

Nautel Supplier Quality Assurance Requirements		Doc Number: QAP06.1.SOP Revision: B
Approval	Supply Chain Manager, QA Manager	
Revision	Description of Change	Date
B	Revised and re-written (Merged Site Install and Service center	6 March 2018
A	Initial Release	27 March 2012

1.0 Introduction

This document defines the supplier quality assurance requirements imposed on suppliers that provide products or services to Nautel Limited and Nautel Maine Inc and is in accordance with ISO9001:2015 Para 8.4.

1.1 Scope

This document applies to certain Purchase Orders issued by Nautel Limited. Refer to Para 1.4 for applicability and non-applicability.

1.2 Reference Documents

The following documents of the latest revision at the time of the purchase order form part of this specification as specified.

Number	Title
ASME Y 14.5	Dimensioning and Tolerancing
AS9102	Aerospace First Article Inspection Requirement
IPC-A-600	Acceptability of Printed Boards
IPC-A-610	Acceptability of Electronic Assemblies
IPC-A-620	Requirements and Acceptance for Cable and Wire Harness Assemblies
IPC-1710	PWB supplier evaluation form
IPC-6012	Qualification and Performance Specification for Rigid Printed Boards
IPC-6013	Qualification and Performance Specification for Flexible/Rigid-Flexible Printed Boards
ISO9001:2015	Quality management systems -- Requirements
ISO14001:2015	Environmental management systems -- Requirements with guidance for use
ISO17025:2017	General requirements for the competence of testing and calibration laboratories
IPC/JEDEC J-STD-020	Moisture/Reflow Sensitivity Classification for Non-hermetic Solid State Surface Mount Devices
IPC/JEDEC J-STD-033	Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices
J-STD-001	Requirements for Soldered Electrical and Electronic Assemblies
MIL-DTL-5541	Chemical conversion coatings on aluminum and aluminum alloys
QAP06.SOP	Purchasing
QAP06A.FRM	Vendor Questionnaire-Manufacturers and Distributors
QAP06B.FRM	Vendor Questionnaire-Services

1.3 Responsibilities

- The Supply Chain department is responsible for ensuring that this procedure is followed.
- Quality Assurance is responsible for supplier approval (except as noted) and the content of this document.
- Facilities is responsible for supplier approval of facilities suppliers
- The hiring manager is responsible for approval of suppliers of internal processes. Human Resources is responsible to keep records.
- Customer Service is responsible for obtaining applicable site acceptance test sign offs.
- Engineering is responsible defining the requirements and drawing package.
- The Supplier is responsible to follow these requirements.

1.4 Supplier category definitions and applicability

This document applies to the following supplier classes as specified on the PO:

Supplier Type	Class Code	Definition
Inventory Material Contract Manufacturers	INCM	Procurement, assembly and test of Nautel assemblies or parts to Nautel drawings and design files
Inventory Material - Key Suppliers	INKS	Top 10 Finished Off the shelf electronic or electric assemblies or equipment (QA Monitoring)
Inventory Material - Manufacturer	INMF	Finished Off the shelf electronic or electric assemblies or equipment (3 rd Party equipment)
In Country - Site installation contractors & Service centers	ICSC	Providing repair, maintenance or test services on Nautel's behalf or Providing installation or commissioning of Nautel transmitters on Nautel's behalf
Inventory Material (Bare Board Manufacturers)	INBB	Providing PWB fabrication services to Nautel's drawings or specifications
Inventory Material -Special Processes, eg. welding	INSP	Providing soldering, welding, painting, plating, chemical conversion coating to Nautel's drawings or specifications
Inventory Material - Service Provider, eg. calibration	INSV	Providing services for inventory or production items, eg. calibration
Professional Services for suppliers of internal processes	PSIP	Providing Design, Software Design, Sub-contracting services, including test sets etc
On-Site Facility Services/Maintenance	MA	Suppliers providing Electrical, plumbing, contractors, landscaping, etc)

This document does not apply to the following supplier classes:

Supplier Type	Class Code	Definition
Intercompany POs	CO	PO's between NL, NMI and NCT
Freight	FR	Freight & Transport
Goods Non-inventory	GD	Non-inventory goods (paper etc)
Inventory Material - Distributor	INDS	All other distributors
Inventory Material - Raw Material	INRM	Aluminum, metal etc
Temporary Labour	TL	Casual Direct Labour

Utilities	UT	
Professional Services - External	PS	Lawyers, medical, consulting etc
Subcontractor	SC	

1.5 Supplier Approval

Suppliers are approved by different groups within Nautel as per the table below:

Supplier Type	Class Code	Approval By
Inventory Material Contract Manufacturers	INCM	Quality Assurance
Inventory Material - Key Suppliers	INKS	Quality Assurance
Inventory Material - Manufacturer	INMF	Quality Assurance
In Country - Site installation contractors & Service centers	ICSC	Quality Assurance
Inventory Material (Bare Board Manufacturers)	INBB	Quality Assurance
Inventory Material -Special Processes, eg. welding	INSP	Quality Assurance
Inventory Material - Service Provider, eg. calibration	INSV	Quality Assurance
Professional Services for suppliers of internal processes	PSIP	Hiring Manager
Facility Services/Maintenance	MA	Facilities Manager

1.5.1 Supplier Approval - QA

Suppliers approved by QA undergo an assessment using any of the following methods unless agreed to otherwise by the Head of Operations and the Nautel Quality Manager.

