BL-03: Align Tool Changer (Cincinnati)

SAFETY FIRST

- ☐ Follow all Caterpillar facility safety practices when performing this task.
- ☐ Electrical power must be on while aligning the tool changer. Use extreme caution when jogging the tool changer to different positions.

EQUIPMENT

- ☐ Machine Tool Changer Alignment Kit
- ☐ Allen wrenches
- ☐ adjustable wrench
- ☐ flashlight
- ☐ warning tag
- ☐ shims for cap on tool changer arm
- ☐ metal piece to block door proximity switch
- ☐ metal object to block tool changer rotating arm proximity switch

RESOURCES

- ☐ machine manufacturer's specifications / manuals
- ☐ operator with knowledge of machine operation to jog the machine during adjustment

Align Tool Changer (Cincinnati)

1. Prepare tool changer for alignment.

Caution: It is important that you do not turn the control panel off.

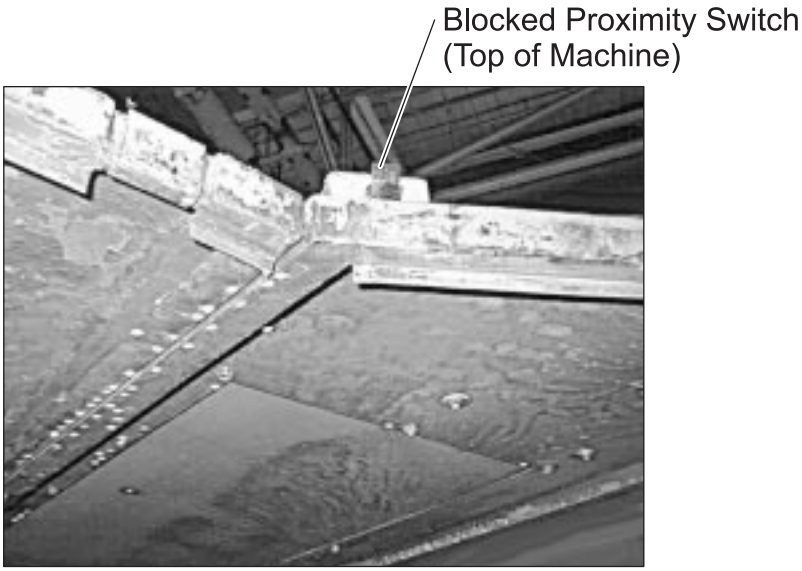
- ☐ Attach a warning tag to the control console to show that there is a repairman in the machine.

2. Place the machine in tool change position.

- ☐ Check AXIS ALIGN button on the control console. If the indicator light is not illuminated, press the AXIS ALIGN button.
- ☐ Check MECH ALIGN button on the control console. If the indicator light is not illuminated, press the MECH ALIGN button.

Note: If in "shuttle pending" mode, which it will tell you on the lower left corner of the screen, you must get out of that mode.

- ☐ Press DATA RESET (under Emergency Stop).
- ☐ Press MDI.
- ☐ If there is a tool in the spindle pocket, type in M52 and press CYCLE START on the control console keyboard (bottom row).
- ☐ Press the MECH MANUAL button on the control console to put the machine in manual mode.
- ☐ Open the doors to the tool changer area.
- ☐ Block the proximity switch on the door (as shown below) so the machine can be jogged during alignment.



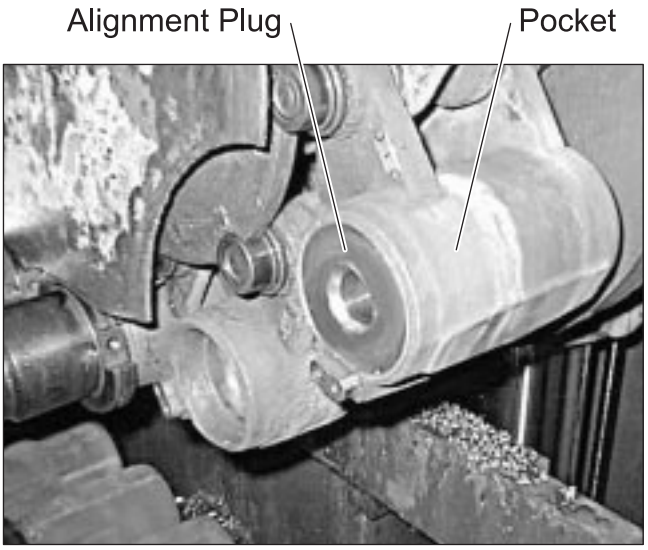
Door Switch Blocked

3. Adjust the tool changer arm for alignment with the tool chain.

- ☐ Ask the operator / assistant to move the tool changer assembly to the tool chain position. Make sure tool #1 is in the right position.

