AUDITING

MEASUREMENT & TEST

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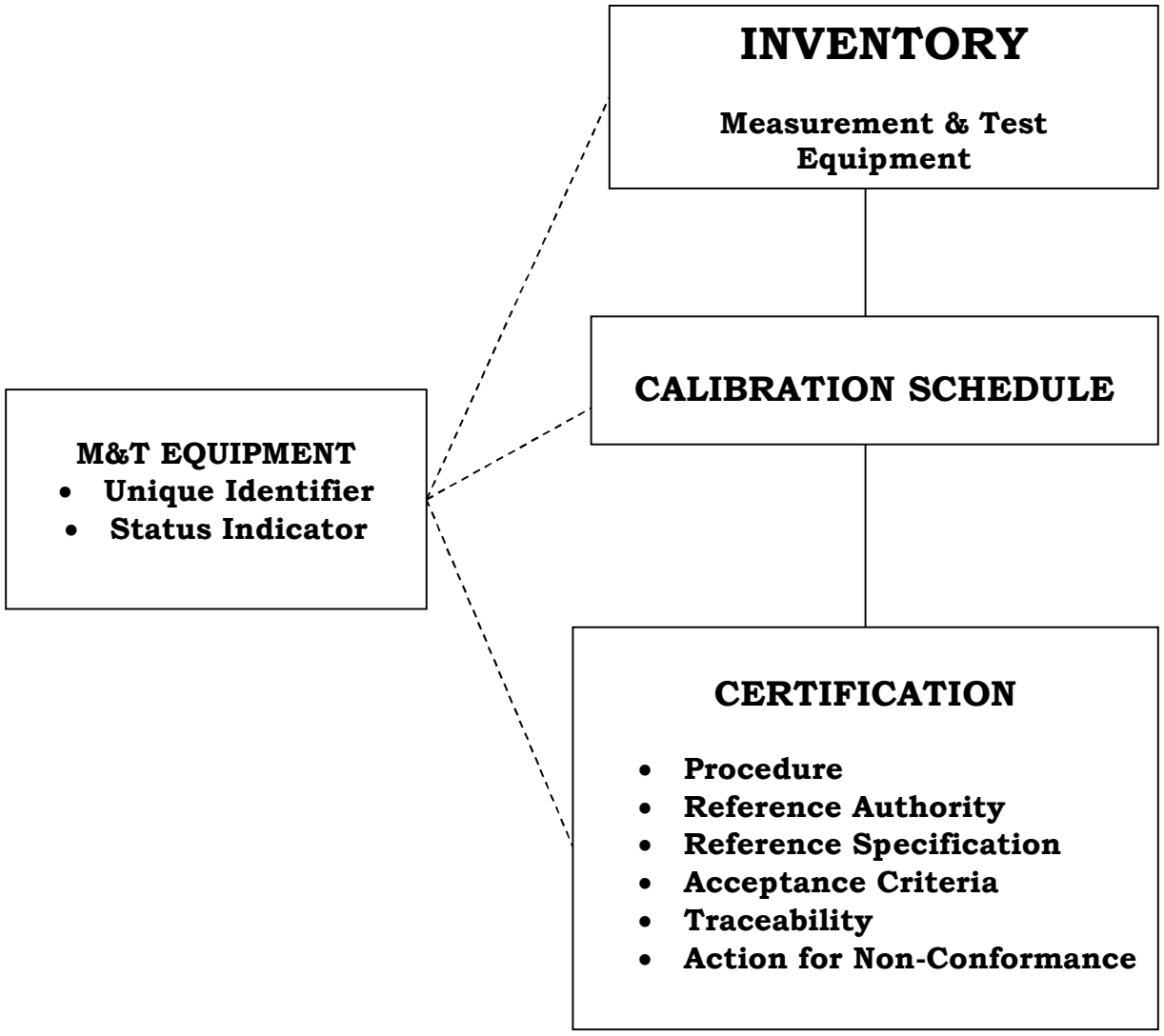
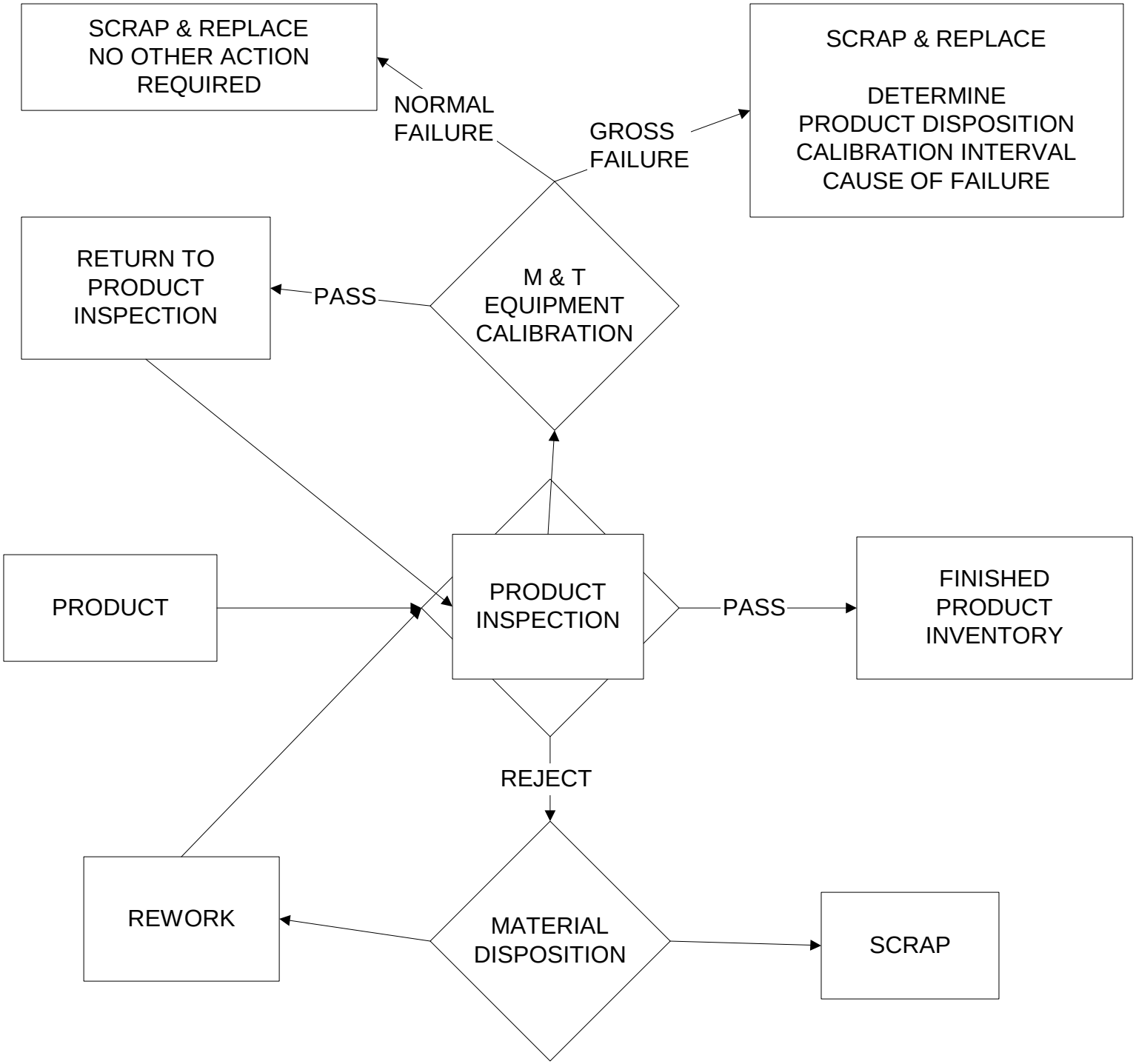