- Review of existing third party or other certifications granted
- Vendor Capability surveys (QAP06A.FRM/QAP06B.FRM)
- On site audits
- Existing product technology evaluation
- Prior history of compliance of procured material to Nautel requirements
- Supplier performance
- Promptness and effectiveness of corrective action taken by the Supplier

Continued approval will be contingent upon demonstrated ongoing quality performance and the satisfactory results of periodic audits. Approval is recorded in Syspro and documentation maintained in Unipoint.

1.5.2 Supplier Approval – Hiring Manager

Suppliers hired to provide internal processes are approved by the hiring manager and an SMT member. Records required for this class of supplier are:

- Consultancy agreement
- Reference check
- Non-disclosure agreement
- Requirements S36, S37, S38, if applicable

These records are maintained by the HR Manager.

1.5.3 Supplier Approval - Facilities

The Facilities Manager is responsible for the approval and records of suppliers providing facilities services. This includes checks for the requirements in S36, S37, S38 as applicable.

1.6 Supplier Disqualification & Surveillance

At any time Nautel may, at its discretion and providing reasonable justification, revoke the approval granted to a Supplier or place a Supplier under surveillance. In making such a decision, Nautel will consider any criteria it deems relevant, including:

- Quality and delivery performance
- Performance, Unsatisfactory response, late response, or failure to respond to a Corrective Action Request or Requests for Supplier Actions.
- Unapproved activities: e.g use of unapproved parts, changes to product design that affect Nautel product without prior approval, etc...
- No business activity for an extended period of time or Change in Supplier's manufacturing or processing capability or unsatisfactory audit results.

Being placed under surveillance can result in the following:

- Production and deliveries on existing contracts may continue, but no new contract or bid solicitations can be placed to the Supplier or sub Supplier.
- The Supplier must implement a corrective action plan approved by Nautel and submit follow up status reports as defined and agreed with Nautel.
- Audit frequency will be increased.

All the above actions, and any other actions deemed necessary, may be at the Suppliers expense (s) and will be maintained until such time that Nautel regains confidence in the Supplier quality management system and control process.

2.0 Structure and use of this document

This document is referenced on each Nautel PO and the requirements are divided into seven tables based on the supplier type as per para 1.4

Supplier Type	Class Code	Definition
Inventory Material Contract Manufacturers	INCM	Table 1
Inventory Material - Key Suppliers	INKS	Table 2
Inventory Material - Manufacturer	INMF	Table 3
In Country - Site installation contractors & Service centers	ICSC	Table 4
Inventory Material (Bare Board Manufacturers)	INBB	Table 5
Inventory Material -Special Processes, eg. welding	INSP	Table 6
Inventory Material - Service Provider, eg. calibration	INSV	Table 7
Professional Services for suppliers of internal processes	PSIP	Table 8
On-Site Facility Services/Maintenance	MA	Table 9

The requirements are divided into three categories;

- General quality management system requirements
- Product/service/process specific requirements
- Purchase order specific requirements that apply on a per PO basis and are specifically called out on the purchase order

The tables reference the supplier quality clauses in section 4.

This document will be available in .PDF format on the Nautel website.

2.1 Compliance

The supplier is responsible to meet all requirements specified in this document. If the requirements cannot be met, or are not applicable, the vendor shall notify the Nautel Buyer. In case of conflict with drawing requirements, contact the Nautel Quality Assurance Department via the Buyer.

The requirements of these clauses are in addition to, and not in place of, other procurement requirements. Compliance with the requirements of these clauses does not relieve the Supplier of their responsibility for furnishing materials and services which fully comply with applicable drawing and specification requirements – nor does it guarantee acceptance of materials and services by Nautel Limited.

Drawing and purchase order requirements always take precedence over these requirements. In the event of conflict with these requirements and any other Nautel Limited document, contact the buyer.

All queries with respect to quality, these requirements, or subsequent quality related activities shall be directed to the Nautel Limited Quality Assurance Manager via the Buyer. No answers or interpretations, written or verbal, may change a requirement of this document unless accompanied by specific authorization on a Purchase Order.

In the event a Supplier desires an exception to these requirements, a request delineating the exception(s) must be submitted for Nautel approval prior to initial acceptance of a purchase order or subsequent shipment of materials to Nautel.

Suppliers may request deviation(s) regarding a manufacturing process or material. A deviation is a temporary change to an approved procedure, process or engineering requirement and is not a substitute for an Engineering Change Order (ECO).

A request for deviation to a drawing or specification must be submitted and approved in writing by Nautel prior to shipment of any material to Nautel. Once approved, the Supplier deviation must be clearly documented and attached to all shipping documents and invoices.

It is the supplier's responsibility to provide product that meets Nautel Supplier Quality requirements. The supplier may be subject to charge back for all costs incurred by Nautel due to non-compliance to any applicable requirement set forth such as, without being limited to, source inspection, on site and sub tier Supplier audits, NCR raised after the first article approval including product rework, overdue request for supplier action, overdue shipment, and probation/surveillance activities. Any rework cost

chargeable to supplier to address the supplier nonconformance will be discussed and agreed by Nautel with the supplier before starting the rework on the nonconforming product.

3.0 Supplier Requirements

The following tables define the Supplier Quality Requirements by Supplier class that form part of Nautel Limited purchase orders. The applicable SQRs will vary by supplier type.

