



Standard Practice for Functional Inspections and Adjustments of Alpine Ski/Binding/Boot Systems¹

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INTRODUCTION

Adhering to these guidelines may help reduce the risk of injuries resulting from improper mechanical functioning of releasable alpine binding systems. Skiing involves inherent risks and injury can result from simply falling down, impact with an object, or from many other actions. Many injuries are unrelated to system function and a properly functioning system cannot protect the skier in all situations. Compliance with these guidelines in no way guarantees that injury will be prevented.

1. Scope

1.1 This practice provides procedures for inspection and adjustment of alpine ski/binding/boot systems.

1.2 This practice should be followed for systems, whether newly mounted or previously mounted, when work is performed on the system that may affect its release function, unless otherwise specified by the binding manufacturer in non-rental applications.

1.3 Nonapplicability of this function and release inspection practice to rental shop operations is based upon the existence of applicable ASTM practices.

NOTE 1—Refer to Practice F 1064 for equivalent procedures and tolerances for complete and incomplete rental systems.

2. Referenced Documents

2.1 ASTM Standards:

- E 456 Terminology for Relating to Quality and Statistics²
- F 473 Specification for Binding Mounting Area Dimensions on Alpine Skis and Bindings³
- F 504 Test Method for Measuring the Quasi-Static Release Moments of Alpine Ski Bindings³
- F 939 Practice for Selection of Release Torque Values for Alpine Ski Bindings³
- F 944 Specification for Properties of Adult Alpine Ski Boots³
- F 1061 Specification for Ski Binding Test Devices³
- F 1062 Test Method for Verification of Ski Binding Test Devices³

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² *Annual Book of ASTM Standards*, Vol 14.02.

³ *Annual Book of ASTM Standards*, Vol 15.07.

- F 1064 Practice for Sampling and Inspection of Complete Alpine Ski/Binding/Boot Systems in Rental Applications³
- 2.2 *ISO Standards*:⁴
 - 5355 Ski Boots (Size Greater than 220 mm) for Ski Bindings for Downhill Skiing Interfaces
 - 8061 Method for the Selection of Release Torque Values
 - 8614 Ski Binding—Vocabulary
 - 9462 Alpine Ski Binding Safety Requirements and Test Methods
 - 11088 Assembly, adjustment, and inspection of an alpine ski-binding-boot system

3. Terminology

3.1 Definitions:

3.1.1 *clean versus lubricated tolerance*—the accepted difference between clean and lubricated test results, defined as not more than 20 % of the clean test, used whenever a functional test for binding-boot compatibility is required (see 6.3).

3.1.2 *clockwise versus counterclockwise tolerance*—the accepted difference between test results about an axis perpendicular to the plane of the ski, usually from the toe piece component, and defined as within the inspection tolerance.

3.1.3 *corrective action*—procedures other than readjustment of the visual indicator setting (see 3.1.11) to include repair or replacement of system components.

3.1.4 *deviation*—the difference between the test result (see 3.1.16) and the selected reference torque value (see 3.1.12), usually expressed as a percentage of the selected reference torque value.

3.1.5 *in use tolerance*—the accepted difference between the reference torque value and the test result(s), defined as ± 30 % of the reference torque value, or ± 5 Nm for twist and 20 Nm

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

for forward lean, whichever is greater, or two horizontal rows up or down from the selected reference torque value determined on the binding manufacturer's adjustment chart. In the absence of an applicable manufacturer's chart, use Annex A2. For non-rental applications, this tolerance is used as the upper and lower limit for determining if system release values are acceptable for in-use or in-service purposes, after said system has been released to the customer. This limit is derived from Practice F 1064, 3.1.1 *Class I deviation*. This deviation (± 16 to 30 %, or two horizontal rows up or down from the selected reference torque value) is defined as a minor deviation that does not require corrective action for equipment that is in-service, in rental applications. It is used as the upper and lower limit for readjustment of the binding.

