

Frontier Electronic Systems Purchase Order Quality Requirements

Q100. Quality Management System- the Supplier shall maintain an Inspection or Quality System that:

- b) Meets ISO 9000 series, current revision.
- c) Satisfies standard inspection requirements of FAR 52.246-2.
- d) Meets AS9100 series, current revision

Q101. Order of Precedence - In the event of conflict between specifications, drawings, and PO, the following order shall take precedence:

1. Purchase order
2. Directed attachments
3. Drawings
4. Specifications
5. Referenced documents

Q102. Responsibility for Conformance - Neither inspection and/or tests made by FES or by Government / Customer representatives shall relieve Supplier of the responsibility to furnish an item that conforms to the requirements of the procurement document. Seller will notify Buyer in writing when discrepancies in the Seller's process or product are discovered or suspected which may affect parts or assemblies Seller has delivered or will deliver under this contract. Seller shall respond in writing to Buyer inquiry concerning component alerts (i.e. GIDEP alerts, MDA alerts, MDA assurance advisory etc) within ten (10) days of the buyer request. Response shall include point of contact for information, element affected, impact, and any action taken.

Q103. Frontier Electronic Systems Surveys, Surveillance Audits, and Inspection - FES has the right to conduct surveys, audits and inspection of Supplier's facilities, and those of sub-tier suppliers with prior coordination with Supplier, to determine capability to comply, and to verify continuing compliance, with the requirements of the procurement document. During performance on this contract, your quality control or inspection system and manufacturing processes may be subject to review, verification, and analysis by FES Customers with prior coordination by an authorized FES Representative.

Q104. Corrective Action Request - When a quality problem exists with any Supplier item, FES may forward a "Corrective Action Request" to Supplier, requiring timely response that shall include the following information: analysis of the cause of the problem, statement of the action taken to prevent recurrence, and the effectivity of the action. When corrective action is required for Government / Customer source inspected items, Supplier shall coordinate such action with the Government / Customer quality representative assigned to administer Supplier facility. Lack of timely and/or effective Supplier Corrective Action response within given deadline as documented on FES SCA form Fm7.4-2a (unless deadline extended in writing by FES Quality) could result in one of the following: probation, suspension of placement of new purchases, and/or Supplier's removal from the FES Approved Supplier List.

Q105. Critical and Limited-Life Material / Items - Items having characteristics susceptible to quality degradation with age must be marked in a manner indicating the date at which the critical life was actually initiated or the useful life will be expended. Items that contain or use paint, rubber, adhesives, liquid-locking materials, lubricants, etc., shall not be used after its expiration date unless the vendor can produce documented evidence of revalidation. Rubber goods must have the package/container stamped with its cure date or date of assembly.

Q106. No Substitutions

- a) Substitutions and changes in materials, specifications, or processes are not permitted unless authorized by Change Order Notice to the FES PO.
- b) As per Boeing Terms and Conditions Clause Number D607.
http://www.boeingsuppliers.com/idscommon/clauses/clause_index.htm
- c) Discrepancies, omissions, and the need for clarifications or interpretations of any nature encountered by Seller in respect of Buyer-furnished drawings or engineering data will be brought to the attention of FES for resolution within 7 days of receipt of the purchase order.

Frontier Electronic Systems Purchase Order Quality Requirements

Q107. Counterfeit Part Prevention

- a) For All Suppliers: Seller bears the responsibility of delivering authentic Goods or items from its suppliers, subcontractors, or OEMs.
- b) For Brokers: Seller bears the responsibility of delivering authentic Goods or items from its suppliers, subcontractors, or OEMs.
Seller shall maintain a method of traceability that ensures tracking of the supply chain back to the OEM manufacturer and shall supply records of this traceability to Buyer on request or is compliant with SAE AS5553.
- c) For Boeing Purchases: As per Boeing Terms and Conditions Clause Number **GP7**, Section **14**.
http://www.boeingsuppliers.com/idscommon/clauses/clause_index.htm

Q108. Packaging - Material delivered here under shall be packaged in accordance with:

- a) All material shall be protected against corrosion, contamination, deterioration, or other spoilage during transit. All material shall be packed with suitable protection as to prevent damage through handling, transit, and during storage prior to use. Packaging will be in accordance to "Standard Practice for Commercial Packaging" per ASTM D 3951-15 unless otherwise stated.
- b) Certified electrostatic sensitive (ESD) device packaging shall be used to enclose electrostatic sensitive devices.
- c) Product will be packaged in accordance with specification called out in this PO.

