european space agency
agence spatiale européenne

Pages 1 to 36

CHECKLIST FOR MONOLITHIC MICROCIRCUIT

MANUFACTURER AND LINE SURVEY

ESA/SCC Basic Specification No. 2029000

Manufacturer :
Location :
Survey Team Leader :
Date of Survey :
Microcircuit Type(s) :

space components
coordination group

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 1	November 1994		

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.

TABLE OF CONTENTS

1. INTRODUCTION

This checklist is intended for use during the initial survey of a Manufacturer's ability to produce high quality articles, his management organisation, production facilities, test facilities and technical know-how. When completed, this checklist should enable the party interested in procurement of the subject components to assess the ability of the Manufacturer concerned to successfully execute a contract for the supply of high reliability space hardware.

2. SURVEY CHECKLIST

2.1 INTERVIEW ON ARRIVAL OF SURVEY TEAM

(a) Introductory Remarks by Team Leader (Explanation of purpose of survey, procedures to be followed, time limitations, etc.):-

(b) Notes (Atmosphere during reception, willingness to co-operate, interest shown, comments on personnel, general remarks):-

2.2 MANUFACTURER AND SURVEY TEAM INFORMATION

(a) Survey requested by :

Survey Team Leader :

Team Members :

(b) Key personnel of Manufacturer interviewed:-

Name	Function	Tlph. Ext.
1.		
2.		
3.		
4.		
5.		

(c) Type of Company (Private company, limited company, etc.)

Affiliated with any other company? If so, which:

No. of employees:

- Total number :
- Production :
- Quality Assurance :
- Q.A. Inspection :
- Prod. Engineering :
- Design Engineering :
- Reliability Control :
- Other :

(d) Number of shifts :

(e) Plant area :

(f) General production line :

(1) Device types manufactured:

(2) Will flow diagrams of steps to produce monolithic microcircuits be available to Survey Team?

YES NO

Are specifications, if any, referenced in the flow diagrams?

YES NO

(g) Principal Government and industrial customers:-

1.
2.
3.
4.
5.

(h) The Manufacturer's Quality System is organised in accordance with:

Comments

(i) Manufacturer's Government Service Inspection:

DCAS Inspector, resident/non-resident

(j) National Inspectorate:

(k) Is the Manufacturer's monolithic microcircuit production

(1) Continuous?	YES	NO
(2) Pilot production?	YES	NO
(3) Advanced R&D, limited?	YES	NO

(l) The Manufacturer has adequate experience in the production of the following hi-rel parts:-

2.3 MANAGEMENT ORGANISATION

(a) What is general policy/attitude of the Management regarding quality/reliability programme?

(b) Which level of Management participates actively in orientating policy towards space component production?

(c) Which organisation, if any, reviews and monitors all work involved in space component production?

(d) Is work related to space components (contracts) regarded as "normal business" or as belonging to the "unique order" category?

(e) What is the general policy concerning proprietary rights?

(f) Has the "Reliability" department the same authority from Management as the "Engineering" and "Production" departments? Does this mean direct responsibility for reliability of products in the line?

(g) Has the Q.A. Manager direct authority for implementation of quality policy and actions related to the line?

(h) Does a system exist for the regular supply of quality report summaries to Management?

Does this system lead to (corrective) actions being taken in respect of the production line?

(i) Are key management staff notified of persistent out-of-control conditions?

(j) What is length of service and experience of key management personnel (Q.A., Reliability, Production, Engineering Design)?

(k) How would contract for space components be organised?

(l) How can original requirements from Orderer (Space Agency or end-user) be assumed to be correctly translated into internal instructions?

(m) How can information necessary to the Orderer (corrective actions, deviations, notification of inspections and/or problem areas) be assumed to be issued and channelled to the Orderer?

2.4 QUALITY ASSURANCE SYSTEM AND ORGANISATION

(a) To whom does Q.A. Manager report?

	YES	NO
(b) Does the company reflect a positive attitude towards Quality Assurance?	___	___
Comments		
(c) Has the Q.A. group sufficient authority in relation to its position within the company's organisation (see organigram)?	___	___
Comments		
(d) Are areas of responsibility within the Q.A. group clearly defined?	___	___
Comments		
(e) Are corrective actions to which Q.A. management is committed delegated to responsible staff or does Q.A. management have direct authority regarding the line?	___	___
Which?		
(f) Is there a periodic and comprehensive quality data reporting system which covers all operational phases?	___	___
Comments		

(g) What is the relationship between Q.A. and Reliability?

