Telemetry-West

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BUSINESS PARTNER QUALITY ASSURANCE REQUIREMENTS

The requirements are an integral part of **all** purchase orders. The **requirements** become an integral part of purchase orders to the extent specified there-in. Materials (which includes documentation) received which do not conform to the requirements as invoked will be subject to rejection or such other measures deemed necessary by the L3 Communications Telemetry-West (L3 TW) Quality Assurance representative. The appropriate specific quality requirements that apply to the purchase order will be referred to by the applicable QA **code number**(s), as identified on the purchase order. Supplier or vendor is referred to as Business Partner (BP) henceforth.

01 QUALITY PROGRAM AND INSPECTION SYSTEM REQUIREMENTS

BUSINESS PARTNER OBLIGATION

Compliance with the provisions of one or more of these specifications in no way relieves the Business Partner of the final responsibility to furnish acceptable supplies or services, as specified. The Business Partner is responsible to flow down the applicable requirements to assure that appropriate sub-tier Business Partners also conform to (L3 TW) requirements.

PURCHASE ORDER & CONTRACT REVIEW

The Business Partner shall perform contract and record reviews to ensure that all relevant documentation, requirements and revisions are available and understood.

A purchase order acknowledgement must be sent back to the L3 TW Buyer.

RIGHT OF ACCESS

L3 TW reserves the right of access for their representatives, their customer, and regulatory authorities (accompanied by L3 TW representatives) to all facilities involved in the order and to all records applicable to the order.

QUALITY MANAGEMENT SYSTEM

The Business Partner shall implement or maintain a Quality Management System or Inspection system applicable and adequate for material or service being supplied to L3 TW. Additionally, the Business Partner shall comply with the following requirements:

- ISO 9001:2008 or later; or AS9100 Rev C or later; or a Quality Management System approved by L3 TW survey/audit process.
- Business Partners performing testing, measuring, calibration or any use of metrology shall have a Calibration Control System in accordance with the ANSI Z540-1 Standard or equivalent.
- Calibration facilities serving L3 TW shall be registered to ISO 9001 Quality Management System and/or ISO/IEC 17025 Quality Management System for Laboratories.

INSPECTION AND / OR PRODUCTION TOOLING

- The Business Partner shall be responsible for the protection, calibration, and care, other than normal wear, of all production and inspection tooling and equipment furnished or owned by L3 TW for use in performance of Purchase Order requirements. All tooling shall be subject to surveillance and/or inspection upon notice. Said tooling, or replacement tooling of equal quality shall be returned in an acceptable condition upon demand or notice.

QUALIFIED PRODUCTION LIST (QPL) VERIFICATION

- Business Partners, including Distributors, providing QPL parts shall supply the prime manufacturer's name and QPL number, and corresponding QPL test report number with each shipment, as applicable to Purchase Order requirements. When providing parts that use an industrial or military specification (mil-spec) part number, per a particular specification, if your part number is different from the number used in the specification, supplier shall provide both part numbers on the shipping documentation.

CONTROL OF NONCONFORMING SUPPLIES

- The Business Partner shall provide and maintain an effective documented system for the control of nonconforming supplies including its identification, segregation and disposition, to prevent the use, shipment, or commingling with conforming supplies.
- The Business Partner shall notify the buyer upon identification of nonconformances applicable to the product shipment requested on the Purchase Order and upon identification of nonconformances applicable to the supplies previously provided.
- The Business Partner shall conduct Material Review when nonconforming material is identified.
    - When material requires Rework, Business Partner is authorized to proceed with correction without Buyer's quality representative approval.
        - **Rework** is defined as – A disposition category in which the nonconforming product can be re-worked to drawing or specification to eliminate the nonconformance. (Business Partner is authorized to proceed)
    - When material requires Repair or Use as Is, Business Partner shall submit a request, in writing, and is NOT authorized to proceed or deliver without Buyer's Quality representative approval.
        - **Repair** is defined as – An MRB disposition in which nonconforming product can be worked to a condition where the product does not meet the physical requirements of the drawing but can meet the functional requirements of the product. (Business Partner is NOT authorized to proceed or deliver and shall submit a Waiver for approval)
        - **Use as Is (UAI)** is defined as – A disposition in which it is determined that non-conforming product may be used "As Is" to meet the requirements of its application without additional rework even though it does not meet all the requirements of the drawing. (Business Partner is NOT authorized to proceed or deliver and shall submit a Waiver for approval)

NOTICE OF PREVIOUS REJECTION

- When the Business Partner submits material that had been previously rejected by the Buyer, the Business Partner's shipping document shall contain the Return Material Authorization (RMA) number.