Q109. Control of Documents/Records - Seller shall maintain/retain documents/records on file for the retention period identified below. Seller shall also ensure such documents/records of Seller's Subcontractor(s) shall remain on file by Seller's Subcontractor(s) or Seller for the same retention period. Records held for the required retention period shall not be destroyed without Buyer's written concurrence.:

- a) 3 years
- b) 7 years
- c) 10 years
- d) 15 years
- e) Life of the product

SELLER CERTIFICATIONS AND REPORTS

Q200. Certificate of Compliance Required

- a) **A Certificate of Compliance is required.** One shall be completed and returned with each shipment and shall identify as a minimum the following:
 - 1) Part number.
 - 2) FES PO number and line number
 - 3) Serial number and revision (if applicable).
 - 4) Lot / Date code, Heat number, TCN, Lot number or other means of traceability
 - 5) Statement certifying that all material delivered under the referenced PO complies with specifications/drawings noted and was inspected as stated and those inspection records are available for review.
- b) **Certificates of Compliance are required from the manufacturer and all distributors (to maintain the traceability back to the OEM).** They shall be completed and shall identify as a minimum the following:
 - 1) Part number.
 - 2) FES PO number and line number on Distributor's C of C as well as shipping information from Manufacturer to Distributor.
 - 3) Serial number and revision (if applicable).
 - 4) Lot / Date code, Heat number, TCN, Lot number or other means of traceability (Distributor C of C shall include Manufacturer's Lot/Date code)
 - 5) Statement certifying that all material delivered under the referenced PO complies with specifications/drawings noted and was inspected as stated and those inspection records are available for review.
- c) **A Certificate of Compliance is required.** One shall be completed and returned with each shipment and shall identify as a minimum the following:
 - 1) Part number and revision
 - 2) FES PO number and line number
 - 3) Statement certifying that all material delivered under the referenced PO complies with specifications/drawings noted and was inspected as stated.

Frontier Electronic Systems Purchase Order Quality Requirements

Q201. Report Submittals with Delivery

- a) Test Data - Functional assemblies furnished shall be accompanied by lot acceptance test data showing full conformance with the acceptance test or other functional requirements of the drawing.
- b) Test Reports - A test report shall be furnished giving the military, federal, or industrial specifications by which the described item on the PO is tested and the actual test data measured. The test report shall be signed by an authorized agent of the supplier or laboratory and the title of the person stated.
- c) Inspection Results (100%) - A list of all characteristics when specified per the drawing or specification, including noted Key product characteristics (KPC), are checked and results are provided to FES.
- d) Proof of Inspection - Seller shall provide confirmation of a visual inspection having been performed before delivery to FES.
- e) Inspection Results (Sampling) – Seller shall provide inspection results that comply with the sampling requirements of Level II in the ANSI/ASQ-Z1.4 standard, unless specified otherwise on the PO. A list of all characteristics when specified per the drawing or specification, including noted Key product characteristics (KPC), are checked and results are provided to FES.

Q202. Raw Materials Certification - Quantitative chemical and physical data showing conformance with the applicable raw material specification (material test reports), along with traceability of such data / certifications to the original manufacturer, shall be provided with shipment. This data shall be signed and certified to be accurate by an official of the testing agency.

Q203. Certificate of Calibration for Deliverable Product

- a) Certificate of Calibration shall be furnished with each unit supplied under this purchase agreement. These certificates shall be traceable to the National Institute of Standards and Technology (NIST) and calibrations shall be performed in accordance with ANSI/NCSL Z540-11, current revision, and/or ISO 10012-1. If any occurrence of an out-of-tolerance condition is encountered during and/or after production of product submitted under this PO, FES shall be notified immediately in writing.

