# NATIONAL SPENT NUCLEAR FUEL PROGRAM ENGINEERING DESIGN FILE

EDF-NSNF- 082

Revision 0

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Title: IMPACT TENSILE TESTING OF STAINLESS STEELS AT VARIOUS TEMPERATURES

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Title: IMPACT TENSILE TESTING OF STAINLESS STEELS AT VARIOUS TEMPERATURES

5. Purpose: Stainless steels are used for the construction of numerous spent nuclear fuel or radioactive material containers that may be subjected to high strains and moderate strain rates during accidental drop events. Mechanical characteristics of these base materials and their welds under dynamic loads in the strain rate range of concern (1 to 300 per second) are not well documented. However, research is being performed at the Idaho National Laboratory to quantify these characteristics.

The work presented herein discusses tensile impact testing of dual-marked 304/304L and 316/316L stainless steel material specimens. Both base material and welded material specimens were tested at -20 °F, room temperature, 300 °F, and 600 °F conditions. Utilizing a drop weight impact test machine and 1/4-inch and 1/2-inch thick dog bone-shaped test specimens, a strain rate range of approximately 4 to 40 per second (depending on initial temperature conditions) was achieved. Factors were determined (see table below for typical values) that reflect the amount of increased strain energy the material can absorb due to strain rate effects. Using the factors, elevated true stress-strain curves for these materials at various strain rates and temperatures were generated.

Strain rate (per sec.)	-20 °F	Room Temperature	300 °F	600 °F
	30	4L Stainless Stee	l	
5	1.333	1.235	1.166	1.043
10	1.361	1.278	1.210	1.094
22	1.428	1.381	1.316	1.217
25	1.445	1.407	1.342	1.247
	31	6L Stainless Stee	I	
5	1.275	1.265	1.162	1.040
10	1.296	1.281	1.187	1.070
22	1.346	1.321	1.247	1.140
25	1.359	1.331	1.262	1.158

By incorporating the strain rate elevated true stress-strain material curves into an inelastic finite element computer program as the defined material input, significant improvement in the accuracy of the computer analyses was attained. However, additional impact testing is necessary to achieve higher strain rates (up to 300 per second) before complete definition of strain rate effects can be made for accidental drop events and other similar energy-limited impulsive loads.

This research approach, using impact testing and a total energy analysis methodology to quantify strain rate effects, can be applied to many other materials used in government and industry.

The current, principal NSNFP procedures applied to this activity include the following:

- NSNFP Procedure 6.01, Review and Approval of NSNFP Internal Documents
- NSNFP Procedure 6.03, Managing Document Control and Distribution
- NSNFP Procedure 3.04, Engineering Documentation.

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# IMPACT TENSILE TESTING OF STAINLESS STEELS AT VARIOUS TEMPERATURES

WBS Number C.B.30.03.02.02.C2

March 2008

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D. K. Morton and R. K. Blandford

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This document was developed and is controlled in accordance with NSNFP procedures. Unless noted otherwise, information must be evaluated for adequacy relative to its specific use if relied on to support design or decisions important to safety or waste isolation.

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# **ABSTRACT**

Stainless steels are used for the construction of numerous spent nuclear fuel or radioactive material containers that may be subjected to high strains and moderate strain rates during accidental drop events. Mechanical characteristics of these base materials and their welds under dynamic loads in the strain rate range of concern (1 to 300 per second) are not well documented. However, research is being performed at the Idaho National Laboratory to quantify these characteristics.

The work presented herein discusses tensile impact testing of dual-marked 304/304L and 316/316L stainless steel material specimens. Both base material and welded material specimens were tested at -20 °F, room temperature, 300 °F, and 600 °F conditions. Utilizing a drop weight impact test machine and 1/4-inch and 1/2-inch thick dog bone-shaped test specimens, a strain rate range of approximately 4 to 40 per second (depending on initial temperature conditions) was achieved. Factors were determined (see table below for typical values) that reflect the amount of increased strain energy the material can absorb due to strain rate effects. Using the factors, elevated true stress-strain curves for these materials at various strain rates and temperatures were generated.

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316L Stainless Steel					
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By incorporating the strain rate elevated true stress-strain material curves into an inelastic finite element computer program as the defined material input, significant improvement in the accuracy of the computer analyses was attained. However, additional impact testing is necessary to achieve higher strain rates (up to 300 per second) before complete definition of strain rate effects can be made for accidental drop events and other similar energy-limited impulsive loads.

This research approach, using impact testing and a total energy analysis methodology to quantify strain rate effects, can be applied to many other materials used in government and industry.

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# **ACRONYMS**

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ASME American Society of Mechanical Engineers

ASTM American Society for Testing and Materials

B&PV Boiler and Pressure Vessel

CFA Central Facilities Area (at INL)

CITRC Critical Infrastructure Test Range Complex (at INL)

CMTR certified material test report

DOE U.S. Department of Energy

FY fiscal year

GV gauge volume

HRAP hot rolled, annealed, and pickled

INL Idaho National Laboratory

IRC INL Research Center

ITM Impact Testing Machine

LOP lack of penetration (pertinent to weld examination)

LVDT linear variable displacement transducer

NVLAP National Voluntary Laboratory Accreditation Program

NSNFP National Spent Nuclear Fuel Program

OAS overall average strain

OCRWM Office of Civilian Radioactive Waste Management (DOE-RW)

QA quality assurance

SNF spent nuclear fuel

UTS ultimate tensile strength

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# IMPACT TENSILE TESTING OF STAINLESS STEELS AT VARIOUS TEMPERATURES

## 1. INTRODUCTION AND PURPOSE

Most structural design acceptance criteria are stress-based. These stress-based criteria are prudent for normal operating conditions where static loading due to pressure, weight, and thermal loads dominate. Years of experience have repeatedly demonstrated that these criteria (e.g., ASME B31.1 Power Piping Code) have achieved successful designs. However, other component designs become excessively conservative when satisfying these stress-based design criteria for the high stresses typically resulting from low probability, off-normal dynamic events, such as an accidental drop. This conservatism frequently manifests itself as thicker material in an inefficient design. The downside of this inefficiency is that it can significantly elevate life cycle costs and potentially degrade structural performance over the design life of the component.

By extending the knowledge of material responses beyond the typical 'quasi-static' uniaxial tensile test behavior, the accuracy of stresses/strains predicted by finite element method (FEM) inelastic analysis computer codes for low probability (but design governing) dynamic events, such as accidental drops, can be improved. Accurate knowledge of the actual responses of components or structures to dynamic loads means improved designs, safer designs, more cost-effective designs, and better overall engineered solutions to the many national infrastructure problems at hand. Examples of dynamic loads include, but are not limited to, radioactive material container drop events, vehicle crashes, vehicle crashes into highway safety barriers or security barriers, and more. These dynamic loads typically yield strain rate responses that are greater than 0.01 per second but less than 300 per second. These moderate strain rates are higher than quasi-static tensile testing rates yet less than strain rates associated with ballistics.

In the past, full-scale component testing was the norm in evaluating the structural integrity of vehicle designs during crashes or the structural integrity and containment capabilities of spent nuclear fuel containers during accidental drop events. Methods for performing nonlinear inelastic analyses were either lacking or very approximate at best. Currently, with improved computational capabilities and software, the trend is to use nonlinear analytical methods, with limited or no actual testing, once the acceptability of the analysis methodology has been established. Improved software and analysis methodologies for performing inelastic, large deformation analyses are now common and offer numerous advantages relative to full-scale component testing, including relatively low cost analytical simulations, ease of evaluating material and design options, elimination of costs associated with actual fabrication, testing, and post-test disposal, etc. In order to rely only on an analytical approach, accurate results from methodologies and software must be demonstrated which in turn mandate a precise definition of inelastic, dynamic material properties (e.g. true stress-strain curves reflecting strain rate effects). Other variables such as temperature, welded material properties, aged material properties, and project specific conditions (if appropriate) must also be considered.

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True stress-strain curves at elevated strain rates (in the range of 1 to 300 per second) are not readily available. Additionally, most published material data do not consider variables such as: full uniform strain range; varying strain rates; temperature; specific material composition and specification; welded material properties; or aged material properties (if appropriate), especially in combinations.

Most metals tend to get stronger as the rate of straining increases. Taking advantage of this phenomenon is desirable when designing for low probability dynamic events. The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section III, Division 1, Appendix F (Reference 1) contains rules for performing inelastic (large deformation) analyses. Paragraph F-1322.3(c) permits the adjustment of the stress-strain curve to include strain rate effects resulting from dynamic behavior (e.g., during drop events). However, these code rules also mandate the justification of that adjusted stress-strain curve. Therefore, it is imperative to perform material impact testing in order to provide the necessary justification for using these strain rate elevated true stress-strain curves for inelastic analyses that invoke this Code. The phrase "strain rate elevated" refers to the fact that the strain rate effects on a stress-strain curve reflecting dynamic loading raises the curve upward (higher strength) when compared to a stress-strain curve reflecting quasi-static conditions.

The development of beyond-yield-strength true stress-strain curves of commonly used construction materials, addressing both strain rate and temperature effects is necessary to achieve accurate analytical results. In order to begin to consider these variables, the Department of Energy's (DOE) National Spent Nuclear Fuel Program (NSNFP), working with the Office of Civilian Radioactive Waste Management (OCRWM), and the Idaho National Laboratory (INL), has supported an initial effort into the study of strain rate phenomena. This first phase of material impact testing considered 304/304L and 316/316L dual-stamped stainless steel (hereafter referred to as 304L and 316L, respectively). Both base and welded materials at -20 °F, room, 300 °F, and 600 °F temperatures were tested at strain rates between 4 and 40 per second. The strain rates achieved during impact testing were dependent on the temperature of the material as well as the amount of energy imparted to the material. This report addresses the first phase of completed testing. Higher strain rates of interest (40 to 300 per second or more) at the same temperature conditions, using test specimens from the same material heats and welds must be investigated in the future in order to span the entire range of strain rates of interest.

The objective of this research effort was to improve understanding of the strain rate phenomenon by experimentally studying the mechanical properties of candidate materials subjected to impact loading. The purpose of this task was to determine strain rate effects for 304L and 316L stainless steel material under dynamic, impact loading at various cold and hot temperatures. The goal is to ultimately develop true stress-strain curves reflecting various strain rates and temperatures for many materials and provide justification of each strain rate elevated true stress-strain curve. The test data developed can be used to establish an analysis methodology that can then be applied in analytical simulations to more accurately predict the deformation and resulting material straining in the components being evaluated that are subject to dynamic, impulsive loads. The long-term goal is to develop sufficient data to provide clear and distinct guidance regarding impact analysis methodologies and how engineering personnel can perform these analyses and obtain viable results without needing to perform confirmatory testing. This work can also help establish strain-based acceptance criteria for these events.

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## 2. QUALITY ASSURANCE

This document was developed and is controlled in accordance with NSNFP procedures. Unless noted otherwise, information must be evaluated for adequacy relative to its specific use if relied on to support design or decisions important to safety or waste isolation.

The NSNFP procedures applied to this activity implement DOE/RW-0333P, *Quality Assurance Requirements and Description* (Reference 2), and are a part of the NSNFP QA Program (Reference 3). The NSNFP QA Program has been assessed and accepted by representatives of the Office of Quality Assurance within the Office of Civilian Radioactive Waste Management for work scope of the NSNFP.

The current, principal NSNFP procedures applied to this activity include the following:

- NSNFP 6.01, Review and Approval of NSNFP Internal Documents (Reference 4),
- NSNFP 6.03, Managing Document Control and Distribution (Reference 5),
- NSNFP 3.04, Engineering Documentation (Reference 6).

# 2.1 Quality Requirements

The material testing effort described in this report was required to satisfy the NSNFP Quality Assurance Program. This required the generation of a test plan, establishment of agreements for quality-affecting activities that the NSNFP could not perform, initiation of laboratory (or scientific) notebook usage during the research effort, and documentation of the material testing effort with a final report.

As identified in NSNFP Procedure 11.01 (Reference 7), a test plan prescribes the requirements, controls, and documentation necessary for testing conducted within the NSNFP. The test plan is to provide background information and objectives, identify test requirements, describe the test methodology, specify the test equipment, software, and procured services, state the applicable acceptance criteria, describe the test procedure, and identify the information necessary for the test documentation. If any quality-affecting services need to be procured, NSNFP Procedure 4.02 (Reference 8) describes the process for acquiring government sector services for the NSNFP, including generating a NSNFP Task Management Agreement document. A Task Management Agreement is written to clarify the NSNFP needs, identify any technical requirements, specify deliverables, and discuss other issues required of the provider of the outside services. The providers sign the Task Management Agreement, clearly indicating their awareness of what is required of them.

Regarding the documentation of technical information during actual impact testing, NSNFP Procedure 3.04 identifies the requirements for creating and using a laboratory notebook. Pertinent impact test data were recorded in the laboratory notebook. Additional test data (such as quasi-static tensile test results or voluminous deformation history data) were generated during the research effort but were placed into separate binders (referenced in the laboratory notebook) and are considered part of the laboratory notebook documentation. During periods of test activity, the laboratory notebook was reviewed at approximately monthly intervals by a

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cognizant person (other than the individual filling in the notebook). This laboratory notebook was submitted to the NSNFP to be retained as a quality assurance (QA) record.

The personnel performing the material impact research had ten years or more of engineering experience in structural evaluations and were trained per NSNFP Procedure 2.04 (Reference 9). Software used to perform finite element analysis comparisons to test specimen result met NSNFP 19.01 (Reference 10). Software used to evaluate test data (by performing simple mathematical functions such as adding, multiplying, or integration similar to those capabilities on a handheld calculator) were confirmed with sample problem checks or reviewed like an engineering calculation and reported on in the final documentation (this report). This final test report followed the requirements of NSNFP Procedure 6.01.

Although INL's Consumer Grade – Quality Level 4 process (currently referred to as Commercial Grade – Quality Level 3) was used to procure test specimen materials, ASME Section III approved materials with certified material test reports (CMTRs) were purchased. For confirmation, material samples were tensile tested to verify the CMTR data and to establish the material quasi-static stress-strain curves used by this strain rate research effort.

# 2.2 Services Provided By Outside Suppliers

Certain services not addressed by the NSNFP QA Program needed to be provided by outside suppliers in order for this investigation to proceed. As such, five different activities (addressed in the following subsections) were considered to be quality-affecting. These activities included: (1) welding and weld examination services for the welded plates; (2) calibrating the measuring devices used to determine pre-impact test specimen measurements and post-impact deformations; (3) providing properly controlled hardware and software to perform computer evaluations to predict resulting test specimen deformations; (4) performing confirmatory dimensional measurements of test specimen gages and post-impact test specimens; and (5) determining quasi-static tensile material property (stress-strain) data. These quality-affecting activities were supplied by the INL as detailed in two NSNFP Task Management Agreement documents, DOE/SNF/TMA-009, Revision 1 (Reference 11) for welding and weld examination services and DOE/SNF/TMA-013, Revision 1 (Reference 12) for the remaining four services. Test Plan DOE/SNF/PP-039, Revision 8 (Reference 13) also discussed these quality-affecting activities.

# 2.2.1 Welding and Weld Examination Services for Welded Plates

Welding and weld examination services were quality-affecting activities that could not be performed by the NSNFP. Therefore, these activities were performed by a qualified supplier, the INL. This service is discussed in Section 2.3.3 of the Task Management Agreement DOE/SNF/TMA-009. The INL prepared the welded plates (from which test specimens were cut) for dynamic testing in support of Test Plan DOE/SNF/PP-039. The welded plates incorporated the weld joint design anticipated for the Standardized DOE Spent Nuclear Fuel Canisters. Full volumetric radiographic examinations were performed on the completed welds to verify the integrity of the welds prior to dynamic load testing. Examination reports, weld wire material certifications, and the INL Laboratory Notebooks (Reference 14) were submitted to the NSNFP.

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## 2.2.2 Calibration Services

The NSNFP required the services of the INL to initiate or maintain calibration and the associated documentation for specific NSNFP-identified measuring devices, including but not limited to: micrometers, calipers, load cells, accelerometers, etc. Calibration was performed in accordance with INL procedures. The Test Plan (DOE/SNF/PP-039) specified the project-defined minimum accuracy required for particular NSNFP measuring devices.

The basis for acceptance of calibration services included the calibration labels applied directly to each measuring device (or provided to the NSNFP test personnel for those items where affixing a label was not viable) and the applicable calibration sheet(s). These calibration sheets were made available to the NSNFP test personnel as each measuring device completed calibration prior to use. The INL maintains qualification records for all personnel providing calibration services. The NSNFP test personnel retained applicable calibration sheets for NSNFP record keeping.

# 2.2.3 Computer Support Services for Validated Software

The NSNFP required computer hardware/software services of the INL to provide a computing environment for running the ABAQUS/Explicit software. The ABAQUS/Explicit software was already installed on the identified compute server 'Aurora'. In order to provide adequate documentation in compliance with NSNFP procedures (NSNFP 19.01), the NSNFP performed its own installation test and validation of ABAQUS/Explicit on the hardware and operating system software configuration identified. Any subsequent changes made by the INL that altered the hardware configuration, the operating system software configuration, or the ABAQUS/Explicit software (e.g., adding software updates) would likely nullify the NSNFP software validation. Therefore, the NSNFP requested that the INL maintain a hardware configuration, an operating system configuration, and an ABAQUS/Explicit software configuration (i.e., specific version of the software) for a reasonably long period of time (ideally one year or more). The NSNFP required early notification of any software or hardware configuration changes or scheduled or unexpected maintenance needs that the INL performed so that the impact of any such changes could be evaluated. ABAQUS/Explicit was revalidated prior to continued use after any such configuration changes.

Because the NSNFP performed its own validation and verification of software (e.g., ABAQUS/Explicit) per NSNFP 19.01, compliance with INL procedures associated with software verification and validation were not required. No additional technical requirements beyond those specified by INL procedures, applicable to computer systems operated by the INL are required by the NSNFP.

# 2.2.4 Confirmatory Dimensional Measuring Services

The NSNFP required the services of the INL to implement the INL Quality Assurance Program requirements for Quality Engineering and Inspection activities. Those activities included dimensional measurements on NSNFP-provided test components or impact test specimens. The Test Plan DOE/SNF/PP-039 provided details and requirements with respect to dimensional measurements to be performed by INL Quality Assurance personnel. Sketches, drawings, data sheets, or specifications were provided by the NSNFP to supplement the Test Plan. Measuring devices used were calibrated by the INL Standards and Calibration Laboratory.

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Measurement documentation was provided to the NSNFP test personnel at the completion of the measurement efforts.

The correct dimensional measurement of the test specimens before and after impact testing was significant to the success of this investigation. NSNFP test personnel measured the test specimens before and after impact testing. Pre-test measurements included the use of go/no go gages. Plexiglas templates, referred to as go/no go gages, were developed so that quick, accurate checks of the overall test specimen geometry could be made. These go/no go gages were measured by a qualified INL dimensional inspector and accepted for use by the NSNFP test personnel based on those INL measurements. Pre- and post-test measurements of test specimens were performed by NSNFP test personnel using calibrated calipers. However, to demonstrate the validity of these measurements, post-test measurements of identified impact test specimens were also taken by a qualified INL dimensional inspector.

# 2.2.5 Quasi-Static Tensile Testing Services

The NSNFP required the services of the INL to perform material quasi-static tensile testing at varying temperatures in the range of -20 °F to 600 °F. The goal was to obtain sufficient data to adequately plot the quasi-static true stress-strain curve up to test specimen failure. Test Plan DOE/SNF/PP-039 provided details and requirements with respect to this material tensile testing effort. Basic testing requirements were to follow ASTM Standard A 370 (Reference 15), excluding any identified reporting requirements. Sketches, drawings, data sheets, or test requirements were provided by the NSNFP to supplement the Test Plan as appropriate. The tensile test device and any other associated instrumentation providing pertinent data were calibrated by the INL Standards and Calibration Laboratory. NSNFP test personnel or other personnel supporting the NSNFP witnessed the material tensile testing process.

For material initially procured to investigate room temperature strain rate effects in 2004, the quasi-static tensile testing was performed by the Materials Testing Laboratory located at the central facilities of the INL (at CFA-602). The NSNFP Program Applicability Evaluation PAE-010 (Reference 16) provided details of how this INL National Voluntary Laboratory Accreditation Program (NVLAP) qualified supplier would perform this service.

The quasi-static material tensile testing performed in 2006 and 2007 for material procured to investigate strain rate effects at varying temperatures was performed at a laboratory located at the INL Research Center (IRC). This service is discussed in Task Management Agreement DOE/SNF/TMA-013. Since the cognizant laboratory personnel at IRC did not have NVLAP accreditation, personnel associated with the Materials Testing Laboratory provided oversight to assure compliance with ASTM A370 requirements. Material data obtained [continuous force-strain (or displacement) data through test specimen failure] was provided to the NSNFP at the completion of the tensile tests. The equipment used for this quasi-static tensile testing was calibrated through the INL Standards and Calibration Laboratory and documented in the INL Laboratory Notebook LAB-771 (Reference 17) submitted to the NSNFP for record retention.

# 2.3 Computer Program Validation and Configuration Management

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Several activities used in this task to evaluate and operate on test data incorporated computer programs including I-DEAS (Reference 18), ABAQUS/Explicit, Version 6.6-3 (Reference 19), DADiSP 2002 (Reference 20), a collection of EXCEL spreadsheets referred to herein as NSNF/MED/017, Revision 1 (Reference 21), and digital motion analysis software used in conjunction with the high-speed digital camera.

#### 2.3.1 I-DEAS Software

The I-DEAS Master Series solid modeling computer program was used to create the finite element models of the physical impact tests. A solid model was created first, and then used to generate the finite element model. The following is a summary of the configuration management for I-DEAS. I-DEAS was not used for the calculations – only for modeling purposes. Model verification was performed using ABAQUS/Explicit, Version 6.6-3.

Program Used: I-DEAS 10 NX Series

Computer Used: Dell Precision 450, U.S. Govt. ID 374043

# 2.3.2 ABAQUS/Explicit Software

The computer program ABAQUS/Explicit, a linear and nonlinear finite element analysis software package that is widely used in many industries, was employed to calculate the response of the test specimen model to the impact test events. The ABAQUS/Explicit analytical results were compared to the measured experimental data. Version 6.6-3 was the NSNFP validated version (Reference 22). The following is a summary of the configuration management and validation performed for ABAQUS/Explicit.

Program Used: ABAQUS/Explicit Version: 6.6-3

Computer Used: SGI Model: Altix 4700 (Aurora)

# **Verification Manual/Test Problem Manual/Example Manual:**

ABAQUS Example Problems Manual, Version 6.6, ABAQUS, Inc.,

Providence, Rhode Island, 2006. (Reference 23)

## **NSNFP Validation:**

Software Report For ABAQUS/Explicit Version 6.6-3, DOE/SNF/REP-107,

Rev. 0, November 2006. (Reference 22)

#### 2.3.3 DADISP 2002 Software

DADiSP 2002 (hereafter referred to as DADiSP) is a technical data analysis and display program that was used to reduce, manipulate, operate on, and plot test data using mathematical functions in a spreadsheet type environment. Therefore, a complete verification and validation

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effort was not deemed necessary. However, insight into the validity of DADiSP results was important. Hence, an effort to verify the specific functions used in DADiSP for this report was completed. Verification of the DADiSP integration functions used in this task is contained in Appendix A.

Program Used: DADiSP 2002

Computer Used: Dell M50 Portable Workstation, U.S. Govt. ID 371849

Dell Precision 470 Workstation, U.S. Govt. ID 384252

#### 2.3.4 Excel Software

The collection of Excel spreadsheets used to gather test data, generate stress-strain curves, and calculate the strain rate factors have been processed per the requirements of NSNFP Procedure 19.01. Rather than a verification/validation effort as was done for ABAQUS/Explicit, these spreadsheets were checked just as an engineering hand calculation would be checked. Appendix B identifies the author that generated each spreadsheet and the reviewer of each spreadsheet (including the reviewer's signature).

Software Used: Excel 2003

NSNFP Assigned Identifier: NSNF/MED/017, Revision 1

Computer Used: Dell M50 Portable Workstation, U.S. Govt. ID 371849

Dell Precision 470 Workstation, U.S. Govt. ID 384252

## 2.3.5 Digital Motion Analysis Software

The recording of high-speed digital camera image data and motion analyses were performed with software that was provided with the high-speed digital camera. Only the high-speed digital camera's frame rates could be calibrated (for accurate timing). Since the image data is dependent on each unique camera view, it was not possible to validate the camera software ahead of time. However, the camera digital image was scaled prior to motion analysis to the specimen's measured gauge length between marked points on the test specimen. Additionally, for accuracy checking purposes and following the motion analysis, the final camera determined strain value was compared to the final strain value determined from test specimen measurements made with a calibrated caliper. See Section 6.5.1 for additional details.

Software Used: Photron Motion Tools, Version 1.2.0

Photron Fastcam Viewer, Version 2.4.3.8

Computer Used: Dell M60 Portable Workstation, U.S. Govt. ID 376246

Dell Precision 470 Workstation, U.S. Govt. ID 384252

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## 3. REPRESENTATION OF STRESS-STRAIN BEHAVIOR

In a one-dimensional quasi-static tensile test, a uniform slender test specimen is stretched (ends displaced at a constant rate) along its long central axis. Such testing follows the requirements of ASTM A 370. The results are plotted as a force versus displacement curve, which is a representation of the performance of the test specimen material. From this force-displacement curve, engineering stress-strain and true stress-strain curves can be produced using classical engineering relationships.

The term quasi-static is sometimes applied to this 'static' test since a significant length of time and slow strain rate  $(10^{-5} \text{ to } 10^{-2} \text{ per second})$  are involved in performing the uniaxial tensile test. Strain rate behavior is defined as the difference in strength of a stress-strain curve produced under dynamic loading conditions compared to its quasi-static curve.

# 3.1 Quasi-Static Tensile Testing

Stress-strain curves are usually presented as:

- 'Engineering' stress-strain curves, in which the original specimen cross-sectional area is used to determine stress and the change in length divided by the original length determines strain,
- 'True' stress-strain curves, where the instantaneous cross-sectional area of the specimen is used to determine the stress and the strain.

To document a quasi-static tensile test, an engineering stress-strain curve is developed from the load-displacement measurements made during the test on the test specimen (Figure 1, typical for ductile material). The engineering stress, S, plotted on this curve is the average longitudinal stress in the tensile specimen obtained by dividing the load, P, by the original specimen area,  $A_o$ . The engineering strain, e, plotted on the curve is the average linear strain obtained by dividing the change in gauge length,  $\Delta L$ , of the specimen by the original length,  $L_o$ .

$$S = P / A_o$$
$$e = \Delta L / L_o$$

The elastic limit, shown as point B in Figure 1, is the greatest stress the material can withstand without measurable permanent strain remaining after complete release of load. The yield strength, shown as point YS in Figure 1, is the stress required to produce a small, specified amount of inelastic deformation. The usual definition of this property is the offset yield strength determined by the stress corresponding to the intersection of the linear elastic segment of the stress-strain curve offset by a specified strain of 0.2% (e = 0.002). The tensile strength, or ultimate strength,  $S_u$ , is the corresponding stress where the maximum load that the material can withstand occurs. This also corresponds to the point where the specimen becomes unstable (onset of necking) and necks down during the remaining course of the tensile test. Necking is the point of rapid, localized reduction of cross-sectional area of a specimen under tensile loading. It is disregarded in calculating engineering stress but is taken into account in determining true stress. Complete fracture (failure point) of the specimen follows necking.

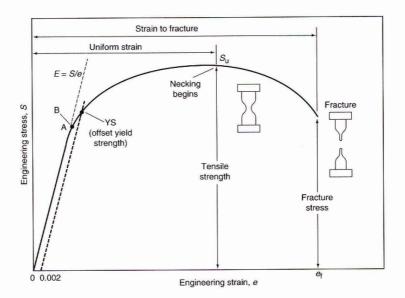


Figure 1. Typical engineering tensile stress-strain curve [from the Atlas of Stress-Strain Curves (Reference 24)].

The engineering stress-strain curve does not give the most accurate indication of the deformation characteristics of a material because it is based on the original specimen dimensions that actually change continuously during the test. Also, at the point of ultimate load, necking begins and the cross-sectional area of the specimen decreases rapidly and the load required to continue deformation lessens, as implied in Figure 1. The average stress based on the original area likewise decreases, and produces the downturn in the engineering stress-strain curve beyond the point of maximum load. In reality, the material continues to strain harden to fracture, so that the stress required to produce further deformation should also increase. If the true stress, based on the actual cross-sectional area of the specimen is used, the stress-strain curve increases continuously to fracture. If the strain measurement is also based on instantaneous measurement, the curve obtained is the true stress-strain curve as illustrated in Figure 2. The true stress-strain curve is also known as the flow curve, because it represents the basic plastic-flow characteristics of the material. The true stress is often referred to as the flow stress.

Up to the point of necking, the true stress,  $\sigma_t$ , may be expressed in terms of engineering stress by:

$$\sigma_t = S(e + 1)$$

Up to the onset of necking, the true strain,  $\varepsilon_t$ , may be determined from the engineering strain, by:

 $\varepsilon_t = \ln (e + 1)$ , where  $\ln is$  the natural  $\log e$ 

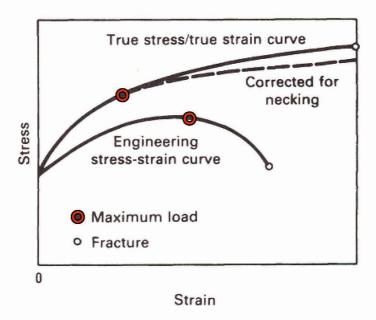


Figure 2. Comparison of engineering and true stress-strain curves [from the *Atlas of Stress-Strain Curves*].

Beyond the point of maximum load (necking), the true strain is based on the actual current area, A, and is expressed:

$$\varepsilon_t = \ln (A_o/A)$$

and the true stress is based on the load and actual current area:

$$\sigma_t = P/A$$

At the point of fracture, the true strain  $(\varepsilon_t)$  and true stress  $(\sigma_t)$  are thus expressed:

$$\varepsilon_t = \ln (A_o/A_f)$$
 and  $\sigma_t = P_f/A_f$ 

where A<sub>f</sub> is the area at fracture and P<sub>f</sub> is the load at fracture.

The true stress-strain curve beyond the onset of necking (the maximum load or uniform strain limit) is further complicated by the development of radial and hoop stresses in the necking region. The average axial or nominal stress given by  $\sigma_t = P/A$  is not the true equivalent uniaxial stress because the hoop and radial stresses are not zero. Beyond necking, the nominal stress is often corrected to get the true equivalent uniaxial stress using a Bridgman Correction factor (Reference 25), which is dependent upon specimen geometry (corrected shape in Figure 2).

# 3.2 Typical Variations In Material Properties

Reference 26 provides indications (also listed in Table 1 of this report) of the variation in material property data typically achieved in standard engineering tests [i.e., results of identical tests performed on identical specimens fabricated from one specific heat<sup>1</sup> and material

<sup>&</sup>lt;sup>1</sup> Heat – A unique identifying number assigned to the product of one furnace melt.

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specification (plate, bar, etc.)]. These typical coefficients of variation basically indicate that even quasi-static tensile testing, which is considered more controllable than dynamic material impact testing, still has a considerable variation in the test data results. Variation is also expected from the dynamic impact tests. However, if dynamic material impact testing can be limited to this same level of variation or less (as evidenced by the accuracy of the analysis comparisons), the impact test results should be considered just as valid and useable as other standard material property test results.

Table 1. Typical Coefficients of Variation.

Variable	Typical Variance (%)
Yield strength of metals	7
Ultimate strength of metals	5
Modulus of elasticity of metals	5
Fracture toughness of metals	15
Tensile strength of welds	10

#### 3.3 Strain Rate Effects

Strain rate is simply the time rate of straining. Average strain rates for most quasi-static tensile tests range between 10<sup>-2</sup> and 10<sup>-5</sup> per second. Greater strain rates (10<sup>-1</sup> to 10<sup>2</sup> per second and higher) are considered dynamic tests. The literature generally indicates that steels experience an elevation or increase in strength relative to the quasi-static stress level as the strain rate increases; however, the amount of increase is not well defined for many materials and strain rates. The effects of strain rate are generally expressed as an increase in strength relative to the quasi-static stress-strain curve. This report focuses on determining and justifying true stress-strain curves that reflect strain rates ranging from 4 to 40 per second (nominally) for both 304L and 316L base and welded material at varying temperatures.

# 3.4 Recognition of Energy Density in True Stress-Strain Curves

It is recognized that the "area under the [engineering] stress-strain curve represents energy absorption per unit volume ... of material" (Reference 27). When looking at the associated true stress-strain curve, the significant area under the curve beyond the uniform strain limit might be interpreted as implying that a substantial amount of energy absorption capacity is available. However, this 'area' is actually strain energy density (e.g., in.-lb./in.<sup>3</sup>) and the energy absorption capacity is a function of the volume of material straining. Figure 3 shows an engineering stress-strain curve, the corresponding true stress-strain curve, and the uniform strain limit for a representative stainless steel at room temperature. Figure 4 illustrates the volume of stainless steel material being strained during a typical tensile test with respect to the uniform strain limit. Up to the uniform strain limit, the full volume of material in the test specimen gauge (or reduced area) length is being uniformly strained. Past the uniform strain limit, the material starts to neck, involving only a local and greatly reduced amount of material volume contained within the necking region. In fact, the volume of material involved is constantly decreasing as the strain increases. Figure 4 illustrates that the area under the true stress-strain curve beyond the uniform strain limit cannot be used to determine energy absorption capacity without knowing just how much material volume is being locally strained. Viewing the true stress-strain curve from this 'energy density' perspective is necessary in understanding that there really is only a

limited amount of energy absorption capacity remaining in the material strained beyond the uniform strain limit. The constantly reducing volume of involved material is also the reason why it is difficult to quantify strain rate effects beyond the uniform strain limit. Since this report is attempting to generate data to support engineering design efforts, limiting the test strains to below the uniform strain limit (the onset of necking) is reasonable.

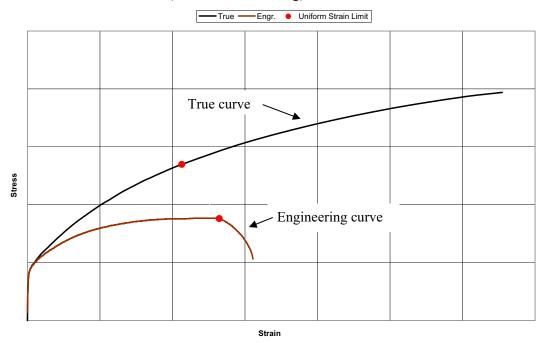


Figure 3. Representative engineering and true stress-strain curves.

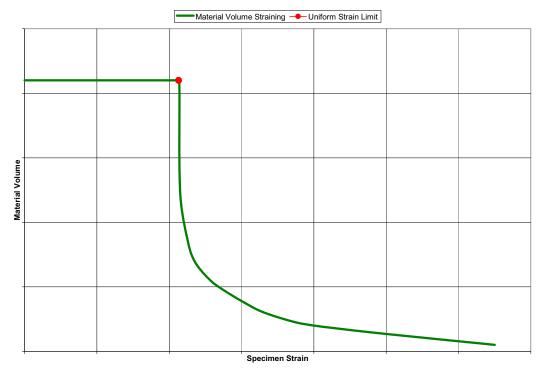


Figure 4. Representation of material volume involved in straining during tensile testing.

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#### 4. METHODOLOGY

In order to generate a true stress-strain curve at a specified strain rate, classical engineering mechanics (incorporating conservation of energy and momentum methods) are used. A drop weight device is employed to perform dynamic impact testing at increased strain rates. The energy transferred to the test specimen and causing the tensile deformation is determined assuming an inelastic collision of the drop weight and the test specimen holder. Some kinetic energy is lost during the inelastic impact. This loss is accounted for by applying the reduced velocity predicted by conservation of momentum theory to the combined mass of the drop weight and impact driver when determining the total energy imparted to the test specimen. Energy losses due to other causes are considered negligible.

A 'total impact energy method' was developed using the concept that the area under a true stress-strain curve (up to the uniform strain limit – the strain at the onset of necking) is equivalent to the amount of energy (strain energy) that the test specimen gauge length volume of material can absorb up to a specific strain level achieved in the material. The total impact energy method develops a strain rate elevated true stress-strain curve by multiplying each stress point (beyond yield) on the quasi-static curve by a constant (referred to as the 'factor'). This factor is the ratio of the impact energy (as described above) absorbed by the test specimen's gauge length volume (e.g., in.-lb./in.³) divided by the area under the quasi-static true stress-strain curve up to the true strain achieved in the impact test specimen. Elevated true stress-strain curves (reflecting strain rate effects) produced using this methodology are considered valid up to the uniform strain limit of the material. Future testing and analysis efforts may better define the curve between the uniform strain limit and failure.

Incorporating the total impact energy method described above, the strain rate elevated true stress-strain curve development effort used a multi-step process summarized as follows:

- 1. **Perform Quasi-Static Tensile Testing Section 5:** Obtain the quasi-static true stress-strain curve(s) of the material(s) under consideration. This is the basis for characterizing the strain rate effects.
- 2. **Perform Impact Tensile Testing Section 6:** Determine the response of test specimens subjected to impact tensile testing. This effort provides the test specimen strain, at a specific rate, when subjected to an impact from a known weight dropped from a known height, in a known test apparatus.
- 3. **Quantify Strain Rate Effects Section 7:** Calculate the factors, establish a reasonable curve fit, and then generate the associated strain rate elevated true stress-strain curves. This effort invokes the methodology briefly described above. Once the factor (for a specific strain rate at a specific temperature) is calculated, the quasi-static curve is used to generate the elevated true stress-strain curve.
- 4. **Perform Analyses for Data Validation Section 8:** Using the strain rate elevated true stress-strain curves as input, perform FEM inelastic analyses of the impact tensile tests to determine the validity of the test data. This effort uses the strain rate data generated to determine its computational effectiveness.

The following sections address each of the above four steps in greater detail.

## 5. QUASI-STATIC TENSILE TESTING

Strain rate effects are best characterized by comparison to quasi-static tensile test results, expressed as true stress-strain curves. Although 304L and 316L stainless steel materials have been studied for many years and by numerous investigators (e.g., References 28-31), relatively little recent, representative data reflecting current commercial supplier practices and dualstamping is readily available to practitioners. Even less data expressed as true stress-strain relationships out to failure can be found in the literature. Accurate quasi-static stress-strain data were needed for each unique material heat at each temperature to be investigated. To support this moderate strain rate research, considerable quasi-static tensile testing was required. This testing has resulted in a significant amount of basic material data recorded as engineering stressstrain curves and their converted true stress-strain relationships. The results of this quasi-static testing effort, besides establishing an initial basis for the strain rate research, has the added benefit of contributing to the existing data pool for these materials and make the data more readily available to other researchers, engineers, and interested parties. Typical stress-strain values are often of interest for failure analyses and integrity evaluations associated with low probability, extreme loading conditions. Reference 32 provides additional information on this quasi-static testing effort, including resulting material yield strength, ultimate strength, ultimate strain, fracture strength, fracture strain and reduction in area values.

The quasi-static tensile testing discussed herein was conducted in accordance with ASTM procedure A 370 on 304L and 316L stainless steel plate materials at temperatures ranging from -20 °F to 600 °F. Two plate thicknesses, ten different material heats, and both base and welded material were investigated. NSNFP test personnel were present at all quasi-static tensile testing efforts even though INL personnel were performing the actual testing. This provided important background knowledge and confirmed that the testing performed was appropriate.

Efforts to conduct strain rate research began in 2004 and tensile material properties were required of the materials being investigated. Since the initial effort was to consider room temperatures only, quasi-static tensile testing of 304L and 316L specimens was performed by the Materials Testing Laboratory located at the central facilities of the INL (at CFA-602). This laboratory had National Voluntary Laboratory Accreditation Program (NVLAP) credentials. Because this report incorporates some of the impact testing performed in the initial effort, this report will describe the various aspects addressed in the quasi-static tensile testing for that material. This quasi-static tensile testing effort will be referred to as 'Initial Testing'.

After the initial phase of impact testing, funding was provided to impact test base and welded materials at varying temperatures. Because this called for many impact tests and different test specimen geometries, additional plate material was procured and more quasi-static tensile testing was required. This set of quasi-static tensile testing was performed at the INL Research Center (IRC), located in Idaho Falls, because of the need for testing at varying temperatures. Material tensile testing was performed at -20 °F, room, 300 °F, and 600 °F temperatures for both base and welded materials. Because the cognizant laboratory personnel at the IRC did not have NVLAP accreditation, personnel having NVLAP accreditation from the Materials Testing Laboratory provided oversight to assure compliance with ASTM A 370 requirements. This quasi-static tensile testing effort will be referred to as 'Additional Testing'.

## 5.1 Test Material Procurement

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INL's Consumer Grade – Quality Level 4 process was used to procure test specimen materials. However, the materials were always stamped as ASME SA-240 (Reference 33) plate and the associated certified material test reports (CMTRs) were obtained. The alloys were procured from various manufacturers as 4-foot by 10-foot plates. The as-received plate material was hot rolled, annealed, and pickled (HRAP finish). For procurement confirmation purposes, the quasi-static tensile testing results were used to verify the CMTR data as well as determine the necessary stress-strain relationships.

# 5.1.1 Initial Testing

The initial material impact testing effort procured two ½-inch thick plates, one 304L and one 316L in FY04. The 304L plate had a heat number of 10W8 and the 316L plate had a heat number of 09T9. This material yielded pertinent impact test data that has been incorporated into this report.

# 5.1.2 Additional Testing

The additional material testing effort started in FY05 with the procurement of four plates of stainless steel material. In order to achieve strain rates below 16 per second, two ¼-inch thick plates were procured. The ¼-inch thick 304L plate had a heat number of 485896 and the 316L plate had a heat number of 48R8. In order to achieve strain rates above 16 per second, two ½-inch thick plates were procured. The ½-inch thick 304L plate had a heat number of 54M7 and the 316L plate had a heat number of 230468. These plates were designated to be used for both base and welded material impact testing. Having base and welded material test specimens from the same material heat would allow for more direct comparison of strain rate responses.

This material was to be handled by many individuals and different organizations while being machined, welded, examined, etc. In order to maintain proper traceability throughout this entire strain rate research effort, it was recognized that each plate material needed to be color coded upon receipt. Both the ¼-inch and the ½-inch 304L plate material were painted bright yellow while the ¼-inch and ½-inch 316L plate material were painted a light blue. Differentiation between the ¼- and ½-inch thick plates was easy so the same color was used for both thicknesses. Figure 5 shows a freshly painted ½-inch thick 304L plate and Figure 6 shows a freshly painted ½-inch thick 316L plate.



Figure 5. Painted ½-inch thick 304L plate.

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Figure 6. Painted ½-inch thick 316L plate.

From the perspective of this research effort, the welding of the 'bright yellow and light blue' plates described above and the associated weld examination process also had to be procured. As previously described in Section 2.2.1, the INL provided these welding and weld examination services. The first step was to cut the 4x10-foot plate into a number of smaller plates that could be more easily handled during and after welding. Water jet cutting was used to accomplish this. Figure 7 pictures the 304L plate cut into 5-1/2-inch wide by 26-inch long (in the direction the plate was rolled at the mill) pieces. After weld preparations (Figure 8) were machined (Figure 9), plate pairs were welded together using a gas tungsten arc welding process (Figure 10) identified as Weld Procedure S2.0 (see Appendix C) from the INL Welding Manual (Reference 34). Unique plate numbers were written (in the format of WXX with a permanent marker) on the upper right hand corner of each welded plate to maintain traceability. For example, as seen in Figure 10, plate W16 was being welded (even though weld machine obscures the 'W'). Weld wire ER308L was used for the 304L plate material and weld wire ER316L was used for the 316L plate material. As can be seen in Figure 10, a copper backing bar was used as well as a small run out tab at both ends (to get, as much as possible, a full plate length weld up to the plate edges). After completing the weld on the top side (painted side) with two weld passes, the reverse side of the weld was 'back gouged' (at an INL machine shop) to prepare that side for welding. Small imperfections at the surface where the copper backing bar was stationed needed to be removed with a small groove. The final single weld pass was made down that groove, completing the welded plate. Figure 11 shows a close-up view of the final weld appearance. The plate welds (also identified with the same unique plate number) were then radiographed and evaluated per INL procedure TPR 4970, Appendix C (Reference 35) to determine their acceptability. TPR 4970, Appendix C invokes ASME B&PV Code, Section III, Class 1 weld radiographic acceptance criteria. Figure 12 shows how the plates were marked for identification and weld examination. The radiograph film length was six inches. Measuring from the top (with the plate number in the upper right hand corner), the plate was marked to identify distances of 4 thru 10 inches and 16 thru 22 inches. These two 6-inch intervals captured the weld length that would become the gauge length for the welded impact test specimens. If additional weld material needed to be used for quasi-static tensile testing, additional radiography was performed on those additional weld lengths. At the completion of the INL effort, all welds passed the examination criteria, as evidenced by Reference 14.



Figure 7. 304L plates cut and weld prepared.

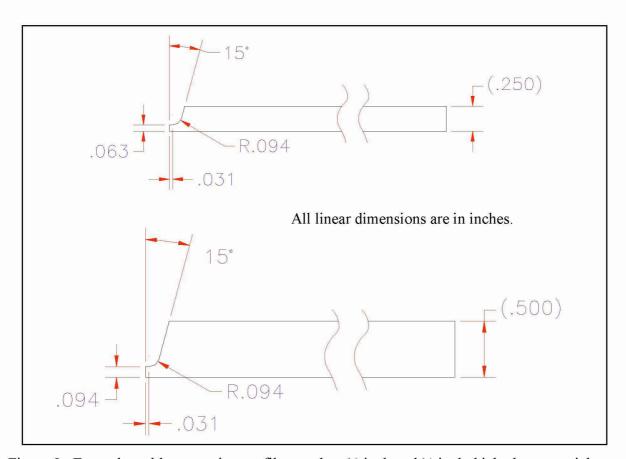


Figure 8. Example weld preparation profiles used on 1/4-inch and 1/2-inch thick plate material.



Figure 9. Close-up of machined weld preparation on ½-inch thick plate.



Figure 10. 304L plates being welded.



Figure 11. Close-up of final weld appearance on the welded plates.

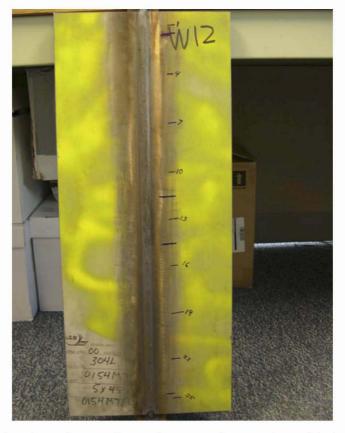


Figure 12. Markings showing where radiographs were taken on the welded plate.

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During the plate welding effort, NSNFP test personnel maintained two lists that noted the material and thickness of each marked plate, the plate's facility location (for tracking fabrication progress on top side welding, back gouging, reverse side welding, repairs, weld examination, etc.), and if the welded plate was used for quasi-static tensile test specimens, impact test specimens, or placed in storage for future use. Tables 2 and 3 show these 'final status' lists for the 304L and the 316L welded plates respectively. Obviously, during the fabrication and weld examination efforts, these tables were 'living documents', constantly being revised and updated but capturing plate specific details related to the welding and weld examination process. For example, a plate number in the format of WXX indicated that the plate was welded and passed the weld examination process on the first attempt. A plate number in the format of WXX R1 indicated that the welding was completed but did not pass the radiography examination on the first attempt and the weld needed to be repaired. After the weld repair effort was completed, the plate passed the weld examination effort. A plate number in the format of WXX-2 indicates that the initial weld did not pass the weld examination or the wrong weld wire was used and the entire weld needed to be removed and the process started over. In those cases, the welded plate was cut apart and the central portion of the plate (approximately a 1 to 1-1/4-inch wide strip including the weld) was removed. The long edges (that were the outside edges of the previous welded plate) were then weld prepped (using the same geometry as before) and the plates were then welded together again. As the final step, these plates and new welds were radiographed again for final examination. Tables 2 and 3 also indicate that certain \( \frac{1}{4} \)-inch welded plates had an initial indication of a 'lack of penetration' (LOP). However, this finding was questioned by the INL weld engineer and upon reading further radiography efforts and evaluating cut, etched, and polished test coupons (from plate W57), these LOP indications were finally accepted.

The INL submitted their documentation (Reference 14) generated during this welding and weld examination process to the NSNFP. Included in that documentation were the laboratory notebooks, identification of weld process parameters, weld examination results, and the associated radiographs. Notes were made by INL personnel that additional radiography was performed but the reason was unknown. Actually, the additional radiographs were performed at the request of NSNFP test personnel to examine portions of welds that were to be used for quasistatic tensile testing. This data package is in the NSNFP document control center and can be reviewed for more detailed information. Note that the real purpose behind the weld documentation was to establish that the welds being tested (for either quasi-static tensile testing or impact tensile testing) were representative and acceptable with no significant flaws that could adversely affect either test results. Hence, welds meeting the radiographic requirements were mandated. Actual canister closure welds would only be welded from one side but the reverse side or back pass performed for this research effort was necessary to provide sufficient welded material for material testing purposes.

Since the welding of the above plates took a substantial amount of time, more plate material was procured in FY06. This plate material would permit an earlier onset of impact testing with new test specimen geometries. In addition, this material would yield a good estimate of the required amount of drop weight and drop height necessary to achieve the desired strain rates for the limited number of welded plate test specimens. Two ½-inch thick plates were procured (the 304L plate had a heat number of 64A1 and the 316L plate had a heat number of 76H3) and two ½-inch thick plates were procured (the 304L plate had a heat number of 72K9 and the 316L plate had a heat number of 67K0). These plates were initially referred to as our

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'auxiliary' plate material but the test data from these plates were later deemed just as significant as any other. It also permitted the incorporation of more material heats into the resulting data collection.

Table 2. 304L welded plate material history.

Plate Identifier	Thickness (in.)	Current Location	Status	Designated Use
W1-2	1/2	613	Cut/Reweld/B-done/1W-done/TS	D-4-4/TS
W2-2	1/2	613	Cut/Reweld/Storage	
W3	1/2	613	Storage	
W4 R1	1/2	613	Weld Repair/Storage	
W5	1/2	613	B-done/TS	D-4-4/TS
W6	1/2	613	B-done/W-done	D-4-4
W7	1/2	613	B-done/W-done	D-4-4
W8	1/2	613	B-done/W-done	D-4-4
W9	1/2	613	B-done/W-done	D-4-4
W10	1/2	613	B-done/TS	D-4-4/TS
W11 R1	1/2	613	Weld Repair/Storage	
W12	1/2	613	Storage	
W13	1/2	613	Storage	
W14 R1	1/2	613	Weld Repair/Storage	
W15 R1 ½		613	Weld Repair/Storage	
W16	1/2	613	Storage	
W49	1/4	613	Storage	
W50*	1/4	613	B-done/TS	D-2-2/TS
W51	1/4	613	Storage	
W52*	1/4	613	Storage	
W53	1/4	613	Storage	
W54	1/4	613	B-done/W-done	D-2-2
W55*	1/4	613	Only weld specimens cut out	D-2-2
W56*	1/4	613	B-done/W-done	D-2-2
W57*	1/4	613	Partial cut/B-done/1W-done/TS	*S*/TS/D-2-2
W58	1/4	613	Only weld specimens cut out	D-2-2
W59*	1/4	613	B-done/W-done	D-2-2
W60-2	1/4	613	Cut/Reweld/Storage	
W61	1/4	613	Storage	
W62	1/4	613	Storage	
W63	1/4	613	B-done/W-done	D-2-2
W64*	1/4	613	Storage	

Notes: B – Base material W – Weld material TS – Quasi-static tensile test specimen

D-2-2 and D-4-4 are impact test specimen geometry designations

<sup>\* -</sup> Initial lack of penetration (LOP) indication later acceptable

<sup>\*</sup>S\* - Special Top Welded D-2-2 cut out with initial lack of penetration (LOP) for test/examination of circular coupons

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Table 3. 316L welded plate material history.

Plate Identifier	Thickness (in.)	Current Location	Status	Designated Use
W17	1/2	613	B-done/TS	D-4-4/TS
W18	1/2	613	B-done/W-done	D-4-4
W19	1/2	613	B-done/W-done	D-4-4
W20	1/2	613	B-done/W-done	D-4-4
W21	1/2	613	B-done/W-done	D-4-4
W22	1/2	613	Storage	
W23	1/2	613	B-done/W-done/TS	D-4-4/TS
W24	1/2	613	Storage	
W25	1/2	613	Storage	
W26	1/2	613	Storage	
W27	1/2	613	Storage	
W28	1/2	613	B-done/1W-done/TS	D-4-4/TS
W29	1/2	613	Storage	
W30	1/2	613	Storage	
W31	1/2	613	Storage	
W32 R1	1/2	613	Weld Repair/Storage	
W33	1/4	613	Stamona	
W34*	1/4	613	Storage B-done/W-done	D-2-2
W34* W35 R1	1/4	613	Weld Repair/Storage	D-2-2
W35 K1 W36*	1/4	613	B-done/W-done	D-2-2
W30. W37-2	1/4	613		D-2-2
W37-2 W38*	1/4	613	Cut/Reweld/Storage	
W39*	1/4	613	Storage Only weld specimens cut out	D 2 2
W40*	1/4	613	Storage/TS	D-2-2 D-2-2/TS
W40* W41*	1/4	613	Only weld specimens cut out	D-2-2/1S D-2-2
W41* W42*	1/4	613	-	D-2-2
W42** W43-2	1/4	613	Storage Cut/Reweld/Storage	
W43-2 W44*	1/4	613	B-done/W-done	D-2-2
W44** W45*	1/4	613	B-done/W-done	D-2-2 D-2-2
W45** W46	1/4	613		D-2-2
W46 W47	1/4		Storage	
W47 W48*	1/4	613	Storage B-done/1W-done/TS	D 2 2/TC
W 48*	*/4	613	B-done/1W-done/1S	D-2-2/TS

Notes: B – Base material W – Weld material TS – Quasi-static tensile test specimen

D-2-2 and D-4-4 are impact test specimen geometry designations

<sup>\* -</sup> Initial lack of penetration (LOP) indication later acceptable

### 5.2 Quasi-Static Test Specimen Geometries

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The quasi-static tensile test specimens, satisfying the geometry recommendations of ASTM A 370, were either rectangular or round in cross section, depending on the test machine used to perform the tensile testing.

### 5.2.1 Initial Testing

The test specimen geometry used in the initial phase of quasi-static tensile testing was the 'Sheet-Type Subsized Specimen' identified in ASTM A 370. Figure 13 illustrates the rectangular cross section test specimen geometry used. Smaller pieces of material from the full 304L and 316L plates were cut out and marked (using a permanent marker) indicating the material type, heat number, and the longitudinal (parallel to) or transverse (perpendicular to) orientation with respect to the mill rolling direction of the plate. These smaller pieces were provided to the INL's machine shop to fabricate the test specimens. Only one smaller piece at a time was provided to the machine shop in order to assure proper distinction between 304L and 316L material and the proper plate orientation (longitudinal or transverse). Only after each batch of test specimens were received back from the machine shop would another plate be provided for more test specimen fabrication efforts. These specimens, marked with an alphanumeric identifier, material type, heat number, and orientation (transverse or blank indicating longitudinal), did not receive any heat treatments following this machining.

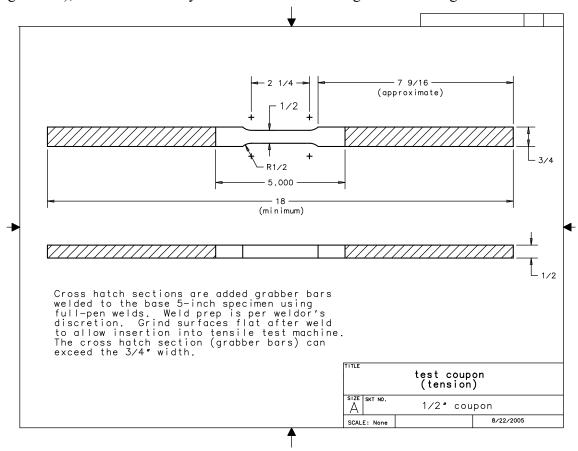


Figure 13. Sheet-type subsized specimen geometry used for initial quasi-static testing.

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#### 5.2.2 Additional Testing

A slightly different approach from that described for the initial testing was taken to fabricate quasi-static tensile test specimens for the additional testing, including the use of round test specimens. However, only longitudinal oriented (parallel with the plate rolling direction) test specimens were fabricated from these plates. The 'auxiliary' base material blanks were water jet cut from the large 4x10-foot plates (see the smaller rectangular cutouts in Figures 14 and 15). Color coding occurred as these water jet cut blanks were removed from these plates. Figures 14 and 15 show the color coding used for both thicknesses of the 304L material (orange) and the 316L material (purple), respectively. The color coding was used for material traceability.



Figure 14. Auxiliary 304L plate with orange paint coding.

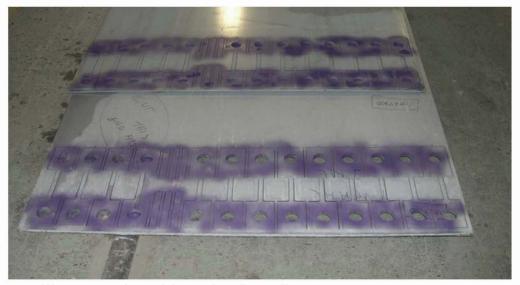


Figure 15. Auxiliary 316L plate with purple paint coding.

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The base material blanks from the welded plates material (heat numbers 485896, 48R8, 54M7, and 230468) described in the previous section were cut from the remaining 'drop' material produced when cutting the 5-1/2-inch by 26-inch long plates from the 4 by 10-foot plates. These smaller drop plate pieces were marked to establish the longitudinal direction (parallel with the plate's rolling direction) and the material type and heat number. These smaller pieces of drop material from the 304L and 316L plates were then provided to the INL's machine shop to fabricate the test specimens. Only one smaller plate at a time was provided to the machine shop in order to assure proper distinction between 304L and 316L material. Only after each batch of test specimens were received back from the machine shop would another plate be provided for more fabrication efforts.

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The welded material blanks were cut from the welded plates. Figures 16 and 17 below show examples of welded material blanks water jet cut from the welded plates. As was done for the base material, the welded blanks (identified by color and thickness) were controlled by NSNFP test personnel so as to maintain full traceability between 304L and 316L welded material during test specimen fabrication.



Figure 16. Both 304L and 316L ½-inch thick welded plates showing welded material blanks (attached to impact test specimens, which were later removed).

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Figure 17. 316L 1/4-inch thick plate showing welded material blank cut from the plate (also attached to impact test specimen, which was later removed).

With the base and welded material blanks or smaller drop plate pieces (obtained as described above), it was now possible to fabricate the test specimens. The test specimen geometry depended upon the plate thickness. The ½-inch thick plate blanks were machined into round, small-sized 0.350 inch diameter test specimens as shown in Figure 18. Specimen blanks from the 1/4-inch thick plates were machined into round, small-sized 0.160-inch diameter specimens as shown in Figure 19. The test specimens were marked (with a unique numerical identifier) to indicate material type, heat number, and whether the test specimen was either base or welded material. The ends of the specimens outside of the gauge length were threaded to match the holders on the tensile test machine. Test specimens were not heat treated following machining.

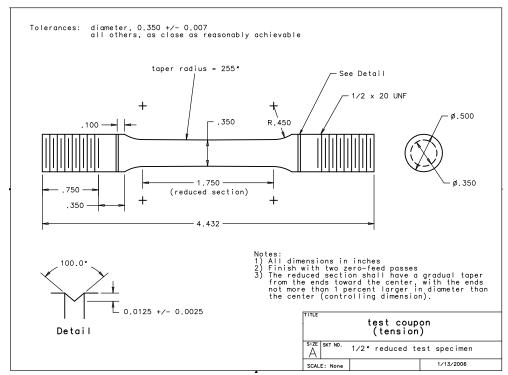


Figure 18. Round, small-size 0.350-inch diameter quasi-static tensile test specimen used for additional testing of ½-inch thick plate.

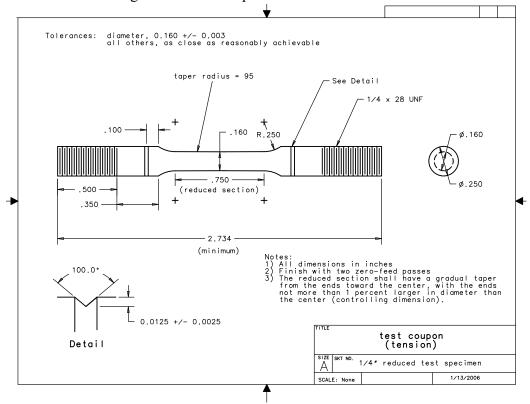


Figure 19. Round, small-sized 0.160-inch diameter quasi-static tensile test specimen used for additional testing of 1/4-inch thick plate.

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#### 5.3 **Quasi-Static Test Procedure**

The quasi-static tensile testing procedures followed the requirements of ASTM A 370 except for the stated reporting requirements. A total of three tensile tests for each material heat (and each orientation if applicable) at each temperature under consideration, for base and welded material as applicable, were performed. The quasi-static tensile testing was performed by INL personnel with NSNFP test personnel in attendance to assure acceptable data was obtained.

#### 5.3.1 Initial Testing

Quasi-static tensile tests were performed at the Materials Testing Laboratory on February 19 and June 3, 2004. Mr. H. C. Bean, laboratory manager, conducted the tests using the Tinius-Olsen tensile test machine (see Figure 20). Test specimen dimensions were measured by the INL laboratory manager prior to tensile testing. NSNFP test personnel also recorded continuous force-displacement data for the entire duration of each test (load initiation through specimen failure). Both longitudinal and transverse oriented test specimens were tensile tested. The flat ends of the test specimens were inserted into plate grippers as seen in Figure 21. The strain rate achieved during the quasi-static tensile testing was approximately 10<sup>-3</sup> to 10<sup>-4</sup> per second.



Figure 20. Tinius-Olsen tensile test machine at the Materials Testing Laboratory.

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Figure 21. Close-up of inserted test specimen with extensometer attached.

### 5.3.2 Additional Testing

Conventional quasi-static tensile tests were performed at -20 °F, room temperature, 300 °F, and 600 °F using an Instron Model 4505 universal testing machine with a maximum capacity of 22,000 pounds. Prior to tensile testing, each specimen was dimensionally checked. Those measurements were used in the determination of the test specimen's cross sectional area or were within acceptable tolerances to use the nominal cross sectional area. These round specimens were gripped in threaded connectors, aligned using pins and clevises, and loaded by a crosshead displacement that produced strain rates of approximately 10<sup>-3</sup> to 10<sup>-4</sup> per second. Force-displacement output was continuously recorded to specimen failure. LabVIEW 7.0 (Reference 36) software was used to record and display the specimen temperature, force-displacement and engineering stress-strain data, and write the data to an Excel file for evaluation.

The -20 °F temperature testing was achieved using an insulated 'coldbox' surrounding the test specimen and extensometer. Liquid nitrogen was fed into the coldbox to achieve the desired initial temperature conditions of -20 °F and to maintain those conditions throughout the tensile test. Figure 22 shows this test setup, including the three thermocouples attached to the test specimen.

For the room temperature tests, displacements were measured over the specimen gauge length using an extensometer. Figure 23 shows a room temperature tensile test setup with the extensometer in place. The room temperature within the laboratory was considered acceptable for temperature conditions.



Figure 22. Cold (-20 °F) temperature tensile testing setup.



Figure 23. Room temperature tensile testing setup at IRC.

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For the 300 °F and 600 °F tests, an electric furnace enclosure was used. Because the extensometer was not compatible with the temperatures inside the furnace enclosure, two coupled, vertical rods, one on each side of the test specimen and attached to the upper specimen holder, transferred the deformation in the gauge length to an extensometer and linear variable displacement transducer (LVDT) located outside of the furnace. The elevated temperature tensile test setup is shown in Figure 24 with the furnace open to show the specimen with transfer rods, extensometer, and LVDT. Figure 25 shows an alternate furnace setup that was also used.



Figure 24. Elevated temperature tensile testing setup with furnace door open.



Figure 25. Alternate furnace setup used with door closed.

## 5.4 Achieving Temperature Conditions

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Due to the importance of achieving the proper temperatures for the quasi-static tensile testing performed, this section provides more details of how and what temperatures conditions were achieved during the quasi-static tensile testing.

### 5.4.1 Initial Testing

The quasi-static tensile testing at the Materials Testing Laboratory was performed in a typical office/laboratory conditioned environment at ambient room conditions, meaning that the temperature was in the 65 °F to 75 °F range per the laboratory manager, Mr. H. C. Bean. This falls within a very close 71 °F  $\pm$  6 °F temperature range. Hence, these test specimen temperatures were acceptable.

### 5.4.2 Additional Testing

For the room temperature tests, test specimen temperatures were not directly measured for every test. Recorded data for three different days from the INL Lab Notebook LAB-771 (that documented the quasi-static tensile testing at the IRC) indicates the room temperature ranged from 72 to 74 °F on those days. The engineer in charge of the tensile testing (Mr. R. Lloyd) indicated that the anticipated worst temperature range in the IRC labs would be 68 °F to 77 °F, also within a very close 71 °F  $\pm$  6 °F temperature range. These room temperature conditions were acceptable.

Test specimen temperatures other than room conditions (while in a furnace or cold box) were monitored throughout each tensile test cycle using temperature data from three thermocouples attached (thin wire spot-welded) to each test specimen. Figure 26 shows three thermocouples attached at the top, middle, and bottom locations of the gauge length of a typical round test specimen machined from ½-inch thick plate.

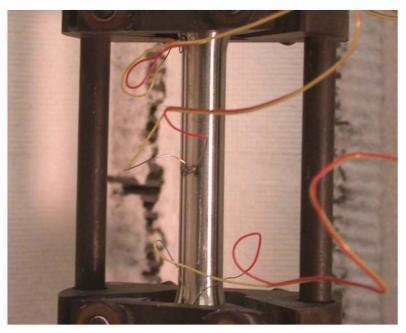


Figure 26. Thermocouples attached to a quasi-static tensile test specimen.

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Prior to beginning the quasi-static tensile test, the test specimens were allowed to uniformly 'soak' to the designated test temperature. Because of the small size of the test specimens, automated methods of preheating, pre-cooling and holding the specimens at appropriate conditions during the quasi-static tensile test were not employed. The three temperatures from the test specimen were monitored by the laboratory technician and furnace or cold box temperatures were manually adjusted as necessary so that variations in test specimen temperatures were minimized as much as possible.

The temperature data for the three thermocouples were recorded. These three temperatures were averaged and then the maximum and the minimum average temperatures achieved during the quasi-static tensile testing (from test start to test specimen fracture) were established. These data are included in files 1A and 1B on the Report CD-R (Reference 37) included with this report. Laboratory Notebook NSNF/SN/04.01 (hereafter referred to as NSNFP Lab Notebook) Binder Volume 6 (Reference 38) contains a summary of these maximum and minimum average temperatures for the quasi-static tensile tests that were actually used as a basis for establishing the true stress-strain properties for that specific material and temperature conditions. Table 4 summarizes the test specimen temperature ranges measured during the 2006 and 2007 quasi-static tensile testing of 304L and 316L stainless steels performed by the INL for the NSNFP.

Table 4. Worst case average temperature ranges achieved during quasi-static tensile testing.

Desired Test Temperature	Worst Case Average Temperature Range Achieved		
-20 °F	+14/-5 °F		
300 °F	+13/-8 °F		
600 °F	+18/-19 °F		

Table 4 temperature ranges are the worst-case ranges for all basis testing completed. Most of the tests had temperatures much closer to the desired test temperature. However, even these worst-case temperature ranges are considered acceptable. The data on the Report CD-R contains the maximum and minimum average temperatures for the entire test interval, including the onset of necking through final rupture. However, the material impact testing effort only used data up to the onset of necking. Therefore, the temperature ranges listed above in Table 4 reflect the averaged maximum and minimum temperature ranges achieved up to the onset of necking.

The upper worst-case temperature range result for the -20 °F testing (+14 °F) appears somewhat high until it is recognized that the test specimens actually get hotter during tensile testing near the middle location due to the material straining. This fact is clearly illustrated by the plot of measured test specimen temperatures for Test #141, a 316L material test (see Figure 27). Even though the environment was kept close to -20 °F (as evidenced by the top and bottom temperatures), the middle temperature rose much higher (due to material straining), significantly affecting the average temperature results. However, this is the physical phenomenon that occurs during actual drop events. The important fact is that the starting (soaked) temperature and the sustained environment (represented by the larger end portions of the test specimen) adequately

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reflect the -20 °F conditions. Heat generation also occurs in the higher temperature tensile tests but the temperature values are more removed from zero, making the effects less noticeable.

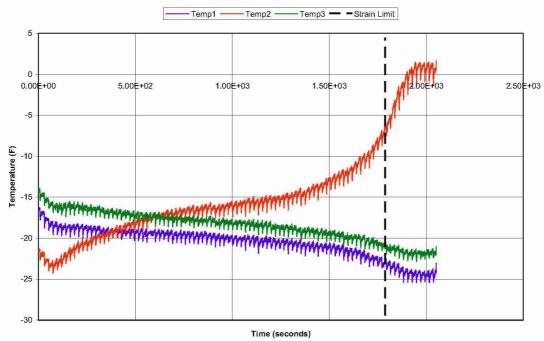


Figure 27. Data from three thermocouples showing how middle temperature rises due to straining during -20 °F tensile test.

## 5.5 Quasi-Static Tensile Testing Results

A significant number of quasi-static tensile tests (over 160) were performed in order to support the material impact testing effort discussed herein. As previously mentioned, three tensile tests for each material heat (and each plate orientation if applicable) at each temperature under consideration for both base and welded material were performed. One test was chosen from each set of three tests that best represented typical results. Because the number of tests for a particular set of conditions was limited to three, statistical methods were not employed to establish an average or mean result. All three tests were plotted as engineering stress-strain curves and the most representative specimen result was chosen for the applicable set of conditions.

Tables 5 and 6 list the specific quasi-static tensile test specimen identifier (of the three tests performed) chosen to represent that specific material condition. These tables (with background colors matching the material color coding) include both 'initial' and 'additional' testing. Tables 5 and 6 address only the longitudinally oriented test specimen results. In the tables, 'NA' indicates that quasi-static testing was not performed for those specific conditions. As earlier discussed, transverse oriented test specimens (perpendicular to the plate's rolling direction) were also quasi-static tensile tested at the INL Materials Testing Laboratory under room temperature conditions. These transverse test results were performed to help assess any potential response variation in test specimens reflecting varying orientation with respect to the direction that the plate material was rolled at the mill. Section 6.6.2 contains specific

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information regarding the comparison of results between longitudinal and transverse oriented quasi-static and impact tensile tests.

Table 5. Identification of 304L tensile tests establishing basis true stress-strain curves.

Material	Thickness	Heat	Type	Temp. (F)	Specimen Used
1/24/04/21/02				-20	NA
			Base	Room	MT03
				300	NA
		40000		600	NA
		10W8			
			Weld	-20	NA
				Room	NA
				300	NA
				600	NA
			Base	-20	156
	ı			Room	153
				300	146
	1/2-inch	54M7		600	151
	Thick			20	400777
			XX7 - 1 -3	-20	183W
			Weld	Room	177W
				300	171W
				600	179W
				-20	106
			Base		106 113
			Dase	Room	
				300	109
304L		72K9		600	111
				-20	NA
			Weld	Room	NA
				300	NA
				600	NA
		64A1	Base		
				-20	13
				Room	2
				300	5
				600	8
				20	NT A
			Weld	-20	NA NA
				Room	
	1/4 : ala			300	NA NA
	1/4-inch Thick			600	NA
	IIICK		Base	-20	55
				Room	47
				300	50
				600	53
		485896		000	
			Weld	-20	81W
				Room	73W
				300	74W
				600	77W

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Table 6. . Identification of 316L tensile tests establishing basis true stress-strain curves.

Material	Thickness	Heat	Type	Temp. (F)	Specimen Used
				-20	NA
			Base	Room	MT12
				300	NA
		оото		600	NA
		09Т9			
			Weld	-20	NA
				Room	NA
				300	NA
				600	NA
					·
				-20	125
			Base	Room	128
				300	120
	1/2-inch			600	123
	Thick	67K0			120
				-20	NA
			Weld	Room	NA
			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	300	NA
				600	NA
				000	11/1
				-20	141
		230468	Base	Room	138
316L			Dusc	300	131
				600	135
				000	155
			Weld	-20	181W
				Room	167W
				300	161W
				600	164W
				-20	42
		48R8	Base	Room	33
				300	35
				600	37
			Weld	-20	84W
				Room	63W
				300	66W
	1/4-inch			600	68W
	Thick				
				-20	26
		76Н3	Base	Room	17
				300	19
				600	22
				-20	NA
			Weld	Room	NA
				300	NA
				600	NA

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The quasi-static tensile tests were performed through the entire material response range, out to failure. However, because the impact testing only needed to use data out to the uniform strain limit (the strain at the onset of necking), no Bridgman correction was applied to this data.

#### 5.5.1 Initial Testing

Quasi-static tensile tests were performed on 304L and 316L plate material at the INL Materials Testing Laboratory following the tension test guidelines of ASTM A 370. Three test specimens were tested for each material and MT03 was chosen as typical for the 304L material and MT12 was chosen as typical of the 316L material. The quasi-static engineering and true stress-strain curves developed from these tests are contained on the Report CD-R, files 1A and 1B.

#### 5.5.2 Additional Testing

Quasi-static tensile tests were performed on 304L and 316L plate material at the INL Research Center following the tension test guidelines of ASTM A 370. Three test specimens were tested for each material and Table 5 shows the tests chosen as typical for the 304L material and Table 6 shows the tests chosen as typical of the 316L material. The quasi-static engineering and true stress-strain curves developed from these tests are contained on the Report CD-R, files 1A and 1B (data is too voluminous for incorporation into the pages of this report).

For a typical test sequence, specimens were tensile tested to failure with the specimen beginning to 'neck' after achieving the maximum engineering strength followed shortly by fracture of the specimen. As the neck progressed to failure, non-uniform geometry altered the uniaxial stress state to a complex stress state involving shear components as well as normal stresses. Specimens typically failed in a combination of shear and tensile 'cup and cone' geometry characteristic of ductile materials and is illustrated in Figure 28. The tensile testing of welded material test specimens was performed identical to the base material tests. However, the welded material specimens looked unique when compared to the base material specimens shown in Figure 28. Figure 29 shows a close-up picture of a welded material test specimen where the surface roughness (known as the 'orange peel' effect due to the straining of the irregular grain structure resulting from the welding) can be seen.



Figure 28. 'Cup and cone' type failure at fracture point.

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Figure 29. Welded quasi-static tensile test specimen showing 'orange peel' effect.

In order to substantiate the quasi-static stress-strain curves determined herein, an attempt was made to locate similar data published in the literature. A limited amount of comparative data was found for 304 stainless steel and is illustrated in Figure 30 as true stress-strain terminated at or near the uniform stress limit. Figure 30 shows a combination of data from two sources (identified in the legend and most likely from different material heats) taken from Reference 24 at the temperatures indicated. Figure 31 shows the true quasi-static stress-strain curves derived herein from a single material heat (54M7) for the four temperature conditions considered in this investigation. These results are typical and representative of the quasi-static tensile test finding for the 304L plate material. The Figure 31 curves have been terminated at their uniform strain limits.

By comparing Figures 30 and 31, one can see great similarities, even though different material heats are involved. Stress and strain magnitudes are comparable as are the data trends. The true stress-strain curves lower with increasing temperature in both figures. The uniform strain limit reduces with increasing temperatures above room temperature (the 600 °F curve from the published data is from a different source than the other three curves so a definitive conclusion cannot be made there but this conclusion is true for the 300 °F data). The shape of the 304 and 304L true stress-strain curves at cold temperatures take on a unique shape. (For the most part, this phenomenon was not observed in the 316L material tested although a small, but noticeable hump was noted for one 316L base material specimen tested at -20 °F.) Therefore, the quasistatic true stress-strain curves obtained herein are indeed acceptable and representative. The testing methodology used herein was appropriate.

Finally, establishing the uniform strain limits (in terms of true strain) was important in order to establish the acceptable limits for the impact testing. Based on the quasi-static testing performed, Table 7 indicates the uniform strain limits established for both the base and welded materials at the temperatures considered. Background colors match the color coding used for each material.

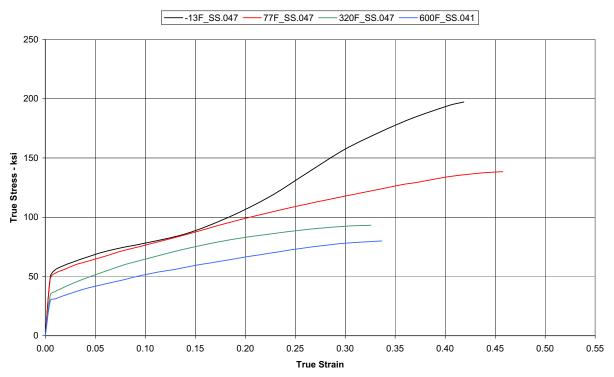


Figure 30. Stress-strain curves from published 304 data in Atlas of Stress-Strain Curves.

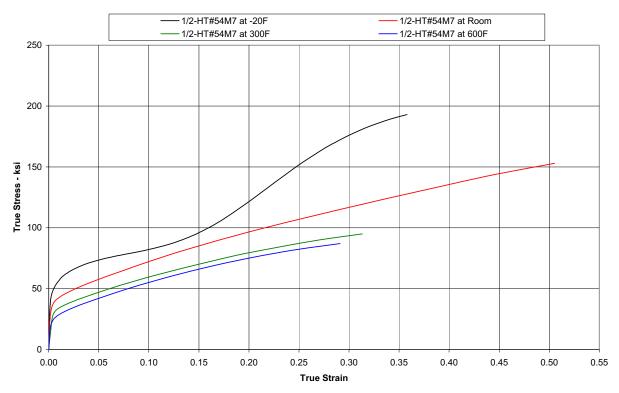


Figure 31. 304L stress-strain curves determined from INL testing discussed herein.

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Table 7. Uniform strain limits established for base and welded materials.

Thickness (inches)	Material	Heat #	Temp.	Uniform Strain Limit	
			(°F)	Base	Weld
		485896	-20	0.38	0.47
			70	0.46	0.39
	304L		300	0.30	0.21
			600	0.25	0.23
		64A1	-20	0.44	-
			70	0.52	-
			300	0.31	-
1/			600	0.29	-
1/4			-20	0.51	0.42
		48R8	70	0.46	0.40
			300	0.28	0.25
	3161		600	0.27	0.24
	316L		-20	0.52	-
		76Н3	70	0.48	-
			300	0.31	-
			600	0.28	-
	304L	54M7	-20	0.36	0.38
			70	0.48	0.37
		34111	300	0.32	0.21
			600	0.29	0.20
		72K9	-20	0.36	-
			70	0.50	-
			300	0.31	-
			600	0.28	-
1/2		10W8	70	0.42	-
/2	316L	230468	-20	0.40	0.37
			70	0.46	0.35
			300	0.30	0.25
			600	0.28	0.20
		67K0	-20	0.43	-
			70	0.41	-
			300	0.27	-
			600	0.25	-
		09Т9	70	0.40	-

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### 6. IMPACT TENSILE TESTING

The data needed to justify the definition of appropriate material responses considering strain rate effects was obtained using an impact test device. This impact test device (identified as the Impact Testing Machine or ITM) is a drop weight tower that drops a large weight from an identified height onto a test fixture that holds the material test specimens. By using a combination of different weights, different drop heights, and different specimen sizes, varying strain levels and strain rates can be achieved in the test specimens.

## 6.1 Impact Testing Machine

The goal behind the design of the ITM was to create a test device that could be used to investigate strain rate responses of multiple materials (including steels, plastics, etc.) as well as structural impact responses of actual components (e.g., impact limiter material or concrete specimens) small enough to fit within the ITM. Hydraulic-based systems could evaluate constant strain rate effects (with certain limits on strain rates and test specimen sizes) but the representation of an actual drop event or vehicle crash would not be present. Rather than pursuing a costly hydraulic-based test apparatus design with a smaller test specimen capacity, the ITM could test larger-sized material specimens and accurately reflect true impact loads (energy-limited events) with dropped weights nearing 1600 pounds (or more if needed). From the instant of impact during a drop event or crash, energy dissipation occurs. This is a response that is important to reflect during these material impact tests so that proper insights into analysis methodologies can be obtained.

During FY03, the ITM (see Figure 32) was taken from the conceptual design stage to an assembled test apparatus. The basic concept behind the ITM design is that of a falling weight (from heights up to 13 feet) impacting a test specimen resulting in permanent deformation. The falling weight is controlled within a vertical tower, while the loading on the test specimen is controlled by way of a specimen holder or test fixture. The ITM consists of a drop tower (including base plate, structural tube framing and vertically slotted pipe with an attached hoist), a drop weight (sometimes referred to as a 'pig') which was fabricated from 14-inch diameter bar stock, a drop hook (electronic quick release mechanism), and the test fixture. The drop weight (pig) is designed so that cylindrical disks of pre-determined weight can be added to vary the total magnitude of the dropped weight. The ITM is approximately 23 feet tall.

Major components of the tower, the drop weights, and the test specimen fixtures (that hold the test specimens) were fabricated. Figure 33 shows these components, ready for assembly. Figure 34 illustrates the three specimen fixtures or holders (for shear, bending, and tension loading investigations) that were also fabricated. The bending fixture has had limited test use (not discussed herein) and the shear specimen fixture has not yet seen service.

The major components of the drop tower were then assembled. A four-sided enclosure was also fabricated with the goal to confine potential fragments and reduce noise concerns for the NSNFP test personnel. The assembled ITM (see Figure 35) was then located at the INL's Reactor Test Complex, in the Materials Test Reactor building. Later on, the ITM was moved to another location at the INL. See Section 6.6.1 for additional information.

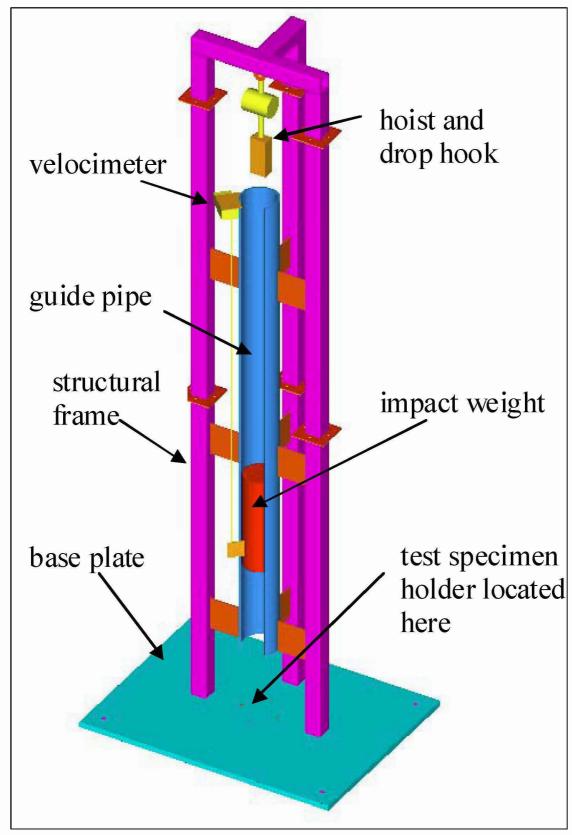


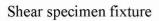
Figure 32. Conceptual design of Impact Testing Machine (ITM).





Figure 33. ITM fabricated components ready for assembly.







Bending specimen fixture



Tension specimen fixture

Figure 34. Three existing ITM test specimen fixtures.

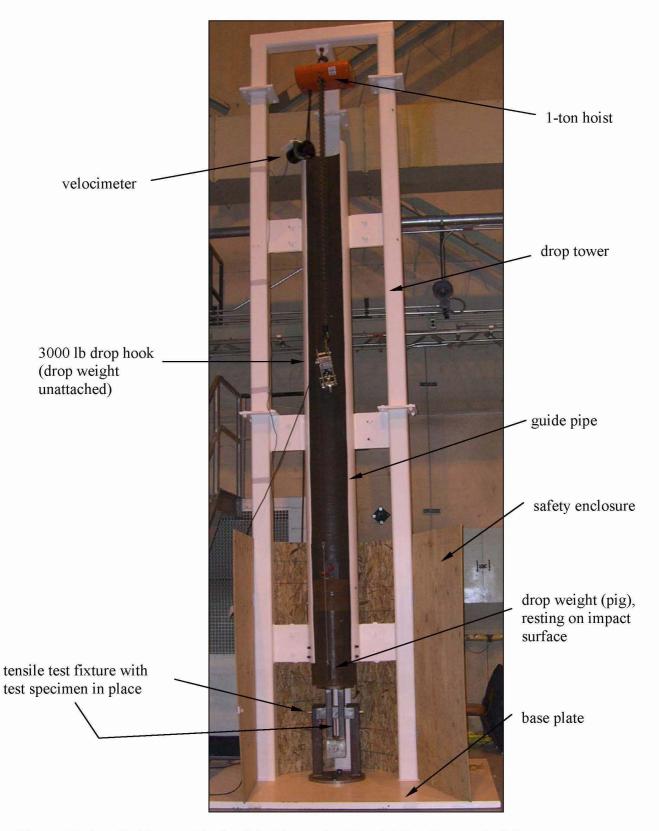


Figure 35. Installed Impact Testing Machine at the Material Test Reactor building.

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Drop weight impact test machines are typically used for compression testing. To carry out a tensile test under moderate strain rates, the ITM incorporated a special tensile holding fixture. The tensile test fixture (previously pictured in Figure 34) is illustrated in Figure 36 with specific components identified. The tensile test specimen fixture consists of a support stand and an impact driver. The support stand is made up of a bottom plate that bolts to the ITM base plate, two vertical legs, and an upper cross-member. The impact driver consists of a top (impact surface) plate, four vertical legs, and a lower cross-member. All structural members of the impact driver and support stand were fabricated from solid bar and plate carbon steel. The impact driver is connected to the support stand through the pinned ends of the dog bone-shaped tensile test specimen. During a test, the dropped weight impacts the impact driver on the tensile test fixture that is centered under the slotted guide pipe. The dropped weight contacts the impact driver, transferring its kinetic energy to the test specimen by way of the lower cross-member. The impact force is applied to the lower end of the tensile test specimen and is reacted through the upper end of the specimen into the upper cross-member of the fixture support stand. The pinned ends on the test specimen provide for pure tension loading of the specimen. [Note that in October-November 2005, the lower cross-member's top surface was notched (approximately 1-1/4-inch wide and 1-1/2-inch deep, both front and back) so that the bottom punch marks on the original test specimens could be visually seen.]

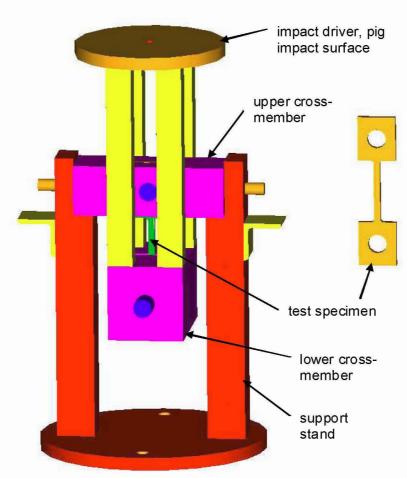


Figure 36. ITM tensile test specimen fixture.

## 6.2 Test Specimens

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The initial phase of material impact testing performed in FY04 and continuing into FY05 was performed at room temperature conditions and used a dog bone-shaped test specimen as identified in Figure 37 (geometry 'A'). Note that the test length includes the gauge length (uniform cross section along entire length) as well as both end transitions. All test specimens were water jet cut from their respective plates (see Section 5.1.1). Color coding, applied when multiple test specimens were cut from the entire plate at one time, was used to differentiate not only 304L or 316L material but was also used to differentiate longitudinal versus transverse oriented test specimens. Figure 38 illustrates the 304L plate already water jet cut and painted. Red indicated longitudinal test specimens, yellow indicated transverse test specimens, and green indicated shear blank specimens (for future use). Figure 39 illustrates the 316L plate already water jet cut and painted. Black indicated longitudinal test specimens, white indicated transverse test specimens, and brown indicated shear blank specimens for future use.

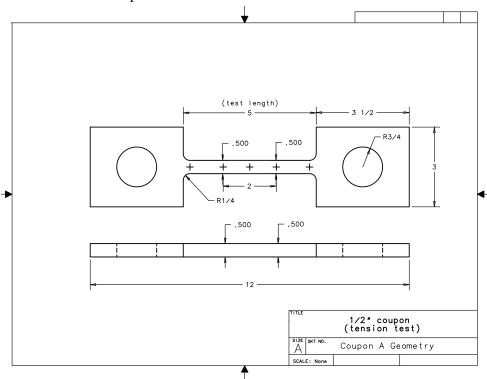


Figure 37. Tensile test specimen 'A' for initial material impact testing.

This initial testing allowed the NSNFP test personnel to gain valuable insights regarding the response of this test specimen geometry. Basically, this geometry worked well with strain rates in the 25 per second range but attempts to get strain rates of 10 per second produced low strains that were difficult to measure. Continuing material impact testing performed in FY05 permitted the testing and evaluation of many geometries. The results indicated that the test specimens needed to be long enough to avoid substantial end-effect complications yet be short enough to achieve the highest strain rates possible. Strains also needed to be large enough to be measurable by a high-speed digital camera. Low strains (near the yield strength) were difficult to measure (pixel limitations of the camera) and they did not clearly define a reasonable amount of area beneath the stress-strain curve (energy absorbed by the material). Larger strains were easier to measure and produced reasonable amounts of area beneath the stress-strain curve.



Figure 38. Initial 304L plate water jet cut and test specimens painted.



Figure 39. Initial 316L plate water jet cut and test specimens painted.

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The additional geometry testing and associated data evaluation efforts indicated that a minimum gauge length of 3 inches was necessary for a good uniform strain distribution along the gauge length with minimal transition end effects. In addition, with the goal of achieving strain rate tests in the 5 to 10 per second strain rate range, thinner \(\frac{1}{4}\)-inch thick specimens of the same minimum gauge length of 3 inches were deemed necessary. At this time, it was also recognized that a more formal test specimen identification method was needed that would clearly indicate not only the test specimen's generic profile but also the width and thickness of the gauge length. Therefore, an identifier format of 'X-N-N' was adopted. The X would be an alpha character that could specify generic geometry designations or profiles (e.g., A, D, etc), the first N was a numeric value that indicated the gauge width nominally measured in eights of an inch, and the second N (the last character) was also a numeric character that indicated the gauge thickness also nominally measured in eights of an inch. Hence, D-4-4 indicated a D profile with a ½-inch gauge width and a ½-inch gauge thickness. Similarly, A-2-2 indicated an A profile with a ¼-inch gauge width and a ¼-inch gauge thickness. Use of the original 'A' geometry identifier was continued in testing records for material impact tests already completed. However, any material impact testing performed after November 2005 using the older 'A' test specimens would refer to those test specimens as having an A-4-4 geometry.

Figures 40 and 41 illustrate the geometries for the 3-inch gauge length test specimens cut from ½-inch plate material (D-4-4 specimens) and ¼-inch plate material (D-2-2 specimens), respectively. The material was identified in Section 5.1.2.

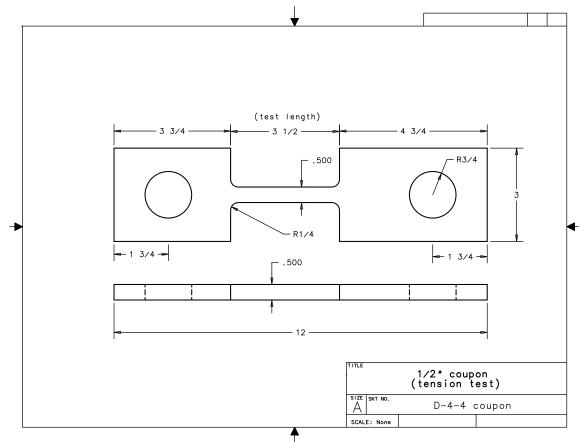


Figure 40. D-4-4 test specimen geometry for ½-inch thick plate material.

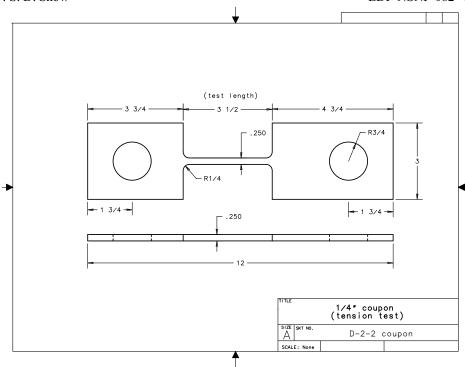


Figure 41. D-2-2 test specimen geometry for 1/4-inch thick plate material.

Finally, it was also decided to try a longer gauge length for the ¼-inch thickness plates, similar to the 'A' geometry. Therefore, an A-2-2 test specimen geometry was used to evaluate its effectiveness at achieving low strain rates in the 5 per second range. Figure 42 illustrates this test specimen geometry.

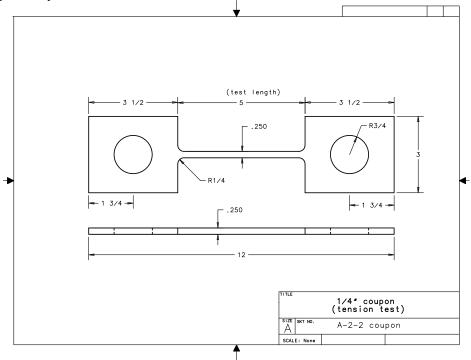


Figure 42. A-2-2 test specimen geometry for ½-inch thick plate material.

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Figures 14 and 15, in additional to illustrating the material blanks cut for quasi-static testing, show how the above impact test specimens were water jet cut from the 'auxiliary' plate material. Figures 16 and 17 have previously provided illustrations on how the welded plates were water jet cut to obtain impact test specimens along with the material necessary for quasi-static tensile testing. Figure 43 provides a clear indication of how six typical material impact test specimens (four base and two welded material test specimens), were water jet cut from a single welded plate. All of the impact test specimens from the 'auxiliary' plates and the welded plates were longitudinally (parallel with the mill rolling direction) oriented.

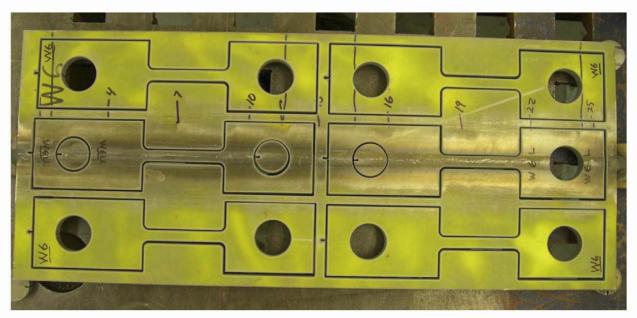


Figure 43. Material impact test specimens (D-4-4) water jet cut from welded plate W6.

Note that the base material test specimens were ready for pre-test inspection directly after removal from the plates. On the other hand, the welded material test specimens required additional machining to remove the weld crowns and achieve a square cross section along the entire gauge length. Figure 44 illustrates what a typical welded material impact test specimen square cross section would look like. Included in the test material are weld material, base material, the interface, and heat-affected zone material.

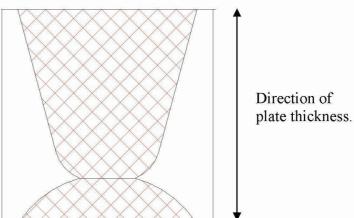


Figure 44. Cross-section of welded material test specimen showing weld material (cross-hatched) and base metal (not cross-hatched) within the square test specimen cross-section profile.

### 6.2.1 Pre-Test Dimensional Measurements

Prior to impact testing, the uniformity and acceptability of each test specimen was determined by NSNFP test personnel using specially developed go/no go gages and marking gages followed by detailed measurements with a calibrated caliper.

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The first step was to assess the overall geometry of the test specimen. Even though the gauge length dimensions were of primary importance, it was still deemed appropriate to have nearly identical test specimens. This was determined using a go/no go gage. A go/no go gage is a plate with the test specimen maximum and minimum-tolerance shape step-machined into it. The dimensions checked using these go/no go gages were considered 'important" in order to achieve overall test specimen uniformity and so the maximum tolerances were established at  $\pm$  0.100 inches. The fabrication of the go/no go gage reflected these tolerances. Figure 45 illustrates this type of profile check go/no go gage with the 'important' dimensions blanked out for determination by the INL dimensional inspector. If an actual test specimen dimension is too large, it will not fit into the gage (can't go past the Level 1, identified on Figure 45). If an actual test specimen dimension is too small, it will fall past the minimum tolerance step when inserted into the gage (past Level 2 – the next step down). A dimensionally acceptable test specimen will fit into the gage but will not fall past the Level 2 step.

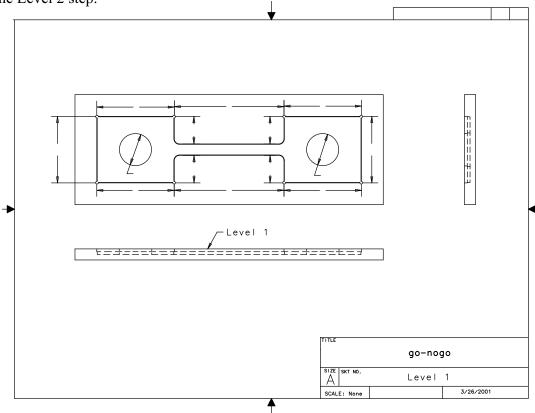


Figure 45. Typical go/no go gage for overall geometry checks of impact test specimens.

Special care was taken to examine the test specimen as it rested on Level 2 of the go/no go gage. The test specimen might not fall past Level 2 if the go/no go gage had a minimal number of locations (potentially just two small points) where the test specimen could rest. Therefore, each test specimen was carefully inspected as it rested in the go/no go gage, looking for gaps around the periphery.

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After determining if the test specimen's overall geometry was acceptable, the width and thickness of the entire gauge length was checked. This also was determined with a go/no go gage. Figure 46 is the fabrication sketch of one of the go/no go gages used to determine the geometry acceptance of the gauge length. This go/no go gage was inserted onto the gauge length portion of the test specimen as fully as possible (down to the first machined step), moving the gage along the entire length for the dimension being measured. Insertion past the outer surface and down to the first machined step was required or the test specimen would be rejected. If the test specimen could be fully inserted to the first step, the measurement was deemed acceptable. However, insertion beyond the opening of the first step would cause the test specimen to be rejected since this would indicate a too small dimension. Since these measurements were along the gauge length, these measurements were considered 'critical' for accurate strain measurements and so the maximum tolerances were established at  $\pm$  0.020 inches. If acceptable, the test specimen was marked with its unique test specimen identifier.

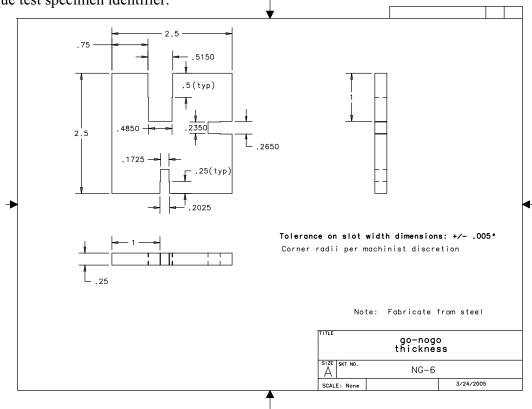


Figure 46. Typical go/no go gage for width and thickness checks.

Next, as part of the pre-test checking process, pre-defined punch guide holes (also considered critical dimensions) were established with separate marking gages (see Figure 47 with critical dimensions blanked out for determination by a qualified dimensional inspector), allowing each test specimen to be consistently marked with a punch. Finally, after punch marking and identifying those marks with alpha characters starting with 'A'(see Figure 48 for a marking example), calipers with points were then used to measure the pre-test distances between the punch marks. A second pair of calibrated calipers were then used to measure the widths (front and back) and thicknesses at intermediate points (e.g., points B and C for D-2-2 and D-4-4 geometries). Acceptance of test specimen critical width dimensions were based on the average of front and back width values. The distance between the two outer-most punch marks defined the test specimen's gauge length. These punch mark lengths and width and thickness measurements along the inner

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gauge length were recorded on the specimen data sheets [see Appendix D for a representative data sheet (page 1 for pre-test data) and see NSNFP Lab Notebook Binder Volumes 2 and 3 for all the actual pre-test specimen data].

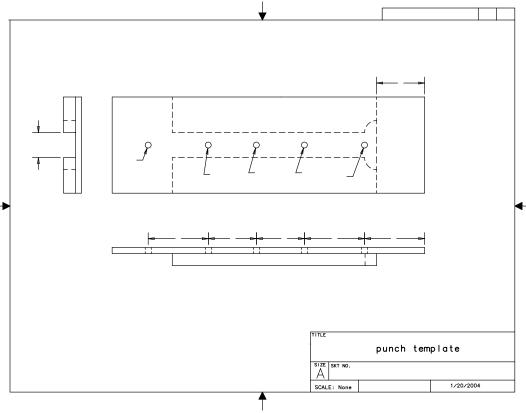


Figure 47. Typical punching gage for 'A' (or A-4-4) test specimens.

Fabrication of these go/no go gages and marking gages were not considered a quality-affecting activity since they were dimensionally checked by an INL qualified dimensional inspector after fabrication and prior to use. After the gages were measured by the qualified dimensional inspector, NSNFP test personnel determined whether or not the go/no go gages were within acceptable tolerances ( $\pm$  0.100 inches for important dimensions,  $\pm$  0.020 inches for critical dimensions). Appropriate gages were used for each different test specimen geometry used for final material impact testing. Dimensional inspections of the gages were made by the qualified dimensional inspector following the completion of each phase of testing. Dimensional inspections of the go/no go and marking gages performed at the completion of prior testing phases were considered as the 'prior to use' dimensional inspection for the next testing phase. As part of a final closeout, the INL Standards and Calibration Laboratory measured these go/no go gages. From their independent measurements, it was determined that the gages were still within the acceptable tolerances for both important and critical dimensions.

### 6.2.2 Final Pre-Test Preparations

The final step of the pre-test preparations was to visibly mark each test specimen so that high-speed digital imagery could be used to perform motion analysis of the impact event. Figure 48 illustrates these marking along with the test specimen's identifier in the format of 304L-XXX or 316L-XXX where XXX is the unique test specimen number.

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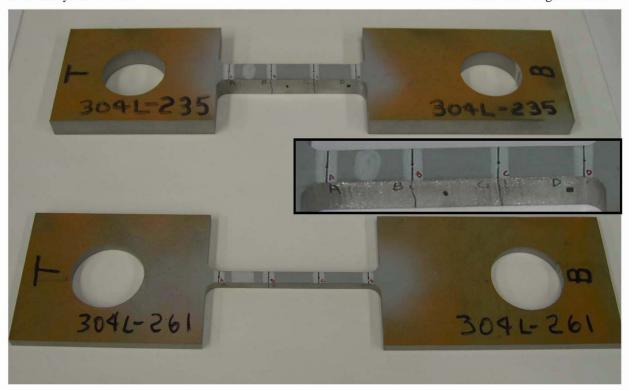


Figure 48. Typical marked material impact test specimens (with close-up picture of gauge length highlighting punch mark identifiers).

## 6.3 Impact Test Procedure

Actual impact testing began once the test specimens were measured and marked to assure acceptable test specimen geometry, that pre-test gauge lengths and cross-sections were measured, and specimen identification was clear and unique. All specimen measurements were taken using calibrated measuring devices (see Report CD-R, File 3). The generic test procedure is very similar for all of the material impact tests performed.

- Step 1: First, the desired test weight (or pig) is selected and that weight is loaded into the ITM, above the tensile test fixture. The drop height has already been established (through preliminary analytical estimates, engineering judgment, or from the findings of prior ITM tests) in an attempt to achieve the desired strain rate and strain in the test specimen.
- Step 2: The room temperature impact testing process continues with the insertion of a room temperature soaked test specimen into the tensile test fixture. For the other temperature conditions (-20 °F, 300 °F, and 600 °F), the test specimens are soaked to their necessary pre-test temperatures prior to insertion into the tensile test fixture (cold) or prior to impact testing (hot) as discussed in the next Section 6.4.
- Step 3: The drop weight is positioned at the predetermined drop height (measured using a tape measure) in order to achieve the desired impact velocity and impact energy. High-speed digital camera settings and lighting are already established but final checks are made to assure operability.
- Step 4: When test preparations are complete, data recordings are started [for accelerometers and the velocimeter (if desired)] and the electronic drop hook is tripped, allowing the drop weight to fall under the influence of gravity.

