

**TRC**  
***ADVANCED TECHNOLOGIES, INC***

**QUALITY MANUAL**

**Jan, 2007**  
**Revision 5**

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Issued to: IN-HOUSE

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## QUALITY POLICY

*It is the policy of TRC Instruments, Inc. to consistently provide on-time delivery of defect free products and systems to our customers. We achieve this goal through a workforce of professional, dedicated employees and a network of highly qualified suppliers and sub-contractors who share our ideals and have a proven track record of outstanding performance.*

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**Cas Vanwoerden**  
*Vice-President*

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## 1. DOCUMENTATION MANAGEMENT

### 1.1 Issues

The level of this document is such that infrequent re-issues are anticipated.

Issue	Reason for Reissue	Date	Issued by	Approval
1	Initial release	Dec 97	C. Vanwoerden	_____
2	Rev. 1, Update format	May 98	C. Vanwoerden	_____
3	Rev. 2, Inclusion of references to Department Standards	Apr 99	C. Vanwoerden	_____
4	Rev. 3, general Update	Apr 01	Ozdemir Genc	_____
5	Rev 4, Update DS	May 04	Ozdemir genc	_____
6	Rev 5, Update Section 4.0.1	Jan 07	C. Vanwoerden	_____

### 1.2 Controlled Copies

Controlled manuals are issued to designated recipients who are required to sign an acknowledgment form that is maintained in the Quality files. Subsequent revisions are controlled in the same manner.

Each controlled copy has a unique number entered on the title page and is stamped "Controlled Copy" in red. Any copy not so identified shall be deemed to be uncontrolled.

Responsibility for the disposal of obsolete copies shall be that of the designated recipient.

### 1.3 Uncontrolled Copies

These copies will be stamped uncontrolled in black ink on the front sheet of the manual. Uncontrolled copies may be issued to customers and third parties at the discretion of the Company. These will not be maintained and users should contact the Executive responsible for the TRC Quality System, if any doubt exists regarding the validity of an uncontrolled copy.

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## 2. COMPANY PROFILE

TRC is the leading independent Designer of systems for the production, gathering and distribution of Oil and Gas products. TRC partners with major suppliers of SCADA hardware and software and tailors these off-the-shelf products to meet the specific requirements of our customers. Turn-key contracts are accomplished in partnership with major international contractors who share TRC's goal of providing customers with solutions that meet or exceed their requirements.

Founded in 1996, TRC became an early leader in the design of large scale, PC-based SCADA systems. To this day, TRC has the demonstrated expertise to develop new, and upgrade existing, SCADA systems with state-of-the art master stations, communications networks, distributed databases and Remote Terminal Units providing systems of maximum operational reliability. Today's systems are characterized by use of industry standard hardware and software platforms, and are built using processes founded on ISO 9001 practices that are in conformance with relevant international standards.

Thus, TRC is an international supplier providing turnkey systems on a worldwide basis, in addition to providing subcontracting services to other suppliers or end users.

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### 3. APPROACH TO QUALITY

The approach TRC takes to ensure the delivery of high quality products and services to our customers is based on two premises. Firstly, the products we provide must meet the highest industry standards, and secondly, the processes we use in designing, building and installing the systems we supply to our customers must be modeled on best industry practices and be in conformance with applicable domestic and international standards.

To this end, the products selected for supply to a customer are procured from reliable vendors from whom, wherever possible, TRC has obtained similar products and has thus developed successful working relationships. Furthermore, care is taken to check that such products meet the relevant industry standards in addition to any additional requirements specified by the customer.

TRC also exerts great care in establishing partnerships with subcontractors with whom to team when necessary to meet the full compliment of products and services required on a specific contract. To this end TRC senior managers travel extensively to visit potential candidate companies and conduct interviews to establish a high level of confidence that these companies have the capability and resources to perform the work required of them.

With regard to internal processes, TRC has designed its own Quality Management System in accordance with ISO 9001 principles. In so doing, in recognition that the major portion of the systems supplied consists of software, special attention is given to the ISO 9000-3 guidelines which address the application of the ISO 9001 principles to this product. The software quality assurance system will thus also be in accordance with the principles embodied in the earlier IEEE Standard 730.

In summary, the basis for achieving and improving quality in all activities at TRC is:

- the preparation of specifications which define the required outcome of each state of a project, product, service or operation
- the production of plans which define the responsibilities, methods, resources and times necessary to achieve these requirements
- the periodic and systematic reviews of progress, the identification and resolution of problems and the documented revision of the plans if changes are necessary
- the measurement of performance and comparison with the requirement; the identification of the reasons for any disparities and the implementation of corrections or improvements as required
- the prompt attention to any adverse reports or suggestions for improvement made by customers or suitably qualified personnel
- the timely generation of information which requires action by other personnel or which is needed by the customer

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- the compilation, analysis and preservation of records and documentation which demonstrate that the required quality objectives are met, and, where necessary, corrective action is taken in a controlled manner, followed by confirmation of its effectiveness
  - the periodic and systematic reviews of the quality management system to ensure its effectiveness and adequacy in meeting changing needs

The remainder of this manual addresses the elements of the TRC Quality Management System, generally structured to the corresponding section numbers of the ISO 9001 standard.

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## **4. QUALITY SYSTEM IMPLEMENTATION**

### **4.1 Management Responsibility**

#### **4.1.1 Quality Policy**

It is the policy of TRC Instruments, Inc. to consistently provide on-time delivery of defect free products and systems to our customers. We achieve this goal through a workforce of professional, dedicated employees and a network of highly qualified suppliers and sub-contractors who share our ideals and have a proven track record of outstanding performance.

The purpose of this Quality Assurance Manual, which is issued under the direct authority of the President, is to define how the above Quality Policy is implemented within the TRC organization.

#### **4.1.2 Organization**

TRC has developed a project management approach, which assures our customers that their projects will be implemented in a responsive, timely, and reliable manner. We employ a proven process of consultation, planning, engineering, and implementation which has been proven through the successful completion of well over 400 projects. An organizational chart of our company is depicted in Figure 4.0-1.

The philosophy behind the TRC organizational structure is that a project can best be executed by an established project team that has completed similar projects, and that has developed a team environment from their ongoing experience together. To this end, the Projects department is structured into teams, rather than into functional departments.

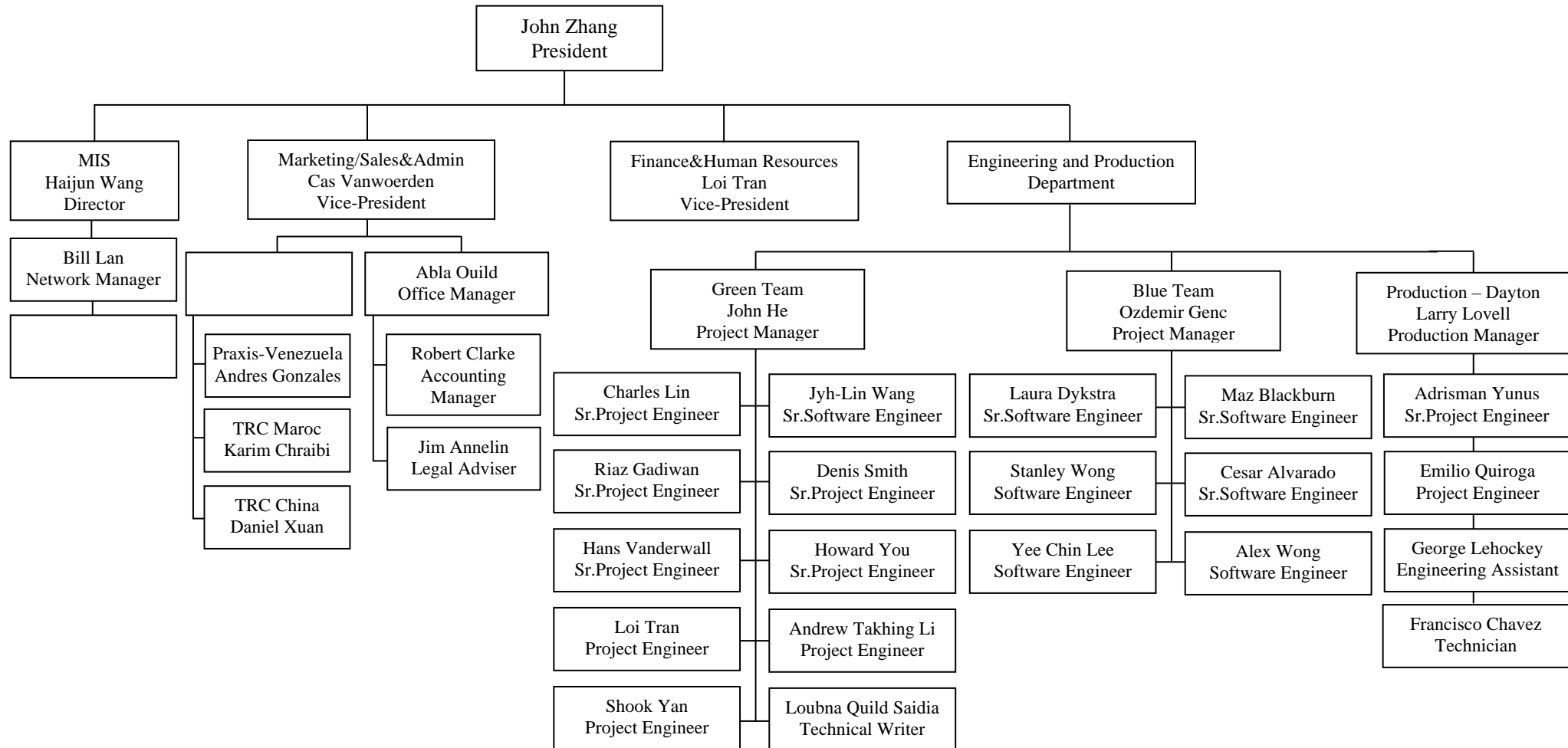
Each team is guided by a Team Leader, who reports directly to the Vice President of Engineering. Team Leaders are chosen because of their ability to focus on the “big picture”. They are directly responsible for the successful implementation of the project. The Team Leaders plan, organize, implement and evaluate the project so that performance criteria and schedule are met. The Team Leaders are also the primary point of contact with the customer. Team Leaders are our most senior and experienced project engineers.

Each team has several team members who together bring a wide variety of experiences in the design, programming and integration of SCADA and PLC systems.

Responsibility for Quality within the TRC organization is vested in The Vice President of Engineering who reports directly to the President. He is responsible for monitoring the operation of the quality system and has full authority to conduct audits and take whatever action may be necessary to ensure that the Quality System requirements are adhered to. By delegation, each of the Team Leaders have the responsibility to ensure that all work performed under their control is performed in full compliance with the requirements of this policy manual.

**Figure 4.0-1 TRC Organization Chart**

TRC Organization Chart  
January 16, 2007



The TRC Quality Assurance Program applies to each functional work area. This ensures that all company activities that affect quality are conducted in the manner planned and chartered by the President, under whose authority the program has been established. The organizational structure provides for access to responsible management at a level where appropriate action can be effected.

#### **4.1.3 Management Review**

A major review of the quality system is carried out annually.

The review comprises a meeting of senior management to identify areas where changes or improvements should be introduced in order to improve the effectiveness, efficiency or scope of the quality system.

The following topics are considered:

- Results of internal audits
- Corrective Action analysis
- Second party assessment (when applicable)
- National and international QA developments
- Supplier performance

Interim reviews of the above topics are held with senior management to resolve quality related problems.

#### **Applicable Department Standards:**

<b>Quality Management Responsibility</b>	<b>DS-100</b>
<b>Project Management</b>	<b>DS101</b>

## **4.2 QUALITY SYSTEM**

### **4.2.1 General**

TRC maintains a documented quality system as a means of ensuring that products and services comply with specified requirements.

### **4.2.2 Quality System Procedures**

Documentation is structured as follows:

- The Quality Manual
- Work Instructions
- Quality Plans

The function of these documents is as defined below.

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#### **4.2.2.1 The Quality Manual**

This document defines overall TRC policy towards quality management and has been generated to:

- introduce new employees to TRC policy.
- continually remind employees of TRC policy.
- define the objectives to be achieved when amending existing processes or introducing new processes within TRC.
- explain in general terms to second or third party organizations how the quality documents are organized.

#### **4.2.2.2 Department Standards**

Department Standards are the procedural documents that describe how the company performs its major quality processes, relating these to the specific requirements of the twenty ISO 9001 clauses. These documents contain clear definitions of the company processes addressed detailing responsibilities and requirements to achieve each specified objective.

The correlation between the various TRC Department Standards and the Clauses of the ISO 9001 Quality Systems Model is shown in Figure 4.2.2.2 - 1.

#### **4.2.2.3 Work Instructions**

These are detailed documents defining specific processes to be used by various groups in the performance of their day to day tasks, and generally give detailed instructions on how these tasks should be carried out. These documents may also include operating manuals for various pieces of equipment, programmer reference guides, source code documentation guidelines, together with numerous other items of a less formal nature.

#### **4.2.2.4 Quality Plans**

Where required by contract, quality plans are prepared to produce a consolidated description of the quality processes that are to be used in the performance of the project. Such quality plans address key aspects of project management, hardware and software engineering, procurement and construction. They also describe any project specific practices or techniques that may be required in the fulfillment of contractual obligations, and any additional or alternative controls that may be specified by the customer. Where necessary, contract specific standards are generated. Quality Plans are approved by The Vice President of Engineering.