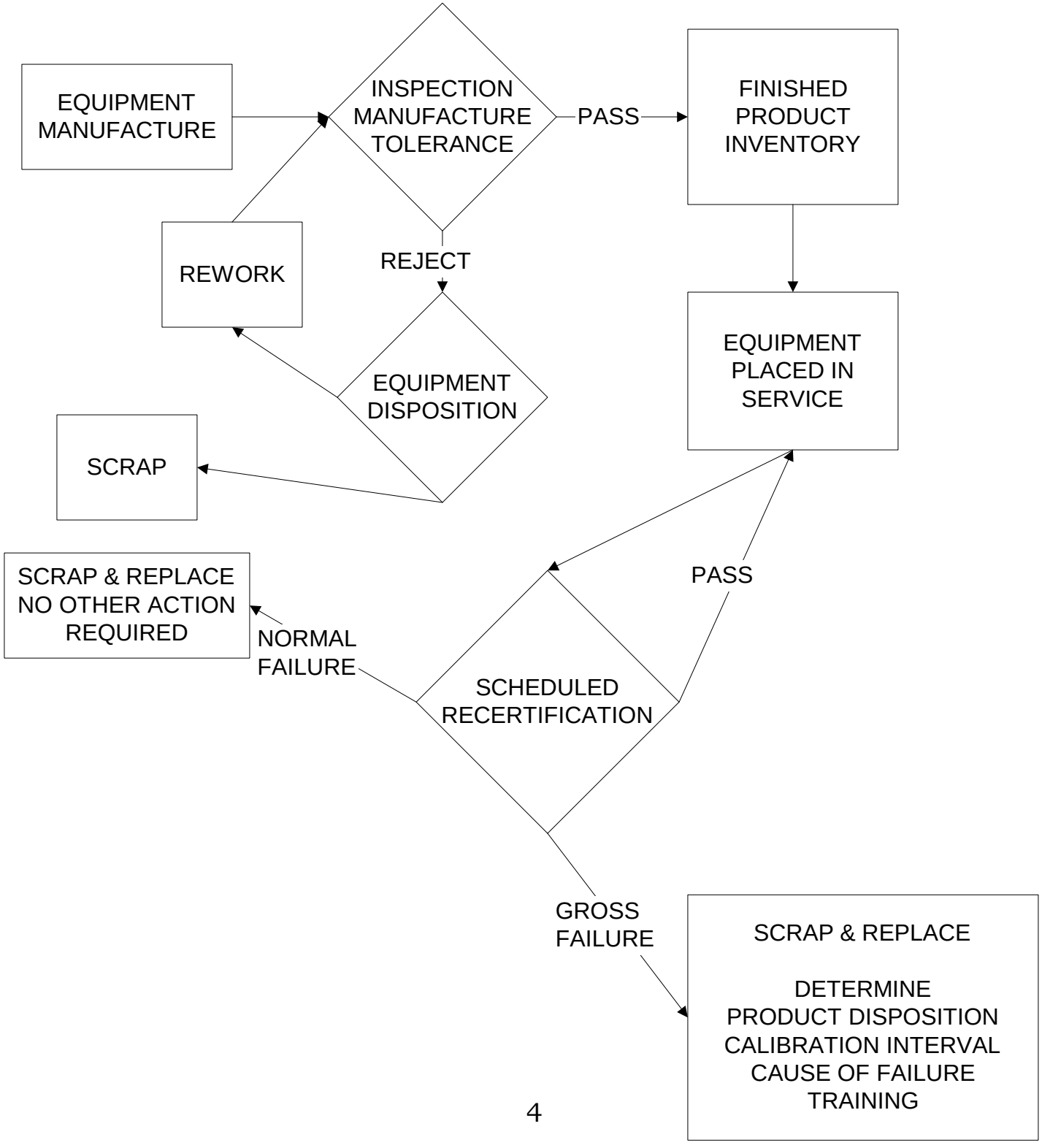
OVERVIEW



