

Packaging and Handling Requirements Manual

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1. Currency Statement

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2. Review and Approval

This manual will be reviewed, approved, and reissued whenever significant updates have been made according to the Toshiba Global Commerce Solution (TGCS) Document Control Procedure.

Reviewers

Version	Reviewers
V8.0	Document Review Distribution List: <ul style="list-style-type: none"> • Donald Smith, TGCS Hardware Test Manager (Approver) • Roger Asbill, QE (Approver)

3. Document Distribution and Change Notification

When reissued with changes, the document owner will send a note to all appropriate TGCS personnel notifying them of the availability of a new version (e.g. VM or Lotus Note, Forum, Hard copy, Etc.).

4. Archival Requirements

This manual will be retained in **Agile**. Only the latest level of this manual will be retained in this manner.

5. Document Availability


This manual is available to all TGCS personnel via **Agile**.



6. Summary of Changes

Changes resulting in document revisions will be summarized in this table in reverse chronological sequence. Revision bars (|) will highlight the text changed in new manual versions.

Version	Approval Date	Change Description
8.0	07/14/2022	Revising label location in section 7.4.
7.0	09/22/2022	New packaging regulation in France.
6.0	12/16/2021	Update to section 2.3, 2.5, 4.1
5.0	03/23/2021	Adding pallet strapping requirements for shipment in truck trailers.
4.0	02/05/2020	Clarifying FRU requirements.
3.0	09/03/2020	Removing acceptance of metal banding.
2.0	03/02/2020	Brand letterhead update.
1.0	05/20/2019	Full specification refresh.
0.0	11/09/2017	Initial release of the document.

7. Glossary

Term	Definition
ASTM	American Society for Testing and Materials. aka ASTM International
Bill of Lading	The document issued for a carrier to identify quantity and description of the goods being shipped, the shipper, the consignee, and the points of loading and discharge.
Case Number	A TGCS unique alphanumeric identification that identifies a transport unit.
Country of Origin or CoO	The country of production, manufacture or growth of an article, part, subassembly, or product. It is the country where the article obtained its present identity as a part, subassembly or finished product. An article must be substantially transformed in a new country in order for the country of origin to change. An article's country of origin is the country in which the last substantial transformation occurred.
Customer Purchase Order Number	A purchase order number that has been provided by the purchaser at order entry time.
FFC	Fulfillment Center performing late stage customization and TGCS customer order fulfillment
FRU	Field Replaceable Unit. A FRU is a spare part that can be replaced in the field.
HSC	 Half Slotted Carton
IATA	International Air Transport Association
IPPC	International Plant Protection Convention
ISO	International Organization for Standardization
ISPM	International Standard for Phytosanitary Measures
ISTA	International Safe Transit Association
LTL	Less Than Truckload
MTM	Machine Type Model- Nomenclature used by TGCS to identify a serialized product finished goods. Machine Types are 4 numeric characters. Models are 3 alphanumeric characters.
MES	Miscellaneous Equipment Specification. A kit of parts used as spares, to add features to, or upgrade machines in the field.
NMFTA	National Motor Freight Traffic Association
MWPM	Manufactured Wood Packing Material. Materials which by virtue of the way they are made are not pathways for pest migration. Examples: Plywood, oriented strand board (OSB), paper overlaid veneer (POV), masonite, and particle board. Such materials are not regulated and are considered compliant with international regulations aimed at preventing pest migration.
NMWP	Non-Manufactured Wood Packing - Implies that the wood is raw lumber and the processing done to it has been limited to one or more of the following -- dimensional cutting, debarking, heat

Term	Definition
	treatments, chemical treatments, and kiln drying. SWPM used in export trade must meet ISPM 15 treatment and debarking requirements to prevent pest migration. Also known as SWPM.
Overpack	Packaging material that encloses more than one part, or a complete order or product. The contained products may be different or the same type.
Packing List	This document identifies the contents of a pallet or case. This may relate to a case of multiple, different items, or to a single machine, describing the details of its configuration.
RETT	Rolled End Tuck Top carton (aka "pizza box style") 
RPQ	Request for Price Quotation - a product or service that is potentially available, but not part of the standard product feature offering. Typical RPQs include hardware modifications, BIOS/firmware, packaging, labelling, etc.
RSC	Regular Slotted Carton 
SCAC code	Standard Carrier Alpha Code. A SCAC is a unique NMFTA identifier for a carrier.
SWPM	Solid Wood Packing Material. Implies that the wood is raw lumber and the processing done to it has been limited to one or more of the following -- dimensional cutting, debarking, heat treatments, chemical treatments, and kiln drying. SWPM used in export trade must meet ISPM 15 treatment and debarking requirements to prevent pest migration. Also known as NMWP
Tier 1	Vendor/supplier that provides final customization and shipment to our business partners or customers.
Tier 2	Manufacturer awarded the business of building our components and shipping to Tier 1.
Transport Package	A package intended for transportation and handling of one or more machines, articles, smaller packages or other bulk material.
Transport Unit	Either a unit load or transport package. Examples are a case and a pallet.
ULS	Unit Load Shipper
Unit Load	One or more transport packages or other items held together by means such as a pallet, strapping, stretch wrap, etc. making them suitable for transport, stacking and storage as a unit.

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1 Introduction

The Toshiba Global Commerce Solutions (TGCS) Packaging and Handling Requirements Manual (hereinafter referred to as the "Manual") defines the requirements for packaging products from shipment to or on behalf of TGCS.

1.1 Scope

This specification defines the minimum general requirements for the packaging of all parts, subassemblies, products, and materials that will be shipped to any worldwide TGCS manufacturing, distribution, fulfillment center, or customer.

Additional requirements may be required for certain products, parts, or commodities via engineering specifications or purchase orders.

All previous versions (e.g. GA21-9261-11b or 3AD00500000) are obsolete and should be discarded.

From this point forward in the manual, "Suppliers, Fulfillment Centers, and TGCS locations" will be referred to collectively as "shippers".

1.2 Shipper's Responsibility

It is the shipper's responsibility:

1. To ensure their packaging methods and materials comply with all applicable laws and regulations. This is especially important for materials classified as hazardous or dangerous, such as chemicals, batteries, or magnetized materials.
2. To ensure shipments are packaged in a manner such that the cartons and their contents arrive at their destination **free from damage**.
3. To adjust packaging methods and materials if performance indicates existing designs are not consistently arriving free from damage.
4. To ensure shipments are economically packaged in a manner which minimizes adverse effects on the environment and solid waste.
5. To ensure export shipments are packaged, labeled, and marked in compliance with TGCS guideline 3ADLBLGUIDE.
6. To ensure packaged products meet or surpass the minimum TGCS test requirements as defined by this specification. See 2.7 "Individual Shipment Pkg Testing" & 2.8 "Unitized Shipment Pkg Testing" on page 14 for details.
7. To comply with TGCS Standards (see Appendix A on page 38)
8. To comply with applicable industry standards and best practices (e.g ISO, ASTM, ISTA, IATA etc.)

1.3 Compliance

1. Adherence to the requirements of this manual is required with the goal to minimize shipping damage, streamline receiving processes, and reduce packaging costs.
2. When a special packaging specification is called out on a request for quotation or purchase order, that specification will take precedence over this document if the specifications are in conflict.
3. International shipments must conform to all unique export requirements.
4. Electronic components must be packaged and shipped in accordance with OEM manufacturer's specifications and generally accepted industry standards for that component type.
5. TGCS requires compliance with respect to the appearance and content of product package labels, packing lists, shipping labels and all bar codes used on these items for any entity performing work on TGCS's behalf.
6. For vendors and suppliers providing parts, products, or service to TGCS, this document must be included in the RFQ.
7. Compliance to the TGCS packaging requirements, safety guidelines, and legal regulations contained in this specification will be enforced as a condition of purchase per TGCS purchase contracts. At any time, TGCS reserves the right to:

- **Reject and return** any shipments received that are improperly packaged or identified.
- **Charge the shipper** for the cost of labor and materials for any repackaging resulting from noncompliance with this or any other specification referenced on the Purchase Order.

- **Remove from its list of approved supplier sources** any supplier that, after notice, repeatedly fails to comply with its packaging requirements.

Any shipper requiring deviation from requirements contained in this manual must receive written authorization from TGCS or the receiving location **prior to shipment**.

2 General Packaging Requirements

The general requirements listed in this section must be met for all shipments. Unless additional requirements are identified in this or other TGCS packaging specifications, all other packaging decisions are left to the shipper's discretion.

Note: Packaging costs must be included in all part quotations provided to TGCS Purchasing.

2.1 Consistency

Parts and customer orders must be packaged consistently, both in terms of the containers used and quantity of parts per container for a given part number or customer order. For example, a TGCS Tier 1 customer fulfillment supplier should not change overpack dimensions that would split a customer order.

For parts orders, if the total delivered quantity is not evenly divisible by pallet; the remaining parts shall be packaged, identified with quantity, and marked "partial". Suppliers and TGCS Procurement should work together to set order quantities consistent with carton, pallet layer, full pallet, or truckload quantities.

Shippers must get approval of TGCS Purchasing **prior** to initiating a change in the container size or quantity shipped per container.

2.2 Environmental Packaging

TGCS is very concerned about the effect packaging waste has on the environment. When choosing materials to package items to be purchased by TGCS, shippers must consider the environmental impact of discarded packing materials. TGCS's strategy for solid waste and overall environmental management can best be achieved by acting upon the focus items identified in Table 1 Environmental Packaging.

Description	Requirements
Ozone Depleting Substances (ODS's)	<ul style="list-style-type: none"> • Halogenated chlorofluorocarbons (CFCs) and hydrogenated chlorofluorocarbons (HCFCs) must not be used to manufacture materials used to package parts, products being shipped to or on behalf of TGCS or any subcomponents, subassemblies destined for TGCS product. • Halogenated flame-retardants are also not to be used unless required for a specific application. Steps shall be taken to minimize the use of Methyl Bromide (commonly used as a fumigant for solid wood packing materials) with alternative packaging materials where feasible. See TGCS specification 1-9700-000.
Banned Substances	<ul style="list-style-type: none"> • 1° Aromatic hydrocarbons of mineral oil (MOAH) comprising from 1 to 7 aromatic rings. • 2° Hydrocarbons saturated with mineral oil (MOSH) containing 16 to 35 carbon atoms. • Until December 31, 2024, the ban on the use of mineral oils applies when the mass concentration in the ink of mineral oil aromatic hydrocarbons (MOAH) is greater than 1%. • As of January 1, 2025, the ban on the use of mineral oils applies: <ul style="list-style-type: none"> • For mineral oil aromatic hydrocarbons (MOAH), when the mass concentration in the ink of these substances is greater than 0.1% or the mass concentration in the ink of compounds with 3 to 7 aromatic rings is greater than one part per million (ppm). • For hydrocarbons saturated with mineral oil (MOSH), when the mass concentration in the ink of these substances is greater than 0.1%.