(h) Is a Q.A. manual or equivalent document supplied to all levels of appropriate supervisory personnel?	___	___
Is such document kept updated?	___	___
Comments		

	YES	NO
(i) Are written procedures available for identification and positive control of accepted/rejected materials?	___	___

Comments

(j) What is ratio Q.A. inspectors : personnel directly involved in production?

(k) Is inspection (acceptance sampling or sorting) performed by Q.A. personnel:-

On receipt?	Sampling ___	Sorting ___	None ___
During processing?	Sampling ___	Sorting ___	None ___
During final testing?	Sampling ___	Sorting ___	None ___

Comments

(l) Are written procedures kept and used in areas for:-

Receiving inspection?	___	___
In-process inspection?	___	___
Fabrication processing?	___	___
Final testing?	___	___

Comments

(m) Does Q.A. maintain a system of written procedures for statistic controls (control chart, lot plot, etc.) in any of the following areas?

In-process inspection?	___	___
Fabrication processing?	___	___
Final inspection?	___	___

Comments

(n) Is Q.A. responsible for determination of need for, and the conducting of, quality training? ___ ___

Comments

(o) Are training programmes provided for special process personnel? ___ ___

Comments

	YES	NO
(p) Do employees have to pass tests:-		
After training?	___	___
Periodically?	___	___
Comments		
(q) Are production operators provided with visual aids and working instructions?	___	___
Comments		

2.5 CALIBRATION

(a) Does Manufacturer maintain calibration facilities and standards?	___	___
Is this service purchased?	___	___
If so, from whom?		
(b) Do calibration personnel have written procedures for control and a time schedule for measurement frequency?	___	___
Comments		
(c) Is there an effective calibration record control system?	___	___
(d) Are calibration procedures adhered to and up-to-date?	___	___
Comments		
(e) Are decals used for equipment identification to show that units have been calibrated; when next calibration date is due and calibrator identification?	___	___
Are decals up-to-date?	___	___
(f) Are adjustments of calibrated equipment required to be sealed and tamper-proof?	___	___
(g) Who is in charge of initiating calibration steps?		
User	___	___
Calibration personnel	___	___
Q.A.	___	___

	YES	NO
(h) Do calibration procedures provide for removal of any equipment not maintained or calibrated according to established schedules?	___	___
Comments		
(i) Have calibrating personnel up-to-date certification records reflecting date, traceability to NBS and identification of calibrator?	___	___
(1) Mechanical standard?	___	___
(2) Electrical standard?	___	___
(j) Is modified and/or repaired equipment calibrated prior to release?	___	___

2.6 DRAWING AND CHANGE CONTROL

(a) Has Manufacturer adequate written procedures for control of specification and contract changes?	___	___
Comments		
(b) Does Manufacturer's system provide for documented change control guaranteeing availability of required drawing at relevant manufacturing or inspection step?	___	___
Do flow documents show current revisions?	___	___
Comments		
(c) Are drawings furnished by ESTEC and contract changes adequately controlled?	___	___
Comments		
(d) Does Q.A. review all drawings and changes therein prior to their becoming effective?	___	___
Comments		
(e) Has Manufacturer established a procedure for notifying his Supplier of changes in drawings?	___	___
Comments		
(f) Are current specification revisions shown on prints of drawings?	___	___

		YES	NO
2.7	RELIABILITY		
	(a) Is structure of Reliability organisation clearly defined?	___	___
	Has Reliability same authority in respect of the line as Production or Engineering management?	___	___
	Comments		
	(b) Is there a direct feed-back of information between Reliability, Design Engineering and Q.A. groups to ensure timely notification of all relevant data?	___	___
	Comments		
	(c) Does Reliability respond promptly and efficiently to unexpected and/or newly detected failure modes?	___	___
	Comments		
	(d) Are line failures (types and causes) analysed and reported to those responsible for corrective actions?	___	___
	(e) Are corrective actions resulting from failure analysis agreed with the Q.A. group involved or Reliability if parts or process changes must be made?		
	Q.A. Group	___	___
	Reliability	___	___
	Comments		
	(f) Has Reliability right to approve test specifications, data tabulation, parts or process changes?	___	___
	(g) Is there a system for in-process failure analysis?	___	___
	End-item failure?	___	___
	Reporting?	___	___
	Comments		