MEASUREMENT & TEST PLAN



LIFE OF MEASUREMENT & TEST EQUIPMENT



UNIQUE IDENTIFIER

To be controlled, all measurement and test equipment must have a unique identifier.

KEEP IT SIMPLE. The requirement is simply to uniquely identify the item. Complex identification systems only generate unnecessary problems.

If equipment comes with a unique identifier, use it.

All new gages produced at Winchester are given a gage number and serial number that taken together provide a unique identifier.

If gages sent to Winchester Industries, Inc. for verification do not have an identifier on them, they apply an alpha numeric identifier to each gage such as UP1, UP2, UP3, etc. All measurement & test equipment must have a unique identifier.

METHOD OF VERIFICATION

The verification procedure will detail specifically the verification process for a specific measurement & test equipment. Appropriate methods:

- CERTIFIED METROLOGY LAB
- CONTOUR MAPPING
- MASTER GAGE
- TOLERANCED DIMENSION VERIFICATION
- CERTIFIED TEST EQUIPMENT
- DOCUMENTED PROCEDURES

VERIFICATION PROCEDURE

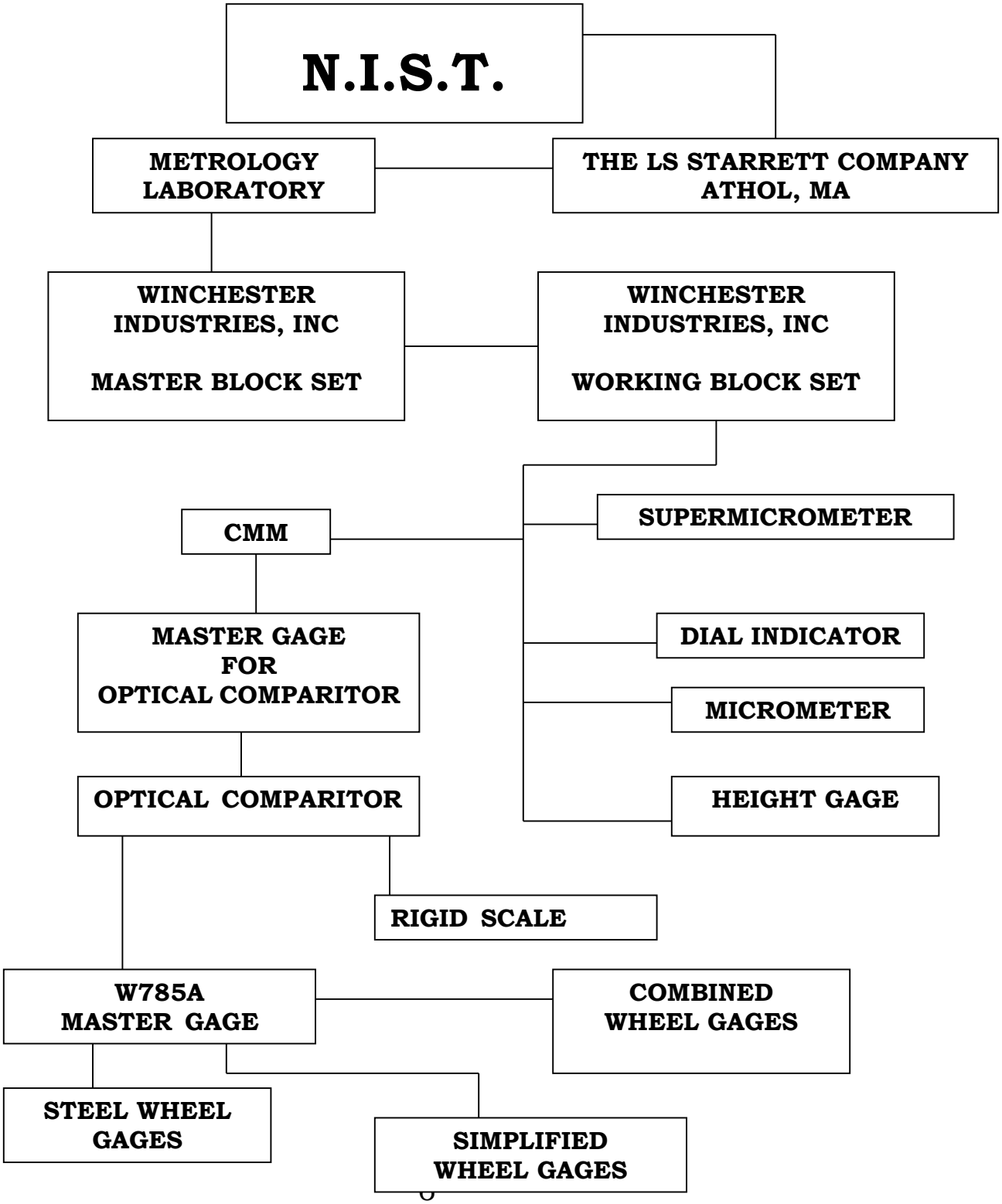
The verification procedure is the documented process by which measurement & test equipment is demonstrated to be conforming or non-conforming to an established specification defined by a recognized authority.