When not specifically required by contract, the quality planning information will be included in the Statement of Work prepared for that project.

TRC Document Number DS-	ISO 9001 Section Title	Management Responsibility	Quality System	Contract Review	Design Control	Document and Data Control	Purchasing	Control of Customer Supplied Product	Product Identification and Traceability	Process Control	Inspection and Testing	Control of Inspection, measuring and Test Equipment	Inspection and Test Status	Control of Nonconforming Product	Corrective and Preventive Action	Handling, Storage, Packaging, Preservation and Delivery	Control of Quality Records	Internal Quality Audits	Training	Servicing	Statistical Techniques
	TRC Quality Procedures																				
	TRC Quality Manual	X																			
100	Quality Management Responsibility	X	X																		
101	Project Management	X																			
102	Contract Review			X																	
103	Design Control				X																
104	Design Reviews				X																
105	System Development				X					X											
106	Software Configuration Management				X				X												
107	Quality System Documentation Control					X															
108	Vendor Qualification						X														
109	Purchase Orders						X														

TRC Document Number DS-	ISO 9001 Section Title	Management Responsibility	Quality System	Contract Review	Design Control	Document and Data Control	Purchasing	Control of Customer Supplied Product	Product Identification and Traceability	Process Control	Inspection and Testing	Control of Inspection, measuring and Test Equipment	Inspection and Test Status	Control of Nonconforming Product	Corrective and Preventive Action	Handling, Storage, Packaging, Preservation and Delivery	Control of Quality Records	Internal Quality Audits	Training	Servicing	Statistical Techniques
	TRC Quality Procedures																				
110	Customer Supplied Product						X														
111	System Testing										X										
112	Control of Test Equipment										X										
113	Receiving Inspection										X										
114	Inspection and Test Status												X								
115	Control of Nonconforming Product													X							
116	Corrective and Preventive Action														X						
117	Handling, Storage, Packaging, Preservation and Delivery															X					
118	Control of Quality Records																X				
119	Quality Audits																	X			
120	Training																		X		

TRC Document Number DS-	ISO 9001 Section Title	Management Responsibility	Quality System	Contract Review	Design Control	Document and Data Control	Purchasing	Control of Customer Supplied Product	Product Identification and Traceability	Process Control	Inspection and Testing	Control of Inspection, measuring and Test Equipment	Inspection and Test Status	Control of Nonconforming Product	Corrective and Preventive Action	Handling, Storage, Packaging, Preservation and Delivery	Control of Quality Records	Internal Quality Audits	Training	Servicing	Statistical Techniques
	TRC Quality Procedures																				
121	Customer Service																			X	
	Not Applicable																				X

**Figure 4.2.2.2 - 1 TRC Quality Procedure Correlation Matrix**

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### 4.2.3 Quality Planning

Quality planning is performed at the outset of each contract to ensure the successful transition from proposal to project. A plan is prepared for the acquisition of the resources required and for defining the processes to be used in the implementation of the project. The internal and customer review points, and each project specific issue necessary to ensure that the specified requirements can be met, are also addressed.

#### **Applicable Department Standards:**

**Quality Management Responsibility**

**DS-100**

### 4.3 CONTRACT REVIEW

All contracts are reviewed by TRC to ensure that:

- the requirements are adequately defined and documented.
- any requirements differing from those in the tender are resolved.
- TRC has the resources and capability to meet contractual requirements.
- any administrative or interface requirements not covered by the quality system are identified.

Evidence of these reviews are the authorized signatures on the appropriate documentation generated during both the proposal and contract definition phases.

#### **Applicable Department Standards:**

**Contract Review**

**DS-102**

### 4.4 DESIGN CONTROL

#### 4.4.1 General

Design activities are performed by qualified individuals in accordance with sound engineering practices to ensure that specified requirements are met.

#### 4.4.2 Design and Development Planning

Responsibilities and resources required for each design, development and inspection activity are identified, and each activity is assigned to a person who is qualified to perform that task.

#### 4.4.3 Organization and Technical Interfaces

Where more than one discipline is involved, the organizational and technical interfaces are identified and the necessary information documented, transmitted, and regularly reviewed.

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#### **4.4.4 Design Input**

Prior to commencement of a new design the requirements are documented, reviewed and approved by the Team Leader and the Vice President of Engineering.

#### **4.4.5 Design Review**

During the course of the project and at appropriate points in the software development life cycle, reviews are held as required to ensure that the project requirements are being correctly interpreted and implemented. Records of these reviews are typically in the form of completed checklists. Customer participation in such reviews is arranged when called for by contract. Primary responsibility for ensuring the adequacy of these reviews rests with the responsible Team Leader.

#### **4.4.6 Design Output**

Design outputs are documented, and expressed in terms of requirements, calculations, analysis, drawings, material schedules, and sketches.

Design outputs are reviewed to ensure that they:

- meet the design input requirements.
- contain or reference acceptance criteria.
- conform to appropriate regulatory requirements
- identify any requirements of the design crucial to the safe and correct functioning of the equipment.

#### **4.4.7 Design Verification**

All design outputs are verified to confirm that design input requirements have been achieved by means of one, or a combination, of the following techniques:

- Peer group reviews.
- Undertaking qualification tests and demonstrations.
- Comparing the design with a similar proven design.

#### **4.4.8 Design Validation**

Design validation, to ensure that the product conforms to defined user needs occurs in the form of site acceptance tests. These generally follow formal acceptance tests in the factory and are conducted using procedures that have been approved by the customer. It is these site acceptance tests, when the design is subject to live data from the operational environment, that validation occurs.

#### **4.4.9 Design Changes**

Any change to an existing design is subject to the same level of input, output, and verification as the original design.

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**Applicable Department Standards:**

<b>Design Control</b>	<b>DS-103</b>
<b>Design Reviews</b>	<b>DS-104</b>
<b>System Development</b>	<b>DS-105</b>
<b>Software Configuration Management</b>	<b>DS-106</b>

**4.5 DOCUMENT AND DATA CONTROL****4.5.1 General**

Documents and data, including software releases, are identified and controlled in accordance with defined procedures that ensure their traceability and continued integrity.

**4.5.2 Document Approval and Issue**

All working documents and data are reviewed and approved for adequacy by authorized personnel prior to issue. This control ensures that:

- pertinent issues of appropriate information are available at all locations where operations essential to the effective functioning of the quality system are performed.
- obsolete or superseded documents are identified and promptly removed from all points of issue or use.

**4.5.3 Document Changes**

Any change to an issued document is subject to the same level of review and approval as the original issue.

Changes are highlighted on the document, or alternatively, in an historical log.

Registers, master lists, or equivalent controls are maintained. These identify the current issues and distribution of documents in order to preclude the use of non-applicable documents, and ensure that holders of controlled copies are issued subsequent revisions.

**Applicable Department Standards:**

<b>Quality System Documentation Control</b>	<b>DS-107</b>
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**4.6 PURCHASING****4.6.1 Evaluation of Sub-contractors and Suppliers**

Sub-contractors and suppliers of standard products are selected on the basis of their ability to meet TRC requirements. Whenever possible, their selection is based on their past performance record in supplying similar equipment or services. The performance of approved suppliers is monitored to ensure their continued viability.

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#### **4.6.2 Purchasing Data**

Purchase Orders are supported as necessary by referenced information such as drawings, sketches and specifications, clearly describing the product or service ordered. This minimizes the possibility of any ambiguity.

#### **4.6.3 Verification of Purchased Product**

Where specified in the contract, the customer, or his representative, is afforded the right to verify at source, or on receipt, that purchased product or service conforms to specified requirements. However, ultimate responsibility for subcontracted work remains with TRC.

#### **Applicable Department Standards:**

<b>Vendor Qualification</b>	<b>DS-108</b>
<b>Purchase Orders</b>	<b>DS-109</b>

#### **4.7 CONTROL OF CUSTOMER-SUPPLIED PRODUCT**

Free issue items are subjected to controls equivalent to those applied to bought in items.

Such controls apply at Receiving, Inventory control, all stages of Development, Inspection, Testing, and Commissioning.

The customer is informed immediately of any defects, shortages, or accidental damage.

#### **Applicable Department Standards:**

<b>Customer Supplied Product</b>	<b>DS-110</b>
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#### **4.8 PRODUCT IDENTIFICATION AND TRACEABILITY**

Documentation is maintained to identify work in progress and completed equipment. Where traceability is specified by the customer, the extent of traceability will be agreed for the contract, and any necessary additional or alternative procedures included in a contract specific Standard and Quality Plan.

#### **Applicable Department Standards:**

<b>Software Configuration Management</b>	<b>DS-106</b>
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## 4.9 PROCESS CONTROL

Processes used during the implementation of the project are identified, planned, and carried out as defined in the Quality Plan. TRC normally uses no special processes that can not be verified by inspection and/or test, but if employed, monitoring techniques will be developed and documented.

### Applicable Department Standards:

**System Development**

**DS-105**

## 4.10 INSPECTION AND TESTING

### 4.10.1 Receiving Inspection and Testing

No incoming material or product is used or processed until it has been checked for compliance with specified requirements.

### 4.10.2 In-process Inspection and Testing

In-process inspection and testing are defined in the appropriate procedural documents. Products are held until satisfactory completion of inspection and testing has been achieved.

### 4.10.3 Final Inspection and Testing

Prior to commencing final inspection and testing, checks are carried out to ensure that all previous inspections and tests have been completed as specified.

### 4.10.4 Inspection and Test Records

Records are maintained to give evidence that all products have passed specified inspections and/or test stages with defined acceptance criteria.

### Applicable Department Standards:

**System Testing**

**DS-111**

**Receiving Inspection**

**DS-113**

## 4.11 CONTROL OF INSPECTION, MEASURING AND TEST EQUIPMENT

### 4.11.1 General

All inspection, measuring, and test equipment for quantitative measurement and/or setting-up is controlled, calibrated, and maintained. This applies to equipment owned by TRC, its employees, or a third party. Such equipment displays its calibration status at all times.

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### 4.11.2 Selection of Equipment

Equipment to be used shall be specified in general or contract-specific documents, taking into account the accuracy required.

### 4.11.3 Calibration

Calibration equipment in regular use is uniquely identified, entered into a recall system, and calibrated at defined frequencies. Any equipment used infrequently is identified as un-calibrated when the calibration period expires, but is calibrated prior to use for quantitative measurement.

Steps are taken to ensure that equipment is safeguarded from unauthorized adjustments or tampering which could invalidate calibration settings. Any equipment found to be outside calibration, that cannot be adjusted or economically repaired, is scrapped.

### 4.11.4 Records

Records are maintained of all inspection, measuring and test equipment. These are reviewed periodically to ensure that optimum frequencies of calibration are specified.

#### Applicable Department Standards:

**Control of Test Equipment**

**DS-112**

## 4.12 INSPECTION AND TEST STATUS

The inspection and test status of products are identified by labels, route cards, inspection/test records, physical location or other suitable means. Identification is maintained throughout all stages of design and production.

#### Applicable Department Standards:

**Inspection and Test Status**

**DS-114**

## 4.13 CONTROL OF NONCONFORMING PRODUCT

### 4.13.1 General

Product that does not conform to the specified requirement is prevented from inadvertent use or installation. Such product is segregated or identified while awaiting rework, concession, or disposal.

### 4.13.2 Nonconformity Review and Disposition

Nonconforming product may be:

- reworked to meet the specified requirements.
- accepted with or without repair by concession.
- rejected and scrapped.
- returned to supplier.

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Where it is proposed to issue a concession, the customer must be consulted if the nonconforming product constitutes a deviation from the specification, or approved documentation.

Repaired or reworked product is rechecked as required.

The manufacture or supplier of a product with serious or multiple defects is investigated immediately upon detection to establish the root cause and take corrective action to prevent recurrence. Work processes, concessions, quality records and customer complaints are reviewed to allow the appropriate corrective action.

**Applicable Department Standards:**

**Control of Nonconforming Product**

**DS-115**

**4.14 CORRECTIVE AND PREVENTIVE ACTION**

Corrective Action is initiated by the analyses of non-conformances. Data is collected on which non-conformances are most frequent and how they can be eliminated by changes in the process, design or specifications.

Preventive Action is taken continuously based on the collection of input from the customer, test data, inspection results, supplier contact and process review. This data is analyzed to determine what actions can be taken that will result in improved operations.

**Applicable Department Standards:**

**Corrective and Preventive Action**

**DS-116**

**4.15 HANDLING, STORAGE, PACKING, PRESERVATION AND DELIVERY**

**4.15.1 Handling and Storage**

Methods are defined, and equipment provided, to ensure that all product, inspection, measuring and test equipment, tools, and fixtures are not damaged or allowed to deteriorate during handling and storage. The condition of product in stock is assessed at appropriate intervals.

**4.15.2 Packaging and Delivery**

Equipment is packaged and identified to ensure continued conformance to specified requirements during delivery to destination.