Packaging Materials Essential Requirements – Restricted Heavy Metals and other Materials of Concern	<p>The sum concentration level of incidental amounts of lead, cadmium, mercury, hexavalent chromium and brominated flame retardants (PBB's and PBDE's) present in any packaging material, component or sub-component shall not exceed 100 parts per million (100 ppm) by weight (0.01%) of that material, component or sub-component. These limits apply globally for all packaging used for products brought to market by TGCS.</p>
Packaging Data Collection and Reporting	<p>TGCS has revised Engineering Specification 5897660 to reflect these updated requirements and to provide a mechanism for reporting packaging related data for non-restricted materials and certifications for compliance regarding restricted substances.</p>
Source Reduction	<p>TGCS encourages the source reduction (minimization) of packaging materials used to package and ship our products, parts, and supplies, provided safety and product protection are not compromised. See TGCS specification C-P 1-3600-005.</p>
Reusable Packaging Systems	<p>TGCS favors reusable package designs over expendable or recyclable ones provided total costs are equivalent or less. The design of a reusable container system is a joint effort between all parties to the reuse system.</p>
Recyclable Packaging	<ul style="list-style-type: none"> • Use paper-based packaging materials that are easily recycled like corrugated fiberboard, molded pulp, etc. • Minimize ink coverage and use water-based and soy-based inks or inks which are FDA/USDA approved, • Use tapes and starch glues that do not inhibit recycling (adhesive remains with the tape when removed). • Avoid coatings or impregnating of corrugated unless these are of a type which do not adversely affect recycling operations. • Design packages so that components can be easily separated prior to recycling: <ul style="list-style-type: none"> – Do not bond two or more dissimilar materials together (e.g. foam pads glued to corrugated) in any disposable packaging design. Exceptions may be made for some types of reusable packaging but this should still be minimized. – Do not use free-rise polyurethane based foam-in-place or foam-in-bag materials. – Do not use Polyvinyl Chloride (PVC) for any packaging application. – Do not use free flowing dunnage materials regardless of material composition (loose "peanuts" etc.) <p>Note: Depending upon the country of manufacture an appropriate recycling symbol may be used. Multiple symbols are permissible but not recommended. In all cases, these symbols shall appear on a minor surface, generally the bottom of the carton. See TGCS specification 5897661.</p>
Conserving Natural Resources	<p>In procuring paper and paper-based packaging, one of TGCS's objectives is the conservation of natural resources, including rain forests and so-called "old growth" forests. To help conserve these natural resources, it is TGCS's intent to only consider paper and paper-based packaging materials that are procured from forests that are managed in an ecologically sound and sustainable manner.</p> <p>Sustainable forestry is an evolving area, and considerable progress is being made in developing and implementing sustainable forestry practices. Buyers should understand TGCS's goal with regard to procuring from forests that are managed in an ecologically sound and sustainable manner.</p>

Table 1 Environmental Packaging

2.3 Environmental Packaging Selection Criteria

Table 2 shows a list of the preferred packaging materials. Table 3 shows a list of industry wide commonly used packaging materials. Each is evaluated on a variety of environmental criteria. Shippers are required to use materials which provide the best overall product protection and value but when all else is equal, choose the material that has the least possible adverse effect on the environment. Selection outside of preferred packaging materials will require prior approval by TGCS development engineering.

Material Description	OS	WA	SR	RP	WR	DC	Comments/Suggested Substitutes
1. Corrugated Honeycomb	G	Y	G	G	G	G	Highly recyclable, resilient
2. Molded Pulp	G	G	G	Y	G	G	Highly recyclable, nests during shipment
3. Air Pack Packaging	G	G	G	Y	G	G	Highly recyclable, ships flat
4. EPE: Polyethylene	Y	Y	Y	G	Y	Y	Capable of reuse but expensive to return
5. Recycled and Remolded HDPE	G	Y	G	G	G	G	Nests during shipment, relatively high price

Table 2 Preferred Packaging Material Selection Criteria

Material Description	OS	WA	SR	RP	WR	DC	Comments/Suggested Substitutes
Corrugated Fiberboard	G	G	G	Y	G	G	Good recycling and value, poor for reuse
Paperboard / Chipboard	G	G	G	Y	G	G	This is 100% recycled content material
Paper Dunnage / Wraps	G	G	G	Y	G	G	Preferred over bubble due to recycling
Molded Starch Peanuts in Bags	G	Y	G	Y	G	G	Preferred over foam-in-place polyurethane
Padded 100% Paper Bags	G	G	G	Y	G	G	Preferred over paper/bubble combinations
Suspension Style Packaging	G	G	G	Y	G	G	Can replace expanded foam cushions
EPU: Polyurethane Foam	Y	G	Y	G	Y	G	Good recycling market (US only)
Plywood Crates	Y	G	Y	G	Y	R	Good reusability, essential for some items
Wooden Pallets	Y	G	Y	G	Y	Y	Fumigation may be required (bad for env.)
EPS: Polystyrene Foam	Y	G	Y	Y	Y	Y	Very inexpensive but poor reusability
EPP: Polypropylene Foam	Y	Y	Y	G	Y	Y	Capable of reuse but expensive to return
Plastic Bubble Wrap	Y	G	G	G	R	R	Good performance but not recyclable
Stretch / Shrink Wrap, Bags	Y	Y	Y	R	Y	Y	No good substitutes for these
Pressure Sensitive Tape	Y	G	Y	R	Y	Y	Carriers prefer this over gummed tape
Corrugated Plastic	Y	Y	Y	G	R	R	Excellent durability reuse potential
Commingled Foam / Corrugate	R	G	G	Y	R	R	Not approved unless package is reused
Commingled Foam / Wood	R	G	Y	G	R	R	Not approved unless package is reused
ESD Static Shielding Bags	R	G	R	Y	R	R	Technically required for ESD items
Foam-in-place, Foam-in-bag	R	Y	R	R	R	R	Suggest molded starch as a substitute
Padded bags with plastic bubble core	R	G	Y	Y	R	R	Suggest 100% paper construction instead
PVC Plastics	B	B	B	B	B	B	Legal and customer concerns in some areas
Foams with CFCs, HCFCs	B	B	B	B	B	B	Prohibited by Montreal Protocol
All loose fill type materials (peanuts)	B	B	B	B	B	B	Banned due to nuisance factor (scattering)
Legend							

Overall Score (OS)	Green (G)=Preferred, no restrictions, Yellow (Y)=Acceptable, it may be a concern in some countries or to some customers, Red (R)=Restricted, use is approved only where technically required and no G or Y alternative exists. Black (B)=Unacceptable in all situations.
Worldwide Availability (WA)	Green (G)=Globally available, Yellow (Y)=available in some countries, Red (R)=very limited availability around the world
Source Reduction (SR)	Green (G)=Contains significant amount of recycled content (>20%), Yellow (Y)=some recycled content (<20%) is possible, Red (R)=includes no recycled content typically
Reuse Potential (RP)	Green (G)=capable of >5 reuses, Yellow (Y)=capable of 1-5 reuses, R=Incapable of reuse
Worldwide Recyclability (WR)	Green (G)=commonly recycled worldwide, Yellow (Y)=technically capable of being recycled but not done in most places. Red (R)=recycling channels severely limited or not available.
Disposition Cost (DC)	Green (G)=earns money when recycled/disposed, Yellow (Y)=breaks even when recycled/disposed, Red (R)=costs money to recycle or dispose.

Table 3 Packaging Material Environmental Selection Criteria

2.4 Shipping Environment Hazards

Consideration must be given to common hazards that are typically encountered in the distribution environment. The Table 4 details some of the most common hazards to be considered.

Term	Definition / Usage Notes
Shock	Intermittent forces caused by dropping the package to the floor, stacks tipping over, bumps in the road, or any number of other causes. Express carrier or small package delivery systems represent the most severe environment for shock.
Vibration	Continuous forces applied to the package whenever it is physically transported. Airplanes, trucks, and conveyors will always impart some level of vibration to the package. Vibration causes abrasion, which can be especially damaging to painted and/or textured external machine covers and can fatigue electrical connections.
Compression	<p>During shipping, handling, and storage packages will be subjected to dynamic and static compression due to stacking. Compression strength diminishes considerably in humid/moist environments and when the stacks are not aligned. Small packages (<70kg or 150 lbs.) must withstand dynamic compressive forces in all directions.</p> <p>Packages or containers must withstand dynamic stack heights of at least 2.5 m (or 100 inches) since this could be how high they will be stacked in trucks and other vehicles. Furthermore, packages or containers stored in a warehouse must be able to withstand static stack heights of 5.0 m (or 200 inches), measured from floor to top of stack, for a period of 30 days (including humid areas) without visible degradation to any package or its contents.</p> <p>Note: If for some reason the packaging cannot be stacked to these limits for safety (stability) reasons, then the maximum stack quantity shall be marked on the package using the ISO-780 symbol for stack height limitations. However, this approach should not be used as a method to circumvent appropriate package design which could otherwise be made to comply with the 5.0m (200 inch) static stack height standard.</p>
Temperature & Humidity	<p>Products may encounter temperature extremes ranging from -40°C (-40°F) to +60°C (+140°F) in the distribution environment. Humidity extremes such as 85% relative humidity (RH) may also be experienced. Packaging materials and methods must be effective at these extremes as well.</p> <p>Note: As an example, the performance of EPS foam does not vary greatly at these temperature extremes. Conversely, the performance of EPE and EPP foams can vary ±20% or more. Interestingly, EPE and EPP foam actually become stiffer as temperatures rise since the air in the cells expand.</p>
Contamination: Including “Clean room Quality Packaging”	Contamination is a concern in all packaging applications. It is very important to customers to receive a clean looking product even if contaminants would not necessarily damage the product functionally. Products should be sealed to prevent the intrusion of dust, dirt, or residue from manufacturing and shipping processes. This is even more critical when shipping to certain countries including China, India, and most parts of Asia and Africa. “Clean room quality” extends beyond particulate free packaging. Tight limits on organic contamination, nonvolatile residue, and out gassing apply. Where applicable, this usually means double bagging using materials procured from approved suppliers.

Table 4 Common Shipping Hazards

2.5 Moisture Sensitive Items

Electronic assemblies that require moisture protection (e.g. touch panels) should be packaged in a heat-sealed polybag with desiccant inside. Conversely, if bags are being used primarily for dust or surface protection only (not for moisture), then it is recommended not to seal the bags hermetically and not use desiccant. Bare sheet metal is best protected with volatile corrosion inhibitors (VCI's) instead of barrier materials but do not use VCI's to package electronic assemblies. As with temperature extremes, it is also important to consider the effect moisture may have on the performance of the packaging materials used. Moisture has little effect on closed cell foams (EPS, EPE, EPP) but can affect all paper-based materials. Of course, paper generally softens with increased moisture content reducing compression strength and altering, but not necessarily reducing, the cushioning performance of molded pulp. Table 5 outline several of the most common shipping environment hazards for moisture to be considered in the design of the complete packaging solution.

