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<b>Supplier Quality Standard</b>	<b>SOP No:</b> <b>010-101164-01</b>	<b>Rev: 09</b>
	<b>Department: Global Supplier Quality</b>	

**Description:** Quality Management System Requirements for Suppliers  
**Applies to:** As indicated in Christie Engineering drawings

**Approvals**

<i>Title</i>	<i>Name</i>
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**REVISION STATUS**

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## 2 Introduction

### 2.1 Acronyms

3F4M change	A Change to a part or process involving or affecting Form, Fit, Function, Man, Machine, Material or Method
ATP	Acceptance Test Plan
CB	Certification Body
CDS	Christie Digital Systems
CRD	Comprehensive RoHS Declaration
CSA	Canadian Standards Association
DFM	Design For Manufacturability
DFT	Design For Testability
EPR	Engineering Pilot Run
ESD	Electrostatic Discharge
FAI	First Article Inspection
FCT	Functional Circuit Test
FMEA	Failure Modes and Effects Analysis
GD&T	Geometric Dimensioning and Tolerancing
GSQ	Global Supplier Quality
ICT	In-Circuit Test
MAC	Media Access Control
OTS	Off The Shelf
PCB	Printed Circuit Board
PO	Purchase Order
PPR	Production Pilot Run
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals
RoHS	Restriction of Hazardous Substances
SQS	Supplier Quality Standard (this document)
UL	Underwriters Laboratory
WEEE	Waste Electrical and Electronic Equipment
RMA/RMO	Return Material Acknowledgment /Purchase Order
COFC	Certificate of Compliance

### 2.2 References

- ASME Y14.5 -1994 Dimensioning and Tolerancing
- IPC-7711/7721 Rework, Repair and Modification of Electronic Assemblies
- IPC-A-610 Acceptability of Electronic Assemblies



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IPC/WHMA-A-620 Requirements and Acceptance for Cable and Wire Harness Assemblies

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## 2.3 Document Conventions

**Shall** is used to indicate a mandatory requirement.

**Will** is used to indicate a statement of intent or fact.

**Should** is used to indicate a preferred alternative or design goal, but is not mandatory.

**May** is used to indicate an option.

## 2.4 Scope

The purpose of this document is to define and describe the necessary quality and performance requirements to ensure a successful partnership between Christie Digital and our suppliers.

The SQS outlines the minimum activities and quality performance required of the supplier's quality management system and of delivered products or services.

The requirements contained in this SQS are considered part of the PO issued by Christie Digital Supply Chain.

The supplier's acceptance of a PO constitutes acceptance of the following requirements:

- a. Notes and reference items in the PO;
- b. Notes and specifications on drawings or engineering specifications;
- c. This SQS document.

In case of a conflict between this SQS document and Christie drawings or specifications, Christie drawing or specification shall take precedence.

## 3 Supplier Responsibilities

### 3.1 Quality Management System Requirements

- a. The supplier shall establish, document, implement and maintain a quality management system.
- b. Suppliers shall ensure adequate competence of personnel working on Christie product. Records of training shall be maintained.
- c. When supplier chooses to outsource any process that affects product conformity with Christie requirements, the supplier shall ensure control over such processes.
- d. Supplier shall have a documented procedure to review and approve documents and forms prior to their release.

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## 3.2 Change Management Requirements

- a. Christie requires advanced notification of any major design, materials, organizational or process changes - referred to as 3F4M change, to allow Christie to review the impact on its products and customers.
- b. Supplier shall submit to GSQ the Supplier Deviation Change Request or their own form if considered appropriate by Christie GSQ.
- c. When Supplier Deviation or Change Requests are received, Christie evaluates these requests through an internal approval procedure. Supplier shall implement change only after receiving approval from Christie.
- d. Typical areas include changes in critical supply chain, manufacturing facility, final test, final inspection or other critical processes, materials and test methodologies, as well as changes to the part affecting form, fit or function.
- e. Potential changes which require notification and approval may include but are not limited to the representative examples listed below:
  - i. Supplier or subcontractor/s change;
  - ii. Specification change;
  - iii. Material or manufacturer change;
  - iv. Safety critical components change;
  - v. Changes affecting regulatory and agency reports;
  - vi. Change of secondary processes : e.g. plating chemicals or methods;
  - vii. Addition/ change of major processing equipment;
  - viii. Change or addition of manufacturing facility;
  - ix. Change of manufacturing process;
  - x. Change in test and inspection process and equipment;
  - xi. Change of tooling design;
  - xii. Change of packaging;
  - xiii. Change in performance or pass/fail criteria or test methods;
  - xiv. Change in location and content of any markings (barcode, license label, MAC address, part#, etc.);
  - xv. Major organizational changes or significant changes in responsibilities
- f. Written change requests shall include as applicable:

