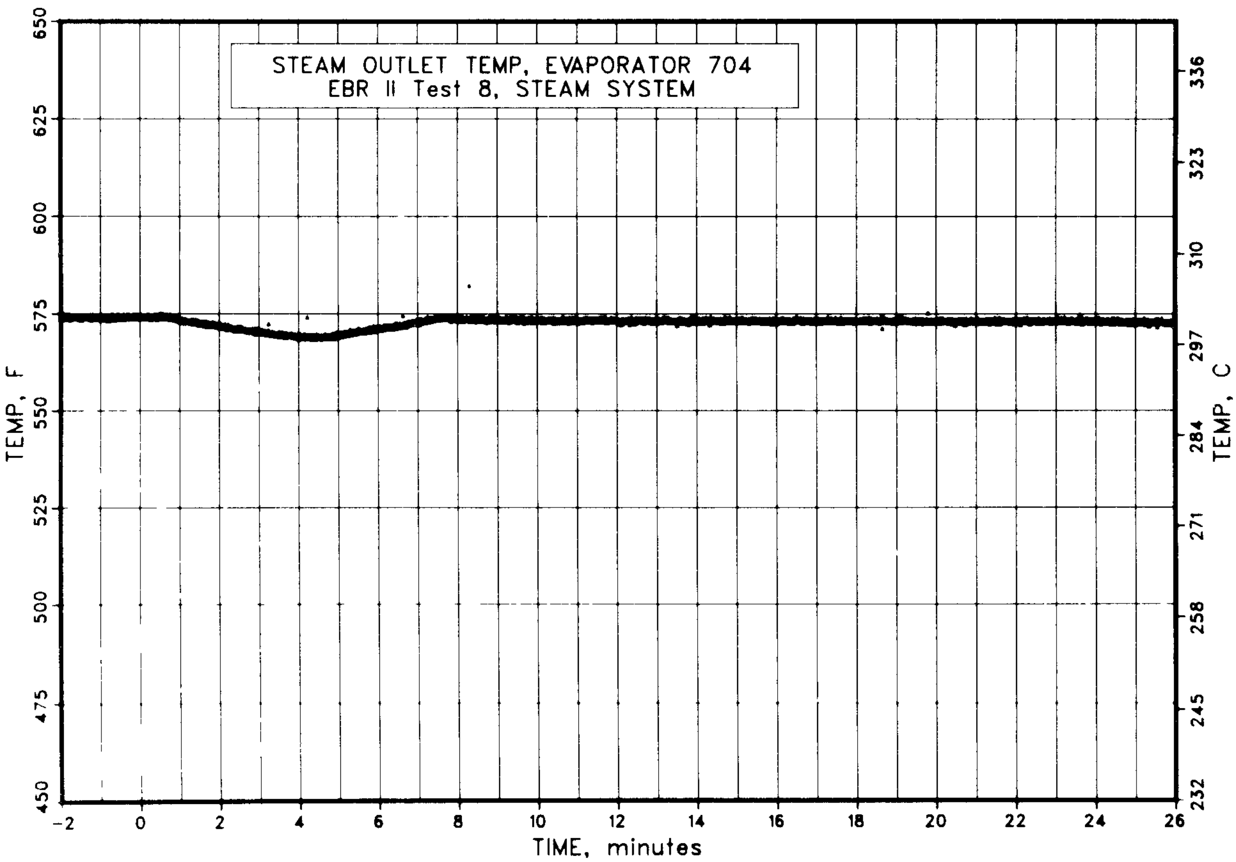
STEAM OUTLET TEMP, EVAPORATOR 704
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
650
625
600
575
550
525
500
475
450
336
323
310
297
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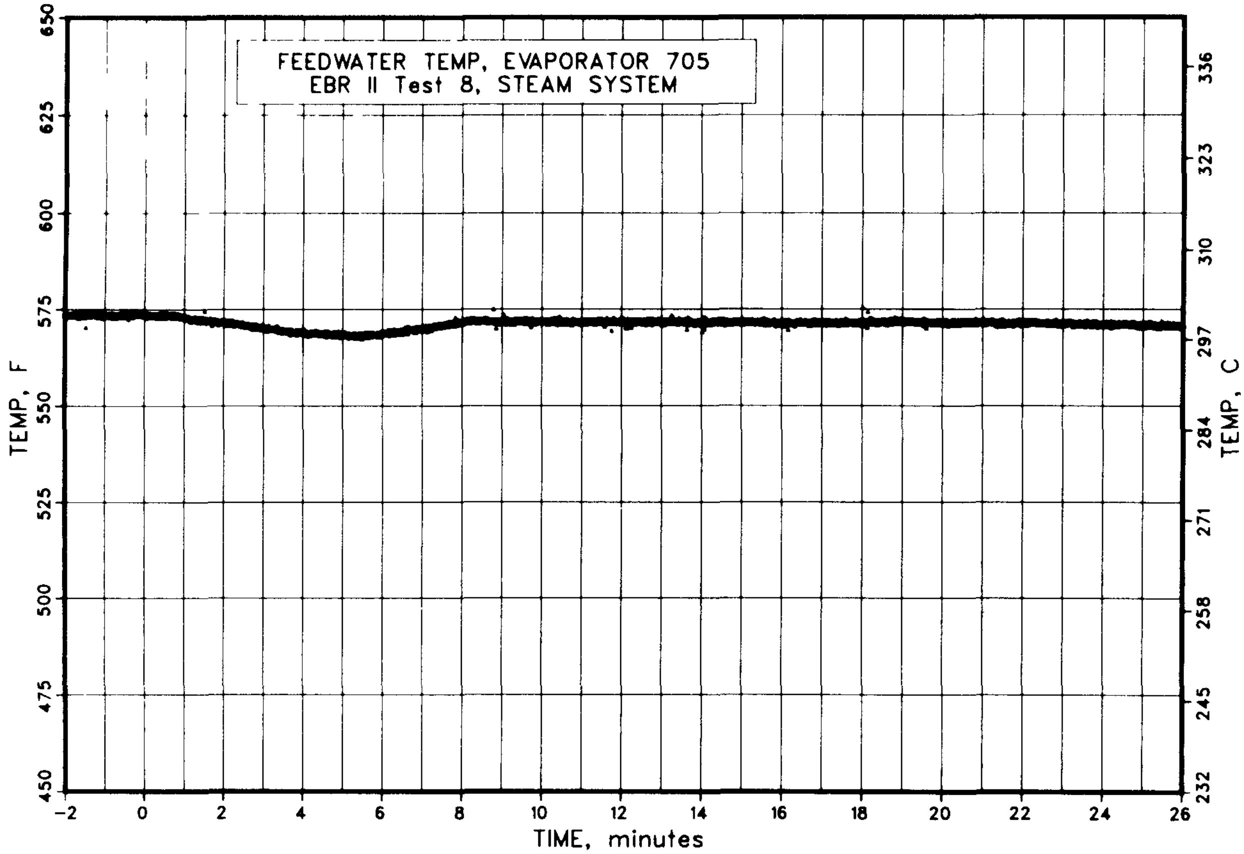
FEEDWATER TEMP, EVAPORATOR 705
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
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625
