BL-02: Align a Tool Changer (Kearney Trecker - LL Pit Machines)

SAFETY FIRST

- ☐ Follow all Caterpillar facility safety standards when performing this task.
- ☐ Floor surfaces around the tool changer may be covered with oil or cooling fluids. Exercise caution when moving around the tool changer area.
- ☐ Tool alignment parts may be heavy. Exercise caution when handling the parts.
- ☐ Always perform the alignment in the MANUAL mode of operation.

EQUIPMENT

- ☐ setup rings
- ☐ dial indicator alignment tool
- ☐ paper suit, as necessary
- ☐ pen or pencil
- ☐ paper
- ☐ grease pencil or chalk
- ☐ machine operator / electrician (to operate machine cycles)

RESOURCES

- ☐ machine alignment specifications

Align a Tool Changer

Note: Someone familiar with the machine's control will be needed to assist in this procedure. Make no adjustments until all tool change alignments have been checked and recorded. This procedure assumes that the home positions of the axes are consistent and correct. It also assumes all tool change components are in good mechanical condition.

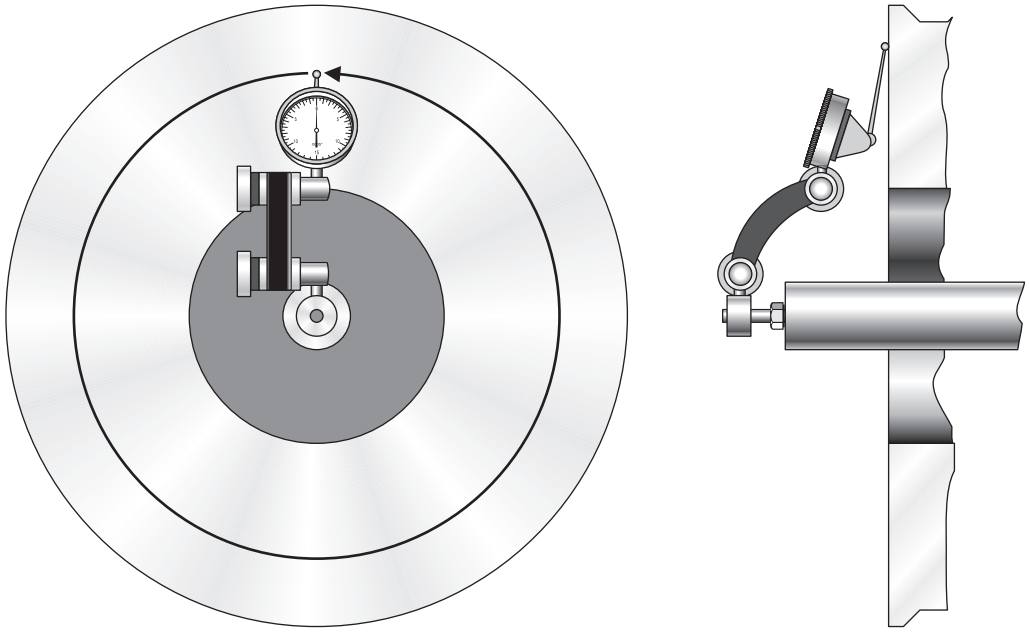
1. Observe the tool change cycle.

- ☐ Check and replace as necessary the eight roller bearings supporting the tool changer platform. Damaged bearings can cause tool changer misalignment.

- ☐ Run the warm-up program long enough to allow the spindle bearings to warm up and the tool changer components to become fully lubricated.
- ☐ Perform several automatic tool changes. Observe the movements between the tool chain, tilt head, select arm, and spindle for problems such as binding, jerking, or rocking.

2. Check the alignment of the change arm to spindle.

- ☐ Inspect the change arm clamps for wear. Excessive wear can contribute to misalignment.
- ☐ Mark the two ends of the change arm using a grease pencil or chalk. When taking the readings involving the change arm, note which end is being checked.
- ☐ Rotate the change arm to 90 degrees or horizontal position.
- ☐ Unclamp the change arm, place the setup rings in the change arm, and clamp the change arm.
- ☐ Unclamp the spindle collet, insert the indicator tool through the setup ring, and clamp the spindle collet.
- ☐ Set up the dial indicator on the face of the setup ring. See the figure below.