CORRECTIVE ACTION REQUESTS

- Corrective action requests issued against materials found to be nonconforming upon receipt at L3 TW shall be investigated and responded to within the specified timeframe (i.e., 20 calendar days) with immediate containment, root cause, corrective action taken and the effectivity of its implementation. The effectiveness of the corrective action will be assessed by L3 TW on future orders. **Noncompliance with this requirement could result in non-placement of further Purchase Orders, until the issue is resolved.**

CHANGE CONTROL

- The Business Partner shall provide in writing advance notification to the buyer of any change(s) to facilities, materials, or approved processes at the Business Partner's facility or at the Business Partner's sub-tier facilities that could affect the customer's contracted product. This includes, but is not limited to, fabrication assembly, handling, testing, facility location or introduction of a new sub-tier Business Partner.

- After L3 TW qualification, parts/material procured to L3 TW specifications shall require buyer notification of any proposed changes to the manufacturing baseline which may affect the performance, quality, reliability or interchangeability of such parts/material.

- Any proposed changes to the manufacturing baseline which may affect the performance, quality, reliability or interchangeability of such parts/material procured to L3 TW specifications, drawings or purchase order requirements shall require **a waiver/deviation** approved by the Quality Engineer (or designee) and appropriate Engineering discipline (or designee) in writing, in advance prior to receipt of hardware. The approved waiver/deviation MUST accompany the receipt of material, hardware/software.

MATERIAL

- Material supplied in support of this Purchase Order/Subcontract shall not contain any 'suspect' or 'known' Counterfeit parts, materials or work. Parts/Materials/Work shall be procured only from OEM's and or Authorized Franchised Distributors for those OEM's. Any deviation request must be submitted for approval and authorized in writing, in advance by the BUYER. The Supplier will ensure that this section or equivalent is flowed down to all lower tier subcontracts to prevent the inadvertent use of Counterfeit parts, material or work. If a waiver is granted, the supplier shall provide a copy of the waiver with the deliverable data package.

- The use of substitute material is not permitted without written Request for deviation approval from L3 TW.

- Any waiver/deviation must be approved by the Quality Engineer (or designee) and appropriate Engineering (or designee) discipline in writing, in advance prior to receipt of hardware. The approved waiver/deviation MUST accompany the receipt of material, hardware/software.

DOCUMENTATION AVAILABILITY

- Test reports, inspection records, or verifiable documentation of quality, indicating conformance to applicable specification shall be maintained by the Business Partner and shall be available for review by the Buyer, Government and/or Regulatory Authorities upon request.
- The reports, records or verifiable documentation shall be retained for a period of **seven (7) years** after final shipment unless otherwise specified in the Purchase Order/Contract.

02 BUSINESS PARTNER'S ACCEPTANCE INSPECTION (Certificate of Conformance (CofC))

The Business Partner shall submit with each shipment a Certificate of Conformance (CofC), which at a minimum includes:

- L3 TW Purchase Order (PO) number
- L3 TW Part Number
- Revision controlled items procured to a Source Controlled Document (SoCD) or Specification Controlled Document (SCD) also require:
  - L3 TW Part Number Revision Letter (SoCD and SCD)
  - Manufacturer's CAGE code (SoCD only)
  - Serial numbers (SoCD only where document calls for serialized marking)
- Quantity shipped
- Business Partner Name
- Title of Business Partner's Authorized Representative
- Date
- Statement that the materials furnished to L3 TW are in conformance with applicable requirements of the PO, drawings and specifications, which no unauthorized material substitutions have been made, and supporting documentation is on file and shall be made available to L3 TW, Customer, or Government Representatives upon request.
  - An example of an acceptable statement of CofC is as follows: "This is to certify that all items noted are in conformance with the purchase order, drawings, specifications, and other applicable documentation. Material specified was furnished and no substitutions have been made without L3 TW authorization."

Note 1: All supporting paperwork provided, e.g., test reports, secondary process sources, etc. require traceability to the Business Partner's CofC.
Note 2: When a distributor or Business Partner drop-ships an order, the manufacturer's CofC with the manufacturer's name in place of the distributor business partners' name is acceptable.
Note 3: When listed on the L3 TW PO, shelf life, and lot traceability CofC requirements are detailed under QA codes 14 and 15A-F.

MECHANICAL HARDWARE: Along with the above requirements a Business Partner's CofC shall state the inspection mechanism (i.e. manual, manual coordinate measuring machine (CMM), automatic CMM). When inspected with an automatic CMM the CMM report shall be provided.