600
575
550
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500
475
450
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297
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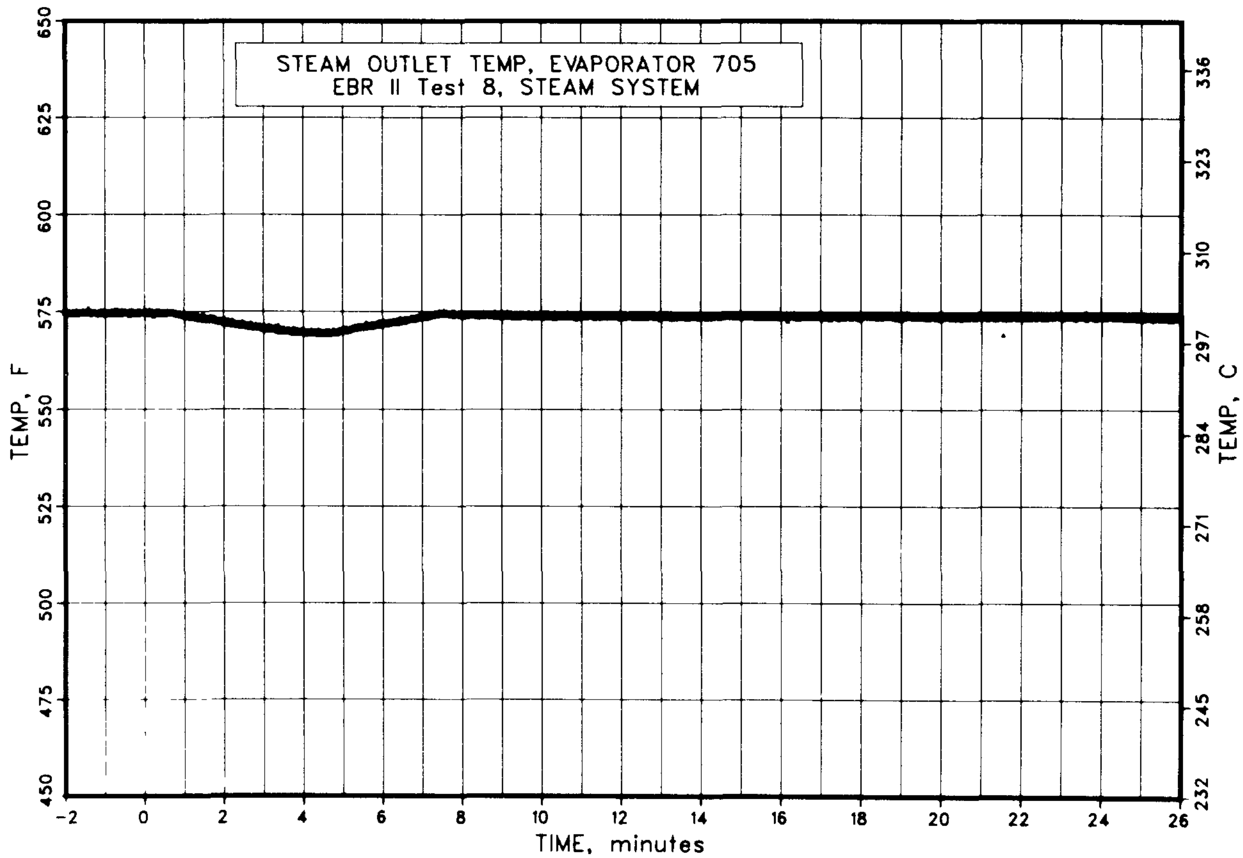
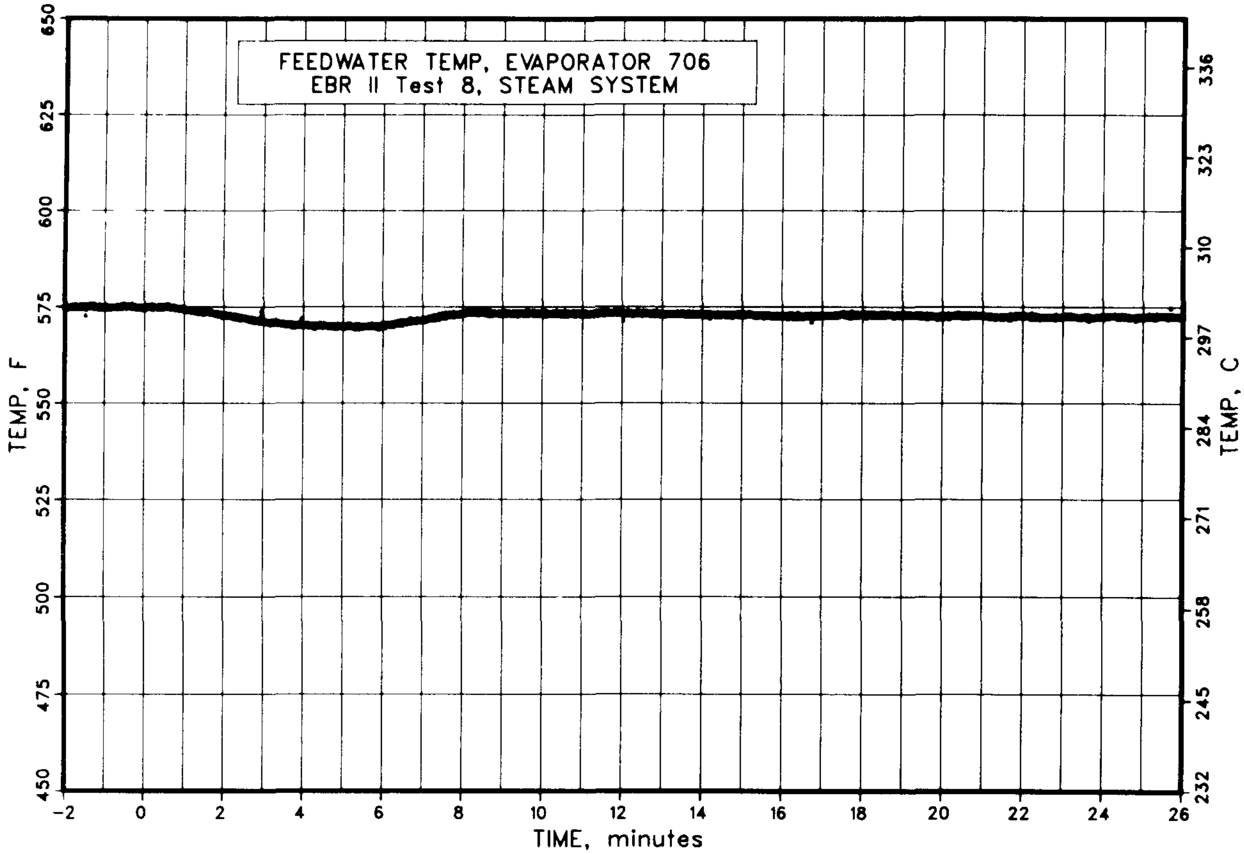
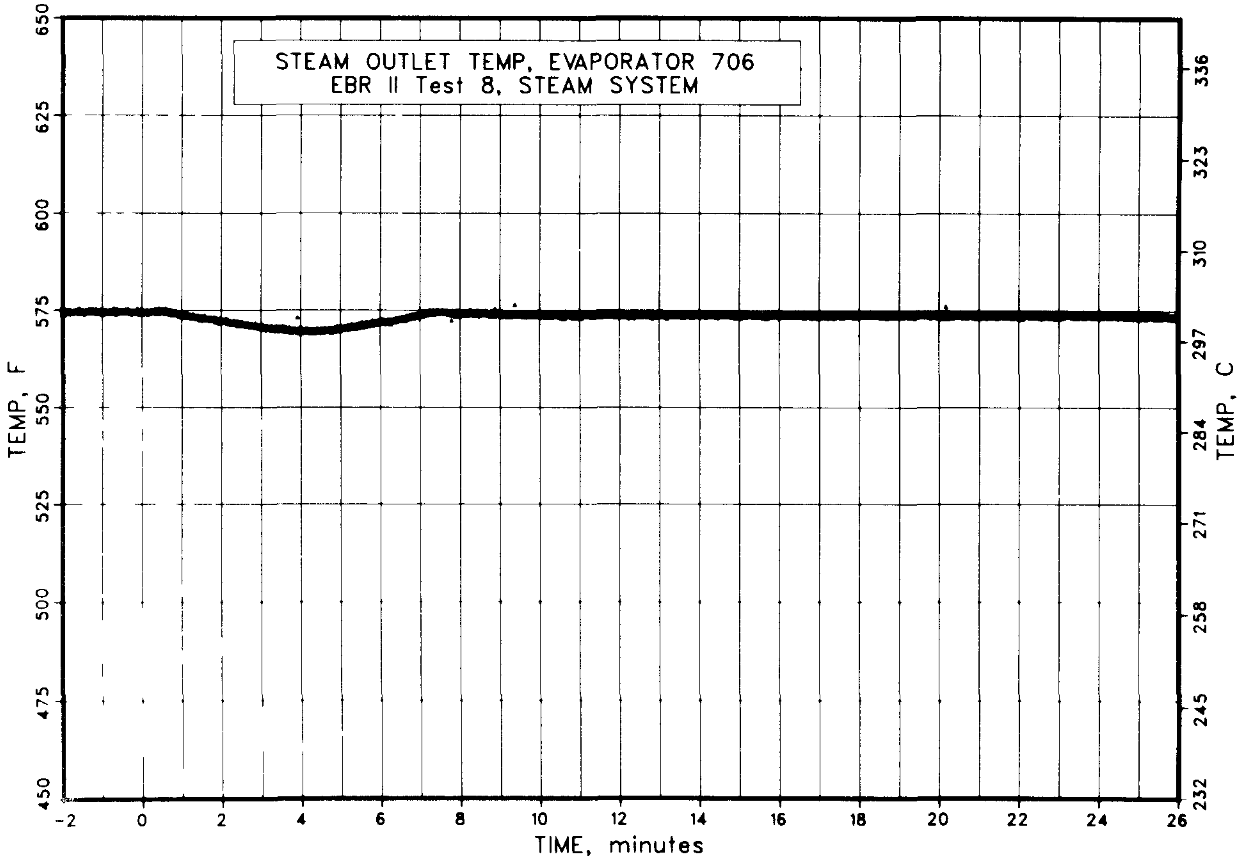
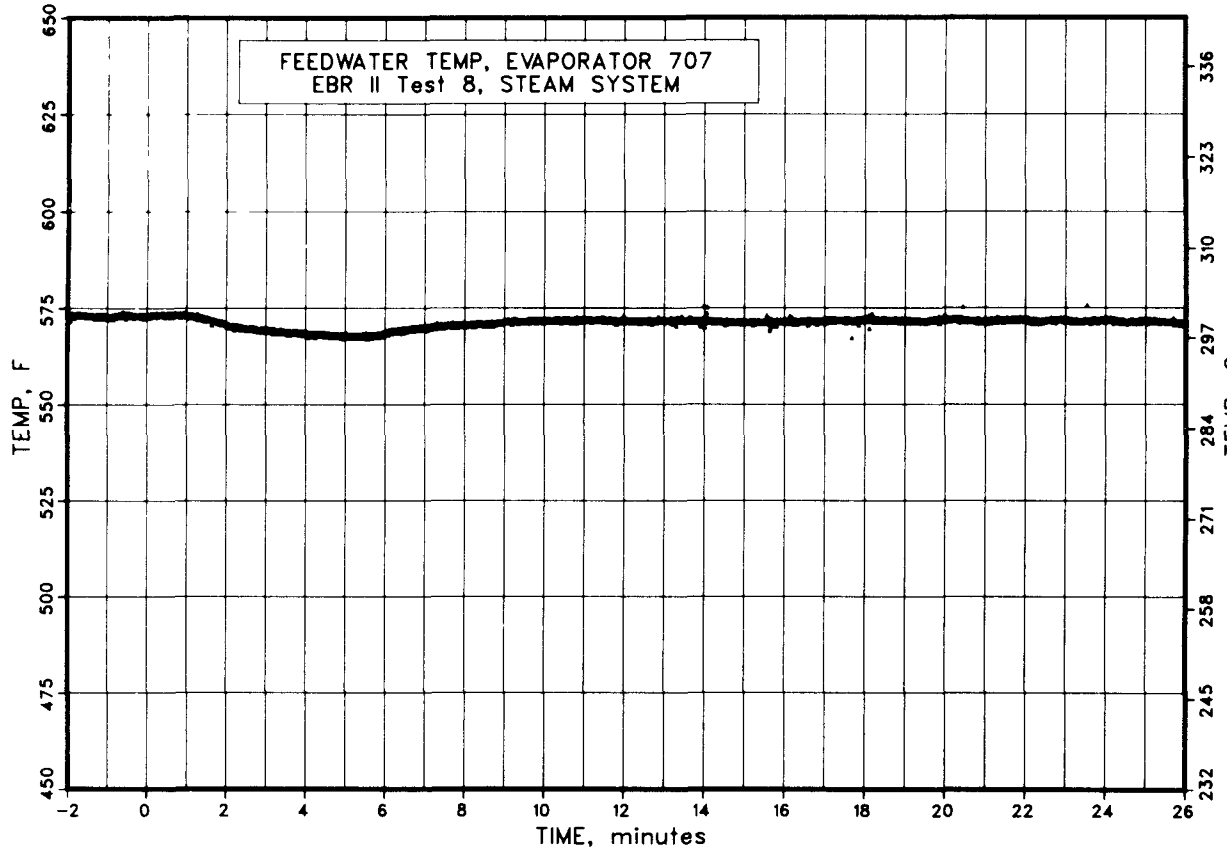
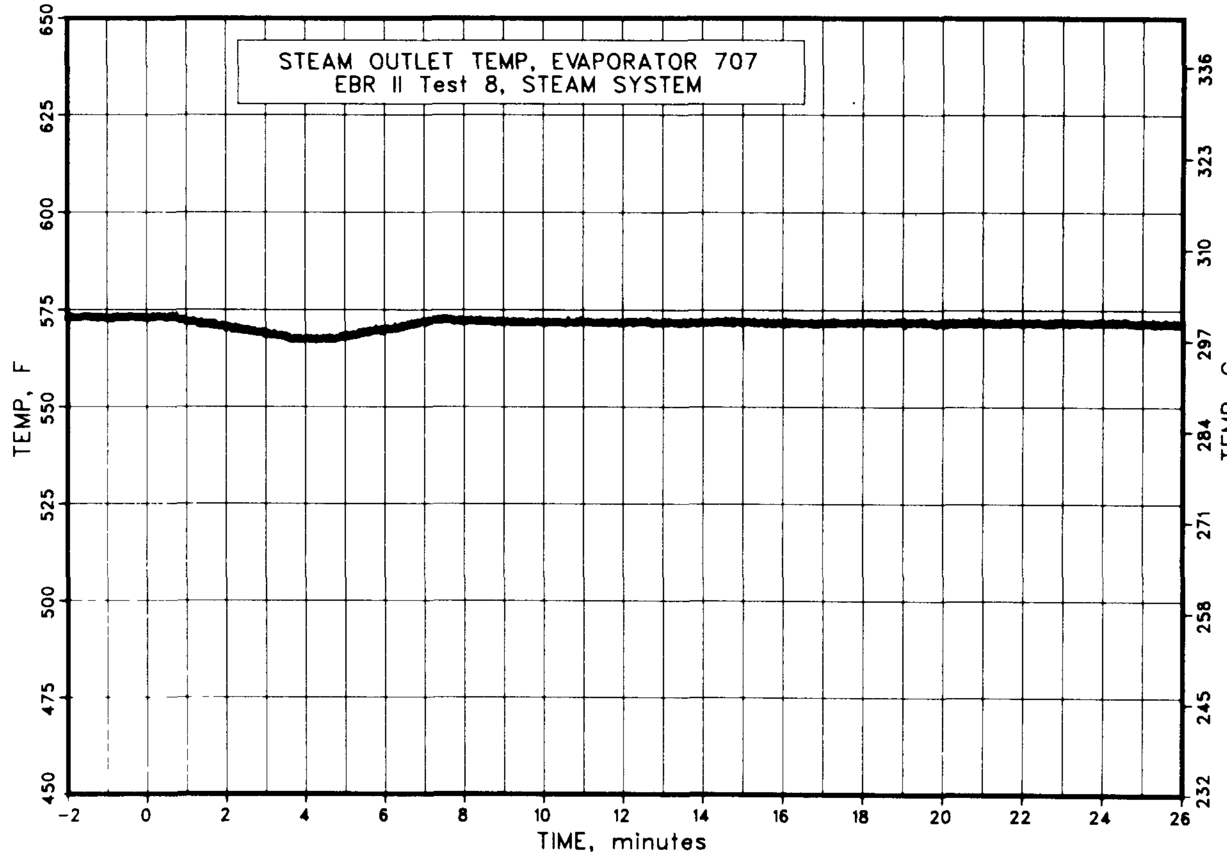
26