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- i. Detailed description of change;
- ii. Purpose and justification of change;
- iii. Risk of change;
- iv. Price impact;
- v. Plan for Supplier Qualification;
- vi. Results of Supplier Qualification;
- vii. Plans for identifying, marking and segregating parts;
- viii. Time schedule

### 3.3 Resource Management Responsibilities

- a. Business and technical discussions will be conducted in English and all suppliers shall have staff trained and available for communications.
- b. When called out in Christie specifications, it is the Supplier's responsibility to ensure personnel are competent in reading, understanding and applying ASME Y14.5 -1994 GD&T where required, including personnel involved with:
  - i. contract/ drawing review;
  - ii. product verification;
  - iii. product and process design;
- c. Supplier shall provide and maintain: workspace, process equipment and transportation to assure conformity to Christie product requirements.
- d. Supplier should maintain a Disaster Recovery Plan available for Christie review.
- e. Supplier shall provide normal working hour access to their facilities/working area for logistics purposes.
- f. Supplier shall assist Christie staff in organizing quality audits at their facilities. Christie will communicate the audit agenda and schedule prior to agreed audit date.

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### 3.4 Design and Product Development

#### 3.4.1 Drawings/ Specification Control and Contract Review

a. Supplier shall conduct internal Contract, Specification and Drawing review related to the product. This review shall be conducted prior to the commitment to supply product to Christie Digital and shall ensure:

- i. product requirements are defined;
- ii. evaluation of changes on contract or purchase orders, differing from previously received;
- iii. that the supplier is able to meet the defined requirements;

b. Upon review, any changes to the Contract, Specification or Drawing(s) are to be approved by Christie via a drawing specification update or deviation prior to manufacturing. The supplier is bound to the Contract, Specification and Drawing(s) once approved and released. (See watermark below).

c. Records of the review and actions taken shall be maintained and their progress shall be effectively communicated to Christie, and through the supplier's organization.

d. The supplier shall ensure the drawing revision corresponding to the Christie issued PO is used for all design and manufacturing purposes; this includes any engineering/ technical specifications called on Christie drawings. If discrepancies are found, Christie Supply Chain Management shall be contacted for clarification.

e. All Christie released drawings will carry one of two watermarks; "Officially Released" or "For Quote or samples only".

Drawing watermark for <b>Production parts</b>	Drawing watermark for <b>Prototypes and Engineering samples</b>
<b>OFFICIALLY RELEASED</b> Document Control Date (EXP: FEBRUARY 20 2013)	<b>FOR QUOTE OR SAMPLES ONLY</b>

f. Documents and records required by Christie shall be controlled.



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- g. Required records by this standard shall be kept on file for five years after fulfilling the last received PO. Upon request, records shall be retrieved and sent electronically to Christie within 24 hours.

### 3.4.2 Supplier Design and Development

- a. When design and development services are provided, the Supplier shall maintain a detailed project plan including schedule.
- b. Suppliers shall assess and communicate any risks to the design.
- c. Supplier shall assure they meet the Christie specification and drawings. Inadequacies in specifications or drawings or deviations from Christie requirements shall be communicated to Christie. Suppliers are encouraged to suggest potential alternate solutions to those specified to support improved manufacturability, reliability, optimum cost, etc.
- d. Design outputs shall be measured against design inputs. E.g. Part verification and qualification at each design phase. Records of the design qualification shall be documented and communicated to Christie, including inadequacies in specifications or drawings or deviations from Christie requirements and drawings.
- e. Christie design stages are:
- i. Prototype,
  - ii. Engineering Pilot Run (EPR),
  - iii. Production Pilot Run (PPR), and
  - iv. Mass production


### 3.5 Purchasing Of Material Used For Christie Products

- a. The supplier is required to assure purchased material meets Christie specifications and must ensure that no counterfeit parts or part substitutions are used in Christie product.
- b. Supplier shall have policies and procedures that adequately preclude, detect and remove counterfeit parts from any goods.
- c. Supplier shall provide Christie only with goods containing components that have been sourced from the original component manufacturer or the original component manufacturer's authorized distributor, unless Christie has previously authorized a different source. A certificate of conformance shall be provided with shipments of electrical, electronic and electro-mechanical components.