Q204. Material Shelf Life

- a) Chemicals or other identified items shall have a minimum of 50% of its original shelf life upon receipt by FES. Expiration date information and an MSDS/SDS sheet must be provided with shipment.
- b) Certificate of Analysis shall be included with shipment along with an MSDS/SDS sheet.
- c) Materials or other identified items shall have a minimum of 50% of its original shelf life upon receipt by FES, expiration date information must be provided with shipment.
- d) MSDS/SDS sheet required.

Q205. Non-RoHS Compliant Parts/Finishes – All finishes shall contain tin/lead solder conforming to J-STD-006. Solder coated finishes applied over pure tin surfaces are not acceptable unless approved by the Buyer at time of purchase order placement.

Q206. Change Notification for Non-COTS parts - Seller shall notify buyer immediately in writing of any change described below.

Upon receipt of such notice from the Seller, the Buyer shall have the right to direct the Seller to repeat all or part of the qualification, and/or conduct a full/delta First Article Inspection at the Seller's expense and to obtain from the Seller all data necessary to prove the acceptability of the proposed change.

- 1) Changes to the design, form, fit, or function
- 2) Changes in material
- 3) Changes in Seller's manufacturing and/or acceptance process(es) or procedure(s)
- 4) Changes in tooling or test equipment
- 5) Changes in manufacturing location
- 6) Changes in outside processing source
- 7) If two years or more has elapsed since the last manufactured item was produced (unless otherwise stated)

Frontier Electronic Systems Purchase Order Quality Requirements

- Seller shall not incorporate any change prior to receipt of written authorization from buyer
- Request for drawing or document changes should clearly state the following:
 - 1) IS and SHOULD BE condition
 - 2) Reference the applicable drawing zone, paragraph number
 - 3) Name of the supplier
 - 4) Date the change is requested
 - 5) Document number, revision letter of each engineering drawing and/or specification affected
 - 6) Supplier's part number and name for the item
 - 7) A brief descriptive title that indicates the purpose of the change
 - 8) Reason for change
 - 9) Schedule and/or cost impact
 - 10) Effectivity by serial number or lot and/or quantity affected

Q207. Certification of Conformance and Traceability of Origin - Semiconductors, Diodes, and Transistors (MIL-PRF-19500), and Microcircuits (MIL-PRF-38535 and MIL-PRF-38534)

Manufacturers who offer the product described by the specifications noted above shall provide written certification, signed by the company or corporate official who has management responsibility for the production of the products: (1) that the product being supplied has been manufactured and tested in accordance with this specification and conforms to all of its requirements, and (2) that all products are as described on the certificate which accompanies the shipment. The certificate shall contain the following minimum information:

a. Manufacturer Documentation:

1. Manufacturer's name and address
2. Customer's or distributors' name and address
3. Device type and quality level (JAN, JANTX, JANTXV, JANS, etc), and performance specification sheet number
4. Lot date code (including assembly plant code)
5. Inspection date
6. Quantity of devices in shipment from manufacturer
7. Statement certifying product conformance and traceability
8. Signature and date of transaction
9. Solderability inspection date and re-inspection date (only if performed)
10. DMS marking for part III listing (if applicable)

b. Distributor documentation from each distributor:

1. Distributor name and address
2. Name and address of customer
3. Quantity of devices in shipment
4. Certification that this shipment is a part of shipment covered by the manufacturer's documentation, and an attached copy of the manufacturer's original certification
5. Signature and date of transaction
6. Certification that Authorized dealers and distributors have handled the products in accordance with the requirements of JEDEC Standard JESD 31 and EIA-625
7. Solderability inspection date and re-inspection date (if performed)
8. DMS marking for part III listing
9. Device type, quality level (JAN, JANTX, JANTXV, JANS, etc.), and performance specification sheet number

Frontier Electronic Systems Purchase Order Quality Requirements

Q208 Material Review Delegation of Authority (MRB/MRA)

The supplier is NOT granted Material Review Delegation of Authority (MRB/MRA) to disposition nonconforming material as

- 1) Use-as-is
- 2) Repair
- 3) Repair by the use of a standard procedure
- 4) Scrap

Q209 Personnel Certifications for Critical Processes (per drawing)

Training records/certifications required for personnel performing critical processes shall be available upon buyer's request.

