

# Loadstar Sensors Quality Manual

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Revision 3.00

October, 2021



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## 1 Quality Manual Control

The CEO and designated Management Representative control Quality Manual issue and approval. Electronic copies of the latest controlled version of the manual are controlled and available for review by employees on the intranet. This Quality Manual is the property of Loadstar Sensors and may be distributed with the understanding if it is copied or used in any way, the original Loadstar Sensors document is credited. Printed manuals are issued as "Reference Only" copies and are uncontrolled. Uncontrolled manuals will not have any specific numbering or registration. Issue of an uncontrolled copy is for informational purposes and as such will not be updated with any revisions.

The Loadstar Quality Management System is periodically assessed to reaffirm that the established controls are adequate.

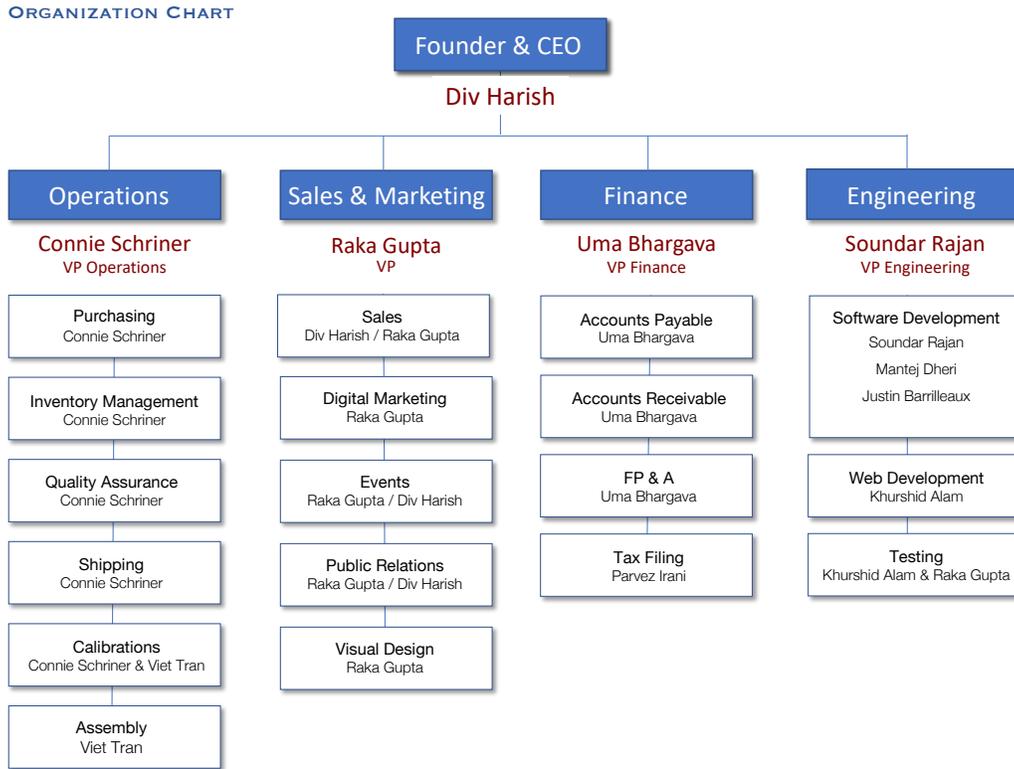
## 2 Company Background and Locations

Loadstar Sensors was established in 2003 to develop and market sensor solutions, with an initial emphasis on load cells. Loadstar combines robust, sensitive sensing with modern communications protocols to provide load cells for automotive, aerospace, medical and industrial applications. We offer a wide range of standard sensors for force, torque, pressure, level, and displacement. We also work closely with partners to develop new products based on our core technology.

Our goal is to develop our Quality System in line with the requirements of ISO 9001:2000 and exceed it where needed to assure exceptional customer satisfaction while maintaining beneficial relationships with sales partners and suppliers.

Currently Loadstar Sensors operates out of a single location in Fremont, California and all marketing, sales, research & development, manufacturing and operations are conducted there. We have sales representatives who partner with us in key geographies and markets and suppliers in North America and Asia.

### 3 Organization



**Figure 1. Loadstar Sensors Organization**

#### 3.1 Training

Employees are hired based on their qualifications to perform specific job functions. Senior Management is responsible for providing them training in the basic skills needed to perform those job functions and for supporting opportunities to expand or enhance employees' skills and to provide necessary additional training as necessary to ensure the competence of personnel performing work affecting product quality and customer satisfaction. Competence is determined on the basis of the employee's education, training, skills and experience and ongoing performance.

## 4 Quality Management Model

The Loadstar Sensors Quality Management model is divided into four aspects that cover the entirety of our business:

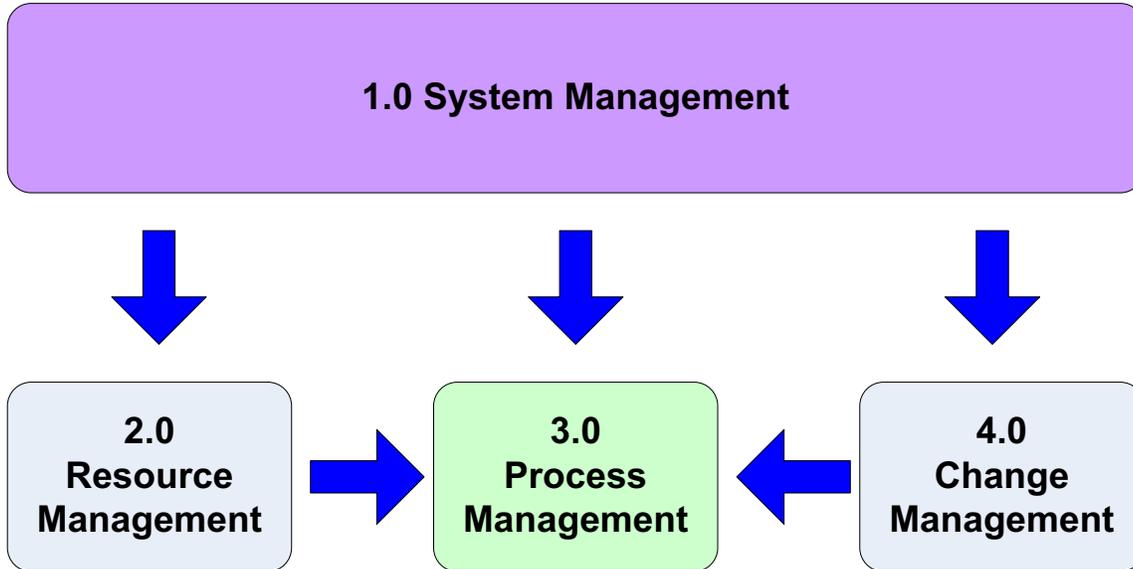


Figure 2. Loadstar Sensors Quality Management Model

### 1.0 System Management

Senior Management, consisting of the CEO and Vice Presidents, is responsible for ensuring that the Quality System is defined and deployed, and for actively seeking opportunities to continuously improve. The elements include Annual Quality Planning, at minimum annual Management Review to ensure the system is effective, this Quality Manual defining the components of the system, and a Quality Scorecard (to be defined) containing key quality metrics that monitor the ongoing effectiveness of the Quality System and Loadstar Sensors' business.

### 2.0 Resource Management

Senior Management is responsible for providing sufficient resources and for creating an environment to enable successful implementation of its business strategy. These include finance, facilities, environmental health and safety, available and capable equipment, qualified effective employees, quick access to required information and opportunities for continual learning.

### 3.0 Process Management

Senior Management is responsible for ensuring that the company's core processes are defined, effectively deployed throughout the organization and that all employees are actively engaged to

follow the defined process, or to cause the process to be improved. These include customer development, product development, supplier development, production and customer service.

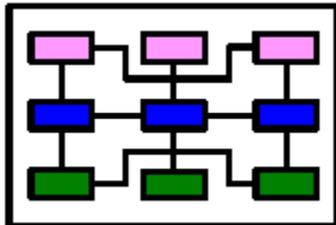
#### 4.0 Change Management

Senior Management will establish processes to monitor and analyze the business systems to ensure that processes are working effectively and when opportunities arise to decisively take corrective or preventive action. These monitoring processes include product and process reviews, a problem solving methodology to execute root cause analysis. Process metrics will be established to monitor the effectiveness of the change management systems and are to be reviewed at least annually by Senior Management team during Management Review.

**Note:** All personnel who manage, perform, and verify work affecting product and service quality are responsible for implementing the quality system. The Vice President of Operations, as the Management Representative for Senior Management, is primarily responsible for coordinating, monitoring, and maintaining the system.

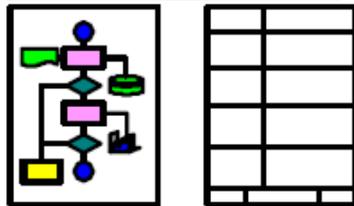
### 4.1 Quality Management System Structure

The Quality System is defined and documented at four levels:



**Level 1:**

The Loadstar Sensors Quality System is defined by the Quality Manual and associated Policies which describe the relationship of the various processes that together make up our business. This level is owned by Senior Management.



**Level 2:**

Process maps and associated matrices document Level 2, which links all elements of the Quality System and define Level 3 activities. Owned by qualified Process Owners.



**Level 3:**

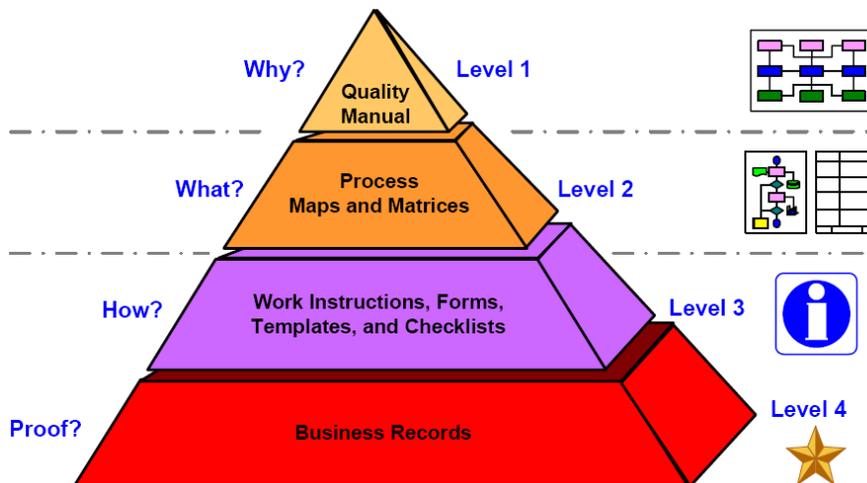
Instructions, forms, templates, databases, and checklists comprise the Level 3 documentation. These documents are used to define how an activity is performed and to record the results of specific business activities required by the process maps or matrices.

Owned by qualified Process Users of the system.



**Level 4:**

Business records are retained as evidence of the compliance and effectiveness of the activities defined in the Quality System. Each Level 2 Process Map defines how the business records generated by that process is managed.



**Figure 3. Loadstar Sensors Quality Management Structure**



## 5 Quality Management System Requirements

The Loadstar Sensors Quality Management System will clearly and concisely document the responsibilities of individuals who carry out activities related to the level of quality for product or services provided to Loadstar Sensors' customers.

Each critical process within the Quality Management System is documented in a process map. The process map is the responsibility of the process owner designated on that map. Process Owners are responsible for capturing best business practices within that process, ensuring that the process reflects current best practice and for changing the map when opportunities for improvement are identified. Process Users will be trained on the current version of the process, agree to follow defined best practice, or cause the process to be changed when they identify an improvement opportunity.

### 5.1 Loadstar Sensors Quality Policy

*It is the policy of Loadstar Sensors to provide products and services of the highest possible standards that meet or exceed our customers' needs for quality, safety and reliability. We specify the acceptable ranges for key parameter for every sensor we sell and meet or exceed this goal for every shipped order. We seek to continually find opportunities to improve our processes and products to keep achieving this goal.*

### 5.2 QMS Document Control

Documentation that describes the structure and processes of the Quality Management System are controlled using the same processes as the Change Order process that controls product and physical process documentation. The only difference is that the authority to approve changes for QMS documentation depends on the level of the documentation as follows:

- Level 1. Senior Management must approve all changes
- Level 2. The Process Owner approves changes that are fully contained within a process map. If changes affect other processes, all affected Process Owners approve the change.
- Level 3. The Process Owner of the process(es) that use the Level 3 document as well as document owners approve.
- Level 4. Since these are quality records, no changes are permitted. Any amendments may be appended to records to fix errors.

