

OWNER'S GUIDE

1100MX AUTOMATIC TOOL CHANGER (ATC)

TECHNICAL DOCUMENT

1.1 PURPOSE

This document gives instructions on installing and using an Automatic Tool Changer (ATC) for 1100MX.

1.2 PRODUCT INFORMATION

Product: Automatic Tool Changer (ATC) for 1100MX (PN 39289)

The Automatic Tool Changer (ATC) holds up to 12 tools in a single tray. If your program requires more tools, the ATC changes tools automatically for all tools assigned to the tray, and pauses for a manual tool change for all tools not assigned to the tray.

Quantity	Description
1	ATC Assembly
3	Fixed Standoff Assembly (PN 35832)
10	Plastic Screw (PN 32173)
1	Tilt Standoff Assembly (PN 35911)



Note: If any of these items are missing, we can help. Email support@tormach.com to contact Tormach Technical Support for guidance on how to proceed.

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2.1 SETUP

Complete the following steps in the order listed:

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2.1.2 Air Requirements	3
2.1.3 Prepare the Machine	3
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2.1.1 Required Tools

This procedure requires the following tools. Collect them before you begin.

Required Tools for Installation

- 1-1/2 in. adjustable wrench
- 16 mm and 19 mm open-ended wrench
- Marker
- Metric hex wrench set
- Phillips screwdriver
- Small, flat-head screwdriver
- Snips
- Socket wrench, 13 mm socket, and (optionally) an extender

Required Tools for Verification

- BT30 tool holder (for alignment rod)
- Machinist's square, between 6 in. and 9 in. (152 mm and 229 mm)
- Straight rod (for BT30 tool holder), between 8 in. and 12 in. (203 mm and 305 mm)

2.1.2 Air Requirements

You must verify that the site conforms to the following air supply requirements.

- **Air Pressure** Between 90 psi and 120 psi (620 kPa to 825 kPa).
If the air supply is more than 120 psi (825 kPa), you must use a regulator.
- **Dry Air** We recommend using a compressed air dryer, desiccator, or filter between the air compressor and the machine.
- **Lubricated Air** You must lubricate the air with air tool oil. Use the [FRL Filter-Regulator-Lubricator \(PN 32457\)](#) or similar for this purpose.

2.1.3 Prepare the Machine

1. If there's a tool holder in the spindle, remove it.
2. Remove any accessories or fixtures from the machine table.
3. Center the machine table: from the PathPilot interface, in the **MDI Line** DRO field, type the command for your machine's center position, as detailed in the following table. Then select the **Enter** key.

Machine	Command
1100M and 1100MX	G20 G53 G1 X9 Y-5.5 Z0 F20
770M, 770MX, and PCNC 770	G20 G53 G1 X7 Y-3.75 Z0 F20
PCNC 440	G20 G53 G1 X5 Y-3.125 Z0 F20
PCNC 1100	G20 G53 G1 X9 Y-4.75 Z0 F20

 **WARNING!** Electrical Shock Hazard: You must power off the machine before making any electrical connections. If you don't, there's a risk of electrocution or shock.

4. Power off the machine and the PathPilot controller.
 - a. Push in the Emergency Stop button on the operator box, which removes power to motion control.
 - b. From the PathPilot interface, select **Exit**.
 - c. Turn the Main Disconnect switch to **OFF** on the side of the electrical cabinet.

2.1.4 Install the Automatic Tool Changer (ATC)

Complete the following steps in the order listed:

Disassemble the Power Drawbar Button	3
Install the Air Cylinder	4
Mount the Automatic Tool Changer (ATC) Bracket	4
Install the Main Assembly	5
Level the Automatic Tool Changer (ATC)	5
Make Air Connections	8
Make Electrical Connections	8
Verify the Installation	8

Disassemble the Power Drawbar Button

1. Disconnect the shop air supply from the machine.
2. Remove four M5 × 0.8 - 10 mm button head cap screws that secure the Power Drawbar button cover.

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3. Disconnect the air lines from the Retract and Extend ports on the Power Drawbar.

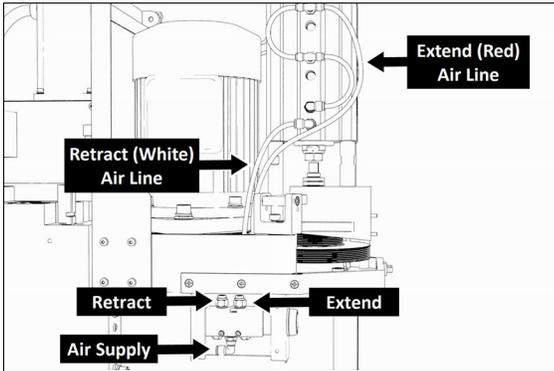


Figure 2-1: Power Drawbar air line routing.