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**Applicable Department Standards:**

**Handling, Storage, Packaging, Preservation and Delivery** **DS-117**

**4.16 CONTROL OF QUALITY RECORDS**

Records that furnish documentary evidence of quality and design are specified, prepared, and maintained. Care is taken to ensure that all records are legible, identifiable, retrievable and protected against damage, deterioration, or loss. Requirements and responsibilities for record transmittal, distribution, retention, maintenance, and disposition are established and documented

Each department identifies its own quality records along with their retention periods and storage requirements.

The various records demonstrate achievement of the required quality, the effective operation of the quality system, and the performance of subcontractors/suppliers.

All records are checked to ensure that they are legible and identifiable to the product, activity or area concerned. The records are stored in such a way that they may be readily retrieved.

**Applicable Department Standards:**

**Control of Quality Records** **DS-118**

**4.17 INTERNAL QUALITY AUDITS**

TRC operates a program of planned and documented internal audits to ascertain whether quality activities comply with planned arrangements, and to determine the effectiveness and efficiency of the quality system.

Audit results are documented, and any necessary corrective actions are agreed with personnel having responsibility for the cause of each non-compliance observed. Management personnel ensure that corrective action is implemented within an agreed timetable, and the implementation and effectiveness of the agreed action is monitored by the auditing authority.

**Applicable Department Standards:**

**Quality Audits** **DS-119**

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#### **4.18 TRAINING**

Training is given to ensure that all activities are performed by suitably qualified and experienced personnel. Records are maintained of all training activities.

**Applicable Department Standards:**

**Training**

**DS-120**

#### **4.19 SERVICING**

The provision of responsive after-sales service to the customer is a key element in TRC' strategy. TRC provides this service during warranty, and is available to supply additional products and services under follow-on contracts beyond. All such work will be governed by the same procedures as were invoked in the implementation of the original system. Just as during project implementation, the focus will remain on providing responsive customer care.

When servicing product supplied by TRC, reference will be made to the original job file, and wherever possible, spare parts and associated inspections and tests will be identical to that originally supplied.

**Applicable Department Standards:**

**Customer Service**

**DS-121**

#### **4.20 STATISTICAL TECHNIQUES**

TRC has reviewed the need for statistical techniques and has determined that none are available which could justify their use on the type of product being supplied. The need for such techniques will be evaluated from time to time as business conditions change.

**Applicable Department Standards:**

**Not Applicable**

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Department Standard

Standard No. DS 100 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

Quality Management Responsibility

1.0 Scope

1.1 This procedure describes the prime responsibilities of TRC management for the definition and ongoing viability of the company's Quality Assurance Program.

2.0 Reference

2.1 ISO 9001 - 1994, Clause 4.1

2.2 TRC Quality Manual

3.0 Responsibilities

3.1 Vice President of  
Engineering

Responsibility for quality within the TRC organization is vested in the Vice President of Engineering. In this role, he shall:

- 3.1.1 Define and agree to the TRC Quality Policy with the President.
- 3.1.2 Have ultimate responsibility for ensuring that the requirements of ISO 9001 are implemented and maintained.
- 3.1.3 On an annual basis, carry out a review of the TRC Quality Management System.
- 3.1.4 Review and identify training requirements for all personnel assigned Quality Assurance tasks.
- 3.1.5 Maintain and review for adequacy the documentation defining the quality system.
- 3.1.6 Participate in vendor evaluation audits/visits.
- 3.1.7 Analyze non-conformances related to purchased items.
- 3.1.8 Inform and advise all personnel of the quality system requirements.

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## Department Standard

Standard No. DS 100 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

- 3.1.9 Log and handle all complaints that are related to quality.
- 3.1.10 Attend meetings conducted with the Customer as requested by the Project Managers.
- 3.1.11 Promote the TRC total quality philosophy and culture.
- 3.2 Project Managers
  - 3.2.1 The Project Managers are responsible for ensuring that all aspects of their respective projects are managed in accordance with the documented TRC quality management system
  - 3.2.2 Where specified by contract, generation of project specific quality plans.
- 3.3 Team leaders
  - 3.3.1 Shall have sole responsibility for the quality of line functions, the administration of quality records/documents and the adequacy of quality training for assigned personnel within their teams.
  - 3.3.2 Team leaders are the quality managers for their respective teams.
- 3.4 All TRC Personnel
  - 3.4.1 Think quality and report defective material, processes and work operations.
- 4.0 Requirements
  - 4.1 No amount of Quality Assurance activity can take away from the Team Leaders their ultimate responsibility for product/service quality.
  - 4.2 The Vice President of Engineering's prime objective in his role as Executive responsible for Quality is to provide the assurance, both inside and outside of TRC, that specifications are met and that systems exist to ensure the continued achievement of same.

### Department Standard

Standard No. DS 100 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

- 4.3 The Vice President of Engineering shall provide the visibility of the Company's quality achievement and where non-achievement occurs, shall demand remedial action from the responsible areas.

#### 5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	Dec 5 , 1997
Dave Ellis	Rev 1	Update Format	May 23 , 1998
Cas Vanwoerden	Rev 2	Include Dept Standard	April 18 , 1999
Ozdemir Genc	Rev 3	General Update	April 1 , 2001
Ozdemir Genc	Rev 4	Update DS	May 12, 2004
Cas Vanwoerden	Rev 5	Update Section 4.01	Jan 16, 2007

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## Department Standard

Standard No. DS 101 Date: Dec 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### Project Management

#### 1.0 Scope

- 1.1 This procedure defines the responsibilities of the Project Managers and identifies the Work Instructions that serve as tools in meeting these responsibilities.
- 1.2 It also includes a chart showing the typical project life cycle of a TRC system.

#### 2.0 References

- 2.1 ISO 9001 - 1994, Clause 4.1
- 2.2 Work Instructions WI 201 through WI 206

#### 3.0 Responsibilities

##### 3.1 Project Managers:

- 3.1.1 Report to the Vice President of Engineering
- 3.1.2 Charged with carrying out the following responsibilities on all assigned projects including:
  - 3.1.2.1 All contractual and commercial aspects of a project.
  - 3.1.2.2 Timely execution of the project schedule. Completion of the project at or below budget. Identifying Customer quality assurance requirements and conveying these to the responsible Team Leaders and all project team members.
  - 3.1.2.3 Customer liaison.
  - 3.1.2.4 Coordination of the activities of all TRC staff as required for the successful implementation of the project requirements.
  - 3.1.2.5 Generation of Change Orders if the scope of work changes.
  - 3.1.2.6 Generation of a formal Order Acknowledgment to the Customer.
  - 3.1.2.7 Providing timely invoicing information to accounting.

## Department Standard

Standard No. DS 101 Date: Dec 2007 Rev. No. 5

Written By: DE  
Approved By: JD

- 3.1.2.10 Coordinating the archiving of project records.
- 3.1.2.11 Chairing of regular project team meetings for each assigned project.

### 4.0 Requirements

- 4.1 At the earliest opportunity after receipt of an order, the Project Manager shall sign the acknowledgment copies of the Customer's purchase order and issue a formal letter of acknowledgment. If, due to some discrepancy in the order or lack of needed information, there will be a delay in the issuance of the order acknowledgment, a formal notification of receipt of the order shall be forwarded to the Customer.
- 4.2 Project Managers shall ensure project control by strict adherence to the following Project Management Work Instructions.
  - WI 201 Project Filing Systems
  - WI 202 Project Communications
  - WI 203 Project Scheduling
  - WI 204 Change Order Variance Request
  - WI 205 Project Meetings
  - WI 206 Project Cost Control
- 4.3 Following the completion of the contract review, and unless the contract calls for an alternative documentation set, a Statement of Work (SOW) shall be prepared. This document shall be the definitive text that defines exactly what TRC will be supplying to the Customer. It includes a technical description of the scope of supply, together with such data as project schedule, project staffing and the quality requirements that will govern implementation of the project. This plan will identify any special procedures or processes that are to be used as well as indicating all Customer-imposed witness and/or "hold" points and other items that would otherwise be included in a separate Quality Plan.
- 4.4 An alternative documentation set is often stipulated by the Customer. Often this will call for the separation of the technical and project planning/quality information. Under these circumstances, the technical information is usually included in a Functional Design Specification (FDS), with the remaining data

Department Standard

Standard No. DS 101 Date: Dec 2007 Rev. No. 5

Written By: DE  
Approved By: JD

being put into a separate Project Quality Plan. The TRC Quality Management System (QMS) allows for both of these alternatives.

- 4.5 The SOW or FDS and Project Quality Plan shall be approved by the Customer.
- 4.6 The life cycle of a typical TRC system implementation is shown in Figure 4.6 - 1.

5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

Department Standard			
Standard No.	DS 101	Date:	April 98
Rev. No.	0	Written By:	DE
		Approved By:	JD

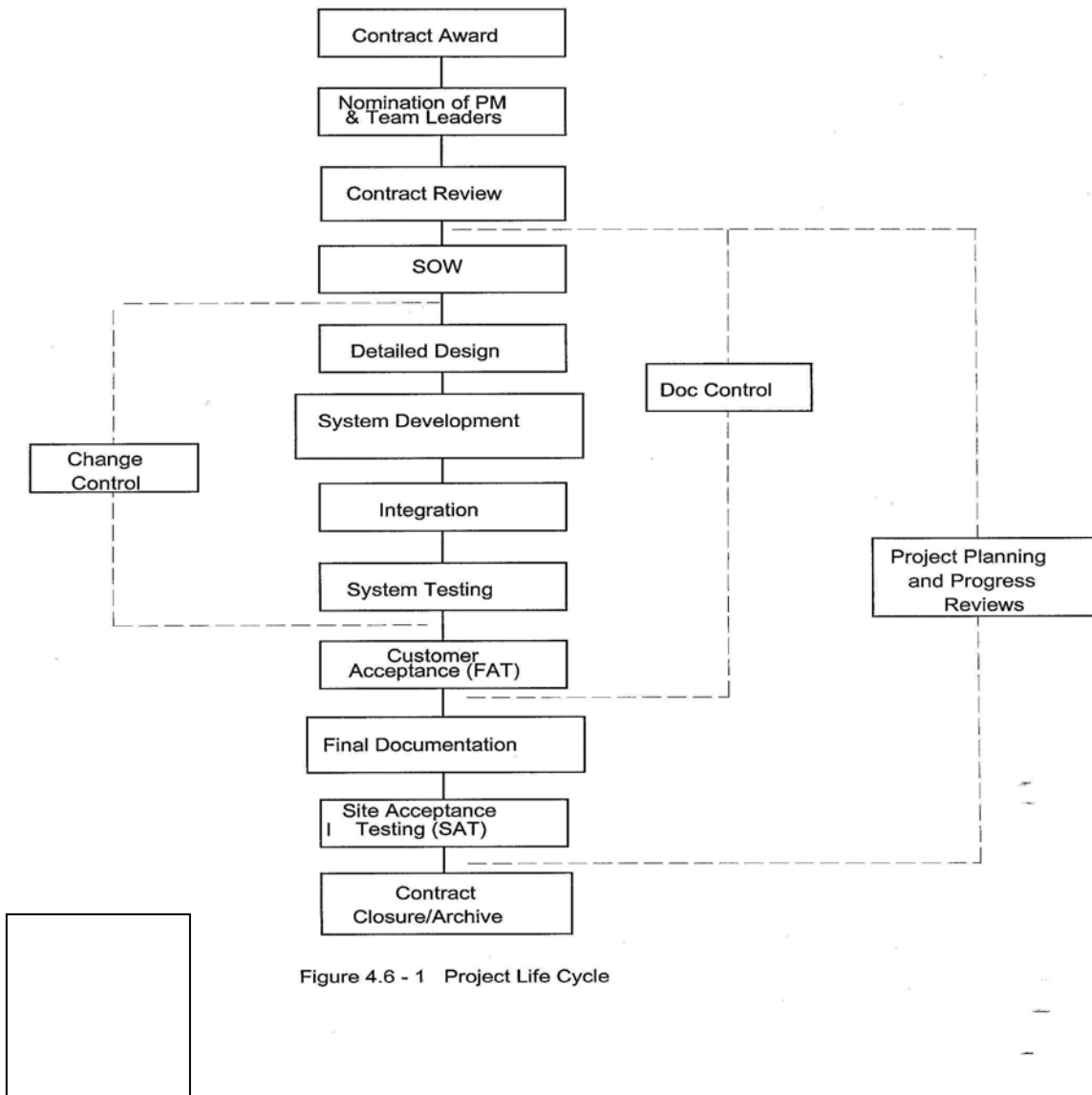


Figure 4.6 - 1 Project Life Cycle

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## Department Standard

Standard No. DS102 Date: Dec 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### Contract Review

#### 1.0 Scope

- 1.1 This procedure defines the responsibilities for the review of all project-related contracts received.

#### 2.0 References

- 2.1 ISO 9001 - 1994, Clause 4.3
- 2.2 ISO 9000-3:1991(E), Clause 5.2

#### 3.0 Responsibilities

##### 3.1 Vice President of Sales and Marketing:

- 3.1.1 Responsible for the review of the purchase order and/or contract to determine if the requirements of the purchase order match the proposal given to the Customer.
- 3.1.2 A copy of the sales documents shall be given to the Project Manager in advance of the Sales Handoff Meeting.
- 3.1.3 A copy of the sales document is given to the Accounting department.