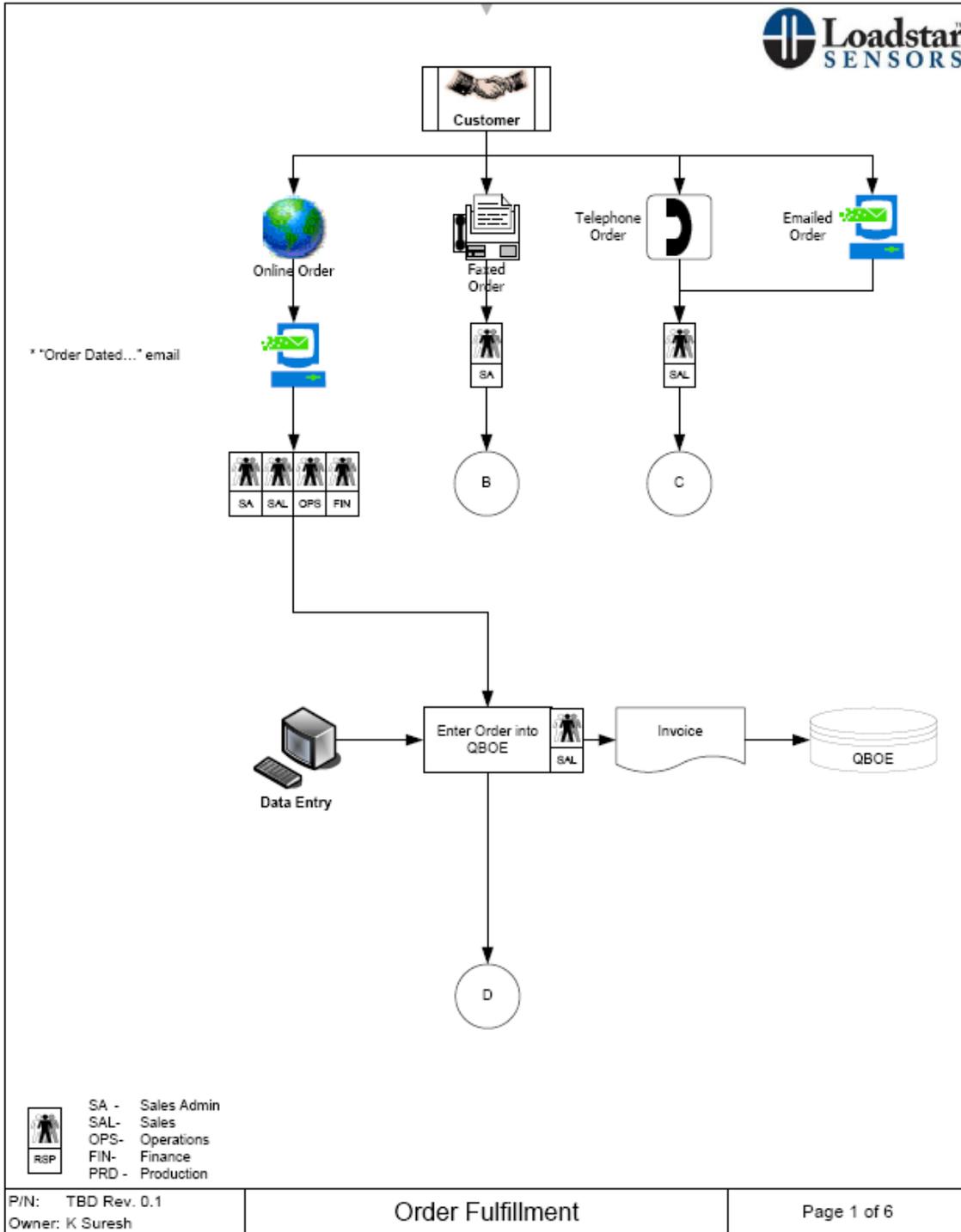
### 5.3 Equipment Calibration

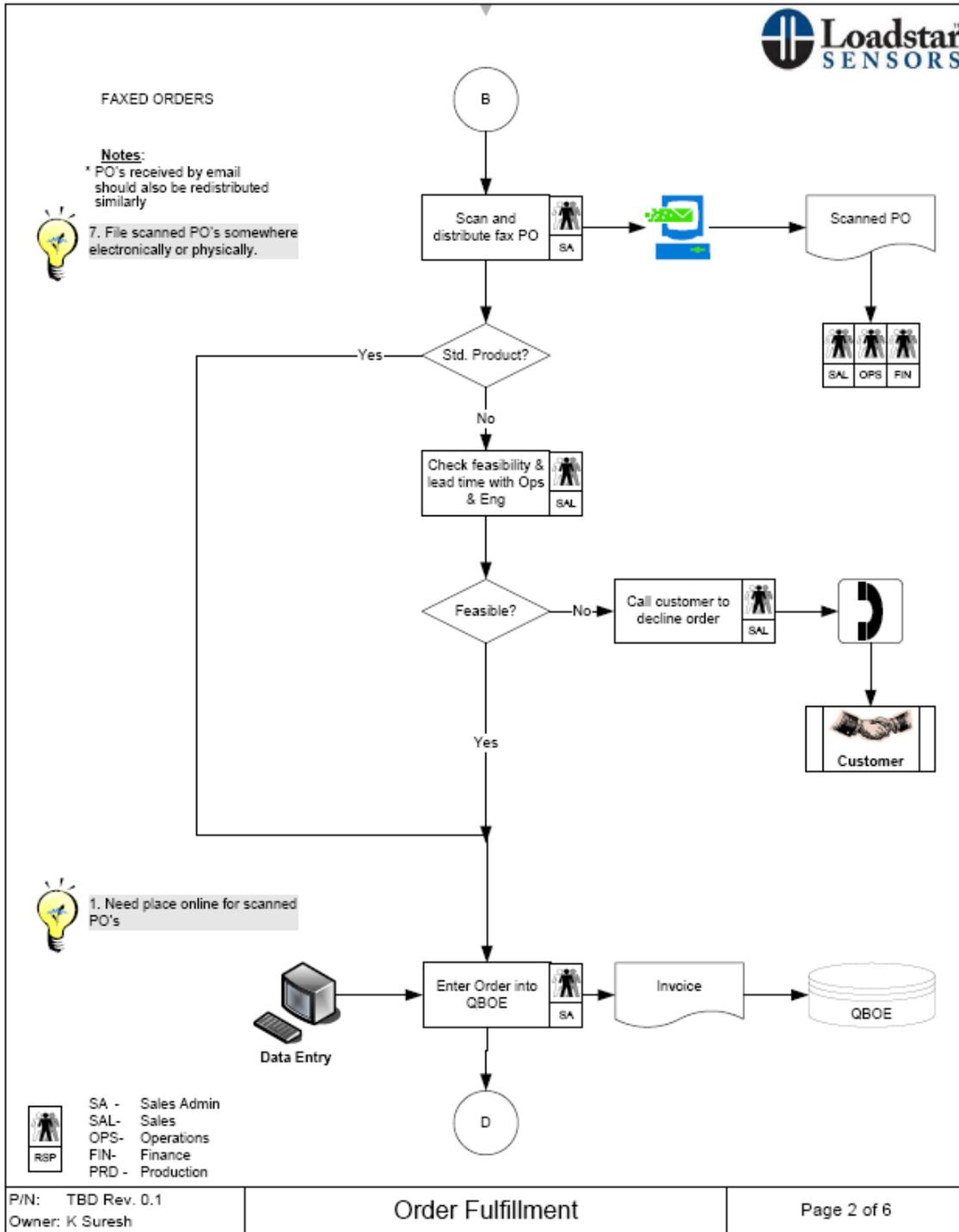
Equipment Calibration is owned by Process & Test Engineering within the Operations function. In summary, a list of equipment that requires calibration is generated and the calibration requirement and frequency for each type of equipment is determined. In general, most equipment is calibrated once a year while calibrated deadweights have a calibration frequency of 3 years (unless visible damage is observed). Equipment is sent to approved external calibration laboratory for calibration and calibration labeling. Calibration records are maintained by Process and Test Engineering on paper.