	YES	NO
(h) Are following items submitted to failure analysis as a matter of routine?		
- Production line rejects	___	___
- Lots with a high rejection rate	___	___
Define:-		
- Items returned by Orderer	___	___
- Items returned by Orderer with special request for failure analysis	___	___
(i) Has Manufacturer a failure analysis laboratory or an equivalent facility?	___	___
Comments		
(j) Are failure analysis procedures:-		
(1) Available?	___	___
(2) In use?	___	___
(3) Adequate?	___	___
Comments		
(k) Is failure analysis equipment:-		
(1) Available?	___	___
(2) In use?	___	___
(3) Adequate?	___	___
Comments		
(l) Are there special personnel for failure analysis?	___	___
Comments		
(m) Are failure analysis reports:-		
(1) Available?	___	___
(2) Adequate?	___	___
Comments		
(n) Has Reliability a programme to ensure reliability of monolithic microcircuit device designs prior to release thereof?	___	___
Comments		

	YES	NO
(o) Has Reliability access to all pertinent development and production data of monolithic microcircuit devices for analysis purposes?	___	___
Comments		
(p) Is reliability data available of monolithic microcircuit devices from the line(s) which the Manufacturer wishes to be approved?	___	___
Comments		
(q) Has Manufacturer an evaluation laboratory for determination of product characteristics?	___	___
(r) If Manufacturer has an evaluation laboratory:		
- Does it operate according to an established programme? or	___	___
- According to special requests?	___	___
Comments		
(s) Give examples of problems investigated by evaluation laboratory		
(t) Are laboratory results available on request?	___	___
(u) Are data sheets based on these results?	___	___

2.8 CONTROL OF PROCUREMENT SOURCES

(a) Has Manufacturer adequate written procedures for purchase control of materials, components and services?	___	___
Comments		
(b) Has Manufacturer an effective vendor rating system?	___	___
Comments		

	YES	NO
(c) Does rating system provide for effectiveness of written corrective actions received from Suppliers?	___	___
Comments		
(d) Do purchase documents require delivery of test reports if such reports are specified in the relevant ESA contract?	___	___
Comments		
(e) Is there a means of channelling information when specification changes require modification of current purchase orders?	___	___
Is "Receiving Inspection" notified of changes in purchase orders?	___	___
Comments		

2.9 CONTROL OF INCOMING MATERIALS (Performed in situ)

(a) Are Manufacturer's written standard inspection procedures adequate for control of incoming materials and services received?	___	___
Do inspectors know how and when to apply these procedures?	___	___
Comments		
(b) Are materials received in a controlled area from which removal prior to inspection is impossible?	___	___
Comments		
(c) Are materials properly handled and protected during the receiving process?	___	___
Comments		
(d) Does Receiving Inspection use drawings and purchase orders?	___	___
If so, do these documents show Quality Control review?	___	___
Comments		
(e) Are test reports from Suppliers being reviewed?	___	___
Comments		

	YES	NO
(f) Are accepted materials adequately identified?	___	___
Do documents show evidence of acceptance?	___	___
Comments		
(g) Are rejected materials adequately identified and segregated?	___	___
Comments		
(h) Which materials are subject to limited shelf life limitations?		
Comments		
(i) Are shelf life and cure date materials properly identified and controlled?	___	___
Comments		
(j) Do records indicate traceability of units, lots and sublots to applicable documents (specification, revision letter - if any - and inspection record)?	___	___
Comments		
(k) Are materials stored in a controlled area under the responsibility of an authorised Custodian?	___	___
Comments		
(l) Are suitable inspections and tests, including physical and chemical tests, performed on raw materials?	___	___
Comments		
(m) Are such tests performed:		
- In-house?	___	___
- At other locations?	___	___
Comments		

	YES	NO
(n) Are storage containers, racks, bins, etc. adequate for type of material stored?	___	___
Comments		
(o) Is lot traceability maintained?	___	___
Comments		
(p) Is "first in/first out" method applied?	___	___

2.10 IN-PROCESS INSPECTIONS AND TESTS

(a) To whom does In-process Q.A. Inspection report?