03 SOURCE INSPECTION

L3 TW Source Inspection is subject to this requirement prior to shipment from Business Partner's Plant. All items covered by this Purchase Order are subject to surveillance and inspection by the Buyer's representative at the point of manufacture. This will include surveillance of the product and Business Partner's systems, procedures and facilities, as mutually agreed between BUYER and SELLER.
The Business Partner shall furnish the necessary facilities and equipment, and perform tests to demonstrate conformance to the Buyer's drawings and/or specifications.

Final inspection and acceptance of Source Inspected material will be at the Buyer's facility unless otherwise specified on the Purchasing document. The Business Partner shall provide reasonable advance notice to permit scheduling of Source Inspection.

The Business Partner shall provide evidence of the Buyer's Source Inspection performed with each shipment.

04 IN-PROCESS INSPECTION

L3 TW In-Process Inspection is subject to this requirement during Manufacturing Process. All items covered by this Purchase Order are subject to in-process inspection by the Buyer's Quality Representative. The Business Partner shall provide evidence of this in-process inspection performed with each shipment.

The Buyer's Quality Representative shall designate the required in-process source inspection points on the Business Partner's flow plan upon receipt and prior to manufacturing, as mutually agreed between BUYER and SELLER.

Business Partners of items considered to be a Hybrid device are subject to the Hybrid Oversight and Monitoring Requirements Matrix. All option, recommended oversight, and monitoring may be tailored based on the hybrids issues and history. As a minimum, prior to application of epoxy material, hermetic sealing (pre-cap) or any permanent closure, the Business Partner shall present the Product to the Buyer for inspection.

05 FIRST ARTICLE INSPECTION

<u>All Business Partners of harnessing, cabling, L3 TW build to print items and power supplies, which are L3 TW Revision Controlled Items,</u> shall select one item from the first production lot to be submitted against the Purchase Order and the Business Partner shall thoroughly inspect and record all drawing/specification parameters and the actual inspection results obtained on AS9102 First Article Inspection Report (FAIR) forms or equivalent. First Article Inspection Reports <u>ARE</u> required when part revision (except Direct Drawing Change -DDC) has changed, a lapse in part production from the same Business Partner has exceeded 2 years, by Buyer request, or there has been a change in the Business Partner part production.

- Part/Item inspected and used for the first article shall be identified as "First Article" and **shall be** accompanied by the completed inspection forms when received at the Buyer's facility.
- Business Partner may contact Buyer's facility to verify Buyer has FAIR on file, prior to proceeding. Once verified, Buyer will amend the purchase order with statement such as "FAIR IS ON FILE AND NOT REQUIRED FOR THIS DELIVERY". If FAIR is not on file with Buyer, perform or forward a copy with the Purchase Order.

Quality code shall not be invoked if:

- Business Partner requests a waiver or deviation and it is approved by L3 TW Quality Assurance prior to receipt at Buyers facility.
- Part revision has not changed (or is only a DDC), a lapse in part production from the same Business Partner is less than 2 years, and there has been no change in Business Partner part production. The purchase order will be amended with note such as "AN APPROVED FAIR IS ON FILE AND NOT REQUIRED FOR THIS DELIVERY".

Caution: Commencement of the production run prior to first article acceptance by L3 TW is at Business Partner's risk.

06 WORKMANSHIP STANDARD

The material and workmanship shall conform to the latest revision of the applicable standard(s) or as indicated on the drawing(s) of the following:

- Business Partners of Equipment to MIL-HDBK-454, (*Standard General Requirements for Electronic Equipment*)
- Business Partners of Cabling and Harnessing to IPC / WHMA-A-620, (*Requirements and Acceptance for Cable and Wire Harness Assemblies*)
- Business Partners of Assemblies to ANSI / J-STD-001, (*Requirements for Soldered Electrical and Electronic Assemblies*)
- Business Partners of Assemblies to ANSI / IPC-A-610, (*Acceptability of Electronic Assemblies*)
- Business Partners of Printed Wiring Boards IPC-A-600, Acceptability of Printed Boards

Note: If drawing or document calls out L3 TW workmanship standards i.e. BI-Q-001 or 1701036, BP shall request a copy of the document to ensure compliance herein.

MECHANICAL HARDWARE INSPECTION

- Business Partners of mechanical hardware shall perform de-burring of mechanical hardware with drilled and threaded holes. Business Partner's workmanship and Inspection shall ensure that the hardware meets the drawing requirements when subjected to Inspection under magnification (7x magnification) upon receipt at L3 TW.