##### 3.2 Project Managers:

- 3.2.1 Shall, upon receipt of the sales file, have the Project Secretary make the required number of copies for the project team and for the project files.
- 3.2.2 Shall have overall responsibility for the contract following the Sales Handoff Meeting.
- 3.2.3 Based upon a review of the contract, proposal and specifications coordinate with the Project Engineer in preparing for the Project Kickoff Meeting.

## Department Standard

Standard No.    DSI02 Date:    Dec 2007    Rev. No.    5

Written By: DE  
Approved By: JD

3.2.4    Shall coordinate the resolution of any differences identified between the TRC and Customer documents.

### 4.0    Requirements

4.1    Each contract shall be reviewed to ensure that:

- a. The scope of the contract and requirements are adequately defined and documented.
- b. Any requirements differing from those in the tender are resolved.
- c. Possible contingencies or risks are identified
- d. Responsibilities regarding any subcontracted work are clearly defined. e. TRC has the capability to meet the contractual requirements.

4.2    A record of such contract review shall be maintained in the project files. Any differences between documents shall be noted and the resolution of these issues shall be clearly documented as an addendum to the Contract Review Form.

4.3    Documents to which the Project Manager is given access shall include but not be limited to:

- a. The original Customer's inquiry information.
- b. The TRC proposal.
- c. Internal confidential responses to Customer's specifications. d.

The Sales Binder - structured to include the following:

- (1) Customer's Purchase Order
- (2) Cost summary
- (3) Revisions to the bid
- (4) Correspondence with the Customer
- (5) TRC internal correspondence
- (6) Correspondence with vendors

### Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

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## Department Standard

Standard No. DS 103 Date: Dec 2007 Rev. No. 5

Written By: DE

Approved By: JD

### Design Control

#### 1.0 Scope

- 1.1 This procedure defines the design and design change control process used to assure the delivery of a properly designed and validated system that meets the Customer's specified requirements.

#### 2.0 References

- 2.1 ISO 9001 - 1994, Clause 4.4

#### 3.0 Responsibilities

##### 3.1 Vice President of Engineering:

- 3.1.1 Establishes a design process that ensures conformance to the Customer's specification and applicable industry standards.
- 3.1.2 Shall ensure that the procedures used in the verification and peer review of the design and design changes are adequate to meet the project quality requirements.
- 3.1.3 Shall ensure that verification processes are formally recorded.
- 3.1.4 Shall ensure that any subsequent changes to the scope of supply or functionality are properly reviewed, approved and agreed with the Customer by project management, prior to implementation.

##### 3.2 Project Manager:

- 3.2.1 Shall ensure that a definitive design is agreed with the Customer. This is usually included in the Statement of Work (SOW).
- 3.2.2 Shall ensure that there is technical review of the SOW to assure that applicable quality, technical and reliability parameters are addressed.
- 3.2.3 Shall ensure that any subsequent changes to the scope of supply are agreed with the Customer prior to implementation.

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## Department Standard

Standard No. DS 103 Date: Dec 2007 Rev. No. 5

Written By: DE  
Approved By: JD

3.2.4 Shall conduct an adequate number of design review meetings during the design phase of the project.

### 3.3 Project Engineer:

3.3.1 Shall be responsible for generation of the SOW.

3.3.2 Shall ensure that the detail design is in accordance with the agreed documents.

3.3.3 Shall identify, control and approve any change to the agreed scope of functionality.

3.3.4 Shall immediately identify any potential problem areas to the Project Manager.

3.3.5 Shall coordinate engineering and software development activities.

## 4.0 Requirements

### 4.1 Design Process Validation

A project plan is developed for monitoring and evaluating the system design and development activities. Depending on the requirements of the contract, this plan will either be included in the Project Quality Plan, or incorporated into the Statement of Work. The planning includes but is not limited to:

a. A project schedule with appropriate milestones at which key events throughout the design and development activity are monitored and reviewed.

b. Timely formal design reviews.

c. Provision for corrective action as necessary.

### 4.2 There are four design control measures that are used:

a. Design reviews

b. Prototype testing

c. Expert review by external consultants

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Standard No. DS 103 Date: Dec 2007 Rev. No. 5

Written By: DE  
Approved By: JD

d. Comparison with a proven design.

4.3 In most instances it is appropriate to apply two or more of the above measures. Even under ordinary circumstances, design verification will involve personnel other than those responsible for the design work under review.

5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April!, 1998

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## Department Standard

Standard No. DS 104 Date: Dec 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### Design Reviews

#### 1.0 Scope

1.1 This procedure defines the use of Design Reviews at TRC.

#### 2.0 References

2.1 ISO 9001 - 1994, Clause 4.4

2.2 ISO 9000-3: 1991 (E), Clause 5.5,5.6

#### 3.0 Responsibilities

##### 3.1 Team Leaders:

3.1.1 Identify the points in the development of the system at which Design Reviews should be conducted and provide this information to the Project Manager.

3.1.2 Identify suitably qualified staff to participate in Design Reviews, and ensure that they are given the time, budget, and recognition for performing this function.

##### 3.2 Project Managers:

3.2.1 Incorporate Design Reviews into the project schedule and identify these reviews into the Project Quality Plan or equivalent document.

3.2.2 Schedule and chair the Design Reviews and ensure that the proceedings are included in the meeting minutes.

3.2.3 Ensure that any action items arising from the meeting are closed and signed off, and that the minutes are placed into the Project File.

#### 4.0 Requirements

4.1 Design Reviews are formal examinations of the design by a group of experts in the discipline(s) being reviewed. A review is made to assure management that all aspects of the specification have been adequately considered and that the resulting

## Department Standard

DS 104 Date: Dec 2007 Rev. No. 5

Standard No.

Written By: DE  
Approved By: JD

design represents the consensus of the review group that the design criteria defined in the Customer's specification have been met.

- 4.2 Reviews may be held at various points in the development schedule depending on the size and nature of the system being supplied. The review schedule for a specific project will be defined in that Project's Quality Plan.
- 4.3 Prior to the review, a checklist should be prepared identifying the issues that need to be examined during the Design Review. Checklists will typically consist of a listing of key issues that have been identified as requirements in the Customer's specification, as well as common issues that arise on similar projects. Such checklists help to ensure that potential oversights have not been made and that all requirements have been accommodated.
- 4.4 Checklists developed for specific projects will be retained to provide a point of departure for the development of similar lists for use on future projects. This approach provides continuity both from one project to the next and also between the various members of the engineering staff who are called upon to provide this function on different projects.
- 4.5 Formal minutes shall be taken at Design Reviews with action items assigned as appropriate to resolve issues requiring corrective action. Closure of all such action items shall be verified prior to the design receiving final approval. Design Review minutes will be filed with the other quality records for that Project and retained for at least two (2) years from the end of the project warranty period.

### 5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

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## Department Standard

Standard No. DS 105 Date: Dec 2007 Rev. No. 5

Written By: DE

Approved By: JD

### System Development

#### 1.0 Scope

- 1.1 This standard defines the process used by TRC in designing, developing, configuring and integrating the elements of a system to meet the Customer's specification requirements.

#### 2.0 References

- 2.1 ISO 9001 - 1994, Clause 4.4,4.9,4.10
- 2.2 ISO 9000-3:1991(E), Clause 5.6
- 2.3 Design Review Procedure DS 104

#### 3.0 Responsibilities

##### 3.1 Vice President of Engineering:

- 3.1.1 Verifies that the Statement of Work (SOW) or Project Quality Plan, as appropriate, adequately addresses the requirements of the project being undertaken.
- 3.1.2 Shall ensure that verification processes are formally conducted and the results recorded.

##### 3.2 Project Managers:

- 3.2.1 Shall prepare a development plan for the project. This information will usually be incorporated into the SOW or the Project Quality Plan and shall include any changes necessary to the approach identified in Section 4.0 of this standard.
- 3.2.2 In addition to the technical details, the Plan shall define how the project is to be staffed, managed and controlled.

##### 3.3 Engineering Staff:

- 3.3.1 Shall perform the activities defined in Section 4.0 of this standard.

---

## Department Standard

Standard No. DS 105 Date: Dec 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### 4.0 Requirements

#### 4.1 Configuration

The systems provided by TRC are typically configured with standard software packages that are configured with two main software products, one to handle the SCADA requirements, and the other, the PLC's. The packages used are rich in functionality enabling the vast majority of the Customer's requirements to be met by configuring tables and writing scripts, as opposed to the need for writing complex low level software.

#### 4.2 Review Methodology

Throughout the development phase of the project a peer review methodology shall be used to identify and correct errors. The goal will be to correct any such errors as early in the development cycle as possible to avoid their propagation throughout the remainder of the project implementation. Technical review shall also be provided by the responsible Lead Engineers using checklists designed to verify that potential oversights have not been made and that all requirements have been accommodated. In addition, design reviews will be held at critical points to provide the best assurance that all issues have been handled and that the development is proceeding according to plan. These reviews shall be recorded in meeting minutes and included as quality records in the project file.

#### 4.3 Development Phases

The system development process used at TRC will vary to some degree based on the type of system being implemented. Specific details, if different than that depicted in this procedure, shall be documented in the SOW or Project Quality Plan. A typical system development process is shown diagrammatically in Figure 4.3 - 1 and is as described below:

##### 4.3.1 Basic Design

This is the initial design activity in which the overall database structure is established and the input/output points are defined. These phase outputs enable the parallel SCADA and PLC detailed design activities to begin.

##### 4.3.2 Detailed Design

## Department Standard

Standard No. DS 105 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

During this phase, the SCADA team proceeds with the building of the graphics screens and the links (tags) to the real-time data base fields. The output of this activity is the MMI and real-time database.

In parallel, the PLC team proceeds with the development of the PLC ladder logic, together with any special PLC programming that may be required (such as AGA calculations).

### 4.3.3 SCADA/PLC Interface Verification

At this point the two teams come together to finalize and verify the interface between the PLC and SCADA portions of the design. A key output of this phase is the detailed interface tables.

### 4.3.4 Design Finalization

Once the interfaces have been verified, the SCADA team will replicate the design as necessary to set-up the entire system and will prepare the SCADA report formats.

The PLC team will similarly complete their designs and produce the annotated ladder logic lists.

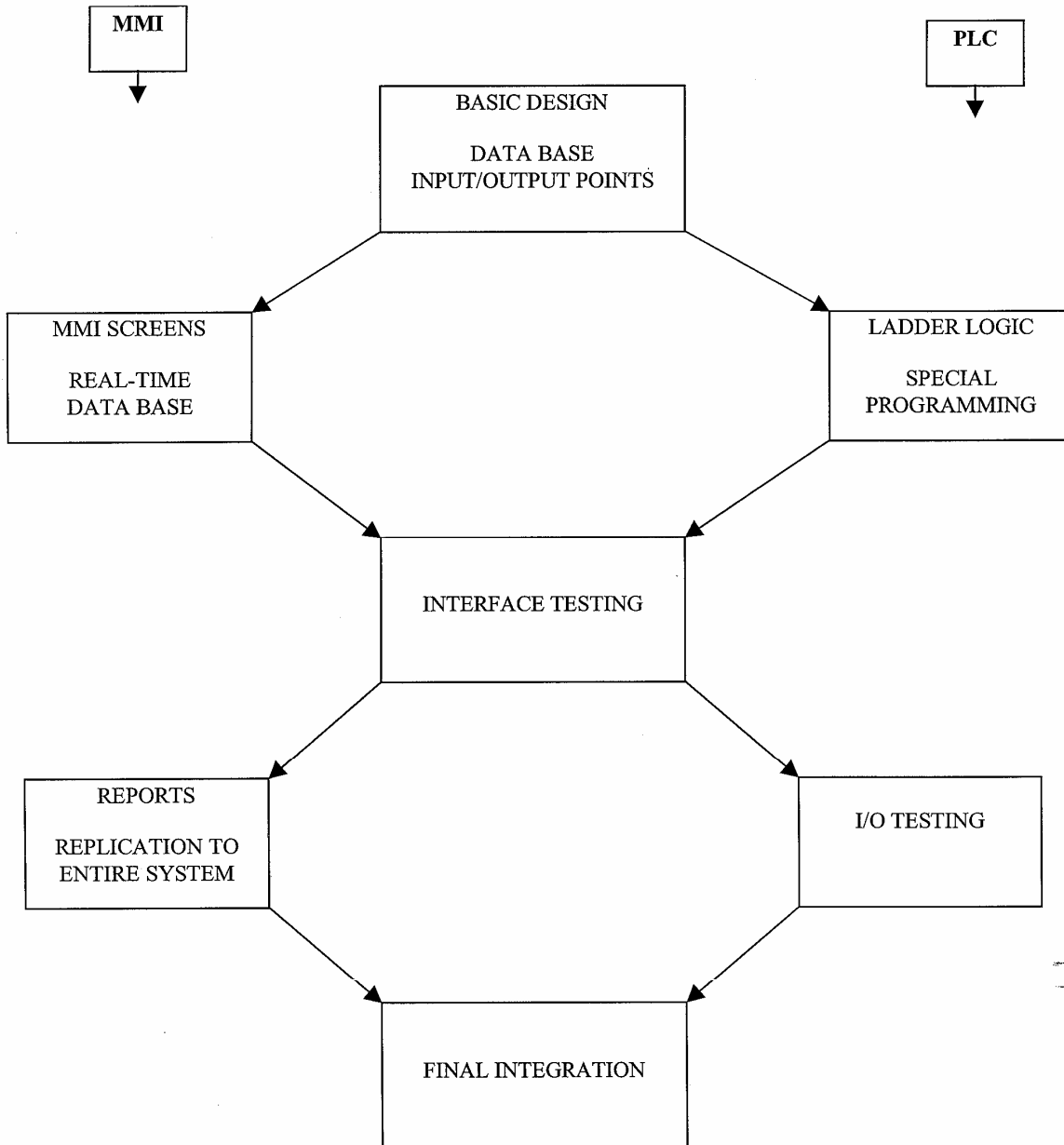
### 4.3.5 System Integration

The final stage at the TRC facility will be the integration of the SCADA and PLC portions of the system. This will include the dry running of the Factory Acceptance Test procedures on the equipment that will be staged at the TRC facility in Houston.

