ATTACHMENT (8)

Non-Proprietary -- Vendor Report TR-PENG-042,

"Test Report for MNSA Hydrostatic and Thermal Tests"

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

TEST REPORT FOR MNSA HYDROSTATIC AND THERMAL CYCLE TESTS

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

Reviewed By: Karl H. Haslinger 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: K. V. Margotta K.V.M 7/3/97
Printed Name Signature Date

Date of Issue: 07/ 3 /97

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.

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 borated water (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.

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.

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 trial 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 that 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

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, ± 10°F, and

establishing a pressure of 2,500 , ± 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.

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.

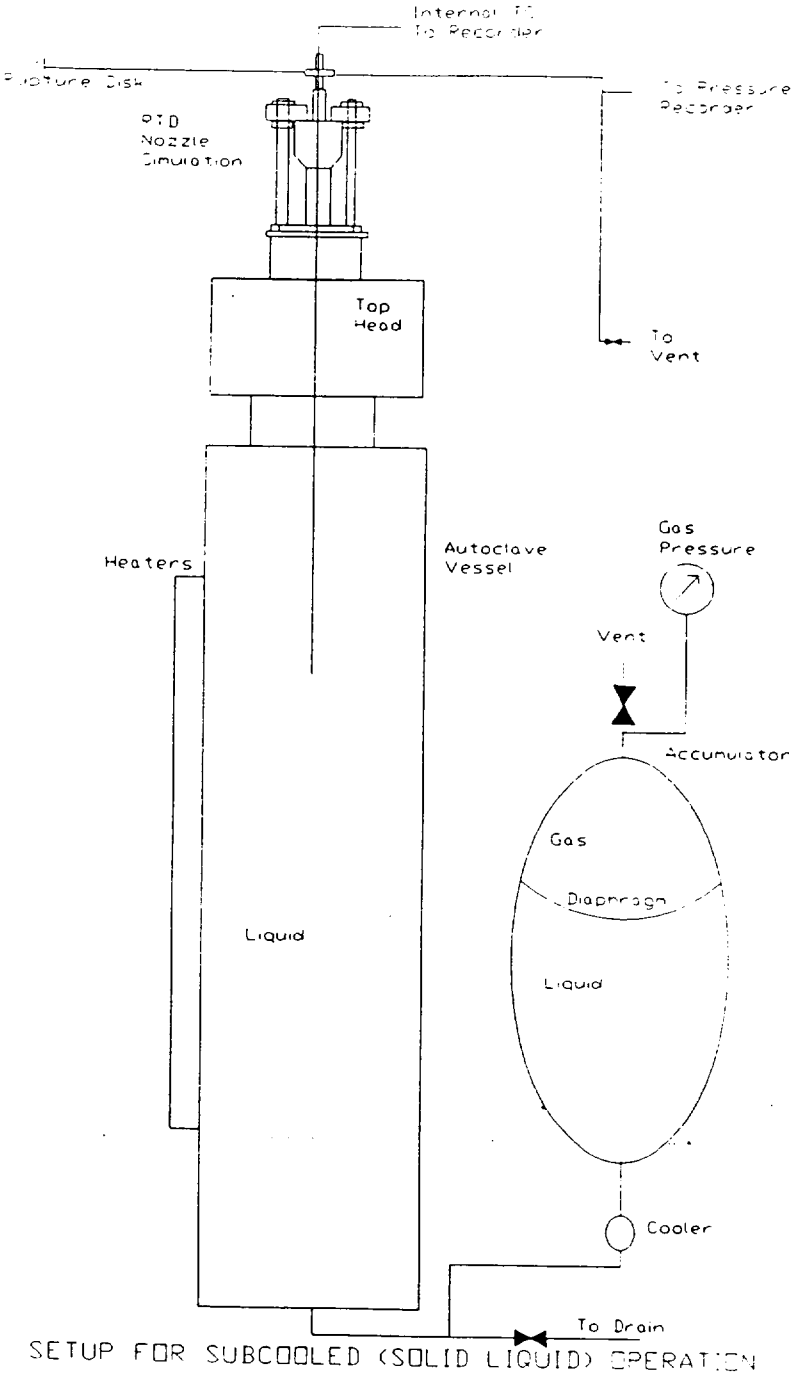
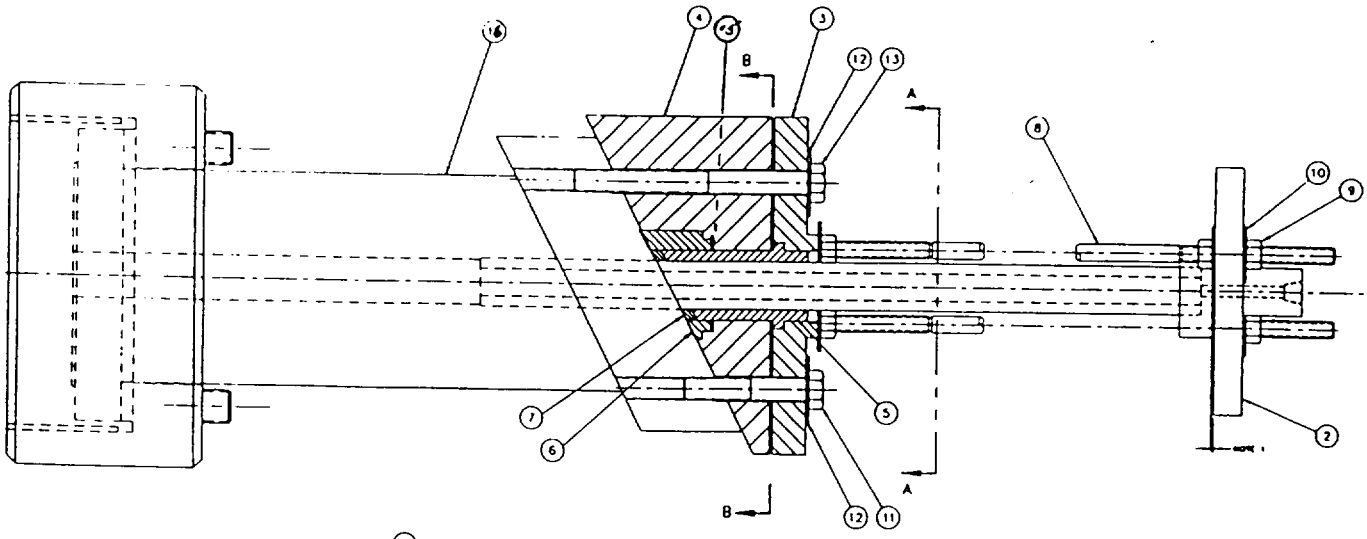