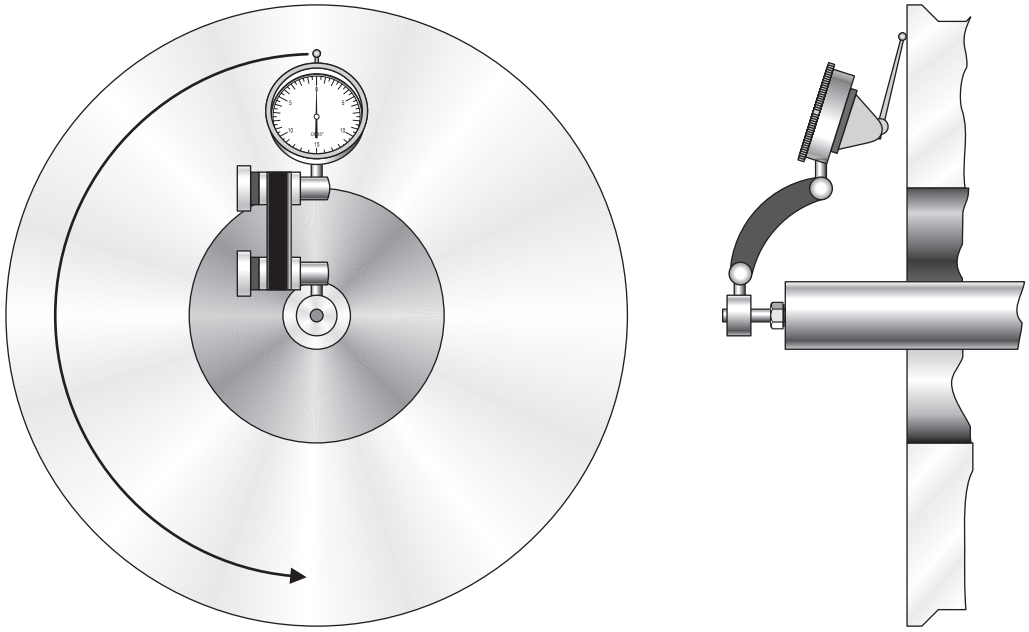


Position of the Dial Indicator

- ☐ Adjust the position of the indicator so the face can be read when the dial indicator is rotated 360 degrees.
- ☐ Position the dial indicator needle on the face of the ring.

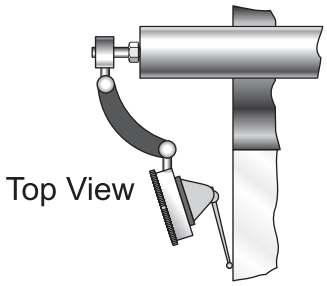
Note: A needle angle of 10 degrees or more from the face will lessen accuracy.

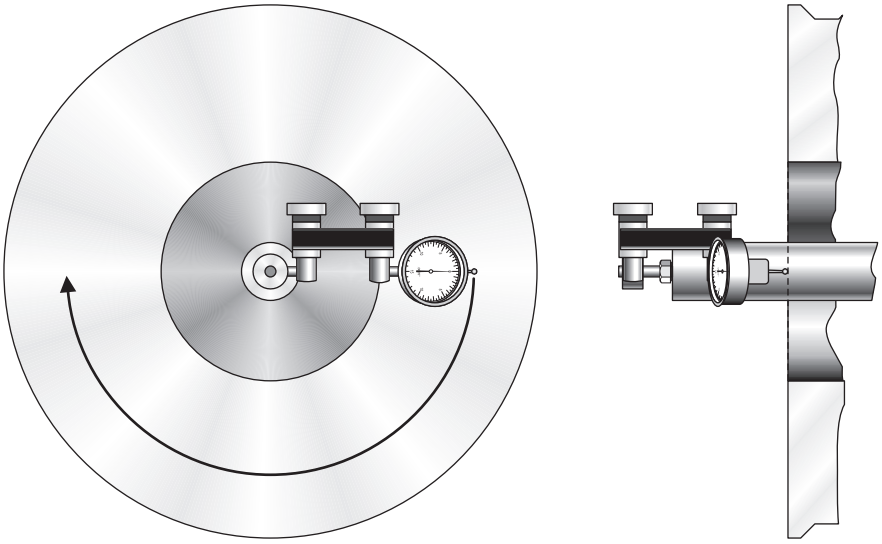
- ☐ Rotate the indicator to ensure that the needle remains in contact with the ring face. If the needle does not remain in contact, apply more pressure to the needle.
- ☐ Rotate the indicator until it is positioned on the face of the ring at the 12 o'clock position.
- ☐ Set the dial to read zero and sweep the indicator to the 6 o'clock position.
- ☐ Record the readings. The figure below shows the area sweep with the indicator.



