VOLUME 5
DATA MANAGEMENT STUDY

APPENDIX E
CONTRACTOR DATA PACKAGE
QUALITY ASSURANCE (QA)

Prepared By
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J.R. Gottshall

Quality Assurance Management
Voyager Spacecraft System Project

Approved By
A. Frank, Cognizant Engineer
Data Management and Control Task
Voyager Spacecraft System Project

Prepared For
Jet Propulsion Laboratory
California Institute of Technology
4800 Oak Grove Drive
Pasadena, California

Under JPL Contract No. 951112

General Electric
Missile and Space Division
Valley Forge Space Technology Center
P.O. Box 5555 - Philadelphia, Penna. 19101
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1    INTRODUCTION</td>
<td>1–1</td>
</tr>
<tr>
<td>2    DATA ITEM LIST/USER MATRIX</td>
<td>2–1</td>
</tr>
<tr>
<td>3    USER FLOWDIAGRAMS</td>
<td>3–1</td>
</tr>
<tr>
<td>4    DATA REQUIREMENT DESCRIPTIONS (DRD'S)</td>
<td>4–1</td>
</tr>
<tr>
<td>5    DOCUMENTATIONRELATIONSHIPTREES</td>
<td>5–1</td>
</tr>
<tr>
<td>6    DATA ITEM PHASING/FREQUENCY</td>
<td>6–1</td>
</tr>
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</table>
INTRODUCTION

This appendix presents the Contractor Data Package (Data Item Matrix, Data Requirement Descriptions, User Flow Diagram, Document Relationship Tree, and Frequency and Phasing Charts) for Quality Assurance (QA).

These data include control and review procedures to ensure that component, subsystem, and system design, manufacture, assembly, and testing will produce items that meet the established specifications. This category also includes manufacturing verification tests to obtain quality assurance.

The complete list of Contractor Data Package appendixes is-as follows:

Appendix A - Technical Description and System Engineering (SE)
Appendix B - Planetary Quarantine (PQ)
Appendix C - Manufacturing (MG)
Appendix D - Configuration Management (CM)
Appendix E - Quality Assurance (QA)
Appendix F - Test (TE) and Mission Operations (MP)
Appendix G - Reliability Assurance (RA)
Appendix H - Logistics and Support (LS)
Appendix I - Overall Management (MA), Scheduling (SC), Manning and Financial (MF)
Appendix J - Procurement and Contracting (PC)
Appendix K - Data Management (DM)
Appendix L* - Facilities (FA)
Appendix M* - Safety (SA)
Appendix N* - Site Activation for Launch (AL)

*Appendixes L through Q prepared under Contract NAS 7-584
Appendix O* - Science (SI)
Appendix P* - Related Project Interfaces (RP)
Appendix Q* - Advanced Missions (AM)

* Appendixes L through Q prepared under Contract NAS 7-584
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<th>DATA ITEM NUMBER</th>
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<td>QA-003</td>
<td>Manual, Instrument Calibration and Maintenance</td>
<td>An approved set of procedures for calibration cycle instruments so that reliable data and confidence are obtained from the procedure.</td>
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<td>QA-004</td>
<td>Manual, Quality Assurance Operating Procedures</td>
<td>Formalizes the specific requirements of the Quality Assurance established operations procedures.</td>
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<td>QA-005</td>
<td>Manual, Special Test Equipment, Component</td>
<td>Controls and maintains the equipment current, necessary for performance requirements.</td>
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<td>QA-006</td>
<td>Manual, Workmanship Standards</td>
<td>Provides visual aids and standards jointly selected for use during the program.</td>
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<td>QA-007</td>
<td>Minutes, Material Review Board</td>
<td>Minutes of formal meetings of the Material Review Board.</td>
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<td>QA-008</td>
<td>Plan, Inspection</td>
<td>Documents the specific parameters of inspection and the required quality levels in fabrication, assembly.</td>
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<tr>
<td>QA-009</td>
<td>Plan, Quality Assurance Program</td>
<td>The system contractor's total quality plan which meets contractual requirements.</td>
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<td>QA-010</td>
<td>Plan, Sampling</td>
<td>Documents and controls the sample size necessary to meet quality levels.</td>
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<td>QA-011</td>
<td>Plan, Test and Operating, for Special Test Equipment (STE), Component</td>
<td>A detailed checkout and operating procedure for test equipment, guaranteeing and confidence in the test results. In process checkout equipment.</td>
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<td>DATA ITEM LIST/USER MATRIX</td>
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- R = REVIEW AUTHORITY
- A = APPROVAL AUTHORITY
- PM = PROJECT MANAGER APPROVAL

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<th>DATA REVIEW</th>
<th>DESIGN REVIEW</th>
<th>FAILURE REVIEW</th>
<th>INTEGRATED SAFETY</th>
<th>INTEGRATED TEST</th>
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<td>QA-012</td>
<td>Procedure, Process Control</td>
<td>Essential process controls needed to supplement the procedure.</td>
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<td>QA-013</td>
<td>Procedure, Test/Inspection</td>
<td>Specific test and inspection procedures to be performed.</td>
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<td>QA-014</td>
<td>Procedure, Rework</td>
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<td>QA-015</td>
<td>Procedure, Area Control</td>
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<td>QA-016</td>
<td>Record, Calibration</td>
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<td>QA-017</td>
<td>Record, Shelf Life</td>
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<td>QA-018</td>
<td>Record, Tool and Gauge Usage</td>
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<tr>
<td>QA-019</td>
<td>Record, Test (Materials, Parts, Sub-Assemblies)</td>
<td>A chronological and historical record used in reviewing status, solving anomalies and verifying acceptance requirements.</td>
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<tr>
<td>QA-001</td>
<td>Logbook, Component</td>
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<td>QA-002</td>
<td>Logbook, Vehicle</td>
<td>To verify to the customer the chronological and historical record for the vehicle presented for buy-off.</td>
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* KEY INFORMAL DATA
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<tr>
<th>DATA ITEM NUMBER</th>
<th>DATA ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>QA-020</td>
<td>*Report, Failure Analysis</td>
<td>Documentation of the investigatory analysis of nonproblem cause, and prevention.</td>
</tr>
<tr>
<td>QA-021</td>
<td>*Report, Nonconforming Material (NCMR)</td>
<td>A document to report nonconformance in fabrication assembly, and inspection and the cause, corrective and disposition.</td>
</tr>
<tr>
<td>QA-022</td>
<td>*Report, Process Trends</td>
<td>Identifies shifts in quality levels during processes so corrective action can be taken.</td>
</tr>
<tr>
<td>QA-023</td>
<td>*Report, Quality Audit</td>
<td>Measures the level of compliance in all areas of fabrication assembly and test to the governing quality document.</td>
</tr>
<tr>
<td>QA-024</td>
<td>*Report, Quality Status</td>
<td>A report of the system contractor's quality performance submitted to the customer.</td>
</tr>
<tr>
<td>QA-025</td>
<td>Report, Special Measurement and Test Equipment Evaluation (Component)</td>
<td>A special capability study of test equipment to verify and confidence in test and inspection results.</td>
</tr>
<tr>
<td>QA-026</td>
<td>Report, Quality Assurance Audit Summary</td>
<td>Summary of the audits verifying compliance in fabrication testing, inspection, to specific control documents.</td>
</tr>
<tr>
<td>QA-027</td>
<td>Report, Quality Assurance Trend Summary</td>
<td>Summarization of QA trend reports to determine any quality levels and to emphasize corrective action.</td>
</tr>
<tr>
<td>QA-028</td>
<td>Report, Break of Inspection</td>
<td>Identifies the break of inspection event which causes processing to be stopped and verifies that all material a component is maintained as prime.</td>
</tr>
<tr>
<td>QA-029</td>
<td>*Report, Failure Categorization</td>
<td>An analysis report categorizing failures and assigning for failures to design, component, fabrication, or test.</td>
</tr>
<tr>
<td>QA-030</td>
<td>Report, Qualification Status</td>
<td>Reports the status of the type approval (TA) program to the customer.</td>
</tr>
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* KEY INFORMAL DATA
## DATA ITEM LIST/USER MATRIX

### APPLICABILITY TO FUNCTIONAL USERS AT CONTRACTOR LEVEL

<table>
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U = USE  
R = REVIEW AUTHORITY  
A = APPROVAL AUTHORITY  
PM = PROJECT MANAGER APPROVAL

2-6-1
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<th>DESIGN REVIEW</th>
<th>FAILURE REVIEW</th>
<th>INTEGRATED SAFETY</th>
<th>MADE ON</th>
<th>MATERIAL REVIEW</th>
<th>SOURCE EVALUATION</th>
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*KEY INFORMAL DATA*
### DATA ITEM LIST/USER MATRIX

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**Legend:**
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2-8-2  2-7/8
The Quality Assurance Data User Flow Diagrams were developed to show the quality activities and required data items on Voyager to meet customer requirements (NPC 200–2, 3, 4) and the needs of a long-life space system quality program. Interfaces with the systems office, the contractor Voyager project, and procurement sources have been indicated from contract award through launch. The quality assurance data items shown in the diagrams agree with Voyager data item lists.