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- d. Upon Christie’s request, the Supplier shall provide information on any goods containing conflict minerals, which currently includes gold, tin, tungsten and tantalum.
  - i. Form to be completed in the format of the CFSI Conflict Minerals Reporting Template at <http://www.conflictreesourcing.org/conflict-minerals-reporting-template>
    - 1. Supplier shall promptly provide a written update of any change in or addition to the CMRT necessary to provide complete and accurate information.
  - ii. The Supplier shall fill out a CMRT within 10 days upon request
- e. Material traceability shall be maintained by suppliers. Records of purchased material shall be maintained.
- f. Supplier shall fulfill environmental requirements and prepare CRD/REACH (Comprehensive RoHS/REACH Declaration) upon request by Christie Compliance department.
- g. Suppliers are required to have an adequate supplier control program: e.g. qualified supplier list, supplier audit program, and supplier selection and qualification criteria.

### 3.6 Product Realization and In-Process control

- a. Suppliers are authorized to produce parts for Prototype and Engineering samples to drawings marked “OFFICIALLY RELEASED” and/or “FOR QUOTE OR SAMPLES ONLY”.
- b. Production parts shall be produced by suppliers only to drawings that are marked “OFFICIALLY RELEASED”.
- c. Supplier to ensure Part Number markings and Vendor Code markings as per drawing requirements. Vendor code shall be requested from Christie Supply Chain Management.
- d. Supplier shall have a documented process for assuring conformance of products to all specifications.
- e. The supplier shall validate any processes for production where the resulting output cannot be or is not verified by subsequent monitoring or measurement and, as a consequence, deficiencies become apparent only after the product is in use or the service has been delivered.
- f. Critical features are marked on the drawing with a “squirrel” , noted on the part specification as “Critical Safety Item (CSI)”, or otherwise noted as critical in the drawing or

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specification. These features require a demonstrated ability to control processes, and confirm conformance. The drawing may call up a specific Acceptance Test Plan (ATP) or method. This may include test methods, fixtures, gauges, processes, capability studies and sample sizes specific to that feature. In case an ATP or method is not specified, supplier shall use industry standard gauges and measurement techniques to demonstrate conformance. The outcome of the inspection of these features shall be recorded and provided to Christie if requested and be retained by the supplier.

- g. Supplier's processes and their in process controls and final inspection, shall be clearly defined through a process control plan or alternate document (e.g. Job traveller). Records of measurements and inspection to be maintained.
- h. Product traceability:
  - i. Serialized parts, when required on the drawing/specifications, require traceability to the supplier's critical processes, batch builds, manufacturing dates etc.
  - ii. Non-serialized parts require traceability to Christie part number, lot/batch number/date code, and manufacturer name on product and/or packaging.
  - iii. In the event of a recall deemed to be caused by a deficiency in a product provided by the supplier, the supplier shall aid in identifying all lots/batches affected by this deficiency.
- i. Suppliers that supply plastic made parts/components as part of the assembly, in order to meet UL(Underwriters Laboratories)/CSA(Canadian Standard Association) traceability requirements, shall submit a Certificate of Compliance with every shipment, that shall contain:
  - i. Supplier name, UL/CSA Code(if applicable), Customer (Christie Digital Systems), Part Number, Part Name, Declaration statement, Purchasing Order#, Quantity Shipped, and Material specified, Material Supplier, Material lot#, Serial#(if applicable), Manufacturing date, Date and Authorized supplier signature, Title.
- j. If supplier has set-up its own UL/CSA File#, the Certificate of Compliance shall be replaced with a label applied on transportation boxes, that contains:
  - i. Supplier name, UL/CSA Code, UL/CSA File No., Customer (Christie Digital Systems), Part Number, Part Name, Purchasing Order#, Lot#, Quantity Shipped, Date packed.

