ORACLE

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Supplier Engineering Storage Device Manufacturing Requirements for External/Internal Manufacturer (EM/IM) and Joint Design for Manufacturing (JDM)

Overview

This document defines the best practice interaction between Oracle's Storage Device Core Commodity Team (Supply Engineer [SE]) and the Integrator Supplier as listed.

Audience

This document is for personnel in Storage Device Supplier Engineering working with Joint Design for Manufacturing (JDM), Original Design Manufacturers (ODMs), and External/Internal Manufacturers (EM/IMs).

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SCOPE

This document defines Oracle quality support requirements within manufacturing at both internal and external sites and how they work in collaboration to collect quality data. Included are the processes in place to handle discrepant material and material management.

1.0 SUPPORT

1.1 EM/IM/JDM

The EM/IM/JDM are responsible for providing key personnel to support Oracle's core commodities. The Manufacturing Site support person is the primary interface for day-to-day issues concerning core commodities, and must support quality control meetings with Oracle as required.

The Manufacturing Site support person is also the first point of contact if an issue concerning a core commodity is escalated at the Manufacturing Site, and is responsible for communicating any metrics establishing an early warning trigger level. The Manufacturing Site support person initiates the investigation and raises the trigger to the Oracle Supply Engineer (SE).

1.2 Oracle

The Oracle SE provides support to the EM/IM/JDM for the core commodity quality management, including development of key quality management processes, that is, data reporting, failure analysis (FA), non-conformance corrective action tool (NCAT) management, HDD/SSD supplier feedback, and failure verification processes.

The Oracle SE performs a line audit from HDD/SSD receiving process into the factory through to the pack-out of systems or FRUs. The frequency is once a year or as deemed necessary.

As part of critical training for the Manufacturing Site, the Oracle Supplier Engineer (SE) need to work with the HDD/SSD supplier for providing HDD/SSD handling training material to the Manufacturing Site to incorporate into their training curriculum.

2.0 COMMUNICATION

2.1 General Communication

The following expectations are considered key to establishing a strong communication and engagement link between Oracle and their Manufacturing Sites:

- Weekly meetings between Oracle and Manufacturing QE (formal agenda and weekly minute tracker)
- [EM/IM] Notification of Product and Process Change Notifications (PPCN)
- Details of escalation contacts and hierarchy.

- Distribution of the weekly HDD/SSD reject parts per million (RPPM) reports
- Notification of RPPM triggers according to the Trigger Map conditions (refer to *Appendix A*, ***Error! Reference source not found.***), including NCAT, Post Pack Audit (PPA) and On-Going Reliability test (ORT) rejects
- Sharing of information affecting Manufacturers in relation to HDD/SSDs:
- (Engineering Change Orders [ECOs]Reference
- New Product Introduction [NPI], Process Validation Test [PVT], and Stop Ship and Purge [SSP])

3.0 EM METRIC DATA

3.1 Usage Metrics

The Manufacturing Site must provide usage metric data to Oracle Supplier Engineering, using the template provided (refer to *Appendix B,* ***Error! Reference source not found.***). The report must be provided to Oracle on a mutually agreed to weekly frequency. The usage metric data must include all items listed in the template shown in *Appendix B,* ***Error! Reference source not found.***.

NOTE: The following data is NOT to be included in the weekly usage metric data:

- Finished Goods Inventory (FGI) and Work In Progress (WIP) dekits

3.2 Critical Failures (NCAT)

The Manufacturing Site must provide visibility to critical failures from:

ORT

Reliability Quality Test (RQT),

NPI, PVT of next generation drives.

As a minimum, when notifying the Oracle SE and PE, this must include the following commodity-specific information:

- Platform name and serial number
- The location, date of fails, and Time To Failure (TTF)
- The part and serial numbers of failing FRUs
- Fail logs
    - The next steps and recommendations are provided by the Oracle SE and PE. If verified by the Manufacturing Site and/or the HDD/SSD supplier, provide the following:
- NCAT number
- Any Probability Ratio Sequential Test (PRST) data
    - The Manufacturing Site must submit an NCAT, as appropriate, utilizing the HDD/SSD Supplier Engineering Owner Assignment. See *APPENDIX C NCAT Owners.*

- For ORT failures, the Manufacturing Site must ship drives back to the HDD/SSD suppliers within 24 hours of receipt of the RMA number from the supplier. Shipping/tracking information must be provided as proof of shipment and for tracking.