4. Disconnect the air line from the Air Supply port on the Power Drawbar button.
5. Remove two M4 × 0.7 - 50 mm socket head cap screws that secure the Power Drawbar button to the spindle head. Then, cut the cable ties that secure the air lines together.
6. Remove the Power Drawbar button from the spindle head.

Install the Air Cylinder

1. Attach the air cylinder on to the ATC main assembly.

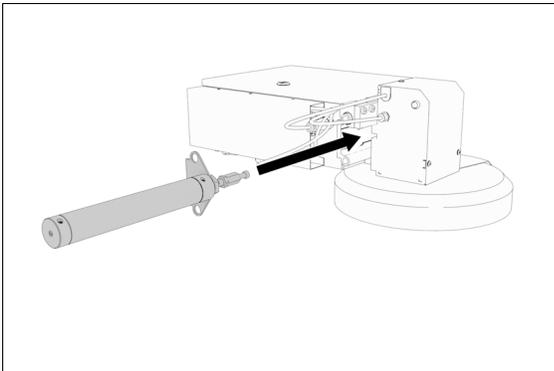


Figure 2-2: Putting the air cylinder into the ATC main assembly.

2. Secure the air cylinder to the ATC main assembly with a 12 mm hex wrench (provided) and two M14 × 20 mm socket head cap screws.

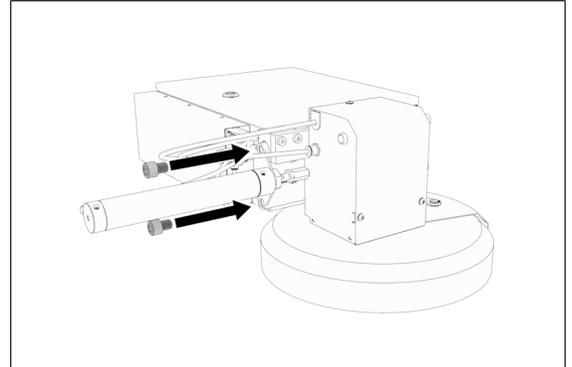


Figure 2-3: Putting the air cylinder hardware into the air cylinder.

3. Connect the air lines from the ATC main assembly to the air cylinder as follows:
 - Connect the short air line to the front of the cylinder.
 - Connect the long air line to the back of the cylinder.

Mount the Automatic Tool Changer (ATC) Bracket

1. Identify the four provided standoffs that are used to mount the ATC to the Z-column:
 - Three fixed standoffs
 - One tilt standoff
2. Remove the flange nuts and the washers from the standoffs, and then set them aside.
3. Identify and remove the four set screws on the Z-column with a flat-blade screwdriver.
4. Install the four standoffs on the Z-column as shown in the following image.

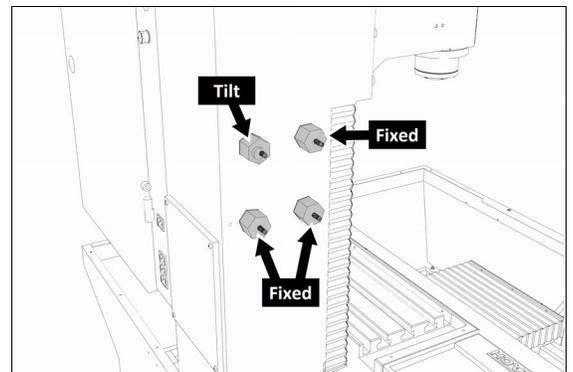


Figure 2-4: Four standoffs installed on the Z-column.

5. Securely tighten the standoffs on the Z-column with a 1-1/2 in. adjustable wrench.

- Put the ATC mounting bracket on the standoff's threaded studs as shown in the following image.

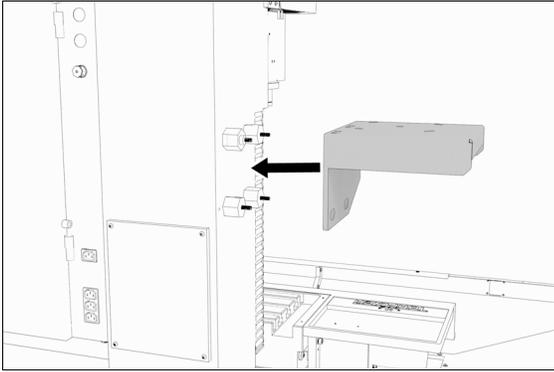


Figure 2-5: ATC mounting bracket moving on to the four standoffs.



