

**ATTACHMENT (8)**

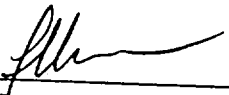
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**Non-Proprietary -- Vendor Report TR-PENG-042,  
“Test Report for MNSA Hydrostatic and Thermal Tests”**

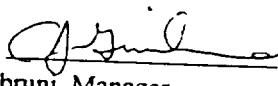
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Ref. Test Request TS070A	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241
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**TEST REPORT FOR  
MNSA HYDROSTATIC AND  
THERMAL CYCLE TESTS**

Prepared By:  Date: 6/23/97  
F. V. Rossano, Engineer  
Testing Services

Reviewed By:  Date: 6/25/97  
K. H. Haslinger, Supervisor  
Testing Services

Approved By:  for PL Date: 7/3/97  
P. Leombruni, Manager  
Primary Systems

The tests described in this report are accepted as meeting the objectives and instruction in the referenced test request and test procedures.		
Cognizant Engineer: <u>K. V. Margotta</u>	<u></u>	<u>7/3/97</u>
Printed Name	Signature	Date

Date of Issue: 07/3/97

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RECORD OF REVISIONS

NUMBER	DATE	PAGES INVOLVED	PREPARED BY	APPROVALS
00	07/03/97	All	F. V. Rossano	K. H. Haslinger P. Leombruni K. V. Margotta

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## 1.0 INTRODUCTION

The Structural Integrity and Testing Group (TS) of CE Nuclear Operations (CENO) was requested, via Reference 9.1, to verify the integrity of the MNSA (Mechanical Nozzle Seal Assembly) seal clamp assemblies for Field Services, Mechanical Engineering, (FSME). The test requirements are contained in References 9.1 and 9.2. Only the hydrostatic test and thermal cycle test are covered by this procedure.

This report presents the objectives, presents a description of the test hardware, outlines the test procedures, presents the test results, and lists the documentation requirements for the test. Copies of data sheets are contained in the appendices of this report.

Per References 9.1 and 9.11, Quality Assurance (Q/A) requirements for Design Verification (Section 3.6 of Reference 9.3) were applicable to this test program.

## 2.0 OBJECTIVE

The objective of this test was to qualify one MNSA seal clamp for an instrument nozzle located at the bottom of a PWR pressurizer and one MNSA seal clamp for a Hot Leg RTD nozzle. Specific requirements were to assemble the seal clamps, perform a room temperature hydrostatic test of each assembly, perform a thermal cycle test (each test consisting of three cycles) of each assembly, and to complete the test documentation with a test report.

## 3.0 SUMMARY

The qualification testing of the MNSA seals was performed from June 10, 1997 through June 17, 1997, using the autoclaves located in Building 5 of ABB/CENO's test facilities. Both seal assemblies were subjected to hydrostatic testing at 3,175 Psig,  $\pm 50$  Psig and to a thermal cycle test from room temperature up to 650 °F,  $\pm 10$  °F, and 2,500 Psig,  $\pm 50$  Psig. The seal assemblies were then disassembled and examined for any indications that boric acid had leaked past the seals. There were no signs of boric acid leakage found during the post test examination and the seal assemblies are considered to have successfully completed this qualification test.

## 4.0 TEST APPARATUS

The test apparatus consisted of the following components:

- Autoclaves capable of operating at up 2,800 Psig at 650°F.
- Instruments to monitor and record the test parameters.
- Mock-ups of the NSSS pressure boundaries and the MNSA clamp seal assemblies.

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#### 4.1 Autoclave

The autoclave is a vessel capable of maintaining high temperature, high pressure water. The Structural Integrity and Testing Group of ABB/CENO has several of these autoclaves. They are capable of using typical NSSS chemistry and obtaining primary system temperatures and pressures. Autoclaves 5A and 6A were used for this test. These are 5" inside diameter by 36" long autoclaves designed to operate at up to 2,800 Psig at 650°F. Higher operating pressures are allowable at lower temperatures. The hydrostatic test at 3,175 Psig was performed at room temperature and was within the operating capability of these autoclaves. A schematic of the autoclave arrangement, for the thermal cycle test, is shown in Figure 1. Additional description of the autoclave facilities is contained in Reference 9.4

#### 4.2 Seal Assemblies

FSME provided two mock-ups of the NSSS pressure boundary in place of the normal autoclave head. They also provided all MNSA clamp seal components. These items are described by References 9.6, 9.7, and 9.8. No special tools were needed for the assembly and disassembly of the MNSA clamps. Calibrated torque wrenches were used to meet the requirements of Reference 9.10.

#### 4.3 Test Measurement Equipment

Table 1 contains a list of test instruments. The pressure recorder and the thermocouple recorder were part of the autoclave room facilities. The pressure recorders were 24 hour circular chart devices. The temperature recorder was a continuous multi-channel strip chart recorder. Calibrated thermocouples were used to record the temperature of the water in the autoclave. These instruments were calibrated and the calibration records retained in accordance with Reference 9.5. TS provided calibrated torque wrenches for the assembly of the MNSA clamps. Copies of calibration data sheets are contained in Appendix C.

### 5.0 TEST SETUP

The setup of the autoclave was the responsibility of TS. The general arrangement of the autoclave was as shown in Figure 1. The water used was planned to be demineralized water for the hydrostatic tests and boric acid solution (nominally 2,200 PPM boric acid in DI water) for the thermal cycle tests. However, to save some schedule time, the boric acid solution was also used for two of the hydrostatic tests on the Hot Leg RTD nozzle seal and both of the hydrostatic tests on the bottom nozzle seal.

The instructions for the assembly of the MNSA seal clamps were provided by FSME in Reference 9.10. All of the assembly of the seal components were performed under the direction of FSME personnel.

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Exceptions to Reference 9.10 were noted on a copy of the reference and a listed here. For the Hot Leg RTD MNSA, the test assembly started at Section 7.1.5 of Reference 9.10. The following section numbers are from Reference 9.10:

Section 7.2.3: It was necessary to lift the RTD nozzle to install the compression collar.

Section 7.2.9: The bolts were torqued to 35 ft-lb. to set the seal, then loosened and retorqued to 30 ft-lb.

Section 7.2.14: It was not necessary to bend the washer tabs due to the short duration of this test program and the absence of significant vibration.

For the Bottom Pressurizer MNSA, the test assembly started with Section 6.1.4 of Reference 9.10. The following section numbers are from Reference 9.10:

Section 6.2.4: It was necessary to reduce the diameter of the shoulder bolt from 0.760" to 0.740" for one inch above the threads in order to fit into the holes in the test mock-up.

Section 6.2.7: It was necessary to adjust the lower flange using the 1/2 inch hex bolts for alignment before torquing the shoulder screws to 10 ft-lb.

Section 6.2.8: The compression collar required remachining to increase the inside diameter in the upper region. A 0.050 inch thick shim was also installed between the Grafoil seal and the compression collar.

Section 6.2.20: It was not necessary to bend the washer tabs due to the short duration of this test program and the absence of significant vibration.

## **6.0 PERFORMANCE OF THE TEST**

All testing was performed by qualified personnel, or persons working under the direction of qualified personnel, per Reference 9.9. The following performance requirements were the same for each of the two MNSA seal clamps tested. The component being tested was identified on the data sheets used. There were no serial numbers for any of the test components.

The general operation guidelines for autoclave operation, given in Reference 9.4, were followed for the set-up of the autoclave. Prior to the MNSA seal testing, all fitting connections were checked, to the extent possible, to verify that they were not likely to provide a leakage path during the test.

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All wetted parts and seal surface metal parts were clean and oil free. The seal clamps were assembled per instructions supplied by FSME. Some minor adjustments were required to the assembly procedures. These adjustments were recorded onto a copy of the assembly procedure and onto Data Sheet 1. Copies of data sheets are contained in the appendices to this report. The data for the Hot Leg RTD seal are contained in Appendix A and the data for the pressurizer bottom seal are contained in Appendix B.

## 6.1 Hydrostatic Test

For this test phase, the rupture disk was removed from each autoclave and the accumulators were isolated from the autoclaves with valves. Four trials were performed on the Hot Leg RTD nozzle and two trials were performed on the pressurizer bottom nozzle. The hydrostatic pressure requirement was 3,175,  $\pm$  50, Psig, at ambient temperature. The pressure should not decay by more than 50 Psig. If any decay of more than 50 Psig can not be attributed to leakage from other than the test seal, the test would have been considered a failure.

### 6.1.1 Hot Leg Mock-up

For the initial two test trials the autoclave was filled with plain demineralized water. The test assembly was vented at the top to allow gases to escape from the autoclave and seal regions. The system was sealed after it was filled and vented.

The first test had a leakage rate of about 150 Psi over 19 minutes. The pressure was released and the autoclave head nut was retorqued to a higher torque value, 120 ft-lb. The duration of the second test was 16 minutes, and the pressure decay was 15 Psi, within the acceptable limits. Following the second trial, which was initially considered successful, the autoclave was drained and refilled with boric acid solution, in preparation for the thermal cycle tests.

During the preparation for the thermal cycle test, some moisture was found in the seal region. After some discussion, it was decided to recheck the tightness of the seal assembly and to repeat the hydrostatic test since there was the possibility that the moisture was due to a leak that had not been detected following the second hydrostatic tests. One 1/2" bolt was found to be less than the 30 ft-lb. torque that was initially applied. All of the 1/2 inch bolts were initially retightened to 35 ft-lb. to set the seal, loosened, and retorqued to 30 ft-lb. The hydrostatic test was repeated using the boric acid solution in the autoclave. This third test lasted 29 minutes, and the decay was 50 Psi. While this was within the acceptable limits, it was decided to retorque the autoclave head and repeat the test for a longer duration.

A fourth test was performed, while the pressure was maintained for an extended period, of 3 hours. Over this 3 hour period, there was a 100 Psig decay in pressure, but no signs



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of leakage from the seal area. The seal interface was checked periodically, with strips of paper slipped into the mock-up, between the lower flange and the autoclave head. No traces of moisture were found and the test was considered successful. (Note that the MNSA was never disassembled after the initial assembly prior to the first hydrostatic test and completing thermal cycle test).

A copy of Data Sheet 2 was completed for each hydrostatic test trial. Copies of these data sheets and of the pressure recorder chart are contained in Appendix A.

#### 6.1.2 Bottom Pressurizer MNSA

To save some program test time, it was decided to perform this hydrostatic test with the boric acid solution required for the thermal cycle test. The first hydrostatic test attempt failed at 1,600 Psi. The system was disassembled and it appeared that the Grafoil seal ring was not sufficiently compressed.

FSME decided to make some modifications to the seal compression collar and to install a 0.050 inch thick shim between the compression collar and the Grafoil seal ring. The seal was reassembled with a new Grafoil seal ring and the modified components. A hydrostatic test was performed at 3,175 Psig, with a duration of 26 minutes, during which the pressure decay was less than 50 Psi. The crevices between pressurizer mock-up and seal lower flange were checked for signs of moisture, and none was found.

A copy of Data Sheet 2 was completed for each test. The test hardware was then prepared for the thermal cycle test. Copies of the data sheets and of the pressure recorder charts are contained in the Appendix B of this report

#### 6.2 Thermal Cycle Test

This test was performed on each assembly following successful completion of the hydrostatic test. Each autoclave contained the 2,200 PPM boric acid solution from the previous hydrostatic tests. About 500 milliliters of solution were drained from each system to allow an initial air pocket at the top of each autoclave. The rupture disk was installed, along with vent lines, and accumulator lines. The accumulator was precharged with nitrogen gas.

All heat-up and cool-down rates were in accordance with the operating guidelines, Reference 9.4. Heat-up of the autoclave was limited to 150°F/hour. Each autoclave was vented from the top during the first thermal cycle at between 250°F and 300°F to remove oxygen from the system.

A total of three (3) thermal cycles were required for each seal assembly. A thermal cycle was defined as heating the autoclave from ambient (less than 200°F) to 650°F,  $\pm 10^\circ\text{F}$ , and

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establishing a pressure of 2,500 ,  $\pm$  50, Psig, and then allowing the system to cool to less than 200°F. The elevated temperature/pressure had to be held for at least 60 minutes. The first cycle started from room temperature. The remaining cycles started from where the autoclave cooled overnight.

Pressure indication was not a reliable method to identify leakage while hot. Therefore, visual examinations were performed. A mirror was used to look for any steam wisps. (Note: leakage from locations other than the test seal clamp would not have invalidated the test if the integrity of the test seal could have been demonstrated.) Furthermore, residual deposits of boric acid outside of the seal may also have been indications of a leak. There were no observed leaks from either of the test components during any of the cycles.

A copy of Data Sheet 3 was completed for each assembly for each thermal cycle. Copies of the Hot Leg RTD MNSA data sheets and recorder charts are contained in Appendix A. Copies of the pressurizer bottom nozzle MNSA data sheets and recorder charts are contained in Appendix B.

## 7.0 POST TEST INSPECTION AND DATA REDUCTION

At the conclusion of the test, the seal clamps were inspected, disassembled and examined. FSME procedures were followed. Representatives of FSME were present for the disassembly. All seal boundary were examined to determine if any boric acid solution leaked past the seal interfaces. There were no signs of boric acid crystals outside of the seal boundary formed by the Grafoil seal for either assembly. Therefore, the seal specimens have met the acceptance requirements of Reference 9.1.

## 8.0 DOCUMENTATION AND QUALITY ASSURANCE REQUIREMENTS

Quality Assurance, as Design Verification, was required for this program per Reference 9.1. The requirements were a test procedure, controlled instruments, and a test report as specified in QP 3.6 of QPM-101, Reference 9.3.

This report document presents a description of the test, reports the test environment data, contains references to supporting data, and provides a list of instruments used. Copies of data sheets, recorder charts, and calibration data sheets are included in the appendices of this test report. Transmission of any test records to Quality Records and/or SCE is the responsibility of the Cognizant Engineering Group, FSME.

The data and documentation retention period will be five (5) years after issue of this test report. The original copies of these documents will be retained in the TS Group files for that period. Copies of the test procedure and test report will be sent to the Cognizant Engineer.

