

Procedure



Cover Page

Systems Group Quality: Ongoing Reliability Testing (ORT) Policy

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Overview:	This document describes Ongoing Reliability Testing (ORT) for all Oracle hardware products, including, but not limited to, servers, storage units, workstations, network appliances, and Storage Servers. Provide a brief explanation as to what the document is about.
Audience:	This document is for personnel involved in the manufacturing and testing of Oracle products, regardless of whether the manufacturing or testing activity takes place at Oracle Internal Manufacturing sites, an External Manufacturer or Supplier, or elsewhere. Operations product groups can use this document as the baseline for creating specific ORT plans and procedures. Provide a list of functional groups impacted by the document, each functional group requires at least one Approver.

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Introduction

As part of the overall testing strategy for its products, Oracle conducts reliability testing to ensure that products shipped to customers perform reliably over time. When a product has passed Revenue Release, the primary mechanism for monitoring outgoing product reliability is Ongoing Reliability Test or ORT.

This document describes a common set of high-level policies that govern the way ORT is specified, administered, monitored, and used to continuously improve the reliability of Oracle products. A summary of the ORT program requirements, requirement owners and reference paragraphs is included in *Appendix A, ORT Program Responsibility Matrix*, on page 24.

The ORT 'big rules', are as follows:

- All products must have an ORT with at least one Probability Ratio Sequential Testing (PRST) decision planned in each fiscal quarter. If production quantities are of insufficient volume to meet the sample size requirements for a PRST decision in one quarter, 10% of the quarterly production must be tested in ORT
- All ORT failures must have a Non Conforming Action Tracking tool entry (NCAT) initiated. The verification of corrective action of the failures is tracked within the NCAT process.
- Any ORT PRST rejects or policy waivers must have an additional Non-Conforming Action Tracker (NCAT) record initiated, in addition to an NCAT for each individual Chargeable Failure
- Within two business days after a PRST rejection, a initiation of the Stop Ship Purge (SSP) process is required of the affected product, unless the appropriate WWOPS product group's vice president (VP) approves continued shipment.
- Verification of corrective action for a PRST rejection must be tracked within the NCAT process and be monitored by ORT. Any subsequent ORT failures for the same root cause, previously reported as corrected, require immediate escalation to the appropriate WWOPS product group VP for a Stop Shipment Purge decision of the affected product.
- Material must be made available to satisfy ORT sample plan requirements (priority over revenue); and the exceptions must be escalated to the WWOPS product group VP.
- Manufacturer's must have controls that ensure that Work Orders for ORT/PA/RQT use only new HDD's/SSD's. Exceptions to this needs Oracle approval.

Any exceptions to the above ORT 'big rules' require approval by the (Operations) Product Group VP as well as an NCAT being filed and the completion of a *Systems Quality Group: ORT Waiver Form, 913-3671*.

1 ORT Purpose

The purpose of the ORT is to continuously monitor the reliability performance of Oracle products in an environment that is as close as possible to the customer environment. By monitoring reliability, Oracle can do the following:

- Ensure that its products routinely meet the reliability specifications
- Respond to any reliability issues by identifying and resolving the root cause(s) of the problems detected

Any activity that is not aligned with this purpose hinders the usefulness of ORT because it can create skepticism that an issue will be seen by a customer. Therefore, activities counter to the purpose of ORT must not be performed as part of ORT, including:

- Exposing products to stress (such as thermal, mechanical, electrical, frequency, and so on) that would not normally be encountered in the customer environment
- Conducting experiments or running qualification testing on unreleased Field replaceable units (FRU) or components on systems in ORT, including verifying or commissioning experimental or pre-revenue release hardware, software, firmware, or diagnostics. Programs to conduct experiments or run qualification testing on unreleased FRUs or components are covered by Reliability Qualification Testing (RQT). For information on RQT, refer to:
<https://serverras.oraclecorp.com/PHPS/rqt-ort.php> (restricted access).
- (If there are exceptions to including qualifications of components or FRUs in ORT, these must be documented with an NCAT and a ORT Waiver Form.)

2 ORT Policies

In order to receive meaningful, consistent, and easy-to-interpret results from WWOPS ORT procedures and programs, it is necessary to specify ORT policies. This includes using the following:

- The sampling plan IV-D from *MIL-HDBK-781A*
- MTBFtool to generate mean time between failure (MTBF) specifications
- PRST plots
- An appropriate test sample
- The appropriate mix of system configurations to test

2.1 Using the Sampling Plan IV-D From MIL-HDBK-781A

Use 'sampling plan IV-D' on page 225 of the *Handbook for Reliability Test Methods, Plans, and Environments for Engineering Development, Qualification, and Production (MIL-HDBK-781A)* as the standard ORT method for all Oracle products.

MIL-HDBK-781A was published by the US Department of Defense on April 1, 1996. For the purposes of ORT, it is considered equivalent to *MIL-STD-781D*, which contains all information from *MIL-STD-781D* and is the current version of the Department of Defense standard.

'Sampling plan IV-D' specifies the following decision risk parameters used for ORT:

- Producer's risk (α) = 20%
- Consumer's risk (β) = 20%
- Discrimination ratio (d) = 2.0 : 1

NOTE 1: These terms are defined in *MIL-HDBK-781A, Section 3, Definitions, on pages 6-8*.

An appropriate test sample size must be used for the ORT of all Oracle products. This involves determining the following by planning for a successful ORT PRST run at least once every quarter. This includes the following:

- Generating a PRST decision
- Ensuring that a representative sample of the number of systems in production is included in ORT
- Calculating the total test time of all the units tested to meet the various ORT parameters

2.2 Using MTBFTool to Generate MTBF Targets

Use the MTBFTool to generate the MTBF specifications. MTBFTool (restricted access) can be found at the link below:

<https://serverras.oraclecorp.com/HTMLS/RASSUITE/rassuite.html>

In order to get access to MTBFtool refer to the following link:

<https://serverras.oraclecorp.com/PHPS/33.php>

2.2.1 MTBF Specifications

MTBF is a commonly used reliability metric that represents the average time between system failures when a system is in operation. Each product group must ensure that the MTBF specification is adjusted periodically to reflect changes in the mix of configurations tested in ORT.

The MTBF specification used in ORT is the minimum acceptable MTBF value, which is determined to be a reliability disaster requiring a full technical review. This is referred to the Telcordia Equivalent or T.E. MTBF value shown in MTBFTool. Not meeting this minimum acceptable MTBF value can lead to a stop ship purge, a field change order (FCO) or any other significant action affecting Oracle's customers or revenue. For more information on MTBF (restricted access), refer to: https://serveras.oraclecorp.com/PHPS/mtbf_whitepapers.php.

2.2.2 **MTBFtool**

MTBFtool is an online tool that calculates the predicted MTBF for each product in ORT, based on the observed or estimated reliability of the components that comprise the given product. MTBFtool is maintained by Reliability, Availability, and Serviceability (RAS) Engineering.