Types of Materials	Definition / Usage Notes
Barrier Materials	<p>Barrier materials used in moisture controlled packaging are:</p> <ul style="list-style-type: none"> Acceptable: Materials that are made to MIL B-131-F (Military Std). These are metal/polyethylene combinations with various types of outside layers (scrim fabric, polyester, Tyvek™, or Kraft paper). The Water Vapor Transmission Rates (WVTR's) for these materials is 0.02 grams of water/24hours/100in². Preferred: Materials that combine polyethylene with a sputtered metal layer. These minimize pinholes and can achieve WVTRs as low as 0.002 grams of water/24hours/100in². Materials achieving WVTRs this low should be used for long-term storage of highly valuable parts.
Desiccant Use and Handling	<p>Activated clay type desiccants are preferred. Desiccants are packaged in multiple units that define their moisture absorbing capacity not their volume. Use 1 unit of desiccant for every 562cm² (90 in²) of barrier surface area or 0.03m³ (0.83 ft³) of volume inside the barrier. This amount can be increased or decreased depending on the WVTR of the barrier and the intended storage time. TGCS generally uses desiccant in 2, 4, or 16 unit pouches depending on the size of the item.</p> <p>Desiccant must be carefully handled prior to use. It can become saturated in a matter of hours if left exposed, even in an air-conditioned room. It must therefore always be sealed inside airtight drums or sealed barrier bags prior to use. Humidity indicating cards should be used inside the storage containers as needed to monitor the fitness of the desiccant.</p> <p>Note: The indicating cards only indicate if the desiccant is still active. It is possible that the desiccant is 99% saturated but still active. Do not assume that a positive indication on the card (blue) means that the full capacity of the desiccant still exists. This can only be determined by weighing it on a precision calibrated gram scale.</p> <p>Activated clay type desiccant is reusable. It can be reactivated in an oven by baking it at 96C ± 5C for 6 hours. This will restore approximately 90% of its capacity. Do not exceed this temperature as it may melt the tyvek pouch material.</p>
Vapor Phase Corrosion Inhibitors (VpCI's)	<p>Bare sheet metal parts such as chassis, brackets, or other pre-plated steel parts must be wrapped in a volatile corrosion inhibiting (VpCI) bag or paper. This will prevent corrosion on the parts. Discuss with TGCS Packaging Engineer to determine quantity/size of VpCI paper to be used.</p> <p>IMPORTANT: VpCI's should not be used for electronic assemblies.</p>

Table 5 Shipping Environment Hazards, Moisture

2.6 Electrostatic Discharge (ESD)

ESD is one of the most common hazards for electronic components. It is critical to consistently handle these parts in a

static safe manner and use packaging materials that can protect against these hazards. All electronic parts will be treated as ESD Sensitive regardless of the part's actual level of ESD sensitivity. This will eliminate confusion when to apply proper protective techniques. The best method for packaging ESD sensitive parts is to use a static dissipative material closest to the ESD sensitive part. A conductive material is then used to surround the ESD sensitive item, outside of the dissipative layer, to provide an electrostatic shield (faraday cage). Note: Our approved ESD shielding bags combine the dissipative material on the inside with a conductive metal layer on the outside to achieve complete protection.

Thermoformed blister style packages alone do not provide this dual protection. Cushioning and outer packaging should also be static dissipative if there is potential for the ESD sensitive part to come into direct contact with it after unpacking from the bag. In general, plain Kraft corrugated board is not considered a major ESD threat when combined with the use of an approved shielding bag. However, all materials and containers used within an ESD controlled manufacturing environment must be static dissipative. All packaging materials used for ESD protection must be thoroughly tested and meet the requirements of recognized industry ESD standards and test methods. Unauthorized materials pose a direct quality hazard to ESD sensitive items. Use of only TGCS approved ESD materials is required. Suppliers are not allowed to use "buried metal" or "metal-in" style bags. All approved bags are of the "metal-out" style. Table 6 outlines the approved ESD packaging materials. Deviation from the approved ESD packaging materials requires TGCS approval prior to usage.

Package Type	Definition / Usage Notes
Static Shielding Bags	A multi-layer bag that consists of a static dissipative material next to the ESD sensitive item along with a thin outer metallic layer.
Static Dissipative Cartons	An ordinary Kraft corrugated container with static dissipative foam may be used to contain the ESD sensitive item provided the part is first placed in a static shielding bag. The foam is used for protection from shock and is not adequate for ESD protection. If a static shielding bag is not used, the outer box must be manufactured from an approved conductive corrugated board and have static dissipative cushioning.
Unit Card Boxes (UCB's)	These containers consist of an external conductive molded case with an interior static dissipative foam insert. These containers should only be used for parts that fit the available containers exactly.
Thermoformed Blister Style Packages	This style of packaging is acceptable if the material that contacts the part is manufactured from an approved static dissipative material and is inside a conductive outer container. For Field Service the individual outer carton will be required to provide physical strength; this too must be made from approved conductive material unless the part is placed in an approved ESD shielding bag.
Reusable Tote Style Boxes for Bulk Handling	Reusable tote boxes manufactured from conductive corrugated or plastic materials may be used for interplant, supplier, or intra plant shipments to manufacturing areas. Tote style boxes cannot be used for parts bound for TGCS Tier 1 fulfillment centers, business partners, field service, or field service distribution centers.

Table 6 Approved ESD Packaging Methods

2.7 Individual Shipment Package Testing

TGCS has adopted ISTA-6-FedEx-A as our standard for individual shipment testing. Table 7 below, lists the test criteria representing the industry standard test sequence to simulate transportation of a single unit shipment. The actual supply chain is to be understood before the below tests are performed. The purpose of this testing methodology is to match up the products anticipated supply chain environment with the test sequence that best represents that environment. ISTA Certification is not necessary but testing shall be conducted by an ISTA certified facility. Equipment calibration is critical for repeatability. Preferred sample size will be determined by the number of unique configurations. OEM/ODM and TGCS are to agree upon the configurations and test plan prior to the start of testing.

Product/Service	U.S. Shipments						International Shipments		
	Electronic, Powered, Medical Items			All Other Items			All Items		
	Regular	Flat	Elongated	Regular	Flat	Elongated	Regular	Flat	Elongated
Free-Fall Drop Test*	X	X	X	X	X	X	X	X	X
Concentrated Impact Test		X			X			X	
Bridge Impact Test			X			X			X
Compression Test	X	X	X	X	X	X	X	X	X
Rotary Vibration Test				X	X	X			
Random Vibration Test – U.S.**	X	X	X						
Random Vibration Test – International**							X	X	X
Second Free-Fall Drop Test*							X	X	X

Package Weight	Drop Height	Drops per Sequence
Equal to or less than 75 lbs.	30"	10
Greater than 75 lbs. but equal to or less than 100 lbs.	24"	10
Greater than 100 lbs. but equal to or less than 150 lbs.	18"	10

* Computer-aided data acquisition and analysis are available upon request.

** The random vibration system can test samples up to 200 lbs., and the rotary vibration table can test samples up to 1,250 lbs. Contact FedEx Packaging Services before sending test samples weighing more than 200 lbs.

Packaging Definitions

For testing purposes, we classify packaging into three categories. Use these simple definitions to determine if your packaging configuration is flat, elongated or regular.

Flat Package

We classify a package as flat if the shortest dimension is less than or equal to 8", the next shortest dimension is at least four times the length of the shortest dimension, and the volume of the total package is at least 800 cubic inches.

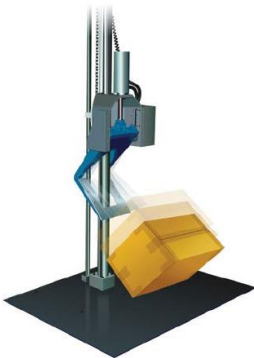
Elongated Package

We classify a package as elongated if the longest dimension is at least 36" and the other two dimensions measure 20 percent or less than the longest dimension.

Regular Package

We classify any package that is not defined as flat or elongated as a regular package.

Impact Tests
Free-Fall Drop Tester



Vibration Tests
Random Vibration Tester



Compression Test
Compression Tester



Table 7 ISTA-6-FedEx-A 2018 edition

2.8 Unitized Shipment Package Testing

TGCS has adopted ISTA-3E as our standard for unitized shipment testing. Table 8 lists the test criteria representing the industry standard test sequence to simulate transportation of a unitized shipment. The actual supply chain is to be understood before the below tests are performed. The purpose of this testing methodology is to match up the products anticipated supply chain environment with the test sequence that best represents that environment. ISTA Certification is not necessary but testing shall be conducted by an ISTA certified facility. Equipment calibration is critical for repeatability. Preferred sample size is one full unitized load. If that quantity of units is unavailable it is acceptable to TGCS to utilize a full bottom layer of product with the rest of the load filled as “dummy” boxes that represent the correct amount of weight the product would experience in normal transportation. OEM/ODM and TGCS are to agree upon the test plan prior to the start of testing.

Test Sequence				
The tests shall be performed on each test sample in the sequence indicated in the following table:				
Sequence #	Test Category	Test Type	Test Level	For ISTA Certification
1	Atmospheric Preconditioning	Temperature and Humidity	Ambient	Required
2	Atmospheric Conditioning	Controlled Temperature and Humidity	Temperature and humidity chosen from chart	Optional
3	Shock (Alternative methods allowed – select one test type)	Incline Impact (Conbur)	48 in per second (1.2 m per second)	Required
		Horizontal Impact	48 in per second (1.2 m per second)	
4	Shock	Rotational Edge Drop	Height varies with packaged-product weight	Required
5	Compression (Alternative methods allowed – select one test type)	Machine Apply and Release	Calculated Test Force x 1.4	Required
		Machine Apply and Hold	Calculated Test Force	
		Weight and Load Spreader	Calculated Test Load	
6	Vibration	Random	Overall G _{rms} level of 0.54	Required

Table 8 ISTA-3E 2017 edition

2.9 Product Fragility

TGCS adheres to corporate standard C-H 1-9711-004 for product fragility testing.

It is essential that fragility tests are performed to understand the failure point (test to failure) on each axis measured in g-force. If failure occurs before crossing the 70 g threshold, product is to be evaluated for mechanical strengthening. If no failure occurs after crossing the 80 g threshold, product is to be evaluated for mechanical cost reduction. This data is critical in understanding which package cushion material to select and keeping overall cost down.

For fragility vibration a test sample size of 3 units is recommended but not required. Vibration is to be conducted and recorded in 3 axes (X, Y, and Z).

For fragility shock each of the products 6 faces are to be tested and g-values recorded (Bottom, Top, Left, Right, Front, and Rear). The overall goal of fragility testing is to ship in the most economical method possible driven by sound data analysis.

3 Containers (Primary Packaging)

Table 9 summarizes the basic requirements for the use of containers. Exceptions may apply for specific situations.

Item	DO	DO NOT !
General	<ul style="list-style-type: none"> Do protect parts from: <ol style="list-style-type: none"> dust, dirt, and abrasion all reasonable hazards during shipping, handling, and storage, such as shock, vibration, compression, moisture and ESD. Do provide packaging that permits safe handling, shipping, and storage. 	<ul style="list-style-type: none"> Do NOT use crates, wire bound boxes or expendable wooden containers, unless corrugated containers will not provide adequate protection Do NOT pack different order numbers in the same package.
Containers	<ul style="list-style-type: none"> Do use TGCS recommended modular boxes. Do use boxes of sufficient strength to permit stacking during shipment and storage. Do use nonstandard containers when part size, fragility, and so on dictates. Smaller is better. 	<ul style="list-style-type: none"> Do NOT use boxes less than 190 mm x 150 mm x 25 mm (7.5" x 6" x 1") in size for primary packaging. Do NOT use container's flaps to extend the height of the container.

Closure	<ul style="list-style-type: none"> Do use pressure sensitive film tapes (polyester or polypropylene) or reinforced water activated gummed tape for corrugated containers. Do use tape that is a minimum of 50 mm (2") wide. Do use tape or heat-sealing to close poly bags. Do use strapping/banding for half-slotted, telescoping or double cover (cap & tube) containers. Do use the "H" style taping method to reinforce the flaps of heavy containers, see Figure 1 <i>Carton Taping Methods</i> on page 21. 	<ul style="list-style-type: none"> Do NOT use staples as part of the package closure; that is, where the customer must open the package to gain access to the contents. This includes all packages including bags, envelopes, or cartons. Stitched manufacturer's joints are not preferred but they are acceptable since this is not where the container is opened. This is primarily a safety concern, not an environmental concern.
Markings	<ul style="list-style-type: none"> Do use "heavy" symbols on containers exceeding 12 kg (26 lbs). See section 7 <i>Requirements for Heavy Packages</i>. Old labels and markings on used packing material must be removed or permanently and indelibly covered up if they do not apply to the current shipment. Do use essential safety warnings or symbols where applicable. Example: the graphic "Top Heavy" symbol. 	<ul style="list-style-type: none"> Do NOT attempt to use labels as a means to get away with a less than adequate package design. Example: "Do not TOP LOAD". When these types of labels are used it is an indication that more work is needed to improve the package. Such labels are no guarantee that the instruction provided by the label will be observed and followed by carriers. Do NOT routinely put TGCS logo on cartons unless part of a specific marketing design.
Dunnage	<ul style="list-style-type: none"> Do use corrugated inserts and dividers. Do select the right size container/carton for the parts to minimize the use of dunnage material. Do minimize internal part vibration, especially on painted and/or textured surfaces by reducing internal void space. 	<ul style="list-style-type: none"> Do NOT use or specify others to use any form of "free flow or loose fill" dunnage material (aka "peanuts", "popcorn", or similar) regardless of material type. Do NOT use newspaper as dunnage material. Do NOT stuff wrong sized cartons with excess dunnage, use a smaller carton instead.