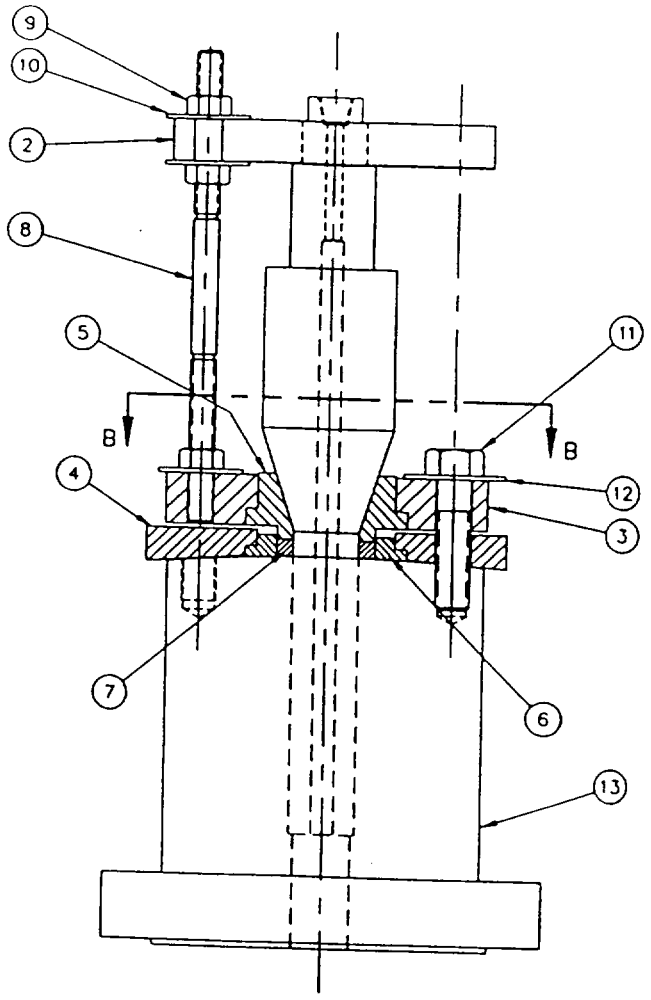
Figure 1. Test Facility Schematic



① PRESSURIZER LEVEL AUTOCLAVE ASSEMBLY

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

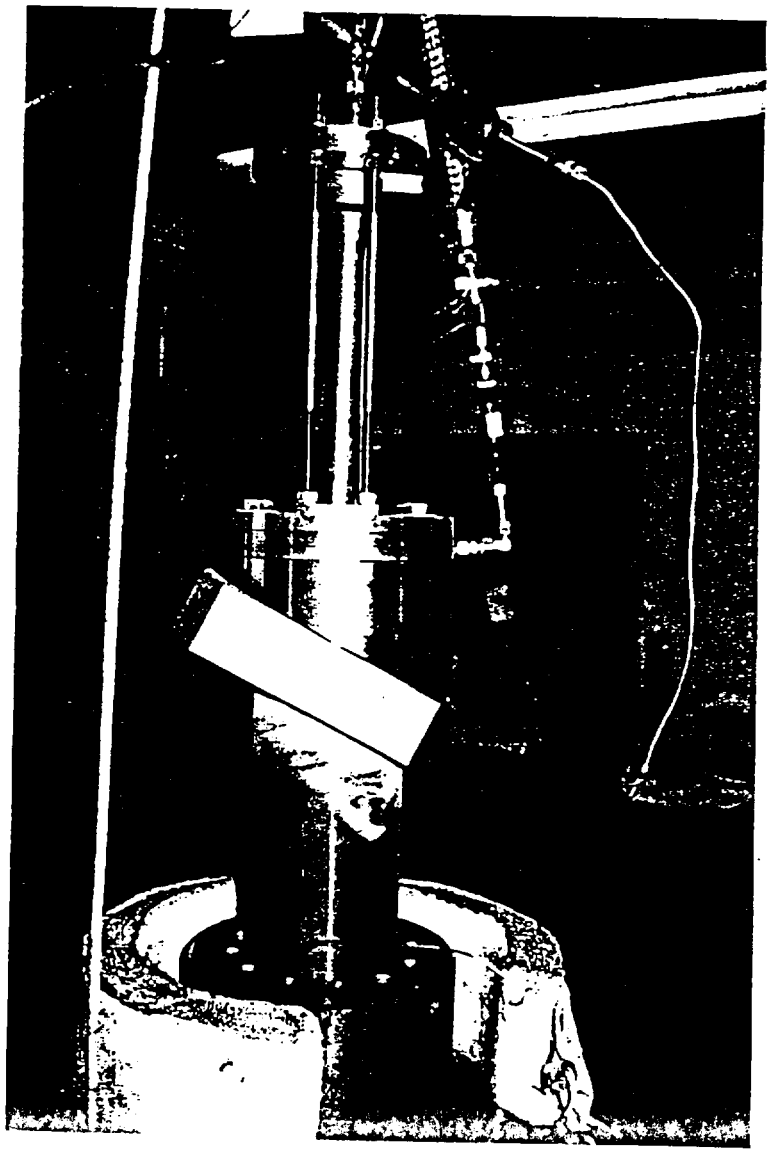


Figure 4. Photograph of Pressurizer Bottom Seal

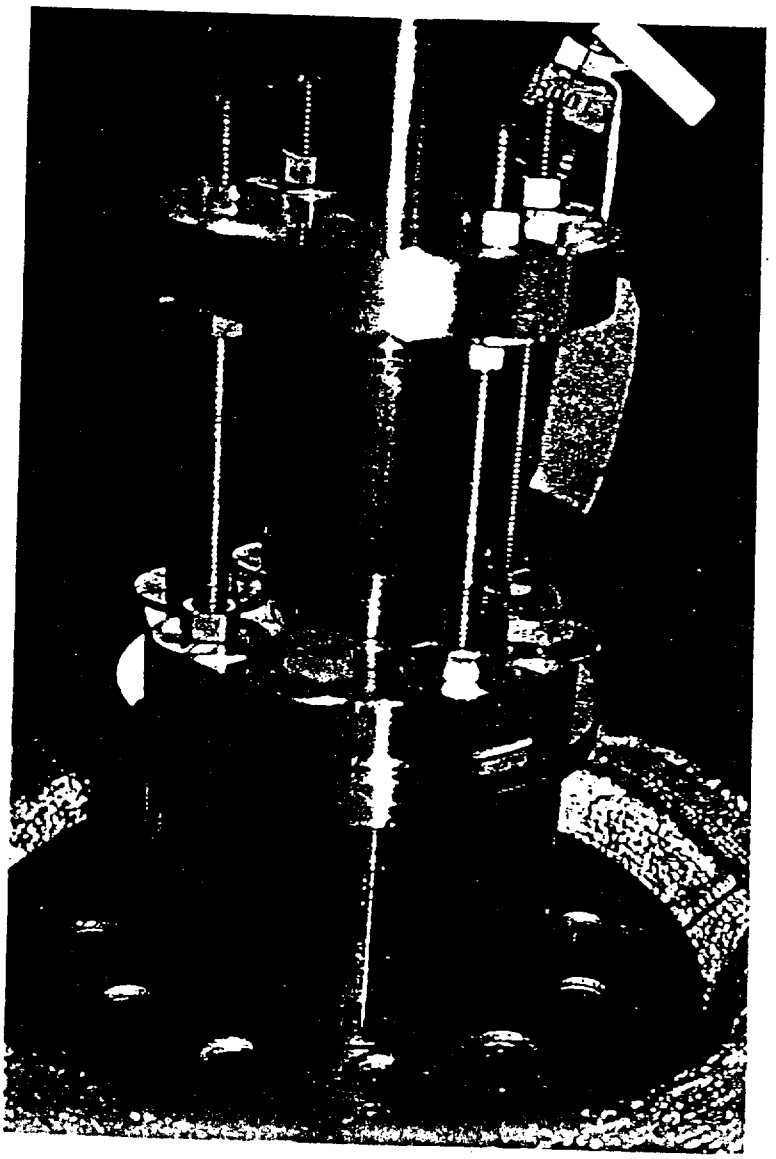


Figure 5. Photograph of Hot Leg Rtd Nozzle Seal

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 ± 5°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.

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

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?	☒	
2 Are the test procedures listed?	☒	
3 Are the test results listed?	☒	
4 Is the test request document number included on the test report cover page?	☒	
5 Has the test report been signed and dated by the author?	☒	
6 Has provision been made for approval by the manager of the testing organization?	☒	
7 Has provision been made for a statement of acceptance by the Cognizant Engineer?	☒	

Comments/Remarks:

Reviewed by:

Karl H. Haslinger — Karl H. Haslinger — 6/25/97

Printed Name — Signature — Date

Appendix A

HOT LEG RTD DATA SHEETS AND CHARTS

Ref. Test Request TS070A Suppl. 00	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241

Data Sheet 1

General Data Sheet

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: Hot Leg RTD	
Observers: J. Iannazzo, F. Rossano, T. Turri, K. Casselden	Date: 6/10/97

Seal and test components were visually examined and found to be acceptable. An initial stack up of parts was performed without a Graphitoil seal. Suggestions were made to match the seal retainer and lower flange to match the contoured surfaces. The compression collar was a tight fit and needs further evaluation to fit in place and to be removed. In one case, we were able to lift the nozzle slightly to fit the compression collar into place.

Torque wrench used for assembly was Mech. Eng #25 # CE-1031

Proceeded to assemble anticlave hardware & perform hydrostatic test. See hydrostatic test data sheets.

While preparing for 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. Hamblin & J. Turri were advised of the finding. An additional hydrostatic test is planned for 6/10/97.

Is this data sheet continued onto another page? yes 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: Hot Leg RTD	Autoclave ID: 6A
Test Number: 1	Date: 6/10/97
Pressure Gauge ID: EL-964	Calibrated: 6/02/97
	Calibration Due: 12/02/97
Observers: J. Jemaczko, F. Rossano, J. Tani, K. Marsolo	

Time at 3,175 Psig: from 1106 hrs to 1125 hrs
Leaks observed? Yes (No) Pressure decay from 3,200 psi 3,050 psi required.
If yes, explain: No visible leakage JMR
Other Comments: Released pressure and retorque ambient bolt. See Test #2 for next trial.
Test performed at room temperature.
As system was pressurized, at about 900 psig, the RTD probe jumped from the bottomed position to impact against the top plate.

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Data Sheet 2

Hydrostatic Test Data

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: Hot	Autoclave ID: 6A
Test Number: 2	Date: 6/10/97
Pressure Gauge ID: EL-964	Calibrated: 6/02/97
	Calibration Due: 12/02/97
Observers: J. Tancredo, F. Rossano, I. Turci, K. Hasselka	

Time at 3,175 Psig: from 1129 hrs to 1145 hrs
Leaks observed? Yes (No) Pressure held steady within 15 psig
If yes, explain:
Other Comments: Test performed after re-torquing autoclave head
Test was deemed a success based on less pressure decay than allowable.
Performed hot at room temperature.

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Data Sheet 1

General Data Sheet

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: Hot Leg RTD	
Observers: T. Jaroncka, F.V. Kassamy, K. Margotta	Date: 6/1/97

Re-established hydrostatic pressure set up. N.G. Heat the autoclave heat the thermal cycle boric acid solution. The torque of the ½"-20 bolts was checked. The first bolt turned about ½ of a turn (½ of a flat) to reach 30 ft-lbs. Assume that the seal crush and that Step 2.2.9 of 33-NOME-EP-0124 did not achieve metal to metal contact at 30 ft-lbs. Per direction of K. Margotta, the torque on the ½ b.lt was increased to 35 ft-lbs.

Cooldown Hydrostatic test #3. See separate data sheet.

Perform Hydrostatic test #4. See separate data sheet

6/12/97 Start Thermal cycle test.

13:50 Autoclave at 645.5 press at 2500
Starting 1 hour run. No steam leaks
14:10 647.9° 2500 psig No steam Leaks
14:30 645.0 2490 psig No steam Leaks
14:40 646.8 2470 psig No Steam Leaks
14:52 653.8 2500 psig No Leaks End Char.

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: Hot Leg RTD	Autoclave ID: 6A
Test Number: 3	Date: 6/11/97
Pressure Gauge ID: EL 96a	Calibrated: 6/2/97
	Calibration Due: 12/2/97
Observers: T. Tomasko, F.V. Russo, K. Magoffin	

Time at 3,175 Psig: from 0817 HRS to 0846 HRS
Leaks observed? Yes / No There was about a 50 psi decay over ½ hours.
If yes, explain: No visual leaks. MK
Other Comments: Solution in autoclave was 2,200 ppm Boron that was diluted slightly by DI water from pump.
Un-torqued autoclave head and re-torqued autoclave head.
Seal bolts were not adjusted. Repeat hydrostatic test. MK

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: Hot Leg RTD	Autoclave ID: QA
Test Number: 4	Date: 6/11/97
Pressure Gauge ID: EL-766	Calibrated: 6/2/97
	Calibration Due: 12/2/97
Observers: F. Rosano, J. Janeczko, J. Turek, K. Magrath	

Time at 3,175 Psig: Run of 48 HRS to 1150 HRS

Leaks observed? Yes (No)

If yes, explain: Hydrostatic decay from 3200 psi to 3100 psi over 3 hrs. Checked slots above & below lower flange and found no signs of leakage. JM

Other Comments: Retorque Autoclave head prior to this test. Leave pressure on system for an extended time period. Proceed to thermal cycle testing JM

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Data Sheet 3

Thermal Cycle Test Data

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

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

Time	Temperature, Deg. F	Pressure, Psig	Visual Observations, Leaks (1)	Observer
0800	N/A	N/A	Startup	JHL
0995	305	<100	Completed 2nd Vent	JHL
13:50	645.5	2500	Starting 1 hour Test No Leaks	JHL
14:10	647.9	2500	No Leaks	JHL
14:30	645.0	2490	No Leaks	JHL
14:40	646.8	2470	No Leaks	JHL
14:52	653.8	2500	No Leaks End 1 hour	JHL

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

Time	Temperature, Deg. F	Pressure, Psig	Visual Observations, Leaks (1)	Observer
06:20	149.5	0	Start up. No Leaks.	JDG.
11:00	581.0	2100	No Leaks	JDG
11:45	644.7	2460	No Leaks	DMC
12:07	651.4	2500	No Leaks	HM
12:51	654.3	2500	No Leaks	HM
13:02	650.3	2500	No Leaks. - System turned off	JDG

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

Ref. Test Request TS070A Suppl. 00	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241