Step 5: Following conclusion of the material impact test, high-speed digital camera data is evaluated to determine if an adequate strain rate has been achieved. Pertinent information concerning the test (date, test number, drop weight used, drop height, temperature, test specimen number, etc.) was recorded in the NSNFP Lab Notebook.

Weight measurements of the drop weights used in the tests were initially determined with 500 and 5000 pound calibrated load cells (see Report CD-R, File 3) and marked with the measured weight (see Figure 49). These marked weights included the weight of the rigging (approximately 5.7 pounds) necessary to interface with the electronic drop hook. After the completion of impact testing, the weights were weighed by the INL Standards and Calibration Laboratory using a device that was significantly more accurate than the load cells. Appendix E provides detailed comparisons of the weight measurements taken using both devices. For the weights used for the impact testing reported herein, the comparisons were within one pound for all individual weights less than 600 pounds and the single remaining largest weight (labeled 'A' and initially weighed at 1097 pounds) measured 10 pounds lighter, resulting in less than a 1% variation. Hence, the test weight data used throughout the testing effort was considered acceptable.



Figure 49. ITM test weights 'B', C', and 'A' (left to right) and disk weights #1 through #6 (on 'B' and 'C') along with the tensile (back left on left pallet), shear (front left on right pallet), and bending (front right on right pallet) test fixtures.

Details regarding data acquisition can be found in Section 6.5 and certain aspects of recording the necessary test data did affect the impact test procedure. Accelerometer output from preliminary ITM tests in early 2004 yielded indications of high frequency responses believed associated with metal-to-metal contact of the drop weight and impact plate. Depending on the stiffness of the system and the proximity of the transducers, metal-to-metal impact can excite high frequency (but low energy) transducer resonances or 'ringing'. Subsequent ITM tests, and all tests reported herein, incorporated a ½-inch thick Buna-N-Rubber (Durometer hardness of approximately 60A, somewhat harder than tire treads) pad laid onto the impact surface of the impact driver to reduce the ringing (and to prevent lateral slippage/sliding at the interface). Test results obtained with and without the pad showed no significant change in test specimen strains.

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The early ITM tests attempted to use the accelerometer data to determine the strain rate response of each test specimen. However, when applying various filtering techniques to the accelerometer data to reduce higher frequency noise and lower frequency drift, it was noticed that the time content was being altered. Rather than having to address that adverse consequence, high-speed digital camera results were utilized. This device not only visually recorded the impact event but it also permitted the determination of the deformation or strain history, from which the test specimen's strain rate could be calculated. Acceleration data was no longer needed for quality-affecting data purposes. However, acceleration data was still recorded during impact tests in case future insights of specific test responses needed to be ascertained.

A velocimeter was installed on the ITM even though the INL Standards and Calibration Laboratory determined that the device could not be calibrated within their system. The decision was made that the velocimeter could not provide qualified data. However, the velocimeter data could be used for confirmatory purposes. There was an initial concern that the drop weight might possibly rub along the guide pipe, slowing the drop weight and reducing the final impact velocity. The velocimeter data could be used to support the contention that the drop weight (pig) did not lose any measurable velocity during the drop event. The actual ITM installation and alignment was very accurate and the guide pipe was vertically positioned. No rubbing noises could be heard nor measured by the accelerometers during any of the material impact tests. Measurements from the velocimeter (for over 250 impact tests) confirmed that the final impact velocity matched the velocity magnitude calculated using the simple equation of motion for a free fall of a body under the influence of gravity:

$$v = \sqrt{2gh}$$

where: v = velocity at impact (in./sec.)

 $g = acceleration of gravity (386.4 in./sec.^2)$ 

h = drop height (in.).

Even after performing numerous material impact tests, the NSNFP test personnel were vigilant in monitoring data accuracy and constantly looking for improvements. In mid-June 2006, during impact tests using lighter drop weights (less than 800 pounds), a questionable response was noticed in the deformation history. A potential cause of this odd response was thought to be a slight drag from the velocimeter (as its line was rolling out) that might be tipping the drop weight and altering its direct, flat impact onto the test fixture. It appeared that lighter weights were more susceptible to this potential occurrence. Limited testing was performed that indicated there might be some small affects beyond the variability of the material properties. Therefore, the decision was made to immediately stop using the velocimeter in order to eliminate any potential concerns about its possible affect on the impact tests. In order to reevaluate past impact tests, limited testing was performed using the heavier 1097 pound drop weight (labeled 'A'). No significant variation was seen in this comparison impact testing when the velocimeter was and was not attached to the drop weight. Therefore, only past impact tests that used a drop weight equal to or greater than 1097 pounds (that had the velocimeter attached) would be considered valid.

The material impact testing performed (for acceptable impact tests) limited the maximum strains to below the uniform strain limit, such that necking of the test specimens was not expected to occur. This is a strain limit that most component designs would not want to exceed in pure tension due to impending stability concerns if the through-wall strain levels exceeded this value.

The impact test procedure also needed to reflect an adequate number of impact tests to be performed and an acceptable tolerance on the test results obtained. At the onset of material impact testing in 2004, the goal was to achieve three valid impact tests at certain strain rates (called target strain rates) identified in the Test Plan. Typically, multiple impact tests were performed in order to achieve the desired strain rates. This was necessary due to variations in material properties and the nonlinear responses of the test specimens, making initial response predictions difficult. It was hoped that the test specimen inelastic strains would vary significantly between 0.1 and the uniform strain limit for the three tests conducted at each target strain rate. With a reasonable spread in maximum strain achieved for the three tests at the same strain rate, it would then be possible to generate an elevated true stress-strain curve reflecting the average of those three target strain rate tests. Obviously, a tight tolerance on the strain rate was needed in order to generate an elevated true stress-strain curve that reflected the target strain rate. Therefore, it became necessary to define an acceptable tolerance on the strain rates achieved. For target strain rates above 20 per second, a tolerance of  $\pm 2$  per second was established. For target strain rates of 10 per second and below, an initial tolerance of  $\pm$  2 per second was established but was later tightened to  $\pm$  1 per second for the associated impact tests reported herein. The goal was to develop a sufficient number of these elevated true stress-strain curves such that the structural analyst could adequately define material responses for a drop event. While this was adequate for initial impact testing and establishing performance characteristics of the test specimens, numerous impact tests were not being utilized.

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After contemplating various approaches to increase the use of all data from valid impact tests, it was decided to still attempt to achieve the target strain rates identified in the Test Plan. For base material, three distinct impact tests were attained for each target strain rate. For welded material (due to a limited number of available test specimens), only two impact tests per target strain rate were attained. Impact testing still had to be performed at some strain rate levels and achieving the target strain rates satisfied the Test Plan requirement. This would also still permit the generation of elevated true stress-strain curves at specific target strain rates if deemed pertinent. However, finding a way to use all of the available valid impact test data was still needed. The NSNFP test personnel determined that if factors (constant values that quantified the strain rate effects for impact tests) could be calculated efficiently, then factor versus strain rate curves could be generated. This would incorporate all valid impact testing results. Hence, this approach was adopted.

# 6.4 Achieving Impact Temperature Conditions

Room temperature impact testing results and engineering judgment were combined to determine that only the D-2-2 and the D-4-4 test specimen geometries would be needed to achieve the desired strain rates for the cold and elevated temperature impact testing. Limiting the number of test specimen geometries minimized the amount of temperature baseline testing needed to establish the parameters necessary to achieve adequate impact temperature conditions. If this initial assessment proved wrong, additional temperature baseline testing would be performed for additional test specimen geometries. However, the impact testing indeed demonstrated that these two test specimen geometries were sufficient to allow all of the target strain rates to be achieved.

## 6.4.1 Room Temperature Testing

Considering all of the room temperature material impact testing completed, the room temperatures ranged from 52 °F to 85 °F. The locations where the material impact testing was performed were in two older facilities that had limited temperature controls during the fall, winter,

spring, and summer seasons. However, this range of room temperatures is still considered acceptable. Performing the room temperature impact testing did not require establishing any specific release times for the drop hook. The impact tests were performed when test preparations

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### 6.4.2 Elevated Temperature Testing

were complete and the NSNFP test personnel were ready.

The NSNFP assigned the task of performing strain rate impact testing at elevated temperatures of 300 °F and 600 °F for both base and welded material. The initial question was how to achieve the test specimen heating process. Heating the entire test fixture and test specimen to 600 °F was not considered wise when repeatedly impacting the test fixture (made of A36 carbon steel) with weights up to 1600 pounds. This would probably deform the test fixture too much for future use. Heating the test specimens in an oven and then loading them into the test fixture would be possible but the process of handling a hot test specimen in a short enough time interval to maintain proper temperature conditions did not seem reasonable. Open flame heating was considered too dangerous. Electric heat guns (focused on heating the test specimen itself while in the test fixture) were chosen as the best option.

Multiple heating setups were tested before effective heating processes were proven viable for both the D-4-4 and the D-2-2 test specimens. The D-4-4 and D-2-2 test specimens used for temperature baseline testing had five equally spaced holes for thermocouples to be embedded into the central volume of the test specimen along its gauge length (Figure 50 illustrates the D-2-2 temperature baseline test specimen). Preliminary baseline testing (not documented in the NSNFP Lab Notebook) tried different numbers of electric heat guns, different heat gun positions, different heat gun settings, and different heating time intervals. In addition, it was recognized during the preliminary testing that heat shields or reflectors were needed to provide additional local heating control. Two heat shields (for front and back) were developed for the D-4-4 and D-2-2 specimen testing and another unique pair were created for the D-2-2 specimen testing at 600 °F (see Figure 51 for a picture of each heat shield geometry). Finally, for the D-2-2 baseline specimen testing, it was recognized that the thinner gauge length lost heat much quicker that the D-4-4 specimen. In order to better protect the D-2-2 specimen, a 'cradle' (see Figure 52) was fabricated that would essentially insulate the D-2-2 specimen test length on three sides (while still leaving viewing room for the high-speed camera). Hence, the preliminary testing permitted a large variety of heating methods to be tried and adjusted before the final (or near final) test setup was established. At this stage, documentation of the temperature baseline testing commenced in the NSNFP Lab Notebook.

The goal of the temperature baseline testing was to demonstrate the validity of the proposed heating process for both the 300 °F and 600 °F testing efforts and to demonstrate that it was repeatable. The test process approach required that the test specimens be overheated in order to allow time for test preparations (e.g., removing heating equipment for a clear camera view) to occur while the test specimen was cooling down to the target temperature. Therefore, the heating process also had to determine at what time interval (following the heat guns being turned off) the impact test could commence (see Section 6.4.2.1).

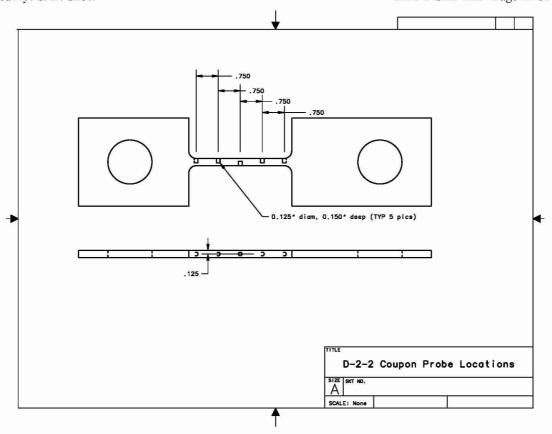


Figure 50. Temperature baseline testing specimen D-2-2 showing thermocouple hole locations.



Figure 51. Heat shields for all test specimens (left) except D-2-2 test specimens at 600 °F (right).



Figure 52. D-2-2 cradle holding an impacted test specimen (upper right insert is of cradle alone).

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The final heating configuration consisted of four heat guns. The heat guns were symmetrically placed, two in the front and two in the back, as illustrated in Figure 53. The bottom heat guns had three-inch long nozzle extenders and were positioned into the slot cut into the lower cross-member and pushed fully forward. This alignment centered the directed heat onto a spot approximately 1-inch below the 3-inch wide shoulder transition, onto the large bottom holder area. The top heat guns were positioned so that the nozzles were in contact with the bottom surface of the upper cross-member and pushed fully forward. This alignment centered the directed heat onto a spot approximately ½-inch below the 3-inch wide shoulder transition, onto the gauge length. Once an acceptable heating level was achieved, the barrels on the heat guns were marked to establish that particular heat gun setting (no gradations existed on the heat guns so marking was necessary in order to reset the heat gun settings). Table 8 indicates the heat gun barrel marking used.

Table 8. Heat gun barrel markings used for elevated temperature impact testing.

Test Spec	cimen Geometry	300 °F Testing	600 °F Testing
D-2-2	Top Guns	L-L	TT
D-2-2	Bottom Guns	L-L	J-J
D 4 4	Top Guns	D-D	E-E
D-4-4	Bottom Guns	Н-Н	r-r



Figure 53. Temperature baseline testing setup showing four heat guns in position.

The heat shields were placed on top of the lower cross-member, bridging across the slot cut, and pressed up against the test specimen, front and back. Constant monitoring during the temperature baseline testing (and during the heating process for impact testing) was necessary to make sure these heat shields did not vibrate (due to operation of the heat guns) out of position

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during the heating process. The heat shields allowed the heating process to concentrate more heat into the bottom holder areas of the test specimens, minimizing heat loss through those large areas while the notches permitted hot air to rise and bathe the gauge length. Overall, much improved temperature distributions were measured throughout the gauge length with the heat shields in place.

In order to achieve acceptable test specimen temperature tolerances, a very prescriptive heatup process was used. The settings for the heat guns, marked during baseline testing, were achieved by adjusting to a full power setting and then reducing the setting down to the desired power level marking at the start of every day of elevated temperature testing. As indicated above, five thermocouple readouts (at 1.5 second intervals) were recorded (at three second intervals) for each temperature baseline test performed. Achieving consistent timing of the heating cycle durations was also considered vitally important in order to achieve consistency in the heating process (Section 6.4.2.1 explains the timing aspects in more detail). Every temperature baseline test performed as a basis test is included in NSNFP Lab Notebook Binder Volume 4. As can be seen in Figure 54, a representative D-2-2 test specimen was heated until a steady-state condition was achieved, and then the heat guns were turned off (after 25 minutes of heating as monitored on the digital timer). Thermocouple data was continuously recorded after the heat guns were turned off so that the test specimen cooldown (toward the target impact temperature of 600 °F in this specific case) could be monitored. Figure 55 illustrates the associated enlargement of the cooldown process (also contained in the NSNFP Lab Notebook Binder Volume 4). As can be seen, 18 seconds after the heat guns were turned off, the maximum temperature was 626 °F and the minimum temperature was 578 °F.

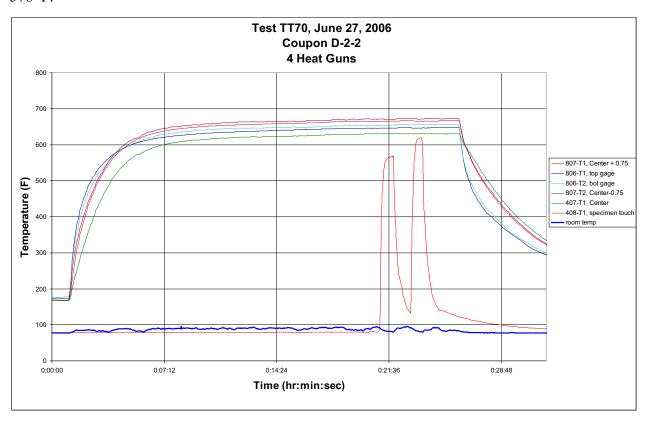


Figure 54. Representative temperature baseline test showing heat-up, steady-state, and the cooldown following the heat guns being turned off after 25 minutes of heating.

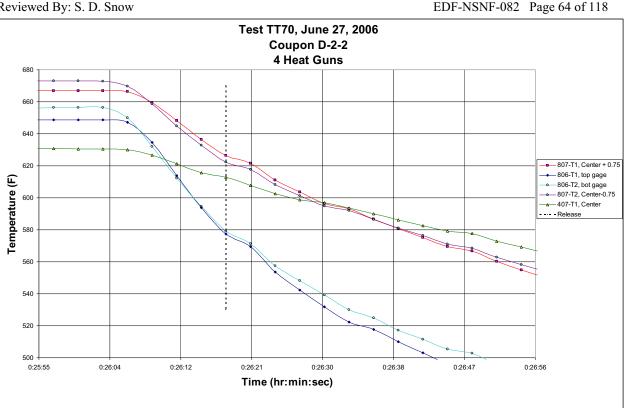


Figure 55.Representative cooldown with release time of 18 seconds identified by vertical dashed line showing temperature range of 578 to 626 °F.

It was recognized that heat gun settings and time duration alone were not sufficient to justify the acceptable heating of the test specimens for the actual impact testing. Therefore, it was decided that actual temperature measurements of each test specimen before impact testing at pre-established times (see Section 6.4.2.1) near the end of the heating process should be performed to gain further confirmation that each heat-up cycle was acceptable and following the baseline testing parameters. The initial assumption during temperature baseline testing was that the temperature at the center portion of the gauge length would be sufficient to judge the adequacy of the test specimen temperature and the heating process. Early on in the temperature baseline testing, test specimen measurements of the hot spot where the top heat guns were directed onto the gauge length were monitored to determine just how hot those locations became. However, during heat gun failure testing (see Section 6.4.2.3), it was determined that another temperature measurement near the bottom punch mark of the test specimen was needed to assure proper heat gun performance during the heating cycle. Therefore, after the heat gun failure testing, it became routine during temperature baseline testing to measure the temperatures of the test specimen (D-4-4 specimen on the side) or test specimen holder (D-2-2 cradle on the side) at the center and at the bottom punch mark locations. A thermocouple was used for these temperature measurements. The temperature baseline testing established the timing for the measurements and the acceptable ranges for these measured test specimen temperatures [Figure 54 illustrates a bottom temperature was measured first (570 °F) and then a center position (619 °F) temperature measurement was taken]. Table 9 indicates the acceptable ranges of these two test specimen temperatures (based on the multiple temperature baseline tests performed) as well as the ranges of temperatures achieved during actual material impact testing. All material impact tests conformed to the test specimen temperature measurement tolerances established.

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Table 9. Measured test specimen temperature ranges during baseline and impact testing.

Data	Measurement	300 °F	Testing	600 °F Testing		
Recorded	Location	D-2-2	D-4-4	D-2-2	D-4-4	
During Baseline	Bottom	270 to 320 °F	280 to 320 °F	540 to 630 °F	570 to 620 °F	
Testing	Center	280 to 320 °F	285 to 320 °F	585 to 635 °F	580 to 635 °F	
During	Bottom	270 to 314 °F	282 to 321 °F*	545 to 611 °F	572 to 607 °F	
Impact Testing	Center	283 to 307 °F	286 to 317 °F	585 to 627 °F	580 to 592 °F	

<sup>\* -</sup> The one 321 °F temperature was accepted since heat gun failure was clearly not indicated.

Note that early on in the impact testing, efforts to measure the D-4-4 test specimens proved difficult. The measured temperatures were unexpectedly low. After various attempts, including performing heat-up testing with the thermocouple instrumented baseline test specimen again, it was recognized that the impact test specimens, since they were water jet cut, had a rougher surface on the sides where the temperature measurements were taken whereas the baseline test specimens had smoother machined surfaces. (For D-2-2 testing, a cradle was used for baseline testing and impact testing and the cradle side surfaces were machined smooth.) Therefore, the side surfaces on the impact test specimens where the temperature measurements were to be taken were locally polished in order to improve the thermocouple contact. This greatly improved the impact test specimen temperature measuring process. For each successful heat-up cycle, the confirmatory bottom and center test specimen temperature measurements made prior to impact testing were recorded and entered into the lab notebook. If the measured temperatures were not acceptable, the heating process was continued (heat guns turned off at the proper time) but the impact test was not performed.

Two other issues were discussed during preliminary temperature testing and a final decision was made to address each in the temperature baseline testing. The heat-up cycle was very time consuming (see Section 6.4.2.1) with a lot of heat being absorbed by the test fixture. It was believed that another indication of repeatability would be the temperatures of the test fixture, taken before and after each heat-up cycle. Although not expected to be a precise indicator of test specimen temperatures, knowing the generic temperature history of the test fixture throughout the heating process could provide additional confirmation of a proper and repeatable process. Section 6.4.2.2 contains additional information on temperature measurements of the test fixture. In an effort to address potential equipment failure, additional testing was performed to determine if a single heat gun failure could be detected. Section 6.4.2.3 describes how the test specimen pre-impact test temperatures were utilized to help detect a potential heat gun failure.

The NSNFP Lab Notebook provides the overall process and insights related to the qualified temperature baseline testing performed and the associated Binder Volume 4 provides the test specific baseline results (each test geometry at each elevated temperature) as well as testing summaries. A full testing day's worth of temperature baseline testing was achieved and then repeated on another day. In an effort to demonstrate full repeatability, the heat guns were reset prior to a second day of temperature baseline testing. Finally, if any problems arose, it was decided early on that the instrumented test specimen used for the temperature baseline testing could be re-used on impact testing days or other days as necessary to gain insights on a continuing acceptable heat-up

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process. Those types of confirmation checks were made and each confirmed that the heating process was always within stated tolerances. These confirmatory checks are also documented in the NSNFP Lab Notebook Binder Volume 4.

## 6.4.2.1 Heating/Cooldown Durations and Trip Hook Release Times

These intervals were determined during the preliminary testing, used throughout temperature baseline testing, and followed during actual material impact testing at elevated temperatures. The time intervals established between heat guns off and heat guns back on allowed not only for the impact test to be performed but also were established in order to allow adequate time for the determination of the impact test strain rate, permit the test fixture to cooldown for handling purposes, and to allow for sufficient time to change drop weights. All times were determined and followed using a digital timer. A continuous timing sequence was used (see below for temperature specific timing intervals) that began at the start of a test day (heat guns on) and ended with the final material impact test for that day.

## **Event Timing** 300 °F Impact Tests (Six tests maximum per day)

0 min. Start Heat Guns

12 to 13 min. Bottom Punch Measurement (initially the hot spot)

14 to 15 min. Centerline Measurement

17 min. Heat Guns Off

Specimen dependent Drop Weight Released

52 min. or Heat Guns Back On (repeat above steps for next test)

1 hr 22 min. (after third test only)

# **Event Timing** 600 °F Impact Tests (Five tests maximum per day)

First Test of Day:

0 min. Start Heat Guns

55 to 56 min. Bottom Punch Measurement (initially the hot spot)

57 to 58 min. Centerline Measurement

60 min. Heat Guns Off

Specimen dependent Drop Weight Released

1 hr 45 min. Heat Guns On (go to timing below for remaining tests)

Remaining Four Tests of Day:

0 min. Start Heat Guns

20 to 21 min. Bottom Punch Measurement (initially the hot spot)

22 to 23 min. Centerline Measurement

25 min. Heat Guns Off

Specimen dependent Drop Weight Released

1 hr 15 min. Heat Guns Back On (repeat above steps for next test)

In addition, the drop hook release time needed to be established. The baseline testing established the drop hook release times, which were hoped to be less than 30 seconds from turning off the heat guns in order to minimize thermal gradients across the test specimen thickness. Obviously, the impact time is the most critical time parameter but with different weights resulting in different drop heights, the time between drop hook release and actual impact varied between zero and 1 second. Therefore, if a 1 second long time interval could be determined wherein the worst case temperature values achieved acceptable weighted average temperatures and acceptable maximum and minimum temperatures, then the drop hook should be activated at the start of that 1 second time interval. This is what is documented in NSNFP Lab Notebook Binder Volume 4. The one exception was for the D-4-4 test specimen at 300 °F temperature. The time at which the measured worst case temperature ranges achieved the minimal temperature ranges (22 seconds) was much longer than the other tests (16 to 20 seconds). Therefore, it was decided to not exceed 20 seconds for a trip hook activation time so that any potential thermal gradient effects through the test specimen thickness would be minimized and not become a detrimental issue. Table 10 below summarizes the temperature tolerances achieved during temperature baseline testing for each target temperature for each unique test specimen geometry at the drop hook release time or a one second interval afterwards. These drop hook release times were achieved by the NSNFP test personnel for each material impact test completed.

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Table 10. Drop hook release times and associated test specimen temperatures.

	Test Specimen Geometry								
		D-2-2			D-4-4				
Target Temp. (°F)	Drop Hook Release Time (sec.)	Weighted Avg. Temp. Range (°F)	Max/Min Temp. Range (°F)	Drop Hook Release Time (sec.)	Weighted Avg. Temp. Range (°F)	Max/Min Temp. Range (°F)			
300	16	+5/-10	+23/ -24	20	+12/-7	+18/ -12			
600	18	+15/+4	+32/ -32	18	+8/-7	+28 -28			

Temperature ranges are from target temperatures of 300 °F and 600 °F. Hook release time is interval after heat guns are turned off.

The weighted average temperature covers the entire gauge length whereas the max/min temperature ranges are the highest or lowest temperature regardless of specific location. One important point to recognize is that the minimum temperature range typically reflected the temperature measurements made at the extreme ends (top and bottom locations) of the gauge length. This is reasonable due to the heat loss through the pin connected ends (through the top and bottom cross-members) of the test specimen. Note that Table 9 indicates the worst-case temperature tolerances achieved during all of the numerous temperature baseline tests completed. For most of the tests, the weighted average temperature and maximum and minimum temperatures were much closer to the target test temperatures.

## 6.4.2.2 Test Fixture Temperatures

Test fixture temperatures were recorded during the temperature baseline testing as well as during the actual material impact tests. Temperature measurements of the upper cross-member (on the top surface centered in front of the slotted opening) and lower cross-member (facing the impact driver, on the right side approximately 2 inches down from the top and 2 inches toward the back) were taken immediately before the heat guns were turned on and approximately one minute after the heat guns were turned off. These temperatures, recorded in the NSNFP Lab Notebook obviously varied somewhat due to variations in the heating process and to varying initial conditions. Although not considered as significant as the measured test specimen temperatures, this information was considered to provide insights into the overall performance of the heat guns throughout the impact testing effort and to also provide test repeatability insights. Since the start of each day's impact testing could be at a different room temperature than that of the baseline testing, it was decided to look at the temperature changes of the test fixture throughout the multiple heat-up cycles for a full day of testing and see how they compared to the baseline testing data. Variances are those temperature values that were beyond the range of test fixture temperatures established during baseline testing. The variance was considered zero if the change in temperature was within the tolerance achieved during the two days of baseline testing. These variance data are determined in the NSNFP Lab Notebook Binder Volume 4 and are summarized below in Table 11.

Impact Test	300	)°F	600 °F		
Variances From Temperature Baseline Testing	D-2-2 D-4-4		D-2-2	D-4-4	
Largest Single Test Variance	8°F	11 °F	24 °F	20 °F	
Average Variance of Viable Impact Tests	2.4 °F	3.7 °F	9.3 °F	7.0 °F	

Table 11. Test fixture temperature variances.

Initial desires were that the worst case variance from that established during temperature baseline testing would be less than 25 °F. This tolerance was achieved. Hence, the test fixture temperature data also confirms an acceptable heating process was used for the elevated temperature material impact testing.

#### 6.4.2.3 Heat Gun Failure

The possibility of heat gun failure during a heat-up process was investigated. Documentation of that effort and the establishment of acceptable temperature range checks is contained in the temperature baseline testing data. Plots in the NSNFP Lab Notebook Binder Volume 4 show temperature time histories of what happened during 300 °F and 600 °F baseline testing if a specific heat gun failed. This was achieved by following the established temperature baseline heat-up process (using the instrumented test specimens) until reasonable steady state conditions were achieved and then a heat gun was turned off while the remaining three heat guns

sufficient since the results were similar to the 300 °F testing.

continued to heat. This was repeated four times until each heat gun in sequence had been turned off. The 300 °F heat-up process was repeated but it was felt that one test for 600 °F testing was

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The results show that center test specimen measurements accurately indicated a top front or top back heat gun failure. The center temperatures reduced by 28 to 44 °F for 300 °F testing and 56 to 74 °F for 600 °F testing, a very measurable difference. For a bottom front or bottom back heat gun failure, the center test specimen temperature measurement proved to be inconclusive so measurements of the bottom punch (or base) area were taken and these proved much more insightful. The bottom punch or base temperatures reduced by approximately 42 to 61 °F for 300 °F testing and 70 to 132 °F for 600 °F testing, again a very measurable difference.

It was decided that in place of hot spot temperature checks, test specimen temperature measurements at the bottom punch mark were necessary to assure that none of the four heat guns failed during the heat-up cycle. Therefore, heat gun failure baseline testing was used to establish acceptable ranges for bottom punch (or base) temperature measurements. The heat-up and cooldown baseline testing mandated higher acceptable temperatures than those determined for proper heat gun performance at the center position. In conclusion, these heat gun failure data were used to assure that heat gun failure would be detected and impact testing would therefore be terminated until a replacement heat gun could be incorporated and validated with additional temperature baseline testing.

#### 6.4.2.4 Resulting Test Specimen Temperatures at Impact

An initial accuracy target of the weighted average test temperature of  $\pm$  25 °F was specified in the Test Plan but it was quickly realized that not only should a reasonable weighted average test specimen temperature be achieved but that a limit on the highest and lowest temperatures must also be imposed. Initial desires for acceptable maximum and minimum temperature ranges (within the test specimen gauge length) were  $\pm$  25 °F for the 300 °F testing and  $\pm$  35 °F for the 600 °F testing. As can be seen in the baseline testing information provided in Table 10, these accuracy goals were met. The worst case extremes (of any of the associated baseline tests) were then used to establish the temperature ranges applicable to the heating process used. However, most of the baseline testing results were actually much closer to the target temperatures than the extremes listed.

It was expected that certain variabilities in test conditions could arise for the many anticipated days of actual material impact testing. Therefore, the previously stated temperature ranges achieved during temperature baseline testing (see Table 10) were rounded up to values that would become the stated temperature tolerances achieved during impact testing. These final temperature tolerances are presented in Table 12.

Table 12. Temperature tolerances for material impact testing.

	All Test Specimens				
Target Temperature (°F)	Weighted Avg. Temperature Range	Max/Min Temperature Range			
	(°F)	(°F)			
300	+15/-10	±25			
600	+15/-10	±35			

(Reference 39) provided the following conclusion:

In addition to the significant amount of measured temperature data, a thermal analysis of the temperature cooldown of a D-4-4 test specimen was performed to provide more insights into the validity of the measured temperatures and insight on whether significant thermal gradients existed through the thickness during cooldown. This thermal analysis effort, reported in EDF-NSNF-065

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"The main conclusion, deduced from the comparison of the predictions of the ABAQUS model to the test data for the 300 and 600 °F tests, is that the thermocouples should accurately represent the transient thermal response of the test coupon during the initial cooldown (i.e., the first 20-30 seconds after the heaters are shut off). Thermocouple lag, or delay, effects were not seen in the data. Also, the temperature distribution across the thickness of the coupon test section was determined to be uniform."

## 6.4.3 Cold Temperature Testing

For the -20 °F material impact testing, the decision was made to use a research freezer (with a stated capacity down to -40 °F) to cold-soak the test specimens. Similar to the elevated temperature testing, it was decided to not cold-soak the entire tensile test fixture down to -20 °F. It was decided to cold-soak each test specimen down to a temperature lower than -20 °F and then take the time (while the test specimen was warming) to insert the test specimen into the test fixture and prepare for impact testing.

Preliminary temperature baseline testing determined how much colder than -20 °F was necessary to allow sufficient time for placement of the test specimen into the test fixture and prepare for the impact test. A time interval no longer than one minute was thought to be adequate for impact testing once the test specimen had been removed from the research freezer. Instrumented temperature baseline test specimens [both the D-2-2 (with cradle) and the D-4-4 test specimens as used for the elevated temperature testing] with three thermocouples inserted into the mid-cross section (top punch, bottom punch, and center positions along the gauge length) were used to determine the test specimen temperature responses. Both the D-4-4 and the D-2-2 preliminary temperature results indicated that an initial cold-soak temperature of approximately -33 °F was needed. Preliminary testing also indicated that having just a few specimens in the freezer caused the freezer to cycle frequently because it was difficult to keep just air sufficiently cold. Therefore, a thick stainless steel plate was inserted into the freezer so that this denser mass could help the freezer temperature stabilize. This established a more consistent temperature in the freezer and all test specimens were stacked onto this plate to promote more rapid cooling.

Temperature baseline testing for cold temperatures could now proceed with data being recorded in the NSNFP Lab Notebook. In order to simulate impact testing conditions as much as possible, the three thermocouple leads were taped close to the test specimen body so that the specimen could still be inserted into the test fixture while monitoring and recording the temperatures. Timing was monitored using the same digital timer used for the elevated temperature testing. Timing started with the opening of the research freezer. The instrumented test specimen was removed from the freezer, loaded into the test fixture, a one minute pause interval occurred, and then the specimen was returned to the freezer. Rather than directly holding the test specimen, a tab of duct tape was used to hold the test specimen, thus minimizing localized heat gain. Only test specimens that had cold-soaked at least overnight were used to establish the warm-up timing.

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However, other warm-up tests were performed during the remainder of the day once the test specimen had cold-soaked and stabilized to at least a temperature below -30 °F. These tests, using both test specimen geometries, were used to demonstrate the repeatability of the test process. The NSNFP Lab Notebook Binder Volume 4 contains this repeatability data. These repeatability tests (using the weighted averages of the recorded temperatures) were biased to start at the average temperature of the established starting temperature range. These plots (illustrated in Figure 56 for the D-2-2 test specimen repeatability tests biased to -33.25 °F) show a very tight grouping of curves, confirming a very repeatable warm-up process, especially up to the time that the drop hook was released. The D-4-4 temperature baseline testing results (not shown), reflecting a test specimen with more thermal mass, had an even closer temperature grouping than the D-2-2 results.

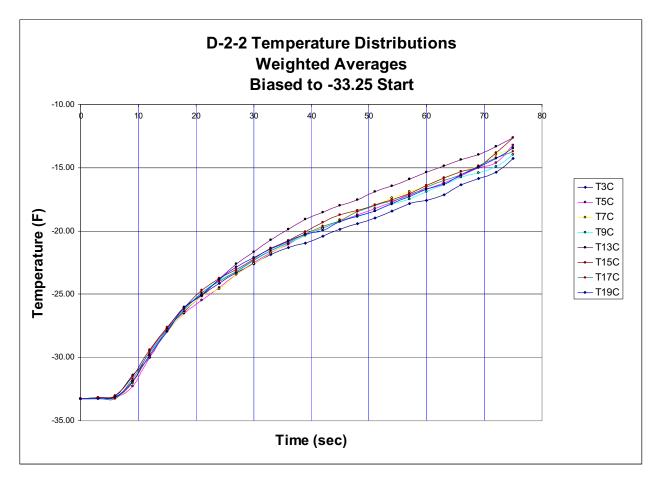


Figure 56. Repeatability tests for D-2-2 test specimen all temperatures biased to start at -33.25 °F.

As previously mentioned, only the thoroughly cold-soaked test specimens were tested (first tests of the day) to establish the timing for the impact tests. Warm-up tests 1C, 11C, 24C, and 25C addressed the D-2-2 specimens and warm-up tests 2C, 12C, 21C, and 23C addressed the D-4-4 specimens. Presentation and evaluation of this data is contained in NSNFP Lab Notebook Binder Volume 4. Figure 57 illustrates the warm-up test results for D-2-2 test specimen at test 25C. Again, note that the D-4-4 test results provided even closer temperature grouping due to the larger thermal mass of the thicker test specimen.

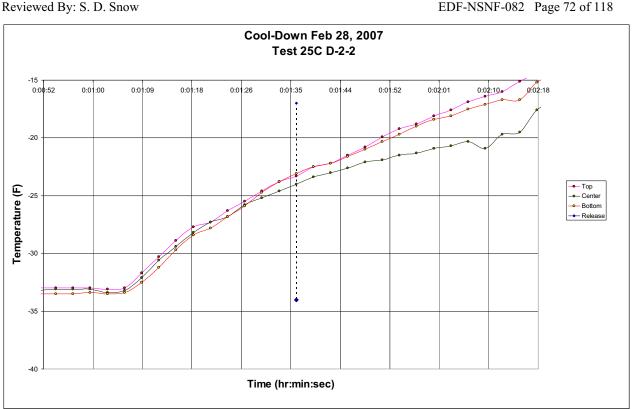


Figure 57. Typical D-2-2 warm-up test from overnight cold-soaked conditions.

Table 13 lists the weighted average temperature and the maximum and minimum temperature ranges determined during the temperature baseline testing. In addition, the averages of the weighted average, maximum, and minimum temperatures for each of the four baseline tests were then determined. From these averages of the averages, constant factor adjustments were made to address the probable temperatures that would be achieved at an anticipated minimum starting temperature and at an anticipated maximum starting temperature. These anticipated starting temperatures became the acceptable starting temperature ranges for cold impact testing. For the D-4-4 specimens, the starting acceptable temperature range for impact testing was -31 to -34.5 °F. For the D-2-2 specimens, the acceptable starting temperature range for impact testing was -32 to -34.5 °F.

Table 13. Test specimen cold temperature ranges at impact test.

Temperature Parameter	D-2-2 Specimen	D-4-4 Specimen
Weighted Average Temperature Range at Impact	-21.8 to -23.6 °F	-20.7 to -22.1 °F
Maximum / Minimum Temperature Range at Impact	-19.0 to -24.3 °F	-20.5 to -22.3 °F

Testing was also performed to demonstrate that cradles reused during the test day would not adversely affect the temperatures of D-2-2 test specimens that had cold-soaked overnight. After performing an overnight cold-soaked D-2-2 warm-up test, the cradle was returned to the

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freezer no longer than 3 minutes and 15 seconds after initial opening of the freezer for test specimen removal. After waiting 45 minutes, another overnight cold-soaked test specimen was placed into the cradle. After 15 more minutes of cooling, the center temperature of the cold-soaked test specimen was checked. The D-2-2 test specimen was just as cold as it had been after the overnight cold-soak. Therefore, this same minimal timing for cradle cooling was applied if cradles were to be reused during a single test day. Appropriate time intervals were recorded in the NSNFP Lab Notebook for cradles reused during a single day.

### 6.4.3.1 Trip Hook Release Times

The established timing interval for the -20  $^{\circ}$ F material impact testing (from freezer opening to release of drop hook) was 36 seconds for the D-2-2 specimens and 51 seconds for the D-4-4 test specimens. Temperature baseline test data can be found in the NSNFP Lab Notebook Binder Volume 4 for the -20  $^{\circ}$ F temperature testing efforts.

## 6.4.3.2 Acceptability of Cold Test Specimen Temperatures at Impact

Table 14 summarizes the actual measured starting temperature ranges achieved during the -20 °F impact testing performed during 2007. These temperature ranges are based on temperature measurements from an instrumented test specimen that was placed inside the freezer during the entire testing sequence. This starting temperature range satisfies both the D-2-2 and the D-4-4 starting temperature range criteria established during temperature baseline testing. The room temperatures during actual impact tests ranged from 66 to 71 °F, very similar to the room temperatures experienced during baseline testing (68 to 71 °F). In fact, the room temperature during cold impact testing never exceeded the maximum baseline testing room temperature experienced and were within 2 °F of the minimum room temperature experienced during baseline testing. Hence, the room temperature conditions during actual impact testing had no adverse effect on the timing intervals established for the cold test specimens.

Table 14. Initial temperature ranges for cold material impact testing.

<b>Test Specimen Geometry</b>	Initial Temperature Range (°F)
D-2-2 or D-4-4	-32.1 to -33.4 °F

Therefore, the actual temperatures achieved in the test specimens for cold impact testing were expected to have been within the ranges established during temperature baseline testing and shown in Table 13. These narrow temperature ranges were acceptable for impact testing. It is interesting to note that the warmest starting test specimen temperature recorded for impact testing was -32.1 °F (compared to an allowable of -31 °F) so the actual temperature ranges would have been even closer than the temperatures predicted in Table 13.

# 6.5 Data Acquisition

This section discusses in more detail the types of data recorded during the actual impact tests. Pre- and post-test dimensional measurements of the test specimens are addressed in Sections 6.2 and 6.7, respectively.

## 6.5.1 High-Speed Digital Camera

Strain rates vary with time during accidental drops or crash events. Since the ITM reflects a true impact event, the strain rate starts out at a fairly constant value but then dissipates to zero as the impact energy of the dropped weight is transformed into permanent test specimen deformation.

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A Photron Fastcam high-speed digital camera was used to record image data of the impact events. The camera was positioned to look directly at the specimen front surface. Displacement histories for test specimen geometry 'A' (A-4-4) punch marks A through D (see Figure 48) were recorded during a drop event. Punch mark E was not visible to the camera during any impact testing performed prior to cutting the slot into the test fixture's lower crossmember (see Section 6.1). For test specimen geometries A-2-2, D-2-2, and D-4-4 (all tested after November 21, 2005 with the slot already cut), the entire gauge length of the test specimen was visible to the camera. Imaging data were recorded at a frame rate of 3000 frames per second and a resolution of 512 x 1024 pixels for the initial strain rate testing performed in 2004. However, starting in early 2005, the imaging data were recorded at 8000 frames per second at a resolution of 256 x 1024 pixels.

Motion analysis of the digital image data was used to determine displacement histories of the camera visible specimen punch marks. Displacement histories of camera visible punch marks on the test specimen were measured directly from the frame exposures. Engineering strain histories were developed from the recorded displacement histories and were converted to true strain histories using the relationship:

$$\varepsilon_{true} = \ln(1 + \varepsilon_{engineering})$$

For this strain rate research, the impact test strain rate was defined as that rate of straining occurring early in the specimen response stage where the strain rate is nearly constant with time. Figure 58 illustrates a typical strain history data plot used to determine strain rates. For the test shown, the slope was determined to be a line from the origin through a true strain data point of 0.1558 at time 0.006 seconds. This calculates to be a strain rate of 0.1558/0.006 = 26.0 per second. Strain rate data were recorded on page 2 of the test data sheets (as shown in the Appendix D sample and contained in the NSNFP Lab Notebook Binder Volumes 2 and 3 for each impact test).

Imagery of the impact event from before impact to after specimen initial rebound was saved to a DVD, typically 1340 frames for each test. (These DVDs are part of the NSNFP Lab Notebook Binder Volume 5 and were submitted to the NSNFP as records.) The displacements of the camera visible punch marks were used to develop strain histories for the specimens by performing motion analysis of the recorded image files. Motion analysis data are contained in the NSNFP Lab Notebook Binder Volume 5 (eight books total). The camera frame rate was calibrated before and after testing to assure accuracy (see Report CD-R, file 3). Motion analysis results (strains) were also compared to test specimen final measured results (strains) to verify accuracy. The camera data were (on average for all 260 impact tests used to calculate factors) within 2.5% of the measured test specimen strains. This indicates that the strain rates derived from the camera data were accurately determined. Section 7.1 contains camera versus measured strain comparisons for every impact test considered herein.

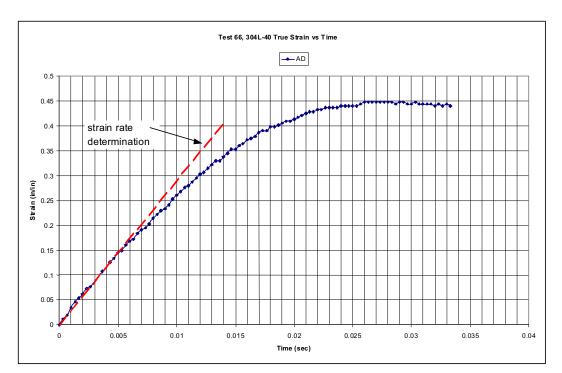


Figure 58. Camera determined true strain history for specimen 304L-40.

#### 6.5.2 Accelerometer and Velocimeter Data

During an impact test, test specimen acceleration histories were measured using calibrated  $500 \, \mathrm{g}$  and  $5000 \, \mathrm{g}$  accelerometers mounted on the back side of the impact driver lower cross-member. Acceleration histories were recorded on a Data Acquisition System (DAQ)  $2000 \, \mathrm{A}$  at a rate of  $5000 \, \mathrm{samples}$  per second for  $20 \, \mathrm{seconds}$ . Acceleration data were recorded with the goal of having that additional impact data in case of future test specimen response questions. The raw acceleration data were filtered using a Butterworth bandpass filter. The frequency band used was  $2 \, \mathrm{Hz} - 500 \, \mathrm{Hz}$ . Integration of this acceleration trace was also performed using DADiSP 2002. Both of these results were recorded on page 2 of the test data sheets for both the  $304 \, \mathrm{L}$  and  $316 \, \mathrm{L}$  test specimens, located in NSNFP Lab Notebook Binder Volumes 2 and 3, respectively.

As previously mentioned in Section 6.3, drop weight velocities were initially measured by the attachment of a velocimeter (a device that could not be calibrated at the INL) to the lower end of the drop weight. Velocity histories were recorded on a Data Acquisition System (DAQ) 2000A at a rate of 5000 samples per second for 20 seconds. Prior to mid-June 2006, velocimeter data was recorded and these results can also be found in the NSNFP Lab Notebook Binder Volumes 2 and 3 for those tests where incorporated.

Accelerometer and velocimeter data were recorded as 'data of interest'. The data gathered by these devices supported observations made by the NSNFP test personnel and certain aspects of the camera data. However, they were not used in the development of the factors or the strain rate elevated true stress-strain curves.

### 6.6 Previous ITM Performance

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Having described the ITM, the test specimens, and the impact test methodology used, a brief review of the two locations where the ITM has been used for material impact testing is appropriate. Also discussed herein is the past testing of both longitudinal and transverse oriented test specimens, the results of which were used to establish how test specimens were to be cut from the plate material.

#### 6.6.1 Test Performance at Different Test Sites

The initial placement of the ITM at the Material Test Reactor building (RTC-603) at the INL occurred on November 12, 2003. The MTR building had an overhead crane, more than 30 feet of overhead clearance above the ITM, and a robust floor (consisting of a 12-inch thick concrete slab poured over large concrete encased steel beams) with a load rating of 1250 pounds per square foot. Due to building demolition plans, the ITM was then moved to the INL's Critical Infrastructure Test Range Complex (CITRC) Building 613 in late April, 2005. This facility also has an overhead crane, more than 25 feet of overhead clearance above the ITM, and a 4.75-foot thick reinforced concrete floor situated on bedrock that has a posted allowable floor loading of 2500 lb./ft². Both locations have strong, rigid floors. However, it was decided to perform confirmatory testing of duplicate impact tests in order to determine if any noticeable change in test specimen response could be detected. Comparisons of these confirmatory impact tests appear in Table 15 below for 304L material and Table 16 below for 316L material. Some of the tests reported below are using different material heats and different test specimen geometries (all of the 304L tests excluding 69 and 172) from another research effort but the comparative insights are still valid.

Table 15. Comparison of 304L strain responses for impact tests performed at different locations.

Test Number	est Number Location		Drop Weight (lb.) Drop Height (in.)		Variation (%)	
69	MTR	1513	31	0.3242	2.56	
172	613	1313	31	0.3161	2.30	
91	MTR	1513	14	0.4116	2.57	
176	613	1313	14	0.4013	2.37	
96	MTR	1347	15.75	0.4146	9.45	
185	613	1347	13.73	0.3788		
100	MTR	1097	20	0.3949	0.92	
193	613	1097	20	0.3913	0.92	
104	MTR	790	25.375	0.3406	0.38	
198	613	/90	23.373	0.3393	0.36	
				Average	3.18	

Table 16. Comparison of 316L strain responses for impact tests performed at different locations.

Test Number	Location	Drop Weight (lb.)	Drop Height (in.)	True Strain	Variation (%)
24	MTR	1513	36	0.3878	2.05
174	613	1313	30	0.3959	2.03
75	MTR	1347	40	0.3843	2.19
184	613	1347	40	0.3929	2.19
28	MTR	1097	45	0.3493	0.85
192	613	1097	43	0.3523	0.83
49	MTR	790	50	0.2661	0.22
197	613	790	50	0.2667	0.22
				Average	1.33

As can be seen from Tables 15 and 16, the comparisons of identical impact tests at different facilities are extremely close. Even including one set of 304L tests that were within 9.45% (evidencing material variability), the average variations are very low. Therefore, material impact tests performed at either location can be combined together since the ITM responses are deemed to be facility independent.

## 6.6.2 Longitudinal Versus Transverse Specimen Orientation

One of the initial goals of the material impact testing was to compare impact responses of test specimens that were fabricated reflecting longitudinal (parallel to plate rolling) and transverse (perpendicular to plate rolling) orientations. The first effort was to perform "quasistatic" tensile testing which was previously described in Section 5.0. Both 304L (Heat #10W8) and 316L (Heat #09T9) material were tested. The testing consisted of three specimens from each orientation for both materials, resulting in twelve total tests. Table 17 contains the tensile material property results of that testing.

Table 17. Longitudinal and transverse quasi-static tensile test results.

Test ID	Specimen ID	Material	Heat Number	Orientation	Elongation (%)	Ultimate Load (lb.)
03	MT03	304L	10W8	Longitudinal	63	22,100
04	MT04	304L	10W8	Longitudinal	64.5	22,200
23	MT23	304L	10W8	Longitudinal	62	22,000
05	MT05	304L	10W8	Transverse	62.5	22,000
06	MT06	304L	10W8	Transverse	63	22,200
24	MT24	304L	10W8	Transverse	59	21,800
11	MT11	316L	09T9	Longitudinal	61	20,500
12	MT12	316L	09T9	Longitudinal	61	20,500
21	MT21	316L	09T9	Longitudinal	59	20,400
09	MT09	316L	09T9	Transverse	58	20,700
10	MT10	316L	09T9	Transverse	60.5	20,700
22	MT22	316L	09T9	Transverse	58	20,500

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As can be seen, the ultimate load and the elongation results indicate very little difference between the longitudinal and the transverse-oriented test specimens for each material.

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The next step was to perform impact tests, using the same material as indicated above. Identical test weights and drop heights were used during the actual impact tests, using both the longitudinal and the transverse-oriented test specimens described in Section 6.2. For 304L, the longitudinal specimens were color coded red and the transverse specimens were color coded light yellow. For 316L, the longitudinal specimens were color coded black and the transverse specimens were color coded white. Drop weights and drop heights were chosen to maximize test specimen strains, purposely challenging floor flexibility in order to maximize any potential facility difference. The results of that comparative testing are summarized in Table 18. The results show that the variations between longitudinally-oriented test specimens and transverseoriented test specimens are insignificant, less than a 3% variation on average. This is well within the range of material property variations previously discussed. Therefore, based on these comparative results of both quasi-static and impact tensile testing, the decision was made to proceed with material impact testing at varying temperatures with longitudinally oriented test specimens only.

#### **Post-Test Dimensional Measurements** 6.7

Post-test dimensional measurements were needed to determine the deformation changes so that achieved strains could be calculated for each impact tested specimen.

#### 6.7.1 **Test Specimen Deformations**

After impact testing, appropriate test specimen deformation measurements were taken by NSNFP test personnel. These measurements included the deformed lengths between the punch marks as well as the reduced widths and thicknesses at the same punch locations measured during pre-test measurements. This characterized the post-impact geometry of each test specimen. These measurements were recorded on page 1 of the test data sheet for pre- and postimpact deformation measurements (as representatively shown in Appendix D and contained in the NSNFP Lab Notebook Binder Volumes 2 and 3). With this post-test dimensional data, strains could be calculated and recorded on page 2 of the test data sheet along with the acceleration and velocity traces previously discussed in Section 6.5.2.

After impact testing, the welded material test specimens exhibited the 'orange peel' effect, as did the quasi-static tensile test specimens (see Section 5.5.2). Figure 59 illustrates a welded material test specimen before impact testing (left) and a welded material test specimen after impact testing (right). The rough surface (due to the straining of the irregular grain structure resulting from welding) made post-test width and thickness measurements more difficult to achieve.

Table 18. Comparison of deformation responses of longitudinal and transverse-oriented test specimens for varying

Weight (lb.)	Drop Height (in.)	Test ID	Specimen ID	Direction	Gauge Delta (in.)	Avg. Delta (in.)		Test ID	Specimen ID	Direction	Gauge Delta (in.)	Avg Delta (in.)
	(===)			I		04L Mate	eria	ıl		I	()	()
1513	31	69	304L-43	longitudinal	1.7260	1.7010		145	304L-111	transverse	1.7220	1.515
1513	31	172	304L- 126	longitudinal	1.6760	1.7010		146	304L-112	transverse	1.7085	1.7153
1347	38	66	304L-40	longitudinal	1.8490	1.8090		149	304L-113	transverse	1.7795	1.7975
1347	38	167	304L-125	longitudinal	1.7690	1.8090		150	304L-114	transverse	1.8155	1./9/.
1097	43	65	304L-39	longitudinal	1.6085	1.6055		153	304L-115	transverse	1.5500	1.5593
1097	43	165	304L-124	longitudinal	1.6025	1.6055		154	304L-116	transverse	1.5685	1.5593
790	43	58	304L-32	longitudinal	1.1025	1 00 40		157	304L-117	transverse	1.0980	1 000
790	43	162	304L-123	longitudinal	1.0870	1.0948		158	304L-118	transverse	1.1000	1.0990
												Avg.
					3	16L Mate	eria	.l				
1513	36	24	316L-8	longitudinal	2.1325			147	316L-35	transverse	2.2090	
1513	36	173	316L-52	longitudinal	Necked	2.1325		148	316L-36	transverse	2.1070	2.1473
1513	36	174	316L-53	longitudinal	Necked			175	316L-46	transverse	2.1260	
1347	40	25	316L-9	longitudinal	2.0725			151	316L-37	transverse	2.0140	
1347	40	166	316L-49	longitudinal	Broke	2.1155		152	316L-38	transverse	2.1290	2.0740
1347	40	184	316L-54	longitudinal	2.1630	2.1133		168	316L-44	transverse	2.0790	2.0740
1347	40	75	316L-28	longitudinal	2.1110			-	-	-	-	
1097	45	28	316L-12	longitudinal	1.8795			155	316L-39	transverse	1.8030	
1097	45	164	316L-48	longitudinal	1.8735	1 0024		156	316L-40	transverse	1.8265	1.8050
1097	45	192	316L-55	longitudinal	1.8960	1.8824		163	316L-43	transverse	1.7855	1.8050
1097	45	29	316L-13	longitudinal	1.8805			-	=	-	-	
790	50	49	316L-23	longitudinal	1.3720			159	316L-41	transverse	1.3815	
790	50	161	316L-47	longitudinal	1.4255	1.3910		160	316L-42	transverse	1.3650	1.354
790	50	197	316L-56	longitudinal	1.3755			199	316L-57	transverse	1.3175	
1347	34	169	316L-50	longitudinal	1.7625	1.7625		171	316L-45	transverse	1.7955	1.792
												Avg.

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#### 6.7.2 Certified Dimensional Inspector Validations

The NSNFP test personnel measured the post-test impact test specimens. As a means of checking the post-test measurements and to add validity to all dimensional measurements performed by NSNFP test personnel, an INL qualified dimensional inspector also measured the deformed test specimens. Page 3 of the test specimen data sheets contains the results of those independent measurements. NSNFP Lab Notebook Binder Volumes 2 and 3 contain the test data sheets and these confirmatory measurements. All dimensions measured by the INL dimensional inspector validated the NSNFP test personnel measurements. None of the post-test measurements differed by more than 0.75% (INL compared to NSNFP test personnel). Appendix F contains qualification documentation for the INL dimensional inspector.

The INL qualified dimensional inspector also measured the go/no go gages periodically or on an as-needed basis when newer devices completed fabrication and needed to be verified before use. This activity was previously discussed in Section 6.2.1. Documentation of the measurements made by the INL qualified dimensional inspector on the go/no go gages is contained in the NSNFP Lab Notebook Binder Volume 1.

#### 6.8 Closeout Calibration

Calibrated measuring and test equipment were used for measuring all quality-affecting data. In order to demonstrate the calibration history of the measuring and test equipment used, the Report CD-R (file 3) contains the INL Calibration and Standards Laboratory calibration sheets for all of the devices used for the time intervals when the device was used for this strain rate research effort. The applicable measuring and test equipment used in this strain rate research effort also received a closeout calibration. The closeout calibration indicated all measuring and test equipment were acceptable.



Figure 59. 'Orange peel' effect in welded material impact test specimen (right).

# 7. TEST RESULTS: DEVELOPMENT OF FACTORS AND STRAIN RATE ELEVATED TRUE STRESS-STRAIN CURVES

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The data needed to justify the definition of material responses considering strain rate effects were obtained using the ITM. By using a combination of different weights and different drop heights, varying strain levels and strain rates were achieved. The energy input in straining the test specimen was known from the input test variables of mass (drop weight and impact driver) and impact velocity (of drop weight). The total test energy also included the work done elongating the test specimen. At a given test temperature, specimen displacement histories were measured. These test inputs and outputs are used to determine test specimen strain, rate of straining, and a 'factor' (derived from the test energy) that can be applied to the appropriate quasi-static true stress-strain curve to generate a corresponding strain rate elevated true stress-strain curve.

A brief literature search (References 40 and 41) indicated that the shape of strain rate elevated true stress-strain curves for stainless steels relative to the quasi-static shape are similar. Two potential options that preserve this curve shape are (1) shifting the curve upward (the addition of a constant to each point) or (2) factoring (multiplication of each stress point by a constant). Both techniques utilize the established shape of the quasi-static curve as determined from tensile tests as the starting point. Since the literature was inconsistent as to a specific shape of strain rate elevated curves, variations in curve shape were initially addressed by evaluating both a factored and a shifted technique (Reference 42). These early evaluation efforts (up to the uniform strain limit) indicated less than a 3% difference between the two techniques. The 'factored' approach was the simplest for structural analysts to apply since the area under the quasi-static stress-strain curve did not have to be determined as it would be if using the shifted approach. One only need to multiply the stress values by the strain rate factor to attain the strain-rate elevated stress-strain curve. Therefore, the 'factored' approach was adopted for this study.

# 7.1 Development of Factors

Each unique dynamic impact test performed results in a strain rate 'factor' corresponding to the particular test material, heat, specimen geometry, temperature, and strain rate achieved in the test. By performing a sufficient number of impact tests using various weights dropped from a variety of heights, a plot of the strain rate factor versus strain rate can be generated for a particular type of material, heat, and temperature.

A total impact energy approach was used that considers the test specimen strain energy. Strain energy is the energy required to strain (deform) a volume of material a specified amount. It is equivalent to the area under the stress-strain curve up to a specified strain level. Remember that the goal of the ITM testing was to limit strains to below the uniform strain limit. For this approach, the quasi-static true stress-strain curve is determined and the area under that curve up to the strain level of interest is evaluated. The strain level of interest is that strain achieved in an actual impact test specimen at a given strain rate. It is acknowledged that energy loses may exist in the transfer of energy from the drop weight to the specimen. However, loses are believed small. Knowing the energy input to the specimen during the impact test and assuming the shape for the strain rate elevated true stress-strain curve being generated, the corresponding true stress

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value can be established by bounding the input energy density (area under the stress-strain curve) to the value of true strain achieved in the impact test.

The energy input to the specimen is determined by applying conservation of momentum theory to the total impact energy assuming an inelastic impact. The total impact energy applied to specimen deformation is calculated as follows:

$$E_{total} = \frac{1}{2}mv^2 + w\Delta$$

where:  $\frac{1}{2} m v^2$ is the kinetic energy of the combined mass (drop weight +impact driver) and is the potential energy due to deformation of the specimen.  $w\Delta$ 

> $mass = m_{drop\ weight} + m_{impact\ driver}$ m =weight =  $w_{drop\ weight} + w_{impact\ driver}$

elongation of test specimen  $\Delta =$ 

velocity of the combined mass (drop weight + impact driver)  $\nu =$ 

 $(m_{drop\ weight})(v_{impact})/m$  (conservation of momentum)  $\nu =$ 

 $v_{impact}$  = impact velocity of the drop weight

 $=\sqrt{2gh}$  where g is the acceleration of gravity and h is the drop height

The total impact energy approach assumes that the area under the strain rate elevated true stress-strain curve (up to the strain value achieved in the test specimen) equals the total impact energy per material volume used to dynamically strain the test specimen during the ITM impact test. The units for total impact energy are in.-lb. The area under a material stress-strain curve has the units of psi (stress) per in./in. (strain), or in.-lb. per cubic inch, or strain energy density. The area under the strain rate elevated true stress-strain curve up to the magnitude of the overall average strain achieved in the test specimen is determined by dividing the total impact energy (E<sub>total</sub>) by the material volume absorbing the impact energy (volume of test specimen material strained).

The volume of material strained during the dynamic impact test was the specimen gauge length volume plus a portion of the transition region volume. Because all strain energy density needed to be addressed, it was also necessary to determine the distribution of strain in the test specimen transition regions. Strains would not be expected to be uniform or of a magnitude equal to the overall average strain in the gauge length. They would likely vary from the overall average strain value at the gauge end of the transition to near zero at the large end of the transition region. The transition region strain distribution and material volumes were determined using dynamic simulations of the ITM impact tests in the computer program ABAQUS/Explicit. Finite element models of the test specimens used and the associated ITM impact driver mass were generated. Test specimen material properties were based on the quasi-static true stress strain curves developed for each particular material and heat. The resulting transition region strain distribution and material volume results from these computer simulations were incorporated into the procedure for determining test specimen strain energy densities and strain rate factors (see Report CD-R, file 2B).

The actual process of determining the factor values involves an iterative integration of the true stress-strain curves. At a given magnitude of overall average strain, the applicable (material, Author: D. K. Morton and R. K. Blandford Reviewed By: S. D. Snow

heat and temperature dependent) quasi-static true stress strain curve must be elevated such that the strain energy density represented by the area under the resulting curve matches the energy density from the impact test (input energy and volume of material strained). In this process the magnitude of overall average strain being used must match the magnitude achieved in the impact

test. The factor is then determined as the ratio of the area under the elevated curve to that under

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the quasi-static curve both determined up to the same magnitude of the overall average strain. The corresponding strain rate is that resulting directly from the impact test being evaluated.

This process was accomplished using the computer program DADiSP. Knowing the quasi-static stress-strain curve shape and the area required under the curve at a given strain level, the factor value can be 'estimated', the resulting stress-strain curve plotted and integrated to see if the area matches that required. An improved estimate is made of the factor value, if necessary, and the process iterates to a final, acceptable value.

## 7.1.1 Development of Spreadsheets

In practice, a 'reverse' process was employed for quickly determining the factor for a given set of three impact test parameters: (1) the total impact energy (E total), (2) the overall average strain achieved (OAS), and (3) the gauge volume (GV). The total energy (E total) is defined above in Section 7.1. The overall average strain (OAS) is the average true strain through the gauge length resulting from the impact test and is determined from the measured data recorded on the specimen data sheets following the test. The gauge volume (GV) is the volume of material within the gauge length strained as a result of the impact test and is also determined from the test specimen measured and recorded data. These three impact test parameters are presented in Tables 19 through 22 for the 304L impact tests at the temperatures considered and Tables 23 through 26 for the 316L impact tests at the temperatures considered. In these tables, the 'True Strain' column is OAS, the 'Total Energy' column is E total, and the 'Test Specimen Volume' column is GV.

Rather than directly calculating the factor for each unique set of test parameters using the iterative integration approach (a time consuming effort), a series of worksheets and spreadsheets were developed for a broad range of specified factors and overall average strains that bounded those expected from the actual impact testing. The iterative integration approach was performed only once for each set of unique material properties. This 'pre-solving' approach saved time. Using this set of worksheets and spreadsheets and a given set of three impact test parameters, the corresponding factor could be quickly 'interpolated' from the bounding results. A discussion of the development of the worksheets and spreadsheets is presented in the following paragraphs.

For a given material type (304L or 316L), heat (base and welded material), and temperature, a series of factored true stress-strain curves is generated using the appropriate digitized quasi-static true stress-strain curve and a range of bounding factors and overall average strains. For this work, factors ranged from 1.0 to 2.0 in six increments and overall average strain values ranged from 0.01 to 0.45 in nine increments. A DADiSP worksheet was employed for this effort. The quasi-static true stress-strain curve is first factored. The area under the resulting true stress-strain curve up to the limit of each overall average strain value is determined for each factor. The resulting set of values (6x9=54) of 'area under the curve' (units of in.-lb./in.<sup>3</sup>) and corresponding true overall average strain values are input to a Material Curve Excel spreadsheet

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(see upper left hand corner of Figure 60). The DADiSP worksheets used for the work performed in this report are contained on the Report CD-R (file 2A).

Table 19. Selected impact test parameters and factors for 304L at -20 °F conditions.

Test ID	Test Specimen Geometry	% Diff.	True Strain Rate (sec. <sup>-1</sup> )	True Strain	Test Specimen Identifier	Material Heat Number	Total Energy (inlb.)	Test Specimen Volume (in.3)	Factor
432	D-2-2	-0.5	8.9	0.1168	304L-261	64A1	2273	0.1887	1.436
434	D-2-2	-3.2	11.4	0.2377	304L-262	64A1	5066	0.1875	1.214
445	D-2-2	-0.9	7.5	0.1190	304L-289	64A1	2327	0.1878	1.443
436	D-2-2	-2.5	5.5	0.0813	304L-263	64A1	1466	0.1872	1.447
453	D-2-2	-4.1	5.4	0.0613	304L-292	64A1	1179	0.1893	1.582
455	D-2-2	-5.4	11.3	0.1784	304L-293	64A1	3559	0.1878	1.285
449	D-2-2	-3.8	13.4	0.2286	304L-264	64A1	4963	0.1860	1.269
489	D-2-2	-2.6	15.4	0.2648	304L-311	64A1	5962	0.1851	1.231
438	D-4-4	-2.9	23.7	0.1496	304L-235	72K9	14793	0.7599	1.556
442	D-4-4	-3.9	29.5	0.2019	304L-288	72K9	22294	0.7545	1.537
443	D-4-4	-1.6	28.4	0.3209	304L-290	72K9	36872	0.7584	1.252
457	D-4-4	-4.7	19.9	0.1596	304L-294	72K9	17024	0.7635	1.627
459	D-4-4	-0.9	28.9	0.2677	304L-295	72K9	29456	0.7638	1.316
477	D-4-4	-3.4	19.4	0.1203	304L-296	72K9	12643	0.7593	1.794
496	D-4-4	-2.5	35.7	0.3166	304L-298	72K9	37656	0.7569	1.308
451	D-2-2	-1.5	9.7	0.1474	304L-291	485896	2951	0.1872	1.293
462	D-2-2	-5.1	10.0	0.1860	304L-303	485896	4073	0.1911	1.268
466	D-2-2	-4.2	10.9	0.1265	304L-304	485896	2467	0.1914	1.297
470	D-2-2	-1.5	15.3	0.2590	304L-305	485896	5931	0.1803	1.202
485	D-2-2 W	-3.4	10.8	0.1243	304L-308	485896	2457	0.1896	1.437
490	D-2-2 W	-3.6	10.5	0.1451	304L-309	485896	2940	0.1911	1.404
464	D-4-4	-3.2	23.1	0.1825	304L-300	54M7	17128	0.7545	1.422
468	D-4-4	-4.7	22.6	0.1472	304L-301	54M7	13193	0.7620	1.469
481	D-4-4	-6.5	23.5	0.1209	304L-312	54M7	11481	0.7698	1.652
487	D-4-4 W	-2.3	20.8	0.1220	304L-284	54M7	13109	0.7602	1.518
491	D-4-4 W	-1.4	22.5	0.1556	304L-285	54M7	17005	0.7521	1.477

Table 20. Selected impact test parameters and factors for 304L at room temperature conditions.

Test ID	Test Specimen Geometry	% Diff.	True Strain Rate (sec. <sup>-1</sup> )	True Strain	Test Specimen Identifier	Material Heat Number	Total Energy (inlb.)	Test Specimen Volume (in.³)	Factor
63	A	2.0	21.8	0.2536	304L-37	10W8	32448	1.1399	1.343
64	A	0.7	22.8	0.2753	304L-38	10W8	37278	1.1457	1.376
65	A	-6.1	24.9	0.3054	304L-39	10W8	42171	1.1615	1.335
66	A	-5.9	26.0	0.3438	304L-40	10W8	47602	1.1556	1.287
69	A	-9.4	25.2	0.3242	304L-43	10W8	44528	1.1556	1.305
134	A	-3.1	24.3	0.3971	304L-48	10W8	57402	1.1412	1.284
135	A	-1.7	26.4	0.4138	304L-105	10W8	60274	1.1547	1.257
136	A	1.1	27.5	0.4282	304L-106	10W8	63128	1.1511	1.257
165	A	-3.6	25.8	0.3051	304L-124	10W8	42163	1.1543	1.345
167	A	-4.3	25.9	0.3305	304L-125	10W8	47479	1.1520	1.360
172	A	-2.3	24.9	0.3161	304L-126	10W8	44442	1.1331	1.375
250	A-2-2	-2.3	5.9	0.1191	304L-180	64A1	3023	0.2858	1.307
253	A-2-2	2.7	5.9	0.1501	304L-181	64A1	3928	0.2849	1.275
247	D-2-2	-2.5	12.8	0.2439	304L-183	64A1	4805	0.1920	1.219
249	D-2-2	-0.4	13.3	0.2841	304L-184	64A1	5830	0.1926	1.200
252	D-2-2	-2.0	11.2	0.2797	304L-185	64A1	5678	0.1911	1.203
259	D-2-2	0.0	10.6	0.1908	304L-189	64A1	3616	0.1911	1.274
262	D-2-2	-3.8	10.6	0.2236	304L-190	64A1	4381	0.1899	1.261
294	D-2-2	-4.3	5.3	0.0766	304L-204	64A1	1242	0.1905	1.366
305	D-2-2	-1.6	10.9	0.2745	304L-207	64A1	5310	0.1869	1.179
312	D-2-2	-1.8	9.6	0.1348	304L-209	64A1	2335	0.1869	1.307
246	D-4-4	-0.9	27.2	0.2691	304L-175	72K9	26423	0.7695	1.456
248	D-4-4	-0.8	27.4	0.2696	304L-176	72K9	26589	0.7692	1.462
251	D-4-4	-3.1	26.2	0.3117	304L-177	72K9	31434	0.7680	1.416
254	D-4-4	-2.2	29.2	0.3658	304L-178	72K9	37194	0.7794	1.317
258	D-4-4	-1.1	27.1	0.2785	304L-179	72K9	27874	0.7737	1.458
260	D-4-4	-1.9	27.0	0.2793	304L-186	72K9	29285	0.7734	1.527
261	D-4-4	-2.4	26.8	0.2910	304L-187	72K9	30008	0.7716	1.473
288	D-4-4	-4.3	24.5	0.2163	304L-202	72K9	19624	0.7674	1.456
289	D-4-4	-3.6	23.7	0.2026	304L-201	72K9	17922	0.7653	1.454
290	D-4-4	-3.2	22.1	0.1936	304L-203	72K9	17179	0.7707	1.469
301	D-4-4	-6.3	32.6	0.3329	304L-215	72K9	33299	0.7647	1.373
302	D-4-4	-4.1	29.3	0.3081	304L-216	72K9	29669	0.7572	1.377
313	D-4-4	-4.0	24.0	0.1806	304L-217	72K9	16492	0.7560	1.573
314	D-4-4	2.1	22.4	0.1578	304L-218	72K9	14821	0.7719	1.650
315	D-4-4	-2.6	29.1	0.2380	304L-219	72K9	22427	0.7629	1.472
316	D-4-4	0.8	27.0	0.1629	304L-220	72K9	14788	0.7563	1.611
317	D-4-4	-2.7	21.6	0.1201	304L-221	72K9	9880	0.7608	1.575
348	D-2-2	1.3	10.5	0.1460	304L-225	485896	2531	0.1833	1.191
355	D-2-2	-3.0	9.9	0.1720	304L-244	485896	3299	0.1935	1.203
360	D-2-2	-2.7	10.1	0.2227	304L-245	485896	4299	0.1890	1.155
379	D-2-2 W	-0.1	9.6	0.1621	304L-272	485896	3250	0.1926	1.301
403	D-2-2 W	-3.2	8.2	0.1306	304L-275	485896	2479	0.1800	1.374
413	D-2-2 W	-3.6	8.1	0.1156	304L-276	485896	2430	0.1917	1.469
349	D-4-4	-0.7	23.9	0.1824	304L-226	54M7	14349	0.7317	1.469
354	D-4-4	-1.0	21.9	0.1302	304L-227	54M7	9905	0.7485	1.535
356	D-4-4	0.6	23.0	0.2118	304L-248	54M7	17147	0.7470	1.411
381	D-4-4 W	-1.4	22.4	0.1834	304L-273	54M7	17016	0.7506	1.321
401	D-4-4 W	0.7	20.3	0.1528	304L-274	54M7	14245	0.7377	1.398

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Table 21. Selected impact test parameters and factors for 304L at 300 °F conditions.

Test ID	Test Specimen Geometry	% Diff.	True Strain Rate (sec. <sup>-1</sup> )	True Strain	Test Specimen Identifier	Material Heat Number	Total Energy (inlb.)	Test Specimen Volume (in.3)	Factor
274	D-4-4	1.2	34.7	0.2961	304L-196	72K9	21555	0.7656	1.258
285	D-4-4	-0.4	25.3	0.2785	304L-200	72K9	19928	0.7701	1.256
327	D-4-4	-0.7	27.5	0.2570	304L-208	72K9	18043	0.7692	1.267
329	D-4-4	-3.3	24.1	0.2167	304L-222	72K9	14713	0.7587	1.310
331	D-4-4	-1.7	22.5	0.1876	304L-223	72K9	12697	0.7746	1.336
339	D-4-4	-4.1	19.2	0.1181	304L-229	72K9	7476	0.7530	1.451
340	D-4-4	-0.5	23.9	0.1441	304L-230	72K9	9139	0.7446	1.396
341	D-4-4	0.4	22.6	0.1269	304L-233	72K9	8297	0.7557	1.467
376	D-4-4	-3.4	21.6	0.2118	304L-232	72K9	14463	0.7674	1.312
321	D-2-2	-3.1	10.6	0.1806	304L-210	64A1	2493	0.1863	1.191
324	D-2-2	-0.1	8.5	0.1575	304L-211	64A1	2185	0.1869	1.238
367	D-2-2	-8.4	5.3	0.1238	304L-239	64A1	1684	0.1881	1.282
370	D-2-2	-2.6	5.3	0.1083	304L-240	64A1	1185	0.1869	1.069
383	D-2-2	-2.9	6.7	0.1089	304L-242	64A1	1264	0.1893	1.120
385	D-2-2	-7.6	4.4	0.0770	304L-243	64A1	893	0.1896	1.219
386	D-2-2	-1.8	9.1	0.1861	304L-260	64A1	2542	0.1860	1.171
397	D-2-2	0.6	10.6	0.2003	304L-214	64A1	2757	0.1863	1.154
388	D-2-2	-1.9	10.4	0.2064	304L-246	485896	3103	0.1848	1.164
396	D-2-2	-2.8	9.1	0.1717	304L-268	485896	2639	0.1851	1.245
398	D-2-2	-1.3	10.9	0.1775	304L-270	485896	2640	0.1917	1.156
428	D-2-2 W	-1.7	9.9	0.1761	304L-283	485896	2965	0.1947	1.265
430	D-2-2 W	-0.8	10.9	0.1599	304L-281	485896	2578	0.2019	1.189
377	D-4-4	-2.1	22.5	0.2382	304L-251	54M7	15230	0.7443	1.308
405	D-4-4	-1.7	22.5	0.1936	304L-254	54M7	12203	0.7464	1.374
407	D-4-4	-0.9	21.7	0.1370	304L-255	54M7	7921	0.7368	1.409
512	D-4-4	-1.4	18.6	0.1636	304L-249	54M7	10032	0.7488	1.400
513	D-4-4 W	1.1	21.0	0.1562	304L-286	54M7	12073	0.7548	1.369
516	D-4-4 W	1.1	20.7	0.1917	304L-321	54M7	13898	0.7512	1.242

Table 22. Selected impact test parameters and factors for 304L at 600 °F conditions.

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Test ID	Test Specimen Geometry	% Diff.	True Strain Rate (sec. <sup>-1</sup> )	True Strain	Test Specimen Identifier	Material Heat Number	Total Energy (inlb.)	Test Specimen Volume (in.3)	Factor
333	D-4-4	-0.5	22.9	0.2147	304L-224	72K9	12477	0.7704	1.228
335	D-4-4	-0.3	21.6	0.1332	304L-228	72K9	6913	0.7566	1.292
417	D-4-4	-0.4	21.4	0.2536	304L-234	72K9	14666	0.7593	1.169
509	D-4-4	-3.4	16.8	0.1533	304L-299	72K9	8353	0.7698	1.281
297	D-2-2	3.9	4.7	0.1123	304L-205	64A1	1160	0.1899	1.095
344	D-2-2	-1.9	10.9	0.2481	304L-212	64A1	2966	0.1881	1.014
347	D-2-2	-1.2	8.2	0.1776	304L-213	64A1	2165	0.1875	1.151
361	D-2-2	-11.2	4.6	0.1098	304L-236	64A1	1099	0.1887	1.074
364	D-2-2	-4.4	5.0	0.1065	304L-237	64A1	1041	0.1890	1.056
365	D-2-2	-6.6	9.9	0.2305	304L-238	64A1	2755	0.1860	1.050
410	D-2-2	-3.0	10.7	0.1913	304L-241	64A1	2211	0.1899	1.054
389	D-2-2	-0.7	8.4	0.2006	304L-247	485896	2612	0.1848	1.062
391	D-2-2	-3.2	9.7	0.2505	304L-266	485896	3320	0.1836	1.023
392	D-2-2	-3.5	8.1	0.1931	304L-267	485896	2725	0.1896	1.135
408	D-2-2	-2.4	9.5	0.2456	304L-269	485896	3548	0.1911	1.079
412	D-2-2	-3.5	9.8	0.1476	304L-271	485896	1819	0.1965	1.022
424	D-2-2 W	-4.8	9.2	0.1443	304L-279	485896	1811	0.1944	1.120
506	D-2-2 W	1.4	8.6	0.1805	304L-282	485896	2165	0.1896	1.039
395	D-4-4	-2.3	21.0	0.1514	304L-253	54M7	7759	0.7731	1.262
415	D-4-4	-1.4	21.7	0.2170	304L-258	54M7	12168	0.7587	1.255
419	D-4-4	0.1	21.5	0.2587	304L-259	54M7	14692	0.7599	1.194
423	D-4-4 W	-2.9	20.3	0.1991	304L-278	54M7	12104	0.7299	1.146
507	D-4-4 W	1.1	19.1	0.1978	304L-320	54M7	11591	0.7314	1.103

Table 23. Selected impact test parameters and factors for 316L at -20 °F conditions.

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Test ID	Test Specimen Geometry	% Diff.	True Strain Rate (sec. <sup>-1</sup> )	True Strain	Test Specimen Identifier	Material Heat Number	Total Energy (inlb.)	Test Specimen Volume (in.3)	Factor
437	D-4-4	-2.5	23.7	0.1565	316L-115	67K0	14657	0.7494	1.367
439	D-4-4	-1.9	29.2	0.2145	316L-125	67K0	21705	0.7494	1.350
441	D-4-4	-2.8	20.4	0.1066	316L-126	67K0	9824	0.7599	1.459
444	D-4-4	-2.9	28.3	0.3365	316L-180	67K0	35635	0.7635	1.185
458	D-4-4	0.7	19.7	0.1528	316L-184	67K0	14423	0.7527	1.381
460	D-4-4	-1.9	31.8	0.3011	316L-185	67K0	32198	0.7548	1.262
478	D-4-4	-2.0	16.7	0.1074	316L-186	67K0	9784	0.7551	1.448
497	D-4-4	-1.1	39.1	0.4101	316L-188	67K0	45885	0.7506	1.171
431	D-2-2	-2.7	9.7	0.1104	316L-111	76H3	2252	0.1941	1.349
433	D-2-2	-3.1	8.6	0.1652	316L-160	76H3	3606	0.1902	1.334
435	D-2-2	-5.4	6.5	0.1042	316L-161	76H3	1904	0.1896	1.250
446	D-2-2	-2.9	5.3	0.0770	316L-164	76H3	1445	0.1881	1.378
456	D-2-2	-1.3	10.8	0.1678	316L-183	76H3	3510	0.1884	1.284
448	D-2-2	-5.4	13.0	0.2223	316L-163	76H3	5050	0.1866	1.295
450	D-2-2	-2.1	14.7	0.2702	316L-162	76H3	6220	0.1881	1.218
452	D-2-2	-2.9	11.3	0.1723	316L-181	48R8	3298	0.1830	1.147
465	D-2-2	-5.0	10.1	0.1463	316L-195	48R8	2947	0.1863	1.238
473	D-2-2	-4.5	10.0	0.1934	316L-197	48R8	4115	0.1896	1.194
461	D-2-2	-4.6	10.7	0.1225	316L-194	48R8	2293	0.1836	1.216
475	D-2-2	-3.5	17.2	0.3062	316L-198	48R8	6994	0.1821	1.148
492	D-2-2 W	-3.2	10.0	0.1166	316L-199	48R8	2273	0.1929	1.347
486	D-2-2 W	0.0	10.2	0.1392	316L-174	48R8	2914	0.2007	1.340
463	D-4-4	-5.2	23.7	0.2148	316L-191	230468	18687	0.7554	1.384
467	D-4-4	-4.7	24.5	0.1708	316L-192	230468	13912	0.7485	1.437
471	D-4-4	-6.8	21.5	0.1444	316L-193	230468	11912	0.7641	1.517
482	D-4-4	-5.3	19.4	0.1183	316L-201	230468	9875	0.7482	1.672
484	D-4-4	-1.2	23.1	0.1336	316L-203	230468	10713	0.7374	1.566
488	D-4-4 W	2.0	21.0	0.1306	316L-178	230468	11865	0.7191	1.427
493	D-4-4 W	0.0	22.9	0.1927	316L-179	230468	18578	0.7266	1.376

Table 24. Selected impact test parameters and factors for 316L at room temperature conditions.

Test ID	Test Specimen Geometry	% Diff.	True Strain Rate (sec. <sup>-1</sup> )	True Strain	Test Specimen Identifier	Material Heat Number	Total Energy (inlb.)	Test Specimen Volume (in.3)	Factor
23	A	-2.9	24.1	0.3743	316L-7	09T9	49097	1.1286	1.292
24	A	-4.3	25.9	0.3878	316L-8	09T9	51928	1.1525	1.274
25	A	-4.0	24.4	0.3788	316L-9	09T9	50302	1.1448	1.284
26	A	-3.5	24.0	0.3710	316L-10	09T9	47867	1.1102	1.295
27	A	0.4	25.8	0.3660	316L-11	09T9	47325	1.1079	1.308
28	A	-5.5	25.2	0.3493	316L-12	09T9	44386	1.1115	1.305
30	A	-5.6	14.0	0.1293	316L-14	09T9	13856	1.1421	1.451
31	A	-8.4	16.9	0.1647	316L-15	09T9	17824	1.1534	1.364
32	A	-2.9	18.4	0.1975	316L-16	09T9	21780	1.1151	1.365
51	A	-6.3	26.2	0.3043	316L-25	09T9	38433	1.1358	1.337
75	A	-4.3	25.8	0.3843	316L-28	09T9	50361	1.1457	1.258
76	A	-2.9	27.2	0.2877	316L-29	09T9	35273	1.1489	1.309
164	A	-0.4	26.5	0.3472	316L-48	09T9	44378	1.1205	1.305
169	A	-1.2	24.3	0.3300	316L-50	09T9	42758	1.1228	1.346
170	A	-1.7	21.8	0.2688	316L-51	09T9	31579	1.0998	1.338
184	A	-1.5	25.8	0.3929	316L-54	09T9	50441	1.0926	1.279
192	A	0.0	27.1	0.3523	316L-55	09T9	44407	1.1142	1.287
229	A	-1.1	20.4	0.2510	316L-61	09T9	29325	1.1016	1.359
239	A-2-2	-5.4	7.3	0.1910	316L-75	76H3	5313	0.2768	1.287
240	A-2-2	-0.4	6.0	0.1508	316L-76	76H3	3936	0.2808	1.267
241	A-2-2	-2.0	4.9	0.1186	316L-77	76H3	2981	0.2786	1.301
237	D-2-2	-3.8	8.5	0.2038	316L-71	76H3	3844	0.1869	1.256
238	D-2-2	1.3	10.6	0.2639	316L-72	76H3	5241	0.1860	1.226
242	D-2-2	0.1	10.3	0.1968	316L-73	76H3	3644	0.1839	1.265
293	D-2-2	3.3	12.0	0.2249	316L-78	76H3	4246	0.1845	1.236
295	D-2-2	-2.6	5.9	0.0812	316L-79	76H3	1262	0.1878	1.280
303	D-2-2	1.3	5.7	0.0908	316L-97	76H3	1513	0.1920	1.313
306	D-2-2	-3.5	9.3	0.1323	316L-98	76H3	2326	0.1929	1.270
230	D-4-4	-3.4	29.2	0.3422	316L-62	67K0	32526	0.7455	1.292
231	D-4-4	-2.7	30.5	0.3532	316L-63	67K0	34796	0.7500	1.316
232	D-4-4	-3.4	28.0	0.2913	316L-64	67K0	28413	0.7536	1.392
233	D-4-4	-2.6	30.2	0.3322	316L-65	67K0	32356	0.7533	1.326
276	D-4-4	-5.5	33.4	0.3017	316L-83	67K0	27125	0.7347	1.298
277	D-4-4	0.9	32.3	0.3031	316L-84	67K0	27131	0.7347	1.290
278	D-4-4	-2.0	29.7	0.3204	316L-85	67K0	28557	0.7353	1.258
279	D-4-4	-3.8	28.9	0.3128	316L-86	67K0	28521	0.7404	1.290
280	D-4-4	3.0	27.6	0.3095	316L-87	67K0	28503	0.7431	1.304
291	D-4-4	-0.8	22.0	0.1811	316L-91	67K0	14550	0.7446	1.344
292	D-4-4	0.0	23.3	0.2032	316L-94	67K0	16757	0.7368	1.348
304	D-4-4	-2.4	29.3	0.3910	316L-95	67K0	36038	0.7404	1.197
307	D-4-4	-1.9	27.5	0.2290	316L-103	67K0	19849	0.7473	1.349
308	D-4-4	0.3	22.8	0.1481	316L-104	67K0	13834	0.7479 0.7476	1.643
309	D-4-4	-0.9	23.7	0.1828	316L-105	67K0	15226		1.385
310	D-4-4 D-4-4	-1.3	22.4	0.1713	316L-106	67K0	14709	0.7446	1.459
311	D-4-4 D-4-4	0.1	29.0 21.7	0.2428	316L-107	67K0	21808 9864	0.7524	1.364 1.649
318 350	D-4-4 D-2-2	-2.5 -1.9	10.2	0.1138 0.1491	316L-108 316L-127	67K0 48R8	2701	0.7371 0.1947	1.049
357	D-2-2 D-2-2	-2.6	9.8	0.1491	316L-127 316L-128	48R8	3391	0.1947	1.283
359	D-2-2 D-2-2	-3.6	10.4	0.1928	316L-126	48R8	4728	0.1917	1.177
380	D-2-2 W	-1.5	10.4	0.2027	316L-165	48R8	3385	0.1854	1.129
404	D-2-2 W	-2.9	11.9	0.1514	316L-168	48R8	2732	0.1950	1.278
414	D-2-2 W	-6.0	9.6	0.1505	316L-169	48R8	2707	0.1930	1.364
351	D-4-4	-0.4	24.6	0.1973	316L-109 316L-137	230468	14323	0.1923	1.351
352	D-4-4	1.6	21.4	0.1760	316L-137	230468	12178	0.7467	1.381
353	D-4-4	0.0	20.5	0.1381	316L-139	230468	8624	0.7359	1.361
358	D-4-4	-2.0	21.8	0.2069	316L-142	230468	14671	0.7524	1.331
382	D-4-4 W	0.1	20.4	0.1729	316L-166	230468	14514	0.7422	1.306
402	D-4-4 W	1.3	21.8	0.1470	316L-167	230468	12080	0.7461	1.311
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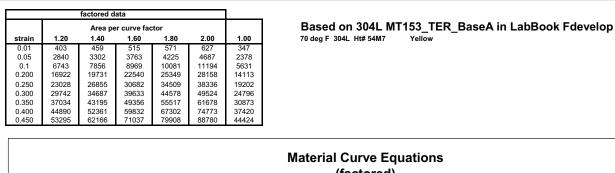
Table 25. Selected impact test parameters and factors for 316L at 300 °F conditions.

Test ID	Test Specimen Geometry	% Diff.	True Strain Rate (sec. <sup>-1</sup> )	True Strain	Test Specimen Identifier	Material Heat Number	Total Energy (inlb.)	Test Specimen Volume (in.3)	Factor
284	D-4-4	-1.3	23.3	0.2589	316L-88	67K0	17964	0.7467	1.213
286	D-4-4	-0.3	21.9	0.2331	316L-89	67K0	15964	0.7395	1.245
287	D-4-4	-0.8	22.5	0.2313	316L-90	67K0	15490	0.7416	1.217
328	D-4-4	0.3	25.4	0.2271	316L-112	67K0	15385	0.7551	1.216
330	D-4-4	-0.2	21.6	0.1689	316L-113	67K0	11995	0.7587	1.369
337	D-4-4	-2.3	25.4	0.1590	316L-120	67K0	10378	0.7500	1.290
338	D-4-4	-0.9	23.0	0.1258	316L-121	67K0	8495	0.7380	1.432
511	D-4-4	-2.3	16.6	0.1312	316L-189	67K0	8018	0.7554	1.255
320	D-2-2	-0.5	9.7	0.1610	316L-99	76H3	2424	0.1911	1.266
322	D-2-2	-1.8	11.4	0.2156	316L-100	76Н3	3224	0.1932	1.156
323	D-2-2	-0.6	10.4	0.1745	316L-101	76H3	2553	0.1929	1.196
366	D-2-2	-2.9	4.0	0.0978	316L-133	76Н3	1198	0.1887	1.165
368	D-2-2	-4.4	4.9	0.1144	316L-134	76H3	1628	0.1890	1.307
369	D-2-2	4.2	5.5	0.1043	316L-135	76H3	1302	0.1896	1.166
384	D-2-2	-2.2	4.1	0.0694	316L-158	76H3	862	0.1890	1.274
387	D-2-2	-1.0	9.6	0.1981	316L-159	76H3	2950	0.1872	1.213
325	D-2-2	-4.4	9.0	0.1614	316L-116	48R8	2300	0.1821	1.184
399	D-2-2	-3.7	9.4	0.1776	316L-153	48R8	2640	0.1869	1.176
400	D-2-2	-0.3	10.7	0.2250	316L-154	48R8	3312	0.1878	1.086
429	D-2-2 W	-1.6	10.3	0.1697	316L-177	48R8	2614	0.2010	1.150
495	D-2-2 W	-3.6	11.2	0.2064	316L-200	48R8	2931	0.1899	1.071
342	D-4-4	-2.8	23.6	0.1683	316L-118	230468	9102	0.7491	1.228
378	D-4-4	2.0	21.7	0.2654	316L-145	230468	16128	0.7398	1.208
406	D-4-4	2.1	22.5	0.2216	316L-147	230468	12621	0.7401	1.202
515	D-4-4 W	-2.8	24.8	0.1871	316L-205	230468	12499	0.7257	1.236
514	D-4-4 W	-0.2	20.9	0.2153	316L-206	230468	14014	0.7098	1.197

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	1											
Test ID	Test Specimen Geometry	% Diff.	True Strain Rate (sec1)	True Strain	Test Specimen Identifier	Material Heat Number	Total Energy (inlb.)	Test Specimen Volume (in.3)	Factor			
296	D-2-2	0.2	5.0	0.0940	316L-92	76H3	965	0.1947	1.017			
300	D-2-2	2.2	10.2	0.2384	316L-96	76H3	3144	0.1929	1.023			
343	D-2-2	-1.7	9.7	0.2020	316L-102	76H3	2668	0.1941	1.071			
345	D-2-2	-5.4	11.7	0.2042	316L-129	76H3	2576	0.1899	1.041			
346	D-2-2	-1.3	9.5	0.1734	316L-130	76H3	2149	0.1896	1.073			
362	D-2-2	-8.7	5.1	0.1196	316L-131	76H3	1323	0.1902	1.054			
363	D-2-2	-10.0	5.3	0.1018	316L-132	76H3	1156	0.1890	1.136			
319	D-4-4	-0.6	23.6	0.1780	316L-109	67K0	10028	0.7485	1.171			
332	D-4-4	-0.6	20.9	0.1873	316L-119	67K0	10788	0.7506	1.177			
334	D-4-4	0.3	23.2	0.1517	316L-114	67K0	8060	0.7593	1.138			
418	D-4-4	-1.8	20.7	0.2269	316L-124	67K0	13132	0.7596	1.105			
390	D-2-2	-1.4	9.7	0.2292	316L-140	48R8	2982	0.1977	1.034			
409	D-2-2	-1.3	9.1	0.2205	316L-155	48R8	2839	0.1875	1.091			
411	D-2-2	-1.4	10.7	0.2041	316L-157	48R8	2497	0.1869	1.066			
425	D-2-2 W	-0.1	9.0	0.1781	316L-173	48R8	2405	0.1956	1.137			
505	D-2-2 W	-2.5	8.3	0.1943	316L-176	48R8	2349	0.1965	0.991			
394	D-4-4	0.5	22.4	0.2396	316L-146	230468	12171	0.7461	1.138			
416	D-4-4	-1.3	21.9	0.1666	316L-148	230468	7998	0.7281	1.242			
420	D-4-4	-0.3	20.5	0.2705	316L-152	230468	13817	0.7206	1.131			
508	D-4-4 W	-0.8	19.1	0.2011	316L-204	230468	11139	0.7365	1.053			
510	D-4-4 W	-2.2	21.4	0.2010	316L-171	230468	11472	0.7341	1.088			



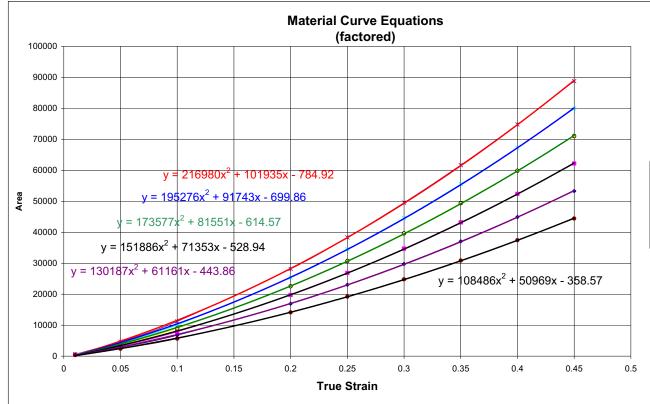


Figure 60. Excel Material Curve spreadsheet, 304L, heat 54M7, ½-inch base material at room temperature.

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Material curve equations are developed next in an Excel spreadsheet using the 'area under the curve' (in.-lb./in.³) and overall average strain values determined in the DADiSP worksheets for the specified factors and strain limits. These material curves are material type (304L or 316L), heat (base and welded material), and temperature specific. The Material Curve Excel spreadsheet for 304L, heat 54M7, base material, at 70°F is shown in Figure 60. In the Excel spreadsheet, the 54 'area under the curve' values are input versus factor and overall average strain values and are then plotted [area (y coordinate) versus true strain (x coordinate)] and fit with a 2<sup>nd</sup> order polynomial. The equation for the curve is then determined for each factor. This equation provides the relationship between the area under the factored true stress strain curve (energy density) up to a given strain limit. The Material Curve spreadsheets used for the work performed herein are contained on the Report CD-R (file 2D).

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The strain distribution through the transition regions was based on the overall average strain in the gauge length and the ABAQUS/Explicit predictions by applying the ratio of the overall average strain to the corresponding value used in the computer simulations. The volume of transition region material strained to these distributions was also based on the ABAQUS/Explicit model that incorporated nominal specimen dimensions. An Excel spreadsheet was used to determine the strain and volume distributions from ABAQUS/Explicit output coordinates and coordinate displacements. The spreadsheets for the specimen geometries used for the work reported herein are contained on the Report CD-R (file 2D).

The resulting material curve equations are input into a final Excel spreadsheet (see Figure 61 for a representative example) to determine the specific factor value for a given strain rate impact test using the overall average strain (OAS), gauge volume (GV), and test total impact energy (E<sub>total</sub>) parameters. The final spreadsheet used to calculate the elevated strain rate factor for a specific impact test is material type (304L or 316L), heat (base and welded material), temperature, and geometry specific. The spreadsheet is material, heat, and temperature specific because it utilizes the derived material curve equations to determine appropriate energies. The spreadsheet is geometry dependent because it utilizes the ABAOUS/Explicit predicted strain and material volume distributions in the transition regions to determine appropriate energies. Representative spreadsheets for all the materials, temperatures, and specimen geometries used for the work performed herein are provided on the Report CD-R (file 2D). Also contained on the Report CD-R (file 2D) are the calculated factors. NSNFP Lab Notebook Binder Volume 7 also contains the resulting factors along with details of the associated test conditions and parameters. These factors are presented in this report in Tables 19 through 22 for the 304L impact tests at the temperatures considered and Tables 23 through 26 for the 316L impact tests at the temperatures considered.

### 7.1.2 Checking of Spreadsheets

Once the Excel spreadsheets were developed, they were thoroughly checked in accordance with NSNFP Procedure 19.01 for verification of routines and macros within exempt commercial software. The spreadsheets were assigned the unique identifier NSNF/MED/017, Revision 1 by the NSNFP Document Control Coordinator and were submitted to NSNFP Document Control. Checking and verification of the spreadsheets is documented on the Signature Sheet contained in Appendix B. Verification of the DADiSP routines used in this process is documented in Appendix A.

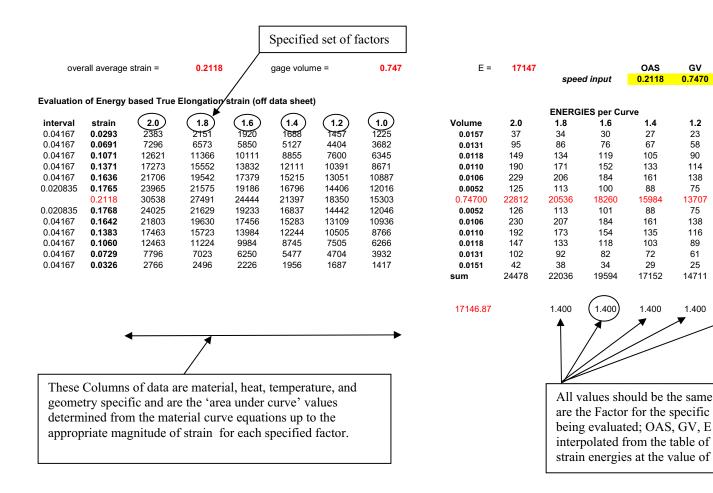


Figure 61. Excel Spreadsheet for Final Factor Determination, Test #356, 304L, Heat 54M7, ½-Inch Base Material at 70°F.

#### 7.2 Strain Rate Elevated True Stress-Strain Curves

For each successful strain rate test, an associated strain rate factor was determined as described in Section 7.1. For each of the materials (304L or 316L) investigated, the factors were plotted versus strain rate and fitted with a linear curve. These plots are shown in Figures 62 through 69 for the two materials and four temperatures tested. The results shown in these figures for a particular material and temperature include all material heats, both base and weld metal, and various specimen geometries (A and D profiles in ½-inch and ¼-inch thicknesses). Given the relatively limited strain rate range studied to date, a linear fit of all of the material and temperature related results was considered to best trend the material data. It is recognized that, at this time, the majority of the linear fit curves do not pass through the coordinate point (0.0, 1.0), representing a factor of one at a strain rate of zero (quasi-static conditions), as would be expected. This may be attributed to a lack of data at higher strain rates and/or a need for a higher order curve fit. With the data currently limited to strain rates of just 40 per second or lower (depending on temperature), a higher order fit is no easier justified and the linear fit is adequate at this time for trending. The data point (0.0, 1.0) was added to the strain rate data when establishing the linear curve fits shown in the figures.

For a particular material (304L or 316L) and chosen temperature, the strain rate elevated true stress-strain curve can be developed up to the uniform strain limit from the factor predicted by the linear curve fit at the strain rate of interest. Using the corresponding material and temperature quasi-static true stress-strain curve, the strain rate elevated curve is developed by multiplying the appropriate factor times the true stress coordinates of the quasi-static true stress-strain curve.

Strain rate elevated true stress-strain curves for 304L and 316L materials developed using the linear curve fit relationships at various strain rates and temperatures are illustrated in Figures 70 through 79 (with strains up to their respective uniform strain limit). The 304L curves shown were based on the quasi-static true stress strain curve for ½-inch thick, 304L, heat 54M7, base material at the indicated temperature. The 316L curves shown were based on the quasi-static true stress-strain curve for ½-inch thick, 316L, heat 230468, base material at the indicated temperature. The quasi-static true stress-strain curves for all materials, heats, and temperatures can be found on the Report CD-R (files 1A and 1B).

Figures 70 through 74 illustrate the strain rate elevated true stress-strain curves for 304L stainless steel at 0 (quasi-static results), 5, 10, 22, and 25 per second strain rates at -20, room, 300, and 600 °F temperatures respectively. Figures 75 through 79 illustrate the same information but for 316L material.

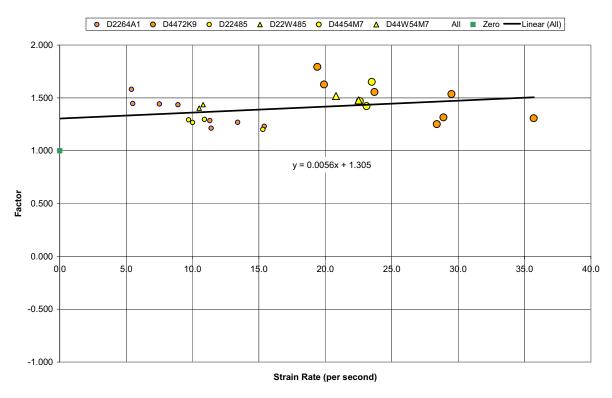


Figure 62. Factor versus strain rate curve at -20 °F for 304L.

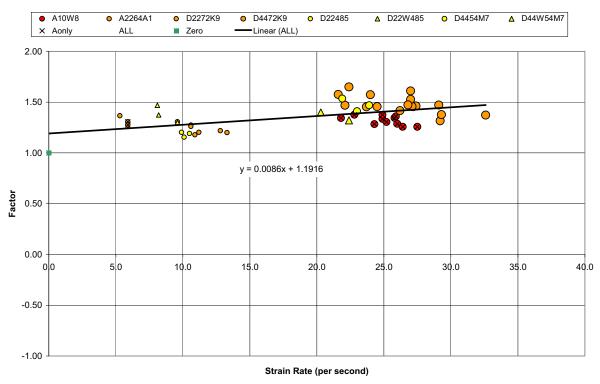


Figure 63. Factor versus strain rate curve at room temperature for 304L.

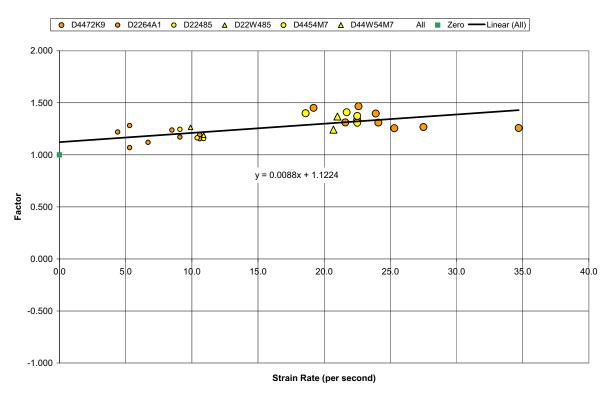


Figure 64. Factor versus strain rate curve at 300 °F for 304L.

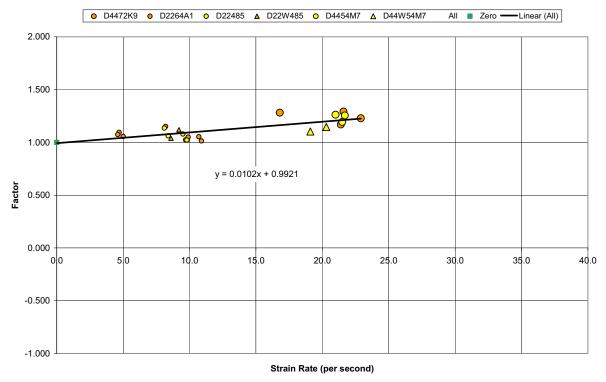


Figure 65. Factor versus strain rate curve 600 °F for 304L.