3.1.6 *initial visual indicator setting*—the visual indicator setting derived from the binding manufacturer's adjustment chart.

3.1.7 *inspection tolerance*—the accepted difference between the reference torque value and the test result. Defined as ± 15 % of the reference torque value, or ± 3 Nm for twist and ± 10 Nm for forward lean, whichever is greater, or one horizontal row up or down from the selected reference torque value determined on the binding manufacturer's adjustment chart, (see Annex A2). It is used as the criteria for prompting consultation of the binding manufacturer's troubleshooting procedures or readjustment of the binding, or a combination of both.

3.1.7.1 *Discussion*—When an algorithm or table is used to provide a value, either may be used (differences may be insignificant).

3.1.8 *limit for readjustment*—the accepted difference between the reference torque value (see 3.1.12) and test result(s) (see 3.1.16), defined as ± 30 % of the reference torque value, or ± 5 Nm for twist and 20 Nm for forward lean, whichever is greater, or two horizontal rows up or down from the selected reference torque value determined on the binding manufacturer's adjustment chart (see Annex A2). Used as the upper and lower limit for readjustment of the binding.

3.1.9 *measured release value*—release torque value determined by the use of a testing device of the type defined in Annex A1.

3.1.10 *readjustment value*—the value that shall be added or subtracted from the initial visual indicator setting to bring the test result within the inspection tolerance.

3.1.11 *release/retention value*—the release torque of the ski/binding/boot system.

3.1.11.1 *discretionary settings*—visual indicator settings higher or lower than the normal setting range

(1) (–)—a symbol, that when placed to the left of Type I (see 3.1.14.1), provides release/retention values lower than Type I, corresponds to a further increase in the risk of inadvertent binding release in order to gain increased releasability in a fall.

(2) (+)—a symbol, that when placed to the right of Type III (see 3.1.14.3), provides release/retention values higher than Type III, corresponds to a further decrease in releasability in a fall in order to gain a decreased risk of inadvertent binding release.

3.1.12 *reference torque value*—the nominal release torque value derived from a document compatible with Practice F 939, such as Annex A2, or information supplied by the binding or test device manufacturer.

3.1.13 *skier code*—the letter code derived from the binding manufacturer's adjustment chart, based on a skier's parameters (height, weight, age, and skier type).

3.1.14 *skier type*—a classification, selected by the skier, for the type of skiing to be undertaken.

3.1.14.1 *Type I*—a designation that provides lower than average release/retention values; corresponds to an increased risk of inadvertent binding release in order to gain releasability in a fall; also applies to entry level skiers uncertain of their classification.

3.1.14.2 *Type II*—a designation that provides average release/retention values appropriate for most recreational skiing; applies to skiers not classified as in Type I or Type III.

3.1.14.3 *Type III*—a designation that provides higher than average release/retention values; corresponds to decreased releasability in a fall in order to gain a decreased risk of inadvertent binding release.

3.1.14.4 (/)—a symbol that separates skier type designations, used when, as a result of troubleshooting, different skier types have been selected for determining twist (M_x), and forward lean (M_z) release/retention values; shown in the order (twist/forward lean) or (T/H) to denote toe piece (T) and heel piece (H) of this ski binding. Other conventions may be used to record different skier types for twist and forward lean when required by the documentation

3.1.15 *system*—a group of interacting components, usually comprised of a ski, binding, and boot.

3.1.16 *test result*—the middle quantitative value of three repetitions of the same test.

3.1.17 *troubleshooting*—the binding manufacturer's recommendations or procedures of analyzing system failure.

3.1.18 *visual indicator setting*—the setting displayed on the binding's release/retention adjustment scale.

4. Significance and Use

4.1 The purpose of this practice is to aid in providing the end user with an appropriately functioning system with appropriate release torque setting(s).

4.2 The definitions and tolerances defined in this practice do not necessarily apply to procedures incorporating an inspection interval or schedule, in which such procedures are specified by the binding manufacturer. This practice is not intended to be a method for evaluating equipment design.

