2. To: (Receiving Organization)
Characterization & Interim Stabilization Engineering

3. From: (Originating Organization)
BL Aftanas/COGEMA Engineering Corporation

4. Related EDT No.:
N/A

5. Proj./Prog./Dept./Div.:
Characterization Project Operation

6. Design Authority/ Design Agent/Cog. Engr.:
CA Esvelt

7. Purchase Order No.:
N/A

8. Originator Remarks:
For review and approval

9. Equip./Component No.:
N/A

10. System/Bldg./Facility:
N/A


12. Major Assm. Dwg. No.:
N/A

13. Permit/Permit Application No.:
N/A

14. Required Response Date:
ASAP

---

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Document/Drawing No.</th>
<th>Sheet No.</th>
<th>Rev. No.</th>
<th>Title or Description of Data Transmitted</th>
<th>Approval Designator</th>
<th>Reason for Transmittal</th>
<th>Originator Disposition</th>
<th>Receiving Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HNF-3223</td>
<td>All</td>
<td>0</td>
<td>LDUA Software Custodian's Notebook</td>
<td>NA</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

15. DATA TRANSMITTED

16. KEY

<table>
<thead>
<tr>
<th>Reason for Transmittal</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Approval</td>
<td>1</td>
</tr>
<tr>
<td>2. Release</td>
<td>2</td>
</tr>
<tr>
<td>4. Review</td>
<td>4</td>
</tr>
<tr>
<td>5. Post-Review</td>
<td>5</td>
</tr>
<tr>
<td>6. Dist. (Receipt Acknow. Required)</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disposition (H) &amp; (I)</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Approved</td>
<td>1</td>
</tr>
<tr>
<td>2. Approved w/comment</td>
<td>2</td>
</tr>
<tr>
<td>3. Disapproved w/comment</td>
<td>3</td>
</tr>
<tr>
<td>4. Reviewed no/comment</td>
<td>4</td>
</tr>
<tr>
<td>5. Reviewed w/comment</td>
<td>5</td>
</tr>
<tr>
<td>6. Receipt acknowledged</td>
<td>6</td>
</tr>
</tbody>
</table>

17. SIGNATURE/DISTRIBUTION

<table>
<thead>
<tr>
<th>Reason for Approval Designator (F)</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Authority</td>
<td>1</td>
</tr>
<tr>
<td>Design Agent/BL Aftanas</td>
<td>2</td>
</tr>
<tr>
<td>Cog. Eng. CA Esvelt</td>
<td>3</td>
</tr>
<tr>
<td>QA</td>
<td>4</td>
</tr>
</tbody>
</table>

18. Signature of EDT Originator

19. Authorized Representative Date for Receiving Organization

20. Design Authority/ Cognizant Manager

21. DOE APPROVAL (if required)

Ctrl. No.  
[] Approved  
[] Approved w/comments  
[] Disapproved w/comments

BD-7400-172-2 (05/96) GEF097
LDUA SOFTWARE CUSTODIAN'S NOTEBOOK

B. L. Aftanas
COGEMA Engineering Corp., Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: 615768       UC: 2070
Org Code: 08E00       Charge Code: D25K2
B&R Code: EW3120074     Total Pages: 147

Key Words: arm, software, light duty utility arm, logbook, custodian

Abstract: This notebook records the software change requests and problem reports for the Light Duty Utility Arm robotic manipulation arm control software up to and including revision 1.0.7.

TRADEMARK DISCLAIMER. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

Printed in the United States of America. To obtain copies of this document, contact: Document Control Services, P.O. Box 950, Mailstop H6-08, Richland WA 99352, Phone (509) 372-2420; Fax (509) 376-4989.

Approved for Public Release

A-6400-073 (01/97) GEF321
LDUA
Software Custodian's Notebook
LDUA-SCN-97-001
LDUA
Software Custodian's Notebook

1. Software Configuration Management Plan ........................................... 1-1
2. Software Configuration Procedures ....................................................... 2-1
3. SDAS User Interface ............................................................................. 3-1
4. SDAS Server & Drivers .......................................................................... 4-1
5. Spar LDUA Console ............................................................................... 5-1
6. LDUA Position Client/Server ................................................................. 6-1
7. World Model .......................................................................................... 7-1
8. Software Change Notification Contact List ........................................... 8-1
9. LDUA Software Change Request/Problem Report Log .......................... 9-1
Software Configuration
Management Plan
**Engineering Data Transmittal**

2. **To:** (Receiving Organization)
   - Surveillance And Retrieval Technology
3. **From:** (Originating Organization)
   - Surveillance And Retrieval Technology
5. **Proj./Prog./Dept./Div.:**
   - 22920
6. **Cog. Eng.:**
   - G. R. Kiebel
7. **Purchase Order No.:**
   - N/A
8. **Originator Remarks:**
   - Approval/Release
11. **Receiver Remarks:**

<table>
<thead>
<tr>
<th>(A) Item No.</th>
<th>(B) Document/Drawing No.</th>
<th>(C) Sheet No.</th>
<th>(D) Rev. No.</th>
<th>(E) Title or Description of Data Transmitted</th>
<th>(F) Impact Level</th>
<th>(G) Reason for Transmittal</th>
<th>(H) Disposition</th>
<th>(I) Receiver Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WHC-SD-TD-SDP-001</td>
<td>0</td>
<td></td>
<td>Light Duty Utility Arm Software Development Plan</td>
<td>3SQ</td>
<td>1/2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Impact Level (F):**
- 1. Approval
- 2. Release
- 3. Information
- 4. Review
- 5. Post-Review
- 6. Inform

**Reason for Transmittal (G):**
- 1. Approved
- 2. Approved w/comment
- 3. Disapproved w/comment
- 4. Reviewed no/comment
- 5. Reviewed w/comment
- 6. Receipt acknowledged

**Signature/Distribution (See Impact Level for required signatures):**

<table>
<thead>
<tr>
<th>(J) Name</th>
<th>(K) Signature</th>
<th>(L) Date</th>
<th>(M) MSIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. K. Welty</td>
<td>(Signature)</td>
<td>(Date)</td>
<td>(MSIN)</td>
</tr>
</tbody>
</table>

**DOE APPROVAL (if required):**

- [ ] Approved
- [ ] Approved w/comments
- [ ] Disapproved w/comments

**Signature of EDT Originator:**

- [Signature]
  - [Date] 7/26/93

**Authorized Representative Date for Receiving Organization:**

- [Date] 7/26/93

**Cognizant/Project Engineer's Manager:**

- [Signature] R. C. Eschenbaum
  - [Date] 7/26/93
**INFORMATION RELEASE REQUEST**

**Purpose**
- [ ] Speech or Presentation
- [ ] Full Paper
- [ ] Summary
- [ ] Abstract
- [ ] Visual Aid
- [ ] Speakers Bureau
- [ ] Poster Session
- [ ] Videotape

**ID Number (include revision, volume, etc.)**
WHC-SD-TD-SDP-001, Rev. 0

**List attachments.**
N/A

**Date Release Required**
7/31/93

**Title**: Light Duty Utility Arm Software Development Plan

**Unclassified Category**: Unclassified

**Impact Level**: Q

**New or novel (patentable) subject matter?**
[ ] No  [x] Yes  Disclosure No(s):

**Trade secrets, and/or inventions?**
[ ] No  [x] Yes  Identify:

**Copyrights?**
[ ] No  [x] Yes  Attached permission:

**Trademark?**
[ ] No  [x] Yes  Identify:

**Complete for Speech or Presentation**

**Title of Conference or Meeting**: N/A

**Group or Society Sponsoring**: N/A

**Date(s) of Conference or Meeting**: N/A

**City/State**: N/A

**Title of Journal**: N/A

**CHECKLIST FOR SIGNATURES**

**Reviewer - Signature Indicates Approval**

<table>
<thead>
<tr>
<th>Name (printed)</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>H. Toffer</td>
<td>H. Toffer</td>
<td>9/22/93</td>
</tr>
<tr>
<td>S. W. Berglin</td>
<td>S. W. Berglin</td>
<td>10/15/93</td>
</tr>
<tr>
<td>J. D. Watrous</td>
<td>J. D. Watrous</td>
<td>9/29/93</td>
</tr>
<tr>
<td>R. C. Eschenbaum</td>
<td>R. C. Eschenbaum</td>
<td>9/29/93</td>
</tr>
<tr>
<td>W. R. Whittington</td>
<td>W. R. Whittington</td>
<td>10/15/93</td>
</tr>
<tr>
<td>D. E. Trader</td>
<td>D. E. Trader</td>
<td>10/15/93</td>
</tr>
<tr>
<td>D. J. Hastings</td>
<td>D. J. Hastings</td>
<td>10/15/93</td>
</tr>
<tr>
<td>V. Fitzpatrick</td>
<td>V. Fitzpatrick</td>
<td>10/30/93</td>
</tr>
</tbody>
</table>

**Information conforms to all applicable requirements.**

**INFORMATION RELEASE ADMINISTRATION APPROVAL STAMP**

Stamp is required before release. Release is contingent upon resolution of mandatory comments.

**References Available to Intended Audience**

**Transmit to DOE/HQ/Office of Scientific and Technical Information**

**Author/Requester (Printed/Signature)**

**Intended Audience**
- [X] External

**Responsible Manager (Printed/Signature)**

**Date Cancelled**: 9/20/93

**Date Disapproved**: 9/20/93
**SUPPORTING DOCUMENT**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Duty Utility Arm Software Development Plan</td>
<td>WHC-SD-TD-SDP-001</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. Key Words</th>
<th>6. Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDUA Development Plan</td>
<td>G. R. Kiebel/T. J. Samuel</td>
</tr>
<tr>
<td>Computer Software Design Description (CSDD)</td>
<td></td>
</tr>
<tr>
<td>Computer Software Requirements Specification (CSRS)</td>
<td></td>
</tr>
<tr>
<td>V&amp;V Report</td>
<td></td>
</tr>
</tbody>
</table>

**APPROVED FOR PUBLIC RELEASE**

<table>
<thead>
<tr>
<th>7. Abstract</th>
</tr>
</thead>
<tbody>
<tr>
<td>This plan describes the activities to be performed and controls to be applied to the process of specifying, obtaining, and qualifying the control and data acquisition software for the LDUA System. It serves the purpose of a software quality assurance plan, a verification and validation plan, and a configuration management plan.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8. PURPOSE AND USE OF DOCUMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9. Impact Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>3SQ</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10. RELEASE STAMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFFICIAL RELEASE BY WHC</td>
</tr>
<tr>
<td>DATE OCT 20 1993</td>
</tr>
<tr>
<td>Sta. 21</td>
</tr>
</tbody>
</table>

**DISCLAIMER** - This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.
# LIGHT DUTY UTILITY ARM SOFTWARE DEVELOPMENT PLAN

## Table of Contents

1.0 PURPOSE .................................................................................. 1

2.0 SCOPE .................................................................................... 1

3.0 INTRODUCTION  
   3.1 DESCRIPTION OF LDUA AND ITS MISSION ......................... 1
   3.2 QUALITY GOALS .................................................................. 2
   3.3 DESCRIPTION OF THE DEVELOPMENT PROCESS  
       3.3.1 CONCEPT .................................................................. 3
       3.3.2 REQUIREMENTS ............................................................ 3
       3.3.3 DESIGN ........................................................................ 3
       3.3.4 IMPLEMENTATION ......................................................... 4
       3.3.5 TESTING ..................................................................... 5

4.0 TERMINOLOGY  
   4.1 ACRONYMS ....................................................................... 5
   4.2 DEFINITIONS ........................................................................ 6

5.0 LDUA SOFTWARE LIFE CYCLE  
   5.1 DESCRIPTION OF LIFE CYCLE ............................................. 6
   5.2 CATEGORIES OF SOFTWARE ............................................... 7
   5.3 LIFE CYCLE ACTIVITIES ..................................................... 9
   5.4 LIFE CYCLE DELIVERABLES ............................................... 10
   5.5 VERIFICATION AND VALIDATION (V&V) ......................... 11
   5.6 SCHEDULING THE LDUA LIFE CYCLE ............................... 12

6.0 DELIVERABLES  
   6.1 COMPUTER SOFTWARE REQUIREMENTS SPECIFICATION (CSRS) 12
   6.2 COMPUTER SOFTWARE DESIGN DESCRIPTION (CSDD) ........ 13
   6.3 USER DOCUMENTS ............................................................. 13
   6.4 SOFTWARE TESTING DOCUMENTS .................................... 14
   6.5 USER TRAINING ................................................................. 15
   6.6 COMPUTER SOFTWARE ..................................................... 15
   6.7 VERIFICATION AND VALIDATION (V&V) REPORT ............ 15
   6.8 VERIFICATION AND VALIDATION (V&V) RECORDS ........... 15

7.0 VERIFICATION AND VALIDATION  
   7.1 VERIFICATION METHODS .................................................... 16
       7.1.1 INDEPENDENT REVIEWS .......................................... 16
       7.1.2 CODE EVALUATION .................................................... 17
       7.1.3 PROTOTYPE SOFTWARE ............................................. 17
       7.1.4 SOFTWARE COMPONENT TESTING ............................ 18
   7.2 VALIDATION TESTING ........................................................ 18

1-5
LIGHT DUTY UTILITY ARM SOFTWARE DEVELOPMENT PLAN

1.0 PURPOSE

This plan describes the activities to be performed and controls to be applied to the process of specifying, obtaining, and qualifying the control and data acquisition software for the Light Duty Utility Arm (LDUA) System. It serves the purpose of a software quality assurance plan, a verification and validation plan, and a configuration management plan.

2.0 SCOPE

This plan applies to all software that is an integral part of the LDUA control and data acquisition system, that is, software that is installed in the computers that are part of the LDUA system as it is deployed in the field. This plan applies to the entire development process, including: requirements; design; implementation; and operations and maintenance. This plan does not apply to any software that is not integral with the LDUA system.

This plan has been prepared in accordance with WHC-CM-6-1 "Engineering Practices", EP-2.1 (Ref. 2), WHC-CM-3-10 "Software Practices" (Ref. 3), and WHC-CM-4-2, QR 19.0, "Software Quality Assurance Requirements" (Ref 1).

3.0 INTRODUCTION

3.1 DESCRIPTION OF LDUA AND ITS MISSION

The mission of the LDUA is to perform surveillance and characterization operations in support of the U.S. Department of Energy (DOE) goal of remediation of defense nuclear wastes currently stored in Hanford Underground Storage Tanks (USTs). The LDUA has a multi-axis robotic arm with a 2.74 meter (nine foot) reach and 22.7 kilogram (fifty pound) payload that is mounted on the end of a 13.7 meter (forty-five foot) positioning mast. It is designed to enter an UST through an available 30.5 centimeter (twelve inch) riser. A deployment vehicle carries the positioning equipment to insert the mast and arm into the
riser, and a containment enclosure to control contamination when the arm is in the tank or being transported from tank to tank. Interchangeable end effectors are mounted one at a time on the end of the arm. These end effectors provide a wide range of observation and measurement functions such as photographic and video inspection and recording, detailed surface mapping of the tank and surface of the waste, in-situ chemical analysis of the waste, and so forth. A control and data acquisition system provides both stand-alone operation of subsystems and a supervisory level of control for integrated operations.

The LDUA System will be implemented in successive stages, or missions: Mission one is mostly concerned with surveillance activities; mission two is involved with in-situ analysis of the waste; and mission three is concerned with depth penetration of the waste with possible small scale retrieval of samples.

The LDUA system is being implemented by a consortium DOE contractors from several DOE sites and National Laboratories. These contractors are individually funded by and responsible to the DOE Office of Technology Development (OTD) through multiple Technical Task Plans (TTPs). These TTPs interlock and effectively establish a cooperative arrangement with Westinghouse Hanford Company (WHC) as the lead site responsible for coordination of the effort, for taking ownership of the completed system, and for assuring that it is qualified for deployment into Hanford USTs. The LDUA system is divided into several subsystems; generally speaking, each contractor is responsible for one or more subsystems. Commercial companies are also involved as third party participants under direct contractual relationships with one or more of the DOE contractors.

3.2 QUALITY GOALS

An important goal of the finished LDUA system is to demonstrate advanced robotic technology that can be of benefit to the tank waste remediation effort. This technology is emerging from a research and development effort by OTD and is ready to become commercially supported; the LDUA will provide the pilot system to encourage and stimulate this commercial development.

However, the LDUA system must be fully qualified to deploy into underground storage tanks and function as an operational system; no compromise in safety, reliability, or maintainability can be made for the sake of the technology demonstration. The system must be capable of being operated by Hanford operations personnel. The system must also be flexible and expandable in order to accommodate lessons learned from actual tank deployment, and to support new surveillance and characterization end effectors.

These goals have been used as the basis for choosing the quality assurance provisions of this plan.
3.3 DESCRIPTION OF THE DEVELOPMENT PROCESS

3.3.1 Concept

The concept for the LDUA and its control system has evolved through previous work within OTD within the Robotics Technology Development Program (RTDP) and the Underground Storage Tank - Integrated Demonstration (UST-ID) program. The control system concept has been reviewed for suitability to LDUA by means of a Value Engineering session. Functional requirements for the LDUA system have been further refined by a series of meetings with the tank farm operations organizations (notably, Tank Surveillance Technology). A functions and requirements document is being prepared for the LDUA system which includes requirements for the control and data acquisition system.

3.3.2 Requirements

From the LDUA system functions and requirements, a Computer Software Requirements Specification (CSRS) document shall be produced by WHC. The CSRS is a detailed specification for the LDUA software. There shall be a single CSRS for the LDUA and it shall apply to the integrated system, but it shall be organized by subsystem. It shall be verified by a review that is co-incident with, or related to, the LDUA system Conceptual Design Review. The LDUA software shall be validated against the CSRS by means of formal validation testing at the end of the development process.

Certain features of the system, such as the human-machine interface (HMI), may be prototyped during this process to help establish requirements.

3.3.3 Design

Next, the design process shall break the LDUA software into its software components. The functional specification and interfaces for these components shall be defined, and the method of implementation shall be selected. Software components shall be classified into pre-defined categories that are based primarily on the method of implementation. The responsibility for producing each of the software components shall rest with the software component supplier, which will be a member of the DOE consortium or a commercial vendor under contract to such a member.

A Computer Software Design Description (CSDD) shall be prepared by WHC. Certain software component suppliers may be called upon for technical aid in this effort. The CSDD shall describe the integrated LDUA software in terms of its breakdown into the software components and their interfaces. It shall be verified at a preliminary stage of completion by a review that is related to the LDUA system 25% design review, and verified at completion by a review.
that is related to the LDUA system 80% design review. User documents shall be also be reviewed at this point in draft form.

Software components in certain categories may require further design effort by the supplier, which shall break the component down into its constituent modules. Such designs shall be appended to the CSDD. Verification of these designs shall be done by a review on a per-component basis.

Certain features of a software component, such as the human-machine interface (HMI), may be prototyped during this process to help establish design details.

3.3.4 Implementation

After the design is approved, each software component shall be implemented by the supplier according to its category. The supplier may purchase commercial software, modify existing RTDP software, or program new software. Newly created software and existing RTDP software shall be required to comply with coding and documentation standards; this may require that modifications be made to the existing RTDP software.

WHC shall produce an overall Software Operation Manual that applies to the integrated system. Software component suppliers shall provide appropriate technical reference documents according to the category of the software component and the nature of the end user. For example, software components that are only seen by a programmer would have an application program interface (API) description, whereas those that had an interface with an operator would have an operating manual. A software maintenance manual must be provided for any software components that become the responsibility of WHC to maintain after delivery, or that have the potential to become the responsibility of WHC.

An implementation review shall be conducted to verify that finished software component meets its design requirements, that it complies with applicable coding standards, and the required documentation is available and acceptable. Some categories of software component shall also have component testing performed prior to the review. This would be accomplished by execution of a test suite provided by the software component supplier. WHC may perform code evaluations on key modules within software components at any time during the implementation of the software component.

