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When additional samples are submitted in mid-May, the test rifles will again, with a few exceptions, be subjected to the full range of standard rifle test procedures, comprised of Measurements, Accuracy, Function & Endurance testing, Environmental and Abusive testing.

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**Remington Arms Company Inc.**RESEARCH & DEVELOPMENT TECHNICAL CENTER  
315 WEST RING ROAD  
ELIZABETHTOWN, KY 42701**Initial Tests, Measurements and Inspections:****HEADSPACE AND PROOF - TLW0010A THROUGH TLW0010C:****TLW0010A – Measure Headspace**

All test samples will be measured for headspace before being tested in either the jack or shot from the shoulder. The chamber, bolt face & locking lugs on both the bolt and the receiver will be inspected for the presence of dirt or debris. If dirt or debris that could affect headspace measurement is present then these areas of the firearm will be cleaned before using the gauges.

**Method:**

- The graduated headspace gauges based on Remington chamber dimensions (Ref.: Remington Gauge Drawing # 41560 ...A, ...B, ...C, & ...D) will be used and the headspace measurements will be recorded to the nearest .001" increment as indicated by the gauge. The .30-06 Remington chamber drawing LB-153 will be used for chamber dimensions and LB-154 will be used for chamber drawings for the .270 caliber.
- The headspace measurements will be recorded to the nearest .001" increment as indicated by the gauge.
- If the measurement is taken at the start of the test then headspace should be less than Min. + .005".
- As the test progresses, headspace will be taken at each "Safety Inspection" scheduled in the plan and, in addition, at each "Clean & Inspect" activity scheduled by the plan.
- The readings for each firearm will be recorded on the "Daily Test Data Sheet" to be kept with each firearm in the accompanying data packet.
- For any firearms where the headspace is changing at each inspection point the firearm will be withdrawn from test and examined for the cause.
- In no case will any firearm in the test program be allowed to continue test if the headspace exceeds Min. + .009".

**Data Required:**

- Rifle serial number

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- Headspace measurements for each sample

**TLW0010B – Proof Test**

All test sample firearms will be subjected to a standard .30-06 (or .270) Factory Proof Load, shot in the blow-up room using a lanyard. This procedure will be completed before the firearm can be used for any additional firing tests.

Before proof testing the firearm should be inspected for:

- Barrel Obstructions
- Bore and chamber are free of grease or oil and other debris.

For fully assembled firearms, one definitive proof cartridge should be fired in each firearm. Definitive proof ammunition is to be used in accordance with the "Handling of Ammunition" procedure defined in the SAAMI Technical Committee Manual, Volume III, Section II, Page 24-10 as follows.

- "Cartridges to be tested should be placed in a vertical position with primer end down in a recessed holding block."
- "... a cartridge should be lifted vertically from the block. It should be rotated slowly, end over end, in a vertical plane through 360° pausing momentarily when the powder is at the bullet end and again when the powder is at the primer end."
- "The cartridge is then rotated slowly, a minimum amount to enter chamber, keeping primer end in lowest possible position until inserted gently and carefully into the chamber."
- "The cartridge should be seated in the chamber as far as practicable with the fingers. The bolt or breech mechanism should be closed gently in order not to disturb the position of the powder in the cartridge case. The object of this method of handling cartridges is to position the propellant powder at the primer end of the cartridge case by permitting it to fall gently against the primer and while rotating the case."

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Note that these procedures for proof testing were developed to consistently position the propellant thereby providing greater consistency of proof pressures. Failure to follow this procedure during the definitive proof testing of each chamber of the firearm could result in pressure levels significantly below the minimum proof pressure specification as determined for the cartridge.

Any firearms components, such as bolts, bolt heads, receivers including chambers, etc. which were previously subjected to proof testing and, which subsequently, have any proof sensitive components changed, altered, or substituted, should be re-proofed.

Method:

- Record headspace before proof testing (*see previous procedure "TLW0010A - Measure Headspace."*)
- After firing the proof round, the firearm will be carefully examined to determine if any damage to the product has occurred due to exposure to the proof pressure. This inspection includes:
  - Visual inspection for damage,
    - damaged receiver or bolt, especially the locking lugs on the bolt or the receiver
    - bulged chamber or bore, split, cracked or otherwise damaged barrel,
    - broken stock,
    - any other part subjected to the proofing stress, which can be visually examined for damage.
    - Any "suspicious" areas should be submitted to magna-flux inspection before proceeding.
  - Magna-Flux all bolt heads after Proof.
- The fired proof cartridge should be examined to determine that no firearm fault has introduced cartridge failure, such as:
  - Expanded cartridge head.
  - Excessive roughness, rings, or bulging, which would affect extraction.
  - Beginning separation or material stretching in front of the case head indicating excessive headspace or excessive pressure as stated above.
  - Any cartridge case failure indicating a firearm fault.
- In addition, the spent proof round should be examined for the presence of unusual deformation, split case or split head, and for any evidence of a pierced primer. Any of these conditions may be indicative that high-pressure gases may have vented into the action where other damage to components may have occurred.