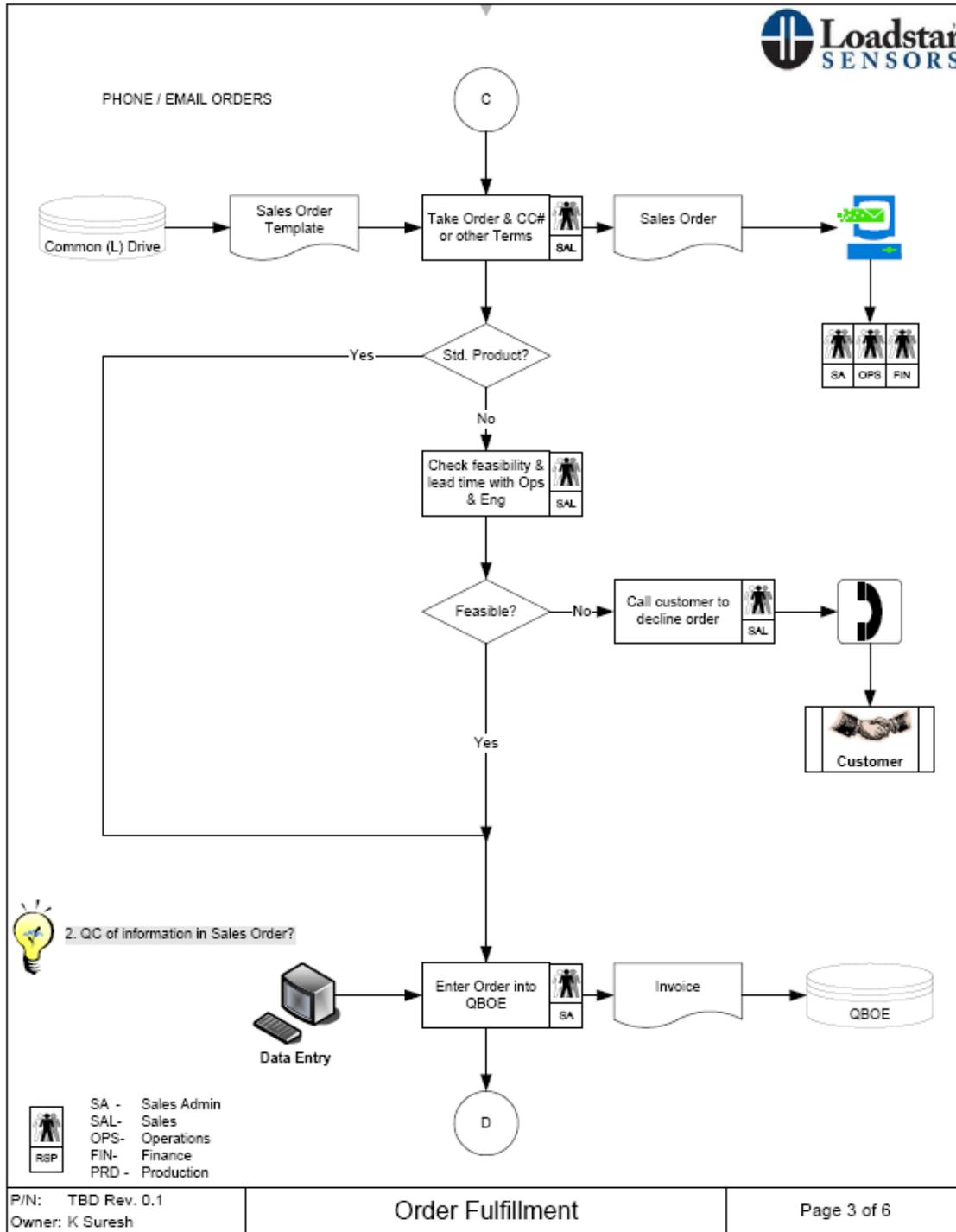
## 6 Key Process List

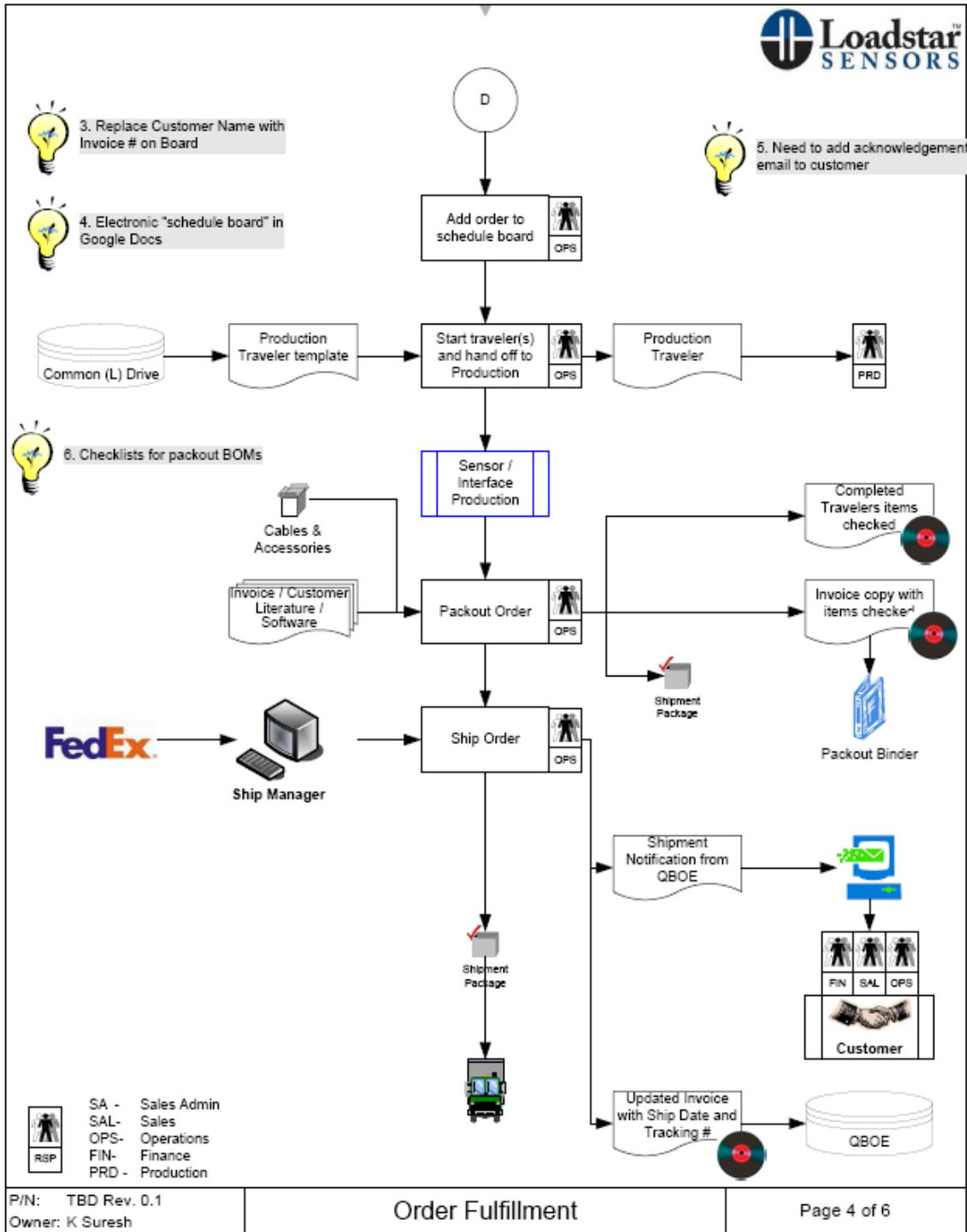
Note that as the Loadstar Sensors Quality Management System matures and as the size of the organization grows, more processes are expected to be added to this list.

<i>Process Number</i>	<i>Process Name</i>	<i>Status</i>
<b>1.0 System Management</b>		
LS1-00-L01	Loadstar Sensors Quality Manual (this document)	DONE
LS1-00-P01	Management Review	DONE
<b>2.0 Resource Management</b>		
LS2-00-P01	Equipment Calibration	DONE
LS2-00-P02	QMS Document Control	DONE
<b>3.0 Core Process Management</b>		
LS3-00-P01	Order Fulfillment	DONE
LS3-00-S01	Product Life Cycle	DONE
LS3-00-P02	Supplier / Component Qualification	DONE
LS3-00-P03	RMA Process / Failure Analysis	DONE
LS3-00-P04	Change Order (ECO)	DONE
LS3-00-P05	Sensor Manufacturing Process	DONE
LS3-00-P06	Production Purchasing / Receiving	DONE
<b>4.0 Change Management</b>		
LS4-00-P01	Corrective Action / Preventive Action	DONE



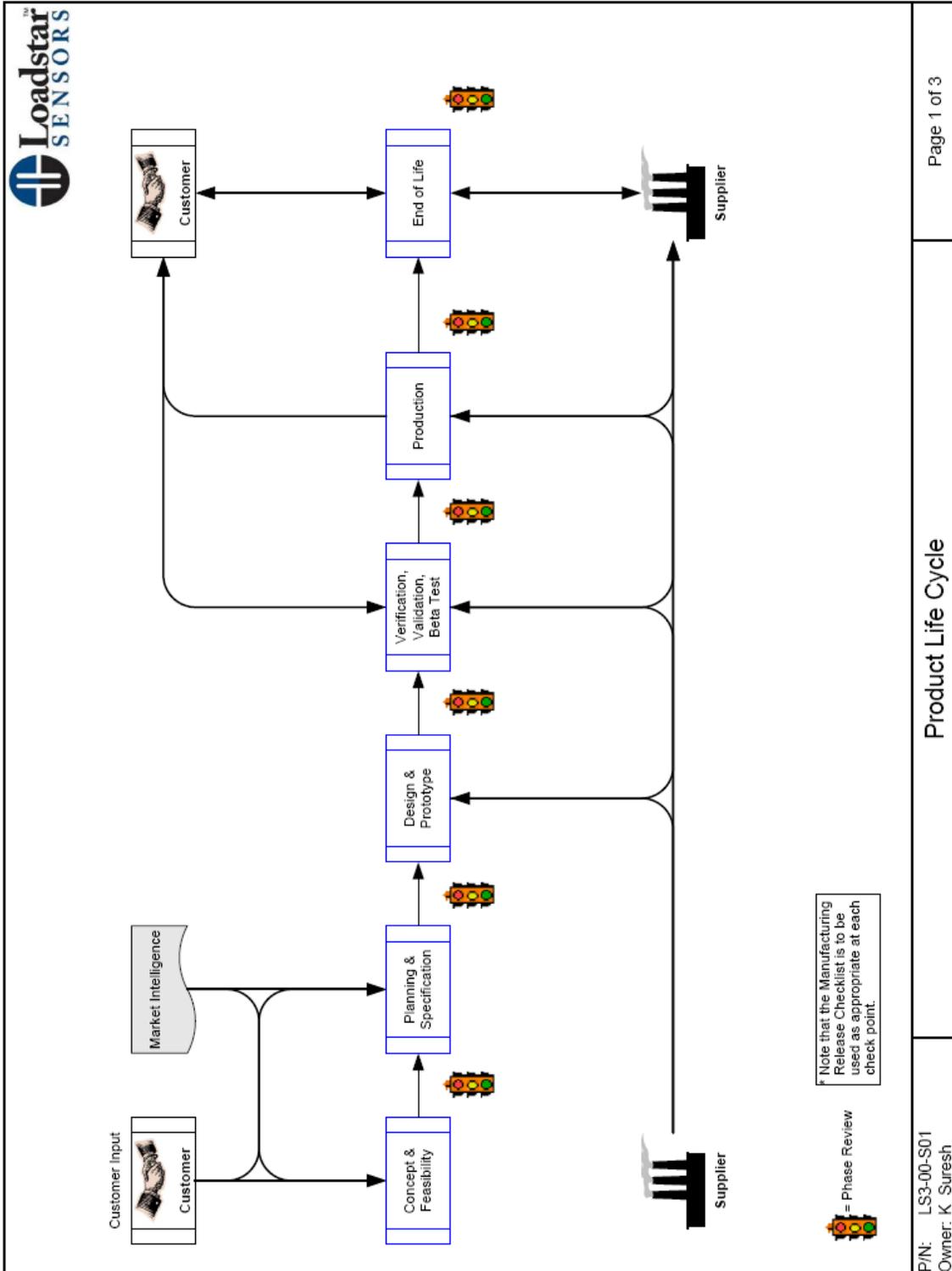




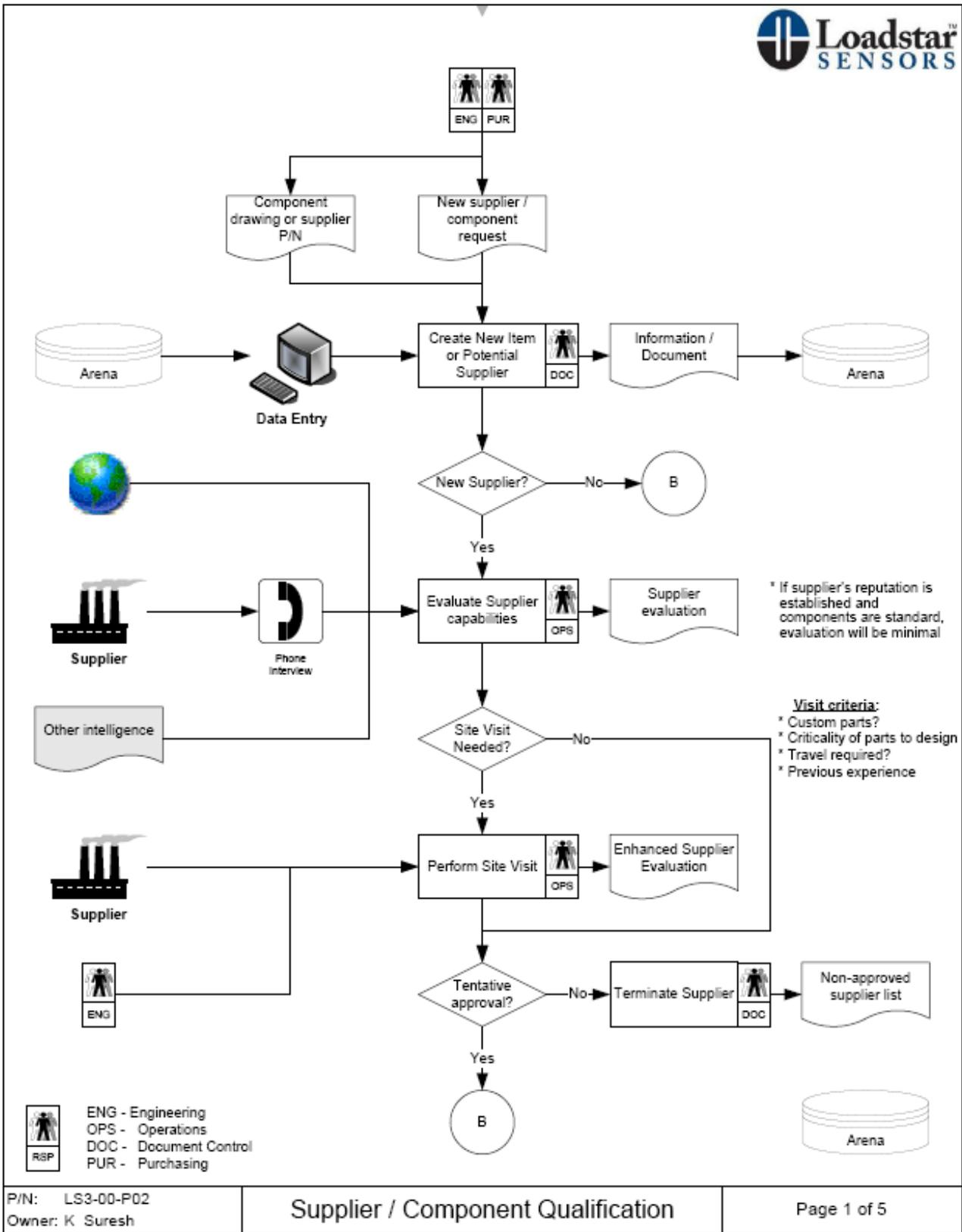


		Problems & Opportunities
No.	Priority Urgent / Important / Improvement	<u>Description</u> Describe each problem or opportunity. Include enough detail that it can be prioritized and acted upon.
	Improvement	Need place online for scanned PO's
	Important	QC of information in Sales Order?
	Improvement	Replace Customer Name with Invoice # on Board
	Improvement	Electronic "schedule board" in Google Docs
	Urgent	Need to add acknowledgement email to customer
	Important	Checklists for packout BOMs
	Important	File scanned PO's somewhere electronically or physically.
P/N: TBD Rev. 0.1 Owner: K Suresh		<b>Order Fulfillment</b>
		Page 5 of 6