WHC shall produce the Testing Documents, which shall be used for validation testing of the finished LDUA software. For certain categories, software component suppliers shall provide test cases applicable to their software.
3.3.5 Testing

After implementation is complete, the software components shall be integrated into the LDUA system which will be set up in the cold test facility at WHC, and validation testing shall then be done according to the procedures and provisions described in the Testing Documents. When testing is complete, all of the verification records (results of various reviews, evaluations, and component tests) and the validation records (results of the validation testing) shall be collected and issued by WHC, and a Verification and Validation Report (V&V Report) shall be prepared by WHC. A review shall be held to evaluate the records and the report.

A software component shall be placed under WHC configuration management upon acceptance for integration. The supplier must furnish a software component in a format compatible with WHC configuration management. Change control shall be under the authority of the WHC cognizant engineer during integration, but the supplier shall be responsible for performing any modifications to the code. Turnover of a software component from the supplier to WHC shall occur when all software components have been successfully integrated into the LDUA system. Change control shall transfer to WHC Document Control according to WHC standard engineering practices when validation testing begins.

The CSRS, CSDD, Testing Documents, Software Operation Manual, and V&V Report shall be the responsibility of WHC and shall be released and controlled according to WHC standard engineering practices for supporting documents. Technical reference manuals shall be the responsibility of the software component supplier and shall be maintained in the LDUA project file. All other documentation shall be entered into the LDUA project file.

4.0 TERMINOLOGY

4.1 ACRONYMS

API: Application Program Interface
CDR: Conceptual Design Review
CSDD: Computer Software Design Description
CSRS: Computer Software Requirements Specification
DDR: Detail Design Review
DOE: U.S. Department of Energy
4.2 DEFINITIONS

**Computer Software Media.** Is the different kinds of tapes, discs, etc. used by the computer for storing and retrieving software (Ref. 2).

**Computer Software.** Computer programs, procedures, and possibly associated documentation and data pertaining to the operation of a computer system. (IEEE Std. 729-1983, Ref. 7).

**Configuration Management.** The process of identifying and defining the configuration items in a system, controlling the release and change of these items throughout the system life cycle, recording and reporting the status of configuration items and change requests, and verifying the completeness and correctness of configuration items (IEEE Std. 729-1983, Ref. 7).

**Software Life Cycle.** The period of time that starts when a software product is conceived and ends when the product is no longer available for use (IEEE Std. 729-1983, Ref. 7).

**Validation.** The process of evaluating software at the end of the software development process to ensure compliance with software requirements (IEEE Std. 729-1983, Ref. 7).
Verification. The process of determining whether or not the products of a given phase of the software life cycle fulfill the requirements established during the previous phase. The act of reviewing, inspecting, testing, checking, auditing, or otherwise establishing and documenting whether or not items, processes, services, or documents conform to specified requirements (IEEE Std. 729-1983, Ref. 7).

5.0 LDUA SOFTWARE LIFE CYCLE

5.1 DESCRIPTION OF LIFE CYCLE

The development process described in section 3.3 is based on a software life cycle model. As suggested in section 3.3, the LDUA life cycle model consists of the following 5 phases:

- Requirements Phase
- Design Phase
- Implementation Phase
- Testing Phase
- Operation and Maintenance Phase

This software life cycle is based upon WHC-CM-3-10, SP 1.1 (Ref. 3) and IEEE Software Engineering Standard 1012-1986, "IEEE Standard for Software Verification and Validation Plans".

5.2 CATEGORIES OF SOFTWARE

Categories have been established for software components. The categories depend mostly on the method of obtaining the software component.

A. **Standard Commercial**: This category of software is available off the shelf in the open market and is fully supported by the vendor.

B. **Special Commercial**: This category of software is supplied by a commercial vendor, but it is either not an off-the-shelf product or is not supported by the vendor.

C. **Existing RTDP**: This is software which has been developed under the RTDP; it typically embodies technology not yet available in marketplace, but which has been judged to be essential to LDUA.
D. **Application Specific:** This is software which will be developed new by WHC or one of the other DOE contractors in the consortium.

The provisions of this plan apply differently to software in each of the categories. Such differences are noted throughout the plan.
### 5.3 LIFE CYCLE ACTIVITIES

<table>
<thead>
<tr>
<th>PHASE</th>
<th>ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>Establishes detailed requirements for the integrated software from the LDUA system function and requirements. An outline test plan shall be produced at the same time as the CSRS in order to help assess the testability of the CSRS.</td>
</tr>
<tr>
<td>Design</td>
<td>Translates the detailed requirements into a computer software design description, which is a description the integrated software that shows its breakdown into software components and describes their function and interfaces. Additional design work may be done for some categories of software components that shall break them down into their constituent modules.</td>
</tr>
<tr>
<td>Implementation</td>
<td>Produces working software components from the design description. The method of implementation depends on the software component category (see section 5.2).</td>
</tr>
<tr>
<td>Testing</td>
<td>Integrates software components into the LDUA system in the cold test facility. Software is placed under WHC configuration management at beginning of Testing Phase. During the integration period, change control is under control of LDUA Control System Cognizant Engineer. Turnover from supplier to WHC occurs at the transition from integration to formal testing. Validates the software by formal testing of the complete system according to validation testing procedures. Change control is under WHC Document Control procedures at this point.</td>
</tr>
<tr>
<td>Operations and Maintenance</td>
<td>Uses software for its intended purpose. Residual errors are removed and enhancements may be added during the useful life of the software.Ownership of the LDUA system is transferred from engineering to operations.</td>
</tr>
</tbody>
</table>
### 5.4 LIFE CYCLE DELIVERABLES

<table>
<thead>
<tr>
<th>PHASE</th>
<th>DELIVERABLES</th>
<th>RESP.</th>
<th>SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>Computer Software Requirements Spec.</td>
<td>WHC</td>
<td>6.1</td>
</tr>
<tr>
<td></td>
<td>Software Testing Documents:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Software Test Plan (outline)</td>
<td>WHC</td>
<td>6.4</td>
</tr>
<tr>
<td>Design</td>
<td>Computer Software Design Description</td>
<td>WHC,B,C,D</td>
<td>6.2</td>
</tr>
<tr>
<td></td>
<td>- Contributions by supplier</td>
<td>B,C,D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- SW Component Design Description</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>User Documents (draft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Software Operation Manual</td>
<td>WHC</td>
<td>6.3</td>
</tr>
<tr>
<td></td>
<td>- Technical Reference Documents²</td>
<td>A,B,C,D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Software Testing Documents:</td>
<td>WHC</td>
<td>6.4</td>
</tr>
<tr>
<td></td>
<td>- Software Test Plan (draft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Software Test procedures (outline)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Software Test Specifications (draft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implementation</td>
<td>User Documents</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Software Operation Manual</td>
<td>WHC</td>
<td>6.3</td>
</tr>
<tr>
<td></td>
<td>- Technical Reference Documents²</td>
<td>A,B,C,D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computer Software</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Software Component Test Suite</td>
<td>B,C,D</td>
<td>6.6</td>
</tr>
<tr>
<td></td>
<td>Software Testing Documents:</td>
<td>WHC</td>
<td>6.4</td>
</tr>
<tr>
<td></td>
<td>- Software Test Plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Software Test procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Software Test Specifications</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>User Training</td>
<td>(all)</td>
<td>6.5</td>
</tr>
<tr>
<td>Testing</td>
<td>Verification and Validation Report</td>
<td>WHC</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td>Verification and Validation Records</td>
<td>(all)</td>
<td>6.8</td>
</tr>
<tr>
<td>Operating and Maintenance</td>
<td>(modifications repeat the same process as above and will generate the same deliverables, as appropriate)</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

1. Responsibility for deliverable is denoted as follows:
   - WHC = Westinghouse Hanford;
   - A, B, C, or D = Supplier of the software component (refer to section 5.2).

2. Technical Reference Documents may include:
   - Operating Manual for software component
   - API description
5.5 VERIFICATION AND VALIDATION (V&V)

<table>
<thead>
<tr>
<th>PHASE</th>
<th>VERIFICATION AND VALIDATION ACTIVITY</th>
<th>RESP$^1$</th>
<th>SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>Software Requirements Review</td>
<td>WHC</td>
<td>7.1.1</td>
</tr>
<tr>
<td></td>
<td>Prototype Software (optional)</td>
<td>D</td>
<td>7.1.3</td>
</tr>
<tr>
<td>Design</td>
<td>Software Design Review</td>
<td>WHC</td>
<td>7.1.2</td>
</tr>
<tr>
<td></td>
<td>Prototype Software (optional)</td>
<td>D</td>
<td>7.1.3</td>
</tr>
<tr>
<td>Implementation</td>
<td>Preparation of Test Cases</td>
<td>WHC</td>
<td>7.2.2</td>
</tr>
<tr>
<td></td>
<td>Software Implementation Review</td>
<td>WHC</td>
<td>7.1.1</td>
</tr>
<tr>
<td></td>
<td>Software Component Testing</td>
<td>B,C,D</td>
<td>7.1.4</td>
</tr>
<tr>
<td></td>
<td>Code Evaluation (optional)</td>
<td>WHC</td>
<td>7.1.2</td>
</tr>
<tr>
<td>Testing</td>
<td>Validation Testing</td>
<td>WHC</td>
<td>7.2.1</td>
</tr>
<tr>
<td></td>
<td>Verification &amp; Validation Review</td>
<td>WHC</td>
<td>7.1.1</td>
</tr>
<tr>
<td>Operations and</td>
<td>(any of the above, as appropriate)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Each of these activities shall be documented. The accumulated set of these documents plus the Verification and Validation Report shall constitute the V&V Records (refer to Section 6.8)

$^1$ Responsibility for activity is denoted as follows:

WHC = Westinghouse Hanford;
A, B, C, or D = Supplier of the software component (refer to section 5.2).
5.6 SCHEDULING THE LDUA LIFE CYCLE

A project schedule has been established for the LDUA system. The software activities and deliverables specified in this plan shall be synchronized to the key milestones in that schedule according to the guidelines given below:

<table>
<thead>
<tr>
<th>PHASE</th>
<th>RELATED LDUA SYSTEM MILESTONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>The Requirements Review shall coincide with the LDUA Conceptual Design Review (CDR). This will end the Requirements Phase.</td>
</tr>
<tr>
<td>Design</td>
<td>A preliminary level of the CSDD shall be reviewed at the LDUA 20% Detail Design Review (PDR). The Design Review of the finished CSDD shall coincide with the LDUA 80% Detail Design Review (DDR). Design reviews of individual software components may occur subsequent to DDR.</td>
</tr>
<tr>
<td>Implementation</td>
<td>The Implementation Phase will end when the software is accepted for integration into the LDUA system at the beginning of LDUA cold test.</td>
</tr>
<tr>
<td>Testing</td>
<td>The Testing Phase will exactly overlap LDUA cold testing.</td>
</tr>
<tr>
<td>Operations and</td>
<td>The Operations and Maintenance Phase will begin when LDUA cold testing is finished and the LDUA system has been accepted by tank farm operations.</td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
</tr>
</tbody>
</table>

6.0 DELIVERABLES

6.1 COMPUTER SOFTWARE REQUIREMENTS SPECIFICATION (CSRS)

The CSRS is a complete and exact description of the functions that the software is expected to perform. It shall be the basis of both design and validation testing and it shall derive from the LDUA system functions and requirements.

There shall be one CSRS for the LDUA software which shall apply to the integrated system. It shall be structured so that each subsystem is sufficiently independent to facilitate selective design, implementation, and testing to accommodate the phased LDUA missions (see discussion in section 3.1).
6.2 COMPUTER SOFTWARE DESIGN DESCRIPTION (CSDD)

The CSDD shall describe the design of the LDUA software in terms of its decomposition into software components. It shall describe the functions of individual software components and the interfaces between them. There shall be a single CSDD and it shall address the LDUA software as an integrated system. Its primary purpose shall be to assure that each software component is well enough defined so that its supplier can produce it with high confidence of success, and that it will integrate into the finished system, and that the resulting integrated system will meet the functional requirements.

A typical decomposition is hierarchical and begins at the top level by showing the execution units (processes, tasks, programs, etc.) and their intercommunication. The subsequent levels of decomposition break each process into modules (subprograms, functions, objects, etc). Structure Charts (Ref. 6) are one appropriate decomposition format for traditional procedural languages such as C. Alternate or additional decomposition strategies (such as object class hierarchies) can be used where they are more appropriate. The LDUA Control System Cognizant Engineer (see section 8.0) shall approve the methods used.

Certain software components, notably those in category D (Application Specific), may need to be further decomposed to some level. The decomposition need not go down to the most detailed levels, but only needs to establish a correct fundamental structure for the code so that it will not have to be significantly re-structured during the coding phase. The required level of decomposition of the design of each software component shall be recommended by the Lead Software engineer and shall be approved by the LDUA Control System Cognizant Engineer (see section 8.0).

6.3 USER DOCUMENTS

The Software Operation Manual describes how to use the integrated LDUA software for its intended purpose, and how to recover from operational errors. There shall be a single such manual for the LDUA. It shall be prepared in draft form during the Design Phase and shall be completed during the Implementation Phase to a degree that facilitates integration and validation testing of the software. It is expected that some revision may take place during the Testing Phase.

This document shall have a section organized according to the normal tasks a user would perform with the system, a section organized as a reference for menus and displays, and a section organized as a tutorial for inexperienced users. During the Design Phase, the reference section would be the most complete, and the other sections would be sketchy. Since the supervisory control system will be based on a graphic user interface (GUI)
with pull-down or pop-up menus and dialogue boxes, it is expected that the reference section will consist mostly of pictures of display windows (screen dumps) with accompanying descriptions.

The suppliers of software components shall be responsible for providing one or more Technical Reference Documents for each software component. These documents will vary according to the category of the software component and according to the nature of its user.

- An Operating Manual shall be supplied with the software component if it has an interface with an operator.
- An Application Program Interface (API) Description shall be supplied with the software component if it has an interface that a programmer would be expected to use.
- All software components in categories C (Existing RTDP) and D (Application Specific), and maybe some in category B (Special Commercial), shall be supplied with a Software Maintenance Manual. This document shall include whatever is necessary to enable WHC software support staff to isolate and correct mistakes in the software component. It may include items such as program listings, structural diagrams, explanatory text, and so forth.

The standard user documentation provided by the vendor will be acceptable for category A (Standard Commercial) software components. For category B (Special Commercial) software components it shall be desirable to obtain as many items from the list as possible, subject to the vendor's ability to provide them and the procurement contract with the vendor.

All Technical Reference Documents to be supplied must be available at least in draft form during the Design Review, and must be completed during the Implementation Phase.

### 6.4 SOFTWARE TESTING DOCUMENTS

The complete set of Software testing documents consists of a test plan, test procedures, and test specifications, as defined by EP-4.2 (Ref 2). For the Requirements Phase, only the outline of the test plan is required in draft form in order to help assess the testability of the CSRS. For the Design Phase, the full set of Software Testing Documents is produced, but in a preliminary and incomplete form which only need support the software implementation effort: Software Test Plan (draft); Software Test procedures (outline); Software Test Specifications (draft). For the Testing phase, the full set of Software Testing Documents is completed. These documents shall include or reference the test cases prepared with the code.
6.5 USER TRAINING

Training must be available from the supplier of each software component for WHC technical staff before the Testing Phase begins. LDUA Control System Cognizant Engineer (see section 8.0) may waive the requirement for training by the supplier for software components where the Technical Reference Documents are sufficient. WHC technical staff shall subsequently train operations organizations.

6.6 COMPUTER SOFTWARE

Computer software includes computer codes, command files, configuration description files, and data directly related to the operation of computer systems. It includes source, object, and executable formats, and data in its multiple forms such as binary and text files, and database tables. Software shall conform to LDUA software coding standards (to be established by the LDUA Control System Cognizant Engineer (see section 8.0) in a future document). It shall be turned over to WHC from the supplier in such a form that it can be placed under configuration management as described in section 9.0.

6.7 VERIFICATION AND VALIDATION (V&V) REPORT

The Verification and Validation Report summarizes all the V&V activities which have been performed upon all the software components during the life cycle and explains how the results of these activities prove the acceptability of the LDUA integrated software.

6.8 VERIFICATION AND VALIDATION (V&V) RECORDS

Verification and validation records are the collected, documented results of all the V&V activities which have been performed on all the software components. This includes:

- Independent review reports
- Design review completion reports
- Test results and test reports
- Verification and Validation Report.
7.0 VERIFICATION AND VALIDATION

The verification and validation (V&V) provisions of this plan identify and describe those software development activities (summarized in Section 5.5) whose primary purpose is to establish confidence and to provide objective evidence that the software adequately and correctly performs all its required functions and does not have harmful or unacceptable behavior. Verification refers to the process of evaluating the products of a single phase of the life cycle against the inputs to that phase. Validation refers to objectively testing the finished software product against the CSRS. The V&V activities are integrated into the software development process during all phases of the life cycle.

7.1 VERIFICATION METHODS

Verification activities shall consist of independent reviews, formal design reviews, code evaluations, and software component testing. Prototype software may be used optionally as an adjunct to these activities at the discretion of the Lead Software Engineer (see section 8.0). Section 5.5, and the detail sections it references, establish the minimum verification activities required, and suggest additional activities which may be performed for individual software components at the discretion of the LDUA Control System Cognizant Engineer.

7.1.1 Independent Reviews

Independent reviews shall be conducted by reviewers who are competent individuals other than those responsible for the design being reviewed. The primary materials reviewed shall be one or more of the deliverables for the life cycle phase in which the review is performed. The function of the review shall be to establish that the reviewed materials adequately satisfy the requirements of the baseline documents which were input to the life cycle phase. A written report of the review will be prepared and comments and action items from the review will be entered into and tracked by the LDUA project comment database.

Independent reviews shall be conducted according to EP-4.1 (Ref 2). All reviews shall be documented as part of the V&V Records. The specific reviews required are:

- **Software Requirements Review** is conducted at the end of the Requirements Phase to assure that the requirements stated in the CSRS are adequate, technically feasible, and complete, and that they accurately conform to the functions and requirements for the associated LDUA system. The
Software requirements review is part of the preliminary design review of its LDUA subsystem.

- **Software Design Review** -- The Software Design Review evaluates the technical adequacy, completeness, and correctness of the detailed design before the start of actual coding. Evaluates the acceptability of the detailed design depicted in the computer software design description, establish that the detailed design satisfies the requirements of the CSRS, and review compatibility with other software and hardware with which the software component is required to interact. There shall be a preliminary design review and a final design review. They shall be coordinated with the LDUA project schedule as noted in section 5.6.

- **Software Implementation Review** -- The Software Implementation Review is an evaluation of the completed software, user documents, and test documents to determine: 1) Software is complete and satisfies computer software design description or purchase specifications, and is ready to begin integration for validation testing; 2) User documents are complete and correct enough to enable testers to use product in testing; and 3) Testing documents are complete and adequate for Testing Phase to begin. The results of any software component testing (see section 7.1.4) shall also be reviewed.

- **V&V Review** -- The software verification and validation review is an evaluation of the adequacy of the completed software verification and validation activities and the Verification and Validation Report. It is performed at the end of the Testing Phase.

### 7.1.2 Code Evaluation

Code evaluation is a set of procedures and error-detection techniques for reading of code by a group of people. The two types of code evaluation which may be used for LDUA software are **Code Inspections** or **Code Walkthroughs**. These techniques are described in chapter 3 of Myers (Ref. 5). These may be performed on selected modules within a category C (Existing RTDP) or D (Application Specific) software component by WHC at the discretion of the LDUA Control System Cognizant Engineer (see section 8.0).

### 7.1.3 Prototype Software

Prototype software mimics some aspects of the actual software which is being developed. Its purpose is to provide users and other parties affected by the software a chance to acquire some "hands on" experience with the proposed software in order to make informed comment and assure that the requirements and design for the proposed software well and truly address the needs of the application. Prototype software is also useful for assessing the human factors provisions of the human-machine interface (HMI).
Prototype software shall be implemented quickly and cheaply; it need not be complete nor durable, nor must it be maintained beyond its initial use. Prototype software need not itself be developed according to this development plan: that is, it need not follow the software life cycle, it need not be formally reviewed, and it need not be released. However, it shall be subject to configuration control (see Section 9).