Note: Make sure that the tilt standoff's eccentric cam fits into the large slot on the ATC mounting bracket.

- Secure the bracket by reinstalling the washers and flange nuts that you removed in Step 2 with a 13 mm socket.
- Pull the bracket toward the front of the machine. You'll make adjustments to the location of the bracket later in this procedure, but we recommend starting with it moved forward.

Install the Main Assembly

- Remove the four provided M8 × 1.25 - 16 mm socket head cap screws and washers from the bottom of the ATC electrical cabinet. Then, set all aside for later use.



CAUTION! Team Lift Required: You must have the aid of more than one person to lift and move the object. The object is heavy, and lifting it by yourself can cause serious injury.

- Lift the ATC main assembly on to the mounting bracket.

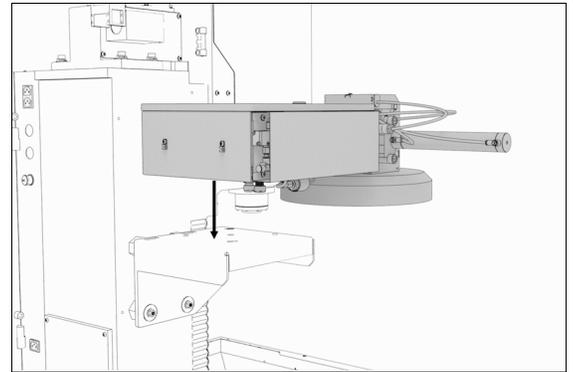


Figure 2-6: ATC main assembly positioned above the mounting bracket.

- Align the locating pin on the ATC main assembly with the matching hole in the mounting bracket.
- Secure the ATC main assembly to the mounting bracket with the four M8 × 1.25 - 16 mm socket head cap screws and washers that you set aside in Step 1.

Level the Automatic Tool Changer (ATC)

This section gives instructions to roughly level the ATC on the machine by using a long, straight rod. More adjustments are made later in the installation procedure.

NOTICE! After the initial installation, you must level the ATC. If you don't, there's a risk of machine damage.

Complete the following steps in the order listed:

Prepare the Machine	5
Examine Perpendicularity in the Y Direction	6
Examine Perpendicularity in the X Direction	6
Examine the Alignment of the Carousel Door Opening	7

Prepare the Machine

- Push the tool tray toward the spindle.

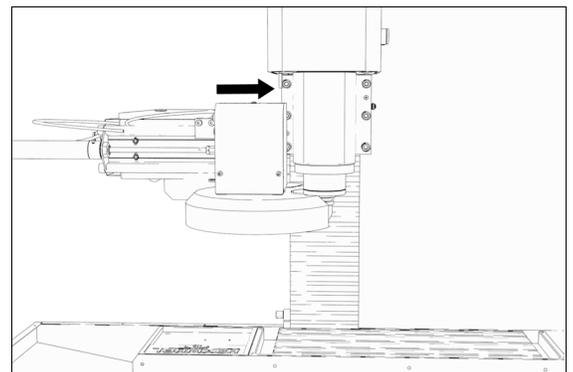


Figure 2-7: Tool tray moved in toward the spindle.

2. Make sure that the linear bearing on the ATC is flush with the ATC main assembly.

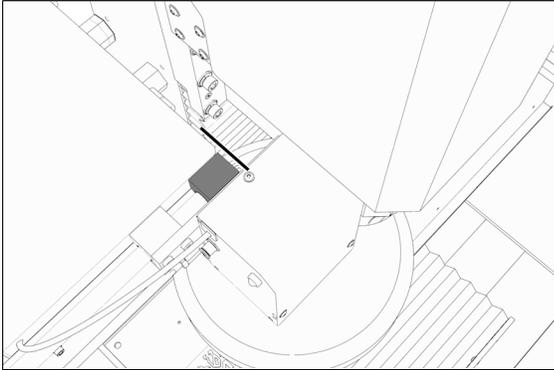


Figure 2-8: Linear bearing flush with the ATC main assembly.

3. Find a straight rod between 8 in. and 12 in. (203 mm and 305 mm) long. Verify that it's straight: roll it on a known flat surface (like a granite surface plate).



Note: You'll use the rod to verify that the ATC is correctly installed on the mill, so it must be straight.

4. Put the alignment rod into a tool holder.
5. Put the tool holder into the fork so that the groove in the tool holder slides into the fork, and so that the drive slot aligns with the dog. Don't rest the tool holder on top of the fork.
6. Put a machinist's square on the machine table.