NOTE 2—Refer to Practice F 1064 for definitions and tolerances pertaining to the evaluation of equipment once in use.

5. Procedure

5.1 *Inspections*—Two types of inspection procedures are described in this practice: (1) procedures to check the system for appropriate function, and (2) procedures to check the system for appropriate release torque calibration (see Appendix X4). In all procedures requiring a measured release value, the system testing device should meet Specification F 1061 and be checked by the method described in Annex A1.

5.1.1 *Functional Inspections*—These inspections shall include inspection of all boot-to-binding adjustments and clearances, appropriate elastic travel (see 6.1), symmetry of torsional release, boot-binding compatibility (see 6.3), and other inspections recommended by the equipment manufacturers (see Appendix X4).

5.1.2 *Release Torque Value Inspections*—The release torque value of the system, as assembled for use, shall be inspected with the use of a system testing device (see Annex A1). A description of release torque value inspections and tolerances is included in this practice (see Section 7 and Appendix X4).

5.2 *Reference Torque Value Selection*—Reference torque values for release torque may be selected using Annex A2 or tables supplied by the binding manufacturer or system testing device manufacturer, which are in accordance with Practice F 939. Reference torque values above the upper limit specified by Practice F 939 or above the binding manufacturer's recommendations should not be used. Values below the lower limit or below the binding manufacturer's recommendations may be used unless the binding manufacturer recommends against such procedures.

6. Functional Inspections

6.1 *Test for Elastic Travel and Recentering*—The system should be exercised to ensure the boot or plate can travel a distance specified by the manufacturer and return freely to within 2 mm of the original position. This test should be made in all directions of release and in a manner specified by the binding manufacturer. If no displacement is specified, then displacement of 5 mm measured at the toe or heel (as appropriate) should be used and the test should be performed by any device or method capable of displacing the boot or plate the necessary distance.

6.2 *Test for Symmetrical Release*—The system should be tested for twist release in both the clockwise and counterclockwise directions with a device of the type specified in Annex A1.

6.3 *Test of Boot/Binding Compatibility*—Used as a diagnostic inspection for determining the compatibility of a boot and binding used in a system. The boot should be of a shape, composition, construction, and condition acceptable to the binding manufacturer. Functional inspections specified by the binding manufacturer to determine the compatibility of the boot and binding should be performed. If no functional inspection procedures are specified by the binding manufacturer, a functional inspection should be performed to determine the difference in test results between a clean, dry boot/binding system and the same system after lubrication of all boot/binding interfaces. This functional inspection should be made in all directions of release specified by the binding manufacturer, using a device of the type specified in Annex A1 (see 5.1).

6.3.1 The lubricant used for this test should be applied in a thin film and may be of any type specified by the boot or binding manufacturer. If unspecified, a liquid detergent or soap or a lubricant of a type normally accepted in the maintenance of the binding, such as a grease or silicone spray lubricant, may be used. If a spray lubricant is used, ensure that overspray does not contaminate other systems.

6.3.2 If there is reason to believe a boot/binding interface or system has been contaminated, a common dishwashing soap or detergent solution may be used to help clean the system, provided all surfaces are flushed with clean water afterwards.

7. Release Torque Inspections

7.1 *Tests for Twist Release*—A test should be performed to determine the torque required to release the binding in twist (M_z) about an axis perpendicular to the plane of the boot sole. This test should be performed using a device of the type described in Annex A1 and should be performed in both clockwise and counterclockwise directions of release. Test results should be within the appropriate inspection tolerance. Units that exceed the inspection tolerance should be readjusted to test within the inspection tolerance. When an initial visual indicator setting is used (see Appendix X4), readjustment should not be attempted if test result(s) exceed the limit for readjustment without first taking corrective action as specified by the binding manufacturer.