Table 1: Inventory Material Contract Manufacturers, Class INCM	
General QMS Requirements	G1 or G3 and G5, G7, G8, G9, G10, G11, G12, G13, G14, G15, G16, G17, G18, G19, G20, G21, G22, G23, G24, G25, G27, G28, G29, G30, G31, G32, G33
Specific product/ Service Requirements	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15, S16, S17, S18, S19, S20
Per PO requirements	G34, G36, G37, G38, G39, G40, S21 through S38

Table 2: Inventory Material - Key Suppliers, Class INKS	
General QMS Requirements	G1 or G3
Specific product/ Service Requirements	S5, S12, S13, S16, S17, S20
Per PO requirements	As required

Table 3: Inventory Material – Manufacturer, Class INMF	
General QMS Requirements	G1 or G3
Specific product/ Service Requirements	S5, S12, S13, S16, S17, S20
Per PO requirements	As required

Table 4: In Country - Service centers, or In Country - Site installation contractors, Class ICSC	
General QMS Requirements	Service Center: G4 and G32 Site Installation Contractor: G4
Specific product/ Service Requirements	Service Center: S5, S6, S11, S12, S13 Site Installation Contractor: S36, S37, S38 as applicable
Per PO requirements	As required

Table 5: Inventory Material (Bare Board Manufacturers), Class INBB	
General QMS Requirements	G1, G2, G8, G9, G11, G18, G23, G33,
Specific product/ Service Requirements	S1, S7, S15
Per PO requirements	S22, As required

Table 6: Inventory Material -Special Processes, eg. Welding, Class INSP	
General QMS Requirements	G1 and G2
Specific product/ Service Requirements	S1, S3, S16, S15, S17, S18, S20
Per PO requirements	As required

Table 7: Inventory Material - Service Provider, eg. Calibration, Class INSV	
General QMS Requirements	G4 or POs for Calibration services G35
Specific product/ Service Requirements	None
Per PO requirements	As required

Table 8: Professional Services for suppliers of internal processes, Class PSIP	
General QMS Requirements	None
Specific product/ Service Requirements	As per paragraph 1.5.2
Per PO requirements	As required

Table 9: Facility Services/Maintenance, Class MA	
General QMS Requirements	None
Specific product/ Service Requirements	S36, S37, S38 as applicable
Per PO requirements	As required

4.0 Supplier Quality Requirements

SQR Number	Quality Management System Requirement			
G1	ISO9001: The supplier shall be ISO9001:2015 Registered and have a valid Certificate			
G2	ISO14001: The supplier shall be ISO14001:2015 Registered and have a valid certificate			
G3	COMPLEX PRODUCTS: Suppliers of materiel to Nautel are expected to have implemented and documented the following elements in their Quality System. They shall meet the intent of ISO9001:2015 and/or requirements below:			
	QA Manual	G5, G6	Inspection, Measuring and Test Equipment	G21
	Contract Review	-	Inspection and Test Status	S19
	Design Control	-	Control of Nonconforming Product	G27
	Document Control	G8, G9	Corrective Action	G28
	Purchasing	G10 thru G14	Handling, Storage, Packaging and Delivery	S12, S20
	Purchaser Supplied Product	G22, S7, S8, S15	Quality Records	G23
	Product Identification and Traceability	G9, G21, G23	Internal Quality Audits	-
	Process Control	G19, G24, S5, S6, S9, S10, S11, S12, S13, S14	Training	G24, S14
	Inspection and Testing	G15, G16, G21, G19, S3	Servicing	G32
		Quality Improvement Program	G29	
G4	INSPECTION SYSTEM REQUIREMENTS: The Supplier is responsible for ensuring that all inspections and tests have been performed that are necessary to substantiate that the supplies or services furnished under this purchase order conform to specification requirements for the manufacturer's parts. As applicable, the following clauses apply to this order: G7, G9, G8, G15, G21, G23, G27, S1, S2, S19, S20.			
G5	ORGANIZATIONAL/CERTIFICATION CHANGES: Suppliers shall notify Nautel in a timely manner of any changes in its organization affecting manufacturing site location, manufacturing processes, facility and registration status, approved sub Suppliers and sub contractors, statistical distribution of specified parameters, or other such changes.			
G6	QUALITY MANUAL: The Supplier's quality system shall be documented and shall be in a quality manual and further documented in subset procedures/work instructions etc.			
G7	DESIGN AUTHORITY/PARTS/MATERIAL SUBSTITUTIONS: Nautel Limited is the Design Authority and as such has sole technical responsibility for the product. The supplier does not have the authority to substitute, change, deviate, repair and/or alter the design, instructions, Bill of Materials, product or materials without express approval from Nautel Limited, See G8. The supplier shall build-to-print the product in compliance with the documentation provided by Nautel Limited using documented and validated manufacturing processes.			
G8	CONFIGURATION AND CHANGE CONTROL: The supplier shall have a documented configuration and change control process over internal and customer information. The process shall ensure that all design changes are implemented in such a manner as to not adversely affect quality or reliability. Changes requested by the supplier to Nautel drawings, design, instructions, Bill of Materials, product or materials will be handled through supplier deviation. Deviations must be submitted for Nautel approval prior to initial acceptance of a purchase order or subsequent shipment of materials to Nautel. Deviations may or may not be incorporated into the original drawings, depending on the type and scope of the			