Data Sheet 3

Thermal Cycle Test Data

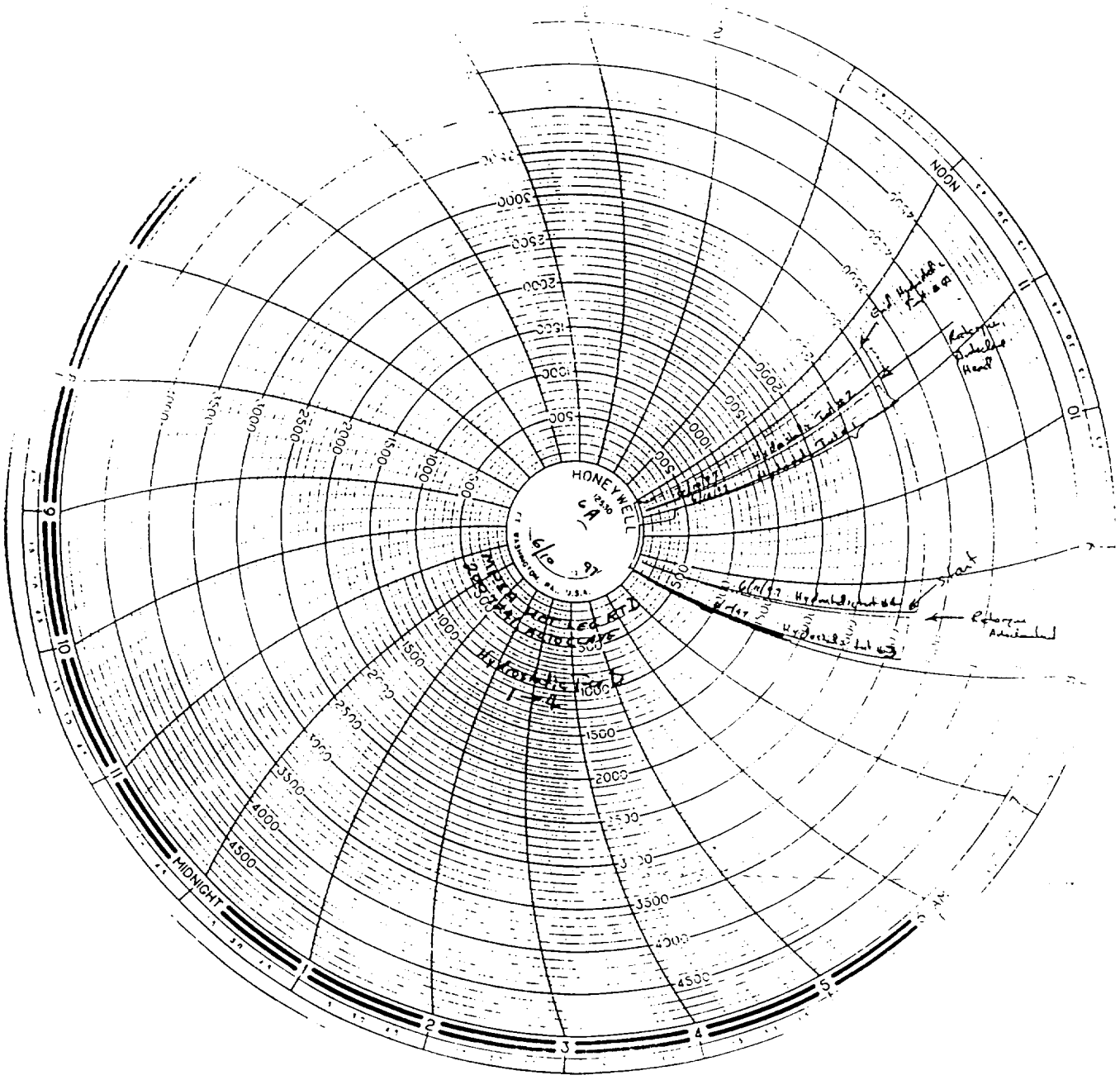
ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: Hot Leg RTD	Autoclave ID: 6A
Cycle Number: 3	Date: 6/ /97
Pressure Gauge ID: EL-969	Calibrated: 6/2/97
	Calibration Due: 12/2/97
TC ID CL-1006	Calibrated: 5/7/96
	Calibration Due: Extended based on first use to 12/14/97
TC Recorder ID: CC-0142	Calibrated: 3/13/97
	Calibration Due: 9/13/97

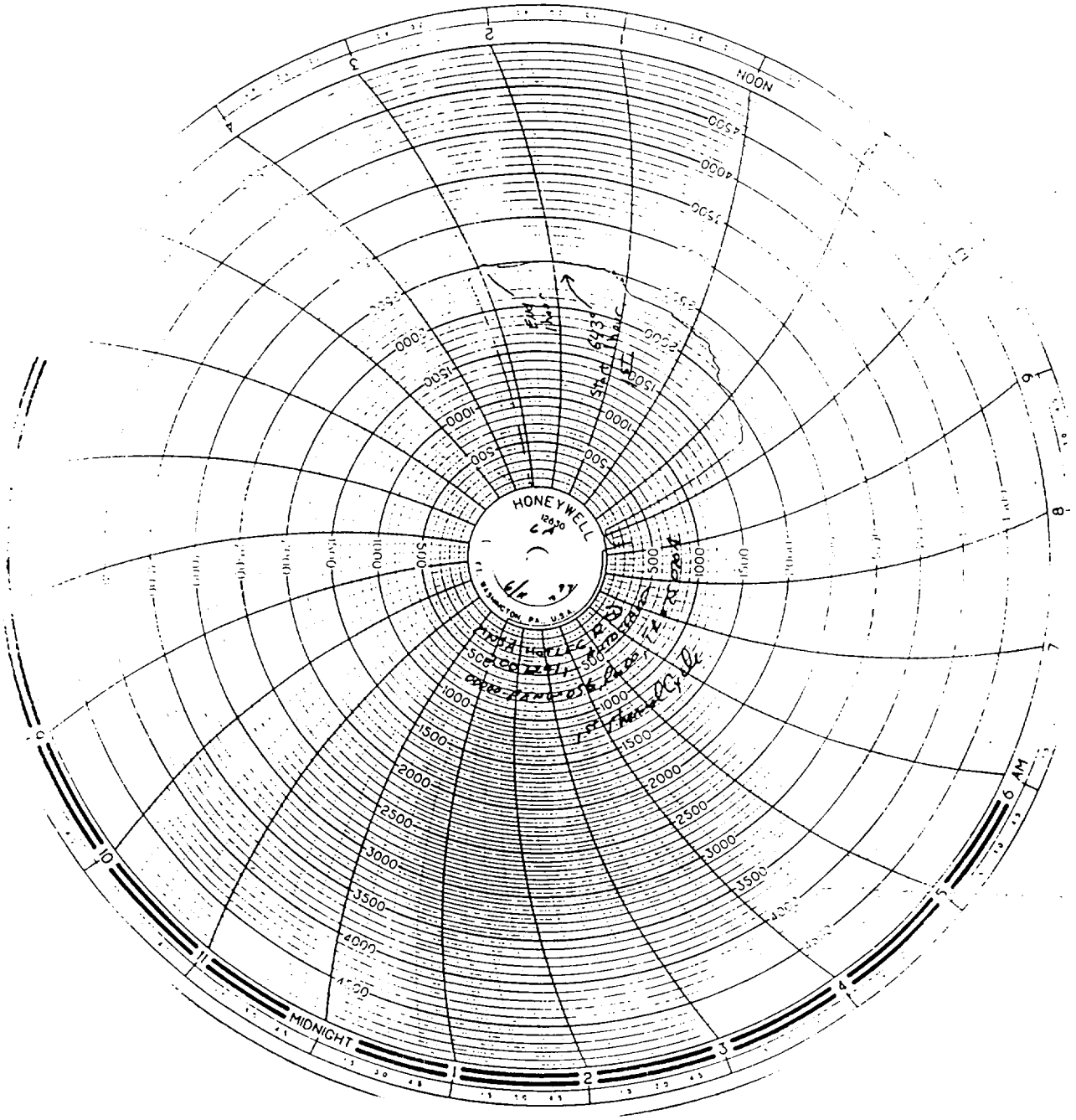
Time	Temperature, Deg. F	Pressure, Psig	Visual Observations, Leaks (1)	Observer
05:00	156	0	No Leaks Start up	[illegible]
09:30	651.9	2500	Starting 1 hour Test No Leaks	[illegible]
09:45	656.5	2550	No Leaks	[illegible]
10:00	650.3	2500	No Leaks	[illegible]
10:15	651.4	2460	No Leaks	[illegible]
10:31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

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

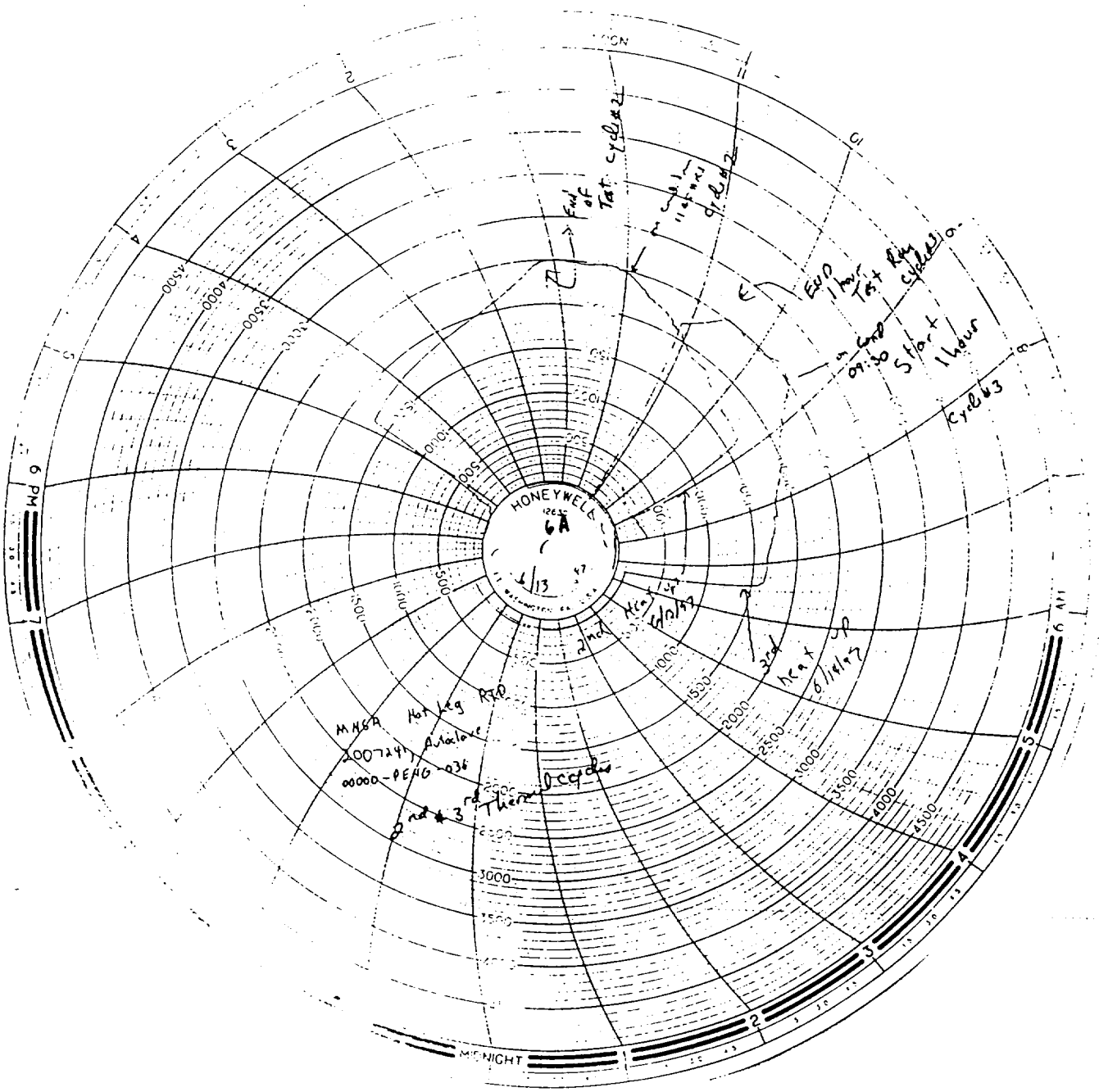
Is this data sheet continued onto another page? NO This is page 1 of 1