7.2 *Tests of Forward Lean Release*—A test should be made to determine the torque required to release the binding in forward lean. This test should be made using a device of the type described in Annex A1. Test result(s) should be within the inspection tolerance. Units that exceed the inspection tolerance should be readjusted to within the inspection tolerance. When an initial indicator setting is used (see 3.1.6 and Appendix X4), readjustment should not be attempted if test result(s) exceed the limit for readjustment without first taking corrective action as specified by the binding manufacturer (see 3.1.1 and 3.1.7).

7.2.1 If no independent means are provided to adjust the forward lean release, this test should be used to ensure the ratio of forward lean to twist release is as specified by the manufacturer.

7.3 *Other Release Tests*—Tests of the type in 7.1 and 7.2 should be made in any other direction specified by the binding manufacturer.

8. Test Conditions

8.1 *Visual Indicator Setting for Functional Inspections*—All functional inspections should be performed at a setting provided by the binding manufacturer. If no manufacturer recommendations are provided, all functional inspections should be performed at the setting selected for the skier.

8.2 *Release Adjustment for Validating Visual Indicator Setting*—Tests to validate the visual indicator setting should be made in accordance with the procedures specified by the binding manufacturer.

8.3 *Binding Preconditioning*—The binding should be cycled at least once in all directions prior to calibration of the release/retention value or validation of the visual indicator setting. Once all functional inspections have been completed on the system, a lubricant may be used on the boot-binding interfaces, unless otherwise specified by the binding manufacturer.

NOTE 3—The use of a lubricant is not intended to improve the performance of the system in use but to reduce the boot-binding friction.

8.4 *Temperature*—Tests should be performed at temperatures between 10 and 25°C (55 and 80°F).

8.5 *Load Rate*—Tests should be performed at a load rate specified by the manufacturer of the testing device or in accordance with the binding manufacturer’s recommendations. If no recommendations are provided, the load required to release the boot or plate from the binding should be applied smoothly in such a way that the time to achieve release is between 1 and 5 s.

9. Report/Workshop Ticket

9.1 In principal, a report/workshop ticket is generated by the ski shop and delivered to the user. It shall contain at least the following information:

- 9.1.1 Skier parameters,
- 9.1.2 Visual indicator settings, and
- 9.1.3 Pass/fail result of the system inspection.

10. Miscellaneous

10.1 Some other functional inspections that may be considered in diagnostic procedures are described in Appendix X1 and Appendix X2.

ANNEXES

(Mandatory Information)

A1. TESTING DEVICE INSPECTION REQUIREMENTS

A1.1 Definition

A1.1.1 For the purposes of this practice, a testing device is defined as any piece of equipment capable of indicating the torque or force required to release the boot or plate.

A1.1.2 Testing equipment should be of a type that conforms to Specification F 1061.

A1.2 Inspection Schedule

A1.2.1 The test device is inspected prior to preseason testing and at least once during the skiing season or whenever it is apparent that the device is not performing as intended, or both.

A1.3 Inspection

A1.3.1 The test device is inspected in accordance with all procedures recommended by the manufacturer of the test device or by the manufacturer of the system to be tested (if appropriate).

A1.3.2 The calibration of the test device is checked by a procedure recommended by either the test device manufacturer or system manufacturer.

A1.3.3 The calibration is checked at three points over the range in which the test device is intended to be used or as specified by the test device manufacturer.

A1.3.4 The test device is corrected by means of an adjustment to the indicator, if necessary, to read within $\pm 5\%$ or ± 2.5 Nm, whichever is greater, of the desired value.

A1.3.5 If a dead weight is used, its weight should be known to be accurate within $\pm 2\%$.

A1.3.6 Calibration of the testing device may also be made with respect to a reference binding if recommended by the manufacturer.

A1.3.7 A reference boot or binding, if used, is as recommended by the manufacturer for that purpose and tested with all surfaces lubricated, unless otherwise specified in the manufacturer’s procedures.

A2. RELEASE TORQUE SELECTION PROCEDURES

A2.1 See Appendix X1 through X3 in Practice F 939.