Rotate the Dial Indicator

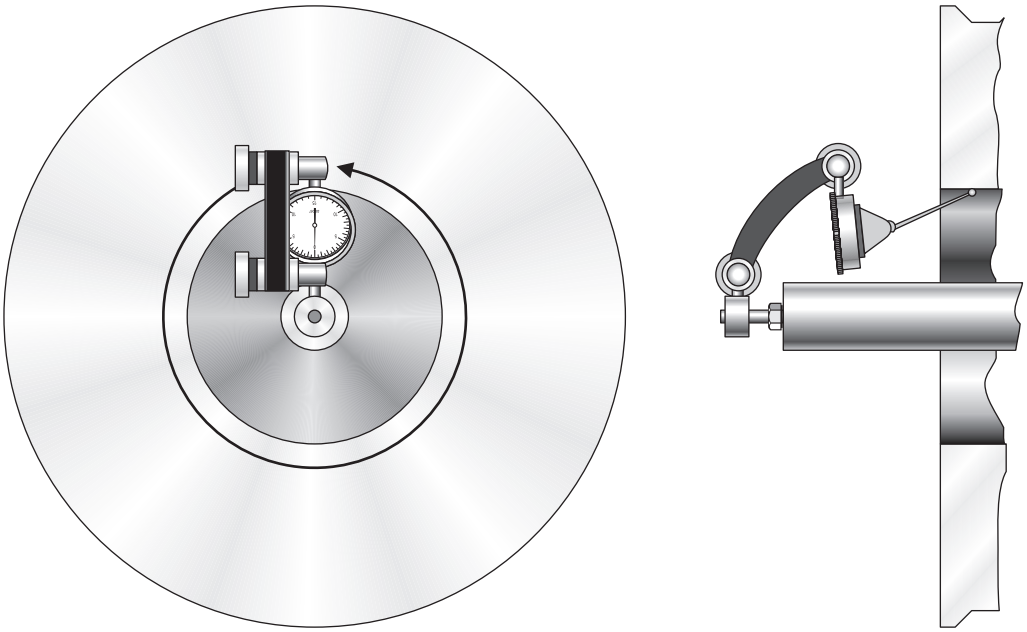
- ☐ Sweep the face from 3 to 9 o'clock to record these readings. See the figure below.





Sweep from 3 o'clock to 9 o'clock

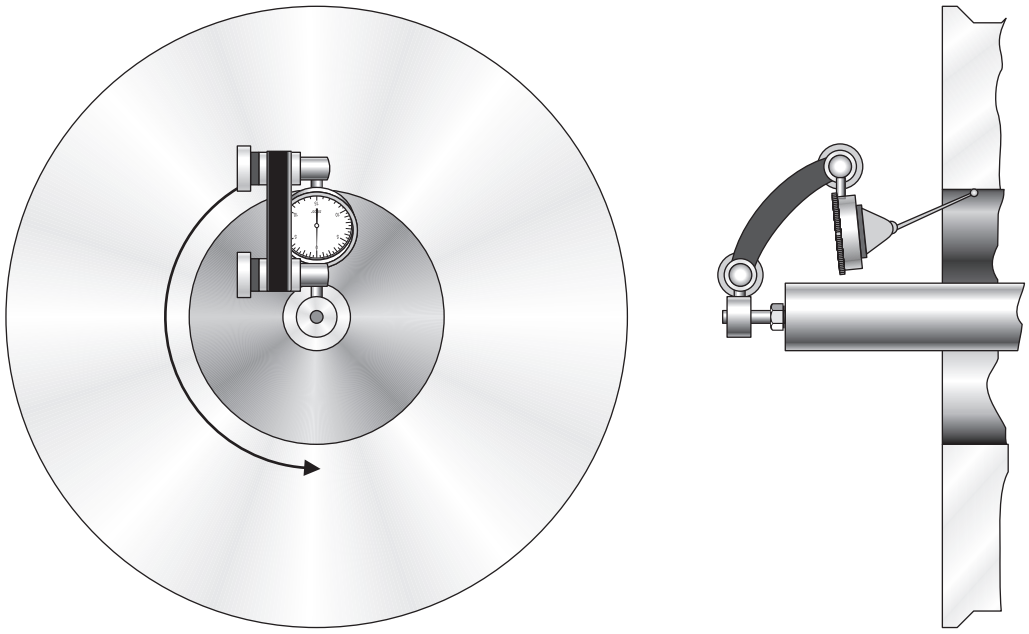
- Set the indicator to sweep the bore of the setup ring. See the figure below.