SQR Number	Quality Management System Requirement
	change. The deviation will be reviewed by Nautel and be approved or disapproved. Once approved, the Supplier deviation must be clearly documented and attached to all shipping documents and invoices.
G9	INTERPRETATION OF DRAWINGS. Unless otherwise specified, interpretation of drawings shall be in accordance with the provisions of USA Standard Drafting Practices ASME Y 14.5 – “Dimensioning and Tolerancing” Latest Rev. of issue on date of the Purchase Order.
G10	PURCHASING: The Supplier shall have a system that assures all purchase orders issued in support of Nautel are placed in accordance with the Nautel Approved Manufacturer list.
G11	<p>MANUFACTURER CONTROL: The Supplier shall manage their vendors’ quality and take responsibility to ensure material provided as part of this order comply with Nautel drawing, specifications, standards and requirements. This may include:</p> <ul style="list-style-type: none"> • Supplier audits/Supplier Approval/Re-approval (If not previously approved by Nautel) • Appropriate resources assigned for supplier management, surveillance, and QA • Part by Part inspection and test plans (Detailed requirements) • Incoming Inspection Criteria • Source inspection if required • First Article Inspection • Sampling rate selection • Special Processes (Machining, Paint, Chemical Conversion Coating etc) • Flow down of applicable requirements of this document • Maintenance of Receiving Verification Instructions and records of inspections • Supplier failure analysis and Corrective Actions
G12	SUBCONTRACT: The vendor may not subcontract any part of the assembly without first notifying Nautel and obtaining approval.
G13	<p>PRINTED WIRING BOARD SUPPLIER QUALIFICATION: The vendor shall provide the following information to Nautel for review for the qualification of new PWB vendors:</p> <ul style="list-style-type: none"> • Vendors IPC-1710 evaluation form • Supplier Quality survey form • On-site supplier audit results • First Article report per S24 including solder mask material verification • Electrical test reports of first article (Continuity, shorts and impedance if applicable) • Microsection analysis of multilayer board
G14	COUNTERFEIT PARTS: The supplier shall maintain a counterfeit part (Hardware and Electronic Parts) prevention program that prevents ordering from unauthorized suppliers/distributors. The program shall include inspections, tests and screens for parts procured from unauthorized sources. If suspect/counterfeit parts are furnished under this purchase order, the supplier shall promptly replace such suspect/counterfeit parts with parts acceptable to Nautel Limited. The Supplier shall be liable for all costs relating to removal and replacement of said parts. All incidences of counterfeit parts shall be immediately reported to Nautel.
G15	INSPECTION: All inspection and/or testing activity shall be documented in such a way as to describe the requirements such as parameters to be checked, method of checking, statistical methods, sampling plan, nonconformance criteria, etc.
G16	WORKMANSHIP STANDARDS: The supplier shall maintain a workmanship standard for the part or assembly being built.
G17	INVENTORY CONTROL: The supplier shall have a documented material storage and handling process. Where the possibility of spoilage exists, items in storage shall be date stamped/coded, etc., and used on a First-in First-out basis. Packaging, and marking, must allow for the administration of FIFO (First In - First Out) inventory control.

SQR Number	Quality Management System Requirement
G18	SHELF LIFE: The supplier shall maintain a shelf life program ensuring that items are not used beyond their shelf life and that their life is controlled after opening the container.
G19	<p>MANUFACTURING CONTROL: The supplier shall have a documented manufacturing control process (Travelers/KANBAN/Work Order) process. Operations performed must be traceable to the individual who performed the work. All work and test data shall be traceable to the work order or batch.</p> <p>Corrections to work instructions or documents shall be recorded, dated and signed in ink or other permanent method with the original data being legible and retrievable after the change. Work instructions and all key documents must be revision controlled, with a process in place to ensure that revisions are replaced with the latest revision in a timely fashion.</p> <p>Each time a change is made in to a critical operation (i.e.: new operator, new machine, or new technique), a complete examination shall be made by the Supplier to validate that the required quality levels are achieved.</p>
G20	TEST REPORTS: Test data/reports shall contain the results of tests which indicate conformance to the requirements detailed in the Nautel drawing and / or other applicable procedures/specifications. These reports must be traceable to the Serial number of the circuit card or assembly being tested. Test reports shall be maintained on file as per G23.
G21	CALIBRATION: All Inspection, Tools, Gauges, Test and Measurement equipment used in the manufacture, test and processing of the items shall be within its calibration interval (Due date) and traceable to known government standards.
G22	NAUTEL TOOLING OR TEST JIGS/TEST SETS: Where provided by Nautel, when tooling/Test jigs become worn, damaged or require modification and must be rebuilt or refurbished accordingly, the Supplier shall notify Nautel Purchasing for approval. Upon completion of the repairs and/or modifications to the tooling, the Supplier should inquire if samples will be required for approval prior to shipment of any materiel produced from the repaired and/or modified tooling.
G23	<p>RECORDS RETENTION (3YRS): The Supplier shall retain on file all traceability, quality, acceptance and test records of the material provided on this purchase order for a period of at least 3 years after last delivery;</p> <p>The quality records shall include product identification; quantity of product inspected/tested; inspection/test procedures used; inspector/tester, date of inspection/test, and number, type, and severity of defects found. Internal Quality reports shall be prepared at regular intervals and summarize inspection and test results.</p>
G24	TRAINING: The supplier shall have a training program and documented evidence of employee training to internal build, test and quality documents for the products being manufactured for Nautel.
G25	SUPPLIER MATERIAL REVIEW BOARD (MRB) AUTHORITY (NO): The Supplier does not have the authority for Use-As-Is or Repair MRB dispositions under this PO. Only Scrap and Rework dispositions are permitted.
G26	Reserved
G27	<p>NON-CONFORMANCE CONTROL: The supplier shall have a documented Non-conformance process that identifies and segregates non-conforming material from acceptable material. The Supplier shall review and analyze internal records for repetitive discrepancies. When discrepancies are noted, they shall be brought to the attention of management for corrective action. Upon receiving of any non-conformance/corrective action, the supplier shall do the following:</p> <ul style="list-style-type: none"> • Complete containment activities within 24hrs of notification. • Complete investigation within 10 working days.