06 (Cont) SPECIAL PROCESS

Business Partners of L3 TW Build to Print Machined Metal Parts shall use approved special process Business Partners as identified on the Purchase Order.

- Any other specified requirements or special process control(s) referenced on the Purchase Order shall apply.
- Special processes are those yielding product that cannot adequately be evaluated for conformance to requirements through inspection or non-destructive testing, such as welding, plating, painting, heat-treating, bonding, chem.-film, etc. The Business Partner shall, at a minimum, demonstrate a degree of control over these processes to provide assurance that specifications are met and complied with. As applicable, the Business Partner shall provide adequate training for personnel, certifications, destructive testing of samples and detailed procedures.
- Furthermore, upon request, copies of special process procedures / certifications shall be supplied to L3 TW.
- If the Business Partner uses facilities other than their own for special processes, that facility shall be subject to the same conditions as stated herein. All certifications shall be supplied as objective evidence and must indicate the name and location of the facility performing each special process. The certificate of conformance from the special processing supplier shall be referenced/traceable on the manufacturer's certificate of conformance.

07 PHYSICAL AND CHEMICAL ANALYSIS FOR BUSINESS PARTNERS OF L3 TW BUILD TO PRINT MACHINED METAL PARTS

L3 TW reserves the right to periodically validate test reports for raw Materials provided against the Purchase Orders

- **Manufactured Articles-Raw Material Test Reports**
  The Business Partner shall maintain on file, and assure availability for Buyer's review upon request, results of chemical and/or physical analysis reports required to satisfy specification requirements for raw materials used in the manufacture of articles delivered under this Purchase Order. **The test report number shall be referenced on the Business Partners Certificate of Conformance.**

- **Raw Material – Chemical and Physical Test Results**
  Each shipment of raw material shall be accompanied by legible and reproducible copies of the applicable chemical and physical test results identifiable to the material specifications identified in this Purchase Order. Test reports furnished shall contain the signature of an authorized representative of the agency performing the tests and evidence of conformance to specification requirements. **The test report number shall be referenced on the Business Partners Certificate of Conformance.**

- **Mill or Foundry Physical and Chemical Test Reports**
  These reports which identify the foundry performing the smelting operation and demonstrate conformance to all applicable specifications for all metals used in the fabrication of the ordered material, shall be maintained on file and a true copy thereof (either carbon or photographic) shall be supplied with each shipment. **The test report number shall be referenced on the Business Partners Certificate of Conformance.**

08 RADIOGRAPHIC INSPECTION

Note: Used on Assemblies with solder joints where joints are unable to be visually inspected or if radiographic inspection is required by source control drawing.

The material on this Purchase Order requires radiographic inspection by a laboratory certified to MIL-HDBK-728//5 ASTM E1742/E1742M and approved by the Buyer. The radiographs shall be interpreted and evaluated to specifications and standards by the certified laboratory as required by the drawing and/or the Purchase Order. The radiographs shall be filed and stored at the Business Partner and a soft copy of the laboratory X-ray report, at a minimum, shall accompany the material delivered to L3 TW.

09 PRINTED WIRING BOARD (PWB) REQUIREMENTS

Business Partner's deliverable support packages shall include:

Documentation:

1. Business Partner's C of C.
2. Lot Date Code of PWB must tie to all required documents.
3. Manufacturer's C of C for each of the original laminate(s) used:
   a. Include the levels of restricted substances, i.e., Lead, Mercury, Hexavalent chromium, Cadmium, Polybrominated biphenyls and Polybrominated diphenylethers.
4. Panelization layout drawing including PWB and coupon identifications.
5. Layer view stack up (construction configuration).
6. Unpopulated Printed Board Electrical Test Report in accordance with IPC-9252.
7. Impedance Test Report, as applicable.
8. Microsection Lab Report consisting of, but not limited to:
   a. Acceptance criteria or overall results clearly and visibly identified on the first page of the documents provided. No failures are to be buried or embedded within this report.
   b. Finished layer stack up measurements.
   c. Photos (color preferred) of entire plated through hole barrels sectioned from both "As Is" and "Stressed".

Materials/Hardware:

1. Coupons in accordance with the drawing and PO, shall be provided and clearly identified. As a minimum, coupon marking shall reference the manufacturer's CAGE (Commercial and Government Entity) code, lot or date code, drawing & dash number, and panel serial number. One set of coupons shall be traceable to every panel of boards produced.
2. Microsection mounts with clear location identification.
3. One PWB solder sample.
4. When metal backed 6000 series Duroid material is called out: Use of "Reversed Treated Copper Foil" (RFT) in lieu of "rolled copper" is acceptable.