KEEP IT SIMPLE AND CLEAR.

Calibration and Verification are often used interchangeably, but there is a real difference. Verification is simply confirming that a gage conforms. Calibration checks for conformity, but also provides the ability to adjust some non-conforming conditions to conforming. Measurement & test equipment adjusted must have a report stating the as received condition and the final as adjusted condition.

TRACEABILITY

A characteristic of a calibration, is analogous to a pedigree. A traceable calibration is achieved when each instrument and standard, in a hierarchy stretching back to the national standard, was itself properly calibrated, and the results properly documented.



REFERENCE AUTHORITY

This is the recognized organization responsible for issuing and maintaining the specification used to verify the measurement & test equipment listed. Examples of reference authorities:

- Manufactures of measurement and test equipment or the OEM.
- Internal Quality Program
- Government agencies.
- Trade Organizations
- ANSI

REFERENCE SPECIFICATION

This is the detailed definition used as the basis for verification. The reference specification is usually dependent on a reference authority to be complete. Examples of Reference Specifications:

- Product Specifications
- Manufacturers drawings
- Winchester Industries, Inc. drawings at www.railroadgage.com
- Trade Standards
- ANSI Specifications
- Quality Program Specifications

CALIBRATION INTERVAL

The calibration interval or calibration frequency is the time period allowed between equipment verification or calibration.

Calibration intervals must be determined based on the type of service, equipment characteristics, durability of equipment and the degree of accuracy required.

A one year calibration interval is most common.

Calibration intervals for master gages can normally be longer than those of working gages, due to light use of the gages.

Equipment history should be monitored and calibration intervals lengthen or shortened appropriately.

CALIBRATION DUE DATE

This is the date that an item must be calibrated on or before. The calibration due date is determined by taking the date the gage or equipment is ñput in serviceò and adding the calibration interval.

The calibration date, the date the calibration/verification is performed is seldom the in service date.

Example:
Winchester gets a batch of gages for verification/calibration.

Interval of Calibration ï 1 Year (365 days)

May 3, 2015 ï Calibration Due date
May 3, 2015ï Repair shop ships gage to Winchester
May 8, 2015 ï Winchester receives gage
May 10, 2015 ï Winchester completes verification
Date of Calibration

Time for shipment & handling and possible storage at customerôs facility until needed for service.

Mo-day-2015 ï In service date ï Date gage actually put in service, determined by customer
Mo-day-2016 ï Calibration Due date

CALIBRATION SCHEDULE

The calibration schedule is the tool that assures gages are verified according to their established calibration interval. Keep the calibration schedule simple, focus on the equipment identifier and the calibration due date. Include only what additional information makes the whole process work easier ï equipment type, description, location and user.

It is recommended that measurement and test equipment controlled be listed by calibration due date with equipment due for calibration first on top of the list.

STATUS

Measurement and test equipment STATUS must be controlled.

Every status category used must be defined. Examples of possible gage STATUS conditions:

- Pre-Release
- In-Service
- Verify at Use
- Out-of-Service
- Out-for-Verification
- Missing
- Scrapped

You want to absolutely eliminate the possibility of any out of control measurement and test equipment being used in the processing of your material.

The calibration schedule and/or gage inventory are the primary tools for controlling the calibration process. Properly maintained, these documents ensure that only measurement and test equipment properly calibrated is being used.

The purpose of the status indicator is to provide a clearly visible indicator to the user of the gage that the gage is in calibration or to alert the user that the gage is due for calibration.