Examine Perpendicularity in the Y Direction

1. Make sure that the rod is perpendicular to the machine table in the Y direction: compare the rod's position to the vertical edge of the machinist's square.
 - If the rod is perpendicular to the vertical edge of the machinist's square, go to "Examine Perpendicularity in the X Direction" (below).
 - If the rod must be adjusted, go to Step 2.
2. Loosen the flange nuts on the standoffs.

3. Turn the tilt standoff with an adjustable wrench, and slowly pivot the ATC until the rod is perpendicular to the vertical edge of the machinist's square.

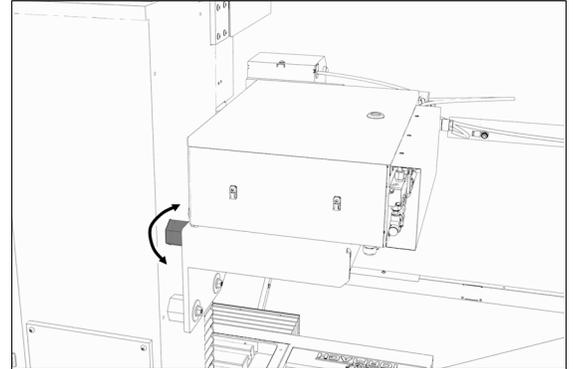


Figure 2-9: Tilt standoff.

4. Tighten the flange nuts with a 13 mm socket.
5. Reexamine the alignment of the ATC in the Y direction. If the rod isn't perpendicular to the vertical edge of the machinist's square, repeat Steps 2 through 5.

Examine Perpendicularity in the X Direction

1. Make sure that the rod is perpendicular to the machine table in the X direction: compare the rod's position to the vertical edge of the machinist's square.
 - If the rod is perpendicular to the vertical edge of the machinist's square, go to "Examine the Alignment of the Carousel Door Opening" (on the next page).
 - If the rod must be adjusted, go to Step 2.
2. Loosen the two socket head cap screws on the linear rails.

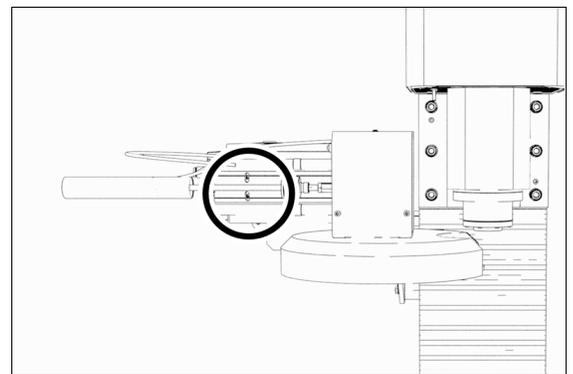


Figure 2-10: Socket head cap screws on the linear rails.

3. Slowly pivot the linear rails up or down until the rod is perpendicular to the vertical edge of the machinist's square.
4. Tighten the socket head cap screws.

5. Reexamine the alignment of the ATC in the X direction. If the rod isn't perpendicular to the vertical edge of the machinist's square, repeat Steps 2 through 5.

Examine the Alignment of the Carousel Door Opening

1. Remove the tool holder from the fork, and then set it aside.



Note: You'll need this tool later in the installation procedure to make further alignments.

2. Power on the machine and the PathPilot controller.
 - a. Turn the Main Disconnect switch to **ON** on the side of the electrical cabinet.
 - b. Twist out the Emergency Stop button on the operator box, which enables movement to the machine axes and the spindle.
 - c. Press the Reset button on the operator box.
 - d. Bring the machine out of reset and reference it.
3. Verify that the ATC is all the way forward (toward the spindle), and then slowly move the Z-axis down (-Z) to examine the clearance of the carousel door opening.
4. Make sure that the carousel door opening is approximately equal to the front back and left of the spindle mounting flange:
 - If it is, go to Step 8.

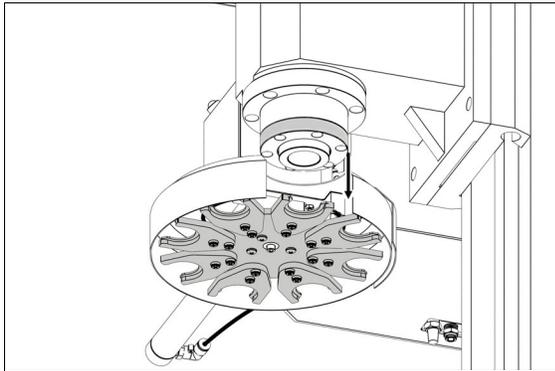


Figure 2-11: Distance between the carousel door opening and the spindle mounting flange.