7.1.4 Software Component Testing

For category B (Special Commercial), C (Existing RTDP), and D (Application Specific) software components, testing occurs at the end of implementation phase to show that a software component meets its design requirements and is ready to integrate for cold test. This testing is accomplished by a test suite of software provided by supplier of the software component. This test suite is not the same as the validation testing described in section 7.2; the test suite is only concerned with the software component, whereas validation testing is concerned with the integrated LDUA software.

7.2 VALIDATION TESTING

7.2.1 Software Validation Testing

Software Validation Testing is the process of testing the software to prove that it meets original specifications as defined in the CSRS. Validation testing shall occur during the testing phase of the software life cycle and shall be the key vehicle for bringing the software into commission for operations. The software will be installed into its LDUA system and the complete system will then be tested.

Validation testing shall be planned and conducted in accordance with the provisions of the LDUA test plan (to be established in the future) and EP-4.2 (Ref 2).

Validation Testing shall consist of subjecting the integrated LDUA software to all its test cases (see section 7.2.2); the inputs defined by each test case shall be applied and the responses of the software under test shall be captured and evaluated against the expected results also defined in each test case.

7.2.2 Test Case Preparation

As described in section 7.2.1, validation testing is defined by a set of test cases; each test case contains a set of inputs to be applied to the software, a set of expected results, and a description of the environment in
which the test case is to be applied. Test cases for software component shall be developed at the same time that it is being designed and coded, and the preparation is considered part of the verification process. Test cases shall be part of the software testing documents (refer to section 6.4).

Test cases shall be based upon the CSRS. A minimum set of test cases would exercise all the primary functions of the software as defined strictly by its externally specified behavior ("black box" testing). Where the source code to a software component is available, additional test cases can be created based upon the knowledge of the internal structure and details of the code ("white box" testing).

8.0 RESPONSIBILITIES

LDUA Control System Cognizant Engineer -- The LDUA Control System Cognizant Engineer shall interpret how this software development plan is applied to the integrated system and to each software component and shall coordinate and approve work of software component suppliers. He or she shall also determine whether a piece of software is integral to the LDUA system and therefore covered by this plan.

Lead Software Engineer -- The Lead Software Engineer shall have responsibility for producing one or more software components, and will typically be a member of the software component supplier's staff. The Lead Software Engineer shall assure that the software component is properly acquired and controlled according to this software development plan according to guidelines established by the LDUA Control System Cognizant Engineer. Specific responsibilities include: helping establish the functional requirements for software; making decisions on design issues; assuring that software developers comply with requirements of this software development plan; preparing documents; allocating and scheduling resources; and assuring that configuration management requirements are followed.

LDUA System Lead -- The LDUA system lead is responsible for overall direction and coordination of the LDUA system project, and shall be responsible for assuring that the software deliverables and schedule are acceptable with respect to the schedule and technical requirements of the LDUA system.

Cognizant Manager -- The Cognizant Manager shall be responsible for assuring that reviews and approvals appropriate to impact level are obtained for software and other configuration items. The WHC Technical Manager who is assigned responsibility for the LDUA shall be considered the Cognizant Manager.
Software Custodians -- Software Custodians shall be responsible for the physical custody of the software assigned to them. This shall involve control of access to the software, distribution to users, control of media, and physical protection, and other duties defined in Section 9.0 of this plan. The Software Custodian shall also be the single point of contact for problem reporting.

Quality Assurance -- WHC Quality Assurance is responsible for reviewing and approving software deliverables as noted in Section 10 of this plan.

Safety -- WHC Safety is responsible for reviewing and approving software deliverables as noted in Section 10 of this plan.

9.0 CONFIGURATION MANAGEMENT

This section of the plan identifies the items which are defined to be part of the configuration of the software and describes the process for controlling release and change of these configuration items.

Configuration items defined by this plan are the life cycle deliverables described in Section 5.4.

9.1 CONFIGURATION CONTROL OF DOCUMENTS

Documents that are defined in section 5.4 to be the responsibility of WHC shall be controlled as Supporting Documents. Other documents shall be the responsibility of the supplier of the software component, and two copies shall be furnished to WHC - one copy shall be maintained in the LDUA project file, the other copy shall be available for field reference. Where possible, the supplier shall provide an electronic copy of the documents to allow future update by WHC.

Supporting Documents shall be issued a supporting document number according to EP-1.1 (Ref 2). They shall be released via an Engineering Data Transmittal (EDT) form according to EP-1.6 (Ref 2). Changes to released supporting documents shall be controlled via an Engineering Change Notice (ECN) according to EP-2.2. (Ref.2)

Supporting Documents shall be released during the software life cycle phase in which they are created, unless they are noted as being in draft or outline form in Section 5.4. They may be presented in an unreleased form at the review which verifies them and then be released immediately following incorporation of comments from that review. Prior to release, the documents shall be controlled by the LDUA Control System Cognizant Engineer.
9.2 CONFIGURATION CONTROL OF SOFTWARE

9.2.1 Identification Of Software

The LDUA integrated software shall be issued a supporting document number according to EP-1.1 (Ref 2). A Computer Software Description (EP 2.1, section 5.3.2, Ref 2) bearing this number shall be prepared and maintained as the actual entity of release and change control. This document shall list: the identification and revision levels of all the software components which comprise the integrated software; the documents numbers and revision levels of related supporting documents; the name of the software custodian (see section 9.2.3) and identification of the software repositories (see section 9.2.2) which physically contain the software components; and a listing of identification and revision levels of all the modules that make up each software component.

Software components shall be controlled as computer files. These files may contain various kinds of data or program modules. Appropriate identifiers shall be assigned by the Lead Software Engineer to files, modules, and any separately identifiable parts of modules for category B (Special Commercial), C (Existing RTDP), or D (Application Specific) software components. All files, modules, and procedures shall carry their identifier so that it displays on listings and outputs, wherever this is practicable. The Lead Software Engineer shall maintain and control assignments of specific identifiers to software components.

The identifier for software components shall be further applied such that it is readily apparent in an appropriate format on the LDUA computer systems on which it resides. For example: Software file names, as they appear in the computer system file directories, should reflect the file identifier.

9.2.2 Physical Control Of Software

Computer software shall be physically controlled from a software repository. Software repositories shall be implemented on the standard file system for the computers which are used by the LDUA system. A directory structure shall be established for each repository that contains the files that make up a configuration of the software component. This directory structure shall be hierarchical and shall resolve to a single root directory for all the directories that contain the files for a single revision of the software component. Each revision of the software component shall be a complete stand-alone copy (as opposed to only the changes from an earlier revision). Archiving utilities can be used to contain revisions of the software so long as it is possible to reconstruct a verbatim copy from the archive, including the directory structure.
Access control to the repository shall be provided by the security feature of the computer system on which it is implemented. The Software Custodian for the repository shall assure that these security features are properly applied. Only one individual at a time shall be authorized to make modifications to a software component.

The software repository shall contain the master copy of a software component, and all application copies shall be made from the master copy. Backups of the contents of the software repository shall be made to assure protection from loss or damage. At least two separate backup copies of the repository shall be maintained at all times, and shall be kept in physically separated locations so as to prevent a single facility accident from destroying both copies.

Category A (Standard Commercial) software components (see section 5.2) are received on the manufacturer's standard distribution media (mag tape, floppy disk, etc), and are installed from that media onto the target computer. The distribution media shall be retained and controlled by the software custodian (see section 9.2.3) and shall serve the purpose of a software repository. Backup copies and copies for installation shall be controlled by the license agreement with the manufacturer and by WHC practices for use of commercial software.

Introduction of new software components or new versions of existing software component into the software repository are controlled. Refer to Section 9.2.4 for an explanation of these controls.

9.2.3 Software Custodian

The Software Custodian is the designated person who maintains control of and access to computer software and its media. The software custodian is responsible for the software repository and controls all access to it, all distributions of software from it, and all backups of it.

9.2.4 Release And Change Control Of Software

The LDUA software shall be released via an Engineering Data Transmittal (EDT) form according to EP-1.6 (Ref 2). Changes to released software shall be controlled via an Engineering Change Notice (ECN) according to EP-2.2 (Ref 2). The EDT and any ECNs shall be applied to the Computer Software Description (see section 9.2.1). The Lead Software Engineer shall deliver a copy of the approved EDT or ECN to the Software Custodian with media copies of the software itself. The Software Custodian shall then add the software from the media copy to the repository and log the change.

Prior to release, changes to the software shall be controlled by the LDUA Control System Cognizant Engineer or by the Lead Software Engineer (refer to
Section 8.0). This means that the Software Repository shall be established by the Lead Software Engineer when the first software components appear. Additions or changes to unreleased software within the repository shall be the responsibility of the LOUA Control System Cognizant Engineer or Lead Software Engineer during the time it is being created and debugged. No audit trail of changes to software items in the repository is required prior to initial release of the software.

Versions of software shall carry lettered revision numbers prior to release and numbered revision numbers after release. The revision numbers shall be displayed on each configuration item in the same place and with the same prominence as the item's identification.

Prototype and Feature Test Software (refer to Section 7.1.3) shall not be released, but shall be controlled as pre-release software as noted above.

9.2.5 Problem Reporting And Corrective Action

9.2.5.1 Testing Phase Problems

During the Testing Phase of the software life cycle (and after initial release of the software), problem reporting and corrective action shall be implemented by the testing procedures and tracked by the test log for the LDUA system.

9.2.5.2 Operations Phase Problems

During the Operations and Maintenance Phase of the software life cycle, problems, errors, or difficulties with the software, or requests for changes shall be reported on a Software Change Request and Problem Report (SCR/PR), which shall be similar in format to the one in SP-6.3 (Ref. 3).

- Each SCR/PR shall be numbered and a log shall be maintained which tracks each SCR/PR.
- SCR/PRs shall be delivered to Software Custodian who shall enter them into the SCR/PR log and forward them to LOUA Control System Cognizant Engineer.
- LDUA Control System Cognizant Engineer shall assess problem or change request and assign it for consideration to individual with appropriate qualifications.
- A determination shall be made whether problem requires corrective action, whether corrective action requires changes to the baseline configuration, and how extensive the modification will be. If modifications are
extensive, changes to baseline documents such as computer software requirements specifications or computer software design descriptions may be required, and a "mini-life cycle" may be used with appropriate V&V.

- If no corrective action is needed, SCR/PR is closed out at that point.

- If modification is required, resources are assigned, authority to modify the affected software components is granted by the LDUA Control System Cognizant Engineer to a designated software engineer, and working copies of software to be modified are distributed from the software repository. This effort may involve coordination of work among local and off-site organizations: for problems involving category A (Standard Commercial) or B (Special Commercial) software, the commercial supplier may offer a new revision of the software, or may only provide suggested work-arounds; for problems involving category C (Existing RTDP) software, any changes may require review and approval by a central body that maintains the code for the shared community of RTDP users.

- When modifications to software components are complete and verified, an ECN is approved and issued for the new versions of the software and any affected documents (A single ECN can cover many SCR/PRs). The new version of the software is delivered to the Software Custodian who introduces it into the software repository, and the LDUA is re-certified by validation testing. The SCR/PR is closed out at this point.

9.2.6 Physical Media Control

Computer Software Media (also simply referred to as Media) is the different kinds of tapes, discs, etc. used by the computer for storing and retrieving software in electronic form (as opposed to printed on paper).

Physical media control assures that the stored data or software comes from a known and approved source, is traceable to its source, is physically retrievable, and cannot be lost or compromised by day-to-day operations or catastrophic events. The provisions of physical media control are:

- A log shall be kept by the Software Custodian of when software is copied onto physical media from the software repository (backup copies are not included). Each copy shall be serial-numbered.

- Media shall carry a label containing:
  - Software component identifier
  - Serial number (from the log) and date of copy.
  - Responsible individual/organization.
9.2.7 Configuration Status Accounting And Reporting

A database shall be established for tracking existence and status of all configuration items. The LDUA Control System Cognizant Engineer shall be responsible for establishing and maintaining this database.

10.0 IMPACT LEVELS AND APPROVALS

The impact level and approval signature requirements for each deliverable are given in the table below. The impact level of all LDUA software has been determined according to EP-2.1 (Ref 2), Section 5.1, which references EP-1.7 (Ref 2) as basis of determination.
## SOFTWARE DELIVERABLE IMPACT LEVEL/APPROVAL MATRIX

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Software Requirements Specification (CSRS)</td>
<td>3SQ</td>
<td></td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Computer Software Design Description (CSDD)</td>
<td>3Q</td>
<td>-</td>
<td>A</td>
<td>-</td>
<td>A</td>
<td>A</td>
<td>R</td>
</tr>
<tr>
<td>Testing Documents</td>
<td>3SQ</td>
<td></td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>SW Operation Manual</td>
<td>3Q</td>
<td></td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>R</td>
</tr>
<tr>
<td>Technical Reference Documents</td>
<td>3Q</td>
<td>A</td>
<td>A</td>
<td>-</td>
<td>A</td>
<td>R</td>
<td>PR</td>
</tr>
<tr>
<td>Computer Software Description</td>
<td>3Q</td>
<td>A</td>
<td>A</td>
<td>-</td>
<td>A</td>
<td>A</td>
<td>PR</td>
</tr>
<tr>
<td>V&amp;V Records</td>
<td>3Q</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>R</td>
</tr>
<tr>
<td>V&amp;V Report</td>
<td>3SQ</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>R</td>
</tr>
<tr>
<td>Prototype Software</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**LEGEND:**
- **A** = Approve
- **R** = Review
- **PR** = Post Review
- **I** = Information
11.0 REFERENCES

   - QR 19.0 Software Quality Assurance Requirements

   - EP-1.1 Engineering Document Identification
   - EP-1.2 Preparation of Engineering Specifications
   - EP-1.6 Engineering Data Transmittal (EDT)
   - EP-1.7 Engineering Document Approval and Release Requirements
   - EP-2.1 Computer Software
   - EP-2.2 Engineering Document Change Control
   - EP-4.1 Design Verification Requirements
   - EP-4.2 Testing Practices


SOFTWARE CONFIGURATION
PROCEDURES
Software Configuration Index

1. Software Configuration Index
2. Software Change Notification List
3. LDUA Authorized Users List
4. Controlled Versions List
5. Minimum Retest Procedure
6. Problem Report/Change Request Log
Software Change Notification List

For changes to the SDAS User Interface software notify the following organizations:

Tank Waste Remediation System
# SDAS User Interface Controlled Versions

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Authorized uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>28-Feb-96</td>
<td>28-Feb-96</td>
<td>Development only of unit 1</td>
</tr>
<tr>
<td>19-Mar-96</td>
<td>19-Mar-96</td>
<td>Development only of unit 1</td>
</tr>
<tr>
<td>26-Mar-96</td>
<td>26-Mar-96</td>
<td>Development and Integration testing of unit 1</td>
</tr>
<tr>
<td>29-Jun-96</td>
<td>29-Jun-96</td>
<td>Development, Qualification Testing, and Hot Deployment testing of unit 1</td>
</tr>
<tr>
<td>18-Feb-97</td>
<td>18-Feb-97</td>
<td>Development, Qualification Testing, and deployment of unit 1 in Hanford Tanks</td>
</tr>
<tr>
<td>1.0.6</td>
<td>03-Apr-97</td>
<td>Development, Qualification Testing, and deployment of unit 1 in Hanford Tanks</td>
</tr>
<tr>
<td>1.0.7</td>
<td>19-Mar-98</td>
<td>Development, Qualification Testing, and deployment of unit 1 in Hanford Tanks</td>
</tr>
</tbody>
</table>
SDAS 1.0.7 Minimum Retest Procedure

Tests the modifications made as a result of resolving Change Request/Problem Report numbers 55, 56, 57, 58, 59, 60, and 62.

1. Attach console terminals to both the LDUA Arm Level Controller and the GISC CPU.
2. Power down the Subsystem controller and then restore power.
3. Observe the boot sequence of both computers, watching for errors.
4. Verify the correct Position server software is loaded.
5. Verify that the Position Server is started and transmits updates.
6. Power down the SCS Console and then restore power.
7. Observe the SCS Console boot sequence.
8. Verify that the correct software is loaded and run automatically.
9. Verify that the SGCS software does not terminate due to an error.
10. Log onto the SCS Console as oper.
12. Check for the correct operation of the add/change EE button, especially with the Extended Reach End Effector.
13. Check that the collision queue looks reasonable.
14. Check for the correct operation of the Locate MDS button.
15. Check that the collision queue looks reasonable.
16. Check for the correct operation of the Restart button.
17. Check that the collision queue looks reasonable.
18. Check for the correct operation of the Save World and Load World buttons.
19. Check that the collision queue looks reasonable after a Load World operation.
20. Login to the oper account on drum and observe that the correct software (TopSDAS and VideoSDAS) is loaded automatically.
21. Reboot the SDAS Server and observe the boot sequence.
22. Verify that the correct software is being loaded by observing the version number printed by the boot sequence.
23. Verify that there are no errors printed by the boot sequence.
24. Verify that the time is set correctly, including proper daylight savings time.
25. Start the TopSDAS software and verify that it connects correctly to the SDAS Server.
26. Verify that the Extended Reach End Effector is mounted.
27. Verify that LDUA robot position data is available.
28. Verify that the correct TIP identification data is being returned.
29. Check the operation of the TopSDAS control panel for accessing end effectors.
30. Verify that the correct operation of the Extended Reach End Effector control panel.
31. Check the operation of the TopSDAS and Error Display control panels for detecting and displaying SDAS server error messages.
32. Quit the TopSDAS software and verify that it disconnects correctly from the SDAS Server.
33. Start the VideoSDAS software and verify that it connects correctly to the SDAS Server.
34. Check the operation of the VideoSDAS control panel for identifying or specifying end
SDAS 1.0.7 Minimum Retest Procedure

effectors.
35. Verify that the correct operation of the video switcher control panel.
36. Verify that the correct operation of both video titler control panels.
37. Check the operation of the VideoSDAS and Error Display control panels for detecting and displaying SDAS server error messages.
38. Quit the VideoSDAS software and verify that it disconnects correctly from the SDAS Server.
39. Login to the oper account on harp and observe that the correct software (GuestSDAS) is loaded automatically.
40. Start the GuestSDAS software and verify that it connects correctly to the SDAS Server.
41. Check the operation of the VideoSDAS control panel for identifying or specifying end effectors.
42. Verify that the correct operation of the video switcher control panel.
43. Quit the GuestSDAS software and verify that it disconnects correctly from the SDAS Server.
SDAS 1.0.6 Minimum Retest Procedure

1. Attach console terminals to both the LDUA Arm Level Controller and the GISC CPU.
2. Power down the Subsystem controller and then restore power.
3. Observe the boot sequence of both computers, watching for errors.
4. Verify the correct Position server software is loaded.
5. Verify that the Position Server is started and transmits updates.
6. Power down the SCS Console and then restore power.
7. Observe the SCS Console boot sequence.
8. Verify that the correct software is loaded and run automatically.
9. Verify that the SGCS software does not terminate due to an error.
10. Log onto the SCS Console as oper.
12. Connect the real and simulated robots.
13. Operate both robots and verify that both robots correctly display the robot positions.
14. Check for the correct operation of the force moment sensor.
15. Login to the oper account on drum and observe that the correct software is loaded automatically.
16. Reboot the SDAS Server and observe the boot sequence.
17. Verify that the correct software is being loaded by observing the version number printed by the boot sequence.
18. Verify that there are no errors printed by the boot sequence.
19. Start the TopSDAS software and verify that it connects correctly to the SDAS Server.
20. Verify that LDUA robot position data is available.
21. Verify that the correct TIP identification data is being returned.
22. Verify that the correct Cartesian data is being returned.
23. Verify that the correct joint data is being returned.
24. Verify that the correct operation of the video switcher control panel.
25. Check the operation of the TopSDAS control panel for accessing end effectors.
26. Check the operation of the TopSDAS and Error Display control panels for detecting and displaying SDAS server error messages.
27. Quit the TopSDAS software and verify that it disconnects correctly from the SDAS Server.
28. Login to the oper account on harp and observe that the correct software is loaded automatically.
29. Start the GuestSDAS software and verify that it connects correctly to the SDAS Server.
30. Verify that the correct operation of the video switcher control panel.
31. Quit the GuestSDAS software and verify that it disconnects correctly from the SDAS Server.
SDAS Release Notes
Version 1.0.6

This release of the Supervisory Data Acquisition System (SDAS) is a Hanford specific release. None of the non-Hanford pieces or features have been tested. Here is the list of Change Requests and Problem Reports that have been incorporated into this release.