	Process Records		
<u>Record</u> Databases are backed up on the server:	<u>Index</u> Records are indexed by the following key words:	<u>Retention</u> Records are retained for the <u>minimum</u> time indicated:	<u>Disposal</u> Records are disposed of by the following method:
* Completed Travelers	* Invoice Number	* 5 years after ship date	* Shred
* Invoice Copy with Items checked	* Invoice Number	* 5 years after ship date	* Shred
* Updated Invoice with Ship Date and Tracking Number	* Invoice Number	* 5 years after ship date	* Electronic delete
*	*	*	*
*	*	*	*
*	*	*	*
*	*	*	*
P/N: TBD Rev. 0.1 Owner: K Suresh	Order Fulfillment		Page 6 of 6

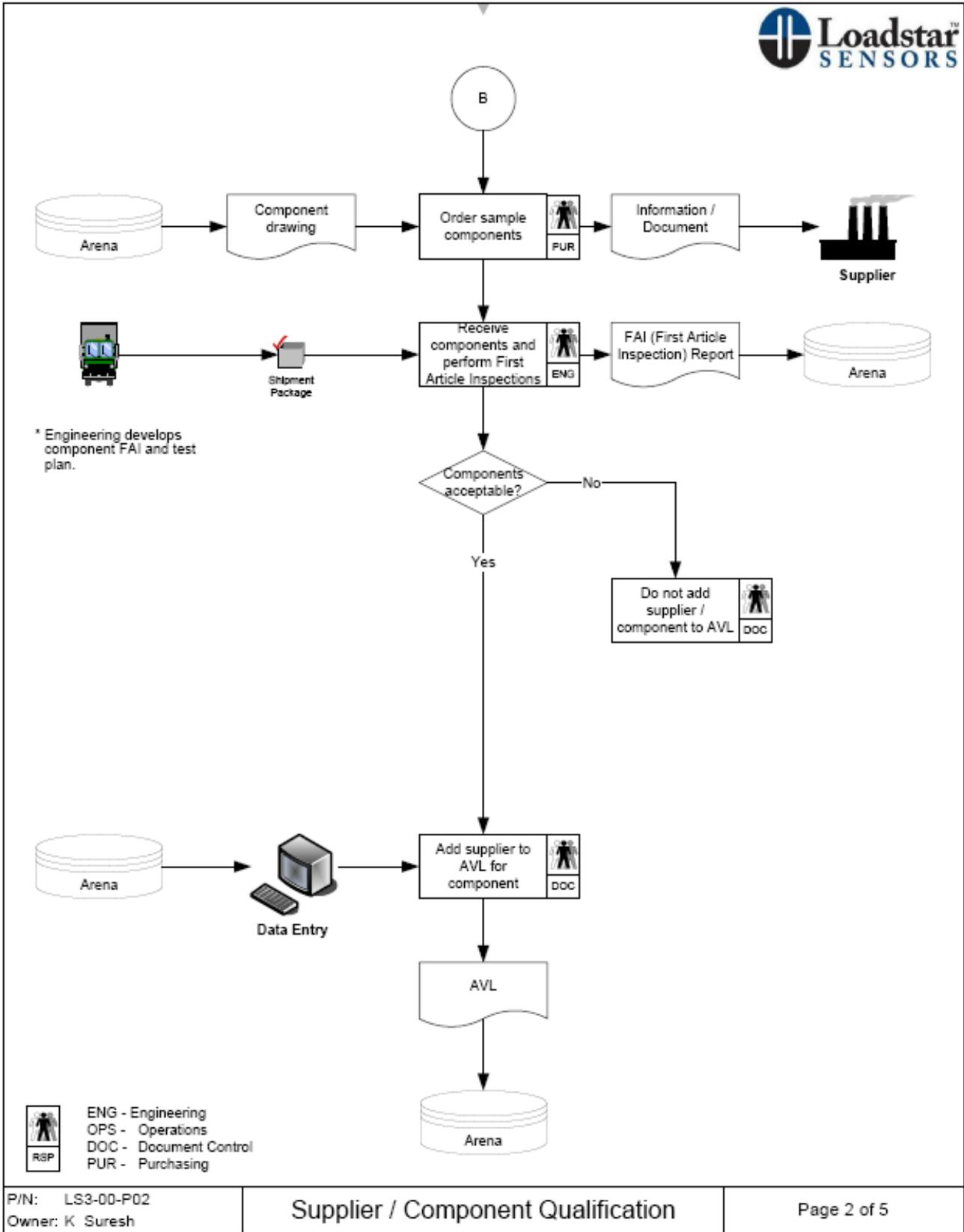


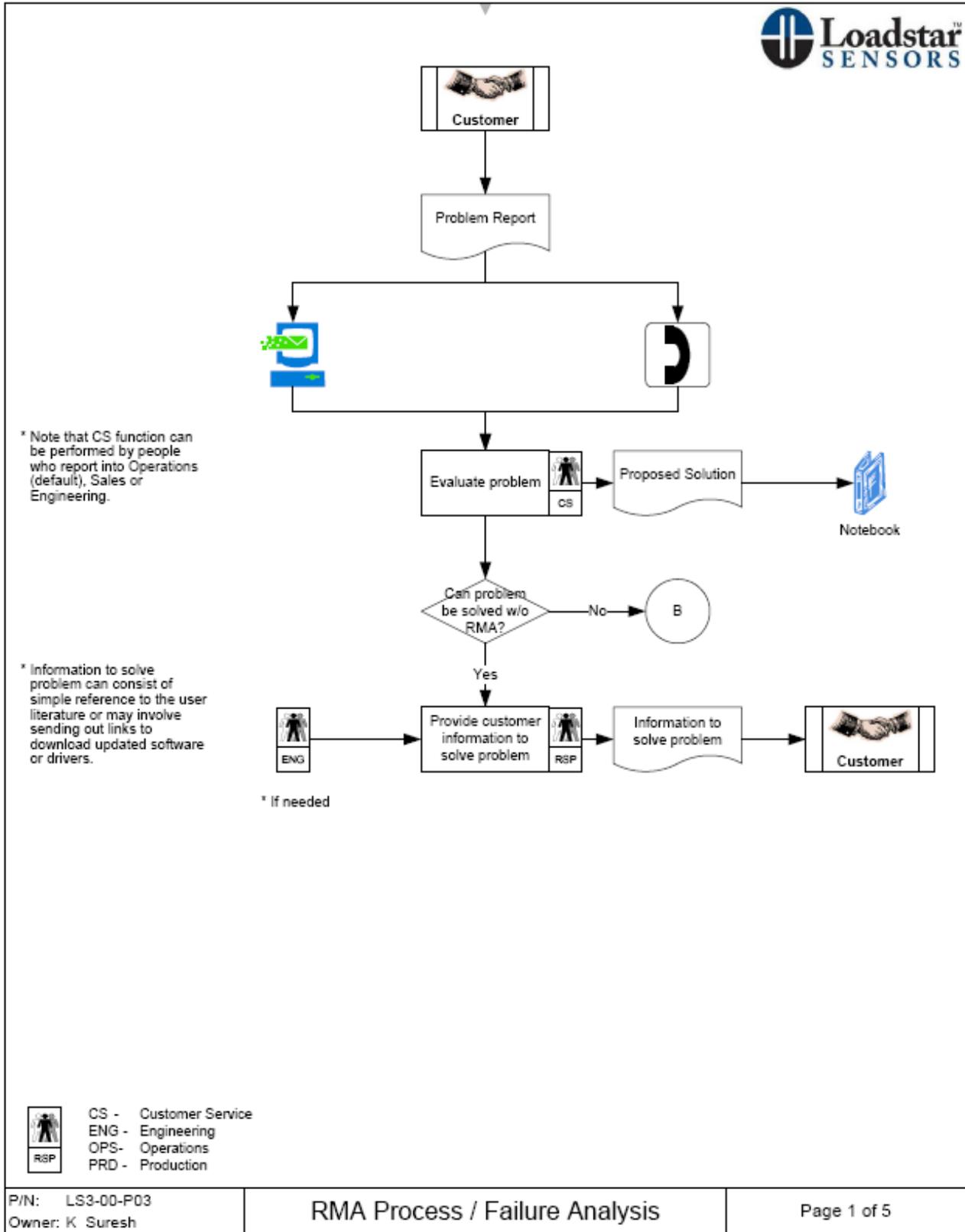


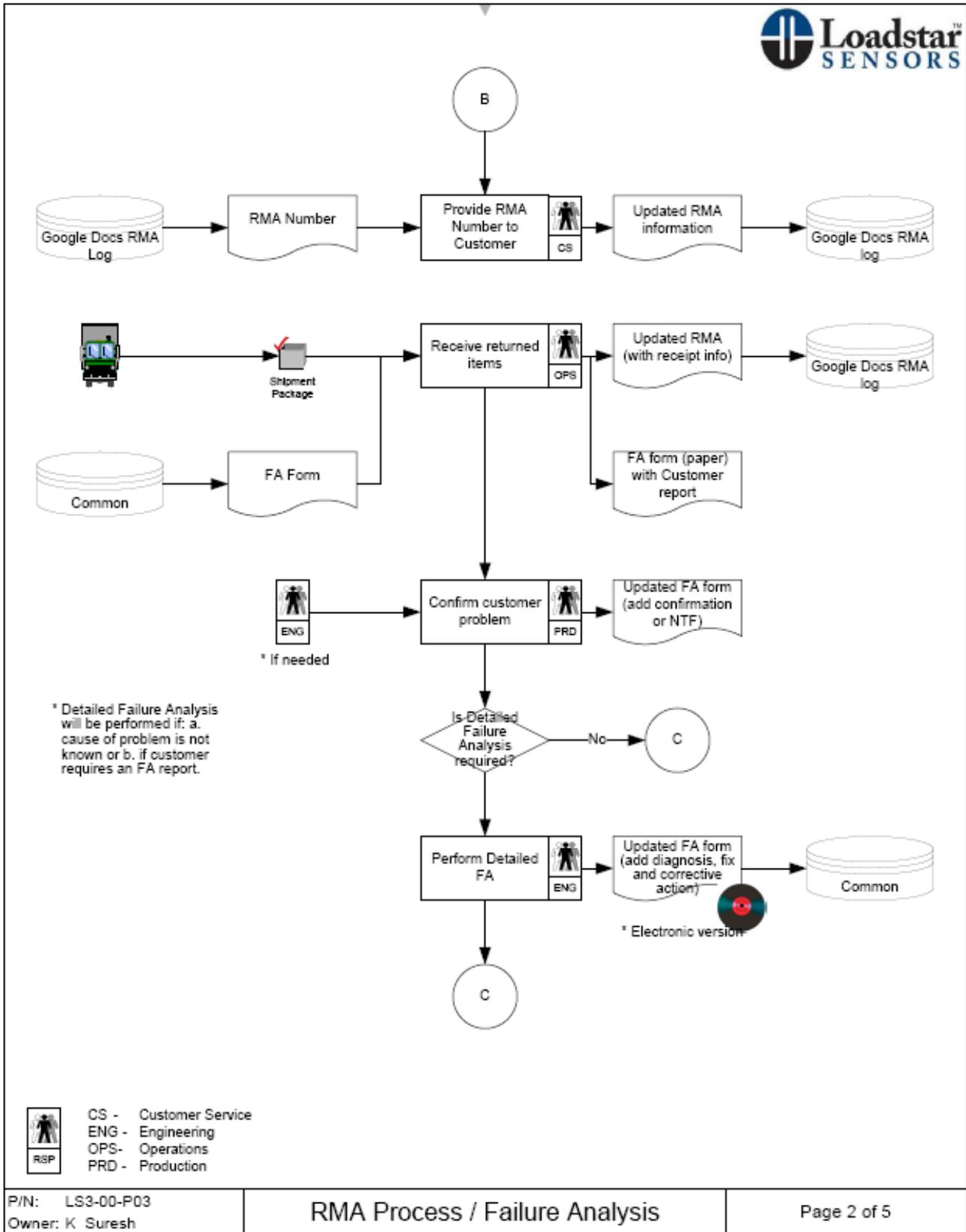


P/N: LS3-00-P02  
 Owner: K Suresh

Supplier / Component Qualification

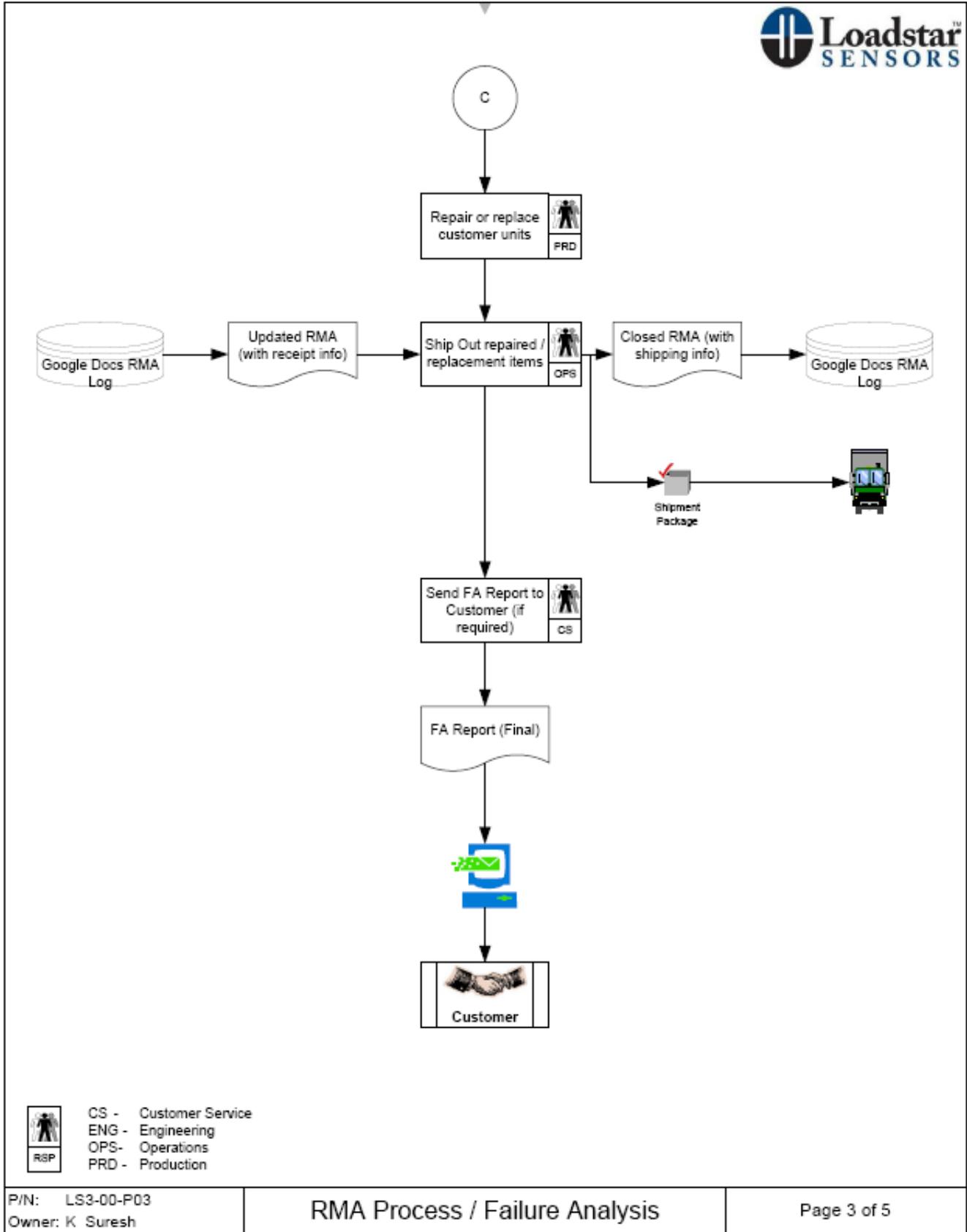






P/N: LS3-00-P03  
 Owner: K Suresh

RMA Process / Failure Analysis



		Problems & Opportunities
No.	Priority Urgent / Important / Improvement	<u>Description</u> Describe each problem or opportunity. Include enough detail that it can be prioritized and acted upon.
	Improvement	
	Important	
	Improvement	
	Improvement	
	Urgent	
	Important	
	Important	