- If it's not, go to Step 5.

5. Loosen the four socket head cap screws that secure the ATC main assembly to the mounting bracket with a 6 mm hex wrench.

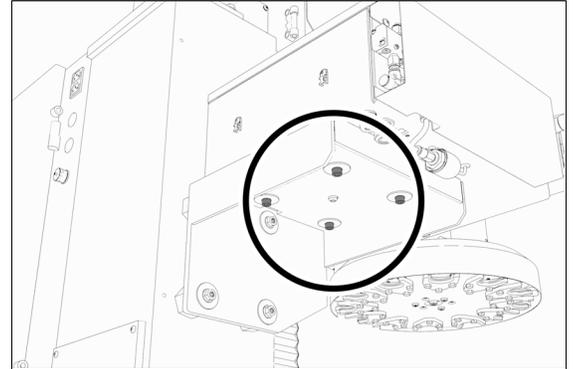


Figure 2-12: Socket head cap screws securing the ATC main assembly to the mounting bracket.

6. Adjust the carousel door opening as required:
 - **If the Carousel Door Opening is Contacting the Front**
Pivot the ATC around the locating pin on the bottom of the mounting bracket toward the front of the machine (closer to you).
 - **If the Carousel Door Opening is Contacting the Back**
Pivot the ATC around the locating pin on the bottom of the mounting bracket toward the back of the machine (closer to the machine column).
 - **If the Carousel Door Opening is Contacting the Left**
Loosen the four flange nuts that attach the mounting bracket to the column to move the bracket forward or backward.



Note: Moving the ATC mounting bracket could change the position of the tilt standoff (on the Z-column). If you move it, you must verify that the ATC is still correctly installed; go to "Examine Perpendicularity in the Y Direction" (on the previous page).

Repeat this step as needed.

7. Tighten the socket head cap screws and the flange nuts (if you loosened them in Step 5).
8. Move the tool tray to its retracted position.

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- Center the machine table: from the PathPilot interface, in the **MDI Line DRO** field, type the command for your machine's center position, as detailed in the following table. Then select the **Enter** key.

Machine	Command
1100M and 1100MX	G20 G53 G1 X9 Y-5.5 Z0 F20
770M, 770MX, and PCNC 770	G20 G53 G1 X7 Y-3.75 Z0 F20
PCNC 440	G20 G53 G1 X5 Y-3.125 Z0 F20
PCNC 1100	G20 G53 G1 X9 Y-4.75 Z0 F20

- Power off the machine and the PathPilot controller.
 - Push in the Emergency Stop button on the operator box, which removes power to motion control.
 - From the PathPilot interface, select **Exit**.
 - Turn the Main Disconnect switch to **OFF** on the side of the electrical cabinet.

Make Air Connections

- Cut the cable tie that secures the ATC cables and plastic tubes together with snips.
- Route the loose ends of the two 1/4 in. plastic tubes connected to the ATC main assembly through the enclosure knockout, up the energy chain, and toward the Power Drawbar. Then, pull the air line from the FRL back through the energy chain.

WARNING! Crush Hazard: If the ATC isn't completely retracted, it could move once the air is reconnected. When you reconnect the air, you must keep your hands away from the ATC.

- Trim and connect the loose ends of the 1/4 in. plastic tubes in the following order:
 - Connect the Retract (PDB Bottom) airline to the bottom push-to-connect elbow on the Power Drawbar.
 - Connect the Advance (PDB Top) airline to the top push-to-connect elbow on the Power Drawbar
 - Connect the air supply line from the FRL to the air in port in the ATC main assembly, as shown in the following image.

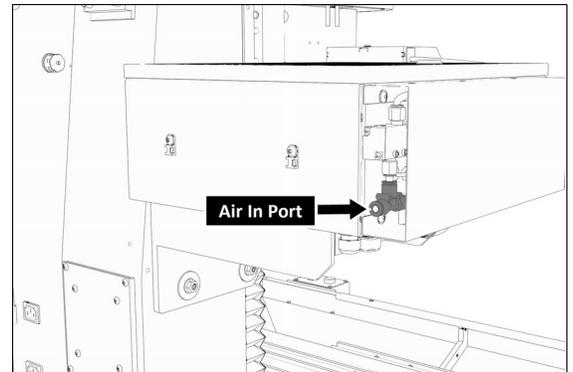


Figure 2-13: Air in port in the ATC main assembly.

