

U-03a: Clean Linear Scale (Farrand)

SAFETY FIRST

- Follow all Caterpillar facility safety standards when performing this task.
- To prevent unanticipated axis movement, lock and tag the machine before cleaning the scales. You will be working in the area around the machine table.

EQUIPMENT

- analog ohmmeter
- scale
- isopropyl alcohol or other approved cleaning solution
- paper towels

RESOURCES

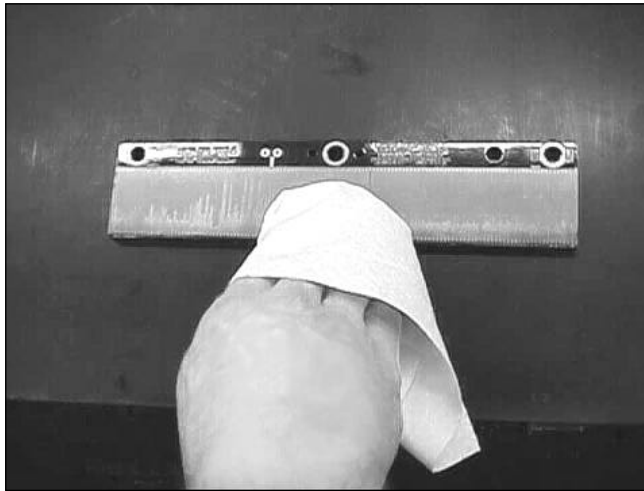
- none required

Clean Linear Scales

1. Ask the Operator to power down the machine.
2. Perform a lockout/tagout on the machine.
3. Remove the scale cover.



4. Clean the scale. See the figure below.



Cleaning the Scale Surfaces

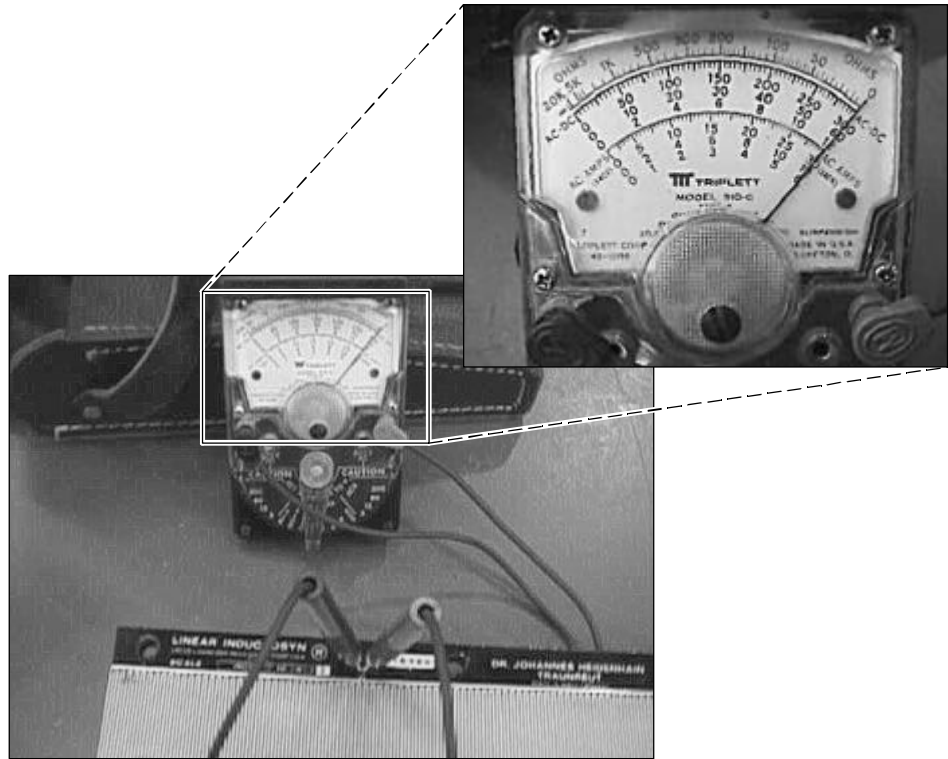
- Apply cleaning solution to the paper towel.
- Wipe off the front, back, and lower edge of the scale.

Note: Coolant collects along the lip of the scale cover and the bottom edge of the scales during machine operation. Over time, the exposure to the coolant corrodes the scale surface. This is a common cause for “loss of feedback” fault messages.

