



Microsun Electronics Corporation  
Quality Assurance Manual

MICROSUN ELECTRONICS CORPORATION  
QUALITY CONTROL MANUAL

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## MICROSUN ELECTRONICS CORPORATION

### Corporate Quality Policy Statement

To All Employees:

The customers who have selected MICROSUN ELECTORNICS CORPORATION have done so with the expectations that we will provide them with products that meet their design requirements, fulfill their intended functions and operate reliable for a reasonable period of time.

How well our services satisfy our customers will continually impact our quality reputation. It is our reputation as a quality service that will directly affect our success in the electronics market today as well as in the future. In this highly competitive electronics contract manufacturing market, only those who can achieve and maintain the coveted reputation as a *“Quality Service Provider”* will survive and flourish. By embracing our Corporate Quality Policy all of us will be contributing to our industry recognition as a leader in the services we provide to our customers.

To completely embrace our Corporate Quality Policy and fulfill the objectives of this policy, each and every employee must commit to working as a team. Our quality-minded team must understand our customer’s requirements and be committed to comply with these requirements on a daily basis. Each employee who demonstrates daily adherence to all process procedures not only is embracing Microsun Electronics Corporate Quality Policy but also makes a daily statement that the are a member of the MICROSUN ELECTRONICS quality team.

The Quality Assurance Manager has been chartered with the responsibility of drawing together the quality organization plans, procedures and daily activities which will ensure compliance to al customer requirements. The Quality Assurance Manager will also be responsible for developing the necessary detailed procedures and instructions to ensure a functioning quality system exists at MICROSUN ELECTRONICS CORP.

MICROSUN ELECTRONICS CORP. employees must always remember how well we embrace our commitment to quality will be reflected in our reputation as an industry leader in product support and service quality.

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Amer Elshafei – Director of Quality

**MICROSUN ELECTRONICS CORPORATION****Quality Assurance Policy Revisions**

<b><u>Revision Date</u></b>	<b><u>Revised Portion</u></b>	<b><u>Approved by</u></b>
August, 2002	Original Version (A)	Anthony Wish
June, 2003	Complete Revision (B)	Christopher Thompson
September, 2006	Complete Revision (B)	Sean Malone
January, 2008	Merger Revision (C)	Sean Malone

## Confidentiality

### Quality Assurance Policy Manual

# MICROSUN ELECTRONICS CORPORATION

## PROPRIETARY DATA

The data and information disclosed in this manual is furnished upon the following understanding and agreement:

By acceptance of this document you agree that all rights to the drawings, specifications and other data contained therein, as well as the proprietary and novel features of the subject matter are reserved by Microsun Electronics Corporation and are disclosed in confidence. They are not to be manufactured, used, sold or disclosed to others, nor are devices embodying such features or information derived from these disclosures to be used or disclosed, unless and until expressly authorized by MICROSUN ELECTRONICS CORPORATION.

This document, its contents, drawings, specifications etc. are and will remain the property of MICROSUN ELECTRONICS CORPORATION and are not to be copied or reproduced without expressed written permission of a corporate officer. This document, in its complete form, will be returned to MICROSUN ELECTRONICS CORPORATION upon request of any member of MICROSUN ELECTRONICS management.

Prepared by: \_\_\_\_\_  
Amer Elshafei, Director of Quality

Date: \_\_\_\_\_

## **1.0 Quality Assurance Policy Manual**

### **1.1 Instruction:**

- 1.1.1 This manual has been prepared to serve as a basic reference and guide for all personnel who contribute to the overall quality effort at MEC (Microsun Electronics Corporation). This policy manual will be used daily in our effort to consistently assure that our customers receive products of a quality level equal to and when possible better than their requirements and specifications.
- 1.1.2 Individual sections have been written designating instructions and procedures, including all manufacturing inspections and test processes, up to and including the shipping operation.
- 1.1.3 A record is maintained of all personnel and customers who a copy of this manual has been issued. As sections are changed the revised sections will be issued automatically to all holders of controlled copies of this manual. The newly revised section(s) will be accompanied by instructions to remove the old sections and replace them with the new sections they just received. Old sections are required to be discarded immediately. The old sections must be discarded, to ensure only the latest and most current revision of the manual are ever in use.
- 1.1.4 All controlled copies of this manual remain the property of MEC. The holders of these controlled copies are not to reproduce this manual or any portion of its contents without the express written consent from an Officer of MEC.

### **1.2 Purpose:**

- 1.2.1 This manual will serve as a guide to establish precedents for making decisions affecting the quality of any product.
- 1.2.2 This manual will be used as an aid to continuity. As company policy, this manual will not be subject to change due to any turnover of personnel.
- 1.2.3 This manual will serve as a quality training guide for all MEC employees.

- 1.2.4 Management intends for this manual to be used as the base reference point by which all current practices will be audited.

## **2.0 Organization of Quality Assurance**

### **2.1 The Quality Assurance Manager**

2.1.1 The Quality Assurance Manager reports directly to the President of the company.

2.1.2 General Duties of the Quality Assurance Manager are as follows:

- Day to day management of the Quality Assurance organization.
- Direct interface with all customer Quality Assurance counterparts.
- Primary lead of all auditing functions. The Quality Assurance Manager will focus special attention to company wide compliance to the Corporate Quality Policy.

2.2 Inspection Organization: A general description of the “Inspection Organization” and their individual duties and responsibilities are as follows:

2.2.1 Receiving Inspection: Performs visual and mechanical inspections and test on purchased or customer supplied parts, components and materials.

2.2.2 Process Inspections: Performs visual, mechanical and continuity tests, as applicable to all parts, assemblies and sub-assemblies. Process inspections will be looking for In-Process product conformance to current drawings, Engineering Change Notice (ECN's) specifications and work instructions.