- If you haven't already done so, connect your shop's air supply to the FRL.

Make Electrical Connections

- Route the ATC power cable and the USB cable toward the rear of the machine and out of one of the enclosure knockouts.
- Put the USB cable in the access hole in the rear of the stand toward the controller.
- Put the USB cable into any open USB port on the PathPilot controller.
- Connect the ATC power cable to the ATC Power connector on the side of the electrical cabinet (below the Enclosure Lights Power connectors).

Verify the Installation

- Power on the machine and the PathPilot controller.
 - Turn the Main Disconnect switch to **ON** on the side of the electrical cabinet.
 - Twist out the Emergency Stop button on the operator box, which enables movement to the machine axes and the spindle.
 - Press the Reset button on the operator box.
 - Bring the machine out of reset and reference it.

2. If you have not yet done so, you must make sure that the PathPilot controller is updated to the latest version of PathPilot.
3. From the PathPilot interface, on the **Settings** tab, select the **ATC** radio button.

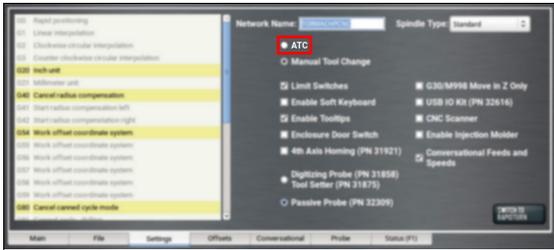


Figure 2-14: ATC radio button on the Settings tab.

The **ATC** tab appears in the PathPilot interface.



Note: If prompted, you may need to update the firmware for the ATC. Follow the on-screen instructions.

4. Load an empty tool holder into the spindle:
 - a. Push and hold the collet open button on the side of the ATC.
The collet opens.
 - b. Load a tool into the spindle.
 - c. Release the button.
The collet closes.
5. From the PathPilot interface, on the **Main** tab, in the **RPM DRO** field, type 1000. Then select the **Enter** key.
6. Select **FWD**.
The spindle starts.

7. From the **Status** tab, make sure that the **VFD Running** green light comes on.



Figure 2-15: VFD Running light on the Status tab.



Note: If the VFD Running light did not come on in Step 8, we can help. Email support@tormach.com to contact Tormach Technical Support for guidance on how to proceed.

8. Select **Stop**.
The spindle stops.

2.1.5 Make Final Alignments to the Automatic Tool Changer (ATC)

Complete the following steps in the order listed:

Adjust the Tool Alignment and Set the Tool Tray Height and Encoder Position 9

Adjust the Tool Alignment and Set the Tool Tray Height and Encoder Position

1. From the PathPilot interface, on the **ATC** tab, select **Ref Tool Tray**.

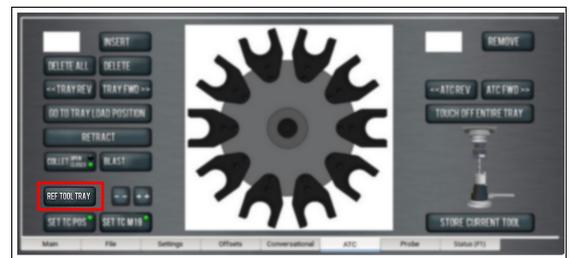


Figure 2-16: Ref Tool Tray button on the ATC tab.

The tool tray spins.



Note: You're only required to reference the tool tray once, unlike the mill axes' referencing procedure.

2. If you haven't already done so, load a tool into the spindle.
3. Manually rotate the spindle two revolutions by hand.
The encoder has now been oriented.

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4. Disconnect the air from the machine.
5. While manually advancing the tool tray toward the spindle, align the fork with the tool. Complete the following steps in the order listed:
 - a. Slowly jog the Z-axis up or down until the groove in the fork aligns with the groove in the tool holder.
 - b. Determine if the tray must move clockwise or counterclockwise to align the fork with the tool holder. From the PathPilot interface, in the **ATC** tab, either select **-** to step the tool tray counterclockwise or **++** to step the tool tray clockwise.
 - c. Fully seat the ATC to its tray load position, verifying that the tool and its drive dog slots are fully inserted into the fork.
6. Verify that, from the **Status** tab, the **ATC Tray In** LED is still illuminated.
If the LED isn't illuminated, examine the tool tray. It may have exceeded the Tray In sensor during adjustments in the previous step.
7. On the **ATC** tab, select **Set TC POS**.