If the product configuration MTBF is not found in the MTBFtool, the Oracle product ORT team escalates the problem to RAS engineering, at Server_Ras_US@oracle.com. Until MTBFtool figures become available, use the design MTBF, found in the product requirements document (PRD) divided by 3, as an interim number for the ORT target MTBF. In these cases always inform the product team, and manage them as exceptions.

If there are inconsistencies between the final figures in MTBFtool and the design MTBF, escalate the issue to RAS engineering.

If the calculated ORT target MTBF changed, plan a transition to it before starting a new PRST plot following an ORT decision, using the mechanism described in *Section 2.9, Management of ORT*, on page 13.

If a new ORT configuration mix is required, plan the transition at the same time. A phased changeover to the new configuration mix is acceptable, but it must be completed within one calendar month of introducing a new ORT target MTBF.

Complete a review of the ORT target MTBF by the tenth week of every quarter if situations or product changes occur, for example:

- Volume of the top ATO and/or PTO configurations changes in the supply plan
- ORT configuration's proportion of supply plan changes, so that the ratio of tested systems also changes
- MTBFtool numbers for the chosen configurations change
- New or EOL FRUs affecting ORT are expected in the next quarter

Ensure that the changes to the ORT plan comply with the requisites of the platform quarterly review policy, as described in *Section 2.9, Management of ORT*, on page 13.

2.3 Using PRST Plots

Use PRST plots for all Oracle products to graphically represent the status of the ORT testing. For more information, refer to the 'Sampling Plan IV D' in *MIL-HDBK-781A*. PRST plots reflect:

- ORT progress
- ORT experiment control limits
- ORT variance from MTBF specifications

For information on interpreting PRST plots, refer to:

For a template to generate PRST plots from a given set of specified MTBF targets and power-on hours, refer to *WWOPS Systems: Ongoing Reliability Test (ORT) Report Template*, 913-3532-xx.

2.3.1 Determining a PRST Decision using the ORT Sizing Template

Accumulate sufficient power-on hours by planning for a successful ORT and at least one PRST decision every quarter in the ORT of all Oracle products. Because this level of testing can take a substantial amount of time (particularly for systems with relatively high MTBF targets), it is necessary to test multiple systems simultaneously.

In situations where production volumes do not practically permit this level of testing (such as very low volume products or products nearing their EOL), alternate reliability test plans by submitting a *WWOPS Systems: ORT Waiver Form* with an NCAT with written documented approval from the (Operations) Product Group VP, the (Operations) Product Line Director and ORT Management in the Systems Quality Office. Refer to *Systems Quality Group: ORT Waiver Form*, 913-3671-xx Doc Revision 03 or later.

Use the ORT sizing template to define the minimum number of units under test (UUT) in each quarter. Refer to *WWOPS Systems: Ongoing Reliability Test (ORT) Sizing Template*, 913-3549-xx

The template calculates:

- The ORT target MTBF
- The number of systems of each configuration required in each quarter
- The test time

Where possible, the template allows trade-offs between the test time and the number of systems to be made before reaching the final ORT sizing requirements.

ORT UUTs individual systems must be run for a minimum ORT POH test time of three weeks. This lower limit ensures that the product is tested over a time scale that is

representative of early deployed life. The template also limits the maximum test time to 'less than 90 days', consistent with Oracle rotational test capital guidelines and legal requirements.

2.3.2 Determining a Representative Sample

The material tested in ORT must be broadly representative of a sample of the product's current production. For products with multiple configurations, the material tested in ORT must reflect the proportions of each configuration currently in production. This is recommended to include maximum product configurations. Ideally a random sample is tested. For information on how to determine ORT configurations when dealing with ATO configurations, see *Appendix B, External Assemble-To-Order (XATO) Configurations*, on page 26.

2.3.3 Sample Plan Adherence

Use the sample plan adherence metric to monitor the number of ORT UUTs against the sample plan requirements, and determine whether the run duration of the projected ORT is excessive or not. When the achieved ORT POHs fall significantly behind the planned POHs, an action to add UUTs, and/or an NCAT with an ORT Process Waiver is required. The Oracle platform operations PM is responsible for submitting waiver requests.

For a detailed description of the sample plan adherence metric, refer to: *WWOPS Systems: Ongoing Reliability Test (ORT) Report Template*, 913-3532-xx. The waiver approval process is defined in *Section 2.6, Exception Process*, on page 11.

2.3.4 Minimum Alternative ORT Supply Plan

The Oracle product ORT team can implement a temporary alternative ORT plan when the UUTs required for ORT over the life of the quarter come to more than 10% of the quarterly supply plan. In that case consider the following options:

- Limit the system infeed to ORT
- Spread the ORT required hours over more than one quarter
- Extend the duration of UUTs time in ORT

It is required that the number of UUTs in a quarter be at least 10% of the total current quarterly supply plan.

Any agreed alternative ORT plan must be documented when the sample plan is out of compliance with policy. A NCAT record -(ORT Policy Waiver) must be raised by the responsible product engineer (PE) to document and communicate the plan.

NOTE 2: This is considered a temporary, (2 quarters or less), alternative. If the situation is permanent, a policy waiver is required.

NOTE 3: The NCAT tool automatically sends notices to VPs, Product Line Directors (PLD), and other interested parties when records are initiated.

The NCAT must define the duration of the waiver from normal sampling requirements. The NCAT can be closed after the platform's status was noted on the weekly ORT summary report. Resume normal ORT sampling when the supply plan allows it.

2.4 **Using the Appropriate Test Diagnostics**

Use the appropriate test diagnostics for all Oracle products in ORT. The test profile run by ORT systems must be broadly representative of customer use and be adequately controlled and documented in the product ORT plan. Specifically, test diagnostics must place loads on FRUs that are within the possible FRU-variable range in a customer application setting. Excessive stresses, such as severe data burst rates or hard disk drive read-write patterns unlike anything that can be encountered in a customer application environment, and, more importantly, minimal test-application coverage obfuscate ORT purpose can lead to confusion as to the significance of ORT results.

The ORT team must approve all changes. The team must ensure that the ORT process is highly available, and the test profile is robust and readily restarted, and they must ensure that the test remains easily maintainable, that is, capable of accommodating updates with minimal disruption.

When a platform is expected to be power cycled in a repetitive manner in a customer environment, power cycling must be included in the ORT test plan. In that case, the UUTs must be exercised by a moderate number of external power cycles, ('hard' or 'down to black'). The number of power cycles must be representative of that platform's typical customer usage. It is recommended that a minimum of one power cycle per week and a maximum of two per day be implemented.

Escalate any cases where the provision of these functions is believed not to be economically viable, to the relevant ORT team for consideration, and treat these cases as exceptions if the requirements are waived.