Caution: Stay clear of the rotating assembly.

- ☐ Check the bolts in the change arm.
- ☐ If a tool is in the #1 pocket in the tool chain, remove it.
- ☐ Place the alignment plug, from the alignment kit, in the #1 pocket, as shown below.



Alignment Plug in #1 Pocket

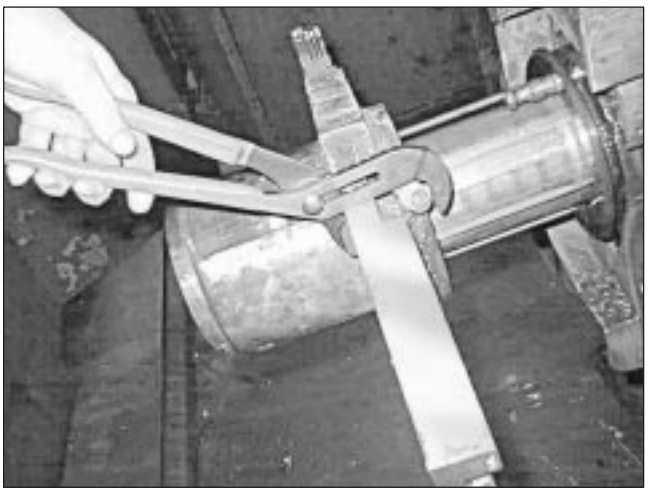
Caution: Stay clear of the rotating arm.

- ☐ Ask the operator / assistant to rotate the arm clockwise with the manual jog button on the side of the machine.

Caution: Stay clear of the moving arm.

- ☐ Ask the operator / assistant to move the arm out.

- ☐ Use adjustable pliers to squeeze the spring arm lever, to insert the alignment disk in the hand of the tool changer arm. If needed, ask for assistance to insert the disk while you squeeze.



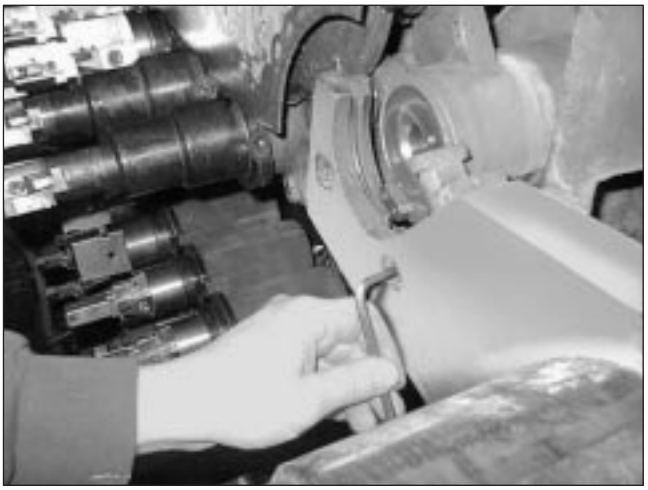
Insert the Alignment Disk

Caution: Stay clear of the moving arm and the entire tool changer assembly.

- ☐ Ask the operator / assistant to move the arm back in.

Caution: Be careful to avoid being struck by the arm.

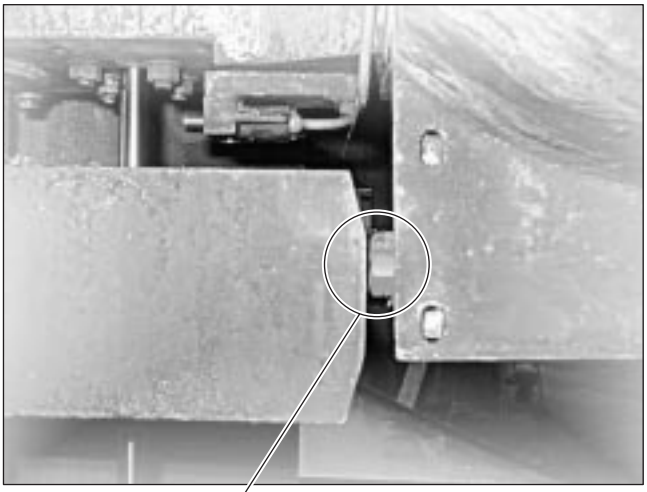
- ☐ Insert the alignment pin from the adjustment kit through the alignment disk and into the plug. If the pin will not insert smoothly, the key may be misaligned.
- ☐ If necessary, slightly adjust the key on the tool changer arm using the Allen head screws on the tool changer hand, as shown below.