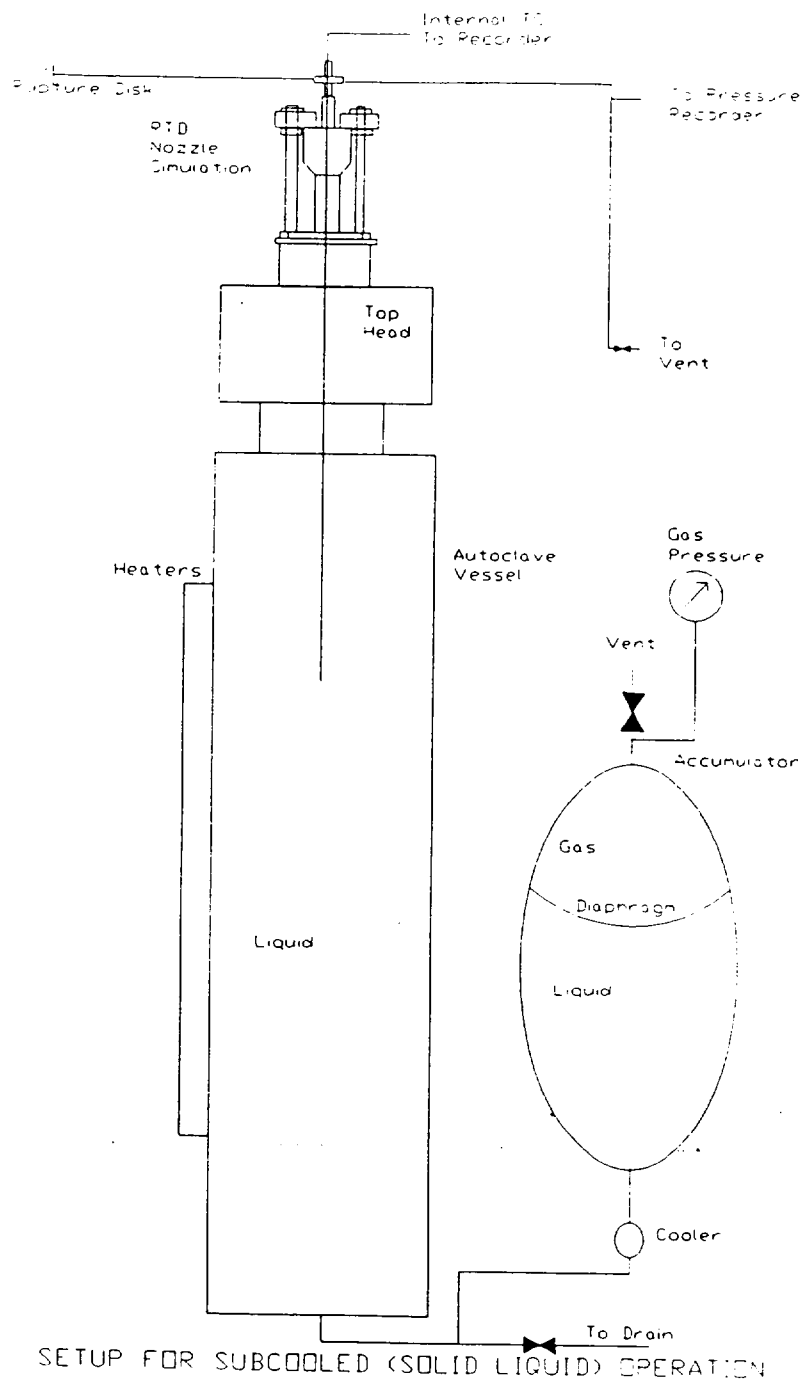
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Calibration data for those instruments controlled per Reference 9.5, will be stored per the requirements of Reference 9.5.

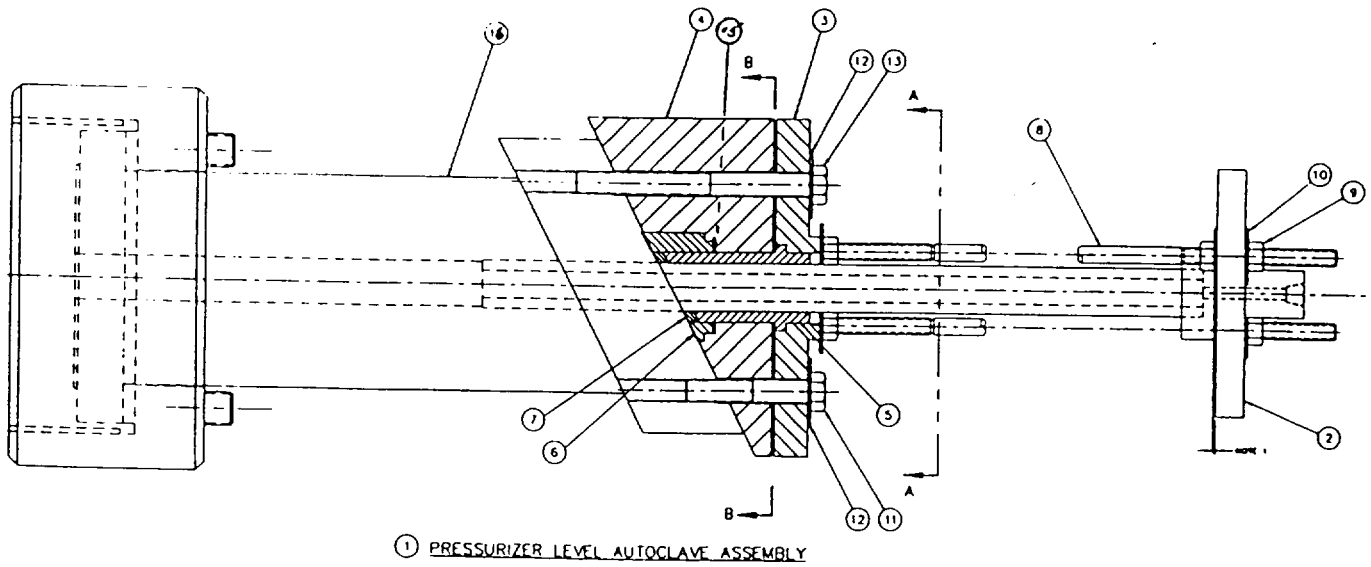
## **9.0 REFERENCES**

- 9.1 Test Request TS070A, Supplements 00 and 01.
- 9.2 S-NOME-WTR-0007, Rev. 00, Test Requirements for the San Onofre MNSA Clamps for Pressurizer Instrument Nozzles and RTD Hot Leg Nozzles.
- 9.3 QPM-101, Revision 01.
- 9.4 00000-PENG-006, Rev. 00, Autoclave Operating Guidelines.
- 9.5 MISC-PENG-IPQP-007, Rev. 01, Quality Program Plan for Engineering Operations Control of Measuring and Test Equipment.
- 9.6 Drawing E-MNSA-228,005, Rev. 02, MNSA Autoclave Test Fixtures.
- 9.7 Drawing E-MNSA-228,006, Rev. 01, Pressurizer Level Autoclave Assy.
- 9.8 Drawing E-MNSA-228,007, Rev. 01, Hot Leg RTD Autoclave Assy.
- 9.9 Inter Office Memo PENG-96-501, Assessment of Test Personnel Certificates for 1997.
- 9.10 S3-NOME-EP-0124, Rev. 00, Engineering Procedure for the Installation of the Mechanical Nozzle Seal Assemblies for SONGS Unit 3.
- 9.11 PP-2007241, Rev. 00, Project Plan for MNSA Clamp Analysis and Testing.

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**Figure 1. Test Facility Schematic**

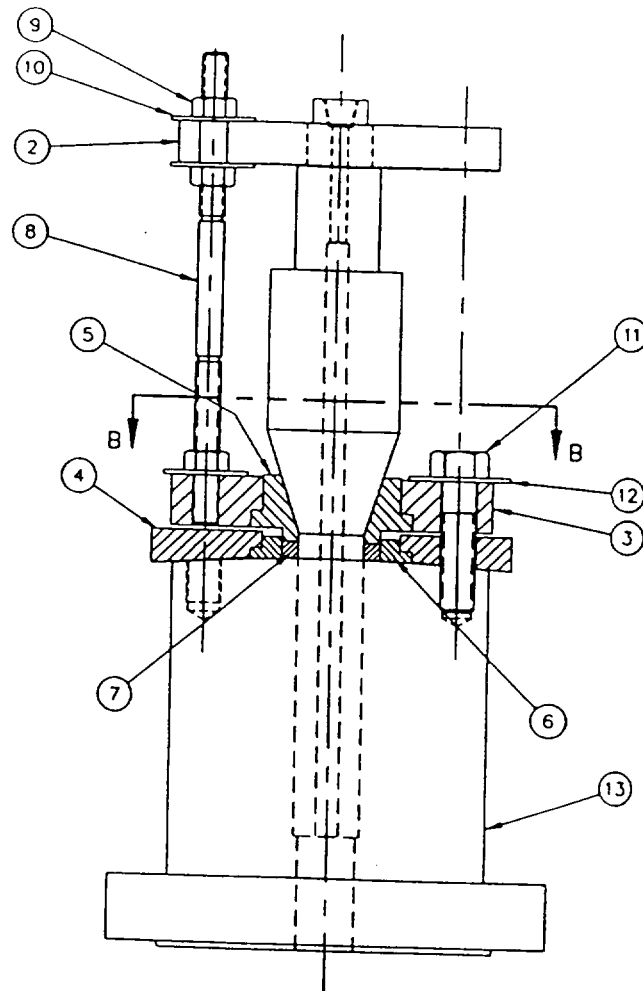


- 2 Top Plate
- 3 Upper Flange
- 4 Lower Flange
- 5 Compression Collar
- 6 Packing Retainer

- 7 Split Packing
- 8 Tie Rod
- 9 Hex Nut
- 10 Retainer Washer (3/8")

- 11 Hex Hd Cap Screw, short
- 12 Retainer Washer (1/2")
- 13 Hex Hd Cap Screw, long
- 15 Spacer
- 16 Pressure Level Autoclave Test Fixture

Figure 2. Sketch of Pressurizer Bottom Head Seal Arrangement



① HOT LEG RTD AUTOCLAVE ASSEMBLY

- 2 Top Plate
- 3 Upper Flange
- 4 Lower Flange
- 5 Compression Collar
- 6 Packing Ring
- 7 Split Packing

- 8 Tie Rod
- 9 Hex Nut
- 10 Retainer Washer (3/8")
- 11 Hex Hd Cap Screw
- 12 Retainer Washer (1/2")
- 13 Hot Leg RTD Autoclave Fixture

Figure 3. Sketch of Hot Leg RTD Nozzle Seal Arrangement

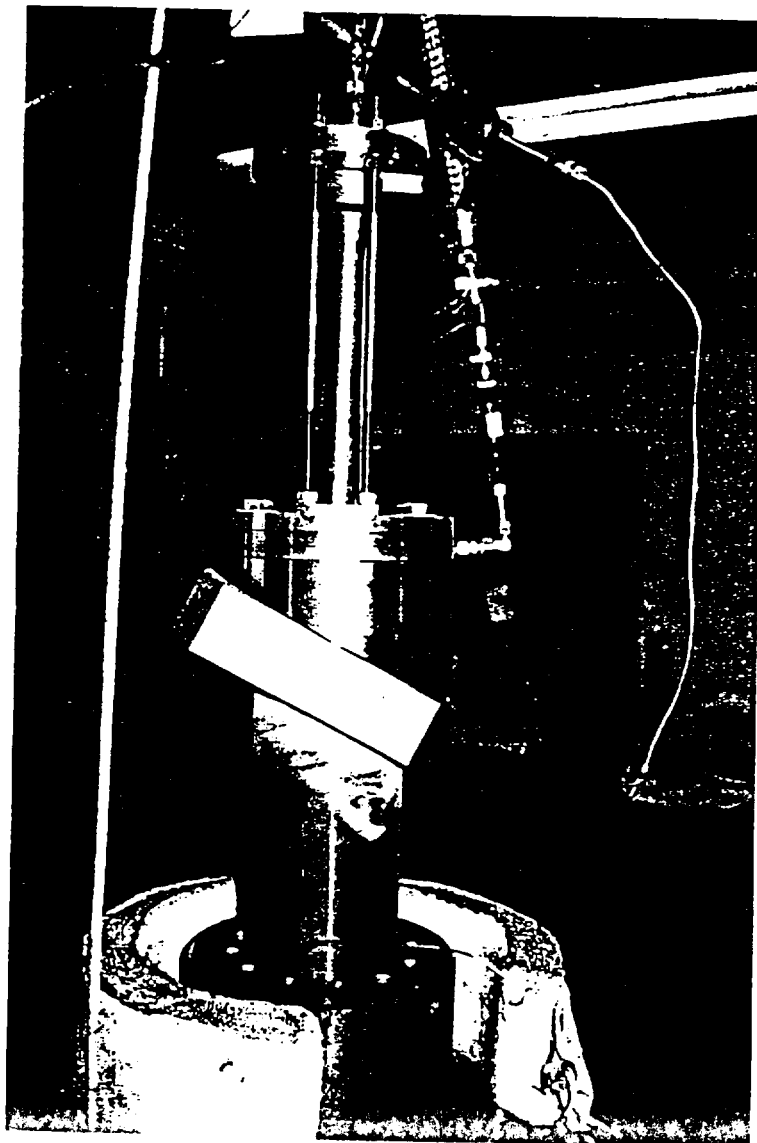


Figure 4. Photograph of Pressurizer Bottom Seal

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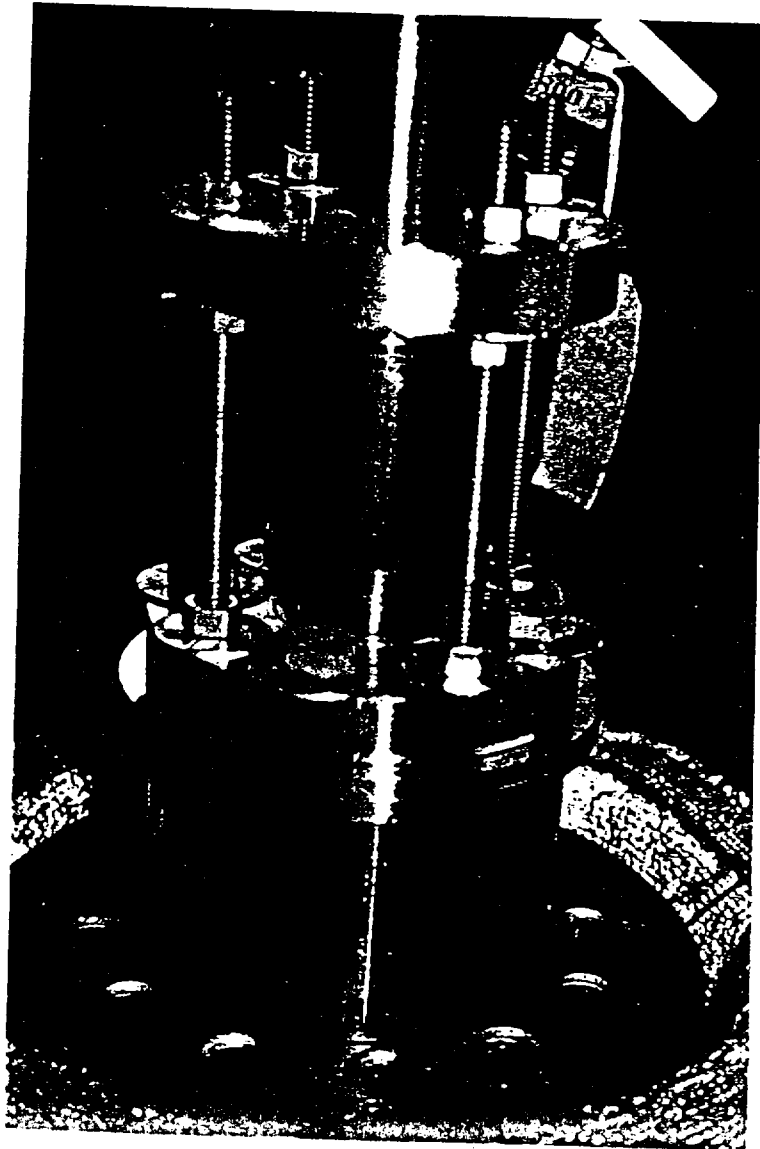


Figure 5. Photograph of Hot Leg Rtd Nozzle Seal



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Table 1  
List of Test Instruments

System Pressure:

Honeywell circular recorder.  
Attached to Autoclave 5A.  
Laboratory identification EL-963.  
Model Y702C1(P3)-134-000-2274.  
Calibrated range 0-3500 Psig.  
Calibrated 06/02/97 and due 12/02/97.

