# SPERRY AUTOMATICS CO., INC.

# QUALITY ASSURANCE MANUAL

## TABLE OF CONTENTS

**INTRODUCTION**

For over thirty years the management of Sperry Automatics Co. has been committed to manufacturing defect-free products for its customers. We are even more committed today to an ongoing Quality Assurance Program. It is a management tool that aids us in the continuing evaluation and improvement of our present processes and in turn, leads us to new procedures and equipment which aids us in being “state of the art” in our industry.

This manual is prepared as a guide for the day to day practices that are used by Sperry Automatics Company to ensure that our quality standards, as well as our customers, are maintained on a continuing basis.

Our manual is a living document. It serves as the cornerstone of Sperry Automatics Company’s ongoing Quality Assurance Program. It is designed to provide both the initial and the ongoing training and guidance of our employees, not only the Quality Assurance, but also in manufacturing. It shall be a basis for the selection of processes, controls, tools, and new equipment suitable to the accomplishments of our goal of providing our customers with defect free products.

It is the intent of Sperry Automatics management to provide customers with a responsive Quality Assurance System. As such, this manual may be subject to change from time to time. An officer of this company or its delegate before implementation must approve these changes or supplementary procedures.

Changes will be issued only to holders of controlled copies of this manual.

Charles A. Pugliese

Charles A. Pugliese
President

**QUALITY POLICY**

It is the policy of Sperry Automatics Company to provide defect free goods and services, have a high reliability, and are delivered on time at competitive costs.

It is Sperry Automatics Company's policy to obtain a clear understanding of each customers quality specifications and standards and to assure that appropriate measures are taken to manufacture products which confirm to these standards and economically verify that these standards are being met.

We are committed to produce products to a zero-defect level which shall be based on mutually developed engineering, material, and testing standards which reflect customer needs and the statistically measured capabilities of Sperry Automatics' procedures.

Sperry Automatics recognizes that "zero-defect" requires:

Commitment and leadership of top management, personnel trained and committed to defect prevention methodology, plant equipment and working environment compatible with zero-defect quality, and suppliers who are equally capable and committed to zero-defect quality.

**RESPONSIBILITY FOR QUALITY**

Sperry Automatics Company's management realizes that the responsibility for quality rests with each and every employee whether it be management, technician, or operator. Each person in this chain must perform his/her duties in a professional and conscientious manner to assure that every product is manufactured correctly the first time and every time. Sperry Automatics Company's management makes every effort to provide all employees with the tools, equipment, and skills necessary to design a quality process, manufacture a quality product, and provide this product to the customer on time. It is management's policy to look at quality as a team effort that will build quality into the product from the design through the manufacturing stages.

It is the responsibility of the Quality Assurance Department to coordinate the various quality activities of each of Sperry Automatics Company's departments in such a manner as to assure that final products meet customer specification 100% of the time. As needed, the Quality Assurance Department shall utilize the services of company management, engineering, manufacturing, shipping, and suppliers to fulfill this responsibility.

## QUALITY ORGANIZATION

**Purpose:**

- To outline the duties and responsibilities of the Quality Assurance Department in meeting the goals set forth in this manual.

**Procedure:**

The Quality Assurance Department is an organization separate from the Manufacturing Department. It is the responsibility of Quality Assurance to assist and support the Manufacturing Department in the production of defect-free goods. It does this by providing a complete first piece analysis of each set-up, verification of inspection procedure compliance during the fabrication operation, random sampling audits of the supplier's performance, and a final inspection audit of the pre-established critical characteristics. It is the responsibility of the Quality Assurance Department to maintain adequate records of these inspections.

A member of the Quality Assurance Department shall be an active participant in the Quality Planning phase for products and processes. Whenever feasible, statistical techniques shall be employed to provide for defect prevention and process control.

A member of the Quality Assurance Department participates in the review and disposition of discrepant material and the coordination of corrective action to provide for the prevention of future reoccurrence.

