Usage Note

One or more TTC Quality Clauses are applicable to all TTC customer orders. They indicate specific customer requirements that must be met in order to completely satisfy all customer requirements. Quality Clauses can be found as note for each Customer Order and/or Project within the Company's ERP system (Syteline).

TTC-1.1 Standard Quality Requirements

As a minimum, TTC shall maintain a basic quality system as documented in the TTC Quality Manual (POLICY-001), in compliance with ISO 9001 and AS9100 (latest revisions). The manual clearly describes the deployment of the managing quality system in place at the supplier's facility and the methods used to monitor and report on the system's effectiveness. The manual describes processes for: contract review; supplier quality management; control of inspection, measuring and test equipment that ensure calibration traceable to the National Institute of Standards and Technology (NIST) standards; control of nonconforming products; and control of quality records. Calibrated equipment shall be safeguarded from adjustments, damage or deterioration that would invalidate the calibration status and subsequent measurement results. TTC shall include in the shipping documentation package to the Customer a "Certificate of Conformance" (C of C) stating that the materials and/or services supplied meet all purchase requirements. The C of C shall include, or provide reference to other documents that include, as a minimum:

a) Suppliers' Name,
b) Customer's Purchase Order Number,
c) Part/Material Numbers and Revision Levels, if applicable,
d) Manufacturer's Part Numbers, if applicable,
e) Quantity,
f) All Serial Numbers, if applicable,
g) Date and signature or stamp of authorized TTC representative.

TTC-2.1 Special Certificate of Compliance

The supplier shall include in the shipping documentation package to the customer a "Special Certificate Of Compliance" document, stating that the materials and/or services supplied meet all purchase requirements. When this clause is invoked, the Special C of C" shall be used in lieu of the standard "C of C" identified in TTC-1. The Special C of C shall include, or provide reference to other documents that include, as a minimum:

a) Supplier's Name,
b) Customer's Purchase Order Number,
c) Part/Material Numbers and Revision Levels, if applicable,
d) Manufacturer's Part Numbers, if applicable,
e) Quantity,
f) All Serial Numbers, if applicable,
g) A statement of compliance to any specific Purchase Order, requirements such as special environmental testing (e.g. extended temperature testing, vibration, etc.), as identified in the customer's PO,
h) Date, and signature or stamp of authorized TTC representative.

TTC-3.1 Bar Coding - Packaging

Bar coding - Packaging is a requirement on this order. Refer to the applicable Work Instruction in Process Maps for additional information.

TTC-4.1 Bar Coding - Product Marking

Bar coding Product Marking is a requirement on this order. Refer to the applicable Bar Coding Work Instruction (900103029-xxx) for additional information.

TTC-5.1 Special Product Labeling

Special product labeling is a requirement on this order. Refer to the product labeling instructions for this customer to get additional information.

TTC-6.1 Customer Source Inspection (Type)

Customer Source Inspection (CSI) of the type specified (in process, final, etc.) is required on this order. Refer to the customer source inspection instructions in Process Maps to get additional information

TTC-7.1 Government Source Inspection (Type)

Government Source Inspection (GSI) of the type specified (in process, final, etc.) is required on this order. Refer to the government source inspection instructions for this order to get additional information.

TTC-8.1 As Built Configuration List

An 'As Built Configuration List' is required on this order. Each shipment shall include a listing of the serial numbers, part numbers and model numbers of each serialized assembly. The list shall be reviewed and stamped by the QC Inspection authority.

TTC-9.1 Customer Review/Approval of Drawings (Type)

Drawings of the type specified require Customer Review/Approval on this order. Drawings shall be delivered to the customer for review and approval prior to the delivery of the first unit of hardware, or as otherwise directed in the contract.

TTC-10.1 Configuration Control (Type)

Drawings of the type specified require configuration control. These drawings may also require Customer Review/Approval (refer to TTC-8). Changes to approved documents require customer approval prior to incorporation.

TTC-11.1 First Article Inspection

Items produced on this purchase order require First Article Inspection on the first initial production and the first article produced and if the revision has changed. A comprehensive inspection and test of that item shall be performed to assure conformance with all drawing and specification requirements. A copy of the First Article Inspection Report shall be provided.