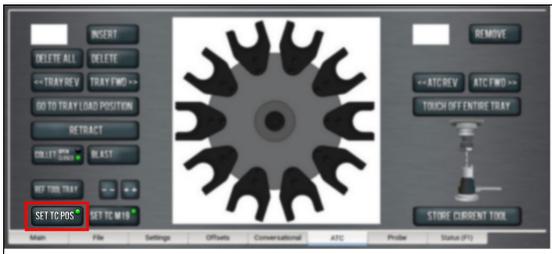


Figure 2-17: Set TC POS button on the ATC tab.

The tool change position has now been set.

8. Select **Set TC M19**. Then, in the dialog box that displays, select **OK**.



Figure 2-18: Confirmation dialog box to change the spindle's alignment position.

9. Follow the on-screen instructions to set the spindle's tool change rotation position:
 - a. Rotate the spindle clockwise in the fork by hand, and hold it in place. Then, select **OK**.
 - b. Rotate the spindle counterclockwise in the fork by hand, and hold in place. Then, select **OK**.
The tool change rotation position has now been set. In the dialog box that displays, select **OK**.
10. Manually move the ATC back to the retracted position.

WARNING! Crush Hazard: If the ATC isn't completely retracted, it could move once the air is reconnected. When you reconnect the air, you must keep your hands away from the ATC.

11. Reconnect the air.
12. Remove the tool from the spindle.
13. Move the Z-axis up: in the **MDI Line** DRO field, type `G20 G53 G1 Z0 F20`. Then select the **Enter** key.
14. On the **ATC** tab, select **Go To Tray Load Position**. Then, manually load a tool into the fork.
15. Orient the spindle: from the PathPilot interface, in the **MDI Line** DRO field, type `M19 R0 Q10`. Then select the **Enter** key.
16. Open the collet: on the ATC tab, select **Collet**, and wait until the LED toggles from **Closed** to **Open**.

Note: You must verify that the collet is open (and not just that the brake is engaged) before you continue.

17. Verify that the spindle is concentric with the tool: slowly jog the Z-axis down and, depending on the result, do one of the following:
 - **If the Spindle is Concentric with the Tool** You've completed the alignments.
 - **If Adjustments are Required** Go to Step 18.

18. Determine if the tray must move left or right. Use two wrenches to loosen the jam nut on the end of the cylinder rod, making sure that you don't spin the rod end when adjusting the jam nut. Then, either turn the rod end one-half turn further on to the cylinder rod to move the tool tray to the left, or turn it one-half turn off of the cylinder rod to move the tool tray to the right. Once finished, tighten the jam nut.

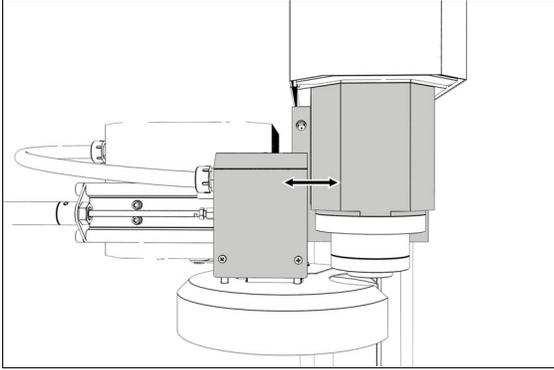


Figure 2-19: Moving the tool tray left or right.



Note: Don't move the tool tray more than 0.100 in. in either direction (left or right). If you do, the tool tray will exceed the Tray In sensor, which affects how ATC operations are communicated to PathPilot.

19. Adjust for the ATC's backlash: apply light pressure forward and backward on the carousel; then, from the PathPilot interface, on the **ATC** tab, select ++ or -- until there's equal space on the front and the back of the BT30 taper.
20. Verify that, from the **Status** tab, the **ATC Tray In** LED is still illuminated.
If the LED isn't illuminated, examine the tool tray. It may have exceeded the Tray In sensor during adjustments in the previous step.
21. Repeat adjustments until the tool's shank is concentric with the collet in the spindle.
22. Move the Z-axis up: in the **MDI Line DRO** field, type `G20 G53 G1 Z0 F20`. Then select the **Enter** key.
23. Remove the tool from the ATC. Then, select **Retract**.

3.1 OPERATION

Note: Make sure that there's always a tool holder in the collet while the machine is not in use. Retracting the Power Drawbar to the clamped position with no tool holder in the collet will eventually fatigue the collet, and may shorten its service life. For more information, refer to the Power Drawbar documentation.