Dial Indicator Set Up in the Bore

- Rotate the indicator to ensure that the needle remains in contact with the bore. If the needle does not remain in contact with the bore, apply more pressure to the needle.
- Rotate the indicator until it is positioned against the bore at the 12 o'clock position.

- ☐ Set the indicator to zero and sweep to the 6 o'clock position. The figure below shows the area sweep with the indicator.



Sweep this area with the indicator.

- ☐ Physically center the change arm until the indicator reads the same at the 6 and 12 o'clock positions.
- ☐ Reset the indicator to zero. Check the 3 and 9 o'clock positions and record these readings.
- ☐ Unclamp the spindle collet and remove the indicator tool. Leave the change arm centered vertically to the spindle.

3. Check the alignment of the tilt head to the change arm.

- ☐ Raise and unclamp the tilt head.
- ☐ Insert the indicator tool through the setup ring into the tilt head collet. Clamp the tilt head.
- ☐ With the change arm centered vertically with the spindle, check and record bore and face indicator readings of the tilt head to change arm alignment.
- ☐ Unclamp the tilt head and remove the indicator tool.

4. Rotate the change arm 180 degrees and recheck.

- ☐ Extend, rotate 180 degrees, and retract the change arm.
- ☐ Check and record the face and bore indicator readings at both ends of the change arm.
- ☐ Take all change arm readings, and then remove the indicator tool from the spindle or tilt head collet.
- ☐ Carefully remove both setup rings from the change arm.

Caution: Unclamping the change arm may allow the ring in the spindle end of the arm to fall.

- ☐ Lower the tilt head and return the change arm to the vertical position.

5. Check the alignment of the select arm to the tilt head.

- ☐ Place the setup ring in the select arm and clamp the select arm.
- ☐ Position the select arm over the tilt head.
- ☐ Clamp the indicator tool in the tilt head. Check and record the face and bore indicator readings of the tilt head / select arm alignment.
- ☐ Remove the indicator tool and the setup ring.

6. Align the tool change components.

- ☐ Review your indicator readings and alignment notes to gain an overview of the parts or the machine that are misaligned.
- ☐ Position the spindle at the Y and Z homes for a tool change. Moving the home positions affects the quality of the parts. Therefore, the sequence of alignments is as follows: the change arm aligns to the spindle; the tilt head aligns to the change arm; and the select arm aligns to both the tilt head and the tool chain.
- ☐ Loosen the locking nuts and adjust the jack screws located at the base of each component. Performing the (up / down, right / left, and front / back position) adjustments on the changer arm, select arm, and tilt head as needed.
- ☐ Make each alignment using the setup rings and indicator tools for reference.
- ☐ Make all alignments within .010” or less.

7. Align the change arm.

- ☐ Loosen the locking nuts at the base of the change arm. Adjust the jack screws until the change arm is aligned to the spindle.
- ☐ Tighten the locking nuts wrench-tight to secure the alignment.
- ☐ Adjust the change arm rotational stops to set the rotary positions.

8. Align the tilt head.

- ☐ Loosen the locking nuts and adjust the jack screws to align the tilt head to the change arm.
- ☐ Tighten the locking nuts wrench-tight to secure the alignment.
- ☐ Adjust the tilt head stops to set the raised and lowered positions.

9. Align the select arm.

- ☐ Ensure that the select arm is centered around a tool when picking it up from the chain and that the tool is centered over the tilt head when placing the tool in the tilt head.

Note: The travel of the select arm is a multiple adjustment: an adjustment at the base and an adjustment of the extending cylinders. The base adjustment positions the tilt head over the tilt head and tool chain properly; the cylinder adjustments stop the select arm travel in the correct places. An accurate alignment may require a combination of the two adjustments.

- ☐ Loosen the locking nuts and adjust the jack screws to align the select arm to the tilt head and the tool chain.
- ☐ Tighten the locking nuts wrench-tight to secure the alignment.
- ☐ Adjust the cylinder rods to position the select arm over the tilt head and tool chain.

10. Return the machine to normal operations.

- ☐ Remove the setup rings and indicator tool. Return the machine to normal operations.
- ☐ Return the setup rings and indicator tool to the maintenance area.
- ☐ Document the work history.