

ISTA, Your Alliance in Transport Packaging, is the world leader in Performance Tests for Packaged-Products.

ISTA 2 Series tests are a combination of basic test elements from ISTA 1 Series (Non-Simulation Integrity Performance Testing) **and** advanced test elements from ISTA 3 Series (General Simulation Performance Testing).

- They challenge the capability of the package and product to withstand transport hazards, **but**
- They only simulate some actual transport hazards, **and**
- They do not necessarily comply with carrier packaging regulations.

When properly applied, ISTA procedures will provide tangible benefits of:

- Shortened packaged development time and confidence in product launch
- Protection of products and profits with reduced damage and product loss
- Economically balanced distribution costs
- Customer satisfaction and continued business.

There are three sections: Overview, Testing and Report

- **Overview** provides the general knowledge required before going into the testing laboratory **and**
- **Testing** presents the specific instructions to do the testing in the laboratory **and**
- **Report** indicates what data shall be recorded to submit a test report to ISTA.

Two systems of weights and measures are presented in ISTA test procedures. They are the English system (Inch-Pound) and the international system SI (Metric). Inch-Pound units are shown first with Metric units in brackets, except in some tables where they are shown separately.

- Either system may be used as the unit of measure (standard units), **but**
- The standard units chosen shall be used consistently throughout the procedure.
- Units are converted to two significant figures **and**
- Not exact equivalents.

VERY IMPORTANT:

The entire document shall be read and understood before proceeding with a test.

OVERVIEW OF PROCEDURE 2A

Preface

Test Procedure 2A is a partial simulation test for individual packaged-products.

- It can be used to evaluate the performance of a packaged-product.
- It can be used to compare relative performance of package and product design alternatives.
- It should be considered for the evaluation of packaged-products intended for international distribution.
- The package and product are considered together and not separately.
- Some conditions of transit, such as moisture, pressure or unusual handling, may not be covered.

Other ISTA Procedures may be appropriate for different conditions or to meet different objectives.

Specific suggestions:

- For packaged-products that may be transported in a small parcel delivery system consider ISTA General Simulation Performance Test Procedure 3A
- Refer to *Guidelines for Selecting and Using ISTA Procedures and Projects* for additional information.

OVERVIEW OF PROCEDURE 2A

Scope

Test Procedure 2A covers testing of individual packaged-products weighing 150 pounds (68kg) or less when prepared for shipment.

EXCEPTION:

Individual packaged-products on a visible skid or pallet and that weigh more than 100 pounds (45 kg) may be tested according to Test Procedure 3E.

Product Damage Tolerance and Degradation Allowance

The shipper shall determine the following prior to testing:

- What constitutes damage to the product **and**
- what damage tolerance level is allowable, if any, **and**
- the correct methodology to determine product condition at the conclusion of the test **and**
- the acceptable package condition at the conclusion of the test.

For additional information on this determination process refer to *Guidelines for Selecting and Using ISTA Projects and Procedures*.

NOTE:

When conducting the Compression Test:

- Box failure that could result in a stacking failure is considered a failed test, **if**
- the packaged-product may be warehoused in a stack for more than 24 hours during distribution.
- Box failure is allowed if the packaged-product provided is not stacked for more than 24 hours, **and**
- at the conclusion of all testing, the product is not damaged according the Product Damage and Tolerance established **and**
- the package still meets the acceptable package condition, both of which are determined above.

For additional information on this determination process refer to *Guidelines for Selecting and Using ISTA Procedures and Projects*.

Samples

Samples should be the untested actual package and product, but if one or both are not available, the substitutes shall be as identical as possible to actual items.

Number of samples required:

One sample is required for the tests in this procedure.

Replicate Testing Recommended:

To permit an adequate determination of representative performance of the packaged-product, ISTA:

- Requires the procedure to be performed one time, **but**
- Recommends performing the procedure five or more times using new samples with each test.

NOTE:

Packages that have already been subjected to the rigors of transportation cannot be assumed to represent standard conditions. In order to insure testing in perfect condition, products and packages shipped to certified laboratories for testing must be:

- over-packaged for shipment to the laboratory **or**
- repackaged in new packaging at the laboratory.

