

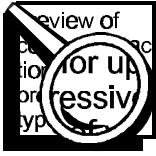
BL-04

MAINTENANCE MECHANIC TRAINING

SKILL DEVELOPMENT GUIDE

**Duty BL: Tool Changers
BL-04: Align Tool Changer (G & L)**

Issued 06/01/98



Task Preview

Align Tool Changer (G & L)

The tool changer components requiring alignment include the spindle, swing spindle, exchange arm and tool chain. For smooth tool change operation, the following must be aligned:

- spindle to the exchange arm.
- swing spindle to the exchange arm.
- swing spindle to the tool chain.

The Maintenance Mechanic will be positioned inside the machining area for tool setups and alignment checks. An Electrician will enter the tool changer commands at the Control Panel.

Communication regarding machine commands and machine movement is critical to the safety of personnel performing the alignment. Be constantly aware of the physical position of the machine and of the operations that will occur when commands are entered. The machining area floor surface is slippery; exercise caution when moving around inside the machine.

How your skills will be checked

The Skill Check will require you to align a G & L tool changer. All tools, materials, and resources will be available. The Evaluator will verify that your demonstration meets the skill objective by observing or measuring each task standard. You must demonstrate safe work practices during the Skill Check. Contact your Evaluator when you are ready for the Skill Check.



Skill Objective

Given two alignment tools, align the G & L tool changer.

Task Standards

1. Tool changer must change tools without jerking or binding.
2. When checked with a straightedge, the spindle alignment tool turned diameter must be parallel with the exchange arm alignment tool turned diameter.
3. When checked with a straightedge, the swing spindle alignment tool turned diameter must be parallel with the exchange arm alignment tool turned diameter.
4. When checked with a straightedge, the swing spindle alignment tool turned diameter must be parallel with the tool chain alignment tool turned diameter.

What You Will Need

This section contains the safety information, tools, and resources you will need before aligning a G & L tool changer.

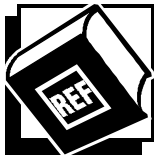
SAFETY FIRST

**DON'T TAKE
CHANCES**

- Follow all Caterpillar facility safety standards when performing this task.
- You will be inside the machining area, close to the spindle. Check for adequate head clearance.
- The machining area table surface is slippery; exercise caution to avoid injury from falls.
- Communicate clearly with coworkers when performing the alignment procedure. It is important that personnel be able to predict machine movement.
- The machine must be placed in the SETUP mode during the alignment procedure.



- two alignment tools (with the same turned diameters)
- shim stock
- access to a surface grinder
- straightedge or gauge block



- G & L General Instruction and Repair Parts Manual



Task Steps

Align Tool Changer (G & L)

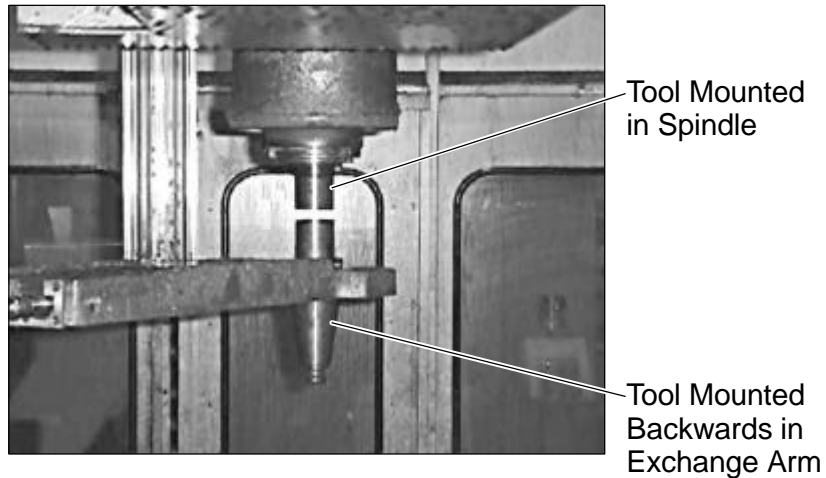
1. Obtain the required materials for the alignment procedure.
 - Get two alignment tools with the same turned diameters, a straightedge (or gauge block), and a piece of shim stock.
2. Ask an Electrician to assist with the alignment procedure.
 - The Electrician will enter machine commands, as needed, for machine movements. Spindle, swing spindle, exchange arm, and tool chain movement is required to align the tool changer.