Adjusting the Key

- ☐ Verify the key on the hand is aligned with the tool key.
- ☐ Down by the lower chair, check height alignment. If height adjustment is necessary, grind or shim the hard washer located on the rod that actuates the tool changer assembly from chain A to chain B.
- ☐ Ask the operator or assistant to move chain B so there is an empty pocket at tool change position.
- ☐ Insert the plug into the empty pocket.
- ☐ Leave the disk in the arm.
- ☐ Insert pin and adjust.
- ☐ Ask the operator / assistant to move the tool changer arm from chain A to chain B to confirm chain-to-chain alignment.
- ☐ Check for horizontal misalignment.
- ☐ Shim the adjustment pins on the top and bottom of the tool changer arm assembly, as shown below, to correct horizontal misalignment.

Note: Do not grind shims, they will peel off.

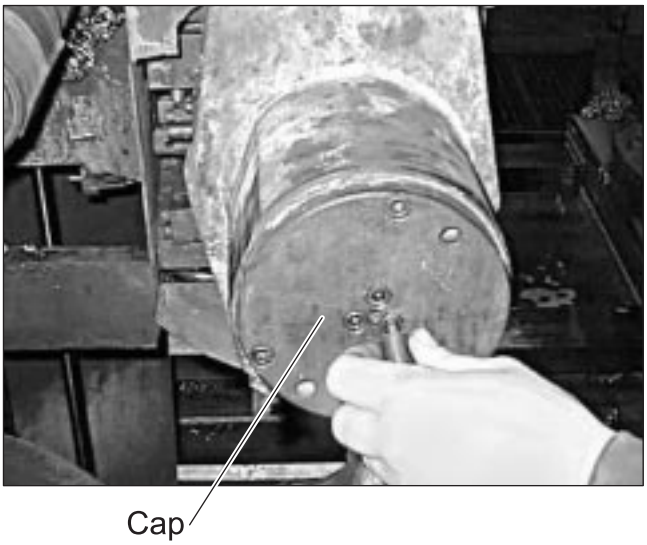


Horizontal Adjustment Pin

- ☐ Ask the operator / assistant to move the tool changer arm out.
- ☐ Remove the alignment disk.
- ☐ Ask the operator / assistant move the tool changer arm in.
- ☐ Check for angular misalignment of the key on the tool changer hand and the tool key.

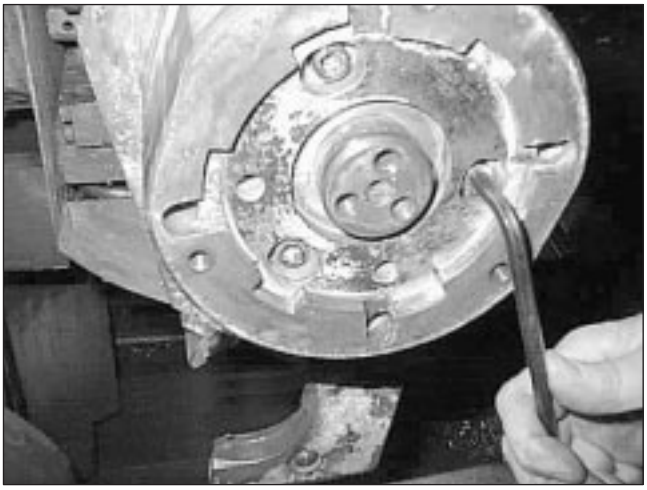
☐ Correct angular misalignment, if necessary.

a. Remove the cap from the end of the tool changer arm using appropriate Allen wrench, as shown below.



Removing the Cap

b. Loosen all three Allen head screws inside the cap, as shown below.



Arm Clamp Screws

c. Manually move the arm until the key angles match.

d. Tighten the Allen head screws.

e. Replace the cap on the end of the tool changer arm.