3.3 X-Option and FRU Data

If any of the Manufacturing Sites are configuring HDD/SSD X-options and FRUs, collect and report this data on a weekly basis. You can include this report in the weekly RPPM reports currently provided, or generate it as a separate report.

The Manufacturing Site must provide a First Article Inspection (FAI) report for each drive configuration for Oracle approval to either the SCE or SE . For details, refer to WWOPS Supplier Engineering: Mass Storage Group First Article Inspection (FAI) Guidelines, 923-2320-xx.

4.0 ESCALATIONS

4.1 Oracle Integration

The SE must provide a 'trigger' map which defines the actions and owners for out-of-goal conditions and escalation events. See *Appendix A*, ***Error! Reference source not found.*** for more details.

The SE must monitor the RPPM level, as follows:

- If RPPM hits trigger level 1, the Oracle SE must notify the Supplier Engineering PM.
- If RPPM hits trigger level 2, the Oracle SE must initiate a Technical Assessment within Supplier Engineering to identify cause of trigger.

4.2 SSP Events

The SE must ensure that the Manufacturing Site QE is notified upon the initiation of the SSP process.

The Manufacturing Site must work on the assigned actions from the technical assessment and/or pre-assessment items, and if applicable, on the SSP activities, as follows:

- Provide the inventory levels of the affected parts and locations.
- Ensure that all affected areas are purged and quarantined.
- Ensure that the purged material is dispositioned according to instructions of the SSP.

The EM QE must maintain regular communication as prescribed by the SSP process.

5.0 TRAINING

All EM employees handling Oracle core commodities must complete relevant ESD and manual HDD/SSD handling training, as described in the appropriate EM documentation.

The Manufacturing Site must keep records of HDD/SSD handling and ESD training.

The Manufacturing Site must maintain the current HDD/SSD handling and ESD training material.

NOTE 1: The Oracle SE can provide the HDD/SSD handling material from the HDD/SSD suppliers.

5.0 AUDITS

Regular HDD/SSD Process Handling Audits must be scheduled between the Oracle SCE and the HDD/SSD Supplier Field Application Engineer (FAE).

The following conditions can lead to scheduling an audit:

- New Manufacturing Site is qualified.
- The process changes at the Manufacturing Site.
- Increasing number of disk drive failures are found to be caused by 'mishandling'.
- The Manufacturer requests an audit.
- Manufacturer's last audit was more than one year ago.
- Follow up audits must be held according to recommendation from previous audit findings.
    - The HDD/SSD Certification Process document will form the basis of the audit itself. *Complete Audit Summary form See Appendix E, Audit Summary.*

7.0 FAILURE VERIFICATION

The Manufacturing Sites must provide a suitable on-site work area for HDD/SSD Suppliers equipment to perform on-site drive failure validation. Test logs must be made available for each tested HDD/SSD.

8.0 MANUFACTURING BARCODE LABEL REQUIREMENTS

8.1 Barcode Format of Sub-Assembly Commodities

The manufacturer ensures that all sub-assembly commodity barcodes adhere to the serialized sub-assembly label specification, as defined in *Identification, Labeling, and Bar-Coding Standards for Assemblies*, 950-4477-xx.

8.2 Barcode Scanning of Sub-Assembly Commodities

The manufacturer ensures that the Oracle serial number (18 characters) and Oracle part number barcodes (as defined in the Serialized Sub-Assembly Label table in *Identification, Labeling, and Bar-Coding Standards for Assemblies*, 950-4477-xx) are scanned into the shop floor system as part of the standard manufacturing process.

NOTE 2: The EM must be able to demonstrate traceability based on the label information captured during drive integration.

9.0 EM/IM/JDM PROCESS CONTROL

9.1 Control of the Second-Time Disk Drive Failures

The Manufacturing Sites must show adequate process control to identify disk drives that are second-time functional failures to support the HDD/SSD returns protocol with the suppliers. Manufacturing Sites must design this control feature in accordance with their internal shop floor system capability.