Honeywell circular recorder.  
Attached to Autoclave 6A.  
Laboratory identification EL-964.  
Model Y702C1(P3)-134-000-2274.  
Calibrated range 0-3500 Psig.  
Calibrated 06/02/97 and due 12/02/97.

System Temperature: Yokogawa strip chart recorder.

Model HR-1300.  
Calibrated range 0-1000°F.  
Calibrated 03/13/97 and due 09/13/97.  
Laboratory identification CL-0142.

Temperature Sensors: Projects Inc. Thermocouples, SST sheathed Type J.

Attached to Autoclave 5A.  
Calibrated Range 100°F to 700°F.  
Calibrated 05/06/96 and due 12/13/97.\*  
Laboratory identification CL-1018.

Attached to Autoclave 6A.  
Calibrated Range 100°F to 700°F.  
Calibrated 05/07/96 and due 12/10/97.\*  
Laboratory identification CL-1008.

\* The TCs used were TCs that had been previously calibrated and stored for future use. Per Reference 9.5, the calibration period can be extended for this type of sensor for the normal calibration period following first use. This test was the first use of these devices. Both TCs were calibration checked 06/19/97 and found to meet the accuracy requirements of  $\pm 5^\circ\text{F}$ .

Torque Wrenches: Proto

Range: 0-250 in-lb.  
Calibrated 04/16/97 and due 04/16/98.  
Laboratory identification: ME-25.

Range: 0-150 ft-lb.  
Calibrated 05/20/97 and due 11/20/97.  
Laboratory identification: CL-1031.

Copies of the calibration data sheets for the above instruments are contained in Appendix C.

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Design-Related Testing Checklist  
**TEST REPORT**

Document Title: Test Report For MNSA Hydrostatic and Thermal Cycle Tests

Document Number: TR-PENG-042

Revision: 00

	Yes	N/A
1 Is the test purpose stated?	<input checked="" type="checkbox"/>	
2 Are the test procedures listed?	<input checked="" type="checkbox"/>	
3 Are the test results listed?	<input checked="" type="checkbox"/>	
4 Is the test request document number included on the test report cover page?	<input checked="" type="checkbox"/>	
5 Has the test report been signed and dated by the author?	<input checked="" type="checkbox"/>	
6 Has provision been made for approval by the manager of the testing organization?	<input checked="" type="checkbox"/>	
7 Has provision been made for a statement of acceptance by the Cognizant Engineer?	<input checked="" type="checkbox"/>	

**Comments/Remarks:**

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Reviewed by:

Karl H. Haslinger

Printed Name

*Karl H. Haslinger*

Signature

6/25/97

Date

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Appendix A

HOT LEG RTD DATA SHEETS AND CHARTS

Description	Pages
Assembly Hydrostatic Test Data Sheets	A2-A7
Thermal Cycle Data Sheets	A8-A10
Pressure Recorder Charts	A11-A13
Temperature Recorder Charts	A14-A16
Disassembly Data Sheets	A17

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Data Sheet 1

General Data Sheet

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: <i>Hot Leg RTD</i>	
Observers: <i>J. Janczko, F. Rossaro, J. Turci, K. Harvella</i>	Date: <i>6/10/97</i>

Seal and test components were visually examined and found to be acceptable. An initial stack up of parts was performed without a backup seal. Suggestions were made to modify the seal retainers and lower flange to match the contoured surface. The compression collar was a tight fit and needs further modification to fit in place and to be removed, otherwise, we were able to lift the nozzle slightly to fit the compression collar into place.

Torque wrench used for assembly was  
Mach. Eng #25 #CL-1031

Proceeded to assemble and close backman & perform hydrostatic test. See hydrostatic test data sheet. JWH

While preparing for the thermal cycle test, water was observed above and below the lower flange. It is assumed that this water came from the previous hydrostatic test. K. Harvella & J. Turci were advised of the finding. An additional hydrostatic test is planned for 6/11/97.

Is this data sheet continued onto another page? <sup>yes</sup> ~~no~~ This is page 1 of 3.

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Data Sheet 2

Hydrostatic Test Data

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: <i>Hot Leg RTD</i>	Autoclave ID: <i>6A</i>
Test Number: <i>1</i>	Date: <i>6/10/97</i>
Pressure Gauge ID: <i>EL-964</i>	Calibrated: <i>6/02/97</i>
	Calibration Due: <i>12/02/97</i>
Observers: <i>J. Jemczko, F. Rossano, J. Tani, K. Nagata</i>	

Time at 3,175 Psig: <i>from 1106 HRS to 1125 HRS</i>
Leaks observed? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> <i>Pressure decay from 3,200 psi to 3,050 psi over period.</i>
If yes, explain: <i>No visible leakage</i> <i>MM</i>
Other Comments: <i>Relieved pressure and retorqued ambiclamp head.</i>
<i>See Test #2 for next trial.</i>
<i>Test performed at room temperature.</i>
<i>As system was pressurized, at about 900 psig, the RTD cable jumped from its bottomed position to impact against the top plate.</i>

Is this data sheet continued onto another page? *yes* This is page *2* of *3*

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Data Sheet 2

Hydrostatic Test Data

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: <i>HA</i>	Autoclave ID: <i>6A</i>
Test Number: <i>2</i>	Date: <i>6/10/97</i>
Pressure Gauge ID: <i>EL-964</i>	Calibrated: <i>6/02/97</i>
	Calibration Due: <i>12/02/97</i>
Observers: <i>J. Tanaka, F. Rossini, J. Turri, K. Mangano</i>	

Time at 3,175 Psig: <i>from 1129 HRS to 1145 HRS</i>
Leaks observed? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
If yes, explain: <i>Pressure held steady within 15 psig</i>
Other Comments: <i>Test performed after re-tagging autoclave head</i>
<i>Test was deemed a success based on less pressure decay than allowable.</i>
<i>Performed test at room temperature.</i>

Is this data sheet continued onto another page? *No* This is page *3* of *3*

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Data Sheet 1  
General Data Sheet  
ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: <i>Hot Leg RTD</i>	
Observers: <i>J. Janicko, F.V. Kishore, K. Margotta</i>	Date: <i>6/1/97</i>

<i>Re-established hydrostatic pressure setup. NB that the autoclave has the thermal cycle basic acid solution. The torque of the 12-20 bolts was checked. The first bolt turned about 1/2 of a turn (1/2 of a flat) to reach 30 ft-lbs. Assume that the seal crimp and that Step 2.2.9 of 33-NOME-EP-0124 did not require metal to metal contact at 30 ft-lbs. Per direction of K. Margotta, the torque on the 12 b.16 was increased to 35 ft-lbs.</i>	
<i>Complete Hydrostatic test #3. See separate data sheet.</i>	
<i>Perform Hydrostatic test #4. See separate data sheet.</i>	
<i>6/12/97 Start Thermal cycle test.</i>	
<i>13:50</i>	<i>Autoclave at 645.5 press at 2500</i>
<i>Starting 1 hour run. No steam leaks log</i>	
<i>14:10</i>	<i>647.9 2500 psig No steam leaks</i>
<i>14:30</i>	<i>645.0 2490 psig No steam leaks</i>
<i>14:40</i>	<i>646.8 2470 psig No steam leaks</i>
<i>14:52</i>	<i>653.8 2500 psig No leaks End hour.</i>

Is this data sheet continued onto another page? *yes* This is page *1* of *3*.

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Data Sheet 2

Hydrostatic Test Data

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: <i>Hot Leg RTD</i>	Autoclave ID: <i>6A</i>
Test Number: <i>3</i>	Date: <i>6/11/97</i>
Pressure Gauge ID: <i>EL 96A</i>	Calibrated: <i>6/2/97</i>
	Calibration Due: <i>12/2/97</i>
Observers: <i>J. Tammko, F.V. Rucaro, K. Magelke</i>	

Time at 3,175 Psig: <i>from 0817 HRS to 0846 HRS</i>
Leaks observed? Yes/No <i>No</i>
If yes, explain: <i>There was about a 50 psi drop over 1/4 hour.</i>
<i>No visual leaks. JHK</i>
Other Comments: <i>Solution in autoclave was 2,200 lbs/kg that was diluted slightly by DI water from pump.</i>
<i>Check autoclave level and re torque seal clamp head.</i>
<i>Seal bolts were not adjusted. Repeat hydrostatic test.</i>
<i>JHK</i>

Is this data sheet continued onto another page? Yes This is page 2 of 3



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Data Sheet 2

Hydrostatic Test Data

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: <i>14+ Log RTD</i>	Autoclave ID: <i>AA</i>
Test Number: <i>4</i>	Date: <i>6/11/97</i>
Pressure Gauge ID: <i>FL-762</i>	Calibrated: <i>6/2/97</i>
	Calibration Due: <i>12/2/97</i>
Observers: <i>F. Rosary, J. Janeczko, J. Turci, K. Marzetta</i>	

Time at 3,175 Psig: <i>from 08:45 HRS to 11:50 HRS</i>
Leaks observed? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
If yes, explain: <i>slight pressure drop from 3200 psi to 3100 psi over 3 hrs</i>
<i>checked slots above &amp; below lower flange, and found no signs of leakage. JMM</i>
Other Comments: <i>Return Autoclave head prior to this test.</i>
<i>leave pressure on system for an extended time period.</i>
<i>proceed to thermal cycle testing JMM</i>

Is this data sheet continued onto another page? No This is page 3 of 3

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Data Sheet 3

Thermal Cycle Test Data

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: <u>Hot Leg RTD</u>	Autoclave ID: <u>6A</u>
Cycle Number: <u>1</u>	Date: <u>6/12/97</u>
Pressure Gauge ID: <u>EL-964</u>	Calibrated: <u>6/2/97</u>
	Calibration Due: <u>12/2/97</u>
TC ID: <u>CL-1008</u>	Calibrated: <u>5/7/96</u>
	Calibration Due: <u>re-calibrated due to use to 12/10/97</u>
TC Recorder ID: <u>CL-0142</u>	Calibrated: <u>3/13/97</u>
	Calibration Due: <u>9/13/97</u>

Time	Temperature, Deg. F	Pressure, Psig	Visual Observations, Leaks (1)	Observer
0800	N/A	N/A	Startup	AKC
0945	305	2100	Completed 2 <sup>nd</sup> Vent	AKC
13:50	645.5	2500	Starting 1 hour test No Leaks	gag
14:10	647.9	2500	No Leaks	gag
14:30	645.0	2490	No Leaks	gag
14:40	646.8	2470	No Leaks	gag
14:52	653.8	2500	No Leaks End 1 hour	gag

1. Use Data Sheet 1 if additional comments are needed.

Is this data sheet continued onto another page? no. This is page 1 of 1

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Data Sheet 3

Thermal Cycle Test Data

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: <i>Hot Leg RTD</i>	Autoclave ID: <i>6A</i>
Cycle Number: <i>2</i>	Date: <i>6/13/97</i>
Pressure Gauge ID: <i>EL-964</i>	Calibrated: <i>6/2/97</i>
	Calibration Due: <i>12/2/97</i>
TC ID: <i>CL-1008</i>	Calibrated: <i>5/7/96</i>
	Calibration Due: <i>extended based on signature to 12/10/97</i>
TC Recorder ID: <i>CL-0142</i>	Calibrated: <i>3/13/97</i>
	Calibration Due: <i>9/13/97</i>

Time	Temperature, Deg. F	Pressure, Psig	Visual Observations, Leaks (1)	Observer
<i>06:20</i>	<i>149.5</i>	<i>0</i>	<i>Start up. No leaks.</i>	<i>gag.</i>
<i>11:00</i>	<i>581.0</i>	<i>2100</i>	<i>No Leaks</i>	<i>gag</i>
<i>11:45</i>	<i>644.7</i>	<i>2460</i>	<i>No Leaks</i>	<i>gag</i>
<i>12:07</i>	<i>651.4</i>	<i>2500</i>	<i>No Leaks</i>	<i>gag</i>
<i>12:51</i>	<i>654.3</i>	<i>2500</i>	<i>No Leaks</i>	<i>gag</i>
<i>13:02</i>	<i>650.3</i>	<i>2500</i>	<i>No Leaks. - Sys. turned off</i>	<i>gag</i>