The most popular status indicator is a calibration sticker. These stickers normally include the following information:

- Calibration or certification as a header or title
- Signature or initials of person calibrating or putting equipment in service
- Date of calibration
- Date in-service
- Due date.

Calibration stickers are simple to use, however, some equipment is used in an environment that makes the stickers illegible or destroys the sticker in a very short period of time. When the sticker becomes illegible or is missing, the user cannot determine the calibration status of the equipment.

Some equipment is too small or are designed in a manner that prohibits the effective application of a calibration sticker.

When the gage size, use or environment prohibits the use of stickers, it is normally acceptable to use an alternate method to show the calibration status. Some examples:

- **Apply Sticker to the Storage Container** ï many small micrometers, calipers, dial indicators, etc are stored in a box or container. Some shops have gage storage boards. It is normally acceptable to apply the calibration sticker to the gageôs storage container. If several gages are stored on the same board, a sticker unique to each gage should be posted. It is very important that each gage be permanently marked with a unique identifier. When the sticker is not attached to the gage, it must contain the unique identifier of the gage.
- **Color Coding** ï Gages can be color coded to indicate the calibration status. An area of the gage can be painted or marked with a unique color to indicate to the user when the gage is due for calibration. The shop must post a calibration status instruction board with a legend of the calibration status color codes that is accessible and clearly visible to the gage user. It is important that a sufficient number of the instruction boards are posted in the work area. It is very important that each gage be permanently marked or etched with a unique identifier.

  When color coding is used, the calibration records become very important because the records must be reviewed to ensure that all gages requiring calibration are recalled for calibration. With no date on the gage, the calibration record is the only objective evidence to prove when the gage was calibrated last.

- **Engraving/Stamping** ï Gages that are subjected to harsh environments or gages that are handled in a manner that destroys stickers or paint color codes can be engraved or stamped with the unique identifier and calibration date. Instructions must be posted and readily available to all gage users.

- **Calibration Schedule** ï Posting a copy of the Calibration Schedule in each work area using measurement and test equipment is a simple way of confirming **STATUS.** Even where stickers are applied, it is prudent to post the Calibration Schedule as a backup status indicator.

NON-CONFORMANCE PROCESS

Measurement and Test Equipment is designed to verify that an item conforms or does not conform to required specifications.

Measurement and Test Equipment is originally produced to a manufacture specification. Once in service, the equipment will be re-certified to original manufacture specifications or specific re-certification specifications according to a schedule defined by its calibration interval.

Measurement and Test Equipment is designed to properly verify product throughout its entire life cycle. It is normal to expect Measurement and Test Equipment to eventually fail at re-certification. Failure at re-certification can be classified as NORMAL FAILURE or GROSS FAILURE.

NORMAL FAILURE

NORMAL FAILURE occurs when equipment eases out of the normal tolerance range. This occurs when equipment goes out of tolerance with normal use. Equipment is designed to reach this condition without affecting the product verification process.

Examples:

Master setting disc with class "XX" tolerance (+/- 35 millionths of an inch, 0.000035") wearing to deviation of 56 millionths, 0.000056". The tolerance range on this standard is so tight that it would fit 100 times in the width of a human hair. Another example to put this tolerance in perspective. One millionth of an inch is to the inch as 1/16 is to a mile. The 35 millionths then would be the same as 2 3/16" is to a mile.

W883-X (M-214 Center Bowl NO-GO Gage.
Manufacture Tolerance: +/-.010"
Re-certification Tolerance: +/-.020"
This gage checks the wear limit for a center bowl, which is allowed to wear 0.625" from it's nominal. Even if this gage was to wear .040", it would be insignificant when compared to the .625" wear range. It should also be noted that the original manufacture tolerance was +/-.010" and the use of this gage would cause one to expect it to get smaller from wear, not larger. This would cause bolsters to be removed from service sooner than required, but again insignificantly early.