The Quality Assurance Department is responsible for the calibration of gages and instruments and maintenance of appropriate records of calibration. The Quality Assurance Department will also supervise the gage repeatability and reproducibility (G.R.&R.) studies that will be performed prior to the start of production.

The Quality Assurance Department operates freely in all manufacturing areas. Under no circumstances shall any member of the QA team be placed in the control of Manufacturing/Production staff. Whenever a difference of opinion exists with regard to the ultimate acceptability of a product, it shall be the responsibility of Quality Assurance to make this determination, after consultation with the appropriate Engineering and Management personnel as needed. The customer will be included in the decision if a critical characteristic and/or a functional reports to the President.

An organizational chart is included as Exhibit #1.

**QUALITY PLANNING**

**Purpose:**

- To prepare an organizational program that emphasizes “PREVENTION” for the manufacturing of a product meets all specified characteristics. To determine, prior to manufacturing, those procedures which requires particular care to assure economical manufacturing and customer satisfaction. The ultimate objective is to establish a framework for continuous organizational and product improvement.

**Procedure:**

The planning for quality manufacturing is a continuous process at Sperry Automatics. There are six phases to our quality planning process are as follows:

**Phase 1 Request for Bid**

Sales, Engineering, Quality, and others, as needed review:

A - Customer Print

B - Customer Specification

C - Customer Contact, if necessary

D - Methods of Manufacturing, Processing, and Inspection

E - Submit Quotation

**Phase 2 Receipt of the Initial Order**

1. Meeting is convened (Manufacturing, Engineering, QA, and Sales) to review:

A - All Customer Documents

B - Historical Documents

C - Critical Characteristics

D - Questionnaire for Submittal to Customer

2. Review Customer’s response to questionnaire. Document as required:

A - Control Plan & F.M.E.A.

B - Master Inspection Record

3. Design tooling and cams.

4. Review design.

5. Build or purchase tools and cams.

6. Mount tool and cams onto machine and debug setup.

**Phase 3 First Piece Sample Submission**

1. Submit sample size of 12 pieces or as required by customer.

2. Complete a dimensional layout of all print characteristics.

3. Forms to be submitted to customer:

    A - “Marked Up” customer print and specifications

    B - Material and process certifications

    C - S.P.C. studies if required

4. Review of non-conformances, with customer, if necessary (prior to shipment).

5. Request written customer approval of sample submission.

**Phase 4 Initial Production Run**

1. Calibrate gages

2. Conduct G.R.&R. studies on critical characteristics

3. Review centering and variation of critical characteristics

4. Issue inspection procedure and current print

**Phase 5 Repeat Orders and/or Setups**

1. Document sample measurements on the Master Inspection Record

    A - Review present recordings with previous recordings. Note if there have been any shifts or trends in the measurements.

2. Review internal and external complaint and/or rejection files.

3. Repeat Phase 4 as required

**Phase 6 Ongoing Quality Improvement**

At an annual meeting of the Sperry Automatics Steering Committee, process performances, complaints, rejections, and future system improvement requirements are reviewed. This committee then formulates a quality plan that outlines specific objectives, along with targeted implementation and completion dates.

**INSPECTION REQUIREMENTS**

**Purpose:**

- To provide QA and Manufacturing personnel with the information needed to assure the manufacturing and inspection of an acceptable part.

**Procedure:**

As part of Sperry Automatics' Quality Planning program, a quality inspection procedure is documented for each manufactured component. A copy of this procedure is included with the inspection approval packet after first piece approval. The inspection instructions are displayed on the machine and is used as a reference by production and quality personnel. These instructions outline the methods and/or measurement instruments that are to be used to verify the quality of each feature during manufacturing.

* Whenever special testing techniques are needed to properly conduct inspection or test, it will be the responsibility of QA to determine the need, develop the technique, and to document instructions on the application of the technique. These special inspection requirements will be reviewed with the customer for their approval and concurrence. As needed, special instructions will be attached to and be made part of the component's inspection procedure.