2.2.3 Final Inspection: Verifies that all previous processing inspection and required tests have been performed. Final inspection will verify that all previous inspection results have been properly documented. They will verify that all previous rework (if required) is complete and found acceptable through the re-inspection process. All finished assemblies and sub-assemblies will also be inspected at this time for cleanliness and final readiness for shipping to the customer.

2.2.4 Packaging and Shipping Inspection: Consists of visual inspection of packaged assemblies for conformance to proper packing methods, packaging procedures and documented packaging instructions.

- 2.2.5 Source Inspection: An extension of the Receiving Inspection. Source Inspection is exercised when it is not practical to wait for product to be received in-house before inspection is performed. All suppliers and sub tiers in the production process are subject to audits by MEC quality personnel to ensure all required manufacturing standards are met.
- 2.2.6 Test Equipment Repair and Calibration: Falls under the responsibilities of the Quality Assurance Department. This is an ongoing program, utilized as required by specific customer contract, to ensure all test and measuring devices maintain accuracy within the same tolerance range they are required to monitor. An outside agency or service is employed and the personnel in the Quality Assurance department ensure required adherence to this program.
- 2.2.7 Testing: Inspectors assigned to this area will ensure wire and cable harnesses' are tested for continuity per drawings, diagrams and work instructions. Inspectors also ensure Printed Circuit Boards (PCB's) are tested as required by specific customer contract.

### 2.3 Document Control:

2.3.1 This area of responsibility is part of the Quality Assurance Department. The personnel assigned to these duties will ensure that only the latest drawings, specifications and procedures are on file and released for use at all times. They will also be responsible for revision control of all manuals in used by MEC.

## 3.0 Contract Review

- 3.1 Purpose: To assure that the employees of MEC understand what is ordered, verify that all resources are available to fulfill the contract and allow the Planning Department to develop provisions for special circumstances needed to complete the contracted work.
- 3.2 Scope: A Contract Review will be conducted on all incoming jobs and contracted work.
- 3.3 Procedures:
  - 3.3.1 An MEC Sales Representative will conduct initial customer contacts and negotiations. Any requests for bids or work will be forwarded to the Planning Department.
  - 3.3.2 The Planning Department will start a Contract Review Sheet which will contain as a minimum:

- Date contact/bid request is received
- Date completed work is require
- Customer point of contact
- Special requirements needed to complete work.
- Amendments to the contract and customer approval.

3.3.3 The Planning Department will define the requirements of the contract prior to its acceptance, asses the capability of MEC to meet those requirements, resolve any discrepancies and propose amendments for customer approval, if needed. The Planning Department to complete the work, including:

- Equipment
- Special skills or training required of employees
- Test controls
- Revisions to standard operating procedures

3.3.4 All documentation regarding the contract, amendments and special provisions will be forwarded to Production for implementations.

#### **4.0 Receiving Inspection**

4.1 Purpose: Receiving inspection provides for inspection and test of all incoming parts and materials in accordance with purchase orders, contracts, drawings, prints, catalog specifications, work orders and work authorizations.

4.2 Scope: Receiving inspection applies to all products from vendors, customers and sub-contractors

4.3 Procedures:

4.3.1 When purchased parts and materials are received, from an external source, the receiving inspector will as a minimum:

- Verify quantity actually received against the quantity recorded on the packing slip which accompanied the products.
- Visually inspect the material, parts or components for damage.
- Visually inspect components for proper ID and values, per Purchase Order, catalog or specifications.
- Mechanically measure fabricated parts or assemblies for conformance to drawings, prints and specifications, as well as to form, fit and functionality.
- Raw PCB's will be visually inspected for proper ID, revision levels, visual oxidation, contamination or damage.

- 4.3.2 All parts or materials in a shipment may be rejected and returned to the vendor or supplier if they do not pass individual inspection acceptance criteria. Under extenuating circumstances a rejected lot may be screened 100% and only the defective units returned.
- 4.3.3 Customer furnished parts, components or kits will be subject to the same receiving inspection procedure as described above in section 4.3.1 and 4.3.2 if a cause for rejection is found.
- 4.3.4 When internally fabricated or assembled parts require outside processing such as: plating, painting, silk screening, welding, machining, testing or temperature cycling operations the receiving inspection personnel will be provided with a copy of the Outside Work Authorization or Purchase Order before the product is sent out for processing and conduct the following:
- The receiving inspector will log the Outside Work Authorization or Purchase Order number and all associated pertinent information into the "Items Out for Processing Log" for tracking and record retention purposes.
  - Upon return receipt of these subject items, the Receiving Inspector will enter the receiving date and additional information required by the log.
  - Again, sections 4.3.1 and 4.3.2 apply and are required to be performed.
  - When the item(s) pass receiving inspection, they are stamped as received and accepted on their respective traveler(s).
  
  - The integrity of all received materials is maintained through the constant tracking of inventory, the periodic inspection of expiration dates and the monitoring of any special storage conditions as indicated on the receiving.
  - Discrepant or non-conforming materials are separated and kept in a separate storage area as stipulated in section 4.6.

#### 4.6 Non-Conforming Materials:

4.6.1 Segregation: Any Material or product found to be non-conforming is immediately transferred to the designated area and is clearly labeled.

4.6.2 Identification and Documentation:

- Shortages and non-conforming materials are identified by the Receiving Inspector or the Production Manager and the Quality Assurance Manager is notified.
- Non-conforming items found in Receiving Inspection are recorded in the receiving log and the Quality Assurance Manager is notified. All information is then recorded in a Supplier Quality Report.
- Non-conforming items found in production are recorded in the Non-Conforming Materials Report and the Quality Assurance Manager is notified.

4.6.3 Review and Disposition: The Materials Review Board (MRB) inspects all non-conforming materials. The MRB will investigate the cause of the event and will assign one of the following dispositions:

- Scrap: Material is scrapped with all salvageable parts removed.
- Rework: Material is assigned to Production Planning for rework.
- Return to Supplier or Customer.
- Use As Is with Customer Approval

4.6.4 Corrective Action and Prevention: The MRB, if applicable, Will recommend a change in production in order to preclude re-occurrence of the non-conforming event. Any such revision in process will be coordinated through Engineering, Quality Assurance, and the Production Manager. In Addition, the Quality Assurance Manager will take the following steps for preventions.