Warning: Communication between personnel is critical for the safe performance of this procedure. Be constantly aware of the physical position of the machine and the motions that will occur when a command is entered at the control panel.

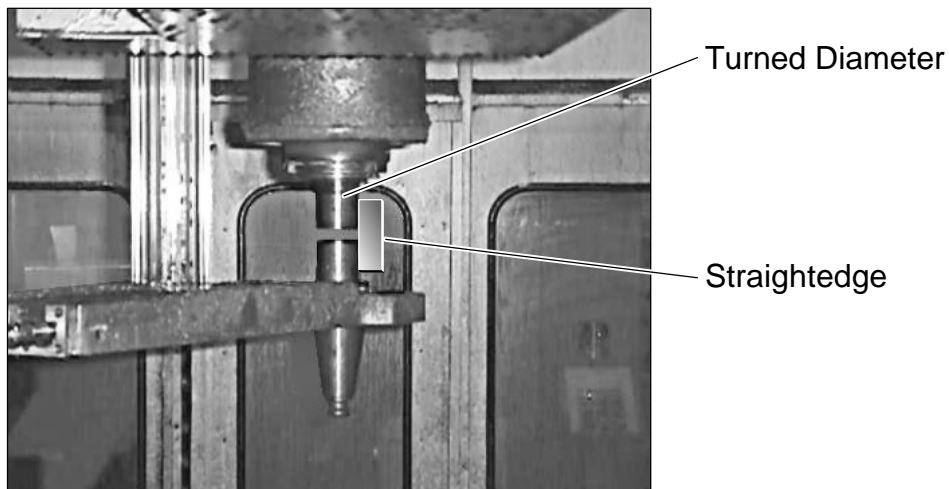
3. Align the exchange arm to the spindle.
 - Ask the Electrician to extend the exchange arm all the way down.

Warning: You will be working inside the machining area during tool changer alignment. The floor surfaces are slippery; exercise caution to avoid falls.

- Chuck one alignment tool in the spindle; chuck the second alignment tool backwards in one end of the exchange arm. See the figure below.



- Ask the Electrician to rotate the exchange arm.
- Hold a straightedge or gauge block against the two turned diameters to check for parallelism. Observe for a gap between the straightedge and diameters. See the figure below for the parallelism check.



- Use the table below as a guide for aligning the spindle to the exchange arm.

IF:	THEN:
Turned diameters are parallel	The end of the exchange arm that is being checked is aligned with the spindle.
Turned diameters are not parallel	Adjust the eccentric knobs in the exchange arm: <ol style="list-style-type: none"> 1. Locate the two eccentric knobs in the exchange arm. 2. Rotate the knobs until the turned diameters are parallel. 3. Check the surfaces again to see if they are parallel.

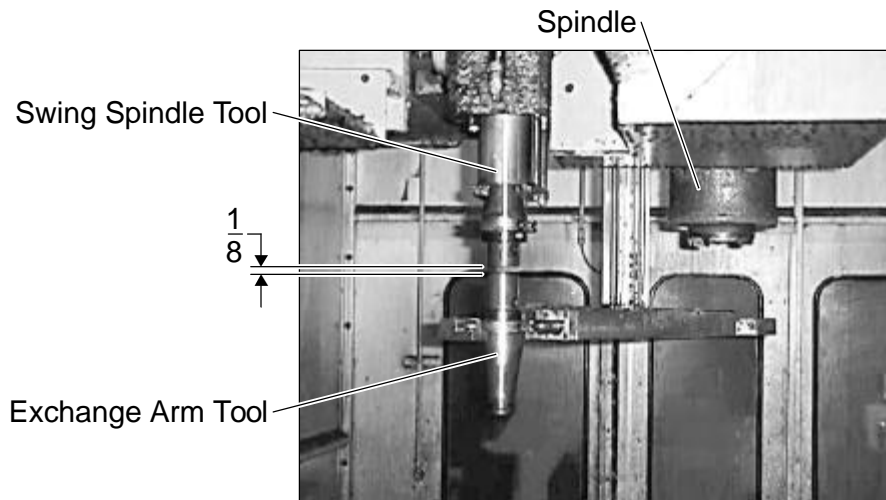
Exchange Arm to Spindle Alignment

- Ask the Electrician to rotate the exchange arm so that you can align the other end.
 - Remove the alignment tool and chuck it in the other end of the exchange arm. Repeat the alignment check, as outlined in the table above, for the other end of the exchange arm.
4. Align the swing spindle to the exchange arm.