Table 9 Primary Packaging Do's and Don'ts

3.1 Selection of Bulk versus Individual Style Packaging

Inbound parts to support TGCS or supplier manufacturing applications are typically packaged in bulk (multiple parts per package). Parts that are destined for Tier 1 customer fulfillment operations are usually packaged individually but may be packaged in bulk from suppliers and individually packaged during fulfillment in order to reduce transit costs. Bulk/Single unit packaging design should be based on which is most cost effective considering the total supply chain. The default method is individual packaging unless otherwise instructed and approved by TGCS. Spare parts shipped to the field for servicing TGCS equipment are called "field replacement units" (FRUs) and should conform to additional requirements contained in section 6, FRU Packaging Requirements. FRUs are typically packaged as single units in packaging suitable for multiple shipments via express carriers.

3.2 Modular Cartons

TGCS can assist suppliers with dimensioning unit load shippers, sleeves, and cartons to ensure shipping efficiency and compatibility with the TGCS supply chain. Some common RSC, HSC, Sleeves, and Trays follow in Table 10. Dimensions are approximate inside, see drawings for detail.

P/N	Type	L mm	W mm	H mm	L in	W in	H in
83Y1172	HSC	785.0	585.0	430.0	30.9	23.0	16.9
83Y1173	HSC	785.0	585.0	530.0	30.9	23.0	20.9
83Y1174	HSC	785.0	585.0	630.0	30.9	23.0	24.8
83Y1175	HSC	578.0	585.0	770.0	22.8	23.0	30.3
80Y2975	RSC	498.0	364.0	521.0	19.6	14.3	20.5
80Y2983	RSC	562.0	452.4	396.8	22.1	17.8	15.6
80Y2988	RSC	457.2	279.4	265.2	18.0	11.0	10.4
80Y2989	RSC	279.4	223.8	150.9	11.0	8.8	5.9
80Y3010	RSC	798.0	698.0	523.0	31.4	27.5	20.6
80Y3012	RSC	618.0	518.0	540.0	24.3	20.4	21.3
80Y3020	RSC	468.0	233.0	420.0	18.4	9.2	16.5
80Y3021	RSC	493.0	394.0	413.0	19.4	15.5	16.3
80Y3033	RSC	630.0	523.0	675.0	1.0	20.6	26.6
3AA00801800	Sleeve	584.2	476.3	502.9	23.0	18.8	19.8
3AA01016900	Sleeve	584.2	476.3	381.0	23.0	18.8	15.0
80Y2728	Sleeve	582.7	479.4	187.3	22.9	18.9	7.4
80Y2974	Sleeve	583.0	480.0	238.0	22.9	18.9	9.4
80Y2975	Sleeve	997.0	597.0	324.0	39.3	23.5	12.8
80Y2978	Sleeve	975.0	597.0	404.0	38.4	23.5	15.9
80Y2979	Sleeve	972.0	597.0	876.0	38.5	23.5	34.5
80Y2980	Sleeve	762.0	659.0	508.0	30.0	27.4	20.0
80Y2981	Sleeve	762.0	659.0	864.0	30.0	27.4	34.0
80Y2982	Sleeve	762.0	659.0	664.0	30.0	27.4	26.1
80Y2997	Sleeve	584.2	476.3	304.8	23.0	18.8	12.0
80Y2998	Sleeve	965.2	590.6	596.9	38.0	23.3	23.5
80Y3002	Sleeve	965.0	591.0	546.0	38.0	23.3	21.5
80Y3001	Sleeve	813.0	711.0	864.0	32.0	28.0	34.0
80Y3025	Sleeve	813.0	711.0	600.0	32.0	28.0	24.0
42T9475	Tray	767.0	714.0	127.0	30.2	28.1	5.0
80Y2969	Tray	600.0	489.0	102.0	23.6	19.3	4.0
80Y2970	Tray	934.0	619.0	127.0	39.1	24.4	5.0
80Y3000	Tray	813.0	711.0	125.0	32.0	28.0	5.0
80Y3004	RETT	217.0	140.0	48.0	8.6	5.5	1.9
83Y1181	RETT & Cushion	209.6	146.1	38.1	8.3	6.0	1.5

Table 10 Common TGCS Packaging

3.3 Edge Crush Test (ECT) vs. Mullen Equivalents

Either method of specifying corrugated material can be used for packages of equal size and gross weight according to their respective rules. However, they may not perform exactly the same in practice because the materials are made

differently. See Table 11 Edge Crush Test (ECT) vs. Mullen Test
Equivalency Chart for equivalency values. Compression strength is more important to TGCS than burst strength.
Therefore, all corrugate will be specified by its ECT.

The following table defines rule equivalents not necessarily performance equivalents.

Single Wall			Double Wall		
ECT (lb./inch)	ECT (kN/m)	Mullen (lb./in²)	ECT (lb./inch)	ECT (kN/m)	Mullen (lb./in²)
32	5.60	200			
40	7.00	250			
44	7.71	275	48	8.41	275
55	9.63	350	51	8.93	350
			61	10.68	400
			71	12.43	500
			82	14.36	600

Table 11 Edge Crush Test (ECT) vs. Mullen Test Equivalency Chart

3.4 Minimum Corrugated Board Strength

The following table provides minimum board strength for cartons of various sizes and weight ranges. Exceptions to these requirements are approved only if tests are conducted which verify that the package design provides equivalent compression strength.

Container Style	Sum of container Length + Width + Depth			
	0 - 762 mm 0 - 30"	763 - 1270 30.1 - 50	1271 - 2286 50.1 - 90	Over 2286 Over 90
Regular Slotted Container (RSC)	44 ECT 1896 kPa 275 psi, SW	48 ECT 1896 kPa 275 psi, DW	51 ECT 2413 kPa 350 psi, DW	51 ECT 2413 kPa 350 psi, DW
Half Slotted Container (HSC)	44 ECT 1896 kPa 275 psi, SW	48 ECT 1896 kPa 275 psi, DW	51 ECT 2413 kPa 350 psi, DW	N/R
Half Slotted Container (Palletized)	N/R	N/R	71 ECT 3447 kPa 500 psi, DW	Triple wall
Full Telescoping Style (FTHSC)	44 ECT 1896 kPa 275 psi, SW	44 ECT 1896 kPa 275 psi, SW	55 ECT 2413 kPa 350 psi, SW	51 ECT 2413 kPa 350 psi, DW
Tube and Cap Style	N/R	N/R	71 ECT 3447 kPa 500 psi, DW	Triple wall
Roll-end Tuck Top Mailers	44 ECT 1896 kPa 275 psi, SW	55 ECT 2413 kPa 350 psi, SW	55 ECT 2413 kPa 350 psi, SW	N/R
All Other Styles	44 ECT 1896 kPa 275 psi, SW	48 ECT 1896 kPa 275 psi, DW	51 ECT 2413 kPa 350 psi, DW	51 ECT 2413 kPa 350 psi, DW
Notes: N/R = Package style Not Recommended for this size container. ECT = Edge Crush Test SW = Single wall DW = Double wall				

Table 12 Minimum Board Strength for Corrugated Containers

3.5 Getting the most out of the Corrugated Cartons and Inserts

The following guidelines are provided for getting the greatest economic benefit from the cardboard cartons and inserts are listed below.

1. The flute direction in the outer carton should always run vertically.
2. If used, specify that corrugated inserts are to be 1.5 - 3.0mm (0.06 - 0.12") **taller** than the specified inside depth (height) of the carton. This ensures that the divider contributes to overall carton strength.
3. Double wall materials with lower board strength will usually provide more compression strength than single wall materials with higher burst values. Double wall also offers the best overall value relative to its enhanced performance.
4. When using corrugated sleeves inside cartons align the flutes **horizontally** for the sleeve. The corners will add strength vertically and the horizontal flutes will add strength laterally. This improves overall compression strength. Cartons will be oriented in any direction during most phases of the distribution network.

3.6 Carton Closure Methods

Lightweight or palletized RSCs (regular slotted cartons) may be taped as shown on the left in Figure 1 below. Unpalletized heavier RSCs (those exceeding 10 kg or 22 lbs.) must be taped using the “H” method shown below on the right. Use approved Toshiba Logo tape for all carton closure applications.

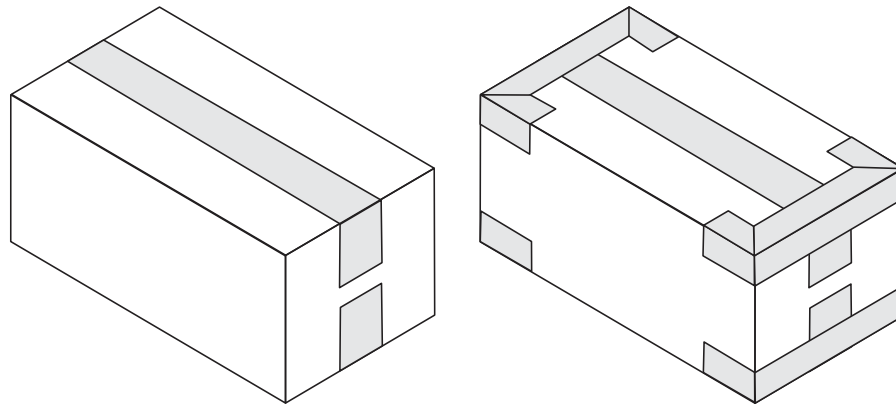


Figure 1 Carton Taping Methods

Single cover boxes, double cover boxes, and HSC (half slotted cartons) should be **banded** as shown in Figure 2 below. Tape should be used only to seal an HSC. Edge protectors may be omitted when banding automatically and banding is **not** attaching the carton to a pallet.

Note these designs are not suitable for parcel delivery services, use an RSC instead.

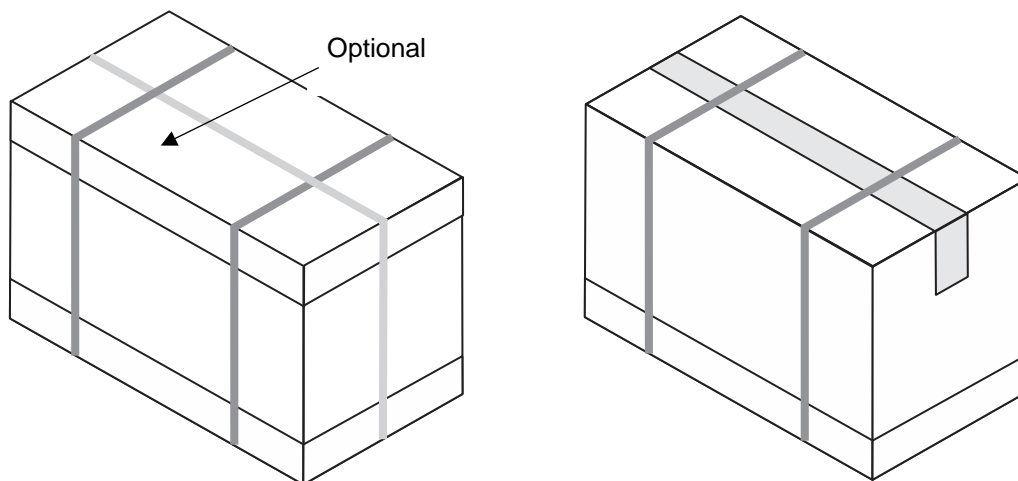


Figure 2 Carton Banding Methods

4 Transport Packaging

Table 11 below summarizes the basic requirements for palletization, unitization and securement. Exceptions or waivers to these basic may be allowed for certain situations after discussion with and approval from the responsible TGCS Engineer.