1. Use Data Sheet 1 if additional comments are needed.

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Data Sheet 3

Thermal Cycle Test Data

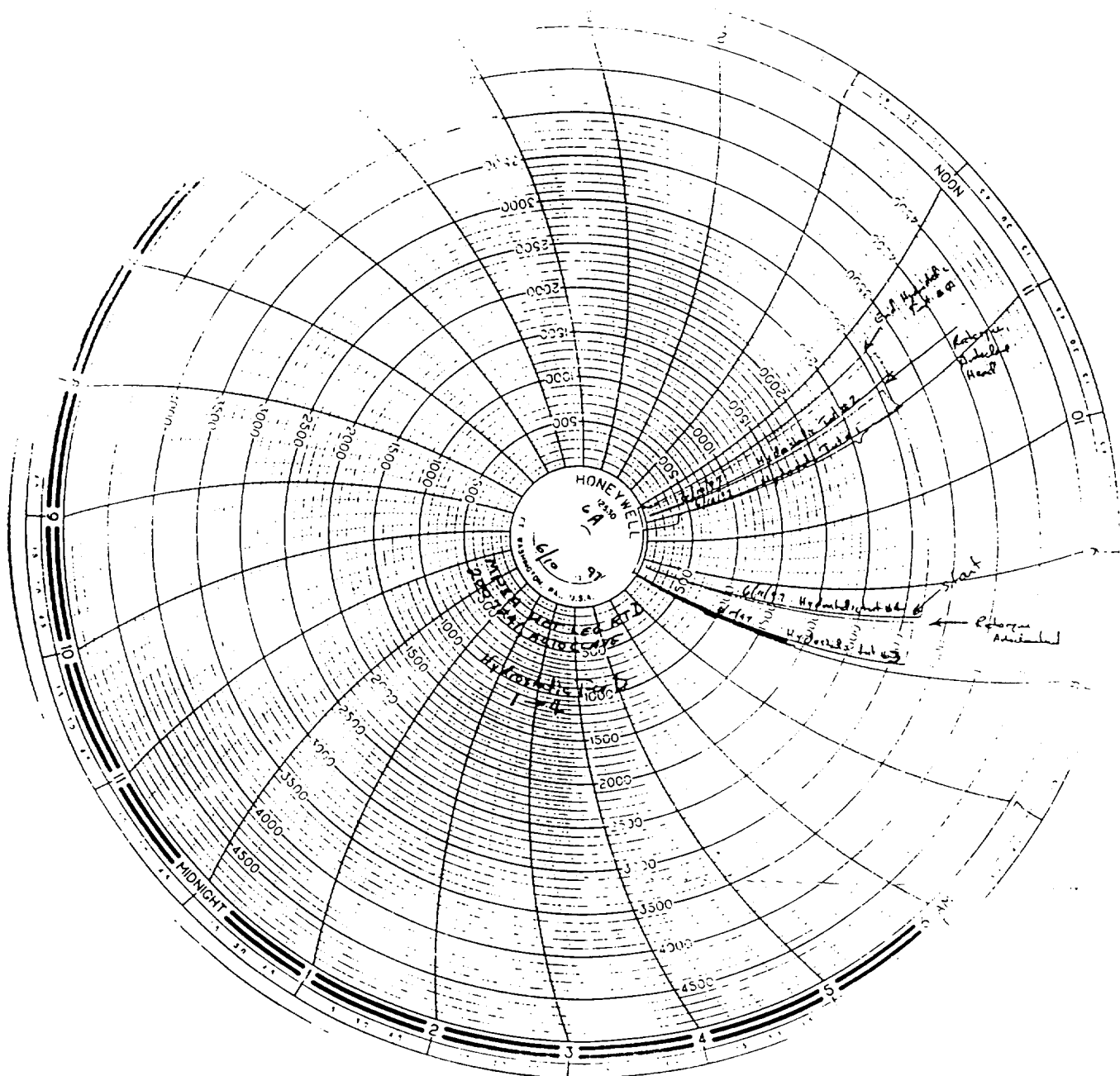
ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: <u>Hot Leg RTD</u>	Autoclave ID: <u>6A</u>
Cycle Number: <u>3</u>	Date: <u>6/1/97</u>
Pressure Gauge ID: <u>EL-969</u>	Calibrated: <u>6/2/97</u>
	Calibration Due: <u>12/2/97</u>
TC ID: <u>CL-1008</u>	Calibrated: <u>5/7/96</u>
	Calibration Due: <u>extended beyond first use to 12/14/97</u>
TC Recorder ID: <u>CL-0142</u>	Calibrated: <u>3/13/97</u>
	Calibration Due: <u>8/13/97</u>

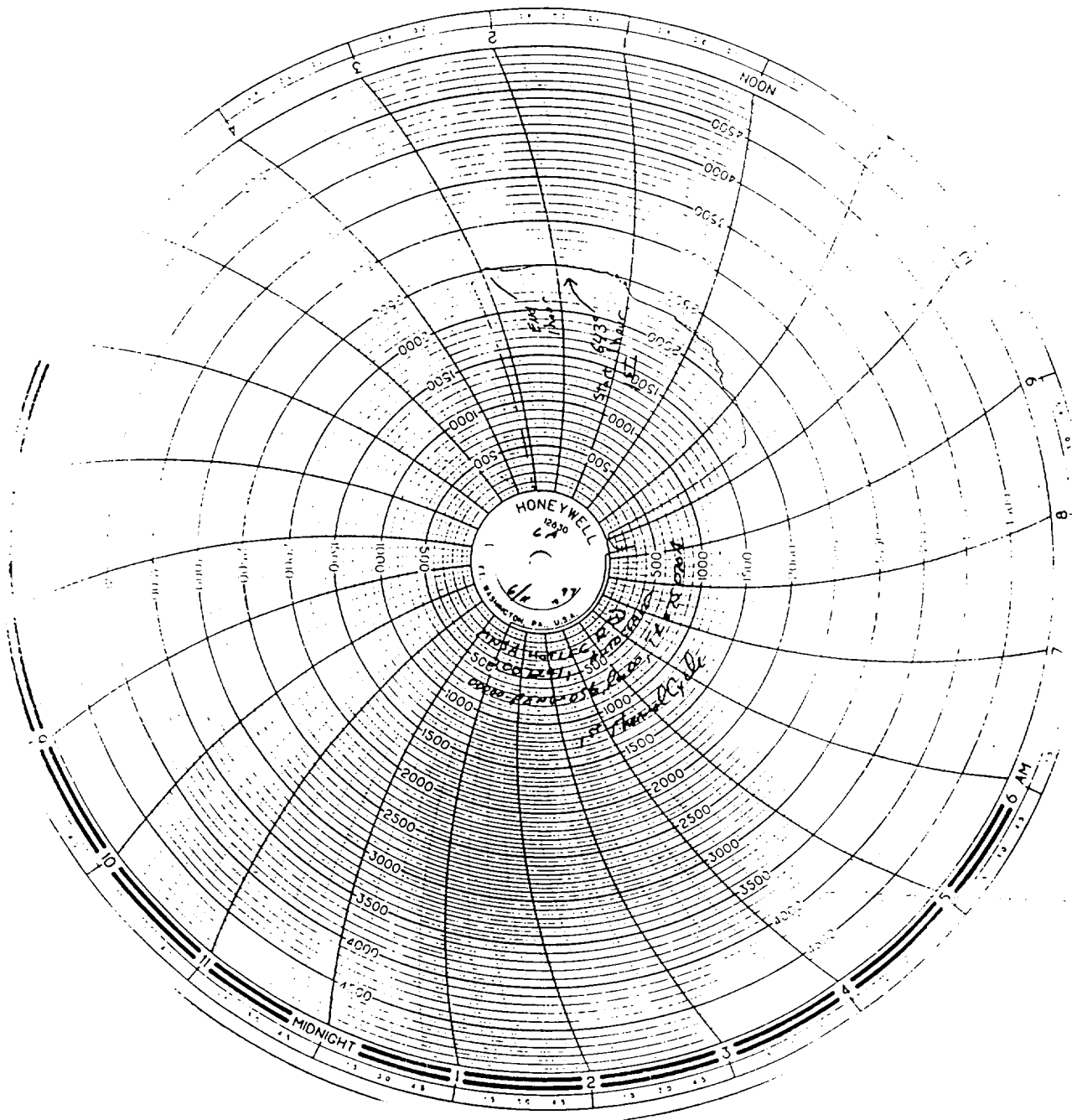
Time	Temperature, Deg. F	Pressure, Psig	Visual Observations, Leaks (1)	Observer
05:00	156	0	No Leaks Start up	Jef
09:30	651.9	2500	Starting 1 hour Test No Leaks	Jef
09:45	656.5	2550	No Leaks	Jef
10:00	650.3	2500	No Leaks	Jef
10:15	651.4	2460	No Leaks	Jef
10:31	657.6	2500	No Leaks End 1 hour Run	Jef

1. Use Data Sheet 1 if additional comments are needed.

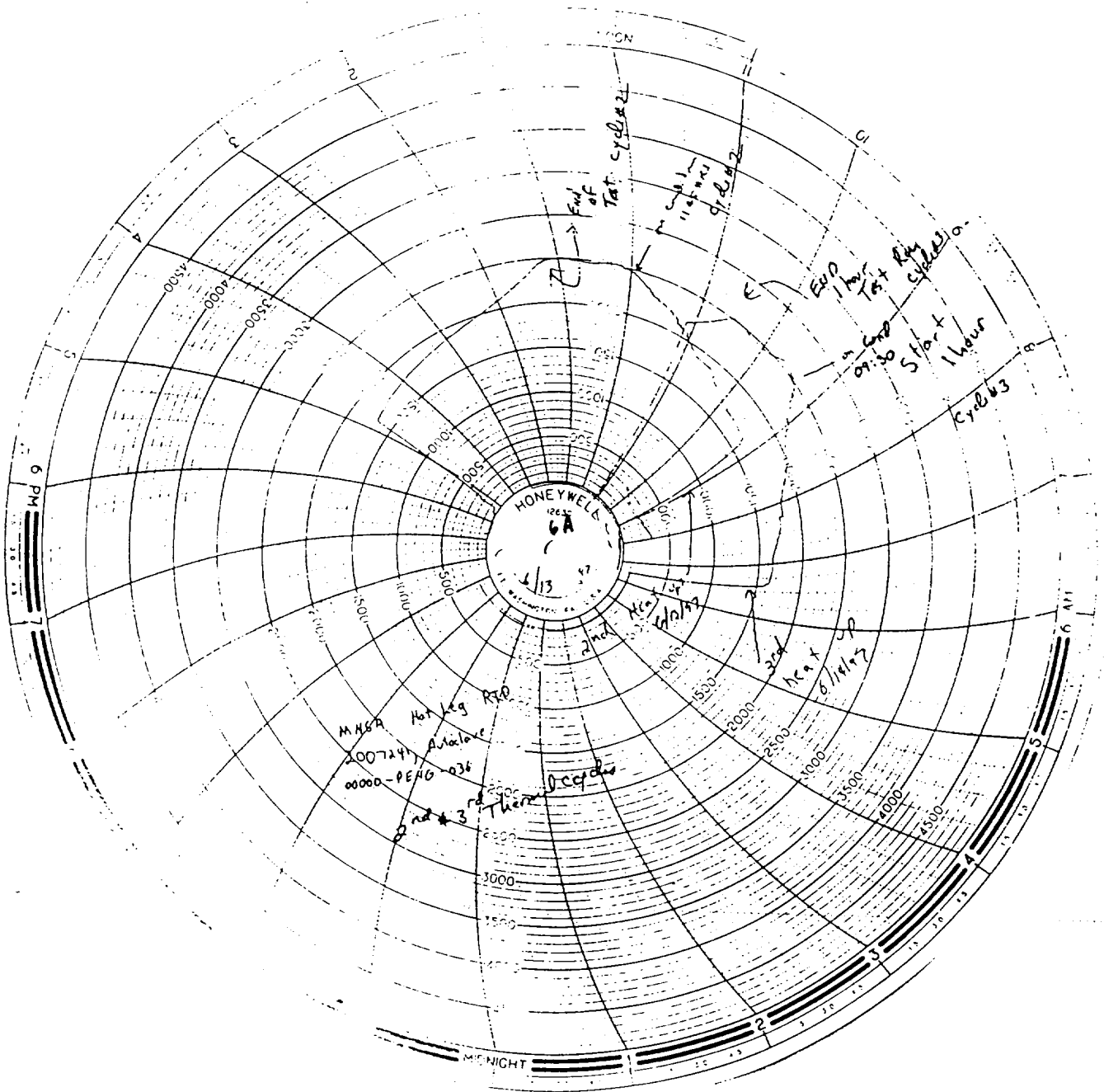
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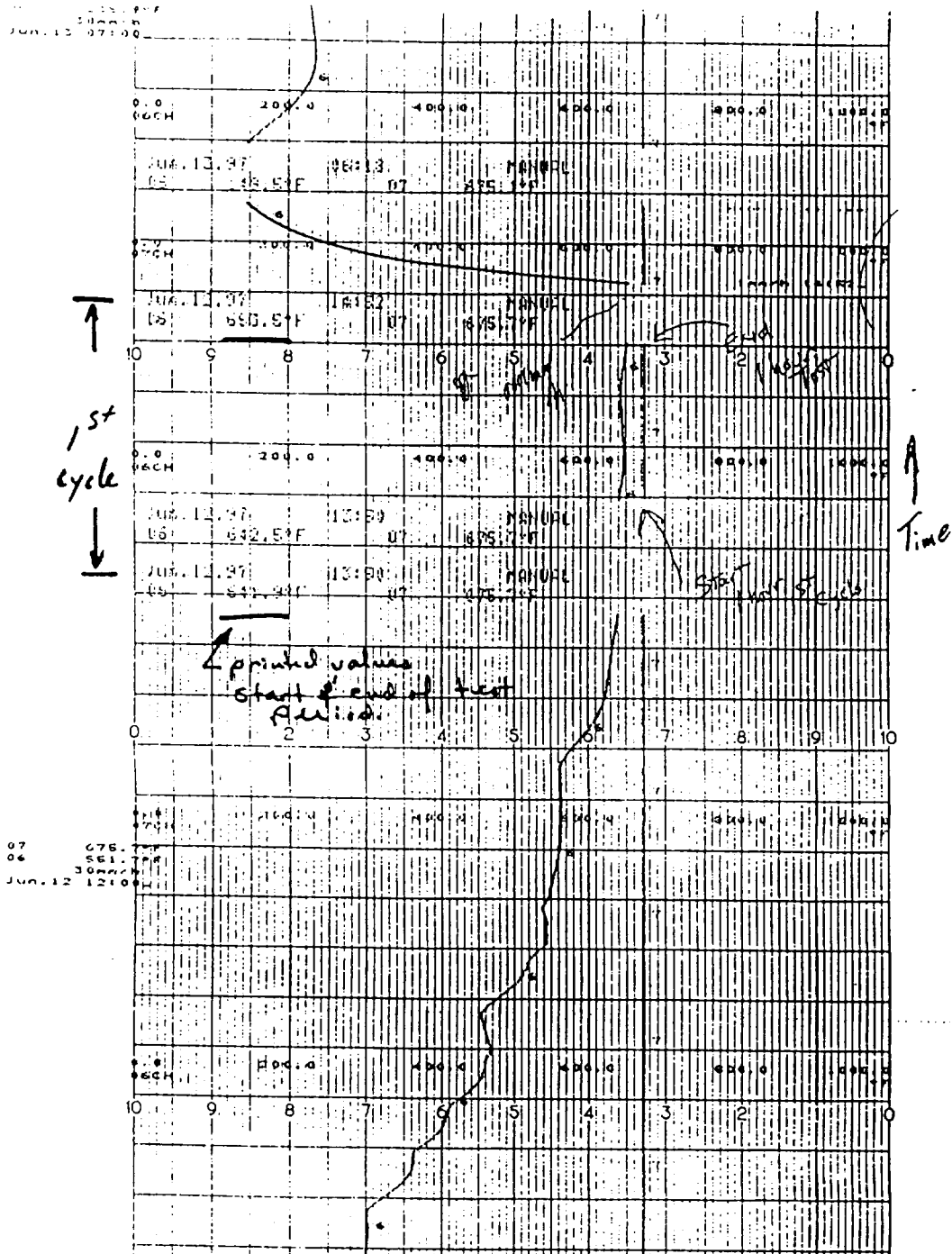
Pressure Recorder Chart. Units are Psig.



Pressure Recorder Chart. Units are Psig.