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- Take note of any indication of significant gas leakage, if present, it may indicate that the firearm was not subjected to full proof pressures and the proof test would then be invalid and would require re-proofing.
- A firearm is only properly proofed when the cartridge has been fired without evidence of significant gas leakage.
- Save the spent proof case in a Zip-Lock plastic bag and label and place in the data packet for further reference. If any parts were broken or otherwise damaged, place these parts in the same bag as the proof case and label. Place a label on the firearm and withdraw the firearm from the test.
- Each sample firearms' headspace (*see following procedure "TLW0010C - Re-Measure Headspace after Proof"*) must remain in range from min. to min.  $+.007$ " after proofing, with no individual firearm's headspace to grow more than  $.002$ " after firing one proof round. After successful proofing, the right lug on the bolt head will be marked in the center (i.e. center of top to bottom and center or front to rear) of the lug with a center punch to indicate that it has been proofed.
- After proof, if the firearm passes the inspection and headspace has been measured (*see next section of test plan*), stamp the firearm on the barrel with an authorized Remington proof stamp. Locate the proof mark on the right rear of the barrel in the specified location for the Remington proof stamp. **DO NOT STAMP** if the headspace exceeds Min  $+.009$ ".
- Because of the higher pressures involved in shooting proof cartridges, adequate precautions, both mechanical and procedural, should be taken to protect personnel performing the firearms proof testing. To this end, the firearm should be securely mounted, completely shielded from the operator and firing accomplished by a remote control method.

Data Required:

- Rifle serial number
- Record and note any headspace growth and the corresponding round level.
- Record significant gas leakage and/or firearm damage.
- Record any case damage or other ammunition related malfunctions.
- Record any damage to the firearm resulting from the proof test. Document with Photographs is necessary.

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All test samples will be re-measured for headspace after proof and before being tested in either the jack or shot from the shoulder. The chamber, bolt face & locking block/locking notch will be inspected for the presence of dirt or debris. If dirt or debris that could affect headspace measurement is present then these areas of the firearm will be thoroughly cleaned before using the gauges.

**Method:**

- The graduated headspace gauges based on Remington chamber dimensions (Ref. Remington Gauge Drawing # 41560 ...A (min.), ...B (+.005), ...C (+.007), & ...D (+.009)) will again be used and the headspace measurements will be recorded to the nearest .001" increment as indicated by the gauge. The .30-06 Remington chamber drawing LB-153 will be used for chamber dimensions and LB-154 will be used for chamber drawings for the .270 caliber.
- The headspace measurement taken prior to the proof test should be less than min. + .005". If, after proof, the growth of the headspace is more than + .002" from the pre-proof condition, then stop and review the results with the test manager before continuing to the next phase of the test.
- In no case should the measurement for headspace after initial proof test be greater than min. +.007" for a new firearm.
- If at any time during the test program the headspace exceeds a maximum of Min. + .009" do not continue to fire the rifle, tag the gun with a label reading "Do Not Shoot This Firearm – Exceeds Maximum Allowable Headspace" and return the firearm to the Test Manager for disposition.

**Data Required:**

- Rifle serial number
- Record and note any headspace growth and round level.

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**FORCES - TLW0010D THROUGH TLW0010K:**

**TLW0010D - Measure Firing Pin Indent:**

The firing pin indent will be measured for each of the sample rifles using SAAMI qualified copper crushers. The average of three trials per sample rifle will be calculated. The Average of three indents must be equal to or greater than 0.017".