5. The use of PWB overage stored for a year or more requires L3 TW pre-approval, L3 TW confirmation of original coupon availability, a Solderability test in accordance with IPC-J-STD-003 performed after PO acceptance, and a Solderability C of C to be supplied with the PWB. Solderability test samples shall be retained by Business Partner for a minimum of 3 years.
6. Plated thru-hole diameters are after plating. Panels shall be drilled individually and stacking is prohibited. Only new drill bits shall be used and holes in coupons shall be drilled with drills just prior to drill replacement. Holes drilled with lasers do not apply.
7. Etch back Requirements: CLASS 3 & 3A PWB's made from materials of Polyimide or Epoxy Glass with four (4) or more layers shall have a POSITIVE ETCHBACK (0.0001-0.0015) with a three (3) point wrap. Plasma desmear process required. NEGATIVE ETCHBACK is PROHIBITED.

Packaging:

1. Each PWB shall be heat sealed in an individual electro-static discharge/moisture barrier bag (ESD/MBB) in accordance with MIL-PRF-81705, with a non-corrosive Type II Desiccant in accordance with MIL-D-3464, and a Humidity Indicator Card (HIC) in accordance with J-STD-033.
2. Each bag shall have adequate space between the heat seal and the PWB to allow opening and resealing of the bag a minimum of three times.
3. Each bag shall be labeled, at a minimum, with the L3 TW part number, date code, serial number, and panel location designator.

Specification:

1. PWBs shall be manufactured to the requirements of the drawing, including any special instruction(s) on the purchase order. In the absence of fabrication specifications, contact the Buyer for a Purchase Order change notice.
2. Test Failure Threshold: Failure of more than 20% of the panels or parts in a lot for the same type of defect shall cause the lot to be suspect. Manufacture shall contact L3 TW Buyer regarding all suspect lots for potential referee or additional evaluation testing. No referee testing is allowed without a Referee Approval form and input from L3 TW buyer.

NOTE:

Manual sodium etch process is **PROHIBITED**.

10 CERTIFIED TEST DATA

Business Partners of parts or components receiving additional screening requirements or destructive physical analysis shall provide certified test data (or a true copy thereof) with each shipment. Data shall be of applicable electronic or physical measurements on stationery identifying the name and address of the organization performing the testing. This includes requirements performed by Subtiers or Distributors. The data shall be provided in a reproducible soft copy format on a compact disc (CD), such as either Excel or PDF file.

Test data report shall include the following items listed below:

- Summary (attribute) data, quantity accepted and/or rejected, test quantity and parameters tested.
- Certified test report stating all tests were conducted to approve L3 TW Source Control Drawings (SOCD's), Specification Control Drawings (SCD's), Selected Item Drawings (SID's), Altered Item Drawings (AID's) and the results meet the specified requirements.
- C of C per Business Partner's Acceptance Inspection
- When required by L3 TW Source Control Drawings (SOCD's), Specification Control Drawings (SCD's), Selected Item Drawings (SID's), Altered Item Drawings (AID's), actual (variable) readings taken from measuring instrumentation on required test quantity and test parameters.

11 IDENTIFICATION

MARKING PERMANENCY

Items supplied shall meet marking permanency requirements of the applicable specification or drawing for markings, such as part numbers and identification. Permanent, non-conductive epoxy-based inks are preferred, such as those conforming to MIL-I-43553.

After testing for marking permanency per specification requirements, there shall be no deterioration or discoloration of the markings such that legibility is impaired; and there shall be no deleterious mechanical or electrical damage or deterioration of the material or finishes caused by the markings.

- **Business Partners of MATERIALS, PARTS, SUBASSEMBLIES and ASSEMBLIES.**
  Material, parts subassemblies or assemblies shall be identified with the buyer's specification/drawing & revision level or Business Partner part number as referenced on the applicable Purchase Order. This marking shall be as required by the specification or drawing.

- **Business Partners of PRINTED CIRCUIT BOARDS AND MULTI-LAMINATE BOARDS**
  For printed circuit and multi-laminate boards, the part number with the appropriate revision shall be applied to the individual packaging of the item, using suitable stick-on type labels (not applied directly to the item).

- **Business Partners of "BAG AND TAG" ITEMS (too small for part number application)**
  For "bag and "tag" items, the part number, with appropriate revision, shall be applied to the individual bag / container / packaging, in accordance with Handling and Packaging Requirements (QA Code 12), using suitable stick-on type labels.

- **Business Partners of FABRICATED METAL PARTS**
  Fabricated detailed machined parts shall include the Business partner's name or logo adjacent to the part number and revision level marking in the drawing as applicable. If the part is too small for a name or logo, then the Business Partner shall default to "Bag and Tag".