<table>
<thead>
<tr>
<th>CR/PR No.</th>
<th>Short Descriptive Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>SDAS User Interface crashes frequently</td>
</tr>
<tr>
<td>25</td>
<td>Many Opto22 errors on, requires many reboots</td>
</tr>
<tr>
<td>26</td>
<td>Shorten long (1024 byte) error message buffers</td>
</tr>
<tr>
<td>27</td>
<td>ChannelList VI name loading hangs from TopSDAS</td>
</tr>
<tr>
<td>28</td>
<td>Need new control panel for HRSVS #2</td>
</tr>
<tr>
<td>29</td>
<td>Get frequent busy channel errors from both VCR control panels</td>
</tr>
<tr>
<td>31</td>
<td>Error message driver discards error messages</td>
</tr>
<tr>
<td>32</td>
<td>Provide Opto22 timeout status to SDAS User Interface</td>
</tr>
<tr>
<td>33</td>
<td>Provide display of Opto22 timeout status to user</td>
</tr>
<tr>
<td>34</td>
<td>Error on Opto22/ISIO-2 port halts SDAS CPU</td>
</tr>
<tr>
<td>35</td>
<td>Status lights on VCR control panels no longer work</td>
</tr>
<tr>
<td>36</td>
<td>Need to remove non-functional control panels</td>
</tr>
<tr>
<td>37</td>
<td>Titler display of robot position too slow</td>
</tr>
<tr>
<td>38</td>
<td>Titler #2 doesn't work</td>
</tr>
<tr>
<td>40</td>
<td>Robot position client/server software is not reliable</td>
</tr>
<tr>
<td>49</td>
<td>HRSVS#2 VI hangs LabVIEW</td>
</tr>
<tr>
<td>52</td>
<td>Produce formal release of SDAS software</td>
</tr>
</tbody>
</table>

The Following Documents have been modified to reflect the changes to SDAS.

<table>
<thead>
<tr>
<th>Document Number</th>
<th>Revision</th>
<th>Date</th>
<th>Document Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHC-SD-TD-OMM-001</td>
<td>2</td>
<td>04/25/97</td>
<td>OPERATION AND MAINTENANCE MANUAL FOR THE LDUA SUPERVISORY CONTROL AND DATA ACQUISITION SYSTEM (LDUA SYSTEM 4200) AND CONTROL NETWORK (LDUA SYSTEM 4400)</td>
</tr>
<tr>
<td>SNL-LDUA-96-006</td>
<td>V1 R2</td>
<td>03/10/97</td>
<td>The Supervisory Data Acquisition System (SDAS) Programmer's Manual</td>
</tr>
<tr>
<td>SNL-LDUA-96-009</td>
<td>V1 R1</td>
<td>04/04/97</td>
<td>The SDAS Programmer's Manual - Appendix A: Device Driver Descriptions</td>
</tr>
</tbody>
</table>
SDAS USER INTERFACE
Software Change Notification List

For changes to the SDAS User Interface software notify the following organizations:

Tank Waste Remediation System
# SDAS User Interface Controlled Versions

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Authorized uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>28-Feb-96</td>
<td>28-Feb-96</td>
<td>Development only of unit 1</td>
</tr>
<tr>
<td>19-Mar-96</td>
<td>19-Mar-96</td>
<td>Development only of unit 1</td>
</tr>
<tr>
<td>26-Mar-96</td>
<td>26-Mar-96</td>
<td>Development and Integration testing of unit 1</td>
</tr>
<tr>
<td>29-Jun-96</td>
<td>29-Jun-96</td>
<td>Development, Qualification Testing, and Hot Deployment testing of unit 1</td>
</tr>
<tr>
<td>18-Feb-97</td>
<td>18-Feb-97</td>
<td>Development, Qualification Testing, and deployment of unit 1 in Hanford Tanks</td>
</tr>
<tr>
<td>1.0.6</td>
<td>03-Apr-97</td>
<td>Development, Qualification Testing, and deployment of unit 1 in Hanford Tanks</td>
</tr>
<tr>
<td>1.0.7</td>
<td>19-Mar-98</td>
<td>Development, Qualification Testing, and deployment of unit 1 in Hanford Tanks</td>
</tr>
</tbody>
</table>
SDAS 1.0.7 Minimum Retest Procedure

Tests the modifications made as a result of resolving Change Request/Problem Report numbers 55, 56, 57, 58, 59, 60, and 62.

1. Attach console terminals to both the LDUA Arm Level Controller and the GISC CPU.
2. Power down the Subsystem controller and then restore power.
3. Observe the boot sequence of both computers, watching for errors.
4. Verify the correct Position server software is loaded.
5. Verify that the Position Server is started and transmits updates.
6. Power down the SCS Console and then restore power.
7. Observe the SCS Console boot sequence.
8. Verify that the correct software of loaded and run automatically.
9. Verify that the SGCS software does not terminate due to an error.
10. Log onto the SCS Console as oper.
12. Check for the correct operation of the add/change EE button, especially with the Extended Reach End Effector.
13. Check that the collision queue looks reasonable.
14. Check for the correct operation of the Locate MDS button.
15. Check that the collision queue looks reasonable.
16. Check for the correct operation of the Restart button.
17. Check that the collision queue looks reasonable.
18. Check for the correct operation of the Save World and Load World buttons.
19. Check that the collision queue looks reasonable after a Load World operation.
20. Login to the oper account on drum and observe that the correct software (TopSDAS and VideoSDAS) is loaded automatically.
21. Reboot the SDAS Server and observe the boot sequence.
22. Verify that the correct software is being loaded by observing the version number printed by the boot sequence.
23. Verify that there are no errors printed by the boot sequence.
24. Verify that the time is set correctly, including proper daylight savings time.
25. Start the TopSDAS software and verify that it connects correctly to the SDAS Server.
26. Verify that the Extended Reach End Effector is mounted.
27. Verify that LDUA robot position data is available.
28. Verify that the correct TIP identification data is being returned.
29. Check the operation of the TopSDAS control panel for accessing end effectors.
30. Verify that the correct operation of the Extended Reach End Effector control panel.
31. Check the operation of the TopSDAS and Error Display control panels for detecting and displaying SDAS server error messages.
32. Quit the TopSDAS software and verify that it disconnects correctly from the SDAS Server.
33. Start the VideoSDAS software and verify that it connects correctly to the SDAS Server.
34. Check the operation of the VideoSDAS control panel for identifying or specifying end
SDAS 1.0.7 Minimum Retest Procedure

35. Verify that the correct operation of the video switcher control panel.
36. Verify that the correct operation of both video titler control panels.
37. Check the operation of the VideoSDAS and Error Display control panels for detecting and displaying SDAS server error messages.
38. Quit the VideoSDAS software and verify that it disconnects correctly from the SDAS Server.
39. Login to the oper account on harp and observe that the correct software (GuestSDAS) is loaded automatically.
40. Start the GuestSDAS software and verify that it connects correctly to the SDAS Server.
41. Check the operation of the VideoSDAS control panel for identifying or specifying end effectors.
42. Verify that the correct operation of the video switcher control panel.
43. Quit the GuestSDAS software and verify that it disconnects correctly from the SDAS Server.
SDAS 1.0.6 Minimum Retest Procedure

1. Attach console terminals to both the LDUA Arm Level Controller and the GISC CPU.
2. Power down the Subsystem controller and then restore power.
3. Observe the boot sequence of both computers, watching for errors.
4. Verify the correct Position server software is loaded.
5. Verify that the Position Server is started and transmits updates.
6. Power down the SCS Console and then restore power.
7. Observe the SCS Console boot sequence.
8. Verify that the correct software of loaded and run automatically.
9. Verify that the SGCS software does not terminate due to an error.
10. Log onto the SCS Console as oper.
12. Connect the real and simulated robots.
13. Operate both robots and verify that both robots correctly display the robot positions.
14. Check for the correct operation of the force moment sensor.
15. Login to the oper account on drum and observe that the correct software is loaded automatically.
16. Reboot the SDAS Server and observe the boot sequence.
17. Verify that the correct software is being loaded by observing the version number printed by the boot sequence.
18. Verify that there are no errors printed by the boot sequence.
19. Start the TopSDAS software and verify that it connects correctly to the SDAS Server.
20. Verify that LDUA robot position data is available.
21. Verify that the correct TIP identification data is being returned.
22. Verify that the correct Cartesian data is being returned.
23. Verify that the correct joint data is being returned.
24. Verify that the correct operation of the video switcher control panel.
25. Check the operation of the TopSDAS control panel for accessing end effectors.
26. Check the operation of the TopSDAS and Error Display control panels for detecting and displaying SDAS server error messages.
27. Quit the TopSDAS software and verify that it disconnects correctly from the SDAS Server.
28. Login to the oper account on harp and observe that the correct software is loaded automatically.
29. Start the GuestSDAS software and verify that it connects correctly to the SDAS Server.
30. Verify that the correct operation of the video switcher control panel.
31. Quit the GuestSDAS software and verify that it disconnects correctly from the SDAS Server.
SDAS Release Notes
Version 1.0.6

This release of the Supervisory Data Acquisition System (SDAS) is a Hanford specific release. None of the non-Hanford pieces or features have been tested. Here is the list of Change Requests and Problem Reports that have been incorporated into this release.

<table>
<thead>
<tr>
<th>CR/FR No.</th>
<th>Short Descriptive Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>SDAS User Interface crashes frequently</td>
</tr>
<tr>
<td>25</td>
<td>Many Opto22 errors on, requires many reboots</td>
</tr>
<tr>
<td>26</td>
<td>Shorten long (1024 byte) error message buffers</td>
</tr>
<tr>
<td>27</td>
<td>ChannelList VI name loading hangs from TopSDAS</td>
</tr>
<tr>
<td>28</td>
<td>Need new control panel for HRSVS #2</td>
</tr>
<tr>
<td>29</td>
<td>Get frequent busy channel errors from both VCR control panels.</td>
</tr>
<tr>
<td>31</td>
<td>Error message driver discards error messages</td>
</tr>
<tr>
<td>32</td>
<td>Provide Opto22 timeout status to SDAS User Interface</td>
</tr>
<tr>
<td>33</td>
<td>Provide display of Opto22 timeout status to user</td>
</tr>
<tr>
<td>34</td>
<td>Error on Opto22/ISIO-2 port halts SDAS CPU</td>
</tr>
<tr>
<td>35</td>
<td>Status lights on VCR control panels no longer work</td>
</tr>
<tr>
<td>36</td>
<td>Need to remove non-functional control panels</td>
</tr>
<tr>
<td>37</td>
<td>Tilter display of robot position too slow</td>
</tr>
<tr>
<td>38</td>
<td>Tilter #2 doesn’t work</td>
</tr>
<tr>
<td>40</td>
<td>Robot position client/server software is not reliable</td>
</tr>
<tr>
<td>49</td>
<td>HRSVS#2 VI hangs LabVIEW.</td>
</tr>
<tr>
<td>52</td>
<td>Produce formal release of SDAS software.</td>
</tr>
</tbody>
</table>

The Following Documents have been modified to reflect the changes to SDAS.

<table>
<thead>
<tr>
<th>Document Number</th>
<th>Revision</th>
<th>Date</th>
<th>Document Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHC-SD-TD-OMM-001</td>
<td>2</td>
<td>04/25/97</td>
<td>OPERATION AND MAINTENANCE MANUAL FOR THE LDUA SUPERVISORY CONTROL AND DATA ACQUISITION SYSTEM (LDUA SYSTEM 4200) AND CONTROL NETWORK (LDUA SYSTEM 4400)</td>
</tr>
<tr>
<td>SNL-LDUA-96-006</td>
<td>V1 R2</td>
<td>03/10/97</td>
<td>The Supervisory Data Acquisition System (SDAS) Programmer’s Manual</td>
</tr>
<tr>
<td>SNL-LDUA-96-009</td>
<td>V1 R1</td>
<td>04/04/97</td>
<td>The SDAS Programmer’s Manual - Appendix A: Device Driver Descriptions</td>
</tr>
</tbody>
</table>
SDAS SERVER AND DRIVERS
Software Change Notification List

For changes to the SDAS Server and Drivers software notify the following organizations:

Idaho National Engineering Laboratory
Sandia National Laboratories
Tank Waste Remediation System
## SDAS Server and Drivers Controlled Versions

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Authorized uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0.1</td>
<td>19-Jan-96</td>
<td>Development only of unit 1</td>
</tr>
<tr>
<td>1.0.2</td>
<td>07-Mar-96</td>
<td>Development only of unit 1</td>
</tr>
<tr>
<td>1.0.3</td>
<td>23-Apr-96</td>
<td>Development and Integration testing of unit 1</td>
</tr>
<tr>
<td>1.0.4</td>
<td>20-Jun-96</td>
<td>Development and Integration testing of unit 1</td>
</tr>
<tr>
<td>1.0.5</td>
<td>08-Aug-96</td>
<td>Development, Qualification Testing, and Hot Deployment testing of unit 1</td>
</tr>
<tr>
<td>10-Mar-97</td>
<td>10-Mar-97</td>
<td>Development, Qualification Testing, and deployment of unit 1 in Hanford Tanks</td>
</tr>
<tr>
<td>1.0.6</td>
<td>03-Apr-97</td>
<td>Development, Qualification Testing, and deployment of unit 1 in Hanford Tanks</td>
</tr>
<tr>
<td>1.0.7</td>
<td>19-Mar-98</td>
<td>Development, Qualification Testing, and deployment of unit 1 in Hanford Tanks</td>
</tr>
</tbody>
</table>
Minimum Retest Procedure

For changes to the SDAS Server and Drivers software the following tests must be run as the minimum:

1. Reboot the SDAS Server and observe the boot sequence.
2. Verify that the correct software is being loaded by observing the version number printed by the boot sequence.
3. Verify that there are no errors printed by the boot sequence.
4. Run the appropriate SDAS User Interface control panels to test the specific features that were modified.
SPAR LDUA CONSOLE
Software Change Notification List

For changes to the Spar LDUA software notify the following organizations:

Idaho National Engineering Laboratory
Oak Ridge National Laboratory
Sandia National Laboratories
Spar Aerospace, Ltd.
Tank Waste Remediation System
# Spar LDUA Controlled Versions

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Authorized uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-Aug-96</td>
<td>9-Aug-96</td>
<td>Development and Qualification Testing testing of unit 1</td>
</tr>
<tr>
<td>13-Aug-96</td>
<td>13-Aug-96</td>
<td>Development and Qualification Testing testing of unit 1</td>
</tr>
<tr>
<td>16-Aug-96</td>
<td>16-Aug-96</td>
<td>Development, Qualification Testing, and Hot Deployment testing of unit 1</td>
</tr>
</tbody>
</table>
Minimum Retest Procedure

The Spar LDUA software is composed of the following components:

1. The LDUA Console software
2. The Supervisory Graphics Control Software (SGCS)
3. The Subsystem Controller software (SSC or ALC)
4. The LDUA Diagnostics
5. The GISC Application Programming Interface (API) software

Each component has a unique place in the system and each requires a separate minimum retest procedure.

For changes to the **LDUA Console software** the following tests must be run as the minimum:

1. Power down the Subsystem controller and then restore power.
2. Wait for the Subsystem controller boot sequence to complete.
3. Logout of the LDUA Console and log back in as oper.
4. Verify that the correct software is loaded and run automatically.
5. Test the specific features that were modified.

For changes to the **Supervisory Graphics Control Software (SGCS)** the following tests must be run as the minimum:

1. Power down the Subsystem controller and then restore power.
2. Wait for the Subsystem controller boot sequence to complete.
3. Power down the SCS Console and then restore power.
4. Observe the SCS Console boot sequence.
5. Verify that the correct software is loaded and run automatically.
6. Verify that the SGCS software does not terminate due to an error.
7. Log onto the SCS Console as oper.
8. Start the World Model software from the WorldModel script icon.
9. Connect the real and simulated robots.
10. Operate both robots and verify that both robots correctly display the robot positions.
11. Test the specific features that were modified.
Minimum Retest Procedure

For changes to the **Subsystem Controller software** (SSC or ALC) the following tests must be run as the minimum:

1. Attach console terminals to both the LDUA Arm Level Controller and the GISC CPU.
2. Power down the Subsystem controller and then restore power.
3. Observe the boot sequence of both computers, watching for errors.
4. Verify the correct ALC software is loaded from the flash EPROM.
5. Verify that the ALC software is started and runs without errors.
6. Verify that the Position Server software loads and runs without causing errors on either computer.
7. Verify that the robot can be operated from the pendant.
8. Verify that the robot can be operated from the LDUA Console.
9. Test the specific features that were modified.

For changes to the **LDUA Diagnostics software** the following tests must be run as the minimum:

1. Attach console terminals to the LDUA Arm Level Controller.
2. Power down the Subsystem controller and then restore power.
3. Observe the boot sequence of the ALC, watching for errors.
4. Verify the correct ALC software is loaded from the flash EPROM.
5. Verify that the ALC software is started and runs without errors.
6. Interrupt the boot sequence during the systemUp countdown sequence.
7. Run the lduaDiag routine.
8. Test the specific features that were modified.