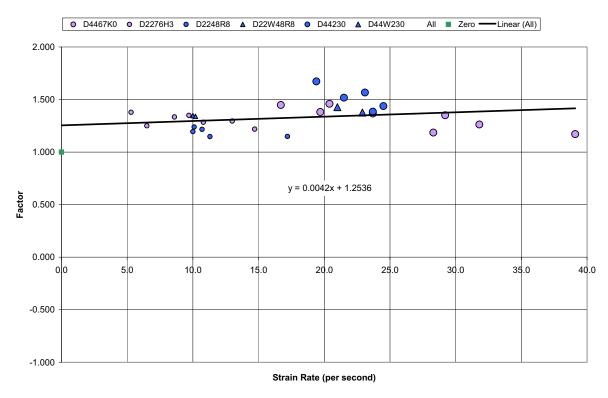


Figure 66. Factor versus strain rate curve at -20 °F for 316L.

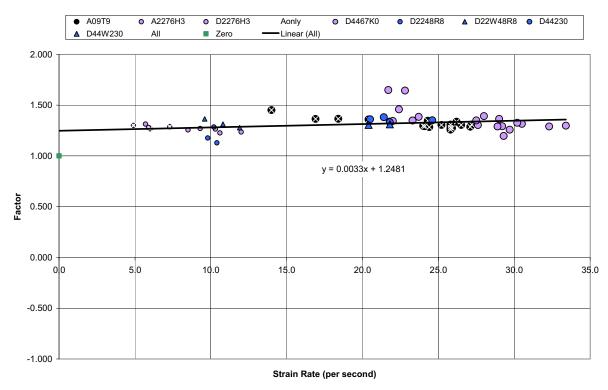


Figure 67. Factor versus strain rate curve at room temperature for 316L.

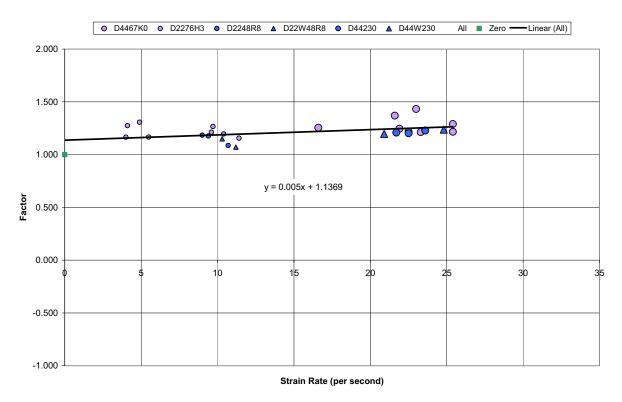


Figure 68. Factor versus strain rate curve at 300 °F for 316L.

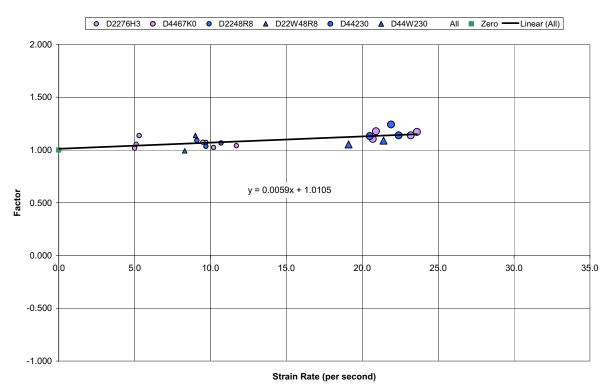


Figure 69. Factor versus strain rate curve at 600 °F for 316L.

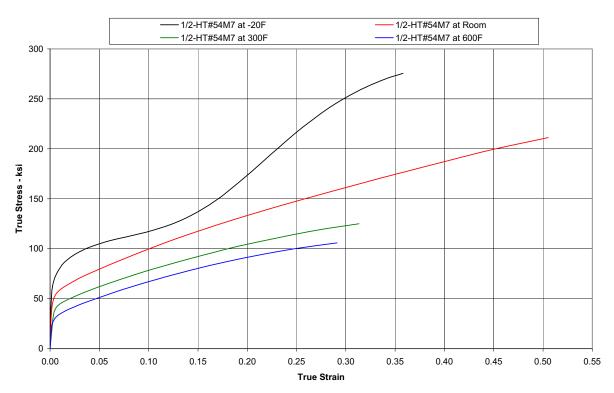


Figure 70.304L heat 54M7 true stress-strain curve at 22/second strain rate at varying temperatures.

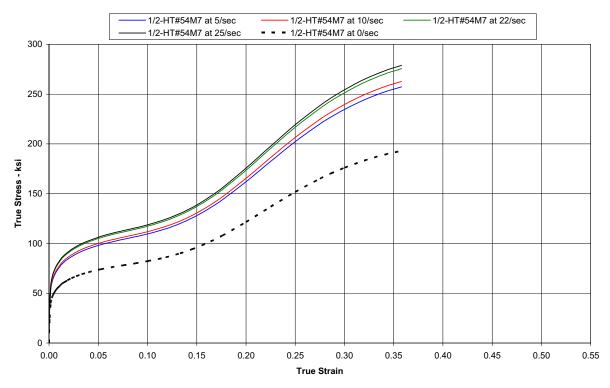


Figure 71. 304L heat 54M7 true stress-strain curve at -20 °F at varying strain rates.

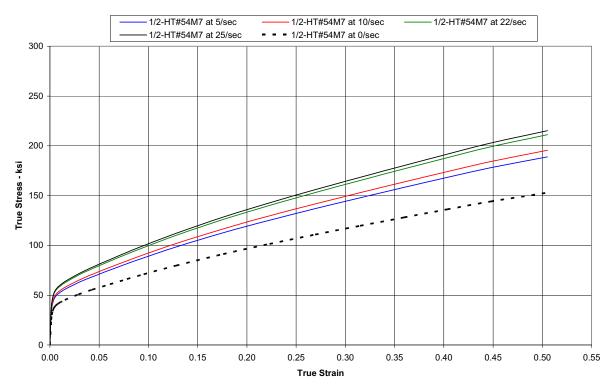


Figure 72. 304L heat 54M7 true stress-strain curve at room temperature at varying strain rates.

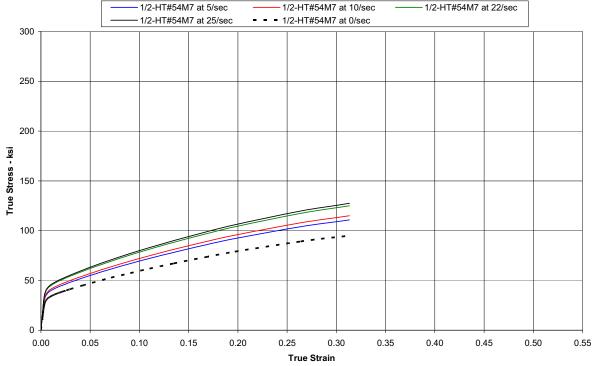


Figure 73. 304L heat 54M7 true stress-strain curve at 300 °F at varying strain rates.

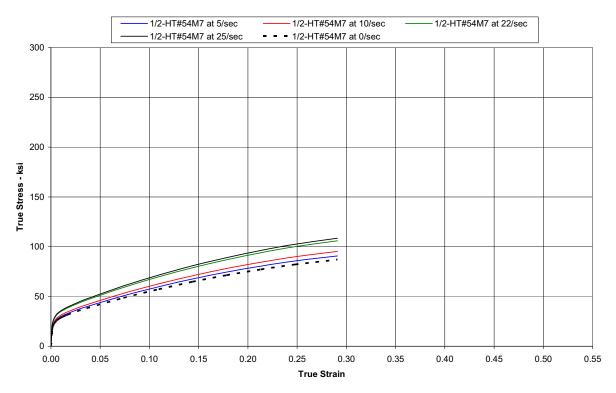


Figure 74. 304L heat 54M7 true stress-strain curve at 600 °F at varying strain rates.

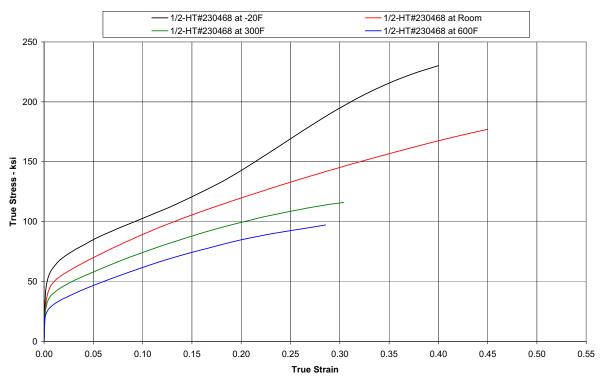


Figure 75. 316L heat 230468 true stress-strain curve at 22/second strain rate at varying temperatures.

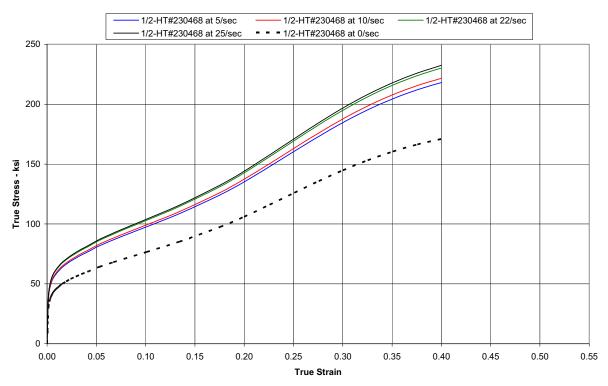


Figure 76. 316L heat 230468 true stress-strain curve at  $-20^{\circ}$ F at varying strain rates.

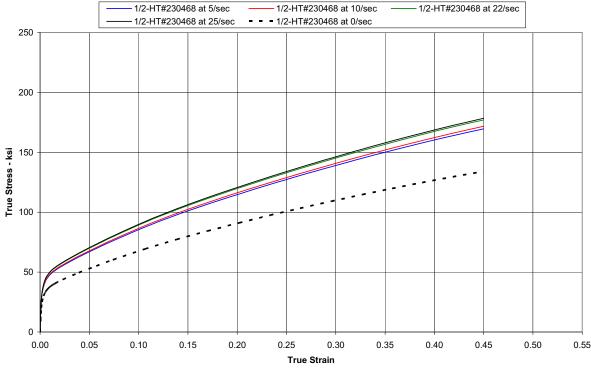


Figure 77. 316L heat 230468 true stress-strain curve at room temperature at varying strain rates.

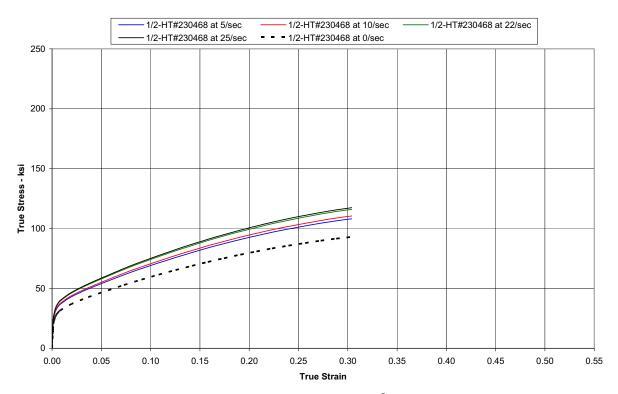


Figure 78. 316L heat 230468 true stress-strain curve at 300 °F at varying strain rates.

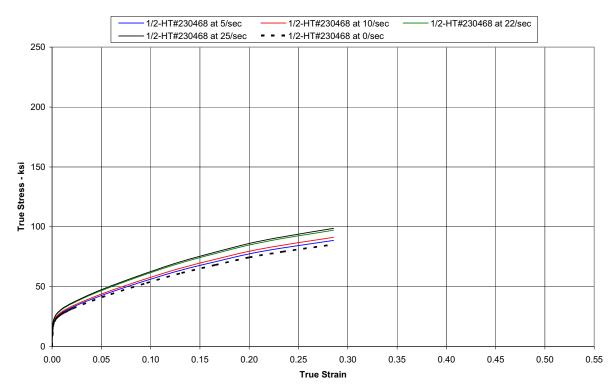


Figure 79. 316L heat 230468 true stress-strain curve at 600 °F at varying strain rates.

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Although this testing program did not investigate the entire strain rate range of interest (up to 300 per second), certain important insights can be observed by evaluating the findings to date. The strain rate elevated true stress-strain curves (Figures 70 through 79) clearly illustrate that increasing strain rates result in increased (higher strength) true stress-strain curves (factors are positive and increasing with increasing strain rate). It is expected that this trend would continue, possibly to a limit, as higher strain rates are investigated. However, actual magnitudes and rates of change beyond those considered herein cannot be quantified without further testing.

Comparing 304L versus 316L curves, the increased capacity to absorb impact energy appears more significant in the 304L than in the 316L material. Figures 70 and 75 illustrate how the strain rate elevated true stress-strain curves vary with temperature at a strain rate of 22 per second. These two figures both indicate that at the same strain rate, increasing temperature decreases the strain rate gain in strength. This is shown more clearly by the listing of factors (calculated from each appropriate curve fit) in Table 27 where the magnitudes decrease as the temperatures increase.

Table 27. Factors for specified strain rates.

Strain rate (per sec.)	-20 °F	Room Temperature	300 °F	600 °F
	304	4L Stainless Stee	el	
5	1.333	1.235	1.166	1.043
10	1.361	1.278	1.210	1.094
22	1.428	1.381	1.316	1.217
25	1.445	1.407	1.342	1.247
	31	6L Stainless Stee	el	
5	1.275	1.265	1.162	1.040
10	1.296	1.281	1.187	1.070
22	1.346	1.321	1.247	1.140
25	1.359	1.331	1.262	1.158

## 8. USING RESULTS: ABAQUS/EXPLICIT ANALYSES USING STRAIN RATE ELEVATED TRUE STRESS-STRAIN CURVES

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With the strain rate factors and strain rate elevated true stress strain curves developed (within the specified strain rate range), it is appropriate to investigate the actual validity of these impact test results. As discussed in Section 1 of this report:

"The test data developed can be used to establish an analysis methodology that can then be applied in analytical simulations to more accurately predict the deformation and resulting material straining in the components being evaluated that are subject to dynamic, impulsive loads."

Forty finite element analyses were performed of various impact tests using the fully dynamic, inelastic analysis software ABAQUS/Explicit, Version 6.6-3. Material properties were input as either non-factored (the quasi-static true stress-strain curve) or factored true stress-strain curves (reflecting strain rate effects as quantified herein using the appropriate curve fit data). The true stress-strain curves input to each analysis reflected the proper material heat (either base or welded material) at the proper temperature, as described in Sections 5 and 6. For the factored true stress-strain input, two strain rate elevated true stress strain curves were input into the finite element model. The first true stress-strain curve had a zero strain rate designated and the second curve had an upper bound (typically 30 per second) strain rate designated. The factors applied were the factors resulting from the curve fits identified on the appropriate factor versus strain rate curves presented in Section 7, even if the factor was not unity at zero strain rate. Linear interpolation of the material properties for strain rates between these two bounding strain rate points was used.

Due to symmetry in two planes, a quarter-model of the test specimen was created (see Figure 80) with mass from the impact driver appropriately applied. Model restraint was provided by fixing the upper cross-member pin in space and by applying plane symmetry boundary restraints to the specimen and lower cross-member pin. To initiate a test simulation, the model mass representing the drop weight was given an initial velocity equal to the drop weight's impact velocity. The analyses were run for a time period of approximately 0.030 seconds, which was determined from the actual testing to be sufficient to capture the full downward motion of the test specimen. Nominal dimensions for the test specimen geometry were used (just like a typical design analysis approach), rather than test specimen specific dimensions based on pre-test measurements.

Table 28 provides a summary of all forty analyses performed, grouped by temperature and strain rate. Percent difference comparisons using non-factored and factored analysis results are made to the actual resulting gauge length axial deformations (for the temperatures considered) at the target strain rates of 10 and 22 per second. In Table 28, the plus values indicate over-prediction and the negative values indicate under-prediction. The Table 28 results clearly indicate that the strain rate adjusted (factored) material input yields more accurate analysis predictions than when just the quasi-static (non-factored) true stress-strain curves are used. Considerable error (over 40%) results when just the quasi-static true stress-strain curves are used, indicating that strain rate effects are real and significant. As expected, all of the analysis results using the non-factored input over-predicted the axial deformation. Without

elevating the true stress-strain curve, a higher strain prediction results in order to equate the impact test's strain energy density with the area under the defined stress-strain curve. The factored material input analyses had estimates above and below the actual deformation, anticipated considering material property and test specimen geometry variabilities.

In general terms, the analysis results show significant improvement for all temperatures except for the 600 °F results. Seven out of the ten 600 °F analyses performed had more accurate results using the factored input but three tests (#391, #508, and #394) had higher percent differences. The percentage variation at 600 °F between non-factored and factored input is reduced due to the lower magnitude of strain rate factors, especially at the strain rates of 5 and 10 per second. These associated factors are less than 1.10, clearly within the variability of plate material properties. Table 29 provides more detailed test and analysis comparison results for each impact test analytically considered, with the shaded portions reflecting the lower strain rate analysis results. Appendix G contains the names and dates of the ABAQUS/Explicit models used for this comparative evaluation. This information is being provided in accordance with NSNFP Procedure 19.03 (Reference 43). The strain rate data quantified herein has indeed provided an improved analysis methodology for dynamic, impulsive events.

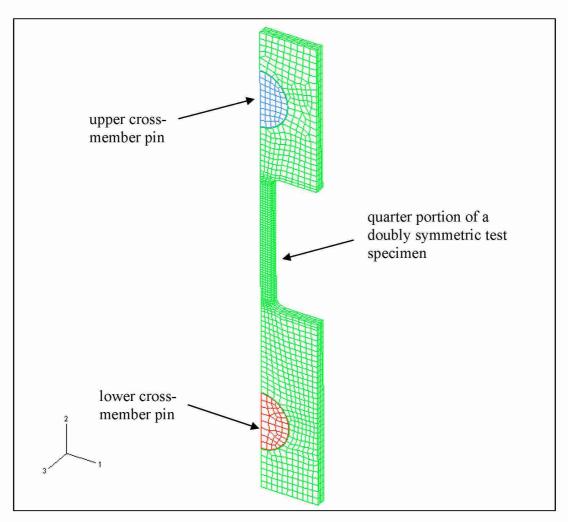


Figure 80. ABAQUS/Explicit symmetric model of impact test specimen.

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Table 28. Summary of comparisons of analytical results using non-factored and factored input to actual impact test deformations.

Temperature		erence Comparisons Between Actual Test Results ABAQUS/Explicit Calculated Results (%)						
	Non-Fa	actored	Factored					
	SR=10	SR=22	SR=10	SR=22				
-20 °F	+24.8 to +40.7	+25.2 to +36.9	-6.2 to +10.6	-3.6 to +6.3				
Room	+22.6 to +33.3	+21.4 to +34.8	-5.5 to +4.4	-4.5 to +4.0				
300 °F	+11.4 to +34.7	+8.9 to +24.1	-7.8 to +12.7	-9.4 to -0.3				
600 °F	+2.6 to +12.0	+2.0 to +12.4	-5.7 to +5.9	-7.6 to -1.8				

Positive table values indicate over-predicted deformations and negative table values indicate under-predicted deformations, when compared to actual test results.

SR – strain rate (sec<sup>-1</sup>)

Table 29. Comparison of ABAQUS/Explicit predictions using non-factored and factored input to test deformations

1 adie 29.	. Comp	T				cuons				ed input to to		uion
Material	Temp.	E Kate	e Specimen	Drop Weight	Drop Height	Test No.	Test Specimen	Gauge Deform.	Material Test	Without ABAQUS	Factors Percent	A
	(F)	(sec. <sup>-1</sup> )	Geom.	(lb.)	(in.)	No.	No.	(in.)	Used	Deform. (in.)	Difference	De
		9.7		1097	2.5	451	304L-291	0.4775	55			
		8.9		790	3.0	432	304L-261	0.3710	13			
	-20	22.5		1097	17.5	491	304L-285	0.5060	183W	0.6929	36.9%	
		22.6		790	20.0	468	304L-301	0.4760	156	0.6184	29.9%	
		19.9		1097	17.5	457	304L-294	0.5210	106	0.7067	35.6%	
		9.9		1097	2.75	355	304L-244	0.5660	47			
		9.6		790	3.0	312	304L-209	0.4340	2			
	Room	22.4		1097	17.375	381	304L-273	0.6050	177W	0.7701	27.3%	
		23.9		790	21.625	349	304L-226	0.6005	153	0.7652	27.4%	
304L		22.1		1097	17.5	290	304L-203	0.6415	113	0.8648	34.8%	
304L		10.4		1097	2.375	388	304L-246	0.6865	50			
		10.6		790	3.0	321	304L-210	0.5955	5			
	300	20.7		1097	14.0	516	304L-321	0.6335	171W	0.7836	23.7%	
		22.5		790	18.188	405	304L-254	0.6420	146	0.7807	21.6%	
		21.6		1097	14.5	376	304L-232	0.7090	109	0.8797	24.1%	
		9.7		1097	2.375	391	304L-266	0.8550	53			
		10.7		790	2.5	410	304L-241	0.6325	8			
	600	19.1		1097	11.5	507	304L-320	0.6560	179W	0.7065	7.7%	
		21.7		790	18.0	415	304L-258	0.7285	151	0.8139	12.4%	
		21.4		1097	14.5	417	304L-234	0.8665	111	0.9289	7.2%	
		10.1		1097	2.5	465	316L-195	0.4745	42			
		9.7		790	3.0	431	316L-111	0.3500	26			
	-20	22.9		1097	19.0	493	316L-179	0.6390	181W	0.8003	25.2%	
		21.5		790	18.0	471	316L-193	0.4675	141	0.6218	33.0%	
		19.7		1097	14.75	458	316L-184	0.4965	125	0.6286	26.6%	
		9.8		1097	2.75	357	316L-128	0.6380	33			
		9.3		790	3.0	306	316L-98	0.4250	17			
	Room	20.4		1097	14.75	382	316L-166	0.5675	167W	0.7126	25.6%	
		21.4		790	18.25	352	316L-138	0.5765	138	0.6997	21.4%	
316L		22.0		1097	14.75	291	316L-91	0.5955	128	0.7335	23.2%	
310L		10.7		1097	2.5	400	316L-154	0.7575	35			
		9.7		790	3.0	320	316L-99	0.5255	19			
	300	20.9		1097	14.0	514	316L-206	0.7230	161W	0.8118	12.3%	
		22.5		790	18.688	406	316L-147	0.7440	131	0.8103	8.9%	
		21.9		1097	16.0	286	316L-89	0.7865	120	0.9208	17.1%	
		9.7		1097	2.125	390	316L-140	0.7735	37			
		9.5		790	2.5	346	316L-130	0.5690	22			
	600	19.1		1097	11.0	508	316L-204	0.6675	164W	0.6854	2.7%	
		22.4		790	17.875	394	316L-146	0.8120	135	0.8286	2.0%	
		20.7		1097	13.0	418	316L-124	0.7640	123	0.8073	5.7%	

#### 9. OBSERVATIONS FROM TEST RESULTS

A total of 260 dynamic impact tensile tests of 304L and 316L stainless steels were used in this report to calculate strain rate factors for the strain rate range of 4 to 40 per second. More than 160 quasi-static tensile tests were also performed to establish stress-strain relationships of the materials used. This section discusses several observations related to this large population of tests.

#### 9.1 Quasi-Static Tensile Testing

The quasi-static tensile testing performed for this research effort produced results that were correct, as evidence in Section 5.5. However, additional discussion is needed to more fully explain how the uniform strain limits were determined.

The text book explanation for determining the uniform strain limit of typical steels would indicate that it is the strain at which the tensile stress is at its maximum (ultimate tensile strength or UTS). However, with these stainless steels, the quasi-static engineering curves did not have a significant 'hump' shape (as seen in Figure 2) but were relatively flat for a significant strain range. This is illustrated in Figure 81.

Figure 81 illustrates how the maximum UTS value [the red dot that is less than 0.25% higher in strength than the adjacent blue (left) and black (right) square boxes] would lead the text book engineer to pick 0.43 engineering strain as the uniform strain limit. In reality, the onset of **significant necking** is actually closer to the black square box value of 0.47 engineering strain (if not a little higher). Typical accuracy tolerances for these tensile test machines is  $\pm 0.5\%$  of the load (which carries over to stress accuracy). Attempts to indicate that the maximum UTS can be so precisely determined within a few psi is not appropriate. Since this research effort was interested in accurately defining the strain energy density for each material at the onset of significant necking, the higher uniform strain limit value would have been chosen. In Section 5.5, Table 7 lists the uniform strain limits chosen for use in this research effort.

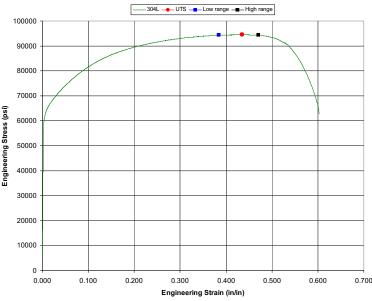


Figure 81. Engineering plot of 304L material exhibiting flat response near UTS.

#### 9.2 Impact Tensile Testing

A number of significant insights were gained from the impact testing performed for factor determination. A more thorough understanding of what strain rates are achievable with various test specimen geometries was a significant step forward for test planning purposes. However, two specific issues, (1) impact test anomalies and (2) base versus welded material responses, are pertinent to this report and are discussed in further detail below.

#### 9.2.1 Impact Test Anomalies

Ten impact tests were able to achieve strains beyond the established uniform strain limit (see Table 7) yet did not exhibit any signs of necking. Discarding those instances where that strain exceedance was 5% or less (attempting to determine a trend by focusing on extreme indicators), only three impact tests remain. With strains exceeding their established uniform strain limits by 8.7%, 8.7%, and 17.3%, these three 'high indicator' 316L tests (#326, #375, and #422) did not provide clear indications that the uniform strain limit increases with increasing strain rate.

On the other hand, there were a total of four impact tests where the strain achieved was below the established uniform strain limit and the test specimen either necked or broke. Again discarding those tests that had strains greater than 95% of their uniform strain limit (attempting to determine a trend by focusing on extreme indicators), two 316L tests remain [#427 (welded) and #469] that necked at strains of 90.8% and 77.5% of their established uniform strain limits. These 'low indicator' tests were surprises from the perspective that the material failed earlier than anticipated, especially Test #469 that necked at <sup>3</sup>/<sub>4</sub> of the uniform strain limit. However, there was no clear indication that the uniform strain limit decreases with increasing strain rate.

These 'high' and 'low' test anomalies highlight the probabilistic nature of testing that should not be unexpected. Even though material variability has an effect on the impact test results and the uniform strain limit, the impact testing performed herein at strain rates below 40 per second did not provide clear indications that the uniform strain limit varies with strain rate.

#### 9.2.2 Base Versus Welded Material Responses

Prior drop testing experience of full-scale Department of Energy spent nuclear fuel canisters (References 44, 45, and 46) indicated there was no significant variation in the deformation responses of the canister wall when impact occurred directly onto a canister weld. A limited number of impact tests of welded material at elevated temperatures were performed prior to the completion of that material's quasi-static tensile testing. These first impact tests used the same drop weight and drop height as was used for the base material. The resulting strain rate responses of the welded material test specimens appeared to be very similar to the base material. However, some of the welded material test specimens necked or broke where the base material test specimens had not. The conclusion reached was that the welded material had a lower uniform strain limit and fracture strain than the base material. After completion of the quasi-static tensile testing, this indeed turned out to be the case.

Figures 82 and 83 show, for 304L and 316L respectively, quasi-static tensile test results of base and welded materials at 300°F temperature conditions. These representative engineering stress-strain plots illustrate that the uniform strain limit and failure strain for the welded material

are lower than the associated base material. Figures 84 and 85 are comparative strain history plots of 304L and 316L base and welded material impact tests performed at -20 °F. These impact tests used the same drop weight, drop height, and test specimen geometry. These plots illustrate how similar the base and welded material were in terms of strain rate response. The plots also show that the welded material absorbs the impact energy with a lower maximum strain than the base material (i.e., welded material is stronger than base material). However, as discussed above, the welds fail at lower strain levels than the base material (i.e., welded material is less ductile than the base material).

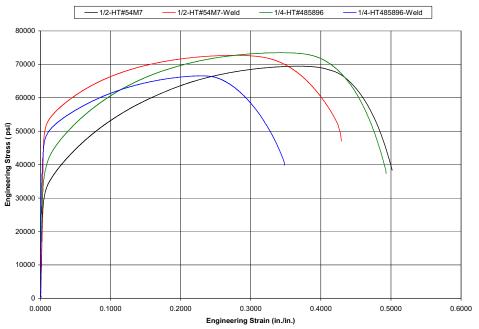


Figure 82. Quasi-static tensile test results for 304L base and welded material at 300° F.

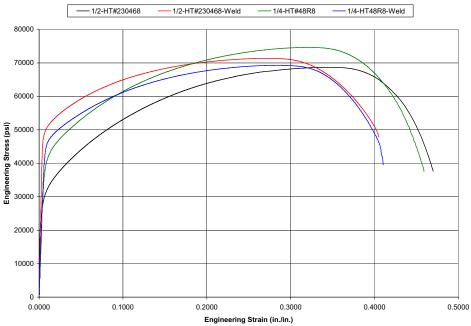


Figure 83. Quasi-static tensile test results for 316L base and welded material at 300° F.

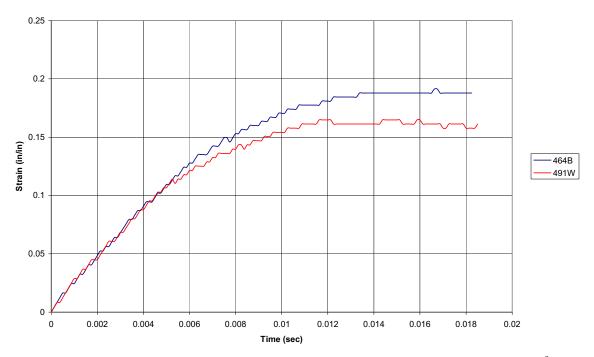


Figure 84. Comparison of base and welded 304L material to identical impact tests at -20 °F.

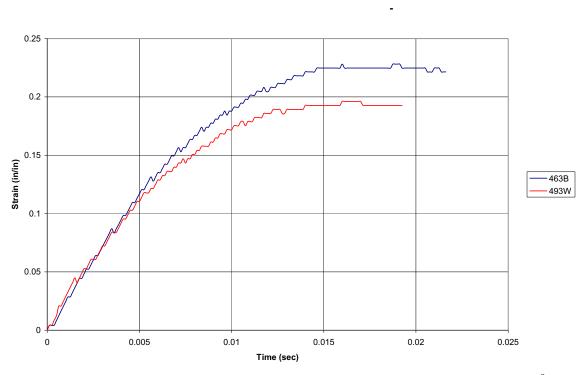


Figure 85. Comparison of base and welded 316L material to identical impact tests at -20 °F.

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Based on the strain rate range achieved herein, the welded material test specimens responded very similar to the base material test specimens. Therefore, one would expect the strain rate factors to be similar. This also was the case, as evidenced by the factor versus strain rate curves (Figures 62 through 69). As can be seen, the welds (identified as triangular-shaped data points) are consistent with the base material data. This permits the structural analyst to use the same strain rate factor data for both base and weld materials when incorporating strain rate effects into finite element models. However, the structural analyst must be fully aware that the welds have a lower uniform strain limit and failure strain and this must be correctly incorporated into the acceptance criteria that the structural analyst is employing.

## 9.3 Factors and Strain Rate Elevated True Stress-Strain Curves Insights

It is important to recognize that the factor versus strain rate curves (Figures 62 through 69) reflect multiple heats and different test specimen geometries. Considering the variability of material properties of all of the test specimens used, the consistency of the curves is quite striking. However, it is too early to engage in discussions on how the formulation of these strain rate test results compare to a characterization of strain rate dependent material behavior (material constitutive equation such as the Cowper-Symonds equation) until strain rate data at higher ranges (up to 300 per second) become available.

#### 10. CONCLUSIONS

Strain rate effects in the range of 4 to 40 per second for tensile loading of 304L and 316L stainless steel materials were successfully quantified at the INL using a large drop weight test machine and a total energy analysis approach. By incorporating the strain rate elevated true stress-strain material curves into an inelastic finite element computer program as the defined material input, significant improvement in the accuracy of the computer analyses was attained. However, additional impact testing is necessary to achieve higher strain rates (up to 300 per second) before complete definition of strain rate effects can be made for accidental drop events and other similar energy-limited impulsive loads.

The results of this material impact testing effort can be used to support the development of strain-based acceptance criteria for national codes and standards use. As documented by this research effort, in addition to quantifying the strain rate effects, the following items may prove useful to codes and standards developers: (1) the effects of strain rate decrease with increasing temperature, (2) base and welded materials appear to behave similarly during impact testing, though welded materials have lower uniform strain and failure strain limits, and (3) the uniform strain limits for both welded material and base material do not appear to vary from the values established during quasi-static tensile testing for the strain rate range discussed herein. In addition to the need for impact tensile testing research at higher strain rates, bending response impact testing would be very beneficial in establishing maximum viable thru-wall and surface strain limits.

This research approach, using impact testing and a total energy analysis methodology to quantify strain rate effects, can be applied to many other materials used in government and industry.

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# Appendix A DADiSP Integration Verification

#### A1. OBJECTIVE

The objective of this appendix is to verify the integration function used in the computer code DADiSP for accuracy. Verification will be accomplished by solving two problems using DADiSP and comparing the DADiSP solutions with the known classical solutions.

#### **A2. KNOWN SOLUTION SAMPLE PROBLEMS**

#### A2.1 Area of a Triangle

The first sample problem chosen for which a known solution (solved by classical methods) exists is a triangle. The particular one used is shown graphically in Figure A1. The area is calculated using classical methods as follows:

$$Area = \frac{b \times h}{2} = \frac{1 \times 2}{2} = 1$$

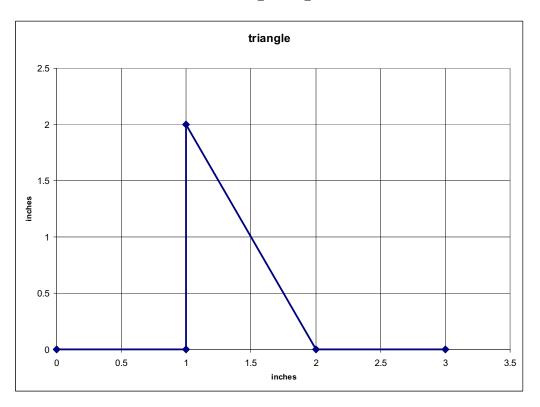


Figure A1. Sample Problem #1 – Triangle.

Figure A2 is the problem defined in DADiSP with Figure A3 showing the execution of the integration function of DADiSP. Note the final integration value of 1 which agrees with the classical solution.

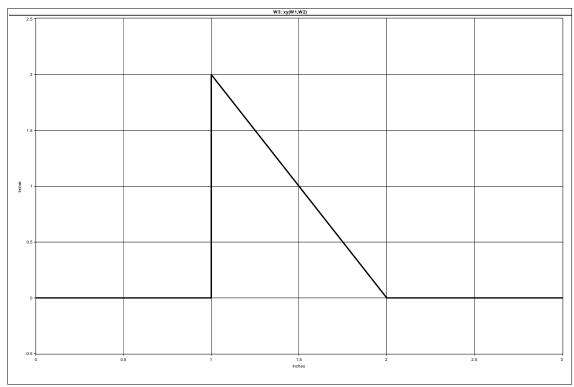


Figure A2. Problem #1 Definition in DADiSP.

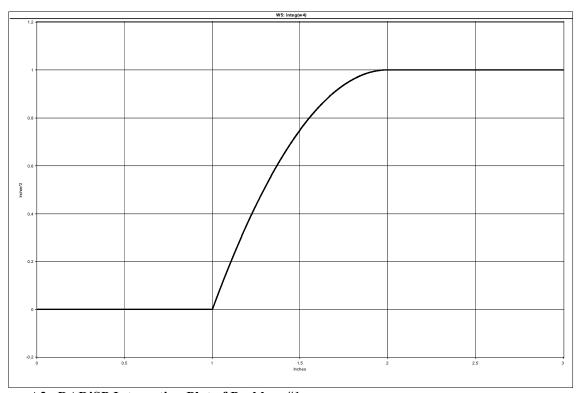


Figure A3. DADiSP Integration Plot of Problem #1.

#### A2.2 Area of a Quarter Circle

The second sample problem chosen for which a known solution (solved by classical methods) exists is a quarter circle of radius 2 inches. It is shown graphically in Figure A4. The area is calculated using classical methods as follows:

$$Area = \frac{\pi \times r^2}{4} = \frac{\pi \times 2^2}{4} = 3.14159$$

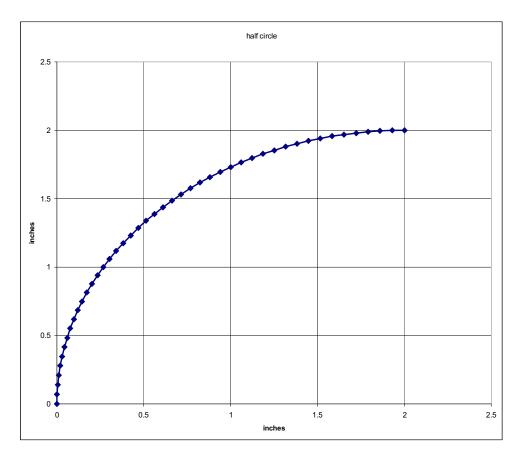


Figure A4. Sample Problem #2 - Quarter Circle.

Figure A5 is the problem defined in DADiSP with Figure A6 showing the execution of the integration function of DADiSP. Note the final integration value of 3.14096 as a percentage of the classical solution is:

$$\frac{3.14096}{3.14159} \times 100 = 99.98 \%$$

The data points of Figure A4 are tabulated in Table A1.

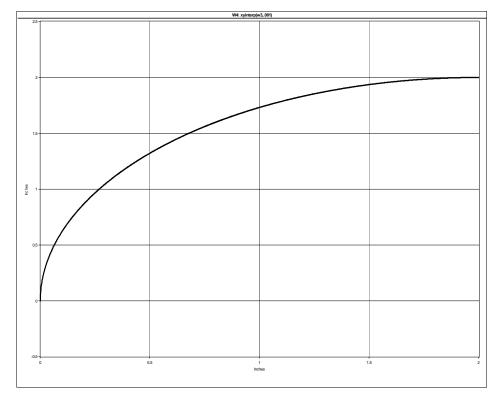


Figure A5. Problem #2 Definition in DADiSP.

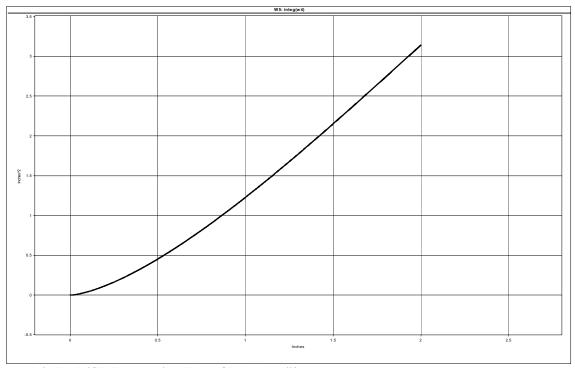


Figure A6. DADiSP Integration Plot of Problem #2.

Table A1. XY values of Figure A4.

x-value	y-value
0	0
0.001218	0.069799
0.004872	0.139513
0.010956	0.209057
0.019464	0.278346
0.030384	0.347296
0.043705	0.415823
0.059409	0.483844
0.077477	0.551275
0.097887	0.618034
0.120615	0.68404
0.145632	0.749213
0.172909	0.813473
0.202412	0.876742
0.234105	0.938943
0.267949	1
0.303904	1.059839
0.341925	1.118386
0.381966	1.175571
0.423978	1.231323
0.467911	1.285575
0.51371	1.338261
0.56132	1.389317
0.610683	1.43868
0.661739	1.48629
0.714425	1.532089
0.768677	1.576022
0.824429	1.618034
0.881614	1.658075
0.940161	1.696096
1	1.732051
1.061057	1.765895
1.123258	1.797588
1.186527	1.827091
1.250787	1.854368
1.31596	1.879385
1.381966	1.902113
1.448725	1.922523
1.516156	1.940591
1.584177	1.956295
1.652704	1.969616
1.721654	1.980536
1.790943	1.989044
1.860487	1.995128
1.930201	1.998782
2	2
<u>-</u>	

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### **Appendix B**

## **Engineering Signoffs for Spreadsheet Calculations**

#### Signature Sheet

#### Verification of Excel Routines and Macros Identified in NSNF/MED/017, Rev. 1

The purpose of this signature sheet is to document verification of certain software routines and macros within exempt commercial software as required by NSNFP Procedure 19.01, Revision 4, Section III, A. The applicable routines and macros were generated using Microsoft Office Excel 2003 (11.8169.8172) SP3 software and are uniquely identified by the NSNFP Document Control Coordinator (DCC) as NSNF/MED/017, Revision 1.

The Excel software was used to generate spreadsheets containing equations, routines, and macros used to manipulate, convert, calculate, and present raw strain rate testing related data into meaningful results. The following 'verifier' signatures indicate independent verification by checking, inspection, and/or alternate calculation that the spreadsheet equations, routines, and macros calculate correct results:

IDENTIFIER	PERFORMER		VERIFIER SIGNATURE	DATE
IDENTIFIER	PERFORMER	PRINT	SIGN	DATE
Spreadsheets A_304L Material Static True Stress Strain	T.E. Rahl	R.K. Blandford	RX Blandford	3/17/2008
Spreadsheets B_316L Material Static True Stress Strain	T.E. Rahl	R.K. Blandford	RX Blondford	3)17/2008
Spreadsheets C_Calibration of Static Test Data	T. E. Rahl	R.K. Blandford	RX Blandfore	3/17/2008
Spreadsheets D_Strain Rate Specimen Strain Distribution	T. E. Rahl	R.K. Blandford	LKBlandfor	3/17/2008
Spreadsheets E_Material Curve Equations	T. E. Rahl	R.K. Blandford	LX blombar	3/17/2000
Spreadsheets F_Strain Rate Test Factor Evaluation	T. E. Rahl	R.K. Blandford	RX Blandford	3/17/2008
Spreadsheets G_Strain Rate Test Summary Tables	D. K. Morton	R.K. Blandford	RX blandfore	3/17/2008

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# Appendix C INL Welding Procedure S2.0

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#### IDAHO NATIONAL ENGINEERING LABORATORY WELDING PROCEDURE SPECIFICATION

WELDING PROCEDURE SPECIFICATION NUMBER: \$2.0

REVISION NUMBER: 11

WELDING PROCESS(ES): GTAW

PAGE 1 of 2

PQR: See Notes \*\* DATE: 03/24/92

TYPE(S): Manual

SCOPE: This welding procedure specification must be used in conjuction with the Idaho National Engineering Laboratory's Welding Manual. This welding procedure specification meets the requirements of the ASME 8 & PV Code Section IX. 1986 edition up to and including A87 addenda. This specification is to be used for welding austenitic stainless steel.

JOINTS (QW-402)

JOINT DESIGM: Grooves and Fillets

BACKING MATERIAL (TYPE):

3XX stainless steel, if required

NONMETALLIC/NONFUSING METAL RETAINERS: None

See INEL Welding Manual

DETAILS

BASE MATERIALS (QW-403)

GENERAL CLASS: 3XX stainless steel

P NO.: B

To P NO.: 8

SPECIFICATION TYPE AND GRADE:

TO SPECIFICATION TYPE AND GRADE:

CHEMICAL ANALYSIS AND MECH. PROP.:

TO CHEMICAL ANALYSIS AND MECH. PROP .:

THICKNESS RANGE:

BASE MATERIAL - GROOVE: 0.020 to 8.0 in.(note 2)

FILLEY: All

PIPE DIA. RANGE:

BASE MATERIAL - GROOVE: All

FILLET: All

SINGLE PASS THICKNESS LIMIT: less than 1/2 in.

FILLER METALS (QW-404)

SPECIFICATION NO. (SFA): A/SFA 5.9

AWS NO. (CLASS): See note 1

F NO.: 6

NOMINAL CHEMICAL COMPOSITION:

SIZE OF FILLER METALS: 0.125 in. max.

DEPOSITED WELD METAL THICKNESS RANGE:

GROOVE: 0.020 to 8.00. in.

FILLET: All

CONSUMABLE INSERT: None

SUPPLEMENTAL FILLER/POWDER: None SOLID/TUBULAR/FLUX COVERED (GMAW): n/a

POSITION (QW-405)

POSITION(S) OF GROOVE: All VERTICAL WELDING PROGRESSION: Up

POSITION(S) OF FILLET: All

PREHEAT (QW-406)

PREHEAT TEMP. (min.): 50 F INTERPASS TEMP. (max.): 350 F PREHEAT MAINTEMANCE: As required

Date: March 2008 EDF-NSNF-082 Page C3 of 3



#### WELDING PROCEDURE SPECIFICATION

WELDING PROCEDURE SPECIFICATION NUMBER: S2.0

REVISION NO.: 11

PAGE: 2 of 2

POSTWELD HEAT TREATMENT (QW-407)

TEMP. RANGE: Mone TIME RANGE: None

GAS (QW-408)

SHIELDING GAS(ES): Argon COMPOSITION: 100% FLOW RATE: 10 to 25 ofh GAS BACKING: Argon COMPOSITION: 100% FLOW RATE: 0.5 cfh min. TRAILING GAS: None

COMPOSITION: None FLOW RATE: None

ELECTRICAL CHARACTERISTICS (QW-409)

CURRENT TYPE: Direct

POLARITY: Straight

AMPS: 10 to 200 \* VOLTS: 8 to 16 \* TUMGSTEN ELECTRODE SIZE AND TYPE: ANS A5.12 EMTh-2 0.125 in. max.

MODE OF TRANSIFER FOR GMAM: 11/a ELECTRODE WIRE FEED SPEED RANGE: Tr/a

PULSING: Optional

TECHNIQUE (OW-410)

STRING OR WEAVE BEAD: Both GAS CUP SIZE: 0.375 in. min.

INITIAL AND INTERPASS CLEANING: Clean with alcohol, acetone, or approved cleaners prior to

welding. Grinding and/or wire brushing is permitted. METHOD OF BACKGOUGING: Grinding, filing, or machining

OSCILLATION: 0.50 in. max.

CONTACT TUBE TO WORK DISTANCE: n/a MULTIPLE OR SINGLE PASS (per side): Either MULTIPLE OR SINGLE ELECTRODES: Single

TRAVEL SPEED (ipm): 1 to 10 PEENING: Not allowed

#### ADDITIONAL NOTES:

- 1) Suggested filler materials: For type 304 use 308 filler, 304L use 308L filler, 316 use 316 filler, 316L use 316L filler, 347 or 348 use 347 or 348 filler, 321 use 321 or 347
- 2) This procedure is qualified for welding metals requiring notch toughness testing in the base metal thickness range of 0.124 to 0.496 in.
- \* [f charpy impact requirements are imposed, the maximum joules/in, shall be: pass 1 35.6 kJ/in.; pass 2: 39.3 kJ/in.; pass 3 and greater 43.1 kJ/in.. Welding must be approved by an authorized Welding Engineer.
- \*\* Q225, Q877, Q4144, Q6233, Q6802

COMPANY: EGSG IDAHO, INC.

PREPARED BY: 1) Ouglas D Hanses DATE: 3/25/92
APPROVED BY: Man J Dale DATE: 3/25/92

Author: D. K. Morton and R. K. Blandford

Reviewed By: S. D. Snow

Date: March 2008

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## Appendix D

## **Representative Test Specimen Data Sheet**

Date: March 2008 EDF-NSNF-082 Page D2 of 4

#### Data Sheet - ITM Tensile Test Coupon - Page 1

Coupon ID: 3 6 103

Material Orientation: (L) T (circle one)

Drop Height: 2 ft 6 in

Heat Number: 67 k0

Weld Number: 104

Specimen Geometry: 104

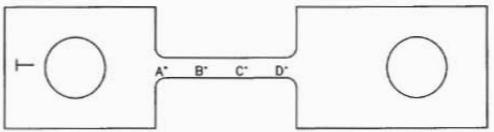
Test Date: 7 / 12 / 06

Pig Weight: 790 lbs

Pre-Test Temp: 79 °F

Caliper Offset: 0.40 in.

Specimen Geometry: 1044



Front Side Shown

Target Gage Length (inches)	Pre-Test Measured Gage Length (inches)	Pre-Test Actual Gage Length, L* (inches)	Post-Test Measured Gage Length (inches)	Post-Test Actual Gage Length* (inches)	Change in Gage Leagth, AL (inches)	Calipers Calibration 1D#
1.000	.6070	1.0070	. 8635	1.2635	.2565	721714
1.000	.6030	1.0030	.8620	1.2620	. 2590	1
1,000		1.0110	.8660	1.2660	.2550	
2.000	1.6035	2.0075	2.1200	2.5200	5165	
2.000	1.6075	2.0075	2.1275	25275	.5200	1
3.000	2.6090	3.0090	3.3835	3.7835	.1745	721714
	Gage Length (inches) 1.000 1.000 2.000 2.000	Target Gage Gage Length (inches)  1.000 .6070  1.000 .6030  1.000 .6110  2.000 1.6035	Target Gage Gage Length (inches) (inche	Target Gage Gage Gage Length (inches) (	Target Gage Gage Gage Gage Length (inches) (inch	Target Gage         Measured Gage         Actual Gage         Measured Gage         Actual Gage         Gage Length, (inches)         Actual Gage         Gage Length, (inches)         Length (inches)         Length (inches)         Length (inches)         AL (inches)           1.000         .6070         1.0070         .8635         1.2635         .2565           1.000         .6030         1.0030         .8620         1.2620         .2590           1.000         .6110         1.010         .8640         1.2660         .2550           2.000         1.6035         2.0035         2.1275         2.5200         5165           2.000         1.6075         2.0015         2.1275         2.5275         .5200

\*-includes caliper points offset

De	Reduced Section Width					The second secon		d Section W x T)	Calipers
	Pre Front	Pre Back	Post Front	Post Back	Pre	Post	Pre	Post	Calibration ID#
В	.4820	.5005	.4365	.4485	.5060	.4495	.2486	.1976	721715
C	.4850	,5000	.4285	.4475	. 5065	.4500	.2495	.1971	721715

Pre-measurements performed by: T1 kdk.

Pre-measurements checked by: K Charden

Post-measurements performed by: T2 kdk

Post-measurements checked by: Bona

Date: 7 / 10 / 16
Date: 7 / 10 / 06
Date: 7 / 12 / 06
Date: 7 / 12 / 06

Reviewed By: S. D. Snow

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### Data Sheet - ITM Tensile Test Coupon - Page 2

Coupon ID: 316L-103

Accel FN: test307 071206

Cam FN: Test\_307

See attached camera data for more details.

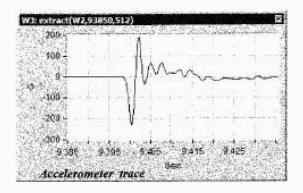
Target Gage Length (inches)	Engr. Strain, €L (ΔL/L)	True Strain, 6 <sub>L</sub> In (AL/L + 1)
1.000	ne	nc
1.000	ne	ne
1.000	ne	ne
2.000	ne	nc
2.000	ne	nc
3.000	.2574	-2290
	Gage Length (inches) 1.000 1.000 2.000 2.000	Gage Strain, Length €L (inches) (AL/L)  1.000 nc  1.000 nc  1.000 nc  2.000 nc

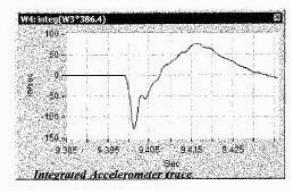
Comments:

nc - not calculated for auxillary tests

Accel. Serial # 38617

True strain rate from camera = 27.5 sec-1





Pt	Engr. Strain, $ \frac{\epsilon_{A}}{A_{pre} - A_{pore}} $ $ \frac{A_{pre} - A_{pore}}{A_{pose}} $	True Strain, $\mathbf{E}_{\Lambda}$ $\operatorname{In}\left(\frac{A_{pre}}{A_{pose}}\right)$
В	ne	nc
C	пс	пс
ave	.2620	.2327

Measurements performed by:

Date: 07 / 16 / 07

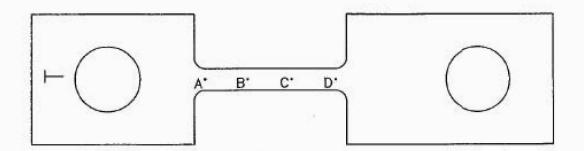
Reviewed By: S. D. Snow

#### Date: March 2008 EDF-NSNF-082 Page D4 of 4

### Qualified Dimensional Inspector Data Sheet - ITM Tensile Test Coupon Page 3

Coupon ID: 3164 - 103

Dimensional Inspector (print): Robert Molwey



Front Side Shown

Distance	Gage Length (inches)	Post-Test Length (inches)	Calipers Calibration ID#						
A-D	3.000	3.7795	721714	2xp	9-26-07				
				- 1995					
	STATES OF THE STATES								

Dimensional Inspector (sign):

Author: D. K. Morton and R. K. Blandford

Reviewed By: S. D. Snow

Date: March 2008

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# Appendix E Drop Weight Comparison

Reviewed By: S. D. Snow

		R	esults of	ITM Weight	s Calibrat	ions		
		Marked		n Laboratory surement	Total	Nominal	Percent	
Cal Lab ID	Marked Label	Weight <sup>(1)</sup> (lbs)	Item Weight (Ibs)	Shackle <sup>(2)</sup> & Link Weight (lbs)	Weight <sup>(5)</sup> (Ibs)	Measured Weight <sup>(6)</sup> (Ibs)	Variation From Marked	
725131	Α	1097	1080.88	5.73	1086.61	1087	< 1%	
725132	В	541	534.34	5.73	540.07	540	< 0.2%	
725133	С	103	102.17	5.73	107.9	108	4.6%	
725134	#1	83 <sup>(4)</sup>	83.44	NA	83.44	83	0	
725135	#2	83 <sup>(4)</sup>	83.4	NA	83.4	83	0	
725136	#3	83 <sup>(4)</sup>	83.31	NA	83.31	83	0	
725137	#4	83 <sup>(4)</sup>	83.47	NA	83.47	83	0	
725138	#5	84 <sup>(4)</sup>	83.43	NA	83.43	83	1.2%	
725139	#6	83 <sup>(4)</sup>	83.39	NA	83.39	83	0	
725140	CFA-S-05-1-12	NA	4.91	NA	NA	NA	NA	
725141	CFA-S-05-1-7	NA	4.93	NA	NA	NA	NA	
725142	CITRC-ML-02-2	NA	0.81	NA	NA	NA	NA	
725143	CITRC-ML-07-1/2-2	NA	0.88	NA	NA	NA	NA	

- 1. Weights measured and marked by NSNFP test personnel using calibrated load cells.
- Shackle weight used for total weight represents average weight of both shackles.
   Weight not used for qualified data testing.
   Weights #1 thru #6 include two bolts.

- 5. Total weight is the sum of the calibration laboratory measurement 'Item Weight' and the 'Shackle & Link Weight.'
- 6. Nominal measured weight is the Total Weight rounded to the nearest whole number.

Author: D. K. Morton and R. K. Blandford

Reviewed By: S. D. Snow

Date: March 2008

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### Appendix F

### **INL Dimensional Inspector Qualifications**

Author: D. K. Morton and R. K. Blandford

Reviewed By: S. D. Snow

414.73 03/10/98 Rev. 01

### PERSONNEL CERTIFICATION DATA FORM

Date: March 2008

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TION I - Reque Applicant: Rober				F: 57562			ertific	ation expi	res: 10/20	000	Date: 09/20/00		
Inspection activity													
TION II - Proce	ssing Do	cume	ntation a	nd Evalu	ations:	(To be	filled	out by L	evel II and	others as requested)			
Discipline: Mech Limits: None	anical		Metho	d: Preci	sion Di	mensio	onal			Level: II	Inspector		
Physical/Vision	Examina	tion F	Ref MCP-6	35 Appe	endix I					Applicant's Ed	ucation Level		
Due Date 08/02			r Vision	_	r Vision	C.	Coli	or Discrim	ination	4 Yr. Degree	2 Yr. Degree		
Requirement	20	0/25 S	nellen							☐ H.S./Equal	Other		
Corrected/Uncorr	rected C	orrect	ed	Corre	oted	V	erify o	ontrast.		Note: See Inspectors Certification F			
							ite for	1		pecified in Appendix			
MCP-535 Appen		or G	_	s Hr by Education Level					1	(Ref MCP-535 Appendix D)			
			H.S.	+2 Y	r.	Sub Exp.*		Hr.	Description				
Drawing interpretation     Dimensional metrology     Measuring hand tools     Geometric tolerancing     Coordinate measuring machine     Contour Projector     Optical Measuring     Equipment.		4 hours 20 hours 20 hours 40 hours 40 hours 8 hours 8 hours		0r 1y 1y		ths		Experience continued since previous cert obtained as a Precision Dimensional Insp See Certification File.					
OJT/Self Study:							_						
Type & Activity/O				Req. Hr	Date	e 1	dr.	Reference Documentation and comments:					
Drawing inte     Dimensional     Measuring H     Geometric T     Coordinate M     Contour Proj     Optical Measuring	Metrology land Tools olerancing deasuring jector	y s g Mach	2 2 4 sine 8	0 hours 0 hours 0 hours 0 hours 0 hours 0 hours 0 hours				See Certi	fication File	ication File.			
Experience: Re	f MCP-53	5 App	endix A. B	ForG									
Hr. Requir				uired Exp	perience					Experience Obtained			
H.S. + 2 Yr.	Other			Descript	tion			Hr.		Reference/Documer	ntation		
1 Year 6 Month							7	55 Hrs.	Application & Interpretation of Geometric Dimensioning & Tolerancing. (Tech. Doc. Consultants INC.)				
Examination Re	sults:												
TEST			tions & Mir		DIVIDU r Quest		TSC		otical Exar	minations	COMPOSITE		
G	en, /(	) 8	pec. /(	_	ther97/(			emo	Oral	Other	200112		
Description				0	3/D/&/T			Support		G/D/&/T -Q/H			
SCORES					82 %		9	7 %		96 %	92 %		
DATE					11/18/20	100	40040	v20000		01/18/2000			

<sup>\*</sup>The Minimum number of examination questions is reduced when the scope of qualification is LIMITED MCP-535 Appendix A & D. Min # questions (actual # questions)

Author: D. K. Morton and R. K. Blandford

Reviewed By: S. D. Snow

Date: March 2008

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414.73 03/10/98 Rev. 01

### PERSONNEL CERTIFICATION DATA FORM

Additional Training Required Prior to	Re-examination:	Minimu	m up-date or re-certificat	ion training:	Q	
NONE	Hours	Subject Required	Hours	Ref. Documentation		
The "Applicant" is Certified in acc Certifying	ordance with MCP	-535 to	perform the above Dis Effective Date of Certific	E PRODUCTION OF VO	thod. Certification Expiration Date	
	Ordance with MCP  Date: 10/10/2000	-535 to		E PRODUCTION OF VO		

Author: D. K. Morton and R. K. Blandford

Date: March 2008 Reviewed By: S. D. Snow EDF-NSNF-082 Page F4 of 6

414.73 02/20/2003 Rev. 04

### BBWI PERSONNEL CERTIFICATION DATA FORM

Applica	nt: Robert B	Mohney	S	#: 57562	Cu	rrent certific	cation exp	ires: 10/11	0/2003	Date: 09/11/200	
Inspecti	on activity ca	andidate will	be perfor	ming: Pre	cision (	Dimensional	Inspectio	ns.			
TION	l – Processi	ng Docume	ntation a	nd Evalua	ations:	(To be fille	d out by L	evel II and	d others as requested	.)	
Disciplir Limits:	ne: Mechani NONE	cal	Metho	d: Precis	ion Dim	nensional			Level: II	Inspector	
Physica	al/Vision Ex	amination f	Ref. MCP-	-535 Appe	ndix I				Applicant's Ed	ducation Level	
N, 131	te 08/18/20	- 13		B. Far		C. Co	lor Discrin	nination	4 Yr. Degree	2 Yr. Degre	
Require	equirement 20/25 Snellen			N/A		Verify	Contrast		☐ H.S./Equal	☐ Other	
Correct	Corrected/Uncorrected Corrected					ОК		Note: See Inspecto	ors Certification F		
Trainin	a: * Sub Exi	o. = additiona	al experie	nce permi	tted to	substitute fo	r formal tr	aining as	specified in Appendix	ForG	
Shows I keeps	35 Appendix		Var Park Alak	r. by Educ		PATER HOSPIGATION	55 W. W. W.	THE THE PARTY	(Ref. MCP-535 Appe	STATE OF THE STATE	
Subject/Topic/Description H.S.			H.S.	+ 2 Yı	5	Sub Exp.*	Hr.	Descript	tion		
2. 3. 4. 5.	Drawing Interpretation     Dimensional Metrology     Measuring Hand Tools     Geometric Tolerancing     Coordinate Measuring     Machine     Contour Projector     Optical Measuring     Equipment.		4 hours 20 hours 20 hours 40 hours 40 hours 8 hours 8 hours	5	1 1 2 1 1 1 8			obtained	ience continued since previous certific ed as a Precision Dimensional Inspec ertification File.		
OJT/Se	If Study:										
			State LW	Req. Hr.	Date	Hr.	Reference Documentation and Comments:				
Type & Activity/Objective Required  1. Drawing Interpretation 2. Dimensional Metrology 3. Measuring Hand Tools 4. Geometric Tolerancing 5. Coordinate Measuring Machine 6. Contour Projector 7. Optical Measuring Equipmen			8	10 hours 20 hours 20 hours 40 hours 30 hours 10 hours	2		See Certi	fication Fil	e.		
Thurst.	ence: Ref. M	ICP-535 App									
	Ir. Required		Req	uired Exp		6 8	Land T	Ò	Experience Obtained	ON HAND WATER OF	
H.S.	+ 2 Yr. (	)ther		Descripti	on		Hr.		Reference/Docume	entation	
1 Year	6 Month						55 Hrs.	Appli	cation & Interpretation Dimensioning & Tole (Tech. Doc. Consulta	erancing.	
							40 Hrs.		Gage Mentor (CBT )	Training)	

Author: D. K. Morton and R. K. Blandford

Reviewed By: S. D. Snow

Date: March 2008

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414.73 02/20/2003 Rev. 04 Use with MCP-535

#### BBWI PERSONNEL CERTIFICATION DATA FORM

5. Examination Results:

TEST	Written Exami	nations &	& Min	Nur			700000	ST SCORES Prac	tical Exami	nations	COMPOSITE		
TYPE	Gen.25/(30)	Spec.	Ц	1	Other	1(	)	Demo	Oral	Other	SCORE		
Description	Written							Plate/Holes		Practical Demo			
Scores	83 %			105				90 %		90 %	88 %		
Date	9/02/03							9/04/03		9/11/03			

<sup>\*</sup>The Minimum number of examination questions is reduced when the scope of qualification is LIMITED MCP-535 Appendix A & D. Min # questions/(actual # questions)

Additional Training Required Prior to Re-examination:	Minimum up-date or re-certification training:							
None	Hours	Subject Required	Hours	Ref. Documentation				
1,000			33					

7. The "Applicant" is Certified in accordance with MCP-535 to perform the above Discipline – Method.

Effective Date of Certification:	Certification Expiration Date:	TRAIN Qualification Code:
09/11/03	10/10/2008	QLMECH02
		00/14/02
Michael J. Chaffin		09/11/03

 $\label{eq:Author:D.K.Morton and R.K. Blandford} \\ Reviewed \ By: \ S.\ D.\ Snow$ 

PERSONNEL CERTIFICATION DATA FORM

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414.73 01/28/2004 Rev. 05 Use with MCP-535 & MCP-1309

FΩ	TION	_ Rea	uest (To	he fille	d out k	ov Annli	cant'	e Suna	anvie	or)							
			pert B. Mo		o out i	Time hitch	575		10.611		certific	ation expi	res: 10/	10/06	3		Date: 10/12/06
FΩ	TION I	I – Pro	ressina	Docum	nentst	ion and	d Eva	aluatio	ne.	/To	he filler	d out by L	evel III)				
		10.000	cision Di		0.4044			2000			fication		ever iii)		j	Level: II	Inspector
	Physica	al/Visio	on Exami	nation											Appl	icant's Ed	ducation Level
	Due Da			A. Ne		ion	В. І	Far Vis	ion		C. Col	or Discrim	ination		4 Yr. [		2 Yr. Degree
	Require	ment		20/25	Snelle	en					Verify	Contrast			H.S./E	qual	Other
	Correct	ed/Und	orrected	Corr	ected		Un	-Corre	cted	Ĺ	ОК	K Note:					
	Trainin	g: ¹Su	ıb Exp. = a	dditiona	l exper	rience pe	ermitte	ed to su	bstiti	ute fo	or formal	training as	specified	l in M	CP-535 8	k MCP1309	
									Education Level Training Acquire								
	Subject/Topic/Description H.S.						+ 2	+ 2 Yr. S			Exp. <sup>1</sup>	Hr.	Descrip	ption			
	See Pre	vious	Certification	ons									See Ce	ertific	ation Fil	e	
a	OJT/Se	lf Stud	ly:														
	Type &	Activity	//Objectiv	e Requ	iired	Re	eq. H	r. I	Date		Hr.	Reference	e Docum	enta	tion and	Comment	s:
N/A See Certification File																	
	Experie	nce:															
	H	lr. Req	uired			Requi	red E	xperie	nce					Exp	perience	Obtained	
	H.S.	+ 2 Y	r. Othe	r			)escr	iption			Hr. Reference					e/Docume	ntation
						ee Prev									Manager Ver	ertification	
	Examin	ation l	Results:	The MCP	Minimu 1309. N	um numb lin # que:	stions	/(actual:	# que	stion	15)		the scope	e of q	ualification	1 Is LIMITED	MCP-535 &
	TES		Written 8	Examin	ations	& Min					EST SC		ctical Ex	LABITIITIBUUTIS			COMPOSITE
	TYF	Έ	Gen.	( )	Spec.	. /(	)	Other	I(	)	D	emo	Ora	al	(	Other	SCORE
	Descrip	tion									1						
	Scores																N/A
	Date																
	Addition None	al Trai	ning Requ	uired P	rior to	Re-exa	imina	ition:	-			ate or re-o t Required		on tra	aining: Hours	Ref Dog	umentation
									-		odojeo	r requires			riours	Trei. Book	
	Th. #2			anen ora				u. Moo	L		envees				na.		L-J
		-	nt" is Cer e Date of				e wit					to perfor ion Date:	m the al	pove		ine – Met N Qualifica	
			10/10/0								/10/09			TRAIN Qualification Code: QLMECH02			
			MG-L	110	-er-												10/12/08
	). <del></del>	Р	Michae rinciple Le	vel III E	xamine	er .					Princi	ple Level II		er			10/12/06 Date
	Print/Type Name Signature																

Author: D. K. Morton and R. K. Blandford

Reviewed By: S. D. Snow

Date: March 2008

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### Appendix G

### **Electronic File Information**

#### Date: March 2008 EDF-NSNF-082 Page G2 of 6

#### **ELECTRONIC FILES**

The following electronic files associated with work performed in this report were generated and stored on 1 Digital Video Disk (DVD) using the +R DVD format. The DVD has the unique title "Electronic Files SR Test Comparisons". All ABAQUS/Explicit input (.inp) and output (.odb) files were transferred from PC (Govt. Property ID: 384252) to the DVD.

After the files were written to the DVD, the files were checked by accessing and visually checking the ABAQUS/Explicit input files and viewing the results in ABAQUS Viewer for the output files. This work was performed by the preparer (R. K. Blandford). The reviewer (S. D. Snow) performed random readability checks of the DVD.

The files were used for the work described in report Section 8 (USING RESULTS: ABAQUS/EXPLICIT ANALYSES USING STRAIN RATE ELEVATED TRUE STRESS-STRAIN CURVES) of this report and are listed below. The "Date Modified" indicates the date when the model file was last changed in any way and then saved to the identified PC hard drive and documents the final configuration as used in the analyses contained in this report.

The file names on the DVD are descriptive with the associated acronyms describing various model details that were used in the particular input file. The significant acronyms identifying the input files model configuration are:

Typical file title	304L_70_T290_D44_72K9_1097_175_FR.inp
304L	material (304L, 316L)
70	temperature (-20, 70, 300, 600°F)
T###	strain rate test number
D44	test specimen geometry (an included W implies a welded material otherwise base material is implied)
72K9	material heat number (72K9, 64A1,54M7,485896,67K0,230468,48R8,76H3
1097	test drop weight magnitude
175	a number descriptor for the test drop height magnitude

175	17.5-inches	14	14-inches
3	3-inches	2125	21.25-inches
21625	21.625-inches	250	2.50-inches
275	2.75-inches	18	18-inches
17375	17.375-inches	1150	11.50-inches
1450	14.50-inches	20	20-inches
2375	23.75-inches	1825	18.25-inches
18188	18.188-inches	1475	14.75-inches
16	16-inches	18688	18.688-inches
17875	17.875-inches	13	13-inches
11	11-inches	19	19-inches

a descriptor for the true stress strain curve

FR or FRY implies a factored true stress-strain curve

S implies a quasi-static true stress-strain curve (no factors applied)

FR

Name A	Size	Туре	Date Modified
304L_70_T290_D44_72K9_1097_175_FR.inp	564 KB	INP File	1/30/2008 12:25 PM
304L_70_T290_D44_72K9_1097_175_FR.odb	12,287 KB	ODB File	1/30/2008 6:07 PM
304L_70_T290_D44_72K9_1097_175_S.inp	564 KB	INP File	1/23/2008 8:38 AM
304L_70_T290_D44_72K9_1097_175_S.odb	12,275 KB	ODB File	1/23/2008 9:27 AM
304L_70_T312_D22_64A1_790_3_FR.inp	256 KB	INP File	1/30/2008 3:41 PM
304L_70_T312_D22_64A1_790_3_FR.odb	6,623 KB	ODB File	1/30/2008 5:15 PM
304L_70_T312_D22_64A1_790_3_S.inp	256 KB	INP File	1/17/2008 3:35 PM
304L_70_T312_D22_64A1_790_3_S.odb	6,590 KB	ODB File	1/21/2008 10:34 AM
304L_70_T349_D44_54M7_790_21625_FR.inp	564 KB	INP File	1/30/2008 3:43 PM
304L_70_T349_D44_54M7_790_21625_FR.odb	12,289 KB	ODB File	1/30/2008 5:13 PM
304L_70_T349_D44_54M7_790_21625_S.inp	564 KB	INP File	1/23/2008 7:25 AM
304L_70_T349_D44_54M7_790_21625_S.odb	12,285 KB	ODB File	1/23/2008 8:18 AM
304L_70_T355_D22_4858_1097_275_FR.inp	257 KB	INP File	1/30/2008 8:35 AM
304L_70_T355_D22_4858_1097_275_FR.odb	6,542 KB	ODB File	1/30/2008 10:23 AM
304L_70_T355_D22_4858_1097_275_S.inp	257 KB	INP File	1/17/2008 2:53 PM
304L_70_T355_D22_4858_1097_275_S.odb	6,596 KB	ODB File	1/21/2008 8:43 AM
304L_70_T381_D44W_54M7_1097_17375_FR.inp	565 KB	INP File	1/30/2008 12:30 PM
304L_70_T381_D44W_54M7_1097_17375_FR.odb	12,311 KB	ODB File	1/31/2008 8:50 AM
304L_70_T381_D44W_54M7_1097_17375_S.inp	565 KB	INP File	1/23/2008 12:35 PM
304L_70_T381_D44W_54M7_1097_17375_S.odb	12,256 KB	ODB File	1/23/2008 1:55 PM
304L_300_T321_D22_64A1_790_3_FR.inp	257 KB	INP File	1/30/2008 2:10 PM
304L_300_T321_D22_64A1_790_3_FR.odb	6,613 KB	ODB File	1/31/2008 10:54 AM
304L_300_T321_D22_64A1_790_3_S.inp	256 KB	INP File	1/22/2008 3:26 PM
304L_300_T321_D22_64A1_790_3_S.odb	6,515 KB	ODB File	1/23/2008 7:16 PM
304L_300_T376_D44_72K9_1097_1450_FR.inp	564 KB	INP File	1/30/2008 2:14 PM
[304L_300_T376_D44_72K9_1097_1450_FR.odb	12,295 KB	ODB File	1/31/2008 12:53 PM
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304L_300_T376_D44_72K9_1097_1450_S.odb	12,278 KB	ODB File	1/24/2008 8:22 AM
304L_300_T388_D22_4858_1097_2375_FR.inp	257 KB	INP File	1/30/2008 2:05 PM
304L_300_T388_D22_4858_1097_2375_FR.odb	6,602 KB	ODB File	1/31/2008 10:39 AM
304L_300_T388_D22_4858_1097_2375_S,inp	256 KB	INP File	1/17/2008 4:17 PM
304L_300_T388_D22_4858_1097_2375_S.odb	6,595 KB	ODB File	1/21/2008 11:40 AM
304L_300_T405_D44_54M7_790_18188_FR.inp	565 KB	INP File	1/30/2008 2:12 PM
304L_300_T405_D44_54M7_790_18188_FR.odb	12,267 KB	ODB File	1/31/2008 12:59 PM
304L_300_T405_D44_54M7_790_18188_S.inp	564 KB	INP File	1/22/2008 4:02 PM
304L_300_T405_D44_54M7_790_18188_S.odb	12,259 KB	ODB File	1/24/2008 8:31 AM
304L_300_T516_D44W_54M7_1097_14_FR.inp	564 KB	INP File	1/30/2008 12:32 PM
304L_300_T516_D44W_54M7_1097_14_FR.odb	12,267 KB	ODB File	1/31/2008 8:51 AM
304L_300_T516_D44W_54M7_1097_14_S.inp	564 KB	INP File	1/23/2008 3:47 PM
304L_300_T516_D44W_54M7_1097_14_S.odb	12,284 KB	ODB File	1/28/2008 6:17 PM
304L_600_T391_D22_4858_1097_2125_FRY.inp	257 KB	INP File	2/13/2008 12:30 PM
304L_600_T391_D22_4858_1097_2125_FRY.odb	6,611 KB	ODB File	2/14/2008 8:09 AM

Name A	Size	Туре	Date Modified
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304L_600_T391_D22_4858_1097_2125_SY.odb	6,597 KB	ODB File	2/14/2008 8:39 AM
304L_600_T410_D22_64A1_790_250_FR.inp	257 KB	INP File	1/30/2008 2:18 PM
304L_600_T410_D22_64A1_790_250_FR.odb	6,566 KB	ODB File	1/31/2008 5:17 PM
304L_600_T410_D22_64A1_790_250_S.inp	257 KB	INP File	1/23/2008 8:12 AM
304L_600_T410_D22_64A1_790_250_S.odb	6,596 KB	ODB File	1/24/2008 12:13 PM
304L_600_T415_D44_54M7_790_18_FR.inp	564 KB	INP File	1/30/2008 2:19 PM
304L_600_T415_D44_54M7_790_18_FR.odb	12,294 KB	ODB File	1/31/2008 3:35 PM
304L_600_T415_D44_54M7_790_18_S.inp	564 KB	INP File	1/23/2008 10:17 AM
304L_600_T415_D44_54M7_790_18_S.odb	12,304 KB	ODB File	1/24/2008 3:59 PM
304L_600_T417_D44_72K9_1097_1450_FR.inp	564 KB	INP File	1/30/2008 2:22 PM
304L_600_T417_D44_72K9_1097_1450_FR.odb	12,269 KB	ODB File	1/31/2008 5:28 PM
304L_600_T417_D44_72K9_1097_1450_S.inp	564 KB	INP File	1/23/2008 10:39 AM
304L_600_T417_D44_72K9_1097_1450_S.odb	12,289 KB	ODB File	1/24/2008 5:52 PM
304L_600_T507_D44W_54M7_1097_1150_FR.inp	564 KB	INP File	1/30/2008 2:03 PM
304L_600_T507_D44W_54M7_1097_1150_FR.odb	12,273 KB	ODB File	1/31/2008 8:44 AM
304L_600_T507_D44W_54M7_1097_1150_S.inp	564 KB	INP File	1/23/2008 3:02 PM
304L_600_T507_D44W_54M7_1097_1150_S.odb	12,252 KB	ODB File	1/23/2008 6:42 PM
304L20_T432_D22_64A1_790_3_FR.inp	257 KB	INP File	1/30/2008 11:16 AM
304L20_T432_D22_64A1_790_3_FR.odb	6,632 KB	ODB File	1/30/2008 1:04 PM
304L20_T432_D22_64A1_790_3_S.inp	257 KB	INP File	1/17/2008 2:09 PM
304L -20 T432 D22 64A1 790 3 S.odb	6,551 KB	ODB File	1/22/2008 8:06 AM
304L20_T451_D22_4858_1097_250_FR.inp	257 KB	INP File	1/30/2008 11:13 AM
304L20_T451_D22_4858_1097_250_FR.odb	6,639 KB	ODB File	1/30/2008 1:07 PM
304L20_T451_D22_4858_1097_250_S.inp	257 KB	INP File	1/17/2008 12:43 PM
304L20_T451_D22_4858_1097_250_S.odb	6,597 KB	ODB File	1/22/2008 8:32 AM
304L20_T457_D44_72K9_1097_175_FR.inp	565 KB	INP File	1/30/2008 11:58 AM
304L20_T457_D44_72K9_1097_175_FR.odb	12,301 KB	ODB File	1/30/2008 3:28 PM
304L20_T457_D44_72K9_1097_175_S.inp	565 KB	INP File	1/21/2008 1:35 PM
304L20_T457_D44_72K9_1097_175_S.odb	12,263 KB	ODB File	1/22/2008 2:29 PM
304L20_T468_D44_54M7_790_20_FR.inp	565 KB	INP File	1/30/2008 11:57 AM
304L20_T468_D44_54M7_790_20_FR.odb	12,275 KB	ODB File	1/30/2008 3:28 PM
304L20_T468_D44_54M7_790_20_S.inp	565 KB	INP File	1/21/2008 11:32 AM
304L20_T468_D44_54M7_790_20_S.odb	12,277 KB	ODB File	1/22/2008 9:50 AM
304L20_T491_D44W_54M7_1097_175_FR.inp	564 KB	INP File	1/30/2008 12:28 PM
304L20_T491_D44W_54M7_1097_175_FR.odb	12,274 KB	ODB File	1/31/2008 8:28 AM
304L20_T491_D44W_54M7_1097_175_S.inp	564 KB	INP File	1/21/2008 3:06 PM
[≦] 304L20_T491_D44W_54M7_1097_175_S.odb	12,272 KB	ODB File	1/23/2008 10:58 AM
316L_70_T291_D44_67K0_1097_1475_FR.inp	564 KB	INP File	1/30/2008 3:10 PM
316L_70_T291_D44_67K0_1097_1475_FR.odb	12,298 KB	ODB File	2/4/2008 10:59 AM
316L_70_T291_D44_67K0_1097_1475_S.inp	564 KB	INP File	1/24/2008 11:21 AM
316L_70_T291_D44_67K0_1097_1475_S.odb	12,271 KB	ODB File	1/25/2008 3:13 PM

Name A	Size	Туре	Date Modified
316L_70_T306_D22_76H3_790_3_FR.inp	257 KB	INP File	1/30/2008 3:07 PM
316L_70_T306_D22_76H3_790_3_FR.odb	6,626 KB	ODB File	2/4/2008 9:10 AM
316L_70_T306_D22_76H3_790_3_S.inp	257 KB	INP File	1/21/2008 8:18 AM
316L_70_T306_D22_76H3_790_3_S.odb	6,601 KB	ODB File	1/21/2008 2:56 PM
316L_70_T352_D44_2304_790_1825_FR.inp	564 KB	INP File	1/30/2008 3:09 PM
316L_70_T352_D44_2304_790_1825_FR.odb	12,295 KB	ODB File	2/4/2008 10:50 AM
316L_70_T352_D44_2304_790_1825_S.inp	564 KB	INP File	1/24/2008 10:10 AM
316L_70_T352_D44_2304_790_1825_S.odb	12,305 KB	ODB File	1/29/2008 6:24 PM
316L_70_T357_D22_48R8_1097_275_FR.inp	257 KB	INP File	1/30/2008 3:05 PM
316L_70_T357_D22_48R8_1097_275_FR.odb	6,580 KB	ODB File	2/4/2008 8:44 AM
316L_70_T357_D22_48R8_1097_275_S.inp	257 KB	INP File	1/25/2008 12:00 PM
316L_70_T357_D22_48R8_1097_275_S.odb	6,590 KB	ODB File	1/25/2008 12:58 PM
316L_70_T382_D44W_2304_1097_1475_FR.inp	564 KB	INP File	1/30/2008 3:56 PM
316L_70_T382_D44W_2304_1097_1475_FR.odb	12,269 KB	ODB File	2/4/2008 12:38 PM
316L_70_T382_D44W_2304_1097_1475_S.inp	564 KB	INP File	1/24/2008 4:42 PM
316L_70_T382_D44W_2304_1097_1475_S.odb	12,270 KB	ODB File	1/25/2008 6:09 PM
316L_300_T286_D44_67K0_1097_16_FR.inp	565 KB	INP File	1/31/2008 8:20 AM
316L_300_T286_D44_67K0_1097_16_FR.odb	12,280 KB	ODB File	2/5/2008 8:52 AM
316L_300_T286_D44_67K0_1097_16_S.inp	565 KB	INP File	1/25/2008 11:14 AM
316L_300_T286_D44_67K0_1097_16_S.odb	12,290 KB	ODB File	1/28/2008 2:55 PM
316L_300_T320_D22_76H3_790_250_FR.inp	257 KB	INP File	1/31/2008 8:10 AM
[3] 316L_300_T320_D22_76H3_790_250_FR.odb	6,496 KB	ODB File	2/4/2008 5:44 PM
316L_300_T320_D22_76H3_790_250_S.inp	256 KB	INP File	1/21/2008 8:58 AM
[5] 316L_300_T320_D22_76H3_790_250_S.odb	6,586 KB	ODB File	1/21/2008 4:17 PM
316L_300_T400_D22_48R8_1097_250_FR.inp	257 KB	INP File	1/31/2008 8:03 AM
316L_300_T400_D22_48R8_1097_250_FR.odb	6,617 KB	ODB File	2/4/2008 5:01 PM
316L_300_T400_D22_48R8_1097_250_S.inp	256 KB	INP File	1/25/2008 9:10 AM
316L_300_T400_D22_48R8_1097_250_S.odb	6,536 KB	ODB File	1/28/2008 10:33 AM
316L_300_T406_D44_2304_790_18688_FR.inp	564 KB	INP File	1/31/2008 8:18 AM
316L_300_T406_D44_2304_790_18688_FR.odb	12,279 KB	ODB File	2/4/2008 5:29 PM
316L_300_T406_D44_2304_790_18688_S.inp	564 KB	INP File	1/25/2008 10:38 AM
316L_300_T406_D44_2304_790_18688_S.odb	12,294 KB	ODB File	1/28/2008 12:04 PM
316L_300_T514_D44W_2304_1097_14_FR.inp		INP File	1/31/2008 7:52 AM
316L_300_T514_D44W_2304_1097_14_FR.odb	12,214 KB	ODB File	2/4/2008 2:51 PM
316L_300_T514_D44W_2304_1097_14_S.inp	564 KB	INP File	1/25/2008 7:53 AM

Name A	Size	Туре	Date Modified
316L_300_T514_D44W_2304_1097_14_S.odb	12,243 KB	ODB File	1/28/2008 8:41 AM
316L_600_T346_D22_76H3_790_250_FR.inp	256 KB	INP File	1/31/2008 8:39 AM
316L_600_T346_D22_76H3_790_250_FR.odb	6,584 KB	ODB File	2/5/2008 8:20 AM
316L_600_T346_D22_76H3_790_250_S.inp	256 KB	INP File	1/21/2008 10:55 AM
316L_600_T346_D22_76H3_790_250_S.odb	6,583 KB	ODB File	1/21/2008 5:26 PM
316L_600_T390_D22_48R8_1097_2125_FR.inp	257 KB	INP File	1/31/2008 8:25 AM
316L_600_T390_D22_48R8_1097_2125_FR.odb	6,499 KB	ODB File	2/5/2008 8:16 AM
316L_600_T390_D22_48R8_1097_2125_S.inp	257 KB	INP File	1/25/2008 1:56 PM
316L_600_T390_D22_48R8_1097_2125_S.odb	6,592 KB	ODB File	1/28/2008 4:51 PM
316L_600_T394_D44_2304_790_17875_FR.inp	564 KB	INP File	1/31/2008 8:43 AM
316L_600_T394_D44_2304_790_17875_FR.odb	12,297 KB	ODB File	2/5/2008 10:38 AM
316L_600_T394_D44_2304_790_17875_S.inp	564 KB	INP File	1/25/2008 2:03 PM
316L_600_T394_D44_2304_790_17875_S.odb	12,302 KB	ODB File	1/28/2008 6:07 PM
316L_600_T418_D44_67K0_1097_13_FR.inp	564 KB	INP File	1/31/2008 8:47 AM
316L_600_T418_D44_67K0_1097_13_FR.odb	12,277 KB	ODB File	2/5/2008 9:48 AM
316L_600_T418_D44_67K0_1097_13_S.inp	564 KB	INP File	1/25/2008 2:51 PM
316L_600_T418_D44_67K0_1097_13_S.odb	12,283 KB	ODB File	1/29/2008 9:01 AM
316L_600_T508_D44W_2304_1097_11_FR.inp	564 KB	INP File	1/31/2008 7:55 AM
316L_600_T508_D44W_2304_1097_11_FR.odb	12,267 KB	ODB File	2/4/2008 3:12 PM
316L_600_T508_D44W_2304_1097_11_S.inp	564 KB	INP File	1/25/2008 8:42 AM
316L_600_T508_D44W_2304_1097_11_S.odb	12,239 KB	ODB File	1/28/2008 8:19 AM
316L20_T431_D22_76H3_790_3_FR.inp	257 KB	INP File	1/30/2008 2:31 PM
316L20_T431_D22_76H3_790_3_FR.odb	6,532 KB	ODB File	1/31/2008 6:09 PM
316L20_T431_D22_76H3_790_3_S.inp	256 KB	INP File	1/23/2008 3:29 PM
[최] 316L20_T431_D22_76H3_790_3_S.odb	6,608 KB	ODB File	1/25/2008 9:02 AM
316L20_T458_D44_67K0_1097_1475_FR.inp	564 KB	INP File	1/30/2008 2:34 PM
316L20_T458_D44_67K0_1097_1475_FR.odb	12,291 KB	ODB File	2/4/2008 9:08 AM
316L20_T458_D44_67K0_1097_1475_S.inp	564 KB	INP File	1/24/2008 8:06 AM
316L20_T458_D44_67K0_1097_1475_S.odb	12,275 KB	ODB File	1/25/2008 11:25 AM
316L20_T465_D22_48R8_1097_250_FR.inp	256 KB	INP File	1/30/2008 2:26 PM
316L20_T465_D22_48R8_1097_250_FR.odb	6,627 KB	ODB File	1/31/2008 6:00 PM
316L20_T465_D22_48R8_1097_250_S.inp	256 KB	INP File	1/23/2008 11:19 AM
316L20_T465_D22_48R8_1097_250_S.odb	6,587 KB	ODB File	1/24/2008 6:18 PM
316L20_T471_D44_2304_790_18_FR.inp	565 KB	INP File	1/30/2008 2:33 PM
316L20_T471_D44_2304_790_18_FR.odb	12,298 KB	ODB File	2/4/2008 8:57 AM
316L20_T471_D44_2304_790_18_S.inp	564 KB	INP File	1/23/2008 4:45 PM
[최 316L20_T471_D44_2304_790_18_S.odb	12,280 KB		1/25/2008 8:52 AM
316L20_T493_D44W_2304_1097_19_FR.inp	564 KB	INP File	1/30/2008 3:54 PM
[5] 316L20_T493_D44W_2304_1097_19_FR.odb	12,293 KB	ODB File	2/4/2008 12:40 PM
316L20_T493_D44W_2304_1097_19_S.inp	564 KB	INP File	1/24/2008 3:10 PM
isi 316L20_T493_D44W_2304_1097_19_S.odb	12,262 KB	ODB File	1/25/2008 4:41 PM

### LABORATORY NOTEBOOK NSNF/SN/04.01 NSNFP MATERIAL STRAIN RATE TESTING

# LAB NOTEBOOK BINDER VOLUME 8

Strain Rate Testing Calibration Information

### GO / NO GO GAUGES

Calibration Date: 1/10/2008  Next Cal Due Date: 1/10/2009  1	NAME: DANA KEITH MO	RTON	BAD	GE; 35698	PH: 526-1274	ARI	EA: STC	BLDG: EROB	RM: W2D1
Charge Level: 12 2	ID Number: 725378 Calibration Date: 1/1		EA				GO-NOC		1#:
Repair/Adj/etc C.L: 0 3	Next Cal Due Date: 1/1	0/2009	1	☐ Accepta	nce Test	1	. € In	Tolerance	·
Material Amount: 0 4	Charge Level: 12		2	Special	Test	2	COL	ut of Tolerance >1x <2x	
Charge Number: 100853GSA 5	Repair/Adj/etc C.L: 0		3 .	▼ Calibrat	ion to MFG S <sub>l</sub>	pecs 3	COU	it of Tolerance >2x <3x	
Cai Work Inst ID: 6166 6 Functional Check 6 C Out of Tolerance-Undetermined  Outside Vendor: 7 Performance Check 7 Inoperative  8 Modify 8 Damaged  9 Repair-needs Charge Level 9 Not Used  10 Other 10 Not Determined  11 Excessed  Calibrated By: Larry Deming S#: 39571 Phone: 526-2761 12 Extension  CALIBRATION STANDARDS USED  T24663 704666	Material Amount: 0		4	Clean	,	4	COU	nt of Tolerance >3x <5x	
Outside Vendor:  7   Performance Check   7   Inoperative   8   Damaged   9   Repair-needs Charge Level   9   Not Used   10   Other   10   Not Determined   11   Excessed   11   Excessed   12   Extension   Excessed   12   Extension   Excessed   13   Excessed   14   Excessed   15   Extension   Excessed   15   Extension   Excessed   15   Extension   Excessed   16   Extension   Excessed   16   Extension   Extension	Charge Number: 100	0853GSA	5	Limited	Calibration	5	COL	ut of Tolerance >5x	
8	Cal Work Inst ID: 616	66	6	Function	nal Check	6	C Ou	it of Tolerance-Undeter	mined
9	Outside Vendor:		7	Perform	ance Check	7	[ Inc	operative	
Calibrated By: Larry Deming S#: 39571 Phone: 526-2761 12  Extension  CALIBRATION STANDARDS USED  T24663 704666			8	Modify		8	┌ Da	maged	
Calibrated By: Larry Deming S#: 39571 Phone: 526-2761 12 Extension  CALIBRATION STANDARDS USED  T24663 704666	-		9	Repair-	needs Charge I	Level 9	☐ No	ot Used	
Calibrated By: Larry Deming S#: 39571 Phone: 526-2761 12 Extension  Calibrated By: Larry Deming S#: 39571 Phone: 526-2761 12 Extension  Calibrated By: Larry Deming S#: 39571 Phone: 526-2761 12 Extension  Calibrated By: Larry Deming S#: 39571 Phone: 526-2761 12 Extension  Calibrated By: Larry Deming S#: 39571 Phone: 526-2761 12 Extension  Calibrated By: Larry Deming S#: 39571 Phone: 526-2761 12 Extension  Calibrated By: Larry Deming S#: 39571 Phone: 526-2761 12 Extension  Calibrated By: Larry Deming S#: 39571 Phone: 526-2761 12 Extension  Calibrated By: Larry Deming S#: 39571 Phone: 526-2761 12 Extension  Calibrated By: Larry Deming S#: 39571 Phone: 526-2761 12 Extension  Calibrated By: Larry Deming S#: 39571 Phone: 526-2761 12 Extension  Calibrated By: Larry Deming S#: 39571 Phone: 526-2761 12 Extension  Calibrated By: Larry Deming Calibration Archive Larry Demind Calibration Ar			10	Other		10	No	ot Determined	
CALIBRATION STANDARDS USED    724663						. 11	Ex	cessed	
STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES  LABORATORY TEMPERATURE AND HUMIDITY  Physical STD (106C) 20.0° +/-0.3° C (40-55% RH)   Electronic STD (106D) 23.0° +/-0.5° C (30-45% RH)  Dimensional STD (106B) 20.0° +/-0.25° C (30-45% RH)   Electronic CAL (Lab 112) 23.0° +/-1.0° C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0° +/-0.5° C (20-50% RH)   Remaining S&CL calibration areas: 23.0° +5,-3.0° C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  NOMINAL (STD)	Calibrated By: Lar	rry Deming	S#: 3	19571 Phone	:: 526-2761	. 12	2 ┌ Ex	tension	
STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES  LABORATORY TEMPERATURE AND HUMIDITY  Physical STD (106C) 20.0° +/-0.3° C (40-55% RH)   Electronic STD (106D) 23.0° +/-0.5° C (30-45% RH)  Dimensional STD (106B) 20.0° +/-0.25° C (30-45% RH)   Electronic CAL (Lab 112) 23.0° +/-1.0° C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0° +/-0.5° C (20-50% RH)   Remaining S&CL calibration areas: 23.0° +5,-3.0° C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  NOMINAL (STD)			\					· ·	
STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES  LABORATORY TEMPERATURE AND HUMIDITY  Physical STD (106C) 20.0° +/-0.3° C (40-55% RH)   Electronic STD (106D) 23.0° +/-0.5° C (30-45% RH)  Dimensional STD (106B) 20.0° +/-0.25° C (30-45% RH)   Electronic CAL (Lab 112) 23.0° +/-1.0° C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0° +/-0.5° C (20-50% RH)   Remaining S&CL calibration areas: 23.0° +5,-3.0° C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  NOMINAL (STD)  MFG. ACCURACY	, F	724662	704666	CALI	BRATION ST	ANDARDS	SUSED		
LABORATORY TEMPERATURE AND HUMIDITY  Physical STD (106C) 20.0° +/-0.3° C (40-55% RH)   Electronic STD (106D) 23.0° +/-0.5° C (30-45% RH)  Dimensional STD (106B) 20.0° +/-0.25° C (30-45% RH)   Electronic CAL (Lab 112) 23.0° +/-1.0° C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0° +/-0.5° C (20-50% RH)   Remaining S&CL calibration areas: 23.0° +5,-3.0° C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY	<u> </u> -	724003	704000				<u> </u>		
LABORATORY TEMPERATURE AND HUMIDITY  Physical STD (106C) 20.0° +/-0.3° C (40-55% RH)   Electronic STD (106D) 23.0° +/-0.5° C (30-45% RH)  Dimensional STD (106B) 20.0° +/-0.25° C (30-45% RH)   Electronic CAL (Lab 112) 23.0° +/-1.0° C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0° +/-0.5° C (20-50% RH)   Remaining S&CL calibration areas: 23.0° +5,-3.0° C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY									
LABORATORY TEMPERATURE AND HUMIDITY									
Physical STD (106C) 20.0 ° +/-0.3 °C (40-55% RH)   Electronic STD (106D) 23.0 ° +/-0.5 °C (30-45% RH)  Dimensional STD (106B) 20.0 ° +/-0.25 °C (30-45% RH)   Electronic CAL (Lab 112) 23.0 ° +/-1.0 °C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0 ° +/-0.5 °C (20-50% RH)   Remaining S&CL calibration areas: 23.0 ° +5,-3.0 °C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY	VALUES	FUR NATURA	AL PHYSICA	L CUNSTANTS	, OR DERIVED I	ROM THE R	ATIO TYP	E OF SELF CALIBRATION	N TECHNIQUES
Dimensional STD (106B) 20.0 ° +/-0.25 ° C (30-45% RH)   Electronic CAL (Lab 112) 23.0 ° +/-1.0 ° C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0 ° +/-0.5 ° C (20-50% RH)   Remaining S&CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY	Physica	al STD (106C)	20.0°						(30-45% RH)
Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY	Dimens	sional STD (10	6B) 20.0 °	+/-0.25 ° C (30-	45% RH)   E	lectronic CAL (	Lab 112)	23.0 ° +/-1.0 ° C	(20-50% RH)
NOMINAL (STD)  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION UNITS  AS FOUND (UUT)  MFG. ACCURACY	Phys/D	im CAL (Lab 1	111) 20.0°	+/-0.5 ° C (20-5	0% RH)   R	emaining S&CI	L calibration	areas: 23.0 ° +5,-3.0 ° C	(20-50% RH)
NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY	Manufactur	rer's environm	ental specific	ations are evalua	ted for conformat	ice when calib	rations are	performed outside the above	e stated conditions.
COMMENTS	NOMINAL (S'	TD)	OUT		CE CONDITION			•	G. ACCURACY
COMMENTS									
COMMENTS									
COMMENTS								·	
COMMENTS	· · · · · · · · · · · · · · · · · · ·			•	,				
			,		COMM	ENTS			

NAME: DANA KEITH MORTON	BADG	E: 35698 PH: 526-1274	AREA: STC BLDG: EROB RM: W2D1
ID Number: 725379 Mfr: BEA Calibration Date: 1/10/2008		Model: NG-2 Noun Na ACTION CODE	me: GO-NOGO GAGE Serial #:  AS FOUND
Next Cal Due Date: 1/10/2009	1 [	Acceptance Test	1 • In Tolerance
Charge Level: 4	2 Γ	Special Test	2 C Out of Tolerance >1x <2x
Repair/Adj/etc C.L: 0	3 5	Calibration to MFG Specs	3 C Out of Tolerance >2x <3x
Material Amount: 0	4 <b>「</b>	Clean	4 C Out of Tolerance >3x <5x
Charge Number: 100853GSA	5	Limited Calibration	5 C Out of Tolerance >5x
Cal Work Inst ID: 6166	6 T	Functional Check	6 C Out of Tolerance-Undetermined
Outside Vendor:	7	Performance Check	7   Inoperative
	8 T	Modify	8 Damaged
	9 Г	Repair-needs Charge Level	9 Not Used
`	10 Г	Other	10 Not Determined
	,		11 Excessed
Calibrated By: Larry Deming	S#: 39	9571 Phone: 526-2761	12 Extension
• .		CALLED A MACAL CHI A NO.	DDC LIGHT
724663	·	CALIBRATION STANDA	RDS USED
721005			
			ANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED HE RATIO TYPE OF SELF CALIBRATION TECHNIQUES
Name and the second sec		LABORATORY TEMPERATURE	ND HUMIDITY
Physical STD (106C)		v' •	STD (106D) 23.0 ° +/-0.5 ° C (30-45% RH)
Dimensional STD (106B)  Phys/Dim CAL (Lab 111)		+/-0.25 ° C (30-45% RH) = Electronic ( +/-0.5 ° C (20-50% RH) = Remaining	CAL (Lab 112) 23.0 ° +/-1.0 ° C (20-50% RH)  S&CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
	•	_	
Manufacturer's environments			calibrations are performed outside the above stated conditions.
NOMINAL (STD)	OUT	OF TOLERANCE CONDITIONS FOUNI UNITS A	S FOUND (UUT) MFG. ACCURACY
		<u> </u>	<u> </u>
	<del></del>	COMMENT	
		COMMENTS	

NAME: DANA KEITH MORTON	BADGE: 35698	PH: 526-1274 A	AREA: STC BLDG	EROB RM: W2D1	
ID Number: 725380 Mfr: BEA Calibration Date: 1/10/2008		Noun Nam  TION CODE	e: GO-NOGO GAGE AS F	Serial #:	
Next Cal Due Date: 1/10/2009	1 Acceptar	ice Test	1 • In Tolerance		•
Charge Level: 12	2 Special T	est	2 C Out of Tolerand	e >1x <2x	,
Repair/Adj/etc C.L: 0	3 🔽 Calibratio	on to MFG Specs	3 C Out of Toleran	:e >2x <3x	•
Material Amount: 0	4 Clean	•	4 C Out of Tolerand	:e >3x <5x	
Charge Number: 100853GSA	5 Limited	Calibration	5 C Out of Toleran	:e >5x	
Cal Work Inst ID: 6166	6 Function	al Check	6 C Out of Toleran	e-Undetermined	
Outside Vendor:	7 Performa	ince Check	7   Inoperative		
r	8 Modify		8 Damaged		
	9 Repair-n	eeds Charge Level	9 Not Used		
	10 Cother		10 Not Determine	1.	
			11 Excessed		
Calibrated By: Larry Deming	S#: 39571 Phone:	526-2761	12 Extension		•
			<u> </u>		
724663	704666 CALIB	RATION STANDAR	DS USED		
12400	704000				
STANDARDS USED ARE TRA	CEABLE TO THE NATION				
VALUES FOR NATURAL				LIBRATION TECHNIQUE	
Physical STD (106C)	20.0 ° +/-0.3 ° C (40-55	ORY TEMPERATURE AN RH)   Electronic ST		° +/-0.5 ° C (30-45% RH)	,
Dimensional STD (106B)	) 20.0 ° +/-0.25 ° C (30-4	5% RH)   Electronic CA	L (Lab 112) 23.0	'_+/-1.0 ° C (20-50% RH)	
Phys/Dim CAL (Lab 111	) 20.0 ° +/-0.5 ° C (20-50°	% RH) Remaining S&	cCL calibration areas: 23.0	' +5,-3.0 ° C (20-50% RH)	•
Manufacturer's environmen	tal specifications are evaluate	d for conformance when ca	librations are performed outs	ide the above stated condition	ons.
NOMBIAL (CTD)	OUT OF TOLERANC UNITS	E CONDITIONS FOUND I	DURING CALIBRATION FOUND (UUT)	MFG. ACCUR	ACV
NOMINAL (STD)		A3		MFG. ACCOR	AC1
	· V				
	·		· .		<u> </u>
		COMMENTS			

NAME: DANA KEITH	MORTON	BAD	GE; 35698	PH: 526-1274	AREA: STC	BLDG: EROB	RM: W2D1
ID Number: 725381 Calibration Date:	Mfr: BEA	<b>A</b>	Model: NG	-4 Noun N	ame: GO-NQGO (	GAGE Seria	al #:
Next Cal Due Date:	1/10/2009	1	- Accepta	nce Test	1 @ In Tole	erance	
Charge Level:	12	2	☐ Special	Test	2 C Out of	Tolerance >1x <2x	•
Repair/Adj/etc C.L:	0	3	Calibrat	ion to MFG Specs	3 C Out of	Tolerance >2x <3x	
Material Amount:	0	4	Clean	•	4 C Out of	Tolerance >3x <5x	(
Charge Number:	100853GSA	5	Limited	Calibration	5 C Out of	Tolerance >5x	
Cal Work Inst ID:	6166	6	Function Function	nal Check	6 C Out of	Tolerance-Undeter	mined
Outside Vendor:		7	Perform	ance Check	7   Inopera	ative	
•	•	8	☐ Modify		8 Damag	ed	
		9	Repair-	needs Charge Level	9 Not Us	ed	
		10	Other		10	termined	,
			•		11 Excess	ed	
Calibrated By:	Larry Deming	S#: 3	39571 Phone	: 526-2761	12 Extens	ion	
			0411		A DDC HCCD		
	724663	704666	CALI	BRATION STAND	ARDS USED		
				NAL INSTITUTE OF ST , OR DERIVED FROM T			
	ri <u>nadilik i didi piti di 14 an annunga an</u> ungunga <del>an ara ara ara ara ara ara ara</del>	<del></del>	LABORA'	TORY TEMPERATURE	AND HUMIDITY		
	ysical STD (106C)		+/-0.3 ° C (40-5	· •	STD (106D)	23.0 ° +/-0.5 ° C	•
	mensional STD (106B) ys/Dim CAL (Lab 111)		+/-0.25 ° C (30- +/-0.5 ° C (20-5		CAL (Lab 112) g S&CL calibration area.	23.0 ° +/-1.0 ° C s: 23.0 ° +5,-3.0 ° C	•
					•	•	
Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION					· · · · · · · · · · · · · · · · · · ·		
NOMINAL	(STD)	30.	UNITS		AS FOUND (UUT)		FG. ACCURACY
				•			
			· · · · · · · · · · · · · · · · · · ·			<u> </u>	·
			. (,	COMMENTS			

NAME: DANA KEITH	MORTON	BA	DGE: 35698	PH: 526-1274	ARE	A: STC	BLDG; EROB	RM; W2D1
ID Number: 725382 Calibration Date:	Mfr: BE.	Α	Model: NO	G-5 No	oun Name: C	GO-NOGO G	AGE Seria AS FOUND	1#:
Next Cal Due Date:	1/10/2009	1	Accept	ance Test	.1	C In Tole	rance	
Charge Level:	4	2	☐ Special	Test	2,,	• Out of	Tolerance >1x <2x	
Repair/Adj/etc C.L:	0	3	Calibra	tion to MFG Sp	pecs 3	C Out of	Tolerance >2x <3x	
Material Amount:	0	4	Clean		4	C Out of	Tolerance >3x <5x	•
Charge Number:	100853GSA	5	Limited	d Calibration	5	C Out of	Tolerance >5x	
Cal Work Inst ID:	6166	6	Function Function	onal Check	6	Out of	Tolerance-Undeter	mined
Outside Vendor:	•	7	Perform	nance Check	7	Inopera	ntive	· · · · · · · · · · · · · · · · · · ·
		8	Modify	•	8	☐ Damag	ed	
		9	Repair-	needs Charge L	evel 9	☐ Not Us	ed	
		10	Other		10	Not De	termined	
	,			•	11	T Excess	ed	
Calibrated By:	Larry Deming	S#:	39571 Phon	e: 526-2761	12	Extensi	ion	
	'n		CAL	BRATION ST	ANDARDS	USED		
,	724663							
						·		
							HNOLOGY DERIVED	
			LABORA	TORY TEMPERA	ATURE AND H	UMIDITY		
	ysical STD (106C)		° +/-0.3 ° C (40-		ectronic STD (1	-	23.0 ° +/-0,5 ° C	,
	mensional STD (106B ys/Dim CAL (Lab 11)	,	° +/-0.25 ° C (30 ° +/-0.5 ° C (20-	' '	ectronic CAL (1 emaining S&CL	•	23.0 ° +/-1.0 ° C a: 23.0 ° +5,-3.0 ° C	
				, ,			rmed outside the above	
				CE CONDITIONS	***************************************	·····		
NOMINAL	(STD)	O(	UNITS	CE COMBITIONS		UND (UUT)		FG. ACCURACY
	***	<u> </u>		1			<del></del>	· · · · · · · · · · · · · · · · · · ·
				- to - 2.0				
				COMM	ENTS			

### **M&TE Out-of-Tolerance Notification**

Notification Status: Approved

#### Notification

To:

Internal Customer - Equipment User/Custodian: Dana K Morton/DXM/CC01/INEEL/US Org:

B160

User Location: STC-EROB

Area Point of Contact: Gary D Roberts

This equipment (ID# 725382) was found to be out-of-tolerance when received by the calibration organization. Re-evaluation of prior decisions relating to product, processes, tests, survey measurements, research, experiments, etc. made with this equipment - including appropriate documentation to determine out -of-tolerance impact - is REQUIRED.