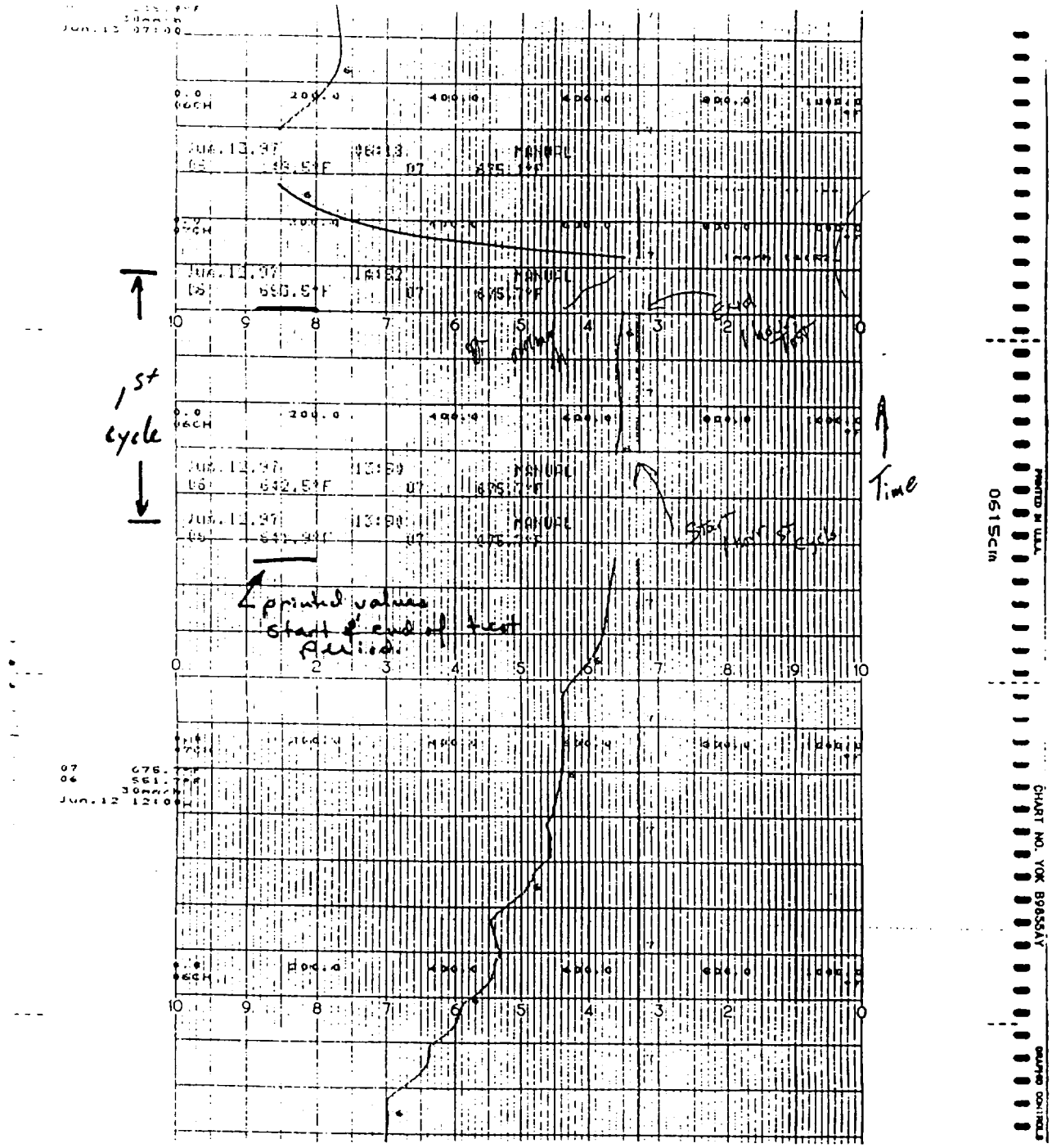
Pressure Recorder Chart. Units are Psig.



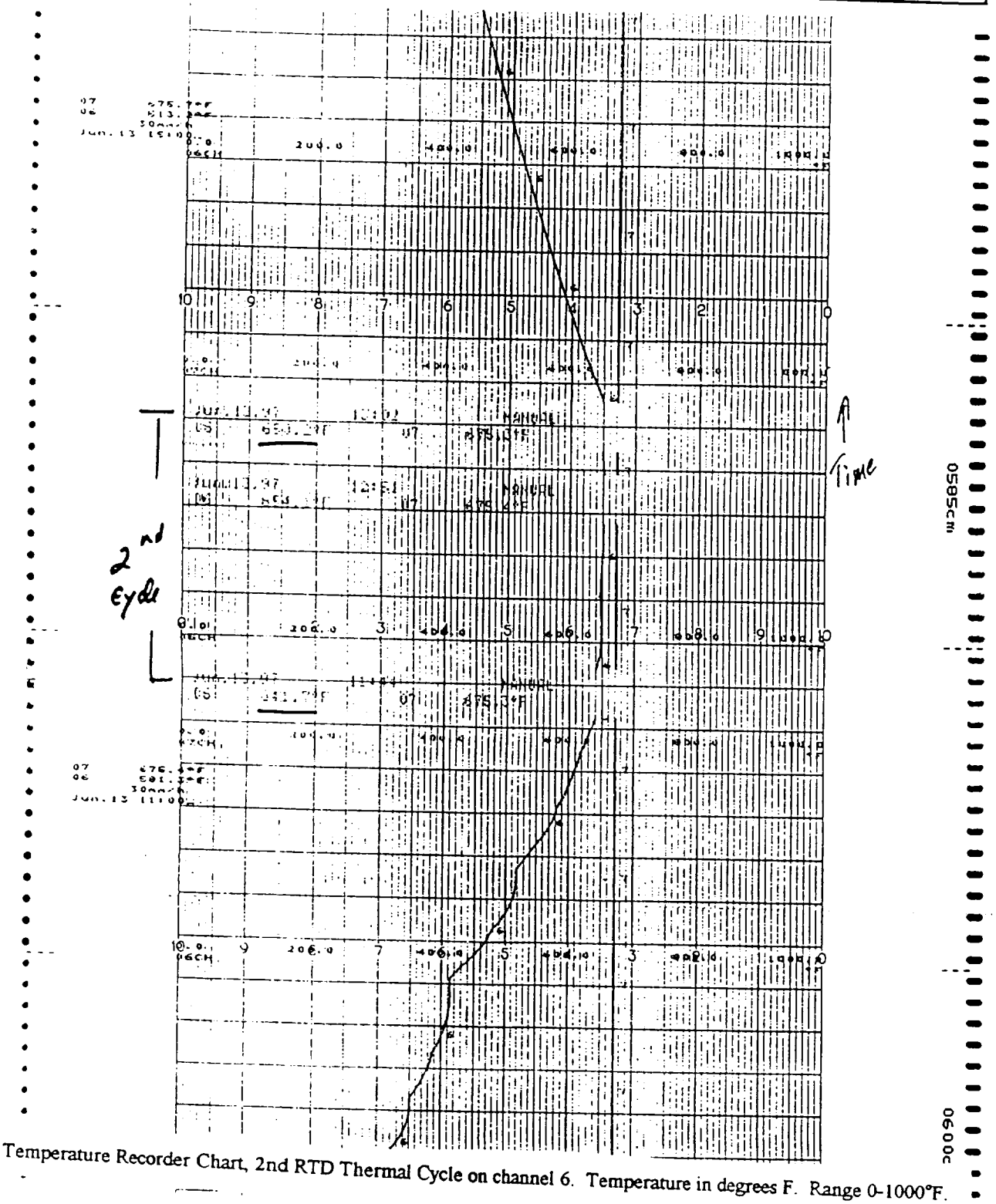
Pressure Recorder Chart. Units are Psig.



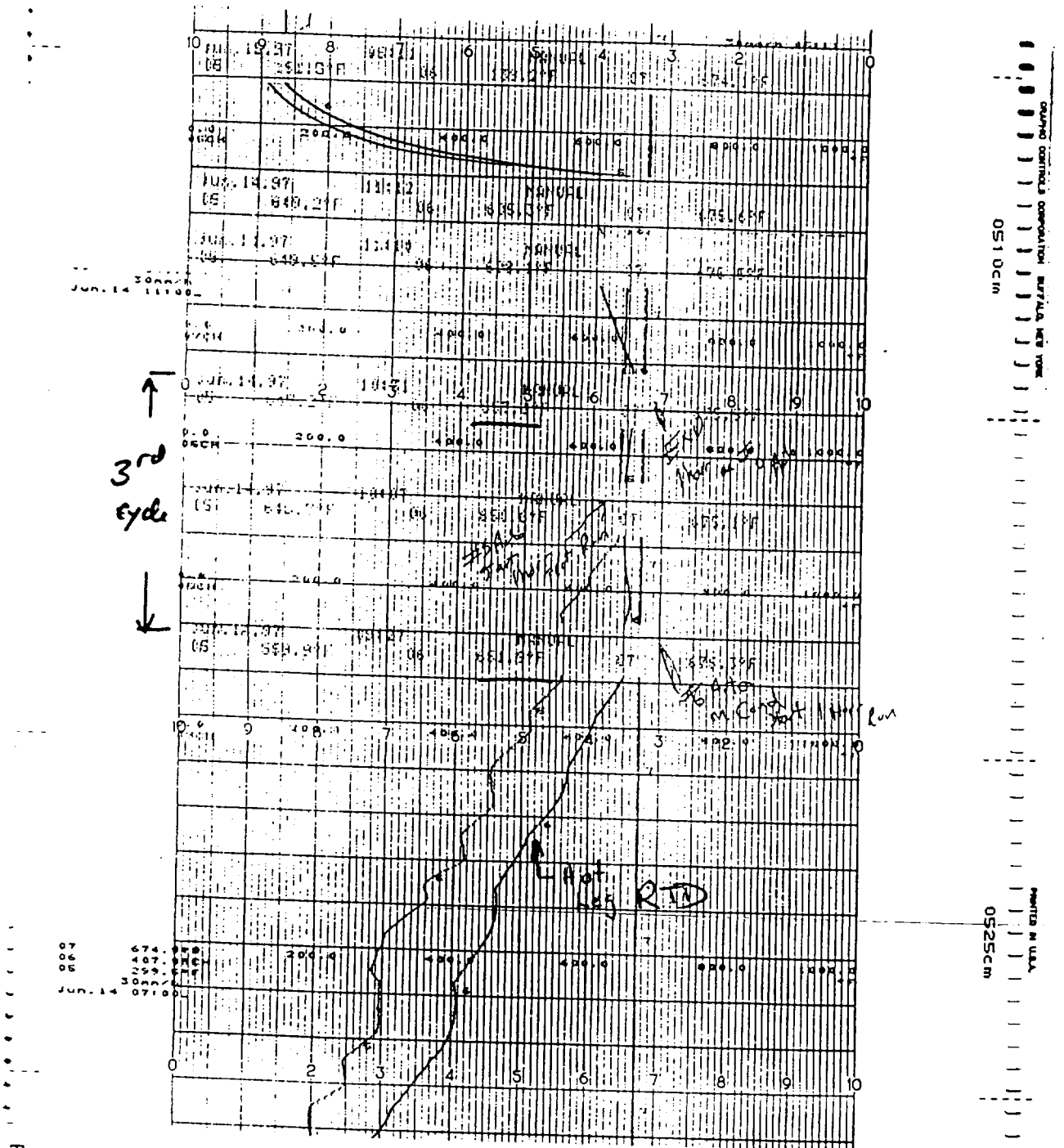
Pressure Recorder Chart. Units are Psig.