TTC-12.1 Statement of Work (Type)

Equipment of the type specified is subject to additional requirements per a Statement of Work (SOW), which must be met to achieve compliance to contract requirements.

TTC-13.1 Quality Requirements – Special Test Equipment (STE)

Equipment of the type specified is subject to fabrication, workmanship and documentation standards per TTC Commercial Best Practices as documented in 900103036-001, STE Documentation & Build Work Instruction and 900103037-001, STE Workmanship Standards Work Instruction.

TTC-14.1 Special Packaging

Special packaging is a requirement on this order. Shipments identified as being F-35 (JSF) shall contain special markings on the exterior of the packaging. The method or special identification shall be the placement of color coding labels on two sides of each box containing the shipment. The identification shall be a 2”x 4” Avery label (stock number AVE6432RG-Fluorescent Red, self-adhesive label or comparable).

TTC-15.1 CFE, Incorporation into End Item

Incorporation of Customer Furnished Equipment (CFE) is a requirement on this order. CFE received from customer shall be received, inspected and registered into TTC’s CFE/GFE system. When allocated to the production job, CFE shall be formally reconciled by the TTC CFE/GFE Manager. Notify the QA Manager upon each shipment lot of this item.

TTC-16.1 NGC, Ryder SCATS on RMAs

This information applies to NGC field returns that specify the use of the Ryder "SCATS" shipping system for returning items back to the customer. When NGC sends equipment back to TTC for repair, the NGC accounting/inventory system automatically backs out the returned items from their original PO, effectively making it an "active item." When it is time for us to ship back the RMA items, we simply log in to the Ryder SCATS system using our normal login and password, and develop bar codes per our standard process using the original PO and line item numbers (even if the TTC job is closed out).

TTC-17.1 Customer-Designated Suppliers

QA Review of the Customer PO shows that the Customer has designated the use of certain suppliers on the performance of the order as identified herein. When applicable, the QA Manager shall notify the TTC Purchasing Manager of the applicable items. The QA Manager shall arrange for appropriate Receiving Inspection activity to ensure compliance with this requirement. Contact the QA Manager for additional information.

TTC-18.1 Customer-Approved Special Process Sources

QA Review of the Customer PO shows that the Customer has specified the use of pre-approved Special Process Sources on the performance of the order as identified herein. When applicable, the QA Manager shall notify the TTC Purchasing Manager of those providers of Special Process that are authorized for use on this order. The QA Manager shall arrange for appropriate Receiving Inspection activity to ensure compliance with this requirement. Contact the QA Manager for additional information.

TTC-19.1 Early Shipment Rule (30 Days):

A 30-day, date management rule is in effect for Purchase Order deliveries on this contract. The rule precludes shipments on this Purchase Order greater than thirty (30) days prior to the Purchase Order delivery due date. Attempts to ship early may result in cost penalties, may delay Customer acceptance, or may impact our TTC Supplier Rating. Requests for delivery schedule changes shall be made to the Buyer through the TTC Contracts Department.

TTC-20.1 Customer-Specified Configuration:

The customer has specified a unique configuration for this item - refer to the Master Control EDM system and look in "My Organizers / External Documents" under the appropriate Customer Order number.
Manufacturing, Test and Final QC shall verify that the "as-shipped" configuration meets the customer-specified requirements.

QA: 01 Electrostatic Discharge (ESD) Control

All items on this Purchase Order, unless otherwise noted, require ESD handling per ANSI/ESD S-20.20 (latest release) or other “TTC Approved” ESD Control System for protection of Electrical and Electronic Parts, Assemblies and Equipment. Packaging shall be clearly identified as containing ESD sensitive materials. All items shall be packaged in ESD protective bags, tubes, or film.

QA: 02 TTC Drawings

Parts referenced on this purchase order are to be manufactured to the specifications called out by the applicable TTC drawings. As part of the acknowledgement process, suppliers are required to ensure that they have the drawing revision referenced on this purchase order. If you do not have the drawing revision referenced by this purchase order, please contact the TTC buyer immediately before proceeding.

QA: 03 Domestic Specialty Metals

Suppliers of Domestic Specialty Metals (TTC Part Numbers beginning with **"5101"** or **"5106"**) must comply with the requirements of **DFARS 252.225-7014**, and must provide objective evidence that they have supplied compliant specialty metals **(Certificate of Compliance).** The text of the DFARs clause appears below.