If evaluation assistance is desired, call Quality Engineering. If further information is desired regarding the out-of-tolerance condition, call the calibrator listed below.

#### Calibration Results:

Calibration / As-Foun

d Date:

01/10/2008

Last Successful Calibration:

Calibrated by:

Larry W Deming

Phone: 526-2468

Location: CFA-698-103 B

Calibration

S&CL

Organization:

Equipment Description: Manufacturer:

Model No:

Serial No:

go-nogo gage

**BEA** 

NG-5

ID Number: 725382

Cal Work Ins No .: 6166

Function Tested	Nominal (Std)	Accuracy	As-Found Reading
dimensional check of gap (A)	0.250	+/- 0.020 inch	0.2285
dimensional check of gap (B)	0.250	+/- 0.020 inch	0.229
dimensional check of gap (H)	0.250	+/- 0.020 inch	0.272
		,	

Calibration Remarks: (file attachments allowed)
Measurement just barely out of tolerance.
Evaluation Required?:

REQUIRED

O Not Required-New Equipment

O Not Required-Other

#### Evaluation:

Evaluator: Dana K Morton

Evaluation: (file attachments allowed)

This go/no go gage is still acceptable for use through the measuring procedure used by the team members. Even though certain measurements exceed tolerances, the fact that multiple measurements were taken for a specific portion of the gage and that those other measurements do satisfy the required tolerance allows for the determination of an acceptable go/no go gage.

During gage use, the test specimen is fully inserted (as far as it can go), with a minimal insertion to the first shoulder, approximately a 1/4-inch depth. An acceptable test specimen will insert to this depth but not proceed further. The Cal Lab was requested to make three gap measurements along each of the two gage depths (initial depth checking for too large of a test specimen and the secondary depth checking for too small of a test specimen). The dimensional gap H (in the initial depth) exceeds the tolerance but the other two measurements (F and G) are 0.270 inches, meaning that by fully inserting to the gage shoulder, the test specimen cannott be larger than 0.270 inches, which is acceptable. In a similar fashion, dimensional gaps A and B (in the secondary depth) barely exceed the tolerance but dimensional gap C, measuring 0.230 inches, is acceptable and is located at the very initial opening of the secondary depth, again providing a very clear indication of test specimen acceptance within the stated tolerances when the test specimen cannot proceed past the first shoulder.

This gage was initially measured by an INL qualified dimensional inspector and placed into use in August 2004. The slight over-tolerance was known but follow-on direct measurements were used to double check test specimen acceptability. However, in May 2005, this N-5 gage was replaced with NG-6. NG-5 has not been used since May 2005 and will not be used in the future.

Selected Approver: Robert K Blandford

NOTE: This evaluation or a separate out -of-tolerance evaluation must be retained with organization quality assurance records. Quality requirements for this evaluation and quality record retention are based on PDD-13450 and LWP-13455.

**Evaluation Approval:** 

Date: 01/10/2008 Approval: Robert K Blandford

Approval Comments: I agree.

#### Comments/Attachments

Add any comments here and/or use the area for any attachment.

#### Document History:

Created by Larry W Deming on 01/10/2008 07:54:22 AM
Larry W Deming edited document 08:02 AM 01/10/2008
Notification sent: Larry W Deming on Thursday, January 10, 2008.
Sent to user: Dana K Morton: 08:02 AM 01/10/2008
Dana K Morton edited document 12:28 PM 01/10/2008
Submitted for approval to Robert K Blandford: Dana K Morton on Thursday, January 10, 2008

Sent for approval to Robert K Blandford: 12:29 PM 01/10/2008

Evaluation Approval: Robert K Blandford on Thursday, January 10, 2008

1/10/2008

NAME: DANA KEITH M	IORTON	BA	DGE: 35	698 PH: 526-1274	AREA: STC BLDG: EROB RM: W2D1
ID Number: 725383 Calibration Date: 1	Mfr: BEA /10/2008	A	Mo	odel: NG-6 Noun Na ACTION CODE	ame: GO-NOGO GAGE Serial #:  AS FOUND
Next Cal Due Date: 1	/10/2009	1	Γ	Acceptance Test	1 • In Tolerance
Charge Level:	3	2		Special Test	2 C Out of Tolerance >1x <2x
Repair/Adj/etc C.L: 0	)	· 3	ত	Calibration to MFG Specs	3 C Out of Tolerance >2x <3x
Material Amount: 0	)	4	$\Gamma$	Clean	4 C Out of Tolerance >3x <5x
Charge Number: 1	00853GSA	5	Γ	Limited Calibration	5 C Out of Tolerance >5x
Cal Work Inst ID: 6	5166	6	Γ	Functional Check	6 C Out of Tolerance-Undetermined
Outside Vendor:		7	Г	Performance Check	7   Inoperative
		8	Г	Modify	8 Damaged
	•	9	$\Gamma$	Repair-needs Charge Level	9 Not Used
		10	厂	Other	10 Not Determined
					11 Excessed
Calibrated By:	arry Deming	S#:	39571	Phone: 526-2761	12 Extension
	724663		7	CALIBRATION STANDA	ARDS USED
	724003	<u> </u>	╡		
STANDARD	S USED ARE TRA	CEABL	E TO TI	IE NATIONAL INSTITUTE OF ST	ANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED
					THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES
	: 10mm (1040)	20.0		LABORATORY TEMPERATURE	
•	sical STD (106C) ensional STD (106B)				23.0 ° +/-0.5 ° C (30-45% RH)  CAL (Lab 112) 23.0 ° +/-1.0 ° C (20-50% RH)
	/Dim CAL (Lab 11)				g S&CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
Manufac	turer's environmen	tal speci	fications	are evaluated for conformance when	n calibrations are performed outside the above stated conditions.
	The state of the s	O	UT OF T	OLERANCE CONDITIONS FOUN	D DURING CALIBRATION
NOMINAL (	(STD)		U	NITS A	AS FOUND (UUT) MFG. ACCURACY
<del></del> -		_			
				COMMENTS	

NAME: DANA KEITH MORTON	BADGE: 35698	PH: 526-1274	AREA: STC BLDG: E	ROB RM: W2D1
ID Number: 725384 Mfr: BEA Calibration Date: 1/10/2008	Model: M	IK-1 Noun Na	ame: PUNCH TEMPLATE AS FO	Serial #: U <b>ND</b>
Next Cal Due Date: 1/10/2009	1 / Accep	tance Test	1 • In Tolerance	
Charge Level: 4	2 Specia	al Test	2 C Out of Tolerance	>1x <2x
Repair/Adj/etc C.L: 0	3 Calibr	ation to MFG Specs	3 C Out of Tolerance	>2x <3x
Material Amount: 0	4 Clean		4 C Out of Tolerance	>3x <5x
Charge Number:	5 Limite	ed Calibration	5 C Out of Tolerance	>5x
Cal Work Inst ID: 6166	6 Functi	onal Check	6 C Out of Tolerance	Undetermined
Outside Vendor:	7 Perfor	mance Check	7   Inoperative	
	8 Modif	ý	8 Damaged	
	9 Repair	r-needs Charge Level	9 Not Used	
`	10 C Other	,	10   Not Determined	
;			11 Excessed	
Calibrated By: Larry Deming	S#: 39571 Pho	ne: 526-2761	12 Extension	.•
724663	CAL	JIBRATION STANDA	ARDS USED	
724003				
STANDARDS USED ARE TRAC	EABLE TO THE NAT	IONAL INSTITUTE OF ST.	ANDARDS AND TECHNOLOGY	DERIVED FROM ACCEPTED
			HE RATIO TYPE OF SELF CAL	
	,	ATORY TEMPERATURE		,
Physical STD (106C)  Dimensional STD (106B)	20.0 ° +/-0.3 ° C (40 20.0 ° +/-0.25 ° C (3		•	/-0.5 °C (30-45% RH) /
Phys/Dim CAL (Lab 111)	20.0 ° +/-0.5 ° C (20		, ,	/-1.0 ° C (20-50% RH) -5,-3.0 ° C (20-50% RH)
			calibrations are performed outside	•
			D DURING CALIBRATION	
NOMINAL (STD)	UNITS		S FOUND (UUT)	MFG. ACCURACY
		COMMENTS		

NAME: DANA KEITH MORTON	BAD	GE: 35698	PH: 526-1274	AREA: STC	BLDG; EROB	RM: W2D1
ID Number: 725385 Mfr: Bi Calibration Date: 1/10/2008	EA	Model: M	K-2 Noun P	Name: PUNCH TEM	MPLATE S AS FOUND	Serial #:
Next Cal Due Date: 1/10/2009	1	Accept	ance Test	1 6 In Tole	rance	
Charge Level: 2	2	Special	Test	2 C Out of	Tolerance >1x <2	<b>x</b>
Repair/Adj/etc C.L: 0	3 '	Calibra	tion to MFG Specs	3 C Out of	Tolerance >2x <3	<b>x</b>
Material Amount: 0	4	Clean		4 C Out of	Tolerance >3x <5	x
Charge Number:	5	Limited	l Calibration	5 C Out of	Tolerance >5x	
Cal Work Inst 1D: 6166	6	Function	onal Check	6 C Out of	Tolerance-Undete	rmined
Outside Vendor:	7	Perform	nance Check	7 [ Inopera	itive	
•	8	☐ Modify		8 T Damag	ed	
	9	Repair-	needs Charge Level	9 Not Us	ed	
	10	Other		10	termined	
•				11 Excess	ed	
Calibrated By: Larry Deming	S#:	39571 Phon	e: 526-2761	12 Extens	on	
				. BBC NGER		
724663		CALI	BRATION STAND	ARDS USED		<del></del>
724003						
STANDARDS USED ARE TI VALUES FOR NATURA			ONAL INSTITUTE OF S'S, OR DERIVED FROM			
***************************************		LABORA	TORY TEMPERATURE	AND HUMIDITY		1
Physical STD (106C)	20.0 9	+/-0.3 ° C (40-	55% RH)   Electronic	STD (106D)	23.0 ° +/-0.5 ° C	(30-45% RH)
Dimensional STD (100		+/-0.25 °C (30	· •	CAL (Lab 112)	23.0 ° +/-1.0 ° C	•
Phys/Dim CAL (Lab I	11) 20.0 9	' +/-0.5 ° C (20-	50% RH)   Remainin	g S&CL calibration areas	s: 23.0 ° +5,-3.0 ° C	(20-50% RH)
Manufacturer's environm	ental specifi	cations are evalu	ated for conformance whe	n calibrations are perfo	rmed outside the abov	ve stated conditions.
NOMINAL (STD)	<b>O</b> U	T OF TOLERAN UNITS	ICE CONDITIONS FOU	ND DURING CALIBRA AS FOUND (UUT)		FG. ACCURACY
		· · · · · · · · · · · · · · · · · · ·	<del></del>			
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						· · · · · · · · · · · · · · · · · · ·
			COMMENT	<u> </u>		·
			COMMENT	,		

NAME: DANA KEITH	MORTON	BAE	GE: 3	5698 PH: 526-1274	ARE	A: \$1	FC BLDG: EROB RM: W2D1
ID Number: 725386 Calibration Date:	Mfr: BEA		М	odel: MK-3 Noun Na	me:	PUN	ICH TEMPLATE Serial #:  AS FOUND
Next Cal Due Date:	1/10/2009	1	Γ_	Acceptance Test	1	<b>(</b>	In Tolerance
Charge Level:	2	2	Γ	Special Test	2	C	Out of Tolerance >1x <2x
Repair/Adj/etc C.L:	0	3	<b>▽</b>	Calibration to MFG Specs	3	C	Out of Tolerance $>2x < 3x$
Material Amount:	0	4	Γ	Clean	4	$\subset$	Out of Tolerance >3x <5x
Charge Number:	100853GSA	5	Γ	Limited Calibration	5	C	Out of Tolerance >5x
Cal Work Inst ID:	6166	6	Γ	Functional Check	6	$\subset$	Out of Tolerance-Undetermined
Outside Vendor:		7	$\Gamma_{}$	Performance Check	7	Γ	Inoperative
	•	8	$\Gamma$	Modify	8	Γ	Damaged
	•	9		Repair-needs Charge Level	9	Γ	Not Used
	<b>\</b>	10	Γ	Other	10	Г	Not Determined
					11	Γ	Excessed
Calibrated By:	Larry Deming	S#: :	39571	Phone: 526-2761	12	Γ	Extension
				CATINDATION STANDA	nnc	TIGI	en.
	724663			CALIBRATION STANDA	KUS	031	ED
<u>:</u>	72.000		╬		司		
•							
							AND TECHNOLOGY DERIVED FROM ACCEPTED TYPE OF SELF CALIBRATION TECHNIQUES
7700	ES FOR HAT CRALE					<del></del>	
Ph	ysical STD (106C)	20.0 °	+/-0.3	°C (40-55% RH) Electronic S			
. Dir	mensional STD (106B)	20.0 °	+/-0.2	5 ° C (30-45% RH)   Electronic C	CAL (L	ab 11	23.0° +/-1.0° C (20-50% RH)
Phy	ys/Dim CAL (Lab 111)	20.0 °	+/-0.5	° C (20-50% RH) Remaining	S&CL	calib	ration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
Manufa	icturer's environments	i specific	etions	are evaluated for conformance when	calibr	ations	s are performed outside the above stated conditions.
NOMINAL	(STD)	OU		OLERANCE CONDITIONS FOUNI NITS A			CALIBRATION D (UUT) MFG. ACCURACY
				*****			
<del></del>		-					·
<del></del>		_		COMMENTS	-		

NAME: DANA KEITH M	1ORTON	BA	DGE: 35698	PH: 526-1274	ARI	A: S	ГC	BLDG; ERO	B R	M: W2DI
ID Number: 725387 Calibration Date: 1	Mfr; BEA 2/10/2008		Model:	MK-4 Nou ACTION CODE	n Name:	DIM	ENSION.	AL CHECK		Serial #:
Next Cal Due Date: 1	/10/2009	1	☐ Acc	eptance Test	1	<b>(</b>	In Toler	ance .		
Charge Level: 4	1	2	☐ Spe	cial Test	2	$\subset$	Out of T	olerance >1	x <2x	
Repair/Adj/etc C.L: 0	)	3	Cali	bration to MFG Spec	s 3	C	Out of T	olerance >2	x <3x	
Material Amount: 0		4	Clea	n .	4	$\Gamma$	Out of T	olerance >3	x <5x	
Charge Number: 1	00853GSA	5	Lim	ited Calibration	5	$\mathcal{C}$	Out of T	olerance >5	x	
Cal Work Inst ID: 6	5166	6	Fun	ctional Check	6	$\overline{}$	Out of T	olerance-U	ndetermin	ed
Outside Vendor:		7	Peri	ormance Check	, 7	Г	Inoperat	ive	,	
	•	8	☐ Mod	lify	8	Г	Damage	d		
		9	Rep	air-needs Charge Lev	el 9	Γ	Not Use	<b>d</b>		ſ
		10	Oth	er	10	Г	Not Det	ermined		
					11	Γ	Excesse	i		•
Calibrated By: I	Larry Deming	S#:	39571 Pi	ione: 526-2761	12	Г	Extension	n.		
•	, ,			·						
}	704662		C/	LIBRATION STAN	NDARDS	US	ED 1	<del></del>	ſ	<b></b>
	724663					<u> </u>				
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CT AND A D.D.	C LICED ADE TO AC	EADL	e TO THE NA	TIONAL INSTITUTE OF	E STANDA	DDS	AND TECH	NOI OCY DE	DIVED ED	OM ACCEPTED
				TIONAL INSTITUTE OF NTS, OR DERIVED FRO						
			LABO	DRATORY TEMPERATU	JRE AND I	IUMI	DITY			
_	sical STD (106C)				onic STD (1			23,0 ° +/-0,	•	·
	ensional STD (106B) s/Dim CAL (Lab 111)		° +/-0.23 ° C (	•	onic CAL (ining S&CL		ration areas:	23.0 ° +/-1.	-	-
•				aluated for conformance v	-					
				RANCE CONDITIONS FO		······	<del></del>	<del></del>	·····	
NOMINAL (	(STD)	00	UNITS				D (UUT)		MFG.	ACCURACY
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				COMMEN	ITS			· · · · · ·		

### ACCELEROMETERS

11/29/2007

NAME: DANA KEITH	MORTON	BADGE: 3569	3 PH: 5	526-1274	AREA: STC		BLDG: EROB	RM: W2D1
ID Number: 716211 Calibration Date:	Mfr: P0 7/26/1999 12:4		el: 353B03 A	Noun	Name: ACCEI <b>DE</b>	LEROI		Serial #: 38617 FOUND
Next Cal Due Date:	7/19/2000	1	Accep	stance Test	1	•	In Tolerance	
Charge Level:	0	2	Specia	al Test	2	O	Out of Tolera	ance >1x <2x
Repair/Adj/etc C.L:	0	3	✓ Calibr	ration to MFC	Specs 3	O	Out of Tolera	ance >2x <3x
Material Amount:	0	4	Clean		4	O	Out of Tolera	ance $>3x < 5x$
Charge Number:	827257038	5	Limite	ed Calibration	n 5	0	Out of Tolera	ance >5x
Cal Work Inst ID:	PCB	<b>6</b> ′	☐ Functi	ional Check	6	, ·O	Out of Tolera	nce-Undetermined
Outside Vendor:	PCB	7	Perfor	mance Check	c 7		Inoperative	
	,	8	Modif	îy	8	Д	Damaged	
		9	Repair	r-needs Charg	ge Level 9	П	Not Used	
	•	10	Other		1	0 🗆	Not Determin	ned
				e)	. 1	1 🗀	Excessed	
Calibrated By:	Mike Stears	S#:	61767 Pho	ne: 526-2761	1	2	Extension	, , , , , , ,
0		CAL	IBRATION S	TANDARD	SUSED			
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	V							
<u> </u>	l			]				
		ABLE TO THE NATI						
			ATORY TEMPE	, , , , , , , , , , , , , , , , , , , ,				
Physical :	STD (106C)	20.0 ° +/-0.3 ° C (40-		Electronic STD (	•	23.0	) ° +/-0.5 ° C (3	0-45% RH)
	onal STD (106B)	20.0 ° +/-0.25 ° C (30	, ,	Electronic CAL	•		)° +/-1.0°C (2	
7 · -	n CAL (Lab 111)	20.0 ° +/-0.5 °C (20-		,	L calibration areas		) ° +5,-3.0 °C (	·
Manufacture	r's environmental i	specifications are evalu	ated for conform	ance when calib	rations are perfo	rmed ou	tside the above s	tated conditions.
NOMINAL (S	STD)	OUT OF TOLERAL UNITS			RING CALIBRA S FOUND (UU		M	IFG. ACCURACY
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	1					····	· -	
			COM	MENTS				

11/29/2007

NAME: DANA KEI	TH MORTON	BADGE: 356	98	PH: 526-1274	AREA: ST	c	BL	DG: EROB	RM: W2D1	
ID Number: 7162 Calibration Date:			del: 353	3B03 Noun l	Name: AC	CEL	EROME		Serial #: 3861 OUND	7
Next Cal Due Da	te: 7/12/2001	1		Acceptance Test		1	• In T	olerance		
Charge Level:	1	2		Special Test		2	O Out	of Toleran	ce >1x <2x	
Repair/Adj/etc C	.L: 0	3	V	Calibration to MFG	Specs	3	O Out	of Toleran	ce >2x <3x	
Material Amount	<b>: 0</b> .	4		Clean		4	C Out	of Toleran	ce >3x <5x	
Charge Number:	P44300001	5		Limited Calibration		5	C Out	of Toleran	ce >5x	
Cal Work Inst ID	: PCB	6		Functional Check		6	O Out	of Toleran	ce-Undetermine	d
Outside Vendor:	PCB	7		Performance Check		7	☐ Inop	perative		
•		. 8		Modify		8	☐ Dar	naged		
		9		Repair-needs Charge	Level	9	☐ Not	Used		•
		10		Other		10	☐ Not	Determine	:d	
						11	☐ Exc	essed		
Calibrated By:	Mike Stears	S#:	61767	7 Phone: 526-2761		12	☐ Ext	ension		٠
CALIBRATION STANDARDS USED										
. [				THON STANDARDS	USED					
STANDARDS VALUES	S USED ARE TRACEABLE S FOR NATURAL PHYSIC	E TO THE NAT	ΓΙΟΝΑL ITS, OR	INSTITUTE OF STANDA DERIVED FROM THE R	ARDS AND T ATIO TYPE	ECH OF S	NOLOGY ELF CAL	DERIVED F	ROM ACCEPTED	<del></del>
·		LABO	RATOR	Y TEMPERATURE AND	HUMIDITY			74-man (1844) (1844) (1844)		
_		° +/-0.3 ° C (4			· · · · ·			+/-0.5 ° C (30	·	
	• • • •	° +/-0.25 °C (2		,		reas:		+/-1.0 °C (20 +5,-3.0 °C (2	·	
	urer's environmental specif	•		, ,				•		
				ONDITIONS FOUND DU						
NOMINAI		UNIT			FOUND (			М	FG. ACCURAC	<b>Y</b>
<u> </u>		·-								
				· <u></u>				<del></del>	,	
				COLOGEN						
				COMMENTS			•			

11/29/2007

NAME: DANA KEIT	TH MORTON	]	BADGE: 35698	PH: 526-12	74	AREA: ST	C BLDG	: EROB	RM: W2D1
ID Number: 7162 Calibration Date:	11 Mfr: P0 8/19/2003	СВ		: 353B03 ACTION:CODE		Name: AC	CELEROMETE AS FO		Serial #: 38617
Next Cal Due Dat	e: 7/7/2004	1	☐ Acce	ptance Test		i 💿 h	n Tolerance		
Charge Level:	2	2	☐ Spec	ial Test		2 O C	Out of Tolerance	>1x <2x	
Repair/Adj/etc C.	L: 0	3	Calib	oration to MFG S	pecs	3 O C	Out of Tolerance	>2x <3x	
Material Amount:	0	4	Clean	n		4 - C C	Out of Tolerance	>3x < 5x	
Charge Number:	100348027	5	☐ Limi	ted Calibration		5 O C	Out of Tolerance	>5x	
Cal Work Inst ID:	PCB	6	_ Func	tional Check		6 C C	Out of Tolerance	-Undetern	nined
Outside Vendor:	PCB	7	Perfo	rmance Check		7 🔲 la	noperative		
	•	8	☐ Mod	ify		8 🗀 E	Damaged		
		9	Repa	ir-needs Charge I	Level	9 🔲 N	lot Used		
		10	Othe	7		10	lot Determined		
					2	11 🔲 E	Excessed	,	
Calibrated By:	Stan Zohner	S#:	58146 Pho	one: 526-2761		12 🗀 E	extension		
			CALI	DD ATHANI OTA	MID A DIDG	LICED			
ſ			CALI	BRATION STAI	IDAKU	USED		<u> </u>	
Į.									
	USED ARE TRACE FOR NATURAL PH								
			LABORA	TORY TEMPERATI	URE AND I	HUMIDITY			<del></del>
·	al STD (106C)		-/-0.3 ° C (40-5		ronic STD (			.5 °C (30-4	•
	osional STD (106B) Dim CAL (Lab 111)		-/-0.25 ° C (30 -/-0.5 ° C (20-5)		ronic CAL ( ining S&CI	Lab 112) . calibration a		.0 ° C (20-5 3.0 ° C (20-	-
	rer's environmental:			, ,	_			•	
	- BEHALLOUISCHALL				· · · · · · · · · · · · · · · · · · ·		·		
NOMINAL	. (STD)	001	UNITS	CE CONDITIONS F		FOUND (		MF	G. ACCURACY
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	•			COMMEN	NTS				•

PCB test referral QA# 102401

11/29/2007

NAME: DANA KEITH MOI	RTON	В	ADGE: 35	698 PH:	526-1274	ARE	A: S7	C BLDG: EROB	RM: W2D1
ID Number: 716211 Calibration Date: 11/	Mfr: 11/2004	PCB	Мо	odel: 353B03 ACTION		n Name	: AC	CELEROMETER S AS FOUND	Serial #: 38617
Next Cal Due Date: 10/2	21/2005	1		Acceptance Tes	st	1	•	In Tolerance	
Charge Level: 2		2		Special Test		2	0	Out of Tolerance > 1x < 2x	
Repair/Adj/etc C.L: 0		3.	<b>D</b>	Calibration to N	IFG Specs	3	O	Out of Tolerance >2x <3x	
Material Amount: 0		4		Clean	ı	4	O	Out of Tolerance >3x <5x	
Charge Number: 100	)664GSA	5		Limited Calibra	ition	5	Ô	Out of Tolerance >5x	,
Cal Work Inst ID: PCI	В	6		Functional Che	ck	6	O	Out of Tolerance-Undeter	mined
Outside Vendor: PC	В	7		Performance C	heck	7		Inoperative	
		8	$\square$	Modify		8		Damaged	
		9 .		Repair-needs C	harge Level	9		Not Used	
		10		Other		10		Not Determined	
•						11		Excessed	
Calibrated By: Sco	ott Lish	S#:	101141	Рһоле: 526-2	761	12		Extension	
				,					,
			CA	LIBRATION	STANDARI	DS USI	ED		<b>–</b>
						_			
					j				
STANDARDS USED	ARE TRAC	EABLET	O THE NA	TIONAL INSTIT	UTE OF STAN	DARDS	AND '	TECHNOLOGY DERIVED FRO	OM ACCEPTED
								OF SELF CALIBRATION TE	
				PRATORY TEMP			DITY	·	
Physical STD  Dimensional S				(40-55% RH) (30-45% RH)	Electronic STI Electronic CA		2)	23.0 ° +/-0.5 ° C (30-4 23.0 ° +/-1.0 ° C (20-5)	
Phys/Dim CA	, ,			(20-50% RH)		-		areas: 23.0 ° +5,-3.0 ° C (20-	
Manufacturer's en	nvironment	d specificat	ions are ev	aluated for conform	nance when cal	ibrations	аге р	erformed outside the above state	ed conditions.
		OUT	OF TOLE	RANCE CONDITION	ONS FOUND D	URING	CALI	BRATION	<del></del>
NOMINAL (STD	<b>)</b> )	•	UNI	TS	A	S FOU	ND	(UUT) MFC	G. ACCURACY
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				COM	IMENTS				

Unit sent to manufacture for calibration. QA# 111220

11/29/2007

NAME: DANA KEITH	MORTON	J	BADGE: 35698	PH: 526	1274	ARE	A: ST	C BLDG: EROB	RM: W2D1
ID Number: 716211 Calibration Date:	. M	fr: PCB	Model	: 353B03 ACTION CO		Name:	AC(	CELEROMETER AS FOUND	Serial #: 38617
Next Cal Due Date:	11/4/2006	5 1	☐ Ac	ceptance Test		1	•	In Tolerance	
Charge Level:	2	2	☐ Spe	ecial Test		2	0	Out of Tolerance >1x	<2x
Repair/Adj/etc C.L:	0	3	☑ Cal	ibration to MF0	3 Specs	3	0	Out of Tolerance >2x	<3x
Material Amount:	0	4	Cle	an		4	0	Out of Tolerance >3x	<5x
Charge Number:	100853G	SA 5	Lin	nited Calibration	n ′	5	0	Out of Tolerance >5x	
Cal Work Inst ID:	PCB	6	Fur	nctional Check		6	0	Out of Tolerance-Und	etermined
Outside Vendor:	PCB	7	Per	formance Check	<b>k</b>	7		Inoperative	
		. 8	Mo	dify		8		Damaged	•
		9	Re	pair-needs Char	ge Level	9		Not Used	
•		10	☐ Oth	ner		10		Not Determined	
						11		Excessed	
Calibrated By:	Scott Lish	ı S#:	101141 P	hone: 526-2761		12		Extension	•
		<b>V</b>					_		
	1		CALI	BRATION ST	ANDARD	SUSE	D C		
								ECHNOLOGY DERIVED OF SELF CALIBRATION	
			LABORA	TORY TEMPERA	TURE AND	HUMII	PITY		
-	STD (106C)		/-0.3 ° C (40-5		ectronic STD (			23.0 ° +/-0.5 ° C (	ŕ
	nal STD (10) CAL (Lab 1	•	/-0.25 ° C (30- /-0.5 ° C (20-5	• •	ectronic CAL ( maining S&C)	-	-	23.0 ° +/-1.0 ° C ( reas: 23.0 ° +5,-3.0 ° C	•
-	,		-	•	_			rformed outside the above	•
				CE CONDITIONS	<del></del>				
NOMINAL (S	STD)		UNITS			FOU			MFG. ACCURACY
						<del></del>			
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			·····	COMMI	ENTS			<del></del>	

QA#115894 S&CL overcheck required.

11/29/2007

NAME: DANA KEIT	'H MORTON	E	ADGE: 3	35698 PH: 526-1274	AREA	A: STC	BLDG: EROB	RM: W2D1			
ID Number: 7162 Calibration Date:	11 Mfr: P 12/14/2006	СВ	M	Iodel: 353B03 Not ACTION CODE	un Name:	ACCELERON	METER AS FOUND	Serial #: 38617			
Next Cal Due Dat	e: 11/11/2007	1		Acceptance Test	1	in Tolerar	ice				
Charge Level:	2	2		Special Test	2	Out of To	lerance > l x <	2x			
Repair/Adj/etc C.	L: 0	3	<b>V</b>	Calibration to MFG Specs	3	Out of To	lerance >2x <	3x			
Material Amount:	0	4		Clean	4	C Out of To	lerance >3x <	5x			
Charge Number:	100853GSA	5		Limited Calibration	5	Out of To	lerance >5x				
Cal Work Inst ID:	PCB	6		Functional Check	6	C Out of To	lerance-Unde	termined			
Outside Vendor:	PCB	7		Performance Check	7	Inoperativ	⁄e				
		8		Modify	8	Damaged	•				
		9		Repair-needs Charge Leve	1 9	☐ Not Used					
		10		Other	10	Not Deter	mined				
					11	Excessed					
Calibrated By:	Scott Lish	S#:	10114	Phone: 526-2761	12	Extension					
	·		_			_					
·		, -		ALIBRATION STANDAR	WS USE.	D T		<del></del>			
			<u> </u>								
	,		;								
				ATIONAL INSTITUTE OF STAN ANTS, OR DERIVED FROM TH							
			LAE	ORATORY TEMPERATURE A	ND HUMID	ITY					
Physic	al STD (106C)	20.0 ° +	-/-0.3 ° C	(40-55% RH)   Electronic ST	TD (106D)	23.0	° +/-0.5 °C (3	0-45% RH)			
	sional STD (106B)			(30-45% RH)   Electronic C/	•	•	) ° +/-1.0 ° C (2	·			
Phys/I	Oim CAL (Lab 111)	20.0 ° +	·/-0.5 ° C	(20-50% RH) Remaining So	&CL calibra	tion areas: 23.0	) ° +5,-3.0 ° C (	20-50% RH)			
Manufactu ————	rer's environmental	specificat	ions are c	evaluated for conformance when co	alibrations :	are performed ou	tside the above s	tated conditions.			
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY											
	·			·			·	<del>-</del>			
						<del></del>					
	,										
				COMMENTS	_'						

QA# 122337 S&CL overcheck required.

12/12/2007

NAME: DANA KEITH	MORTON	BAI	OGE: 35698	PH: 526-1274		EA: STC	BLDG: EROB	RM: V	W2D1
ID Number: 716211 Calibration Date:	Mfr: P	PCB	Model: 3:	53B03 CTION CODE	Noun Name	: ACCELER	OMETER AS FOUND	Serial #:	38617
Next Cal Due Date:	11/26/2008	1 [	- Accep	tance Test	1	♠ In Tole	rance		
Charge Level:	2	2 Γ	Specia	il Test	2	C Out of	Tolerance >1x	<2x	
Repair/Adj/etc C.L:	0 .	3 F	Calibra	ation to MFG Spe	ecs 3	C Out of	Tolerance >2x	<3x \	
Material Amount:	0	4 F	- Clean		4	C Out of	Tolerance >3x	<5x	
Charge Number:	100853GSA	5	Limite	d Calibration	5	C Out of	Tolerance >5x		
Cal Work Inst ID:	PCB	6 F	Functi	onal Check	6	C Out of	Tolerance-Und	etermined	
Outside Vendor:	PCB	7	- Perfor	mance Check	7	[ Inopera	ntive		
		8 F	Modify	y	8	☐ Damag	ed		
		9. [	Repair	-needs Charge Le	evel 9	Not Us	ed		
		10	Other		10	☐ Not De	termined		
				٠	11	F Excesse	ed		
Calibrated By:	Scott Lish	S#: 10	01141 Phon	ne: 526-2761	12	Extensi	ion		
			CAI	IBRATION STA	ANDARDS	USED			
					1, (D/IIC)	COLD			•
·									•
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STANDAR VALU	DS USED ARE T ES FOR NATUR	RACEABLE AL PHYSIC	TO THE NATI	IONAL INSTITUTE IS, OR DERIVED FI	OF STANDA	RDS AND TEC ATIO TYPE OF	HNOLOGY DER	IVED FROM . TION TECHN	ACCEPTED IQUES
		·	LABOR	ATORY TEMPERA	TURE AND I	HUMIDITY			
	vsical STD (106C)		° +/-0.3 ° C (40	-	ctronic STD (	•		°C (30-45% F	•
	nensional STD (10 /s/Dim ĊAL (Lab	• •	' +/-0.25 ° C (3 <sup>0</sup> ' +/-0.5 ° C (20		ctronic CAL (i nainine S&CI	Lab 112) . calibration areas		°C (20-50% F	•
·	•	•		ated for conformanc	-			·	,
				NCE CONDITIONS			····		
NOMINAL	(STD).	00	UNITS	NCE CONDITIONS		UND (UUT)		MFG. ACC	CURACY
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				COMME	ENTS				•

Calibrated at PCB QA# 141993 S&CL overcheck required.

NAME: DANA KEI	TH MORTON	BADGE: 3	5698	PH: 52	6-1274	AREA: STO	7	BLDG:	EROB	RM: W2D1
ID Number: 7162 Calibration Date:			odel: 353		Noun l	Name: ACC	ELI	EROMETE	R Se	erial #: 38619 UND
Next Cal Due Da	te: 7/26/2000	1		Accept	ance Test		1	<b>⊚</b> In To	lerance	
Charge Level:	0	2		Special	Test		2	C Out o	f Tolerance	>1x <2x
Repair/Adj/etc C	.L: 0	3	V	Calibra	tion to MFG	Specs	3	Out o	f Tolerance	>2x <3x
Material Amoun	:: 0	4		Clean			4	C Out o	f Tolerance	>3x <5x
Charge Number:	827257038	5		Limited	l Calibration	, <i>,</i>	5	C Out o	f Tolerance	>5x
Cal Work Inst ID	: PCB	6		Function	nal Check		6	C Out o	f Tolerance	-Undetermined
Outside Vendor:	PCB	7		Perform	nance Check	:	7	Inope	rative	
		8		Modify			8	☐ Dama	iged	•
		9		Repair-	needs Charg	ge Level	9	☐ Not U	Jsed	
		1	0 🗀	Other			10	Not I	Determined	
							11	☐ Exces	ssed	
Calibrated By:	Mike Stears	s S	#: 6176	7 Phon	e: 526-2761		12	Exten	sion	
		C	AT IRRA	TION S	TANDARD:	SUSED				
				110.11						
i						<u> </u>			<u></u>	
		CEABLE TO THE NA PHYSICAL CONSTA								
		LAB	ORATORY	TEMPER	ATURE AND	HUMIDITY		31.6		
-	ical STD (106C) insional STD (106B)	20.0 ° +/-0.3 ° C 20.0 ° +/-0.25 ° C	•		ilectronic STD ( ilectronic CAL (	•			.5 °C (30-459 .0 °C (20-509	·
	Dim CAL (Lab 111		•		temaining S&C	•	eas:		3.0 °C (20-50)	
Manufac	urer's environmen	tal specifications are e	valuated for	r conforms	nce when calib	rations are pe	rforn	ned outside th	e above stated	conditions.
		OUT OF TOLE	RANCE CO	ONDITION	S FOUND DU	RING CALIB	RAT	ION		
NOMINA	Ĺ (STD)	UN				FOUND (			MFG	ACCURACY
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		·								
				COMN	MENTS					

NAME: DANA KEITH MORTON		BADO	BADGE: 35698		РН: 526-1274	I: 526-1274 AREA: STC		BLDG: EROB		RM: W2D1
ID Number: 71621 Calibration Date:	3 Mfr: Po	•	Mod	el: 353	BB03 Noun I	Name: AC	CEL	ERC		Serial #: 38619 FOUND
Next Cal Due Date	: 7/12/2001		1		Acceptance Test		1	•	In Tolerance	
Charge Level:	1		2		Special Test		2	O	Out of Tolera	nce >1x <2x
Repair/Adj/etc C.L	.: 0		3	V	Calibration to MFG	Specs	3	Ō	Out of Tolera	nce >2x <3x
Material Amount:	0	•	4		Clean		4	0	Out of Tolera	nce >3x <5x
Charge Number:	P44300001	•	5	П	Limited Calibration		5	O	Out of Tolera	nce >5x
Cal Work Inst ID:	PCB		6		Functional Check		6	0	Out of Tolera	nce-Undetermined
Outside Vendor:	PCB		7		Performance Check		7		Inoperative	
			8		Modify		8		Damaged	
			9		Repair-needs Charge	e Level	9		Not Used	
			10		Other		10		Not Determin	ed
							11		Excessed	
Calibrated By:	Mike Stears		S#:	61767	Phone: 526-2761		12		Extension	•. •
			CAI	TRD A	TION STANDARD	e liced				
F			CAL			CSED	ī			<del></del>
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					INSTITUTE OF STANDA DERIVED FROM THE R					
	-		LABOR	ATOR	Y TEMPERATURE AND	HUMIDITY			<u> </u>	
·	I STD (106C)	20.0 ° +/-0.3	-						3.0 ° +/-0.5 ° C (	•
	ional STD (106B) im CAL (Lab 111)	20.0 ° +/-0.2 20.0 ° +/-0.5	,				reas:		3.0 ° +/-1.0 °C (; 3.0 ° +5,-3.0 °C	•
			•		or conformance when calib	rations are pe	erfor			•
		OUT OF T	TOLERA	NCE C	ONDITIONS FOUND DU	RING CALI	BRA	TION		
NOMINAL	(STD)		UNIT	S	AS	S FOUND (	UU	T)	ľ	MFG. ACCURACY
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					COMMENTS					

11/29/2007

NAME: DANA KEI	TH MORTON		BADGI	E: 35698 PH: 526-	1274	AR	EA: STO	BLDG: ERC	OB R	M: W2D1
ID Number: 7162 Calibration Date:		ifr: PCB		Model: 353B03 ACTION COD		Namo	e: ACC	ELEROMETER AS FOUNI		al#: 38619
Next Cal Due Da	te: 7/7/2004	1		Acceptance Test		1	<b>⑥</b> In	Tolerance	•	
Charge Level:	2	. 2		Special Test		2	O 0	ut of Tolerance >1x	<2x	
Repair/Adj/etc C	.L: 0	3	V	Calibration to MFG	Specs	3	O 0	ut of Tolerance >2x	<3x	
Material Amount	:: 0	× 4		Clean		4	0 0	ut of Tolerance >3x	<5x	
Charge Number:	1003480	27 5		Limited Calibration		5	0 0	ut of Tolerance >5x		
Cal Work Inst ID	: PCB	. 6		Functional Check		6	CO	ut of Tolerance-Uno	determine	<b>i</b>
Outside Vendor:	PCB	7		Performance Check	·	7	☐ In	operative		
		8		Modify		8	□ D	amaged		
		9		Repair-needs Charge	e Level	9	□ N	ot Used		
		10	V)	Other		10	□ N	ot Determined		,
						11	E	ccessed		
Calibrated By:	Stan Zoh	ner S#	: 5814	6 Phone: 526-2761	•	12	E	ctension		. :
				CALIBRATION STA	A ND A DDG	e tie	ED			•
[			<del></del>	CALIBRATIONSIA	NDARD.		EU		<u> </u>	
				E NATIONAL INSTITUTE STANTS, OR DERIVED FI						
			L	ABORATORY TEMPERA	TURE AND	HUM	IDITY		•	
<u>-</u>	cal STD (106C)				ctronic STD (			23.0 ° +/-0.5 ° C	•	•
×.	nsional STD (10 Dim CAL (Lab	-			ctronic CAL ( maining S&CI	•		23.0 ° +/-1.0 ° C eas: 23.0 ° +5,-3.0 °	•	·
•				•	_				•	•
Manutaci	urer \$ environn			re evaluated for conformance		***************************************		······································	ove stated co	aditions.
NOMINA	L (STD)	ου		DERANCE CONDITIONS UNITS			CALIB UND (U		MFG. A	CCURACY
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test referral QA# 102401

11/29/2007

NAME: DANA KEITH MORTON			BADGE: 35	698 PH: 526-1274	ARI	EA: S	TC BLDG: EROB RM: W2D1
ID Number: 71621 Calibration Date:	3 Mfr: F	РСВ	Mo	odel: 353B03 Not	ın Name	: AC	CCELEROMETER Serial #: 38619 AS FOUND
Next Cal Due Date	: 10/21/2005	1		Acceptance Test	1	•	In Tolerance
Charge Level:	2	2		Special Test	2	O	Out of Tolerance >1x <2x
Repair/Adj/etc C.L	: 0	3	<b>.</b>	Calibration to MFG Specs	3	0	Out of Tolerance >2x <3x
Material Amount:	0	4		Clean	4	0	Out of Tolerance >3x <5x
Charge Number:	100664GSA	5		Limited Calibration	. 5	0	Out of Tolerance >5x
Cal Work Inst ID:	PCB	6		Functional Check	. 6	O	Out of Tolerance-Undetermined
Outside Vendor:	РСВ	7		Performance Check	7		Inoperative
•		8		Modify	8		Damaged
•		9	Г	Repair-needs Charge Level	1 9		Not Used
		10		Other	10		Not Determined
					11		Excessed
Calibrated By:	Scott Lish	S#:	101141	Phone: 526-2761	12		Extension
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<b>r</b> ~	<del> </del>		CA	LIBRATION STANDAR	DS US	ED	
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STANDARDS I VALUES I	JSED ARE TRAC OR NATURAL P	EABLE TO HYSICAL	O THE NA CONSTA	TIONAL INSTITUTE OF STAN NTS, OR DERIVED FROM THI	IDARDS . E RATIO	AND '	TECHNOLOGY DERIVED FROM ACCEPTED E OF SELF CALIBRATION TECHNIQUES
			LABO	RATORY TEMPERATURE AN	IMUH DI	DITY	
Physica	STD (106C)	20.0 ° +	-/-0.3 ° C (	40-55% RH)   Electronic ST	D (106D)		23.0 ° +/-0.5 ° C (30-45% RH)
	ional STD (106B)			(30-45% RH)   Electronic CA	AL (Lab 11	(2)	23.0 ° +/-1.0 °C (20-50% RH)
Phys/Di	m CAL (Lab 111)	20.0°+	·/-0.5°C (	20-50% RH) Remaining Sa	&CL calib	ration	areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
Manufactur	er's environmental	specificat	ions are ev	aluated for conformance when ca	libration	are p	performed outside the above stated conditions.
NOMINAL	(STD)	OUT (	OF TOLER UNI	ANCE CONDITIONS FOUND TS	DURING AS FOU		
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				COMMENTS			

Unit sent to manufacture for calibration. QA# 111220

11/29/2007

NAME: DANA KEITH MORTON		BADGE:	35698 PH: 526-1274		ARE	A: S7	C BLDG: EROB	RM: W2D1
ID Number: 716213 M Calibration Date: 11/4/2005	fr: PCB	N	Model: 353B03 ACTION CODE		lame:	AC	CELEROMETER AS FOUND	Serial #: 38619
Next Cal Due Date: 11/4/2006	1		Acceptance Test		1 .	•	In Tolerance	
Charge Level: 2	2		Special Test		2	O	Out of Tolerance >1x	<2x
Repair/Adj/etc C.L: 0	3	V	Calibration to MFG Sp	oecs	3	O	Out of Tolerance >2x	<3x
Material Amount: 0	4		Clean		4	0	Out of Tolerance >3x	<5x
Charge Number: 100853GS	SA 5	-	Limited Calibration	,	5	0	Out of Tolerance >5x	
Cal Work Inst ID: PCB	6 .		Functional Check		6	O	Out of Tolerance-Und	etermined
Outside Vendor: PCB	7		Performance Check		7		Inoperative	
	8		Modify		8		Damaged	
	9		Repair-needs Charge I	Level	. 9		Not Used	
	: 10		Other		10		Not Determined	•
					11		Excessed	•
Calibrated By: Scott Lish	S#:	10114	1 Phone: 526-2761		12		Extension	
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			NATIONAL INSTITUTE OF FANTS, OR DERIVED FROM					
	<u></u>	LA	BORATORY TEMPERATUR	RE AND H	IUMII	DITY	· · · · · · · · · · · · · · · · · · ·	
Physical STD (106C)	20.0 °	⊦/-0.3 ° C	(40-55% RH)   Electron	nic STD (1	06D)		23.0 ° +/-0.5 ° C (	30-45% RH)
Dimensional STD (100	6B) 20.0°	+/-0.25 ° (	C (30-45% RH)   Electron	nic CAL (I	Lab 11:	2)	23.0° +/-1.0°C (	20-50% RH)
Phys/Dim CAL (Lab 1	11) 20.0 °	⊦/-0.5 ° C	(20-50% RH) Remain	ing S&CL	calibr	ation	areas: 23.0 ° +5,-3.0 ° C	(20-50% RH)
Manufacturer's environm	ental specifica	tions are	evaluated for conformance wi	hen calibr	ations	are p	erformed outside the above	stated conditions.
NOMINAL (STD)	OUT		ERANCE CONDITIONS FO NITS					MFG. ACCURACY
			1		·····			
			COMMEN'	rs				

QA#115894 S&CL overcheck required.

11/29/2007

NAME: DANA KEITI	MORTON	В	ADGE: 3	5698 PH: 526-1274	AREA: S	STC BLDG: EROB RM: W2D1
ID Number: 71621: Calibration Date:	3 Mfr: PCI 12/14/2006	В	M	odel: 353B03 Noun N	Name: A0	CCELEROMETER Serial #: 38619 AS FOUND
Next Cal Due Date	: 11/11/2007	1		Acceptance Test	1 💿	In Tolerance
Charge Level:	2	2		Special Test	2 - C	Out of Tolerance >1x <2x
Repair/Adj/etc C.L	: 0	3	<b>.</b>	Calibration to MFG Specs	3 C	Out of Tolerance >2x <3x
Material Amount:	0	4		Clean	4 O	Out of Tolerance >3x <5x
Charge Number:	100853GSA	5 .		Limited Calibration	5 C	Out of Tolerance >5x
Cal Work Inst ID:	PCB	6		Functional Check	6 C	Out of Tolerance-Undetermined
Outside Vendor:	PCB	7		Performance Check	7	] Inoperative
		8		Modify	. 8	Damaged
•		9		Repair-needs Charge Level	9 🗀	Not Used
		10		Other	10 🗀	Not Determined
•					11 🗀	Excessed
Calibrated By:	Scott Lish	S#:	101141	Phone: 526-2761	12 [	Extension
			_	A TEND A MICON COM A NO. A DOC	. VICED	
			<u>C2</u>	ALIBRATION STANDARDS	USED	
F						
STANDARDS I VALUES I	JSED ARE TRACEA OR NATURAL PHY	BLE TO SICAL	O THE NA	ATIONAL INSTITUTE OF STANDA INTS, OR DERIVED FROM THE RA	ARDS AND ATIO TYP	TECHNOLOGY DERIVED FROM ACCEPTED PE OF SELF CALIBRATION TECHNIQUES
				ORATORY TEMPERATURE AND I		
•	, ,			(40-55% RH)   Electronic STD (1 (30-45% RH)   Electronic CAL (1	·	23.0° +/-0.5°C (30-45% RH) 23.0° +/-1.0°C (20-50% RH)
	, ,			(20-50% RH) Remaining S&CL	•	
Manufactur	er's environmental sp	ecificati	ions are e	valuated for conformance when calibr	rations are	performed outside the above stated conditions.
		OUT (	OF TOLE	RANCE CONDITIONS FOUND DUE	RING CAL	LIBRATION
NOMINAL	(STD)		UN:	ITS AS	FOUND	(UUT) MFG. ACCURACY
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	<del></del>			COMMENTS		

QA# 116282 \\
S&CL overcheck required.

12/12/2007

NAME: DANA KEITH	MORTON		BADGE:	35698 PH: 526-1274	AREA: STC I	BLDG: EROB	RM: W2D1
ID Number: 716213 Calibration Date:	Mfr: F	СВ	N	Model: 353B03 Not	un Name: ACCELERON	METER AS FOUND	Serial #: 38619
Next Cal Due Date:	11/26/2008	1	Γ	Acceptance Test	i . In Toleran	ce	
Charge Level:	2	2	Г	Special Test	2 C Out of Tol	erance >1x <2	2x
Repair/Adj/etc C.L:	0	3	r	Calibration to MFG Specs	3 C Out of Tol	erance >2x <3	3x
Material Amount:	0	4	Γ	Clean	4 C Out of Tol	erance >3x <5	5x
Charge Number:	100853GSA	5	Г	Limited Calibration	5 C Out of Tol	erance >5x	
Cal Work Inst ID:	PCB	6	Γ	Functional Check	6 C Out of Tol	erance-Undete	ermined
Outside Vendor:	PCB	7 .	Г	Performance Check	7 [ Inoperative	e '	
		8	Γ	Modify	8 Damaged		
		9	Г	Repair-needs Charge Level	1 9 Not Used		
		10	Γ	Other	10 Not Determ	mined	·
*				. ·	11 Excessed		
Calibrated By:	Scott Lish	S#:	10114	1 Phone: 526-2761	12   Extension	•	
					D.   DD. 0. VOTD		
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	DELIGED ADES	ED 4 CE 4	DIETA	EVE NATIONAL INSTITUTE OF	STANDADDS AND TECHNI	OLOGY DEBIN	ED EDOM A COERCED
				THE NATIONAL INSTITUTE OF ONSTANTS, OR DERIVED FROM			
				LABORATORY TEMPERATU	RE AND HUMIDITY		
	ysical STD (106C)				nic STD (106D)	23.0 ° +/-0.5 ° C	•
	mensional STD (10 ys/Dim CAL (Lab				nic CAL (Lab 112) ning S&CL calibration areas:	23.0° +/-1.0°C	C (20-50% RH) C (20-50% RH)
				,	_		
Manuf	acturer's environr	nental sp	.,	s are evaluated for conformance w			ove stated conditions.
NOMINAL	(STD)			TOLERANCE CONDITIONS FO JNITS	UND DURING CALIBRATI AS FOUND (UUT)		MFG. ACCURACY
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		•		COMMEN	TS		•

Calibrated at PCB QA# 141994 S&CL overcheck required.

NAME: DANA KEIT	H MORTON	BADGE: 3	5698	PH: 526-1274	AREA: STC		BLDG: ER	OB RM: W2D1
ID Number: 71621 Calibration Date:	5 Mfr: PCE 7/26/1999 12:53:		odel: 353	B03 Noun l	Name: ACCI <b>DE</b>	ELER		Serial #: 38621 AS FOUND
Next Cal Due Date	e: 7/19/2000 ,	1		Acceptance Test		1 6	In Tolera	nce
Charge Level:	0	2		Special Test		2 (	Out of To	olerance >1x <2x
Repair/Adj/etc C.I	.: O	3	<b>V</b>	Calibration to MFG	Specs	3 (	Out of To	olerance >2x <3x
Material Amount:	0	4		Clean		4 (	Out of To	olerance >3x <5x
Charge Number:	827257038	5		Limited Calibration		5 (	Out of To	elerance >5x
Cal Work Inst ID:	PCB	6		Functional Check		6 (	Out of To	lerance-Undetermined
Outside Vendor:	PCB	7		Performance Check		7	Inoperativ	ve
		8		Modify		8 Г	Damaged	
		. 9		Repair-needs Charg	e Level	9 [	Not Used	
		1	0 🗖	Other		10 [	Not Deter	mined
						11 [	Excessed	
Calibrated By:	Mike Stears	, s	#: 61767	7 Phone: 526-2761		12	Extension	· · · · · · · · · · · · · · · · · · ·
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آآ		<u>C</u> ,	ALIBRA	FION STANDARDS	S USED	٦٢		
F					)[	╬	<del></del>	
STANDARDS	USED ARE TRACEAL	BLE TO THE N	ATIONAL I	NSTITUTE OF STANDA	RDS AND TE	CHNO	LOGY DERIV	ED FROM ACCEPTED
				ERIVED FROM THE R				
				TEMPERATURE AND		_		
•		0.0 ° +/-0.3 ° C 0.0 ° +/-0.25 ° C	•				23.0 ° +/-0.5 ° C 23.0 ° +/-1.0 ° C	
	•	0.0 ° +/-0.5 ° C	-					C (20-50% RH)
Manufactu	rer's environmental spe	eclfications are e	valuated for	conformance when calib	rations are peri	ormed	outside the abo	ove stated conditions.
		OUT OF TOLE	RANCE CO	ONDITIONS FOUND DU	RING CALIBR	ATIO	N	
NOMINAL		UN			FOUND (U			MFG. ACCURACY
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<u>-</u>				COMMENTS			<del></del>	

NAME: DANA KEI	TH MORTON	BAD	GE: 356	98	PH: 52	6-1274	AREA: S	TC		BLDG:	EROB	RM:	W2D1
ID Number: 7162 Calibration Date:	15 Mfr: 1 7/17/2000 4:4		Мо	del: 35		Noun TION COL	Name: A	CCEI	LERO	OMETE	_	Serial a	<b>#: 38621</b>
Next Cal Due Da	te: 7/12/2001		1		Accepta	nce Test		1	•	In Tole	rance		
Charge Level:	1		2		Special 7	Гest		2	0	Out of	Tolerand	ce >1x <	2x
Repair/Adj/etc C.	L: 0		3	V	Calibrat	ion to MFG	Specs	3	O	Out of	<b>Foleran</b>	ce >2x <	3x
Material Amount	: 0		4		Clean	•		4	0	Out of	Toleran	ce >3x <	5x
Charge Number:	P44300001	-	5		Limited	Calibration		5	0	Out of	Foleran	ce >5x	
Cal Work Inst ID	: PCB		6		Function	nal Check		6	Ó	Out of	Toleran	ce-Unde	termined
Outside Vendor:	PCB		· 7		Perform	ance Check		7		Inopera	tive		
			8		Modify			8		Damag	ed		
			9		Repair-r	eeds Charge	e Level	9		Not Us	ed		
	•		10		Other			10		Not De	termine	d	
	·							11		Excesse	ed		
Calibrated By:	Mike Stears		S#:	6176	7 Phone	: 526-2761		12		Extensi	on .		:
CALIBRATION STANDARDS USED													
													· **
[			****				<u> </u>						
	S USED ARE TRAC S FOR NATURAL P												
			LABO	RATOR	Y TEMPER	ATURE AND	HUMIDIT	Y		,			
• •	cal STD (106C)	20.0 ° +/-0.3	-			Electronic STD	•		,	3.0 ° +/-0.:	•	•	
	nsional STD (106B) Dim CAL (Lab 111)	20.0 ° +/-0.2 20.0 ° +/-0.5	•			Electronic CAL ternaining S&C	•	areas		3.0 ° +/-1.1 3.0 ° +5,-3		-	
	irer's environmenta				•	_					•		•
					<del></del>								
NOMINAL (STD)  Out of tolerance conditions found during calibration  NOMINAL (STD)  UNITS  AS FOUND (UUT)  MFG. ACCURACY													
	:						· · · · · · · · · · · · · · · · · · ·		•	<del></del>	-		
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<del>.,</del>			•				<del></del>					<del></del>	
		\	•		COMN	1ENTS							

NAME: DANA KEITH MORTON			BADGE: 35698	PH: 526-12	74	AR	REA: STC	BLDG: ERO	B RM: W2D1				
ID Number: 7162 Calibration Date:	15 Mfr: P0 8/19/2003	СВ		353B03 CTION CODE	Noun 1	Nam	ne: ACCEI	LEROMETER AS FOUND	Serial #: 38621				
Next Cal Due Dat	te: 7/7/2004	1	Accep	tance Test		1	<b>⑤</b> In To	olerance					
Charge Level:	2	2	Specia	al Test		2	OgOut	of Tolerance >1x	<2x				
Repair/Adj/etc C.	L: 0	3	✓ Calibr	ation to MFG Sp	ecs	3	Out o	of Tolerance >2x	<3x				
Material Amount:	0	4	Clean	•		4	Out o	of Tolerance >3x	<5x				
Charge Number:	100348027	5	Limite	ed Calibration		5	O Out	of Tolerance >5x					
Cal Work Inst ID	: PCB	6	Funct	ional Check		6	O Out	of Tolerance-Und	etermined				
Outside Vendor:	PCB	7	Perfor	mance Check		7	_ Inop	erative					
		. 8	Modif	Ty		8	☐ Dam	aged					
		9	Repai	r-needs Charge L	evel	9	☐ Not !	Used					
		10	Other			10	☐ Not I	Determined					
						11	☐ Exce	essed					
Calibrated By:	Stan Zohner	S#:	58146 Pho	ne: 526-2761		12	[] Exter	nsion					
	CALIBRATION STANDARDS USED												
						<u> </u>							
	USED ARE TRACE FOR NATURAL PH								D FROM ACCEPTED IN TECHNIQUES				
	ral STD (106C) asional STD (106B)		LABORATO /-0.3 ° C (40-55° /-0.25 ° C (30-4)		RE AND I	106D	)	23.0 ° +/-0.5 ° C 23.0 ° +/-1.0 ° C					
Phys/I	Oim CAL (Lab 111)	20.0 ° +	/-0.5 ° C (20-50	% RH)   Remai	ning S&CI	L cali	bration areas:	23.0 ° +5,-3.0 ° C	(20-50% RH)				
Manufactu	rer's environmental s	pecificat	ions are evaluate	d for conformance v	vhen calibi	ratio	as are perfor	med outside the abov	e stated conditions.				
NOMINAL	. (STD)	OUT	OF TOLERANC UNITS	E CONDITIONS FO			G CALIBRA UND (UU		MFG. ACCURACY				
				<u></u>	<del></del>								
				<del></del>									
	<del></del>												
				COMMEN	TS								
PCB	# 102401			,									

11/29/2007

NAME: DANA KEIT	TH MORTON	E	ADGE: 35	6698 PH: 5	26-1274 -	ARE	A: ST	C BLDG: EROB	RM: W2D1
ID Number: 7162 Calibration Date:	15 Mfr: F 6/21/2005	CB	Mo	odel: 353B03 ACTION (		Name	: AC	CELEROMETER AS FOUND	Serial #: 38621
Next Cal Due Dat	e: 5/24/2006	1		Acceptance Test		I	•	In Tolerance	
Charge Level:	2	2		Special Test		2	O	Out of Tolerance >1x <	:2x
Repair/Adj/etc C.	L: 0	3	~	Calibration to M	FG Specs	3	0	Out of Tolerance >2x <	3x
Material Amount	. 0	4		Clean		4	O	Out of Tolerance >3x <	<5x
Charge Number:	100853GSA	5		Limited Calibrat	ion	5	O	Out of Tolerance >5x	
Cal Work Inst ID	PCB	6	<b></b>	Functional Chec	k	6	O	Out of Tolerance-Unde	termined
Outside Vendor:	PCB	7		Performance Ch	eck	7		Inoperative	•
		8		Modify		8		Damaged	
	•	9		Repair-needs Ch	arge Level	9		Not Used	
		10		Other		10		Not Determined	
						11	Γ]	Excessed	
Calibrated By:	Scott Lish	S#:	101141	Phone: 526-27	61	12		Extension .	
			C	ALIBRATION S	"T A NIN A DY	o tiet	210		
Ī	The state of the s			LIDICATIONS	I	75 031	<i>5D</i>		
					]				
								ECHNOLOGY DERIVED	
VALUES	FOR NATURAL P	HYSICAL	CONSTA	INTS, OR DERIVE	FROM THE	RATIO	TYPE	OF SELF CALIBRATION	TECHNIQUES
Physic	al STD (106C)	20.0 ° →		ORATORY TEMPE (40-55% RH)	RATURE ANI Electronic STE			23.0 ° +/-0.5 ° C (3	0-45% RH)
•	nsional STD (106B)			(30-45% RH)	Electronic CAI			23.0 ° +/-1.0 ° C (2	•
Phys/I	Dim CAL (Lab 111)	20.0 ° +	-/-0.5 ° C	(20-50% RH)	Remaining S&	CL calibi	ration a	areas: 23.0 ° +5,-3.0 ° C	20-50% RH)
Manufacte	irer's environmental	specificat	tions are ev	aluated for conform	ance when cal	ibrations	are p	erformed outside the above i	tated conditions.
NOMINAL	. (STD)	OUT	OF TOLE UN	RANCE CONDITIO		uring S FOU			IFG. ACCURACY
								<u>-</u> _	
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•			,	COM	MENTS			,	

QA# 114602 S&CL overcheck required.

11/29/2007

NAME: DANA KEIT	H MORTON	9	BADGE: 3	5698 PH: 52	26-1274	ARE	A: STC	BLDG:	EROB	RM: W2D1
ID Number: 71621 Calibration Date:	.5 Mfr: I 6/1/2006	PCB	M	odel: 353B03 ACTION C		Name	: ACC	ELEROMETE AS FO	R :	Serial #: 38621
Next Cal Due Date	e: 5/17/2007	i		Acceptance Test		1	<b>⊚</b> I	n Tolerance	•	
Charge Level:	2	2		Special Test		2	0	Out of Toleranc	e > 1 x < 2 x	
Repair/Adj/etc C.I	<b>.</b> : 0	3	<b>V</b>	Calibration to M	FG Specs	. 3	0	Out of Toleranc	e >2x <3x	
Material Amount:	0	4	П	Clean		4	0 0	Out of Toleranc	e >3x <5x	
Charge Number:	100853GSA	5		Limited Calibrat	ion	5	0	Out of Toleranc	e >5x	
Cal Work Inst ID:	PCB	6		Functional Check	k	6	0	Out of Toleranc	e-Undeter	mined
Outside Vendor:	PCB	7		Performance Che	eck	7		noperative		
		8		Modify		8		Damaged		•
		9	Г	Repair-needs Ch	arge Level	9		Not Used		
		10		Other		10		Not Determined		
	(					11	<u> </u>	Excessed		
Calibrated By:	Scott Lish	S#:	101141	Phone: 526-27	61	12	E	Extension	•	
CALIBRATION STANDARDS USED										
· ·				ALIBRATION 5	TANDARD	1		ī		<u> </u>
Ė		<u> </u>								
				ATIONAL INSTITUT						
			LAB	ORATORY TEMPES	LATURE AND	HUMII	DITY	,		
Physica	al STD (106C)	20.0°+	/-0.3 ° C	(40-55% RH)	Electronic STD (	(106D)	_	23.0 ° +/-0.	5°C (30-4	5% RH)
	sional STD (106B)			- 1	Electronic CAL	•	-		0 ° C (20-5	•
•	im CAL (Lab 111)			,	Remaining S&C			•	3.0°C (20∹	
Manufactu	rer's environmenta	l specificat	ions are e	valuated for conforms	ince when calib	rations	are per	formed outside th	e above state	d conditions.
NOMINAL	(STD)	OUT		RANCE CONDITION ITS			CALIBI ND (U		MF	G. ACCURACY
						<del></del>				
•				COM	MENTS					

QA# 117751 S&CL overcheck required.

11/29/2007

NAME: DANA KEITH	MORTON	BADGE: 35698 PH: 526			274	ARE	A: S1	C BLDG: EROB	LDG: EROB RM: W2D1		
ID Number: 716215 Calibration Date:	5 Mfr: PC 6/13/2007	В	M	odel: 353B03 ACTION COE		Name:	AC	CELEROMETER AS FOUND	Serial #: 38621		
Next Cal Due Date:	5/24/2008	1		Acceptance Test		1 -	•	In Tolerance	,		
Charge Level:	2	2		Special Test		2	O	Out of Tolerance >1x <	2x		
Repair/Adj/etc C.L:	: 0	3	V	Calibration to MFG	Specs	3	0	Out of Tolerance >2x <	3x		
Material Amount:	0	4		Clean	٠	4	O	Out of Tolerance >3x <	5x		
Charge Number:	100853GSA	5		Limited Calibration		5	O	Out of Tolerance >5x			
Cal Work Inst ID:	PCB	6		Functional Check		6	0	Out of Tolerance-Undet	ermined		
Outside Vendor:	PCB	7		Performance Check		7		Inoperative			
		8		Modify	•	8		Damaged			
	,	9		Repair-needs Charge	e Level	9	П	Not Used			
		10		Other		10		Not Determined			
						11		Excessed			
Calibrated By:	Scott Lish	S#:	101141	Phone: 526-2761		12		Extension			
			, ,		ND 1 DD 6			-	,		
	<del>-</del>		<u>C.</u>	ALIBRATION STA	NDARDS	USE	:D	<del></del>			
									==   !		
·											
								TECHNOLOGY DERIVED F OF SELF CALIBRATION T			
			LAB	ORATORY TEMPERAT	URE AND I	HUMII	DITY				
•	•				tronic STD (1			23.0 ° +/-0.5 °C (30	•		
	, ,			•	tronic CAL ( aining S&CL			23.0 ° +/-1.0 ° C (20 areas: 23.0 ° +5,-3.0 ° C (20			
								erformed outside the above s	·		
NOMINAL (	STD)	OUT	OF TOLE UN	RANCE CONDITIONS F ITS					FG. ACCURACY		
	·		<u> </u>								
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	·										
					·						
				COMME	NTS						

QA# 134165 S&CL overcheck required.

11/29/2007

NAME: DANA KEIT	AME: DANA KEITH MORTON BADGE: 35698 PH: 526-1274 AREA: STC BLDG: EROB RM: W2D1										
ID Number: 7163 Calibration Date:	33 Mfr: PCB 10/21/1999 4:22:		odel: 350	A04 Noun l	Name: ACCI	ELE	ROMETE		Serial #: 1427 OUND		
Next Cal Due Dat	e:	1		Acceptance Test		1	O In Tol	erance			
Charge Level:	0	2		Special Test		2	O Out o	f Tolerand	ce >1x <2x		
Repair/Adj/etc C.	L: 0	. 3		Calibration to MFG	Specs	3	O Out o	f Tolerand	ce >2x <3x		
Material Amount:	0	4		Clean		4	Out o	f Tolerand	ce >3x <5x		
Charge Number:	572121017	. 5		Limited Calibration	ı	5	O Out o	f Tolerand	ce >5x		
Cal Work Inst ID:	: PCB	6		Functional Check		6	C Out o	f Tolerand	ce-Undetermined		
Outside Vendor:	PCB	7		Performance Check	:	7	☐ Inope	rative			
/		8		Modify		8	☐ Dama	ged			
		9		Repair-needs Charg	ge Level	9	☐ Not U	Ised			
		1	0 🔽	Other		10	☑ Not D	etermine	d		
						11	☐ Exces	sed			
Calibrated By:	Terry Wilde	S	#: 5743	8 Phone: 526-2761		12	Exten	sion			
CALIBRATION STANDARDS USED											
lī		<u> </u>	ALIBRA	TION STANDARDS	S OSED	7					
						╁			<b>=</b>   :		
						jc					
				INSTITUTE OF STANDA							
VALUES	FOR NATURAL PHYS	SICAL CONSTA	ANTS, OR	DERIVED FROM THE R	ATIO TYPE O	FSE	CLF CALIBR	ATION TE	CHNIQUES		
Dhyen	cal STD (106C) 20	LAB 0.0 ° +/-0.3 ° C		TEMPERATURE AND H)   Electronic STD (			23.0 ° +/-0	.5 ° C (30-4	15% RH)		
•	• •	0,0 ° +/-0.25 ° C	•		,			.0 ° C (20-	•		
		0.0 ° +/-0.5 ° C			L calibration are	as:		3.0 ° C (20			
Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.											
· ·	OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY										
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	and the second s										
			,		<del></del>			-			
	,			COMMENTS							

RETURNED BACK TO USER

NAME: DANA KEITH MORTON	BADGE: 35698	PH: 526-1274 AREA:	STC BLDG: EROB RM: W2D1
ID Number: 716333 Mfr: PCB Calibration Date: 7/17/2000 4:57:16 PM	Model: 35	0A04 Noun Name: A ACTION CODE	CCELEROMETER Serial #: 1427 AS FOUND
Next Cal Due Date: 7/12/2001	1 🗀	Acceptance Test	1 • In Tolerance
Charge Level: 1	2 🗀	Special Test	2 Out of Tolerance >1x <2x
Repair/Adj/etc C.L: 0	3	Calibration to MFG Specs	3 Out of Tolerance >2x <3x
Material Amount: 0	4	Clean	4 C Out of Tolerance >3x <5x
Charge Number: P44300001	5 🔲	Limited Calibration	5 C Out of Tolerance >5x
Cal Work Inst ID: PCB	6 🗖	Functional Check	6 Out of Tolerance-Undetermined
Outside Vendor: PCB	7	Performance Check	7 Inoperative
,	8	Modify	8 Damaged
	9 🗖	Repair-needs Charge Level	9 Not Used
	10	Other	10 Not Determined
,	•		11 Excessed
Calibrated By: Mike Stears	S#: 6176	7 Phone: 526-2761	12 Extension
•			
	CALIBRA	ATION STANDARDS USED	
STANDARDS USED ARE TRACEABLE	TO THE NATIONAL	INSTITUTE OF STANDARDS ANI	TECHNOLOGY DERIVED FROM ACCEPTED
			PE OF SELF CALIBRATION TECHNIQUES
Physical CTD (106CA 20.0.0		Y TEMPERATURE AND HUMIDIT	
	+/-0.3 ° C (40-55% F +/-0.25 ° C (30-45%		23.0° +/-0.5°C (30-45% RH) 23.0° +/-1.0°C (20-50% RH)
Phys/Dim CAL (Lab 111) 20.0 °	+/-0.5 ° C (20-50% F		•
Manufacturer's environmental specific	itions are evaluated fo	or conformance when calibrations are	performed outside the above stated conditions.
OUT	OF TOLERANCE C	ONDITIONS FOUND DURING CAI	LIBRATION
NOMINAL (STD)	UNITS	AS FOUND	(UUT) MFG. ACCURACY
			•
		COMMENTS.	

11/29/2007

NAME: DANA KEITH MO	RTON	BADGE: 35698	PH: 526-		AREA: STC		BLDG	: EROB	RM: W2D1	
ID Number: 716333 Calibration Date: 8/2	Mfr: PCB 1/2003 11:44:08 A	Model: 35		Noun N	lame: ACCI	ELE	ROMETE		Serial #: 1427 OUND	
Next Cal Due Date: 8/2	1/2004	ı E	Accepta	nce Test		i	● In To	olerance		
Charge Level: 2		2	Special	Test	•	2	O Out o	of Toleran	ce >1x <2x	
Repair/Adj/etc C.L: 0		3 ₹	Calibrat	ion to MFG	Specs	3	Out o	of Toleran	ce >2x <3x	
Material Amount: 0		4	Clean			4	O Out o	of Toleran	ce >3x <5x	
Charge Number: 100	348027	5	Limited	Calibration		5	O Out o	of Toleran	ce >5x	
Cal Work Inst ID: PC	В	6	Function	nal Check		6	O Out o	of Toleran	ce-Undetermined	
Outside Vendor: PC	В	7	Perform	ance Check		7	[ Inope	erative		
		8	Modify			8	Dam Dam	aged		
		9	Repair-r	needs Charge	e Level	9	Not I	Used		
*		10	Other			10	Not I	Determine	d	
						11	Exce	ssed		
Calibrated By: Star	n Zohner	S#: 581	146 Phone	: 526-2761		12	Exte	nsion	•	
CALIBRATION STANDARDS USED										
		CALIBR	ATIONSIA	ANDARDS	USED	ī		<u> </u>	<u> </u>	
						ΪĒ				
STANDARDS USED VALUES FOR N	ARE TRACEABLE 1	TO THE NATIONAL L CONSTANTS, OF	L INSTITUTE R DERIVED FI	OF STANDAI ROM THE RA	RDS AND TEC	CHNO F SE	OLOGY DE LF CALIBE	RIVED FR	OM ACCEPTED CHNIQUES	
	<u> </u>	LABORATOR	RY TEMPERA	TURE AND H	UMIDITY					
Physical STD		+/-0.3 ° C (40-55%)	, i	ectronic STD (10	•			.5 °C (30-4	·	
Dimensional S  Phys/Dim CA	• •	+/-0.25 ° C (30-45% +/-0.5 ° C (20-50%)	1	ectronic CAL (L maining S&CL	-	ıe.		.0 ° C (20-5 3 0 ° C (20-		
Phys/Dim CAL (Lab 111) 20.0 ° +/-0.5 ° C (20-50% RH) Remaining S&CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.										
Manufacturer 5 cm							<del></del>	e above state	tu turillors.	
NOMINAL (STD		OF TOLERANCE ( UNITS	CONDITIONS		FOUND (U			MF	G. ACCURACY	
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COMMENTS										

PCB QA# 102391

11/29/2007

NAME: DANA KEITH MORTON			ADGE: 35	698 PH: 526-1274	AREA: STC BLDG: EROB RM: W2D1					
ID Number: 71633 Calibration Date:	3 Mfr: P 6/21/2005	CB	Мо	odel: 350A04 Noun	Name: ACCELE	EROMETER AS FOUND	Serial #: 1427			
Next Cal Due Date	: 5/24/2006	1		Acceptance Test	1 📵 In To	olerance				
Charge Level:	2	2		Special Test	2 C Out o	of Tolerance >1x	<2x			
Repair/Adj/etc C.L	.: 0	3	V	Calibration to MFG Specs	3 Out of Tolerance >2x <3x					
Material Amount:	0	4		Clean	4 .C Out o	of Tolerance >3x	<5x			
Charge Number:	100853GSA	5		Limited Calibration	5 O Out o	of Tolerance >5x				
Cal Work Inst ID:	РСВ	6		Functional Check	6 C Out o	of Tolerance-Und	etermined			
Outside Vendor:	PCB	7		Performance Check	7   Inope	erative				
		8		Modify	8 🗍 Dam	aged				
		9		Repair-needs Charge Level	9   Not 1	Used				
•		10		Other	10 🔲 Not 1	Determined				
					11 Exce	ssed				
Calibrated By: Scott Lish S#: 101141 Phone: 526-2761 12 T Extension										
듄			CA	LIBRATION STANDARD	OS USED					
ŀ			<u> </u>							
							==			
				TIONAL INSTITUTE OF STAND						
			LABO	DRATORY TEMPERATURE AND	HUMIDITY					
•	il STD (106C)			(40-55% RH)   Electronic STD		23.0° +/-0.5°C (	-			
	im CAL (Lab 111)			(30-45% RH)   Electronic CAL (20-50% RH)   Remaining S&0	CL calibration areas:	23.0 ° +/-1.0 ° C (7 23.0 ° +5,-3.0 ° C	•			
-				aluated for conformance when cali			,			
NOMINAL	(STD)	OUT	OF TOLE! UN!	RANCE CONDITIONS FOUND DI TS A	URING CALIBRAT S FOUND (UUT		MFG. ACCURACY			
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QA# 114639 S&CL overcheck required.

NAME: DANA KEITI	MORTON	В	ADGE: 3	5698 PH: 526-1	·	ARE	A: ST	C BLDG: EROB	RM: W2D1
ID Number: 71633 Calibration Date:	3 Mfr: F 6/1/2006	СВ	М	odel: 350A04 ACTION COI		Name:	AC	CELEROMETER AS FOUND	Serial #: 1427
Next Cal Due Date	: 5/17/2007	1		Acceptance Test		Ì	<b>©</b>	In Tolerance	
Charge Level:	2	2		Special Test		2	0	Out of Tolerance >1x	<2x
Repair/Adj/etc C.L	: 0	3	V	Calibration to MFG	Specs	3	O	Out of Tolerance >2x	<3x
Material Amount:	0	4		Clean		4	O	Out of Tolerance >3x	<5x
Charge Number:	100853GSA	853GSA 5 Limited Calibration 5 O Out of Tolerance >							
Cal Work Inst ID:	PCB	6		Functional Check		6	O	Out of Tolerance-Unde	etermined
Outside Vendor:	utside Vendor: PCB 7 Performance Check 7 Inoperative								
		8		Modify		8	П	Damaged	
		9		Repair-needs Charg	e Level	. 9		Not Used	
		10		Other		10		Not Determined	•
						11		Excessed	
Calibrated By:	Scott Lish	S#:	101141	Phone: 526-2761		12		Extension	
		1					_		
			<u>C</u> ,	ALIBRATION STA	NUARUS	USE	ע		
• [									
STANDARDS I VALUES I	USED ARE TRAC	EABLE TO HYSICAL	THE NA	ATIONAL INSTITUTE ( ANTS, OR DERIVED FR	OF STANDA OM THE RA	RDS A	ND T	ECHNOLOGY DERIVED OF SELF CALIBRATION	FROM ACCEPTED TECHNIQUES
			LAB	ORATORY TEMPERAT	URE AND H	IUMII	OITY		
-	I STD (106C)				tronic STD (1			23.0 ° +/-0.5 ° C (	
	ional STD (106B) im CAL (Lab 111)				tronic CAL (I taining S&CL			23.0 ° +/-1.0 ° C () areas: 23.0 ° +5,-3.0 ° C	•
	•		:	•	_			erformed outside the above	
	et a en a 11 ontinetit 7								Stated Controller
NOMINAL	(STD)	OUT	UN	RANCE CONDITIONS I ITS					MFG. ACCURACY
		_							
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				COMME	NTS				

QA# 117750 S&CL overcheck required.

11/29/2007

NAME: DANA KEIT	H MORTON	В	ADGE: 35	698 PH: 520	5-1274 ,	ARE	A: STC	BLDG	: EROB	RM: W2D1
ID Number: 71633 Calibration Date:	33 Mfr: F 6/13/2007	CB <sup>†</sup>	Мо	del: 350A04 ACTION C		ı Name	: ACCI	ELEROMETE AS F	ER OUND	Serial #: 1427
Next Cal Due Date	e: 5/24/2008	1		Acceptance Test		1	<b>●</b> In	Tolerance		
Charge Level:	2	2		Special Test		2	ОО	ut of Tolerand	ce >1x <2x	•
Repair/Adj/etc C.I	<b>.</b> : 0	3	•	Calibration to MF	G Specs	3	C o	ut of Tolerand	ce >2x <3x	
Material Amount:	0	4		Clean ,		4	C 0	ut of Tolerand	ce >3x <5x	
Charge Number:	100853GSA	. 5		Limited Calibration	on	5	0 0	ut of Tolerand	ce >5x	
Cal Work Inst ID:	PCB	<sub>.</sub> 6		Functional Check		6	0 0	ut of Tolerand	e-Undeter	mined
Outside Vendor:	PCB	7		Performance Che	ck	7	∏ In	operative		
		8		Modify		8	D	amaged		·
		9		Repair-needs Cha	rge Level	9	ΠN	ot Used		
		10		Other		10	□ N	ot Determine	i	
					,	11	E	xcessed		
Calibrated By:	Scott Lish	S#:	101141	Phone: 526-276	1	- 12	□ E	xtension	٠.	
			<i>C</i> 4	LIDDATION		SO LION				•
F			CA	LIBRATION ST	ANDAKI		'D	1		
·						<u> </u>		1		
STANDARDS VALUES	USED ARE TRAC	EABLE TO	O THE NA	TIONAL INSTITUT NTS, OR DERIVED 1	E OF STAND FROM THE	DARDS A	AND TEC	CHNOLOGY DI F SELF CALIBI	ERIVED FRO	OM ACCEPTED CHNIQUES
Parklandisassa V. didasassa va annonces e e e e			LABO	RATORY TEMPER	ATURE ANI	HUMII	DITY			
•	al STD (106C)			1	lectronic STD				.5 °C (30-4	•
	sional STD (106B) sim CAL (Lab 111)			` , ' !	lectronic CAL emaining S&0	•	•		.0 ° C (20-5 3.0 ° C (20-	•
•				•				ŕ	·	•
Maduractor	ter 3 chylrondien(3)			aluated for conforma		<del></del>		·	ie above stati	a conditions.
NOMINAL	(STD)	OUT	OF TOLER UNIT	ANCE CONDITION TS		S FOU			MF	G. ACCURACY
	<del></del>	· ·	<del> </del>	<del> </del>	<del></del>			<del></del>		<u> </u>
										·
	`	-								
				COMM	IENTS				•	

QA# 134166 S&CL overcheck required.

NAME: DANA KEIT	H MORTON	GE: 3569	PH: 526-1274	AREA: STC		BLDG	EROB	RM: W2D1		
ID Number: 7178. Calibration Date:	30 Mfr: Po 9/18/2000 1:53		Mod	lel: 350	)B04 Noun :	Name: ACC	ELE	ROMETE	R AS FC	Serial #: 6203
Next Cal Due Date	e: 8/15/2001		1		Acceptance Test	1	. (	In Tole	rance	
Charge Level:	1		2		Special Test		2 (	Out of	Tolerance	e >1x <2x
Repair/Adj/etc C.l	L: 0		3	V	Calibration to MFG	Specs 3	6	Out of	Tolerance	e >2x <3x
Material Amount:	0		4		Clean	, 4		Out of	Tolerance	e >3x <5x
Charge Number:	572152030		5		Limited Calibration	4	i (	Out of	Tolerance	e >5x
Cal Work Inst ID:	PCB		6		Functional Check	ć	5 (	Out of	Tolerance	e-Undetermined
Outside Vendor:	PCB		7		Performance Check	7	, [	Inopera	ative	
			8		Modify	8	8 [	] Damag	ged	
			9		Repair-needs Charge	Level 9	• [	Not Us	sed	
	·	•	10		Other	1	0 [	Not De	etermined	
			•			. 1	1 [	Excess	ed	
Calibrated By:	Mike Stears		S#:	61767	Phone: 526-2761		2	Extens	ion	•
CALIBRATION STANDARDS USED										
ſī	,		CAI	JIBKA	TION STANDARDS	SUSED	7		<u> </u>	<b>—</b>
<u>[</u>			······································							
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					INSTITUTE OF STANDA DERIVED FROM THE R					
			LABOR	ATORY	Y TEMPERATURE AND	HUMIDITY				
-	al STD (106C)	20.0 ° +/-0.3	3°C (40	)-55% R	H)   Electronic STD (	(106D)		23.0 ° +/-0	.5 ° C (30-4	15% RH)
	sional STD (106B) Dim CAL (Lab 111)	20.0 ° +/-0.3				•	•••		.0 ° C (20-5 3.0 ° C (20-	·
•	, ,	20.0 ° +/-0.:							,	•
MINUMETER	rer's environmental				r conformance when calib				e above stat	ed conditions.
NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY										
		······								
	COMMENTS									

11/29/2007

D Number: 717830	M: W2D1
Charge Level: 2 2 3 Special Test 2 0 Out of Tolerance >1x < Repair/Adj/etc C.L: 0 3  Calibration to MFG Specs 3 0 Out of Tolerance >2x < Material Amount: 0 4  Clean 4 0 Out of Tolerance >2x < Material Amount: 100348027 5  Limited Calibration 5 0 Out of Tolerance >3x < Charge Number: 100348027 5  Limited Calibration 5 0 Out of Tolerance >5x   Cal Work Inst ID: PCB 6  Functional Check 6 0 Out of Tolerance-Under Outside Vendor: PCB 7  Performance Check 7  Inoperative 8  Modify 8  Damaged 9  Repair-needs Charge Level 9  Not Used 10  Not Determined 11  Excessed 10  Not Determined 11  Excessed 10  Extension	al #: 6203
Repair/Adj/etc C.L: 0 3	•
Material Amount: 0	x <2x
Charge Number: 100348027 5	x <3x
Call Work Inst ID: PCB 6	x <5x
Outside Vendor: PCB 7 Performance Check 7 Inoperative  8 Modify 8 Damaged  9 Repair-needs Charge Level 9 Not Used  10 Other 10 Not Determined  11 Excessed  Calibrated By: Stan Zohner S#: 58146 Phone: 526-2761 12 Extension  CALIBRATION STANDARDS USED  STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACC VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQU  LABORATORY TEMPERATURE AND HUMIDITY  Physical STD (106C) 20.0° +/-0.3° C (40-55% RH) Electronic STD (106D) 23.0° +/-0.5° C (30-45% RH)  Dimensional STD (106B) 20.0° +/-0.25° C (30-45% RH) Electronic CAL (Lab 112) 23.0° +/-1.0° C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0° +/-0.5° C (20-50% RH) Remaining S&CL calibration areas: 23.0° +5,-3.0° C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions of the conditions are performed outside the above stated conditions.	<b>X</b>
8	ndetermined
9 Repair-needs Charge Level 9 Not Used  10 Other 10 Not Determined  11 Excessed  Calibrated By: Stan Zohner S#: 58146 Phone: 526-2761 12 Extension  CALIBRATION STANDARDS USED  STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACC VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQU  LABORATORY TEMPERATURE AND HUMIDITY  Physical STD (106C) 20.0° +/-0.3° C (40-55% RH)   Electronic STD (106D) 23.0° +/-0.5° C (30-45% RH)  Dimensional STD (106B) 20.0° +/-0.25° C (30-45% RH)   Electronic CAL (Lab 112) 23.0° +/-1.0° C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0° +/-0.5° C (20-50% RH)   Remaining S&CL calibration areas: 23.0° +5,-3.0° C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditional conformance when calibrations are performed outside the above stated conditions.	
Calibrated By: Stan Zohner S#: 58146 Phone: 526-2761 12 Extension  CALIBRATION STANDARDS USED  CALIBRATION STANDARDS USED  STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACC VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQU  LABORATORY TEMPERATURE AND HUMIDITY  Physical STD (106C) 20.0° +/-0.3° C (40-55% RH)   Electronic STD (106D) 23.0° +/-0.5° C (30-45% RH)  Dimensional STD (106B) 20.0° +/-0.5° C (30-45% RH)   Electronic CAL (Lab 112) 23.0° +/-0.5° C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0° +/-0.5° C (20-50% RH)   Remaining S&CL calibration areas: 23.0° +5,-3.0° C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.	
CALIBRATION STANDARDS USED  CALIBRATION STANDARDS USED  STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACC VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNOLOGY DERIVED FROM ACC VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNOLOGY DERIVED FROM THE RA	
CALIBRATION STANDARDS USED  CALIBRATION STANDARDS USED  STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACC VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQU  LABORATORY TEMPERATURE AND HUMIDITY  Physical STD (106C) 20.0° +/-0.3°C (40-55% RH)   Electronic STD (106D) 23.0° +/-0.5°C (30-45% RH)  Dimensional STD (106B) 20.0° +/-0.25°C (30-45% RH)   Electronic CAL (Lab 112) 23.0° +/-1.0°C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0° +/-0.5°C (20-50% RH)   Remaining S&CL calibration areas: 23.0° +5,-3.0°C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditional conformance when calibrations are performed outside the above stated conditional conformance when calibrations are performed outside the above stated conditional conformance when calibrations are performed outside the above stated conditional conformance when calibrations are performed outside the above stated conditional conformance when calibrations are performed outside the above stated conditional conformance when calibrations are performed outside the above stated conditional conformance when calibrations are performed outside the above stated conditions.	
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STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACC VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUE  LABORATORY TEMPERATURE AND HUMIDITY  Physical STD (106C) 20.0° +/-0.3°C (40-55% RH)   Electronic STD (106D) 23.0° +/-0.5°C (30-45% RH)  Dimensional STD (106B) 20.0° +/-0.25°C (30-45% RH)   Electronic CAL (Lab 112) 23.0° +/-1.0°C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0° +/-0.5°C (20-50% RH)   Remaining S&CL calibration areas: 23.0° +5,-3.0°C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.	
STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACC VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUE  LABORATORY TEMPERATURE AND HUMIDITY  Physical STD (106C) 20.0° +/-0.3°C (40-55% RH)   Electronic STD (106D) 23.0° +/-0.5°C (30-45% RH)  Dimensional STD (106B) 20.0° +/-0.25°C (30-45% RH)   Electronic CAL (Lab 112) 23.0° +/-1.0°C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0° +/-0.5°C (20-50% RH)   Remaining S&CL calibration areas: 23.0° +5,-3.0°C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.	
VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUE  LABORATORY TEMPERATURE AND HUMIDITY  Physical STD (106C) 20.0° +/-0.3°C (40-55% RH)   Electronic STD (106D) 23.0° +/-0.5°C (30-45% RH)  Dimensional STD (106B) 20.0° +/-0.25°C (30-45% RH)   Electronic CAL (Lab 112) 23.0° +/-1.0°C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0° +/-0.5°C (20-50% RH)   Remaining S&CL calibration areas: 23.0° +5,-3.0°C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION	CCEPTED
Physical STD (106C) 20.0° +/-0.3° C (40-55% RH)   Electronic STD (106D) 23.0° +/-0.5° C (30-45% RH)  Dimensional STD (106B) 20.0° +/-0.25° C (30-45% RH)   Electronic CAL (Lab 112) 23.0° +/-1.0° C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0° +/-0.5° C (20-50% RH)   Remaining S&CL calibration areas: 23.0° +5,-3.0° C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions are performed outside the above stated conditions.	
Dimensional STD (106B) 20.0 ° +/-0.25 °C (30-45% RH)   Electronic CAL (Lab 112) 23.0 ° +/-1.0 °C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0 ° +/-0.5 °C (20-50% RH)   Remaining S&CL calibration areas: 23.0 ° +5,-3.0 °C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions are performed outside the above stated conditions.	
Phys/Dim CAL (Lab 111) 20.0° +/-0.5°C (20-50% RH) Remaining S&CL calibration areas: 23.0° +5,-3.0°C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated condition.  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION	•
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION	•
	nditions.
	CCURACY
	· · · · · · · · · · · · · · · · · · ·
COMMENTS	

PCB QA# 102393

11/29/2007

NAME: DANA KEIT	H MORTON	В	BADGE: 35698 PH: 526-1274			AREA: STC BLDG: EROB RM: W2D1				
ID Number: 71783 Calibration Date:	0 Mfr: PO	СВ	N	lodel: 350B04		Name:	: AC	CELEROMETER AS FOUND	Serial #: 6203	
Next Cal Due Date	: 10/21/2005	1		Acceptance Tes	st	1	•	In Tolerance		
Charge Level:	2	2		Special Test		2	0	Out of Tolerance >1x	<2x	
Repair/Adj/etc C.L	<b>.</b> : 0	3		Calibration to N	MFG Specs	3	O	Out of Tolerance >2x	<3x	
Material Amount:	0	4		Clean		4	0	Out of Tolerance >3x	<5x	
Charge Number:	100664GSA	5		Limited Calibra	ition	5	C	Out of Tolerance >5x		
Cal Work Inst ID:	PCB	6		Functional Che	ck	6	0	Out of Tolerance-Und	etermined	
Outside Vendor:	PCB	7		Performance Cl	neck	7		Inoperative		
•		8		Modify		8		Damaged		
		9		Repair-needs C	harge Level	9		Not Used		
	-	10		Other		10		Not Determined		
						11		Excessed	•	
Calibrated By:	Scott Lish	S#:	10114	Phone: 526-2	761	12		Extension	. •	
CALIBRATION STANDARDS USED										
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	18									
L			<u> </u>			<u>ل</u>				
STANDARDS VALUES	USED ARE TRACE FOR NATURAL PH	ABLE TO	THE N	ATIONAL INSTITU ANTS, OR DERIVE	TE OF STAND. D FROM THE R	ARDS A	ND T	TECHNOLOGY DERIVED OF SELF CALIBRATION	FROM ACCEPTED TECHNIQUES	
			LAB	ORATORY TEMPI	ERATURE AND	HUMII	OITY			
•	al STD (106C)			(40-55% RH)	Electronic STD			23.0° +/-0.5°C (	•	
	sional STD (106B) im CAL (Lab 111)			(30-45% RH)   (20-50% RH)	Electronic CAL Remaining S&C	-		23.0 ° +/-1.0 ° C ( areas: 23.0 ° +5,-3.0 ° C	•	
Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.										
NOMINAL	(STD)	OUT		ERANCE CONDITIO					MFG. ACCURACY	
	***************************************	. —		· · · · · · · · · · · · · · · · · · ·						
				COM	MENTS					

Unit sent to manufacture for calibration. QA# 111221

11/29/2007 -

NAME: DANA KEITH	MORTON	BADG	E: 35698 PH: 52	6-1274	AREA: ST	C BLDG: EROB	RM: W2D1
ID Number: 717830 Calibration Date:	Mfr: PC	CB <sub>.</sub>	Model: 350B04 ACTION C		lame: ACC	CELEROMETER AS FOUND	Serial #: 6203
Next Cal Due Date:	11/7/2006	1 🗆	Acceptance Test		1 6	In Tolerance	
Charge Level:	2	2 🗀	Special Test		2 O	Out of Tolerance >1x	<2x
Repair/Adj/etc C.L:	0	3. 🔽	Calibration to MI	FG Specs	3 C	Out of Tolerance >2x	<3x
Material Amount:	0	4	Clean		4 O	Out of Tolerance >3x	<5x
Charge Number:	100853GSA	5	Limited Calibrati	on	5 O	Out of Tolerance >5x	
Cal Work Inst ID:	PCB	6	Functional Check		6 - O	Out of Tolerance-Unde	etermined
Outside Vendor:	PCB	7 🗀	Performance Che	ck	7	Inoperative	
		8 🗖	Modify		.8 🔲	Damaged	
		9	Repair-needs Cha	arge Level	9 🔲	Not Used	
		10	Other		10 🔲	Not Determined	
,					11 🔲	Excessed	
Calibrated By:	Scott Lish	S#: 101	141 Phone: 526-276	51	12 🔲	Extension	
•			CALIBRATION ST	FANDADDS	LISED		
			CALIBRATIONS	ANDARDS	COED		
				·			
				}			
						ECHNOLOGY DERIVED OF SELF CALIBRATION	
Processor - spanification (		I.	ABORATORY TEMPER	ATURE AND H	UMIDITY		
•	• •			lectronic STD (1	06D)	23.0 ° +/-0.5 ° C (	30-45% RH)
	•			Electronic CAL (L ternaining S&CL	-	23.0 ° +/-1.0 ° C (7) reas: 23.0 ° +5,-3.0 ° C	
•			, , ,	-		rformed outside the above	
		OUT OF TO	LERANCE CONDITION	is found dur	ING CALIB	RATION	
NOMINAL (	STD)	1	JNITS	ASI	FOUND (	UUT) A	MFG. ACCURACY
					<del></del>		
				••••			
			COMM	IENTS			

QA#115895 S&CL overcheck required.

NAME: DANA KEITH	MORTON	В	ADGE:	35698 PH: 526-1274	ARE	A: ST	BLDG: EROB RM: W2D1	
ID Number: 717830 Calibration Date:	) Mfr: P 12/14/2006	СВ		Model: 350B04 Noun ACTION CODE	Name:	ACC	CELEROMETER Serial #: 6203 AS FOUND	
Next Cal Due Date:	11/29/2007	1		Acceptance Test	1	<b>6</b>	In Tolerance	
Charge Level:	2	2		Special Test	2	0	Out of Tolerance >1x <2x	
Repair/Adj/etc C.L:	0	3	V	Calibration to MFG Specs	3	0	Out of Tolerance >2x <3x	
Material Amount:	0	4		Clean	4	0	Out of Tolerance >3x <5x	
Charge Number:	100853GSA	. 5		Limited Calibration	5	0	Out of Tolerance >5x	
Cal Work Inst ID:	PCB ·	6		Functional Check	6	0	Out of Tolerance-Undetermined	
Outside Vendor:	PCB	7		Performance Check	7		Inoperative	
•		8		Modify	8		Damaged )	
		9		Repair-needs Charge Level	9		Not Used	
		10		Other	10		Not Determined	
		,			11		Excessed	
Calibrated By:	Scott Lish	S#:	10114	Phone: 526-2761	12		Extension ,	
				CALUDDATION CTANDADD	e net	n.		
			<del>`</del>	CALIBRATION STANDARD	OSE OSE	<u>u</u>		
F					╬┈			
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STANDARDS U VALUES F	SED ARE TRACI	EABLE TO	O THE I	NATIONAL INSTITUTE OF STAND FANTS, OR DERIVED FROM THE I	ARDS A	ND T	ECHNOLOGY DERIVED FROM ACCEPTED OF SELF CALIBRATION TECHNIQUES	
			LA	BORATORY TEMPERATURE AND	HUMII	OITY	<u> </u>	
Physical	STD (106C)	20.0 ° +	/-0.3 ° C	(40-55% RH)   Electronic STD			23.0 ° +/-0.5 ° C (30-45% RH)	
	onal STD (106B)			C (30-45% RH)   Electronic CAL	•	•	23.0 ° +/-1.0 ° C (20-50% RH)	
	n CAL (Lab 111)			2 (20-50% RH)   Remaining S&C				
Manufacture	r's environmental	specificat	ons are	evaluated for conformance when calil	brations	are pe	rformed outside the above stated conditions.	
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY								
		-						
		_					`	
	<u> </u>							
				COMMENTS				

QA# 122338 S&CL overcheck required.

12/12/2007

NAME: DANA KEITH N	MORTON	ВА	DGE: 35698	PH: 526-1274	AREA: STC	BLDG: EROB	RM: W2D1	
ID Number: 717830 Calibration Date:	Mfr: PC	В	Model: 3:	50B04 Noun	Name: ACCELERON	METER AS FOUND	Serial #: 6203	
Next Cal Due Date: 1	11/26/2008	1	☐ Accep	tance Test	1 🧖 In Toleran	ce		
Charge Level:	2	2	Specia	l Test	2 C Out of Tol	erance >1x <2	х	•
Repair/Adj/etc C.L: (	0	3	マ Calibra	ation to MFG Specs	3 C Out of Tol	erance >2x <3	x	
Material Amount: (	0	4	Clean		4 C Out of Tol	lerance >3x <5	x	
Charge Number:	100853GSA	5	Limite	d Calibration	5 C Out of Tol	erance >5x		•
Cal Work Inst ID:	PCB ·	6	Functi	onal Check	6 C Out of Tol	lerance-Undete	rmined	
Outside Vendor: I	РСВ	7	Perfor	mance Check	7   Inoperative	e		
		8	┌ Modif	<b>y</b> .	8 Damaged			
		9	☐ Repair	-needs Charge Level	9 Not Used			
,		10	Other	•	10 Not Determ	mined		
					11   Excessed			
Calibrated By:	Scott Lish	S#: 1	101141 Phor	ne: 526-2761	12   Extension			
			CAI	JIBRATION STAND	ADDSTISED			
			CAL	ABRATION STAND	ARDS CSED			
,								
			<u> </u>					
STANDARI VALUE	OS USED ARE TRA	ACEABLI PHYSIC	E TO THE NATI CAL CONSTANT	ONAL INSTITUTE OF S IS, OR DERIVED FROM	TANDARDS AND TECHN THE RATIO TYPE OF SE	OLOGY DERIVE	ED FROM ACCEPTED ON TECHNIQUES	,
			LABOR	ATORY TEMPERATURE	AND HUMIDITY			
-	sical STD (106C)		° +/-0.3°C (40	•	STD (106D)	23.0 ° +/-0.5 ° C		٠
	ensional STD (106B s/Dim CAL (Lab 111	•	) ° +/-0.25 ° C (3 ) ° +/-0.5 ° C (20	- !	g S&CL calibration areas:	23.0 ° +/-1.0 ° C 23.0 ° +5,-3.0 ° C		
_	* * *		•		n calibrations are performe	•	, , , , , , , , , , , , , , , , , , ,	
NOMINAL (	(STD)	OI	UT OF TOLERA UNITS		ND DURING CALIBRATION AS FOUND (UUT)		IFG. ACCURACY	
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				COMMENTS	······································			

COMMENT

Calibrated at PCB QA# 141994 S&CL overcheck required.