As described in Table 2-1, Test Diagnostics, below, test diagnostics comprises a rigorous, strictly defined and tested combination of low-level hardware and external software diagnostics, along with a suite of common customer applications.

Table 2-1 Test Diagnostics

Diagnostics Component	Description
Low-Level Hardware	Power-on self tests (POSTs), internal status diagnostics (heartbeat detectors,

Diagnostics Component	Description
	and so on), LED status indicators
External Software Diagnostics	Varies for every system configuration in ORT according to: <ul style="list-style-type: none"> • the target customer market • the diagnostic suite's assessed level of stability, availability, and sophistication • the length of test time devoted to each type of diagnostic in ORT
Common Customer Applications	Varies for every system configuration in ORT according to the target customer market and the application's assessed level of stability, availability, and sophistication

2.5 Ownership, Responsibilities, Support, and Help

Operations is responsible for ensuring compliance with these rules, except where explicitly noted otherwise. The PE, the Supplier Engineer, and the Operations Program Managers (PMs) are the responsible product ORT team within Oracle. Operations is responsible for monitoring the system supplier's performance against its process, serving as the initial escalation point for any general questions.

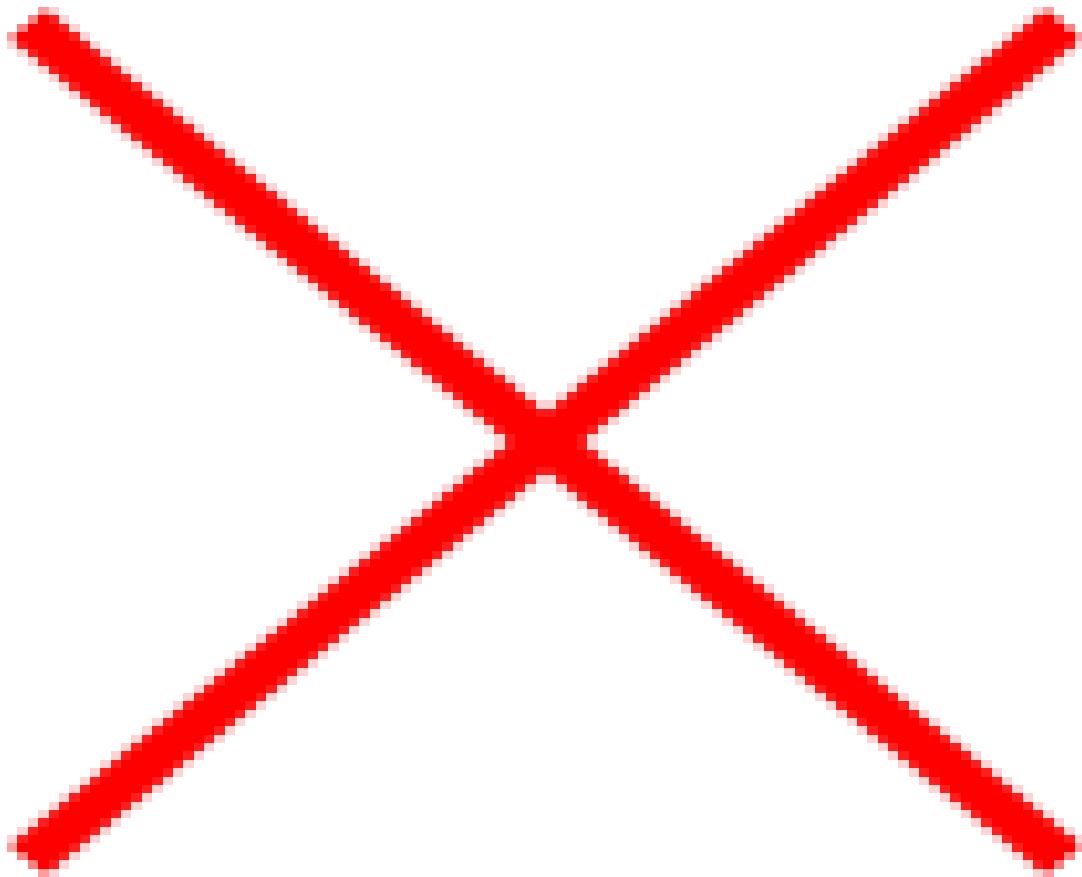
2.6 Exception Process

In exceptional circumstances, the product team can deviate from these policies through the ORT waiver process as described in Figure 2-1, ORT Waiver Approval Policy, on page 12. The approval process and time lines are described in that process flowchart. Any such waiver must be recorded as described in the *Systems Quality Group: ORT Waiver Form*, 913-3671-xx. You must also generate a NCAT record, (use the 'ORT' template in NCAT), to record the policy waiver. The NCAT priority is determined by using the FMEA Table (embedded in the NCAT tool help link) to score the associated business risk. The NCAT record stays open through to the end of the waiver period, when it is re-evaluated and closed if the policy is met.

The reasons for the waiver from the WWOPS ORT policy are predominately business decisions, therefore the Oracle platform operations PM is responsible for the completion and submission of the waiver form.

Examples of issues that require an approved policy waiver include the following:

- Adherence to sample plan indicates a RED status. The ORT team determined that the number of UUTs must remain below the target for business reasons (this is not a temporary low-build-quantity issue). Refer to *Section 2.3.3, Sample Plan Adherence*, on page 9.
- Stopping or limiting ORT prior to the end-of-life EOL dates defined in *Section 6.2, End-Of-Life (EOL)*, on page 22.



- The first run of ORT does not comply with current NPI guidelines as defined in *Section 6.1, New Product Introduction (NPI)*, on page 22.
- Use of alternative reliability demonstration test methodologies or monitoring processes which do not conform to the guidelines provided by the WWOPS ORT policy.

Figure 2-1 ORT Waiver Approval Policy

2.7 ORT Area

ORT must be sufficiently staffed with trained operators and monitored for timely failure detection, to ensure that Oracle is notified of failures within one business day of their occurrence.

Use a dedicated ORT test area for testing. If none is available, create a clean testing area, where you also provide adequate physical protection for the UUTs. Appropriate environmental

factors must also be provided, that is, main power, temperature, and humidity must be representative of customer deployment. Ensure that the test peripherals are properly maintained and calibrated.

2.8 Manufacturing Sites

If a product is manufactured at more than one location, an ORT must be run with units from each production site (POHs can be combined). The Oracle product ORT team must document and list all production sites in the product ORT plan, with input from the product team.