## 5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

Department Standard			
Standard No.	DS 105	Date: April 98	Rev. No. 0
		Written By: DE	Approved By: JD



**Figure 4.3 - 1 SYSTEM DEVELOPMENT PROCESS**

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## Department Standard

Standard No. DS 106 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### Software Configuration Management

#### 1.0 Scope

1.1 This procedure defines the technique used for Software Configuration Management at TRC.

#### 2.0 References

- 2.1 ISO 9001 - 1994, Clause 4.4
- 2.2 ISO 9001 - 1994, Clause 4.8
- 2.3 ISO 9000-3: 1991 (E), Clause 6.1.3

#### 3.0 Responsibilities

3.1 Vice President of Engineering:

3.1.1 Ensure, by periodic audit, that the Software Configuration Management discipline defined in this standard is strictly adhered to on all projects.

3.2 Team Leaders:

3.2.1 Identify responsibilities for performing the Software Configuration Management activities described in section 4.0 below.

3.2.2 Provide the day to day management of the Software Configuration Management function.

#### 4.0 Requirements

4.1 Configuration Management shall be provided as a mechanism for identifying, controlling and tracking the versions of each software item produced on a project. In this context, software item refers to each unique combination of graphics displays, data base points, scripts, PLC ladder logic, etc., needed to customize the standard software products being provided to fully implement the Customer's requirements. The basic features of the Configuration Management system shall be as identified below:

## Department Standard

Standard No. DS 106 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: ill

- 4.2 A date/time stamp shall identify each unique version of a configured software item. Back-ups of all files shall be made on a daily basis and all current versions shall be frozen and archived at the end of each week.
- 4.3 A Master Control Worksheet shall be used to identify the versions of each configured item, which together constitute a specific version of a complete product. This worksheet shall also identify the build status of software products in development or delivered and installed.
- 4.4 One master copy of each configured software item shall be maintained, and this shall be kept under strict configuration control. Before any updates are permitted to this master copy the responsible Lead Engineer shall make a detailed review and sign-off the changes from the previous version. This will prevent the simultaneous updating of a controlled version of a given software item by more than one person.
- 4.5 Both current and historical versions of the master copies of each configured software item shall be maintained on a central server to which individual workstations are connected via a Local Area Network. These workstations shall access required files on a read-only basis to facilitate on-going development activities.
- 4.6 Distribution records of the configured software items shall be maintained on the Master Control Worksheet. This will enable the coordination of updates of any subsequent changes that may need to be distributed to multiple locations once the software has left the TRC facility.
- 4.7 Any updates resulting from Customer directed change requests shall be identified and tracked from initiation through to release via entries and comments on the Master Control Worksheet.

### 5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

---

## Department Standard

Standard No. DS 107 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### Quality System Documentation Control

#### 1.0 Scope

1.1 This procedure describes the prime responsibilities for the generation and control of the following documents:

- . Quality Manual
- . Department Standards .
- Work Instructions

#### 2.0 Reference

- 2.1 ISO 9001 - 1994, Clause 4.5
- 2.2 ISO 9000-3: 1991(E), Clause 6.3

#### 3.0 Responsibilities

##### 3.1 Vice President of Engineering:

The Vice President of Engineering, with the assistance of the Quality Management System (QMS) Documentation Coordinator, shall be responsible for maintaining the integrity of QMS documentation. Specific responsibilities include:

- 3.1.1 Production and control of the Quality Manual.
- 3.1.2 Assignment of responsibility for the production of Department Standards and Work Instructions.
- 3.1.3 Review and approval of the Department Standards to ensure that the required clauses on ISO 9001 are appropriately addressed.
- 3.1.4 Approval and recording of all changes to the Quality Manual and Department Standards.
- 3.1.5 Maintenance of the Quality Manual and Department Standard masters.

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## Department Standard

Standard No. DS 107 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

- 3.1.6 Establishment and maintenance of the distribution for the Quality Management System documentation and responsibility for ensuring distribution of the latest copies.
- 3.2 Team Leaders:
  - 3.2.1 Generation of Department Standards relating to their areas of responsibility as defined by the Vice President of Engineering.
  - 3.2.2 Generation and maintenance of Work Instructions applicable to their respective areas of responsibility.
  - 3.2.3 Maintenance of the QMS documentation allocated to them.
  - 3.2.4 Ensure that staff under their supervision are aware of and understand the QMS documents and subsequent amendments relevant to their activities, and that their work is performed in accordance with these procedures.
  - 3.2.5 Provide the QMS Documentation Coordinator with a review sheet, signed by the staff under their supervision who are effected by a QMS change, acknowledging that these staff members they have read and understood each documentation update.
- 3.3 All Personnel:
  - 3.3.1 Ensuring that they work to the approved procedures as documented in the Department Standards and Work Instructions.
  - 3.3.2 Where such procedures are deemed for any reason to be inadequate, the perceived deficiency shall be highlighted and brought to the immediate attention of their supervision for resolution.
  - 3.3.3 Signing the review sheets to signify having read and understood the document.

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## Department Standard

Standard No. DS 107 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### 4.0 Requirements

#### 4.1 Definitions

Department Standard: A clear definition of a process detailing responsibilities and requirements to achieve a specified objective. A Department Standard shall define a process that relates directly to ISO 9001.

A Department Standard may involve more than one function.

Work Instruction: A clear, often detailed instruction defining how to carry out a specified task. Work Instructions are issued only to the functions directly affected.

#### 4.2 Structure

Department Standards shall have the following common standard structure:

##### 1.0 Scope

This defines the process and includes any limitations.

##### 2.0 References

Reference shall be made to the relevant sections of International or Industry Standards and to other associated TRC procedural documents. If no documents are to be referenced, then this section should still be included and 'None' put in the text.

##### 3.0 Responsibilities

This section defines the responsibilities of all personnel whose task is affected by the document

##### 4.0 Requirements

The section shall include details of the process together with any descriptive or explanatory text.

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## Department Standard

Standard No. DS 107 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### 5.0 Procedure Revision History

The last section is a table in which the revision history of the procedure shall be documented. It includes the author of the change, the revision number, the reason for the revision and the date on which the new revision was released.

The structure of Work Instructions is not formally controlled and is left to the discretion of the responsible Team Leader.

#### 4.3 The Approved Signatories

'Writer': The originator of the document

'Approver': In the case of a Departmental Standard, this shall be the Vice President of Engineering. In the case of a Work Instruction, this may be the Team Leader.

#### 4.4 Master Index

A master list or equivalent document control procedure shall be maintained to identify the current version of each document. A log of the original signatures approving the release of each document and its subsequent revisions shall be maintained along with this index.

#### 4.5 QMS Document Distribution

The controlling versions of the TRC Quality Manual, all Department Standards, and most Work Instructions shall be maintained on a server at the TRC facility, under the configuration control of the TRC Quality Management System (QMS) Documentation Coordinator. These documents are thus directly accessible in read only manner to all TRC employees and other authorized personnel who have access to the TRC network via their respective workstations. In this way, TRC ensures that all staff are operating from the same current versions. In addition, a limited number of controlled manuals may be issued in hard copy to designated recipients. Such recipients shall be required to sign an acknowledgment form that is maintained in the Documentation Coordinator's Quality files.

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## Department Standard

Standard No. DS 107 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

To avoid the use of obsolete copies of these documents, when a copy is printed by anyone other than the Documentation Coordinator, each page shall be overprinted with a diagonal banner which reads, "UNCONTROLLED COPY, VOID AFTER XXX YY, ZZZZ", where XXX YY, ZZZZ is the date on which the copy was printed (e.g. Jan 16, 1998). Such uncontrolled copies may be issued to customers and third parties at the discretion of the Company. These copies will not be maintained, thus holders of uncontrolled copies have the responsibility of verify that they have the latest revision prior to taking any action or decision based on the content of such copies.

### 4.6 Change Control

- 4.6.1 All changes to a released document shall be reviewed and approved by the same function/organization that performed the original review, unless The Vice President of Engineering specifically specifies otherwise.
- 4.6.2 A Departmental Standard or Work Instruction shall be submitted for reissue whenever significant procedural changes are to be incorporated into the standard company methodology. Such company-wide changes will usually occur after they have been tested in controlled circumstances on specific projects. Such circumstances shall be recorded - typically in that Project's Quality Plan or equivalent document.
- 4.6.3 Changes that require the reissuing of the procedures shall be dealt with as follows:
  - . A hardcopy of the current version of the document shall be obtained from the Documentation Coordinator. This shall be marked-up to reflect suggested changes, and forwarded to the Vice President of Engineering for review and approval.

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## Department Standard

Standard No. DS 107 Date: Jan 2007 Rev. No. 5

Written By: DE

Approved By: JD

- The Documentation Coordinator shall place a note with the Department Standard masters indicating that the document in question is in the process of being updated. He or she shall also maintain a record of who is initiating the change and the date that the hardcopy was requested. This note shall be initialed and dated. The Documentation Coordinator shall ensure that not more than one change to the same document is in process at anyone time.
  - All changes to QMS documents shall be highlighted by the placement of a vertical bar alongside the left-hand paragraph that has changed.
- 4.6.4 Any controlled hardcopies shall be distributed by the Documentation Coordinator and stamped as such on the binder of the documents. Absence of such a stamp indicates that that manual is uncontrolled and should not be used as a working document.
- 4.6.5 Anyone holding a maintained manual of QMS documents will from time to time receive either a new or an updated version of specific documents. When an updated document is received it shall be placed in sequence in the correct manual and the out-of-date issue shall be destroyed immediately. The manual holder shall mark the change of issue on the index sheet by hand. This change shall be initialed and dated. When a suitable number of changes have taken place, a revised index will be issued.
- 4.6.6 Upon each issue of Department Standard or Work Instruction, the individuals that are affected by the tasks identified within the document are required to sign a review sheet to the effect that the contents of the document have been read and understood.

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Department Standard

Standard No. DS 107 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

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## Department Standard

Standard No. DS 108 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### Vendor Qualification

#### 1.0 Scope

- 1.1 This procedure defines the process that shall be used at TRC for the qualification and subsequent performance monitoring of vendors and subcontractors.
- 1.2 The terms vendors and subcontractors for the purpose of this procedure are taken to be:
  - Suppliers of equipment or material fabricated to a TRC design.
  - Suppliers of custom software.
  - Suppliers of services in response to a custom specification.
  - Suppliers of major items that represent a significant portion of the cost of a project.

The term vendor as used throughout the remainder of this document shall be considered to include both vendor and subcontractor.

- 1.3 Qualification shall be based on an assessment of a vendor's ability to provide a quality product that meets the Customer's specified requirements together with, where available, their past record of timely delivery in supplying similar items.

#### 2.0 Reference

- 2.1 ISO 9001 - 1994, Clause 4.6

#### 3.0 Responsibilities

- 3.1 Engineering or Project Management may initiate the process of qualifying a new vendor by submitting the required qualification data to the Vice President of Engineering for vendor approval.
- 3.2 The Vice President of Engineering shall be responsible for approving the addition of a new vendor to the Approved Vendor Listing.
- 3.3 Purchasing shall be responsible for collecting and maintaining vendor performance records, updating them as necessary to reflect any deviations from contracted performance.

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## Department Standard

Standard No. DS 108 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

3.4 Purchasing shall be responsible for maintaining, updating and issuing the Approved Vendor Listing.

### 4.0 Requirements

4.1 New vendors of custom software, or equipment or material fabricated to TRC design shall be approved either by a site visit, or by review and approval of a Vendor Evaluation Questionnaire prior to placement of the initial purchase order. For a new vendor to be considered for qualification they must submit the following information:

- Their Quality Assurance Manual or equivalent documentation. The
- technical capabilities that qualify the vendor for approved status (completion of Vendor Evaluation Questionnaire).
- Identification of the equipment or software that the vendor has in operation, or services provided, that are pertinent to the proposed supply.

4.2 The Approved Vendor List, signed by the Vice President of Engineering, shall be maintained by Purchasing and updated and distributed at least quarterly.

4.3 Placing of orders from vendors selected from the Approved Listing shall be based on, but not limited to, the vendor's quoted cost and delivery at the time of purchase. A vendor listed as approved does not necessarily imply that a purchase order has been or will be issued to that vendor. The inclusion of a vendor on the Approved Listing only signifies that at one time the vendor was assessed as capable of supplying a quality product to satisfy TRC requirements. It does not relieve the vendor of his responsibility to deliver a quality product and to maintain that quality level.