Read the following sections to understand how to operate the ATC:

- 3.1.1 Assign Tool Numbers 12
- 3.1.2 Automatically Load a Tool into the Tool Tray 12
- 3.1.3 Automatically Unload a Tool From the Tool Tray 12
- 3.1.4 Load a Tool into the Spindle 12
- 3.1.5 Manually Unload a Tool From the Tool Tray 13
- 3.1.6 Retrieve a Tool From the Tool Tray 13
- 3.1.7 Switch to Manual Tool Changes 13

3.1.1 Assign Tool Numbers

- Use any tool number, from 1-1000, to assign a position in the tool tray.

3.1.2 Automatically Load a Tool into the Tool Tray

1. Load a tool into the spindle.
2. From the PathPilot interface, on the **ATC** tab, type the tool number in the **Tool DRO** field. Then select the **Enter** key.
3. Select **Store Current Tool**.



Figure 3-1: Store Current Tool button on the ATC tab.

The tool is assigned to the nearest open slot. The ATC fetches the tool from the spindle and stores the tool in the tray. When stored, the tool number displays on the tray image in the center of the screen.

4. Click **Retract**.

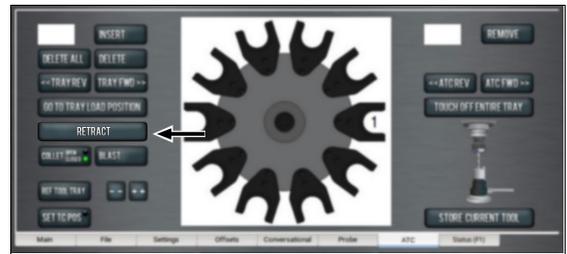


Figure 3-2: Retract button on the ATC tab.

The tray returns to the machining position.

3.1.3 Automatically Unload a Tool From the Tool Tray

Note: Typing a new tool number in the **Tool DRO** field doesn't remove the tool from its tray assignment.

1. From the PathPilot interface, on the **ATC** tab, type the tool number in the **Remove DRO** field. Then select the **Enter** key.



Figure 3-3: Remove DRO field on the ATC tab.

2. Select **Remove**.
The ATC fetches the tool from the tray.
3. Unload the tool from the spindle.
4. From the **ATC** tab, select **ATC FWD** or **ATC REV**.

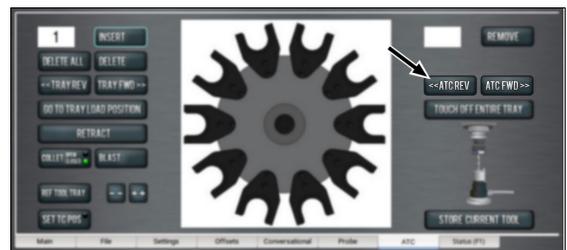


Figure 3-4: ATC REV and ATC FWD buttons on the ATC tab.

The tray moves to the next location and fetches another tool.

5. Select **Retract**.
The tray returns to the machining position.

3.1.4 Load a Tool into the Spindle

Load a tool into the spindle:

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1. Push and hold the collet open button on the side of the ATC.
The collet opens.
2. Load a tool into the spindle.
3. Release the button.
The collet closes.

3.1.5 Manually Unload a Tool From the Tool Tray

1. From the PathPilot interface, on the **ATC** tab, in the **Insert** DRO field, type the tool number. Then select the **Enter** key.
2. Select **Go To Tray Load Position**.
The spindle head moves up and the ATC moves into the door open position.
3. Select **Delete**.

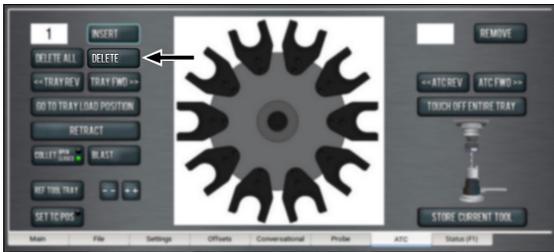


Figure 3-5: Delete button on the ATC tab.

The tool is unassigned from the tray and the tray moves to that tool.

4. Select **Tray FWD** or **Tray REV**.
The tray moves to the next slot location.
5. Select **Retract**.
The tray returns to the machining position.

3.1.6 Retrieve a Tool From the Tool Tray

- Depending on your workflow, do one of the following from the PathPilot interface:
 - Type the command directly into the **MDI Line** DRO field using the following format: **T[TOOL NUMBER] M06**
For example, T1 M06
 - Type the tool number in the **Tool** DRO field. Then select the **Enter** key.

3.1.7 Switch to Manual Tool Changes

- From the PathPilot interface, on the **Settings** tab, select the **Manual Tool Change** radio button.
The Automatic Tool Changer (ATC) is prevented from making tool changes.