Early attention is devoted to the quality assurance program plan, conducting special quality system studies, and obtaining rapid integration of major subcontractor quality programs into the prime contractor quality assurance system; Continuous from the systems design phase through launch, key quality activities are:

**SDR through PDR**
- Develop parts qualification plan
- Review specifications and drawings
- Initiate training program
- Monitor breadboard activities
- Establish procurement source (supplier) evaluation system

**PDR through HDR**
- Begin parts and process qualifications
- Finalize Quality Assurance Operating Procedures Manual
- Initiate component special test equipment design
- Calibrate tools and gages
- Continue certification of personnel
- Establish QA engineer residents at major subcontractors
- Monitor model fabrication and tests

**MDR through CDR**
- Continue test plan development
- Conduct failure analyses
- Inspect engineering model procurement, fabrication and tests
- Conduct audits
- Review purchase requisitions for TA and PTM hardware
CDR through FACI
- Update procedures and processes
- Update component STE
- Continue STE, tool and gage calibrations
- Inspect TA and PTM fabrication and tests
- Review process trends and conduct failure analyses
- Compile documentation, including deviation data for FACI

FACI through MAR
- Prepare launch operations QA plan
- Implement defect preventive measures evolving from FACI
- Perform FA and OSE in-process inspection test and certification
- Conduct failure analyses
- Compile Mission Acceptance Review documentation
- Review status of each vehicle

MAR through Launch
- Inspect shipments of FA, OSE and STE
- Receipt inspection at launch site
- Monitor pre-launch tests
- Provide QA data for problem solving areas
### Quality Assurance User Flow Diagrams

<table>
<thead>
<tr>
<th>Figure Number</th>
<th>Title</th>
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<tbody>
<tr>
<td>E-1</td>
<td>Quality Assurance User Flow Diagram — Summary</td>
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System Office

Contract Statement

Specifications

Contractor

QA Detailed Functions & Responsibilities

Establish QA Specification and Drawing Review Plan

Conduct QA Special System Studies

Quality Assurance Program Plan Review

Review QA Operating Procedures

Evaluate QA Training and Indoctrination Requirements

Prepare QA Program Items for Issue to Major Subcontractors
CONFIGURATION INSPECTION

FIRST ARTICLE CONFIGURATION INSPECTION

REVIEW QA PROGRAM

COMPILE DEVIATION DATA FOR

REVIEW PROCESS TREND AND CONDUCT FAILURE ANALYSIS

INSPCT FABRICATION AND TEST OF TA & PTM MODELS

IMPLEMENT DEFECT PREVENTIVE MEASURES EVOLVING

PERFORM FLIGHT ARTICLE N.S. PROCESS INSPECTION

PREPARE LAUNCH OPERATIONS, QA PLAN

CONDUCT FAILURE ANALYSIS

MISSION ACCEPTANCE REVIEW

COMPILE DOCUMENTATION

REVIEW STATUS OF EACH VEHICLE

COMPILE SUBCONTRACTOR DOCUMENTS FOR MAI

LEGEND:

ACTIVITY: T

3-6-3
Figure E-1. Quality Assurance User Flow Diagram - Summary
Figure E-2. Quality Assurance User Flow Diagram - Contract Award Through Preliminary Design Review
Figure E-3. Quality Assurance User Flow Diagram - Preliminary Design Review Through Critical Design Review
Figure E-4. Quality Assurance User Flow Diagram - Critical Design Review Through Launch (Sheet 1 of 2)
QUALITY ASSURANCE PLANS AND STATUS

DEVELOP LAUNCH OPERATIONS QA PLANS

PARTICIPATE IN CONFIGURATION MEETINGS

QUALIFICATION STATUS REPORT QA-042

PREPARE LAUNCH OPERATIONS INSPECTION PROCEDURES

LAUNCH OPERATIONS INSPECTION PROCEDURES QA-041

CONDUCT PARTS LIFE TEST

PARTS LIFE TEST REPORTS QA-012

IMPLEMENT PREVENTION RECOMMENDATIONS EVOLVING FROM FACI

PERSONAL W-PROCESS INSPECTION AND TESTS FOR FLIGHT ARTICLES

QUALIFICATION STATUS REPORT QA-014

ANALYSIS FAULT


CONDUCT AUDITS

CONDUCT AUDITS REPORT QA-026

SUBMIT MINUTES QA-007

UPDATE MANUALS

UPDATED MANUALS QA-003, 004

TEST EQUIPMENT QA-015

QUALIFICATION REQUERIES QA-015

TRAINING

INSTITUTE LAUNCH OPERATIONS TRAINING

REQUEST REQUEST

REQUEST INSPECTION AND TESTING ALL COMPLMENTS AND DOCUMENTATION REQUIRED FOR MORRO ACCEPTANCE TO FLIGHT ARTICLES

SUBCONTRACTOR

QA STATUS REPORT QA-114
Figure E-4. Quality Assurance User Flow Diagram - Critical Design Review Through Launch (Sheet 2 of 2)
## Quality Assurance Data Requirement Descriptions

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<td>Logbook, Component</td>
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<td>QA-002</td>
<td>Logbook, Vehicle</td>
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<tr>
<td>QA-003</td>
<td>Manual, Instrument Calibration and Maintenance</td>
</tr>
<tr>
<td>QA-004</td>
<td>Manual, Quality Assurance Operating Procedures</td>
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<tr>
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<tr>
<td>QA-006</td>
<td>Manual, Workmanship Standards</td>
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<td>Minutes, Material Review Board</td>
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<td>Record, Shelf Life</td>
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<td>QA-018</td>
<td>Record, Tool and Gauge Usage</td>
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<td>Record, Test (Materials, Parts, Sub-Assemblies)</td>
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<td>*Report, Process Trends</td>
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<tr>
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<td>*Report, Quality Audit</td>
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<td>&amp;A-031</td>
<td>Specification, Special Test Equipment (STE), Component</td>
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*Key Informal Data*
**LOGBOOK, COMPONENT**

To record chronological historical data and pertinent information used in reviewing component status, tracing and solving anomalies and to determine suitability in meeting requirement and acceptance criteria.

**INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:**
- CM-003, Change Notice
- QA-009, Plan, Quality Assurance Program
- QA-021, *Report, Nonconforming Material (NCMR)
- TE-027, *Logbook, Test
- TE-061, *Logbook Cumulative Test Time

**APPLICATIONS**
- Special Handling
- NASA Discreet
- JPL Discreet
- Other

**FREQUENCY OF ISSUE:**
- Annually
- Semi-Annually
- Quarterly
- Bi-Monthly
- Semi-Monthly
- Monthly
- Weekly
- Other, as specified

**EXPIRATION DATE:**
- Daily thru M1

**REFERENCE DOCUMENTS**
- Instruction
- Letter
- List
- Log
- Manual
- Memorandum
- Minutes
- Plan
- Procedure
- Report
- Regulation
- Specification
- Standard
- Voucher

**APPLICATIONS**
- Special Handling
- NASA Discreet
- JPL Discreet
- Other

**EXPIRATION DATE:**
- Daily thru M1
A DRD at the subcontractor/vendor level similar in content to this DRD is required.

OUTLINE OF CONTENTS:
1. Component Logbook is a chronological, historical record of component activity starting with the first functional test.
2. Each Component Logbook is serialized and is assigned to a specific piece of hardware identified by a lot number or serial number.
3. The cognizant engineer identifies the various parameters to be recorded in the logbook.
   a. Number of mate and demating of connectors.
   b. Number of hours power was applied to the component.
   c. Number of operating test cycles of the component.
   d. Number of out-of-specification readings (failures) troubleshooting procedure, assignable for the out-of-specification reading and how the correction was accomplished. This is in addition to MRB documentation.
   e. Any abnormal occurrence, no matter how insignificant, is recorded.
4. References break of inspection record and nonconforming material record.
5. References the failures and failure analysis reports.
6. Identifies component configuration.
LOGBOOK, VEHICLE

To verify by a documented logbook to the customer the historical and chronological acceptance events of the vehicle presented for buy off.

INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:
CM-005, Index, Contract End Item Approved Configuration
CM-010, List, Hardware Incorporated Changes
CA-001, Logbook, Component
CA-009, Plan, Quality Assurance Program
CA-021, *Report, Nonconforming Material (NCMR)
RA-006, Log, Problem/Failure Summary

REFERENCE DOCUMENTS:
APPLICABLE STANDARDS.
Logbooks may be any number of volumes dependent upon events (number of BOI's etc.) occurring during vehicle processing. Since the books are a completion of numerous types of data items, they will be in notebook form with appropriate covers.