SQR Number	Quality Management System Requirement
	<p>Note: The cost of returning nonconforming material may be borne by the Supplier.</p> <p>When a quality problem is reported to the supplier, the supplier shall provide documented evidence that the subsequent shipments meet all applicable requirements and were inspected for the identified non-conformance, until formal corrective action has been taken and approved.</p>
G28	<p><u>CORRECTIVE AND PREVENTIVE ACTION:</u> The supplier shall have a corrective and preventive action system. When material is found to be discrepant, a request for Corrective or Preventive Action may be sent to the Supplier. All corrective or preventive action requests issued by Nautel must be acknowledged within 24 hrs and proposed actions must be submitted to Nautel's Quality Manager or designate for approval no later than 10 working days from the date of acknowledged of corrective or preventive action.</p>
G29	<p><u>CONTINUOUS IMPROVEMENT:</u> The supplier shall review its performance in the supply of the assembly and implement corrective actions to reduce internal and external defects reported by Nautel to improve the quality and processes/product. There shall be an active and prioritized list of scheduled quality/reliability issues being addressed.</p>
G30	<p><u>SHIPPING & RECEIVING:</u> The supplier shall have a documented shipping and receiving process. Nautel requires that a packing list be provided with all shipments and contain the information below in human readable text. The same information printed by barcode on the packing list along with the human readable text is preferred. If the barcode cannot be printed directly on the packing list, a label may be printed and applied to the packing list.</p> <ul style="list-style-type: none"> • NAUTEL P. O. Number • NAUTEL Part Number • Quantity • Packing List Number
G31	<p><u>FINAL ACCEPTANCE.</u> All goods or services are subject to final acceptance by Nautel. Inspection may be performed at the Buyer's option on a statistical sampling basis. Nautel Ltd. may reject an entire lot when defective items, within the sample, exceed the allowable quantity. The rejected lot may be returned to the Supplier for replacement, credit or screening, or may be subject to 100% screening by the Buyer, with associated cost of such screening billed to the Supplier.</p>
G32	<p><u>RMA PROCESS:</u> The supplier shall have an RMA process to ensure returned material is traceable.</p>
G33	<p><u>FAILURE ANALYSIS:</u> In the event of serious malfunction, unacceptable performance trends, Customer RMA's, lot rejections or Nautel line stoppage attributed to product made by the vendor, the vendor shall provide timely failure analysis to identify root cause and implement corrective action.</p>
G34	<p><u>NAUTEL LIMITED SOURCE INSPECTION:</u> Nautel (or third party on behalf of) reserves the right to inspect the items at the supplier's facility at any point in the process. When identified by Nautel, the supplier shall provide all necessary inspection data, facilities, equipment and inspection/test personnel to perform the inspection and notify the Buyer at least ten (10) full working days prior to the inspection date.</p>
G35	<p><u>CALIBRATION.</u> All instruments, gauges, meters, fixtures, etc. used to determine the compliance of the goods or services shall have known accuracies matching the precision of the requirement in accordance with either ANSI/NCCL Z540-1, or ISO 10012, or ISO 17025. The accuracy shall be demonstrated by periodic calibration and comparison against Standards which, in turn, have calibration traceable to your National Standards organization (e.g. National Research Council in Canada, NIST in U.S.).</p>
G36	<p><u>GOVERNMENT INSPECTION:</u> The Supplier is required to have government inspection prior to shipment. On receipt of this order, promptly contact the government representative who normally services your plant. If no representative services your plant, contact the Buyer for the nearest National Defence Quality Assurance Representative.</p>

SQR Number	Quality Management System Requirement
G37	QUALITY ASSURANCE PLAN: The supplier shall prepare and submit a Quality Assurance Plan for Nautel Limited review and approval prior to the first shipment of parts.
G38	PROCESS CAPABILITY (CPK): The supplier shall identify which parameters to be analyzed for process capability. These shall be reported once a month. The production CpK target is 1.33.
G39	ACCEPTANCE TEST PROCEDURES: The supplier shall prepare and submit an Acceptance Test Procedure (ATP) for Nautel Limited review and approval prior to the first shipment of parts.
G40	RECORDS RETENTION (10): The Supplier shall retain on file for a period of at least 10 years after last delivery; all Traceability, Quality, Acceptance and Test records of the material provided on this Purchase Order.
G41	SUPPLIER MATERIAL REVIEW BOARD (MRB) AUTHORITY (YES): The Supplier has the authority for Use-as-is or rework MRB/NCM dispositions (except repair) under this PO for supplier defects that do NOT affect, fit, form, function, cosmetics, or reliability of the assembly. All "use as is" or "repair" supplier NCM's shall be sent to NAUTEL for information. NCM's that affect fit, form, function, cosmetics, or reliability of the HLA shall be sent to NAUTEL for approval.