2.9 Management of ORT

In order to manage ORT effectively, the following requirements must be met:

- A product ORT review meeting with the Oracle product ORT team must occur at least quarterly.
When reviewing:
 - Ensure that the operating system (OS), packages, and patches are appropriate and are at the default shipping configuration
 - Review the deployed diagnostics, and consider new or enhanced ones
 - Plan ahead for the deployment of new software or firmware
 - Identify any potential for process alignment or combination of architecturally similar products
 - Review the resource and training of staff assigned to ORT
 - Plan for continuation of the ORT across future site transition or consolidation
 - Review the supply plan configuration mix to check the ORT target MTBF
- The review meeting for the following quarter must be held by week ten of the current quarter. The review template, along with meeting minutes and issues identified, must be created and archived at that time.
- The Oracle product ORT team is responsible for driving the meeting with the PE having the responsibility for completion and submission of the template.

NOTE 4: Use the following format for completed templates: Platform name_FYyyQx, for example: X4-4_FY15Q1.

- Complete the platform ORT quarterly review report and email it to the responsible posting personnel, who posts it to the ORT quarterly review report archives, located

at the appropriate Beehive repository.

- The Oracle product team must drive the agreed change into the product ORT plan, and immediately communicate changes to applicable external manufacturers (EMs).
 - When NPI or other extraordinary circumstances warrant significant changes to the build plan, update the platform ORT quarterly report, asynchronous with the typical quarterly review cycle. The changes must be communicated to, and reviewed with, the ORT team and EMs, and the revised template must be archived.

2.10 Rack Mounting Environment

ORT must strive to simulate customer environments to capture potential issues before they become a crisis in the field. Because of this, it is preferred that rackable products be configured into a rack for ORT testing. Rack mounting must only be implemented where data center conditions can be assured. See rack mounting details in *Appendix C, Rack Mounting Guidelines*, on page 27.

3 ORT Failures

An ORT failure is a failure in any system under ORT, as determined solely from the customer's perspective. If an incident initiates a customer to place a service call or request a FRU replacement, the incident is considered an ORT failure, regardless of whether:

- The incident can or cannot be duplicated (CND) in further FRU-level or system-level testing
- The incident is eventually ascribed to non-hardware related items (such as firmware, internal system diagnostics, or the Oracle Service repair strategy)

NOTE 5: A NCAT entry must be initiated for every Chargeable ORT failure. The NCAT must include an assessment of the manner in which the ORT failure occurred, the consequences of the failure for the system availability, and the associated time to failure.

3.1 Failure of a Unit in ORT

The following activities must occur at every ORT Chargeable failure:

- A NCAT must be raised against the system in ORT , following the guidelines in *WWOPS Quality: Corrective and Preventive Action Process*, 923-3644-xx, within one business day after the failure event occurs. Clearly mark in the NCAT that the failure occurred in ORT. For organizations using the FACOPS manufacturing database for

failure logging, a FACOPS report must also be opened for every ORT fail with the same response time requirements.

- Notify the PE responsible for the product of the failure by e-mail within 24 hours of the failure identification. Plotting of a failure must also take place within one business day, unless the failure is proven to be Non-Chargeable.
 - If at any point during the investigation the failure mode or failure symptoms are believed to pose a significant risk to customer quality, initiate the purge and stop ship process as detailed in *WWOPS Product Life Cycle and Technology: Stop Ship and Purge (SSP) Process*, 923-1826-xx. This includes problems that can result in a system panic customers and other problems that might only affect a small number of customers.

Failures are assumed to be chargeable and remain chargeable on ORT plots, unless proven otherwise; this includes non-repeatable and NTF failures. Inform the Oracle product ORT team of the reason of failure, so that they can determine whether it is chargeable or ask for assistance from other Oracle personnel to help. Document the information in the NCAT record.

If a chargeable failure is plotted on an ORT plot that did not reach an accept or reject decision, and the failure is subsequently proven to be Non-Chargeable, the failure is removed from the plot, which can result in an accept decision.

There is no Dead on Arrival (DOA) exception period in ORT; all failures are treated equally.

Units that fail to boot or cannot power on upon their arrival in ORT are counted as ORT failures with zero (0) hours time to failure (TTF).

3.2 Failure Categories

For the ORT failure categories and subcategories that must be recorded for every ORT failure event, refer to Table 3-1, ORT Failure Categories, below.

Table 3-1 ORT Failure Categories

<i>Category</i>		<i>Definition</i>
TTF	DOA	Failed within 72 hours of system run time in ORT
	ELF	Failed after 72 hours of system run time in ORT
Failure Recovery	Recoverable	System recovered without causing system downtime. Examples: <ul style="list-style-type: none"> • Failure of a redundant power supply

Category	Definition	
		<ul style="list-style-type: none"> Correctable or 'soft' errors reported on memory or storage devices outside of those allowed within product guidelines ***
	Unrecoverable	<p>System operation and availability was disrupted by the event Example: System panic</p>
Failure Classification	Test escapes	test escape failures 'should-have' been caught in manufacturing test, had the tests been in place or 'strong' enough. The previous test process did not find or was not capable of finding the failure. Test escape failures may not be easy to replicate.
	Reliability	reliability failures indicate a time-based failure mechanism. When the failure eventually appeared it was easily caught by the test.
	Unknown	The data does not clearly indicate either a latent or reliability failure
Failure Type	Verified	<ol style="list-style-type: none"> 1. A failure occurs. 2. The failure is repeated in current condition. 3. The part is moved to another location. 4. The failure occurs again.
	Non-reproducible	<ol style="list-style-type: none"> 5. A failure occurs. 6. The failure does not repeat in its current condition.
	Unverified	<ol style="list-style-type: none"> 7. A failure occurs. 8. The failure is repeated in its current condition. 9. The part is moved to another location. 10. The failure does not reoccur.

3.3 Failure Classifications

In ORT policy, all failures are considered chargeable until the appropriate ORT engineer or root cause analysis (RCA) demonstrates otherwise. For a table describing ORT failure classifications, refer to *Appendix D, ORT Failure Classifications*, on page 28.

NOTE 6: ORT currently tests products that completed all manufacturing processes and are ready to ship. Therefore, ORT identifies the same success or failures that customers experience, reflecting Oracle's quality and reliability.

3.4 Failure Analysis – Timeliness

Create a test plan for each ORT failure, and document the failure in NCAT. The plan defines how the failure is brought to initial closure within the target time, and also includes mechanisms intended for failure analysis and fix verification. It is perfectly acceptable during the failure verification of ORT events to address long TTFs by using acceleration mechanisms

and targeted diagnostics if retesting with the original ORT profile for an extended period often proves unsatisfactory.

For a product near EOL, consider the economics of failure analysis and repair. However, do not neglect an appropriate level of diligence, which can yield valuable lessons for other products. Document any behavior unique to EOL in the NCAT case.

Ensure that repairs on ORT systems are done promptly. The successful repair of a failed ORT system produces an 'as new' system as defined by Oracle Test guidelines.

All repaired ORT systems must undergo a regular product test, in addition to any unique fix verification, before shipping.