P/N: LS3-00-P03 Owner: K Suresh		<b>RMA Process / Failure Analysis</b>
		Page 4 of 5

	Process Records		
<u>Record</u> Databases are backed up on the server:	<u>Index</u> Records are indexed by the following key words:	<u>Retention</u> Records are retained for the <u>minimum</u> time indicated:	<u>Disposal</u> Records are disposed of by the following method:
* Completed Travelers (example)	* Invoice Number	* 5 years after ship date	* Shred
*	*	*	*
*	*	*	*
*	*	*	*
*	*	*	*
*	*	*	*
P/N: LS3-00-P03 Owner: K Suresh	RMA Process / Failure Analysis		Page 5 of 5



\* Proposed product changes includes new product introductions

Test Results (if needed)

Proposed Product Change

Initiate Change Request  
ENG



OPS DOC MKT

- ECO contents:**
- \* Redline BOMs
  - \* Updated drawings
  - \* Reason for change
  - \* Type of change
  - \* Affected parts
  - \* Other required documentation

AA

Enter / Update ECO into Arena  
DOC



Preliminary ECO



Schedule Review Meeting  
DOC



OPS ENG MKT

B

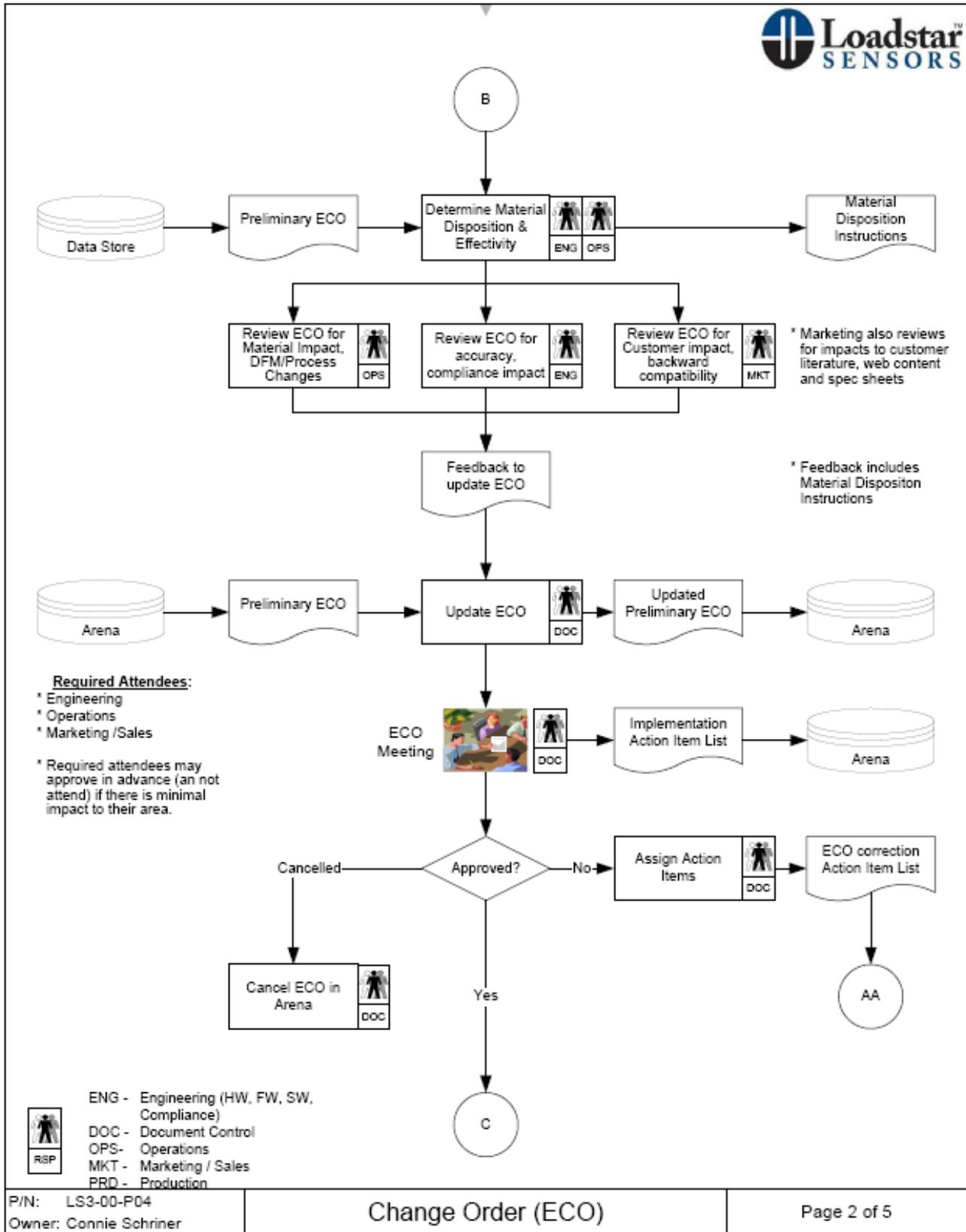


- ENG - Engineering (HW, FW, SW, Compliance)
- DOC - Document Control
- OPS - Operations
- MKT - Marketing / Sales
- PRD - Production

P/N: LS3-00-PD4  
Owner: Connie Schriener

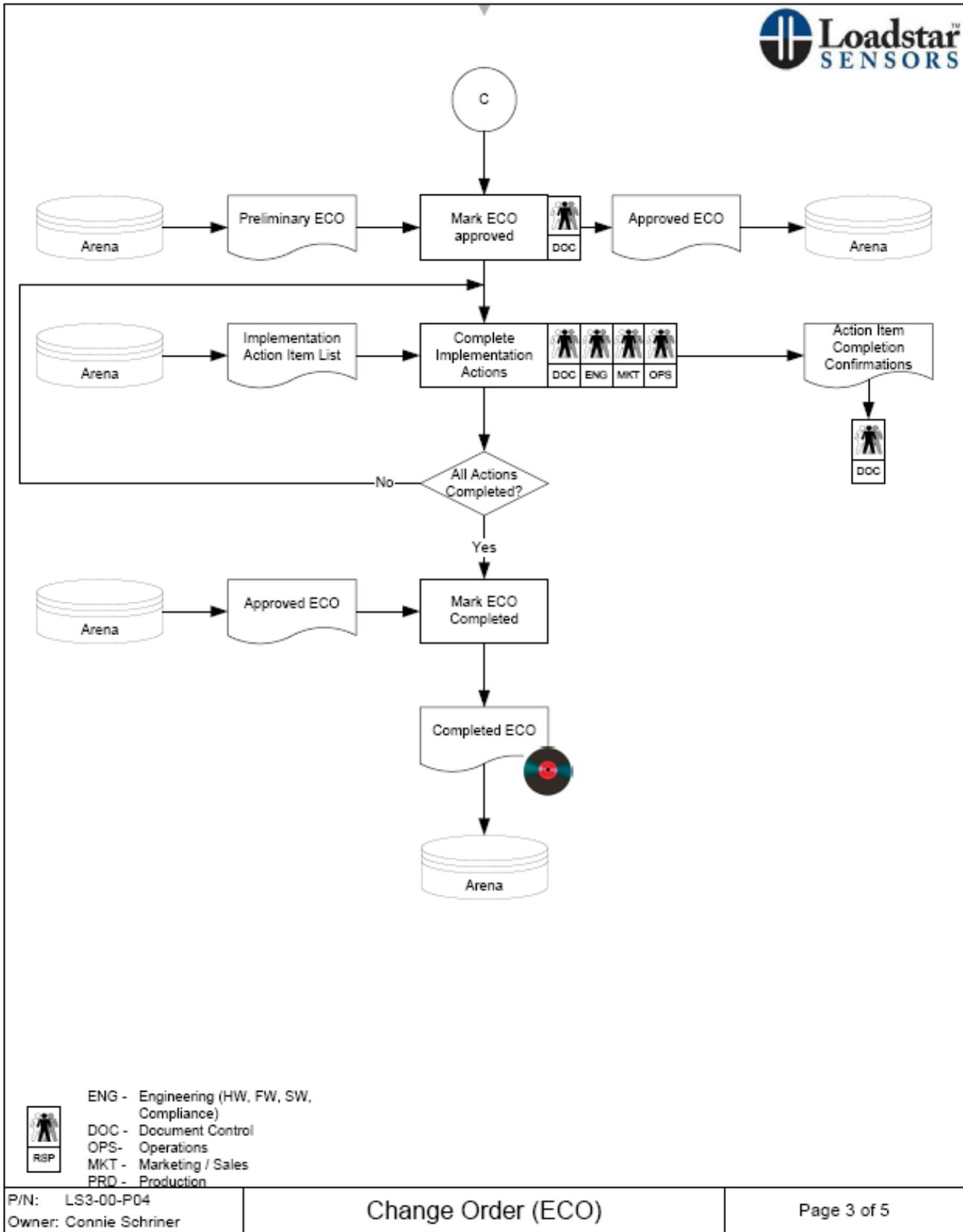
Change Order (ECO)