11/29/2007

NAME: DANA KEIT	H MORTON	BADGE:	35698		PH: 52	6-1274	AREA: STC		BLDG	: EROB	RM: V	V2D1
ID Number: 72127 Calibration Date:	78 Mfr: F 8/21/2003 12:	-	Model:	350B	•	Noun	Name: ACC <b>DE</b>	ELE	ROMETE		Serial #: FOUND	6657
Next Cal Due Date	e: 8/21/2004	•	1		Accept	ance Test		1	● In To	lerance		
Charge Level:	2		2		Special	Test		2	Out o	f Tolera	nce >1x <	2x
Repair/Adj/etc C.I	.: O		3	V	Calibra	tion to MFC	Specs :	3	Out o	of Tolera	nce >2x <	3x
Material Amount:	0	·	4 l		Clean			4	C Out o	f Tolera	nce >3x <	5x
Charge Number:	100348027		5		Limited	d Calibration	า	5	O Out o	of Tolera	nce >5x	
Cal Work Inst ID:	PCB		6		Function	nal Check		6	Out o	f Tolera	nce-Undet	ermined
Outside Vendor:	PCB		7		Perform	nance Check	c	7	☐ Inope	erative		
			8		Modify	,		8	☐ Dam	aged		
			9		Repair-	needs Charg	ge Level	9	☐ Not U	Jsed		
			10		Other		٠	10	☐ Not I	Determin	ed	
								11	☐ Exce	ssed		
Calibrated By:	Stan Zohner	•	S#: 5	8146	Phon	e: 526-2761		12	Exter	nsion		
			~A1 1E	ID A T	יז אחני	ΓANDARD	c licen					
F					TONE		3 CSEB	7				
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	USED ARE TRAC FOR NATURAL P											
		LA	BORAT	ORY	TEMPER	ATURE AND	HUMIDITY					
-	al STD (106C)	20.0 ° +/-0.3 ° C	-	-		Electronic STD			23.0 ° +/-(			
	sional STD (106B) bim CAL (Lab 111)	20.0 ° +/-0.25 ° 20.0 ° +/-0.5 ° C	•			Electronic CAL Remaining S&C	(Lab 112) L calibration are	eas:	23.0 ° +/-1 23.0 ° +5.	•	20-50% RH)	•
·	rer's environmenta		,	•	1	_						ons.
							RING CALIB					
NOMINAL	(STD)		NITS	. E CO			S FOUND (U			M	FG. ACC	URACY
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	\				COMN	MENTS						

PCB QA# 102393

11/29/2007

NAME: DANA KEI	TH MORTON		BADGE: 35698 PH: 526-1274			AREA: STC BLDG: EROB RM: W2D1					
ID Number: 7212 Calibration Date:	78 Mfr:	PCB	N	fodel: 350B04 ACTION CODE	Noun N	ame	AC	CELEROMETER  AS FOUND	Serial #: 6657		
Next Cal Due Date	te: 10/21/2005	1		Acceptance Test		1	•	In Tolerance			
Charge Level:	2	2		Special Test		2	O	Out of Tolerance >1x	<2x		
Repair/Adj/etc C.	L: 0	3	Y	Calibration to MFG Sp	ecs	3	O	Out of Tolerance >2x	<3x		
Material Amount	: 0	4		Clean		4	С	Out of Tolerance >3x	<5x		
Charge Number:	100664GSA	. 5		Limited Calibration		5	0	Out of Tolerance >5x			
Cal Work Inst ID	: PCB	6		Functional Check		6	С	Out of Tolerance-Und	etermined		
Outside Vendor:	PCB 1	7		Performance Check		7.		Inoperative			
		8		Modify		8		Damaged			
		9		Repair-needs Charge L	evel	9		Not Used	4		
		10		Other		10		Not Determined			
	V.			·		11		Excessed	•		
Calibrated By:	Scott Lish	S#:	10114	1 Phone: 526-2761	•	12		Extension			
				NA E ERWA A TOLONIC COM A NIV	ABBC	T.O.		•			
Ī				CALIBRATION STANI	DAKUS	USE	עי	<u> </u>			
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				ATIONAL INSTITUTE OF S ANTS, OR DERIVED FROM							
	,		LA	BORATORY TEMPERATUR	E AND H	UMII	OITY				
Physic	cal STD (106C)	20.0 °	+/-0.3 ° C	(40-55% RH)   Electron	ic STD (16	)6D)		23.0 ° +/-0.5 ° C (	30-45% RH)		
	nsional STD (106B) Dim CAL (Lab 111				ic CAL (L			23.0° +/-1.0°C (	•		
				evaluated for conformance wh	ng S&CL			•			
111111111111111111111111111111111111111	7707 FERTHORNIC								states conditions.		
NOMINAL	(STD)			ERANCE CONDITIONS FOU NITS					MFG. ACCURACY		
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				COMMENT	'S						

Sent to manufacture for calibration. QA# 111221

# INL CALIBRATION INPUT DATA 11/29/2007

NAME: DANA KEIT	H MORTON	BADG	E: 35698 PH: 5	26-1274 AR	EA: STC	BLDG: EROB	RM: W2D1
ID Number: 7212' Calibration Date:	78 Mfr: P 11/7/2005	СВ	Model: 350B04 ACTION 0		e: ACCELER	OMETER AS FOUND	Serial #: 6657
Next Cal Due Dat	e: 11/7/2006	1 🗔	Acceptance Test	1	In Tole	rance	
Charge Level:	2	2 🗀	Special Test	2	Out of	Tolerance >1x <	2x
Repair/Adj/etc C.	L: 0	3	Calibration to M	FG Specs 3	O Out of	Tolerance >2x <	3x
Material Amount:	0	4 .	Clean	4	Out of	Tolerance >3x <	5x
Charge Number:	100853GSA	5 <sup>′</sup> 🗔	Limited Calibrat	ion 5	Out of	Tolerance >5x	•
Cal Work Inst ID:	PCB	6 🗀	Functional Chec	k 6	Out of	Tolerance-Undet	ermined
Outside Vendor:	PCB	7	Performance Ch	eck 7	Inopera	ttive	
		8	Modify	8	☐ Damag	ed	
		9 🗀	Repair-needs Ch	arge Level 9	☐ Not Us	ed	
		10	Other	10	Not De	termined	
				11	Excess	ed .	
Calibrated By:	Scott Lish	S#: 101	141 Phone: 526-27	61 12	Extensi	on	
			CALIDDATIONS	TANDADDE HE	ED		•
F			CALIBRATION S	TANDARDS US	<u> </u>		
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			E NATIONAL INSTITU				
ATTACA CONT.		1	LABORATORY TEMPE	RATURE AND HUM	IDITY		
-	al STD (106C)			Electronic STD (106D)		23.0 ° +/-0.5 ° C (30	ŕ
	sional STD (106B) Dim CAL (Lab 111)			Electronic CAL (Lab 1 Remaining S&CL calib	•	23.0 ° +/-1.0 ° C (20 23.0 ° +53 0 ° C (2	•
			are evaluated for conform	_			
		OUT OF TO	OLERANCE CONDITIO	NS FOUND DURING	CALIBRATIO	ν .	
NOMINAL	(STD)		UNITS	AS FOU	JND (UUT)	M	FG. ACCURACY
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		<del></del>	СОМ	MENTS			

QA#115895 S&CL overcheck required.

11/29/2007

NAME: DANA KEITI	H MORTON	B	ADGE: 35	5698 PH: 526-1274	AREA	STC	BLDG: EROB	RM: W2D1
ID Number: 72127 Calibration Date:	8 Mfr: P	CB	Mo	odel: 350B04 No ACTION CODE	un Name: A	ACCELERO	METER AS FOUND	Serial #: 6657
Next Cal Due Date	: 11/29/2007	1		Acceptance Test	1 1	In Tolera	ance	•
Charge Level:	2	2		Special Test	2	Out of T	olerance >1x <	2x
Repair/Adj/etc C.L	.: 0	3	<b>V</b>	Calibration to MFG Specs	3 (	Out of T	olerance >2x <	Зх
Material Amount:	0	4		Clean	4	Out of T	olerance >3x <	5x
Charge Number:	100853GSA	5		Limited Calibration	5	Out of T	olerance >5x	
Cal Work Inst ID:	PCB	6		Functional Check	6	Out of T	olerance-Undet	ermined
Outside Vendor:	PCB	7		Performance Check	7	Inoperat	ive	
		8		Modify	8 [	Damage	d ,	
1 .		9		Repair-needs Charge Leve	9	Not Use	đ	,
		10		Other	10	Not Dete	ermined	,
					11 1	Excesse	d	
Calibrated By:	Scott Lish	S#:	101141	Phone: 526-2761	12	Extension	n On	24
•					•		*	
F	<u> </u>		CA	ALIBRATION STANDAL	RDS USEI	<u> </u>		<del></del>
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				ATIONAL INSTITUTE OF STA ANTS, OR DERIVED FROM TH				
	<u> </u>		LABO	ORATORY TEMPERATURE A	ND HUMIDI	TY		
Physica	1 STD (106C)	20.0 ° +	/-0.3 ° C	(40-55% RH) Electronic S	TD (106D)	23	.0 ° +/-0.5 °C (30	-45% <sub>,</sub> RH)
	sional STD (106B)			•	AL (Lab 112)		0.0 ° +/-1.0 ° C (20	•
	im CAL (Lab 111)				&CL calibrat		1.0 ° +5,-3.0 °C (2	· .
Manufactur	rer's environmental	specificat	ions are ev	valuated for conformance when c	alibrations a	re performed o	utside the above st	ated conditions.
NOMINAL	(STD)	OUT	OF TOLE	RANCE CONDITIONS FOUND ITS	DURING CA AS FOUN			FG. ACCURACY
						;		
				. —				
	1	<del></del>						<u> </u>
				COMMENTS				

QA# 122338 S&CL overcheck required.

12/12/2007

NAME; DANA KEITH N	MORTON	BA	DGE: 35698	PH: 526-1274	AREA: STC	BLDG: EROB	RM: W2D1
ID Number: 721278 Calibration Date:	Mfr: P 12/11/2007	СВ	Model: 350	B04 Nour	n Name: ACCELER	ROMETER AS FOUND	Serial #: 6657
Next Cal Due Date: 1	1/26/2008	1	Accepta	nce Test	1 🌀 In Tole	erance	•
Charge Level: 2	2 \	2 1	Special '	Γest	2 C Out of	Tolerance >1x <2	2x
Repair/Adj/etc C.L: (	)	3.	Calibrat	on to MFG Specs	3 C Out of	Tolerance >2x <3	3x
Material Amount: (	;	4	Clean		4 C Out of	Tolerance >3x <	5x
Charge Number: 1	100853GSA	5 [	Limited Limited	Calibration	5 C Out of	Tolerance >5x	
Cal Work Inst ID:	РСВ	6	Function	al Check	6 C Out of	Tolerance-Undete	ermined
Outside Vendor: I	PCB	. 7	Perform	ance Check	7 Inopera	ative	
		8	Modify		8   Damag	ged	
		9 [	Repair-r	eeds Charge Level	9 Not Us	sed	
		10	Other		10 Not De	etermined	
					11 Excess	ed	
Calibrated By:	Scott Lish	S#: 1	01141 Phone	526-2761	12 Fextens	ion	
•	•		CATT	DD ATTION OT AND	A DDC HCCD		
Í		,	CALI	BRATION STAND	I SED		
		2,					
STANDARD VALUE	OS USED ARE T	RACEABLE AL PHYSIC	E TO THE NATIO	NAL INSTITUTE OF S , OR DERIVED FROM	TANDARDS AND TEC	CHNOLOGY DERIV F SELF CALIBRATI	ED FROM ACCEPTED ON TECHNIQUES
		# ##	LABORA	TORY TEMPERATURI	E AND HUMIDITY		*
Phys	sical STD (106C)	20.0	° +/-0.3 °C (40-5	. '	c STD (106D)	23.0 ° +/-0.5 ° C	(30-45% RH)
Dime	ensional STD (10	•	° +/-0.25 ° C (30-		c CAL (Lab 112)	23.0 ° +/-1.0 ° C	
Phys	/Dim CAL (Lab I	11]) 20,0	° +/-0.5 ° C (20-56	9% RH) Remainir	ng S&CL calibration area	as: 23.0 ° +5,-3.0 °	C (20-50% RH)
Manufac	turer's environm	ental specifi	ications are evalua	ed for conformance whe	en calibrations are perfe	ormed outside the abo	ove stated conditions.
NOMINAL (	(STD)	OU	UNITS	CE CONDITIONS FOU	ND DURING CALIBR AS FOUND (UUT		MFG. ACCURACY
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				COMMENTS	S		

Calibrated at PCB QA# 141994 S&CL overcheck required.

NAME: DANA KEI	TH MORTON		BADGE:	71/3W/ 35698 PH: 526		ARE	A: STC	BLDG:	: EROB RM: W2D1			
ID Number: 7227 Calibration Date:		РСВ	N	Iodel: 353B03 ACTION CO		Name	: ACC	ELEROMETE AS FO		Serial #: 85173		
Next Cal Due Da	te: 5/24/2006	1		Acceptance Test	,	1	• In	1 Tolerance	-i			
Charge Level:	2	2		Special Test		2	0 0	out of Tolerance	e >1 x <2x			
Repair/Adj/etc C.	pair/Adj/etc C.L: 0 3 🔽 Calibration to MFG Specs							3 Out of Tolerance >2x <3x				
Material Amount	: 0	4		Clean		.4	00	Out of Tolerance >3x <5x				
Charge Number:	100853GSA	5		Limited Calibration	n	5	5 C Out of Tolerance >5x					
Cal Work Inst ID	: PCB	6		Functional Check		6	0.0	out of Tolerance	e-Undeten	mined		
Outside Vendor:	PCB	7		Performance Chec	:k	7	7 🔲 Inoperative					
	٠.	8		Modify	٠	8		amaged		·		
		9		Repair-needs Char	rge Level	9		lot Used				
		10		Other		10		lot Determined				
						11	□ E	xcessed				
Calibrated By:	Scott Lish	S#:	10114	Phone: 526-276	1	12	E	xtension				
ē.			_							•		
. [			<u>                                     </u>	ALIBRATION ST	ANDARD	S USE	<u>CD</u>	7	T	<b>–</b>		
1		·				╫				<b>=</b>		
									· _			
	STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES											
Physi	cal STD (106C)	20.0 ° +		ORATORY TEMPERA (40-55% RH)   El	ectronic STD (	-	D11 1	23.0° +/-0.	5°C (30-4	% RH)		
Dime	nsional STD (106B)	20.0 ° 4	-/-0.25 ° C	(30-45% RH)   EI	ectronic CAL (	(Lab 11	2)	23.0° +/-t.	0°C (20-50	% RH)		
Phys/	Dim CAL (Lab 111)	20.0 ° +	⊦/-0.5 ° C	(20-50% RH)   Re	emaining S&C	L calibr	ation are	as: 23.0 ° +5,-3	3.0 ° C (20±	60% RH)		
Manufact	urer's environmenta	l specifica	tions are	evaluated for conforman	ce when calib	rations	are per	formed outside the	e above state	d conditions.		
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY									G. ACCURACY			
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			·									
				COMM	ENTS							

QA# 114602 S&CL overcheck required.

11/30/2007

NAME: DANA KEITH MORTON BADGE: 35698	PH: 526-1274 ARE	EA: STC BLDG: EROB RM: W2D1						
ID Number: 722795 Mfr: PCB Model: 3 Calibration Date: 6/1/2006 A	Noun Name CTION CODE	:: ACCELEROMETER Serial #: 85173 AS FOUND						
Next Cal Due Date: 5/17/2007 1	tance Test 1	• In Tolerance						
Charge Level: 2 2 Specia	l Test 2	Out of Tolerance >1x <2x						
Repair/Adj/etc C.L: 0 3 🗹 Calibr	ation to MFG Specs 3	C Out of Tolerance >2x <3x						
Material Amount: 0 4	4	Out of Tolerance >3x <5x						
Charge Number: 100853GSA 5 Limite	d Calibration 5	C Out of Tolerance >5x						
Cal Work Inst ID: PCB 6	onal Check 6	C Out of Tolerance-Undetermined						
Outside Vendor: PCB 7 Perfor	mance Check 7	☐ Inoperative						
8 🗍 Modif	y	☐ Damaged						
9 🔲 Repai	-needs Charge Level 9	☐ Not Used						
10 Cother	10	Not Determined						
	11	☐ Excessed						
Calibrated By: Scott Lish S#: 101141 Pho	ne: 526-2761 12	Extension						
CALIBE	ATION STANDARDS USE	en .						
CALIBR	ATION STANDARDS USE							
STANDARDS USED ARE TRACEABLE TO THE NATIONA VALUES FOR NATURAL PHYSICAL CONSTANTS, O	L INSTITUTE OF STANDARDS A R DERIVED FROM THE RATIO	AND TECHNOLOGY DERIVED FROM ACCEPTED TYPE OF SELF CALIBRATION TECHNIQUES						
LABORATO	RY TEMPERATURE AND HUMI	DITY						
Physical STD (106C) 20.0 ° +/-0.3 ° C (40-55%		·						
Dimensional STD (106B) 20.0 ° +/-0.25 ° C (30-45° Phys/Dim CAL (Lab 111) 20.0 ° +/-0.5 ° C (20-50%		,						
Manufacturer's environmental specifications are evaluated	. , -	,						
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY								
		<del></del>						
	COMMENTS							

QA# 1147751 S&CL overcheck required.

11/30/2007

NAME: DANA KEIT	TH MORTON	BAD	OGE: 35698 PH: 5	526-1274 A	REA: STC	BLDG: EROB	RM: W2D1
ID Number: 7227 Calibration Date:	95 Mfr: F 6/13/2007	PCB	Model: 353B03		ne: ACCELER	OMETER AS FOUND	Serial #: 85173
Next Cal Due Dat	te: 5/24/2008	1 [	Acceptance Tes	t .~ .	l 🌀 In Tole	erance	
Charge Level:	2	2	Special Test	2	2 C Out of	Tolerance >1x <2	2x
Repair/Adj/etc C.	L: 0	3	Calibration to M	AFG Specs	3 Out of	Tolerance >2x <3	Sx
Material Amount	. 0	· 4	Clean	4	4 C Out of	Tolerance >3x <5	5x
Charge Number:	100853GSA	5	Limited Calibra	tion :	5 C Out of	Tolerance >5x	
Cal Work Inst ID	: PCB	6 E	Functional Che	ck (	6 C Out of	Tolerance-Undet	ermined
Outside Vendor:	PCB	7	Performance Cl	neck	7   Inopera	ative	
·		8	Modify	;	8 🔲 Damag	ged	
	١	9	Repair-needs C	harge Level	9 🔲 Not Us	sed	·.
		10	Other		10 🔲 Not De	etermined	
					11 Excess	sed	
Calibrated By:	Scott Lish	S#: 10	01141 Phone: 526-2	761	12 🔲 Extens	ion	
			CALIBRATION	CTANDADDC II	CED		
ſſ			CALIBRATION	TANDARDS U	<u> </u>		
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			THE NATIONAL INSTITU ONSTANTS, OR DERIVE				
		** · · · · · · · · · · · · · · · · · ·	LABORATORY TEMPI	ERATURE AND HU	MIDITY		
-	al STD (106C)		3 ° C (40-55% RH)	Electronic STD (106	•	23.0 ° +/-0.5 ° C (30	-45% RH)
	nsional STD (106B) Dim CAL (Lab 111)		.25 °C (30-45% RH)   .5 °C (20-50% RH)	Electronic CAL (Lab Remaining S&CL ca	·	23.0 ° +/-1.0 ° C (20 23.0 ° +5,-3.0 ° C (2	•
•	,			-			•
Manhacti	eret a environbientar		s are evaluated for conforn				ated conditions.
NOMINAL	. (STD)	OUT OF	TOLERANCE CONDITION UNITS		G CALIBRATIO DUND (UUT)		FG. ACCURACY
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			COM	MENTS	•		

QA# 134165 S&CL overcheck required.

## CALIPERS

NAME: DANA KEI	TH MORTON ·	BADGE: 35698		26-1274	AREA: STC		BLDG:	EROB	RM: W2D1
ID Number: 7163 Calibration Date:			Model: 6 INC	H N	Noun Name: I	DIGI	TAL CAI		Serial #: S225
Next Cal Due Da	te: 8/23/2000	1	☐ Accep	tance Test		1 (	In Tol	erance	
Charge Level:	1	2	Specia	ıl Test		2 (	Out of	Tolerand	e >1 x <2x
Repair/Adj/etc C.	L: 0	. 3	☑ Calibr	ation to MFG	Specs	3 (	Out of	Tolerand	e >2x <3x
Material Amount	: 0	4	Clean	÷		4 (	Out of	Tolerand	e >3x <5x
Charge Number:	572121017	5,	Limite	d Calibration	i	5 (	Out of	Tolerand	e >5x
Cal Work Inst ID	: 3053G	6	_ Functi	onal Check	•	6 (	Out of	Tolerand	e-Undetermined
Outside Vendor:		7	Perfor	mance Check	1.	7 [	Inoper	ative	
		8	Modif	у		8 [	Dama <sub>i</sub>	ged	
		9	Repair	r-needs Charg	e Level	9 [	Not U	sed	
	,	10	Other			10 [	Not D	etermined	i
	•			•		11	Excess	sed	
Calibrated By:	Shane Warner	S#:	43896 Pho	ne: 526-2761		12 [	Extens	sion	
	,	CAL	IDD ATION C	TA NIN A INDA	CHICED				
Ī	700835	CAL	BRATION S	ANDARDS	CSED	Ī			
		EABLE TO THE NATION OF THE NAT							
		LABORA	TORY TEMPE	RATURE AND	HUMIDITY				
•	cal STD (106C)	20.0 ° +/-0.3 ° C (40-	: !	Electronic STD (			23.0° +/-0.5	-	·
	nsional STD (106B) Dim CAL (Lab 111)	20.0 ° +/-0.25 ° C (30 20.0 ° +/-0.5 ° C (20-	• !	Electronic CAL ( Remaining S&CI	,		23.0° +/-1.0 23.0° +5,-3	-	•
_		specifications are evalu	,	•				,	•
	itel 3 enamonmentsi	•			•			ADOVE SUIT	eu conuntions.
NOMINAL	. (STD)	OUT OF TOLERAN UNITS			FOUND (U			MF	G. ACCURACY
			···	· <del></del>					
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	· · · · · · · · · · · · · · · · · · ·			MENUTO					
			COM	MENTS					

NAME: DANA KEI	TH MORTON	BADGE	: 35698	P	H: 526-1274	AREA: ST	c	BLI	G: EROB	RM: W2D1
ID Number: 7163 Calibration Date:	309 Mfr: I 1/24/2000 2:0	OWLER 01:26 PM	ľ	Model: 6	NCH ACTION COI	Noun Name	:: D	IGITAL (		Serial #: S225
Next Cal Due Da	te: 1/24/2001	•	1 [	Acc	eptance Test		1	<b>⊚</b> In T	olerance	
Charge Level:	1	:	2	Spe	cial Test		2	O Out	of Tolera	nce > 1x < 2x
Repair/Adj/etc C	.L: 0	;	3 [	<b>☑</b> Cal	bration to MFG	Specs	3	O Out	of Tolera	nce >2x <3x
Material Amount	: 0		4 [	Cle	an		4	C Out	of Tolera	nce >3x <5x
Charge Number:	572152030		5 [	Lim	ited Calibration		5	Out	of Tolera	nce >5x
Cal Work Inst ID	: 3053G		6 [	Fun	ctional Check		6	Out	of Tolera	nce-Undetermined
Outside Vendor:			7 [	Per	ormance Check		7	☐ lnop	erative	
		:	8 [	Mo	lify		8	☐ Dan	naged	
<u>~</u> .		•	9 [	Rep	air-needs Charg	e Level	9	☐ Not	Used	
			10 [	Oth	er		10	☐ Not	Determin	ed .
					•		11	☐ Exc	essed	
Calibrated By:	Bob Randall	•	S#: 3	4986 PI	ione: 526-2761		12	Exte	ension	
			CATT			e tiern				
Ţ.	704670 70		2056	70776	N STANDARD	SUSED	$\neg$	· · · · · · · · · · · · · · · · · · ·	<del>-</del>	
				1			7	•		<u> </u>
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STANDARD:	S USED ARE TRAC	EABLE TO THE	NATIO	NAL INST	ITUTE OF STAND	ARDS AND T	ECI	INOLOGY	DERIVED	FROM ACCEPTED
	FOR NATURAL P									
					IPERATURE AND					
-	cal STD (106C)	20.0 ° +/-0.3 ° (	•	•	Electronic STD				-/-0.5 ° C (3	•
	nsional STD (106B)  Dim CAL (Lab 111)	20.0 ° +/-0.25 ° 20.0 ° +/-0.5 ° 0	•	•	Electronic CAL   Remaining S&C	•	<b></b>		/-1.0°C (2	0-50% RH) 20-50% RH)
	urer's environmental		·	·	•					
	orer 2 chandillenta	specifications are	C CVAIU2	ited for Conf	Offizable which can	// actions are pe		inco vatarot		
NOMINA	L (STD)		leran INITS	CE CONDI	TIONS FOUND DU AS	JRING CALIE S FOUND (			M	IFG. ACCURACY
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				CC	MMENTS	-				
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NAME: DANA KEI	TH MORTON	В	ADGE: 35698		PH: 526	-1274	AREA: STC		BI	DG: ERO	В	RM: W2D1
ID Number: 716. Calibration Date		Ifr: FOWLER 00 10:51:53 A	-	lodel: 6	INCH	TION C	Noun Name:	DIG	ITAL	CALIPE	R AS FO	Serial #: S225 UND
Next Cal Due Da	ite: 11/21/200	01	· 1		Accept	ance Test		1	•	In Tolera	nce	
Charge Level:	. 1 .		2		Specia	l Test	•	2	0	Out of To	lerance	>1x <2x
Repair/Adj/etc C	.L: 0		3	V	Calibra	ation to MI	G Specs	3	0	Out of To	lerance	>2x <3x
Material Amoun	t: 0		4		Clean	,		4	0	Out of To	olerance	>3x <5x
Charge Number:	57215202	20	5	П	Limite	d Calibrati	on	5	0	Out of To	olerance	>5x
Cal Work Inst ID	): 3053G		6		Functi	onal Check	:	6	C	Out of To	olerance	-Undetermined
Outside Vendor:			7		Perfor	mance Che	ck	7		Inoperati	ve ·	
			8		Modif	y .		8.		Damaged	ł	•
			9		Repair	-needs Cha	arge Level	9		Not Used	l	
			10		Other			10		Not Dete	rmined	
								11		Excessed		
Calibrated By:	Bob Rand	dall .	S#:	34986	Phor	ie: 526-276	51	12		Extension	n	
					ON 000		a ***					
	700835	702056	707769	RAII	0131	ANDARD	SUSED	קר		<del>- 1</del>		1
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STANDARD	S USED ARE T	RACEABLE TO	THE NATIO	NAL INS	STITUTE	OF STAND	ARDS AND TE	CHNO	oroc.	Y DERIVE	D FROM	ACCEPTED
		AL PHYSICAL										
_							HUMIDITY					
•	ical STD (106C) ensional STD (10		'-0.3 ° C (40-55 '-0.25 ° C (30-4	•		ectronic STD	· .			+/-0.5 ° C	•	,
	Dim CAL (Lab	• .	-0.5 ° C (20-50			ectronic CAL maining S&C	(Lab 112) L calibration are	as:		+/-1.0 ° C +5,-3.0 ° C	•	•
_	•	rental specificati			•	•		,				•
,							IRING CALIBE					<u>,                                      </u>
NOMINA	L (STD)	0010	UNITS	.E CON	DITIONS		S FOUND (U		)N		MFG.	ACCURACY
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NAME: DANA KEI	TH MORTON	В	ADGE: 35698.		PH: 526-1274	AREA: STC			BLDG: EROB	RM: W2D1
ID Number: 7163 Calibration Date:		Ifr: FOWLER 1 11:11:02 A	-	Model:	6 INCH ACTION	Noun Name:	DIC	ITA		Serial #: S225
Next Cal Due Da	te: 5/20/2002	2	1		Acceptance Tes	t ·	1	•	In Tolerance	
Charge Level:	1	1	2		Special Test		2	O	Out of Toleran	nce >1x <2x
Repair/Adj/etc C	.L: 0		3	V	Calibration to M	1FG Specs	3	Ö	Out of Toleran	nce >2x <3x
Material Amount	: 0		4		Clean		4	0	Out of Tolera	1ce >3x <5x
Charge Number:	57215201	10 .	5		Limited Calibra	tion	5	0	Out of Toleran	nce >5x
Cal Work Inst ID	: 3053H		6		Functional Che	ck	6	0	Out of Tolera	nce-Undetermined
Outside Vendor:			7		Performance Ch	ieck	7		Inoperative	
			, 8		Modify		8		Damaged	
			, 9		Repair-needs C	harge Level	9		Not Used	
			10		Other		10		Not Determin	ed
							11		Excessed	
Calibrated By:	Тетгу Wi	lde	S#:	57438	Phone: 526-2	761	12		Extension	
·						•	j			
Г	<del></del>			BRAT	ION STANDAI	RDS USED	_		——————————————————————————————————————	, (
	718307	703081	707769	] <u> </u>  r			丰			
1			<u> </u>	<u>                                     </u>			╬			╣,
			L							
					STITUTE OF STA RIVED FROM TH					
			LABORA	TORY T	EMPERATURE A	ND HUMIDITY				
Physi	cal STD (106C)	20.0 ° +	/-0.3 ° C (40-5	5% RH)	Electronic S	TD (106D)		23.0	° +/-0.5 °C (30-	45% RH)
Dime	nsional STD (10	6B) 20.0°+	/-0.25 ° C (30-	45% RH	)   Electronic C	AL (Lab 112)		23.0	° +/-1.0 °C (20-	50% RH)
Phys/	Dim CAL (Lab	111) 20.0°+	/-0.5 ° C (20-5	0% RH)	Remaining S	&CL calibration are	as:	23.0	° +5,-3.0 °C (20	)-50% RH)
Manufact	urer's environn	nental specificat	ions are evalua	ted for c	onformance when c	alibrations are per	form	ed ou	tside the above sta	ted conditions.
NOMINA	OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY									
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				1	COMMENTS					

NAME: DANA KEI	TH MORTON	В	ADGE: 35	5698	PH: 52	6-1274	AREA	STC		BLDG	: EROB		RM: W2D1	
ID Number: 7163 Calibration Date:		4fr: FOWLER 4:24:36 PM	<b>.</b>	Mo	del: 6 INCI ACT	H TION COD		ame: I	OIGI	TAL CA		e FOUND	Serial #	: S225
Next Cal Due Da	ite: 3/4/2004		1		Acceptan	ce Test		1	•	In Toler	ance			
Charge Level:	2		. 2		Special T	est		2	0	Out of T	Foleran	ice > l x	<2x	
Repair/Adj/etc C	.L: 0		3	7	Calibratio	n to MFG	Specs	3	O	Out of T	Toleran	ce >2x	<3x	
Material Amount	:: 0		4		Clean			4	0	Out of T	<b>Foleran</b>	ice >3x	<5x	
Charge Number:	1003480	27	5	П	Limited (	Calibration		5	O	Out of Tolerance >5x				
Cal Work Inst ID	: 3053J		6		Function	al Check		6	Out of Tolerance-Undetermined					d ·
Outside Vendor:			7		Performa	nce Check	•	7		Inoperat	tive			
	•		8		Modify			8		Damage	ed			
			9		Repair-no	eds Charge	Level	9		Not Use	ed			
			10		Other			10		Not Det	ermine	ed		
								11		Excesse	xd	2		
Calibrated By:	Тегту Wi	ilde	S#:	5743	8 Phone:	526-2761		12		Extension	on			
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CALIBRATION STANDARDS USED    718307														
	718307	703081	7020.		707769		╬						. ,	
		·											1	•
CTANDA DO	a vicena . BE 7	DACEABLE TO	THE N	TION	LENCTRE	E OF CEANIE	ADDC 450			. OGV DE				·
		RACEABLE TO AL PHYSICAL												٠ و
			LABO	DRATO	RY TEMPEI	ATURE AND	HUMIDI	TY						
•	cal STD (106C)		/-0.3 <sub>,</sub> ° C (	-		Electronic STD	·		:	23.0° +/-0	.5°C (	30-45% 1	UH)	
	nsional STD (10	•	/-0.25 ° C	•		Electronic CAL	•			23.0° +/-1			•	
·	Dim CAL (Lab	•	/-0.5°C (	•	- 1	Remaining S&(				23.0° +5,-		`	•	
Manufact	urer's environn	nental specificati	ODS ALE EN	aluated	for conforms	nce when cali	brations a	re perf	rmed	outside th	e above	stated co	nditions.	
NOMINAI	OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY													
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11/29/2007

NAME: DANA KEITH MORTON	BADGE: 35698	PH: 526-1274 ARI	EA: STC BLDG: E	ROB RM: W2D1						
ID Number: 716309 Mfr: FOW Calibration Date: 3/9/2004 8:46:37		el: 6 INCH Noun ACTION CODE	Name: DIGITAL CALI	PER Serial #: S225 AS FOUND						
Next Cal Due Date: 12/9/2004	1 🔲	Acceptance Test	1 🕟 In Toleran	ce						
Charge Level: 2	2	Special Test	2 C Out of To	erance >1x <2x						
Repair/Adj/etc C.L: 0	3	Calibration to MFG Specs	3 Out of To	lerance >2x <3x						
Material Amount: 3	4	Clean	4 C Out of To	erance >3x <5x						
Charge Number: 530130226	5	Limited Calibration	5 Out of To	erance >5x						
Cal Work Inst ID: 3053J	6 🔲	Functional Check	6 C Out of To	erance-Undetermined						
Outside Vendor:	7 🗀	Performance Check	7 🔲 Inoperativ	e						
	8 🗀	Modify	8 Damaged							
•	9 🗖	Repair-needs Charge Level	9 Not Used							
	10 🗀	Other	10 Not Deter	mined						
			11 Excessed	,						
Calibrated By: Terry Wilde	S#: 57438	Phone: 526-2761	12 Extension							
	G. 17 188									
718307 70205		ATION STANDARDS USI	<u>SD</u>							
718307 70205	703081	707769								
STANDARDS USED ARE TRACEABLE VALUES FOR NATURAL PHYSI										
	LABORATOR	Y TEMPERATURE AND HUMI	DITY							
Physical STD (106C) 20.	0°_+/-0.3°C (40-55%)	RH)   Electronic STD (106D)	23.0 ° +/-0.5 °	C (30-45% RH)						
` ,	0° +/-0.25°C (30-45%	,	•	C (20-50% RH)						
, , ,	0°+/-0.5°C (20-50%)		•	°C (20-50% RH)						
Manufacturer's environmental spec	ifications are evaluated t	or conformance when calibrations	are performed outside the a	Dove stated conditions.						
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY										
		/								
			,							
		COMMENTS								

REPLACED 2 BATTERIES AT A COST OF \$3.00

# INL CALIBRATION INPUT DATA 11/29/2007

NAME: DANA KEI	35698 PH: 526-127	1	AR	EA: S	TC BLDG	: EROB	RM: W2D1			
ID Number: 7163 Calibration Date:	09 M 2/8/2005	fr: FOWLE	<b>R</b> 1	Model: 6 INCH ACTION CODE	N	loun	Nan	ne: DIGITAL CA AS FO		Serial #: S225
Next Cal Due Dat	te: 2/8/2006	. 1		Acceptance Test		1	•	In Tolerance		
Charge Level:	2	. 2		Special Test		2	0	Out of Tolerance	>1x <2x	,
Repair/Adj/etc C.	L: 0	3	V	Calibration to MFG Sp	ecs	3	0	Out of Tolerance	e >2x <3x	v .
Material Amount	: 0	4		Clean		4	O	Out of Tolerance	e > 3x < 5x	•
Charge Number:	100853G	SA 5		Limited Calibration		5	0	Out of Tolerance	e>5x	
Cal Work Inst ID	: 3053L	. 6		Functional Check		6	C	Out of Tolerance	e-Undeterm	ined
Outside Vendor:		7	П	Performance Check	•	7		Inoperative		
		8		Modify		8		Damaged		
		9		Repair-needs Charge L	evel	9		Not Used		•
		10		Other	•	10		Not Determined		
						11		Excessed		•
Calibrated By:	Terry Wil	lde S#:	57438	B Phone: 526-2761		12		Extension		
				X						•
i i	718307	702056	1	081 707769	DARDS	US	SED		1	
	710507	702030	103	001 (10770)						╣
STANDARDS	USED ARE T	RACEABLE T	O THE	NATIONAL INSTITUTE OF	STANDA	RDS	AND	TECHNOLOGY D	ERIVED FRO	M ACCEPTED
				fants, or derived from						
				BORATORY TEMPERATU						
-	cal STD (106C) nsional STD (10			•	nig STD ( nic CAL (				0.5 °C (30-45 1.0 °C (20-50	•
	Dim CAL (Lab 1	•			ing S&CI		•		-3.0 °C (20-5	•
Manufacti	urer's environm	ental specifica	tions are	evaluated for conformance w	hen calib	ratio	os are	performed outside f	he above state	d conditions.
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NOMINAL	L(STD)	•		NITS				(UUT)	MFG	. ACCURACY
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		<del>-</del>		COMMEN	TS.	<u>:</u>		×	•	· · · · · · · · · · · · · · · · · · ·
				COMMITTEE	-~					

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NAME: DANA KEI	TH MORTON		BADGE:	: 35698 PH: 5	26-1274	AR	EA: S	STC BLDG: 1	EROB	RM: W2D1
ID Number: 7163 Calibration Date:		1fr: FOWLI	ER	Model: 6 INC ACTION CO		Nour	Nar	ne: DIGITAL CAL AS FOU		Serial #: S225
Next Cal Due Dat	te: 2/2/2007	. 1		Acceptance Test		1	◉	In Tolerance		
Charge Level:	2	2		Special Test		2	0	Out of Tolerance >	1x <2x	*
Repair/Adj/etc C.	L: 0	3	V	Calibration to MF	G Specs	3	0	Out of Tolerance >	>2x <3x	÷ .
Material Amount	: 0	. 4		Clean		4	0	Out of Tolerance >	-3x <5x	•
Charge Number:	100853G	SA 5		Limited Calibration	on	5	0	Out of Tolerance >	>5x	
Cal Work Inst ID	: 3053L	6	$\Box$	Functional Check		6	O	Out of Tolerance-	Undetermir	ed
Outside Vendor:		7		Performance Che	ck	7		Inoperative		
		8		Modify		8		Damaged		
	•	. 9		Repair-needs Cha	rge Level	9		Not Used		•
		10		Other	•	10		Not Determined		
						11		Excessed		
Calibrated By:	Terry Wi	ilde S#:	57438	8 Phone: 526-276	1	12		Extension		
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[i	718307	702056		CALIBRATION S	TANDAR	DS US	ED			า .
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1										
				NATIONAL INSTITU TANTS, OR DERIVED						
		<b>V</b>	LÄ	BORATORY TEMPE	RATURE AN	D HUM	IDIT	Y		,
Physic	cal STD (106C)	20.0 °	+/-0.3 ° C	C (40-55% RH)	Electronic ST	D (106D	)	23.0 ° +/-0.5	°C (30-45%	RH)
Dime	nsional STD (10	20.0°	+/-0.25 °	C (30-45% RH)	Electronic CA	L (Lab 1	12)	23.0 ° +/-1.0	°C (20-50%	RH)
Phys/	Dim CAL (Lab	111) 20.0°	+/-0.5 ° (	C (20-50% RH)	Remaining Se	&CL cali	bratio	a areas: 23.0 ° +5,-3.	0°C (20-50	% RH)
Manufact	urer's environn	nental specific	ations are	evaluated for conform	ance when ca	libratio	ns are	performed outside the	above stated	conditions.
NOMINAL (STD)  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  MFG. ACCURACY										
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				COM	MENTS			•		

1/31/2008

NAME: DANA KEI	TH MORTON	В	ADGE:	35698	PH: 52	26-1274	AI	ŒA:	STC BLDG: EROB	RM: W2D1
ID Number: 7163 Next Cal Due Da		OWLE	₹		odel: 6 INCI CTION CO		Nou	ı Nar	ne: DIGITAL CALIPER AS FOUND	Serial #: S225
Calibration Date:	1/24/2008	1		Accep	tance Test		1	•	In Tolerance	
Charge Level:	2	2		Specia	il Test		2	O	Out of Tolerance >1x <2x	
Repair/Adj/etc C.	L: 0	3	V	Calib	ation to MF	G Specs	3	0	Out of Tolerance $>2x < 3x$	
Material Amount	: 0	4		Clean			4	0	Out of Tolerance >3x <5x	
Charge Number:	100853GSA	5		Limite	ed Calibratio	n	5	C	Out of Tolerance >5x	
Cal Work Inst ID	: 3053O	6		Funct	onal Check		6	0	Out of Tolerance-Undetern	nined
Outside Vendor:		7		Perfor	mance Chec	:k	7		Inoperative	
		8	П	Modif	у̀		8		Damaged	
	•	9		Repai	r-needs Char	rge Level	9		Not Used	
		10	П	Other			10		Not Determined	•
							11		Excessed	
Calibrated By:	Terry Wilde	S#:	57438	Pho	ne: 526-276	1	12		Extension	
										•
lī.	710207 F 70	2056			RATION S	TANDAR	US US	SED		<b>—</b>
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									TECHNOLOGY DERIVED FROM TECHNOLOGY DERIVED TECHNOLO	
Parks mile and indicate over the control of a second			LA	BORAT	ORY TEMPER	LATURE A	ND HUN	IIDIT	Y	
•	cal STD (106C)			(40-55		Electronic ST	•	•	23.0 ° +/-0.5 ° C (30-4	•
	nsional STD (106B) Dim CAL (Lab 111)			C (30-45 : (20-509	′ !	Electronic C	•	•	23.0 ° +/-1.0 ° C (20-5	•
-					. ,	Remaining S			·	
Manuacto	irer's environmental						·		performed outside the above stat	ed conditions.
NOMINAL	. (STD)	OUT		eranci NITS	E CONDITION					G. ACCURACY
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					COMN	MENTS				

11/29/2007

NAME: DANA KEITH	MORTON	В	ADGE: 35	698 PH: 526-1274	AI	REA: S	TC BLDG: EROB	RM: W2D1			
ID Number: 716309 Calibration Date:	Mfr: 1/31/2007	FOWLER	L	Model: 6 INCH ACTION CODE	Nour	n Nam	e: DIGITAL CALIPER AS FOUND	Serial #: S225			
Next Cal Due Date:	1/31/2008	1		Acceptance Test	1	<b>©</b>	In Tolerance				
Charge Level:	2	2		Special Test	2	0	Out of Tolerance > 1x < 2x	•			
Repair/Adj/etc C.L:	1	3	<b>2</b> (	Calibration to MFG Specs	3	0	Out of Tolerance >2x <3x				
Material Amount:	1.5	4		Clean	4	C	Out of Tolerance >3x <5x				
Charge Number:	100853GSA	5		imited Calibration	5	O	Out of Tolerance >5x				
Cal Work Inst ID:	3053L	6	□ F	functional Check	6	0	Out of Tolerance-Undeter	mined			
Outside Vendor:		7	T F	Performance Check	7		Inoperative	•			
		8		Modify	8		Damaged				
	•	9	F F	Repair-needs Charge Level	9		Not Used				
		10		Other	10		Not Determined				
					11		Excessed				
Calibrated By:	Terry Wilde	S#:	57438	Phone: 526-2761	12		Extension				
				TIPE I MICH COLUMN							
<u></u>	718307	702056	70308	ALIBRATION STANDAR	WS US	ED		<b>–</b> ]			
F	710507	702030	70300	71 707705	러는			==			
				TIONAL INSTITUTE OF STAINTS, OR DERIVED FROM TH							
			LABO	DRATORY TEMPERATURE A	ND HUM	IIDITY					
Physical	\$TD (106C)	20.0°+	/-0.3 ° C (	40-55% RH)   Electronic ST	TD (106I	))	23.0 ° +/-0.5 °C (30				
	onal STD (106B)			(30-45% RH)   Electronic Ca	•	•	23.0 ° +/-1.0 °C (20-	•			
	n CAL (Lab 111) er's environment			20-50% RH) Remaining Solution Remaining Solution RH Remaining Solution RH Remaining Solution RH			•				
Manual Company (1997)		OUT	OF TOLE	RANCE CONDITIONS FOUND	DURIN	G CAL	IRRATION				
NOMINAL (	STD)	0011	UNI					G. ACCURACY			
			•				,				
		. —	.=		·						
				COMMENTS							

REPAIR CHARGE LEVEL OF 1 WAS FOR REPLACING BATTERY AT A COST OF \$1.50

11/30/2007

NAME: DANA KEIT	H MORTON	BA	DGE: 35698		PH: 526-1274	AREA: STO			BLDG: EROB	R	M: W2D1
ID Number: 72171 03290036	14 M	fr: STARRET	Т	Mode	el: 6 INCH	Noun Nan	ne: I	DIGIT	TAL CALIP	ER	Serial #:
Calibration Date:	12/15/200	3 3:57:03 PM			ACTION (	CODE			AS	S FOUN	D
Next Cal Due Date	e: 9/15/2004	ŀ	1		Acceptance Test	<b>!</b> .	1	•	In Tolerance	e	
Charge Level:	2		2		Special Test		2	О	Out of Toles	rance >1	x <2x
Repair/Adj/etc C.I	L: 0		3	<b>V</b>	Calibration to M	IFG Specs	3	0	Out of Toles	rance >2	x <3x
Material Amount:	0		4		Clean		4	O	Out of Toles	rance >3	x <5x
Charge Number:	100664GS	SB	5		Limited Calibra	tion	5	O	Out of Tole	rance >5	<b>x</b>
Cal Work Inst ID:	3053J		6		Functional Chec	k	6	C	Out of Tole	rance-Ur	ndetermined
Outside Vendor:		•	7		Performance Ch	eck	7		Inoperative		
			8		Modify		8		Damaged		
·			9		Repair-needs Cl	narge Level	9		Not Used		
	*		10 ′		Other		10		Not Determ	ined	
			•				11		Excessed		
Calibrated By:	Terry Wil	de	S#:	5 <sup>5</sup> 7438	Phone: 526-27	<b>7</b> 61	12		Extension		
			CALL	DD 400	TON COLANDA	ano rigen					
F	718307	707769	703081	7	ION STANDAI	KD2 O2ED	7			<del>-</del>	
j	/1630/	707709	703081	][/04 ][	2030		井				
l L				╬			╬				
<u>L</u>							ᆜᆜ				
					STITUTE OF STA						
			LABORA	TORY T	EMPERATURE A	ND HUMIDITY					· · · · · · · · · · · · · · · · · · ·
Physics	al STD (106C)	20.0 ° +/-0	).3 ° C (40-5	55% RH)	Electronic S	TD (106D)		23.0	° +/-0.5 °C (	(30–45% R	H)
Dimen	sional STD (100	SB) 20.0 ° +/-0	0.25 ° C (30-	-45% RH	Electronic C	AL (Lab 112)		23.0	° +/-1.0°C (	(20-50% R	H)
Phys/D	im CAL (Lab 1	11) 20.0° +/-0	).5 °C (20-5	60% RH)	Remaining S	&CL calibration at	eas:	23.0	° +5,-3.0 ° C	(20-50% F	tH)
Manufactu	rer's environm	ental specification	ıs are evalua	ted for c	onformance when c	alibrations are pe	rforn	ned out	tside the above	stated cor	iditions.
NOMINAL	NOMINAL (STD)  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  UNITS  AS FOUND (UUT)  MFG. ACCURACY										
	×		<u> </u>								
				•	COMMENTS						

INITIAL CALIBRATION TEST REFERRAL QA# 104353

NAME: DANA KEITH MORTON BADGE: 35698 PH: 526-1274 AREA: STC BLDG: EROB RM: W2D1												
ID Number: 72171	4 Mfr: S	TARRE	TT	Model: 6 INCH	No	un Name	: DIGITAL CALIP	ER	Serial #:			
03290036 Calibration Date:	11/2/2004			ACTION CODE			AS FOUND		•			
Next Cal Due Date	: 11/2/2005	1		Acceptance Test	1	<b>⊚</b> In 7	Colerance	1				
Charge Level:	2	2		Special Test	2	O Out	of Tolerance >1x <	2x -				
Repair/Adj/etc C.L	.: O	3	V	Calibration to MFG Specs	3	O Out	of Tolerance >2x <	3x				
Material Amount:	0	4		Clean	4	C Out	of Tolerance >3x <	5x				
Charge Number:	100664GSB	5		Limited Calibration	5	C Out	of Tolerance >5x	•				
Cal Work Inst ID:	3053K	6		Functional Check	6	O Out	of Tolerance-Unde	termined				
Outside Vendor:		7		Performance Check	7	☐ Ino	perative					
		8		Modify .	8	☐ Dar	naged					
		9		Repair-needs Charge Level	9	☐ Not	Used					
		10		Other	10	☐ Not	Determined					
					- 11	□ Ехс	essed					
Calibrated By:												
· F	718307 70	2056	703	CALIBRATION STANDARD 081 707769		EU		<del>-</del>	•			
F	3	2030	,05	001   707705	╬							
									•			
STANDARDS VALUES	USED ARE TRACE FOR NATURAL PI	EABLE TO	O THE	NATIONAL INSTITUTE OF STAND. FANTS, OR DERIVED FROM THE R	ARDS RATIO	S AND TEC TYPE OI	CHNOLOGY DERIVED F SELF CALIBRATION	FROM AC	CCEPTED QUES			
			LA	BORATORY TEMPERATURE AND	HUM	IIDITY						
	1 STD (106C)			(40-55% RH)   Electronic STD			23.0 ° +/-0.5 ° C (		•			
	ional STD (106B) im CAL (Lab 111)			C (30-45% RH)   Electronic CAL C (20-50% RH)   Remaining S&C	-	•	23.0 ° +/-1.0 ° C ( s: 23.0 ° +5,-3.0 ° C					
·				evaluated for conformance when calib			,					
				ERANCE CONDITIONS FOUND DU								
NOMINAL	(STD)	001				UND (U		MFG. AC	CCURACY			
				COMMENTS								

NAME: DANA KEITH MORTON	BADGE: 3569	8 PH: 526-1274	AREA: 9	TC BLDG: ERO	B RM: W2D1
MANUEL PANA METTH HUNTUN	DADGE, 3307	E EL. JAU-12/4	AREA	DEDG. ERO	NIVA. WAUI
ID Number: 721714 Mfr: 5	STARRETT	Model: 6 INCH	Noun N	ame: DIGITAL CALII	PER Serial #:
Calibration Date: 10/10/2005		ACTION CODE		AS FOUND	
Next Cal Due Date: 10/10/2006	1	ceptance Test	1 💿	In Tolerance	
Charge Level: 2	2 Spe	ecial Test	2 O	Out of Tolerance >1x	<2x
Repair/Adj/etc C.L: 0	3 🔽 Ca	libration to MFG Specs	3 C	Out of Tolerance >2x	<3x
Material Amount: 0	4 🗀 Cle	an	4 O	Out of Tolerance >3x	<5x
Charge Number: 100583GSA	5 🔲 Lir	nited Calibration	5 O	Out of Tolerance >5x	
Cal Work Inst ID: 3053L	6 🔲 Fu	nctional Check	, 6 C	Out of Tolerance-Und	etermined
Outside Vendor:	7 Per	formance Check	7	Inoperative	
	8 🗀 Mo	dify	8 🗀	Damaged	
•	9 🔲 Re	pair-needs Charge Level	9 🗀	Not Used	
•	10 🔲 Otl	ner ·	10 🗀	Not Determined	
			11 🔲	Excessed	
Calibrated By: Terry Wilde	S#: 57438 P	hone: 526-2761	12 🗌	Extension	
	CAL	IBRATION STANDAR	De Hern		
718307 7	02056 703081		DS USED		<del></del>
STANDARDS USED ARE TRAC		ONAL INSTITUTE OF STAN S, OR DERIVED FROM THE			
TABLES FOR NATURAL F					N TECHNIQUES
Physical STD (106C)	20.0 ° +/-0.3 ° C (40	ATORY TEMPERATURE AN -55% RH)   Electronic STI		23.0 ° +/-0.5 ° C	(30-45% RH)
Dimensional STD (106B)	20.0 ° +/-0.25 ° C (3	0-45% RH) Electronic CA	L (Lab 112)	23.0 ° +/-1.0 ° C	(20-50% RH)
Phys/Dim CAL (Lab 111)	20.0 ° +/-0.5 ° C (20	-50% RH)   Remaining S&	CL calibration	areas: 23.0 ° +5,-3.0 ° C	(20-50% RH)
Manufacturer's environmenta	l specifications are evalu	ated for conformance when cal	librations are	performed outside the abov	e stated conditions.
NOMINAL (STD)	OUT OF TOLERA UNITS	NCE CONDITIONS FOUND I	OURING CAI AS FOUND		MFG. ACCURACY
					·
		·		·	
,		COMMENTS			

NAME: DANA KEIT	TH MORTON	BADG	E: 35698 PH: 5	26-1274	AREA: STC BLDG: EROB			RM: W2D1
ID Number: 7217 03290036	14 Mfr: 5	STARRETT	Model: 6 D	NCH	No	un N	ame: DIGITAL CALIPE	ER Serial #:
Calibration Date:	9/26/2006		ACTION C	ODE			AS FOUND	
Next Cal Due Dat	e: 9/26/2007	1 🗀	Acceptance Test	•	1	•	In Tolerance	
Charge Level:	2	2	Special Test		2	Ö	Out of Tolerance >1x <	2x
Repair/Adj/etc C.	L: 0	3 . 🔽	Calibration to MF	G Specs	3	0	Out of Tolerance >2x <	3x
Material Amount:	0	4	Clean		4	O	Out of Tolerance >3x <	5x
Charge Number:	100853GSA	5	Limited Calibrati	on	5	0	Out of Tolerance >5x	
Cal Work Inst ID	3053L	6 🗖	Functional Check		6	O	Out of Tolerance-Undet	ermined
Outside Vendor:		7 🗀	Performance Che	ck	7		Inoperative	
		8 🗀	Modify		8		Damaged	
		9 🗀	Repair-needs Cha	arge Level	9		Not Used	
		10	Other	,	10		Not Determined	
					11		Excessed	
Calibrated By:	Terry Wilde	S#: 574	38 Phone: 526-276	51	12		Extension	
			CALIDDATION	OTT A BUTS A TRESC	ric	· ED	•	
ſī	718307 7	02056 70	CALIBRATION S 3081 707769	ANDARDS		ED		
ļ.	710307 ,	02030	707705		F			
							TECHNOLOGY DERIVED E OF SELF CALIBRATION	
		· 1	ABORATORY TEMPE	RATURE AND F	IUM	IDIT	Y	
Physic	al STD (106C)	20.0 ° +/-0.3 °	C (40-55% RH)	Electronic STD (1	06D	)	23.0 ° +/-0.5 ° C (3	•
	nsional STD (106B)	*		Electronic CAL (I		-	23.0° +/-1.0°C (2	
·	Dim CAL (Lab 111)		,	Remaining S&CL			•	
Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.								
NOMINAL (STD)  UNITS  AS FOUND (UUT)  MFG. ACCURACY								
								(
			COM	MENTS				

NAME: DANA KEIT	H MORTON	BA	DGE: 35698	PH: 526-1		ARE	A: STC	BLDG	: EROB	RM: W	/2D1
ID Number: 7217		STARRET		Model: 6 INCH				e: DIGITAL (			erial #:
03290036										_	
Calibration Date:	10/11/2007			ACTION COD	E			AS FC	UND	•	÷
Next Cal Due Date	e: 10/11/2008	1	Acce	ptance Test		1	<b>⊚</b> In '	Tolerance			·
Charge Level:	2	2	Spec	ial Test	:	2	C Ou	t of Tolerance	e >1x <2x		
Repair/Adj/etc C.l	L: 0	3	✓ Calib	oration to MFG S	Specs	3	O Ou	t of Tolerance	e >2x <3x		
Material Amount:	0	4	Clean	ı .	•	4	C Ou	t of Tolerance	e >3x <5x		
Charge Number:	100853GSA	. 5	C Limi	ted Calibration		5	C Ou	t of Tolerance	e >5x		
Cal Work Inst ID:	3053N	6	Func	tional Check		6	C Ou	t of Tolerance	e-Undeter	mined	
Outside Vendor:		7	Perfo	rmance Check		7	☐ Inc	perative			
		8	☐ Mod	ify	,	8	☐ Da	maged			
		. 9	☐ Repa	ir-needs Charge	Level	9	∏ No	t Used			
		10	Othe	r		10	☐ No	t Determined			
				1		11	Ex-	cessed			,
Calibrated By:	Terry Wilde	S#: 5	57438 Ph	one: 526-2761		12	☐ Ex	tension		•	
	1		•								
· F	718307	705471	703081	BRATION STA	NDARDS	USI	ED	11	<del></del>	<b>—</b>	•
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				<u> </u>				<u> </u>	<u>'</u>		
STANDARDS VALUES	USED ARE TRA FOR NATURAL	CEABLE TO PHYSICAL C	THE NATIO CONSTANTS,	NAL INSTITUTE ( , OR DERIVED FR	OF STANDAR OM THE RA	DS A	AND TE	CHNOLOGY DI F SELF CALIBI	ERIVED FI	OM ACCE	epted Es
			LABORAT	ORY TEMPERAT	URE AND H	UMI	DITY		-		
Physic	al STD (106C)	20.0 ° +/-(	0.3 ° C (40-5	5% RH)   Elec	tronic STD (10	6D)		23.0 ° +/-0	).5 °C (30-	45% RH)	
	sional STD (106B)		0.25 ° C (30-4		tronic CAL (La		•		1.0 °C (20-	•	:
Phys/C	im CAL (Lab 111)	) 20.0°+/-(	0.5 ° C (20-50	9% RH)   Rem	aining S&CL	calibr	ration are:	as: 23.0° +5,	-3.0°C (20	-50% RH)	
Manufactu	rer's environmen	al specification	ns are evaluat	ed for conformance	when calibra	tions	are perf	ormed outside t	he above sta	ted conditio	ons.
NOMINAL	(STD)	OUT OF	F TOLERANG UNITS	CE CONDITIONS I			calibr ND (U	-	MF	G. ACCU	JRACY
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				COMME	C117						

12/4/2007

NAME: DANA KEITH	MORTON	ВА	DGE: 35698		PH: 526-1274	AREA: STO			BLDG: E	ROB	RM: W2D1
ID Number: 72171:	5 M	fr: STARRET	T	Mod	del: 6 INCH	Noun Nan	ıe: I	DIGIT	ΓAL CA	LIPER	Serial #:
Calibration Date:	12/15/200	3 3:58:14 PM	i		ACTION CO	DE		Λ,		AS FO	UND
Next Cal Due Date:	9/15/2004		1		Acceptance Test		1	•	In Tole:	rance	
Charge Level:	2		2		Special Test		2	0	Out of	Folerance	>1x <2x
Repair/Adj/etc C.L	: 0		3	7	Calibration to MFC	Specs	3	0	Out of	Гојетапсе	>2x <3x
Material Amount:	0		4		Clean		4	O	Out of	Tolerance	:>3x <5x
Charge Number:	100664GS	SB	5		Limited Calibration	1	5	O	Out of	Folerance	:>5x
Cal Work Inst ID:	3053J		6		Functional Check		6	O	Out of	Folerance	-Undetermined
Outside Vendor:			7		Performance Check	c	7		Inopera	tive	
			8		Modify		8	·□	Damage	ed	
	1 a		9		Repair-needs Charg	ge Level	9		Not Us	ed	•
			10		Other		10		Not De	termined	
					,		11		Excesse	ed	
Calibrated By:	Terry Wile	de	S#:	57438	Phone: 526-2761		12		Extensi	on ·	
		<b>19</b>	CALI	DDAT	ΓΙΟΝ STANDARD	e lieph				·	
Г	718307	702056	703081	7	)7769	JUSED	7				7
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					NSTITUTE OF STANDA ERIVED FROM THE R						
			LABORA	TORY	TEMPERATURE AND	HUMIDITY					
-	STD (106C)		0.3 ° C (40-5							°C (30-45	,
1	onal STD (106 m CAL (Lab 1	•	0.25 °C (30 0.5 °C (20-5			•	eas:			°C (20-50 )°C (20-5	,
•	•				conformance when calib						•
		-			NDITIONS FOUND DU						
NOMINAL (	STD)	00101	UNITS			FOUND (U				MFG	. ACCURACY
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	<u> </u>				COMMENTS				<del>-</del>	<del></del>	

INITIAL CALIBRATION TEST REFERRAL QA# 104353

NAME: DANA KEIT	'H MORTON	P	BADGE:	35698 PH: 526-1274		AR	EA: S	STC BLDG: EROB RM: W2D1
ID Number: 7217.03290062	15 Mfr:	STARRE	TT	Model: 6 INCH		No	un N	lame: DIGITAL CALIPER Serial #:
Calibration Date:	10/12/2004	*		ACTION CODE				AS FOUND
Next Cal Due Date	e: 10/12/2005	1		Acceptance Test		1	<b>©</b>	In Tolerance
Charge Level:	2	2		Special Test		2	O	Out of Tolerance $>1x < 2x$
Repair/Adj/etc C.l	L: 0	3	$\overline{\mathbf{v}}$	Calibration to MFG Specs		3	0	Out of Tolerance $>2x < 3x$
Material Amount:	0	4		Clean		4	O	Out of Tolerance $>3x < 5x$
Charge Number:	100664GSA	5		Limited Calibration		5	0	Out of Tolerance >5x
Cal Work Inst ID:	3053K	6		Functional Check		6	Ó	Out of Tolerance-Undetermined
Outside Vendor:		7	$\Box$	Performance Check		7		Inoperative
		8	. 🔲	Modify		8		Damaged
		9		Repair-needs Charge Level		9		Not Used
	•	10		Other		10		Not Determined
						11		Excessed
Calibrated By:	Terry Wilde	S#:	57438	Phone: 526-2761		12		Extension
				CALIDDATION CTANDAD	ne.	TIC	ED	
ſſ	718307	702056		CALIBRATION STANDAR	<u> </u>	US	ED	
· · · · · · · · · · · · · · · · · · ·					7			
STANDARDS	USED ARE TRA	CEABLE T	о тне	NATIONAL INSTITUTE OF STAN	NDAF	eds.	AND	TECHNOLOGY DERIVED FROM ACCEPTED
VALUES	FOR NATURAL	PHYSICAL	CONS	FANTS, OR DERIVED FROM TH	E RA	TIO	TYF	PE OF SELF CALIBRATION TECHNIQUES
Physic	al STD (106C)	20.0 ° +		BORATORY TEMPERATURE AND (40-55% RH) Electronic ST				Y 23.0 ° +/-0.5 ° C (30-45% RH)
	sional STD (106B)			C (30-45% RH)   Electronic CA		_		23.0 ° +/-1.0 ° C (20-50% RH)
Phys/D	oim CAL (Lab 111)	20.0°+	-/-0.5 ° C	(20-50% RH) Remaining Se	&CL	calit	ratio	n areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
Manufactu	rer's environment	al specificat	tions are	evaluated for conformance when ca	alibra	tion	s are	performed outside the above stated conditions.
		OUT	OF TOL	ERANCE CONDITIONS FOUND	DUR	ING	CAI	LIBRATION
NOMINAL	(STD)		U	NITS	AS F	O	JND	(UUT) MFG. ACCURACY
		٠						
,				COMMENTS		•		

NAME: DANA KEIT	H MORTON		BADGE:	: 35698 PH	5698 PH: 526-1274			AREA: STC BLDG: EROB RM: V			
ID Number: 72171 03290062	15 M	1fr: STARR	ETT	Model: 6	INCH	No	un N	Name: DIGITAL CALIPER	Serial #:		
Calibration Date:	10/10/20	05		ACTION	CODE			AS FOUND			
Next Cal Due Date	e: 10/10/20	06 1		Acceptance Te	st	l	•	In Tolerance			
Charge Level:	2	2		Special Test		2	0	Out of Tolerance $>1x < 2x$			
Repair/Adj/etc C.I	L: 0	3	7	Calibration to !	MFG Specs	3	O	Out of Tolerance $>2x < 3x$			
Material Amount:	0 -	- 4		Clean		4	O	Out of Tolerance $>3x < 5x$			
Charge Number:	100583G	SA 5		Limited Calibra	ation	5	O	Out of Tolerance >5x			
Cal Work Inst ID:	3053L	6		Functional Che	ck	6	C	Out of Tolerance-Undetermin	ed		
Outside Vendor:		7		Performance C	heck	7		Inoperative			
		8		Modify		8		Damaged			
		9		Repair-needs C	harge Level	9		Not Used			
		10		Other		10		Not Determined			
						. 11		Excessed			
Calibrated By:	Terry Wi	ilde S#:	57438	8 Phone: 526-2	761	12		Extension	•		
CALIBRATION STANDARDS USED											
F	718307	703081		2056 707769	,		LD		1		
lī.											
			][								
								TECHNOLOGY DERIVED FROM PE OF SELF CALIBRATION TECH			
			LA	BORATORY TEM	PERATURE ANI	HUM	IDIT	<u> </u>			
Physica	al STD (106C)	20.0 °		(40-55% RH)	Electronic STD			23.0 ° +/-0.5 ° C (30-45%	RH)		
	sional STD (10	•		C (30-45% RH)	Electronic CAL	•	•	23.0 ° +/-1.0 ° C (20-50%	·		
·	im CAL (Lab	•	-	C (20-50% RH)	Remaining S&				·		
Manufactu	rer's environn	nental specifica	tions are	evaluated for confo	rmance when cali	bratio	ns are	performed outside the above stated o	conditions.		
NOMINAL	(STD)	OUT		ERANCE CONDIT					ACCURACY		
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									,		
		`		· CO,	MMENTS						

NAME: DANA KEITI	H MORTON		BADGE: 35698	PH: 526		AR	EA: S	STC BLDG	: EROB	RM: W2D1
ID Number: 721715 Mfr: STARRETT Model: 6 INCH 03290062						No	un N	ame: DIGITAL (	CALIPER	Serial #:
Calibration Date:	9/26/2006	5		ACTION CO	DE			AS FO	UND	
Next Cal Due Date	: 9/26/2007	7 1	Acc	eptance Test		1	•	In Tolerance	•	•
Charge Level:	2	2	☐ Spe	cial Test	•	2	0	Out of Tolerance	>1x <2x	
Repair/Adj/etc C.L.	.: O	. 3	✓ Cali	bration to MFG	Specs	3	0	Out of Tolerance	e >2x <3x	•
Material Amount:	0	4	Clea	ın		4	O	Out of Tolerance	>3x <5x	
Charge Number:	100853G	SA 5	Lim	ited Calibration	ı	5	O	Out of Tolerance	e >5x	
Cal Work Inst ID:	3053L	6	[] Fun	ctional Check		6	O	Out of Tolerance	e-Undetern	nined
Outside Vendor:		7	Perf	ormance Check	:	7		Inoperative	,	
		8	☐ Mod	lify		8		Damaged		
		9 .	Rep	air-needs Charg	ge Level	9		Not Used		
		10	Oth	er		10		Not Determined	•	
			•			11		Excessed		
Calibrated By:	Terry Wil	lde S#:	57438 Pł	one: 526-2761	•	12		Extension		
•			CALL	DY ATTON OT	ANDADD	e nic	TPIN.			
F	718307	702056	703081	BRATION ST	ANDARDS		ED		1	<del>-</del>
F	11020.	70-000	705001	1 1		╬			╬──	=
. IF						í			<u> </u>	<del>-</del>
			CONSTANT:		ROM THE R	ATIC	TYP	TECHNOLOGY DI E OF SELF CALIBI		
Physica	STD (106C)	′ 20.0° +	/-0.3 ° C (40-		ectronic STD (				0.5 °C (30-4	5% RH) .
Dimens	ional STD (10	6B) 20.0°+	-/-0.25 ° C (30	45% RH) El	ectronic CAL (	Lab l	12)	23.0 ° +/-1	.0 ° C (20-5	0% RH)
Phys/Di	m CAL (Lab 1	111) 20.0°+	-/-0.5 ° C (20-	0% RH)   Re	maining S&CI	_ cahi	bratio	n areas: 23.0 ° +5,-	3.0 ° C (20-	50% RH)
Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.										
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY										
		_ ,								
				СОММ	ENTS					

					11/30/2007					
NAME: DANA KEIT	H MORTON		BADGE:	35698 F	PH: 526-1274	AF	LEA: S	TC I	BLDG: EROB	RM: W2D1
ID Number: 72171 03290062	5 Mfr: S	TARRE	ETT	Model:	6 INCH	. No	un Na	ame: DIGIT	'AL CALIPE	R Serial #:
Calibration Date:	10/11/2007			ACTION	N CODE			· <b>A</b> S	S FOUND	1
Next Cal Due Date	: 10/11/2008	1		Acceptance T	'est	1	•	In Toleranc	e	·
Charge Level:	2	2		Special Test		<b>^</b> 2	0	Out of Tole	rance >1 x <2	x
Repair/Adj/etc C.I	.: <b>0</b>	3	~	Calibration to	MFG Specs	3	O	Out of Tole	rance >2x <3	x
Material Amount:	0	4		Clean	·	4	O	Out of Tole	rance >3x <5	x
Charge Number:	100853GSA	5		Limited Calib	oration	5	0	Out of Tole	rance >5x	
Cal Work Inst ID:	3053N	6		Functional Ch	heck	6	O	Out of Tole	rance-Undete	ermined
Outside Vendor:		7		Performance	Check	7		Inoperative		
		8		Modify		8		Damaged		
	·	9		Repair-needs	Charge Level	9		Not Used		•
		10		Other		10		Not Determ	ined	
•						11		Excessed		
Calibrated By:	Terry Wilde	S#:	57438	Phone: 526-	-2761	12		Extension		
				· · · · · · · · · · · · · · · · · · ·						
`IF			1		ON STANDAR	DS US	SED	<del></del>	<del></del>	<del></del>
, <u> </u>	718307 70	)5471	703	081 7077	69	ᆛ				<b> </b>
F			╬			井				
L			<u>                                     </u>		<u> </u>					
	USED ARE TRACI FOR NATURAL PI									ROM ACCEPTED FECHNIQUES
			LA	BORATORY TE	MPERATURE AN	iD HUM	IDIT	·		
_	al STD (106C)			(40-55% RH)	Electronic ST	•			° +/-0.5 °C (30	÷*
	sional STD (106B)			C (30-45% RH)	Electronic CA	-	-		° +/-1.0 °C (20	•
•	im CAL (Lab 111)			(20-50% RH)	Remaining Se				° +5,-3.0 °C (2	•
Manufactu	rer's environmental	specifica	tions are	evaluated for con	formance when ca	libratio	ns are	performed out	side the above s	tated conditions.
NOMINAL	(STD)	OUT		ERANÇE COND NITS	ITIONS FOUND			ibration (UUT)	М	FG. ACCURACY
	(-1-)									
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					·					
				. C0	OMMENTS		•			

# **DATA ACQUISITION**

11/30/2007

NAME: DANA KEI	TH MORTON	BADGE:	35698 PH: 526-1274	AREA: STC BLDG: 1	ROB RM: W2D1			
ID Number: 722'	721 Mfr: IC	OTECH	Model: DAQ BOOK 2000A	Noun Name: 16 E	IT DAC Serial #:			
Calibration Date:	: 4/12/2005		ACTION CODE	AS FO	UND			
Next Cal Due Da	ate: 4/12/2006	1	Acceptance Test	1 C In Tolerance				
Charge Level:	8	2 🔲	Special Test	2 • Out of Tolerance	>1x <2x			
Repair/Adj/etc C	.L: 4	3	Calibration to MFG Specs	3 Out of Tolerance	>2x <3x			
Material Amount	t: 0	4 🗀	Clean	4 Out of Tolerance	>3x <5x			
Charge Number:	100853GSA	5	Limited Calibration	5 Out of Tolerance	>5x			
Cal Work Inst ID	0: 6054	6	Functional Check	6 C Out of Tolerance	Undetermined )			
Outside Vendor:		7	Performance Check	7				
		8 🔲	Modify	8 Damaged	·			
		9 🔲	Repair-needs Charge Level	9 Not Used	•			
		10 🗀	Other	10 Not Determined				
				11 Excessed				
Calibrated By:	Brian Berls	S#: 10218	2 Phone: 526-2761	12 Extension	•			
,	4		ALIBRATION STANDARD	e lieph				
	216578 70	1587	ALIBRATION STANDARD	S CSED				
STANDARD VALUE	S USED ARE TRACE S FOR NATURAL PH	ABLE TO THE N	IATIONAL INSTITUTE OF STAND ANTS, OR DERIVED FROM THE R	ARDS AND TECHNOLOGY DER ATIO TYPE OF SELF CALIBRA	IVED FROM ACCEPTED TION TECHNIQUES			
		LAI	BORATORY TEMPERATURE AND	HUMIDITY				
	ical STD (106C)	20.0 ° +/-0.3 ° C	:		°C (30-45% RH)			
	msional STD (106B)  Dim CAL (Lab 111)	20.0 ° +/-0.25 ° C		•	°C (20-50% RH) °C (20-50% RH)			
Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.								
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION								
NOMINA	L (STD)			S FOUND (UUT)	MFG. ACCURACY			
X1	000		9.9 mV	9,952	+-0.02875			
			, , , , , , , , , , , , , , , , , , , ,					
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			COMMENTS					

Initial calibration Adjusted unit to meet manufacturers specifications and recalibrated unit.

#### **M&TE Out-of-Tolerance Notification**

Notification Status: Approved

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1.3	UHIRL	auvi

To: Internal Customer - Equipment User/Custodian: Tommy E Rahl/TER/CC01/INEEL/US Org:

B340

User Location: IF-EROB

Area Point of Contact: Gary D Roberts

This equipment (ID# 722721) was found to be out-of-tolerance when received by the calibration organization. Re-evaluation should be performed on prior decisions relating to product, processes, tests, survey measurements, research, experiments, etc. made with this equipment. Appropriate documentation to determine out-of-tolerance impact is required.

If evaluation assistance is desired, call Quality Engineering . If further information is desired regarding the out-of-tolerance condition, call the calibrator listed below

Cali	ibration	Resu	ite:
COL	in auci	11034	ъ.

Calibration/As-Foun

d Date:

04/12/2005

Last Successful Calibration: 04/12/2005

Calibrated by:

Brian L Berls

Phone: 526-2208

Location: CFA-698-

Calibration

S&CL

Organization:

<b>Equipment Description</b>	: 16 bit DAC		
Manufacturer: IOTECH	Nomenclature: 16 bit DAC	Model No: DAQ BOOK 2001A	Serial No: 238927
ID Number: 722721	Cal Work ins No .: 6054		
Function Tested	Nominal (Std)	Accuracy	As-Found Reading
9.9mV	X1000	+-0.02875mV	9.952mV
	·		

Calibration Remarks: (file attachments allowed)

Adjusted unit to meet manufacturers specifications and recalibrated unit.

#### Evaluation:

Evaluator: Tommy E Rahl

Evaluation: (file attachments allowed)

The x1000 gain of the DBK54 module attached to the DAQBook 2001A has never been used for any

data aquisition tasks performed with this system.

Selected Approver: Dana K Morton

NOTE: This evaluation or a separate out -of-tolerance evaluation must be retained with organization quality assurance records. Quality requirements for this evaluation and quality record retention are

based on MCP-2391 and PRD-101.

#### **Evaluation Approval:**

Date: 04/14/2005 Approval: Dana K Morton Approval Comments: Agree with evaluation.

#### Comments/Attachments

Add any comments here and/or use the area for any attachment.

#### **Document History:**

Created by Brian L Berls on 04/12/2005 04:33:44 PM Brian L Berls edited document 04:36 PM 04/12/2005

Notification sent: Brian L Berls on Tuesday, April 12, 2005. Sent to user: Tommy E Rahl: 04:36 PM 04/12/2005 Tommy E Rahl edited document 04:44 PM 04/12/2005

Submitted for approval to Dana K Morton: Tommy E Rahl on Tuesday, April 12, 2005

Sent for approval to Dana K Morton: 04:44 PM 04/12/2005 Dana K Morton edited document 12:02 PM 04/14/2005

Evaluation Approval: Dana K Morton on Thursday, April 14, 2005

NAME: DANA KEIT	H MORTON	I	BADGE: 35698	8 PH: 526-	1274	AREA: STC		C BLDG:	EROB	RM: W2D1
ID Number: 72272 238927	21 M	Ifr: IOTECH	N	Model: DAQ BO	OK 2000A			Noun Name: 16	BIT DAC	Serial #:
Calibration Date:	4/17/2006	6		ACTION CO	DE '			AS FO	DUND	
Next Cal Due Date	e: 4/17/200°	7 1	Ad	cceptance Test		1	•	In Tolerance		
Charge Level:	8	2	☐ Sp	pecial Test		2	0	Out of Tolerance	e >1x <2x	
Repair/Adj/etc C.I	.: O	3	☑ Ca	alibration to MF0	G Specs	3	0	Out of Tolerance	e >2x <3x	,
Material Amount:	0	4	☐ CI	lean		4	O	Out of Tolerance	e >3x <5x	
Charge Number:	100853G	SA 5	☐ Li	mited Calibratio	n	5	Ó	Out of Tolerand	e >5x	
Cal Work Inst ID:	6054	. 6	☐ Fu	inctional Check	•	6	0	Out of Tolerand	e-Undetern	nined
Outside Vendor:		7	☐ Pe	erformance Chec	k	7		Inoperative		
		8	□ M	odify		8		Damaged		
		9	☐ Re	epair-needs Char	ge Level	9		Not Used		•
		10	□ Ot	ther		10		Not Determined		
						11		Excessed		•
Calibrated By:	Brian Ber	rls S#:	102182	Phone: 526-2761	•	12		Extension		
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F	701507	714001		IBRATION ST	ANDARDS	USI	<u>CD</u>	<del></del>		7
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<u></u>			<u> </u>						1	<u> </u>
STANDARDS VALUES	USED ARE T FOR NATUR	RACEABLE TO AL PHYSICAL	O THE NATIO	ONAL INSTITUTE 'S, OR DERIVED F	OF STANDAL	RDS A	AND T	ECHNOLOGY DE	RIVED FRO	M ACCEPTED HNIOUES
				***************************************						
Physica	il STD (106C)	20.0°+	-0.3 °C (40-	ATORY TEMPERA -55% RH)   Ele	ctronic STD (1	^	DITY	23.0 ° +/-0	.5 ° C (30-45	% RH)
•	sional STD (10		/-0.25 ° C (30	, ,	ectronic CAL (L	٠	2)		.0 ° C (20-50	-
Phys/D	im CAL (Lab 1		/-0.5 ° C (20-		maining S&CL		•		3.0 °C (20-50	·
Mannfactui	er's environm	ental specificat	ions are evalu.	ated for conforman	ce when calibra	ations	are pe	erformed outside th	e above stated	conditions.
	···	OUT	OF TOLERAN	NCE CONDITIONS	FOUND DUR	ING	CALII	RRATION		
NOMINAL	(STD)	001	UNITS			_	-	UUT)	MFG	. ACCURACY
				······································		····				
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11/30/2007

NAME: DANA KEITH	MORTON	BADGE: 35	598 PH: 526-1274	AREA: STC BLDG	EROB RM: W2D1			
ID Number: 722721 238927	Mfr: IO	TECH	Model: DAQ BOOK 2000A	Noun Name: 16	BIT DAC Serial #:			
Calibration Date:	4/2/2007		ACTION CODE	AS	FOUND			
Next Cal Due Date:	4/2/2008	1	Acceptance Test	1	:			
Charge Level:	8	2 🗀	Special Test	2 Out of Toler	ance >1x <2x			
Repair/Adj/etc C.L:	0	3	Calibration to MFG Specs	3 Out of Toler	ance >2x <3x			
Material Amount:	0	4	Clean	4 Out of Toler	rance >3x <5x			
Charge Number:	100853GSA	5	Limited Calibration	5 Out of Tole	ance >5x			
Cal Work Inst ID:	6054	6	Functional Check	6 Out of Toler	ance-Undetermined			
Outside Vendor:		7 🗀	Performance Check	7 🔲 Inoperative				
		8	Modify	8 Damaged	•			
	•	9	Repair-needs Charge Leve	9 Not Used				
•	1	10	Other	10 Not Determ	ned			
			, · ·	11 Excessed	•			
Calibrated By:	Donnie Lindsay	S#: 1051	38 Phone: 526-2761	12 Extension	•			
٠. ا	301893	CA	LIBRATION STANDARDS	USED				
	301093							
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STANDARDS U VALUES F	SED ARE TRACEA OR NATURAL PHY	ABLE TO THE NAT VSICAL CONSTAI	FIONAL INSTITUTE OF STANDA NTS, OR DERIVED FROM THE RA	RDS AND TECHNOLOGY DE ATIO TYPE OF SELF CALIB	RIVED FROM ACCEPTED ATION TECHNIQUES			
		LABO	RATORY TEMPERATURE AND I	IUMIDITY				
Physical	STD (106C)	20.0 ° +/-0.3 ° C (4	10-55% RH) Electronic STD (1	06D) 23.0 ° +/-0	.5 °C (30-45% RH)			
Dimensi	onal STD (106B)	20.0 ° +/-0.25 ° C	(30-45% RH)   Electronic CAL (	Lab 112) 23.0 ° +/-1	.0 ° C (20-50% RH)			
Phys/Dia	n CAL (Lab 111)	20.0 ° +/-0.5 ° C (2	20-50% RH) Remaining S&CL	calibration areas: 23.0 ° +5,-	3.0 ° C (20-50% RH)			
Manufacture	r's environmental sp	pecifications are eva	duated for conformance when calibr	ations are performed outside th	e above stated conditions.			
NOMBIAL	CTD)	OUT OF TOLER UNI	ANCE CONDITIONS FOUND DUF		MEC ACCUIDACY			
NOMINAL (	310)	- UNI	15 A5	FOUND (UUT)	MFG. ACCURACY			
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	,							
		,	COMMENTS					

S&CL overcheck required.

12/11/2007

NAME: DANA KEITI	H MORTON	BADGE: 3	5698 PH: 526-1274	AREA: STC BLDG: EROB RM: W2D1					
ID Number: 72272 238927	I Mfr: I	ОТЕСН	Model: DAQ BOOK 2000	A Noun Name: 16 BIT DAC Serial #:					
Calibration Date:	12/5/2007		ACTION CODE	AS FOUND					
Next Cal Due Date	: 12/5/2008	1 🗀	Acceptance Test	1 • In Tolerance					
Charge Level:	8	2 🗀	Special Test	2 Out of Tolerance >1x <2x					
Repair/Adj/etc C.L	.: 0	3	Calibration to MFG Spec	cs 3 Out of Tolerance >2x <3x					
Material Amount:	0	4	Clean	4 C Out of Tolerance >3x <5x					
Charge Number:	100853GSA	5	Limited Calibration	5 C Out of Tolerance >5x					
Cal Work Inst ID:	6054	6 🗀	Functional Check	6 · C Out of Tolerance-Undetermined					
Outside Vendor:	•	7	Performance Check	7 Inoperative					
		8 🗀	Modify	8 Damaged					
		9 🗖	Repair-needs Charge Le	vel 9 🔲 Not Used					
		10	Other	10 Not Determined					
			•	11 Excessed					
Calibrated By:	Donnie Lindsa	ny S#: 105	138 Phone: 526-2761	12 Extension					
		C		ac Hopp					
	304399		ALIBRATION STANDARI	JS USED					
· · · · · · · · · · · · · · · · · · ·									
				DARDS AND TECHNOLOGY DERIVED FROM ACCEPTED RATIO TYPE OF SELF CALIBRATION TECHNIQUES					
,		LABO	DRATORY TEMPERATURE ANI	DHUMIDITY					
Ť	l STD (106C)	20.0 ° +/-0.3 ° C	•						
•	ional STD (106B) m CAL (Lab 111)	20.0 ° '+/-0.25 ° C 20.0 ° +/-0.5 ° C		L (Lab 112) 23.0 ° +/-1.0 ° C (20-50% RH)  CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)					
,			·	ibrations are performed outside the above stated conditions.					
TI GII GII GI	DI TELLITORINE MAI								
NOMINAL	(STD)	UNI	RANCE CONDITIONS FOUND D TS A	S FOUND (UUT) MFG. ACCURACY					
	COMMENTS								

11/30/2007

NAME: DANA KEI	TH MORTON	E	ADGE: 3	35698 PH: 526-12	74	AREA: STC		C BLDG: ERO	B RM: W2D1
ID Number: 7227 Calibration Date:	22 Mfr: I 4/7/2005	PCB	M	Iodel: 483A ACTION COD	Noun Nan E	ne: A	MPI	LIFIER Serial  AS FOUN	
Next Cal Due Dat	te: 4/7/2006	1		Acceptance Test		1	•	In Tolerance	
Charge Level:	4	2		Special Test		2	0	Out of Tolerance >1x	x <2x
Repair/Adj/etc C.	L: 0	3	V	Calibration to MFG S	Specs .	3	0	Out of Tolerance >2x	x <3x
Material Amount	0 _	4		Clean		4	0	Out of Tolerance >3x	: <5x
Charge Number:	100108GSA	5		Limited Calibration		5	O	Out of Tolerance >5x	<b>:</b>
Cal Work Inst ID	: 6053	6		Functional Check		6	0	Out of Tolerance-Un	determined
Outside Vendor:		7		Performance Check		7		Inoperative	
		8		Modify		8		Damaged	
		9		Repair-needs Charge	Level	9		Not Used	•
		10		Other		10		Not Determined	
		`		,		11		Excessed	
Calibrated By:	Brian Berls	S#:	102182	2 Phone: 526-2761		12		Extension	
ſĭ	301893 2	90716		ALIBRATION STAN	DARDS	USF	ED .		<del></del>
	301893   2	90/10	2780	701463					
				ATIONAL INSTITUTE OI ANTS, OR DERIVED FRO					
,			LAE	ORATORY TEMPERATI	RE AND H	UMI	DITY	· .=.	Ţ
Physic	cal STD (106C)	20.0°+	-/-0.3 ° C	(40-55% RH)   Electr	onic STD (10	06D)		23.0 ° +/-0.5 ° C	(30-45% RH)
Dimer	nsional STD (106B)	20.0°+	-/-0.25 ° C	(30-45% RH)   Electr	onic CAL (L	ab i i	2)	23.0 ° +/-1.0 ° C	
Phys/l	Dim CAL (Lab 111)	20.0°+	-/-0.5 ° C	(20-50% RH) Rema	ining S&CL	calibr	ation	reas: 23.0 ° +5,-3.0 ° C	(20-50% RH)
Manufacti	orer's environmenta	specificat	ions are o	evaluated for conformance v	vhen calibra	tions	are p	erformed outside the abov	e stated conditions.
NOMINAI	(STD)	OUT		ERANCE CONDITIONS FO				bration (UUT)	MFG. ACCURACY
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				· · · · · · · · · · · · · · · · · · ·					•
			• .	COMMEN	ITS				

Initial calibration

NAME: DANA KEI	TH MORTON	В	ADGE: 3569	98 PH: 520	26-1274 · AREA: STC			BLDG: EROB	RM: W2D1
ID Number: 7227 Calibration Date:	22 Mfr: Po 4/17/2006	CB <sub>.</sub>	Mod	lel: 483A ACTION CO		ıme: A	MPLIFII	ER Serial #: 1	747
Next Cal Due Da	te: 4/17/2007	1	□ A	Acceptance Test		1	● In T	olerance	
Charge Level:	4	2 -	□ s	pecial Test		2	O Out	of Tolerance >1x <2	2x
Repair/Adj/etc C.	L: 0	3	<b>☑</b> c	Calibration to MF	G Specs	3	O Out	of Tolerance >2x <3	Зx
Material Amount	. 0	4		Clean		4	O Out	of Tolerance >3x <5	5x
Charge Number:	100853GSA	5		imited Calibration	On	5	O Out	of Tolerance >5x	
Cal Work Inst ID	: 6053	6 .	F	unctional Check		6	C Out	of Tolerance-Undet	ermined
Outside Vendor:		7	□ P	erformance Che	ck.	7	☐ Inop	perative	
		8		<b>Modify</b>		8	☐ Dan	naged	
		9	□ R	Repair-needs Cha	rge Level	9	☐ Not	Used.	
		10		Other		10	☐ Not	Determined	
						11	□ Ехс	essed	
Calibrated By:	Brian Berls	S#:	102182	Phone: 526-276	1	12	☐ Exte	nsion	
CALIBRATION STANDARDS USED									
Ī	718405 30	1893	290716		ANDARD	)			
	- · · · · · · · · · · · · · · · · · · ·								•
:									
STANDARDS	USED ARE TRACE	ABLE TO	O THE NAT	IONAL INSTITUT	E OF STANDA	ARDS A	ND TECH	NOLOGY DERIVED F	ROM ACCEPTED
VALUES	FOR NATURAL PH	YSICAL	CONSTAN	TS, OR DERIVED I	FROM THE R	ATIO 1	TYPE OF S	ELF CALIBRATION T	ECHNIQUES
Physic	al STD (106C)	20.0° +/	LABOR 0.3°C (40	RATORY TEMPER. D-55% RH)   E	ATURE AND ! lectronic STD (		DITY	23.0 ° +/-0.5 ° C (30-	-45% RH) .
- ,	sional STD (106B)		/-0.25 ° C` (3		lectronic CAL (	-	2)	23.0 ° +/-1.0 ° C (20-	•
Phys/I	Oim CAL (Lab 111)	20.0° +/	/-0.5 ° C (20	0-50% RH) R	emaining S&C	L calibra	ation areas:	23.0 ° +5,-3.0 ° C (20	0-50% RH)
Manufacty	rer's environmental s	pecificati	ions are eval	uated for conformat	nce when callb	rations	are perform	ned outside the above sta	ated conditions.
		OUT O	F TOLERA	NCE CONDITION	S FOUND DU	RING (	CALIBRAT	TON	
NOMINAL	(STD)		UNIT	S	AS	FOU	ND (UU1	T) MF	FG. ACCURACY
								<del></del>	
-									
				COMM	ENTS				

NAME: DANA KEITI	H MORTON	В	ADGE: 3	5698 PH: 526	-1274	ARE	A: \$7	C BLDG: EROB RM: W2D1
ID Number: 72272 Calibration Date:	2 Mfr: P0 4/2/2007	СВ	М	odel: 483A ACTION CO	Noun Nar	ne: A	MP.	LIFIER Serial #: 747 AS FOUND
Next Cal Due Date	: 4/2/2008	1		Acceptance Test		1	•	In Tolerance
Charge Level:	4	2		Special Test		2	O	Out of Tolerance >1x <2x
Repair/Adj/etc C.L	.: <b>0</b>	3	<b>Y</b>	Calibration to MF	G Specs	3	0	Out of Tolerance >2x <3x
Material Amount:	0	4		Clean		4	0	Out of Tolerance >3x <5x
Charge Number:	100853GSA	5		Limited Calibratio	on .	5	0	Out of Tolerance >5x
Cal Work Inst ID:	6053	6		Functional Check		6	O	Out of Tolerance-Undetermined
Outside Vendor:		7		Performance Chec	:k	7		Inoperative
		8		Modify		8		Damaged
		9		Repair-needs Char	rge Level	9		Not Used
		10		Other	*	10		Not Determined
						11		Excessed
Calibrated By:	Brian Berls	S#:	102182	Phone: 526-276	1	12		Extension
			~	ALIBRATION ST	ANDADDO	TICE	'D	•
	301893 29	0716	2780		ANDARDS	USE	<u></u>	
								FECHNOLOGY DERIVED FROM ACCEPTED OF SELF CALIBRATION TECHNIQUES
			LAB	DRATORY TEMPERA	TURE AND H	UMII	OITY	
•	l STD (106C)			•	ectronic STD (1			23.0 ° +/-0.5 ° C (30-45% RH)
	ional STD (106B) im CAL (Lab 111)				ectronic CAL (L emaining S&CL			23.0 ° +/-1.0 ° C (20-50% RH)  areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
-	, ,			. ,				
Manufactur	er's environmental i							erformed outside the above stated conditions.
NOMINAL	(STD)	OUT C	OF TOLE UN	RANCE CONDITIONS ITS				BRATION (UUT) MFG. ACCURACY
					·			·
					ENTE			
				COMM	EN12			•

# INL CALIBRATION INPUT DATA 12/13/2007

NAME: DANA KEITH	MORTON	BA	DGE: 35698	PH: 526-127	4 ARE	A: ST	C: BLDG: EROB	RM: W2D1
ID Number: 722722 Calibration Date:	Mfr: P 12/13/2007	СВ	Model: 48	3A N CTION CODE	Ioun Name: A	MP	LIFIER Serial #: 747  AS FOUND	
Next Cal Due Date:	12/13/2008	1	Accept	ance Test	` 1	•	In Tolerance	
Charge Level:	4	2		l Test	2	$\mathbf{C}$	Out of Tolerance $>1x < 2x$	
Repair/Adj/etc C.L:	0	3	✓ Calibra	ation to MFG S <sub>l</sub>	pecs 3	$\Gamma$	Out of Tolerance $>2x < 3x$	•
Material Amount:	0	4	┌ Clean		- 4	$\Gamma$	Out of Tolerance $>3x < 5x$	
Charge Number:	100853GSA	5	[ Limite	d Calibration	5	$\overline{}$	Out of Tolerance >5x	
Cal Work Inst ID:	6053	6	Function	onal Check	6	$\Gamma$	Out of Tolerance-Undeterm	ined
Outside Vendor:		7 .	Perfon	nance Check	. 7	Γ	Inoperative	
		8	│ Modify	4	8	Γ	Damaged	
		9	☐ Repair	-needs Charge I	Level 9	Γ	Not Used	
•		10	Cother Other		10	Γ	Not Determined	•
				`	11	Γ	Excessed	
Calibrated By:	Brian Berls	S#:	102182 Phon	e: 526-2761	12	Γ	Extension	
			CAI	IBRATION S	TA NDA DDS	1121	an.	·
	290716	38317			ANDARDS	03.		
,	١.							
*	<u>'</u>							· ·
							AND TECHNOLOGY DERIVED TYPE OF SELF CALIBRATION	
			LABOR	ATORY TEMPER	ATURE AND H	IUMI	DITY	
	ysical STD (106C)		)° +/-0.3°C (40		Electronic STD (1	-	23.0 ° +/-0.5 ° C (3	•
	mensional STD (10 ys/Dim CAL (Lab		)		Electronic CAL (I ternaining S&CL		23.0 ° +/-1.0 ° C (2 ration areas: 23.0 ° +5,-3.0 ° C (	•
Manufi	acturer's environn	ental speci	fications are evalu	ated for conforma	nce when calibr	ations	are performed outside the above s	tated conditions.
alakaire ola alakaistajaan jalapaista jarah jalah 1,491 a.,484 ti <sup>1</sup> 10 tila dili dilikaista alakai		0	UT OF TOLERA	NCE CONDITION	S FOUND DUE	RING	CALIBRATION	
NOMINAL	. (STD)	_	UNITS				· ·	G. ACCURACY
		_						
				COMM	IENTS			

# **EXTENSOMETER**

11/30/2007

NAME: DANA KE	TH MORTON	В	ADGE: 3569	8	PH: 526-1274	AREA:	STC	BLDG: I	EROB	RM: W2D1
ID Number: 721 2"/2 INCH	774 N	Afr: EPSILON	ſ	Mod	el: 3542	Noun Name	: EXT	ENSOMETE	R	Serial #: E82572-
Calibration Date	: 1/26/200	4 4:32:41 PM			ACTION	CODE			AS FO	UND
Next Cal Due D	ate: 1/26/200	5	1		Acceptance T	est	1	• In Toler	ance	
Charge Level:	8		2		Special Test		2	Out of T	Colerance	>1x <2x
Repair/Adj/etc C	LL: 0		3	V	Calibration to	MFG Specs	3	C Out of T	Colerance	>2x <3x
Material Amoun	t: 0		4		Clean		4	C Out of T	Colerance	>3x <5x
Charge Number:	100666H	127	5		Limited Calib	ration	5	Out of T	Colerance	>5x
Cal Work Inst II	D: 6021		6		Functional Ch	neck	6	Out of T	Tolerance-	-Undetermined
Outside Vendor:			. 7		Performance (	Check	7	Inoperat	tive	
			8		Modify		8	☐ Damage	ed	
			9		Repair-needs	Charge Level	9	☐ Not Use	:d	
		Tr.	10		Other		10	Not Det	ermined	
							11	☐ Excesse	ď	
Calibrated By:	Larry De	ming	S#:	3957	1 Phone: 526-	2761	12	Extension	on	
			CAI	IDD.		A DDO HOED			•	-
	350619	718306	719653		715111 71	8783				7
		110000	-	╁						
					. INSTITUTE OF S					
			LABOR	LATOR	Y TEMPERATUR	E AND HUMIDIT	TY		· · · ·	
Phys	ical STD (106C)	20.0 ° +/	-0.3 °C (40			nic STD (106D)		23.0 ° +/-0.5	°C (30-45	% RH)
	ensional STD (10	•	-0.25 ° C (3			ic CAL (Lab 112)		23.0 ° +/-1.0	°C (20-50	% RH)
Phys	Dim CAL (Lab	111) 20.0°+/	-0.5 ° C (20	)-50% F	RH)   Remaini	ing S&CL calibration	n areas	: 23.0 ° +5,-3.	0°C (20-5	60% RH)
Manufac	urer's environs	nental specificati	ons are eval	uated f	or conformance wh	en calibrations are	perfo	rmed outside the	above state	d conditions.
NOMINA	L (STD)	OUT O	F TOLERA UNIT		CONDITIONS FOU	UND DURING CA AS FOUNI			MFC	G. ACCURACY
					<del></del>		<del></del>	<del></del>		
	•	*			COMMENT	<b></b>				

Meets mfg. Tolerance. Initial calibration. QA#: 104740 104741 104742

NAME: DANA KEIT	TH MORTON	ВА	DGE: 356	98 PH; 526-12	74	AREA: ST	rc Bld	G: EROB	RM: W2D1
ID Number: 7217 2"/ 2 INCH	74 N	Mfr: EPSILON		Model: 3542	Noun	Name: I	EXTENSOME	TER	Serial #: E82572-
Calibration Date:	2/8/2005	i		ACTION COD	E		AS	FOUND	
Next Cal Due Dat	e: 2/8/2006	1		Acceptance Test		1 📵	In Tolerance	-	
Charge Level:	8	2		Special Test		2 O	Out of Tolera	nce >1x <2	2x
Repair/Adj/etc C.	L: 0	3	V	Calibration to MFG	Specs	3 O	Out of Tolera	ance >2x <	3x
Material Amount:	0	. 4		Clean	1	4 O	Out of Tolera	nce >3x <	ō <b>x</b>
Charge Number:	1001080	GSA 5		Limited Calibration		5 O	Out of Tolera	ance >5x	
Cal Work Inst ID:	6021	6		Functional Check		6 O	Out of Tolera	ince-Undet	ermined
Outside Vendor:		7		Performance Check		7 🗆	Inoperative		
		8		Modify		8	Damaged		
		9		Repair-needs Charge	: Level	9 🗀	Not Used		
	., .	10		Other		10	Not Determin	ned	
						11	Excessed		
Calibrated By:	Larry De	eming S#:	39571	Phone: 526-2761		12 🗀	Extension		
			CA	I IDD ATION OT AN	ID A DDC I	UCED			
ſſ	350619	718306	718416	LIBRATION STAN  721053 7	15111	OSED		7	_
, A	330017	710300	710-11	721033	13111			1	<del>-</del>
				FIONAL INSTITUTE OF TS, OR DERIVED FRO					
			LABO	RATORY TEMPERATI	RE AND H	MIDITY			
₹	al STD (106C)		-		onic STD (10	•		/-0.5 °C (30-	ĭ
	isional STD (1) Dim CAL (Lab				onic CAL (La ining S&CL c			/-1.0 ° C (20- 5,-3.0 ° C (20	ŕ
_	·		•	luated for conformance	_				·
The second secon		-		ANCE CONDITIONS FO					
NOMINAL	(STD)		UNIT	-		OUND		, MI	FG. ACCURACY
***************************************	,								
				<u> </u>					
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	-			COMMEN	ITS				

11/30/2007

NAME: DANA KEITI	H MORTON	BAI	OGE: 35	698 PH: 526-1274	AREA: STC BLDG: EROB RM: W2D1
ID Number: 72177	<del></del>				oun Name: EXTENSOMETER Serial #: E82572-
2"/ 2 INCH Calibration Date:	2/8/2006		•	ACTION CODE	AS FOUND
Next Cal Due Date	: 2/8/2007	1		Acceptance Test	1   In Tolerance
Charge Level:	8	2		Special Test	2 Out of Tolerance >1x <2x
Repair/Adj/etc C.L	:: 1	3	V	Calibration to MFG Specs	3 Out of Tolerance >2x <3x
Material Amount:	0	4		Clean	4 Out of Tolerance >3x <5x
Charge Number:	100853GSA	<b>5</b> ,		Limited Calibration	5 Out of Tolerance >5x
Cal Work Inst ID:	6021	6		Functional Check	6 Out of Tolerance-Undetermined
Outside Vendor:		7		Performance Check	7
		8		Modify	8 Damaged
		9		Repair-needs Charge Level	9 Not Used
		10		Other	10 Not Determined
					11 Excessed
Calibrated By:	Larry Deming	S#:	39571	Phone: 526-2761	12 Extension
			. CA	LIBRATION STANDARI	AC LICED
	350619 7151	11	71878		
. [					
					PARDS AND TECHNOLOGY DERIVED FROM ACCEPTED RATIO TYPE OF SELF CALIBRATION TECHNIQUES
· · · · · · · · · · · · · · · · · · ·		<del></del>	LABO	RATORY TEMPERATURE ANI	HUMIDITY
	, ,		•	40-55% RH)   Electronic STD	(106D) 23.0° +/-0.5°C (30-45% RH)
				(30-45% RH)   Electronic CAI 20-50% RH)   Remaining S&	
•			,		
Manuactor	-			7	brations are performed outside the above stated conditions.
NOMINAL		OUT OF	TOLER UNI	ANCE CONDITIONS FOUND D TS A	S FOUND (UUT)  MFG. ACCURACY
	·				
	<del></del>	-			
<del> </del>			<u>-</u>		
				COMMENTS	

Instrument was found to be very close to being out of tolerance. Re-ran Travel verses VDC to re-establish values. Repairs(Optimized)

# **HIGH-SPEED DIGITAL CAMERA**

12/4/2007

NAME: DANA KEI	TH MORTON	BADGE:	35698 PH: 526-1274	AREA: STC	BLDG: EROB	RM: W2D1
ID Number: 3764 CAMERA	.50 Mfr: PF Serial #: 1181141	IOTRON 12	Model: APX	Noun Name: HIGH	I SPEED DIGITAL	·:
Calibration Date:	4/1/2004.		ACTION CODE		AS FOUND	
Next Cal Due Da	te:	1 🗀	Acceptance Test	1 O In To	lerance	·
Charge Level:	4	2 🔽	Special Test	2 Out o	of Tolerance >1x <2x	
Repair/Adj/etc C.	L: 0	3 🗀	Calibration to MFG Spec	s 3 O Out o	f Tolerance >2x <3x	,
Material Amount	: 0	4	Clean	4 O Out o	of Tolerance >3x <5x	
Charge Number:	100664GSA	5 🔲	Limited Calibration	5 C Out o	f Tolerance >5x	
Cal Work Inst ID	: SPEC	6	Functional Check	6 C Out o	f Tolerance-Undeter	mined
Outside Vendor:		7	Performance Check	7 🔲 Inope	rative	
		8 🗖	Modify	8 🔲 Dama	aged	,
		9	Repair-needs Charge Lev	el 9 🗌 Not U	Jsed	
•		10 🗹	Other	10 🗹 Not I	Determined	
				11 Exces	ssed	
Calibrated By:	Scott Lish	S#: 10114	1 Phone: 526-2761	12 Exter	nsion	
	·					
ſſ	700661		CALIBRATION STANDA	KDS USED		7
11 	700001					
			ATIONAL INSTITUTE OF STA ANTS, OR DERIVED FROM TI			
		LAİ	BORATORY TEMPERATURE	AND HUMIDITY		•
Physic	•	20.0 ° +/-0.3 ° C		STD (106D)	23.0 ° +/-0.5 °C (30-4	5% RH)
	•	20.0 ° +/-0.25 ° (		CAL (Lab 112)	23.0 ° +/-1.0 °C (20-5	-
,	,	20.0 ° +/-0.5 ° C	` '	S&CL calibration areas:	23.0° +5,-3.0°C (20-	•
Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.						
NOMINAI	NOMINAL (STD)  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  UNITS  AS FOUND (UUT)  MFG. ACCURACY					
·····			·			
	<u></u>					
			COMMENTS	· · · · · · · · · · · · · · · · · · ·		

Three runs were taken on the camera to assure repeatability. The test point was off the General Out, Positive Trigger coax connection. The uncertainty analysis was based on the uncertainty of the frequency counter and statistcal analysis.

## Bechtel B&W Idaho Standards and Calibration Laboratories

## **Certificate of Calibration**

For

nstrument: High Speed Digital Camera		Submitted by: I	Keith Morton
Manufacturer:	Photron	Address:	INEEL (EROB)
Model No.:	APX		
Serial No.:	118114112		
Calibration Rec	all No.: 376450		

This high-speed camera was compared directly with a frequency counter traceable to the National Institute of Standards and Technology (NIST). A minimum of three runs were made on this high-speed camera to ensure the reproducibility of the data. The certified value is the mean of all measurements.

		Measurements		
Calibration Date:	4/01/04	performed by:	J. Scott Lish	
Procedure No.:	NA	Certificate No.:	04-025	
Temperature:	23°C	Humidity:	35%RH	

Approved by: Metrology Manager)

Bechtel B&W Idaho
Standards and Calibration Laboratories
P.O. Box 1625
Idaho Falls, Idaho 83415-4137
208.526.2017

## Bechtel B&W Idaho

# Standards & Calibration Laboratories Bechtel B&W Idaho Idaho Falls, Idaho

Instrument:	High Speed Digital Camera	Certificate No.:	04-025
Manufacturer:	Photron	Calibration Date:	4/01/04
Model No.:	APX	Serial No.:	118114112
Calibration Rec	all No.: 376450		, ,

Traceability: Values and the associated uncertainties supplied by the Standards and Calibration Laboratory (S&CL) are traceable to one or more of the following:

- A. The values of the units (either base or derived) maintained and disseminated by a national measurement institute such as NIST, NRC, etc.
- B. Intrinsic standards fundamental physical phenomena
- C. Standards derived by the ratio of self-calibration techniques.