SQR Number	Product Specific Quality Requirements
S1	Nautel Drawing Package: The Nautel drawing package may reference standards or specifications that are out of date, obsolete or superseded. The latest, replacement or newest standard shall be used as applicable. If the vendor is unsure of which standard, a request for clarification shall be sent to the Nautel Buyer.
S2	REFURBISHED/USED/REPAIRED MATERIALS: Material supplied shall be of new manufacture. Used, repaired or refurbished parts/material shall not be supplied. Repair for out of specification conditions is not authorized without prior Nautel approval.
S3	INCOMING MATERIAL IDENTIFICATION AND TRACEABILITY: The supplier shall record incoming part batch traceability information (Date received, Date Code, Lot, Batch or serial numbers) to be able to identify lot or batch related issues. This applies to all parts and material received, including mechanical, electrical and chemical, whether custom fabricated parts or off the self parts.
S4	MOISTURE SENSITIVE DEVICES: The supplier shall have a documented process of handling, packing, identifying and storing all moisture sensitive (MS) designated parts as per J-STD-020 'Moisture/ Reflow Sensitivity Classification for Non-hermetic Solid State Surface Mount Devices' and J-STD-033B 'Handling,
S5	SOLDERING AND ASSEMBLY WORKMANSHIP CL2: Assemblies (CCAs) shall meet the requirements of IPC-A-610, and J-STD-001 Class 2. The supplier shall provide evidence of inspection as per S19.
S6	FLUX TYPE: Only aqueous (water) based fluxes are allowed for use in either SMT or hand soldering. No-Clean fluxes <u>are not allowed</u> for use on Nautel circuit cards. Some Nautel boards have voltages in excess of 500VDC and must be free of any residual contamination, nor attract contamination.
S7	PRINTED WIRING BOARDS (PWB), COMMERCIAL: Printed Circuit Boards (PCB) shall be purchased and manufactured in accordance to the latest revision of Nautel's drawing number, Nautel approved PWB board supplier and as per below:

SQR Number	Product Specific Quality Requirements
	<p>Rigid & Flex Printed Wiring Boards (PWB) shall meet the requirements of;</p> <ul style="list-style-type: none"> • Rigid: IPC-6012, Class 2 • Rigid: IPC-A-600 Class 2 • Flex: IPC-6013 Class 2 <p>All PWB's shall be sealed to prevent deterioration of solderability or damage. PWBs shall be traceable by Date Code to the materials used, process controls used and test data at the time of manufacture to the panel. A micro-section report and sample button shall be requested by the supplier and kept on file with each part number and date code for multilayer & Flex boards. All Nautel PWB's shall be 100% electrically tested for opens, shorts, solder mask and impedance if required.</p> <p>Nautel will provide gerber files via email, modem or FTP and suppliers are allowed to request a change in the board layout design, if the change will assist in the manufacturing or the testing of an assembly as per code G8.</p>
S8	<p><u>SOLDERMASK:</u> Many Nautel boards have tracks that carry in excess of 500 VDC. The solder mask type, thickness and workmanship must be verified to ensure that it will meet this requirement over the products lifetime. Results of the verification shall be documented as part of each PWB test report.</p>
S9	<p><u>CCA ASSEMBLY WASHING AND CLEANLINESS:</u> All circuit card assemblies shall be washed in De-ionized water and saponifier and be tested for cleanliness (Ionic Contamination) as per J-STD-001. NOTE: Some parts are not washable in the supplier's process. The supplier is responsible to identify which parts may be degraded and not washable as part of the front-end engineering process. These parts must be installed by hand and cleaned locally only.</p> <p>QTY 5 of each assembly shall be tested for ionic contamination and the results provided to Nautel. In the case of non-washable parts, testing may be done prior to those parts being installed.</p>
S10	<p><u>BALL GRID ARRAYS:</u> Circuit Card Assemblies with Ball Grid Arrays (BGAs) shall have the following process controls:</p> <ul style="list-style-type: none"> • A temperature profile test shall be conducted on each board to ensure that the thermal profile to achieve Lead-free BGA ball collapse as per manufacturer's data sheet and leaded solder is achieved. • The BGA's on QTY 5 boards per P/N on shall be X-rayed and images provided to Nautel Limited. • During production, 100% of all BGAs will be x-rayed and the images stored locally. Sampling may be implemented after zero defect of 5 batches of assemblies and the results forwarded to Nautel.
S11	<p><u>SOLDERING IRON VERIFICATION:</u> The supplier shall have a soldering iron verification program that verifies the tip voltage (< 2 VAC) and resistance to ground (< 2 Ohms).</p>
S12	<p><u>ELECTROSTATIC DISCHARGE (ESD) PROTECTION:</u> The vendor shall have an ESD control program that includes handling, packaging, marking, training and soldering iron verification (See Code S11). Electrostatic sensitive devices and assemblies shall be manufactured, packaged, marked and handled in a manner that will prevent mechanical/electrical damage. The packaging shall withstand normal transport and handling requirements. ESD sensitive devices must be packaged in <u>static shielding materials/containers</u>. Chemically treated/dissipative containers are not acceptable.</p>
S13	<p><u>CABLE ASSEMBLY WORKMANSHIP CL2:</u> Cable Assemblies (CAs) shall meet the requirements of IPC-A-620, and J-STD-001 Class 2.</p>
S14	<p><u>CRIMPING PROCESS CONTROL:</u> The supplier shall perform assembler level training and crimp pull tests on crimp contacts and ferrules to ensure the crimping process meets the pull strength as stated on the drawing/specifications or manufacturer information. Evidence of sample crimp pull tests shall be maintained on file with the supplier. IPC-A-620 may be used as a guide.</p>
S15	<p><u>SPECIAL PROCESSES:</u> Special Processes (e.g. painting, welding, anodizing, passivation, chemical conversion coating) must be performed by a vendor's QA approved Supplier. The special process supplier must provide a</p>