APPENDIXES

(Nonmandatory Information)

X1. EXAMPLE OF TEST METHOD FOR REPRODUCIBILITY AMONG OPERATORS

X1.1 Scope

X1.1.1 This test method covers procedures that may be supplied by the test device manufacturer to the user for the purpose of evaluating reproducibility among operators.

X1.2 Procedure

X1.2.1 Select a ski/binding/boot system typical of equipment in use and adjust the visual indicator setting until the measured release value falls within the approximate middle of the range of release for the test device.

X1.2.2 Randomly order a series of tests in which each operator performs five repetitions of the test (see example, Fig. X1.1).

X1.2.3 Designate one person to make all observations. The observer should not perform any tests.

X1.2.4 Conduct all training recommended by the test device manufacturer.

X1.2.5 Conduct all tests in the order determined in X1.2.2.

X1.2.6 Do not allow the operators to observe each other or the results of any tests.

X1.2.7 Observe and record the test results to the resolutions specified by the test device manufacturer.

X1.2.8 Perform tests in only one direction of release. Repeat the entire procedure for other directions as appropriate.

X1.3 Calculation

X1.3.1 Determine the test result for each operator.

X1.3.2 Determine the range of operator medians and express it as a percentage of the median for all operators.

X1.4 Evaluation

X1.4.1 Variability among operators of more than 15 % should prompt continued training and retesting.

Operator Name	_____ A _____	_____ B _____	_____ C _____	_____ D _____	_____ E _____	
	(3) _____	(4) _____	(5) _____	(1) _____	(2) _____	a
	(7) _____	(10) _____	(8) _____	(9) _____	(6) _____	b
	(11) _____	(12) _____	(14) _____	(15) _____	(13) _____	c
	(20) _____	(18) _____	(16) _____	(17) _____	(19) _____	d
	(24) _____	(21) _____	(22) _____	(23) _____	(25) _____	e
Operator Medians (Line b through Line f)	_____					f
		Highest	Line g	_____	_____	g
		Median	Line g	_____	_____	h
		Lowest	Line g	_____	_____	i
		Range = Line h - Line j =		_____	_____	j
		Variability = $\frac{\text{Line k}}{\text{Line i}} \times 100 =$		_____ %		k
Observer's Name	_____				Date	____/____/____

NOTE—(B) denotes test sequence.

FIG. X1.1 Data and Calculation Sheet for Multiple-Operator Reproducibility Test

X1.5 Other Uses for This Test Method

X1.5.1 This test method may be used to evaluate multiple observers of the test device scale using a single operator.

X1.5.2 This test method also may be modified to evaluate multiple observers of other scales such as the visual indicator setting scale of the binding. These other test methods may require criteria for evaluation different from X1.4.1.

X2. DIAGNOSTIC PROCEDURE FOR VISUAL INSPECTION OF INTERFACES

X2.1 Ensure binding components are positioned and secured in accordance with the binding manufacturer's recommendations and that there are no missing or protruding fasteners.

X2.2 Prior to insertion of the boot into the binding, inspect all interfacing surfaces and repair or replace as needed.

X2.3 Following boot insertion, inspect the system for appropriate boot/binding interface contact. Inspect and adjust the binding to achieve clearances as specified by the binding manufacturer.

X2.4 While performing tests for symmetrical release (see 6.2) and tests for elastic travel and re-centering (see 6.1), if appropriate, ensure there is no contact other than between the boot toe and the intended interfaces of the binding toe unit.

X2.5 While performing tests for forward lean release (see 7.2), ensure there is no contact of the boot toe upper with the binding toe housing prior to loading and during release and that there is no contact with surfaces not specified by the manufacturer prior to loading and during release. For plate bindings, ensure there is no plate contact with surfaces not specified by the manufacturer prior to loading and during release.

X3. GUIDELINES FOR INSPECTION OF USED EQUIPMENT

INTRODUCTION

The following guidelines may be helpful to ski binding mechanics when servicing customer-owned older ski equipment. It is intended as a guide only and may not contain all points or procedures necessary to properly service customer-owned older ski equipment.