DFARS 252.225-7014 Preference for Domestic Specialty Metals.
PREFERENCE FOR DOMESTIC SPECIALTY METALS (JUN 2005) including ALTERNATE I (APR 2003) and associated legislative changes per Section 804 of the FY 2008 National Defense Authorization Act, 'Clarification of the Protection of Strategic Materials Critical to National Security' (JAN 2008).
(a) Definitions. As used in this clause-
(a.1) Qualifying country means any country listed in subsection 225.872-1 of the Defense Federal Acquisition Regulation Supplement.
(a.2) Specialty metals means-
(a.2.i) Steel-
(a.2.i.A) with a maximum alloy content exceeding one or more of the following limits: manganese, 1.65 percent; silicon, 0.60 percent; or copper, 0.60 percent; or
(a.2.i.B) containing more than 0.25 percent of any of the following elements: aluminum, chromium, cobalt, columbium, molybdenum, nickel, titanium, tungsten, or vanadium:
(a.2.ii) Metal alloys consisting of nickel, iron-nickel, and cobalt base alloys containing a total of other alloying metals (except iron) in excess of 10 percent;
(a.2.iii) Titanium and titanium alloys; or
(a.2.iv) Zirconium and zirconium base alloys.
(b) Any specialty metals incorporated in articles delivered under this contract shall be melted in the United States or its outlying areas.
(c) This clause does not apply to specialty metals melted in a qualifying country or incorporated in an article manufactured in a qualifying country.
(d) The Contractor shall insert the substance of this clause, including this paragraph (d), in all subcontracts for items containing specialty metals.
Note: This QA clause has been revised to include the text "...and associated legislative changes per Section 804 of the FY 2008 National Defense Authorization Act, 'Clarification of the Protection of Strategic Materials Critical to National Security' (JAN 2008)." found in the second paragraph of this QA clause and is effective July 8, 2008. No other changes have been made to this QA clause.

QA: 04 Supplier Retained Quality Records

Records of the work performed on this purchase order are to be documented and maintained by the supplier as formal quality records. The supplier shall retain and control these records for a period of 10 years. Copies of these documents shall accompany every delivery to TTC and be retained by TTC’s Audit Receiving department. TTC and its customers may request an audit of records and/or facility of the supplier within a reasonable time (5 to 10 business days). By acceptance of this purchase order the supplier agrees to and will comply with this requirement.

QA: 05 Certification of Material/Coating Type

Supplier shall provide a Certificate of Conformance (C of C), stating that raw materials and/or coatings and/or paints used during manufacturing of items on this purchase order are in accordance with applicable specifications as referred to or furnished within this purchase order.
A Mill material cert & the Plater’s, Coater’s and/or Painter’s C of C if applicable shall be supplied with each shipment.
The results of all chemical and physical tests, as well as other evidence that shows acceptability of raw materials and/or coatings and/or paint shall be

supplied with each shipment. These records shall also be maintained on file for inspection at any time during normal business hours for a period of ten years as part of the Supplier Retained Quality Record. TTC retains the right to audit the results of chemical and physical tests conducted by the supplier.

QA: 06 Packaging and Identification of Finished/Painted Items

Items shall be packaged in such a manner as to prevent damage, nicks, gouges, scratches or other defects during shipment from the supplier to TTC. Packaging materials shall be adequate to ensure that part-sweating and/or moisture accumulation does not occur during shipping. Parts received must be properly identified by the TTC part number listed on the Purchase Order. Acceptable means of identification include bag-and-tag, labeling on the outside of packing materials, or any other method that allows identification of individual parts. Drawings are supplied as part of the purchasing documentation to help identify each of the parts - all such drawings shall be returned to TTC along with the shipment. Parts will be rejected at receiving inspection if not properly packaged or identified.

QA: 07 Seller's Supplier Control

All Seller procured supplies/services which become a part of the item(s) delivered in accordance with this Purchase Order shall conform to drawing(s) and specification(s) requirements. Seller's system shall assure: Purchase Order flow down of applicable quality and technical requirements, suppliers' capability to produce items and adequate methods of assuring compliance. Seller's suppliers shall be required to flow down and verify requirements of supplies/services they subcontract.