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- k. All buildings and facilities used in the manufacturing, packaging, testing and storage of any materials and/or Product will be of suitable size, construction and location to facilitate cleaning, and will be maintained in a good state of repair

### 3.6.1 First Article Inspection General Requirements (FAI)

First article inspections are conducted to ensure the production processes are capable of producing component or assemblies which conform to all requirements. First Article Inspection reports are required for custom parts only.

- a. FAI records shall be submitted by Supplier.
- b. Prototypes and Engineering samples (EPR) shall include first article inspection reports. If there are no changes to the parts or production processes between the prototype and Engineering sample phases, it will not be necessary to repeat the FAI unless requested by Christie.
- c. Production representative parts (PPR), and on-going mass production shipments that had Engineering changes, require a FAI.
- d. FAI records must be kept on file at the Supplier, and available as required.
- e. FAIs to be repeated for product and/ or process changes. The detail of FAI required for changes to be determined by Christie GSQ.
- f. Any discrepancies to be documented and approved prior to mass production. Approval will take the form of:
  - i. Approved temporary deviation;
  - ii. Drawing/specification update;
- g. FAIs of top level assemblies shall include an FAI on the components of the assembly when those components are manufactured to Christie drawing or specification.
- h. If additional testing is specified (environmental, vibration and drop tests, etc.), these test results shall be submitted as part of the FAI.
- i. A Comprehensive RoHS Declaration shall be provided prior to product approval to production, as per European Union Directive 2011/65/EU.

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- j. Specific First Article Inspection requirements for each commodity are listed in the appropriate Measurement/Inspection section of this document.

### 3.6.2 Measurement / Inspection Requirements for Optical Parts

#### 3.6.2.1 Optics and Opto-Mechanical FAI Requirements:

- a. FAI should include:
- Verification of dimensions and appropriate drawing notes for a minimum of three samples;
  - Verification of transmission or reflection performance via measurement of a witness sample from the same coating run that produced the part being measured for the FAI or measurement of the parts themselves;
  - Material certification for the raw substrate material
- b. FAI submission for optics shall include reliability test results when specified on the Christie drawing.
- c. FAI Transmission and Reflection measurement results should be provided in both graphical (coating curve) and in tabular (spreadsheet) formats.

#### 3.6.2.2 Witness Samples

- a. For optical coatings, witness samples shall be produced for each coating run unless reflectance or transmission will be measured using actual production parts.
- b. Witness samples to be placed in coating chamber to represent worst case variation.
- c. Witness samples shall be retained for a minimum of five years

#### 3.6.2.3 Optical Coating Reliability Tests

- a. Coating reliability tests as specified on the drawing/specifications shall be performed for every production coating run.
- b. Records of reliability tests shall be retained as specified by this document.

#### 3.6.2.4 Optical Modules

- a. Electronic assemblies within optical modules shall be built and repaired according to IPC-7711, IPC-7721, IPC-A-610 class 2 for high performance electronic assemblies (most recent issues) unless otherwise specified in the module specifications.



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- b. An Acceptance Test Procedure (ATP) shall be provided to and approved by Christie prior to production launch.
- c. Evidence that the product meets all requirements in the Module Specification shall be provided prior to production approval.

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### 3.6.3 Measurement / Inspection Requirements for Mechanical Parts (not applicable to OTS (off-the-shelf) parts)

	FAI requirements		
	Prototyping and Engineering approval (EPR)	Production (PPR)	Supporting documents
<u>Dimensional including drawing notes</u>	Minimum (1) part measured as per drawing	Minimum (1) part measured as per drawing	Marked-up drawing Dimensional inspection report with tolerances and pass and fail or reject/accept result including Notes
<u>Material and functional</u>	As requested	<u>To be submitted with FAI</u>	Raw Material Certification or CofC (Certificate of Compliance), at the discretion of GSQ.ROHS & REACH Certificate If applicable, functional testing records with pass and fail results. Secondary processes to be reported on FAI (coatings, painting etc.) Note: Certifications and quality reports provided to CDS may vary in content and complexity. Acceptance will be at the discretion of GSQ.
<u>Appearance (where specified)</u>	As requested	Colour samples/ chips on the same substrate as the part shall be provided by supplier for appearance / colour match approval when requested	Paint material data sheet Samples shall be individually labeled with: Supplier name; Paint code and paint manufacturer; Paint colour, Paint Texture, Project name; Approved by Christie _____
<u>Process control</u>	As requested	Process Control Requirement shall be agreed with GSQ prior	Process flow chart , or process control plan, or job traveler , and testing plan