Warning: Be aware of the physical position of the exchange arm during machine movement.

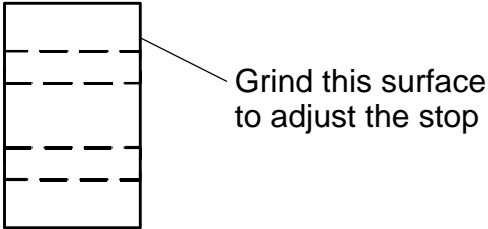
- Ask the Electrician to extend the exchange arm all the way down.
- Chuck a alignment tool in the swing spindle.
- Chuck a alignment tool backwards in the exchange arm.

- Ask the Electrician to rotate the exchange arm. Position the swing spindle tool and exchange arm alignment tool approximately 1/8" apart. See the figure below.



- Check the parallelism of the two turned diameters. Use the “straightedge” technique described in step 3.

- Use the following guide to align the swing spindle to the exchange arm.

IF:	THEN:
Turned diameters are parallel	The swing spindle arm is aligned to the exchange.
Swing spindle under-travels (swings short of parallel)	<ol style="list-style-type: none"> 1. Remove the block. 2. Grind the block surface as shown.  <ol style="list-style-type: none"> 3. Install the block and check again for parallelism. 4. Repeat steps 1-3, as necessary.
Swing spindle over-travels (swings past parallel)	<ol style="list-style-type: none"> 1. Place shim stock between the stop block and the machine. 2. Check the surfaces again to see if they are parallel. 3. Readjust shim stock as necessary.

Swing Spindle to Exchange Arm Alignment

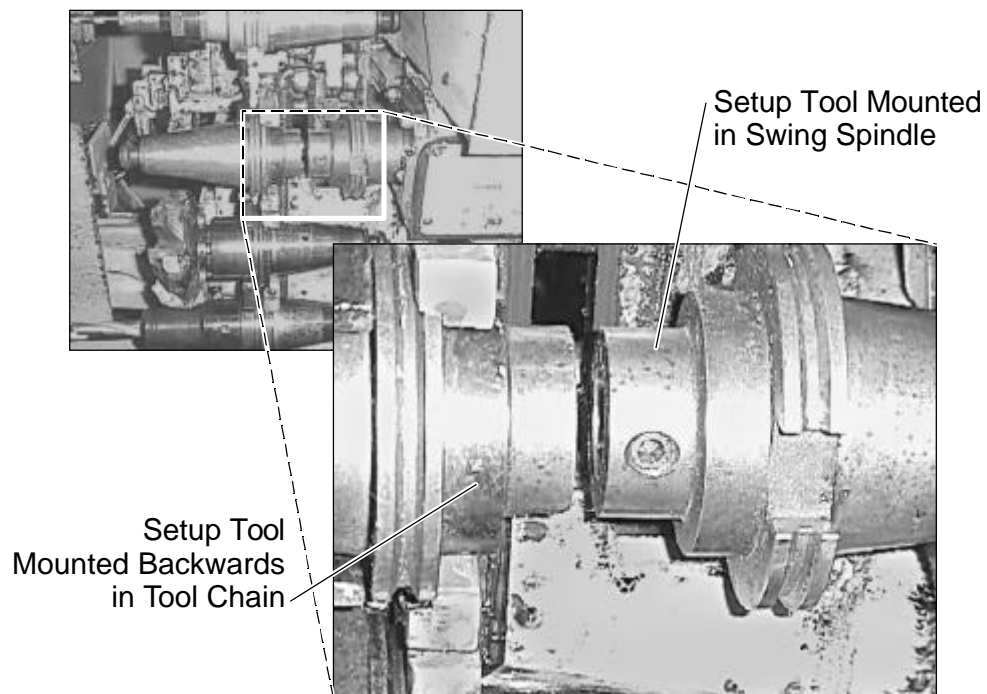
5. Align the swing spindle to the tool chain.