Item	DO	DO NOT !
Pallets	<ul style="list-style-type: none"> • Incoming freight shipping to TGCS fulfillment centers should use the TGCS standard pallets whenever possible – US/Europe/Asia – Use 32R0158 48"x40" or similar • On custom sized machine pallets, provide a minimum 711 x 95 mm (28 x 3.75") minimum inside dimension for pallet jack access on two opposite sides. • If pallet is SWPM, use only those properly heat-treated and certified per ISPM 15. • Use a center block or stringer if the span between blocks or stringers would otherwise exceed 500mm (20"). 	<ul style="list-style-type: none"> • Do NOT use pallets that have bark visible on the wood. • Do NOT use pallets that have evidence of insect damage on them (such as grub holes). • Do NOT use broken wood pallets. • Do NOT accept substandard pallets from your suppliers (TGCS and suppliers). • Do NOT use pallets without bottom deck boards (skids) for shipping. • Do NOT use alternate pallet materials (paper, plastic, metal) without prior TGCS approval.
Packaging	<ul style="list-style-type: none"> • Use unit load shippers (over packs) for small cartons. • Cut down unit load shippers if headspace is greater than 76 mm (3.0"). This reduces dimensional weight, prevents collapsing of the lid, and prevents pooling of water on top. • Fill only lateral voids in unit load shippers. • Use setup empty cartons marked "filler box" to fill lateral voids to stabilize partial loads. • Use unit load shippers or vertical corner boards if the pallet consists of 5 or more layers of cartons. • Use top caps sized for the load when palletizing smaller cartons. 	<ul style="list-style-type: none"> • Do NOT use top caps on top of cartons if the cap is too big or too small (use a top pad instead). • Do NOT stack cartons into unit load shippers higher than the top surface of the ULS. • Do NOT use free-flow dunnage materials to fill voids in over packs. • Do NOT fill voids on top of cartons in a unit load shipper (cut the ULS down instead). • Do NOT extend unit load shipper height by adding a second tube on top of the first. • Do NOT allow containers to overhang pallet.

Palletization, Unitization	<ul style="list-style-type: none"> • Build only cubic, stackable loads (no hay stacking). • Occupy at least 80% of the pallet surface. • Staple bottom caps to pallet to reduce movement. • Use plastic film between wet pallets and cartons. • Fill vertical voids between stacked cartons so that the load occupies the entire surface. • Palletize shipments consisting of a single package weighing in excess of 32 kg (70 lbs.). Pallet size should match package size (minimum 80% coverage). While not required by most carriers, packages less than 32kg may be palletized for fulfillment and customer convenience • Palletize multiple purchase orders of one part number on a pallet. 	<ul style="list-style-type: none"> • Do NOT mix production and non-production material. • Do NOT haystack or pyramid stack cartons on pallets. • Do NOT exceed 4 layers when stacking cartons if unit load shippers are not being used. • Do NOT bulk fill ULS's with unpackaged small parts. • Do NOT pack multiple case numbers inside a unit load shipper. • Do NOT palletize a single shipment consisting of a single carton weighing less than 32 kg (70 lbs) shipping by express carriers.
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Item	DO	DO NOT !
Banding, Strapping	<ul style="list-style-type: none"> • Use at least two bands. (see Figure 2) • Use polyester banding—13mm (.50") wide and 0.5mm (.020") thick for general use, with crimp or heat seal banding closures with the padlock symbol • Use the banding notches (not the fork notch) for cross bands on stringer style pallets. • Use full-length horizontal pressed fiber angle boards where the same piece extends under both bands. Some exceptions may apply with for automated banding applications. • For inter-continental and air shipments of palletized loads of multiple cartons, 4-way banding is an approved alternative to 2-way banding with mechanically applied stretch wrap. • For large machines, stretch wrap or banding may be eliminated if the machine is bolted to the pallet and the banding or wrap is not needed to maintain package integrity. • Use ratchet strapping and/or load locks when shipping in a truck trailer to secure loads. 	<ul style="list-style-type: none"> • Do NOT use small plastic clips (load spreaders) as edge protectors unless the band is threaded through the clip to keep it from falling off. • Do NOT use polypropylene or nylon banding for pallet securement. • Do NOT use metal banding. • Do NOT use buckle style hand applied banding fasteners. Do NOT staple or nail through the bands. Staples may be used to "frame" bands used for permanent reinforcement of crates. However, the staple itself should not puncture the bands. Whenever such bands are used, also mark these containers with a graphical symbol that indicates "Do not cut this band". • Do NOT filament tape, rope, twine, and all other plastic banding materials

Stretch Wrap	<ul style="list-style-type: none"> • Use mechanically applied stretch wrap. Stretch wrap alone when properly applied is sufficient for intra-continental full truckload surface shipments only. 2-way banding alone is approved for less than truckload (LTL) shipments. • Use 80 gauge (min) film with a properly adjusted machine that pre-stretches the film • Use 5 mm (.180") fiberboard 50 mm x 50 mm (2" x 2") vertical corner posts to keep cartons aligned under the film. • Tie the stretch wrap to the pallet directly • Spiral-wrap the cartons with a minimum 50% overlap. Wrap should overlap 75mm (3") over the top of the pallet base and at the top of the stack. Cover all corners. Wrapping over the areas for fork access is allowed. • For inter-continental and all air shipments use 2-way banding in combination with mechanically applied stretch wrap. • Use a top cap outside of the vertical corner boards (under stretch wrap) if needed to stabilize the load. • Band first, then wrap. 	<ul style="list-style-type: none"> • Do NOT use hand applied stretch wrap • Do NOT use pass-thru style stretch wrapping unless supplemented with banding or spiral wraps. • Do NOT use black opaque stretch wrap for security purposes (use corrugated over packs instead). • Note: Do not confuse Shrink Wrap with Stretch Wrap. Shrink wrap is applied with heat to form a tight load. Stretch wrap is applied from a roll and is pre-stretched by the applicator.
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Item	DO	DO NOT !
Edge Protectors	<ul style="list-style-type: none"> • Use full length pressed fiber type where the same piece extends under both bands. They are effective for use under bands (horizontally), for aligning the corners of stacked boxes on pallets (vertically), and for fortifying the stacking strength of cartons. Some exceptions may apply for automated banding applications. • Use vertical edge protectors if the pallet consists of 5 or more layers of cartons • Use plastic banding clips that require the banding to be threaded through the clip to keep it intact are acceptable. 	<ul style="list-style-type: none"> • Do NOT use metal edge protectors. These are subject to being bent and may present a safety hazard (sharp edges). • Do NOT use other plastic banding clips. These are less desirable since they are more prone to becoming dislodged and lost. • Do NOT use scrap pieces of corrugated fiberboard.

Table 12 Palletization, Unitization, and Securement

Note: As a reminder, see section 1.2 for the shipper's responsibility.

4.1 TGCS Pallet Size and Style Requirements

TGCS P/N	Dimensions mm (in.)	Style	Composition	Description
7386801 ⁽¹⁾	711x813x114 (28x32x4.5)	Stringer	HT & DB HW or SW	Custom size "POS" pallet, 2-way entry
32R0158⁽¹⁾	1219x1016x114 (48x40x4.5)	Stringer	HT & DB HW or SW	GMA Pallet, full size, partial 4-way entry. Required for many North America business partners. Highly recommended for supplier re-use.
6038887 ⁽¹⁾	1016x1219x114 (40x48x4.5)	Stringer	HT & DB HW or SW	Full size, partial 4-way entry
6038888 ⁽¹⁾	1016x610x121 (40x24x4.8)	Stringer	HT & DB HW or SW	Half size, partial 4-way entry
7344270 ⁽¹⁾	508x610x127 (20x24x5.0)	Stringer	HT & DB HW or SW	Quarter-size, 2-way entry
25P1096 ⁽²⁾	1016x1219x113 (40x48x4.4)	Block	Plywood	Full perimeter, full 4-way entry, overlapping block perimeter
32R0163 ⁽¹⁾	600x800x147 (23.6x31.5x5.8)	Block	HT & DB HW or SW	Half euro size, 6 or 8 block style, full perimeter base, 4-way entry
22R0055 ⁽¹⁾	1000x1200x147 (39.4x47.3x5.8)	Block	HT & DB HW or SW	Full size, 9 block, 4-way entry, full perimeter base
3AA01284700 ⁽¹⁾	1000x1200x147 (39.4x47.3x5.8)	Block	HT & DB HW or SW	Full size, 9 block, 4-way entry, unidirectional base
3AA00782700 ⁽¹⁾	800x1200x128 (31.5x47.3x5.0)	Block	HT & DB HW or SW	Full size, 9 block, 4-way entry, unidirectional base
41E1631 ⁽²⁾	711x813x114 (28x32x4.5)	Block	Plywood	Custom size "POS" pallet, full perimeter, 6 block, full 4-way entry, overlapping block perimeter
46D2148 ⁽²⁾	1308x648x114 (51.5x25.5x4.5)	Block	Plywood	Half-size Full perimeter, 6 block, full 4-way entry, overlapping block perimeter
46D2149 ⁽²⁾	648x648x114 (25.5x25.5x4.5)	Block	Plywood	Quarter-size, full perimeter, 6 block, full 4-way entry, overlapping block perimeter
46D2212 ⁽²⁾	1016x1219x110 (40x48x4.3)	Block	Plywood	Full size, full perimeter, 9 block, full 4-way entry, overlapping block perimeter
46D2422 ⁽²⁾	1290x1090x114 (50.8x42.9x4.5)	Block	Plywood	Full size, full perimeter, 9 block, full 4-way entry, overlapping block perimeter
46D2147 ⁽²⁾	1130x625x114 (44.5x24.6x4.5)	Block	Plywood	Half size, full perimeter, 6 block, full 4-way entry, overlapping block perimeter

Table 13 Acceptable Pallet Sizes and Styles for General Use

Notes: (1) Indicates that this pallet contains Solid Wood Packing Material (SWPM) and must be properly heat-treated.

(2) Indicates that this pallet must **not** contain SWPM and therefore is not susceptible to pest infestation.

HT = Heat-Treated: Achieved a core temperature of 56C (133F) for a minimum of 30 minutes per ISPM 15 2016-06 or later.

DB = Debarked: SWPM must be made from debarked wood compliant to ISPM 15 2016-06 or later.

SW = Softwood: Constructed from timbers from coniferous or needle bearing species of trees (pine, cedar, spruce, fir, etc.).

HW = Hardwood: Constructed from timbers from non-coniferous or leaf bearing species trees (oak, maple, poplar, alder, etc.).

Unidirectional Base: Has runners (bottom deck boards) in one direction only and the base is open to the floor on two sides.

Full Perimeter Base: Has bottom deck boards in both directions touching the ground.

Stringer Style: Constructed from beams ("stringers"), typically 2 for half size or 3 for full size to which deck boards are attached.

Block Style: Constructed from blocks to which deck boards are attached. Typically 6 blocks for half size or 9 blocks for full size.

2-way entry: Forklift and pallet jack access on 2 opposite sides only (stringer style without fork notches in the stringers).

Partial 4-way entry: Fork lift access on 4 sides but pallet jack access on only 2 opposite sides (stringer style with fork notches).

Full 4-way entry: Full forklift and pallet jack access on all four sides, possible only with block style pallets.