Changes to the **GISC Application Programming Interface (API) software** are really changes to both the **Subsystem Controller software** (SSC or ALC) and the **Position Server software**. The minimum retest procedure for each of these two software packages must be run.
LDUA POSITION CLIENT/SERVER
Software Change Notification List

For changes to the Position Client & Server software notify the following organizations:

Idaho National Engineering Laboratory
Sandia National Laboratories
Tank Waste Remediation System
# SCS Position Controlled Versions

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Authorized uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0.0</td>
<td>06-Aug-96</td>
<td>Development and Integration testing of unit 1</td>
</tr>
<tr>
<td>1.0.1b</td>
<td>14-Aug-96</td>
<td>Development, Qualification Testing, and Hot Deployment testing of unit 1</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Merged with SDAS Server software as of release 2/18/97</td>
</tr>
</tbody>
</table>
Minimum Retest Procedure

For changes to the Position Client & Server software the following tests must be run as the minimum:

1. Attach console terminals to both the LDUA Arm Level Controller and the GISC CPU.
2. Power down the Subsystem controller and then restore power.
3. Observe the boot sequence of both computers, watching for errors.
4. Verify that the correct Position server software is loaded.
5. Verify that the Position Server is started and waits for a connection from the Position Client.
6. Reboot the SDAS Server and observe the boot sequence.
7. Verify that the correct Position Client software is being loaded.
8. Verify that the Position Client software starts and connects to the Position Server software.
9. Run the TopSDAS control panel software and verify that LDUA robot position data is available.
10. Verify that the correct TIP identification data is being returned.
11. Verify that the correct cartesian data is being returned.
12. Verify that the correct joint data is being returned.
13. Test the specific features that were modified.
WORLD MODEL
Software Change Notification List

For changes to the World Model software notify the following organizations:

Sandia National Laboratories
Tank Waste Remediation System
# SCS World Model Controlled Versions

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Authorized uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>08-Aug-96</td>
<td>08-Aug-96</td>
<td>Development and Qualification Testing testing of unit 1</td>
</tr>
<tr>
<td>21-Aug-96</td>
<td>21-Aug-96</td>
<td>Development, Qualification Testing, and Hot Deployment testing of unit 1</td>
</tr>
<tr>
<td>19-Feb-97</td>
<td>19-Feb-97</td>
<td>Development, Qualification Testing, and deployment of unit 1 in tanks T-106 and AX-104</td>
</tr>
<tr>
<td>06-Mar-97</td>
<td>06-Mar-97</td>
<td>Development, Qualification Testing, and deployment of unit 1 in tanks T-106 and AX-104</td>
</tr>
<tr>
<td>03-Apr-97</td>
<td>03-Apr-97</td>
<td>Development, Qualification Testing, and deployment of unit 1 in tanks T-106 and AX-104</td>
</tr>
<tr>
<td>13-Jul-98</td>
<td>13-Jul-98</td>
<td>Development, Qualification Testing, and deployment of unit 1 in tanks T-106 and AX-104</td>
</tr>
</tbody>
</table>
Minimum Retest Procedure

For changes to the World Model software the following tests must be run as the minimum:

1. Restart the World Model software from the WorldModel script icon.
2. Test the specific features that were modified.
SOFTWARE CHANGE NOTIFICATION
LIST
Software Change Notification List

The contact information for each organization is listed below:

<table>
<thead>
<tr>
<th>Organization</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idaho National Engineering Laboratory</td>
<td>Cal Christianson</td>
</tr>
<tr>
<td></td>
<td>2525 Fremont Avenue MS 3710</td>
</tr>
<tr>
<td></td>
<td>Idaho Falls, ID 83402</td>
</tr>
<tr>
<td></td>
<td>(208) 526-3653 voice</td>
</tr>
<tr>
<td></td>
<td>(208) 526-4366 FAX</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:cal2@inel.gov">cal2@inel.gov</a></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Oak Ridge National Laboratory</td>
<td>Barry Burks</td>
</tr>
<tr>
<td></td>
<td>Box 2008 Bldg. 7601 MS 6304</td>
</tr>
<tr>
<td></td>
<td>Oak Ridge, TN 37831-6304</td>
</tr>
<tr>
<td></td>
<td>(423) 576-7350 voice</td>
</tr>
<tr>
<td></td>
<td>(423) 576-2081 FAX</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:burksbl@ornl.gov">burksbl@ornl.gov</a></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Sandia National Laboratories</td>
<td>Diane Schafer Callow</td>
</tr>
<tr>
<td></td>
<td>Box 5800 MS 1176</td>
</tr>
<tr>
<td></td>
<td>Albuquerque, NM 87185-1176</td>
</tr>
<tr>
<td></td>
<td>(505) 844-2377 voice</td>
</tr>
<tr>
<td></td>
<td>(505) 845-7080 FAX</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:dmschaf@isrc.sandia.gov">dmschaf@isrc.sandia.gov</a></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Spar Aerospace, Ltd.</td>
<td>Brian Hill</td>
</tr>
<tr>
<td></td>
<td>9445 Airport Road</td>
</tr>
<tr>
<td></td>
<td>Brampton, Ontario L6S4J3</td>
</tr>
<tr>
<td></td>
<td>(905) 790-4473 voice</td>
</tr>
<tr>
<td></td>
<td>(905) 790-4430 FAX</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:bhill@spar.ca">bhill@spar.ca</a></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Tank Waste Remediation System</td>
<td>Geoffrey A. Barnes</td>
</tr>
<tr>
<td></td>
<td>Box 450 B4-51</td>
</tr>
<tr>
<td></td>
<td>Richland, WA 99352</td>
</tr>
<tr>
<td></td>
<td>(509) 376-2241 voice</td>
</tr>
<tr>
<td></td>
<td>(509) 372-0504 FAX</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:geoffrey_a_barnes@rl.gov">geoffrey_a_barnes@rl.gov</a></td>
</tr>
</tbody>
</table>
LDUA SOFTWARE CHANGE
REQUEST/PROBLEM
REPORT LOG
LDUA Software Change Request/Problem Report Log

The following CR/PR sheets were lost by PNNL and are not included in the log:

<table>
<thead>
<tr>
<th>CR/PR Number</th>
<th>Issue Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#26 SDAS Server</td>
<td>Resolved 04/03/97</td>
</tr>
<tr>
<td>#27 SDAS User Int.</td>
<td>Resolved 04/03/97</td>
</tr>
<tr>
<td>#31 SDAS Server</td>
<td>Resolved 04/03/97</td>
</tr>
<tr>
<td>#32 SDAS Server</td>
<td>Resolved 04/03/97</td>
</tr>
<tr>
<td>#33 SDAS User Int.</td>
<td>Resolved 04/03/97</td>
</tr>
<tr>
<td>#36 SDAS User Int.</td>
<td>Resolved 04/03/97</td>
</tr>
<tr>
<td>CR/PR No.</td>
<td>Software Name</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------</td>
</tr>
<tr>
<td>1</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>2</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>3</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>4</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>5</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>6</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>7</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>8</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>9</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>10</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>11</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>12</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>13</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>14</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>15</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>16</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>17</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>18</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>19</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>20</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>21</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>22</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>23</td>
<td>Spar LDUA</td>
</tr>
<tr>
<td>24</td>
<td>SDAS User Int</td>
</tr>
<tr>
<td>25</td>
<td>SDAS Server</td>
</tr>
<tr>
<td>26</td>
<td>SDAS Server</td>
</tr>
<tr>
<td>27</td>
<td>SDAS User Int</td>
</tr>
<tr>
<td>28</td>
<td>SDAS User Int</td>
</tr>
<tr>
<td>29</td>
<td>SDAS Server</td>
</tr>
<tr>
<td>30</td>
<td>SDAS Server</td>
</tr>
<tr>
<td>31</td>
<td>SDAS Server</td>
</tr>
<tr>
<td>32</td>
<td>SDAS Server</td>
</tr>
<tr>
<td>33</td>
<td>SDAS User Int</td>
</tr>
<tr>
<td>34</td>
<td>SDAS Server</td>
</tr>
<tr>
<td>35</td>
<td>SDAS User Int</td>
</tr>
<tr>
<td>36</td>
<td>SDAS User Int</td>
</tr>
<tr>
<td>37</td>
<td>SDAS User Int</td>
</tr>
<tr>
<td>38</td>
<td>SDAS User Int</td>
</tr>
<tr>
<td>39</td>
<td>World Model</td>
</tr>
<tr>
<td>40</td>
<td>Robot Pos. C/</td>
</tr>
<tr>
<td>41</td>
<td>World Model</td>
</tr>
<tr>
<td>42</td>
<td>World Model</td>
</tr>
<tr>
<td>43</td>
<td>World Model</td>
</tr>
</tbody>
</table>
### LDUA SOFTWARE CHANGE REQUEST / PROBLEM REPORT LOG

<table>
<thead>
<tr>
<th>CR/PR No.</th>
<th>Software Name</th>
<th>Report Date</th>
<th>Current Status</th>
<th>Resolved Date</th>
<th>Short Descriptive Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>44</td>
<td>World Model</td>
<td>01/27/97</td>
<td>Resolved</td>
<td>01/30/97</td>
<td>Truck azimuth entered into LDUA Console and World Model differ by 180 degrees.</td>
</tr>
<tr>
<td>45</td>
<td>World Model</td>
<td>01/27/97</td>
<td>Resolved</td>
<td>01/30/97</td>
<td>Add capability to save multiple configurations.</td>
</tr>
<tr>
<td>46</td>
<td>World Model</td>
<td>01/27/97</td>
<td>Resolved</td>
<td>02/10/97</td>
<td>Collision check real robot as well as simulation robot.</td>
</tr>
<tr>
<td>47</td>
<td>World Model</td>
<td>01/27/97</td>
<td>Resolved</td>
<td>01/30/97</td>
<td>No collision checking of ITH after moving truck.</td>
</tr>
<tr>
<td>48</td>
<td>World Model</td>
<td>02/10/97</td>
<td>Resolved</td>
<td>02/19/97</td>
<td>Add a gripper end effector with long scraper fingers.</td>
</tr>
<tr>
<td>49</td>
<td>SDAS User Int</td>
<td>02/10/97</td>
<td>Resolved</td>
<td>02/10/97</td>
<td>HRS VS#2 VI hangs LabVIEW.</td>
</tr>
<tr>
<td>50</td>
<td>World Model</td>
<td>02/11/97</td>
<td>Resolved</td>
<td>02/19/97</td>
<td>Collision between ITH and real robot not detected.</td>
</tr>
<tr>
<td>51</td>
<td>World Model</td>
<td>03/01/97</td>
<td>Resolved</td>
<td>03/10/97</td>
<td>Force Moment Sensor indicates overload and doesn't start automatically.</td>
</tr>
<tr>
<td>52</td>
<td>SDAS Server</td>
<td>03/11/97</td>
<td>Resolved</td>
<td>04/03/97</td>
<td>Produce formal release of SDAS software.</td>
</tr>
<tr>
<td>53</td>
<td>SDAS Server</td>
<td>03/11/97</td>
<td>Deferred</td>
<td></td>
<td>Create version of SDAS &amp; GISC software that boots from flash RAM.</td>
</tr>
<tr>
<td>54</td>
<td>World Model</td>
<td>04/03/97</td>
<td>Resolved</td>
<td>04/03/97</td>
<td>There are simulated AX-104 Air Lift Circulators in all Cold Test Facility models. Remove them from the CTF model and leave them in the CTF+ALC model.</td>
</tr>
<tr>
<td>55</td>
<td>SDAS User Int</td>
<td>07/15/97</td>
<td>Resolved</td>
<td>03/18/97</td>
<td>Add a extended reach end effector control panel.</td>
</tr>
<tr>
<td>56</td>
<td>World Model</td>
<td>02/10/98</td>
<td>Resolved</td>
<td>03/19/98</td>
<td>Add a extended reach end effector with sampling scoops.</td>
</tr>
<tr>
<td>57</td>
<td>SDAS User Int</td>
<td>03/05/98</td>
<td>Resolved</td>
<td>03/19/98</td>
<td>SDAS User Interface crashes frequently.</td>
</tr>
<tr>
<td>58</td>
<td>SDAS User Int</td>
<td>03/05/98</td>
<td>Resolved</td>
<td>03/19/98</td>
<td>EREE control panel dumps sample when opened.</td>
</tr>
<tr>
<td>59</td>
<td>SDAS Server</td>
<td>03/05/98</td>
<td>Resolved</td>
<td>03/19/98</td>
<td>SDAS error reports are usually off by one hour.</td>
</tr>
<tr>
<td>60</td>
<td>SDAS User Int</td>
<td>03/05/98</td>
<td>Resolved</td>
<td>03/19/98</td>
<td>Want titler to clear screen on exit.</td>
</tr>
<tr>
<td>61</td>
<td>SDAS User Int</td>
<td>03/20/98</td>
<td>Deferred</td>
<td></td>
<td>SDAS User Interface still crashes frequently (see 57).</td>
</tr>
<tr>
<td>62</td>
<td>SDAS User Int</td>
<td>03/24/98</td>
<td>Resolved</td>
<td>03/24/98</td>
<td>The label on the &quot;Currently Mounted End Effector button&quot; on TopSDAS is not correctly set under all conditions.</td>
</tr>
<tr>
<td>63</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>67</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>69</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>71</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>73</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>77</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>79</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>81</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Change Request and Problem Report

CR/PR Number: 1-23

1. Software Id.(Name): Spar LDUA Rev: 1.1.0-16-Aug-96
   System Name: LDUA

2. Prepared by: GR Kiebel Date: 8/29/96

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date:

4. Description & Justification if Change Request:

5. Submitter's Priority
   [B] High
   [C] Medium
   [D] Low

6. Change Authority: Date:
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: / / 

7. Assigned to:

8. Solution Comments Cost/Schedule Estimate: / 

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: Date:
   Cognizant Manager: Date:
   CR/PR Preparer: Date:
   Design Authority: Date:
Change Request and Problem Report

CR/PR Number: 1

1. Software Id. (Name): ____________________ Rev: __________
   System Name: ________________________________

2. Prepared by: ____________________ Date: __________

3. CR/PR Type: [ ] Change Request [X] Problem Report
   Requested Completion Date: __________

4. Description & Justification if Change Request:

The "LduaHomeToZero" command from the pendant, and the "unstow" command, both have a problem if there is an existing autosequence in the buffer. The "LduaHomeToZero" command causes the preexisting sequence to execute, the "unstow" command apparently just fails to do anything until the motion is aborted.

5. Submitter's Priority
   [X] High  [ ] Medium  [ ] Low

6. Change Authority: ____________________ Date: __________
   [ ] Accept  [ ] Modify  [ ] Reject  [ ] Defer Until: ___ / ___ / ___

7. Assigned to: _______________________

8. Solution Comments  Cost/Schedule Estimate: __________ / __________

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

Cognizant Engineer: ____________________ Date: __________
Cognizant Manager: ____________________ Date: __________
CR/PR Preparer: ________________________ Date: __________
Design Authority: ______________________ Date: __________
Change Request and Problem Report

1. Software Id. (Name): ________________________ Rev: ______________
   System Name: ________________________________________________

2. Prepared by: ________________________ Date: ______________

3. CR/PR Type: [ ] Change Request [x] Problem Report
   Requested Completion Date: ______________

4. Description & Justification if Change Request:

   The shoulder yaw joint position was observed to be -360 degrees in error: i.e. actual position was 118 degrees and the indication was -242 degrees. Is there a flaw in the software?

5. Submitter's Priority [x] High [ ] Medium [ ] Low

6. Change Authority: ________________________ Date: ______________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: __/__/____

7. Assigned to: ______________________________________________

8. Solution Comments Cost/Schedule Estimate: _____ / _____

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

    Cognizant Engineer: ________________________ Date: ______________
    Cognizant Manager: ________________________ Date: ______________
    CR/PR Preparer: ________________________ Date: ______________
    Design Authority: ________________________ Date: ______________
Change Request and Problem Report

CR/PR Number: 3

1. Software Id. (Name): ____________________________ Rev: ____________
   System Name: ______________________________________________________

2. Prepared by: ____________________________ Date: ____________

3. CR/PR Type: [X] Change Request [ ] Problem Report
   Requested Completion Date: ____________

4. Description & Justification if Change Request:
   The file dialogs for reading and writing autosequence files are hard to use. The width of the fields that display path and file names need to be much wider - we are only getting the first few characters in some cases and can't read the whole file or path name. Also, it does not seem possible to navigate up/down the directory structure by just clicking on entries in the list fields.

5. Submitter's Priority: [X] High [ ] Medium [ ] Low

6. Change Authority: ____________________________ Date: ____________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defefer Until: __/__/____

7. Assigned to: ____________________________

8. Solution Comments: ____________________________
   Cost/Schedule Estimate: ____________

9. Software/Documents Affected: ____________________________

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: ____________________________ Date: ____________
    Cognizant Manager: ____________________________ Date: ____________
    CR/PR Preparer: ____________________________ Date: ____________
    Design Authority: ____________________________ Date: ____________
Change Request and Problem Report

1. Software Id. (Name): ___________________________ Rev: _____________
   System Name: ________________________________________________

2. Prepared by: ___________________________ Date: _____________

3. CR/PR Type: [ ] Change Request [X] Problem Report
   Requested Completion Date: _______________

4. Description & Justification if Change Request:

   The VPM will go to -551.6 inches, but an autosequence will only accept -549 as a maximum value.

5. Submitter's Priority [X] High [ ] Medium [ ] Low

6. Change Authority: ___________________________ Date: _____________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: __/__/____

7. Assigned to: ____________________________________________

8. Solution Comments Cost/Schedule Estimate: _____ / ______

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

    Cognizant Engineer: ___________________________ Date: _____________
    Cognizant Manager: ___________________________ Date: _____________
    CR/PR Preparer: ___________________________ Date: _____________
    Design Authority: ___________________________ Date: _____________
Change Request and Problem Report

CR/PR Number: 5

1. Software Id. (Name): ____________________ Rev: __________

System Name: ________________________________

2. Prepared by: ____________________________ Date: __________

3. CR/PR Type: [X] Change Request [ ] Problem Report

Requested Completion Date: __________

4. Description & Justification if Change Request:

There should be an "Acknowledge All" button for errors and warnings (especially warnings). Sometimes the system spews out quite a few messages and acknowledging them one by one is a real pain.

5. Submitter's Priority [X] High [ ] Medium [ ] Low

6. Change Authority: __________________________ Date: __________

[ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: ___/___/

7. Assigned to: ______________________________

8. Solution Comments Cost/Schedule Estimate: ___ / ___

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: __________________________ Date: __________
   Cognizant Manager: __________________________ Date: __________
   CR/PR Preparer: ____________________________ Date: __________
   Design Authority: __________________________ Date: __________
Change Request and Problem Report

CR/PR Number: 6

1. Software Id. (Name): ___________________ Rev: __________
   System Name: ___________________________

2. Prepared by: __________________________ Date: __________

3. CR/PR Type: [ ] Change Request [X] Problem Report
   Requested Completion Date: ______________

4. Description & Justification if Change Request:
   There is a problem with the SGCS software whenever the Real robot and the Simulation robot have their LLTI connection active at the same time. Whenever the Real robot is connected, the Simulation robot flies apart. We have a temporary work around. If we disable the production of deflection compensation packets in the IGRP shared library, the problem goes away. The problem may be in the Spar code or in the IGRIP code, or both. We are suspicious of a particular section of the deflection compensation packet stuffing code. It appears to be off by one joint.

5. Submitter's Priority [ ] High [X] Medium [ ] Low

6. Change Authority: __________________ Date: __________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: __/__/____

7. Assigned to: __________________________

8. Solution Comments Cost/Schedule Estimate: _____ / _____

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: ___________________ Date: __________
    Cognizant Manager: ___________________ Date: __________
    CR/PR Preparer: _____________________ Date: __________
    Design Authority: __________________ Date: __________
Change Request and Problem Report

CR/PR Number: 7

1. Software Id. (Name): ___________________________ Rev: ___________
   System Name: ____________________________

2. Prepared by: ___________________________ Date: ___________

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date: ___________

4. Description & Justification if Change Request:

   Autosequence files should allow comments to be inserted (it is not necessary to modify to
   the autosequence dialog screens to display these comments or to enter them - we can use
   an external text editor for that).

5. Submitter's Priority [ ] High [ ] Medium [ ] Low

6. Change Authority: ___________________________ Date: ___________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: ___________

7. Assigned to: ___________________________

8. Solution Comments Cost/Schedule Estimate: ___________

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

    Cognizant Engineer: ___________________________ Date: ___________
    Cognizant Manager: ___________________________ Date: ___________
    CR/PR Preparer: ___________________________ Date: ___________
    Design Authority: ___________________________ Date: ___________
Change Request and Problem Report

CR/PR Number: 8

1. Software Id. (Name): ____________________ Rev: ____________
   System Name: ___________________________ ____________

2. Prepared by: ___________________________ Date: ____________

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date: ____________

4. Description & Justification if Change Request:
   It would be nice to have a canned "LDUA home joints to zero" command on the LDUA
   Console, or at least a button on the joint autosequence dialog screen that set all the joint
   values in the edit line to zero (we have to re-zero the LDUA joints every time the we want
   to move the VPM, and the LDUA has gone into the lock mode while inside the VPM).

5. Submitter's Priority [ ] High [ ] Medium [ ] Low

6. Change Authority: ___________________________ Date: ____________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: __/__/____

7. Assigned to: ____________________________

8. Solution Comments Cost/Schedule Estimate: ______________/

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: ___________________________ Date: ____________
    Cognizant Manager: ___________________________ Date: ____________
    CR/PR Preparer: ______________________________ Date: ____________
    Design Authority: ____________________________ Date: ____________
Change Request and Problem Report

CR/PR Number: 9

1. Software Id. (Name): ____________________________ Rev: ____________
   System Name: ____________________________

2. Prepared by: ____________________________ Date: ____________

3. CR/PR Type: [x] Change Request [ ] Problem Report
   Requested Completion Date: ____________

4. Description & Justification if Change Request:
   Display should indicate when the position data is not valid, for example, before purge on, or when LDUA is limped.