4 ORT Reporting Requirements

Report ORT progress at least on a weekly basis through the methodology agreed upon by the Oracle supplier management or the appropriate Oracle internal manufacturing forums. For data elements that must be recorded during data collection for every unit tested and every failure occurring in ORT, refer to *Appendix E, ORT Data Reporting Requirements*, on page 29.

4.1 Report Template

Use the ORT report template to generate ORT reports for Oracle and to raise any issues to the Oracle ORT Team. For internal manufactured platforms where a Oracle database is in use, the weekly reports can use an automated report template, which must conform with all of the data categories listed in the template. Refer to *WWOPS Systems: Ongoing Reliability Test (ORT) Report Template*, 913-3532-xx.

Update the ORT reports weekly, and attach them to an email sent to the alias prior to Tuesday, 12AM GMT. The plots are stored in the Beehive folder. The email's subject line must describe the platform(s) and the reporting timeframe being reported. If there are multiple platform plots from a single site, it is possible to attach all the plot files to a single email. Suppliers can also choose to publish the ORT plots to a website.

4.2 Storing and Format of ORT Reports

4.2.1 PRST Plot Archival

To maintain a level of traceability, store each platform's weekly PRST plot for the current ORT run. When the run completes and a decision is reached, you can delete the previous weekly

reports if the saved completed run record contains all of the previous partially completed run records. All ORT PRST plots that record a decision must be stored for ten years after the product becomes end of life (EOL). All plots must be stored with all pages available for review in .PDF or in an OpenOffice compatible format.

4.2.2 Weekly Summary Report

Weekly summary ORT Reports are stored for a minimum of one year, in PDF or in Open Office-compatible format. The PM of operations engineering quality management is responsible for the creation and storage of the weekly summary status reports. They are archived on the appropriate beehive folder or website: The weekly ORT summary report uses the PRST plot status color codes, detailed in *WWOPS Systems: Ongoing Reliability Test (ORT) Report Template*, 913-3532-xx , to report the status of each platform's ORT.

5 ORT Decision Response Policies

To fully capitalize on the value of ORT testing and to fully protect Oracle's customers from reliability problems, it is necessary to establish policies that govern how WWOPS reacts to specific events in ORT.

Specifically, this policy stipulates the activities that must occur at these events:

- A failure of a unit in ORT, refer to *Section 3.1, Failure of a Unit in ORT*, page 14
- A PRST reject decision for a product in ORT
- A PRST accept decision for a product in ORT

These activities are described in the following sections:

5.1 PRST Reject Decision for a Product in ORT

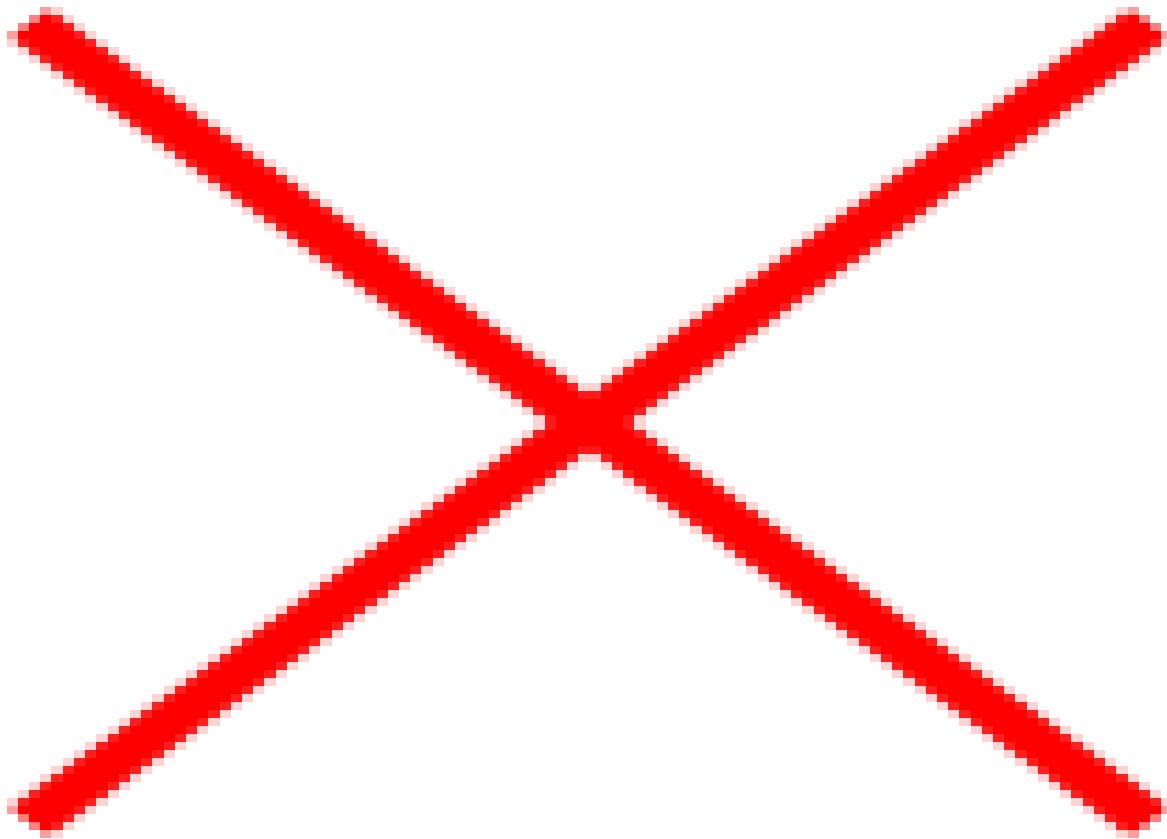
A ORT PRST reject occurs either due to meeting the reject criteria on the PRST plot or by three failures of identical failure mode's occurring in a single PRST run. There are strict deadlines for response after a ORT PRST reject occurs. The ORT PRST reject process flow, with deadline requirements and ownership details, is shown in Figure 5-1, PRST Reject Process Map, on page 19. The following activities must occur at every PRST reject decision in ORT:

- Inform the Oracle Product ORT team within one business day of the ORT failure that causes a reject decision.
- Archive the Reject ORT PRST plot, and start a new one immediately, as outlined in *Section 5.3, Starting a New Plot*, on page 21.