Temperature Recorder Chart, 1st 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.

Ref. Test Request TS070A Suppl. 00	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241

Data Sheet 1

General Data Sheet

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: Hot Leg RTD	
Observers: J. Janeczko, F. Rositano, K. Haydt	Date: 6/17/97

Disassembly of seal following hydrostatic test and thermal cycle Test.

The ~~bolt~~ tie nuts on the threaded rods above the ~~upper flange~~ top plate were removed. Pliers were required to un thread the tie rods from the upper flange. One hex head cap screw was broken when it stuck in the RTD autoclave 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 grafoil seal, the retainer (packing ring) or lower flange. The lower flange was removed and then the packing ring. The top surface of the autoclave fixture had water stains, but no boric acid. It is assumed that the water stains were from the moisture detected prior to the 3rd hydrostatic test. Since the 3rd & 4th 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 FSMG.

[signature]

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

00000-PENG-036, Rev. 00

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Appendix B

PRESSURIZER BOTTOM NOZZLE DATA SHEETS AND CHARTS

Ref Test Request TS070A Suppl 00	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No 2007241

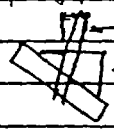
Data Sheet 1

General Data Sheet

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: Pressurizer Bottom Seal	
Observers: J. Janocko, F.V. Rossano, J. Turci, K. Margotta	Date: 6/4/97

Started trial fit up of bolt hardware. Some interference fit problems were found. The two shoulder bolts were turned down from 0.760 ϕ to 0.740ϕ for 1" of length with nominal clearance tolerance of ±.005".

6/5/97 Observed that when we did a trial fit of hex bolts (step 6.2.7 of 53-NOMG-EP-0104) into ~~tight~~ holes, they bound. We used to loosen shoulder bolts that held the cover plate in place to be able to get the hex bolts in place. When shoulder screws were tightened, the hex bolts bound. The equipment engineer was advised. It is possible for this bolt to operate with the socket head shoulder screws loose. When the compression collar was fitted around the yoke and into the cover plate, it bound. The yoke appears to have a slight cock from  perpendicular which may be causing the binding.

The system was disassembled. The graphoil seal was installed and the system reassembled. To complete the reassembly up to the installation of the compression collar, the shoulder screws were loose. Torque shoulder screws to 120 in lb (10 ft lb) using ME #25 installed on to anti-clank.

Is this data sheet continued onto another page? Yes This is page 1 of 3

Ref. Test Request TS070A Suppl. 00	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241

Data Sheet 1

General Data Sheet

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: Pressurizer Bottom Seal	
Observers: J. Ianeczky, F. V. Rossano, K. Margetta, J. Turse	Date: 6/12/97

Installed upper flange pieces. Install ½" bolts with plain washers (per K. Margetta direction) and tightened bolts to finger tight. In a cross pattern, the ½" bolts were tightened to 30 ft lbs using CL-1031. The tie rods and retainer plate were installed. The retainer plate was adjusted to leave a gap between the ~~flat~~ full simulated valve body and plate by lifting the plate by turning the nut below the plate about 2/3 of a turn. The bolts were tightened to 75 in-lbs using ME25. Flat washers were used at the tie rod nut locations per K. Margetta. There were no tabs to bend.

The system was set up for the hydrostatic test. See Data Sheet 2.

Is this data sheet continued onto another page? no This is page 2 of 3

Ref. Test Request TS070A Suppl 00	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241

Data Sheet 2

Hydrostatic Test Data

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

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

Time at 3,175 Psig: None
Leaks observed? (Yes) No at 1,600 Psig
If yes, explain: Leaked from graphite seal region at 1,600 psig.
Other Comments: System was disassembled for examination. Engineering took compression collar for modification.

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

Ref. Test Request TS070A Suppl. 00	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241

Data Sheet 1

General Data Sheet

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: Pressurizer Bottom Seal	
Observers: J. Janeczko, F.V. Hassan, K. Margiotta, J. Turci	Date: 6/13/97

Received modified compression collar and spacer shims.
Compression collar ID was opened up in the top region
of collar. FSME to document changes.
Spacer was to fit between Grafoil seal and compression
collar. 0.050" shim used. Technician ground outside
edge to fit assembly.
The system was rebuilt, similar to previous steps and
a second hydrostatic test was performed. See Data sheet 2
for hydrostatic test.

Is this data sheet continued onto another page? yes This is page 1 of 2

Ref. Test Request TS070A Suppl. 00	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241

Data Sheet 2

Hydrostatic Test Data

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: Pressurizer Bottom Seal	Autoclave ID: 5A
Test Number: 2	Date: 6/13/97
Pressure Gauge ID: EL-963	Calibrated: 6/2/97
	Calibration Due: 12/2/97
Observers: F. Rossary, J. Franczko, J. Turtil, K. Margetts	

Time at 3,175 Psig: from 1632 Hrs to 1655
Leaks observed? Yes / No Not at Seal
If yes, explain: Small leak at tube fitting, NOT AT SEAL. This explains small pressure decay. Seal was checked by sliding paper strips to seal, underbottom flange. There was no moisture detected.
Other Comments: Seal was assembled using a 0.050" thick shim between the compression collar and gasket seal. Nozzle popped (jumped up) at 2200 psig. Proceed to thermal cycle test

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

Ref. Test Request TS070A Suppl. 00	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241

Data Sheet 3

Thermal Cycle Test Data

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: Pressurizer Bottom Seal	Autoclave ID: 5A
Cycle Number: 1	Date: 6/14/97
Pressure Gauge ID: EL-963	Calibrated: 6/2/97
	Calibration Due: 12/2/97
TC ID CL-1078	Calibrated: 5/6/96
	Calibration Due extended due to fixture 12/13/97
TC Recorder ID: CL-0142	Calibrated: 3/13/97
	Calibration Due 9/13/97

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

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

Ref. Test Request TS070A Suppl 00	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241

Data Sheet 3

Thermal Cycle Test Data

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

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

Time	Temperature, Deg. F	Pressure, Psig	Visual Observations, Leaks (1)	Observer
05:00	118	0	No Leaks Heat up	
09 ~~10~~:10	643.4	2470	No Leaks Starting 1 hour Run	
09:25	647.4	2475	No Leaks	
09:40	647.8	2475	No Leaks	
09:55	648.8	2475	No Leaks	
10:12	648.8	2475	No Leaks Shut down END	

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

Data Sheet 3

Thermal Cycle Test Data

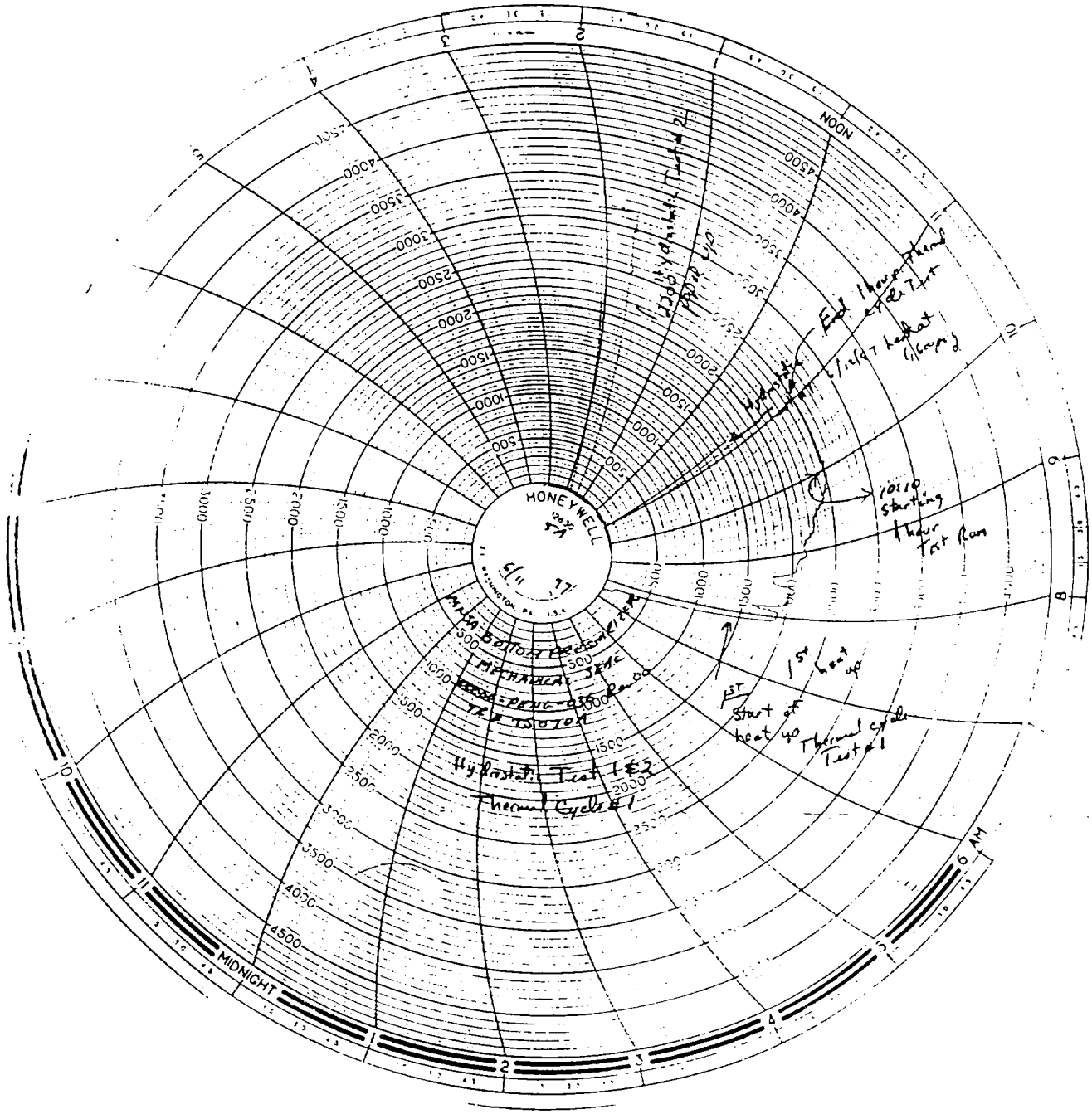
ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested: Pressurizer Bottom Seal	Autoclave ID: SA
Cycle Number: 3	Date: 6/15/97
Pressure Gauge ID: EL-963	Calibrated: 6/2/97
	Calibration Due: 12/2/97
TC ID CL-1018	Calibrated: 5/6/96
	Calibration Due extended First use 12/13/97
TC Recorder ID: CL-0142	Calibrated: 3/13/97
	Calibration Due 9/13/97