- A Non-Conforming Materials Summary will be done outlining the number of occurrences of each event and the corrective action taken.
- Corrective actions will be monitored to ensure their completion.
- Costs of rework, repair and scrap will be tracked.
- Total number of reoccurrences will be monitored if necessary.
- The Quality Assurance Officer will use all documentation to follow trends found in the causation of non-conforming materials.

## 4.7 Traceability

4.7.1 MEC shall maintain the identification of the product during all production activities:

- Receiving: Per procedure, all incoming product is labeled and recorded in a receiving log.

- Production: Travelers accompany each contract, requiring all employees involved to record their specific role in each stage of production from procurement of parts to final inspection.
- Shipping: Each completed product is serialized and shipped with copies of the traveler and any other required contract information. A shipping log is maintained to record quantities and dates of shipments.

## 5.0 Process Inspections

- 5.1 Purpose: Process inspections provide for the visual testing of assemblies and sub-assemblies during the manufacturing process.
- 5.2 Scope: All wire and cable assemblies, PCB assemblies, sub-assemblies and integration work specified as an operation on the Traveler.
- 5.3 Procedure:
- 5.3.1 In-process inspectors will use any or all of the following, as applicable, during the inspection process: wire lists, parts lists, bill of material (BOM's), schematics, wiring diagrams, assembly drawings, prints, Engineering Change Notices (ECN's), in-house work instructions, customer furnished procedures, customer furnished or approved sample assemblies, customer specifications, government specifications, IPC-A-610 specifications, etc.

**Note:** Unless otherwise specified, customer furnished prints and assembly drawings take precedence over any other document listed above. In addition, it is encouraged to use complete and customer approved first articles as sample assemblies for inspection purposes.

- 5.3.2 Using the traveler and accompanying paperwork and drawings, determine the specification and workmanship criteria for the assemblies received for inspection. Review all specifications, work instructions, drawing notes and ECN's before performing any inspections.
- 5.3.3 PCB assemblies are visually inspected 100% for:
- Proper masking
  - Part damage
  - Correct components (Value and ID)
  - Correct component placement
  - Correct component orientation (including polarity)

- Missing parts or components
  - Special heat sink and fastener assembly requirements
  - Adherence to all special notes on prints and drawings
  - Adherence to special process requirements
  - Adherence to all workmanship standards and customer requirements.
  - Small capacitors and Surface Mount parts are visually inspected using proper magnification.
- 5.3.4 Wire assemblies, as well as equipment cases, control panels and card nests are 100% visually and mechanically inspected for:
- Wire assembly damage
  - Correct hardware assembly and build-up
  - Solder and crimp quality
  - Termination quality
  - Cleanliness
- 5.3.5 Case and housing assemblies are visually and mechanically inspected for:
- Correct hardware assembly and build-up.
  - Assembly formation damage.
  - Proper application of torque requirements.
  - Proper application of sealant and fastening materials.
- 5.3.6 Inspection results of assemblies and sub-assemblies will be appropriately documented.
- 5.3.7 Product that has been rejected will be returned to the work station and operator who originally performed the work or a designated rework station. The defects will be corrected and the assembly(s) will be re-inspected by the same inspector who rejected the work the first time.
- 5.3.8 When the assembly work has passed all required In-Process Inspections, the inspector(s) will stamp and date the respective traveler(s) that will release the assemblies to the next operation.
- 5.4 Any defect or process indicator found during process inspection will immediately be documented on the production traveler, and Production Supervision and Quality Assurance will be notified.
- 5.4.1 Quality Assurance will decide if the discrepancy should result in immediate rework, or if assembly should be referred to the Material Review Board for disposition assignment.

5.4.2 A corrective action report will be generated listing the type of defect/process indicator, the inspector responsible for finding the discrepancy, the process stage the problem occurred, and the operator(s) responsible for the discrepancy.

5.4.3 Using the corrective action report, Quality Assurance will work with Production, Engineering, and, if necessary, customer representatives to determine the best course of action to correct the discrepancy and preclude its reoccurrence. This action will be documented on the corrective action report, and its implementation date will be recorded.

5.4.4 Quality Assurance will be charged with ensuring the implementation of the corrective action, and the monitoring of its results. If the discrepancy reoccurs or the results are less than satisfactory, the corrective action process will be repeated until the process and results meet all customer requirements.

**Note:** Section 5.0 is the Basic Process Inspection Procedure for all products and assemblies produced or serviced at MEC. Specific, detailed procedures are covered by MEC "Standard Operating Procedures" (SOP's).

## 6.0 Final Inspection

6.1 Purpose: Final inspection affords the Quality Assurance department a final opportunity to inspect all work performed for compliance to all customer requirements before the finished product is shipped to the customer.

6.2 Scope: All products and assemblies produced or serviced at MEC will receive a final inspection. There are seven (7) categories of product or services performed at MEC:

1. Wire Harnesses
2. Cable Assemblies
3. Wired Modules and Sub-Assemblies
4. Chassis
5. Power Supplies
6. PCB Assemblies
7. Up-Grades and Returns

6.3 Procedures:

6.3.1 Remove all paperwork from the folder or jacket and ensure that you have all the required prints, drawings, ECN's, parts lists/BOM's, work instructions, traveler(s) etc... Verify that all

traveler operations, up to the Final Inspection have been completed and appropriate blocks stamped.