- ☐ Check for misalignment between the groove on the hand and the groove on the alignment disk.
- ☐ Correct misalignment if necessary.
    a. Remove the cap from the end of the tool changer arm as in the previous procedure.
    b. Add or remove shims from the cap head, as shown below.

Shimming to Correct Groove Misalignment

    c. Replace the cap on the end of the tool changer arm.

- ☐ Check for play (looseness, lost motion) in the tool changer assembly.
- ☐ Remove play, if necessary.
    a. Ask the operator / assistant to move the tool changer assembly to the spindle position.
    b. Visually check the hydraulic arm for proper operation. It is a go or no go. Wiggle the tool changer arm to see if the arm is loose, use a wrench to tighten the tool changer arm connection. If it requires adjustment, ask the operator / assistant to relieve hydraulic pressure.
    c. Ask the operator / assistant to restore hydraulic pressure.
    d. Ask the operator / assistant repeat the "AXIS ALIGN" and "MECH ALIGN" procedures.
- ☐ Check for play again.

- ☐ If you cannot shim or adjust to, remove remaining play.

  a. Remove cylinder mounting blocks for rebushing or reboring in the shop. See the figure below.

  b. Remove rod end attachment for remachining in the shop.

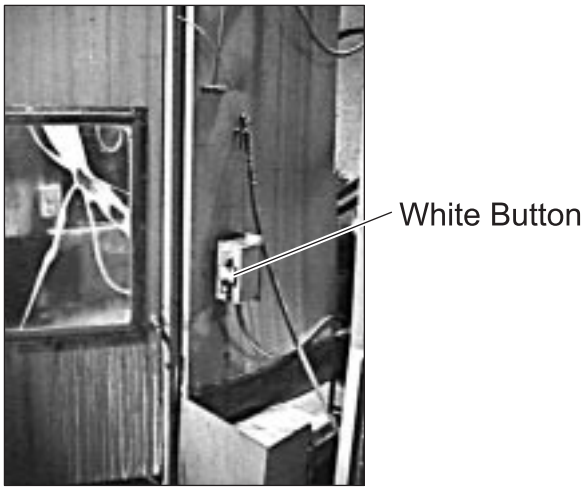
- ☐ Remove the plug from pocket #1 on the tool chain.
- ☐ Place the tool previously removed from pocket #1 on the tool chain.

4. Adjust spindle for alignment with tool changer assembly.

Note: Start here if dropping tools under spindle.

- ☐ Verify “AXIS ALIGN”. If necessary, repeat “AXIS ALIGN” procedure.
- ☐ Verify “MECH ALIGN”. If necessary, repeat “MECH ALIGN” procedure.
- ☐ Remove the metal piece from the door proximity switch.

- ☐ Hold in the white button on the side of the door. See the figure below.



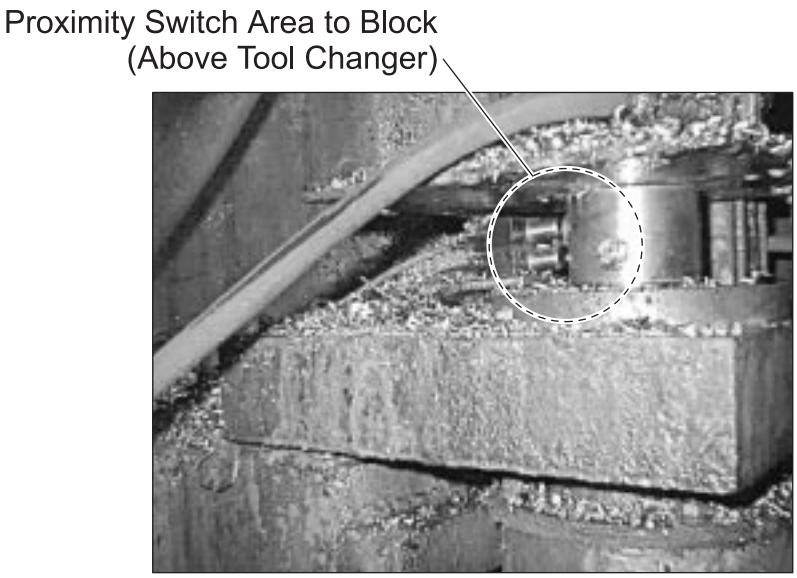
- ☐ Install the plug in the spindle.
- ☐ Reblock the door proximity switch.
- ☐ Put in MECH MANUAL.
- ☐ Move the tool changer assembly to the spindle position from the control console.
- ☐ Ask the operator / assistant to move the arm clockwise to spindle position.
- ☐ Visually verify key alignment inside the spindle pocket.
- ☐ Have the operator / assistant move the change arm out.
- ☐ Place the adjustment disk back into the change arm as in the previous section.
- ☐ Ask the operator / assistant to move the change arm back in.