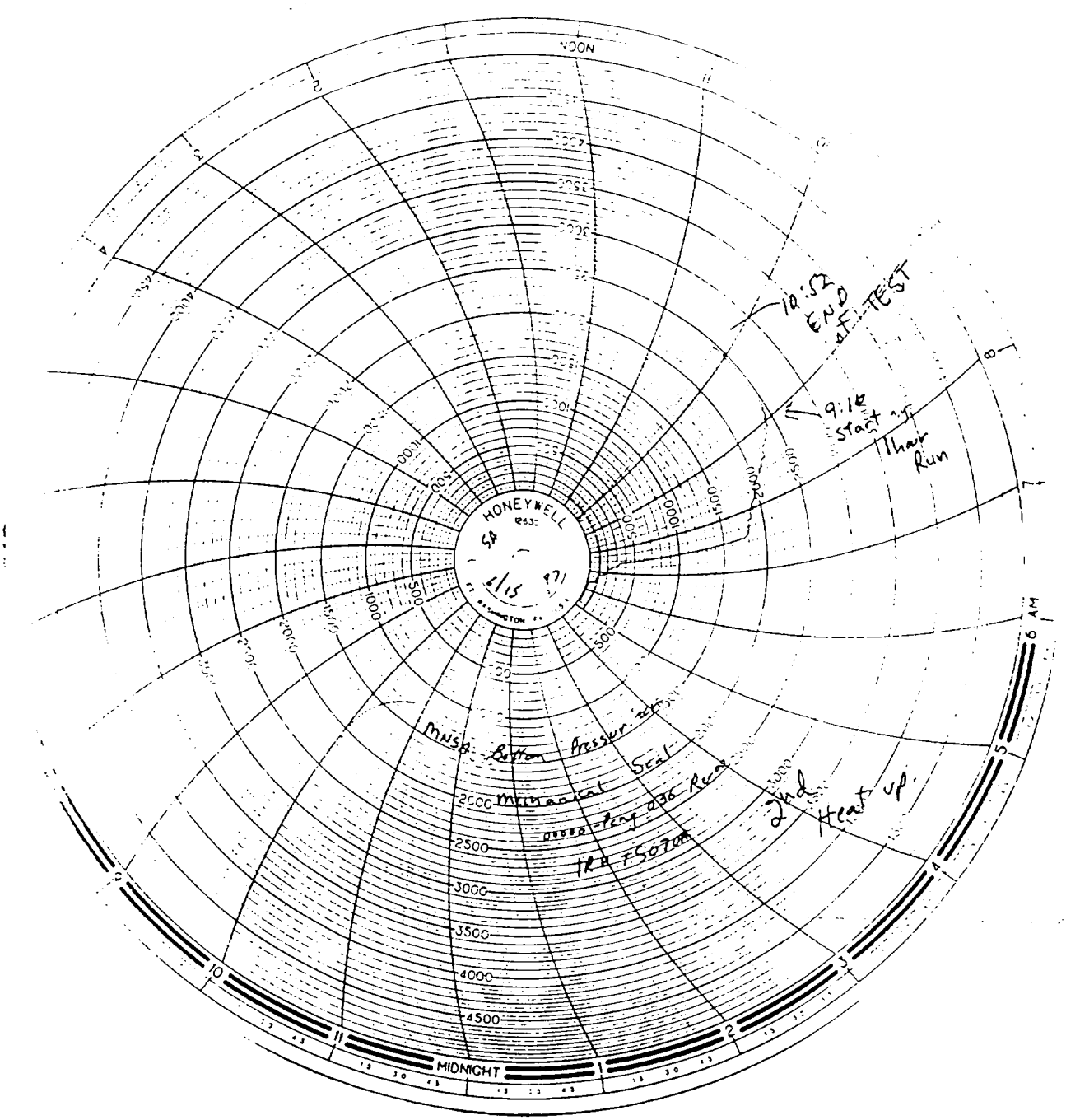
Time	Temperature, Deg. F	Pressure, Psig	Visual Observations, Leaks (1)	Observer
~~06:35~~ 07	116	0	No Leaks Start Heat up	JAJ
13:00	642.7	2490	No Leaks Starting Hour Run	~~JAJ~~
13:15	645.6	2500	No Leaks	MM
13:30	645.8	2500	No Leaks	M
13:45	650.0	2510	No Leaks	M
	651.6			

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

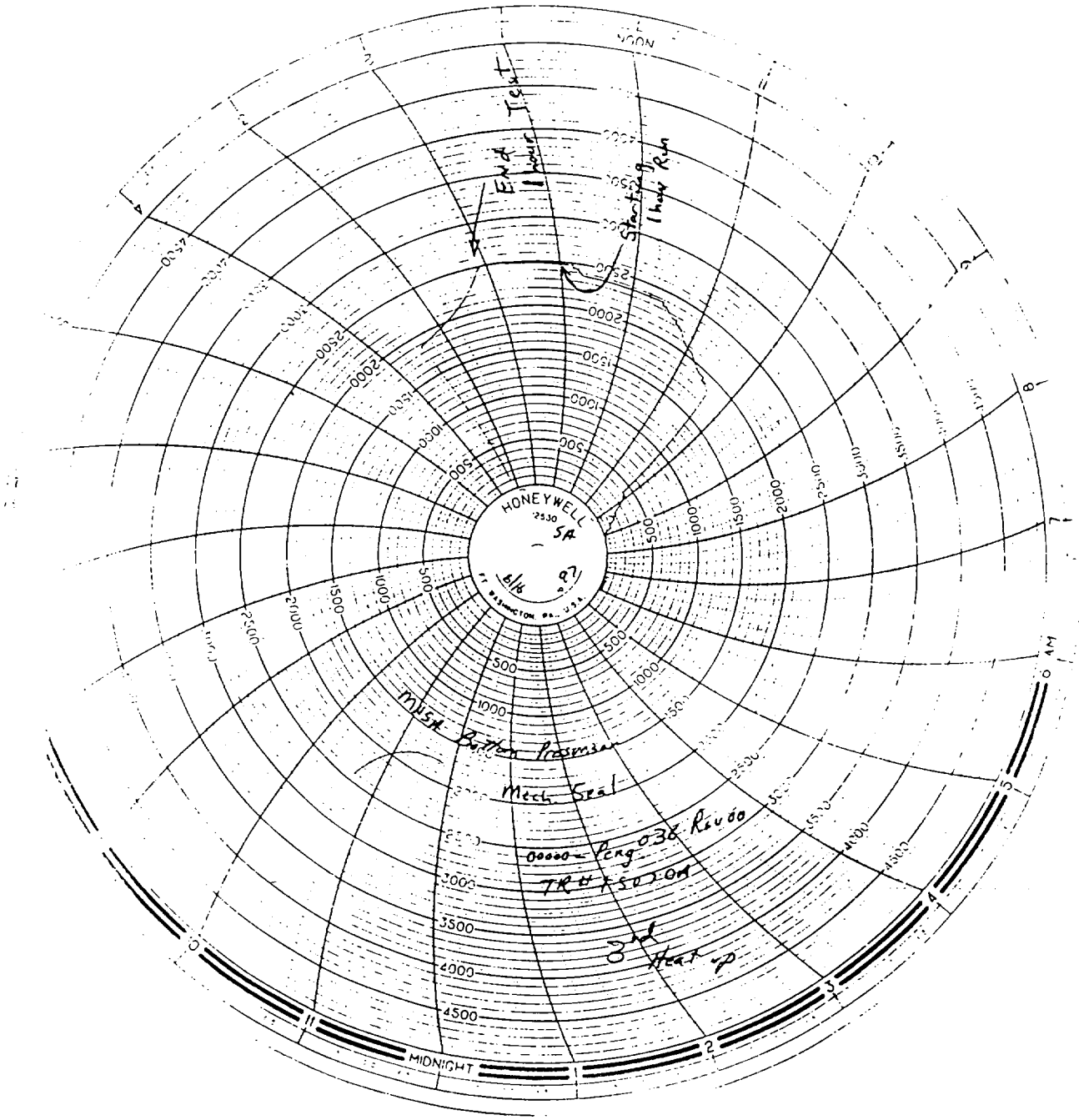
Is this data sheet continued onto another page? NO This is page 1 of 1



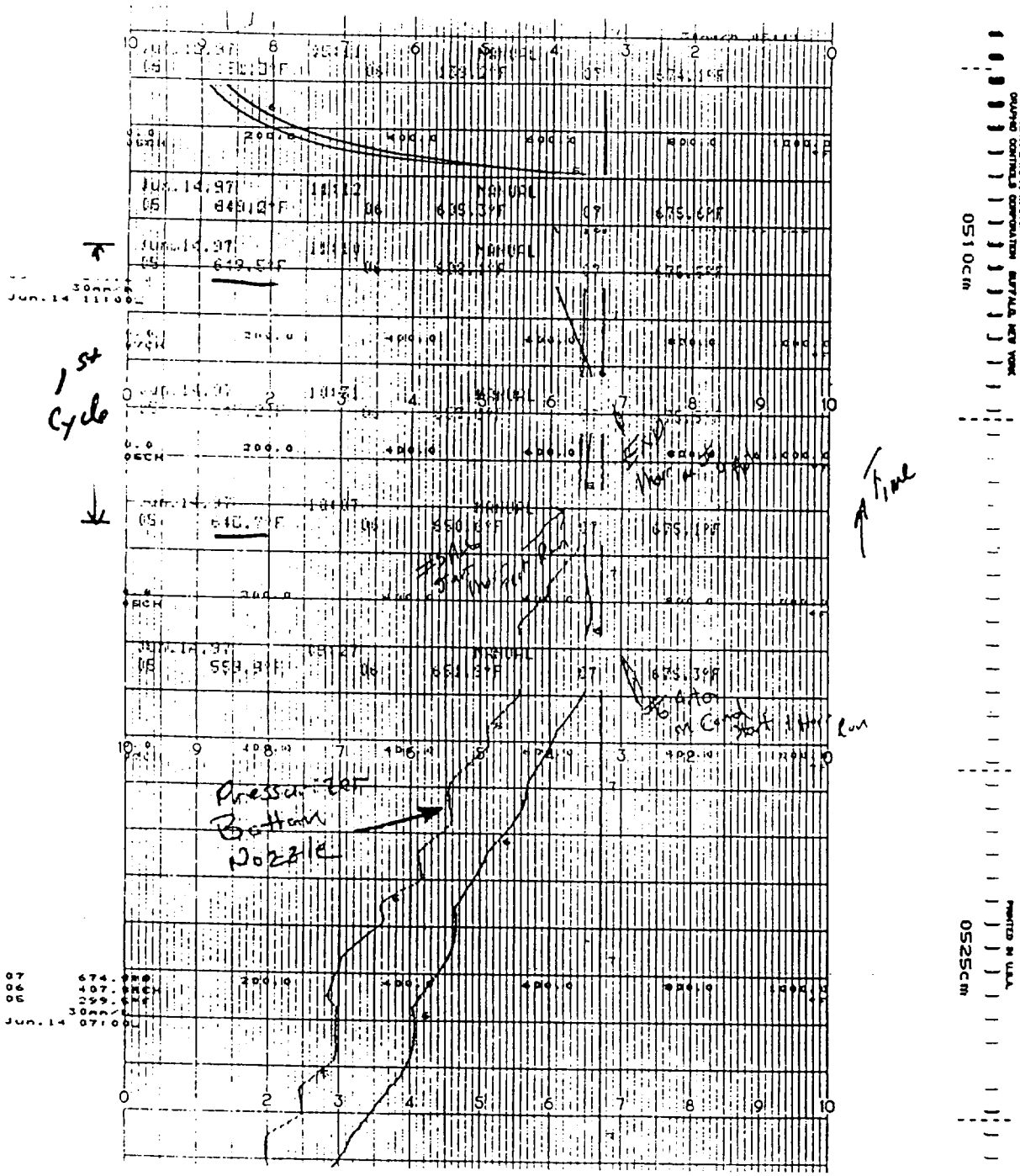
Pressure Recorder Chart. Units are Psig.