- 6.3.2 Using the traveler and accompanying paperwork and drawings, determine the specification and workmanship criteria for the assemblies received for final inspection. Review all specifications, work instructions, drawing notes and ECN's before performing any inspections.
- 6.3.3 Ensure that all previous inspection documentation is present. Review the previous inspection results to ensure that all work/rework has been performed, appropriately inspected and the acceptance blocks have been stamped.
- 6.3.4 Obtain all Customer supplied or approved samples and visual aids needed to complete inspection.
- 6.3.5 Using the appropriate inspection magnification, inspect the assemblies for compliance to the required specifications. As a minimum, final inspection should incorporate the following:
- Correct PCB assembly identification, revision levels, dash numbers, serialization and/or special markings per specifications.
  - 100% visual inspection for the correct installation of all polarized parts and components. (ie.: capacitors, diodes, transistors, and IC's).
  - 100% visual inspection looking for: Missing, raised and damaged components, correct component installation (attention to values and identification), correct wiring, lead lengths and sleeving, contamination and PCB damage.
  - 100% visual inspection of all solder joints.
  - 100% inspection of all mechanical assemblies. Special attention to correct dimensions, staking, fastening requirements, missing hardware or assembly components.
  - 100% inspection of wire harnesses or cables.
- 6.3.6 All final inspection results will be documented by the inspector performing this operation.
- 6.3.7 If any discrepancies are found during final inspection, these observations will be recorded on an Inspection Data Sheet (the assembly (s) will not be released for rework until the inspection results are properly recorded).
- 6.3.8 All discrepancies will be returned to the responsible operator who performed the original work or a designated rework

station. The responsible operator will rework all discrepancies back to specification compliance.

6.3.9 All rework will be documented on the traveler. The reworked assembly(s) and rework documentation will be returned to final inspection.

6.3.10 The final inspector will stamp the appropriate blocks on the traveler when final acceptance of the assembly(s) has been achieved.

6.3.11 Assemblies that have passed final inspection, including all paperwork and documentation, will be placed on a designated table for final cleaning.

**Note:** Section 6.0 is the Basic Final Inspection procedure for all products and assemblies produced or serviced at MEC. Specific, detailed procedures are covered by MEC "Standard Operating Procedures" (SOP's)

## 7.0 Testing

7.1 Purpose: The Test Department provides the equipment and methods to electrically, mechanically or electronically exercise assemblies or sub-assemblies to ensure functional compliance to customer or design specifications.

7.2 Scope: This section applies to the testing of modules, sub-assemblies, wire and harness assemblies and completed systems. Testing will be performed as required by specific customer contract or statement of work utilized customer supplied or approved test fixtures and documentation. All testing will be performed utilizing calibrated and certified test equipment and controlled test procedures. Provisions have been made to include functional electrical testing as well as temperature cycling test methods.

7.3 Procedure:

7.3.1 Testing supervision will establish and maintain testing stations as required to ensure acceptable operating levels are maintained through all levels of product performance.

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7.3.2 The Test Supervisor will control all written test procedures as well as maintain all test equipment and test fixtures used throughout the test procedure.

- 7.3.3 All irregularities or problems with test equipment or test fixtures will be documented by the test operator and immediately inform the Testing Department Supervisor. The Testing Department is responsible for prompt investigation and corrective action as required. All corrective actions will also be recorded on the Test Documentation and properly filed for future reference
- 7.3.4 Changes or modifications to test fixtures or test procedures will be documented and approved by the customer.
- 7.3.5 Work orders being processed through the Testing Department will be logged in when received. Date started, date completed, final test results and the date the assembly(s) leave the department will also be recorded in the same log.
- 7.3.6 The Testing Department Supervisor will maintain all forms and records used by the Test Department. Copies of these forms and records are kept on file for a period of at least two years.
- 7.3.7 Test failures are recorded by the Test Operator both on the traveler and on the daily test report with the following actions:
- Assemblies which fail testing will undergo the necessary troubleshooting procedures.
  - Troubleshooting will be performed by a test technician or the Test Supervisor to determine the actual root cause of the failure.
  - All troubleshooting activities will be documented in the appropriate space or blocks on the Daily Test Report.
  - All rework or repairs performed in the Testing Department will be inspected by a QA Inspector for acceptance to customer and MEC workmanship standards.
  - When assemblies pass testing, either after the first pass or after rework or repairs are successful in achieving acceptable test results, the respective traveler(s) will be initialed or stamped and dated in the appropriate block(s) by the test person who performed the work.
  - A QA Inspector must accept all rework or repairs made, as well as, stamp and date the respective traveler(s) before the assemblies can leave the Test Department.

7.4 Burn-in and Temperature Cycling will be performed when required by purchase order, contract, customer or government specifications.

7.4.1 Burn-in is the process of applying electrical power to the assembly circuitry while the assembly is placed in an environment that is held at an elevated temperature range. The elevated temperature range will vary in accordance with the customer or specifications.

7.4.2 Temperature cycling is the process of subjecting an assembly to both a specified high and low temperature as well as experience the entire temperature range within a specific time schedule.

- Assemblies which have Temperature Cycling requirements most often require the temperature to be cycled numerous times during a period of no less than 12 to 24 hours.
- Often there is the added requirement of having electrical power continuously applied to the assembly circuits throughout the temperature cycling process.

7.4.3 Both of these tests are performed for the expressed purpose of gaining a higher reliability product.

7.4.4 Assemblies that fail during the performance of either of these two tests, will be handled in accordance with section 7.3.7 of this procedure.

7.4.5 Successful completion of either of these two tests will be recorded on the respective traveler(s). The test operator who performed the test will be required to initial or stamp and date the traveler(s) in the appropriate blocks.

7.5 Up-grades and Returns

7.5.1 Up-grades and returns, when received must first be handled in accordance with the receiving inspection procedures and then take the following steps:

- New travelers will be generated for each individual assembly received at MEC for up-grade or rework and repair.
- New work instructions will also be generated as required.
- When a customer returns assemblies to MEC for up-grading to a new revision level, all pertinent forms – to information should be incorporated into the special

notes sections on the traveler or into the new work instruction.