It should be emphasized that it is the vendor's responsibility to assure conformance to TRC Quality, design and specified requirements and that TRC is NOT required to perform on-site inspections during fabrication or pre-delivery for the purpose of assuring a quality product.

4.4 The performance of vendors on the approved list shall be continually assessed. A deletion from the Listing shall be based on a vendor's failure to deliver a quality product to the agreed delivery schedule, failure to take actions to correct a quality

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Written By: DE  
Approved By: JD

deficiency or shall be due to a recommendation based on a subsequent site visit or survey. A vendor's inability to meet price and delivery requirements on a particular quotation, shall not be the sole cause for the vendor's removal from the Listing.

- 4.5 Failure to deliver material or equipment conforming to TRC quality requirements shall be advised, in writing, to the particular vendor and shall be noted on the vendor file. Failure, by the vendor, to take appropriate corrective action shall result in the vendor being removed from the Approved Listing.

### 5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

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## Department Standard

Standard No. DS 109 Date: April 98 Rev. No. a

Written By: DE  
Approved By: JD

### Purchase Orders

#### 1.0 Scope

1.1 This procedure defines the TRC Purchase order process.

#### 2.0 Reference

2.1 ISO 9001 - 1994, Clause 4.6.3

#### 3.0 Responsibilities

3.1 Any employee may generate a purchase request.

3.2 The responsible Project Manager or Team Leader shall approve all purchase requests that fall within their financial jurisdiction.

3.3 The Buyer shall prepare the Purchase Order and be the principal contact with the Vendor.

#### 4.0 Requirements

##### 4.1 Purchase Requisitions.

All requests for purchase shall be clear, precise and complete. Where applicable, manufacturer's part numbers or specification data sheet numbers shall be defined on the requisition together with quantities, anticipated prices, required delivery dates and locations, quality requirements and other pertinent data. In cases where the item is to be purchased to a TRC drawing or specification, the defining documentation shall be appended to the requisition.

##### 4.2 Purchase Order Placement

###### 4.2.1 Competitive Bids

Prior to releasing a purchase order for an item considered by the Project Manager or Team Leader to be a major purchase, unless the equipment specified is a sole source item, the Buyer will endeavor to obtain bids

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Approved By: JD

from three (3) vendors. The vendors invited to submit bids shall be selected from those listed on the Approved Vendors List.

Prior to its release, the completed Purchase Order shall be reviewed and approved by the person who has budget authority for the item to be purchased or his/her designee.

### 4.2.2 Parts Substitution

The buyer will attempt to purchase all equipment to the exact specifications given. If this cannot be done, the buyer may make suggestions of alternates to the requisitioner. However, the buyer does not have the authority to deviate from the specifications or to purchase substitute items without the express approval of the requisitioner.

### 4.3 Verification at subcontractors

Where a purchased product is to be verified at the sub-contractor's premises, the verification arrangements and the method of product release shall be specified in the purchasing documents.

### 5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

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## Department Standard

Standard No. DS 110 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### Customer Supplied Product

#### 1.0 Scope

- 1.1 This procedure describes the steps that will be taken to provide adequate control of items supplied by a Customer for incorporation into, or to support the testing of, a TRC supplied system.

#### 2.0 Reference

- 2.1 ISO 9001 - 1994, Clause 4.7

#### 3.0 Responsibilities

##### 3.1 Project Managers:

3.1.1 Shall be responsible for the care and handling of any item supplied to TRC by the Customer.

3.1.2 Shall identify such items in the project planning documents, and shall identify any special issues pertinent to such item or items.

3.1.3 Shall liaise with the Customer on any issues relative to the condition, suitability for the purpose intended, or other subject of mutual interest.

3.1.4 Shall be responsible for preparing and maintaining records regarding all Customer supplied items.

#### 4.0 Requirements

- 4.1 Any item that the Customer supplies into the custodianship of TRC for incorporation into, or for testing of or with a system that TRC will ultimately deliver to the Customer, shall be handled with the same care and shall be given the same protection as new items purchased for the project.
- 4.2 On receipt of such items, each shall be inspected against the corresponding packing slip to confirm that the correct item and, where relevant, quantities of items, has/have been delivered. Records shall be made of unique identification information e.g. model and serial numbers, and notes shall be made of the

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Standard No. DS 110 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

condition of the item(s) with special reference to any damage. In the latter case, such information shall be immediately communicated to the Project Manager who shall convey this information to the Customer for follow up action.

- 4.3 When Customer supplied items are of the types that require maintenance, the need for such shall be the subject of special consideration in the contract. When this responsibility falls to TRC, such maintenance shall be provided by qualified individuals and at the prescribed periods defined in the contract.
- 4.4 At the conclusion of the project, all Customer supplied items shall be returned to the Customer or disposed of in the manner defined in the contract. Formal Customer acknowledgment of returned items shall be obtained and recorded in the project files.

### 5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

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## Department Standard

Standard No. DS 111 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### System Testing

#### 1.0 Scope

- 1.1 This procedure defines the requirements for the verification and testing of TRC supplied systems. System testing includes TRC' integration testing, Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT).
- 1.2 The procedure defines the responsibilities and gives an overview of the process employed. Details of the tests conducted on a specific system shall be as defined in the SOW or Project Quality Plan, and the test procedures prepared for the project under test.

#### 2.0 References

- 2.1 ISO 9001 - 1994, Clause 4.9,4.10,4.11,4.12,4.13,4.14.
- 2.2 ISO 9000-3:1991(E), Clause 5.7

#### 3.0 Responsibilities

##### 3.1 Vice President of Engineering:

- 3.1.1 Shall provide qualified personnel to carry out the testing specified in the procedures prepared for the system under test.
- 3.1.2 Shall provide facilities as required for the effective testing of the system.
- 3.1.3 Shall provide test equipment at the TRC facility as required for field simulation and testing of the system under any loading scenarios specified in the contract.
- 3.1.4 Shall ensure that all staff working within the test teams are suitably qualified, and are conversant with and adhere to all procedures applicable to the system under test.

##### 3.2 Project Manager:

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- 3.2.1 Shall obtain whatever Customer approvals of test procedures, test data or other documentation that is stipulated in the contract.
- 3.2.2 Shall negotiate the system test schedule with both the Customer and TRC management in order to optimize the use of TRC resources while meeting the requirements of the project.
- 3.2.3 Shall verify that system design documentation and data meet the requirements of the Statement of Work prior to the start of system testing.
- 3.2.4 Shall ensure that all test procedures, data and documentation required for a system testing is available, identifiable, approved and of the latest issue, prior to commencement of tests.
- 3.2.5 Shall ensure that all lower level tests have been satisfactorily completed and that all equipment and software specified in the test procedures are in place.
- 3.2.6 Shall ensure that all deliverable equipment and software plus any test equipment, test fixtures, test software and/or test data required to support the tests is uniquely identified in the System Activity Log (or equivalent) prior to the commencement of the testing.

### 3.3 Test Personnel:

- 3.3.1 Shall record all actions taken in the System Activity Log, and shall initiate the appropriate corrective actions to rectify any identified system nonconformance.
- 3.3.2 Shall ensure that any items found to be nonconforming during the system test process are segregated, identified, and reported to the Project Manager for resolution.
- 3.3.3 Shall highlight to the Vice President of Engineering any changes that would improve the effectiveness of methods use during the test process.

### 4.0 Requirements

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Standard No. DS 111 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

- 4.1 System test shall be carried out to confirm that the system has been designed and built to meet the Customer requirements specified in the contract, and that it conforms to the relevant standards of operational safety and workmanship.
- 4.2 System testing shall begin with TRC integration tests designed to verify that the various parts of the system function correctly over the range of operation required by the system being supplied. This testing, and the balance of the testing conducted at the TRC facility will usually occur with an agreed subset of the project equipment, the remainder being shipped directly to the Customer's site for installation.
- 4.3 Nonconformances to specification or errors identified during the system test phase of the project shall be recorded in the System Activity Log and corrective actions instigated as required until all known problems have either been resolved or otherwise dispositioned in consultation with the Customer.
- 4.4 When integration testing has been completed, the Factory Acceptance Tests shall be dry run using the Customer approved procedures.
- 4.5 Once TRC staff is satisfied that the system is operating satisfactorily the formal Factory Acceptance Test, usually witnessed by the Customer, may begin. Successful completion of this milestone is a precursor to system delivery.
- 4.6 Once the total system has been installed at the customer's site, Site Acceptance Tests will usually be conducted. In most cases this will constitute final sign-off of the system and the hand-over to the Customer. Any alternative scenarios shall be clearly documented in the SOW or Project Quality Plan.

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Department Standard

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5.0 Procedure Revision History

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Dave Ellis	Rev 0	Initial Release	April 1, 1998

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## Department Standard

Standard No. DS 112 Date: April 98 Rev. No. 0

Written By: DE  
Approved By: JD

### Control of Test Equipment

#### 1.0 Scope

- 1.1 This procedure defines the requirements for the control of inspection, measuring and test equipment and software used to support the building and testing of TRC supplied systems.

#### 2.0 References

- 2.1 ISO 9001 - 1994, Clause 4.11

#### 3.0 Responsibilities

##### 3.1 Vice President of Engineering:

- 3.1.1 Shall ensure that any equipment used for measuring or test purposes that could effect the quality of a system being supplied by TRC is managed in accordance with the provisions of this procedure.

##### 3.2 Team leaders:

- 3.2.1 Shall maintain a log of all test equipment and software within their jurisdiction, irrespective of its ownership. For each entry, this log shall record the serial number or other identifying characteristic, calibration dates and status, and a record of its usage.
- 3.2.2 Shall ensure that all such items that are used for quantitative measurements during the building or any testing phase of a project be calibrated or otherwise checked prior to use to ascertain their ability to perform within the stated accuracy limits.
- 3.2.3 Shall ensure that all equipment and software, the calibration or physical condition of which could be compromised by mishandling, is properly stored and safeguarded against such an occurrence.

## Department Standard

Standard No. DS 112 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### 4.0 Requirements

- 4.1 All inspection, measuring, and test equipment used for quantitative measurement and/or setting-up shall be controlled, calibrated, and maintained. This applies to equipment owned by TRC, its employees or a third party. Such equipment shall display its calibration status at all times.
- 4.2 Equipment to be used on a project shall be specified. The choice of equipment shall take into account the accuracy required.
- 4.3 Any calibration equipment in regular use shall be uniquely identified, entered into a recall system, and calibrated at defined frequencies. Any equipment used infrequently may be identified as uncalibrated when the calibration period expires, but shall be calibrated prior to use for quantitative measurement.

Steps shall be taken to ensure that equipment is safeguarded from unauthorized adjustments or tampering which could invalidate calibration settings. Any equipment found to be outside calibration, that cannot be adjusted or economically repaired, is scrapped.

- 4.4 Records shall be maintained of all inspection, measuring and test equipment. These shall be reviewed periodically to ensure that optimum frequencies of calibration are specified.

### 5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

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## Department Standard

Standard No. DS 113 Date: April 198 Rev. No. 0

Written By: DE  
Approved By: JD

### Receiving Inspection

#### 1.0 Scope

- 1.1 This procedure defines the TRC Receiving Inspection function.
- 1.2 Its scope includes both standard items, plus those that require special attention, e.g. any custom made cabinets, PCB's or first article inspections from recently approved vendors that are not certified to ISO 9000 standards.
- 1.3 The intent of the procedure is to assure that only components or assemblies which have been verified as complying with the purchase order are allowed to proceed to the project, that nonconforming items are clearly segregated, and that records are maintained which can be used to evaluate vendor performance

#### 2.0 References

- 2.1 ISO 9001 - 1994, Clause 4.10.1, 4.10.2

#### 3.0 Responsibilities

##### 3.1 Vice President of Engineering:

- 3.1.1 Shall provide sufficient personnel to handle the Receiving Inspection function.
- 3.1.2 Shall ensure that procedures are such that incoming material is not used or processed until it has been inspected to specified requirements.
- 3.1.3 Shall monitor the Receiving Inspection function regarding quality issues.
- 3.1.4 Shall ensure that issues requiring corrective action are properly coordinated with the appropriate suppliers.
- 3.1.5 Shall ensure that appropriate quality records on supplier performance are maintained.

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## Department Standard

Standard No. DS 113 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### 4.0 Requirements

4.1 All goods received shall be subject to the following procedure irrespective of the reason for their delivery. That is, whether they have been purchased for a particular project, purchased for shop supplies, purchased for systems development purposes, purchased as miscellaneous supplies or have been shipped as engineering samples.

4.2 The following activities shall take place in the receiving area in relation to received goods:

4.2.1 On initial delivery, receiving personnel shall inspect the packing or container for external damage, paying attention to evidence of water damage, puncturing of the container, or evidence of excessive vibration. Some containers may carry Tilt or Vibration tell devices. These devices shall be checked to confirm that they have not been activated.

4.2.2 If any evidence of damage is present on the container or packing, this shall be noted on the shipper's delivery document before signing acknowledging receipt of delivery.

Upon completion of container inspection, the received goods shall be inspected to ensure that all items on the vendor packing list are included, and that these items correspond with what was included on the Purchase Order.

Quantities of partial shipped items should be noted on the Purchase Order and initialed by the individual receiving the goods. This document shall then be forwarded to the user for corrective action.