Plywood: A composite pallet constructed from processed wood plies and resins. Blocks are typically constructed of plywood or particle board. These pallets are not susceptible to pest infestation.

4.1.1 Pallet Terminology

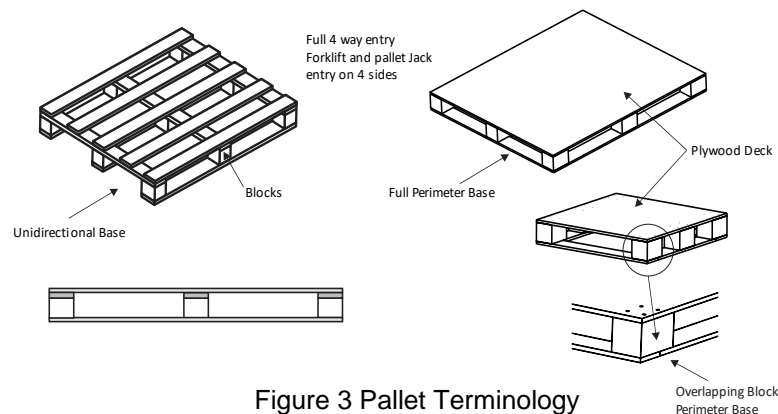
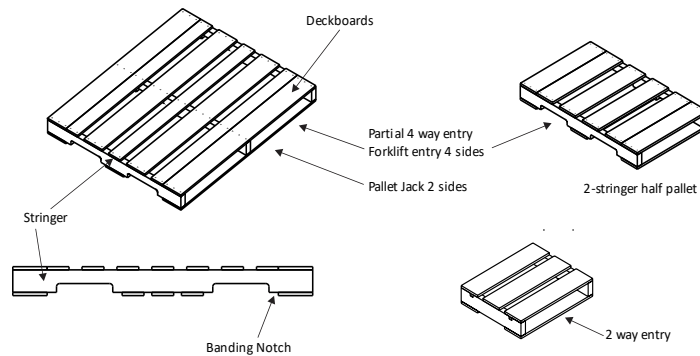


Figure 3 Pallet Terminology

4.2 Unit Load Shippers (ULS)

Pallet loads should be over packed when loads are heavy, consist of many layers, are transported inter-continental, or prior performance of packaging or palletization methods has not been viewed as successful.

Note: For air shipments, savings of roughly \$5 US per cm (\$12 US per inch) can be achieved by cutting down full size (1000x1200mm) unit load shippers to reduce voids.

4.3 Considerations for Transportation Efficiency

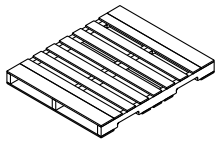
To ensure the lowest possible shipping cost and minimum delivery time, it's important to prepare loads that optimize and physically fit the transportation vehicles that will be used (e.g. airplanes, intermodal containers, trucks, etc.). This optimization is important on all shipments, but most critical on international and intercontinental shipments. When multiple modes of transportation are used and where dimensions cannot be optimized for all modes, it is advisable to optimize on the most expensive portion of the journey. In most cases, this would be an air portion that can cost 7-10 times more on a per unit basis than ocean or surface shipment

Some useful air and intermodal references for transportation and logistical information include:

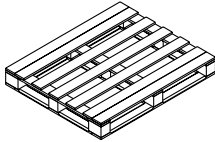
International Air Transport Association (IATA) Unit Load Device (ULD) Technical Manual. ISO 668 - Series 1 freight containers — Classification, dimensions and ratings. ISO 668:2013(E) or later.

4.4 Pallet Construction

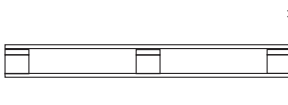
Good 
Use these



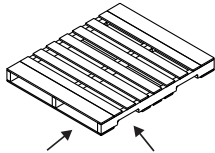
Size: US 40x48
Size: Europe 1200x800
or 1200x1000
Other sizes which allows product to
fill pallet footprint with prior
approval



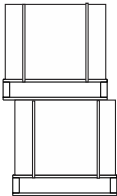
Pallet deck and boards adequate
to support load w/o deformation



$\geq 85\text{mm}$
Fork entry at least 85mm
Fork entry unobstructed



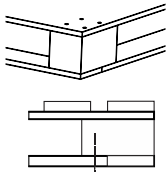
Four way entry for forklifts
(block style), 2 way entry for
pallet jacks
Partial 4-way for stringer style,
except quarter size



Pallets with bottom
deckboards which allow
stacking without deforming
the underlying load

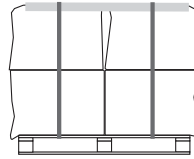


Proper construction of all
load bearing members
(stringers, runners, blocks,
etc.

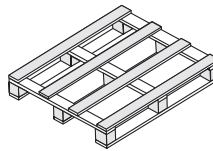


Overlapping blocks on
bottom butted boards to
avoid toe nailing

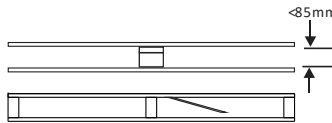
Poor 
Avoid these



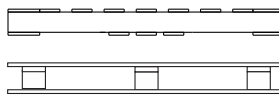
Unit loads that exceed the pallet
footprint



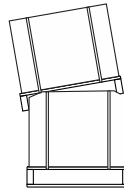
Pallet board which does not
support the load weight



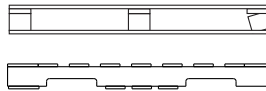
$< 85\text{mm}$
Insufficient clearance
Obstructed entry



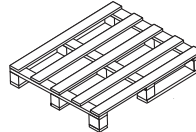
Stringer style missing fork
notches (except quarter size)
Wing style pallets



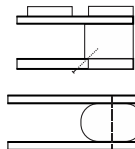
Pallets that stack in an unsafe
manner or deform the
underlying load



Improper, damaged, missing,
or dangerous attachment of
load bearing members



Inadequate overlap of
bottom butted boards and
blocks

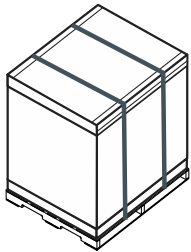


Constructions which do not
survive the typical handling
environment (e.g. plastic
doughnuts)

Figure 4 Pallet Construction

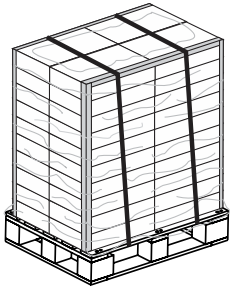
4.5 Unitization Techniques

Good 
Use these

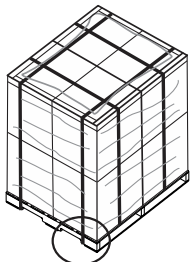


Multiple sized containers consolidated in Unit Load Shippers

Steel banding for heavy loads (over 800 lbs.) or polyester/nylon strapping for loads less than 800 lbs, with proper use of corner boards



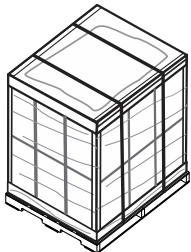
Use of fiber vertical edge protectors or corner boards when stack exceeds 5 cartons



4-way strapping/banding that correctly using the strapping notch on stringer style pallets

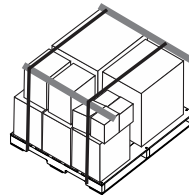


Proper use of the strapping notch

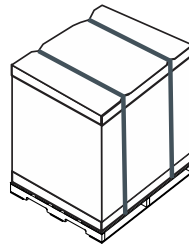


Best-of-Breed technique:
--2-way or 4-way strapping
-Top and bottom caps
- Vertical corner boards under caps
- Horizontal corner boards under bands
Use of machine applied tensioned stretch wrap OVER bands
-Enhanced roping method to secure wrap

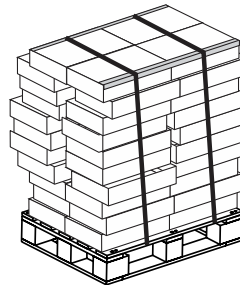
Poor 
Avoid these



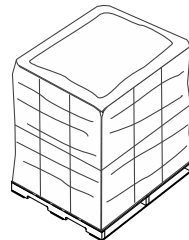
Unit loads made from multiple sized containers



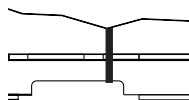
No strapping or strapping pulled through containers



Stacks greater than 5 cartons w/o vertical corner boards allows load shifting and carton corner damage



Loads unitized with stretch wrap with are not properly secured to the shipping pallet, allowing load shift. Common with hand applied or improperly tensioned stretch wrap.



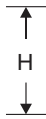
Stretch wrap which deforms the load

Improper use of the strapping notch on stringer style pallets, leading to loose strapping

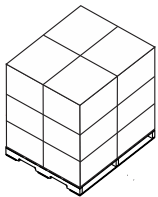
Figure 5 Pallet Utilization

4.6 Palletization

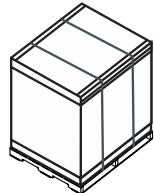
Good 
Use these



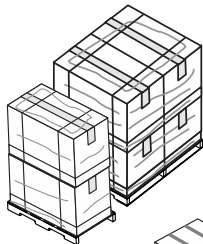
Unit load heights that are cost optimized considering all transportation modes used



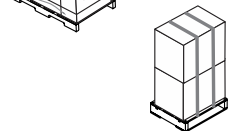
Unit loads made from modular or similar sized product containers that fill the pallet footprint



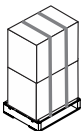
Loads that provide a flush top surface by adding marked empty cartons



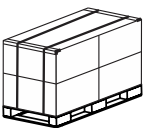
Multiple sized containers consolidated into unit load shippers



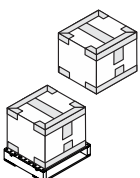
Utilizing proper pallet selection to optimize the load, unless receiver or customer requires a specific pallet size e.g. RPQ.



Use a smaller pallet and stack vertically

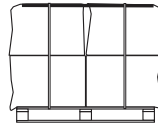


Containers which simply do not fit well in standard sized unit load shippers or pallets are placed on custom sized pallets that match the load, after review with receiving location

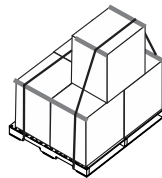


A carton with a single case number weighing 70 lbs. or under is not required to be on a pallet, however, in many cases it is preferred when shipping TGCS customer orders, or if prior transportation performance requires it. Cartons >70 lbs must be palletized

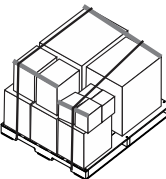
Poor 
Avoid these



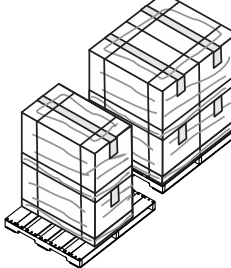
Loads that do not meet height requirements for the transportation modes used



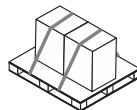
Loads that exceed the pallet footprint



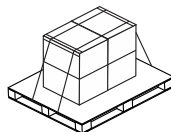
"Haystacking" - pallet loads that do not provide a flat surface for stacking



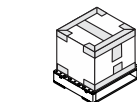
Unit loads of multiple sized containers not inside unit load shippers



Selecting pallets that do not allow 80% of the pallet surface to be efficiently used



Using less than 80% of the pallet surface area



Non-modular containers that fit poorly on the pallet resulting in poor pallet utilization

Palletized loads weighing less than 70 lbs are not required to be on a pallet, but may be for customer convenience.

Figure 6 Palletization

5 Marking and Labeling

See the TGCS Global Labeling Guide, P/N 3ADLBLGUIDE, for requirements for part labels, FRU labels, product package labels, packing lists, case contents labels, and shipping labels. The TGCS Global Labeling Guide is available from TGCS procurement or Agile.