- When assemblies are returned to MEC for rework or repairs, a Quality Assurance Inspector must verify the presence of a valid reject.
- The Quality Assurance Inspector will appropriately mark all verified rejects or defective areas and record specific data on the respective assembly traveler.
- Touch-up or repair operators will correct all areas marked by the MEC QA Inspector and initialed or stamp and date the appropriate blocks on the traveler(s).
- All assemblies that have been reworked or repaired will be returned to the same QA representative who originally inspected the product.
- When all revision up-grade work has been completed on the respective assemblies, the operator who performed the work will initial or stamp and date the appropriate blocks on the traveler(s).
- All assemblies that have had all required revision up-grade work completed will be sent to final inspection.
- If an assembly(s) were returned to MEC for defects or problems that can not be verified by visual inspection, the inspector will elevate the returns to QA Supervisor.
- If QA Supervision can not verify the reason for customer rejection, the item or assembly(s) will have a tag attached to it that will state “No Rejects Found”. The tagged item(s) will be repackaged and returned to the customer.
- All assembly(s) which pass final inspection and their travelers are properly stamped off and dated will be repackaged and returned to the customer.
- A ten (10) working day turn around time is a normal requirement for processing all up-grade and returned items.
- Any assemblies returned to MEC that require immediate attention or a special turn around time will be yellow tagged with the legend “Urgent & Immediate Attention Required”. Everyone involved will receive special instructions from Management relative to the special turn around requirements.

## **8.0 Stamps and Stamp Control**

### **8.1 Purpose:**

- 8.1.1 Rubber stamps are issued as a minimum to all QA Inspectors. The QA Inspectors will use their respective

stamps to both indicate their individual acceptance or rejection on product surfaces, travelers and inspection documents or records.

- 8.1.2 Rubber stamps when issued to production and assembly personnel will be used on travelers and product routing sheets to indicate what operations have been performed as well as show performed the work.
  - 8.1.3 Test personnel who are issued rubber stamps will use them on travelers, product routing sheets and special test documents. Test personnel will use their individual stamps to indicate the performance of test operation as well as to indicate test acceptance or rejection.
  - 8.1.4 To ensure that management knows who has been assigned each individual set of stamps; an issuance and control log is used and kept current by management or a designated employee.
- 8.2 Scope: This section is to all assembly, test and inspection stamps assigned to MEC employees. Management will purchase, issue and control all rubber stamps used at MEC.
- 8.3 Procedure:
- 8.3.1 When rubber stamps are issued to an employee, management will require the employee to place an imprint of the assigned stamp in the stamp control log. Next to the stamp imprint the employee will be required to print and sign their name, as well as put the date they received the stamp.
  - 8.3.2 The guidelines and rules that accompany the responsibility of being assigned a stamp are as follow:
    - A rubber stamp is only issued to one individual at a time.
    - Stamps are not to be loaned to anyone. The stamp is the same as a person's signature and use of someone else's stamp is the same as forgery or the falsification of records.
    - Stamps should never be left unattended at a workstation or in an unlocked toolbox.
    - When an employee changes job descriptions or leaves the company, their assigned stamp must be returned to management.
    - When an employee is required to return their stamp to management, the stamp will not be re-issued or used

again by anyone for a period of no less than two calendar months.

- Employees who misplace, lose or suspect their stamp of being stolen must report this occurrence immediately to management.
- Stamps are only to be used for the expressed purpose of indicating any of the following; performance of an operation, acceptance of an item or assembly or rejection of the same.
- Travelers and forms are to be stamped using ink suitable for paper.
- Waterproof, indelible ink will be used when product surfaces are to be stamped by inspection or test personnel.

## **9.0 Document and Change Control**

- 9.1 Purpose: The purpose of this section is to provide a means to assure that the latest drawings, specifications and procedures are both available and in use throughout the company. It is the intent of this section to also manage Engineering Changes to ensure they are received, released and controlled in an orderly and systematic fashion.
- 9.2 Scope: All released documents which include: drawings, prints, specifications, process procedures, work instructions, test procedures, wiring diagrams and schematic engineering orders and engineering change notices.
- 9.3 Definitions:
- 9.3.1 Released document: any of the items referenced in the above section 9.2 that have been reviewed and approved by no less than one representative each from Quality Assurance and Engineering Management.
- 9.3.2 Engineering Order: an officially released document that implements a permanent change to a previously released drawing, print, schematic, specification, procedure, diagram or work instruction.
- 9.3.3 Engineering Change Notice: an officially released notification of a change or changes to a previously released drawing, print, schematic, specification, procedure, diagram or work instruction that may be or are in actual use at the time of the notification. Engineering Change Notices when received should be implemented as an official change to the document presently in use.

#### 9.4 Procedure:

9.4.1 Customer furnished, as well as in-house generated released documents are the basic foundation for all processed employed in any manufacturing or service operation. All levels of performance are judged by the standards contained in these released documents.

9.4.2 At MEC, the Quality Assurance Department maintains the document control system.

9.4.3 The responsibilities of the Quality Assurance Department for the document control systems are as follows:

- Maintains a current file of all of the latest original released documents received from customers or as generated in-house.
- Maintains a file of all obsolete documents. These documents are retained for the expressed purpose of reference, history of past assembly or test configurations and for use in reworking and re-testing customer returns.
- Ensure that only the latest and most current revisions of any released document is in use throughout the company.
- Prompt removal of all illegible or marked up released and controlled documents from use within the company.
- Control the release of all Engineering Change Notices or document revision changes.
- Ensure that the latest revision changes are made to all controlled manuals in use throughout the company.

9.4.4 Changes to documents presently in use are handled as follows:

- When a document has been distributed and is presently in use throughout the manufacturing operations, it can only be changed by an approved Customer Change Notice. The change is issued as a permanent supplement to the original product it affects. When received, the changes to the product, assemblies or processing/test procedures should be implemented as directed by management.
- An authorized representative of either the Quality Assurance or Engineering Department can only change customer furnished documents. The changes to the documents will be initialed and dated by the representative making the change.