QA: 08 Requirements for Seller Submitting Inspection and/or Test Data Documentation

Seller shall provide objective, written evidence of hardware conformance to Purchase Order requirements with each shipment. Recorded data shall include not only results of all routine inspections and tests, but in addition, any special selection tests, conditioning (burn-in) tests, lot acceptance tests, sampling tests or any other test used to determine conformance. If Seller is a jobber or distributor of the item(s) in this Purchase Order, then Seller shall require the same performance documentation from the original manufacturer of the item(s). Additionally, Seller shall secure from that manufacturer a right for Buyer to acquire or inspect (at Buyer's option) all pertinent data in that manufacturer's possession showing the items compliance to all specifications.
The exact format of the submitted data is not critical, but shall contain the following minimum information:

1. Seller's name and address.
2. Buyer's part number and Buyer's Purchase Order number (and P.O. revision number, if applicable).
3. Drawing revision level.
4. Number of items in lot.
5. Number of items inspected.
6. Manufacturer’s Name.
7. Lot number and date code (if applicable).

The Seller shall submit either attributes data or variables data, at Seller's discretion, unless variables data is specifically requested by the Buyer. The Seller's format is acceptable. As a minimum, attributes data shall include the parameter inspected, the tolerance and a summary of the inspection test results. Variables data shall include, at a minimum, the parameter inspected, the tolerance, and the measurement obtained for each item inspected.
Data sheets and/or test reports shall bear evidence of acceptance by Seller's signature (or stamp) and date signed.
The submission of inspection and/or test data as provided herein shall not modify or limit any representations, warranties or commitments made elsewhere or in any way affect the obligation of the Seller to perform strictly in accordance with the provisions of this Purchase Order.
The requested data is to be retained by the Seller for a period of ten (10) years after the date of the completion of this Purchase Order, unless otherwise specified in the Purchase Order.

QA: 09 Date/Lot Code Shipping Requirements

Each shipment shall consist of material from only one manufacturer and a single date coded or numbered lot. If Lot/Date Codes are not available due to use by the Manufacturer of unique serial numbers in lieu of Lot/Date Codes, the serial numbers shall be noted on shipping documents.

If this requirement cannot be complied with:

a. Seller shall notify the Buyer of the minimum number of date coded lots per shipment, and the minimum number of parts per lot (150 minimum is preferred) that Seller can ship on a best effort basis.

b. With Buyer concurrence, multiple manufacturer and date coded lots may be included in one shipment provided that they are segregated, packaged and identified separately.

Each different Manufacturer and date-coded lot must be documented as a separate line number on the shipper and the shipper or other suitable documentation must document the following minimum information:

1. Manufacturer Name
2. Lot/Date Code (or serial number as above if applicable)
3. Manufacturer P/N
4. Country of Origin
5. Quantity

QA: 10 Configuration Certification

Seller is required to provide as built configuration data using an itemized packing list or Seller's approved method of electronic data transmission. The configuration data shall include serial numbers and part numbers of each assembly down to the serviceable level or to the level otherwise tracked by Seller's serial numbers.

QA: 11 Conformance Certification

The Seller shall provide certification with each shipment that all quality, conformance, and other applicable requirements have been met in accordance with the specification(s) stated in the item description/part number appearing on this Purchase Order. The certification shall be signed (or duly authenticated via approved alternate means) by the corporate officer who has management responsibility for the production of the product, or other designated responsible individual.
As a minimum, the following information shall be included in the conformance certification:
1. Purchase Order Number (TTC P.O. number)
2. Purchased Part Number (as shown on the P.O.)
3. Manufacturer's P/N, if different from above
4. Manufacturer (NOT Distributor)
5. Authorized Signature per the above

QA: 12 Exclusion of Pure Tin Finishes

Electronic, electrical, electromechanical, and mechanical piece parts and assemblies, including the internal fabrication of hardware, delivered to TTC under the provisions of this Purchase Order shall not have pure tin finishes. Additionally, any tin-lead (SnPb) plating or solder process/processing shall result in a finish of no less than 3% lead composition. Note: This applies to component leads and terminations, carriers, bodies, cages, brackets, housings, mechanical items, hardware (nuts, screws, bolts), etc. This does not apply to MIL-SPEC Parts or TTC Drawings that allow the use of Tin (Sn) with less than 3% Lead (Pb).