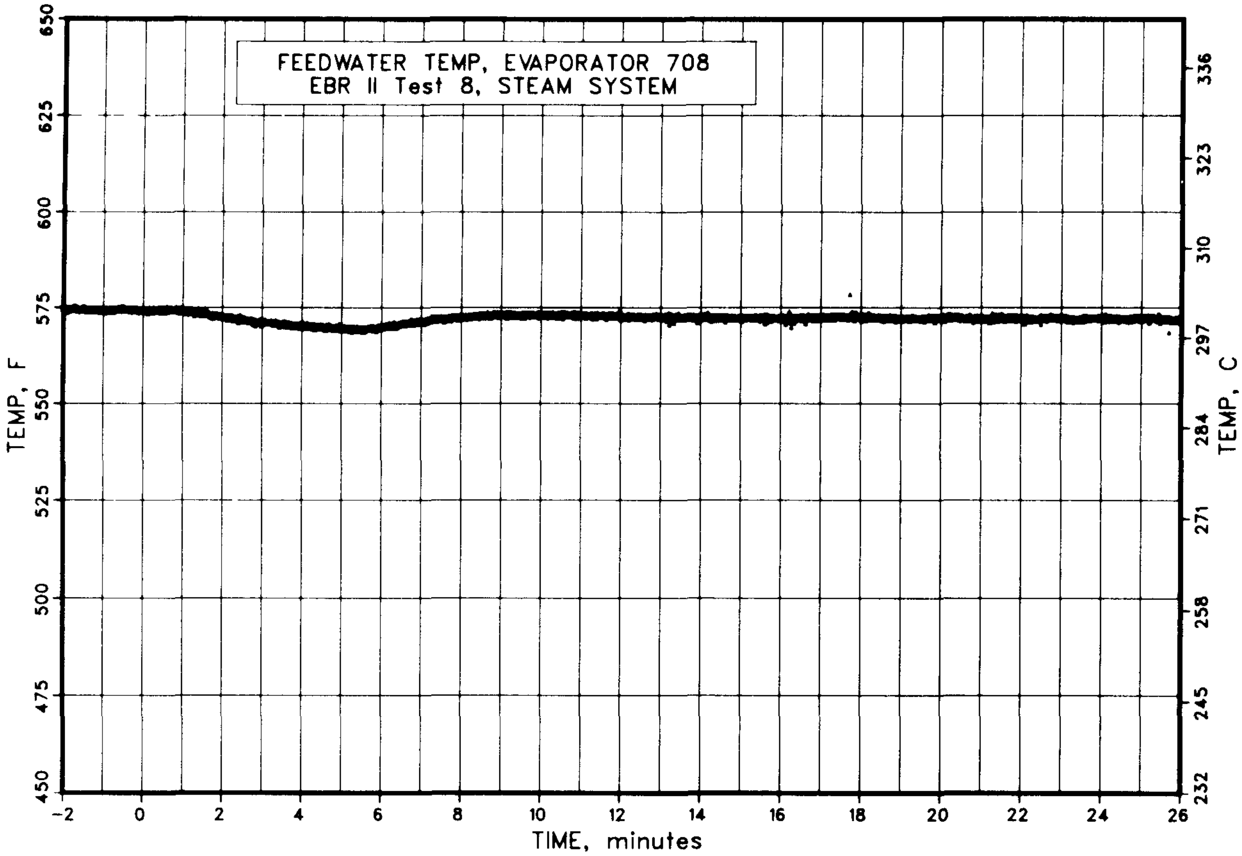

STEAM OUTLET TEMP, EVAPORATOR 705
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
650
625
600
575
550
525
500
475
450
336
323
310
297
284
271
258
245
232
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26