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	certificate of compliance that states that the special process was performed in accordance with the requirements of the Drawing.
S16	<p><u>CHEMICAL CONVERSION COATING:</u> When Irridite Class 3 is called on the drawing, <u>this means Type 2 (No Hexavalent Chromium), Class 3 (for protection against corrosion where low electrical resistance is required) as per MIL-DTL-5541.</u></p> <p>The supplier shall verify that the chemical conversion coating supplier has validated his process and can provide latest test reports indicating that their chemical conversion coating meets the 168Hr salt spray and electrical resistance tests per in MIL-DTL-5541 or equivalent.</p>
S17	<p><u>COSMETIC SURFACES:</u> Cosmetic workmanship standards for fabricated materials/parts, plastics, labels, silk-screening, pad printing, assemblies and finished product surfaces shall be per the latest revision of applicable documents as referenced on the Nautel drawings and/or Purchase Orders. This normally includes any visual defects such as, colour variation, nicks, dents, scratches, digs or foreign material are cause for rejection. Ensure adequate packaging for transport to prevent damage to cosmetic surfaces. This applies to paint, panels or any other finishing.</p>
S18	<p><u>MERCURY CONTAMINATION:</u> Material supplied to this purchase order shall not contain mercury. Usage of equipment which might cause mercury contamination in the manufacture, fabrication, assembly or test of this material is prohibited. This requirement must be passed on to all subcontractors. The Supplier shall provide certification stating material is free from mercury contamination with each shipment.</p>
S19	<p><u>Assembly serialization and inspection status:</u> Each assembly shall have the following identified on a tag or equivalent:</p> <ul style="list-style-type: none"> • Build Work Order number • Stockcode number • Drawing Number and revision • BOM number and revision • Unique top level serial number (Barcoded and visual readable) • Unique serial number of sub-assembly circuit cards (Barcoded and visual readable) as applicable • Date and evidence of inspection • ECR's or DWA's applied • Test status: Software/firmware programmed, Test procedure used, revision and date
S20	<p><u>PACKAGING:</u> The packaging and pack shall provide the protection necessary to ensure no quality degradation occurs during handling, storage or in transit.</p> <p>The Supplier will package all final products in accordance to the Nautel Purchase Order. Where required Electro-Static Discharge (ESD) protection shall be utilized in accordance with IPC-A-610 class II, IP-CM-770, IPC-WHMA-A-620.</p>
S21	<p><u>SOLDERING AND ASSEMBLY WORKMANSHIP CL3:</u> Assemblies (CCAs) shall meet the requirements of IPC-A-610, and J-STD-001 Class 3. The supplier shall provide evidence of inspection to the appropriate standard with each delivered lot.</p>
S22	<p><u>PRINTED WIRING BOARDS (PWB), COMMERCIAL:</u> Printed Circuit Boards (PCB) shall be purchased and manufactured in accordance to the latest revision of Nautel's drawing number, Nautel approved PWB board supplier and as per below:</p> <p>Rigid & Flex Printed Wiring Boards (PWB) shall meet the requirements of;</p> <ul style="list-style-type: none"> • Rigid: IPC-6012, Class 3 • Rigid: IPC-A-600 Class 3 • Flex: IPC-6013 Class 3