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- Initiate a NCAT record (using the ORT template) within one business day, in the NCAT. The NCAT record is used to document phases of the waiver process and the corrective action on the failures. The PRST plot recording the ORT reject must be attached to the NCAT record. The waiver form, if used, must also be attached to the NCAT record.
- The ORT PRST Reject technical assessment meeting must be completed by the technical assessment lead. All failures that contribute to a PRST reject must be detailed, which must include failure descriptions as well as root cause corrective action (RCCA).
- Within two business days of a PRST rejection, an emergency stop shipment is required of the affected product unless the appropriate WWOPS product group VP approves continued shipment in writing. All quality and reliability related waivers must be approved by the operations engineering director before being sent to the WWOPS VP. The responsible PE manager initiates or conducts the waiver approval discussion, after which the waiver is forwarded to the Systems Quality Office ORT manager, the WWOPS Product Line Director and the WWOPS Product line VP for their approvals.
 - Within five business days of a PRST rejection, a technical pre-assessment recommendation must be reached, and the WWOPS VP must make a decision whether to proceed with a stop ship or waiver. **Refer to WWOPS Product Life Cycle and Technology: Stop Ship and Purge (SSP) Process**, 923-1826-xx.
- If the new failure is not proven to be non-chargeable by the end of the deadline, it remains on the plot, and the reject decision stands, even if the failure subsequently becomes non-chargeable. Other chargeable failures already on the plot do not change status during this period.
- If a chargeable ORT failure is part of a plot that reached an ORT accept decision, but the failure is subsequently proven to be non-chargeable, the failure remains on the plot, and the accept decision stands.
 - When SSP activity is required to address a failure that contributed to a PRST reject, reference the activity defined within the SSP as well as the SSP number on the template. Any SSP activity must follow the **WWOPS Product Life Cycle and Technology: Stop Ship and Purge (SSP) Process**, 923-1826-xx.
- The NCAT record must remain open and to track all RCCA of the individual failures, and/or the results of the SSP, until all individual items contributing to the ORT PRST rejection are understood, and Closed Loop Corrective Action (CLCA) was completed.

Figure 5-1 PRST Reject Process Map



5.1.1 **Multiple PRST Rejects and TQR Requirements**

If three PRST rejects occur in a platform in a row, an additional platform Total Quality Review (TQR) is required. The review is lead by the PE and must include the additional team members from the Oracle platform ORT team. The TQR must take into account all of the PRST failures that attribute to the last three PRST rejects. The review must provide clear action items, ownership, and deadlines. When the review is completed, documents related to the review are archived in the appropriate Beehive folder.

5.2 **Accepting Decision**

Inform the Oracle product ORT team within one business day of an accept decision being reached, as shown on the ORT plot. Refer to *WWOPS Systems: Ongoing Reliability Test (ORT) Report Template*, 913-3532-xx.

Issue the ORT plot, and start a new one immediately, as outlined in *Section 5.3, Starting a New Plot*, below.

The plot recording the ORT accept must be logged, stored, and published in OpenOffice or PDF format on the relevant website within one business day.

5.3 Starting a New Plot

The date of an accept or reject decision, the actual outcome, and the number of hours accumulated, are recorded on the ORT report, as the last decision. Refer to *WWOPS Systems: Ongoing Reliability Test (ORT) Report Template*, 913-3532-xx.

Move any NCAT which is still open into the relevant section of the report, and zero the plot to start a new report. Move to the new plot any hours already accumulated after the accept or reject point.

Reaching an accept or reject decision does not affect ORT systems already on test. They continue to accumulate time for the new plot, and are removed and replaced when they reached their planned time on test.

5.4 Purge and Stop Ship

ORT continues to run, where practicable, during stop ship and stop build activities, except where such activity relates to a health and safety risk from operating the systems. Data collection from ORT continues similarly.

Where corrective actions from ORT, or elsewhere, require purge activity, create a plan to migrate ORT systems to fixed material, and document it in each of the relevant NCAT. Take the appropriate action to minimize or recover from the loss of test time because of rework activity. Refer to *WWOPS Product Life Cycle and Technology: Stop Ship and Purge (SSP) Process*, 923-1826-xx.

If the purge or stop ship activity results in a RED status for sample plan adherence for the current ORT run, an approved *Systems Quality Group: ORT Waiver Form*, 913-3671-xx, is required. The approval process is defined in *Section 2.6, Exception Process*, on page 11.

5.5 Analysis of ORT Generated Alarms

When ORT failures occur, the best practice is to perform a thorough analysis which can reveal systemic issues or failure mode trends. The goal is to prevent customer exposure to the failure mode. Investigate other factory and field quality metrics, and determine if other platforms are experiencing similar issues on the FRU. Metrics and additional data sources, that can be referenced, and are detailed in the technical assessment form, *WWOPS Product Life Cycle and*

Technology: Stop Ship and Purge (SSP) Process, 923-1826-xx (some of these are customer systems integration (CSI)_DOA, 8+ or 8-90 day data, subtier data, manufacturing in process results, and so on). If the failure is in a commodity FRU, you must alert the commodity team to determine if there is a lot-specific issue. If systemic issues or failure mode ORT trends are identified, open a NCAT record (QMS Alarm-ORT Reject/Trends) to document and drive further analysis and corrective actions. ORT trends are defined as three failures, due to a common failure mode, in a single PRST run, or five failures across similar product lines.

Any single failure can be sufficient to drive a purge, technical pre-assessment, stop build or stop ship activities. Refer such events, for example, health and safety issues, to the Oracle Product ORT team. Ensure that sufficient information is gathered on the failure, which is logged in the NCAT to support potential technical pre-assessment.

6 Product Life Cycle Process (PLCP) Adherence

6.1 New Product Introduction (NPI)

During NPI, the Oracle Product ORT team must ensure that an ORT plan is completed to exit 'Phase 5, Customer Acceptance'. ORT itself starts in 'Phase 7, Sustain', and must begin before general availability (GA), or immediately after RQT completion. Where an ODM already has a product reliability demonstration process in place, that process must be reviewed to determine whether it meets the mandated Oracle ORT requirements. The CQO ORT PM can assist you with this review.

6.2 End-Of-Life (EOL)

To exit 'Phase 7', an EOL plan must be in place. The Oracle product ORT team must ensure that ORT to EOL is documented in the plan. ORT must test systems that are representative of all production builds, including the final build, until the platform's last ship date. Consider the ORT test location again when generating the EOL plan.

At EOL, ORT stops two months before all products are built, and or when an 'accept' decision is reached on systems, including the product that is representative of the final build. If these conditions cannot be met, and a further run of ORT is not feasible, the product team considers and documents an alternative plan for approval by the WWOPS Product Line VP. Refer to *Section 2.3.4, Minimum Alternative ORT Supply Plan*, on page 9, for a possible alternative plan for a reduced volume of systems.

6.3 Exception to the NPI and EOL Process

Exceptions from the NPI time lines or EOL sample plan requires an approved waiver. Submit the form: *Systems Quality Group: ORT Waiver Form*, 913-3671-xx as defined in *Section 2.6, Exception Process*, on page 11. It is possible to continue to run ORT testing after EOL was announced with a reduced sample plan through the waiver from ORT policy requirements process.

7 Test Completion

After test completion, systems must complete a pre-ship cleanup and test to ensure that they meet all the cosmetic and functional requirement levels of new products.