(b) Are inspection and/or operation travellers used sequential to performance and control of all operations and processes?	___	___
Comments		
(c) Do travellers refer to inspection procedures?	___	___
Do inspectors know how and when to use them?	___	___
Comments		
(d) Do travellers refer to controlled specifications?	___	___
Do specifications show current revision status?	___	___
Comments		
(e) Does Q.A. have written in-process procedures to control acceptance of products?	___	___
Comments		
(f) Is type and quantity of available inspection equipment adequate for type of work being accomplished?	___	___
Comments		

	YES	NO
(g) Are documentation and instruments used by inspectors subject to calibration control?	___	___
Is calibration evident and up-to-date?	___	___
Comments		
(h) Is there a specific material review procedure?	___	___
Comments		
(i) Do in-process Q.A. inspectors summarise quality experience on the basis of specific process stages?	___	___
Do they issue quality reports on a regular basis?	___	___
Do reports result in assistance and/or action?	___	___
Comments		
(j) Are requests for corrective action issued in writing?	___	___
Are such requests answered?	___	___
Does corrective action ensue?	___	___
Comments		
(k) Does Q.A. maintain any statistic controls (X&R, etc.) in the in-process area?	___	___
Are these controls up-to-date and at individual process stations?	___	___
Comments		
(l) Is wafer identification maintained throughout processing?	___	___
Comments		
(m) Are masks checked prior to use?	___	___
Comments		

	YES	NO
(n) Is metallisation adhesion verified?	___	___
Comments		
(o) Are wafers stored and transported in protective carriers?	___	___
Comments		
(p) Are dice inspected for physical damage following scribing?	___	___
Comments		
(q) Are dice selected by 100% electrical screening?	___	___
Comments		
(r) Do inspectors have adequate visual aids to establish reject criteria prior to encapsulation?	___	___
Comments		
(s) Are there documents describing in-process manufacturing procedures and controls?	___	___
Comments		
(t) Are there documents describing in-process inspections?	___	___
Do inspectors know how and when to use them?	___	___
Comments		
(u) Are there specific standards for handling, cleanliness and care of materials, parts and equipment?	___	___
Comments		

	YES	NO
(v) Are calibrations evidenced and up-to-date?	___	___
(w) Has Q.A. authority to stop production flow in case of out-of-control conditions?	___	___
Is a written material review procedure in use?	___	___
Comments		
(x) Are records maintained of training and competence of operators for welding, soldering, radiography, radiflo and plating?	___	___
Comments		
(y) Are certified operators identifiable by means of a card or badge on their clothing?	___	___
Comments		

2.11 SURVEY OF MANUFACTURING LINE

This review shall be performed in 2 phases:-

(1) Identification of the various steps listed in the flow chart to define the corresponding operations and collect all relevant information.

(2) Actual line survey (indicate if inspection was performed).

If different technologies are applied, the inspection results shall be supplied on separate sheets.

2.11.1 Manufacturing Equipment

	YES	NO
(a) Are phases of manufacture carried out under controlled environmental conditions?	___	___
(b) Detail phases and conditions.		

2.11.2 Fabrication of Substrate

	YES	NO
(a) Is material procured from an outside source?	___	___
(b) Are goods inwards inspections sufficient to determine acceptability of each procured wafer?	___	___
Comments		

	YES	NO
(c) Are wafers produced in-house?	___	___
(d) Are adequate controls documented and maintained for wafer production?		
(1) Wafer slicing (thickness, flatness, parallelism)	___	___
(2) Wafer preparation (grinding, polishing, cleaning)	___	___
(3) Environmental conditions (RH, temperature, dust count)	___	___
Comments		
(e) Are adequate controls documented and maintained on wafer testing?		
(1) Visual inspection ("orange peel", pyramids, stacking faults, lineage, haze, mottle, cracks, dimples, nicks, pits, scratches, twin lineage, bumps, tweezer marks)	___	___
(2) Electrical tests (conductivity, resistivity)	___	___
(3) Structural tests (surface roughness, surface orientation, crystal perfection)	___	___
(4) Number of items inspected per lot	___	___
(5) Environmental conditions (RH, temperature, dust count)	___	___
(6) Disposition of rejects	___	___
Comments		
(f) Are adequate instructions and procedures issued regarding substrate handling?		
(1) Techniques and precautions to be exercised	___	___
(2) Records of substrate damage	___	___
(3) Remedial instructions for personnel effecting significant damage	___	___
(4) Control of static discharge	___	___
(5) Protection from contamination	___	___
(6) Segregation of damaged items	___	___
Comments		