OVERVIEW OF PROCEDURE 2A

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	Required
3	Compression	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	
4	Vibration	Fixed Displacement	1 in. (25mm) peak to peak at a freq. to be determined	Required
		Alternative Random	Overall G _{rms} level of 1.15	
5	Shock	Drop	Height varies with packaged-product weight	Required
		Alternative Incline (Conbur)	Impact Velocity varies with packaged-product weight	
		Alternative Horizontal Impact	Impact Velocity varies with packaged-product weight	
6	Vibration	Fixed Displacement	1 in. (25mm) peak to peak at a freq. to be determined	Required
		Alternative Random	Overall G _{rms} level of 1.15	

EQUIPMENT REQUIRED FOR PROCEDURE 2A

Equipment Required Atmospheric Conditioning

Atmospheric Conditioning:

- Chamber and Control apparatus complying with the apparatus section of ASTM D 4332-01.
- Humidity recording apparatus complying with the apparatus section of ASTM D 4332-01.
- Temperature recording apparatus complying with the apparatus section of ASTM D 4332-01.

Equipment Required Compression

The following alternatives are acceptable for the equipment required for the Compression Test:

Type of Compression Test	Equipment	In compliance with the apparatus section of:
Apply and Release Test	Compression test system	ASTM D 642-00
Apply and Hold Test	Compression test system	ASTM D 642-00
Apply and Hold Test	Weight and load spreader	NA

Equipment Required Vibration

The following alternatives are acceptable for the equipment required for the Vibration Test:

Fixed Displacement Vibration Test:

- Vibration Test System with a 1 inch (25 mm) fixed or controlled displacement complying with Method A1 or A2 of the apparatus section of ASTM D 999-01.
Rotary or vertical linear motion of the platform is acceptable.
- Metal shim 0.06 inch (1.5 mm), thick approximately 2.0 inches (50 mm) wide and at a convenient length.
- Tachometer or suitable indicator for determining vibration frequency in cycles per second (Hz) or cycles per minute (CPM).
- Automatic timer or stopwatch.

Random Vibration Test:

- Random Vibration Test System complying with the apparatus section of ASTM D 4728-01.

Equipment Required Shock

The following alternatives are acceptable for the equipment required for the Shock Test:

Type of Shock Test	Equipment	In compliance with the apparatus section of:
Drop Test	Free fall drop tester	ASTM D 5276-98
Vertical Shock Test	Shock test machine	ASTM D 5487-98
Alternative Incline Test	Incline impact tester (conbur)	ASTM D 880-92(02)
Alternative Horizontal Test	Horizontal impact test system	ASTM D 4003-98

BEFORE YOU BEGIN PROCEDURE 2A

Prior to beginning the tests identify the faces, edges and corners according to the procedure below.

Step	Action
1	Place the packaged-product in its intended shipping position as determined by shipper. If the shipping position can be variable, place the packaged-product so that the primary shipping label location is on the top face.
2	Does the packaged-product have only six faces (2 sides, 2 ends, top and bottom)? <ul style="list-style-type: none"> • If Yes, then go to Step 5. • If No, continue to next Step.
3	Develop a method to identify each face, edge and corner and document with a diagram.
4	Go to the next Block.
5	Is the package a corrugated container? <ul style="list-style-type: none"> • If Yes, continue to next Step. • If No, then go to Step 8.
6	Does the package have a manufacturer's joint connecting a side and an end face? <ul style="list-style-type: none"> • If Yes, continue to next Step. • If No, then go to Step 8.
7	Turn the packaged-product so that you are looking directly at a face with the manufacturer's joint on the observer's right and go to Step 9.
8	Position one of the smallest width faces of the packaged-product directly in front of you.
9	<p>Identify faces according to the diagram below.</p> <div style="text-align: center;"> </div>
10	Identify edges using the numbers of the two faces forming that edge. Example: Edge 1-2 is the edge formed by face 1 and face 2 of the packaged-product.
11	Identify corners using the numbers of the three faces that meet to form that corner. Example: Corner 2-3-5 is the corner formed by face 2, face 3, and face 5 of the packaged-product.
12	Go to next Block.

BEFORE YOU BEGIN PROCEDURE 2A

Packaged-Product
Weight and Size
Measurement

You shall know the packaged-products:

- gross weight in pounds (kg), **and**
- outside dimensions of Length, Width and Height (L x W x H) in inches (mm or m)

Before You Begin
Atmospheric
Conditioning

Required Preconditioning:

The packaged-product should be stored prior to climate conditioning at laboratory ambient temperature and humidity for six (6) hours.