**RECORDS AND REPORTS**

**Purpose:**

- To assure that records of inspection operations and other quality related test results are maintained.
- To provide objective evidence of inspection tasks performed.
- To provide a historical background for Sperry Automatics corrective action and continuous quality improvement program.

**Program:**

It is the responsibility of QA to assure that accurate records of first piece, in - process, audit, and out - going inspections are completed as required.

Sperry Automatics' management will determine the types of reports that will be obtained from inspection records. Active files of inspection data will be maintained, whenever possible, in a central QA file. Inactive records will be stored "on site" for at least three years after the completion of the order, unless otherwise specified by customer contract.

As a minimum, inspection record will include:

| | |
|---|---|
| Characteristics observed | Number of observations |
| Number and types of deficiencies found | Corrective action taken |
| Final disposition | Inspector identification |
| Date of the inspection and/or test | S.P.C. Data sheets as needed |

When required by customer contract, Sperry Automatics will furnish copies of inspection data (histograms, statistical process control charts, sampling results, etc.).

**CORRECTIVE ACTION**

**Purpose:**

- To provide a system when it is determined that a process is not stable, capable, on target, or when non-conforming material is found. To provide for a systematic approach to prevent future reoccurrence of these discrepancies. This procedure applies to internally generated request, customer request for corrective action, and request to the company's suppliers for corrective action.

**Procedure:**

It is the responsibility of QA to initiate a "Cause and Corrective Action Request" (C.C.A.R.) form.

This form will be issued as a result of the quality review of non-conforming material, customer complaints and/or rejections, lack of process capability, supplier quality problems, or other such discrepancies.

Any member of the Management Steering Committee may request that a C.C.A.R. be issued. The requester shall provide a detailed description of the non-conformance, date, frequency of occurrence, and a possible cause of the problem. The requester shall also arrange to have all suspect material quarantined into a secured holding area.

It will be the responsibility of the assigned Steering Committee member(s) to investigate and determine the root cause of the non-conformance. The results of their investigation shall be documented on the C.C.A.R. form along with a recommendation of corrective action to prevent reoccurrence. The report shall be forwarded to the plant manager for concurrence and then distributed to all of the involved departments for implementation.

**The procedure for non-conformance analysis is as follows:**

- Identify non-conforming characteristics
- Determine process changes that resulted in the non-conformance
- List possible causes
- Identify most probable causes
- Test most probable causes
- Verify root cause
- Implement and verify interim corrective action
- Identify and implement permanent corrective action
- Verify that the implementation has resolved the problem

**CORRECTIVE ACTION**

Some of the tools that are utilized for problem analysis are:

- Designed experiments
- Cause and effect diagrams
- Data collection
- Pareto Diagrams
- Capability Studies

QA is the liaison with the customer's quality organization. As such, QA is responsible for requesting deviation on out of specification parts, answering quality complaints, preparing corrective action reports, etc.

If it is suspected that non-conforming product has been shipped , QA will immediately notify the appropriate customer personnel. The information communicated to the customer shall be noted on a C.C.A.R. form. A written report detailing cause and corrective action shall be forwarded to the appropriate customer contact.

Some of the tools that are utilized for problem analysis are :

- Designed experiments
- Cause and effect diagrams
- Data collection
- Pareto Diagrams
- Capability Studies... etc.

QA is the liaison with the Customer Quality Organization. As such, QA is responsible for requesting deviations on out-of-specification parts, answering quality questions and preparing corrective action reports, etc.

If it is suspected that non-conforming product was received by the customer, QA will immediately notify the appropriate customer personnel. The information communicated to the customer shall be noted on the C.C.A.R. form. A written report detailing Cause and Corrected Action shall be forwarded to the appropriate customer contact.

**DRAWING & SPECIFICATION CHANGE CONTROL**

**Purpose:**

- To detail the procedures used by Sperry Automatics to assure the latest drawing and/or specifications, as required by the customer purchase order, are utilized in the manufacturing area.