	YES	NO
(g) Are adequate controls documented and maintained on wafer purity?		
(1) Resistivity (ohms/cc at +25°C)	___	___
(2) Solids content	___	___
(3) Organic impurities	___	___
(4) Frequency of checks	___	___
(5) Frequency of calibration of test equipment	___	___

Comments

2.11.3 Circuit Integration on Wafer

(a) Are adequate controls documented and maintained on circuit integration techniques?		
(1) Surface passivation (environmental control, substrate handling, layer thickness, flaw detection)	___	___
(2) Junction formation (furnace profiling, temperature, gas flow rate, dwell time)	___	___
(3) Patterning	___	___
(4) Metallisation (material, thickness)	___	___
(5) Formation of resistive elements	___	___

Comments

(b) Do process control documents for circuit integration procedures specify the following parameters?		
(1) Environmental conditions prevailing during processing	___	___
(2) Handling of substrate	___	___
(3) Lot identification	___	___
(4) Date of processing activity	___	___
(5) Number of items inspected	___	___
(6) Percentage defective	___	___
(7) Median value of parameters	___	___
(8) Range of parametric values	___	___

Comments

	YES	NO

2.11.4 Production Control

(a) Are adequate controls documented and maintained to ensure purity of materials used in production of circuits? ___ ___

(b) Are adequate controls documented and maintained on the following photoresist factors?

(1) Preparation (frequency, chemicals, method) ___ ___

(2) Evaluation (specific gravity, viscosity, solids, residue, definition of line width, pinhole count) ___ ___

(3) Storage conditions (temperature, type of container) ___ ___

(4) Application (mounting of substrate, temperature control, rpm of spinner, acceleration, time of rotation) ___ ___

(5) Baking (time, temperature) ___ ___

(6) Exposure (contact pressure, light intensity, time) ___ ___

(7) Development (time, temperature inspection, magnification, lighting, rejection criteria) ___ ___

(8) Environmental control (temperature, relative humidity, dust count, lighting) ___ ___

Comments

(c) Are adequate controls documented and maintained on the following etching factors?

(1) Concentration (frequency of replacement) ___ ___

(2) Temperature ___ ___

(3) Time (etch rate of each passivation layer or metal) ___ ___

(4) Method of drying ___ ___

Comments

	YES	NO
(d) Are the following controls and tolerances documented and maintained during the mask-making process?		
(1) Environmental conditions during fabrication of mask (relative humidity, temperature, dust count)	___	___
(2) Geometry (width and length)	___	___
(3) Pinholes (density and size distribution)	___	___
(4) Scratches	___	___
(5) Storage	___	___
(6) Edge raggedness	___	___
(7) Method of inspection	___	___
Comments		
(e) What method is used for forming metallisation (check)?		
(1) Vacuum chamber deposition	___	___
(2) Electron beam deposition	___	___
(3) Sputtering	___	___
(4) Other	___	___
(f) Does the Manufacturer have the capability to satisfactorily perform metal adhesion tests?	___	___
Comments		
(g) Is a Scanning Electron Microscope available?	___	___
Comments		
(h) Has the Manufacturer the documented procedures, equipment and trained personnel to perform electrical tests on the metallised wafer to determine if the circuit meets parameter requirements?	___	___
If not, explain		

	YES	NO
(i) What scribing and dicing method is used (check)?		
(1) Diamond scribe	___	___
(2) Laser scribe	___	___
(3) Manual	___	___
(4) Sawing	___	___
(5) Other	___	___
(j) Are the following controls documented and maintained on the die-mounting operation?		
(1) Temperature	___	___
(2) Time (visual observation of eutectic flow)	___	___
(3) Pressure (by hand)	___	___
(4) Ultrasonic power (when applicable)	___	___
(5) Cleanliness	___	___
(6) Ambient (surrounding atmosphere) (at room temperature)	___	___
Comments		
(k) Is the die mount strength test adequately documented?	___	___
Comments		
(l) What type of lead-bonding is used in production?		
Comments		
(m) Are the following controls documented on the lead-bonding operation?		
(1) Temperature (not applicable to ultrasonic bonding)	___	___
(2) Pressure	___	___
(3) Time (dwell time)	___	___
(4) Condition of capillary or electrode control	___	___
(5) Ultrasonic power (when applicable)	___	___
(6) Ambient (surrounding atmosphere)	___	___
Comments		