<table>
<thead>
<tr>
<th>OUTLINE OF CONTENTS:</th>
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<tbody>
<tr>
<td>1. Lists all components by serial number, drawing and revision number, and verifies acceptance buy off.</td>
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<tr>
<td>2. Verifies inspection buy off during assembly.</td>
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<tr>
<td>3. List of all nonconforming material reports written during assembly and test and verifies acceptance buy off.</td>
</tr>
<tr>
<td>4. Lists all MRB actions and dispositions.</td>
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<tr>
<td>5. Lists all tests and results and verifies acceptance.</td>
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<tr>
<td>6. Records power on time, cycle times, mating and demating of connectors, etc. All pertinent actions as performed on the vehicle during assembly and test.</td>
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<td>7. Records all break of inspection events.</td>
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<tr>
<td>8. Record of compliance to the latest configuration.</td>
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</table>
MANUAL INSTRUMENT CALIBRATION AND MAINTENANCE

Provide a standardized, approved set of procedures for performing the scheduled calibration and maintenance of test and measurement instruments. These controlled procedures maintain the accuracy standards for reliability and confidence in the inspection and test data.

INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:

&A-009, Plan, Quality Assurance Program

REFERENCE DOCUMENTS:
MIL-C-45662 - Calibration System Requirements

APPLICABLE STANDARDS:
Calibration and maintenance procedures for equipment used in tests are published by the equipment engineer. Calibration cycles are based on manufacturer's recommendations and from established historical records on the equipment. A DRD at the subcontractor/vendor level similar in content to this DRD is required.

**OUTLINE OF CONTENTS:**

1. Type of Equipment, by Manufacturer.
2. A brief description of the equipment.
3. Equipment accuracy limits and ranges.
4. Maintenance procedure as recommended by the manufacturers and supplemented by the equipment engineer.
5. Calibration procedure for the technician utilizing secondary standards traceable to the Bureau of Standards.
6. Description of the method of documenting the calibration and maintenance performed.
MANUAL, QUALITY ASSURANCE OPERATING PROCEDURES

To meet the historical and specific customer requirements with established Voyager Management Quality Assurance Procedures

INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:
QA-009, Plan, Quality Assurance Program
QA-021, Report, Nonconforming Material (NCMR)

CLASSIFICATION:
- Secret
- Confidential
- Secret Restricted Data
- Unclassified

FORM OF DATA:
- Printed Document
- Chart
- Diagram
- Drawing
- Film (Static or Motion)
- Illustration
- Model
- Recording (tape or DISC)
- Computer Card
- Computer Tape
- Microfilm (W/ or w/o Card)
- Other

REFERENCE DOCUMENTS:
- Military Specifications
- Configuration Management (JPL)
- NPC 200-2
- NPC 200-3

APPLICABLE STANDARDS:
- Military Specifications
- Configuration Management (JPL)
- NPC 200-2
- NPC 200-3
SPECIAL INSTRUCTIONS:

Procedures incorporate specific customer, and established quality requirements as governed by NASA and Military documents.

OUTLINE OF CONTENTS:

1. Defines the purpose and scope of the operating procedure.
2. Assigns specific responsibilities for implementation and control of the procedure.
4. Defines method of measurement and audit requirements.
5. Defines the documentation required to meet the procedure/requirements.

Example: Processing of Nonconformance Material Report through the Material Review Board.
MANUAL, SPECIAL TEST EQUIPMENT, COMPONENT

To control the configuration of the special test equipment consistent with changes necessitated by design and performance requirements and represents an operation manual for special test equipment.
Quality Assurance Engineer is responsible for maintaining the manual current with the design and performance requirements and changes.

OUTLINE OF CONTENTS:

1. Manual describes the test equipment by drawing number and alteration notice and covers its test capabilities as related to a specific piece of hardware.
2. A complete set of print control drawings are a part of the manual.
3. Each modification to test equipment is authorized by a print control drawing and the manual is updated.
4. Changes in operating procedures are made at each revision, and manual is maintained current.
5. Special precautions for operation are detailed in manual.
6. Equipment troubleshooting procedures are detailed.
7. Checkoff lists are detailed for operating equipment.
8. Defines the limitation of the equipment.
ORGANIZATION ORIGINATING REQUIREMENT: QA

TITLE OF DOCUMENT: MANUAL, WORKMANSHIP STANDARDS

USE OF DOCUMENT: To provide visual aids for operators and inspectors as acceptance criteria for applicable processes.

INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS: QA-009, Plan, Quality Assurance Program

CLASSIFICATION: SECRET

FORM OF DATA: PRINTED DOCUMENT

REFERENCE DOCUMENTS: NPC - 200-4

APPLICABLE STANDARDS.
SPECIAL INSTRUCTIONS

Samples of workmanship are closely coordinated and compatible with the operator/inspector training school for certification. Photographs or work samples must be jointly selected with the customer. A DRD at the subcontractor/vendor level similar in content to this DRD is required.

SPECIAL DISTRIBUTION (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)

OUTLINE OF CONTENTS:

1. The manual defines the categories of acceptance and rejection with samples of work or photographs defining, accept, minimum acceptable, and reject.
2. Defines the limitations on rework (e.g. number of splices).
3. Recommends approved inspection procedure (e.g. magnification power).
4. Establishes the most significant criteria of inspection.

(CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD)
**TITLE OF DOCUMENT:**

MINUTES, MATERIAL REVIEW BOARD

---

**INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:**

CM-016, List, Deviations and Waivers  
QA-009, Plan, Quality Assurance Program  
QA-021, Report, Nonconforming Material (NCMR)  
RA-007, Minutes, Failure Analysis Review Board (FARB)  
SE-057, Drawings (Category B) for Interface Control

---

**REFERENCES AND/OR APPROVALS REQUIRED:**

DRAFT  
PREPUBLICATION  
PROOF

---

**CLASSIFICATION:**  
O SECRET  
O CONFIDENTIAL  
O SECRET RESTRICTED DATA  
O CONFIDENTIAL RESTRICTED DATA  
O UNCLASSIFIED

---

**KIND OF DATA:**  
O ABSTRACT  
O BULLETIN  
O CATALOG  
O CONTRACT  
O DIRECTIVE  
O DISCLOSURE  
O ENGINEERING CHANGE ORDER  
O ENGINEERING CHANGE PROPOSAL  
O HANDBOOK  
O INDEX

---

**REFERENCE DOCUMENTS:**

NASA Specifications

---

**APPlicable STANDARDS:**

---

**REVIEWS AND/OR APPROVALS REQUIRED:**  
(LIST IN ORDER OF SUBMITTAL)

**SUBMIT FOR REVIEW TO:**

---

**SUBMIT FOR APPROVAL TO:**

Manager, Quality Assurance

---

*Key Informal Data*
SPECIAL INSTRUCTIONS:

A DRD at the subcontractor/vendor level similar in content to this DRD is required.

Contents (see below) shall be coded for inclusion in data system facilitating computerizing data.

OUTLINE OF CONTENTS:

1. Description of hardware by drawing number and nomenclature.
2. Identification of hardware by serial number and lot number.
3. Description of nonconformance and the assignable cause.
4. Corrective action assigned to specific individuals or functions.
5. Disposition of the hardware:
   a. Accept as is
   b. Return to vendor
   c. Repair
   d. Retest
   e. Scrap
   f. For Engineering use only "E" stamp
   g. Submit to failure analysis
6. Approvals
   a. Quality Assurance Engineering
   b. Design engineering
   c. Customer representative

(CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD.)
**Title of Document:**
PLAN, INSPECTION

**Use of Document:**

To document the parameters to be controlled during the manufacture cycle to assure the highest level-of quality consistent with drawing requirements.

**Interrelationship with Other Data Requirements:**
- MG-004, Manufacturing Standing Instructions (MSIs)
- MG-012, *Request, Manufacturing Planning
- QA-009, Plan, Quality Assurance Program
- SE-059, Drawings (Category E) for Manufacture and Procurement of Prime Equipment

**Classification:**
- SPECIAL HANDLING
- NASA DISCREET
- CONFIDENTIAL RESTRICTED DATA
- NASA DISCREET
- UNCLASSIFIED

**Form of Data:**
- PRINTED DOCUMENT
- ABSTRACT
- INSTRUCTION
- BROCHURE
- LETTER
- BULLETIN
- LIST
- CONTRACT
- MANUAL
- DIRECTIVE
- MEMORANDUM
- DISCLOSURE
- MINUTES
- COMPUTER CARD
- ORDER
- PROCEDURE
- COMPUTER TAPE
- REGULATION
- MICROFILM (W/O CARD)
- ENGAGEMENT CHANGE PROPOSAL
- SCHEDULE
- ENGAGEMENT CHANGE
- SPECIFICATION
- PROPOSAL
- STANDARD
- INDEX
- VOUCHER

**Reviews and/or Approvals Required:**
- MANAGER, QUALITY ASSURANCE

---

*Key Informal Data*
SPECIAL INSTRUCTIONS:

For critical processes special inspection planning is issued. A DRD at the subcontractor/vendor level similar in content to this DRD is required.

SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)

None

OUTLINE OF CONTENTS:

Inspection Planning contains control parameters that specify attributes to be inspected and lists any special inspection tooling required to verify conformance to the Quality Assurance Plan during the manufacturing cycle.

1. Hardware drawing number
2. Hardware nomenclature
3. Project
4. NHA number
5. Applicable specifications (manufacturing standing instructions, military standard, etc.)
6. Operation number
**TITLE OF DOCUMENT:**

PLAN, QUALITY ASSURANCE PROGRAM

**INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:**

MG-009, Plan, Manufacturing
RA-015, Report, Failure Review
SC-002, Schedule, Project Level (PERT)
SC-004, Schedule, Task and Subtask Level (PERT)
SE-006, Plan, Cleanliness Control

**CLASSIFICATION:**

- Group 1
- Group 2
- Group 4
- Special Handling
- JPL Discreet
- NASA Discreet
- Project Discreet
- Public Domain
- Unclassified
- Confidential
- Proprietary
- Restricted Data
- Other as specified

**REFERENCE DOCUMENTS:**

NPC - 200-2, 200-3 and 200-4

**APPLICABLE STANDARDS:**

No applicable standards listed.

**REVIEWS AND/OR APPROVALS REQUIRED:**

(List in order of submittal)

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<th>Draft</th>
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<th>Prepublication Proof</th>
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Submit for Review To:

- Project Manager

Submit for Approval To:

- Project Manager
SPECIAL INSTRUCTIONS:

None

SPECIAL DISTRIBUTION (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)

OUTLINE OF CONTENTS:

Delineates the implementation of the controls proposed by the system contractor necessary to meet the requirements of NPC 200-2 and the customer work statement. Contents are as follows:

1. Introduction
2. Approach/Problems
   a. Traceability
   b. Customer/Contractor Relationship
   c. Life-Sensitive Flight Hardware
   d. Cleanliness
3. Management
   a. GE
   b. Major Subcontractors
   c. Program Management
4. Program Controls
   a. Design and development control
   b. Control of procured material
   c. Control of contractor's fabricated articles
   d. Test controls
   e. Data reporting and corrective action
   f. QA audits
   g. Inspection, measuring and test equipment
5. Relationship with other management plans

-2-
TITLE OF DOCUMENT:

PLAN, SAMPLING

INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:

QA-009, Plan, Quality Assurance Program
QA-019, Record, Test (Materials, Parts, Subassemblies)

CLASSIFICATION:

- Group 1
- Group 2
- Group 3
- Group 4
- Special Handling
- Proprietary
- Public Domain
- No For

FORM OF DATA:

- Printed Document
- Chart
- Diagram
- Drawing
- Film (Static or Motion)
- Illustration
- Model
- Recording (Tape or Disc)
- Computer Card
- Computer Tape
- Microfilm (W/ or WO Card)
- Other

KIND OF DATA:

- Abstract
- Brochure
- Bulletin
- Catalog
- Contract
- Directive
- Disclosure
- Engineering Change Order
- Engineering Change Proposal
- Handbook
- Index
- Instruction
- Letter
- List
- Log
- Manual
- Memorandum
- Minutes
- Procedure
- Regulation
- Request for Engineering Change Proposal
- Schedule
- Specification
- Standard
- Voucher

REFERENCE DOCUMENTS:

- MIL-STD-105
- NPC 200-2
Incoming inspection planning with the Quality Assurance Engineer determines the acceptable quality levels for incoming inspection of bulk material or special articles and specifies the sampling plan for the lot size. A DRD at the subcontractor/vendor level similar in content to this DRD is required.

OUTLINE OF CONTENTS:

1. Hardware drawing number
2. Hardware nomenclature
3. Applicable specifications
4. Lot size
5. Sample size
6. Acceptance criteria
7. Operating characteristic curve
8. Space for recording data
9. Signature of originator
10. Revision number of planning
11. Date
**VOYAGER DATA REQUIREMENT DESCRIPTION**

|--------------------------------------|----------|-----------------------------|-------|-------------------|---------------|---------------------|---------|

**TITLE OF DOCUMENT:**

PLAN, TEST AND OPERATING, FOR SPECIAL TEST EQUIPMENT, (STE), COMPONENT

**TYPE OF DOCUMENT:**

To document the detailed checkout procedure of the test equipment prior to utilizing with flight hardware.

**INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:**

TE-001, Plan, Integrated Test

**CLASSIFICATION:**

O SECRET  O CONFIDENTIAL  O SECRET RESTRICTED DATA  O CONFIDENTIAL RESTRICTED DATA  O UNCLASSIFIED

O GROUP 1  O GROUP 2  O GROUP 3  O GROUP 4  O PROPRIETARY  O PUBLIC DOMAIN  O UNCLASSIFIED

O SPECIAL HANDLING  O NASA DISCREET  O JPL DISCREET  O PROJECT DISCREET

**DRM OF DATA:**

O PRINTED DOCUMENT  O ABSTRACT  O INSTRUCTION

O CHART  O BROCHURE  O LETTER

O DIAGRAM  O BULLETIN  O LIST

O DRAWING  O CATALOG  O LOG

O FILM (STATIC OR MOTION)  O CONTRACT  O MANUAL

O ILLUSTRATION  O DIRECTIVE  O MEMORANDUM

O MODEL  O DISCLOSURE  O MINUTES

O RECORDING (TAPE OR DISC)  O ENGINEERING CHANGE ORDER

O COMPUTER CARD  O PLAN

O COMPUTER TAPE  O PROCEDURE

O MICROFILM (W/ OR W/O CARD)  O REQUEST FOR ENGINEERING

O OTHER

**REVIEWS AND/OR APPROVALS REQUIRED:**

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Submit for review to:

Submit for approval to:

Manager, Quality Assurance
SPECIAL INSTRUCTIONS:

Quality Assurance engineer witnesses the checkout and operation of the test equipment and verifies the adequacy of the performance to the test procedure.

SPECIAL DISTRIBUTION. (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)

OUTLINE OF CONTENTS:

1. Description of the test equipment.
2. Detail of the parameters to be tested for and checkout procedures for each parameter.
3. Facilities and peripheral equipment needed to supplement the test equipment.
4. Initial wiring checkout procedures.
5. Operational checkout with a simulated test procedure and a sample data sheet.
6. Special precautions to be taken by operator to assure confidence in the data and integrity of the test.

(CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD)
PROCEDURE, PROCESS CONTROL

To identify the step-by-step operating instruction for process-oriented inspections such as radiography and ultrasonic test. These procedures will supplement those contained in Manufacturing Standing Instructions.

INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:
MG-004, Manufacturing Standing Instructions (MSIs)
MG-009, Plan, Manufacturing
QA-009, Plan, Quality Assurance Program

REFERENCE DOCUMENTS:
NPC 200-2, 200-3, 200-4

APPLICABLE STANDARDS:
SPECIAL INSTRUCTIONS:

1. Procedure defines the process to be controlled.
2. Document the parameters to be controlled for the preparation of the material.
3. Delineate all controls for the fabrication process by specific conditions to be maintained during the processing.
4. Define the methods of verification and documentation of the process verification.
5. Describe method of verification and the maintenance of special environments to be maintained.
6. References the workmanship standards to be followed.

SPECIAL DISTRIBUTION. (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)

OUTLINE OF CONTENTS:

1. Procedure defines the process to be controlled.
2. Document the parameters to be controlled for the preparation of the material.
3. Delineate all controls for the fabrication process by specific conditions to be maintained during the processing.
4. Define the methods of verification and documentation of the process verification.
5. Describe method of verification and the maintenance of special environments to be maintained.
6. References the workmanship standards to be followed.
VOYAGER DATA REQUIREMENT DESCRIPTION

TITLE OF DOCUMENT:

PROCEDURE, TEST/INSPECTION

Provides the necessary specific test/inspection procedures to be performed on the system/subsystem.

INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:

- MG-004, Manufacturing Standing Instructions (MSIS)
- QA-006, Manual, Workmanship Standards
- QA-009, Plan, Quality Assurance Program
- RA-002, List, Critical and Limited Life Items
- RA-005, List, Parts Application Data

CLASSIFICATION:

- Secret
- Confidential
- Secret Restricted Data
- Confidential Restricted Data
- Unclassified

FORM OF DATA:

- Printed Document
- Chart
- Diagram
- Drawing
- Film (Static or Motion)
- Illustration
- Model
- Recording (TAPE or Disc)
- Computer Card
- Computer Tape
- Microfilm (W/OR W/O CARD)
- Other

REFERENCE DOCUMENTS:

- QA-01: Procedure, Test/Inspection

APPLICABLE STANDARDS:

- [List of applicable standards]

REVIEWS AND/OR APPROVALS REQUIRED:

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<tr>
<td>Manager, Quality Assurance</td>
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SPECIAL INSTRUCTIONS:

Specific detailed procedures are written for each inspection and test operation. A DRD at the subcontractor/vendor level similar in content to this DRD is required.