- Swing spindle to tool chain alignment requires two alignment checks: vertical alignment of swing spindle, and alignment of the chain to the swing spindle.

Vertical Alignment:

- Ask the Electrician to select a tool pocket, retract the swing spindle, and move to the tool change position.

- Chuck one alignment tool in the swing spindle.
- Chuck the other alignment tool backwards in the tool chain. See the figure below.



- Using a straightedge, check the parallelism of the two turned diameters. Use the table below as a guide for aligning the swing spindle to the tool chain.

IF:	THEN:
Turned diameters are parallel	The swing spindle is aligned to the tool chain.
Swing spindle under-travels (swings short of parallel)	<ol style="list-style-type: none"> 1. Remove the stop block. 2. Grind the stop block as shown. <div style="text-align: center;"> <p style="text-align: right;">Grind this surface to adjust the stop</p> </div> <ol style="list-style-type: none"> 3. Install the block and recheck alignment. 4. Repeat steps 1-3, as necessary.
Swing spindle over-travels (swings past parallel)	<ol style="list-style-type: none"> 1. Place shim stock between the stop block and the machine. 2. Check the surfaces again to see if they are parallel. 3. Readjust shim stock as necessary.

Swing Spindle to Tool Chain Alignment

- Leave the tool setup in place for the tool chain to swing spindle alignment check.

Alignment of Tool Chain to Swing Spindle

- Using a straightedge, check the parallelism of the two turned diameters. Ask the Electrician to adjust the tool chain position if the turned diameters are not parallel.
 - Recheck for parallelism.
 - Ask the Electrician to enter new constants for the chain position.
6. Test the machine.
- Remove both alignment tools.
 - Ask the Electrician to perform several tool changes.
 - Listen and observe for smooth operation when the:
 - a. chain brings the tool around to the swing spindle position.
 - b. swing spindle takes the tool from the tool chain.
 - c. swing spindle moves to the exchange arm position.
 - d. exchange arm removes the tool from the swing spindle.
 - e. exchange arm moves the tool to the spindle.
 - Realign components, as necessary.
7. Store alignment tools in designated area.
8. Document work history.



Concept Check

Align Tool Changer (G & L)

Answer the following questions to check your understanding of tool changer alignment. Circle the correct answer in each question. Then compare your responses with the answers at the bottom of this page. Some of the questions may have more than one correct answer. If you have difficulty answering a question, review the Skill Development Guide or ask your Trainer for assistance.

1. When performing the alignment procedure, the OFF-TEST-ON-SETUP switch must be in the _____ position.
 - a. OFF
 - b. TEST
 - c. ON
 - d. SETUP
2. The _____ must be aligned to the exchange arm.
 - a. spindle
 - b. swing spindle
 - c. tool chain
3. The _____ must be aligned to the tool chain.
 - a. spindle
 - b. swing spindle
 - c. tool chain

Answers: (1. d 2. b. 3. b)

Next Step

If you are ready to demonstrate the task now, ask your Evaluator or Trainer to schedule the Skill Check. However, if you need to practice some of the steps first, continue to the next section.



Practice

The following practice will help prepare you for the Skill Check. Ask your Trainer to set up the practice for you. After you complete a practice, ask your Trainer to check your work.

Practice

Your Trainer will ask you to align a G & L tool changer. An Electrician will be available to assist with the entering machine commands, as needed. When practicing the alignment, be aware of the safety considerations: slippery surfaces, head clearance, and the necessity to communicate with coworkers regarding machine movement.

During this practice you will:

- obtain the necessary equipment.
- align the exchange arm to the spindle arm.
- align the swing spindle to the exchange arm.
- align the swing spindle to the tool chain.
- test tool changer operation.

Practice Objective

The tool changer must change tools without jerking or binding. When checked with a straightedge, the spindle alignment tool turned diameter must be parallel with the exchange arm alignment tool turned diameter; the swing spindle alignment tool turned diameter must be parallel with the exchange arm alignment tool turned diameter; the swing spindle alignment tool turned diameter must be parallel with the tool chain alignment tool turned diameter. All the safe practices associated with aligning a tool changer must be demonstrated.

Next Step

Continue to practice until you are ready for the Skill Check. When you are ready to demonstrate the task, ask your Evaluator or Trainer to schedule the Skill Check.