Required Conditioning Recommended: After the required precondition

To permit an adequate determination of packaged-product performance at anticipated atmospheric limits and where it is known that the atmospheric extremes are detrimental to the product, ISTA

- **Requires** the highest temperature and humidity limits shall be used, **but**
- **Recommends** that both the highest and lowest atmospheric conditions be used.

A separate 2A test sequence should be conducted following each atmospheric condition selected from the table below:

Anticipated Conditions	Time in Hours	Temperature in °C ±2°C (°F ±4°F)	Humidity in %
Frozen or winter ambient	72	-29°C (-20°F)	uncontrolled RH
Refrigerated packages	72	5°C (40°F)	85% RH ±5%
Controlled temperature	72	23°C (72°F)	85% RH ±5%
Tropical (Wet) climate	72	38°C (100°F)	85% RH ±5%
Tropical (Wet) then desert (Dry):	72 then 6	38°C (100°F) then 60°C (140°F)	85% RH ±5% then 30% RH ±5%
Desert or summer ambient	72	50°C (120°F)	uncontrolled RH
User Defined High Limit	72	Based upon known conditions	Known conditions
User Defined Low Limit	72	Based upon known conditions	Known conditions
User Defined Cycle	72	Based upon known conditions	Known conditions

CAUTION:

When using weights and a load spreader use extreme care to prevent injury.

Familiarity with the following formula is required:

Compression Test System	Test Force	English Units - Pounds Force (lbf)	Metric Units - Newtons(N)
Apply and Release Test Force	AR	$[W_t \times (S - 1) \times F] \times 1.4$	$[W_t \times (S - 1) \times F \times 9.8] \times 1.4$
Apply and Hold Test Force	AH	$W_t \times (S - 1) \times F$	$W_t \times (S - 1) \times F \times 9.8$
Weight & Load Spreader	Test Load	English Units Pounds (lb)	Metric Units – Kilograms (kg)
Dead Weight AH Test Load	DW-AH	$W_t \times (S - 1) \times F$	$W_t \times (S - 1) \times F \times 9.8$
Where			
AR	Test Load for Apply and Release		Pounds Force (lbf) Newtons
AH	Test Load for Apply and Hold -Machine		Pounds Force (lbf) Newtons
DW-AH	Test Load for Apply and Hold -Dead Weight		Pounds (lb) Kilograms (kg)
W_t	Total weight of the packaged-product		Pounds Kilograms
S	Total number of packaged-products in a stack		
1	Represents the bottom container in a Stack		1
F	Compensating factor		Typical range 3-6, ISTA recommends a minimum of 5 if the packaged-product may be warehoused in a stacked for more than 24 hours during distribution, otherwise a minimum of 4 is recommended.
1.4	Compensating Factor for time of compression		1.4 1.4
9.8	Metric conversion factor		NA 9.8

Continued

Before You Begin
Compression
Testing

BEFORE YOU BEGIN PROCEDURE 2A

Before You Begin
Compression
Testing
Continued

If you do not know the number of packaged-products that may be in a stack (S) determine the number to use by performing the appropriate action as indicated below:

Step	Action
1	Will the packaged-product be stacked for more than 24 hours during distribution? For example: in a warehouse or cross docking <ul style="list-style-type: none"> • If Yes, then go to the next Step. • If No, then go to Step 3.
2	Divide 270 inches (6.9 m) by the height of one packaged-product in inches (m). Round the value calculated up to a whole number and use the number just determined as "S" in the appropriate formula above. $S = 270 \text{ in.} \div H$ (Metric: $S = 6.9 \text{ m} \div H$)
3	Divide 90 inches (2.3 m) by the height of one packaged-product in inches (m). Round the value calculated up to a whole number and use the number just determined as "S" in the appropriate formula above. $S = 90 \text{ in.} \div H$ (Metric: $S = 2.3 \text{ m} \div H$)

Before You Begin
Vibration Testing

CAUTION:

A restraining device or devices shall be used with the vibration test system to:

- Prevent the test specimen from moving off the platform **and**
- Maintain test orientation of the packaged-product, **but**
- The device or devices shall not restrict the vertical motion of the test specimen during the test.

Select Fixed Displacement Vibration or Random Vibration as a test method.