SELLER REQUIRED PROGRAMS / PROCESSES

Q300. ESD Protection Program - Seller is required to have an Electrostatic Discharge Control Program, which is subject to review and approval by the Buyer. The Seller's Electrostatic Discharge protection program must comply with ANSI/EIA-625, ANSI ESD §20.20, MIL-STD-1686, MIL-HDBK-263, or equivalent

Q301. GFE / CFE Program

- a) The supplier is required to maintain a program for the accurate material identification, segregation, and control of Customer Furnished Equipment (CFE). The FES buyer shall be notified if any deficiency or failure is noted after delivery.
- b) The supplier is required to maintain a program for the accurate material identification, segregation, and control of Customer Furnished Material (CFM). The FES buyer shall be notified if any deficiency or failure is noted after delivery.
- c) The supplier is required to maintain a program for the accurate material identification, segregation, and control of Government Furnished Equipment (GFE). The FES buyer shall be notified if any deficiency or failure is noted after delivery.
- d) The supplier is required to maintain a program for the accurate material identification, segregation, and control of Government Furnished Material (GFM). The FES buyer shall be notified if any deficiency or failure is noted after delivery.

Q302. Contamination / Foreign Object Debris (FOD) Control – Seller shall maintain a FOD prevention program. Seller's FOD prevention program shall include the review of design and manufacturing processes to identify and eliminate foreign object entrapment areas and paths through which foreign objects can migrate. Parts/Assemblies shall be protected by Seller from contamination or damage from foreign objects during processing, testing, inspection, handling, and packaging prior to delivery to Buyer. Buyer shall have the right to perform inspections, verifications, and FOD prevention program audits at Seller's facility to ensure program documentation and effectiveness. The seller shall provide a copy of their FOD prevention process to FES, along with the latest audit results of the process upon request.

Q303. Test and Measurement Equipment Calibration Requirement

- a) Product acceptance inspections and tests, conducted in fulfillment of this order, shall be performed with calibrated equipment traceable to National Institute of Standards and Technology (NIST).
- b) Seller shall provide and maintain a calibration program that is in conformance with ISO 10012-1 "Quality Assurance Requirements for Measuring Equipment", ANSI/NCSL Z540-1 "General Requirements for Calibration Laboratories and Measuring and Test Equipment", or comparable standards as alternatives to MIL-STD-45662, "Calibration Systems Requirements".
- c) Seller shall provide and maintain a calibration program that is in conformance with ANSI/NCSL Z540-1 "General Requirements for Calibration Laboratories and Measuring and Test Equipment"

Frontier Electronic Systems Purchase Order Quality Requirements

Q304. Red Plague Mitigation: Wire and Wire Harness manufacturers and distributors shall provide methods and processes for the control, transportation, and storage to mitigate the formation of "red plague".

Wire manufacturing controls shall:

- Provide traceability to the plating batch for each lot of wire or cable, including date of manufacture which shall not exceed two years from receipt.
- Continuous lengths of wire or cable shall have the ends sealed using heat shrinkable caps or an equivalent method for preventing unimpeded ingress of water (liquid and/or vapor).
- Ensure that the wire or cable is packaged in a sealed vapor barrier type bag containing desiccant.

Q305. Traceability Requirements for Assemblies/Modules - The Seller shall develop and maintain records for traceability and lot control for all parts, including Commercial Off The Shelf (COTS) material furnished under the Purchase Order. All traceability data shall be accessible and retrievable.

- The seller shall be capable of tracing a parts manufacturing lot to a specific serialized assembly
- The seller shall be capable of tracing each part to its manufacturer and lot identifications (lot date code or batch designation)
- The seller shall ensure markings for small devices are recorded in the manufacturing and processing records prior to use.

SUPPLIER / VENDOR SELECTION CRITERIA

Q400. Frontier Electronic Systems Approved Suppliers - Supplier shall use only sub-tier suppliers approved by FES. Supplier shall control sub-tier supplier procurements to the extent necessary to ensure quality requirements specified in the procurement document are satisfied. All Suppliers shall be required to flow down and verify requirements of supplies/services they procure.

Q401. Required Vendors – Parts or materials may be purchased only from vendors listed on approved engineering documentation.