Seller shall provide a Certificate of Conformance (C of C) with each shipment. The C of C shall mean that the Seller or Seller's agent has verified that delivered product meets the above listed composition requirements, or the material meets at least one of the following provisions:

a. Seller or Seller's agent has contacted the Original Equipment Manufacturer (OEM) and verified that the specific Mfr / Lot Date Code of delivered product meets the specified minimum lead (Pb) requirement if Tin (Sn) is present in the product.

b. Seller or Seller's Subcontractor has verified by actual sample testing (X-ray Fluorescence testing is preferred) or other industry acceptable method that a minimum of 3% lead (Pb) is present in any process that uses tin (Sn).

Seller shall be responsible for managing the compliance with this requirement with subcontractors or sub-tier suppliers, and provide evidence of the appropriate flow-down and management of this requirement to the satisfaction of the Buyer or designate. Unless otherwise specified in this quality attachment, all exceptions must be authorized in writing by the TTC Buyer.

QA: 13 100% Surge Current Testing for Surface Mount Tantalum Capacitors

General
Any surface mount tantalum capacitor furnished to TTC under the provisions of this Purchase Order shall be subjected to and pass surge current testing in accordance with the conditions specified below. This requirement shall apply to loose components (piece parts), circuit card assemblies (CCAs), modules and any other type of hardware or product that contains surface mount tantalum capacitors. If Seller is unable to comply with these requirements, Seller shall contact Buyer for further direction prior to proceeding.

Flow down Requirements
Seller shall be responsible for communicating this requirement to subcontractors or sub-tier suppliers as required to assure that non-surge current screened product is not delivered.

Certificate of Conformance
Seller shall provide a signed Certificate of Conformance or an equivalent signed document that specifies that delivered product contains only surface mount tantalum capacitors that have been subjected to and passed surge current testing. This Certificate of Conformance or equivalent document proving the

passing of surge current testing also requires at a minimum the following information:

1. Manufacturer Name
2. Lot/ Date Code
3. Manufacturer P/N
4. Country of Origin
5. Quantity

Screening Conditions
All surface mount tantalum capacitors shall be subjected to and pass surge current testing per MIL-PRF-55365F, Pg. 22, paragraph 4.7.16, Surge Option "A" or better.

QA: 14 Fiber Optic Inspection Criteria

Photographic evidence is required to be submitted with every fiber optic assembly supplied. This will ensure that the end termini of each assembly was inspected to meet inspection criteria that TTC will employ during incoming inspection. Four zones will be examined which include A (the inner core), B (the cladding), C (the adhesive), and D (the contact). Failure conditions are outlined in tables 1 through 4 of IEC 61300-3-35.

QA: 15 Part Substitutions Not Allowed

The supplier shall furnish items of the exact manufacturer's part number specified on the TTC purchase order that were fabricated by the exact manufacturer specified on the TTC purchase order. Substitutions that offer "alternate" or "equivalent" items that do not meet these requirements are not permitted unless specifically authorized by the TTC Purchasing Department via purchase order amendment. Parts received that do not comply with these requirements will be rejected and will be returned to the supplier at the supplier's expense.

QA: 16 Configuration Change Reporting

The supplier shall maintain control over the item configuration in each of the following categories:

a) Methods, procedures, materials, planning and/or sequencing used in the manufacturing, processing, assembly, inspection and/or test of an item,
b) Location of the site where some or all of the work on items is being performed,
c) Source or processing (applicable to supplier outsourced materials and/or services),
d) Performance specifications and/or capabilities of the item,
e) Qualification status of the item,
f) Commercial availability of the item (part obsolescence notification),
g) Internal configuration of the item including materials used, dimensions, thicknesses, component placement, sensitivity to environments, utilization of lead-free components, etc., and
h) Electrical interconnection including pin assignments, I/O functions, addition/removal of functional features, inclusion of 'advanced' or 'hidden' features, etc.
Configuration control shall be established during the initial procurement of the item, and shall be maintained throughout the life of the item. Appropriate configuration data and customer-specific part numbers shall be generated by the supplier for the item to provide positive identification and control of all configuration parameters and to ensure that items provided in subsequent purchases will match the original configuration status.