W636 F-Knuckle Nose Worn Limit Gage 49822
Manufacture Tolerance: +/-.005"
Re-certification Tolerance: +/-.015"
When this gage wears, this gage moves in the direction of rejecting material that should have been accepted. The tolerance range is so short compared the allowable range that again it is insignificant. This gage is also an excellent example of gage application being much more a factor than any gage tolerance. The inspector puts this gage over the

knuckle and must not be able to move it more than half way down the knuckle. He must orient the gage correctly to the coupler and properly judge half the knuckle dimension.

The normal and correct expectation for Measurement and Test Equipment is that it will eventually fail re-certification and be replaced with no impact on the Quality Program.

GROSS FAILURE:
GROSS FAILURE occurs when a piece of Measurement & Test Equipment fails re-certification to an excessive and unexpected degree. For example, a master setting disc is out of tolerance by a number of thousandths instead of millionths.

It is sort of like a person dying under suspicious circumstances - an autopsy is required.

Required evaluation:
- Correct disposition of material inspected with failed equipment.
- Who needs to be notified?
- Cause of GROSS FAILURE?
- Are changes required to existing procedures?
- Is additional training required?

A GROSS FAILURE IS UNCOMMON, BUT A SERIOUS EVENT WHEN IT DOES OCCUR.

NON-CONFORMANCE ACTION REPORT

The non-conformance action report makes the calibration system complete. This report should contain:

- Unique identifier
- Description
- Reference Authority
- Reference Specification
- Verification Details
- Specifics of non-conformance
- Disposition of non-conforming equipment.
- Disposition of material accepted/rejected with non-conforming equipment.
- Date and Signature of appropriate individual

NON-CONFORMANCE

ACTION REPORT

GAGE NUMBER:_____ SERIAL NUMBER:_____

THIS GAGE HAS BEEN REJECTED FOR NOT MEETING MINIMUM REQUIREMENTS OF ITS SPECIFICATION.

PROPER DOCUMENTED DISPOSITION FOR BOTH THE GAGE AND MATERIAL IT HAS INSPECTED SINCE ITS LAST VERIFICATION MUST BE MADE.

DISPOSITION OF GAGE:

DISPOSITION OF INSPECTED MATERIAL

EXAMPLE:
NON-CONFORMING ACTION REPORT FORM

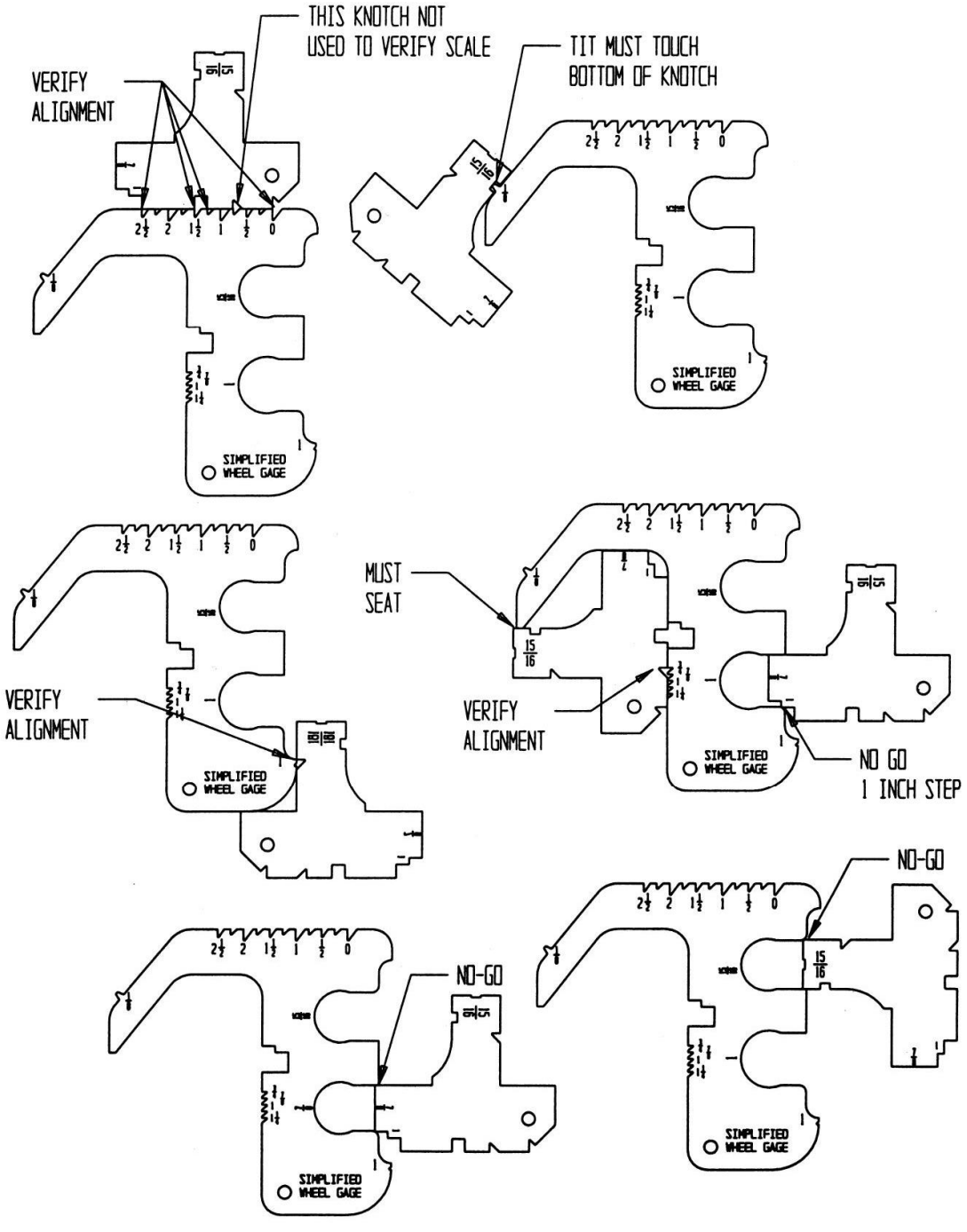
Winchester Industries, Inc. attaches a copy of this form to all REJECTED calibration reports