The values of the standard then transferred to other measurement standards by the use of approved procedures that incorporate nationally acceptable techniques thus allowing for an unbroken chain of traceability. These values are checked with round robins and the use of check standards. Finally, the values are transferred to the general-purpose measurement and test equipment using approved procedures and calculated uncertainties using tech note 1297.

- Note 1:This certificate or report shall not be reproduced, except in full, without the advance written approval of the Idaho National Engineering and Environmental Laboratory (INEEL) Standards and Calibration Laboratories, Idaho Falls, Idaho.
- Note 2:The as-received condition of the standard, set of standards, or measurement equipment described herein was as expected, unless noted in the body of the certificate or report.

## Bechtel B&W Idaho

# Standards & Calibration Laboratories Bechtel B&W Idaho Idaho Falls, Idaho

Instrument:	High Speed Digital Camera	Certificate No.:	04-025
Manufacturer:	Photron	Calibration Date:	04/01/04
Model No.:	APX	Serial No.:	118114112
Calibration Rec	all No.: 376450		

#### **Frames Per Second**

Measured Value	Nominal	Uncertainty
59.99933	60	2 ppm
124.99861	125	2 ppm
249.9972	250	2 ppm
499.9944	500	2 ppm
999.9888	1,000	2 ppm
1,999.977	2,000	2 ppm
2,999.966	3,000	2 ppm
3,999.955	4,000	2 ppm
5,999.933	6,000	2 ppm
7,999.910	8,000	2 ppm
9,999.889	10,000	2 ppm
14,999.833	15,000	2 ppm
19,999.77	20,000	2 ppm
23,999.73	24,000	2 ppm
29,999.66	30,000	2 ppm
39,999.55	40,000	2 ppm
49,999.44	50,000	2 ppm
87,599.02	87,600	2 ppm
99,998.88	100,000	2 ppm
119,998.65	120,000	2 ppm

Note: In the determination of the uncertainties there is no allowance for drift, temperature coefficients, power coefficients, etc. Measured uncertainty is for time of measurement only at a K-factor of two.

		Standards Used		
ID No.	Manufacturer	Model No.	Description	Due Date
700661	HP	5316B	Frequency Counter	6/04/04

12/4/2007

NAME: DANA KEIT	TH MORTON	BAD	GE: 35698	PH: 526-1274	ARI	EA: STC	BLDG: EROB	RM: W2D1
ID Number: 3764 CAMERA	50 Mfr: Serial #: 11811	PHOTRON 4112		Model: APX	Noun N	ame: HIGH	SPEED DIGITA	L .
Calibration Date:	10/19/2004			ACTION CODE			AS FOUND	
Next Cal Due Dat	te:	1 [	Acc	eptance Test	1	O In Tol	erance	-
Charge Level:	4	2	Spe	cial Test	2	Out o	f Tolerance >1x <	2x
Repair/Adj/etc C.	L: 0	3	] Cali	bration to MFG Spec	s 3	O Out o	f Tolerance >2x <	3x
Material Amount:	. 0	4 [	Clea	n .	4	Out o	f Tolerance >3x <	5x
Charge Number:	100664GSA	5	Lim	ited Calibration	• 5,	Out o	f Tolerance >5x	
Cal Work Inst ID:	SPEC	6	Fun	ctional Check	6	C Out of	f Tolerance-Under	termined
Outside Vendor:		7 🗀	Peri	formance Check	7	☐ Inope	rative	
1		8 🗀	Mod	dify	8	☐ Dama	ged	•
		9	Rep	air-needs Charge Lev	rel 9	☐ Not U	Jsed	
		10	Oth	er	10	Not D	etermined	
					11	☐ Exces	sed	
Calibrated By:	Scott Lish	S#: 10	1141 Pl	топе: 526-2761	12	Exten	sion	
			C41.11		DDG NG	nn		
ī	700661		CALII	BRATION STANDA	KDS US	ED .		
	700001							
ļ								=
STANDARDS	USED ARE TRAC	EABLE TO T	HE NATIO	NAL INSTITUTE OF ST	ANDARDS	AND TECHN	OLOGY DERIVED I	ROM ACCEPTED
	STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES							
				ORY TEMPERATURE				1
. •	al STD (106C)	20.0 ° +/-0.3	· ·		STD (106D)		23.0 ° +/-0.5 ° C (30	•
	nsional STD (106B) Dim CAL (Lab 111)	20.0 ° +/-0.2 20.0 ° +/-0.5	,		CAL (Lab 11 S&CL calib	ration areas:	23.0 ° +/-1.0 ° C (20 23.0 ° +5,-3.0 ° C (20	,
Manufactu	rer's environments	al specifications	are evaluat	ed for conformance when	calibration	ı are performe	d outside the above s	tated conditions.
		OUT OF 1	OLERANO	E CONDITIONS FOUN	D DURING	CALIBRATIO	ON	
NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY				FG. ACCURACY				
							<u> </u>	<u>.</u>
							<u> </u>	
				<u> </u>				<u> </u>
				COMMENTS		•	<del></del>	

Three runs were taken on the camera to assure repeatability. The test point was off the General Out, Positive Trigger coax connection. The uncertainty analysis was based on the uncertainty of the frequency counter and statistcal analysis. See history folder for analysis.

#### Bechtel B&W Idaho Standards and Calibration Laboratories

## **Certificate of Calibration**

For

Instrument:	High Speed Digital Camera	_ Submitted by:	Keith Morton
Manufacturer:	Photron	Address:	INEEL (EROB)
Model No.:	APX		
Serial No.:	118114112		
Calibration Rec	all No.: 376450		,
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		<i>, •</i>	•
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<b>U</b> 1	ed camera was compare e National Institute of S	_	
	ree runs were made on		
			ean of all measurements.
reproductority	of the data. The certif	led value is the m	ean of an measurements.
	ν,		
	· ·		
		: .	
•			
	,		•
		Measurements	
Calibration Date	e: 10/19/04	performed by:	J. Scott Lish
Procedure No.:	NA	Certificate No.:	04-034
Temperature:	23°C	Humidity:	35%RH
,			
Ammanu a di lavu	ME	1 tooks	
Approved by:	Metrolog	y Manager)	
	/ HISTORY	, managon,	÷

Bechtel B&W Idaho
Standards and Calibration Laboratories
P.O. Box 1625
Idaho Falls, Idaho 83415-4137
208.526.2017

### Bechtel B&W Idaho

# Standards & Calibration Laboratories Bechtel B&W Idaho Idaho Falls, Idaho

Instrument:	High Speed Digital Camera	Certificate No.:	04-034
Manufacturer:	Photron	Calibration Date:	10/19/04
Model No.:	APX	Serial No.:	118114112
Calibration Rec	all No.: 376450		

Traceability: Values and the associated uncertainties supplied by the Standards and Calibration Laboratory (S&CL) are traceable to one or more of the following:

- A. The values of the units (either base or derived) maintained and disseminated by a national measurement institute such as NIST, NRC, etc.
- B. Intrinsic standards fundamental physical phenomena
- C. Standards derived by the ratio of self-calibration techniques.

The values of the standard are then transferred to other measurement standards by the use of approved procedures that incorporate nationally acceptable techniques thus allowing for an unbroken chain of traceability. These values are checked with round robins and the use of check standards. Finally, the values are transferred to the general-purpose measurement and test equipment using approved procedures and calculated uncertainties using tech note 1297.

- Note 1: This certificate or report shall not be reproduced, except in full, without the advance written approval of the Idaho National Engineering and Environmental Laboratory (INEEL) Standards and Calibration Laboratories, Idaho Falls, Idaho.
- Note 2: The as-received condition of the standard, set of standards, or measurement equipment described herein was as expected, unless noted in the body of the certificate or report.

## Bechtel B&W Idaho

# Standards & Calibration Laboratories Bechtel B&W Idaho Idaho Falls, Idaho

Instrument: High Speed Digital Camera Certificate No.: 04-034

Manufacturer: Photron Calibration Date: 10/19/04

Model No.: APX Serial No.: 118114112

Calibration Recall No.: 376450

#### **Frames Per Second**

Measured Value	Nominal	Uncertainty
59.99932	60	3 ppm
124.99859	125	3 ppm
249.9971	250	3 ppm
499.9943	500	3 ppm
999.9888	1,000	3 ppm
1,999.977	2,000	3 ppm
2,999.966	3,000	3 ppm
3,999.955	4,000	3 ppm :
5,999.933	6,000	3 ppm
7,999.909	8,000	3 ppm
9,999.887	10,000	3 ppm
14,999.830	15,000	3 ppm
19,999.77	20,000	3 ppm
23,999.72	24,000	3 ppm
29,999.66	30,000	3 ppm
39,999.54	40,000	3 ppm
49,999.43	50,000	3 ppm
87,599.01	87,600	3 ppm
99,998.87	100,000	3 ppm
119,998.63	120,000	3 ppm

Note: In the determination of the uncertainties there is no allowance for drift, temperature coefficients, power coefficients, etc. Measured uncertainty is for time of measurement only at a K-factor of two.

		Standards Used		
ID No.	Manufacturer	Model No.	Description	Due Date
700661	HP	5316B	Frequency Counter	12/14/04

17/4/2007

NAME: DANA KEI	TH MORTON	BA	ADGE: 3569	98 PH: 526-1274	ARE	EA: ST	C BLDG: EROB RM: W2D1			
ID Number: 3764	150 Mfr: PI Serial #: 1181141	HOTROI 12	N ,	Model: APX	Nöun N	ame:	HIGH SPEED DIGITAL			
Calibration Date:				ACTION CODE			AS FOUND			
Next Cal Due Da	te: 8/3/2006	1 1	□ A	cceptance Test	1	•	In Tolerance			
Charge Level:	8	2	<b>▽</b> s	pecial Test	2	O	Out of Tolerance >1x <2x			
Repair/Adj/etc C	.L: 0	3	[ C	Calibration to MFG Specs	3	0	Out of Tolerance >2x <3x			
Material Amount	: 0	4		Clean	4	С	Out of Tolerance >3x <5x			
Charge Number:	100853GSA	5		imited Calibration	5	O	Out of Tolerance >5x			
Cal Work Inst ID	: SPEC	6	☐ F	unctional Check	6	· O	Out of Tolerance-Undetermined			
Outside Vendor:		7	П. Р	erformance Check	7		Inoperative			
		8		lodify	8		Damaged			
·		9	☐ R	epair-needs Charge Leve	el 9		Not Used			
		10		Other .	10	V	Not Determined			
				,	11		Excessed			
Calibrated By:	Scott Lish	S#:	101141	Phone: 526-2761	12		Extension			
	į .	ı	CAT	IDD ATION STANDAL	one uei	e <b>r</b> s				
	712330		CAI	LIBRATION STANDAL	CDS CSI	<u>cD</u>				
					$\dashv =$					
			CONSTAN	ts, or derived from th	E RATIO	TYPE	FECHNOLOGY DERIVED FROM ACCEPTED OF SELF CALIBRATION TECHNIQUES			
Physi	cal STD (106C)	20.0 ° +/-	0.3 °C (40	ATORY TEMPERATURE A -55% RH)   Electronic S			23.0 ° +/-0.5 ° C (30-45% RH)			
Dime	nsional STD (106B)	20.0 ° .+/-	-0.25 °C (3	0-45% RH)   Electronic C	AL (Lab 11	2)	23.0 ° +/-1.0 ° C (20-50% RH)			
Phys/	Dim CAL (Lab 111)	20.0 ° +/-	-0.5 ° C (20	2-50% RH)   Remaining S	&CL calibi	ration	areas: 23.0 ° +5,-3.0 ° C (20-50% RH)			
Manufact	urer's environmental s	pecificatio	ons are eval	uated for conformance when c	alibrations	are p	erformed outside the above stated conditions.			
NOMINA	OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY									
<del></del>				` -	·					
,		-								
	,			COMMENTS						

Three runs were taken on the camera to assure repeatability. The test point was off the General Out, Positive Trigger coax connection. The uncertainty analysis was based on the uncertainty of the frequency counter and statistcal analysis. See history folder for analysis.

12/4/2007

NAME: DANA KEI	TH MORTON	BADGE: 3	35698 PH: 526-1274	AREA: STC	RM: W2D1					
ID Number: 3764	.50 Mfr: Pl Serial #: 1181141	HOTRON 112	Model: APX	Noun Name: HIGH	SPEED DIGITAL	· .				
Calibration Date:	8/14/2006		ACTION CODE		AS FOUND					
Next Cal Due Dat	te: 7/26/2007	1 🔲	Acceptance Test	1 🌘 In Tole	erance	•				
Charge Level:	8	2	Special Test	2. O Out of	Tolerance >1x <2x					
Repair/Adj/etc C.	L: 0	3	Calibration to MFG Specs	3 Out of	Tolerance >2x <3x					
Material Amount	: 0	4 🗀	Clean	4 C Out of	Tolerance $>3x < 5x$					
Charge Number:	100853GSA	5 🗀	Limited Calibration	5 Out of	Tolerance >5x					
Cal Work Inst ID	: SPEC	6	Functional Check	6 C Out of	Tolerance-Undetern	nined				
Outside Vendor:		7 🔲	Performance Check	7 🔲 Inoper	ative					
		8 🔲	Modify	8 🔲 Dama	ged					
		9 🗆	Repair-needs Charge Leve	el 9 🗌 Not U	sed '					
		10 🗀	Other	10 🔲 Not D	etermined					
				11 Excess	sed					
Calibrated By:	Scott Lish	S#: 10114	Phone: 526-2761	12 Extens	sion					
			ALIBRATION STANDA	RDS USED						
	700661					]				
						]				
<u>[</u>										
STANDARDS VALUES	S USED ARE TRACE S FOR NATURAL PI	EABLE TO THE N	ATIONAL INSTITUTE OF STA ANTS, OR DERIVED FROM TH	NDARDS AND TECHNO	DLOGY DERIVED FRO LF CALIBRATION TEC	M ACCEPTED HNIQUES				
		LAE	ORATORY TEMPERATURE A	ND HUMIDITY						
Physic	cal STD (106C)	20.0 ° +/-0.3 ° C		•	23.0 ° +/-0.5 ° C (30-45	% RH)				
	nsional STD (106B)	20.0 ° +/-0.25 ° C			23.0 ° +/-1.0 ° C (20-50	,				
Phys/	Dim CAL (Lab 111)	20.0 ° +/-0.5 ° C	(20-50% RH) Remaining S	S&CL calibration areas:	23.0° +5,-3.0°C (20-50	0% RH)				
Manufact	urer's environmental	specifications are	evaluated for conformance when o	calibrations are performe	d outside the above stated	l conditions.				
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY										
		· · · · · · · · · · · · · · · · · · ·								
	· .		<del></del>							
			<u> </u>		<del></del>					
			COMMENTS							

Three runs were taken on the camera to assure repeatability. The test point was off the General Out, Positive Trigger coax connection. The uncertainty analysis was based on the uncertainty of the frequency counter and statistcal analysis. See history folder for analysis.

12/4/2007

NAME: DANA KEIT	TH MORTON	P	ADGE: 3	35698 PH: 526-127	14	ARE	A: STC	BLDG: EROB	R	RM: W2D1
ID Number: 3764 CAMERA	50 Mfr: F Serial #: 118114	PHOTRO	N	Model: APX	No	oun Na	ame: HIG	H SPEED DIGIT.	AL	
Calibration Date:	7/18/2007			ACTION COD	E .			AS FOUND	)	
Next Cal Due Dat	e: 7/18/2008	1		Acceptance Test		1	● In To	olerance		
Charge Level:	8	2		Special Test		2	Out	of Tolerance >1x	<2x	
Repair/Adj/etc C.	L: 0	3	<b>7</b>	Calibration to MFG S	pecs	3	C Out	of Tolerance >2x	<3x	
Material Amount:	0	4		Clean		4	O Out	of Tolerance >3x	<5x	
Charge Number:	100853GSA	<b>5</b> ,		Limited Calibration		5	Out	of Tolerance >5x		
Cal Work Inst ID:	6142	6		Functional Check		6	O Out	of Tolerance-Und	etermin	ed
Outside Vendor:		7		Performance Check		7	☐ Inop	erative		
		8		Modify		8	☐ Dam	aged		
		9		Repair-needs Charge	Level	9	☐ Not	Used	•	•
•		10		Other		10	☐ Not	Determined		
		-				11	Exce	essed		
Calibrated By:	Scott Lish	S#:	10114	Phone: 526-2761		12	☐ Exte	nsion	-	
			_	,			_			
F	700661			ALIBRATION STAN	DAKU	SUSE	D C	<del></del>	<del></del>	
ľ	7,0003.									
Ĺ										•
				ATIONAL INSTITUTE OF ANTS, OR DERIVED FRO						
Physic	al STD (106C)	20.0°+		ORATORY TEMPERATU (40-55% RH)   Electro	RE AND		DITY	23.0 ° +/-0.5 °C (	30-45% R	u <b>h</b> n
•	sional STD (106B)				onic CAL (		2)	23.0 ° +/-1.0 °C (		,
Phys/I	Dim CAL (Lab 111)	20.0 ° +	/-0.5 ° C	(20-50% RH) Remai	ning S&C	L calibr	ation areas:	23.0 ° +5,-3.0 ° C	(20-50%	RH)
Manufactu	rer's environmental	specificat	ions are o	evaluated for conformance v	vhen calib	rations	are perforn	ned outside the above	stated co	nditions.
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY									CCURACY	
	·									
<del></del>	<del></del>	<del></del>		<u>·</u>	•		<del></del>		• • • • • • • • • • • • • • • • • • • •	
				COMMEN	TS			·		

Three runs were taken on the camera to assure repeatability. The test point was off the General Out, Positive Trigger coax connection.

# LOAD CELLS

12/20/2007

NAME: DANA KEITH MO	ORTON	BADG	E: 35698 PH: 526-1274	AREA: STC	AREA: STC BLDG: EROB RM: W2D1				
ID Number: 721515 143547A/1210AF	Mfr: INT	ERFACE	Model: 500 LB	Noun Name: LC	AD CELL	Serial #:			
Calibration Date: 9/	9/2003		ACTION CODE		AS FOUND	•			
Next Cal Due Date: 6/9	9/2004	1 🗀	Acceptance Test	1 🌀 In Tolera	nce				
Charge Level: 12	2	2 🗀	Special Test	2 Out of To	olerance >1x <2x				
Repair/Adj/etc C.L: 0		3 🔲	Calibration to MFG Specs	3 O Out of To	olerance >2x <3x				
Material Amount: 0		4	Clean	4 Out of To	olerance >3x <5x	•			
Charge Number: 10	00348027	5 <b>v</b>	Limited Calibration	5 Out of To	olerance >5x				
Cal Work Inst ID: 57	748C	6 🗆	Functional Check	6 C Out of To	olerance-Undeterm	nined			
Outside Vendor:		7	Performance Check	7 🔲 Inoperati	ve ,				
•		8 🗀	Modify	8 Damageo	i				
		9	Repair-needs Charge Level	9 🗍 Not Used	1				
		10	Other	10 🔲 Not Dete	rmined				
				11 Excessed	1 .				
Calibrated By: St	an Zohner	S#: 581	46 Phone: 526-2761	12 Extensio	n	·			
. ,			CAT TODA MECANICIPA NO. 4	nna tiann					
721	1171 7211	90	CALIBRATION STANDA	KDS USED		7			
STANDARDS USEI	D ARE TRACEAL	BLE TO TH	E NATIONAL INSTITUTE OF STA	NDARDS AND TECHNOL	LOGY DERIVED FRO	OM ACCEPTED			
VALUES FOR	NATURAL PHY	SICAL CON	STANTS, OR DERIVED FROM TE	E RATIO TYPE OF SELI	F CALIBRATION TE	CHNIQUES			
Physical STE	D.(106C) 2		ABORATORY TEMPERATURE A C (40-55% RH)   Electronic S		3.0 ° +/-0.5 ° C (30-4	5% RH)			
-					3.0 ° +/-1.0 ° C (20-5)				
Phys/Dim C	AL (Lab 111) 20	0.0 ° +/-0.5	C (20-50% RH)   Remaining S		3.0 ° +5,-3.0 ° C (20-				
Manufacturer's	environmental spe	cifications a	re evaluated for conformance when (	alibrations are performed	outside the above state	ed conditions.			
WEIGHT TO THE PROPERTY OF THE		OUT OF TO	DLERANCE CONDITIONS FOUND	DURING CALIBRATION	٧				
NOMINAL (ST	D)	^	UNITS	AS FOUND (UUT)	MFC	G. ACCURACY			
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		<del></del>							
, and gray of their enders about the second recommendation		<del></del>				1			
			COMMENTS						

721171 THRU 721190 INITIAL CALIBRATION LIMITED: MUST BE USED WITH READOUT P# 721514 CH 1 ECAL 2.174 ESCL 499.6

12/20/2007

NAME: DANA KEIT	TH MORTON	BADGE: 3569	8	PH: 526-1274	AREA: STC		BLDG: ERO	)B RM: W2D1
ID Number: 7215 143547A/1210AF	15 Mfr: I	NTERFACE .	Mode	el: 500 LB	Noun Nam	e: I	LOAD CELL	Serial #:
Calibration Date:	1/22/2004 10:	59:06 AM		ACTION COI	ЭE			AS FOUND
Next Cal Due Dat	e:	1		Acceptance Test		1	C In Tolera	nce
Charge Level:	2	2		Special Test		2	Out of To	elerance >1x <2x
Repair/Adj/etc C.	L: 0	3		Calibration to MFG	Specs	3	Out of To	elerance >2x <3x
Material Amount:	0	4	. 🗀 .	Clean		4	C Out of To	olerance >3x <5x
Charge Number:	100664gsx	<sub>)</sub> 5		Limited Calibration		5	C Out of To	elerance >5x
Cal Work Inst ID	5748C	6		Functional Check		6	C Out of To	olerance-Undetermined
Outside Vendor:		7		Performance Check		7	Inoperativ	ve
		8		Modify		8	✓ Damaged	
	,	9		Repair-needs Charg	e Level	9	Not Used	
	4	10	<b>V</b>	Other		10	Not Deter	rmined
•	•	,				11	Excessed	
Calibrated By:	Stan Zohner	S#:	58146	Phone: 526-2761		12	Extension	1
		CAT	TDD A TE	ON CTANDADDO	ucen			
. [[		CAL	IBKA II	ON STANDARDS	USED	1		
.						i		,
				STITUTE OF STANDA RIVED FROM THE RA				ED FROM ACCEPTED ON TECHNIQUES
	akahadahan di Sa <del>ndan di San</del> ahan di Sanahan	LABOR	ATORY TI	EMPERATURE AND H	IUMIDITY		. Maria - A Carrigon	,
Physic	cal STD (106C)	20.0° +/-0.3°C (40		Electronic STD (1	06D)		23.0 ° +/-0.5 ° C	
	nsional STD (106B)	20.0° +/-0.25° C (3 20.0° +/-0.5° C (20	·				23.0 ° +/-1.0 ° C 23.0 ° +5,-3.0 ° (	
-	Dim CAL (Lab 111)			,				
Manufacti	orer's environmental			onformance when calibrate				ve stated conditions.
NOMINAL	L (STD)	OUT OF TOLERA UNITS		DITIONS FOUND DUR AS	ING CALIBR FOUND (U			MFG. ACCURACY
					1			•
	4	· <u></u>		· ·				·
				<b></b>				
			C	COMMENTS				

USER SAID WAS OVERANGED. UNIT IS NOT WORKING PROPERLY RECOMMEND EXCESS

ITM weights under 500 pounds were initially weighed with load cell #721515 in January 2004. Afterwards, that load cell was damaged prior to re-calibration so weights under 500 pounds were rechecked in February 2004 using load cell # 721882. The weights were found acceptable as marked. **INL Calibration Laboratory** measurements in October 2007 also confirmed accuracy of weights weighing less than 500 pounds.

12/20/2007

NAME: DANA KEITH MORTON	BADGE: 35698	PH: 526-1274 AREA	A: STC BLDG: EROB	RM: W2D1
ID Number: 721882 Mfr: II Calibration Date: 2/19/2004 4:09		fodel: 500 LB Nou	n Name: LOAD CELL AS	Serial #: 147313A FOUND
Next Cal Due Date: 11/19/2004	1 🗀	Acceptance Test	1 • In Tolerance	
Charge Level: 10	2 🗀	Special Test	2 Out of Tolera	ance >1x <2x
Repair/Adj/etc C.L: 0	3 🗔	Calibration to MFG Specs	3 C Out of Tolera	nnce >2x <3x
Material Amount: 0	4	Clean	4 Out of Tolera	ance >3x <5x
Charge Number: 100664gsx	5	Limited Calibration	5 Out of Tolera	ance >5x
Cal Work Inst ID: 5748C	6 🗀	Functional Check	6 C Out of Tolera	ance-Undetermined
Outside Vendor:	7 🗀	Performance Check	7 [ Inoperative	
\	8 🗂	Modify	8 Damaged	
	9 🗀	Repair-needs Charge Level	9 Not Used	
	10	Other	10 Not Determin	ned
			11 Excessed	•
Calibrated By: Stan Zohner	S#: 5814	6 Phone: 526-2761	12 Extension	٠.
	CALIDD	ATION STANDARDS USE	, , , , , , , , , , , , , , , , , , ,	
375257	CALIBRA	TION STANDARDS USE		
		INSTITUTE OF STANDARDS AND DERIVED FROM THE RATIO T		
anagamannan keny tenggahangan kilabihil <sub>ada</sub> jaggah dikang diabangka sarusan pr <del>ancesa sama</del> s	LABORATOR	Y TEMPERATURE AND HUMID	ITY ,	
Physical STD (106C)	20.0 ° +/-0.3 ° C (40-55% F	tH)   Electronic STD (106D)	23.0 ° +/-0.5 ° C (	30-45% RH)
Dimensional STD (106B)	20.0 ° +/-0.25 ° C (30-45%	RH) Electronic CAL (Lab 112)	23.0 ° +/-1.0 ° C (	20-50% RH)
Phys/Dim CAL (Lab 111)	20.0 ° +/-0.5 ° C (20-50% F	th) Remaining S&CL calibrat	tion areas: 23.0 ° +5,-3.0 ° C	(20-50% RH)
Manufacturer's environmental	specifications are evaluated f	or conformance when calibrations a	are performed outside the above	stated conditions.
NOMINAL (STD)	OUT OF TOLERANCE OUNITS	CONDITIONS FOUND DURING C AS FOUN		MFG. ACCURACY
				<del> </del>
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	,			
		COMMENTS	<u> </u>	

INITIAL CALIBRATION
LIMITED: MUST BE USED WITH READOUT P# 721514
MUST BE USED ON CHANNEL 1
ECAL 2.121 AND ESCL 500.0

12/20/2007

NAME: DANA KEITH MORTON	BA	DGE: 3	5698 PH: 526-1274	AR	REA: STC BLDG: EROB RM: W2D1				
ID Number: 721882 Mfr: IN Calibration Date: 3/10/2005	TERFA	CE	Model: 500 LB ACTION CODE	N	oun Name: LOAD CELL Serial #: 147313 AS FOUND				
Next Cal Due Date: 3/10/2006	1		Acceptance Test	1	● In Tolerance				
Charge Level: 10	2		Special Test	2	Out of Tolerance >1x <2x				
Repair/Adj/etc C.L: 0	3		Calibration to MFG Specs	3	Out of Tolerance >2x <3x				
Material Amount: 0	4		Clean	4	Out of Tolerance >3x <5x				
Charge Number: 100853GSA	<b>5</b> .	<b>y</b>	Limited Calibration	5	Out of Tolerance >5x				
Cal Work Inst ID: 5748F	6		Functional Check	6	Out of Tolerance-Undetermined				
Outside Vendor:	7		Performance Check	7	Inoperative				
•	8		Modify	8	Damaged				
·	9		Repair-needs Charge Level	9	Not Used				
	10		Other	10	Not Determined				
			1	11	Excessed				
Calibrated By: Stan Zohner	S#: 5	58146	Phone: 526-2761	12	Extension				
250016 350	NO 1 5		ALIBRATION STANDARDS	S US	SED .				
350816 350	0815	7220	28	는					
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	<del></del>	····		Ţ					
STANDARDS USED ARE TRACE VALUES FOR NATURAL PH	ABLE TO YSICAL (	THE NA	ATIONAL INSTITUTE OF STANDA ANTS, OR DERIVED FROM THE R	ATIC	S AND TECHNOLOGY DERIVED FROM ACCEPTED  TYPE OF SELF CALIBRATION TECHNIQUES				
- Name and the state of the sta		LAB	DRATORY TEMPERATURE AND I	HUM	IIDITY				
Physical STD (106C)	20.0° +/-	0.3 ° C	(40-55% RH)   Electronic STD (	106D	23.0 ° +/-0.5 ° C (30-45% RH)				
Dimensional STD (106B)	20.0° +/-	0.25 ° C	(30-45% RH)   Electronic CAL (	Lab I	112) 23.0 ° +/-1.0 ° C (20-50% RH)				
Phys/Dim CAL (Lab 111)	20.0° +/-	0.5 ° C	(20-50% RH) Remaining S&CL	L calil	ibration areas: 23.0 ° +53.0 ° C (20-50% RH)				
Manufacturer's environmental s	pecificatio	ns are ev	valuated for conformance when calib	ration	ns are performed outside the above stated conditions.				
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY									
· · · · · · · · · · · · · · · · · · ·									
. •			COMMENTS						

LIMITED: MUST BE USED WITH READOUT P# 721514 MUST BE USED ON CHANNEL 1 ECAL 2.121 AND ESCL 500.0

12/20/2007

NAME: DANA KET	TH MORTON	BADG	E: 35698 PH: 526-1274	AREA: STC BLDG: EROB RM: W2D1						
ID Number: 7218 Calibration Date:		NTERFACE	Model: 500 LB ACTION CODE	Noun Name: LOAD CELL Serial #: 147313A AS FOUND						
Next Cal Due Da	te: 8/28/2007	1	Acceptance Test	1						
Charge Level:	10	2 🗀	Special Test	2 Out of Tolerance >1x <2x						
Repair/Adj/etc C	.L: 0	3 🔲	Calibration to MFG Specs	3 Out of Tolerance >2x <3x						
Material Amount	: <b>0</b>	4 🗀	Clean	4 C Out of Tolerance >3x <5x						
Charge Number:	100853GSA	5 🗆 🔽	Limited Calibration	5 C Out of Tolerance >5x						
Cal Work Inst ID	: 5748H	6 🗀	Functional Check	6 C Out of Tolerance-Undetermined						
Outside Vendor:		7 🗆	Performance Check	7 [ Inoperative						
		8 🗖	Modify	8 Damaged						
		9 🗆	Repair-needs Charge Level	9 Not Used						
		10 🗍	Other	10 Not Determined						
			•	11 Excessed						
Calibrated By:	Stan Zohner	S#: 5814	16 Phone: 526-2761	12 D Extension						
			CALIBRATION STANDARD	nc licen						
. [	375257		CALIBRATION STANDARD	OS USED						
	3,323,									
STANDARDS VALUES	S USED ARE TRACE S FOR NATURAL PE	EABLE TO THE HYSICAL CON	NATIONAL INSTITUTE OF STAND STANTS, OR DERIVED FROM THE I	ARDS AND TECHNOLOGY DERIVED FROM ACCEPTED RATIO TYPE OF SELF CALIBRATION TECHNIQUES						
e i	The same of the sa		ABORATORY TEMPERATURE AND							
Physic	cal STD (106C)		C (40-55% RH) Electronic STD							
Dime	nsional STD (106B)		°C (30-45% RH) Electronic CAL							
Phys/	Dim CAL (Lab 111)	20.0° +/-0.5°	C (20-50% RH) Remaining S&C	CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)						
Manufact	urer's environmental	specifications a	re evaluated for conformance when cali	brations are performed outside the above stated conditions.						
NOMINAI	L (STD)		LERANCE CONDITIONS FOUND DI JNITS A	URING CALIBRATION S FOUND (UUT) MFG. ACCURACY						
		<u> </u>								
			COMMENTS							

LIMITED: MUST BE USED WITH READOUT P# 721514 MUST BE USED ON CHANNEL 1 ECAL 2.121 AND ESCL 500.0

### INL CALIBRATION INPUT DATA 12/20/2007

NAME: DANA KEIT	H MORTON	F	BADGE: 35698	PH: 526-12		AR	EA: S	STC BLDO	: EROB	RM: W	/2D1
ID Number: 7215; #: 144177A/1210A		Ifr: INTERF	ACE	Model: 5000 1	.B (D & m	V)		Noun Name	e: LOAD (	CELL	Serial
Calibration Date:	9/8/2003			ACTION CODE	C			AS FO	DUND		
Next Cal Due Date	e: 6/8/2004	1 .	☐ Acce	ptance Test	•	1	•	In Tolerance			
Charge Level:	12	2	☐ Spec	al Test		2	C	Out of Tolerance	e >1x <2x		
Repair/Adj/etc C.I	L: 0	3	Calib	ration to MFG S	pecs	3	0	Out of Tolerance	e >2x <3x		
Material Amount:	0 .	4	Clean	ı		4	0	Out of Tolerance	e >3x <5x		
Charge Number:	10034802	27 5	Limi	ed Calibration		5	Ö	Out of Toleranc	e >5x		
Cal Work Inst ID:	· 5748C	6	Func	tional Check		6	O	Out of Toleranc	e-Undeten	mined	
Outside Vendor:	**	7	Perfo	rmance Check		7		Inoperative			
		. 8	☐ Mod	fy		8		Damaged			
		9	Repa	ir-needs Charge	Level	9		Not Used			
		10	Othe	r		10		Not Determined			
						11		Excessed			
Calibrated By:	Stan Zoh	ner S#:	58146 Pho	one: 526-2761		12		Extension			
			0.17	373 A 1737 O 37 O 37 A				•			
·	708595	711804	714631	BRATION STA	NDARDS	US.	ED		1		
	708393	/11004	714051			┝			] 	=	
STANDARDS VALUES	USED ARE T FOR NATUR	RACEABLE T AL PHYSICAL	O THE NATIO CONSTANTS	NAL INSTITUTE O OR DERIVED FRO	OF STANDA OM THE RA	RDS TIO	AND TYP	TECHNOLOGY DE OF SELF CALIB	ERIVED FR RATION TI	OM ACCE	PTED S
·	1.000 (10(6))			ORY TEMPERAT							
-	al STD (106C) sional STD (10		-/-0.3 ° C (40-5 -/-0.25 ° C (30-		ronic STD (1) ronic CAL (L				0.5 ° C (30- 1.0 ° C (20-:		
	im CAL (Lab	-	-/-0.5 ° C (20-5		aining S&CL				-3.0 ° C (20		
Manufactu	rer's environn	ental specificat	tions are evalua	ed for conformance	when calibra	ation	s are	performed outside t	he above sta	ted conditio	ns.
	· · · · ·	OUT	OF TOLERAN	CE CONDITIONS F	OUND DUR	ING	CAI	IRRATION		· · · · ·	
· NOMINAL	(STD)	001	UNITS					(UUT)	MF	G. ACCU	IRACY
									-		
·				-	· · · ·			*****			
		<del></del>							·		
				· · · · · · · · · · · · · · · · · · ·							
				COMME	NTS						

INITIAL CALIBRATION
LIMITED: MUST BE USED WITH READOUT P# 721514 CH 2
ECAL 4.005 ESCL 4665

12/20/2007

NAME: DANA KEI	TH MORTON		BADGE: 3	35698 PH: 526	-1274	AR	EA:	STC BLDG: EROB	RM: W2D1
ID Number: 7215 #: 144177A/1210.		Ifr: INTERF	ACE	Model: 5000	LB (D & n	nV)		Noun Name: LOAD C	ELL Serial
Calibration Date:		4		ACTION COL	DE			AS FOUND	
Next Cal Due Da	te: 3/17/200	5 . 1		Acceptance Test		1	C	In Tolerance	
Charge Level:	64	. 2		Special Test		2	•	Out of Tolerance >1x <2x	
Repair/Adj/etc C	.L: 0	3		Calibration to MFG	Specs	3	O	Out of Tolerance $>2x < 3x$	1
Material Amount	: <b>0</b>	4		Clean		4	O	Out of Tolerance $>3x$ $<5x$	
Charge Number:	100664G	<b>SA</b> 5	7	Limited Calibration	ı	5	O	Out of Tolerance >5x	
Cal Work Inst ID	: 5748C	6		Functional Check		6	O	Out of Tolerance-Undeterm	nined
Outside Vendor:		7	П	Performance Check		7		Inoperative	
		. 8		Modify		8		Damaged	•
		· 9		Repair-needs Charg	e Level	9		Not Used	
		10		Other		10		Not Determined	
						11		Excessed	
Calibrated By:	Stan Zoh	ner S#:	58146	Phone: 526-2761		12		Extension	
	,		_					•	•
• [	71500		_	ALIBRATION ST		I	FD		<b>-</b>
	715606	714631	7155	714644	709226		<del></del>		4
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			<u> </u>			<u> </u>			
								TECHNOLOGY DERIVED FROE OF SELF CALIBRATION TEC	
براها والمستخدمة والمستحدة والمستحددة والمستحدد والمستحد والمستحدد والمستحدد والمستحدد والمستحدد والمستحدد والمستحدد وا		, year gasy range a rapes describer	LAF	SORATORY TEMPERA	TURE AND I	IUM	IDIT	Y	
Physi	cal STD (106C)	20.0 %			ectronic STD (			23.0 ° +/-0.5 ° C (30-45	5% RH)
Dime	nsional STD (10	6B) 20.0°	+/-0.25 ° C	: (30-45% RH)   Ek	ectronic CAL (	Lab i	12)	23.0 ° +/-1.0 ° C (20-50	)% RH)
Phys/	Dim CAL (Lab	111) 20.0°	+/-0.5 ° C	(20-50% RH) Re	maining S&CL	. calit	ratio	n areas: 23.0 ° +5,-3.0 ° C (20-5	50% RH)
Mánufact	urer's environn	nental specifica	tions are o	evaluated for conforman	ce when calibr	ation	s are	performed outside the above state	d conditions.
AT THE RESERVE THE PARTY OF THE		OUT	OF TOLI	ERANCE CONDITIONS					
NOMINAL				NITS	Α	S FC		·	G. ACCURACY
	.6238	/TENS/DISP				500	+/- 6		
							+/- 6		
								+/- 6 +/- 6	
				COMM	ENTS				

UNIT WAS OUT OF TOLERANCE IN DISPLAY MODE. MADE ADJSUTMENTS AND RECALIBRATED.

INITIAL CALIBRATION USING mV OUT

LIMITED: MUST BE USED WITH DISPLAY P# 721514 CH 2. ECAL 4.041 ESCL 4770. IF NOT USED WITH ABOVE LISTED DISPLAY MAY

BE USED IN mV OUTPUT MODE.

EXCITATION VOLTAGE: 10 VDC.
CALIBRATED AND THEN GENERATED NEW COEFFICIENTS.

#### **M&TE Out-of-Tolerance Notification**

**Notification Status: Approved** 

#### **Notification**

To: Internal Customer - Equipment User/Custodian: Tommy E Rahl/TER/CC01/INEEL/US Org:

4663

**User Location: IF-EROB** 

Area Point of Contact: Gary D Roberts

This equipment (ID# 721516) was found to be out-of-tolerance when received by the calibration organization. Re-evaluation should be performed on prior decisions relating to product, processes, tests, survey measurements, research, experiments, etc. made with this equipment. Appropriate documentation to determine out-of-tolerance impact is required.

If evaluation assistance is desired, call Quality Engineering. If further information is desired regarding the out-of-tolerance condition, call the calibrator listed below.

#### **Calibration Results:**

Calibration/As-Fou

06/16/2004

Last Successful Calibration: 09/02/2003

nd Date:

Calibrated by:

Stanley D Zohner

Phone: 526-2350

Location: CF-698-107

Calibration

S&CL

Organization:

<b>Equipment Description</b>	: LOAD CELL	•	
Manufacturer: INTERFACE	Nomenclature: LOAD CELL	Model No: 5000 LBS	Serial No: 144177A
ID Number: 721516	Cal Work ins No.:		
Function Tested	Nominal (Std)	Accuracy	As-Found Reading
LBS/TENSION/DISPLAY	4492.6238	+/- 6	4500
LBS/TENSION/DISPLAY	4692.3969	+/- 6	4700
LBS/COMP/DISPLAY	4493.3956	+/- 6	4500
LBS/COMP/DISPLAY	4692.9214	+/- 6	4700
		· .	

Calibration Remarks: (file attachments allowed)

UNIT WAS OUT OF TOLERANCE. MADE ADJSUTMENTS AND RECALIBRATED. LIMITED: MUST BE USED WITH READOUT P# 721514 CH 2 ECAL 4.0401 ESCL 4700

#### **Evaluation:**

Evaluator: Tommy E Rahl

Evaluation: (file attachments allowed)

All weighing activites performed with the 5k load cell were tension measurements at weights below 2000 lbs. Since the out-of- tolerances occurred in the weight range above 4000 lbs, the weight measurements are still valid and within acceptable tolerances.

Selected Approver: Dana K Morton

NOTE: This evaluation or a separate out-of-tolerance evaluation must be retained with organization quality assurance records. Quality requirements for this evaluation and quality record retention are based on MCP-2391 and PRD-101.

#### **Evaluation Approval:**

Date: 06/16/2004 Approval: Dana K Morton

Approval Comments: Agree with evaluator statement.

#### **Comments/Attachments**

Add any comments here and/or use the area for any attachment.

#### **Document History:**

Created by Stanley D Zohner on 06/16/2004 10:00:51 AM Stanley D Zohner edited document 10:15 AM 06/16/2004

Notification sent: Stanley D Zohner on Wednesday, June 16, 2004.

Sent to user: Tommy E Rahl: 10:15 AM 06/16/2004 Tommy E Rahl edited document 11:01 AM 06/16/2004

Submitted for approval to Dana K Morton: Tommy E Rahl on Wednesday, June 16, 2004

Sent for approval to Dana K Morton: 11:02 AM 06/16/2004 Dana K Morton edited document 11:50 AM 06/16/2004

Evaluation Approval: Dana K Morton on Wednesday, June 16, 2004

NAME: DANA KEIT	TH MODITON		RADCE:	12/20/2007 2: 35698 PH: 526-1274 A				AREA: STC BLDG: EROB RM				
NAME: DANA KELI	I MOKTON		BADGE:	33076 PH:	240-14/4	AK	LA:	SIC BLING	EKUB	RM: W2D1		
ID Number: 7215 #: 144177A/1210A		lfr: INTERF	ACE	Model: 50	000 LB (D &	mV)		Noun Name: LOAD CELL Seri				
Calibration Date:	3/10/2003	5		ACTION C	ODE			AS FO	UND	·		
Next Cal Due Dat	e: 3/10/200	5 1		Acceptance Test		1	•	In Tolerance	•			
Charge Level:	20	2		Special Test		2	O	Out of Tolerance	>1x <2x			
Repair/Adj/etc C.l	L: 0	· 3		Calibration to Mi	FG Specs	3	O	Out of Tolerance	>2x <3x			
Material Amount:	0	4		Clean		4	O	Out of Tolerance	>3x <5x	•		
Charge Number:	100853G	SA 5	7	Limited Calibrati	on	5	C	Out of Tolerance	>5x			
Cal Work Inst ID:	5748F	6		Functional Check	•	6	С	Out of Tolerance	-Undeterm	ined		
Outside Vendor:		7		Performance Che	eck	7		Inoperative				
		8	1. 1	Modify		8		Damaged				
		. 9		Repair-needs Cha	arge Level	9		Not Used				
· .		10		Other		10		Not Determined				
				•		11		Excessed	•			
Calibrated By:	Stan Zoh	ner S#:	58146	Phone: 526-270	51	12		Extension				
				CALIBRATION S	TANDADD	e tie	ED					
Ī	350816	350815	7220		I	7	<u> </u>					
ľ	330010	000010				一						
STANDARDS VALUES	USED ARE T	RACEABLE T	O THE N	NATIONAL INSTITU FANTS, OR DERIVEI	TE OF STAND	ARDS	AND	TECHNOLOGY DE	RIVED FRO	OM ACCEPTED		
),						<del></del>						
Physic	al STD (106C)	20.0 ° -		BORATORY TEMPE (40-55% RH)	Electronic STD				.5 °C (30-45	% RH)		
Dimen	sional STD (10	6B) 20.0° 4	+/-0.25 ° (	C (30-45% RH)	Electronic CAL	(Lab l	12)	23.0 ° +/-1	.0 ° C (20-50	% RH)		
Phys/D	Dim CAL (Lab l	111) 20.0° +	⊦/-0.5 ° C	(20-50% RH)	Remaining S&C	L calil	ration	areas: 23.0 ° +5,-	3.0 ° C (20-5	0% RH)		
Manufactu	rer's environm	ental specifica	tions are	evaluated for conform	ance when calib	ration	s are	performed outside th	e above state	d conditions.		
NOMINAL	(STD)	· OUT		ERANCE CONDITION				IBRATION (UUT)	MFC	. ACCURACY		
	•				***************************************							
		-										
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				СОМ	MENTS				(	, .		

LIMITED: MUST BE USED WITH DISPLAY P# 721514 CH 2. ECAL 4.041 ESCL 4700. IF NOT USED WITH ABOVE LISTED DISPLAY MAY BE USED IN mV OUTPUT MODE. EXCITATION VOLTAGE: 10 VDC.

TENSION COEFFICIENTS A: -0.4066477956 B: 116.5617946 C: -0.001512210655 COMPRESSION COEFFICIENTS A: -0.7305250315 B: -116.6423674 C: -0.002982122665

12/20/2007

NAME: DANA KEIT	TH MORTON		BADGE:		26-1274	AR	EA:	STC BLDG: ERG	)B I	RM: W2D1
ID Number: 7215 #: 144177A/1210A		Afr: INTERF	ACE	Model: 50	00 LB (D & 1	nV)		Noun Name: LO	AD CEL	L Serial
Calibration Date:	8/28/200	6		ACTION CO	ODE			AS FOUNI	)	
Next Cal Due Dat	e: 8/28/200	7 1		Acceptance Test		1	•	In Tolerance		
Charge Level:	20	2		Special Test		2	O	Out of Tolerance >1x	<2x	
Repair/Adj/etc Ç.l	L: 0	3		Calibration to MF	G Specs	3	0	Out of Tolerance >2x	<3x	
Material Amount:	0.	4		Clean		4	0	Out of Tolerance >3x	. <5x	
Charge Number:	100853G	SSA 5	7	Limited Calibratio	on	5	O	Out of Tolerance >5x		
Cal Work Inst ID:	5748H	. 6		Functional Check	•	6	$\circ$	Out of Tolerance-Uno	determine	d
Outside Vendor:		7		Performance Chec	:k	7		Inoperative		
		8		Modify		8		Damaged		i e
		9		Repair-needs Cha	rge Level	9		Not Used		
		10		Other		10		Not Determined		
						11		Excessed		
Calibrated By:	Stan Zoh	ner S#:	58146	Phone: 526-276	1	12		Extension		•
				AT IND ATION C	TANDADY	o Tie	ED.			
F	350816	350815	7239	ALIBRATION S	IANDARDS	03	<u>ED</u>		<del></del>	
ľ	330010	350015				┢				
			L CONST		FROM THE R	ATIO	TYP	TECHNOLOGY DERIVE E OF SELF CALIBRATIO		
Physic	al STD (106C)	20.0 °			Electronic STD (			23.0 ° +/-0.5 ° C	(30-45% R	:H)
Dimen	isionał STD (10	06B) 20.0 °	+/-0.25 ° C	(30-45% RH)	Electronic CAL (	Lab I	12)	23.0 ° +/-1.0 ° C	(20-50% R	(H)
Phys/D	Dim CAL (Lab	111) 20.0°	+/-0.5 ° C	(20-50% RH)	Remaining S&Cl	_ calit	ration	areas: 23.0 ° +5,-3.0 ° 0	20-50%	RH)
Manufactu	rer's environn	nental specifica	tions are e	evaluated for conforma	nce when calib	ration	s are	performed outside the abo	ve stated co	nditions.
NOMINAL	. (STD)	OUT		ERANCE CONDITION				IBRATION (UUT)	MFG. A	CCURACY
	<u> </u>							<u>_</u>		
								<del></del>	•	
		1		COMN	MENTS					* •

LIMITED: MUST BE USED WITH DISPLAY P# 721514 CH 2. ECAL 4.041 ESCL 4700. IF NOT USED WITH ABOVE LISTED DISPLAY MAY BE USED IN mV OUTPUT MODE. EXCITATION VOLTAGE: 10 VDC.

TENSION COEFFICIENTS A: 0.4066477956 B: 116.5617946 C: -0.001512210655 COMPRESSION COEFFICIENTS A: 0.7305250315 B: -116.6423674 C: -0.002982122665

## **TENSILE TEST MACHINE**

11/30/2007

NAME: NATHAN D	EWITT	BADGI	E: 901441		PH: 526-911	8 AI	REA: CFA		BLDG: 602	RM:	
ID Number: 2672 MACHINE	216 M Serial #: 1:	ifi: TINIUS ( 52760	OLS		Model: 4001	ζ.	Noun Na	me:	COMPRESSI	ION TENSIO	ON TEST
Calibration Date:	6/2/2003	4:59:58 PM			ACT	ION CODE	C			AS FOUN	D
Next Cal Due Da	te: 6/2/2004		1		Acceptance	e Test		1		ance	
Charge Level:	16		2		Special Te	st		2	Out of T	olerance >1:	x <2x
Repair/Adj/etc C	L: 4		3	V	Calibration	n to MFG S	pecs	3	Out of T	olerance >2	x <3x
Material Amount	: <b>0</b>		4		Clean			4	Out of T	Tolerance >3	x <5x
Charge Number:	5501030	22	5		Limited C	alibration		5	Out of T	olerance >5	x
Cal Work Inst ID	: 3547D		6		Functiona	l Check		6	Colerance-Un	determined	
Outside Vendor:			7		Performan	ice Check		7	☐ Inoperat	ive	<i>i</i>
			· 8		Modify			8	☐ Damage	e <b>d</b>	
		•	9 .		Repair-ne	eds Charge	Level	. 9	☐ Not Use	d	
			10		Other			10	Not Det	ermined	
	• 1							11	☐ Excesse	d	
Calibrated By:	Michael	Sato	S#:	6663	1 Phone: 5	526-2761		12	Extension	ón	
,	<b>x</b> ,			T TDI	RATION ST	TANDADD	e Hern				
	711255	711256	71464		701349	710406	28128	33	<u> </u>		
,											
		RACEABLE TO AL PHYSICAL									
	1.0000 (4.0.40)	***			ORY TEMPER			4		5 0 5 400 4504	n.r.n.
-	cal STD (106C) nsional STD (10		/-0.3 ° C ( /-0.25 ° C		, ,	lectronic STD ( lectronic CAL )	, ,			.5 °C (30-45% .0 °C (20-50%	•
	Dim CAL (Lab	•	/-0.5°C (			emaining S&C		area		3.0 °C (20-50%	•
Manufact	urer's environn	sental specificat	ions are ev	aluated	i for conforma	ice when calib	rations are	perfo	rmed outside th	e above stated (	conditions.
OUT OF TOLE NOMINAL (STD) UN					RANCE CONDITIONS FOUND DURING CA					MFG.	ACCURACY
	:										
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	}				COMM	ENTS					

#### Calibration Issue of the Tinius-Olsen Compression Tension Test Machine - 267216

Static load testing was performed using the Tinius-Olsen test machine on June 3, 2004. The calibration for that machine expired one day earlier on June 2, 2004. At the time it was thought that an extension to the calibration had been granted. That turned out to not be the case and because of that oversight, technically, the testing was done with a machine that had an expired calibration. The oversight was realized and the machine was calibrated on July 27, 2004, approximately 7-1/2 weeks past the calibration due date. Results of that calibration indicated that the machine was in tolerance with no adjustments necessary. Hence, it can be concluded that the machine was in tolerance on June 3, 2004.

11/30/2007

E				11/30/2		P. 22	00:				
NAME: NATHAN DI	EWITT	BADGI	E: 901441	) PH: 526-9118	· A	REA:	CFA	BLDG: 602	RM:		
ID Number: 2672 MACHINE	Serial #: 1527	TINIUS (	OLS -	Model: 400K		Noui	n Na	me: COMPRESSION			
Calibration Date:	7/27/2004			ACTION COD	_			AS FOUNI	D		
Next Cal Due Date	e: 7/27/2005	. 1		Acceptance Test		1	In Tolerance				
Charge Level:	16	2		Special Test	•	2	2 Out of Tolerance >1x <2x				
Repair/Adj/etc C.l	L: 0	3	<b>三</b>	Calibration to MFG	Specs	3	$\mathbf{C}$	Out of Tolerance >2x	: <3x		
Material Amount:	0	4		Clean		4	O	Out of Tolerance >3x	: <5x		
Charge Number:	100652110	5		Limited Calibration		5	Out of Tolerance >5x				
Cal Work Inst ID:	3547E	6		Functional Check		6	6 C Out of Tolerance-Undetermined				
Outside Vendor:		. 7		Performance Check		7		Inoperative			
		8		Modify		8	П	Damaged			
,		9		Repair-needs Charge	e Level	9	<b>E</b>	Not Used			
		10	$\Box$	Other		10		Not Determined	•		
					۲,	11		Excessed			
Calibrated By:	Stan Zohner	S#: ′	58146	Phone: 526-2761		12	<u> </u>	Extension			
			C	CALIBRATION STA	ANDARD	s us	ED				
[	714644	709226	7013	710406	281283						
. [[											
								TECHNOLOGY DERIVI E OF SELF CALIBRATION			
			LAE	BORATORY TEMPERA	TURE AND	HUM	IDIT	Y			
Physic	al STD (106C)	20.0 ° +	/-0.3 ° C	(40-55% RH) Ele	ctronic STD	(106D)	)	23.0 ° +/-0.5 ° C	(30-45% RH)		
Dimen	sional STD (106B)	20.0°+	/-0.25 ° C	(30-45% RH)   Ele	ctronic CAL	(Lab 1	12)	23.0 ° +/-1.0 ° C	(20-50% RH)		
Phys/I	Dim CAL (Lab 111)	) 20.0°+	/-0.5 ° C	(20-50% RH) Ren	maining S&C	CL calib	ratio	n areas: 23.0 ° +5,-3.0 °	C (20-50% RH)		
Manufactu	rer's environmen	tal specificat	ions are	evaluated for conformanc	e when cali	bration	s are	performed outside the abo	ove stated conditions.		
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY											
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								<del> </del>			
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				COMMI	ENTS				•		

11/30/2007

NAME: NATHAN DE	WITT	BADGE: 90144	1 PH: 526-9118	AREA: CFA	BLDG: 602 RM:
ID Number: 26721 MACHINE	6 Mfr: T Serial #: 152760	INIUS OLS	Model: 400K	Noun Nam	e: COMPRESSION TENSION TEST
Calibration Date:	8/1/2005		ACTION CODE		AS FOUND
Next Cal Due Date	:: 9/27/2005	1 🔲	Acceptance Test	1 C	In Tolerance
Charge Level:	1	2	Special Test	2 0	Out of Tolerance >1x <2x
Repair/Adj/etc C.I.	.: O	3	Calibration to MFG Spec	s 3 C	Out of Tolerance >2x <3x
Material Amount:	0	4	Clean	4 O	Out of Tolerance >3x <5x
Charge Number:	p51401008	5	Limited Calibration	5 C	Out of Tolerance >5x
Cal Work Inst ID:	3547D	6	Functional Check	6 C	Out of Tolerance-Undetermined
Outside Vendor:		7	Performance Check	7 🔟	Inoperative
	•	8	Modify	8	Damaged
		9	Repair-needs Charge Lev	re) 9 🗀	Not Used
		10	Other	10 🔽	Not Determined
				11	Excessed
Calibrated By:	Larry Deming	S#: 395	71 Phone: 526-2761	12	Extension
· ·				•	
F			CALIBRATION STANDA	RDS USED	<u> </u>
<u> </u>				_	
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L					
STANDARDS VALUES	USED ARE TRACE FOR NATURAL PI	EABLE TO THE I	NÁTIONAL INSTITUTE OF STA TANTS, OR DERIVED FROM TH	NDARDS AND T	ECHNOLOGY DERIVED FROM ACCEPTED OF SELF CALIBRATION TECHNIQUES
		LA	BORATORY TEMPERATURE A	ND HUMIDITY	
Physica	l STD (106C)	20.0 ° +/-0.3 ° C	(40-55% RH)   Electronic S	TD (106D)	23.0 ° +/-0.5 ° C (30-45% RH)
	ional STD (106B)	20.0 ° +/-0.25 °		AL (Lab 112)	23.0 ° +/-1.0 ° C (20-50% RH)
Phys/D	im CAL (Lab 111)	20.0 ° +/-0.5 ° C	(20-50% RH)   Remaining S	S&CL calibration at	reas: 23.0° +5,-3.0°C (20-50% RH)
Manufactur	er's environmental	specifications are	evaluated for conformance when c	alibrations are pe	rformed outside the above stated conditions.
NOMINAL	(STD)		ERANCE CONDITIONS FOUND NITS	DURING CALIE AS FOUND (I	
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	Ň.	,	COMMENTS		<i>N</i>

BASED ON THE PAST IN TOLERANCE CALIBRATIONS AND THE INHERENT STABILITY OF THIS MACHINE, THE CALIBRATION DUE DATE HAS BEEN EXTENDED 2 MONTHS. NEW DUE DATE: 9/27/2005

11/30/2007  NAME: NATHAN DEWITT BADGE: 901441 PH: 526-9118 AREA: CFA BLDG: 602 RM:												
NAME: NATHANT	JEWIII	BADG	E: 901441	PH: 520-9118	·	AKEA:	CFA	BLDG: 602	KM:			
ID Number: 2672 MACHINE	216 Mi Serial #: 152	fr: TINIUS 2760	OLS	Model: 400K	. ( .	Nou	n Na	me: COMPRESSION	TENSION	rest		
Calibration Date:	9/15/2005			ACTION COD	ÞΕ			AS FOUN	D	•		
Next Cal Due Da	te: 9/15/2006	1		Acceptance Test		1	•	In Tolerance				
Charge Level:	16	2	Г :	Special Test		2	O	Out of Tolerance >1x	x <2x			
Repair/Adj/etc C	.L: 0	. 3	<u> </u>	Calibration to MFG	Specs	3	C	Out of Tolerance >2x	Out of Tolerance >2x <3x			
Material Amount	: 0	4.	<u> </u>	Clean		4	C	Out of Tolerance >3x	Out of Tolerance >3x <5x			
Charge Number:	P5140100	8 5		Limited Calibration		5	O	Out of Tolerance >5x				
Cal Work Inst ID	: 3547E	6	Functional Check 6 C Out of Tolerance-Undet						determined			
Outside Vendor:		· 7	<u> </u>	Performance Check		7		Inoperative	•			
		8		Modify		8		Damaged				
		9		Repair-needs Charge	e Level	9	Γ.	Not Used				
		10		Other		10	Γ.:	Not Determined	•			
,						11		Excessed		•		
Calibrated By: Stan Zohner S#: 58146 Phone: 526-2761 12 Extension												
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ſ	250016	250015	7013	ALIBRATION STA			ED		<del></del>	1		
	350816	350815	7013	281283	9							
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			<u> </u>							· · · · · · · · · · · · · · · · · · ·		
								TECHNOLOGY DERIVI E OF SELF CALIBRATION				
			LAB	ORATORY TEMPERA	TURE AN	D HUMI	DIT	·	·			
Physi	cal STD (106C)	20.0 ° ,	-/-0.3 ° C	(40-55% RH)   Elec	ctronic STI	D (106D)		23.0 ° +/-0.5 ° C	(30-45% RH)			
Dime	nsional STD (106	B) 20.0° 4	-/-0.25 ° C	(30-45% RH)   Elec	etronic CA	L (Lab I	12)	23.0 ° +/-1.0 ° C	(20-50% RH)	1		
Phys/	Dim CAL (Lab 11	11) 20.0° +	-/-0.5 ° C <sub>.</sub> (	(20-50% RH) Ren	naining S&	CL calib	ration	areas: 23.0 ° +5,-3.0 °	C (20-50% RH)	ı		
Manufact	urer's environme	ntal specifics	ions are ev	valuated for conformanc	e when cal	libration	are	performed outside the abo	ve stated condi	ions.		
		OUT		RANCE CONDITIONS				<del>-</del>				
NOMINA	L (STD)		UNITS				IND	(UUT)	MFG. ACC	URACY		
<del></del>								-				
		•		COMME	INTS							

11/30/2007

ID Number: 267216 Mfr: TINIUS OLS Model: 400K Noun Name: COMPRESSION TENSION TEST MACHINE Serial #: 152760 Calibration Date: 9/18/2006 ACTION CODE Next Cal Due Date: 9/18/2007 1 Acceptance Test 1 © In Tolerance									
Next Cal Due Date: 9/18/2007 1 Acceptance Test 1 6 In Tolerance									
Charge Level: 16 2 Special Test 2 C Out of Tolerance >1x <2x									
Repair/Adj/etc C.L: 0 3									
Material Amount: 0 4 Clean 4 C Out of Tolerance >3x <5x									
Charge Number: P51101ICS 5  Limited Calibration 5 C Out of Tolerance >5x									
Cal Work Inst ID: 3547F 6 Functional Check 6 C Out of Tolerance-Undetermined									
Outside Vendor: 7 Performance Check 7 Inoperative									
8 Modify 8 Damaged									
9 Repair-needs Charge Level 9 Not Used									
10 Other 10 Not Determined									
11 Excessed									
, Calibrated By: Stan Zohner S#: 58146 Phone: 526-2761 12 Extension									
CALIBRATION STANDARDS USED    350816									
350615   350615   701545   710400   251265									
STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED	<del></del>								
VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES									
LABORATORY TEMPERATURE AND HUMIDITY									
Physical STD (106C) 20.0° +/-0.3° C (40-55% RH)   Electronic STD (106D) 23.0° +/-0.5° C (30-45% RH)  Dimensional STD (106B) 20.0° +/-0.25° C (30-45% RH)   Electronic CAL (Lab 112) 23.0° +/-1.0° C (20-50% RH)									
Dimensional STD (106B) 20.0 ° +/-0.25 ° C (30-45% RH)   Electronic CAL (Lab 112) 23.0 ° +/-1.0 ° C (20-50% RH)  Phys/Dim CAL (Lab 111) 20.0 ° +/-0.5 ° C (20-50% RH)   Remaining S&CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)									
Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.									
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY									
COMMENTS									

11/30/2007

NAME: NATHAN D	EWITT	BADG	E: 9014	41	71/30 PH: 526-911		ARE	A: CFA	BLDG: 602	RM:			
ID Number: 2672 MACHINE	Serial #: 1527	TINIUS (	OLS		Model: 400		No	oun N	ame: COMPRESSION				
Calibration Date:	9/18/2007	•	_		ACTION CO	DE		c	AS FOUNI	U			
Next Cal Due Dat		1			ptance Test		1	_	In Tolerance	,			
Charge Level:	16	2		-	al Test		2		Out of Tolerance >1x				
Repair/Adj/etc C.l	L: 0	3	V	Calib	ration to MFO	3 Specs	3	C	Out of Tolerance >2x	: <3x			
Material Amount:	0	4		Clean	1		4	С	Out of Tolerance >3x	: <5x			
Charge Number:	P51101SS9	5		Limit	ed Calibration	n	5	C	Out of Tolerance >5x	:			
Cal Work Inst lD:	3547J	6		Funct	Functional Check			C	C Out of Tolerance-Undetermined				
Outside Vendor:		7	Performance Check			7		Inoperative					
		8	Γ	Modi	fy		8	Ľ	Damaged				
		9	Π	Repa	ir-needs Char	ge Level	9		Not Used	•			
		10	Γ	Other		•	1	0 [	Not Determined				
	•						1	1 🗀	Excessed				
Calibrated By:	Stan Zohner	58146	5 Pho	ne: 526-2761		1	2	Extension					
			(	CALII	BRATION ST	ΓANDAF	RDS L	SED					
	350816	350815	70	349	710406	28128	3						
Į			<u> </u>				<u> </u>						
L			<u> </u>										
									D TECHNOLOGY DERIVI PE OF SELF CALIBRATION				
,			· L.A	BORAT	ORY TEMPER	ATURE A	ND HU	MIDIT	Υ				
•	al STD (106C)			C (40-55		lectronic SI	-	•	23.0 ° +/-0.5 ° C	•			
•	nsional STD (106B)			-		lectronic Ca ternaining S	-	-	23.0 ° +/-1.0 ° C				
•	Dim CAL (Lab 111)			(20-50					,				
Manufacti	irer's environment							•	e performed outside the abo	ve stated conditions.			
NOMINAL	. (STD)		LERANCE CONDITIONS FOUND JNITS					LIBRATION  O (UUT)	MFG. ACCURACY				
				1		<del>,</del>							
· · · · · · · · · · · · · · · · · · ·		_		<del>, , , -, -, , , , , , , , , , , , , , ,</del>						•			
		•			COMM	IENTS							

## TEMPERATURE READOUTS

11/30/2007

NAME: DANA KEITI	H MORTON		BADGE: 3565	<del></del>	6-1274	AREA: ST	C BLDG	: EROB	RM: W2D1
ID Number: 72280 040704878	6 N	1fr: EXTECI	<b>.</b>	Model: EA15	1	Noun Name: 7	TEMPERATUR	E READOU	T Serial #:
Calibration Date:	5/11/200	5		ACTION C	ODE		AS F	DUND	
Next Cal Due Date	: 5/11/200	6 1	A	cceptance Test		1 @	In Tolerance		
Charge Level:	4	2	□ s	pecial Test		2 C	Out of Tolerand	e >1x <2x	
Repair/Adj/etc C.L	.: 0	3	<u> </u>	alibration to M	FG Specs	3 C	Out of Tolerand	e >2x <3x	
Material Amount:	0	4		lean	•	4 C	Out of Tolerand	e >3x <5x	ı
Charge Number:	100853G	SA 5	L: L	imited Calibrati	on	5 C	Out of Tolerand	e >5x	
Cal Work Inst ID:	5113	6	☐ F	unctional Check	(	6 C	Out of Tolerand	e-Undeterm	ined <sup>-</sup>
Outside Vendor:		7	_ P	erformance Che	ck	7 ]	Inoperative		
		. 8	_ N	lodify		8	Damaged		~
		9	☐ R	epair-needs Ch	arge Level	9 🗔	Not Used		•
		10		ther		10 🗀	Not Determined		
						11 -	Excessed		
Calibrated By:	Brian Be	rls S#:	102182	Phone: 526-270	51	12	Extension		
			Č.	IDD ATION O	TANDAN	DC HCED			
	216578	701587	715356	JBRATION S	700392		700394	700855	า .
·	706129	701307	713330	70000	700392	700393	700394	700833	1
F	700127							<u> </u>	
<u></u>									<u> </u>
							ECHNOLOGY DE OF SELF CALIBR		
			LABOR	ATORY TEMPER	ATURE AN	D HUMIDITY		.*	
Physica	J STD (106C)	20.0 ° -	+/-0.3 ° C (40	-55% RH)   I	ectronic ST	D (106D)	23.0 ° +/-0.	5 °C (30-45%	RH)
Dimens	ional STD (10	6B) 20.0° +	⊦/-0.25 ° C (3	0-45% RH)   I	electronic CA	AL (Lab 112)	23.0 ° +/-1.	0 ° C (20-50%	RH)
Phys/D	im CAL (Lab	111) 20.0° 4	⊦/-0.5 ° C (20	-50% RH)   F	temaining S&	&CL calibration a	reas: 23.0 ° +5,-:	3.0 °C (20-50)	∕₀ RH)
Manufactur	er's environn	nental specifica	tions are eval	pated for conforma	nce when ca	librations are pe	rformed outside th	e above stated	conditions.
NOMBLAI	·*	OUT	of tolera UNIT	NCE CONDITION				· MEC	A COLUD A CV
NOMINAL	(310)		ONII	<b></b>		AS FOUND (	001)	MrG.	ACCURACY
									,
	•			· · · · · · · · · · · · · · · · · · ·					<del></del>
					<del></del>	·	1		•
			•	COMN	MENTS				

Initial calibration.
Receiving inspection test referral QA# 114093

11/30/2007

NAME: DANA KEIT	H MORTON		BAD	GE: 35698	PH: 5	26-1274	AREA: S	TC	BLDG	: EROB	RM: W2D1
ID Number: 72280 040704878	)6 M	Ifr: EXTEC	H	N	Model: EA15	No	un Name:	TEI	MPERATUR	E READO	JT Serial #:
Calibration Date:	4/27/2006	5			ACTIO	N CODE			A.	S FOUND	
Next Cal Due Date	: 4/27/2007	7	1 .		Acceptance T	est	1	•	In Tolerance	e	
Charge Level:	4		2		Special Test		2	O	Out of Toler	rance > l x <	2x
Repair/Adj/etc C.I	.: O		3	[Z]	Calibration to	MFG Specs	3	$\cap$	Out of Toler	rance >2x <	3x
Material Amount:	0		4		Clean		4	O	Out of Toles	rance >3x <	5x
Charge Number:	100853G	SA	5		Limited Calil	oration	5	O	Out of Toler	rance >5x	
Cal Work Inst ID:	5113		6	$\Box$	Functional C	heck	6	C	Out of Toler	rance-Unde	termined
Outside Vendor:			7 .		Performance	Check	7		Inoperative		
			8		Modify		8		Damaged		
		•	9		Repair-needs	Charge Leve	el 9	<u> </u>	Not Used		`
	•. •		10		Other		10		Not Determ	ined	
							11		Excessed		
Calibrated By:	Donnie L	indsay	S#:	105138	Phone: 526	-2761	12	П	Extension		
				CALL	DD ATION C	TABIBA DIDA	CHOPP			-	
ال	P020713	701587	71-	700666	700392	700393	70039	<u> </u>	700855	706129	71
·	715356	70,1507	╬	70000	700352	700375	10057	_	700033	700127	╣
Ė			╬				i	╡			1 .
					NAL INSTITUT , OR DERIVED						
				LABORA	TORY TEMPER	RATURE AND	HUMIDITY	,			
Physica	il STD (106C)	20.0 °	+/-0.3	3°C (40-5	5% RH)   1	Electronic STD (	106D)		23.0 ° +/-0.	5 ° C (30-459	6 RH)
Dimens	ional STD (10	6B) 20.0°	+/-0.2	.5 ° C (30-	45% RH)   1	Electronic CAL (	Lab 112)		23.0 ° +/-1.	0°C (20-509	6 RH)
Phys/D	im CAL (Lab 1	111) 20.0.°	+/-0.5	5°C (20-5	0% RH)   1	Remaining S&CI	L calibration	areas	:: 23.0 ° +5,-:	3.0 °C (20-50	% RH)
Manufactu	er's environm	ental specific	ations	are evalua	ted for conforms	nce when calib	rations are	erfo	rmed outside th	e above stated	conditions.
NOMINAL	(STD)	<b>ο</b> ψ	r of 1	OLERAN UNITS	CE CONDITION		RING CALI			MFG.	ACCURACY
	<del> </del>										
·			,				- · · · · · · · · · · · · · · · · · · ·				
			*****								
					COMN	MENTS		-			

S&CL overcheck required.

11/30/2007

NAME: DANA KEIT	H MORTON	В	ADGE: 35698	PH: 526	-1274	AREA: S	тс	BLDG: EF	ЮВ	RM: W2D1
ID Number: 72280	06 Mfr	: EXTECH	Ŋ	Model: EA15	Nou	ın Name:	TE	MPERATURE F	(EADOU	T Serial #:
Calibration Date:	5/7/2007			ACTION	CODE			AS F	OUND	
Next Cal Due Date	e: 5/7/2008	1	Γ	Acceptance Te	st	1	•	In Tolerance		
Charge Level:	4	2	Γ	Special Test		2	C	Out of Tolerand	ce >1x <2	x
Repair/Adj/etc C.I	L: 1	3	[ <b>7</b> ]	Calibration to l	MFG Specs	3	C	Out of Tolerand	ce >2x <3	x
Material Amount:	0 -	4	<b>.</b>	Clean		4	C	Out of Tolerand	ce >3x <5	x
Charge Number:	100853GSA	A 5	匚	Limited Calibr	ation	. 5	C	Out of Toleran	ce >5x	
Cal Work Inst ID:	5113	6	Γ.	Functional Che	eck	6	C	Out of Tolerand	ce-Undete	rmined
Outside Vendor:		7	Γ	Performance C	heck	7		Inoperative	,	•
		8	Π	Modify .		8	Γ	Damaged		
		9	$\Gamma$	Repair-needs (	harge Leve	1 9		Not Used		
		10	) [	Other		10		Not Determine	đ	
•						11		Excessed		
Calibrated By:	Donnie Lin	dsay Si	#: 105138	Phone: 526-2	2761	12	Γ.	Extension		
	•		CALL	BRATION ST	ANDADDO	LICED				
F	715356	701587	700666	700392	700393	70039	94	700856	700855	
ľ	702971									
								HNOLOGY DERIV		
			LABORA	TORY TEMPERA	TURE AND F	IUMIDIT	γ			
•	al STD (106C)		-0.3 ° C (40-5		ectronic STD (1	•		23.0 ° +/-0.5 °	•	,
	sional STD (106B Dim CAL (Lab 111	•	-0.25 ° C (30 -0.5 ° C (20-5		ectronic CAL (I maining S&CL	•	area	23.0 ° +/-1.0 ° s: 23.0 ° +5,-3.0 °	*	
	•			·				rmed outside the ab	•	,
				CE CONDITIONS	- necessary and a second					
NOMINAL	(STD)	0010	UNITS			FOUND			MFG.	ACCURACY
1500	Deg F	_	-	type K		1502.5	_			+- 2.2 Deg F
	Deg F		=	type K		1903.1	_			+- 2.4 Deg F
1000 ]	Deg C	<del>-</del>	Temp t	уре К		1001.5	Deg	<u>. C</u>	+	- 1.2 Deg C
		. <u>-</u>								
				COMM	FIA I 2					

UUT was out of tolerance on upper end of test range. Adjusted UUT to meet manufacturer's specifications and recalibrated unit.

#### **M&TE Out-of-Tolerance Notification**

Notification Status: Approved

No		

To: Internal Customer - Equipment User/Custodian: Dana K Morton/DXM/CC01/INEEL/US Org:

B340

ID Number: 722806

**User Location: STC-EROB** 

Area Point of Contact: Gary D Roberts

This equipment (ID# 722806) was found to be out-of-tolerance when received by the calibration organization. Re-evaluation of prior decisions relating to product, processes, tests, survey measurements, research, experiments, etc. made with this equipment - including appropriate documentation to determine out-of-tolerance impact - is REQUIRED.

If evaluation assistance is desired, call Quality Engineering. If further information is desired regarding the out-of-tolerance condition, call the calibrator listed below.

Calibration Results:		· · · · · · · · · · · · · · · · · · ·	·
Calibration/As-For	ın		
d Date:	05/07/2007	Last Successfi	ul Calibration: 04/27/2006
Calibrated by:	Donovan M Lindsay		Phone: 526-0648 Location: CFA-698-112
Calibration Organization:	S&CL		
Equipment Descri	ption: Manufacturer:	Model No:	Serial No:
TEMPERATURE READOUT	EXTECH	EA15	040704878

Cal Work Ins No.: 51130

Function Tested	Nominal (Std)	Accuracy	As-Found Reading
Temperature Type K	1500 Deg F	+-2.2 Deg F	1502.5 Deg F
Temperature Type K	1900 Deg F	+-2.4 Deg F	1903.1 Deg F
Temperature Type K	1000 Deg C	+-1.2 Deg C	1001.5 Deg F
			·

Calibration Remarks: (file attachments allowed)

Evaluation Approval: Robert K Blandford on Thursday, May 10, 2007

UUT was out of tolerance on upper end of test range. Adjusted U and recalibrated unit.  Evaluation Required?:	JUT to meet manufacturer's specification	ıs
● REQUIRED		
○ Not Required-New Equipment		
O Not Required-Other	-	
Evaluation:		·
Evaluator: Dana K Morton	(	
Evaluation: (file attachments allowed)	<b>,</b>	
This test equipment was only used to measure temperatures values were for temperatures at 1500F or higher. Therefore, data previously taken with this test equipment.		
Selected Approver: Robert K Blandford		
NOTE: This evaluation or a separate out-of-tolerance evaluatio quality assurance records. Quality requirements for this evaluate based on PDD-13450 and LWP-13455.		
Evaluation Approval:		
Date: 05/10/2007 Approval: Robert K Blandford Approval Comments: No Comment		•
Commonts/Attachments	•	
Add any comments here and/or use the area for any attachment.	· · · · · · · · · · · · · · · · · · ·	
Document History:		٠.,
Created by Donovan M Lindsay on 05/07/2007 04:10:37 PM		
Donovan M Lindsay edited document 04:14 PM 05/07/2007 Notification sent: Donovan M Lindsay on Monday, May 07, 2007.	44	
Sent to user: Dana K Morton: 04:14 PM 05/07/2007		
Dana K Morton edited document 11:13 AM 05/10/2007		
Submitted for approval to Robert K Blandford: Dana K Morton on Thursday, May Sent for approval to Robert K Blandford: 11:13 AM 05/10/2007	y 10, 2007	

11/30/2007

NAME: DANA KEIT	H MORTON	<del></del>	В.	ADGE: 35		1: 526-1274		ARE	A: STC	В	LDG: ERC	)B	RM: W2D1
ID Number: 72280	)7 M	fr: EXT	ЕСН		Model: EA1	5	Noun	Nar	ne: T	EMPERA?	TURE RI	EADOU	JT Serial #:
G037371 Calibration Date:	5/11/2005	5			ACTION	CODE				A	S FOUN	ď	
Next Cal Due Date	: 5/11/2006	5	i	D	Acceptance To			1	<b>⊚</b> 1	n Tolerano			
Charge Level:	4	:	2		Special Test			2	0	Out of Tole	rance >1	x <2x	
Repair/Adj/etc C.I	.: <b>0</b>	:	3	17	Calibration to	MFG Spec	s .	3	0	Out of Tole	erance >2	2x <3x	
Material Amount:	0		4	Γ	Clean			4	0 0	Out of Tole	rance >3	x <5x	
Charge Number:	100853G	SA :	5	Γ	Limited Calib	ration		5	0	Out of Tole	rance >5	x	
Cal Work Inst ID:	5113		6	Γ.	Functional Ch	eck		6	0	Out of Tole	rance-U	ndeterm	nined
Outside Vendor:			7	Γ	Performance (	Check		7	<u> </u>	noperative			
		1	8	Г	Modify			8.		Damaged -			
		9	9	Γ:	Repair-needs	Charge Lev	rel	9	<u> </u>	Not Used		٠	•
•			10	$\Gamma_{i}$	Other			10		Not Detern	nined		
								11	F	Excessed			
Calibrated By:	Brian Bei	rls	S#:	102182	Phone: 526-	2761		12		Extension			
				C	ALIBRATION	J CTANNA	pne	Her	n				•
F	216578	70158	37	70060	- 1				0393	70039	94 7	00855	<b>7</b>
ľ	706129								====				1
					ATIONAL INSTIT NTS, OR DERIV								
Physics	al STD (106C)	20.	.0°+		ORATORY TEM (40-55% RH)	PERATURE A Electronic			ITY	23.0 °	+/-0.5 ° C	(30-45%	6 RH)
_	sional STD (10	•			(30-45% RH)	Electronic (		•	)		+/-1.0 ° C	•	•
Phys/D	im CAL (Lab	111) 20.	.0 ° +	/-0.5 ° C (	(20-50% RH)	Remaining	S&CL o	alibra	tion are	eas: 23.0 °	+5,-3.0 ° (	(20-50	% RH)
Manufactu	rer's environn	ental spec	ificati	ions are ev	aluated for confo	rmance when	calibra	tions	are per	formed outs	de the abo	ve stated	conditions.
NOMINAL	(STD)	-	OUT C	UN]	RANCE CONDIT	IONS FOUN	D DURI AS F					MFG.	ACCURACY
		_		· · · · · · · · · · · · · · · · · · ·								<del></del>	
				· · · · · · · · · · · · · · · · · · ·	•								
				,	CO	 MMENTS					- , -		

Initial calibration. Receiving inspection test referral QA# 114093

				11/30/200	·/					
NAME: DANA KEIT	H MORTON	]	BADGE: 356	98 PH: 526-12	:74	AREA: STO	BLDG	EROB	RM: W2D1	
ID Number: 72280 G037371	97 M	Ifr: EXTEC	1	Model: EA15	Nou	n Name: T	EMPERATUR	E READO	OUT Ser	rial#:
Calibration Date:	5/23/2005	5		ACTION COD	E		AS F	DUND		
Next Cal Due Date	: 5/23/2006	5 1		cceptance Test		1 C I	n Tolerance			
Charge Level:	0	2	C S	pecial Test		2 (	Out of Tolerand	e > 1 x < 2 x	:	
Repair/Adj/etc C.I	.: 2	3	<u>v</u>	Calibration to MFG	Specs	3 🥷 (	Out of Tolerand	e >2x <3x	:	
Material Amount:	Ó	. 4		lean		4 C (	Out of Tolerand	:e >3x <5x	:	
Charge Number:	100853G	SA 5	To L	imited Calibration		5 C C	Out of Tolerand	ce >5x		
Cal Work Inst ID:	5113	6	_ F	unctional Check		6 C C	Out of Tolerand	e-Undeter	mined	
Outside Vendor:		7	T P	erformance Check		7 🗀 1	noperative			
		8		lodify		8 🗀 I	Damaged	•		
,		9	F P	epair-needs Charge	: Level	9 🗀 1	Not Used	•	•	
		10		Other		10 🗀 1	Not Determined	į		
					/	11 [] I	Excessed			
Calibrated By:	Brian Ber	ris S#:	102182	Phone: 526-2761		12 🗍 I	Extension			
			CAI	JBRATION STAN	VI A DING	HCED .	•			
[	216578	701587	700666		(DAKDS	USED			7	
··							1		7	
				IONAL INSTITUTE OF TS, OR DERIVED FRO						
			LABOR	ATORY TEMPERATI	URE AND H	UMIDITY				
Physic	al STD (106C)	20.0 °	⊦/-0.3 ° C (44		ronic STD (10		23.0 ° +/-0	.5 ° C (30-4	5% RH)	
	sional STD (10 im CAL (Lab	•	+/-0.25 ° C (3 +/-0.5 ° C (20		ronic CAL (L tining S&CL	.ab 112) calibration an		.0 ° C (20-5) 3.0 ° C (20-)		
-			`	uated for conformance			•		•	
NOMINAL	(STD)	OUT	of tolera UNIT	NCE CONDITIONS FO		ING CALIBI FOUND (U		MFC	G. ACCURACY	Y
Ch 1 i	nput		-190 to	1900 F		+3.5 all po	ints		0.05% +1.5	
							<del></del>			
		<del>.</del> —		COMMEN	JTS	<del></del>			· ·	<del></del>
•				COMMEN	110					

Adjusted unit to meet manufacturers specifications and recalibrated unit.

### **Temperature Readout**

#722807

**Not Used To Collect Data** 

**Prior To** 

5/23/2005

11/30/2007

NAME: DANA KEIT	H MORTON		BADGE	E: 35698	PH: 52	6-1274	AREA: S	TC	BLDG: EROB	RM: W2D1
ID Number: 72280 G037371	07 N	Иfr: EXTEC	Н .	N	Model: EA15	Noi	un Name:	TE	MPERATURE READ	OUT Serial #:
Calibration Date:	4/27/200	6			ACTION	CODE			AS FOUN	D
Next Cal Due Date	e: 4/27/200	7	1		Acceptance To	est	1	•	In Tolerance	
Charge Level:	4		2 ]		Special Test		2	C	Out of Tolerance >1:	< <2x
Repair/Adj/etc C.I	L: 0		3 [	<u> </u>	Calibration to	MFG Specs	3	C	Out of Tolerance >2:	c <3x
Material Amount:	0		4		Clean		4	Ç	Out of Tolerance >3:	<5x
Charge Number:	100853G	SA	5 [		Limited Calib	ration	5	Ċ	Out of Tolerance >5	
Cal Work Inst ID:	5113		6		Functional Ch	eck	6	C	Out of Tolerance-Un	determined
Outside Vendor:			7 [		Performance (	Check	7		Inoperative	
			8 [	!	Modify		8	Γ	Damaged	
. ·	•		9 [	!	Repair-needs (	Charge Leve	1 9	Γ	Not Used	
			10 [		Other		10		Not Determined	
							11		Excessed	
Calibrated By:	Donnie L	Lindsay	S#: 10	05138	Phone: 526-2	2761	12	_	Extension	
F	715256	D020712			BRATION ST				700204 70000	<del></del>
Ľ	715356 706129	P020713	/0	1587	700666	700392	70039	3	700394 70085	3
IL I	700129	<u> </u>	╬		][[		<u> </u>	⊣		
L		<u> </u>	<u> </u>		<u> </u>		<u> </u>			
									HNOLOGY DERIVED FI SELF CALIBRATION T	
			LA	ABORA'	TORY TEMPERA	TURE AND I	IUMIDITY	,		
Physica	al STD (106C)	20.0 °	+/-0.3 ° (	C -(40-5	5% RH)   EI	ectronic STD (	106D)		23.0 ° +/-0.5 °C (30-	45% RH)
Dimen	sional STD (10	06B) 20.0°	+/-0.25°	°C (30-	45% RH)   EI	ectronic CAL (	Lab 112)		23.0 ° +/-1.0 °C (20-	50% RH)
Phys/D	im CAL (Lab	111) 20.0°	+/-0.5 ° (	C (20-5	0% RH)   Re	emaining S&CL	calibration	areas	23.0 ° +5,-3.0 ° C (20	-50% RH)
é Manufactu	rer's environn	nental specifica	tions are	e evalua	ted for conforman	ce when calibr	ations are p	perfo	rmed outside the above sta	ted conditions.
NOMINAL	(STD)	OUT		LERANO	CE CONDITIONS		RING CALI FOUND			G. ACCURACY
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S&CL overcheck required.

# INL CALIBRATION INPUT DATA 11/30/2007

NAME: DANA KEIT		BAD	GE: 35698	PH: 526	-1274	AREA: STC BLDG: EROB RM: W2D1						
ID Number: 72280 G037371	)7 M	1fr: EXTEC	H	N	Aodel: EA15	Nou	n Name:	TE	MPERATUR	E READO	UT	Serial #:
Calibration Date:	5/7/2007				ACTION	CODE			AS	FOUND		
Next Cal Due Date	: 5/7/2008		1		Acceptance Te	st	1	•	In Tolerance	<b>;</b>		
Charge Level:	4	٠	2		Special Test		2	O	Out of Toler	ance > 1 x	<2x	
Repair/Adj/etc C.1	.: <b>0</b>	•	3	<b>☑</b>	Calibration to	MFG Specs	3	C	Out of Toler	ance >2x	<3x	
Material Amount:	0		4	$\Gamma$	Clean		4	Ç	Out of Toler	ance >3x	<5x	
Charge Number:	100853G	SA	5	Γ	Limited Calibr	ation	5	C	Out of Toler	ance >5x		
Cal Work Inst lD:	5113		6	$\Gamma$	Functional Che	eck	6	C	Out of Toler	ance-Unde	etermined	
Outside Vendor:			7		Performance C	Check	7		Inoperative	••		
•			8	Γ.	Modify		8		Damaged			
• .			9		Repair-needs (	Charge Leve	1 9		Not Used			
			10	Γ	Other		10		Not Determi	ined		
							11		Excessed			
Calibrated By:	Donnie I	indsay	S#:	105138	Phone: 526-2	2761	12		Extension			
					<b>DD</b> 1 <b>D</b> 1 O 1 O 1							
´ [F	715356	702971	7	700666	BRATION ST	700393	70039	)4	700856	700855	<b>-</b>	
·	701587	702571	┧	70000	100372	700373	70057		700050	700055	1	•
			jĒ									
STANDARDS	USED ARE T	RACEABLE	тот	HE NATIO	ONAL INSTITUTE	OF STANDA	RDS AND	TEC	HNOLOGY DE	RIVED FRO	M ACCEPT	ED
					, OR DERIVED F							
Dhoois	.) PTD (104C)	20.09			TORY TEMPERA			1	22.00 . / 0		N DYB	
-	11 STD (106C) sional STD (10			3°C (40-5 25°C (30-		ectronic STD (1 ectronic CAL (1	Ţ.			5 ° C (30-45 0 ° C (20-50	•	
	im CAL (Lab	•		5 ° C. (20-5		maining S&CL	•	areas		3.0 °C (20-5	-	
Manufactu	rer's environn	nental specific	ation	s are evalus	ted for conforman	ce when calibr	ations are	perfo	rmed outside th	e above state	d conditions.	
		OUT	r of	TOLERAN	CE CONDITIONS	S FOUND DUF	RING CAL	IBR/	ATION		The last section of the la	
NOMINAL	(STD)			UNITS			FOUND			MFC	i. ACCUR	ACY
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					COMM	ENTS						
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11/30/2007

NAME: DANA KEITH	MORTON	В	ADGE: 35698	PH: 520		AREA	: ST	C BLDG: ERO	В	RM: W2D1
ID Number: 72340° 40704910	7 M	fr: EXTECH	1	Model: EA15	No	oun Nan	ne: T	EMPERATURE RE	ADOUT	Γ Serial#
Calibration Date:	11/28/200	5		ACTION C	ODE			AS FOUN	ID	
Next Cal Due Date	: 11/28/200	6 1		cceptance Test		1	•	In Tolerance		
Charge Level:	4	2	$\square$ $s_1$	pecial Test		2	O	Out of Tolerance >1	x <2x	
Repair/Adj/etc C.L	: 0	3	<b>⊘</b> C	alibration to M	FG Specs	3	O	Out of Tolerance >2	2x <3x	
Material Amount:	0	4	□ с	lean		4	0	Out of Tolerance >3	x <5x	
Charge Number:	100853G	SA 5		imited Calibrat	ion	5	O	Out of Tolerance >5	x	
Cal Work Inst ID:	5113N	6	☐ F	unctional Checl	ζ.	6	C	Out of Tolerance-U	ndeterm	ined
Outside Vendor:		7	_ P	erformance Che	eck	7	Π	Inoperative		
•		8	M	lodify		8		Damaged		
		9	R	epair-needs Ch	arge Level	9	П	Not Used		
		10	□ o	ther		10		Not Determined		
			,		÷	11	Γ	Excessed		
Calibrated By:	Chris Duc	iley S#:	101142	Phone: 526-27	61	12		Extension		
-		٠					_	. ,	-	
	714801	701587	714891	706129	700855		5356	7	<del></del>	<u> </u>
i i	714001	101501	77.105.		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					
STANDARDS	USED ARE T	RACEABLE TO	THE NATIO	ONAL INSTITUT	E OF STANI	DARDS A	ND T	ECHNOLOGY DERIVE	D FROM	ACCEPTED
								OF SELF CALIBRATIO		
Physica	1 STD (106C)	20.0 ° +	LABORA -0.3 °C (40-	TORY TEMPER	ATURE ANI Rectronic STD		lTY	23.0 ° +/-0.5 ° C	(30.45%)	DITV.
_	ional STD (10		/-0.25 ° C (30		lectronic CAL	. ,	)	23.0° +/-1.0°C	•	
Phys/Di	im CAL (Lab	111) 20.0°+/	/-0.5 ° C (20-	50% RH)   R	emaining S&	CL calibra	tion a	reas: 23.0 ° +5,-3.0 ° C	(20-50%	RH)
Manufactur	er's environm	ental specificati	ions are evalu	ated for conforma	nce when cali	brations s	re pe	rformed outside the abov	e stated co	onditions.
3000 00 CE W 16 FE W MINISTER W 16 FE	<del></del>	OUT	)F TOLERAN	NCE CONDITION	S FOUND D	URING C	ALIB	RATION	<del>7.:</del>	
NOMINAL	(STD)		UNITS	;	A	S FOUN	1D (1	UUT)	MFG. A	CCURACY
								<u> </u>		
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		_ `								
				COMM	ENTS		,			

INITIAL CALIBRATION RECEIVING INSPECTION TEST REFERRAL QA# 115845

11/30/2007

NAME: DANA KEIT	H MORTON		BADO	GE: 35698	PH: 526-17	274	AREA: S	TC	BLDG: ERC	BLDG: EROB RM: W2D1		
ID Number: 72340 40704910	)7 M	fr: EXTEC	:H	M	Model: EA15	Nour	Name:	TEI	MPERATURE RE	EADOUT	Serial #:	
Calibration Date:	12/4/2006	;			ACTION C	ODE			AS FO	UND		
Next Cal Due Date	e: 12/4/2007	,	ì	Ė	Acceptance Test		1	•	In Tolerance			
Charge Level:	4		2		Special Test		2	O	Out of Tolerance	> 1x < 2x		
Repair/Adj/etc C.I	J: 0	•	3	V	Calibration to M	FG Specs	. 3	C	Out of Tolerance	e > 2x < 3x		
Material Amount:	0		4	<u> </u>	Clean		4	0	Out of Tolerance	>3x <5x		
Charge Number:	100853G	SA	5	<u></u>	Limited Calibrat	ion	5	O	Out of Tolerance	>5x		
Cal Work Inst ID:	5113N		6	<u> </u>	Functional Check	k	. 6	O	Out of Tolerance	-Undetermined		
Outside Vendor:			7	Γ.:	Performance Che	eck	7		Inoperative	•		
			8		Modify		8		Damaged			
/			9	Γ	Repair-needs Ch	arge Level	. 9		Not Used		ř	
			10		Other		10		Not Determined			
							Ĥ		Excessed			
Calibrated By:	Donnie L	indsay	S#:	105138	Phone: 526-27	61	12		Extension		•	
	•			CALL	DD ATTONICT A	ND 4 DDC	LICED					
F	715356	701587	1 -	702971	BRATION STA	700392	70039	13	700394 76	00855		
ŀ	706129	385979	╬	702771	700000	, ,	70055		70037			
STANDADOS	USED ADE T	DACEARLE	TOTI	HF NATIC	NAL INSTITUTE (	)F STANDAL	IDS AND	TEC	HNOLOGY DERIVE	ED FROM ACCEP	TFD	
VALUES	FOR NATUR	AL PHYSICA	T CO	NSTANTS	, OR DERIVED FR	OM THE RA	TIO TYP	E OF	SELF CALIBRATIO	ON TECHNIQUES		
·					TORY TEMPERAT			•	,			
_	al STD (106C)			C (40-5		tronic STD (10 tronic CAL (L	•		23.0 ° +/-0.5 ° C 23.0 ° +/-1.0 ° C	• •		
	sional STD (10 im CAL (Lab i	•		.5 ° C (30- 5 ° C (20-5		aining S&CL	•	areas	•	•		
·	-				•	when calibra	tions are	perfa	rmed outside the abo	ve stated condition	<b>s.</b> .	
***************************************					CE CONDITIONS I	<del>*************************************</del>					<del></del>	
NOMINAL	(STD)	00	. 0	UNITS			OUND			MFG. ACCUI	RACY	
				<u>.</u>								
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					СОММЕ	NTS ·					<del></del>	
					COMME	.,,,						

S&CL overcheck required.

## INL CALIBRATION INPUT DATA 11/11/2007

NAME: DANA KEIT	H MORTON	BADGE: 35698	PH: 526-1274	AREA: STC	BLDG: EROB	RM: W2D1				
ID Number: 72340 40704910	7 Mfr: EXTE	СН 1	Model: EA15 N	Ioun Name: TEM	IPERATURE READOL	JT Serial #:				
Calibration Date:	12/5/2007		ACTION CODE		AS FOUND					
Next Cal Due Date	:: 12/5/2008	I 🗀	Acceptance Test	1 📵	In Tolerance					
Charge Level:	4	2	Special Test	2 C	Out of Tolerance >1x <	2x				
Repair/Adj/etc C.L	.: 0	3 🔽	Calibration to MFG Spe	cs 3 C	Out of Tolerance >2x <	3x				
Material Amount:	0	4	Clean	4 C	Out of Tolerance >3x <	5x				
Charge Number:	100853GSA	5	Limited Calibration	5 <b>C</b> :	Out of Tolerance >5x					
Cal Work Inst ID:	5113T	6	Functional Check	6 <b>C</b>	Out of Tolerance-Undet	ermined				
Outside Vendor:	,	7	Performance Check	7	Inoperative					
	•	8	Modify	8 T	Damaged					
		9	Repair-needs Charge Le	vel 9	Not Used					
		10 🗔	Other	10	Not Determined					
•				11 🗔	Excessed					
Calibrated By:	Donnie Lindsay	S#: 105138	Phone: 526-2761	12	Extension					
· F	714001 715356				·	<b>ח</b>				
	714801 715356	304399	700833   700836			1				
F						1				
<u></u>										
			ONAL INSTITUTE OF STANI S, OR DERIVED FROM THE							
		LABORA	TORY TEMPERATURE AN	D HUMIDITY						
Physica	il STD (106C) 20.0	° +/-0.3 ° C (40-	55% RH)   Electronic STI	O (106D)	23.0 ° +/-0.5 ° C (30-45%	( RH)				
		° +/-0.25 ° C (30			· 23.0 ° +/-1.0 ° C (20-50%	•				
Phys/D	im CAL (Lab 111) 20.0	° +/-0.5 ° C (20-	50% RH) Remaining S&	CL calibration areas:	23.0 ° +5,-3.0 °C (20-50	% RH)				
Manufactur	er's environmental specifi	ications are evalu	ated for conformance when cal	ibrations are perfor	med outside the above stated	conditions.				
NOMINAL		T OF TOLERAN UNITS	CE CONDITIONS FOUND D A	URING CALIBRA AS FOUND (UU		ACCURACY				
			COMMENTS							
			COMMINATION							

11/30/2007

NAME: DANA KEITH MORTON			BADGE: 35698 PH: 526-1274				AREA: STC BLDG: EROB RM: W2D1					
ID Number: 72340 040704827	8 N	ffr: EXTECH	ł	Model: EA15	No	oun Nan	ne: T	EMPERATUR	E READOU	JT Serial #:		
Calibration Date:	11/28/200	05		ACTION	CODE			AS F	OUND			
Next Cal Due Date	: 11/28/200	06 1 .		Acceptance Tes	t	1	<b>(</b>	In Tolerance	•			
Charge Level:	4	2		Special Test		. 2	C	Out of Toleran	ce >1x <2x			
Repair/Adj/etc C.L.	: 0	3	区	Calibration to M	1FG Specs	3	O.	Out of Toleran	ce >2x <3x			
Material Amount:	0	4		Clean		4	0	Out of Toleran	ce >3x <5x	•		
Charge Number:	100853G	SA 5	<u></u>	Limited Calibra	tion	5	C	Out of Toleran	ce >5x			
Cal Work Inst ID:	5113N	6		Functional Chec	:k	6	C	Out of Toleran	ce-Undeten	nined		
Outside Vendor:		. 7		Performance Ch	eck	7		Inoperative				
•		8		Modify		8		Damaged				
		9		Repair-needs Cl	harge Level	9		Not Used				
		10	Ē	Other		10	П	Not Determine	d .			
						11		Excessed				
Calibrated By:	Chris Du	dley S#:	101142	Phone: 526-27	761	12		Extension				
			CA	LIBRATION S	TANDARD	S USFI	n					
	714801	701587	71489		700855	7	356			7		
				TIONAL INSTITUT NTS, OR DERIVED								
		•	LABO	RATORY TEMPE	RATURE AND	HUMID	ITY					
ŕ	STD (106C)		-		Electronic STD			23.0 ° +/-0.	5 ° C (30-45%	(RH)		
*	ional STD (10 m CAL (Lab 1				Electronic CAL Remaining S&C				0 °C (20-50 <del>%</del> 5.0 °C (20-50	•		
•	·			duated for conforma	• •			•	•	,		
				ANCE CONDITION			-					
NOMINAL	(STD)	1	UNI			S FOUN			MFG.	ACCURACY		
	· · · · · · · · · · · · · · · · · · ·							·	·			
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		. ,		COMN	4ENTS			<del></del>				

INITIAL CALIBRATION
RECEIVING INSPECTION TEST REFERRAL QA# 115845

11/30/2007

NAME: DANA KEIT	H MORTON	BADGE: 35	698 PH: 526		AREA: STC	BLDG: E	ROB RM	l: W2D1
ID Number: 72340 040704827	98 Mfr: 1	ЕХТЕСН	Model: EA15	Noun	Name: TEM	IPERATURE	READOUT	Serial #:
Calibration Date:	12/4/2006	•	ACTION	CODE		AS	FOUND	
Next Cal Due Date	:: 12/4/2007	1 🗔	Acceptance Te	st	1 .	In Tolerance		
Charge Level:	4	2	Special Test		. 2 🤿	Out of Tolera	nce >1x <2x	
Repair/Adj/etc C.I	.: O	3	Calibration to I	MFG Specs	3 C	Out of Tolera	nce >2x <3x	
Material Amount:	0	4 [	Clean		4 C	Out of Tolera	nce >3x <5x	
Charge Number:	100853GSA	5	Limited Calibra	ation	5 C	Out of Tolera	nce >5x	
Cal Work Inst ID:	5113N	6	Functional Che	ck	6 6	Out of Tolera	nce-Undeterm	ined
Outside Vendor:		7	Performance C	heck	7	Inoperative		
		8	Modify		8 🗀	Damaged		
		9	Repair-needs C	harge Level	9 🗀	Not Used		
		10	Other		10	Not Determin	ed	
					. 11 📋 .	Excessed		
Calibrated By:	Donnie Linds	say S#: 1051	38 Phone: 526-2	761	12	Extension		•
		Ċ	I IDDATION CT	A NID A DDC I	uceb			
F	715356 7	01587 70297	LIBRATION ST.	700392	700393	700394	700855	
		06129	700000	700372	700373	700374	700033	
ŀ				<u></u>				
STANDARDS VALUES	USED ARE TRAC FOR NATURAL P	EABLE TO THE NAPHYSICAL CONSTA	TIONAL INSTITUTE NTS, OR DERIVED FI	OF STANDAR ROM THE RAT	DS AND TECH	NOLOGY DER ELF CALIBRA	IVED FROM ACTION TECHNIC	CEPTED UES
			RATORY TEMPERA					
	il STD (106C)	20.0° +/-0.3°C (		ectronic STD (100			°C (30-45% RH	
	sional STD (106B) im CAL (Lab 111)	20.0 ° +/-0.25 ° C 20.0 ° +/-0.5 ° C (	, ,	ectronic CAL (La maining S&CL c	•		°C (20-50% RH •°C (20-50% RI	
		·	lusted for conforman					
Strangeror or military field solve 407 407 billion 417 per			ANCE CONDITIONS		The second secon	Training to the second		
NOMINAL	(STD)	UNI			OUND (UU		MFG. AC	CURACY
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S&CL overcheck required.