For Fixed Displacement Vibration:

Familiarity with the following formula is required to calculate the test duration after the frequency required to bounce the packaged-product is determined in the Vibration Test Block:

$$\text{Test Duration in Minutes} = \frac{14,200 \text{ Vibratory Impacts}}{\text{Cycles Per Minute (CPM) or [Cycles Per Second (Hz) x 60]}}$$

NOTE:

The test duration for the Second Vibration Test Block may be different from that calculated for the First Vibration Test Block because the frequency required to bounce the packaged-product in the Second Vibration Test Block may be different.

Continued

BEFORE YOU BEGIN PROCEDURE 2A

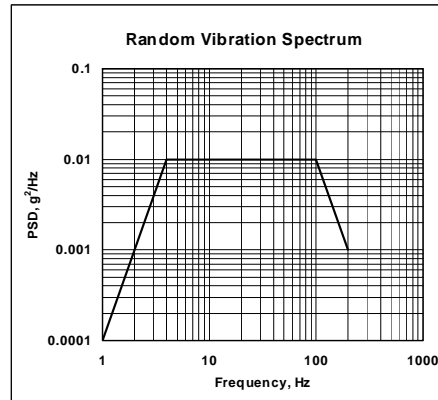
The chart below shows example Test Duration's calculated for several frequencies:

CPM	Hz	Test Duration in Minutes
150	2.5	95
180	3.0	79
210	3.5	68
240	4.0	60
270	4.5	53
300	5.0	48

For Random Vibration:

The following breakpoints shall be programmed into the vibration controller to produce the acceleration versus frequency profile (spectrum) below with an overall G_{rms} level of 1.15

Frequency (Hz)	PSD Level, g^2/Hz
1.0	0.0001
4.0	0.01
100.0	0.01
200.0	0.001



Before You Begin Shock Testing

The test drop height varies with the weight of the packaged-product.

Find the weight of the packaged-product in the following chart to determine a drop height or an equivalent impact velocity to be used for a substituted drop:

Packaged-Product Weight				Drop Height			Impact Velocity	
Equal to or greater than		But Less than		Free Fall			Incline or Horizontal	
lb	kg	lb	kg	In.	mm		ft/s	m/s
0	0	21	10	38	970		14	4.4
21	10	41	19	32	810		13	4.0
41	19	61	28	26	660		12	3.6
61	28	100	45	20	510		10	3.2
100	45	150	68	12	310		8	2.5

The test method requires the packaged-product to be dropped in several different package orientations.

A drop test must be performed in all required orientations where dropping the packaged-product is practical.

If dropping in a required orientation is not practical an equivalent incline or horizontal test can be substituted for that orientation.

When using impact velocity, if any test in a Test Sequence is below the required minimum level, that sequence event must be repeated until the test impact velocity meets the minimum.

TEST SEQUENCE FOR PROCEDURE 2A

The test blocks that follow contain tables that indicate the required steps for each test in the procedure.

TEMPERATURE AND HUMIDITY	
Step	Action
1	The packaged-product should be stored prior to climate conditioning at laboratory ambient temperature and humidity for six (6) hours.
2	Select an anticipated condition from the Before You Begin Block.
3	Check the conditioning apparatus to insure that the temperature and humidity are at the required levels.
4	Place the packaged-product in the conditioning.
5	At the completion of the required conditioning time period remove the packaged-product from the conditioning apparatus.
6	Record the ambient laboratory temperature and humidity when testing starts. Go to the next Test Block and perform the remaining test sequence as quickly as possible.