QA: 17 PWB Microsection Analysis

The supplier shall run coupons on all multilayer boards and shall submit a copy of the microsection analysis form with each order. The supplier shall keep all microsection buttons for a period of three (3) years after which they may be discarded.

QA: 18 Foreign Object Damage (FOD)

Suppliers of FOD sensitive articles shall establish procedures to control and eliminate Foreign Object Damage and/or contamination during manufacturing, assembly, test and inspection operations. The FOD program shall be subject to review and approval by TTC.

QA: 19 Preproduction Panelization Requirements

The Pre-production Panelization Scheme must be approved by the customer before board construction is allowed to begin.

The PWB manufacturer shall provide panelized data for review prior to the first build of a revision of that part number. Any change to the panelized data will require a new review by the customer of the Panelization data. Format for the panel layout are Gerber files. The manufacturer shall indicate whether or not the data has been modified for etch compensation. If providing compensated data, the manufacturer shall report the amount of etch compensation added to each layer. Data shall not be scaled. The following items are required in the panelized data:

a. Each part and coupon strip shall have a unique marking (i.e. text or number) in silkscreen that can be used to identify its location in a panel once it is depanelized.

b. If the customer expects the B coupon to be designed for registration evaluation. Its construction should insure that both minimum annular ring and minimum spacing between plated holes and circuitry are met. The B coupon shall have a land size that makes this possible, even if that size pad with that particular drilled hole diameter does not exist on the part. (One exception to this requirement is if the manufacturer uses an alternate coupon, such as an R coupon to evaluate registration).

c. A and B coupons shall be located on the panel per IPC-2221 design criteria. The B coupons, if used for registration evaluation, shall be the coupons closet to the panel corners. The lay-out shall support the evaluation of two B coupons per drill/plating step in opposing corners in opposing axis.

Panel layout data shall be forwarded to the customer's PDE through the Customer Supplier manager in encrypted format or posted to a secure FTP site. The Pre-Production Panelization Scheme Approval form (see Panelization Approval Form.doc) will be forwarded to the PWB supplier by the Customer Supplier manager after review and acceptance.
Appendix A

Reference; Panelization Approval Form.doc

QA: 20 PWB Manufacturing and Testing

All boards shall be tested and manufactured in accordance with the applicable document listed on the drawing. Unless otherwise specified on the drawing, the most current revision and Class 3 requirements shall be used. All testing, except those items specifically identified as being done by an approved testing laboratory, shall be conducted by the supplier at their facility or one that meets IPC-QL-653.

QA: 21 Copper Tensile and Elongation Testing

Copper tensile and elongation testing shall be conducted monthly. Results shall be available upon request.

QA: 22 Coupon Evaluations

One thermally stressed A coupon per panel shall be evaluated. In addition, one thermally stressed B coupon per panel shall be evaluated for each drill/plating step. Two registration coupons per panel per drill step shall be evaluated. These coupons shall come from opposing corners of the panel. In the case where B coupons are used for registration evaluation, two B coupons must be evaluated per drill step, each coming from opposing corners and opposing axis. If an alternate registration is used, the fabricator shall provide information on how the coupons are evaluated and provide the resulting data from the evaluation (see Lab Coupon Review Summary Information Form.doc). Registration coupons are also subject to coupon retention requirements for the lot.
Appendix B:

Reference; Lab Coupon Review Summary Information Form.doc

QA: 23 Corrective Action Requirements

Supplier is obligated to support an investigation into any discrepancies or systematic quality concerns identified by TTC or the supplier pertaining to the goods or services being supplied and which TTC formally requests via TTC's corrective action form. TTC may generate this request at any time prior to or subsequent to, delivery of the goods or services being supplied. The supplier response shall be furnished within the time requested via the applicable corrective action form and shall state all actions to be accomplished by the supplier to correct the issue and prevent recurrence.

QA: 24 Quality System Compliance

In addition to any basic quality system requirements of this order, the supplier shall maintain a quality system complying with SAE AS9100. Registration with or certification by an independent third party is not required, but evidence of such registration or certification to this quality standard may show compliance to this requirement without further actions by TTC or the supplier. TTC's approval of the suppliers system does not constitute acceptance of goods or services, nor relief of purchase order or subcontract requirements.