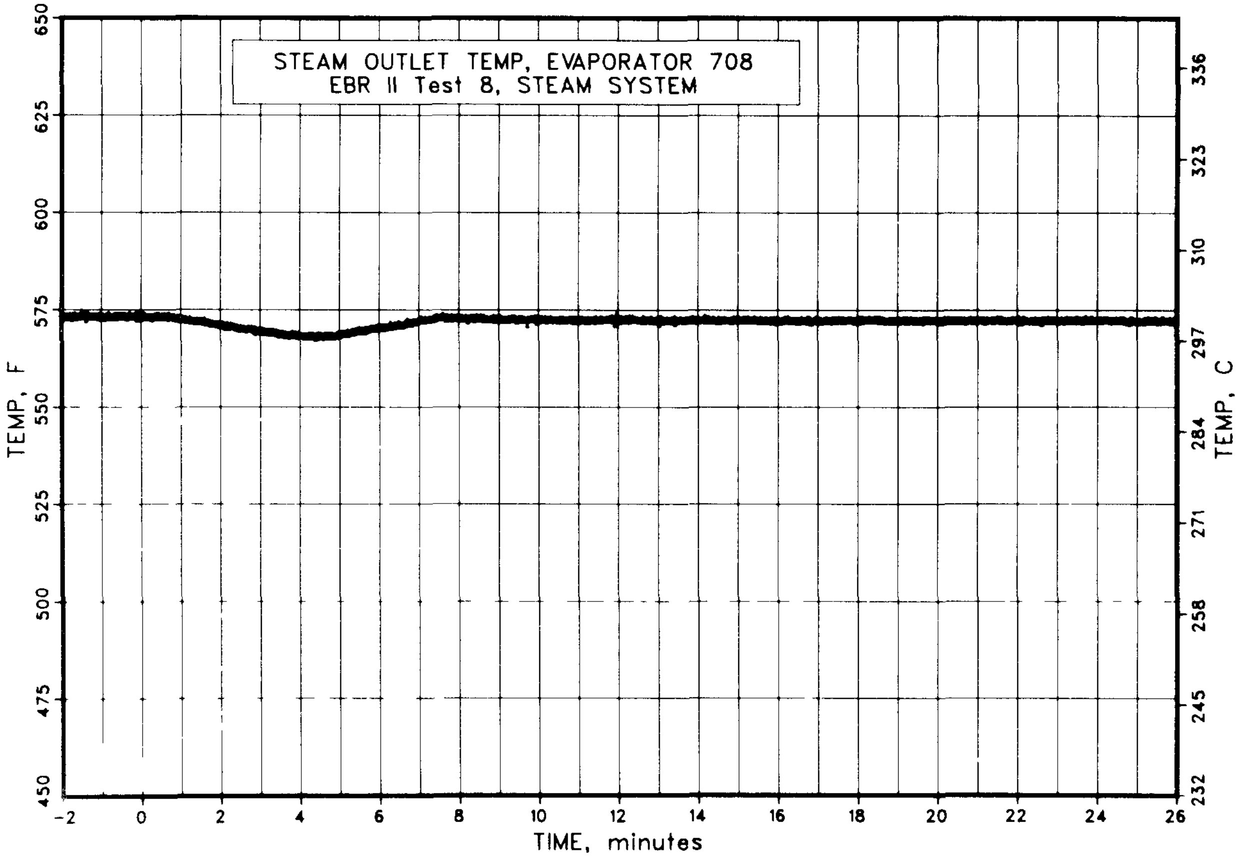

FEEDWATER TEMP, EVAPORATOR 706
EBR II Test 8, STEAM SYSTEM
TEMP, F
650
625
600
575
550
525
500
475
450
TEMP, C
336
323
310
297
284
271
258
245
232
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

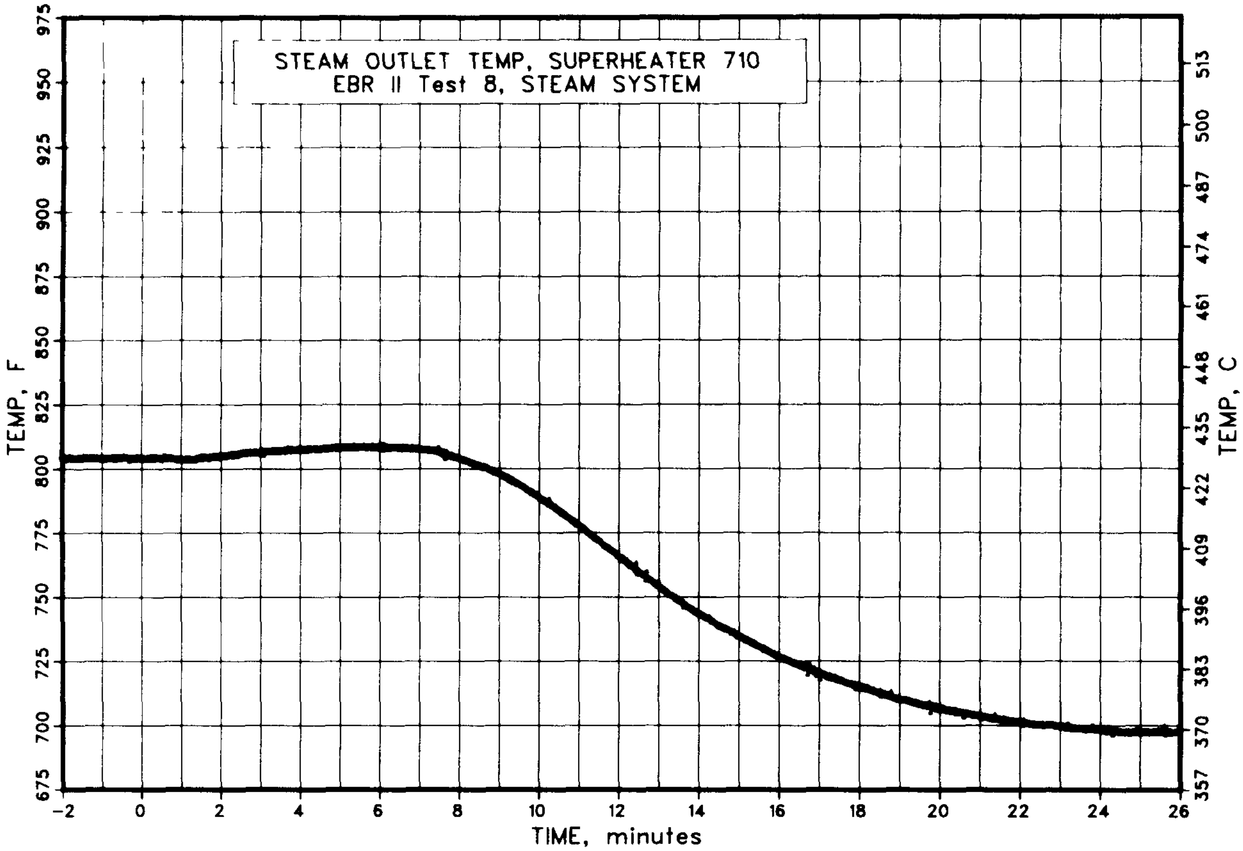

STEAM OUTLET TEMP, EVAPORATOR 706
EBR II Test 8, STEAM SYSTEM
TEMP, F
650
625
600
575
550
525
500
475
450
TEMP, C
336
323
310
297
284
271
258
245
232
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

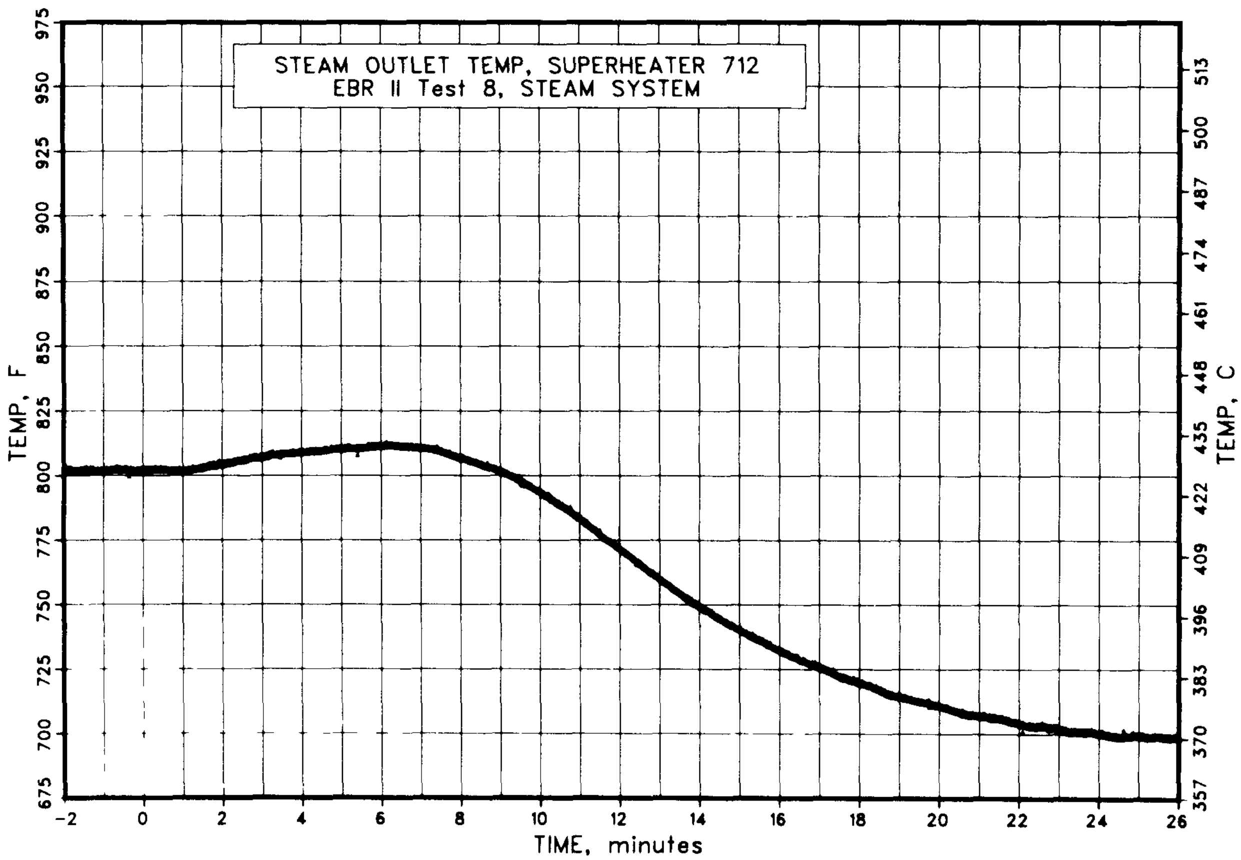

FEEDWATER TEMP, EVAPORATOR 707
EBR II Test 8, STEAM SYSTEM
TEMP, F
650
625
600
575
550
525
500
475
450
TEMP, C
336
323
310
297
284
271
258
245
232
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