12/11/2007

NAME: DANA KEITI	MORTON		BADG	E: 35698	PH: 526-1274		AREA: S	TC	BLDG: EROB	RM: W2D1
ID Number: 72340 040704827	8 M	fr: EXTEC	Н	N	1odel: EA15	Nou	n Name:	TEI	MPERATURE READO	OUT Serial
Calibration Date:	12/5/200	7			ACTION COL	DE	•		AS FOUND	· · · · ·
Next Cal Due Date	: 12/5/2008	3	1	<u></u>	Acceptance Test		1	•	In Tolerance	
Charge Level:	4	2	2	$\Gamma$	Special Test		, 2	C	Out of Tolerance >1x	<2x
Repair/Adj/etc C.L	: 0 .	. :	3	[	Calibration to MFG	Specs	3	0	Out of Tolerance >2x	<3x
Material Amount:	0		4	Γ.	Clean		4	O	Out of Tolerance >3x	<5x
Charge Number:	100853G	SA :	5	Γ	Limited Calibration		5	O	Out of Tolerance >5x	
Cal Work Inst ID:	5113T	(	6	<u>「</u>	Functional Check		6	O	Out of Tolerance-Und	etermined
Outside Vendor:		•	7	Γ	Performance Check		7		Inoperative	
		;	8	Γ.	Modify		8		Damaged	,
			9	_	Repair-needs Charg	e Level	1 9	П	Not Used	
			10	Г	Other		10	П	Not Determined	
							11	Γ	Excessed	
Calibrated By:	Donnie L	indsay	S#:	105138	Phone: 526-2761		12	Γ	Extension	
· ·	714901	715756	7 2		BRATION STAND		USED		<u></u>	<del></del>
<u> -</u>	714801	715356	ال ال	04399	700855 700	856				
			一							<b>-</b>
									HNOLOGY DERIVED FRO SELF CALIBRATION TE	
			I	.ABORA	TORY TEMPERATURI	E AND H	UMIDITY	,		,
Physical	STD (106C)	20.0 °	+/-0.3 °	°C (40-5	5% RH)   Electroni	c STD (1	06D)		23.0 ° +/-0.5 ° C (30-4	5% RH)
	ional STD (10			°C (30-					23.0 ° +/-1.0 °C (20-5	•
	m CAL (Lab i			°C (20-5	,	_	calibration		·	
Manufactur	er's environn	ental specifica	tions a	re evalua	led for conformance whe	n catibra	tions are	perfo	rmed outside the above state	ed conditions.
, NOMINAL	(STD)	OUT		DLERAN UNITS	CE CONDITIONS FOU		ING CAL			G. ACCURACY
		<del></del>			<del></del> .					
		_ `								
					COMMENT	S				

11/30/2007

NAME: DANA KEITH	MORTON		BAD	GE: 35698	8 PH: 520		AREA: S	TC	BLDG:	EROB	RM: W2	D1
ID Number: 72426:	5 M	fr: EXTEC	:H	]	Model: EA15	Nou	n Name:	TEI	MPERATUR	E READ	OUT	Serial #:
Calibration Date:	10/31/200	)6			ACTION	CODE			AS	FOUN	D	
Next Cal Due Date:	10/31/200	)7	1		Acceptance To	est	, 1	•	In Tolerance	:		•
Charge Level:	4		2		Special Test		2	O	Out of Toler	ance >1	x <2x	
Repair/Adj/etc C.L.	: 0		3	<b>V</b>	Calibration to	MFG Specs	3	C	Out of Toler	ance >2>	x <3x	
Material Amount:	0		4		Clean		4	C	Out of Toler	ance >3>	<5x	,
Charge Number:	100853G	SA	5		Limited Calib	ration	5	Ç.	Out of Toler	ance >5x		
Cal Work Inst ID:	5113N		6		Functional Ch	eck	6	C	Out of Toler	ance-Un	determined	
Outside Vendor:			7		Performance (	Check	. 7	Π	Inoperative			
			8		Modify		. 8		Damaged	,		
			9	<u></u>	Repair-needs	Charge Level	9		Not Used			
			10		Other		10		Not Determi	ned		4
		•					11		Excessed			
Calibrated By:	Donnie L	indsay	S#:	105138	B Phone: 526-	2761	12	Г	Extension			
ſ <del>-</del>	715356	700666		700392	700393	700394	70612	20	700855	70297	<del>,                                    </del>	
<b>⊩</b>	701587	385979	╬	700392	700393	700374	70012		700633	70297	-	
			j									
					ONAL INSTITUT S, OR DERIVED I							red
Physica	I STD (106C)	20.0°	+/-0	LABOR/ 3 °C (40-	ATORY TEMPER	ATURE AND H lectronic STD (1		ľ	23.0° +/-0.	5°C (30-	45% RHN	
_	ional STD (10					lectronic CAL (1			23.0 ° +/-1.	•		
Phys/Di	m CAL (Lab	111) 20.0°	+/-0.:	5°C (20-	-50% RH) R	emaining S&CL	calibration	area:	s: 23.0 ° +5,•3	3.0 ° C (20	-50% RH)	
Manufactur	er's environn	nental specific	atlon	are evalu	ated for conforma	nce when calibr	ations are	perfo	rmed outside the	e above sta	ted conditions	•
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY												
		<u> </u>							<del></del>			
					COMM	IENTS				<del>. ,</del>		

S&CL overcheck required. INITIAL CALIBRATION TEST REFERRAL QA# 121542

11/30/2007

NAME: DANA KEIT	H MORTON	BADGE: 35698	PH: 526-1274	AREA: STC BLDG: EROB RM: W2D1
ID Number: 72426 040406419	55 Mfr: EX	TECH !	Model: EA15 N	oun Name: TEMPERATURE READOUT Serial #
Calibration Date:	10/23/2007		ACTION CODE	AS FOUND
Next Cal Due Date	e: 10/23/2008	1 🗂	Acceptance Test	1 • In Tolerance
Charge Level:	4	2	Special Test	2 C Out of Tolerance >1x <2x
Repair/Adj/etc C.I	.: <b>0</b>	3 <b>v</b>	Calibration to MFG Spec	cs 3 C Out of Tolerance >2x <3x
Material Amount:	0	4	Clean	4 C Out of Tolerance >3x <5x
Charge Number:	100853GSA	5	Limited Calibration	5 Out of Tolerance >5x
Cal Work Inst ID:	5113S	6	Functional Check	6 Out of Tolerance-Undetermined
Outside Vendor:		7	Performance Check	7 Inoperative
		8	Modify	8 Damaged
		9	Repair-needs Charge Lev	vel 9 Not Used
		10	Other	10 Not Determined
		•		11 Excessed
Calibrated By:	Donnie Lindsay	S#: 105138	Phone: 526-2761	12 Extension
		0.11		og Harry
	715356 7015			700393 700394 700855
	700856			
				DARDS AND TECHNOLOGY DERIVED FROM ACCEPTED RATIO TYPE OF SELF CALIBRATION TECHNIQUES
,		LABORA	TORY TEMPERATURE ANI	о ним <b>і</b> ріту
	, ,	20.0 ° +/-0.3 ° C (40-		
		!0.0 ° +/-0.25 ° C (30 !0.0 ° +/-0.5 ° C (20-		L (Lab 112) 23.0 ° +/-1.0 ° C (20-50% RH)  CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
•	, ,	•	•	,
Малияси	rer's environmental sp		the same of the sa	ibrations are performed outside the above stated conditions.
NOMINAL	(STD)	UNITS	NCE CONDITIONS FOUND D A	URING CALIBRATION S FOUND (UUT) MFG. ACCURACY
			·	
<del></del>	····		CONTRACTO	
			COMMENTS	×

11/30/2007

NAME: DANA KEIT	H MORTON	В	ADGE: 356	98 PH: 526		AREA: STC	BLDG: EROB	RM: W2D1
ID Number: 72426 050607560	66 M	fr: EXTECH		Model: EA15	Noui	n Name: Tl	EMPERATURE READ	OUT Serial #:
Calibration Date:	10/31/200	)6		ACTION	CODE		AS FOUN	D
Next Cal Due Date	e: 10/31/200	1		Acceptance To	est	1 (	In Tolerance	
Charge Level:	4	2	Ε	Special Test		2 (	Out of Tolerance >1:	x <2x
Repair/Adj/etc C.I	.: <b>0</b>	3	~	Calibration to	MFG Specs	3 C	Out of Tolerance >2	x <3x
Material Amount:	0	4		Clean		4 (	Out of Tolerance >3:	x <5x
Charge Number:	100853G	SA 5	ŗ	Limited Calib	ration	5 <b>(</b>	Out of Tolerance >5	<b>x</b> ·
Cal Work Inst ID:	5113N	6	Γ.	Functional Ch	eck	6 (	Out of Tolerance-Ur	ndetermined
Outside Vendor:		7		Performance (	Check	7. 「	Inoperative	
		8	E.A	Modify		8	Damaged	
		9	<u></u>	Repair-needs	Charge Level	9 Г	Not Used	
		1	0 [	Other		10 [	Not Determined	
Ĭ.						11 Г	Excessed	
Calibrated By:	Donnie L	indsay S	3#: 1051	38 Phone: 526-	2761	12	Extension	
			CA	LIBRATION ST	ΓANDARDS	USED 1		
· [	715356	700666	70039	2 700393	700394	706129	700855 7029	71
	701587	385979						
L			<u> </u>					
STANDARDS VALUES	USED ARE T FOR NATUR	RACEABLE T AL PHYSICAL	O THE NA	FIONAL INSTITUT NTS, OR DERIVED	E OF STANDA FROM THE RA	RDS AND TI	ECHNOLOGY DERIVED F OF SELF CALIBRATION T	ROM ACCEPTED ECHNIQUES
			LABO	RATORY TEMPER	ATURE AND H	IUMIDITY		
_	al STD (106C)				lectronic STD (1		23.0 ° +/-0.5 ° C (30	·
	isional STD (10	,		· • •	dectronic CAL (I temaining S&CL	•	23.0 ° +/-1.0 ° C (20 reas: 23.0 ° +5,-3.0 ° C (2	•
	Dim CAL (Lab	•		•	•			:
Manufactu	rer's environn			<del>,</del>	<del></del>		rformed outside the above so	rated conditions.
NOMINAL	. (STD)	OUT	OF TOLER UNI	ANCE CONDITION		RING CALIB FOUND (I		FG. ACCURACY
				·				
	····				<del></del>			<u> </u>
	-							
				COMM	IENTS			

S&CL overcheck required. INITIAL CALIBRATION TEST REFERRAL QA# 121542

11/30/2007

NAME: DANA KEITH MORTON		. ]	BADGE: 35698 PH: 526-1274		6-1274	AREA: STC BLDG			RM: W2D1
ID Number: 72426 050607560	66 M	fr: EXTECI	ł	Model: EA15	Nou	n Name:	TEN	IPERATURE READ	OUT Serial #:
Calibration Date:	2/28/2007	7		ACTION	CODE			AS FOUN	)
Next Cal Due Date	: 2/28/2008	3		Acceptance T	est	1	O	In Tolerance	
Charge Level:	4	2	2 🗆	Special Test		2	O	Out of Tolerance >1x	: <2x
Repair/Adj/etc C.I	.: 0.5	3	3 <b>V</b>	Calibration to	MFG Specs	3	O	Out of Tolerance >2x	: <3x
Material Amount:	0	•	4 🗆	Clean		4	Ç	Out of Tolerance >33	<5x
Charge Number:	100853G	SA :	5 🗀	Limited Calib	ration	5	C	Out of Tolerance >5>	
Cal Work Inst ID:	5113N	(	6 🗖	Functional Ch	neck	6	•	Out of Tolerance-Un	determined
Outside Vendor:			7 🗀	Performance (	Check	. 7		Inoperative	
		;	в 🗀	Modify		8		Damaged	
			9 🗆	Repair-needs	Charge Leve	1 9	Г	Not Used	
			10 🗀	Other	_	10	Г	Not Determined	
	•							Excessed	
Calibrated By:	Donnie L	indsav	S#: 10513	8 Phone: 526	-2761			Extension	
<b>,</b>							•	<del>,</del>	
F				LIBRATION S					
<u> </u>	715356	700666	700392	700393	700394	70085	55	706129 7029	<u>'1</u>
	701587		<u> </u>		,		닉		<u> </u>
. L		<u> </u>	<u> </u>			<u>L</u>			
STANDARDS VALUES	USED ARE T FOR NATUR	RACEABLE 1 AL PHYSICA	O THE NAT L CONSTAN	IONAL INSTITUT	E OF STANDA FROM THE RA	RDS AND	TEC E OF	HNOLOGY DERIVED F SELF CALIBRATION T	ROM ACCEPTED ECHNIQUES
			LABO	RATORY TEMPER	ATURE AND I	HUMIDIT	Y		
Physica	al STD (106C)	20.0 °	+/-0.3 ° C (44	0-55% RH)   I	Electronic STD (1	106D)		23.0 ° +/-0.5 °C (30	-45% RH)
Dimen	sional STD (10	•	+/-0.25 °C (:	, , ,	Electronic CAL (1	-		23.0 ° +/-1.0 °C (20	-50% RH)
Phys/D	oim CAL (Lab	111) 20.0°	+/-0.5 ° C (20	0-50% RH)   I	Remaining S&CL	. calibration	areas	: 23.0°+5,-3.0°C (2	0-50% RH)
Manufactu	rer's environn	nental specifica	tions are eval	uated for conforma	nce when calibr	ations are	perfo	rmed outside the above st	nted conditions.
		OUT		ANCE CONDITION					
√ NOMINAL	TS	А	S FOUN	•	•	FG. ACCURACY			
	-100.0 deg F Type K -50.0 deg F Type K					-290. -157.	_		+- 1.5 deg F +- 1.5 deg F
0.0 d			ype K		-51.0			+- 1.5 deg F	
100.0	<del>-</del>			ype K		139.		•	+- 1.5 deg F
500.0	-			ype K		880.			+- 1.7 deg F
1000			Type K			1839.5 deg F			+- 2.0 deg F

**COMMENTS** 

Unit came in with a comment stating that it was not measuring properly. Found unit to be out of tolerance at all test points, on both channels, and checking all thermocouple types. Adjusted unit using manufacture's procedure to meet the manufacture's specifications, and re-calibrated the unit.

SECL overcheck required.

### **Temperature Readout**

#724266

**Not Used To Collect Data** 

**Prior To** 

2/28/2007

12/11/2007

NAME: DANA KEITH MORTON	BADGE: 35698	PH: 526-1274 A	REA: STC BLDG: ERC	B RM: W2D1
ID Number: 724266 Mfr: EXTE 050607560	ECH N	Model: EA15 Noun 1	Name: TEMPERATURE RE	ADOUT Serial #:
Calibration Date: 12/5/2007		ACTION CODE	AS FO	UND
Next Cal Due Date: 12/5/2008	1	Acceptance Test	1	
Charge Level: 4	2	Special Test	2 C Out of Tolerance	>1x <2x
Repair/Adj/etc C.L: 0	3	Calibration to MFG Specs	3 C Out of Tolerance	>2x <3x
Material Amount: 0	4	Clean	4 C Out of Tolerance	>3x <5x
Charge Number: 100853GSA	5	Limited Calibration	5 C Out of Tolerance	>5x
Cal Work Inst ID: 5113T	· 6	Functional Check	6 C Out of Tolerance	-Undetermined
Outside Vendor:	7	Performance Check	7 [ Inoperative	
	8	Modify	8 Damaged	
	9 厂	Repair-needs Charge Level	9 Not Used	
	10	Other	10 Not Determined	
			11 Excessed	
Calibrated By: Donnie Lindsay	S#: 105138	Phone: 526-2761	12 Extension	
•				
714801 71535		700856   700855	ISED I	
714601 71555	0 304399	700830 700833		
				7
CTANDADDC HORDADD TO ACEAD	E TO THE NAME	ANALINETITE OF STANKAR	CAND STORMAL OCU PRIM	
STANDARDS USED ARE TRACEABI VALUES FOR NATURAL PHYSI		S, OR DERIVED FROM THE RAT		
	LABORA	ATORY TEMPERATURE AND HU	MIDITY	
•	0°+/-0.3°C (40-		•	•
	0 ° +/-0,25 °C (30 0 ° +/-0.5 °C. (20-	•		•
Manufacturer's environmental spec	•			•
		NCE CONDITIONS FOUND DURIN		· Stated Constitution
NOMINAL (STD)	UNITS		OUND (UUT)	MFG. ACCURACY
,				
	·			
<u> </u>				
		COMMENTS		

## THERMOCOUPLES

11/30/2007

NAME: DANA KEIT	H MORTON	BA	ADGE: 350	598 PH: 526	-1274	AREA	: STC	BLDG: E	ков	RM: W2D1	
ID Number: 72286 Calibration Date:	08 M 5/5/2005	fr: EXTECH		Model: TYPE K ACTION C		Noun N	ame	: THERMOCOUF		Serial #:	
Next Cal Due Dat	e: 5/5/2006	1		Acceptance Test	i.	1	•	In Tolerance			
Charge Level:	4	2		Special Test		2	O	Out of Tolerance	>1x <2x		
Repair/Adj/etc C.	L: 0	3	マ	Calibration to Mi	G Specs	3	C	Out of Tolerance	>2x <3x		
Material Amount:	0	4		Clean		4	O	Out of Tolerance	>3x <5x	•	
Charge Number:	100853G	SA 5		Limited Calibrati	on	5	C	Out of Tolerance	>5x		
Cal Work Inst ID:	3052	6	Γ.	Functional Check	<b>K</b>	6	O	Out of Tolerance	Undeterm	ined	
Outside Vendor:		7		Performance Che	ck	7		Inoperative			
		8	$\overline{\mathbf{L}_{i,j}}$	Modify		8		Damaged			
•		9		Repair-needs Cha	arge Level	9		Not Used			
		. 10		Other		10		Not Determined			
						11		Excessed			
Calibrated By:	Chris Du	dley S#:	101142	Phone: 526-276	61	12		Extension			
CALIBRATION STANDARDS USED											
	715424	717617	71427		ANDAR	JOUNE				1	
ĺ										]	
STANDARDS VALUES	S USED ARE T S FOR NATUR	RACEABLE TO AL PHYSICAL	O THE NA	TIONAL INSTITUT NTS, OR DERIVED I	E OF STANI FROM THE	DARDS A RATIO T	ND T YPE	ECHNOLOGY DERI OF SELF CALIBRA	VED FROM	I ACCEPTED. NIQUES	
			LABC	RATORY TEMPER	ATURE AN	D HUMID	ITY	The state of the s			
_	cal STD (106C)			. ,	lectronic STI	, ,		23.0° +/-0.5°	-	•	
	nsional STD (10 Dim CAL (Lab	•		•	lectronic CAI emainine S&	=	•	23.0 ° +/-1.0 ° reas: 23.0 ° +53.0	•	* * .	
Phys/Dim CAL (Lab 111) 20.0 ° +/-0.5 ° C (20-50% RH)   Remaining S&CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)  Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.											
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY											
	}										
		<u> </u>						<u> </u>		·	
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						·					
				COMM	TENTS						

INITIAL CALIBRATION TEST REFERRAL qa# 114094 VERIFIED TO 220 DEG C.

11/30/2007

NAME: DANA KEIT	H MORTON	]	BADGE: 35	6698 PH: 526-	1274	ARE	A: STC	BLDG	: EROB	RM: W2D1
ID Number: 72280 Calibration Date:	08 M 4/27/2006	lfr: EXTECI	ł	Model: TYPE K		Noun l	Name	THERMOCO	UPLE OUND	Serial #:
Next Cal Due Dat	e: 4/27/2001	7 1		Acceptance Test	,	1	<b>⊚</b> 1	n Tolerance		
Charge Level:	4	2		Special Test		2	0	Out of Tolerand	ce >1x <2x	
Repair/Adj/etc C.l	L: 0	3	<b>₽</b>	Calibration to MF	G Specs	3	C	Out of Tolerand	ce >2x <3x	
Material Amount:	0	4		Clean		4	0.0	Out of Tolerand	e >3x <5x	
Charge Number:	100853G	SA . 5	<u>.                                    </u>	Limited Calibratio	n .	5	C	Out of Tolerand	e >5x	
Cal Work Inst ID:	3052V	6	Γ	Functional Check		6	c	Out of Tolerand	e-Undeterm	ined
Outside Vendor:		7	Γ	Performance Chec	k	7		noperative		
		8	<b>I</b> . \	Modify		8	<b>∏</b> : I	Damaged		
		9	<u> </u>	Repair-needs Char	ge Level	9		Not Used		,
		10		Other		10		Not Determined	i	
						11		Excessed		
Calibrated By:	Brian Be	rls S#:	102182	Phone: 526-2761		12		Extension		
CALIBRATION STANDARDS USED										
Ĩ	714272	714273	7176		ANDARI	OS USE	D	7		<b>1</b> .
	73-12/2	77.1273	7.70							1 .
										<u></u>
				ATIONAL INSTITUTE						
	······································		LABO	DRATORY TEMPERA	TURE ANI	HUMII	DITY	The second of	T the second of	
Physic	al STD (106C)	20.0 °	+/-0.3 ° C	(40-55% RH)   Eli	ectronic STD	(106D)		23.0 ° +/-0	.5 ° C (30-45%	RH)
	nsional STD (10	•		, ,	ectronic CAI	•	•		.0 ° C (20-50%	•
·	Dim CAL (Lab	•	•	•	maining S&				3.0 °C (20-50)	
Manufacti	rer's environr	nental specifica	tions are ev	aluated for conforman	ce when cali	brations	are per	formed outside th	e above stated	conditions.
NOMINAI	. (STD)	OUT	OF TOLE UN	RANCE CONDITIONS		uring ( .S FOU		,	MFG.	ACCURACY
					<u> </u>					
<del></del>										
	, , , , , , , , , , , , , , , , , , , ,									
				COMM	ENTS					

VERIFIED TO 220 DEG C.

## INL CALIBRATION INPUT DATA 11/30/2007

NAME: DANA KEI	NAME: DANA KEITH MORTON			598 PH: 52	6-1274	AREA: STC BLDG: E			: EROB	RM: W2D1
ID Number: 7228 Calibration Date:		r: EXTECH	i ,	Model: TYPE 1		Noun	Name	e: THERMOCO	UPLE OUND	Serial #:
Next Cal Due Dat	te: 5/8/2008	1		Acceptance Test		1	•	In Tolerance		
Charge Level:	4	2		Special Test		2	C	Out of Tolerand	e >1x <2x	
Repair/Adj/etc C.	L: 0	3	<u>v</u>	Calibration to MI	FG Specs	3	C	Out of Tolerand	ce >2x <3x	
Material Amount	: 0	4		Clean		4	C	Out of Tolerand	e >3x <5x	
Charge Number:	100853GS	A 5		Limited Calibrati	on	5	C	Out of Tolerand	ce >5x	
Cal Work Inst ID	: 3052V	6		Functional Check	<b>.</b> .	6	C	Out of Tolerand	e-Undeterr	nined
Outside Vendor:		7		Performance Che	eck	7	Γ.	Inoperative		
		. 8	<u>[</u> ]	Modify		8	$\Gamma$	Damaged		
•		9	<u></u> 1	Repair-needs Cha	arge Level	9	$\Gamma$	Not Used		
•	•	10		Other		10		Not Determine	d	
					•	11		Excessed		
Calibrated By:	Brian Berl	s S#:	102182	Phone: 526-270	51	12	$\Box$	Extension	:	
CALIBRATION STANDARDS USED										
`	715356	715424	71278		IANDARI	73 031	C.I.J		li	<u> </u>
Ì										
			][							
STANDARDS	S USED ARE TR	ACEABLE T	O THE NA	TIONAL INSTITUT	E OF STANI	DARDS A	AND T	ECHNOLOGY DI	ERIVED FRO	M ACCEPTED
ALUE	O POR MAINE	LIMISICAL		The second secon				OF SELF CALIBI	CATION TEC	MAIQUES
Physic	cal STD (106C)	20.0 ° ↔		RATORY TEMPER 10-55% RH)   I	Electronic STD			23.0 ° +/-0	).5 ° C (30-45	% RH)
Dime	nsional STD (106)	B) 20.0°	-/-0.25 ° C	(30-45% RH)   I	Electronic CAI	. (Lab 11	2)	23.0 ° +/-1	.0 °C (20-50	% RH)
Phys/	Dim CAL (Lab 11	11) 20.0° +	+/-0.5 ° C (2	20-50% RH)   I	Remaining S&	CL calibi	ration a	areas: 23.0 ° +5,-	3.0 ° C (20-5	0% RH)
Manufacti	urer's environme	ntal specifica	tions are eva	luated for conforma	nce when call	ibrations	are p	erformed outside tl	e above state	d conditions.
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY								. ACCURACY		
									<del>- ,</del>	
		<u> </u>								
·									· <u></u>	
	COMMENTS									

11/30/2007

NAME: DANA KEI	TH MORTON		B	ADGE: 35	698 PH: 526-1274	ARJ	A: ST	C BLDG: EROB RM: W2D1		
ID Number: 7228 Calibration Date:		1fr: EXT	ECH		Model: TYPE K ACTION CODE	Noun	Name	:: THERMOCOUPLE Serial #:  AS FOUND		
Next Cal Due Da	te: 5/5/2006		1		Acceptance Test	1	•	In Tolerance		
Charge Level:	4 .		2		Special Test	. 2	O	Out of Tolerance >1x <2x		
Repair/Adj/etc C.	L: 0		3	V	Calibration to MFG Specs	3	0	Out of Tolerance >2x <3x		
Material Amount	: 0		4	П	Clean	4	C	Out of Tolerance $>3x < 5x$		
Charge Number:	100853G	SA	5		Limited Calibration	5	C	Out of/Tolerance >5x		
Cal Work Inst ID	: 3052		6		Functional Check	6	O	Out of Tolerance-Undetermined		
Outside Vendor:			7	<b>I</b>	Performance Check	7		Inoperative		
,			8	Γ.:	Modify	8		Damaged		
			9	<u></u>	Repair-needs Charge Leve	el 9	П	Not Used		
			10		Other	10	0 🗀	Not Determined		
					•	1	1 🗍	Excessed		
Calibrated By:	Chris Du	dley	S#:	101142	Phone: 526-2761	1:	2 🗀	Extension		
CALAND ATTON OF THE THE TOTAL										
	715424	71427	72	71427	LIBRATION STANDAR	US US	LD.			
. •	713 12 1	77.12				1				
STANDARDS VALUES	S USED ARE T S FOR NATUR	RACEABI AL PHYSI	LE TO	THE NA	TIONAL INSTITUTE OF STAI NTS, OR DERIVED FROM TH	NDARDS E RATIO	AND T	ECHNOLOGY DERIVED FROM ACCEPTED OF SELF CALIBRATION TECHNIQUES		
•					RATORY TEMPERATURE A					
	cal STD (106C)			•	40-55% RH)   Electronic ST			23.0 ° +/-0.5 ° C (30-45% RH)		
	nsional STD (10 Dim CAL (Lab				(30-45% RH)   Electronic C/ 20-50% RH)   Remaining S			23.0 ° +/-1.0 ° C (20-50% RH)  reas: 23.0 ° +5,-3.0 ° C (20-50% RH)		
			ificatio	ons are ev				rformed outside the above stated conditions.		
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY										
,	·	- ,								
				•		**************************************				
	·				COMMENTS		······································			

INITIAL CALIBRATION TEST REFERRAL qa# 114094 VERIFIED TO 220 DEG C.

11/30/2007

NAME: DANA KEITH MORTON	BADGE: 350	598 PH: 526-1274	AREA: STC BLDG: EROB RM: W2D1					
ID Number: 722809 Mfr: E Calibration Date: 4/27/2006	XTECH	Model: TYPE K ACTION CODE	Noun Name: THE	RMOCOUPLE AS FOUND	Serial #:			
Next Cal Due Date: 4/27/2007	1 🗀 .	Acceptance Test	1 💿 ln Tole	rance	•			
Charge Level: 4	2 🗀 :	Special Test	2 C Out of	Tolerance >1x <2x	-			
Repair/Adj/etc C.L: 0	3	Calibration to MFG Specs	3 C Out of	Tolerance >2x <3x				
Material Amount: 0	4 🗀	Clean	4 C Out of	Tolerance >3x <5x				
Charge Number: 100853GSA	5 🗔	Limited Calibration	5 C Out of	Tolerance >5x				
Cal Work Inst ID: 3052V	6	Functional Check	6 C Out of	Tolerance-Undeterr	nined			
Outside Vendor:	7	Performance Check	7 🗍 Inopera	ative				
	* 8 <u>[</u> i	Modify	8 Damag	ged				
	9	Repair-needs Charge Level	9 🔲 Not Us	sed				
	10 🗀	Other	10 Not De	etermined				
			11 Excess	ed				
Calibrated By: Brian Berls	S#: 102182	Phone: 526-2761	12 Extens	ion				
	CA	I IDD ATION CTANDAD	DC HCED					
714272 7	14273 71761	LIBRATION STANDAR 5 715424	US USED	<del></del>	7)			
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		7,5,12,			4			
STANDARDS USED ARE TRACE	EABLE TO THE NA	TIONAL INSTITUTE OF STAN	DARDS AND TECHNO	LOGY DERIVED FRO	M ACCEPTED			
VALUES FOR NATURAL P	<del></del>	NTS, OR DERIVED FROM THE		F CALIBRATION TEC	HNIQUES			
Physical STD (106C)	20.0 ° +/-0.3 ° C (4	RATORY TEMPERATURE AN 40-55% RH)   Electronic STI		23.0° +/-0.5°C (30-45	% RH)			
Dimensional STD (106B)	20.0 ° +/-0.25 ° C	(30-45% RH)   Electronic CA	L (Lab 112)	23.0 ° +/-1.0 °C (20-50	% RH)			
Phys/Dim CAL (Lab 111)	20.0 ° +/-0.5 ° C (	20-50% RH) Remaining S&	CL calibration areas:	23.0 ° +5,-3.0 ° C (20-5	0% RH)			
Manufacturer's environmental	specifications are ev	aluated for conformance when ca	librations are performed	outside the above state	d conditions.			
NOMINAL (STD)	OUT OF TOLER UNI	ANCE CONDITIONS FOUND I	DURING CALIBRATIO AS FOUND (UUT)		i. ACCURACY			
·			· · · · · · · · · · · · · · · · · · ·					
•								
•		COMMENTS						

VERIFIED TO 220 DEG C.

## INL CALIBRATION INPUT DATA 11/30/2007

NAME: DANA KEIT	H MORTON	BADG	E: 35698 P.	H: 526-1274	ARE	A: STC	BLDG: EROB	RM: W2D1	
ID Number: 7228 Calibration Date:	09 Mfr 5/8/2007	EXTECH	Model: TY ACTIO	PE K N CODE	Noun	Name: T	HERMOCOUPLE AS FOUND	Serial #:	
Next Cal Due Dat	e: 5/8/2008	1 🗔	Acceptance ?	Γest	1	<b>⑥</b> In	Tolerance		
Charge Level:	4	2	Special Test		2	O Ou	t of Tolerance >1x <2	x	
Repair/Adj/etc C.	L: 0	3	Calibration to	o MFG Specs	3	C Ou	t of Tolerance >2x <3	x	
Material Amount:	. 0	4 [	Clean		4	O Óu	t of Tolerance >3x <5	x	
Charge Number:	100853GSA	5 🗔	Limited Cali	bration	5	C Ou	t of Tolerance >5x		
Cal Work Inst ID:	3052V	6 F.	Functional C	heck	6	C Ou	t of Tolerance-Undete	rmined	
Outside Vendor:	•	7 🗀	Performance	Check	7	Inc	perative		
		8	Modify		8	☐ Da	maged		
		9	Repair-needs	Charge Level	9	☐ No	u Used		
		10	Other		10	☐ No	t Determined		
	·				11	☐ Ex	cessed		
Calibrated By:	Brian Berls	S#: 102	182 Phone: 526	5-2761	12	☐ Ex	tension		
CALIBRATION STANDARDS USED									
	715356	715424 7	12788 71427						
					4				
							HNOLOGY DERIVED FR SELF CALIBRATION TI		
			ABORATORY TEN						
Physic	cal STD (106C)		°C (40-55% RH)	Electronic STI		D111	23.0 ° +/-0.5 °C (30-	45% RH) .	
	nsional STD (106B	•	°C (30-45% RH)	Electronic CA	•	•	23.0 ° +/-1.0 °C (20-	•	
Phys/I	Dim CAL (Lab III	) 20.0 ° +/-0.5 °	°C (20-50% RH)	Remaining S&	:CL calibi	ation areas	: 23.0 ° +5,-3.0 ° C (20	-50% RH)	
Manufactu	irer's environmen	tal specifications a	re evaluated for conf	formance when cal	ibrations	are perfo	rmed outside the above sta	ted conditions.	
NOMINAL	. (STD)		DLERANCE CONDI UNITS			ND (UL		G. ACCURACY	
			· · · · · · · · · · · · · · · · · · ·						
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		-							
			,			<del></del>			
	•		CC	<b>DMMENTS</b>			,		

11/30/2007

NAME: DANA KEIT	H MORTON		BADGE: 3	5698 PH: 526-1274	AREA: STC BLDG: EROB RM: W2D1
ID Number: 7228: Calibration Date:	10 M 5/5/2005	Ifr: EXTEC	Н	Model: TYPE K ACTION CODE	Noun Name: THERMOCOUPLE Serial #:  AS FOUND
Next Cal Due Date	e: 5/5/2006	1	. [	Acceptance Test	1 • In Tolerance
Charge Level:	4	. 2		Special Test	2 Out of Tolerance >1x <2x
Repair/Adj/etc C.I	L: 0	3	<u> </u>	Calibration to MFG Spec	s 3 C Out of Tolerance >2x <3x
Material Amount:	0	4		Clean	4 C Out of Tolerance >3x <5x
Charge Number:	100853G	SA 5	<u> </u>	Limited Calibration	.5 C Out of Tolerance >5x
Cal Work Inst ID:	3052	6		Functional Check	6 C Out of Tolerance-Undetermined
Outside Vendor:		7	. 🗀	Performance Check	7 [ Inoperative
		8	厂	Modify	8 Damaged
•		9	<u>.                                    </u>	Repair-needs Charge Lev	vel 9 Not Used
		. 10	Γ	Other	10 Not Determined
					11 Excessed
Calibrated By:	Chris Du	dley S#	: 10114	Phone: 526-2761	12 Extension
·					
· F	715424	714272	7142	ALIBRATION STANDAL	RDS USED
	/13424	/142/2	1 /142	273 717617	
ļi			╁──		
<u> </u>					
					NDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED IE RATIO TYPE OF SELF CALIBRATION TECHNIQUES
The state of the s			LAF	ORATORY TEMPERATURE A	ND HUMIDITY
Physic	al STD (106C)	20.0 °	+/-0.3 ° C	(40-55% RH)   Electronic S	TD (106D) 23.0 ° +/-0.5 ° C (30-45% RH)
	nsional STD (10	•		• •	AL (Lab 112) 23.0 ° +/-1.0 ° C (20-50% RH)
Phys/I	Dim CAL (Lab	111) , 20.0°	+/-0.5 ° C	(20-50% RH) Remaining S	S&CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
Manufactu	rer's environs	nental specific	ations are o	evaluated for conformance when o	calibrations are performed outside the above stated conditions.
NOMINAL	. (STD)	our		ERANCE CONDITIONS FOUND IITS	AS FOUND (UUT) MFG. ACCURACY
	····	<del>_</del> _			
					<u>'5</u>
			•	COMMENTS	

INITIAL CALIBRATION TEST REFERRAL qa# 114094 VERIFIED TO 220 DEG C.

11/30/2007

NAME: DANA KEIT	H MORTON	BAI	OGE: 35698	PH: 526-1274	AREA: STC		BLDG: EROB	RM: W2D1
ID Number: 72281 Calibration Date:	0 Mfr: 1	EXTECH	M	odel: TYPE K ACTION CODE	Noun	Name: THE	RMOCOUPLE AS FOUND	Serial #:
Next Cal Due Date	: 4/27/2007	1 [	Acc	eptance Test	1	♠ In Tol	erance	1
Charge Level:	4	2	Spec	cial Test	2	C Out of	Tolerance > 1x < 2x	
Repair/Adj/etc C.I	.: <b>0</b>	3	Cali	bration to MFG Specs	3	C Out of	Tolerance >2x <3x	
Material Amount:	0 · ·	4 [	Clea	un Č	4	C Out of	Tolerance >3x <5x	
Charge Number:	100853GSA	5	Lim	ited Calibration	5	Out of	Tolerance >5x	
Cal Work Inst ID:	3052V	6	Fun	ctional Check	6	C Out of	Tolerance-Undeter	mined
Outside Vendor:		7 [	Perf	ormance Check	7	☐ Inoper	rative	
•		8 J	Mod	lify	.8	[ Dama	ged	•
		9 [	Rep	air-needs Charge Level	9	∏. Not U	sed	
		10	Oth	er	10	Not D	etermined	
					13	Exces	sed	
Calibrated By:	Brian Berls	S#: 1	02182 Ph	one: 526-2761	12	Exten	sion	
			CALIT		ne ilei	2 <b>D</b>		
ÌF.	714272 7	14273	717615	715424	ادی ور	سع		
				NAL INSTITUTE OF STAN OR DERIVED FROM THE				
The second secon	anti Menan and di		LABORAT	ORY TEMPERATURE AN	D HUMI	DITY		
Physic	al STD (106C)		.3 ° C (40-55				23.0 ° +/-0.5 ° C (30-4	5% RH)
	sional STD (106B) Dim CAL (Lab 111)		0.25 ° C (30-4 0.5 ° C (20-50	. 1		•	23.0° +/-1.0°C (20-5 23.0° +5,-3.0°C (20-	•
·	•		•	ed for conformance when cal				•
		-		CE CONDITIONS FOUND I				
NOMINAL	(\$TD)	30101	UNITS			ND (UUT)		G. ACCURACY
			· · · · · · · · · · · · · · · · · · ·	<u> </u>		· · · · · · · · · · · · · · · · · · ·		
							·	
				COMMENTS				

VERIFIED TO 220 DEG C.

# INL CALIBRATION INPUT DATA 11/30/2007

NAME: DANA KEIT	H MORTON	В	ADGE: 3	5698 PH: 526-1274	AREA: STC	BLDG: EROB	RM: W2D1
ID Number: 72281 Calibration Date:	10 Mfr: E 5/8/2007	ХТЕСН	1	Model: TYPE K ACTION CODE	Noun Name: THEI	AS FOUND	Serial #:
Next Cal Due Date	e: 5/8/2008	ì		Acceptance Test	1 🕟 In Tole	rance	,
Charge Level:	4	2		Special Test	2 C Out of	Tolerance >1x <2x	,
Repair/Adj/etc C.I	L: 0	3	V	Calibration to MFG Specs	3 Out of	Tolerance >2x <3x	
Material Amount:	0	. 4		Clean	4 C Out of	Tolerance >3x <5x	
Charge Number:	100853GSA	5	$\Box$	Limited Calibration	5 C Out of	Tolerance >5x	
Cal Work Inst ID:	3052V	6	<u></u>	Functional Check	6 C Out of	Tolerance-Undeterr	nined
Outside Vendor:		7	П	Performance Check	7 🗀 Inopera	ntive	
		8	٣	Modify	8 🗀 Darnag	ed	
•		9		Repair-needs Charge Level	9   Not Us	ed	
		10		Other	10 Not De	termined	
				•	11 Excess	ed ·	,
Calibrated By:	Brian Berls	S#:	102182	Phone: 526-2761	12 Extens	ion	
						`)	•
F	715256 71	5424	7127	ALIBRATION STANDARI 88 714272	DS USED	<del></del>	<del></del>
	715356 71	13424	/12/	88 /142/2			╣
·` , ,							<b>=</b>
CT AND A DOC	HEED ARE TRACE	FADI E T	OTHEN	ATIONAL INSTITUTE OF STANI	DARDS AND TECHNO	I OCY DEDIVED EDG	M ACCEPTED
				ATIONAL INSTITUTE OF STAN ANTS, OR DERIVED FROM THE			
				ORATORY TEMPERATURE AN	D HUMIDITY		a . a see particular a seminar a sem
-	al STD (106C) sional STD (106B)			(40-55% RH) Electronic STI (30-45% RH) Electronic CA	•	23.0 ° +/-0.5 ° C (30-45	·
	Sim CAL (Lab 111)				-	23.0 ° +/-1.0 °C (20-50 23.0 ° +5,-3.0 °C (20-5	•
		specificat	ions are e	valuated for conformance when cal		•	•
		<del></del>					
NOMINAL	(STD)	0010		RANCE CONDITIONS FOUND DITTS  A	S FOUND (UUT)		. ACCURACY
		·	<del></del>				
			_		``		
		******				<del></del>	
	· · · · · · · · · · · · · · · · · · ·			COMMENTS			

11/30/2007

NAME: DANA KEIT	H MORTON	E	ADGE: 356	98 PH: 526-12	74	AREA	A: STC	BLDG:	EROB	RM: W2D1	
ID Number: 7228 Calibration Date:	11 M 5/5/2005	fr: EXTECH	I	Model: TYPE K ACTION COI	DE ·	Noun N	Vame	: THERMOCO	UPLE OUND	Serial #:	
Next Cal Due Dat	e: 5/5/2006	- 1		Acceptance Test		1	•	In Tolerance			
Charge Level:	4	2		Special Test		2	C	Out of Toleran	ce >1x <2x		
Repair/Adj/etc C.l	L: 0	. 3	V	Calibration to MFG	Specs	3	$\mathbf{C}$	Out of Toleran	ce >2x <3x	•	
Material Amount:	0	4	<b>[</b> ]	Clean		4	C	Out of Toleran	ce >3x <5x		
Charge Number:	100853G	SA 5		Limited Calibration		5	C	Out of Toleran	ce >5x		
Cal Work Inst ID:	3052	. 6	Γ.	Functional Check		6	C	Out of Toleran	ce-Undeterr	nined	
Outside Vendor:		7	<u> </u>	Performance Check		7		Inoperative	•		
		. 8	<b>F</b> .	Modify		8	$\prod_{i=1}^{n}$	Damaged			
		9	<u> </u>	Repair-needs Charg	e Level	9		Not Used			
		10		Other		10		Not Determine	d		
						11		Excessed			
Calibrated By:	Chris Du	dley S#:	101142	Phone: 526-2761		12		Extension			
	•		<b>C</b> 4.1	IND ATTON OT A	NIN A DI	SC LICE	т.		•		
ſ	715424	714272	714273	717617	· DAKI	JOUSE			<u> </u>	7]	
	49-	71.5.2	72,2,5		<del> </del>					ĺ	6. 
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				TONAL INSTITUTE O							,
·			LABOI	RATORY TEMPERAT	URE ANI	HUMID	ITY				usilisasi varr
Physic	al STD (106C)	20.0 ° +	-/-0.3 °C (4	0-55% RH)   Elect	ronic STE	(106D)		23.0 ° +/-0.	5 ° C (30-45%	6 RH)	
	sional STD (10	•	•	•		(Lab 112	-		0°C (20-50%	ŕ	
Phys/I	Oim CAL (Lab )	111) 20.0° +	-/-0.5 °C (2	0-50% RH)   Rema	aining S&	CL calibra	ition ar	eas: 23.0° +5,-	3.0 °C (20-50	% RH)	
Manufactu	rer's environn	nental specifica	tions are eval	luxted for conformance	when cali	brations :	are pe	rformed outside th	e above stated	conditions.	· · ·
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURA						ACCURAC	CY .				
					<del></del>						
		<del></del>				<u>'</u>		tradition of the same of the s	<del></del>		
			/ -	COMME	NTS -						

INITIAL CALIBRATION TEST REFERRAL qa# 114094 VERIFIED TO 220 DEG C.

11/30/2007

NAME: DANA KEITH MORTON	BADGE: 35698	PH: 526-1274	. AREA: STC BLDG: 1	EROB RM: W2D1					
ID Number: 722811 Mfr: EX Calibration Date: 4/27/2006	KTECH N	Model: TYPE K  ACTION CODE	Noun Name: THERMOCOL AS FO	•					
Next Cal Due Date: 4/27/2007	1	ceptance Test	1 • In Tolerance						
Charge Level: 4	2	ecial Test	2 Out of Tolerance	>1x <2x					
Repair/Adj/etc C.L: 0	3 🔀 Ca	libration to MFG Specs	3 C Out of Tolerance	>2x <3x					
Material Amount: 0	4	ean	4 C Out of Tolerance	>3x <5x					
Charge Number: 100853GSA	5 🗀 Lii	mited Calibration	5 C Out of Tolerance	>5x					
Cal Work Inst ID: 3052V	6 🗀 Fu	nctional Check	6 C Out of Tolerance	-Undetermined					
Outside Vendor:	7 Pe	rformance Check	7 [ Inoperative						
	8   M	odify	8 Damaged						
	9 <u>  R</u> e	pair-needs Charge Level	9 Not Used						
	10	her	10 Not Determined						
			11 Excessed						
Calibrated By: Brian Berls	S#: 102182 I	Phone: 526-2761	12 Extension						
714272 71	4273 715424	BRATION STANDARI	DS USED	· · · · · · · · · · · · · · · · · · ·					
114272	7273 1713424	1 1							
	. /								
STANDARDS USED ARE TRACE VALUES FOR NATURAL PH	ABLE TO THE NATION	ONAL INSTITUTE OF STAN S, OR DERIVED FROM THE	DARDS AND TECHNOLOGY DEF RATIO TYPE OF SELF CALIBRA	RIVED FROM ACCEPTED ATION TECHNIQUES					
	LABORA	ATORY TEMPERATURE AN	D HUMIDITY	erine erini se samat erini kalandari kanta erini erini kanan amani erin samat ere esama ere esama ere esama er Tanan erini eri					
Physical STD (106C)	20.0 ° +/-0.3 ° C (40-		•	°C (30-45% RH)					
Dimensional STD (106B)  Phys/Dim CAL (Lab 111)	20.0 ° +/-0.25 ° C (30 20.0 ° +/-0.5 ° C (20-		•	0 ° C (20-50% RH) 0 ° C (20-50% RH)					
		· •	ibrations are performed outside the	,					
NOMINAL (STD)	OUT OF TOLERAN	NCE CONDITIONS FOUND D	OURING CALIBRATION AS FOUND (UUT)	MFG. ACCURACY					
	<del></del>								
		COMMENTS							

VERIFIED TO 220 DEG C.

11/30/2007

NAME: DANA KEIT	H MORTON	В	ADGE: 356	98 PH: 526-1274	AR	EA: ST	C BLDG: EROB	RM: W2D1
ID Number: 72281 Calibration Date:	Mfr 5/8/2007	EXTECH		Model: TYPE K ACTION CODE	Nou	n Name	:: THERMOCOUPLE AS FOUND	Serial #:
Next Cal Due Date	e: 5/8/2008	1		Acceptance Test	1	•	In Tolerance	
Charge Level:	4	2	T s	pecial Test	. 2	C	Out of Tolerance >1x <2x	ζ.
Repair/Adj/etc C.I	L: 0	3	<u></u>	Calibration to MFG Specs	s 3	C	Out of Tolerance >2x <3x	τ .
Material Amount:	0	4	<u> </u>	Clean	4	O	Out of Tolerance >3x <5	<b>c</b> .
Charge Number:	100853GSA	5.		imited Calibration	5	O	Out of Tolerance >5x	
Cal Work Inst ID:	3052V	6	T F	functional Check	6	O	Out of Tolerance-Undete	rmined
Outside Vendor:		7	[ F	erformance Check	7		Inoperative	
		8	<u> </u>	Modify	8	Γ	Damaged	
	a.	9	T. F	Repair-needs Charge Leve	el 9		Not Used	
		10		Other	1	0 🎵	Not Determined	
					1	1 🗍	Excessed	
Calibrated By:	Brian Berls	S#:	102182	Phone: 526-2761	1	2 🗍	Extension	٠.
F	715424	715356	712788	LIBRATION STANDA	RDS US	ED		<b>—</b>
	715424	715550	/12/00	714272	╗	·		_
. [								
							ECHNOLOGY DERIVED FR OF SELF CALIBRATION TX	
			LABO	RATORY TEMPERATURE A	AND HUM	IIDITY		
•	al STD (106C)		/-0.3 ° C (4	, ,	,	-	23.0 ° +/-0.5 ° C (30	•
	sional STD (106B Dim CAL (Lab 11	•	·/-0.25°C ( ·/-0.5°C (2	30-45% RH)   Electronic ( 0-50% RH)   Remaining	•	-	23.0 ° +/-1.0 ° C (20- ureas: 23.0 ° +5,-3.0 ° C (20	,
	•			•			erformed outside the above sta	-
NOMINAL	(STD)		UNIT	ANCE CONDITIONS FOUNI	AS FO	,		G. ACCURACY
	· · · · · · · · · · · · · · · · · · ·			·				
	•			· .		····		
				COMMENTS				

11/30/2007

NAME: DANA KEITH MORTON	BAD	OGE: 35698	PH: 526-1274	: AREA	A: STC	BLDG: EROB RM: W2D1
ID Number: 722812 Mfr: EX Calibration Date: 5/5/2005	ТЕСН	N	Model: TYPE K ACTION CODE	Noun N	lame:	THERMOCOUPLE Serial #: AS FOUND
Next Cal Due Date: 5/5/2006	1	□` Ac	cceptance Test	1	<b>©</b> 1	n Tolerance
Charge Level: 4	2	∏ Sp	pecial Test	2	C (	Out of Tolerance >1x <2x
Repair/Adj/etc C.L: 0	.3	☑ Ca	alibration to MFG Specs	3	0	Out of Tolerance >2x <3x
Material Amount: 0	4	CI	ean	:4	C	Out of Tolerance >3x <5x
Charge Number: 100853GSA	5	∏ Li	mited Calibration	5	<b>C</b>	Out of Tolerance >5x
Çal Work Inst ID: 3052	6	Fu Fu	inctional Check	. 6	(	Out of Tolerance-Undetermined
Outside Vendor:	7	T Pe	erformance Check	7	П	noperative
	8	Г м	odify	8	П	Damaged
	9 .	∏ Re	epair-needs Charge Level	. 9	<b>—</b> 1	Not Used
	10	[_` O	ther ·	10		Not Determined
,				. 11		Excessed
Calibrated By: Chris Dudley	S#: 1	101142	Phone: 526-2761	12	[] i	Extension
	t					
715424 714	272	714273	BRATION STANDARS	DS USE	D	<del>][</del> ] · ·
715424 714	2/2	/142/3	, 717017		<del></del>	
STANDADIS LICED ADE TRACEA	DI E TO 2	TUE NATIO	NAL INCTITITE OF CTAN	DA BBC A	NID TER	CINAL ACV DEBISED FROM A COUNTRY
						CHNOLOGY DERIVED FROM ACCEPTED F SELF CALIBRATION TECHNIQUES
TO THE MICHIGANICAN PROPERTY MANAGEMENT OF THE TAX OF T		LABORA	TORY TEMPERATURE AN	D HUMID	ITY	The state of the s
		).3 °C (40-5				23.0 ° +/-0.5 °C (30-45% RH)
·		).25 ° C (30 ).5 ° C (20-5		•		23.0 ° +/-1.0 ° C (20-50% RH) as: 23.0 ° +5,-3.0 ° C (20-50% RH)
		•	,			
Manufacturer's environmental sp		<del></del>				formed outside the above stated conditions.
NOMINAL (STD)	OUT OF	TOLERAN UNITS	ICE CONDITIONS FOUND D A	URING C LS FOUI		and the second of the second o
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· · · · · · · · · · · · · · · · · · ·						
					,	
ν			COMMENTS			

INITIAL CALIBRATION TEST REFERRAL qa# 114094 VERIFIED TO 220 DEG C.

11/30/2007

NAME: DANA KEIT	H MORTON	ВА	DGE: 35698	PH: 526-1274	AREA: \$	TC BLDG: EROB	RM: W2D1
ID Number: 72281 Calibration Date:	12 Mfr: Mfr:	EXTECH	, <b>M</b>	odel: TYPE K ACTION CODE	Noun Nam	e: THERMOCOUPLE AS FOUND	Serial #:
Next Cal Due Date	e: 4/27/2007	1	□ Acc	eptance Test	1 @	In Tolerance	
Charge Level:	4	2	Spec	cial Test	2 C	Out of Tolerance > 1x <	2x
Repair/Adj/etc C.I	L: 0	3	✓ Cali	bration to MFG Spec	s 3 C	Out of Tolerance >2x <	3x
Material Amount:	0	; <b>4</b>	Clea	ın	4 C	Out of Tolerance >3x <	5x
Charge Number:	100853GSA	5	Lim	ited Calibration	5 C	Out of Tolerance >5x	
Cal Work Inst ID:	3052V	6	Fun	ctional Check	6 C	Out of Tolerance-Under	termined
Outside Vendor:		7	Perf	ormance Check	7	Inoperative	•
		8	☐ Mod	lify	8	Damaged	
		9	Rep	air-needs Charge Lev	el 9 🗔	Not Used	
		10	Oth	er	10	Not Determined	
					11 🗔	Excessed	
Calibrated By:	Brian Berls	S#: 1	102182 ∂Pł	one: 526-2761	12	Extension	•.
,	2		<b>6.11</b>		NDC HOND	,	
F	714272	714273	717615	RATION STANDA	KDS OSED		· ·
ľ	714272	142/3	717015	13,24			
· [[							
						TECHNOLOGY DERIVED I	
Physic	al STD (106C)	20.0 ° +/-4	LABORAT 0.3 ° C (40-55	ORY TEMPERATURE	AND HUMIDITY STD (106D)	23.0 ° +/-0.5 °C (30	0-45% RH)
•	sional STD (106B)		0.25 °C (30-2		CAL (Lab 112)	23.0 ° +/-1.0 °C (20	-
Phys/I	Dim CAL (Lab 111)	20.0 ° +/-	0.5 ° C (20-50	% RH)   Remaining	S&CL calibration	areas: 23.0 ° +5,-3.0 ° C (	20-50% RH)
Manufactu	rer's environment	al specificatio	ns are evaluat	ed for conformance when	calibrations are j	performed outside the above s	tated conditions.
NOMINAL	. (STD)	OUT O	F TOLERANO UNITS	E CONDITIONS FOUN	D DURING CAL AS FOUND		FG. ACCURACY
	<u> </u>						
<del></del>				· · · · · · · · · · · · · · · · · · ·			
			<u> </u>	COMMENTS			

VERIFIED TO 220 DEG C.

## INL CALIBRATION INPUT DATA 11/30/2007

NAME: DANA KEIT	H MORTON	В	ADGE: 3569	8 PH: 526-1274	AREA: STC BLDG: EROB RM: W2D1
ID Number: 72281 Calibration Date:	12 Mf 5/8/2007	r: EXTECH	[	Model: TYPE K ACTION CODE	Noun Name: THERMOCOUPLE Serial #: AS FOUND
Next Cal Due Date	e: 5/8/2008	1	□ A	cceptance Test	1 • In Tolerance
Charge Level:	4	2	∏ Sp	pecial Test	2 C Out of Tolerance >1x <2x
Repair/Adj/etc C.I	L: 0	3	☑ C	alibration to MFG Specs	3 Out of Tolerance >2x <3x
Material Amount:	0	4	C C	lean	4 C Out of Tolerance >3x <5x
Charge Number:	100853GS	A 5	[] Li	mited Calibration	5 C Out of Tolerance >5x
Cal Work Inst ID:	3052V	6	· 🗍 💮 Fo	inctional Check	6 C Out of Tolerance-Undetermined
Outside Vendor:		7	Pe	erformance Check	7 Inoperative
		8	Г м	odify	8 Damaged
		9	☐ R	epair-needs Charge Level	9 Not Used
		10	□ o	ther	10 Not Determined
					11 Excessed
Calibrated By:	Brian Berl	s S#:	102182	Phone: 526-2761	12 Extension
		)	CAI	IBRATION STANDAR	ne licen
Γ	715424	715356	712788	714272	JS USED
. [					
					DARDS AND TECHNOLOGY DERIVED FROM ACCEPTED RATIO TYPE OF SELF CALIBRATION TECHNIQUES
**************************************		***************************************	LABOR	ATORY TEMPERATURE AN	D HUMIDITY .
•	al STD (106C)		-/-0.3 °C (40		
	sional STD (106) Dim CAL (Lab 11	ŕ	·/-0.25 ° C (3 ·/-0.5 ° C (20		23.0 ° +/-1.0 ° C (20-50% RH)  CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
					,
Margiacin	rer's environme			,	ibrations are performed outside the above stated conditions.
NOMINAL	(STD)	OUT (	UNITS	NCE CONDITIONS FOUND E	AS FOUND (UUT)  MFG. ACCURACY
	-	_		·	·
		_			
•				COMMENTS	· · · · · · · · · · · · · · · · · · ·

11/30/2007

NAME: DANA KEITH MORTON	BA	ADGE: 350	698 PH: 526-1274	AREA: ST	C BLDG: EROB	RM: W2D1
ID Number: 722813 Mfr: EX Calibration Date: 5/5/2005	ГЕСН		Model: TYPE K ACTION CODE	Noun Nam	e: THERMOCOUPLE AS FOUND	Serial #:
Next Cal Due Date: 5/5/2006	1	Γ,	Acceptance Test	ı 🥷	In Tolerance	
Charge Level: 4	2	<u>.                                    </u>	Special Test	2 C	Out of Tolerance $>1x < 2x$	
Repair/Adj/etc C.L: 0	3	<u>I</u>	Calibration to MFG Specs	3 O	Out of Tolcrance $>2x < 3x$	
Material Amount: 0	4	Γ	Clean	4 C	Out of Tolerance >3x <5x	•
Charge Number: 100853GSA	5	Γ	Limited Calibration	5 C	Out of Tolerance >5x	
Cal Work Inst ID: 3052	6	Γ	Functional Check	6 C	Out of Tolerance-Undeterr	nined
Outside Vendor:	7	Γ	Performance Check	7	Inoperative	
	8	Γ	Modify	8 📑	Damaged	•
•	9	Г	Repair-needs Charge Level	9 🗀	Not Used	
·	10	Γ	Other	10	Not Determined	
				11	Excessed	
Calibrated By: Chris Dudley	S#:	101142	Phone: 526-2761	12	Extension	
· .			·			
715424 7142	772	71427	LIBRATION STANDARI 3 717617	DS USED		7
713424		,,	5 777017			1
		::				]
STANDARDS USED ARE TRACEAL	RI E TO	THE NA	FIONAL INSTITUTE OF STANF	ARDS AND T	FCHNOLOGY DEBIVED FROM	
			NTS, OR DERIVED FROM THE			
			RATORY TEMPERATURE ANI			
-		•	10-55% RH)   Electronic STD (30-45% RH)   Electronic CAL	-	23.0° +/-0.5° C (30-45% 23.0° +/-1.0° C (20-50%	
			20-50% RH) Remaining S&6	•	•	•
Manufacturer's environmental spe	cificatio	ns are eva	duated for conformance when cali	brations are pe	erformed outside the above stated	conditions.
		<del></del>	ANCE CONDITIONS FOUND D	•		
NOMINAL (STD)		UNIT		S FOUND (		ACCURACY
			•			
				· · · · · · · · · · · · · · · · · · ·		
			COMMENTS			

INITIAL CALIBRATION TEST REFERRAL qa# 114094 VERIFIED TO 220 DEG C.

11/30/2007

NAME: DANA KE	NAME: DANA KEITH MORTON BADGE: 35698						A: ST	C BLDG: ER	ОВ	RM: W2D1
ID Number: 722 Calibration Date		1fr: EXTECH	I M	fodel: TYPE K		Noun	Nam	e: THERMOCOUP AS FOU		Serial #:
Next Cal Due Da	ate: 4/27/200	7 1.	☐ Acc	eptance Test		1	◉	In Tolerance		,
Charge Level:	4 .	2	☐ Spe	cial Test		2	O	Out of Tolerance >	1x <2x	
Repair/Adj/etc C	C.L. 0 .	3	☑ Cal	ibration to MF	G Specs	3	Ç	Out of Tolerance >	2x <3x	•
Material Amoun	t: 0	4	Cle	an	,	4	0	Out of Tolerance >	3x <5x	
Charge Number:	100853G	SA 5 , .	[ Lin	nited Calibratio	n	5	O	Out of Tolerance >	5x	
Cal Work Inst II	D: 3052V	6	Fur	ctional Check		6 C Out of Tolerance-Undetermine				nined
Outside Vendor:		7	Per Per	formance Chec	:k	7 Inoperative				
		8	Mo	dify		8 Damaged				,
	,	9	☐ Rep	pair-needs Cha	rge Level	9		Not Used		
·		10	Oth	er .	,	10		Not Determined		
11 ☐ Exce								Excessed		
Calibrated By: Brian Berls S#: 102182 Phone: 526-2761 12 Extension										
			CALU	D ATLON OT	AND A DY	SC TICE				
	714272	714273	717615	715424	ANDAKI		T)			7
i			:			╗				1
										]
								ECHNOLOGY DERIV		
		принамент принам	LABORA	ORY TEMPERA	TURE ANI	HIMII	OITY			
Phys	ical STD (106C)	20.0°+	-/-0.3 ° C (40-5		ectronic STD			23.0 ° +/-0.5 ° (	C (30–45%	4 RH)
Dim	ensional STD (10	6B) 20.0°+	-/-0. <b>2</b> 5 ° C (30-	45% RH)   El	ectronic CAI	. (Lab 11:	2)	23.0 ° +/-1.0 ° (	20-509	( RH)
Phys	/Dim CAL (Lab	111) 20.0°+ /	-/-0.5 ° C (20-50	0% RH)   Re	maining S&	CL calibr	ation a	reas: 23.0 ° +5,-3.0 °	C (20-50	% RH)
Manufac	turer's environn	nental specificat	ions are evaluai	ed for conforman	ce when cali	brations	are p	erformed outside the ab	ove stated	conditions.
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY										
	·									
		· -		<del></del>						
			1	COMM	ENTS					

VERIFIED TO 220 DEG C.

NAME: DANA KEITI	I MORTON	В	ADGE: 3	5698 PH: 526-1274	AREA: STC	BLDG: EROB	RM: W2D1		
ID Number: 72281 Calibration Date:		ХТЕСН		Model: TYPE K ACTION CODE		THERMOCOUPLE AS FOUND	Serial #:		
Next Cal Due Date	: 5/8/2008	1		Acceptance Test	1 🕟 In	Tolerance			
Charge Level:	4	2		Special Test	2 C O	ut of Tolerance >1x <2	x		
Repair/Adj/etc C.L	: 0	3	V	Calibration to MFG Specs	3 C O	ut of Tolerance >2x <3:	x		
Material Amount:	0	4	Γ	Clean	4 C O	ut of Tolerance >3x <5	<b>x</b> -		
Charge Number:	100853GSA	5	Γ.	Limited Calibration	5 6 0	ut of Tolerance >5x			
Cal Work Inst ID:	3052V	6		Functional Check	6 C Q	ut of Tolerance-Undete	rmined		
Outside Vendor:		7	Γ	Performance Check	7 📘 In	operative			
		8	Γ.	Modify	8 🗍 Da	amaged			
		. 9		Repair-needs Charge Level	9 🗍 N	ot Used			
		10		Other	10 🔲 N	ot Determined			
	•		٠		11 🔲 Ex	ccessed	,		
Calibrated By:	Brian Berls	S#:	102182	Phone: 526-2761	12 🗀 Ex	ctension			
				,	0.0 110111				
<u> </u>	715424 71	5356	71278	ALIBRATION STANDARI	OS OSED		<del></del>		
F	713424 71	3330	/12/	714272			╣ .		
STANDARDS I	USED ARE TRACI	EABLE TO	THE NA	ATIONAL INSTITUTE OF STAN NTS, OR DERIVED FROM THE	DARDS AND TEC RATIO TYPE OF	THNOLOGY DERIVED FR	OM ACCEPTED CHNIQUES		
	ant : remain	· · · · · · · · · · · · · · · · · · ·		ORATORY TEMPERATURE AN					
Physica	1 STD (106C)	20.0 ° +		(40-55% RH)   Electronic STI		23.0 ° +/-0.5 ° C (30-4	15% RH)		
	ional STD (106B)			(30-45% RH)   Electronic CA	•	23.0 ° +/-1.0 ° C (20-5	•		
Phys/Di	m CAL (Lab 111)	20.0 ° +	/-0.5 ° C	(20-50% RH) Remaining S&	CL calibration area	s: 23.0 ° +5,-3.0 ° C (20	-50% RH)		
Manufactur	er's environmental	specificati	ons are ev	aluated for conformance when cal	ibrations are perfo	ormed outside the above stat	ed conditions.		
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY							G. ACCURACY		
			<del></del>						
	COMMENTS								

11/30/2007

NAME: DANA KEIT	H MORTON	B/	ADGE: 356	98 PH: 526-1274	AREA: STC	BLDG: EROB	EROB RM: W2D1	
ID Number: 7228 Calibration Date:	14 Mfr: 5/5/2005	EXTECH		Model: TYPE K ACTION CODE	Noun Name:	THERMOCOUPLE AS FOUND	Serial #:	
Next Cal Due Date	e: 5/5/2006	1		Acceptance Test	1 @	In Tolerance		
Charge Level:	4	2		Special Test	2 C	Out of Tolerance >1x <2x		
Repair/Adj/etc C.I	L: 0	3	<u> </u>	Calibration to MFG Specs	3 (	Out of Tolerance >2x <3x		
Material Amount:	0	. 4	Γ.	Clean	4 (	Out of Tolerance >3x <5x		
Charge Number:	100853GSA	5		Limited Calibration	5 C	Out of Tolerance >5x	•	
Cal Work Inst ID:	3052	, <b>6</b>	Γ.	Functional Check	6 C	Out of Tolerance-Undeter	mined	
Outside Vendor:		7		Performance Check	7 [	Inoperative		
•		8		Modify	8 🗀	Damaged		
		9	Γ.:	Repair-needs Charge Level	9 🗀	Not Used		
		10		Other	10 🗀	Not Determined		
	•				11 🗀	Excessed		
Calibrated By:	Chris Dudle	y S#:	101142	Phone: 526-2761	12	Extension		
			C 4.1	ENDER A TRANSPORT OF A BUT A TOWN	NO VICED		,	
F	715424	714272	714273	LIBRATION STANDARI	DS USED			
STANDARDS VALUES	USED ARE TRAC FOR NATURAL	CEABLE TO PHYSICAL (	THE NAT	TONAL INSTITUTE OF STANE TS, OR DERIVED FROM THE	OARDS AND TE RATIO TYPE O	CHNOLOGY DERIVED FRO	M ACCEPTED HNIQUES	
/		The state of the s	LABOR	RATORY TEMPERATURE ANI	HUMIDITY	NOTE I TO MODELLE STATE OF THE	A STATE OF THE STA	
-	al STD (106C)		-0.3 °C (44	0-55% RH)   Electronic STD	(106D)	23.0 ° +/-0.5 ° C (30-45	% RH)	
	síonal STD (106B) Dim CAL (Lab 111)		-0.25 ° C - (2) -0.5 ° C - (2)	30-45% RH)   Electronic CAL	. (Lab 112) CL calibration are	23.0 ° +/-1.0 ° C (20-50° as: 23.0 ° +5,-3.0 ° C (20-50°	•	
•			-	uated for conformance when call	•	, ,		
,		,				į.		
NOMINAL (STD)  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  NOMINAL (STD)  UNITS  AS FOUND (UUT)  MFG. ACCURACY								
			·		,		·	
<u></u> -				COMMENTS				

INITIAL CALIBRATION TEST REFERRAL qa# 114094 VERIFIED TO 220 DEG C.

11/30/2007

NAME: DANA KEITH MORTON		, j	BADGE: 35698	PH: 526-1274	AREA: STC	BLDG: EROB	G: EROB RM: W2D1		
ID Number: 72281 Calibration Date:	14 N 4/27/200	Afr: EXTECH	I N	fodel: TYPE K ACTION CODE	Noun Name: TH	ERMOCOUPLE AS FOUND	Serial #:		
Next Cal Due Date	e: 4/27/200°	7 1	☐ Acc	ceptance Test	l 📵 In To	lerance	4		
Charge Level:	4	2	Spe	cial Test	2 C Out o	of Tolerance >1x <2x			
Repair/Adj/etc C.I	L: 0	3	▼ Cal	ibration to MFG Specs	3 C Out o	of Tolerance >2x <3x			
Material Amount:	0	4	Cle	an	4 C Out o	of Tolerance >3x <5x			
Charge Number:	100853G	iSA 5	Lin	nited Calibration	5 C Out o	of Tolerance >5x			
Cal Work Inst ID:	3052V	6	Fur	nctional Check	6 C Out o	mined			
Outside Vendor:	٠	7	Per	formance Check	7 🔲 Inope	erative			
		8	∏ Mo	dify	8 🔲 Dama	aged			
		9	Rej	pair-needs Charge Leve	el 9 🗀 Not U	Jsed			
		10	Ctl Otl	ег	10 🔲 Not I	Determined			
	•				11 Exce	ssed			
Calibrated By:	Brian Be	rls S#:	102182 P	hone: 526-2761	12 Exter	nsion			
ſ	714272	714273	717615	BRATION STANDA	RDS USED		<b></b>		
L	/142/2	714273	717013	/13424	_		-		
			0.700.00.00	NAT INCEPTIVE OF CTA	NO ADDC AND TROUB				
VALUES	FOR NATUR	AL PHYSICAL	CONSTANTS	NAL INSTITUTE OF STA , OR DERIVED FROM TH	E RATIO TYPE OF SE	LF CALIBRATION TEC	CHNIQUES		
THE PERSON NAMED IN COLUMN TO THE PE			LABORA'	TORY TEMPERATURE A	ND HUMIDITY	an al-damentana	THIS ALL SHAPE		
·	al STD (106C)		-/-0.3 °C (40-5			23.0 ° +/-0.5 ° C (30-45	•		
	nsional STD (10	-	-/-0.25 °C (30-		AL (Lab 112)	23.0 ° +/-1.0 °C (20-50	•		
·	Dim CAL (Lab	·	-/-0.5 °C (20-5	,	&CL calibration areas:	23.0 ° +5,-3.0 °C (20-5	·		
Manufactu	rer's environt			ted for conformance when c	-		d conditions.		
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY									
<del>,</del>									
				COMMENTS					

VERIFIED TO 220 DEG C.

Calibration Date: 5/8/2007  Next Cal Due Date: 5/8/2008  Charge Level: 4	EXTECH I 2	BADGE:	Model: T			Nam	rc BLDG:		RM: W2D1  Serial #:	
Calibration Date: 5/8/2007  Next Cal Due Date: 5/8/2008  Charge Level: 4	1				Noun	Nam	e THERMOCOL	IIDI E	Serial #	
Charge Level: 4			ACTION CO		<b>A</b>		AS FO		Scriniti.	
-	2		Acceptance	Test	1	•	In Tolerance			
D - 1/4 17/4 - O 7 - O		<b>F</b>	Special Tes	st	2	C	Out of Tolerance	e >1 x <2x	4	
Repair/Adj/etc C.L: 0	3	1	Calibration	to MFG Specs	3 Out of Tolerance $>2x < 3x$					
Material Amount: 0	4.	Γ	Clean		4 Out of Tolerance >3x <5x					
Charge Number: 100853GSA	5	Γ.	Limited Ca	libration	5 C Out of Tolerance >5x					
Cal Work Inst ID: 3052V	6		Functional	Check	6	Õ	Out of Tolerance	Out of Tolerance-Undetermined		
Outside Vendor:	7	Γ.:	Performano	ce Check	7		Inoperative			
	8	Γ.	Modify 8 Damaged				Damaged			
	9		Repair-nee	ds Charge Level	9		Not Used			
	10	<u> </u>	Other		10		Not Determined			
					11		Excessed	•		
Calibrated By: Brian Berls	S#:	10218	2 Phone: 52	26-2761	12		Extension			
•										
715424 7	15356	712		ON STANDARI	DS USE	ED_	<del>-11 -11</del>	<u> </u>	<del>-</del> 11	
/13424 /	13330	/12	700 714	272	╣	-,		<u>`</u>	╣	
					7				1	
OTANIA AREA HORRA AREA TRACE			JAMIONAL INC							
STANDARDS USED ARE TRAC VALUES FOR NATURAL P										
		LA	BORATORY TE	MPERATURE ANI	HUMI	DITY		in the second second		
Physical STD (106C)			(40-55% RH)	Electronic STE	-	<b>-</b> \		5 °C (30-459	•	
Dimensional STD (106B)  Phys/Dim CAL (Lab 111)			(30-45% RH) (20-50% RH)	Electronic CAI		-	•	0°C (20-507 .0°C (20-50	•	
Manufacturer's environmenta	i specificat	: tions are	evaluated for co				,			
				DITIONS FOUND D					·	
NOMINAL (STD)	001		NITS		S FOU			MFG.	ACCURACY	
			<del></del>	<del></del>			·		· · · · · · · · · · · · · · · · · · ·	
	` —		<del> </del>						<del></del>	
		·			·					
			<u></u>	OMMENTS			-,			

11/30/2007

NAME: DANA KEITH MORTON	BADGE: 35	71/3W2007 5698 PH: 526-1274	AREA: STC BLDG: EROB RM: W2D1					
ID Number: 722815 Mfr. E. Calibration Date: 5/5/2005	<b>Х</b> ТЕСН	Model: TYPE K ACTION CODE	Noun Name: THERMOCOUPLE Serial #:  AS FOUND					
Next Cal Due Date: 5/5/2006	1 🗀	Acceptance Test	l 🕟 In Tolerance					
Charge Level: 4	2	Special Test	2 C Out of Tolerance >1x <2x					
Repair/Adj/etc C.L: 0	3 <u>F</u> .	Calibration to MFG Specs	3 C Out of Tolerance >2x <3x					
Material Amount: 0	4	Clean	4 C Out of Tolerance >3x <5x					
Charge Number: 100853GSA	5	Limited Calibration	5 C Out of Tolerance >5x					
Cal Work Inst ID: 3052	6 F	Functional Check	6 C Out of Tolerance-Undetermined					
Outside Vendor:	7	Performance Check	7 Inoperative					
	8	Modify	8 Tamaged					
	9	Repair-needs Charge Level	9 Not Used					
	10	Other	10 Not Determined					
			11 Excessed					
Calibrated By: Chris Dudley	S#: 101142	Phone: 526-2761	12 Extension					
		T TWO A COLON COT A NO. A DE	AC HOPP					
715424 71	4272 71427	ALIBRATION STANDARE	S USED					
			ARDS AND TECHNOLOGY DERIVED FROM ACCEPTED RATIO TYPE OF SELF CALIBRATION TECHNIQUES					
* Tribling Set 17 - A Control of the	LABO	PRATORY TEMPERATURE AND	ниміріту					
Physical STD (106C)	20.0 ° +/-0.3 ° C (		, ,					
Dimensional STD (106B)  Phys/Dim CAL (Lab 111)	20.0° +/-0.25°C 20.0° +/-0.5°C (		(Lab 112) 23.0 ° +/-1.0 ° C (20-50% RH)  CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)					
•	·	, ,	brations are performed outside the above stated conditions.					
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY								
		<u> </u>						
		COMMENTS						

INITIAL CALIBRATION TEST REFERRAL qa# 114094 VERIFIED TO 220 DEG C.

11/30/2007

				11/30/					
NAME: DANA KE	TH MORTON	1	BADGE: 3	5698 PH: 526	-1274	AREA: STC	BLDG:	EROB	RM: W2D1
ID Number: 722 Calibration Date		fr: EXTECI	4	Model: TYPE K ACTION CO		Noun Name:	THERMOCOL AS FO		Serial #:
Next Cal Due Da	ate: 4/27/2007	1		Acceptance Test		I 📵 Ir	Tolerance		
Charge Level:	4	2	$\Box$	Special Test		2 0 0	ut of Tolerance	e >1x <2x	
Repair/Adj/etc C	C.L: 0	3	V	Calibration to MF	G Specs	3 O O	ut of Tolerance	e >2x <3x	
Material Amoun	t: 0 -	4	$\Gamma$	Clean		4 0 9	ut of Tolerance	e > 3x < 5x	
Charge Number:	100853G	SA 5	1	Limited Calibration	n	5 C O	ut of Tolerance	e >5x	
Cal Work Inst II	D: . 3052V	6		Functional Check	d Check 6 C Out of Tolerance				ined
Outside Vendor:		7	<b></b>	Performance Chec	k /	7 [ Inoperative			
		8		Modify 8 Damaged					
	÷	9	$\Gamma$	Repair-needs Char	ge Level	9 🗀 N	ot Used		
	•	10	Π,	Other		10 🗀 N	ot Determined	*	
						11 🗀 E	xcessed		
Calibrated By:	Brian Ber	is S#:	102182	Phone: 526-276	i	12   E	xtension	•	
	•			AT IDD ATTON OT	A NIYA A PAR	e licen		· ·	
	714272	714273	7176	ALIBRATION ST	ANDARI	JS USED	<del>                                     </del>		า
	/142/2	714273	1 /1/0	13 /15424	<del></del>				1
									<u></u>
CTANDADA	CHOPA ARE TO	ACCADI E T	O TUE N	ATIONAL INSTITUTE	OFCTANE	A DOC AND FEE		NIVED 1110	
				ATIONAL INSTITUTE ANTS, OR DERIVED F					
		12 34 17 2 22 24 24 24 24 24 24 24 24 24 24 24 2	LAB	ORATORY TEMPERA	TURE ANI	HUMIDITY			
Phys	ical STD (106C)	20.0 ° +	-/-0.3 ° C	(40-55% RH)   EN	ectronic STD	(106D)	23.0 ° +/-0.5	5 °C (30-45%	, RH)
	ensional STD (100	•			ectronic CAL	•		D°C (20-50%	-
	/Dim CAL (Lab 1					CL calibration area		.0 ° C (20-50	•
Manufac	turer's environm	ental specificat	ions are e	valuated for conforman	ce when cali	brations are perfe	ormed outside the	above stated	conditions.
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY								ACCURACY.	
<u> </u>									
COMMENTS									

VERIFIED TO 220 DEG C.

NAME: DANA KEITH MORTON BADGE: 35698 PH: 526-1274 AREA: STC BLDG: EROB RM: W2D1									
NAME: DANA KEITH MC	ORTON	- I	BADGE: 3	5698 PH: 526-1274	AREA	: STC	BLDG: EROB	RM: W2D1	
ID Number: 722815 Calibration Date: 5/8	M: 8/2007	fr: EXTECH	I	Model: TYPE K ACTION CODE	Noun N	ame: THEF	AS FOUND	Serial #:	
Next Cal Due Date: 5/8	8/2008	. 1		Acceptance Test	1 (	In Toler	rance	•	
Charge Level: 4		2		Special Test	2	Out of	Folerance >1x <2x		
Repair/Adj/etc C.L: 0		. 3	<u> </u>	Calibration to MFG Specs	3 (	Out of	Folerance >2x <3x		
Material Amount: 0	,	4	r	Clean	4	Out of '	Folerance >3x <5x		
Charge Number: 10	0853GS	SA 5		Limited Calibration	5 )	Out of	Folerance >5x		
Cal Work Inst ID: 30	52V .	6		Functional Check	6	○ Out of '	Folerance-Undeter	mined	
Outside Vendor:	utside Vendor: 7 Performance Check				7	Inopera	tive		
		8		Modify	8 Damaged				
		9	Γ.:	Repair-needs Charge Level	9	Not Use	ed		
		10	П	Other	10 Not Determined				
					11 [	_ Excesse	ed		
Calibrated By: Brian Berls S#: 102182 Phone: 526-2761 12  Extension								•	
			C		NO LICET				
715	5424	715356	7127	ALIBRATION STANDARI 88 714272	DO DOET	,	<del></del>	<b>—</b> ]	
,	7424	713330	/12/	714272	┪				
37							``		
				ATIONAL INSTITUTE OF STANI LNTS, OR DERIVED FROM THE					
				ORATORY TEMPERATURE AN					
Physical STI	. ,			(40-55% RH) Electronic STI (30-45% RH) Electronic CAI	•		3.0 ° +/-0.5 ° C (30-4 3.0 ° +/-1.0 ° C (20-5		
Dimensional Phys/Dim CA		•		(20-50% RH) Remaining S&	, ,		3.0 ° +5,-3.0 ° C (20-	•	
Manufacturer's	environm	ental specificat	tions are e	valuated for conformance when cal	ibrations a	re performed	outside the above state	ed conditions.	
		OUT	OF TOLE	RANCE CONDITIONS FOUND D	URING ĆA	LIBRATION	· ·		
NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY									
· <u></u>									
					<del></del>		·		
COMMENTS									

11/30/2007

r	<u> </u>			,11/3	W2007					
NAME: DANA KEI	TH MORTON		BADGE: 3	5698 PH: 5	526-1274	ARE.	A: STC	BLDG	EROB.	RM: W2DI
ID Number: 7234 Calibration Date:		Mr: EXTEC 05	СН	Model: TYPE ACTION		Noun 1	Name:	THERMOCO AS F	UPLE OUND	Serial #:
Next Cal Due Da	te: 5/21/200	7 1		Acceptance Te	st	1	<b>6</b> ]	In Tolerance		
Charge Level:	4	2		Special Test		2	0	Out of Toleran	ce >1x <2	<b>x</b>
Repair/Adj/etc C	.L: 0	3	V	Calibration to l	MFG Specs	3	Ç (	Out of Toleran	ce >2x <3	<b>x</b> . ,
Material Amount	: 0	4		Clean		4	0	Out of Toleran	ce >3x <5	<b>x</b>
Charge Number:	100853G	iSA 5		Limited Calibr	ation	5	, C	Out of Toleran	ce.>5x	
Cal Work Inst ID	: 3052U	. 6		Functional Che	ck	6	6 C Out of Tolerance-Undetermined			
Outside Vendor:		7		Performance C	7		Inoperative			
		8	ノロ	Modify 8				•		
		9		Repair-needs Charge Level 9				Not Used		
		16	0 🗀	Other		10		Not Determine	d	
				•		11		Excessed		
Calibrated By: Chris Dudley S#: 101142 Phone: 526-2761 12 T Extension										
			c	ALIBRATION S	TANDAD	ne lier	n			
· [	370602	723247	7224		717617				ſ	<b>—</b>
, .										
				ATIONAL INSTITU ANTS, OR DERIVE						
		englestati de ur	LAB	ORATORY TEMPE	RATURE AN	D HUMID	ITY			
_	cal STD (106C)			(40-55% RH)	Electronic STI	D (106D)		23.0 ° +/-0.	.5 °C (30-4	5% RH)
	nsional STD (10	•		(30-45% RH)	Electronic CA	•	•		.0 ° C (20-5	
	Dim CAL (Lab	•		(20-50% RH)	Remaining S&			·	3.0 ° C (20	•
Manufact	urer's environs	nental specific	cations are e	valuated for conforn	ance when cal	librations	are peri	formed outside th	e above state	ed conditions.
NOMINA	NOMINAL (STD)  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  NOMINAL (STD)  UNITS  AS FOUND (UUT)  MFG. ACCURACY									
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		,	• .	COM	MENTS					

INITIAL CALIBRATION RECEIVING INSPECTION TEST REFERRAL QA# 115846

NAME: DANA KEIT		BADGE: 35698 PH: 526-1274		526-1274	ARE	A: ST	C BLDG: EROB	RM: W2D1		
ID Number: 72340 Calibration Date:	9 M 5/8/2007	fr: EXTECH	i	Model: TYP		Noun	Namo	e: THERMOCOUPLE  AS FOUND	Serial #:	
Next Cal Due Date	:: 11/8/2008	1		Acceptance Te	st	1	•	In Tolerance		
Charge Level:	4	2	<u></u>	Special Test		2	C	Out of Tolerance > 1x <2	2x	
Repair/Adj/etc C.L	.: <b>0</b>	3	<b>Y</b>	Calibration to I	MFG Specs	3	C	Out of Tolerance >2x <3	3x	
Material Amount:	0	4		Clean	•	4	C	Out of Tolerance >3x <5	5 <b>x</b>	
Charge Number:	100853G	SA 5		Limited Calibra	ation	5	C	Out of Tolerance >5x		
Cal Work Inst ID:	3052V	6	Γ	Functional Che	ck	6	C	Out of Tolerance-Undete	ermined	
Outside Vendor:		7	Γ.	Performance C	heck	7		Inoperative		
		8	Γ.	Modify		8		Damaged		
		9	$\square$	Repair-needs C	harge Level	9		Not Used		
	•	10		Other		10		Not Determined		
						11		Excessed		
Calibrated By:	Brian Ber	ls S#:	102182	2 Phone: 526-2	761	12		Extension	• .	
	715424	712788	7153	ALIBRATION 714272	STANDAR	DS USI	ED	<del></del>		
F	715424	712700	7133	714272		╬			<del>-</del>	
STANDARDS	USED ARE T	RACEARLE T	O THE N	ATIONAL INSTIT	ITE OF STAN	DARDS	AND T	ECHNOLOGY DERIVED FI	ROM ACCEPTED	
VALUES	FOR NATURA	L PHYSICAL	. CONST	ANTS, OR DERIVE	D FROM THE	RATIO	TYPE	OF SELF CALIBRATION T	ECHNIQUES	
				ORATORY TEMP			DITY			
•	il STD (106C) sional STD (106			(40-55% RH)   (30-45% RH)	Electronic STI		2)	23.0 ° +/-0.5 ° C (30- 23.0 ° +/-1.0 ° C (20-	•	
	im CAL (Lab 1	•		(20-50% RH)	Remaining S&	•	•		•	
Manufactu	rer's environm	ental specifical	tions are e	valuated for conform	nance when cal	ibrations	are pe	erformed outside the above sta	ted conditions.	
· · · · · · · · · · · · · · · · · · ·		OUT	OF TOLE	RANCE CONDITION	ONS FOUND D	URING	CALIE	BRATION	· · · · · · · · · · · · · · · · · · ·	
NOMINAL	NOMINAL (STD)  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  NOMINAL (STD)  MFG. ACCURACY									
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				COM	MENTS				., .,	

11/30/2007

NAME: DANA KEITH MORTON	BADGE: 356	98 PH: 526-1274	AREA: STC BLDG: EROB RM: W2D1						
			The state of the s						
ID Number: 723410 Mfr: EX Calibration Date: 11/21/2005	TECH	Model: TYPE K ACTION CODE	Noun Name: THERMOCOUPLE Serial #:  AS FOUND						
Next Cal Due Date: 5/21/2007	1 🗀	Acceptance Test	l • In Tolerance						
Charge Level: 4	2	Special Test	2 C Out of Tolerance >1x <2x						
Repair/Adj/etc C.L: 0	3 <b>Z</b>	Calibration to MFG Specs	3 Out of Tolerance >2x <3x						
Material Amount: 0	4 🗀	Clean	4 C Out of Tolerance >3x <5x						
Charge Number: 100853GSA	5 <u> </u>	Limited Calibration	5 C Out of Tolerance >5x						
Cal Work Inst ID: 3052U	6 <b></b>	Functional Check	6 C Out of Tolerance-Undetermined						
Outside Vendor:	7	Performance Check	7 Inoperative						
	8 🗀	Modify	8 Damaged						
	9	Repair-needs Charge Level	9 Not Used						
	10	Other	10 Not Determined						
			11 Excessed						
Calibrated By: Chris Dudley S#: 101142 Phone: 526-2761 12 T Extension									
	CA1	LIBRATION STANDARI	OC LICED						
370602 723									
370002 723	722.5	7,72713 7,77017							
STANDADDS ISED ARE TRACEA	RI F TO THE NAT	TIONAL INSTITUTE OF STANK	DARDS AND TECHNOLOGY DERIVED FROM ACCEPTED						
			RATIO TYPE OF SELF CALIBRATION TECHNIQUES						
		RATORY TEMPERATURE AND							
	20.0° +/-0.3°C (4								
·	20.0 ° +/-0.25 ° C (2 20.0 ° +/-0.5 ° C (2	•	(Lab 112) 23.0 ° +/-1.0 ° C (20-50% RH)  CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)						
	ecifications are eva	luated for conformance when cali	brations are performed outside the above stated conditions.						
	OUT OF TOLER	ANCE CONDITIONS FOUND D	URING CALIBRATION						
NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY									
			<u> </u>						
•									
		COMMENTS							

INITIAL CALIBRATION RECEIVING INSPECTION TEST REFERRAL QA# 115846

# INL CALIBRATION INPUT DATA 11/30/2007

NAME PANA ST	ELI MODEON		CF. 25409	71/3W/2007	ADEA STO	DI DC: EDOR	D84, 19/201		
NAME: DANA KEI	I H MURTUN	BAD	GE: 35698	PH: 526-1274	AREA: STC	BLDG: EROB	RM: W2D1		
ID Number: 7234 Calibration Date:	10 Mfr: 5/8/2007	EXTECH		TYPE K	Noun Name: Th	IERMOCOUPLE AS FOUND	Serial #:		
Next Cal Due Dat	te: 11/8/2008	1	Acceptan	ce Test	1 🕟 In T	olerance			
Charge Level:	4	2	Special To	est	2 C Out	of Tolerance >1x <2x	<b>c</b> .		
Repair/Adj/etc C.	L: 0 .	3	Calibratio	n to MFG Specs	3 Out of Tolerance >2x <3x				
Material Amount	: 0	4	Clean		4 C Out	c c			
Charge Number:	100853GSA	. 5 F	Limited C	Calibration	5 C Out	of Tolerance >5x			
Cal Work Inst ID	: 3052V	· 6 「	Functiona	l Check	of Tolerance-Undeter	rmined			
Outside Vendor:		7	Performa	nce Check	7 🔲 Inop	erative			
		8	Modify		8 Dam	naged			
•		9	Repair-ne	eds Charge Level	9 Not	Used			
		10	Other		10 🔲 Not	Determined			
		,			11 Exce	essed			
Calibrated By:	Brian Berls	S#: 10	2182 Phone:	526-2761	12 🗍 Exte	nsion			
			CALIDDAT	ION STANDAR	ne licen		•		
. (1	715424	715356		4272	DS CSED		<b>—</b>		
	715424	715550	7.12700   7.1	12/2			=		
STANDARDS	USED ARE TRA	CEABLE TO T	IE NATIONAL IN	STITUTE OF STAN	DARDS AND TECH	NOLOGY DERIVED FR	OM ACCEPTED		
						ELF CALIBRATION TE			
mt*	Ü			EMPERATURE AN		22.09.1/0.596./20.4	Sec DID		
	cal STD (106C) nsional STD (106B)		°C (40-55% RH) 5°C (30-45% RH		•	23.0 ° +/-0.5 ° C (30-4 23.0 ° +/-1.0 ° C (20-5	•		
	Dim CAL (Lab 111)		°C (20-50% RH)		CL calibration areas:	·	•		
Manufact	urer's environmen	tal specifications	are evaluated for o	onformance when ca	librations are perforn	ned outside the above stat	ed conditions.		
Lamber Alle College Co		OUT OF T	OLERANCE COM	DITIONS FOUND I	OURING CALIBRAT	ION	······································		
NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY									
						· ·	<u></u>		
							·		
		<del></del>		COMMENTS	····································				
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11/30/2007

NAME: DANA KEIT	'H MORTON	BADGE	35698 PH: 526-1274	AREA: STC BLDG: EROB	RM: W2D1
ID Number: 7234 Calibration Date:	11 Mfr: EX 11/21/2005	KTECH	Model: TYPE K ACTION CODE	Noun Name: THERMOCOUPLE AS FOUND	Serial #:
Next Cal Due Dat	e: 5/21/2007`	1 🗀	Acceptance Test	1	
Charge Level:	4	2	Special Test	2 Out of Tolerance >1x <2x	
Repair/Adj/etc C.l	L: 0	3 🔀	Calibration to MFG Specs	3 C Out of Tolerance >2x <3x	·
Material Amount:	0	4	Clean	4 C Out of Tolerance >3x <5x	
Charge Number:	100853GSA	5	Limited Calibration	5 Out of Tolerance >5x	
Cal Work Inst ID:	3052U	6 F	Functional Check	6 Out of Tolerance-Undetern	nined
Outside Vendor:		7	Performance Check	7 \ \int \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
		8	Modify	8 Damaged	•
,		9	Repair-needs Charge Leve	9 Not Used	
		10	Other	10 Not Determined	
			•	11  Excessed	
Calibrated By:	Chris Dudley	S#: 1011	42 Phone: 526-2761	12 Extension	. •
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· [	370602 723		CALIBRATION STANDAR 1915 722456 717617		7)
ľ	370002   725	7247 724	722430 777017		=
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				DARDS AND TECHNOLOGY DERIVED FROM RATIO TYPE OF SELF CALIBRATION TEC	
		LA	BORATORY TEMPERATURE AN	D HUMIDITY	
Physic	al STD (106C)	20.0 ° +/-0.3 ° (	(40-55% RH)   Electronic ST	D (106D) 23.0 ° +/-0.5 ° C (30-45%	6 RH)
Dimen	sional STD (106B)	20.0 ° +/-0.25 °	C (30-45% RH)   Electronic CA	L (Lab 112) 23.0 ° +/-1.0 ° C (20-509	6 RH)
Phys/I	Dim CAL (Lab 111)	20.0 ° .+/-0.5 ° C	(20-50% RH)   Remaining S8	CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50	% RH)
Manufactu	rer's environmental s	pecifications are	evaluated for conformance when ca	librations are performed outside the above stated	conditions.
NOMINAL	(STD)		ERANCE CONDITIONS FOUND I		ACCURACY
				,	
4					,
, <u></u>	· · · · · · · · · · · · · · · · · · ·				
				/ .	
			COMMENTS		

INITIAL CALIBRATION RECEIVING INSPECTION TEST REFERRAL QA# 115846

NAME: DANA KEIT	H MORTON	F	BADGE: 35698	PH: 526-127	4 AR	EA: STC	BLDG: EROB	RM: W2D1
ID Number: 7234 Calibration Date:	11 M 5/8/2007	fr: EXTECH	i i	Model: TYPE K ACTION CODI		ı Name: THI	ERMOCOUPLE AS FOUND	Serial #:
Next Cal Due Dat	e: 11/8/2008	3 1	☐ Ac	ceptance Test	1 1	ln To	lerance	•
Charge Level:	4	2	∏ Sp	ecial Test	. 2	C Out o	f Tolerance > 1x < 2	x
Repair/Adj/etc C.	L: 0	3	☑ Ca	libration to MFG S	pecs 3	C Out o	f Tolerance >2x <3	x
Material Amount:	0	4	Cle	ean	4	C Out o	f Tolerance >3x <5	x
Charge Number:	100853G	SA 5	Lir	mited Calibration	. 5	C Out o	f Tolerance >5x	•
Cal Work Inst ID:	3052V	6	J Fu	nctional Check	6	C Out o	f Tolerance-Undete	rmined
Outside Vendor:		7	Per	rformance Check	7	Inope	rative	
		8	∏ Мо	odify	8	Dama	iged	
		9	Re	pair-needs Charge	Level 9	∏ Not U	Jsed	
		10	Ct Ot	her	10	Not D	Determined	
	•		•		1	Exces	sed	٠
Calibrated By:	Brian Ber	ls S#:	102182 P	Phone: 526-2761	. 12	Exten	sion	•
			CALI	BRATION STAN	DARDS US	ED	1	
	715424	715356	712788	714272				
<u> </u>								
							OLOGY DERIVED FR LF CALIBRATION TE	
Dhunia	eal STD (106C)	20.09		TORY TEMPERATU			23.0° +/-0.5°C (30-4	150/ DUN
•	rai S1D (100C) nsional STD (10		-/-0.3 ° C (40-5 -/-0.25 ° C (30-		mic STD (106D) mic CAL (Lab 1		23.0° +/-0.3°C (30-2	•
	Oim CAL (Lab !	•	-/-0.5 ° C (20-5		ning S&CL calib	,	23.0 ° +5,-3.0 ° C (20	·
Manufactu	ırer's environm	ental specificat	ions are evalus	ated for conformance w	hen calibration	s are performe	ed outside the above stat	ed conditions.
		OUT	OF TOLERAN	ICE CONDITIONS FO	UND DURING	CALIBRATIO	ON	·····
NOMINAL	. (STD)		UNITS		AS FO	ND (UUT)	MF	G. ACCURACY
				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
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				COMMEN	ГS			
Replaced connect	or.							

11/30/2007

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NAME: DANA KEI	TH MORTON	*****	BADGE: 35	698 PH: 5	526-1274	ARE	A: STO	BLDG: EROB	RM: W2D1
ID Number: 7234 Calibration Date:		ffr: EXTEC 05	Н		Model: TYPE K ACTION CODE		Vame	: THERMOCOUPLE AS FOUND	Serial #:
Next Cal Due Da	te: 5/21/200	7 1		Acceptance Te	st'	1	(	In Tolerance	
Charge Level:	4	2		Special Test		2	0	Out of Tolerance >1x	<2x
Repair/Adj/etc C.	.L: 0	3	<u> </u>	Calibration to I	MFG Specs	3	0	Out of Tolerance >2x	<3x
Material Amount	: 0	4		Clean		4	O	Out of Tolerance >3x	<5x
Charge Number:	100853G	SA 5	<u> </u>	Limited Calibra	ation	5	C	Out of Tolerance >5x	
Cal Work Inst ID	: 3052U	6	Γ.,	Functional Check		6	C	Out of Tolerance-Unde	etermined
Outside Vendor:	or: 7 Performance Check		7		Inoperative				
		8	<u> </u>	Modify		8		Damaged	
		9		Repair-needs C	harge Level	9		Not Used	
		10		Other		10		Not Determined	
						11		Excessed	
Calibrated By:	Chris Du	dley S#	: 101142	2 Phone: 526-2	761	12		Extension	
			C	ALIBRATION S	TANDADI	ne lief	D		•
Į.	370602	723247	7224		717617	7			<del></del>
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								ECHNOLOGY DERIVED F OF SELF CALIBRATION 1	
	we until don't regulate the con-		LABO	DRATORY TEMPE	RATURE ANI	D HUMID	ITY		
Physi	cal STD (106C)	20.0 °	+/-0.3 ° C	(40-55% RH)	Electronic STE	(106D)		23.0 ° +/-0.5 ° C (30	)-45% RH)
	nsional STD (10	-		(30-45% RH)	Electronic CAI	•		23.0 ° +/-1.0 ° C (20	•
_	Dim CAL (Lab	,		·	Remaining S&			·	•
(VIANUIACI)	uter s en viron	······································					-	rformed outside the above so	ated congruous.
NOMINA	L (STD)	OUT	OF TOLES UNI	RANCE CONDITIO TS		URING C S FOUI			FG. ACCURACY
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								<del>.</del>	
				COM	MENTS				

INITIAL CALIBRATION RECEIVING INSPECTION TEST REPERRAL QA# 115846

1/30/7007

NAME: DANA KEIT	TH MORTON		BADGE: 35698 PH: 526-12				EA: S	STC BLDG: EROB RM: W2D1
ID Number: 7234 Calibration Date:	12 M 4/27/2006	fr: EXTEC	CH	Model: TYPE K ACTION CODE		Noun	Naı	me: THERMOCOUPLE Serial #:  AS FOUND
Next Cal Due Dat	e: 10/27/200	)7 1		Acceptance Test		1	•	In Tolerance
Charge Level:	4	2		Special Test		2	C	Out of Tolerance >1x <2x
Repair/Adj/etc C.	L: 0	3	7	Calibration to MFG Spe	cs	3	C	Out of Tolerance >2x <3x
Material Amount:	. 0	4	$\Gamma$	Clean		4	C	Out of Tolerance >3x <5x
Charge Number:	100853gs	a 5	Г	Limited Calibration		5	C	Out of Tolerance >5x
Cal Work Inst ID:	: 3052V	6		Functional Check		6	C	Out of Tolerance-Undetermined
Outside Vendor:		7		Performance Check		7		Inoperative
		8	Γ.	Modify		-8	Ī	Damaged
		9	Π.:	Repair-needs Charge Le	vel	9		Not Used
		10		Other		10		Not Determined
				•		11		Excessed
Calibrated By:	Brian Ber	ls S#:	10218	32 Phone: 526-2761		12		Extension
				CAR IND AMION COLUMN		No tro	ED	
ſſ	714272	714273	71	7615 715424	AKI	75 03	ED	
		,,,,,,,,				7		
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STANDARDS VALUES	S USED ARE T S FOR NATUR	RACEABLE AL PHYSICA	AL CON	NATIONAL INSTITUTE OF S STANTS, OR DERIVED FROM ABORATORY TEMPERATURI	THE	RATIO	TYP	TECHNOLOGY DERIVED FROM ACCEPTED PE OF SELF CALIBRATION TECHNIQUES
Physic	cal STD (106C)	20.0 °		C (40-55% RH)   Electroni				23.0 ° +/-0.5 ° C (30-45% RH)
Dimer	nsional STD (10	6B) 20.0°	+/-0.25	°C (30-45% RH)   Electroni	ic CAI	L (Lab 1	12)	23.0 ° +/-1.0 ° C (20-50% RH)
Phys/l	Dim CAL (Lab I	11) 20.0°	+/-0.5 °	C (20-50% RH)   Remainin	ng S&	CL calib	ratio	n areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
Manufacto	urer's environn	ental specific	ations ar	e evaluated for conformance who	en cal	ibration	s are	performed outside the above stated conditions.
NOMINAI	L (STD)	ou		LERANCE CONDITIONS FOU JNITS				LIBRATION  (UUT) MFG. ACCURACY
					-			
	•			COMMENT	S			

VERIFIED TO 220 DEG C.