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	<p>All PWB's shall be sealed to prevent deterioration of solderability or damage. PWBs shall be traceable by Date Code to the materials used, process controls used and test data at the time of manufacture to the panel. A micro-section report and sample button shall be requested by the supplier and kept on file with each part number and date code for multilayer & Flex boards. All Nautel PWBs's shall be 100% electrically tested for opens, shorts, solder mask and impedance if required.</p> <p>Nautel will provide gerber files via email, modem or FTP and suppliers are allowed to request a change in the board layout design, if the change will assist in the manufacturing or the testing of an assembly as per code G8.</p>
S23	<p>CABLE ASSEMBLY WORKMANSHIP CL3: Cable Assemblies (CAs) shall meet the requirements of IPC-A-620, and J-STD-001 Class 3.</p>
S24	<p>FIRST ARTICLE SAMPLES AND INSPECTION REPORT:</p> <p>When requested on the PO, the supplier shall produce first article samples and a first article report. The first article units shall be of production quality level and will be sold to Nautel customers. The First Article units shall be subject to a first article process, as per AS9102, or supplier equivalent process that verified all parts, materials, processes, software and tests. The supplier shall deliver the first article report prior to delivering the first article samples. This requirement extends to all parts in the assembly and the supplier may flow down this requirement as required.</p> <p>All characteristics shall be identified in the report (Dimensions, Material, processes, workmanship). Dimensions recorded shall be referenced to the drawing zone / locations or by numbering the characteristics and including a copy of the numbered drawing. A supplier certificate of compliance is required for any part that has painting, plating, chemical conversion coating, or anodizing as part of the First Article Report.</p>
S25	<p>INSPECTION AND TEST PLAN: The supplier shall prepare and submit an Inspection and Test Plan for Nautel Limited review as requested. The Supplier shall identify the proposed test processes for each assembly to ensure parts are acceptable, manufacturing processes are capable, and components are not misplaced. The supplier shall specify the sample rate if not 100%. These may include:</p> <ul style="list-style-type: none"> • PWB Electrical short, continuity & impedance testing • PWB Micro Section Analysis (Bare PWB's) • Flying Probe testing • X-Ray Testing (BGA's) • Acoustic Microscopy (BGAs) • Automatic Optical Inspection (Standard 100%) • Crimping pull testing/process control • Cable harness testing (Continuity/wire position, hipot) • Functional Test (If applicable) • Special process controls set up (Measurements, tests, solder training, crimp verification, crimping training, workmanship training, etc) • Shipping containers/packaging

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S26	<p>INSPECTION REPORT: The supplier shall perform an inspection of the part and provide a dimensional inspection report. The report shall include actual read and record data and be sent to Nautel with the parts. The report may be tailored to critical dimensions after adequate supplier performance has been achieved. The inspection sample shall be tagged to ensure that it can be measured at Nautel as well. The Test/Inspection results may be in the form of a list, computer printout or other means, but must clearly identify the dimensions/characteristics they represent and be clearly related to the item from which they were derived. The supplier must comply with at least one of the following requirements</p> <ul style="list-style-type: none"> • One Part per P/N per Purchase Order • The first and last items of each batch supplied. • Each of the first five items manufactured in any individual batch. • Each fifth item of any individual batch. • A random sample selected in accordance with MIL-STD-105D. General Inspection Level II, AQL 1%.
S27	<p>CHEMICAL AND PHYSICAL ANALYSIS: Each shipment of metallic or non-metallic raw material must be accompanied by a Chemical and Physical analysis test report containing:</p> <ul style="list-style-type: none"> • Name & Location of the raw material manufacturer or mill. • Material identification by specification number and material condition. • Manufacturer or mill lot identification number of the raw material. • Actual chemical and physical test results as specified in the applicable material specifications.
S28	<p>RAW MATERIAL TRACEABILITY: Each shipment of finished or semi finished goods manufactured from metallic or non-metallic raw material must be accompanied by a certificate from the Supplier containing:</p> <ul style="list-style-type: none"> • Name & location of the raw material manufacturer. • Material identification by specification number. • Manufacturer or mill lot or batch number of the raw material.
S29	<p>DYE PENETRANT TEST: The Supplier must perform a dye penetrant test on 5 samples from the batch ordered. Results of this test must be recorded and the samples identified by tag or other means. The samples and test results must be included with each batch shipment.</p>
S30	<p>RADIOGRAPHIC TEST: The Supplier must perform a radiographic examination of samples selected in accordance with MIL-STD-105D, General Inspection Level 2 from the batch ordered. Results of this examination must be recorded and the samples identified by tag or other means. The samples, examination results and photographic records must be included with each batch shipment.</p>
S31	<p>Certificate of Conformance for Electronic Components: The supplier shall provide a certificate of conformance from the original equipment manufacturer (OEM) or franchised distributor. If the components are procured from a broker or non-authorized distributor, the supplier must provide a certificate of compliance that warrants the components to be new & original (not refurbished, recovered, or reworked) and traceable to the OEM. Electronic components means; resistors, capacitors, inductors, diodes, transistors, FETs, integrated circuits, hybrids, ASICs, wound components and relays.</p>
S32	<p>HAZARDOUS MATERIAL: The Supplier is required to submit "Material Safety Data Sheets" (MSDS) with each shipment. Outside shipping containers and use containers shall be identified with the appropriate warning labels.</p>
S33	<p>CALIBRATION CERTIFICATE: The vendor shall provide a valid calibration certificate with the test and measurement equipment being purchased.</p>
S34	<p>CALIBRATION TEST REPORT: The vendor shall provide a calibration test report indicating:</p> <ul style="list-style-type: none"> • Before and after measured values • Certificate of traceability

SQR Number	Product Specific Quality Requirements
	<ul style="list-style-type: none"> • Standards used in calibration and accuracy • Signed certificate of calibration
S35	<p><u>SPECIAL PACKAGING:</u> The assemblies shall be shipped in wooden packaging. The packaging and pack shall provide the protection necessary to ensure no quality degradation occurs during handling, storage or in transit.</p>
S36	<p><u>INSURANCE:</u> The supplier shall have \$2m Business Liability Insurance</p>
S37	<p><u>WORKMEN's COMPENSATION:</u> The supplier shall be in good standing with Workmen's Compensation Board or equivalent of the applicable jurisdiction.</p>
S38	<p><u>SAFETY TRAINING:</u> The supplier staff performing the work shall have the following safety training as applicable:</p> <ul style="list-style-type: none"> • Fall arrest • Scissor lift • Confined space • Electrical lockout • WHIMIS/GHS • First Aid