Page 1 of 5



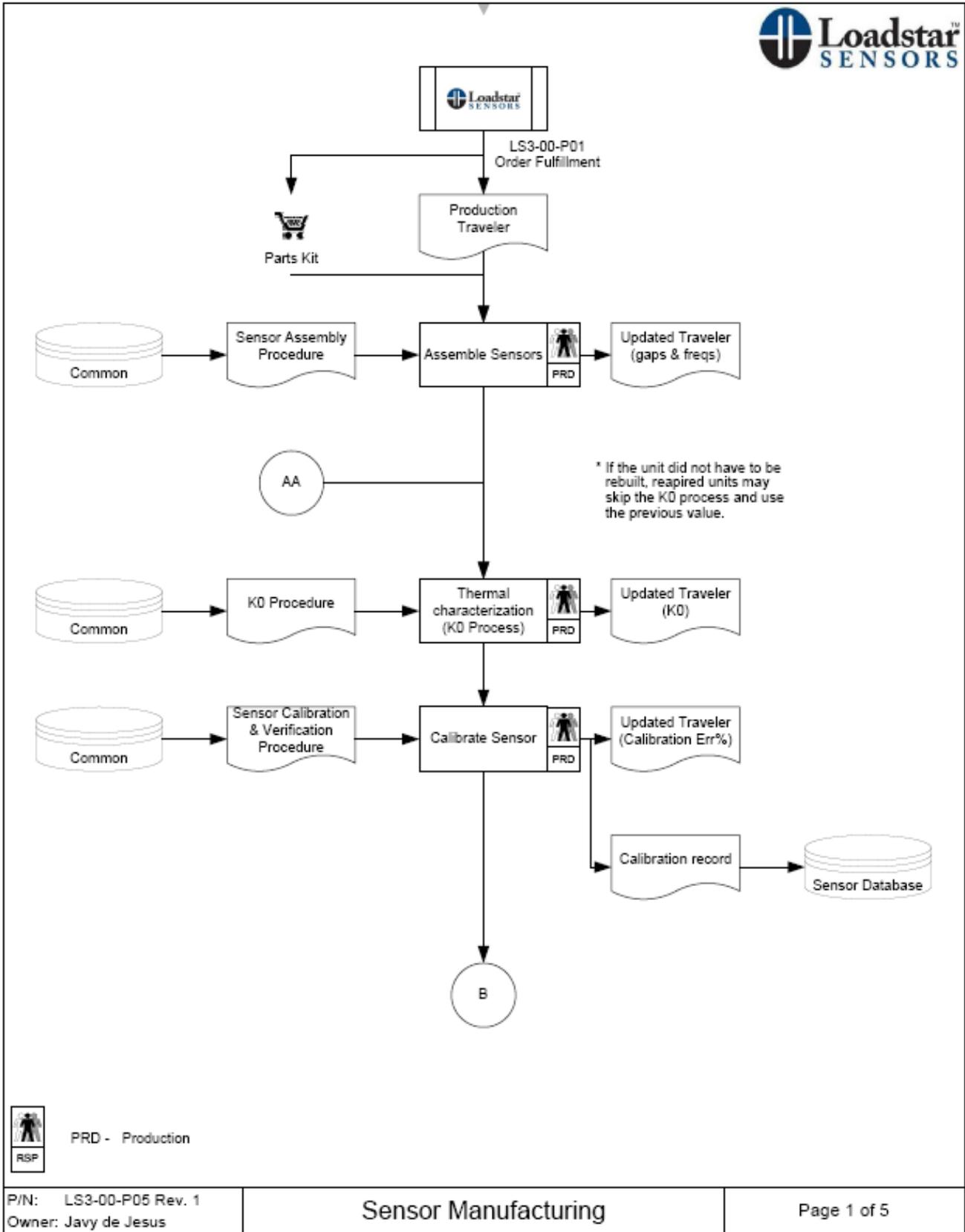
P/N: LS3-00-P04  
 Owner: Connie Schriener

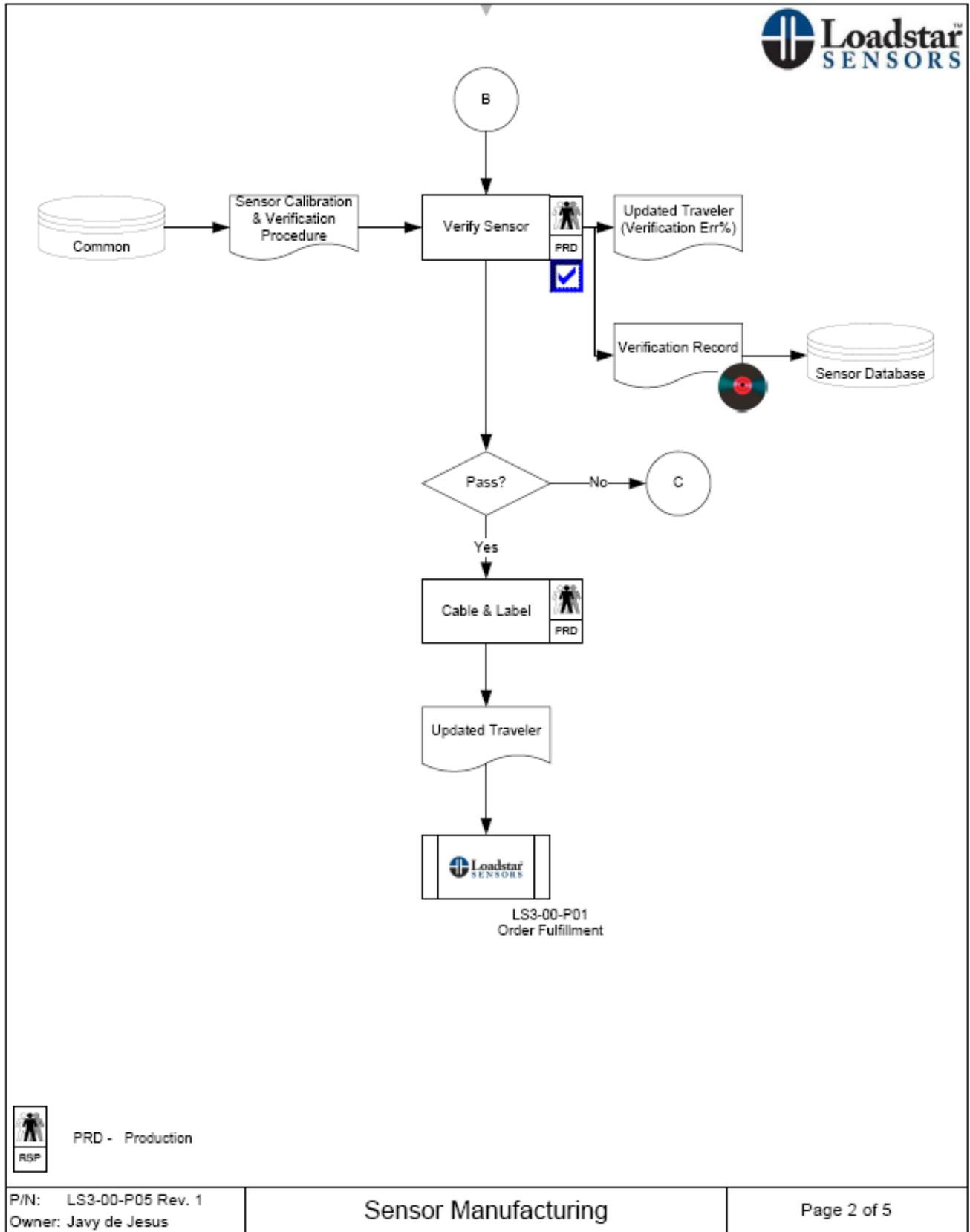
Change Order (ECO)

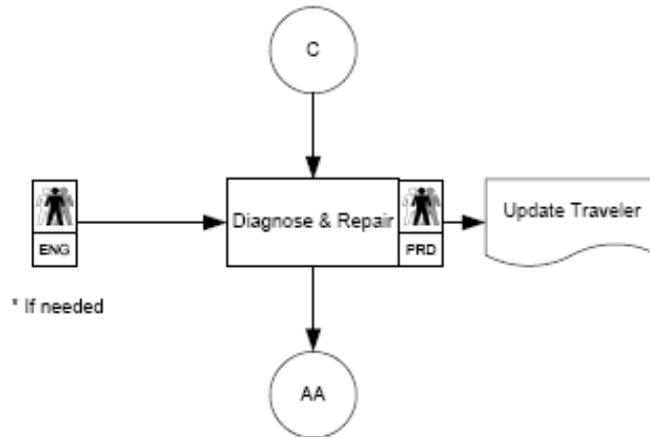


		Problems & Opportunities	
No.	Priority Urgent / Important / Improvement	<u>Description</u> Describe each problem or opportunity. Include enough detail that it can be prioritized and acted upon.	
 1	Improvement		
 2	Important		
 3	Improvement		
 4	Improvement		
 5	Urgent		
 6	Important		
 7	Important		
P/N: LS3-00-P04 Owner: Connie Schriener		Change Order (ECO)	Page 4 of 5

	Process Records		
<u>Record</u> Databases are backed up on the server:	<u>Index</u> Records are indexed by the following key words:	<u>Retention</u> Records are retained for the <u>minimum</u> time indicated:	<u>Disposal</u> Records are disposed of by the following method:
* ECO (Final Stage: Completed)	* ECO Number	* 5 years after all affected parts are obsoleted	* Archive offline
x	x	x	x
x	x	x	x
x	x	x	x
x	x	x	x
x	x	x	x
x	x	x	x
P/N: LS3-00-P04 Owner: Connie Schriener	Change Order (ECO)		Page 5 of 5







PRD - Production

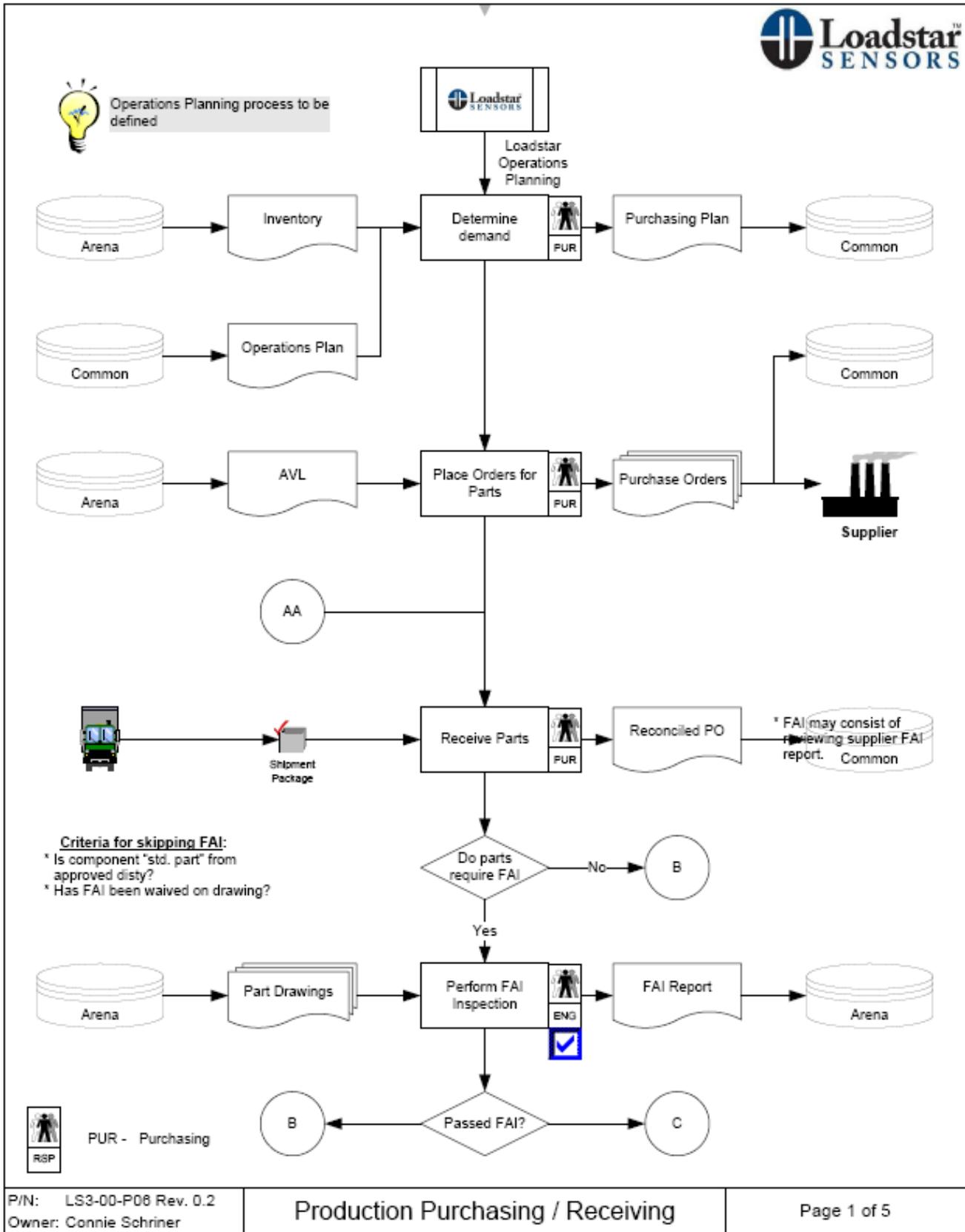
P/N: LS3-00-P05 Rev. 1  
Owner: Javy de Jesus