4.3 The parts shall then be subjected to the appropriate level of inspection as defined in the Project Quality Plan, or equivalent controlling document, prior to being issued to the user.

4.4 Parts or assemblies which have been rejected, either because the items are not correct or because their status cannot be clearly determined after the initial inspection, shall be segregated and brought to the attention of the Project manager for disposition.

## Department Standard

Standard No. DS 113 Date: Jan 2007 Rev. No. 5

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Approved By: JD

- 4.5 A document package containing the delivery packing list with Receiving Inspection approval and the copy of the Purchase Order completes the incoming acceptance of the delivery. This package together with the Receiving Log shall be retained for a period of three (3) years.

### 5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

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## Department Standard

Standard No. DS 114 Date: April 98 Rev. No. a

Written By: DE  
Approved By: JD

### Inspection and Test Status

#### 1.0 Scope

- 1.1 This procedure describes the TRC' system for indicating the inspection status of in-process and deliverable systems.

#### 2.0 References

- 2.1 ISO 9001 - 1994, Clause 4.12

#### 3.0 Responsibilities

- 3.1 All personnel, who either inspect or sign off on in-process or deliverable components of systems, shall indicate the status of these by completing and signing the associated paperwork.

#### 4.0 Requirements

- 4.1 The inspection status of materials, parts and assemblies shall be recorded on the items themselves and/or on the items' accompanying paper work with tags, stamps or initial and dates.
- 4.2 Rejected parts shall be clearly marked with a distinctive tag and disposed of to ensure that they can not inadvertently be incorporated into the current or a future system, unless action has been taken to correct the nonconformance.
- 4.3 Procured items inspected at their source are to be identified with accepted tag, or inspection stamp or accompanying paperwork.
- 4.4 The status of software builds is documented on a Master Control Worksheet and records are maintained of any software deficiency that requires correction prior to release.

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Department Standard

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Written By: DE  
Approved By: ill

5.0 Procedure Revision History

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Dave Ellis	Rev 0	Initial Release	April 1, 1998

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## Department Standard

Standard No. DS 115 Date: April 98 Rev. No. 0

Written By: DE  
Approved By: JD

### Control of Nonconforming Product

#### 1.0 Scope

- 1.1 This procedure describes the process used at TRC to ensure that material that does not conform to requirements is identified and segregated from conforming material until a determination is made as to its disposition.

#### 2.0 References

- 2.1 ISO 9001 - 1994, Clause 4.13

#### 3.0 Responsibilities

##### 3.1 Vice President of Engineering:

- 3.1.1 Shall ensure that all staff understand the importance of reporting any product nonconformance, and that they strictly adhere to the nonconformance reporting process.

- 3.1.2 Shall be responsible for maintaining the integrity of the process used for the review and disposition of nonconforming hardware or software product.

##### 3.2 Team Leaders and Project Managers

- 3.2.1 Shall be responsible for reviewing nonconformance reports and deciding on the disposition of each nonconforming item.

- 3.2.2 In cases where the item or software is reworked to meet the specified requirements, they shall specify the level of inspection and verification testing that will be invoked to provide the necessary assurance that the problem has been corrected.

##### 3.3 All employees:

- 3.3.1 Any employee noting a nonconforming item shall report it, whether or not they have specific responsibility for inspecting or testing the item involved.

## Department Standard

Standard No. DS 115 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### 4.0 Requirements

- 4.1 Nonconformance is considered a temporary condition to be resolved by rework, repair and test, re-calibration or by scraping the material and removing it completely from the work area.
- 4.2 Material shall be considered nonconforming in the following circumstances:
  - 4.2.1 The part or assembly does not conform to the manufacturer's specification.
  - 4.2.2 The part or assembly does not conform to TRC purchase part drawing or specification.
  - 4.2.3 The part or assembly has failed a system level test.
  - 4.2.4 The calibration date has expired on the tool or test equipment.
  - 4.2.5 The part or assembly is subject to an Engineering Change Order.
- 4.3 Material considered nonconforming shall be tagged as such, either physically, or by appropriate entry on associated documentation.
- 4.4 Parts, which cannot physically be tagged or labeled, shall be packaged and then tagged.
- 4.5 All parts tagged or labeled as nonconforming shall be segregated until the disposition of the material is defined.
- 4.6 Parts or assemblies tagged as nonconforming shall not be considered shippable.
- 4.7 The Vice President of Engineering shall periodically review the nonconformance reports to look for trends that justify the initiation of corrective action.

### 5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

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## Department Standard

Standard No. DS 116 Date: April 98 Rev. No. a

Written By: DE  
Approved By: JD

### Corrective and Preventive Action

#### 1.0 Scope

- 1.1 This procedure describes the steps that shall be taken to implement corrective action to resolve specific process issues that are effecting the quality of current systems, and preventive action that seeks to eliminate potential causes of nonconformity in future systems.

#### 2.0 References

- 2.1 ISO 9001 - 1994, Clause 4.14

#### 3.0 Responsibilities

##### 3.1 Vice President of Engineering:

- 3.1.1 Has overall responsibility for providing the other senior TRC Managers and TRC Customers with the assurance that corrective actions are effective, and shall coordinate Team Leaders in conducting a common approach to the analysis and monitoring of processes and defects.
- 3.1.2 Shall ensure that the quality system provides for analysis of repetitive faults as well as isolated reports to determine the need for corrective action.
- 3.1.3 Is responsible for coordinating, evaluating, and monitoring corrective action efforts to assure that action is taken promptly and effectively.

##### 3.2 Team Leaders:

- 3.2.1 Shall be responsible for ensuring prompt and effective measures to address corrective actions that have been identified as being necessary within their areas of responsibility.
- 3.2.2 Shall ensure that procedures used by their staff are updated in a timely manner to reflect the process changes implemented to deal with any recognized deficiencies.

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## Department Standard

Standard No. DS 116 Date: April 198 Rev. No. 0

Written By: DE  
Approved By: JD

3.3 All employees:

3.3.1 Are responsible for reporting defective material, processes, and/or work operations, and for providing suggestions for improvement that will minimize future potential product nonconformities.

4.0 Requirements

4.1 Team Leaders, employees, vendors, Customers and third party agencies may report nonconformance via:

4.1.1 A memo labeled as a Nonconforming Material Report.

4.1.2 Engineering Change Requests.

4.1.3 Audit reports.

4.1.4 Memos, letters or faxes.

4.1.5 Phone calls and/or E-mail

4.1.6 Field service reports.

4.2 All nonconformances shall be entered into a database that shall be periodically reviewed to identify negative trends that may require corrective action.

4.3 In arriving at corrective action decisions, evaluation shall be made of any manufactured product that might be affected by the same quality problem. Such products may be in the hands of the user, in stock, installed, or in transit.

4.4 The investigation of the cause of nonconformity relating to product, process, and quality system shall be recorded.

4.5 Changes shall be documented in Engineering Change Notices, changes in standards and/or instructions, and/or system drawing changes.

4.6 During the review of nonconformance trends, the effect of previous corrective actions will be considered to determine their effectivity.

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## Department Standard

Standard No. DS 116 Date: Jan 2007 Rev. No. 5

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Approved By: JD

### 4.7 Preventive Actions:

- 4.7.1 Problems that have been corrected but appear to need further investigation, monitoring or action will be documented.
- 4.7.2 These problems shall be periodically reviewed and a determination made of any that may need further action. Those requiring action shall have the required action steps documented.
- 4.7.3 Controls shall be initiated to monitor the effectiveness of the preventive action.

### 4.8 Records

- 4.8.1 The Vice President of Engineering is responsible for circulating a brief, but specific, report to all concerned after the corrective action is closed (including suppliers and the person who identified the need for corrective action).
- 4.8.2 Records of corrective actions shall be maintained, such that whenever it is suspected that a reported problem is a re-occurrence of the same or similar problem, this history may be retrieved for examination.
- 4.8.3 Records of Corrective Actions shall be retained for three (3) years.

### 4.9 Controls to ensure that Corrective Action is effective are as follows:

- 4.9.1 The Vice President of Engineering, or his designee, shall maintain a file of Corrective Actions taken.
- 4.9.2 Corrective Actions taken as a result of a previous internal audit shall be reviewed at the start of a new internal audit. The internal audit shall contain a follow-up section that is intended to verify that the Corrective Action taken was effective.

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## Department Standard

Standard No. DS 117 Date: April 98 Rev. No. a

Written By: DE  
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### Handling, Storage, Packaging, Preservation and Delivery

#### 1.0 Scope

- 1.1 This procedure describes the steps that shall be taken to ensure that all product, inspection, measuring and test equipment, tools, jigs, and fixtures etc. are not damaged or allowed to deteriorate due to the effects of humidity, temperature, corrosion, static electricity or time, during handling and storage.
- 1.2 When ready for delivery, equipment shall be packaged and identified to ensure continued conformance to specified requirements during transport and delivery to its final destination.

#### 2.0 References

- 2.1 ISO 9001 - 1994, Clause 4.15

#### 3.0 Responsibilities

##### 3.1 Vice President of Engineering:

- 3.1.1 Has overall responsibility for ensuring that appropriate methods are used company-wide for the handling, storage and delivery of all items the deterioration of which could adversely effect product quality.
- 3.1.2 Has responsibility for providing adequate facilities, environmental controls, and protective packaging materials etc. for facilitating the requirements of this procedure.

##### 3.2 Team Leaders:

- 3.2.1 Shall ensure that adequate procedures are followed to safeguard all material and equipment for which they are responsible. Such safeguards shall apply during all stages from receipt of equipment, through any temporary storage that may be required, through use of the items during the system build and integration process, and finally through their packaging for shipment.

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3.2.2 Shall ensure that all of their staff are sensitive to the issues covered in this procedure and adhere strictly to its requirements.

### 3.3 Project Managers:

3.3.1 Shall address the packaging and delivery requirements of their respective projects in the Project Quality Plan, or equivalent document.

3.3.2 Are responsible for ensuring that all material and magnetic media are properly packaged and labeled in accordance with project requirements to ensure safe arrival at their ultimate destination.

## 4.0 Requirements

### 4.1 Handling

4.1.1 All ESD susceptible devices received from distributors or manufacturers should be delivered in anti-static shielded bags, shielded containers or tubes, and PCA's should be delivered in anti-static shielded bags or shielded containers. If they are not, then consideration shall be given to returning the equipment to the vendor. If discussions with the vendor fail to correct future performance, the vendor shall be removed from the Approved Vendor List.

4.1.2 Grounded wrist straps shall be provided for the use of personnel handling ESD susceptible devices.

4.1.3 Anti -static boxes or containers shall be used when storing or moving ESD susceptible devices.

4.1.4 Loose Printed Circuit Assemblies shall be stored individually in anti-static pouches, or black antistatic tote bins.

4.1.5 The areas in which ESD susceptible devices are stored shall be air conditioned at all times to normal office environmental levels.

4.1.6 Any lead acid and sealed lead acid re-chargeable batteries shall be stored in isolation from electronic components that may be damaged by fumes emitted from the batteries. Lead acid and sealed lead acid re-chargeable

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batteries shall be re-charged on a monthly basis. These types of batteries in storage degrade naturally over time and if left in a discharged condition for more than 24 hours will suffer plate contamination and subsequently be unable to hold a charge.

- 4.1.7 Prior to shipment, either in a system or in a spares delivery, lead acid or sealed lead acid batteries shall be given a float charge to bring the battery up to the manufacturer's charged level. This procedure does not apply to batteries stored in a "dry" condition.
- 4.1.8 During the periodic internal audits of the TRC operation, the condition of equipment at the facility shall be accessed. Any damaged or otherwise compromised equipment or material shall be brought to the attention of the responsible manager for disposition.

### 4.2 Packaging for Shipment

- 4.2.1 Any loose printed circuit assemblies shall be packed in anti-static bags. Only non-static generating packing materials shall be used in the overall packing (eg. 'pink' poly).
- 4.2.2 Battery shipments shall be packed separated from all other material. The packing container shall be marked appropriate for the hazardous material (battery electrolyte) and shall be marked for upright handling. In instances where the batteries are shipped "dry" with the electrolyte shipped separately no hazardous labeling need be applied to the battery.
- 4.2.3 Only items with similar weights shall be packed in anyone container. For example, a system power supply shall not be packed along with circuit boards.
- 4.2.4 In shipments where a number of boxes are being shipped in anyone delivery, each box shall be clearly marked: "Box X of N".
- 4.2.5 All parts shall be adequately packed, so that normal transportation levels of vibration will not disturb them. Protection around the parts shall be appropriate to the mode of transportation to which the delivery has been consigned.

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Approved By: JD

- 4.2.6 The total weight of the parts packed shall not exceed the strength limits of the packing container. The gross weight and size shall not exceed limits set by the transportation company to which the delivery has been consigned.
- 4.2.7 Cables and/or harness shall be bagged, tied, or otherwise constrained to avoid entanglement within the shipping container.
- 4.2.8 The Project Manager shall ensure that the shipper has equipment adequate to handle the type of equipment they are being asked to deliver. For example, a shipper equipped with air-ride vehicles can be approved for delivery of completed electronic panels whereas a shipper with flat bed trucks can be approved only for delivery of enclosures or metalwork.
- 4.2.9 A listing of approved shippers shall be maintained. This listing shall cover the service they provide, the delivery area they cover, any weight or size limitations they may have and the type of equipment they are approved to deliver.

