Implementation of Counterfeit Parts Control Plan for Advanced Electronic Components for Space

November, 2012
Introduction

In cases where the need for the latest “state-of-the-art” advanced component technology is required, space users may look to commercial offering when they are looking for the latest and greatest.

While this need for high performance, high density parts may solve one problem, it may spawn a secondary problem of obsolescence and counterfeit parts for future missions, as electronic component life cycles are shortened for current state of the art technology.

In order to assure mission success it is absolutely essential to implement a counterfeit parts control plan to reduce the risk and costs associated with re-working systems with bad parts, or a worst case scenario of catastrophic failure after launch.
Why Space Systems can be Vulnerable

• Using advanced components in Space systems may increase the vulnerability to counterfeit electronic parts, as the need for the latest and greatest parts may lead to usage of commercial offerings.

• Long program lifecycles make this an increasing problem, as a typical commercial part may be manufactured for a relatively short time period when compared to Space programs whose designs may last for decades.

• Low production demand by Space users makes it a difficult case for commercial manufacturers to continue production of less than state of the art.

• Even when obsolescence is planned for, long program life cycles may still require the purchase of obsolete parts. User may be required to go out to the independent market.
Why is the Risk Increasing?

- Growing availability of a wide variety of counterfeit parts and weaknesses in the supply chain have allowed these parts to enter the inventories and hardware of even the largest government contractors
- Shrinking high-reliability product life cycles and long lead times
- Obsolete high-reliability components command high market prices
- Buyers under increasing pressure to reduce costs
- The steady flow of recycled electronic components
- Counterfeiting methods have grown more sophisticated, which has made them more successful at breaking into the legitimate market
Implementing a Counterfeit Parts Control Plan

AS5553: Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition

“The Organization shall develop and implement a counterfeit parts control plan that documents its process used for risk mitigation, disposition, and reporting of counterfeit parts …”
1. Avoidance

- Avoidance begins with the choice of suppliers in the supply chain and the scrutiny applied to each supplier.
- Whether you buy parts directly from the manufacturer or an independent distributor, make sure your source is aware of counterfeit issues. Ask questions on certifications and industry involvement.
- Any company you deal with must have a Counterfeit Electronic Parts Control Plan detailing their implementation of SAE AS5553, the industry standard for Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition.
Know your suppliers...

... and the entire supply chain for your parts

- Maintain a register of approved suppliers.
- Knowing the people, policies, and practices of manufacturers is the best up-front way of knowing what you’re buying before parts even come through the door.
- All it takes is a single gap or unexpected supplier in the chain for counterfeit parts to get in.
- Documentation should be scrutinized for unrecognized sources in the supply chain and affected lots flagged for closer scrutiny.
Distribution of Counterfeit Parts

- Counterfeiters will push their products into distribution channels by any means necessary.
- Many route their parts through independent sellers who don’t check them prior to selling. However, some find ways to get their product into a normally trusted supply chain.
- Some counterfeiters monitor online searches: you may search for an obsolete part, find nothing, search again the next day, and get a hit. Once you place your order, the counterfeiter will make your fake parts for you.
- Many cases have been reported in which an unscrupulous business has bought an excess of genuine parts from manufacturers and authorized distributors, only to “return” counterfeits to get them into the legitimate supply chain.
- In extreme cases, counterfeiters have been known to fake entire retail locations or even factories.
2. Detection: What is a counterfeit?

**AS5553 Definition:**
“… A suspect part that is a copy or substitute … whose material performance, or characteristics are knowingly misrepresented by the supplier…”

**Examples include:**
- Recycled components sold as new parts
- Falsified certificates of compliance
- Commercial components re-marked as high-reliability components
- Lower speed grade or tolerance parts marked as higher speed grade or higher tolerance parts
- New components re-marked as obsolete components
- Re-marked components matching form but not function or reliability
- Reverse engineered copies
X-Ray image of 3 identically marked parts, whose contents do no match
“Blacktopped” marking with new part number and lot date code
Counterfeit Part Examples

Refinished leads from a used part
Leads chemically stripped and replated
Dendritic growth apparent where residual chemicals are attacking the new plating
Parts aren’t the only thing being counterfeited

Counterfeit Apple store complete with the “Genius Bar” and the signature blue Apple shirts. Looks real on the inside …
Parts aren’t the only thing being counterfeited

Counterfeit Apple store complete with the “Genius Bar” and the signature blue Apple shirts. Looks real on the inside ...
Too bad on the outside, the “Geniuses” didn’t know how to spell ‘Store’
Check Your Parts

- Visual examination by trained inspectors is essential
- Solvent tests may be used to detect re-marking and blacktopping
- Radiographic examination is vital
- Destructive Physical Analysis
- 100% electrical testing
- XRF to check plating materials and thicknesses
- Scanning Electron Microscopy (SEM)
- Scanning Acoustic Microscopy (SAM)
- Reference to detailed specification or a known-good part

Markings partially removed by a solvent test

Overall x-ray view of a dual in-line package integrated circuit. The structure of a lead frame can serve as a fingerprint for a certain package style.
3. Mitigation

The level of scrutiny depends on the level of risk

- **Low Risk:** Purchased from manufacturer, where pre-cap and final source inspection were performed.
- **High Risk:** HARD TO FIND OBSOLETE PARTS from an unfamiliar supplier.
  - Documentation must be thoroughly reviewed
  - Parts 100% visually inspected
  - DO every test necessary for you to have confidence that you’ve actually bought what you think you have bought

*The dice found in two of the packages with fake Analog Devices markings. The die on the left had a Motorola logo, and the die on the right was completely different and bore no logo at all.*
To Test or not to Test?