Sensor Manufacturing

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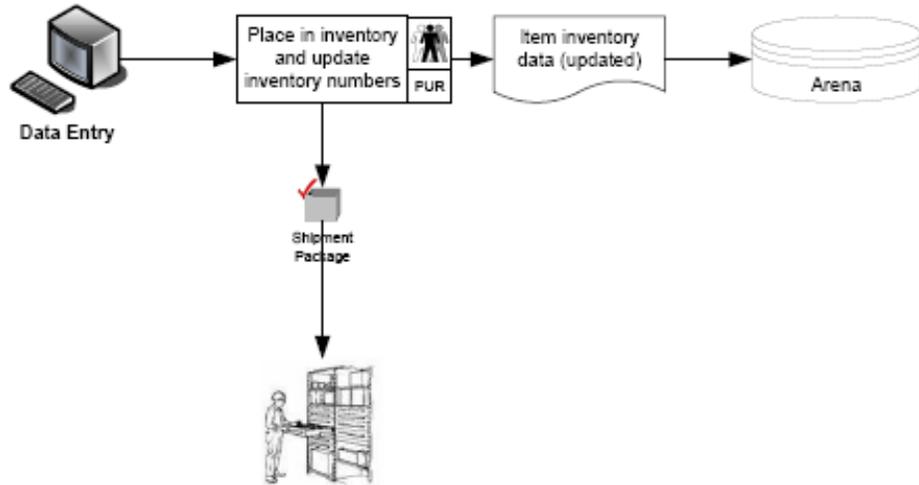
		Problems & Opportunities	
No.	Priority Urgent / Important / Improvement	<u>Description</u> Describe each problem or opportunity. Include enough detail that it can be prioritized and acted upon.	
 1	Improvement		
 2	Important		
 3	Improvement		
 4	Improvement		
 5	Urgent		
 6	Important		
 7	Important		
P/N: LS3-00-P05 Rev. 1 Owner: Javy de Jesus		<b>Sensor Manufacturing</b>	Page 4 of 5

	<b>Process Records</b>		
<u>Record</u> Databases are backed up on the server:	<u>Index</u> Records are indexed by the following key words:	<u>Retention</u> Records are retained for the <u>minimum</u> time indicated:	<u>Disposal</u> Records are disposed of by the following method:
* Sensor Verification Record	* Sensor Name (ID)	* 5 years after ship date	* Offline storage
x	x	x	x
x	x	x	x
x	x	x	x
x	x	x	x
x	x	x	x
x	x	x	x
P/N: LS3-00-P05 Rev. 1 Owner: Javy de Jesus	<b>Sensor Manufacturing</b>		Page 5 of 5