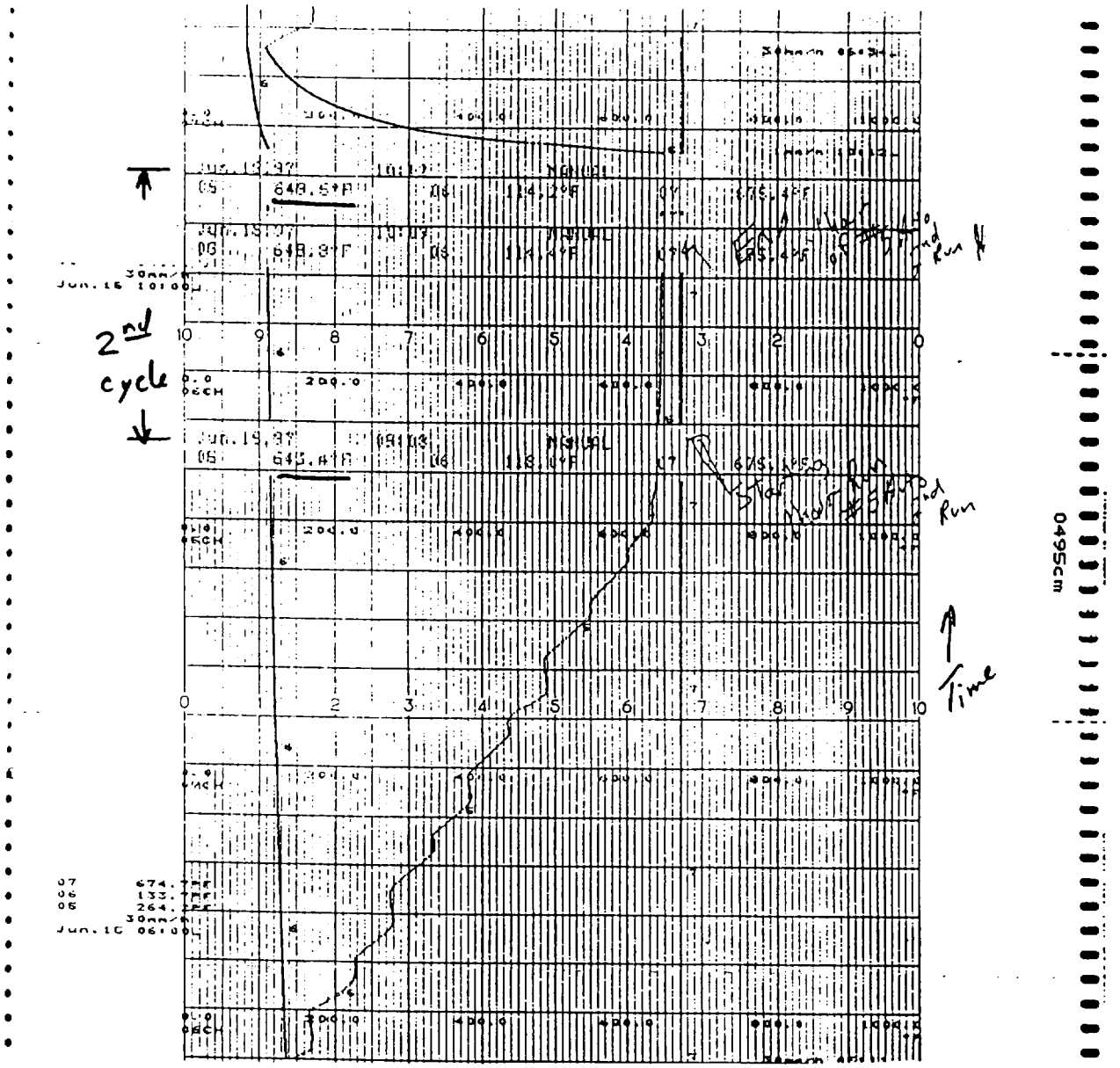
Pressure Recorder Chart. Units are Psig.



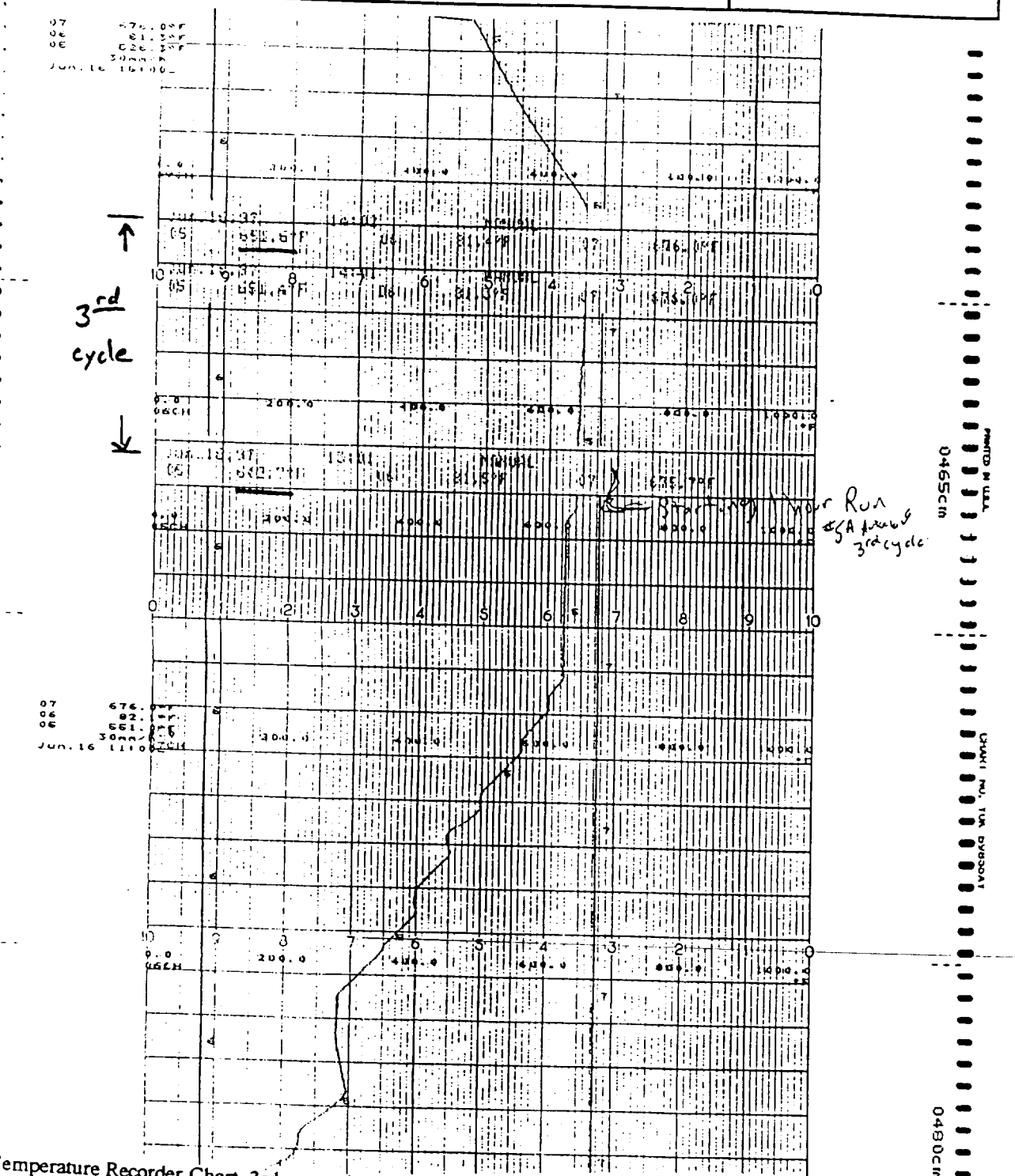
Pressure Recorder Chart. Units are Psig.



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.