## 10.0 Repair, Calibration and Certification of Measuring and Test Equipment

10.1 Purpose: This section provides for a program to repair as required, calibrate and certify the accuracy of the measuring, test equipment and tools used for the acceptance of product by the MEC Quality Assurance Department.

10.2 Scope: This section applies to all equipment and tools used by the inspection and test department personnel to accept deliverable product and assemblies for our customers.

10.3 Procedure:

10.3.1 Calibration of test equipment utilized by MEC for acceptance of product will be accomplished as required by specific customer contract.

10.3.2 MEC uses an outside Calibration Service whose facility meets the requirements of Mil-Hdbk-52. The calibration service maintains equipment that is traceable to the National Bureau of Standards.

10.3.3 The calibration service maintains a current log of all equipment used by MEC that, by contract, they calibrate and certify.

- The calibration service issued MEC an appropriate notice, usually one month before the date of calibration expiration.
- These recall notices aid the QA Department in its efforts to remain current in all areas of calibration certifications.

10.3.4 The service attaches their certification sticker to each piece of equipment that is calibrates and certifies.

- The certification sticker will be placed on a surface that will not interfere with the use, be damaged or removed by the intended use of the equipment.
- As a minimum: each sticker will indicate the actual calibration date and expiration date of certification of the equipment.

10.3.5 Production tools or gauges used during In-Process acceptance of deliverable products or assemblies, are calibrated and certified as required by customer contract.

- The calibration service will maintain, calibrate and certify these production tools or gauges in accordance with all of the above sections of this procedure.

10.3.6 Test equipment, measuring devices and gauges that will not be used at any time for inspection or acceptance of deliverable products or assemblies, will not be maintained, calibrated or certified by the Calibration Service.

10.3.7 All test equipment, measuring devices and gauges that are out of or overdue for calibration will be red tagged as "Reference Only" and will not be used for any inspection purposes.

## 11.0 Sampling Plans

11.1 Purpose: This section provides plans to statistically sample materials, components and parts to determine their acceptability.

11.2 Scope: These plans are used whenever 100% inspection or testing is impractical or unreasonable.

11.3 Procedures:

11.3.1 MEC conduct 100% inspections and testing of all incoming parts and materials in accordance with purchase orders, contracts, drawings, catalog specifications, customer or government specifications, work orders and work authorizations.

11.3.2 In a continuing effort to improve or quality, anything other than "0" (zero) defects will be reported immediately to the Production and Quality Assurance Managers.

## 12.0 Control and Disposition of Non-Conforming Items

12.1 Purpose: The purpose of this section is to assure systematic processing of non-conforming items.

12.2 Scope: This section applies to the four basic types of items:

1. Parts, components and material in Receiving Inspection or Stock.
2. Products already in process.
3. Completed assemblies in stock.
4. Customer owned products in the process of repair or modification.

12.3 Definitions:

12.3.1 Defects and Defectives: A defect is defined as any attribute that fails to conform to specifications or drawing requirements. A defective item is defined as a device with one or more defects.

### 12.3.2 There are four basic types of defects:

1. CRITICAL- Functional failure of product conformance which will threaten life or result in loss of property.
2. MAJOR-Functional failure of product conformance which severely affects the product form, fit and function.
3. MINOR-An attribute which deviates from specifications or drawings, but can be reworked to conformance.
4. INCIDENTAL-An attribute that does not affect “fit or functionality” and could be viewed as only cosmetic in nature.

### 12.3.3 There are five basic decisions that may be made regarding non-conforming items:

1. Use “As Is” .
2. “Rework” the item back to conformance, specifications or drawing.
3. “Repair” the item to a planned, but customer acceptable deviation from specification or drawing.
4. “Scrap” the item.
5. “RTV” Return to Vendor or Customer.

## 12.4 Procedure:

12.4.1 Non-conforming parts, components and materials in Receiving Inspection or Stock is controlled with a Supplier Quality Report. These items are held in a specific area in the Receiving Department with their disposition clearly marked or tagged to their respective container. Once copy is sent to Purchasing, one copy to Finance and one copy is held in Receiving Inspection. The Receiving Inspections copy returned with the respective item(s) to the Vendor/Customer.

**Note:** The disposition of these items will always be RTV (Return to Vendor) unless they meet the conditions of Section 4.3.2 of this manual. Items that meet the conditions of Section 4.3.2, of this manual are either acceptable or deemed incidental in nature and can be used “As Is”. In-process items found to have an incidental defect will be evaluated by Quality Assurance for a “Use As Is” decision.

12.4.2 Non-conforming assemblies, either in process and or completed and in stock, that are found to have a “*Minor Defect*” will be moved back to the most appropriate workstation where they will be reworked to specification and drawing compliance. The Engineering Department will assist in the development of associated rework instructions on an as needed basis.

12.4.3 Non-Conforming assemblies, either in-process and or

completed and in stock, which are found to have a “*Major Defect*” will be evaluated jointly by Quality Assurance and Engineering Departments. All “repair work” will be performed to a customer approved “Planned Deviation”.

12.4.4 Non-conforming assemblies either in process or completed and in stock, which are found to have either a Major or Critical defect will receive joint evaluation by the Quality Assurance and Engineering Departments. If it is decided that the product is beyond a condition that can be repaired to customer satisfaction, then the product will be scrapped. Accounting, Finance and Planning will be notified of this Important decision.

12.4.5 Any time Quality Assurance has to involve Engineering to evaluate Major or Critical defect, this effort will be considered to be a MRB (Materials Review Board) activity. Their evaluation activity will be documented and retained to file in the Quality Assurance Department.

### **13.0 Control of Purchases**

13.1 Purpose: The intent of this section is to assure that purchased products, supplies and services conform to specified customer requirements, MEC has agree to supply.

13.2 Scope: This section includes all Purchase Orders for parts, components, wire, material and services used at MEC in the production of deliverable goods or services to MEC customers.