• Understanding your risk level is key. Is this for a non-critical application or for a mission critical application, such as life support?

• How confident are you that you are getting authentic material?

• Cost vs Benefit: The decision to test is about risk mitigation.
As counterfeiting increases, both suppliers and customers must be informed and vigilant. It is critical that parts dispositioned as counterfeit are reported and quarantined so that they do not re-enter the supply chain.

Lots conclusively identified as being counterfeit should be reported to organizations such as GIDEP, ERAI, and applicable Government investigative authorities.

A variety of industry organizations and trade associations are developing and continually improving policies and practices to prevent and detect counterfeit parts. Therefore, reporting of counterfeit activities is key.
Conclusion

Take a proactive approach to reducing your risk by implementing a counterfeit parts control plan.

As long as there is money to be made by people without ethics in the booming electronics industry, there will be counterfeiters, and unfortunately, they are only getting better at what they do.
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TSYS (NASDAQ)
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
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<tbody>
<tr>
<td>1976</td>
<td>TRW Components International (TRWCI) was formed by TRW, Inc., to serve the needs of the international space and military communities</td>
</tr>
<tr>
<td>1994</td>
<td>ISO Certification first received</td>
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<tr>
<td>1999</td>
<td>TRWCI merged with Cubic Memory to form Vertical Circuits, Inc. (VCI)</td>
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<tr>
<td>2007</td>
<td>The space and military arm of VCI became Trident Space &amp; Defense</td>
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<tr>
<td>2010</td>
<td>AS9100 Revision B certification received</td>
</tr>
<tr>
<td>2011</td>
<td>ISO 27001 certification received</td>
</tr>
<tr>
<td>2012</td>
<td>AS9100 Revision C certification received</td>
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*TRW heritage and structure has been maintained since 1976*
Established in 1987

HQ: Annapolis, Maryland, US

NASDAQ: TSYS

Market Segments: Government and Commercial

Employees: 1,600+

2011 Revenues: $425M
Why You Need TCS

• 35 years experience in parts engineering, quality assurance and procurement of EEE parts used in satellite, manned space, missile and aircraft / avionics applications
  ▪ Highly trained and experienced senior level component engineers who understand all EEE part types
  ▪ Competent quality inspectors who can discern subtle physical attributes
  ▪ Senior procurement professionals who know and understand the importance of proper sourcing and supply chain management
  ▪ Large database of Destructive Physical Analysis reports utilized for “known good unit” comparisons

• Parts engineers and quality assurance personal trained in counterfeit parts detection
  ▪ Participants in GIDEP
  ▪ Member ERAI
  ▪ IDEA trained
  ▪ AS9100:2009 certified
  ▪ SAE AS5553 compliant
  ▪ TCS internal processes and procedures
Summary of Capabilities

**Engineering Services**
- BOM review
- Design assistance
- Parts selection
- Parts engineering
- Radiation analysis / derating / test
- Supply of hardware and materials
- Construction analysis
- Qualification testing
- Part specification preparation
- Upscreen document preparation
- Device screening, LAT / QCI testing
- PEMs screening & qualification
- Upscreen testing
- Die procurement and test
- Obsolescence life cycle / management
- Obsolete part manufacturing
- Counterfeit part detection
- Applications support
- Failure analysis
- Cost and schedule estimates

**Export Compliance**
- 35 years experience with Departments of State and Commerce
- Thorough knowledge of regulations and policies
- Jurisdiction & requirements determined prior to contract

**Procurement / Quality Assurance**
- Manufacturer selection
- Order placement
- Follow-up / recovery planning
- Problem resolution
- GIDEP alert tracking
- ESCC Alert tracking
- Destructive Physical Analysis
- ITAR Registered

**Procurement / Quality Assurance**
- Prohibited Materials Analysis (XRF)
- Long lead procurement
- Status reporting
- Receiving and inspection
- Data review
- Kitting and shipment
- AS9100C / ISO9001:2008 certified
- ISO27001 certified

**Manufacturing Support**
- Materials and process review
- Customer source inspections
- Product assurance testing
- Unique device manufacturing
- Quality assurance
- Die banking
- Problem analysis and resolution
- Data review and analysis

**After Delivery Services**
- Long-term storage of data, samples & customer owned material
- Kitting to BOM
- Assembly, Integration & Test support
- Warranty
Experience

✓ 35 years of success in space

✓ Hundreds of years of cumulative experience

✓ Over 150 programs supported around the globe

✓ Complete range of capabilities to service any component management requirement

✓ An extension of your own capabilities when and where YOU need them

✓ All the disciplines required for complete parts management solutions via a single point of contact

✓ SPACE IS WHAT WE DO!