5. Submitter's Priority
   [ ] High [x] Medium [ ] Low

6. Change Authority: ____________________________ Date: ____________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: __ / __ / __

7. Assigned to: ____________________________

8. Solution Comments Cost/Schedule Estimate: ______ / ______

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
   Cognizant Engineer: ____________________________ Date: ____________
   Cognizant Manager: ____________________________ Date: ____________
   CR/PR Preparer: ____________________________ Date: ____________
   Design Authority: ____________________________ Date: ____________
Change Request and Problem Report

CR/PR Number: 10

1. Software Id. (Name): ___________________ Rev: __________ System Name: __________________________

2. Prepared by: _________________________ Date: __________

3. CR/PR Type: [ ] Change Request [ ] Problem Report Requested Completion Date: __________

4. Description & Justification if Change Request:
   Warning and Error messages should identify which specific joint is at faulted or affected. Sometimes it is easy to tell which one is meant by other system indications, and sometimes it is not.

5. Submitter's Priority [ ] High [ ] Medium [ ] Low

6. Change Authority: ___________________ Date: __________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: _____ / _____ / _____

7. Assigned to: __________________________

8. Solution Comments Cost/Schedule Estimate: ______ / ______

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: ___________________ Date: __________
    Cognizant Manager: ___________________ Date: __________
    CR/PR Preparer: ______________________ Date: __________
    Design Authority: ____________________ Date: __________

9-15
Change Request and Problem Report

CR/PR Number: /

1. Software Id. (Name): ____________________ Rev: ________________
   System Name: _____________________________________________

2. Prepared by: ____________________________ Date: ______________

3. CR/PR Type: [✓] Change Request [ ] Problem Report
   Requested Completion Date: __________________

4. Description & Justification if Change Request:

   Warning and Error message numbers should be displayed as part of the messages on the
   LDUA Console (it is presumed that the numbers given in the Spar Software Manual for
   pendant error codes would be suitable for this). This provides a concise, unambiguous
   way to reference messages, and to look up corrective actions in the operating manual.

5. Submitter's Priority
   [ ] High
   [✓] Medium
   [ ] Low

6. Change Authority: ____________________ Date: __________________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: __/__/____

7. Assigned to: __________________________

8. Solution Comments Cost/Schedule Estimate: _____ / _____

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: ____________________ Date: ______________
   Cognizant Manager: ____________________ Date: ______________
   CR/PR Preparer: _________________________ Date: ______________
   Design Authority: ______________________ Date: ______________
Change Request and Problem Report

CR/PR Number: 12

1. Software Id. (Name): ______________________ Rev: ____________
   System Name: __________________________________________

2. Prepared by: __________________________ Date: ____________

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date: __________

4. Description & Justification if Change Request:
   There should be an “are you sure you want to do this” dialog pop up that appears when
   the “Purge Off” button is pushed. This pop up should explain that the LDUA will
   unconditionally go limp if the command is issued, and it should allow the operator to
   cancel.

5. Submitter's Priority: [ ] High [ ] Medium [ ] Low

6. Change Authority: __________________________ Date: __________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: ______/____/

7. Assigned to: __________________________________________

8. Solution Comments: __________________________
   Cost/Schedule Estimate: ______ / ______

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: __________________________ Date: __________
    Cognizant Manager: __________________________ Date: __________
    CR/PR Preparer: __________________________ Date: __________
    Design Authority: __________________________ Date: __________
Change Request and Problem Report

CR/PR Number: 13

1. Software Id. (Name): ___________________________ Rev: ____________
   System Name: ____________________________

2. Prepared by: ____________________________ Date: ____________

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date: ____________

4. Description & Justification if Change Request:
   The "Stow" and "Unstow" buttons should be moved to the LDUA screen, or there should be a status indicator added to their present location to give the operator some feedback that the command has been accepted and is in progress. Presently, the only way to tell is to pop back to the LDUA screen, which is awkward. Progress messages during the stow/unstow process would be nice also - some of the other commands have them.

5. Submitter's Priority [ ] High [ ] Medium [ ] Low

6. Change Authority: ____________________________ Date: ____________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: /__/_/

7. Assigned to: ____________________________

8. Solution Comments ____________________________ Cost/Schedule Estimate: ____________

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
   Cognizant Engineer: ____________________________ Date: ____________
   Cognizant Manager: ____________________________ Date: ____________
   CR/PR Preparer: ____________________________ Date: ____________
   Design Authority: ____________________________ Date: ____________
Change Request and Problem Report

CR/PR Number: 14

1. Software Id. (Name): ______________________ Rev: __________
   System Name: ________________________________

2. Prepared by: ___________________________ Date: __________

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date: __________

4. Description & Justification if Change Request:
   The select VPM axis command fails intermittently from pendant when VPM is at top position.

5. Submitter's Priority [ ] High [X] Medium [ ] Low

6. Change Authority: __________________ Date: __________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: __/__/____

7. Assigned to: ____________________________

8. Solution Comments Cost/Schedule Estimate: _____ / _____

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: ______________________ Date: __________
        Cognizant Manager: ______________________ Date: __________
        CR/PR Preparer: ______________________ Date: __________
        Design Authority: ______________________ Date: __________

9-19
Change Request and Problem Report

CR/PR Number: 15

1. Software Id. (Name): _______________ Rev: __________
   System Name: _______________

2. Prepared by: _______________ Date: __________

3. CR/PR Type: [X] Change Request [ ] Problem Report
   Requested Completion Date: __________

4. Description & Justification if Change Request:
   It is highly desirable to be able to change the VPM tube sequence while the VPM is deployed. Presently, the VPM must be stowed in order to do this.

5. Submitter's Priority [ ] High [X] Medium [ ] Low

6. Change Authority: __________________________ Date: __________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: __________

7. Assigned to: __________________________

8. Solution Comments Cost/Schedule Estimate: __________ / __________

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: __________________________ Date: __________
    Cognizant Manager: __________________________ Date: __________
    CR/PR Preparer: __________________________ Date: __________
    Design Authority: __________________________ Date: __________

9-20
Change Request and Problem Report

CR/PR Number: 16

1. Software Id. (Name): ________________________ Rev: ________________________
   System Name: ____________________________________________________________

2. Prepared by: ________________________ Date: ________________________

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date: ________________________

4. Description & Justification if Change Request:
   It would enhance safety when operating in the diagnostic mode to have a display that
   showed the net distance between the inner and outer VPM tubes so that the operator can
   avoid unwinding the winches. This display could be a single live number with upper and
   lower limits displayed, or it could be two live numbers with one number representing the
   margin from the lower limit and the other number representing the margin from the upper
   limit (0 would mean at the limit, positive numbers would mean safe clearance, negative
   number would mean improper clearance).

5. Submitter's Priority [ ] High [ ] Medium [ ] Low

6. Change Authority: ________________________ Date: ________________________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: _____ / _____ / _____

7. Assigned to: ____________________________________________________________

8. Solution Comments Cost/Schedule Estimate: _____ / _____

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: ________________________ Date: ________________________
   Cognizant Manager: ________________________ Date: ________________________
   CR/PR Preparer: ________________________ Date: ________________________
   Design Authority: ________________________ Date: ________________________
Change Request and Problem Report

CR/PR Number: 17

1. Software Id. (Name): ___________________________ Rev: ___________
   System Name: ________________________________

2. Prepared by: _________________________________ Date: ______________

3. CR/PR Type: [X] Change Request [ ] Problem Report
   Requested Completion Date: ______________

4. Description & Justification if Change Request:

   There should be an "are you sure you want to do this" dialog pop up that appears when
   the purge mode is changed from flammable to non-flammable tank mode. This pop up
   should explain the seriousness of issuing this command, and it should allow the operator
   to cancel.

5. Submitter's Priority  [ ] High  [ ] Medium  [X] Low

6. Change Authority: __________________________ Date: ______________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: __/__/____

7. Assigned to: ________________________________

8. Solution Comments  Cost/Schedule Estimate: ____ / ______

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: __________________________ Date: ___________
   Cognizant Manager: __________________________ Date: ___________
   CR/PR Preparer: ____________________________ Date: ___________
   Design Authority: __________________________ Date: ___________

9-22
Change Request and Problem Report

CR/PR Number: 18

1. Software Id. (Name): ____________________________ Rev: __________
   System Name: ____________________________

2. Prepared by: ____________________________ Date: __________

3. CR/PR Type: [X] Change Request [ ] Problem Report
   Requested Completion Date: __________

4. Description & Justification if Change Request:
   The announcement of singularity problems during joint mode moves is generally perceived
   as a nuisance rather than an aid.

5. Submitter's Priority  [ ] High  [ ] Medium  [X] Low

6. Change Authority: ____________________________ Date: __________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: /__/__

7. Assigned to: ____________________________

8. Solution Comments Cost/Schedule Estimate: _____ / _____

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: ____________________________ Date: __________
    Cognizant Manager: ____________________________ Date: __________
    CR/PR Preparer: ____________________________ Date: __________
    Design Authority: ____________________________ Date: __________
Change Request and Problem Report

CR/PR Number: 19

1. Software Id. (Name): ___________________ Rev: __________
   System Name: __________________________

2. Prepared by: __________________________ Date: __________

3. CR/PR Type: [X] Change Request [ ] Problem Report
   Requested Completion Date: __________

4. Description & Justification if Change Request:
   There should be two new indicators for each LDUA joint to indicate that the joint is
   enabled to move: the first indicator would tell that the joint was clear of the VPM outer
   tube and the second indicator would tell that the joint was clear of the riser. Presently, the
   system just refuses to move the joint if it is inhibited by one of these interlocks, and
   operator must guess why based on messages that list several possibilities without
   specifying a particular one.

5. Submitter's Priority [ ] High [ ] Medium [X] Low

6. Change Authority: ___________________ Date: __________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: ______/____/____

7. Assigned to: __________________________

8. Solution Comments Cost/Schedule Estimate: ______ / ______

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: ___________________ Date: __________
    Cognizant Manager: ___________________ Date: __________
    CR/PR Preparer: ___________________ Date: __________
    Design Authority: ___________________ Date: __________
Change Request and Problem Report

CR/PR Number: 20

1. Software Id. (Name): ________________________ Rev: ______________
   System Name: ________________________________

2. Prepared by: ________________________ Date: ______________

3. CR/PR Type: [ ] Change Request [X] Problem Report
   Requested Completion Date: ______________

4. Description & Justification if Change Request:
   [The home LDUA command (from the pendant) appears not to work when the VPM
   housing is tilted to 5 degrees from vertical.]

5. Submitter's Priority [ ] High [ ] Medium [X] Low

6. Change Authority: ________________________ Date: ______________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: __/__/____

7. Assigned to: ______________________________

8. Solution Comments Cost/Schedule Estimate: _____ / ______

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
   Cognizant Engineer: ________________________ Date: ______________
   Cognizant Manager: ________________________ Date: ______________
   CR/PR Preparer: ____________________________ Date: ______________
   Design Authority: __________________________ Date: ______________

9-25
Change Request and Problem Report

CR/PR Number: 21

1. Software Id. (Name): ________________ Rev: ________________

System Name: ____________________________________________

2. Prepared by: __________________________ Date: __________

3. CR/PR Type: [ ] Change Request [X] Problem Report

Requested Completion Date: __________________

4. Description & Justification if Change Request:
   An end effector cannot be mounted with the VPM in outer/inner sequence because the indentations on the LDUA TIP are covered by the bottom of the outer tube - the TIP does not stick out far enough.

5. Submitter's Priority [ ] High [ ] Medium [X] Low

6. Change Authority: __________________________ Date: __________

[ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: __/__/____

7. Assigned to: ______________________________

8. Solution Comments Cost/Schedule Estimate: ____ / _____

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: __________________________ Date: __________

   Cognizant Manager: __________________________ Date: __________

   CR/PR Preparer: __________________________ Date: __________

   Design Authority: __________________________ Date: __________
Change Request and Problem Report

CR/PR Number: 22

1. Software Id. (Name): ___________________ Rev: ______________
   System Name: ________________________________

2. Prepared by: ___________________ Date: ______________

3. CR/PR Type: [X] Change Request [ ] Problem Report
   Requested Completion Date: ______________

4. Description & Justification if Change Request:

   [A general comment: It is a better interface practice to gray out commands/controls that are invalid in a particular state. At present, commands/controls are only grayed out for supervisor/operator login.]

5. Submitter's Priority
   [ ] High [ ] Medium [X] Low

6. Change Authority: ___________________ Date: ______________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: / /

7. Assigned to: ________________________________

8. Solution Comments Cost/Schedule Estimate: /

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: ___________________ Date: ______________
   Cognizant Manager: ___________________ Date: ______________
   CR/PR Preparer: ___________________ Date: ______________
   Design Authority: ___________________ Date: ______________
Change Request and Problem Report

CR/PR Number: 23

1. Software Id. (Name): ___________________  Rev: __________
   System Name: ________________________________

2. Prepared by: _____________________________  Date: __________

3. CR/PR Type: [ ] Change Request  [ ] Problem Report
   Requested Completion Date: ________

4. Description & Justification if Change Request:
   It would be better to offer the operator the option (perhaps by means of a pop up dialog)
   to have the LDUA joints automatically homed to zero when a VPM move is commanded,
   but fails because the LDUA joints are not at zero position. This situation occurs
   frequently under normal operation because the LDUA joints move off zero when the
   LDUA locks. It is a pain to have to go into joint autosequence and zero them every time
   before moving the VPM.

5. Submitter's Priority
   [ ] High  [ ] Medium  [ ] Low

6. Change Authority: _________________________  Date: __________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: ___/___/

7. Assigned to: _______________________________

8. Solution Comments  Cost/Schedule Estimate: _____ / ______

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: ___________________________  Date: __________
    Cognizant Manager: ___________________________  Date: __________
    CR/PR Preparer: ______________________________  Date: __________
    Design Authority: ____________________________  Date: __________

9-28
Change Request and Problem Report

CR/PR Number: 24

1. Software Id. (Name): SDAS User Intf  Rev: __________
   System Name: IDU UI #1

2. Prepared by: JE Ellis Date: 1/15/97

3. CR/PR Type: [ ] Change Request [x] Problem Report
   Requested Completion Date: __________

4. Description & Justification if Change Request:
   System crashes frequently. This may be due to improper handling of data buffer data types in LabVIEW CIN's from Sandia.

5. Submitter's Priority  [x] High  [ ] Medium  [ ] Low

6. Change Authority: JE Ellis Date: 2/25/97
   [x] Accept [ ] Modify [ ] Reject [ ] Defer Until: __________

7. Assigned to: JE Ellis

8. Solution Comments  Cost/Schedule Estimate: __________
   [x] Rewrote SDAS ExtSub.c to have a specific action for buffer data types. Also updated each buffer data CIN to refer to the new action.

9. Software/Documents Affected:
   SDAS User Intf, SD: version 2/8/97

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: ___________________________ Date: 2/21/97
   Cognizant Manager: ___________________________ Date: 2/23/97
   CR/PR Preparer: ___________________________ Date: 2/1/97
   Design Authority: ___________________________ Date: 3/1/97

9-29
Change Request and Problem Report

CR/PR Number: 25

1. Software Id. (Name): SDAS Server  Rev: 

System Name: LDUW  Unit #1

2. Prepared by: JE Ellis  Date: 1/15/97

3. CR/PR Type: [ ] Change Request  [x] Problem Report

Requested Completion Date: 

4. Description & Justification if Change Request:
   Server has Opto 22 errors when booted and requires several reboots to clear all errors.

5. Submitter's Priority [x] High  [ ] Medium  [ ] Low

6. Change Authority: [x] Accept  [ ] Modify  [ ] Reject  [ ] Defer Until: 

7. Assigned to: JE Ellis

8. Solution Comments  Cost/Schedule Estimate: 

Rewrote SDAS Opto 22 support routines to incorporate better algorithms. Routines now detect Opto 22 powerup errors and reinitialize the hardware. Database channels no longer go offline.

New rule: Do not regularly access channels to could be powered off.

9. Software/Documents Affected:
   SDAS Server & Drivers version 2/18/97

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: 
   Date: 2/18/97

   Cognizant Manager: 
   Date: 2/24/97

   CR/PR Preparer: 
   Date: 2/27/97

   Design Authority: 
   Date: 3/1/97
This page intentionally left blank.

CP/PR sheet was lost.
This page intentionally left blank.

CP/PR sheet was lost.
Change Request and Problem Report

CR/PR Number: 28

1. Software Id. (Name): SDAS User Interface
   System Name: ADL Unit #1

2. Prepared by: JE Ellis Date: 1/15/97

3. CR/PR Type: [X] Change Request [ ] Problem Report
   Requested Completion Date: 

4. Description & Justification if Change Request:
   New HRSVS(#2) is different from old HRSVS(#1). Both
   will be used, but each requires a unit specific control
   panel. Add new control panel for HRSVS#2

5. Submitter's Priority: [X] High [ ] Medium [ ] Low

   Date: 1/15/97

7. Assigned to: JE Ellis

8. Solution Comments: Cost/Schedule Estimate:
   Modified HRSVS.vi to create HRSVS2.vi and associated
   sub.vii's. Incorporated into TopSDAS.vi

9. Software/Documents Affected:
   SDAS User Interface version 2/8/97
   SDAS CMM WHC-SD-TD-CMM-001

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: 
    Cognizant Manager: 
    CR/PR Preparer: 
    Design Authority: 
    Date: 2/8/97

9-33
Change Request and Problem Report

CR/PR Number: 29

1. Software Id. (Name): SDAS Server  Rev: 
   System Name: MEMORY UNIT #1

2. Prepared by: J. C. Ellis  Date: 1/15/97

3. CR/PR Type: [ ] Change Request  [X] Problem Report
   Requested Completion Date:

4. Description & Justification if Change Request:
   When VCR control panel is opened, server emits busy channel error for vcr1Trigger or vcr2Trigger.

5. Submitter's Priority  [ ] High  [X] Medium  [ ] Low

6. Change Authority:  Date: 2/26/97
   [X] Accept  [ ] Modify  [ ] Reject  [ ] Defer Until: __/__/__

7. Assigned to: J. C. Ellis

8. Solution Comments  Cost/Schedule Estimate:  
   Hardware problem. VCR wiring was disconnected.
   No Action on Software Required.

9. Software/Documents Affected:
   None

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer:  Date: 2/26/97
   Cognizant Manager:  Date: 
   CR/PR Preparer:  Date: 2/26/97
   Design Authority:  Date: 2/26/97
Change Request and Problem Report

CR/PR Number: 30

1. Software Id. (Name): SDAS Server

2. Prepared by: JG Ellis Date: 1/15/97

3. CR/PR Type: [ ] Change Request [X] Problem Report

Requested Completion Date:

4. Description & Justification if Change Request:

   Observed that time based records do not process properly when there is only one in the database.

   Side note: This was using sdas 0 that completely broke dates. This needs to be tested with known good server.

5. Submitter's Priority
   [ ] High [ ] Medium [X] Low

6. Change Authority: ____________________________ Date: ____________________________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: ____________

7. Assigned to: ____________________________

8. Solution Comments Cost/Schedule Estimate: _______ / _______

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: ____________________________ Date: ____________________________
   Cognizant Manager: ____________________________ Date: ____________________________
   CR/PR Preparer: ____________________________ Date: ____________________________
   Design Authority: ____________________________ Date: ____________________________
This page intentionally left blank.

CP/PR sheet was lost.
This page intentionally left blank.

CP/PR sheet was lost.
This page intentionally left blank.

CP/PR sheet was lost.
Change Request and Problem Report

CR/PR Number: 34

1. Software Id. (Name): SDAS Server
   System Name: EduA Unit #1

2. Prepared by: JE Ellis Date: 1/31/97

3. CR/PR Type: [ ] Change Request [X] Problem Report
   Requested Completion Date:

4. Description & Justification if Change Request:
   When power to an Opto 22 drain board is lost, or if the serial cable chain is broken, the force 30 run light turns red. (I think this means the CPU halted). This is a major problem.