TTC Reserves the right to conduct surveillance at the supplier's facility to determine that the supplier's quality system meets the requirements of the quality standard as set forth herein. Acceptance of this order includes the support of onsite quality and process audits to be conducted as determined necessary by TTC.

QA: 25 Notification of Process Changes

The supplier shall notify TTC quality assurance via the TTC purchasing agent of any proposed or inadvertent changes to the manufacturing procedures, work instructions, travelers, manufacturing process procedures and inspection and test procedures within 10 days of knowledge of such changes.

QA: 26 Inspection Reports Submittal Required

The supplier shall provide inspection reports at the time of delivery for every item on this purchase order every time that it is manufactured. Reports shall include: test and/or inspection procedure document number and revision level, part number inspected; serial, lot batch, or date code numbers as applicable; identification of each inspection point; the results of each inspection point, and; the identification of the person performing the inspection. Inspection results outside of the required limits that have been accepted shall reference the TTC Nonconformance Report, NCR, by which the departure was accepted.

QA: 27 Traceability of EEE Parts

A method of traceability that ensures tracking of the supply chain back to the manufacturer of all EEE components and devices being delivered on this order. This traceability method shall include the identification of all intermediaries from the manufacturer to the direct source of the product for the seller. Each intermediary back to and including the manufacturer shall be identified by including the company name and location, lot batch code, date code and all applicable serial numbers. Traceability shall be made available to TTC within 5 working days of such a request.

QA: 28 Conformance Certification

The Seller shall provide certification with each shipment that all quality, conformance, and other applicable requirements have been met in accordance with the specification(s) stated in the item description/part number appearing on this Purchase Order. The certification shall be signed (or duly authenticated via approved alternate means) by the corporate officer who has management responsibility for the production of the product, or other designated responsible individual.

As a minimum, the following information shall be included in the conformance certification:
1. Purchase Order Number (TTC P.O. number)
2. TTC Part Number (as shown on the P.O.)
3. Manufacturer's P/N, if different from above
4. Manufacturer (NOT Distributor)
5. Authorized Signature per the above
6. Manufacturer serial number or Lot date code
7. The manufacturers/OEM C of C must be supplied with the shipment.
8. Authorized Distributors must certify that they are an Authorized distributor for the OEM.
9. Quantity of Items delivered

QA: 29 Coupon Evaluations

One thermally stressed A coupon per panel shall be evaluated. In addition, one thermally stressed B coupon per panel shall be evaluated for each drill/plating step. Two registration coupons per panel per drill step shall be evaluated. These coupons shall come from opposing corners of the panel. In the case where B coupons are used for registration evaluation, two B coupons must be evaluated per drill step, each coming from opposing corners and opposing axis. The fabricator shall have a micro section test report from a DSCC approved independent lab showing applicable compliance to IPC-6012, MIL-PRF-55110 or MIL-PRF-3102 requirements. A copy of this test report shall be delivered to TTC with the PWB's on this order

QA: 30 Nonconformance Disposition

PWB and Metalwork fabricators do not have the authority to disposition nonconformances such as "use as is" or "repair" without the approval of TTC.

QA: 31 No Changes Without Approval

The Seller is required to inform TTC's Purchasing Manager in writing of all changes (Class I) which affect form, fit, function, safety, weight, maintainability, service life, reliability, replaceability or interchangeability of the item(s) to be delivered to TTC.
All Class I changes require the TTC Purchasing Manager's approval, prior to implementation by the Seller.

- Prior to receipt of written authorization from TTC's Purchasing Manager for Class I changes (or written concurrence from TTC's Purchasing Manager that a proposed change is a Class II change), the Seller shall not incorporate any Engineering change which affects Buyer's, Seller's or Governmental specifications or engineering drawings in any item of this purchase order.
- This includes any Acceptance test procedures or Product specification changes or other technical requirements imposed towards the acceptance of the procured item.

- All Class II engineering changes shall be submitted for information and concurrence of classification from TTC's Purchasing Manager.

Note: Class II changes do not require prior approval by TTC's Purchasing Manager but do require concurrence in the classification.
Any advance coordination for the Seller proceeding "at their risk" does not constitute any acceptance of the risk or implied agreement to the change and is for information and coordination purposes only. The Seller shall be liable for any costs incurred by TTC, including any retrofit costs, which result from misclassifying the engineering change or from implementing the engineering change without authorization (Class I) or concurrence (Class II), as applicable.