This test includes, but is not limited to:

- Inspecting and removing any dust accumulation from both the inside and outside of the system
- Completing any updates to the revision of piece parts, software, and firmware
- Running a full final functional test, just as for new products
- Polishing and touching up any visible paint or finish imperfection that may have occurred during ORT.

Appendix A ORT Program Responsibility Matrix

ORT Requirement	Ref Section	Responsible Individual(s) or organization(s)
Use MTBFtool (restricted access) to generate platform configuration MTBF values for input into the Sample Plan template 913-3549-xx https://serverras.oraclecorp.com/HTMLS/RASSUITE/rassuite.html	2.2.2.2	PE
Track ORT progress and status using a PRST Plot. use plot template: 913-3532-xx	2.3	Mfg location personnel
Plan for a PRST decision every quarter by creating a Sample Plan (with appropriate Target MTBF, sample size, test duration, configurations, and infeed). Use form: 913-3549-xx	2.3.1	PE
Use appropriate platform configurations for ORT	2.3.2	PE
Continually ensure that the sample plan is met – sample plan adherence. If a RED status sample plan adherence metric cannot be immediately corrected a policy waiver must be submitted and approved	2.3.3	Mfg personnel, Operations Program Manager
Use appropriate test diagnostics, include power cycling (if appropriate)	2.4	Test Eng, Mfg personnel, PE, and ORT Team
If policy waivers are required, complete the waiver form and obtain approvals. Use <i>Systems Quality Group: ORT Waiver Form</i> , 913-3671-xx. Open a NCAT record	2.6	Operations Program Manager
Use an appropriate ORT test area and trained personnel	2.7	Mfg personnel
Run ORT at all manufacturing site(s) where platform is produced	2.8	Mfg personnel, PE, and ORT Team
Conduct a product ORT review meeting with the Oracle Product ORT team every quarter by week 10.	2.9	Platform ORT Team led by the PE
Test rack-mountable platforms in a rack (if appropriate and conditions allow)	2.10	Mfg personnel
Create a NCAT record for every ORT failure. Report and plot the failure within 24 hours	3.1	Mfg personnel
Provide high priority failure analysis on any failures	3.4	Mfg personnel

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ORT Requirement	Ref Section	Responsible Individual(s) or organization(s)
Email the ORT plots to the appropriate alias weekly. Use plot template: 913-3532-xx	4.1	Mfg personnel
Archive ORT plots for 7 years in Beehive Website	4.2.1	Mfg personnel
Create Weekly ORT Summary Status Reports and archive for at least 1 year	4.2.2	Ops Eng Quality PM
When a PRST Reject occurs, inform the team within 1 day, archive the plot, start a new plot, open a NCAT record , hold a technical pre-assessment meeting, recommend a waiver or SSP within 2 days, if a waiver is recommended gain approval from the VP within 5 days. Use the <i>Systems Quality Group: ORT Waiver Form</i> , 913-3671	5.1	Mfg personnel, PE, ORT Team, and Operations Program Manager as well as PLD and commodity Eng when appropriate
If 3 PRST rejects occur in a row on a platform, a TQR is required	5.1.1	Platform ORT Team led by the PE
When a PRST Accept occurs, inform the team within 1 day, archive the plot, start a new plot	5.2	Mfg personnel
If a SSP is required, follow policy defined in 923-1826-xx	5.4	ORT Team
Analyze ORT failures to identify and react to quality trends	5.5	Mfg personnel
For NPI start ORT no later than 6 weeks after RR and before general availability (GA) which ever is less	6.1	Mfg personnel
Run ORT until EOL of a platform	6.2	Mfg personnel
Cleanup, retest and inspect ORT UUTs after their ORT run is completed	7	Mfg personnel
Note: Mfg personnel could be either external or internal to Oracle. There may be cases where PE responsibilities are largely filled by a PE from an external Manufacturing organization.		

Appendix B External Assemble-To-Order (XATO) Configurations

Where the majority of the supply plan is a XATO configuration, use representative dummy configurations for ORT.

Demonstration of X-option reliability is not required for system-level ORT processes. However, the Oracle product ORT team can incorporate the use of X-options in ORT configurations at its discretion. This is appropriate where there is a high pick-up rate on X-options, the reliability of which is considered a risk, and is not otherwise demonstrated. You must document the rationale and plan, and treat it as an exception.

Appendix C Rack Mounting Guidelines

If a platform can implement rack mounting in ORT, refer to *Section 2.9, Management of ORT*, on page 13. The following details provide guidelines for the that implementation:

For practical considerations, rackable products are those in which at least three units can be mounted in a rack.

- If a system can only be configured in a rack, it is preferred that it is rack-mounted in ORT.
- If a system can either be configured in a rack or standalone, it is preferred that a representative portion of configurations is rack mounted in ORT.
- If a system can only be configured as standalone, it must not be rack-mounted in ORT.
- Rack configuration density must be maximized to the extent that it is a realistic customer configuration.
- The minimum rack configuration is specified in the platform's ORT plan.
- NPI products must strive to implement ORT in rack configurations at their initial ORT program launch, but only when data center conditions can be reassured.
- Sustaining products must review transition to compliance with this policy during the quarterly ORT plan review, balancing benefits with cost considerations (material, time, labor, and rotational equipment management [REP] considerations).

Appendix D ORT Failure Classifications

Classification	Definition	Accounted By		
		PRST Plots	CLCA Logs	MTBF Calculations
Independent	An event external to the UUT that causes the UUT to fail.			
Dependent	An event that is caused either by the failure of another component or assembly within the UUT or by over-stressful test profiles.			
Chargeable Failures	<p>The initial (default) classification of all failures; examples include failures that cause:</p> <ul style="list-style-type: none"> • The system is not to perform to its designated functional specifications • Diagnostic alerts (such as system-level hardware alerts, test diagnostic flags, and other hard or transient occurrences) • Service or manual operator intervention to restore the product or system operation (for both software-related and firmware-related failures) 	x	x	x
Chargeable Failures – Corrected	<p>A chargeable failure for which the RCCA was verified through testing and for which a closed loop corrective action (CLCA) was taken; examples include the following:</p> <ul style="list-style-type: none"> • Failures attributed to known FRU hardware or firmware inadequacies for which: <ul style="list-style-type: none"> • A documented ECO path was outlined and agreed upon • An adequate plan was created for retesting the redesigned FRU or system attribute • Failures for which manufacturing process adjustments and screens were made, testing was conducted, and the fix was proven effective 	x	x	x
Non-Chargeable Failures	<p>Failures that do not require manual intervention or have any impact on a FRU, subsystem, or system availability. Examples include failures due to the following:</p> <ul style="list-style-type: none"> • Erroneous or overly sensitive external diagnostic software suites (such as Oracle VTS) • Test engineering errors made while changing, reading, or erroneously reporting diagnostic and customer application suites • Known and documented application bugs • Known and documented external diagnostic software bugs or coverage • External environmental causes, such as power outages or glitches, inadequate ventilation in the ORT testing location, or other environmental factors that cause the ORT UUTs to be operated outside their normal operating limits 		x	

Appendix E ORT Data Reporting Requirements

ORT data reporting requirements describe the data elements that must be recorded during data collection for every unit tested, and every failure occurring in ORT. This information enables the automatic generation of additional data associated with the various ORT programs, systems, and FRUs in test. It also enables additional control charting and cross-platform roll-ups that eventually must increase the future sensitivity and detection capabilities of ORT.