### 5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

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## Department Standard

Standard No. DS 118 Date: April 98 Rev. No. 0

Written By: DE  
Approved By: JD

### Quality Records

#### 1.0 Scope

- 1.1 This procedure provides instructions for the control and retention of quality records.
- 1.2 Records can be in the form of hard copy or electronic or other media.

#### 2.0 References

- 2.1 ISO 9001 - 1994, Clause 4.16
- 2.2 ISO 9000-3:1991(E), Clause 6.3

#### 3.0 Responsibilities

##### 3.1 Vice President of Engineering:

- 3.1.1 Has the responsibility to monitor the procedures that require the maintenance of quality records, and coordinate with those responsible to assure that these records are being retained as defined in this procedure.
- 3.1.2 Shall make available suitable facilities for the filing and storage of quality records to minimize deterioration and to prevent their damage or loss. Such facilities shall include both physical and electronic storage capabilities as necessary.

##### 3.2 Team Leaders and Project Managers:

- 3.2.1 Shall arrange for the generation and maintenance of the quality records that result from the activities for which they have responsibility. These records shall legible, and shall be suitably filed and indexed to make them readily available for audit and as a data source for subsequent analysis or use on future projects.
- 3.2.2 Shall conduct an annual review of the quality records under their control, and shall dispose of those for which the retention period has been exceeded.

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## Department Standard

Standard No. DS 118 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### 4.0 Requirements

- 4.1 A quality record is any procedure, drawing, form, or computer file that describes the "as built product" delivered to a Customer. Such records shall include, but not be limited to, the following:
  - 4.1.1 Project data: This is retained in the project files until it is boxed and placed in archive storage after completion of the project. Each box shall be marked with the project name and completion date, the box contents, and the retention date.
  - 4.1.2 Engineering drawings: These are kept in flat files and/or hard drive/disc media in the CAD area.
  - 4.1.3 Purchasing records: Purchase Orders and vendor and subcontractor performance records are kept in file cabinets under the control of the purchasing staff.
  - 4.1.4 Internal quality audit reports, corrective action results and other quality data used for analysis purposes: This information is maintained by the Vice President of Engineering.
  - 4.1.5 Software releases, documentation and associated records: These are maintained by the Team Leaders in their respective areas.
  - 4.1.6 Vendor records: Vendor records are filed alphabetically and maintained by Purchasing.
  - 4.1.7 Receiving Inspection records: These are maintained in the Inspection area.
  - 4.1.8 Employee training records: Training records are maintained by the respective Team Leaders.
- 4.2 The Vice President of Engineering shall review all procedure revisions and, if appropriate, will update the quality record retention period as dictated by current business conditions.

## Department Standard

Standard No. DS 108 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

deficiency or shall be due to a recommendation based on a subsequent site visit or survey. A vendor's inability to meet price and delivery requirements on a particular quotation, shall not be the sole cause for the vendor's removal from the Listing.

- 4.5 Failure to deliver material or equipment conforming to TRC quality requirements shall be advised, in writing, to the particular vendor and shall be noted on the vendor file. Failure, by the vendor, to take appropriate corrective action shall result in the vendor being removed from the Approved Listing.

### 5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

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## Department Standard

Standard No. DS 119 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

### Quality Audits

#### 1.0 Scope

1.1 This procedure defines the responsibilities and requirements for audits of the TRC Quality Management System.

1.2 The types of audits covered by this procedure are:

- . Internal Quality Audits
- . Supplier Audits
- . Special Audits

#### 2.0 References

2.1 ISO 9001 - 1994, Clause 4.17

2.2 ISO 9000-3:1991(E), Clause 4.3

#### 3.0 Responsibilities

3.1 Vice President of Engineering:

- 3.1.1 Shall be responsible for the generation and maintenance of the quality system audit schedule.
- 3.1.2 Shall select and co-ordinate the auditors to accomplish the audit schedule.
- 3.1.3 Shall ensure that personnel performing audits are adequately trained prior to performing audits.
- 3.1.4 Shall monitor actions resulting from audits and notify the President of actions not completed as agreed.
- 3.1.5 Shall, on a sample basis, check audit actions upon completion.
- 3.1.6 Shall circulate copies of the audit report to the lead auditor, audited individual and audited individual's manager within two weeks of receipt.

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## Department Standard

Standard No. DS 119 Date: Apri198 Rev. No. 0

Written By: DE

Approved By: JD

- 3.1.7 Shall annually review the performance of the auditors and audit program to assess if TRC and ISO 9001 requirements are being achieved.
- 3.1.8 Shall initiate special audits when requested by the Customer.
- 3.1.9 Shall plan and initiate outside supplier audits as required.
- 3.2 Auditor:
  - 3.2.1 Shall arrange to conduct audits in the month specified on the schedule, and agree the logistics with the auditee.
  - 3.2.2 Shall prepare a checklist for the audit.
  - 3.2.3 Shall have overall responsibility for the audit within the assigned area. He or she shall lead the introductory meeting, report back to the Vice President of Engineering, obtain corrective actions and commitment to complete actions by a defined date and generate the audit report.
  - 3.2.4 Shall provide the audit report within two (2) weeks of audit completion.
  - 3.2.5 Shall conduct an annual review of the quality records under his or her control, and shall dispose of those for which the retention period has been exceeded.
- 3.3 Team Leaders:
  - 3.3.1 Shall provide the necessary resources to enable the auditor to conduct the audit.
  - 3.3.2 Shall provide access to the facilities and evidential material as requested by the auditor.
  - 3.3.3 Shall be available to attend the introductory and audit closeout meetings.
  - 3.3.4 Shall jointly, with the auditor, determine corrective actions and suitable clearance dates with the Auditor within two (2) weeks of the audit completion.

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3.3.5 Shall ensure that all agreed corrective actions are cleared by their respective due dates.

3.3.6 Shall notify the Vice President of Engineering, when the audit actions have been completed.

3.4 The President:

3.4.1 Shall obtain a plan of action from the Vice President of Engineering to clear corrective actions identified as having exceeded agreed completion dates.

4.0 Requirements

4.1 Types of Audits:

4.1.1 Internal System Audit

An audit of the quality system operated within a Team, Project or other organizational entity. These audits shall be designed to ensure that:

- a. The quality system documentation adequately defines the needs of the business.
- b. The documented procedures are practical, understood, and followed.
- c. Training is being conducted and is accomplishing its purpose.

The audit plan shall take into consideration the status of previous audit findings and the importance of the area being audited.

4.1.2 Special Audits

This is an audit specified by the Customer on a specific topic or stage in the process. Such an audit shall be detailed in the Project Quality Plan or equivalent document. The scope of individual project audits will vary, but the elements of the quality system that fall within the scope shall be audited along with specific issues.

## Department Standard

Standard No. DS 119 Date: April 198 Rev. No. 0

Written By: DE  
Approved By: JD

### 4.1.3 Supplier Audits

An audit of a company or person that supplies services and/or parts to TRC.

### 4.2 Frequency of Audits

4.2.1 The TRC Quality Management System shall be audited a minimum of once a year.

4.2.2 The Vice President of Engineering shall determine the audit schedule for suppliers.

### 4.3 Auditor Independence

Audits shall be carried out by persons independent of the activity being audited.

4.4 Records of audits shall be maintained for three (3) years.

4.5 Before a Management Review can take place, a planned, conducted, and documented audit shall be performed to measure the existence of and conformance to approved standards and instructions.

4.6 The outcome of an audit shall be confirmation that either:

- a. Procedures are adhered to in the defined manner.
- b. That existing procedures no longer reflect current requirements and are in need of revision or cancellation.

### 5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

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## Department Standard

Standard No. DS 120 Date: Apr198 Rev. No. 0

Written By: DE  
Approved By: JD

### Training

#### 1.0 Scope

- 1.1 This procedure defines the company-wide policy regarding training of TRC personnel.

#### 2.0 References

- 2.1 ISO 9001 - 1994, Clause 4.18
- 2.2 ISO 9000-3:1991(E), Clause 6.9

#### 3.0 Responsibilities

##### 3.1 The President:

- 3.1.1 Analyze continuously the Company's current and future manpower needs to develop, implement and coordinate programs to provide qualified personnel to meet those needs.

##### 3.2 Vice President of Engineering:

- 3.2.1 Provide input in the form of comments, and/or recommendations to each training proposal submitted by the Team Leaders, and approve training program.

##### 3.3 Team Leaders:

- 3.3.1 Identify training requirements based on personnel turnover, wastage, introduction of new technology and products, which the company plans to introduce in the future.
- 3.3.2 Establish and implement the training program needed to meet all requirements.

#### 4.0 Requirements

It is the policy of TRC, to:

## Department Standard

Standard No. DS 120 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

- 4.1 Regard the skills, knowledge, and abilities of all employees as an important asset for the Company.
- 4.2 Develop and utilize these assets in the best interest of the Company and the employees concerned.
- 4.3 Provide appropriate development opportunities for employees to further their education and/or skills related to their jobs.
- 4.4 Provide to all permanent employees an employee benefits briefing at the start of their employment.
- 4.5 Introduced all exempt employees as part of their orientation procedure to all Team Leaders and other key members of the TRC staff.
- 4.6 Brief all employees on the TRC Quality Management System, with special emphasis on the procedures that govern the work in the organizations to which they will be assigned.
- 4.7 Maintain a record of each employee's basic skill set and the training he or she receives while at TRC.

### 5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998

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## Department Standard

Standard No. DS 121 Date: April 98 Rev. No. a

Written By: DE

Approved By: JD

### Customer Service

#### 1.0 Scope

1.1 This procedure defines the process and responsibilities for providing after-sales service to the Customer.

1.2 The scope of this service will vary depending on the terms of the contract. However, it will typically include:

- The provision of field service, initially under the warranty provisions of the contract, but later under the terms of a maintenance agreement.
- The provision of additional training courses.
- The servicing and replacement of spare parts.
- The general post-contract management of TRC' interface with the Customer.

A principal objective of the Service function is Customer care, ensuring that problems received are evaluated and resolved as expeditiously as possible by the member of TRC management team best equipped to handle the problem.

#### 2.0 References

2.1 ISO 9001 - 1994, Clause 4.14 and 4.19.

#### 3.0 Responsibilities

3.1 Vice President of Engineering:

3.1.1 Shall have ultimate responsibility that this procedure is adhered to.

3.1.2 Shall assign the technical authority as required throughout the process.

3.1.3 Shall be immediately responsive to all reported Customer problems that have been escalated to him in accordance with the procedure defined below.

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## Department Standard

Standard No. DS 121 Date: April 98 Rev. No. a

Written By: DE

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## Department Standard

Standard No. DS 121 Date: April 198 Rev. No. 0

Written By: DE  
Approved By: JD

### 3.2 Team Leaders:

- 3.2.1 Shall arrange for and manage the provision of the specific services required by contract.
- 3.2.2 Shall ensure that personnel assigned to the Service function are adequately qualified on the basis of training and/or experience and are sensitive to the need for responsive Customer care.
- 3.2.3 Shall provide immediate response to resolve any Service related problems being experienced by a Customer.
- 3.2.4 Shall provide regular reports to TRC senior management on all customer reported problems and the actions taken to resolve them.

### 3.3 All Employees

- 3.3.1 Any employee who receives information regarding the dissatisfaction of a TRC Customer, and is unable to handle the issue directly, shall immediately bring this information to the attention of the responsible TRC manager.
- 3.3.2 If the problem is one that the employee can handle within his or her scope of responsibility, he or she shall endeavor to address the situation immediately, reporting to his or her supervisor at the earliest opportunity.

### 4.0 Requirements

- 4.1 Wherever possible, Customer Service functions shall be handled by the same staff and using the same procedures as are used during the course of the implementation of a project. This gives a Customer a sense of continuity after project delivery and will typically lead to the generation of additional business.
- 4.2 To ensure the continuity of good Customer relations, TRC shall make every effort to be responsive to any problem or expression of dissatisfaction raised by a Customer. To this end, the following procedure shall be invoked for addressing such problems:

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Standard No. DS 121 Date: Jan 2007 Rev. No. 5

Written By: DE  
Approved By: JD

- 4.2.1 All reported problems shall be logged, giving the date and time of the call or other contact, the nature of the problem, to whom it was reported and, ultimately, its resolution.
- 4.2.2 The Salesperson responsible for that Customer shall be notified immediately, and a decision made as to whom will be the primary Customer interface on this particular problem.
- 4.2.3 The manager to whom a problem is referred for resolution shall perform an evaluation and, if the resolution is within his or her jurisdiction, shall prepare an action plan and assign resources for its implementation.
- 4.2.4 The action plan will be communicated back to the Customer either by the technical manager or the responsible Salesperson as decided in 4.2.2 above.
- 4.2.5 The responsible manager shall monitor the resolution of the problem and when resolved shall ensure that the resolution is recorded in the log and the action closed.
- 4.2.6 If either the problem cannot be handled by the first management level to which it was referred; or if it has not been possible to convey a proposed action plan back to the Customer within 24 hours; or if the Customer is not comfortable with the plan proposed, then the issue will be escalated to the Vice President of Engineering for follow up action.

### 5.0 Procedure Revision History

Author	Rev	Reason for Revision	Date
Dave Ellis	Rev 0	Initial Release	April 1, 1998