QA: 32 Packaging of Printed Circuit Boards and Moisture Sensitive Devices

Suppliers shall package Printed Circuit Boards (PCB) in Moisture barrier bags compliant to IPC-1601 (Latest revision). Moisture Barrier Bags type D are not permitted. Reference -Typical Packaging Material Types.

Moisture Sensitive Devices (MSD) levels 2 and above packaged per J-STD-033 (Latest revision).

Bags are to be vacuum sealed, contain desiccant and a humidity indicator card. All J-STD labeling fields properly completed. The Supplier of these items must provide the following information on the labeling;

- Manufacturer
- Part Number
- Lot/Date Code
- Quantity
- Moisture Sensitivity Level (MSL)
- Reflow Peak Body Temperature
- Date Bag is sealed
- In addition for PCB;
  - ✓ Recommended storage conditions Temp/RH (example ≤ 30°C/60% RH).
  - ✓ Allowed exposure time before baking is required or bake when HIC exceeds ___ %.
  - ✓ Recommended Baking criteria, temp and time to bake.

QA: 33 Independent Testing

In accordance with section 10.0 of Raytheon's Tier 3 PWB Requirements document 61494, all mounts inspected by the manufacturer to evaluate compliance to the drawing specification shall be evaluated by an approved testing laboratory. Section 15 of 61494 lists Raytheon's approved testing laboratories. Test results shall be submitted with the order.

QA: 34 NFD Testing/Inspection Requirements

With each shipment, the supplier shall provide hard copy test results for the requirements listed below. Each test document shall be labeled with Lot/Date Code, TTC/CW part number, person performing the test, the date of the test and the result of the test, (pass/fail, no anomalies, etc.).
Minimum required testing:

- Visual Inspection: All components
- Component Photos: 3 per Lot/DC
- Radiological Inspection: All Components
- Radiological Images: 3 per Lot/DC
- Scanning Electron Microscopy: 1 per Lot/DCPackage Configuration and Dimensions: 20 per Lot/DC. If less than 20 components, all shall be measured.
- MQ XRF Elemental Analysis: 3 per Lot/DC. Add MQ and Material Analysis if MQ < 3.
- STFRm 3:1/Ambient Swipe): 3 per Lot/DC
- STFRs (Acetone/Ambient Swipe): 3 per Lot/DC
- Scrape Test: 3 per Lot/DC
- Solderability Test: 3 per Lot/DC. If parts fail Authenticity Testing or are found to be suspect counterfeit, do not perform.
- STFRs (Dynosolve/120C 30M Soak & Swipe): 3 per Lot/DC
- Decapsulation/Die Verification: 3 per Lot DC

QA: 35 COTS Date/Lot Code Shipping Requirements

This part shall be identified by Lot/Date Code, Lot Number, or unique Serial Number. The order for this part may be satisfied by multiple Manufacturers and/or multiple Lot/Date Codes, Lot Numbers or Serial Numbers.
Each different Manufacturer and associated Lot/Date Code, Lot Number or Serial Number shall be identified as a separate line on the shipper. The shipper or other suitable documentation must indicate the following minimum information:
1. Manufacturer
2. Lot/Date Code, Lot Number or Serial Number
3. Manufacturer P/N
4. Country of Origin
5. Quantity

QA: 36 Customer Furnished Material

36.1 Raytheon
These material, parts or components shall have traceability to the manufacturer.
1. The manufacturer shall be identified on the item, packaging, reel or incoming paperwork.
2. Traceability shall be provided in the form of a serial number, lot number or Lot/Date Code.

QA: 37 CUI Data Transmission

All CUI data transmissions shall be compliant to 48 CFR 252.204.7012 and 48 CFR 252.204.7008. Data transmissions that are not applicable to the CFR's listed are to be considered self-deleting.

QA: 38 Calibration Activities

Calibration activities shall comply with ANSI/NCSL Z540-1 (latest revision) or ISO/IEC 17025 (latest revision). Objective evidence of certification to one of these National Standards shall be provided by supplier based on certification and expiration dates.