COMPRESSION							
Step	Action						
1	Testing is to be conducted using the test force or load from the Before You Begin Test Block and by performing the appropriate action as indicated in the table below:						
	<table border="1"> <thead> <tr> <th>IF the testing equipment to be used is a ...</th> <th>THEN go to ...</th> </tr> </thead> <tbody> <tr> <td>Compression Test System</td> <td>Step 2.</td> </tr> <tr> <td>Weight and load spreader</td> <td>Step 7.</td> </tr> </tbody> </table>	IF the testing equipment to be used is a ...	THEN go to ...	Compression Test System	Step 2.	Weight and load spreader	Step 7.
IF the testing equipment to be used is a ...	THEN go to ...						
Compression Test System	Step 2.						
Weight and load spreader	Step 7.						
2	Center the packaged-product with face 3 resting on the lower platen of the compression tester.						
3	Start the test machine and bring the platens together at the rate of one-half (0.5) inch (13 mm) per minute.						
4	Perform the appropriate action as indicated in the table below:						
	<table border="1"> <thead> <tr> <th>IF the compression test is a ...</th> <th>THEN ...</th> </tr> </thead> <tbody> <tr> <td>Apply and Release Test</td> <td>Increase the force until it reaches the AR Test Force value determined in the Before You Begin Compression Testing block. Then go to Step 5.</td> </tr> <tr> <td>Apply and Hold Test</td> <td>Increase the force until it reaches the AH Test Force value determined in the Before You Begin Compression Testing block. Then go to Step 6.</td> </tr> </tbody> </table>	IF the compression test is a ...	THEN ...	Apply and Release Test	Increase the force until it reaches the AR Test Force value determined in the Before You Begin Compression Testing block . Then go to Step 5.	Apply and Hold Test	Increase the force until it reaches the AH Test Force value determined in the Before You Begin Compression Testing block . Then go to Step 6.
IF the compression test is a ...	THEN ...						
Apply and Release Test	Increase the force until it reaches the AR Test Force value determined in the Before You Begin Compression Testing block . Then go to Step 5.						
Apply and Hold Test	Increase the force until it reaches the AH Test Force value determined in the Before You Begin Compression Testing block . Then go to Step 6.						
5	Release the force. Go to Step 11.						
6	Maintain the force for one (1) hour, and then release the force. Go to Step 11.						
7	Place the packaged-product with face 3 resting on a smooth, flat, rigid surface.						
8	Place a rigid load spreader that is larger than the top face of the test specimen on the packaged-product.						
9	Add weight to the load spreader to bring the total weight up to the DW-AH Test Load determined in the Before You Begin Compression Testing block and maintain for one (1) hour.						
10	Remove the weight and load spreader.						
11	<p>Is the product damaged or the package degraded according to the Product Damage Tolerance and Package degradation Allowance?</p> <ul style="list-style-type: none"> • If Yes, then the packaged-product has failed the test, go to the Test Report. • If No, then go to the Vibration Test Block. 						

TEST SEQUENCE FOR PROCEDURE 2A

FIXED DISPLACEMENT							
Step	Action						
1	Determine if testing is going to be Fixed Displacement or Random Vibration.						
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">IF Vibration testing is going to be ...</th> <th style="text-align: left;">THEN go to ...</th> </tr> <tr> <td>Fixed Displacement</td> <td>Step 2.</td> </tr> <tr> <td>Random</td> <td>the Random Vibration Test Block.</td> </tr> </table>	IF Vibration testing is going to be ...	THEN go to ...	Fixed Displacement	Step 2.	Random	the Random Vibration Test Block.
IF Vibration testing is going to be ...	THEN go to ...						
Fixed Displacement	Step 2.						
Random	the Random Vibration Test Block.						
2	Put the packaged-product on the vibration table so that face 3 rests on the platform.						
3	Start the vibration system to vibrate at 1 inch (25 mm) total displacement at the machine's lowest frequency.						
4	Maintain a fixed displacement at 1 inch (25 mm) and slowly increase the frequency (speed) of the vibration table until the packaged-product begins to momentarily leave the surface of the platform.						
5	Hold the vibration frequency to that determined in Step 4.						
6	<p>Can a metal shim be intermittently moved between the bottom of the longest dimension of the packaged-product and the surface of the platform?</p> <ul style="list-style-type: none"> • If Yes, hold that frequency and then continue to next Step. • If No, then increase the frequency until the requirement of Step 6 is met and hold that vibration frequency. 						
7	Determine the test duration in minutes using the formula indicated in the Before You Begin Block and the CPM or Hz frequency identified in Step 6.						
8	Begin vibration duration.						
9	<p>Are you using a vertical linear motion on the vibration system?</p> <ul style="list-style-type: none"> • If Yes, then go to Step 13. • If No, then continue with the next Step. 						
10	<p>Stop the vibration test half way through the vibration duration and perform the appropriate action as indicated in the table below:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">IF a single 90° horizontal rotation is...</th> <th style="text-align: left;">THEN perform a horizontal rotation of ...</th> </tr> <tr> <td>Possible</td> <td>90° as the specimen rests on the platform.</td> </tr> <tr> <td>Not practical because of the size of the packaged-product or the stability of the packaged-product.</td> <td>180° as the specimen rests on the platform.</td> </tr> </table>	IF a single 90° horizontal rotation is...	THEN perform a horizontal rotation of ...	Possible	90° as the specimen rests on the platform.	Not practical because of the size of the packaged-product or the stability of the packaged-product.	180° as the specimen rests on the platform.
IF a single 90° horizontal rotation is...	THEN perform a horizontal rotation of ...						
Possible	90° as the specimen rests on the platform.						
Not practical because of the size of the packaged-product or the stability of the packaged-product.	180° as the specimen rests on the platform.						
11	Start the vibration system and continue the vibration test at the frequency used in Step 8.						
12	<p>Can a metal shim be intermittently moved between the bottom of the longest dimension of the packaged-product and the surface of the platform?</p> <ul style="list-style-type: none"> • If Yes, then continue to next Step. • If No, then slowly increase the frequency until the requirement of Step 12 is met. 						
13	Complete vibration duration.						
14	Inspection of the package-product for visible damage is allowed, provided inspection does not alter, in any way, the current condition of the package or the condition or position of the product(s).						
15	Vibration testing is now complete. Go to the Shock Test Block.						