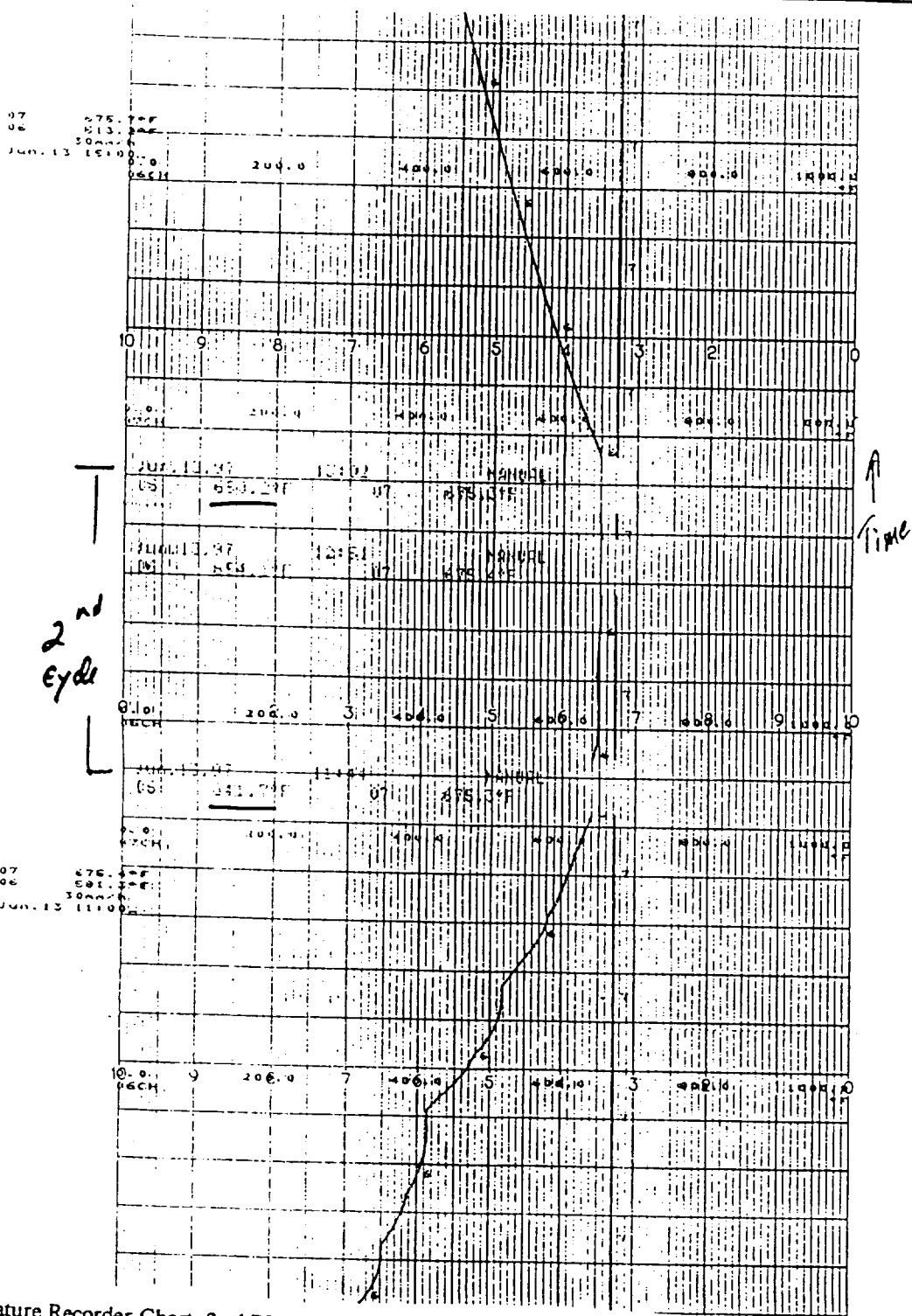


Pressure Recorder Chart. Units are Psig.

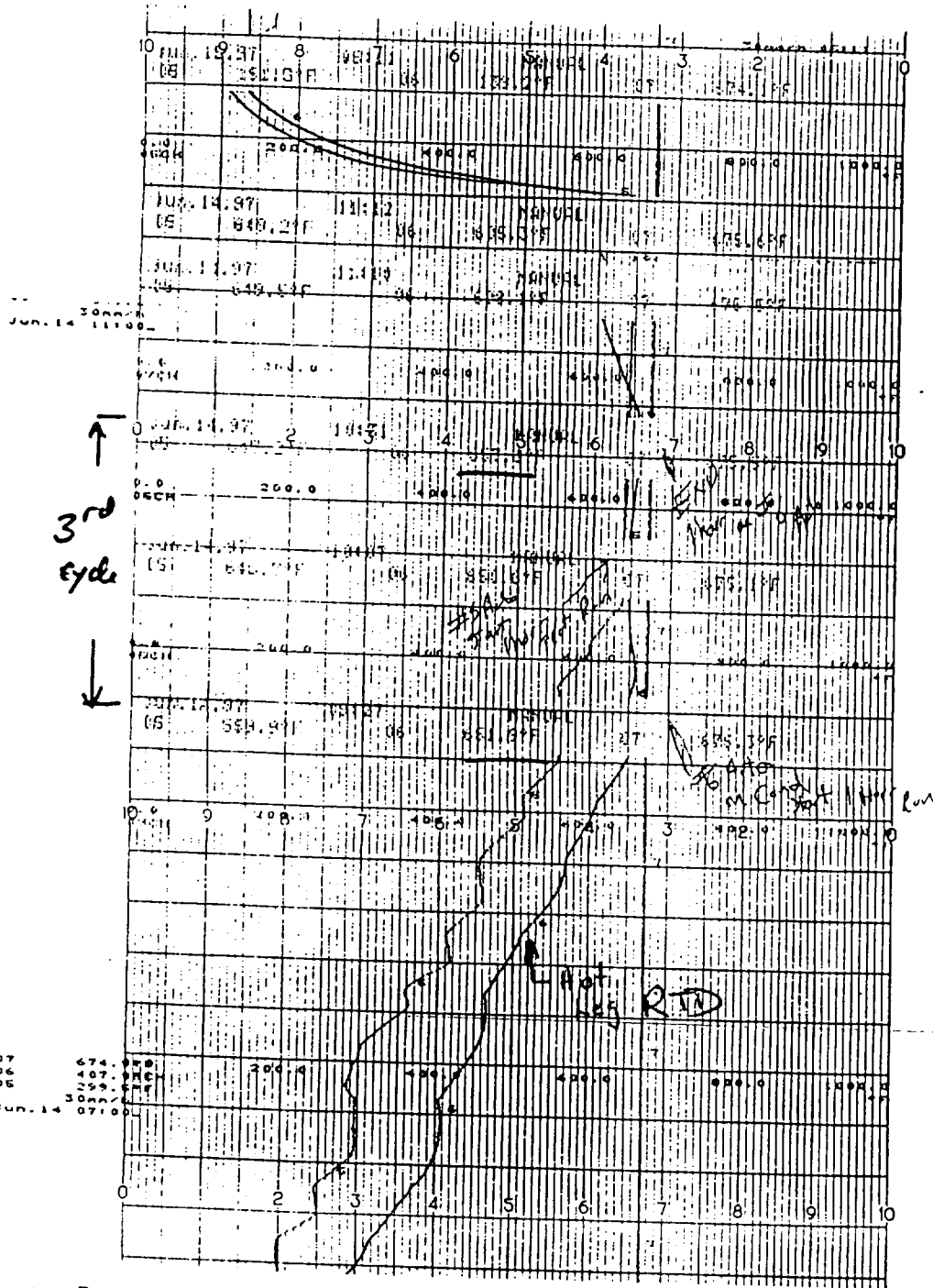


Temperature Recorder Chart, 1st RTD Thermal Cycle on channel 6. Temperature in degrees F. Range 0-1000°F.





Temperature Recorder Chart, 2nd RTD Thermal Cycle on channel 6. Temperature in degrees F. Range 0-1000°F.



Temperature Recorder Chart, 3rd RTD Thermal Cycle on channel 6. Temperature in degrees F. Range 0-1000°F.

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Data Sheet I  
General Data Sheet  
ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested	Hot Leg RTD
Observers	J. Janeczek, F. Borstner, K. Mayhew
Date:	6/12/87

Disassembly of seal following hydrostatic test and thermal cycle test.

The ~~last~~<sup>top</sup> nuts on the threaded rods above the ~~upper flange~~<sup>top plate</sup> were removed. Pliers were required to run thread the tie rods from the upper flange. One hex head cap screw was broken when it stuck in the RTD anticlave fixture. The upper flange was removed. There were no sign of boric acid crystals around the compression collar. The RTD nozzle was lifted slightly to remove the compression collar. There were no signs of boric acid crystals on the top surface of the graphite seal, the retaining ~~ring~~<sup>ring</sup> or lower flange. The lower flange was removed and then the packing ring. The top surface of the anticlave fixture had water stains, but no boric acid. It is assumed that the water stains were from the moisture detected prior to the 3<sup>rd</sup> hydrostatic test. Since the 3<sup>rd</sup> & 4<sup>th</sup> hydrostatic tests used a boric acid solution, there was no evidence of leakage from these tests or the thermal cycle tests. The parts were returned to FSME.

*[Signature]*

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Appendix B

PRESSURIZER BOTTOM NOZZLE DATA SHEETS AND CHARTS

Description	Pages
Assembly Hydrostatic Test Data Sheets	B2-B6
Thermal Cycle Data Sheets	B7-B9
Pressure Recorder Charts	B10-B12
Temperature Recorder Charts	B13-B15
Disassembly Data Sheets	B16

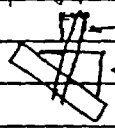
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Data Sheet 1  
General Data Sheet  
ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: <u>Pressure Bottom Seal</u>	Date: <u>6/11/67</u>
Observers: <u>J. Janowski, F.V. Rossano, J. Tursi, K. Margotta</u>	

Started trial fit up of hot hardware. Some interference fit problems were found. The two shoulder bolts were turned down from  $\phi 0.760$  to  $\phi 0.740$  for 1" of height with nominal shape tolerances of  $\pm 0.005$ ".

6/12/67 Observed that when we did a trial fit of hot bolts (Step 6.2.7 of S3-NOMO-EP-0001) into <sup>new</sup> hot holes, they bound. We used to loose shoulder bolts that held the lower flange in place to be able to get the hot bolts in place. When shoulder screws were re-tightened, the hot bolts bound. The Comincont engine was advised. It is possible for this hot to operate with the Archibald Shoulder Screws loose. When the compression collar was filled around the gudge and into the lower flange, it bound. The angle appears to have a slight cock for  while perpendicular which may be causing the binding.

The system was disassembled. The gudgeon seal was installed and the system re-assembled. To complete the re-assembly up to the installation of the compression collar, the shoulder screws were loose. Torque shoulder screws to 120 in lb (10 ft lb) using HE #15 installed. On to auto clamp.

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Data Sheet 2  
Hydrostatic Test Data  
ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: <i>Pressurizer Bottom Seal</i>	Autoclave ID: <i>5A</i>
Test Number: <i>1</i>	Date: <i>6/12/97</i>
Pressure Gauge ID: <i>E1-963</i>	Calibrated: <i>6/2/97</i>
Observers: <i>F. Rossano, G. Williams, J. Turci</i>	Calibration Due: <i>12/2/97</i>

Time at 3,175 Psig: <i>None</i>
Leaks observed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <i>at 1,600 Psig</i>
If yes, explain: <i>Leaked from gasket seal region at 1,600 psig</i>
Other Comments: <i>System was disassembled for examination. Reg. Sargium took compression collar for modification.</i>

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Data Sheet 2

Hydrostatic Test Data

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: <i>Pressurized Bottom Seal</i>	Autoclave ID: <i>5A</i>
Test Number: <i>2</i>	Date: <i>6/22/97</i>
Pressure Gauge ID: <i>EL-963</i>	Calibrated: <i>6/2/97</i>
	Calibration Due: <i>12/2/97</i>
Observers: <i>E. Rossano, J. Tanicotto, J. Turci, K. Mangella</i>	

Time at 3,175 Psig: <i>from 1632 Hrs to 1658</i>
Leaks observed? Yes/No <i>Not at Seal</i>
If yes, explain: <i>Small leak at tube fitting, NOT AT SEAL</i>
<i>This explains small pressure decay. Seal was checked by sliding paper strips to seal, under bottom flange. There was no moisture detected.</i>
Other Comments: <i>Seal was assembled using a 0.050" thick shim between the compression rollers and graphite seal.</i>
<i>Nozzle popped (jumped up) at 2,800 psig.</i>
<i>Proceed to thermal cycle test</i>

Is this data sheet continued onto another page? NO This is page 2 of 2

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Data Sheet 3

Thermal Cycle Test Data

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: <i>Pressurize Bottom Seal</i>	Autoclave ID: <i>5A</i>
Cycle Number: <i>1</i>	Date: <i>6/14/97</i>
Pressure Gauge ID: <i>EL-963</i>	Calibrated: <i>6/2/97</i>
	Calibration Due: <i>12/1/97</i>
TC ID: <i>CL-1015</i>	Calibrated: <i>5/6/96</i>
	Calibration Due: <i>extended due to failure 12/13/97</i>
TC Recorder ID: <i>CL-0142</i>	Calibrated: <i>3/13/97</i>
	Calibration Due: <i>9/13/97</i>

Time	Temperature, Deg. F	Pressure, Psig	Visual Observations, Leaks (1)	Observer
<i>05:25</i>	<i>77.0</i>	<i>0</i>	<i>No Leaks heat up</i>	<i>gmg.</i>
<i>07:12</i>	<i>300.0</i>	<i>0</i>	<i>1st Vent</i>	<i>gmg</i>
<i>07:33</i>	<i>300.0</i>	<i>0</i>	<i>2nd Vent</i>	<i>gmg</i>
<i>10:10</i>	<i>643.7</i>	<i>2500</i>	<i>Starting 1 hour Test Run No Leaks</i>	<i>gmg</i>
<i>10:25</i>	<i>646.2</i>	<i>2500</i>	<i>No Leaks</i>	<i>gmg</i>
<i>10:40</i>	<i>647.7</i>	<i>2500</i>	<i>No Leaks</i>	<i>gmg</i>
<i>10:55</i>	<i>648.2</i>	<i>2500</i>	<i>No Leaks</i>	<i>gmg</i>
<i>11:12</i>	<i>648.9</i>	<i>2500</i>	<i>No Leaks End 1 hour</i>	<i>gmg</i>

1. Use Data Sheet 1 if additional comments are needed.

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Data Sheet 3

Thermal Cycle Test Data

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: <i>Pressurizer Bottom Seal</i>	Autoclave ID: <i>5A</i>
Cycle Number: <i>2</i>	Date: <i>6/15/97</i>
Pressure Gauge ID: <i>FL-963</i>	Calibrated: <i>6/2/97</i>
	Calibration Due: <i>12/2/97</i>
TC ID: <i>CL-1018</i>	Calibrated: <i>5/6/96</i>
	Calibration Due: <i>Extended First Use 12/13/97</i>
TC Recorder ID: <i>CL0142</i>	Calibrated: <i>3/13/97</i>
	Calibration Due: <i>9/13/97</i>