**Procedure:**

Sperry Automatics fabricates and manufactures in accordance with customer drawings and/or specs as furnished with the customer purchase order/contact.

Upon receipt of the customer's purchase order, the Sales Department will review the part number and revision specified. If the revision number is not listed on the purchase order, Sales shall contact the customer to verify the latest customer print revision. If the corresponding revision print is not in the possession of Sperry Automatics, a current copy will at that time be requested. A production release will not be issued until the revised print has been received and reviewed.

All pre-existing drawings will be marked as "Obsolete", and the individual responsible for the manufacturing will be notified of the changes so to make the necessary changes.

When a new print is received the applicable department shall convene to discuss and review the changes, and make arrangement for any need for a change in tooling or machining techniques.

A current drawing will be issued for each production release. QA will remove the print from the manufacturing station whenever the production run is completed.

Only drawings and specifications, which are issued with the manufacturing order, are to be used in the production and inspection of the item.

QA shall be responsible for the removal and disposition from the manufacturing and inspection files all "Obsolete" prints.

QA is also responsible for verification that changes have been made prior to the approval of the production run. In addition, QA must verify that all products manufactured to the previous revision level have been properly segregated and identified as to prevent contamination of new material.

**MEASUREMENT AND TEST EQUIPMENT**

**Purpose:**

- To outline the responsibilities, systems, and processes to be used by Sperry Automatics to select, inspect, calibrate, and maintain measuring and test equipment used for the acceptance of products and/or processes.

**Application:**

Management/Engineering, QA, and Manufacturing are responsible for the gage planning and design. Criteria for gage selection shall be the verification that the significant features are being adequately measured. Special application gages and/or methods shall require the concurrence and approval of the customer.

**Traceability:**

All gages and test equipment, where applicable, shall be calibrated to standards traceable to the National Bureau of Standards (N.B.S.).

**Calibration:**

Gage calibration is to be performed only by qualified QA personnel or outside service to conform to MIL-STD -45662 and/or MIL-STD -120. Each new instrument procured by Sperry Automatics shall be inspected prior to use. Obsolete, worn, damaged, or abused gages are to be immediately removed from service and replaced with a calibrated device.

Only Sperry Automatics and/or customer supplied measuring devices are to be used for product and/or process monitoring. Each of these instruments shall be calibrated prior to use and re-calibrated on a cycle based on stability, usage, required precision , accuracy, repeatability, etc. Should jigs or fixtures be used as a means of acceptance, these devices shall also be subject to the calibration requirements of this procedure.

**QUALITY AUDITS AND INSPECTION**

**Purpose:**

- To outline the various types of inspection to be utilized by Sperry Automatics to assure compliance with Sperry Automatics specifications and requirements.

**Procedure:**

INITIAL SAMPLE SUBMISSIONS:

Samples for all new tool applications will be verified to customer blueprint and specifications and any other special instructions that may be included with the purchase order. This inspection will be performed by QA. The sample measurement form will also be included. QA is responsible for the proper completion and submission of the customer supplied forms, if applicable. It is the normal procedure of Sperry Automatics to submit 12 sample pieces, unless otherwise specified by the customer. Samples will be randomly selected from the initial 15-minute production run. When required, material and processing specifications will be included with the sample submission. The customer's approval of the submitted samples with be forwarded via internal memorandum to QA and Manufacturing by the Sales Department.

FIRST PIECES INSPECTION (PRODUCTION RUN):

It is the responsibility of the technical group to set p the tooling in such a manner as to provide part which meet the dimensional characteristics of the customer supplied print and as detailed on the Master Inspection Record.

IN-PROCESS INSPECTION:

In-process inspections are performed periodically as the work order is being produced, The frequency of inspection and sample size will be as required on the Master Inspection Record. Each day the operator and inspector will note, in the Process Log File, the acceptance or rejection of the days output.