Ref. Test Request TS070A Suppl. 00	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241

Data Sheet 1

General Data Sheet

ABB/C-E MNSA CLAMP SEAL VERIFICATION TEST

Seal Tested	Pressurizer Bottom Head Seal	
Observers	T Jaroszko, F. Rosano, K. Margetta, J. Tulis	Date: 6/17/97

Disassembly following hydrostatic test & thermal cycle test.
The hex nuts above the top plate were removed. The top plate was removed. The four tie rods were removed. The four hex head cap screws were removed. The upper flange plates were removed. The compression collar was pried up and out of the lower flange. There was no sign of boric acid crystals on the compression collar. The shoulder screws were removed. The lower flange plates were removed. The packing retainer was removed. There was no sign of boric acid past the graphoil seal. The shim used between the compression collar and graphoil was removed.
The test parts were returned to ESMO

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

Appendix C

CALIBRATION CERTIFICATIONS AND DATA SHEETS

ABB

NON PERMANENT

QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type: Pressure Meadu
Manufacturer Honeywell
Range Cal 0-350 psig Accuracy ± .50 psig
Mfg. Serial No. 8401-385 HA7005
C-E ID No. EL-963

Calibration Date 6/02/97
Calibration Due Date 12/02/97
Calibration Document:
[X] Procedure CMM-EID-017 Rev. 00
[ ] Manufacturer's Specifications

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
Test Gage	CL-1040		
NIST # 822/244600			

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: Auto5A Final Cal Standard used

[X] ACCEPTED [ ] REJECTED

CALIBRATED BY: F.V. Rossano/T. Tancredi
Testing Services

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

ABB

NON-PERMANENT

QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type Pressure Recorder
Manufacturer Honeywell
Cal'd Range 0-3500 psi Accuracy ± 5 psi
Mfg. Serial No. 8401-385407006
C-E ID No. EL-964

Calibration Date 6/02/97
Calibration Due Date 12/02/97
Calibration Document:
[X] Procedure 00000-ETD-017 Rev. 00
[ ] Manufacturer's Specifications

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
Test Gage	CL-1040		
NIST # 822/249620			

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.
0	0	As found	
500	450		
1000	975		
1500	1480		
2000	2000		
2500	2475		
3000	2975		
3500	3455		
2000	2000		
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: Auto GA Limited Calibration

[X] ACCEPTED [ ] REJECTED

CALIBRATED BY: F. Vasquez / J. E. Francisco

Testing Services

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

NON-PERMANENT
QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type Recorder
Manufacturer Yokogawa
Range 0-1000 °F Accuracy ±5 °F
Mfg. Serial No. _____
C-E ID No. CL-014L

Calibration Date 3/13/97
Calibration Due Date 9/13/97
Calibration Document:
[ ] Procedure _____ Rev. ___
[x] Manufacturer's Specifications TM3-07L

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
Omega Calibrator CL-20	CL1023		

NIST # 811/254990, 811/254993-95

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.
60	60.7	as found	
100	100.7		
200	200.5		
300	300.9		
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	649.9		
2	650.1		
3	650.1		
4	650.0		
5	649.9		
7	650.2		
8	650.3		

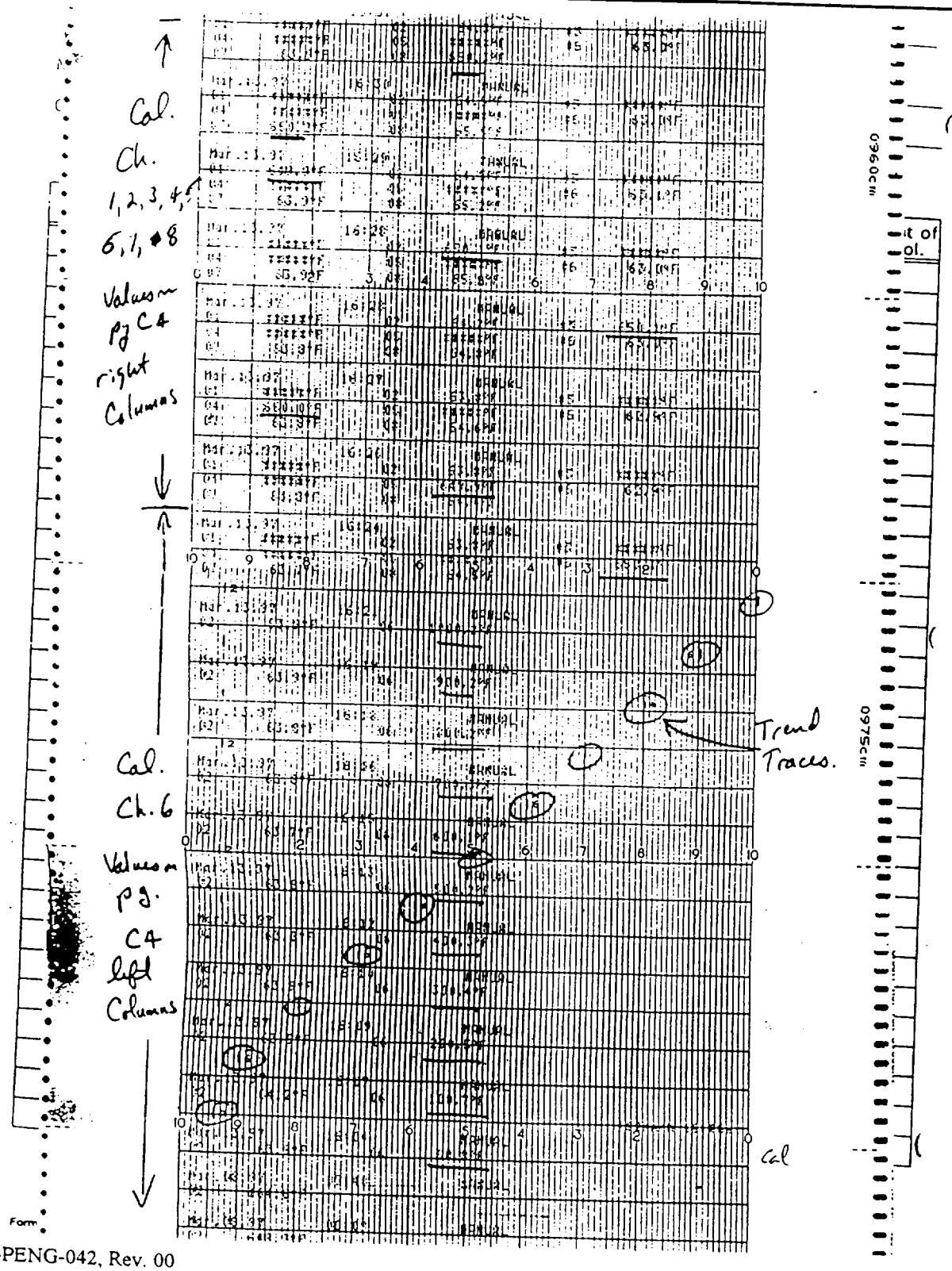
CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED.

REMARKS: Limited Type Range Calibration, Rec - 1000°F Copy of chart on pg 2

[✓] ACCEPTED [ ] REJECTED

CALIBRATED BY: _____

Testing Services


Cal.
Ch.
1, 2, 3, 4, 5, 7, & 8
Values on pg C4 right Columns
Cal.
Ch. 6
Values on pg. C4 left Columns
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Ref. Test Request TS070A	ABB/COMBUSTION ENGINEERING PRIMARY SYSTEMS	Project No. 2007241

ABB

NON PERMANENT
QUALITY RECORD
CERTIFICATE OF CALIBRATION

Instrument Type TC-Type J
Manufacturer Project's
Range Rm - 750°F Accuracy ± 9°F
Mfg. Serial No. A94-13250
C-E ID No. CL-1008

Calibration Date 5/07/96
Calibration Due Date 11/07/96 x12/11/97 HHL
Calibration Document:
[X] Procedure 00000-CID-[illegible] Rev. 00
[ ] Manufacturer's Specifications

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
Jofra Temp Calibrate	IL-680		
Analogic	IL-456		
TC Switch & Est. wire	N/A		

NIST 811/249328, 811/249057, 252613, 252187, 811/249279-92, 554389, 245109413

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.
50	49.7	as found	
150	149.6		
250	248.9		
350	349.9		
450	450.6		
550	551.0		
650	650.8		
760	760.7		
349	349.0		
250	248.9		

Standard Value	As Found	As Left	Out of Tol.

cal included 1st was lost on 6/11/97 HHL

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 Rx # 5

[X] ACCEPTED [ ] REJECTED

CALIBRATED BY: HHL
Testing Services

NON PERMANENT
QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type: Thermocouple-Type J
Manufacturer: Projects
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:
[X] Procedure aaaa-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.
Jaffa Oven	IL-680		
TC Readout	CL-1023		
TC w/in & Switch	N/A		
NIST # DN47, PM03			

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.	Standard Value	As Found	As Left	Out of Tol.
80	79.5	as found					
200	199.3						
300	300.3						
400	400.5						
500	502.2						
600	602.9						
700	702.8						
755	757.4						

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 #7 Limited calibration usage

CALIBRATED BY: F.V. Rossano

[X] ACCEPTED [ ] REJECTED

Testing Services

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

ABB

NON-PERMANENT

QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type: TC-Type J
Manufacturer: Project's
Range: Rm - 750°F Accuracy: ± 4°F
Mfg. Serial No.: 494-10902
C-E ID No.: CL-1018

Calibration Date: 5/06/96
Calibration Due Date: ~~5/06/96~~ X 12/13/97 fllll
Calibration Document:
[X] Procedure ~~xxxxx CID-xxx~~ Rev. 00
[ ] Manufacturer's Specifications

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
Jofra Temp Calibrator	IL-680		
Analogic	IL-456		
TC Switch & Ext Wire	N/A		

NIST 811/249328, 811/249059, 252613, 232187, 811/249279-92, 554369, 245109413

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.
75	74.9	as found	
150	148.0		
250	246.4		
350	346.9		
450	448.3		
550	547.1		
650	~~648.8~~	646.1 fllll	
750	745.6	✓	X

Standard Value	As Found	As Left	Out of Tol.
P,T: pn mm-CID-069, limit for std. TC's is ±5°F at 750°F			
Cal extended on first use loaned 6/13/97 fllll			

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 Rm #8 Limit Cal Range based on usage

CALIBRATED BY: fllll

[X] ACCEPTED [ ] REJECTED
Limited RM - 650°F

Testing Services

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

ABB

NON-PERMANENT QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type: Thermocouple-Type J
Manufacturer: Projects
Range: Rm-750°F Accuracy: ±5°F
Mfg. Serial No.: A94-1090L
C-E ID No.: CL-1018

Calibration Date: 6/19/97
Calibration Due Date: 12/19/97
Calibration Document:
[✓] Procedure 0000-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.
Isotech Oven	IL-680		
TC Readout	CL-1023		
TC wire & Switch	N/A		
NIST # DN47, PM03			

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.
80	79.3	as found	
200	198.6		
300	298.4		
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 #4 Limited cal based on usage

[✓] ACCEPTED [ ] REJECTED

CALIBRATED BY: F.V. Rossano

Testing Services

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

Quality Plus Inc - *Metrology Services*

ACCEPTED

CERTIFICATION OF ACCURACY

DATE 4/16/97

CUSTOMER:
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

Mech Lab #25

THE FOLLOWING TORQUE WRENCH WAS CALIBRATED PER QUALITY PLUS, INC. PROCEDURE QP-552 WITH A CONTROL DATE OF 03/31/95. IN ACCORDANCE WITH QUALITY PLUS, INC. QUALITY MANUAL, REV.8, 3-31-95. M&TE 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.

		ACTUAL RESULTS			
		AS FOUND		AFTER ADJUSTMENT	
CAL POINT		CLOCKWISE	COUNTRCLKWS	CLOCKWISE	COUNTRCLKWS
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: David F. Roy

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

ACCEPTED
DATE 5/20/97

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

PRECISION
INSPECTION, inc.

TORQUE CALIBRATION CERTIFICATE

REPORT NUMBER: 21301-2 PO Number: 45676KP

DATE OF CALIBRATION: 5/20/97

CUSTOMER: ABB Combustion Engineering

CALIBRATION
DUE DATE 11-20-97

INSTRUMENT: Torque Wrench, 150 ft/lbs.

S/N: CL-1031 MAKE: Proto 153668

	PRECENT OF RANGE				
CLOCKWISE	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 ± 1%