5. Submitter's Priority [ ] High [ ] Medium [ ] Low

6. Change Authority: [X] Accept [ ] Modify [ ] Reject [ ] Defer Until:
   Date: 2/8/97

7. Assigned to: JE Ellis

8. Solution Comments Cost/Schedule Estimate: 1/
   Error in SDAS programmer's manual describing return error codes for isio_readk procedures, caused nsending errors in Opto 22 support code and video switcher drivers. Fixed drivers.

9. Software/Documents Affected
   SDAS programmer's Manual WHC-SD-TD-00MM-001
   SDAS Server & Drivers 2/18/97

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer:
   Cognizant Manager:
   CR/PR Preparer:
   Design Authority:

   Date: 2/8/97
   Date: 2/8/97
   Date: 2/8/97
   Date: 2/8/97
Change Request and Problem Report

CR/PR Number: 35

1. Software Id.(Name): SDAS User Intf
   Rev: 
   System Name: Unit #1

2. Prepared by: JE Felis/DA Clark Date: 1/26/97

3. CR/PR Type: [ ] Change Request [X] Problem Report
   Requested Completion Date:

4. Description & Justification if Change Request:
   The feedback panel lights on both VCR#1 & #2 control
   panels no longer work. (Also getting occasional buggy
   channel errors, is this related?)

5. Submitter's Priority [ ] High [X] Medium [ ] Low

6. Change Authority: [X] Accept [ ] Modify [ ] Reject [ ] Defer Until: 
   Date: 2/25/97

7. Assigned to: JE E1/s

8. Solution Comments Cost/Schedule Estimate:
   VCR vii was using sdasGetString instead of
   sdasGetString

9. Software/Documents Affected:
   SDAS User Intf version 2/18/97

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: [X] Signed Date: 2/28/97
    Cognizant Manager: [X] Signed Date: 2/28/97
    CR/PR Preparer: [X] Signed Date: 2/28/97
    Design Authority: [X] Signed Date: 3/14/97
This page intentionally left blank.
CP/PR sheet was lost.
Change Request and Problem Report

CR/PR Number: 37

1. Software Id. (Name): SDAS User Interface
   System Name: LDI/A Unit #1

2. Prepared by: JE Ellis/Ken Bennett Date: 1/26/97

3. CR/PR Type: [X] Change Request [ ] Problem Report
   Requested Completion Date: ________________

4. Description & Justification if Change Request:
   The title update rate is unacceptably slow. Also,
   the position displayed is way, way behind the
   actual position of the arm.

5. Submitter's Priority
   [ ] High [ ] Medium [ ] Low

6. Change Authority: [X] Accept [ ] Modify [ ] Reject [ ] Defer Until: 1/1

7. Assigned to: JE Ellis

8. Solution Comments
   SDAS User Intf had many channels of LDI/A robot position open.
   Each one used a lot of resources. I now have one VI that gets
   robot position into a global for all users. Also, the channel uses
   the NB_SILENT_FLUSH overrun method. This channel regularly overruns!

9. Software/Documents Affected:
   SDAS User Intf. version 3/18/97

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: ________________ Date: 3/28/97
    Cognizant Manager: ________________ Date: 2/25/97
    CR/PR Preparer: ________________ Date: 5/28/97
    Design Authority: ________________ Date: 3/1/97

9 - 42
Change Request and Problem Report

CR/PR Number: 38

1. Software Id. (Name): SDAS User Interface
   System Name: MA Unit #1

2. Prepared by: J.E. Ellis/Ken Brennan Date: 1/26/97

3. CR/PR Type: [ ] Change Request [X] Problem Report
   Requested Completion Date: __________

4. Description & Justification if Change Request:
   Tiller #2 new/replacement unit was installed and
does not work with the SDAS software

5. Submitter's Priority: [X] High [ ] Medium [ ] Low

6. Change Authority: Date: 2/6/97
   [X] Accept [ ] Modify [ ] Reject [ ] Defer Until: __________

7. Assigned to: J.E. Ellis

8. Solution Comments Cost/Schedule Estimate: ______
   This was new hardware. Made the VI just the same
   as Tiller #1 and it all works fine now.

9. Software/Documents Affected:
   SDAS User Interface Version 2/18/97

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: [Signature] Date: 2/12/97
    Cognizant Manager: [Signature] Date: 2/12/97
    CR/PR Preparer: [Signature] Date: 2/28/97
    Design Authority: [Signature] Date: 3/4/97
Change Request and Problem Report

CR/PR Number: 39

1. Software Id. (Name): World Model
   Rev: ______________
   System Name: D/A Unit #1

2. Prepared by: JE Ellis Date: 1/27/97

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date: ______________

4. Description & Justification if Change Request:

5. Submitter's Priority
   [ ] High [ ] Medium [ ] Low

6. Change Authority: [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: / /
   Date: 2/25/97

7. Assigned to: JE Ellis / J. Tects

8. Solution Comments
   Cost/Schedule Estimate: __________
   Added AX-104 model. Also increased the number of risers allowed from 20 to 40.

9. Software/Documents Affected:
   World model version 2/19/97
   SDAS user manual W/CS BD TD CM14.90+ (no change needed)

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: [Signature] Date: 2/38/97
    Cognizant Manager: [Signature] Date: 2/38/97
    CR/PR Preparer: [Signature] Date: 2/38/97
    Design Authority: [Signature] Date: 2/38/97
Change Request and Problem Report

Robot Pos C/S CR/PR Number: 40

1. Software Id. (Name): [Welder Model] Rev: __________
   System Name: [LDA A Unit #1]

2. Prepared by: [JE Ellis] Date: 1/27/97

3. CR/PR Type: [ ] Change Request [X] Problem Report
   Requested Completion Date: __________

4. Description & Justification if Change Request:
   The robot position client/server software is difficult to use and is unreliable.

5. Submitter's Priority [X] High [ ] Medium [ ] Low

6. Change Authority: [Signature] Date: 2/25/97
   [X] Accept [ ] Modify [ ] Reject [ ] Defer Until: __________

7. Assigned to: [JE Ellis]

8. Solution Comments
   Cost/Schedule Estimate: __________
   Replaced Sandia C++ code with simpler software.
   Complex and integrated it into SDAS server

9. Software/Documents Affected:
   SDAS Server & Drivers revision 2/18/97
   Robot Position Client/Server is no longer a configuration item.
   SDAS User Manual WUC-SB-TD-0MM-001

10. Approvals Indicate CR is Complete or PR is Resolved.
   Cognizant Engineer: [Signature] Date: 2/25/97
   Cognizant Manager: [Signature] Date: 3/4/97
   CR/PR Preparer: [Signature] Date: 3/4/97
   Design Authority: [Signature] Date: 3/4/97

   Need to remove manuals from Configuration File.
Change Request and Problem Report

CR/PR Number: CL1

1. Software Id. (Name): World Model  Rev: 
   System Name: LDUH Unit #1

2. Prepared by: JE Ellis  Date: 1/27/97

3. CR/PR Type: [X] Change Request  [ ] Problem Report
   Requested Completion Date:

4. Description & Justification if Change Request:
   Add the capability to read the LDUH Force Moment Sensor.

5. Submitter's Priority  [ ] High  [X] Medium  [ ] Low

6. Change Authority:  Date: 2/26/97
   [X] Accept  [ ] Modify  [ ] Reject  [ ] Defer Until: 1/1

7. Assigned to: JE Ellis  J. Tucker

8. Solution Comments  Cost/Schedule Estimate:
   Write new software and integrated it with
   SDAS Server, Drives and World Model

9. Software/Documents Affected:
   SDAS Server/Drivers version 2/8/97
   World Model version 2/19/97
   SDAS User Manual WHC-SD-TD-OMM-001

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: 
    Cognizant Manager:  
    CR/PR Preparer:   
    Design Authority:  
    Date: 2/28/97
Change Request and Problem Report

1. Software Id. (Name): World Model Rev: ____________
System Name: LDM Unit #1

2. Prepared by: JE Ellis Date: 1/27/97

3. CR/PR Type: [ ] Change Request [ ] Problem Report
Requested Completion Date: ____________

4. Description & Justification if Change Request:
The world end effector change mechanism does not allow you to remove an end effector. It only allows you to replace one with another. Need option to say there is no end effector.

5. Submitter's Priority [ ] High [ ] Medium [ ] Low

6. Change Authority: [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: ____________
Date: 2/25/97

7. Assigned to: JE Ellis J. Tucker


9. Software/Documents Affected:
World Model version 2/19/97
SDAS user man WHC-SD-TD-01M-001

10. Approvals Indicate CR is Complete or PR is Resolved.
Cognizant Engineer: ________ Date: 2/38/97
Cognizant Manager: ________ Date: 2/38/97
CR/PR Preparer: ________ Date: 2/38/97
Design Authority: ________ Date: 3/3/97

9-47
Change Request and Problem Report

CR/PR Number: 43

1. Software Id. (Name): World Model
   System Name: DVA Unit #1
   Rev: 

2. Prepared by: JE Ellis
   Date: 1/17/97

3. CR/PR Type: [X] Change Request [ ] Problem Report
   Requested Completion Date: 

4. Description & Justification if Change Request:
   Since there is no way to remove a piece of In-Tank Hardware, if you make any mistake, you throw away everything you have done and start over. The ability to delete INTH is greatly needed.

5. Submitter's Priority
   [X] High [ ] Medium [ ] Low

6. Change Authority: [X] Accept [ ] Modify [ ] Reject [ ] Defer Until: 
   Date: 2/25/97

7. Assigned to: JE Ellis / S. Turner

8. Solution Comments
   Cost/Schedule Estimate: 
   Modified Model to incorporate feature.

9. Software/Documents Affected:
   World Model version 2/19/97
   SDAS User Manual WHC-SD-TD-0MM-001

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: Date: 2/28/97
    Cognizant Manager: Date: 2/28/97
    CR/PR Preparer: Date: 3/18/97
    Design Authority: Date: 3/18/97

9 - 48
Change Request and Problem Report

CR/PR Number: 44

1. Software Id.(Name): World Model  Rev: 

System Name: LDUA Unit #1

2. Prepared by: J E Ellis  Date: 1/27/97

3. CR/PR Type: [X] Change Request [ ] Problem Report

Requested Completion Date: 

4. Description & Justification if Change Request:

The value you need to enter into the LDUA Console and the World Model for truck azimuth differ by 180°.

5. Submitter's Priority  [ ] High  [X] Medium  [ ] Low

6. Change Authority: Date: 2/25/97

[ ] Accept  [X] Modify  [ ] Reject  [ ] Defer Until:

7. Assigned to: J E Ellis J. Tucker

8. Solution Comments  Cost/Schedule Estimate:

Modified the position of the LDUA device in the World Model to match the Spar base coordinate system. Also changed the frame of reference for the end-effectors to match the Spar convention.

9. Software/Documents Affected:

World Model version 2/19/97

10. Approvals Indicate CR is Complete or PR is Resolved.

Cognizant Engineer: Date: 2/28/97
Cognizant Manager: Date: 2/28/97
CR/PR Preparer: Date: 2/28/97
Design Authority: Date: 3/1/97
Change Request and Problem Report

CR/PR Number: 45

1. Software Id. (Name): World Model

2. Prepared by: JE Ellis Date: 1/27/97

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date:

4. Description & Justification if Change Request:
   Quite a bit of work can go into setting up an LDUA configuration, but the World Model can only save the last configuration. It would be very helpful to allow the user to save multiple configurations and choose the desired one to load.

5. Submitter's Priority [ ] High [X] Medium [ ] Low

6. Change Authority: [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until:

7. Assigned to: JE Ellis, J. Treston

8. Solution Comments Cost/Schedule Estimate:
   Added the capability to save the configuration to a named file and load it back again.

9. Software/Documents Affected:
   World Model version 2/19/97
   SDAS User Manual WHC-SD-TD-0000

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: [Signature] Date: 2/19/97
   Cognizant Manager: [Signature] Date: 2/20/97
   CR/PR Preparer: [Signature] Date: 2/28/97
   Design Authority: [Signature] Date: 3/1/97

9-50
Change Request and Problem Report

CR/PR Number: 46

1. Software Id. (Name): World Model  
   System Name: 17.14 Unit #1

2. Prepared by: JE Ellis  
   Date: 1/27/97

3. CR/PR Type: [X] Change Request  
   Requested Completion Date: __________

4. Description & Justification if Change Request:
   The real robot is not in the collision checked
   so collisions, only the simulated robot.

5. Submitter's Priority  
   [ ] High  
   [ ] Medium  
   [X] Low

6. Change Authority: J. T. Tucker  
   Date: 2/25/97  
   [X] Accept  
   [ ] Modify  
   [ ] Reject  
   [ ] Defer Until: __________

7. Assigned to: JE Ellis, J. Tucker

8. Solution Comments  
   Cost/Schedule Estimate: ______/____
   This was a performance issue. The MIPS 4400 CPU was not
   fast enough to do all the calculation required without impacting
   the graphics update rate. Since we upgraded to a MIPS 10600 CPU,
   this is no longer a issue & the real robot is now checked also.

9. Software/Documents Affected:
   World Model: Version 2/19/97
   SDAS User Man WUC-SD-TD-0MM-001

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer:  
    Cognizant Manager:  
    CR/PR Preparer:  
    Design Authority:  

   Date: 2/23/97  
   Date: 2/24/97  
   Date: 2/24/97

9-51
Change Request and Problem Report

CR/PR Number: 47

1. Software Id. (Name): World Model
   System Name: LDQA Unit #1

2. Prepared by: JE Ellis
   Date: 1/27/97

3. CR/PR Type: [ ] Change Request [X] Problem Report
   Requested Completion Date:_________

4. Description & Justification if Change Request:
   After changing the orientation of the Truk/MVP via the locate (LDUA dialog), the collision checking no longer checks the In-Tank Hardware for collisions.

5. Submitter's Priority [ ] High [ ] Medium [ ] Low

6. Change Authority: [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: ______
   Date: 2/5/97

7. Assigned to: JE Ellis / J. Tucker

8. Solution Comments Cost/Schedule Estimate:_____
   Modified software to preserve the collision queues after changes in LDUA position.

9. Software/Documents Affected:
   World Model version 2/19/97

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: ________________ Date: 2/28/97
   Cognizant Manager: ________________ Date: 2/28/97
   CR/PR Preparer: ________________ Date: 2/28/97
   Design Authority: ________________ Date: 3/3/97
Change Request and Problem Report

CR/PR Number: 48

1. Software Id. (Name): World Model
   System Name: Div Win #1

2. Prepared by: JE Ellis
   Date: 2/10/97

3. CR/PR Type: [X] Change Request [ ] Problem Report
   Requested Completion Date: 

4. Description & Justification if Change Request:
   Add a gripper and effector with long waste scraper fingers to World Model

5. Submitter's Priority
   [X] High [ ] Medium [ ] Low

6. Change Authority: [ ] Accept [X] Modify [ ] Reject [ ] Defer Until: 

7. Assigned to: SE Ellis J. Tucker

8. Solution Comments
   Solution Comments
   Done.

   Cost/Schedule Estimate: ___ / ___

9. Software/Documents Affected:
   World Model version 2/19/97

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: ___/___/97
    Cognizant Manager: ___/___/97
    CR/PR Preparer: ___/___/97
    Design Authority: ___/___/97

9-53
Change Request and Problem Report

CR/PR Number: 49

1. Software Id. (Name): SDAS User Interface
   Rev:
   System Name: LDVA Unit #1

2. Prepared by: Date: 2/16/97

3. CR/PR Type: [ ] Change Request [x] Problem Report
   Requested Completion Date:

4. Description & Justification if Change Request:
   HRSVS #2 VI hangs when various buttons are pushed & LV hangs.

5. Submitter's Priority
   [x] High [ ] Medium [ ] Low

6. Change Authority: Date: 2/25/97
   [x] Accept [ ] Modify [ ] Reject [ ] Defer Until:

7. Assigned to: JE EHS

8. Solution Comments
   Cost/Schedule Estimate:
   Corrected error in Opt22 drivers that took records offline
   when record generated busy record (i.e. 0). Now generates
   error, but does not go offline, just entries OK. NODATE.

9. Software/Documents Affected:
   SDAS Server & Drivers version 2/18/97

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: Date: 2/24/97
    Cognizant Manager: Date: 2/25/97
    CR/PR Preparer: Date: 2/18/97
    Design Authority: Date: 3/1/97
Change Request and Problem Report

CR/PR Number: 50

1. Software Id. (Name): World Model
   Rev: 
   System Name: LWA Unit #1

2. Prepared by: JE Ellis/Dave Clark
   Date: 2/11/97

3. CR/PR Type: [ ] Change Request [X] Problem Report
   Requested Completion Date: 

4. Description & Justification if Change Request:
   Added a piece of In-Tank Hardware and tried
to collide with real robot. Collision was not detected

5. Submitter's Priority
   [X] High [ ] Medium [ ] Low

6. Change Authority: JE Ellis
   Date: 2/17/97
   [X] Accept [ ] Modify [ ] Reject [ ] Defer Until: 1/1

7. Assigned to: JE Ellis

8. Solution Comments
   Cost/Schedule Estimate: 
   Problem was tried to a lack of adding the 3rd into the Robot
collision queue. This was added in 4 macros that needed to access the collision queue, and the problem was solved.

9. Software/Documents Affected:
   World Model version 2/19/97

10. Approvals Indicate CR is Complete or PR is Resolved.

Cognizant Engineer: [Signature] Date: 2/11/97
Cognizant Manager: [Signature] Date: 2/11/97
CR/PR Preparer: [Signature] Date: 2/11/97
Design Authority: [Signature] Date: 3/1/97

9-55
Change Request and Problem Report

CR/PR Number: 51

1. Software Id. (Name): World Model Rev: ____________
   System Name: IDA Unit #1

2. Prepared by: J.E. Ellis Date: 3/1/97

3. CR/PR Type: [ ] Change Request [X] Problem Report
   Requested Completion Date: ____________

4. Description & Justification if Change Request:
   The FMS force indicator turns red indicating that forces greater than 75°F have been detected. Also FMS does not startup reliably automatically

5. Submitter's Priority [X] High [ ] Medium [ ] Low


7. Assigned to: Jake Tucker

8. Solution Comments Cost/Schedule Estimate: ____________
   The FMS is not a calibrated instrument. Removed the feature where the indicator turns red, by setting the joint limit to 1000°F which can not be reached. Also, inserted FMS startup code in giscript, so that it starts automatically.

9. Software/Documents Affected:
   SDAS User Manual: IHC-SD-TD-OHM-001
   SDAS Server & Drivers version 3/10/97
   World Model version 3/6/97

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: Edward Ellis Date: 3/1/97
    Cognizant Manager: Edward Ellis Date: 3/1/97
    CR/PR Preparer: Edward Ellis Date: 3/1/97
    Design Authority: Edward Ellis Date: 3/1/97
# Change Request and Problem Report

**CR/PR Number:** 52

1. **Software Id. (Name):** SDAS Server & Drivers  
   **Revision:**  
   **System Name:** LDUA unit #1

2. **Prepared by:** J.E. Ellis  
   **Date:** 3/11/97

3. **CR/PR Type:** [ ] Change Request  [ ] Problem Report  
   **Requested Completion Date:** 

4. **Description & Justification if Change Request:**
   Produce formal release of SDAS software.  
   Integrate software into source code tree, generating changes.  
   Binary from source tree, test to show correct operation and document new installation procedures.

5. **Submitter’s Priority**  
   [ ] High  [ ] Medium  [ ] Low

6. **Change Authority:**  
   [ ] Accept  [ ] Modify  [ ] Reject  [ ] Defer Until: __/__/____

7. **Assigned to:** J.E. Ellis

8. **Solution Comments**  
   **Cost/Schedule Estimate:** 
   Incorporated all changes from interim releases 2/18/97 & 3/10/97.  
   Added further modifications and ran all through testing while installed on Unit #1.  
   Automated distribution file production and target installation.