- **Business Partners of Wire**
  Each spool of wire on this order shall be legibly and permanently identified with the following information:
  1. Purchase Order Number
  2. Gage
  3. L3 TW Part Number
  4. Military Specification Number (as applicable)

12 HANDLING and PACKAGING REQUIREMENTS

FOREIGN OBJECTION ELIMINATION (FOE) AWARENESS/CLEANLINESS

Business Partner shall maintain a Foreign Object Elimination (FOE) Control program/process, or equivalent, assuring work is accomplished in a manner preventing foreign objects or materials from entering and remaining in deliverable items, to preclude the potential for Foreign Object Damage (FOD).

Reference Note: Staples shall not be used in packing or provided with documentation.

Business Partner shall provide **appropriate** FOE training to employees performing operations.

After fabrication, Business Partner shall have parts cleaned of smudges; loose, spattered, or excess solder; metal chips; dust; dirt; fibers; or any other foreign material which might detract from the intended operation, function, or appearance of the equipment. (This would include any particles that could loosen or become dislodged during the normal expected life of the equipment).
All corrosive materials shall be removed. Cleaning processes shall have no deleterious effect on the equipment or parts.

ELECTRICAL OVERSTRESS (EOS) OR ELECTROSTATIC DISHCHARGE (ESD)

Business Partners of items susceptible to Electrical Overstress (EOS) or Electrostatic Discharge (ESD), shall ensure the items contracted under this Purchase Order are considered electro-static sensitive and must be handled and packaged in accordance with ANSI/ESD S20.20, ANSI/EIA-625 or equivalent.
Note: If drawing or document calls out L3 TW ESD procedure i.e. BI-Q-002, BP shall request a copy of the document to ensure compliance herein.

PACKING AND PACKAGING ACCEPTANCE

Packing and packaging shall conform to the requirement of the drawing or specification for the part / material being purchased and to any special requirements delineated within the specific quality provisions invoked by the Purchase Order.

In those cases where packing and packaging requirements are not defined as stated above, packing and packaging shall, in general, conform to the following requirements:

1. Each bag shall have adequate space between the heat seal and the product to allow opening and resealing of the bag a minimum of three times.

2. Use of Pink Polyethylene Plastic bags and Staples are non-authorized packaging materials and shall not be used for compliance with the L3 TW Foreign Object Elimination program where such items are prohibited in the vicinity of the manufactured products.

3. Packing and packaging procedures, practices and methods in effect at all Business Partners shall be subject to review and approval by the Buyer's quality representative.

EOS/ESD SUSCEPTIBLE PRODUCTS

All electronic items shall be enclosed with ESD/moisture barrier bags with correct moisture sensitive level (ESD/MBB), then wrappings, cartons, boxes, and other containers, as applicable to the extent necessary to provide protection from hazards of static electricity, contamination and physical damage encountered in general handling, shipping, and storage.

MACHINED PRODUCTS

Housings, frames, etc. may be wrapped in clear anti-static bubble-wrap for protection prior to other packing methods (bagging, boxing).

Materials used for enclosing parts shall be dry and in accordance with good commercial practice.

NON-CORROSION

Material in direct contact with metal surfaces shall not cause or promote corrosion.
Packaging material used shall be non-abrasive, chemically neutral (ph 6.5 to 7.5) and have a water soluble acidity of not more than 0.02% equivalent sulfur trioxide.

PHYSICAL PROTECTION

Physical protection of items packaged shall be accomplished by the use of cushioning, bracing, or blocking, as applicable to prevent rupture of flexible barriers, free movement within rigid or semi-rigid containers and physical damage due to transmission of shock and vibration.

CUSHIONING

Cushioning material **used to pack suitably protected products** shall be dry, dust-free and shall not cause or promote corrosion or static electricity and should be fungus-resistant.

Preferred **cushioning** materials are antistatic bubble pack **(bubble wrap),** Styrofoam, or approved type cellulose, etc. The use of shredded newspaper, or crumbled paper, etc. is not desirable but may be permissible provided items so cushioned are enclosed in **sealed bags.**

Materials used for blocking, bracing, etc. shall be chosen with regard for size, weight, and configuration of the items to be protected.

UNIT PACK

All items with the same identity, i.e. same part number may be packaged together in the same container, subject to other requirements of this specification relative to physical protection.