Q403. Boeing Approved Process Sources - Any process sources shall be an approved processor as required by D1-4426 "Approved Process Sources." A list of the approved processors and associated processes are available at <http://www.boeing.com/companyoffices/doingbiz/d14426/index.html>

A certificate of conformance and/or equivalent process certificate, signed by an authorized agent of the processor shall be provided with each shipment. The certificate shall include:

- purchase order number,
- part number(s),
- trace number (as applicable),
- process specification number w/revision,
- processing date(s)
- name and address of the processor(s) performing each of the D1-4426 process(es).

Frontier Electronic Systems Purchase Order Quality Requirements

RESTRICTED MATERIALS

Q500. Domestic/ Qualified Specialty Metals Only - As per requirements of DFARS 252.225-7009 (June 2013), Contractor is prohibited from incorporating into military parts, components, and/or "end-item deliverables", specialty metals which have been melted outside of the United States, its possessions, or Puerto Rico, unless certain limited exceptions as set forth in the clause or DFARS subpart 225.7002-2 apply. Compliance to the DFARS 252.225-7009 shall be stated in the Supplier's standard Certificate of Conformance or by a separate certificate.

Q501. Prohibited Materials - Constructions, finishes, and sub-assemblies are prohibited from containing the material(s) identified. The seller shall provide a certificate with each shipment stating the prohibited materials are not present in their deliverable product.

- a) Pure Cadmium
- b) Pure Zinc
- c) Mercury and Mercury Vapors
- d) Magnesium
- e) Pure Tin. Any tin that is present must contain a minimum of 3 weight percent lead.
- f) Cables, insulators, and guards containing PVC (Polyvinyl Chloride)
- g) Asbestos
- h) PCB (Polychlorinated Biphenyl)
- i) Kapton Tape

FABRICATED ITEMS, ASSEMBLIES, AND SUB-ASSEMBLIES

Q600. Printed Circuit Board Requirements - Each deliverable will be serialized consecutively in sequence and will not duplicate any serial numbers shipped on previous purchase orders. FES shall be notified if any rework is performed on a printed wiring board. Rework performed shall be documented per serial number. All rework documentation shall be shipped with the board.

- a) Items shall meet requirements of IPC-A-600 (current revision) and shall include Net List Testing.
- b) Items shall meet requirements of MIL-PRF-55110 and shall include Net List Testing. Manufacturer not required to be certified to MIL-PRF-55110.
- c) Items shall meet and be certified to the requirements of MIL-PRF-55110 and shall include Net List Testing and test coupon(s). Manufacture shall be certified to the requirements of MIL-PRF-55110.
- d) Items shall meet requirements of IPC 6012 Class 3/A, Type 3
- e) Prior to acceptance of PWB/PCBs, all Group A test coupon micro-sections (cross sections) and Process Producibility Analysis (PPA) boards will be submitted as referenced on purchase order.
- f) PWBs shall comply with AA0115-247
- g) Items shall meet requirements of IPC 6013 TYPE 4, USE A, CLASS 3 for space application. Note: Do not remove from frame unless otherwise directed.
- h) Items shall meet requirements of IPC 6012 TYPE 3, USE B, CLASS 2

Q601. Welder Certification - Shall be in accordance with MIL-STD-1595.

FIRST ARTICLES AND EXTENDED / ADDITIONAL INSPECTIONS

Q700. First Article Inspection Requirement

- a) The first pieces of material furnished shall be accompanied by variable measurement data showing full compliance of each dimension shown in the corresponding drawing. Attributing data shall be furnished for each dimension accepted with functional gauging.
- b) The first pieces of material furnished shall be accompanied by a First Article Inspection and shall be completed in accordance with AS9102 "Aerospace First Article Inspection Requirements" current revision.