9. **Software/Documents Affected:**
   SDAS Server & Drivers V 1.0.6  
   SDAS User Intf V 1.0.6  
   SCADAS OMM Whc-SD-TD-OMM-001 Rev 2

10. **Approvals Indicate CR is Complete or PR is Resolved.**
   
   Cognizant Engineer: ___________________________  
   Date: ___________________________
   Cognizant Manager: ___________________________  
   Date: ___________________________
   CR/PR Preparer: ___________________________  
   Date: ___________________________
   Design Authority: ___________________________  
   Date: ___________________________
Change Request and Problem Report

CR/PR Number: 53

1. Software Id. (Name): SDAS Server & DriverRev: __________
   System Name: LDU A Unit #1

2. Prepared by: [E] Date: 3/11/97

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date: __________

4. Description & Justification if Change Request:
   Modify SDAS PROCrate & LDU A system crate
   to have SDAS cpu & GISC CPU boot from Flash RAM
   like the Spar CPU does.

5. Submitter’s Priority  [ ] High  [ ] Medium  [X] Low

6. Change Authority: __________________________ Date: __________
   [ ] Accept  [ ] Modify  [ ] Reject  [ ] Defer Until: / __/ __

7. Assigned to: __________________________

8. Solution Comments  Cost/Schedule Estimate: __________ / __________

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: __________________________ Date: __________
   Cognizant Manager: __________________________ Date: __________
   CR/PR Preparer: __________________________ Date: __________
   Design Authority: __________________________ Date: __________
Change Request and Problem Report

CR/PR Number: __________

1. Software Id.(Name): World Model  Rev: __________
   System Name: __________

2. Prepared by: Jake Tucker/Dave Clark  Date: 4/3/97

3. CR/PR Type: [X] Change Request  [ ] Problem Report
   Requested Completion Date: 4/3/97

4. Description & Justification if Change Request:
   Remove simulated AX104 ALCE from Cell test facility mod 2/11 lift circulators

5. Submitter's Priority  [ ] High  [ ] Medium  [X] Low

6. Change Authority: __________  Date: 4/3/97
   [X] Accept  [ ] Modify  [ ] Reject  [ ] Defer Until: __________

7. Assigned to: Jake Tucker

8. Solution Comments  Cost/Schedule Estimate: $100  5 wks
   Removed the offending items as required.

9. Software/Documents Affected:
   None

10. Approvals Indicate CR is Complete or PR is Resolved.

    Cognizant Engineer: __________  Date: 4/3/97
    Cognizant Manager: __________  Date: 4/3/97
    CR/PR Preparer: __________  Date: 4/3/97
    Design Authority: __________  Date: 4/3/97
Change Request and Problem Report

CR/PR Number: 55

1. Software Id.(Name): SDAS User Interface Rev: 1.0.6
   System Name: SDAS User Interface SW version 1.0.7

2. Prepared by: Todd Shreeve Date: 7/15/97

3. CR/PR Type: [X] Change Request [ ] Problem Report
   Requested Completion Date: 9/30/97

4. Description & Justification if Change Request:
   Custom window to add a new window effect

5. Submitter's Priority
   [X] High [ ] Medium [ ] Low

6. Change Authority:
   [X] Accept [ ] Modify [ ] Reject [ ] Defer Until: 7/15/97
   Date: 3/18/97

7. Assigned to: JEEEllis

8. Solution Comments
   Cost/Schedule Estimate: $14K
   Added EREP control panel & updated documentation.

9. Software/Documents Affected:
   SDAS User Interface SW version 1.0.7
   OMM rev 1

10. Approvals Indicate CR is complete or PR is Resolved.
    Cognizant Engineer: Date: 3/15/98
    Cognizant Manager: Date: 7/18/98
    CR/PR Preparer: Date: 7/15/97
    Design Authority: Date: 3/18/98

9-60
Change Request and Problem Report

CR/PR Number: 56

1. Software Id. (Name): World Model  Rev: 
   System Name: DUA Unit #1

2. Prepared by: Todd Samuel  Date: 3/10/98

3. CR/PR Type: [x] Change Request  [ ] Problem Report
   Requested Completion Date: 3/1/98

4. Description & Justification if Change Request:
   Need to add model of ERTE 40 world model

5. Submitter's Priority  [x] High  [ ] Medium  [ ] Low

6. Change Authority:  Date: 3/10/98
   [x] Accept  [ ] Modify  [ ] Reject  [ ] Defer Until: 

7. Assigned to: J. Tucker

8. Solution Comments  Cost/Schedule Estimate: $3K / Yrs
   (see back)

9. Software/Documents Affected:
   World Model SW version

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer:  Date: 3/20/98
    Cognizant Manager:  Date: 3/20/98
    CR/PR Preparer:  Date: 3/24/98
    Design Authority:  Date: 3/24/98
# Change Request and Problem Report

**CR/PR Number:** 57

<table>
<thead>
<tr>
<th>1. Software Id. (Name):</th>
<th>SDAS (1/2/08)</th>
<th>Rev: 1.0.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Name:</td>
<td>LDAU unit #1</td>
<td></td>
</tr>
</tbody>
</table>

| 2. Prepared by:        | Todd Samuel   | Date: 3/5/98 |

<table>
<thead>
<tr>
<th>3. CR/PR Type:</th>
<th>[ ] Change Request [X] Problem Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requested Completion Date:</td>
<td>3/10/98</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Description &amp; Justification if Change Request:</th>
</tr>
</thead>
<tbody>
<tr>
<td>During operations training SDAS crashed very frequently. Please try to make SDAS more reliable.</td>
</tr>
</tbody>
</table>

| 5. Submitter's Priority | [X] High | [ ] Medium | [ ] Low |

<table>
<thead>
<tr>
<th>6. Change Authority:</th>
<th>[X] Accept</th>
<th>[ ] Modify</th>
<th>[ ] Reject</th>
<th>[ ] Defer Until:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>3/5/98</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 7. Assigned to:        | JE Ellis    |            |

<table>
<thead>
<tr>
<th>8. Solution Comments</th>
<th>Cost/Schedule Estimate: $5K 1.30hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Divided SDAS User Intf into Top SDAS 2 Video SDAS components.</td>
<td></td>
</tr>
<tr>
<td>This enhanced reliability some System still crashes. Recommend further study and troubleshooting. (see CRPR #61).</td>
<td></td>
</tr>
<tr>
<td>Updated Documentation,</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9. Software/Documents Affected:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDAS User Intf SW version 1.0.7</td>
</tr>
<tr>
<td>OMM rev 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10. Approvals Indicate CR is Complete or PR is Resolved.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Cognizant Engineer:</th>
<th>Edward Ellis</th>
<th>Date: 3/5/98</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognizant Manager:</td>
<td></td>
<td>Date: 3/10/98</td>
</tr>
<tr>
<td>CR/PR Preparer:</td>
<td></td>
<td>Date: 3/14/98</td>
</tr>
<tr>
<td>Design Authority:</td>
<td></td>
<td>Date: 3/19/98</td>
</tr>
<tr>
<td>Technical/Lead</td>
<td></td>
<td>Date: 3/25/98</td>
</tr>
</tbody>
</table>
Change Request and Problem Report

CR/PR Number: 58

1. Software Id. (Name): SDAS User Intf  Rev: 1.0.6
   System Name: LDUA unit #1

2. Prepared by: Todd Samuel  Date: ____________

3. CR/PR Type: [ ] Change Request  [X] Problem Report
   Requested Completion Date: 3/19/98

4. Description & Justification if Change Request:
   When ERET control panel is closed and reopened, the scoops open and dump the sample. Please make the jaws remain where last commanded.

5. Submitter's Priority: [X] High  [ ] Medium  [ ] Low

6. Change Authority: Todd Samuel  Date: 3/6/98
   [X] Accept  [ ] Modify  [ ] Reject  [ ] Defer Until: ____________

7. Assigned to: JE Ellis

8. Solution Comments  Cost/Schedule Estimate: 4K 1 yrs
   Made change to VI. Controls behave correctly.

9. Software/Documents Affected:
   SDAS User Intf SW  version 1.0.7

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer:  Date: 3/25/98
   Cognizant Manager:  Date: 3/20/98
   CR/PR Preparer:  Date: 3/19/98
   Design Authority:  Date: 3/21/98
Change Request and Problem Report

CR/PR Number: 59

1. Software Id. (Name): SDAS Server Rev: 1.0.6

System Name: LDUA unit #1

2. Prepared by: Todd Samuel Date: 3/5/98

3. CR/PR Type: [ ] Change Request [ ] Problem Report

Requested Completion Date: 3/19/98

4. Description & Justification if Change Request:

SDAS errors report a time that is off by 1 hour from wall clock time.

5. Submitter's Priority [ ] High [ ] Medium [ ] Low

6. Change Authority: Todd Samuel Date: 3/5/98

[ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: 

7. Assigned to: J E Ellis

8. Solution Comments

Cost/Schedule Estimate: $4K / 4hrs

Current implementation was to set the time zone information by hand. Modifying SDAS boot file (configuration change). Changed TIME_RPC code to get time zone info from Unix and set it automatically.

9. Software/Document Affected:

SDAS server SW version 1.0.7

SLAS console SW version 1.0.1

CMM rev 1

10. Approvals Indicate CR is Complete or PR is Resolved.

Cognizant Engineer: J E Ellis Date: 3/25/98

Cognizant Manager: J E Ellis Date: 3/19/98

CR/PR Preparer: Todd Samuel Date: 3/19/98

Design Authority: J E Ellis Date: 3/24/98

Technical Lead: J E Ellis
Change Request and Problem Report

CR/PR Number: GO

1. Software Id.(Name): SDAS User Draft  Rev: 1.0.6
   System Name: LDUA unit #1

2. Prepared by: Todd Samuel  Date: 3/5/98

3. CR/PR Type: [X] Change Request  [ ] Problem Report
   Requested Completion Date: 3/19/98

4. Description & Justification if Change Request:
   Want title to only put text out when title VII is open. Want text cleared from screen when VII is closed.

5. Submitter's Priority: [ ] High  [ ] Medium  [ ] Low

6. Change Authority: Todd Samuel  Date: 3/5/98
   [X] Accept  [ ] Modify  [ ] Reject  [ ] Defer Until: _ _ _

7. Assigned to: J E Ellis

8. Solution Comments  Cost/Schedule Estimate: $4K 4 Wks
   Modified VII. Behaves as desired now.

9. Software/Documents Affected:
   SDAS User Draft SW version 1.0.7

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: Todd Ellis  Date: 3/25/98
    Cognizant Manager: Todd Samuel  Date: 3/20/98
    CR/PR Preparer: Todd Samuel  Date: 3/18/98
    Design Authority:  Date: 3/17/98

9-65
Change Request and Problem Report

CR/PR Number: 61

1. Software Id. (Name): SDAS User File  Rev: 1.0.7
   System Name: LDAU Unit #1

2. Prepared by: J E Ellis/Todd Samuel  Date: 3/20/98

3. CR/PR Type: [ ] Change Request  [x] Problem Report
   Requested Completion Date: 

4. Description & Justification if Change Request:
   During operations SDAS crashes occasionally.
   (SEE CR/PR #57) This problem (57) was never fully resolved
   and needs further analysis.

5. Submitter's Priority  [x] High  [ ] Medium  [ ] Low

6. Change Authority: __________________________ Date: ________________
   [ ] Accept  [ ] Modify  [ ] Reject  [ ] Defer Until: ________

7. Assigned to: ________________________________

8. Solution Comments  Cost/Schedule Estimate: $____K 1 week

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: __________________________ Date: ________________
   Cognizant Manager: __________________________ Date: ________________
   CR/PR Preparer: ____________________________ Date: ________________
   Design Authority: __________________________ Date: ________________

9 - 66
Change Request and Problem Report

1. Software Id. (Name): **SDAS Userlnt**  Rev: **1.0.6**

   System Name: **LDAU unit #1**

2. Prepared by: **JE Ellis / KL Brown**  Date: **3/24/98**

3. CR/PR Type: [ ] Change Request  [X] Problem Report

   Requested Completion Date: **3/24/98**

4. Description & Justification if Change Request:

   When SDAS gets robot panel position data indicating 
   "NO END EFFECTOR", it does not always clear the currently 
   mounted END EFFECTOR button. This causes confusion about the 
   true state of the system.

5. Submitter's Priority  [X] High  [ ] Medium  [ ] Low

6. Change Authority:  Date: **3/25/98**

   [X] Accept  [ ] Modify  [ ] Reject  [ ] Defer Until: **1/1**

7. Assigned to: **JE Ellis**

8. Solution Comments  Cost/Schedule Estimate: **$2K / 4hrs**

   Software assumed that the button was blank whenever the 
   control panel was started. In fact it is only blank the 
   first time started. Software now correctly blanks the button.

9. Software/Documents Affected:

   **SDAS Userlnt** SW version 1.0.7

10. Approvals Indicate CR is Complete or PR is Resolved.

    Cognizant Engineer: **JE Ellis**  Date: **3/25/98**
    Cognizant Manager: **KL Brown**  Date: **3/25/98**
    CR/PR Preparer: **KL Brown**  Date: **3/25/98**
    Design Authority: **JE Ellis**  Date: **3/25/98**
Change Request and Problem Report

CR/PR Number: _____________

1. Software Id. (Name): ____________________ Rev: ____________
   System Name: ________________________________

2. Prepared by: ____________________________ Date: ____________

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date: ________________

4. Description & Justification if Change Request:

5. Submitter's Priority [ ] High [ ] Medium [ ] Low

6. Change Authority: __________________________ Date: ____________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: __/__/____

7. Assigned to: ________________________________

8. Solution Comments Cost/Schedule Estimate: _______/_______

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: __________________________ Date: ____________
   Cognizant Manager: __________________________ Date: ____________
   CR/PR Preparer: ___________________________ Date: ____________
   Design Authority: __________________________ Date: ____________

9-68
Change Request and Problem Report

CR/PR Number: ____________

1. Software Id. (Name): __________________________ Rev: ____________
   System Name: _____________________________________________

2. Prepared by: __________________________ Date: ____________

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date: ____________

4. Description & Justification if Change Request:

5. Submitter's Priority [ ] High [ ] Medium [ ] Low

6. Change Authority: __________________________ Date: ____________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: __/__/____

7. Assigned to: _____________________________________________

8. Solution Comments Cost/Schedule Estimate: / ______

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: __________________________ Date: ____________
    Cognizant Manager: __________________________ Date: ____________
    CR/PR Preparer: __________________________ Date: ____________
    Design Authority: __________________________ Date: ____________
Change Request and Problem Report

CR/PR Number: __________

1. Software Id. (Name): ____________________ Rev: __________
   System Name: ____________________________________________

2. Prepared by: ____________________ Date: __________

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date: __________

4. Description & Justification if Change Request:

5. Submitter's Priority [ ] High [ ] Medium [ ] Low

6. Change Authority: ____________________ Date: __________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: __ / __ / __

7. Assigned to: __________________________

8. Solution Comments Cost/Schedule Estimate: ______ / ______

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

    Cognizant Engineer: ____________________ Date: __________
    Cognizant Manager: ____________________ Date: __________
    CR/PR Preparer: ____________________ Date: __________
    Design Authority: ____________________ Date: __________
Change Request and Problem Report

CR/PR Number: ____________

1. Software Id. (Name): ___________________ Rev: ____________
   System Name: ____________________________

2. Prepared by: ___________________________ Date: ____________

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date: ____________

4. Description & Justification if Change Request:

5. Submitter's Priority [ ] High [ ] Medium [ ] Low

6. Change Authority: ______________________ Date: ____________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: / / __

7. Assigned to: ____________________________

8. Solution Comments Cost/Schedule Estimate: ______ / ______

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer: ____________________ Date: ____________
    Cognizant Manager: ____________________ Date: ____________
    CR/PR Preparer: ________________________ Date: ____________
    Design Authority: ______________________ Date: ____________

9-71
## Change Request and Problem Report

CR/PR Number: __________

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Software Id. (Name):</td>
<td>Rev:</td>
<td>System Name:</td>
<td></td>
</tr>
<tr>
<td>2. Prepared by:</td>
<td>Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. CR/PR Type:</td>
<td>Requested Completion Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Description &amp; Justification if Change Request:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Submitter's Priority</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Change Authority:</td>
<td>Date:</td>
</tr>
<tr>
<td></td>
<td>Accept</td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Assigned to:</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Solution Comments</td>
<td>Cost/Schedule Estimate:</td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Software/Documents Affected:</td>
</tr>
</tbody>
</table>

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Approvals Indicate CR is Complete or PR is Resolved.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognizant Engineer:</td>
<td>Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognizant Manager:</td>
<td>Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CR/PR Preparer:</td>
<td>Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design Authority:</td>
<td>Date:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Change Request and Problem Report

CR/PR Number: ____________

1. Software Id. (Name): ________________ Rev: ____________
   System Name: ____________________________________________________________________

2. Prepared by: ________________ Date: ____________

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date: ____________

4. Description & Justification if Change Request:

5. Submitter's Priority [ ] High [ ] Medium [ ] Low

6. Change Authority: ________________ Date: ____________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: ____________

7. Assigned to: ____________________________________________________________________

8. Solution Comments Cost/Schedule Estimate: ____________ / ____________

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
    
    Cognizant Engineer: ________________ Date: ____________
    Cognizant Manager: ________________ Date: ____________
    CR/PR Preparer: ________________ Date: ____________
    Design Authority: ________________ Date: ____________
Change Request and Problem Report

CR/PR Number:__________

1. Software Id. (Name):__________________ Rev:__________
   System Name:__________________________

2. Prepared by:________________________ Date:____________

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date:______________

4. Description & Justification if Change Request:

5 Submitter's Priority [ ] High [ ] Medium [ ] Low

6. Change Authority:____________________ Date:____________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until:__/__/____

7. Assigned to:__________________________

8. Solution Comments Cost/Schedule Estimate:_____/________

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer:____________________ Date:__________
    Cognizant Manager:____________________ Date:__________
    CR/PR Preparer:_______________________ Date:__________
    Design Authority:_____________________ Date:__________

9-74
Change Request and Problem Report

CR/PR Number:__________

1. Software Id. (Name):__________________________ Rev:__________
   System Name:________________________________________

2. Prepared by:__________________________ Date:________________

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date:__________

4. Description & Justification if Change Request:

5. Submitter's Priority  [ ] High  [ ] Medium  [ ] Low

6. Change Authority:__________________________ Date:__________
   [ ] Accept  [ ] Modify  [ ] Reject  [ ] Defer Until:__/__/____

7. Assigned to:__________________________

8. Solution Comments  Cost/Schedule Estimate:_____/_____

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.
    Cognizant Engineer:__________________________ Date:__________
    Cognizant Manager:__________________________ Date:__________
    CR/PR Preparer:__________________________ Date:__________
    Design Authority:__________________________ Date:__________

9-75
Change Request and Problem Report

CR/PR Number: ____________

1. Software Id. (Name): ____________________ Rev: ____________
   System Name: ____________________________________________

2. Prepared by: __________________________ Date: ____________

3. CR/PR Type: [ ] Change Request [ ] Problem Report
   Requested Completion Date: ____________

4. Description & Justification if Change Request:

5. Submitter’s Priority [ ] High [ ] Medium [ ] Low

6. Change Authority: __________________________ Date: ____________
   [ ] Accept [ ] Modify [ ] Reject [ ] Defer Until: __/__/____

7. Assigned to: ______________________________________

8. Solution Comments Cost/Schedule Estimate: __________ / __________

9. Software/Documents Affected:

10. Approvals Indicate CR is Complete or PR is Resolved.

   Cognizant Engineer: __________________________ Date: ____________
   Cognizant Manager: __________________________ Date: ____________
   CR/PR Preparer: __________________________ Date: ____________
   Design Authority: __________________________ Date: ____________