13 (Reserved)

14 SHELF LIFE (Age Sensitive Material)

Business Partners of material/parts with a shelf-life shall ensure that, at the time of receipt at L3 TW, the parts have a minimum of 50% of the specified shelf life remaining. The Business Partner shall be responsible for legibly and permanently identifying the part and/or container, certification, and shall include the following four items:

- Part Number
- Manufacturing Storage/Shelf Life (Used to calculate remaining shelf life)
- Date of Manufacture (DOM) (If used in calculating shelf life, e.g. shelf life is 1 year from DOM)
- Shelf life expiration date (on the container, bag, spool, reel, etc.)

Exception: Insulated wire - unless received with Date of Manf (DOM or shelf life), the expiration date will be applied by Receiving Inspection to the ERP system as seven years from date of receipt at L3 TW.

15A TRACEABILITY

Traceability shall be provided as part of the C of C for material on this procurement as identified:

- Manufacturer Name (mandatory)

  and one or more of the following (mandatory)

- Manufacturer's Lot Date Code
- Date of Manufacture
- Manufacture Date

Exception: When item is machined hardware, gaskets, thermal pads and tubing, the following are acceptable:

- Manufacturer Lot Trace
- Manufacturer Lot Job Number

NOTE 1: When the Business Partner (BP) is a distributor, the Original Equipment Manufacturer (OEM) or Original Component Manufacturer (OCM) name shall be documented on the distributor's C of C and traceable to the OEM/OCM within the distributor's process.

NOTE 2: When Quality Code 15B-F is also called out on the PO, Quality Code 15B-F shall take precedence.

NOTE 3: When multiple Lots or Date Codes are provided, the BP shall segregate, package, and label each Lot or Date Code individually.

15B TRACEABILITY (LDC < 24 Months) **

Traceability shall be provided same as 15A with the added requirement that Manufacturer's Lot Date Code or Date of Manufacture or Manufacture Date shall be less than 24 months old **

** Parts that are older than specified requirement MAY be accepted with TW pre-approval provided the manufacturer performs acceptance testing which demonstrates that the part is still functional and has not experienced any degradation during storage.

Pre-approval steps:

- BP will submit a wavier/deviation
- BP will submit manufacturer's documented acceptance testing, consisting at a minimum, functional testing over the device's rated operating temperature range and visual inspection
- TW buyer grants or denies pre-approval

15C TRACEABILITY (LDC < 60 Months) **

Traceability shall be provided same as 15A except the for the requirement that Manufacturer's Lot Date Code or Date of Manufacture or Manufacture Date shall be less than 60 months old

** Parts that are older than specified requirement MAY be accepted with TW pre-approval provided the manufacturer performs acceptance testing which demonstrates that the part is still functional and has not experienced any degradation during storage.

Pre-approval steps:

- BP will submit a wavier/deviation
- BP will submit manufacturer's documented acceptance testing, consisting at a minimum, functional testing over the device's rated operating temperature range and visual inspection
- TW buyer grants or denies pre-approval

15D TRACEABILITY (Single LDC)

Traceability shall be provided same as 15A with the added requirement that the entire line item be from a single Manufacturer's Lot Date Code or Date of Manufacture or Manufacture Date.

NOTE 1: All internal components of the deliverable item must be from single lots.

15E TRACEABILITY (WAFER LOT)

Traceability shall be provided same as 15A with the following added requirement:

- Manufacturer's Lot Trace (mandatory)
- Manufacturer's Wafer Lot or Batch (mandatory)

15F TRACEABILITY (OEM/OCM)

Traceability shall be provided same as 15A with the added requirement that if the BP is a distributor, the Original Equipment Manufacturer (OEM) or Original Component Manufacturer (OCM) C of C shall be provided.

16 PROHIBITED MATERIAL REQUIREMENTS

The use of pure Cadmium, pure Zinc or pure Tin is prohibited.

- Business Partners of **ELECTRONIC, ELECTRICAL, ELECTRO-MECHANICAL** and/or piece part(s), and assemblies (including internal hardware) shall have NEITHER internal nor external surfaces coated with pure Cadmium, Zinc or tin layer. Electronic part terminals and leads coated with a tin alloy shall contain a minimum of 3 percent (3%) lead (Pb).

- Business Partners of **METALLIC MECHANICAL** parts and/or piece parts, hardware or materials shall NOT be manufactured using pure tin nor contain a plating finish of pure Cadmium, Zinc or Tin. Tin alloy plating finish **shall** contain a minimum of 3 percent (3%) lead (Pb).