Type	Attribute Name	Description
TEST	Operation	Logistic operation
TEST	ORT Number	Sequential test cycle
TEST	Start Time Stamp	Time stamp of when ORT test starts
TEST	Stop Time Stamp	Time stamp of when ORT test finished
PRST	Decision Code	A (Accept), R (Reject), S (Stop)
PRST	Decision Date	Date of the PRST decision
PRST	Design MTBF	Target applied in PRST calculation
FAIL	NCAT Number	Associated with failed FRU
FAIL	Failed FRU PN	Failed FRU PN
FAIL	Failed FRU SN	If ORT failed, failed FRU SN
FAIL	Failed System PN	PN of the failed system
FAIL	Failed System SN	SN of the failed system
FAIL	Failed Time Stamp	When the test was stopped for failure
FAIL	Failure Code	Test dependent; code explains what failed
FAIL	Failure Description	Text describes failure
FAIL	Failure Time to Failure	Calculated from first time system tested
FAIL	ORT Failure Chargeability	Whether chargeable or not
FAIL	ORT Failure Dependency	Was failure dependent on another failure
FAIL	ORT Failure recovery	Whether system was recoverable
FAIL	ORT Failure Type	Whether the failure was verified
FAIL	Slot ID	Drive location for the failed FRU
FAIL	U Location	DIMM socket (that is, Uniboard)
FAIL	FACOPS FA #	<i>For internally manufactured systems only:</i> Failure analysis number from FACOPS
FAIL	Keywords from FA	<i>For internally manufactured systems only:</i> Keywords from failure analysis from FACOPS

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Type	Attribute Name	Description
FAIL	RCCA Results	<i>For internally manufactured systems only:</i> Results of RCCA
FAIL	Failed Test	<i>For internally manufactured systems only:</i> Process stage(log op) when the ORT test failed
CONFIG	Date Code	Year and week FRU was manufactured at supplier
CONFIG	Parent PN	System PN
CONFIG	Parent SN	System SN
CONFIG	PN	PN of the FRU inside the system tested
CONFIG	Quantity	Quantity of part (usually one)
CONFIG	SN	SN of the FRU inside the system tested
CONFIG	System Model	System model
CONFIG	Vendor Code	Unique number to identify Oracle supplier
CONFIG	Vendor PN	Sometimes different from Oracle PN
CONFIG	Vendor SN	SN as defined by the vendor
CONFIG	UUT Location	<i>For internally manufactured systems only:</i> Location in the Oracle factory of unit (system)

Reference Information

Reference Documents and Records

Document Title	Number	ESO Controlled¹		Quality Record²	
		Yes	No	Yes	No
<i>WWOPS Systems: Ongoing Reliability Test (ORT) Report Template</i>	913-3532-xx	X			X
<i>WWOPS Systems: Ongoing Reliability Test (ORT) Sizing Template</i>	913-3549-xx	X			X
<i>Systems Quality Group: ORT Waiver Form</i>	913-3671-xx	X			X
<i>WWOPS Quality: Oracle America Quality Policy Manual</i>	923-1607-xx	X			X
<i>WWOPS Product Life Cycle and Technology: Stop Ship and Purge (SSP) Process</i>	923-1826-xx	X			X
<i>WWOPS Quality: Corrective and Preventive Action Process</i>	923-3644-xx	X			X
<i>Handbook for Reliability Test Methods, Plans, and Environments for Engineering Development, Qualification, and Production</i>	MIL-HDBK-781A		X		X
Reliability Qualification Testing (restricted access): https://serverras.oraclecorp.com/homepage.php	N/A		X		X

¹ All references to documents controlled by Engineering Services were current when this document was released.

All hard copies of this document are to be used for reference only.

² For quality record information, refer to *WWOPS Quality: Control of Quality Records, 923-1764-xx*.

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Document History and Approvals

Dash	Rev	Date	Description of Change	Originator
01	A	02 Jul 2003	Initial release.	N/A
02	A	27 Jan 2005	Updated to current StarOffice template; updated document to reflect current policy	N/A
02	B	16 Mar 2007	Merged WWOPS Scalable Systems Group: <i>Ongoing Reliability Test Execution</i> , 911-2306-xx (now obsolete), into this document	N/A
03	A	27 Aug 2010	Updated various links due to change from Sun to Oracle, and change Sun to Oracle references throughout the document.	N/A
Agile History				
Rev	Date	Description of Change		Originator
04	30 May 2014	Updated document to reflect change in organizational names and titles, implementation of Non-Conforming Action Tracking system tool, deletion of references to obsolete CPAS and PITT Quality Management tools, additional clarification of failures involving SW and FW, and removed references to obsolete documents. Clarified end points in Flow 5-1. Clarified records retention process and updated schedule (from seven to an active plus ten years) in Section 4.2.1.		N/A
05	7 Apr 2015	Add "Manufacturer's must have controls that ensure that Work Orders for ORT/PA/RQT use only new HDD's/SSD's. Exceptions to this needs Oracle approval." to Introduction in the Big Rules list.		N/A
06	27 Apr 2015	Section 2.5 – update to reflect the new roll out of NCAT and how an NCAT is prioritized per business risk. Removed all the references to NCAT Severity ratings.		N/A
07	28 Jul 2017	Updated Links. In reference section, changed from 913-3672, <i>WWOPS Chief Quality Office: Quality Management System Deviation</i> to new waiver form 913-3671, Systems Quality Group: ORT Waiver Form .		N/A
08	6/1/23	Update attachment category to AQP documents, so they are visible to external users. No content changes.		N/A

a. Custom Styles

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This section is hidden; it uses custom and default styles to ensure they are displayed in the Para format pulldown list.

8 Heading 1

8.1 Heading 2

8.1.1 Heading 3

8.1.1.1 Heading 4

AppendixSub

- Bullet

11. NumberedList

- b. AlphaList

Comment

Example/Code

Figure 1 - FigureCaption

Caption

Figure/Table Anchor

NOTE 7: Note

Table 1 - TableCaption

1 TableStep

TIP: *Tip*

• **Warning**

10 point

Bold

Callouts (helvetica)

Display (Courier Light)

Systems Group Quality: Ongoing Reliability Testing (ORT) Policy

Input (Courier Bold)

Italics

Text (Bookman)

Title

Default

Weblink

CoverTitle

- CoverBullet