X3.1 Customer Concerns

X3.1.1 Ask the equipment owner what, if any, problems have been encountered since the skis, boots, or bindings were last serviced.

X3.2 Technical Information

X3.2.1 Consult the component supplier's technical literature for the specific maintenance requirements and any specific notices concerning the product.

X3.3 Suitability

X3.3.1 Consult the supplier's technical literature for information to determine the component's suitability for the user. If the binding is not recommended for the user or it is currently adjusted to a visual indicator setting near the bottom or the top of the binding's range of adjustment, the owner should be informed that the product may not be suitable.

X3.4 Availability of Parts, Tools, Technical Information

X3.4.1 Inform the owner if the parts, tools, and technical information are no longer available and that the services you can perform will therefore be limited. If your shop has a policy regarding the servicing or non-servicing of products in this category, inform the consumer of the policy.

X3.5 Boot/Binding Compatibility

X3.5.1 Ensure the boots and binding conform to all applicable current norms and that they are compatible with each other. Refer to the binding and boot manufacturer's technical literature for information to help determine compatibility.

X3.6 Compatibility of Under-Binding Accessories

X3.6.1 If under-binding accessories, such as lifters or plates are used, ensure they meet the binding or boot suppliers' recommendations, or both, and do not interfere with proper function of the ski brake. Ensure that the ski brake lifts the ski at least 30 mm from the horizontal surface the ski/binding is resting upon.

X3.7 Excessive Wear or Damage

X3.7.1 *Bindings*—Inspect for damage, such as flat spots on rollers, missing or excessively worn low-friction inserts, or housing cracks.

X3.7.2 *Boots*—Inspect the soles for excessive wear, warped soles, or contaminated binding contact areas. Check for modified or damaged shells, liners, or buckles.

X3.7.3 *Skis*—Inspect the ski mounting area to ensure all binding mounting screws are snug and properly seated. Check for delaminations, edge pullouts, cracked side walls, damaged tip or tail protectors, or bends or twists.

X3.8 Binding to Boot Adjustments

X3.8.1 Consult the appropriate manufacturer's technical literature for information for that specific product.

X3.9 Initial Assessment

X3.9.1 Provide the owner with a list of all work recommended up to this point in the assessment and an estimate of the cost. Further work should not be performed on a system if sufficient technical information or proper parts are not available or if any of the components comprising the system are excessively worn or damaged and cannot be repaired.

X3.10 Tests

X3.10.1 Do not begin any tests until all damage has been corrected. Ensure all binding to boot adjustments have been completed and they are correct.

X3.10.1.1 *Screw Tightness*—Apply 3 to 4 Nm of torque to each binding mounting screw after the screw has been properly seated. If a screw moves at all, it should be removed, glue should be applied to the mounting hole, and the screw should be reinserted into the hole. If the screw hole is stripped, an appropriate repair should be made.

X3.10.1.2 *Antishock Travel*—Using a dead-blow hammer, strike the boot and displace the boot toe of center and confirm the appropriate return. Check for elastic travel of the heel piece by depressing the cocking lever and releasing it quickly.

X3.10.1.3 *Compatibility* (if indicated)—Conduct a clean versus lubricated test as specified by the binding manufacturer.

X3.10.1.4 *Visual Indicator Setting Verification*—If the result in forward lean, or twist in either direction, exceeds the inspection tolerance, troubleshooting procedures are recommended by the binding manufacturer.

X3.11 Final Assessment

X3.11.1 Determine what, if any, additional services may be required and provide the owner with an estimate of the cost. If the owner does not authorize these services, advise the owner/user to return the equipment to the owner in the condition in which it was received.

X4. FLOWCHART OF PRACTICE F 1063 PROCEDURES

X4.1 See Fig. X4.1 for a flowchart outlining the procedures in Practice F 1063.