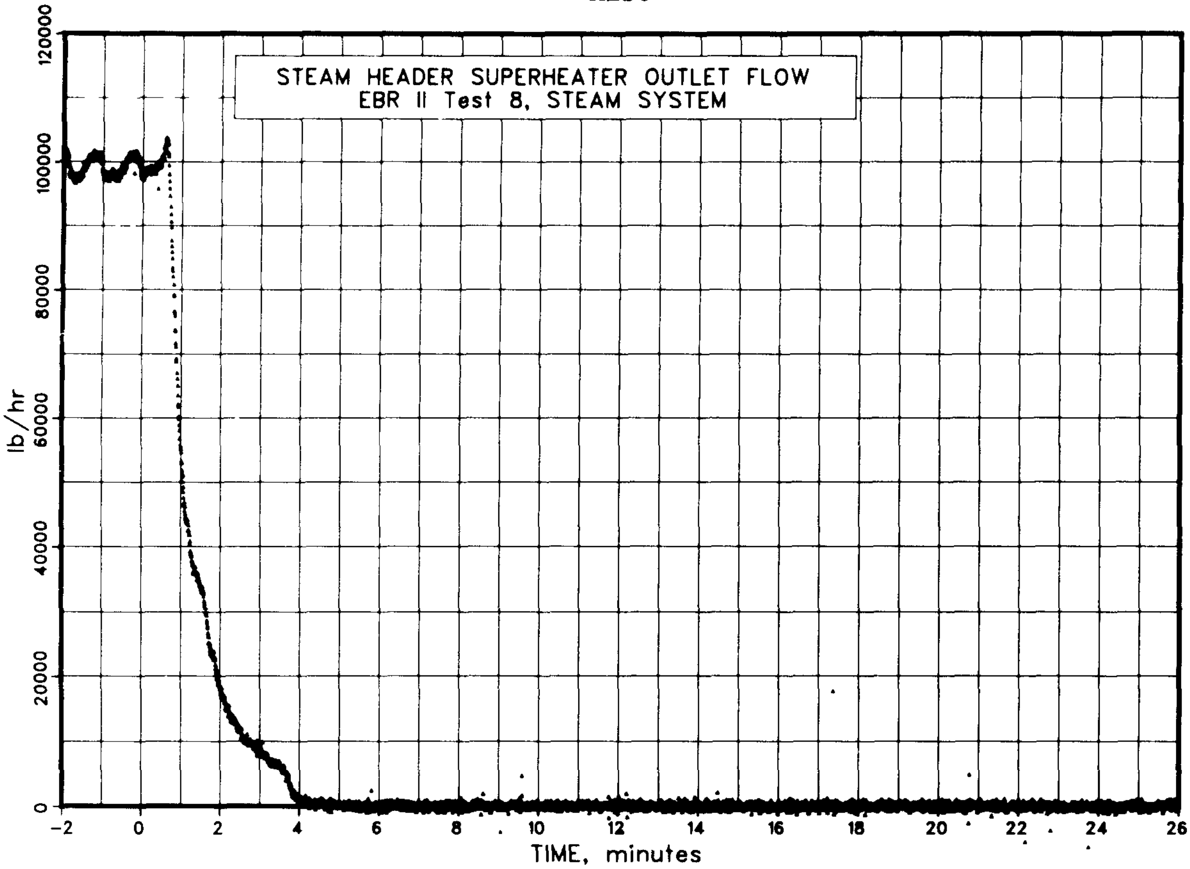

STEAM OUTLET TEMP, EVAPORATOR 707
EBR II Test 8, STEAM SYSTEM
TEMP, F
650
625
600
575
550
525
500
475
450
TEMP, C
336
323
310
297
284
271
258
245
232
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

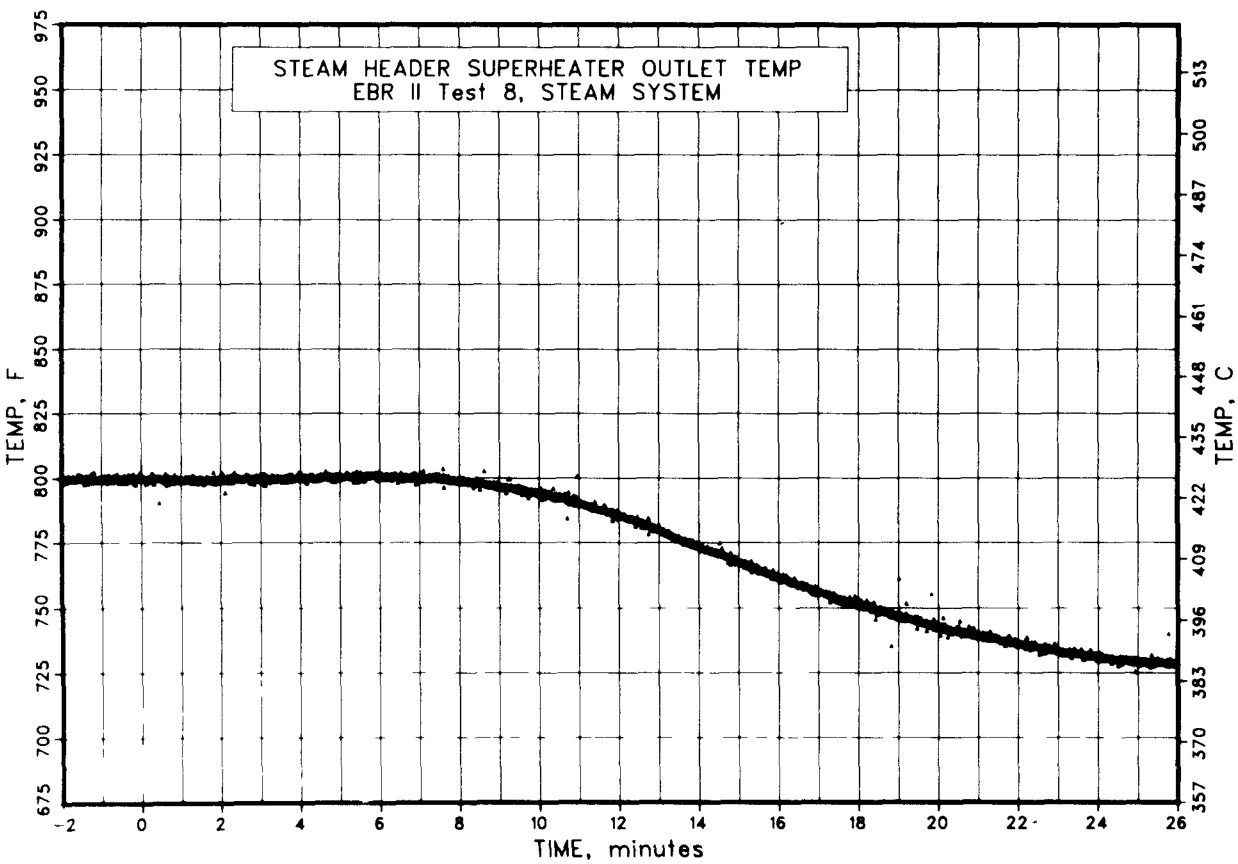

FEEDWATER TEMP, EVAPORATOR 708
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
650
625
600
575
550
525
500
475
450
336
323
310
297
284
271
258
245
232
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26