The Production Manager will also post a report of acceptance and rejection along with an efficiency report daily.

OUTSIDE PROCESSING:

When required by manufacturing or purchase order, product will be sent to an outside service. When the product has been returned, QA will perform a lot audit to verify that the subcontracted operations have been performed in accordance to specification.

FINAL INSPECTION:

Final inspection of each production lot shall be performed by QA in accordance with requirements noted on the inspection procedure and findings to be documented on the Master Inspection Record.

DOCK AUDITS:

QA will periodically select lots that are scheduled for shipment to verify dimensional and visual features meet specifications required. All lots selected from stock for shipment will be re-inspected for conformance to print, and disposition to be recorded on the Dock Audit Report and any discrepancy remanded to the Production Manager. Any non-conformance is quarantined for review and disposition.

## CONTROL OF PURCHASES AND SUB-CONTRACTORS

**Purpose:**

- To provide for systems and procedures that assure that purchased materials and services meet customer and Sperry Automatics requirements.

**Procedure:**

RAW MATERIAL:

Certification of compliance  chemical/physical test is required by contract or purchase order for each shipment that is received by Sperry Automatics. Each raw material supplier is encouraged to submit statistical data verifying process control with each shipment. This data is subject to periodic audit using outside laboratories. Accepted material is tagged by type, a Heat number is applied for traceability purposes, and stored until used. Non-conforming material is segregated and returned for correction.

SERVICES:

A certification of compliance to Sperry Automatics specification is required with each shipment received. Upon receipt, goods are audited by QA to ensure conformance to customer specification. Periodically, outside service vendors will be subject to audit by laboratory as well as Sperry QA.

Sperry Automatics uses only proven suppliers who can meet standards of quality, delivery, and price. At time of consideration of a new supplier, vendors are subject to survey and sample testing as determined by designated Sperry Automatics personnel.

## STATISTICAL PROCESS CONTROL

**Purpose:**

- To document the statistical methods and processes used by Sperry Automatics to control process variables, determine “assignable causes” of process changes, and corrective action implementations.

**Procedure:**

Purchase order, customer contact, and Sperry Automatics Management will determine key characteristics and the type of Statistical Process Control techniques that will be used for process monitoring.

It is Sperry Automatics intention to achieve a +/- 4 Sigma capability on critical characteristics for all new applications. Statistical Process control is an “on-line, real time” program that is administered by the operators and Quality Assurance.

Statistical Process Control is used as an integral part of Sperry’s process to provide the information necessary for continuous improvement in quality and productivity. Data from the control charts and other quality tools are used to identify opportunities for variation reduction in the process output.

**INDICATION OF INSPECTION STATUS**

**Purpose:**

- To detail the methods, procedures, and forms utilized by Sperry Automatics to indicate acceptability or non-conformance of material throughout the manufacturing process.

**Procedure:**

RAW MATERIAL

Upon receipt, material verified as acceptable will be identified using material identification color coding and placed in stock. Non-conforming material will be identified by a rejection ticket, segregated, and returned.

WORK IN PROCESS (WIP)

The machine operator/set-up person is responsible for quality of machine output. At the end of each shift the produced product will be submitted to QA for visual and dimensional analysis and verification using the lot sampling procedure. The yellow production ticket included with the product is stamped "ACCEPTED" upon passing inspection or replaced with a red "REJECTION" ticket documenting non-conformance and segregated for review and disposition.

Upon acceptance, the product is forwarded to its next operation as so indicated on yellow routing ticket or to be packaged for shipment.

**COMPLETED ITEM INSPECTION**

**Purpose:**

- To establish the methods, procedures, and responsibilities for the final inspection of completed products.
- To assure that they meet both Sperry's and their customers' standards and requirements.

**Procedure:**

All completed production lots are to be submitted for Final Inspection. The inspection will be performed in accordance to the product's quality inspection instructions. Inspection will be performed on a lot-by-lot or batch-by-batch basis utilizing the appropriate customer or Sperry sample plan. If deemed necessary, 100% inspection will be performed to assure compliance.