**Method:**

- Using copper crushers, "burnish" both ends of the crusher slug by gently rubbing both ends on the granite base of the dial indicator stand (use outside edge of the plate.)
- Place the copper crusher in a .30-06 / .270-crusher holder, place the crusher holder on the base of the dial indicator and zero the dial indicator with the point of the indicator in the approximate center of the crusher.
- Carefully, with the gun held so that the muzzle is pointed down toward the floor, gently insert the crusher holder into the chamber, being sure that the extractor clearance cut on the crusher is properly oriented relative to the extractor position.
- While maintaining a firm hold on the bolt handle, gently, and slowly ease the bolt forward to the full forward position and then rotate down being sure that the action locks fully.
- Holding the firearm in a horizontal and level position, and pointing the firearm in a safe direction, pull the trigger until the firing pin releases.
- Carefully open the action and remove the crusher holder, being careful not to drop the copper crusher.
- Leave the crusher in the holder and place under the dial indicator.
- Move the crusher holder so that the point of the dial indicator finds the deepest portion of the firing pin indent.
- Record the dial indicator reading to the nearest .001".
- Repeat procedure two more times and record the dial indicator readings using a new copper crusher for each trial.
- Each firearm sample should have three readings that will be averaged.
- Record all three readings for the data file.

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Data Required:

- Rifle serial number
- Each of the three trial indents
- The calculated average indent by rifle.

**TLW0010E - Measure Sear/Trigger Engagement and Sear Lift:**

The Sear/Trigger Engagement will be measured. The amount of engagement must be measured between .020" and .025" measured with the bolt in the fully closed and locked position.

Method for measuring Sear/Trigger Engagement:

- The 30" Optical comparator will be used to measure the engagement at 50X magnification.
- With the barreled action held firmly in position, the barreled action will be aligned such that the action is held perpendicular to the lens in both the horizontal and vertical planes.
- With action closed and locked, the safety in the "fire" position, measure the amount of overlap between the sear and the trigger.

Method for measuring Sear Lift:

- Remove the bolt from the action.
- Place the Safety in the "Off-Safe" (i.e. "Fire") position.
- With the action held firmly in a horizontal position pre-load the sear in the downward position using a small screwdriver and with a dial indicator zeroed on the top of the sear, gently rotate the Safety to the "On-Safe" position.
- Record the amount of vertical movement of the sear.
- Minimum sear lift is 0.006" and maximum sear lift is 0.018"

Data Required:

- Rifle Serial number
- Record Sear/Trigger Engagement
- Record Sear Lift

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**TLW0010F - Measure Trigger Pull Forces:**

Trigger pull (force and displacement required to manually operate the trigger)

**Method:**

- Trigger pull is to be performed to the SAAMI standard; horizontal pull at the center of the finger radius of the trigger using the Test Lab apparatus designed for taking this measurement.
- Use the 1-10 lb. Chatillion Force digital force gauge.
- Force is measured parallel to the bore with the stock assembled to the action.
- Three pulls are to be taken on each sample rifle and the results averaged.
- The average force for the three trials must be between 3.5 lb. and 5.0 lb.

**Data Required:**

- Rifle Serial number
- All three data points for each trial rifle
- The average of the three measurements for each sample rifle

**TLW0010G - Measure Safe On/Off Forces:**

Using the Chatillion Digital force gauge and the wooden holding fixture used to take trigger pull readings, push the Safe to the "Safe Off" position on each test sample. Complete three trials. Record all three readings for each firearm. Repeat the test, this time pushing the Safe to the "Safe On" position on each trial. Record all three readings. Average each of the three sets of readings in each direction for each test sample. These measurements are for information only. A minimum of 1 lb. force in either direction will be assumed as the reference criteria.

**Method:**

- Use trigger pull apparatus to hold the rifle for this test.
- Use the Chatillion Digital Force gauge (0-10 lb. range) with the disc point or the "v" shaped point. Use the same tip on all subsequent trials.
- Make three trials in each direction for each sample.

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- Average the results of each of the three trials.
- For Phase II rifles, the ISS system will be checked.

Data Required:

- Rifle serial number
- Each of the three readings for each direction on each sample
- The average of each of the three sets of readings
- The results of the ISS system check.

**TLW0010H - Measure Bolt Lift and Bolt Closing Forces:**

The force required opening the bolt and closing the bolt will be measured for each sample. Both of these forces will be taken with the chamber empty and then repeated, this time with a new dummy round in the chamber. There is not a specification for these forces and the readings will be taken for information only.