B

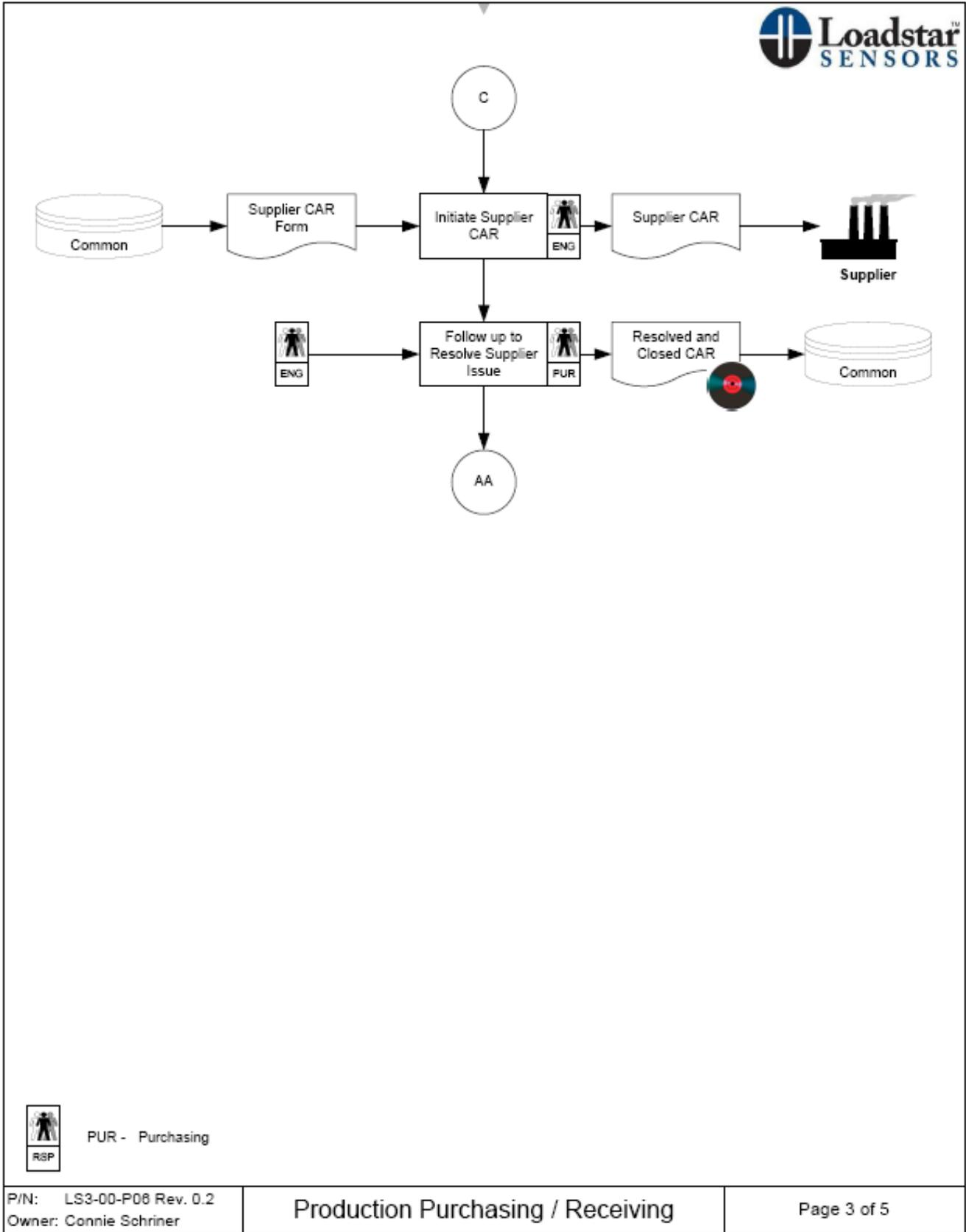


PUR - Purchasing

P/N: LS3-00-P08 Rev. 0.2  
Owner: Connie Schriener

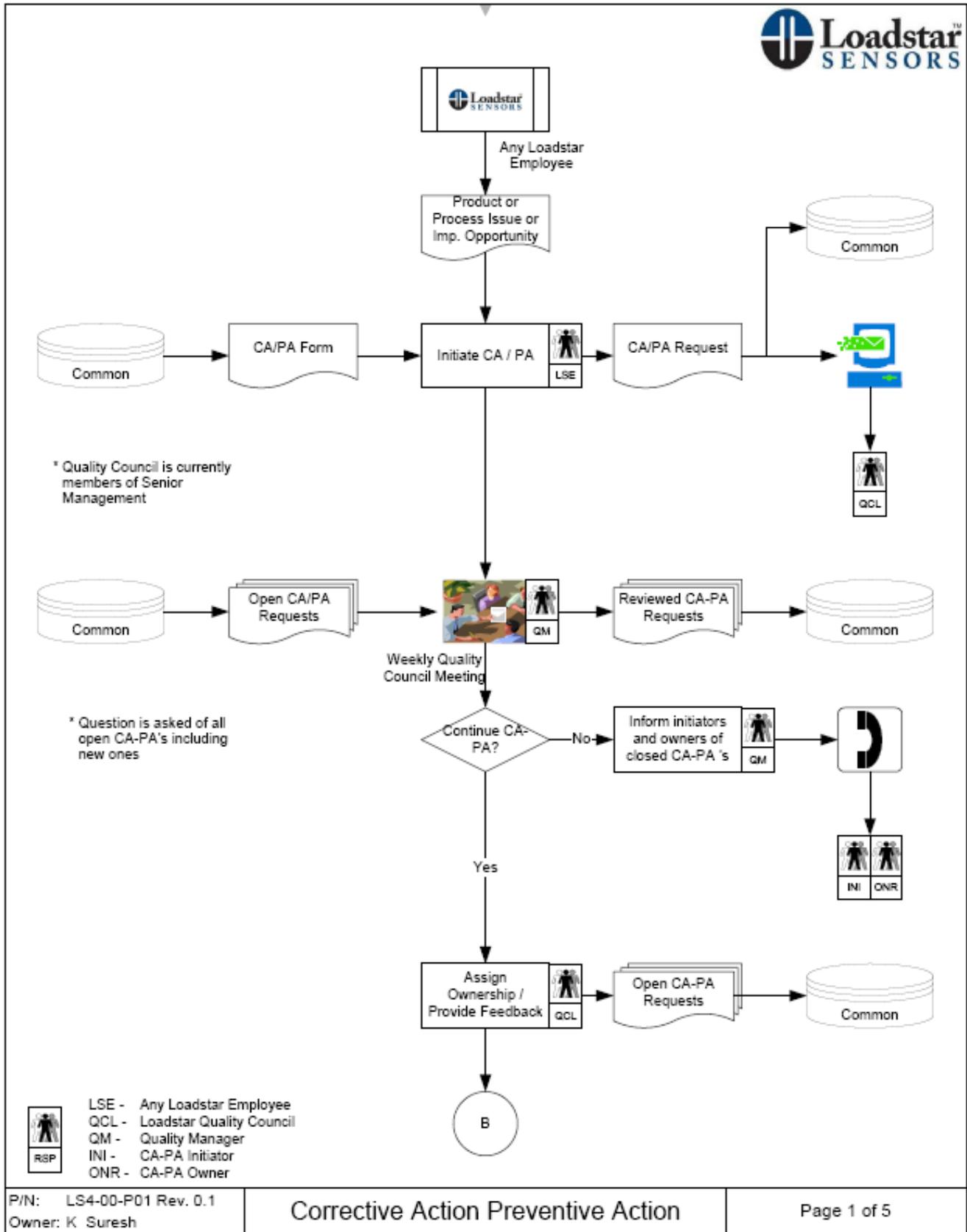
Production Purchasing / Receiving

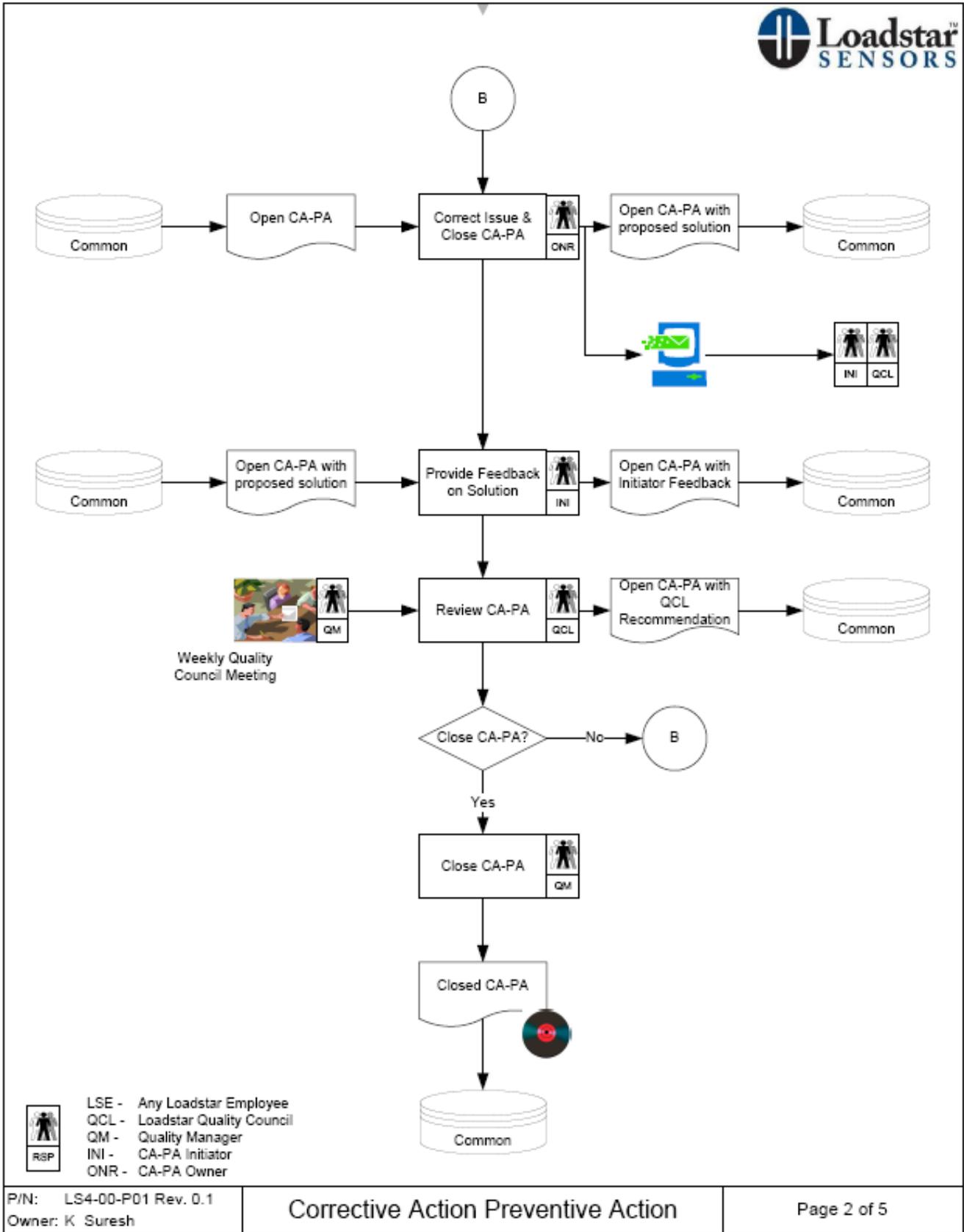
Page 2 of 5



		Problems & Opportunities	
No.	Priority Urgent / Important / Improvement	<u>Description</u> Describe each problem or opportunity. Include enough detail that it can be prioritized and acted upon.	
	Urgent	Operations Planning process to be defined	
	Important		
	Improvement		
	Improvement		
	Urgent		
	Important		
	Important		
P/N: LS3-00-P08 Rev. 0.2 Owner: Connie Schriener		Production Purchasing / Receiving	Page 4 of 5

	Process Records		
<u>Record</u> Databases are backed up on the server:	<u>Index</u> Records are indexed by the following key words:	<u>Retention</u> Records are retained for the <u>minimum</u> time indicated:	<u>Disposal</u> Records are disposed of by the following method:
* Resolved and Closed CAR	* Supplier / Date	* 5 years after resolution date	* Offline storage
x	x	x	x
x	x	x	x
x	x	x	x
x	x	x	x
x	x	x	x
x	x	x	x
P/N: LS3-00-P08 Rev. 0.2 Owner: Connie Schriener	Production Purchasing / Receiving		Page 5 of 5







LSE - Any Loadstar Employee  
 QCL - Loadstar Quality Council  
 QM - Quality Manager  
 INI - CA-PA Initiator  
 ONR - CA-PA Owner

P/N: LS4-00-P01 Rev. 0.1  
 Owner: K Suresh

Corrective Action Preventive Action

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		Problems & Opportunities
No.	Priority Urgent / Important / Improvement	<u>Description</u> Describe each problem or opportunity. Include enough detail that it can be prioritized and acted upon.
	Improvement	
	Important	
	Improvement	
	Improvement	
	Urgent	
	Important	
	Important	
P/N: LS4-00-P01 Rev. 0.1 Owner: K Suresh		Corrective Action Preventive Action
		Page 4 of 5

	Process Records		
<u>Record</u> Databases are backed up on the server:	<u>Index</u> Records are indexed by the following key words:	<u>Retention</u> Records are retained for the <u>minimum</u> time indicated:	<u>Disposal</u> Records are disposed of by the following method:
* Closed CA-PA's	* CA-PA Number	* 5 years after close date	* Offline Storage
*	*	*	*
*	*	*	*
*	*	*	*
*	*	*	*
*	*	*	*
*	*	*	*
P/N: LS4-00-P01 Rev. 0.1 Owner: K Suresh	Corrective Action Preventive Action		Page 5 of 5



**LS2-00-P01 Equipment Calibration****1.0 Test Equipment**

Each Piece of Equipment Used to Calibrate a Sensor shall be calibrated at least once annually. The calibration shall be performed by authorized calibration facilities that have NIST traceable reference sensors and equipment to perform the calibration to established standards. The calibration date and certificate will be placed on or near the equipment being used so that test personnel can clearly see the date until which the reference is valid.

If during use, any equipment seems suspect, then all calibrations shall cease until the equipment is thoroughly evaluated and its accuracy re-established with reference to established references.

If using dead weights to check accuracy of reference equipment then personnel shall only use dead weights that have a traceable calibration certificate.

**2.0 Dead Weights**

If dead weights are used to calibrate the sensors, then only units with calibration certificates shall be used. These dead weights need not be calibrated annually unless there is any visible damage to the reference weights.

**3.0 Displacement and other physical parameters**

Only reference displacements with valid calibration certificates from established and reputable sources shall be used to perform calibrations of displacement, pressure or other physical parameters. If no such references are available, then best efforts shall be made to let the customer know what reference was used to perform the calibrations.

**LS2-00-P02 QMS Document Control****1.0 Quality Management System Goal**

The goal of the quality management system is to ensure that EVERY unit shipped to a customer undergoes a strict calibration and verification process before it is shipped to the customer. Records shall be maintained for EVERY sensor shipped so that one can go back and get a detailed record of what the test results showed prior to shipment.

Please note this is done for EVERY Sensor without fail. Not on a sample basis on a statistical scale but for every unit.

**2.0 Quality Management System Process***2.1 Sensor Identification*

Every sensor unit shall be assigned a unique ID prior to any further processing.

*2.2 Sensor Labeling*

Every sensor has a label placed on it clearly identifying the Model Number, Capacity and Type of Calibration performed. For e.g. RSB2-050M-S\*C01 indicates it's a RSB2 Button Load Cell with 50 Kg capacity (M Stands for Metric in kg, S for Standard in lb) and the S indicates the sensor is made of Steel. The \*C01 indicates its been calibrated in Compression, \*C02 indicates its been calibrated in Tension and \*C03 means its been calibrated in Universal Mode (both tension and compression).

Furthermore, the date of calibration shall be clearly marked and identified with a Calibration due by date.

*2.3 Sensor Traveler*

Every sensor that is earmarked for an order shall have a traveler created that outlines all the key sensor information and data produced during the manufacturing process. The internal serial numbers as well as the external sensor ID shall be clearly marked on the traveler with the other details of the order such as calibration mode, any interface devices used etc.

**3.0 Quality Management System Software**

LoadVUE MFG is a system software that is used to perform and store all records related to calibration, verification, and printing of calibration certificates. Every sensor that is calibrated is done using this software. Every calibration has the following parameters filled in before being stored:

- Name of person performing the calibration
- Date and time of calibration
- Model Number, Serial Number and Type of Calibration
- Reference Loads Applied
- Calculated Loads and corresponding errors as % of full scale
- Calibration coefficients computed and burned into sensor and/or sensor interfaces
- Calibration Equipment used

#### **4.0 Maintenance of Calibration Records**

The detailed calibration and maintenance records are maintained for a period of at least ten years from the date of calibration. LoadVUE MFG application software stores all the information on a server in the Cloud. These records can be obtained by going to [www.loadstarsensors.com/sensordb](http://www.loadstarsensors.com/sensordb). It is a secure site protected by a login and pwd needed to access it.

Periodic backups of the database will be performed to ensure no loss of data.



**LS3-00-P05    Sensor Manufacturing Process****1.0 Sensors Manufactured In-House**

The manufacture of sensor shall be done per the detailed process steps that were developed in house and is not included here for confidentiality purposes. The sensors shall be put through complete battery of tests including thermal cycling, exercising prior to calibration, warm up, calibration and verification steps before being stored in finished goods inventory.

Detailed information such as the Cx, Cr, target gaps for reference and sensor capacitors, k0 value, Cx vs Cr curves shall be stored in the Sensor Database.

Calibrations from zero to full scale shall be performed and stored in the calibration database at the time of shipment to customer.

**2.0 Sensors Manufactured by Contract Manufacturers**

Loadstar Sensors shall provide designated and qualified vendors to make load cells to our specifications in small lots. Each sensor shall be delivered to load cell with a calibration certificate that certifies that the sensor meets the stated and required specification.

Loadstar Sensors shall test calibrate and verify the key specs are met prior to shipment of the part to a customer.

**LS3-00-P06 Production Purchasing/Receiving****3.0 Approved Vendor List**

Purchasing materials to build sensors, interfaces and related accessories is a critical part of making good quality sensors and sensor solutions. In order to assure that the final product meets all specifications, the procurement of raw materials and parts shall be done only from vendors on the approved vendor list.

The approved vendor list shall consist of vendors who meet our strict case by case quality standards. In most cases, we will buy parts from vendors with ISO quality certificates and approved processes.

New Vendors shall be added to the lists only after sample testing items and making sure they meet strict quality standards.

**4.0 Purchase Orders**

When ordering parts from vendors on the approved vendor list, a Purchase Order shall be created with items being ordered, quantities being ordered, price per unit, payment terms, shipping instructions, expected ship date and any other detailed instructions needed to fulfil the order.

The vendor will provide a W-9 certificate and provide payment terms and bank details for Loadstar Sensors to make payment arrangements accordingly.

**5.0 Receiving Items**

Whenever possible, Loadstar Sensors will examine and test incoming items to ensure that quality standards are being met by the vendor delivering the parts. Even if not all parts are tested, at least a small sample from every incoming batch should be tested to make sure the batch is not all bad. If the results of the sample testing are not good, then more tests shall be performed to weed out the bad units and corrective action initiated to fix the underlying cause of the problem.

Ultimately, every sensor is tested, calibrated and verified prior to shipment. So if there are any issues with parts, then those issues will be caught by that final process.

**LS4-00-P01 Corrective Action/Preventive Action**

Whenever an issue is brought to the attention of the company, the appropriate personnel in the engineering, manufacturing and quality control departments shall be notified of the issue.

The issue shall be given an identifier and the issue notification date shall be identified and marked.

The appropriate personnel shall conduct a thorough review, investigation and failure analysis to get to the underlying root cause of the issue. Further analysis can be initiated and conducted by technical experts as needed. The name(s) of such technical experts shall be identified on the failure analysis report.

Once the failure analysis is performed, a corrective action shall be initiated. Such action shall be written down and documented in detail. Any engineering drawings or process diagrams shall be amended to reflect the change in process or methods. Such change in process or documentation shall be reviewed by appropriate personnel and approved by the senior management team member responsible for that area.

Any communication with end customer shall be performed by the customer service representative or sales personnel who manages that account in conjunction with the senior management person responsible for that area.