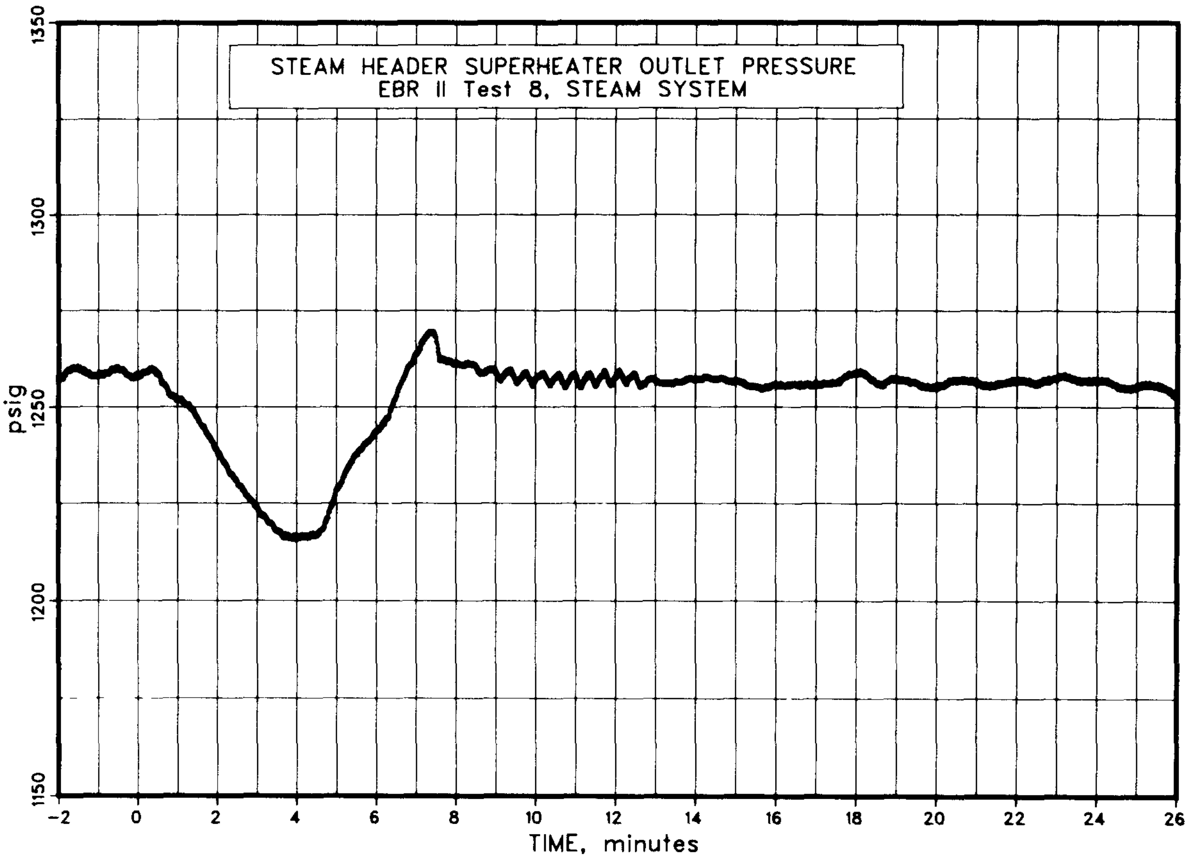

STEAM OUTLET TEMP, EVAPORATOR 708
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
650
625
600
575
550
525
500
475
450
336
323
310
297
284
271
258
245
232
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26

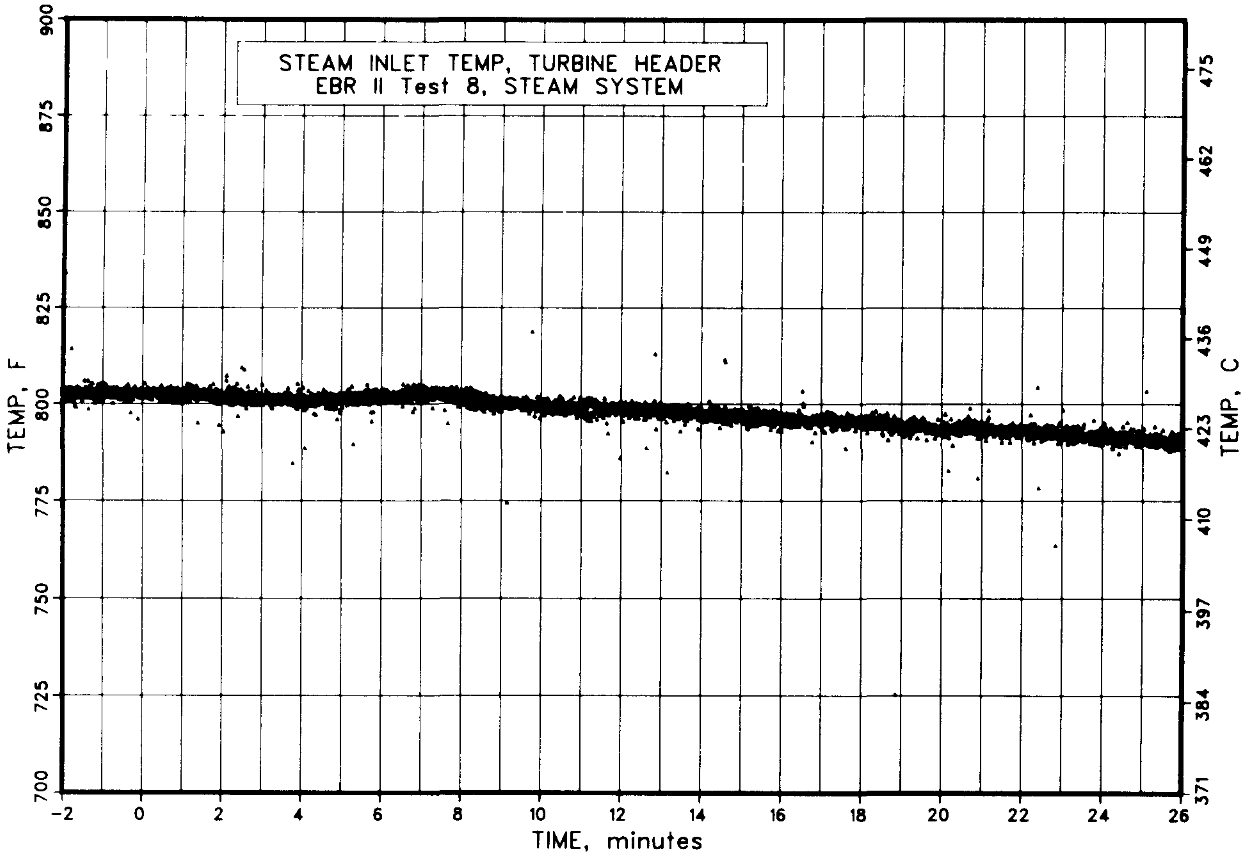

STEAM OUTLET TEMP, SUPERHEATER 710
EBR II Test 8, STEAM SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

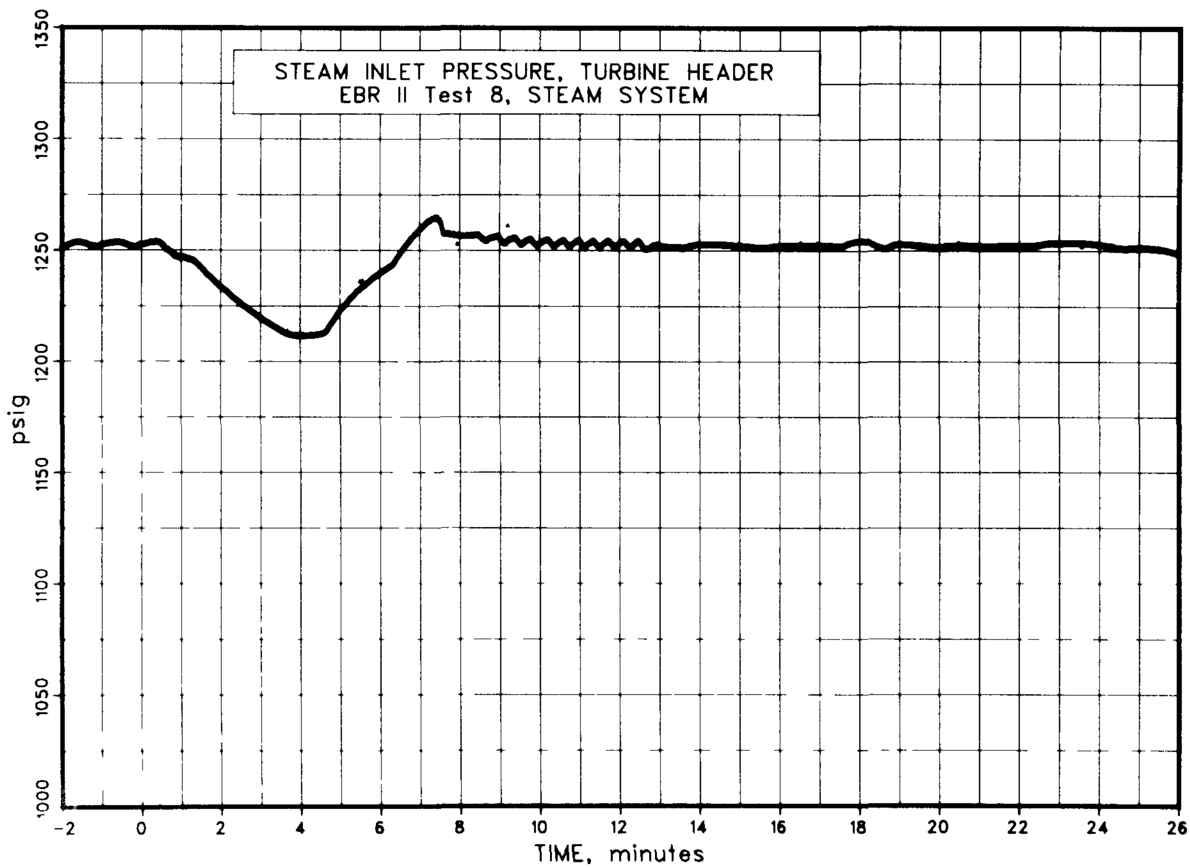

STEAM OUTLET TEMP, SUPERHEATER 712
EBR II Test 8, STEAM SYSTEM
TEMP, F
975
950
925
900
875
850
825
800
775
750
725
700
675
TEMP, C
513
500
487
474
461
448
435
422
409
396
383
370
357
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