9.2 Reporting Control for Next Generation *HDD/SSD*s

- The Manufacturing Sites must show adequate reporting capability whenever next generation drives are being integrated.
- The Manufacturing Sites must distinguish between current and next generation ddrives when publishing the RPPM reports, and by agreement, decide when to stop reporting current generation.

MRB and Return to Vendor (RTV) Process Data

- The Manufacturing Sites must have a MRB and RTV process flowchart with measurable timelines.
- The Manufacturing Sites must provide the MRB and RTV aging report, as required.
    - By agreement, the Manufacturing Sites must return the verified HDD/SSDs within 10 working days after they were transacted into the Manufacturer's MRB location. This is tracked and measured using the weekly RPPM reports as shown in *Appendix B,* ***Error! Reference source not found.***.

NOTE 3: Manufacturers must use only approved HDD/SSD packaging when returning disk drives to suppliers for FA purposes. Manufacturers must use single- or multi-box packaging where applicable.

9.4 First In, First Out (FIFO) Management

If the vintage or age of the drives being used in the process potentially impacts the overall weekly performance, by agreement, further investigation can be required. The suitable approach is to plot the vintage data on a weekly basis. This shows how well the Manufacturing Sites are managing their FIFO process.

9.5 System RMA Rework (E2N)

The Manufacturing Sites must keep record of all system RMAs associated with drive re-use. The data must be kept in the Manufacturing database and available on request. Refer to the HDD/SSD utility to determine if the HDD/SSD is fit for re-use, for instance, HDD/SSD utility to screen for power on hours (). If necessary get Oracle Supplier Engineering approval for use as FRU only.

For E2N process and requirements, refer to *WWOPS Technology: Server Rework and Reconfiguration Specifications*, 923-3671-xx**.**

APPENDIX A RPPM TRIGGER MAP

There are four main RPPM contributors that are evenly considered as impacting the EM's performance and subsequently can require investigation.

The SE must initiate an investigation if any of the triggers are exceeded after reviewing the data. This RPPM result is measured using a roll-up of all the rejected drives, as these RPPM contributors are the measurements of the EM's overall performance. These RPPM contributors are monitored using both the EM RPPM and suppliers DPPM reports. NCAT will be raised if necessary.

This process applies to all drive types and interfaces.

Data Source	Trigger	Action and Decision Plan
DPPM		
	>500 DPPM (Trigger)	SE formal technical
RPPM	>500 RPPM (Trigger 1)	Continuous monitoring of
	>1000 RPPM (Trigger 2)	SE informal technical
PPA	1 x PPA fail (Trigger 1)	SE informal technical
	2 x PPA fails in one week	Formal technical assessment
ORT	1 x ORT fail (Trigger 1)	SE informal technical
	2 x ORT fails in one week, or two fails for same symptom in	Formal technical assessment

The following four statements are guidelines on how to assess the RPPM report whenever the usage is below 2000 in accordance with the number of rejects reported. This is a means to manage over trigger alerts.

If one failure is rejected and the usage is less than 2000, the RPPM is not considered to be exceeding the trigger limit.

If two failures are rejected (different failure modes) and the usage is less than 2000, the RPPM is not considered to be exceeding the trigger limit.

If two failures are rejected with the same failure mode and the usage is less than 2000, the RPPM is considered to be exceeding the trigger limit.

If the number of failures are greater than two rejects (various failure mode) and the usage is less than 2000, the RPPM is considered to be exceeding the trigger limit.