13.3 Procedures:

13.3.1 The purchase of parts, components, wire, materials and services are done through a written instrument called a Purchase Order. MEC purchases orders have four sections and are as follows:

- Vendor Copy: these pages are sent to the supplier along with applicable specifications, drawings, prints and special instructions. These pages and the Acceptance copy page make up the standard conditions of the purchase agreement and the flow down of requirements.
- Acceptance Copy: these pages are sent to the supplier along with the Vendor Copy pages. As compiled, these become the standard conditions of the purchase agreement. The vendor is required to sign and date the appropriate pages of this package as their acknowledgment of acceptance of the terms and conditions of the Purchase Order.

- Accounts Payable Copy: these pages are sent to the Finance Department for use in the accounting process.
- Follow-up Copy: these pages remain in the Purchasing Department. They serve as a record of contract with a supplier, as well as, a means for expediting delivery of goods or services.

13.3.2 Information for the regular ordering of parts, components, wire and materials are kept on file per vendor or supplier name. These files will contain:

- Vendor stock numbers
- Manufacturers used
- Part Numbers
- Approved equivalents
- Approved alternate sources
- Quantities ordered
- Past vendor or supplier performance information

13.3.3 Information for assessing vendor or supplier performances is obtained from:

- Receiving records
- Receiving inspection records
- QA inspection records
- QA generated vendor discrepancy reports
- Purchase order records
- Vendor return reports and QA generated Supplier Quality Reports (SQR's)

13.3.4 Vendors and suppliers will receive continuous feedback on the status of their performance through the following:

- QA generated vendor discrepancy reports
- QA generated vendor return reports
- QA generated Supplier Quality Reports

13.3.5 Vendor and suppliers who generate a performance history of consistently late deliveries, above industry normal discrepancies and receive a correspondingly high number of SQR's, will be contacted jointly by MEC QA Department and Purchasing Representatives. Their contact with the vendor or supplier will be to discuss and ultimately achieve an improvement in performance.

13.3.6 Vendors and suppliers that have a demonstrated "good" performance record will be placed on the MEC "approved vendors list". MEC will annually publish this list.

13.3.7 Vendors and suppliers that are contacted jointly by the QA

department and Purchasing representatives because of  
 “less than acceptable” performance and who do not improve in their subsequent performance will be removed from (or be prevented from being placed on) the “approved vendors list”.

#### **14.0 Certification and Training**

14.1 Purpose: The purpose of this section is to assure that employees involved in the production process have the necessary training and certification to perform their jobs.

14.2 Scope: This section applies, as a minimum, to all MEC production employees.

14.3 Procedures:

14.3.1 All MEC employees are selected and hired for each respective job based on the individual education, background and previous job related experience.

14.3.2 The job application and interview sheet is the primary tool used in this evaluation process. The job application is available through the companies Personnel Department. Each job interview sheet contains, as a minimum, the following:

- Job name
- Generalized job summary and description
- As applicable, specific job duties
- Specific qualifications required for MEC acceptance of an individual for a job could include the following: trade licenses, certifications, educational degrees, specific years of experience and the ability to pass job skill related tests. Test requirements will normally be part of the job advertisement.

14.3.3 Training programs shall contain as a minimum:

- Training supervisor
- Date and location of training
- Method of evaluation of trained skills
- Date of most recent training
- Work experience of trained personnel
- Test results or certifications that are documented and provided to trained personnel
- Functions that trained personnel are certified to perform
- Work experience of trained personnel
- Records of training for specific job functions

- Periodic reviews of work performance under trained guidelines
- Signature of trainer to validate evaluation and testing

14.4 All MEC employees may be required to handle electronic components or assemblies and must be trained and certified in electrostatic discharge control and safety.

14.4.1 This training requirement will ensure that the employees are aware of the hazards of static discharge. The Quality Assurance Department will be responsible for ensuring this training requirement is completed by all eligible employees.

14.4.2 The Quality Assurance Department will also have the associated responsibility of ensuring all production and related employees, their work stations, equipment and grounding devices are consistently providing the necessary and required ESD safeguards. This will include the use and auditing of all associated verification logs, static measuring devices and checkpoints enacted by MEC. The level of surveillance, audits and inspections of associated logs will be set by the Quality Assurance Manager and recorded in the Quality Inspection Procedures for continual reference and use.

14.5 Training and Certification to the requirements of IPC-A-610D and IPC/EIA J-STD-001D will be a requirement for all employees assembling, processing, soldering and inspecting product for customers employed under Government-awarded contracts.

14.5.1 MEC will train and certify selected employees to the requirements of IPC-A-610D and IPC/EIA J-STD-001D utilizing a training course that complies with the requirements and intent of this specification ONLY.

14.5.2 Employees who are trained and certified to any level of IPC-A-610D or IPC/EIA J-STD-001D certification are constantly reminded that their ability to maintain their certification is fragile. If any employee can not consistently demonstrate the knowledge and workmanship skills that this type of contract work demands, their certification status can be revoked by the Quality Assurance Department. If an employee's certification is ever revoked, the decision to retrain and re-certify the employee will be made jointly by the Quality Assurance and Training Managers.

14.5.3 All IPC-A-610D and IPC/EIA J-STD-001D certifications must be renewed on a bi-annual basis. Certification may be required as needed for employees performing special job

functions, or for employees demonstrating the need for re-training due to poor work performance. The Training Manager will maintain training records and testing schedules. Re-testing and re-certification of employees is also the responsibility of the Training Manager.