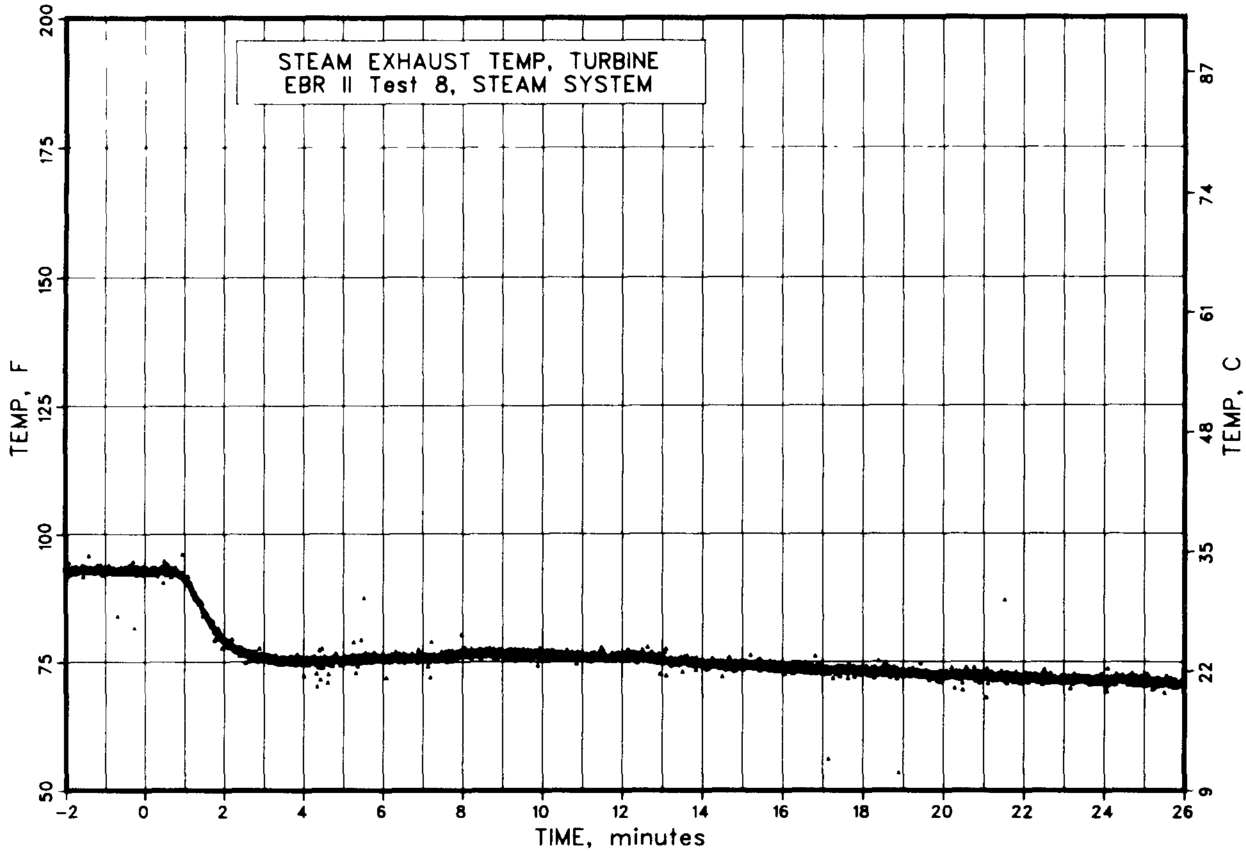

STEAM HEADER SUPERHEATER OUTLET FLOW
EBR II Test 8, STEAM SYSTEM
lb/hr
0
20000
40000
60000
80000
100000
120000
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

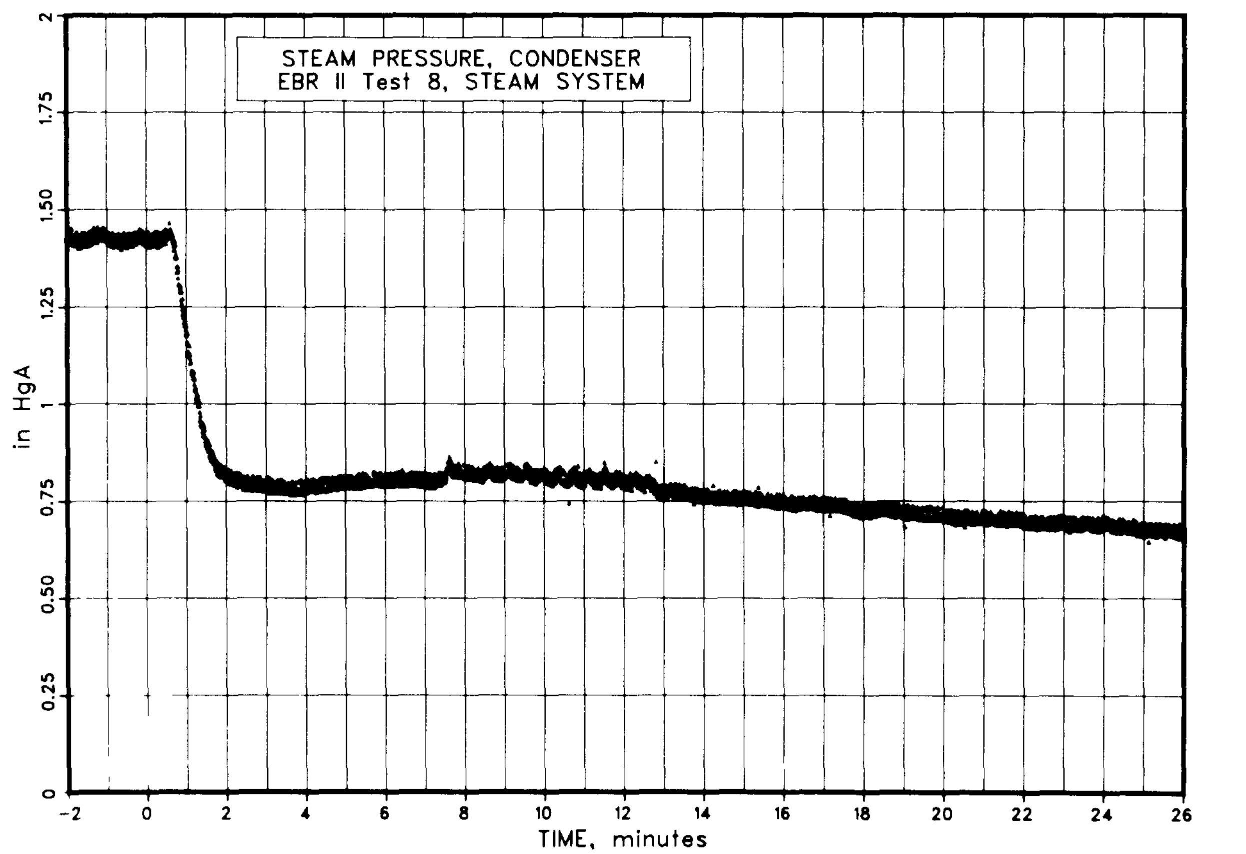

STEAM HEADER SUPERHEATER OUTLET TEMP
EBR II Test 8, STEAM SYSTEM
TEMP, F
675
700
725
750
775
800
825
850
875
900
925
950
975
TEMP, C
357
370
383
396
409
422
435
448
461
474
487
500
513
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

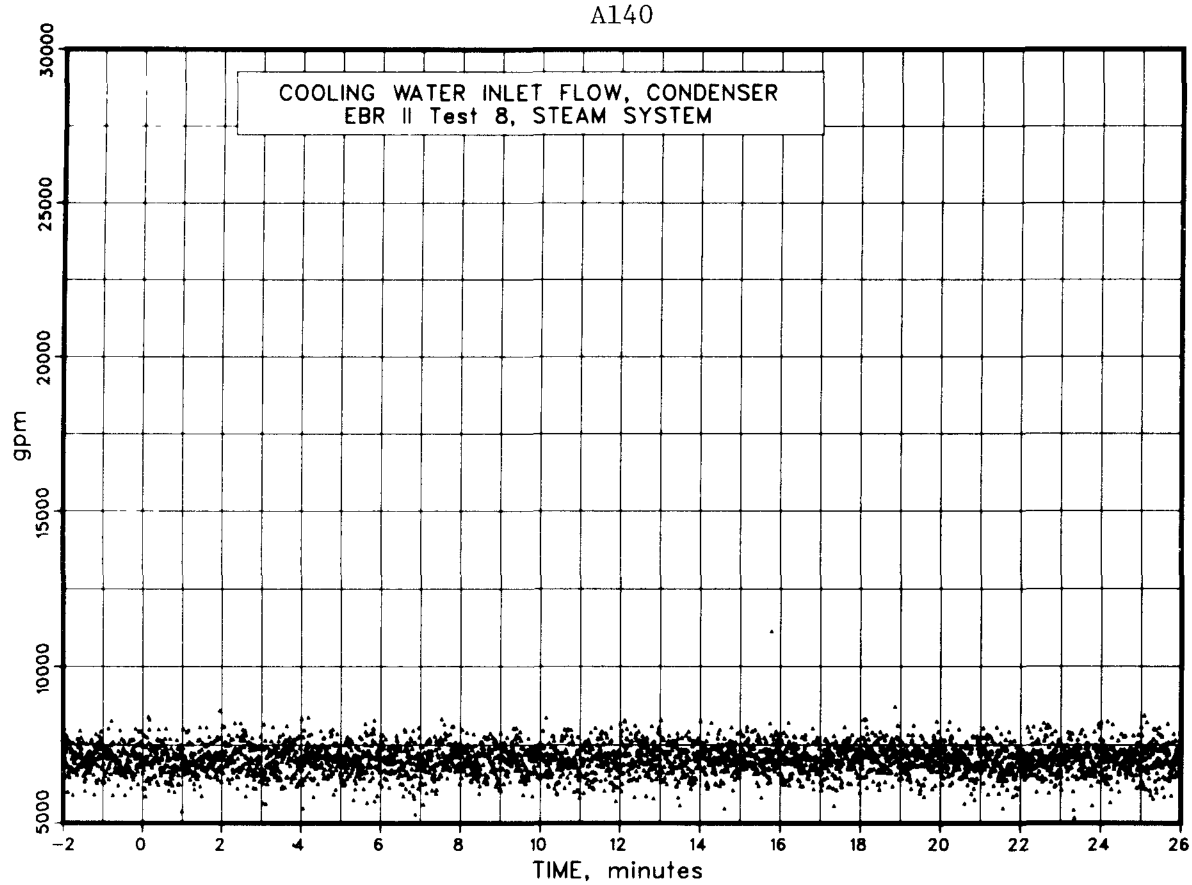

STEAM HEADER SUPERHEATER OUTLET PRESSURE
EBR II Test 8, STEAM SYSTEM
psig
1350
1300
1250
1200
1150
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes

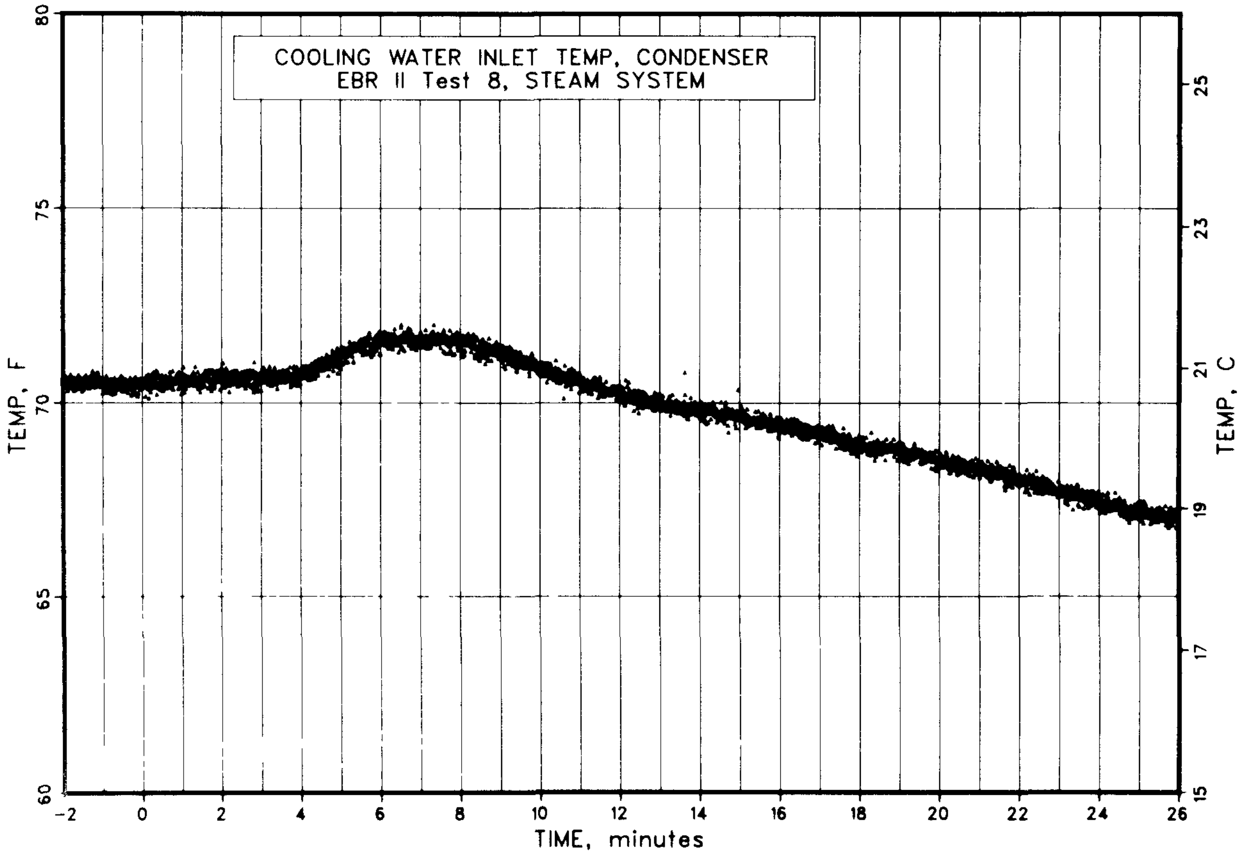

STEAM INLET TEMP, TURBINE HEADER
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
900
875
850
825
800
775
750
725
700
475
462
449
436
423
410
397
384
371
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26

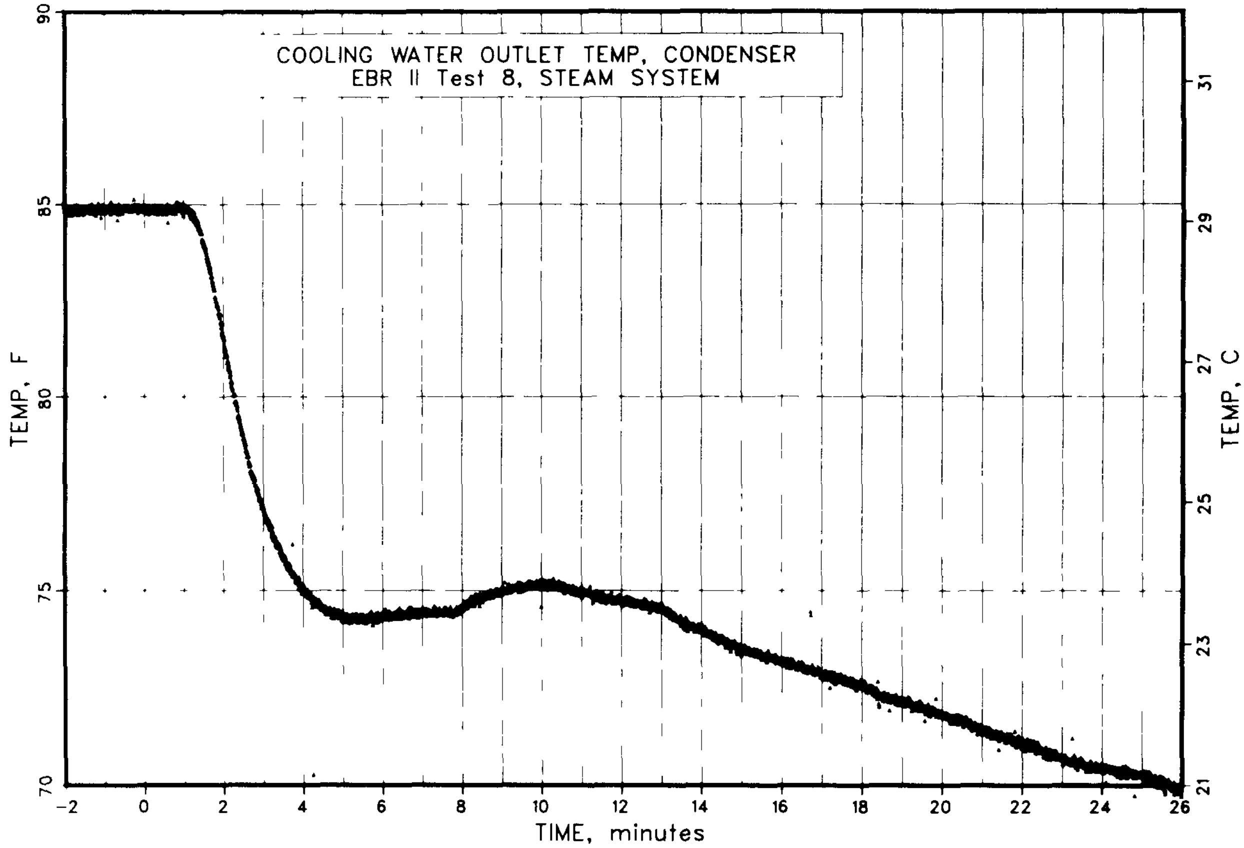

STEAM INLET PRESSURE, TURBINE HEADER
EBR II Test 8, STEAM SYSTEM
psig
TIME, minutes
1350
1300
1250
1200
1150
1100
1050
1000
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26


STEAM EXHAUST TEMP, TURBINE
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
200
175
150
125
100
75
50
87
74
61
48
35
22
9
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26


STEAM PRESSURE, CONDENSER
EBR II Test 8, STEAM SYSTEM
in HgA
TIME, minutes
2
1.75
1.50
1.25
1
0.75
0.50
0.25
0
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26


COOLING WATER INLET FLOW, CONDENSER
EBR II Test 8, STEAM SYSTEM
gpm
30000
25000
20000
15000
10000
5000
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes


COOLING WATER INLET TEMP, CONDENSER
EBR II Test 8, STEAM SYSTEM
TEMP, F
80
75
70
65
60
TEMP, C
25
23
21
19
17
15
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME, minutes


COOLING WATER OUTLET TEMP, CONDENSER
EBR II Test 8, STEAM SYSTEM
TEMP, F
TEMP, C
TIME, minutes
90
85
80
75
70
31
29
27
25
23
21
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26