NAME: DANA KEI	TH MORTON	1	BADGE: 35698	PH: 526-1274	AREA: STC BLDG: EROB RM: WZD1
ID Number: 7234 Calibration Date		1fr: EXTEC	i I	Model: TYPE K ACTION CODE	Noun Name: THERMOCOUPLE Serial #:  AS FOUND
Next Cal Due Da	ite: 11/8/200	8 1	☐ Ac	cceptance Test	l • In Tolerance
Charge Level:	4	2	C Sp	ecial Test	2 C Out of Tolerance >1x <2x
Repair/Adj/etc C	.L: 0	3	Ca	libration to MFG Specs	3 C Out of Tolerance >2x <3x
Material Amount	t: 0	4	CI	ean	4 C Out of Tolerance >3x <5x
Charge Number:	100853G	iSA 5	∏; Li₁	mited Calibration	5 C Out of Tolerance >5x
Cal Work Inst ID	): 3052V	6	J Fu	nctional Check	6 Out of Tolerance-Undetermined
Outside Vendor:	•	7	☐ Pe	rformance Check	7
		8	∏ Me	odify	8 Damaged
		9	Re	pair-needs Charge Level	9 Not Used
		10	☐ Ot	her	10 Not Determined
					11 Excessed
Calibrated By:	Brian Be	rls S#:	102182 I	Phone: 526-2761	12 T Extension
		٠.			
•	715424	715356	712788	BRATION STANDAR	DS USED
i	713424	713330	712766	714272	
STANDARD	S HSED ARE T	DACEAR! E T	O THE NATH	ONAL INSTITUTE OF STAN	DARDS AND TECHNOLOGY DERIVED FROM ACCEPTED
VALUE	S FOR NATUR	AL PHYSICAL	CONSTANT	S, OR DERIVED FROM THE	RATIO TYPE OF SELF CALIBRATION TECHNIQUES
			LABORA	TORY TEMPERATURE AN	D HUMIDITY
	ical STD (106C)		⊦/-0.3 ° C (40-:		
	nsional STD (10 Dim CAL (Lab	•	+/-0.25 ° C (30 +/-0.5 ° C (20-:	•	L (Lab 112) 23.0 ° +/-1.0 ° C (20-50% RH)  CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
•			-		ibrations are performed outside the above stated conditions.
NOMINA	L (STD)	001	UNITS	ICE CONDITIONS FOUND D	S FOUND (UUT) MFG. ACCURACY
_	<del></del>				
				COMMENTS	

11/30/2007

NAME: DANA KEI	TH MORTON	В	ADGE: 35698 PH: 526-1274		A	AREA: STC BLDG: EROB RM: W2D1				
ID Number: 7234 Calibration Date:	13 M 11/21/200	fr: EXTECH 5		Model: TYPE K ACTION CODE	Nou	n Nar	me: THERMOCOUPLE Serial #:  AS FOUND			
Next Cal Due Da	te: 5/21/2007	1		Acceptance Test		i (	In Tolerance			
Charge Level:	4	2		Special Test		2 (	Out of Tolerance >1x <2x			
Repair/Adj/etc C.	L: 0	3	<b>!</b>	Calibration to MFG Specs	s	3 C	Out of Tolerance $>2x < 3x$			
Material Amount	: 0	4	П	Clean		4 (	Out of Tolerance >3x <5x			
Charge Number:	100853GS	SA 5	$\Box$ .	Limited Calibration		5 C	Out of Tolerance >5x			
Cal Work Inst ID	3052U	6		Functional Check		6 <b>(</b>	Out of Tolerance-Undetermined			
Outside Vendor:		7		Performance Check		7	Inoperative			
		8		Modify	•	8 F	Damaged			
		. 9		Repair-needs Charge Leve	el	9 [	Not Used			
		10		Other		10 T	Not Determined			
						11	Excessed			
Calibrated By:	Chris Dud	ley S#:	101142	Phone: 526-2761		12 F	Extension			
			<b>C</b> 4		one to	ern.				
	370602	723247	72291	<b>LIBRATION STANDAR</b> 5 722456 71761		SED	· ·			
			ė,							
							TECHNOLOGY DERIVED FROM ACCEPTED E OF SELF CALIBRATION TECHNIQUES			
Dhumi	al STD (106C)	2008 #/		RATORY TEMPERATURE AT 40-55% RH)   Electronic ST			Y 23.0° +/-0.5°C (30-45% RH)			
•	sional STD (106C)		•	(30-45% RH)   Electronic CA			23.0 ° +/-1.0 ° C (20-50% RH)			
Phys/	Dim CAL (Lab 1	11) 20.0°+/	-0.5 ° C (	20-50% RH) Remaining S	&CL cal	ibration	n areas: 23.0 ° +5,-3.0 ° C (20-50% RH)			
Manufact	rer's environm	ental specificati	ons are ev	aluated for conformance when c	alibratio	os are	performed outside the above stated conditions.			
NOMINAI	. (STD)	ouro	F TOLER UNI	ANCE CONDITIONS FOUND			LIBRATION (UUT) MFG. ACCURACY			
	·									
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	-	_								
				COMMENTS						

INITIAL CALIBRATION
RECEIVING INSPECTION TEST REFERRAL QA# 115846

		11/30/2007	,				
NAME: DANA KEITH MORTON	BADGE: 35	698 PH: 526-1274	AREA: STC BLDG: EF	OB RM: W2D1			
ID Number: 723413 Mfr: EX Calibration Date: 5/8/2007	(TECH _	Model: TYPE K ACTION CODE	Noun Name: THERMOCOUP AS FOU				
Next Cal Due Date: 11/8/2008	1	Acceptance Test	l 🕟 In Tolerance				
Charge Level: 4	2	Special Test	2 C Out of Tolerance >	1x <2x			
Repair/Adj/etc C.L: 0	3	Calibration to MFG Specs	3 C Out of Tolerance >	2x <3x			
Material Amount: 0	4	Clean	4 C Out of Tolerance >	3x <5x			
Charge Number: 100853GSA	5	Limited Calibration	5 C Out of Tolerance >	-5x			
Cal Work Inst ID: 3052V	6	Functional Check	6 C Out of Tolerance-U	Indetermined			
Outside Vendor:	7	Performance Check	7 Inoperative				
	8	Modify	8 Damaged				
,	9	Repair-needs Charge Level	9 Not Used				
·	10	Other	10 Not Determined				
			11 Excessed				
Calibrated By: Brian Berls	S#: 102182	Phone: 526-2761	12 Extension				
	CA	LIBRATION STANDARI	ne ticen				
715424 715			OSED TOTAL				
715424 715	356 71278	38 714272					
STANDARDS USED ARE TRACEA	ABLE TO THE NA	TIONAL INSTITUTE OF STANI	OARDS AND TECHNOLOGY DERIV	ED FROM ACCEPTED			
VALUES FOR NATURAL PHY	YSICAL CONSTA	NTS, OR DERIVED FROM THE	RATIO TYPE OF SELF CALIBRAT	ION TECHNIQUES			
Physical CTD (1060)	LABO 20.0 ° +/-0.3 ° C (	PRATORY TEMPERATURE AND		C (20 ACA) DVD			
, ,	20.0 ° +/-0.3 ° C (			C (30-45% RH) C (20-50% RH)			
	20.0 ° +/-0.5 ° C (		•	C (20-50% RH)			
Manufacturer's environmental s	pecifications are ev	aluated for conformance when cali	brations are performed outside the ab	ove stated conditions.			
	OUT OF TOLER	RANCE CONDITIONS FOUND D	URING CALIBRATION				
NOMINAL (STD)	UNI	TS A	S FOUND (UUT)	MFG. ACCURACY			
,				. <del></del>			
		COMMENTS					
t .		•	,				

11/30/2007

NAME: DANA KEITI	MORTON		BADGE: 356	98 PH: 52		AREA	: STC	BLDG:	EROB	RM: W2D1
ID Number: 72341 Calibration Date:	4 M	lfr: EXTECH	Į.	Model: TYPE I		Noun N	lame	THERMOCO	UPLE OUND	Serial #:
Next Cal Due Date	: 5/21/2007	7 1		Acceptance Test		1	(	In Tolerance		
Charge Level:	4	2		Special Test		2	O	Out of Toleran	ce > 1 x < 2 x	
Repair/Adj/etc C.L	: 0	3	7	Calibration to M	FG Specs	3	O	Out of Toleran	ce >2x <3x	×
Material Amount:	0	4		Clean		4	C	Out of Toleran	ce >3x <5x	
Charge Number:	100853G	SA 5		Limited Calibra	ion	5	C	Out of Toleran	ce >5x	
Cal Work Inst ID:	3052U	6		Functional Chec	k ·	6	C	Out of Toleran	ce-Undeten	mined
Outside Vendor:		7		Performance Ch	eck	7		Inoperative		
		8	Γ.	Modify		8		Damaged		
		9		Repair-needs Cl	arge Level	9		Not Used		
		10		Other		10		Not Determine	d	
						11		Excessed		
Calibrated By:	Chris Du	dley S#:	101142	Phone: 526-27	61	12	П	Extension		
					w		_			
	370602	723247	72245	LIBRATION ST	717617	SUSE	<u> </u>		<u></u>	7)
·	370002	123241	12245	722913	717017	<u> </u>				1
				TIONAL INSTITUT						
# 1/4	<del></del>		LABO	RATORY TEMPER	ATURE AND	HUMID	ITY	pom A restrict to the Command of the second of the		
Physica	1 STD (106C)	20.0 ° -			electronic STD			23.0 ° +/-0.	5 °C (30-459	4 RH)
Dimens	ional STD (10	•			Electronic CAL	•	•		0 ° C (20-50%	•
Phys/D	im CAL (Lab	111) 20.0° ₹	-7-0.5 ° C (2	20-50% RH)   I	Remaining S&C	CL calibra	tion ar	eas: 23.0 ° +5,-3	3.0 ° C (20-50	% RH)
Manufactur	er's environn	nental specifica	tions are eve	lusted for conforma	nce when cali	brations :	are pe	formed outside th	e above stated	conditions.
NOMINAL	(STD)	OUT	of toler UNI	ANCE CONDITION		URING C S FOUR			MFG.	ACCURACY
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										-
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				COMN	<b>MENTS</b>					

INITIAL CALIBRATION RECEIVING INSPECTION TEST REFERRAL QA# 115846

				11/3W2007	
NAME: DANA KE	ITH MORTON	<u>l</u>	BADGE: 35698	PH: 526-1274	AREA: STC BLDG: EROB RM: W2D1
ID Number: 723 Calibration Date	-	Afr: EXTEC	M .	lodel: TYPE K ACTION CODE	Noun Name: THERMOCOUPLE Serial #: AS FOUND
Next Cal Due D	ate: 11/8/200	8 1	_ Acc	eptance Test	l • In Tolerance
Charge Level:	4	2	Spe	cial Test	2 C Out of Tolerance >1x <2x
Repair/Adj/etc (	C.L: 0	3	Cal	ibration to MFG Specs	3 C Out of Tolerance >2x <3x
Material Amour	nt: 0	. 4	Cle	an	4 C Out of Tolerance >3x <5x
Charge Number	1008530	GSA 5	Lin	nited Calibration	5 Out of Tolerance >5x
Cal Work Inst I	D: 3052V	6	Fur	ctional Check	6 C Out of Tolerance-Undetermined
Outside Vendor	:	7	Per	formance Check	7   Inoperative
	•	8	Mo	dify	8 Damaged
		9	T. Rep	pair-needs Charge Leve	9 Not Used
		10	Oth	er	10 Not Determined
				•	11 Excessed
Calibrated By:	Brian Be	erls S#:	102182 P	hone: 526-2761	12 Extension
•			CALI	BRATION STANDAR	ne lieen
	715424	715356	712788	714272	DS USED
	713-24	713330	712700	714272	
·					
STANDARI	DS USED ARE T	TRACEABLE T	O THE NATIO	NAL INSTITUTE OF STAR	DARDS AND TECHNOLOGY DERIVED FROM ACCEPTED
VALU	ES FOR NATUR	AL PHYSICAL	. CONSTANTS	OR DERIVED FROM TH	RATIO TYPE OF SELF CALIBRATION TECHNIQUES
				ORY TEMPERATURE A	
•	sical STD (106C)		+/-0.3 ° C (40-5		
	ensional STD (19 s/Dim CAL (Lab		+/-0.25 ° C (30 +/-0.5 ° C (20-5)		L (Lab 112) 23.0 ° +/-1.0 ° C (20-50% RH)  CL calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
		•	·	. ,	librations are performed outside the above stated conditions.
7772712				· · · · · · · · · · · · · · · · · · ·	
NOMINA	AL (STD)	OUT	OF TOLERANG UNITS	CE CONDITIONS FOUND	AS FOUND (UUT) MFG. ACCURACY
				<del></del>	
				· '	
				COMMENTS	

11/30/2007

NAME: DANA KEITI	I MODTON	PAI	DGE: 356	98 PH: 526-1274	AREA: STO	BLDG: EROB RM: W2D1
NAME: DANA KETT	HORION	DAI	DGE: 350	78 111. 520-1274	AREA. STC	BEDG. ENOB KW. WIDI
ID Number: 72341 Calibration Date:	5 Mfr: EX' 11/21/2005	TECH		Model: TYPE K ACTION CODE	Noun Name:	THERMOCOUPLE Serial #: AS FOUND
Next Cal Due Date	: 5/21/2007	1		Acceptance Test	1 @	In Tolerance
Charge Level:	4	2	Γ	Special Test	- 2 C	Out of Tolerance >1x <2x
Repair/Adj/etc C.L	: 0	3	<u> </u>	Calibration to MFG Specs	3 <b>C</b> )	Out of Tolerance >2x <3x
Material Amount:	0	4	Γ	Clean	4 C	Out of Tolerance >3x <5x
Charge Number:	100853GSA	5	<u></u>	Limited Calibration	5 C	Out of Tolerance >5x
Cal Work Inst ID:	3052U	6	Γ	Functional Check	6 C	Out of Tolerance-Undetermined
Outside Vendor:		7	Γ.	Performance Check	7 🗔	Inoperative
	•	8		Modify	8	Damaged
	,	9	<u>.                                    </u>	Repair-needs Charge Level	9	Not Used
		10	Γ	Other	10	Not Determined
	·				11	Excessed
Calibrated By:	Chris Dudley	S#: · 1	101142	Phone: 526-2761	12 🗍	Extension
ſr <sup>~</sup>	270602 7220	147	722915	722456 717617	DS USED	
<b> </b> -	370602 7232	4/	122913	722456 717617		
<u> </u>						
						CHNOLOGY DERIVED FROM ACCEPTED OF SELF CALIBRATION TECHNIQUES
100			LABO	RATORY TEMPERATURE AND	HUMIDITY	
Physica	I STD (106C) 2	0.0° +/-0	.3 ° C (4	0-55% RH)   Electronic STD	(106D)	23.0° +/-0.5°C (30-45% RH)
	• •			30-45% RH)   Electronic CAL		23.0 ° +/-1.0 °C (20-50% RH)
Phys/Di	im CAL (Lab 111) 2	:0.0° +/-0	).5 °C (2	0-50% RH) Remaining S&C	CL calibration are	as: 23.0 ° +5,-3.0 °C (20-50% RH)
Manufactur	er's environmental sp	ecification	are eva	usted for conformance when cali	brations are per	formed outside the above stated conditions.
NOMINAL	(STD)	OUT OF	TOLER/ UNIT	ANCE CONDITIONS FOUND DI	URING CALIBI S FOUND (U	
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				COMMENTS		

INITIAL CALIBRATION
RECEIVING INSPECTION TEST REFERRAL QA# 115846

NAME: DANA KEIT	'H MORTON	BA	DGE: 35698	PH: 526-1274	AREA: STC	BLDG: EROB	RM: W2D1
ID Number: 7234 Calibration Date:	15 Mfr: E 5/8/2007	XTECH	M	odel: TYPE K ACTION CODE	Noun Name: THE	RMOCOUPLE AS FOUND	Serial #:
Next Cal Due Dat	e: 11/8/2008	1	☐ Acc	eptance Test	I 🕟 In Tole	erance	
Charge Level:	4	. 2	☐ Spe	cial Test	2 🤼 Out of	Tolerance >1x <2x	
Repair/Adj/etc C.l	L: 0	.3	<b>✓</b> Cali	bration to MFG Specs	3 C Out of	Tolerance >2x <3x	*.
Material Amount:	0	4	Clea	an	4 C Out of	Tolerance >3x <5x	
Charge Number:	100853GSA	5	Lim	ited Calibration	5 O Out of	Tolerance >5x	•
Cal Work Inst ID:	3052V	6	Fun	ctional Check	6 C Out of	Tolerance-Undeterr	nined
Outside Vendor:	. '	7	Peri	Formance Check	7   Inoper	ative	
		8	Mod	dify	8 Damag	ged	
		9	Rep	air-needs Charge Level	9 Not Us	sed	
		10	Oth	er	10 ∏ Not De	etermined	
•					11 Excess	sed	
Calibrated By:	Brian Berls	S#: 1	102182 Pi	none: 526-2761	12 Extens	sion	
F	715404 71	10700	<del>'-</del> -	BRATION STANDAR	DS USED		<b>-</b> 1
	715424 71	12788	715356	714272			╣
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				NAL INSTITUTE OF STAN OR DERIVED FROM THE			
			LABORAT	ORY TEMPERATURE AN	D HUMIDITY		A 4538 101 E
-	al STD (106C)		0.3 °C (40-5		-	23.0 ° +/-0.5 °C (30-45	•
	osional STD (106B) Dim CAL (Lab 111)		0.25 °C (30-4 0.5 °C (20-5)	•		23.0 ° +/-1.0 °C (20-50) 23.0 ° +5,-3.0 °C (20-50)	
•			•	ed for conformance when ca			
Manufacto	TEL 2 CHALLORINGHER						COMUNICORS.
NOMINAL	(STD)	OUT OI	F TOLERANG UNITS	CE CONDITIONS FOUND I	URING CALIBRATIO AS FOUND (UUT)		. ACCURACY
	í			· · · · · · · · · · · · · · · · · · ·			
		<del></del>				<del> </del>	
,				COMMENTS			

NAME: DANA KEI	TH MORTON	BAD	OGE: 35698 P	H: 526-1274	AREA: S	TC BLDG: EI	ROB RM: W2D1
D Number: 7234 Calibration Date:	16 Mfr: 11/21/2005	EXTECH	Model: TY	PE K ON CODE	Noun Nan	ne: THERMOCOUF	
Next Cal Due Da	te: 5/21/2007	1	Acceptance	Test	1 @	In Tolerance	
Charge Level:	4	2	Special Tes	t	2 C	Out of Tolerance	>1x <2x
Repair/Adj/etc C.	L: 0	3 - 1	Calibration	to MFG Specs	3 C	Out of Tolerance	>2x <3x
Material Amount	: 0	4	Clean		4 C	Out of Tolerance	>3x <5x
Charge Number:	100853GSA	5	Limited Cal	ibration	5 <b>(</b>	Out of Tolerance	>5x
Cal Work Inst ID	: 3052U	6	Functional	Check	6 C	Out of Tolerance-	Undetermined
Outside Vendor:		, ,7	Performanc	e Check	7 🗀	Inoperative	
		8	Modify		8 F	Damaged	
		9	Repair-need	ls Charge Level	9 F	Not Used	·
		10	Other		10 ∫	Not Determined	
		. ~			11 [	Excessed	•
Calibrated By:	Chris Dudley	S#: 1	01142 Phone: 52	6-2761	12 🗆	Extension	
			C.1				
~ [	370602 7	17617	723247 72291		DS USED		·
{							
						TECHNOLOGY DERIVE OF SELF CALIBRAT	VED FROM ACCEPTED ION TECHNIQUES
Physic	cal STD (106C)	20.0 ° +/-0.	LABORATORY TEN 3 °C (40-55% RH)	IPERATURE ANI Electronic STD			C (30-45% RH)
Dime	nsional STD (106B)	20.0 ° +/-0.	25 ° C (30-45% RH)	Electronic CAl	L (Lab I 12)	23.0 ° +/-1.0 °	C (20-50% RH)
Phys/i	Dim CAL (Lab 111)	20.0 ° +/-0.	.5 ° C (20-50% RH)	Remaining S&	CL calibration	areas: 23.0 ° +5,-3.0 °	°C (20-50% RH)
Manufact	urer's environments	) specification	s are evaluated for conf	ormance when cali	ibrations are p	performed outside the al	ove stated conditions.
NOMINAI	L (STD)	OUT OF	TOLERANCE CONDI UNITS		URING CAL		MFG. ACCURACY
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						<del> </del>	

NAME: DANA KEI	TH MORTON	В	ADGE: 3	5698 PH: 526-1274	ARI	EA: STC	BLDG: EROB	RM: W2D1				
ID Number: 7234 Calibration Date:		EXTECH		Model: TYPE K ACTION CODE	Noun	Name: THE	RMOCOUPLE AS FOUND	Serial #:				
Next Cal Due Da	te: 11/8/2008	1		. Acceptance Test	i	● In Tole	rance					
Charge Level:	4	2	Γ.	Special Test	2	C Out of	Tolerance >1x <2	x				
Repair/Adj/etc C	L: 0	3	7	Calibration to MFG Specs	3	Out of	Tolerance >2x <3	x				
Material Amount	: 0	4	Γ_	Clean	. 4	C Out of	Tolerance >3x <5	x				
Charge Number:	100853GSA	5	Γ.	Limited Calibration	5	C Out of	Tolerance >5x					
Cal Work Inst ID	: 3052V	6	Ţ.	Functional Check	6	C Out of	Tolerance-Undete	rmined				
Outside Vendor:		7	Γ	Performance Check	7	Inopera	ative					
		8		Modify	8	Damag	ed					
		9		Repair-needs Charge Level	9	Not Us	ed					
		10	<u> </u>	Other	10	Not De	etermined					
					11	Excess	ed					
Calibrated By:	Brian Berls	S#:	102182	Phone: 526-2761	12	Extens	ion .					
[	715424 7	15356	7127	ALIBRATION STANDARI	DS USI	ED		$\overline{}$				
	,,13-12-	,		55 77 12 12	╗			<b>=</b>				
STANDARDS	S USED ARE TRAC	EABLE TO	THE NA	ATIONAL INSTITUTE OF STAN	DARDS	AND TECHNO	LOGY DERIVED FR	OM ACCEPTED				
VALUES	FOR NATURAL P	HYSICAL	CONSTA	NTS, OR DERIVED FROM THE	RATIO	TYPE OF SEL	F CALIBRATION TE	CHNIQUES				
				DRATORY TEMPERATURE AN		···		,				
•	cal STD (106C)			(40-55% RH)   Electronic STI (30-45% RH)   Electronic CA	• •		23.0 ° +/-0.5 ° C (30-4 23.0 ° +/-1.0 ° C (20-4					
	Dim CAL (Lab 111)			(20-50% RH) Remaining S&	•		23.0 ° +5,-3.0 ° C (20-	•				
Manufact	urer's environments	l specificati	ons are ev	aluated for conformance when cal	ibrations	are performed	outside the above star	ted conditions.				
				RANCE CONDITIONS FOUND D			· · · · · · · · · · · · · · · · · · ·					
NOMINAI	L (STD)	0010	UN			ND (UUT)		G. ACCURACY				
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				COMMENTS								
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11/30/2007

NAME: DANA KEITH MORTON	l	BADGE: 356	98 PH: 526-1274	ARE	A: STC	BLDG: ER	OB R	M: W2D1				
1D Number: 724271 M Calibration Date: 11/16/200	ffr: EXTECF 06	I	Model: TYPE K ACTION CODE	Noun N	lame: TH	ERMOCOUPI AS FOUR		Serial #:				
Next Cal Due Date: 5/16/2008	8 1		Acceptance Test	1	● In To	olerance		·				
Charge Level: 4	2	<u> </u>	Special Test	2	Out o	of Tolerance >	x <2x					
Repair/Adj/etc C.L: 0	3	<u>v</u>	Calibration to MFG Specs	3	Out o	of Tolerance >2	2x <3x					
Material Amount: 0	4		Clean	4	C Out o	of Tolerance >3	3x <5x					
Charge Number: 100853G	<b>SA</b> 5		imited Calibration	5	Out o	of Tolerance >	ix					
Cal Work Inst ID: 3052W	6	F.	Functional Check	6	C Out o	of Tolerance-U	ndetermine	ed.				
Outside Vendor:	7	F	Performance Check	7	Inope	erative						
	8		Modify	8	Dam:	aged	N.					
	9	T F	Repair-needs Charge Level	9	Not I	Used						
	10		Other	10	☐ Not I	Determined						
			•	11	Exce	ssed						
Calibrated By: Brian Be	rls S#:	102182	Phone: 526-2761	12	Exter	nsion						
	·											
715424	712788	714272	LIBRATION STANDARI	) USE		<u> </u>						
			TIONAL INSTITUTE OF STANI									
VALUES FOR MATOR	ALTRIBICAL	<del> </del>	<u> </u>	HEFT E	úar . /	EF CAUIDIOS II	ON TECHNI	QUES				
Physical STD (106C)	20.0 ° +	LABUI 1-0.3 ° C (4-	RATORY TEMPERATURE ANI 0-55% RH)   Electronic STE		114	23.0 ° +/-0.5 ° C	(30-45% RI	ł)				
Dimensional STD (10	6B) 20.0° +	-/-0.25 ° C (	30-45% RH)   Electronic CAI	L (Lab 112	)	23.0 ° +/-1.0 ° C	(20-50% RI	f) <sup>°</sup>				
Phys/Dim CAL (Lab	111) 20.0° +	·/-0.5 ° C (2	0-50% RH) Remaining S&c	CL calibra	tion areas:	23.0° +5,-3.0°	C (20-50% R	H)				
Manufacturer's environm	nental specifica	ions are eva	luated for conformance when cali	ibrations a	re perform	ed outside the abo	ve stated con	ditions.				
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY												
· · · · · · · · · · · · · · · · · · ·	<u> </u>					<del></del> . •	,					
					<del></del> -	<del></del>	<del> </del>					
			COMMENTS									

S&CL discovered due date in ICAL data base does not match due date on unit, due to confusion between S&CL, Receiving inspection and user (Keith Morton). We are updating database and changing the due date from 5-2-08 to 5-16-08 and the calibration date from 11-2-06 to 11-16-06 to match the calibration label on the unit in the user's possession. Unit was visually inspected when received back from receiving inspection on 11-16-06. Upon performing evaluation, there is very minimal risk in changing the due date 14 days later to 5-16-08 to match the label on the unit. Brian Berls 3-22-07

12/11/2007

NAME: DANA KEITH MORTON	BADGE: 3569	8 PH: 526-1274	AREA: STC BLDG: EROB RM: W2D1
ID Number: 724271 Mfr: EXT Calibration Date: 12/5/2007	ЕСН	Model: TYPE K ACTION CODE	Noun Name: THERMOCOUPLE Serial #:  AS FOUND
Next Cal Due Date: 6/5/2009	1 🗀	Acceptance Test	1 • In Tolerance
Charge Level: 4	2 Γ	Special Test	2 Out of Tolerance >1x <2x
Repair/Adj/etc C.L: 0	3 <u>F</u>	Calibration to MFG Spec	s 3 C Out of Tolerance >2x <3x
Material Amount: 0	4	Clean	4 C Out of Tolerance >3x <5x
Charge Number: 100853GSA	5 T	Limited Calibration	5 Out of Tolerance >5x
Cal Work Inst ID: 3052HH	6 F	Functional Check	6 C Out of Tolerance-Undetermined
Outside Vendor:	7	Performance Check	7 Inoperative
	8	Modify :	8 Damaged
•	9	Repair-needs Charge Lev	el 9 Not Used
	10	Other	10 Not Determined
•			11 Excessed
Calibrated By: Donnie Lindsay	S#: 10513	8 Phone: 526-2761	12 Extension
715404 7 7153		IBRATION STANDARD	S USED
715424 7153:	714273	717615	
, ,			
			ARDS AND TECHNOLOGY DERIVED FROM ACCEPTED ARTIO TYPE OF SELF CALIBRATION TECHNIQUES
The second se	LABOR	ATORY TEMPERATURE AND	HUMIDITY
	0 ° +/-0.3 ° C (40		(106D) 23.0 ° +/-0.5 ° C .(30-45% RH)
, , ,	0 ° +/-0.25 ° C (3 0 ° +/-0.5 ° C (20		
			L calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
			orations are performed outside the above stated conditions.
NOMINAL (STD)	UNITS	NCE CONDITIONS FOUND DI	FOUND (UUT)  MFG. ACCURACY
-			
		COMMENTS	

S&CL overcheck required.

11/30/2007

NAME: DANA KEIT	H MORTON	NAME: DANA KEITH MORTON BA		35698 PH: 526-1274	AREA: STC	BLDG: EROB	ROB RM: W2D1			
ID Number: 7242' Calibration Date:	72 M 11/16/200	lfr: EXTEC	Н	Model: TYPE K ACTION CODE	Noun Name: TH	ERMOCOUPLE AS FOUND	Serial #:			
Next Cal Due Dat	e: 5/16/2008	3 1		Acceptance Test	1 🕟 ln To	olerance				
Charge Level:	4	2	Γ.	Special Test	2 Out	of Tolerance >1x <2	(			
Repair/Adj/etc C.l	L: 0	3	<b>I</b>	Calibration to MFG Specs	3 C Out	of Tolerance >2x <3	(			
Material Amount:	0	4	Γ.	Clean	4 C Out	of Tolerance >3x <5	ζ.			
Charge Number:	100853G	SA 5	Γ	Limited Calibration	5 C Out o	of Tolerance >5x				
Cal Work Inst ID:	3052W	6	Γ	Functional Check	6 C Out	of Tolerance-Undeter	rmined			
Outside Vendor:		7	Γ	Performance Check	7 [Inop	erative				
		8	<u></u>	Modify	8 Dam					
		9	Γ	Repair-needs Charge Level	9   Not 1	Used				
		10	Γ	Other	10 Not 1	Determined				
					11 Exce	ssed				
Calibrated By:	Brian Ber	rls S#:	10218	82 Phone: 526-2761	12 Exte	nsion				
-										
F	715424	71.4272		CALIBRATION STANDAR	DS USED	<del></del>	<del></del> 1			
L I	715424	714272	]  <u>' /12</u> ]	714273		<del></del>				
			╬							
<u>[L</u>		<u> </u>								
				NATIONAL INSTITUTE OF STAN TANTS, OR DERIVED FROM THE						
			to the second	BORATORY TEMPERATURE AN			A DESCRIPTION OF THE PROPERTY			
Physic	al STD (106C)	20.0 °		(40-55% RH)   Electronic STI		23.0 ° +/-0.5 °C (30-4	5% RH)			
Dimen	sional STD (10	6B) 20.0°	+/-0.25 °	C (30-45% RH) Electronic CA	L (Lab 112)	23.0 ° +/-1.0 ° C (20-5	0% RH)			
Phys/I	Dim CAL (Lab 1	111) 20.0°	+/-0.5 ° C	C (20-50% RH)   Remaining S&	CL calibration areas:	23.0 ° +5,-3.0 ° C (20-	50% RH)			
Manufactu	rer's environa	nental specifica	itions are	evaluated for conformance when ca	librations are perform	ed outside the above stat	ed conditions.			
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY										
			· · · · · ·							
						<del></del>				
				COMMENTS						

S&CL discovered due date in ICAL data base does not match due date on unit, due to confusion between S&CL, Receiving inspection and user (Keith Morton). We are updating database and changing the due date from 5-2-08 to 5-16-08 and the calibration date from 11-2-06 to 11-16-06 to match the calibration label on the unit in the user's possession. Unit was visually inspected when received back from receiving inspection on 11-16-06. Upon performing evaluation, there is very minimal risk in changing the due date 14 days later to 5-16-08 to match the label on the unit. Brian Berls 3-22-07

12/11/2007

NAME: DANA KEITH MORTON	BADGE: 35698	PH: 526-1274	AREA: STC BLDG: E	ROB RM: W2D1
ID Number: 724272 Mfr: EXTECT Calibration Date: 12/5/2007	CH 1	Model: TYPE K N	oun Name: THERMOCOU	PLE Serial #: FOUND
Next Cal Due Date: 6/5/2009	1. 🔲	Acceptance Test	1 6 In Tolerance	
Charge Level: 4	2	Special Test	2 C Out of Toleran	nce > 1 x < 2x
Repair/Adj/etc C.L: 0	3	Calibration to MFG Specs	3 C Out of Toleran	nce >2x <3x
Material Amount: 0	<b>4</b> $\Gamma$	Clean	4 C Out of Tolera	nce >3x <5x
Charge Number: 100853GSA	5 F.	Limited Calibration	5 C Out of Toleran	nce >5x
Cal Work Inst ID: 3052HH	6	Functional Check	6 C Out of Toleran	nce-Undetermined
Outside Vendor:	7	Performance Check	7   Inoperative	
•	8	Modify	8 Damaged	
	9 T.	Repair-needs Charge Level	9 Not Used	
	10	Other	10 Not Determin	ed .
			11 Excessed	
Calibrated By: Donnie Lindsay	S#: 105138	Phone: 526-2761	12 Extension	•
· ;	C41.	IDD ATION OF AND ADDO	MORE	
715424 715356	714273	BRATION STANDARDS	OSED	
715424 713330	714275	777015		
STANDARDS USED ARE TRACEABLE	TO THE NATE	ONAL INSTITUTE OF STANDAR	PDS AND TECHNOLOGY DED	IVED FROM A CCEPTED
VALUES FOR NATURAL PHYSIC	AL CONSTANT	S, OR DERIVED FROM THE RA	TIO TYPE OF SELF CALIBRA	TION TECHNIQUES
		TORY TEMPERATURE AND H		,
•	' +/-0.3 ° C (40-		•	°C (30-45% RH)
·	° +/-0.25 ° C (30 ° +/-0.5 ° C (20-:		·	°C (20-50% RH) °C (20-50% RH)
Manufacturer's environmental specifi			•	•
	<del></del>			
NOMINAL (STD)	UNITS	ICE CONDITIONS FOUND DURI AS F	FOUND (UUT)	MFG. ACCURACY
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-				
· · · · · · · · · · · · · · · · · · ·		-		<u> </u>
-		COMMENTS		<u></u>

S&CL overcheck required.

NAME: DANA KEITH	MORTON	)	BADGE: 3	5698 PH: 526-1274	AREA: STC BLDG: EROB RM: W2D							
ID Number: 724273	Mfr: E			Model: TYPE K			ne: THERMOCOUPLE Serial #:					
Calibration Date:	11/16/2006			ACTION CODE	,		AS FOUND					
Next Cal Due Date:		]		Acceptance Test	1		In Tolerance					
Charge Level:	4	2		Special Test	2		Out of Tolerance >1x <2x					
Repair/Adj/etc C.L:	4	3		Calibration to MFG Specs	3		Out of Tolerance >2x <3x					
Material Amount:	0	4	•	Clean	4		Out of Tolerance >3x <5x					
Charge Number:	100853gsa	5		Limited Calibration	5	C	Out of Tolerance >5x					
Cal Work Inst ID:	3052W	6		Functional Check	6	$\mathbf{C}$	Out of Tolerance-Undetermined					
Outside Vendor:		7		Performance Check	7	<b>1</b>	Inoperative					
		8		Modify	8	Γ	Damaged					
		9		Repair-needs Charge Level	9		Not Used					
		10		Other	10		Not Determined					
					11		Excessed					
Calibrated By:	Brian Berls	S#:	102182	Phone: 526-2761	12		Extension					
<u> </u>	715424 71	2788	7142	ALIBRATION STANDARI	DS US	ED						
<u> </u>	713424   71	2760	/142	72 370002	-	··						
CTIANDA BROKE	CER ARE WOLCE	ADIET	o THE N	ATIONAL INCTITUTE OF STANS	DARRE	AND	TECUDIAL OCY DEBUYED FROM ACCEPTED					
							TECHNOLOGY DERIVED FROM ACCEPTED E OF SELF CALIBRATION TECHNIQUES					
Barrer December - The Ref College of Polymore College of Polymore			LAB	ORATORY TEMPERATURE ANI								
-	STD (106C)			(40-55% RH) Electronic STE			23.0 ° +/-0.5 °C (30-45% RH)					
	onal STD (106B) n CAL (Lab 111)			(30-45% RH)   Electronic CAI (20-50% RH)   Remaining S&	•	•	23.0 ° +/-1.0 ° C (20-50% RH)  areas: 23.0 ° +5,-3.0 ° C (20-50% RH)					
•				,			performed outside the above stated conditions.					
IVARIBURACUI V.			· · · · · · · · · · · · · · · · · · ·	RANCE CONDITIONS FOUND D	<del></del>							
NOMINAL (	STD)	OBI					(UUT) MFG. ACCURACY					
		_										
		_										
				COMMENTS								

12/11/2007

NAME: DANA KEI	TH MORTON		BAD	GE: 35698	PH: 526		A	REA: S	rc	BLDG: EROB	RM: W2D1
ID Number: 7242 Calibration Date:		Ifr: EXTEC 7	H	N	Model: TYPE K ACTION		Nou	ın Nam	ie: 1	THERMOCOUPLE AS FOUND	Serial #:
Next Cal Due Da	ite: 6/5/2009		1		Acceptance Te	st		1	•	In Tolerance	
Charge Level:	4		2		Special Test			2	C	Out of Tolerance >1x <	2x
Repair/Adj/etc C	.L: 0	÷	3	<u> </u>	Calibration to I	MFG Specs	s	3	C	Out of Tolerance >2x <	3x
Material Amount	t: 0		4	Γ.	Clean			4	$\mathbf{C}$	Out of Tolerance >3x <	5x
Charge Number:	100853G	SA	5	Γ	Limited Calibra	ation		5	C	Out of Tolerance >5x	
Cal Work Inst ID	э: 3052НН	•	6		Functional Che	ck		6	C	Out of Tolerance-Unde	termined
Outside Vendor:			7	Γ_	Performance C	heck		7		Inoperative	
• .			8	Γ	Modify			8	Γ	Damaged	
			9	Γ	Repair-needs C	harge Leve	el .	9	<u> </u>	Not Used	
			10	Γ	Other			10		Not Determined	
								11		Excessed	
Calibrated By:	Donnie L	indsay	S#:	105138	Phone: 526-2	761		12		Extension	
CALIBRATION STANDARDS USED											
[	715356	715424	7	714273	717615	ANDARD	<u>s u</u>	SED	_		<u> </u>
	713330	713424	╬	/142/5	1 /1/0/3		╬		_		
			j				jĒ				<u></u>
STANDARD	S USED ARE T	RACEABLE	тот	HE NATIO	NAL INSTITUTE	OF STAND	ARD	S AND	TEC	HNOLOGY DERIVED FRO	M ACCEPTED
										SELF CALIBRATION TEC	
					TORY TEMPERA				•		
•	ical STD (106C) ensional STD (10			3 °C (40-5 25 °C (30-	•	ectronic STD ( ectronic CAL )				23.0 ° +/-0.5 ° C (30-45) 23.0 ° +/-1.0 ° C (20-50)	•
	/Dim CAL (Lab	-			•	maining S&C	•	•	areas	•	
	•					e when calib	ratio	ons are c	erfo	rmed outside the above stated	•
<del></del>			<del></del>		CE CONDITIONS						
NOMINA	L (STD)	001	OF.	UNITS	CE CONDITIONS			OUND			. ACCURACY
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		_ <del>-</del>								<u> </u>	· · · · · · · · · · · · · · · · · · ·
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		<b>-</b> -			COMM	ENTS					
or or		,								•	

NAME: DANA KEITH MORTON	BADGE:	35698 PH: 526-1274	AREA: STC	BLDG: EROB	RM: W2D1						
ID Number: 724274 Mfr: I Calibration Date: 11/16/2006	ÉXTECH	Model: TYPE K ACTION CODE	Noun Name: TH	ERMOCOUPLE AS FOUND	Serial #:						
Next Cal Due Date: 5/16/2008	1 🗀	Acceptance Test	1 . • In To	erance .							
Charge Level: 4	2 🗍	Special Test	2 C Out o	f Tolerance >1x <2x							
Repair/Adj/etc C.L: 0	3	Calibration to MFG Specs	3 C Out o								
Material Amount: 0	4 🗀	Clean	4 C Out o	f Tolerance >3x <5x							
Charge Number: 100853gsa	5	Limited Calibration	5 C Out o	f Tolerance >5x							
Cal Work Inst ID: 3052W	6 <b></b>	Functional Check	6 C Out o	f Tolerance-Undeterm	nined						
Outside Vendor:	7	Performance Check	7 [ Inope	rative							
	8	Modify	8 Dama	ged							
	9 🗔	Repair-needs Charge Level	9 Not U	sed							
·	10 🗔	Other	10 Not D	etermined							
			11 Exces	sed							
Calibrated By: Brian Berls	S#: 102182	Phone: 526-2761	12 Exten	sion	i						
715424 7		CALIBRATION STANDARI	DS OSED		<b>n</b>						
,					<b>j</b>						
		NATIONAL INSTITUTE OF STAN FANTS, OR DERIVED FROM THE									
·	LA	BORATORY TEMPERATURE AN	D HUMIDITY	The state of the s							
Physical STD (106C)	20.0 ° +/-0.3 ° C			23.0 ° +/-0.5 ° C (30-45	% RH)						
Dimensional STD (106B)		C (30-45% RH)   Electronic CA	•	23.0 ° +/-1.0 ° C (20-50	•						
Phys/Dim CAL (Lab 111)	20.0 ° +/-0.5 ° C	: (20-50% RH)   Remaining S&	CL calibration areas:	23.0 ° +5,-3.0 °C (20-5	0% RH)						
Manufacturer's environmenta	specifications are	evaluated for conformance when cal	ibrations are perform	ed outside the above state	d conditions.						
NOMINAL (STD)		ERANCE CONDITIONS FOUND D NITS A	OURING CALIBRATI AS FOUND (UUT		. ACCURACY						
	i .										
				·							
•											
•		COMMENTS									

· 12/11/2007

NAME: DANA KEI	TH MORTON		BAD	GE: 35698	PH: 526	-1274	AREA	: STC	BLDG: ER(	ОВ	RM: W2D1
ID Number: 7242 Calibration Date:		Ifr: EXTEC	Н	·	Model: TYPE K ACTĮON		Noun N	ame:	THERMOCOUPL AS FO		Serial #:
Next Cal Due Da	ite: 6/5/2009		1		Acceptance Te	st		Ģ	In Tolerance		
Charge Level:	4	1	2	П	Special Test	•	2	. (	Out of Tolerance	e >1x <	2x
Repair/Adj/etc C	.L: 0		3	<b>V</b>	Calibration to	MFG Spec	s .		Out of Tolerance	e >2x <	3x
Material Amount	:: 0		4		Clean	,	4	- (	Out of Tolerance	e >3x <	5x
Charge Number:	100853G	SA	5		Limited Calibr	ation	:		Out of Tolerance	e >5x	
Cal Work Inst 1D	э: 3052НН		6	Γ	Functional Che	eck	(	; (	Out of Tolerance	e-Undet	ermined
Outside Vendor:			7		Performance C	heck	•	, L	Inoperative		•
			8	Γ	Modify		. 1	3 F.	Damaged		
		·	9	Γ	Repair-needs (	Charge Lev	el 9		Not Used		•
,			10	Γ	Other			0 [	Not Determined		
							;	1 [	Excessed		
Calibrated By:	Donnie L	indsay	S#:	105138	Phone: 526-2	2761	:	2	Extension		
. [	715356	715424	7	714273	717615	ANDARD	SUSE	)			7)
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STANDARD	S USED ARE T	RACEABLE	τοτ	HE NATIO	ONAL INSTITUTE	OF STAND	ARDS A	D TE	CHNOLOGY DERIV	ED FRO	M ACCEPTED
VALUE	S FOR NATUR	AL PHYSICA	L CC	ONSTANTS	S, OR DERIVED F	ROM THE F	T OITAS	YPE O	F SELF CALIBRATION	ON TECI	HNIQUES
Di	cal STD (106C)	20.0.9			TORY TEMPERA			TY	2208 ./ 0580	. (20.45)	, DIN
Ť.	nsional STD (100C)			3 ° C (40-5 25 ° C (30-		ectronic STD ectronic CAL			23.0 ° +/-0.5 ° C 23.0 ° +/-1.0 ° C	•	•
	Dim CAL (Lab I	•		5 ° C (20-5		maining S&C				-	·
Manufact	urer's environm	ental specific	ations	are evalua	ated for conforman	ce when calib	rations a	re per	formed outside the abo	ve stated	conditions.
		OUT	OF	TOLERAN	CE CONDITIONS	FOUND DU	RING C	ALIBE	ATION		A CONTRACTOR OF THE CONTRACTOR
NOMINA	L (STD)			UNITS		AS	FOUN	D (U	UT)	MFG.	ACCURACY
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S&CL overcheck required.

## **THERMOMETERS**

11/29/2007

NAME: DANA KEITH MORTON		BAD	GE: 350	598	PH: 526-127	4 AREA:	STC	BLDG: EROB RM: W2D1				
ID Number: 72127 #: 297914-101-000		YTEK		Mode	el: MX6	Noun Name	:: INFI	RARED THI	ERMOMI	ETER Serial		
Calibration Date:	9/3/2003 5:10:0	4 PM			ACTIO	N CODE			AS FO	DUND		
Next Cal Due Date	: 9/3/2004		i		Acceptance	Test	1	• In Tole	rance			
Charge Level:	6		2		Special Test	•	2	C Out of	Tolerance	e >1x <2x		
Repair/Adj/etc C.L	.: O		3		Calibration t	o MFG Specs	3	Out of	Toleranc	e >2x <3x		
Material Amount:	0		4		Clean	,	4	Out of	Toleranc	e >3x <5x′		
Charge Number:	100348027		5	<b>V</b>	Limited Cali	bration	5	Out of	Toleranc	e >5x		
Cal Work Inst ID:	•		6		Functional C	Check	6	C Out of	Toleranc	e-Undetermined		
Outside Vendor:			7	<b></b>	Performance	: Check	7	Inoper	ative			
			8		Modify	•	8	Dama;	ged			
	,		9		Repair-need	s Charge Level	9	Not U	ied	·		
		,	10	<b>.</b>	Other		10	Not D	etermined			
							11	Excess	ed			
Calibrated By:	Chris Dudley		S#:	10114	2 Phone: 52	6-2761	12	Extens	ion			
•			<b>C</b> 4	LIDD	ATTONICTAN	in a dire ticer						
F	719721		71542		ATTON STAN	DARDS USED	<u></u>			<del>-</del>		
F							一			==		
	USED ARE TRACE FOR NATURAL PH											
Physica	al STD (106C)	20.0 ° +/-0.:				IRE AND HUMID! onic STD (106D)	FY.	22.0° ±/.0	.5°C (30-	450/ DUN		
•	sional STD (106B)	20.0° +/-0.2				onic GAL (Lab 112)			.0°C (20-	•		
Phys/D	im CAL (Lab 111)	20.0 ° +/-0.:	5°C (	20-50% l	RH) Rema	ining S&CL calibrati	on areas	: 23.0 ° +5,-	3.0 ° C (20	-50% RH)		
Manufactu	rer's environmental s	pecifications	s are ev	aluated i	or conformance v	when calibrations a	e perfo	rmed outside th	e above sta	ted conditions.		
		OUT OF	TOLEF	LANCE (	CONDITIONS FO	OUND DURING CA	LIBRA	TION	-	ANTONIO DE SERVICIO DE SERVICI		
NOMINAL	(STD)	,	UNI	TS		AS FOUN	D (UU	T)	MF	G. ACCURACY		
		·										
	·	<del></del>				<del></del>	<del></del>		-			
								<del></del>	<del></del>			
					COMMEN	ITS						

INITIAL CALIBRATION SECL OVERCHECK REQUIRED LIMITED: -30 TO 420 DEG. C.

11/29/2007

NAME: DANA KEITH MORTON		В	ADGE: 3	5698	PH: 52		AREA: ST	С	BLDG: E	ROB	RM: W2D1	
ID Number: 72128	31 M	Ifr: RAYTEK		Мос	del: TYPE	ζ	Noun Nam	e: T	HERMOCOU	PLE PRO	OBE Serial	
Calibration Date:	9/3/2003	5:16:06 PM			AC	TION COI	<b>DE</b>			AS FOU	JND	
Next Cal Due Date	e: 9/3/2004		1		Accepta	nce Test		1	• In Tolera	nce		
Charge Level:	4		. 2		Special '	Γest		2	Out of To	olerance	>ix <2x	
Repair/Adj/etc C.I	L: <b>0</b>		3		Calibrati	on to MFG	Specs	3	Out of To	olerance	>2x <3x	
Material Amount:	0	•	. 4		Clean			4	C Out of To	olerance	>3x <5x	
Charge Number:	10034802	27	5	7	Limited	Calibration		5	C Out of To	olerance :	>5x	
Cal Work Inst ID:	3052O		6		Function	al Check		6	Out of To	olerance-	Undetermined	
Outside Vendor:		* *	7		Perform	ance Check	*	7	Inoperati	ve		
			8	Γ.	Modify	•		8	Damageo	i		
			9		Repair-n	eeds Charg	e Level	9	Not Used	i		
•			10		Other			10	Not Dete	rmined		
							-	11	Excessed	1		
Calibrated By:	Chris Du	dley	S#:	10114	12 Phone	526-2761		12	Extension	n·		
	CALIBRATION STANDARDS USED											
F	715424	370602	7176		717614	714272	SUSED				<u> </u>	
<u></u>			., .								j	
									INOLOGY DERI			
<b>.</b>	1.000 (1040)					ATURE AND						
•	al STD (106C) sional STD (10		-0.3 ° C -0.25 ° C			lectronic STD lectronic CAL			23.0° +/-0.5° 23.0° +/-1.0°	•	•	
	oim CAL (Lab	•		•			L calibration a	reas:	·			
Manufactu	rer's environn	iental specificati	0115 BTC C1	/aluated	for conforma	nce when cali	orations are po	erfor	med outside the a	bove stated	l conditions.	
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY												
<del></del>												
		_	<del></del>						-			
					COMM	LENTS						

INITIAL CALIBRATION S&CL OVERCHECK REQUIRED LIMITED: 0 TO 220 DEG. C.

11/29/2007

NAME: DANA KEITH MORT	FON BA	DGE: 35698	PH: 526-1274	AREA: STC	BLDG: EROB	RM: W2D1
ID Number: 721279 #: 297914-101-0001	Mfr: RAYTEK	N	Model: MX6	Noun Name: INFRA	RED THERMOME	ETER Serial
Calibration Date: 2/7/2	.005		ACTION CODE		AS FOUND	
Next Cal Due Date: 2/7/2	1006	☐ Ac	cceptance Test	1 <b>©</b> In To	olerance	
Charge Level: 6	2	☐ Sp	ecial Test	2 C Out	of Tolerance >1x <2	žx .
Repair/Adj/etc C.L: 0	3	Ca	alibration to MFG Spe	ecs 3 C Out	of Tolerance >2x <3	3x
Material Amount: 0	4	CI CI	ean	4 C Out	of Tolerance >3x <5	5x
Charge Number: 1008	53GSA 5	₽ Li	mited Calibration	5 C Out	of Tolerance >5x	
Cal Work Inst ID: 3124	E 6	Fu Fu	inctional Check	6 C Out	of Tolerance-Undet	ermined
Outside Vendor:	7	Pe	erformance Check	7 📘 Inop	erative	
	8	Г. м	odify	8 Dam	naged	•
	9	T Re	epair-needs Charge L	evel 9 Not	Used	
	. 10	T. 0	ther	10 Not	Determined	•
				11 F Exce	essed	,
Calibrated By: Chris	s Dudley S#:	101142	Phone: 526-2761	12 Exte	ension	
<b>-</b>	,					
		CALI	BRATION STAND	ARDS USED		<del>-</del>
37060	02 722456		<u> </u>			=
						=  '
STANDARDS USED A VALUES FOR NA	RE TRACEABLE TO TURAL PHYSICAL	THE NATIO	ONAL INSTITUTE OF ST S, OR DERIVED FROM T	FANDARDS AND TECHN THE RATIO TYPE OF SE	OLOGY DERIVED FR ELF CALIBRATION TI	ROM ACCEPTED ECHNIQUES
		LABORA	TORY TEMPERATURE	AND HUMIDITY		
Physical STD (I		'-0.3 ° C (40-5		STD (106D)	23.0 ° +/-0.5 ° C (30-	-
Dimensional ST	, ,	-0.25 °C (30		c CAL (Lab 112)	23.0° +/-1.0°C (20-	•
Phys/Dim CAL		'-0.5 ° C (20-5	•	g S&CL calibration areas:	·	•
Manufacturer's env	vironmental specificati	ons are evalus	ated for conformance whe	n calibrations are perform	red outside the above sta	ted conditions.
NOMINAL (STD)		of toleran UNITS		ND DURING CALIBRATI AS FOUND (UUT		FG. ACCURACY
	<del></del>					
·						
			COMMENTS	S		

LIMITED: -30 TO 420 DEG. C.

11/29/2007

NAME: DANA KEIT	H MORTON	BA	ADGE: 35698	PH: 526-1274	AREA: STC BLDG: EROB RM: \				
ID Number: 72128	31 M	Ifr: RAYTEK	N	Model: TYPE K	Noun l	Name	: THERMOCOUPLE I	PROBE	Serial
Calibration Date:	2/7/2005		•	ACTION CODE			AS FOUND	•	
Next Cal Due Date	e: 2/7/2006	1	☐ Ac	ceptance Test	. 1	<b>(</b>	In Tolerance		
Charge Level:	4	2	☐ Sp	ecial Test	2	C	Out of Tolerance >1x	<2x	
Repair/Adj/etc C.I	L: 0	3	<b>☑</b> Ca	libration to MFG Specs	3	0	Out of Tolerance >2x	<3x	
Material Amount:	0	. 4	CI	ean	4	Ç	Out of Tolerance >3x	<5x	
Charge Number:	100853G	SA 5	Li:	mited Calibration	5	C	Out of Tolerance >5x		
Cal Work Inst ID:	3052S	6.	┌ Fu	nctional Check	6	$\mathbf{C}$	Out of Tolerance-Unde	etermined	
Outside Vendor:	•	7	Pe	rformance Check	7		Inoperative		
		8	<u> </u>	odify	8		Damaged		
		9	T Re	pair-needs Charge Leve	1 9		Not Used		
		10	[ O	her	10		Not Determined		
					. 11	$\Box$	Excessed		
Calibrated By:	Chris Du	dley S#:	101142 . 1	Phone: 526-2761	12		Extension		
			CALI	BRATION STANDAR	DS USE	D		•	
	715424	712788	714273	714272					
					_				
				NAL INSTITUTE OF STAN , OR DERIVED FROM THE					)
	·	<del></del>	LABORA	TORY TEMPERATURE AN	D HUMIE	YTIC			<b></b>
Physic	al STD (106C)	20.0 ° +/-	-0.3 ° C (40-5	5% RH)   Electronic ST	D (106D)		23.0 ° +/-0.5 ° C (30	0-45% RH)	
	sional STD (10	•	0.25 °C (30-	•	•	•	23.0 ° +/-1.0 ° C (20		
Phys/L	oim CAL (Lab	·	-0.5 ° C (20-5	,			, ,	•	
Manufactu	rer's environn	nental specification	ons are evalua	ted for conformance when ca	librations	are pe	rformed outside the above s	tated conditions.	
NOMINAL	(STD)	OUT O	F TOLERAN UNITS	CE CONDITIONS FOUND I	OURING O			FG. ACCURAC	CY
				· · · · · · · · · · · · · · · · · · ·					
		<u> </u>					,		
									<del></del>
				COMMENTS					

LIMITED: 0 TO 220 DEG. C.

11/29/2007

NAME: DANA KEITI	MORTON	В	ADGE: 35698	E: 35698 PH: 526-1274				BLDG: EROB	RM: W	/2D1
ID Number: 72127 #: 297914-101-000		r. RAYTEK	. N	1odel: MX6	Nou	n Nar	ne: Il	NFRARED THERMO	METER	Serial
Calibration Date:	1/25/2006			ACTION COD	ÞΕ			AS FOUND	•	
Next Cal Due Date	: 1/25/2007	1	Fi Ace	ceptance Test	:	1	•	ln Tolerance		
Charge Level:	6	2	☐ Spe	ecial Test		2	O	Out of Tolerance >1x	<2x	
Repair/Adj/etc C.L	: 0	. 3	Cal	ibration to MFG	Specs	3	O	Out of Tolerance >2x	<3x	
Material Amount:	0	4	Cle	an		4	C	Out of Tolerance >3x	<5x	
Charge Number:	100853GS	A 5	[ Lin	nited Calibration		5	O	Out of Tolerance >5x		•
Cal Work Inst ID:	31241	6	Fui	nctional Check		6	C	Out of Tolerance-Und	letermined	
Outside Vendor:		7	☐ Per	formance Check		7	Γ.	Inoperative		
	,	8	Г Мо	dify		8		Damaged		
		9	☐ Re	pair-needs Charge	e Level	9		Not Used		
		10	Ctl	ner		10		Not Determined		
						i 1		Excessed		•
Calibrated By:	Brian Berl	ls S#:	102182 F	hone: 526-2761		12		Extension	•	
· F			CALI	BRATION STA	NDARDS	USI	ED	<del></del>	<del></del>	
	370602	717617							<del> </del>   :	
<u> </u>			<u> </u>	<u> </u>		-				•
L	الصححي		<u> </u>	<u> </u>		<u> </u>	<del></del> :			
								ECHNOLOGY DERIVE OF SELF CALIBRATION		
				TORY TEMPERAT	URE AND I	HUMI	DITY			
•	al STD (106C)		-/-0.3 ° C (40-		tronic STD (			23.0 ° +/-0.5 ° C	•	
	sional STD (106	·	+/-0.25 ° C (30 +/-0.5 ° C (20-:		tronic CAL ( taining S&CI		•	23.0 ° +/-1.0 ° C areas: 23.0 ° +5,-3.0 ° C	•	
•	im CAL (Lab 1	·		, ,				,		
Manufactu	rer's environm	**************************************				-		erformed outside the abov	e stated conditi	ons.
NOMINAL	(STD)	OUT	of toleran UNITS	ICE CONDITIONS I					MFG. ACC	URACY
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		_			_					
				COMME	NTS				· · · · · · · · · · · · · · · · · · ·	

LIMITED: -30 TO 420 DEG. C.

11/29/2007

NAME: DANA KEIT	H MORTON	P	ADGE: 3	5698 PH: 526-1274	AREA: STC	BLDG: EROB	RM: W2D1
ID Number: 72128	31 M	fr: RAYTE	ζ	Model: TYPE K	Noun Name: THER	RMOCOUPLE PR	OBE Serial
Calibration Date:	1/25/2006	i		ACTION CODE		AS FOUND	
Next Cal Due Date	e: 1/25/2007	7 1		Acceptance Test	l 🌀 In Toler	ance	
Charge Level:	4	2	Γ	Special Test	2 C Out of T	Solerance >1x <2x	
Repair/Adj/etc C.I	L: 0	3	П	Calibration to MFG Specs	3 O Out of T	Tolerance >2x <3x	
Material Amount:	<b>0</b> ,	4		Clean	4 C Out of T	Folerance >3x <5x	:
Charge Number:	100853G	SA 5	<b>▼</b>	Limited Calibration	5 C Out of T	Tolerance >5x	
Cal Work Inst ID:	3052V	6		Functional Check	6 C Out of T	Folerance-Undeter	mined
Outside Vendor:		7	Γ.	Performance Check	7 🗍 Inopera	tive	•
		8	Γ	Modify	8 T; Damage	ed	
		9		Repair-needs Charge Level	9 Not Use	ed.	
		10	Γ	Other	10 🔲 Not Det	ermined	
					11 Excesse	d	
Calibrated By:	Brian Ber	rls S#:	102182	Phone: 526-2761	12 📑 Extension	on	
	ř	•	C	ALIBRATION STANDARI	os lised		
Ī	370602	717617			1		
			CONSTA	ATIONAL INSTITUTE OF STANI NTS, OR DERIVED FROM THE ORATORY TEMPERATURE ANI	RATIO TYPE OF SELF		
Physic	al STD (106C)	20.0 ° +		(40-55% RH)   Electronic STI		3.0 ° +/-0.5 ° C (30-4	5% RH)
Dirnen	sional STD (10	6B) 20.0° +	-/-0.25 ° C	(30-45% RH)   Electronic CAI	L (Lab 112) 2	3.0 ° +/-1.0 °C (20-5	0% RH)
Phys/I	Dim CAL (Lab 1	111) 20.0° 4	·/-0.5 ° C	(20-50% RH) Remaining S&	CL calibration areas: 2.	3.0 ° +5,-3.0 ° C (20-	50% RH)
Manufactu	rer's environn	ental specifical	tions are e	valuated for conformance when cal	ibrations are performed	outside the above state	ed conditions.
NOMINAL	(STD)	OUT	OF TOLE UN	RANCE CONDITIONS FOUND D ITS A	URING CALIBRATION S FOUND (UUT)		G. ACCURACY
						<del></del>	
				·			
	*	•		COMMENTS		•	

LIMITED: 0 TO 220 DEG. C.

11/29/2007

NAME: DANA KEIT	H MORTON	В	ADGE: 3	5698 PH: 526-1274		ARE	A: \$7	RM: W2D1	
ID Number: 7212' #: 297914-101-000		r: RAYTEK	``	Model: MX6	Nour	n Nar	ne: l	NFRARED THERMOM	ETER Serial
Calibration Date:	1/18/2007			ACTION CODE				AS FOUND	
Next Cal Due Dat	e: 1/18/2008	1		Acceptance Test	٠	1	•	In Tolerance	
Charge Level:	6	2	П	Special Test		2	$\mathbf{C}$	Out of Tolerance >1x <2	2x .
Repair/Adj/etc C.l	L: <b>0</b>	3		Calibration to MFG Sp	ecs	3	$\mathbf{C}$	Out of Tolerance >2x <3	3x
Material Amount:	0,	4	<u> </u>	Clean '		4	C	Out of Tolerance >3x <5	5x
Charge Number:	100853GS.	A 5	V	Limited Calibration		5	C	Out of Tolerance >5x	
Cal Work Inst ID:	3124J	6		Functional Check		6	C	Out of Tolerance-Undet	ermined
Outside Vendor:	•	7		Performance Check		7		Inoperative	•
		8	<u> </u>	Modify		8		Damaged	
	•	9		Repair-needs Charge I	Level	9		Not Used	
		10		Other		10		Not Determined	
	,				•	11		Excessed	
Calibrated By:	Brian Berl	s <b>S#</b> :	10218	2 Phone: 526-2761		12	$\Gamma$	Extension	
			_						
ſī	722456	370602	715	ALIBRATION STAN	DARDS	USI	<u>D</u>	<u> </u>	
	122430	370002	][/ <u>1</u> 3.	712788					
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			CONST	ANTS, OR DERIVED FROM	A THE RA	TIO'	ГУР	TECHNOLOGY DERIVED F E OF SELF CALIBRATION 1	
Physic	:al STD (106C)	20.0 °		BORATORY TEMPERATULE (40-55% RH)   Electro	RE AND H		DITY	23.0 ° +/-0.5 ° C (30	-45% RH)
	nsional STD (106)			•	nic CAL (I	-	2)	23.0° +/-1.0°C (20	
Phys/l	Dim CAL (Lab 11	11) 20.0°	+/-0.5 ° C	(20-50% RH)   Remain	ing S&CL	. calibi	ation	areas: 23.0 ° +5,-3.0 ° C (2	0-50% RH)
Manufacti	Irer's environme	ntal specifica	tions are	evaluated for conformance w	hen calibr	ations	are	performed outside the above st	ated conditions.
NOMINAL	. (STD)	OUT		ERANCE CONDITIONS FO NITS					FG. ACCURACY
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		- <del></del>							
. —				COMMEN	TS			,	

LIMITED: -30 TO 420 DEG. C.

11/29/2007

NAME: DANA KEIT	AME: DANA KEITH MORTON BADGE				6-1274	AREA: STC BLDG: EROB RM: W2D1					
ID Number: 72128	31 M	fr: RAYTEK	<b>.</b> 1	Model: TYPE l	ζ.	Noun	Nam	e: THERMOCO	UPLE PR	OBE S	erial
Calibration Date:	1/18/2007	7		ACTION C	ODE			AS FO	OUND		
Next Cal Due Date	: 1/18/2008	3 1	□ Ac	ceptance Test		1	•	In Tolerance	·		
Charge Level:	4 .	2	<b>□</b> Sp	ecial Test		2	C	Out of Tolerance	e > 1 x < 2 x		
Repair/Adj/etc C.L	.: O	3	Ca	libration to MF	G Specs	, <b>3</b>	C	Out of Tolerance	e >2x <3x		
Material Amount:	0	4	Cl	ean		4	C	Out of Tolerance	e >3x <5x	•	
Charge Number:	100853G	SA 5	۲. Lin	mited Calibrati	on	5	C	Out of Tolerance	e >5x		
Cal Work Inst ID:	3052V	6	Fu	nctional Check		6	C	Out of Tolerance	e-Undeter	mined	
Outside Vendor:		7	Pe	rformance Che	ck	7		Inoperative			
		8	M.	odify		8	П	Damaged			
		9	Re	pair-needs Cha	rge Level	9		Not Used			
		10	∏ Ot	her		. 10	Γ	Not Determined			
						11	П	Excessed			
Calibrated By:	Brian Bei	rls S#:	102182	Phone: 526-276	51	12	Γ	Extension			
•			,				_		:		
` <b>F</b>	722456	370602	715424	712788	714272					¬ ·	
F	122430	. 370002	713424	/12/00	114212	<u> </u>	4273			╣.	
F						╬			· · · · · · · · · · · · · · · · · · ·	-	
L			<u> </u>			<u></u>					
								ECHNOLOGY DE			
			<del></del>	·							<del></del>
Physica	al STD (106C)	20.0°+	-/-0.3 °C (40-	STORY TEMPER	ATURE AND Sectronic STD		DITY	23.0 ° +/-0.:	5 °C (30-4	5% RH)	
_	sional STD (10		-/-0.25 ° C (30		lectronic CAL		2)	23.0 ° +/-1.	_	•	
Phys/D	im CAL (Lab	111) 20.0°+	-/-0.5 °C (20-	50% RH)   R	emaining S&0	CL calibr	ation a	areas: 23.0 ° +5,-3	3.0 ° C (20-	60% RH)	
Manufactu	rer's environn	nental specificat	ions are evalu	ated for conforma	nce when call	brations	are p	erformed outside the	e above state	d conditions.	
NOMINAL	(STD)	OUT	OF TOLERAN UNITS	ICE CONDITION		URING (			MFC	G. ACCURAC	Y
		· -		-	<del></del>			<del></del>			
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				COMM	IENTS						

LIMITED: 0 TO 220 DEG. C.

12/18/2007

NAME: DANA KEITH	MORTON	В	BADGE: 35698 PH: 526-1274			ARE	A: S	STC BLDG: EROB RM: W2D1
ID Number: 721279 101-0001	Mfr: R	AYTEK	_	Model: MX6	Nou	ın Nai	ne:	INFRARED THERMOMETER Serial #: 29791
· •	12/18/2007			ACTION COD	E			AS FOUND
Next Cal Due Date:	12/18/2008	1	i –	Acceptance Test		1	•	In Tolerance
Charge Level:	6	2	Γ	Special Test		2	$\subset$	Out of Tolerance $>1x < 2x$
Repair/Adj/etc C.L:	0	3	Γ	Calibration to MFG S	Specs	3	$\subset$	Out of Tolerance $>2x < 3x$
Material Amount:	Ö	4	Γ	Clean		4	$\boldsymbol{c}$	Out of Tolerance $>3x < 5x$
Charge Number:	100853GSA	5	~	Limited Calibration		5	$\subset$	Out of Tolerance >5x
Cal Work Inst ID:	3124N	6	Γ	Functional Check	:	6	$\overline{}$	Out of Tolerance-Undetermined
Outside Vendor:		7	Γ	Performance Check		7	Γ	Inoperative
		8		Modify		8	Γ	Damaged
		9	Γ	Repair-needs Charge	Level	9	Γ	Not Used
`.		10	Γ	Other		10	Γ	Not Determined
•						11	Γ	Excessed
Calibrated By:	Brian Berls	S#:	10218	Phone: 526-2761		12	Γ	Extension
				CALIBRATION S	TANDA	<b>ond</b>	HIC	SEN.
	370602	7224	56	CALIBRATIONS	TANDA	INDS		SED TO THE REPORT OF THE PERSON OF THE PERSO
							F	
								S AND TECHNOLOGY DERIVED FROM ACCEPTED O TYPE OF SELF CALIBRATION TECHNIQUES
The state of the s				LABORATORY TEMPE	RATURE	AND I	IUM	HDITY
Ph	ysical STD (106C)	20	).0 ° +/-	0.3 °C (40-55% RH)	Electronic .	STD (1	06D)	23.0 ° +/-0.5 ° C (30-45% RH)
	mensional STD (10				Electronic			
	ys/Dim CAL (Lab	•						bration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
Manuli	acturer's environ	nental spe	CITICATIO	ons are evaluated for conform	ance when	calibr	ation	ns are performed outside the above stated conditions.
NOMINAL	. (STD)	i		F TOLERANCE CONDITIO UNITS			-	G CALIBRATION ID (UUT) MFG. ACCURACY
		_						
		-						<u> </u>
		-					<del>ي</del>	
		-						
	•			COM	MENTS		,	

LIMITED: -30 TO 420 DEG. C.

12/18/2007

NAME: DANA KEITH	MORTON	ВАГ	)GE: 35698	PH: 526-1274	ARE	A: STC	BLDG: EROB	RM: W2D1	
ID Number: 721281 Calibration Date:	Mfr: R 12/18/2007	RAYTEK		el: TYPE K CTION CODE	Noun 1	Name: THERI	MOCOUPLE PRO	DBE Serial #:	
Next Cal Due Date:	12/18/2008	1 [	- Accepta	ance Test	1	♠ In Tolera	nce		
Charge Level:	4	2 「	- Special	Test	2	C Out of To	olerance >1x <2x		
Repair/Adj/etc C.L:	0.	3	Calibra	tion to MFG Specs	. 3	Out of To	olerance >2x <3x		
Material Amount:	0	4 F	- Clean		4	Out of To	olerance >3x <5x		
Charge Number:	100853GSA	5 : <b>F</b>	Limited	Calibration	5	C Out of To	olerance >5x		
Cal Work Inst 1D:	3052НН	6 F	Functio	nal Check	6	C Out of To	olerance-Undetern	nineđ	
Outside Vendor:	1	7	Perform	nance Check	7	☐ Inoperati	ve	٠	
		8 F	Modify		8	☐ Damaged	i		
		9 [	Repair-	needs Charge Leve	1 9	Not Used			
		10 T	- Other		10	Not Dete	rmined		
					11	Excessed	l		
Calibrated By:	Brian Berls	S#: 10	02182 Phone	: 526-2761	12	Extension	n		
	•		CAL	IBRATION STAN	DARDS	USED			
	715424	714272							
					[				
				<u> </u>					,
				ONAL INSTITUTE OF S, OR DERIVED FROM					
***************************************			LABORA	TORY TEMPERATU	RE AND H	UMIDITY			
Pin	ysical STD (106C)	20.0	° +/-0.3 ° C (40-	55% RH)   Electro	nic STD (10	)6D)	23,0 ° +/-0.5 ° C (	30-45% RH)	
	mensional STD (10 ys/Dim CAL (Lab	•	° +/-0.25 °C (30 ° +/-0.5 °C (20-:		nic CAL (L:	•	23.0° +/-1.0°C (	•	
	•	·	•				23.0 ° +5,-3.0 ° C	•	
Manut	acturer's environi			ated for conformance w				stated conditions.	
NOMINAL	. (STD)	OU	UNITS	ICE CONDITIONS FO		ING CALIBRAT JND (UUT)		G. ACCURACY	
								·	-
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LIMITED: 0 TO 220 DEG. C.

# WEIGHTS

11/30/2007

NAME: DANA KEIT	H MORTON	В	ADGE:	35698 PH: 526-1274	· Al	EA: S	STC BLDG: EROB RM: W2D1
ID Number: 72513 Calibration Date:	31 Mfr. BE. 10/10/2007	A	ľ	Model: 1080.88 LB , ACTION CODE	Noun	Name	e: WEIGHT Serial #: WEIGHT A  AS FOUND
Next Cal Due Date	e: 4/10/2009	1		Acceptance Test	1	•	In Tolerance
Charge Level:	8	2		Special Test	2	C	Out of Tolerance >1x <2x
Repair/Adj/etc C.I	L: 0	3	<b>V</b>	Calibration to MFG Specs	3	C	Out of Tolerance >2x <3x
Material Amount:	0	4	П	Clean	4	O	Out of Tolerance >3x <5x
Charge Number:	100853GSA	5	$\Gamma$	Limited Calibration	5	C	Out of Tolerance >5x
Cal Work Inst ID:	3014P	6	Г	Functional Check	6	C	Out of Tolerance-Undetermined
Outside Vendor:		7	Γ	Performance Check	7		Inoperative '
		8	Γ	Modify	8		Damaged
		9	Γ	Repair-needs Charge Level	9		Not Used
		10	Γ:	Other	10		Not Determined
					1		Excessed
Calibrated By:	Steve Palmer	S#:	5671	0 Phone: 526-2761	13	2	Extension
			_	·			
F	344008		<u> </u>	CALIBRATION STANDAR	US US	SED	
F	344008						
ľ		,			╗		
							TECHNOLOGY DERIVED FROM ACCEPTED DE OF SELF CALIBRATION TECHNIQUES
Triming in a name of the second section of the	a y an ann ann an an an ann ann ann an an a		LA	BORATORY TEMPERATURE AN	ND HUM	ndrr	Y
Physic	al STD (106C) 2	0.0 ° +	/-0.3 ° C	(40-55% RH)   Electronic ST	D (106E	)	23.0 ° +/-0.5 ° C (30-45% RH)
				C (30-45% RH)   Electronic CA	•	•	23.0 ° +/-1.0 ° C (20-50% RH)
Phys/I	Dim CAL (Lab 111) 2	:0.0 ° +	/-0.5 ° C	(20-50% RH) Remaining Se	&CL cali	bration	n areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
Manufactu	rer's environmental sp	ecificati	ions are	evaluated for conformance when ca	alibratio	ns are	performed outside the above stated conditions.
NOMINAL	. (STD)	OUT (		ERANCE CONDITIONS FOUND NITS			D (UUT) MFG. ACCURACY
			<u>-</u>				
<u> </u>							
				COMMENTS			

Nominal: 1080.882 lb Tolerance: +/- 3.00 lb AS-found data: 1080.882 lb

Uncertainty of standards used: +/- 52.0 g (+/- 0.115 lb)

Note: Nominal was determined by the initial calibration value. All following calibrations will be compared to the nominal (initial calibration value).

11/30/2007

NAME: DANA KEITH	I MORTON	BADGE: 35698 PH: 526-1274			Α	C BLDG: EROB RM: W2D1				
ID Number: 725132 Calibration Date:	2 Mfr: BE	E <b>A</b>	Mo	odel: 534.34 LB ACTION CODE	Noun	Nar	ne: \	WEIGHT Serial #: WEIGHT B  AS FOUND		
Next Cal Due Date:	: 4/10/2009	1		Acceptance Test	]		•	In Tolerance		
Charge Level:	6	2		Special Test		2	O	Out of Tolerance >1x <2x		
Repair/Adj/etc C.L	: 0	3	Ž.	Calibration to MFG Specs	3	3	O	Out of Tolerance >2x <3x		
Material Amount:	0	4		Clean	4	1	C	Out of Tolerance >3x <5x		
Charge Number:	100853GSA	5 '		Limited Calibration	:	5	C	Out of Tolerance >5x		
Cal Work Inst ID:	3014P	6	T :	Functional Check	(	5	C	Out of Tolerance-Undetermined		
Outside Vendor:		7		Performance Check	•	7	П	Inoperative		
		8	Γ	Modify	;	3		Damaged		
	1	. 9	П	Repair-needs Charge Leve		9		Not Used		
		10		Other		10		Not Determined		
	•					11		Excessed		
Calibrated By:	Steve Palmer	S#:	56710	Phone: 526-2761		12		Extension		
			•	LI INDATION CTANDA		105		•		
	344008	<del></del>	CA	ALIBRATION STANDAL	KDS (	JSE	<u>.D</u>			
	344008				╬					
STANDADOS I	USED ADE TRACE	ARIETO	THE NA	TIONAL INSTITUTE OF STA	NDAR	NG A	ND 1	TECHNOLOGY DERIVED FROM ACCEPTED		
								OF SELF CALIBRATION TECHNIQUES		
		0000		ORATORY TEMPERATURE A			DITY			
•				(40-55% RH)   Electronic S (30-45% RH)   Electronic C		-	20	23.0 ° +/-0.5 °C (30-45% RH)		
•	• •			(20-50% RH)   Remaining S	-		•	23.0 ° +/-1.0 ° C (20-50% RH)  areas: 23:0 ° +5,-3.0 ° C (20-50% RH)		
Manufactur	er's environmental s	pecificati	ons are ev	aluated for conformance when o	calibrat	ions	are p	performed outside the above stated conditions.		
NOMINAL (STD)  Out of tolerance conditions found during calibration  NOMINAL (STD)  UNITS  AS FOUND (UUT)  MFG. ACCURACY										
	-									
				COMMENTS						

Nominal: 534:335 lb Tolerance: +/- 2.00 lb AS-found data: 534.335 lb

Uncertainty of standards used: +/- 52.0 g (+/- 0.115 lb)

Note: Nominal was determined by the initial calibration value. All following calibrations will be compared to the

nominal (initial calibration value).

11/30/2007

NAME: DANA KEIT	NAME: DANA KEITH MORTON			35698	PH: 526-1274	4 AREA: STC BLDG: EROB RM: W2D1						
ID Number: 72513 Calibration Date:	33 N 10/10/20	<b>1fr: BEA</b> 07	1	Model: 102. ACT	168 LB ION CODE	Noun I	Name	: WEIGHT	Serial AS FOUND	#: WEIGHT C		
Next Cal Due Date	: 4/10/200	9 1		Acceptant	ce Test	1	•	In Tolerand	pe '			
Charge Level:	4	2		Special To	est	2	C	Out of Tole	erance >1x <2	x		
Repair/Adj/etc C.I	.: O	- 3	V	Calibratio	n to MFG Specs	3	C	Out of Tole	erance >2x <3	x		
Material Amount:	0	4		Clean		4	O	Out of Tole	erance >3x <5	x		
Charge Number:	100853G	SA 5		Limited C	alibration	5	C	Out of Tole	erance >5x			
Cal Work Inst ID:	3014P	. 6	Γ.	Functiona	l Check	6	$\mathbf{c}$	Out of Tole	erance-Undete	rmined		
Outside Vendor:	•	. 7	$\Box$	Performar	nce Check	7		Inoperative	:			
		8	Γ:	Modify	•	8		Damaged				
		9		Repair-ne	eds Charge Leve	1 9	9 Not Used					
		10		Other		10	10 Not Determined					
						11	Γ.,	Excessed		. ,		
Calibrated By:	Steve Pa	lmer S#	: 5671	O Phone:	526-2761	12	· []	Extension				
		•			70N 07 4 N/2 4							
·	344008		1	ALIBRAT	TON STANDAL	RDS US	ED			<del>-</del>		
F	311000		╫			╗				<del> </del>		
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STANDARDS VALUES	USED ARE T FOR NATUR	RACEABLE '	TO THE	NATIONAL II FANTS, OR D	NSTITUTE OF STA ERIVED FROM TH	NDARDS IE RATIO	AND TYPI	TECHNOLOGE OF SELF CA	GY DERIVED F	ROM ACCEPTED ECHNIQUES		
			LA	BORATORY	TEMPERATURE A	ND HUM	IDITY	7				
•	al STD (106C)		+/-0.3 ° C	(40-55% RH	Electronic S	TD (106D)	)	23.0	° +/-0.5 °C (30	-45% RH)		
	sional STD (10	•		C (30-45% RI			-		° +/-1.0 °C (20	•		
•	oim CAL (Lab	,		(20-50% RH	•				° +5,-3.0 ° C (2	,		
Manufactu	Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.											
NOMINAL	NOMINAL (STD)  UNITS  AS FOUND (UUT)  MFG. ACCURACY											
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					COMMENTS							
					COMMENTS	,						

Nominal: 102.168 lb Tolerance: +/- 1.50 lb AS-found data: 102.168 lb

Uncertainty of standards used: +/- 52.0 g (+/- 0.115 lb)

Note: Nominal was determined by the initial calibration value. All following calibrations will be compared to the nominal (initial calibration value).

11/30/2007

NAMÉ: DANA KEITH	MORTON		BA	ADGE: 3	5698 PH: 526-	1274	ARE	A: \$7	C BLDG:	EROB	RM: W2D1
D Number: 725134 Calibration Date:	M 10/10/200	Ifr: BEA		M	1odel: 83.35 LB* ACTION COI		Nam	ne: V	VEIGHT AS FO	Serial #: W DUND	EIGHT 1
Next Cal Due Date:	4/10/2009	• `	1		Acceptance Test		1	•	In Tolerance		
Charge Level:	2		2		Special Test		2	0	Out of Tolerance	e >1x <2x	
Repair/Adj/etc C.L:	: 0		3	V	Calibration to MFG	Specs	3	0	Out of Tolerance	e >2x <3x	
Material Amount:	0		4		Clean	-	4	O	Out of Tolerance	e >3x <5x	
Charge Number:	100853G	SA	5		Limited Calibration	!	5	C	Out of Tolerance	e >5x	
Cal Work Inst ID:	3015P		6		Functional Check		6	C	Out of Toleranc	e-Undeterr	mined
Outside Vendor:			7		Performance Check		7	$\Box$	Inoperative		,
			8		Modify		8		Damaged	٠,	
•			9		Repair-needs Charg	ge Level	9		Not Used	•	
•			10		Other		10		Not Determined	}	
							11		Excessed		
Calibrated By:	Steve Pal	lmer	S#:	56710	Phone: 526-2761		12		Extension	•	
					LI IND LONG NOW		T:01	O.P.			
•	718069				CALIBRATION ST	ANDARDS	USI	ED	7	1	<b>-</b>
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					NATIONAL INSTITUTE 'ANTS, OR DERIVED F						
Physical	l STD (106C)	2	0.0 ° +		BORATORY TEMPERA (40-55% RH)   Ele	TURE AND H				0.5°C (30-4	5% RH)
Dimens	ional STD (10	)6B) 2	0.0°+	/-0.25 ° (	C (30-45% RH)   Ele	ectronic CAL (I	Lab 1	12)	23.0 ° +/-1	1.0 °C (20-5	0% RH)
Phys/Di	m CAL (Lab	111) 2	0.0°+	/-0.5 ° C	(20-50% RH) Re	maining S&CL	calib	ration	areas: 23.0 ° +5,	-3.0 ° C (20-	50% RH)
Manufactur	er's environr	nental spe	cificati	ions are	evaluated for conforman	ce when calibr	ation	s are	performed outside t	he above stat	ed conditions.
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY											
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										<del></del>	
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					COMM	ENTS					

Weight #1
Nominal: 83.388 lb
Tolerance: +/- 1.50 lb
As-found data: 83.444 lb
Uncertainty of Standards Used: +/- 0.050 lb
Note: Nominal value was determined by the average weight from the initial calibration values for the (83 lb to 84 lb) weights.

11/30/2007

NAME: DANA KEI	TH MORTON	В	ADGE: 35698 PH	: 526-1274	AREA: STC BLDG: EROB RM: W2I	01		
ID Number: 725		BEA	Model: 83.35 LE ACTION		n Name: WEIGHT Serial #: WEIGHT 2  AS FOUND			
Next Cal Due Da	te: 4/10/2009	l	Acceptance Te	est	1 • In Tolerance			
Charge Level:	. 2	2	Special Test		2 C Out of Tolerance >1x <2x			
Repair/Adj/etc C	.L: 0	3	✓ Calibration to	MFG Specs	3 C Out of Tolerance >2x <3x			
Material Amount	: 0	4	Clean		4  Out of Tolerance >3x <5x			
Charge Number:	100853GSA	5	Limited Calibration	ration	5 C Out of Tolerance >5x			
Cal Work Inst ID	e: 3014P	6	Functional Ch	eck	6 C Out of Tolerance-Undetermined			
Outside Vendor:		7	Performance (	Check	7 [ Inoperative	•		
		8	Modify		8 Ti Damaged			
	,	9	Repair-needs	Charge Level	9 Not Used			
		10	Other		10 Not Determined			
	•				II Excessed	-		
Calibrated By:	Steve Palmer	S#:	56710 Phone: 526-	2761	12 Extension			
	•				a vann			
[	718069		CALIBRATION	STANDARD	S USED			
	71000							
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					ARDS AND TECHNOLOGY DERIVED FROM ACCEPT ATIO TYPE OF SELF CALIBRATION TECHNIQUES	(ED		
	S. C. LANCE SECTION OF THE SECTION O		LABORATORY TEM	PERATURE AND	HUMIDITY			
•	ical STD (106C)	-	-0.3 °C (40-55% RH)	Electronic STD	•			
	ensional STD (106B)  Dim CAL (Lab 111)		-0.25 ° C (30-45% RH)   -0.5 ° C (20-50% RH)	Electronic CAL Remaining S&C	(Lab 112) 23.0 ° +/-1.0 ° C (20-50% RH) L calibration areas: 23.0 ° +5,-3.0 ° C (20-50% RH)			
•			. ,	_	orations are performed outside the above stated conditions.			
		OUT	F TOLERANCE CONDIT	IONS FOUND DU	IRING CALIFRATION			
NOMINA	L (STD)		UNITS		FOUND (UUT) MFG. ACCUR	ACY		
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Weight #2
Nominal: 83.388 lb
Tolerance: +/- 1.50 lb
As-found data: 83.400 lb
Uncertainty of Standards Used: +/- 0.050 lb
Note: Nominal value was determined by the average weight from the initial calibration values for the (83 lb to 84 lb) weights.

11/30/2007

NAME: DANA KEIT	H MORTON	В	ADGE: 3	5698 PH: 526-1	274	ARE	A: S	fC BLDG: EROB RM: W	2D1
ID Number: 72513 Calibration Date:	6 Mfr: BEA		N	odel: 83.35 LB ACTION COD		Nan	ne: V	VEIGHT Serial #: WEIGHT AS FOUND	3
Next Cal Due Date	: 4/10/2009	1		Acceptance Test	;	1	•	In Tolerance	
Charge Level:	2	2		Special Test		2	O	Out of Tolerance >1x <2x	
Repair/Adj/etc C.L	.: 0	3	7	Calibration to MFG	Specs	3	C	Out of Tolerance >2x <3x	
Material Amount:	0	4	$\Box$	Clean		4	C	Out of Tolerance $>3x < 5x$	
Charge Number:	100853GSA	5		Limited Calibration		5	O	Out of Tolerance >5x	
Cal Work Inst ID:	3014P	6	<b></b>	Functional Check		6	0	Out of Tolerance-Undetermined	
Outside Vendor:		7	Γ	Performance Check		7		Inoperative	
	•	8 .		Modify		8		Damaged	
		9		Repair-needs Charge	e Level	9		Not Used	
		10	Ţ.	Other	•	10		Not Determined	
						11		Excessed	
Calibrated By:	Steve Palmer	S#:	56710	Phone: 526-2761		12		Extension	
			_	AT IDD ATION OT A	ND A DDC	. FIOI	e in		
· IF	718069	$\overline{}$		ALIBRATION STA	INDARDS	031	LD		
F	7.000	=							
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STANDADDS	IICED ADE TDACEAU	I F T	THEN	ATIONAL INSTITUTE	OF STANDA	DDC	AND	TECHNOLOGY DERIVED FROM ACCE	Derry
VALUES	FOR NATURAL PHYS	SICAL	CONST	ANTS, OR DERIVED FR	OM THE RA	ATIO	TYP	E OF SELF CALIBRATION TECHNIQUE	S
			LAB	ORATORY TEMPERAT	TURE AND H	IUMI	DITY		
•	• •				etronic STD (1	106D)		23.0 ° +/-0.5 ° C · (30-45% RH)	
					etronic CAL (I		•	23.0 ° +/-1.0 °C (20-50% RH)	`,
•			•	• •	naining S&CL			, , ,	
Manutactu	rer's environmental spe	CITICATI	ons are e	evaluated for conformanc	e when calibr	ations	are	performed outside the above stated condition	ns.
NOMINAL	OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  NOMINAL (STD) UNITS AS FOUND (UUT) MFG. ACCURACY								
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				СОММЕ	ENTS				

Weight #3
Nominal: 83.388 lb
Tolerance: +/- 1.50 lb
As-found data: 83.308 lb
Uncertainty of Standards Used: +/- 0.050 lb
Note: Nominal value was determined by the average weight from the initial calibration values for the [83 lb to 84 lb) weights.

11/30/2007

NAME: DANA KEITI	H MORTON	В	ADGE: 3569	8 PH: 526-127	14	AREA	: STC	BLDG: EROB	RM: W2D1		
ID Number: 72513 Calibration Date:	7 Mfr: 10/10/2007	BEA	Mod	el: 83.35 LB ACTION CODE		Name	e: WEIGHT	Serial #:	WEIGHT 4		
Next Cal Due Date	: 4/10/2009	`1	□ Ac	ceptance Test		1	In Tole	rance			
Charge Level:	2	2	☐ Sp	ecial Test		2	Out of	Tolerance >1x <2	x		
Repair/Adj/etc C.L	.: 0	3	☑ Ca	libration to MFG S	pecs	3	C Out of	Tolerance >2x <3	<b>x</b>		
Material Amount:	0	4	[] CI	ean		4	C Out of	Tolerance >3x <5	x		
Charge Number:	100853GSA	5	∏ Li	Limited Calibration			C Out of	Out of Tolerance >5x			
Cal Work Inst ID:	3014P	6	∏ Ft	nctional Check		6	C Out of	Tolerance-Undete	ermined		
Outside Vendor:		7	☐ Pe	Performance Check 7 Inoperative							
		8	Г М	odify		8	Damag	ed			
		9	∏. Re	pair-needs Charge	Level	9	Not Us	ed			
	. 10			her	10 Not Determined						
		١			,	11	Excess	ed			
Calibrated By:	Steve Palme	r S#:	56710	Phone: 526-2761		12	Extens	ion			
			CAL	IDD ATTOXICT AS	m a nnc	T (CYP)	<b>n</b>				
. ` [	718069		CAL	IBRATION STAN	·	USE					
	710005								=-		
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Sunnesse: आंग्रेजिंगे सम्मानका स्थापन का न्यां पर करियों से वर्षी ह	10 10 10 10 10 10 10 10 10 10 10 10 10 1		LABOR	ATORY TEMPERATU	RE AND H	UMID	ITY		<u>,</u>		
Physica	al STD (106C)		/-0.3 ° C (40	· I	onic STD (1	-		23.0 ° +/-0.5 ° C (30	1-45% RH)		
	sional STD (106B) rim CAL (Lab 111)		/-0.25 ° C (3 /-0.5 ° C (20		onic CAL (L ining S&CL		•	23.0° +/-1.0°C (20 23.0° +5,-3.0°C (2	•		
-			_	asted for conformance v				·	•		
MANUSACION	iei s caviloanica	···							ateu constroux		
NOMINAL	(STD)		UNIT	NCE CONDITIONS FO			ND (UUT)		FG. ACCURACY		
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Weight #4

MEIGHT HANNOMINAL: 83.388 lb

Tolerance: +/- 1.50 lb

As-found data: 83.468 lb

Accuracy of Standards Used: +/- 0.050 lb

Note: Nominal value was determined by the average weight from the initial calibration values for the (83 lb to 84 lb)

was obtained. weights.

11/30/2007

NAME: DANA KEI	TH MORTON	) B	ADGE: 356	98 PH: 526-	1274	ARE	A: S	TC BLDG: EROB RM: W2D1
ID Number: 725		fr: BEA 17	Мо	del: 83.35 LB ACTION CO		n Nam	ne: V	WEIGHT Serial #: WEIGHT 5 AS FOUND
Next Cal Due Da	ite: 4/10/2009	1		Acceptance Test		1	•	In Tolerance
Charge Level:	2	2		Special Test		2	O	Out of Tolerance >1x <2x
Repair/Adj/etc C	.L: 0	3	<u>v</u>	Calibration to MFC	Specs	3	0	Out of Tolerance >2x <3x
Material Amount	t: 0	4		Clean		4	С	Out of Tolerance >3x <5x
Charge Number:	100853G	SA 5	I	imited Calibration	1	5	O	Out of Tolerance >5x
Cal Work Inst ID	): 3014P	, 6	F. F	unctional Check	,	6	Ö	Out of Tolerance-Undetermined
Outside Vendor:		7	F F	Performance Check	ζ.	7	П	Inoperative
		8		Modify		8		Damaged
		9	П	Repair-needs Charg	ge Level	9		Not Used
. 1		10		Other	:	10		Not Determined
•						11		Excessed
Calibrated By:	Steve Pal	mer S#:	56710	Phone: 526-2761		12		Extension
ı	718069		CA	LIBRATION ST	ANDARD:	S USI	ED	
	718009					╬═		
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								TECHNOLOGY DERIVED FROM ACCEPTED E OF SELF CALIBRATION TECHNIQUES
		<del>7</del>		RATORY TEMPERA				
Phys	ical STD (106C)	20.0 ° 4			ectronic STD (			23.0 ° +/-0.5 ° C (30-45% RH)
Dime	ensional STD (10	6B) 20.0° +	/-0.25 ° C	(30-45% RH)   El	ectronic CAL	( <b>La</b> b 11	2)	23.0 ° +/-1.0 ° C (20-50% RH)
Phys	Dim CAL (Lab 1	111) 20.0° +	-/-0.5 ° C (∂	20-50% RH)   Re	maining S&C	L calib	ration	areas: 23.0 ° +5,-3.0 ° C (20-50% RH)
Manufaci	lurer's environm	ental specificat	ions are eva	luated for conforman	ce when calib	rations	are :	performed outside the above stated conditions.
NOMINA	NOMINAL (STD)  OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION  NOMINAL (STD)  UNITS  AS FOUND (UUT)  MFG. ACCURACY							
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			<del></del>	COMM	ENTS			

Weight #5
Nominal: 83.388 lb
Tolerance: +/- 1.50 lb
As-found data: 83.432 lb
Uncertainty of Standards Used: +/- 0.050 lb
Total Nominal value was determined by the av

Note: Nominal value was determined by the average weight from the initial calibration values for the (83 lb to 84 lb) weights.

11/30/2007

NAME: DANA KEITH MORTON	В	ADGE:	35698 PH: 526-1274	AREA	A: STC B	LDG: EROB	RM: W2D1
ID Number: 725139 Mfr: E Calibration Date: 10/10/2007	EA	יו	Model: 83.35 LB No ACTION CODE	un Nam	e: WEIGHT	Serial #: V S FOUND	VEIGHT 6
Next Cal Due Date: 4/10/2009	1		Acceptance Test	1	• In Toleranc	e	:
Charge Level: 2	2		Special Test	2	Out of Tole	rance >1x <2x	
Repair/Adj/etc C.L: 0	3	V	Calibration to MFG Specs	3	C Out of Tole	rance >2x <3x	
Material Amount: 0	4		Clean	4	Out of Tole	rance >3x <5x	
Charge Number: 100853GSA	5		Limited Calibration	5	Out of Tole	rance >5x	
Cal Work Inst ID: 3014P	6	Γ	Functional Check	6	C Out of Tole	rance-Undeten	mined
Outside Vendor:	7	$\Gamma$	Performance Check	7	Inoperative		
	8	Γ	Modify	8	Damaged		
	9		Repair-needs Charge Level	9	Not Used		
<u>~</u>	10	<b>.</b>	Other	10	Not Determ	nined	
			•	11	Excessed		
Calibrated By: Steve Palmer	S#:	5671	0 Phone: 526-2761	12	Extension		
				Do Man			
718069			CALIBRATION STANDARI	DS USE	<u> </u>	<del>-</del> 1	
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			NATIONAL INSTITUTE OF STAN FANTS, OR DERIVED FROM THE				
		LA	BORATORY TEMPERATURE AN	D HUMID	ITY	MARIAN .	
Physical STD (106C)	20.0 ° +	/-0.3 ° C	(40-55% RH)   Electronic STI	O (106D)	23.0	° +/-0.5 °C (30-4	5% RH)
Dimensional STD (106B)			C (30-45% RH)   Electronic CA	•	,	° +/-1.0 °C (20-5	•
Phys/Dim CAL (Lab 111)			C (20-50% RH)   Remaining S&		-	° +5,-3.0 ° C (20-	ŕ
Manufacturer's environmental	specificati	ont are	evaluated for conformance when cal	ibrations	are performed outs	ide the above stat	ed conditions.
NOMINAL (STD)	OUT		ERANCE CONDITIONS FOUND D NITS		ALIBRATION ND (UUT)	MF	G. ACCURACY
					-		
			COMMÊNTS				

Weight #6
Nominal: 83.388 lb
Tolerance: +/- 1.50 lb
As-found data: 83.278 lb
Uncertainty of Standards Used: +/- 0.050 lb
Note: Nominal value was determined by the average weight from the initial calibration values for the (83 lb to 84 lb) weights.

11/30/2007

NAME: DANA KEITH MORTON			DGE: 3	5698 PH: 526-1274	TC BLDG: EROB	RM: W2D1		
ID Number: 725140 05-1-12	Mfr: BEA		. M	lodel: 4.92 LB SHACKLE	Noun Name: WEIGI		ın Name: WEIGHT	Serial #: CFA-S-
Calibration Date:	10/10/2007			ACTION CODE			AS FOUND	
Next Cal Due Date:	4/10/2009	1		Acceptance Test	1	•	In Tolerance	
Charge Level:	2	2		Special Test	2	·O	Out of Tolerance >1x <2x	: •
Repair/Adj/etc C.L:	0	3	V	Calibration to MFG Specs	3	O	Out of Tolerance >2x <3x	
Material Amount:	0	4		Clean	4	C	Out of Tolerance >3x <5x	ζ.
Charge Number:	100853GSA	5		Limited Calibration	5.	C	Out of Tolerance >5x	
Cal Work Inst ID:	3014P	6		Functional Check	6	C	Out of Tolerance-Undeter	mined
Outside Vendor:		· 7		Performance Check	7		Inoperative	,
		8		Modify	8	Γ	Damaged	
		9		Repair-needs Charge Level	9		Not Used	
	• • •	10		Other	10		Not Determined	
					11		Excessed	
Calibrated By:	Steve Palmer	S#:	56710	Phone: 526-2761	12		Extension	•
			_	ALIBRATION STANDARDS	2110	Ρħ		
	328934			ALIDATIONSTANDARDS	<u>                                     </u>	ED_		$\overline{}$
,								
				ATIONAL INSTITUTE OF STANDA ANTS, OR DERIVED FROM THE RA				
	<u> </u>		LAI	SORATORY TEMPERATURE AND I	ним	IDIT	Y	
•	, ,			(40-55% RH) Electronic STD (			23.0 ° +/-0.5 °C (30-	
	, ,			(30-45% RH)   Electronic CAL ( (20-50% RH)   Remaining S&CI		-	23.0 ° +/-1.0 ° C (20- n areas: 23.0 ° +5,-3.0 ° C (20-	·
•				evaluated for conformance when calibr				·
(7/20012(10)	er a cura onincian ap							TO COUNTY OF
NOMINAL	(STD)	OUT		ERANCE CONDITIONS FOUND DUI NITS AS				FG. ACCURACY
		_						
			·····				•	
•				COMMENTS				

Nominal: 4.920 lb

Tolerance: +/- 0.50 lb

AS-found data: 4.9095344 lb
Uncertainty of standards used: +/- 0.722 g (+/- 0.00159 lb)
Note: Nominal value was determined by the average weight from the initial calibration values for the (5 lb) shackles.

11/30/2007

NAME: DANA KEIT	H MORTON	X.	BADGE: 35691	8 PH: 52	6-1274	ARI	A: STC	BLDG: E	ROB	RM: W2D1
ID Number: 72514 05-1-7	41 M	Ifr: BEA	Mode	el: 4.92 LB SH/	ACKLE		Noun 1	Name: WEIGHT	r	Serial #: CFA-S-
Calibration Date:	10/10/20	07		ACTION CO	ODE			AS FOU	JND	;
Next Cal Due Dat	e: 4/10/200	9 1.	☐ Ac	ceptance Test		1	In	Tolerance		
Charge Level:	2	. 2	☐ Sp	ecial Test		2	CO	ut of Tolerance	>1x <2x	
Repair/Adj/etc C.l	L: 0	. 3	✓ Ca	libration to MF	G Specs	3	CO	ut of Tolerance	>2x <3x	4
Material Amount:	0	4	Cl	ean		4	C 0	ut of Tolerance	>3x <5x	
Charge Number:	100853G	SSA 5	[] Lie	mited Calibratio	n	5	$\circ$	ut of Tolerance	>5x	•
Cal Work Inst ID:	3014P	6	Fu	nctional Check		6	C 0	ut of Tolerance-	Undeterr	nined
Outside Vendor:		7	Pe	rformance Chec	ck	7	[ ] In	operative		,
		8	∏ M	odify		8	D	amaged		
		9	`∏ Re	pair-needs Cha	rge Level	9	ΠN	ot Used		•
		10	☐ Ot	her		10	$\prod$ N	ot Determined		•
						11	[ E	cessed		
Calibrated By:	Steve Pa	lmer S#:	56710 I	Phone: 526-276	1	12	E:	ctension		
			CAL	IBRATION ST	TANDARDS	: HS	FD			
Ī	328934									<b>1</b>
[							188 <sub>0</sub> -			
			][							
								CHNOLOGY DER		
VALUES	TOR NATUR	EAL PHYSICAL		-				F SELF CALIBRA	IION IE	.HNIQUES
Physic	al STD (106C)	20.0°	LABUR. 40-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	ATORY TEMPER -55% RH)   E	LATURE AND F Electronic STD (1			23.0 ° +/-0.5	°C (30-4	5% RH)
Dimen	sional STD (10	06B) 20.0°-	+/-0.25 ° C (3	0-45% RH)   E	Electronic CAL (I	Lab 1	12)	23.0 ° +/-1.0	°C (20-5	0% RH)
Phys/I	Dim CAL (Lab	111) 20.0°	⊦/-0.5 ° C (20	-50% RH)   R	ternaining S&CL	. calib	ration are	as: 23.0° +5,-3.0	O°C (20-	50% RH)
Manufactu	rer's environt	nental specifica	tions are evalu	ated for conforma	nce when calibr	ation	s are per	formed outside the	above state	ed conditions.
NOMINAL	. (STD)	OUT	OF TOLERA UNITS	NCE CONDITION			CALIBE IND (U	*	MFC	G. ACCURACY
									•	
		<del>-</del> -								
				COMM	IENTS					
							•			

Nominal: 4.920 lb
Tolerance: +/- 0.50 lb
AS-found data: 4.9289902lb
Uncertainty of standards used: +/- 0.722 g (+/- 0.00159 lb)
Note: Nominal value was determined by the average weight from the initial calibration values for the (5 lb) shackles.

11/30/2007

NAME: DANA KEITI	H MORTON		BADGE: 35698	PH: 526-1274	AREA: STC	BLDG: EROB	RM: W2D1
ID Number: 72514	2 N	Afr: BEA	Mode	l: 0.8 LB LINK	Noun Name: WI	EIGHT Seria	al #: CITRIC-ML-02-
Calibration Date:	10/10/20	07	·	ACTION CODE	4	AS FOUND	
Next Cal Due Date	:: <b>4/10/2</b> 00	9 1	☐ Acc	ceptance Test	l 📵 In To	lerance	
Charge Level:	2	2	☐ Spe	cial Test	2 C Out o	of Tolerance >1x <2	x
Repair/Adj/etc C.L	.: O	3	☑; Cal	ibration to MFG Specs	3 C Out o	of Tolerance >2x <3	<b>x</b>
Material Amount:	0 .	4	Cle	an	4 . C Out o	of Tolerance >3x <5	x
Charge Number:	1008530	isa 5	[ Lin	nited Calibration	5 C Out o	of Tolerance >5x	
Cal Work Inst ID:	3014P	6	Fur	ctional Check	6 C Out o	of Tolerance-Undete	rmined
Outside Vendor:		7	Per	formance Check	7 Inope	erative	
		8	∏ Mo	dify	8 T Dama	aged	
		9	☐ Rep	pair-needs Charge Leve	el 9 🗇 Not U	Used	
		10	Cit Oth	пег	10 Not I	Determined	
					11 Exce	ssed	
Calibrated By:	Steve Pa	lmer S#:	56710 P	hone: 526-2761	12 Exter	nsion	
		ì	CALL	DD ATION CTANDA	DDC HCED	,	
F	328934	<u> </u>	CALI	BRATION STANDA	KUS USED		
· ·	320754						
STANDARDS VALUES	USED ARE T	TRACEABLE T	L CONSTANTS	ONAL INSTITUTE OF STA S, OR DERIVED FROM T	HE RATIO TYPE OF S	NOLOGY DERIVED FI ELF CALIBRATION T	ROM ACCEPTED ECHNIQUES
Physica	i) STD (106C)	20.0°	LABORA 2-0.3 ° C (40-1	TORY TEMPERATURE A	AND HUMIDITY STD (106D)	23.0° +/-0.5°C (30-	45% PH
•	sional STD (16		+/-0.25 ° C (30		CAL (Lab 112)	23.0 ° +/-1.0 ° C (20-	•
Phys/D	im CAL (Lab	111) 20.0°	+/-0.5 ° C (20-5	50% RH)   Remaining	S&CL calibration areas:	23.0 ° +5,-3.0 ° C (20	0-50% RH)
Manufactui	rer's environs	nental specifica	tions are evalus	nted for conformance when	calibrations are perforn	ned outside the above st	ated conditions.
NOMINAL (STD)			of toleran UNITS	CE CONDITIONS FOUNI	DURING CALIBRAT AS FOUND (UUT		FG. ACCURACY
	1						
							·
				COMMENTS			

Nominal: 0.8 lb

Nominal: 0.818
Tolerance: +/- 0.50 lb
As-found data: 0.809 lb
Uncertainty of Standards Used: +/- 0.722 g (+/- 0.00159 lb)

Note: Nominal value was determined by the average weight from the initial calibration values for the (1 lb) links.

11/30/2007

NAME: DANA KEI	TH MORTON	F	ADGE: 35698	PH: 526-1274	AP	EA: S	rc bldg: e	ROB RM: W2D1			
ID Number: 725:	143 N	Afr: BEA	Model: (	0.8 LB LINK	Nou	Nam	e: WEIGHT	Serial #: CITRIC-ML-07-			
Calibration Date:	. 10/10/20	07	A	CTION CODE			AS FOU	JND			
Next Cal Due Da	ite: 4/10/200	9 1	Accep	tance Test	1	•	In Tolerance				
Charge Level:	2	2	Special	al Test	2	C	Out of Tolerance	>1x <2x			
Repair/Adj/etc C	.L: 0	3	Calibr	ation to MFG Sp	ecs 3	C	Out of Tolerance	>2x <3x			
Material Amount	t: <b>0</b>	4	Clean		4	0	Out of Tolerance	>3x <5x			
Charge Number:	1008530	isa 5	Limit	ed Calibration	5	Ċ	Out of Tolerance	>5x			
Cal Work Inst ID	): 3014P	6	Funct	ional Check	6	ွဂ	Out of Tolerance-	Undetermined			
Outside Vendor:		. 7	Perfo	mance Check	. 7		Inoperative	•			
		8	Modi	fy	8	!	Damaged				
		9	☐ Repai	r-needs Charge L	evel 9		Not Used				
		10	Other		10	) <u>[</u>	Not Determined	·			
	•				13		Excessed	·			
Calibrated By:	Steve Pa	lmer S#:	56710 Pho	ne: 526-2761	12		Extension	· ·			
•			CALIDI	RATION STANI	NA DINC 116	ED					
	328934		CALIBI	ATION STANI	JAKUS US	ED		<del></del>			
	320331										
								IVED FROM ACCEPTED TION TECHNIQUES			
				DRY TEMPERATUR							
Phys	ical STD (106C)	20.0°+	-/-0.3 ° C (40-55%		nc STD (106D			°C (30-45% RH)			
Dime	ensional STD (1	06B) 20.0°+	-/-0.25 ° C (30-45	% RH)   Electron	ic CAL (Lab	112)	23.0 ° +/-1.0	°C (20-50% RH)			
Phys	/Dim CAL (Lab	111) 20.0°+	-/-0.5 ° C (20-50%	( RH)   Remaini	ing S&CL cali	bration	areas: 23.0 ° +5,-3.0	0 ° C (20-50% RH)			
Manufac	turer's environ	nental specifical	ions are evaluated	l for conformance wh	en calibratio	os are (	performed outside the	above stated conditions.			
NOMINA	L (STD)	OUT (	OF TOLERANCE UNITS	CONDITIONS FOL	AS FO			MFG. ACCURACY			
		<u></u>		<del></del>							
		<u> </u>		· .							
				COMMENT	5		,				

Nominal: 0.846 lb

Tolerance: +/- 0.50 lb

As-found data: 0.883 lb

Uncertainty of Standards Used: +/- 0.722 g (+/- 0.00159 lb)

Note: Nominal value was determined by the average weight from the initial calibration values for the (1 lb) links.