5. Inspect the scale.
 - Check the surface of the scale for nicks, cuts, and abrasions. The scale is covered with a polymer-type material. A nick or abrasion that penetrates the covering can cause a ground problem.
 - If the scale is damaged, do not continue with the cleaning process. The scale must be replaced. Perform the procedure for scale replacement.

6. Check the scale for continuity.

- Connect the analog meter to the scale, as shown below.

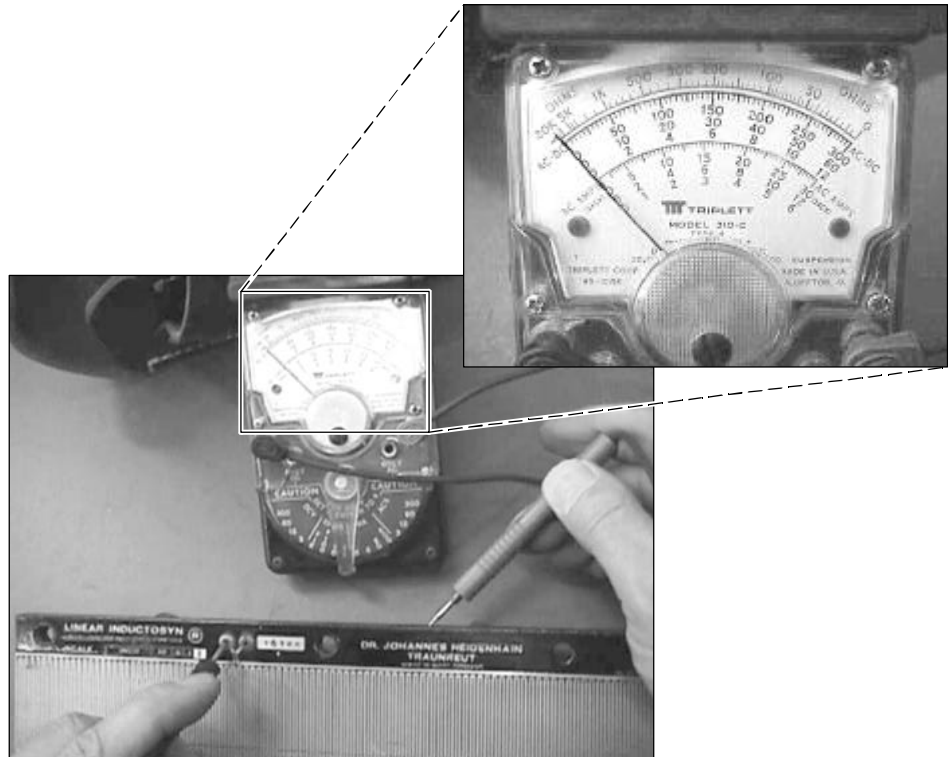


Probe Placement for the Continuity Check

- Expect a reading of 4 ohms or less. A reading greater than 4 ohms indicates a defective scale. The scale must be replaced. Perform the procedure for scale replacement.

7. Check the ground.

- Connect the analog meter to the scale, as shown below.