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		to first production run for critical features	
<u>Safety Critical Part</u>	as requested	Certificate of compliance /UL file	Part/ packaging label Certificate of compliance

### 3.6.4 Measurement / Inspection Requirements for Electrical / Electronic Parts

1. Designed by Christie- Typically PCB assemblies, harnesses;
2. Supplier Custom Design for Christie- Typically power supplies, ballasts, board assemblies;
3. OTS (Off the Shelf)- Typically PCB assemblies, harnesses, electronic components, power supplies, motors, fans, fluid movers (e.g. compressors, pumps)

	REQUIREMENT	1- Designed by Christie	2- Supplier Custom Design for Christie	3- OTS
GENERAL	All Christie assemblies shall be built and repaired according to IPC-7711, IPC-7721, IPC/WHMA-A-620, IPC-A-610 CLASS 2 FOR HIGH PERFORMANCE ELECTRONIC PRODUCTS (MOST RECENT ISSUE) guidelines unless otherwise specified in the assembly/module spec.	X	X	IPC Class 2 min.
Pre-prototype Reviews and planning to be done between Christie and Supplier as required	Design review DFM and DFT Performance and reliability test scope planning Safety critical items review	X	X	



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PROTOTYPING AND ENGINEERING APPROVAL – The following data information to be provided as required	Visual inspection		X	X	
	DFM/DFT review for manufacturability and testability and reporting problems		X	X	
	Design validation test results			X	
	CRD (Comprehensive RoHs Declaration), REACH, WEEE		X	X	X
	Harness continuity/short, Signal Integrity crimp height, Hi-pot, dimensional measurement, pull test results		X	X	Tested to assure compliance
	Special handling procedures if required		X	X	X
PRODUCTION 1ST ARTICLE The following data to be provided as required	ICT and functional test plan and coverage data		X	X	
	Harnesses: continuity/short, Signal Integrity crimp height, Hi-pot, dimensional measurement, pull test results		X	X	
	Regulatory Agency Approval Data (such as UL, CB, etc. reports and certificates) as required			X	X
ONGOING PRODUCTION- The following data to be available as required.	Boards, Ballasts, Power Supplies	- Production process yield data - ATP: Special instructions as agreed	X	X	
		FP, ICT & FCT test results based on agreement between Christie and supplier	X	X	
	Harness	Continuity/short, Signal Integrity, Hi-pot Sampling: Pull test; crimp height; strip ATP: Special instructions as agreed	X	X	
RMA	Supplier to have repair analysis database of all rejected material and provide feedback upon request		X	X	When Requested

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### 3.7 Packaging

- a. Packaging to assure product integrity, and cleanliness during transportation.
- b. Packaging shall be sufficient to meet the ASTM D4169-16 “Standard Practice for Performance Testing of Shipping Containers and Systems”. It also should meet the similar ISTA “International Safe Transit Association” standard for shipping containers. The containers must be able to meet the specified drop tests and vibration requirements. It is recommended but not mandatory to test all packages to this standard however if there is any damage during shipping, this standard will be used to determine if the packaging was sufficient.
- c. All goods, wrappers, and containers shall be packed, marked and labeled as required by federal, provincial and municipal laws and regulations for the protection and safety of persons and property.
- d. Supplier should follow the requirements outlined in spec 010-101136-01, CDS Guideline For Packaging for packaging design/marketing and material selection. As a general rule, material used for packaging should be chosen from environmental friendly recycling materials and supplier should avoid any excess packaging if not mandated.
- e. Goods must be boxed, packed or crated so as to qualify for lowest freight or transportation rates, and to prevent damage to the goods during transit.
- f. ESD-sensitive material to be packaged in ESD safe protective material/containers.
- g. Large PCB’s to be delivered in slotted shipping containers/trays. Smaller boards can be bulk packed provided they are adequately protected.
- h. Special packaging for custom parts/assemblies specified on drawings is subject to Christie’s approval.