TEST SEQUENCE FOR PROCEDURE 2A

RANDOM	
Step	Action
1	Put the packaged-product on the vibration table so that face 3 rests on the platform.
2	Start the vibration system to produce the random vibration spectrum indicated in the Before You Begin Block.
3	Stop the vibration system after the completion of 30 minutes. Invert the packaged-product so that face 1 (top) rests on the platform.
4	Begin the vibration duration for this orientation.
5	Stop the vibration system after the completion of 10 minutes. Place the packaged-product so that either face 2 or 4 rests on the platform.
6	Begin the vibration duration for this orientation.
7	Stop the vibration system after the completion of 10 minutes. Place the packaged-product so that either face 5 or 6 rests on the platform.
8	Begin the vibration duration for this orientation.
9	Stop the vibration testing at the end of 10 minutes.
10	Inspection of the packaged-product for visible damage is allowed, provided inspection does not alter, in any way, the current condition of the package or the condition or position of the product(s).
11	Vibration testing is now complete. Go to the Shock Test Block.

Shock Test Block

DROP			
Step	Action		
1	Determine the method(s) of test and the required drop height or impact velocity in the Before You Begin Block.		
2	Do you have a packaged-product with only 6 faces as identified in the Face, Edge and Corner Identification Block? <ul style="list-style-type: none"> • If Yes, continue with the next Step. • If No, then go to Step 6. 		
3	Test the packaged-product according to the method and level determined in Step 1. Follow the sequence in the table below.		
4	Sequence #	Orientation	Specific face, edge or corner
	1	Corner	most fragile face-3 corner, if not known, test 2-3-5
	2	Edge	shortest edge radiating from the corner tested
	3	Edge	next longest edge radiating from the corner tested
	4	Edge	longest edge radiating from the corner tested
	5	Face	one of the smallest faces
	6	Face	opposite small face
	7	Face	one of the medium faces
	8	Face	opposite medium face
	9	Face	one of the largest faces
	10	Face	opposite large face

Continued

TEST SEQUENCE FOR PROCEDURE 2A

5	Shock testing is now complete. Go to the Second Vibration Test Block.
6	Select a bottom face corner to replace the corner required in Step 4 Sequence 1 to begin the test.
7	Identify the edges of the packaged-product that meet the Step 4 Sequence 2 and 3 requirements.
8	Select any 6 faces to replace the faces required in Step 4 Sequence 5 through 10.
9	Using the corner, edges and faces from Steps 6 through 8 go to Step 3 and proceed.
10	Shock testing is now complete. Go to the Second Vibration Test Block.