	YES	NO
(n) Is the strength of lead bonds verified?	___	___
How?		
(o) Are devices cleaned prior to sealing?	___	___
Is 100% inspection performed on cleanliness?	___	___
Comments		
(p) Are devices stored and transported in protective carriers following cleaning operation?	___	___
Comments		
(q) What type of internal visual inspection is performed?		
(r) Are rejected parts placed in containers for rejected parts?	___	___
(s) Are rejected parts identified as rejects?	___	___
How?		
(t) What final disposition is made of rejected parts?		
(u) What type of seals are used in the sealing of packages?		
Comments		
(v) Are the following controls, when applicable, documented on the sealing operation?		
(1) Pre-seal bake (time, temperature, ambient)	___	___
(2) Heat (or power) used to produce the seal	___	___
(3) Humidity during sealing (specify moisture content in ppm)	___	___
(4) Flow rate of gases	___	___
(5) Welding controls (pressure power, time)	___	___
Comments		

		YES	NO
2.11.5	Final Test Area and Screening Facility		
	(a) Are they separate operations?	___	___
	(b) Are final production tests (see ESA/SCC specification) performed by production personnel under Q.A. monitoring?	___	___
	OR		
	Are they performed by Q.A. personnel?	___	___
	Comments		
	(c) Does the final test have written inspection and test procedures for product classes on the line?	___	___
	Do inspectors know when and how to use them?	___	___
	Comments		
	(d) Do inspectors use assigned stamp to indicate inspection status on material and accompanying documents?	___	___
	Comments		
	(e) Are requests for corrective action made in writing?	___	___
	Are such requests answered?	___	___
	Comments		
	(f) Are rejected devices identified and segregated in a controlled area?	___	___
	Comments		

	YES	NO
(g) Are records maintained of accepted and rejected material and are they identifiable with the material they represent?	___	___
Comments		
(h) Are device failures analysed?	___	___
Are device failure analyses summarised and reported by final Q.A.?	___	___
Comments		
(i) Is a summary inspection and test report sent regular to Quality Management (lot acceptance, percentage of defects, types of failure)?	___	___
Do these summary reports result in actions to decrease problem areas?	___	___
Comments		
(j) Is a testing laboratory or equivalent facility available for quality assurance purposes?	___	___
Which of the following tests are performed in the laboratory or facility?		
(1) Electrical tests	___	___
(2) Mechanical tests	___	___
(3) Chemical tests	___	___
Comments		
(k) Is there automatic equipment for the electrical testing of monolithic microcircuit devices?	___	___
Go-no-go?	___	___
D.C. and A.C. test?	___	___
Comments		

	YES	NO
(l) Are statistical controls of device parameter distribution maintained?	___	___
Are they reported to Q.A. or Reliability?	___	___
Comments		
(m) Is an environmental test facility maintained in-house?	___	___
If not, state where:		
Are the following tests performed at this facility?		
(1) Temperature (high, low, cycle)	___	___
(2) Shock (mechanical, thermal)	___	___
(3) Acceleration	___	___
(4) Vibration (fixed, variable)	___	___
(5) Moisture resistance	___	___
(6) Altitude	___	___
(7) Radiographic	___	___
(8) Hermeticity tests	___	___
(a) Fine leak, if applicable	___	___
(b) Gross leak or penetrant dye	___	___
(9) Lead fatigue	___	___
(10) Life tests - operating	___	___
Comments		
(n) Is available equipment used:		
- For production?	___	___
- In R&D?	___	___
- For Quality Control on a sample basis?	___	___
- For screening?	___	___
(o) Are charts provided for the monitoring of environmental test equipment?	___	___
Comments		

	YES	NO
(p) Is test equipment adequate for fulfilment of specification requirements?	___	___
Comments		
(q) Is final external visual inspection performed on 100% of the devices?	___	___
Comments		
(r) Are devices stored in a limited access area?	___	___
Comments		
(s) Are devices adequately identified to Customer requirements?	___	___
Comments		
(t) Are there provisions for lot identification?	___	___
Comments		

(u) How many burn-in positions are available:

- At room ambient temperature?