SPECIAL DISTRIBUTION (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)

OUTLINE OF CONTENTS:

1. Identifies the article to be inspected or tested by its specific drawing number, latest revision, serial and lot number.
2. Defines the objectives of test/inspection.
3. Specifies the equipment to be used including the range, accuracy required, and type.
4. Details the test operator's/inspector's operation to be performed, the exact method of measuring or testing.
5. Details the exact conditions to be maintained during test/inspection including environmental and precautions for the protection of article and instruments.
6. Establishes the criteria for acceptance or rejection of the article being tested or inspected including workmanship standards.
7. Identifies the test specifications and the test procedures to be followed (standing instructions).
8. Reports the test cycle and schedule to be followed.
To outline the steps and approvals required to process any rework.
The procedure will implement and conform to the rework policies specified by the Reliability Section.

<table>
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<th>OUTLINE OF CONTENTS:</th>
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<tbody>
<tr>
<td>1. Purpose</td>
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<tr>
<td>2. Scope</td>
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<tr>
<td>3. Definitions</td>
</tr>
<tr>
<td>4. Responsibilities</td>
</tr>
<tr>
<td>5. Procedures</td>
</tr>
</tbody>
</table>

(SPECIAL DISTRIBUTION (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW))
PROCEDURE, AREA CONTROL

To control the requirements of the Voyager contract for the cleanliness of fabrication and test areas and to maintain the required quality level in these areas.

INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:
- MG-009, Plan, Manufacturing
- QA-009, Plan, Quality Assurance Program
- SE-021, General Engineering Specification, Magnetic Cleanliness
- SE-023, General Engineering Specification, Cleanliness

APPLICATIONABLE STANDARDS:

REFERENCE DOCUMENTS:

APPROVALS REQUIRED:

DRAFT DATE PREPUBLICATION PROOF DATE

SUBMIT FOR REVIEW TO

Project Manager

PAGE 1 OF 2
The Quality Appraisal function will define the criteria of the environments for the facilities where hardware will be built, tested, packaged and stored. This criteria will establish limits for cleanliness and handling as required by the customer's contract. A plan of controlling, auditing, and reporting will be incorporated into the area requirement specifications. A DRD at the subcontractor/vendor level similar in content to this DRD is required.

SPECIAL DISTRIBUTION. (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)

OUTLINE OF CONTENTS:
1. Identify area of control.
2. Define the levels of control.
   a. Temperature
   b. Humidity
   c. Particle count
   d. Audit period
   e. Storage and handling
3. Define method of controlling contamination.
   a. Material, floors, furniture, and tools.
   b. Clothing, shoes
   c. Protective clothing
4. Maintenance schedules and methods to be used.
5. Frequency of measurement of area contamination level.
6. Maintain capability control charts in each area.

(CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD)
An established automatic computerized recall system for tools, gages and instruments to maintain the integrity and confidence in the inspection and test operations. A reference for establishing wear patterns and maintenance cycles.

**INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:**

- QA-009, Plan, Quality Assurance Program
- QA-018, Record, Tool and Gauge Usage
- TE-129, Procedure, Equipment Calibration and Checkout

**CLASSIFICATION:**

- Group 1
- Group 2
- Group 3
- Group 4
- Special Handling
- NASA Discreet
- JPL Discreet
- Confidential
- Group 5
- Public Domain
- Unclassified
- Other, as specified

**USE OF DOCUMENT:**

**FREQUENCY OF ISSUE:**

- Annually
- Semi-Annually
- Quarterly
- 81-Monthly
- Semi-Monthly
- 81-Weekly
- Weekly
- Daily
- As required

**REFERENCE DOCUMENTS:**

- Category
- DRL No.
- Level No.
- DRL Item No.
- No. of Copies
- Information Cutoff Date or Milestone
- Estimated Manhours for Single Preparation
- Estimated Cost ($) for Single Preparation
- Date Data Due to User
- Frequency of Issue
- Publication Date
- PDR
- Update (Frequency or Milestone)
- As required
- Expiration Date

**APPLICABLE STANDARDS:**

- Form of Data
- Kind of Data
- Reference Documents

**REVIEWS AND/OR APPROVALS REQUIRED:**

(Draft in Order of Submittal)

- Submit for Review to:
- Submit for Approval to: Manager, Quality Assurance
SPECIAL INSTRUCTIONS:

Automatic data processing techniques are utilized by the Instrument Control Section to assure periodic recall of measurement and test equipment for calibration purposes. A DRD at the subcontractor/vendor level similar in content to this DRD is required.

SPECIAL DISTRIBUTION, (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)

OUTLINE OF CONTENTS:

The record contains:
1. Inventory control number
2. Equipment name
3. Manufacturer's name
4. GE drawing number/model no.
5. Serial number
6. Range
7. Responsible operation
8. Responsible custodian
9. Last inventory date
10. Condition code
11. Calibration cycle
12. Calibration date (due)
13. Present location
14. Part number
15. Purchase order of instrument
16. Listing of repairs made at calibration
17. Data points performed at each calibration
18. Name of personnel performing the calibration

(CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD)
To control the use of materials which are subject to age deterioration and dispose of material whose useful life is expended.

INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:
QA-009, Plan, Quality Assurance Program
RA-009, Plan, Reliability Program
SE-001, Plan, Engineering Development
SE-016, Specification, Material
SE-028, List, Approved Materials
The control of limited lifetime material is by means of shelf life labels permanently attached to the material. Determination of shelf life is made by reference to the supplier’s instruction manual or special instructions supplied with the material or indication of shelf life limitations marked on the material by the Materials and Process Laboratory. A DRD at the subcontractor/vendor level similar in content to this DRD is required.

OUTLINE OF CONTENTS:

The shelf lifetime label indicates the following information:

1. Material part no. and/or nomenclature.
2. Purchase order number.
3. Date not to be used after _________
4. Temperature storage requirements.
5. Disposition routine for time date expired material.
6. As each label is affixed to the container a permanent record is established for the material and contains this information:
   Date, Type of Material, Released to, Expiration Date of Material, Disposition of Material, etc.

1 (CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD.)
RECORD, TOOL AND GAGE USAGE

To assure, by documentation, that tools and gages which measure dimension, contours, or locations affecting quality characteristics are initially checked for accuracy prior to use and periodically thereafter to ensure continued accuracy.

INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:
MG-001, Drawings, Interface Tools, Jigs and Fixtures
MG-002, *Drawings, Tools, Jigs and Fixtures
QA-004, Manual, Quality Assurance Operating
QA-009, Plan, Quality Assurance Program

CLASSIFICATION:
- O SECRET
- O CONFIDENTIAL
- O CONFIDENTIAL RESTRICTED DATA
- O Unclassified
- O PROPRIETARY
- O PUBLIC DOMAIN
- O NOFORN

FORM OF DATA:
- O PRINTED DOCUMENT
- O CHART
- O DIAGRAM
- O DRAWING
- O FILM (STATIC OR MOTION)
- O ILLUSTRATION
- O MODEL
- O RECORDING (TAPE OR DISC)
- O COMPUTER CARD
- O COMPUTER TAPE
- O MICROFILM (W/ OR W/O CARD)
- O OTHER

REFERENCE DOCUMENTS:

APPLICABLE STANDARDS:

REVIEWS AND/OR APPROVALS REQUIRED:
(LIST IN ORDER OF SUBMITTAL)

DRAFT | DATE | PREPUBLICATION PROOF | DATE
--- | --- | --- | ---

SUBMIT FOR REVIEW TO:

SUBMIT FOR APPROVAL TO:
Manager, Quality Assurance

*Key Informal Data
The control, identification, and recall of tools and gages are the responsibility of the Quality Appraisal Instrument and Calibration Laboratory. A DRD at the subcontractor/vendor level similar in content to this DRD is required.

OUTLINE OF CONTENTS:

The control, identification and recall capability is by means of a computerized system. The computer cards within this system contain the pertinent information for control.

1. Lab control number.
2. Supplier's identification number and nomenclature.
3. Purchase order number and cost.
4. Present location.
5. Tolerances.
6. Date of last calibration.
7. Frequency of calibration.
8. Date of next calibration.
**TITLE OF DOCUMENT:**

RECORD, TEST
(MATERIALS, PARTS, SUB-ASSEMBLIES)

To permanently record variable data of testing results of flight hardware.

**INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:**
QA-009, Plan, Quality Assurance
QA-013, Procedure, Test/Inspection
TE-001, Plan, Integrated Test
TE-130, Plan, General Test

**CLASSIFICATION:**
- GROUP 1
- GROUP 2
- GROUP 3
- GROUP 4
- SPECIAL HANDLING
- NASA DISCREET
- JPL DISCREET
- PROJECT DISCREET
- PROPRIETARY
- PUBLIC DOMAIN
- CONFIDENTIAL
- CONFIDENTIAL RESTRICTED DATA
- UNCLASSIFIED
- RESTRICTED DATA
- CONFIDENTIAL RESTRICTED DATA
- UNCLASSIFIED

**FORM OF DATA:**
- PRINTED DOCUMENT
- ABSTRACT
- INSTRUCTION
- CHART
- BROCHURE
- LETTER
- DIAGRAM
- BULLETIN
- LIST
- DRAWING
- CONTRACT
- LOG
- FILM (STATIC OR MOTION)
- DIRECTIVE
- MANUAL
- ILLUSTRATION
- DISCLOSURE
- MEMORANDUM
- MODEL
- PLAN
- RECORDING (TAPE OR DISC)
- DISCLOSURE
- DIRECTORY
- COMPUTER CARD
- DISCLOSURE
- COMPUTER TAPE
- ENGINEERING CHANGE ORDER
- COMPUTER MICROFILM (W/ OR W/O CARD)
- REQUEST FOR ENGINEERING CHANGE PROPOSAL
- OTHER
- HANDBOOK
- SCHEDULE
- DRAWING
- SPECIFICATION
- MODEL
- STANDARD
- PDF
- INDEX
- VOUCHER

**REFERENCE DOCUMENTS:**

NPC 200-2

**APPLICABLE STANDARDS:**

**REVIEWS AND/OR APPROVALS REQUIRED:**

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<tbody>
<tr>
<td>Manager, Quality Assurance</td>
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**SPECIAL INSTRUCTIONS**

Computer cards will be used for parts data.

Preprinted data sheets will be used to record material and subassembly data.

**SPECIAL DISTRIBUTION. (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)**

**OUTLINE OF CONTENTS:**

1. Component name.
2. GE drawing number with most recent revision.
3. Vendor serial number.
4. Vendor's name (not trademark).
5. Vendor's test procedures number and revision.
6. The name, make, model number, vendor's identification number and calibration due date of the test equipment, gages or tools used.
7. Provisions for signatures of the vendor's and GE responsible representative(s).
8. A brief description of each test with a reference to the applicable paragraph in the vendor's test procedure (e.g., input power, continuity, frequency response, etc.).
9. Units of measure (e.g., ohms, ma, etc.).
10. Tolerances - Given in limits, not percent (e.g., 4750-5250 ohms) except where measurement is in percent (e.g., harmonic distortion).
11. Actual readings taken during tests. Do not record as pass or fail unless otherwise specified.
12. Date of tests.
13. Operating time matrix: includes hardware operating and nonoperating time in the testing environments.
15. The number of any failure reporting documents associated with the test.

(continue on third sheet, if necessary, and affix to this DRD)
**REPORT, FAILURE ANALYSIS**

To document the investigatory steps in the analysis of a nonconformance including what was the problem, what caused it, and what is being done to prevent recurrence.

Users: Quality Appraisal (FARB) - Reliability - Design Engineering

**INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:**
- QA-009, Plan, Quality Assurance Program
- QA-021, Report, Nonconforming Material (NCMR)
- RA-007, Minutes, Failure Analysis Review Board (FARB)
- RA-009, Plan, Reliability Program
- RA-015, Report, Failure Review

**CLASSIFICATION:**
- UNCLASSIFIED

**USE OF DOCUMENT:**
To document the investigatory steps in the analysis of a nonconformance including what was the problem, what caused it, and what is being done to prevent recurrence.

**FREQUENCY OF ISSUE:**
- As required

**APPLICATIONS:**
- PROJECT DISCREET
- NASA DISCREET
- JPL DISCREET
- SPECIAL HANDLING
- UNCLASSIFIED

**OTHERWISE, AS SPECIFIED**

**REFERENCE DOCUMENTS:**
- APPLICABLE STANDARDS;

**REVIEWS AND/or APPROVALS REQUIRED:**

**REMARKS:**

**PAGE 10 OF 2**
SPECIAL INSTRUCTIONS.

In Section 3 of the contents, X-rays, pictures, sketches or other descriptive media should be used to completely describe the failure mechanism.

A DRD at the subcontractor/vendor level similar in content to this DRD is required.

The report will reference a number correlating it to a specific nonconforming material report.

OUTLINE OF CONTENTS:

1. Description of Failure Symptoms - Includes what test the unit failed, under what conditions, the data (or measurement) and when.

2. What Failed - What part, wire, module, bracket, etc., was the actual failure.

3. Analysis Steps - Description of the total steps taken to identify the failure and the effects of the failure on associated equipment.

4. Corrective Action - What has been done to prevent reoccurrence of the problem including reference to the documentation that accomplishes this.
**REPORT, NONCONFORMING MATERIAL (NCMR)**

An established document to report nonconformance in the fabrication, assembly, inspection and test of hardware. It assigns responsibility for nonconformance, corrective action and disposition of the hardware to rework, MRB, failure analysis.

**INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:**
- QA-007, Minutes, Material Review Board (MRB)
- QA-009, Plan, Quality Assurance Program
- QA-020, "Report, Failure Analysis"
- SE-056, Drawings (Category A) for Design Evaluation
- SE-058, Drawings (Category C) for Test

**CLASSIFICATION:**
- O SECRET
- O CONFIDENTIAL
- O SECRET RESTRICTED DATA
- O CONFIDENTIAL RESTRICTED DATA
- O UNCLASSIFIED

**KIND OF DATA:**
- O ABSTRACT
- O BROCHURE
- O BULLETIN
- O CONTRACT
- O DIRECTIVE
- O DISCLOSURE
- O ENGINEERING CHANGE ORDER
- O ENGINEERING CHANGE PROPOSAL
- O ENGINEERING CHANGE REPORT
- O ENGINEERING CHANGE SCHEDULE
- O ENGINEERING CHANGE SPECIFICATION
- O ENGINEERING CHANGE VOUCHER

**REFERENCE DOCUMENTS:**
- Contract NASA Specifications

**REMARKS:**

*Key Informal Data*
A DRD at the subcontractor/vendor level similar in content to this DRD is required. See sample format.

OUTLINE OF CONTENTS:
1. Serialized preprinted form.
2. Description of the hardware by drawing number and nomenclature.
3. Description of nonconformance and the assignable responsibility.
4. Assigning of corrective action to individual and/or function for implementation.
5. Disposition recommended:
   a. Failure analysis
   b. Return to vendor
   c. Rework
   d. Scrap
   e. MRB
   f. Accept as is
   g. Retest
6. Approvals required:
   Manufacturing engineering
   Design engineering
   Quality assurance engineering

(CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD.)
### 4. DISCREPANCY (IN-PROCESS) (FUNCTIONAL)

Failure Discovered During | Reason for Report | Repair or Disposition Action | Replacement
--- | --- | --- | ---
1. Bench Test | Failed Item | Repaired in Place | 1. Identical Part
3. Storage | Time Expired | Adjusted | 3. None Needed
4. Shipping | Other | Eliminated | 4. Not Available
5. Checkout | 
6. Maintenance | 
7. Mfr. Test | 
8. Operation | 
9. Qual | 

### 15. INITIAL DISPOSITION

### 16. DISPOSITION

### 17. CORRECTIVE ACTION (TO AVOID RECURRENT)

---

Nonforming Material Report

---
**REPORT, PROCESS TRENDS**

To detect nonconformance trends at receiving/inspection, fabrication, final assembly and test to identify shifts in quality levels so that timely corrective action can be taken.

**INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:**
- MG-004, Manufacturing Standing Instructions (MSI's)
- QA-007, Minutes, Material Review Board (MRB)
- QA-009, Plan, Quality Assurance Program
- QA-021, Report, Nonconforming Material (NCMR)

---

**REFERENCE DOCUMENTS:**

NPC 200-2

**APPLICABLE STANDARDS**
The Process Control Engineer performs a daily review of all NCM reports and interfaces with Engineering, Manufacturing Planning and Supervision, Quality Assurance to determine assignables for defects and corrective action. Trend charts are maintained weekly from these determinations.

OUTLINE OF CONTENTS:

1. The Nonconforming Material Reports are developed into trend charts for each area of manufacturing, inspection, test and assembly.

2. Each area is broken down into the major elements of activity, and trend charts are plotted with established control limits (upper and lower).

3. Responsibility for corrective action on nonconformance is assigned to Manufacturing, Engineering and Quality Assurance and each function is measured by the trend charts.

4. Trend charts and records are maintained on all operators and inspectors to measure performance and determine needs for additional training.

5. A summary of corrective action status is made each week to supplement the trend charts.
**VOYAGER DATA REQUIREMENT DESCRIPTION**

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<tr>
<th>ORGANIZATION ORIGINATING REQUIREMENT</th>
<th>CODE</th>
<th>OFFICE RESPONSIBLE FOR DRD</th>
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<th>DRD APPROVED BY</th>
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**TITLE OF DOCUMENT:**

*REPORT, QUALITY AUDIT*

**USE OF DOCUMENT:**

To measure the level of compliance to the established Quality Assurance Operating Procedures and Manufacturing Standing Instructions and to implement corrective action as necessary.

**INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:**

QA-009, Plan Quality Assurance Program

QA-021, Report, Nonconforming Material (NCMR)

**CLASSIFICATION:**

- GROUP I
- USER: SPECIAL HANDLING
- USER: JPL DISCRET
- USER: NOFORN

**FORM OF DATA:**

- PRINTED DOCUMENT
- ABSTRACT
- INSTRUCTION

**REFERENCE DOCUMENTS:**

NPC 200-2

**APPLICABLE STANDARDS:**

**REVIEWS AND OR APPROVALS REQUIRED:**

(DRAFT ORDER OF SUBMITTAL)

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*Key Informal Data*
SPECIAL INSTRUCTIONS:

SPECIAL DISTRIBUTION. (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)

OUTLINE OF CONTENTS:

1. Name of area or operation, date of audit, audited by ________________________________
2. List the specific document for which the area was audited. (e.g., QAOP).
3. Results of audit and recommendation for correction and/or improvement.
4. Assign responsibility for correction and/or improvement.
5. Establish completion dates for correction/improvement.
6. Reschedule audit period.

(CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD.)
**REPORT, QUALITY STATUS**

To compile and submit to the customer for information the system contractor performance for meeting the quality requirements as supported by the various control documents.

**INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:**
- MA-019, Report, Quarterly Written
- PC-002, Report, Contract Status
- QA-004, Manual, Quality Assurance Operating Procedures
- QA-009, Plan, Quality Assurance Program

**REFERENCE DOCUMENTS:**
- NPC 200-2
OUTLINE OF CONTENTS:

1. General narrative comment on the conformance of meeting the quality levels of the Voyager Program.
2. Summarized pictorial illustrations, graphs of the various measurements of the quality performance such as:
   a. MRB activity
   b. NCMR activity
   c. Corrective actions
   d. Tests
   e. Audits
   With supplemental narrations on the progress in each area of activity.
**Report, Special Measurement and Test Equipment Evaluation (Component)**

When analysis of the quality levels indicate a shift in performance or accuracy, a special measurement and test equipment evaluation capability study is performed to verify the integrity and confidence in the test results.

**Reference Documents:**

NPC 200-2

**Applicable Standards:**

**Form of Data:**

- Printed Document
- Chart
- Diagram
- Drawing
- Film (Static or Motion)
- Illustration
- Model
- Recording (TAPE or Disc)
- Computer Card
- Computer Tape
- Microfilm (W/Or W/O Card)
- Other

**Kind of Data:**

- Abstract
- Brochure
- Bulletin
- Catalog
- Contract
- Directive
- Disclosure
- Engineering Change Order
- Request for Engineer Change Proposal
- Engineering Change Proposal
- Handbook
- Index

**Reviews and/or Approvals Required:**

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<th>Date</th>
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**Submit for Review to:**

- Manager, Quality Assurance

**Submit for Approval to:**

- Manager, Quality Assurance
QUALITY ASSURANCE Engineer witnesses the special measurement and test equipment evaluation.

SPECIAL DISTRIBUTION (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING ODL WRITE IN DISTRIBUTION BELOW)

OUTLINE OF CONTENTS:

1. Procedure for the verification that the equipment is compatible with desired resolution of measurement parameters.
2. Defines data requirements of the special test.
To summarize status of compliance to the control documents as imposed on the systems contractor in areas of fabrication, inspection and testing of prime hardware.

INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:
QA-009, Plan, Quality Assurance Program
QA-023, Report, Quality Audit
QA-027, Report, Quality Assurance Trend Summary
SPECIAL INSTRUCTIONS:

SPECIAL DISTRIBUTION. (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL, WRITE IN DISTRIBUTION BELOW)

Submitted quarterly to Spacecraft System Office.

OUTLINE OF CONTENTS:

1. Summary of biweekly audits listing.
2. Name of area and/or operation (date of audits).
3. Findings, corrective action, completion dates and open corrective actions with promise dates of completion.
4. Overall rating for area audited and an indication of trends.
5. Analysis, conclusions and recommendations.

The summary extends to all areas of fabrication, assembly, inspection and test.
**REPORT, QUALITY ASSURANCE TRENDS SUMMARY**

Summarize and analyze all trend reports to determine the status of the overall fabrication, assembly, inspection and test performance and to determine need for emphasis on corrective action.

**INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:**

- QA-007, Minutes, Material Review Board (MRB)
- QA-009, Plan, Quality Assurance Program
- QA-021, Report, Nonconforming Material (NCMR)
- QA-022, Report, Process Trends

**REFERENCE DOCUMENTS:**

NPC 200–2

**APPLICABLE STANDARDS:**

... 

*Key Informal Data*
The weekly quality trends are plotted on control charts; process averages are calculated and control limits established. Each specific area of performance, electronic shops, machine shops, sheet metal shop, assembly and test areas is plotted to indicate trends to control quality of the outgoing hardware. A summary analysis for each area is submitted to assign responsibility for control.

OUTLINE OF CONTENTS:

1. Report summarizes the process parameters within a given area that are measured for performance trends.
   a. Mechanical machine shop
   b. Mechanical sheet metal shop.
   Typical control parameters in these areas are, dimensional surface finish, welding concentricity, procedure. Defects are assigned responsibility by shop planning, engineering, inspection planning.

2. Electronic shops are controlled in the following areas:
   a. Module or printed circuits
   b. Black box assembly
   c. Test
   Typical control parameters in these areas are: accumulations, assembly and orientation, soldering, welding, procedural and handling and defects are assigned responsibility.

(CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD)
REPORT, BREAK OF INSPECTION

To report status of the hardware affected by the "Break of Inspection" event delaying assembly and test schedules of the overall program.
In-Process Inspection makes out a Break of Inspection card with a copy to Quality Assurance Data Collection Center.

A DRD at the subcontractor/vendor level similar in content to this DRD is required.

OUTLINE OF CONTENTS:

1. Summary of the Break of Inspection cards and their status.
2. Contains the action taken on specific hardware affected by the break of inspection.
3. Shows status of parts and substitutions by serial number of the affected parts.
4. Shows hardware status awaiting Break of Inspection action.
5. Lists hardware requiring Material Review Board action as direct result of the Break of Inspection event.
6. Identifies the reinspection required to progress hardware to next level of assembly or test.

See attached form.
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<th>NOMECLATURE</th>
<th>PARTS REINSTALLED</th>
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VOYAGER Quality Assurance Break of Inspection Report
*REPORT, FAILURE CATEGORIZATION

Computerize and categorization of, and assigning responsibilities for failure with regard to: (1) class of equipment; (2) environmental test during which failure occurred; (3) test levels at instant of failure; (4) description of failure; (5) transducers (if any) records at time of failure.

INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:
QA-009, Plan, Quality Assurance Program
QA-020 *Report, Failure Analysis
QA-021, Report, Nonconforming Material (NCMR)
RA-009, Plan, Reliability Program

CLASSIFICATION:
☐ SECRET ☐ CONFIDENTIAL ☐ SECRET RESTRICTED DATA ☐ CONFIDENTIAL RESTRICTED DATA ☐ UNCLASSIFIED
☐ GROUP 1 ☐ GROUP 2 ☐ GROUP 3 ☐ GROUP 4 ☐ PROPRIETARY ☐ NASA DISCREET ☐ JPL DISCREET ☐ PROJECT DISCREET ☐ PUBLIC DOMAIN ☐ NOFORN

REFERENCE DOCUMENTS:

APPLICABLE STANDARDS

REVIEWS AND/OR APPROVALS REQUIRED:
(LIST IN ORDER OF SUBMITTAL)

DRAFT DATE PREPUBLICATION PROOF DATE

SUBMIT FOR REVIEW TO

SUBMIT FOR APPROVAL TO

Manager, Quality Assurance
SPECIAL INSTRUCTIONS.

SPECIAL DISTRIBUTION. (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL, WRITE IN DISTRIBUTION BELOW)

OUTLINE OF CONTENTS:

Computer cards bear information regarding:

1. Failure report number
2. Equipment identification/name
3. Equipment categories
   a. Subsystem
   b. Class of equipment
4. Environmental test during which failure occurred
5. Test level at the instant of failure
6. Category of failed element (electrical, mechanical, etc.)
7. Transducer records at instant of failure, etc.

(CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD)
REPORT, QUALIFICATION STATUS

To report to the customer the status of the Type Approval Program.

INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS:

PC-013, List, Bidder
QA-004, Manual, Quality Assurance Operating Procedures
QA-009, Plan, Quality Assurance Program
QA-024, *Report, Quality Status
TE-165, Report, Test

CLASSIFICATION:
0 SECRET
0 CONFIDENTIAL
0 SECRET RESTRICTED DATA
0 CONFIDENTIAL RESTRICTED DATA
0 UNCLASSIFIED
0 GROUP 1
0 GROUP 2
0 GROUP 3
0 GROUP 4
0 NASA DISCRETED
0 JPL DISCRETED
0 SPECIAL HANDLING
0 PROPRIETARY
0 PROJECT DISCRETED
0 PUBLIC DOMAIN
0 NOFON

FORM OF DATA:
\[\text{PRINTED DOCUMENT}\]
\[\text{CHART}\]
\[\text{DIAGRAM}\]
\[\text{DRAWING}\]
\[\text{FILM (STATIC OR MOTION)}\]
\[\text{ILLUSTRATION}\]
\[\text{MODEL}\]
\[\text{RECORDING (TAPE OR DISC)}\]
\[\text{COMPUTER CARD}\]
\[\text{COMPUTER TAPE}\]
\[\text{MICROFILM (W/ OR WO CARD)}\]
\[\text{OTHER}\]

REFERENCE DOCUMENTS:

NPC-200-2

APPLICABLE STANDARDS
SPECIAL INSTRUCTIONS:

Submitted to the customer initially then monthly as part of Quality Status Report.

OUTLINE OF CONTENTS:

1. Matrix consisting of:
   a. End item list to be qualified
   b. Dates for
      (1) Hardware availability
      (2) Test facilities availability
      (3) Test procedure availability
      (4) Environmental tests

2. Narrative of:
   a. Completed tests
   b. Significant events
      (1) Milestones
      (2) Problems/solutions
   c. Expenditures act/planned

(CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD.)
**SPECIFICATION, SPECIAL TEST EQUIPMENT (STE), COMPONENT**

**CLASSIFICATION**
- [ ] SECRET
- [ ] CONFIDENTIAL
- [ ] SECRET RESTRICTED DATA
- [ ] CONFIDENTIAL RESTRICTED DATA
- [x] UNCLASSIFIED

**TYPE OF DOCUMENT**
- [x] CONTROL
- [ ] ACTION
- [ ] REFERENCE
- [ ] INFORMATION

**USE OF DOCUMENT**
To definitize the component special test equipment design and test and verification requirements.

**INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS**
- QA-009, Plan, Quality Assurance Program
- TE-001, Plan, Integrated Test
- TE-123, Plan, Special Test Equipment (STE) Verification Tests
- TE-130, Plan, General Test

**REFERENCE DOCUMENTS**
- JPL Configuration Management Manual

**APPLICABLE STANDARDS**

**REVIEWS AND/OR APPROVALS REQUIRED:**
**MANAGER, QUALITY ASSURANCE**
SPECIAL INSTRUCTIONS:

Cognizant Quality Assurance engineers will prepare the requirements section of the STE Specification to initiate design.

OUTLINE OF CONTENTS:

1. Scope - outline of specification applicability.
2. Applicable documents - component specification, workmanship standards, etc.
3. Requirements - measurement tolerances, safety, operability, etc.
4. Test and verification - test requirements for the equipment prior to use with flight hardware, measurement studies, etc.
5. Preparation for delivery - special handling requirements.
6. Notes - as applicable.

(CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD)
DOCUMENTATION RELATIONSHIP TREES

A documentation relationship tree has been prepared to show the relationships of data items within each functional category as well as their relationships across categories.

Relationships within each functional category are shown by constructing a tier pattern beginning with the top-level (or governing) data item and relating in descending order all data items within the category to this top-level data item. (The location of a data item at a given level on the diagram does not necessarily indicate the importance of that specific item but identifies and defines its relation to all other data items in that category.)

Relationships between data items in one category and data items in other functional categories are shown by (1) shaded arrows to indicate the direction of the relationship and (2) an alphabetic code to indicate the nature of the interrelationship as follows:

a. Data items needed for preparation and/or support of the referenced item. (I)
b. Data items that are supported or needed by this data item. (S)
c. Data items that relate "to" and provide information of a general nature but are not required in an input or support role. (G)

Each data item appearing on the Data Item List (DIL) was examined and evaluated with respect to its contribution to, or dependence upon, data items appearing in other categories and is included in the diagrams. Additionally, certain data elements indicated in the user flow diagrams (but currently not identified as individual data items) have been shown within a dashed rectangle to clarify relationships.
Figure E-5. Quality Assurance
Documentation Relationship Tree (QA)
Preparation requirements for Quality Assurance data items are shown in Quality Assurance Data Item Phasing and Frequency Matrix, Figure E-6. With the exception of control and administrative-type data items, Quality Assurance document needs have a direct relationship with the scope and complexity of the hardware program and range from piece part to system level.

The basis for compilation of these estimates are:

a. Comparisons with other spacecraft systems, the makeup of which can be accurately described in terms of the total number of piece parts used and the percentages of non-electronic piece parts used. In the case investigated (a total of 11,740 piece parts, excluding OSE), the percentages were approximately 89 percent electronic and 11 percent non-electronic.

b. Assume that each Voyager Spacecraft will contain approximately 100,000 piece parts.

c. For each Voyager Spacecraft, assume it will be composed of:

- 28 Prime Equipment CEI's
- 36 Identification Item CEI's
- 85 Engineering Critical Components CEI's (Configuration Management Plan, Phase IB) 149

Assume 11 Subassemblies for each Identification Item 11 x 36 396
Assume 34 Subassemblies for each Engineering Critical Component 34 x 85 2,040

Total Spacecraft Assemblies 2,585

d. Eight equivalent Spacecraft then would contain 8 x 2, 585 testable assemblies 20,680

e. For OSE, AHSE and MDE, assume:

- 36 Prime Equipment CEI's
- 135 Identification Items (CEI's)
- 18 Engineering Critical Components (CEI's) (from Configuration Management Plan, Phase IB) 189
Assume:

11 Subassemblies for each Identification Item
(CEI's) \( \times \) 11 x 135 \( \quad \) 1,485

Assume:

24 Subassemblies for each Engineering Critical Components (CEI's) \( \times 24 \times 18 \) \( \quad \) 432

Total OSE, AHSE and MDE Assemblies \( \quad \) 2,106

Assume two sets OSE \( \quad \) 4,212

Total Spacecraft Assemblies \( \quad \) 20,680

S/C, OSE, AHSE, MDE total assemblies \( \quad \) 24,892

Assume:

Average of four tests per assembly (acceptance testing, Eng. Dev. Testing, T/A Testing, PTM Testing, Flight Accept. Testing and retesting requirements) \( \quad \) 568 tests

f. From Para. E. 2, a the number of piece part test records can be calculated.

8 equivalent \( S/C \times 89,000 + 20 \) percent excess \( \quad \) 726,220

assume an average of two test records for each electronic piece part \( \quad \) 1,452,440

8 equivalent \( S/C \times 11,000 \) non-electronic piece parts.

Assume an average of one test record for each part. \( \quad \) 88,000

Total \( S/C \) Piece Part Test Records \( \quad \) 1,540,440

g. Using as a basis the ratio of estimated drawings for the Spacecraft versus the OSE:

OSE will contain approximately 70,000 piece parts

Assume two sets of OSE will be produced \( \quad \) 140,000

Piece Part Test Record Total \( \quad \) 1,680,440

The Quality Assurance Data Item Density Profile, Figure E-7, shows the distribution and density of data item preparation requirements. Requirements are shown by monthly
averages and reflect both formal and key informal data items. Of particular interest is the impact caused by data item QA-019, **Test Records** (Materials, Parts, Subassemblies).
## QUALITY ASSURANCE (QA)

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*Key Informal Data*

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**Legend:**
- **PAC1**: First Article Configuration Inspection
- **HDR**: Critical Design Review
- **CDR**: Mission Acceptance Review
- **MAR**: Joint Flight Acceptance Review
- **FACT**: Composite Testing
- **T/A HDWE**: Test & Acceptance Hardware
- **EST**: Estimated
Figure E-6. Quality Assurance Data Item Phasing and Frequency Matrix (Sheet 1 of 2)
### Quality Assurance (QA) (Cont')

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#### SDR

- 3.5 MO.

#### PDI

- 3.5 MO.

### Key Informal Data

- **A** Annual
- **S/A** Semi-Annual
- **W** Weekly
- **M** Monthly
- **B/W** Bi-Weekly
- **B/M** Bi-Monthly
- **Q** Quarterly
- **O/T** One Time
- **A/R** As Required
- **U** Update
- **I** Initial
- **F** Final
- **S/R** New and Revise
- **SDR** System Design Re
- **HDR** Hard Design Re
- **PDR** Preliminary De

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**Abbreviations:**
- **CDR**: Critical Design Review
- **FACI**: First Article Configuration Inspection
- **MAR**: Mission Acceptance Review
- **JFACT**: Joint Flight Acceptance
- **Composite Testing**
Figure E-6. Quality Assurance Data Item Phasing and Frequency Matrix (Sheet 2 of 2)
Figure E-7. Quality Assurance Data Item Density Profile