APPENDIX B HDD USAGE REPORT SAMPLE

Foxconn Nanning Summary by Calendar MSFT

				2021 / 11			2021 / 12			2022 / 01			2022 / 02			Usage	Failures	RPM
Vendor Name	Part Number	Component Description	Goal	Usage	Failures	RPM	Usage	Failures	RPM	Usage	Failures	RPM	Usage	Failures	RPM			
HGST	7357761	Assy,Drive,14TB,3.5",SAS3/7200rpm,Coral,with encryption	1,000	6928	1	144	10439	4	383	13350	16	1199	2028			31835	21	660
HGST	8205846	Assy,Drive,18TB CMR,3.5",SAS3/7200rpm,Coral	3,000	7878	5	635	7372	6	814	7818	5	640	1344			23914	16	669
Intel	7361253	M.2,240GB,SATA,22x80mm,SSD,INTEL, DC S4510	1,000	849	1	1178	1094			1312			22			3209	1	312
Intel	7361255	M.2,480GB,SATA,22x80mm,SSD,INTEL, DC S4510	1,000	649	1	1541	274			8			20			939	1	1065
Intel	7361454	ASSY, 6.4TB GEN2, FLASH F640B NVMe AIC, AURA 8	1,000	1615	6	3715	2107	5	2373	2482	2	806	44			6118	13	2125
Intel	7361493	ASSY,SSD, 6.4TB Gen2, SFF-2.5", NVMe x4,Marlin	1,000	295			21			2100						2408		
Intel	7361496	ASSY,SSD, 6.4TB Gen2, SFF-2.5", NVMe x4,Coral-D	1,000	114			3916			4116						8130		
Intel	8204578	ASSY,SSD, 6.8TB, 2.5in, NVMe, Intel D7-P5500, Marlin	1,000	1359			730			42	1	23810				2002	1	500
Intel	8204580	ASSY,SSD, 6.8TB, 2.5in, NVMe, Intel D7-P5500, Coral-D	1,000				24									24		
Intel	8204597	ASSY, 6.4TB GEN4 FLASH, NVMe AIC, AURA 9	1,000	2595	4	1541	2515	2	795	1810	5	2762	410			7153	11	1538
Intel	8205123	M.2,240GB,SATA,22x80mm,SSD,Generic(AML)	1,000				4			175			60			225		
Intel	8208066	Assy,SSD, 3.84TB, 2.5in, NVMe, D7-P5500, Marlin	1,000	241	1	4149	16			20						266	1	3759
Intel	8208067	Assy,SSD, 3.84TB, 2.5in, NVMe, D7-P5500, Coral D	1,000				20									20		
SEAGATE	7363537	ASSY,DRV,1.2TB,10KRPM,SAS3,512N,SFF,MARLIN	1,000	1761			5282	4	757	4229	3	709	40			11244	7	623
Samsung	8204589	ASSY,SSD, 6.8TB, 2.5in, NVMe, Samsung PM1733, Marlin	1,000	3601	1	278	5525	1	181	11897	1	84	96			20789	3	144
Samsung	8206197	Assy, SSD, 3.84TB, 2.5in, NVMe,PM1733, Marlin	1,000	2643			1885			1497	1	668				5867	1	170
	8202558	ASSY,SSD,240GB M.2,LFF,CORAL-DORY	1,000	290			1490			1160						2910		
	8204578	ASSY,SSD, 6.8TB, 2.5in, NVMe, Intel D7-P5500, Marlin	1,000	1						1						1		
	8205123	M.2,240GB,SATA,22x80mm,SSD,Generic(AML)	1,000	5967			5515	1	181	7591			478			19139	1	52
	8206533	ASSY,SSD,800GB ME,2.5",SAS3,MARLIN	1,000	8			10									18		
	8208066	Assy,SSD, 3.84TB, 2.5in, NVMe, D7-P5500, Marlin	1,000	1												1		
	8211124	ASSY,SSD, 15.36TB, 2.5in, NVMe, Samsung PM1733a, Marlin	1,000				684			84						684		
	8211220	M.2,480GB,SATA,22X80mm,SSD,Multi-Source	1,000				376			2581	2	775				2951	2	678
	8211563	Assy, SSD, 3.84TB, 2.5in, NVMe, PM1733, Coral D	1,000				56			34						90		

APPENDIX C NCAT OWNERS

Type	Vendor	Supplier Engineer	Email Address
HDD	WDC	Jason Zhang	hua.z.zhang@oracle.com
HDD	Seagate	Jason Zhang	hua.z.zhang@oracle.com
SSD	Micron	Jason Zhang	hua.z.zhang@oracle.com
SSD	Samsung	Russell Yang	russell.yang@oracle.com
SSD	Intel	Geoff Wears	geoffrey.wears@oracle.com

APPENDIX D ACRONYMS

Acronym	*Description*
BGMS	Back Ground Media Scan
CIR	Change initiation request
CPAS	Corrective and Preventative Action System
DPPM	Defective parts per million
E2N	Equivalent 2 new
ECO	Engineering change order
EM	External Manufacturer
ESD	Electrostatic devices (Electrostatic discharge)
FA	Failure Analysis
FAE	Field Application Engineer
FAI	First article inspection
FCAL	Fibre Channel Arbitration Loop
FGI	Finished goods inventory
FIFO	First in, first out
FRU	Field Replaceable Unit