- At specified ambient temperature?

- At specified case temperature (cooled hot plate)?

(v) Does burn-in require soldering of leads?	___	___
Comments		

YES NO

(w) What precautions are taken to maintain solderability of leads after burn-in?

Comments

(x) How does Manufacturer ensure that failed devices are separated from processed lots of:

- SCC Level 'B'

- SCC Level 'C'

(y) Has Manufacturer all test equipment necessary to perform all qualification tests:

- In-house? ___ ___
- In nearby facility? ___ ___

Specify equipment and its location:

- In remote location ___ ___

Specify equipment and its location:

2.12 FACILITIES AND EQUIPMENT

(a) Is facility adequately lighted? ___ ___

Ventilated? ___ ___

Temperature-controlled? ___ ___

Dust-controlled? ___ ___

Comments

(b) Is good housekeeping being practiced? ___ ___

Comments

	YES	NO
(c) Does vendor have own mask-making facility?	___	___
Comments		
(d) Are mask-making operations performed in an ultra-clean room?	___	___
(e) Are photo-engraving (photoresist exposure) operations performed in an ultra-clean room?	___	___
Comments		
(f) If answers to (d) and (e) above are "yes", to what clean room specifications?		
(g) Are particle counts taken and recorded regularly?	___	___
Comments		
(h) Are the following operations performed in a 100 count environment without moving the devices to an environment with a high contamination level?		
(1) Final assembly	___	___
(2) Internal visual inspection	___	___
(3) Cleaning	___	___
(4) Sealing	___	___
(i) How often are air-filters checked and changed?		
(j) How often is the contamination level of the 10 000 count environment checked?		
(k) How often is the contamination level of the 100 count environment checked?		
(l) Is a log kept which shows when contamination levels are checked?	___	___

	YES	NO
(m) Is authority granted to cease production when contamination level is exceeded?	___	___
(n) Personnel in 100 count environment:		
(1) What deviations from regulations and/or requirements related to this environment were noted with regard to:-		
(a) Gowns and/or smocks and trousers		
(b) Caps		
(c) Overshoes		
(d) Finger cots		
(2) Was any lint-producing material (wool, knitted garments, etc.) noticed under protective clothing?	___	___
(o) Are components and tools cleaned to written procedures?	___	___
Are these procedures based on probable contaminants?	___	___
(p) Are clean room procedures and discipline specified in respect of clothing, access, food consumption, allowable materials, cosmetics, etc.?	___	___
(q) Are temporary storage space and products finished in the area suitably protected to maintain cleanliness level?	___	___

2.13 PRESERVATION, PACKING AND SHIPPING

(a) Are there adequate written procedures for control of shipping?	___	___
Comments		
(b) Are materials designated for shipment properly identified, handled and protected?	___	___
Comments		
(c) Do copies of Customer's purchase order and evidence of inspection acceptance accompany materials from end of final test up to the time of shipment?	___	___
Comments		

	YES	NO
(d) Do Q.A. personnel perform audits of all outgoing lots?	___	___
Comments		
(e) Do shipping documents reflect inspection status or evidence of inspection, identification and similar shipping requirements?	___	___
Comments		
(f) Does Manufacturer verify conformity of devices and invoices with purchase order?	___	___
Comments		
(g) Does Manufacturer implement special packaging methods for hi-rel devices?	___	___
If so, which of following methods is used?		
- Individual packages	___	___
- Mechanical protection	___	___
- Environmental protection	___	___
- Special warning labels	___	___
(h) Is shipping method designed to allow official inspection by Customs without actual removal of protective material?	___	___
Comments		
(i) Do instructions prohibit the use of substandard packaging methods for shipment of hi-rel devices?	___	___

2.14 SUMMARY OF INSPECTION RESULTS

Indicate inspection results per manufacturing and testing area, whereby:
V = Adequate.
O = Insufficient.
– = Not checked.
N/A = Not applicable.

	1	2	3	4	5	6	7	8	9	10
Environmental conditions:										
Cleanliness										
Temperature control										
Humidity control										
Occupancy										
Procedures available:										
Travellers										
Calibration										
Segregation of rejects										
Inspection evidence										

Area No.

1 =
2 =
3 =
4 =
5 =
6 =
7 =
8 =
9 =
10 =

2.15 GENERAL OBSERVATIONS (Not to exceed 2 pages)