5.1 Country of Origin

TGCS requires that each article have the full English name of its country of origin marked on the article itself and on the article's product package (immediate container). The marking must be as conspicuous, legible, indelible, and permanent as the nature of the article and container will permit. Further definition of these terms is provided:

1. **Conspicuous:** Capable of being easily seen with normal handling of the article or container
2. **Legible:** Can be easily read by a person with normal eyesight
3. **Indelible:** Resists fading
4. **Permanent:** Survives normal distribution and handling

No abbreviations, with the exception of UK for United Kingdom and US or USA for the United States of America, are acceptable. The two character ISO 3166 country codes, alone, are not acceptable for country of origin marking on articles or product packages. For detailed information regarding what is acceptable, TGCS's country of origin marking requirements and other required labels, refer to the TGCS Global Labeling Guide, P/N 3ADLBLGUIDE.

5.2 Wooden Package Assembly Markings

In order to comply with new regulations restricting the movement of SWPM (solid wood packing materials), TGCS requires all shippers to comply with TGCS Engineering Specification 37L8024 and/or ISPM 15 (*Regulation of wood packaging material in international trade*) pallet treatment and marking procedures. This procedure shall be followed for all wooden type package assemblies such as crates and pallets made from solid wood, plywood, or other specified wooden composites. It is not necessary to mark each component of the assembly, only the total assembly. In summary, each solid wood pallet or wooden assembly is marked with an abbreviation representing the type of wood, its treatment if any, the assembly part number, the supplier name, and date of manufacture. See the specifications above for additional detail.

5.3 Markings for Reusable Containers

To ensure compliance with marking regulations, proper classification, and to reduce duty payments, all reusable containers must be permanently marked as follows:

**Reusable Container
Container Made in XXX**

Where "XXX" is the full country name in English where the reusable container was made. Examples of these would be reusable plastic over packs used for components. The only allowable country abbreviations are USA for United States, and UK for the United Kingdom.

If the reusable container is not empty, and the reusable container is the immediate container (the innermost level of packaging in which an article will be received by the ultimate purchaser), the reusable container must also indicate the country of origin of the contents. For example, a reusable container made in China that is filled with goods with a country of origin of Thailand must be marked as follows. The first two lines would be permanent and the last line temporary if the container may be used for other items from other countries:

**Reusable Container
Container Made in China
Contents Made in Thailand**

Important: Do not use this marking for packages that are capable of reuse, but are not actually reused.

5.4 Policy on Use of TGCS Logo on Packaging

Do not routinely use TGCS Logo's on packaging for items that are not destined for retail environments. For example, all FRU's, shipments between TGCS suppliers, or shipments to manufacturing areas. TGCS branding graphics should only be used when created from original approved artwork provided by TGCS and used on packaging when released and specified by TGCS engineering.

6 FRU Packaging Requirements

6.1 Field Replacement Unit (FRU) Packaging Requirements

The information in this section addresses the minimum packaging requirements for Field Replaceable Units (FRUs). FRU's may also be synonymously termed as a Customer Replaceable Unit (CRU), Field Service Part, or Spare Part. All FRU's must be **individually packaged** and labeled. It is common for FRU's to go from truck to air, to truck, to storage, to truck once more. This necessitates a package capable of withstanding these demands while ensuring functionality of the packaged contents.

6.2 Applicability

The **minimum** requirements that appear in this appendix have been established for achieving damage free delivery. Additional measures may be taken to achieve even higher assurance of damage prevention. Conformance to these requirements is **mandatory for all shippers of FRUs distributed to TGCS service, business partners, self-service, providers or customers.**

6.3 FRU Packaging Basic Requirements

Description	Requirements
Design	The package must provide superior product protection but must also be designed with the needs of the customer in mind. The package must be easily handled, unpacked, and repackaged for reshipment to the field to be effective.
Density	The smaller the package (for a given part), the better its shipping density can be. In general, smaller is better . Of course, this objective must be balanced by the need to provide sufficient protective cushioning for fragile parts. The first priority must be to provide sufficient protection ; however, if this can be done with a smaller package then this is preferred. Using the correct minimum board strength for cartons will avoid unnecessary overpacking.
Environment	There are several ways to design environmentally friendly packaging. <ol style="list-style-type: none"> 1. Source reduce by increasing the recycled material content in the package 2. Reduce the size of the package without compromising protection 3. Do not permanently co-mingle (bond together) dissimilar materials 4. Use materials that are widely recycled (corrugated and paper based). 5. Reusable packaging should be considered only where a closed loop logistics system is practical, established and repeatable with adequate volumes.
Carton Strength	FRU packages must provide extra strength to ensure damage free delivery. Double wall regular slotted containers (RSCs) are typically recommended for most FRU applications. All cartons for FRU's should have the board strength marked on the carton with either a box maker's certificate or similar manner.
Carton Closure	Use qualified Toshiba logo tape. Gummed water activated tapes (reinforced Kraft) may fail in moist environments and are therefore second choice for FRUs. Express parcel carriers discourage the use of gummed tapes because it impairs the operation of conveyors and slides.
Cushioning	Some commonly used cushioning materials are not effective in the field service environment. Examples are low-density foam-in-place polyurethane's (less than 0.7 lb/ft ³), EPS, and all loose-fill cushioning materials. Materials that may be acceptable for one-way product shipments may be ineffective for FRUs.
Testing	All packages for fragile parts (low fragility) must be qualified by lab testing.

Security Tape	All rigid individual FRU packages must be sealed using security tape by the shipper. Use the printed security for normal cartons and plastic containers. Seal the package such that removing the part breaks the security seal.
Consistency	Once the packaging method is determined for a particular item, it is essential to apply that same packaging specification consistently at all sources for that part number (plants, suppliers, vendors, etc.)

Table 14 FRU Packaging Requirements

6.4 FRU Special Requirements

Description	Requirements
Electronic Parts	Many electronic components are susceptible to damage due to electrostatic discharge (ESD) and must be packaged individually by the shipper in ESD protective packaging. All packaging materials for ESD-sensitive items must be TGCS-approved. Generally, there must be a static dissipative material closest to the ESD sensitive part, one conductive or shielding layer used to surround the ESD sensitive item and an ESD warning label in the package structure. There must not be any static generating materials in the package, even if they are outside of the shielding layer.
Moisture Sensitive	Components or assemblies that are subject to corrosion due to moisture must be packaged in barrier bags (metal lined) with desiccant hermetically sealed inside. If desiccant cannot be used, do not seal the bag hermetically since this may trap moisture inside and actually cause corrosion.
Heavy Parts	Packages that exceed 12kg (26.4 lbs.) are considered heavy. Special design, marking, and palletization requirements apply to all heavy packages to ensure safe handling in the field. Bulky packages regardless of weight will benefit from these requirements as well (use judgment). The target weight limit for manually handled packages should not exceed 16 kg (35 lbs.).
Liquids and Chemicals	Some supplies such as lubricants, paint, cleaning solvents, and other Dangerous Goods must be packaged to meet strict Government regulations. <u>Performance Oriented Packaging</u> must be used for these items to prevent leakage. Consult with carrier for specific requirements for the substances to be packaged and shipped. Also See <i>"Recommendations on the Transport of Dangerous Goods – Model Regulations"</i> or US DOT "HM-181 titled <i>"Performance-Oriented Packaging (POP) Standards; Changes to Classification, Hazard Communication, Packaging and Handling Requirements Based on UN Standards and Agency Initiative."</i>
Other	Contact Packaging Engineering for assistance on parts that have special requirements not listed in this checklist.

Table 15 FRU Special Requirements

6.5 Special FRU Marking and Labeling

For all labeling requirements related to identification of the contents, country of origin, and similar information provided on the product package label refer to TGCS Global Labeling Guide, P/N 3ADLBLGUIDE.

7 Requirements for Heavy Packages

Manually handled packages in excess of 12kg (26 lbs.) are considered heavy and must carry one of the caution symbols that illustrate the proper lifting techniques for handling heavy package, see Figure 7 on page 34. Manual handling should not occur if inbound part packaging exceeds 16 kg (35 lbs.). Exceptions need prior approval. Packaged FRUs and products weighing less than 32 kg (70 lbs.) are not required to be palletized individually for shipment; however, shipments

from TGCS fulfillment centers typically consolidate and palletize these for business partner and customer handling convenience.

Heavy packages should include handles, handgrips, or hand holes to facilitate manual handling (Figure 7) but these must be reinforced if necessary to ensure there is no “tear out” during handling.

7.1 Heavy Packages, Handling Features

Heavy packages should be designed with features to improve safety and convenience when handling. This means hand holes or integral handles for packages in the 12kg - 55 kg weight range (26 - 121 lbs.) and others deemed bulky. Hand holes should be die cut with a scored top line so that the material remains in the hole. This minimizes contamination and improves gripping comfort. Fortifying the hole is usually necessary to prevent the carton from ripping out when lifting. Reinforcement in the form of filament tape imbedded in the corrugated board is highly recommended for this purpose. Dimensions vary depending on the size and material of the carton and the equipment used to make it. Your carton supplier will usually select one of the sizes listed in Figure 7. Interior cushions should also be designed to align with the hand hole. It is also very important that interior packing materials do not interfere with the hand hole. Plastic or fabric handles may be used but should be recessed if possible when not in use to prevent snagging on conveyors. See section 7.4 to understand how many handles are necessary per weight category.

A	B
114mm 4.5"	38mm 1.5"
102mm 4.0"	32mm 1.25"
89mm 3.5"	38mm 1.5"
83mm 3.25"	35mm 1.38"
89mm 3.5"	25mm 1.0"

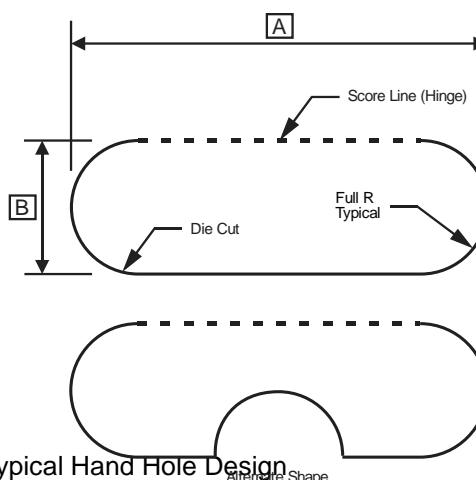


Figure 7 Typical Hand Hole Design

7.2 Heavy Packages Marking and Labeling

Item	Detailed Requirements
Application Options	Preprint the symbols on cartons if possible using the same colors as other graphics on the package. However, when this is impractical you should use one of the peel-n-stick (<i>3M Tape Pad</i>) labels instead. We discourage the use of ink stamps for this application.
Usage	The symbols are required for all product and FRU packages that meet any of the weight ranges listed below. They are required for all parts and products meeting the criteria and are prohibited on those not meeting the criteria. Do not use the symbols on large unit load shippers, castered products, or others clearly beyond the capacity of a person(s) to lift manually.
Placement	Place just one symbol on top of the package (on the horizontal surface) on one of the flaps such that taping the carton will not obscure the symbol. 92F6939 is 75 mm x 75 mm (3" x 3") and the other three are 75 mm x 150 mm (3" x 6"). Be consistent in placing the label from shipment to shipment.
Symbol Design	The symbols are identical for all shippers. There must not be any substitution for the designated artwork. These should be used for preprinted package graphics where needed. Artwork is available in Agile