Caution: May drop plug.

- ☐ Insert the alignment rod into the alignment disk and through to the plug.
- ☐ Correct misalignment, if necessary.
    a. Press the machine “SETUP” button on the control console (hard key).
    b. Press “ACCESS” on the console touch screen. Note: Press “ESCAPE” to take you back one step in the event of an error.
    c. Press “SERVICE” on the console touch screen.
    d. Press “SYS. COMM” on the console touch screen.

e. Check data for the x and y axis automatic tool change position listed in the manufacturer's manual. The manual tells you which munbers are "X" and which are "Y". (56 and 57)

f. Block the proximity switch on the tool changer assembly rotating arm with a metal object so that the machine thinks the tool changer is at the tool chain position, allowing you to use the hand wheel for adjustment. See the figure below.



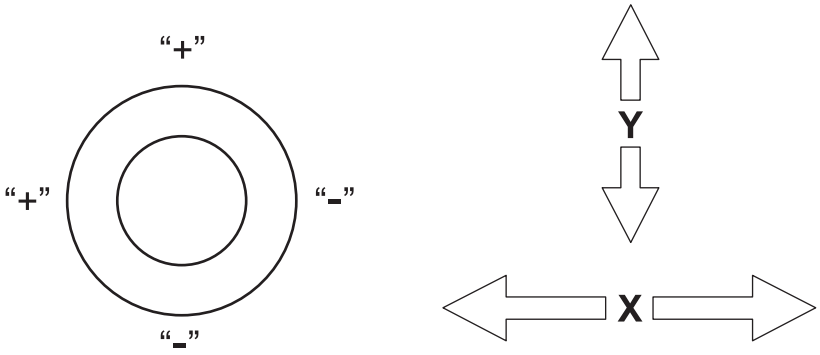
Rotating Arm Proximity Switch

g. Highlight whichever axis (X or Y) on the control console (to the right of the handwheel).

h. Press RUN (hard key).

i. Using the hand wheel on the control console, adjust either or both axes to line up the spindle with the tool changer arm. See the figure below.

Axis Handwheel



j. Check for alignment using the alignment pin.

k. Record the values for the X and Y using the previous procedure (page 14 #3d).

m. Use the arrow key to highlight the axis that needs to be adjusted.

n. Press "MODIFY" (on the control console touch screen).

o. Using the keypad on the console, enter the number for the corresponding axis from the MDI screen.

p. Press "ENTER" (on the keypad).

q. Press "RUN" (hard key).

- ☐ Remove the object blocking the tool changer rotating arm proximity switch.
- ☐ Ask the operator / assistant to move the tool changer arm out.
- ☐ Remove metal blocking the door proximity switch.
- ☐ Press the white button on the side of the door.o Pull the alignment plug out. (You may need to tap on the plug to get it to release.)
- ☐ Ask the operator / assistant to move the tool changer arm in.
- ☐ Ask the operator / assistant to return the tool changer assembly to the tool chain position.

5. Input the Value changes. (This is done only if you had to change the X or Y values.)

- ☐ Press E-STOP.
- ☐ Press MACHINE OFF. (square red button-this locks the new number in the disk)
- ☐ Press CONTROL INITIALIZED.
- ☐ Press MASTER START.
- ☐ Press RUN.
- ☐ Press AXIS ALIGN and hold until the screen shows alignment.
- ☐ Reblock the door proximity switch.

6. Check operation of the tool changer.

Note: If values were changed, you will have to do the first two blocks.

- ☐ Pull out the E-STOP.
- ☐ Press “MASTER START”.
- ☐ Press “MECH ALIGN”.
- ☐ Press MDI (hard key).
- ☐ Verify that the machine loads the tool correctly.
- ☐ Enter “M52” to store all tools.
- ☐ Press CYCLE START.
- ☐ Remove all alignment tools from the machine and store in alignment kit.

- ☐ Remove the blocking device from the door proximity switch.
- ☐ Close the machine doors.
- ☐ Remove the warning tag from the console.