	Time	Temperature, Deg. F	Pressure, Psig	Visual Observations, Leaks (1)	Observer
<i>st</i>	<i>05:00</i>	<i>118</i>	<i>0</i>	<i>No Leaks Heat up</i>	<i>MT</i>
<i>09</i>	<i>07:40</i>	<i>643.4</i>	<i>2470</i>	<i>No Leaks Starting 1 hour run</i>	<i>gag</i>
	<i>09:25</i>	<i>647.4</i>	<i>2475</i>	<i>No Leaks</i>	<i>gag</i>
	<i>09:40</i>	<i>647.8</i>	<i>2475</i>	<i>No Leaks</i>	<i>SA</i>
	<i>09:55</i>	<i>648.8</i>	<i>2475</i>	<i>No Leaks</i>	<i>MT</i>
	<i>10:12</i>	<i>648.8</i>	<i>2475</i>	<i>No Leaks Shut down</i> <sup><i>END</i></sup>	<i>gag</i>

1. Use Data Sheet 1 if additional comments are needed.

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Data Sheet 3

Thermal Cycle Test Data

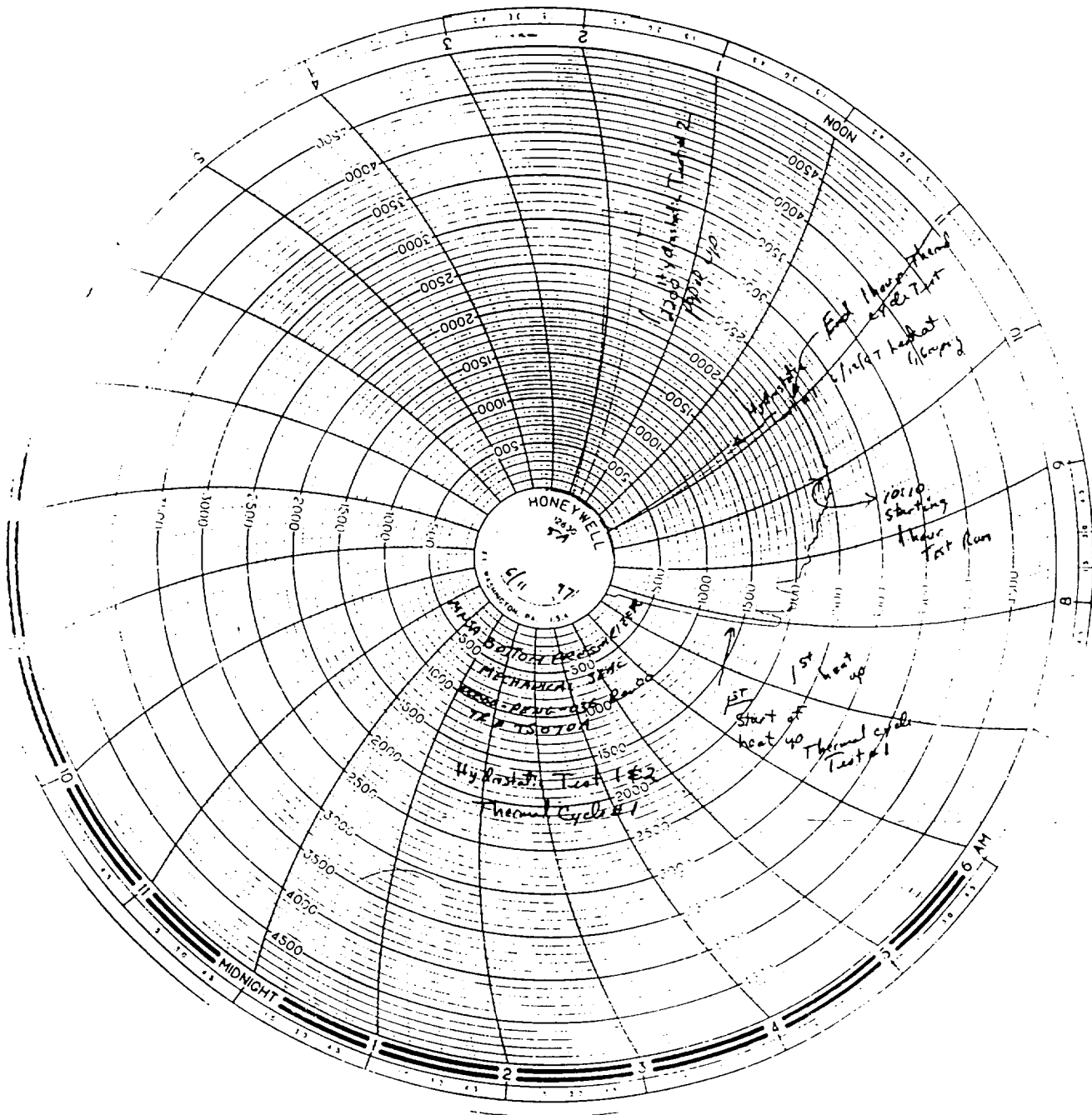
ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: <i>Pressurizer Bottom Seal</i>	Autoclave ID: <i>5A</i>
Cycle Number: <i>3</i>	Date: <i>6/15/97</i>
Pressure Gauge ID: <i>EL-963</i>	Calibrated: <i>6/2/97</i>
	Calibration Due: <i>12/2/97</i>
TC ID: <i>CL-1018</i>	Calibrated: <i>5/6/96</i>
	Calibration Due: <i>extended F. by USE 12/13/97</i>
TC Recorder ID: <i>CL-0142</i>	Calibrated: <i>3/13/97</i>
	Calibration Due: <i>9/13/97</i>

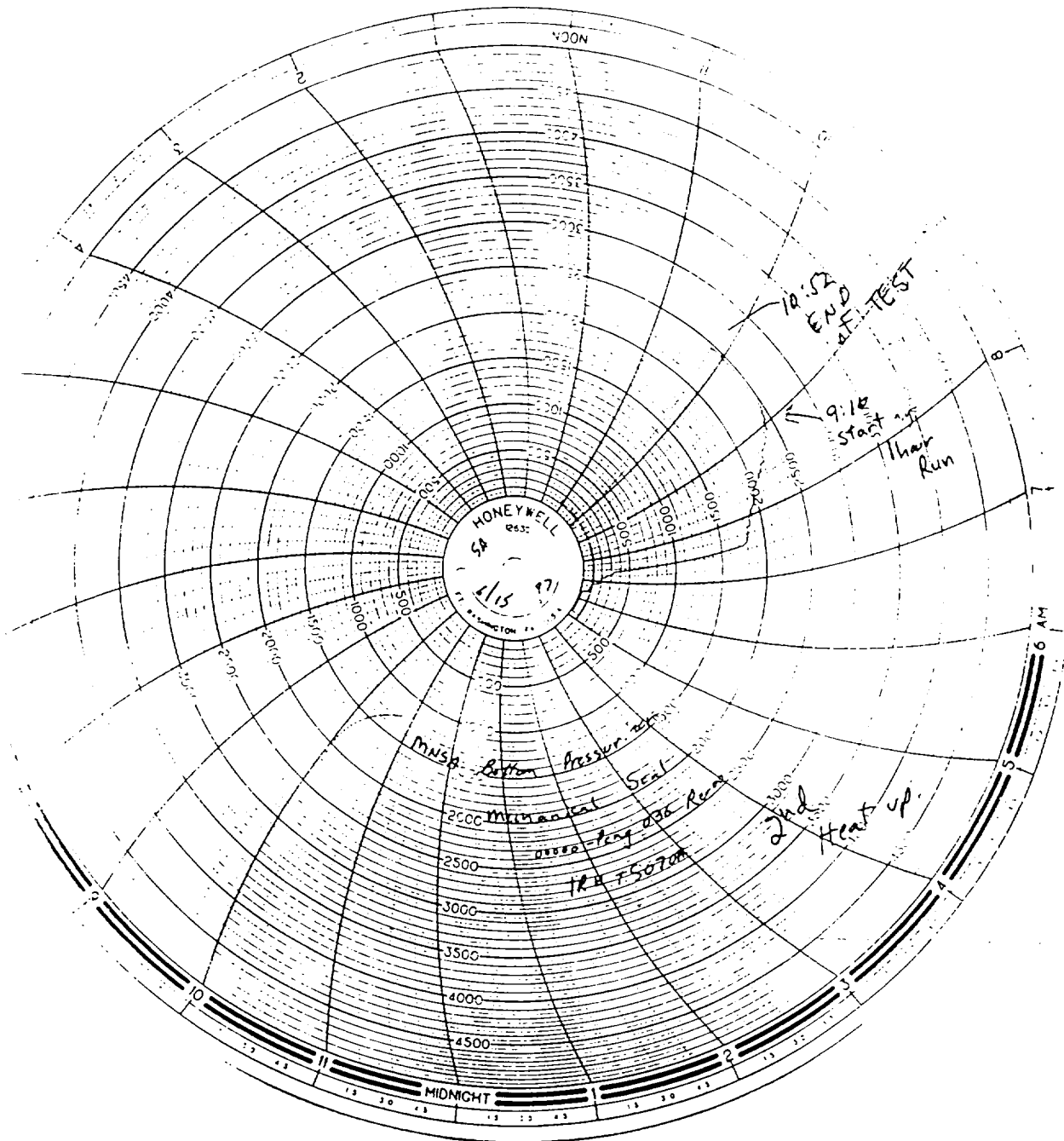
Time	Temperature, Deg. F	Pressure, Psig	Visual Observations, Leaks (1)	Observer
<i>06:35</i> <del>07</del>	<i>116</i>	<i>0</i>	<i>No Leaks Start Heat up</i>	<i>gag</i>
<i>13:00</i>	<i>642.7</i>	<i>2490</i>	<i>No Leaks Starting Hour Run</i>	<i>gag</i>
<i>13:15</i>	<i>645.6</i>	<i>2500</i>	<i>No Leaks</i>	<i>gag</i>
<i>13:30</i>	<i>645.8</i>	<i>2500</i>	<i>No Leaks</i>	<i>gag</i>
<i>13:45</i>	<i>650.0</i>	<i>2510</i>	<i>No Leaks</i>	<i>gag</i>
	<i>651.6</i>			

1. Use Data Sheet 1 if additional comments are needed.

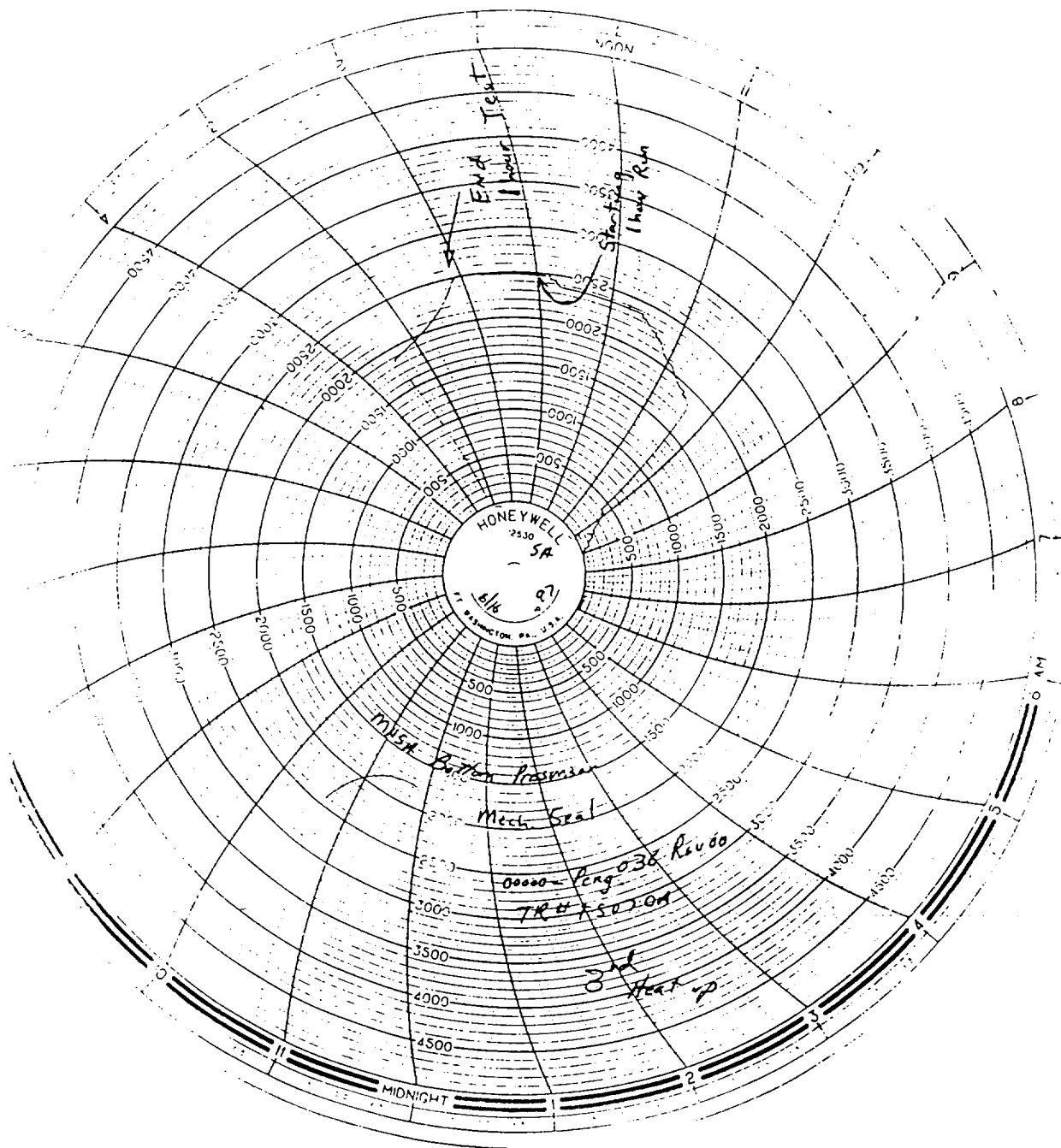
Is this data sheet continued onto another page? *No* This is page *1* of *1*