The Business Partner shall provide a written C of C, with each shipment, which attests that the products contained therein, meet the requirements of the Purchase Order. The C of C shall mean that the Business Partner has contacted the Original Equipment Manufacturer (OEM) and verified that the product s meets the specified minimum 3% lead requirement as referenced above in the mechanical or electromechanical parts section. A copy of the OEM certificate shall be provided to verify that the Mfr / LDC of delivered products meet the specified requirements. This does not apply to MIL-SPEC parts.

NOTE: Component leads shall be subjected to test upon receipt at L3 TW to verify prohibited materials, i.e. lead metallic content.

17 PARTICLE IMPACT NOISE DETECTION (PIND)

Reduction of risk due to foreign contaminants in devices with lids or cavities:

- A purchase order requiring PIND testing or Business Partners of devices with a lid or cavity shall implement a Particle Impact Noise Detection (PIND) cleaning procedure prior to lid sealing. The Business Partner shall use double-sided tape, place unit to be cleaned upside down (towards the tape) on the transducer, and run a PIND test in accordance with MIL-STD-883, 2020 condition A. If there is a strike indication, test shall be repeated until the run is completed without any indications. Results of testing including number and types of particles along with number of tests shall be recorded by the Business Partner. Deviations from this requirement shall be approved by L3 TW in writing prior to lid seal. The manufacturer or approve test lab shall perform PIND testing and PIND test data shall be delivered with the parts.
- Particle Impact Noise Detection Testing (PIND) Devices listed in this order shall be 100% Particle Impact Noise Detection (PIND)-tested per:

- MICROCIRCUITS: (1) MIL-STD-883, Method 2020, Test Condition "A",
- HYBRIDS: MIL-STD-883, Method 2020, Test Condition "A" or "B",
- TRANSISTORS: Mil-STD-750, Method 2052,Condition "A",
- DIODES: Mil-PRF-19500
- RELAYS: Mil-PRF-39016, Rev. E, Appendix "B", and the Manufacturer's Approved Procedure

18. HYBRID DEVICES

Subcontract Business Partners of hybrid devices (including formed lead packages), each device shall be individually packaged in specialized containers, part number PP2525 Corstat Pillow Pak manufactured by Conductive Container Inc (CCI) or L3 TW approved equivalent shall be used. Packages shall be clearly marked with ESD warning and sealed with Non-static generating tape or other equivalent means to ensure adequate protection against physical damage.

	10 June 2015		06-10-2015
Manager of Procurement	Date	Director of Quality Assurance	Date

Telemetry-West

BUSINESS PARTNER QUALITY ASSURANCE REQUIREMENTS CHANGE HISTORY

This section provides the details of changes to L3 TW's Business Partner Quality Assurance Requirements, QASF-185.

Rev.	Summary	Date
1	Initial release	11/21/2012
2	#13 added as a placeholder	12/04/2012
3	#10 Certified Test Data: deletions and addition of bulleted item, #15 A-E Traceability: Added Exceptions	01/09/2013
4	#5 First Article Inspection: Added "which are L3 TW Revision Controlled Items" #7 Physical and Chemical Analysis: Added L3 TW build to print #14 Shelf Life: Added Exception #15 A-E Traceability: Added…or date of manf or manf date, Added to exceptions …or gaskets, thermal pads and tubing. Added to Note 1, added new Note 2 #15F Traceability (OEM/OCM): added section to address OEM/OCM	04/12/2013
5	#1 Control of Nonconforming Supplies: Added multiple sections to Control of Nonconforming Supplies #3 Source Selection: Modified section #4 In-Process Inspection: Added subject to this requirement, and as mutually agreed between Buyer and Seller #15 A, B, C, E Traceability: Added Note 3 #15F Traceability: Modified Note 2	05/24/2013
6	#6 Special Process: added…of build to print machine, metal parts, #7 Added to all sections: The test report number shall be referenced on the Business Partners C of C. #8 PWB Requirements: Total re-write of section #15 A-F Traceability: Modified all sections Added Date to the signature line	01/07/2014
7	#2 Business Partners Acceptance Inspection (C of C): Note added #6 Workmanship Standard: Added: The C of C from the special processing supplier shall be referenced/traceable on the manf C of C.	02/20/2014
8	#2 Business Partners Acceptance Inspection (C of C): Added: Mechanical Hardware Note.	05/22/2014
9	#1Added note to MATERIAL section for substitute material, #2 added additional C of C requirements Added overall revision page to end.	07/16/2014
10	#2 Add requirement to obtain serial number on C of C for SoCD components that call for serialization within the document	09/03/2014`
11	#2 Material: Updated the counterfeit clause #9 significant changes: e.g. Change Solder Samples required from two to one #6 Add L3 TW to BUILD TO PRINT reference	06/04/2015