Method:

- After locating the rifle in the trigger pull fixture and securely locking in place, (it may be necessary to clamp the fixture to the bench if not already securely fixed in place), locate the hook of the force gauge at the point on the bolt handle just behind the ball.
- With the chamber empty and using the Chatillion gauge, pull the gauge straight up and perpendicular to the bore, measure the force required to open the bolt.
- Lock the firearm in a horizontal position, using the trigger pull holding fixture, (i.e. shooting position) before taking the measurements.
- Take three readings for each gun in the sample.
- Record all readings.
- Repeat the procedure only this time push the bolt closed.
- Note that it may be necessary to start the bolt closed by hand so the firing pin head is depressed sufficiently out of the notch and can start up the cam surface of the bolt as the firing pin is cocked.
- Repeat the above procedure this time with a new, unused dummy round in the chamber.

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Data Required:

- Rifle serial number
- Each of the three readings taken for each of the 4 states for each test sample
- The average of each set of three measurements per state

TLW00101 - Measure Magazine Spring Force:

The force produced by the compression of the Magazine Spring in the box with the follower attached will be measured. These measurements will be taken for information only. There is no specification currently defined for this characteristic.

Method:

- Use the Chatillion TCD200 Spring Testing Machine with the Chatillion Digital Force Gauge (0-10 lb. range). Use the disc probe (1/2" dia.) on the gauge.
- Place the magazine box, bottom side down, on the staging table.
- Zero force gauge with no load applied.
- Lower the gauge until it just touches the magazine follower, approximately in the middle location both side to side and front to rear.
- Zero force gauge again if necessary.
- Lower the gauge 0.200" and take the spring force measurements.
- Lower the gauge another 1.0".
- Take the force measurement at this depressed location of the spring.
- Repeat procedure two additional trials for each box.
- Average the 3 trials for each box and at each measurement location.

Data Required:

- Force Measurements taken on each trial per box at each of the measurement locations.
- The Average Force measurement per box.
- The serial number of the Chatillion Digital Force Gauge used for the procedure.

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**TLW0010J - Measure Recoil Force:**

Using the Remington designed recoil force device, measure the recoil forces for both the .30-06 and .270 caliber rifles. This test will only be done during Phase II with the synthetic stocks assembled to the actions. The measurements will be taken for information only.

**Method:**

- Assemble device to stock.
- Shoot the test in "blow-up" range using the jack. Fire the rifle remotely. (As an alternative, the rifle may be shot from the shoulder, with prior review of the safety status of the firearms.)
- Use the round with the heaviest available factory bullet.
- Shoot ten rounds per sample rifle.
- Average the ten rounds for each sample.

**Data Required:**

- Rifle serial number
- The peak force and area under the curve will be calculated for each shot for which data is captured.
- A plot of each shot, 4 signals captured per shot (3 for force and 1 for acceleration.)
- The average for peak force and areas under the curve of the ten trials per rifle.

**TLW0010K - Measure Lock Time:**

Using the Remington method of measuring Lock Time, measure the lock time on the sample rifles provided. Do three trials on each sample rifle. Average the three trials. This data is for information only. The expectation is that lock time will be in the 3-msec. range. This test is scheduled for Phase I testing but may have to be postponed until Phase II if the metal stocks create a measurement problem.

**Method:**

- Standard Remington Lock Time Measurement procedure. (Sear Safety Cam release to 1<sup>st</sup> firing pin contact with the primer.)

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- Measure three lock times per sample rifle

Data Required:

- Rifle serial number
- Each lock time trial
- Average lock time per rifle
- Settings used on the equipment.

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**WEIGHTS OF MAJOR COMPONENTS - TLW0010L THROUGH TLW0010O:**

*Note: The Weight measurements are scheduled for Phase II when the synthetic stocks are available for test.*

**TLW0010L - Overall Weight:**

The test samples will be weighed on the Mettler Toledo digital balance (PB8000) located in the Metrology Lab. The rifles will be weighed once each with the chamber and magazine empty. The rifle will have only the open sights attached, no scope or other accessories attached.

**Method:**

- Clean the platen of the digital balance, if necessary.
- If the balance is not already on and has been turned on at least 30 minutes for warm-up, turn the balance on and wait 30 minutes for the balance circuitry to stabilize.
- Run the balance calibration routine if necessary.
- Make sure the units are set to "lb."
- With the chamber empty and the magazine box empty of rounds, carefully place the rifle on its left side with the rifles approximate front to rear balance point directly over the center of the balance platen.
- When the scale settles down, record the weight in lb. to the nearest 0.1 lb. (Note that the scale has three decimal points displayed.)

**Data Required:**

- Rifle serial number
- Weight to the nearest 0.1-lb.
- Serial number of the Mettler PB8000 balance (it should be SN 2114475246)

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**TLW0010M - Weight of Stock Assembly:**

The stock, disassembled from the barreled action, will be weighed. (Synthetic stock only.) The test samples will be weighed on the Mettler Toledo digital balance (PB8000) located in the Metrology Lab. The rifle's stocks will be weighed once each.