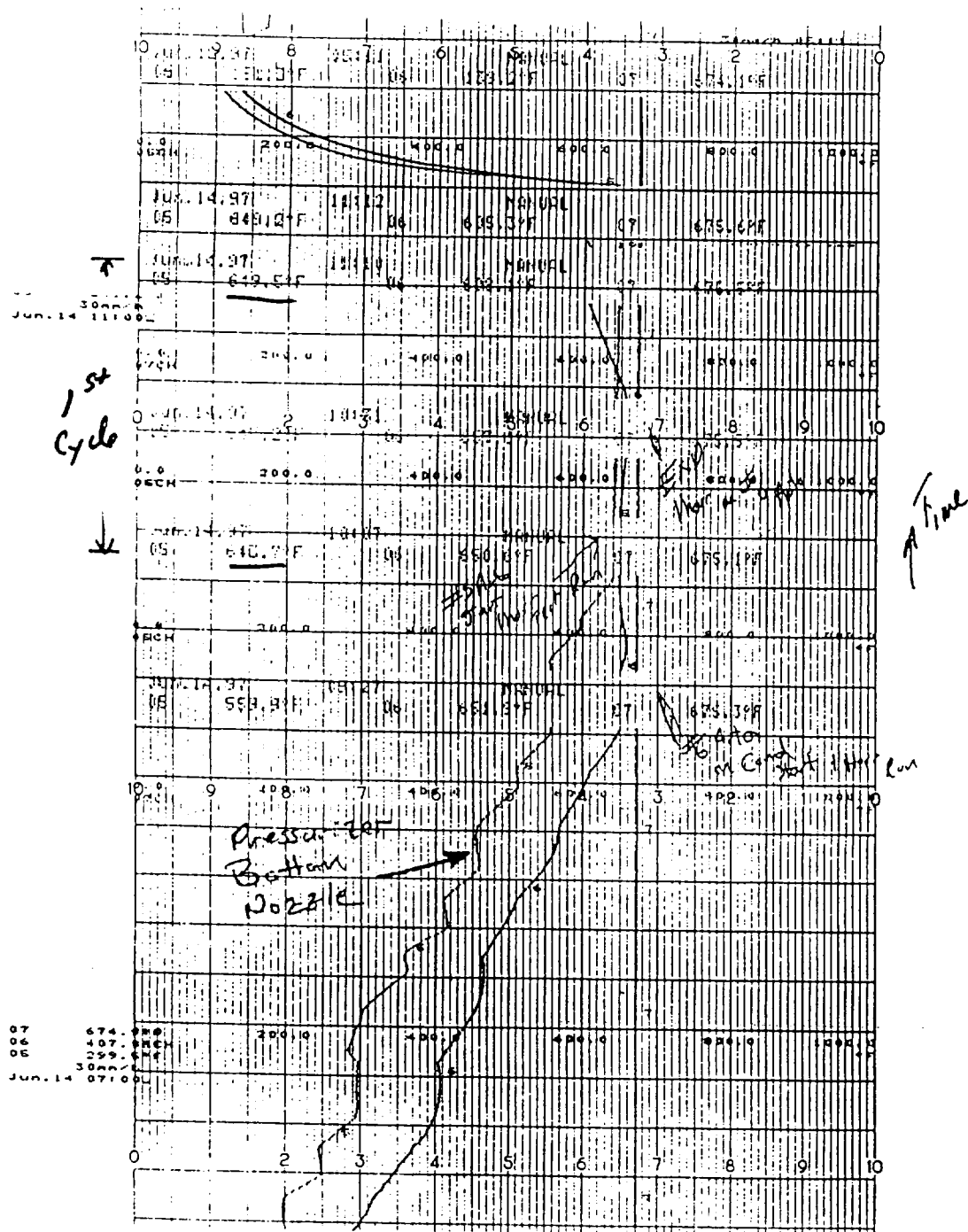
Pressure Recorder Chart. Units are Psig.



Pressure Recorder Chart. Units are Psig.

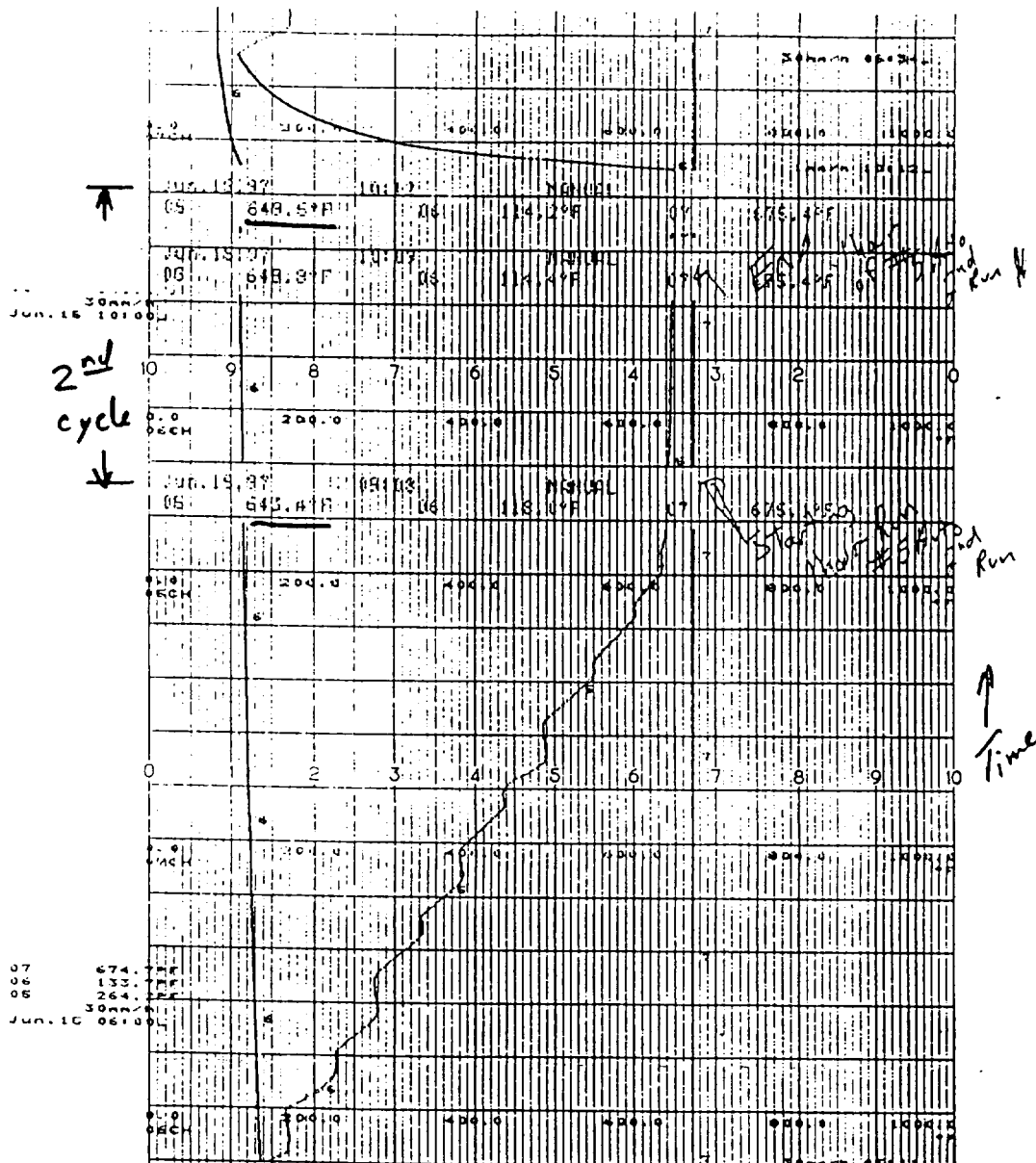


Pressure Recorder Chart. Units are Psig.

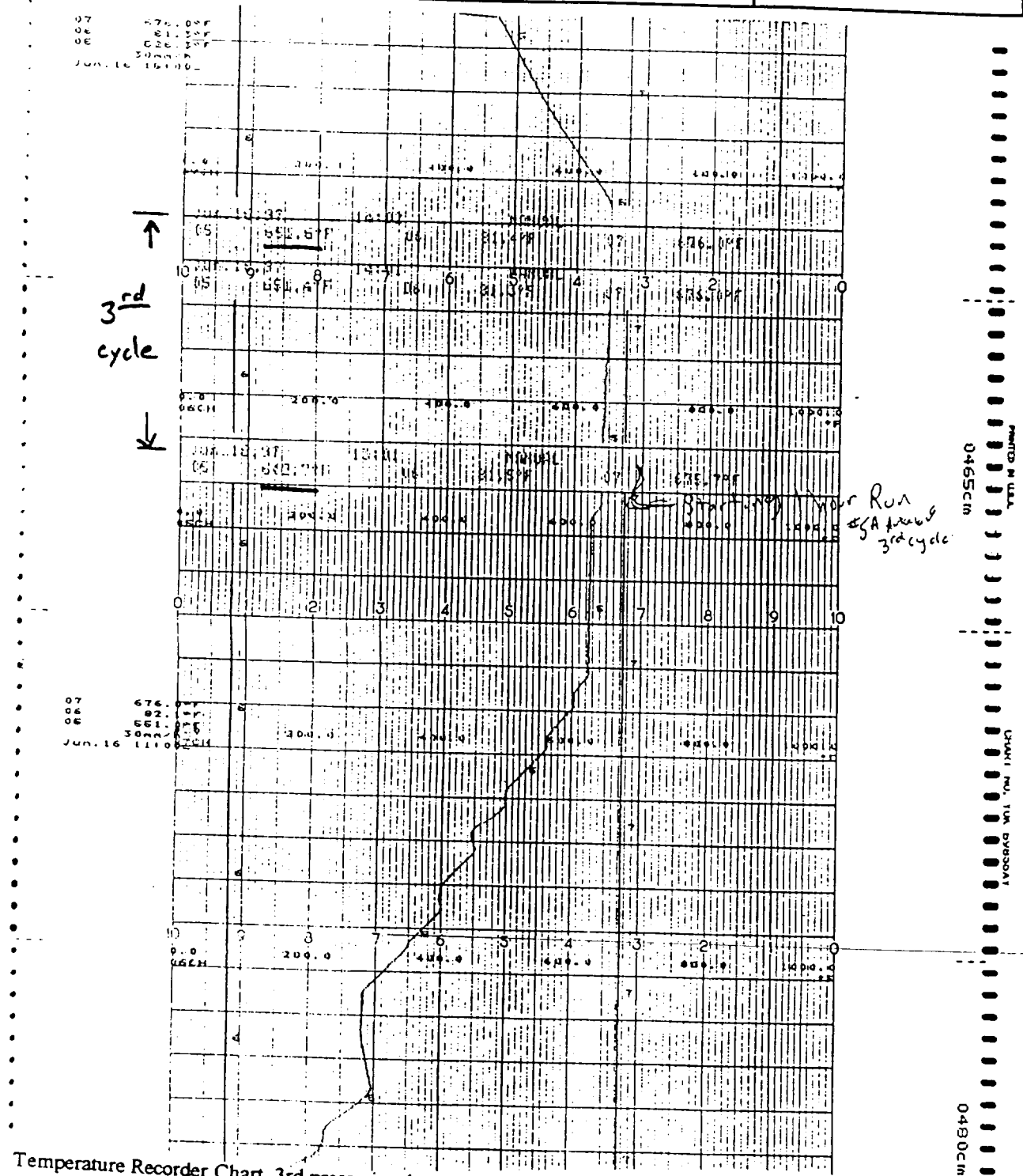


Temperature Recorder Chart, 1st pressurizer bottom nozzle thermal cycle on channel 5.  
Temperature in degrees F. Range 0-1000°F.





Temperature Recorder Chart, 2nd pressurizer bottom nozzle thermal cycle on channel 5.  
Temperature in degrees F. Range 0-1000°F.



Temperature Recorder Chart, 3rd pressurizer bottom nozzle thermal cycle on channel 5.  
Temperature in degrees F. Range 0-1000°F.



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# Appendix C

## CALIBRATION CERTIFICATIONS AND DATA SHEETS

Description	Pages
Pressure Recorders	C2-C3
Temperature Recorder	C4-C5
Thermocouples	C6-C9
Torque Wrenches	C10-C11

Ref. Test Request TS070A	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241
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**PAID**

NON PERMANENT  
QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type: <u>Pressure Head</u>	Calibration Date: <u>6/02/97</u>
Manufacturer: <u>Honeywell</u>	Calibration Due Date: <u>12/02/97</u>
Range: <u>0-3500 psig</u> Accuracy: <u>± 50 psig</u>	Calibration Document:
Mfg. Serial No.: <u>8401-385427005</u>	I V Procedure: <u>QMS-EID-C17</u> Rev. <u>00</u>
C-E ID No.: <u>EL-963</u>	I I Manufacturer's Specifications

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
<u>Test Gauge</u>	<u>CL-1040</u>		

NIST # 822/249600

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.
0	0	as found	
500	500		
1000	1000		
1500	1510		
2000	2000		
2500	2510		
3000	3010		
3500	3500		
2500	2510		
1500	1505		
0	0	✓	

Standard Value	As Found	As Left	Out of Tol.

CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED.

REMARKS: AutoSA from last Cal. handle usage

☒ ACCEPTED ☐ REJECTED

CALIBRATED BY: [Signature]  
Ed. Brown / S. Janczko  
Testing Services

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NON-PERMANENT  
QUALITY RECORD  
CERTIFICATE OF CALIBRATION

Instrument Type <u>Pressure Recorder</u>	Calibration Date <u>6/02/97</u>
Manufacturer <u>Honeywell</u>	Calibration Due Date <u>12/02/97</u>
Range <u>0-1500 psi</u> Accuracy <u>± 0.25%</u>	Calibration Document:
Mfg. Serial No. <u>8401-385407006</u>	<input checked="" type="checkbox"/> Procedure <u>00000-51D-017</u> Rev. <u>00</u>
C-E ID No. <u>EL-968</u>	<input type="checkbox"/> Manufacturer's Specifications

Test Equipment Used To Perform Calibration:			
Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
<u>Test Gas</u>	<u>CL-1040</u>		
<u>NIST # 822/249620</u>			

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.	Standard Value	As Found	As Left	Out of Tol.
0	0	As Found					
500	450						
1000	975						
1500	1450						
2000	2000						
2500	2475						
3000	2975						
3500	3450						
4000	4000						
4500	4500						
5000	5000						
5500	5500						
6000	6000						
6500	6500						
7000	7000						
7500	7500						
8000	8000						
8500	8500						
9000	9000						
9500	9500						
10000	10000						

CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED.