Label Manufacturer	3M Corp. (Tape Pad TM product number 809GP).		
Label and Artwork Part Numbers.	Weight Range: 12-18 kg	Size: 75 x 75mm	P.N.: 92F6939
	Weight Range: 18-32 kg	Size: 75x150mm	P.N.: 92F6940
	Weight Range: 32-55 kg	Size: 75x150mm	P.N.: 92F6941
	Weight Range: > 55 kg	Size: 75x150mm	P.N.: 92F6942



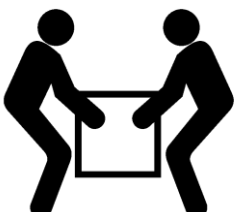




 12 - 18 kg (26.4 - 39.7 lbs)	  18-32 kg (39.7-70.5 lbs)
  32-55 kg (70.5-121.2 lbs)	  >55 kg (over 121.2 lbs)

Figure 8 Symbols for Heavy Packages

7.3 Heavy Packages Requirements Matrix

Shipment Type	Gross Weight Range of Individual Packages ¹	Pallet				Marking					Pkg
		A	B	C	D	E	F	G	H	I	
Machines, Parts, FRUs	0-12 kg (0-26.3 lbs.)	•				•					
	12-18 kg (26.4-39.6 lbs.)	•					•				•
	18-32 kg (39.7-70.4 lbs.)	•						•			•
	32-55 kg (70.5-121 lbs.)			•					•		•
	55-91 kg (122-200 lbs.)				•					•	
	Over 91 kg (Over 200 lbs.)				•	•					
Item is <12kg (26 lbs.) but is bulky (use		•				•					•
Item is 12-18 kg and has 2 sides >762mm (30")		•					•				•
Item is 18-32 kg and has 2 sides >762mm (30")			•					•			•

LEGEND

- A. Bulk palletization (multiple units on one pallet), singles are not required to have a pallet, but pallets may be preferred for orders shipping from TGCS fulfillment centers.
- B. Bulk palletization, ship single packages with an individual pallet the same size as the package.
- C. Use only individual pallets the same Length x Width as the package.
- D. Use only individual pallets Length x Width as the package.
- E. Heavy symbol **not required** for this weight range and shipment type.
- F. Heavy symbol with 12-18 kg weight range (ref TGCS PN 92F6939).
- G. Heavy symbol, 18-32 kg weight range, **2-person lift symbol** (ref TGCS PN 92F6940).
- H. Heavy symbol, 32-55 kg weight range, **3-person lift symbol** (ref TGCS PN 92F6941).
- I. Heavy symbol, over 55 kg weight range, **forklift symbol** (ref TGCS PN 92F6942).
- J. Handgrips (hand holes or handles) must be included in the package.

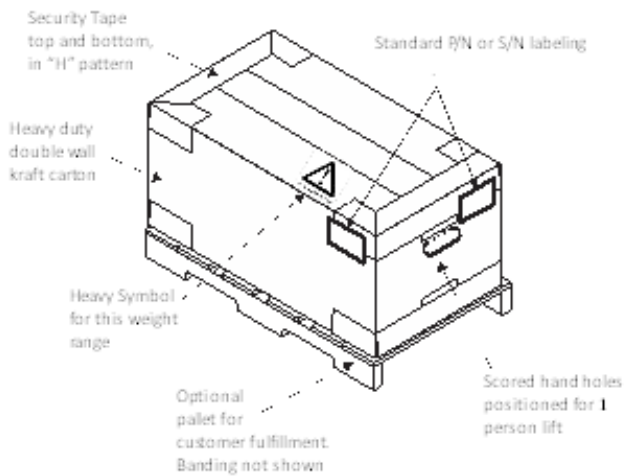
Table 16 Heavy Packages Matrix

7.4 Packaging by Weight Range

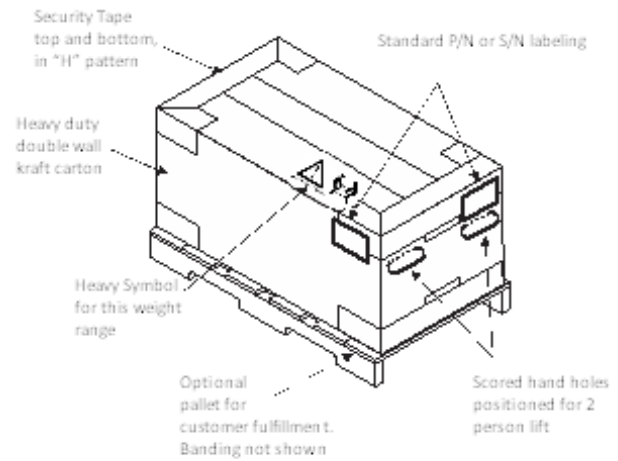
Note: Examples below show RSC and tape, but HSC with tray (or sleeve & trays) with bands (as shown in >55kg example) is an approved option.

Note: Only one label required.

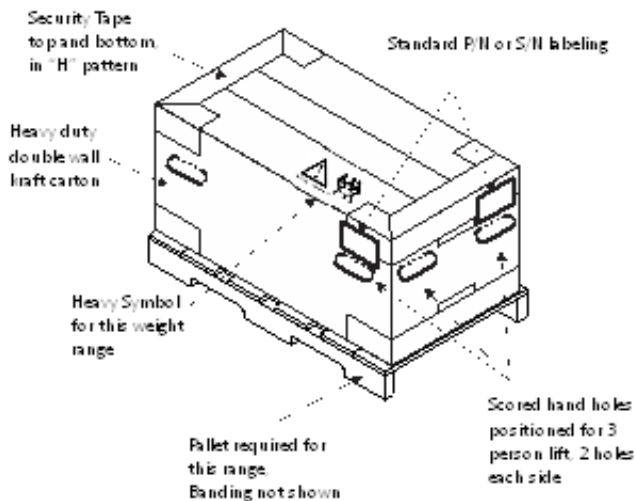
12-18kg (26.5-39.7 lbs.)



18-32kg (39.7-70.5 lbs.)



32-55kg (70.5-121.2lbs.)



55kg (>121.2lbs.)

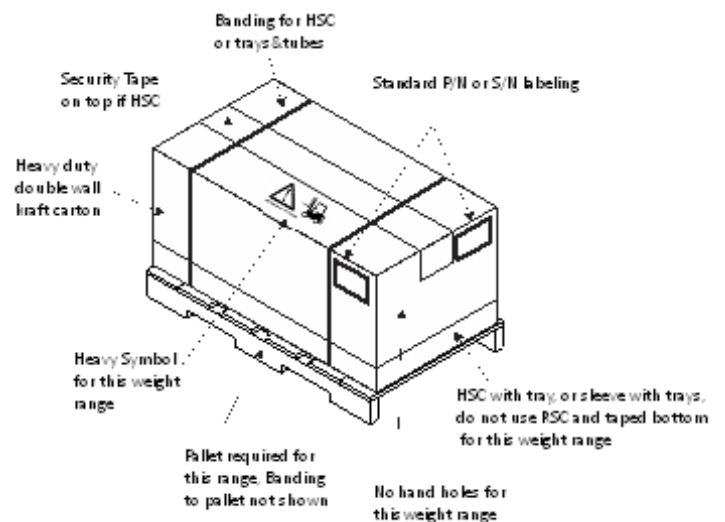


Figure 9 Packages Weight Range

8 Packaging for Export

8.1 Country Specific Procedures

Some countries have unique Shipping Procedural Instructions (SPI) that include packaging requirements. Some of the general and special packaging requirements and recommendations are summarized below. These are the most important packaging related requirements that will ensure smooth clearance through Customs for most countries and includes a reminder of some of the more important packaging quality considerations applicable to all export shipments. Deviations from these core packaging requirements must be approved by TGCS Procurement representatives.

8.2 Export Shipments — General Packaging Requirements

International shipments require the very best, most durable packaging designs and materials. This may include wooden crating, moisture barriers, and other heavy-duty methods.

- Ocean Shipments (containerized) should have:
 - Skids or pallets with double wall (minimum) corrugated fiberboard unit load shippers (ULS).
 - Moisture protection: VCI bags or wraps required for sheet metal parts and hermetically sealed aluminized barrier bags with desiccant for items containing disk drives.
 - Blocking, bracing or dunnage (including inflatable) to restrict movements of the items inside the ocean container
- Surface shipment of casters machines on casters (without a pallet) is only allowed in or between the **USA** and **Canada**. Padded van "mover service" style transportation is required to do this.
- Air Shipments require:
 - Bulk: Skids or pallets with double wall (minimum) corrugate ULSs.
 - Individual Cartons: No pallet or skid is required if less than 32 kg (70 lbs.). Use double wall cartons and sealing tape applied in the "H" style top and bottom.
- Weights and dimensions must be in metric units (cm, kg); imperial units may also be provided (inches/pounds) as supplemental information.
- Solid wood packaging material used in export must comply with ISPM 15 treating and marking requirements (see 5.2).
- Prior labels and markings on packing material must be removed or covered if they do not apply to the current shipment.
- Palletize/unitize any container or over pack that exceeds 32 kg (70 lbs.) unless specifically exempted by a particular carrier. Single cartons under 32 kg (70 lbs.) are not required to be palletized, but may be for receiver or customer convenience.
- Always palletize any overpack or carton that consists of two or more pieces (e.g. tray(s) and sleeve).
- Palletized loads should be secured to the pallet using a minimum of machine applied stretch wrap plus 2-way banding. Tie the stretch wrap to the pallet using the roping method at the base.
- Minimize the package size and overall shipment dimensions. Excess void areas should be eliminated (i.e. do not fill excess void areas with unnecessary dunnage), instead reduce package size. This reduces dimensional weight and shipping costs.
- Use heavy-duty double-wall cartons taped on all seams in the "H" style top and bottom.
- Extremely heavy or top-heavy items should carry appropriate symbols indicating the weight and center of gravity.
- Extraneous labels or markings should be minimized. Where necessary for handling safety, use international handling symbols.
- Do not use labels such as "fragile", "top load only", etc. in an attempt to compensate for poor or weak packaging.

A. References and Standards

TGCS Documents

The following standards and reference documents are available from TGCS. If there is contention in the reference documents and this guide, contact TGCS Procurement or Engineering for resolution.

- 3ADLBLGUIDE TGCS Global Labelling Guide
- 3ADMECH1001 Country of Origin Labeling for Products, Sub-assemblies and Parts
- 3ADMECH1002 Product Definitions and Serial Numbering
- 3ADLABEL001 Automatic Identification for Packaging, Distribution and Manufacturing
- 92F6933 Packaging/Product Requirements for Dangerous Goods
- 5897660 Packaging Materials, Essential Requirements
- 16F5050 FRU (Field Replaceable Unit) Packaging Requirements (under review)
- C-S 1-1120-000 Graphics, Basic Packaging

External Documents

The following documents are useful references and are available from their publishers. Note the TGCS specifications will take precedence over these references. Contact the TGCS Procurement or Engineering for resolution if necessary.

- ISO Standards
 - ISO 3166 Country Codes

Note: For the complete and current list, see http://www.iso.org/iso/country_codes

 - ISO 15394 Packaging - Bar Code and Two-dimensional Symbols for Shipping, Transport, and Receiving Labels
 - ISO/IEC 15417 Bar Code Symbolology Specification - Code 128
 - ISO/IEC 15418 GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance
- IPPC ISPM 15 Regulation of wood packaging material in international trade
- ASTM D6149 -16 Standard Practice for Performance Testing of Shipping Containers and Systems
- UN Performance Oriented Packaging – *“Recommendations on the Transport of Dangerous Goods – Model Regulations”* or US DOT *“HM-181 titled “Performance-Oriented Packaging (POP) Standards; Changes to Classification, Hazard Communication, Packaging and Handling Requirements Based on UN Standards and Agency Initiative.”*
- ISTA-6-FedEx-A
- ISTA-3E