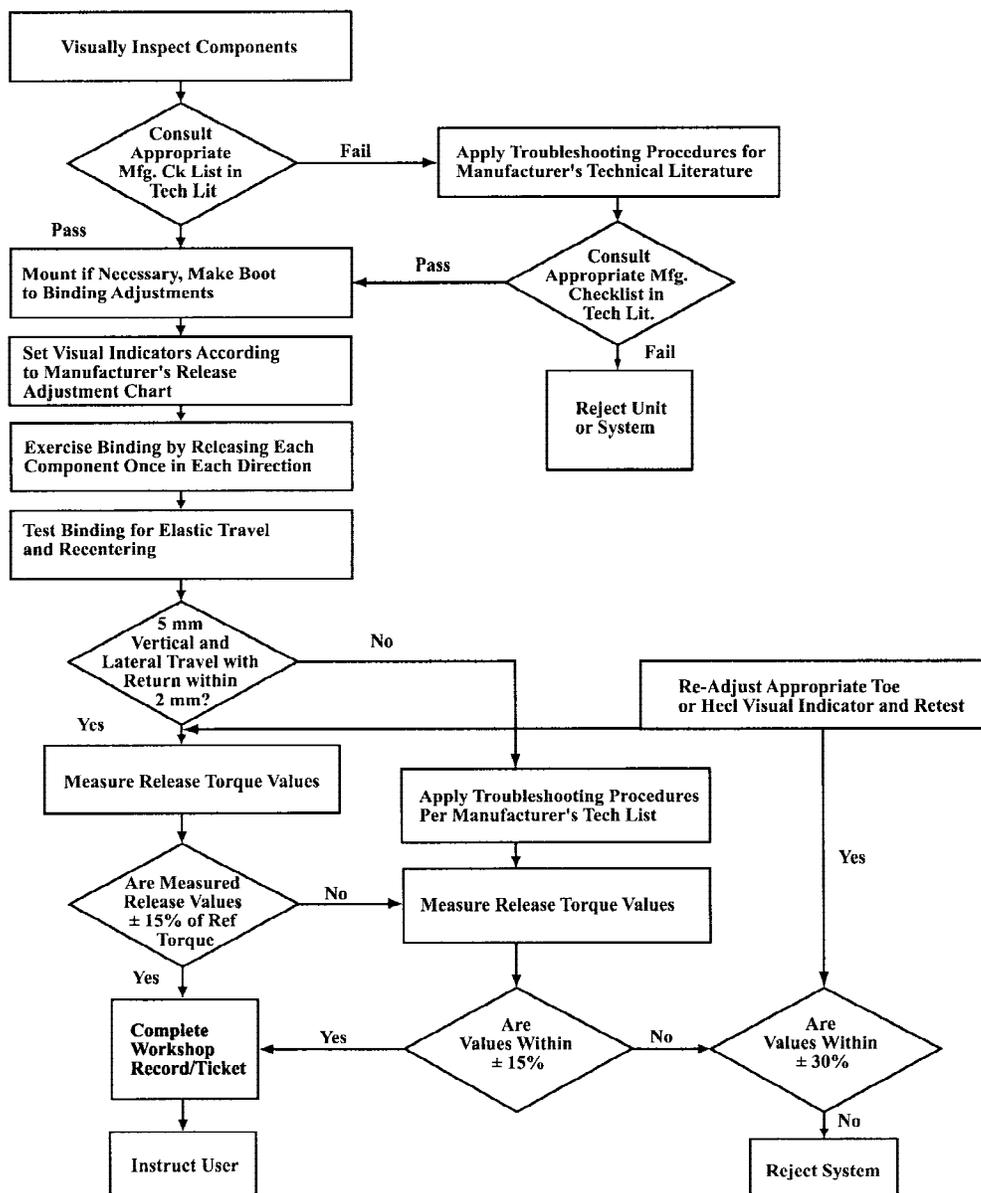


FIG. X4.1 Flowchart of Practice F 1063 Procedures

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