### 3.8 Christie’s property including intellectual property at supplier

- a. Supplier shall have a documented procedure to identify, verify, protect and safeguard Christie property for use or incorporation into the product.
- b. Christie owned tooling (includes: molds, fixtures, gauges, testing equipment) or other property (including intellectual property) shall be under supplier’s control.

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- c. Any modifications or improvements to Christie owned tooling must be approved by Christie GSQ prior to changes.
- d. Any damage or defect on Christie owned tooling or other property shall be communicated to Christie within 24h after preliminary investigation and provide interim action plan associated.

### 3.9 Control of monitoring and measuring devices

- a. A Calibration Control Program and Preventative maintenance must be in place for control of monitoring on measuring devices/gauges/ testing equipment/fixtures. Measuring equipment calibration shall be traceable to national or international standards. Any Christie designed test equipment shall be on supplier's Calibration Control Program.
- b. Calibration, inspection and maintenance records shall be maintained. Calibration status shall be defined on gauges, fixtures and /or instruments.

### 3.10 Nonconforming Product Control

- a. Supplier shall have an established system of non-conformance control to prevent defective product from being shipped to Christie. If suspect or non-conforming parts have been shipped, GSQ shall be notified immediately.
- b. Any request to use non-conforming material or material deviating from current officially released drawing must be through a completed Supplier Deviation and Change form. Form can be provided by GSQ. Approval from Christie in writing is required before shipping.
- c. Rework/sort activities include:
  - i. Local third party may be hired by Christie Supply Coordinator on behalf of supplier for urgent containment action on nonconforming products received from supplier in Christie stock.
  - ii. Supplier will be notified prior to rework /containment action, and material disposition after sort, and costs to be agreed.
- d. Returned parts:
  - i. Supplier shall maintain records of parts returned from Christie. Records shall include quantity of parts returned, reference to RMA or some other means of tracking return, serial/lot/batch number (if applicable), reason for return, disposition of parts and details on any rework/repair completed on the parts. Records shall be available for supply to Christie upon request.

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- ii. Any rework or repair done to a part must be completed in accordance with documented and approved instructions. Approved instructions shall be available for supply to Christie upon request.
- iii. Any processing on a returned part which is done outside of approved processes, or does not bring the part into compliance with specifications will require approval from Christie prior to shipping the parts to Christie.

### 3.11 Supplier Corrective Action Requests (SCARs)

- a. Non-conformances conveyed by Christie via Supplier Corrective Action Request (SCAR) require :
  - i. Interim action plan for containment and effective date (e.g. replacement timing/rework/ sort at supplier);
  - ii. Root cause analysis shall be provided as per SCAR form;
  - iii. Final solution plan shall include preventive action plan to prevent causes from recurrence and implementation date. Corrective action shall address the actual root cause(s);
  - iv. Verification plan shall include method of verification that the actions taken were effective (E.g. FAI/ dimensional measurement/inspection record/ capability study etc.).
- b. Supplier shall provide supporting documents with the SCAR response.
- c. Records of the SCARs and supportive documents shall be archived as specified by this standard.

### 3.12 Christie Scorecards

- a. Suppliers may be selected to receive a periodic scorecard. Scorecards are used to convey feedback on the supplier's performance and should be used as a tool for continual improvement.



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### 3.13 SUPPLIER ACKNOWLEDGEMENT SHEET

(To be returned to Christie Global Supplier Quality)

The undersigned certifies on behalf of \_\_\_\_\_ (the "Supplier") that the Supplier acknowledges, understands and will comply with the Quality Requirements set forth on Christie's Supplier Quality Standards Document 00-101164-01.

Supplier Name \_\_\_\_\_

Name (Please Print) \_\_\_\_\_

Signed \_\_\_\_\_

Title \_\_\_\_\_  
(Quality Manager or Authorized Signing Officer)

Date \_\_\_\_\_

Request for deviation to the above document- to be listed below and please attach details if required:

- 
- 
- 
- 

Christie Agreement (Name Print and Signature, Title and Date):

\_\_\_\_\_