When requested, special inspection reports will be kept (e.g. histograms) and maintained within the Master Inspection Record file.

Lots found acceptable will be released to packaging for shipment or stock storage. Lots found to be non-conforming will be quarantined and a report submitted to the Material Review Board and to the Production Manager for disposition.

**FINISHED GOODS-PACKAGING, SHIPPING, and LOT CONTROL**

**Purpose:**

- To describe the system used by Sperry Automatics to identify special handling, packaging, and lot traceability requirements.

**Procedure:**

It is the responsibility of Sales and of the Production Manager to identify and internally document any special packaging and handling requirements specified either by the customer or if so necessary by the type of material being processed (e.g. hazardous material). Documentation is to be noted in the Quality Plan and in the Master Inspection Record. QA will verify that packaging specification are met and compliance is adhered to customer instructions.

LOT CONTROL

The raw material lot traceability system is initiated at the raw materials staging area. A stock clerk will record the lot information as noted on the Raw Material Log record. The heat number will remain the main identifier of traceability whether assigned at the point of drawing or at Sperry Automatics.

The lot identification number will be recorded on the Master Inspection Record, within the container the parts are packaged in, and when applicable on the shipping record. This procedure will render a system for tracing all products that has been manufactured with a specific heat of raw material.

Sperry Automatics, in its Commitment to Quality employs selected personnel who are either certified or familiar with the following regulations and requirements:

- D.O.T. 72 Subpart H, Material Purchase and Handling
- MIL-SPEC
- F.A.A.
- C-Class Handling
- I.S.O.
- U.S.S.A.E.

## QUALITY REVIEW OF NON-CONFORMING MATERIAL

**Purpose:**

- To outline the policies of Sperry Automatics with regard to Quality Review of Non-Conforming Material.

**Procedure:**

Quality review is established to provide for the disposition of material and components which have been determined non-conforming with either Sperry Automatics' or by customer specifications. A review team should consist of Sales, Engineering, Manufacturing, QA, and a customer representative.

All material and/or components determined to be non-conforming will be identified with a red "REJECT TAG", isolated from the flow of accepted material, identified as required for Quality Review and submitted for evaluation and disposition.

Quality Review will consider form, fit, safety, workmanship, and function when making disposition of non-conformances. At the discretion of the Q.R. team, non-conformances to Sperry's specs, which meet that of the customer's, can be accepted to "use as is".

If the Quality Review Team considers it necessary, A "Cause and Corrective Action" or "Supplier Cause and Correction" form will be issued.

**SELF-AUDIT CHECKLIST**

**Purpose:**

- To evaluate Sperry Automatics compliance to the systems and procedures as outlined in the Quality Assured Manual.

**Procedure:**

An audit team consisting of two members is to be selected from the Management Steering Committee each year. This team shall be responsible for evaluating each section of the Quality Assurance Manual and the conformances by Sperry Automatics to its section requirements.

Any areas found to be deficient shall be noted on the auditor's report. The responsible departments must respond as to the cause and corrective action and the anticipated date for system correction immediately after notification by the auditing committee.

**INTERNAL AUDITS**

**Purpose:**

- To assure that all procedures and functions as required by the Quality Assurance Manual are consistently in effect. This audit procedure shall be applied to the Quality Assurance Systems plant-wide.

**Procedure:**

This audit shall be conducted at least once per year by Quality Assurance and at least once annually by QA and at least one member of management. The audit will be performed in addition to any audits conducted by customers or other external agencies. The audit will be performed to the requirements of the "Self-Audit Checklist" (See exhibit # 21).

The results of the audit will be recorded and kept on file in the QA office. If system discrepancies are noted they are to immediately be corrected.

Self-audit results will be published upon the survey completion and shall be distributed to all designated management personnel. Self-audit files shall be maintained in the QA office.