Date: _____

Signature: _____ Title: _____

Winchester Industries, Inc.
Document Number 019
Revision Date 11/11/97

EXAMPLE
MASTER GAGE APPLICATION



WINCHESTER INDUSTRIES, INC.
P.O. BOX 917
106 GROPPO DRIVE
WINSTED, CT 06098-0917
(860) 379-5336

+++AAR CERTIFIED M1003 CERTIFICATION # QA-WNCH EXPIRES 8/31/00
+++CALIBRATION GAGES CALIBRATED TO MASTER BLOCK SET 51674.7
++TRACEABLE TO BUREAU OF N.I.S.T. WASHINGTON D.C.
+++ TEST #821/254855+++ REVERIFICATION DUE 11/99
+++UNCERTAINTY EVALUATED ACCORDING TO N.I.S.T TN 1297

ACCEPTED

DATE	6/26/98	PROGRAM	H:W676R
TIME	7:47:49	OPERATOR	DMD (DMD)
Gage Number	W676	Serial Number	00157

+++ COUPLERS WORN LIMIT AND RECONDITIONED +++
+++ ACCEPTANCE CONTOUR GAGE +++
+++ REFERENCE: GAGE 25623-1 DRAWING 43467 REV E +++

+++ RECERTIFICATION WEAR LIMIT ALLOWANCE .015 APPLIED +++

no	sym	actual	nominal	u_tol/tp	l_tol/epd	dev	out of tol
N0046	A9	TOLERANCE					
	DST	5.31058	5.31200	0.01500	-0.01500	-0.00142	I---*.----I
N0048	A10	TOLERANCE					
	DST	5.12314	5.12500	0.01500	-0.01500	-0.00186	I---*.----I
N0052	M5	TOLERANCE					
	DY	-1.35943	-1.36000	0.01500	-0.01500	0.00057	I----.*---I

EXAMPLE:
WINCHESTER LONG FORM CERTIFICATION

PROVIDES:
- Technician Identification
- N.I.S.T. Traceability
- Unique Identifier
- Description
- Reference Specification/Authority
- Acceptance Criteria
- AAR Certification
- Detailed measurements