Frontier Electronic Systems Purchase Order Quality Requirements

Q701. Detailed First Article Inspection and Test Requirement

- SCOPE-First article inspection and test (FAIT) in accordance with SAE AS9102 is required, with the exception that the time requirement in Section 5.3, number 5 shall be 1 year (not 2 year) lapse in production
- PURPOSE-The purpose of the FAIT is to provide a documented physical and functional inspection (objective evidence) performed by the seller's quality assurance which verifies that a seller's production methods have produced hardware that conforms to established requirements. A successfully completed FAIT establishes the baseline controls to ensure continued product compliance. The FAIT shall be verified and approved by the buyer
- DATA SUBMITTAL REQUIREMENTS-Submit FAI report for approval 1 week prior to shipment of parts. Do not ship parts without written notice of FAI approval from buyer
- DESCRIPTION-The FAIT process applies to detail parts, assemblies and all levels of parts within an assembly. Note: procured standard catalog hardware is excluded.
- The FAIT shall be complete, independent, and shall document planning work instructions, material processing systems and controls, tools and fixtures, inspection/test equipment, test procedures, physical, chemical and functional inspection process to verify that prescribed production methods have produced an item conforming to Engineering drawings, planning, purchase order, Engineering specifications, and/or other applicable design documents
- Note: Sellers that create internal drawings for the purpose of hardware build and/or assembly must verify all components of their internal drawings as well as all components of Buyer's drawings during the FAIT. In addition, the seller's internal drawings must be submitted with the FAIT
- The FAIT shall apply to the seller and the seller's sub-tier suppliers when the sub-tier produces design characteristics for the subcontractor (i.e. Build to Print). The seller shall insure the requirement for FAIT is flowed down to sub-tier suppliers
- The FAIT forms shall comply with AS9102 requirements.
- Any proposed exception to the FAIT requirements shall be submitted in writing within 10 days after the purchase order date
- An FAIT shall not be considered complete until all non-conformances are resolved.
- The FAIT requirement, once invoked, shall continue to apply even after initial compliance. Delta FAIT's shall be submitted to the buyer when they are completed. See Q code 206 for causes of a full/delta FAIT.
- Check marks in place of stamp impressions are unacceptable. Test reports shall indicate what part number was tested, Acceptance Test Procedure (ATP) used, ATP revision and software versions issued for test (if applicable).
- Refer to attached FAI checklist. Parts will not be accepted until everything on the checklist is compliant.

Q702. Seller Source Inspection by Customer / Government: Contact FES when product is ready for inspection.

- a) Customer In-Process Inspection required.
- b) Customer Final Inspection required.
- c) Government In-Process Inspection required.
- d) Government Final Inspection required.

Q703. Frontier Electronic Systems In-process Inspection - Supplier performance of in-process operations to FES requirements shall be verified by FES representative during item manufacture at one or more of the following, as specified by purchase order:

- a) Prior to encapsulation/conformal coating
- b) Prior to cleaning
- c) Prior to plating
- d) Prior to assembly close-up
- e) As specified by special instructions noted on Purchase Order

Frontier Electronic Systems Purchase Order Quality Requirements

PACKAGING / SHIPPING REQUIREMENTS

Q800. Plastic Encapsulated Devices

- a) The supplier shall ensure plastic devices delivered under this purchase order have been classified in accordance with J-STD-020, current revision.
- b) Plastic encapsulated parts shall be handled and packaged in accordance with J-STD-033, current revision.

OTHER SPECIAL INSTRUCTIONS

Q900. Drop Shipment of Materials / Equipment to FES Suppliers / Sub Contractors - Material ordered on this PO is to be drop-shipped to a destination other than Frontier Electronic Systems Corp, Stillwater, Oklahoma. The quality data required by this contract shall accompany the shipment and copies of such data shall be provided to the FES buyer, reference "Receiving Inspection," the same date that material shipment is made.

Q901. Age Control - Date of manufacture of parts / materials delivered under this purchase order must be less than:

- a) 1 years
- b) 2 years
- c) 3 years
- d) 5 years
- e) 10 years

Q902. For Use In Human Space Flight - Materials, Manufacturing, and Workmanship of highest quality standards are essential to Astronaut Safety. If you are able to supply the desired item with a higher quality than that of the items specified or proposed, you are requested to bring this fact to the immediate attention of the purchaser (FES buyer).

Q903. AS9015 Requirements for Delegation of Product Verification- When FES buyer delegates product verification, seller shall conform to the requirements of AS9015, "Supplier Self Verification Process Delegation Programs", current revision. FES buyer reserves the right to conduct surveillance at the seller's facility to ensure the seller's quality system conforms to the requirements of AS9015.

AS9015 establishes minimum requirements for seller's delegation of product verification. When delegating product verification, seller is not relieved of its obligations under contract.