- 14.5.4 Electrostatic Discharge Training is currently administered by Amer Elshafei, Director of Quality. IPC-A-610D and IPC/EIA J-STD-001D training is currently administered by Melinda Ehret, Training Manager. Both positions work together to evaluate the need for training and re-training outside of normal requirements.
- 14.5.4 Training and testing records and associated examples of practical skills are subject to Quality Assurance review and audits.
- 14.6 Job specific training of all production employees is considered an ongoing requirement. Management will be responsible for ensuring constant review of the performance of their employees. Whenever a new hire or a long-term employee lacks the demonstrated skills to perform any job task, "on the job training" will be enacted. All "on the job training" given to an employee needs to be documented. The need for documentation is necessary both to assist in employee performance evaluations and for management/employee utilization purposes.
- 14.7 MEC Management reserves the right to recommend or utilize outside professional training facilities, seminars or continuing education programs to improve their employees' job skills and performance.

## **15.0 Packing and Shipping**

- 15.1 Purpose: The purpose of this section is to assure that all items that will be delivered to MEC customers are packaged, identified and shipped properly.
- 15.2 Scope: This section covers all items for shipment to customers.
- 15.3 Procedures:
- 15.3.1 The document that governs all shipments is the Packing list. The packing slip originates in the Receiving Department from Sales Order information. Packing List are generated in the Receiving department and sent to the shipping area where it is held until the required assemblies are ready for shipment.

- 15.3.2 When assemblies are released by final inspection and sent

to the shipping area, each item is checked against the information on the packing list.. As a minimum the items must match the Purchase Order Number, Assembly/Part Number and quantity to be shipped.

15.3.3 Each assembly will be packed in anti-static protective materials (if require). Each item or assembly will be placed into a shipping container in a way that reasonably prevents damage from occurring during subsequent shipping and handling.

15.3.4 The packing list and any other required documents such as bills of lading, air bills, declarations or certifications of compliance are attached to the shipping container. The containers are labeled with source and destination names, address and appropriate handling instructions, as well as any other information required by MEC customers.

## **16.0 Quality Program Planning**

16.1 Purpose: The purpose of this section is to provide for quality program planning using available documentation to initiate process controls, track non-conformances, identify uncommon defects and process indicators, and prepare for special processes not encompassed in normal operations.

16.2 Scope: This section applies to all work in stages of pre-production and in process.

16.3 Pre-Production procedure:

16.3.1 Request for quotes or proposals are reviewed by MEC Executive Management as quickly and as early as possible to determine if special processes are warranted.

16.3.2 Any special or unusual requirements that need to be addressed by the Quality Assurance organization will be forwarded to the Quality Assurance Manager at this time.

16.3.3 Quality Assurance will work with Engineering to examine all customer BOMs, drawings, and specifications to determine if additional inspection criteria or additions to established defect or process indicator criteria is warranted. Any necessary criteria will be documented and included in the documentation folder to be used by production in process control.

16.3.3 The Quality Assurance Manager will provide Executive

Management with the necessary planning and costing information for each area of extraordinary QA requirements.

16.3.4 This information will be incorporated into the proposal or quotation package as well as denoted on the Contract Review sheet.

16.3.5 Quality Assurance, Production, and Engineering will determine how to develop and implement any special processes using customer assistance and approval if required.

#### 16.4 Production Procedure:

16.4.1 Special processes will be implemented by Production, with careful observation and analysis by Quality Assurance to ensure that defects or process indicators do not result.

16.4.2 Any process indicators or defects that occur that have not been previously defined and documented shall be identified as soon as possible and will be processed according to the non-conformance procedures outlined in Section 5.

16.4.3 It shall be the responsibility of the Quality Assurance Manager to ensure that all identified and defined defects and process indicators resulting from process variances are documented and added to inspection criteria for future reference. Quality Assurance is also responsible for working with Production to ensure that necessary changes in process controls are implemented immediately and continuously monitored until the desired results are met.

16.4.4 The Quality Assurance Manager shall ensure that all process controls and inspection criteria are maintained in the latest revision status, unless required otherwise by customer specifications.

#### 16.5 Continuous Improvement Program

16.5.1 MEC is committed to developing and constantly improving manufacturing processes through the following measures:

- Constant monitoring of the assembly process by Production Supervisors and Quality Assurance to ensure that all customer requirements, static control precautions, and inspection criteria are strictly adhered to.
- Control of process operations and conditions to limit variances in production procedures and results.

- Keeping a Wave Solder Log that details the optimum conditions for each assembly. The goal is to have perfect solder joints THE FIRST TIME.
- Tracking process indicators and defects through non-conformance reports and inspection results to limit the reoccurrence of process failures and identify and eliminate trends in the production process that result in non-conformances.
- Using Statistical Process Control to analyze defects and assist in the problem-solving process. These controls include Pareto Charts, Graphs and constant data collection to insure the constant flow of information.
- Striving to achieve and maintain process capability standards as defined by customer specifications, the occurrence of non-conformances, and statistical process control.
- The objective of incorporating “Continuous Flow Manufacturing’ into our assembly process to reach 95% productivity, increase quality through self-inspection and eliminate excess inventory.

## 17.0 Internal Quality Audits

17.1 Purpose: To establish an internal audit plan for conducting quality control audits within assigned areas. The plan furnishes the Quality Assurance Manager with the information needed to implement corrective actions necessary to improve both quality and efficiency.

17.2 Scope: This section applies to the Quality Assurance Manual and the procedures located herein.

17.3 Procedures:

17.3.1 Audits will be scheduled and coordinated with the specific area Manager. Random audits can be performed at the QA Managers discretion without this coordination.

17.3.2 If deficiencies exist, the audit will be incomplete until a corrective action has been implemented. This implementation must be complete within a time period specified by the QA Manager and the Production Manager.

17.3.3 Types of Audits: The areas to be audited will be divided into the following areas:

- Contract Review: Including control of specification change control and revisions to production processes.

- Personnel: Including training, certification, stamp issue and tracking of production incidents.
- Measuring and Test Equipment: Calibration and maintenance.
- Assembly: Preparation per specification, using travelers.
- Soldering Operations
- Inspection
- Receiving Inspection
- ESD Training and Testing
- Inventory and Storage: Including maintenance of environment controls, monitoring shelf life and proper storage inventory.
- Any other specific task or process deemed necessary by the QA Manager.