Second Vibration Test Block

FIXED DISPLACEMENT							
Step	Action						
1	Determine if testing is going to be Fixed Displacement or Random Vibration.						
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Random	the Random Vibration Test Block.						
2	Put the packaged-product on the vibration table so that face 3 rests on the platform.						
3	Start the vibration system to vibrate at 1 inch (25 mm) total displacement at the machine's lowest frequency.						
4	Maintain a fixed displacement at 1 inch (25 mm) and slowly increase the frequency (speed) of the vibration table until the packaged-product begins to momentarily leave the surface of the platform.						
5	Hold the vibration frequency to that determined in Step 4.						
6	<p>Can a metal shim be intermittently moved between the bottom of the longest dimension of the packaged-product and the surface of the platform?</p> <ul style="list-style-type: none"> • If Yes, hold that frequency and then continue to next Step. • If No, then increase the frequency until the requirement of Step 6 is met and hold that vibration frequency. 						
7	Determine the test duration in minutes using the formula indicated in the Before You Begin Block and the CPM or Hz frequency identified in Step 6.						
8	Begin vibration duration.						
9	<p>Are you using a vertical linear motion on the vibration system?</p> <ul style="list-style-type: none"> • If Yes, then go to Step 13. • If No, then continue with the next Step. 						
10	<p>Stop the vibration test half way through the vibration duration and perform the appropriate action as indicated in the table below:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;">IF a single 90° horizontal rotation is...</th> <th style="width: 50%;">THEN perform a horizontal rotation of ...</th> </tr> <tr> <td>Possible</td> <td>90° as the specimen rests on the platform.</td> </tr> <tr> <td>Not practical because of the size of the packaged-product or the stability of the packaged-product.</td> <td>180° as the specimen rests on the platform.</td> </tr> </table>	IF a single 90° horizontal rotation is...	THEN perform a horizontal rotation of ...	Possible	90° as the specimen rests on the platform.	Not practical because of the size of the packaged-product or the stability of the packaged-product.	180° as the specimen rests on the platform.
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Possible	90° as the specimen rests on the platform.						
Not practical because of the size of the packaged-product or the stability of the packaged-product.	180° as the specimen rests on the platform.						
11	Start the vibration system and continue the vibration test at the frequency used in Step 8.						

Continued

TEST SEQUENCE FOR PROCEDURE 2A

12	<p>Can a metal shim be intermittently moved between the bottom of the longest dimension of the packaged-product and the surface of the platform?</p> <ul style="list-style-type: none"> • If Yes, then continue to next Step. • If No, then slowly increase the frequency until the requirement of Step 12 is met.
13	Complete vibration duration.
14	Inspection of the package-product for visible damage is allowed, provided inspection does not alter, in any way, the current condition of the package or the condition or position of the product(s).
15	All testing is now complete. Go to the Test Report Block.

RANDOM	
Step	Action
1	Put the packaged-product on the vibration table so that face 3 rests on the platform.
2	Start the vibration system to produce the random vibration spectrum indicated in the Before You Begin Block.
3	Stop the vibration system after the completion of 30 minutes. Invert the packaged-product so that face 1 (top) rests on the platform.
4	Begin the vibration duration for this orientation.
5	Stop the vibration system after the completion of 10 minutes. Place the packaged-product so that either face 2 or 4 rests on the platform.
6	Begin the vibration duration for this orientation.
7	Stop the vibration system after the completion of 10 minutes. Place the packaged-product so that either face 5 or 6 rests on the platform.
8	Begin the vibration duration for this orientation.
9	Stop the vibration testing at the end of 10 minutes.
10	Inspection of the packaged-product for visible damage is allowed, provided inspection does not alter, in any way, the current condition of the package or the condition or position of the product(s).
11	All testing is now complete. Go to the Test Report Block.

TEST REPORT FOR PROCEDURE 2A

The packaged-product has satisfactorily passed the test if, upon examination, it meets the Product Damage Tolerance and Package Degradation Allowance.

ISTA Certified Testing Laboratories:

- Should file a test report on all ISTA Test Procedures or Projects conducted.
- Shall file a test report on all ISTA Test Procedures or Projects conducted to obtain Transit Tested Package Certification or Acknowledgement.

For additional information, refer to *Guidelines for Selecting and Using ISTA Procedures and Projects*.

ISTA Transit Tested Program

The ISTA Transit Tested Certification Mark as shown is a:

- registered certification mark **and**
- can only be used by license agreement **and**
- by a member of the International Safe Transit Association.

When a member prints this certification mark on a packaged-product with their license number they are showing their customer and the carrier that it has passed the requirements of ISTA preshipment testing.



In order to maintain its certified status and eligibility for identification with the TRANSIT TESTED Certification Mark, each packaged-product must be re-tested whenever a change is made in the:

- Product **or**
- Process **or**
- Package.

Changes in the product include changes in:

- Design **or**
- Size **or**
- Materials.

Changes in the process include changes in:

- Manufacturing **or**
- Assembly **or**
- Filling.

Changes in the package include changes in:

- Configuration **or**
- Dimensions **or**
- Weight **or**
- Materials **or**
- Components.

As a quality control procedure, packaged-products should be re-tested frequently, for example, yearly.

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