Acronym	*Description*
HDD/SSD	Hard disk drive/Sloid State Device
JDM	Joint Design for Manufacturing
MRB	Materials Review Board
NCAT	Nonconformance Corrective Action Tool
NPI	New product introduction
NTF	No trouble found
ODM	Original Design Manufacturer
OEM	Original Equipment Manufacturer
ORT	Ongoing reliability test
PE	Product Engineer
PID	Process induced defects
PPA	Post pack-out audit
PRST	Probability ratio sequential test
PVT	Process validation test
RMA	Return material authorization
RPPM	Reject parts per million
RQT	Reliability quality test
RTV	Return to vendor
SAS	Serial Attach SCSI
SATA	Serial ATA
SCE	Supply Chain Engineer
SCSI	Small Computer System Interface
SE	Supplier Engineer
SQE	Supplier Quality Engineer
SSP	Stop ship and purge
TE	Test Engineer
TTF	Time to failure
WIP	Work in progress

APPENDIX E AUDIT SUMMARY

HDD/SSD Audit Summary	
Supplier:	
Location:	
Audit Date:	
Auditor:	
Program:	
Major Findings:	

Minor Findings:	
Summary of Audit:	

RELATED INFORMATION

REFERENCE DOCUMENTS AND RECORDS	
Mass Storage Group First Article Inspection (FAI) Guidelines	923-2320
Embedded Logic in Serial Numbers, Lot Codes, and Assembly Identifications (IDs)	923-3383
Supplier Traceability Requirements	923-3406
Corrective and Preventive Action Process	923-3644
Server Rework and Reconfiguration Specifications	923-3671
Identification, Labeling, and Bar-Coding Standards for Assemblies	*950-4477*

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DOCUMENT HISTORY

Dash	*Rev*	*Date*	*Description of Change*	*Originator*
01	A	20 Sep 2004	Initial release.	N/A
02	A	23 Nov 2004	Updated to the new SO template. Added new Section 7 on manufacturing barcode labeling requirements, and amended Appendix A to redefine trigger values for DPPM and RPPM.	N/A
02	B	06 Jun 2005	Updated document title.	N/A
03	A	20 Jul 2006	Updated to reflect current processes and some new requirements.	N/A
04	A	25 May 2007	Updated to the latest SO template. Updated sections 3, 3.3, and 6. Added sections 3.4, 3.5, and 8.	N/A
05	A	29 Nov 2007	Added Section 9. Updated Sections 3.1, 3.3, 3.5, and Appendix A.	N/A
06	A	30 Jul 2009	Updated Section 1, 2, 3.1, 3.2, 4, and 7, and Appendix A, B, and C. Inserted Section 6 and 10.5 and Appendix D. Former Section 3.3 and 3.4 became current Section 10.3 and 10.4, respectively.	N/A
07	A	08 Feb 2010	Updated Appendix A.	N/A
08	A	19 Dec 2011	Changed all 'Sun' references to 'Oracle' and all 'CPAS' references to 'NCAT/CPAS' in the whole document. Removed reference to RR Donnelley. In Section 10.3, changed HDD bracket returns process to bracket returns process, as well as the separate paragraph for equivalent to new (E2N). Updated Appendix C, Acronyms and Appendix D, NCAT/CPAS Owners.	N/A
Agile History				
Rev		*Date*	*Description of Change*	*Originator*
09		5 Nov 2012	Section 3.1 – updated weekly usage metric data information, updated Section 9, HDD Hard Disk Drive Audit, Section 10.3 – removed Bracket return process, Section 6 – added reference to new Appendix E, and added Appendix E, HDD Audit Summary. Updated Appendix D.	N/A
10		25 Mar 2016	Removed Section 9 HDD_AUDIT. Updated Appendix C, NCAT Owners table; removed Seagate, Toshiba, and Western Digital. Added Internal Manufacturing.	N/A
11		7 Nov 2017	Changed this document from HDD only to also cover SSD	N/A
12		31 Jan 2022	Changed SCE role to SE since there is no SCE role now.	N/A
Fusion History				
03		03 Mar 2022	Updated to current corporate template	N/A