REMARKS: Auto GA Limited Cal based on way

☒ ACCEPTED ☐ REJECTED

CALIBRATED BY: [Signature]  
F. V. Hassan / J. E. Jackson to  
Testing Services

Ref. Test Request TS070A	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241
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NON-PERMANENT  
QUALITY RECORD  
CERTIFICATE OF CALIBRATION

Instrument Type <u>Recorder</u>	Calibration Date <u>3/13/97</u>
Manufacturer <u>Yokogawa</u>	Calibration Due Date <u>9/13/97</u>
Range <u>0-1000°F</u> Accuracy <u>± 5°F</u>	Calibration Document:
Mfg. Serial No. _____	<input type="checkbox"/> Procedure _____ Rev. _____
C-E ID No. <u>CL-0142</u>	<input checked="" type="checkbox"/> Manufacturer's Specifications <u>TS-072</u>

Test Equipment Used To Perform Calibration:			
Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
<u>Omegacalibrator</u>	<u>CL1023</u>		
<u>CL-20</u>			
<u>NIST# 811/254790, 811/254993-95</u>			

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.
60	60.7	as found	
100	100.7		
200	200.5		
300	200.9		
400	400.3		
500	500.2		
600	600.1		
700	700.3		
800	800.2		
900	900.2		
1000	1000.2		
650	650.1		

Standard Value	As Found	As Left	Out of Tol.
Check each channel at 650°F			
Ch 1			
1	649.9		
2	650.1		
3	650.1		
4	650.0		
5	649.9		
7	650.2		
8	650.3		

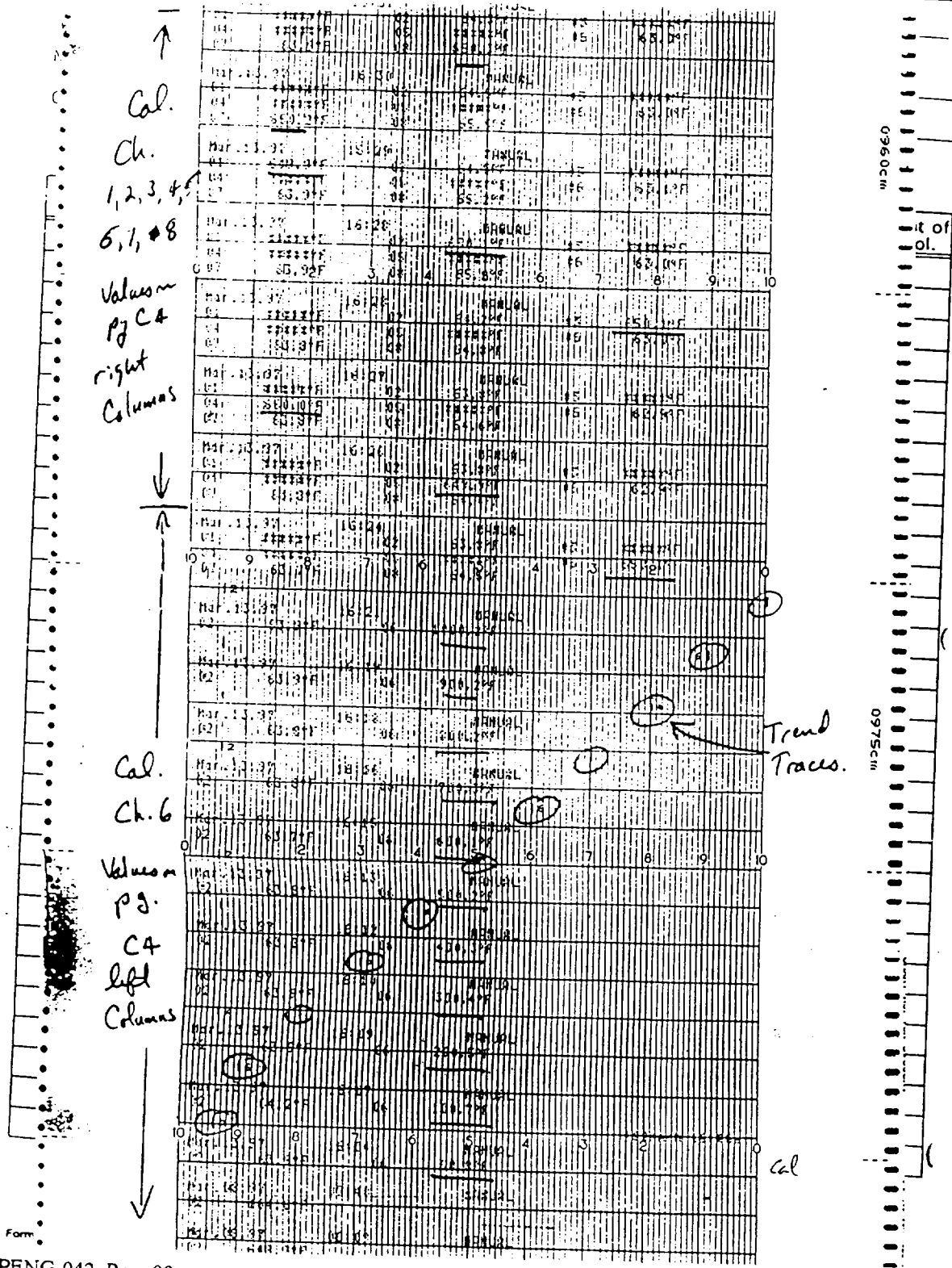
CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED.

REMARKS: Limited-Range, 0-1000°F, Range - 1000°F Calibration pg 2

☒ ACCEPTED ☐ REJECTED

CALIBRATED BY: [Signature]

Testing Services





Ref. Test Request TS070A

ABB/COMBUSTION ENGINEERING  
PRIMARY SYSTEMS

Project No. 2007241

NON PERMANENT  
QUALITY RECORD  
CERTIFICATE OF CALIBRATION

Instrument Type TC-Type J  
 Manufacturer Project's  
 Range 0-750°F Accuracy ± 1°F  
 Mfg. Serial No. A94-13250  
 C-E ID No. CL-1008

Calibration Date 5/07/96  
 Calibration Due Date 11/07/96 11/21/97  
 Calibration Document: 23 HLL  
 [X] Procedure 0000-CID-22 Rev. 00  
☐ Manufacturer's Specifications

## Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
<u>Joffe Temp Calibrator</u>	<u>IL-680</u>		
<u>Analogic</u>	<u>IL-456</u>		
<u>TC Switch &amp; Ext. wire</u>	<u>N/A</u>		

NIST 811/249328, 811/249057, 252613, 252187, 811/249279-92, 554359, 245109413

## CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.
<u>80</u>	<u>79.7</u>	<u>as found</u>	
<u>150</u>	<u>149.6</u>		
<u>250</u>	<u>248.9</u>		
<u>350</u>	<u>349.9</u>		
<u>450</u>	<u>450.6</u>		
<u>550</u>	<u>551.0</u>		
<u>650</u>	<u>650.8</u>		
<u>760</u>	<u>760.7</u>		
<u>349</u>	<u>349.0</u>		
<u>250</u>	<u>248.9</u>		

Standard Value	As Found	As Left	Out of Tol.

cal internal  
based on 1st use  
6/11/97  
HLL

CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED.

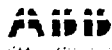
REMARKS: SW Rs #5☒ ACCEPTED☐ REJECTEDCALIBRATED BY: HLL

Testing Services

Ref. Test Request TS070A

ABB/COMBUSTION ENGINEERING  
PRIMARY SYSTEMS

Project No. 2007241

NON PERMANENT  
QUALITY RECORD  
CERTIFICATE OF CALIBRATION

Instrument Type Thermocouple - Type J  
 Manufacturer Projecks  
 Range Rm - 750°F Accuracy ± 5°F  
 Mfg. Serial No. A94 - 13250  
 C-E ID No. CL-1008

Calibration Date 6/19/97  
 Calibration Due Date 12/19/97  
 Calibration Document:  
☒ Procedure QW00-ETD-069 Rev. 00  
☐ Manufacturer's Specifications

## Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
<u>Tiffin Oven</u>	<u>IL-680</u>		
<u>TC Readout</u>	<u>CL-1023</u>		
<u>TC wire &amp; shield</u>	<u>N/A</u>		
<u>NIST# DN47, PM03</u>			

## CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.
<u>80</u>	<u>79.5</u>	<u>as found</u>	
<u>200</u>	<u>199.3</u>		
<u>300</u>	<u>299.3</u>		
<u>400</u>	<u>400.5</u>		
<u>500</u>	<u>502.2</u>		
<u>600</u>	<u>602.9</u>		
<u>700</u>	<u>702.8</u>		
<u>755</u>	<u>757.4</u>		

Standard Value	As Found	As Left	Out of Tol.

CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED.

REMARKS: TC Serial # 7Limited cal. based on usageCALIBRATED BY: F.V. Rossano☒ ACCEPTED☐ REJECTED

Testing Services

Ref. Test Request TS070A

ABB/COMBUSTION ENGINEERING  
PRIMARY SYSTEMS

Project No. 2007241

FADIP

NON PERMANENT  
QUALITY RECORD  
CERTIFICATE OF CALIBRATION

Instrument Type TC - Type J  
 Manufacturer Project's  
 Range Rm - 750°F Accuracy ± 1°F  
 Mfg. Serial No. A94-10902  
 C-E ID No. CL-1018

Calibration Date 5/06/96  
 Calibration Due Date 4/06/96 X 12/13/97  
 Calibration Document: 269 #11 full  
☒ Procedure 00000 CID-008 Rev. 00  
☐ Manufacturer's Specifications

## Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
<u>Jeffco Temp Calibrator</u>	<u>IL-680</u>		
<u>Analogic</u>	<u>IL-456</u>		
<u>TC Switch &amp; Ext. Wire</u>	<u>N/A</u>		

NIST 811/249328, 811/249057, 252613, 252187, 811/249279-92, 554369, 245109413

## CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.
<u>75</u>	<u>74.9</u>	<u>as found</u>	
<u>150</u>	<u>148.0</u>		
<u>250</u>	<u>248.4</u>		
<u>350</u>	<u>348.9</u>		
<u>450</u>	<u>448.3</u>		
<u>550</u>	<u>547.1</u>		
<u>650</u>	<u>646.1</u>	<u>full</u>	
<u>750</u>	<u>745.6</u>		<u>X</u>

Standard Value	As Found	As Left	Out of Tol.

Note: per spec. CID-008, limit for std. TC's is ± 5.6°F at 750°F

Cal is limited based on first use 6/13/97 full

CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED.

REMARKS: SW per spec Limit Cal range based on usage

☒ ACCEPTED ☐ REJECTED  
Limit RM - 650°F

CALIBRATED BY: full

Testing Services

Ref. Test Request TS070A	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241
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NON-PERMANENT  
QUALITY RECORD  
CERTIFICATE OF CALIBRATION

Instrument Type <u>Thermocouple-Type J</u>	Calibration Date <u>6/19/97</u>
Manufacturer <u>Project</u>	Calibration Due Date <u>12/19/97</u>
Range <u>Rm-750°F</u> Accuracy <u>± 5°F</u>	Calibration Document:
Mfg. Serial No. <u>A94-1090L</u>	<input checked="" type="checkbox"/> Procedure <u>Q000-ETD-069</u> Rev. <u>00</u>
C-E ID No. <u>CL-1018</u>	<input type="checkbox"/> Manufacturer's Specifications

Test Equipment Used To Perform Calibration:			
Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
<u>Tiffin Oven</u>	<u>IL-680</u>		
<u>TC Readout</u>	<u>CL-1023</u>		
<u>TC wire &amp; switch</u>	<u>N/A</u>		
<u>NIST# DN 47, PM03</u>			

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.
80	79.3	as found	
200	198.6		
300	299.4		
400	399.8		
500	500.9		
600	601.7		
700	701.6		
755	756.3		

Standard Value	As Found	As Left	Out of Tol.

CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED.

REMARKS: TC Switch & Limited calibration usage FW

☒ ACCEPTED ☐ REJECTED

CALIBRATED BY: F.V. Ross AND

Testing Services

Ref. Test Request TS070A

ABB/COMBUSTION ENGINEERING  
PRIMARY SYSTEMS

Project No. 2007241

**Quality Plus Inc** - Metrology ServicesACCEPTED CERTIFICATION OF ACCURACYDATE 4/16/97CUSTOMER:ABB COMBUSTION ENGINEERING  
1000 PROSPECT HILL RD.  
WINDSOR CT 06095  
P.O.#: 44716KP

DATE: 04/01/97

GAGE TYPE: TORQUE WRENCH

MAKE: PROTO

SER#: #25

DATE DUE: 04/01/98

THE FOLLOWING TORQUE WRENCH WAS CALIBRATED PER QUALITY PLUS, INC.  
PROCEDURE QP-652 WITH A CONTROL DATE OF 03/31/95. IN ACCORDANCE  
WITH QUALITY PLUS, INC. QUALITY MANUAL, REV.8, 3-31-95. M&T USED IS  
TSD 6000, S/N QP223, CALB. ON 3/22/97. N.I.S.T. TEST # 821/257176-96  
TOLERANCE: +/- 4% IN/LBS; 10CFR21 APPLIES.

Mech Lab #25

CAL POINT		AS FOUND		AFTER ADJUSTMENT	
		CLOCKWISE	COUNTCLKWS	CLOCKWISE	COUNTCLKWS
50	IN/LBS	49.50	50.50		
100	IN/LBS	98.90	100.20	NO ADJUSTMENTS REQUIRED	
150	IN/LBS	148.50	150.00		
200	IN/LBS	197.60	201.20		
250	IN/LBS	246.00	250.40		

INSPECTED BY: 

GAGE CALIBRATION • FIRST ARTICLE INSPECTION • REPAIRS • GRANITE PLATE RESURFACING • CASTING LAYOUT  
TORQUE CALIBRATION • ON SITE CALIBRATION • PRESSURE GAGE CALIBRATION • CMM CONTRACT INSPECTION  
170 Grove Street • Chicopee MA 01020 • (413) 594-5529 • (413) 594-5596 fax

Ref. Test Request TS070A	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241
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PRECISION  
INSPECTION, inc.

ACCEPTED *[Signature]*  
DATE 5/20/97

PLYMOUTH INDUSTRIAL PARK  
CORNER OF NAPCO AND CONTAINER DRIVES  
P.O. BOX 46  
TERRYVILLE, CONNECTICUT 06786  
TELEPHONE 203/583-2050

### TORQUE CALIBRATION CERTIFICATE

REPORT NUMBER: 21301-2 PO Number: 45676KP

DATE OF CALIBRATION: 5/20/97

CUSTOMER: ABB Combustion Engineering

INSTRUMENT: Torque Wrench, 150 ft/lbs.

S/N: CL-1031 MAKE: Proto 153668

**CALIBRATION**  
DUE DATE 11-20-97

	<u>PERCENT OF RANGE</u>				
<u>CLOCKWISE</u>	20%	40%	60%	80%	100%
INDICATED WRENCH TORQUE:	30'lbs.	60'lbs.	90'lbs.	120'lbs.	150'lbs.
ACTUAL TORQUE:	30'lbs.	60'lbs.	90'lbs.	120'lbs.	149'lbs.

#### COUNTERCLOCKWISE

INDICATED  
WRENCH TORQUE:

ACTUAL TORQUE:

PROCEDURE: #32  
TEMPERATURE /HUMIDITY: 68°/41%  
THIS INSTRUMENT WAS CALIBRATED USING MASTER CALIBRATOR  
SERIAL NO. 5217  
CALIBRATED ON 6/17/96 DUE: 6/17/98  
TRACEABLE TO THE NIST THROUGH NIST TEST NO. MMAP 822/LA

*Chris Paulin*  
CALIBRATION TECHNICIAN

Ref. ANSI B107.14  
Ref. Federal Spec. GGG-W-686  
Mil-W-26497  
Calibration conforms to ANSI Z540-1  
Estimated level of accuracy is  $\pm 1\%$