**Method:**

- Clean the platen of the digital balance, if necessary.
- If the balance is not already on and has been turned on at least 30 minutes for warm-up, turn the balance on and wait 30 minutes for the balance circuitry to stabilize.
- Run the balance calibration routine if necessary.
- Make sure the units are set to "lb."
- Label the stock as to which barreled action it came from.
- Carefully place the stock on its left side with the stock's approximate front to rear balance point directly over the center of the balance platen.
- When the scale settles down, record the weight in lb. to the nearest 0.1 lb. (Note that the scale has three decimal points displayed.)

**Data Required:**

- Rifle serial number
- Weight to the nearest 0.1-lb.
- Serial number of the Mettler PB8000 balance (it should be SN 2114475246)

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**TLW0010N - Weight of Barrel Assembly:**

The barreled action, disassembled from the stock, will be weighed. Remove the bolt assembly from the barreled action. The test samples will be weighed on the Mettler Toledo digital balance (PB8000) located in the Metrology Lab. The rifle's barreled actions will be weighed once each.

**Method:**

- Tag the bolt so that it is labeled with the last four digits of its rifle's serial number. This bolt assembly must be returned to its original rifle or the headspace may change.
- Clean the platen of the digital balance, if necessary.
- If the balance is not already on and has been turned on at least 30 minutes for warm-up, turn the balance on and wait 30 minutes for the balance circuitry to stabilize.
- Run the balance calibration routine if necessary.
- Make sure the units are set to "lb."
- Carefully place the barreled action on its left side with the barreled action's approximate front to rear balance point directly over the center of the balance platen.
- When the scale settles down, record the weight in lb. to the nearest 0.1 lb. (Note that the scale has three decimal points displayed.)
- Re-assemble the stock on its corresponding barreled action.

**Data Required:**

- Rifle serial number
- Weight to the nearest 0.1-lb.
- Serial number of the Mettler PB8000 balance (it should be SN 2114475246)



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**TLW00100 - Weight of Bolt Assembly:**

The bolt assembly, disassembled from the rifle, will be weighed. The test samples will be weighed on the Mettler Toledo digital balance (PB8000) located in the Metrology Lab. The rifle's bolt assembly will be weighed once each.

**Method:**

- Check to be sure that the bolt is correctly tagged with the last four digits of its rifle's serial number. This bolt assembly must be returned to its original rifle or the headspace may change. 83
- Clean the platen of the digital balance, if necessary.
- If the balance is not already on and has been turned on at least 30 minutes for warm-up, turn the balance on and wait 30 minutes for the balance circuitry to stabilize.
- Run the balance calibration routine if necessary.
- Make sure the units are set to "lb."
- Carefully place the bolt assembly with the bolt assembly's approximate front to rear balance point directly over the center of the balance platen.
- When the scale settles down, record the weight in lb. to the nearest 0.1 lb. (Note that the scale has three decimal points displayed.)
- Re-assemble the bolt on its corresponding barreled action.

**Data Required:**

- Rifle serial number
- Weight to the nearest 0.1-lb.
- Serial number of the Mettler PB8000 balance (it should be SN 2114475246)

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**LENGTHS OF MAJOR COMPONENTS - TLW0010P THROUGH TLW0010R:**

**TLW0010P - Overall Length:**

Phase II measurement of Overall Length of the firearm. For information only.

**Method:**

- Set butt of gun on the floor near a wall
- Bring the top of the barrel to the wall so that the top of the barrel lies even with the wall surface
- Measure the distance from the floor to the end of the muzzle using a tape measure

**Data required:**

- Rifle Serial number
- Measurements for each sample rifle.

**TLW0010Q - Barrel Length:**

Measure the length of the barrel. For the .30-06 and .270 caliber, the barrel length should be 22"  $\pm$  .125" measured from the bolt face to the end of the muzzle.

**Method:**

- Check firearm for live ammunition
- Close bolt over and empty chamber
- With the butt of the rifle on the floor and the muzzle pointing up, carefully and gently, so as to not scratch the bore or nick the rifling, insert a brass rod (not steel) into the muzzle of the rifle until it stops on the bolt face. Move the brass rod around to insure that you are on the bolt face and not on the edge of the ejector or extractor.
- Carefully mark the brass rod where it is even with the edge of the muzzle
- Remove the rod and measure the length.

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