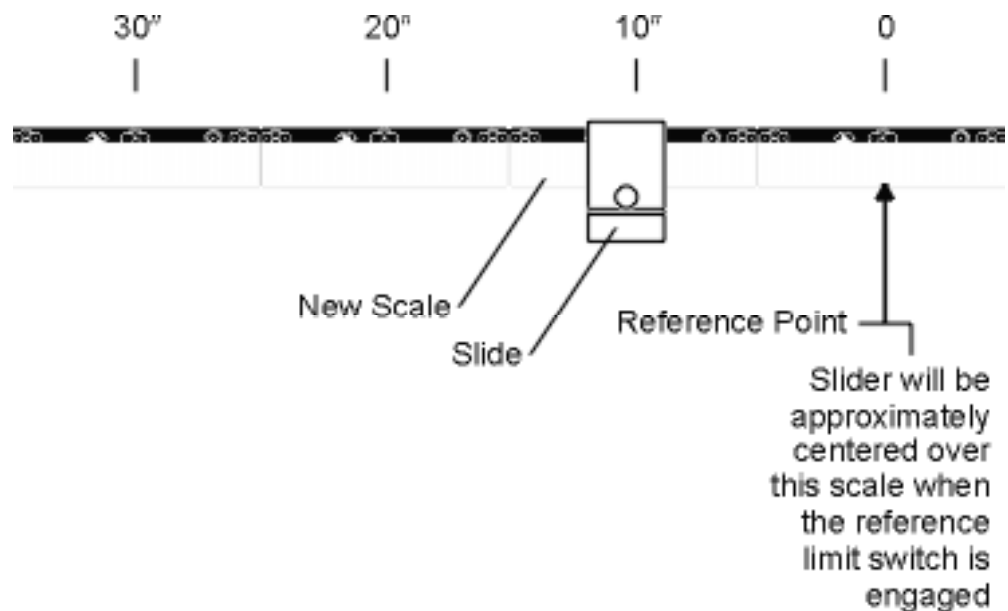
Probe Placement for the Ground Check

- Expect a ground reading of infinity. The scale is defective if the reading is not infinity. Do not continue with the cleaning process. Perform the procedure for scale replacement.

8. Install the scale.

- Install the three mounting screws hand-tight. You need to be able to nudge the scale in the right and left directions during the laser alignment process so do not over-tighten them.
- Attach the wires to the scale in the same sequence they were removed. The scale segments are attached in series.
- Reconnect the two wires at the preamp.

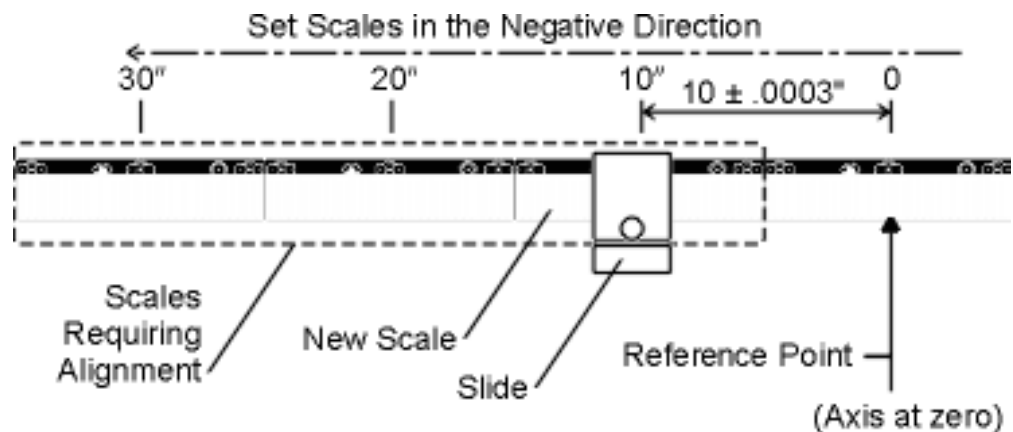
9. Prepare for the alignment process.
 - Inform the PMP Technician and the Machine Operator that you are ready for scale alignment. The PMP Technician will set up the required alignment equipment. The Machine Operator will assist by positioning the axis, as needed, during the alignment process.
10. Ask the Machine Operator to establish the machine reference point.
 - Ask the Machine Operator to reference the table.
 - Ask the PMP Technician to zero the laser readout when the table has the reference limit switch engaged.



Established Machine Reference Point

11. Align the scales.

- Ask the Machine Operator to position the 10 inches past the center of the new scale. For example: Ask the machine Operator to position the machine at 20". Refer to the example shown in the figure below.
- Ask the Machine Operator to position the machine at the center of the new scale. For example: Ask the Machine Operator to position the machine at 10". Refer to the example shown in the figure below.
- If the reading is below the allowable tolerance, insert the alignment tool into the adjustment hole and adjust the scale in the negative direction until the scale is within tolerance.
- If the laser readout is above the tolerance limit, insert the alignment tool into the adjustment hole and adjust the scale in the positive direction. Adjust until the laser readout is below the tolerance limit. Repeat the three previous steps.
- Set the scales in a negative direction, as shown in the figure below.



- The tolerance limit is $10 \pm .0003$ inches, as stated earlier. Ask the Machine Operator to move the table in 10" segments. Check every scale in the series and align all scales that require alignment.

12. Replace the scale cover.
13. Remove the lock and tag.
14. Inform the Operator that the scales have been cleaned.
15. Clean up the work area.
16. Document the work history.